SSA5085A
SSA5083A
Spectrum Analyzer

User Manual

EN02A

SIGLENT TECHNOLOGIES CO.,LTD

Contents

1 Copyright and Declaration

Copyright

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Declaration

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Product Certification

SIGLENT guarantees this product conforms to the national and industrial standards in China as well as the ISO9001: 2008 standard and the ISO14001: 2004 standard. Other international standard conformance certification is in progress.

2 Important Safety Information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

2.1 General Safety Summary

Carefully read the following safety precautions to avoid personal injury and prevent damage to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

To Avoid Fire or Personal Injury.

Use Proper Power Line.
Only use a local/state approved power cord for connecting the instrument to mains power sources.

Ground the Instrument.
The instrument grounds through the protective terra conductor of the power line. To avoid electric shock, the ground conductor must be connected to the earth. Make sure the instrument is grounded correctly before connect its input or output terminals.

Connect the Signal Wire Correctly.
The potential of the signal wire is equal to the earth, so do not connect the signal wire to a high voltage. Do not touch the exposed contacts or components.

Look over All Terminals' Ratings.
To avoid fire or electric shock, please look over all ratings and signed instructions of the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Equipment Maintenance and Service.
When the equipment fails, please do not dismantle the machine for maintenance. The equipment contains capacitors, power supply, transformers, and other energy storage devices, which may cause high voltage damage. The internal devices of the equipment are sensitive to static electricity, and direct contact is easy to cause irreparable damage to the equipment. It is necessary to return to the factory or the company's designated maintenance organization for maintenance.
Be sure to pull out the power supply when repairing the equipment. Live line operation is strictly prohibited. The equipment can only be powered on when the maintenance is completed and the maintenance is confirmed to be successful.

Identification of Normal State of Equipment.

After the equipment is started, there will be no alarm information and error information at the interface under normal conditions. The curve of the interface will scan from left to right freely; if there is a button in the scanning process or there is an alarm or error prompt, the device may be in an abnormal state. You need to view the specific prompt information. You can try to restart the setting. If the fault information is still in place, do not use it for testing. Contact the manufacturer or the maintenance department designated by the manufacturer to carry out maintenance to avoid the wrong test data caused by the use of the fault or endanger the personal safety.

Not Operate with Suspected Failures.

If you suspect that there is damage to the instrument, please let qualified service personnel check it.

Avoid Circuit or Wire Exposed Components Exposed.

Do not touch exposed contacts or components when the power is on.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep the surface of the instrument clean and dry.

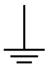
Not to use the equipment for measurements on mains circuits, not to use the equipment for measurements on voltage exceed the voltage range describe in the manual. The maximum additional transient voltage cannot exceed 1300V.

The responsible body or operator should refer to the instruction manual to preserve the protection afforded by the equipment. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Any parts of the device and its accessories are not allowed to be changed or replaced, other than authorized by the manufacturer or agent.

2.2 Safety Terms and Symbols

When the following symbols or terms appear on the front or rear panel of the instrument or in this manual, they indicate special care in terms of safety.

	This symbol is used where caution is required. Refer to the accompanying information or documents to protect against personal injury or damage to the instrument.
	This symbol warns of a potential risk of shock hazard.
	This symbol is used to denote the measurement ground connection.
	This symbol is used to denote a safety ground connection.
	This symbol shows that the switch is an On/Standby switch. When it is pressed, the analyzer's state switches between Operation and Standby. This switch does not disconnect the device's power supply. To completely power off the analyzer, the power cord must be unplugged from the AC socket after the instrument is in the standby state.
	This symbol is used to represent alternating current, or "AC".
CAUTION	The "**CAUTION**" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which may be dangerous if not followed. Do not proceed until its conditions are fully understood and met.
WARNING	The "**WARNING**" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which, if not followed, could cause bodily injury or death. If a WARNING is indicated, do not proceed until the safety conditions are fully understood and met.

2.3 Working Environment

The design of the instrument has been verified to conform to EN 61010-1 safety standard per the following limits:

Environment

The instrument is used indoors and should be operated in a clean and dry environment with an ambient temperature range.

Note: Direct sunlight, electric heaters, and other heat sources should be considered when evaluating the ambient temperature.

	Warning: Do not operate the instrument in explosive, dusty, or humid environments.

Ambient Temperature

Operating: 0 ℃ to +50 ℃

Non-operation: -30 ℃ to +70 ℃

Note: Direct sunlight, radiators, and other heat sources should be taken into account when assessing the ambient temperature.

Humidity

Operating: 5% ~ 90 %RH, 30 ℃, derate to 50 %RH at 40 ℃

Non-operating: 5% ~ 95% RH

Mains supply voltage fluctuations

Refer to 2.5 Power and Ground Requirements

Altitude

Operating: ≤ 3,048 m, 25 ℃

Non-operating: ≤ 12,191 m

Installation (overvoltage) Category

This product is powered by mains conforming to installation (overvoltage) Category II.

Note: Installation (overvoltage) category I refers to situations where equipment measurement terminals are connected to the source circuit. In these terminals, precautions are done to limit the transient voltage to a correspondingly low level.

Installation (overvoltage) category II refers to the local power distribution level which applies to equipment connected to the AC line (AC power).

Degree of Pollution

The analyzers may be operated in environments of Pollution Degree II.

Note: Degree of Pollution II refers to a working environment that is dry and non-conductive pollution occurs. Occasional temporary conductivity caused by condensation is expected.

IP Rating

IP20 (as defined in IEC 60529).

2.4 Cooling Requirements

This instrument relies on the forced air cooling with internal fans and ventilation openings. Care must be taken to avoid restricting the airflow around the apertures (fan holes) at each side of the analyzer. To ensure adequate ventilation it is required to leave a 15 cm (6 inch) minimum gap around the sides of the instrument.

⚠	**CAUTION:** Do not block the ventilation holes located on both sides of the analyzer.
⚠	**CAUTION:** Do not allow any foreign matter to enter the analyzer through the ventilation holes, etc.

2.5 Power and Grounding Requirements

The instrument operates with a single-phase, 100 to 240 Vrms (+/-10%) AC power at 50/60 Hz (+/-5%), or single-phase 100 to 120 Vrms (+/-10%) AC power at 400 Hz (+/-5%).

No manual voltage selection is required because the instrument automatically adapts to line voltage.

Depending on the type and number of options and accessories (probes, PC port plug-in, etc.), the instrument can consume up to 193 W of power.

Note: The instrument automatically adapts to the AC line input within the following ranges:

Voltage Range:	90 - 264 Vrms	90 - 132 Vrms
Frequency Range:	47 - 63 Hz	380 - 420 Hz

The instrument includes a grounded cord set containing a molded three-terminal polarized plug and a standard IEC320 (Type C13) connector for making line voltage and safety ground connection. The AC inlet ground terminal is connected directly to the frame of the instrument. For adequate protection against electrical shock hazards, the power cord plug must be inserted into a mating AC outlet containing a safety ground contact. Use only the power cord specified for this instrument and certified for the country of use.

Warning: Electrical Shock Hazard!

Any interruption of the protective conductor inside or outside of the analyzer, or disconnection of the safety ground terminal creates a hazardous situation. Intentional interruption is prohibited.

The position of the instrument should allow easy access to the socket. To make the instrument completely power off, unplug the instrument power cord from the AC socket.

The power cord should be unplugged from the AC outlet if the analyzer is not to be used for an extended period.

CAUTION: The outer shells of the front panel terminals are connected to the instrument's chassis and therefore to the safety ground.

2.6 Cleaning

Clean only the exterior of the instrument, using a damp, soft cloth. Do not use chemicals or abrasive elements. Under no circumstances allow moisture to penetrate the instrument. To avoid electrical shock, unplug the power cord from the AC outlet before cleaning.

Warning: Electrical Shock Hazard!

No operator serviceable parts inside. Do not remove covers.

Refer servicing to qualified personnel

2.7 Abnormal Conditions

Do not operate the analyzer if there is any visible sign of damage or has been subjected to severe transport stresses.

If you suspect the analyzer's protection has been impaired, disconnect the power cord and secure the instrument against any unintended operation.

Proper use of the instrument depends on careful reading of all instructions and labels.

	Warning: Any use of the analyzer in a manner not specified by the manufacturer may impair the instrument's safety protection. This instrument should not be directly connected to human subjects or used for patient monitoring.

2.8 Safety Compliance

This section lists the safety standards with which the product complies.

U.S. nationally recognized testing laboratory listing

1. UL 61010-1:2012/R: 2018-11. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.
2. UL 61010-2-030:2018. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part2-030: Particular requirements for testing and measuring circuits.

Canadian certification

1. CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.
2. CAN/CSA-C22.2 No. 61010-2-030:2018. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular requirements for testing and measuring circuits.

Informations

essentielles sur la sécurité

Ce manuel contient des informations et des avertissements que les utilisateurs doivent suivre pour assurer la sécurité des opérations et maintenir les produits en sécurité.

Exigence de Sécurité

Lisez attentivement les précautions de sécurité ci - après afin d 'éviter les dommages corporels et de prévenir les dommages aux instruments et aux produits associés. Pour éviter les risques potentiels, utilisez les instruments prescrits.

Éviter l 'incendie ou les lésions corporelles.

Utilisez un cordon d'alimentation approprié.

N'utilisez que des cordons d'alimentation spécifiques aux instruments approuvés par les autorités locales.

Mettez l'instrument au sol.

L'instrument est mis à la Terre par un conducteur de mise à la terre de protection du cordon d'alimentation.Pour éviter un choc électrique, le conducteur de mise à la terre doit être mis à la terre.Assurez - vous que l'instrument est correctement mis à la terre avant de connecter les bornes d'entrée ou de sortie de l'instrument.

Connectez correctement le fil de signalisation.

Le potentiel de la ligne de signal est égal au potentiel au sol, donc ne connectez pas la ligne de signal à haute tension.Ne touchez pas les contacts ou les composants exposés.

Voir les cotes de tous les terminaux.

Pour éviter un incendie ou un choc électrique, vérifiez toutes les cotes et signez les instructions de l'instrument.Avant de brancher l'instrument, lisez attentivement ce manuel pour obtenir de plus amples renseignements sur les cotes.

Entretien du matériel.

En cas de défaillance de l'équipement, ne pas démonter et entretenir l'équipement sans autorisation. L'équipement contient des condensateurs, de l'alimentation électrique, des transformateurs et d'autres dispositifs de stockage d'énergie, ce qui peut causer des blessures à haute tension. Les dispositifs internes de l'équipement sont sensibles à l'électricité statique. Le contact direct peut facilement causer des blessures irrécupérables à l'équipement. L'équipement doit être retourné à l'usine ou à l'organisme de maintenance désigné par l'entreprise pour l'entretien. L'alimentation électrique doit être retirée pendant l'entretienLa ligne ne doit pas être mise sous tension tant que l'entretien de l'équipement n'est pas terminé et que l'entretien n'est pas confirmé.

Identification de l'état normal de l'équipement.

Après le démarrage de l'équipement, dans des conditions normales, il n'y aura pas d'information d'alarme et d'erreur au bas de l'interface, et la courbe de l'interface sera balayée librement de gauche à droite; si un blocage se produit pendant le processus de numérisation, ou si l'information d'alarme ou d'erreur apparaît au bas de l'interface, l'équipement peut être dans un état anormal. Pour voir l'information d'alarme spécifique, vous pouvez d'abord essayer de redémarrerSi l'information sur la défaillance est toujours présente, ne l'utilisez pas pour l'essai. Contactez le fabricant ou le Service de réparation désigné par le fabricant pour effectuer l'entretien afin d'éviter d'apporter des données d'essai erronées ou de mettre en danger la sécurité personnelle en raison de l'utilisation de la défaillance.

Ne pas fonctionner en cas de suspicion de défaillance.

Si vous soupçonnez des dommages à l'instrument, demandez à un technicien qualifié de vérifier.

L 'exposition du circuit ou de l' élément d 'exposition du fil est évitée.

Lorsque l 'alimentation est connectée, aucun contact ou élément nu n' est mis en contact.

Ne pas fonctionner dans des conditions humides / humides.

Pas dans un environnement explosif.

Maintenez la surface de l 'instrument propre et sec.

Le Circuit d 'alimentation électrique ne peut pas être mesuré à l' aide du dispositif, ni la tension qui dépasse la plage de tension décrite dans le présent manuel.

Seuls les ensembles de sondes conformes aux spécifications du fabricant peuvent être utilisés.

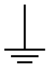
L'organisme ou l'opérateur responsable doit se référer au cahier des charges pour protéger la protection offerte par le matériel.La protection offerte par le matériel peut être compromise si celui - ci est utilisé de manière non spécifiée par le fabricant.

Aucune pièce du matériel et de ses annexes ne peut être remplacée ou remplacée sans l'autorisation de son fabricant.

Remplacer la batterie dans l 'appareil avec les mêmes spécifications de batterie au lithium.

Termes et symboles de sécurité

Lorsque les symboles ou termes suivants apparaissent sur le panneau avant ou arrière de l'instrument ou dans ce manuel, ils indiquent un soin particulier en termes de sécurité.

	Ce symbole est utilisé lorsque la prudence est requise. Reportez-vous aux informations ou documents joints afin de vous protéger contre les blessures ou les dommages à l'instrument.
	Ce symbole avertit d'un risque potentiel de choc électrique.
	Ce symbole est utilisé pour désigner la connexion de terre de mesure.
	Ce symbole est utilisé pour indiquer une connexion à la terre de sécurité.
	Ce symbole indique que l'interrupteur est un interrupteur marche / veille. Lorsqu'il est enfoncé, l'état de l'instruments bascule entre Fonctionnement et Veille. Ce commutateur ne déconnecte pas l'alimentation de l'appareil. Pour éteindre complètement l'instruments, le cordon d'alimentation doit être débranché de la prise secteur une fois l'instruments en état de veille.
	Ce symbole est utilisé pour représenter un courant alternatif, ou "AC".
CAUTION	Le symbole " **CAUTION**" indique un danger potentiel. Il attire l'attention sur une procédure, une pratique ou une condition qui peut être dangereuse si elle n'est pas suivie. Ne continuez pas tant que ses conditions n'ont pas été entièrement comprises et remplies.
WARNING	Le symbole " **WARNING**" indique un danger potentiel. Il attire l'attention sur une procédure, une pratique ou une condition qui, si elle n'est pas suivie, pourrait entraîner des blessures corporelles ou la mort. Si un AVERTISSEMENT est indiqué, ne continuez pas tant que les conditions de sécurité ne sont pas entièrement comprises et remplies.

Environnement de travail

La conception de l'instrument a été certifiée conforme à la norme EN 61010-1, sur la base des valeurs limites suivantes:

Environnement

L'instrument doit être utilisé à l'intérieur dans un environnement propre et sec dans la plage de température ambiante.

Note: la lumière directe du soleil, les réchauffeurs électriques et d'autres sources de chaleur doivent être pris en considération lors de l'évaluation de la température ambiante.

	Attention: ne pas utiliser l'instrument dans l'air explosif, poussiéreux ou humide.

Température ambiante

En fonctionnement: 0 ℃ à +50 ℃

Hors fonctionnement: -30 ℃ à +70 ℃

Note: pour évaluer la température de l'environnement, il convient de tenir compte des rayonnements solaires directs, des radiateurs thermiques et d'autres sources de chaleur.

Humidité

Fonctionnement: 5% ~ 90% HR, 30 °C, 40 °C réduit à 50% HRHors fonctionnement: 5% ~ 95%, 65 ℃, 24 heures

Fluctuation de la tension d'alimentation

Voir connexions d'alimentation et au sol

Altitude

Fonctionnement: ≤ 3000 m

À l'arrêt: ≤ 12,191 m

Catégorie d 'installation (surtension)

Ce produit est alimenté par une alimentation électrique conforme à l 'installation (surtension) Catégorie II.

Installation (overvoltage) Category Definitions Définition de catégorie d 'installation (surtension)

La catégorie II d'installation (surtension) est un niveau de signal applicable aux terminaux de mesure d' équipement reliés au circuit source.Dans ces bornes, des mesures préventives sont prises pour limiter la tension transitoire à un niveau inférieur correspondant.

La catégorie II d'installation (surtension) désigne le niveau local de distribution d 'énergie d' un équipement conçu pour accéder à un circuit alternatif (alimentation alternative).

Degré de pollution

Un instruments peut être utilisé dans un environnement Pollution Degree II.

Note: Pollution Degree II signifie que le milieu de travail est sec et qu'il y a une pollution non conductrice.Parfois, la condensation produit une conductivité temporaire.

IP Rating

IP20 (as defined in IEC 60529).

Exigences de refroidissement

Cet instrument repose sur un refroidissement à air forcé avec des ventilateurs internes et des ouvertures de ventilation. Des précautions doivent être prises pour éviter de restreindre le flux d'air autour des ouvertures (trous de ventilateur) de chaque côté de la lunette. Pour assurer une ventilation adéquate, il est nécessaire de laisser un espace minimum de 15 cm (6 pouces) sur les côtés de l'instrument.

⚠	**ATTENTION:** Ne bloquez pas les trous de ventilation situés des deux côtés de la lunette.
⚠	**ATTENTION:** Ne laissez aucun corps étranger pénétrer dans la lunette par les trous de ventilation, etc.

Connexions d'alimentation et de terre

L'instrument fonctionne avec une alimentation CA monophasée de 100 à 240 Vrms (+/- 10%) à 50/60 Hz (+/- 5%), ou monophasée 100 - 120 Vrms (+/-10 %)   Alimentation CA à 400 Hz (+/-5%).
Aucune sélection manuelle de la tension n'est requise car l'instrument s'adapte automatiquement à la tension de ligne.

Selon le type et le nombre d'options et d'accessoires (sondes, plug-in de port PC, etc.), l'instrument peut consommer jusqu'à 193 W d'énergie.
Remarque: l'instrument s'adapte automatiquement à l'entrée de ligne CA dans les plages suivantes:

Plage de tension:	90 - 264 Vrms	90 - 132 Vrms
Gamme de fréquences:	47 - 63 Hz	380 - 420 Hz

L'instrument comprend un jeu de cordons mis à la terre contenant une fiche polarisée à trois bornes moulée et un connecteur standard IEC320 (Type C13) pour établir la tension de ligne et la connexion de mise à la terre de sécurité. La borne de mise à la terre de l'entrée CA est directement connectée au châssis de l'instrument. Pour une protection adéquate contre les risques d'électrocution, la fiche du cordon d'alimentation doit être insérée dans une prise secteur correspondante contenant un contact de sécurité avec la terre. Utilisez uniquement le cordon d'alimentation spécifié pour cet instrument et certifié pour le pays d'utilisation.

Avertissement: risque de choc électrique!

Toute interruption du conducteur de terre de protection à l'intérieur ou à l'extérieur de la portée ou la déconnexion de la borne de terre de sécurité crée une situation dangereuse.

L'interruption intentionnelle est interdite.

La position de l'instruments doit permettre un accès facile à la prise. Pour éteindre complètement l'instruments, débranchez le cordon d'alimentation de l'instrument de la prise secteur.

Le cordon d'alimentation doit être débranché de la prise secteur si la lunette ne doit pas être utilisée pendant une période prolongée.

ATTENTION: les enveloppes extérieures des bornes du panneau avant sont connectées au châssis de l'instrument et donc à la terre de sécurité.

Nettoyage

Nettoyez uniquement l'extérieur de l'instrument à l'aide d'un chiffon doux et humide. N'utilisez pas de produits chimiques ou d'éléments abrasifs. Ne laissez en aucun cas l'humidité pénétrer dans l'instrument. Pour éviter les chocs électriques, débranchez le cordon d'alimentation de la prise secteur avant de le nettoyer.

Avertissement: risque de choc électrique!

Aucune pièce réparable par l'opérateur à l'intérieur. Ne retirez pas les capots.

Confiez l'entretien à un personnel qualifié

Conditions anormales

Utilisez l'instrument uniquement aux fins spécifiées par le fabricant.
N'utilisez pas la lunette s'il y a des signes visibles de dommages ou si elle a été soumise à de fortes contraintes de transport.

Si vous pensez que la protection de l'instruments a été altérée, débranchez le cordon d'alimentation et sécurisez l'instrument contre toute opération involontaire.

Une bonne utilisation de l'instrument nécessite la lecture et la compréhension de toutes les instructions et étiquettes.

⚠	**Avertissement:** Toute utilisation de l'instruments d'une manière non spécifiée par le fabricant peut compromettre la protection de sécurité de l'instrument. Cet instrument ne doit pas être directement connecté à des sujets humains ni utilisé pour la surveillance des patients.

Conformité en matière de sécurité

La présente section présente les normes de sécurité applicables aux produits.

U.S. nationally recognized testing laboratory listing

■ UL 61010-1:2012/R:2018-11. Prescriptions en matière de sécurité pour les appareils électriques utilisés en laboratoire et de mesure - partie 1: prescriptions générales.

■ UL 61010-2-030:2018. Prescriptions de sécurité pour les appareils électriques de mesure, de contrôle et de laboratoire - partie 2 - 030: prescriptions spéciales pour les circuits d 'essai et de mesure.

Canadian certification

■ CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11. Prescriptions en matière de sécurité pour les appareils électriques utilisés en laboratoire et de mesure - partie 1: prescriptions générales.

■ CAN/CSA-C22.2 No. 61010-2-030:2018. Prescriptions de sécurité pour les appareils électriques de mesure, de contrôle et de laboratoire - partie 2 - 030: prescriptions spéciales pour les circuits d 'essai et de mesure.

3 Quick Start

This chapter guides users to quickly get familiar with the appearance, panel and the user interface, as well as announcements during the first use of the analyzer.

3.1 General Inspection

1. Inspect the shipping container

Keep the damaged shipping container or cushioning material until the contents of the shipment have been completely checked and the instrument has passed both electrical and mechanical tests.

The consigner or carrier will be responsible for damages to the instrument resulting from shipment. **SIGLENT** will not provide free maintenance or replacement.

2. Inspect the instrument

If the instrument is found to be damaged, defective or fails in electrical or mechanical tests, please contact **SIGLENT**.

3. Check the accessories

Please check the accessories according to the packing list in the box. If the accessories are incomplete or damaged, please contact your **SIGLENT** sales representative.

3.2 Preparing for Use

3.2.1 Appearance and Dimension

Adjust the supporting legs properly to use them as stands to tilt the analyzer upwards for stable placement as well as easier operation and observation of the instrument display.

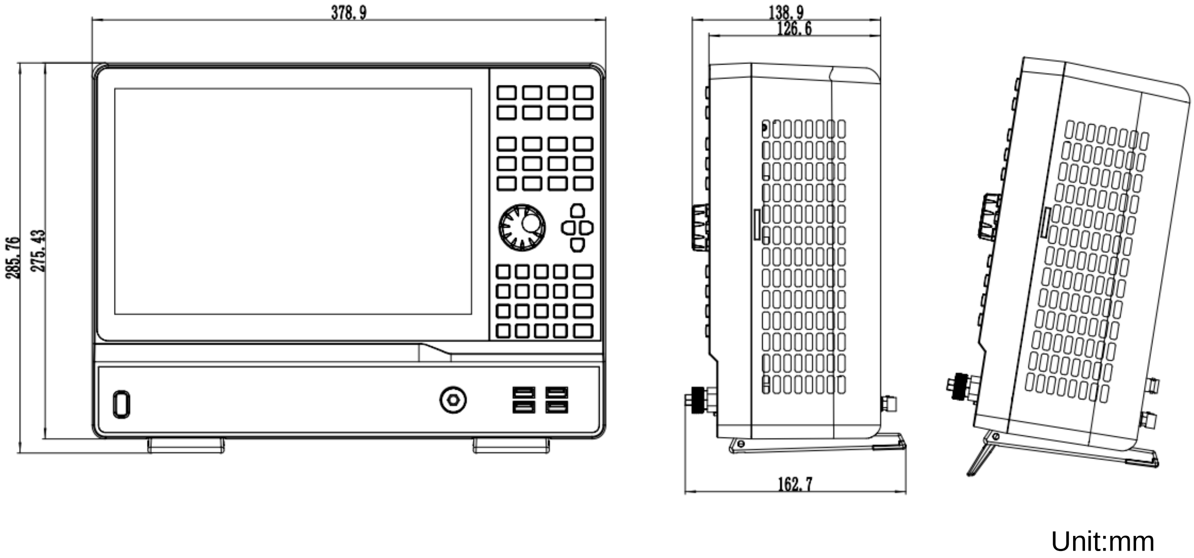


Figure 3-1 Front and lateral View

3.2.2 Connect to AC Power Supply

The spectrum analyzer accepts 100-240V, 50/60Hz or 100-120V 400Hz AC power supply. Please use the provided power cord to connect the instrument to the power source as shown in the figure below. Before powering on, make sure the analyzer is protected by a fuse.

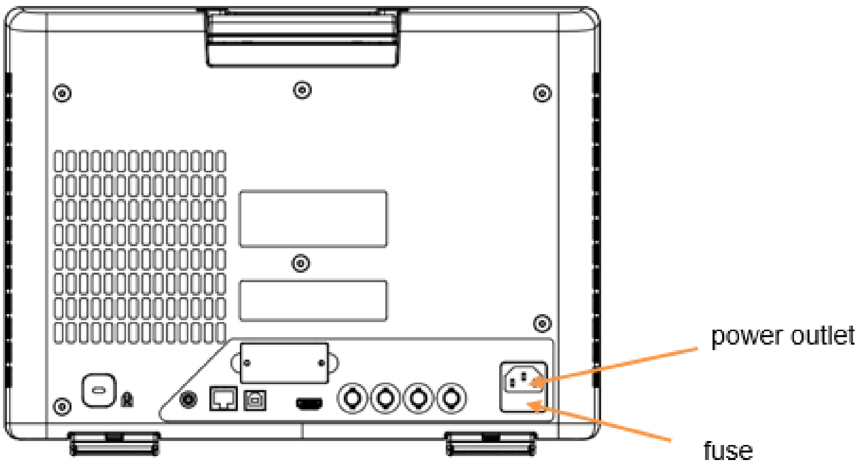


Figure 3-2 Rear View

3.3 Front Panel

Figure 3-3 the Front Panel

Table 3-1 Front Panel Description

NO.	Name	Description
1	LCD Screen	12.1 inch multi-touch screen, resolution 1280*800
2	Power Switch	Stand by status: Orange Power on status: White Short press: To Stand by status with current state saved Long press: To Stand by status without current state saved
3	Function Keys	Function and control input
4	USB Host	The analyzer can serve as a “host” device to connect USB memory, USB mouse and keyboard, SIGLENT USB-GPIB adaptor, etc
5	RF Input	2.92 mm male connector, compatable with 2.92mm/3.5mm/SMA connector mechanically

3.4 Rear Panel

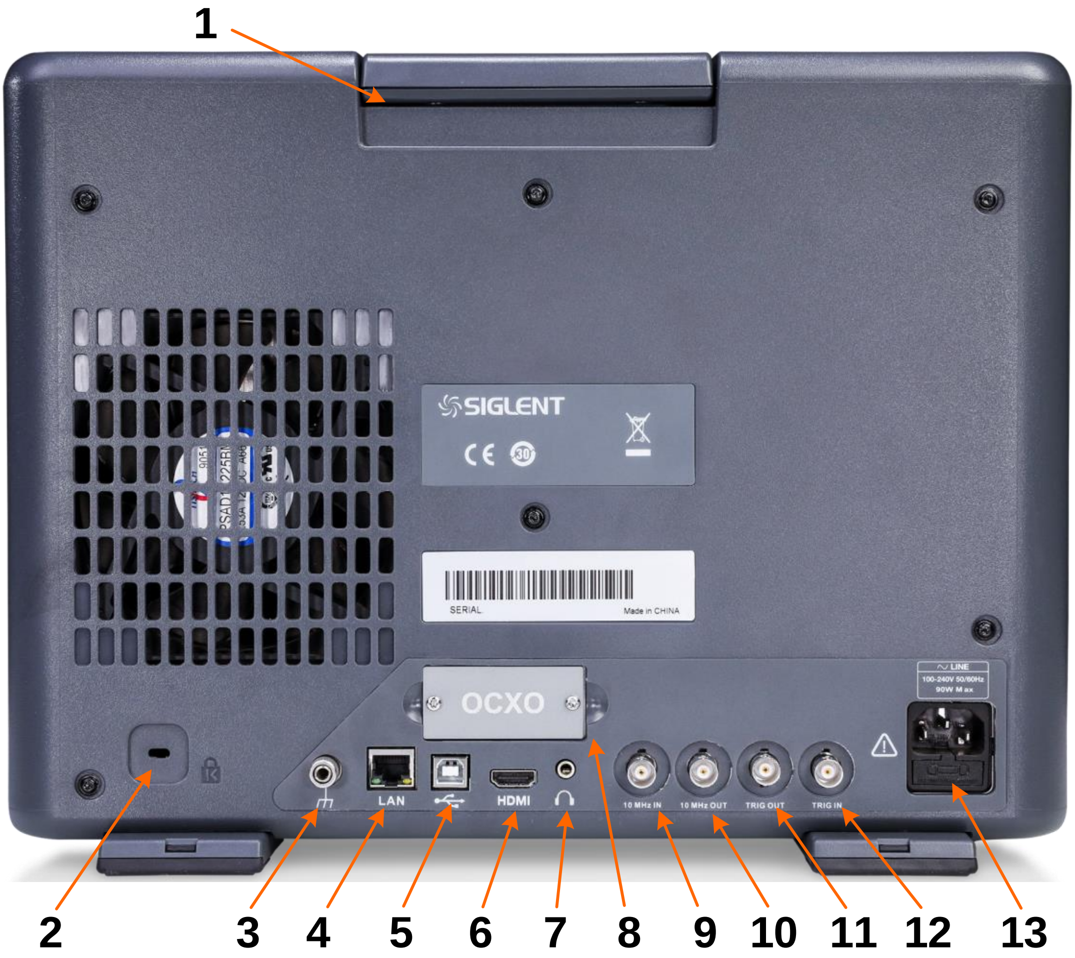


Figure 3-4 Rear Panel

Table 3-2 Rear Panel

NO.	Name	Description
1	Handle	Pull up the handle vertically for easy carrying of the instrument. When you do not need the handle, press it down.
2	Safety Lock Hole	If needed, you can use a security lock(purchased separately) to lock the analyzer to a desired location.
3	GND Terminal	Connect the casing ground and the ground with the grounding conductor.
4	LAN	Through this interface, the analyzer can be connected to your local network (LAN) for remote control. Set the parameter in System menu.
5	USB Device	Through this interface, the analyzer can be connected to PC for remote control.

6	HDMI	Output the LCD screen display content of the analyzer and connect it to the external monitor through HDMI cable for synchronous display.
7	Audio	3.5 mm audio cable jack, which can be externally connected with headphones or speakers to monitor the audio demodulation output of modulated signals. Set the parameter in Meas Setup menu.
8	OCXO	The OCXO reference clock source with better temperature coefficient and clock accuracy can be selected to obtain a more stable reference clock. This module is a factory installed option.
9	REF IN 10 MHz	The [10 MHz IN] and [10 MHz OUT] connectors are usually used to build synchronization among multiple instruments. The analyzer can use the internal or an external reference source. Set the parameter in Input/Output menu
10	REF OUT 10 MHz	The [10 MHz IN] and [10 MHz OUT] connectors are usually used to build synchronization among multiple instruments. When an internal reference source is used, the [10 MHz OUT] connector can output a 10 MHz clock signal generated by the analyzer. This signal can be used to synchronize other instruments.
11	TRIG OUT	Trigger output to indicate various working states inside the analyzer, which is used to establish event synchronization among multiple instruments.Set the parameter in Input/Output menu.
12	TRIG IN	In external trigger mode, the analyzer will update the trace scan after the Trigger In connector receives an external trigger signal that meets the trigger input specifications. Set the parameter in Trigger menu.
13	AC Power Supply	Before power on, please ensure that the ground wire of AC power supply is well connected with the earth, and ensure that the grounding wire of grounding terminal is well connected with the earth. Please confirm that the fuse works normally before power on.

3.5 User Interface

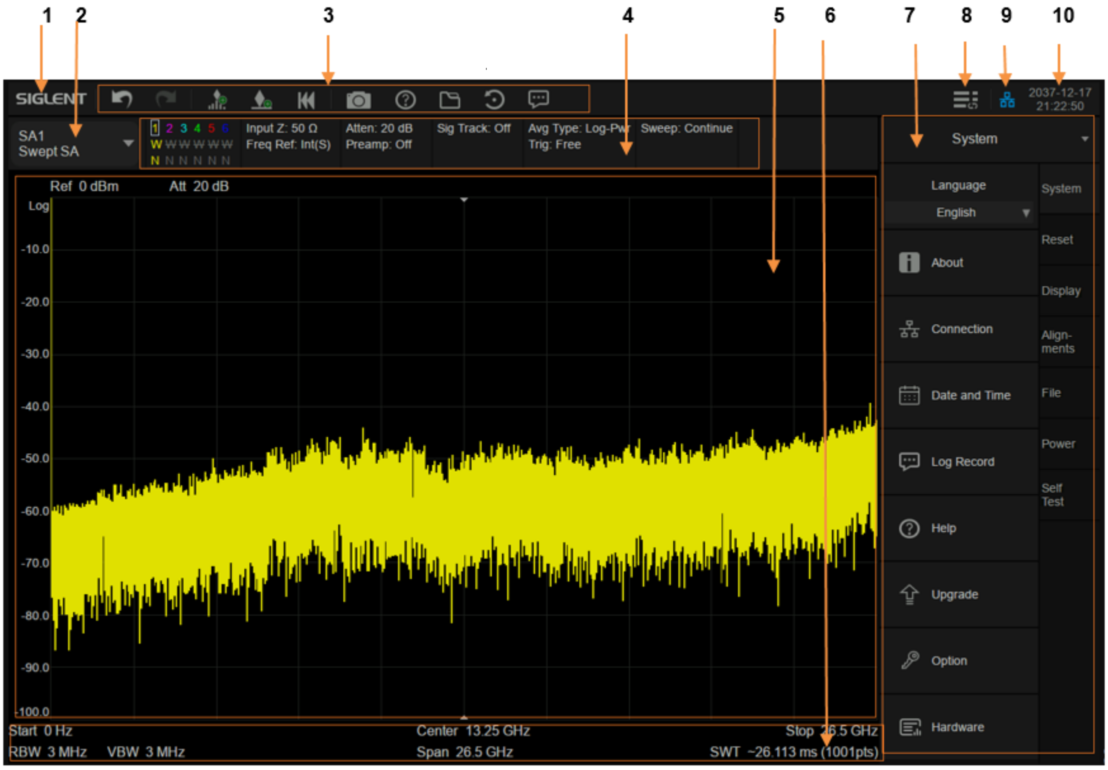


Figure 3-5 User Interface of spectrum analyzer mode

Table 3-3 Spectrum Analyzer Mode User Interface

No	Name	Description
1	SIGLENT	SIGLENT logo
2	Mode/Measure	Indicate the current working mode and measurement function of the analyzer, and click to switch, such as spectrum analysis mode, real-time spectrum mode, etc.
3	Shortcut Menu	Shortcuts to common used measurement functions, such as peak search, screen capture, file and other functions.
4	Instrument Configuration	Indicate the main working states of trace, interface, sweep, trigger, etc.
5	Measurement Result	Display the signal measurement results of the analyzer in various forms such as waveform, spectral line, cursor, table, statistics, constellation diagram, etc
6	Sweep Parameter	Indicate and control the main sweep parameters, such as frequency, resolution, scanning time, etc.
7	Menu	Complete the parameter setting of the analyzer.

8	Menu Switch	Control the opening and closing of the menu area. After closing, a larger measurement result area can be displayed.
9	Interface Status	Indicates and controls the connection status of LAN, USB memory and other devices.
10	Date and Time	Indicates and controls the time and date.

3.6 Touch screen and mouse operation

The analyzer provides a 12.1 inch multi-touch screen and supports various gesture operations including:

- Press or click on the upper-right-corner of the screen to enter the main menu
- Swipe up and down or left and right in the waveform area to change the X-axis center coordinate or Y-axis reference level;
- Perform two-points scaling in the waveform area to change the X-axis span;
- Click on a screen parameter or menu for parameter selection or editing;
- Open and drag the marker;
- Use auxiliary shortcuts to perform common operations.

You can turn the touch screen function on and off via **Touch**.

3.7 Keyboard operation

The analyzer provides a 12.1 inch multi-touch screen and supports various gesture operations including:

- Press or click on the upper-right-corner of the screen to enter the main menu;
- Swipe up and down or left and right in the waveform area to change the X-axis center coordinate or Y-axis reference level;
- Perform two-points scaling in the waveform area to change the X-axis span;
- Click on a screen parameter or menu for parameter selection or editing;
- Open and drag the marker;
- Use auxiliary shortcuts to perform common operations.

You can turn the touch screen function on and off via **Touch**.

3.8 Using Built-in Help

The built-in help system provides information about every function key at the front panel and every menu soft key.

- Press **Help** and the embedded help would show up.

- Click on the items in the contents tree on the left to navigate to any topics interested.
- Click the green back or forward arrow to go back or forward to the contents just read.
- Click the close sign button in the top right corner or press the Esc front-panel key to quit the help system.

3.9 Firmware Operation

3.9.1 Check System Information

Users can get the system information by press **System** > "**System**" > "**About**", including.

- Product Model, Serial and Host ID
- Software Version and hardware Version
- Option Information

3.9.2 Load Option

Refer to the procedures below to activate the options you have purchased.

1. Press **System** > "System" > "Load Option";
2. Enter the license key in the onscreen window. Press **Enter** to confirm your input and terminate the license key input. Or;
3. Load the .lic file provided by pressing **File** > "**Load**" from internal memory or USB stick.

The option will be enabled after rebooting.

3.9.3 Firmware Upgrade

Follow this procedure to update the instrument firmware:

1. Download the firmware package from an official SIGLENT website.
2. Extract and copy the .ADS file into the root directory of an USB stick.
3. Plug the USB stick into the USB Host connector. Press **System** > "**System**" > "**Update**"; find the .ADS file in USB stick.
4. Press the "**Load**", the analyzer will perform the update process automatically.

	The upgrade process will take several minutes. When the upgrade is completed, the machine will reboot. Any interruption during the update process will result in update failure and system data loss. This is **not covered under the warranty** and the user will bear repair costs and shipping. Do not remove the USB storage device until the update is finished.

3.10 Remote Control

The analyzer supports communication with computers via USB, LAN, and GPIB-USB interfaces. By using these interfaces, in combination with programming languages and/or NI-VISA software, users can remotely control the analyzer based on a SCPI (Standard Commands for Programmable Instruments) compliant command set, LabView and IVI (Interchangeable Virtual Instrument), to interoperate with other programmable instruments.

You can also remote monitor and control the analyzer in Web Browser or Easy Spectrum.

For more details, refer to the ‘Programming Guide’ or contact your nearest SIGLENT office.

3.11 Service and Support

SIGLENT warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three years (accessories for a period of one year) from the date of shipment from an authorized Siglent distributor.

If the product proves defective within the respective period, SIGLENT will provide repair or replacement as described in the complete warranty statement. To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest Siglent sales and service office. Except as provided in this summary or the applicable warranty statement, SIGLENT makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall SIGLENT be liable for indirect, special or consequential damages.

4 Mode & Measurement

The analyzer operates in multiple operating modes, each of which contains several measurements:

- **Spectrum Analyzer Mode (GPSA):**
  - Swept Spectrum Analyzer (Swept SA)
  - Channel Power (CH Power)
  - Adjacent Channel Power Ratio (ACPR)
  - Occupied BW (OBW)
  - T-Power (T-Power)
  - Third Order Intercept (TOI)
  - Spectrum Monitor (Spectrum Monitor)
  - Carrier Noise Ratio (CNR)
  - Harmonic Analysis (Harmonic)

- **Real-Time Spectrum Analyzer Mode (RTSA):**
  - Real Time Spectrum & PvT (Spectrum & PvT)

- **Modulation Analyzer Mode (MA):**
  - Digital Modulation Analyzer (DMA)
  - Analog Modulation Analyzer (AMA)

- **EMI Measurement Mode (EMI)**

- **PULSE Measurement Mode（PULSE）**

- **Phase Noise Measurement Mode（PN）**

- **Noise Figure measurement Mode（NF）**

- **Bluetooth Measurement Mode（BT）**

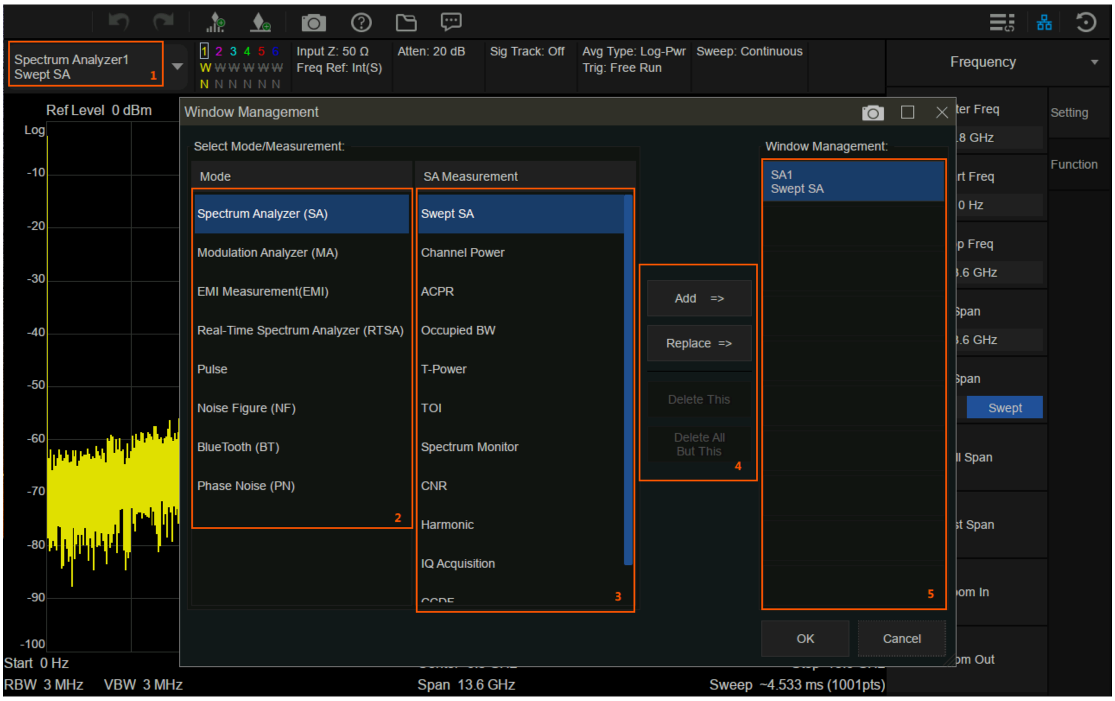


Figure 4-1 Mode/measurement selection

The analyzer supports the creation of multiple independent modes / measurements, but only one of them can be activated at the same time. At this time, other measurements enter the background. Wait until the next activation to restore the state before switching

1. The entry of the mode / measurement switching window also represents the currently running mode / measurement
2. Mode selection
3. Measurement selection
4. Operation options, including adding a measurement, replacing the selected measurement, deleting the selected measurement and deleting all (created) measurements
5. A list of measurements that have been created, with the currently active mode / measurement highlighted

Command Format	**:INSTrument[:SELect]** **:INSTrument[:SELect]?**
Instruction	Select the working mode of the spectrum analyzer.
Parameter Type	Enumeration
Parameter Range	GPSA: Spectrum Analysis Mode MA: Modulation Analysis RTSA: Real-Time Spectrum Analysis EMI:emi Measurement Mode pulseX:Pulse Measurement Mode pn: Phase Noise Measurement Mode nfIG: Noise figure Measurement Mode BT: Bluetooth Measurement Mode

Return	Enumeration
Example	:INSTrument　MA

Command Format	**:INSTrument:MEASure** **:INSTrument:MEASure?**
Instruction	Get/Set the measurement mode.
Parameter Type	Enumeration
Parameter Range	SA: Spectrum Analysis ACPR: Adjacent Channel Power Ratio CHPower: Channel Power OBW: Occupy Bandwidth TPOWer: Time-Domain Power SPECtrogram: Spectrogram TOI: Third-Order Intermodulation HARMonics: Harmonic Analysis CNR: Carrier-to-Noise Ratio
Return	Enumeration: SA||ACPR|CHP|OBW|TPOW|SPEC|TOI|HARM|CNR
Example	:INSTrument:MEASure　ACPR

5 Spectrum Analyzer Mode

The ‘Spectrum Analyzer’ mode is the default mode of the analyzer.

5.1 Frequency & Span

5.1.1 Frequency & Span

Set the frequency-related parameters and functions of the analyzer. The sweep will restart every time the frequency parameters are modified.

The frequency range of a channel can be expressed by these parameters: Start Frequency, Center Frequency, Stop Frequency and Span. If any of the parameters change, the others will be adjusted automatically in order to ensure the coupling relationship among them:

$$f_{center} = (f_{start} + f_{stop})/2$$
$$f_{span} = f_{stop} - f_{start}$$

, Where f_{span} is the span.

The LO will sweep from the Start Frequency to the Stop Frequency if the Span > 0, while the LO is fixed at a constant frequency if Span = 0 (Zero Span).

Span change, associated with BW and scan parameters.

After the frequency related parameters are changed, restart scanning \ measurement.

Last sweep sets the sweep width to the value before the last modification.

Zoom in sets the sweep width to half the current sweep width value.

Zoom out sets the sweep width to twice the current sweep width value.

Command Format	**[:SENSe]:FREQuency:CENTer** **[:SENSe]:FREQuency:CENTer?**
Instruction	Sets the center frequency of the spectrum analyzer. Gets the center frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	50 Hz~28 GHz Zero Span: 0 ~ 28 GHz
Return	Float, unit: Hz
Example	:FREQuency:CENTer 0.2 GHz

Command Format	**[:SENSe]:FREQuency:STARt** **[:SENSe]:FREQuency:STARt?**
Instruction	Sets the start frequency of the spectrum analyzer. Gets the start Frequency.
Parameter Range	0 Hz ~ 28 GHz Zero Span: 0 ~ 28 GHz
Example	:FREQuency:STARt 100 Hz

Command Format	**[:SENSe]:FREQuency:STOP** **[:SENSe]:FREQuency:STOP?**
Instruction	Sets the stop frequency of the spectrum analyzer. Gets the stop frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	100 Hz ~ 28 GHz Zero Span: 0 ~ 28 GHz
Return	Float, unit: Hz
Example	:FREQuency:STOP 1.0 GHz

Command Format	**[:SENSe]:FREQuency:SPAN** **[:SENSe]:FREQuency:SPAN?**
Instruction	Sets the frequency span. Setting the span to 0 Hz puts the analyzer into zero span. Gets span value.
NOTE	Channel Power Only: [:SENSe]:CHPower:REQuency:SPAN OBW Only: [:SENSe]:OBWidth:REQuency:SPAN ACPR Only: [:SENSe]:ACPower:REQuency:SPAN TOI Only: [:SENSe]:TOI:REQuency:SPAN CNR Only: [:SENSe]:CNR:REQuency:SPAN
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	0 Hz, 100 Hz ~ 28GHz
Return	Float, unit: Hz
Example	:FREQuency:SPAN 1 GHz

Command Format	**[:SENSe]:FREQuency:SPAN:FULL**
Instruction	Sets the frequency span to full scale.
Example	:FREQuency:SPAN:FULL

Command Format	**[:SENSe]:FREQuency:SPAN:ZERO**
Instruction	Sets the frequency span to zero span.
Example	:FREQuency:SPAN:ZERO

Command Format	**[:SENSe]:FREQuency:SPAN:PREVious**
Instruction	Sets the frequency span to the previous span setting.
Example	:FREQuency:SPAN:PREVious

Command Format	**[:SENSe]:FREQuency:SPAN:HALF**
Instruction	Sets the frequency span to half of the current span setting.
Example	:FREQuency:SPAN:HALF

Command Format	**[:SENSe]:FREQuency:SPAN:DOUBle**
Instruction	Sets the frequency span to double the current span setting.
Example	:FREQuency:SPAN:DOUBle

5.1.2 X Axis Scale

Set the scale type of X-axis to Linear (Lin) or Logarithmic (Log) scale.
In Log scale type, the frequency scale of X-axis is displayed in the logarithmic form.

Command Format	**:DISPlay:WINDow:TRACe:X[:SCALe]:SPACing** **:DISPlay:WINDow:TRACe:X[:SCALe]:SPACing?**
Instruction	Sets the The x type Gets the The x type
Parameter Type	enumeration
Return	LOG/LIN
Example	:DISPlay:WINDow:TRACe:X:SPACing LOG :DISPlay:WINDow:TRACe:X:SPACing?

5.1.3 Freq Offset

Set the frequency offset value to illustrate the frequency conversion between the measured device and the input of the spectrum analyzer.

- This parameter does not affect any hardware settings of the spectrum analyzer, but only changes the display values of center frequency, start frequency and stop frequency.
- To eliminate the frequency offset value, the frequency offset value can be set to 0 Hz.

Command Format	**[:SENSe]:FREQuency:OFFSet** **[:SENSe]:FREQuency:OFFSet?**
Instruction	Sets the frequency offset of the spectrum analyzer. Gets the frequency offset.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	-100 GHz ~ 100 GHz
Return	Float, unit: Hz
Example	:FREQuency:OFFSet 1 GHz

5.1.4 Freq Step

Setting the value of Freq Step will change the direction key step of center frequency, start frequency, stop frequency and frequency offset.

- At a fixed step change the value of the center frequency can reach the purpose of switching measurement channels rapidly and continuously.
- There are two kinds of frequency step modes: **Auto** and **Manual**. In Auto mode, the Freq step is 1/10 of the span in Non-zero span or equals the RBW while in Zero Span. In Manual mode, you can set the step using the numeric keys.

Command Format	**[:SENSe]:FREQuency:CENTer:STEP[:INCRement]** **[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?**

Instruction	Specifies the center frequency step size. Gets the center frequency step.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1 Hz ~ 28 GHz
Return	Float, unit: Hz
Example	:FREQuency:CENTer:STEP 2 MHz

Command Format	**[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1** **[:SENSe]:FREQuency:CENTer:STEP:AUTO?**
Instruction	Specifies whether the step size is set automatically based on the span. Gets center frequency step mode.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:FREQuency:CENTer:STEP:AUTO OFF

5.1.5 Signal Track

Turn on or off the signal tracking function. It is used to track the signal whose frequency is unstable and the instantaneous change of the amplitude is less than 3 dB. By marking cursor 1 on the measured signal, the change of the measured signal can be tracked and measured all the time.

The signal tracking process is shown in the following figure:

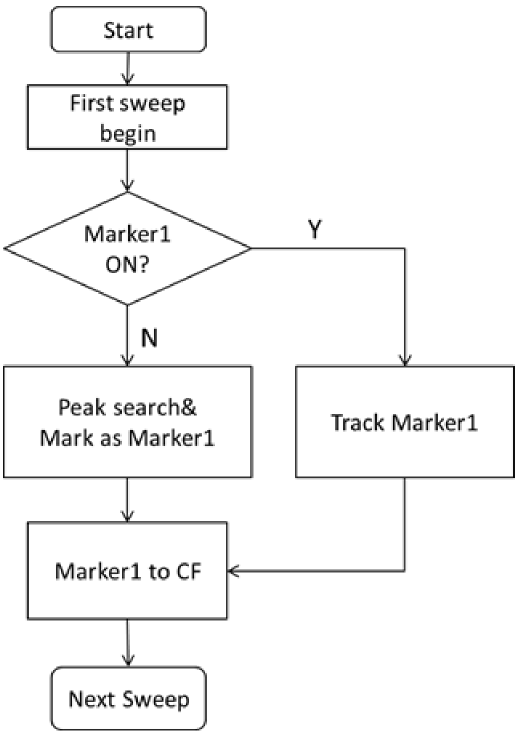


Figure 5-1 Signal Tracking Flow

- When Marker1 is on, turn on signal tracking, a point whose amplitude does not change more than 3 dB near Marker1 will be searched and marked, and the frequency at that point will be set to center frequency.
- When Maker1 is off, turn on signal tracking, Marker1 will be activated, and a peak search will be performed, and then the peak frequency will be set to center frequency.
- Signal tracking function is only available in sweep analysis. Signal tracking function is turned off in following cases:
  - ✧ Zero Span mode
  - ✧ Traces are not updated, including single sweep mode or View mode.
  - ✧ Cont Peak function turned on
  - ✧ Other non-Swept SA measurement modes

Command Format	**:CALCulate:MARKer:TRCKing[:STATe] OFF|ON|0|1** **:CALCulate:MARKer:TRCKing[:STATe]?**
Instruction	Sets the signal track state Gets the signal track state
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer:TRCKing ON

5.1.6 Auto Tune

Automatically search the signal in the full frequency band and adjust the frequency and amplitude parameters to the best state. One key to perform signal search and automatic parameter setting.

- When this function is enabled, Auto Tune is displayed in the status bar of the screen. After the automatic search is complete, Auto Tune disappears.
- Reference level, scale size, input attenuation and other parameters may be modified during automatic search.

Command Format	**[:SENSe]:FREQuency:TUNE:IMMediate**
Instruction	Perform auto tune
Parameter Type	No parameter
Parameter Range	No parameter
Return	No return
Example	:FREQuency:TUNE:IMMediate

5.2 BW

The bandwidth menu contains the RBW (Resolution Bandwidth), VBW (Video Bandwidth), average type and filter type. Filter type includes the EMI filter type that enables EMI measurement controls.

5.2.1 Resolution Bandwidth

Set the resolution bandwidth in order to distinguish between signals which have frequency components that are near one another.

- Reducing the RBW will increase the frequency resolution, but will also increase the sweep time dramatically (Sweep Time is affected by a combination of RBW and VBW when the analyzer is in Auto mode).
- Generally, the frequency resolution ability is affected by RBW, RBW Filter shape factor, LO Phase noise, and LO Residual FM.
- RBW varies with the span (non-zero span) in Auto RBW mode.
- Under EMI filter, RBW can only be set to 200 Hz, 9 kHz, 120 kHz and 1 MHz with a 6dB shape factor.

Command Format	**[:SENSe]:BWIDth[:RESolution]** **[:SENSe]:BWIDth[:RESolution]?**
Instruction	Specifies the resolution bandwidth. For numeric entries, all RBW types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered. Gets the resolution bandwidth.
NOTE	[:SENSe]:CHPower:BANDwidth[:RESolution] [:SENSe]:OBWidth:BANDwidth[:RESolution] [:SENSe]:ACPower:BANDwidth[:RESolution] [:SENSe]:TOI:BANDwidth[:RESolution] [:SENSe]:HARMonics:BANDwidth[:RESolution] [:SENSe]:TPOWer:BANDwidth[:RESolution] [:SENSe]:SPECtrogram:BANDwidth[:RESolution] [:SENSe]:CNR:BANDwidth[:RESolution]
Parameter Type	Discrete
Parameter Range	1Hz , 3Hz , 10 Hz , 30 Hz , 100 Hz , 300 Hz , 1 kHz , 3 kHz , 10 kHz , 30 kHz , 100 kHz , 300 kHz , 1 MHz , 3 MHz , 10 MHz
Return	Float, unit: Hz
Example	:BWIDth 1 kHz

Command Format	**[:SENSe]:BWIDth[:RESolution]:AUTO OFF|ON|0|1** **[:SENSe]:BWIDth[:RESolution]:AUTO?**
Instruction	Turn on/off auto resolution bandwidth state. Gets the resolution bandwidth auto state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:BWID:AUTO On

5.2.2 Video Bandwidth

Set the video bandwidth in order to filter out the noise outside the video band.

- Reducing the VBW will smooth the trace and helps to highlight small signals from noise, but it will also increase the sweep time (Sweep Time is affected by a combination of RBW and VBW when it is in Auto mode).
- VBW varies with RBW when it is in Auto mode. While in Manual mode, VBW is not affected by RBW.

Command Format	**[:SENSe]:BWIDth:VIDeo** **[:SENSe]:BWIDth:VIDeo?**
Instruction	Specifies the video bandwidth. Gets the video bandwidth.
NOTE	[:SENSe]:OBWidth:BANDwidth[:RESolution] [:SENSe]:ACPower:BANDwidth[:RESolution] [:SENSe]:TOI:BANDwidth[:RESolution] [:SENSe]:HARMonics:BANDwidth[:RESolution] [:SENSe]:TPOWer:BANDwidth[:RESolution] [:SENSe]:SPECtrogram:BANDwidth[:RESolution] [:SENSe]:CNR:BANDwidth[:RESolution]
Parameter Type	Discrete
Parameter Range	1Hz , 3Hz , 10 Hz , 30 Hz , 100 Hz , 300 Hz , 1 kHz , 3 kHz , 10 kHz , 30 kHz , 100 kHz , 300 kHz , 1 MHz , 3 MHz , 10 MHz
Return	Float, unit: Hz
Example	:BWIDth:VIDeo 10 kHz

Command Format	**[:SENSe]:BWIDth:VIDeo:AUTO OFF|ON|0|1** **[:SENSe]:BWIDth:VIDeo:AUTO?**
Instruction	This command turns on/off auto video bandwidth state. Gets the video bandwidth state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	BWIDth:VIDeo:AUTO OFF

5.2.3 V/R Ratio

Set the ratio of VBW to RBW. This value is different while measuring different kinds of signals:

- Sine/Continuous Wave (CW) signals: Use 1 to 3 (for faster sweeps)
- Pulsed/transient signals: Use 10 (to reduce the influence on the amplitude of transient signals)
- Noise signals: Generally use 0.1 (to obtain the average of noises)

Command Format	**[:SENSe]:BWIDth:VIDeo:RATio** **[:SENSe]:BWIDth:VIDeo:RATio?**

Instruction	Specifies the ratio of the video bandwidth to the resolution bandwidth. Gets the ratio of the video bandwidth to the resolution bandwidth.
Parameter Type	Discrete, Float
Parameter Range	0.001, 0.003, 0.01, 0.03, 0.1, 0.3, 1.0, 3.0, 10.0, 30.0, 100.0, 300.0, 1000.0
Return	Float
Example	:BWIDth:VIDeo:RATio 30

5.2.4 Filter Type

EMI filter according to CISPR16 standard. Different from ordinary RBW filter, EMI filter support -6dB bandwidth.

Support bandwidth 200Hz, 9kHz, 120kHz, 1MHz.

Command Format	**[:SENSe]:FILTer:TYPE EMI|GAUSS [:SENSe]:FILTer:TYPE?**
Instruction	Sets filter type Gets filter type
Parameter Type	Enumeration
Parameter Range	EMI|GAUSS
Return	Enumeration
Example	:FILTer:TYPE EMI

5.3 Sweep

5.3.1 Sweep Type

There are two sweep types, Swept and FFT. Swept can only support a minimum of 3kHz RBW, and conversely FFT can only support a maximum of 10kHz RBW.

5.3.1.1 Auto Sweep Type

When automatic sweep type is enabled, the analyzer automatically switches sweep types based on RBW and sweep type rules.

Command Format	**[:SENSe]:SWEep:MODE FFT|SWEep** **[:SENSe]:SWEep:MODE?**
Instruction	Sets sweep mode. Gets sweep mode.
Parameter Type	Enumeration
Parameter Range	FFT|SWEep
Return	Enumeration
Example	:SWEep:MODE SWEep

Command Format	**[:SENSe]:SWEep:MODE AUTO|FFT|SWEep** **[:SENSe]:SWEep:MODE?**
Instruction	Sets sweep mode auto state. Gets sweep mode auto state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:SWEep:MODE AUTO 1

5.3.2 Sweep Type Rules

Speed first. This option tells the analyzer to select the faster one based on the sweep time when automatically switching the sweep type.

The dynamic range is preferred. This selection tells the analyzer to automatically switch the sweep type based on the dynamic range, but if the dynamic range is very close between sweep and FFT, select the faster one.

Command Format	**[:SENSe]:SWEep:TYPE:AUTO:RULes** **[:SENSe]:SWEep:TYPE:AUTO:RULes?**
Instruction	Sets / get suto sweep type rules
Parameter Type	Enumeration
Parameter Range	RANge|SPEed
Return	RANge|SPEed
Example	:SWEep:TYPE:AUTO:RULes SPEed

5.3.3 Sweep Points

The number of sweep points represents the number of sweep and trace displayed points (201~10001).

More sweep points will improve the resolution of waveform, but also affect the minimum sweep time, and increase the time of data processing and remote access to data, and reduce the response rate.

Under the influence of the scheme, when the sweep type is FFT, the sweep points cannot remain effective all the time, and the actual output points may be less than the sweep points in some states.

Command Format	**[:SENSe]:SWEep:POINts** **[:SENSe]:SWEep:POINts?**
Instruction	Sets sweep points. Gets sweep points.
Parameter Type	integer
Parameter Range	201-10001
Example	:SWEep:POINts 2001 :SWEep:POINts?

5.3.4 Sweep Time & Sweep Time Rules

When the sweep type is normal swept, you can change the sweep time (SWT) to control the time required to sweep the current frequency range. The sweep time supports automatic mode and manual mode:

AutoSWT refers to the appropriate sweep time of the analyzer according to the relevant configuration line operation, which satisfies the following calculation logic:

When Span>0:

$$\mathrm{AutoSWT} = \max[\mathrm{minSWT},\ k*(\mathrm{f_{span}}/\mathrm{RBW}/\mathrm{VBW}),\ \mathrm{Points}*\mathrm{ResTimeperPoint}];$$
$$\mathrm{k} = 3、12;$$
$$\mathrm{minSWT} = 1\,\mathrm{ms}$$

When Span=0:

$$\mathrm{AutoSWT} = \max[\mathrm{minSWT},\mathrm{Points}*\mathrm{ResTimeperPoint}];$$
$$\mathrm{minSWT} = 1\,\mathrm{us}$$

Where velocity factor K =3 or 12, corresponding to two supported Sweep Time Rules: Speed or Accuracy; $\mathrm{ResTimeperPoint}$ Represents the DSP response time of a sweep point, it is inversely correlated with RBW value.

Users can also manually set the sweep time based on actual requirements. But it needs to be satisfied:

When Span>0: 1ms <= SWT <= 4ks

When Span=0: 1us <= SWT <= 6ks

In general, the manual sweep time should not be longer than the automatic sweep time in this condition. Otherwise, unforeseeable anomalies may be caused and may be marked (UNCAL).
It should be pointed out in particular that under the influence of the scheme, when the sweep type is FFT, the sweep time can only be calculated by the instrument itself, and any modification related to the sweep time cannot take effect.

Command Format	**[:SENSe]:SWEep:TIME** **[:SENSe]:SWEep:TIME?**
Instruction	Specifies the time in which the instrument sweeps the display. A span value of 0 Hz causes the analyzer to enter zero span mode. In zero span the X-axis represents time rather than frequency.
Parameter Type	Float, unit: ks, s, ms, us
Parameter Range	1us ~ 6000s
Return	Float, unit: s
Example	:SWEep:TIME 5s

Command Format	**[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1** **[:SENSe]:SWEep:TIME:AUTO?**
Instruction	This command turns on/off auto sweep time state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:SWEep:TIME:AUTO ON

Command Format	**[:SENSe]:SWEep:SPEed NORMal|ACCUracy** **[:SENSe]:SWEep:SPEed?**
Instruction	Toggles the sweep speed between normal and accuracy.
Parameter Type	Enumeration
Parameter Range	ACCUracy|NORMal
Example	:SWEep: SPEed NORMal

5.3.5 Sweep Time Estimate

The estimated sweep time represents the time actually consumed by each sweep, including data sampling time (sweep time) and related scheduling time.
The estimated sweep time cannot be modified.

5.3.6 Sweep/Measure

Sweep/Measure

Single/Continue controls analyzer to perform single or continuous sweep/measure.

Restart

Restart the current sweep or measure. In particular, if the sweep parameters are modified, a restart will be performed.

Command format	**:INITiate:CONTinuous OFF|ON|0|1** **:INITiate:CONTinuous?**
Instructions	Sets continuous sweep mode on-off. Gets continuous sweep mode state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:INITiate:CONTinuous OFF

Command Format	**:INITiate[:IMMediate]**
Instruction	Restarts the current sweep.
Example	:INITiate:IMMediate

Command Format	**:INITiate:RESTart**
Instruction	Restarts the current sweep.
Example	:INITiate:RESTart

5.4 Amplitude

Set the amplitude parameters of the analyzer. Through modifying these parameters, signals under measurement can be displayed in a proper mode for easier observation and minimum error. Any change of Ref Level, Attenuator Value, Preamp mode and Ref Offset will restart sweep.

5.4.1 Ref Level

Set the maximum power or voltage that can be currently displayed in the trace window. The value is displayed at the upper left corner of the screen grid.
The maximum reference (Ref) level available is affected by the maximum mixing level; input attenuation is adjusted under a constant maximum mixing level in order to fulfill the following condition:

Ref <= ATT - PA - 20dBm, where ATT = Attenuation value, PA = Preamplifier value

Note: the maximum reference level of different machine models may be different, please refer to the data manual specifically.

Command Format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel** **:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?**
Instruction	This command sets the reference level for the Y-axis. Gets reference level.
Parameter Type	Float, unit: dBm, dBmV, dBuV, dBuA, V, W
Parameter Range	Unit is dBm: -170 dBm ~ 23 dBm; Unit is dBmV: -123.01 dBmV ~ 69.99 dBmV; Unit is dBuV: -63.01 dBuV ~ 129.99 dBuV; Unit is dBuA: -96.99 dBuA ~ 96.01 dBuA; Unit is Volts: 707.11pV ~ 3.16 V; Unit is Watts: 0W ~ 199.53m W
Return	Float, unit: dBm
Example	:DISPlay:WINDow:TRACe:Y:RLEVel 20 DBM

5.4.2 Attenuator

Set the value for the internal attenuator of the RF input. So that the large signal can be low distortion and the small signal can pass through the mixer with low noise.

Ref <= ATT - PA - 20dBm, where ATT = Attenuation value, PA = Preamplifier value

Input attenuation can be set up to auto or manual mode.

- Auto mode: the attenuation value is automatically adjusted according to the state of preamplifier and the current reference level.
- The maximum input attenuation can be set to 50dB, resolution: 2dB. When the set parameters do not meet the above formula, you can adjust the reference level.

Command format	[:SENSe]:POWer[:RF]:ATTenuation [:SENSe]:POWer[:RF]:ATTenuation?
Instructions	Sets/gets the attenuation value
Parameter Type	Integer
Parameter Range	0 dB ~ 50 dB (Even gears only)
Return	Integer, unit dB
Example	:POWer:ATTenuation 10

Command format	[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1 [:SENSe]:POWer[:RF]:ATTenuation:AUTO?
Instructions	Sets/gets the auto attenuation value switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:POWer[:RF]:ATTenuation:AUTO ON

5.4.3 RF Preamp

Control the state of the internal preamplifier (PA) located in the RF input signal path. When the signal-under-measurement is small, turning on the preamplifier can reduce the displayed noise level and aid distinguishing small signals from the noise.

The corresponding icon “**PA**” will appear at the left side of the screen when the preamplifier is turned on.

Command format	[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1 [:SENSe]:POWer[:RF]:GAIN[:STATe]?
Instructions	Sets/gets the preset amplifier inside the switch spectrometer
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:POWer:GAIN ON

5.4.4 Y Axis Unit

Sets the display unit of magnitude.

Command format	:UNIT:POWer DBM|DBMV|DBUV|V|W :UNIT:POWer?
Instructions	Sets/gets the display unit of magnitude
Parameter Type	Enumeration
Parameter Range	DBM|DBMV|DBUV|DBUA|V|W
Return	Enumeration: DBM|DBMV|DBUV|V|W
Example	:UNIT:POWer DBMV

5.4.5 Y Axis Scale Type

Set the scale type of the Y-axis to Lin or Log. The default is Log.

- In Lin mode, the vertical Scale value cannot be changed. The Display area is set for reference level of 0%.
- In Log scale type, the Y-axis denotes the logarithmic coordinate. The value shown at the top of the grid is the reference level and each grid represent the scale value. The unit of Y-axis will automatically switch to the default unit (dBm) in Log scale type when the scale type is changed from Lin to Log.
- In Lin scale type, the Y-axis denotes the liner coordinate; the values shown at the top of the grid and the bottom of the grid are the reference level and 0 V. The scale setting function is invalid. The unit of Y-axis will automatically switch to the default unit (Volts) in Lin scale type when the scale type is charged from Log to Lin.
- The scale type does not affect the setting of Y-axis unit.

Set the unit of the Y-axis to dBm , dBmV , dBuV , dBuA , Volts (RMS) or Watts. Default is dBm.
The conversion relationships between units are as follows.

$$\mathrm{dBm} = 10\lg\left(\frac{\mathrm{Volts}^2}{\mathrm{R}} \times \frac{1}{1\mathrm{mW}}\right)$$

$$\mathrm{dB\mu V} = 20\lg\left(\frac{\mathrm{Volts}}{1\mathrm{\mu V}}\right)$$

$$\mathrm{dBmV} = 20\lg\left(\frac{\mathrm{Volts}}{1\mathrm{mV}}\right)$$

$$\mathrm{Watts} = \frac{\mathrm{Volts}^2}{\mathrm{R}}$$

Where, R denotes the reference impedance. The default value is 50Ω and can be adjusted by pressing “**Correction > RF input**”. The “75 Ω” impedance is just a numeric value, not a real impedance. Setting the RF input to 75 Ω will not change the actual input impedance. A 75 Ω feed-through adapter is required to match 75 Ω circuits to the 50 Ω input of the analyzer.

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision** **:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision?**
Instructions	Sets/gets the scale on which trace logarithms are displayed
Parameter Type	Float
Parameter Range	0.1 dB ~ 20 dB
Return	Float, unit dB
Example	:DISPlay:WINDow:TRACe:Y:PDIVision 10 dB

Command format	:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing LINear|LOGarithmic :DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing?
Instructions	Sets/Gets the scale display type
Parameter Type	Enumeration: LINear |LOGarithmic
Return	Enumeration: LIN|LOG
Example	:DISPlay:WINDow:TRACe:Y:SPACing LINear

5.4.6 Ref Offset

Assign an offset to the reference level to compensate for gains or losses generated between the device under measurement and the analyzer.

The change of this value changes both the reference level readout and the amplitude readout of the marker; but does not impact the position of traces on the screen.

Command format	:DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet :DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet?
Instructions	Sets/gets the frequency offset
Parameter Type	Float
Parameter Range	-100 dB~100 dB
Return	Float, unitdB
Example	:DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet 2

5.5 Trigger

The analyzer provides a variety of trigger functions, users can choose from the trigger menu.

5.5.1 Trigger Source

The analyzer provides a variety of trigger sources to suit different trigger requirements.

Free Run

Free trigger is the default mode of the analyzer, in which the spectrum analyzer sweeps circularly and continuously.

Video

When the user wants to capture an instantaneous signal that appears for a very short time, the video trigger mode can be adopted . In this working mode, only when the rising edge or falling edge of a signal touches the Trigger Level, the signal will be triggered and displayed on the screen.

External

External trigger provides users with richer trigger functions. If users want to realize the periodic trigger and delay trigger spectrum analyzer, they can choose the external trigger mode. In this mode, it is triggered by the rising or falling edge of the external input signal. The square wave signal with a certain frequencycan be periodically triggered, and the delay time can be adjusted by setting the Trigger Delay option.

Periodic

When Periodic is selected, the analyzer uses the built-in period timer signal as the trigger. The trigger event is set by the periodic timer parameter, which is modified by offset and periodic synchronization Src.

You can synchronize periodic signals with external events (using periodic synchronization Src) to get closer to a reliable trigger signal.

If the synchronization source is not selected (off state), the internal timer will not synchronize with any external timed events.

Command format	**:TRIGger[:SEQuence]:SOURce** **:TRIGger[:SEQuence]:SOURce?**
Instructions	sets the trigger source. gets the trigger source.
Parameter Type	Enumeration
Parameter Range	"IMMediate ", "VIDeo ", "EXTernal ","FRAMe"
Return	"IMM", "VID", "EXT" ,"FRAMe"
Example	:TRIGger:SOURce VID

5.5.2 Trigger Level

Sets the amplitude level for the video trigger (absolute level only supported). When the video signal crosses the voltage level with the selected slope, it is triggered.

Command format	**:TRIGger[:SEQuence]: {type}:LEVel** **:TRIGger[:SEQuence]: {type}:LEVel?**
Instructions	sets the trigger level. gets the trigger level. {type}: "VIDeo", "EXTernal"
Parameter Type	Float
Parameter Range	-300 dBm ~50 dBm
Return	Float
Example	:TRIGger:VIDeo:LEVel -20

5.5.3 Trigger Slope

Set the trigger polarity for external trigger, video trigger. The options are rising edge trigger and falling edge trigger.

The same trigger source uses the same trigger edge for both gating and triggering.

Command format	**:TRIGger[:SEQuence]: {type}:SLOPe** **:TRIGger[:SEQuence]: {type}:SLOPe?**
Instructions	sets the trigger edge. gets the trigger edge. {type}: " VIDeo ", " EXTernal "
Parameter Type	Enumeration
Parameter Range	"POS", "NEG"
Return	"POS", "NEG"
Example	:TRIGger: EXTernal:SLOPe :TRIGger: VIDeo:SLOPe?

5.5.4 Trigger Delay

When scanning is at zero span, negative delay can be set . The time range of negative delay is related to the number of sweep points and sweep time:

Maximum negative delay time = [496M / (sweep points * 64) - 5] * sweep time

Maximum positive delay time =500ms

Command format	**:TRIGger[:SEQuence]:{type}:DELay** **:TRIGger[:SEQuence]:{type}:DELay?**
Instructions	sets the trigger delay gets the trigger delay {type}:" VIDeo ", " EXTernal " ,"FRAMe"

Parameter Type	Float
Return	Float
Example	:TRIGger:EXTernal:DELay 5e-3 :TRIGger:FRAMe:DELay?

Command format	**:TRIGger[:SEQuence]:{type}:DELay:STATe :TRIGger[:SEQuence]:{type}:DELay:STATe?**
Instructions	sets the trigger delay state. gets the trigger delay state. {type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal: DELay:STATe 1

5.5.5 Zero Span Trigger Delay Compensation (external trigger only)

In normal cases, after the trigger is generated, the data is displayed and the data is triggered at the same time. However, the processing time of the trigger path and the data path is different. As a result, the data displayed at the trigger time is the previous data. This does not affect the integrity of the data and does not cause data loss at the trigger point. However, in some cases, it is necessary to display the zero point of screen coordinate as the input signal information of trigger point, so the function of zero span delay compensation is needed.

Command format	**:TRIGger[:SEQuence]:EXTernal:DELay:COMPensation OFF|ON|0|1 :TRIGger[:SEQuence]:EXTernal:DELay:COMPensation?**
Instructions	Enable /disable the external trigger zero sweep delay compensation
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal:DELay:COMPensation OFF

5.5.6 Period (periodic trigger only)

Set the trigger period. For gating and triggering, the same trigger source uses the same trigger cycle.

Command format	**:TRIGger[:SEQuence]:FRAMe:PERiod :TRIGger[:SEQuence]:FRAMe:PERiod?**
Instructions	Set/Query Period Trigger period
Parameter Type	Float
Parameter Range	100ns~10s
Return	Float
Example	:TRIGger:FRAMe:PERiod 1s

5.5.7 Offset Time

Adjust the cumulative offset between the periodic trigger clock and trigger events. The periodic trigger clock cannot be viewed on the software, only the trigger event can be seen. Therefore, in order to adjust the trigger event time, only the offset between the periodic triggering clock and the triggering event can be adjusted. However, the absolute value of the internal offset is unknown, and each modification of the offset is cumulative on the previous basis.

Command format	**:TRIGger[:SEQuence]:FRAMe:OFFSet** **:TRIGger[:SEQuence]:FRAMe:OFFSet?**
Instructions	Set/Query Period Trigger period offset
Parameter Type	Float
Parameter Range	0s~10s
Return	Float
Example	:TRIGger:FRAMe:OFFSet 1s

5.5.8 Reset Time Offset Display

Reset the display of cycle trigger time offset.

Command format	**:TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet**
Instructions	Reset Period trigger offset return to zero
Example	:TRIGger:FRAMe:OFFSet:DISPlay:RESet

5.5.9 Sync Source (periodic trigger only)

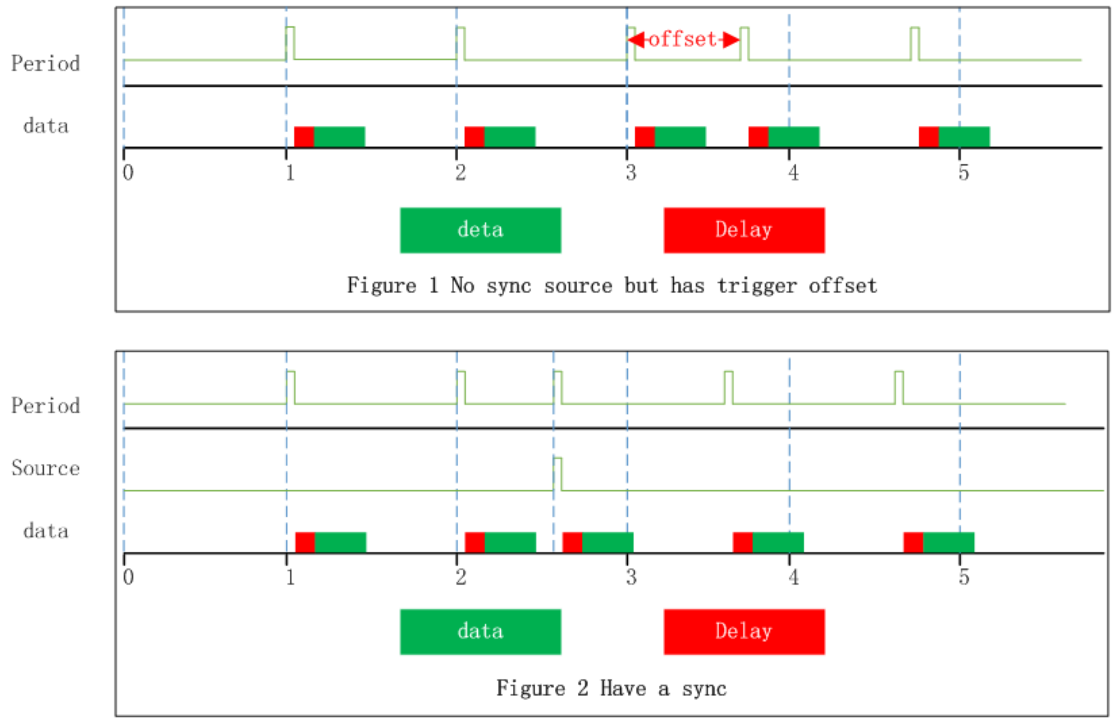


Figure 5-2 Trigger of synchronization source

Command format	**:TRIGger[:SEQuence]:FRAMe:SYNC** **:TRIGger[:SEQuence]:FRAMe:SYNC?**
Instructions	Set/Query the type of periodic synchronization
Parameter Type	Enumeration
Parameter Range	"OFF", "EXT"
Return	"OFF", "EXT"
Example	:TRIGger:FRAMe:SYNC EXT

5.5.10 Gate Source

Select a gate source for gate measurement. The optional sources are external source and periodic source.

External

Set the trigger source of the gate to be an external source. Similar to trigger, when configuring external sources, you can choose whether to trigger on the rising edge or the falling edge, and configure zero span delay compensation. The configuration of the gating source affects the configuration of the trigger source.

Period

Set the trigger source of the gate to a periodic source. Similar to trigger, you can configure trigger period, trigger offset, and trigger period synchronization sources when configuring periodic sources. The configuration of the gating source affects the configuration of the trigger source.

Command format	**[:SENSe]:SWEep:EGATe:SOURce** **[:SENSe]:SWEep:EGATe:SOURce?**
Instructions	Set or query the gate source type
Parameter Type	Enumeration
Parameter Range	" EXTernal ","FRAMe"
Return	"EXT","FRAMe"
Example	:SWEep:EGATe:SOURce EXT

5.5.11 Gate

The gate is to separate the spectrum information of some signals that occupy the same part in the frequency domain but are separated from each other in the time domain, such as time division multiple access signals.

5.5.11.1 Gate On

Turn on or off the gate function. When this function is enabled, the gate settings view is closed

Command format	**[:SENSe]:SWEep:EGATe[:STATe]** **[:SENSe]:SWEep:EGATe[:STATe]?**
Instructions	Set or query the gate switch
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:SWEep:EGATe 1

5.5.11.2 Gate Method

Configure the gate method.

- LO gate: In this gate mode, the sweep does not start immediately, but detects the trigger of the gate source first. After the trigger of the gate source, the gate signal is determined according to the gate delay and gate width.

  When the gate signal is high, the sweep begins. When the gate signal is low, sweep stops. When the next gate trigger occurs, continue as before until the specified bandwidth has been swept.

  In zero span mode, data is collected only when the gate is open, so the setting of the gate will affect the actual sweep time, even though there is no actual sweep process.

- FFT gate: In this gate mode, the sweep does not start immediately, but detects the trigger of the gating source first. After the trigger of the gate source, the gate signal is determined according to the gate delay and gate width.

When the gate signal is high, sweep starts, data is collected and FFT transformation is carried out. Since the data processed by FFT needs to be continuous, the gate can be low only after FFT transformation is completed, which is also why the gate length of FFT is a fixed value.

The gate length of FFT needs to be larger than the data length required to complete FFT. When FFT completes a spectrum calculation, the gate will be lower. Then wait for the generation of the next gate trigger and repeat the previous action until the specified bandwidth is swept. FFT gate is unavailable in zero span mode.

- Video gate: In this gate mode, after entering the sweep mode, it starts immediately and detects the trigger of the gate source at the same time. After the trigger of the gate source, the gate signal is determined according to the gate delay and the gate width.

  When the gate signal is low, the output data is a constant value; when the gate signal is high, the spectrum swept at this time is output. The video trigger does not affect the sweep process, but displays the spectrum of the gate signal at the high moment, and a fixed value at other moments.

  With this gate mode, it is usually necessary to set the sweep time to a long time so that the gate signal appears at least once in each display point, thus ensuring that the detector can obtain the real data in the corresponding time interval when the detect mode is peak detect.

Command format	**[:SENSe]:SWEep:EGATe:METHod** **[:SENSe]:SWEep:EGATe:METHod?**
Instructions	Set/Query the gate method
Parameter Type	Enumeration
Parameter Range	"OFF","LO","VIDeo","FFT"
Return	"OFF","LO","VIDeo","FFT"
Example	:SWEep:EGATe:METHod FFT

5.5.11.3 Gate Length

Set the gate length. This parameter cannot be changed when FFT gate.

The relationship between RBW and gate length in FFT gate mode

RBW	gate length (us)
1Hz	2498064
3Hz	828368
10Hz	272348

30Hz	86968
100Hz	27807
300Hz	10323
1000Hz	5447
3000Hz	2333
10000Hz	1117

Command format	**[:SENSe]:SWEep:EGATe:LENGth** **[:SENSe]:SWEep:EGATe:LENGth?**
Instructions	Set/Query the gate length
Parameter Type	Float
Parameter Range	2.106us~5s
Return	Float
Example	:SWEep:EGATe:LENGth 1s

5.5.11.4 Gate Delay

Configure the delay between gate trigger and gate on.

Command format	**[:SENSe]:SWEep:EGATe:DELay** **[:SENSe]:SWEep:EGATe:DELay?**
Instructions	Set or query the gate delay
Parameter Type	Float
Parameter Range	Swept: 8.906us~25s Zero span: 1.894us~25s
Return	Float
Example	SWEep:EGATe:DELay 0.005s

5.5.11.5 Gate View

When Turn on this view:

- Disable the gate on/off and the gate function.
- To enter the zero span mode, set different Gate View Sweep Time based on different gate methods.When you close the gate view, the sweep span and sweep time before the gate view is enabled are restored.

Gate View Sweep Time

Controls the sweep time in the gate view window. When selecting different gate methods, the instrument will automatically configure different sweep time.

Gate View Start Time

Set the start time on the left of the gate view, that is, set a delay.

Command format	**[:SENSe]:SWEep:EGATe:VIEW** **[:SENSe]:SWEep:EGATe:VIEW?**
Instructions	Set or query the gate view switch
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:SWEep:EGATe:VIEW 1

Command format	**[:SENSe]:SWEep:EGATe:VIEW:STARt** **[:SENSe]:SWEep:EGATe:VIEW:STARt?**
Instructions	Set/Query the gate View start time
Parameter Type	Float
Return	Float
Example	:SWEep:EGATe:VIEW:STARt 1s

Command format	**[:SENSe]:SWEep:EGATe:TIME** **[:SENSe]:SWEep:EGATe:TIME?**
Instructions	Set/Query the gate View time
Parameter Type	Float
Return	Float
Example	[:SENSe]:SWEep:EGATe:TIME 1s

5.6 Trace

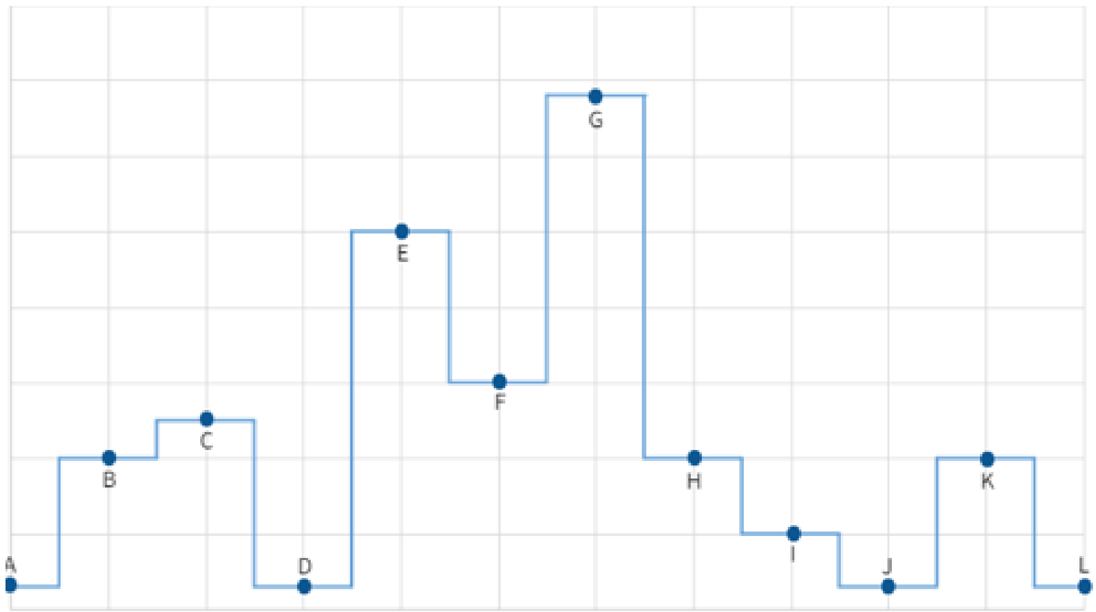


Figure 5-3 trace select

The sweep signal is displayed as a trace on the screen.

Command format	**:TRACe[1]|2|3|4|5|6 [:DATA]?**
Instructions	Get trace data
Return	String
Example	:TRACe:DATA?

Command format	**:FORMat[:TRACe][:DATA]ASCii|REAL32| REAL** **:FORMat[:TRACe][:DATA]?**
Instructions	Sets/gets the format of trace data read
Parameter Type	Enumeration
Parameter Range	ASCii REAL32 Floating 32-bit REAL Floating 64-bit
Return	Enumeration: ASCii|REAL| REAL32
Example	:FORMat ASCii

5.6.1 Select Trace

The analyzer allows for up to four traces to be displayed at the same time. Each trace has its own color (Trace A -- Yellow, Trace B -- Purple, Trace C -- Light blue and Trace D -- Green). All traces can be set parameter independently. As a default, analyzer will choose Trace A and set the type of the trace as Clear Write.

Command format	TRACe:SELEct TRACe:SELEct?
Instructions	Sets/gets the current trace
Parameter Type	EnumerationTRACE1-6
Return	Enumeration: TRACE1-6
Example	TRACe:SELEct TRACE3

5.6.2 Trace Type

Set the type of the current trace or disable it. The system calculates the sampled data using a specific operation method according to the trace type selected and displays the result. Trace types include Clear Write, Max Hold, Min Hold, View, Average and Blank. The corresponding icon of the trace type will be displayed in the status bar at the left of the screen, as shown in the figure below.

Clear Write

Erases any data previously stored in the selected trace, and display the data sampled in real-time of each point on the trace.

Max Hold

Retain the maximum level for each point of the selected trace. Update the data if a new maximum level is detected in successive sweeps. Max Hold is very effective when measuring events that may take successive scans to measure accurately. Some common applications include FM Deviation, AM NRSC, and frequency hopping or drift.

Min Hold

Display the minimum value from multiple sweeps for each point of the trace and update the data if a new minimum is generated in successive sweeps.

Average

Set the averages times of the selected trace.

More averages can reduce the noise and the influence of other random signals; thus highlighting the stable signal characteristics. The larger the averages times is, the smoother the trace will be. Enabling averaging will take more time to collect the full spectral information because the analyzer needs to sweep the set average count. The displayed data is averaged in a first-in-first-out fashion.

Command format	:TRACe[1]|2|3|4|5|6:TYPE WRITe|MAXHold|MINHold| AVERage :TRACe[1]|2|3|4|5|6:TYPE?
Instructions	Sets/gets the display type of trace
Parameter Type	Enumeration
Parameter Range	WRITe: Trace is in normal mode. Update data MAXHold: Displays the maximum value of traces

	MINHold: Displays the minimum value of trace AVERage: Displays the average value of trace
Return	Enumeration: WRITE|MAXH|MINH| AVER
Example	:TRAC1:TYPE MINH

5.6.3 Trace State

There are four trace states: active, view, blank, and background. Different trace states indicate the refresh and display states of traces:

Active

Refreshed and displayed trace data.

View

The trace data will not be refreshed, and the current latest trace will be displayed in a fixed frame.

Blank

Trace data is no longer refreshed or displayed

Background

Refreshed trace data but no display.

Command format	**:TRACe[1]|2|3|4|5|6:DISPlay[:STATe]** **:TRACe[1]|2|3|4|5|6:DISPlay[:STATe]?**
Instructions	Sets/gets the display status of the trace
Parameter Type	Enumeration: ACTI|VIEW|BLAN| BACK
Parameter Range	ACTIve: Trace is in normal mode. Update data VIEW: Stops updating trace to display current trace data BLANk: Clear trace data BACKground: Set as background
Return	Enumeration: ACTI|VIEW|BLAN| BACK
Example	:TRACe2:DISPlay BLANK :TRACe2:DISPlay?

5.6.4 Detect

The analyzer displays the sweep signal on the screen in the form of a trace. For each trace point, the analyzer always captures all the data within a specific time interval and processes (Peak, Average, etc.) the data using the detector currently selected, then it displays the processed data (a single data point) on the screen.

Select an appropriate detector type according to the actual application in order to ensure the accuracy of the measurement.

The available types are **Pos Peak**, **Neg Peak**, **Sample**, **Normal**, **Average** and **Quasi Peak**. The default is **Pos peak**.

Positive Peak

For each trace point, Positive Peak detector displays the maximum value of data sampled within the corresponding time interval.

Negative Peak

For each trace point, Negative Peak detector displays the minimum value of data sampled within the corresponding time interval.

Sample

For each trace point, Sample detector displays the transient level corresponding to the central time point of the corresponding time interval. This detector type is applicable to noise or noise-like signal.

Normal

Normal detector (also called ROSENFELL Detector) displays the maximum value and the minimum value of the sample data segment in turn: Odd-numbered data points display the maximum value and even-numbered data points display the minimum value. In this way, the amplitude variation range of the signal is clearly shown.

Average

For each trace point, Average detector displays the average value of data sampled within the corresponding time interval.

Command format	**[:SENSe]:DETector:TRACe[1]|2|3|4|5|6[:FUNCtion]** **[:SENSe]:DETector:TRACe[1]|2|3|4|5|6[:FUNCtion]?**
Instructions	Sets/Gets the trace detection type
Parameter Type	Enumeration NEG|POS|SAMP|AVER|NORMAL
Parameter Range	NORMAL: standard NEGative: Negative peak POSitive: positive peak SAMPle: The sampling AVERage: average
Return	Enumeration: NEG|POS|SAMP|AVER|NORMAL
Example	:DETector:TRAC1 AVERage

Command format	**[:SENSe]:DETector:TRACe[1]|2|3|4|5|6:AUTO 0|1** **[:SENSe]:DETector:TRACe[1]|2|3|4|5|6:AUTO?** **[:SENSe]:DETector:TRACe:AUTO:ALL**
Instructions	Set/get trace automatic detection switch
Parameter Type	Boolean

Parameter Range	0|1
Return	0|1
Example	:DETector:TRACe3:AUTO 1 :DETector:TRACe:AUTO:ALL

5.6.5 Math

Set the computational method of the math trace.

Output Z

The Math result is denoted by the Z variable and can be displayed by trace.

Input X, Y

Input X, Y can be applied to trace.

Calculation Type

The analyzer provides the calculation types as shown below:

Power Diff : X-Y+Offset→Z

Power Sum : X+Y+Offset→Z

Log Offset : X+ Offset→Z

Log Diff : X-Y-Ref→Z

Offset value

Command format	**:TRACe[1]|2|3|4|5|6:MATH:X** **:TRACe[1]|2|3|4|5|6MATH:X?**
Instructions	Sets/gets the x-trace of the variable
Parameter Type	Enumeration
Parameter Range	TRACE1-6
Return	Enumeration
Example	:TRACe3:MATH:X 5

Command format	**:TRACe:MATH:Y [1]|2|3|4|5|6** **:TRACe:MATH:Y?**
Instructions	Set the variable Y trace Get the variable y-trace
Parameter Type	Enumeration
Parameter Range	TRACE1-6
Return	Enumeration
Example	:TRACe1:MATH:Y 3

Command format	**:CALCulate[:SELected]:MATH:FUNCtion** **:CALCulate[:SELected]:MATH:FUNCtion?**
Instructions	Sets/gets the trace calculation type
Parameter Type	Enumeration
Parameter Range	OFF PDIF: Power subtracting PSUM: Power up LOFF: Logarithmic deviation LDIF: Logarithmic subtraction
Return	Enumeration
Example	:CALCulate:MATH:FUNCtion PDIF

Command format	**:TRACe[1]|2|3|4|5|6:MATH:OFFSet** **:TRACe[1]|2|3|4|5|6:MATH:OFFSet?**
Instructions	Set the LOG OFFSET constant Ask for the LOG OFFSET constant
Parameter Type	Integer
Parameter Range	-100dB-100dB
Return	-100dB-100dB
Example	:TRACe1:MATH:OFFSet -10 :TRACe3:MATH:OFFSet?

Command format	**:TRACe[1]|2|3|4|5|6:MATH:REFerence** **:TRACe[1]|2|3|4|5|6:MATH:REFerence?**
Instructions	Sets/gets the LOG DIFF constant
Parameter Type	Integer
Parameter Range	-100dB-100dB
Return	-100dB-100dB
Example	:TRACe5:MATH:REFerence 10 :TRACe6:MATH:REFerence?

5.6.6 Normalize

Trace normalization function. Please save the reference trace before using this function.

Command format	**:CALCulate:NTData:STORE:REF**
Instructions	Set normalization to save the reference trace
Example	:CALCulate:NTData:STORE:REF

Command format	**:CALCulate:NTData[:STATe] OFF|ON|0|1** **:CALCulate:NTData[:STATe]?**
Instructions	Set/read switch normalization
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:CALCulate:NTData 1

Command format	:DISPlay:WINDow:TRACe:Y[:SCALe]:NRLevel :DISPlay:WINDow:TRACe:Y[:SCALe]:NRLevel?
Instructions	Sets/gets the normalized reference level
Parameter Type	Float, unitdB
Parameter Range	-200 dB ~ 200 dB
Return	Float, unitdB
Example	:DISPlay:WINDow:TRACe:Y:NRLevel 10

Command format	:DISPlay:WINDow:TRACe:Y[:SCALe]:NRPosition :DISPlay:WINDow:TRACe:Y[:SCALe]:NRPosition?
Instructions	Sets/reads the normalized reference location
Parameter Type	Integer
Parameter Range	0 ~ 100
Return	Integer
Example	:DISPlay:WINDow:TRACe:Y:NRPosition 10

Command format	:DISPlay:WINDow:NTTRace[:STATe] :DISPlay:WINDow:NTTRace[:STATe]?
Instructions	Sets/gets the normalized reference trace switch
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:DISPlay:WINDow:NTTRace 1

5.6.7 Trace Function

Trace function supports the following operations on the specified trace

Trace Copy

Copy data from the source trace to the destination trace. After copying, the trace state of the target trace is automatically changed to view.

Trace Exchange

Exchange the data of the source trace with the data of the target trace. After the exchange, the trace status of the source trace and the target trace will be automatically changed to view.

Preset All Traces

The settings and data of all traces are changed to the default state.

Clear All Traces

Clear all traces data.

Command format	:TRACe:COPY
Instructions	Copy the trace
Example	:TRACe:COPY 1,2

Command format	:TRACe:EXCHange
Instructions	Exchange of trace
Example	:TRACe:EXCHange 1,2

Command format	:TRACe:PRESet:ALL
Instructions	Reset all traces
Example	:TRACe:PRESet:ALL

Command format	:TRACe:CLEar:ALL
Instructions	Clear all traces
Example	:TRACe:CLEar:ALL

5.7 Marker & Peak

The marker appears as a rhombic sign (as shown below) for identifying points on a trace. You can easily read the amplitude, frequency and sweep time of the marked point on the trace.

- The analyzer allows for up to eight/four pairs of markers to be displayed at one time, but only one pair or a single marker is active every time.
- You can use the numeric keys, knob or direction keys to modify the desired frequency or time as well as view the readouts of different points on the trace.

5.7.1 Select Marker

Select one of the eight markers. The default is Marker1. When a marker is selected, you can set its type, trace to be marked, readout type and other related parameters. The enabled marker will appear on the trace selected through the **Select Trace** option and the readouts of this marker are also displayed in the active function area and at the upper right corner of the screen.

Command format	**:CALCulate:MARKer:SELEct** **:CALCulate:MARKer:SELEct?**
Instructions	Sets/Gets the current marker
Parameter Type	Enumeration1-8
Return	Enumeration: 1-8
Example	:CALCulate:MARKer:SELEct 5

5.7.2 Select Trace

Select the trace to be marked by the current marker. Valid selections includeTrace1, 2, 3, 4, 5, 6.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe 1|2|3|4|5|6** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe?**
Instructions	Sets/Gets the marker trace
Parameter Type	Enumeration
Parameter Range	1|2|3|4|5|6
Return	Enumeration
Example	CALCulate:MARK:TRAC 1

5.7.3 Marker Type

5.7.3.1 Normal

One of the marker types. It is used to measure the X (Frequency or Time) and Y (Amplitude) values of a certain point on the trace. When selected, a marker with the number of the current marker (such as “ **1** ”) appears on the trace.

- If no active marker exists currently, a marker will be enabled automatically at the center frequency of the current trace.

- You can use the numeric keys, knob or direction keys to move the marker. The readouts of the marker will be displayed at the upper right corner of the screen.
- The readout resolution of the X-axis (frequency or time) is related to the span. For higher readout resolution, reduce the span.

5.7.3.2 Delta

One of the marker types. It is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the reference point and a certain point on the trace. When selected, a pair of markers appears on the trace: Fixed Related Marker (marked by a combination of the marker number and letter " **+** ", such as " **2+** ") and the Delta Marker (marked by the "∆", such as " 1∆2 ").

- After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker
- The delta marker is in the "relative to" state, and its X-axis position can be changed; the related marker is in the "fixed" state by default (the X-axis and Y-axis positions are fixed), but the X-axis can be adjusted by changing to the "normal" state.
- The first row in the upper right corner of the trace area shows the frequency (or time) difference and amplitude difference between the two markers; the second row in the upper right corner of the trace area shows the X axis and amplitude value of the related marker.
- Delta reset. It is only valid when the current marker is a differential marker. If the marker type of the relative marker of the current marker is normal or differential, change the horizontal position of the relative marker to the horizontal position of the current marker; if the marker type of the relative marker is fixed, change the horizontal position and vertical position of the relative marker to the current one. The horizontal and vertical position of the marker.

5.7.3.3 Fixed

One of the marker types. When "Fixed" is selected, the X-axis and Y-axis of the marker will not change by the trace and can only be changed through the menu. The fixed marker is marked with "+".

After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker

5.7.3.4 Off

Turn off the marker currently selected. The marker information displayed on the screen and functions based on the marker will also be turned off.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE POSition|DELTa|FIXed|OFF :CALCulate:MARKer[1]|2|3|4:MODE?
Instructions	Sets/Gets the marker mode
Parameter Type	Enumeration
Parameter Range	POSition DELTa FIXed OFF
Return	Enumeration: POS|DELT|FIX|OFF
Example	:CALCulate:MARK1:MODE POSition

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe OFF|ON|0|1 :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe?
Instructions	Sets/gets the marker switch status
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARK1:STATe ON

Command format	:CALCulate:MARKer:AOFF
Instructions	Close all markers
Example	:CALCulate:MARKer:AOFF

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8 [:SET]:RESEt:DELTa
Instructions	Difference marker resets to 0 Only valid when the current cursor is a differential marker
Example	:CALCulate:MARKer2:RESEt:DELTa

5.7.4 Marker Postion

Displays and sets the position of the marker. Only the x-axis position can be set.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X?
Instructions	Sets/gets the value of the marker point X axis This command takes effect only when the marker mode is not OFF: :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE If the marker readout type is frequency, the parameter is frequency. When the marker readout type is time, the value is time. Reference commands::CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout
Parameter Type	frequency , Float , unitHz , kHz, MHz , GHz , default Hz or time , Float , unitus , ms , s , ks , default s
Parameter Range	0 Hz ~ max span or 10 ms ~ 1000 s
Return	When the marker readout type is frequency, the reading is frequency, floating point type, in Hz; When the marker readout type is time, the reading is time, floating point type, in s; When the marker readout type is cycle, the reading is cycle, floating point type, unit s;

Example	:CALCulate:MARKer4:X 0.4 GHz :CALCulate:MARKer4:X 200 ms :CALCulate:MARKer4:X?

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y?**
Instructions	Read the value of the Y-axis of the marker point, which can also be used to read the marker noise in the marker function. To execute this command, ensure that the marker is in the onstate.:CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Parameter Type	Float
Parameter Range	None
Return	Float, unitdBm
Example	:CALCulate:MARKer1:Y? Return: -25

5.7.5 Relative To

"Relative to" is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between two markers which can mark on different traces.

After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence 1|2|3|4** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence?**
Instructions	Sets/Gets the marker relative to
Parameter Type	Enumeration
Parameter Range	1|2|3|4|5|6|7|8
Return	Enumeration
Example	:CALCulate:MARKer1:REFerence 3

5.7.6 Readout Type

Select a desired readout type for the X-axis for the marker. Different markers can use different readout types. This setting will change the readout type and affect the marker readings in the active function area and at the upper right corner of the screen, but will not change the actual value.

Frequency

In this type, Normal marker shows the absolute frequency. Delta markers and Delta Pair markers show the frequency difference between the delta marker and reference marker. The default readout mode in non-zero span is "**Frequency**".

Note: This type is invalid in Zero span.

Period

In this type, the Normal marker shows the reciprocal of frequency; while Delta marker and Delta Pair marker show the reciprocal of frequency difference. When the frequency difference is zero, the reciprocal is infinite and 100 Ts is displayed.

Note: This type is invalid in Zero span.

Time

In this type, the Normal marker shows the time difference between the marker and the start of the sweep; while Delta marker and Delta Pair marker show the sweep time difference between the delta marker and reference marker.

The default readout mode in Zero span is Time.

Inverse Time

In this type, the Normal marker Inverse Time = 1 / Time ; while Delta marker and Delta Pair marker s Inverse Time = 1 / Δ Time.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout FREQuency | TIME | PERiod | INTIme** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout?**
Instructions	Sets/gets the marker in X-axis reading mode
Parameter Type	Enumeration
Parameter Range	FREQuency: frequency TIME PERiod INVERSE_TIME
Return	Enumeration: FREQ|TIME|PER| INTIme
Example	:CALCulate:MARKer1:X:READout FREQuency

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout:AUTO 0|1** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout:AUTO?**
Instructions	Sets/gets the marker in X-axis reading mode auto
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:X:READout:AUTO 1

5.7.7 Marker Couple

When Marker Couple is on, Markers are set up and moved in coupled operation on all traces.

When Marker Couple is off, Markers are set up and moved independently for each trace.

Command format	**:CALCulate[:SELected]:MARKer:COUPle** **:CALCulate[:SELected]:MARKer:COUPle?**

Instructions	Set/query the marker coupling switch
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:COUPle 1 :CALCulate:MARKer:COUPle?

5.7.8 Marker Lines

Mark the marker with the intersection of horizontal and vertical lines, which is more convenient to query the marker position in the waveform area.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:LINE:STATe** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:LINE:STATe?**
Instructions	Sets/gets the marker line switch
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer2:X:LINE:STATe 1 :CALCulate:MARKer2:X:LINE:STATe?

5.7.9 Marker Table

Enable or disable the Marker Table.

Display all the markers enabled on the lower portion of the screen, including marker number, trace number, marker readout type, X-axis readout and amplitude. Through this table you can view the measurement values of multiple points. The table allows for up to eight markers to be displayed at one time.

Command format	**:CALCulate:MARKer:TABLe ON|OFF|0|1** **:CALCulate:MARKer:TABLe?**
Instructions	Sets/gets the marker table state
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:TABLe ON

5.7.10 Marker ->

5.7.10.1 M->CF

Set the center frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the center frequency will be set to the frequency of the current marker.

- If the **Delta** or **Delta Pair** marker is selected, the center frequency will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:CENTer
Instructions	Sets/gets the value of the marker X axis to the center frequency .If the marker is not open, this command automatically turns the marker on the center frequency.
Example	:CALCulate:MARKer1:CENTer

5.7.10.2 M -> CF Step

Set the center frequency step of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the center frequency step will be set to the frequency of the current marker.
- If the **Delta** or **Delta** Pair marker is selected, the center frequency step will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STEP
Instructions	Sets/gets the value of the marker X axis to mid-frequency step If the marker is not open, this command automatically turns the marker on the center frequency.
Example	:CALCulate:MARKer1:STEP

5.7.10.3 M -> Start Freq

Set the start frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the start frequency will be set to the frequency of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the start frequency will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:START
Instructions	Sets/gets the value of the marker X axis to the starting frequency, valid when the marker is on
Example	:CALCulate:MARKer1:START

5.7.10.4 M -> Stop Freq

Set the stop frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the stop frequency will be set to the frequency of the current marker.

- If the **Delta** or **Delta Pair** marker is selected, the stop frequency will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STOP**
Instructions	Sets/gets the value of the marker X axis to terminate frequency If the corresponding marker is not open, sending this command will automatically open the marker at the end frequency.
Example	:CALCulate:MARKer1:STOP

5.7.10.5 M ->Ref Level

Set the reference level of the analyzer to the amplitude of the current marker.

- If the **Normal** marker is selected, the reference level will be set to the amplitude of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the reference level will be set to the amplitude of the Delta Marker.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:RLEVel**
Instructions	Sets/gets the value of the marker Y-axis as a reference level If the marker is not open, this command automatically turns the marker on the center frequency.
Example	:CALCulate:MARKer2:RLEVel

5.7.10.6 ΔM->Span

Set the span of the analyzer to the frequency difference between the two markers in Delta marker type.

- If **the Normal** marker is selected, this function is invalid.
- The function is invalid in Zero span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:SET]:SPAN**
Instructions	Sets/gets the difference between the marker and the X axis to sweep width This command takes effect only when the marker mode is DELTa :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Example	:CALCulate:MARKer2:DELTa:SPAN

5.7.10.7 ΔM->CF

Set the center frequency of the analyzer to the frequency difference between the two markers in **Delta** marker type.

- If the **Normal** marker is selected, this function is invalid.
- The function is invalid in Zero span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:SET]:CENTer**
Instructions	Sets/gets the difference between the marker and the X axis to the center frequency This command takes effect only when the marker mode is DELTa :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Example	:CALCulate:MARKer3:DELTa:CENTer

5.7.11 Marker Fn

Special marker functions including Noise Marker, N dB BW and Freq Counter.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FUNCtion OFF|FCOunt|NOISe|NDB** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FUNCtion?**
Instructions	Set/Get marker function
Parameter Type	Enumeration
Parameter Range	OFF: normal NOISe: noisy marker NDB: N dB marker
Return	Enumeration: OFF|NOISe|NDB
Example	:CALCulate:MARK1:FUNCtion NOISe

5.7.11.1 N dB BW

Enable the N dB BW measurement or set the value of N dB. The N dB BW denotes the frequency difference between two points that are located on both sides of the current marker and with N dB fall (N Less than or equal to 0) or rise (N>0) in amplitude as shown in the figure on the next page.

When the measurement starts, the analyzer will search for the two points which are located at both sides of the current point with N dB fall or rise in amplitude and display the frequency difference between the two points in the active function area. "----" would be displayed if the search fails.
The parameters in the figure are shown as:

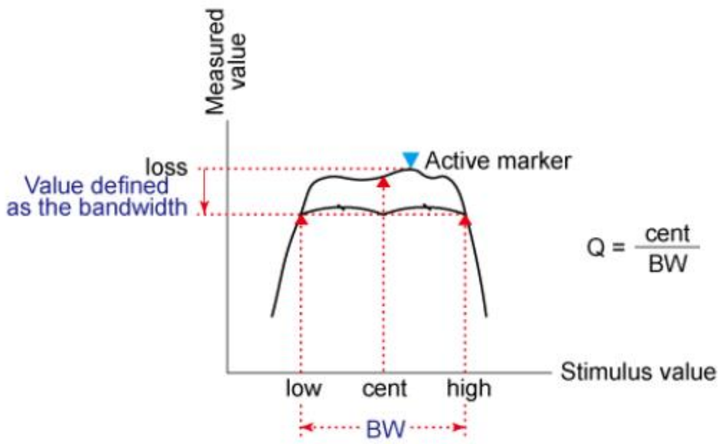


Figure 5-4 N dB parameter

mkr_ndb_bw

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth:NDB** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth:NDB?**
Instructions	Set/Obtain the N dB bandwidth reference value
Parameter Type	Float
Parameter Range	-100 dB ~ 100 dB
Return	Float
Example	:CALCulate:MARK1:BANDwidth:NDB 10 DB

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth:RESult?**
Instructions	Result of setting/reading N dB bandwidth
Return	Float
Example	:CALCulate:MARK1:BANDwidth:RESult?

5.7.11.2 Freq Counter

Turn on or off the frequency counter. The frequency readout is accuracy is up to 0.01 Hz.

- The function is valid only when selecting marker 1.
- If marker 1 is selected but not active, turning on the frequency counter will open marker 1 Normal marker automatically.
- The frequency counter measures the frequency near the center frequency in Zero span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt:[:STATe] ON|OFF|0|1** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt:[:STATe]?**
Instructions	Sets/gets the marker frequency counter state
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARK1:FCOunt 1

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt:X?**
Instructions	Read the marker frequency counter reading
Return	Float
Example	:CALCulate:MARK1:FCOunt:X?

5.7.11.3 Noise Marker

Execute the Noise marker function for the selected marker and read the normalized noise power spectral density.

- If the current marker is “ **Off** ” in the Marker menu, pressing **Noise Marker** will first set it to Normal type automatically; then measure the average noise level at the marked point and normalize this value to 1 Hz bandwidth. During this process, certain compensation is always made based on the detection and trace types. The measurement will be more precise if RMS Avg or Sample detection type is used.

- This function can be used for measuring the C/N ratio.

5.7.11.4 Off

Turn off the noise marker, N dB BW measurement or Frequency Counter, but not the marker itself.

5.7.12 Peak Search

Open the peak search setting menu and execute peak search.

5.7.12.1 Peak Search

Next Search

Execute peak search and mark the peak.

Minium Peak

Execute minimum search and mark the minium peak.

Next Peak

Search for and mark the peak whose amplitude is closest to that of the current peak and which meets the peak search condition.

Next Left Peak

Search for and mark the nearest peak which is located at the left side of the current peak and meets the peak search condition.

Next Right Peak

Search for and mark the nearest peak which is located at the right side of the current peak and meets the peak search condition.

Peak Peak

Execute peak search and minimum search at the same time and mark the results with delta pair markers. Wherein, the result of peak search is marked with the delta marker and the result of minimum search is marked with the reference marker.

Peak -> CF

Execute peak search and set the center frequency of the analyzer to the frequency of the peak. The function is invalid in Zero Span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum
Instructions	Marker searches for peaks and marks them with the specified marker (If peak-to-peak value is on, peak-to-peak value search is carried out; otherwise, single peak value search is carried out, refer to the command:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak:STATe Search criteria include peak type, absolute threshold, and relative offset :CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer4:MAXimum

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum
Instructions	Marker searches for the minimum peak and marks it with the specified marker
Example	:CALCulate:MARKer4:MINimum

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:NEXT
Instructions	Marker searches for the next peak and marks it with the specified marker (Based on the set search criteria, including peak type, absolute threshold, and relative offset, see the following command :CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer1:MAXimum:NEXT

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:LEFT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:RIGHt
Instructions	Marker searches for left/right peaks and marks with the specified marker (Based on the set search criteria, including peak type, absolute threshold, and relative offset, see the following command :CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer1:MAXimum:LEFT

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak
Instructions	Performs a peak-to-peak search, marking with the specified marker
Example	:CALCulate:MARKer1:PTPeak

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum[:SET]:CENTer
Instructions	Execute peak search and set the center frequency of the analyzer to the frequency of the peak
Example	:CALCulate:MARKer1:MAXimum:CENTer

5.7.12.2 Peak Config

Define the conditions of peak search for various peak searches. A real peak should meet the requirements of both the “**Peak Threshold**” and “**Peak Excursion**”.

Peak Threshold

Assign a minimum for the peak amplitude. Peaks whose amplitudes are greater than the specified peak threshold are treated as real peaks.The actual minimal peak threshold is -200dBm when shut down the Peak Threshold.

Peak Excursion

Set the excursion between the peak and the minimum amplitude on both sides of it. Peaks whose excursions are beyond the specified excursion are treated as real peaks.The actual minimal peak excursion is 0dBm when shut down the Peak Excursion.

Command format	**:CALCulate:MARKer:PEAK:THReshold** **:CALCulate:MARKer:PEAK:THReshold?**
Instructions	Sets/gets the absolute threshold for the peak search criteria
Parameter Type	Float, unitdBm
Parameter Range	-200.0 dBm~ 200.0 dBm
Return	Float, unitdBm
Example	:CALCulate:MARKer:PEAK:THReshold -50

Command format	**:CALCulate:MARKer:PEAK:THReshold:STATe** **:CALCulate:MARKer:PEAK:THReshold:STATe?**
Instructions	Set or obtain the absolute threshold switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:CPSEarch ON

Command format	**:CALCulate:MARKer:PEAK:EXCursion** **:CALCulate:MARKer:PEAK:EXCursion?**
Instructions	Sets/gets a relative threshold for the peak search criteria
Parameter Type	Float, unitdB
Parameter Range	0 ~ 200.0 dB
Return	Float, unitdB
Example	:CALCulate:MARKer:PEAK:EXCursion 10

Command format	**:CALCulate:MARKer:PEAK:EXCursion:STATe** **:CALCulate:MARKer:PEAK:EXCursion:STATe?**
Instructions	Set and obtain the relative threshold switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer:PEAK:EXCursion:STATe ON

5.7.12.3 Count Peak

Enable or disable continuous peak search. The default is Off. When enabled, the system will always execute a peak search automatically after each sweep in order to track the signal under measurement.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe]** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe]?**
Instructions	Enable the continuous peak search function Gets the status of the continuous peak search function switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:CPSEarch ON

5.7.12.4 Peak Table

Open the peak table (in the lower window) which lists the peaks (with frequency and amplitude) that meet the peak search condition. Up to 30 peaks can be displayed in the table.

Command format	**:CALCulate:MARKer:PEAK:TABLe** **:CALCulate:MARKer:PEAK:TABLe?**
Instructions	Set/Query the switch of the peak value table
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:PEAK:TABLe ON

Command format	**:CALCulate:PEAK:TABLe?**
Instructions	Get peak table data
Return	String
Example	:CALCulate:PEAK:TABLe?

5.7.12.5 Sort Order

Sort all signals in the peak table by the specific order.

Sort order based on the frequency / time(zero span) , ampt or delta to limit.

Command format	**:CALCulate:MARKer:PEAK:SORT** **:CALCulate:MARKer:PEAK:SORT?**
Instructions	Sets/gets the peak sorting basis
Parameter Type	Enumeration
Parameter Range Return	AMPT|FREQ|DELTa AMPT|FREQ|DELTa
Example	:CALCulate:MARKer:PEAK:SORT FREQ :CALCulate:MARKer:PEAK:SORT?

Command format	:CALCulate:MARKer:PEAK:SORT:ORDEr :CALCulate:MARKer:PEAK:SORT:ORDEr?
Instructions	Sets/Gets the peak sort type
Parameter Type	Enumeration
Parameter Range	ASC|DEC
Return	ASC|DEC
Example	:CALCulate:MARKer:PEAK:SORT:ORDEr DEC :CALCulate:MARKer:PEAK:SORT:ORDEr?

Command format	:CALCulate:MARKer:PEAK:TABLe:DTLimit :CALCulate:MARKer:PEAK:TABLe:DTLimit?
Instructions	Peak sorting based on limit selection
Parameter Type	Integer
Parameter Range	1-6
Return	1-6
Example	:CALCulate:MARKer:PEAK:TABLe:DTLimit 5 :CALCulate:MARKer:PEAK:TABLe:DTLimit?

Command format	:CALCulate:MARKer:PEAK:TABLe:DTLimit:STATe 0|1 :CALCulate:MARKer:PEAK:TABLe:DTLimit:STATe?
Instructions	Set/Query the switch of the peak value table
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:PEAK:TABLe:DTLimit:STATe ON

5.8 Limit

The analyzer supports Pass/Fail test function. In this function, the measured curve will be compared with the pre-edited curve. If the related rules are met, the result is “**Pass**”, else the result is “**Fail**”.

5.8.1 Slect Limit

Activate/Select a limit.

5.8.2 Limit State

Enable or disable slected limit.

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:STATe OFF|ON|0|1** **:CALCulate:LLINe[1]|2|3|4|5|6:STATe?**
Instructions	Sets/gets the restricted state
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe1:STATe OFF

5.8.3 Limit Margin

Set the margin for selected limit.
When trace is between limit and margin, it will be displayed as **Fail Margin.**

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:MARGin** **:CALCulate:LLINe[1]|2|3|4|5|6:MARGin?**
Instructions	Sets/gets the limit margin value
Parameter Type	Float
Parameter Range	-100 dB ~ 100dB
Return	Float
Example	:CALCulate:LLINe2:MARGin 10 :CALCulate:LLINe2:MARGin? :CALCulate:LLINe2:MARGin:STATe 0

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe** **:CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe?**
Instructions	Sets/gets the restricted state
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe1:MARGin:STATe OFF

5.8.4 Limit Type

Set the limit type as upper / lower . The limit 1,3,5 is default as the lower and 2,4,6 as the lower.

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:TYPE UPPer|LOWer** **:CALCulate:LLINe[1]|2|3|4|5|6:TYPE?**
Instructions	Sets/Gets the restriction type
Parameter Type	Enumeration
Parameter Range	UPPer|LOWer
Return	Enumeration
Example	:CALCulate:LLINe1:TYPE LOWer

5.8.5 Limit Edit

Edit the properties of slected limit.

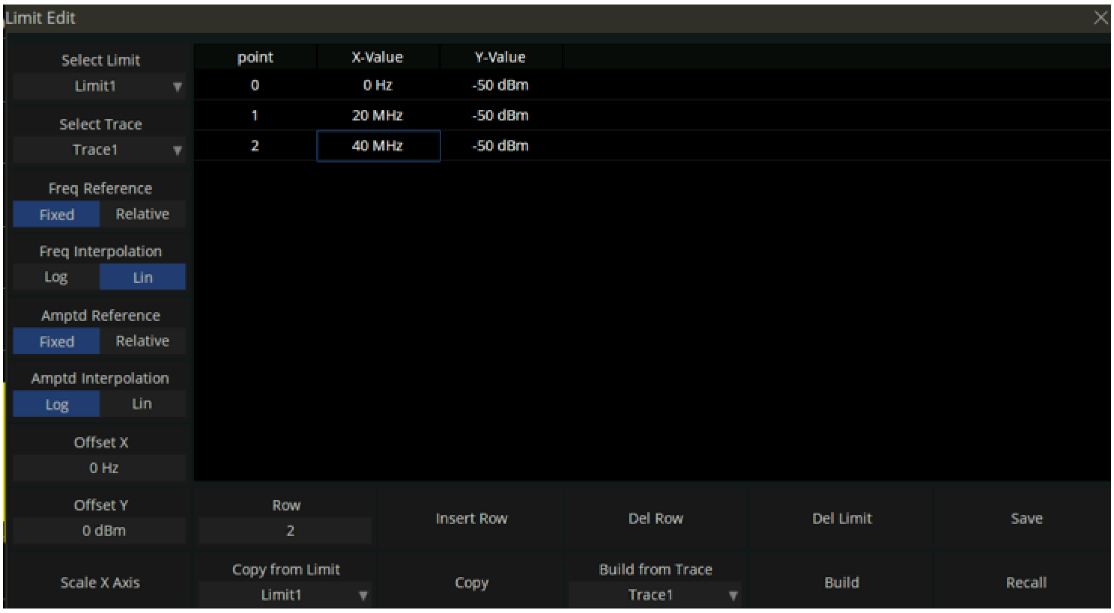


Figure 5-5 limit edit

Table 5-1 Limit1 Edit Menu

Function	**Explanation**
Type	Select upper or lower limit type. The default value is Upper.
Mode	Select limit line or limit point. The default value is Line. Set the number of the point to be edited if you selected the point type, and the range is 1 ~ 100.
Add point	Add a new point for editing.
X-axis	Edit the X-axis value (frequency or time) of the current point.

Amplitude	Edit the amplitude of the current point or line.
Del Point	Delete the point whose number is selected in Mode.
Del All	Delete all the points.
Save/Load	Save or load the limit file.
X Offset	Set offsets of X axis.
Y Offset	Set offsets of Y axis

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X?**
Instructions	Set the limit point template frequency offset Gets the limit point template frequency offset
Parameter Type	Float
Parameter Range	0 ~ 26.5G
Return	Float
Example	:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X 1MHz

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y?**
Instructions	Sets the limit point template amplitude offset Gets the limiter template amplitude offset
Parameter Type	Float
Parameter Range	-350 dB~380 dB
Return	Float
Example	:CALCulate:LLINe5:Offset:Y -10

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DATA val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:DATA?**
Instructions	Sets/gets restricted data (Clears previous data)
Parameter Type	val1 : frequency : Float, val2 : Ampl : Float
Parameter Range	val1 : related with Span val2 : -400 dBm~330 dBm
Return	val1 : frequency : Float, val2 : Ampl : Float
Example	:CALCulate:LLINe2:DATA 100, -20, 200, -25 (Add two points(100,-20) and (200,-25)) :CALC:LLINe1:DATA?

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:ADD val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:POINt:DELete**
Instructions	Add limit point Delete limit points
Parameter Type	val1 : frequency : Float, val2 : Ampl : Float

Parameter Range	val1 : related with Span val2 : -400 dBm~330 dBm
Example	:CALCulate:LLINe1:ADD 100,-20 :CALCulate:LLINe2:POINt:DELete 2

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DELete** **:CALCulate:LLINe:ALL:DELete**
Instructions	Delete specified restrictions Delete all restrictions
Example	:CALCulate:LLINe1:DELete :CALCulate:LLINe:ALL:DELete

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:TRACe** **:CALCulate:LLINe[1]|2|3|4|5|6:TRACe?**
Instructions	Select the limit trace
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe1:TRACe 3

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE** **:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE?**
Instructions	Set/Query the frequency difference type
Parameter Type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1:FREQuency:INTerpolate:TYPE LOG

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe** **:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe?**
Instructions	Set or query the frequency reference type
Parameter Type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2:FREQuency:CMODe FIX

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE** **:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE?**
Instructions	Set or query the range difference type
Parameter Type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1: AMPLitude:INTerpolate:TYPE LOG

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe** **:CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe?**

Instructions	Set or query the amplitude reference type
Parameter Type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2: AMPLitude:CMODe FIX

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:COPY** **:CALCulate:LLINe[1]|2|3|4|5|6:COPY?**
Instructions	Copy the limit
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2:COPY 5

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:BUILd** **:CALCulate:LLINe[1]|2|3|4|5|6:BUILd?**
Instructions	Fitting a trace
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2: BUILd 1 :CALCulate:LLINe2: BUILd?

5.8.6 Limit Test

Enable or disable the limit test function.

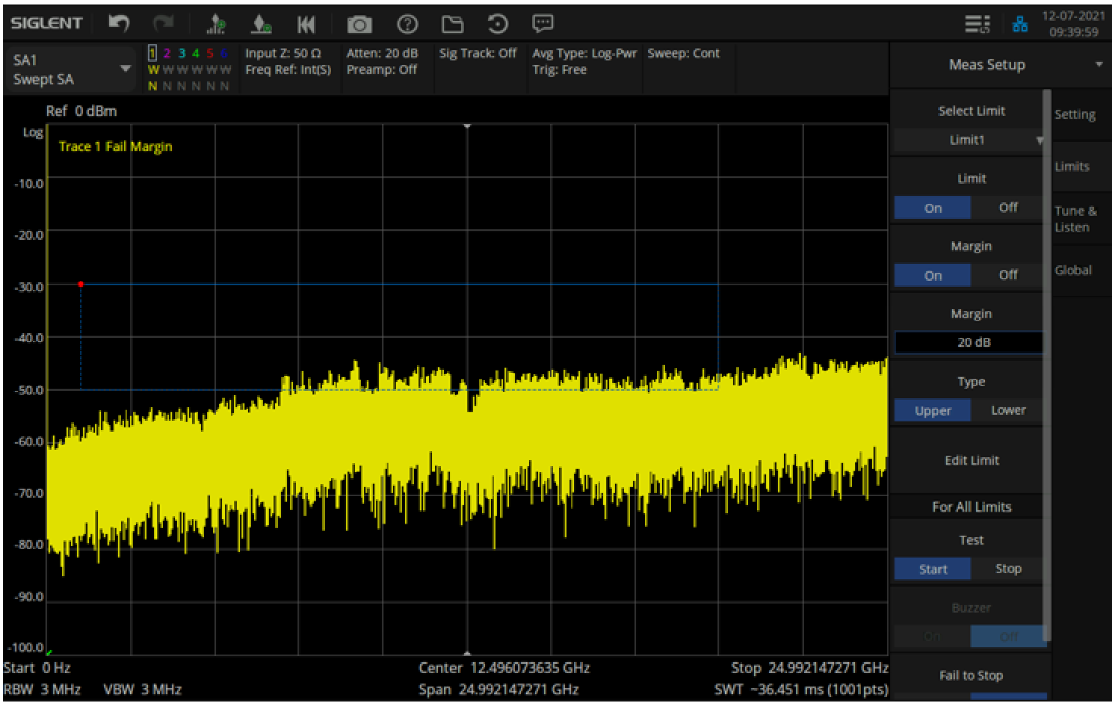


Figure 5-6 test results

Command format	**:CALCulate:LLINe:TEST** **:CALCulate:LLINe:TEST?**
Instructions	Sets/gets the status of the test switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:TEST 1

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FAIL?**
Instructions	Query limit test results.
Return	0|1
Example	:CALCulate:LLINe2:FAIL 1

5.8.7 Setup

Fail to stop

Turn on or off the Fail to stop function. If the function is on, the analyzer will stop sweep and retain the test result when the test result is “Fail”.

Buzzer

Turn on or off the buzzer. When the buzzer is on, it beeps when the test result is “Fail”.

Command format	**:CALCulate:LLINe:CONTrol:BEEP** **:CALCulate:LLINe:CONTrol:BEEP?**
Instructions	Sets/gets the restricted buzzer
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:CONTrol:BEEP OFF

Command format	**:CALCulate:LLINe:FAIL:STOP** **:CALCulate:LLINe:FAIL:STOP?**
Instructions	The set/query limit test stops if it fails
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:FAIL:STOP OFF

5.9 Meas & Meas Setup

Provide optional measurement functions. When activated, the screen will be divided into two parts. The above part is the measure screen which displays traces, and the other part is used to display measurement results.

5.9.1 Swept SA

The Swept SA measurement lets you perform “traditional” Spectrum Analysis, that is, Swept and Zero Span measurements, as well as “Swept FFT” analysis (FFT analysis presented as though it were swept).

5.9.1.1 Average Type

Choose one of the following averaging types: log power (video), power (RMS), or voltage averaging. When trace average is on, the average type is shown on the left side of the display.

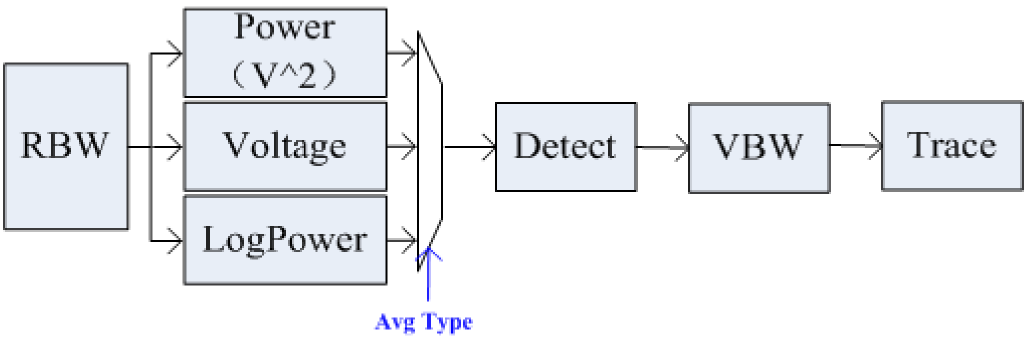


Figure 5-7 Average Type

Log Power

Select the logarithmic (decibel) scale for all filtering and averaging processes. This scale is "Video" because it is the most common display and analysis scale for the video signal within analyzer. This scale is excellent for finding Sine/CW signals near noise.

Power Average

In this average type, all filtering and averaging processes work on the power (the square of the magnitude) of the signal, instead of its log or envelope voltage. This scale is best for real-time power measurement of complex signals.

Voltage Average

In this Average type, all filtering and averaging processes work on the voltage of the envelope of the signal. This scale is suitable for observing rise and fall behavior of AM or pulse-modulated signals such as radar and TDMA transmitters.

Command format	[:SENSe]:AVERage:TYPE LOGPower|POWer|VOLTage [:SENSe]:AVERage:TYPE?
Instructions	Set/Query the average type
Parameter type	Enumeration
Parameter Range	LOGPower POWer VOLTage
Return	Enumeration: LOGP|POW|VOLT
Example	AVERage:TYPE VOLTage

Command format	[:SENSe]:AVERage:TYPE:AUTO 0|1|ON|OFF [:SENSe]:AVERage:TYPE:AUTO?
Instructions	Set/query the average type automatically
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:AVERage:TYPE:AUTO 1

5.9.1.2 Average/Hold Number

Sets the terminal count number N for Average, Max Hold and Min Hold trace types. This number is an integral part of how the average trace is calculated. Basically, increasing N results in a smoother average trace.

Command format	[:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:COUNt [:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:COUNt?
Instructions	Sets/gets the average number of traces
Parameter type	Integer
Parameter Range	1 ~ 999
Return	Integer
Example	:AVERage:TRACe1:COUNt 10

Command format	[:SENSe]:AVERage:TRACe[1]|2|3|4|5|6? [:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:CLEar
Instructions	The current average number of times the trace has been obtained Restart average
Example	:AVERage:TRACe2 ? :AVERage:TRACe2:CLEar

5.9.1.3 Tune & Radio

Demod (AM/FM)

Sets the demodulation type of AM, FM or OFF demod. Default setting is OFF demod.

When AM (or FM) demodulation is turned on, the system automatically opens a cursor to position it at the center frequency, and perform AM (or FM) demodulation for this frequency point.

This machine is equipped with a headphone jack, through which demodulation signal can be output in audio mode. Audio frequency represents the frequency of the modulated signal, and the intensity of audio indicates the amplitude of the modulated signal.

Earphone

Set the headset status/volume.When the headset is turned on, the voice of the modulation signal can be heard through the headset during the demodulation process. The headset is disabled by default. You can set the volume of the headset by volume.

Demodulation time

Set the dwell time of signal demodulation after each sweep. Longer dwell time will benefit continuous demodulation signal.

If the headset is turned on, the voice of the demodulated signal will be heard through the headset during this period.

Command format	**[:SENSe]:DEMod AM|FM|OFF** **[:SENSe]:DEMod?**
Instructions	Sets the demodulation mode Gets the demodulation mode
Parameter type	Enumeration
Parameter Range	AM : Amplitude modulation FM : Frequency modulation OFF
Return	Enumeration: AM|FM|OFF
Example	:DEMod AM

Command format	**[:SENSe]:DEMod:EPHone OFF|ON|0|1** **[:SENSe]:DEMod:EPHone?**
Instructions	Switch the headset
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DEMod:EPHone ON

Command format	**[:SENSe]:DEMod:VOLume** **[:SENSe]:DEMod:VOLume?**
Instructions	Adjust the volume
Parameter type	Integer
Parameter Range	0 ~ 10
Return	Integer
Example	:DEMod:VOLume 10

Command format	**[:SENSe]:DEMod:TIME** **[:SENSe]:DEMod:TIME?**

Instructions	Set the demodulation time Get demodulation time
Parameter type	Float , unitms , us , s
Parameter Range	5 ms ~1000 s
Return	Float , units
Example	DEMod:TIME 5 ms

5.9.1.4 Automatic coupling

Auto coupling instantly sets all auto/manual functions to auto. The automatic coupling action is limited to the current measurement. It does not affect other measurements in the mode.

In the automatic state, the automatic/manual functions are referred to as "coupled", which means that their values will change based on changes made to other values in the measurement. This helps ensure accurate measurements and optimal dynamic range. Automatic coupling is a just-in-time action feature that, when it is performed, all automatic/manual controls for the current measurement are set to automatic and all measurement settings coupled to automatic/manual parameters are automatically set to their best values.

Command format	**:COUPle:ALL**
Instructions	Automatic coupling
Example	:COUPle:ALL

5.9.1.5 Display line

The amplitude line can be used as a reference for the amplitude readout or as a threshold condition for the peak display in the peak table.

The frequency line can be used as a reference for frequency readout.

Command format	**:DISPlay:WINDow:TRACe:Y:DLINe** **:DISPlay:WINDow:TRACe:Y:DLINe?**
Instructions	Sets/gets the amplitude display line
Parameter type	Float
Return	Float
Example	:DISPlay:WINDow:TRACe:Y:DLINe -40

Command format	**:DISPlay:WINDow:TRACe:Y:DLINe:STATe** **:DISPlay:WINDow:TRACe:Y:DLINe:STATe?**
Instructions	Set/get amplitude display line automatically
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISPlay:WINDow:TRACe:Y:DLINe:STATe 1

Command format	:DISPlay:WINDow:TRACe:X:FLINe :DISPlay:WINDow:TRACe:X:FLINe?
Instructions	Set/Obtain the frequency display line
Parameter type	Float
Return	Float
Example	:DISPlay:WINDow:TRACe:X:FLINe 100e6

Command format	:DISPlay:WINDow:TRACe:X:FLINe:STATe :DISPlay:WINDow:TRACe:X:FLINe:STATe?
Instructions	Set/get frequency display line automatically
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISPlay:WINDow:TRACe:X:FLINe:STATe 1

5.9.1.6 Gloabl

The global center frequency causes the current center frequency to act on other measurements/ swep.

Command format	:INSTrument:COUPle:FREQuency:CENTer :INSTrument:COUPle:FREQuency:CENTer?
Instructions	Enable/disable the global center frequency
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:INSTrument:COUPle:FREQuency:CENTer 0 :INSTrument:COUPle:FREQuency:CENTer?

5.9.2 Channel Power

Measure the power and power density within the specified channel bandwidth. When this function is enabled, the span and resolution bandwidth are automatically adjusted to smaller values. Select **Channel Power** and press **Meas Setup** to set the corresponding parameters.

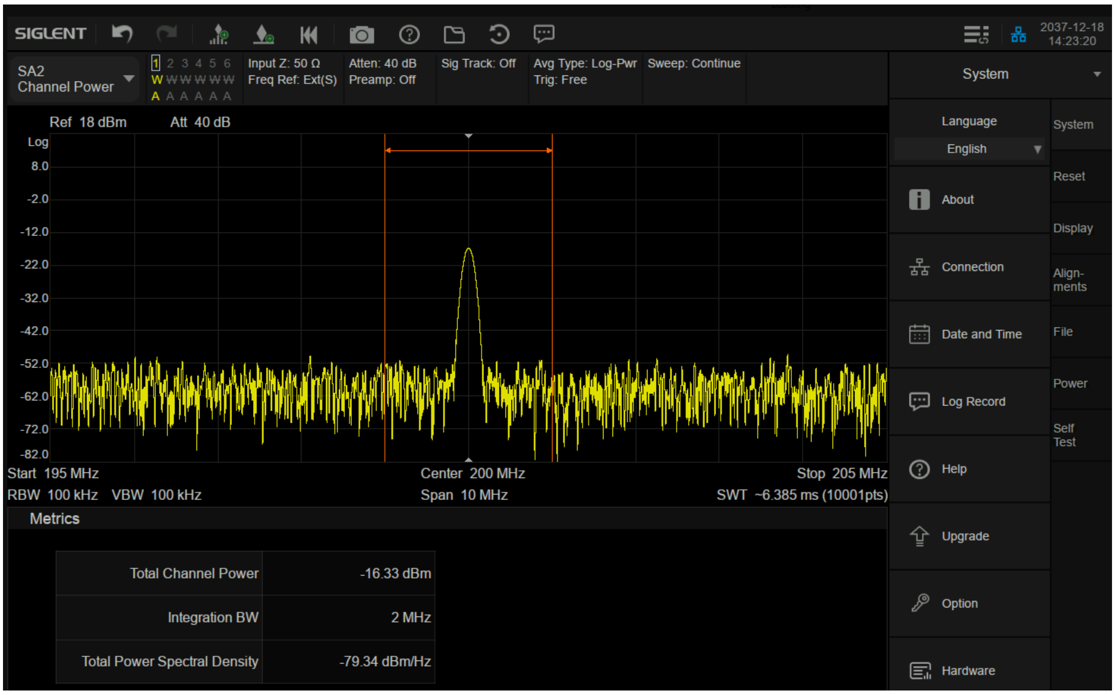


Figure 5-8 Channel Power

Measurement Results: Channel power and power spectral density.

- Channel Power: Power within the integration bandwidth.
- Power Spectral Density: Power (in dBm/Hz) normalized to 1Hz within the integration bandwidth.

Measurement Parameters: Center Freq, Integration BW, Span, Span power.

Command format	**:CHPower:MEASure:CHPower?** **:CHPower:MEASure:CHPower:CHPower?** **:CHPower:MEASure:CHPower:DENSity?**
Instructions	Read channel power and power spectral density
Return	Float , Channel power unit: dBm Float , A unit of spectral density of power :dBm/Hz
Example	:CHPower:MEASure:CHPower?

5.9.2.1 Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr:

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat:

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]:CHPower:AVERage:TCONtrol** **[:SENSe]:CHPower:AVERage:TCONtrol?**
Instructions	Sets/gets the average mode
Parameter type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EnumerationEXPOnentialr|REPEat
Example	:CHPower:AVERage:TCONtrol REPEat

5.9.2.2 Integration BW

Set the frequency width of the channel to be tested and the power of the channel is the power integral within this bandwidth. You can use the numeric keys, knob or direction keys to modify this parameter.

Command format	**[:SENSe]:CHPower:BWIDth:INTegration** **[:SENSe]:CHPower:BWIDth:INTegration?**
Instructions	Sets/gets the integral bandwidth
Parameter type	Float , unitHz , kHz , MHz ,GHz
Return	Float , unitHz
Example	:CHPower:BWIDth:INTegration 1.0 GHz

Command format	**[:SENSe]:CHPower:FREQuency:SPAN:POWer**
Instructions	Sets the value of channel sweep to the integral bandwidth
Example	:CHPower:FREQuency:SPAN:POWer

5.9.2.3 PSD Unit

Select power spectral density unit, optional dBm/Hz , dBm/MHz.

Command format	**:UNIT:CHPower:POWer:PSD** **:UNIT:CHPower:POWer:PSD?**
Instructions	Select the power spectral density unit
Parameter type	Enumeration
Parameter Range	DBMHZ|DBMMHZ
Return	DBMHZ|DBMMHZ
Example	:UNIT:CHPower:POWer:PSD DBMHZ :UNIT:CHPower:POWer:PSD?

5.9.3 ACPR

Measure the power of the main channel and adjacent channels as well as the power difference between the main channel and each of the adjacent channels. When this function is enabled, the span and resolution bandwidth of the analyzer are adjusted to smaller values automatically.

Select **ACPR** and press **Meas Setup** to set the corresponding parameters.

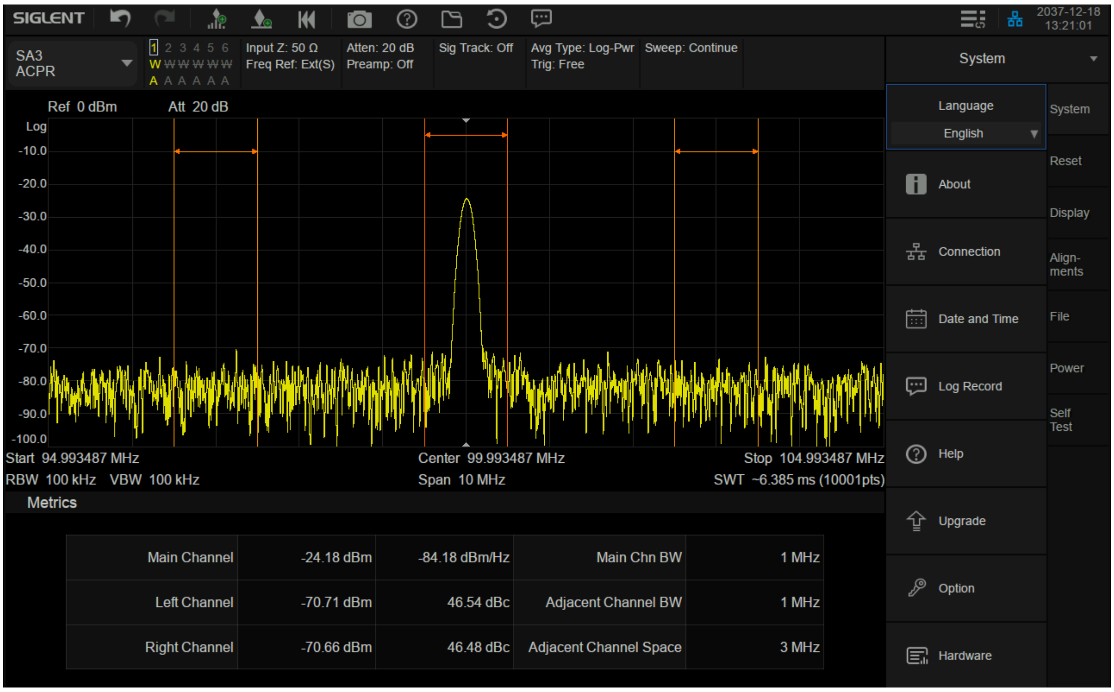


Figure 5-9 ACPR

Measurement Results: Main CH Power, Left channel power and Right channel power.

- Main CH Power : Displays the power within the bandwidth of the main power
- Left channel power : Displays the power of left channel and the power difference between the left channel and the main channel (in dBc)
- Right channel power: Display the power of the right channel and the power difference between the right channel and the main channel (in dBc)

Measurement parameter: Center frequency, main channel bandwidth, adjacent channel bandwidth and channel spacing

Command format	**:MEASure:ACPRatio:ACPower:MAIN?** **:MEASure:ACPRatio:LOWer:POWer?** **:MEASure:ACPRatio:UPPer:POWer?**
Instructions	Get the main channel power Obtain low and high frequency adjacent channel power
Return	Float , unitdBm
Example	:MEASure:ACPRatio:ACPower:MAIN?

Command format	**:MEASure:ACPRatio:LOWer?** **:MEASure:ACPRatio:UPPer?**
Instructions	Obtain the low frequency/high frequency adjacent channel power ratio
Return	Float , unitdBm
Example	:MEASure:ACPRatio:LOWer?

5.9.3.1 Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr:

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat:

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]:ACPower:AVERage:TCONtrol** **[:SENSe]:ACPower:AVERage:TCONtrol?**
Instructions	Setting average Mode Get average pattern
Parameter type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EnumerationEXPOnentialr|REPEat
Example	:ACPower:AVERage:TCONtrol REPEat

5.9.3.2 Main Channel

Set the bandwidth of the main channel and the power of the main channel is the power integral within this bandwidth.

Command format	**[:SENSe]:ACPRatio:BWIDth:INTegration** **[:SENSe]:ACPRatio:BWIDth:INTegration?**
Instructions	Set the bandwidth of the adjacent channel Obtain the bandwidth of the adjacent channel
Parameter type	Float , unitHz , kHz , MHz , GHz
Parameter Range	related with Span
Return	Float , unitHz
Example	:ACPRatio:BWIDth:INTegration 20 MHz

5.9.3.3 Adjacent Chn

Set the frequency width of the adjacent channels.

The adjacent channel bandwidth is related to the main channel bandwidth.

Command format	[:SENSe]:ACPRatio:OFFSet:BWIDth[:INTegration] [:SENSe]:ACPRatio:OFFSet:BWIDth[:INTegration]?
Instructions	Set the main channel bandwidth Get the main channel bandwidth
Parameter type	Float , unitHz , kHz , MHz , GHz
Parameter Range	related with Span
Return	Float , unitHz
Example	:ACPRatio:OFFSet:BWIDth 20 MHz

5.9.3.4 Adj Chn space

Set the difference between the center frequency of the main channel and the center frequency of the adjacent channels.

Adjusting this parameter will also adjust the distance between the upper/lower channel and the main channel.

Command format	[:SENSe]:ACPRatio:OFFSet[:FREQuency] [:SENSe]:ACPRatio:OFFSet[:FREQuency]?
Instructions	Set the adjacent channel interval Gets the adjacent channel interval
Parameter type	Float , unitHz , kHz , MHz , GHz
Parameter Range	related with Span
Return	Float , unitHz
Example	:ACPRatio:OFFSet 20 MHz

5.9.3.5 PSD Unit

Select power spectral density unit, optional is dBm/Hz, dBm/MHz.

Command format	:UNIT: ACPRatio:POWer:PSD :UNIT: ACPRatio:POWer:PSD?
Instructions	Select the power spectral density unit
Parameter Type	Enumeration
Parameter Range	DBMHZ|DBMMHZ
Return	DBMHZ|DBMMHZ
Example	:UNIT: ACPRatio:POWer:PSD DBMHZ :UNIT: ACPRatio:POWer:PSD?

5.9.4 OBW

Integrates the power within the whole span and calculates the bandwidth occupied by this power according to the specified power ratio. The OBW function also indicates the difference (namely “Transmit Freq Error”) between the center frequency of the channel under measurement and the center frequency of the analyzer. Select **Occupied BW** and press **Meas Setup** to set the corresponding parameters.

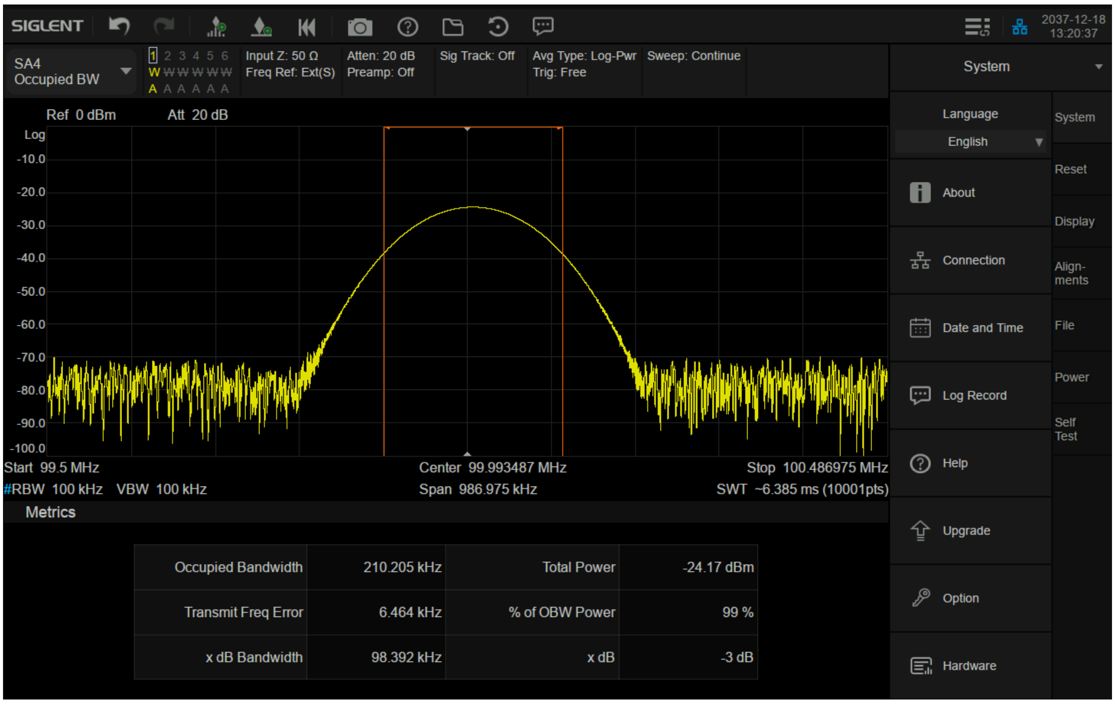


Figure 5-10 OBW

Measurement Results: occupied bandwidth and transmit frequency error.

- **Occupied Bandwidth:** Integrates the power within the whole span and then calculates the bandwidth occupied by the power according to the specified power ratio.
- **Transmit Frequency Error:** The difference between the center frequency of the channel and the center frequency of the analyzer.

Command format	**:MEASure:OBWidth?** **:MEASure:OBWidth:OBWidth?** **:MEASure:OBWidth:CENTroid?**
Instructions	Read bandwidth and bandwidth center
Return	Float , unitHz
Example	:MEASure:OBW?

Command format	**:MEASure:OBWidth:OBWidth:FERRor?**
Instructions	Get transmission frequency error

Return	Float , unitHz
Example	:MEASure:OBWidth:OBWidth:FERRor?

5.9.4.1 Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr:

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat:

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]:OBWidth:AVERage:TCONtrol** **[:SENSe]:OBWidth:AVERage:TCONtrol?**
Instructions	Sets/gets average mode
Parameter type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EXPOnentialr|REPEat
Example	:OBWidth:AVERage:TCONtrol REPE

5.9.4.2 Power ratio

Specifies the percentage of total power measured within occupied bandwidth for the current measurement.

Command format	**[:SENSe]:OBWidth:PERCent** **[:SENSe]:OBWidth:PERCent?**
Instructions	Set the bandwidth usage percentage Gets the percentage of occupied bandwidth
Parameter type	Float
Parameter Range	10~99.99
Return	Float
Example	:OBW:PERCent 50

5.9.4.3 Power Reference

Select the power reference type.

- **Total Power:** The measurement result will display the power in the entire span.
- **OBW power:** The measurement result will display the occupied power.

Command format	**[:SENSe]:OBWidth:PREFerence** **[:SENSe]:OBWidth:PREFerence?**
Instructions	Setting power Reference Obtaining power reference

Parameter type	Enumeration TPOW|OBWPower
Return	Enumeration
Example	:OBWidth:PREFerence TPOW

5.9.4.4 x dB

Sets the x dB value used for the "x dB Bandwidth" result, which measures the bandwidth between two points on the signal that are x dB below the highest signal point in the OBW range.

Command format	**[:SENSe]:OBWidth:XDB** **[:SENSe]:OBWidth:XDB?**
Instructions	Set the bandwidth USAGE dBc value Obtain the occupied bandwidth dBc value
Parameter type	Float
Parameter Range	0.1~100
Return	Float
Example	:OBWidth:XDB 3

5.9.4.5 Power integration mode

Set the power integration mode to Normal or From-Center.

Command format	**[:SENSe]:OBWidth:INTegration[:METHod]** **[:SENSe]:OBWidth:INTegration[:METHod]?**
Instructions	Set integral type Get integral type
Parameter type	Enumeration NORMal|ICENter
Return	Enumeration
Example	:OBWidth:INTegration ICENter

5.9.5 T-Power

The system enters Zero span and calculates the power within the time domain. The types of powers available include Peak, Average and RMS. Select **T-Power** and press **Meas Setup** to set the corresponding parameters.

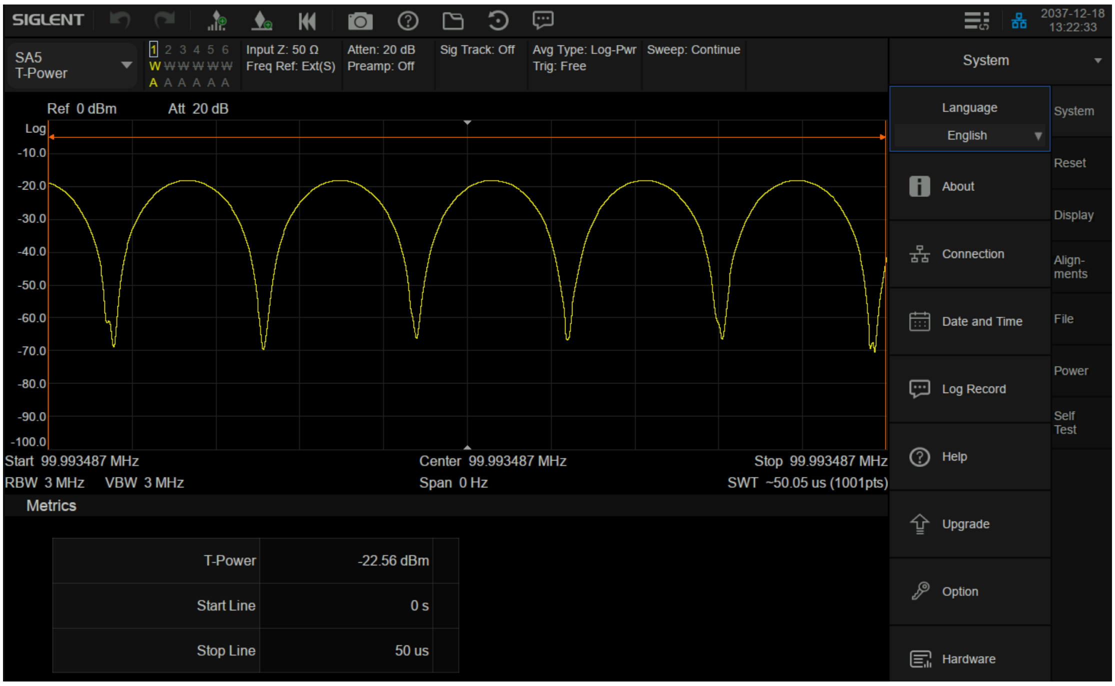


Figure 5-11 T-Power

Measurement Results: T-Power

T-Power: The power of the signal from the start line to the stop line.

Measurement Parameter: Center frequency, start line, stop line.

Command format	**:MEASure:TPOWer?**
Instructions	Read time domain power
Return	Float , unitdBm
Example	:MEASure:TPOWer?

5.9.5.1 Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]: TPOWer:AVERage:TCONtrol** **[:SENSe]: TPOWer:AVERage:TCONtrol?**
Instructions	Sets/gets average mode
Parameter Type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EXPOnentialr|REPEat
Example	:TPOWer:AVERage:TCONtrol REPE

5.9.5.2 Center Frequency

Set the center frequency, this center frequency which is the same with the center frequency of the analyzer. Modifying this parameter will change the center frequency of the analyzer.

Command format	**[:SENSe]:TPOWer:FREQuency:CENTer** **[:SENSe]:TPOWer:FREQuency:CENTer?**
Instructions	Set the time domain power center frequency Obtain the time domain power center frequency
Parameter type	Float , unitHz , kHz , MHz , GHz
Parameter Range	related with Span
Return	Float , unitHz
Example	:TPOWer:FREQuency:CENTer 15kHz

5.9.5.3 Start line

Set the left margin (in time unit) of T-Power measurement. The data calculated under this measurement is between the start line and stop line.

Command format	**[:SENSe]:TPOWer:LLIMit** **[:SENSe]:TPOWer:LLIMit?**
Instructions	Set/Query the time domain power measurement start line
Parameter type	Float , unit : s
Parameter Range	0 ~ 1000 s
Return	Float , time unit: s
Example	:TPOWer:LLIMit 100

5.9.5.4 Stop line

Set the right margin (in time unit) of T-Power measurement. The data calculated under this measurement is between the start line and stop line.

Command format	**[:SENSe]:TPOWer:RLIMit** **[:SENSe]:TPOWer:RLIMit?**

Instructions	Set/Query the time domain power measurement stop line
Parameter type	Float , unit :s
Parameter Range	0 ~ 1000 s
Return	Float , time unit: s
Example	:TPOWer:RLIMit 50 s

5.9.6 TOI

Automatic measurement of IP3 (Third order Intercept Point), including the power of fundamental wave and the Third order in the power, and calculate the adjustable Intercept Point.

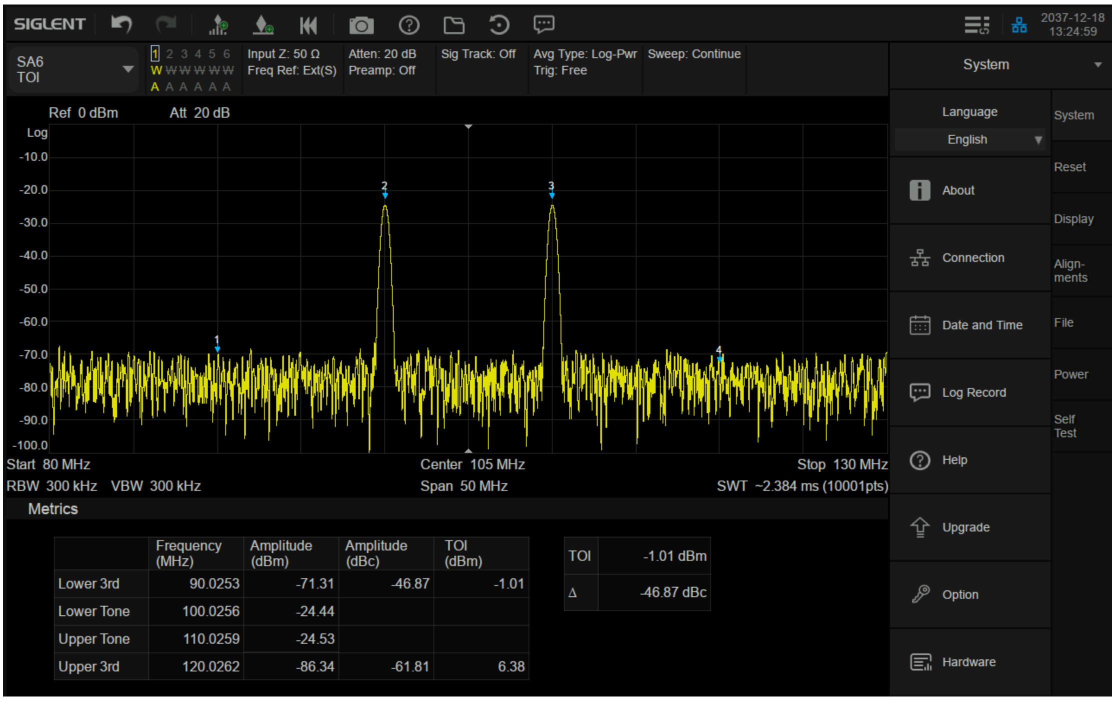


Figure 5-12 TOI

TOI is an automatic measurement. There are no user controlled parameters.

Command format	**:MEASure:TOI?**
Instructions	Read the measurement results of third-order intermodulation distortion Returns the following values separated by commas in scientific count form: Lower Tone frequency (Hz), amplitude, Upper Tone frequency (Hz), amplitude, TOI(Lower 3rd) frequency (Hz), amplitude, third-order intermodulation cutoff (Intercept), High frequency TOI (Upper 3rd) frequency (Hz), amplitude, third-order intermodulation cut-off point (Intercept).
Return	Float
Example	:MEASure:TOI?

Command format	**:MEASure:TOI:IP3?**
Instructions	Read the smaller value in the third-order intermodulation cutoff (Intercept) of low frequency TOI(Lower 3rd) and high frequency TOI(Upper 3rd)

Return	Float
Example	:MEASure:TOI:IP3?

5.9.6.1 Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]:TOI:AVERage:TCONtrol** **[:SENSe]:TOI:AVERage:TCONtrol?**
Instructions	Sets/gets average mode
Parameter Type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EXPOnentialr|REPEat
Example	:TOI:AVERage:TCONtrol REPE

5.9.7 Spectrum Monitor

Display the power of the swept spectrum as an intensity color map commonly referred to as a waterfall chart. Select **Spectrum Monitor** and press **Meas Setup** to set the corresponding parameters.

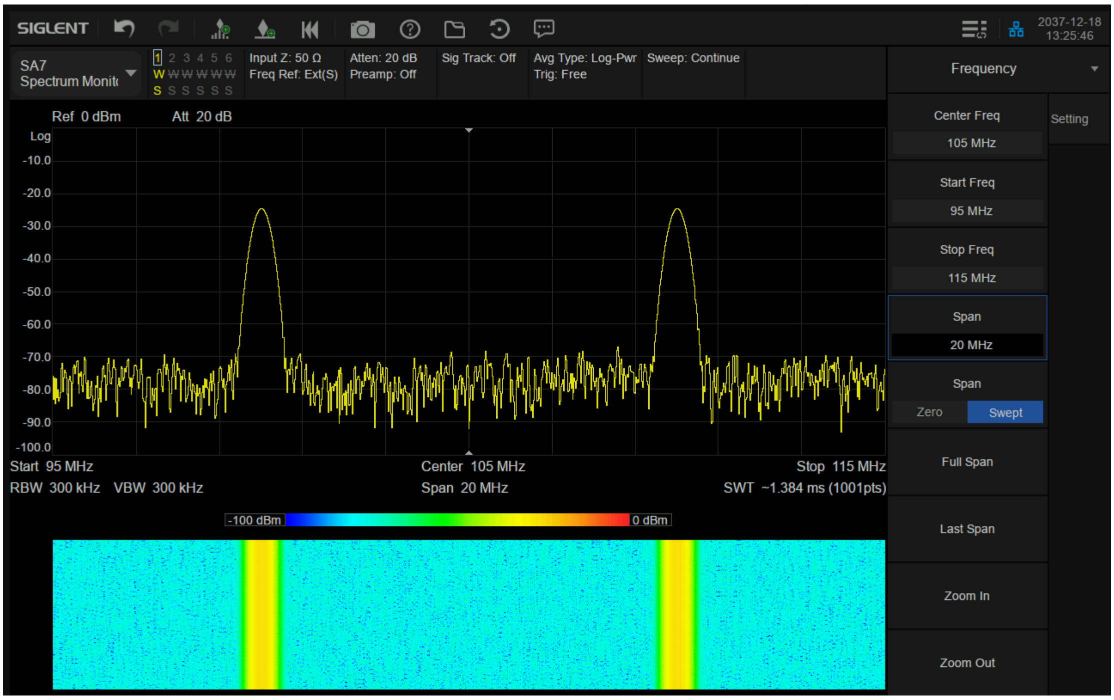


Figure 5-13 Spectrum Monitor

Display the power of spectrum of successive scans as a color map. Also call a waterfall chart.

Measurement Parameter: Spectrogram, Restart.

Spectrogram: Sets the meas state of spectrum monitor.

Restart: clear the measurement and then restart it.

Command format	**[:SENSe]:SPECtrogram:STATe** **[:SENSe]:SPECtrogram:STATe?**
Instructions	Set the spectrum to monitor the operating status Obtain spectrum to monitor operating status
Parameter type	Boolean
Parameter Range	0|1
Return	0|1
Example	[:SENSe]:SPECtrogram:STATe 0 [:SENSe]:SPECtrogram:STATe?

Command format	**[:SENSe]:SPECtrogram:RESTart**
Instructions	Spectrum rescanning
Parameter type	Boolean

Parameter Range	0|1
Return	0|1
Example	[:SENSe]:SPECtrogram:RESTart

5.9.7.1 Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr:

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat:

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]: SPECtrogram:AVERage:TCONtrol** **[:SENSe]: SPECtrogram:AVERage:TCONtrol?**
Instructions	Sets/gets average mode
Parameter Type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EXPOnentialr|REPEat
Example	:SPECtrogram:AVERage:TCONtrol REPE

5.9.8 CNR

Measure the power of the carrier and noise of the specified bandwidth and their ratio. Select **CNR** and press **Meas Setup** to set the corresponding parameters.

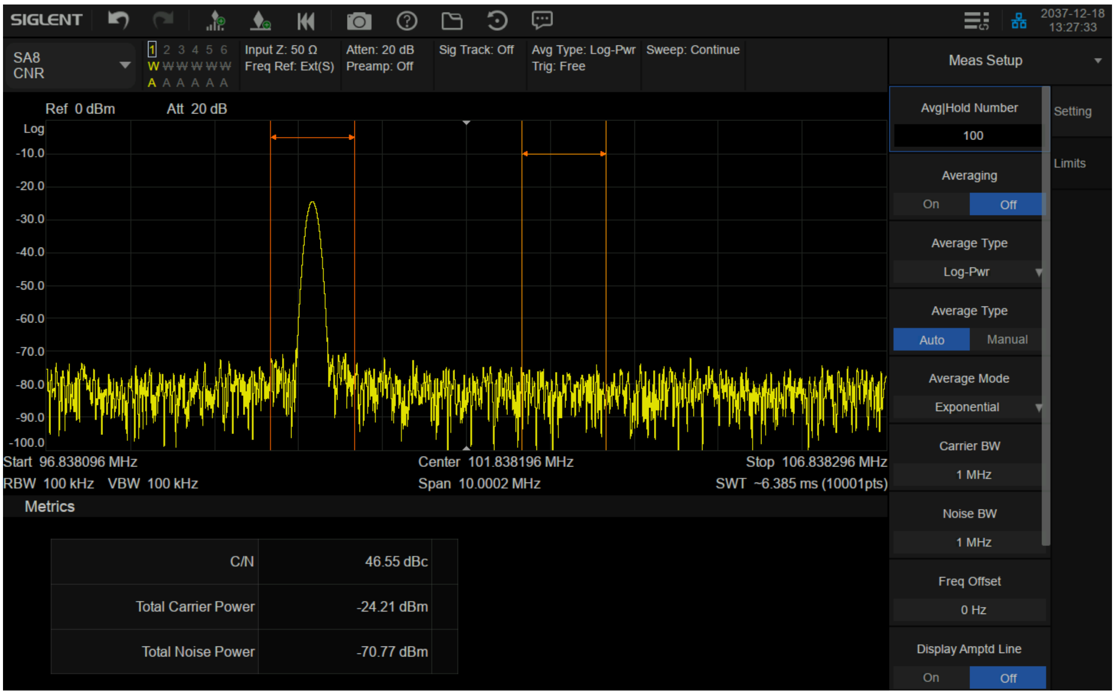


Figure 5-14 CNR

Measurement Results: C/N, Carrier Power, Noise Power.

C/N: the ratio of Carrier Power to Noise Power.

Carrier Power: the total power of the carrier bandwidth.

Noise Power: the total power of the selected noise bandwidth.

Command format	**:CNRatio:MEASure:CNRatio?** **:CNRatio:MEASure:CNRatio:CARRier?** **:CNRatio:MEASure:CNRatio:NOISe?**
Instructions	Obtain the SNR Acquisition of carrier power Get noise power
Return	Float
Example	:CNRatio:MEASure:CNRatio?

5.9.8.1 Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr:

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat:

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]:CNRatio:AVERage:TCONtrol** **[:SENSe]:CNRatio:AVERage:TCONtrol?**
Instructions	Sets/gets average mode
Parameter Type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EXPOnentialr|REPEat
Example	:CNRatio:AVERage:TCONtrol REPE

5.9.8.2 Carrier BW

Set the bandwidth of the carrier to be measured.

Command format	**[:SENSe]:CNRatio:BANDwidth:INTegration** **[:SENSe]:CNRatio:BANDwidth:INTegration?**
Instructions	Sets/gets bandwidth of the carrier
Parameter Type	Float , Unit: Hz , MHz ,
Parameter Range	100 Hz~28 GHz
Return	Float , Unit: Hz
Example	INSTrument:CNRatio:MEASure CNR :CNRatio:BANDwidth:INTegration 20 MHz

5.9.8.3 Noise BW

Set the bandwidth of the noise to be measured.

Command format	**[:SENSe]:CNRatio:BANDwidth:NOISe** **[:SENSe]:CNRatio:BANDwidth:NOISe?**
Instructions	Sets/gets bandwidth of the noise
Parameter Type	Float , Unit: Hz , kHz , MHz , GHz
Parameter Range	100 Hz~3.2 GHz
Return	Float , Unit: Hz
Example	:ACPRatio:OFFSet:BWIDth 20 MHz

5.9.8.4 Freq Offset

Set the difference between carrier center frequency and noise center frequency.

Command format	**[:SENSe]:CNRatio:OFFSet** **[:SENSe]:CNRatio:OFFSet?**

Instructions	Sets/gets frequency offset
Parameter Type	Float , Unit: Hz , kHz , MHz , GHz
Parameter Range	100 Hz~700 MHz
Return	Float , Unit: Hz
Example	:ACPRatio:OFFSet 20 MHz

5.9.9 Harmonics

The harmonic power and total harmonic distortion of carrier signal are measured. The maximum measurable harmonic is 10th harmonic. The fundamental wave amplitude of carrier signal must be greater than - 50 dBm, otherwise the measurement result is invalid.

Figure 5-15 Harmonics

5.9.9.1 Measurement Results

Each harmonic amplitude and total harmonic distortion of carrier signal. It can measure up to 10th harmonic.

5.9.9.2 Fundamental

Set the frequency of the fundamental wave.

If the automatic mode is turned on, the fundamental wave will be automatically found from the first scan. If the automatic mode is turned off, the user can input the fundamental frequency manually.

Command format	[:SENSe]:HARMonics:FREQuency:FUNDamental [:SENSe]:HARMonics:FREQuency:FUNDamental?
Instructions	Set the fundamental frequency Get the fundamental frequency
Parameter Type	Float , unit: Hz , kHz , MHz , GHz
Parameter Range	1 Hz~28 GHz
Return	Float , unitHz
Example	HARMonics:FREQuency:FUNDamental 20 MHz

Command format	[:SENSe]:HARMonics:FREQuency:FUNDamental:AUTO [:SENSe]:HARMonics:FREQuency:FUNDamental:AUTO?
Instructions	Set the fundamental frequency Get the fundamental frequency
Parameter type	Boolean
Parameter Range	0|1
Return	0|1
Example	HARMonics:FREQuency:FUNDamental:AUTO 1

5.9.9.3 Freq Step

Set the harmonic step. In auto mode, the frequency of a harmonic is a multiple of the fundamental frequency.

Command format	[:SENSe]:HARMonics:FREQuency:STEP[:INCRement] [:SENSe]:HARMonics:FREQuency:STEP[:INCRement]?
Instructions	Set the frequency step Get the frequency step
Parameter Type	Float , unit: Hz , kHz , MHz , GHz
Parameter Range	1 Hz~28 GHz
Return	Float , unit: Hz
Example	:HARMonics:FREQuency:STEP 20 MHz

Command format	[:SENSe]:HARMonics:FREQuency:STEP[:INCRement]:AUTO [:SENSe]:HARMonics:FREQuency:STEP[:INCRement]:AUTO?
Instructions	Set the frequency step Get the frequency step
Parameter type	Boolean
Parameter Range	0|1
Return	0|1
Example	:HARMonics:FREQuency:STEP:AUTO 1

5.9.9.4 Harmonic Num

Set the total number of the harmonics to be measured.

Command format	[:SENSe]:HARMonics:NUMBer [:SENSe]:HARMonics:NUMBer?

Instructions	Set harmonic number Querying harmonic number
Parameter Type	Integer
Parameter Range	2 ~ 10
Return	Integer
Example	:HARMonics:NUMBer 5

5.9.9.5 Select Harmonic

When "All" is selected, the trace shows the fundamental wave and all harmonics in the sweep bandwidth.

When 1-10 is selected, the trace shows a zero span trace corresponding to the fundamental wave or the measured harmonic.

Command format	**[:SENSe]:HARMonics:SELect** **[:SENSe]:HARMonics:SELect?**
Instructions	Set select harmonic Query select harmonics
Parameter Type	Integer
Parameter Range	0 ~ 10
Return	Integer
Example	:HARMonics:SELect 7

5.9.10 IQ Acquisition

IQ Acquisition Instructions

IQ acquisition is similar to zero-span measurement in Swept SA, where the input signal is displayed as I/Q data results. It is commonly used for measuring digital modulated signals and supports exporting IQ data to txt files for users to perform data demodulation and analysis. The IQA window presents the I and Q signal waveforms, depicting the voltage changes over time. The I signal is represented by the yellow trace, while the Q signal is represented by the purple trace. I/Q views provided in spectrum measurements enables users to examine complex components of the same signal without the need to modify settings or measurements.

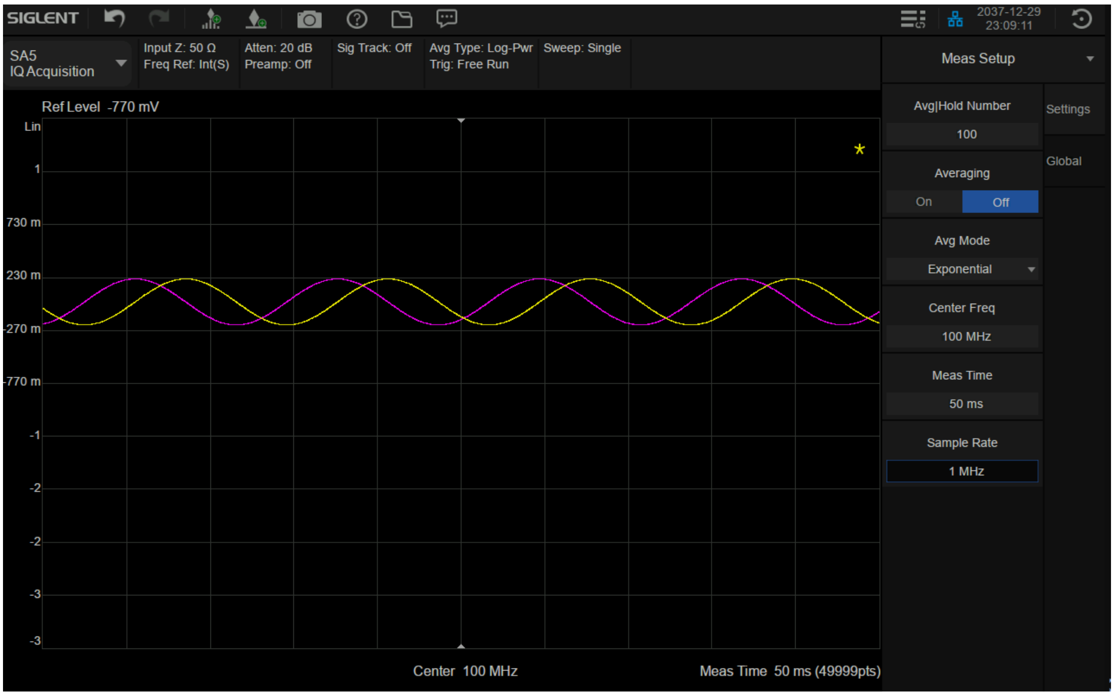


Figure 5-16 IQ Acquisition

5.9.10.1 Amplitude

Configuring the amplitude parameters of the analyzer makes the display of the measured signal visually appealing and minimizes measurement errors. By adjusting these parameters, the signal can be displayed in the current window in an easily observable format. Once the amplitude parameters have been modified, the measurement process will commence anew.

Ref Value

The reference line may be positioned top, center or bottom of the marker by setting a reference value.1.2 Scale/Div

Configuring the unit for each vertical scale division in the logarithmic display can be done by either manually setting the value or enabling automatic scaling, which is determined by the measured results.

Attenuation

Based on the magnitude of the input signal, the user configures the corresponding RF front-end attenuator and amplifier to avoid distortion when presenting large input signals and reduce noise when dealing with small input signals.

5.9.10.2 Averaging

Enable or disable the averaging calculation option for measurement results.

Avg|Hold Number

Averaging|Hold count N represents the counter when the trace type is set to ‘Average’. In a single measurement (Single) and any valid trace type set to ‘Average’, the scan will stop when the counter reaches N.

A higher (Average|Hold) count can reduce the influence of noise or other random signals, highlighting the stable characteristics of the signal.

Average Mode

Select the type of control used for the averaging function. This determines the average operation after the specified number of data acquisitions (average count) has been reached. Options include:

Exponentialr

The measure average operation continuously calculates a weighted average for each index using a specified number of averages.

Repeat

Each time the specified average is reached, the measurement resets the average counter.

Command format	**[:SENSe]:WAVeform:AVERage:TCONtrol** **[:SENSe]:WAVeform:AVERage:TCONtrol?**
Instructions	Set average mode Get average mode
Parameter Type	enumeration
Parameter Range	EXPOnentialr|REPEat
Return	Enumeration :EXPOnentialr|REPEat
Example	:WAVeform:AVERage:TCONtrol REPEat

5.9.10.3 Measuring time

Set the time for collecting signals.

Command format	**[:SENSe]:WAVeform:SWEep:TIME** **[:SENSe]:WAVeform:SWEep:TIME?**
Instructions	Set measuring time Set measuring time
Parameter Type	Float , unit ks , s , ms , us
Parameter Range	1us ~ 10s
Return	Float
Example	:WAVeform:SWEep:TIME 100ms

5.9.10.4 Sampling rate

Set the rate of signal collection, that is, the logarithm of IQ collected by 1s.

Command format	[:SENSe]:WAVeform:SRATe [:SENSe]:WAVeform:SRATe?
Instructions	Set Sampling rate Get Sampling rate
Parameter Type	Float , unit Hz , kHz , MHz , GHz
Parameter Range	1kHz ~ 20MHz
Return	Float , UNIT Hz
Example	:WAVeform:SRATe 200kHz

5.9.10.5 Sampling period

The inverse of the sampling rate. Only commands can be used for query, but Settings are not supported.

Command format	[:SENSe] :WAVeform:APERture?
Instructions	Get the Sampling period
Return	Float , unit :s
Example	:WAVeform:APERture?

5.9.10.6 IQ data Acquisition

1. In the file saving interface, select the file type as. txt to save IQ data. The data length is the number of points under the current configuration (sampling time * sampling rate)
2. Acquisition IQ data through SCPI

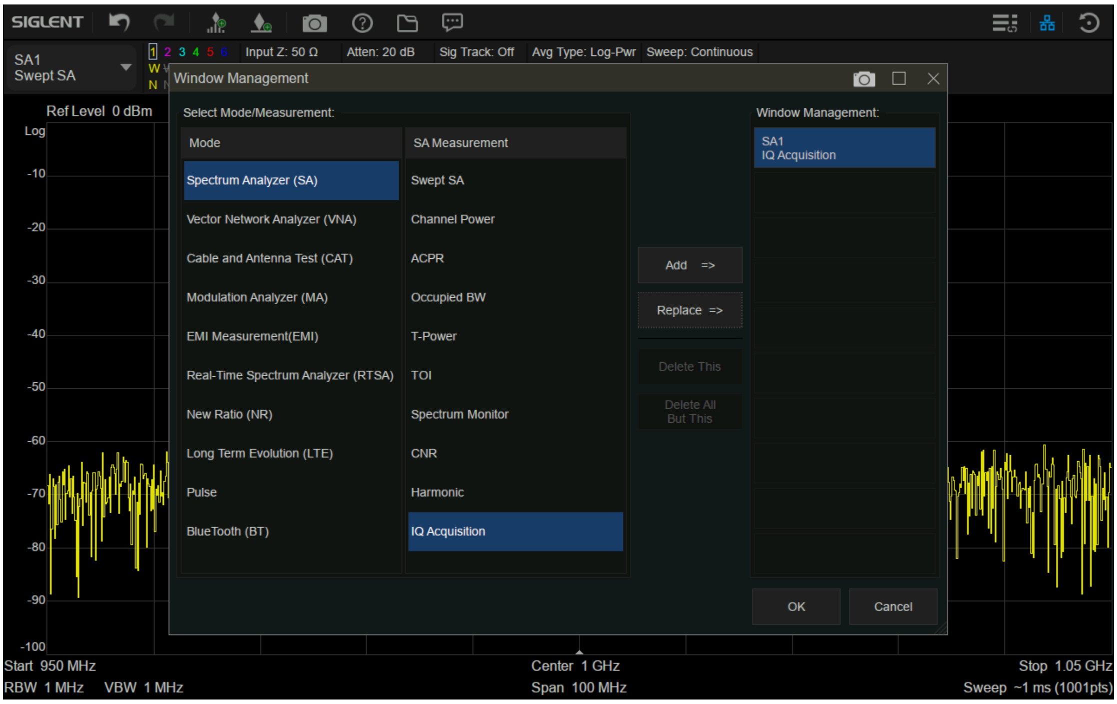
Command format	:SAVE:RAW:IQ
Instructions	Acquisition original data
Parameter Type	Floating + Character
Parameter Range	200~125M
Return	
Example	:SAVE:RAW:IQ 1000000,"raw_iq.txt"

By acquisition IQ data through commands, the original data length and saved file name can be dynamically configured, and the file is saved in the local path by default

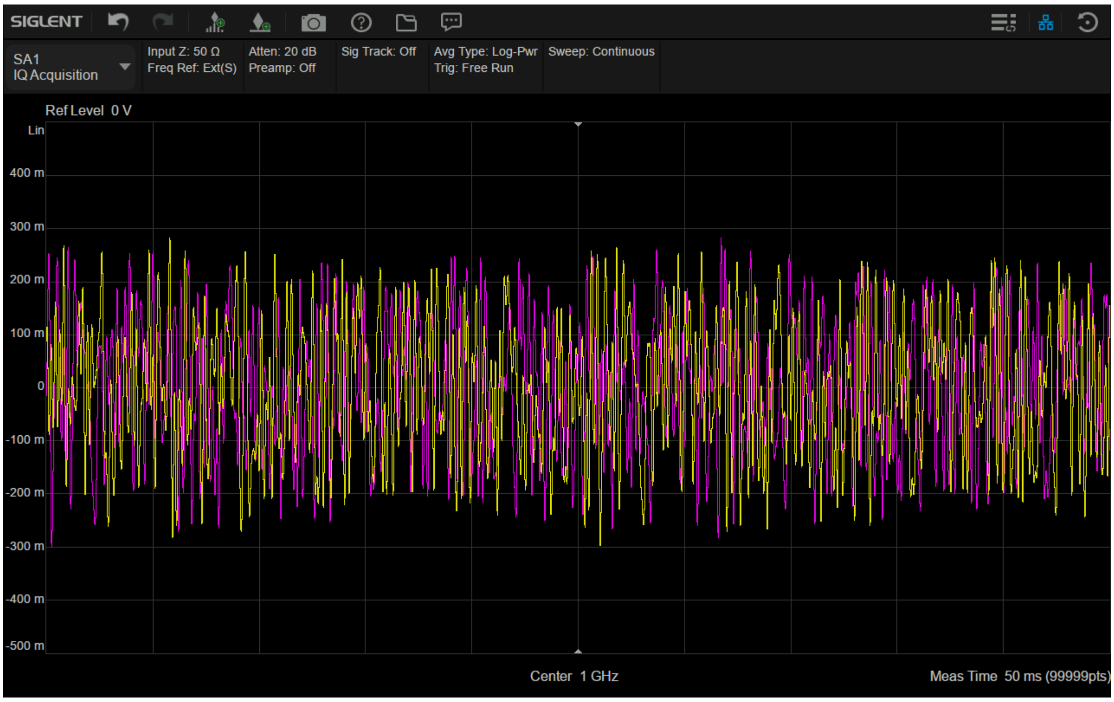
5.9.10.7 Operation Demonstration

1. Input the 16QAM signal through the RF port of SSA5000A.
2. Use the IQ Acquisition to observe the I/Q signal waveform of the signal:

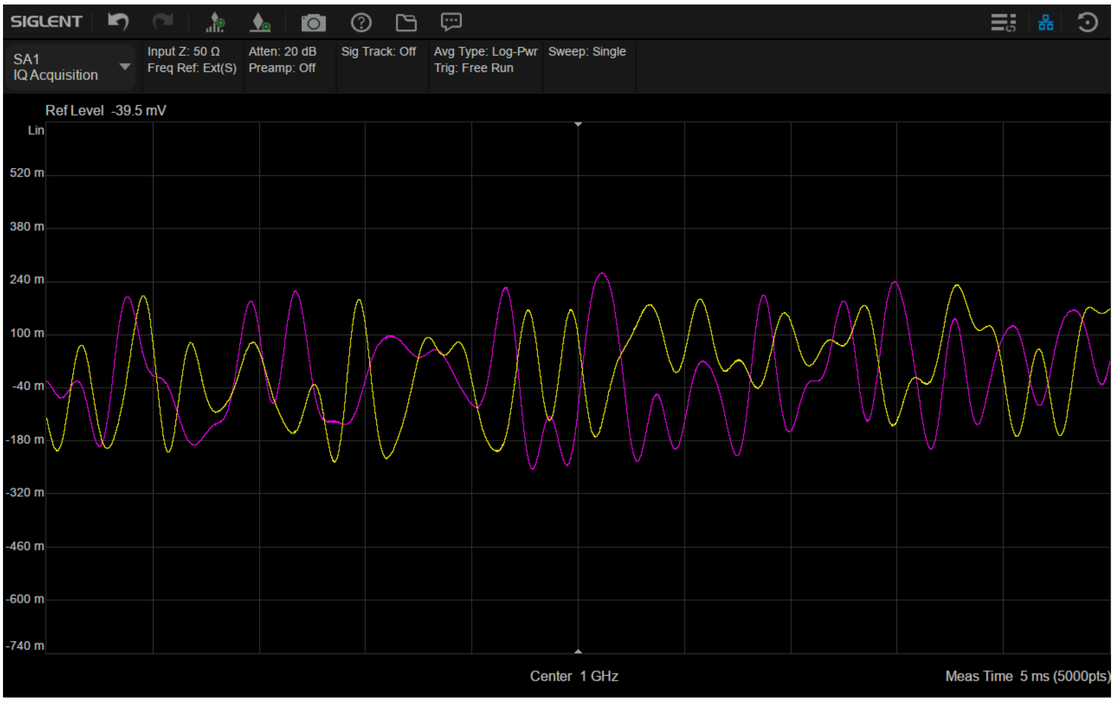
   (1) Click Mode/Meas → pectrum Analyzer(SA) → IQ Acquisition → Replace / Add → OK .



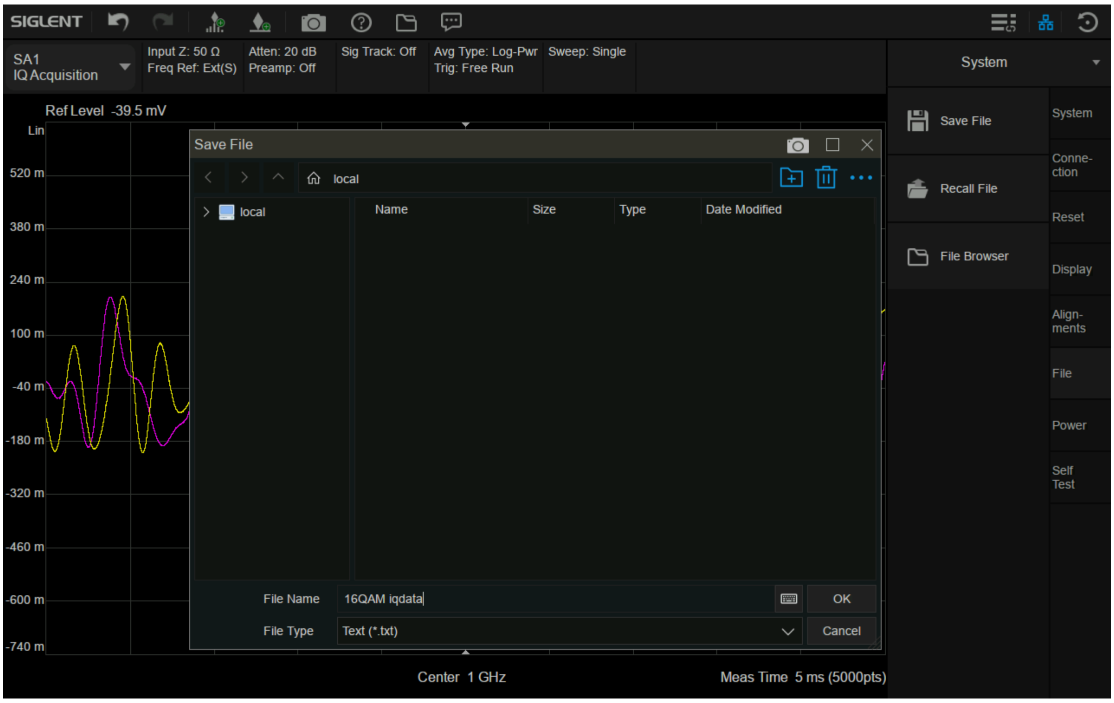
(2) Click FREQ , configure the center frequency corresponding to the IQ signal.



(3) Click AMPTD, Adjust the reference level, the scale and measurement time to better display the I/Q waveform on the screen.



(4) Click Save/Recall , save IQ data as .txt file.



5.9.11 CCDF

CCDF Instructions

The complementary cumulative distribution function (CCDF) reflects the probability of the peak power of the measured signal exceeding a certain threshold, which is the peak power greater than the average power. It can also be said that CCDF can describe the probability of the measured signal greater than a certain peak to average power ratio. As shown in the figure below, the x-coordinate is the difference of power, and the y-coordinate is the percentage. Generally speaking, it is to calculate the average power of a signal and the instantaneous power of each point. For the 0dB point, it is the ratio of greater than or equal to the average power of 0dB point in the total number of points.

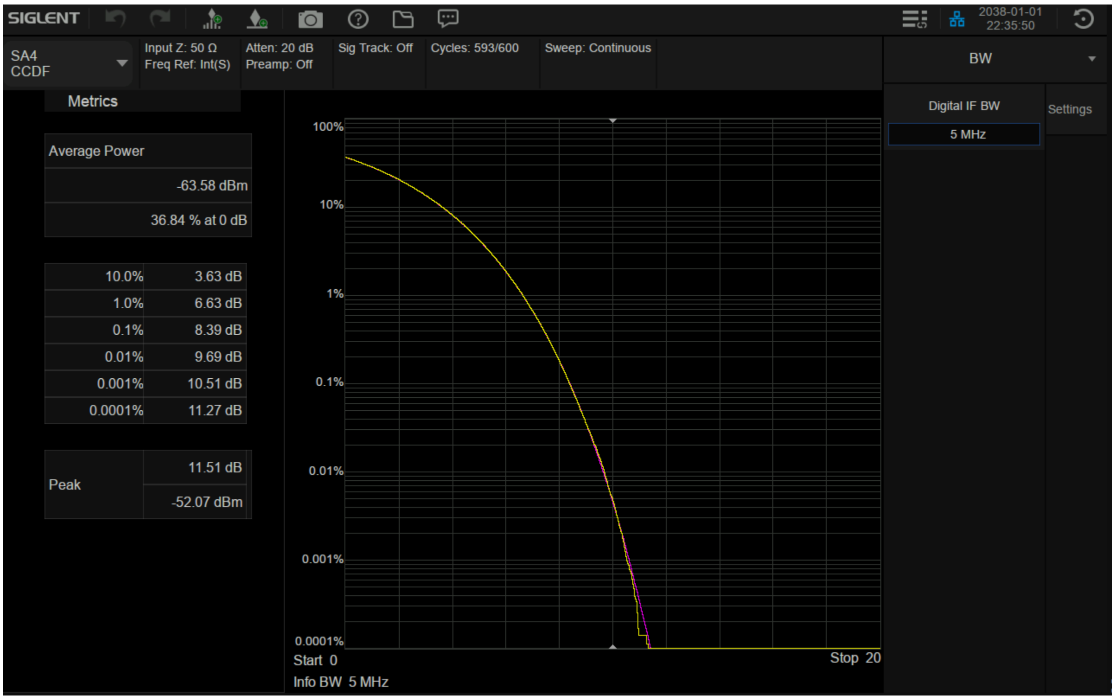


Figure 5-17 CCDF

Average power:

1. Average power
2. The probability of a point with greater than average power among all points

Power level that has 10 % of the power;
Power level that has 1 % of the power;
Power level that has 0.1 % of the power;
Power level that has 0.01 % of the power；
Power level that has 0.001 % of the power;
Power level that has 0.0001 % of the power.

Peak value:

1. delta between maximum power and average power
2. Maximum power

Command format	**:FETCh:PSTatistic?** **:MEASure:PSTatistic?** **:READ:PSTatistic?**
Instructions	Get the CCDF measurement result
Parameter Type	string
Return	1. Average input power 2. Probability at the average input power level 3. Power level that has 10 % of the power 4. Power level that has 1 % of the power 5. Power level that has 0.1 % of the power 6. Power level that has 0.01 % of the power 7. Power level that has 0.001 % of the power 8. Power level that has 0.0001 % of the power 9. Peak power 10. Count
Example	:FETCh:PSTatistic?

5.9.11.1 Digital IF BW

BW is the measured channel bandwidth, ranging from 10k to 10M. Bandwidth not only affects the test range, but also affects the data rate.

Command format	**[:SENSe]:PSTatistic:BANDwidth** **[:SENSe]:PSTatistic:BANDwidth?**
Instructions	Set channel bandwidth Acquire channel bandwidth
Parameter Type	Float
Parameter Range	10k~10M
Return	Float
Example	:PSTatistic:BANDwidth 1e6 :PSTatistic:BANDwidth?

5.9.11.2 Meas Cycles

Meas Cycles refers to the test cycle, if the test cycle is 2, then after the end of the first test cycle, an image is made and the data of this time is saved. When the second test cycle is over, all the data of the second cycle and the first cycle are statistically plotted, and then all the statistical points are removed. Therefore, with the increase of the number of cycles, the number of tests will also increase, and the statistical effect will be closer to the theoretical value.

Command format	**[:SENSe]:PSTatistic:SWEep:CYCLes** **[:SENSe]:PSTatistic:SWEep:CYCLes?**

Instructions	Set test cycle Get test cycle
Parameter Type	Integer
Parameter Range	1~3.2M
Return	Integer
Example	:PSTatistic:SWEep:CYCLes 500 :PSTatistic:SWEep:CYCLes?

5.9.11.3 Meas Interval

Meas Interval refers to the length of time for a measurement period.

Command format	**[:SENSe]:PSTatistic:SWEep:TIME** **[:SENSe]:PSTatistic:SWEep:TIME?**
Instructions	Set the measurement interval Get the measurement interval
Parameter Type	Float
Parameter Range	50us~10ms
Return	Float
Example	:PSTatistic:SWEep:TIME :PSTatistic:SWEep:TIME

5.9.11.4 Counts

There are three main control items in MEAS SETUP: Counts, Meas Cycles and Meas Interval. Their relationship is as follows:

$$\text{Counts} = \text{Meas Cycles} * \text{Meas Interval} * \text{Sample Rate}$$

$$\text{Sample Rate} = \text{BW} * 1.25$$

Where 1 ≤ Meas Cycles ≤ 3.2M, 50us ≤ Meas Interval ≤ 10ms, 1k ≤ Counts ≤ 2G.

Command format	**[:SENSe]:PSTatistic:COUNts?**
Instructions	Get points
Parameter Type	Integer
Parameter Range	1k~2G
Return	Integer
Example	:PSTatistic:COUNts?

5.9.11.5 Ref/guass trace

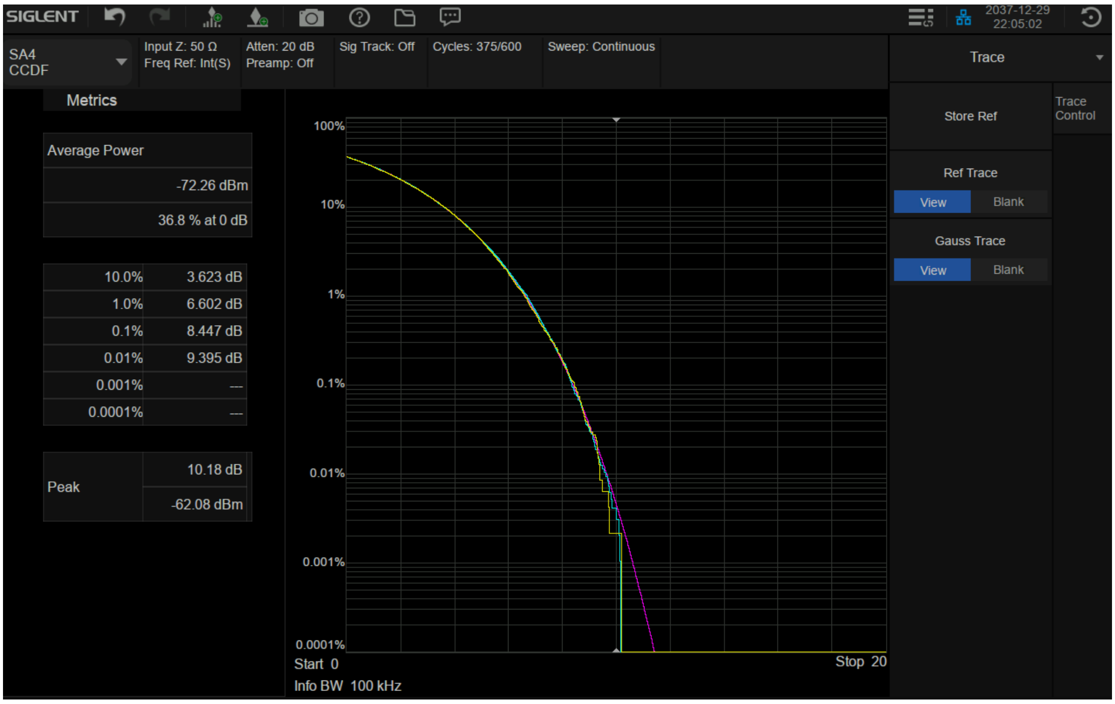


Figure 5-18 trace

As shown in the figure above, blue is the saved reference trace; Purple is Gaussian trace; Yellow is the current trace.

Reference trace

You need to save the reference trace first. After saving the reference trace, you can view the reference trace through the View/Close button.

Command format	**:CALCulate:PSTatistic:STORe:REFerence**
Instructions	Set the save reference trace
Example	:CALCulate:PSTatistic:STORe:REFerence

Command format	**:DISPlay:PSTatistic:RTRace[:STATe]** **:DISPlay:PSTatistic:RTRace[:STATe]?**
Instructions	Set the reference trace switch Get the reference trace switch
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:DISPlay:PSTatistic:RTRace 1

Gaussian trace

Open or close the Gauss trace saved inside the machine

Command format	**:DISPlay:PSTatistic:GAUSsian[:STATe]** **:DISPlay:PSTatistic:GAUSsian[:STATe]?**
Instructions	Set the Gaussian trace switch Get the Gaussian trace switch
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:DISPlay:PSTatistic:GAUSsian 1

5.9.11.6 X Scale/Div

Set the scale on the x axis

Command format	**:DISPlay:PSTatistic:VIEW:WINDow2:TRACe:X[:SCALe]:PDIVision** **:DISPlay:PSTatistic:VIEW:WINDow2:TRACe:X[:SCALe]:PDIVision?**
Instructions	Set the scale on the x axis Get the X-axis scale
Parameter Type	Float
Parameter Range	0.1~10
Return	Float
Example	:DISPlay:PSTatistic:VIEW:WINDow2:TRACe:X:PDIVision 1

6 Real-Time Spectrum Analyzer Mode

This chapter introduces the function keys and menu functions of the front panel under the Real-Time Spectrum Analyzer Mode.

6.1 Frequency & SPAN

6.1.1 Frequency & Span

Set the frequency-related parameters and functions of the analyzer. The sweep will restart every time the frequency parameters are modified.

The frequency range of a channel can be expressed by these parameters: Start Frequency, Center Frequency, Stop Frequency and Span. If any of the parameters change, the others will be adjusted automatically in order to ensure the coupling relationship among them:

$$f_{center} = (f_{start} + f_{stop})/2$$
$$f_{span} = f_{stop} - f_{start}$$

, Where f_{span} is the span.

Command Format	**[:SENSe]:FREQuency:CENTer** **[:SENSe]:FREQuency:CENTer?**
Instruction	Sets the center frequency of the spectrum analyzer. Gets the center frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	2.5kHz~27.9999975 GHz
Return	Float, unit: Hz
Example	:FREQuency:CENTer 0.2 GHz

Command Format	**[:SENSe]:FREQuency:STARt** **[:SENSe]:FREQuency:STARt?**
Instruction	Sets the start frequency of the spectrum analyzer. Gets the start Frequency.
Parameter Range	0 Hz ~ 27.9999975 GHz
Example	:FREQuency:STARt 100 Hz

Command Format	**[:SENSe]:FREQuency:STOP** **[:SENSe]:FREQuency:STOP?**
Instruction	Sets the stop frequency of the spectrum analyzer. Gets the stop frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	5kHz ~ 28 GHz
Return	Float, unit: Hz
Example	:FREQuency:STOP 1.0 GHz

Command Format	[:SENSe]:FREQuency:SPAN [:SENSe]:FREQuency:SPAN?
Instruction	Sets the frequency span. Setting the span to 0 Hz puts the analyzer into zero span. Gets span value.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	5kHz~40MHz
Return	Float, unit: Hz
Example	:FREQuency:SPAN 1 GHz

Command Format	[:SENSe]:FREQuency:SPAN:FULL
Instruction	Sets the frequency span to full scale.
Example	:FREQuency:SPAN:FULL

Command Format	[:SENSe]:FREQuency:SPAN:PREVious
Instruction	Sets the frequency span to the previous span setting.
Example	:FREQuency:SPAN:PREVious

Command Format	[:SENSe]:FREQuency:SPAN:HALF [:SENSe]:FREQuency:SPAN:DOUBle
Instruction	Sets the frequency span to half/double of the current span setting.
Example	:FREQuency:SPAN:HALF

6.1.2 Freq Offset

Set the frequency offset value to illustrate the frequency conversion between the measured device and the input of the spectrum analyzer.

- This parameter does not affect any hardware settings of the spectrum analyzer, but only changes the display values of center frequency, start frequency and stop frequency.
- To eliminate the frequency offset value, the frequency offset value can be set to 0 Hz.

Command Format	[:SENSe]:FREQuency:OFFSet [:SENSe]:FREQuency:OFFSet?
Instruction	Sets the frequency offset of the spectrum analyzer. Gets the frequency offset.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	-100 GHz ~ 100 GHz
Return	Float, unit: Hz
Example	:FREQuency:OFFSet 1 GHz

6.1.3 Freq Step

Setting the value of Freq Step will change the direction key step of center frequency, start frequency, stop frequency and frequency offset.

- At a fixed step change the value of the center frequency can reach the purpose of switching measurement channels rapidly and continuously.

- There are two kinds of frequency step modes: **Auto** and **Manual**. In Auto mode, the Freq step is 1/10 of the span in Non-zero span or equals the RBW while in Zero Span. In Manual mode, you can set the step using the numeric keys.

Command Format	**[:SENSe]:FREQuency:CENTer:STEP[:INCRement]** **[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?**
Instruction	Specifies the center frequency step size. Gets the center frequency step.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1 Hz ~ 40 MHz
Return	Float, unit: Hz
Example	:FREQuency:CENTer:STEP 2 MHz

Command Format	**[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1** **[:SENSe]:FREQuency:CENTer:STEP:AUTO?**
Instruction	Specifies whether the step size is set automatically based on the span. Gets center frequency step mode.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:FREQuency:CENTer:STEP:AUTO OFF

6.2 BW

Set the RBW (Resolution Bandwidth) and filter type. Resolution Bandwidth.

Set the resolution bandwidth in order to distinguish between signals which have frequency components that are near one another.

- Reducing the RBW will increase the frequency resolution.
- RBW varies with the span (non-zero span) in Auto RBW mode.
- Under under the rectangular window filter, the RBW is fixed at 49.938kHz.

RBW value range is related to filter type, please refer to filter type section for details.

Table 6-1 RBW

Parameter	Explanation
Kaiser	100.431kHz ~3.314MHz
Hanning	74.98kHz ~2.47MHz
Flattop	188.462kHz ~ 6.22MHz
Gaussian	98.797 kHz ~ 3.26MHz
Blackman-Harris	100.19kHz~ 3.31MHz
Rectangular	49.938KHz

Command Format	**[:SENSe]:BWIDth[:RESolution]** **[:SENSe]:BWIDth[:RESolution]?**
Instruction	Specifies the resolution bandwidth. For numeric entries, all RBW types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered.
Parameter Type	Float, unit: Hz
Parameter Range	None
Return	Float, Unit: Hz
Example	:BWIDth?

Command Format	**[:SENSe]:BWIDth[:RESolution]:AUTO OFF|ON|0|1** **[:SENSe]:BWIDth[:RESolution]:AUTO?**
Instruction	Turns on/off auto resolution bandwidth state. Gets the resolution bandwidth state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:BWID:AUTO On

Command Format	**[:SENSe]:FILTer:TYPE KAISer | HANNing | FLATtop | GAUSsian | BHARris | RECTangular** **[:SENSe]:FILTer:TYPE?**
Instruction	Sets FFT window function. Gets FFT window function.
Parameter Type	Enumeration
Return	KAIS HANN FLAT GAUS BHAR RECT
Example	:FILT:TYPE KAIS

6.3 Sweep

Sets parameters about the Sweep functions, including acquisition time, sweep mode, sweep times, etc.

6.3.1 Acquisition Time

Set the acquisition time of real-time spectrum analyzer within the real-time analysis span. The acquisition time can be set in “**Auto**” or “**Manual**” mode and the default is “**Auto**”.

Command Format	**[:SENSe]:ACQuisition:TIME** **[:SENSe]:ACQuisition:TIME?**
Instruction	Sets Acquisition time. Gets Acquisition time.
Parameter Type	Float, unit: ks, s, ms, us
Parameter Range	27.5 ms ~ 40 s
Return	Float, unit: s
Default	29.998ms
Menu	Sweep > Acq Time
Example	:ACQuisition:TIME 2s

6.3.2 Sweep

Set the sweep mode in single or continuous, the default is continuous. The corresponding icon of the sweep will be displayed in the status bar at the left of the screen.

6.3.2.1 Single

Set the sweep mode to “**Single**”. You can set the sweep times , and execute the set number of scans every time you press “single time”.

6.3.2.2 Numbers

Set the sweeps times for a single sweep. In single sweep mode, the system executes the specified sweeps times and the number shown on the icon in the status bar at the left of the screen varies with the process of the sweep.

6.3.2.3 Continue

Set the sweep mode to “Continue”. The character Cont on the parameter icon denotes the analyzer is sweeping continuously.

- If the instrument is in single sweep mode and no measurement function is enabled, press this key and the system will enter continuous sweep mode and sweep continuously if the trigger conditions are satisfied.
- If the instrument is in single sweep mode and a measurement function is on, press this key and

the system will enter continuous sweep mode and measure continuously if the trigger conditions are satisfied.

- In continuous sweep mode, the system will send a trigger initialization signal automatically and enter the trigger condition judgment directly after each sweep.

Command format	**:INITiate:CONTinuous OFF|ON|0|1** **:INITiate:CONTinuous?**
Instructions	Sets continuous sweep mode on-off. Gets continuous sweep mode state.
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:INITiate:CONTinuous OFF

6.3.2.4 Pause/Resume

Press the pause key to pause after the sweep of current frame is completed; press the continue key to continue the sweep of the real-time spectrum analyzer if it is in the continuous sweep mode, and if it is in the single sweep mode, the number of times the spectrum analyzer continues to sweep if the number of times the single scanning is not completed. Continue without clearing historical data after pause.

Command Format	**:DISPlay:PAUSe OFF|ON|0|1** **:DISPlay:PAUSe?**
Instruction	Pause current sweeep (pause at the end of the current sweep).
Parameter Type	None
Parameter Range	None
Return	None
Example	:DISPlay:PAUSe 1

6.3.2.5 Restart

Restart will clear all historical data, and restart sweeping to records new data.

Command Format	**:INITiate[:IMMediate]**
Instruction	Restarts the current sweep.
Parameter Type	None
Parameter Range	None
Return	None
Default	None
Menu	
Example	:INITiate:IMMediate

6.4 Amplitude

Set the amplitude parameters of the analyzer. Through modifying these parameters, signals under measurement can be displayed in a proper mode for easier observation and minimum error.

6.4.1 Ref Level

Set the maximum power or voltage that can be currently displayed in the trace window. The value is displayed at the upper left corner of the screen grid.
The maximum reference (Ref) level available is affected by the maximum mixing level; input attenuation is adjusted under a constant maximum mixing level in order to fulfill the following condition:

Ref <= ATT - PA - 20dBm, where ATT = Attenuation value, PA = Preamplifier value

The reference level is an important parameter of the spectrum analyzer, which indicates the upper limit of the current dynamic range of the spectrum analyzer. When the energy of the signal to be measured exceeds the reference level, it may produce nonlinear distortion or even overload alarm.

It is necessary to know the nature of the signal to be measured and carefully select the reference level to obtain the best measurement effect and protect the spectrometer.

Command Format	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?
Instruction	This command sets the reference level for the Y-axis. Gets reference level.
Parameter Type	Float, unit: dBm, dBmV, dBuV, dBuA, V, W
Parameter Range	Unit is dBm : -170 dBm ~ 23 dBm Unit is dBmV : -123.01 dBmV ~ 69.99 dBmV Unit is dBuV : -63.01 dBuV ~ 129.99 dBuV Unit is dBuA : -96.99 dBuA ~ 96.01 dBuA Unit is Volts : 707.11pV ~ 3.16 V Unit is Watts : 0W ~ 199.53m W
Return	Float, unit: dBm
Example	:DISPlay:WINDow:TRACe:Y:RLEVel 20 DBM

6.4.2 Attenuator

Set the value for the internal attenuator of the RF input. So that the large signal can be low distortion and the small signal can pass through the mixer with low noise.

Ref <= ATT - PA - 20dBm, where ATT = Attenuation value, PA = Preamplifier value

Input attenuation can be set up to auto or manual mode.

- Auto mode: the attenuation value is automatically adjusted according to the state of preamplifier and the current reference level.

- The maximum input attenuation can be set to 31 dB. When the set parameters do not meet the above formula, you can adjust the reference level by yourselve.

Command format	**[:SENSe]:POWer[:RF]:ATTenuation** **[:SENSe]:POWer[:RF]:ATTenuation?** **[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1** **[:SENSe]:POWer[:RF]:ATTenuation:AUTO?**
Instructions	Sets/gets the attenuation value
Parameter type	Integer
Parameter Range	0 dB ~ 50 dB
Return	Integer , unitdB
Example	:POWer:ATTenuation 10

6.4.3 RF Preamp

Control the state of the internal preamplifier (PA) located in the RF input signal path. When the signal-under-measurement is small, turning on the preamplifier can reduce the displayed average noise level to aid distinguishing small signals from the noise.

The corresponding icon “**PA**” will appear at the left side of the screen when the preamplifier is turned on.

Command format	**[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1** **[:SENSe]:POWer[:RF]:GAIN[:STATe]?**
Instructions	Sets/gets the preset amplifier inside the switch spectrometer
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:POWer:GAIN ON

6.4.4 Scale

Set the logarithmic units per vertical grid division on the display. This function is only available when the scale type is set to “**log**”.

- By changing the scale, the displayed amplitude range is adjusted.
- Current signal amplitude range that can be displayed:

  The Minimum range: Reference level –10 × current scale value.

  The Maximum range: The reference level.

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision** **:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision?**
Instructions	Sets/gets the scale on which trace logarithms are displayed
Parameter type	Float

Parameter Range	1 dB ~ 20 dB
Return	Float , unitdB
Example	:DISPlay:WINDow:TRACe:Y:PDIVision 10 dB

6.4.5 Unit

The unit can be dBm, dBmV, dBuV, Volts and Watts. The default unit is dBm.

The conversion between units is as follows:

$$\mathrm{dBm} = 10\lg\left(\frac{\mathrm{Volts}^2}{\mathrm{R}} \times \frac{1}{1\mathrm{mW}}\right)$$

$$\mathrm{dB\mu V} = 20\lg\left(\frac{\mathrm{Volts}}{1\mu\mathrm{V}}\right)$$

$$\mathrm{dBmV} = 20\lg\left(\frac{\mathrm{Volts}}{1\mathrm{mV}}\right)$$

$$\mathrm{Watts} = \frac{\mathrm{Volts}^2}{\mathrm{R}}$$

Where R represents the input impedance, the default is 50 ohms.

The impedance selection here only represents the numerical calculation, and does not represent the switching of the actual impedance. After switching the input impedance, the display of the power class units will not change, and the amplitude and energy class units will change accordingly.

Command format	**:UNIT:POWer DBM|DBMV|DBUV|V|W** **:UNIT:POWer?**
Instructions	Sets/gets the display unit of magnitude
Parameter type	Enumeration
Parameter Range	DBM|DBMV|DBUV|DBUA|V|W
Return	Enumeration: DBM|DBMV|DBUV|V|W
Example	:UNIT:POWer DBMV

6.5 Trigger

The trigger type can be PvT, frequency template trigger (FMT), Free Run and External.

Command format	**:TRIGger[:SEQuence]:SOURce IMMediate|PVT|EXTernal** **:TRIGger[:SEQuence]:SOURce?**
Instructions	Setting the Trigger Type Get trigger type
Parameter type	Enumeration
Parameter Range	IMMediate: Free to trigger PVT: pvttrigger EXTernal:external trigger
Return	Enumeration: IMM| PVT |EXT
Example	:TRIGger:SOURce IMMediate

6.5.1 Free Run

Trigger conditions are met at any time, which means trigger signals are generated continuously.

6.5.2 PvT

When the detected video signal voltage exceeds the PvT trigger level, a trigger signal is generated.

6.5.2.1 Trigger Level

Set the trigger level when PVT is triggered. The trigger level line TL and the value of the trigger level will be displayed on the screen.

Command format	**:TRIGger[:SEQuence]:LEVel:LEVel** **:TRIGger[:SEQuence]:LEVel:LEVel?**
Instructions	Set the PVT trigger level Gets the PVT trigger level
Parameter type	Float , unit dBm
Parameter Range	-300dBm ~ 50dBm
Return	Float
Example	:TRIGger:LEVel:LEVel 0.5 dBm

6.5.2.2 Trigger Delay

Set the trigger delay when PVT is triggered

Command format	**:TRIGger[:SEQuence]:LEVel:DELay** **:TRIGger[:SEQuence]:LEVel:DELay?**
Instructions	Set the PVT trigger delay Gets the PVT trigger delay
Parameter type	Float , unitks , s , ms , us , ps , ns

Parameter Range	0~500ms
Example	:TRIGger[:SEQuence]:LEVel: DELay 20ms

6.5.3 External

In this mode, an external signal (TTL signal) is input from the [TRIGGER IN] connector at the rear panel and trigger signals are generated when this signal fulfills the specified trigger edge condition.

6.5.3.1 Trigger Edge

Set the trigger edge in external trigger to the rising (Pos) or falling (Neg) edge of the pulse.

Command format	**:TRIGger[:SEQuence]:EXTernal:SLOPe POSitive|NEGative** **:TRIGger[:SEQuence]:EXTernal:SLOPe?**
Instructions	Set the trigger along the falling edge | along the rise Get trigger edge
Parameter type	Enumeration
Parameter Range	POSitive NEGative
Return	Enumeration:POS|NEG
Example	:TRIGger:EXTernal:SLOPe POSitive

6.5.3.2 Trigger Delay

Set the trigger delay when external trigger is triggered

Command format	**:TRIGger[:SEQuence]:EXTernal:DELay** **:TRIGger[:SEQuence]:EXTernal:DELay?**
Instructions	Set the EXTernal trigger delay Gets the EXTernal trigger delay
Parameter type	Float , unitks , s , ms , us , ps , ns
Parameter Range	0~500ms
Return	Float
Example	:TRIGger[:SEQuence]: EXTernal: DELay 20ms

6.5.4 FMT

Real-time frequency template limiting allows users to limit acquisition based on specific events in the frequency domain. The user can customize the template shape and select the frequency template mask type (greater than, less than, within and outside the template) according to the actual needs, or set the template action (normal, beep and stop), and the defined frequency template can also be saved as LIM file.

6.5.4.1 Template Editing

Mask Type

You can customize the template shape and select the frequency template mask type (greater than, less than, within and outside the template) according to the actual needs.

Build

User can generate a template point table from the selected trace.

Point

Set frequency template points, which can be deleted or added.

6.5.4.2 Template Status

Template is effective or invalid.

Command format	:TRIGger[:SEQuence]:FMT:STATe :TRIGger[:SEQuence]:FMT:STATe?
Instructions	Example Set the template trigger status Gets the template trigger status
Parameter type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:TRIGger:FMT:STATe on

6.5.4.3 Template FMT Action

Normal

Display the fmt area on the screen after Out of fmt mask

Beep

A beep is emitted after Out of fmt mask.

Stop

The waveform stops refreshing after Out of fmt mask.

Command format	**:TRIGger[:SEQuence]:FMT:ACTion NORMal|BEEPer|STOP** **:TRIGger[:SEQuence]:FMT:ACTion?**
Instructions	Set the template trigger action | chirp | normal stop Gets the template trigger action
Parameter type	Enumeration
Parameter Range	NORMal BEEPer STOP
Return	Enumeration: NORM | BEEP| STOP
Example	:TRIGger[:SEQuence]:FMT:ACTion STOP

6.6 Trace

The sweep signal is displayed as a trace on the screen.

Command format	**:TRACe[1]|2|3 [:DATA]?**
Instructions	Get trace data
Return	String
Example	:TRACe:DATA?

Command format	**:TRACe[:DATA]:SPECtrum?**
Instructions	Obtain SPECtrum data
Return	String
Example	:TRACe: SPECtrum?

Command format	**:TRACe[:DATA]:PVT?**
Instructions	Obtain PVT data
Return	String
Example	:TRACe: PVT?

6.6.1 Select Trace

The real-time spectrum analyzer allows for up to three traces to be displayed at the same time. Each trace has its own color (Trace A - Yellow, Trace B - Whtie, Trace C - Red). All traces can be set parameter independently. As a default, analyzer will choose Trace A and set the type of the trace as Clear Write.

6.6.2 Trace Type

Set the type of the current trace or disable it. The system calculates the sampled data using a specific operation method according to the trace type selected and displays the result. Trace types include Clear Write, Max Hold, Min Hold, View, Average and Blank.

Clear Write

Erases any data previously stored in the selected trace, and display the data sampled in real-time of each point on the trace.

Max Hold

Retain the maximum level for each point of the selected trace. Update the data if a new maximum level is detected in successive sweeps.

Min Hold

Display the minimum value from multiple sweeps for each point of the trace and update the data if a new minimum is generated in successive sweeps.

Command format	**:TRACe[1]|2|3:TYPE WRITe|MAXHold|MINHold| AVERage** **:TRACe[1]|2|3:TYPE?**
Instructions	Sets/gets the display type of trace
Parameter type	Enumeration
Parameter Range	WRITe: The trace is in normal mode, and the data is updated MAXHold: Displays the maximum value of traces MINHold: Displays the minimum trace value AVERage: average
Return	Enumeration: WRITE|MAXH|MINH| AVER
Example	:TRAC1:TYPE MINH

6.6.3 Trace State

Blank

Disable the trace display and all measurements of this trace.

Average

Set the averages times of the selected trace. and set the average number of traces.

More averages can reduce the noise and the influence of other random signals; thus, highlighting the stable signal characteristics. The larger the averages times is, the smoother the trace will be.

Command format	**:TRACe[1]|2|3:DISPlay[:STATe]** **:TRACe[1]|2|3:DISPlay[:STATe]?**
Instructions	Sets/gets the display state of the trace
Parameter type	Enumeration: ACTI |BLAN
Parameter Range	ACTIve: The trace is in normal mode, and data is updated
Return	BLANk: clears trace data Enumeration: ACTI | BLAN
Example	:TRACe2:DISPlay BLANk :TRACe2:DISPlay?

6.6.4 Detect

The analyzer displays the sweep signal on the screen in the form of a trace. For each trace point, the analyzer always captures all the data within a specific time interval and processes (Peak, Average, etc.) the data using the detector currently selected, then it displays the processed data (a single data point) on the screen.

Select an appropriate detector type according to the actual application in order to ensure the accuracy of the measurement.

The available types are **Pos Peak**, **Neg Peak**, **Sample** and **Average**. The default is **Pos peak**.

Positive Peak

For each trace point, Positive Peak detector displays the maximum value of data sampled within the corresponding time interval.

Negative Peak

For each trace point, Negative Peak detector displays the minimum value of data sampled within the corresponding time interval.

Sample

For each trace point, Sample detector displays the transient level corresponding to the central time point of the corresponding time interval. This detector type is applicable to noise or noise-like signal.

Average

For each trace point, Average detector displays the average value of data sampled within the corresponding time interval.

Command format	[:SENSe]:DETector:TRACe[1]|2|3[:FUNCtion] [:SENSe]:DETector:TRACe[1]|2|3[:FUNCtion]?
Instructions	Sets/Gets the trace detection type
Parameter type	Enumeration NEG|POS|SAMP|AVER|
Parameter Range	NEGative: NEGative peak value POSitive: indicates a POSitive peak value SAMPle: SAMPle
Return	Enumeration: NEG|POS|SAMP|AVER
Example	:DETector:TRAC1 AVERage

Command format	[:SENSe]:DETector:TRACe:PVTime [:SENSe]:DETector:TRACe:PVTime?
Instructions	Sets/Gets the trace detection type
Parameter type	Enumeration NEG|POS|SAMP|AVER
Parameter Range	NEGative: NEGative peak value POSitive: indicates a POSitive peak value SAMPle: SAMPle
Return	Enumeration: NEG|POS|SAMP|AVER
Example	:DETector:TRACe:PVTime AVERage

Command format	[:SENSe]:DETector:TRACe:SPECtrogram [:SENSe]:DETector:TRACe:SPECtrogram?
Instructions	Sets/Gets the trace detection type
Parameter type	Enumeration NEG|POS|SAMP|AVER
Parameter Range	NEGative POSitive SAMPle
Return	Enumeration: NEG|POS|SAMP|AVER
Example	:DETector:TRACe:SPECtrogram AVERage

6.7 Marker & Peak

The marker appears as a rhombic sign (as shown below) for identifying points on a trace. You can easily read the amplitude, frequency and sweep time of the marked point on the trace.

The analyzer allows for up to eight/four pairs of markers to be displayed at one time, but only one pair or a single marker is active every time.

You can use the numeric keys, knob or direction keys to modify the desired frequency or time as well as view the readouts of different points on the trace.

6.7.1 Select Marker

Select one of the eight markers. The default is Marker1. When a marker is selected, you can set its type, trace to be marked, readout type and other related parameters. The enabled marker will appear on the trace selected through the **Select Trace** option and the readouts of this marker are also displayed in the active function area and at the upper right corner of the screen.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X?**
Instructions	Sets/gets the value of the marker point X axis This command takes effect only when the marker mode is not OFF： :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE If the marker readout type is frequency, the parameter is frequency. When the marker readout type is time, the value is time. Reference commands::CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout
Parameter type	frequency , Float , unit:Hz , kHz , MHz , GHz , default Hz or time , Float , unitus , ms , s , ks , default s
Parameter Range	0 Hz ~ max span or 10 ms ~ 1000 s
Return	When the marker readout type is frequency, the reading is frequency, floating point type, in Hz; When the marker readout type is time, the reading is time, floating point type, in s; When the marker readout type is cycle, the reading is cycle, floating point type, unit s;
Example	:CALCulate:MARKer4:X 0.4 GHz :CALCulate:MARKer4:X 200 ms :CALCulate:MARKer4:X?

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y?**
Instructions	Read/Set the value of the Y-axis of the marker point, which can also be used to read the marker noise in the marker function. To execute this command, ensure that the marker is in the non-off state. :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Parameter type	Float
Parameter Range	None
Return	Float , unit dBm
Example	:CALCulate:MARKer1:Y? Return: -25

6.7.2 Select Trace

Select the trace to be marked by the current marker. Valid selections include A, B, C.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe 1|2|3** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe?**
Instructions	Sets/Gets the marker trace
Parameter type	Enumeration
Parameter Range	1|2|3|4|5|6
Return	Enumeration
Example	CALCulate:MARK:TRAC 1

6.7.3 Marker Type

Marker supports 4 types: normal, differential, fixed, off. Depending on the type of cursor, the reading and position of the cursor are also different when the trace is refreshed.

6.7.3.1 Normal

One of the marker types. It is used to measure the X (Frequency or Time) and Y (Amplitude) values of a certain point on the trace. When selected, a marker with the number of the current marker (such as "**1**") appears on the trace.

- If no active marker exists currently, a marker will be enabled automatically at the center frequency of the current trace.
- You can use the numeric keys, knob or direction keys to move the marker. The readouts of the marker will be displayed at the upper right corner of the screen.

6.7.3.2 Delta

One of the marker types. It is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the reference point and a certain point on the trace. When selected, a pair of markers appears on the trace: Fixed Related Marker (marked by a combination of the marker number and letter " **+** ", such as " **2+** ") and the Delta Marker (marked by the "∆", such as " 1∆2 ").

- After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker
- The delta marker is in the "relative to" state, and its X-axis position can be changed; the related marker is in the "fixed" state by default (the X-axis and Y-axis positions are fixed), but the X-axis can be adjusted by changing to the "normal" state.
- The first row in the upper right corner of the trace area shows the frequency (or time) difference and amplitude difference between the two markers; the second row in the upper right corner of the trace area shows the X axis and amplitude value of the related marker.

6.7.3.3 Fixed

One of the marker types. When “Fixed” is selected, the X-axis and Y-axis of the marker will not change by the trace and can only be changed through the menu. The fixed marker is marked with "+".

After the marker selects “Delta”, the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference “fixed” marker.

6.7.3.4 Off

Turn off the marker currently selected. The marker information displayed on the screen and functions based on the marker will also be turned off.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE POSition|DELTa|FIXed|OFF** **:CALCulate:MARKer[1]|2|3|4:MODE?**
Instructions	Sets/Gets the marker mode
Parameter type	Enumeration
Parameter Range	POSition DELTa FIXed OFF
Return	Enumeration: POS|DELT|FIX|OFF
Example	:CALCulate:MARK1:MODE POSition

Command format	**:CALCulate:MARKer:AOFF**
Instructions	Close all markers
Example	:CALCulate:MARKer:AOFF

6.7.4 Relative To

"Relative to" is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between two markers which can mark on different traces.

After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence 1|2|3|4** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence?**
Instructions	Sets/Gets the marker relative to
Parameter type	Enumeration
Parameter Range	1|2|3|4|5|6|7|8
Return	Enumeration
Example	:CALCulate:MARKer1:REFerence 3

6.7.5 Peak->CF

Set the current peak frequency to the center frequency.

6.7.6 Update Peak/Maximum Peak

Searches for maximum peaks and marks them with specified cursors.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum**
Instructions	Marker searches for maximum peaks and marks them with the specified marker (If peak-to-peak value is on, peak-to-peak value search is carried out; otherwise, single peak value search is carried out)
Example	:CALCulate:MARKer4:MAXimum

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:NEXT**
Instructions	Marker searches for the next peak and marks it with the specified marker
Example	:CALCulate:MARKer1:MAXimum:NEXT

6.7.7 Minimum Peak

Searches for minimum peaks and marks them with specified cursors.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum**
Instructions	Marker searches for the minimum peak and marks it with the specified marker
Example	:CALCulate:MARKer4:MINimum

6.7.8 Left Peak

Search for and mark the nearest peak which is located at the left side of the current peak and meets the peak search condition.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:LEFT**
Instructions	Marker searches for left peaks and marks with the specified marker.
Example	:CALCulate:MARKer1:MAXimum:LEFT

6.7.9 Right Peak

Search for and mark the nearest peak which is located at the right side of the current peak and meets the peak search condition.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:RIGHt**
Instructions	Marker searches for right peaks and marks with the specified marker.
Example	:CALCulate:MARKer1:MAXimum:RIGHt

6.7.10 Peak Peak

Execute peak search and minimum search at the same time and mark the results with delta pair markers. Wherein, the result of peak search is marked with the delta marker and the result of minimum search is marked with the reference marker.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak**
Instructions	Performs a peak-to-peak search, marking with the specified marker
Example	:CALCulate:MARKer1:PTPeak

6.7.11 Countinuous Peak

Enable or disable continuous peak search. The default is Off. When enabled, the system will always execute a peak search automatically after each sweep in order to track the signal under measurement.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe] OFF|ON|0|1** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe]?**
Instructions	Enable the continuous peak search function Gets the status of the continuous peak search function switch
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:CPSEarch ON

6.7.12 Marker to

6.7.12.1 M->CF

Set the center frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the center frequency will be set to the frequency of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the center frequency will be set to the frequency of the Delta Marker.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:CENTer**
Instructions	Sets/gets the value of the marker X axis to the center frequency .If the marker is not open, this command automatically turns the marker on the center frequency.
Example	:CALCulate:MARKer1:CENTer

6.7.12.2 M->Start Freq

Set the start frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the start frequency will be set to the frequency of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the start frequency will be set to the frequency of the Delta Marker.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STARt**
Instructions	Sets/gets the value of the marker X axis to the starting frequency, valid when the marker is on
Example	:CALCulate:MARKer1:STARt

6.7.12.3 M->Stop Freq

Set the stop frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the stop frequency will be set to the frequency of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the stop frequency will be set to the frequency of the Delta Marker.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STOP**
Instructions	Sets/gets the value of the marker X axis to terminate frequency If the corresponding marker is not open, sending this command will automatically open the marker at the end frequency.
Example	:CALCulate:MARKer1:STOP

6.8 Meas & Meas setup

The real-time spectrum analyzer Mode provides several observation window combinations, including Density, spectrum+spectrogram, spectrogram, PvT, 3D+spectrogram.

Command format	**:DISPlay:VIEW[:SELect] {type}** **:DISPlay:VIEW[:SELect]?**
Instructions	Sets the current display view. Query the current view.
Parameter type	Enumeration
Parameter Range	DENSity: Density spectrum SSPectrum: Spectrum + spectrum SPECtrogram: spectrum PVT: Power time
Return	DENS|SSP| SPEC|PVT
Example	:DISP:VIEW DENS :DISP:VIEW?

6.8.1 Density

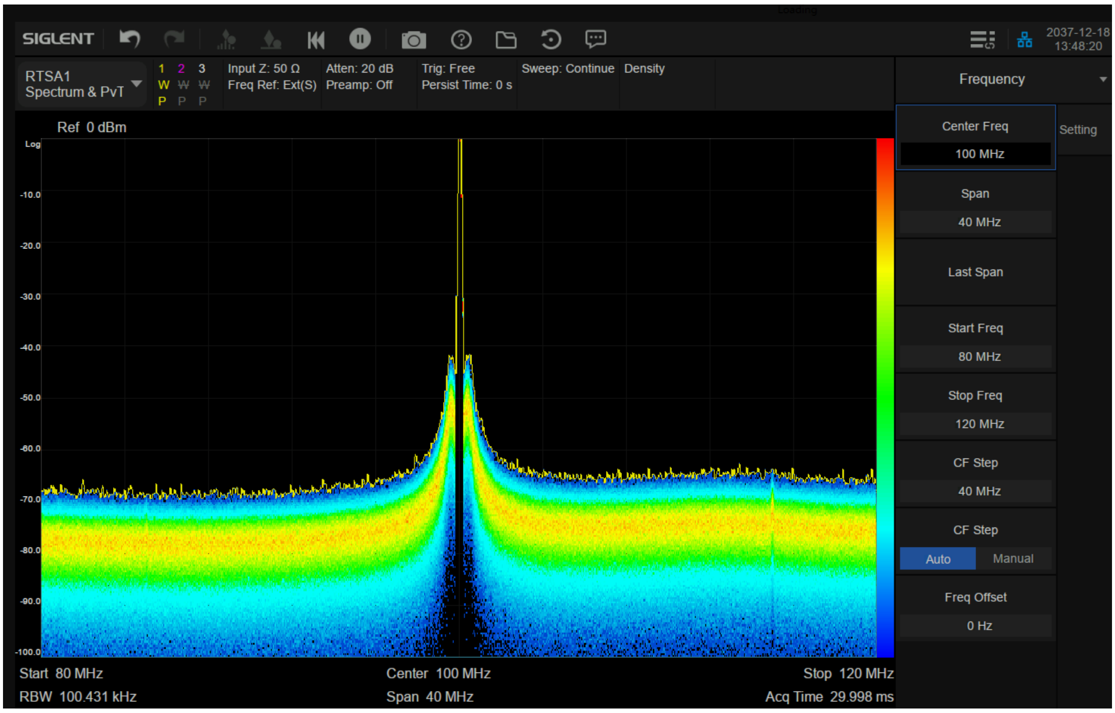


Figure 6-1 Density

The "Density" view provides a good understanding of the frequency band and signals.Since the measurements are gap free and all signal samples are represented in the display, it is possible to see most of the signals in the band at a glance or over a short measurement time.Individual display updates combine thousands of spectra and shows the signal dynamics and unexpected behavior.

The “Density” view uses colour of bitmaps to represent the signal density. Density is defined as the number of probability that frequency and amplitude points are hit during the capture interval (Acq Time).

In this view, the X axis represents frequency, the Y axis represents amplitude, and the colour represents signal density.

By controlling the brightness of the historical signal point of the “Density” view, the afterglow effect can be achieved.

6.8.2 Spectrogram

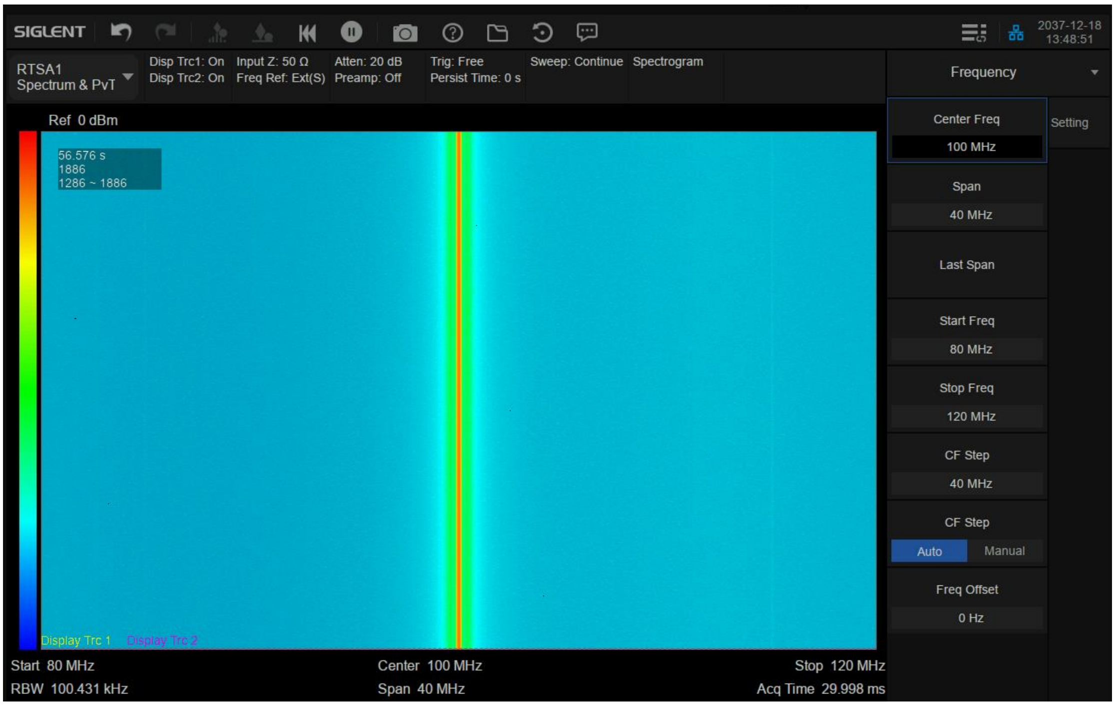


Figure 6-2 Spectrogram

In the “Spectrogram” display, the same spectral data is shown with a time dimension added to the spectrum display. “Spectrogram” records the relationship between the frequency-domain characteristics of each event and time.

In this view, the X axis represents frequency, the Y axis represents time, and the colour represents signal amplitude.

The information area in the upper left corner of the “Spectrogram” display shows the real-time of the latest spectral data (relative to the start measurement), the total number of generated waveform frames, and the waveform display range.

In the "paused" state, the user can observe the historical trace by moving display trace (D1, D2), or the historical range of the waveform data displayed in the waveform area by view start and view end.

In the run state, the view interval offset is 0 by default, that is, the latest historical data is displayed, while D1 and D2 are the latest trace by default.

Reading makers on traces D1 and D2, observe the position (time of occurrence) of the corresponding traces in the historical data, as well as the frequency and amplitude of signals. Compared with the latest trace, it can trace up to 50000 frames in the future. When the total number of generated waveforms is more than 50000 frames, the historical data of more than 50000 frames will be discarded.

6.8.3 Spectrum + Spectrogram

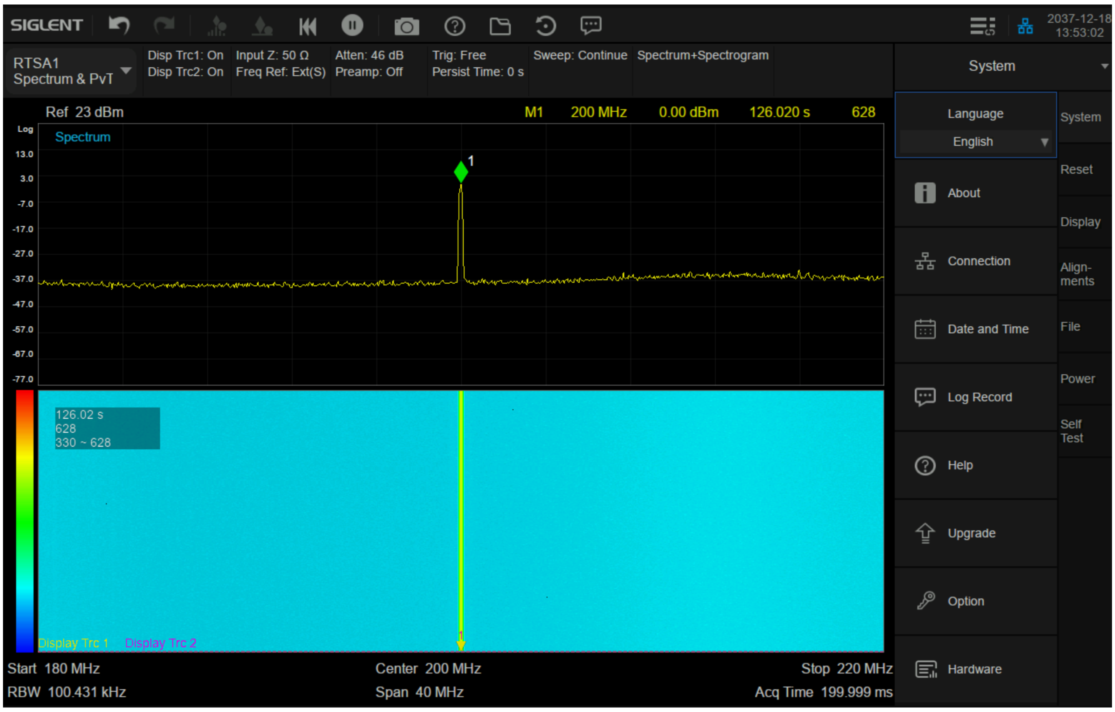


Figure 6-3 Spectrum + Spectrogram

The top view is spectrum which is shown as amplitude vs. frequency, and the bottom view si spectrogram which is mentioned above.

The display trace (D1, D2) specified in the spectrogram is shown as amplitude vs. frequency in the spectrum.

The traces in the spectrum view will refresh when modifying the positions on the y-axis of display trace (D1, D2) in the spectrogram, and when the frequency of the maker in the spectrum view is modified, the maker in the spectrogram will also move on the x-axis.

6.8.4 PvT

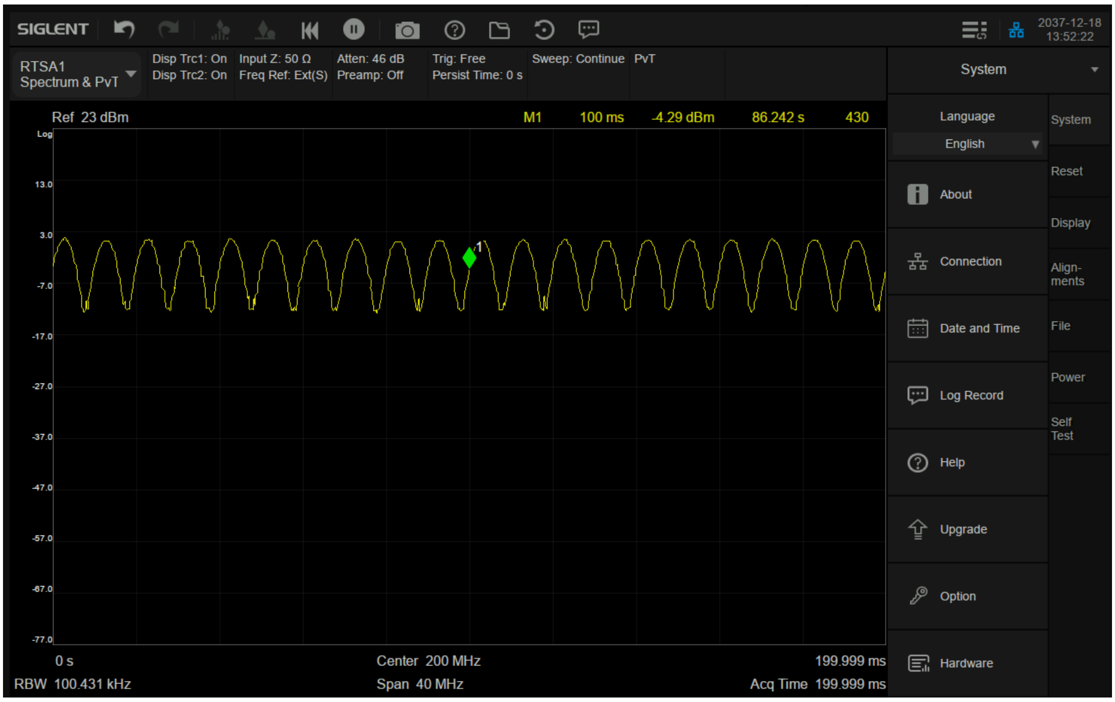


Figure 6-4 PvT

In the time domain, after the input data (IQ data) of FFT is detected, the corresponding PvT data can be obtained. The detection period is also the corresponding acquisition time. The Aladdin RTSA supports up to 50000 PVT traces for cyclic storage, and each PvT trace corresponds to a spectrogram trace.

6.8.5 Meas setup

Open the parameter setting menu corresponding to the currently selected measurement window. The menu of this key only displays the setting items related to the current measurement function. Please view the relevant menu according to the current measurement window.

6.8.5.1 Average | Hold Times

Average|Hold Times N, which is the counter when the trace type in Density view is "Average", "Max Hold" and "Min Hold". In a single measurement (Single), and any valid trace type is "average", "max hold" or "min hold", the sweep stops when the counter reaches N.

Larger average | hold times can reduce the influence of noise or other random signals, thereby highlighting stable signal characteristics in the signal.

Command format	**[:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:COUNt** **[:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:COUNt?**

Instructions	Sets/gets the average number of traces
Parameter type	Integer
Parameter Range	1 ~ 999
Return	Integer
Example	:AVERage:TRACe1:COUNt 10

Command format	**[:SENSe]:AVERage:TRACe[1]|2|3:CLEar**
Instructions	Restart the average.
Example	:AVERage:TRACe2:CLEar

6.8.5.2 Persistence

Sets the time when a frequency / amplitude display point's brightness fades in the persistence bitmap.

- In finite mode, you can customize the afterglow duration. And the length of time that the brightness of a point decays from 100% to 0%.
- In infinite mode, the display brightness of each point is 100% without attenuation, but its probability will change with the measurement time.

Command format	**:DISPlay:VIEW:DENSity:PERSistence** **:DISPlay:VIEW:DENSity:PERSistence?**
Instructions	Set the duration of afterglow Query the duration of the afterglow
Parameter type	Float , unit ks , s , ms , us
Parameter Range	0 s ~ 10 s
Return	Float , unit s
Example	:DISP:VIEW:DENS:PERS 5s

Command format	**:DISPlay:VIEW:DENSity:PERSistence:INFinite** **:DISPlay:VIEW:DENSity:PERSistence:INFinite?**
Instructions	Turn on or off afterglow Unlimited mode. Query the setting status of unlimited afterglow mode.
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISP:VIEW:DENS:PERS:INF ON

6.8.5.3 Display Trace

Controls the frame number of the spectrum where traces D1 and D2 are displayed.

- **Ogram View Start, Ogram View Stop**

  This parameter sets the range of historical trace numbers to be displayed. It only works in **Spectrum, Spectrum+Spectrum, PvT** mode, and the measurement state is paused. The start position is at the bottom of the view and the end position is at the top of the view. Limited by the size of the view frame, the start position and end position are linked.

For Spectral Mode: End Position – Start Position = 600.

For Spectrum + Spectrum Mode: End Position – Start Position = 298.

For PvT Mode: End Position – Start Position = 298.

Command format	**:DISPlay:VIEW:SPECtrogram:TRACe:STOP** **:DISPlay:VIEW:SPECtrogram:TRACe: STOP?**
Instructions	Sets the termination trace for display Query the termination trace displayed
Parameter type	Float
Parameter Range	
Return	Float
Example	:DISP:VIEW:SPEC:TRAC:STOP 600 :DISP:VIEW:SPEC:TRAC:STOP?

- **Select Display Trace**

  The two display traces are only used in the **Spectrum, PvT,** and **Spectrogram+Spectrum** mode.

  In the running state, they are always associated with the latest refreshed trace.

  In the pause state, access to historical in-frame data is achieved by setting Display Trace Offset. Select trace D1 or D2, D1 and D2 will be displayed in different colors. It takes effect under **Spectrum, Spectrum+Spectrum,** and **PvT**. Under **Spectrum + Spectrum, PvT**, the selected trace will be displayed in the foreground, and the other trace will be covered.

- **Trace offset**

  In the pause state, the control displays the historical trace numbers of traces D1 and D2. In non-suspend mode, this number bit cannot be modified.

Command format	**:DISPlay:VIEW:SPECtrogram:TRACe:OFFSet** **:DISPlay:VIEW:SPECtrogram:TRACe: OFFSet?**
Instructions	Sets the trace offset displayed Query the trace offset displayed
Parameter type	Float
Parameter Range	
Return	Float
Example	:DISP:VIEW:SPEC:TRAC:OFFSet 600 :DISP:VIEW:SPEC:TRAC:OFFSet?

6.8.5.4 Color

Sets the color display scheme for RTSA.

Command format	**:DISPlay:VIEW:THEMe WARM | COLD | GRAY** **:DISPlay:VIEW:THEMe?**

Instructions	Sets/Gets the color display scheme.
Parameter type	Enumeration
Parameter Range	WARM | COLD | GRAY
Return	Enumeration
Example	:DISPlay:VIEW:THEMe WARM

6.8.5.5 Global center frequency

Set whether the current CF acts on other scan modes at the same time.

Command format	**:INSTrument:COUPle:FREQuency:CENTer** **:INSTrument:COUPle:FREQuency:CENTer?**
Instructions	Set global CF Get global CF
Parameter type	Boolean
Parameter Range	0|1
Return	0|1
Example	:INSTrument:COUPle:FREQuency:CENTer 0 :INSTrument:COUPle:FREQuency:CENTer?

6.8.5.6 Limit

RTSA masks allow users to limit acquisitions based on specific events in the frequency domain, this feature also only works in **Density** mode. The user can customize the mask data and select the frequency template mask type (upper or lower) according to actual needs, and can also set the mask action (normal, buzzer and stop), the user can define up to 6 different templates, the defined frequency template can be saved as a LIM file.

- **Mask Enable**

  Open or close the current template.

Command format	**:TRIGger[:SEQuence]:FMT:STATe** **:TRIGger[:SEQuence]:FMT:STATe?**
Instructions	Get/Set the mask state.
Parameter type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:TRIGger:FMT:STATe on

- **Template type**

  Set template type: upper/lower limit.

- **Edit the template**

  The user can choose to fit the template from the specified trace, specify the template to test the specific trace, set the template points, set the frequency/amplitude interpolation method between the template points, save and load the template points.

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:TYPE UPPer|LOWer** **:CALCulate:LLINe[1]|2|3|4|5|6:TYPE?**
Instructions	Sets/Gets the restriction type
Parameter type	Enumeration
Parameter Range	UPPer|LOWer
Return	Enumeration
Example	:CALCulate:LLINe1:TYPE LOWer

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X?**
Instructions	Set the limit point template frequency offset Gets the limit point template frequency offset
Parameter type	Float
Parameter Range	0 ~ 26.5G
Return	Float
Example	:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X 1MHz

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y?**
Instructions	Sets the limit point template amplitude offset Gets the limiter template amplitude offset
Parameter type	Float
Parameter Range	-350 dB~380 dB
Return	Float
Example	:CALCulate:LLINe5:Offset:Y -10

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DATA val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:DATA?**
Instructions	Sets/gets restricted data (Clears previous data)
Parameter type	val1 : frequency : Float, val2 : Ampl :Float
Parameter Range	val1 : related with Span val2 : -400 dBm~330 dBm
Return	val1 : frequency : Float, val2 : Ampl :Float
Example	:CALCulate:LLINe2:DATA 100,-20,200,-25(Add two points: (100 ,-20) and (200 ,-25)) :CALC:LLINe1:DATA?

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:ADD val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:POINt:DELete**
Instructions	Add limit point Delete limit points
Parameter type	val1 : frequency : Float, val2 : Ampl : Float

Parameter Range	val1 : related with Span val2 : -400 dBm~330 dBm
Example	:CALCulate:LLINe1:ADD 100,-20 :CALCulate:LLINe2:POINt:DELete 2

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DELete** **:CALCulate:LLINe:ALL:DELete**
Instructions	Delete specified restrictions Delete all restrictions
Example	:CALCulate:LLINe1:DELete :CALCulate:LLINe:ALL:DELete

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:TRACe** **:CALCulate:LLINe[1]|2|3|4|5|6:TRACe?**
Instructions	Select the limit trace
Parameter type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe1:TRACe 3

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE** **:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE?**
Instructions	Set/Query the frequency difference type
Parameter type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1:FREQuency:INTerpolate:TYPE LOG

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe** **:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe?**
Instructions	Set or query the frequency reference type
Parameter type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2:FREQuency:CMODe FIX

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE** **:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE?**
Instructions	Set or query the range difference type
Parameter type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1: AMPLitude:INTerpolate:TYPE LOG

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe** **:CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe?**

Instructions	Set or query the amplitude reference type
Parameter type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2: AMPLitude:CMODe FIX

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:COPY** **:CALCulate:LLINe[1]|2|3|4|5|6:COPY?**
Instructions	Copy the limit
Parameter type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2:COPY 5

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:BUILd** **:CALCulate:LLINe[1]|2|3|4|5|6:BUILd?**
Instructions	Fitting a trace
Parameter type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2: BUILd 1 :CALCulate:LLINe2: BUILd?

- **Template switch**

  All templates are valid or invalid.

- **Template limit action**

  Normal: Displays the restricted area on the screen after exceeding the restricted range.

  Beep: A beep sounds when the limit is exceeded.

  Stop: The waveform stops refreshing when it exceeds the limit range.

Command format	**:TRIGger[:SEQuence]:FMT:ACTion NORMal|BEEPer|STOP** **:TRIGger[:SEQuence]:FMT:ACTion?**
Instructions	Get/Set mask action
Parameter type	Enumeration
Parameter Range	NORM | BEEP| STOP
Return	NORM | BEEP| STOP
Example	:TRIGger:FMT:ACTion STOP

7 Modulation Analyzer Mode

MA mode includes digital modulation analysis (DMA) and analog modulation analysis (AMA). Press **Mode** key to select and add the expected mode to window management.

Press **Meas Setup** key to enter the corresponding measurement parameter configuration menu. According to the actual needs, select the required parameter configuration options, obtain the corresponding output waveform and observe the analysis results.

7.1 Digital Modulation Analysis (DMA)

Through digital signal analysis, a series of indicators such as error vector magnitude, magnitude error, and phase error can be obtained.

7.1.1 Settings

7.1.1.1 Average|Hold times

Average|Hold Times N, is the counter when the trace type is "average", "max hold" and "min hold". In a single measurement (Single), and any valid trace type is "average", "max hold" or "min hold", the sweep stops when the counter reaches N.

Larger (average|hold) times can reduce the influence of noise or other random signals, thereby highlighting stable signal characteristics in the signal.

Command format	**[:SENSe]:AVERage[:STATe]** **[:SENSe]:AVERage[:STATe]?**
Instructions	Set the average measurement status Query the average measurement status
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	Enumeration
Example	:AVERage ON

Command format	**[:SENSe]:AVERage:COUNt** **[:SENSe]:AVERage:COUNt?**
Instructions	Set the average number of measurements Query the average number of measurements
Parameter type	Integer
Parameter Range	1 ~ 1000
Return	Integer
Example	:AVERage:COUNt 20

7.1.1.2 Statistic

Turn on the statistics function, the measurement results will display the maximum and minimum values of the statistics, turn off the statistics function, the measurement results will only display the real-time measurement value. Statistics are disabled by default.

After performing a remeasurement, the statistical results will be cleared and the statistics will be restarted. If the averaging function is turned on, the average calculation of the measurement results will also be cleared and restarted.

Command format	**[:SENSe]:STATistic:STATe** **[:SENSe]:STATistic:STATe?**
Instructions	Set digital demodulation measurement statistics status Query the statistical status of digital demodulation measurements
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	Enumeration
Example	:STATistic:STATeON

Command format	**:CALCulate:RESTart**
Instructions	Restart the statistical measurements
Example	:CALCulate:RESTart

7.1.2 Demod

7.1.2.1 Demod Type & Format

Modulation types are as follows:

QAM modulation : 8QAM , 16QAM , 32QAM , 64QAM , 128QAM , 256QAM

PSK modulation : BPSK , QPSK , 8PSK , DBPSK , DQPSK , D8PSK , pi/4 DQPSK , pi/8 DQPSK , OQPSK

FSK modulation : 2FSK , 4FSK , 8FSK , MSK

ASK modulation : 2ASK

Command format	**[:SENSe]:DDEMod:MODulation** **[:SENSe]:DDEMod:MODulation?**
Instructions	Sets the digital demodulation type Gets the digital demodulation type
Parameter type	Enumeration
Parameter Range	ASK2 MSK BPSK QPSK PSK8 DBPSK DQPSK DPSK8 OQPSK PI4DQ PI8D8 QAM16 QAM32 QAM64 QAM128 QAM256 FSK2 FSK4 FSK8 FSK16
Return	Enumeration
Example	:DDEMod:MODulation FSK8

Command format	**:READ:DDEMod?**
Instructions	Obtain digital demodulation results if demod type is ASK it will return: ASK err rms (% rms) ASK err peak (% pk) symbol position of ASK err peak carrier power carrier offset ASK depth If demod type is FSK it will return: 1.FSK err rms (% rms) 2.FSK err peak (% pk) 3.symbol position of FSK err peak 4. carrier power 5.carrier offset 6.FSK deviation If If demod type is MSK,PSK,QAM it will return: 1. EVM rms (% rms) 2. EVM peak (% pk) 3. symbol position of EVM peak 4.magnitude error rms (% rms). 5. magnitude error peak (% pk) 6.symbol position of magnitude error peak 7.phase error rms (deg) 8.phase error peak (deg pk) 9.symbol position of phase error peak 10. frequency error (Hz) 11. IQ offset 12. SNR(MER) (dB) 13. quadrature error (deg) 14. gain imbalance (dB)
Parameter type	None
Parameter Range	None
Return	String
Example	:READ:DDEMod?

7.1.2.2 Symbol Rate

Set the analyzer symbol rate (symbols per second) to match the system (signal).

The symbol rate setting is limited by the analyzer maximum bandwidth (BW_max).

Command format	**:DDEMod[:FORMat]:SRATe** **:DDEMod[:FORMat]:SRATe?**
Instructions	Sets the digital demodulation symbol rate Read digital demodulation symbol rate
Parameter type	Integer
Parameter Range	1000 ~ 25000000 The sign point is 4 , Maximum sign rate is 25e6 The sign point is 6 , Maximum sign rate is 25e6

	The sign point is 8 , Maximum sign rate is 18.75e6 The sign point is 10 , Maximum sign rate is 15e6 The sign point is 12 , Maximum sign rate is 12.5e6 The sign point is 14 , Maximum sign rate is 10.714285e6 The sign point is 16 , Maximum sign rate is 9.375e6
Return	Integer
Example	:DDEMod:SRATe 2000

7.1.2.3 Points / Symbol

Sets the number of points for demodulating each symbol. The settable values are 2, 4, 8, 10, 12, 14, and 16.

Command format	**[:SENSe]:DDEMod[:FORMat]:SYMBol:POINts** **[:SENSe]:DDEMod[:FORMat]:SYMBol:POINts?**
Instructions	Sets digital demodulation symbol points Query digital demodulation symbol points
Parameter type	Discrete
Parameter Range	4 , 6 , 8 , 10 , 12 , 14 , 16
Return	Discrete
Example	DDEMod:SYMBol:POINts 14

7.1.2.4 Meas Interval

Set the length of digital demodulation analysis and display.

Command format	**[:SENSe]:DDEMod[:FORMat]:RLENgth** **[:SENSe]:DDEMod[:FORMat]:RLENgth?**
Instructions	Set digital demodulation measurement length Get digital demodulation measurement length
Parameter type	Integer
Parameter Range	16 ~ 4096
Return	Integer
Example	:DDEMod:RLENgth 200

7.1.2.5 Constelletion Setting

Edit the symbol order of constellation positions.

7.1.3 Filter

7.1.3.1 Meas Filter

Enable and select Meas Filter.

Meas Filters that can be set include:

- Root Raised Cosine
- Raised Cosine
- Gauss
- Half Sine

Command format	**[:SENSe]:DDEMod:FILTer[:MEASurement]** **[:SENSe]:DDEMod:FILTer[:MEASurement]?**
Instructions	Set up digital demodulation measurement filter Obtain digital demodulation measurement filter
Parameter type	Enumeration
Parameter Range	OFF RRCosine RECTangle GAUSsian HSIN
Return	0|1
Example	:DDEMod:FILTer HSIN

7.1.3.2 Ref Filter

Enable and select Ref Filter.

Ref Filters that can be set include:

- Root Raised Cosine
- Raised Cosine
- Gauss
- Half Sine

Command format	**[:SENSe]:DDEMod:FILTer:REFerence** **[:SENSe]:DDEMod:FILTer:REFerence?**
Instructions	Sets the digital demodulation reference filter Query digital demodulation reference filter
Parameter type	Enumeration
Parameter Range	OFF RRCosine RECTangle GAUSsian HSIN
Return	Enumeration
Example	:DDEMod:FILTer:REFerenceOFF

7.1.3.3 Filter Length

Sets the filter length used by the analyzer. This feature applies to MeasRef Filter and Ref Filter.

Command format	**[:SENSe]:DDEMod:FILTer:RLENgth [:SENSe]:DDEMod:FILTer:RLENgth?**
Instructions	Set the filter length Gets the filter length
Parameter type	Float
Parameter Range	0~128
Return	Float
Example	:DDEMod:FILT:RLENgth 5

7.1.3.4 Alpha/BT

Sets the filter alpha characteristic value of the Sqrt Nyquist raised cosine and root raised cosine Nyquist filters used by the analyzer, or the BT value of the Gauss filter. This feature applies to Meas Ref Filter and Ref Filter.

Command format	**[:SENSe]:DDEMod:FILTer:ABT [:SENSe]:DDEMod:FILTer:ABT?**
Instructions	Set the filter alpha Gets the filter alpha
Parameter type	Float
Parameter Range	0-1
Return	Float
Example	:DDEMod:FILT:ABT 0.5

7.1.4 Burst/sync Search

7.1.4.1 Search Length

Specifies the time range (length) to search for signals.

The search length must satisfy Search Length ≥ 1.2 * Meas Interval / Symbol Rate. If modifying the Meas Interval or Symbol Rate causes the length not to meet the conditions, the analyzer will automatically calculate and match the minimum value.

Command format	**[:SENSe]:DDEMod:SYNC:SLENgth [:SENSe]:DDEMod:SYNC:SLENgth?**
Instructions	Set the search length Gets the search length
Parameter type	Float
Parameter Range	1.28ms-4.672ms
Return	Float
Example	:DDEMod:SYNC:SLENgth 0.5ms

7.1.4.2 Burst Search

Burst search measures the burst power (pulses) in a signal and uses this to segment and isolate the signal for subsequent display and analysis. Using burst search, you can avoid the interference of invalid signals to the analysis process.

Command format	**[:SENSe]:DDEMod:SYNC:BURSt[:STATe]** **[:SENSe]:DDEMod:SYNC:BURSt[:STATe]?**
Instructions	Set the burst search switch Query the burst search switch
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	Enumeration
Example	:DDEMod:SYNC:BURS ON

7.1.4.3 Burst Search Threshold

Setting the thresholds for the rising and falling edges of the burst, in accordance with the peak power of the measured signal.

Command format	**[:SENSe]:DDEMod:SYNC:BURSt:THREshold** **[:SENSe]:DDEMod:SYNC:BURSt:THREshold?**
Instructions	Set the burst search threshold Gets the burst search threshold
Parameter type	Float
Parameter Range	-200dBm~200dBm
Return	Float
Example	:DDEMod:SYNC:BURSt:THREshold -10

7.1.4.4 Burst Min Length

Setting the min Length for the rising and falling edges of the burst

Command format	**[:SENSe]:DDEMod:SYNC:BURSt:MINLength** **[:SENSe]:DDEMod:SYNC:BURSt:MINLength?**
Instructions	Set the minimum burst length Gets the burst minimum length
Parameter type	Float
Parameter Range	10us~10ms
Return	Float
Example	:DDEMod:SYNC:BURSt:MINLength 0.5ms

7.1.4.5 Burst Min Gap

Setting the min gap for the rising and falling edges of the burst.

Represents the minimum distance (in "symbols") between adjacent bursts. The default value is 1 symbol in order to make sure that the burst search finds bursts that are very close to each other. However, in case the "capture buffer" does not contain very close bursts, it is recommended that you increase the value. This makes the burst search faster and also more robust for highly distorted signals.

Note that this parameter only influences the robustness of the burst search. It should not be used to explicitly exclude certain bursts from the measurement. For example, setting the minimum gap length to 100 "symbols" does not ensure that the burst search does not find bursts that have a very small gap.

Command format	**[:SENSe]:DDEMod:SYNC:BURSt:MINGap** **[:SENSe]:DDEMod:SYNC:BURSt:MINGap?**
Instructions	Set the minimum burst interval Gets the minimum burst interval
Parameter type	Float
Parameter Range	10us~10ms
Return	Float
Example	:DDEMod:SYNC:BURSt:MINGap 0.5ms

7.1.4.6 Sync Search

Synchronization search is to search for synchronization codewords in the measured signal, and use this to segment and isolate the signal for subsequent display and analysis.

The synchronous codeword is a string of symbols (coding), so its length must be an integer multiple of the number of bits (number of bits) of each symbol.

Command format	**[:SENSe]:DDEMod:SYNC:SWORd[:STATe]** **[:SENSe]:DDEMod:SYNC:SWORd[:STATe]?**
Instructions	Set the synchronization search switch Query the synchronization search switch
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	Enumeration
Example	:DDEMod:SYNC:SWORd ON

7.1.4.7 Sync Offset

Specifies the time (in symbols) between the start of the measurement data and the start of the sync word. If positive, the sync word starts after the start of the measurement data. If negative, the sync word starts before the start of the measurement data.

Command format	**[:SENSe]:DDEMod:SYNC:SWORd:OFFSet** **[:SENSe]:DDEMod:SYNC:SWORd:OFFSet?**
Instructions	Set the synchronous search offset Gets the synchronous search offset

Parameter type	Integer
Parameter Range	-10000~10000
Return	Integer
Example	:DDEMod:SYNC:SWORd:OFFSet 2

7.1.4.8 Sync Pattern

Edit and display sync codewords.

Command format	**[:SENSe]:DDEMod:SEGMent:BER:PATTern** **[:SENSe]:DDEMod:SEGMent:BER:PATTern?**
Instructions	Set the BERT symbol Get BERT symbol
Parameter type	String
Parameter Range	Binary bit, maximum 320 bits
Return	String
Example	:DDEMod:SEGMent:BER:PATTern “0011”

7.1.5 BERT

Bit error rate test function, that is, the analyzer uses the measurement result of the current demodulation analysis and the preset reference signal to compare by bit to obtain the bit error rate. Reference signals that can be preset in the editing interface and can be saved to a user profile (.sta file) and loaded.

Command format	**[:SENSe]:DDEMod:SEGMent:BER:STATe** **[:SENSe]:DDEMod:SEGMent:BER:STATe?**
Instructions	Setting the BERT switch Querying the BERT switch
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	Boolean
Example	:DDEMod:SEGMent:BER:STATe ON

Command format	**[:SENSe]:DDEMod:SEGMent:BER:PATTern** **[:SENSe]:DDEMod:SEGMent:BER:PATTern?**
Instructions	Setting the BERT pattern Querying the BERT pattern
Parameter type	String
Parameter Range	Binary bit
Return	String
Example	:DDEMod:SEGMent:BER:PATT “0011”

7.2 Analog Modulation Analysis (AMA)

Used for modulation analysis of analog signals, a series of indicators such as carrier power, modulation rate, THD can be obtained through analysis.

Analog modulation analysis includes AM, FM, PM modulation.

The modulation mode, IF bandwidth, and equivalent filter can be selected, and the data can be averaged.

Command format	**:READ:ADEMod?**

Instructions	Obtain the simulation demodulation result
	if demod type is AM it will return:
	carrier_power
	mod_rate
	am_depth
	sinad
	carrier_offset
	
	if demod type is FM it will return:
	carrier_power
	mod_rate
	fm_deviation
	sinad
	carrier_offset
	
	if demod type is PM it will return:
	carrier_power
	mod_rate
	pm radians
	sinad
	carrier_offset

Return	String
Example	:READ:ADEMod?

7.2.1 Demod Type

Analog modulation analysis includes AM, FM, PM modulation.

Command format	**[:SENSe]:ADEMod:STYLe** **[:SENSe]:ADEMod:STYLe?**
Instructions	Sets the analog demodulation type (cannot be set when not analog demodulation) Get analog demodulation type (cannot be queried when not analog demodulation)
Parameter type	Enumeration
Parameter Range	AM: analog AM FM: analog frequency modulation PM: Analog phase modulation
Return	Enumeration： AM|FM|PM
Example	:ADEMod:STYLe AM

7.2.2 IFBW

The IFBW specifies the size of the IF bandwidth of the analyzed signal. If the setting is incorrect, it will affect the accuracy of the measurement results. The intermediate frequency bandwidth IFBW should be as small as possible, which can improve the signal-to-noise ratio of demodulation. IFBW can be set to: 1.2MHz, 960kHz, 600kHz, 480kHz, 300kHz, 240kHz, 120kHz, 96kHz and 60kHz.

For "AM" modulation analysis, the IFBW should be more than twice the modulation frequency; for "FM" modulation analysis, the IFBW should be more than twice the sum of the frequency offset plus the modulation frequency.

Command format	**:CALCulate:IFBW:INDEx** **:CALCulate:IFBW:INDEx?**
Instructions	Set the analog demodulation if bandwidth Obtain analog demodulation intermediate frequency bandwidth
Parameter type	Enumeration
Parameter Range	0-8
Return	0-8
Example	:CALCulate:IFBW:INDEx 5

7.2.3 EqLPF

The EqLPF specifies the equivalent low-pass filter bandwidth of the analyzed signal. If the setting is incorrect, it will affect the accuracy of the measurement results. EqLPF is an additional low-pass filter, which can be used to measure lower the modulation frequency of the modulation signal. The bandwidth of EqLPF is fractional times that of IFBW, and there are 6 gears to choose from, namely IFBW/6, IFBW/20, IFBW/60, IFBW/200, IFBW/600 and IFBW/2000.

The bandwidth of the EqLPF should be as small as possible, which can improve the signal-to-noise ratio of demodulation, but at the same time, it should be greater than or equal to the modulation frequency.

Command format	**:CALCulate:EQLPf:INDEx** **:CALCulate:EQLPf:INDEx?**
Instructions	Set up analog demodulation equalization filter Obtain analog demodulation equalization filter
Parameter type	Enumeration
Parameter Range	0-6
Return	0-6
Example	:CALCulate:EQLPf:INDEx 2

7.2.4 Average

Turn on or off the averaging option for measurement results, and you can set the number of items involved in the averaging calculation. When the averaging option is turned off, the “Average” column of the measurement results becomes “Current”. The larger the average number, the more stable the “average” value.

7.3 Freq

7.3.1 Freq & Span

In MA mode, only the center frequency can be configured.

Span cannot be set and is only used to show the equivalent channel bandwidth under the current configuration.

Command Format	**[:SENSe]:FREQuency:CENTer** **[:SENSe]:FREQuency:CENTer?**
Instruction	Sets the center frequency. Gets the center frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	0 Hz ~ 28 GHz
Return	Float, unit: Hz
Example	[:SENSe]:FREQuency:CENTer 300 MHz

7.3.2 CF Step

The frequency step is the length of using the direction keys to step when the center frequency is set. Pay attention to the following points during use:

Changing the value of the center frequency in fixed steps can achieve the purpose of switching the measurement channels quickly and continuously.

Command Format	**[:SENSe]:FREQuency:CENTer:STEP[:INCRement]** **[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?**
Instruction	Sets frequency step. Gets frequency step.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1 Hz ~ 100 MHz
Return	Float, unit: Hz
Example	[:SENSe]:FREQuency:CENTer:STEP[:INCRement] 20 MHz

7.4 BW

7.4.1 EQBW

The MA mode does not support configuring the resolution bandwidth, and only displays the equivalent resolution bandwidth.

Command Format	**[:SENSe]:BWIDth[:RESolution]?**
Instruction	Querys equalization BW.
Parameter Type	None
Parameter Range	None
Return	Float, unit: Hz
Example	:BWIDth?

7.4.2 Window

The EQBW filter offers several different window functions that you can switch in real-time based on your measurement needs. The available window functions include Rectangular window, Hamming window, Hanning window, Flattop window, Blackman window. The Flattop window is used by default.

Command Format	**[:SENSe]:DDEMod:FFT:WINDow:TYPE** **[:SENSe]:DDEMod:FFT:WINDow:TYPE?**
Instruction	Sets window function. Gets window function.
Parameter Type	Enumeration RECTangular HAMMing : HANNing FLATtop BLACkman
Parameter Range	None
Return	Enumeration RECT HAMM HANN FLAT BLAC
Example	:DDEMod:FFT:WINDow:TYPE BLAC

7.5 Sweep

7.5.1 Measure/Sweep Control (Single/Continue/Restart)

Sweep/Measure:

Single/Continue controls the analyzer to perform a single sweep/measurement or continuous sweep/measurement.

Restart:

Restart the current sweep or measurement. In particular, in the continue mode, modifying some parameters will equivalently perform a restart sweep or measurement.

Command Format	**:INITiat[:IMMediate]**
Instruction	Restart the current sweep. :INITiate:RESTart and :INITiate:IMMediate perform exactly the same function.
Parameter Type	None
Parameter Range	None
Return	None
Default	None
Menu	
Example	:INITiate:IMMediate

Command Format	**:INITiate:CONTinuous OFF|ON|0|1** **:INITiate:CONTinuous?**
Instruction	Sets continuous sweep mode on-off. Gets continuous sweep mode state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:INITiate:CONTinuous OFF

Command Format	**ABORt**
Instruction	This command is used to stop the current measurement. It aborts the currentmeasurement as quickly as possible, resets the sweep and trigger systems, and puts the measurement into an "idle" state. If the analyzer is set for Continuous measurement, it sets up the measurement and initiates a new data measurement sequence with a new data acquisition (sweep) taken once the trigger condition is met. If the analyzer is set for Single measurement, it remains in the "idle" state until an :INIT:IMM command is received.
Parameter Type	None
Parameter Range	None
Return	None
Default	None
Menu	None
Example	INIT;ABORt

7.6 Trigger

7.6.1 Trigger Source

The analyzer provides a variety of trigger sources to suit different triggering needs.

Free Run

Free trigger is the default use mode of the analyzer, at this time, the spectrum analyzer loops and continuously scans.

Video

Using the video trigger mode, a transient signal with a very short time can be captured. In this working mode, the signal will be triggered and displayed on the screen only when the rising or falling edge of a signal touches the Trigger Level.

External

External triggering provides more abundant triggering functions. If you want to realize periodic triggering and delayed triggering, you can choose the working mode of external triggering. In this mode, the trigger is controlled by the rising edge or falling edge of the external input signal, and a square wave signal of a certain frequency can be used for periodic triggering, and the trigger delay time can be adjusted by setting the trigger delay.

Period

When Periodic is selected, the analyzer uses the built-in period timer signal as a trigger. The trigger event is set by the period timer parameter, which is modified by the offset and periodic sync Src.
Use this trigger when there is a periodic signal but no reliable signal to trigger. You can synchronize the periodic signal to an external event (using the periodic sync Src) to get closer to a reliable trigger signal.
If no synchronization source is selected, then the internal timer will not be synchronized with any external timed events.

Command format	**:TRIGger:SOURce** **:TRIGger:SOURce?**
Instructions	sets the trigger source. gets the trigger source.
Parameter type	Enumeration
Parameter Range	"IMMediate ", "VIDeo ", "EXTernal ","FRAMe"
Return	"IMM", "VID", "EXT" ,"FRAMe"
Example	:TRIGger:SOURce VID

7.6.2 Trigger Level

Sets the amplitude level of the video trigger (only absolute levels are supported). A trigger occurs when the slope of the video signal crosses this level.

When the selected trigger source is video trigger, the trigger level will be displayed as an orange line, and the right end of the line will be displayed as:

Trig Line: xxxx dBm

Command format	**:TRIGger: {type}:LEVel** **:TRIGger: {type}:LEVel?**
Instructions	sets the trigger level. gets the trigger level. {type}: "VIDeo", "EXTernal"
Parameter type	Float
Parameter Range	-300~50dB
Return	Float
Example	:TRIGger:VIDeo:LEVel -20

7.6.3 Trigger Slope

Set the external trigger and video trigger trigger polarity. The options are rising edge trigger and falling edge trigger.

Command format	**:TRIGger: {type}:SLOPe** **:TRIGger: {type}:SLOPe?**
Instructions	sets the trigger edge. gets the trigger edge. {type}: " VIDeo ", " EXTernal "
Parameter type	Enumeration
Parameter Range	"POS", "NEG"
Return	"POS", "NEG"
Example	:TRIGger: EXTernal:SLOPe :TRIGger: VIDeo:SLOPe?

7.6.4 Trigger Delay

Set trigger delay, negative delay can be set.

The maximum duration of negative delay = 500M/(symbol rate*symbol points*8)

Command format	**:TRIGger:{type}:DELay** **:TRIGger:{type}:DELay?** **:TRIGger:{type}:DELay:STATe** **:TRIGger:{type}:DELay:STATe?**
Instructions	sets the trigger delay and state. gets the trigger delay and state.

	{type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter type	Float
Parameter Range	-500ms-500ms
Return	Float
Example	:TRIGger:EXTernal:DELay 5e-3 :TRIGger:FRAMe:DELay?

7.6.5 Zero Span Trigger Delay Compensation (External Trigger)

Under normal circumstances, after the trigger is generated, the displayed data and the data at the same time as the trigger are displayed, but because the processing time of the trigger path and the data path are different, the data displayed at the trigger time is the previous data. This does not affect the integrity of the data and will not cause data loss at the trigger point. However, in some cases, it is necessary to display the zero point of the screen coordinates as the input signal information of the trigger point. At this time, the function of zero-span trigger delay compensation is required.

7.6.6 Period (Period)

Set the trigger period.

Command format	:TRIGger:FRAMe:PERiod :TRIGger:FRAMe:PERiod?
Instructions	Set/Query Period Trigger period
Parameter type	Float
Parameter Range	100ns~10s
Return	Float
Example	:TRIGger:FRAMe:PERiod 1s

7.6.7 Offset Time(Period)

Adjusts the cumulative offset between the periodic trigger clock and the trigger event. The periodic trigger clock cannot be seen on the software, only the trigger event can be seen. So if you want to adjust the time of the trigger event, you can only adjust the offset between the periodic trigger clock and the trigger event, but the absolute value of the internal offset is unknown, and each modification to the offset is based on the previous Do accumulation.

Command format	:TRIGger:FRAMe:OFFSet :TRIGger:FRAMe:OFFSet?
Instructions	Set/Query Period Trigger period offset
Parameter type	Float
Parameter Range	0s~10s
Return	Float
Example	:TRIGger:FRAMe:OFFSet 1s

7.6.8 Reset Offset Display (Period)

The reset period triggers the time offset display. Modifying this parameter does not modify the absolute value of the internal offset.

Command format	**:TRIGger:FRAMe:OFFSet:DISPlay:RESet**
Instructions	Reset Period trigger offset return to zero
Example	:TRIGger:FRAMe:OFFSet:DISPlay:RESet

7.6.9 Sync Source (Period)

Set the sync source.

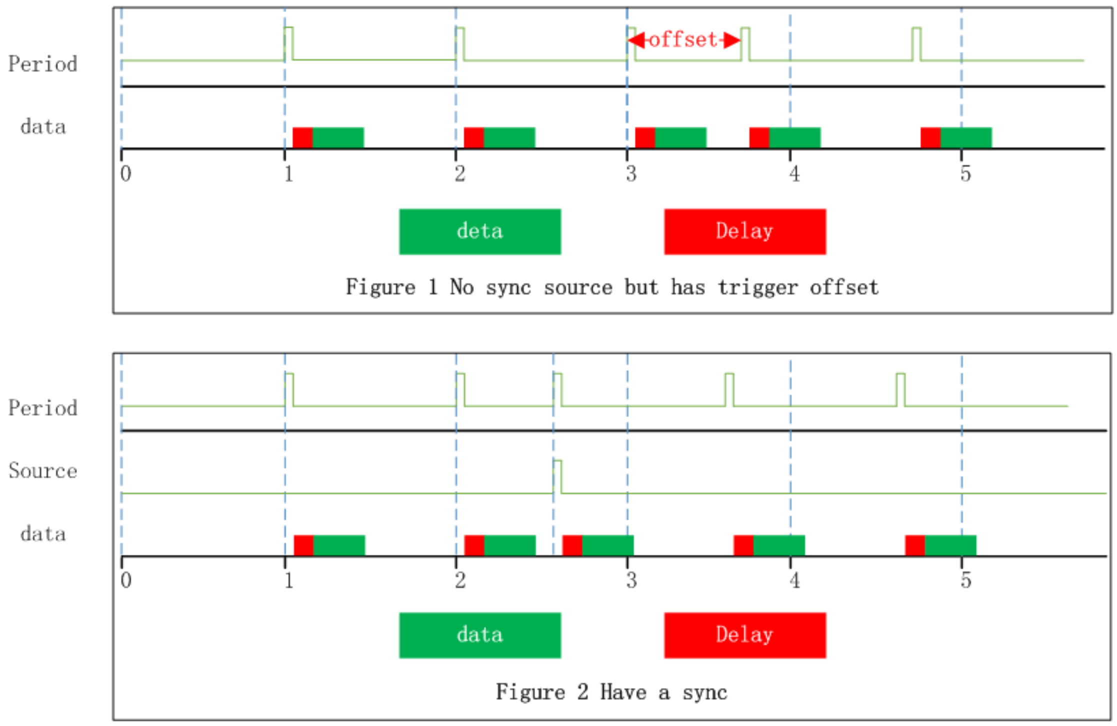


Figure 7-1 Sync Source trigger

Command format	**:TRIGger:FRAMe:SYNC** **:TRIGger:FRAMe:SYNC?**
Instructions	Set/Query the type of periodic synchronization
Parameter type	Enumeration
Parameter Range	"OFF", "EXT"
Return	"OFF", "EXT"
Example	:TRIGger:FRAMe:SYNC EXT

7.6.10 Auto Trigger

Automatic triggering is an auxiliary triggering method used in non-Free run mode. When the user needs continuous triggering but the triggering conditions of the selected triggering type are not satisfied, automatic triggering can be used. After using the automatic trigger, the count starts after a measurement is completed. If the count does not reach the set value and the trigger condition of the selected trigger is satisfied, the count of the automatic trigger will be cleared and the count will be restarted after the next measurement. If the count reaches the set value and the trigger condition of the selected trigger is not met, the forced trigger condition is met, and then the measurement is performed according to the normal trigger process.

Command format	**:TRIGger:ATRigger:STATe** **:TRIGger:ATRigger:STATe?**
Instructions	Set or query the automatic trigger switch
Parameter type	Boolean
Parameter Range	0|1
Return	0|1
Example	:TRIGger:ATRigger:STATe 1

Command format	**:TRIGger:ATRigger** **:TRIGger:ATRigger?**
Instructions	Set or query the automatic trigger time
Parameter type	Float
Parameter Range	1us~100s
Return	Float
Example	:TRIGger:ATRigger 1s

7.6.11 Hold Off

In trigger inhibition, hold represents inhibition and off represents release. Trigger hold-off can be used for other trigger modes other than Free run mode. Intuitively, trigger hold-off can be understood as the strictening of trigger conditions, that is, the occurrence of a trigger must not only satisfy the trigger condition of the selected trigger, but also satisfy the additional conditions in trigger hold-off.

Normal

In normal mode, the count is performed before the trigger, and the next trigger can only be generated after the count meets the set requirements.

Above

For the rising edge of the video trigger (external trigger), it is required that after the trigger, the actual level is still higher than the trigger level (trigger threshold) for at least a specified time.

For the falling edge of video trigger (external trigger), it is required that the actual level is higher than the trigger level (trigger threshold) for a single accumulation time exceeding the specified time before triggering.

For the periodic trigger, the trigger moment is high level, the duration is a time period, and the other time is low level, which can be inferred according to other triggers.

Below

For the rising edge of video trigger (external trigger), it is required that the actual level is lower than the trigger level (trigger threshold) for a single accumulation time exceeding the specified time before triggering.

For the falling edge of the video trigger (external trigger), it is required that the actual level is still lower than the trigger level (trigger threshold) after triggering for at least a specified time.

The periodic trigger can be pushed in the same way.

Command format	**:TRIGger:HOLDoff:STATe** **:TRIGger:HOLDoff:STATe?**
Instructions	Set or query the trigger holdoff switch
Parameter type	Boolean
Parameter Range	0|1
Return	0|1
Example	:TRIGger:HOLDoff:STATe 1

Command format	**:TRIGger:HOLDoff** **:TRIGger:HOLDoff?**
Instructions	Set or query the trigger holdoff time
Parameter type	Float
Parameter Range	0~500ms
Return	Float
Example	:TRIGger:HOLDoff 0.01s

Command format	**:TRIGger:HOLDoff:TYPE** **:TRIGger:HOLDoff:TYPE?**
Instructions	Set or query the trigger holdoff type
Parameter type	Enumeration
Parameter Range	"NORMal","ABOVe","BELOw"
Return	"NORMal","ABOVe","BELOw"
Example	:TRIGger:HOLDoff:TYPE ABOVe

7.7 Ampt

7.7.1 Attenuator & RF Preamp

According to the amplitude of the input signal, the user can set the corresponding RF front-end attenuator and amplifier, the purpose of which is to avoid display distortion when inputting large signals and reduce noise when inputting small signals.

Command Format	**[:SENSe]:POWer[:RF]:ATTenuation** **[:SENSe]:POWer[:RF]:ATTenuation?**
Instruction	Sets the input attenuator. Gets the input attenuator.
Parameter Type	Integer, unit: dB
Parameter Range	0 dB ~ 51 dB
Return	Integer, unit: dB
Example	[:SENSe]:POWer[:RF]:ATTenuation 30 dB

Command Format	**[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1** **[:SENSe]:POWer[:RF]:ATTenuation:AUTO?**
Instruction	Sets the input attenuator. Gets the input attenuator.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	[:SENSe]:POWer[:RF]:ATTenuation:AUTO ON

7.7.2 Ref Level & Scale

Displays and configures the reference and scale of the currently selected window. The unit is based on the unit of the trace data.

Auto Scale and Auto Scale All can be used to adjust the scale of the current and all windows adaptively to the waveform data.

Command Format	**:TRACe1|2|3|4:Y[:SCALe]:RLEVel** **:TRACe1|2|3|4:Y[:SCALe]:RLEVel?**
Instruction	This command sets the reference level for the Y-axis. Gets reference level. The command is valid if the measurement mode is ASK, FSK, MSK, PSK, QAM and the data format is not Syms/Errs.
Parameter Type	Float
Parameter Range	If the display type is Log Mag: -1000 ~ 1000 If the display type is Lin Mag: -1000 ~ 1000 If the display type is Real: -1000 ~ 1000 If the display type is Imag: -1000 ~ 1000 If the display type is I-Q: -1000 ~ 1000 If the display type is Constellation: -1000 ~ 1000

	If the display type is I-Eye: -1000 ~ 1000 If the display type is Q-Eye: -1000 ~ 1000 If the display type is Wrap Phase: -1000 ~ 1000 If the display type is Unwrap Phase: -1000 ~ 1000 If the display type is Trellis-Eye: -1e5 ~ 1e9
Return	Float
Default	
Example	:TRACe4:Y:RLEVel 2

Command Format	**:TRACe1|2|3|4:Y[:SCALe]:PDIVision** **:TRACe1|2|3|4:Y[:SCALe]:PDIVision?**
Instruction	This command sets the per-division display scaling for the y-axis. Gets Scale/Div when scale type. The command is valid if the measurement mode is ASK, FSK, MSK, PSK, QAM and the data format is not Syms/Errs.
Parameter Type	Float
Parameter Range	
Return	Float
Example	:TRACe4:Y:PDIVision 2

Command Format	**:TRACe1|2|3|4[:Y]:AUToscale**
Instruction	Sets auto scale.
Parameter Type	None
Parameter Range	None
Return	None
Example	:TRACe2:AUToscale

7.8 Trace

7.8.1 Select Trace

Select the current trace you want to select. After a trace is selected, parameters such as the reference level of the trace can be adjusted. You can also touch the screen and click the window where the trace is located to select the trace.

After the trace is selected, the mark ">" is displayed to the left of the trace mark.

Command Format	**:CALCulate:PARameter:COUNt** **:CALCulate:PARameter:COUNt?**
Instruction	Sets trace number. Gets trace number.
Parameter Type	Integer
Parameter Range	1 ~ 4
Return	Integer
Example	:CALCulate:PARameter:COUNt 4

7.8.2 Layout

Select the layout of the screen windows. The layout types are as follows:

- Single
- Stacked 2
- Grid 1,2
- Grid 2x2

Command Format	**:DISPlay:LAYout**
Instruction	Sets trace layout on screen. Currently, one row, two columns are not supported (1, 2)
Parameter Type	Integer (rows, columns)
Parameter Range	rows 1 ~ 2 columns 1 ~ 2
Return	
Example	:DISPlay:LAYout 2,2

7.8.3 Trace Display and Layout（DMA）

Window layout:

You can choose to display 1 to 4 windows, and each window can specify the trace data type.

Symbol table:

Displays the demodulated digital symbol code, which can be expressed in binary or hexadecimal.

7.8.4 Trace Display and Layout（AMA）

Display up to 3 windows, each window displays different traces, respectively:

- Time domain waveform;
- Frequency domain waveform;
- Demodulation result parameters.

7.8.5 Select Trace

Select the trace in order to set the corresponding trace parameters. You can also select the trace by clicking on the trace mark displayed in the left status bar of the screen.

7.8.6 Num of Traces

Set the upper limit of displayed trace numbers. Up to four traces can be displayed simultaneously in the screen window.

7.8.7 Data

Select the displayed data of the trace.

Command Format	**:TRACe[1]|2|3|4:DATA:NAME** **:TRACe[1]|2|3|4:DATA:NAME?**
Instruction	Sets trace format. Gets trace format.
Parameter Type	Enumeration
Parameter Range	TIME: time SPECtrum: spectrum MTIMe: IQ meas time MSPEctrum: IQ meas spectrum (FFT of IQ Meas Time.) RTIMe: IQ Reference time (Reconstructed ideal time waveform to compare IQ Meas Time against) RSPEctrum: IQ Reference spectrum (FFT of IQ Reference time.) MERRor: IQ Mag Err (Difference in length of the IQ Meas Time vector and IQ Ref Time vectorat each point in time.) PERRor: IQ Phase Err (Difference in phase of the IQ Meas Time vector and IQ Ref Time vector at each point in time.) EVTime: Error Time (Vector difference between IQ Meas Time and IQ Ref Time at each pointin time.) EVSPectrum: Error Vector Spec SYMSerrs: Syms/Errs RAWtime: Raw data
Return	Enumeration
Example	:TRACe:DATA:NAME SYMS

7.8.8 Format

Select the displayed format of the trace.

Command Format	**:TRACe[1]|2|3|4:FORMat[:Y]** **:TRACe[1]|2|3|4:FORMat[:Y]?**
Instruction	Sets trace format Gets trace format
Parameter Type	Enumeration
Parameter Range	MLOG: Log Mag MLINear: Lin Mag REAL: Real IMAGinary: Imag IQ: I-Q CONStln: Constellation IEYE: I-Eye QEYE: Q-Eye WPHAse: Wrap Phase UWPHase: Unwrap Phase TRELlis: Trellis-Eye
Return	MLOG MLIN REAL IMAG IQ CONS IEYE QEYE WPHA UWPH TREL
Example	:TRACe:FORMat MLIN

7.8.9 Eye Length

Set the length of the Eye diagram.

Command Format	**:TRACe:DEMod:EYE:LENGth** **:TRACe:DEMod:EYE:LENGth?**
Instruction	Sets eye length. Gets eye length.
Parameter Type	Integer
Parameter Range	2 ~ 40
Return	Integer
Example	:TRACe:DEMod:EYE:LENGth 4

7.8.10 Symbol Table

Display the demodulation digital symbols (binary or hex).

Command Format	**:TRACe:DEMod:TABLe:FORMat** **:TRACe:DEMod:TABLe:FORMat?**
Instruction	Displays format of Symbol Table data.
Parameter Type	Enumeration
Parameter Range	BINary|HEXadecimal
Return	Enumeration BIN|HEX
Example	:TRACe:DEMod:TABLe:FORMat HEX

7.9 Marker

7.9.1 Select Marker & Select Trace

To operate a marker, it must first be selected as the marker for the current operation. When there are multiple active marker, the marker currently operating in the waveform area will be displayed at the front, while other marker will be hollowed out (filled in black). At this time, the upper right corner of the waveform area will also display the reading of the current marker. To query the readings of all active marker, open the marker table ([Marker Settings]:[Marker Table]).

A marker can only be associated with one trace. When adding a marker, if it is not manually selected, the marker will be associated with the currently activated trace by default (refer to the trace setting).

7.9.2 Marker Type

Marker supports 2 types : normal,delta,off. Depending on the type of marker, the reading and position of the marker are also different when the trace is refreshed:

- **normal:** The marker is attached to a trace point, the vertical position of the marker is refreshed synchronously with the trace refresh, and the reading is the reading of the trace point.
- **delta:** delta marker use a pair of marker to identify the frequency (time) and amplitude difference between two trace points.

  After selecting "delta", a pair of marker will appear on the trace: a fixed reference marker (marked by a marker number and "+", such as "1+") and a difference marker (marked by a relative marker number and a symbol "∆") ” identifier, such as “1∆2”). At this time, the reading in the upper right corner of the waveform area also displays the frequency (or time) difference and amplitude difference between the difference marker and the reference marker, respectively.

  After the marker selects "delta", the original marker will become the difference measurement marker. If it is not specified, the marker with the current marker number increasing by default will become the reference "fixed" marker.

  The delta marker is in the "relative" state, similar to the "normal" marker, and its X-axis position can be changed; the reference marker is in the "fixed" state by default (the X-axis and Y-axis positions are fixed), but can be changed to "normal" by changing state and the X axis can be adjusted.
- **off:** close marker.

Notice:

When opening a marker or modifying parameters, if the marker has never been opened or the marker position exceeds the current span range, the horizontal position of the marker will be the center frequency, that is, the center of the waveform area.

A marker's relative marker has one and only one and cannot be itself. A marker can be the relative marker of multiple marker at the same time.

When closing a marker, the marker type of other relative markre that it is a relative marker will automatically change to normal.

Command Format	:TRACe[1]|2|3|4:MARKer[1]|2|3|4:ENABle OFF|ON|0|1 :TRACe[1]|2|3|4:MARKer[1]|2|3|4:ENABle?
Instruction	Sets marker state. Gets marker state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRACe1:MARKer1:ENABle ON

Command Format	:TRACe[1]|2|3|4:MARKer[1]|2|3|4:TYPE POSition|DELTa|OFF :TRACe[1]|2|3|4:MARKer[1]|2|3|4:TYPE?
Instruction	Sets marker mode. Gets marker mode.
Parameter Type	Enumeration
Parameter Range	POSition DELTa OFF
Return	Enumeration: POS|DELT|OFF
Example	:TRACe:MARKer:TYPE POSition

7.9.3 Marker X

Set the horizontal position parameter of the current marker.

When the [marker Type] of the current marker is [Off], the marker frequency/marker time cannot be set.

Command Format	:TRACe[1]|2|3|4:MARKer[1]|2|3|4:X :TRACe[1]|2|3|4:MARKer[1]|2|3|4:X?
Instruction	Sets marker X value. Gets marker X value. This command only works when marker is not off.
Parameter Type	Float
Parameter Range	
Return	Float
Example	:TRACe:MARKer:X 200 :TRACe:MARKer:X?

Command Format	:TRACe[1]|2|3|4:MARKer[1]|2|3|4:Y?
Instruction	Gets marker Y value.
Parameter Type	None
Parameter Range	None
Return	Float
Example	:TRACe:MARKer:Y?

7.9.4 Reset Delta

Pressing this control is exactly the same as pressing the “Delta” selection on the Marker Mode radio button. The selected marker becomes a Delta Marker . If the selected marker is already a Delta marker, the reference marker is moved to the current position of the selected marker, thus resetting the Delta to zero.

7.9.5 Relative To

“Relative to” is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between two markers which can mark on different traces.
After the marker selects “Delta”, the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference “fixed” marker

Command Format	**:TRACe[1]|2|3|4:MARKer[1]|2|3|4:REFerence** **:TRACe[1]|2|3|4:MARKer[1]|2|3|4:REFerence?**
Instruction	Sets reference marker. Gets reference marker. Cannot set the current marker to the reference marker.
Parameter Type	Integer
Parameter Range	1 ~ 4
Return	1 ~ 4
Example	:TRACe:MARKer:REFerence 3

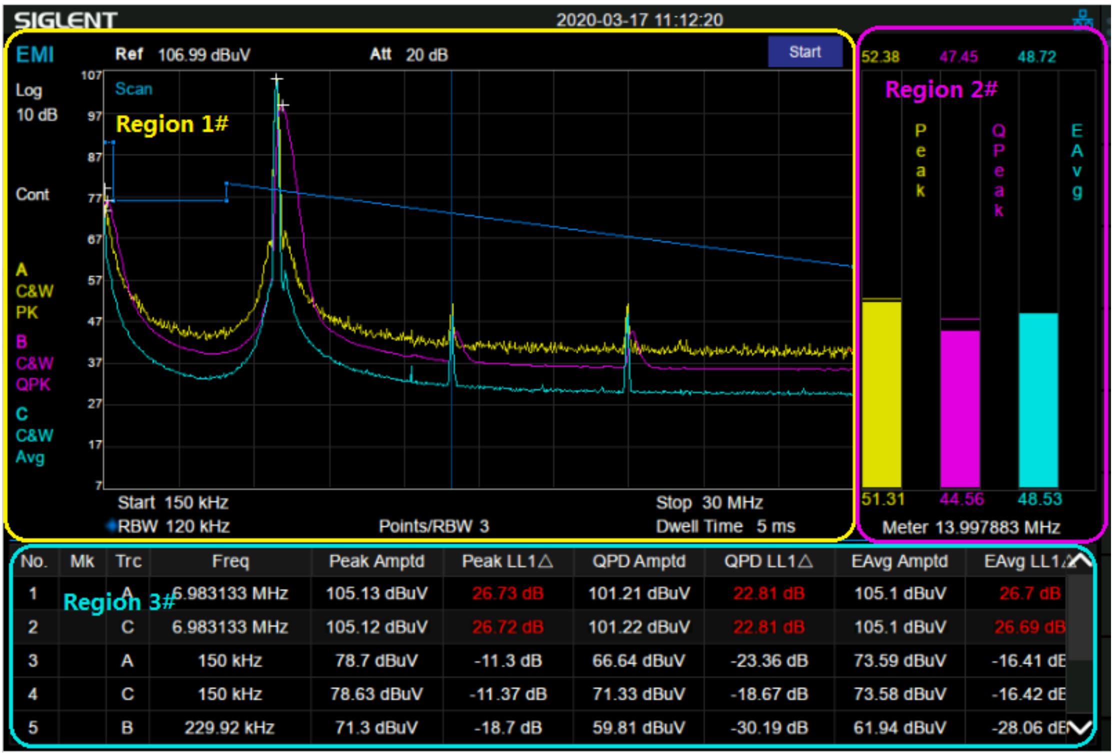
7.9.6 Marker Couple

When this function is On, moving any marker causes an equal X Axis movement of every other marker which is Off.

Command Format	**:CALCulate[:SELected]:MARKer:COUPle OFF|ON|0|1** **:CALCulate[:SELected]:MARKer:COUPle?**
Instruction	Sets marker couple state. Gets marker couple state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer:COUPle ON

8 EMI Measurement Mode

The user interface for EMI Measurement mode has three display regions showing information regarding different setting menus as shown in the figure below.



No.	Mk	Trc	Freq	Peak Amptd	Peak LL1△	QPD Amptd	QPD LL1△	EAvg Amptd	EAvg LL1△
1		A	6.983133 MHz	105.13 dBuV	26.73 dB	101.21 dBuV	22.81 dB	105.1 dBuV	26.7 dB
2		C	6.983133 MHz	105.12 dBuV	26.72 dB	101.22 dBuV	22.81 dB	105.1 dBuV	26.69 dB
3		A	150 kHz	78.7 dBuV	-11.3 dB	66.64 dBuV	-23.36 dB	73.59 dBuV	-16.41 dB
4		C	150 kHz	78.63 dBuV	-11.37 dB	71.33 dBuV	-18.67 dB	73.58 dBuV	-16.42 dB
5		B	229.92 kHz	71.3 dBuV	-18.7 dB	59.81 dBuV	-30.19 dB	61.94 dBuV	-28.06 dB

Figure 8-1 EMI Measurement User Interface

- Region 1#: Spectrum and setting information of scanning.
- Region 2#: Meter graphs, metrics and related setting information.
- Region 3#: Signal list with suspect signals populated by searching.

Meas is the default menu of EMI measurement mode as shown in the Figure 6-2. Sequence is very important for understanding the philosophy of EMI measurement operation because it aligns with the CISPR test flow. Figure 6–3 shows the EMI test flow recommended by CISPR 16-2-3. A complete routine measurement consists of a series of routines, i.e. scanning, search and final measurement.

First, the measurement scans the band based on **Scan Config** settings specified and activated by the user to capture interference spectrum. You can have up to three traces running with different detectors and trace types. You can enable limit lines that the spectrums need to meet, and optionally include a limit margin.

Next, the measurement searches for the peak signal to build a list of peaks called a “signal list”. The search is based on the defined peak excursion and peak threshold under menu **Search**. A cross mark is added onto the trace for each peak signal found.

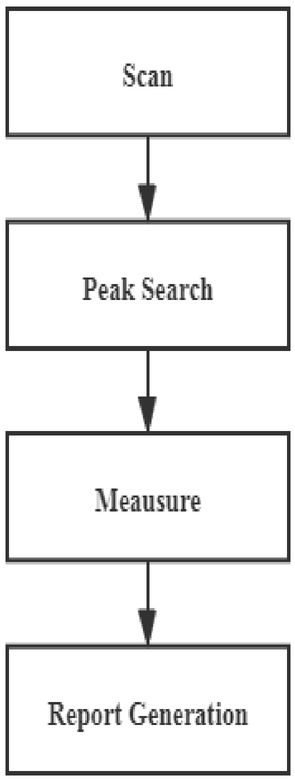


Figure 8-2 CISPR-recommended EMI test flow

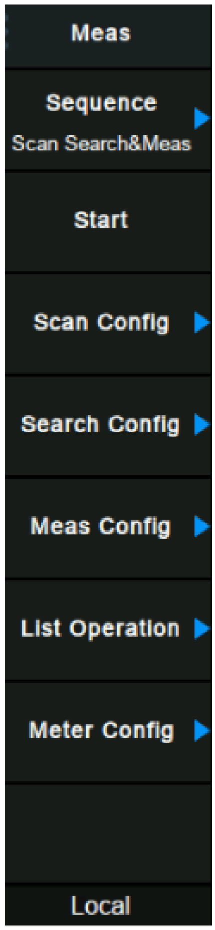


Figure 8-3 Meas Menu

For each of the peak signals found, the instrument is tuned to the signal frequency in zero span and dwells for the specified dwell time under menu **Meas**. Each signal in the list is updated with the final detector and delta limit values when the final measurement is completed.

In some cases, you may not want to run the complete measurement, so you have the flexibility to control the measurement routines. You can choose to just run scan, search, or the final measurement for only certain specific signals in the signal list under menu **Sequence**.

The meters window on the right shows the instantaneous amplitude of each of up to three detectors. Similar to the final measurement, meter consists of making a zero span measurement on the specified meter frequency using independent detectors and dwell times in menu **Meter**. Meter measurement is invalid during scan or a final measurement.

8.1 Frequency & Span

8.1.1 Meter Frequency

Set the frequency of the meter measurement. The meter frequency value is displayed at the bottom of the meter window.

- The frequency of the meters can be at any position, even outside the span displayed on the screen.

8.1.2 Scan Frequency Mode

Set the scan frequency mode to CISPR standard or user customization.

8.1.3 CISPR Band

Select the scan frequency band base on CISPR standard.

8.1.4 Midspan Frequency

Set the frequency at the midspan of scan.

- Modifying the center frequency will modify both the start frequency and stop frequency when the span is constant (except when the start frequency or stop frequency reaches the boundary).

8.1.5 Start Frequency

Set the start frequency of scan. The start and stop frequencies are displayed at the bottom of the grid respectively.

- The span and center frequency vary with the start frequency when the Span does not reach the minimum. For more details, please refer to “**Span**”.

8.1.6 Stop Frequency

Set the stop frequency of scan. The start and stop frequencies are displayed at the lower right sides of the grid respectively.

- The span and center frequency vary with the stop frequency. The change of the span will affect other system parameters. For more details, please refer to “**Span**”.

8.1.7 Span

Set the frequency range of scan.

- The start and stop frequency vary with the span when the center frequency is constant.

- The span can be set down to 100 Hz and up to the full span described in Specifications. When the span is set to the maximum, the analyzer enters full span mode.
- Modifying the span may cause an automatic change in RBW if they are in Auto mode.

8.1.8 X Axis Scale

Set the scale type of X-axis to Linear (Lin) or Logarithmic (Log) scale.
In Log scale type, the frequency scale of X-axis is displayed in the logarithmic form.

Command Format	**:DISPlay:WINDow:TRACe:X[:SCALe]:SPACing** **:DISPlay:WINDow:TRACe:X[:SCALe]:SPACing?**
Instruction	Sets the The x type Gets the The x type
Parameter Type	enumeration
Return	LOG/LIN
Example	:DISPlay:WINDow:TRACe:X:SPACing LOG :DISPlay:WINDow:TRACe:X:SPACing?

Command Format	**[:SENSe]:FREQuency:OFFSet** **[:SENSe]:FREQuency:OFFSet?**
Instruction	Sets the frequency offset of the spectrum analyzer. Gets the frequency offset.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	-100 GHz ~ 100 GHz
Return	Float, unit: Hz
Example	:FREQuency:OFFSet 1 GHz

8.2 BW

Set the Resolution BW of the analyzer. Any change of this parameter will stop the running sequence.

8.2.1 Meter RBW

Set the RBW of meters measurement.

8.2.2 Scan RBW

Set the RBW of scan.

- RBW can only be set to 200 Hz, 9 kHz, 120 kHz and 1 MHz with a 6dB shape factor.
- Set up RBW will affect sweep points for scanning. For more detail, please refer to **Sweep -> Sweep Points**.

8.3 Sweep

8.3.1 Sweep Config

8.3.1.1 RBW / Step

The parameter RBW/Step specifies the scanning step and the number of scanning points under the specified span.

8.3.1.2 Auto RDS

RDS means RBW divided by Step.
Auto RDS specifies RBW/Step value by span and rbw value.

8.3.1.3 Points

Display the number of scan points under the current configuration. This parameter cannot be modified.

8.3.1.4 Dwell Time

Specify the dwell time at each scan point.

8.3.1.5 Sweep Time

Display the time to complete a scan under the current configuration. This parameter cannot be modified.

8.3.2 Sweep Control

8.3.2.1 Scan Single/Continue

Set analyzer to perform single or continuous scan.

8.3.2.2 #(Number) of Scan

Specify the number of scans in the sequence or single process.

8.3.2.3 Meter Single/Continue

Set analyzer to perform single or continuous meter process.

8.4 Amplitude

Set the amplitude parameters of the analyzer. Through modifying these parameters, signals under measurement can be displayed in a proper mode for easier observation and minimum error. Any change of Ref Level, Attenuator Value, Preamp mode and Ref Offset will restart sweep.

8.4.1 Ref Level

Set the maximum power or voltage that can be currently displayed in the trace window. The value is displayed at the upper left corner of the screen grid.

The maximum reference (Ref) level available is affected by the maximum mixing level; input attenuation is adjusted under a constant maximum mixing level in order to fulfill the following condition:

Ref <= ATT - PA - 20dBm, where ATT = Attenuation value, PA = Preamplifier value

Note: the maximum reference level of different machine models may be different, please refer to the data manual specifically.

Command Format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel** **:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?**
Instruction	This command sets the reference level for the Y-axis. Gets reference level.
Parameter Type	Float, unit: dBm, dBmV, dBuV, dBuA, V, W
Parameter Range	Unit is dBm: -170 dBm ~ 23 dBm Unit is dBmV: -123.01 dBmV ~ 69.99 dBmV; Unit is dBuV: -63.01 dBuV ~ 129.99 dBuV; Unit is dBuA: -96.99 dBuA ~ 96.01 dBuA; Unit is Volts:707.11pV ~ 3.16 V Unit is Watts: 0W ~ 199.53m W
Return	Float, unit: dBm
Example	:DISPlay:WINDow:TRACe:Y:RLEVel 20 DBM

8.4.2 Attenuator

Set the value for the internal attenuator of the RF input. So that the large signal can be low distortion and the small signal can pass through the mixer with low noise.

Ref <= ATT - PA - 20dBm, where ATT = Attenuation value, PA = Preamplifier value

Input attenuation can be set up to auto or manual mode.

- Auto mode: the attenuation value is automatically adjusted according to the state of preamplifier and the current reference level.
- The maximum input attenuation can be set to 50dB, resolution: 2dB. When the set parameters do not meet the above formula, you can adjust the reference level.

Command format	[:SENSe]:POWer[:RF]:ATTenuation [:SENSe]:POWer[:RF]:ATTenuation?
Instructions	Sets/gets the attenuation value
Parameter Type	Integer
Parameter Range	0 dB ~ 50 dB (Even gears only)
Return	Integer , unit dB
Example	:POWer:ATTenuation 10

Command format	[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1 [:SENSe]:POWer[:RF]:ATTenuation:AUTO?
Instructions	Sets/gets the auto attenuation value switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:POWer[:RF]:ATTenuation:AUTO ON

8.4.3 RF Preamp

Control the state of the internal preamplifier (PA) located in the RF input signal path. When the signal-under-measurement is small, turning on the preamplifier can reduce the displayed noise level and aid distinguishing small signals from the noise.

The corresponding icon “**PA**” will appear at the left side of the screen when the preamplifier is turned on.

Command format	[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1 [:SENSe]:POWer[:RF]:GAIN[:STATe]?
Instructions	Sets/gets the preset amplifier inside the switch spectrometer
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:POWer:GAIN ON

8.4.4 Y Axis Unit

Sets the display unit of magnitude.

Command format	:UNIT:POWer DBM|DBMV|DBUV|V|W :UNIT:POWer?
Instructions	Sets/gets the display unit of magnitude
Parameter Type	Enumeration
Parameter Range	DBM|DBMV|DBUV|DBUA|V|W
Return	Enumeration: DBM|DBMV|DBUV|V|W
Example	:UNIT:POWer DBMV

8.4.5 Y Axis Scale Type

Set the scale type of the Y-axis to Lin or Log. The default is Log.

- In Lin mode, the vertical Scale value cannot be changed. The Display area is set for reference level of 0%.
- In Log scale type, the Y-axis denotes the logarithmic coordinate. The value shown at the top of the grid is the reference level and each grid represent the scale value. The unit of Y-axis will automatically switch to the default unit (dBm) in Log scale type when the scale type is changed from Lin to Log.
- In Lin scale type, the Y-axis denotes the liner coordinate; the values shown at the top of the grid and the bottom of the grid are the reference level and 0 V. The scale setting function is invalid. The unit of Y-axis will automatically switch to the default unit (Volts) in Lin scale type when the scale type is charged from Log to Lin.
- The scale type does not affect the setting of Y-axis unit.

Set the unit of the Y-axis to dBm, dBmV, dBuV, dBuA, Volts (RMS) or Watts. Default is dBm.

The conversion relationships between units are as follows.

$$\mathrm{dBm} = 10\lg\left(\frac{\mathrm{Volts}^2}{\mathrm{R}} \times \frac{1}{1\mathrm{mW}}\right)$$

$$\mathrm{dB\mu V} = 20\lg\left(\frac{\mathrm{Volts}}{1\mu\mathrm{V}}\right)$$

$$\mathrm{dBmV} = 20\lg\left(\frac{\mathrm{Volts}}{1\mathrm{mV}}\right)$$

$$\mathrm{Watts} = \frac{\mathrm{Volts}^2}{\mathrm{R}}$$

Where, R denotes the reference impedance. The default value is 50Ω and can be adjusted by pressing "**Correction -> RF input**". The "75 Ω" impedance is just a numeric value, not a real impedance. Setting the RF input to 75 Ω will not change the actual input impedance. A 75 Ω feed-through adapter is required to match 75 Ω circuits to the 50 Ω input of the analyzer.

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision** **:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision?**
Instructions	Sets/gets the scale on which trace logarithms are displayed
Parameter Type	Float
Parameter Range	0.1 dB ~ 20 dB
Return	Float , unit dB
Example	:DISPlay:WINDow:TRACe:Y:PDIVision 10 dB

Command format	:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing LINear|LOGarithmic :DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing?
Instructions	Sets/Gets the scale display type
Parameter Type	Enumeration: LINear |LOGarithmic
Return	Enumeration: LIN|LOG
Example	:DISPlay:WINDow:TRACe:Y:SPACing LINear

8.4.6 Ref Offset

Assign an offset to the reference level to compensate for gains or losses generated between the device under measurement and the analyzer.

The change of this value changes both the reference level readout and the amplitude readout of the marker; but does not impact the position of traces on the screen.

Command format	:DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet :DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet?
Instructions	Sets/gets the frequency offset
Parameter Type	Float
Parameter Range	-100 dB~100 dB
Return	Float , unitdB
Example	:DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet 2

8.5 Trigger

The analyzer provides a variety of trigger functions, users can choose from the trigger menu.

8.5.1 Trigger Source

The analyzer provides a variety of trigger sources to suit different trigger requirements.

Free Run

Free trigger is the default mode of the analyzer, in which the spectrum analyzer sweeps circularly and continuously.

Video

When the user wants to capture an instantaneous signal that appears for a very short time, the video trigger mode can be adopted . In this working mode, only when the rising edge or falling edge of a signal touches the Trigger Level, the signal will be triggered and displayed on the screen.

External

External trigger provides users with richer trigger functions. If users want to realize the periodic trigger and delay trigger spectrum analyzer, they can choose the external trigger mode. In this mode, it is triggered by the rising or falling edge of the external input signal. The square wave signal with a certain frequency can be periodically triggered, and the delay time can be adjusted by setting the Trigger Delay option.

Command format	**:TRIGger[:SEQuence]:SOURce** **:TRIGger[:SEQuence]:SOURce?**
Instructions	sets the trigger source. gets the trigger source.
Parameter Type	Enumeration
Parameter Range	"IMMediate ", "VIDeo ", "EXTernal "
Return	"IMM", "VID", "EXT"
Example	:TRIGger:SOURce VID

8.5.2 Trigger Level

Sets the amplitude level for the video trigger (absolute level only supported). When the video signal crosses the voltage level with the selected slope, it is triggered.

Command format	**:TRIGger[:SEQuence]: {type}:LEVel** **:TRIGger[:SEQuence]: {type}:LEVel?**
Instructions	sets the trigger level. gets the trigger level. {type}: "VIDeo", "EXTernal"
Parameter Type	Float
Parameter Range	-300 dBm ~50 dBm
Return	Float
Example	:TRIGger:VIDeo:LEVel -20

8.5.3 Trigger Slope

Set the trigger polarity for external trigger, video trigger. The options are rising edge trigger and falling edge trigger.

The same trigger source uses the same trigger edge for both gating and triggering.

Command format	**:TRIGger[:SEQuence]: {type}:SLOPe** **:TRIGger[:SEQuence]: {type}:SLOPe?**
Instructions	sets the trigger edge. gets the trigger edge. {type}: " VIDeo ", " EXTernal "
Parameter Type	Enumeration
Parameter Range	"POS", "NEG"
Return	"POS", "NEG"
Example	:TRIGger: EXTernal:SLOPe :TRIGger: VIDeo:SLOPe?

8.5.4 Trigger Delay

When scanning is at zero span, negative delay can be set. The time range of negative delay is related to the number of sweep points and sweep time:

Maximum negative delay time = [496M / (sweep points * 64) - 5] * sweep time

Maximum positive delay time =500ms

Command format	**:TRIGger[:SEQuence]:{type}:DELay** **:TRIGger[:SEQuence]:{type}:DELay?**
Instructions	sets the trigger delay gets the trigger delay {type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter Type	Float
Return	Float
Example	:TRIGger:EXTernal:DELay 5e-3 :TRIGger:FRAMe:DELay?

Command format	**:TRIGger[:SEQuence]:{type}:DELay:STATe** **:TRIGger[:SEQuence]:{type}:DELay:STATe?**
Instructions	sets the trigger delay state. gets the trigger delay state. {type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal: DELay:STATe 1

8.6 Trace

The scan signal is displayed as a trace on the screen.

Command format	**:TRACe[1]|2|3| [:DATA]?**
Instructions	Get trace data
Return	String
Example	:TRACe:DATA?

Command format	**:FORMat[:TRACe][:DATA]ASCii|REAL32| REAL** **:FORMat[:TRACe][:DATA]?**
Instructions	Sets/gets the format of trace data read
Parameter Type	Enumeration
Parameter Range	ASCii REAL32 Floating 32-bit REAL Floating 64-bit
Return	Enumeration: ASCii|REAL| REAL32
Example	:FORMat ASCii

8.6.1 Select Trace

The analyzer allows for up to four traces to be displayed at the same time. Each trace has its own color. All traces can be set parameter independently. As a default, analyzer will choose Trace 1 and set the type of the trace as Clear Write.

Command format	**TRACe:SELEct** **TRACe:SELEct?**
Instructions	Sets/gets the current trace
Parameter Type	EnumerationTRACE1-3
Return	Enumeration: TRACE1-3
Example	TRACe:SELEct TRACE3

8.6.2 Trace Type

Set the type of the current trace or disable it. The system calculates the sampled data using a specific operation method according to the trace type selected and displays the result. Trace types include Clear Write, Max Hold, Min Hold, View, Average and Blank. The corresponding icon of the trace type will be displayed in the status bar at the left of the screen, as shown in the figure below.

Clear Write

Erases any data previously stored in the selected trace, and display the data sampled in real-time of each point on the trace.

Max Hold

Retain the maximum level for each point of the selected trace. Update the data if a new maximum level is detected in successive sweeps. Max Hold is very effective when measuring events that may take successive scans to measure accurately. Some common applications include FM Deviation, AM NRSC, and frequency hopping or drift.

Min Hold

Display the minimum value from multiple sweeps for each point of the trace and update the data if a new minimum is generated in successive sweeps.

Average

Set the averages times of the selected trace.

More averages can reduce the noise and the influence of other random signals; thus highlighting the stable signal characteristics. The larger the averages times is, the smoother the trace will be. Enabling averaging will take more time to collect the full spectral information because the analyzer needs to sweep the set average count. The displayed data is averaged in a first-in-first-out fashion.

Command format	**:TRACe[1]|2|3:TYPE WRITe|MAXHold|MINHold| AVERage** **:TRACe[1]|2|3:TYPE?**
Instructions	Sets/gets the display type of trace
Parameter Type	Enumeration
Parameter Range	WRITe: Trace is in normal mode. Update data MAXHold: Displays the maximum value of traces MINHold: Displays the minimum value of trace AVERage: Displays the average value of trace
Return	Enumeration: WRITE|MAXH|MINH| AVER
Example	:TRAC1:TYPE MINH

8.6.3 Trace State

There are four trace states: active, view, blank, and background. Different trace states indicate the refresh and display states of traces:

Active

Refreshed and displayed trace data.

View

The trace data will not be refreshed, and the current latest trace will be displayed in a fixed frame.

Blank

Trace data is no longer refreshed or displayed

Background

Refreshed trace data but no display.

Command format	:TRACe[1]|2|3:DISPlay[:STATe] :TRACe[1]|2|3:DISPlay[:STATe]?
Instructions	Sets/gets the display status of the trace
Parameter Type	Enumeration: ACTI|VIEW|BLAN| BACK
Parameter Range	ACTIve: Trace is in normal mode. Update data VIEW: Stops updating trace to display current trace data BLANk: Clear trace data BACKground: Set as background
Return	Enumeration: ACTI|VIEW|BLAN| BACK
Example	:TRACe2:DISPlay BLANK :TRACe2:DISPlay?

8.6.4 Detect

The analyzer displays the sweep signal on the screen in the form of a trace. For each trace point, the analyzer always captures all the data within a specific time interval and processes (Peak, Average, etc.) the data using the detector currently selected, then it displays the processed data (a single data point) on the screen.

Select an appropriate detector type according to the actual application in order to ensure the accuracy of the measurement.

The available types are **Pos Peak**, **Neg Peak**, **Sample**, **Normal**, **Average** and **Quasi Peak**. The default is **Pos peak**.

Positive Peak

For each trace point, Positive Peak detector displays the maximum value of data sampled within the corresponding time interval.

Negative Peak

For each trace point, Negative Peak detector displays the minimum value of data sampled within the corresponding time interval.

Sample

For each trace point, Sample detector displays the transient level corresponding to the central time point of the corresponding time interval. This detector type is applicable to noise or noise-like signal.

Normal

Normal detector (also called ROSENFELL Detector) displays the maximum value and the minimum value of the sample data segment in turn: Odd-numbered data points display the maximum value and even-numbered data points display the minimum value. In this way, the amplitude variation range of the signal is clearly shown.

Average

For each trace point, Average detector displays the average value of data sampled within the corresponding time interval.

Command format	**[:SENSe]:DETector:TRACe[1]|2|3[:FUNCtion]** **[:SENSe]:DETector:TRACe[1]|2|3[:FUNCtion]?**
Instructions	Sets/Gets the trace detection type
Parameter Type	Enumeration NEG|POS|SAMP|AVER|NORMAL
Parameter Range	NORMAL: standard NEGative: Negative peak POSitive: positive peak SAMPle:The sampling AVERage: average,
Return	Enumeration: NEG|POS|SAMP|AVER|NORMAL
Example	:DETector:TRAC1 AVERage

Command format	**[:SENSe]:DETector:TRACe[1]|2|3:AUTO 0|1** **[:SENSe]:DETector:TRACe[1]|2|3:AUTO?** **[:SENSe]:DETector:TRACe:AUTO:ALL**
Instructions	Set/get trace automatic detection switch
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:DETector:TRACe3:AUTO 1 :DETector:TRACe:AUTO:ALL

8.7 Marker & Peak

The marker appears as a rhombic sign (as shown below) for identifying points on a trace. You can easily read the amplitude, frequency and sweep time of the marked point on the trace.

- The analyzer allows for up to eight/four pairs of markers to be displayed at one time, but only one pair or a single marker is active every time.
- You can use the numeric keys, knob or direction keys to modify the desired frequency or time as well as view the readouts of different points on the trace.

8.7.1 Select Marker

Select one of the eight markers. The default is Marker1. When a marker is selected, you can set its type, trace to be marked, readout type and other related parameters. The enabled marker will appear on the trace selected through the **Select Trace** option and the readouts of this marker are also displayed in the active function area and at the upper right corner of the screen.

Command format	**:CALCulate:MARKer:SELEct** **:CALCulate:MARKer:SELEct?**
Instructions	Sets/Gets the current marker
Parameter Type	Enumeration1-8
Return	Enumeration: 1-8
Example	:CALCulate:MARKer:SELEct 5

8.7.2 Select Trace

Select the trace to be marked by the current marker. Valid selections includeTrace1,2,3.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe 1|2|3** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe?**
Instructions	Sets/Gets the marker trace
Parameter Type	Enumeration
Parameter Range	1|2|3|4|5|6
Return	Enumeration
Example	CALCulate:MARK:TRAC 1

8.7.3 Marker Type

8.7.3.1 Normal

One of the marker types. It is used to measure the X (Frequency or Time) and Y (Amplitude) values of a certain point on the trace. When selected, a marker with the number of the current marker (such as “ **1** ”) appears on the trace.

- If no active marker exists currently, a marker will be enabled automatically at the center frequency of the current trace.

- You can use the numeric keys, knob or direction keys to move the marker. The readouts of the marker will be displayed at the upper right corner of the screen.
- The readout resolution of the X-axis (frequency or time) is related to the span. For higher readout resolution, reduce the span.

8.7.3.2 Delta

One of the marker types. It is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the reference point and a certain point on the trace. When selected, a pair of markers appears on the trace: Fixed Related Marker (marked by a combination of the marker number and letter " **+** ", such as " **2+** ") and the Delta Marker (marked by the "Δ", such as " 1Δ2 ").

- After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker
- The delta marker is in the "relative to" state, and its X-axis position can be changed; the related marker is in the "fixed" state by default (the X-axis and Y-axis positions are fixed), but the X-axis can be adjusted by changing to the "normal" state.
- The first row in the upper right corner of the trace area shows the frequency (or time) difference and amplitude difference between the two markers; the second row in the upper right corner of the trace area shows the X axis and amplitude value of the related marker.
- Delta reset. It is only valid when the current marker is a differential marker. If the marker type of the relative marker of the current marker is normal or differential, change the horizontal position of the relative marker to the horizontal position of the current marker; if the marker type of the relative marker is fixed, change the horizontal position and vertical position of the relative marker to the current one. The horizontal and vertical position of the marker.

8.7.3.3 Fixed

One of the marker types. When "Fixed" is selected, the X-axis and Y-axis of the marker will not change by the trace and can only be changed through the menu. The fixed marker is marked with "+".

After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker

8.7.3.4 Off

Turn off the marker currently selected. The marker information displayed on the screen and functions based on the marker will also be turned off.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE POSition|DELTa|FIXed|OFF** **:CALCulate:MARKer[1]|2|3|4:MODE?**

Instructions	Sets/Gets the marker mode
Parameter Type	Enumeration
Parameter Range	POSition DELTa FIXed OFF
Return	Enumeration: POS|DELT|FIX|OFF
Example	:CALCulate:MARK1:MODE POSition

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe OFF|ON|0|1** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe?**
Instructions	Sets/gets the marker switch status
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARK1:STATe ON

Command format	**:CALCulate:MARKer:AOFF**
Instructions	Close all markers
Example	:CALCulate:MARKer:AOFF

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8 [:SET]:RESEt:DELTa**
Instructions	Difference marker resets to 0 Only valid when the current cursor is a differential marker
Example	:CALCulate:MARKer2:RESEt:DELTa

8.7.4 Marker Postion

Displays and sets the position of the marker. Only the x-axis position can be set.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X?**
Instructions	Sets/gets the value of the marker point X axis This command takes effect only when the marker mode is not OFF: :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE If the marker readout type is frequency, the parameter is frequency. When the marker readout type is time, the value is time. Reference commands::CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout
Parameter Type	frequency , Float , unitHz , kHz , MHz , GHz ,efault Hz or time , Float , unitus , ms , s , ks , default s
Parameter Range	0 Hz ~ max span or 10 ms ~ 1000 s
Return	When the marker readout type is frequency, the reading is frequency, floating point type, in Hz; When the marker readout type is time, the reading is time, floating point type, in s; When the marker readout type is cycle, the reading is cycle, floating point type, unit s;
Example	:CALCulate:MARKer4:X 0.4 GHz :CALCulate:MARKer4:X 200 ms :CALCulate:MARKer4:X?

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y :CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y?
Instructions	Read the value of the Y-axis of the marker point, which can also be used to read the marker noise in the marker function. To execute this command, ensure that the marker is in the onstate.:CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Parameter Type	Float
Parameter Range	None
Return	Float , unitdBm
Example	:CALCulate:MARKer1:Y? Return: -25

8.7.5 Relative To

"Relative to" is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between two markers which can mark on different traces.
After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence 1|2|3|4 :CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence?
Instructions	Sets/Gets the marker relative to
Parameter Type	Enumeration
Parameter Range	1|2|3|4|5|6|7|8
Return	Enumeration
Example	:CALCulate:MARKer1:REFerence 3

8.7.6 Readout Type

Select a desired readout type for the X-axis for the marker. Different markers can use different readout types. This setting will change the readout type and affect the marker readings in the active function area and at the upper right corner of the screen, but will not change the actual value.

Frequency

In this type, Normal marker shows the absolute frequency. Delta markers and Delta Pair markers show the frequency difference between the delta marker and reference marker. The default readout mode in non-zero span is "**Frequency**".
Note: This type is invalid in Zero span.

Period

In this type, the Normal marker shows the reciprocal of frequency; while Delta marker and Delta Pair marker show the reciprocal of frequency difference. When the frequency difference is zero, the reciprocal is infinite and 100 Ts is displayed.

Note: This type is invalid in Zero span.

Time

In this type, the Normal marker shows the time difference between the marker and the start of the sweep; while Delta marker and Delta Pair marker show the sweep time difference between the delta marker and reference marker.

The default readout mode in Zero span is Time.

Inverse Time

In this type, the Normal marker Inverse Time = 1 / Time ;while Delta marker and Delta Pair marker s Inverse Time = 1 / Δ Time.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout FREQuency | TIME | PERiod | INTIme** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout?**
Instructions	Sets/gets the marker in X-axis reading mode
Parameter Type	Enumeration
Parameter Range	FREQuency: frequency TIME PERiod INVERSE_TIME
Return	Enumeration: FREQ|TIME|PER| INTIme
Example	:CALCulate:MARKer1:X:READout FREQuency

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout:AUTO 0|1** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout:AUTO?**
Instructions	Sets/gets the marker in X-axis reading mode auto
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:X:READout:AUTO 1

8.7.7 Marker Lines

Mark the marker with the intersection of horizontal and vertical lines, which is more convenient to query the marker position in the waveform area.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:LINE:STATe** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:LINE:STATe?**
Instructions	Sets/gets the marker line switch
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1

Return	0|1
Example	:CALCulate:MARKer2:X:LINE:STATe 1 :CALCulate:MARKer2:X:LINE:STATe?

8.7.8 Marker ->

8.7.8.1 M->CF

Set the center frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the center frequency will be set to the frequency of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the center frequency will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:CENTer**
Instructions	Sets/gets the value of the marker X axis to the center frequency .If the marker is not open, this command automatically turns the marker on the center frequency.
Example	:CALCulate:MARKer1:CENTer

8.7.8.2 M -> CF Step

Set the center frequency step of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the center frequency step will be set to the frequency of the current marker.
- If the **Delta** or **Delta** Pair marker is selected, the center frequency step will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STEP**
Instructions	Sets/gets the value of the marker X axis to mid-frequency step If the marker is not open, this command automatically turns the marker on the center frequency.
Example	:CALCulate:MARKer1:STEP

8.7.8.3 M -> Start Freq

Set the start frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the start frequency will be set to the frequency of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the start frequency will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:START
Instructions	Sets/gets the value of the marker X axis to the starting frequency, valid when the marker is on
Example	:CALCulate:MARKer1:START

8.7.8.4 M -> Stop Freq

Set the stop frequency of the analyzer to the frequency of the current marker.

- If the **Normal** marker is selected, the stop frequency will be set to the frequency of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the stop frequency will be set to the frequency of the Delta Marker.
- The function is invalid in Zero span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STOP
Instructions	Sets/gets the value of the marker X axis to terminate frequency If the corresponding marker is not open, sending this command will automatically open the marker at the end frequency.
Example	:CALCulate:MARKer1:STOP

8.7.8.5 M ->Ref Level

Set the reference level of the analyzer to the amplitude of the current marker.

- If the **Normal** marker is selected, the reference level will be set to the amplitude of the current marker.
- If the **Delta** or **Delta Pair** marker is selected, the reference level will be set to the amplitude of the Delta Marker.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:RLEVel
Instructions	Sets/gets the value of the marker Y-axis as a reference level If the marker is not open, this command automatically turns the marker on the center frequency.
Example	:CALCulate:MARKer2:RLEVel

8.7.8.6 ΔM->Span

Set the span of the analyzer to the frequency difference between the two markers in Delta marker type.

- If **the Normal** marker is selected, this function is invalid.
- The function is invalid in Zero span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:SET]:SPAN
Instructions	Sets/gets the difference between the marker and the X axis to sweep width This command takes effect only when the marker mode is DELTa

	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Example	:CALCulate:MARKer2:DELTa:SPAN

8.7.8.7 ΔM->CF

Set the center frequency of the analyzer to the frequency difference between the two markers in **Delta** marker type.

- If the **Normal** marker is selected, this function is invalid.
- The function is invalid in Zero span.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:SET]:CENTer
Instructions	Sets/gets the difference between the marker and the X axis to the center frequency This command takes effect only when the marker mode is DELTa :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Example	:CALCulate:MARKer3:DELTa:CENTer

8.7.9 Peak Search

Open the peak search setting menu and execute peak search.

8.7.9.1 Peak Search

Next Search

Execute peak search and mark the peak.

Minium Peak

Execute minimum search and mark the minium peak.

Next Peak

Search for and mark the peak whose amplitude is closest to that of the current peak and which meets the peak search condition.

Next Left Peak

Search for and mark the nearest peak which is located at the left side of the current peak and meets the peak search condition.

Next Right Peak

Search for and mark the nearest peak which is located at the right side of the current peak and meets the peak search condition.

Peak Peak

Execute peak search and minimum search at the same time and mark the results with delta pair markers. Wherein, the result of peak search is marked with the delta marker and the result of minimum search is marked with the reference marker.

Peak -> CF

Execute peak search and set the center frequency of the analyzer to the frequency of the peak. The function is invalid in Zero Span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum**
Instructions	Marker searches for peaks and marks them with the specified marker (If peak-to-peak value is on, peak-to-peak value search is carried out; otherwise, single peak value search is carried out, refer to the command:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak:STATe Search criteria include peak type, absolute threshold, and relative offset :CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer4:MAXimum

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum**
Instructions	Marker searches for the minimum peak and marks it with the specified marker
Example	:CALCulate:MARKer4:MINimum

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:NEXT**
Instructions	Marker searches for the next peak and marks it with the specified marker (Based on the set search criteria, including peak type, absolute threshold, and relative offset, see the following command:CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer1:MAXimum:NEXT

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:LEFT** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:RIGHt**
Instructions	Marker searches for left/right peaks and marks with the specified marker (Based on the set search criteria, including peak type, absolute threshold, and relative offset, see the following command :CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer1:MAXimum:LEFT

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak**
Instructions	Performs a peak-to-peak search, marking with the specified marker
Example	:CALCulate:MARKer1:PTPeak

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum[:SET]:CENTer**
Instructions	Execute peak search and set the center frequency of the analyzer to the frequency of the peak
Example	:CALCulate:MARKer1:MAXimum:CENTer

8.7.9.2 Peak Config

Define the conditions of peak search for various peak searches. A real peak should meet the requirements of both the "**Peak Threshold**" and "**Peak Excursion**".

Peak Threshold

Assign a minimum for the peak amplitude. Peaks whose amplitudes are greater than the specified peak threshold are treated as real peaks. The actual minimal peak threshold is -200dBm when shut down the Peak Threshold.

Peak Excursion

Set the excursion between the peak and the minimum amplitude on both sides of it. Peaks whose excursions are beyond the specified excursion are treated as real peaks. The actual minimal peak excursion is 0dBm when shut down the Peak Excursion.

Command format	**:CALCulate:MARKer:PEAK:THReshold** **:CALCulate:MARKer:PEAK:THReshold?**
Instructions	Sets/gets the absolute threshold for the peak search criteria
Parameter Type	Float , unitdBm
Parameter Range	-200.0 dBm~ 200.0 dBm
Return	Float , unitdBm
Example	:CALCulate:MARKer:PEAK:THReshold -50

Command format	**:CALCulate:MARKer:PEAK:THReshold:STATe** **:CALCulate:MARKer:PEAK:THReshold:STATe?**
Instructions	Set or obtain the absolute threshold switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:CPSEarch ON

Command format	**:CALCulate:MARKer:PEAK:EXCursion** **:CALCulate:MARKer:PEAK:EXCursion?**
Instructions	Sets/gets a relative threshold for the peak search criteria
Parameter Type	Float , unitdB
Parameter Range	0 ~ 200.0 dB
Return	Float , unitdB
Example	:CALCulate:MARKer:PEAK:EXCursion 10

Command format	**:CALCulate:MARKer:PEAK:EXCursion:STATe** **:CALCulate:MARKer:PEAK:EXCursion:STATe?**
Instructions	Set and obtain the relative threshold switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer:PEAK:EXCursion:STATe ON

8.7.9.3 Count Peak

Enable or disable continuous peak search. The default is Off. When enabled, the system will always execute a peak search automatically after each sweep in order to track the signal under measurement.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe]** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe]?**
Instructions	Enable the continuous peak search function Gets the status of the continuous peak search function switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:CPSEarch ON

8.8 Limits

The analyzer supports Pass/Fail test function. In this function, the measured curve will be compared with the pre-edited curve. If the related rules are met, the result is “**Pass**”, else the result is “**Fail**”.

8.8.1 Slect Limit

Activate/Select a limit.

8.8.2 Limit State

Enable or disable slected limit.

Command format	**:CALCulate:LLINe[1]|2|3:STATe OFF|ON|0|1** **:CALCulate:LLINe[1]|2|3:STATe?**
Instructions	Sets/gets the restricted state
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe1:STATe OFF

8.8.3 Limit Margin

Set the margin for selected limit.
When trace is between limit and margin, it will be displayed as **Fail Margin.**

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:MARGin** **:CALCulate:LLINe[1]|2|3|4|5|6:MARGin?**
Instructions	Sets/gets the limit margin value
Parameter Type	Float
Parameter Range	-100 dB ~ 100dB
Return	Float
Example	:CALCulate:LLINe2:MARGin 10 :CALCulate:LLINe2:MARGin? :CALCulate:LLINe2:MARGin:STATe 0

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe** **:CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe?**
Instructions	Sets/gets the restricted state
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe1:MARGin:STATe OFF

8.8.4 Limit Type

Set the limit type as upper / lower . The limit 1,3,5 is default as the lower and 2,4,6 as the lower

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:TYPE UPPer|LOWer** **:CALCulate:LLINe[1]|2|3|4|5|6:TYPE?**
Instructions	Sets/Gets the restriction type
Parameter Type	Enumeration
Parameter Range	UPPer|LOWer
Return	Enumeration
Example	:CALCulate:LLINe1:TYPE LOWer

8.8.5 Limit Edit

Edit the properties of slected limit.

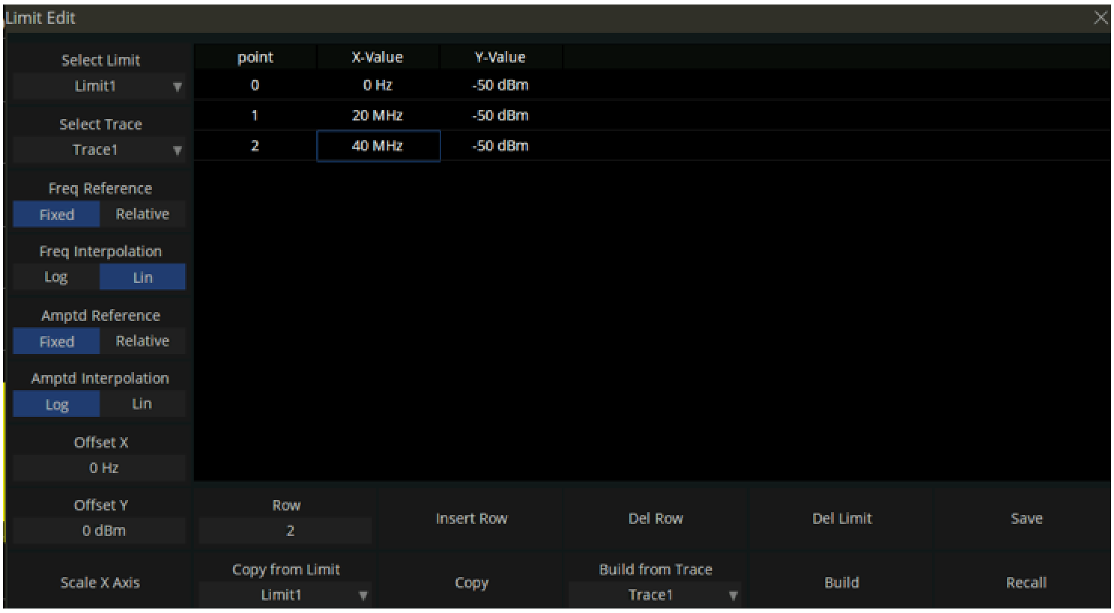


Figure 8-4 limit edit

Table 8-1 Limit1 Edit Menu

Function	Explanation
Type	Select upper or lower limit type. The default value is Upper.
Mode	Select limit line or limit point. The default value is Line. Set the number of the point to be edited if you selected the point type, and the range is 1 ~ 100.
Add point	Add a new point for editing.

X-axis	Edit the X-axis value (frequency or time) of the current point.
Amplitude	Edit the amplitude of the current point or line.
Del Point	Delete the point whose number is selected in Mode.
Del All	Delete all the points.
Save/Load	Save or load the limit file.
X Offset	Set offsets of X axis.
Y Offset	Set offsets of Y axis

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X?**
Instructions	Set the limit point template frequency offset Gets the limit point template frequency offset
Parameter Type	Float
Parameter Range	0 ~ 26.5G
Return	Float
Example	:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X 1MHz

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y?**
Instructions	Sets the limit point template amplitude offset Gets the limiter template amplitude offset
Parameter Type	Float
Parameter Range	-350 dB~380 dB
Return	Float
Example	:CALCulate:LLINe5:Offset:Y -10

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DATA val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:DATA?**
Instructions	Sets/gets restricted data (Clears previous data)
Parameter Type	val1: frequency : Float, val2: Ampl: Float
Parameter Range	val1: related with Span val2: -400 dBm~330 dBm
Return	val1: frequency : Float, val2: Ampl: Float
Example	:CALCulate:LLINe2:DATA 100,-20,200,-25 (Add two points (100, -20) and (200, -25)) :CALC:LLINe1:DATA?

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:ADD val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:POINt:DELete**
Instructions	Add limit point Delete limit points

Parameter Type	val1:frequency : Float, val2: Ampl: Float
Parameter Range	val1: related with Span val2: -400 dBm~330 dBm
Example	:CALCulate:LLINe1:ADD 100,-20 :CALCulate:LLINe2:POINt:DELete 2

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DELete** **:CALCulate:LLINe:ALL:DELete**
Instructions	Delete specified restrictions Delete all restrictions
Example	:CALCulate:LLINe1:DELete :CALCulate:LLINe:ALL:DELete

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:TRACe** **:CALCulate:LLINe[1]|2|3|4|5|6:TRACe?**
Instructions	Select the limit trace
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe1:TRACe 3

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE** **:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE?**
Instructions	Set/Query the frequency difference type
Parameter Type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1:FREQuency:INTerpolate:TYPE LOG

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe** **:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe?**
Instructions	Set or query the frequency reference type
Parameter Type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2:FREQuency:CMODe FIX

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE** **:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE?**
Instructions	Set or query the range difference type
Parameter Type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1: AMPLitude:INTerpolate:TYPE LOG

Command format	:CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe :CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe?
Instructions	Set or query the amplitude reference type
Parameter Type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2: AMPLitude:CMODe FIX

Command format	:CALCulate:LLINe[1]|2|3|4|5|6:COPY :CALCulate:LLINe[1]|2|3|4|5|6:COPY?
Instructions	Copy the limit
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2:COPY 5

Command format	:CALCulate:LLINe[1]|2|3|4|5|6:BUILd :CALCulate:LLINe[1]|2|3|4|5|6:BUILd?
Instructions	Fitting a trace
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2: BUILd 1 :CALCulate:LLINe2: BUILd?

8.8.6 Limit Test

Enable or disable the limit test function.

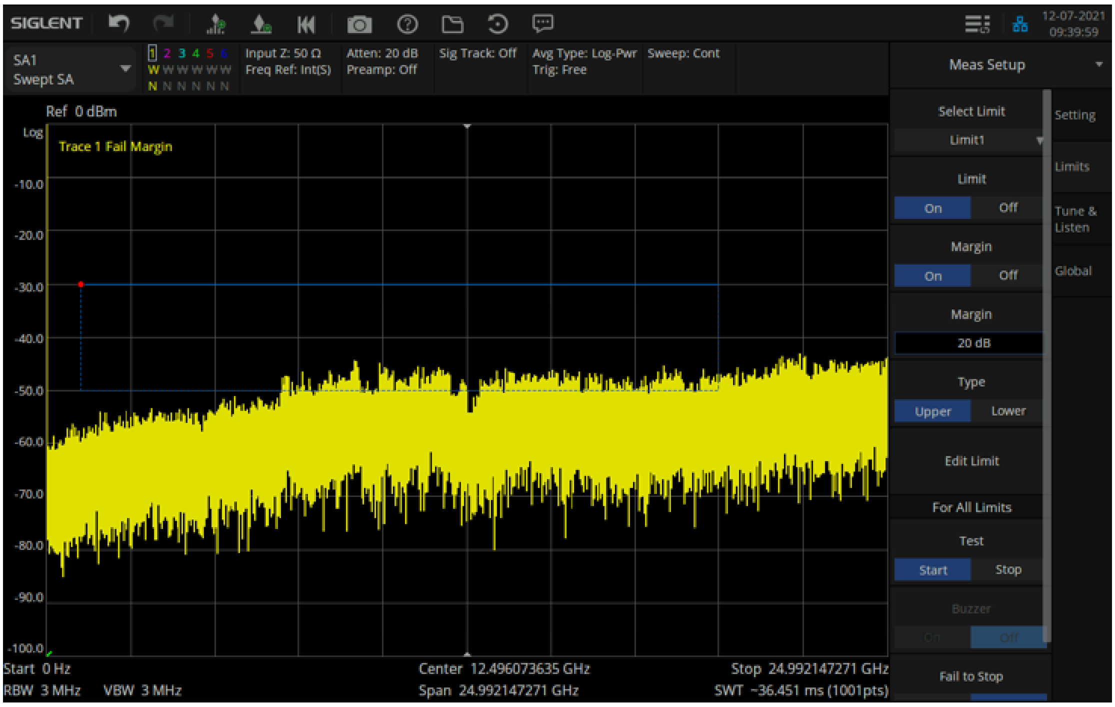


Figure 8-5 test results

Command format	**:CALCulate:LLINe:TEST** **:CALCulate:LLINe:TEST?**
Instructions	Sets/gets the status of the test switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:TEST 1

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FAIL?**
Instructions	Query limit test results.
Return	0|1
Example	:CALCulate:LLINe2:FAIL 1

8.8.7 Setup

Fail to stop

Turn on or off the Fail to stop function. If the function is on, the analyzer will stop sweep and retain the test result when the test result is “Fail”.

Buzzer

Turn on or off the buzzer. When the buzzer is on, it beeps when the test result is “Fail”.

Command format	**:CALCulate:LLINe:CONTrol:BEEP** **:CALCulate:LLINe:CONTrol:BEEP?**
Instructions	Sets/gets the restricted buzzer
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:CONTrol:BEEP OFF

Command format	**:CALCulate:LLINe:FAIL:STOP** **:CALCulate:LLINe:FAIL:STOP?**
Instructions	The set/query limit test stops if it fails
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:FAIL:STOP OFF

8.9 Meas & Meas Setup

8.9.1 Average Type

Choose one of the following averaging types: log power (video), power (RMS), or voltage averaging. When trace average is on, the average type is shown on the left side of the display.

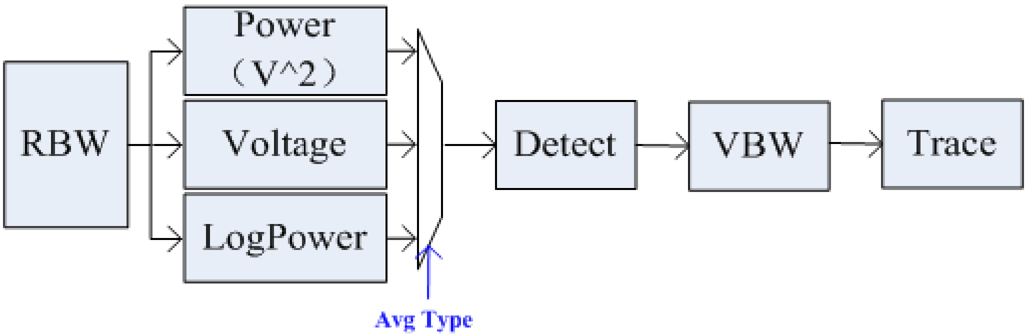


Figure 8-6 Average Type

- **Log Power**
  Select the logarithmic (decibel) scale for all filtering and averaging processes. This scale is "Video" because it is the most common display and analysis scale for the video signal within analyzer. This scale is excellent for finding Sine/CW signals near noise.

- **Power Average**
  In this average type, all filtering and averaging processes work on the power (the square of the magnitude) of the signal, instead of its log or envelope voltage. This scale is best for real-time power measurement of complex signals.

- **Voltage Average**
  In this Average type, all filtering and averaging processes work on the voltage of the envelope of the signal. This scale is suitable for observing rise and fall behavior of AM or pulse-modulated signals such as radar and TDMA transmitters.

Command format	**[:SENSe]:AVERage:TYPE LOGPower|POWer|VOLTage** **[:SENSe]:AVERage:TYPE?**
Instructions	Set/Query the average type
Parameter type	Enumeration
Parameter Range	LOGPower POWer VOLTage
Return	Enumeration: LOGP|POW|VOLT
Example	AVERage:TYPE VOLTage

Command format	[:SENSe]:AVERage:TYPE:AUTO 0|1|ON|OFF [:SENSe]:AVERage:TYPE:AUTO?
Instructions	Set/query the average type automatically
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:AVERage:TYPE:AUTO 1

8.9.2 Meas Control

8.9.2.1 Sequence

Display the menu controls that enable you to configure the measurement sequence. You need to press **Restart Seq** to start the selected measurement sequence. The default is **Scan Only**.

Scan Only

Scan the band based on **Scan Config** settings.

Seach Only

Search for the peak signal on current traces to populate the signal list.

Scan, Search & Measure

The complete measurement includes scan, peak search and final measurement. After doing peak search, the signal list will be cleared and populated with the new search result. It will do final measurement on all signals in the signal list and update the information of the signal list.

Scan & Search

A combination of scan and peak search.

Search & Meas

A combination of peak search and final measurement.

Meas

Do final measurement on the selected signals of the signal list based on **Meas** settings. You can choose **Current Signal**, **All Signals** or **Marked Signals** to be selected under menu **Meas -> Meas Signal**.

8.9.2.2 Restart Secquence

Start or restart the scan, search or final measurement depending on the sequence selected. When started, the label on the menu changes to Stop Sequence. The Meters measurement would be invalid during sequence running.

8.9.2.3 Restart Meas

Start or restart the measure only.

8.9.2.4 Restart Meter

Start or restart the measure meter.

8.9.3 Scan

A group of menus let you configure for scan quickly and easily.

8.9.4 Measure

8.9.4.1 Signal mode

Set the remeasure type, either on a current signal, all signals, or the marked signal in the signal list.

- Current Signal: You could set the current signal under menu **List Operation-> Select Signal**.
- All Signals: Do final measurement on all signals in the signal list.
- Marked Signal: You could mark one or more signals to do final measurement under menu **List Operation-> Mark Signal**.

8.9.4.2 Meas Detector

Set the selected detector to be used for final measuremen.

8.9.4.3 Meas Enable

Enable / disable the measurement.

8.9.4.4 Dwell Time

Set the dwell time for detectors.

8.9.4.5 Select Limit

Select the limit used by each detector to get the limit delta value.

8.9.5 List Operation

8.9.5.1 Select Signal

Select one of the signals as current signal in the signal list. When a signal is selected, you can mark, unmark or delete it from the signal list. It will be relative to **1.4.5.1 Meas Signal**.

8.9.5.2 Mark Signal

Mark the current signal.

8.9.5.3 Clear mark

Unmark the current signal.

8.9.5.4 Mark All

Mark all the signals in the signal list.

8.9.5.5 Clear All Mark

Unmark all the signals in the signal list

8.9.5.6 Delete Signal

Delete the current signal in the signal list.

8.9.5.7 Delete All

Delete all signals in the signal list.

8.9.5.8 Delete Marked

Delete all marked signals in the signal list.

8.9.5.9 Sort By

Sort all signals in the signal list by the specific order. You can sort based on the frequency, detector 1/2/3, detector vs. limit delta or timestamp in ascending or descending order.

Every new signal will be added at the end of the list until you sort the signal list.

8.9.6 Meter

A group of menus let you configure for meter measurement quickly and easily

8.9.6.1 Reset Peak Hold

Reset the maximum hold value of the meter and start accumulating again.

8.9.6.2 Select Meter

Select one of the three meters. When a meter is selected, you can set its detector and limit configure.

8.9.6.3 Meter Enable

Enable/disable the meter measurement.

8.9.6.4 Meter Detector

Set the selected detector to be used for meter measurement.

8.9.6.5 Dwell Time

Set the dwell time for meter measurement.

8.9.6.6 Meter Limit

Edit the properties of meter limit

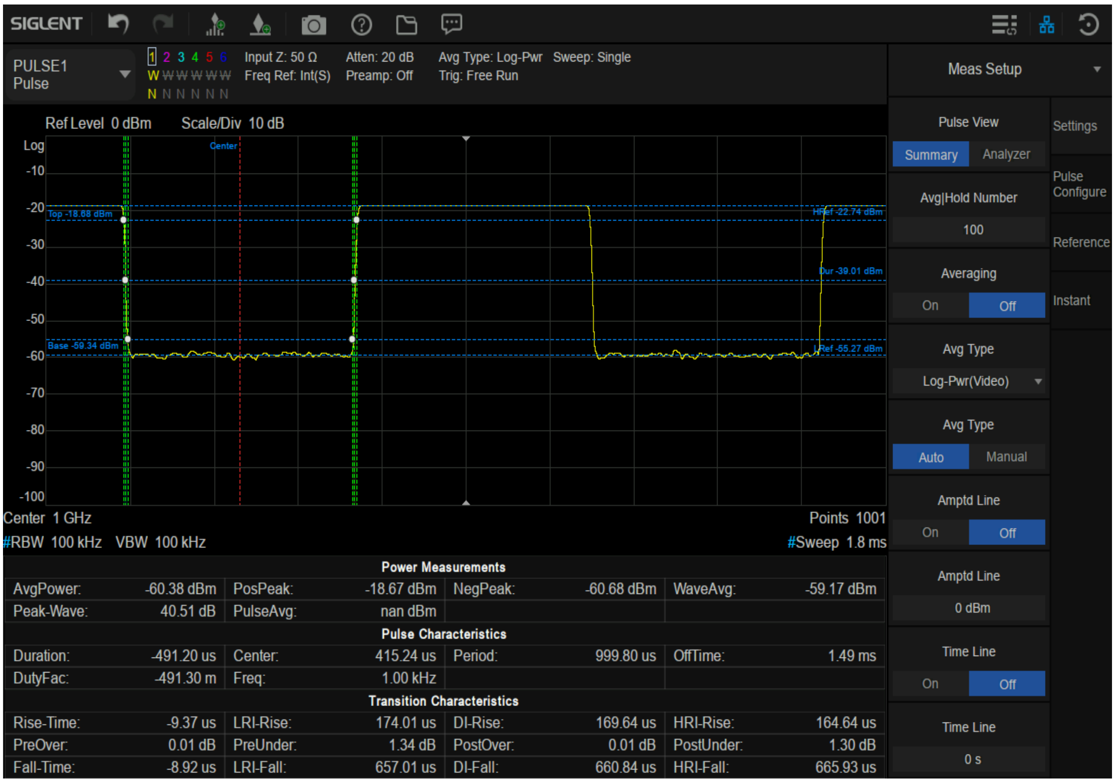
Function	Explanation
Limit	Turn on or off the meter limit.
Value	Set the meter limit value.
Limit1 to Value	Use Limit1 line as meter limit at the current meter’s frequency.
Limit2 to Value	Use Limit2 line as meter limit at the current meter’s frequency.
Limit3 to Value	Use Limit3 line as meter limit at the current meter’s frequency.

8.9.7 Global

The Swept SA measurement lets you perform “traditional” Spectrum Analysis, that is, Swept and Zero Span measurements, as well as “Swept FFT” analysis (FFT analysis presented as though it were swept).

9 Pulse Measurement Mode

The PULSE mode function is mainly used to measure the width, amplitude, and time parameters of pulses.



Command format	INSTrument:MEASure INSTrument:MEASure?
Instruction	Sets/Gets the Measurement mode
Parameter Type	Enumeration
Parameter Range	PULSE
Return	Enumeration: PULSE
Example	INSTrument:MEASure PULSE INSTrument:MEASure?

9.1 Frequency

9.1.1 Frequency

Set the frequency related parameters and functions of the spectrum analyzer.

Command Format	[:SENSe]:FREQuency:CENTer [:SENSe]:FREQuency:CENTer?
Instruction	Sets/Gets the center frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	Zero Span:0 ~ 7.5 GHz
Return	Float, unit: Hz
Example	:FREQuency:CENTer 0.2 GHz :SENSe:FREQuency:CENTer 0.2 GHz

9.1.2 Freq Offset

The frequency offset value is used to indicate the frequency conversion between the tested device and the spectrograph input.

This parameter does not affect any hardware settings of the spectrograph, only changes the center frequency display value.

Command Format	[:SENSe]:FREQuency:OFFSet [:SENSe]:FREQuency:OFFSet?
Instruction	Sets the frequency offset of the spectrum analyzer. Gets the frequency offset.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	-100 GHz ~ 100 GHz
Return	Float, unit: Hz
Example	:FREQuency:OFFSet 1 GHz

9.1.3 Freq Step

The frequency step is the length of the center frequency and frequency offset when using the directional keys for stepping.

- Changing the center frequency value with a fixed step can achieve the goal of quickly and continuously switching measurement channels.
- There are two modes for frequency stepping: automatic and manual. When the frequency step is in automatic mode, if it is not zero sweep width, the frequency step will change with the change of sweep width, and its value is sweep width/10. If it is zero sweep width, the frequency step is the value of RBW. The manual mode allows for arbitrary setting of frequency step values.

Command Format	**[:SENSe]:FREQuency:CENTer:STEP[:INCRement]** **[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?**
Instruction	Specifies the center frequency step size. Gets the center frequency step.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1 Hz ~ 28 GHz
Return	Float, unit: Hz
Example	:FREQuency:CENTer:STEP 2 MHz

Command Format	**[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1** **[:SENSe]:FREQuency:CENTer:STEP:AUTO?**
Instruction	Specifies whether the step size is set automatically based on the span. Gets center frequency step mode.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:FREQuency:CENTer:STEP:AUTO OFF

9.2 BW

9.2.1 Resolution Bandwidth

Set Resolution BandWidth (RBW) to distinguish two signals with similar frequencies. Pay attention to the following points during use:

- Reducing RBW can achieve higher frequency resolution, but it will lead to longer scanning time;
- When the scanning time is in automatic mode, it is affected by both RBW and VBW;
- When RBW is in automatic mode, it will decrease as the scanning width decreases.

Command Format	**[:SENSe]:BWIDth[:RESolution]** **[:SENSe]:BWIDth[:RESolution]?**
Instruction	Set/Gets the resolution bandwidth.
Parameter Type	Discrete
Parameter Range	1Hz , 3Hz , 10 Hz , 30 Hz , 100 Hz , 300 Hz , 1 kHz , 3 kHz , 10 kHz , 30 kHz , 100 kHz , 300 kHz , 1 MHz , 3 MHz , 10 MHz
Return	Float, unit: Hz
Example	:BWIDth 1 kHz

Command Format	**[:SENSe]:BWIDth[:RESolution]:AUTO OFF|ON|0|1** **[:SENSe]:BWIDth[:RESolution]:AUTO?**
Instruction	Turn on/off auto resolution bandwidth state. Gets the resolution bandwidth auto state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:BWID:AUTO On

9.2.2 Video Bandwidth

Set the video bandwidth in order to filter out the noise outside the video band.

- Reducing the VBW will smooth the trace and helps to highlight small signals from noise, but it will also increase the sweep time (Sweep Time is affected by a combination of RBW and VBW when it is in Auto mode).
- VBW varies with RBW when it is in Auto mode. While in Manual mode, VBW is not affected by RBW.

Command Format	**[:SENSe]:BWIDth:VIDeo** **[:SENSe]:BWIDth:VIDeo?**
Instruction	Set/Gets the video bandwidth.
Parameter Type	Discrete
Parameter Range	1Hz , 3Hz , 10 Hz , 30 Hz , 100 Hz , 300 Hz , 1 kHz , 3 kHz , 10 kHz , 30 kHz , 100 kHz , 300 kHz , 1 MHz , 3 MHz , 10 MHz
Return	Float, unit: Hz
Example	:BWIDth:VIDeo 10 kHz

Command Format	[:SENSe]:BWIDth:VIDeo:AUTO OFF|ON|0|1 [:SENSe]:BWIDth:VIDeo:AUTO?
Instruction	This command turns on/off auto video bandwidth state. Gets the video bandwidth state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	BWIDth:VIDeo:AUTO OFF

9.2.3 V/R Ratio

Set the ratio of VBW to RBW. This value is different while measuring different kinds of signals:

- Sine/Continuous Wave (CW) signals: Use 1 to 3 (for faster sweeps)
- Pulsed/transient signals: Use 10 (to reduce the influence on the amplitude of transient signals)
- Noise signals: Generally use 0.1 (to obtain the average of noises)

Command Format	[:SENSe]:BWIDth:VIDeo:RATio [:SENSe]:BWIDth:VIDeo:RATio?
Instruction	Specifies the ratio of the video bandwidth to the resolution bandwidth. Gets the ratio of the video bandwidth to the resolution bandwidth.
Parameter Type	Discrete, Float
Parameter Range	0.001, 0.003, 0.01, 0.03, 0.1, 0.3, 1.0, 3.0, 10.0, 30.0, 100.0, 300.0, 1000.0
Return	Float
Example	:BWIDth:VIDeo:RATio 30

9.3 Sweep

9.3.1 Sweep Points

The number of sweep points represents the number of sweep and trace displayed points (201~10001).

More sweep points will improve the resolution of waveform, but also affect the minimum sweep time, and increase the time of data processing and remote access to data, and reduce the response rate.

Command Format	**[:SENSe]:SWEep:POINts** **[:SENSe]:SWEep:POINts?**
Instruction	Sets sweep points. Gets sweep points.
Parameter Type	integer
Parameter Range	201-10001
Example	:SWEep:POINts 250 :SWEep:POINts?

9.3.2 Sweep Time

When the sweep type is normal swept, you can change the sweep time (SWT) to control the time required to sweep the current frequency range. The sweep time supports automatic mode and manual mode:

Auto SWT refers to the appropriate sweep time of the analyzer according to the relevant configuration line operation, which satisfies the following calculation logic:

$$AutoSWT = \max[minSWT, Points * ResTimeperPoint];$$
$$minSWT = 1us$$

Users can also manually set the sweep time based on actual requirements.But it needs to be satisfied:

$$1us <= SWT <= 6ks$$

In general, the manual sweep time should not be longer than the automatic sweep time in this condition. Otherwise, unforeseeable anomalies may be caused and may be marked (UNCAL).

It should be pointed out in particular that under the influence of the scheme, when the sweep type is FFT, the sweep time can only be calculated by the instrument itself, and any modification related to the sweep time cannot take effect.

Command Format	**[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1** **[:SENSe]:SWEep:TIME:AUTO?**
Instruction	This command turns on/off auto sweep time state.

Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:SWEep:TIME:AUTO ON

Command Format	**[:SENSe]:SWEep:SPEed NORMal|ACCUracy [:SENSe]:SWEep:SPEed?**
Instruction	Toggles the sweep speed between normal and accuracy.
Parameter Type	Enumeration
Parameter Range	ACCUracy|NORMal
Example	:SWEep: SPEed NORMal

9.3.3 Sweep/Measure

Sweep/Measure

Single/Continue controls analyzer to perform single or continuous sweep/measure

Restart

Restart the current sweep or measure. In particular, if the sweep parameters are modified, a restart will be performed.

Command format	**:INITiate:CONTinuous OFF|ON|0|1 :INITiate:CONTinuous?**
Instructions	Sets continuous sweep mode on-off. Gets continuous sweep mode state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:INITiate:CONTinuous OFF

Command Format	**:INITiate[:IMMediate]**
Instruction	Restarts the current sweep.
Example	:INITiate:IMMediate

Command Format	**:INITiate:RESTart**
Instruction	Restarts the current sweep.
Example	:INITiate:RESTart

9.4 Amplitude

Set the amplitude parameters of the analyzer. Through modifying these parameters, signals under measurement can be displayed in a proper mode for easier observation and minimum error. Any change of Ref Level, Attenuator Value, Preamp mode and Ref Offset will restart sweep.

9.4.1 Ref Level

Set the maximum power or voltage that can be currently displayed in the trace window. The value is displayed at the upper left corner of the screen grid.

The maximum reference (Ref) level available is affected by the maximum mixing level; input attenuation is adjusted under a constant maximum mixing level in order to fulfill the following condition:

Ref <= ATT - PA - 20dBm, where ATT = Attenuation value, PA = Preamplifier value

Note: the maximum reference level of different machine models may be different, please refer to the data manual specifically.

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel** **:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?**
Instruction	This command sets the reference level for the Y-axis. Gets reference level.
Parameter Type	Float, unit: dBm, dBmV, dBuV, dBuA, V, W
Parameter Range	Unit is dBm: -170 dBm ~ 23 dBm Unit is dBmV: -123.01 dBmV ~ 69.99 dBmV; Unit is dBuV: -63.01 dBuV ~ 129.99 dBuV; Unit is dBuA: -96.99 dBuA ~ 96.01 dBuA; Unit is Volts: 707.11pV ~ 3.16 V; Unit is Watts: 0W ~ 199.53m W.
Return	Float, unit: dBm
Example	:DISPlay:WINDow:TRACe:Y:RLEVel 20 DBM

Command format	**[:SENSe]:POWer[:RF]:ATTenuation** **[:SENSe]:POWer[:RF]:ATTenuation?**
Instructions	Sets/gets the attenuation value
Parameter Type	Integer
Parameter Range	0 dB ~ 50 dB
Return	Integer , unit dB
Example	:POWer:ATTenuation 10

Command format	**[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1** **[:SENSe]:POWer[:RF]:ATTenuation:AUTO?**
Instructions	Sets/gets the auto attenuation value switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1

Return	0|1
Example	:POWer[:RF]:ATTenuation:AUTO ON

Command format	**[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1** **[:SENSe]:POWer[:RF]:GAIN[:STATe]?**
Instructions	Sets/gets the preset amplifier inside the switch spectrometer
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:POWer:GAIN ON

9.4.2 Ref Offset

Assign an offset to the reference level to compensate for gains or losses generated between the device under measurement and the analyzer.

The change of this value changes both the reference level readout and the amplitude readout of the marker; but does not impact the position of traces on the screen.

Command format	**:DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet** **:DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet?**
Instructions	Sets/gets the frequency offset
Parameter Type	Float
Parameter Range	-100 dB~100 dB
Return	Float , unitdB
Example	:DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet 2

9.4.3 Y Axis Scale

9.4.3.1 Scale Type

Set the scale type of the Y-axis to Lin or Log. The default is Log.

- In Lin mode, the vertical Scale value cannot be changed. The Display area is set for reference level of 0%.
- In Log scale type, the Y-axis denotes the logarithmic coordinate. The value shown at the top of the grid is the reference level and each grid represent the scale value. The unit of Y-axis will automatically switch to the default unit (dBm) in Log scale type when the scale type is changed from Lin to Log.
- In Lin scale type, the Y-axis denotes the liner coordinate; the values shown at the top of the grid and the bottom of the grid are the reference level and 0 V. The scale setting function is invalid. The unit of Y-axis will automatically switch to the default unit (Volts) in Lin scale type when the scale type is charged from Log to Lin.
- The scale type does not affect the setting of Y-axis unit.

Set the unit of the Y-axis to dBm, dBmV, dBuV, dBuA, Volts (RMS) or Watts. Default is dBm.

The conversion relationships between units are as follows.

$$\mathrm{dBm} = 10\lg\left(\frac{\mathrm{Volts}^2}{\mathrm{R}} \times \frac{1}{1\mathrm{mW}}\right)$$

$$\mathrm{dB\mu V} = 20\lg\left(\frac{\mathrm{Volts}}{1\mu\mathrm{V}}\right)$$

$$\mathrm{dBmV} = 20\lg\left(\frac{\mathrm{Volts}}{1\mathrm{mV}}\right)$$

$$\mathrm{Watts} = \frac{\mathrm{Volts}^2}{\mathrm{R}}$$

Where, R denotes the reference impedance. The default value is 50Ω and can be adjusted by pressing "**Correction -> RF input**". The "75 Ω" impedance is just a numeric value, not a real impedance. Setting the RF input to 75 Ω will not change the actual input impedance. A 75 Ω feed-through adapter is required to match 75 Ω circuits to the 50 Ω input of the analyzer.

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision** **:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision?**
Instructions	Sets/gets the scale on which trace logarithms are displayed
Parameter Type	Float
Parameter Range	0.1 dB ~ 20 dB
Return	Float , unit dB
Example	:DISPlay:WINDow:TRACe:Y:PDIVision 10 dB

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing LINear|LOGarithmic** **:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing?**
Instructions	Sets/Gets the scale display type
Parameter Type	Enumeration: LINear |LOGarithmic
Return	Enumeration: LIN|LOG
Example	:DISPlay:WINDow:TRACe:Y:SPACing LINear

9.4.3.2 Unit

Units can be selected as dBm, dBmV, dBuV, dBuA, Volts, and Watts. Default dBm.

The conversion relationship between units is as follows:

Among them, R represents the input impedance, with a default of 50 Ω. You can choose the input impedance of 75 Ω or 50 Ω in the correction.

$$\mathrm{dBm} = 10\lg\left(\frac{\mathrm{Volts}^2}{\mathrm{R}} \times \frac{1}{1\mathrm{mW}}\right)$$

$$\mathrm{dB\mu V} = 20\lg\left(\frac{\mathrm{Volts}}{1\mathrm{\mu V}}\right)$$

$$\mathrm{dBmV} = 20\lg\left(\frac{\mathrm{Volts}}{1\mathrm{mV}}\right)$$

$$\mathrm{dB\mu A} = 10\lg\left(\frac{\mathrm{Volts}^2}{\mathrm{R}} \times \frac{1}{1\mathrm{mW}}\right) - 10\lg(\mathrm{R}) + 10\lg10^9$$

$$\mathrm{Watts} = \frac{\mathrm{Volts}^2}{\mathrm{R}}$$

The impedance selection here only represents numerical calculation and does not represent the switching of actual impedance. After switching the input impedance, the display of power units will not change, while amplitude and energy units will change accordingly.

Command format	**:UNIT:POWer DBM|DBMV|DBUV|V|W** **:UNIT:POWer?**
Instructions	Sets/gets the display unit of magnitude
Parameter Type	Enumeration
Parameter Range	DBM|DBMV|DBUV|DBUA|V|W
Return	Enumeration: DBM|DBMV|DBUV|V|W
Example	:UNIT:POWer DBMV

9.5 Correction

Measured value can be corrected in specific x-axis and y-axis. Now, there are eight corrections, witch enter into force at the same time.

Select Correction

Select a correction (1-8) to operating.

Correct Switch

If the selected switch enter into force.

Command Format	**[:SENSe]:CORRection:CSET#[:STATe]** **[:SENSe]:CORRection:CSET#[:STATe]?**
Illustration	Set Correction Switch Status
Parameter Type	Boolean
Menu	Input/Output>Correction
Return Value	0|1
example	:CORRection:CSET1 0 :CORRection:CSET2 1

Edit Correction

Editing, preserving, loading the selected correction.

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:DATA {x1,y1 }** **[:SENSe]:CORRection:CSET#:DATA?**
Illustration	Get/Set correction points
Parameter Type	Character String of Correction Data {Freq 1Hz, Amp 1dBm, Freq 2Hz, Amp 2dBm, ……}
Parameter Range	
Menu	Input/Output>Correction>Edit Correction
example	:CORRection:CSET1:DATA 10000000,-15, 15000000, -15 :CORRection:CSET1:DATA 10000000,-15

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:ADD {x1,y1 }**
Illustration	Add Correction Point
Parameter Type	Character String of Correction Data {Freq 1Hz, Amp 1dBm, Freq 2Hz, Amp 2dBm, ……}
Parameter Range	
Menu	Input/Output>Correction>Edit Correction
example	:CORRection:CSET1:ADD 10000000,-15, 15000000, -15 :CORRection:CSET1:ADD10000000,15

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:POINt:DELete**
Illustration	Delete a special correction point.
Parameter Type	Serial Number

Menu	Input/Output>Correction>Edit Correction
example	:CORRection:CSET1:POINt:DELete 0

Close All the Correction

All the correction is not effective.

Delet One/All the Correction

Empty all the points of a specail/all correction(s).

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:DELete**
Illustration	Delete all points of a special correction.
Return Value	
example	CORRection:CSET1:DELete

Command Format	**[:SENSe]:CORRection:CSET:ALL:DELete**
Illustration	Delete all the corrections
Return Value	
example	:CORRection:CSET:ALL:DELete

9.6 Trigger

The analyzer provides a variety of trigger functions, users can choose from the trigger menu.

9.6.1 Trigger Source

The analyzer provides a variety of trigger sources to suit different trigger requirements.

Free Run

Free trigger is the default mode of the analyzer, in which the spectrum analyzer sweeps circularly and continuously.

Video

When the user wants to capture an instantaneous signal that appears for a very short time, the video trigger mode can be adopted . In this working mode, only when the rising edge or falling edge of a signal touches the Trigger Level, the signal will be triggered and displayed on the screen.

External

External trigger provides users with richer trigger functions. If users want to realize the periodic trigger and delay trigger spectrum analyzer, they can choose the external trigger mode. In this mode, it is triggered by the rising or falling edge of the external input signal. The square wave signal with a certain frequencycan be periodically triggered, and the delay time can be adjusted by setting the Trigger Delay option.

Periodic

When Periodic is selected, the analyzer uses the built-in period timer signal as the trigger. The trigger event is set by the periodic timer parameter, which is modified by offset and periodic synchronization Src.

You can synchronize periodic signals with external events (using periodic synchronization Src) to get closer to a reliable trigger signal.

If the synchronization source is not selected (off state), the internal timer will not synchronize with any external timed events.

Command format	**:TRIGger[:SEQuence]:SOURce** **:TRIGger[:SEQuence]:SOURce?**
Instructions	sets the trigger source. gets the trigger source.
Parameter Type	Enumeration
Parameter Range	"IMMediate ", "VIDeo ", "EXTernal ","FRAMe"
Return	"IMM", "VID", "EXT" ,"FRAMe"
Example	:TRIGger:SOURce VID

9.6.2 Trigger Level

Sets the amplitude level for the video trigger (absolute level only supported). When the video signal crosses the voltage level with the selected slope, it is triggered.

Command format	**:TRIGger[:SEQuence]: {type}:LEVel** **:TRIGger[:SEQuence]: {type}:LEVel?**
Instructions	sets the trigger level. gets the trigger level. {type}: "VIDeo", "EXTernal"
Parameter Type	Float
Parameter Range	-300~50dBm
Return	Float
Example	:TRIGger:VIDeo:LEVel -20

9.6.3 Trigger Slope

Set the trigger polarity for external trigger, video trigger. The options are rising edge trigger and falling edge trigger.

The same trigger source uses the same trigger edge for both gating and triggering.

Command format	**:TRIGger[:SEQuence]: {type}:SLOPe** **:TRIGger[:SEQuence]: {type}:SLOPe?**
Instructions	sets the trigger edge. gets the trigger edge. {type}: " VIDeo ", " EXTernal "
Parameter Type	Enumeration
Parameter Range	"POS", "NEG"
Return	"POS", "NEG"
Example	:TRIGger: EXTernal:SLOPe :TRIGger: VIDeo:SLOPe?

9.6.4 Trigger Delay

When scanning is at zero span, negative delay can be set . The time range of negative delay is related to the number of sweep points and sweep time:

Maximum negative delay time = [496M / (sweep points * 64) - 5] * sweep time

Maximum positive delay time =500ms

Command format	**:TRIGger[:SEQuence]:{type}:DELay** **:TRIGger[:SEQuence]:{type}:DELay?**
Instructions	sets the trigger delay gets the trigger delay {type}:" VIDeo ", " EXTernal " ,"FRAMe"

Parameter Type	Float
Return	Float
Example	:TRIGger:EXTernal:DELay 5e-3 :TRIGger:FRAMe:DELay?

Command format	**:TRIGger[:SEQuence]:{type}:DELay:STATe** **:TRIGger[:SEQuence]:{type}:DELay:STATe?**
Instructions	sets the trigger delay state. gets the trigger delay state. {type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal: DELay:STATe 1

9.6.5 Zero Span Trigger Delay Compensation (external trigger only)

In normal cases, after the trigger is generated, the data is displayed and the data is triggered at the same time. However, the processing time of the trigger path and the data path is different. As a result, the data displayed at the trigger time is the previous data. This does not affect the integrity of the data and does not cause data loss at the trigger point. However, in some cases, it is necessary to display the zero point of screen coordinate as the input signal information of trigger point, so the function of zero span delay compensation is needed.

Command format	**:TRIGger[:SEQuence]:EXTernal:DELay:COMPensation OFF|ON|0|1** **:TRIGger[:SEQuence]:EXTernal:DELay:COMPensation?**
Instructions	Enable /disable the external trigger zero sweep delay compensation
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal:DELay:COMPensation OFF

9.6.6 Period (periodic trigger only)

Set the trigger period. For gating and triggering, the same trigger source uses the same trigger cycle.

Command format	**:TRIGger[:SEQuence]:FRAMe:PERiod** **:TRIGger[:SEQuence]:FRAMe:PERiod?**
Instructions	Set/Query Period Trigger period
Parameter Type	Float
Parameter Range	100ns~10s
Return	Float
Example	:TRIGger:FRAMe:PERiod 1s

9.6.7 Offset Time

Adjust the cumulative offset between the periodic trigger clock and trigger events. The periodic trigger clock cannot be viewed on the software, only the trigger event can be seen. Therefore, in order to adjust the trigger event time, only the offset between the periodic triggering clock and the triggering event can be adjusted. However, the absolute value of the internal offset is unknown, and each modification of the offset is cumulative on the previous basis.

Command format	**:TRIGger[:SEQuence]:FRAMe:OFFSet** **:TRIGger[:SEQuence]:FRAMe:OFFSet?**
Instructions	Set/Query Period Trigger period offset
Parameter Type	Float
Parameter Range	0s~10s
Return	Float
Example	:TRIGger:FRAMe:OFFSet 1s

9.6.8 Reset Time Offset Display

Reset the display of cycle trigger time offset.

Command format	**:TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet**
Instructions	Reset Period trigger offset return to zero
Example	:TRIGger:FRAMe:OFFSet:DISPlay:RESet

9.6.9 Sync Source (periodic trigger only)

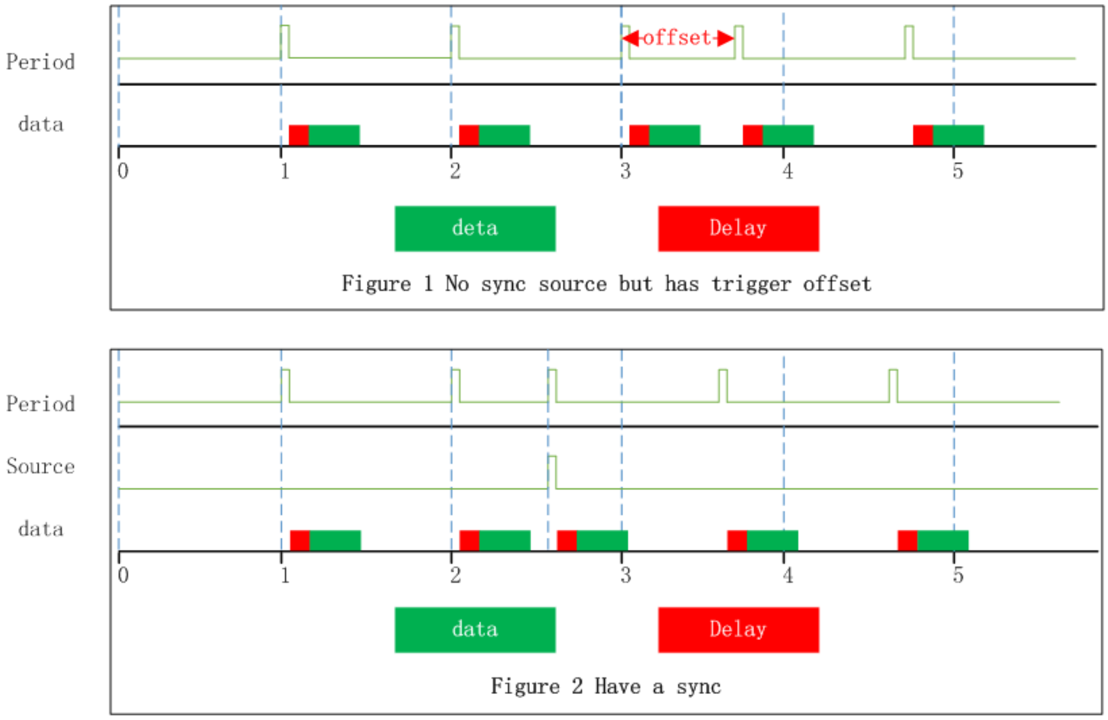


Figure 9-1 Trigger of synchronization source

Command format	**:TRIGger[:SEQuence]:FRAMe:SYNC** **:TRIGger[:SEQuence]:FRAMe:SYNC?**
Instructions	Set/Query the type of periodic synchronization
Parameter Type	Enumeration
Parameter Range	"OFF", "EXT"
Return	"OFF", "EXT"
Example	:TRIGger:FRAMe:SYNC EXT

9.6.10 Gate Source

Select a gate source for gate measurement. The optional sources are external source and periodic source.

External

Set the trigger source of the gate to be an external source. Similar to trigger, when configuring external sources, you can choose whether to trigger on the rising edge or the falling edge, and configure zero span delay compensation. The configuration of the gating source affects the configuration of the trigger source.

Period

Set the trigger source of the gate to a periodic source. Similar to trigger, you can configure trigger period, trigger offset, and trigger period synchronization sources when configuring periodic sources. The configuration of the gating source affects the configuration of the trigger source.

Command format	**[:SENSe]:SWEep:EGATe:SOURce** **[:SENSe]:SWEep:EGATe:SOURce?**
Instructions	Set or query the gate source type
Parameter Type	Enumeration
Parameter Range	" EXTernal ","FRAMe"
Return	"EXT","FRAMe"
Example	:SWEep:EGATe:SOURce EXT

9.7 Trace

The waveform trace is obtained by connecting a set of discrete points to represent the scanned signal. The connection method is shown in the following figure:

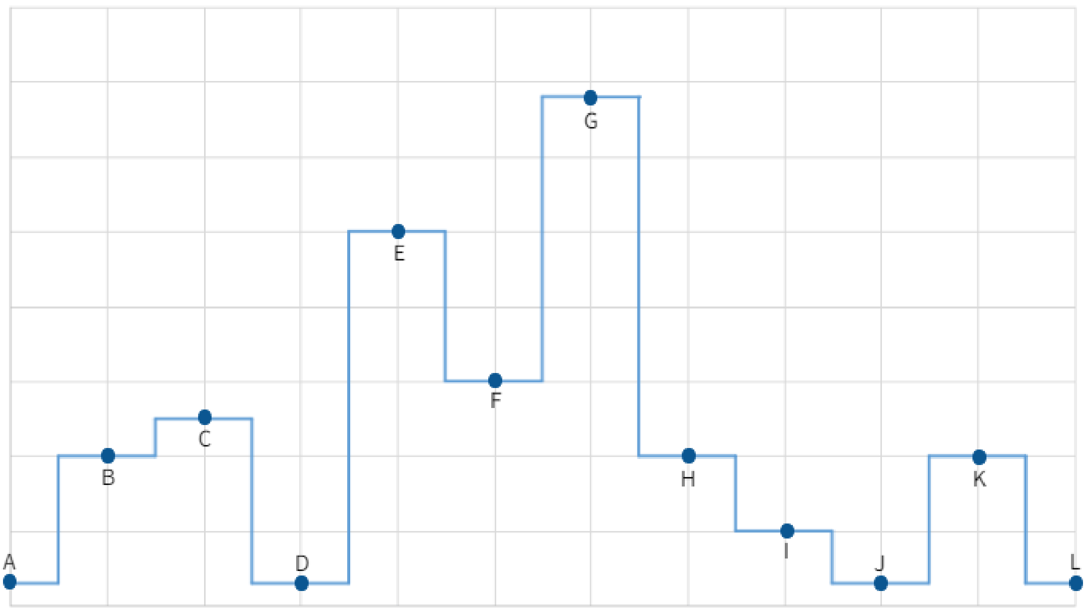


Figure 9-2 Selection of trace lines

The x value of the trace point represents frequency or time (in the case of zero sweep width), and the y value represents the signal amplitude of the current frequency (or time). This point (the point before the trace operation) is obtained by the detector, and in most cases, its number should be consistent with the number of points (scan control related parameters) configured by the user. When using a marker to mark points on a trace, its resolution is also determined by that number of points.

When it is necessary to operate on a trace, the first step is to specify and only one Select Trace can be specified at the same time. The selected trace will have a selected status (with a white border) in the status bar.

9.7.1 Trace Type

Set the type of the current trace or disable it. The system calculates the sampled data using a specific operation method according to the trace type selected and displays the result. Trace types include Clear Write, Max Hold, Min Hold, View, Average and Blank. The corresponding icon of the trace type will be displayed in the status bar at the left of the screen, as shown in the figure below.

Clear Write

Erases any data previously stored in the selected trace, and display the data sampled in real-time of each point on the trace.

Max Hold

Retain the maximum level for each point of the selected trace. Update the data if a new maximum level is detected in successive sweeps. Max Hold is very effective when measuring events that may take successive scans to measure accurately. Some common applications include FM Deviation, AM NRSC, and frequency hopping or drift.

Min Hold

Display the minimum value from multiple sweeps for each point of the trace and update the data if a new minimum is generated in successive sweeps.

~~**View**~~

~~Freezes and holds the amplitude data of the selected trace. The trace data is not updated as the analyzer sweeps.~~

~~**Blank**~~

~~Disable the trace display and all measurements of this trace.~~

Average

Set the averages times of the selected trace.

More averages can reduce the noise and the influence of other random signals; thus highlighting the stable signal characteristics. The larger the averages times is, the smoother the trace will be. Enabling averaging will take more time to collect the full spectral information because the analyzer needs to sweep the set average count. The displayed data is averaged in a first-in-first-out fashion.

Command format	:TRACe[1]|2|3|4|5|6:TYPE WRITe|MAXHold|MINHold| AVERage :TRACe[1]|2|3|4|5|6:TYPE?
Instructions	Sets/gets the display type of trace
Parameter Type	Enumeration
Parameter Range	WRITe: Trace is in normal mode. Update data MAXHold: Displays the maximum value of traces MINHold: Displays the minimum value of trace AVERage: Displays the average value of trace
Return	Enumeration: WRITE|MAXH|MINH| AVER
Example	:TRAC1:TYPE MINH

9.7.2 Trace State

There are four trace states: active, view, blank, and background. Different trace states indicate the refresh and display states of traces:

Active

Refreshed and displayed trace data.

View

The trace data will not be refreshed, and the current latest trace will be displayed in a fixed frame.

Blank

Trace data is no longer refreshed or displayed

Background

Refreshed trace data but no display.

Command format	**:TRACe[1]|2|3|4|5|6:DISPlay[:STATe]** **:TRACe[1]|2|3|4|5|6:DISPlay[:STATe]?**
Instructions	Sets/gets the display status of the trace
Parameter Type	Enumeration: ACTI|VIEW|BLAN| BACK
Parameter Range	ACTIve: Trace is in normal mode. Update data VIEW: Stops updating trace to display current trace data BLANk: Clear trace data BACKground: Set as background
Return	Enumeration: ACTI|VIEW|BLAN| BACK
Example	:TRACe2:DISPlay BLANK :TRACe2:DISPlay?

9.7.3 Detect

The analyzer displays the sweep signal on the screen in the form of a trace. For each trace point, the analyzer always captures all the data within a specific time interval and processes (Peak, Average, etc.) the data using the detector currently selected, then it displays the processed data (a single data point) on the screen.

Select an appropriate detector type according to the actual application in order to ensure the accuracy of the measurement.

The available types are **Pos Peak**, **Neg Peak**, **Sample**, **Normal**, **Average** and **Quasi Peak**. The default is **Pos peak**.

Positive Peak

For each trace point, Positive Peak detector displays the maximum value of data sampled within the corresponding time interval.

Negative Peak

For each trace point, Negative Peak detector displays the minimum value of data sampled within the corresponding time interval.

Sample

For each trace point, Sample detector displays the transient level corresponding to the central time point of the corresponding time interval. This detector type is applicable to noise or noise-like signal.

Normal

Normal detector (also called ROSENFELL Detector) displays the maximum value and the minimum value of the sample data segment in turn: Odd-numbered data points display the maximum value and even-numbered data points display the minimum value. In this way, the amplitude variation range of the signal is clearly shown.

Average

For each trace point, Average detector displays the average value of data sampled within the corresponding time interval.

Command format	**[:SENSe]:DETector:TRACe[1]|2|3|4|5|6[:FUNCtion]** **[:SENSe]:DETector:TRACe[1]|2|3|4|5|6[:FUNCtion]?**
Instructions	Sets/Gets the trace detection type
Parameter Type	Enumeration NEG|POS|SAMP|AVER|NORMAL
Parameter Range	NORMAL: standard NEGative: Negative peak POSitive: positive peak SAMPle: The sampling AVERage: average,
Return	Enumeration:NEG|POS|SAMP|AVER|NORMAL
Example	:DETector:TRAC1 AVERage

Command format	**[:SENSe]:DETector:TRACe[1]|2|3|4|5|6:AUTO 0|1** **[:SENSe]:DETector:TRACe[1]|2|3|4|5|6:AUTO?** **[:SENSe]:DETector:TRACe:AUTO:ALL**
Instructions	Set/get trace automatic detection switch
Parameter Type	Boolean
Parameter Range	0|1
Return	0|1
Example	:DETector:TRACe3:AUTO 1 :DETector:TRACe:AUTO:ALL

9.8 Marker & Peak

The marker appears as a rhombic sign (as shown below) for identifying points on a trace. You can easily read the amplitude, frequency and sweep time of the marked point on the trace.

- The analyzer allows for up to eight/four pairs of markers to be displayed at one time, but only one pair or a single marker is active every time.
- You can use the numeric keys, knob or direction keys to modify the desired frequency or time as well as view the readouts of different points on the trace.

9.8.1 Select Marker

Select one of the eight markers. The default is Marker1. When a marker is selected, you can set its type, trace to be marked, readout type and other related parameters. The enabled marker will appear on the trace selected through the **Select Trace** option and the readouts of this marker are also displayed in the active function area and at the upper right corner of the screen.

Command format	**:CALCulate:MARKer:SELEct** **:CALCulate:MARKer:SELEct?**
Instructions	Sets/Gets the current marker
Parameter Type	Enumeration1-8
Return	Enumeration: 1-8
Example	:CALCulate:MARKer:SELEct 5

9.8.2 Select Trace

Select the trace to be marked by the current marker. Valid selections includeTrace1, 2, 3, 4, 5, 6.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe 1|2|3|4|5|6** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe?**
Instructions	Sets/Gets the marker trace
Parameter Type	Enumeration
Parameter Range	1|2|3|4|5|6
Return	Enumeration
Example	CALCulate:MARK:TRAC 1

9.8.3 Marker Type

9.8.3.1 Normal

One of the marker types. It is used to measure the X (Frequency or Time) and Y (Amplitude) values of a certain point on the trace. When selected, a marker with the number of the current marker (such as “ **1** ”) appears on the trace.

- If no active marker exists currently, a marker will be enabled automatically at the center frequency of the current trace.

- You can use the numeric keys, knob or direction keys to move the marker. The readouts of the marker will be displayed at the upper right corner of the screen.
- The readout resolution of the X-axis (frequency or time) is related to the span. For higher readout resolution, reduce the span.

9.8.3.2 Delta

One of the marker types. It is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the reference point and a certain point on the trace. When selected, a pair of markers appears on the trace: Fixed Related Marker (marked by a combination of the marker number and letter “ **+** ”, such as “ **2+** ”) and the Delta Marker (marked by the “∆”, such as “ 1∆2 ”).

- After the marker selects “Delta”, the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference “fixed” marker.
- The delta marker is in the "relative to" state, and its X-axis position can be changed; the related marker is in the "fixed" state by default (the X-axis and Y-axis positions are fixed), but the X-axis can be adjusted by changing to the "normal" state.
- The first row in the upper right corner of the trace area shows the frequency (or time) difference and amplitude difference between the two markers; the second row in the upper right corner of the trace area shows the X axis and amplitude value of the related marker.
- Delta reset. It is only valid when the current marker is a differential marker. If the marker type of the relative marker of the current marker is normal or differential, change the horizontal position of the relative marker to the horizontal position of the current marker; if the marker type of the relative marker is fixed, change the horizontal position and vertical position of the relative marker to the current one. The horizontal and vertical position of the marker.

9.8.3.3 Fixed

One of the marker types. When “Fixed” is selected, the X-axis and Y-axis of the marker will not change by the trace and can only be changed through the menu. The fixed marker is marked with "+".

After the marker selects “Delta”, the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference “fixed” marker

9.8.3.4 Off

Turn off the marker currently selected. The marker information displayed on the screen and functions based on the marker will also be turned off.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE POSition|DELTa|FIXed|OFF :CALCulate:MARKer[1]|2|3|4:MODE?
Instructions	Sets/Gets the marker mode
Parameter Type	Enumeration
Parameter Range	POSition DELTa FIXed OFF
Return	Enumeration: POS|DELT|FIX|OFF
Example	:CALCulate:MARK1:MODE POSition

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe OFF|ON|0|1 :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe?
Instructions	Sets/gets the marker switch status
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARK1:STATe ON

Command format	:CALCulate:MARKer:AOFF
Instructions	Close all markers
Example	:CALCulate:MARKer:AOFF

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8 [:SET]:RESEt:DELTa
Instructions	Difference marker resets to 0 Only valid when the current cursor is a differential marker
Example	:CALCulate:MARKer2:RESEt:DELTa

9.8.4 Marker Postion

Displays and sets the position of the marker. Only the x-axis position can be set.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X?
Instructions	Sets/gets the value of the marker point X axis This command takes effect only when the marker mode is not OFF： :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE If the marker readout type is frequency, the parameter is frequency. When the marker readout type is time, the value is time. Reference commands::CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout
Parameter Type	frequency , Float , unitHz , kHz , MHz , GHz , default Hz or time , Float , unitus , ms , s , ks , default s
Parameter Range	0 Hz ~ max span or 10 ms ~ 1000 s
Return	When the marker readout type is frequency, the reading is frequency, floating point type, in Hz; When the marker readout type is time, the reading is time, floating point type, in s; When the marker readout type is cycle, the reading is cycle, floating point type, unit s;

Example	:CALCulate:MARKer4:X 0.4 GHz :CALCulate:MARKer4:X 200 ms :CALCulate:MARKer4:X?

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y?**
Instructions	Read the value of the Y-axis of the marker point, which can also be used to read the marker noise in the marker function. To execute this command, ensure that the marker is in the onstate.:CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE
Parameter Type	Float
Parameter Range	None
Return	Float , unitdBm
Example	:CALCulate:MARKer1:Y? Return: -25

9.8.5 Readout Type

Select a desired readout type for the X-axis for the marker. Different markers can use different readout types. This setting will change the readout type and affect the marker readings in the active function area and at the upper right corner of the screen, but will not change the actual value.

Frequency

In this type, Normal marker shows the absolute frequency. Delta markers and Delta Pair markers show the frequency difference between the delta marker and reference marker. The default readout mode in non-zero span is “**Frequency**”.

Note: This type is invalid in Zero span.

Period

In this type, the Normal marker shows the reciprocal of frequency; while Delta marker and Delta Pair marker show the reciprocal of frequency difference. When the frequency difference is zero, the reciprocal is infinite and 100 Ts is displayed.

Note: This type is invalid in Zero span.

Time

In this type, the Normal marker shows the time difference between the marker and the start of the sweep; while Delta marker and Delta Pair marker show the sweep time difference between the delta marker and reference marker.

The default readout mode in Zero span is Time.

Inverse Time

In this type, the Normal marker Inverse Time = 1 / Time; while Delta marker and Delta Pair marker s

Inverse Time = 1 / Δ Time.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout FREQuency | TIME | PERiod | INTIme** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout?**
Instructions	Sets/gets the marker in X-axis reading mode
Parameter Type	Enumeration
Parameter Range	FREQuency: frequency TIME PERiod INVERSE_TIME
Return	Enumeration: FREQ|TIME|PER| INTIme
Example	:CALCulate:MARKer1:X:READout FREQuency

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout:AUTO 0|1** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout:AUTO?**
Instructions	Sets/gets the marker in X-axis reading mode auto
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:X:READout:AUTO 1

9.8.6 Marker Couple

When Marker Couple is on, Markers are set up and moved in coupled operation on all traces. When Marker Couple is off, Markers are set up and moved independently for each trace.

Command format	**:CALCulate[:SELected]:MARKer:COUPle** **:CALCulate[:SELected]:MARKer:COUPle?**
Instructions	Set/query the marker coupling switch
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:COUPle 1 :CALCulate:MARKer:COUPle?

9.8.7 Marker Lines

Mark the marker with the intersection of horizontal and vertical lines, which is more convenient to query the marker position in the waveform area.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:LINE:STATe** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:LINE:STATe?**
Instructions	Sets/gets the marker line switch
Parameter Type	Boolean

Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer2:X:LINE:STATe 1 :CALCulate:MARKer2:X:LINE:STATe?

9.8.8 Marker Table

Enable or disable the Marker Table.

Display all the markers enabled on the lower portion of the screen, including marker number, trace number, marker readout type, X-axis readout and amplitude. Through this table you can view the measurement values of multiple points. The table allows for up to eight markers to be displayed at one time.

Command format	**:CALCulate:MARKer:TABLe ON|OFF|0|1** **:CALCulate:MARKer:TABLe?**
Instructions	Sets/gets the marker table state
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:TABLe ON

9.8.9 Marker Funtion

Special marker functions including Noise Marker, N dB BW and Freq Counter.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FUNCtion OFF|FCOunt|NOISe|NDB** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FUNCtion?**
Instructions	Set/Get marker function
Parameter Type	Enumeration
Parameter Range	OFF: normal NOISe: noisy marker NDB: N dB marker
Return	Enumeration: OFF|NOISe|NDB
Example	:CALCulate:MARK1:FUNCtion NOISe

9.8.9.1 N dB BW

Enable the N dB BW measurement or set the value of N dB. The N dB BW denotes the frequency difference between two points that are located on both sides of the current marker and with N dB fall (N Less than or equal to 0) or rise (N>0) in amplitude as shown in the figure on the next page.

When the measurement starts, the analyzer will search for the two points which are located at both sides of the current point with N dB fall or rise in amplitude and display the frequency difference between the two points in the active function area. "----" would be displayed if the search fails.

The parameters in the figure are shown as:

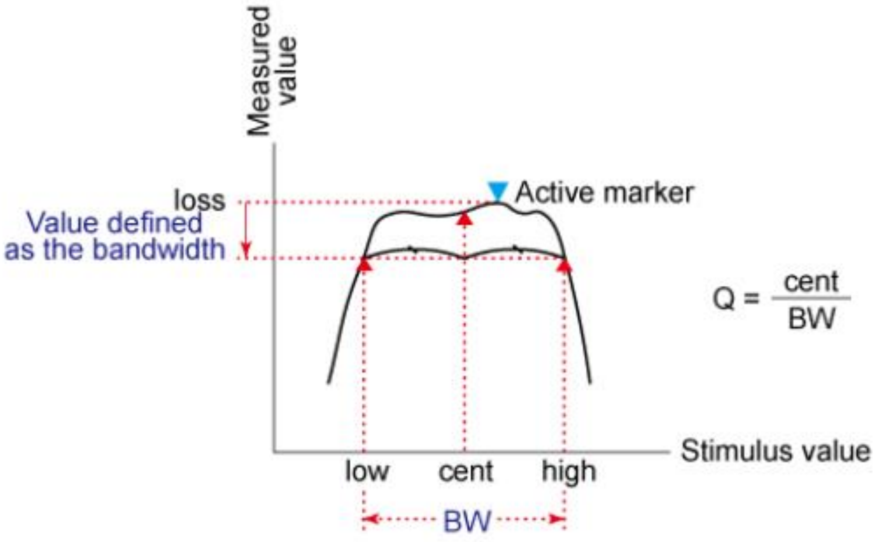


Figure 9-3 N dB parameter

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth:NDB** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth:NDB?**
Instructions	Set/Obtain the N dB bandwidth reference value
Parameter Type	Float
Parameter Range	-100 dB ~ 100 dB
Return	Float
Example	:CALCulate:MARK1:BANDwidth:NDB 10 DB

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth:RESult?**
Instructions	Result of setting/reading N dB bandwidth
Return	Float
Example	:CALCulate:MARK1:BANDwidth:RESult?

9.8.9.2 Freq Counter

Turn on or off the frequency counter. The frequency readout is accuracy is up to 0.01 Hz.

- The function is valid only when selecting marker 1.
- If marker 1 is selected but not active, turning on the frequency counter will open marker 1 Normal marker automatically.
- The frequency counter measures the frequency near the center frequency in Zero span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt:[:STATe] ON|OFF|0|1** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt:[:STATe]?**

Instructions	Sets/gets the marker frequency counter state
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARK1:FCOunt 1

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt:X?**
Instructions	Read the marker frequency counter reading
Return	Float
Example	:CALCulate:MARK1:FCOunt:X?

9.8.9.3 Noise Marker

Execute the Noise marker function for the selected marker and read the normalized noise power spectral density.

- If the current marker is " **Off** " in the Marker menu, pressing **Noise Marker** will first set it to Normal type automatically; then measure the average noise level at the marked point and normalize this value to 1 Hz bandwidth. During this process, certain compensation is always made based on the detection and trace types. The measurement will be more precise if RMS Avg or Sample detection type is used.
- This function can be used for measuring the C/N ratio.

9.8.9.4 Off

Turn off the noise marker, N dB BW measurement or Frequency Counter, but not the marker itself.

9.8.10 Peak Search

Open the peak search setting menu and execute peak search.

9.8.10.1 Peak Search

Next Search

Execute peak search and mark the peak.

Minium Peak

Execute minimum search and mark the minium peak.

Next Peak

Search for and mark the peak whose amplitude is closest to that of the current peak and which meets the peak search condition.

Next Left Peak

Search for and mark the nearest peak which is located at the left side of the current peak and meets the peak search condition.

Next Right Peak

Search for and mark the nearest peak which is located at the right side of the current peak and meets the peak search condition.

Peak Peak

Execute peak search and minimum search at the same time and mark the results with delta pair markers. Wherein, the result of peak search is marked with the delta marker and the result of minimum search is marked with the reference marker.

Peak -> CF

Execute peak search and set the center frequency of the analyzer to the frequency of the peak. The function is invalid in Zero Span.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum**
Instructions	Marker searches for peaks and marks them with the specified marker (If peak-to-peak value is on, peak-to-peak value search is carried out; otherwise, single peak value search is carried out, refer to the command:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak:STATe Search criteria include peak type, absolute threshold, and relative offset :CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer4:MAXimum

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum**
Instructions	Marker searches for the minimum peak and marks it with the specified marker
Example	:CALCulate:MARKer4:MINimum

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:NEXT**
Instructions	Marker searches for the next peak and marks it with the specified marker (Based on the set search criteria, including peak type, absolute threshold, and relative offset, see the following command:CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer1:MAXimum:NEXT

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:LEFT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:RIGHt**
Instructions	Marker searches for left/right peaks and marks with the specified marker (Based on the set search criteria, including peak type, absolute threshold, and relative offset, see the following command

	:CALCulate:MARKer:PEAK:SEARch:MODE :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:EXCursion)
Example	:CALCulate:MARKer1:MAXimum:LEFT

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak**
Instructions	Performs a peak-to-peak search, marking with the specified marker
Example	:CALCulate:MARKer1:PTPeak

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum[:SET]:CENTer**
Instructions	Execute peak search and set the center frequency of the analyzer to the frequency of the peak
Example	:CALCulate:MARKer1:MAXimum:CENTer

9.8.10.2 Peak Config

Define the conditions of peak search for various peak searches. A real peak should meet the requirements of both the “**Peak Threshold**” and “**Peak Excursion**”.

Peak Threshold

Assign a minimum for the peak amplitude. Peaks whose amplitudes are greater than the specified peak threshold are treated as real peaks.The actual minimal peak threshold is -200dBm when shut down the Peak Threshold.

Peak Excursion

Set the excursion between the peak and the minimum amplitude on both sides of it. Peaks whose excursions are beyond the specified excursion are treated as real peaks.The actual minimal peak excursion is 0dBm when shut down the Peak Excursion.

Command format	**:CALCulate:MARKer:PEAK:THReshold** **:CALCulate:MARKer:PEAK:THReshold?**
Instructions	Sets/gets the absolute threshold for the peak search criteria
Parameter Type	Float , unitdBm
Parameter Range	-200.0 dBm~ 200.0 dBm
Return	Float , unitdBm
Example	:CALCulate:MARKer:PEAK:THReshold -50

Command format	**:CALCulate:MARKer:PEAK:THReshold:STATe** **:CALCulate:MARKer:PEAK:THReshold:STATe?**
Instructions	Set or obtain the absolute threshold switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:CPSEarch ON

Command format	:CALCulate:MARKer:PEAK:EXCursion :CALCulate:MARKer:PEAK:EXCursion?
Instructions	Sets/gets a relative threshold for the peak search criteria
Parameter Type	Float , unitdB
Parameter Range	0 ~ 200.0 dB
Return	Float , unitdB
Example	:CALCulate:MARKer:PEAK:EXCursion 10

Command format	:CALCulate:MARKer:PEAK:EXCursion:STATe :CALCulate:MARKer:PEAK:EXCursion:STATe?
Instructions	Set and obtain the relative threshold switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer:PEAK:EXCursion:STATe ON

9.8.10.3 Count Peak

Enable or disable continuous peak search. The default is Off. When enabled, the system will always execute a peak search automatically after each sweep in order to track the signal under measurement.

Command format	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe] :CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe]?
Instructions	Enable the continuous peak search function Gets the status of the continuous peak search function switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARKer1:CPSEarch ON

9.8.10.4 Peak Table

Open the peak table (in the lower window) which lists the peaks (with frequency and amplitude) that meet the peak search condition. Up to 30 peaks can be displayed in the table.

Command format	:CALCulate:MARKer:PEAK:TABLe :CALCulate:MARKer:PEAK:TABLe?
Instructions	Set/Query the switch of the peak value table
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:PEAK:TABLe ON

Command format	:CALCulate:PEAK:TABLe?
Instructions	Get peak table data
Return	String
Example	:CALCulate:PEAK:TABLe?

9.8.10.5 Sort Order

Sort all signals in the peak table by the specific order.

Sort order based on the frequency / time(zero span) , ampt or delta to limit.

Command format	:CALCulate:MARKer:PEAK:SORT :CALCulate:MARKer:PEAK:SORT?
Instructions	Sets/gets the peak sorting basis
Parameter Type	Enumeration
Parameter Range	AMPT|FREQ|DELTa
Return	AMPT|FREQ|DELTa
Example	:CALCulate:MARKer:PEAK:SORT FREQ :CALCulate:MARKer:PEAK:SORT?

Command format	:CALCulate:MARKer:PEAK:SORT:ORDEr :CALCulate:MARKer:PEAK:SORT:ORDEr?
Instructions	Sets/Gets the peak sort type
Parameter Type	Enumeration
Parameter Range	ASC|DEC
Return	ASC|DEC
Example	:CALCulate:MARKer:PEAK:SORT:ORDEr DEC :CALCulate:MARKer:PEAK:SORT:ORDEr?

Command format	:CALCulate:MARKer:PEAK:TABLe:DTLimit :CALCulate:MARKer:PEAK:TABLe:DTLimit?
Instructions	Peak sorting based on limit selection
Parameter Type	Integer
Parameter Range	1-6
Return	1-6
Example	:CALCulate:MARKer:PEAK:TABLe:DTLimit 5 :CALCulate:MARKer:PEAK:TABLe:DTLimit?

Command format	:CALCulate:MARKer:PEAK:TABLe:DTLimit:STATe 0|1 :CALCulate:MARKer:PEAK:TABLe:DTLimit:STATe?
Instructions	Set/Query the switch of the peak value table
Parameter Type	Boolean
Parameter Range	ON|OFF|0|1
Return	0|1
Example	:CALCulate:MARKer:PEAK:TABLe:DTLimit:STATe ON

9.9 Meas & Meas Setup

Provide optional measurement functions. When activated, the screen will be divided into two parts. The above part is the measure screen which displays traces, and the other part is used to display measurement results.

9.9.1 Swept SA

The Swept SA measurement lets you perform “traditional” Spectrum Analysis, that is, Swept and Zero Span measurements, as well as “Swept FFT” analysis (FFT analysis presented as though it were swept).

9.9.1.1 Average Type

Choose one of the following averaging types: log power (video), power (RMS), or voltage averaging. When trace average is on, the average type is shown on the left side of the display.

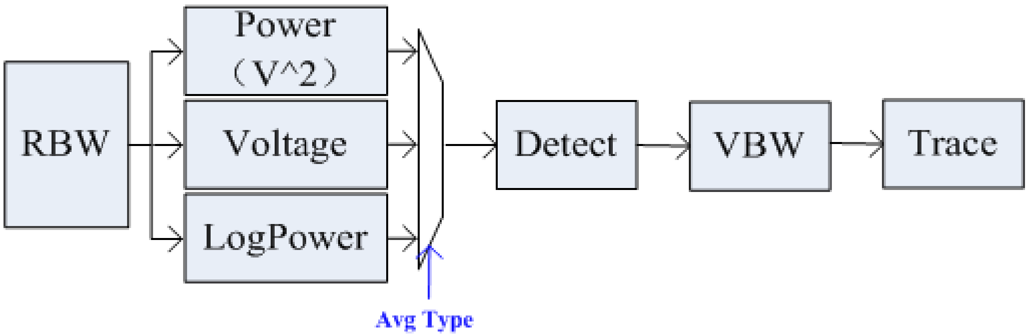


Figure 9-4 Average Type

- **Log Power**
  Select the logarithmic (decibel) scale for all filtering and averaging processes. This scale is "Video" because it is the most common display and analysis scale for the video signal within analyzer. This scale is excellent for finding Sine/CW signals near noise.

- **Power Average**
  In this average type, all filtering and averaging processes work on the power (the square of the magnitude) of the signal, instead of its log or envelope voltage. This scale is best for real-time power measurement of complex signals.

- **Voltage Average**
  In this Average type, all filtering and averaging processes work on the voltage of the envelope of the signal. This scale is suitable for observing rise and fall behavior of AM or pulse-modulated signals such as radar and TDMA transmitters.

Command format	[:SENSe]:AVERage:TYPE LOGPower|POWer|VOLTage [:SENSe]:AVERage:TYPE?
Instructions	Set/Query the average type
Parameter type	Enumeration
Parameter Range	LOGPower POWer VOLTage
Return	Enumeration: LOGP|POW|VOLT
Example	AVERage:TYPE VOLTage

Command format	[:SENSe]:AVERage:TYPE:AUTO 0|1|ON|OFF [:SENSe]:AVERage:TYPE:AUTO?
Instructions	Set/query the average type automatically
Parameter type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:AVERage:TYPE:AUTO 1

9.9.1.2 Average/Hold Number

Sets the terminal count number N for Average, Max Hold and Min Hold trace types. This number is an integral part of how the average trace is calculated. Basically, increasing N results in a smoother average trace.

Command format	[:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:COUNt [:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:COUNt?
Instructions	Sets/gets the average number of traces
Parameter type	Integer
Parameter Range	1 ~ 999
Return	Integer
Example	:AVERage:TRACe1:COUNt 10

Command format	[:SENSe]:AVERage:TRACe[1]|2|3|4|5|6? [:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:CLEar
Instructions	The current average number of times the trace has been obtained Restart average
Example	:AVERage:TRACe2 ? :AVERage:TRACe2:CLEar

9.9.1.3 Pulse Setting and Display

Pulse: Mainly refers to the process in which a physical quantity quickly returns to its initial state after a sudden change in duration. Pulse is a signal that occurs in a short period of time relative to a continuous signal throughout the entire signal cycle. Pulse generally includes main characteristic parameters such as pulse amplitude, pulse width, pulse rise time, pulse fall time, pulse period, pulse frequency, etc.

Trace average

The sum of all amplitudes of the entire trace divided by the number of scan points (dBm).

Determine the top (TOP) and bottom (BASE) of the pulse, positive peak (PosPeak), negative peak (NegPeak), and pulse properties

The entire pulse trace will first calculate the maximum and minimum amplitude values, and then generate a pulse table by counting the amplitude histogram of the entire trace. The pulse table is sorted by amplitude size. The highest level (dBm) in the current statistical table is denoted as (PosPeak), and the lowest level (dBm) is denoted as (NegPeak),

Intermediate level: $Ampt_{mid}$ = (PosPeak - NegPeak) / 2 + NegPeak ,

The intermediate level divides the pulse meter into upper and lower parts according to the rules of $Ampt_{mid}$ above/below the intermediate level. In automatic mode, the pulse top (TOP) is the mode of the upper sub pulse table, and the pulse bottom (BASE) is the mode of the lower sub pulse table. Count and compare the total number of pulse points in the upper and lower parts of the pulse table. The pulse with more points in the upper part is a positive pulse, while the pulse with more points in the lower part is a negative pulse.

Determine the edge of the pulse

When a trace continuously passes through the pulse low reference (RefLow, 10%), pulse continuous reference (RefDuration, 50%), pulse high reference (RefHigh, 90%) (referred to as the rising edge), or when it passes through these three reference amplitudes in the opposite direction (referred to as the falling edge), mark this trace as the edge of the pulse. To fully measure the parameters of a pulse, at least 3 edges are required. When there are less than 3 edges, most pulse measurement results will be displayed as "NAN".

Determine the pulse edge to be measured

When the pulse is a positive pulse, if the first edge is the rising edge, then the measured rising edge is the first edge, and the falling edge is the second edge; If the first edge is a falling edge, then the measured rising edge is the second edge, and the falling edge is the third edge.

When the pulse is negative, if the first edge is the rising edge, then the measured falling edge is the second edge, and the rising edge is the third edge; If the first edge is a falling edge, then the measured falling edge is the first edge and the rising edge is the second edge.

Pulse period

The period of a pulse is the average period of all complete cycle traces.

Pulse duration and pulse center

The pulse duration is the time difference between a positive pulse (negative pulse) passing through the pulse duration reference (RefDuration, 50%) on the rising edge (falling edge) and a falling edge (rising edge) passing through the pulse duration reference (RefDuration, 50%).

The pulse center is the center point where the rising edge (falling edge) of a positive pulse (negative pulse) passes through the pulse duration reference (RefDuration, 50%) and the falling edge (rising edge) passes through the pulse duration reference (RefDuration, 50%).

Pulse closing time

Pulse off time=pulse period - pulse duration

Pulse rise time and fall time

The pulse rise time is the time it takes for the first rising edge of a pulse to pass between the low reference (RefLow, 10%) and the high reference (RefHigh, 90%).

The pulse descent time is the time it takes for the first descending edge of the pulse to pass between the high reference (RefHigh, 90%) and the low reference (RefLow, 10%).

Upward overshoot, ascending overshoot, descending overshoot, descending overshoot

Rising forward excitation is the difference between the minimum amplitude of the first rising edge along the trace and the pulse base at the time of the last passing through the pulse base, and the difference between the minimum amplitude of the previous passing through the pulse base and the pulse base.

Rising overshoot is the difference between the maximum amplitude of the first rising edge of a trace passing through the pulse top (TOP) for the first time and the pulse top (TOP) for the second time.

Descending pre excitation is the difference between the maximum amplitude and the pulse top (TOP) of the first descending edge along the trace at the time point of the last passing through the top of the pulse.

Descending overshoot is the difference between the minimum amplitude of the first falling edge of a trace passing through the pulse base for the first time and the pulse base for the second time.

Waveform average

The waveform average is the average power of all points within the complete cycle of the trace. If there is not at least one complete cycle, the waveform average will return "NAN".

Pulse average value

The pulse average is the average amplitude of all points above the high reference (RefHigh, 90%) of a positive pulse. If there is no positive pulse, return "NAN".

Command format	**[:SENSe]:DISPlay:WINDow:TRACe:Y:DLINe:STATe** **[:SENSe] :DISPlay:WINDow:TRACe:Y:DLINe:STATe?**

Instructions	Set/Get Amplitude Line Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISPlay:WINDow:TRACe:Y:DLINe:STATe 1

Command format	**[:SENSe] :DISPlay:WINDow:TRACe:Y:DLINe [:SENSe] :DISPlay:WINDow:TRACe:Y:DLINe?**
Instructions	Setting/Get amplitude line values
Parameter Type	Enumeration
Parameter Range	
Return	
Example	:DISPlay:WINDow:TRACe:Y:DLIN 20

Command format	**[:SENSe] :DISPlaX:WINDow:TRACe:X:FLINe:STATe [:SENSe] :DISPlaX:WINDow:TRACe:X:FLINe:STATe?**
Instructions	Set/Get Timeline Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISPlaX:WINDow:TRACe:X:FLINe:STATe 1

Command format	**[:SENSe] :DISPlaX:WINDow:TRACe:X:FLINe [:SENSe] :DISPlaX:WINDow:TRACe:X:FLINe?**
Instructions	Set/Get Timeline Values
Parameter Type	Enumeration
Parameter Range	
Return	Enumeration: LOGP|POW|VOLT
Example	:DISPlaX:WINDow:TRACe:X:FLINe 5

Command format	**[:SENSe]:PULSe:LABel:ALL:OFF**
Instructions	Set ALL OFF Switch
Parameter Type	Boolean
Parameter Range	
Return	
Example	:PULSe:LABel:ALL:OFF

Command format	**[:SENSe]:PULSe:LABel:INSTant:REFerence:DURation [:SENSe]:PULSe:LABel:INSTant:REFerence:DURation?**
Instructions	Set/Get Duration Instant Intersection Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:INSTant:REFerence:DURation 1

Command format	[:SENSe]:PULSe:LABel:LEVel:REFerence:DURation [:SENSe]:PULSe:LABel:LEVel:REFerence:DURation?
Instructions	Set/Get Duration Ref line Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:LEVel:REFerence:DURation 1

Command format	[:SENSe]:PULSe:REFerence:DURation [:SENSe]:PULSe:REFerence:DURation?
Instructions	Sets/gets Duration Ref line Position percentage
Parameter Type	Boolean
Parameter Range	
Return	
Example	:PULSe:REFerence:DURation 50

Command format	[:SENSe]:PULSe:LEVel:TYPE:AUTO [:SENSe]:PULSe:LEVel:TYPE:AUTO?
Instructions	Sets/gets Auto Ref Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LEVel:TYPE:AUTO 1

Command format	[:SENSe]:PULSe:LABel:LEVel:REFerence:HIGH [:SENSe]:PULSe:LABel:LEVel:REFerence:HIGH?
Instructions	Sets/gets High Ref line Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:LEVel:REFerence:HIGH 1

Command format	[:SENSe]:PULSe:LEVel:USER:TOP [:SENSe]:PULSe:LEVel:USER:TOP?
Instructions	Sets/gets Pulse Top value
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LEVel:USER:TOP 20

Command format	[:SENSe]:PULSe:LABel:LEVel:REFerence:LOW [:SENSe]:PULSe:LABel:LEVel:REFerence:LOW?
Instructions	Sets/getsLow Ref line Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:LEVel:REFerence:LOW 1

Command format	**[:SENSe] :PULSe:LEVel:USER:BOTTom** **[:SENSe] :PULSe:LEVel:USER:BOTTom?**
Instructions	Sets/getsPulse Base value
Parameter Type	Boolean
Parameter Range	
Return	
Example	:PULSe:LEVel:USER:BOTTom 12

Command format	**[:SENSe]:PULSe:LABel:INSTant:CENTer** **[:SENSe]:PULSe:LABel:INSTant:CENTer?**
Instructions	Sets/gets Center line Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:INSTant:CENTer 1

Command format	**[:SENSe]:PULSe:REFerence:HIGH** **[:SENSe]:PULSe:REFerence:HIGH?**
Instructions	Sets/gets High Ref line Position percentage
Parameter Type	Boolean
Parameter Range	
Return	
Example	:PULSe:REFerence:HIGH 90

Command format	**[:SENSe]:PULSe:LABel:INSTant:REFerence:HIGH** **[:SENSe]:PULSe:LABel:INSTant:REFerence:HIGH?**
Instructions	Sets/gets High Instant Intersection switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:INSTant:REFerence:HIGH 1

Command format	**[:SENSe]:PULSe:LABel:LEVel:REFerence:HIGH** **[:SENSe]:PULSe:LABel:LEVel:REFerence:HIGH?**
Instructions	Sets/gets High Ref line Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:LEVel:REFerence:HIGH 1

Command format	**[:SENSe]:PULSe:REFerence:LOW** **[:SENSe]:PULSe:REFerence:LOW?**
Instructions	Sets/gets Low Ref line Position percentage
Parameter Type	Boolean
Parameter Range	
Return	
Example	:PULSe:REFerence:LOW 10

Command format	[:SENSe]:PULSe:LABel:INSTant:REFerence:LOW [:SENSe]:PULSe:LABel:INSTant:REFerence:LOW?
Instructions	Sets/gets Low Instant Intersection switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:AVERage:TYPE:AUTO 1

Command format	[:SENSe]:PULSe:LABel:LEVel:REFerence:LOW [:SENSe]:PULSe:LABel:LEVel:REFerence:LOW?
Instructions	Sets/getsLow Ref line Switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:PULSe:LABel:INSTant:REFerence:LOW 1

Command format	[:SENSe]:FUNCtion:FALLtime?
Instructions	Gets descent time
Parameter Type	Boolean
Example	:FUNCtion:FALLtime?

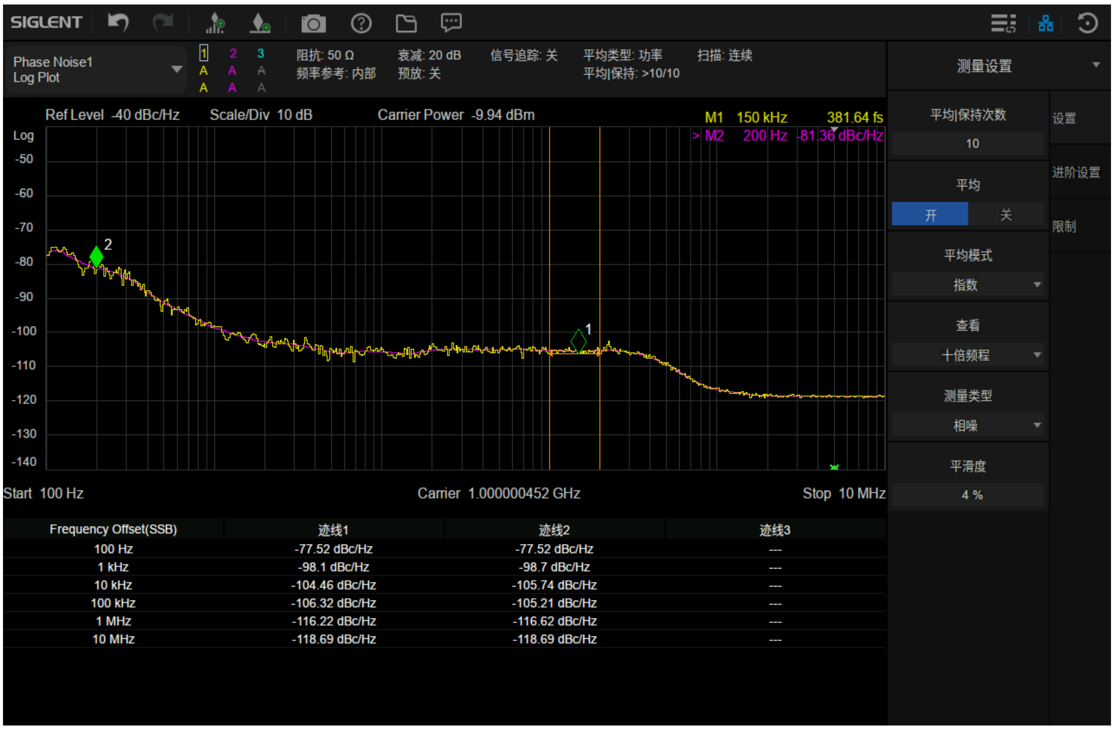
Command format	[:SENSe]:FUNCtion:RISetime?
Instructions	Gets rise time
Parameter Type	Boolean
Example	:FUNCtion:RISetime?

Command format	[:SENSe]:FUNCtion:DURAtiontime?
Instructions	Gets duration
Parameter Type	Boolean
Example	:FUNCtion:DURAtiontime?

Command format	[:SENSe]:FUNCtion:PERIodtime?
Instructions	Gets period
Parameter Type	Boolean
Example	:FUNCtion:PERIodtime?

10 Phase Noise Measurement Mode

The phase noise mode is mainly used for measuring single sideband phase noise testing analysis, jitter analysis, etc.



10.1 Frequency & Span

10.1.1 Carrier Frequency

Specify the center frequency of the carrier wave.

Command format	**[:SENSe]:FREQuency:CARRier** **[:SENSe]:FREQuency:CARRier?**
Instruction	Sets/gets the center frequency
Parameter Type	Float, unit:Hz , kHz , MHz , GHz
Parameter Range	50Hz~28GHz
Return	Float, unit:Hz
Example	:FREQuency:CARRier 0.2 GHz :SENSe:FREQuency:CARRier 0.2 GHz

10.1.2 Start Offset

Specify the center frequency of the carrier wave. Set the starting frequency offset of the logarithmic plot, which refers to the offset frequency of the upper sideband from the carrier frequency.

Command format	[:SENSe]:LPLot:FREQuency:OFFSet:STARt [:SENSe]:LPLot:FREQuency:OFFSet:STARt?
Instruction	Sets/gets Start offset of scanned upper sideband
Parameter Type	Float, unit:Hz , kHz , MHz , GHz
Parameter Range	1Hz~2.8GHz
Return	Float, unit:Hz
Example	:LPLot:FREQuency:OFFSet:STARt 100 Hz :SENSe:LPLot:FREQuency:OFFSet:STARt 0.2 GHz

10.1.3 Stop Offset

Set the end frequency offset of the logarithmic plot, which refers to the offset frequency of the upper sideband from the carrier frequency.

Command format	[:SENSe]:LPLot:FREQuency:OFFSet:STOP [:SENSe]:LPLot:FREQuency:OFFSet:STOP?
Instruction	Sets/gets End offset of scanned upper sideband
Parameter Type	Float, unit:Hz , kHz , MHz , GHz
Parameter Range	100Hz~28GHz
Return	Float, unitHz
Example	:LPLot:FREQuency:OFFSet:STOP 100 Hz :SENSe:LPLot:FREQuency:OFFSet:STOP 0.2 GHz

10.1.4 Auto Tune

Automatically search for carrier signals throughout the entire frequency range, adjust frequency and amplitude parameters to the optimal state, and achieve signal search and parameter automatic setting with just one click.

When this function is executed, "Auto Tune" is displayed in the screen status bar. After the automatic search is completed, the "Auto Tune" flag in the screen status bar disappears.

The automatic search process will modify parameters such as scanning range, reference level, scale size, input attenuation, etc.

Command format	[:SENSe]:FREQuency:CARRier:SEARch
Instruction	Search for carrier signal
Example	:FREQuency:CARRier:SEARch :SENSe:FREQuency:CARRier:SEARch

10.1.5 Singal Tracking

Used to track signals with unstable measurement frequency and instantaneous amplitude changes less than 3 dB. When signal tracking is turned off, the analyzer measures at a fixed carrier frequency. When signal tracking is turned on, the analyzer repeatedly measures the center frequency of the carrier signal during each acquisition and returns a new carrier frequency if necessary.

Command format	**[:SENSe]:FREQuency:CARRier:TRACk[:STATe] [:SENSe]:FREQuency:CARRier:TRACk[:STATe]?**
Instruction	Sets/gets Signal tracking status
Parameter Type	bool
Parameter Range	0|1|OFF|ON
Return	0|1
Example	:FREQuency:CARRier:TRACk ON :SENSe:FREQuency:CARRier:TRACk:STATe OFF

Command format	**[:SENSe]:FREQuency:CARRier:TRACk:SPAN [:SENSe]:FREQuency:CARRier:TRACk:SPAN?**
Instruction	Sets/gets Frequency range of signal tracking
Parameter Type	Float, unit:Hz , kHz , MHz , GHz
Parameter Range	10kHz~50kHz
Return	Float, unit:Hz
Example	:FREQuency:CARRier:TRACk ON :SENSe:FREQuency:CARRier:TRACk:STATe OFF

10.2 Sweep

10.2.1 Sweep Points

Sweep Points characterized the number of scanning and trace display points (601~10001).
More scanning points will improve the resolution of the waveform, while also affecting the minimum scanning time, increasing data processing time and remote access time, and reducing response rate.

Command format	**[:SENSe]:SWEep:POINts** **[:SENSe]:SWEep:POINts?**
Instruction	Sets sweep points. Gets sweep points.
Parameter Type	integer
Parameter Range	601-10001
Return	601-10001
Example	:SWEep:POINts 2001 :SWEep:POINts?

10.2.2 Sweep/Measure

Single/Continue controls analyzer to perform single or continuous sweep/measure,

Restart

Restart the current sweep or measure. In particular, if the sweep parameters are modified, a restart will be performed.

Command format	**:INITiate:CONTinuous OFF|ON|0|1** **:INITiate:CONTinuous?**
Instruction	Sets continuous sweep mode on-off. Gets continuous sweep mode state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:INITiate:CONTinuous OFF

Command format	**:INITiate[:IMMediate]**
Instruction	Restarts the current sweep.
Example	:INITiate:IMMediate

Command format	**:INITiate:RESTart**
Instruction	Restarts the current sweep.
Example	:INITiate:RESTart

10.3 Amplitude

10.3.1 Ref Level

Set absolute power reference value. The position of the reference level can be set to top, middle, or bottom.

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel** **:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?**
Instruction	Sets/gets reference level.
Parameter Type	Float, unitdBc
Parameter Range	-200dBc~20dBc
Return	Float, unitdBc
Example	:DISPlay:WINDow:TRACe:Y:RLEVel -20 :DISPlay:WINDow:TRACe:Y:RLEVel?

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:RPOSition** **:DISPlay:WINDow:TRACe:Y[:SCALe]:RPOSition?**
Instruction	Sets/gets the reference level for the Y-axis.
Parameter Type	Enumeration value
Parameter Range	TOP|CENTer|BOTTom
Return	Enumeration value
Example	:DISPlay:WINDow:TRACe:Y:RPOSition TOP :DISPlay:WINDow:TRACe:Y:RPOSition?

10.3.2 Y Axis Scale Type

Set the scale size of each grid on the vertical axis to adjust the current range of displayed amplitudes. Pay attention to the following points during use:
Adjust the current displayed amplitude range by setting different scales.

The current signal amplitude range that can be displayed:
Minimum value: Reference level – 10 ∗ Current scale;

The maximum value is: reference level.

Command format	**:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision** **:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision?**
Instruction	Sets/gets the scale
Parameter Type	Float
Parameter Range	0.1dB ~ 20dB
Return	Float , unit dB
Example	:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision 5dB

10.4 Marker

10.4.1 Select Marker

Select one of the eight markers. The default is Marker1. When a marker is selected, you can set its type, trace to be marked, readout type and other related parameters. The enabled marker will appear on the trace selected through the **Select Trace** option and the readouts of this marker are also displayed in the active function area and at the upper right corner of the screen.

Command format	**:CALCulate:LPLot:MARKer:SELEct** **:CALCulate:LPLot:MARKer:SELEct?**
Instruction	Sets/Gets the current marker
Parameter Type	Enumeration1-8
Return	Enumeration: 1-8
Example	:CALCulate:LPLot:MARKer:SELEct 5

Command format	**:CALCulate:MARKer:TABLe[:STATe]** **:CALCulate:MARKer:TABLe[:STATe]?**
Instruction	Sets/Gets the marker state
Parameter Type	bool, 0|1|ON|OFF
Return	bool, 0|1|ON|OFF
Example	:CALCulate:MARKer:TABLe ON

10.4.2 Select Trace

Select the trace to be marked by the current marker.1, 2, 3.

Command format	**:CALCulate:LPLot:MARKer[1]|2|3:TRACe 1|2|3** **:CALCulate:LPLot:MARKer[1]|2|3:TRACe?**
Instruction	Sets/Gets the marker trace
Parameter Type	Enumeration
Parameter Range	1|2|3
Return	Enumeration
Example	CALCulate:LPLot:MARK:TRAC 1

10.4.3 Marker Type

10.4.3.1 Normal

One of the marker types. It is used to measure the X (Frequency or Time) and Y (Amplitude) values of a certain point on the trace. When selected, a marker with the number of the current marker (such as " **1** ") appears on the trace.

- If no active marker exists currently, a marker will be enabled automatically at the center frequency of the current trace.

- You can use the numeric keys, knob or direction keys to move the marker. The readouts of the marker will be displayed at the upper right corner of the screen.
- The readout resolution of the X-axis (frequency or time) is related to the span. For higher readout resolution, reduce the span.

10.4.3.2 Delta

One of the marker types. It is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the reference point and a certain point on the trace. When selected, a pair of markers appears on the trace: Fixed Related Marker (marked by a combination of the marker number and letter “ **+** ”, such as “ **2+** ”) and the Delta Marker (marked by the “Δ”, such as “ 1Δ2 ”).

- After the marker selects “Delta”, the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference “fixed” marker
- The delta marker is in the "relative to" state, and its X-axis position can be changed; the related marker is in the "fixed" state by default (the X-axis and Y-axis positions are fixed), but the X-axis can be adjusted by changing to the "normal" state.
- The first row in the upper right corner of the trace area shows the frequency (or time) difference and amplitude difference between the two markers; the second row in the upper right corner of the trace area shows the X axis and amplitude value of the related marker.
- Delta reset. It is only valid when the current marker is a differential marker. If the marker type of the relative marker of the current marker is normal or differential, change the horizontal position of the relative marker to the horizontal position of the current marker; if the marker type of the relative marker is fixed, change the horizontal position and vertical position of the relative marker to the current one. The horizontal and vertical position of the marker.

10.4.3.3 Off

Turn off the marker currently selected. The marker information displayed on the screen and functions based on the marker will also be turned off.

Command format	**:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:MODE POSition|DELTa|OFF** **:CALCulate:LPLot:MARKer[1]|2|3|4:MODE?**
Instruction	Sets/Gets the marker mode
Parameter Type	Enumeration
Parameter Range	POSition DELTa OFF
Return	Enumeration: POS|DELT|OFF
Example	:CALCulate:LPLot:MARK1:MODE POSition

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:STATe OFF|ON|0|1 :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:STATe?
Instruction	Sets/gets the marker switch status
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:MARK1:STATe ON

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:REFerence 1|2|3|4 :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:REFerence?
Instruction	Sets/Gets the marker relative to
Parameter Type	Enumeration
Parameter Range	1|2|3|4|5|6|7|8
Return	Enumeration
Example	:CALCulate:MARKer1:REFerence 3

Command format	:CALCulate:LPLot:MARKer#[:SET]:RESEt:DELTa
Instruction	Difference marker resets to 0 Only valid when the current cursor is a differential marker
Example	:CALCulate:MARKer2:RESEt:DELTa

Command format	:CALCulate:LPLot:MARKer:AOFF
Instruction	Close all markers
Example	:CALCulate:MARKer:AOFF

10.4.4 Marker Postion

Manually set the position of the cursor.

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:X? :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:X:POSition :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:X:POSition?
Instruction	Sets/gets the value of the marker point X axis This command takes effect only when the marker mode is not OFF:
Parameter Type	frequency , Float , unitHz , kHz , MHz , GHz , default Hz
Parameter Range	0 Hz ~ max frequency
Return	Float, unit:Hz;
Example	:CALCulate:LPLot:MARKer4:X 0.4 GHz :CALCulate:LPLot:MARKer4:X?

10.4.5 Marker Fn

The cursor function provides a method for further processing the current cursor data to achieve specific results or make measurement results more accurate.

When the cursor function is turned on, if the current cursor is not open, the cursor type of the current cursor will be automatically changed to [Normal]. When the cursor is turned off, its cursor function will automatically turn off.

Command format	**:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:FUNCtion OFF|RMSNoise** **:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:FUNCtion?**
Instruction	Set/Get marker function
Parameter Type	Enumeration
Parameter Range	OFF|RMSNoise
Return	Enumeration
Example	:CALCulate:LPLot:MARKer1:FUNCtion OFF :CALCulate:LPLot:MARKer1:FUNCtion?

Integrated noise

Calculate the integral of noise density within the specified frequency range. The calculation results can be displayed in degrees, radians, RMS jitter, or total noise power

Command format	**:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:RMSNoise:MODE DEGRee|RADian|JITTerDBC** **:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:RMSNoise:MODE?**
Instruction	Set/Get Result Type for Integral Noise
Parameter Type	Enumeration
Parameter Range	DEGRee|RADian|JITTer|DBC
Return	Enumeration
Example	:CALCulate:LPLot:MARKer1:RMSNoise:MODE DBC :CALCulate:LPLot:MARKer1:RMSNoise:MODE?

Command format	**:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:SPAN** **:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:SPAN?**
Instruction	Set/Get the Result Type of Integral Noise Integral Bandwidth of Integral Noise
Parameter Type	freq , Float, unitHz , kHz , MHz , GHz , default Hz
Parameter Range	Scan start offset ~ Scan end offset
Return	Float, unitHz , kHz , MHz , GHz ,default Hz
Example	:CALCulate:LPLot:MARKer1:BAND:SPAN 1000Hz :CALCulate:LPLot:MARKer1:BAND:SPAN?

Command format	**:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:LEFT** **:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:LEFT?** **:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:RIGHt** **:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:RIGHt?**
Instruction	Set/Get the left/right offset frequency of the integral noise.
Parameter Type	freq , Float, unitHz , kHz , MHz , GHz ,default Hz
Parameter Range	Scan start offset ~ Scan end offset
Return	Float, unitHz , kHz , MHz , GHz , default Hz
Example	:CALCulate:LPLot:MARKer1:BAND:LEFT 1000Hz :CALCulate:LPLot:MARKer1:BAND:RIGHt?

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:RMSNoise: RESult?
Instruction	Set/Get the measurement results of integrated noise
Parameter Type	Float, unit depending on the set result type
Return	Float, unit depending on the set result type
Example	:CALCulate:LPLot:MARKer1:RMSNoise:RESult?

10.4.6 Spurious search

Search for stray signals on the original trace. The spurious search algorithm is as follows:

For each frequency point displayed on the screen, calculate its standard deviation:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \overline{x})^2}{n}}$$

Set the threshold for this frequency point during spurious search

threshold = max(10, σ),

At this frequency point, if:

Ampl $_{\text{Original trace}}$ – **Ampl** $_{\text{Smooth trace}}$ **> threshold**, so consider that frequency point as spurious.

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:SPURious:MAXimum[:PEAK]
Instruction	Search for clutter and mark with the specified cursor
Example	:CALCulate:LPLot:MARKer1:SPURious:MAXimum

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:SPURious:MAXimum:NEXT
Instruction	Next spurious
Example	:CALCulate:LPLot:MARKer1:SPURious:MAXimum:NEXT

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:SPURious:MAXimum:RIGHt
Instruction	Next spurious on the right side
Example	:CALCulate:LPLot:MARKer1:SPURious:MAXimum:RIGHt

Command format	:CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:SPURious:MAXimum:LEFT
Instruction	Next spurious on the left side
Example	:CALCulate:LPLot:MARKer1:SPURious:MAXimum:LEFT

Command format	:CALCulate:PEAK:TABLe?
Instruction	Get spurious list
Example	:CALCulate:PEAK:TABLe?

10.5 Trace

10.5.1 Select Trace

The analyzer allows for up to four traces to be displayed at the same time. Each trace has its own color (Trace A - Yellow, Trace B - Purple, Trace C - Light blue).

All traces can be set parameter independently. As a default, analyzer will choose Trace A and set the type of the trace as Clear Write.

Command format	**:TRACe[1]|2|3 [:DATA]?**
Instruction	Gets the data of trace
Return	character string
Example	:TRACe:DATA?

Command format	**:FORMat[:TRACe][:DATA]ASCii|REAL32| REAL** **:FORMat[:TRACe][:DATA]?**
Instruction	Set/Get Read Trace Data Format
Parameter Type	Enumeration
Parameter Range	ASCii REAL32 REAL Floating 64 bit
Return	Enumeration: ASCii|REAL| REAL32
Example	:FORMat ASCii

Command format	**TRACe:SELEct** **TRACe:SELEct?**
Instruction	Sets/gets the current trace
Parameter Type	EnumerationTRACE1-3
Return	Enumeration: TRACE1-3
Example	TRACe:SELEct TRACE3

10.5.2 Trace Type

Raw data

Display real-time scanned data for each point on the trace.

Smoothing

Each point on the trace is taken as the average of all points within the set smoothing window size centered on the current point.

View

Stop updating trace data for observation and reading purposes. Traces from storage devices or remotely loaded into the system, with the default type being View.

BLANK

Turn off the display of the trace and all measurement functions based on that trace. The trace in the closed state is not displayed, and the data is in the previous state.

Command format	**:TRACe[1]|2|3:LPLot:MODE RAW|SMOothed|VIEW|BLANk** **:TRACe[1]|2|3:LPLot:MODE?** **:TRACe[1]|2|3:LPLot:TYPE** **:TRACe[1]|2|3:LPLot:TYPE?**
Instruction	Sets/gets the type of trace
Parameter Type	Enumeration
Parameter Range	RAW SMOoth VIEW BLANk
Return	Enumeration: RAW|SMOothed|VIEW|BLANk
Example	:TRAC1: LPLot:TYPE BLANk

Command format	**[:SENSe]:LPLot:DETector[:FUNCtion]**
Instruction	Sets/Gets the trace detection type
Return	Enumeration
Example	:LPLot:DETector

10.5.3 Trace Function

Copy

Copy the data from the source trace to the target trace. After copying, the trace status of the target trace will automatically change to View.

Command format	**:TRACe:LPLot:COPY**
Instruction	Copy the trace
Example	:TRACe:LPLot:COPY 1,2

Exchange

Exchange the data of the source trace with the data of the target trace. After the exchange, the trace status of the source trace and the target trace will be automatically changed to view.

Command format	**:TRACe:LPLot::EXCHange**
Instruction	Exchange of trace
Example	:TRACe:LPLot::EXCHange 1,2

Preset All Traces

Set trace 1 as raw data and activate it; Close all other traces.

Command format	:TRACe:PRESet:ALL
Instruction	Reset all traces
Example	:TRACe:PRESet:ALL

Clear All Traces

Clear all traces without affecting the state of any functions or variables in the instrument.

Command format	:TRACe:CLEar:ALL
Instruction	Change all trace data to default minimum values
Example	:TRACe:CLEar:ALL

10.6 Meas

10.6.1 Average

Command format	**[:SENSe]:LPLot:AVERage:STATe 0|1|OFF|ON** **[:SENSe]:LPLot:AVERage:STATe?**
Instruction	Set/Get the average type
Parameter Type	bool
Parameter Range	0|1|OFF|ON
Return	bool
Example	:LPLot:AVERage:STATe ON

10.6.1.1 Average/Hold Number

Sets the terminal count number N for Average, Max Hold and Min Hold trace types. This number is an integral part of how the average trace is calculated. Basically, increasing N results in a smoother average trace.

Command format	**[:SENSe]:LPLot:AVERage:COUNt** **[:SENSe]:LPLot:AVERage:COUNt?**
Instruction	Sets/gets the average number
Parameter Type	Integer
Parameter Range	1 ~ 100
Return	Integer
Example	:LPLot:AVERage:COUNt 10

10.6.1.2 Averaging Mode

Allow selection of control types for average functionality. This will determine the average operation after reaching the specified number of data collection attempts (average count). The options include:

- **Exponential (Exp):** Measure the average operation by continuously calculating the weighted average of each index using a specified number of averages. The average value is displayed at the end of each scan.
- **Repeat:** Every time the specified average is reached, the measurement will reset the average counter.

Command format	**[:SENSe]:LPLot:AVERage:TCONtrol EXPOnentialr|REPEat** **[:SENSe]:LPLot:AVERage:TCONtrol?**
Instruction	Sets/gets the average mode
Parameter Type	Enumeration
Parameter Range	EXPOnentialr|REPEat
Return	EnumerationEXPOnentialr|REPEat
Example	:CHPower:AVERage:TCONtrol REPEat

10.6.2 View

The view menu allows for the selection of display views: Normal, decade, spurious.

Command format	**:DISPlay:LPLot:VIEW NORMal|DECade|SPURious** **:DISPlay:LPLot:VIEW?**
Instruction	Sets/gets the view mode
Parameter Type	Enumeration
Parameter Range	NORMal|DECade|SPURious
Return	EnumerationNORMal|DECade|SPURious
Example	:DISP:LPLot:VIEW NORMal

Command format	**:CALCulate:LPLot:SPURious:TABLe 0|1|OFF|ON** **:CALCulate:LPLot:SPURious:TABLe?**
Instruction	Sets/gets the spurious mode
Parameter Type	bool
Parameter Range	0|1|OFF|ON
Return	bool
Example	:CALC:LPL:SPUR:TABL ON

Command format	**:CALCulate:LPLot:DECade:TABLe 0|1|OFF|ON** **:CALCulate:LPLot:DECade:TABLe?**
Instruction	Sets/gets the decade mode
Parameter Type	bool
Parameter Range	0|1|OFF|ON
Return	bool
Example	:CALC:LPL:DEC:TABL ON

10.6.3 Meas Type

Meas Type allow users to switch between phase noise measurement and DANL Floor.

Command format	**[:SENSe]:LPLot:METHod DANL|PN** **[:SENSe]:LPLot:METHod?**
Instruction	Sets/gets the meas type
Parameter Type	Enumeration
Parameter Range	DANL|PN
Return	EnumerationDANL|PN
Example	:LPLot:METHod PN

10.6.4 Smoothing

The smoothing window allows users to set the smoothing window size for smoothing traces. Unlike average, smoothing refers to the average amplitude of different frequency points in the same frame of data, while average refers to the average amplitude of the same frequency point in different frames.

The smooth window setting requires an average number of points. For a trace, the amplitude value of each frequency point on the trace is centered on the current frequency point, and the number is the number of scan points multiplied by the smoothing window/100, which is the average amplitude value of the original data of these points. The larger the smoothing window, the smoother the trace; When the smoothing window is set to zero, smoothing is turned off.

The larger the smoothing window, the smoother the trace.

Command format	**[:SENSe]:LPLot:SMOoth** **[:SENSe]:LPLot:SMOoth?**
Instruction	Sets/gets the value of smooth
Parameter Type	Float
Parameter Range	0~16
Return	Float
Example	:LPLot:SMOoth 12.5

10.6.5 Carrier amplitude limit

The carrier amplitude limit allows users to set the minimum power value of the carrier. When the carrier power is lower than this power, both carrier search and scanning will stop.

Command format	**[SENSe]:CARRier:THReshold:MINimum** **[SENSe]:CARRier:THReshold:MINimum?**
Instruction	Sets/gets the size of smooth window
Parameter Type	Float
Parameter Range	-200dBm~30dBm
Return	Float
Example	:CARRier:THReshold:MINimum -13.0

10.6.6 Limit

Select trace	Select restriction effective trace
Frequency reference	Choose whether to represent the limit line frequency point as an absolute value or as an offset in the intermediate frequency.
Frequency difference	Set interpolation between frequency points, with options for linear and logarithmic interpolation.
Amplitude reference	Choose whether the amplitude point of the limit line is represented as an absolute value or as an offset of the reference level
Amplitude difference	The amplitude difference sets the interpolation of the specified limit point to linear or logarithmic

X Offset	Set offsets of X axis.
Y Offset	Set offsets of Y axis
X-scale adjustment	Match the X-axis with the selected constraints as much as possible For linear frequency scaling, the range between the starting and ending frequencies is 12.5% higher than the range between the minimum and maximum frequencies.
Add point	Add a new point for editing.
Del Point	Delete the point whose number is selected in Mode.
Save/Load	Save or load the limit file.

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X?**
Instructions	Set the limit point template frequency offset Gets the limit point template frequency offset
Parameter Type	Float
Parameter Range	0 ~ 26.5G
Return	Float
Example	:CALCulate:LLINe[1]|2|3|4|5|6:Offset:X 1MHz

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y** **:CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y?**
Instructions	Sets the limit point template amplitude offset Gets the limiter template amplitude offset
Parameter Type	Float
Parameter Range	-350 dB~380 dB
Return	Float
Example	:CALCulate:LLINe5:Offset:Y -10

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DATA val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:DATA?**
Instructions	Sets/gets restricted data (Clears previous data)
Parameter Type	val1: frequency : Float, val2: Ampl : Float
Parameter Range	val1: related with Span val2: -400 dBm~330 dBm
Return	val1: frequency : Float, val2: Ampl: Float
Example	:CALCulate:LLINe2:DATA 100,-20,200,-25 (Add two points (100, -20) and (200, -25)) :CALC:LLINe1:DATA?

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:ADD val1,val2** **:CALCulate:LLINe[1]|2|3|4|5|6:POINt:DELete**

Instructions	Add limit point Delete limit points
Parameter Type	val1: frequency : Float, val2: Ampl: Float
Parameter Range	val1: related with Span val2: -400 dBm~330 dBm
Example	:CALCulate:LLINe1:ADD 100,-20 :CALCulate:LLINe2:POINt:DELete 2

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:DELete :CALCulate:LLINe:ALL:DELete**
Instructions	Delete specified restrictions Delete all restrictions
Example	:CALCulate:LLINe1:DELete :CALCulate:LLINe:ALL:DELete

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:TRACe :CALCulate:LLINe[1]|2|3|4|5|6:TRACe?**
Instructions	Select the limit trace
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe1:TRACe 3

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE?**
Instructions	Set/Query the frequency difference type
Parameter Type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1:FREQuency:INTerpolate:TYPE LOG

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe?**
Instructions	Set or query the frequency reference type
Parameter Type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2:FREQuency:CMODe FIX

Command format	**:CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE?**
Instructions	Set or query the range difference type
Parameter Type	Enumeration
Parameter Range	LOG|LIN
Return	LOG|LIN
Example	:CALCulate:LLINe1: AMPLitude:INTerpolate:TYPE LOG

Command format	:CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe :CALCulate:LLINe[1]|2|3|4|5|6: AMPLitude:CMODe?
Instructions	Set or query the amplitude reference type
Parameter Type	Enumeration
Parameter Range	FIXed|RELAtive
Return	FIXed|RELAtive
Example	:CALCulate:LLINe2: AMPLitude:CMODe FIX

Command format	:CALCulate:LLINe[1]|2|3|4|5|6:COPY :CALCulate:LLINe[1]|2|3|4|5|6:COPY?
Instructions	Copy the limit
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2:COPY 5

Command format	:CALCulate:LLINe[1]|2|3|4|5|6:BUILd :CALCulate:LLINe[1]|2|3|4|5|6:BUILd?
Instructions	Fitting a trace
Parameter Type	Integer
Parameter Range	1~6
Return	1~6
Example	:CALCulate:LLINe2: BUILd 1 :CALCulate:LLINe2: BUILd?

Command format	:CALCulate:LLINe:TEST :CALCulate:LLINe:TEST?
Instructions	Sets/gets the status of the test switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:TEST 1

Command format	:CALCulate:LLINe[1]|2|3|4|5|6:FAIL?
Instructions	Query limit test results.
Return	0|1
Example	:CALCulate:LLINe2:FAIL1

Command format	:CALCulate:LLINe:CONTrol:BEEP :CALCulate:LLINe:CONTrol:BEEP?
Instructions	Sets/gets the restricted buzzer
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:CONTrol:BEEP OFF

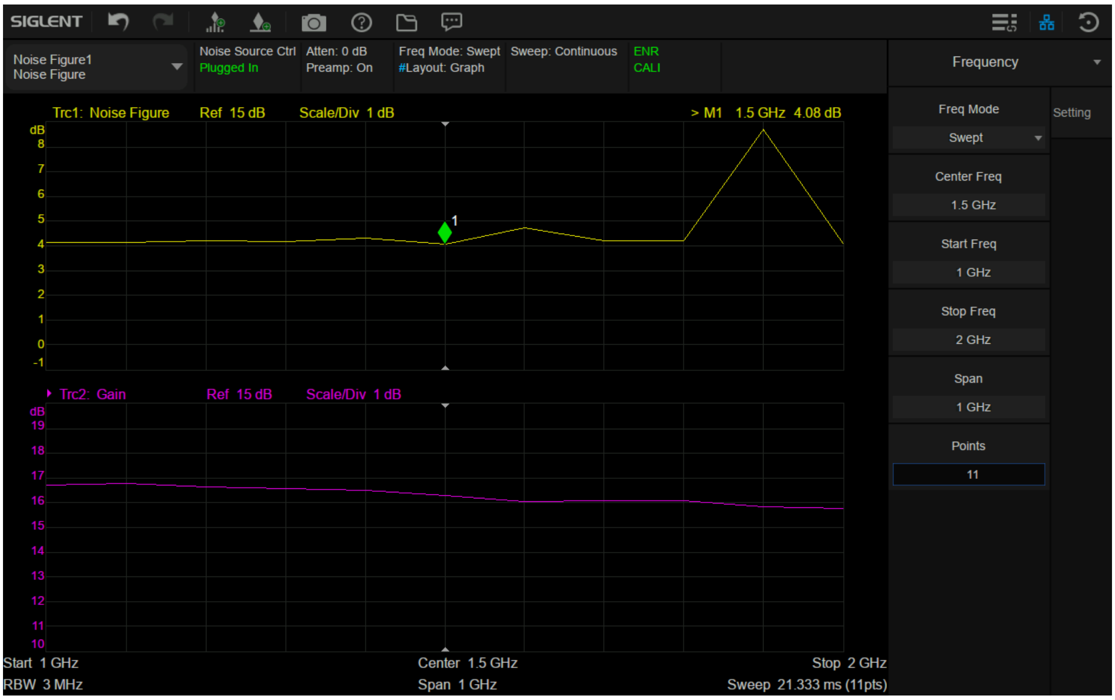
Command format	**:CALCulate:LLINe:FAIL:STOP** **:CALCulate:LLINe:FAIL:STOP?**
Instructions	The set/query limit test stops if it fails
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:CALCulate:LLINe:FAIL:STOP OFF

11 Noise Figure Measurement Mode

Noise Figure Mode is used to measure Noise Figure, Thermal Noise, Equivalent Noise Temperature, etc. Different measurement results can be selected to display under Trace menu.

Calibration is required before measurement. Calibration requires entering the ENR provided by the noise source provider. The analyzer controls the noise source through a USB connection, and the output of the noise source is directly connected to the analyzer's RF signal input port. Then calibration can begin. During the calibration process, each point is measured once with the noise source turned off and once with the noise source turned on.

After calibration, keep the analyzer controlling the noise source, connect the output of the noise source to the input of the DUT, and connect the output of the DUT to the RF signal input port of the analyzer. When the DUT is a frequency converting device, the DUT also requires an external LO signal. If this LO signal is Fixed, it can be manually set or controlled by the analyzer to control the output of the external LO signal source. If this LO signal is Swept, it needs to be controlled by the analyzer to control the output of the external LO signal source. The measurement process is the same as the calibration process, and each frequency point will be measured once in the noise source off and noise source on states.



The NSD28 noise source driver is used to drive the noise source with the required input power supply of + 28V pulse power supply to cooperate with the spectrum analyzer to measure the noise figure , Y factor and equivalent noise temperature.

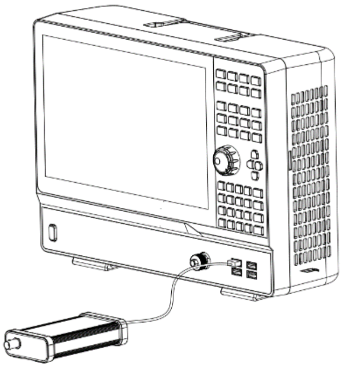
Interfaces description:

-- USB Type-B: Power and control signal input for connecting to the spectrum analyzer.

-- BNC: + 28V pulse power supply output for connecting the noise source to provide input bias.

Connection:

The NSD28 noise source driver is connected to the USB interface of the spectrum analyzer using the attached USB connection line. If the connection is successfully identified, the spectrum analyzer will display the prompt “INFO_NSD_PLUG_IN”, and then the + 28V pulse power output interface of the NSD28 noise source driver is connected to the input bias interface of the adapted noise source using the attached BNC connection line.



11.1 Frequency & Span

11.1.1 Freq Context

It is necessary to set or view the RF/IF/LO frequencies when measuring a frequency converting device. Freq Context defines the way frequencies are shown in the result window and the menu.

RF: Frequencies are displayed as they are before they enter the DUT without any frequency conversion. If Sideband is DSB, the RF frequencies represented are only that of the LSB range. When measuring a frequency converting device, note that the RF frequencies is not equal to the frequencies measured by the analyzer's RF input port.

IF: Frequencies are displayed as they leave the DUT after conversion. They are the frequencies that the analyzer is physically measuring.

LO: Frequencies are displayed as the DUT's external LO, note that they are not the frequencies that the analyzer is physically measuring. This context lets you review the LO frequencies required to program the external LO or those set by the instrument. The LO context is only selectable when the DUT's external LO frequency mode is swept.

Command Format	**[:SENSe]:NFIGure:MODE:FREQuency:CONText** **[:SENSe]:NFIGure:MODE:FREQuency:CONText?**
Instruction	Sets/Gets the frequency context
Parameter Type	Enumeration
Parameter Range	RF | IF | LO
Return	Enumeration: RF | IF | LO
Example	:NFIGure:MODE:FREQuency:CONText 0.2 GHz :NFIGure:MODE:FREQuency:CONText?

11.1.2 Freq Mode

Determines how the list of frequencies to be measured is calculated. When Layout in the Trace Menu is Auto, Layout varies with Freq Mode.

Command Format	**[:SENSe]:NFIGure:FREQuency:MODE** **[:SENSe]:NFIGure:FREQuency:MODE?**
Instruction	Sets/Gets the frequency mode
Parameter Type	Enumeration
Parameter Range	SWEPt: Swept frequencies FIXed: Fixed frequency LIST: Frequency list
Return	Enumeration: SWEP | FIX | LIST
Example	:NFIGure:FREQuency:MODE LIST :NFIGure:FREQuency:MODE?

11.1.2.1 Swept

Set the Center Frequency, Span, Start Frequency, Stop Frequency and Points. Measurement frequencies are linearly distributed Start Frequency and Stop Frequency. In this mode, Fixed Freq and Edit Freq List are invisible.

When Layout is Auto, changes to Graph layout.

Command Format	**[:SENSe]:NFIGure:FREQuency:CENTer** **[:SENSe]:NFIGure:FREQuency:CENTer?**
Instruction	Sets/Gets the center frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1 Hz ~ 28 GHz
Return	Float, unit: Hz
Example	:NFIGure:FREQuency:CENTer 0.2 GHz

Command Format	**[:SENSe]:NFIGure:FREQuency:STARt** **[:SENSe]:NFIGure:FREQuency:STARt?**
Instruction	Sets/Gets the start frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	0 Hz ~ 27.999999999 GHz
Return	Float, unit: Hz
Example	:NFIGure:FREQuency:STARt 0.2 GHz

Command Format	**[:SENSe]:NFIGure:FREQuency:STOP** **[:SENSe]:NFIGure:FREQuency:STOP?**
Instruction	Sets/Gets the stop frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1 Hz ~ 28 GHz
Return	Float, unit: Hz
Example	:NFIGure:FREQuency:STOP 0.2 GHz

Command Format	**[:SENSe]:NFIGure:FREQuency:SPAN** **[:SENSe]:NFIGure:FREQuency:SPAN?**
Instruction	Sets/Gets the frequency span.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1 Hz ~ 28 GHz
Return	Float, unit: Hz
Example	:NFIGure:FREQuency:SPAN 10MHZ

Command Format	**[:SENSe] :NFIGure:SWEep:POINts** **[:SENSe] :NFIGure:SWEep:POINts?**
Instruction	Sets/Gets sweep points.
Parameter Type	Integer
Parameter Range	2 ~ 10001
Return	Integer
Example	:NFIGure:SWEep:POINts 2500

11.1.2.2 Fixed

Set the Fixed Frequency that will be measured. In this mode, Center Freq, Span, Start Freq, Stop Freq and Edit Freq List are invisible. Points are fixed at 1 and cannot be edited (be grey out).

When Layout is Auto, changes to Mete layout.

Command Format	**[:SENSe]:NFIGure:FREQuency:FIXed** **[:SENSe]:NFIGure:FREQuency:FIXed?**
Instruction	Sets/Gets the fixed frequency.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	0 Hz ~ 28 GHz
Return	Float
Example	:NFIGure:FREQuency:FIXed 10MHz

11.1.2.3 Edit Freq List

Customize the measured frequencies. In this mode, Center Freq, Span, Start Freq, Stop Freq and Fixed Freq are invisible.

When Layout is Auto, changes to Table layout.

Command Format	**[:SENSe]:NFIGure:FREQuency:LIST:COPY:SWEPt**
Instruction	Populate the frequency list by copying from Swept
Example	:NFIGure:FREQuency:LIST:COPY:SWEPt

Command Format	**[:SENSe]:NFIGure:FREQuency:LIST:DATA:DELete**
Instruction	Clear frequency list
Example	:NFIGure:FREQuency:LIST:DATA:DELete

11.2 BW

11.2.1 Resolution Bandwidth

Set the resolution bandwidth in order to distinguish between signals which have frequency components that are near one another.

Command Format	**[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]** **[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]?**
Instruction	Specifies the resolution bandwidth. For numeric entries, all RBW types choose the nearest (arithmetically, on a linear scale, rounding up) available RBW to the value entered. Gets the resolution bandwidth.
Parameter Type	Discrete
Parameter Range	1Hz, 3Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3 MHz, 10 MHz
Return	Float, unit: Hz
Example	:NFIGure:BWIDth 1e6

Command Format	**[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]:AUTO OFF|ON|0|1** **[:SENSe]:NFIGure:BWIDth|BANDwidth[:RESolution]:AUTO?**
Instruction	Turn on/off auto resolution bandwidth state. Gets the resolution bandwidth auto state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:NFIGure:BWIDth:AUTO On

11.3 Sweep

11.3.1 Avg Time/Pt

The measurement of each frequency point requires 2 states (noise source on and noise source off). Avg Time/Pt is the measurement duration for each state. Therefore, the total time for a trace result is Avg Time/Pt multiplied by Points multiplied by 2 times.

Command Format	**[:SENSe]:NFIGure:SWEep:TIME** **[:SENSe]:NFIGure:SWEep:TIME?**
Instruction	Sets/Gets Avg Time/Pt.
Parameter Type	Float, unit: ks, s, ms, us
Parameter Range	1us ~ 1ks
Return	Float, unit: s
Example	:NFIGure:SWEep:TIME 5s

Command Format	**[:SENSe]:NFIGure:SWEep:TIME:AUTO** **[:SENSe]:NFIGure:SWEep:TIME:AUTO?**
Instruction	Sets/Gets sweep mode auto state.
Parameter Type	Boolean

Parameter Range	OFF|ON|0|1
Return	0|1
Example	:NFIGure:SWEep:TIME:AUTO 1

11.3.2 Points

Command Format	**[:SENSe]:NFIGure:SWEep:POINts** **[:SENSe]:NFIGure:SWEep:POINts?**
Instruction	Sets/Gets sweep points.
Parameter Type	Integer
Parameter Range	2~10001
Return	Integer
Example	:NFIGure:SWEep:POINts 2500

11.3.3 Sweep/Measure

Sweep/Measure

Single/Continue controls analyzer to perform single or continuous sweep/measure,

Restart

Restart the current sweep or measure. In particular, if the sweep parameters are modified, a restart will be performed.

Command format	**:INITiate:CONTinuous OFF|ON|0|1** **:INITiate:CONTinuous?**
Instructions	Sets continuous sweep mode on-off. Gets continuous sweep mode state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:INITiate:CONTinuous OFF

Command Format	**:INITiate[:IMMediate]**
Instruction	Restarts the current sweep.
Example	:INITiate:IMMediate

Command Format	**:INITiate:RESTart**
Instruction	Restarts the current sweep.
Example	:INITiate:RESTart

11.4 Amplitude

11.4.1 Attenuator & Preamp & Ref Level

Set the amplitude parameters of the analyzer. Through modifying these parameters, signals under measurement can be displayed in a proper mode for easier observation and minimum error. Any change of Ref Level, Attenuator Value, and Preamp mode will restart sweep.

Input attenuation can be set up to auto or manual mode:

- Auto mode: the attenuation value is fixed at 0 to achieve the best measurement results.

Ref Level determined the maximum power or voltage that can be currently displayed in the trace window. The value is displayed at the upper left corner of the screen grid.

Command Format	**:DISPlay:NFIGure:TRACe:{window}:Y[:SCALe]:RLEVel** **:DISPlay:NFIGure:TRACe:{window}:Y[:SCALe]:RLEVel?**
Instruction	Sets/Gets Ref Level for different windows. {window}: NFIGure | NFACtor | GAIN | YFACtor | TEFFective | PHOT | PCOLd
Parameter Type	Float
Parameter Range	NFIGure: -100 ~ 100 NFACtor: 0 ~ 1e9 GAIN: -100 ~ 100 YFACtor: -100 ~ 100 TEFFective: -100e6 ~ 100e6 PHOT: -100 ~ 100 PCOLd: -100 ~ 100
Return	Float
Example	:DISPlay:NFIGure:TRACe:NFIGure:Y:RLEVel 5dB

Command Format	**:DISPlay:NFIGure:TRACe:{window}:Y[:SCALe]:RPOSition** **:DISPlay:NFIGure:TRACe:{window}:Y[:SCALe]:RPOSition?**
Instruction	Sets/Gets Ref Position for different windows. {window}: NFIGure | NFACtor | GAIN | YFACtor | TEFFective | PHOT | PCOLd
Parameter Type	Enumeration
Parameter Range	TOP | CENTer | BOTTom
Return	Enumeration: TOP | CENT | BOTT
Example	:DISPlay:NFIGure:TRACe:NFIGure:Y:RPOSition TOP

Command format	**[:SENSe]:NFIGure:POWer[:RF]:ATTenuation** **[:SENSe]:NFIGure:POWer[:RF]:ATTenuation?**
Instructions	Sets/gets the attenuation value
Parameter Type	Integer
Parameter Range	0 dB ~ 50 dB (Even gears only)
Return	Integer, unit dB
Example	:POWer:ATTenuation 10

Command format	**[:SENSe]:NFIGure:POWer[:RF]:ATTenuation:AUTO** **[:SENSe]:NFIGure:POWer[:RF]:ATTenuation:AUTO?**

Instructions	Sets/gets the auto attenuation value switch
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:POWer:ATTenuation:AUTO ON

Command format	**[:SENSe]:NFIGure:POWer[:RF]:GAIN[:STATe]** **[:SENSe]:NFIGure:POWer[:RF]:GAIN[:STATe]?**
Instructions	Sets/gets the preamplifier inside the switch spectrometer
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:NFIGure:POWer:GAIN ON

11.4.2 Y Axis Scale

Set the logarithmic units per vertical grid division on the display.

- By changing the scale, the displayed amplitude range is adjusted.
- Current signal amplitude range that can be displayed:

  The Minimum range: Reference level –10 × current scale value.

  The Maximum range: The reference level.

Command Format	**:DISPlay:NFIGure:TRACe:{window}:Y[:SCALe]:PDIVision** **:DISPlay:NFIGure:TRACe:{window}:Y[:SCALe]:PDIVision?**
Instructions	Sets/gets the scale for different windows {window}: NFIGure | NFACtor | GAIN | YFACtor | TEFFective | PHOT | PCOLd
Parameter type	Float
Parameter Range	NFIGure: 0.001 ~ 20 NFACtor: 0.001 ~ 20 GAIN: 0.001 ~ 20 YFACtor: 0.001 ~ 20 TEFFective: 0.1 ~ 20e6 PHOT: 0.001 ~ 20 PCOLd: 0.001 ~ 20
Return	Float, unit: dB
Example	:DISPlay:WINDow:TRACe:Y:PDIVision 10 dB

11.4.3 Y Scale Unit

The display units vary depending on the trace display results

Display Result	Y Scale Unit
Noise Figure (Log)	dB
Noise Factor (Lin)	1

Gain	dB
Y Factor	dB
T effective	K (Kelvin)
P hot	dB or dBm/Hz
P cold	dB or dBm/Hz

11.4.4 Auto Scale

Auto Scale can be used to adjust the scale of the current and all windows adaptively to the waveform data.

Command format	**:DISPlay:NFIGure:VIEW[1]:WINDow[1]|2:TRACe:Y[:SCALe]:COUPle** **:DISPlay:NFIGure:VIEW[1]:WINDow[1]|2:TRACe:Y[:SCALe]:COUPle?**
Instructions	Sets/Gets the auto scale switch state when using Graph Layout.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISPlay:NFIGure:VIEW1:WINDow1:TRACe:Y:COUPle 1 :DISPlay:NFIGure:VIEW:WINDow1:TRACe:Y:COUPle?

Command format	**:DISPlay:NFIGure:VIEW3:WINDow[1]:TRACe:Y[:SCALe]:COUPle** **:DISPlay:NFIGure:VIEW3:WINDow[1]:TRACe:Y[:SCALe]:COUPle?**
Instructions	Sets/Gets the auto scale switch state when using Meter Layout.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISPlay:NFIGure:VIEW3:WINDow1:TRACe:Y:COUPle 1 :DISPlay:NFIGure:VIEW3:WINDow1:TRACe:Y:COUPle?

11.5 Trace

11.5.1 Layout

Determined how the measurement results be displayed on screen.

Graph: There are two traces showing two measurement results, Trace 1 in window 1 (top) and Trace 2 in window 2 (bottom) respectively on default. When Overlay/Combined turns On, both two traces display in one window, where the Y axis on the left side represents the Y axis of Trace 1, and the Y axis on the right side represents the Y axis of Trace 2.

Meter: Display a graph and a meter for showing one measurement result. The data in the meter on the right is the current measurement results, and the data in the graph shows the historical measurement changes of the same frequency point. Layout Meter usually used to measure a fixed frequency point. More results can be displayed in a one-row table when using Result Table menu to turn on other results.

Table: Displays discrete results for each frequency point in a tabular form.

Command Format	**:DISPlay:NFIGure:FORMat** **:DISPlay:NFIGure:FORMat?**
Instruction	Sets/Gets layout type.
Parameter Type	Enumeration
Parameter Range	GRAPh | METer | TABLe
Return	Enumeration: GRAPh | METer | TABLe
Example	:DISPlay:NFIGure:FORMat METer :DISPlay:NFIGure:FORMat?

Command format	**:DISP:NFIG:FORM:AUTO** **:DISP:NFIG:FORM:AUTO?**
Instructions	Sets/Gets the layout auto state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISP:NFIG:FORM:AUTO 1 :DISP:NFIG:FORM:AUTO?

Command format	**:DISPlay:NFIGure:TRACe:COMBined[:STATe]** **:DISPlay:NFIGure:TRACe:COMBined[:STATe]?**
Instructions	Sets/Gets Overlay / Combined switch state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:DISPlay:NFIGure:TRACe:COMBined 1 :DISPlay:NFIGure:TRACe:COMBined?

11.5.2 Trace Type

Command Format	**:TRACe[1]|2:NFIGure:TYPE** **:TRACe[1]|2:NFIGure:TYPE?**
Instruction	Sets/Gets trace type in Graph layout.
Parameter Type	Enumeration
Parameter Range	WRITe: Trace is in normal mode. Update data MAXHold: Displays the maximum value of traces MINHold: Displays the minimum value of trace AVERage: Displays the average value of trace
Return	WRITE | MAXH | MINH | AVER
Example	:TRAC1:NFIGure:TYPE MINH

11.5.3 Trace State

Command format	**:TRACe[1]|2:NFIGure:DISPlay[:STATe]** **:TRACe[1]|2:NFIGure:DISPlay[:STATe]?**
Instructions	Sets/gets the display status of the trace in Graph layout
Parameter Type	Enumeration
Parameter Range	ACTive: Trace is in normal mode. Update data VIEW: Stops updating trace to display current trace data BLANk: Clear trace data BACKground: Set as background
Return	ACT | VIEW | BLAN | BACK
Example	:TRACe2:NFIGure:DISPlay ACTive :TRACe1:NFIGure:DISPlay?

11.5.4 Disp Result

This measurement supports seven result types.

Noise Figure: The ratio of the input signal-to-noise ratio and the output signal-to-noise ratio of the DUT characterizes the degree of deterioration of the signal-to-noise ratio after passing through the DUT. Noise Figure is usually expressed in decibels (dB).

Noise Factor: The same as Noise Figure, but expressed using linear units rather than dB.

Gain: The amplification factor.

Y-Factor: The ratio of two noise power levels, one measured with the noise source ON, and the other with the noise source OFF. The Y-Factor measurement is the most common method of measuring the quantities required to calculate Noise Figure and Gain.

T effective: Another way to measure the deterioration of signal-to-noise ratio, especially for one-port devices such as antennas. All white noise can be replaced by a thermal noise source generated by a resistor at an equivalent temperature, that is T effective.

P hot/P cold: The power density of the power measurement normalized to a 1 Hz bandwidth. P hot is measured when the noise source is turned ON, while P cold is measured when the noise source is turned OFF. P hot/P cold usually expressed in dB, which is referenced to natural noise. It can be expressed in dBm/Hz, which is the absolute power density.

Command Format	**:DISPlay:NFIGure:DATA:TRACe[1]|2** **:DISPlay:NFIGure:DATA:TRACe[1]|2?**
Instruction	Sets/Gets display result in Graph layout.
Parameter Type	Enumeration
Parameter Range	NFIGure | NFACtor | GAIN | YFACtor | TEEFective | PHOT | PCOLd
Return	NFIGure | NFACtor | GAIN | YFACtor | TEEFective | PHOT | PCOLd
Example	:DISPlay:NFIGure:DATA:TRACe1 GAIN :DISPlay:NFIGure:DATA:TRACe1?

Command Format	**:DISPlay:NFIGure:DATA:TRACe3** **:DISPlay:NFIGure:DATA:TRACe3?**

Instruction	Sets/Gets display result in Meter layout.
Parameter Type	Enumeration
Parameter Range	NFIGure | NFACtor | GAIN | YFACtor | TEEFective | PHOT | PCOLd
Return	NFIGure | NFACtor | GAIN | YFACtor | TEEFective | PHOT | PCOLd
Example	:DISPlay:NFIGure:DATA:TRACe3 PHOT :DISPlay:NFIGure:DATA:TRACe3?

11.6 Marker

Marker is only supported when Layout is Graph. With Layout Meter or Table, Marker is not supported.

11.6.1 Select Marker & Select Trace

Command Format	**:CALCulate:NFIGure:MARKer[1]|2|…|8:X** **:CALCulate:NFIGure:MARKer[1]|2|…|8:X?**
Instruction	Sets/Gets marker frequency.
Parameter Type	Float
Parameter Range	0Hz ~ 28GHz
Return	Float. Unit: Hz
Example	:CALCulate:NFIGure:MARKer1:X :CALCulate:NFIGure:MARKer2:X?

Command Format	**:CALCulate:NFIGure:MARKer[1]|2|…|8:Y?**
Instruction	Sets/Gets marker y value.
Return	Float. Unit reference to Y Unit
Example	:CALCulate:NFIGure:MARKer2:Y?

Command Format	**:CALCulate:NFIGure:MARKer[1]|2|…|8:TRACe** **:CALCulate:NFIGure:MARKer[1]|2|…|8:TRACe?**
Instruction	Sets/Gets the marker trace.
Parameter Type	Enumeration
Parameter Range	TRACe1 | TRACe2 | 1 | 2
Return	1 | 2
Example	:CALCulate:NFIGure:MARKer8:TRACe 2

11.6.2 Marker Type

Command format	**:CALCulate:NFIGure:MARKer[1]|2|…|8:MODE** **:CALCulate:NFIGure:MARKer[1]|2|…|8:MODE?**
Instructions	Sets/Gets the marker mode
Parameter Type	Enumeration
Parameter Range	POSition | DELTa | FIXed | OFF
Return	Enumeration: POS | DELT | FIX | OFF
Example	:CALCulate:NFIGure:MARKer1:MODE POS :CALCulate:NFIGure:MARKer2:MODE?

11.6.3 Marker All Off

Command Format	:CALCulate:NFIGure:MARKer:AOFF
Instruction	Sets all markers turn to Off.
Example	:CALCulate:NFIGure:MARKer:AOFF

11.7 Meas Setup

11.7.1 Settings

Sets the terminal count number N for Average, Max Hold and Min Hold trace types. This number is an integral part of how the average trace is calculated. Basically, increasing N results in a smoother average trace.

Command format	[:SENSe]:NFIGure:AVERage:COUNt [:SENSe]:NFIGure:AVERage:COUNt?
Instructions	Sets/gets the average number of traces
Parameter type	Integer
Parameter Range	1 ~ 999
Return	Integer
Example	:AVERage:TRACe1:COUNt 10

11.7.2 P hot/P cold Unit

Command format	[:SENSe]:NFIGure:PCHot:UNIT [:SENSe]:NFIGure:PCHot:UNIT?
Instructions	Sets/gets P hot/P cold unit
Parameter Type	Enumeration
Parameter Range	DB: dB DBM_HZ: dBm/Hz
Return	DB | DBM_HZ
Example	:NFIGure:PCHot:UNIT DBM_HZ :NFIGure:PCHot:UNIT?

11.7.3 DUT Setup

Clicking the DUT Setup menu will display a connection diagram for easy and intuitive measurement parameter settings.

11.7.3.1 DUT Type

Command format	[:SENSe]:NFIGure:MODE:DUT [:SENSe]:NFIGure:MODE:DUT?
Instructions	Sets/gets the DUT type.
Parameter Type	Enumeration

Parameter Range	AMPLifier: amplifier DOWNconv: downconverter UPConv: upconverter
Return	AMPL | DOWN | UPC
Example	:NFIGure:MODE:DUT DOWNconv :NFIGure:MODE:DUT?

11.7.3.2 Sideband

Sets the LO offset of the DUT. When DSB is selected, only the frequencies of the LSB is displayed in the menu and diagram.

DSB is selectable only when DUT is Downconv. If DSB is selected and the DUT changes to Upconv, LSB is selected by default.

Command format	**[:SENSe]:NFIGure:MODE:DOWNconv:LOSCillator:OFFSet [:SENSe]:NFIGure:MODE:UPConv:LOSCillator:OFFSet [:SENSe]:NFIGure:MODE:DOWNconv:LOSCillator:OFFSet? [:SENSe]:NFIGure:MODE:UPConv:LOSCillator:OFFSet?**
Instructions	Sets/gets the DUT type.
Parameter Type	Enumeration
Parameter Range	LSB: Lower sideband USB: Upper sideband DSB: Double sideband
Return	LSB | USB | DSB
Example	:NFIGure:MODE:UPConv:LOSCillator:OFFSet DSB

11.7.3.3 LO Type

Command format	**[:SENSe]:NFIGure:MODE:DUT:LOSCillator [:SENSe]:NFIGure:MODE:DUT:LOSCillator?**
Instructions	Sets/gets the DUT type.
Parameter Type	Enumeration
Parameter Range	FIXed | SWEPt
Return	FIX | SWEP
Example	:NFIGure:MODE:DUT:LOSCillator FIXed :NFIGure:MODE:DUT:LOSCillator?

11.7.3.4 Ext LO Control

When Ext LO Control turns On, the analyzer can control the specified generator to output the LO signal required for measurement through SCPI commands.

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:CONTrol[:STATe] [:SENSe]:NFIGure:MODE:LOSCillator:DUT:CONTrol[:STATe]?**
Instructions	Sets/Gets external LO control state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:NFIGure:MODE:LOSCillator:DUT:CONTrol 1 :NFIGure:MODE:LOSCillator:DUT:CONTrol?

11.7.3.5 Ext LO Power

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:POWer[:LEVel]** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:POWer[:LEVel]?**
Instruction	Sets/Gets the fixed power of external LO source.
Parameter Type	Float
Parameter Range	-100 dBm ~ 100 dBm
Return	Float. Unit: dBm
Example	:NFIGure:MODE:LOSCillator:DUT:PARameter:POWer -50

11.7.4 Ext LO Setup

11.7.4.1 Settling Time

Controls the grace period allocated for the LO to settle between the issuing of commands.

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:SETTling[:TIME]** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:SETTling[:TIME]?**
Instruction	Sets/Gets the settling time
Parameter Type	Float, unit: ks, s, ms, us
Parameter Range	0 ~ 1000 ms
Return	Float, unit: s
Example	:NFIGure:MODE:LOSCillator:DUT:PARameter:SETTling 100ms

11.7.4.2 Multiplier Numerator / Multiplier Denominator

Set the external LO frequency Multiplier Factor. If an external frequency divider is used in conjunction with the external LO, then the values of the multiplier denominator should be set to the external frequency divider’s dividing factor. It can be considered that the frequency output set by the analyzer multiplied by the Multiplier Factor results in the actual required LO frequency.

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:MULTiplier:NUMerator** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:MULTiplier:NUMerator?**
Instruction	Sets/Gets the multiplier numerator
Parameter Type	Integer
Parameter Range	1 ~ 20e9
Return	Integer
Example	:NFIGure:MODE:LOSCillator:DUT:PARameter:MULTiplier:NUMerator 1e6

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:MULTiplier :DENominator** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter:MULTiplier :DENominator?**
Instruction	Sets/Gets the multiplier denominator
Parameter Type	Integer
Parameter Range	1 ~ 20e9
Return	Integer
Example	:NFIGure:MODE:LOSCillator:DUT:PARameter:MULTiplier:DENominator 1e6

11.7.4.3 Min Freq / Max Freq

Specify the frequency range of the external LO source. Attempting to set the external LO source to a value less than Min Freq will clip to Min Freq, and attempting to set a value greater than Max Freq will clip to Max Freq.

Command Format	[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter: MINimum[:FREQuency] [:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter: MINimum[:FREQuency]?
Instruction	Sets/Gets the min frequency of the external LO source.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	1Hz ~ 324.999999999GHz
Return	Float, unit: Hz
Example	:NFIGure:MODE:LOSCillator:DUT:PARameter:MINimum 200

Command Format	[:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter: MAXimum [:FREQuency] [:SENSe]:NFIGure:MODE:LOSCillator:DUT:PARameter: MAXimum [:FREQuency]?
Instruction	Sets/Gets the max frequency of the external LO source.
Parameter Type	Float, unit: Hz, kHz, MHz, GHz
Parameter Range	2Hz ~ 325GHz
Return	Float, unit: Hz
Example	:NFIGure:MODE:LOSCillator:DUT:PARameter:MAXimum 200

11.7.4.4 LO Commands

Specify the custom SCPI commands used to control the external LO source, including Power Prefix, Power Suffix, Freq Prefix, Freq Suffix and Auxiliary. Refer to the SCPI command of the external LO source used for setting. If Power Prefix is empty, the command of controlling output LO power will not be send. Similarly, if Freq Prefix is empty, the command of controlling output LO frequency will not be send.

For example, the external LO source need to output a fixed 20 GHz signal with a power of 10 dBm. If the SCPI commands are

POW 10DBM

and

FREQ 20000000000HZ.

In this case, Power Prefix should be POW. Power Suffix should be DBM, Freq Prefix should be FREQ. Freq Suffix should be HZ.

Note that the specified units sent by the analyzer are dBm and Hz, and are not converted based on the command suffix. In the previous example, the signal frequency to be output is 20 GHz. If the frequency suffix is modified to GHZ, the actual frequency command sent will be

FREQ 20000000000GHZ

In this situation, the actual demand can be achieved by using Multiplier Factor. Setting Multiplier

Denominator to 1e9, the command sent will be

FREQ 20GHZ

The auxiliary command is used to send commands between each setting of power and frequency in the following order: auxiliary command > power command > frequency command > auxiliary command >... By default, the auxiliary command is used to ensure that the external signal source is ON. If multiple auxiliary commands are required, use a";" separator between commands.

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:PREFix** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:PREFix?**
Instruction	Sets/Gets the power prefix.
Parameter Type	String
Return	String
Example	:NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:PREFix “POW” :NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:PREFix?

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:SUFFix** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:SUFFix?**
Instruction	Sets/Gets the power suffix.
Parameter Type	String
Return	String
Example	:NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:SUFFix “DBM” :NFIGure:MODE:LOSCillator:DUT:COMMand:POWer:SUFFix?

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:PREFix** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:PREFix?**
Instruction	Sets/Gets the frequency prefix.
Parameter Type	String
Return	String
Example	:NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:PREFix “POW” :NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:PREFix?

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:SUFFix** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:SUFFix?**
Instruction	Sets/Gets the frequency suffix.
Parameter Type	String
Return	String
Example	:NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:SUFFix “DBM” :NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:SUFFix?

Command Format	**[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:AUXiliary** **[:SENSe]:NFIGure:MODE:LOSCillator:DUT:COMMand:AUXiliary?**
Instruction	Sets/Gets the FREQuency suffix.
Parameter Type	String
Return	String
Example	:NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:SUFFix “DBM” :NFIGure:MODE:LOSCillator:DUT:COMMand:FREQuency:SUFFix?

11.7.4.5 Add Source to List

You can search, identify, connect, and control external LO devices to provide LO signal output through USB or LAN. One or more successfully identified devices will appear in the list of Available Source List, showing their manufacturer, model, and serial number information. Selecting one of them in Available Source List will highlight it, and you can click to specify the highlighted source device as the DUT LO, or click the LO column of Available Source List. The device selected as the DUT LO will have a check icon in the LO column.

11.7.5 ENR Setup

ENR is the ratio of the noise temperature difference between the noise source on and off states to the reference temperature. It is a set of calibrated values provided by the noise source. Click Edit ENR to see the currently populated list of ENR values, you can enter new ENR values, edit existing ENR values, or delete existing ENR values. ENR values may vary for different frequencies, and the entered ENR is a series of frequencies and corresponding ENR values. There is only one ENR value for each frequency.

The analyzer will automatically save the entered ENR value and will not be reset due to Preset.

If there is no ENR value, calibration cannot be performed. It will display ENR on the window.

If only one ENR value is entered, it will be used for all frequencies for calibration.

If the minimum frequency of the entered ENR value is less than or equal to the minimum frequency of the measurement frequency point, and the maximum frequency of the ENR value is greater than or equal to the maximum frequency of the measurement frequency point, it will display ENR; otherwise, it will display ~ENR.

Command Format	**[:SENSe]:NFIGure:CORRection:ENR[:MEASurement]:TABLe:DATA:DELete**
Instruction	Clear ENR list.
Example	:NFIGure:CORRection:ENR:TABLe:DATA:DELete

Command Format	**[:SENSe]:NFIGure:CORRection:ENR:MEASurement:TABLe:DATA** **[:SENSe]:NFIGure:CORRection:ENR:MEASurement:TABLe:DATA?**
Instruction	Sets/Gets the ENR value.
Parameter Type	String
Return	String
Example	:NFIG:CORR:ENR:MEAS:TABL:DATA “1000,-10,2000,-8,3000,-6,10000,5”

11.7.6 Calibration

After entering the ENR value, click ENTER as prompted to start calibration. The analyzer will calibrate the currently set frequency point. After calibration is complete, measurement will automatically start.

The analyzer will automatically save the calibration data and will not be reset due to Preset .If the re-calibrated frequency point is inconsistent with the original calibration data frequency point, the original calibration data will not be deleted.

If it has not been calibrated, it cannot be measured. It will display NO CALI on the window.

After calibration, it will display CALI.

If the currently measured frequency point does not match the calibration frequency point, it will display UNCAL.

Command Format	**[:SENSe]:NFIGure:CALibration:INITiate**
Instruction	Start calibration.
Example	:NFIGure:CALibration:INITiate

Command Format	**[:SENSe]:NFIGure:CALibration:DELete**
Instruction	Clear calibration.
Example	:NFIGure:CALibration:DELete

12 Bluetooth Measurement Mode

The Bluetooth measurement function provides RF emission headphone testing that complies with the Bluetooth Core Specification standards to assist users in testing, evaluating, and verifying Bluetooth devices. It supports testing of low-power Bluetooth, basic speed, and enhanced data rate Bluetooth.

12.1 Freq/Channel

12.1.1 Channel

Select the Bluetooth channel to be tested, Setting the channel will configure the center frequency at the same time.

In Low Energy measurement, the relationship between center frequency and channel is below:

CF = 2.402GHz +Channel*2MHz

While in Basci Rate/Enhanced Data Rate measurement :

CF = 2.402GHz + Channel *1MHz

Command format	**[:SENSe#]:FREQuency:CHANnel** **[:SENSe#]:FREQuency:CHANnel?**
Instructions	Sets/Gets the currently set Bluetooth channel
Parameter Type	integar
Parameter Range	0-78
Return	integar
Example	:FREQuency:CHANnel 22

12.1.2 Center Frequency

Command format	**[:SENSe#]:FREQuency:CENTer** **[:SENSe#]:FREQuency:CENTer?**
Instructions	Set/Get the current Bluetooth Center frequency setting
Parameter Type	float
Parameter Range	2.402GHz ~ 10GHz
Return	float
Example	:FREQuency:CENTer 2.410 GHz

12.1.3 Center Frequency Step

Set the step size of the center frequency. After the setting is complete, the knob and button steps will configure the center frequency according to this setting

12.2 Amplitude

12.2.1 Scale

Set the vertical division value of the Cartesian coordinate display format, which is only valid for RF envelope, Demod waveform, and RF spectrum waveform

Command format	**:DISPlay:WINDow#:TRACe[1]|2|3|4:Y[:SCALe]:PDIVision** **:DISPlay:WINDow#:TRACe[1]|2|3|4:Y[:SCALe]:PDIVision?**
Instructions	Set/get scale
Parameter Type	float
Parameter Range	RF Envelope: 0.1~30 dBm Demod Waveform: 0~100MHz RF Spectrum: 0.1 ~ 30dBm
Return	float
Example	:DISPlay:WINDow1:TRACe1:Y:PDIVision 10

12.2.2 Ref Level

Set the value of the reference line in Cartesian coordinate format. Just like the scale, it is only effective for RF envelope, demodulation waveform, and RF spectrum waveform.

Command format	**:DISPlay:WINDow#:TRACe[1]|2|3|4:Y[:SCALe]:RLEVel** **:DISPlay:WINDow#:TRACe[1]|2|3|4:Y[:SCALe]:RLEVel?**
Instructions	set/get reference level
Parameter Type	float
Parameter Range	RF Envelope: -100dBm ~ 30 dBm Demod Waveform: -100 MHz ~ 100MHz RF Spectrum: -100~ 30 dBm
Return	float
Example	:DISPlay:WINDow1:TRACe1:Y:RLEVel 10

12.2.3 Attenuator

Set the attenuation amplitude of the input signal, with a range of 0-20dB. When the input signal amplitude is too large, it is necessary to increase the attenuation. Attention: Increasing the attenuation amplitude will also reduce the signal-to-noise ratio during the demodulation process, thereby affecting the demodulation result.

12.3 Marker/Peak

12.3.1 Select Marker

Select one of the four markers. The default is Marker1. When a marker is selected, you can set its type, trace to be marked, and other related parameters. The enabled marker will appear on the trace selected through the Select Trace option and the readouts of this marker are also displayed in the active function area and at the upper right corner of the screen.

Command format	**:CALCulate:MARKer:SELEct** **:CALCulate:MARKer:SELEct?**
Instructions	Set/Get Current Markrer
Parameter Type	Enumeration 1-4
Parameter Range	Enumeration:1-4
Return	:CALCulate:MARKer:SELEct 5
Example	Set/Get Current Markrer

12.3.2 Select Trace

Select the trace where the makrer is currently being set.
It does not take effect in Result Sum format.

Command format	**:CALCulate:MARKer[1]|2|3:TRACe 1|2|3** **:CALCulate:MARKer[1]|2|3:TRACe?**
Instructions	Set/Get the trace that marker is on
Parameter Type	Enumeration
Parameter Range	1|2|3
Return	Enumeration
Example	CALCulate:MARK1:TRAC 1

12.3.3 Marker Type

12.3.3.1 Normal

One of the marker types. It is used to measure the X (Frequency or Time) and Y (Amplitude) values of a certain point on the trace. When selected, a marker with the number of the current marker (such as “ 1 ”) appears on the trace.
If no active marker exists currently, a marker will be enabled automatically at the center position of the current trace.
You can use the numeric keys, knob or direction keys to move the marker. The readouts of the marker will be displayed at the upper right corner of the screen.
The readout resolution of the X-axis (frequency or time) is related to the span. For higher readout resolution, reduce the span.

12.3.3.2 Delta

One of the marker types. It is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the reference point and a certain point on the trace. When selected, a pair of markers appears on the trace: Fixed Related Marker (marked by a combination of the marker number and letter " + ", such as " 2+ ") and the Delta Marker (marked by the "Δ", such as " 1Δ2 ").

- After the marker selects "Delta", the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference "fixed" marker
- The delta marker is in the "relative to" state, and its X-axis position can be changed; the related marker is in the "fixed" state by default (the X-axis and Y-axis positions are fixed), but the X-axis can be adjusted by changing to the "normal" state.
- The first row in the upper right corner of the trace area shows the frequency (or time) difference and amplitude difference between the two markers; the second row in the upper right corner of the trace area shows the X axis and amplitude value of the related marker.
- Delta reset. It is only valid when the current marker is a differential marker. If the marker type of the relative marker of the current marker is normal or differential, change the horizontal position of the relative marker to the horizontal position of the current marker; if the marker type of the relative marker is fixed, change the horizontal position and vertical position of the relative marker to the current one. The horizontal and vertical position of the marker.

12.3.3.3 Off

Turn off the marker currently selected. The marker information displayed on the screen and functions based on the marker will also be turned off

Command Format	**:TRACe[1]|2|3|4:MARKer[1]|2|3|4:ENABle OFF|ON|0|1** **:TRACe[1]|2|3|4:MARKer[1]|2|3|4:ENABle?**
Instruction	Sets marker state. Gets marker state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRACe1:MARKer1:ENABle ON

Command Format	**:TRACe[1]|2|3|4:MARKer[1]|2|3|4:TYPE POSition|DELTa|OFF** **:TRACe[1]|2|3|4:MARKer[1]|2|3|4:TYPE?**
Instruction	Sets marker mode. Gets marker mode.
Parameter Type	Enumeration
Parameter Range	POSition DELTa OFF

Return	Enumeration: POS|DELT|OFF
Example	:TRACe:MARKer:TYPE POSition

Command format	**:CALCulate:MARKer#[:SET]:RESEt:DELTa**
Instruction	Difference marker resets to 0 Only valid when the current cursor is a differential marker
Example	:CALCulate:MARKer2:RESEt:DELTa

Command format	**:CALCulate:MARKer:AOFF**
Instruction	Close all markers
Example	:CALCulate:MARKer:AOFF

12.3.4 Marker X

Displays and sets the position of the marker.

Command Format	**:TRACe[1]|2|3|4:MARKer[1]|2|3|4:X** **:TRACe[1]|2|3|4:MARKer[1]|2|3|4:X?**
Instruction	Sets marker X value. Gets marker X value. This command only works when marker is not off.
Parameter Type	Float
Parameter Range	According to marker trace
Return	Float
Example	:TRACe:MARKer:X 200 :TRACe:MARKer:X?

Command Format	**:TRACe[1]|2|3|4:MARKer[1]|2|3|4:Y?**
Instruction	Gets marker Y value.
Parameter Type	None
Parameter Range	None
Return	Float
Example	:TRACe:MARKer:Y?

12.3.5 Relative To

“Relative to” is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between two markers which can mark on different traces.

After the marker selects “Delta”, the original marker will become the delta measurement marker, and the related marker of the incrementing sequence number will become the reference “fixed” marker

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence 1|2|3|4** **:CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence?**
Instructions	Sets/Gets the marker relative to

Parameter Type	Enumeration
Parameter Range	1|2|3|4|5|6|7|8
Return	Enumeration
Example	:CALCulate:MARKer1:REFerence 3

12.3.6 Peak

Set the current cursor position to the position of the peak with the maximum or minimum amplitude of the trace.

- **Peak:** Set the current marker position to the position with the maximum amplitude on the trace.
- **Valley:** Set the current marker position to the position with the smallest amplitude on the trace.

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum**
Instruction	Marker searches for peaks on the selected trace and marks them with, the current selected marker
Example	:CALCulate:MARKer4:MAXimum

Command format	**:CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum**
Instruction	Marker searches for valleys on the selected trace and marks them with, the current selected marker
Example	:CALCulate:MARKer4:MINimum

12.4 Trace

12.4.1 Trace Num & Layout

The screen can display up to 4 windows and arrange them according to the layout settings.

The layout methods include:

- Single
- Stacked 2
- Grid 1,2
- Grid 2x2

Windows will be displayed in Grid 2x2 by default.

Command Format	**:CALCulate:PARameter:COUNt** **:CALCulate:PARameter:COUNt?**
Instruction	Sets trace number. Gets trace number.
Parameter Type	Integer
Parameter Range	1 ~ 4
Return	Integer
Example	:CALCulate:PARameter:COUNt 4

Command Format	**:DISPlay:LAYout**
Instruction	Sets trace layout on screen. Currently, one row, two columns are not supported (1, 2)
Parameter Type	Integer (rows, columns)
Parameter Range	rows 1 ~ 2 columns 1 ~ 2
Return	
Example	:DISPlay:LAYout 2,2

12.4.2 Select Trace

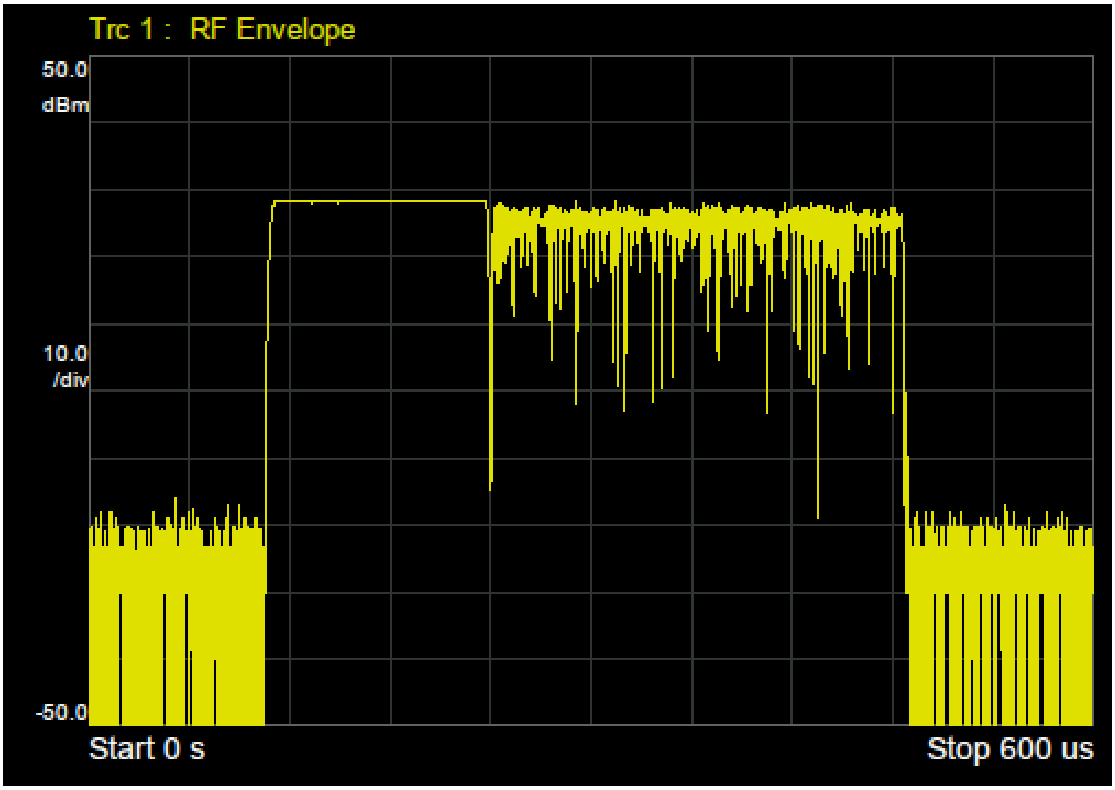
Select the trace you want to configure currently. After selecting a certain trace, the reference level and other parameters of the trace can be adjusted. You can also touch the screen and click on the window where the trace is located to select the trace

After selecting the trace, the symbol ">" will be displayed at the left side of the trace symbol.

12.4.3 Trace Format

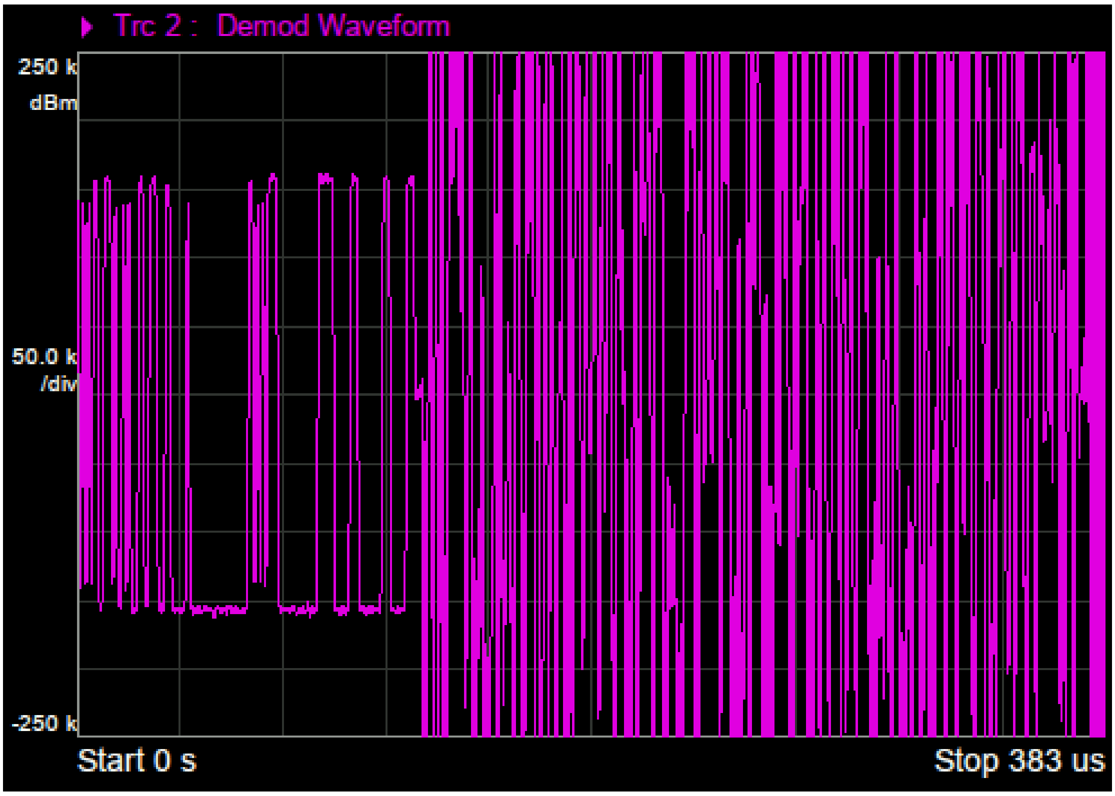
1.RF Envelope

The RF envelope format displays the amplitude envelope information obtained at the current acquisition time.



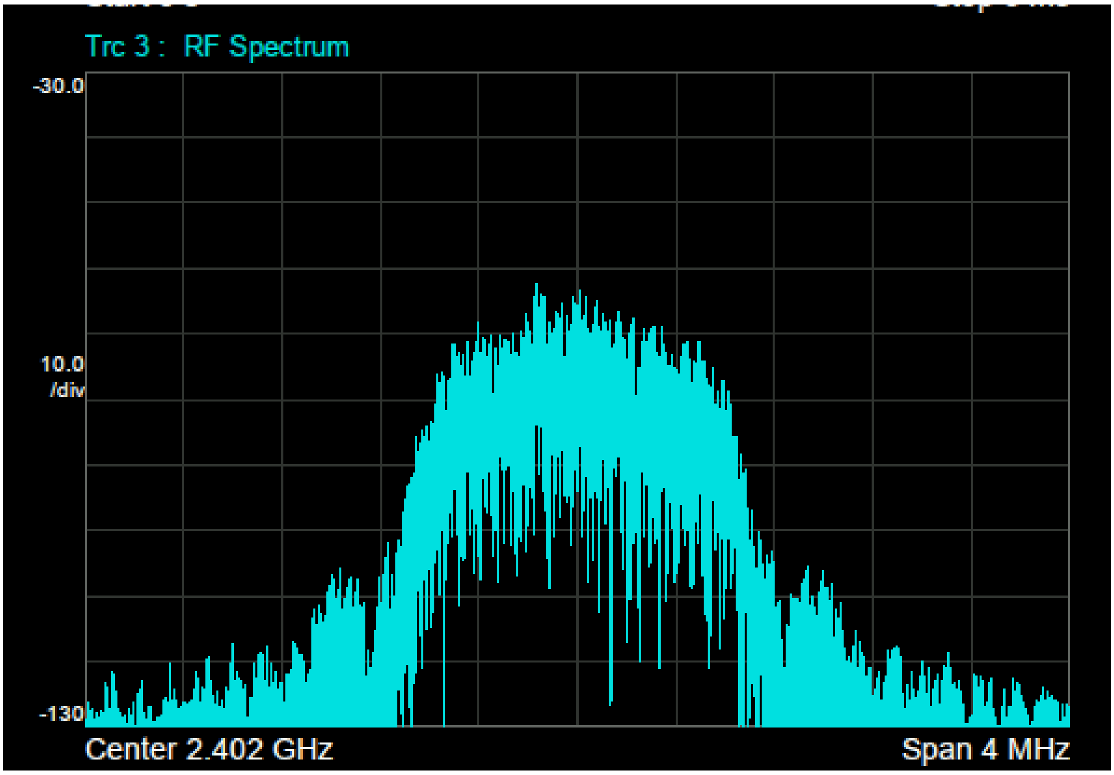
2.Demod Waveform

Displays Demodulation Results.



3.RF spectrum

By performing FFT on the collected data, it displays the frequency domain characteristics of the signal.



4.Result Sum

Summary of measurement results that comply with Bluetooth core specifications.

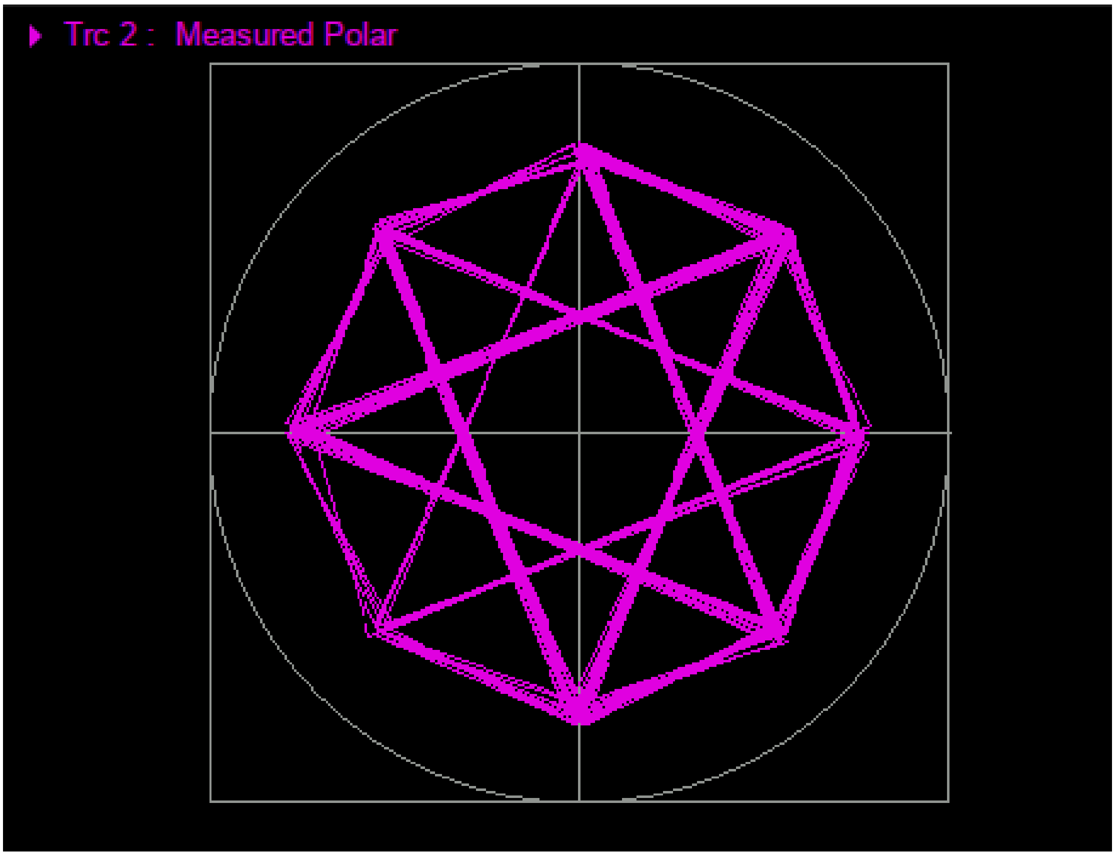
Trc 4 : Result Sum

Packet Type:	ACL_3_DH1	Payload:	PRBS9
Paylaod Length:	664bits	99% devm	5.000 %

Statistic	Current	MAX	MIN
Freq Offset ωi (Hz)	93.058		
Freq Offset ω0 (Hz)	-135.43		
ωi + ω0 (Hz)	-42.369		
DEVMrms (%)	24.120 m		
DEVMpeak (%)	5.6596		
GFSK Avg Pwr (dBm)	-21.862		
DPSK Avg Pwr (dBm)	-25.718		
Rel Avg Pwr (dB)	-22.979		
BER (%)	0.0000		
Bit Errors ()	0.0000		
Guard Inverval (μs)	5.0000		

5. Measured Polar

Constellation diagram reflecting signal modulation performance (only valid when the result is Enhanced data rate type)



Command Format	**:TRACe#:FORMat[:Y]** **:TRACe#:FORMat[:Y]?**
Instruction	Set/get the format of the select trace
Parameter Type	Enumeration
Parameter Range	RFENV| DEMODWV| RFSPEC| SUMMARY| POLAr
Return	Enumeration
Example	:TRACe1:FORMat RFENV

12.5 Sweep

Set the time for the instrument to capture a single data packet.

Command Format	**[:SENSe]:SWEep:TIME** **[:SENSe]:SWEep:TIME?**
Instruction	Set/get the sweep time
Parameter Type	Float with unit:ks,s,ms,us
Parameter Range	1us ~ 1s
Return	Float, Unit s
Example	SWEep:TIME 5ms

12.5.1 Sweep/Measure control

Single/Continuous, controlling the analyzer to perform a single scan/measurement or a continuous scan/measurement. It will be set to Continuous initially.

Restart:

Restart the current scan or measurement. It should be noted that if the scanning parameters are modified, it will effectively perform a restart.

Scanning parameters include sweep time, Center frequency or channel.

Command format	**:INITiate:CONTinuous OFF|ON|0|1** **:INITiate:CONTinuous?**
Instructions	Sets continuous sweep mode on-off. Gets continuous sweep mode state.
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:INITiate:CONTinuous OFF

Command Format	**:INITiate[:IMMediate]**
Instruction	Restarts the current sweep.
Example	:INITiate:IMMediate

Command Format	**:INITiate:RESTart**
Instruction	Restarts the current sweep.
Example	:INITiate:RESTart

12.6 Measurement

Bluetooth Measurement provides support for Bluetooth measurement of three specifications:

1. Basic Rate
2. Enhanced Data Rate
3. Low Energy

According to the Bluetooth protocol, BR/EDR are both classic Bluetooth, and are used in the same measurement that can automatically recognizes signal. Compared to Classical Bluetooth, Low Energy Bluetooth has differences in channel usage, data rate, and data transmission methods.

12.6.1 Low Energy

According to the modulation scheme, Low Enerygy Bluetooth can be divided into three types: LE1M, LE2M and LE Coded

The Payload that supports measurement results calculating include : 0XF0, 0xAA, 0xFF, 0x00,0x0F,0x55

When The Packet Type is LE1M or LE2M:

	0xF0 or 0x0F	0XAA or 0x55	Others
Power Average	Yes	Yes	Yes
Power Peak	Yes	Yes	Yes
Δf1 Average	Yes		
Δf2 Average		Yes	
Δf1 Max	Yes		
Δf2 Max		Yes	
Δf2>185KHz		Yes	
Freq Drift		Yes	
Max Drift Rate		Yes	
Freq Offset		Yes	
Initial Freq Offset		Yes	

When The Packet Type is LECoded

	0xFF or 0x00	Others
Power Average	Yes	Yes
Power Peak	Yes	Yes

Δf1 Average	Yes	
Δf2 Average		
Δf1 Max	Yes	
Δf2 Max		
Δf2>185KHz		
Freq Drift	Yes	
Max Drift Rate	Yes	
Freq Offset	Yes	Yes
Initial Freq Offset	Yes	Yes

12.6.1.1 Basic Rate & Enhanced Data Rate

The main difference between Basic Rate and Enhanced Data Rate lies in transmission speed and transmission quality, while Enhanced Rate is an improvement on Basic Rate Bluetooth. When using BR/EDR measurement, the connected Bluetooth signal will be automatically recognized and the corresponding measurement results will be calculated and displayed.

Basic Rate supports the demodulation from signals list below:

ID,POLL, FHS, DM1,

SCO_HV1,SCO_HV2,SCO_HV3,SCO_DV,

ACL_DH1, ACL_AUX, ACL_DM3, ACL_DH3, ACL_DM5, ACL_DH5

ESCO_EV3, ESCO_EV4, ESCO_EV5

Supported Measurement results calculation from payload type:

0xAA,0x55,0x0F,0xF0

The measurement results table is as follows:

When packet type is ACL_DH1/ACL_DH3/ACL_DH5:

	0xF0 or 0x0F	0xAA or 0x55	Others
Power Average	Yes	Yes	Yes
Power Peak	Yes	Yes	Yes
Δf1 Average	Yes		
Δf2 Average		Yes	
Δf1 Max	Yes		
Δf2 Max		Yes	
Δf2>115KHz		Yes	

Freq Drift		Yes	
Max Drift Rate		Yes	
ICFT	Yes	Yes	

Other signals only support demodulation and power calculation.

12.6.1.2 Enhanced Data Rate

Enhanced data rate measurement supports the following types of signal demodulation:

ESCO_2-EV3, ESCO_3-EV3, ESCO_2-EV5, ESCO_3-EV5

ACL_2-DH1, ACL_3-DH1, ACL_AUX, ACL_2-DH3, ACL_3-DH3, ACL_2-DH5, ACL_3-DH5

The packet formats that support recognition include:

0xAA,0x55,0x0F,0xF0,PRBS9

Support the following measurement results:

Freq Offset ω_i, Freq Offset ω_0, $\omega_i + \omega_0$, devm rms, devm peak, GFSK Average Power, DPSK Average Power, Real Average Power, BER, Bit Error, Guard Interval.

12.6.2 Average

Turn on or off the option to calculate the average measurement results, and you can set the number of participants in the average calculation. When the average option is turned off, the "Avg" column of the measurement results becomes "Current". The larger the average number, the more stable the "Avg" value is.

Command format	**[:SENSe#]:AVERage[:STATe]** **[:SENSe#]:AVERage[:STATe]?**
Instructions	Set/Get the average on|off state
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	: Average 1

Command format	**[:SENSe#]:AVERage:COUNt** **[:SENSe#]:AVERage:COUNt?**
Instructions	Set/Get the average times
Parameter Type	Integar
Parameter Range	1~999
Return	Integar
Example	: Average:COUNt 25

12.7 Trigger

The analyzer provides a variety of trigger functions, users can choose from the trigger menu.

12.7.1 Trigger Source

The analyzer provides a variety of trigger sources to suit different trigger requirements.

Free Run

Free trigger is the default mode of the analyzer, in which the spectrum analyzer sweeps circularly and continuously.

Video

When the user wants to capture an instantaneous signal that appears for a very short time, the video trigger mode can be adopted . In this working mode, only when the rising edge or falling edge of a signal touches the Trigger Level, the signal will be triggered and displayed on the screen.

External

External trigger provides users with richer trigger functions. If users want to realize the periodic trigger and delay trigger spectrum analyzer, they can choose the external trigger mode. In this mode, it is triggered by the rising or falling edge of the external input signal. The square wave signal with a certain frequencycan be periodically triggered, and the delay time can be adjusted by setting the Trigger Delay option.

Periodic

When Periodic is selected, the analyzer uses the built-in period timer signal as the trigger. The trigger event is set by the periodic timer parameter, which is modified by offset and periodic synchronization Src.

You can synchronize periodic signals with external events (using periodic synchronization Src) to get closer to a reliable trigger signal.

If the synchronization source is not selected (off state), the internal timer will not synchronize with any external timed events.

Command format	**:TRIGger[:SEQuence]:SOURce** **:TRIGger[:SEQuence]:SOURce?**
Instructions	sets the trigger source. gets the trigger source.
Parameter Type	Enumeration
Parameter Range	"IMMediate ", "VIDeo ", "EXTernal ","FRAMe"
Return	"IMM", "VID", "EXT" ,"FRAMe"
Example	:TRIGger:SOURce VID

12.7.2 Trigger Level

Sets the amplitude level for the video trigger (absolute level only supported). When the video signal crosses the voltage level with the selected slope, it is triggered.

Command format	**:TRIGger[:SEQuence]: {type}:LEVel** **:TRIGger[:SEQuence]: {type}:LEVel?**
Instructions	sets the trigger level. gets the trigger level. {type}: "VIDeo", "EXTernal"
Parameter Type	Float
Parameter Range	-300~50dBm
Return	Float
Example	:TRIGger:VIDeo:LEVel -20

12.7.3 Trigger Slope

Set the trigger polarity for external trigger, video trigger. The options are rising edge trigger and falling edge trigger.
The same trigger source uses the same trigger edge for both gating and triggering.

Command format	**:TRIGger[:SEQuence]: {type}:SLOPe** **:TRIGger[:SEQuence]: {type}:SLOPe?**
Instructions	sets the trigger edge. gets the trigger edge. {type}: " VIDeo ", " EXTernal "
Parameter Type	Enumeration
Parameter Range	"POS", "NEG"
Return	"POS", "NEG"
Example	:TRIGger: EXTernal:SLOPe :TRIGger: VIDeo:SLOPe?

12.7.4 Trigger Delay

When scanning is at zero span, negative delay can be set . The time range of negative delay is related to the number of sweep points and sweep time:
Maximum negative delay time = [496M / (sweep points * 64) - 5] * sweep time
Maximum positive delay time =500ms

Command format	**:TRIGger[:SEQuence]:{type}:DELay** **:TRIGger[:SEQuence]:{type}:DELay?**
Instructions	sets the trigger delay gets the trigger delay {type}:" VIDeo ", " EXTernal " ,"FRAMe"

Parameter Type	Float
Return	Float
Example	:TRIGger:EXTernal:DELay 5e-3 :TRIGger:FRAMe:DELay?

Command format	**:TRIGger[:SEQuence]:{type}:DELay:STATe** **:TRIGger[:SEQuence]:{type}:DELay:STATe?**
Instructions	sets the trigger delay state. gets the trigger delay state. {type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal: DELay:STATe 1

12.7.5 Trigger Delay

When scanning is at zero span, negative delay can be set . The time range of negative delay is related to the number of sweep points and sweep time:

Maximum negative delay time = [496M / (sweep points * 64) - 5] * sweep time

Maximum positive delay time =500ms

Command format	**:TRIGger[:SEQuence]:{type}:DELay** **:TRIGger[:SEQuence]:{type}:DELay?**
Instructions	sets the trigger delay gets the trigger delay {type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter Type	Float
Return	Float
Example	:TRIGger:EXTernal:DELay 5e-3 :TRIGger:FRAMe:DELay?

Command format	**:TRIGger[:SEQuence]:{type}:DELay:STATe** **:TRIGger[:SEQuence]:{type}:DELay:STATe?**
Instructions	sets the trigger delay state. gets the trigger delay state. {type}:" VIDeo ", " EXTernal " ,"FRAMe"
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal: DELay:STATe 1

12.7.6 Zero Span Trigger Delay Compensation (external trigger only)

In normal cases, after the trigger is generated, the data is displayed and the data is triggered at the same time. However, the processing time of the trigger path and the data path is different. As a result, the data displayed at the trigger time is the previous data. This does not affect the integrity of the data and does not cause data loss at the trigger point. However, in some cases, it is necessary to display the zero point of screen coordinate as the input signal information of trigger point, so the function of zero span delay compensation is needed.

Command format	**:TRIGger[:SEQuence]:EXTernal:DELay:COMPensation OFF|ON|0|1** **:TRIGger[:SEQuence]:EXTernal:DELay:COMPensation?**
Instructions	Enable /disable the external trigger zero sweep delay compensation
Parameter Type	Boolean
Parameter Range	OFF|ON|0|1
Return	0|1
Example	:TRIGger:EXTernal:DELay:COMPensation OFF

12.7.7 Period (periodic trigger only)

Set the trigger period. For gating and triggering, the same trigger source uses the same trigger cycle.

Command format	**:TRIGger[:SEQuence]:FRAMe:PERiod** **:TRIGger[:SEQuence]:FRAMe:PERiod?**
Instructions	Set/Query Period Trigger period
Parameter Type	Float
Parameter Range	100ns~10s
Return	Float
Example	:TRIGger:FRAMe:PERiod 1s

12.7.8 Offset Time

Adjust the cumulative offset between the periodic trigger clock and trigger events. The periodic trigger clock cannot be viewed on the software, only the trigger event can be seen. Therefore, in order to adjust the trigger event time, only the offset between the periodic triggering clock and the triggering event can be adjusted. However, the absolute value of the internal offset is unknown, and each modification of the offset is cumulative on the previous basis.

Command format	**:TRIGger[:SEQuence]:FRAMe:OFFSet** **:TRIGger[:SEQuence]:FRAMe:OFFSet?**
Instructions	Set/Query Period Trigger period offset
Parameter Type	Float
Parameter Range	0s~10s
Return	Float
Example	:TRIGger:FRAMe:OFFSet 1s

12.7.9 Reset Time Offset Display

Reset the display of cycle trigger time offset.

Command format	:TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet
Instructions	Reset Period trigger offset return to zero
Example	:TRIGger:FRAMe:OFFSet:DISPlay:RESet

12.7.10 Sync Source (periodic trigger only)

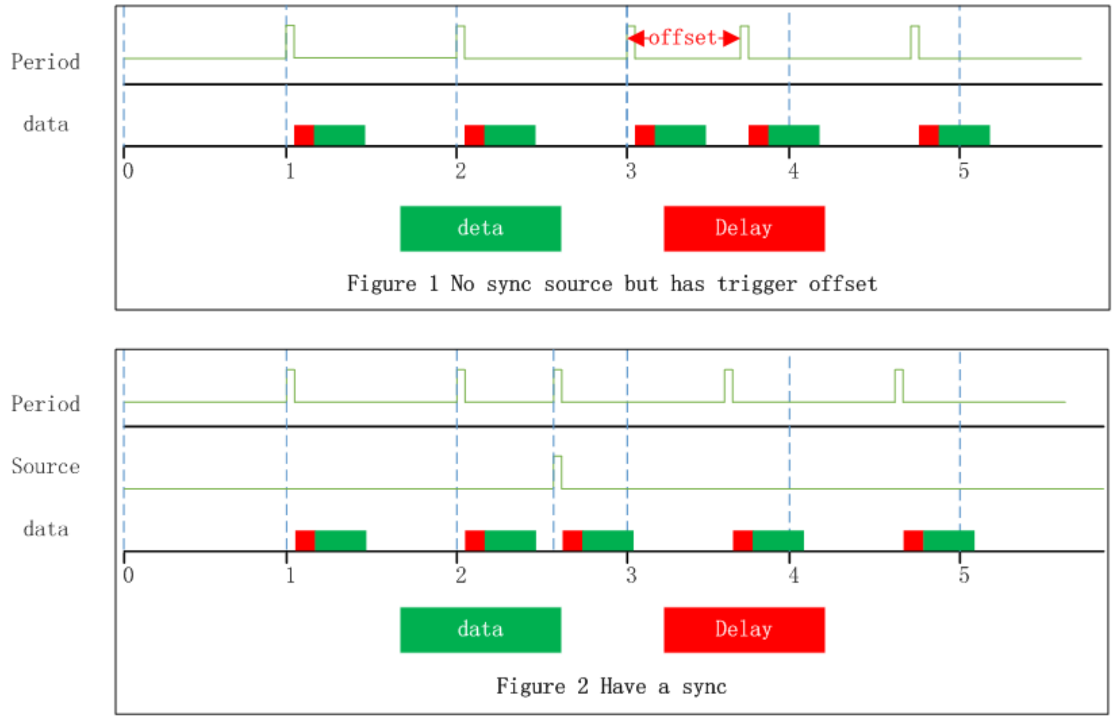


Figure 12-1 Trigger of synchronization source

Command format	:TRIGger[:SEQuence]:FRAMe:SYNC :TRIGger[:SEQuence]:FRAMe:SYNC?
Instructions	Set/Query the type of periodic synchronization
Parameter Type	Enumeration
Parameter Range	"OFF", "EXT"
Return	"OFF", "EXT"
Example	:TRIGger:FRAMe:SYNC EXT

13 Input and Output

13.1 Freq Ref Input

Frequency Reference Source include inside reference source, external reference source and auto-selection reference source. When external reference source is not connected, the button of external reference is not available. Defualt auto-selection reference source.

Command Format	[:SENSe]:ROSCillator:SOURce:TYPE [:SENSe]:ROSCillator:SOURce:TYPE?
Illustration	Set Reference Source
Parameter Type	Enumeration
Parameter Range	INTE|EXT|SENS
example	:ROSCillator:SOURce:TYPE INTE :ROSCillator:SOURce:TYPE EXT :ROSCillator:SOURce:TYPE SENS

13.2 Input Z Correction

Input Impedance include 50 Ohm and 75 Ohm, default 50 Ohm. A adaptor of 75 Ohm to 50 Ohm is required, when the input impedance select 75 Ohm.

The selection of input impedance will influence calculation result only. That influence include voltage and electric current (dBmV, dBuV, dBuA, V, A), but power.

Command Format	[:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude] [:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]?
Illustration	Set Input Impedance
Parameter Type	Enumeration
Parameter range	OHM50|OHM75
example	:CORRection:IMPedance OHM50 :CORRection:IMPedance OHM75

13.3 Correction

Measured value can be corrected in specific x-axis and y-axis. Now, there are eight corrections, witch enter into force at the same time.

Select Correction

Select a correction (1-8) to operating.

Correct Switch

If the selected switch enter into force.

Command Format	**[:SENSe]:CORRection:CSET#[:STATe]** **[:SENSe]:CORRection:CSET#[:STATe]?**
Illustration	Set Correction Switch Status
Parameter Type	Boolean
Menu	Input/Output>Correction
Return Value	0|1
example	:CORRection:CSET1 0 :CORRection:CSET2 1

Edit Correction

Editing, preserving, loading the selected correction.

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:DATA {x1,y1 }** **[:SENSe]:CORRection:CSET#:DATA?**
Illustration	Get/Set correction points
Parameter Type	Character String of Correction Data {Freq 1Hz, Amp 1dBm, Freq 2Hz, Amp 2dBm, ……}
Parameter Range	
Menu	Input/Output>Correction>Edit Correction
example	:CORRection:CSET1:DATA 10000000,-15, 15000000, -15 :CORRection:CSET1:DATA 10000000,-15

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:ADD {x1,y1 }**
Illustration	Add Correction Point
Parameter Type	Character String of Correction Data {Freq 1Hz, Amp 1dBm, Freq 2Hz, Amp 2dBm, ……}
Parameter Range	
Menu	Input/Output>Correction>Edit Correction
example	:CORRection:CSET1:ADD 10000000,-15, 15000000, -15 :CORRection:CSET1:ADD10000000,15

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:POINt:DELete**
Illustration	Delete a special correction point.
Parameter Type	Serial Number
Menu	Input/Output>Correction>Edit Correction
example	:CORRection:CSET1:POINt:DELete 0

Close All the Correction

All the correction is not effective.

Delet One/All the Correction

Empty all the points of a specail/all correction(s).

Command Format	**[:SENSe]:CORRection:CSET[1]2|3|...|8:DELete**
Illustration	Delete all points of a special correction.

Return Value	
example	CORRection:CSET1:DELete

Command Format	**[:SENSe]:CORRection:CSET:ALL:DELete**
Illustration	Delete all the corrections
Return Value	
example	:CORRection:CSET:ALL:DELete

13.4 IF Output

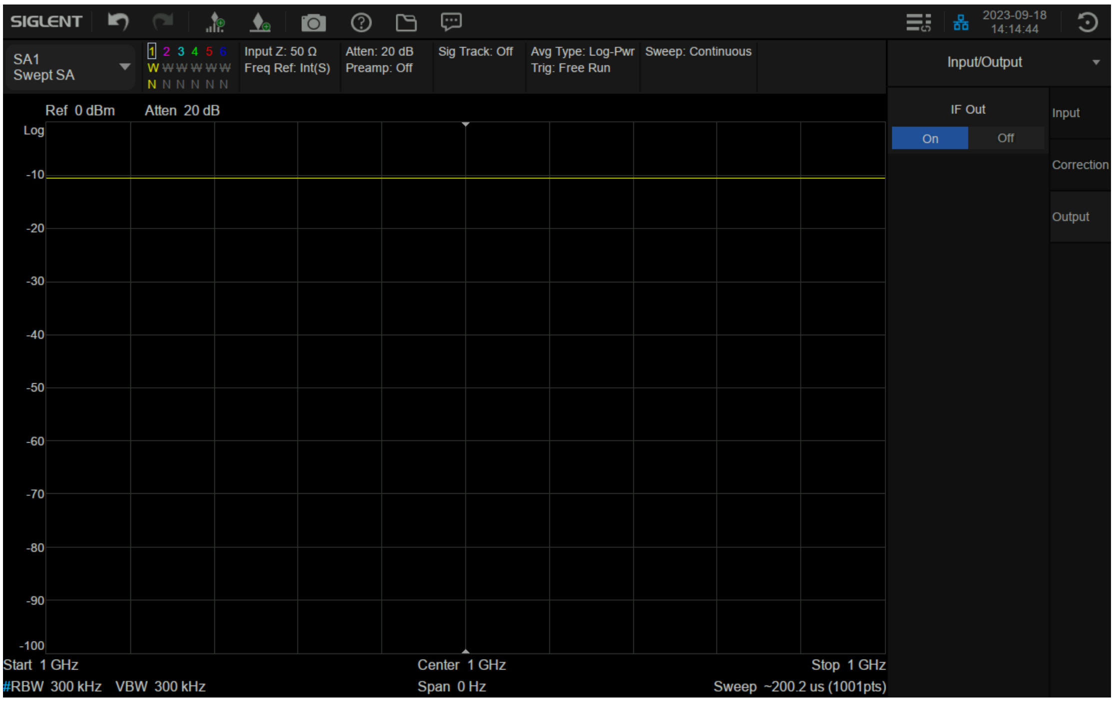
The intermediate frequency (IF) output signal can be used for external signal processing and can be obtained via the ‘IF Out’ output connector on the instrument's rear panel. Please note that the IF output is only useful in Zero Span.

The IF Out signal, centered at approximately 120MHz, is simply a down-converted version of the RF Input signal that is present at the tuned frequency. The bandwidth of the IF output signal is approximately 40MHz. Requires Option SSA5000-IFO.

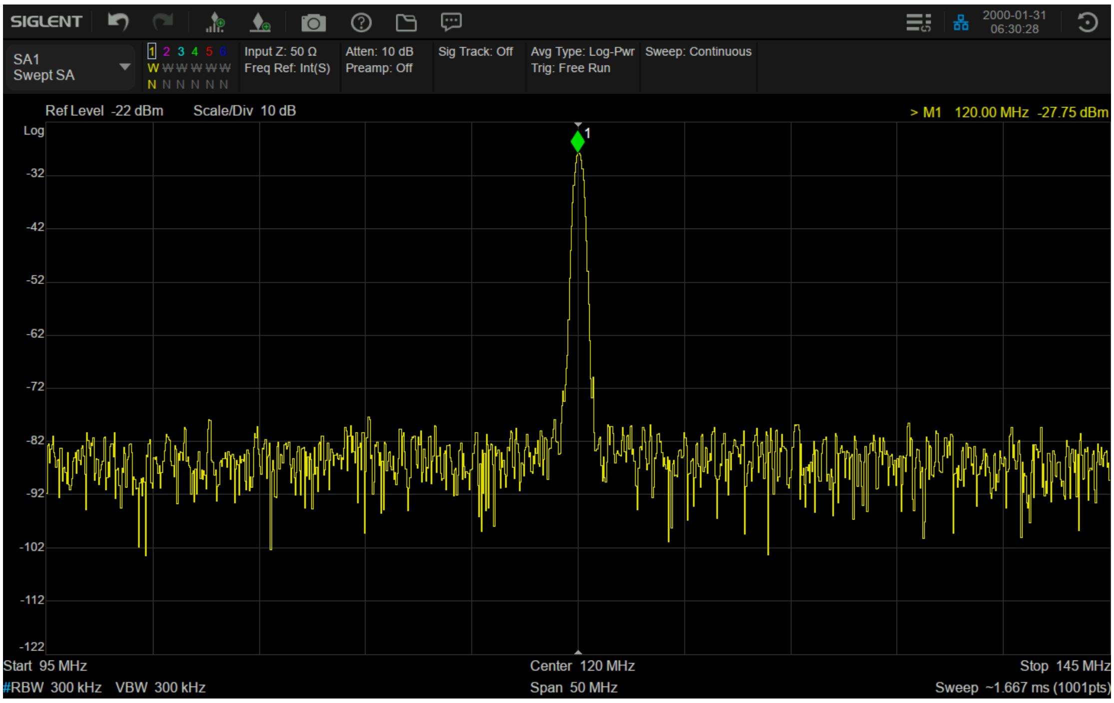
Operation Demonstration

1. Input the RF signal to the RF port, and then output the IF signal through the IF Out connector on the rear panel.
2. Click FREQ , configure the center frequency corresponding to the RF signal and turn on the Zero Span mode.

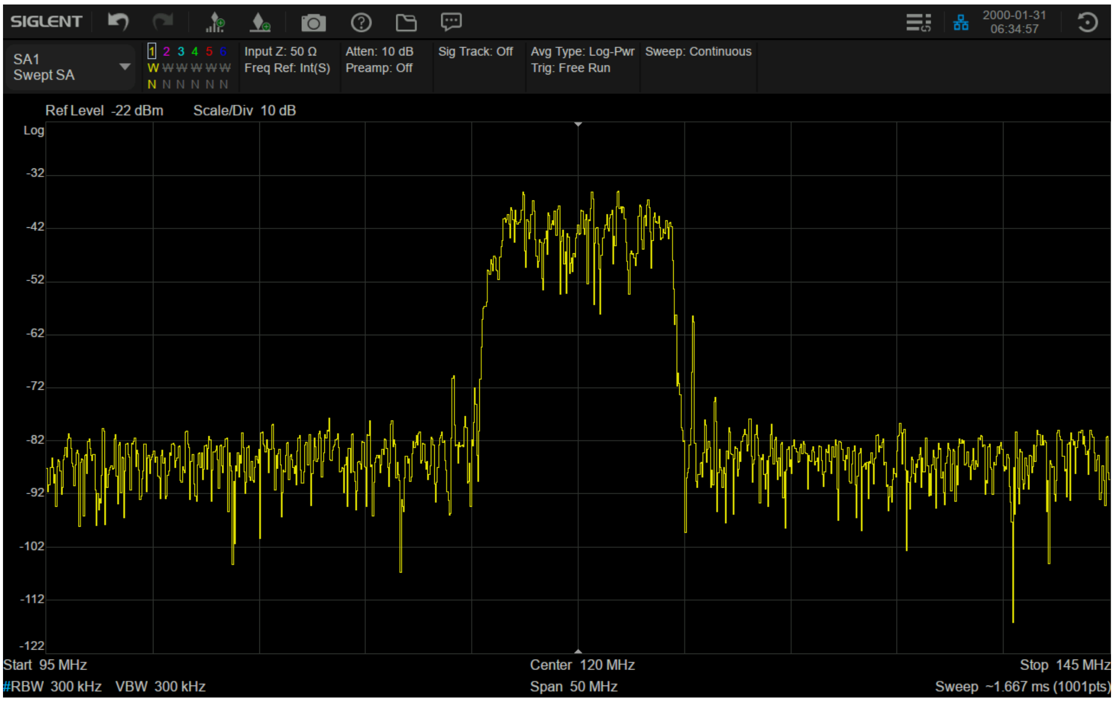
3. Click Input/Output, turn on the IF Out function.



4. Use another spectrum analyzer to observe the IF signal. Configure the center frequency to 120MHz and the span to 50MHz.



IF Output when input an 1GHz RF signal



IF Output when input a 3.5 GHz NR signal

14 System

14.1 System

14.1.1 About

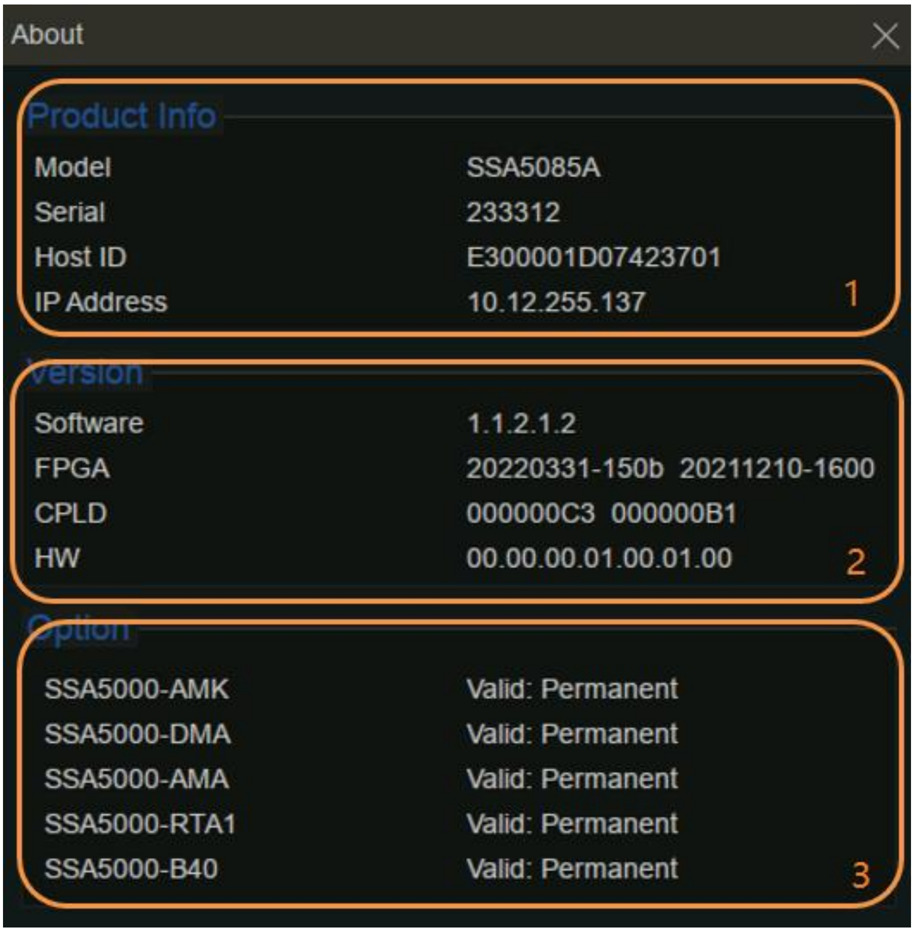


Figure 14-1 about

Area 1 Displays product information, including product name, serial number, Host ID, and IP address.
Area 2 Displays firmware information including software version, FPGA version, CPLD version, and hardware version.
Area 3 displays information about installed options.

Command format	**:SYSTem:CONFigure:SYSTem?**
Instructions	Query device system information
Return	String
Example	:SYSTem:CONFigure:SYSTem?

14.1.2 Hardware

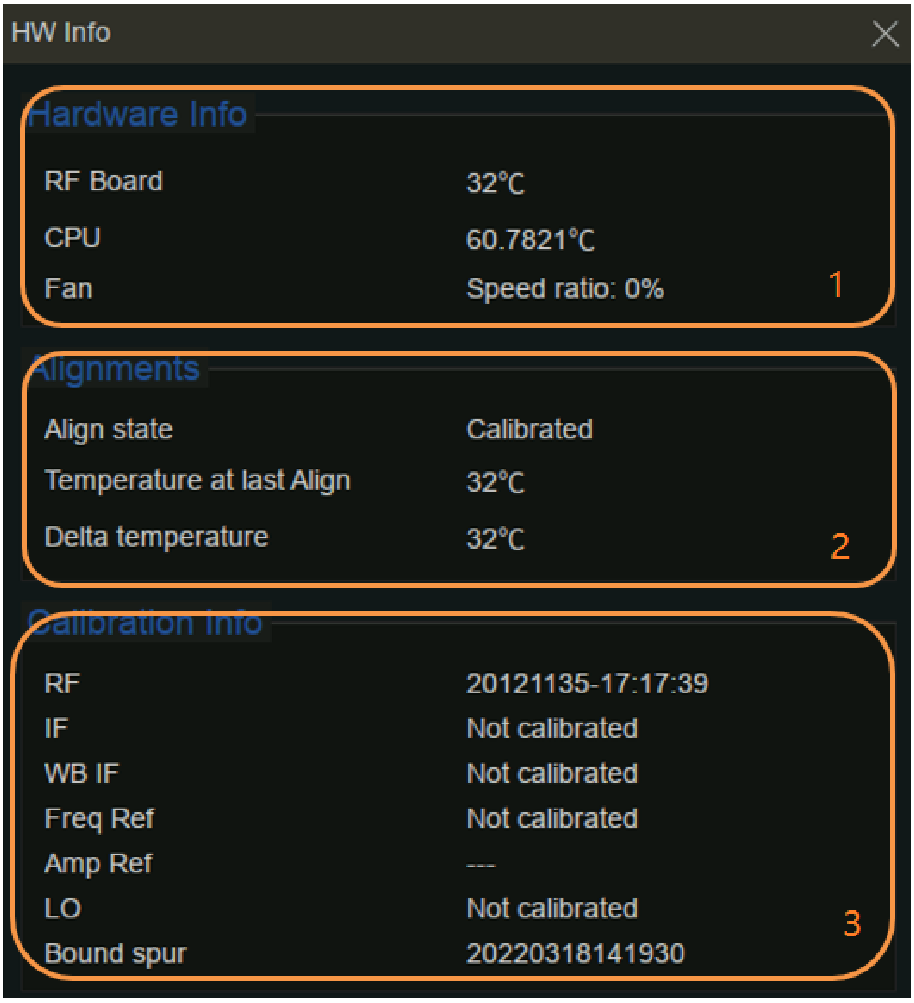


Figure 14-2 Hardware

Area 1 displays the current operating status of the analyzer, including the RF board temperature, CPU temperature, and fan speed.
Area 2 displays automatic alignment (temperature drift compensation) information, including calibration status, time of last calibration, temperature, and temperature difference.
Area 3 shows information about installed options.

14.1.3 Log Record

Display system alarms and warnings.

14.1.4 Language

The analyzer supports a multi-language menu, Chinese and English built-in help and popup messages.

Press this key to select the desired display language.

Command format	**:SYSTem:LANGuage CHINESE|ENGLISH** **:SYSTem:LANGuage?**
Instructions	Setting languages Acquire languages
Parameter type	Enumeration
Parameter Range	CHINESE ENGLISH
Return	Enumeration: CHINESE|ENGLISH
Example	:SYSTem:LANGuage CHINESE :SYSTem:LANGuage?

14.1.5 Connect Setting

14.1.5.1 Network Configuration

Display the MAC address.

Dynamically obtain network IP information (DHCP) or manually set IP address, subnet mask, and gateway parameters.

Command format	**:SYSTem:COMMunicate:LAN:TYPE** **:SYSTem:COMMunicate:LAN:TYPE?**
Instructions	Set/Obtain the DHCP switch
Parameter type	Boolean
Parameter Range	0|1
Return	0|1
Example	:SYSTem:COMMunicate:LAN:TYPE 1 :SYSTem:COMMunicate:LAN:TYPE?

Command format	**:SYSTem:COMMunicate:LAN:IPADdress {“xxx.xxx.xxx.xxx”}** **:SYSTem:COMMunicate:LAN:IPADdress?**
Instructions	Setting an IP Address Obtaining an IP Address
Parameter type	String
Parameter Range	The IP address Settings must comply with specifications (0-255:0-255:0-255:0-255)
Return	IP address string
Example	:SYSTem:COMMunicate:LAN:IPADdress “192.168.1.12” :SYSTem:COMMunicate:LAN:IPADdress?

Command format	**:SYSTem:COMMunicate:LAN:GATeway {“xxx.xxx.xxx.xxx”}** **:SYSTem:COMMunicate:LAN:GATeway?**
Instructions	Set the gateway Access gateway
Parameter type	String
Parameter Range	The IP address must comply with the nic specifications (0-255:0-255:0-255:0-255)

Return	Gateway string
Example	:SYSTem:COMMunicate:LAN:GATeway “192.168.1.1” :SYSTem:COMMunicate:LAN:GATeway?

Command format	**:SYSTem:COMMunicate:LAN:SMASk {“xxx.xxx.xxx.xxx”}** **:SYSTem:COMMunicate:LAN:SMASk?**
Instructions	Set the subnet mask according to your computer network Settings Obtain the subnet mask
Parameter type	String
Parameter Range	The IP address must comply with the nic specifications (0-255:0-255:0-255:0-255)
Return	string
Example	:SYSTem:COMMunicate:LAN:SMASk “255.255.255.0” :SYSTem:COMMunicate:LAN:SMASk?

14.1.5.2 Web services

Analyzer supports web VNC remote access.The analyzer will display the content of the remote projection to the web page, at the same time support mouse and keyboard remote input parameters. VNC reset can be set to View only mode. In this case, the input on the web page is invalid.

- When you log in to the VNC, enter the same password as the preset one.
- To change the port or viewing mode, you need to restart VNC.

Command format	**:SYSTem:WEB:PSW** **:SYSTem:WEB:PSW?**
Instructions	Set web password Get web password
Parameter type	String
Return	Stringxxxxxx
Example	:SYSTem:WEB:PSW “123456”

14.1.5.3 GPIB

Set the GPIB port number. USB Host port on the front panel provides USB-GPIB connection. Use an original board card.

Command format	**:SYSTem:COMMunicate:GPIB:ADDRess {password}** **:SYSTem:COMMunicate:GPIB:ADDRess?**
Instructions	Set the GPIB Get the GPIB
Parameter type	Integer
Return	GPIB address (integer)
Example	:SYSTem:COMMunicate:GPIB:ADDRess 25

14.1.6 Date and Time

Switch the time and date display status in the upper right corner of the screen.
Modify the system time display format, including YMD, MDY, and Dmy.

Command format	**:SYSTem:TIME** **:SYSTem:TIME?**
Instructions	Setting the System Time Obtaining system time
Parameter type	String
Parameter Range	Hours (0~23), minutes (0~59), seconds (0~59)
Return	Stringxxxxxx
Example	:SYSTem:TIME 182559 :SYSTem:TIME?

Command format	**:SYSTem:DATE** **:SYSTem:DATE?**
Instructions	Set the system date Get system date
Parameter type	String
Parameter Range	Year (four lengths), month (1~12), day (1~31)
Return	String:xxxxxxxx
Example	:SYSTem:DATE 20220101 :SYSTem:DATE?

14.1.7 Option

Load the option by loading the purchased.lic option file

Command format	**:SYSTem:LKEY {”option”},{”license key”}**
Instructions	Loading the specified option with the registration code, Restart to take effect
Parameter type	Enumeration , String
Parameter Range	”option”: RTSA|DMA|AMA|AMK|RT40 ”license key”: DING YANG technology to provide authorization code, 16 - bit string
Example	:SYSTem:LKEY “RESA”,”fjbdajffnklmgwno”

14.1.8 Upgrade

Select from memory. The ADS file upgrades the firmware. After the firmware is upgraded, the machine will restart

14.1.9 Help

Help documents are built-in manual documents, including function descriptions and remote command information.

To use the Help document, select a menu button, then press the Help button on the keyboard or touch the “Help on this setting”.At this point, the analyzer will jump to the relevant chapter of the corresponding button in the manual.

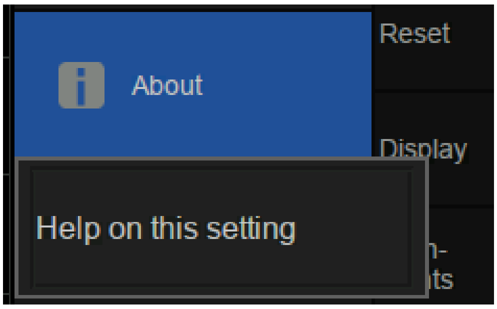


Figure 14-3

14.2 Reset

14.2.1 Preset

Perform a reset operation based on the reset type currently set.

Command format	:SYSTem:PRESet
Note	Reset the device parameters based on the reset type
Example	:SYSTem:PRESet

14.2.2 Preset Type

Perform the reset operation based on the current reset type. Select a configuration type for the spectrum analyzer to reset and load.Reset Settings Preset types include default, last time, and User.

- Default: Reset the default loading parameters
- Last time: reset to the state before the user's last software shutdown.
- User: Resets and loads the configuration file specified by the user. This file can be obtained by saving the user Settings.

Command format	:SYSTem:PRESet:TYPE DFT|LAST|USER :SYSTem:PRESet:TYPE?
Note	Set the reset configuration type Gets the reset configuration type
Parameter	type enumeration
Parameter Range	DFT: default LAST: last USER: user
The return value	enumeration: DFT|LAST|USER
The default value	DFT
Example	:SYSTem:PRESet:TYPE DFT

14.2.3 Save User Config

Saves the current system state as user-defined Settings to internal non-volatile storage.

Command format	:SYSTem:PRESet:USER#:SAVE :SYSTem:PRESet:USER#:LOAD
LOAD	Save the user configuratio Loading user Configuration
Example	:SYSTem:PRESet:USER2:SAVE :SYSTem:PRESet:USER2:LOAD

14.2.4 Power On

Select the configuration to be loaded during power-on. Default configuration, last configuration, and User configuration are available

Command format	**:SYSTem:PON:TYPE DFT|LAST|USER** **:SYSTem:PON:TYPE?**
Note	Set the startup load configuration type Get the startup load configuration type
Parameter type	enumeration
Parameter Range	DFT: Default LAST: last USER: user
The return value	enumeration : DFT|LAST|USER
Default Values	DFT
Example	SYSTem:PON:TYPE DFT

14.2.5 Factory Reset

When Factory Reset is selected, the device will recall the initial config.

Command format	**:SYSTem:FDEFault**
Note	Restore the factory default Settings
Parameter type	None
Parameter Range	None
The return value	None
Default Values	None
Example	:SYSTem:FDEFault

14.2.6 Reset&Clear

Clear the current Settings and restore the default Settings.

Command format	**:SYSTem:CLEAr**
Note	Clear system Settings/files
Parameter type	None
Parameter Range	None
The return value	None
Default Values	None
Example	:SYSTem:FDEFault

14.3 Alignments

The alignment function is used to calibrate errors caused by temperature drift.

Automatic alignment:

After automatic alignment is turned on, the analyzer determines and triggers temperature error calibration logic based on temperature changes.

Calibrate now:

Perform a temperature error calibration immediately.

Command format	**:CALibration:STATe 0|1** **:CALibration:STATe?**
Note	Sets/gets the automatic calibration switch
Parameter type	Boole
Parameter Range	0|1
The return value	0|1
Default Values	0
Example	:CALibration:STATe 0

Command format	**:CALibration**
Note	Perform a calibration immediately
Parameter type	None
Parameter Range	None
The return value	None
Example	:CALibration

14.4 File

Activate the analyzer file operation dialog box to perform file-related operations. Include: File Browser, File Browser, and Recall File.

Command format	**:MMEMory:STORe STA|TRC|COR|CSV|LIM|JPG|BMP|PNG, ”{file}”**
Note	Different modes support different types of file formats
Parameter type	characterstring
Example	:MMEMory:STORe STA, ”ABC.sta”

Command format	**:MMEMory:LOAD STA|TRC|COR|LIM, ”{file}”**
Note	Read the file
Parameter type	characterstring
Example	:MMEMory:LOAD STA, ”ABC.sta” (”File name needs to be added”)

Command format	**:MMEMory:DELete ”{file}”**
Note	Delete files or folders
Parameter type	character string
Example	:MMEMory:DELete ”ABC.sta”

14.5 Display

Set screen brightness.

Set grid brightness in waveform area.

Set buzzer state

Set buzzer volume

Command format	**:DISPlay:WINDow:TRACe:GRATicule:GRID:BRIGhtness** **:DISPlay:WINDow:TRACe:GRATicule:GRID:BRIGhtness?**
Instructions	Set the grid brightness of the waveform area Get waveform area grid brightness
Parameter type	Integer
Parameter Range	0~100
Return	Integer
Example	:DISPlay:WINDow:TRACe:GRATicule:GRID:BRIGhtness 50

Command format	**:DISPlay:WINDow:TRACe:SCREen:BRIGhtness** **:DISPlay:WINDow:TRACe:SCREen:BRIGhtness?**
Instructions	Set screen Brightness Get screen brightness
Parameter type	Integer
Parameter Range	0~100
Return	Integer
Example	:DISPlay:WINDow:TRACe:SCREen:BRIGhtness 50

Command format	**:DISPlay:WINDow:BEEP:VOLUme** **:DISPlay:WINDow:BEEP:VOLUme?**
Instructions	Set the volume of the buzzer Gets the buzzer volume
Parameter type	Integer
Parameter Range	0~100
Return	Integer
Example	:DISPlay:WINDow:BEEP:VOLUme 50

Command format	**:DISPlay:WINDow:BEEP:STATe** **:DISPlay:WINDow:BEEP:STATe?**
Instructions	Set the buzzer switch Obtain the buzzer switch
Parameter type	Boolean
Parameter Range	0/1
Return	0/1
Example	:DISPlay:WINDow:BEEP:STATe 1

14.6 Power

This menu provides shutdown and restart operation buttons.

Analysis Provides energy saving options. You can set the analyzer to automatically turn off the display if no operation is performed within a specified period of time.

When the power-on and power-on function is turned on, the analyzer is powered on and can be turned off.

Command format	**:SYSTem:POWer:OFF**
Instructions	Close the device
Example	:SYSTem:POWer:OFF

Command format	**:SYSTem:POWer:OFF**
Instructions	Restart the device (some machines may not support restart and need to be manually started after shutdown)
Example	:SYSTem:RESTart

14.7 Self Test

14.7.1 Screen Test

Test whether the screen has any pixel defects by displaying five colors: White, Red, Green, Blue and Black. Press ‘Preset’ key to switch the screen color and press ‘←’ key to exit the test.

14.7.2 Keyboard Test

Enter the keyboard test interface. Press the function keys at the front panel one-by-one and observe whether the corresponding key is checked. If not, an error may have occurred in that key. To exit the test, press ‘←’ four times.

14.7.3 LCD Test

If the keys at the front panel are transparent, when the key is pressed, the corresponding backlight will turn on when testing it.

14.7.4 Touch Test

Test whether the touch screen has any defects by touching the test button at specific spots on screen.

15 Remote Control

The analyzer features LAN, USB Device, and GPIB_USB module interfaces. By using a computer with these interfaces, and a suitable programming language (and/or NI-VISA software), users can remotely control the analyzer based on SCPI (Standard Commands for Programmable Instruments) command set, LabView and IVI (Interchangeable Virtual Instrument), to interoperate with other programmable instruments.

This chapter introduces how to build communication between the analyzer and a controller computer with these interfaces.

15.1 Remotely Operating the Analyzer

The analyzer provides both the USB and LAN connection which allows you to set up a remote operation environment with a controller computer. A controller computer could be a personal computer (PC) or a minicomputer. Some intelligent instruments also function as controllers.

15.1.1 USB Device port

Refer to the following steps to finish the connection via USB-Device:

1. Install NI-VISA on your PC for USB-TMC driver.
2. Connect the analyzer USB Device port to a PC with a USB A-B cable.
3. Switch on the analyzer.

The analyzer will be detected automatically as a new USB hardware.

15.1.2 LAN port

Figure 15-1 LAN config

Refer to the following steps to finish the connection via LAN:

1 Install NI-VISA on your PC for VXI driver. Or without NI-VISA, using socket or telnet in your PC's Operating System.

2 Connect the analyzer to PC or the local area network with a LAN cable.

3 Switch on the analyzer.

4 Press button on the front panel **System** → Interface → LAN to enter the LAN Config function menu.

5 Select the IP Config between Static and DHCP.

- DHCP: the DHCP server in the current network will assign the network parameters automatically (IP address, subnet mask, gate way) for the analyzer.
- Static: you can set the IP address, subnet mask, gate way manually. Press Apply.

The analyzer will be detected automatically or manually as a new LAN point.

15.1.3 GPIB-USB Host port

Refer to the following steps to finish the connection via USB:

1 Install NI-VISA on your PC for GPIB driver.

2 Connect the analyzer USB Host port to a PC's GPIB card port, with SIGLENT USB-GPIB adaptor.

3 Switch on the analyzer

Figure 15-2 SIGLENT USB-GPIB Adaptor

4 Press button on the front panel **System** → Interface → GPIB to enter the GPIB number.

The analyzer will be detected automatically as a new GPIB point.

15.2 Build Communication

15.2.1 VISA

NI-VISA includes a Run-Time Engine version and a Full version. The Run-Time Engine version provides NI device drivers such as USB-TMC, VXI, GPIB, etc. The full version includes the Run-Time Engine and a software tool named NI MAX that provides a user interface to control the device.

You can get NI-VISA full version from:

http://www.ni.com/download/.

After download you can follow the steps below to install it:

1 Double click the visa_full.exe, dialog shown as below:

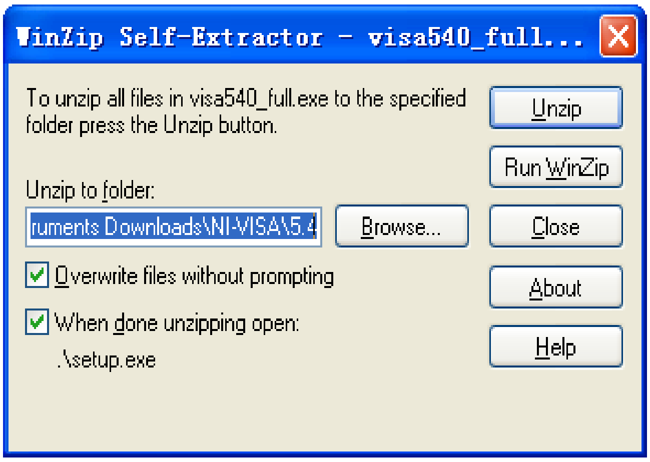


Figure 15-3

2 Click Unzip, the installation process will automatically launch after unzipping files. If your computer needs to install .NET Framework 4, its setup process will auto start.

Figure 15-4

3 The NI-VISA installing dialog is shown above. Click Next to start the installation process.

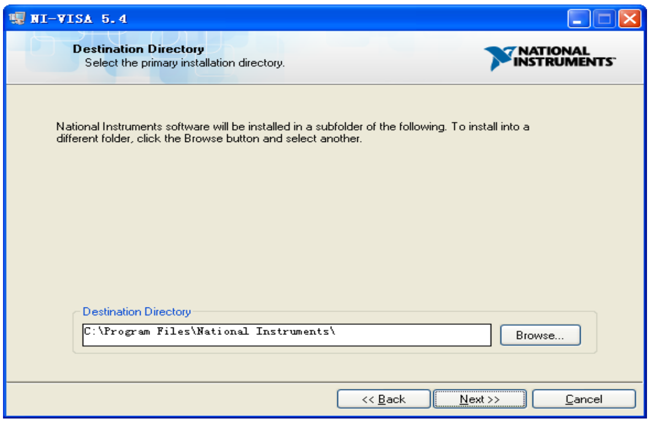


Figure 15-5

4 Set the install path, default path is “C:\Program Files\National Instruments\”, you can change it. Click Next, dialog shown as above.

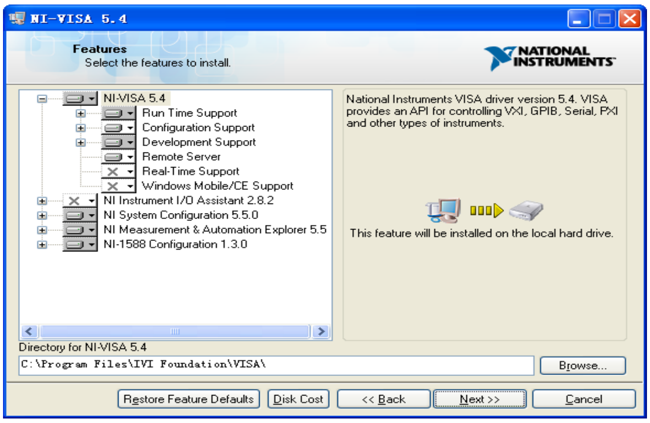


Figure 15-6

5 Click Next twice, in the License Agreement dialog, select the “I accept the above 2 License Agreement(s).”, and click Next, dialog shown as below:

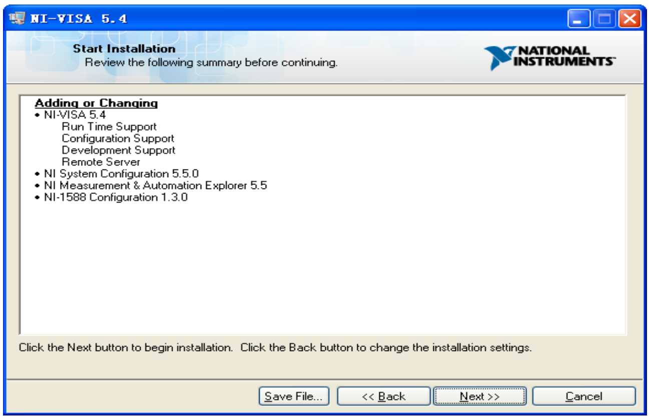


Figure 15-7

6 Click Next to run installation.

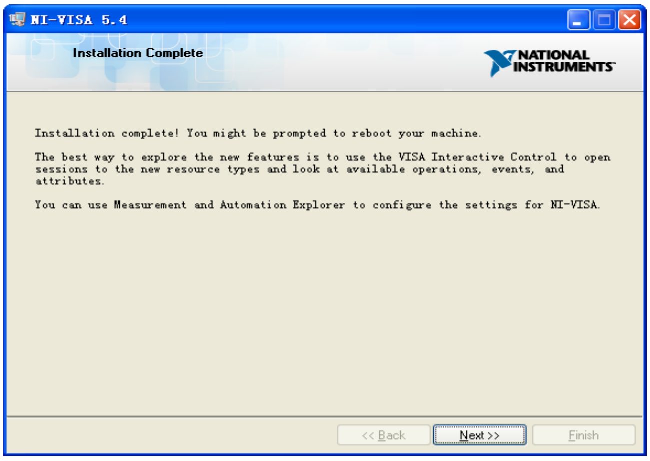


Figure 15-8

Now the installation is complete, reboot your PC.

15.2.2 Sockets/Telnet

Through the LAN interface, VXI-11, Sockets and Telnet protocols can be used to communicate with the analyzer. VXI-11 is provided in NI-VISA, while Sockets and Telnet are commonly included in PC's OS initially.

Socket LAN is a method used to communicate with the analyzer over the LAN interface using the Transmission Control Protocol/Internet Protocol (TCP/IP). A socket is a fundamental technology used for computer networking and allows applications to communicate using standard mechanisms built into network hardware and operating systems. The method accesses a port on the analyzer from which bidirectional communication with a network computer can be established.

Before you can use sockets LAN, you must select the analyzer's sockets port number to use:

- **Standard mode:** Available on port 5025. Use this port for programming.
- **Telnet mode:** The telnet SCPI service is available on port 5024.

15.3 Remote Control Capabilities

15.3.1 User-defined Programming

Users can use SCPI commands to program and control the analyzer. For details, refer to the introductions in “**Programming Examples**”.

15.3.2 NI MAX

Users can control the analyzer remotely by sending SCPI commands via NI-MAX software. NI_MAX is National Instruments Measurement and Automation Explorer. It is an executable program that enables easy communication to troubleshoot issues with instrumentation.

15.3.2.1 Using USB

Run NI MAX software.

1 Click “Device and interface” at the upper left corner of the software;

2 Find the “USBTMC” device symbol

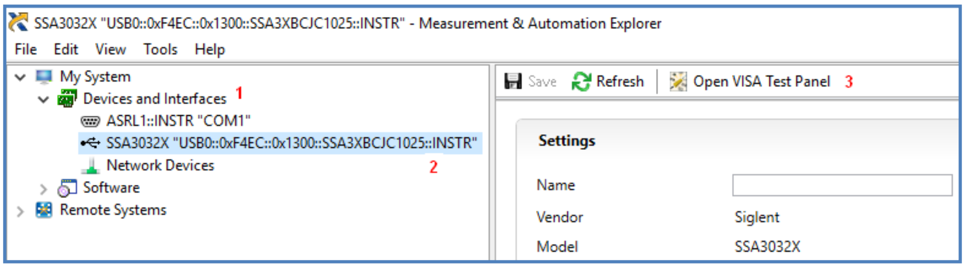


Figure 15-9

3 Click “Open VISA Test Panel” option button, then the following interface will appear.

4 Click the “Input/Output” option button and click the “Query” option button in order to view the operation information.

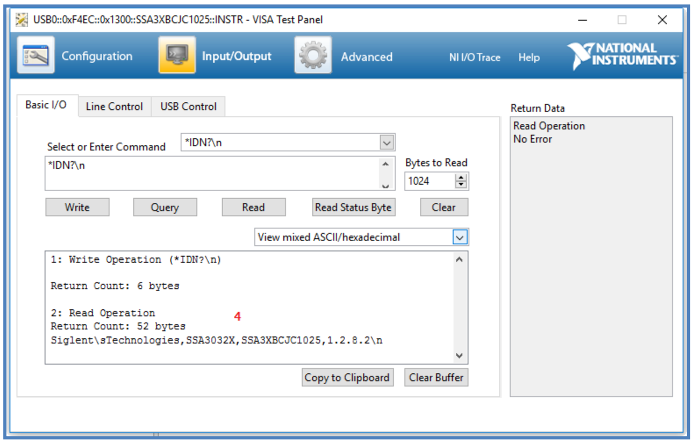


Figure 15-10

Note: The "*IDN?" command (known as the Identification Query) returns the instrument manufacturer, instrument model, serial number, and other identification information.

15.3.2.2 Using LAN

Select "Add Network Device", and select "VISA TCP/IP Resource" as shown:

Run NI MAX software.

1. Click "Device and interface" at the upper left corner of the software;
2. Find the "Network Devices" symbol, click "Add Network Devices";

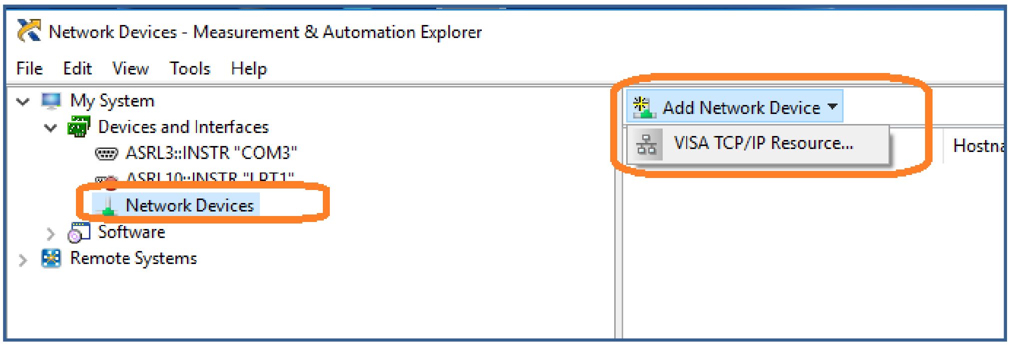


Figure 15-11

3. Select Manual Entry of LAN instrument, select Next, and enter the IP address as shown. Click Finish to establish the connection:

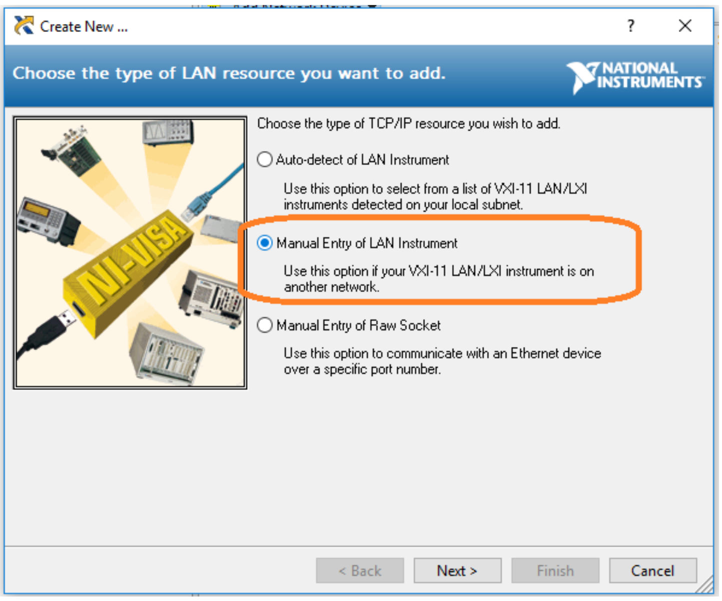


Figure 15-12

Note: Leave the LAN Device Name BLANK or the connection will fail.

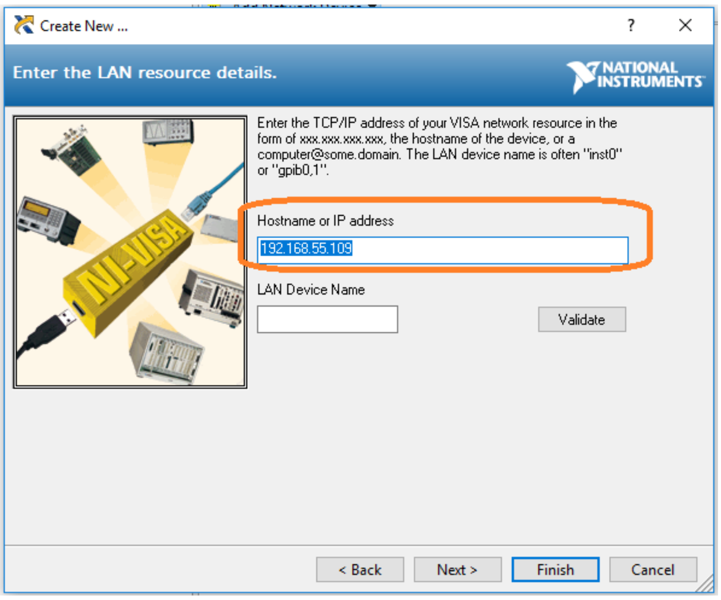


Figure 15-13

4. After a brief scan, the connection should be shown under Network Devices:

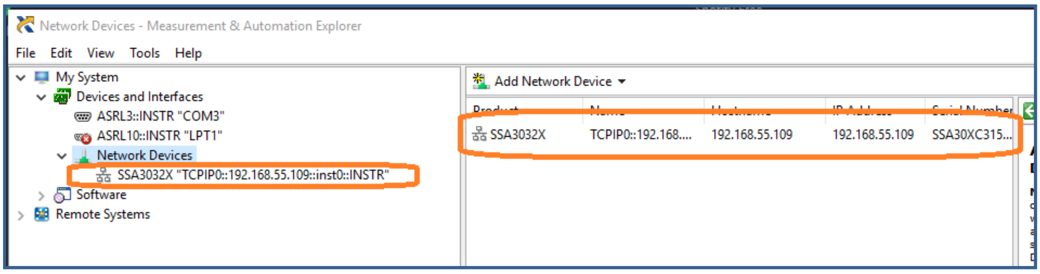


Figure 15-14

5. Right-click on the product and select Open NI-VISA Test Panel:

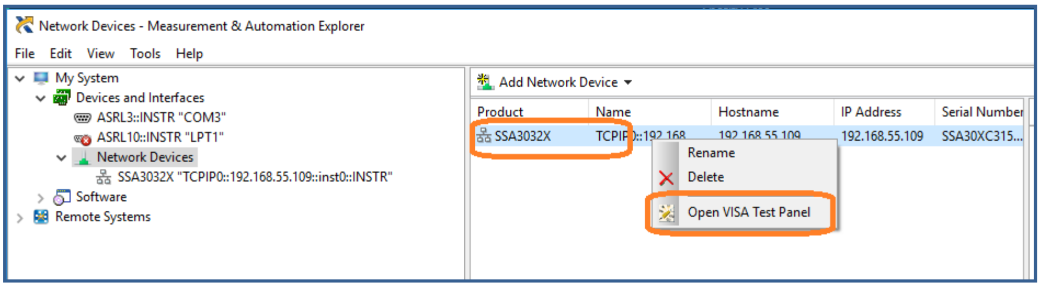


Figure 15-15

6. Click “Input/Output” option button and click “Query” option button. If everything is OK, you will see the Read operation information returned as shown below.

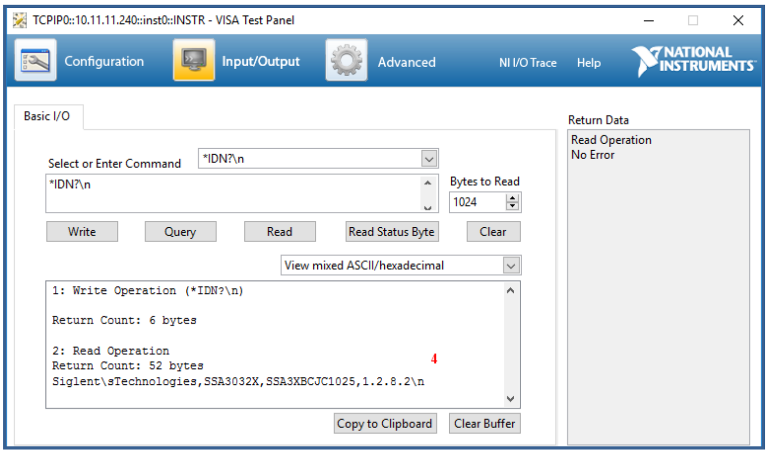
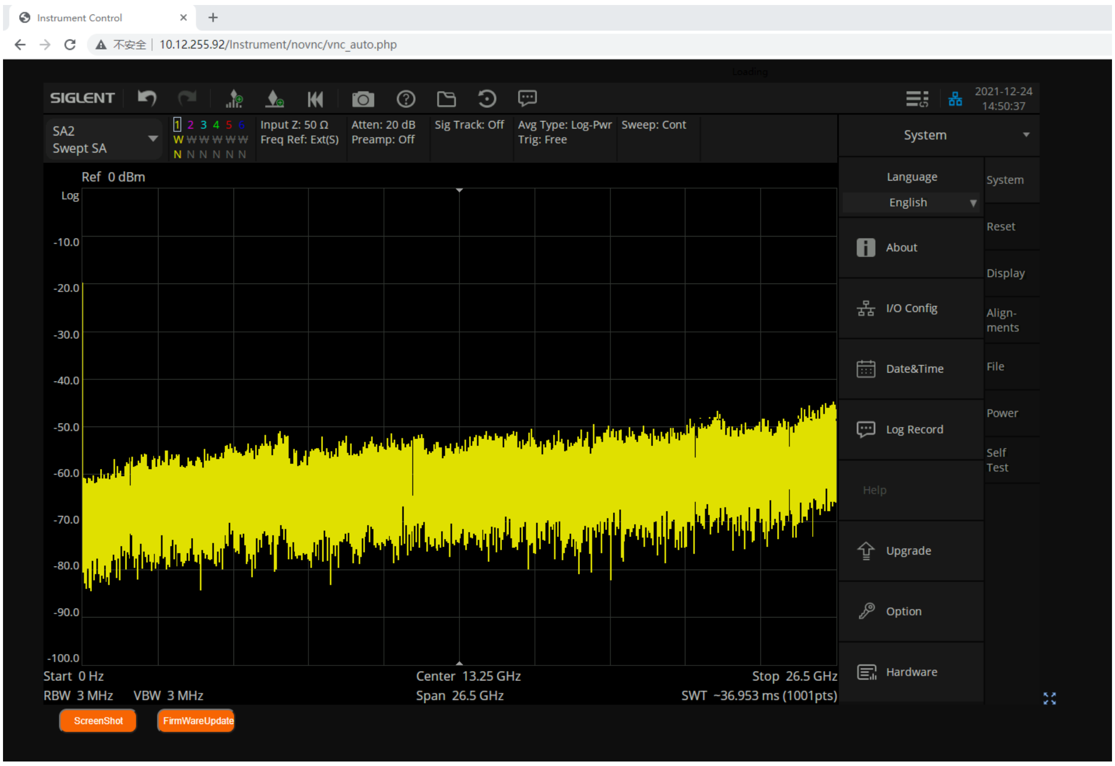


Figure 15-16

15.3.3 Web browser

The analyzer can be remotely controlled through PC or web browser of mobile terminal installing any driver. It mimics the touch screen/mouse clickable display function, just like a physical instrument. The browser also supports screenshot and firmware update functions.



*It is recommended to use a web browser that supports HTML5, such as Chrome or Firefox.

16 SCPI Overview

16.1 Command Format

SCPI commands present a hierarchical tree structure containing multiple subsystems, each of the subsystems is made up of a root keyword and several subkeywords. The command string usually starts with “:”, the keywords are separated by “:” and the followed parameter settings are separated by space. Query commands add “?” at the end of the string.

For example:

:SENSe:FREQuency:CENTer <freq>

:SENSe:FREQuency:CENTer?

SENSe is the root key of the command, FREQuency and CENTer are second and third keywords. The command begins with “**:**”, and separates the keywords at the same time, <freq> separated by space and represents the parameter available for setting; “**?**” represents a query.

16.2 Symbol Instruction

The following four symbols are not the content of SCPI commands and cannot be sent with the commands, but are usually used in the commands.

1 Triangle Brackets < >

The parameter in the triangle brackets must be replaced by an effective value. For example:

Send the “:DEMod:VOLume <value>” command in “:DEMod:VOLume 5”.

2 Square Brackets [ ]

The content in the square brackets can be ignored. When the parameter is ignored, the instrument will set the parameter to its default. For example,

In the “[:SENSe]:POWer[:RF]:ATTenuation?” command, sending any of the four commands below can generate the same effect:

:POWer:ATTenuation?

:POWer:RF:ATTenuation?

:SENSe:POWer:ATTenuation?

:SENSe:POWer:RF:ATTenuation?

3 Vertical Bar |

The vertical bar is used to separate multiple parameters and when sending the command, you can choose one of the parameters. For example,

In the “[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1” command, the parameters available are “OFF”, “ON”, “0” or “1”.

4 Braces { }

The parameters in the braces are optional which can be ignored or set for one or more times. For example:

:CALCulate:LLINe[1]|2:DATA <x-axis>,<ampl>{,<x-axis>, <ampl>}, in the command, the {,<x-axis>, <ampl>} parameters can be ignored or set for one or more times.

16.3 Parameter Type

The parameters in the commands introduced in this manual include 6 types: boolean, enumeration, integer, float, discrete and string.

1 Boolean

The parameters in the commands could be “OFF”, “ON”, “0” or “1”. For example:

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

2 Enumeration

The parameter could be any of the values listed. For example:

[:SENSe]:AVERage:TYPE LOGPower|POWer|VOLTage

The parameter is “OGPower”, “POWer” or “VOLTage”.

3 String

The parameter should be the combinations of ASCII characters. For example:

:SYSTem:COMMunicate:LAN:IPADdress <“xxx.xxx.xxx.xxx”>

The parameter can be set as “192.168.1.12” string.

4 Integer

Except other notes, the parameter can be any integer within the effective value range. For example:

[:SENSe]:DEMod:VOLume <value>

The parameter < value > can be set to any integer between 0 and 10.

5 Float

The parameter could be any value within the effective value range according to the accuracy requirement (the default accuracy contains up to 9 digits after the decimal points). For example:

:CALCulate:BANDwidth:NDB <value>

The parameter < value > can be set to any real number between -100 and 100.

6 Discrete

The parameter could only be one of the specified values and these values are discontinuous. For example:

[:SENSe]:BWIDth:VIDeo:RATio <number>

The parameter <number> could only be one of 0.001, 0.003, 0.01, 0.03, 0.1, 0.3, 1.0, 3.0, 10.0, 30.0, 100.0, 300.0, 1000.0.

16.4 Command Abbreviation

All of the commands are not case sensitive, so you can use any of them. But if abbreviation is used, all the capital letters in the command must be written completely. For example:

:DISPlay:WINDow:TRACe:Y:DLINe:STATe?

Can be abbreviated to:

:DISP:WIND:TRAC:Y:DLIN:STAT?

16.5 IEEE Common Commands

***IDN**

***RST**

***CLS**

***ESE**

***ESR?**

***OPC**

***SRE**

***STB?**

***WAI**

***TRG**

***TST?**

Command Format	***IDN?**
Instruction	Returns an instrument identification information string. The string will contain the manufacturer, model number, serial number, software number, FPGA number and CPLD number.
Menu	None
Example	*IDN? Return: Siglent,SVA1015,1234567890,100.01.01.06.01

Command Format	***RST**
Instruction	This command presets the instrument to a factory defined condition that is appropriate for remote programming operation.
Menu	None
Example	*RST

Command Format	***CLS**
Instruction	Clears the status byte register. It does this by emptying the error queue and clearing all bits in all of the event registers. The status byte register summarizes the states of the other registers. It is also responsible for generating service requests.
Menu	None
Example	*CLS

Command Format	***ESE <number>** ***ESE?**
Instruction	Set the bits in the standard event status enable register. This register monitors I/O errors and synchronization conditions such as operation complete, request control, query error, device dependent error, execution error, command error and power on. A summary bit is generated on execution of the command. The query returns the state of the standard event status enable register.
Menu	None
Example	*ESE 16

Command Format	***ESR?**
Instruction	Queries and clears the standard event status event register. (This is a destructive read.) The value returned reflects the current state (0/1) of all the bits in the register.
Menu	None
Example	*ESR?

Command Format	***OPC** ***OPC?**
Instruction	Set bit 0 in the standard event status register to “1” when all pending operations have finished. The query stops any new commands from being processed until the current processing is complete. Then it returns a “1”, and the program continues. This query can be used to synchronize events of other instruments on the external bus. Returns a “1” if the last processing is complete. Use this query when there’s a need to monitor the command execution status, such as a sweep execution.
Menu	None
Example	*OPC?

Command Format	***SRE <integer>** ***SRE?**
Instruction	This command enables the desired bits of the service request enable register. The query returns the value of the register, indicating which bits are currently enabled. The default value is 255.
Menu	None
Example	*SRE 1

Command Format	***STB?**
Instruction	This query is used by some instruments for a self test.
Menu	None
Example	*STB?

Command Format	***WAI**
Instruction	This command causes the instrument to wait until all pending commands are completed before executing any additional commands. There is no query form to the command.
Menu	None
Example	*WAI

Command Format	***TRG**
Instruction	Restarts the current sweep.
Menu	None
Example	*TRG

Command Format	***TST?**
Instruction	This query is used by some instruments for a self test.
Menu	None
Example	*TST?

16.6 SCPI LIST

16.6.1 GPSA

Mode/Meas	:INSTrument[:SELect] :INSTrument:MEASure
Freq	[:SENSe]:FREQuency:CENTer [:SENSe]:FREQuency:STARt [:SENSe]:FREQuency:STOP [:SENSe]:FREQuency:CENTer:STEP[:INCRement] [:SENSe]:FREQuency:CENTer:STEP:AUTO [:SENSe]:FREQuency:OFFSet [:SENSe]:FREQuency:SPAN [:SENSe]:FREQuency:SPAN:FULL [:SENSe]:FREQuency:SPAN:ZERO [:SENSe]:FREQuency:SPAN:PREVious [:SENSe]:FREQuency:SPAN:HALF [:SENSe]:FREQuency:SPAN:DOUBle [:SENSe]:FREQuency:TUNE:IMMediate :DISPlay:WINDow:TRACe:X[:SCALe]:SPACing :CALCulate:MARKer:TRCKing[:STATe]
BW	[:SENSe]:BWIDth[:RESolution] [:SENSe]:BWIDth[:RESolution]:AUTO [:SENSe]:BWIDth:VIDeo [:SENSe]:BWIDth:VIDeo:AUTO [:SENSe]:BWIDth:VIDeo:RATio [:SENSe]:FILTer:TYPE
Sweep	[:SENSe]:SWEep:TIME [:SENSe]:SWEep:TIME:AUTO :INITiate:CONTinuous :INITiate[:IMMediate] [:SENSe]:SWEep:MODE [:SENSe]:SWEep:MODE:AUTO [:SENSe]:SWEep:TYPE:AUTO:RULes [:SENSe]:SWEep:SPEed [:SENSe]:SWEep:POINts
Ampt	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel

	:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision :DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing :UNIT:POWer :DISPlay:WINDow:TRACe:Y:SCALe:RLEVel:OFFSet [:SENSe]:POWer[:RF]:ATTenuation [:SENSe]:POWer[:RF]:ATTenuation:AUTO [:SENSe]:POWer[:RF]:GAIN[:STATe]
Trigger	:TRIGger[:SEQuence]:SOURce :TRIGger[:SEQuence]:{type}:LEVel :TRIGger[:SEQuence]:{type}:DELay :TRIGger[:SEQuence]:{type}:SLOPe :TRIGger[:SEQuence]:EXTernal:DELay:COMPensation :TRIGger[:SEQuence]:FRAMe:PERiod :TRIGger[:SEQuence]:FRAMe:OFFSet :TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet :TRIGger[:SEQuence]:FRAMe:SYNC [:SENSe]:SWEep:EGATe:SOURce [:SENSe]:SWEep:EGATe[:STATe] [:SENSe]:SWEep:EGATe:VIEW [:SENSe]:SWEep:EGATe:DELay [:SENSe]:SWEep:EGATe:LENGth [:SENSe]:SWEep:EGATe:METHod [:SENSe]:SWEep:EGATe:VIEW:STARt
Trace	TRACe:SELEct :TRACe[1]|2|3|4|5|6:TYPE :TRACe[1]|2|3|4|5|6:DISPlay[:STATe] :TRACe[1]|2|3|4|5|6 [:DATA]? :FORMat[:TRACe][:DATA] [:SENSe]:DETector:TRACe[1]|2|3|4|5|6[:FUNCtion] [:SENSe]:DETector:TRACe[1]|2|3|4|5|6:AUTO [:SENSe]:DETector:TRACe:AUTO:ALL :TRACe[1]|2|3|4|5|6:MATH:X :TRACe[1]|2|3|4|5|6:MATH:Y :CALCulate[:SELected]:MATH:FUNCtion :TRACe[1]|2|3|4|5|6:MATH:OFFSet :TRACe[1]|2|3|4|5|6:MATH:REFerence :CALCulate:NTData:STORE:REF

	:CALCulate:NTData[:STATe] :DISPlay:WINDow:TRACe:Y[:SCALe]:NRLevel :DISPlay:WINDow:TRACe:Y[:SCALe]:NRPosition :DISPlay:WINDow:NTTRace[:STATe] :TRACe:COPY :TRACe:EXCHange :TRACe:PRESet:ALL :TRACe:CLEar:ALL
Marker	:CALCulate:MARKer:SELEct :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y? :CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence :CALCulate:MARKer:AOFF :CALCulate:MARKer:TABLe :CALCulate[:SELected]:MARKer:COUPle :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:READout:AUTO :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:LINE:STATe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:FUNCtion :CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth[1]|2|3|4|5|6|7|8:NDB? :CALCulate:MARKer[1]|2|3|4|5|6|7|8:BANDwidth:RESult? :CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt[:STATe] :CALCulate:MARKer[1]|2|3|4|5|6|7|8:FCOunt:X? :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:CENTer :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STEP :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:START :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STOP :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:RLEVel :CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:SET]:SPAN :CALCulate:MARKer[1]|2|3|4|5|6|7|8:DELTa[:SET]:CENTer :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:NEXT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:LEFT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:RIGHt

	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak :CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe] :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:THReshold:STATe :CALCulate:MARKer:PEAK:EXCursion :CALCulate:MARKer:PEAK:EXCursion:STATe :CALCulate:MARKer:PEAK:TABLe :CALCulate:PEAK:TABLe? :CALCulate:MARKer:PEAK:SORT :CALCulate:MARKer:PEAK:SORT:ORDER :CALCulate:MARKer:PEAK:TABLe:DTLimit:STATe :CALCulate:MARKer:PEAK:TABLe:DTLimit |1|2|3|4|5|6
Limit	:CALCulate:LLINe[1]|2|3|4|5|6:STATe :CALCulate:LLINe[1]|2|3|4|5|6:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:MARGin :CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe :CALCulate:LLINe[1]|2|3|4|5|6:Offset:X :CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y :CALCulate:LLINe[1]|2|3|4|5|6:DATA :CALCulate:LLINe[1]|2|3|4|5|6:ADD :CALCulate:LLINe[1]|2|3|4|5|6:POINt:DELete :CALCulate:LLINe[1]|2|3|4|5|6:DELete :CALCulate:LLINe:ALL:DELete :CALCulate:LLINe[1]|2|3|4|5|6:TRACe :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:COPY :CALCulate:LLINe[1]|2|3|4|5|6:BUILd :CALCulate:LLINe:TEST :CALCulate:LLINe:CONTrol:BEEP :CALCulate:LLINe:FAIL:STOP :CALCulate:LLINe[1]|2|3|4|5|6:FAIL?
Settings	[:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:COUNt [:SENSe]:AVERage:TRACe[1]|2|3|4|5|6? [:SENSe]:AVERage:TRACe[1]|2|3|4|5|6:CLEar

	[:SENSe]:AVERage:TYPE :COUPle:ALL :DISPlay:WINDow:TRACe:Y:DLINe:STATe? :DISPlay:WINDow:TRACe:Y:DLINe :DISPlay:WINDow:TRACe:X:FLINe:STATe? :DISPlay:WINDow:TRACe:X:FLINe [:SENSe]:DEMod [:SENSe]:DEMod:EPHone [:SENSe]:DEMod:VOLume [:SENSe]:DEMod:TIME :INSTrument:COUPle:FREQuency:CENTer
Chp	[:SENSe]:CHPower:BWIDth:INTegration [:SENSe]:CHPower:FREQuency:SPAN:POWer :UNIT:CHPower:POWer:PSD :CHPower:MEASure:CHPower? :CHPower:MEASure:CHPower:CHPower? :CHPower:MEASure:CHPower:DENSity? [:SENSe]:CHPower:AVERage:TCONtrol [:SENSe]:CHPower:FREQuency:SPAN:POWer :UNIT:CHPower:POWer:PSD :CHPower:MEASure:CHPower? :CHPower:MEASure:CHPower:CHPower? :CHPower:MEASure:CHPower:DENSity? [:SENSe]:CHPower:AVERage:TCONtrol
ACPR	[:SENSe]:ACPRatio:BWIDth:INTegration [:SENSe]:ACPRatio:OFFSet:BWIDth[:INTegration] [:SENSe]:ACPRatio:OFFSet[:FREQuency] :MEASure:ACPRatio:ACPower:MAIN? :MEASure:ACPRatio:LOWer:POWer? :MEASure:ACPRatio:UPPer:POWer? :MEASure:ACPRatio:LOWer? :MEASure:ACPRatio:UPPer? [:SENSe]:ACPower:AVERage:TCONtrol
OBW	[:SENSe]:OBWidth:PERCent [:SENSe]:OBWidth:XDB :MEASure:OBWidth? :MEASure:OBWidth:OBWidth?

	:MEASure:OBWidth:CENTroid? [:SENSe]:OBWidth:PREFerence [:SENSe]:OBWidth:INTegration[:METHod] :MEASure:OBWidth:OBWidth:FERRor? [:SENSe]:OBWidth:AVERage:TCONtrol
T-Power	[:SENSe]:TPOWer:FREQuency:CENTer [:SENSe]:TPOWer:LLIMit [:SENSe]:TPOWer:RLIMit :MEASure:TPOWer? [:SENSe]:TPOWer:AVERage:TCONtrol
TOI	:MEASure:TOI? :MEASure:TOI:IP3? [:SENSe]:TOI:AVERage:TCONtrol
Sepctrum Monitor	[:SENSe]:SPECtrogram:STATe [:SENSe]:SPECtrogram:RESTart [:SENSe]:SPECtrogram:AVERage:TCONtrol
CNR	[:SENSe]:CNRatio:BANDwidth:INTegration [:SENSe]:CNRatio:BANDwidth:NOISe [:SENSe]:CNRatio:OFFSet :CNRatio:MEASure:CNRatio? :CNRatio:MEASure:CNRatio:CARRier? :CNRatio:MEASure:CNRatio:NOISe? [:SENSe]: CNRatio:AVERage:TCONtrol
Harmonics	[:SENSe]:HARMonics:FREQuency:FUNDamental [:SENSe]:HARMonics:FREQuency:FUNDamental:AUTO [:SENSe]:HARMonics:FREQuency:STEP[:INCRement] [:SENSe]:HARMonics:FREQuency:STEP[:INCRement]:AUTO [:SENSe]:HARMonics:NUMBer [:SENSe]:HARMonics:SELect

16.6.2 RTSA

Freq	[:SENSe]:FREQuency:CENTer [:SENSe]:FREQuency:STARt [:SENSe]:FREQuency:STOP [:SENSe]:FREQuency:CENTer:STEP[:INCRement] [:SENSe]:FREQuency:CENTer:STEP:AUTO [:SENSe]:FREQuency:OFFSet [:SENSe]:FREQuency:SPAN [:SENSe]:FREQuency:SPAN:FULL [:SENSe]:FREQuency:SPAN:ZERO [:SENSe]:FREQuency:SPAN:PREVious [:SENSe]:FREQuency:SPAN:HALF [:SENSe]:FREQuency:SPAN:DOUBle
BW	[:SENSe]:BWIDth[:RESolution] [:SENSe]:BWIDth[:RESolution]:AUTO [:SENSe]:FILTer:TYPE
Sweep	:INITiate[:IMMediate] :INITiate:CONTinuous [:SENSe]:ACQuisition:TIME :DISPlay:PAUSe
Trigger	:TRIGger[:SEQuence]:SOURce :TRIGger[:SEQuence]:LEVel:LEVel :TRIGger[:SEQuence]:LEVel:DELay :TRIGger[:SEQuence]:EXTernal:DELay :TRIGger[:SEQuence]:EXTernal:SLOPe :TRIGger[:SEQuence]:FMT:STATe :TRIGger[:SEQuence]:FMT:ACTion
Ampt	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel :DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision :UNIT:POWer [:SENSe]:POWer[:RF]:ATTenuation [:SENSe]:POWer[:RF]:ATTenuation:AUTO [:SENSe]:POWer[:RF]:GAIN[:STATe]

Trace	:TRACe[1]|2|3 [:DATA]? :TRACe[:DATA]:SPECtrum? :TRACe[:DATA]:PVT? :TRACe[1]|2|3:TYPE :TRACe[1]|2|3DISPlay[:STATe] [:SENSe]:DETector:TRACe[1]|2|3|4|5|6[:FUNCtion] [:SENSe]:DETector:TRACe:PVTime [:SENSe]:DETector:TRACe:SPECtrogram
Marker	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y? :CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence :CALCulate:MARKer:AOFF :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:CENTer :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:START :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:STOP :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:NEXT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:LEFT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:RIGHt :CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak :CALCulate:MARKer[1]|2|3|4|5|6|7|8:CPSearch[:STATe]
Linit	:CALCulate:LLINe[1]|2|3|4|5|6:STATe :CALCulate:LLINe[1]|2|3|4|5|6:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:MARGin :CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe :CALCulate:LLINe[1]|2|3|4|5|6:Offset:X :CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y :CALCulate:LLINe[1]|2|3|4|5|6:DATA :CALCulate:LLINe[1]|2|3|4|5|6:ADD :CALCulate:LLINe[1]|2|3|4|5|6:POINt:DELete :CALCulate:LLINe[1]|2|3|4|5|6:DELete :CALCulate:LLINe:ALL:DELete :CALCulate:LLINe[1]|2|3|4|5|6:TRACe :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE

	:CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:COPY :CALCulate:LLINe[1]|2|3|4|5|6:BUILd
Meas	:AVERage:TRACe[1]|2|3|4|5|6:COUNt :DISPlay:VIEW[:SELect] :DISPlay:VIEW:DENSity:PERSistence :DISPlay:VIEW:DENSity:PERSistence:INFinite :DISPlay:VIEW:SPECtrogram:TRAC:STOP :DISPlay:VIEW:SPECtrogram:TRAC:OFFSet

16.6.3 MA

DMA	[:SENSe]:AVERage[:STATe] [:SENSe]:AVERage:COUNt [:SENSe]:DDEMod:MODulation :DDEMod[:FORMat]:SRATe [:SENSe]:DDEMod[:FORMat]:SYMBol:POINts [:SENSe]:DDEMod[:FORMat]:RLENgth [:SENSe]:DDEMod:FILTer[:MEASurement] [:SENSe]:DDEMod:FILTer:REFerence [:SENSe]:STATistic:STATe :CALCulate:RESTart :READ:DDEMod? [:SENSe]:DDEMod:SYNC:BURSt[:STATe] [:SENSe]:DDEMod:SYNC:SLENgth [:SENSe]:DDEMod:SYNC:BURSt:THREshold [:SENSe]:DDEMod:SYNC:BURSt:MINLength [:SENSe]:DDEMod:SYNC:BURSt:MINGap [:SENSe]:DDEMod:SYNC:SWORd[:STATe] [:SENSe]:DDEMod:SYNC:SWORd:OFFSet [:SENSe]:DDEMod:SYNC:SWORd:PATTern [:SENSe]:DDEMod:SEGMent:BER:STATe [:SENSe]:DDEMod:SEGMent:BER:PATTern
AMA	[:SENSe]:ADEMod:STYLe :CALCulate:IFBW:INDEx :CALCulate:EQLPf:INDEx :READ:ADEMod?
Freq	[:SENSe]:FREQuency:CENTer [:SENSe]:FREQuency:CENTer:STEP[:INCRement] [:SENSe]:FREQuency:SPAN?
BW	[:SENSe]:BWIDth[:RESolution] [:SENSe]:DDEMod:FFT:WINDow:TYPE
Sweep	:INITiate[:IMMediate] :INITiate:CONTinuous
Trigger	:TRIGger[:SEQuence]:SOURce :TRIGger[:SEQuence]:{type}:LEVel :TRIGger[:SEQuence]:{type}:DELay

	:TRIGger[:SEQuence]:{type}:SLOPe :TRIGger[:SEQuence]:FRAMe:PERiod :TRIGger[:SEQuence]:FRAMe:OFFSet :TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet :TRIGger[:SEQuence]:FRAMe:SYNC :TRIGger[:SEQuence]:ATRigger:STATe :TRIGger[:SEQuence]:ATRigger :TRIGger[:SEQuence]:HOLDoff:STATe :TRIGger[:SEQuence]:HOLDoff :TRIGger[:SEQuence]:HOLDoff:TYPE
Ampt	[:SENSe]:POWer[:RF]:ATTenuation [:SENSe]:POWer[:RF]:ATTenuation:AUTO :TRACe1|2|3|4:Y[:SCALe]:RLEVel :TRACe1|2|3|4:Y[:SCALe]:PDIVision :TRACe1|2|3|4[:Y]:AUToscale [:SENSe]:POWer[:RF]:GAIN[:STATe]
Trace	:CALCulate:PARameter:COUNt :DISPlay:LAYout :TRACe[1]|2|3|4:DATA:NAME :TRACe[1]|2|3|4:FORMat[:Y] :TRACe:DEMod:EYE:LENGth :TRACe:DEMod:TABLe:FORMat
Marker	:TRACe[1]|2|3|4:MARKer[1]|2|3|4:ENABle :TRACe[1]|2|3|4:MARKer[1]|2|3|4:TYPE :TRACe[1]|2|3|4:MARKer[1]|2|3|4:X :TRACe[1]|2|3|4:MARKer[1]|2|3|4:Y? :TRACe[1]|2|3|4:MARKer[1]|2|3|4:REFerence :CALCulate[:SELected]:MARKer:COUPle

16.6.4 EMI

Freq	[:SENSe]:FREQuency:CENTer [:SENSe]:FREQuency:STARt [:SENSe]:FREQuency:STOP [:SENSe] :FSCan:RANGe [:SENSe] :FREQuency:MIDSpan [:SENSe]:FREQuency:OFFSet :DISPlay:WINDow:TRACe:X[:SCALe]:SPACing
BW	[:SENSe]:BWIDth[:RESolution] [:SENSe]:BWIDth[:RESolution]:AUTO [:SENSe]:BANDwidth[:RESolution] [:SENSe]:BANDwidth[:RESolution]:AUTO [:SENSe]:FSCan:SCAN:BWIDth[:RESolution] [:SENSe]:FSCan:SCAN:BWIDth[:RESolution]:AUTO
Sweep	:INITiate:FSCan:CONTinuous :INITiate:METer:CONTinuous :SENSe]:SWEep:TIME :SENSe]:SWEep:COUNt :SENSe]:QPD:DWELl:TIME :SENSe]:SWEep:POINts :SENSe]:FSCan:SCAN:PRBW :SENSe]:FSCan:SCAN:PRBW:AUTO
Trigger	:TRIGger[:SEQuence]:SOURce :TRIGger[:SEQuence]:VIDeo:LEVel :TRIGger[:SEQuence]:LEVel :TRIGger[:SEQuence]:EXTernal:SLOPe :TRIGger[:SEQuence]:EXTernal:DELay:STATe :TRIGger[:SEQuence]:EXTernal:DELay
Ampt	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel :DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision [:SENSe]:POWer[:RF]:ATTenuation :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet [:SENSe]:POWer[:RF]:GAIN[:STATe] :DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing :UNIT:POWer

Trace	:TRACe:SELEct :TRACe:MODE :TRACe[1]|2|3:FSCan:TYPE :TRACe[1]|2|3:TYPE [:SENSe]:AVERage:TRACe[1]|2|3:COUNt [:SENSe]:AVERage:TRACe[1]|2|3:CLEar [:SENSe]:DETector:TRACe[1]|2|3[:FUNCtion] [:SENSe]:FSCan:DETector:TRACe[1]|2|3 [:SENSe]:DETector:TRACe[1]|2|3:AUTO [:SENSe]:DETector:TRACe:AUTO:ALL [:SENSe]:AVERage:TRACe[1]|2|3? :TRACe[1]|2|3 [:DATA]? :TRACe[1]|2|3:FSCan[:DATA]? :TRACe[1]|2|3:MAXimum:X? :TRACe[1]|2|3:MAXimum:Y? :FORMat[:TRACe][:DATA] :TRACe[1]|2|3:DISPlay[:STATe] :TRACe:COPY :TRACe:EXCHange :TRACe:PRESet:ALL
Marker	:CALCulate:MARKer:SELEct :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MODE :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8:MODE :CALCulate:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate[:SELected]:MARKer:AOFF :CALCulate:MARKer[1]|2|3|4|5|6|7|8:TRACe :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8:TRACe :CALCulate:MARKer[1]|2|3|4|5|6|7|8:REFerence :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8:REFerence :CALCulate:MARKer[1]|2|3|4|5|6|7|8:RELative:TO:MARKer :CALCulate:MARKer[1]|2|3|4|5|6|7|8:RELative:TO :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:POSition :CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8:Y? :CALCulate:MARKer[1]|2|3|4|5|6|7|8 [:SET]:RESEt:DELTa

	:CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:DELTa :CALCulate:MARKer[1]|2|3|4|5|6|7|8:X:REFerence :CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y:DELTa? :CALCulate:MARKer[1]|2|3|4|5|6|7|8:Y:REFerence? :CALCulate:MARKer[1]|2|3|4|5|6|7|8 [:SET]:CENTer :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8 [:SET]:SLISt :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8 [:SET]:METer :CALCulate:FSCan:MARKer[1]|2|3|4|5|6|7|8:TO:METer :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum[:SET]:CENTer :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:NEXT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:LEFT :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MAXimum:RIGHt :CALCulate:MARKer[1]|2|3|4|5|6|7|8:PTPeak :CALCulate:MARKer[1]|2|3|4|5|6|7|8:MINimum :CALCulate:MARKer:PEAK:EXCursion :CALCulate:MARKer:PEAK:THReshold :CALCulate:MARKer:PEAK:NUMber
Limit	:CALCulate:LLINe:SEL :CALCulate:LLINe[1]|2|3|4|5|6:STATe :CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe :CALCulate:LLINe[1]|2|3|4|5|6:MARGin :CALCulate:LLINe[1]|2|3|4|5|6:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:OFFSet:X :CALCulate:LLINe[1]|2|3|4|5|6:OFFSet:Y :CALCulate:LLINe[1]|2|3|4|5|6:DATA :CALCulate:LLINe[1]|2|3|4|5|6:ADD :CALCulate:LLINe[1]|2|3|4|5|6:DELete :CALCulate:LLINe[1]|2|3|4|5|6:TRACe :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:CONTrol:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:COPY :CALCulate:LLINe:TEST :CALCulate:LLINe[1]|2|3|4|5|6:BUILd :CALCulate:LLINe[1]|2|3|4|5|6:FAIL?

Meas	[:SENSe]:FSCan:SEQuence [:SENSe]:FSCan:SCAN:POINts? [:SENSe]:FSCan:SCAN:TIME :DISPlay:METer[:STATe] [:SENSe]:METer:DETector:DWELl [:SENSe]:METer:DETector :CALCulate:METer:LIMit[:DATA] :CALCulate:METer:LIMit:STATe :CALCulate:METer:LIMit:ULLine :CALCulate:METer:POWer[:CURRent]? :SENSe]:METer:PHOLd:RESet :CALCulate:SLISt:MARK:SIGNal :CALCulate:SLISt:MARK:CLEar:SIGNal :CALCulate:SLISt:MARK:ALL :CALCulate:SLISt:MARK:CLEar:ALL :CALCulate:SLISt:DELete:SIGNal :CALCulate:SLISt:DELete:ALL :CALCulate:SLISt:DELete:MARKed :CALCulate:SLISt:SORT:TYPE :CALCulate:SLISt:SORT:DAMPlitude :CALCulate:SLISt:SORT:DLDelta :CALCulate:SLISt:SORT:ORDer [:SENSe]:FSCan:SEQuence:REStart [:SENSe]:FSCan:SEQuence:REMeasure [:SENSe]:FSCan:SEQuence:REMeter :CALCulate:SLISt:SET:METer :CALCulate:FSCan:SLISt:SET:METer :CALCulate:FSCan:SLISt:DATA? :DISPlay:MEASure[:STATe] [:SENSe]:FSCan:FINal:DETector#:DWELl [:SENSe]:FSCan:FINal:DETector#:LDELta

16.6.5 PULSE

Freq	[:SENSe]:FREQuency:CENTer [:SENSe]:FREQuency:CENTer:STEP[:INCRement] [:SENSe]:FREQuency:CENTer:STEP:AUTO [:SENSe]:FREQuency:OFFSet
BW	[:SENSe]:BWIDth[:RESolution] [:SENSe]:BWIDth[:RESolution]:AUTO [:SENSe]:BWIDth:VIDeo [:SENSe]:BWIDth:VIDeo:AUTO [:SENSe]:BWIDth:VIDeo:RATio [:SENSe]:BWIDth:VIDeo:RATio:CONfig? [:SENSe]:BANDwidth[:RESolution] [:SENSe]:BANDwidth:VIDeo [:SENSe]:BANDwidth[:RESolution]:AUTO [:SENSe]:BANDwidth:VIDeo:AUTO [:SENSe]:BANDwidth:VIDeo:RATio "[:SENSe]:BANDwidth:VIDeo:RATio:CONfig?
Sweep	:INITiate:CONTinuous [:SENSe]:SWEep:POINts
Trigger	:TRIGger[:SEQuence]:SOURce :TRIGger[:SEQuence]:VIDeo:SLOPe :TRIGger[:SEQuence]:EXTernal:SLOPe :TRIGger[:SEQuence]:VIDeo:LEVel :TRIGger[:SEQuence]:LEVel :TRIGger[:SEQuence]:VIDeo:DELay:STATe :TRIGger[:SEQuence]:VIDeo:DELay :TRIGger[:SEQuence]:EXTernal:DELay:STATe :TRIGger[:SEQuence]:EXTernal:DELay :TRIGger[:SEQuence]:EXTernal:DELay:COMPensation :TRIGger[:SEQuence]:FRAMe:DELay :TRIGger[:SEQuence]:FRAMe:DELay:STATe :TRIGger[:SEQuence]:FRAMe:PERiod :TRIGger[:SEQuence]:FRAMe:OFFSet :TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet :TRIGger[:SEQuence]:FRAMe:SYNC

Ampt	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel ":DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision :SENSe]:POWer[:RF]:ATTenuation [:SENSe]:POWer[:RF]:ATTenuation:AUTO :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet [:SENSe]:POWer[:RF]:GAIN[:STATe] :DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing :UNIT:POWer :TRACe[:Y]:AUToscale
Trace	:TRACe:MODE :TRACe:TYPE :SENSe]:AVERage:TRACe:CLEar [:SENSe]:DETector:TRACe[:FUNCtion] [:SENSe]:DETector:TRACe:AUTO [:SENSe]:DETector:TRACe:AUTO:ALL [:SENSe]:AVERage:TRACe? :TRACe[:DATA]? :TRACe:MAXimum:X? :FORMat[:TRACe][:DATA] :TRACe:DISPlay[:STATe] :TRACe:PRESet:ALL :TRACe:CLEar:ALL

16.6.6 PN

Freq	[:SENSe]:FREQuency:CARRier [:SENSe]:LPLot:FREQuency:OFFSet:STARt [:SENSe]:LPLot:FREQuency:OFFSet:STOP [:SENSe]:FREQuency:CARRier:SEARch [:SENSe]:FREQuency:CARRier:TRACk[:STATe] [:SENSe]:FREQuency:CARRier:TRACk:SPAN [:SENSe]:FREQuency:CARRier:TRACk:SPAN:AUTO [:SENSe]:FREQuency:CARRier:TRACk:ACCuracy
BW	[:SENSe]:BWIDth[:RESolution]
Sweep	:INITiate:CONTinuous [:SENSe]:SWEep:POINts
Ampt	:DISPlay:LPLot:WINDow:TRACe:Y[:SCALe]:RLEVel :DISPlay:LPLot:WINDow:TRACe:Y[:SCALe]:PDIVision :DISPlay:LPLot:WINDow:TRACe:Y[:SCALe]:RPOSition
Trace	:TRACe:SELEct :TRACe:LPLot:MODE :TRACe:LPLot:TYPE :TRACe:LPLot:COPY :TRACe:LPLot:EXCHange :TRACe:PRESet:ALL :TRACe:CLEar:ALL [:SENSe]:LPLot:DETector[:FUNCtion] [:SENSe]:AVERage:TRACe? :TRACe[:DATA]? :FORMat[:TRACe][:DATA]
Marker	:CALCulate:MARKer:TABLe[:STATe] :CALCulate:LPLot:MARKer:SELEct :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:MODE :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:STATe :CALCulate:LPLot:MARKer:AOFF :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:TRACe :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:REFerence :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:RELative:TO:MARKer :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:X :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:X:POSition

	:CALCulate:LPLot:MARKer:COUPle[:STATe] :CALCulate:MARKer[1]|2|3|4|5|6|7|8[:SET]:RESEt:DELTa :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:FUNCtion :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:RMSNoise:MODE :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:SPAN :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:LEFT :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:BAND:RIGHt :CALCulate:LPLot:MARKer[1]|2|3|4|5|6|7|8:RMSNoise:RESult
Linit	:CALCulate:LLINe:SEL :CALCulate:LLINe[1]|2|3|4|5|6:STATe :CALCulate:LPLot:LLINe[1]|2|3|4|5|6:DISPlay :CALCulate:LLINe[1]|2|3|4|5|6:MARGin :CALCulate:LLINe[1]|2|3|4|5|6:MARGin:STATe :CALCulate:LLINe[1]|2|3|4|5|6:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:Offset:X :CALCulate:LLINe[1]|2|3|4|5|6:Offset:Y :CALCulate:LLINe[1]|2|3|4|5|6:DELete :CALCulate:LLINe:ALL:DELete :CALCulate:LLINe[1]|2|3|4|5|6:TRACe :CALCulate:LLINe[1]|2|3|4|5|6:DATA :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:CONTrol:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:INTerpolate:TYPE :CALCulate:LLINe[1]|2|3|4|5|6:FREQuency:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:AMPLitude:CMODe :CALCulate:LLINe[1]|2|3|4|5|6:ADD :CALCulate:LLINe[1]|2|3|4|5|6:POINt:DELete :CALCulate:LLINe[1]|2|3|4|5|6:COPY :CALCulate:LLINe[1]|2|3|4|5|6:BUILd :CALCulate:LLINe:TEST :CALCulate:LLINe:CONTrol:BEEP :CALCulate:LLINe[1]|2|3|4|5|6:FAIL?
Meas	[:SENSe]:LPLot:AVERage:COUNt [:SENSe]:LPLot:AVERage:STATe [:SENSe]:LPLot:AVERage:TCONtrol [:SENSe]:LPLot:METHod [:SENSe]:LPLot:SMOoth

	:DISPlay:LPLot:VIEW :CALCulate:LPLot:SPURious:TABLe :CALCulate:LPLot:DECade:TABLe [SENSe]:CARRier:THReshold:MINimum

16.6.7 NF

Freq	:SENSe]:NFIGure:FREQuency:MODE [:SENSe]:NFIGure:FREQuency:CENTer [:SENSe]:NFIGure:FREQuency:STARt [:SENSe]:NFIGure:FREQuency:STOP [:SENSe]:NFIGure:FREQuency:SPAN [:SENSe]:NFIGure:FREQuency:FIXed [:SENSe]:NFIGure:FREQuency:LIST:DATA:DELete
BW	[:SENSe]:NFIGure:BWIDth[:RESolution] [:SENSe]:NFIGure:BANDwidth[:RESolution] [:SENSe]:NFIGure:BWIDth[:RESolution]:AUTO [:SENSe]:NFIGure:BANDwidth[:RESolution]:AUTO
Sweep	[:SENSe]:NFIGure:SWEep:POINts [:SENSe]:NFIGure:SWEep:TIME [:SENSe]:NFIGure:SWEep:TIME:AUTO :INITiate:CONTinuous
Ampt	:DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RLEVel :DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:RLEVel :DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RLEVel :DISPlay:NFIGure:TRACe:TEEFective:Y[:SCALe]:RLEVel :DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RLEVel :DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RLEVel :DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:PDIVision :DISPlay:NFIGure:TRACe:NFACtor:Y[:SCALe]:PDIVision :DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:PDIVision :DISPlay:NFIGure:TRACe:TEEFective:Y[:SCALe]:PDIVision :DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:PDIVision :DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:PDIVision :DISPlay:NFIGure:TRACe:NFIGure:Y[:SCALe]:RPOSition :DISPlay:NFIGure:TRACe:GAIN:Y[:SCALe]:RPOSition :DISPlay:NFIGure:TRACe:TEEFective:Y[:SCALe]:RPOSition :DISPlay:NFIGure:TRACe:PHOT:Y[:SCALe]:RPOSition :DISPlay:NFIGure:TRACe:PCOLd:Y[:SCALe]:RPOSition :DISPlay[:WINDow]:TRACe#:Y[:SCALe]:AUTO :DISPlay:NFIGure:VIEW3:WINDow#:TRACe:Y[:SCALe]:AUTO [:SENSe]:NFIGure:POWer[:RF]:ATTenuation

	[:SENSe]:NFIGure:POWer[:RF]:ATTenuation:AUTO [:SENSe]:NFIGure:POWer[:RF]:GAIN[:STATe]
Trace	:DISPlay:NFIGure:FORMat :DISP:NFIG:FORM:AUTO :DISPlay:NFIGure:DATA:TRACe :DISPlay:NFIGure:TRACe:COMBined[:STATe] :TRACe:NFIGure:TYPE :TRACe:NFIGure:DISPlay[:STATe]
Marker	:CALCulate:NFIGure:MARKe[1]|2|3|4|5|6|7|8:X :CALCulate:NFIGure:MARKer[1]|2|3|4|5|6|7|8:Y :CALCulate:NFIGure:MARKer[1]|2|3|4|5|6|7|8:MODE :CALCulate:NFIGure:MARKer[1]|2|3|4|5|6|7|8:TRACe :CALCulate:NFIGure:MARKer:AOFF
Meas	[:SENSe]:NFIGure:CORRection:ENR[:MEASurement]:TABLe:DATA:DELete [:SENSe]:NFIGure:CORRection:ENR:MEASurement:TABLe:DATA [:SENSe]:NFIGure:CALibration:DELete

16.6.8 BT

Freq	[:SENSe]:FREQuency:CENTer [:SENSe]:FREQuency:CHANnel
Sweep	:INITiate:CONTinuous [:SENSe]:SWEep:TIME
Ampt	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel :DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision
Trace	:CALCulate:PARameter:SELect :CALCulate:PARameter:COUNt :TRACe:FORMat[:Y]
Trigger	:TRIGger[:SEQuence]:SOURce :TRIGger[:SEQuence]:VIDeo:LEVel :TRIGger[:SEQuence]:LEVel :TRIGger[:SEQuence]:VIDeo:DELay:STATe :TRIGger[:SEQuence]:VIDeo:DELay :TRIGger[:SEQuence]:VIDeo:SLOPe :TRIGger[:SEQuence]:EXTernal:DELay:STATe :TRIGger[:SEQuence]:EXTernal:DELay :TRIGger[:SEQuence]:EXTernal:DELay:COMPensation :TRIGger[:SEQuence]:EXTernal:SLOPe :TRIGger[:SEQuence]:RFBurst:SLOPe :TRIGger[:SEQuence]:FRAMe:DELay:STATe :TRIGger[:SEQuence]:FRAMe:DELay :TRIGger[:SEQuence]:FRAMe:PERiod :TRIGger[:SEQuence]:FRAMe:OFFSet :TRIGger[:SEQuence]:FRAMe:OFFSet:DISPlay:RESet :TRIGger[:SEQuence]:FRAMe:SYNC :TRIGger[:SEQuence]:ATRigger:STATe :TRIGger[:SEQuence]:ATRigger :TRIGger[:SEQuence]:HOLDoff:STATe :TRIGger[:SEQuence]:HOLDoff :TRIGger[:SEQuence]:HOLDoff:TYPE
Meas	[:SENSe#]:AVERage[:STATe] [:SENSe#]:AVERage:COUNt :FILE:RAW:SAVE

16.6.9 Other

IO	[:SENSe]:ROSCillator:SOURce:TYPE [:SENSe]:CORRection:IMPedance[:INPut][:MAGNitude]
Correction	[:SENSe]:CORRection:CSET#[:STATe] [:SENSe]:CORRection:CSET#:ADD [:SENSe]:CORRection:CSET:ALL:DELete [:SENSe]:CORRection:CSET#:DATA? [:SENSe]:CORRection:CSET#:DELete [:SENSe]:CORRection:CSET:ALL:DELete
System	:SYSTem:CONFigure:SYSTem? :SYSTem:LANGuage :SYSTem:COMMunicate:LAN:TYPE :SYSTem:COMMunicate:LAN:IPADdress :SYSTem:COMMunicate:LAN:GATeway :SYSTem:COMMunicate:LAN:SMASk :SYSTem:WEB:PSW :SYSTem:TIME :SYSTem:DATE :SYSTem:LKEY :SYSTem:COMMunicate:GPIB:ADDRess
Reset	:SYSTem:PRESet :SYSTem:PRESet:TYPE :SYSTem:PRESet:USER[1]|2|3|4|5|6|7:SAVE :SYSTem:PRESet:USER[1]|2|3|4|5|6|7:LOAD :SYSTem:PON:TYPE :SYSTem:FDEFault :SYSTem:CLEAr
Calibration	:CALibration:STATe :CALibration
File	:MMEMory:STORe :MMEMory:LOAD :MMEMory:DELete
Display	:DISPlay:WINDow:TRACe:GRATicule:GRID:BRIGhtness :DISPlay:WINDow:TRACe:SCREen:BRIGhtness
Power	:SYSTem:POWer:OFF :SYSTem:RESTart
Buzzer	:DISPlay:WINDow:BEEP:STATe :DISPlay:WINDow:BEEP:VOLUme

17 Service and Support

17.1 Service Summary

SIGLENT warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three years (accessories for a period of one year) from the date of shipment from an authorized Siglent distributor. If the product proves defective within the respective period, **SIGLENT** will provide repair or replacement as described in the complete warranty statement.

To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest Siglent sales and service office. Except as provided in this summary or the applicable warranty statement, **SIGLENT** makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall **SIGLENT** be liable for indirect, special or consequential damages.

17.2 Troubleshooting

Before calling **SIGLENT**, or returning an analyzer for service, perform the quick checks listed below. This check may eliminate the problem.

If the problem remains still, please contact **SIGLENT** and provide your device information in the back of the analyzer.

1 The Power Switch is still dark after power on:

(1) Check that the power is correct / working.

(2) Check the power cord has been connected correctly

(3) Check the power fuse. If a new fuse needs to be installed, please use a specified fuse.

2 The analyzer's screen is still dark (no display) after power on:

(1) Check whether the fan is running while the screen is dark, maybe the LCD cable is loose?

(2) Check whether the fan is not running while screen is dark, maybe it has failed to start up?

(3) Do not disassemble the instrument by yourself and contact **SIGLENT**.

3 The control panel is unresponsive or gives a wrong response:

(1) Press all the keys at the front panel to check if all of them are normal after power on.

(2) Press **System** > **Self Test** > **Key Test** to check if all the keys are working properly.

(3) If all the keys are not working, the numeric keyboard connection might be loose or the numeric keyboard is broken.

(4) If the touch screen is not working, check if the Touch is ON in **Display** > Touch Settings menu.

(5) Check whether the analyzer is locked in a remote control; if so, press **Esc** to unlock it.

(6) Do not disassemble the instrument by yourself and contact **SIGLENT**.

4 The traces on the screen do not update for a long period of time:

(1) Check whether the traces are in View or other status; if so, change to Clear&Write to activiate it.

(2) Verify whether all the trigger conditions have been met and whether there is a valid trigger signal inputting.

(3) Check whether the analyzer is in a Limit test.

(4) Check whether the analyzer is in a single sweep.

(5) Check whether the current sweep time is too long.

(6) Check whether the analyzer is in a Demod listening and the Demod time is too long.

(7) Check whether the analyzer is in an EMI measurement mode, and the Sequance is not in a Scan status.

5 Wrong measurement results or poor precision:

To calculate the system errors and check the measurement results and precision, refer to the introductions in "**Specifications**". To reach these specifications, please:

(1) Check whether all the external devices are successfully connected and are working normally.
(2) Get some knowledge of the signal under measurement and set appropriate instrument parameters.
(3) Make measurements under proper conditions, for example:
(4) Warm-up the instrument appropriately and operate the instrument under the specified environment temperature;
(5) Check if the Correction is ON in SA or VNA mode.
(6) Calibrate the instrument regularly to reduce or avoid errors that might occur over time.
(7) If you need a specific calibration after the stated calibration period, contact **SIGLENT** or get paid service from authorized measurement agencies.

6 System Message:

The instrument may display prompt messages, error messages or state messages according to the current working status. These messages are displayed to help you to use the instrument correctly and are not instrument failures.

Table 17-1 System Message

User system message	Message on screen
System message description (1~199)	
SWT_OOR (1)	Sweep time out of range
RBW_OOR(2)	RBW out of range
SWT_CCOFM(3)	Can't change the sweep time in FFT mode
MRKT_UNDEF(4)	Undefined marker type
MRKFT_UNDEF (5)	Undefined marker function type
MRKDT_UNDEF (6)	Undefined marker delta pair type
MRKRT_UNDEF (7)	Undefined marker read out type
TRCT_UNDEF (8)	Undefined trace type
DETT_UNDEF (9)	Undefined detect type
SCA_CSWL (10)	Can't set the Scale/Div with linear
MRKT_IOFF (11)	The marker type is OFF, please open the current marker
MRK_NDELT (12)	The marker type is not Delta
MRKRT_MBST (13)	The marker read out type must be set time
MATHT_UNDEF (14)	Undefined math type
XML_ANIE (15)	Xml attribute node import error
XSCA_MBSLIZS (16)	X Scale must be set liner in zero span
TG_AXIS_XSCA (17)	The Scale type must be logarithm when normalize
SCALE_TG_AXIS (18)	Scale type cannot be changed to linear while nomalize on
PEAK_UNFOUND (19)	No peak found. Please change the search setting
IMD_FREQ_OOR (20)	Frequency of intermodulation products out of range
AUTO_FAIL (21)	Auto tune process failed
EXT_REF_PLUG_IN (22)	EXT ref plug in
EXT_REF_PLUG_OUT (23)	EXT ref plug out
REF_PLL_UNLOCK (24)	Ref pll unlock
SIG_NOT_STB (25)	Signal is not stable enough to track

QP_RBW_OOR (26)	RBW out of range when do quasi peak scan
LAN_PLUG_IN (150)	Ethernet cable plug in
LAN_PLUG_OUT (151)	Ethernet cable plug out
IP_CONFLICT (152)	IP address conflict
IP_INVALID (153)	IP address invalid
NETM_INVALID (154)	Netmask address invalid
GWAY_INVALID (155)	Gateway address invalid
S21_NORMALIZE_DONE (183)	Normalization of S21 done
VNA_AUTO_CAL_DONE (184)	Auto calibration of VNA done
Execution error (400~599)	
LCF_DTFERR (400)	Load configurations failed, due to file error
Device error (600~799)	
FUF_DTVERR (600)	Firmware upgrade failed, due to the version error
FUF_DTRERR (601)	Firmware upgrade failed, due to the ram error
FUF_DTFERR (602)	Firmware upgrade failed, due to the file error
FUF_DTFVERR (603)	Firmware upgrade failed, due to verify the file error
FUF_DTUZFERR (604)	Firmware upgrade failed, due to unzip the file error
LIC_INVALID (605)	License is invalid!
ADC_ERROR (606)	Warning, ADC Overload!

SIGLENT®

About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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