# SPECTRUM ANALYZERS

# 3250 Series



# Vector Measurement
# User Manual

Document part no. 47090/003

# SPECTRUM ANALYZERS
# 3250 SERIES

# Vector Analyzer Measurement
# User Manual

# About this manual

This manual explains how to use the Vector Analyzer measurement option for the 3250 Series Spectrum Analyzers.

## Intended audience

People carrying out work relating to the design and manufacture of RF and microwave sub-systems and modules, or the installation and maintenance of those systems.

Familiarity with the terms used in RF and microwave measurements is assumed.

## Document conventions

The following conventions apply throughout this manual:

CAPS        Capitals are used to identify names of controls and panel markings.

[CAPS]      Capitals in square brackets indicate hard key titles.

*[Italics]*    Italics in square brackets indicate soft key titles.

## Associated publications

- **3250 Series Operating Manual**
  (PDF version 46892/974, printed version 46882/974)

# Contents

# General

This option enables you to perform FFT Analysis, Power vs Time and other vector measurements using the instrument's internal RF digitizer.

You can make the following measurements:

- FFT Analysis
- Spectrogram
- Power vs Time
- I/Q Polar Vector
- I/Q Wave vs Time
- Mod. Analysis
- CCDF

## Specifications

The instrument includes a wide-band RF digitizer, which is optimized for complex signal analysis applications in communications system test.

### Frequency

| | |
|---|---|
| **Frequency range** | 1 kHz–3 GHz / 8 GHz / 13.2 GHz / 26.5 GHz |
| Bandwidth | 30 MHz |
| Resolution | 1 Hz |

### Dynamic range and accuracy

| | |
|---|---|
| **Intermodulation free dynamic range Adjacent Channel Leakage Ratio (ACLR)** | Typically 80 dB |
| **Residual EVM** | <1% (nominal) |

### A/D converter

| | |
|---|---|
| **Resolution** | 14 bits |
| **ADC clock** | Fixed 85.6 MHz |
| **Sample rate control** | IF: 21.4 MHz; IQ: variable 541.666ks/s to 42.8 Ms/s |
| **Amplitude flatness** | Typically 0.5 dB to 30 MHz |
| **Phase flatness** | 0.05 radians pk-pk to 30 MHz |

### Storage

| | |
|---|---|
| **Data output** | Sampled digital I/Q data is stored in the digitizer's internal memory. Its resolution is 32 bits. It is transferred to the CPU over the PCI bus. |
| **Sample memory** | 128 Mb (32 Msample) |

# Installing the vector analyzer measurement option

To license your vector analyzer measurement option, use the following procedure.

*Note: when you add a new option, or update an existing option, you receive the updated version of all your current options because they are reloaded simultaneously. This process may also require you to update the signal analyzer program so that it is compatible with the new option.*

*If your analyzer came with the vector analyzer measurement licensed, you can skip the licensing.*

*Keep a copy of your license key number in a secure location. If you lose your license key number, call your nearest service or sales office for assistance.*

*If you bought the digitizer with this option, it must be sent to manufacturer. All hardware and software installations will be completed by manufacturer and the instrument returned to you.*

1    Connect keyboard and mouse to the PS2 ports or the USB ports.

2    Turn on the instrument. Wait until the instrument completes its power-up sequence.

3    Press [System], *[Option Info.]*, *[Option Activate]*.

4    Select the *Vector Analyzer* field in the license active dialog window.

*Note: all purchased options must be selected.*

5    Enter the letters/digits of your 32-character license code using the mouse or the keyboard. The license key number is a hexadecimal number.

6    Press *[Activate]*.

7    If licensing completes successfully then the *Activation Success* dialog window displays. If *Invalid License!* is displayed, enter the correct license code again.

8    Press *OK* or press any keypad, then exit from the license menu.

# Measurement guide

This section provides a guide to making measurements of RF signals. Using the procedures specified in this section, you can get RF signal analysis results.

In the case of CW signals, additional hardware is required to cover its 3 GHz signal band range.

## Preparation for measurement

Before connecting a signal to the instrument, make sure the instrument can safely accept the signal level provided. The maximum RF input level is +30 dBm. If the RF input attenuator level is set to 10 dB, the input level can be increased to +40 dBm. Connect a 10 MHz reference input to synchronize the analyzer with a signal source. Fig. 1 shows the instrument set up for testing a device.
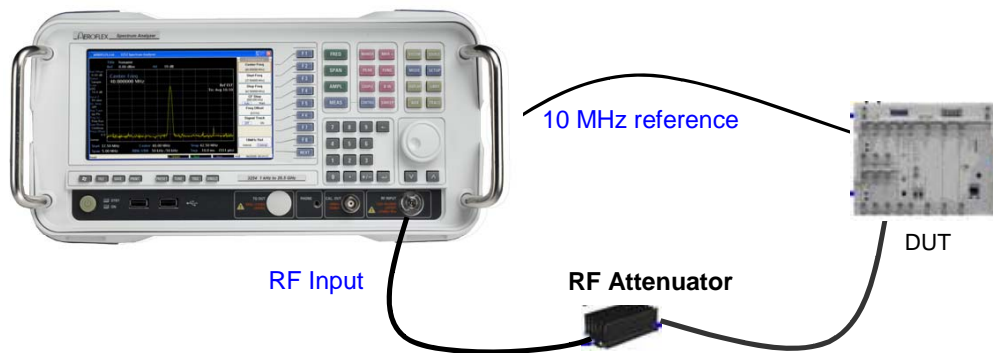


*Fig. 1 Vector analysis measurement setup*

## General steps in making a measurement

All measurements performed in 'vector analyzer options' can be performed with the following steps.

### Select the measurement option

Press [MODE]. All of the installed and licensed options become available and are shown.

Press *[Vector Analyzer]*. Analyze the signal in Vector Analyzer standard format or in non-standard format.

### Set RF attenuator and IF attenuator level by using RF input level

Press [AMPL], select *[Attenuator]*, and adjust attenuator value.

### Select measurement to be performed

Press [MEAS]. There are various measurement menus related to vector analyzer standards, from which you can select specific measurements to be performed. When the trigger conditions are satisfied, digitized vector signals are acquired and analyzed instantly.

Press [MEAS] [Control]. Set up the specific parameters that relate to the selected vector analyzer measurement item.

### Analyze displayed analysis results
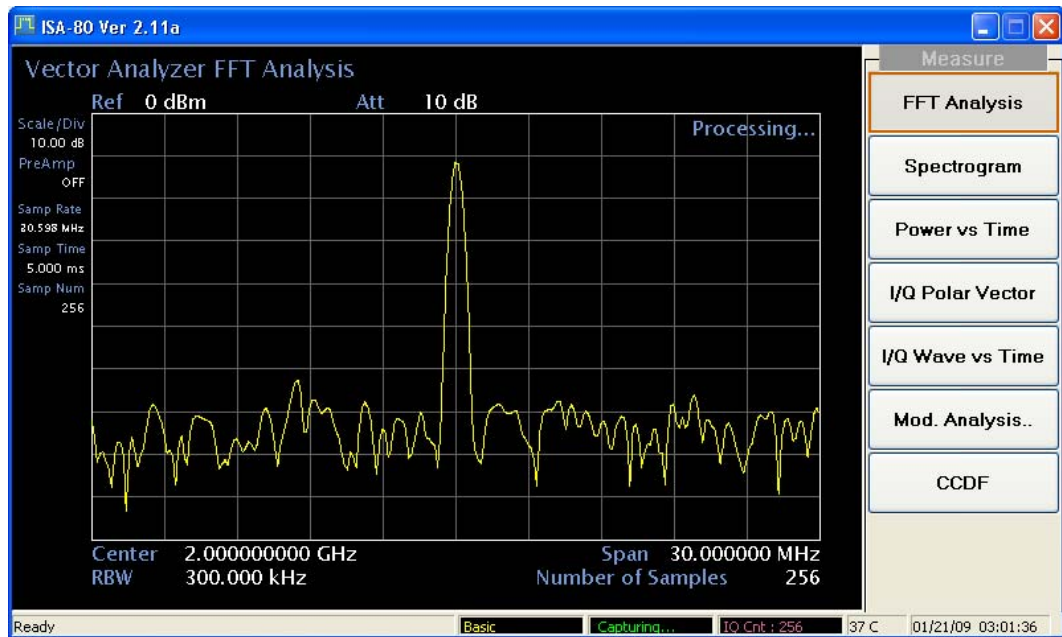
Depending on what measurement is selected, you can adjust the results display using the [TRACE], [DISPLAY] menu. Set the scale of the X and Y axe using SPAN and [AMPL].

# Example measurement results

## Vector Analyzer mode & FFT analysis
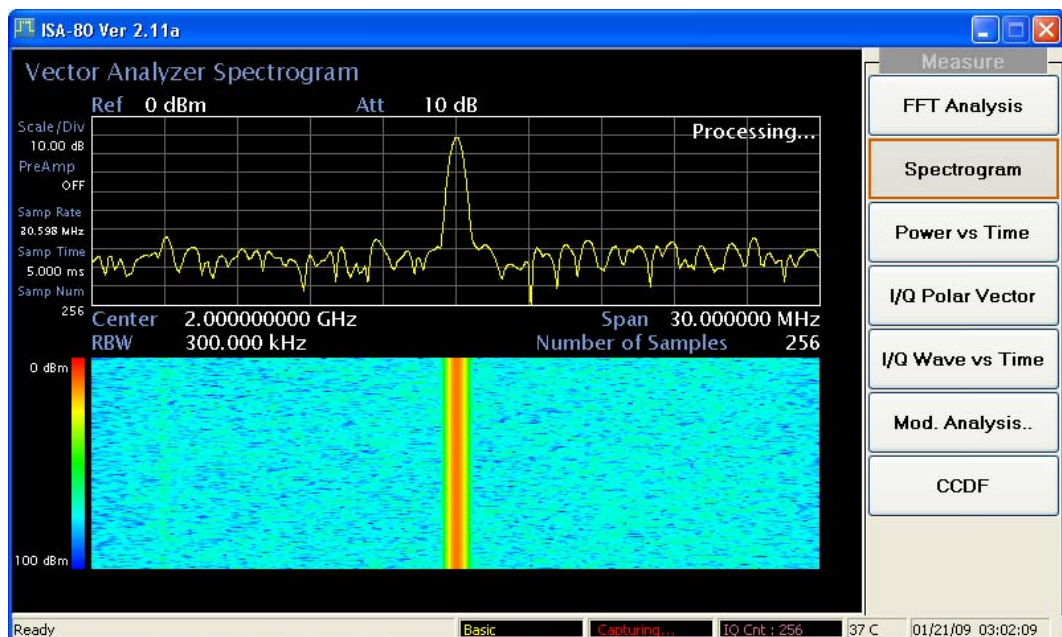
Press [MODE], *[Vector Analyzer]*

Press [MEAS], *[FFT Analysis]*



## Spectrogram

Press [MEAS], *[Spectogram]*

## Power vs Time

Press [MEAS], *[Power vs Time]*
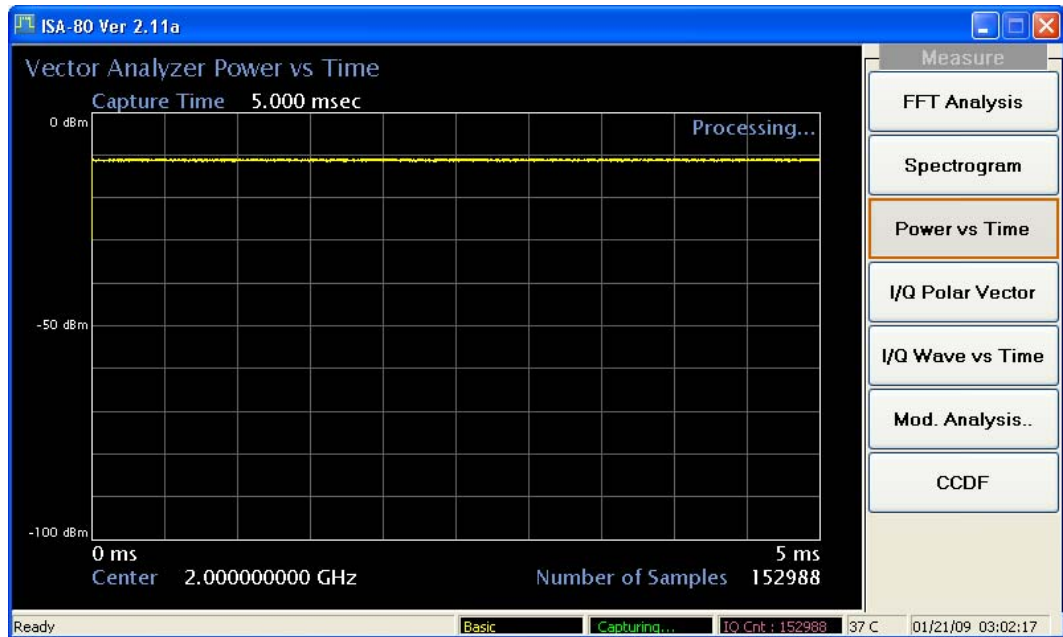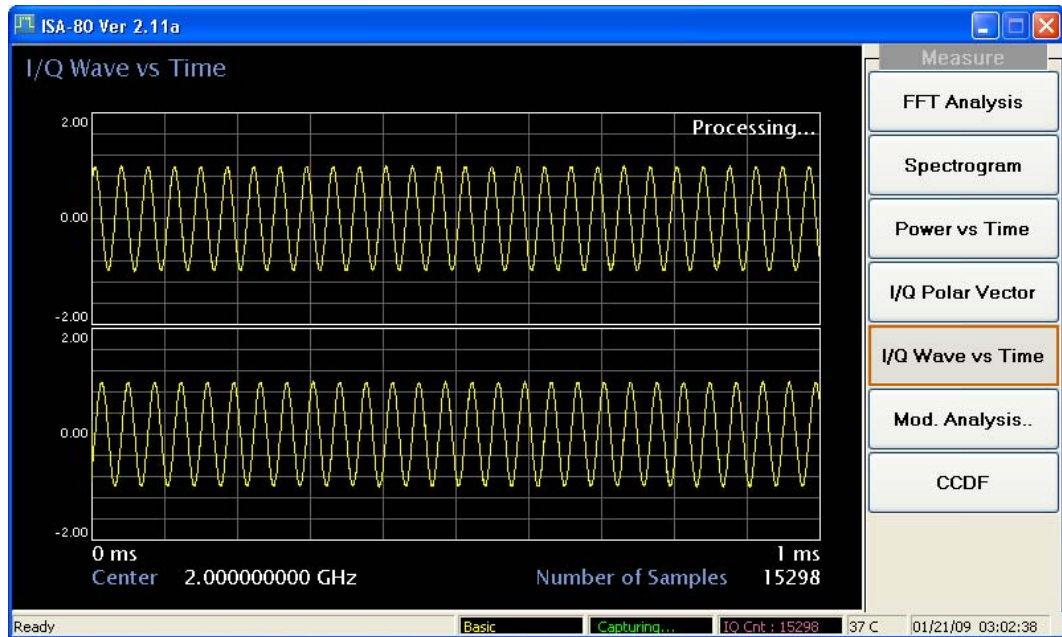


## I/Q Polar Vector

Press [MEAS], *[IQ Polar Vector]*
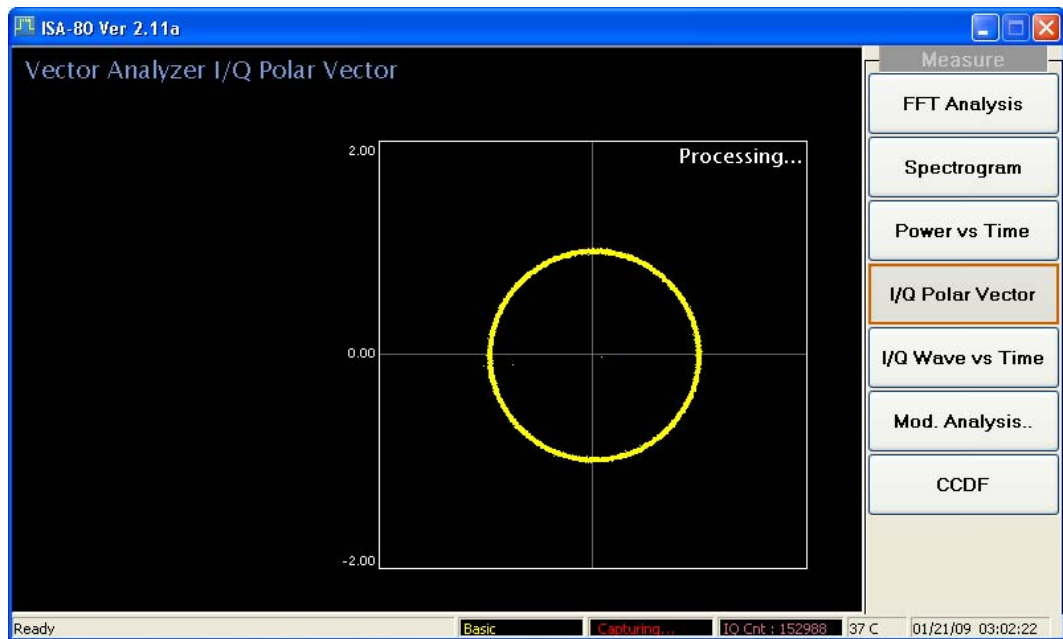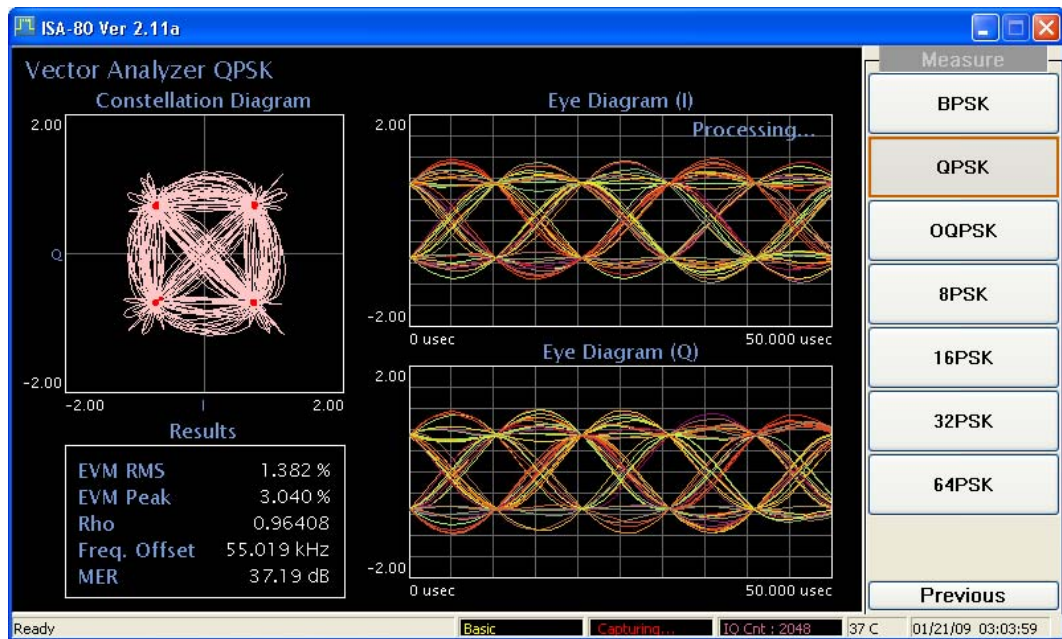
## I/Q Wave vs Time

Press [MEAS], *[IQ Wave vs Time]*
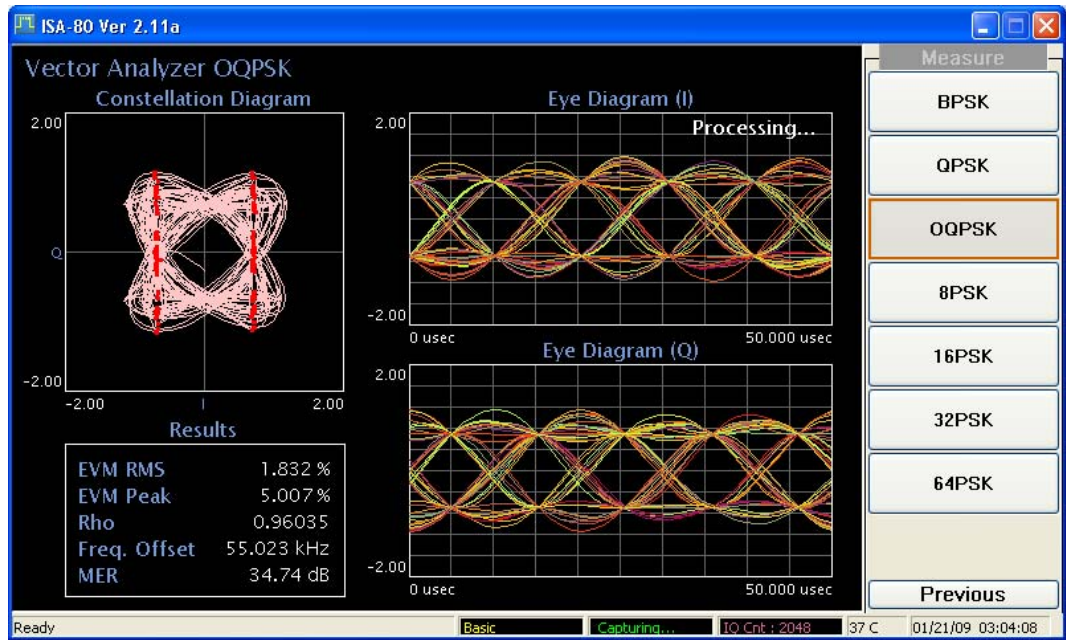


## Mod. Analysis

Press [MEAS], *[IMod Analysis]*, *[PSK or QAM]*



*QPSK*

*OQPSK*



*8PSK*

*16PSK*



*16QAM*
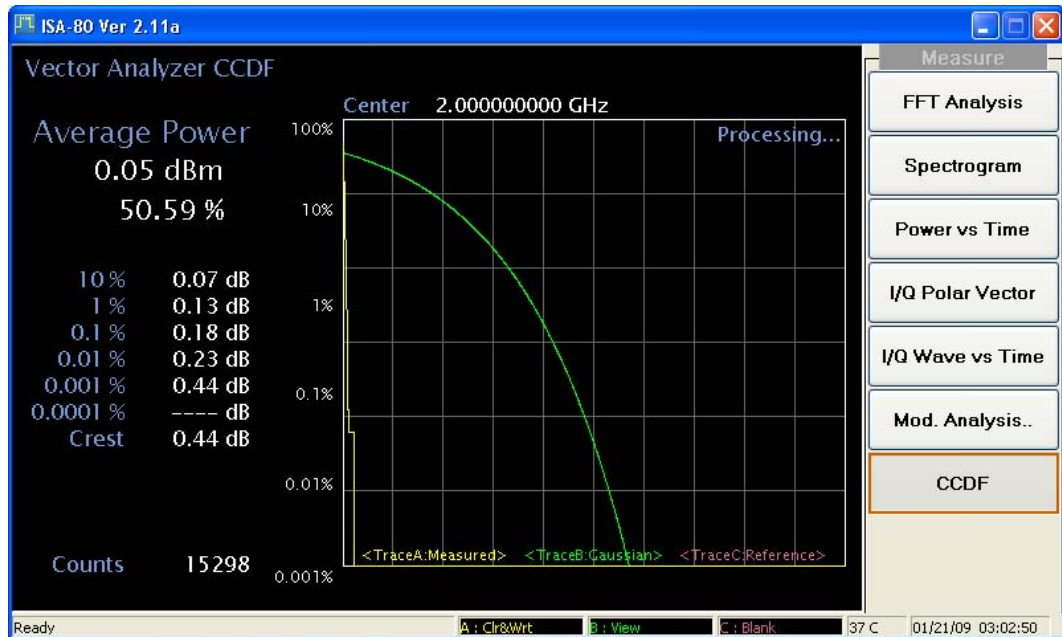
*32QAM*



*64QAM*

## CCDF

Press [MEAS], *[CCDF]*



*CW signal*
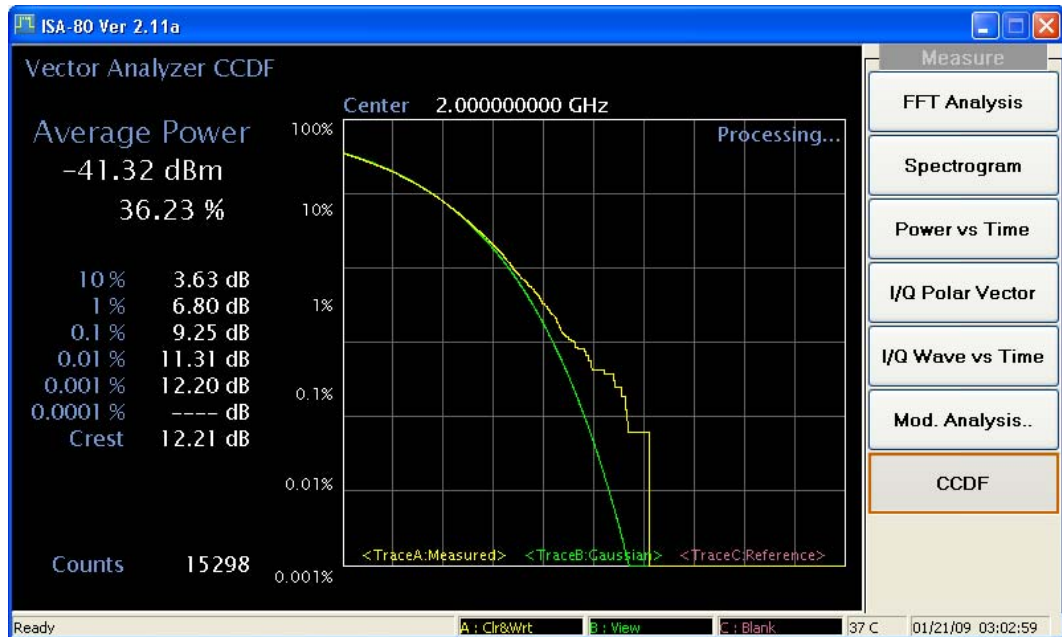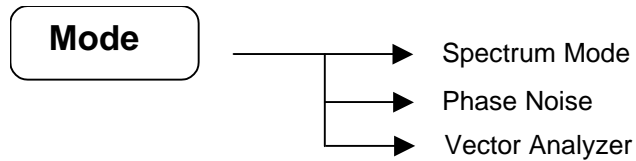


*White noise signal*

# Menu descriptions

## Vector analyzer measurement mode
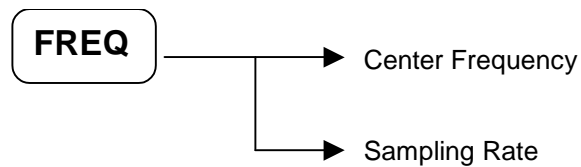
To use vector analyzer measurement options, first set the system to vector analyzer mode:

```
┌──────────┐
│  Mode    │ ──────────────→ Spectrum Mode
└──────────┘         ├──────→ Phase Noise
                     └──────→ Vector Analyzer
```

Select [MODE], then press *[Vector Analyzer]* mode at the right side of the screen.

### Frequency menu

Press [FREQ] in Vector Analyzer mode:

```
┌──────────┐
│  FREQ    │ ──────────────→ Center Frequency
└──────────┘
                     └──────→ Sampling Rate
```
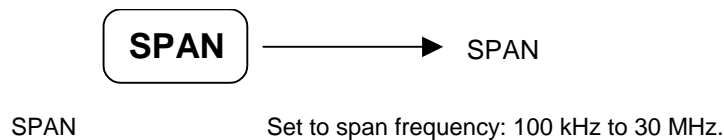
You can access frequency functions from this menu.

| | |
|---|---|
| Center Frequency | Set to center frequency: 1 kHz to 3 / 8 / 13.2 / 26.5 GHz |
| Sampling Rate | Set to sampling rate: 50 kHz to 52 MHz |
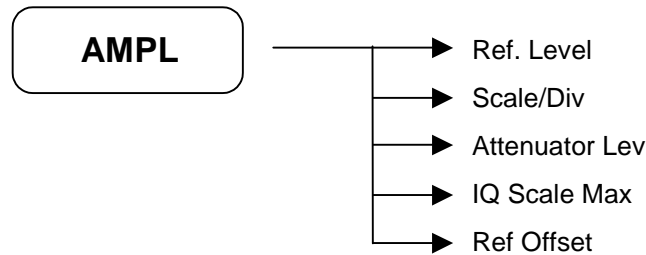
### Span menu (FFT analysis only)

Press [SPAN] in vector analyzer mode:

```
┌──────────┐
│  SPAN    │ ──────────────→ SPAN
└──────────┘
```

| | |
|---|---|
| SPAN | Set to span frequency: 100 kHz to 30 MHz. |

## Amplitude menu

Press [AMPL] in vector analyzer mode:

AMPL
→ Ref. Level
→ Scale/Div
→ Attenuator Lev
→ IQ Scale Max
→ Ref Offset

Amplitude menu keys are used for setting functions that affect the way data on the vertical axis is displayed or corrected.

| | |
|---|---|
| Ref. Level | This allows you to set the value in dBc/Hz of a specified position on the graticule display. |
| Scale/Div | This allows you to set the value of scale in dB for each division of Y-axis. |
| Attenuator Lev | This allows you to set the internal attenuator level in dB. |
| IQ Scale Max | This allows you to set the value of I/Q scale of Y-axis. |
| Ref Offset | Sets the offset value for the displayed signal. |

## Measure menu

Press [MEAS] in vector analysis mode:

MEAS
→ FFT Analysis
→ Spectogram
→ Power vs Time
→ Freq Err vs Time
→ I/Q Polar Vector
→ I/Q Wave vs Time
→ Mod.Analysis
→ CCDF
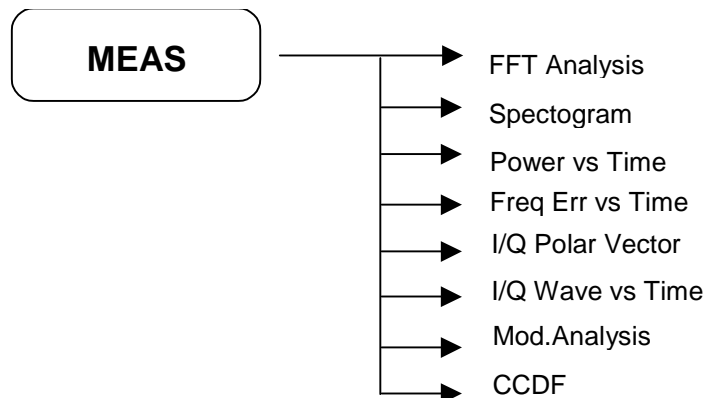
| | |
|---|---|
| FFT Analysis | Measures the FFT trace of an RF signal. |
| Spectogram | Measures the FFT trace of an RF signal in the time domain. |
| Power vs Time | Measures power vs time of an RF signal.  Capture time is set in the Control menu. |
| Freq Err vs Time | Measures frequency error vs time of an RF signal.  Capture time is set in the Control menu. |
| I/Q Polar Vector | Measures the I/Q polar vector of an RF signal. |
| I/Q Wave vs Time | Measures the I/Q wave vs time of an RF signal.  Displays the I and Q trace in each display window. |
| Mod. Analysis | Measures the demodulation analysis of an RF signal (BPSK, QPSK, OQPSK, 8PSK, 16PSK, 32PSK, 64PSK, 4QAM, 8QAM, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM). |
| CCDF | Measures the CCDF (Complementary Cumulative Distribution Function) of the RF signal. |

## Measure control menu (except FFT analysis)

Press [CONTROL] in vector analyzer mode:

```
┌─────────────┐
│   Control   │ ──────────▶  Capture Time
└─────────────┘
```
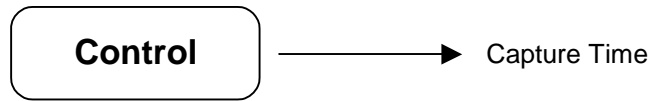
| | |
|---|---|
| Capture Time | Specifies the time to be captured for I/Q analysis. The maximum capture time differs according to the sampling rate. |

## Marker menu (FFT analysis only)

Press [MARKER] in vector analyzer mode:

```
┌─────────────┐
│   Marker    │ ──────────▶  Select Marker
└─────────────┘        ──▶  Normal
                       ──▶  Delta
                       ──▶  OFF
                       ──▶  All OFF
```
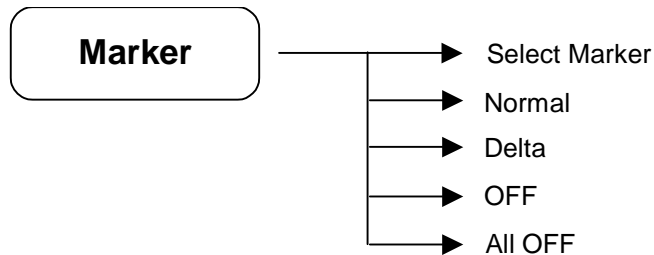
| | |
|---|---|
| Select Marker | Allows you to select one of the four possible markers. Having selected one of the markers, use the other soft keys on this menu to specify the type of marker or measurement. |
| Normal | Sets the specified marker to be a normal marker. |
| Delta | A delta marker is actually a pair of markers. By pressing Delta, you set a pair of markers at your current frequency offset. One of this pair of markers is fixed while the second of the pair can be moved using the scroll knob or the numeric keys. The frequency difference and the amplitude difference between these two points is displayed. |
| OFF | Switches the specified marker off. |
| All OFF | Switches all markers off. All markers are removed from the graticule display, and if the marker table is also being displayed, all entries are removed from it. |

## Peak menu (FFT analysis only)

Press [PEAK] in vector analyzer mode:

```
┌─────────────┐
│    Peak     │ ──────────▶  Peak
└─────────────┘
                       ──▶  Next Peak
```
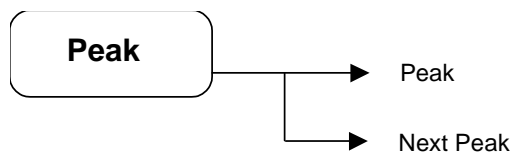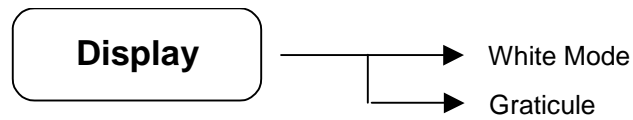
| | |
|---|---|
| Peak | Sets active marker to max level of FFT trace. |
| Next Peak | Sets active marker to next max level of FFT trace. |

## Display menu

Press [Display] in vector analyzer mode:
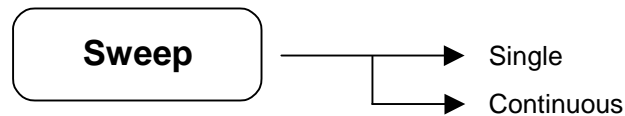


| | |
|---|---|
| White Mode | Change the screen background to white. |
| Graticule | Allows you to display or hide the graticule lines on the display. |

## Sweep menu

Press [Sweep] in vector analyzer mode:
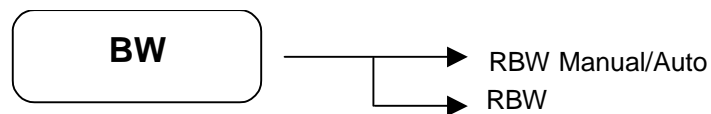


| | |
|---|---|
| Single | The analyzer performs one single measurement and then stops.  You have to press [Restart] every time you want to make another measurement. |
| Continuous | The analyzer continuously measures the signal it is receiving and repeatedly updates the plots and the measurements. |

## BW menu

Press [BW] in vector analyzer mode:



| | |
|---|---|
| RBW Manual/Auto | Sets RBW mode to manual or auto.  In Auto mode, RBW is set automatically to Span/100. |
| RBW | Set to RBW value (1 kHz to 300 kHz). |

## Trace menu

Press [TRACE] in vector analyzer mode:

```
     ┌──────────────┐
     │              │        ──────►  Max Hold
     │    Trace     │  ──┬── ──────►  Average
     │              │    └─── ──────►  AVG. Count
     └──────────────┘
```
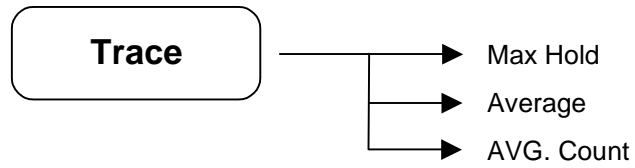
| | |
|---|---|
| Max Hold | Trace level is maximum level. |
| Average | Trace level is averaged.  The trace is then smoothed. |
| Avg. Count | Set to the average count (2 to 1000). |
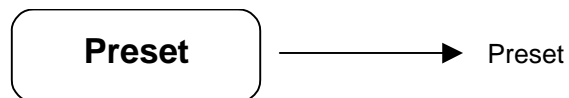
## Preset menu

Press [Preset] in vector analyzer mode:

```
     ┌──────────────┐
     │              │
     │    Preset    │  ──────────►  Preset
     │              │
     └──────────────┘
```

The sub menus of [Preset] have the same function as in the basic spectrum analysis mode.  Please refer to the Spectrum Analyzer Operating Manual (part number 46892/974) for other soft key functions.

# Detailed description of commands

## General

This section gives detailed descriptions of the device messages for the spectrum analyzer in functional order.  The following example shows the command format.

*Note that '  ' = 'blank' throughout this document.*

### SA command

### SCPI command

|  |  |
|---|---|
|  | Command Name |
| Function | The explanation of the command. |
| Remote Command | SA Command   sw |
|  | SA Command   f |
|  | SA Command? |
|  | SCPI Command   sw |
|  | SCPI Command   f |
|  | SCPI Command? |
| Response Message | sw or f |
|  | (Depending on command) |
| Value of f | Range of sw or f |
|  | (Depending on command) |
| Suffix code | Unit of f |
|  | (Depending on command) |
| Initial setting | Initial value for SA System |
| Example | SA Command sw; |
|  | SA Command f; |
|  | SA Command?; |
|  | SCPI Command sw; |
|  | SCPI Command f; |
|  | SCPI Command?; |

## Amplitude

### RL

### :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel

|  |  |
|---|---|
|  | Reference Level |
| Function | Sets the reference level value. |
| Remote Command | RL   f |
|  | RL? |
|  | :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel   f |

:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?

| | |
|---|---|
| Response Message | Reference Level (dBm) |
| Value of f | −170 dBm to 30 dBm (Step : 0.01 dBm) |
| Suffix code | None     : dBm |
| | DBM     : dBm |
| Initial setting | 0 dBm |
| Example | RL 10; |
| | RL 30DBM; |
| | RL ?; |
| | DISP:WIND:TRAC:Y:RLEV 10; |
| | DISP:WIND:TRAC:Y:RLEV 30DBM; |
| | DISP:WIND:TRAC:Y:RLEV?; |

## AT

## [:SENSE]:POWer[:RF]:ATTenuation

| | |
|---|---|
| | Attenuation |
| Function | Sets the amount of attenuation for the input attenuator. |
| Remote Command | AT  f |
| | AT? |
| | [:SENSe]:POWer[:RF]:ATTenuation  f |
| | [:SENSe]:POWer[:RF]:ATTenuation? |
| Response Message | amount of attenuation (dB) |
| Value of f | 0 dB to 55 dB (Step : 5 dB) |
| Suffix code | None     : dB |
| | DB     : dB |
| Initial setting | 10 dB |
| Example | AT 10; |
| | AT 10DB; |
| | AT?; |
| | POW:ATT 10; |
| | POW:ATT 10DB; |
| | POW:ATT?; |

## SD

## :DISPlay:LPLot:WINDow:TRACe:Y[:SCALe]:PDIVision

| | |
|---|---|
| | Scale/Divide |
| Function | Sets the scale/divide value. |
| Remote Command | SD  f |
| | SD? |
| | :DISPlay:LPLot:WINDow:TRACe:Y[:SCALe]:PDIVision  f |
| | :DISPlay:LPLot:WINDow:TRACe:Y[:SCALe]:PDIVision? |

| | |
|---|---|
| Response Message | Scale/Divide (dB/div) |
| Value of f | 0.01 dB to 20 dB (step : 0.01 dB) |
| Suffix code | None     : dB/div |
| | DB       : dB/div |
| Initial setting | 10 dB/div |
| Example | SD 5; |
| | SD 10DB; |
| | SD?; |
| | DISP:LPL:WIND:TRAC:Y:PDIV 5; |
| | DISP:LPL:WIND:TRAC:Y:PDIV 10DB; |
| | DISP:LPL:WIND:TRAC:Y:PDIV?; |

## Display

### GRAT

### :DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe]

| | |
|---|---|
| | Graticule |
| Function | Sets the display graticule to Type1 or Type2 or OFF. |
| Remote Command | GRAT   sw |
| | GRAT? |
| | :DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe]   sw |
| | :DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe]? |
| Response Message | TYPE1     : Type1 |
| | TYPE2     : Type2 |
| | OFF       : OFF |
| Value of sw | TYPE1     : Type1 |
| | TYPE2     : Type2 |
| | OFF       : OFF |
| Initial setting | TYPE1 |
| Example | GRAT TYPE1; |
| | GRAT? |
| | DISP:WIND:TRAC:Y:GRAT:GRID TYPE1; |
| | DISP:WIND:TRAC:Y:GRAT:GRID?; |

### WH

### :DISPlay:WINDow:WHITe

| | |
|---|---|
| | White Mode |
| Function | Turns the white mode ON or OFF. |
| Remote Command | WH   n |
| | WH   sw |
| | WH? |

|  |  |  |
|---|---|---|
|  | :DISPlay:WINDow:WHITe   n |  |
|  | :DISPlay:WINDow:WHITe   sw |  |
|  | :DISPlay:WINDow:WHITe? |  |
| Response Message | 1 | : ON |
|  | 0 | : OFF |
| Value of n | 1 | : ON |
|  | 0 | : OFF |
| Value of sw | ON | : ON |
|  | OFF | : OFF |
| Initial setting | 0 |  |
| Example | WH 1; |  |
|  | WH ON; |  |
|  | WH? |  |
|  | DISP:WIND:WHIT 1; |  |
|  | DISP:WIND:WHIT ON; |  |
|  | DISP:WIND:WHIT?; |  |

## File

### FREAD

### :MMEMory:CATalog

|  |  |  |
|---|---|---|
|  | File Read |  |
| Function | Reads files in the selected folder. |  |
| Remote Command | FREAD?   'file_folder' |  |
|  | :MMEMory:CATalog?   'file_folder' |  |
| Value of file_folder | File Folder |  |
| Response Message | File Name,,File Size. |  |
| Example | FREAD? 'C:'; |  |
|  | FREAD? 'D:\Temp'; |  |
|  | MMEM:CAT? 'C:'; |  |
|  | MMEM:CAT? 'D:\Temp'; |  |

### FSAVE

### :MMEMory:STORe

|  |  |  |
|---|---|---|
|  | File Save |  |
| Function | Saves the file, type defined by the extension. |  |
| Remote Command | FSAVE   'file_name' |  |
|  | :MMEMory:STORe   'file_name' |  |
| Value of file_name | File Path + File Name |  |
| Supported Extension | csv | : I/Q data |
|  | bmp | : Bitmap |

|  |  |
|---|---|
| jpg | : jpeg |
| png | : png |
| Example | FSAVE 'C:\demo.csv'; |
|  | MMEM:STRO 'C:\demo.csv'; |

## FDEL

## :MMEMory:DELete

|  |  |
|---|---|
|  | File Delete |
| Function | Deletes the selected file. |
| Remote Command | FDEL 'file_name' |
|  | :MMEMory:DELete 'file_name' |
| Value of file_name | File Path + File Name |
| Example | FDEL 'C:\demo.bmp'; |
|  | MMEM:DEL 'C:\demo.bmp'; |

## FCOPY

## :MMEMory:COPY

|  |  |
|---|---|
|  | File Copy |
| Function | Copies the selected file. |
| Remote Command | FCOPY 'src_file_name', 'dest_file_name' |
|  | :MMEMory:COPY 'src_file_name', 'dest_file_name' |
| Value of src_file_name, dest_file_name | File Path + File Name |
| Example | FCOPY 'C:\demo.bmp','D:\demo.bmp'; |
|  | MMEM:COPY 'C:\demo.bmp','D:\demo.bmp'; |

## FRENAME

## :MMEMory:MOVE

|  |  |
|---|---|
|  | File Rename |
| Function | Renames the selected file. |
| Remote Command | FRENAME 'src_file_name','dest_file_name' |
|  | :MMEMory:MOVE 'src_file_name','dest_file_name' |
| Value of src_file_name, dest_file_name | File Path + File Name |
| Example | FRENAME 'C:\demo.bmp','C:\demo1_1.bmp'; |
|  | MMEM:MOVE 'C:\demo1.bmp','C:\demo1_1.bmp'; |

## FMOVE

## MMEMory:DATA

|  |  |
|---|---|
|  | File Move |
| Function | Sends or receives binary data of the selected file. The maximum size of the sent file is 2 Mbyte, and the maximum size of the received file is 30 Mbyte. |
| Remote Command | FMOVE 'file_name',definite_length_block |

FMOVE?  'file_name'

MMEMory:DATA  'file_name',definite_length_block

MMEMory:DATA?  'file_name'

| | |
|---|---|
| Value of file_name | File Path + File Name |
| Value of definite_length_block | # + number of file size + file size + file data |
| Example | FMOVE 'C:\Sended_Sample.txt',#14abcd; cf) #+1+4+abcd |
| | FMOVE? 'C:\Received_Sample.txt'; |
| | MMEM:DATA 'C:\ Sended_Sample.txt',#14abcd; |
| | MMEM:DATA? 'C:\ Received_Sample.txt'; |

# Frequency

## CF

## [:SENSe]:FREQuency:CENTer

| | | |
|---|---|---|
| | Center Frequency | |
| Function | Sets the center frequency. | |
| Remote Command | CF  f | |
| | CF? | |
| | [:SENSe]:FREQuency:CENTer  f | |
| | [:SENSe]:FREQuency:CENTer? | |
| Response Message | Center Frequency (Hz) | |
| | (Range : 1 kHz to 3 / 8 / 13.2 / 26.5 GHz) | |
| Value of f | 1 kHz to 3 / 8 / 13.2 / 26.5 GHz | |
| Suffix code | None | : Hz (10^0) |
| | HZ | : Hz (10^0) |
| | KHZ | : kHz (10^3) |
| | MHZ | : MHz (10^6) |
| | GHZ | : GHz (10^9) |
| Initial setting | 1.5 / 4 / 6.6 / 12.25 GHz | |
| Example | CF 123456; | |
| | CF 50MHZ; | |
| | CF?; | |
| | FREQ:CEN7T 123456; | |
| | FREQ:CENT 50MHZ; | |
| | FREQ:CENT?; | |

## SR

## [:SENSe]:FREQuency:SAMPling:RATE

|  |  |
|---|---|
|  | Sampling Frequency |
| Function | Sets to Sampling Rate. |
| Remote Command | SR  f |
|  | SR? |
|  | [:SENSe]:FREQuency:SAMPling:RATE  f |
|  | [:SENSe]:FREQuency:SAMPling:RATE? |
| Response Message | Sampling Rate (Hz) |
|  | (50 kHz to 52 MHz) |
| Suffix code | None        : Hz (10^0) |
|  | HZ            : Hz (10^0) |
|  | KHZ          : kHz (10^3) |
|  | MHZ         : MHz (10^6) |
| Initial setting | According to Span and RBW |
| Example | USF 123456; |
|  | USF 50MHZ; |
|  | USF?; |
|  | FREQ:SAMP:RATE 123456; |
|  | FREQ:SAMP:RATE 50MHZ; |
|  | FREQ:SAMP:RATE?; |

## REF

## :INPut:REFerence

|  |  |
|---|---|
|  | Reference |
| Function | Sets to 10 MHz Reference. |
| Remote Command | REF  sw |
|  | REF? |
|  | :INPut:REFerence  sw |
|  | :INPut:REFerence? |
| Response Message | INT          : Internal |
|  | EXT          : External |
| Value of sw | INTernal: Internal |
|  | EXTernal: External |
| Initial setting | INT |
| Example | REF INT; |
|  | RFC? |
|  | INP:REF INT; |
|  | INP:REF? |

# Marker (FFT analysis only)

## MS[1~9]

## :CALCulate:MARKer[1~9]:STATe

|  |  |  |
|---|---|---|
|  | Marker State | |
| Function | Sets the selected marker state. | |
| Remote Command | MS[1~9]   n | |
|  | MS[1~9]   sw | |
|  | MS[1~9]? | |
|  | :CALCulate:CCDF:MARKer[1~9]:STATe   n | |
|  | :CALCulate:CCDF:MARKer[1~9]:STATe   sw | |
|  | :CALCulate:CCDF:MARKer[1~9]:STATe? | |
| Response Message | 1 | : ON |
|  | 0 | : OFF |
| Value of n | 1 | : ON |
|  | 0 | : OFF |
| Value of sw | ON | : ON |
|  | OFF | : OFF |
| Initial setting | 0 | |
| Example | MS 1; | |
|  | MS5 1; | |
|  | MS5?; | |
|  | CALC:CCDF:MARK:STAT 1; | |
|  | CALC:CCDF:MARK5:STAT ON; | |
|  | CALC:CCDF:MARK5:STAT? | |

## MM[1~9]

## :CALCulate:MARKer[1~9]:MODE

|  |  |  |
|---|---|---|
|  | Marker Mode | |
| Function | Sets the selected marker to Normal, Delta Mode. | |
| Remote Command | MM[1~9]   sw | |
|  | MM[1~9]? | |
| : | CALCulate:MARKer[1~9]:MODE   sw | |
|  | :CALCulate:MARKer[1~9]:MODE? | |
| Response Message | POS | : Normal |
|  | DELT | : Delta |
|  | OFF | : OFF |
| Value of sw | POSition | : Normal |
|  | DELTa | : Delta |
|  | OFF | : OFF |
| Initial setting | OFF | |

| | |
|---|---|
| Example | MM POS; |
| | MM5?; |
| | CALC:CCDF:MARK:MODE POS; |
| | CALC:CCDF:MARK5:MODE? |

## MF[1~9]

## :CALCulate:MARKer[1~9]:X

| | |
|---|---|
| | Marker Frequency |
| Function | Sets the marker frequency of the selected marker. If the marker mode is the delta mode, sets the difference value of the marker frequency and the delta marker frequency. |
| Remote Command | MF[1~9]  f |
| | MF[1~9]? |
| | :CALCulate:MARKer[1~9]:X  f |
| | :CALCulate:MARKer[1~9]:X? |
| Response Message | Marker Frequency (Hz) |
| Value of f | Start Frequency to Stop Frequency |
| Suffix code | None        : Hz (10^0) |
| | HZ          : Hz (10^0) |
| | KHZ         : kHz (10^3) |
| | MHZ         : MHz (10^6) |
| | GHZ          : GHz (10^9) |
| Initial setting | Center Frequency |
| Example | MF 123456; |
| | MF5.1GHZ; |
| | MF5?; |
| | CALC:MARK:X 123456; |
| | CALC:MARK5:X 1GHZ; |
| | CALC:MARK5:X? |

## MA[1~9]

## :CALCulate:MARKer[1~9]:Y

| | |
|---|---|
| | Marker Amplitude |
| Function | Returns the amplitude data. |
| Remote Command | MA[1~9]? |
| | :CALCulate:MARKer[1~9]:Y? |
| Response Message | Marker Amplitude |
| Example | MA?; |
| | MA5? |
| | CALC:MARK:Y? |
| | CALC:MARK5:Y? |

### MAO

### :CALCulate:LPLot:MARKer:AOFF

|  | Marker All OFF |
| --- | --- |
| Function | Turns off all markers. |
| Remote Command | MAO |
|  | :CALCulate:LPLot:MARKer:AOFF |
| Example | MAO; |
|  | CALC:LPL:MARK:AOFF; |

# Measurement

### MEA

### :MEASure:STARt

|  | Measure Start | |
| --- | --- | --- |
| Function | Starts the measurement. | |
| Remote Command | MEA   sw | |
|  | MEA? | |
|  | :MEASure:STARt   sw | |
|  | :MEASure:STARt? | |
| Response Message | FFT | : FFT Analysis |
|  | PVT | : Power vs Time |
|  | POLAR | : IQ Polar Vector |
|  | WVT | : IQ Wave vs Time |
|  | BPSK | : Mod. Analysis – BPSK |
|  | QPSK | : Mod. Analysis – QPSK |
|  | OQPSK | : Mod. Analysis – OQPSK |
|  | 8PSK | : Mod. Analysis – 8PSK |
|  | 16PSK | : Mod. Analysis – 16PSK |
|  | 32PSK | : Mod. Analysis – 32PSK |
|  | 64PSK | : Mod. Analysis - 64PSK |
|  | 4QAM | : Mod. Analysis – 4QAM |
|  | 8QAM | : Mod. Analysis – 8QAM |
|  | 16QAM | : Mod. Analysis – 16QAM |
|  | 32QAM | : Mod. Analysis – 32QAM |
|  | 64QAM | : Mod. Analysis – 64QAM |
|  | 128QAM | : Mod. Analysis – 128QAM |
|  | 256QAM | : Mod. Analysis – 256QAM |
|  | CCDF | : CCDF |
| Value of sw | FFT | : FFT Analysis |
|  | PVT | : Power vs Time |
|  | POLAR | : IQ Polar Vector |

|  |  |
|---|---|
| WVT | : IQ Wave vs Time |
| BPSK | : Mod. Analysis – BPSK |
| QPSK | : Mod. Analysis – QPSK |
| OQPSK | : Mod. Analysis – OQPSK |
| 8PSK | : Mod. Analysis – 8PSK |
| 16PSK | : Mod. Analysis – 16PSK |
| 32PSK | : Mod. Analysis – 32PSK |
| 64PSK | : Mod. Analysis - 64PSK |
| 4QAM | : Mod. Analysis – 4QAM |
| 8QAM | : Mod. Analysis – 8QAM |
| 16QAM | : Mod. Analysis – 16QAM |
| 32QAM | : Mod. Analysis – 32QAM |
| 64QAM | : Mod. Analysis – 64QAM |
| 128QAM | : Mod. Analysis – 128QAM |
| 256QAM | : Mod. Analysis – 256QAM |
| CCDF | : CCDF |

Example    MEA FFT;

MEA?;

MEAS:STAR FFT;

MEAS:STAR?;

## SYR

## :MEASure:SYMBol:RATE

|  | Symbol Rate |
| --- | --- |
| Function | Sets to Symbol Rate. |
| Remote Command | SYR  f |
|  | SYR? |
|  | :MEASure:SYMBol:RATE  f |
|  | :MEASure:SYMBol:RATE? |
| Response Message | Symbol Rate (Hz) |
| Suffix code | None        : Hz (10^0) |
|  | HZ          : Hz (10^0) |
|  | KHZ        : kHz (10^3) |
|  | MHZ        : MHz (10^6) |
| Initial setting | 100 kHz (1 kHz to maximal Sampling Freq/4) |
| Example | SYR 123456; |
|  | SYR 50MHZ; |
|  | SYR?; |
|  | MEAS:SYMB:RATE 123456; |
|  | MEAS:SYMB:RATE 50MHZ; |
|  | MEAS:SYMB:RATE?; |

# Measurement control

## MEAT

## :MEASure:TIME

|  | Capturing Time |
| --- | --- |
| Function | Sets to Capturing Time. |
| Remote Command | MEAT  f |
|  | MEAT? |
|  | :MEASure:TIME  f |
|  | :MEASure:TIME? |
| Response Message | Capturing Time (s) |
| Value of f | 1 ms to max (max changes according to sampling rate) |
| Suffix | None        : s  (10^0) |
|  | kSEC        : ks (10^3) |
|  | SEC         : s  (10^0) |
|  | MSEC       : ms (10^-3) |
| Initial setting | 5 ms |
| Example | MEAT 0.001; |
|  | MEAT 1MSEC; |
|  | MEAT?; |

MEA:TIME 0.001;

MEA:TIME 1MSEC;

MEA:TIME?;

# Mode

## MODE

## :INSTrument[:SELect]

|  | Mode |  |
|---|---|---|
| Function | Sets Current Mode. | |
| Remote Command | MODE sw | |
| | MODE? | |
| | :INSTrument[:SELect] sw | |
| | :INSTrument[:SELect]? | |
| Response Message | SA | : Spectrum Mode |
| | VECTOR | : Vector Analyzer Mode |
| Value of sw | SA | : Spectrum Mode |
| | VECTOR | : Vector Analyzer Mode |
| Initial setting | SA | |
| Example | MODE SA; | |
| | MODE?; | |
| | INST SA; | |
| | INST?; | |

# Peak search (FFT analysis only)

## MPK[1~9]

## :CALCulate:MARKer[1~9]:MAXimum

|  | Peak Search |
|---|---|
| Function | Places the selected marker on the highest point of the marker trace. |
| Remote Command | MPK[1~9] |
| | :CALCulate:MARKer[1~9]:MAXimum |
| Example | MPK; |
| | MPK5: |
| | CALC:MARK:MAX; |
| | CALC:MARK5:MAX; |

## MPKN[1~9]

## :CALCulate:MARKer[1~9]:MAXimum:NEXT

|  | Next Peak Search |
|---|---|

| | |
|---|---|
| Function | Places the selected marker on the next highest point of the marker trace. |
| Remote Command | MPKN[1~9] |
| | :CALCulate:MARKer[1~9]:MAXimum:NEXT |
| Example | x        MPKN; |
| | MPKN5: |
| | CALC:MARK:MAX:NEXT; |
| | CALC:MARK5:MAX:NEXT; |

# Preset

## PRST

## :SYSTem:PRESet

| | |
|---|---|
| | Preset |
| Function | Executes preset.  All instrument parameters are set to default values. |
| Remote Command | PRST |
| | :SYSTem:PRESet |
| Example | PRST; |
| | SYST:PRES; |

# Printer

## HCOPY

## :HCOPy[:IMMediate]

| | |
|---|---|
| | Hard Copy |
| Function | Prints entire screen image. |
| Remote Command | HCOPY |
| | :HCOPy[:IMMediate] |
| Example | HCOPY; |
| | HCOP; |

# Span (FFT analysis only)

## SP

## [:SENSe]:FREQuency:SPAN

| | |
|---|---|
| | Span |
| Function | Sets the span. |
| Remote Command | SP  f |
| | SP? |
| | [:SENSe]:FREQuency:SPAN  f |
| | [:SENSe]:FREQuency:SPAN? |

| | |
|---|---|
| Response Message | Span (Hz) |
| Value of f | 100 kHz to 30 MHz |
| Suffix code | None : Hz (10^0) |
| | HZ : Hz (10^0) |
| | KHZ : kHz (10^3) |
| | MHZ : MHz (10^6) |
| Initial setting | 30 MHz |
| Example | SP 123456; |
| | SP 30MHZ; |
| | SP ?; |
| | FREQ:SPAN 123456; |
| | FREQ:SPAN 30MHZ; |
| | FREQ:SPAN?; |

# Sweep

## CO

## :INITiate:CCDF:CONTinuous

| | |
|---|---|
| | Continuous Sweep |
| Function | Sets the continuous sweep mode. Repeats active sweep. |
| Remote Command | CO |
| | :INITiate:CONTinuous |
| Example | CO; |
| | INIT:CONT; |

## SI

## :INITiate[:IMMediate]

| | |
|---|---|
| | Single Sweep |
| Function | Sets the single sweep mode. After activating sweep, stops sweep repeating. |
| Remote Command | SI |
| | :INITiate[:Immediate] |
| Example | SI; |
| | INIT; |

# System

## BEEP

| | |
|---|---|
| | Beep |
| Function | Turns Beep to ON or OFF when pressing key pad.. |
| Remote Command | BEEP n |
| | BEEP sw |

|  | BEEP? |  |
|---|---|---|
| Response Message | 1 | : ON |
|  | 0 | : OFF |
| Value of n | 1 | : ON |
|  | 0 | : OFF |
| Value of sw | ON | : ON |
|  | OFF | : OFF |
| Initial setting | 0 |  |
| Example | BEEP 1; |  |
|  | BEEP ON; |  |
|  | BEEP?; |  |

## ECHO

|  | Echo |  |
|---|---|---|
| Function | Turns Echo to ON or OFF when controlled by hyper teminal. |  |
| Remote Command | ECHO   n |  |
|  | ECHO   sw |  |
|  | ECHO? |  |
| Response Message | 1 | : ON |
|  | 0 | : OFF |
| Value of n | 1 | : ON |
|  | 0 | : OFF |
| Value of sw | ON | : ON |
|  | OFF | : OFF |
| Initial setting | 1 |  |
| Example | ECHO 1; |  |
|  | ECHO ON; |  |
|  | ECHO?; |  |

# Trace (FFT analysis only)

## TRF

## :TRACe:MODE

|  | Trace Status |  |
|---|---|---|
| Function | Sets the trace status. |  |
| Remote Command | TRF   sw |  |
|  | TRF? |  |
|  | :TRACe:MODE   sw |  |
|  | :TRACe:MODE? |  |
| Response Message | WRIT | : Clear & Wirte |
|  | MAXH | : Max Hold |
| Value of sw | WRITe | : Clear & Wirte |

|  |  |
|---|---|
|  | MAXHold    : Max Hold |
| Initial setting | WRIT |
| Example | TRF WRIT; |
|  | TRF? |
|  | TRAC:MODE WRIT; |
|  | TRAC:MODE?; |

# GPIB common commands

## *CLS

|  |  |
|---|---|
|  | Clear Status Command |
| Function | Clears the status byte register. |
| Remote Command | *CLS |
| Example | *CLS; |

## *ESE

|  |  |
|---|---|
|  | Standard Event Status Enable |
| Function | Sets the standard event status enable register. |
| Remote Command | *ESE  n |
|  | *ESE? |
| Response Message | Register Value |
| Value of n | 0 to 255 : Represents the sum of the bit-weighted values. |
| Example | *ESE 20: |
|  | *ESE?; |

## *ESR?

|  |  |
|---|---|
|  | Standard Event Status Register Query |
| Function | Returns the current value in the standard event status register. |
| Remote Command | *ESR? |
| Response Message | Register Value |
| Example | *ESR?; |

## *IDN?

|  |  |
|---|---|
|  | Identification Query |
| Function | Returns the model name, etc of the equipment |
| Remote Command | *IDN? |
| Response Message | Company, Model, Serial, Version |
| Example | *IDN?; |

## *OPC

|  |  |
|---|---|
|  | Operation Complete Command |
| Function | Sets the standard event register bit 0 to 1 when the requested action is complete. |
| Remote Command | *OPC |

| | |
|---|---|
| Example | *OPC; |

## *OPC?

| | |
|---|---|
| | Operation Complete Query |
| Function | Sets the output queue to 1 to generate a MAV summary message when all pending select device operations have completed. |
| Remote Command | *OPC? |
| Response Message | 1 |
| Example | *OPC?; |

## *RST

| | |
|---|---|
| | Rest Command |
| Function | Resets the device. |
| Remote Command | *RST |
| Example | *RST; |

## *SRE

| | |
|---|---|
| | Service Request Enable Command |
| Function | Sets the bits in the service request enable register. |
| Remote Command | *SRE  n |
| | *SRE? |
| Response Message | Register Value |
| Value of n | 0 to 255 : Represents the sum of the bit-weighted values. |
| Example | *SRE 32; |
| | *SRE?; |

## *STB?

| | |
|---|---|
| | Returns Status Byte Command |
| Function | Returns the current values of the status bytes including the MSS bit. |
| Remote Command | *STB? |
| Response Message | Register Value |

| Bit | Bit Weight | Bit Name | Condition of status byte register |
|---|---|---|---|
| 7 | 128 | ---- | 0 = Not used |
| 6 | 64 | MSS | 0 = Service not requested<br>1 = Service requested |
| 5 | 32 | ESB | 0 = Event status not generated<br>1 = Event status generated |
| 4 | 16 | MAV | 0 = No data in output queue<br>1 = Data in output queue |

| 3 | 8 | ESB2 | 0 = Event status not generated<br>1 = Event status generated |
|---|---|------|------------------------------|
| 2 | 4 | ---- | 0 = Not used |
| 1 | 2 | ---- | 0 = Not used |
| 0 | 1 | ---- | 0 = Not used |

Example                             *STB?;

# GPIB common commands — others

## ESE2

|  |  |
|--|--|
|  | Event Status Enable (End) |
| Function | Allows the End Event Status Enable Register to select which bit in the corresponding Event Register cause a TRUE ESB summary message bit 3 when set. |
| Remote Command | ESE2   n |
|  | ESE2? |
| Response Message | Register Value |
| Value of n | 0 to 255 : Represents the sum of the bit-weighted values. |
| Example | ESE2 1; |
|  | ESE2?; |

## ESR2?

|  |  |
|--|--|
|  | Event Status Register (End) Query |
| Function | Allows the sum of binary-weighted event bit values of the End Event Status Register to be read out by converting them to decimal.  After readout, the End Event status Register is reset to 0. |
| Remote Command | ESR2? |
| Response Message | Register Value |

| Bit | Bit Weight | Event | Description |
|-----|-----------|-------|-------------|
| 7 | 128 | Not used | Not used |
| 6 | 64 | Not used | Not used |
| 5 | 32 | Not used | Not used |
| 4 | 16 | Measurement completed | Measurement has completed (Peak search, OBW, X dB, Noise marker, Freq. Counter, Limit Pass/Fail..) |
| 3 | 8 | AUTO TUNE completed | AUTO TUNE has completed. |

| 2 | 4 | Averaging completed | Sweeping according to the specified AVERAGE number has completed. |
|---|---|---|---|
| 1 | 2 | Calibration completed | Temp Cal, Pre-Filter Cal, ZNC Cal,. Level Cal.. has completed. |
| 0 | 1 | Sweep completed | A single sweep has completed or is in standby. |

Example                          ESR2?;

## ERR

## :SYSTem:ERRor[:NEXT]

|  |  |
|---|---|
|  | Error Code |
| Function | Returns the error code of the current function.  The error code is cleared. |
| Remote Command | ERR? |
| Response Message | Error code |
| Example | ERR?; |

# Remote commands

## < Catalog order >

| Index | Description | SA Command | SCPI Command | Suffix |
|---|---|---|---|---|
| Amplitude | Ref. Level | RL | :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel | <amplitude>\|? |
| Amplitude | Attenuation | AT | [:SENSe]:POWer[:RF]:ATTenuation | <amplitude>\|? |
| Amplitude | Scale/Div | SD | :DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision | <amplitude>\|? |
| Average | Average | AVG | [:SENSe]:AVERage[:STATe] | OFF\|ON\|0\|1\|? |
| Average | Average Count | AVGC | [:SENSe]:AVERage:COUNt | <integer>\|? |
| Bandwidth | Resolution Bandwidth | RB | [:SENSe]:BANDwidth\|BWIDth[:RESolution] | <frequency>\|? |
| Bandwidth | Resolution Bandwidth Auto | RBA | [:SENSe]:BANDwidth\|BWIDth[:RESolution]:AUTO | OFF\|ON\|0\|1\|? |
| Display | Graticule | GRAT | :DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe] | OFF\|ON\|0\|1\|? |
| Display | White Mode | WH | :DISPlay:WINDow:WHITe | OFF\|ON\|0\|1\|? |
| File | Read | FREAD | :MMEMory:CATalog | ? <`directory_name'> |
| File | Save | FSAVE | :MMEMory:STORe | <`file_name'> |
| File | Delete | FDEL | :MMEMory:DELete | <`file_name'> |
| File | Copy | FCOPY | :MMEMory:COPY | <`file_name1'>,<`file_name2'> |
| File | Rename | FRENAME | :MMEMory:MOVE | <`file_name1'>,<`file_name2'> |
| File | Move | FMOVE | :MMEMory:DATA | <`file_name'>,definite_length_block\|? <`file_name> |
| Frequency | Center Frequency | CF | [:SENSe]:FREQuency:CENTer | <frequency>\|? |
| Frequency | Sampling Rate | SR | [:SENSe]:FREQuency:SAMPling:RATE | <frequency>\|? |
| Frequency | Reference | REF | :INPut:REFerence | INTernal\|EXTernal\|? |
| Marker | Marker State | MS[1~9] | :CALCulate:MARKer[1~9]:STATe | OFF\|ON\|0\|1\|? |
| Marker | Marker Mode | MM[1~9] | :CALCulate:MARKer[1~9]:MODE | POSition\|DELTa\|OFF\|? |
| Marker | Marker Freq | MF[1~9] | :CALCulate:MARKer[1~9]:X | <frequency>\|? |
| Marker | Marker Amplitude | MA[1~9] | :CALCulate:MARKer[1~9]:Y | ? |
| Marker | Marker All Off | MAO | :CALCulate:LPLot:MARKer:AOFF | none |
| Measurement | Meas. Start | MEA | :MEASure:STARt | FFT\|PVT\|FVT\|POLAR\|WVT\|BPSK\|QPSK\|OQPSK\|8~64PSK\|4~256QAM\|CCDF\|? |
| Measurement | Symbol Rate | SYR | :MEASure:SYMBol:RATE | <frequency>\|? |
| Measurement | Meas. Time | MEAT | :MEASure:TIME | <time>\|? |
| Mode | Mode | MODE | :INSTrument[:SELect] | SA\|BASIC\|? |
| Peak Search | Peak Search | MPK[1~9] | :CALCulate:MARKer[1~9]:MAXimum | none |
| Peak Search | Next Peak Search | MPKN[1~9] | :CALCulate:MARKer[1~9]:MAXimum:NEXT | none |
| Preset | Preset | PRST | :SYSTem:PRESet | none |
| Printer | Hard Copy | HCOPY | :HCOPy[:IMMediate] | none |
| Span | Span | SP | [:SENSe]:FREQuency:SPAN | <frequency>\|? |
| Sweep | Single | SI | :INITiate:LPLot[:IMMediate] | none |
| Sweep | Continuous | CO | :INITiate:LPLot:CONTinuous | OFF\|ON\|0\|1\|? |
| System | Beep | BEEP | | OFF\|ON\|0\|1\|? |
| System | Echo | ECHO | | OFF\|ON\|0\|1\|? |
| Trace | Trace Function | TRF | :TRACe:MODE | WRITe\|MAXHold\|? |
| Common | *CLS | *CLS | *CLS | none |
| Common | *ESE | *ESE | *ESE | <integer>\|? |
| Common | *ESR | *ESR | *ESR | ? |
| Common | *IDN | *IDN | *IDN | ? |
| Common | *OPC | *OPC | *OPC | ? |
| Common | *RST | *RST | *RST | none |

| Common | *SRE | *SRE | *SRE | <integer>|? |
|---|---|---|---|---|
| **Common** | *SRE | *SRE | *SRE | <integer>|? |
| **Common** | *STB | *STB | *STB | ? |
| **Others** | ESE2 | ESE2 | | <integer>|? |
| **Others** | ESR2 | ESR2 | | ? |
| **Others** | Error Code | ERR | :SYSTem:ERRor[:NEXT] | ? |

# < SA command order >

| Index | Description | SA Command | SCPI Command | Suffix |
|---|---|---|---|---|
| Common | *CLS | ***CLS** | *CLS | none |
| Common | *ESE | ***ESE** | *ESE | <integer>|? |
| Common | *ESR | ***ESR** | *ESR | ? |
| Common | *IDN | ***IDN** | *IDN | ? |
| Common | *OPC | ***OPC** | *OPC | ? |
| Common | *RST | ***RST** | *RST | none |
| Common | *SRE | ***SRE** | *SRE | <integer>|? |
| Common | *STB | ***STB** | *STB | ? |
| Amplitude | Attenuation | **AT** | [:SENSe]:POWer[:RF]:ATTenuation | <amplitude>|? |
| Average | Average | **AVG** | [:SENSe]:AVERage[:STATe] | OFF|ON|0|1|? |
| Average | Average Count | **AVGC** | [:SENSe]:AVERage:COUNt | <integer>|? |
| System | Beep | **BEEP** | | OFF|ON|0|1|? |
| Frequency | Center Frequency | **CF** | [:SENSe]:FREQuency:CENTer | <frequency>|? |
| Sweep | Continuous | **CO** | :INITiate:LPLot:CONTinuous | OFF|ON|0|1|? |
| System | Echo | **ECHO** | | OFF|ON|0|1|? |
| Others | Error Code | **ERR** | :SYSTem:ERRor[:NEXT] | ? |
| Others | ESE2 | **ESE2** | | <integer>|? |
| Others | ESR2 | **ESR2** | | ? |
| File | Copy | **FCOPY** | :MMEMory:COPY | <`file_name1'>,<`file_name2'> |
| File | Delete | **FDEL** | :MMEMory:DELete | <`file_name'> |
| File | Move | **FMOVE** | :MMEMory:DATA | <`file_name'>,definite_length_ block|? <'file_name> |
| File | Read | **FREAD** | :MMEMory:CATalog | ? <`directory_name'> |
| File | Rename | **FRENAME** | :MMEMory:MOVE | <`file_name1'>,<`file_name2'> |
| File | Save | **FSAVE** | :MMEMory:STORe | <`file_name'> |
| Display | Graticule | **GRAT** | :DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe] | OFF|ON|0|1|? |
| Printer | Hard Copy | **HCOPY** | :HCOPy[:IMMediate] | none |
| Marker | Marker Amplitude | **MA[1~9]** | :CALCulate:MARKer[1~9]:Y | ? |
| Marker | Marker All Off | **MAO** | :CALCulate:LPLot:MARKer:AOFF | none |
| Measurement | Meas. Start | **MEA** | :MEASure:STARt | FFT|PVT|FVT|POLAR|WVT| BPSK|QPSK|OQPSK|8~64PSK |4~256QAM|CCDF|? |
| Measurement | Meas. Time | **MEAT** | :MEASure:TIME | <time>|? |
| Marker | Marker Freq | **MF[1~9]** | :CALCulate:MARKer[1~9]:X | <frequency>|? |
| Marker | Marker Mode | **MM[1~9]** | :CALCulate:MARKer[1~9]:MODE | POSition|DELTa|OFF|? |
| Mode | Mode | **MODE** | :INSTrument[:SELect] | SA|BASIC|? |
| Peak Search | Peak Search | **MPK[1~9]** | :CALCulate:MARKer[1~9]:MAXimum | none |
| Peak Search | Next Peak Search | **MPKN[1~9]** | :CALCulate:MARKer[1~9]:MAXimum:NEXT | none |
| Marker | Marker State | **MS[1~9]** | :CALCulate:MARKer[1~9]:STATe | OFF|ON|0|1|? |
| Preset | Preset | **PRST** | :SYSTem:PRESet | none |
| Bandwidth | Resolution Bandwidth | **RB** | [:SENSe]:BANDwidth|BWIDth[:RESolution] | <frequency>|? |
| Bandwidth | Resolution Bandwidth Auto | **RBA** | [:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO | OFF|ON|0|1|? |
| Frequency | Reference | **REF** | :INPut:REFerence | INTernal|EXTernal|? |
| Amplitude | Ref. Level | **RL** | :DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel | <amplitude>|? |

| Amplitude | Scale/Div | **SD** | :DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision | <amplitude>|? |
| Sweep | Single | **SI** | :INITiate:LPLot[:IMMediate] | none |
| Span | Span | **SP** | [:SENSe]:FREQuency:SPAN | <frequency>|? |
| Frequency | Sampling Rate | **SR** | [:SENSe]:FREQuency:SAMPling:RATE | <frequency>|? |
| Measurement | Symbol Rate | **SYR** | :MEASure:SYMBol:RATE | <frequency>|? |
| Trace | Trace Function | **TRF** | :TRACe:MODE | WRITe|MAXHold|? |
| Display | White Mode | **WH** | :DISPlay:WINDow:WHITe | OFF|ON|0|1|? |

# < SCPI command order >

| Index | Description | SA Command | SCPI Command | Suffix |
|---|---|---|---|---|
| Common | *CLS | *CLS | **\*CLS** | none |
| Common | *ESE | *ESE | **\*ESE** | <integer>|? |
| Common | *ESR | *ESR | **\*ESR** | ? |
| Common | *IDN | *IDN | **\*IDN** | ? |
| Common | *OPC | *OPC | **\*OPC** | ? |
| Common | *RST | *RST | **\*RST** | none |
| Common | *SRE | *SRE | **\*SRE** | <integer>|? |
| Common | *STB | *STB | **\*STB** | ? |
| Marker | Marker All Off | MAO | **:CALCulate:LPLot:MARKer:AOFF** | none |
| Peak Search | Peak Search | MPK[1~9] | **:CALCulate:MARKer[1~9]:MAXimum** | none |
| Peak Search | Next Peak Search | MPKN[1~9] | **:CALCulate:MARKer[1~9]:MAXimum:NEXT** | none |
| Marker | Marker Mode | MM[1~9] | **:CALCulate:MARKer[1~9]:MODE** | POSition|DELTa|OFF|? |
| Marker | Marker State | MS[1~9] | **:CALCulate:MARKer[1~9]:STATe** | OFF|ON|0|1|? |
| Marker | Marker Freq | MF[1~9] | **:CALCulate:MARKer[1~9]:X** | <frequency>|? |
| Marker | Marker Amplitude | MA[1~9] | **:CALCulate:MARKer[1~9]:Y** | ? |
| Display | Graticule | GRAT | **:DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe]** | OFF|ON|0|1|? |
| Amplitude | Scale/Div | SD | **:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision** | <amplitude>|? |
| Amplitude | Ref. Level | RL | **:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel** | <amplitude>|? |
| Display | White Mode | WH | **:DISPlay:WINDow:WHITe** | OFF|ON|0|1|? |
| Printer | Hard Copy | HCOPY | **:HCOPy[:IMMediate]** | none |
| Sweep | Continuous | CO | **:INITiate:LPLot:CONTinuous** | OFF|ON|0|1|? |
| Sweep | Single | SI | **:INITiate:LPLot[:IMMediate]** | none |
| Frequency | Reference | REF | **:INPut:REFerence** | INTernal|EXTernal|? |
| Mode | Mode | MODE | **:INSTrument[:SELect]** | SA|BASIC|? |
| Measurement | Meas. Start | MEA | **:MEASure:STARt** | FFT|PVT|FVT|POLAR|WVT| BPSK|QPSK|OQPSK|8~64PSK |4~256QAM|CCDF|? |
| Measurement | Symbol Rate | SYR | **:MEASure:SYMBol:RATE** | <frequency>|? |
| Measurement | Meas. Time | MEAT | **:MEASure:TIME** | <time>|? |
| File | Read | FREAD | **:MMEMory:CATalog** | ? <`directory_name'> |
| File | Copy | FCOPY | **:MMEMory:COPY** | <`file_name1'>,<`file_name2'> |
| File | Move | FMOVE | **:MMEMory:DATA** | <`file_name'>,definite_length_ block|? <'file_name> |
| File | Delete | FDEL | **:MMEMory:DELete** | <`file_name'> |
| File | Rename | FRENAME | **:MMEMory:MOVE** | <`file_name1'>,<`file_name2'> |
| File | Save | FSAVE | **:MMEMory:STORe** | <`file_name'> |
| Others | Error Code | ERR | **:SYSTem:ERRor[:NEXT]** | ? |
| Preset | Preset | PRST | **:SYSTem:PRESet** | none |
| Trace | Trace Function | TRF | **:TRACe:MODE** | WRITe|MAXHold|? |
| Average | Average Count | AVGC | **[:SENSe]:AVERage:COUNt** | <integer>|? |
| Average | Average | AVG | **[:SENSe]:AVERage[:STATe]** | OFF|ON|0|1|? |
| Bandwidth | Resolution Bandwidth | RB | **[:SENSe]:BANDwidth|BWIDth[:RESolution]** | <frequency>|? |

| Bandwidth | Resolution Bandwidth Auto | RBA | **[:SENSe]:BANDwidth\|BWIDth[:RESolution]:AUTO** | OFF\|ON\|0\|1\|? |
|---|---|---|---|---|
| Frequency | Center Frequency | CF | **[:SENSe]:FREQuency:CENTer** | <frequency>\|? |
| Frequency | Sampling Rate | SR | **[:SENSe]:FREQuency:SAMPling:RATE** | <frequency>\|? |
| Span | Span | SP | **[:SENSe]:FREQuency:SPAN** | <frequency>\|? |
| Amplitude | Attenuation | AT | **[:SENSe]:POWer[:RF]:ATTenuation** | <amplitude>\|? |

| Bandwidth | Resolution Bandwidth Auto | RBA | **[:SENSe]:BANDwidth\|BWIDth[:RESolution]:AUTO** | OFF\|ON\|0\|1\|? |
|---|---|---|---|---|
| Frequency | Sampling Rate | SR | **[:SENSe]:FREQuency:SAMPling:RATE** | <frequency>\|? |

# Error codes

| Code | Description |
|:---:|:---:|
| 990 | Not supported in current mode |
| 991 | Not installed (option) |
| 992 | System is busy |
| 993 | Execution error (EXE) |
| 994 | Query error (QYE) |
| 995 | Suffix error |
| 996 | Input data size over error |
| 997 | Undefined command |
| 998 | Unnecessary suffix insertion |
| 999 | Undefined suffix |

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