Contents

SPECTRUM ANALYZERS

3250 Series

GSM/EDGE Measurement User Manual

Document part no. 47090/044

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3250 SERIES

GSM/EDGE Measurement User Manual

Document no. 47090/044 (PDF version)
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About this manual

This manual explains how to use the GSM/EDGE measurement option for the 3250 Series Spectrum Analyzers.

Intended audience

Persons engaged on 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

Precautions

This document is intended to be used in conjunction with the 3250 Operating Manual, which contains a full list of safety precautions. Please ensure that you are familiar with these precautions before using the instrument.

General

This option allows you to perform GSM/EDGE power, spectrum and modulation measurements in accordance with the GSM/EDGE standard.

This user manual describes how to set up the system to perform GSM/EDGE measurements, and the operation of each menu.

Note that the GSM/EDGE measurement software must be installed on the system in order to use the GSM/EDGE measurement option.

You can make the following measurements:

- Transmit Power Measurement
- Power vs. Time Measurement
- Spectrum Analysis
- Phase Error Measurement
- EVM (Error Vector Magnitude) Measurement

Specifications

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

Frequency

Frequency range	3 Hz to 3 / 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 GSM/EDGE measurement option

To license your GSM/EDGE 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 GSM/EDGE 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 buy the digitizer with this option, it must be sent to the manufacturer. All hardware and software installations will be completed by the 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 *GSM/EDGE* 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 key, then exit from the license menu.

Measurement guide — general

This section introduces you to making measurements of GSM/EDGE signals. Using the procedures specified in this and the following section, you can carry out GSM/EDGE signal analysis in the power, spectrum and modulation domains.

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.

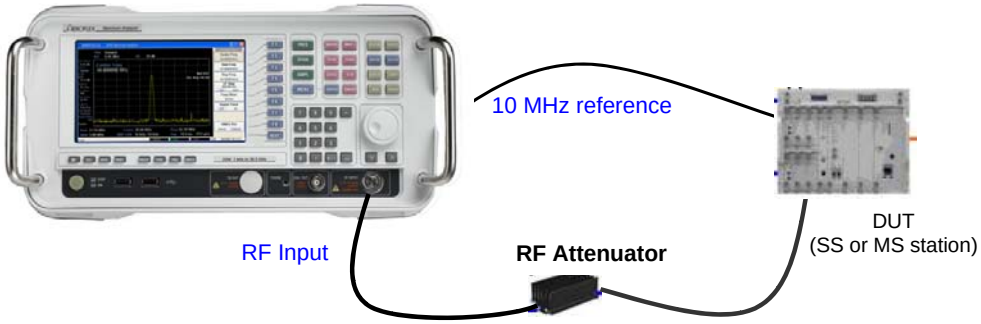


Fig. 1 GSM/EDGE measurement setup

General steps in making a measurement

All measurements made in ‘GSM/EDGE options’ can be performed with the following steps.

1 Select the GSM/EDGE measurement option

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

Press *[GSM/EDGE]* or *[Basic]*. Analyze the signal in GSM/EDGE standard format or in non-standard format (see the Basic mode).

2 Select measurement to be performed

Press [MEAS]. There are various measurement menu related to the GSM/EDGE standards. Use this menu to select the specific measurement to be performed. When the trigger conditions are satisfied, digitized GSM/EDGE signals are acquired and analyzed instantly.

Press [MEAS], [CONTROL]. Set up the specific parameters relating to the selected GSM/EDGE measurement item.

3 Analyze displayed analysis results

Depending on the measurement selected, you can adjust the way results are displayed using the [TRACE], [DISPLAY] menu. Use the [SPAN] and [AMPL] menus to set the scales of the X and Y axes.

GSM/EDGE measurement guide

The Global System for Mobile communication (GSM) digital communications standard defines a voice and data over-air interface between a mobile radio and the system infrastructure. EDGE (Enhanced Data Rates for GSM Evolution) enhances the GSM standard by implementing a new modulation format and filtering designed to provide higher data rates in the same spectrum. EDGE and GSM signals can be transmitted on the same frequency, occupying different timeslots, and both use existing GSM equipment. EDGE has also been adopted as the basis for IS-136HS. The GSM digital communications standard employs an 8:1 Time Division Multiple Access (TDMA) allowing eight channels to use one carrier frequency simultaneously. The 270.833 kbit/s raw bit rate is modulated onto the RF carrier using Gaussian Minimum Shift Keying (GMSK).

Transmit Power

Test purpose and concepts

Transmit Power is the measure of in-channel power for GSM and EDGE systems. Mobile stations and base transceiver stations must transmit enough power, with sufficient modulation accuracy, to maintain a call of acceptable quality without leaking into frequency channels or timeslots allocated for others. GSM and EDGE systems use dynamic power control to ensure that each link is maintained with minimum power. This gives two fundamental benefits: overall system interference is kept to a minimum and, in the case of mobile stations, battery life is maximized. The Transmit Power measurement determines the average power for an RF signal burst at or above a specified threshold value. The threshold value may be absolute, or relative to the peak value of the signal. At the base transceiver station, the purpose of the Transmit Power measurement is to determine the power delivered to the antenna system on the radio-frequency channel under test. The Transmit Power measurement verifies the accuracy of the mean transmitted RF carrier power. This can be done across the frequency range and at each power step.

Test procedure

Perform the steps below to measure the transmit power of a GSM/EDGE signal.

Confirm the input signal level is below the maximum allowed input level (+16 dBm with no RF input attenuator).

Set the following parameters to measure spectral mask in GSM/EDGE mode:

1 Press [MODE] and select *[GSM/EDGE]*.

2 Press [MEAS] and select *[Transmit Power]*.

3 Press [MODE], [SETUP] and set the *[Threshold]*.

Set the following parameters in GSM/EDGE mode to adjust the input signal:

4 Press [FREQ] and select *[Center Freq]*. Set the center frequency to the same value as the RF input frequency.

Test result

The Transmit Power measurement result display should look like Fig. 3, with a time domain display of the burst waveform plotted in dB, and the power measurement values displayed below.

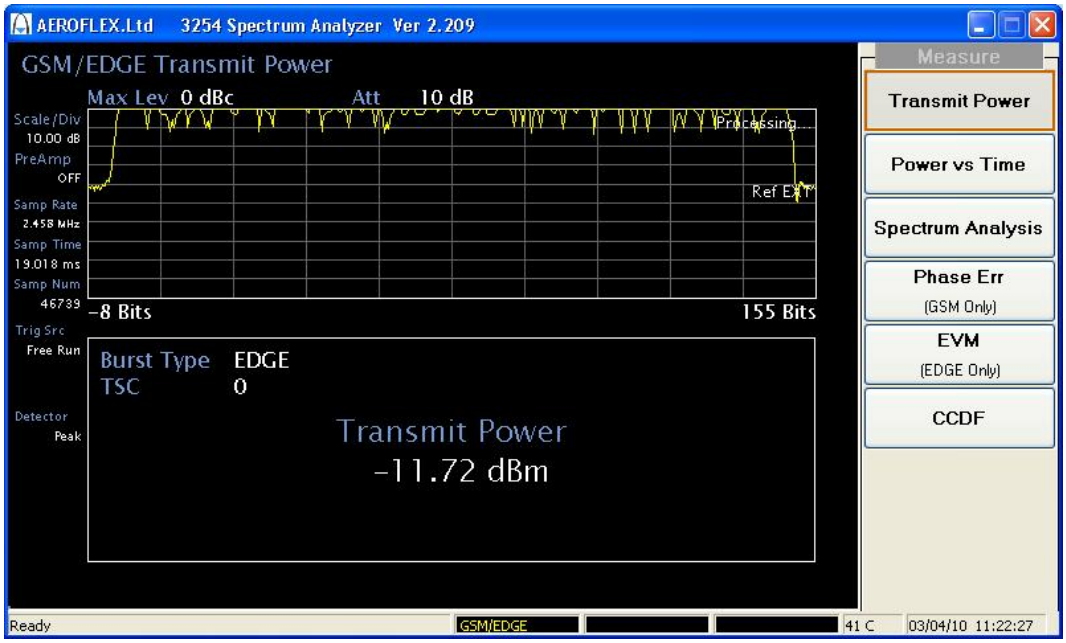


Fig. 2 Result of measuring Transmit Power for GSM/EDGE signal

Power vs. Time

Test purpose and concepts

Power vs. Time measures the mean transmit power during the ‘useful part’ of GSM bursts and verifies that the power ramp fits. Power vs. Time also lets you view the rise, fall, and ‘useful part’ of the GSM burst.

Test procedure

Perform the steps below to measure the power vs. time of a GSM/EDGE signal.

Set the following parameters to measure transmit power in GSM/EDGE mode:

1 Press [MODE] and select *[GSM/EDGE]*.

2 Press [MEAS] and select *[Power vs. Time]*.

Set the following parameters in GSM/EDGE mode to adjust analysis:

3 Press [FREQ] and select *[Center Freq]*. Set the center frequency to the same value as the RF input frequency.

Test results

The Power vs. Time measurement result should look like Fig. 2. The upper part of the window shows the rise, ‘useful part’, and fall of the GSM burst.

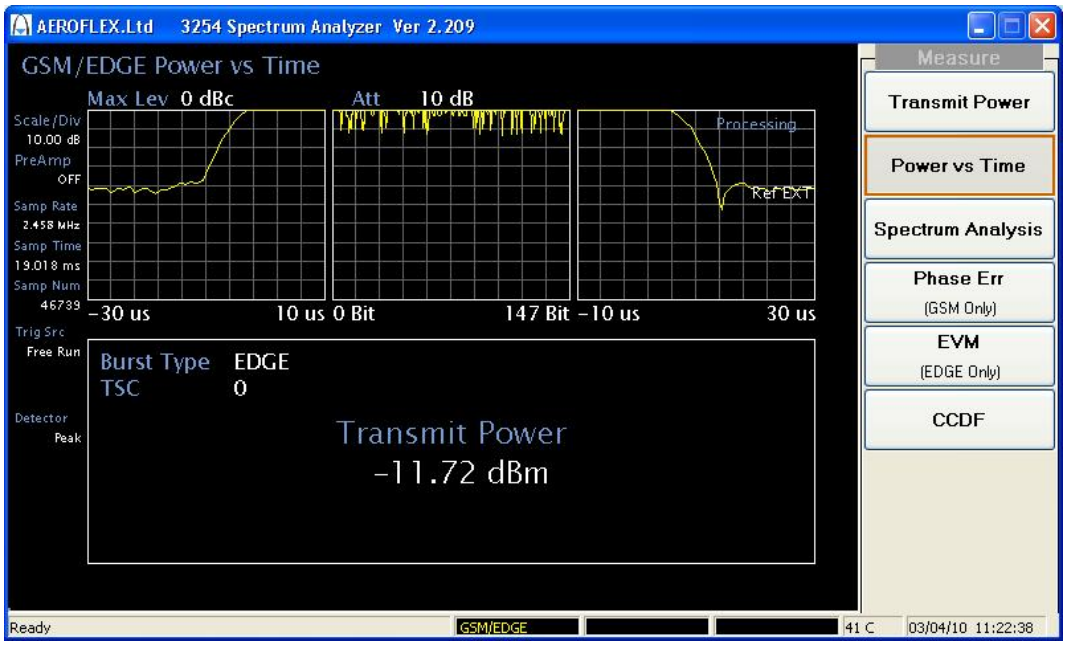


Fig. 3 Result of measuring Power vs. Time for GSM/EDGE signal

Spectrum analysis

Test purpose and concepts

The Output RF Spectrum measurement is the GSM/EDGE version of the adjacent channel power (ACP) measurement. Either a single offset is measured with corresponding traces or six offsets are measured and a table is displayed. In spectrum due to modulation measurements, a sweep spectrum of –1.8 MHz to +1.8 MHz is displayed. The output RF spectrum measurements determine the spectral energy emitted into the adjacent channels. Excessive amounts of energy spilling into an adjacent frequency channel could interfere with signals being transmitted to other MS. The measurements are divided into two main groups: spectrum due to the 0.3 GMSK and 3Π/8 8PSK modulation and noise, and spectrum due to switching transients (burst ramping). Since GSM/EDGE is a TDMA format, RF power is being switched on and off depending on whether the actual burst is being transmitted. The switching of power causes spectral splatter at frequencies other than that being transmitted by the carrier. Fast transitions in the time domain cause switching transients that have high frequency content associated with them.

Test procedure

Perform the steps below to measure the spectrum analysis of a GSM/EDGE signal.

Confirm the input signal level is below the maximum allowed input level (+16 dBm with no RF input attenuator).

Set the following parameters to measure spectrum analysis in GSM/EDGE mode:

1 Press [MODE] and select *[GSM/EDGE]*.

2 Press [MEAS] and select *[Spectrum Analysis]*.

Set the following parameters in GSM/EDGE mode to adjust analysis:

3 Press [FREQ] and select [Center]. Set the center frequency to the same value as the RF input frequency.

Test result

The measured data displays offsets from six frequency offsets. Both modulation and switching measurement data measure the spectrum due to the modulation and noise, and switching (transient) measurements.

Fig. 4 Result of measuring Spectrum Analysis for GSM/EDGE signal

Phase Error (for GSM)

Test purpose and concepts

Phase and frequency error are the measures of modulation quality for GSM systems. Since GSM systems use relative phase to transmit information, the phase and frequency accuracy of the transmitter are critical to the systems' performance and ultimately affect range. GSM receivers rely on the phase and frequency quality of the 0.3 GMSK signal in order to achieve the expected carrier to noise performance. A transmitter with high phase and frequency error will often still be able to support phone calls during a functional test. However, it will tend to prove difficult for mobiles trying to maintain service at the edges of the cell, with low signal levels or under difficult fading and Doppler conditions. The phase error of the test signal is measured by computing the difference between the phase of the transmitted signal and the phase of a theoretically perfect signal.

Test procedure

Perform the steps below to measure the phase error of a GSM/EDGE signal.

Confirm the input signal level is below the maximum allowed input level (+16 dBm with no RF input attenuator).

Set the following parameters to measure phase error in GSM/EDGE mode:

1 Press [MODE] and select *[GSM/EDGE]*.

2 Press [MEAS] and select *[Phase Err]*.

Set the following parameters in GSM/EDGE mode to adjust analysis:

3 Press [FREQ] and select *[Center Freq]*. Set the center frequency to the same value as the RF input frequency.

Test result

The phase error measurement result should look like Fig. 5. The upper part of the window shows the graphical result for phase error, and the lower part shows the numeric result for phase error and frequency error.

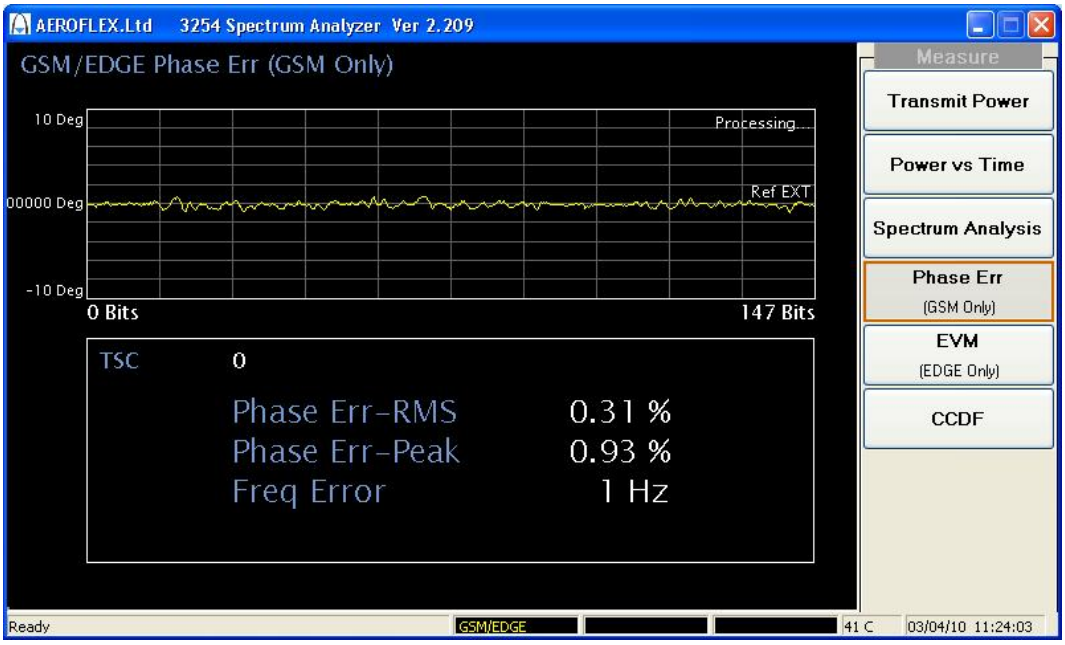


Fig. 5 Result of measuring Phase Error for GSM signal

EVM (for EDGE)

Test purpose and concepts

EVM (Error Vector Magnitude) is the measure of modulation quality for EDGE. Since EDGE uses 3Π/8 PSK modulation, the transmitter's phase, frequency, and amplitude accuracy are critical to the communications system's performance. EVM also affects range. EDGE receivers rely on the quality of the 3Π/8 PSK modulation signal to achieve the expected carrier-to-noise ratio. A transmitter with high EVM will often still be able to support phone calls during a functional test. However, it will tend to prove difficult for mobiles trying to maintain service at the edge of the cell with low signal levels or under difficult fading and Doppler conditions. EVM is measured by calculating the difference between the actual EVM of the transmitted signal and the EVM of a theoretical, ideal signal; this theoretical signal is derived mathematically from data sampled from the transmitted signal.

Test procedure

Perform the steps below to measure the EVM of a GSM/EDGE signal.

Confirm the input signal level is below the maximum allowed input level (+16 dBm with no RF input attenuator).

Set the following parameters to measure EVM in GSM/EDGE mode:

1 Press [MODE] and select *[GSM/EDGE]*.

2 Press [MEAS] and select *[EVM]*.

Set the following parameter in GSM/EDGE mode to adjust analysis:

3 Press [FREQ] and select *[Center Freq]*. Set the center frequency to the same value as the RF input frequency.

Test result

The EVM measurement result should look like Fig. 6. The upper part of the window shows the graphical result for EVM, and the lower part shows the numeric results for EVM and frequency error.

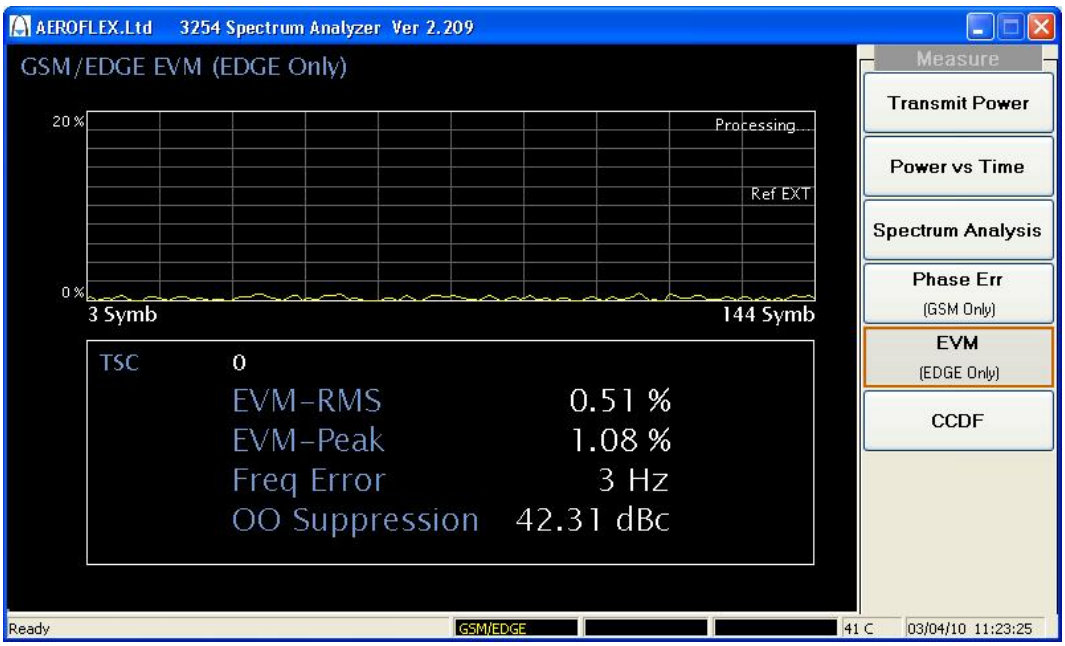


Fig. 6 Result of measuring EVM for EDGE signal

CCDF (complementary cumulative distribution function)

Test purpose and concepts

Many of the digitally modulated signals now look noise-like in the time and frequency domain. This means that statistical measurements of the signals can be a useful characterization. Power Complementary Cumulative Distribution Function (CCDF) curves characterize the higher-level power statistics of a digitally modulated signal. The curves can be useful in determining design parameters for digital communications systems.

Test procedure

Perform the steps below to measure the CCDF of a GSM/EDGE signal.

Confirm the input signal level is below the maximum allowed input level (+16 dBm with no RF input attenuator).

Set the following parameters to measure CCDF in GSM/EDGE mode:

1 Press [MODE] and select *[GSM/EDGE]*.

2 Press [MEAS] and select *[CCDF]*.

Set the following parameters in GSM/EDGE mode to adjust analysis:

3 Press [FREQ] and select *[Center Freq]*. Set the center frequency to the same value as the RF input frequency.

Test result

Fig. 7 shows the analysis result for CCDF for a GSM/EDGE signal. The left side of the window shows the statistical result for power distribution of the input signal, with its numerical value. The right side of the window shows the result graphically, with a ‘Gaussian distribution’ reference.

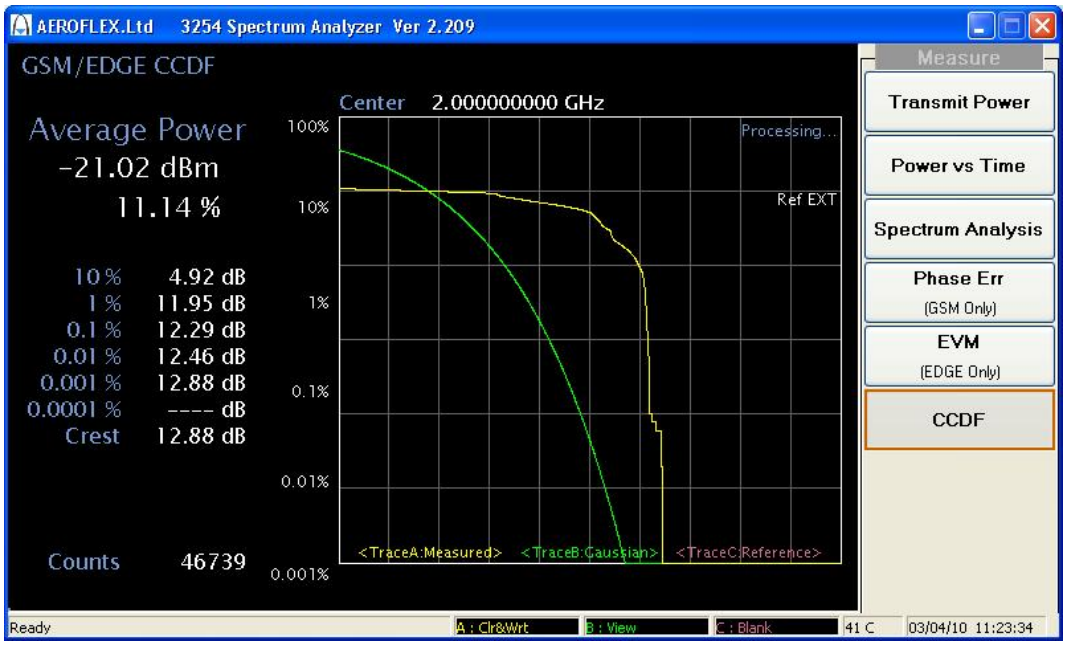
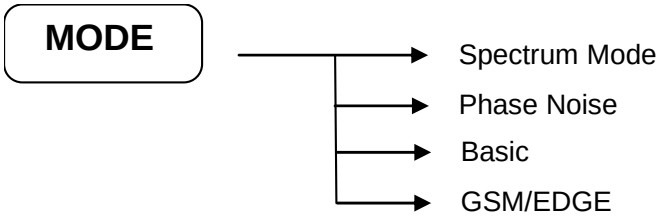


Fig. 7 Result of measuring CCDF for GSM/EDGE signal

Menu descriptions

GSM/EDGE measurement mode

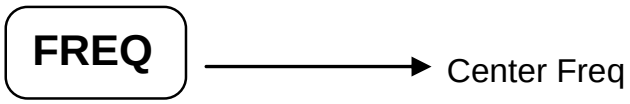
To use GSM/EDGE measurement options, first set the system to GSM/EDGE mode.



Select [MODE], then press *[GSM/EDGE]* mode at the right side of the screen.

Frequency channel menu

Press [FREQ] in GSM/EDGE mode:

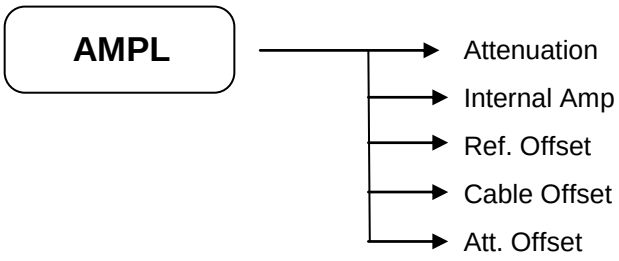


You can access frequency functions from this menu:

Center Freq	Allows you to specify the frequency of the GSM/EDGE input signal.

Amplitude menu

Press [AMPL] in GSM/EDGE mode:

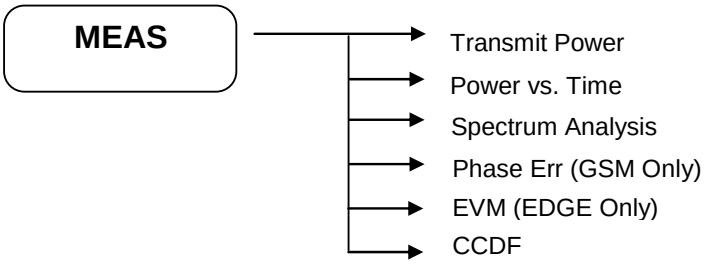


Amplitude menu keys are used for setting functions that affect the way data on the vertical axis is displayed or corrected.

Attenuation	This allows you to set the value of input attenuation, in the range 10 to 55 dB, using the numeric keys, step keys or scroll knob.
Internal Amp	This switches the internal amplifier in or out.
Ref. Offset	This allows you to set an amplitude correction for the reference level.
Cable Offset	This allows you to set an amplitude correction for the cable between the DUT and the instrument.
Att. Offset	This allows you to set an amplitude correction for the attenuator level.

Measure menu

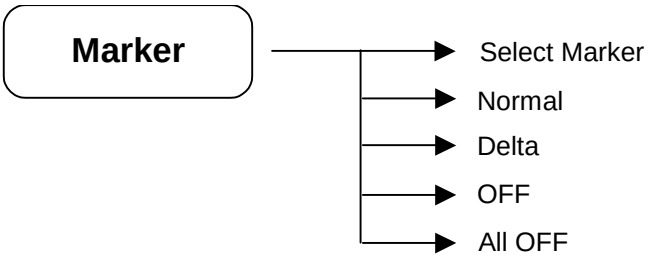
Press [MEAS] in GSM/EDGE mode:



Transmit Power	Measures the transmit power of a GSM/EDGE signal.
Power vs. Time	Measures the mean transmit power during the 'useful part' of a GSM burst, and verifies that the power ramp fits.
Spectrum Analysis	The output RF spectrum measurement determines the spectral energy emitted into adjacent channels.
Phase Err (GSM Only)	The phase error of the test signal is measured by computing the difference between the phase of the transmitted signal and the phase of a theoretically perfect signal.
EVM (EDGE Only)	Measures the EVM Error for an EDGE signal.
CCDF	Measures the CCDF (Complementary Cumulative Distribution Function) of a GSM/EDGE signal.

Marker menu

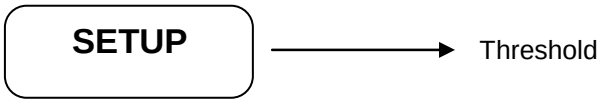
Press [MARKER] in GSM/EDGE mode:



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 are 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.

Mode setup

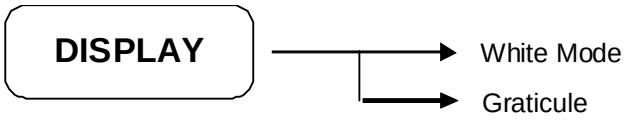
Press [SETUP] in GSM/EDGE Mode:



Threshold	Sets the threshold level (dB).

Display menu

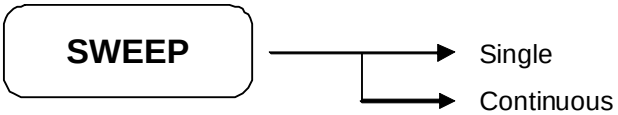
Press [DISPLAY] in GSM/EDGE mode:



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

Sweep menu

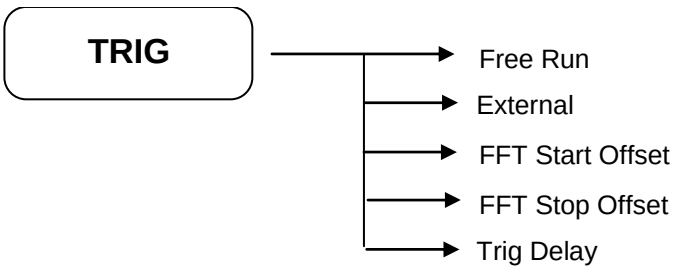
Press [SWEEP] in GSM/EDGE mode:



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.

Trigger menu

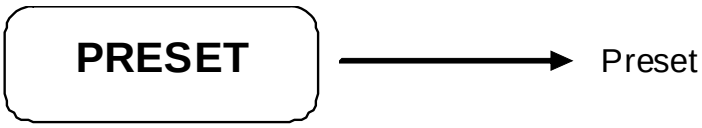
Press [TRIG] in GSM/EDGE mode:



Free Run	Captures the sample data when in Single/Repeat mode, without waiting for any external events.
External	Starts the sweep in sychronization with the external trigger source.
FFT Start Offset	Delays the start of the FFT by the specified time.
FFT Stop Offset	Delays the end of the FFT by the specified time.
Trig Delay	Delays the capture trigger by the specified time.

Preset menu

Press [PRESET] in GSM/EDGE mode:



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 'Δ' = 'blank' throughout this document.

SA command

SCPI command

	Command Name
Function	The explanation of the command.
Remote Command	SA CommandΔsw
	SA CommandΔf
	SA Command?
	SCPI CommandΔsw
	SCPI CommandΔf
	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	RLΔf
	RL?
	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVelΔf
	:DISPlay:WINDow:TRACe:Y[:SCALe]:RLEVel?
Response Message	Reference Level (dBm)
Value of f	–170 dBm to 30 dBm (step: 1 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	ATΔf
	AT?
	[:SENSe]:POWer[:RF]:ATTenuationΔf
	[: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	SDΔf
	SD?
	:DISPlay:LPLot:WINDow:TRACe:Y[:SCALe]:PDIVisionΔf
	: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	GRATΔsw	
	GRAT?	
	:DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe]Δsw	
	: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:LPLot:WINDow:WHITe

	White Mode	
Function	Turns the white mode ON or OFF.	
Remote Command	WHΔn	
	WHΔsw	
	WH?	
	:DISPlay:LPLot:WINDow:WHITeΔn	
	:DISPlay: LPLot:WINDow:WHITeΔsw	
	:DISPlay: LPLot: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?Δ‘file_folder’
	:MMEMory:CATalog?Δ‘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	FSAVEΔ‘file_name’
	:MMEMory:STOReΔ‘file_name’
Value of file_name	File Path + File Name
Supported Extension	sts : Status
	bmp : Bitmap
	jpg : jpeg
	png : png
Example	FSAVE ‘C:\demo.sts’;
	MMEM:STRO ‘C:\demo.sts’;

FLOAD

:MMEMory:LOAD

	File Load
Function	Loads the selected file.
Remote Command	FLOAD?Δ‘file_name’
	:MMEMory:LOADΔ‘file_name’
Value of file_name	File Path + File Name
Supported extension	sts : Status
Example	FLOAD ‘C:\demo.sts’;
	MMEM:LOAD ‘C:\demo.sts’;

FDEL

:MMEMory:DELete

	File Delete
Function	Deletes the selected file.
Remote Command	FDELΔ‘file_name’
	:MMEMory:DELeteΔ‘file_name’
Value of file_name	File Path + File Name
Example	FDEL ‘C:\demo.sts’;
	MMEM:DEL ‘C:\demo.sts’;

FCOPY

:MMEMory:COPY

	File Copy
Function	Copies the selected file.
Remote Command	FCOPYΔ‘src_file_name’, ‘dest_file_name’
	:MMEMory:COPYΔ‘src_file_name’, ‘dest_file_name’
Value of src_file_name, dest_file_name	File Path + File Name
Example	FCOPY ‘C:\demo.sts’,‘D:\demo.sts;
	MMEM:COPY ‘C:\demo.sts,‘D:\demo.sts;

FRENAME

:MMEMory:MOVE

	File Rename
Function	Renames the selected file.
Remote Command	FRENAMEΔ‘src_file_name’,‘dest_file_name’
	:MMEMory:MOVEΔ‘src_file_name’,‘dest_file_name’
Value of src_file_name, dest_file_name	File Path + File Name
Example	FRENAME ‘C:\demo.sts,‘C:\demo1_1.sts;
	MMEM:MOVE ‘C:\demo1.sts,‘C:\demo1_1.sts;

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	FMOVEΔ‘file_name’,definite_length_block
	FMOVE?Δ‘file_name’
	MMEMory:DATAΔ‘file_name’,definite_length_block
	MMEMory:DATA?Δ‘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	CFΔf
	CF?
	[:SENSe]:FREQuency:CENTerΔf
	[: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	2 GHz
Example	CF 123456;
	CF 50MHZ;
	CF?;
	FREQ:CEN7T 123456;
	FREQ:CENT 50MHZ;
	FREQ:CENT?;

REF

:INPut:REFerence

	Reference
Function	Sets the 10 MHz Reference.
Remote Command	REFΔsw
	REF?
	:INPut:REFerenceΔsw
	: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

MS[1~9]

:CALCulate:MARKer[1~9]:STATe

	Marker State	
Function	Sets the selected marker state.	
Remote Command	MS[1~9]Δn	
	MS[1~9]Δsw	
	MS[1~9]?	
	:CALCulate:CCDF:MARKer[1~9]:STATeΔn	
	:CALCulate:CCDF:MARKer[1~9]:STATeΔsw	
	: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 or Delta mode.	
Remote Command	MM[1~9]Δsw	
	MM[1~9]?	
:	CALCulate:MARKer[1~9]:MODEΔsw	
	: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 delta mode, it sets the difference value of the marker frequency and the delta marker frequency.
Remote Command	MF[1~9]Δf
	MF[1~9]?
	:CALCulate:MARKer[1~9]:XΔf
	: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	MEAΔsw	
	MEA?	
	:MEASure:STARtΔsw	
	:MEASure:STARt?	
Response Message	TXP	: Transmit Power
	PVT	: Power vs. Time
	SPEC	: Spectrum Analysis
	PHASE	: Phase Error
	EVM	: EVM
	CCDF	: CCDF
Value of sw	TXP	: Transmit Power
	PVT	: Power vs. Time
	SPEC	: Spectrum Analysis
	PHASE	: Phase Error
	EVM	: EVM
	CCDF	: CCDF
Example	MEA TXP;	
	MEA?;	
	MEAS:STAR TXP;	
	MEAS:STAR?;	

TXPOUT

:FETCh|MEASure|READ:TXPower

	Transmit Power Output
Function	Returns the output of the Transmit Power measurement.
Remote Command	TXPOUT?
	:FETCh|MEASure|READ:TXPower?
Response Message	Burst Type, TSC, Transmit Power (dBm)
Example	TXPOUT?;
	MEAS:TXP?;

PVTOUT

:FETCh|MEASure|READ:PVTime

	Power vs Time Output
Function	Returns the output of the Power vs Time measurement.
Remote Command	PVTOUT?
	:FETCh|MEASure|READ:PVTime?
Response Message	Burst Type, TSC, Transmit Power (dBm)
Example	PVTOUT?;
	MEAS:PVT?;

SPECOUT

:FETCh|MEASure|READ:SPECtrum

	Spectrum Analysis Output
Function	Returns the output of the Spectrum Analysis measurement.
Remote Command	SPECOUT?
	:FETCh|MEASure|READ:SPECtrum?
Response Message	Modulation Ref Power, Spectrum Offset1, Modulation Lower Level1, Lower Diff1, Modulation Upper Level1, Upper Diff1, ~ Spectrum Offset6, Modulation Lower Level6, Lower Diff6, Modulation Upper Level6, Upper Diff6, Switching Ref Power Spectrum Offset1, Switching Lower Level1, Lower Diff1, Switching Upper Level1, Upper Diff1, ~ Spectrum Offset6, Switching Upper Level6, Upper Diff6,
Example	SPECOUT?;
	MEAS:SPEC?;

PHASEOUT

:FETCh|MEASure|READ:PHASE

	Phase Error Output
Function	Returns the output of the Phase Error measurement.
Remote Command	PHASEOUT?
	:FETCh|MEASure|READ:PHASE?
Response Message	TSC, Phase (RMS, %), Phase (Peak, %), Freq Error (Hz)
Example	PHASEOUT?;
	MEAS:PHASE?;

EVMOUT

:FETCh|MEASure|READ:EVM

	EVM Output
Function	Returns the output of the EVM measurement.
Remote Command	EVMOUT?
	:FETCh|MEASure|READ:EVM?
Response Message	TSC, EVM (RMS, %), EVM (Peak, %), Freq Error (Hz), Origin Offset Suppression (dBc)
Example	EVMOUT?;
	MEAS:EVM?;

CCDFOUT

:FETCh|MEASure|READ:CCDF

	CCDF Output
Function	Returns the output of CCDF.
Remote Command	CCDFOUT?
	:FETCh|MEASure|READ:CCDF?
Response Message	Average Power (dBm), Average Power Percent (%), 10% Level Difference (dB), 1% Level Difference (dB), 0.1% Level Difference (dB), 0.01% Level Difference (dB), 0.001% Level Difference (dB), 0.0001% Level Difference (dB), Crest Level Difference (dB), Counts
Example	CCDFOUT?;
	MEAS:CCDF?;

Mode

MODE

:INSTrument[:SELect]

	Mode	
Function	Sets the current mode.	
Remote Command	MODE∆sw	
	MODE?	
	:INSTrument[:SELect]∆sw	
	:INSTrument[:SELect]?	
Response Message	SA	: Spectrum mode
	BASIC	: Basic mode
	GSM	: GSM/EDGE mode
Value of sw	SA	: Spectrum mode
	BASIC	: Basic mode
	GSM	: GSM/EDGE mode
Initial setting	SA	
Example	MODE SA;	
	MODE?;	
	INST SA;	
	INST?;	

Mode Setup

TH

	Threshold
Function	Sets the Threshold Level.
Remote Command	THΔf
	TH?
Response Message	Threshold Level (dB)
Value of f	From 0 to 60
Initial setting	20
Example	TH 20;
	TH?;

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 the entire screen image.
Remote Command	HCOPY
	:HCOPy[:IMMediate]
Example	HCOPY;
	HCOP;

Sweep

CO

:INITiate:CONTinuous

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

SI

:INITiate[:IMMediate]

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

System

BEEP

	Beep	
Function	Turns the beep on or off when pressing the keypad.	
Remote Command	BEEPΔn	
	BEEPΔsw	
	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 on or off when controlled by a hyperterminal.	
Remote Command	ECHOΔn	
	ECHOΔsw	
	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?;	

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	*ESEΔn
	*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	*SREΔn
	*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 1 = Service requested
5	32	ESB	0 = Event status not generated 1 = Event status generated
4	16	MAV	0 = No data in output queue 1 = Data in output queue
3	8	ESB2	0 = Event status not generated 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 causes a TRUE ESB summary message bit 3 when set.
Remote Command	ESE2Δn
	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

Ordered by function

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>|?
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	Load	FLOAD	:MMEMory:LOAD	<`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	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	TXP|PVT|SPEC|PHASE|EVM|CCDF|?
Measurement	Transmit Power Output	TXPOUT	:FETCh|MEASure|READ:TXPower	?
Measurement	Power vs. Time Output	PVTOUT	:FETCh|MEASure|READ:PVTimer	?
Measurement	Spectrum Analysis Output	SPECOUT	:FETCh|MEASure|READ:SPECtrum	?
Measurement	Phase Error Output	PHASEOUT	:FETCh|MEASure|READ:PHASE	?
Measurement	EVM Output	EVMOUT	:FETCh|MEASure|READ:EVM	?
Measurement	CCDF Output	CCDFOUT	:FETCh|MEASure|READ:CCDF	?
Mode	Mode	MODE	:INSTrument[:SELect]	SA|BASIC|GSM|?
Mode Setup	Mode Setup	TH		<level>|?
Preset	Preset	PRST	:SYSTem:PRESet	none
Printer	Hard Copy	HCOPY	:HCOPy[:IMMediate]	none
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|?
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	?
Others	ESE2	ESE2		<integer>|?
Others	ESR2	ESR2		?
Others	Error Code	ERR	:SYSTem:ERRor[:NEXT]	?

Ordered by SA command

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>|?
System	Beep	**BEEP**		OFF|ON|0|1|?
Measurement	CCDF Output	**CCDFOUT**	:FETCh|MEASure|READ:CCDF	?
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**		?
Measurement	EVM Output	**EVMOUT**	:FETCh|MEASure|READ:EVM	?
File	Copy	**FCOPY**	:MMEMory:COPY	<`file_name1'>,<`file_name2'>
File	Delete	**FDEL**	:MMEMory:DELete	<`file_name'>
File	Load	**FLOAD**	:MMEMory:LOAD	<`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	TXP|PVT|SPEC|PHASE|EVM|CCDF|?
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|GSM|?
Marker	Marker State	**MS[1~9]**	:CALCulate:MARKer[1~9]:STATe	OFF|ON|0|1|?
Measurement	Phase Error Output	**PHASEOUT**	:FETCh|MEASure|READ:PHASE	?
Preset	Preset	**PRST**	:SYSTem:PRESet	none
Measurement	Power vs. Time Output	**PVTOUT**	:FETCh|MEASure|READ:PVTime	?
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
Measurement	Spectrum Analysis Output	**SPECOUT**	:FETCh|MEASure|READ:SPECtrum	?
Mode Setup	Mode Setup	**TH**	:INSTrument[:SELect]	<level>|?
Measurement	Transmit Power Output	**TXPOUT**	:FETCh|MEASure|READ:TXPower	?
Display	White Mode	**WH**	:DISPlay:WINDow:WHITe	OFF|ON|0|1|?

Ordered by SCPI command

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
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|?
Measurement	CCDF Output	CCDFOUT	**:FETCh|MEASure|READ:CCDF**	?
Measurement	EVM Output	EVMOUT	**:FETCh|MEASure|READ:EVM**	?
Measurement	Phase Error Output	PHASEOUT	**:FETCh|MEASure|READ:PHASE**	?
Measurement	Power vs. Time Output	PVTOUT	**:FETCh|MEASure|READ:PVTime**	?
Measurement	Spectrum Analysis Output	SPECOUT	**:FETCh|MEASure|READ:SPECtrum**	?
Measurement	Transmit Power Output	TXPOUT	**:FETCh|MEASure|READ:TXPower**	?
Printer	Hard Copy	HCOPY	**:HCOPy[:IMMediate]**	none
Sweep	Continuous	CO	**:INITiate:LPLot:CONTinuous**	OFF|ON|0|1|?
Sweep	Single	SI	**:INITiate:LPLot[:IMMediate]**	none
In/Out	LVDS Aux	LVDSAUX	**:INPut:LVDS:AUXiliary**	Input|TRIstate|OUTput|?
In/Out	LVDS Data	LVDSDATA	**:INPut:LVDS:DATA**	Input|TRIstate|OUTput|?
In/Out	LVDS Maker	LVDSMKR	**:INPut:LVDS:MARKer**	Input|TRIstate|OUTput|?
Frequency	Reference	REF	**:INPut:REFerence**	INTernal|EXTernal|?
Mode	Mode	MODE	**:INSTrument[:SELect]**	SA|BASIC|GSM|?
Measurement	Meas. Start	MEA	**:MEASure:STARt**	TXP|PVT|SPEC|PHASE|EVM|CCDF?
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	Load	FLOAD	**:MMEMory:LOAD**	<`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
Frequency	Center Frequency	CF	**[:SENSe]:FREQuency:CENTer**	<frequency>|?
Amplitude	Attenuation	AT	**[:SENSe]:POWer[:RF]:ATTenuation**	<amplitude>|?

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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