SPECTRUM ANALYZERS
3250 SERIES

UMTS Measurement
User Manual

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About this manual

This manual explains how to use the UMTS 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 UMTS/HSUPA power, spectrum and modulation measurements in accordance with the 3GPP2 UMTS/HSUPA standard.

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

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

You can make the following measurements:

- Transmit Spectrum Mask
- Channel Power
- ACLR (Adjacent Channel Leakage Ratio)
- OBW (Occupied Bandwidth)
- Code Domain Analysis (Code Domain Power & Code Domain Error)
- Composite EVM: provides the following numerical results in addition to this measurement

  EVM Error (RMS): %

  EVM Error (Peak): %

  Frequency Error: Hz

  Peak CDE (I, Q): dB
- QPSK EVM

  EVM Error (RMS): %

  EVM Error (Peak): %

  Frequency Error: Hz

  Origin Offset: %

  Mag.Err (RMS): %

  Phase Err (RMS): Degree
- Channel Identify
- 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	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 UMTS measurement option

To license your UMTS/HSUPA 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 UMTS/HSUPA 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 *UMTS/HSUPA* 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 UMTS signals. Using the procedures specified in this and the following section, you can carry out UMTS signal analysis in the spectrum, code 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.

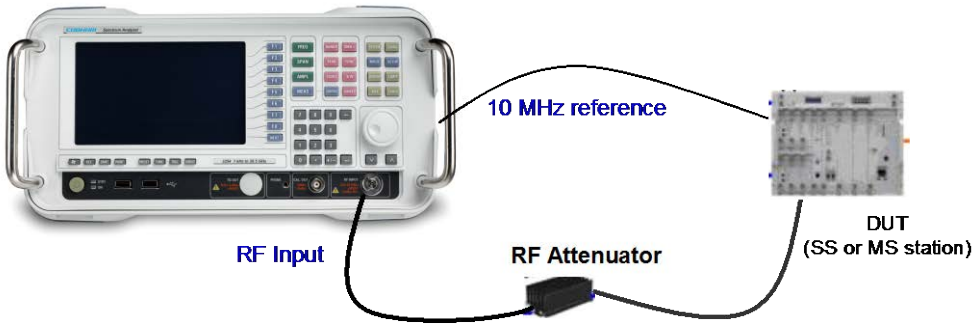


Fig. 1 UMTS measurement setup

General steps in making a measurement

All measurements made in 'UMTS/HSUPA options' can be performed with the following steps.

1 Select the UMTS/HSUPA measurement option

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

Press *[UMTS/HSUPA]* or *[Vector Analyzer]*. Analyze the signal in UMTS/HSUPA standard format or in non-standard format (see the Vector Analyzer mode).

2 Select measurement to be performed

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

Press [MEAS], [CONTROL]. Set up the specific parameters relating to the selected UMTS/HSUPA 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.

UMTS/HSUPA measurement guide

UMTS (or W-CDMA) is an air interface technology for third-generation RF cellular communications systems. This standard is a direct sequence spread-spectrum digital communications technique that supports wider RF bandwidths, typically from 5 to 20 MHz. UMTS uses correlative codes to distinguish one user from another.

In UMTS (standard generated in 3GPP organization), the cells operate asynchronously, which makes the mobile synchronization more complex, but offers the advantage of flexibility in placement of the base stations. There is no need for a global time reference such as GPS, and deployment of indoor and micro base stations is easier when no GPS signal needs to be received.

UMTS supports two basic mode of operation: Frequency Division Duplex (FDD) and Time Division Duplex (TDD). In FDD mode, separate 5 MHz carrier frequencies are used for the uplink and downlink respectively, where in TDD only one 5 MHz carrier is time-shared between the uplink and downlink. This measurement suite is applicable only to the FDD mode of operation specifically conforming with 3GPP FDD Release 5.

This standard is designed to be deployed in conjunction with GSM. Therefore, handovers between GSM and UMTS are supported, in order to be able to increase GSM coverage with the introduction of UMTS.

Each UE (User Equipment) output signal is scrambled with a unique scrambling code that allows the UE to discern one BTS from another. The scrambling codes are applied at a fixed rate of 3.840 Mcps. The scrambling codes are not orthogonal, so some interference can exist between two UEs. Beside distinguishing which transmitter is being listened to, a CDMA receiver must further distinguish between the various channels originating from that transmitter. For example, a BTS transmits unique channels to many mobile users, and each UE receiver must distinguish each of its own channels from all the other channels transmitted by the BTS. In W-CDMA, this function is provided by the channelization codes, also known as OVSF codes.

OVSF codes are orthogonal codes similar to the Walsh codes used in IS-95 and CDMA2000. Each channel originating from a UMTS BTS or UE is multiplied by a different OVSF code. In IS-95, Walsh codes are fixed at 64 chips in length; in UMTS, the length of these codes, also known as the spreading factor (SF), can be configured from 4 to 512 chips, with the resulting downlink or uplink symbol rate being equal to the system chip rate of 3.84 Mcps divided by the SF. For example, a SF of four corresponds to a symbol rate of 960 ksps.

This measurement suite uses procedures as defined in 3GTS 134.121 version 2.0.0 release 99 to measure RF power, adjacent channel leakage ratio, occupied bandwidth, modulation error vector magnitude, frequency stability and peak code domain error.

All measurement parameters can be calculated from a single data set. However, you have the ability to decide whether to extract measurement parameters individually or collectively.

Measurements are based upon a general assumption that the UE under test is commanded to generate a DPCCH and DPDCH channel with a known scrambling code and spreading factor. Measurements can be made for a specific timeslot 0 to 14, or may be measured for a random timeslot. Various trace arrays are available including descrambled DPDCH and DPCCH and QPSK I and Q, from which constellation diagrams may be reconstructed within the application environment. Similarly, code domain power and code domain error arrays are available.

Spectral mask

Test purpose and concepts

This test ensures that the DUT does not influence other UMTS/HSUPA devices transmitting in adjacent channels.

The spectrum emission mask of the UE applies to frequencies that are between 2.5 MHz and 12.5 MHz away from the centre carrier frequency of the UE. The out-of-channel emission is specified relative to the RRC-filtered mean power of the UE carrier. The absolute requirement is based on a −50 dBm/3.84 MHz minimum power threshold for the UE. This limit is expressed for the narrower measurement bandwidths as −55.8 dBm/1 MHz and −71.1 dBm/30 kHz.

Table 1 shows the requirements for a spectral mask for UMTS/HSUPA, which is specified in 3GPP TS 25.101.

Table 1 Spectrum emission mask requirement

∆f in MHz (Note 1)	Minimum requirement (Note 2)		Additional requirements Band II, IV, V, X (Note 3)	Measurement bandwidth (Note 6)
	Relative requirement	Absolute requirement		
2.5 - 3.5	$\left\{-35-15\cdot\left(\frac{\Delta f}{MHz}-2.5\right)\right\}dBc$	-71.1 dBm	-15 dBm	30 kHz (Note 4)
3.5 - 7.5	$\left\{-35-1\cdot\left(\frac{\Delta f}{MHz}-3.5\right)\right\}dBc$	-55.8 dBm	-13 dBm	1 MHz (Note 5)
7.5 - 8.5	$\left\{-39-10\cdot\left(\frac{\Delta f}{MHz}-7.5\right)\right\}dBc$	-55.8 dBm	-13 dBm	1 MHz (Note 5)
8.5 - 12.5 MHz	-49 dBc	-55.8 dBm	-13 dBm	1 MHz (Note 5)

Note 1: ∆f is the separation between the carrier frequency and the centre of the measurement bandwidth.

Note 2: The minimum requirement is calculated from the relative requirement or the absolute requirement, whichever is the higher power.

Note 3: For operation in Band II, IV, V, X only, the minimum requirement is calculated from the minimum requirement calculated in Note 2 or the additional requirement for band II, whichever is the lower power.

Note 4: The first and last measurement position with a 30 kHz filter is at ∆f equal to 2.515 MHz and 3.485 MHz.

Note 5: The first and last measurement position with a 1 MHz filter is at ∆f equal to 4 MHz and 12 MHz.

Note 6: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Test procedure

Perform the steps below to measure the spectral mask of a UMTS/HSUPA 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 UMTS/HSUPA mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

2 Press [MEAS] and select *[Spectral Mask]*.

3 Press [MEAS], [CONTROL]. Press *[Spectral Mask]*to select mask type (Band I through Band IX).

Set the following parameters in UMTS/HSUPA 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.

5 Use the [SPAN] and [MARKER] functions to adjust the trace so that it can be analyzed effectively.

Test results

The Spectral Mask measurement result should look like Fig. 2. The upper part of the window shows the graphical result for Spectral Mask. The text window below shows the result for its suitability for the Spectral Mask (pass or fail). If it fails, the fail frequency and its fail level appear in this lower text window.

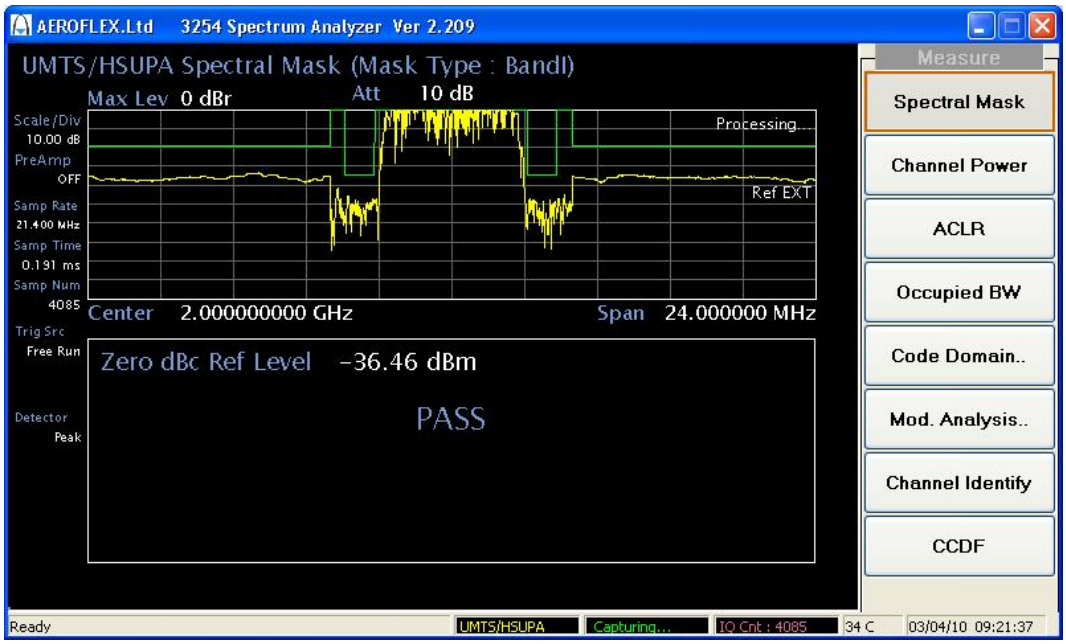


Fig. 2 Result of measuring spectral mask for UMTS/HSUPA signal

Channel power

Test purpose and concepts

From this measurement, you can find the total transmitted power within a defined channel for a UMTS/HSUPA modulated signal. This measurement is used to design, characterize, evaluate, and verify transmitters and their components or devices for base stations and mobile stations.

Test procedure

Perform the steps below to measure the Channel Power of a UMTS/HSUPA 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 Channel Power in UMTS/HSUPA mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

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

Set the following parameters in UMTS/HSUPA mode to adjust analysis:

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

4 Use the [SPAN] and [MARKER] functions to adjust the trace so that it can be analyzed effectively.

Test results

The Channel Power measurement result should look like Fig. 3. The upper part of the window shows the graphical result for Channel Power. The lower text window shows the result as a numerical value for absolute power and its mean power spectral density.

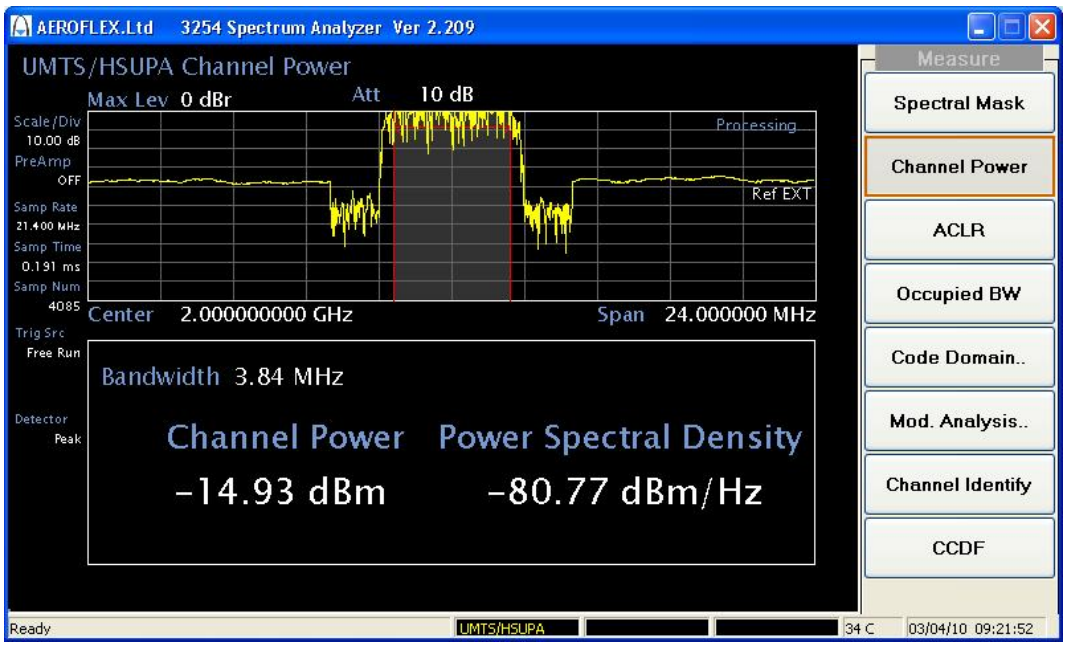


Fig. 3 Result of measuring channel power for UMTS/HSUPA signal

Adjacent channel leakage ratio

Test purpose and concepts

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean power centered on the assigned channel frequency to the RRC filtered mean power centered on an adjacent channel frequency. If the adjacent channel power is greater than –50 dBm, the ACLR should be higher than the value specified in Table 2.

As a composite measurement of out-of-channel emissions, ACLR combines both in-band and out-of-band specifications. This provides a useful measure of spectral re-growth and emissions produced by components and circuit blocks, without the need to perform a full spectrum emission mask measurement. To maintain a quality call by avoiding channel interference, it is important to measure and reduce any adjacent channel leakage power transmitted from a mobile phone. The characteristics of adjacent channel leakage power are mainly determined by the transmitter design, particularly the low-pass filter.

While the user sets the specific offsets and reference bandwidths, the radio specifications recommend some common setups as shown in Table 2.

Table 2 ACLR measurement recommendation

Band	Test device	Offset frequency	Integration bandwidth	Result reference
UMTS (W-CDMA)	Mobile or Base	+/-5 MHz	3.84 MHz	Total power in 3.754 MHz
		+/-10 MHz	3.84 MHz	

Test procedure

Perform the steps below to measure the ACLR of a UMTS/HSUPA 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 ACLR in UMTS mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

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

Set the following parameters in UMTS/HSUPA 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 ACLR Bar Graph measurement result should look like Fig. 4. The upper part of the window shows the graphical result for APLR. The lower text window shows the result as a numerical value for lower and upper offset channel power levels in absolute and relative scale.

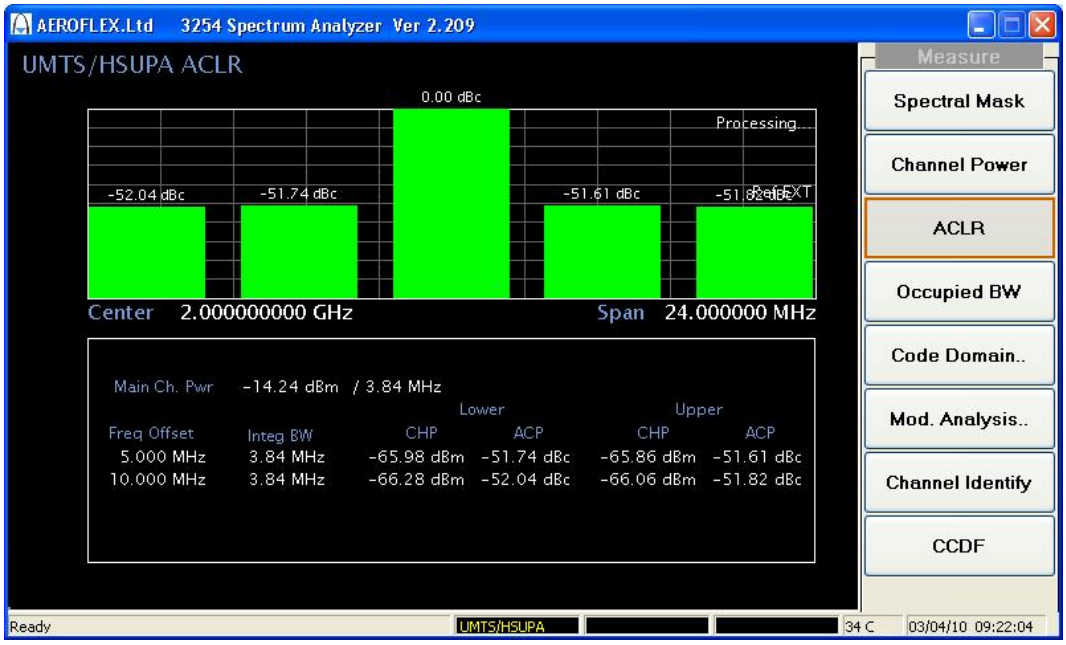


Fig. 4 Result of measuring ACLR for UMTS/HSUPA signal

Occupied bandwidth

Test purpose and concepts

This test ensures that the transmitter filter is well designed and the clock of the DUT is working properly. If the clock rate is too high, this may result in a wide occupied bandwidth (OBW) and malfunction of the DUT.

In this occupied bandwidth measurement, the bandwidth contains 99% of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency. The occupied channel bandwidth is less than 5 MHz, based on a chip rate of 3.84 Mcps.

Test procedure

Perform the steps below to measure the OBW of a UMTS/HSUPA 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 OBW in UMTS mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

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

Set the following parameters in UMTS/HSUPA 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 OBW measurement result should look like Fig. 4. The upper part of the window shows the graphical result for OBW. The lower text window shows the result as a numerical value for the OBW measurement.

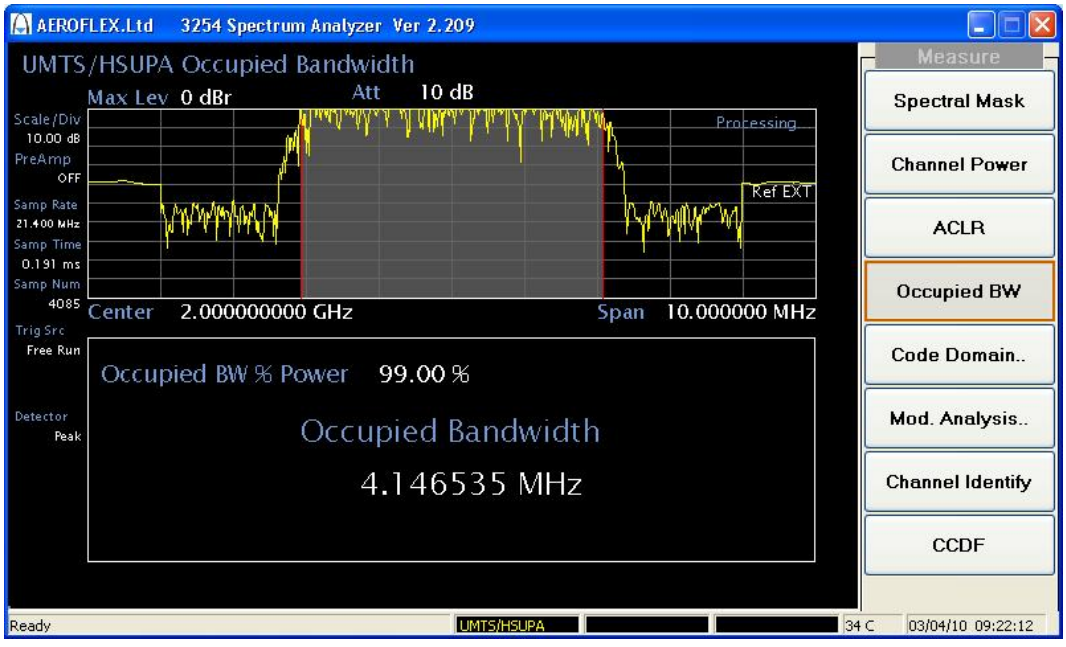


Fig. 5 Result of measuring OBW for UMTS/HSUPA signal

Code domain analysis

Test purpose and concepts

Code domain power is an analysis of the distribution of signal power across the set of code channels, normalized to the total signal power. To analyze the composite waveform, each channel is decoded using a code correlation algorithm. This algorithm determines the correlation coefficient factor for each code. Once the channels are decoded, the power in each code channel is determined. Since the code domain measurements de-spread and de-scramble the UMTS signal into its physical channels, the number of active channels of various symbol rates (which are proportional to its widths) can be observed. The width of the channel is inversely proportional to the Orthogonal Variable Spreading Factor (OVSF) code length in number of bits. In the code domain, there is a fixed amount of code space for a given chip rate. Therefore, by using the different OVSF codes, the system can dynamically allocate the code space for lower rate voice users versus high speed data users.

Spreading is applied to the physical channels. It consists of two operations. The first is the channeling operation, which transforms every data symbol into a number of chips, thus increasing the bandwidth of the signal. The number of chips per data symbol is called the Spreading Factor (SF). The second operation is the scrambling operation, where a scrambling code is applied to the spread signal.

With the channelization, data symbols on so-called I and Q branches are independently multiplied with an OVSF code. With the scrambling operation, the resultant signals on the I and Q branches are further multiplied by complex-valued scrambling code, where I and Q denote real and imaginary parts, respectively.

Test procedure

Perform the steps below to measure the code domain power of a UMTS 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 code domain power in UMTS mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

2 Press [MEAS] and select *[Code Domain..]*.

3 Press [Code Domain Pwr].

3 Press [MEAS], [CONTROL] and set [Channel Detect Mode] and [Channel Detect Threshold].

Set the following parameters in UMTS/HSUPA mode to adjust analysis:

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

Test result

The Code Domain Power measurement result should look like Fig. 6. The upper part of the window shows the graphical result for Code Domain Power for the I channel and the lower part of the window shows the same result for the Q channel.

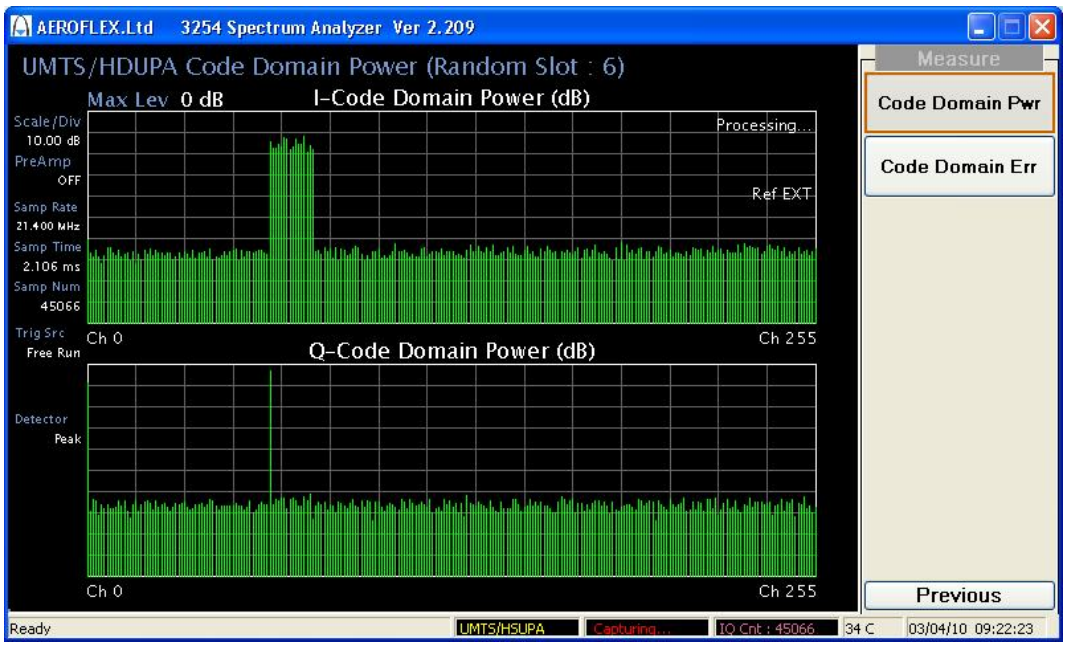


Fig. 6 Result of measuring code domain power for UMTS/HSUPA signal

Modulation analysis

Composite EVM

Test purpose and concepts

In a digitally modulated signal, it is possible to predict what the ideal magnitude and phase of the carrier should be at any time, based on the transmitted data sequence. The transmitter's modulated signal is compared to an ideal signal vector. Rho values are in the range of 0 to 1. A value of 1 indicates perfect correlation to the reference (high modulation quality). The UMTS base station standards require that transmitters have a Rho performance of 0.912 or greater.

In constant amplitude modulation schemes, such as QPSK, the phase and frequency error are the metrics for modulation quality. So phase and frequency errors can be measures of modulation quality for the UMTS system. This modulation quality is quantified through Error Vector Magnitude (EVM) measurements.

Test procedure

Perform the steps below to measure the modulation quality of a UMTS/HSUPA 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 the constellation in UMTS/HSUPA mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

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

3 Press [Composite EVM].

4 Press [MEAS], [CONTROL] and set the [Ch. Detect Mode], [Ch. Detect Threshold], and [Analysis Mode].

Set the following parameters in UMTS/HSUPA mode to adjust analysis:

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

Test result

The UMTS/HSUPA Composite EVM measurement result should look like Fig. 7. The numerical values for modulation accuracy are shown on the left side of this measurement window. The modulation accuracy result lists are as follows:

EVM Error (RMS)

EVM Error (Peak)

Frequency Error

Peak CDE (I,Q)

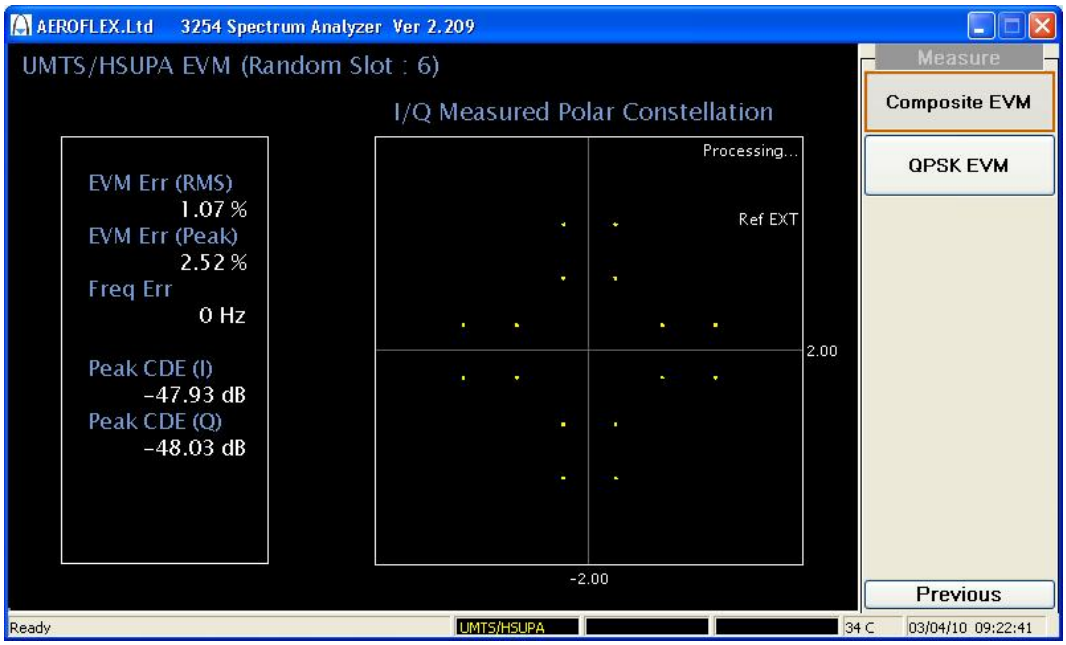


Fig. 7 Result of measuring Composite EVM for UMTS/HSUPA signal

QPSK EVM

Test purpose and concepts

Phase and frequency errors are measures of modulation quality for the UMTS/HSUPA system. This modulation quality is quantified through QPSK EVM measurements. Since the base stations in UMTS/HSUPA systems use the QPSK modulation scheme, the phase and frequency accuracies of the transmitter are critical to the communications system's performance.

A QPSK EVM measurement is useful only in constant amplitude modulation schemes, and it cannot be used to analyze complex modulated signals. The input signal must be a single coded UMTS/HSUPA channel, like a single DPCH.

Test procedure

Perform the steps below to measure the modulation quality of a UMTS/HSUPA 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 the constellation in UMTS/HSUPA mode.

1 Press [MODE] and select *[UMTS/HSUPA]*.

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

3 Press [QPSK EVM].

4 Press [MEAS], [CONTROL] and set *[Symbols]* and *[Origin Offset]*.

Set the following parameters in UMTS/HSUPA mode to adjust analysis:

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

Test result

The UMTS/HSUPA QPSK EVM measurement result should look like Fig. 8. The numerical values for modulation accuracy are shown on the left side of this measurement window. The modulation accuracy result lists are as follows:

EVM Error (RMS)

EVM Error (Peak)

Frequency Error

Origin Offset

Magnitude Error (RMS)

Phase Error (RMS)

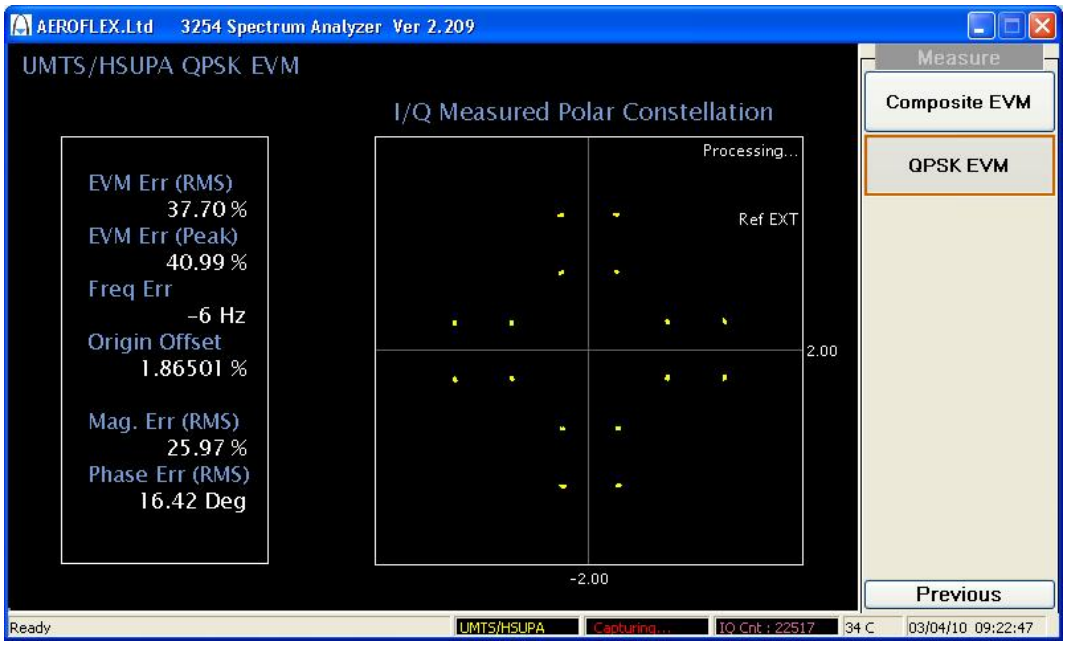


Fig. 8 Result of measuring QPSK EVM for UMTS/HSUPA signal

Channel Identify

Purpose and concepts

Use this measurement to identify the transmitted signal channel structure with its state, branch, spreading factor, code number, gain factor and its number of bits.

A UMTS system carries data through the dedicated channel. The dedicated channel is composed of multiple DPDCH (Dedicated Physical Data Channel) channels and a single DPCCH (Dedicated Physical Control Channel) channel. It can extend its channels by adding HS-DPDCH and E-DPDCH.

The possible combinations of the maximum number of respective dedicated physical channels that may be configured simultaneously for a UE, in addition to the DPCCH, are specified in Table 3. The actual UE capability may be lower than the values specified in Table 3; the actual dedicated physical channel configuration is indicated by higher-layer signaling. The number of configured DPDCHs, denoted Nmax-dpdch, is equal to the largest number of DPDCHs from all the TFCs in the TFCS. Nmax-dpdch is not changed by frame-by-frame TFCI change or temporary TFC restrictions.

Table 3 Maximum number of simultaneously-configured uplink dedicated channels

	DPDCH	HS-DPCCH	E-DPDCH	E-DPCCH
Case 1	6	1	-	-
Case 2	1	1	2	1
Case 3	-	1	4	1

Fig. 9 illustrates the principle of the spreading of uplink dedicated physical channels (DPCCH, DPDCHs, HS-DPCCH, E-DPCCH, E-DPDCHs).

The spreading operation includes a spreading stage, a weighting stage, and an IQ mapping stage. In the process, the streams of real-valued chips on the I and Q branches are summed; this results in a complex-valued stream of chips for each set of channels.

As described in Fig. 9, the resulting complex-valued streams Sdpch, Shs-dpcch and Se-dpch are summed into a single complex-valued stream, which is then scrambled by the complex-valued scrambling code Sdpch,n. The scrambling code is applied aligned with the radio frames, so the first scrambling chip corresponds to the beginning of a radio frame.

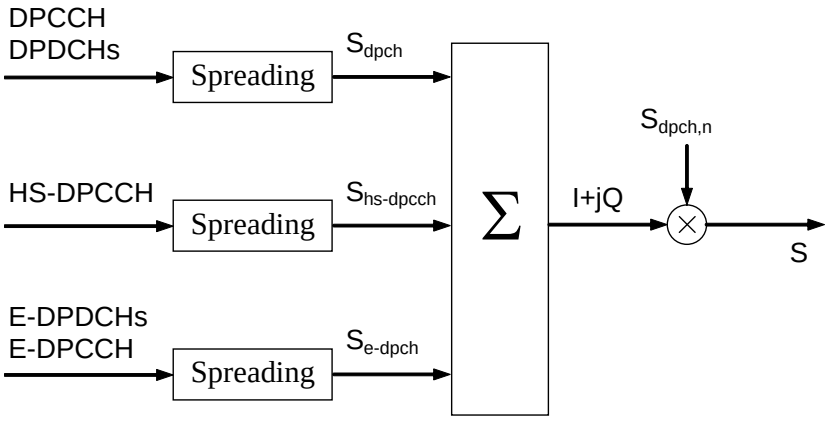


Fig. 9 Spreading for uplink dedicated channels

Fig. 10 illustrates the spreading operation for the uplink DPCCH and DPDCHs.

The DPCCH is spread to the chip rate by the channelization code cc. The nth DPDCH, called DPDCHn, is spread to the chip rate by the channelization code cd,n.

After channelization, the real-valued spread signals are weighted by gain factors, βc for DPCCH, βd for all DPDCHs.

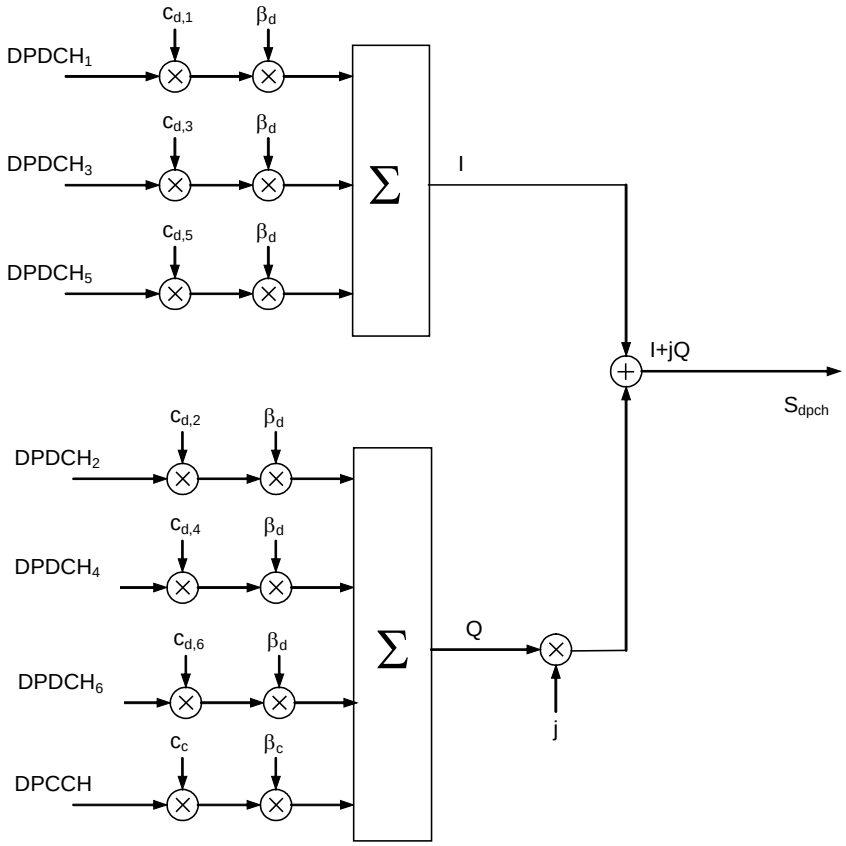


Fig. 10 Spreading for uplink DPCCH/DPDCHs

Fig. 11 illustrates the spreading operation for the HS-DPCCH.

The HS-DPCCH is spread to the chip rate by the channelization code chs. After channelization, the real-valued spread signals are weighted by gain factor βhs.

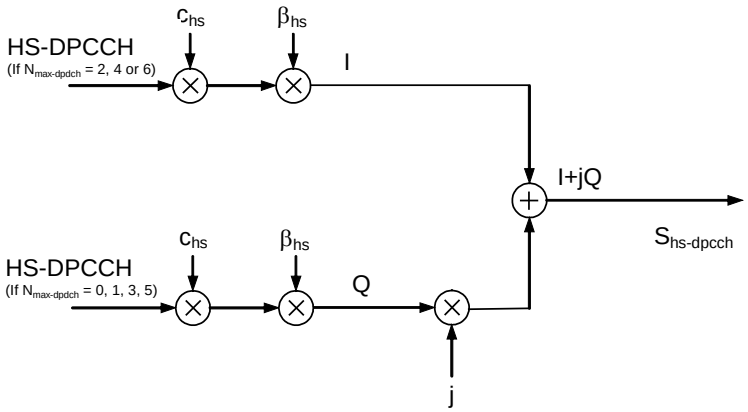


Fig. 11 Spreading for uplink HS-DPCCH

Fig. 12 illustrates the spreading operation for the E-DPDCHs and the E-DPCCH.

The E-DPCCH is spread to the chip rate by the channelization code cec. The k'th E-DPDCH, called E-DPDCHk, is spread to the chip rate using channelization code ced,k.

After channelization, the real-valued spread E-DPCCH and E-DPDCHk signals are respectively weighted by gain factors βec and βed,k.

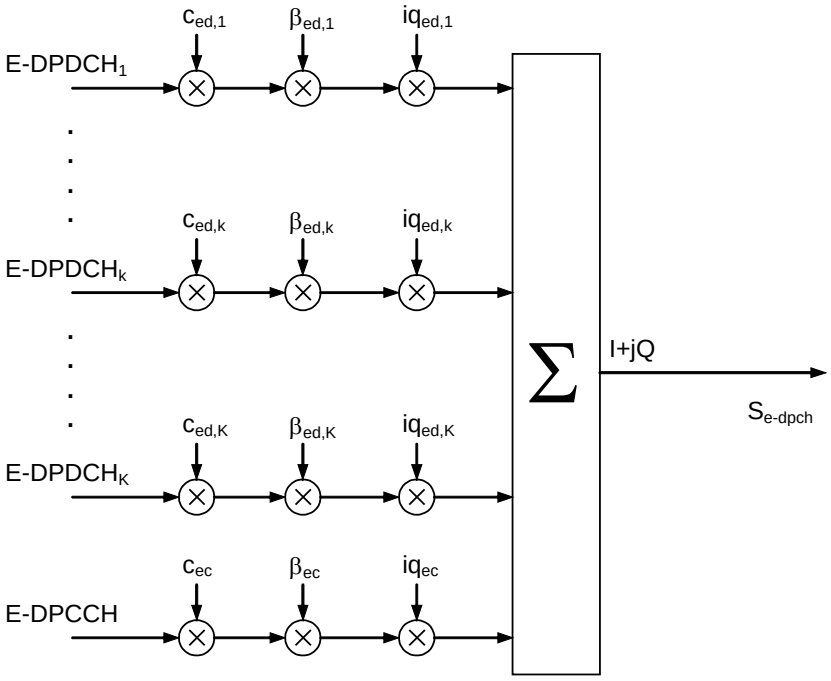


Fig. 12 Spreading for E-DPDCH/E-DPCCH

Test procedure

Perform the steps below to identify the channel of a UMTS/HSUPA 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 identify the channel in UMTS/HSUPA mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

2 Press [MEAS] and select *[Channel Identify]*.

3 Press [MEAS], [CONTROL] and set the [Ch. Detect Mode], [Ch. Det. Threshold] and [Analysis Mode].

Set the following parameters in UMTS/HSUPA mode to adjust analysis:

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

Test result

The UMTS/HSUPA Channel Identify measurement result should look like Fig. 13. From this measurement result, you can identify the analysis result of the Dedicated Physical Channel for a transmitted UMTS signal.

Fig. 13 Result of measuring Channel Identify for UMTS/HSUPA 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 UMTS 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 UMTS/HSUPA mode:

1 Press [MODE] and select *[UMTS/HSUPA]*.

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

Set the following parameters in UMTS 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. 14 shows the analysis result for CCDF for a UMTS/HSUPA 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.

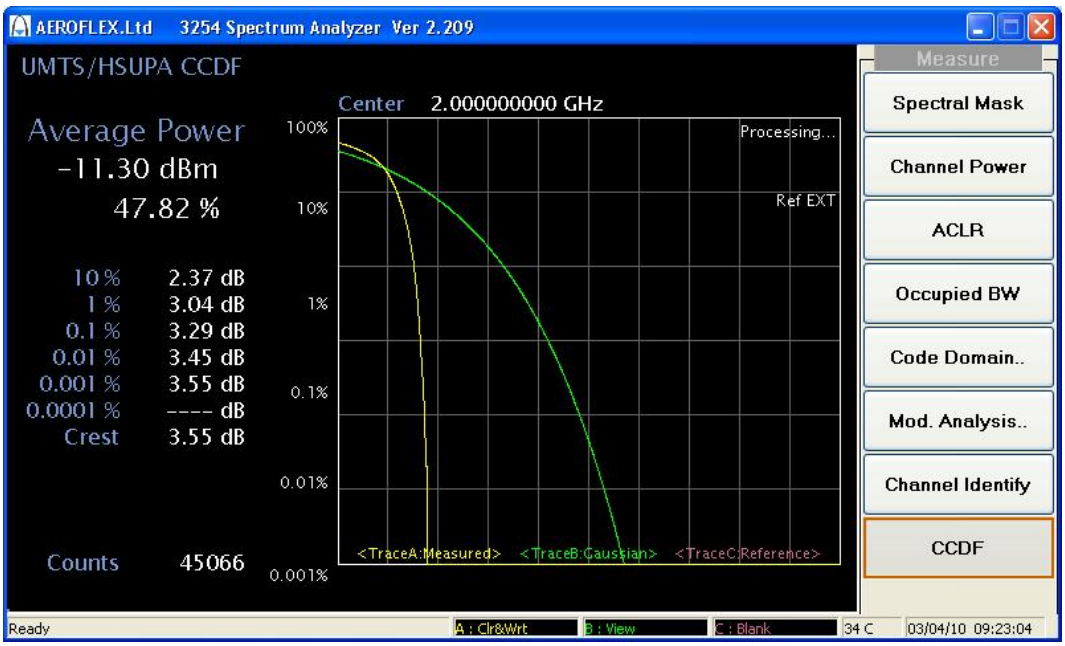
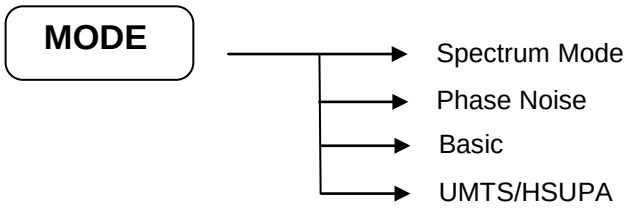


Fig. 14 Result of measuring CCDF for UMTS/HSUPA signal

Menu descriptions

UMTS measurement mode

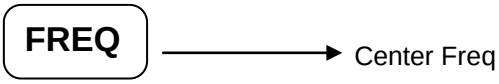
To use UMTS measurement options, first set the system to UMTS/HSUPA mode.



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

Frequency channel menu

Press [FREQ] in UMTS mode:

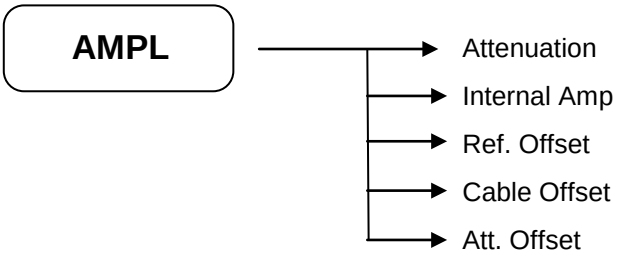


You can access frequency functions from this menu:

Center Freq	Allows you to specify the frequency of the UMTS input signal.

Amplitude menu

Press [AMPL] in UMTS/HSUPA mode:

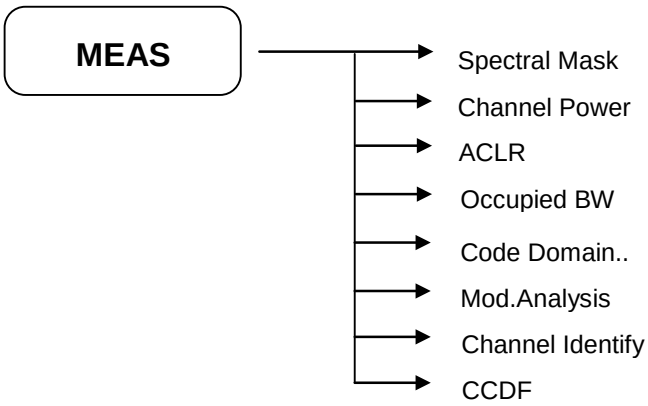


Amplitude menu keys are used for setting functions that affect the way data on the vertical axis is displayed or corrected.

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

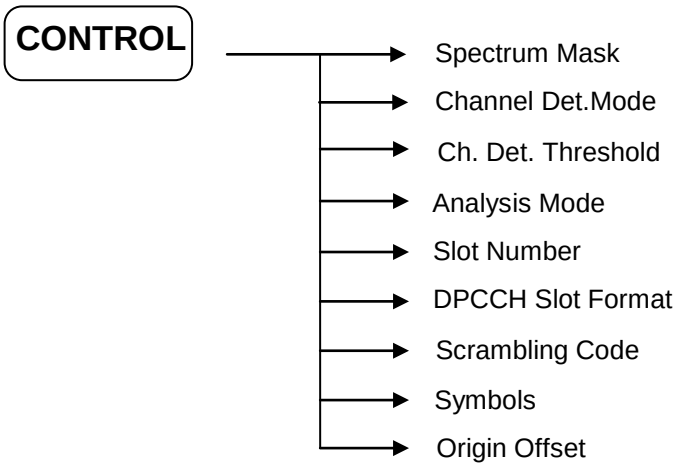
Press [MEAS] in UMTS/HSUPA mode:



Spectral Mask	Measures the spectral mask of a UMTS/HSUPA signal. The pass/fail result, based on a 3GPP2 Std spectral mask, is measured and displayed.
Channel Power	Measures the channel power of a UMTS/HSUPA signal. The channel power on a UMT/HSUPA bandwidth can be measured and displayed in the lower part of the measurement window.
ACLR	Measures the Adjacent Channel Leakage Ratio of a UMTS/HSUPA signal. A ratio of main channel power level versus leakage power is shown in the lower part of the measurement window.
Occupied BW	Measures the Occupied Bandwidth of the signal being displayed. It calculates the frequency band that contains a specified percentage of the total power: the default value is 98%.
Code Domain..	Measures the code domain power and code domain error for a UMTS/HSUPA signal. The X-axis is the number of the OVFS code, and the Y-axis represents the relative code power level for each OVFS code, in dB.
Mod.Analysis	Measures the composite EVM and QPSK EVM error for a UMTS/HSUPA signal. It shows the result as a constellation diagram and numerical result for EVM Error (RMS, Peak), Frequency Error, Peak CDE (I,Q).
Channel Identify	Confirms the data channel structure of a UMTS/HSUPA signal with the following information: Channel State Channel Branch (I or Q) Spreading Factor Code Number Gain Factor Number of Bits
CCDF	Measures the CCDF (Complementary Cumulative Distribution Function) of a UMTS/HSUPA signal.

Measure control menu

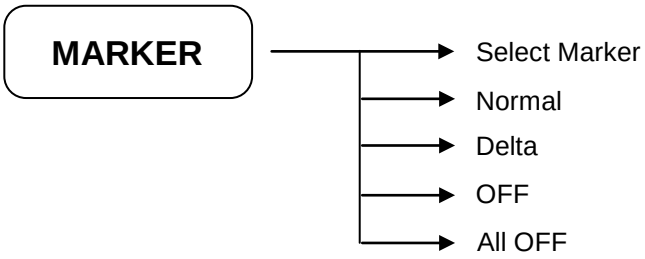
Press [CONTROL] in UMTS/HSUPA mode:



Spectrum Mask	Sets Spectrum Mask for each band class. The band class value can be set from Band Class 1 to 9 (in Spectral Mask measurement only).
Channel Detect Mode	Sets the channel detection mode to be used for composite modulation analysis measurements. The supported detection mode is defined with following contents (as the 3GPP standard document 3GPP TS 25.213). Case 1: 6 DPDCH, 1 HS-DPCCH, 1 E-DPDCH, 1 E-DPCCH Case 2: 1 DPDCH, 1 HS-DPCCH, 2 E-DPDCH, 1 E-DPCCH Case 3: 0 DPDCH, 1 HS-DPCCH, 4 E-DPDCH, 1 E-DPCCH
Channel Detect Threshold	Sets the channel detection threshold (dB) used for identifying the active channel. Any channel with a power below this value is deemed to be inactive and is not included in any EVM measurement.
Analysis Mode	Sets the analysis mode for composite EVM measurements. The analysis mode can be set to Manual or Random operation.
Slot number	Sets the slot number to be analyzed. The slot number range is 0 to 14.
DPCCH Slot Format	Defines the pilot bits for the DPCCH channel. Knowledge of the pilot bits allows the gross frequency error to be estimated and removed, prior to demodulation and EVM analysis. The slot format can be set with the following contents: Slot Format 0: 6 pilot bits Slot Format 1: 8 pilot bits Slot Format 2: 5 pilot bits Slot Format 3: 7 pilot bits
Scrambling code	Sets the scrambling code used. The valid range is 0 to 16777215 ($2^{24} - 1$). Used in Composite EVM analysis.
Symbols	Defines the number of symbols on which the measurement is computed. Used in QPSK EVM analysis.
Origin Offset	Controls whether the origin offset is removed or not, when performing QPSK modulation analysis. It can be set to 'Remove mode' or 'Active mode'.

Marker menu

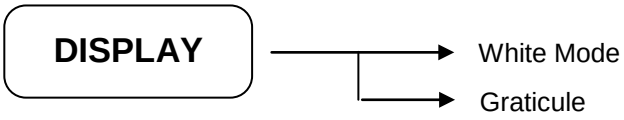
Press [MARKER] in UMTS/HSUPA mode:



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.

Display menu

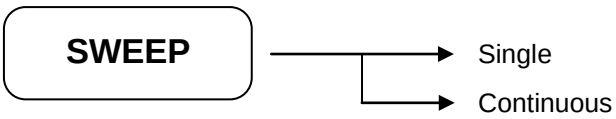
Press [DISPLAY] in UMTS/HSUPA mode:



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

Sweep menu

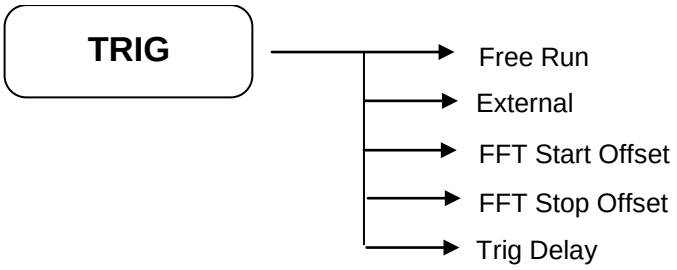
Press [SWEEP] in UMTS/HSUPA mode:



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

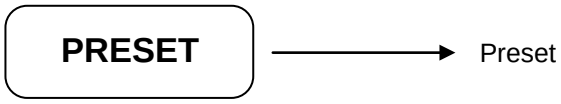
Press [TRIG] in UMTS/HSUPA mode:



Free Run	Captures the sample data when in Single/Repeat mode, without waiting for any external events.
External	Starts the sweep in synchronization 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 UMTS/HSUPA 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 '△' = '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: 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	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:LPLot:WINDow:WHITe

	White Mode	
Function	Turns the white mode ON or OFF.	
Remote Command	WH△n	
	WH△sw	
	WH?	
	:DISPlay:LPLot:WINDow:WHITe△n	
	:DISPlay: LPLot:WINDow:WHITe△sw	
	: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?△'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	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?△'file_name'
	:MMEMory:LOAD△'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	FDEL△'file_name'
	:MMEMory:DELete△'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	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.sts','D:\demo.sts;
	MMEM:COPY 'C:\demo.sts,'D:\demo.sts;

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.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	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	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	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

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 or 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 delta mode, it 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	SEM	: Spectral Mask
	CHP	: Channel Power
	ACP	: ACLR
	OBW	: Occupied Bandwidth
	CDP	: Code Domain Power
	CDE	: Code Domain Error
	EVM	: EVM
	QPSKEVM	: QPSK EVM
	CHAN	: Channel Identify
	CCDF	: CCDF
Value of sw	SEM	: Spectral Mask
	CHP	: Channel Power
	ACP	: ACLR
	OBW	: Occupied Bandwidth
	CDP	: Code Domain Power
	CDE	: Code Domain Error
	EVM	: EVM
	QPSKEVM	: QPSK EVM
	CHAN	: Channel Identify
	CCDF	: CCDF
Example	MEA SEM;	
	MEA?;	
	MEAS:STAR SEM;	
	MEAS:STAR?;	

SEMOUT

:FETChlMEASurelREAD:SEMask

	Spectral Mask Output
Function	Returns the output of the Spectral Mask.
Remote Command	SEMOUT?
	:FETChlMEASurelREAD:SEMask?
Response Message	Pass/Fail State
Example	SEMOUT?;
	MEAS:SEM?;

CHPOUT

:FETChlMEASurelREAD:CHPower

	Channel Power Output
Function	Returns the output level of the Channel Power.
Remote Command	CHPOUT?
	:FETChlMEASurelREAD:CHPower?
Response Message	Channel Power (dBm), Power Spectral Density (dBm/Hz)
Example	CHPOUT?;
	MEAS:CHP?;

ACPOUT

:FETChlMEASurelREAD:ACPower

	Adjacent Channel Power Output
Function	Returns the output of Adjacent Channel Power.
Remote Command	ACPOUT?
	FETChlMEASurelREAD:ACPower?
Response Message	Lower 2nd ACP, Lower 1st ACP, Main CHP, Upper 1st ACP, Upper 2nd ACP (dBm)
Example	ACPOUT?;
	EAS:ACP?;

OBWOUT

:FETChlMEASurelREAD:OBW

	Occupied Bandwidth
Function	Returns the output of Occupied Bandwidth.
Remote Command	OBWOUT?
	:FETChlMEASurelREAD:OBW?
Response Message	Occupied Bandwidth (Hz)
Example	CHPOUT?;
	MEAS:CHP?;

CDPOUT

:FETChlMEASurelREAD:CDPower

	Code Domain Power Output
Function	Returns the output of Code Domain Power.
Remote Command	CDPOUT?
	:FETChlMEASurelREAD:CDPower?
Response Message	Ch0 I-Power (dB), Ch0 Q-Power (dB), ˜ Ch255 I-Power (dB), Ch255 Q-Power (dB)
Example	CDPOUT?;
	MEAS:CDP?;

CDEOUT

:FETCh|MEASure|READ:CDError

	Code Domain Error Output
Function	Returns the Code Domain Error.
Remote Command	CDEOUT?
	:FETCh|MEASure|READ:CDError?
Response Message	Ch0 I-Error (dB), Ch0 Q-Error (dB), –Ch3 I-Error(dB), –Ch3 Q-Error (dB)
Example	CDEOUT?;
	MEAS:CDE?;

EVMOUT

:FETChlMEASurelREAD:EVM

	EVM Output
Function	Returns the output of EVM.
Remote Command	EVMOUT?
	:FETChlMEASurelREAD:EVM?
Response Message	EVM Error (RMS) (%), EVM Error (Peak) (%), Frequency Error (Hz), Peak CDE (I) (dB), Peak CDE (Q) (dB)
Example	EVMOUT?;
	MEAS:EVM?;

QPSKEVMOUT

:FETChlMEASurelREAD:EVM:QPSK

	QPSK EVM Output
Function	Returns the output of QPSK EVM.
Remote Command	QPSKEVMOUT?
	:FETChlMEASurelREAD:EVM:QPSK?
Response Message	EVM Error (RMS) (%), EVM Error (Peak) (%),Frequency Error (Hz), Origin Offset (%), Magnitude Error (%), Phase Error (Deg)
Example	QPSKEVMOUT?;
	MEAS:EVM:QPSK?;

CHANNELOUT

:FETChlMEASurelREAD:CHANnel

	Channel Identify Output
Function	Returns the output of Channel Identify.
Remote Command	CHANNELOUT?
	:FETChlMEASurelREAD:CHANnel?
Response Message	Channel1 Status, Channel1 Branch, Channel1 Spreading Factor, Channel1 Gain Factor, Channel1 Bits Number –Channel14 Status, Channel14 Branch, Channel14 Spreading Factor, Channel14 Gain Factor, Channel14 Bits Number
Example	CHANNELOUT?;
	MEAS:CHAN?;

CCDFOUT

:FETChlMEASurelREAD:CCDF

	CCDF Output
Function	Returns the output of CCDF.
Remote Command	CCDFOUT?
	:FETChlMEASurelREAD: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?;

Measurement control

SMASK

	Spectrum Mask
Function	Sets the Spectrum Mask.
Remote Command	SMASK△sw
	SMASK?
Response Message	Band of Spectrum Mask
Value of n	1 to 9
Initial setting	0
Example	SMASK 1;
	SMASK?;

CDMODE

	Channel Detect Mode
Function	Sets the Channel Detect mode.
Remote Command	CDMODE△sw
	CDMODE?
Response Message	CASE1 : Case1
	CASE2 : Case2
	CASE3 : Case3
Value of sw	CASE1 : Case1
	CASE2 : Case2
	CASE3 : Case3
Initial setting	CASE1
Example	CDMODE CASE1;
	CDMODE?;

CDTH

	Channel Detect Threshold
Function	Sets the level of Channel Detect threshold
Remote Command	CDTH△f
	CDTH?
Response Message	Level of Channel Detect Threshold (dB)
Initial setting	−15
Example	CDTH −15;
	CDTH?;

AMODE

	Analysis Mode
Function	Sets the analysis mode to random or manual.
Remote Command	AMODE△sw
	AMODE?
Response Message	RADM : Random
	MANL : Manual
Value of sw	RADM : Random
	MANL : Manual
Initial setting	RADM
Example	AMODE RADM;
	AMODE?;

SLOT

	Slot Number
Function	Sets the slot number in manual analysis mode.
Remote Command	SLOT△n
	SLOT?
Response Message	Slot Number
Value of n	From 0 to 14
Initial setting	0
Example	SLOT 0;
	SLOT?;

SFORMAT

	DPCCH Slot Format
Function	Sets the slot format in manual analysis mode.
Remote Command	SFORMAT△n
	SFORMAT?
Response Message	DPCCH Slot Format
Value of n	From 0 to 3
Initial setting	0
Example	SFORMAT 0;
	SFORMAT?;

SCODE

	Scrambling Code
Function	Sets the Scrambling Code
Remote Command	SCODE△n
	SCODE?
Response Message	Scrambling Code
Value of n	0 to 16777215
Initial setting	0
Example	SCODE 0;
	SCODE?;

SYMB

	Symbols
Function	Sets the Symbols in QPSK EVM mode.
Remote Command	SYMB△n
	SYMB?
Response Message	Symbols
Initial setting	0
Example	SYMB 0;
	SYMB?;

OOFFSET

	Origin Offset
Function	Sets the origin offset to remove or active.
Remote Command	OOFFSET△sw
	OOFFSET?
Response Message	REMOVE : Remove
	ACTIVE : Active
Value of sw	REMOVE : Remove
	ACTIVE : Active
Initial setting	REMOVE
Example	OOFFSET REMOVE;
	OOFFSET?;

Mode

MODE

:INSTrument[:SELect]

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

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;

Sweep

CO

:INITiate: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 on or off when pressing keypad.	
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 on or off when controlled by a hyperterminal.	
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?;	

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 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	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

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	SEM|CHP|ACP|OBW|CDP|CDE|EVM |QPSKEVM|CHAN|CCDF|?
Measurement	Spectral Mask Output	SEMOUT	:FETCh|MEASure|READ:SEMask	?
Measurement	Channel Power	CHPOUT	:FETCh|MEASure|READ:CHPower	?
Measurement	ACLR	ACPOUT	:FETCh|MEASure|READ:ACPower	?
Measurement	Occupied Bandwidth	OBWOUT	:FETCh|MEASure|READ:OBW	?
Measurement	Code Domain Power	CDPOUT	:FETCh|MEASure|READ:CDPower	?
Measurement	Code Domain Error	CDEOUT	:FETCh|MEASure|READ:CDError	?
Measurement	EVM	EVMOUT	:FETCh|MEASure|READ:EVM	?
Measurement	QPSK EVM	QPSKEVMOUT	:FETCh|MEASure|READ:EVM:QPSK	?
Measurement	Channel Identify	CHANNELOUT	:FETCh|MEASure|READ:CHANnel	?
Measurement	CCDF Output	CCDFOUT	:FETCh|MEASure|READ:CCDF	?
Meas Control	Spectrum Mask	SMASK		<integer>|?
Meas Control	Channel Detect Mode	CDMODE		CASE1|CASE2|CASE3|?
Meas Control	Channel Detect Threshold	CDTH		<level>|?
Meas Control	Analysis Mode	AMODE		RADM|MANL|?
Meas Control	Slot Number	SLOT		<integer>|?
Meas Control	DPCCH Slot Format	SFORMAT		<integer>|?
Meas Control	Scrambling Code	SCODE		<integer>|?
Meas Control	Symbols	SYMB		<integer>|?
Meas Control	Origin Offset	OOFSET		REMOVE|ACTIVE|?

Mode	Mode	MODE	:INSTrument[:SELect]	SAIBASICIUMTSI?
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	OFFIONI0I1I?
System	Beep	BEEP		OFFIONI0I1I?
System	Echo	ECHO		OFFIONI0I1I?
Common	*CLS	*CLS	*CLS	none
Common	*ESE	*ESE	*ESE	<integer>I?
Common	*ESR	*ESR	*ESR	?
Common	*IDN	*IDN	*IDN	?
Common	*OPC	*OPC	*OPC	?
Common	*RST	*RST	*RST	none
Common	*SRE	*SRE	*SRE	<integer>I?
Common	*STB	*STB	*STB	?
Others	ESE2	ESE2		<integer>I?
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	?
Measurement	ACLR	**ACPOUT**	:FETCh|MEASure|READ:ACPower	?
Meas Control	Analysis Mode	**AMODE**		RADM|MANL|?
Amplitude	Attenuation	**AT**	[:SENSe]:POWer[:RF]:ATTenuation	<amplitude>|?
System	Beep	**BEEP**		OFF|ON|0|1|?
Measurement	CCDF Output	**CCDFOUT**	:FETCh|MEASure|READ:CCDF	?
Measurement	Code Domain Error	**CDEOUT**	:FETCh|MEASure|READ:CDError	?
Meas Control	Channel Detect Mode	**CDMODE**		CASE1|CASSE2|CASE3|?
Measurement	Code Domain Power	**CDPOUT**	:FETCh|MEASure|READ:CDPower	?
Meas Control	Channel Detect Threshold	**CDTH**		<level>|?
Frequency	Center Frequency	**CF**	[:SENSe]:FREQuency:CENTer	<frequency>|?
Measurement	Channel Identify	**CHANNELOUT**	:FETCh|MEASure|READ:CHANnel	?
Measurement	Channel Power	**CHPOUT**	:FETCh|MEASure|READ:CHPower	?
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	**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	SEM|CHP|ACP|OBW|CDP|CDE |EVM|QPSKEVM|CHAN|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|UMTS|?
Marker	Marker State	**MS[1~9]**	:CALCulate:MARKer[1~9]:STATe	OFF|ON|0|1|?
Measurement	Occupied Bandwidth	**OBWOUT**	:FETCh|MEASure|READ:OBW	?
Meas Control	Origin Offset	**OOFSET**		REMOVE|ACTIVE|?
Preset	Preset	**PRST**	:SYSTem:PRESet	none
Measurement	QPSK EVM	**QPSKEVMOUT**	:FETCh|MEASure|READ:EVM:QPSK	?

Frequency	Reference	**REF**	:INPut:REFerence	INTernallEXTernall?
Amplitude	Ref. Level	**RL**	:DISPlay:WINDow:TRACe:Y[:SCALe] :RLEVel	<amplitude>l?
Meas Control	Scrambling Code	**SCODE**		<integer>l?
Amplitude	Scale/Div	**SD**	:DISPlay:WINDow:TRACe:Y[:SCALe] :PDIVision	<amplitude>l?
Measurement	Spectral Mask Output	**SEMOUT**	:FETChlMEASurelREAD:SEMask	?
Meas Control	DPCCH Slot Format	**SFORMAT**		<integer>l?
Sweep	Single	**SI**	:INITiate:LPLot[:IMMediate]	none
Meas Control	Slot Number	**SLOT**		<integer>l?
Meas Control	Spectrum Mask	**SMASK**		<integer>l?
Meas Control	Symbols	**SYMB**		<integer>l?
Display	White Mode	**WH**	:DISPlay:WINDow:WHITe	OFFlONl0l1l?

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	ACLR	ACPOUT	**:FETCh|MEASure|READ:ACPower**	?
Measurement	CCDF Output	CCDFOUT	**:FETCh|MEASure|READ:CCDF**	?
Measurement	Code Domain Error	CDEOUT	**:FETCh|MEASure|READ:CDError**	?
Measurement	Code Domain Power	CDPOUT	**:FETCh|MEASure|READ:CDPower**	?
Measurement	Channel Identify	CHANNEL OUT	**:FETCh|MEASure|READ:CHANnel**	?
Measurement	Channel Power	CHPOUT	**:FETCh|MEASure|READ:CHPower**	?
Measurement	EVM	EVMOUT	**:FETCh|MEASure|READ:EVM**	?
Measurement	QPSK EVM	QPSKEVMOUT	**:FETCh|MEASure|READ:EVM:QPSK**	?
Measurement	Occupied Bandwidth	OBWOUT	**:FETCh|MEASure|READ:OBW**	?
Measurement	Spectral Mask Output	SEMOUT	**:FETCh|MEASure|READ:SEMask**	?
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|UMTS| ?
Measurement	Meas. Start	MEA	**:MEASure:STARt**	SEM|CHP|ACP|OBW|CDP|CDE |EVM|QPSKEVM|CHAN|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>l?
Amplitude	Attenuation	AT	**[:SENSe]:POWer[:RF]:ATTenuation**	<amplitude>l?

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

For further information please contact:

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