Contents

SPECTRUM ANALYZERS

3250 Series

1xEV-DO Measurement
User Manual

Document part no. 47090/042

SPECTRUM ANALYZERS
3250 SERIES

1xEV-DO Measurement
User Manual

Document no. 47090/042 (PDF version)
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About this manual

This manual explains how to use the 1xEV-DO measurement option for 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 1xEV-DO power, spectrum and modulation measurements in accordance with the 3GPP2 1xEV-DO standard. This option supports the 1xEV-DO revision 0, 1 and revision A standards.

This user manual describes how to set up the system to perform 1xEV-DO measurements, and the operation of each menu.

Note that the 1xEV-DO measurement software must be installed on the system in order to use the 1xEV-DO measurement option.

You can make the following measurements:

- Transmit Spectrum Mask
- Channel Power
- ACPR (Adjacent Channel Power Ratio)
- 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): %

  Rho: 0 to 1

  Frequency Error: Hz

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

  EVM Error (RMS): %

  EVM Error (Peak): %

  Origin Offset: %

  Frequency Error: Hz
- 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 3/8/13.2/26.5 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 1xEV-DO measurement option

To license your 1xEV-DO 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 1xEV-DO 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 *1xEV-DO* 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 1xEV-DO signals. Using the procedures specified in this and the following section, you can carry out 1xEV-DO signal analysis in the spectrum, code and modulation domains.

Preparation for measurement

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.

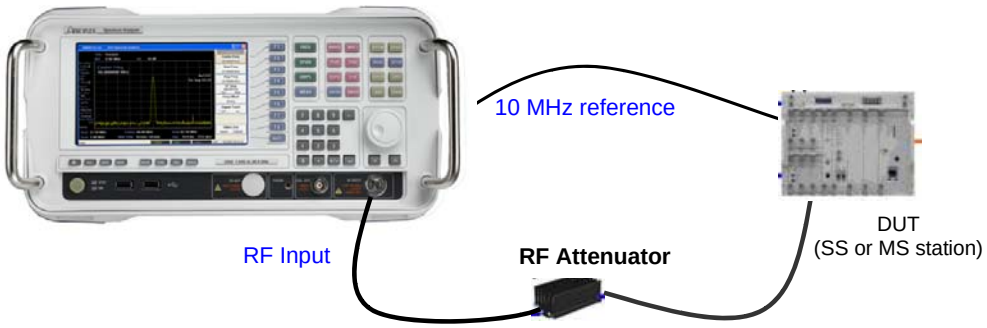


Fig. 1 1xEV-DO measurement setup

General steps in making a measurement

All measurements made in '1xEV-DO options' can be performed with the following steps.

1 Select the measurement option

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

Press [NEXT], then *[1xEV-DO]* or *[Basic]*. Analyze the signal in 1xEV-DO 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 1xEV-DO standards. Use this menu to select the specific measurement to be performed. When the trigger conditions are satisfied, digitized 1xEV-DO signals are acquired and analyzed instantly.

Press [MEAS], [CONTROL]. Set up the specific parameters relating to the selected 1xEV-DO 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.

1xEV-DO measurement guide

1xEV-DO is the name applied to the first single-channel evolution (1xEV) of a 3GPP2 communications system optimized for data only. The 1xEV-DO system originated from the CDMA2000 voice system and has a structural similarity with CDMA2000. The 1xEV-DO system implements 'High Rate Packet Data' using a spreading rate of 1.2288 Mcps, the same as CDMA2000 SR1. It also uses the same digital filter to reduce the final modulation bandwidth, with the result that 1xEV-DO is spectrally compatible with CDMA2000 SR1. Both 1xEV-DO and CDMA2000 SR1 can utilize the same amplifiers, combiners, and antennas to reduce the installation cost of 1xEV-DO. Although 1xEV-DO is compatible with much existing CDMA2000 infrastructure, the two systems may not simultaneously occupy the same channel. Each 1xEV-DO channel requires a paired 1.25 MHz clear channel, therefore it cannot be overlaid with CDMA2000 channels.

The CDMA2000 protocol focuses basically on voice activity rate for its voice transmission. In contrast, the 1xEV-DO protocol focuses on increasing throughput for its packet data transmission. In voice and circuit data services, it continuously occupies a specified channel through the wireless medium when in the process of communication. Because voice transmission (CDMA2000) requires real-time processing, even if there is no data transaction, it must use wireless medium resources. For this reason, the efficiency of resource usage eventually decreases. However, for packet data transmission in 1xEV-DO, it does not need to occupy the wireless medium continuously. Packet data transmission does not use the wireless medium continuously, instead utilizing burst transmission characteristics to maximum effect in order to transmit data efficiently. To make this operation possible, the order of priority and scheduling scheme must be handled efficiently in the base station.

In 1xEV-DO, the rate control and optimal scheduling algorithm performs an important role at the base station. A mobile station establishes a data transmission rate to the base station using a DRC (Data Rate Control) channel with a reference for measuring SNR(or C/I) of the pilot channel.

Fig. 2 describes the layering architecture for the air interface in 1xEV-DO. Each layer consists of 12 of one or more protocols that perform the layer's functionality. Each of these protocols can be individually negotiated.

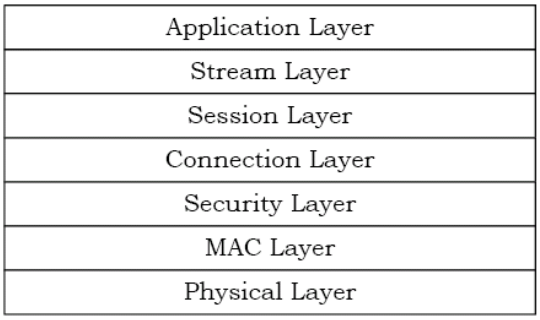


Fig. 2 Air interface layering architecture

The Physical Layer defines the Physical Layer Channels and the Forward and Reverse Channel hierarchies shown in Fig. 3 and Fig. 4. In forward channel it can transmit data from 38.4 kbps to 2.4576 Mbps, and in reverse channel it can transmit data from 9.6 kbps to 153.6 kbps.

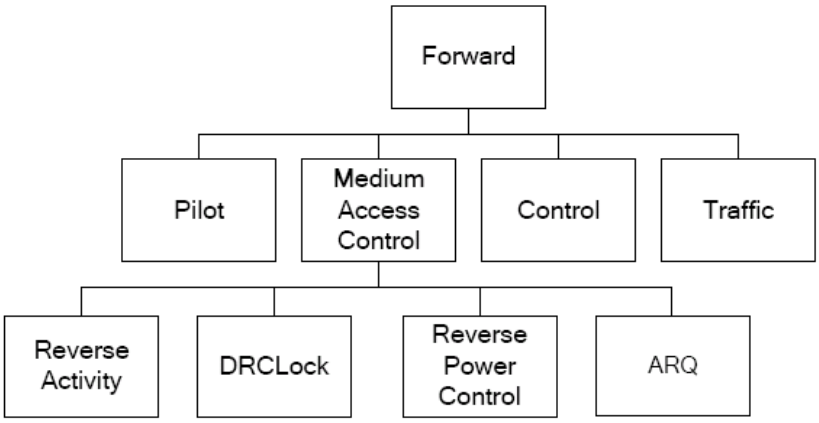


Fig. 3 Forward channel structure

The 1xEV-DO forward channel is divided into pilot channel, MAC channel, control channel and traffic channel. All of the physical channels in the forward link are transmitted via one channel that uses a TDM (time division multiplexing) technique. The MAC (medium access control) channel is different, with MAC layer existing as a physical layer, as you can see in Fig. 2. This channel is used to control the data transmission rate. The pilot channel is used as a reference channel for coherent detection of the mobile station. All of the forward channels are divided in time (time division), and the signal is spread physically. Such a structure is called TD-CDMA (time division-code division multiple access).

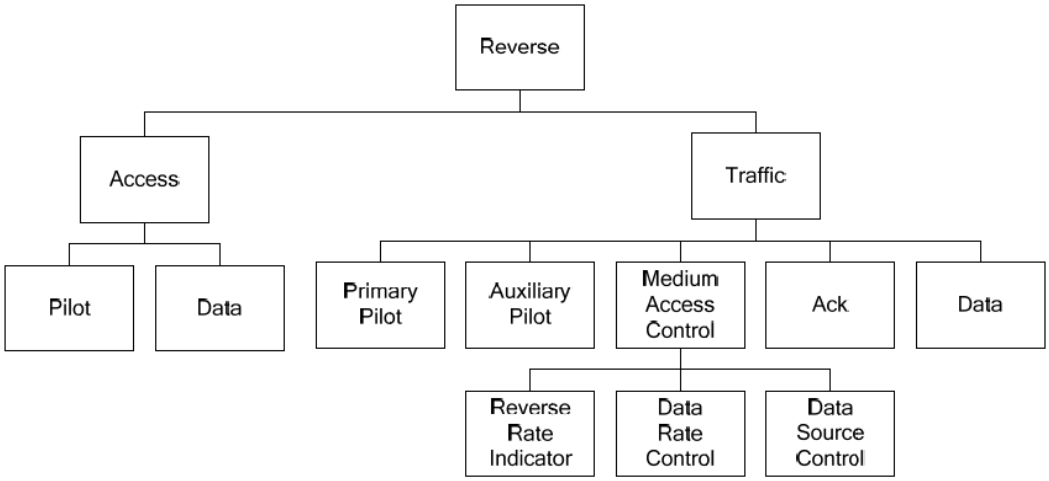


Fig. 4 Reverse channel structure

The 1xEV-DO reverse channel is divided into access channel and traffic channel. All of these channels transmit a pilot channel with its own channel data. The traffic channel is divided into a pilot channel, MAC channel, Ack channel and Data channel. The MAC channel is used to transmit data that relates to the transmission data rate. The Ack channel transmits whether it has correctly received physical layer packet data. The Access channel has a random access scheme and is defined in the MAC layer. The Pilot channel is generated in the physical channel and is not modulated with a 16-chip Walsh function. The 'Reverse Rate Indicator' in the MAC channel passes the data rate to the base station in the reverse channel, and the DRC (data rate control) channel is used to pass the data rate to the base station. In comparison with CDMA2000, it is more important to control the transmission rate.

This 1xEV-DO option basically corresponds with the 1xEV-DO Revision A Standard. Specifically, this measurement option refers to document C.S0024-A v2.0, which is released by the 3GPP2 organization.

Spectral mask

Test purpose and concepts

This test ensures that the DUT does not influence other 1xEV-DO devices transmitting in adjacent channels. There are two standard masks and a user-definable mask. The user mask requires parameter definition in addition to simply declaring the mask type.

Test procedure

Perform the steps below to measure the spectral mask of a 1xEV-DO 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 1xEV-DO mode:

1 Press [MODE] and select *[1xEV-DO]* mode.

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

3 Press [MEAS], [CONTROL], set the *[Capture Time]* and select *[Spectrum Mask]* (PCS or Cellular).

Set the following parameters in 1xEV-DO 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. 5. The upper side 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.

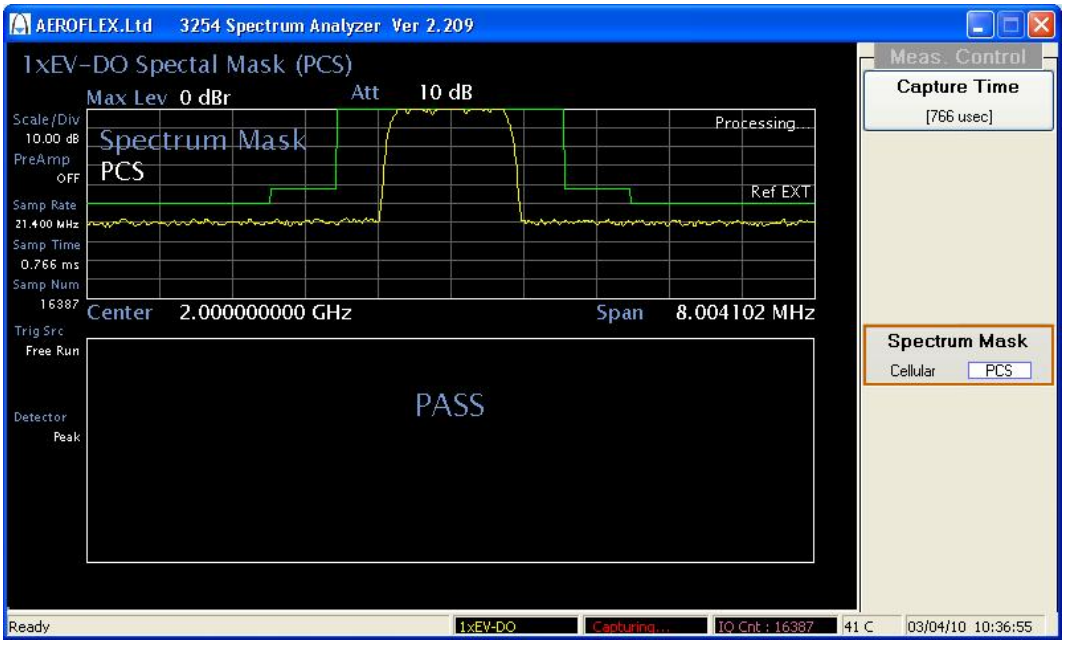


Fig. 5 Result of measuring spectral mask for 1xEV-DO signal — PCS

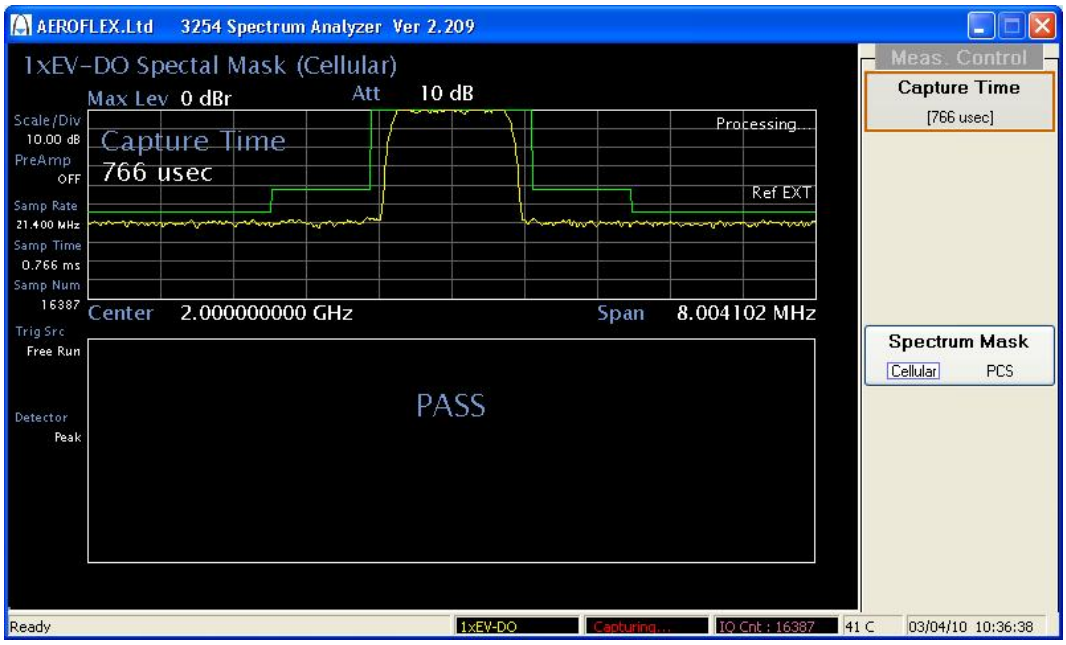


Fig. 6 Result of measuring spectral mask for 1xEV-DO signal — cellular

Channel power

Test purpose and concepts

From this measurement, you can find the total transmitted power within a defined channel for a 1xEV-DO 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 1xEV-DO 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 1xEV-DO mode:

1 Press [MODE] and select *[1xEV-DO]*.

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

Set the following parameters in 1xEV-DO 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. 7. 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.

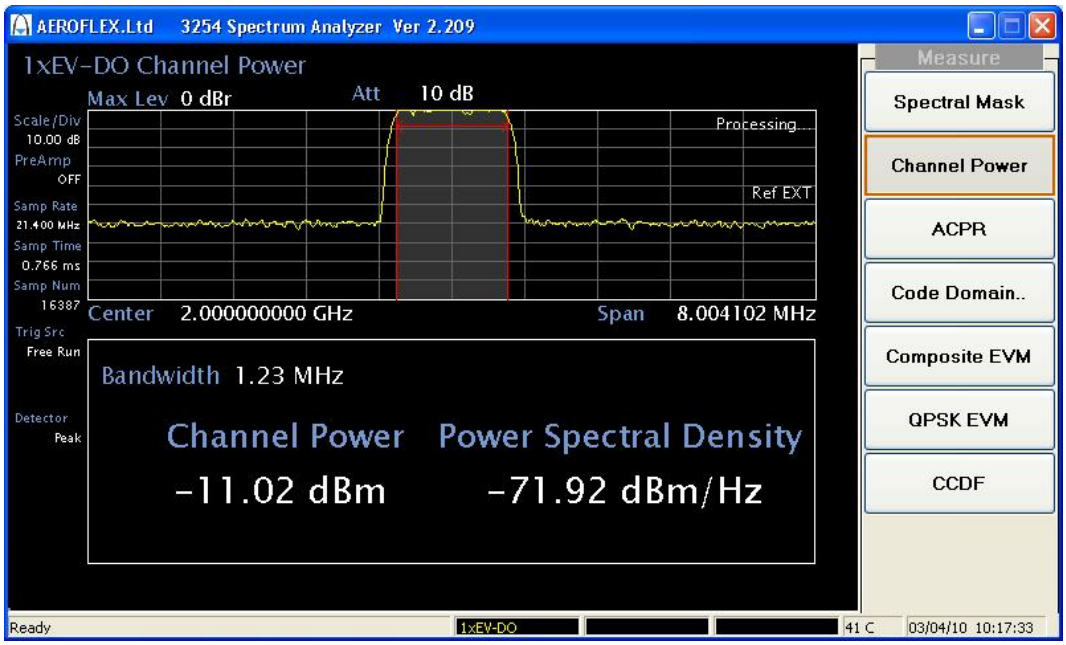


Fig. 7 Result of measuring channel power for 1xEV-DO signal

Adjacent channel power ratio

Test purpose and concepts

The system, which uses CDMA, uses ACPR (adjacent channel power ratio) for the linearity test for the power amplifier. ACPR is defined as the ratio of main channel power level to leakage power level, generated by its own signal. This means that when a specific channel signal goes on, we define how much disturbing signal is generated by the non-linearity of the power amplifier.

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.

Test procedure

Perform the steps below to measure the ACPR of a 1xEV-DO 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 ACPR in 1xEV-DO mode:

1 Press [MODE] and select *[1xEV-DO]*.

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

Set the following parameters in 1xEV-DO 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 ACPR Bar Graph measurement result should look like Fig. 8. The upper part of the window shows the graphical result for APCR. 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. 9 shows the ACPR measurement result in spectrum view mode. It is same as bar mode, except it shows the spectrum trace result and its integration bandwidth in detail.

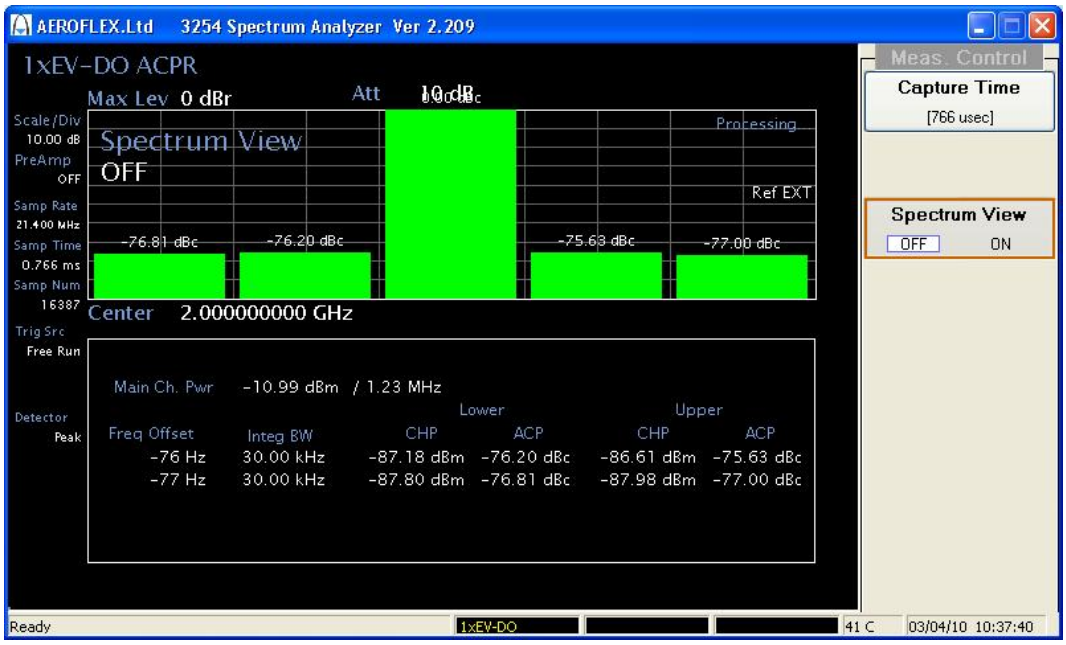


Fig. 8 Result of measuring ACPR for 1xEV-DO signal — bar view

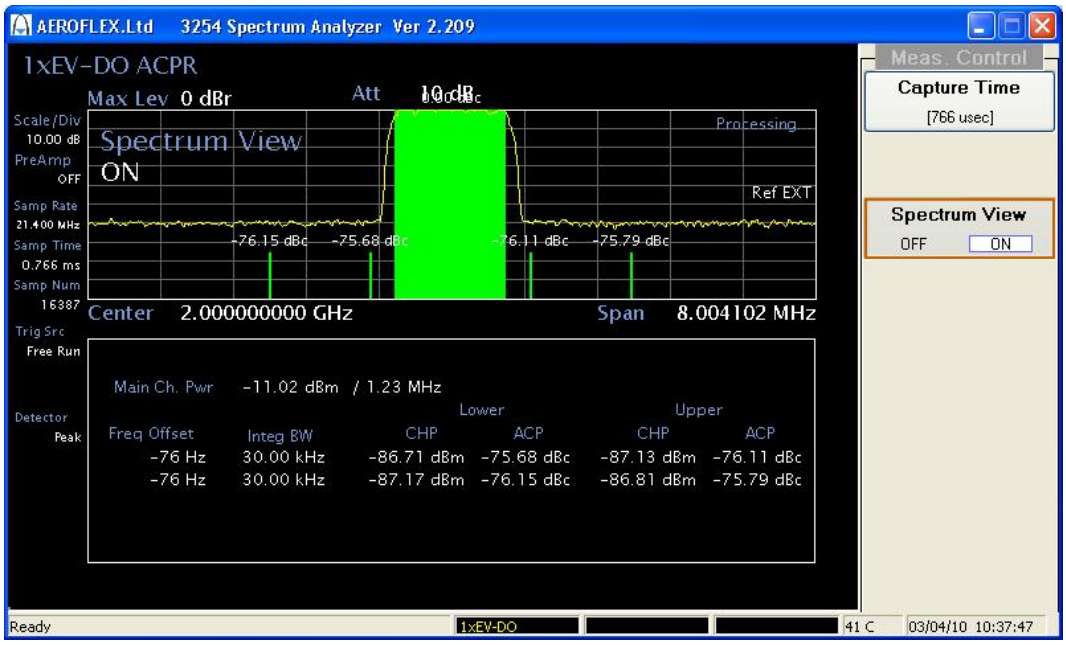


Fig. 9 Result of measuring ACPR for 1xEV-DO signal — spectrum view

Code domain analysis

Test purpose and concepts

This code domain power view provides information about the in-channel characteristics of the 1xEV-DO signal. It directly informs you of the active channels with their individual channel powers. Since the code domain measurements de-spread and de-scramble the 1xEV-DO signal into its physical channels, the number of active channels of various symbol rates can be observed.

Code Domain Power gives the distribution of signal energy among the code-channels, normalized by the total signal energy. Since CDP is a measure of relative energy levels, it is also a measure of relative average power levels over the measurement interval.

The 1xEV-DO Reverse Channel consists of the Access Channel and the Reverse Traffic Channel. The Access Channel consists of a Pilot Channel and a Data Channel. The Reverse Traffic Channel consists of a Pilot Channel, a Reverse Rate Indicator (RRI) Channel, a Data Rate Control (DRC) Channel, an Acknowledgment (ACK) Channel, and a Data Channel. The RRI Channel is used to indicate the data rate of the Data Channel being transmitted on the Reverse Traffic Channel. The DRC Channel is used by the access terminal to indicate to the access network the requested Forward Traffic Channel data rate and the selected serving sector on the Forward Channel. The ACK Channel is used by the access terminal to inform the access network whether or not the physical layer packet transmitted on the Forward Traffic Channel has been received successfully. Fig. 10 shows the structure of the Access Channel, and Fig. 11 and Fig. 12 show the Reverse Traffic Channel in Subtype 0. From the structure and specified Walsh code number, you can match the code domain analysis result to the channel structure of the 1xEV-DO system.

Table 1 summarizes the Walsh code alignments that are specified in the 3GPP2 1xEV-DO standard of C.S0024-A_v2.0.

Table 1 Walsh channel assignments for Subtype 0, 1 Traffic Channel

Channel	Walsh channel
Pilot (RRI)	W0, 16 (I channel)
ACK	W4, 8 (I channel)
DRC	W8, 16 (Q channel)
Data	W2, 4 (Q channel)

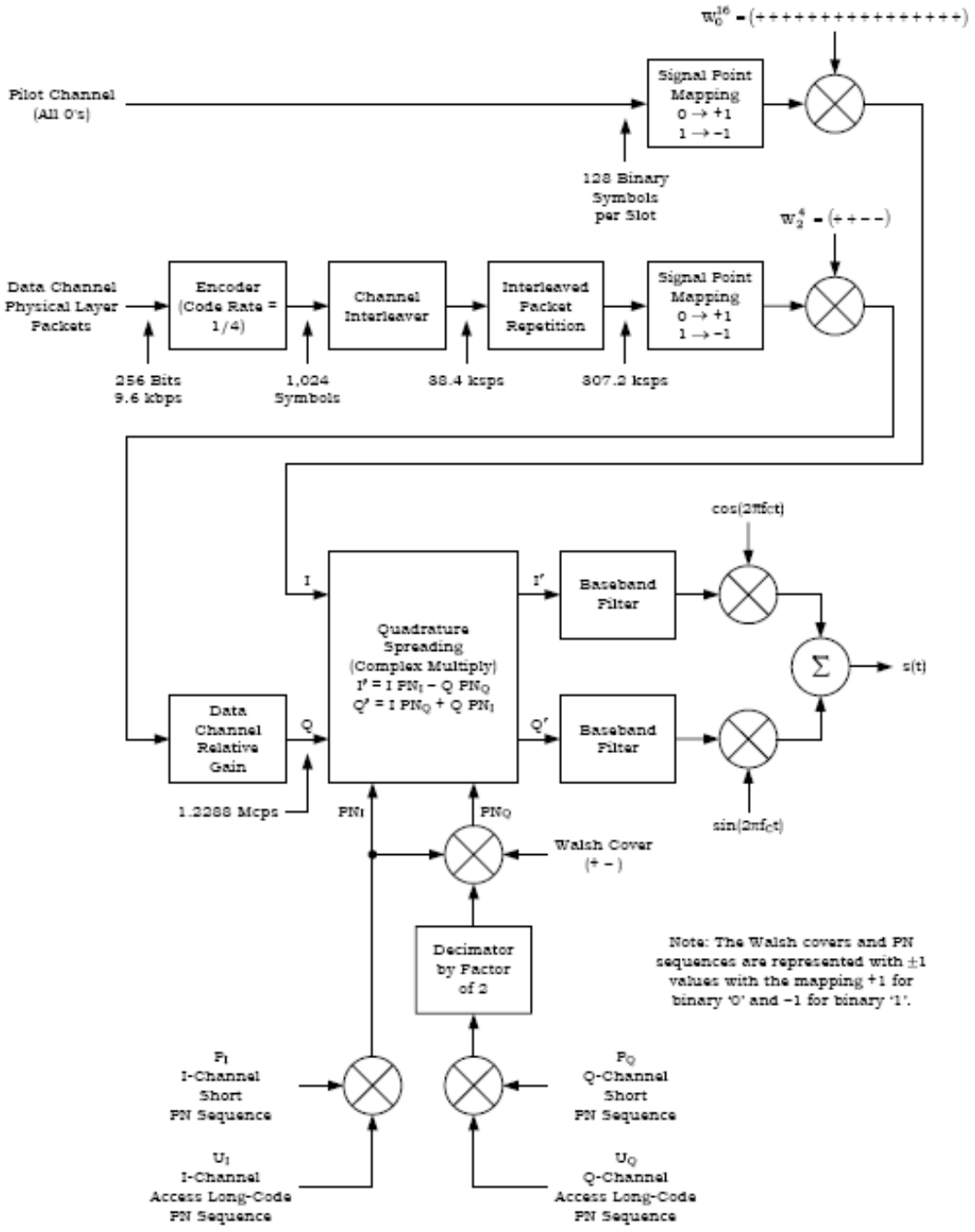


Fig. 10 Subtype 0 physical layer reverse channel structure for the Access Channel

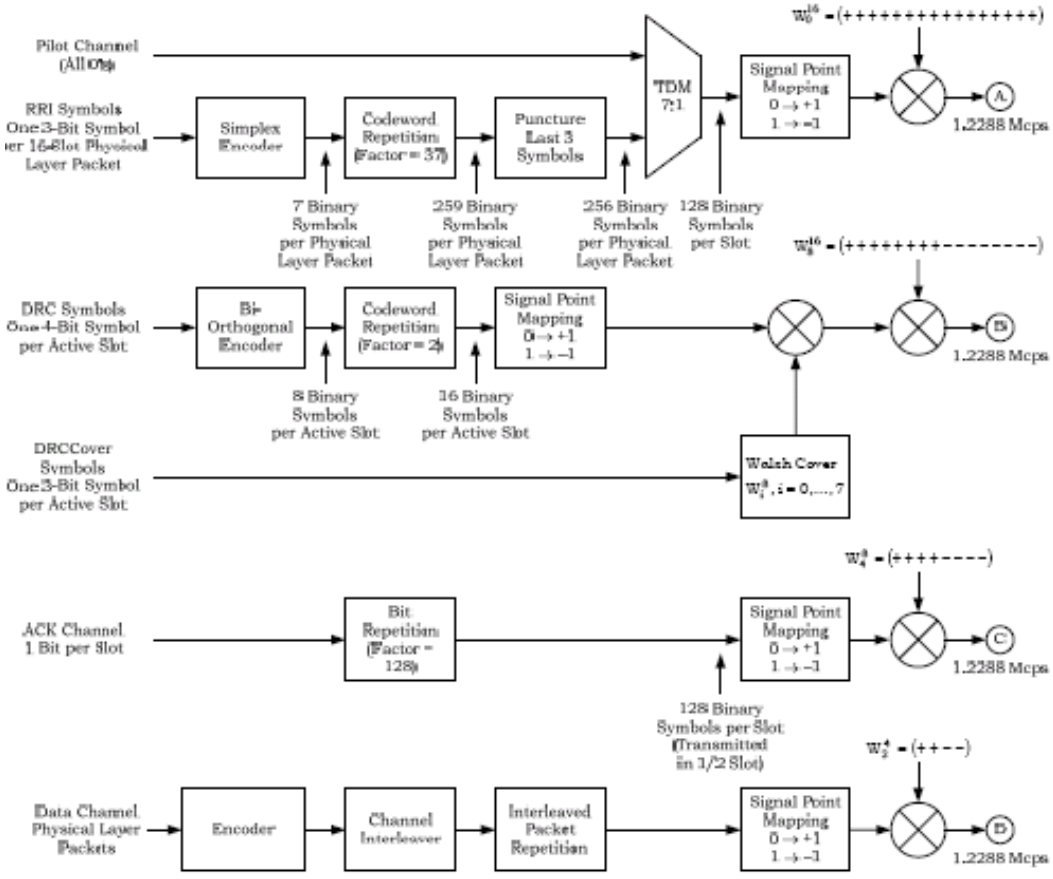


Fig. 11 Reverse channel structure for the Reverse Traffic Channel (part 1 of 2)

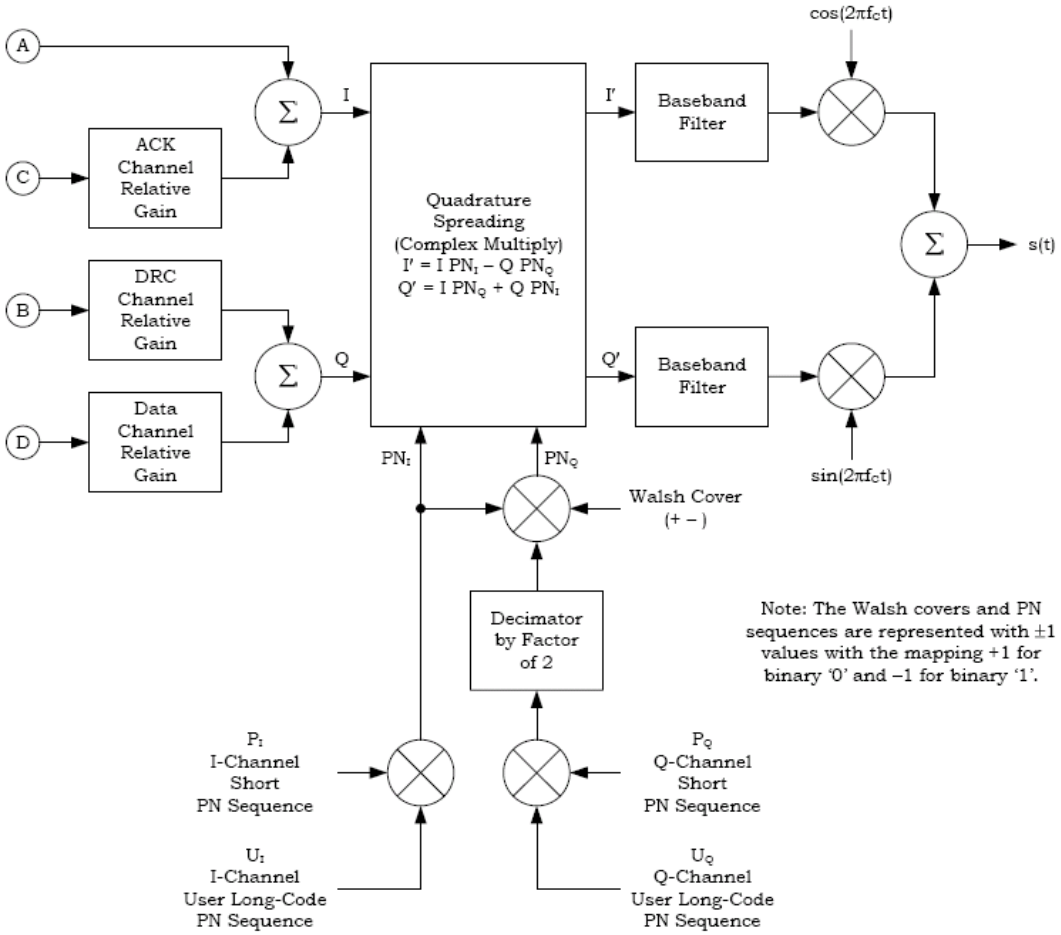


Fig. 12 Reverse channel structure for the Reverse Traffic Channel (part 2 of 2)

The Subtype 2 physical layer has a different structure to the Subtype 0 (default) and Subtype 1 physical layers, and it contains additional channels. Table 2 shows the Walsh channel assignment in a Subtype 2 reverse traffic channel.

Table 2 Walsh channel assignments for Subtype 2 Traffic Channel

Channel	Walsh Channel
Pilot	W0, 16 (I)
Auxiliary Pilot	W28, 32 (I)
RRI	W4, 16 (I)
ACK	W12, 32 (I) , TDM with DSC
DSC	W12, 32 (I) , TDM with ACK
Data	W2, 4 and/or W1, 2 (I, Q)
DRC	W8, 16 (Q)

Test procedure

Perform the steps below to measure the code domain power of a 1xEV-DO 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 1xEV-DO mode:

1 Press [MODE] and select *[1xEV-DO]*.

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

3 Press *[Code Domain Pwr]* or *[Code Domain Err]*.

Set the following parameters in 1xEV-DO 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. 13. The upper trace shows the graphical result for Code Domain Power for the I channel and the lower trace shows the same result for the Q channel. The X-axis shows the Walsh Code number and the Y-axis shows the relative power level for each code in dB.

The bottom part of the window summarizes the Code Domain Power measurement result and relative power level for each 1xEV-DO traffic channel.

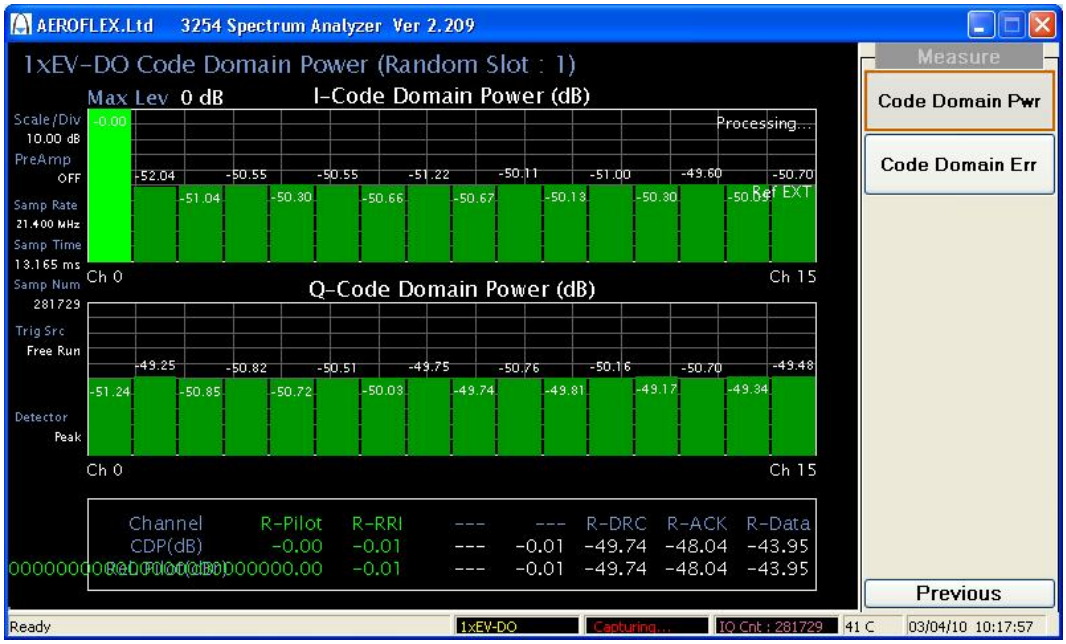


Fig. 13 Result of measuring code domain power for 1xEV-DO signal

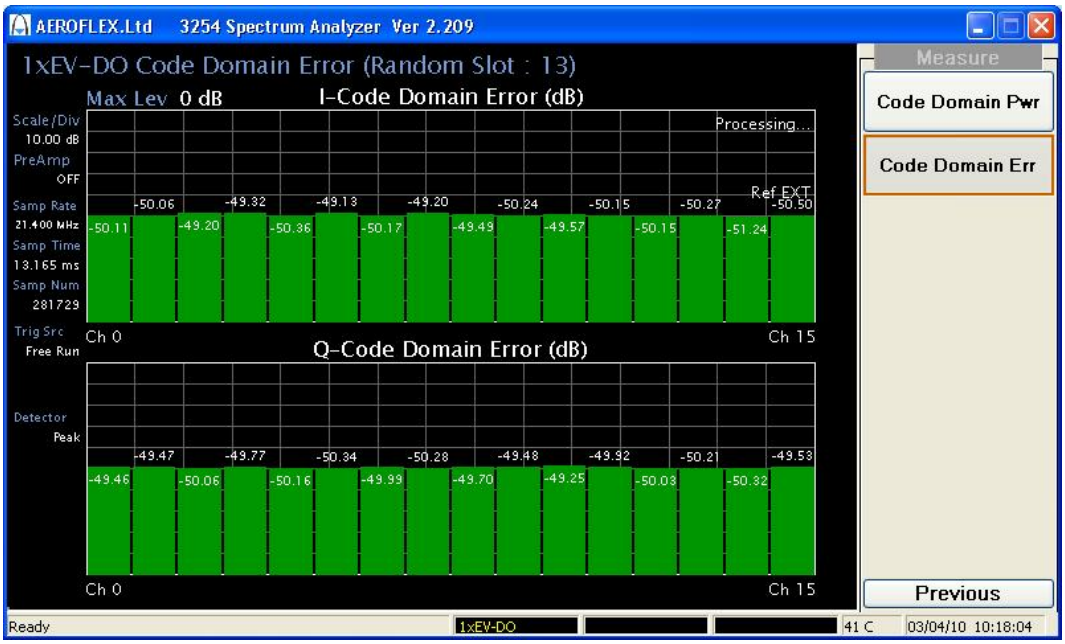


Fig. 14 Result of measuring code domain error for 1xEV-DO signal

Modulation analysis

Composite EVM

Test purpose and concepts

Composite EVM measures the EVM of the multi-code channel signal. It is valuable for determining the quality of the transmitter for a multi-channel signal, detecting spreading or scrambling errors, identifying certain problems between baseband and RF sections, and analyzing errors that cause high interference in the signal.

Rho is the ratio of the correlated power to the total power. The correlated power is computed by removing frequency, phase, and time offset and performing a cross correlation between the correlated signal and an ideal reference. This value is on the range of 0 to 1. A value of 1 indicates perfect correlation to the reference (high modulation quality).

Test procedure

Perform the steps below to measure the EVM of a 1xEV-DO 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 1xEV-DO mode:

1 Press [MODE] and select *[1xEV-DO]*.

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

Set the following parameters in 1xEV-DO 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 1xEV-DO Composite EVM measurement result should look like Fig. 15. The numerical values for modulation accuracy are shown on the left side of this measurement window. The modulation accuracy result lists are as following.

EVM Error (RMS)

EVM Error (Peak)

Rho

Frequency Error

Peak CDE (I,Q)

The frequency error in Band Classes 0, 2, 3, 5, 7, 9, 10, 11 and 12 must be within ±300 Hz, while in Band Classes 1, 4, 6, and 8 it must be within ±150 Hz while in the transmitting process. The overall Rho value must be greater than 0.944 (excess power less than 0.25 dB).

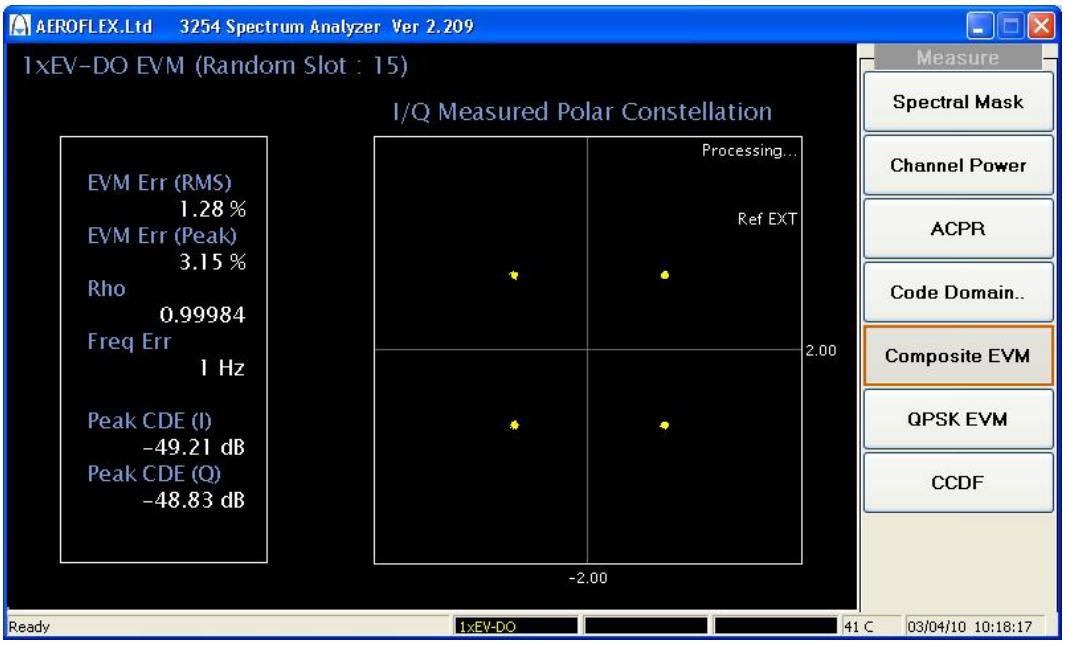


Fig. 15 Result of measuring Composite EVM for 1xEV-DO signal

QPSK EVM

Test purpose and concepts

Phase and frequency errors are measures of modulation quality for the 1xEV-DO system. This modulation quality is quantified through QPSK EVM measurements. Since the base stations in 1xEV-DO 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 1xEV-DO channel, like a Reverse Pilot Channel.

A QPSK EVM measurement can detect baseband filtering, modulation, and RF impairments, but does not detect spreading or scrambling errors.

Test procedure

Perform the steps below to measure the modulation quality of a 1xEV-DO 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 modulation quality in 1xEV-DO mode.

1 Press [MODE] and select *[1xEV-DO]*.

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

3 Press [MEAS], [CONTROL] and set the *[Symbols]*.
Set the symbol number to be analyzed.

Set the following parameters in 1xEV-DO 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 1xEV-DO QPSK measurement result should look like Fig. 16. 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)

Origin Offset

Frequency Error

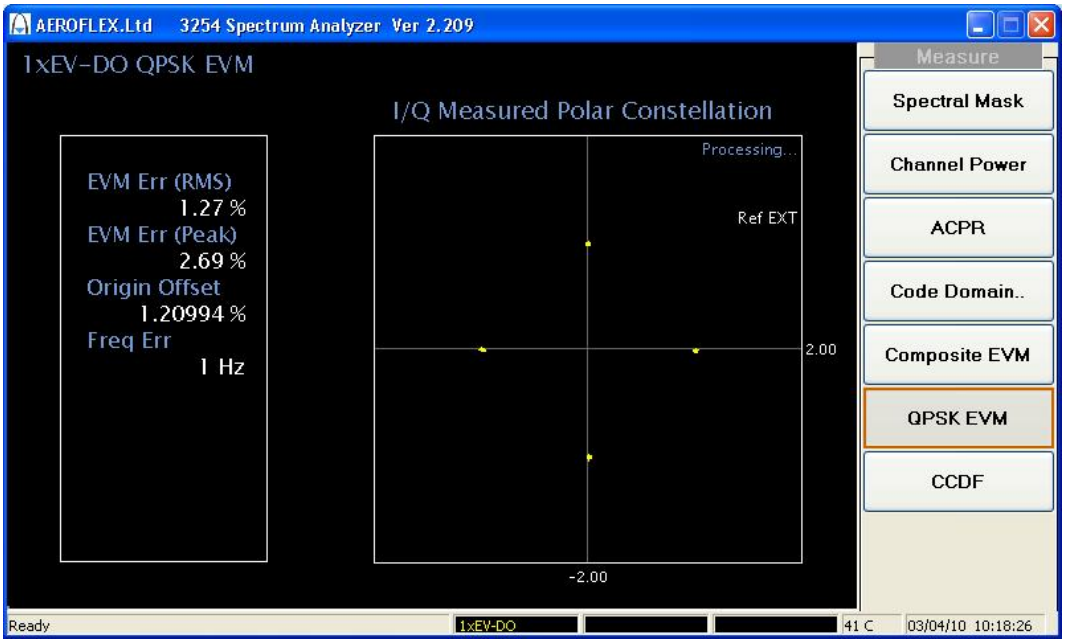


Fig. 16 Result of measuring QPSK EVM for 1xEV-DO signal

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 1xEV-DO 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 1xEV-DO mode:

1 Press [MODE] and select *[1xEV-DO]*.

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

3 Press [MEAS], [CONTROL] and set the *[Capture Time]*.

Set the following parameters in 1xEV-DO 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

Fig. 17 shows the analysis result for CCDF for a 1xEV-DO 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.

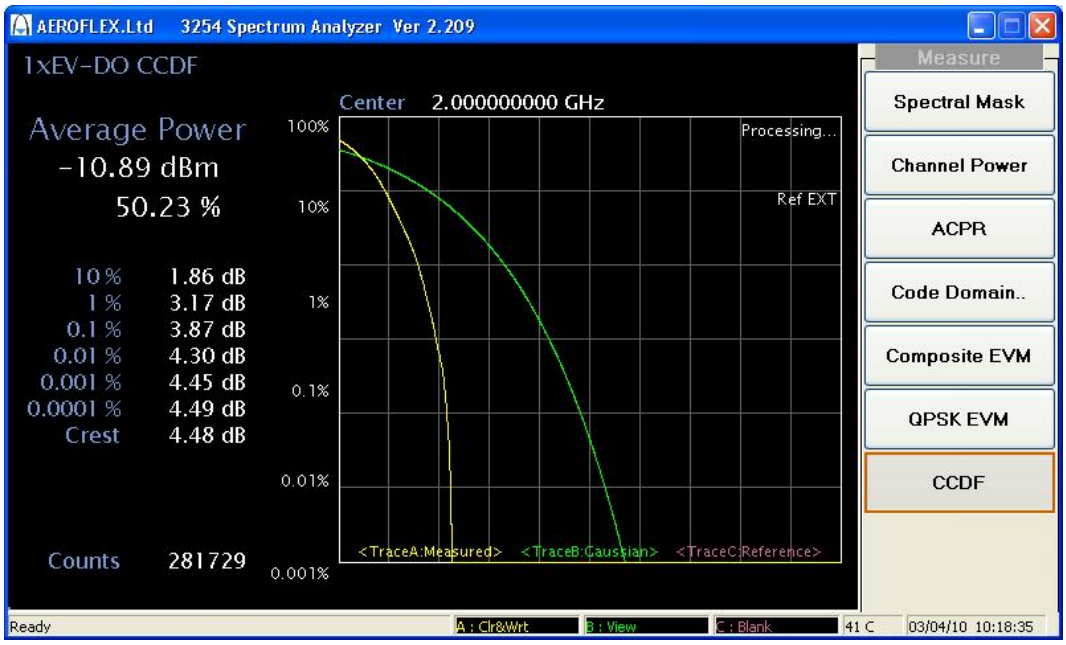
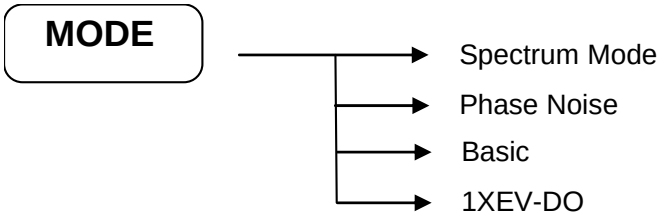


Fig. 17 Result of measuring CCDF for 1xEV-DO signal

Menu descriptions

1xEV-DO measurement mode

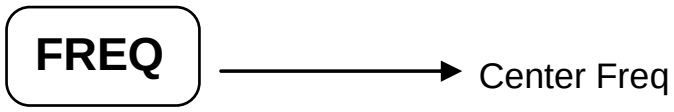
To use 1xEV-DO measurement options, first set the system to 1xEV-DO mode.



Select [MODE], then press *[1xEV-DO]* mode at the right side of the screen.

Frequency channel menu

Press [FREQ] in 1xEV-DO mode:

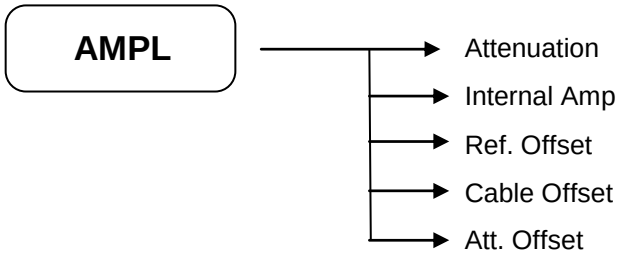


You can access frequency functions from this menu:

Center Freq	Allows you to specify the frequency of the 1xEV-DO input signal.

Amplitude menu

Press [AMPL] in 1xEV-DO mode:

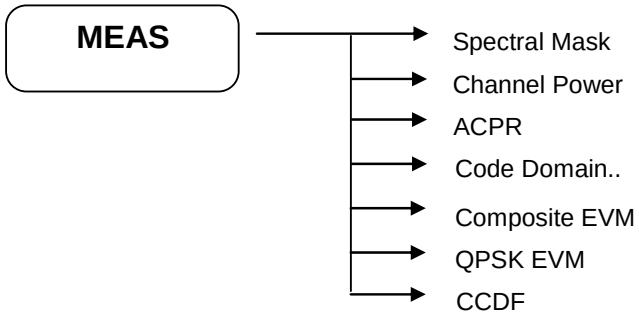


Amplitude menu keys are used for setting functions that affect the way data on the vertical axis is displayed or corrected.

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

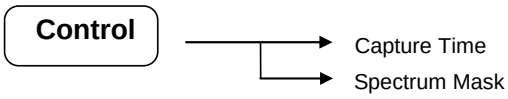
Press [MEAS] in 1xEV-DO mode:



Spectral Mask	Measures the spectral mask of a 1xEV-DO signal. The pass/fail result, based on a 3GPP2 Std spectral mask, is measured and displayed.
Channel Power	Measures the channel power of a 1xEV-DO signal. The channel power on a 1xEV-DO bandwidth can be measured and displayed in the lower part of the measurement window.
ACPR	Measures the adjacent channel power of a 1xEV-DO signal. A ratio of main channel power level versus Leakage power is shown in the lower part of the measurement window.
Code Domain	Measures the code domain power and code domain error for a 1xEV-DO signal. The X-axis is the number of the Walsh code, and the Y-axis represents the relative code power level for each Walsh code, in dB.
Composite EVM	Measures the composite EVM error for a 1xEV-DO signal. It shows the result as a constellation diagram and numerical result for EVM Error (RMS, Peak), Rho, Frequency Error, Peak CDE (I,Q).
QPSK EVM	Measures the QPSK EVM error for a 1xEV-DO signal. It shows the result as a constellation diagram and numerical result for EVM Error (RMS, Peak), Origin Offset, Frequency Error, Peak CDE (I,Q).
CCDF	Measure the CCDF (Complementary Cumulative Distribution Function) of a 1xEV-DO signal.

Measure control menu

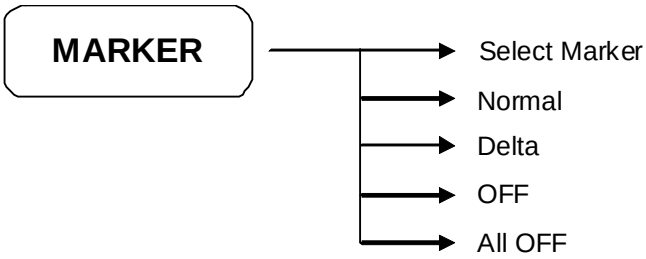
Press [CONTROL] in 1xEV-DO mode:



Capture Time	Sets the capture time.
Spectrum Mask	Sets the spectrum mask to either cellular or PCS.

Marker menu

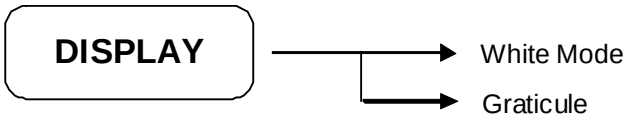
Press [MARKER] in 1xEV-DO mode:



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

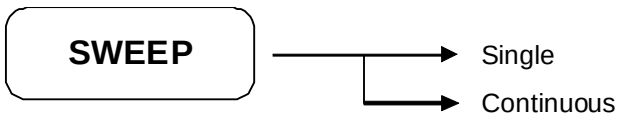
Press [DISPLAY] in 1xEV-DO mode:



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

Sweep menu

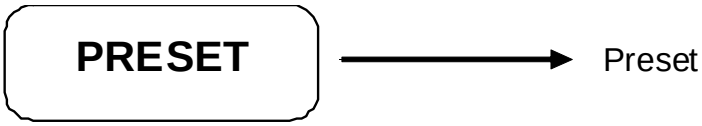
Press [SWEEP] in 1xEV-DO mode:



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.

Preset menu

Press [PRESET] in 1xEV-DO 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 476892/974) 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: 0.01 dBm)
Suffix code	None : dBm
	DBM : dBm
Initial setting	0 dBm
Example	RL 10;
	RL 30DBM;
	RL ?;
	DISP:WIND:TRAC:Y:RLEV 10;
	DISP:WIND:TRAC:Y:RLEV 30DBM;
	DISP:WIND:TRAC:Y:RLEV?;

AT

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

	Attenuation
Function	Sets the amount of attenuation for the input attenuator.
Remote Command	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:330 MHz to 3 GHz)
Value of f	330 MHz to 3 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	SEM	: Spectral Mask
	CHP	: Channel Power
	ACP	: Adjacent Channel Power
	CDP	: Code Domain Power
	CDE	: Code Domain Error
	EVM	: EVM
	QPSKEVM	: QPSK EVM
	CCDF	: CCDF
Value of sw	SEM	: Spectral Mask
	CHP	: Channel Power
	ACP	: Adjacent Channel Power
	CDP	: Code Domain Power
	CDE	: Code Domain Error
	EVM	: EVM
	QPSKEVM	: QPSK EVM
	CCDF	: CCDF
Example	MEA SEM;	
	MEA?;	
	MEAS:STAR SEM;	
	MEAS:STAR?;	

SEMOUT

:FETCh|MEASure|READ:SEMask

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

CHPOUT

:FETCh|MEASure|READ:CHPower

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

ACPOUT

:FETCh|MEASure|READ:ACPower

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

CDPOUT

:FETCh|MEASure|READ:CDPower

	Code Domain Power Output
Function	Returns the output of Code Domain Power.
Remote Command	CDPOUT?
	:FETCh|MEASure|READ:CDPower?
Response Message	Ch0 I-Power (dB), Ch0 Q-Power (dB), ~ Ch31 I-Power (dB), Ch31 Q-Power (dB)
Example	CDPOUT?;
	MEAS:CDP?;

CHANNELOUT

:FETCh|MEASure|READ:CDPower:CHANnel

	Code Domain Power Output of Specific Channel
Function	Returns the Code Domain Power of a specific channel.
Remote Command	CHANNELOUT?
	:FETCh|MEASure|READ:CDPower:CHANnel?
Response Message	CDP of Pilot (dB), CDP of RRI (dB)–CDP of Data, Relative Pilot (dBr), Relative Pilot of RRI (dBr)–Relative Pilot of Data (dBr)
Example	CHANNELOUT?;
	MEAS:CDP:CHAN?;

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), –Ch16 I-Error(dB), –Ch16 Q-Error (dB)
Example	CDEOUT?;
	MEAS:CDE?;

EVMOUT

:FETCh|MEASure|READ:EVM

	EVM Output
Function	Returns the output of EVM.
Remote Command	EVMOUT?
	:FETCh|MEASure|READ:EVM?
Response Message	EVM Error (RMS) (%), EVM Error (Peak) (%), Rho (%), Frequency Error (Hz), Peak CDE(I) (dB)(RC3 or RC4 only), Peak CDE(Q) (dB) (RC3 or RC4 only)
Example	EVMOUT?;
	MEAS:EVM?;

QPSKEVMOUT

:FETCh|MEASure|READ:EVM:QPSK

	QPSK EVM Output
Function	Returns the output of QPSK EVM.
Remote Command	QPSKEVMOUT?
	:FETCh|MEASure|READ:EVM:QPSK?
Response Message	EVM Error (RMS) (%), EVM Error (Peak) (%), Origin Offset (%), Frequency Error (Hz)
Example	QPSKEVMOUT?;
	MEAS:EVM:QPSK?;

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?;

Measurement control

PLAYER

	Physical Layer
Function	Sets the physical layer to Subtype 0, Subtype 1 or Subtype 2.
Remote Command	RADIOCONFIGΔsw
	RADIOCONFIG?
Response Message	SUBTYPE0 : Subtype 0
	SUBTYPE1 : Subtype 1
	SUBTYPE2 : Subtype 2
Value of sw	SUBTYPE0 : Subtype 0
	SUBTYPE1 : Subtype 1
	SUBTYPE2 : Subtype 2
Initial setting	SUBTYPE2
Example	PLAYER SUBTYPE2;
	PLAYER?;

CDMODE

	Channel Detect Mode
Function	Sets channel detect mode to auto or manual.
Remote Command	CDMODEΔsw
	CDMODE?
Response Message	AUTO : Auto
	MANL : Manual
Value of sw	AUTO : Auto
	MANL : Manual
Initial setting	AUTO
Example	CDMODE AUTO;
	CDMODE?;

ACHANNEL

	Active Channel	
Function	Sets to active channel in manual channel detect mode.	
Remote Command	ACHANNELΔsw	
	ACHANNEL?	
Response Message	PILOT	: Pilot
	DRC	: DRC
	ACK	: ACK
	DATA	: Data
	DSC	: DSC (Subtype 2 only)
	RRI	: RRI
	AUXPILOT	: Auxiliary Pilot (Subtype 2 only)
Value of sw	PILOT	: Pilot
	DRC	: DRC
	ACK	: ACK
	DATA	: Data
	DSC	: DSC (Only Subtype 2)
	RRI	: RRI
	AUXPILOT	: Auxiliary Pilot (Only Subtype 2)
Initial setting	PILOT	
Example	ACHANNEL PILOT;	
	ACHANNEL?;	

RRIDMODE

	RRI Decode Mode
Function	Sets RRI decode mode to auto or manual, in manual channel detect mode.
Remote Command	RRIDMODEΔsw
	RRIDMODE?
Response Message	AUTO : Auto
	MANL : Manual
Value of sw	AUTO : Auto
	MANL : Manual
Initial setting	AUTO
Example	RRIDMODE AUTO;
	RRIDMODE?;

MTYPE

	Modulation Type	
Function	Sets modulation type to manual RRI decode mode.	
Remote Command	MTYPEΔsw	
	MTYPE?	
Response Message	NOT	: Not defined
	B4	: B4
	Q4	: Q4
	Q2	: Q2
	Q4Q2	: Q4Q2
	E4E2	: E4E2
Value of sw	NOT	: Not defined
	B4	: B4
	Q4	: Q4
	Q2	: Q2
	Q4Q2	: Q4Q2
	E4E2	: E4E2
Initial setting	NOT	
Example	MTYPE NOT;	
	MTYPE?;	

CDTH

	Channel Detect Threshold
Function	Sets to channel detect threshold.
Remote Command	CDTHΔf
	CDTH?
Response Message	Channel Detect Threshold
Value of f	f <= 0
Initial setting	−35 (dB)
Example	CDTH −35;
	CDTH?;

AMODE

	Analysis Mode
Function	Sets analysis mode to random or manual.
Remote Command	AMODEΔsw
	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 to slot number in manual analysis mode.
Remote Command	SLOTΔn
	SLOT?
Response Message	Slot Number
Value of n	From 0 to 15
Initial setting	0
Example	SLOT 0;
	SLOT?;

SMASK

	Spectrum Mask	
Function	Sets the Spectrum Mask.	
Remote Command	SMASKΔsw	
	SMASK?	
Response Message	CELL	: Cellular
	PSC	: PCS
Value of sw	CELLular	: Cellular
	PCS	: PCS
Initial setting	CELL	
Example	SMASK CELL;	
	SMASK?;	

LCMASKI

	Long Code Mask (I)
Function	Sets to Long Code Mask (I) in Composite EVM mode.
Remote Command	LCMASKIΔn
	LCMASKI?
Response Message	Long Code Mask(I)
Value of n	n >= 0
Initial setting	0
Example	LCMASKI 0;
	LCMASKI?;

LCMASKQ

	Long Code Mask (Q)
Function	Sets to Long Code Mask (Q) in Composite EVM mode.
Remote Command	LCMASKQ∆n
	LCMASKQ?
Response Message	Long Code Mask(Q)
Value of n	n >= 0
Initial setting	0
Example	LCMASKQ 0;
	LCMASKQ?;

SYMB

	Symbols
Function	Sets to Symbols in QPSK EVM mode.
Remote Command	SYMBΔn
	SYMB?
Response Message	Symbols
Value of n	n >= 0
Initial setting	0
Example	SYMB 0;
	SYMB?;

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
	1xEVDO	: 1xEV-DO mode
Value of sw	SA	: Spectrum mode
	BASIC	: Basic mode
	1xEVDO	: 1xEV-DO 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	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	SEM|CHP|ACP|CDP|CDE|EVM |QPSKEVM|CCDF|?
Measurement	Spectral Mask Output	SEMOUT	:FETCh|MEASure|READ:SEMask	?
Measurement	Channel Power	CHPOUT	:FETCh|MEASure|READ:CHPower	?
Measurement	Adjacent Channel Power	ACPOUT	:FETCh|MEASure|READ:ACPower	?
Measurement	Code Domain Power	CDPOUT	:FETCh|MEASure|READ:CDPower	?
Measurement	Channel	CHANNELOUT	:FETCh|MEASure|READ:CHANnel	?
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	CCDF Output	CCDFOUT	:FETCh|MEASure|READ:CCDF	?
Meas Control	Physical Layer	PLAYER		SUBTYPE0|SUBTYPE1 |SUBTYPE2|?
Meas Control	Channel Detect Mode	CDMODE		AUTO|MANL|?
Meas Control	Active Channel	ACHANNEL		PILOT|DRC|ACK|DATA |DSC|RRI|AUXPILOT|?
Meas Control	RRI Decode Mode	RRIDMODE		AUTO|MANL|?
Meas Control	Modulation Type	MTYPE		NOT|B4|Q4|Q2|Q4Q2 |E4E2|?
Meas Control	Channel Detect Threshold	CDTH		<level>|?
Meas Control	Analysis Mode	AMODE		RADM|MANL|?

Meas Control	Slot Number	SLOT		<integer>|?
Meas Control	Spectrum Mask	SMASK		CELLullar|PCS|?
Meas Control	Long Code Mask(I)	LCMASKI		<integer>|?
Meas Control	Long Code Mask(Q)	LCMASKQ		<integer>|?
Meas Control	Symbols	SYMB		<integer>|?
Mode	Mode	MODE	:INSTrument[:SELect]	SA|BASIC|1XEVDO|?
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	?
Meas Control	Active Channel	**ACHANNEL**		PILOT|DRC|ACK|DATA |DSC|RRI|AUXPILOT|?
Measurement	Adjacent Channel Power	**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**		AUTO|MANL|?
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	**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
Meas Control	Long Code Mask(I)	**LCMASKI**		<integer>|?
Meas Control	Long Code Mask(Q)	**LCMASKQ**		<integer>|?
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|CDP|CDE |EVM|QPSKEVM|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|1XEVDO|?
Marker	Marker State	**MS[1~9]**	:CALCulate:MARKer[1~9]:STATe	OFF|ON|0|1|?
Meas Control	Modulation Type	**MTYPE**		NOT|B4|Q4|Q2|Q4Q2|E4E2|?

Meas Control	Physical Layer	**PLAYER**		SUBTYPE0|SUBTYPE1 |SUBTYPE2|?
Preset	Preset	**PRST**	:SYSTem:PRESet	none
Measurement	QPSK EVM	**QPSKEVMOUT**	:FETCh|MEASure|READ:EVM:QPSK	?
Frequency	Reference	**REF**	:INPut:REFerence	INTernal|EXTernal|?
Amplitude	Ref. Level	**RL**	:DISPlay:WINDow:TRACe:Y[:SCALe] :RLEVel	<amplitude>|?
Meas Control	RRI Decode Mode	**RRIDMODE**		AUTO|MANL|?
Amplitude	Scale/Div	**SD**	:DISPlay:WINDow:TRACe:Y[:SCALe] :PDIVision	<amplitude>|?
Measurement	Spectral Mask Output	**SEMOUT**	:FETCh|MEASure|READ:SEMask	?
Sweep	Single	**SI**	:INITiate:LPLot[:IMMediate]	none
Meas Control	Slot Number	**SLOT**		<integer>|?
Meas Control	Spectrum Mask	**SMASK**		CELLullar|PCS|?
Meas Control	Symbols	**SYMB**		<integer>|?
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	Adjacent Channel Power	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	CHANNELOUT	**: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	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|1XEVDO|?
Measurement	Meas. Start	MEA	**:MEASure:STARt**	SEM|CHP|ACP|CDP|CDE|EVM |QPSKEVM|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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5 ADDITIONAL LICENSE RIGHTS SPECIFIC TO PXI SOFTWARE

5.1 Definitions for PXI Software

The following expressions will have the meanings set out below for the purposes of the supplementary rights granted in this Article.

PXI Drivers	All 3000 Series PXI module device drivers including embedded firmware that are installed at runtime
PXI Executable Applications	All executable applications supplied with each 3000 Series PXI module including:-
	PXI Studio
	Soft Front Panels (manual operation graphical user interfaces)
	Utilities including: RF Investigator, PXI Version Information and Self Test
PXI Spectrum Analysis Library	The spectrum analysis measurement suite library .dll software supplied with each 3000 Series PXI module
PXI Optional Application Library	Individual measurement suite available from a range of optional .dll application libraries

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