MX283027A-001
WLAN Test Software
Operation Manual
Operation

Fifth Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided within the MS2830A Signal Analyzer Operation Manual (Mainframe Operation). Please also refer to the document before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W3473AE-5.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

Symbols used in manual

DANGER This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

WARNING This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

MX283027A-001
WLAN Test Software
Operation Manual Operation

4 February 2011 (First Edition)
7 November 2011 (Fifth Edition)

Equipment Certificate

Anritsu Corporation guarantees that this equipment was inspected at shipment and meets the published specifications.

Anritsu Warranty

- During the warranty period, Anritsu Corporation will repair or exchange this software free-of-charge if it proves defective when used as described in the operation manual.
- The warranty period is 6 months from the purchase date.
- The warranty period after repair or exchange will remain 6 months from the original purchase date, or 30 days from the date of repair or exchange, depending on whichever is longer.
- This warranty does not cover damage to this software caused by Acts of God, natural disasters, and misuse or mishandling by the customer.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

Software End-User License Agreement (EULA)

Please read this Software End-User License Agreement (hereafter this EULA) carefully before using (includes executing, copying, registering, etc.) this software (includes programs, databases, scenarios, etc., used to operate, set, etc., Anritsu electronic equipment). By reading this EULA and using this software, you are agreeing to be bound by the terms of its contents and Anritsu Corporation (hereafter Anritsu) hereby grants you the right to use this Software with the Anritsu-specified equipment (hereafter Equipment) for the purposes set out in this EULA.

1. Grant of License and Limitations

1. Regardless of whether this Software was purchased from or provided free-of-charge by Anritsu, you agree not to rent, lease, lend, or otherwise distribute this Software to third parties and further agree not to disassemble, recompile, reverse engineer, modify, or create derivative works of this Software.
2. You may make one copy of this Software for backup purposes only.
3. You are not permitted to reverse engineer this software.
4. This EULA allows you to install one copy of this Software on one piece of Equipment.

2. Disclaimers

To the extent not prohibited by law, in no event shall Anritsu be liable for personal injury, or any incidental, special, indirect or consequential damages whatsoever, including, without limitation, damages for loss of profits, loss of data, business interruption or any other commercial damages or losses, arising out of or related to your use or inability to use this Software.

3. Limitation of Liability

a. If a fault (bug) is discovered in this Software, preventing operation as described in the operation manual or specifications whether or not the customer uses this software as described in the manual, Anritsu shall at its own discretion, fix the bug, or exchange the software, or suggest a workaround, free-of-charge. However, notwithstanding the above, the following items shall be excluded from repair and warranty.
   i) If this Software is deemed to be used for purposes not described in the operation manual or specifications.
   ii) If this Software is used in conjunction with other non-Anritsu-approved software.
   iii) Recovery of lost or damaged data.
   iv) If this Software or the Equipment has been modified, repaired, or otherwise altered without Anritsu's prior approval.
   v) For any other reasons out of Anritsu's direct control and responsibility, such as but not limited to, natural disasters, software virus infections, etc.

b. Expenses incurred for transport, hotel, daily allowance, etc., for on-site repairs by Anritsu engineers necessitated by the above faults shall be borne by you.

c. The warranty period for faults listed in article 3a above covered by this EULA shall be either 6 months from the date of purchase of this Software or 30 days after the date of repair, whichever is longer.

4. Export Restrictions

You may not use or otherwise export or re-export directly or indirectly this Software except as authorized by Japanese and United States law. In particular, this software may not be exported or re-exported (a) into any Japanese or US embargoed countries or (b) to anyone on the Japanese or US Treasury Department's list of Specially Designated Nationals or the US Department of Commerce Denied Persons List or Entity List. By using this Software, you warrant that you are not located in any such country or on any such list. You also agree that you will not use this Software for any purposes prohibited by Japanese and US law, including, without limitation, the development, design and manufacture or production of missiles or nuclear, chemical or biological weapons of mass destruction.

5. Termination

Anritsu shall deem this EULA terminated if you violate any conditions described herein. This EULA shall also be terminated if the conditions herein cannot be continued for any good reason, such as violation of copyrights, patents, or other laws and ordinances.

6. Reparations

If Anritsu suffers any loss, financial or otherwise, due to your violation of the terms of this EULA, Anritsu shall have the right to seek proportional damages from you.

7. Responsibility after Termination

Upon termination of this EULA in accordance with item 5, you shall cease all use of this Software immediately and shall as directed by Anritsu either destroy or return this Software and any backup copies, full or partial, to Anritsu.

8. Dispute Resolution

If matters of dispute or items not covered by this EULA arise, they shall be resolved by negotiations in good faith between you and Anritsu.

9. Court of Jurisdiction

This EULA shall be interpreted in accordance with Japanese law and any disputes that cannot be resolved by negotiation described in Article 8 shall be settled by the Japanese courts.

Cautions against computer virus infection

- Copying files and data
  Only files that have been provided directly from Anritsu or generated using Anritsu equipment should be copied to the instrument.
  All other required files should be transferred by means of USB or CompactFlash media after undergoing a thorough virus check.
- Adding software
  Do not download or install software that has not been specifically recommended or licensed by Anritsu.
- Network connections
  Ensure that the network has sufficient anti-virus security protection in place.

CE Conformity Marking

Anritsu affixes the CE conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

1. Product Model

Software: MX283027A-001 WLAN Test Software

2. Applied Directive and Standards

When the MX283027A-001 WLAN Test Software is installed in the MS2830A, the applied directive and standards of this unit conform to those of the MS2830A main frame.

PS: About main frame

Please contact Anritsu for the latest information on the main frame types that the MX283027A-001 can be used with.

C-Tick Conformity Marking

Anritsu affixes the C-Tick mark on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

C-Tick marking

1. Product Model

Software: MX283027A-001 WLAN Test Software

2. Applied Directive and Standards

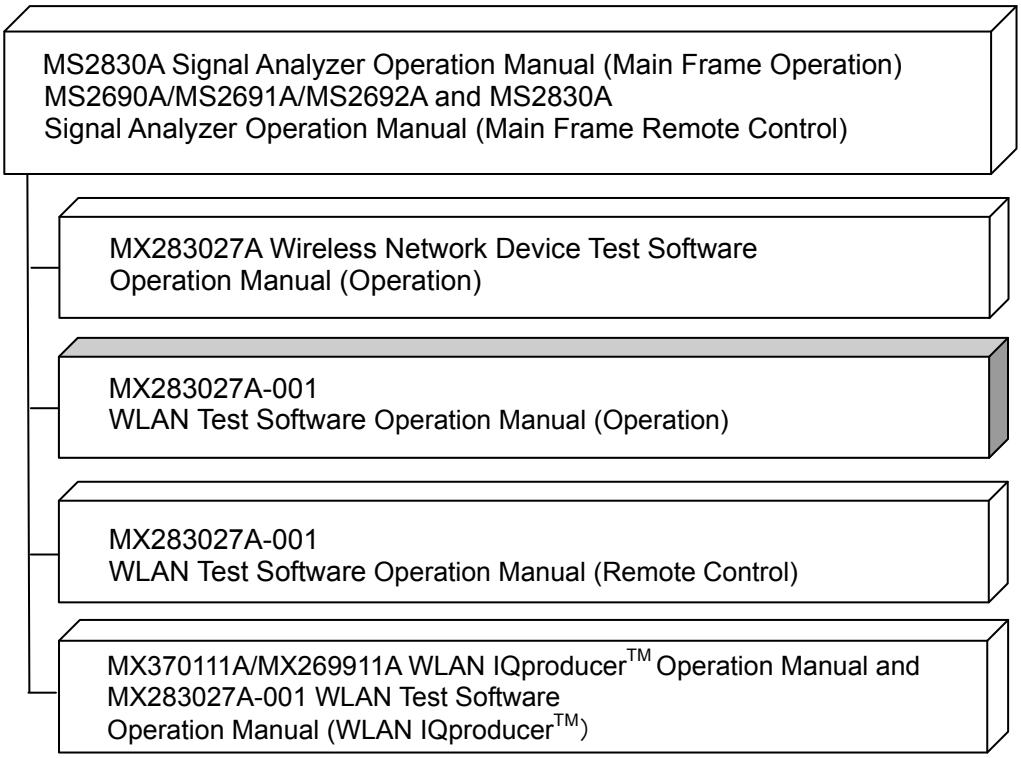
When the MX283027A-001 WLAN Test Software is installed in the MS2830A, the applied directive and standards of this unit conform to those of the MS2830A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that the MX283027A-001 can be used with.

About This Manual

■Composition of Operation Manuals

The operation manuals for MX283027A-001 WLAN Test Software are comprised as shown in the figure below.



- Signal Analyzer Operation Manual (Mainframe Operation)
- Signal Analyzer Operation Manual (Mainframe Remote Control)

These manuals describe basic operating methods, maintenance procedures, common functions, and common remote control of the signal analyzer mainframe.

- MX283027A Wireless Network Device Test Software Operation Manual (Operation)

This manual describes basic operating methods and functions of the MX283027A Wireless Network Device Test Software.

- MX283027A-001 WLAN Test Software Operation Manual (Operation)<This document>

This manual describes basic operating methods and functions of the MX283027A-001 WLAN Test Software.

- MX283027A-001 WLAN Test Software Operation Manual (Remote Control)

This manual describes remote control of the MX283027A-001 WLAN Test Software.

- MX370111A/MX269911A WLAN IQproducer™ Operation Manual and MX283027A-001 WLAN Test Software Operation Manual (WLAN IQproducer™)

This manual describes basic operating methods and functions of the WLAN IQproducer.

Convention Used in This Manual

Throughout this document, the use of MS2830A Series is assumed unless otherwise specified.

In this document,  indicates a panel key.

Table of Contents

Chapter 1 Overview

This chapter provides an overview and describes the product configuration of the MX283027A-001 WLAN Test Software.

1.1 Product Overview

The MS2830A Signal Analyzer (hereinafter referred to as "this instrument") enables high-speed, high-accuracy, and simple measurement of the transmission characteristics of terminals and devices for various types of mobile communications. MS2830A is equipped with high-performance signal analyzer and spectrum analyzer functions as standard, with optional measurement software allowing modulation analysis functionality supporting various digital modulation modes.

The MX283027A-001 WLAN Test Software (hereinafter referred to as "this application") is a software option used to measure RF characteristic of WLAN that is defined in IEEE 802.11 standards.

Note

The following software and options are necessary to use this application:

- MX283027A Wireless Network Device Test Software
- MS2830A-005/105 Analysis Bandwidth Extension to 31.25MHz or MS2830A-006/106 Analysis Bandwidth Extension to 10MHz

Note

With MS2830A-040, the measurement frequency is limited to 3.6 GHz.

This application supports the following measurements.

- Modulation Accuracy
- Transmitter Power
- Carrier Frequency
- Transmitter Power
- Occupied Bandwidth
- Spectrum Mask

This application comes with WLAN IQproducer, which is the standard composition of WLAN waveform generation software for MS2830A-020/021 Vector Signal Generator.

1.2 Product Configuration

1.2.1 Standard configuration

Table 1.2.2-1 lists the application parts for this application.

Table 1.2.1-1 Standard configuration

Item	Model Name/Symbol	Product Name	Q'ty	Remarks
Application	MX283027A -001	WLAN Test Software	1	
PC application	—	WLAN IQproducer	1	WLAN IQproducer license
Accessory	—	Installation CD-ROM	1	Application software, operation manual CD-ROM

1.2.2 Applicable parts

Table 1.2.2-1 lists the application parts for this application.

Table 1.2.2-1 Applicable parts

Model Name/Symbol	Product Name	Remarks
W3473AE	MX283027A-001 WLAN Test Software Operation Manual (Operation)	English, Printed Version
W3474AE	MX283027A-001 WLAN Test Software Operation Manual (Remote Control)	English, Printed Version
W3488AE	MX370111A/MX269911A WLAN IQproducer™ MX283027A-001 WLANTest Software Operation Manual (WLAN IQproducer™)	English, Printed Version

1.3 Specifications

Table 1.3-1 lists the specifications for this application.

Nominal values are not guaranteed.

When MS2830A is used, this software's specification is specified by the condition below, unless otherwise noted.

Attenuator Mode: Mechanical Atten Only

Table 1.3-1 Specifications

Items	Specifications
Target signal	IEEE 802.11a
Modulation/Frequency Measurement	
Measurement Frequency Range	5180 to 5320 MHz (Channel No.: 36 to 64) 5550 to 5700 MHz (Channel No.: 100 to 140) 5745 to 5825 MHz (Channel No.: 149 to 165)
Measured level range	–12 to +30 dBm (without MS2830A-045) −6 to +30 dBm (with MS2830A-045)
Carrier frequency accuracy	After CAL execution at 18º to 28ºC For a signal of Burst Length ≥ 250 µs ± (accuracy of reference frequency × carrier frequency + 16 Hz)
Residual Vector Error	After CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF ≤ 1.6 % (rms)
Transmitter power accuracy	After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB, The signal measured is within the measurement level range and less than or equal to Input Level. ±1.9 dB The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics.
Center frequency leak floor	≤ –50 dBc (Nominal)
Transmitter Spectrum Mask Dynamic Range	≥ 68 dB (at 11 MHz offset from the carrier frequency) ≥ 68 dB (at 20 MHz offset from the carrier frequency) ≥ 68 dB (at 30 MHz offset from the carrier frequency) The dynamic range refers to the transmitted power ratio against the specified frequency offset. It is applied if RBW = 100 kHz and Mixer Level = –19 to –14 dBm.

Table 1.3-1 Specifications (Continued)

Items	Specifications
Target signal	IEEE 802.11g ERP-OFDM
Modulation/Frequency Measurement	
Measurement Frequency Range	2412 to 2472 MHz (Channel No.: 1 to 13) 2484 MHz (Channel No.: 14)
Measured level range	−15 to +30 dBm (without MS2830A-045) −9 to +30 dBm (with MS2830A-045)
Carrier frequency accuracy	After CAL execution at 18º to 28ºC For a signal of Burst Length ≥ 250 µs ± (accuracy of reference frequency × carrier frequency + 13 Hz)
Residual Vector Error	After CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF ≤ 1.2 % (rms)
Transmitter power accuracy	After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB, The signal measured is within the measurement level range and less than or equal to Input Level. ±0.6 dB Excludes the noise floor effect and impedance mismatch error.
Center frequency leak floor	≤ –50 dBc (Nominal)
Transmitter Spectrum Mask Dynamic Range	≥ 68 dB (at 11 MHz offset from the carrier frequency) ≥ 68 dB (at 20 MHz offset from the carrier frequency) ≥ 68 dB (at 30 MHz offset from the carrier frequency) The dynamic range refers to the transmitted power ratio against the specified frequency offset. It is applied if RBW = 100 kHz and Mixer Level = –19 to –14 dBm.

Table 1.3-1 Specifications (Continued)

Items	Specifications
Target signal	IEEE 802.11g ERP-DSSS, IEEE 802.11b
Modulation/Frequency Measurement	
Measurement Frequency Range	2412 to 2472 MHz (Channel No.: 1 to 13) 2484 MHz (Channel No.: 14)
Measured level range	−15 to +30 dBm (without MS2830A-045) −9 to +30 dBm (with MS2830A-045)
Carrier frequency accuracy	After CAL execution at 18º to 28ºC For a signal of Burst Length ≥ 400 μs ± (accuracy of reference frequency × carrier frequency + 21 Hz)
Residual Vector Error	≤ 1.9 % rms The filter that has the same characteristics as that used for the measured signal is specified.
Transmitter power accuracy	After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB, The signal measured is within the measurement level range and less than or equal to Input Level. ±0.6 dB The transmitter power accuracy is obtained by an RSS (root summed square) error of the absolute amplitude accuracy and in-band frequency characteristics.
Center frequency leak floor	≤ –50 dBc (Nominal)
Transmitter Spectrum Mask Dynamic Range	≥ 68 dB (at 11 MHz offset from the carrier frequency) ≥ 68 dB (at 22 MHz offset from the carrier frequency) ≥ 68 dB (at 33 MHz offset from the carrier frequency) The dynamic range refers to the transmitted power ratio against the specified frequency offset. It is applied if RBW = 100 kHz and Mixer Level = –19 to –14 dBm.
Target signal	IEEE 802.11n HT Mixed, HT Greenfield MCS0 to MCS7 and MCS32 are supported (but STBC and MIMO are not).

Table 1.3-1 Specifications (Continued)

Items	Specifications
Modulation/Frequency Measurement	
Measurement Frequency Range	(2.4 GHz band) 2412 to 2472 MHz (Channel No.: 1 to 13) 2484 MHz (Channel No.: 14) (5 GHz band) 5180 to 5320 MHz (Channel No.: 36 to 64) 5550 to 5700 MHz (Channel No.: 100 to 140) 5745 to 5825 MHz (Channel No.: 149 to 165)
Measured level range	(2.4 GHz band) −15 to +30 dBm (without MS2830A-045) −9 to +30 dBm (with MS2830A-045) (5 GHz band) −12 to +30 dBm (without MS2830A-045) −6 to +30 dBm (with MS2830A-045)
Carrier frequency accuracy 20 MHz channel	After CAL execution at 18º to 28ºC, for a signal of Burst Length ≥ 250 µs ± (accuracy of reference frequency × carrier frequency + 13) Hz (2.4 GHz band) ± (accuracy of reference frequency × carrier frequency + 16) Hz (5 GHz band)
Carrier frequency accuracy 40 MHz channel	After CAL execution at 18º to 28ºC, for a signal of Burst Length ≥ 250 µs ± (accuracy of reference frequency × carrier frequency + 62) Hz (2.4 GHz band) ± (accuracy of reference frequency × carrier frequency + 102) Hz (5 GHz band)
Residual Vector Error 20 MHz channel	After CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF ≤1.2 % rms (2.4 GHz band) ≤1.6 % rms (5 GHz band)
Residual Vector Error 40 MHz channel	After CAL execution at 18º to 28ºC, Channel Estimation = SEQ, Phase Tracking = ON, and Amplitude Tracking = OFF ≤1.6 % rms (2.4 GHz band) ≤2.0 % rms (5 GHz band)
Transmitter power accuracy 20 MHz channel	After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB, The signal measured is within the measurement level range and less than or equal to Input Level. ±0.6 dB (2.4 GHz band) ±1.9 dB (5 GHz band) Excludes the noise floor effect and impedance mismatch error.
Transmitter power accuracy 40 MHz channel	After CAL execution at 18º to 28ºC, input attenuator ≥ 10 dB, The signal measured is within the measurement level range and less than or equal to Input Level. ±0.8 dB（2.4 GHz band） ±2.0 dB（5 GHz band） Excluding noise floor effects and impedance mismatch errors
Center frequency leak floor	≤ −50 dBc (Nominal)

Table 1.3-1 Specifications (Continued)

Items	Specifications
Transmitter Spectrum Mask Dynamic Range 20 MHz channel	2.4 GHz band ≥ 68 dB (at 11 MHz offset from the carrier frequency) ≥ 68 dB (at 20 MHz offset from the carrier frequency) ≥ 68 dB (at 30 MHz offset from the carrier frequency) 5 GHz band ≥ 68 dB (at 11 MHz offset from the carrier frequency) ≥ 68 dB (at 20 MHz offset from the carrier frequency) ≥ 68 dB (at 30 MHz offset from the carrier frequency) The dynamic range refers to the transmitted power ratio against the specified frequency offset.It is applied if RBW = 100 kHz and Mixer Level = –19 to –14 dBm.
Transmitter Spectrum Mask Dynamic Range 40 MHz channel	2.4 GHz band ≥ 60 dB (at 21 MHz offset from the carrier frequency) ≥ 69 dB (at 40 MHz offset from the carrier frequency) ≥ 69 dB (at 60 MHz offset from the carrier frequency) 5 GHz band ≥ 60 dB (at 21 MHz offset from the carrier frequency) ≥ 69 dB (at 40 MHz offset from the carrier frequency) ≥ 69 dB (at 60 MHz offset from the carrier frequency) The dynamic range refers to the transmitted power ratio against the specified frequency offset. It is applied if RBW = 100 kHz and Mixer Level = –19 to –14 dBm.
Reception Characteristic Test	
WLAN IQproducer	Comes with WLAN IQproducer as a standard composition.

Chapter 2 Preparation

This chapter describes the preparations required for using the application you are using. Refer to *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)* for common features of the MS2830A not included in this manual.

2.1 Part Names

This section describes the panel keys for operating this application and connectors used to connect external devices. For general points of caution, refer to *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)*.

2.1.1 Front panel

This section describes the front-panel keys and connectors.

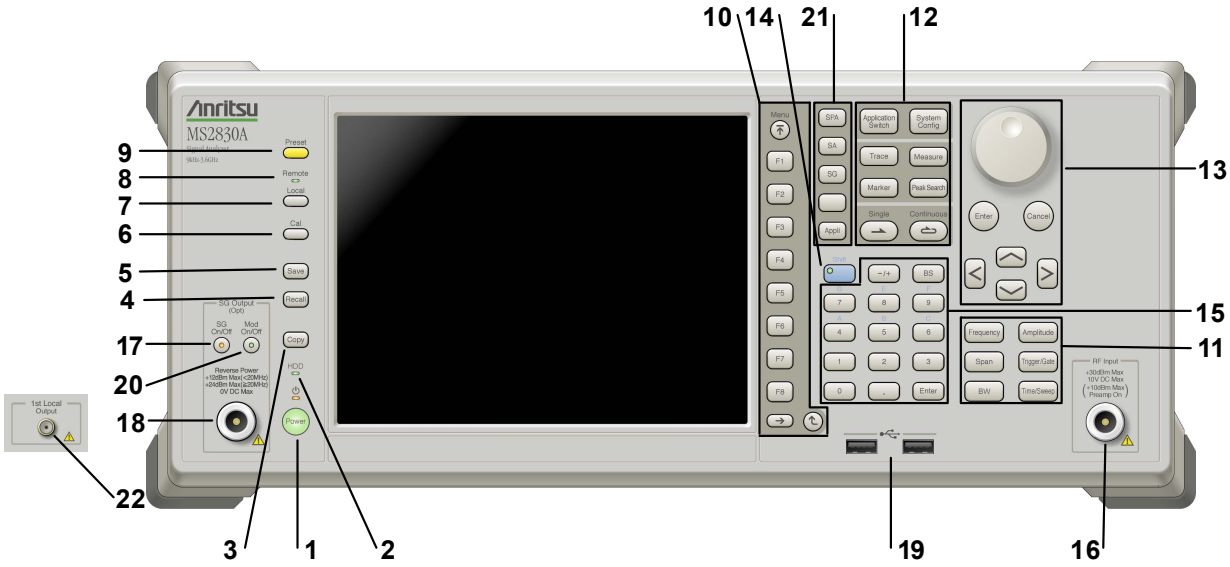
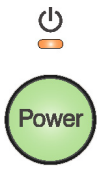


Figure 2.1.1-1 Front panel

1 

Power switch

Press to switch between the standby state (AC power supplied) and power-on state. The Power lamp lights orange at Standby and green at Power On. Press the power switch for about 2 seconds.

2 

Hard disk access lamp

Lights when accessing the internal hard disk

3 

Copy key

Press to capture display screen and save to file.

4 

Recall key

Press to recall parameter file.

5 

Save key

Press to save parameter file.

6 

Cal key

Press to display the Calibration menu.

7 

Local key

Press to return to local operation from remote control via GPIB, Ethernet, or USB (B), and enable panel settings.

8 

Remote lamp

Lights when in remote-control state.

9 

Preset key

Press to display the Preset menu. Resets parameters to initial settings.

10 

Function keys

Selects or configures function menu displayed on the right of the screen. The function menu is provided in multiple pages and layers.

The number on the bottom of the screen indicates the menu page number.

Next key

Press to go to the next page.

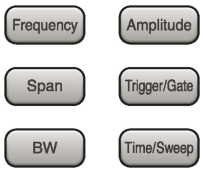
Back key

Press to go back to the previous layer within the function menu.

Top key

Press to go back to the uppermost (top) layer.

11



Main function keys 1

Press to set or execute main functions.

Executable functions vary with the current application.

Executable functions vary with the current application. When nothing happens with the press, it indicates that the application in use does not support the key.

Frequency Press to set frequency parameters.

Amplitude Press to set level parameters.

Span No function is assigned to this key.

Trigger/Gate Press to set trigger parameters

BW No function is assigned to this key.

Time/Sweep Press to set measurement item parameters.

12

Main function keys 2

Press to set or execute main functions.

Executable functions vary with the current application.

Executable functions vary with the current application. When nothing happens with the press, it indicates that the application in use does not support the key.

Application Switch Press to switch application.

System Config Press to display Configuration screen.

Trace Press to set the trace items or to switch the operation window.

Measure Press to set measurement item parameters.

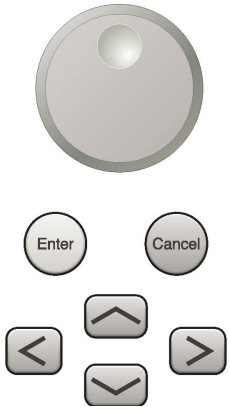
Marker Use when switching graph marker operation.

Peak Search Press to set parameters related to the peak search function.

Single Press to start single measurement.

Continuous Press to start continuous measurements.

13



Rotary knob/Cursor keys/Enter key/Cancel key

The rotary knob and cursor keys select display items or change settings.

Press Enter to set the entered or selected data.

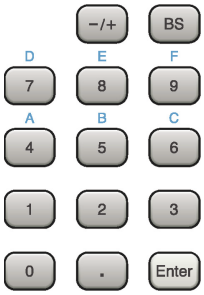
Cancel Press Cancel to cancel input or selected data.

14

Shift key

Operates keys with functions in blue characters on panel. Press the Shift key so the key lamp is green and then press the target key.

15



Numeric keypad

Enters numbers on parameter setup screens.

Press BS to delete the last entered digit or character.

[A] to [F] can be entered by pressing keys 4 to 9 while the Shift key lamp Shift is green.

16

RF Input connector

Inputs RF signal.

17

RF Output Control key

Press SG On/Off to switch on/off the modulation of RF signal when the Vector Signal Generator option is installed. The RF output control key lamp lights orange when the RF signal output is set to On.

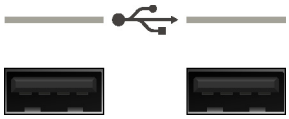
This is not available when the Option 044/045 is installed.

18

RF Output connector

Outputs RF signal, when the Vector Signal Generator option is installed.
This is not available when the Option 044/045 is installed.

19



USB connector (type A)

Connect the accessory USB keyboard, mouse or USB memory.

20

Modulation control key

Press 

to switch on/off the modulation of RF signal when the Vector Signal Generator option is installed. When modulation is on, the key lamp lights up green.
This is not available when the Option 044/045 is installed.

21 

Application key

Press to switch between applications.

SPA key

Press to display the Spectrum Analyzer main screen.

SA key

Press to display the Signal Analyzer main screen, when Option 005/105 and 006/106 are installed.

SG key

Press to display the Signal Analyzer main screen, when Vector Signal Generator option is installed.

Blank key

Not used.

Appli key

When Auto is specified, the application selected by using the Application Switch is displayed. When Manual is specified, the pre-specified Application is displayed.
For details, refer to 3.5.4 “Changing application layout” in *MS2830A Signal Analyzer Operation Manual (Mainframe Operation)*.

22 

1st Local Output connector

This is available when the Option 044/045 is installed.
Supplies local signal and bias current to the external mixer, and receives the IF signal with its frequency converted.

2.1.2 Rear panel

This section describes the rear-panel connectors.

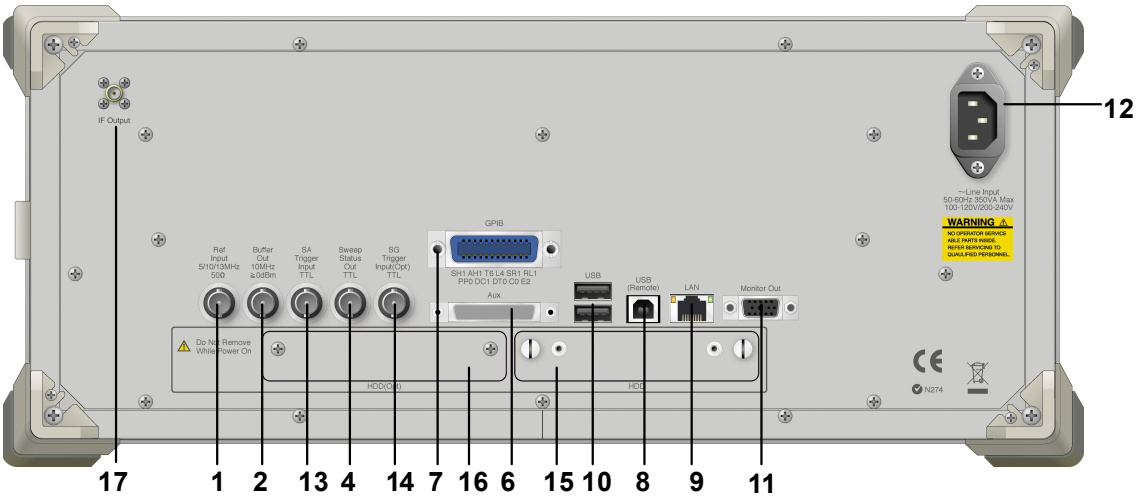


Figure 2.1.2-1 Rear panel

1 Ref Input 5/10/13MHz 50Ω

Ref Input connector (reference frequency signal input connector)

Inputs external reference frequency signal (5 MHz/10 MHz/13 MHz). It is for inputting reference frequency signals with higher accuracy than the instrument's internal reference signal, or for synchronizing the frequency of the mainframe to that of other equipment.

2 Buffer Out 10MHz ≧0dBm

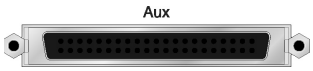
Buffer Out connector (reference frequency signal output connector)

Outputs the internal reference frequency signal (10 MHz)It is for synchronizing frequencies between other equipment and the mainframe.

4 Sweep Status Out TTL

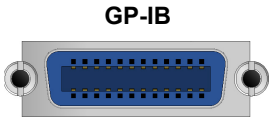
Sweep Status Out connector

Outputs signal when internal measurement is performed or measurement data is obtained.

6 

AUX connector

This is a complex connector for inputting an error rate measurement signal and inputting a baseband clock reference signal of the Vector Signal Generator (optional). See Table 2.1.2-1 for the internal pin assignment of the AUX connector.

7 

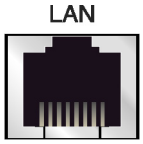
GPIB connector

For external control via GPIB

8 

USB connector (type B)

For external control via USB

9 

Ethernet connector

Connects PC or Ethernet network.

10 

USB connector (type A)

Used to connect a USB keyboard or mouse or the USB memory supplied.

11 

Monitor Out connector

Connects external display.

12 

AC inlet

Supplies power

13 SA Trigger Input TTL

SA Trigger Input connector

This is a BNC connector used to input the external trigger signal (TTL) for the SPA or SA application.

14 SG Trigger Input(Opt) TTL

SG Trigger Input connector

This is a BNC connector used to input the external trigger signal (TTL) for the vector signal generator option.

15 HDD

HDD slot

This is a standard hard disk slot.

16 HDD (Opt)

HDD slot for Option

This is a hard disk slot for the options.

Table 2.1.2-1 AUX connector

Function	Pin Number	Signal Name
SG	13	MARKER1
	11	GND
	38	MARKER2
	36	GND
	39	MARKER3
	16	GND
	42	PULS_MOD
	41	GND
	22	BB_REF_CLK
	20	GND

Do not connect anything to connectors not listed in Table 2.1.1-1, because they are interface connectors provided for device maintenance.

17 

IF output connector

Monitor output of the internal IF signal.

This is available when the Option 044/045 is installed.

2.2 Signal Path Setup

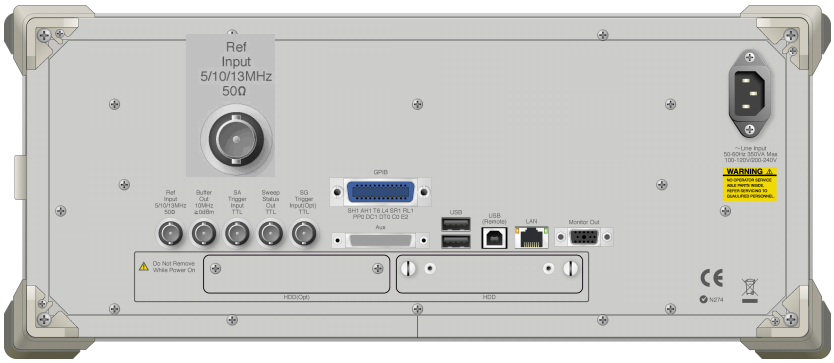
As shown in Figure 2.2-1, connect the mainframe and the DUT using an RF cable, so that the signal to be tested is input to the RF Input connector.

⚠ CAUTION

Do not input a signal that has an excessive level to MS2830A.

Figure 2.2-1 Signal path setup example

Set the 5 MHz/10 MHz/13 MHz reference signal from external sources, as required.



Reference frequency signal

Figure 2.2-2 External signal input

2.3 Application Startup and Selection

To use this application, it is necessary to load (start up) and select the application.

2.3.1 Launching application

The application startup procedure is described below.

Note:

The XXX indicates the application name currently in use.

■Procedure

1. Press System Config to display the Configuration screen.
2. Press F4 (Application Switch Settings) to display the Application Switch Registration screen.
3. Press F1 (Load Application Select), and move the cursor to "XXX" in the Unloaded Applications list.
   - If "XXX" is displayed in the **Loaded Applications** list, this means that the application is already loaded.
   - If "XXX" appears in neither the **Loaded Applications** nor **Unloaded Applications** list, this means that the application has not been installed.
4. Press F7 (Set) to load the application. If "XXX" is displayed in the **Loaded Applications list**, this means that the application is already loaded.

2.3.2 Selecting application

The selection procedure is described below.

■Procedure

1. Press Application Switch to display the Application Switch menu.
2. Press the menu function key displaying "XXX".
   - The application can also be selected with mouse, by clicking "XXX" on the task bar.

2.4 Initialization and Calibration

This section describes the parameter settings and the preparations required before starting measurement.

2.4.1 Initialization

After selecting this application, first perform initialization. Initialization should be performed in order to return the settable parameters to their default settings.

The initialization procedure is as follows.

■Procedure

1. Press Preset to display the Preset function menu.
2. Press F1 (Preset).

2.4.2 Calibration

Perform calibration before measurement. Calibration sets the level accuracy frequency characteristics for the input level to flat, and adjusts level accuracy deviation caused by internal temperature fluctuations. Calibration should be performed when first performing measurement after turning on power, or if beginning measurement when there is a difference in ambient temperature from the last time calibration was performed.

■Procedure

1. Press Cal to display the Application Cal function menu.
2. Press F1 (SIGANA All).

For details on calibration functionality only executable with the MS2830A, refer to *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)*.

Chapter 3 Measurement

This section describes the measurement function, the parameter contents and the setting methods for this application. Measurement parameters can be set and measurement can be performed just by using a remote command. For details about how to set the parameters described in this chapter and how to perform measurement, see the *MX283027A-001 WLAN Test Software Operation Manual (Remote Control)*.

3.1 Basic Operation

3.1.1 Screen layout

This section describes the screen layout of this application.

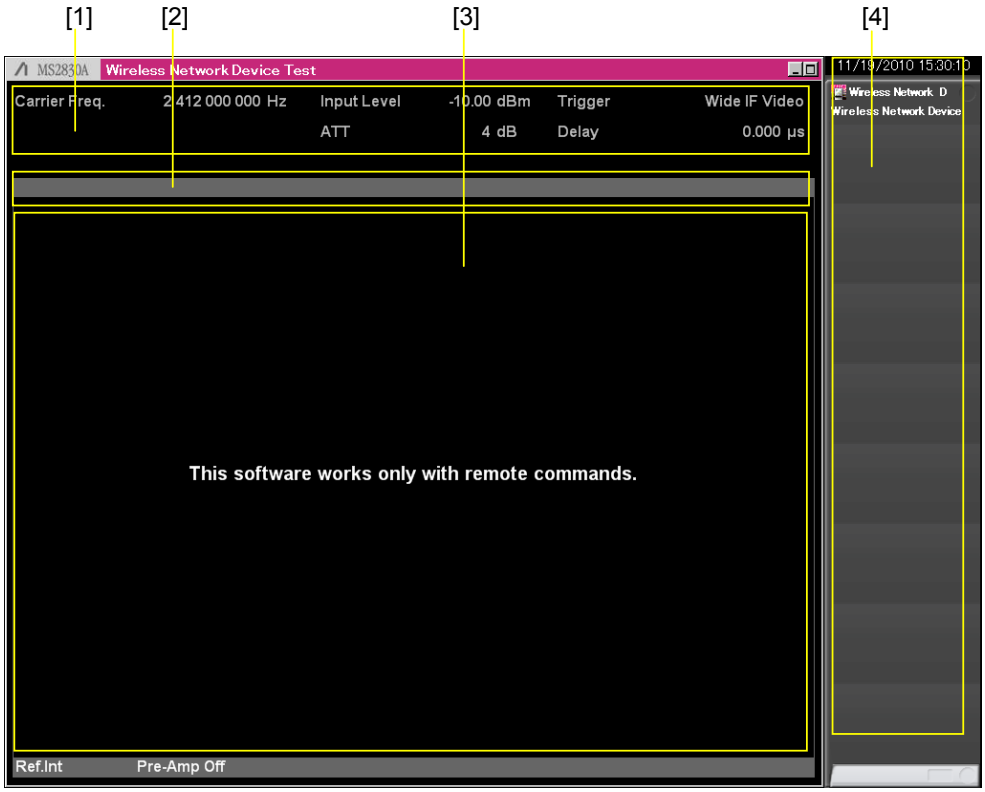


Figure 3.1.1-1 Screen layout

[1] Measurement parameter
Displays the specified parameter.

[2] Status message
Displays signal status.

[3] Result window
No result is displayed with this application.

[4] Function menu
Displays the functions executable with function keys.
Use this to save measurement results.

3.1.2 Performing measurement

There are two measurement modes: single and continuous. Measurement is performed once in the single measurement mode, and continuously in the continuous measurement mode.

Single Measurement

After capturing an input signal based upon the settings of Burst Interval, the selected measurement items are measured only for the measurement count (Storage Count) before measurement is stopped.

Remote Command:

```
:INITiate:MODE:SINGle
```

Continuous Measurement

Following capture of an input signal based on the settings of Burst Interval, the selected measurement items are continuously measured for the measurement count (Storage Count), and this procedure is repeated. Measurement continues even if parameters are changed or the window display is changed. Measurement stops if other applications are selected.

Remote Command:

```
:INITiate:CONTinuous OFF|ON|0|1
:INITiate:MODE:CONTinuous
```

3.2 Setting Frequency

Configures settings related to frequency.

Carrier Frequency

■Summary

Sets a carrier frequency.

■Setting range

100 MHz to Upper limit of the main unit

■Remote command

```
[:SENSe]:FREQuency:CENTer <freq>
```

Channel Number

■Summary

Sets the carrier frequency by channel number.

■Setting range

See Tables 3.2-1 and 3.2-2.

■Remote command

```
[:SENSe]:CWLan:CHANnel <integer>
```

Table 3.2-1 Channel number and center frequency (2.4 GHz band)

Channel Number	Center frequency [MHz]	Channel Number	Center frequency [MHz]
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442	14	2484

Table 3.2-2 Channel number and center frequency (5 GHz band)

Channel Number	Center frequency [MHz]	Channel Number	Center frequency [MHz]
36	5180	116	5580
40	5200	120	5600
44	5220	124	5620
48	5240	128	5640
52	5260	132	5660
56	5280	136	5680
60	5300	140	5700
64	5320	149	5745
100	5500	153	5765
104	5520	157	5785
108	5540	161	5805
112	5560	165	5825

3.3 Setting Level

Configures settings related to level.

Input Level

■Summary

Sets the input level from the target DUT.

■Setting range

(−60.00 + Offset Value) to (30.00 + Offset Value) dBm

■Remote command

```
[:SENSe]:POWer[:RF]:RANGe:ILEVel <real>
```

Offset

■Summary

This turns on/off the Offset function.

■Options

`ON|1`	Enables the offset function.
`OFF|0`	Disables the offset function.

■Remote command

```
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel:OFFSet:ST
ATe OFF|ON|1|0
```

Offset Value

■Summary

This sets the level correction coefficient.

■Setting range

−99.99 to 99.99 dB

■Setting example

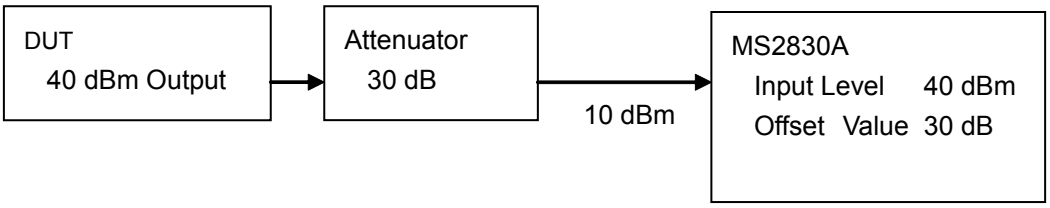


Figure 3.3-1 Input level and offset level setting example

■Remote command

```
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel:OFFSet
<rel_power>
```

3.4 Setting Common Items

This section describes the settings for the common items.

WLAN Standard

■Summary

Selects the WLAN communication standard of the measured signal.

■Options

W11A	Analyze as 802.11a signal.
W11B	Analyze as 802.11b signal.
WGOFdm	Analyze as 802.11g OFDM signal.
WGDSss	Analyze as 802.11g DSSS signal.
W11N	Analyze as 802.11n signal.

■Remote command

```
[:SENSe]:RADio:STANdard <mode>
```

Data Rate

■Summary

Selects the data rate of the measured signal when W11A or WGOFdm is specified for WLAN Standard. This setting is ignored if WLAN Standard is not W11A or WGOFdm.

■Options

AUTO	Auto-detects the modulation mode and analyze.
6MBPs	Sets BPSK 6 Mbps modulation mode for analysis.
9MBPs	Sets BPSK 9 Mbps modulation mode for analysis.
12MBPs	Sets QPSK 12 Mbps modulation mode for analysis.
18MBPs	Sets QPSK 18 Mbps modulation mode for analysis.
24MBPs	Sets 16QAM 24 Mbps modulation mode for analysis.
36MBPs	Sets 16QAM 36 Mbps modulation mode for analysis.
48MBPs	Sets 64QAM 48 Mbps modulation mode for analysis.
54MBPs	Sets 64QAM 54 Mbps modulation mode for analysis.

■Remote command

```
[:SENSe]:CWLan:EVM:DRATe <mode>
```

Modulation

■Summary

Selects the data rate of the measured signal when W11B or WGDSss is specified for WLAN Standard. This setting is ignored if WLAN Standard is not W11B or WGDSss.

■Options

AUTO	Auto-detects the modulation mode and analyze.
DSSS1	Sets DSSS 1 Mbps modulation mode for analysis.
DSSS2	Sets DSSS 2 Mbps modulation mode for analysis.
CC55	Sets CCK 5.5 Mbps modulation mode for analysis.
CC11	Sets CCK 11 Mbps modulation mode for analysis.

■Remote command

```
[:SENSe]:CWLan:EVM:DEMod <mode>
```

Preamble

■Summary

Sets the preamble format if the WLAN communication standard is 802.11b or 802.11g DSSS.

■Options

AUTO	Automatically detect the preamble format when performing analysis.
LONG	Assume the preamble format is Long when performing analysis.
SHORt	Assume the preamble format is Short when performing analysis.

■Remote command

```
[:SENSe]:CWLan:EVM:PREamble <mode>
```

PPDU Format

■Summary

Sets the PPDU format if the WLAN communication standard is 802.11n.

■Options

MIXed	Analyze as HT-Mixed
GREenfield	Analyze as HT-Greenfield

■Remote command

```
[:SENSe]:CWLan:EVM:PFORmat <mode>
```

Channel Bandwidth

■Summary

Sets the Channel Bandwidth for 802.11n.

■Options

20	Analyze as 20 MHz
40	Analyze as 40 MHz
40UPper	Analyze the upper 20 MHz of the 40 MHz band for 40 MHz Upper signals. At this time, the center frequency corresponds to the center of the 40 MHz band.
40Lower	Analyze the lower 20 MHz of the 40 MHz band for 40 MHz Lower signals. At this time, the center frequency corresponds to the center of the 40 MHz band.

■Remote command

```
[:SENSe]:CWLan:EVM:CBANdwidth <mode>
```

Burst Interval

■Summary

Sets Burst Interval of the target signal. The burst interval refers to the period from the start of a burst signal to the start of the next burst signal.

Note

Measurement can be performed as long as an interval longer than that of the burst signal output from the DUT is specified for this parameter. Note, however, that the longer the specified burst interval is, the longer the measurement time becomes. It is therefore recommended to specify an appropriate value according to the measurement signal.

■Setting range

The maximum value can be obtained by using the following procedure:

1) Calculate SMAX, which is the maximum value among the EVM Storage Count, Transmit Power Storage Count, Occupied Bandwidth Storage Count, and Transmit Spectrum Mask Storage Count.

2) Divide 2000 by SMAX, and round down the result to the first decimal place.

3) If the obtained result is 100 or greater, the maximum value is regarded as 100 ms.

If the obtained result is less than 100, the value is the maximum value (unit: ms).

Minimum value

The minimum value is the largest value among the following values. However, the upper limit is 0.2 ms.

"Analysis Length of Transmit Power"

"Analysis Length of Occupied Bandwidth"

"Analysis Length of Transmit Spectrum Mask"

"Sum of Analysis Offset and Analysis Length of EVM"

The calculation formula for obtaining the sum of Analysis Offset and Analysis Length of EVM differs depending on the WLAN communication standard.

Standards	Calculation Formula
802.11b or 802.11g DSSS	0.196 ms + (Analysis Offset + Analysis Length)/11000
802.11a or 802.11g OFDM	0.020 ms + 0.004 × (Analysis Offset+ Analysis Length)
802.11n	0.036 ms + 0.004 × (Analysis Offset+ Analysis Length)

■Remote command

```
[:SENSe]:CWLan:CAPTure:BURSt:INTerval <time>
```

Burst Threshold

■Summary

Sets Burst Threshold level for burst detection. The threshold level based on the floor noise level of captured signal is set here.

■Setting range

0 to 60 dB

■Remote command

```
[:SENSe]:CWLan:CAPTure:BURSt:THReshold <integer>
```

3.5 Setting Measurement Items

Sets measurement items.

3.5.1 Modulation analysis

Sets up EVM measurement.

Table 3.5.1-1 EVM measurement setting items

Menu Display	Function
EVM Measurement	Sets the EVM measurement to On/Off.
Storage Mode	Sets whether to enable averaging in EVM measurement.
Storage Count	Sets the number of EVM measurements.
Analysis Length Setup	Sets whether to set the length of the symbol to be measured manually or automatically.
Analysis Length	Sets the analysis length of EVM measurement.
Analysis Offset	Sets the EVM measurement start position.
EVM Calculation Method	Sets the reference used for the EVM measurement start position.
Channel Estimation	Sets the target of channel estimation.
Tracking	Sets whether to enable amplitude tracking and phase tracking.
Symbol Timing Adjust	Sets the timing of the FFT window during EVM measurement.
Filter	Sets the filter to be used for EVM calculation.
Alpha/BT	Sets the alpha value of the square-route Nyquist filter or the BT product of the Gauss filter.
Limits	Sets the limit value of EVM, etc.

EVM Measurement

■Summary

Sets the EVM measurement to On/Off.

■Options

On	Performs EVM measurement
Off	Does not perform EVM measurement

■Remote command

```
[:SENSe]:CWLan:EVM[:STATe] OFF|ON|0|1
```

Storage Mode

■Summary

Sets whether to enable averaging in EVM measurement.

■Options

On	Perform averaging the number of times specified by Storage Count.
Off	Do not perform averaging.

■Remote command

```
[:SENSe]:CWLan:EVM:AVERage[:STATe] OFF|ON|0|1
```

Note

This setting is applied to the items that belong to EVM measurement.

Storage Count

■Summary

Sets the number of EVM measurements. It sets the burst count to measure in EVM measurement.

■Setting range

2 to 200

■Remote command

```
[:SENSe]:CWLan:EVM:AVERage:COUNt <integer>
```

Note

This setting is applied to the items that belong to EVM measurement.

Analysis Length Setup

■Summary

Sets whether to set the length of the symbol to be measured manually or automatically. If automatic setting is specified, the burst length is obtained by decoding the SIGNAL field and analysis is performed until the end of the burst. However, for 802.11b and 802.11g DSSS, the Analysis Length Setup setting cannot be applied when the EVM Calculation Method `1KCPreamble` or `1K99` setting is selected.

■Options

ON The length of the symbol to be measured is set automatically.

OFF The length of the symbol to be measured must be set manually.

■Remote command

`[:SENSe]:CWLan:EVM:TIME:LENGth[:STATe]:AUTO OFF|ON|0|1`

Note

This setting is applied to the items that belong to EVM measurement.

Analysis Length

■Summary

Sets the analysis length of EVM measurement.

■Setting range

When WLAN Standard is 802.11a, 802.11g OFDM, or 802.11n:

1 symbol to 250 – Analysis Offset symbol, or (Burst Interval – 0.020) × 250 – Analysis Offset symbol, whichever smaller.

When WLAN Standard is 802.11b or 802.11g DSSS, and when EVM Calculation Method is PSDU:

1 chip to 45056 – Analysis Offset chip or (Burst Interval – 0.192) × 11000 – Analysis Offset chip, whichever smaller.

When WLAN Standard is 802.11b or 802.11g DSSS, and when EVM Calculation Method is 1KCPreamble or 1K99:

Cannot be set

When WLAN Standard is 802.11n:

1 symbol to 1370 – Analysis Offset symbol, or (Burst Interval – 0.036) × 250 – Analysis Offset symbol, whichever smaller.

■Remote command

[:SENSe]:CWLan:EVM:TIME:LENGth <integer>

Note

This setting is applied to the items that belong to EVM measurement.

Analysis Offset

■Summary

Sets the analysis start position. If the WLAN communication standard is 802.11a, 802.11g OFDM, or 802.11n, the analysis start position is based on the start of the PSDU. If the WLAN communication standard is 802.11b or 802.11g DSSS, the analysis start position is based on the start of the PLCP preamble when 1KCP or 1K99 is specified for EVM Calculation Method, and is based on the head of the PSUD when PSDU is specified for EVM Calculation Method.

■Setting range

When WLAN Standard is 802.11a, or 802.11g OFDM:

0 symbol to 250 symbol, or (Burst Interval – 0.020) × 250 symbol, whichever smaller.

When WLAN Standard is 802.11b or 802.11g DSSS, and when EVM Calculation Method is PSDU:

0 to 45,056 chips, or (Burst Interval – 0.192) × 11,000 chips, whichever is smaller, – 1

When WLAN Standard is 802.11b or 802.11g DSSS, and when EVM Calculation Method is 1KCPreamble or 1K99:

0 to 1,112 chips (when Preamble is Auto or Long)
56 chips (when Preamble is Short)

When WLAN Standard is 802.11n:

0 to 1,370 symbols, or (Burst Interval – 0.036) × 250 symbols, whichever is smaller, – 1

■Remote command

[:SENSe]:CWLan:EVM:TIME:OFFSet <integer>

EVM Calculation Method

■Summary

Sets the EVM measurement start position. When 1KCPreamble or 1K99 is specified, the measurement start position is based on the start of a burst signal, and the analysis length is fixed to 1,000 chips. When PSDU is specified, the measurement start position is based on the start of PSDU. This function is applied when 802.11b or 802.11g DSSS is selected.

■Options

`1KCPreamble`

The analysis start position is based on the start of a burst signal. The analysis length is fixed to 1,000 chips, regardless of the settings of Analysis Length and Analysis Length Setup. EVM is measured according to IEEE std 802.11-2007.

`1K99`

The analysis start position is based on the start of a burst signal. The analysis length is fixed to 1,000 chips, regardless of the settings of Analysis Length and Analysis Length Setup. EVM is measured according to IEEE std 802.11-1999.

`PSDU`

The analysis start position is based on the start of the PSDU.

■Remote command

```
[:SENSe]:CWLan:EVM:CMEThod PSDU|1KCPreamble|1K99
```

Channel Estimation

■Summary

Sets the target of channel estimation.

■Options

SEQ	The long training sequence is the target.
SDATa	All packets are targets.

■Remote command

```
[:SENSe]:CWLan:EVM:EQUalizer:TRAining <mode>
```

Amplitude Tracking

■Summary

Sets Amplitude Tracking On/Off.

■Options

OFF|0	Disables
ON|1	Enables

■Remote command

```
[:SENSe]:CWLan:EVM:TRACk:AMP OFF|ON|1|0
```

Phase Tracking

■Summary

Sets Phase Tracking On/Off.

■Options

OFF|0	Disables
ON|1	Enables

■Remote command

```
[:SENSe]:CWLan:EVM:TRACk:PHASe OFF|ON|1|0
```

Symbol Timing Adjustment

■Summary

Sets the timing of the FFT window during EVM measurement. The FFT window timing is set based on the center of the guard interval. Specify a value in steps of 1/40 MHz. This setting applies when the WLAN communication standard is 802.11a, 802.11g OFDM, or 802.11n.

■Setting range

−16 to 16

■Remote command

```
[:SENSe]:CWLan:EVM:TADJust <integer>
```

Filter Type

■Summary

Sets the reference filter used for EVM calculation. This setting applies if the WLAN communication standard is 802.11b or 802.11g DSSS.

■Options

NONE	No filter
GAUSsian	Gauss filter
RCOSine	Root Nyquist filter

■Remote command

```
[:SENSe]:CWLan:EVM:FILTer:REFerence <mode>
```

Alpha/BT

■Summary

Sets the alpha value of the square-root Nyquist filter or the BT product of the Gauss filter.

■Setting range

0.3 to 1.0

■Remote command

```
[:SENSe]:CWLan:EVM:FILTer:ALPHa <real>
```

EVM (rms) Limits

■Summary

Sets the EVM (rms) limit.

■Setting range

0.1 to 60.0 %

■Remote command

```
[:SENSe]:CWLan:EVM:LIMit[:UPPer]:DATA <real>
```

EVM (peak) Limits

■Summary

Sets the EVM (peak) limit.

■Setting range

0.1 to 1000.0 %

■Remote command

```
[:SENSe]:CWLan:EVM:LIMit[:UPPer]:PEAK <real>
```

Frequency Error Limits

■Summary

Sets the Frequency Error limit.

■Setting range

0.1 to 30.0 ppm

■Remote command

```
[:SENSe]:CWLan:EVM:LIMit:FERRor <real>
```

Transmitter Center Frequency Leakage Limits

■Summary

Sets the Transmitter Center Frequency Leakage limit. The transmit center frequency leakage is measured if the WLAN communication standard is 802.11a, 802.11g OFDM or 802.11n.

■Setting range

–60.0 to 0.0 dBm

■Remote command

```
[:SENSe]:CWLan:EVM:LIMit:CFLeakage <real>
```

IQ Offset Limits

■Summary

Sets the IQ Offset limit. The IQ offset is measured if the WLAN communication standard is 802.11b or 802.11g DSSS.

■Setting range

−60.0 to 0.0 dB

■Remote command

```
[:SENSe]:CWLan:EVM:LIMit:IQOFfset <real>
```

3.5.2 Transmit Power

Sets up transmission power measurement.

Table 3.5.2-1 Transmit output power setting items

Menu Display	Function
Transmit Power Measurement	Enables/disables the Transmit Power Measurement.
Storage Mode	Sets the storage mode in Transmit Power measurement.
Storage Count	Sets the number of burst signals to be measured during Transmit Power measurement.
Analysis Length	Sets the analysis length in Transmit Power measurement.
Preamble Search	Enables/disables Preamble Search.
Ramp Down Detection	Enables or disables the processing to detect the end of a burst signal by detecting ramp down.
Detection Offset	Adjusts the offset of the detected burst signal in the time direction.
Transmit Power Level Limit	Sets the limit of Transmit Power measurement.
Peak PSD Limits	Sets the limit of Peak PSD measurement.
Max Ramp Up Time	Sets the limit of Ramp Up Time measurement.
Max Ramp Down Time	Sets the limit of Ramp Down Time measurement.

Transmit Power Measurement

■Summary

Enables/disables the Transmit Power Measurement.

■Options

`ON` Performs Transmit Power Measurement.

`OFF` Does not perform Transmit Power Measurement.

■Remote command

```
[:SENSe]:CWLan:TXPower[:STATe] OFF|ON|0|1
```

Storage Mode

■Summary

Sets Storage Mode used in Transmit Power measurement.

■Options

`ON` Perform averaging the number of times specified by Storage Count.

`OFF` Do not perform averaging.

■Remote command

```
[:SENSe]:CWLan:TXPower:AVERage[:STATe] OFF|ON|0|1
```

Note

This setting is applied to the items that belong to Transmit Power measurement.

Storage Count

■Summary

Sets the number of burst signals to be measured during Transmit Power measurement.

■Setting range

2 to 200

■Remote command

```
[:SENSe]:CWLan:TXPower:AVERage:COUNt <integer>
```

Note

This setting is applied to the items that belong to Transmit Power measurement.

Analysis Length

■Summary

Sets the analysis length manually. The measurement start position is the start of a burst signal.

■Setting range

100.0 to 7000.0 µs, or Burst Interval, whichever smaller.

■Remote command

`[:SENSe]:CWLan:TXPower:TIME:LENGth <time>`

Note

This setting is applied to the items that belong to Transmit Power measurement. In addition, it is applied only if both Preamble Search and Ramp Down Detection are OFF. For the relationship between Analysis Length and the other parameters, see Table 3.5.2-2.

Preamble Search

■Summary

Enables/disables Preamble Search. If ON is specified, the start of a burst signal is detected in synchronization with the preamble.For the relationship between Preamble Search and the other parameters, see Table 3.5.2-2. When performing measurement with this parameter set to ON, be sure to adjust the burst size so that it is at least 100 µs.

■Options

ON	Performs Preamble Search.
OFF	Does not perform Preamble Search.

■Remote command

```
[:SENSe]:CWLan:TXPower:TIME:PSEarch OFF|ON|0|1
```

Table 3.5.2-2 Relationship between the Transmit Power measurement operation and the settings of Preamble Search and Ramp Down Detection

Preamble Search Setting	Ramp Down Detection Setting	Details of Transmit Power measurement
On	On	The rising of a burst signal is detected in synchronization with the preamble. The falling of a burst signal is detected upon detection of ramp down within ±10 µs of the burst length that is obtained from the SIGNAL analysis result.
	Off	The rising of a burst signal is detected in synchronization with the preamble. The falling of a burst signal is detected from the burst length derived from the data length that is obtained from the SIGNAL analysis result. In this event, the detection is independent of ramp down.
Off	On	The rising of a burst signal is detected upon detection of ramp up. In this event, the detection is not synchronized with the preamble. The falling of a burst signal is detected upon detection of ramp down.
	Off	The rising of a burst signal is detected upon detection of ramp up. The falling of a burst signal is detected based on the value specified for Analysis Length, independent of ramp down.

Ramp Down Detection

■Summary

Enables or disables the processing to detect the end of a burst signal by detecting ramp down. For the relationship between Ramp Down Detection and the other parameters, see Table 3.5.2-2.

■Options

ON	Performs Ramp Down Detection.
OFF	Does not perform Ramp Down Detection.

■Remote command

```
[:SENSe]:CWLan:TXPower:TIME:RDDetection OFF|ON|0|1>
```

Detection Offset

■Summary

Adjusts the offset of the detected burst signal in the time direction. This parameter is used to adjust the timing when the rising of a burst signal is gradual or stepwise.

■Setting range

−2.0 to 2.0 µs

■Remote command

```
[:SENSe]:CWLan:TXPower:TIME:DOFFset <time>
```

Transmit Power Level Limit

■Summary

Sets the limit of Transmit Power measurement.

■Setting range

−40.0 to +30.0 dB

■Remote command

```
[:SENSe]:CWLan:TXPower:LIMit:TPOWer <ampl>
```

Peak PSD Limit

■Summary

Sets the limit of Peak PSD measurement.

■Setting range

–56.0 to +14.0 dB

■Remote command

```
[:SENSe]:CWLan:TXPower:LIMit:PSDensity <ampl>
```

Max Ramp Up Time

■Summary

Sets the limit of Ramp Up Time. This function is applied when 802.11b or 802.11g DSSS is selected.

■Setting range

0.1 to 10.0 µs

■Remote command

```
[:SENSe]:CWLan:PVTime:LIMit:URTime <time>
```

Max Ramp Down Time

■Summary

Sets the limit of Ramp Down Time. This function is applied when 802.802.11b or 802.11g DSSS is selected.

■Setting range

0.1 to 10.0 µs

■Remote command

```
[:SENSe]:CWLan:PVTime:LIMit:DRTime <time>
```

3.5.3 Occupied Bandwidth Measurement (OBW)

Measures Occupied Bandwidth (OBW).

Table 3.5.3-1 Occupied Bandwidth measurement setting items

Menu Display	Function
Occupied Bandwidth Measurement	Enables/disables Occupied Bandwidth measurement.
Storage Mode	Sets the storage mode for Occupied Bandwidth measurement.
Storage Count	Sets the burst count for Occupied Bandwidth measurement.
Analysis Length Setup	Enables/disables the auto analysis length setup.
Analysis Length	Sets the analysis length for Occupied Bandwidth measurement.
Analysis Offset	Sets the analysis offset for Occupied Bandwidth measurement.
Preamble Search	Enables/disables Preamble Search.
Resolution Bandwidth	Sets RBW.
Detection	Sets detection mode.
Occupied Bandwidth Percent	Sets resolution bandwidth for OBW measurement.
OBW Limits	Sets limit value for OBW measurement.

Occupied Bandwidth Measurement

■Summary

Enables/disables Occupied Bandwidth measurement.

■Options

On	Performs Occupied Bandwidth measurement.
Off	Does not perform Occupied Bandwidth measurement.

■Remote command

```
[:SENSe]:CWLan:OBWidth[:STATe] OFF|ON|0|1
```

Storage Mode

■Summary

Sets the storage mode for Occupied Bandwidth measurement.

■Options

OFF	Does not perform storage processing.
AVERage	The average value is measured.
MAXHold	Holds maximum value.

■Remote command

```
[:SENSe]:CWLan:OBWidth:STORage:MODE
OFF|AVERage|MAXHold
```

Note

This setting is applied to the items that belong to Occupied Bandwidth measurement. In response to a measurement result query command such as READ, MEASure, and FETCh, a valid value is returned for average and an invalid value is returned for max if AVER is selected. In contrast, if MAXHold is selected, a valid value is returned for max and invalid value is returned for average.

Storage Count

■Summary

Sets the burst count for Occupied Bandwidth measurement.

■Setting range

2 to 200

■Remote command

```
[:SENSe]:CWLan:OBWidth:AVERage:COUNt <integer>
```

Note

This setting is applied to the items that belong to Occupied Bandwidth measurement.

Analysis Length Setup

■Summary

Sets whether to set the analysis length manually or automatically. When performing measurement with this parameter set to ON, be sure to adjust the burst size so that it is at least 100 µs.

■Options

OFF|0	Manual setting
ON|1	Automatic setting

■Remote command

```
[:SENSe]:CWLan:OBWidth:TIME:LENGth[:STATe]:AUTO
OFF|ON|1|0
```

Analysis Length

■Summary

Sets the analysis length for Occupied Bandwidth measurement.

■Setting range

100.0 to 7000.0 µs, or Burst Interval, whichever smaller.

■Remote command

```
[:SENSe]:CWLan:OBWidth:TIME:LENGth <time>
```

Note

This setting is applied to the items that belong to Occupied Bandwidth measurement.

Analysis Offset

■Summary

Sets the analysis offset for Occupied Bandwidth measurement. The measurement start position is based on the start of a burst signal.

■Setting range

–1000.0 to 1000.0 µs

■Remote command

```
[:SENSe]:CWLan:OBWidth:TIME:OFFSet <time>
```

Note

This setting is applied to the items that belong to Occupied Bandwidth measurement.

Preamble Search

■Summary

Enables/disables Preamble Search. If ON is specified, the start of a burst signal is detected in synchronization with the preamble.

■Options

ON	Performs Preamble Search.
OFF	Does not perform Preamble Search.

■Remote command

```
[:SENSe]:CWLan:OBWidth:TIME:PSEarch <mode>
```

Resolution Bandwidth

■Summary

Sets resolution bandwidth for OBW measurement.

■Options

30	30 kHz
100	100 kHz
300	300 kHz

■Remote command

```
[:SENSe]:CWLan:OBWidth:BWIDth[:RESolution] <freq>
```

Detection

■Summary

Sets the detection mode in the Occupied Bandwidth measurement.

■Options

POSitive	Positive Peak detection (Default)
RMS	RMS detection

■Remote command

```
[:SENSe]:CWLan:OBWidth:DETector[:FUNCtion] POSitive|
RMS
```

Occupied Bandwidth Percent

■Summary

Sets the occupancy rate in OBW measurement.

■Options

99	99%
90	90%

■Remote command

```
[:SENSe]:CWLan:OBWidth:PERCent <ratio>
```

OBW Limit

■Summary

Sets limit value for OBW measurement.

■Setting range

10.0 to 50.0 MHz

■Remote command

```
[:SENSe]:CWLan:OBWidth:LIMit[:UPPer]:DATA
<bandwidth>
```

3.5.4 Transmit Spectrum Mask measurement

Sets Transmit Spectrum Mask settings.

Table 3.5.4-1 Transmit Spectrum Mask measurement setting items

Menu Display	Function
Transmit Spectrum Mask Measurement	Enables/disables the Transmit Spectrum Mask measurement.
Storage Mode	Sets the storage mode for Transmit Spectrum Mask measurement.
Storage Count	Sets the burst count for Transmit Spectrum Mask measurement.
Analysis Length Setup	Enables/disables the auto analysis length setup.
Analysis Length	Sets the analysis length for Transmit Spectrum Mask measurement.
Analysis Offset	Sets the analysis offset for Transmit Spectrum Mask measurement.
Preamble Search	Enables/disables Preamble Search.
Detection	Sets detection mode.
Limits	Sets limit value for Transmit Spectrum Mask measurement.

Transmit Spectrum Mask Measurement

■Summary

Enables/disables the Transmit Spectrum Mask measurement.

■Options

`On` Performs Transmit Spectrum Mask measurement.

`Off` Does not perform Transmit Spectrum Mask measurement.

■Remote command

`[:SENSe]:CWLan:TOSPectrum[:STATe] OFF|ON|0|1`

Storage Mode

■Summary

Sets the storage mode for Transmit Spectrum Mask measurement.

■Options

OFF	Does not perform storage processing.
AVER	The average value is measured.
MAXH	Holds maximum value.

■Remote command

```
[:SENSe]:CWLan:TOSPectrum:STORage:MODE
OFF|AVERage|MAXHold
```

Storage Count

■Summary

Sets the burst count for Transmit Spectrum Mask measurement.

■Setting range

2 to 200

■Remote command

```
[:SENSe]:CWLan:TOSPectrum:AVERage:COUNt <integer>
```

Note

This setting is applied to the items that belong to Transmit Spectrum Mask measurement.

Analysis Length Setup

■Summary

Sets whether to set the analysis length manually or automatically. When performing measurement with this parameter set to ON, be sure to adjust the burst size so that it is at least 100 µs.

■Options

OFF|0	Manual setting
ON|1	Automatic setting

■Remote command

```
[:SENSe]:CWLan:TOSPectrum:TIME:LENGth[:STATe]:AUTO
OFF|ON|0|1
```

Analysis Length

■Summary

Sets the analysis length for Transmit Spectrum Mask measurement.

■Setting range

100.0 to 7000.0 µs, or Burst Interval, whichever smaller.

■Remote command

```
[:SENSe]:CWLan:TOSPectrum:TIME:LENGth <time>
```

Note

This setting is applied to the items that belong to Transmit Spectrum Mask measurement.

Analysis Offset

■Summary

Sets the analysis offset for Transmit Spectrum Mask measurement. The measurement start position is based on the start of a burst signal.

■Setting range

–1000.0 to 1000.0 µs

■Remote command

```
[:SENSe]:CWLan:TOSPectrum:TIME:OFFSet <time>
```

Note

This setting is applied to the items that belong to Transmit Spectrum Mask measurement.

Preamble Search

■Summary

Enables/disables Preamble Search. If ON is specified, the start of a burst signal is detected in synchronization with the preamble.

■Options

`ON|1`	Performs Preamble Search.
`OFF|0`	Does not perform Preamble Search.

■Remote command

```
[:SENSe]:CWLan:TOSPectrum:TIME:PSEarch OFF|ON|0|1
```

Detection

■Summary

Sets the detection mode for Transmit Spectrum Mask measurement.

■Options

POSitive	Positive peak detection
RMS	RMS detection

■Remote command

```
[:SENSe]:CWLan:TOSPectrum:DETector[:FUNCtion]
POSitive| RMS
```

Limit Level

■Summary

This command sets the maximum relative levels of the start frequency and terminal frequency for Offset 1 to Offset 4 in Transmit Spectrum Mask measurement. The frequency of Offset 1 to 4 depends on the setting of WLAN Standard, and cannot be set directly.

■Remote command

```
:CALCulate:CWLan:TOSPectrum:LIMit:DATA
<rel_ampl_S1>,<rel_ampl_E1>,<rel_ampl_S2>,<rel_ampl
_E2>,<rel_ampl_S3>,<rel_ampl_E3>,<rel_ampl_S4>,<rel
_ampl_E4>
```

Note

When the WLAN communication standard is 802.11a or 802.11g OFDM, the range of Offset 1, 2, 3, and 4 is 9 to 11 MHz, 11 to 20 MHz, 20 to 30 MHz, and 30 to 40 MHz, respectively, and VBW is 30 kHz.

When the WLAN communication standard is 802.11b or 802.11g DSSS, the range of Offset 1, 2, 3, and 4 is 11 to 22 MHz, 22 to 33 MHz, 33 to 33 MHz, and 33 to 33 MHz, respectively, and VBW is 100 kHz.

When the WLAN communication standard is 802.11n 20MHz, the range of Offset 1, 2, 3, and 4 is 9 to 11 MHz, 11 to 20 MHz, 20 to 30 MHz, and 30 to 40 MHz, respectively, and VBW is 30 kHz.

When the WLAN communication standard is 802.11n 20 MHz, the range of Offset 1, 2, 3, and 4 is 9 to 11 MHz, 11 to 20 MHz, 20 to 30 MHz, and 30 to 40 MHz, respectively, and VBW is 30 kHz. Table 3.5.4-2 shows the parameters fixed for Transmit Spectrum Mask measurement.

Table 3.5.4-2 Transmit Spectrum Mask measurement parameters

WLAN Standard	Offset [MHz]				RBW [kHz]	VBW [kHz]
	1	2	3	4		
802.11a, 802.11g OFDM	9 to 11	11 to 20	20 to 30	30 to 40	100	30
802.11b, 802.11g DSSS	11 to 22	22 to 33	-	-	100	100
802.11n 20MHz	9 to 11	11 to 20	20 to 30	30 to 40	100	30
802.11n 40MHz	19 to 21	21 to 40	40 to 60	-	100	30

3.6 Setting Trigger

Configures settings of a trigger.

Trigger Switch

■Summary

This sets the trigger synchronization On/Off.

■Options

ON|1	Enables the trigger function.
OFF|0	Disables the trigger function.

■Remote command

```
:TRIGger[:SEQuence][:STATe] OFF|ON|1|0
```

Trigger Source

■Summary

This sets the trigger source.

■Options

EXTernal	Measurement starts with external trigger signal input.
IMMediate	Free run
SG	Starts measurement by the timing of internal Vector Signal Generator option.
WIF|RFBurst	Measurement starts upon Wideband IF detection (Wide IF Video).

■Remote command

```
:TRIGger[:SEQuence]:SOURce <mode>
```

Trigger Slope

■Summary

Sets the trigger polarity.

■Options

POSitive	Synchronizes with rising edge of the trigger.
NEGative	Synchronizes with falling edge of the trigger.

■Remote command

```
TRIGger[:SEQuence]:SLOPe <mode>
```

Wide IF Trigger Level

■Summary

Sets the trigger Level for the Wide IF trigger.

■Setting range

–60 to 50 dBm

■Remote command

```
:TRIGger[:SEQuence]:WIF|:RFBurst:LEVel:ABSolute
<ampl>
```

Trigger Delay

■Summary

Sets the trigger delay.

■Setting range

–2 to +2 s

■Remote command

```
:TRIGger[:SEQuence]:DELay <time>
```

3.7 EVM Measurement Result

Displays EVM analysis results. The result of each analysis is displayed if the storage mode is disabled (Off), and the average and maximum of the analysis results are displayed if the mode is enabled (On).
Table 3.7-1 lists the responses that are returned when the query command `:FETCh:CWLan[n]?`, `:READ:CWLan[n]?`, or `:MEASure:CWLan[n]?` is issued if `n` of each command is specified as 1 or 4, or omitted. The numbers in the No. row indicate the order of responses if `n` is specified as 1 or omitted.

Table 3.7-1 Response for EVM result query

No.	Response
55	EVM rms (average) (%)
56	EVM rms (max) (%)
57	EVM peak (max) (%)
58	EVM rms (average) (dB)
59	EVM rms (max) (dB)
60	EVM peak (max) (dB)
61	Pass/Fail flag of EVM rms (average)
62	Pass/Fail flag of EVM rms (max)
63	Pass/Fail flag of EVM peak (max)
64	Frequency Error (average) (Hz)
65	Frequency Error (max) (Hz)
66	Frequency Error (average) (ppm)
67	Frequency Error (max) (ppm)
68	Pass/Fail flag of Frequency Error (average)
69	Pass/Fail flag of Frequency Error (max)
70	Center Frequency Leakage (average) (dB)
71	Center Frequency Leakage (max) (dB)
72	Pass/Fail flag of Center Frequency Leakage (average)
73	Pass/Fail flag of Center Frequency Leakage (max)
74	IQ Offset (average) (dB)
75	IQ Offset (max) (dB)
76	Pass/Fail flag of IQ Offset (average)
77	Pass/Fail flag of IQ Offset (max)
78	Pass/Fail flag of Spectrum Flatness
79	IQ Gain Imbalance (average) (dB)
80	IQ Gain Imbalance (max) (dB)
81	Quadrature Error (average) (deg.)
82	Quadrature Error (max) (deg.)

Table 3.7-1 Response for EVM result query (Continued)

83	Symbol Clock Error (average)
84	Symbol Clock Error (max)
85	Pass/Fail flag of Symbol Clock Error (average)
86	Pass/Fail flag of Symbol Clock Error (max)
87	Chip Clock Error (average)
88	Chip Clock Error (max)
89	Pass/Fail flag of Chip Clock Error (average)
90	Pass/Fail flag of Chip Clock Error (max)
91	Count of Modulation Accuracy Measurements

EVM rms (average)

■Summary

Displays the root mean square EVM, which is calculated on the time axis in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method.
The results are returned as a percentage and in dB units.

EVM rms (max)

■Summary

Displays the maximum root mean square EVM out of the values that are calculated on the time axis in the range determined by Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.
The results are returned as a percentage and in dB units.

EVM peak (max)

■Summary

Displays the maximum EVM out of all symbols (all subcarriers and all symbols in the case of OFDM) that are calculated on the time axis in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method.
The results are returned as a percentage and in dB units.

Pass/Fail flag of EVM rms (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by EVM (rms) Limits.

Pass/Fail flag of EVM peak (max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by EVM (peak) Limits.

Frequency Error (average)

■Summary

Displays the average frequency error in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, and Analysis Offset.
The results are returned in Hz units and in ppm units.

Frequency Error (max)

■Summary

Displays the maximum frequency error out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, and Analysis Offset, for the number of burst signals specified by Storage Count. An invalid value is displayed if the storage mode is disabled (Off).
The results are returned in Hz units and in ppm units.

Pass/Fail flag of Frequency Error (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by Frequency Error Limits.

Center Frequency Leakage (average)

■Summary

Displays the average carrier frequency leakage in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method.

Center Frequency Leakage (max)

■Summary

Displays the maximum carrier frequency leakage out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Pass/Fail flag of Center Frequency Leakage (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by Transmitter Center Frequency Leakage Limits.

IQ Offset (average)

■Summary

Displays the average IQ offset in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method.

■Conversion for carrier suppression measurement

In IEEE802.11-2007, carrier suppression measurement is defined as using a bit string consisting of a repetition of 01 as the payload data used to measure signals that are modulated using DQPSK with scramble off. When such scramble off signals are swept by an RBW of 100 kHz, the spectrum has multiple peaks. The ratio of the maximum sinx/x to which these peaks are extrapolated to the sum of all peaks is about –9 dB. The reference of IQ Offset is the power of the target signal, and for the scramble off signals described above, this corresponds to the sum of all peaks.

Therefore, the carrier suppression can be estimated as follows using the IQ Offset obtained from the measurement, regardless of whether scramble is on or off.

Carrier Suppression = IQ Offset + 9 dB

IQ Offset (max)

■Summary

Displays the maximum IQ Offset out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, and Analysis Offset, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Pass/Fail flag of IQ Offset (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by IQ Offset Limits.

Pass/Fail flag of Spectrum Flatness

■Summary

The average spectrum flatness in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, and Analysis Offset is calculated, and then separated into several segments. Next, Pass/Fail judgment is performed for each segment, and the result is displayed. An invalid value is displayed if the WLAN communication standard is 802.11b or 802.11g DSSS.

■About segments

(i) For 802.11a or 802.11g OFDM:
Segment A consists of Subcarrier – 16 to Subcarrier – 1 and Subcarrier + 1 to Subcarrier + 16.
Segment B consists of Subcarrier – 26 to Subcarrier – 17 and Subcarrier + 17 to Subcarrier + 26.

(ii) For 802.11n and 20 MHz:
Segment A consists of Subcarrier – 16 to Subcarrier – 1 and Subcarrier + 1 to Subcarrier + 16.
Segment B consists of Subcarrier – 28 to Subcarrier – 17 and Subcarrier + 17 to Subcarrier + 28.

(iii) For 802.11n, 40 MHz, and MCS ≠ 32:
Segment A consists of Subcarrier – 42 to Subcarrier – 2 and Subcarrier + 2 to Subcarrier + 42.
Segment B consists of Subcarrier – 58 to Subcarrier – 43 and Subcarrier + 43 to Subcarrier + 58.

(iv) For 802.11n and MCS = 32:
Segment A consists of Subcarrier – 42 to Subcarrier – 33, Subcarrier – 31 to Subcarrier – 6, Subcarrier + 6 to Subcarrier + 31, and Subcarrier + 33 to Subcarrier + 42.
Segment B consists of Subcarrier – 58 to Subcarrier – 43 and Subcarrier + 43 to Subcarrier + 58.

■Judgment

(1) The average is calculated from the power of subcarriers in segment A , and the result is taken as the reference power.

(2) If any power deviation of the subcarriers in Segment A from the reference power exceeds ±2 dB, it is judged as Fail.

(3) If any power deviation of the subcarriers in Segment B from the reference power is greater than +2 dB or less than –2 dB, it is judged as Fail.

(4) If no power deviation is judged as Fail in (2) and (3), it is judged as Pass.

IQ Gain Imbalance (average)

■Summary

Displays the average IQ gain imbalance in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method.

IQ Gain Imbalance (max)

■Summary

Displays the maximum IQ gain imbalance out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, and Analysis Offset, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Quadrature Error (average)

■Summary

Displays the average quadrature error in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and EVM Calculation Method.

Quadrature Error (max)

■Summary

Displays the maximum quadrature error out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, and Analysis Offset, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Symbol Clock Error (average)

■Summary

Displays the average symbol clock error in the range determined by Storage Mode and Storage Count.

Symbol Clock Error (max)

■Summary

Displays the maximum symbol clock error out of the values that are calculated for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Pass/Fail flag of Symbol Clock Error (average or max)

■Summary

Returns the Pass/Fail result of Symbol Clock Error.

Chip Clock Error (average)

■Summary

Displays the average chip clock error in the range determined by Storage Mode and Storage Count. An invalid value is displayed if EVM Calculation Method is `1KCPreamble` or `1K99`.

Chip Clock Error (max)

■Summary

Displays the maximum chip clock error out of the values that are calculated for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off. The value is invalid when EVM Calculation Method is `1KCPreamble` or `1K99`.

Pass/Fail flag of Chip Clock Error (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by Chip Clock Error Limits.

Count of Modulation Accuracy Measurements

■Summary

Returns the number of burst signals measured in EVM measurement.

3.8 Transmit Power Measurement Result

Displays Transmit Power Measurement Result. The result of each analysis is displayed if the storage mode is disabled (Off), and the average and maximum of the analysis results are displayed if the mode is enabled (On). Table 3.8-1 lists the responses that are returned when the query command `:FETCh:CWLan[n]?`, `:READ:CWLan[n]?`, or `:MEASure:CWLan[n]?` is issued if `n` of each command is specified as 1 or 2, or omitted. The numbers in the No. row indicate the order of responses if `n` is specified as 1 or omitted.

Table 3.8-1 Response for Transmit Power result query

No.	Response
1	Transmit Power (average) (dBm)
2	Transmit Power (max) (dBm)
3	Pass/Fail flag of Transmit Power (average)
4	Pass/Fail flag of Transmit Power (max)
5	Peak PSD (average) (dBm/MHz)
6	Peak PSD (max) (dBm/MHz)
7	Pass/Fail flag of Peak PSD (average)
8	Pass/Fail flag of Peak PSD (max)
9	Power-on Ramp Time (average) (µs)
10	Power-on Ramp Time (max) (µs)
11	Power-down Ramp Time (average) (µs)
12	Power-down Ramp Time (max) (µs)
13	Pass/Fail flag of overall Ramp (average)
14	Pass/Fail flag of overall Ramp (max)
15	Pass/Fail flag of Power-on Ramp (average)
16	Pass/Fail flag of Power-on Ramp (max)
17	Pass/Fail flag of Power-down Ramp (average)
18	Pass/Fail flag of Power-down Ramp (max)
19	Count of Transmit Power Measurements

Transmit Power (average)

■Summary

Displays the average transmit power, which is calculated on the time axis in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset.

Transmit Power (max)

■Summary

Displays the maximum transmit power out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Pass/Fail flag of Transmit Power (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by Transmit Power Level Limit.

Peak PSD (average)

■Summary

Displays the peak PSD, which is calculated on the time axis in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset. The RBW is 1 MHz.

Peak PSD (max)

■Summary

Displays the maximum peak PSD out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off. The RBW is 1 MHz.

Pass/Fail flag of Peak PSD (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by Peak PSD Limit.

Power-on Ramp Time (average)

■Summary

Displays the power-on ramp time, which is calculated on the time axis in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset.

Power-on Ramp Time (max)

■Summary

Displays the maximum power-on ramp time out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Pass/Fail flag of Power-on Ramp (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by Max Ramp Up Time.

Power-down Ramp Time (average)

■Summary

Displays the power-down ramp time, which is calculated on the time axis in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset.

Power-down Ramp Time (max)

■Summary

Displays the maximum power-down ramp time out of the values that are calculated in the range determined by Storage Mode, Storage Count, Analysis Length, Preamble Search, Ramp Down Detection, and Detection Offset, for the number of burst signals specified by Storage Count. The value is invalid when Storage Mode is Off.

Pass/Fail flag of Power-down Ramp Time (average or max)

■Summary

Returns the result of Pass/Fail judgment performed for the limit value specified by Max Ramp Down Time.

Pass/Fail flag of overall Ramp (average or max)

■Summary

Returns Pass if the Pass/Fail judgment results for both Power-on Ramp Time and Power-down Ramp Time are Pass, and returns Fail in other cases.

Count of Transmit Power Measurements

■Summary

Returns the number of burst signals measured in Transmit Power measurement.

3.9 Transmit Spectrum Mask Measurement Result

Displays Transmit Spectrum Mask measurement results. The result of each analysis is displayed if the storage mode is disabled (Off), and the average and maximum of the analysis results are displayed if the mode is enabled (On). Table 3.9-1 lists the responses that are returned when the query command `:FETCh:CWLan[n]?`, `:READ:CWLan[n]?`, or `:MEASure:CWLan[n]?` is issued if `n` of each command is specified as 1 or 3, or omitted. The numbers in the No. row indicate the order of responses if `n` is specified as 1 or omitted.

Table 3.9-1 Response for Transmit Spectrum Mask result query

No.	Response
20	Peak PSD (RBW) of the reference channel (dBm)
21	Minimum margin level on the negative offset 1 (dBm)
22	Minimum margin from limit line on the negative offset 1 (dB)
23	Minimum margin offset frequency from the center frequency in the negative offset 1 (Hz)
24	Pass/Fail flag on the negative offset 1 (1/fail, 0/pass)
25	Minimum margin level on the positive offset 1 (dBm)
26	Minimum margin from limit line on the positive offset 1 (dB)
27	Minimum margin offset frequency from the center frequency in the positive offset 1 (Hz)
28	Pass/Fail flag on the positive offset 1 (1/fail, 0/pass)
29	Minimum margin level on the negative offset 2 (dBm)
30	Minimum margin from limit line on the negative offset 2 (dB)
31	Minimum margin offset frequency from the center frequency in the negative offset 2 (Hz)
32	Pass/Fail flag on the negative offset 2 (1/fail, 0/pass)
33	Minimum margin level on the positive offset 2 (dBm)
34	Minimum margin from limit line on the positive offset 2 (dB)
35	Minimum margin offset frequency from the center frequency in the positive offset 2 (Hz)
36	Pass/Fail flag on the positive offset 2 (1/fail, 0/pass)
37	Minimum margin level on the negative offset 3 (dBm)
38	Minimum margin from limit line on the negative offset 3 (dB)
39	Minimum margin offset frequency from the center frequency in the negative offset 3 (Hz)
40	Pass/Fail flag on the negative offset 3 (1/fail, 0/pass)
41	Minimum margin level on the positive offset 3 (dBm)
42	Minimum margin from limit line on the positive offset 3 (dB)

Table 3.9-1 Response for Transmit Spectrum Mask result query (Continued)

No.	Response
43	Minimum margin offset frequency from the center frequency in the positive offset 3 (Hz)
44	Pass/Fail flag on the positive offset 3 (1/fail, 0/pass)
45	Minimum margin level on the negative offset 4 (dBm)
46	Minimum margin from limit line on the negative offset 4 (dB)
47	Minimum margin offset frequency from the center frequency in the negative offset 4 (Hz)
48	Pass/Fail flag on the negative offset 4 (1/fail, 0/pass)
49	Minimum margin level on the positive offset 4 (dBm)
50	Minimum margin from limit line on the positive offset 4 (dB)
51	Minimum margin offset frequency from the center frequency in the positive offset 4 (Hz)
52	Pass/Fail flag on the positive offset 4 (1/fail, 0/pass)
53	Pass/Fail flag on overall offset (1/fail, 0/pass)
54	Count of Transmit Spectrum Mask Measurements

Table 3.9-2 lists the responses that are returned when the query command `:FETCh:CWLan[n]?`, `:READ:CWLan[n]?`, or `:MEASure:CWLan[n]?` is issued if `n` of each command is specified as 3.

Figure 3.9-2 Response for Transmit Spectrum Mask result query n=3

No.	Response
36	Absolute power spectral density for negative offset 1 start frequency (dBm)
37	Absolute power spectral density for positive offset 1 start frequency (dBm)
38	Absolute power spectral density for negative offset 2 start frequency (dBm)
39	Absolute power spectral density for positive offset 2 start frequency (dBm)
40	Absolute power spectral density for negative offset 3 start frequency (dBm)
41	Absolute power spectral density for positive offset 3 start frequency (dBm)
42	Absolute power spectral density for negative offset 4 start frequency (dBm)
43	Absolute power spectral density for positive offset 4 start frequency (dBm)
44	Absolute power spectral density for negative offset 4 end frequency (dBm)
45	Absolute power spectral density for positive offset 4 end frequency (dBm)

Peak PSD (RBW) of the reference channel (dBm)

■Summary

Measures the maximum spectrum density within the band in which RBW is 100 kHz.Measurement is performed within the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, and Analysis Offset.

Minimum margin level on the negative offset *n* (dBm)

■Summary

The frequency at which the margin from the limit line becomes minimum is calculated within the frequency range for Offset *n* on the negative side. The absolute value of the spectrum density at the obtained frequency is returned.

Minimum margin from limit line on the negative offset *n* (dB)

■Summary

The frequency at which the margin from the limit line becomes minimum is calculated within the frequency range for Offset *n* on the negative side. The margin from the limit line at the obtained frequency is returned.

Minimum margin offset frequency from the center frequency in the negative offset *n*

■Summary

The frequency at which the margin from the limit line becomes minimum is calculated within the frequency range for Offset *n* on the negative side and returned.

Pass/Fail flag on the negative offset *n*

■Summary

Returns Fail if a frequency in the frequency range of Offset *n* on the negative side exceeds the limit line. Returns Pass if no frequency exceeds the limit line.

Minimum margin level on the positive offset *n* (dBm)

■Summary

The frequency at which the margin from the limit line becomes minimum is calculated within the frequency range for Offset *n* on the positive side The absolute value of the spectrum density at the obtained frequency is returned.

Minimum margin from limit line on the positive offset *n* (dB)

■Summary

The frequency at which the margin from the limit line becomes minimum is calculated within the frequency range for Offset *n* on the positive side. The margin from the limit line at the obtained frequency is returned.

Minimum margin offset frequency from the center frequency in the positive offset *n*

■Summary

The frequency at which the margin from the limit line becomes minimum is calculated within the frequency range for Offset *n* on the positive side and returned.

Pass/Fail flag on the positive offset *n*

■Summary

Returns Fail if a frequency in the frequency range of Offset *n* on the positive side exceeds the limit line. Returns Pass if within the limit line.

Pass/Fail flag on overall offset

■Summary

Returns Fail if a frequency in the frequency range of all Offset *n* values exceeds the limit line. Returns Pass if within the limit line.

Count of Transmit Spectrum Mask Measurements

■Summary

Returns the burst count for Transmit Spectrum Mask measurement.

Absolute power spectral density for negative offset *n* start frequency (dBm)

■Summary

Returns the absolute value of the spectrum density at the start frequency of Offset *n* on the negative side.

Absolute power spectral density for positive offset *n* start frequency (dBm)

■Summary

Returns the absolute value of the spectrum density at the start frequency of Offset *n* on the positive side.

Absolute power spectral density for negative offset 4 end frequency (dBm)

■Summary

Returns the absolute value of the spectrum density at the end frequency of Offset 4 on the negative side.

Absolute power spectral density for positive offset 4 end frequency (dBm)

■Summary

Returns the absolute value of the spectrum density at the end frequency of Offset 4 on the positive side.

3.10 Occupied Bandwidth Measurement Results

Displays the occupied bandwidth measurement results. The result of each analysis is displayed if the storage mode is disabled (Off), and the average or maximum of the analysis results is displayed if the mode is enabled (On).Table 3.10-1 lists the responses that are returned when the query command `:FETCh:CWLan[n]?`, `:READ:CWLan[n]?`, or `:MEASure:CWLan[n]?` is issued if `n` of each command is specified as 1 or 5, or omitted. The numbers in the No. row indicate the order of responses if n is specified as 1 or omitted.

Table 3.10-1 Response for Occupied Bandwidth result query

No.	Response
92	Occupied Bandwidth (average)(Hz)
93	Occupied Bandwidth (max)(Hz)
94	Pass/Fail flag of Occupied Bandwidth (average)
95	Pass/Fail flag of Occupied Bandwidth (max)
96	Count of Occupied Bandwidth Measurements

Occupied Bandwidth (average)(Hz)

■Summary

Displays the average occupied bandwidth in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and Preamble Search. An invalid value is returned if `Max Hold` is specified for Storage Mode.

Occupied Bandwidth (max)(Hz)

■Summary

Returns the occupied bandwidth that is calculated from the maximum trace data in the range determined by Storage Mode, Storage Count, Analysis Length Setup, Analysis Length, Analysis Offset, and Preamble Search. The maximum occupied bandwidth out of the values that are calculated for the number of burst signals specified by Storage Count is displayed. An invalid value is displayed if `Off` or `average` is specified for Storage Mode.

Pass/Fail flag of Occupied Bandwidth (average)

■Summary

Returns Pass if the average occupied bandwidth does not exceed the limit specified by Occupied Bandwidth Limits, and returns Fail in other cases.

Pass/Fail flag of Occupied Bandwidth (max)

■Summary

Returns Pass if the maximum occupied bandwidth does not exceed the limit specified by Occupied Bandwidth Limits, and returns Fail in other cases.

Count of Occupied Bandwidth Measurements

■Summary

Sets the number of burst signals measured in Occupied Bandwidth measurement.

Chapter 4 Performance Test

This chapter describes the measurement devices, setup methods, and performance test procedures required for performing performance tests as preventive maintenance of the MS2830A.

4.1 Overview of Performance Test

4.1.1 Performance test

Performance tests are performed as part of preventive maintenance in order to prevent degradation of the performance of the MS2830A.

Use performance tests when required for acceptance inspection, routine inspection and performance verification after repairs. Use performance tests when necessary for acceptance inspection, routine inspection and performance verification after repairs. Also perform the following performance tests for acceptance inspection, routine inspection and performance verification after repairs.

- Carrier frequency accuracy
- Residual Vector Error

Perform items deemed critical at regular intervals as preventive maintenance. A cycle for routine tests of once or twice a year is recommended.

If items that do not meet the required level are detected during performance testing, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

4.2 Performance Test Items

Warm up the device to be tested and the measuring instruments for at least 30 minutes except if specified otherwise, in order to stabilize them sufficiently before running performance tests. Maximum measurement accuracy requires, in addition to the above, conducting performance tests under ambient temperatures and with little AC power supply voltage fluctuations, as well as the absence of noise, vibrations, dust, humidity and other problems.

4.2.1 Testing methods

(1) Test target standards

- Carrier frequency accuracy
- Residual Vector Error

(2) Measuring instrument for tests

- Vector Signal Generator
- Frequency standard device
  Unnecessary if signal source has sufficient frequency accuracy
- Power meter
  Unnecessary if signal source has sufficient transmitter power accuracy

(3) Setups

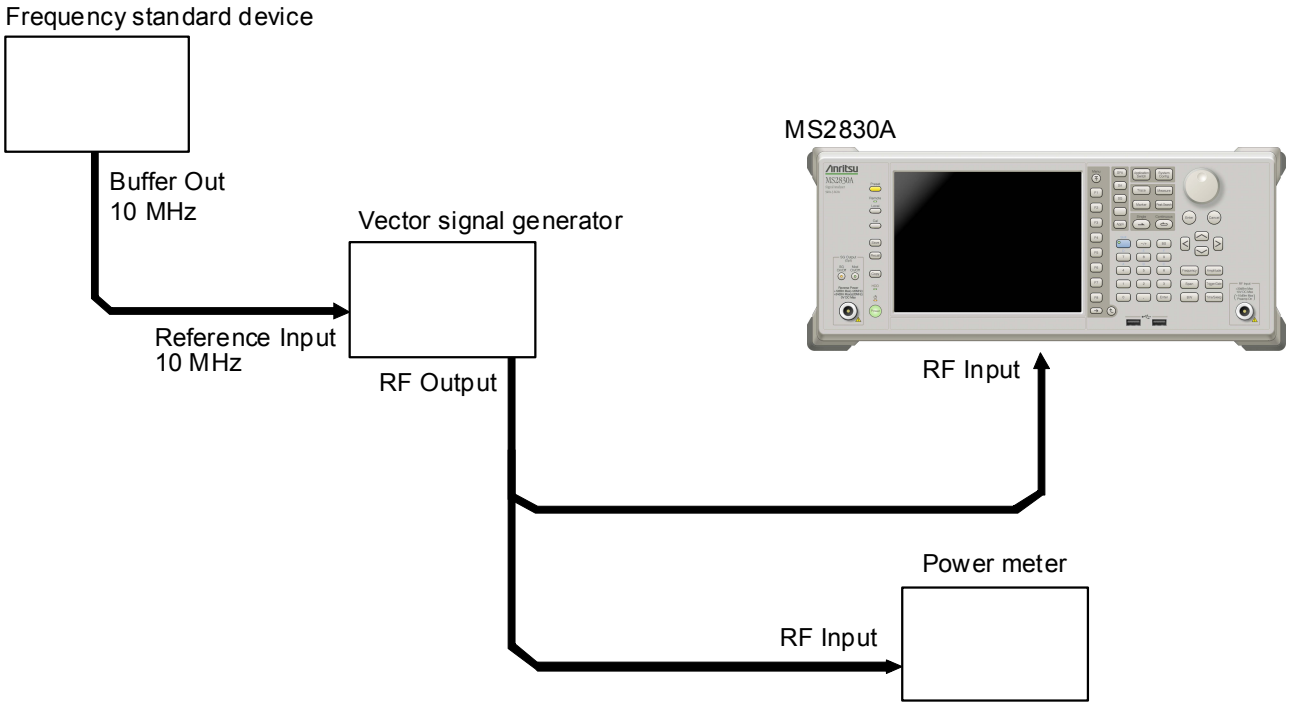


Figure 4.2.1-1 Performance test

(4) Test Procedure

(a) Signal source adjustment

1. Input the 10-MHz reference signal output from the frequency standard device into the Reference Input connector of the vector signal generator. This procedure must be performed after the procedure described in "(b) Setting of the main unit" is performed up to Step 7 and after calibration is performed.
2. Input the 10 MHz reference signal output from the signal generator to the Reference Input connector.
3. Output a WLAN modulation signal from the vector signal generator.
4. Input the vector signal generator output signal into the power meter and measure the power.

(b) Settings of the main unit

1. Turn on the power switch on the front panel and then wait until the internal temperature stabilizes (approx. 1.5 hours after the temperature in the thermostatic bath stabilizes).
2. Press Application Switch, then press the menu function key displaying the character string **Wireless Network Device Test**.
3. Press Preset .
4. Press F1 (Preset) to initialize.
5. Press Cal.
6. Press F1 (SIGANA All) to perform calibration.
7. Press F8 (Close).
8. Specify the frequency output from the vector signal generator by using the `[:SENSe]:FREQuency:CENTer <freq>` command.
9. Specify the measurement result displayed on the power meter by using the `[:SENSe]:POWer[:RF]:RANGe:ILEVel <real>` command.
10. Set the WLAN standard by using the `[:SENSe]:RADio:STANdard` command, enable EVM measurement by sending the `[:SENSe]:CWLan:EVM[:STATe]ON` command, and set the storage mode to Average by sending the `[:SENSe]:CWLan:EVM:AVERage[:STATe] ON` command.
11. Specify the measurement count by using the `[:SENSe]:CWLan:EVM:AVERage:COUNt` command.
12. Start measurement by sending the `:MEASure:CWLan[n]?` command.

13. Confirm that the Frequency Error (carrier frequency accuracy) value is within the specifications.
14. Confirm that the EVM (rms) (residual vector error) value is within the specifications.

(5) Test Results

Table 4.2.1-1 Carrier frequency accuracy (WLAN Standard: 802.11a)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
5180 MHz	–16.0 Hz		+16.0 Hz	±1.0 Hz	
5825 MHz					

Table 4.2.1-2 Carrier frequency accuracy (WLAN Standard: 802.11b)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
2412 MHz	–21.0 Hz		+21.0 Hz	±1.0 Hz	
2484 MHz					

Table 4.2.1-3 Carrier frequency accuracy (WLAN Standard: 802.11g OFDM)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
2412 MHz	–13 Hz		+13.0 Hz	±1.0 Hz	
2484 MHz					

Table 4.2.1-4 Carrier frequency accuracy (WLAN Standard: 802.11n 40 MHz)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
2412 MHz	–62.0 Hz		+62.0 Hz	±1.0 Hz	
2484 MHz					
5180 MHz	–102.0 Hz		+102.0 Hz		
5825 MHz					

Table 4.2.1-5 Residual vector error (WLAN Standard: 802.11a)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
5180 MHz		1.6 %(rms)	0.1 %(rms)	
5825 MHz				

Table 4.2.1-6 Residual vector error (WLAN Standard: 802.11b)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
2412 MHz		1.9 %(rms)	0.2 %(rms)	
2484 MHz				

Table 4.2.1-7 Residual vector error (WLAN Standard: 802.11g OFDM)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
2412 MHz		1.2 %(rms)	0.1 %(rms)	
2484 MHz				

Table 4.2.1-8 Residual vector error (WLAN Standard: 802.11n 40 MHz)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
2412 MHz		1.6 %(rms)	0.1 %(rms)	
2484 MHz				
5180 MHz		2.0 %(rms)	0.1 %(rms)	
5825 MHz				

Appendix A Error Messages

Table A-1 Error Messages

Message	Description
Out of range.	The settable range is exceeded.
Available when WLAN Standard is set to 802.11a, 802.11g OFDM or 802.11n.	—
Available when WLAN Standard is set to 802.11a or 802.11g OFDM.	—
Available when WLAN Standard is set to 802.11b or 802.11g DSSS.	—
Available when WLAN Standard is set to 802.11a, 802.11g OFDM or 802.11n(PPDU Format=Non-HT).	—
Available when WLAN Standard is set to 802.11n.	—
Available when WLAN Standard is set to 802.11b.	—
Not available when WLAN Standard is set to 802.11b.	—
Not available when EVM Calculation Method is set to 1000 chip Preamble EVM.	—

Appendix B Default Value List

Frequency	
Carrier Frequency	2.412 GHz
Channel Number	None
Amplitude	
Input Level	–10.00 dBm
Offset	Off
Offset Value	0.00 dB
System Setting	
WLAN Standard	802.11a
Data Rate	AUTO
Preamble	AUTO
PPDU Format	HT-Mixed
Channel Bandwidth	20MHz
Burst Interval	10 ms
Burst Threshold	30 dB
Common Setting	
Continuous Measurement	Off
Trigger Switch	Off
Trigger Source	Wide IF Video
Trigger Slope	Positive
Trigger Delay	0s
Wide IF Trigger Level	–20 dBm

Modulation Analysis	
EVM Measurement	Off
Storage Mode	Off
Storage Count	2
Analysis Length Setup	On
Analysis Length	10
Analysis Offset	0
EVM Calculation Method	PSDU
Channel Estimation	SEQ
Amplitude Tracking	On
Phase Tracking	On
Symbol Timing Adjustment	0
Filter Type	None
Alpha/BT	0.5
EVM(rms) Limits	5.6
EVM(peak) Limits	1000.0
Frequency Error Limits	20
Transmitter Center Frequency Leakage Limits	−15 dB
IQ Offset Limits	−15 dB

Transmit Power	
Transmit Power Measurement	Off
Storage Mode	Off
Storage Count	2
Analysis Length	1 ms
Analysis Offset	0
Preamble Search	On
Ramp Down Detection	On
Detection Offset	0 ms
Transmit Power Level Limit	23 dBm
Peak PSD Limits	11 dBm
Max Ramp Up Time	2.0 us
Max Ramp Down Time	2.0 us

Occupied Bandwidth

Occupied Bandwidth Measurement	Off
Storage Mode	Average
Storage Count	10
Analysis Length	ms
Analysis Offset	0
Preamble Search	On
Resolution Bandwidth	30 kHz
Detection	Positive
Occupied Bandwidth Percent	99%
OBW Limits	19 MHz

Transmit Spectrum Mask

Transmit Spectrum Mask Measurement	Off
Storage Mode	Off
Storage Count	2
Analysis Length	ms
Analysis Offset	0
Preamble Search	On
Analysis Length Setup	On
Detection	rms
Transmit Spectrum Mask Limit Level	0, –20, –20, –28, –28, –40, –40, –40

Accessory

Title	On, "Wireless Network Device"

Appendix C Measurement Functions

The measurement items supported by this application are described below.

The table below lists the IEEE Std 802.11-2007 and IEEE Std 802.11n-2009 test items that are supported by this application, as well as the measurement functions that enable measurement of each test item.

Table C-1 IEEE 802.11a (IEEE 802.11a-1999)

IEEE	Test Item	Measurement Function	Remarks
17.3.9.1	Transmit power levels	Transmit Power Level	
17.3.9.2	Transmit spectrum mask	Transmit Spectrum Mask	
17.3.9.3	Transmission spurious	—	Measurable with SPA function.
17.3.9.4	Transmit center frequency tolerance	Modulation Analysis	
17.3.9.5	Symbol clock frequency tolerance	Modulation Analysis	
17.3.9.6.1	Transmitter center frequency leakage	Modulation Analysis	
17.3.9.6.2	Transmitter spectral flatness	Modulation Analysis	
17.3.9.6.3 17.3.9.7	Transmitter constellation error Transmit modulation accuracy test	Modulation Analysis	
17.3.8.4	Transmit and receive in-band and out-of-band spurious emissions	—	Measurable with SPA function.
—	Occupied Bandwidth	Occupied Bandwidth	

Table C-2 IEEE 802.11a (IEEE 802.11a-1999)

IEEE	Test Item	Measurement Function	Remarks
18.4.7.1	Transmit power levels	Transmit Power Level	
18.4.7.2	Transmit power level control	Transmit Power Level	
18.4.7.3.	Transmit spectrum mask	Transmit Spectrum Mask	
18.4.7.4	Transmit center frequency tolerance	Modulation Analysis	
18.4.7.5	Chip clock frequency tolerance	Modulation Analysis	
18.4.7.6	Transmit power-on and power-down ramp	Transmit Power Level	
18.4.7.7	RF carrier suppression	—	Calculated from IQ Offset
18.4.7.8	Transmit modulation accuracy	Modulation Analysis	
18.4.6.8	Transmit and receive in-band and out-of-band spurious emissions	—	
—	Occupied Bandwidth	Occupied Bandwidth	

Table C-3 IEEE 802.11g (IEEE 802.11g-2003)

IEEE	Test Item	Measurement Function	Remarks
19.4.3	Transmit and receive in-band and out-of-band spurious emissions	—	Measurable with SPA function.
19.4.7 PMD transmit specifications Compliant with 17.3.9 (802.11a) except for the following test items: Transmit power level (17.3.9.1), Transmit center frequency tolerance (17.3.9.4), Symbol clock frequency tolerance (17.3.9.5)			
19.4.7.1	Transmit power levels	Transmit Power Level	
19.4.7.2	Transmit center frequency tolerance	Modulation Analysis	
19.4.7.3	Symbol clock frequency tolerance	Modulation Analysis	
19.5.4	Transmit spectral mask	Transmit Spectrum Mask	
—	Occupied Bandwidth	Occupied Bandwidth	

Table C-4 IEEE 802.11n (IEEE 802.11n 2009)

IEEE	Test Item	Measurement Function	Remarks
20.3.21.1	Transmit Spectrum Mask	Transmit Spectrum Mask	
20.3.21.2	Spectral Flatness	Modulation Analysis	
20.3.21.3	Transmit Power	Transmit Output Power	
20.3.21.4	Transmit Center Frequency Tolerance	Modulation Analysis	
20.3.21.5	—	—	
20.3.21.6	Symbol Clock Frequency Tolerance	Modulation Analysis	
20.3.21.7.1	Introduction to modulation accuracy tests	Modulation Analysis	
20.3.21.7.2	Transmit Center Frequency Leakage	Modulation Analysis	
20.3.21.7.3	Transmit Constellation Error	Modulation Analysis	
20.3.21.7.4	Transmitter Modulation Accuracy (EVM)	Modulation Analysis	
—	Occupied Bandwidth	Occupied Bandwidth	

References are to page numbers.

Symbol and Numbers

1

A

B

C

D

E

F

G

H

I

U

W