MX285051A-011/MX269051A-011
NR TDD sub-6GHz Downlink
MX285051A-021 NR TDD mmWave Downlink
MX285051A-061/MX269051A-061
NR TDD sub-6GHz Uplink
MX285051A-071 NR TDD mmWave Uplink
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 MS2850A Signal Analyzer Operation Manual (Mainframe Operation) or MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation), and MX285051A/MX269051A 5G Standard Measurement Software (Base License) Operation Manual. Please also refer to them before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W3963AE-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

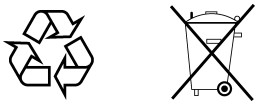
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

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.

MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink
MX285051A-021 NR TDD mmWave Downlink
MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink
MX285051A-071 NR TDD mmWave Uplink
Operation Manual Operation

23 March 2018 (First Edition)
20 February 2019 (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 PDF version.

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   iv) If this Software or the Equipment has been modified, repaired, or otherwise altered without Anritsu's prior approval.
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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.

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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.

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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.

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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.

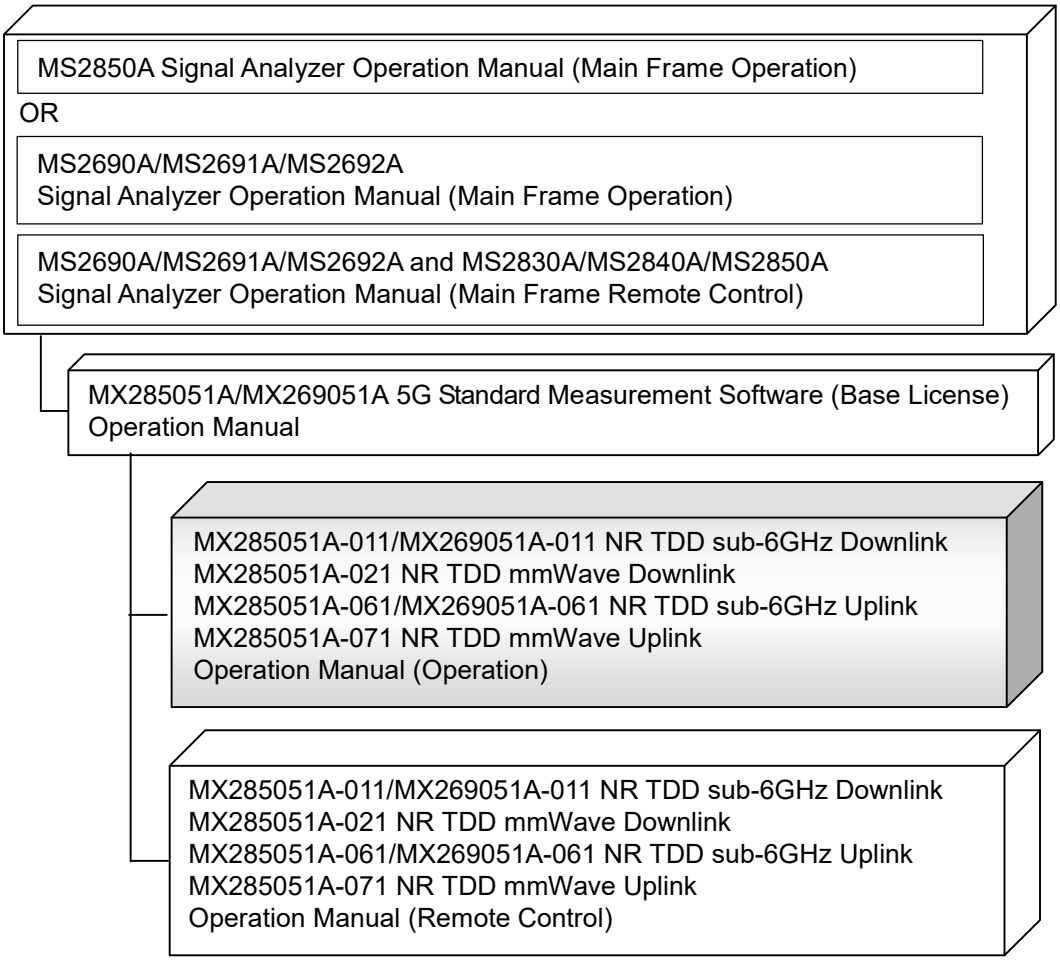
Cautions against computer virus infection

- 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.

About This Manual

■ **Composition of Operation Manuals**

The operation manuals for the
MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink,
MX285051A-021 NR TDD mmWave Downlink,
MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink,
and MX285051A-071 NR TDD mmWave Uplink
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.

- 5G Standard Measurement Software (Base License) Operation Manual

This manual describes operating methods of the 5G Standard Measurement Software (Base License).

- MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink
  MX285051A-021 NR TDD mmWave Downlink
  MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink
  MX285051A-071 NR TDD mmWave Uplink
  Operation Manual (Operation) <This document>

This manual describes basic operating methods, and functions.
As for signal analyzer hardware and its basic functions and operation outline, refer to *MS2850A Signal Analyzer Operation Manual (Mainframe Operation) or MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)*.

- MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink
  MX285051A-021 NR TDD mmWave Downlink
  MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink
  MX285051A-071 NR TDD mmWave Uplink
  Operation Manual (Remote Control)

This manual describes remote control.
As for signal analyzer application's basic remote control functions and its definitions of common commands, refer to *MS2690A/MS2691A/MS2692A and MS2830A/MS2840A/MS2850A Signal Analyzer Operation Manual (Mainframe Remote Control)*.

Convention Used in This Manual

In this document,  indicates a panel key.

Throughout this document, the use of MS2850A is assumed unless otherwise specified. If using MX269051A-011 or MX269051A-061 with , MS269x Series, change MS2850A to read MS269x Series.

Table of Contents

Chapter 1 Overview

This chapter provides an overview and the product configuration of the MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink, MX285051A-021 NR TDD mmWave Downlink, MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink, and MX285051A-071 NR TDD mmWave Uplink.

1.1 Product Overview

The MS2850A or MS269xA Signal Analyzer enables high-speed, high-accuracy, and simple measurements of transmission characteristics of base stations and mobile stations for various mobile communications types. The MS2850A or MS269xA 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 MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink, MX285051A-021 NR TDD mmWave Downlink, MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink, and MX285051A-071 NR TDD mmWave Uplink (hereinafter, referred to as "MX285051A-011/021/061/071 and MX269051A-011/061") are software options for measuring RF characteristics according to 5G NR Standard defined by 3GPP.

The MX285051A-011/021/061/071 and MX269051A-011/061 provides the following measurement features.

- Modulation accuracy measurement
- Carrier frequency measurement
- Transmitter power measurement

The MX285051A/MX269051A 5G Standard Measurement Software (Base License) is required to use the MX285051A-011/021/061/071 and MX269051A-011/061.

1.2 Product Configuration

1.2.1 Standard configuration

Table 1.2.1-1 to Table 1.2.1-6 list the standard configuration of the MX285051A-011/021/061/071 and MX269051A-011/061.

Table 1.2.1-1 MX285051A-011 NR TDD sub-6GHz Downlink Standard configuration

Item	Model	Product Name	Q'ty	Remarks
Application	MX285051A-011	NR TDD sub-6GHz Downlink	1	
Accessory	—	Installation CD-ROM	1	Application software, operation manual CD-ROM

Table 1.2.1-2 MX285051A-021 NR TDD mmWave Downlink Standard configuration

Item	Model	Product Name	Q'ty	Remarks
Application	MX285051A-021	NR TDD mmWave Downlink	1	
Accessory	—	Installation CD-ROM	1	Application software, operation manual CD-ROM

Table 1.2.1-3 MX285051A-061 NR TDD sub-6GHz Uplink Standard configuration

Item	Model	Product Name	Q'ty	Remarks
Application	MX285051A-061	NR TDD sub-6GHz Uplink	1	
Accessory	—	Installation CD-ROM	1	Application software, operation manual CD-ROM

Table 1.2.1-4 MX285051A-071 NR TDD mmWave Uplink Standard configuration

Item	Model	Product Name	Q'ty	Remarks
Application	MX285051A-071	NR TDD mmWave Uplink	1	
Accessory	—	Installation CD-ROM	1	Application software, operation manual CD-ROM

Table 1.2.1-5 MX269051A-011 NR TDD sub-6GHz Downlink Standard configuration

Item	Model	Product Name	Q'ty	Remarks
Application	MX269051A-011	NR TDD sub-6GHz Downlink	1	
Accessory	—	Installation CD-ROM	1	Application software, operation manual CD-ROM

Table 1.2.1-6 MX269051A-061 NR TDD sub-6GHz Uplink Standard configuration

Item	Model	Product Name	Q'ty	Remarks
Application	MX269051A-061	NR TDD sub-6GHz Uplink	1	
Accessory	—	Installation CD-ROM	1	Application software, operation manual CD-ROM

1.2.2 Application parts

Table 1.2.2-1 lists the application parts for the MX285051A-011/021/061/071 and MX269051A-011/061.

Table 1.2.2-1 Application parts

Model	Product Name	Remarks
W3963AE	MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink MX285051A-021 NR TDD mmWave Downlink MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink MX285051A-071 NR TDD mmWave Uplink Operation Manual (Operation)	English, printed version
W3964AE	MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink MX285051A-021 NR TDD mmWave Downlink MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink MX285051A-071 NR TDD mmWave Uplink Operation Manual (Remote Control)	English, printed version

1.3 Specifications

Table 1.3-1 shows the specifications for the MX285051A-011/021/061/071 and MX269051A-011/061.
Nominal values do not guarantee the performance as specifications.

Table 1.3-1 Specifications

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td colspan="2">MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink</td></tr>
<tr><td>Target signal</td><td>Downlink signals defined by TS 38.211.
Subcarrier Spacing is 15 kHz, 30 kHz, or 60 kHz.</td></tr>
<tr><td>Channel bandwidth</td><td>・For Subcarrier Spacing = 15 kHz,
5 MHz(25), 10 MHz(52), 15 MHz(79), 20 MHz(106), 25 MHz(133),
30 MHz(160)*1, 40 MHz(216)*1, 50 MHz(270) *1
・For Subcarrier Spacing = 30 kHz,
5 MHz(11), 10 MHz(24), 15 MHz(38), 20 MHz(51), 25 MHz(65),
30 MHz(78)*1, 40 MHz(106)*1, 50 MHz(133)*1, 60 MHz(162)*2,
70 MHz(189)*2, 80 MHz(217)*2, 90 MHz(245)*2, 100 MHz(273)*2
・For Subcarrier Spacing = 60 kHz,
10 MHz(11), 15 MHz(18), 20 MHz(24), 25 MHz(31),
30 MHz(38)*1, 40 MHz(51)*1, 50 MHz(65)*1, 60 MHz(79)*2,
70 MHz(93)*2, 80 MHz(107)*2, 90 MHz(121)*2, 100 MHz(135)*2
*1: For MX269051A, this is available when MS269xA-077/177 is installed.
*2: For MX269051A, this is available when MS269xA-078/178 is installed.
Numbers in parentheses indicate the numbers of resource blocks.</td></tr>
<tr><td>Capture time</td><td>1, 2 Frame</td></tr>
<tr><td>Setting frequency range</td><td>MX285051A-011
MS2850A-047: 100 MHz to 32 GHz
MS2850A-046: 100 MHz to 44.5 GHz
MX269051A-011
<table>
<tr><th>Option</th><th>077/177</th><th>078/178</th><th>067/167</th><th>Setting frequency range</th></tr>
<tr><td>MS2690A</td><td>✓/X</td><td>✓/X</td><td></td><td>100 MHz to 6 GHz</td></tr>
<tr><td>MS2691A</td><td>X</td><td>X</td><td></td><td>100 MHz to 13.5 GHz</td></tr>
<tr><td></td><td>✓</td><td>✓/X</td><td></td><td>100 MHz to 6 GHz</td></tr>
<tr><td>MS2692A</td><td>X</td><td>X</td><td>✓/X</td><td>100 MHz to 26.5 GHz</td></tr>
<tr><td></td><td>✓</td><td>✓/X</td><td>✓</td><td>100 MHz to 26.5 GHz</td></tr>
<tr><td></td><td>✓</td><td>✓/X</td><td>X</td><td>100 MHz to 6 GHz</td></tr>
</table>
✓ : Installed
X : Not installed
✓/X : Installed or Not installed</td></tr>
<tr><td>Measurement frequency range</td><td>MX285051A-011 800 MHz to 5 GHz
MX269051A-011 600 MHz to 5 GHz</td></tr>
</table>

Table 1.3-1 Specifications (Cont'd)

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td colspan="2">MX285051A-011/MX269051A-011 NR TDD sub-6GHz Downlink (Cont'd)</td></tr>
<tr><td>Measurement level range</td><td>MX285051A-011
–10 to +30 dBm (at Pre-Amp Off, or Pre-Amp not installed.)
–30 to +10 dBm (at Pre-Amp On)
MX269051A-011
–10 to +30 dBm (at Pre-Amp Off, or Pre-Amp not installed.)
–25 to +10 dBm (at Pre-Amp On)</td></tr>
<tr><td>Carrier frequency accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
• Measurement signal: EVM = 1% (rms) of Downlink signal
• Measurement time: 1 Frame
• Either of the following single carrier signals output at the same frequency as the center frequency of the measuring instrument:
Bandwidth 100 MHz (Subcarrier Spacing: 30 kHz)
or Bandwidth 50 MHz (Subcarrier Spacing: 15 kHz)
± (accuracy of reference frequency × carrier frequency + 10 Hz)</td></tr>
<tr><td>Residual EVM</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
• Measurement signal: Downlink signal
• Measurement time: 1 Frame
• Either of the following single carrier signals output at the same frequency as the center frequency of the measuring instrument:
Bandwidth 100 MHz (Subcarrier Spacing: 30 kHz)
or Bandwidth 50 MHz (Subcarrier Spacing: 15 kHz)
≤ 1.0% (rms)</td></tr>
<tr><td>Transmitter power accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
• Input attenuator ≥ 10 dB
• Input signal: Within the range of measurement level and equal to input level or under
• Single carrier signal output at the same frequency as the center frequency of the measuring instrument
MX285051A-011:
<table>
<tr><th>Frequency range</th><th>Pre-Amp Off,
or not installed</th><th>Pre-Amp On</th></tr>
<tr><td>800 MHz ≤ freq. < 4 GHz</td><td>±0.68 dB (Nominal)</td><td>±1.15 dB (Nominal)</td></tr>
<tr><td>4 GHz ≤ freq. < 4.2 GHz</td><td>±1.53 dB (Nominal)</td><td>±2.01 dB (Nominal)</td></tr>
<tr><td>4.2 GHz ≤ freq. ≤ 5 GHz</td><td>±1.45 dB (Nominal)</td><td>±1.94 dB (Nominal)</td></tr>
</table>
MX269051A-011:
<table>
<tr><th>Frequency range</th><th>Pre-Amp Off,
or not installed</th><th>Pre-Amp On</th></tr>
<tr><td>600 MHz ≤ freq. < 5 GHz</td><td>±1.91 dB (Nominal)</td><td>±2.20 dB (Nominal)</td></tr>
</table>
Transmitter power accuracy is calculated from an RSS (root summed square) error of the absolute amplitude accuracy and the in-band frequency characteristics.</td></tr>
<tr><td>Waveform display</td><td>When measuring the single carrier:
• Constellation
• EVM vs Symbol
• EVM vs Resource Block
• EVM vs Subcarrier
• Power vs Resource Block
• Spectral Flatness</td></tr>
</table>

Table 1.3-1 Specifications (Cont'd)

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td colspan="2">MX285051A-021 NR TDD mmWave Downlink</td></tr>
<tr><td>Target signal</td><td>Downlink signals defined by TS 38.211.
Subcarrier Spacing is 60 kHz or 120 kHz.</td></tr>
<tr><td>Channel bandwidth</td><td>• For Subcarrier Spacing = 60 kHz,
50 MHz(66), 100 MHz(132), 200 MHz(264)
• For Subcarrier Spacing = 120 kHz,
50 MHz(32), 100 MHz(66), 200 MHz(132), 400 MHz(264)*1
*1: Available when MS2850A-033/133/034/134 is installed.
Numbers in parentheses indicate the numbers of resource blocks.</td></tr>
<tr><td>Number of carriers</td><td>
<table>
<tr><th>Condition</th><th>Channel bandwidth</th><th>Maximum number of carriers</th></tr>
<tr><td rowspan="3">Without MS2850A-033/133</td><td>50 MHz</td><td>5</td></tr>
<tr><td>100 MHz</td><td>2</td></tr>
<tr><td>200 MHz</td><td>1</td></tr>
<tr><td rowspan="4">With MS2850A-033/133
or
With MS2850A-034/134,
and Center frequency < 4.2 GHz</td><td>50 MHz</td><td>8</td></tr>
<tr><td>100 MHz</td><td>5</td></tr>
<tr><td>200 MHz</td><td>2</td></tr>
<tr><td>400 MHz</td><td>1</td></tr>
<tr><td rowspan="4">With MS2850A-034/134
and Center frequency ≥ 4.2 GHz</td><td>50 MHz</td><td>8</td></tr>
<tr><td>100 MHz</td><td>8</td></tr>
<tr><td>200 MHz</td><td>4</td></tr>
<tr><td>400 MHz</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>Capture time</td><td>1, 2 Frame</td></tr>
<tr><td>Setting frequency range</td><td>MS2850A-047: 100 MHz to 32 GHz
MS2850A-046: 100 MHz to 44.5 GHz</td></tr>
<tr><td>Measurement level range</td><td>–15 to +30 dBm (at Pre-Amp Off, or Pre-Amp not installed.)
–30 to +10 dBm (at Pre-Amp On)</td></tr>
<tr><td>Carrier frequency accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
• Measurement signal: EVM = 2% (rms) of Downlink signal
• Measurement time: 1 Frame
• The following single carrier signal output at the same frequency as the center frequency of the measuring instrument:
Frequency 28 GHz, Bandwidth 100 MHz
± (accuracy of reference frequency × carrier frequency + 10 Hz) (Nominal)</td></tr>
<tr><td>Residual EVM</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
• Measurement signal: Downlink signal
• Measurement time: 1 Frame
• The following single carrier signal output at the same frequency as the center frequency of the measuring instrument:
Frequency 28 GHz, Bandwidth 100 MHz
≤ 2.0% (rms) (Nominal)</td></tr>
</table>

Table 1.3-1 Specifications (Cont'd)

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td colspan="2">MX285051A-021 NR TDD mmWave Downlink (Cont'd)</td></tr>
<tr><td>Transmitter power accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
・ Input attenuator ≥ 10 dB
・ Input signal: Within the range of measurement level and equal to input level or under
・ The following single carrier signal output at the same frequency as the center frequency of the measuring instrument:
Bandwidth 100 MHz
<table>
<tr><th>Frequency range</th><th>Pre-Amp Off, or not installed</th><th>Pre-Amp On</th></tr>
<tr><td>26.5 GHz < freq. < 32 GHz</td><td>±2.54 dB (Nominal)</td><td>±3.74 dB (Nominal)</td></tr>
</table>
Transmitter power accuracy is calculated from an RSS (root summed square) error of the absolute amplitude accuracy and the in-band frequency characteristics.</td></tr>
<tr><td>Waveform display</td><td>When measuring the single carrier:
・Constellation
・EVM vs Symbol
・EVM vs Resource Block
・EVM vs Subcarrier
・Power vs Resource Block
・Spectral Flatness
When measuring the multi carriers:
・Power vs Resource Block
・EVM vs Resource Block</td></tr>
</table>

Table 1.3-1 Specifications (Cont'd)

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td colspan="2">MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink</td></tr>
<tr><td>Target signal</td><td>Uplink signals defined by TS 38.211.
Subcarrier Spacing is 15 kHz, 30 kHz, or 60 kHz.</td></tr>
<tr><td>Channel bandwidth</td><td>・For Subcarrier Spacing = 15 kHz,
5 MHz(25), 10 MHz(52), 15 MHz(79), 20 MHz(106), 25 MHz(133),
30 MHz(160)*1, 40 MHz(216)*1, 50 MHz(270)*1
・For Subcarrier Spacing = 30 kHz,
5 MHz(11), 10 MHz(24), 15 MHz(38), 20 MHz(51), 25 MHz(65),
30 MHz(78)*1, 40 MHz(106)*1, 50 MHz(133)*1, 60 MHz(162)*2,
70 MHz(189)*2, 80 MHz(217)*2, 90 MHz(245)*2, 100 MHz(273)*2
・For Subcarrier Spacing = 60 kHz,
10 MHz(11), 15 MHz(18), 20 MHz(24), 25 MHz(31),
30 MHz(38)*1, 40 MHz(51)*1, 50 MHz(65)*1, 60 MHz(79)*2,
70 MHz(93)*2, 80 MHz(107)*2, 90 MHz(121)*2, 100 MHz(135)*2
*1: For MX269051A, this is available when MS269xA-077/177 is installed.
*2: For MX269051A, this is available when MS269xA-078/178 is installed.
Numbers in parentheses indicate the numbers of resource blocks.</td></tr>
<tr><td>Capture time</td><td>1, 2 Frame</td></tr>
<tr><td>Setting frequency range</td><td>MX285051A-061
MS2850A-047: 100 MHz to 32 GHz
MS2850A-046: 100 MHz to 44.5 GHz
MX269051A-061
<table>
<tr><th>Option</th><th>077/177</th><th>078/178</th><th>067/167</th><th>Setting frequency range</th></tr>
<tr><td>MS2690A</td><td>✓/X</td><td>✓/X</td><td></td><td>100 MHz to 6 GHz</td></tr>
<tr><td rowspan="2">MS2691A</td><td>X</td><td>X</td><td></td><td>100 MHz to 13.5 GHz</td></tr>
<tr><td>✓</td><td>✓/X</td><td></td><td>100 MHz to 6 GHz</td></tr>
<tr><td rowspan="3">MS2692A</td><td>X</td><td>X</td><td>✓/X</td><td>100 MHz to 26.5 GHz</td></tr>
<tr><td>✓</td><td>✓/X</td><td>✓</td><td>100 MHz to 26.5 GHz</td></tr>
<tr><td>✓</td><td>✓/X</td><td>X</td><td>100 MHz to 6 GHz</td></tr>
</table>
✓: Installed
X: Not installed
✓/X: Installed or Not installed</td></tr>
<tr><td>Measurement frequency range</td><td>MX285051A-061 800 MHz to 5 GHz
MX269051A-061 600 MHz to 5 GHz</td></tr>
<tr><td>Measurement level range</td><td>MX285051A-061
–10 to +30 dBm (at Pre-Amp Off, or Pre-Amp not installed.)
–30 to +10 dBm (at Pre-Amp On)
MX269051A-061
–10 to +30 dBm (at Pre-Amp Off, or Pre-Amp not installed.)
–25 to +10 dBm (at Pre-Amp On)</td></tr>
</table>

Table 1.3-1 Specifications (Cont'd)

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td colspan="2">MX285051A-061/MX269051A-061 NR TDD sub-6GHz Uplink (Cont'd)</td></tr>
<tr><td>Carrier frequency accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
・ Measurement signal: EVM = 1% (rms) of Uplink signal
・ Measurement time: 1 Frame
・ Either of the following single carrier signals output at the same frequency as the center frequency of the measuring instrument:
Bandwidth 100 MHz (Subcarrier Spacing: 30 kHz)
or Bandwidth 50 MHz (Subcarrier Spacing: 15 kHz)
± (accuracy of reference frequency × carrier frequency + 10 Hz)</td></tr>
<tr><td>Residual EVM</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
・ Measurement signal: Uplink signal
・ Measurement time: 1 Frame
・ Either of the following single carrier signals output at the same frequency as the center frequency of the measuring instrument:
Bandwidth 100 MHz (Subcarrier Spacing: 30 kHz)
or Bandwidth 50 MHz (Subcarrier Spacing: 15 kHz)
≤ 1.0% (rms)</td></tr>
<tr><td>Transmitter power accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
・ Input attenuator ≥ 10 dB
・ Input signal: Within the range of measurement level and equal to input level or under
・ Single carrier signal output at the same frequency as the center frequency of the measuring instrument
MX285051A-061:
<table>
<tr><th>Frequency range</th><th>Pre-Amp Off, or not installed</th><th>Pre-Amp On</th></tr>
<tr><td>800 MHz ≤ freq. < 4 GHz</td><td>±0.68 dB (Nominal)</td><td>±1.15 dB (Nominal)</td></tr>
<tr><td>4 GHz ≤ freq. < 4.2 GHz</td><td>±1.53 dB (Nominal)</td><td>±2.01 dB (Nominal)</td></tr>
<tr><td>4.2 GHz ≤ freq. ≤ 5 GHz</td><td>±1.45 dB (Nominal)</td><td>±1.94 dB (Nominal)</td></tr>
</table>
MX269051A-061:
<table>
<tr><th>Frequency range</th><th>Pre-Amp Off, or not installed</th><th>Pre-Amp On</th></tr>
<tr><td>600 MHz ≤ freq. < 5 GHz</td><td>±1.91 dB (Nominal)</td><td>±2.20 dB (Nominal)</td></tr>
</table>
Transmitter power accuracy is calculated from an RSS (root summed square) error of the absolute amplitude accuracy and the in-band frequency characteristics.</td></tr>
<tr><td>Waveform display</td><td>When measuring the single carrier:
・Constellation ・EVM vs Subcarrier
・EVM vs Symbol ・Power vs Resource Block
・EVM vs Resource Block ・Spectral Flatness</td></tr>
</table>

Table 1.3-1 Specifications (Cont'd)

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td colspan="2">MX285051A-071 NR TDD mmWave Uplink</td></tr>
<tr><td>Target signal</td><td>Uplink signals defined by TS 38.211.
Subcarrier Spacing is 60 kHz or 120 kHz.</td></tr>
<tr><td>Channel bandwidth</td><td>・For Subcarrier Spacing = 60 kHz,
50 MHz(66), 100 MHz(132), 200 MHz(264)
・For Subcarrier Spacing = 120 kHz,
50 MHz(32), 100 MHz(66), 200 MHz(132), 400 MHz(264)*1
*1: Available when MS2850A-033/133/034/134 is installed.
Numbers in parentheses indicate the numbers of resource blocks.</td></tr>
<tr><td>Capture time</td><td>1, 2 Frame</td></tr>
<tr><td>Setting frequency range</td><td>MS2850A-047: 100 MHz to 32 GHz
MS2850A-046: 100 MHz to 44.5 GHz</td></tr>
<tr><td>Measurement level range</td><td>–15 to +30 dBm (at Pre-Amp Off, or Pre-Amp not installed.)
–30 to +10 dBm (at Pre-Amp On)</td></tr>
<tr><td>Carrier frequency accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
・ Measurement signal: EVM = 2% (rms) of Uplink signal
・ Measurement time: 1Frame
・ The following single carrier signal output at the same frequency as the center frequency of the measuring instrument:
Frequency 28 GHz, Bandwidth 100 MHz
± (accuracy of reference frequency × carrier frequency + 10 Hz)</td></tr>
<tr><td>Residual EVM</td><td>When measuring in the following conditions at 18 to 28°C, after CAL execution,
・ Measurement signal: Uplink signal
・ Measurement time: 1Frame
・ The following single carrier signal output at the same frequency as the center frequency of the measuring instrument:
Frequency 28 GHz, Bandwidth 100 MHz
≤ 2.0% (rms)</td></tr>
<tr><td>Transmitter power accuracy</td><td>When measuring in the following conditions at 18 to 28°C, after calibration.
・ Input attenuator ≥ 10 dB
・ Input signal: Within the range of measurement level and equal to input level or under
・ The following single carrier signal output at the same frequency as the center frequency of the measuring instrument:
Bandwidth 100 MHz
<table>
<tr><th>Frequency range</th><th>Pre-Amp Off, or not installed</th><th>Pre-Amp On</th></tr>
<tr><td>26.5 GHz < freq. < 32 GHz</td><td>±2.54 dB (Nominal)</td><td>±3.74 dB (Nominal)</td></tr>
</table>
Transmitter power accuracy is calculated from an RSS (root summed square) error of the absolute amplitude accuracy and the in-band frequency characteristics.</td></tr>
<tr><td>Waveform display</td><td>When measuring the single carrier:
・Constellation ・EVM vs Subcarrier
・EVM vs Symbol ・Power vs Resource Block
・EVM vs Resource Block ・Spectral Flatness</td></tr>
</table>

Table 1.3-1 Specifications (Cont'd)

Item	Specification
Common items for MX285051A-011/021/061/071 and MX269051A-011/061	
Digitize Function	
Function	Capable of outputting captured waveform data to internal storage or external storage.
Waveform Data	Format: I, Q (32 bit floating point binary format) Level: Assumes as $\sqrt{I^2+Q^2}$ =1 for 0 dBm input Level accuracy: Same as the absolute amplitude accuracy and in-band frequency characteristics of the signal analyzer.
Replay Function	
Function	Analyzes traces of saved waveform data Format: I, Q (32 bit floating point binary format) Sampling rate: MS2850A When measuring the single carrier: Without MS2850A-033/133 Channel bandwidth ≤ 100 MHz: 162.5 MHz Channel bandwidth > 100 MHz: 325 MHz (MX285051A-021/071 only) With MS2850A-033/133 Channel bandwidth ≤ 100 MHz: 162.5 MHz Channel bandwidth > 100 MHz: 650 MHz (MX285051A-021/071 only) When measuring the multi carriers: (MX285051A-021 only) Without MS2850A-033/133: 325 MHz With MS2850A-033/133: 650 MHz With MS2850A-034/134: 1300 MHz MS269xA When measuring the single carrier: Without MS269xA-077/177: 50 MHz Only with MS269xA-077/177: 100 MHz With MS269xA-078/178: 200 MHz

Chapter 2 Preparation

This chapter describes the preparations required for using the MX285051A/MX269051A you are using.
Refer to *MS2850A Signal Analyzer Operation Manual (Mainframe Operation)* or *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)* for common features, the panel keys, connectors used to connect external devices and general points of caution not included in this manual.

2.1 Signal Path Setup

As shown in Figure 2.1-1, 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 the RF Input connector.

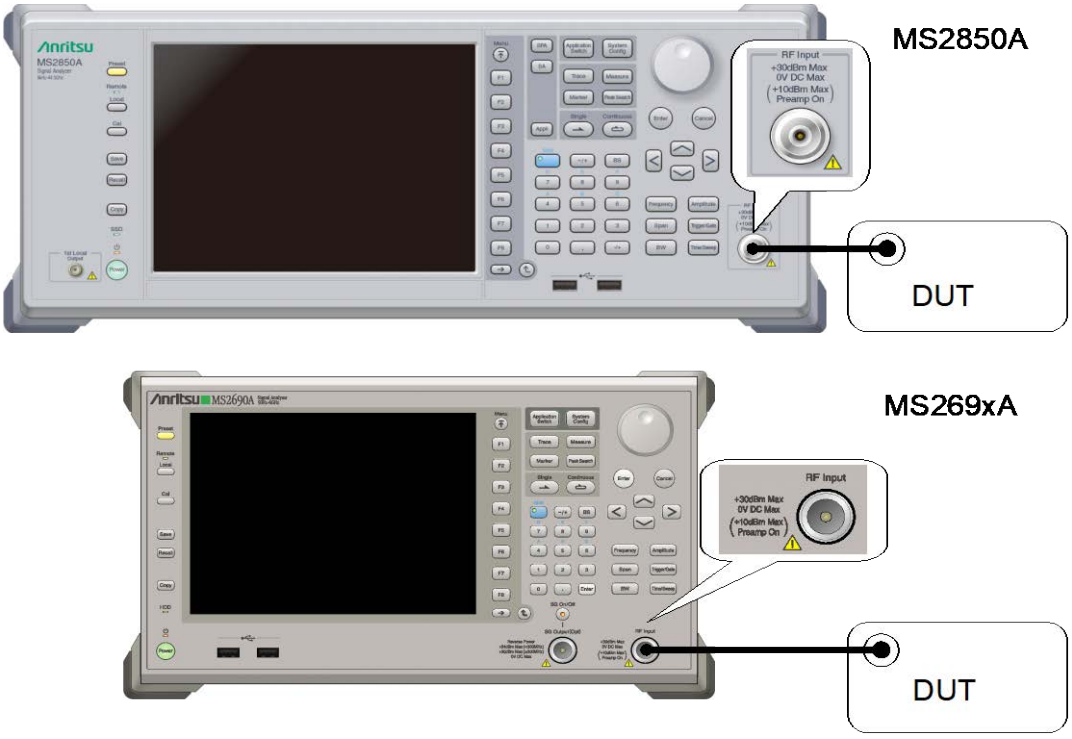


Figure 2.1-1 Signal path setup example

Set the reference signal from external sources, as required.

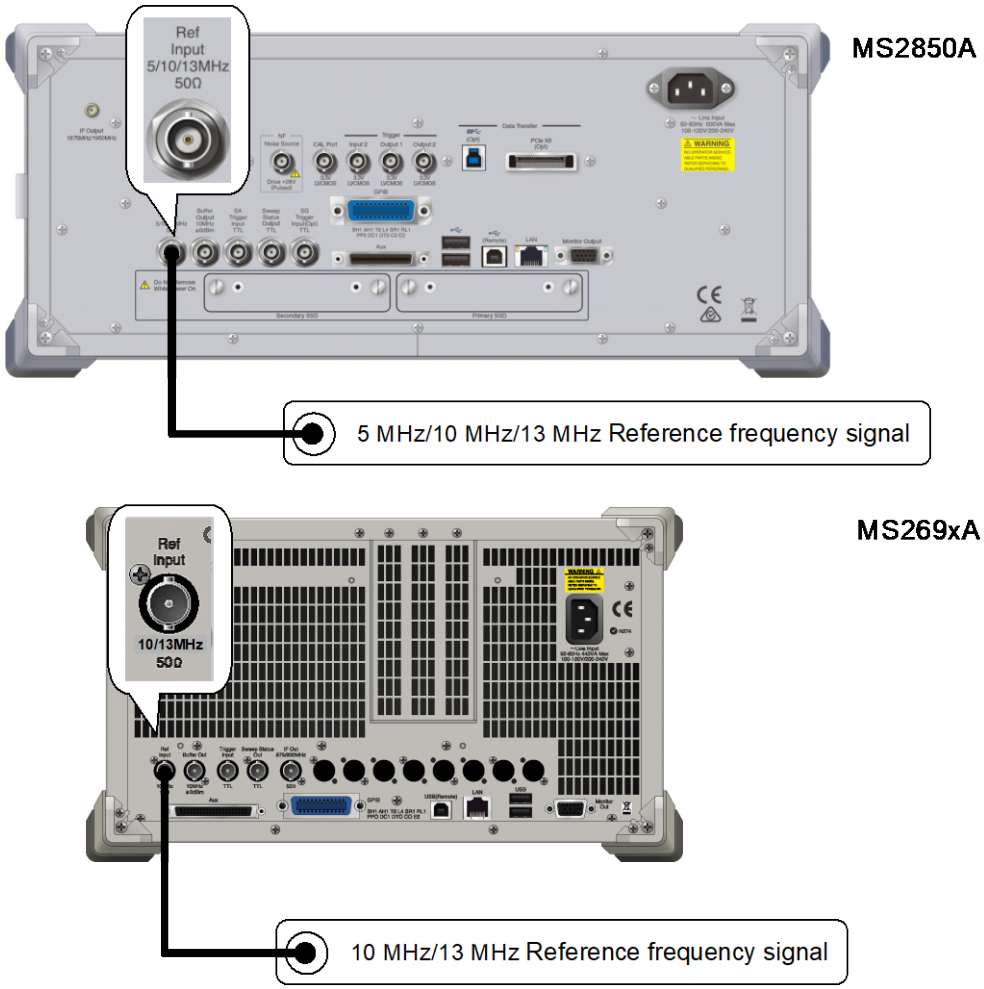


Figure 2.1-2 External reference signal input

2.2 Application Startup and Selection

To use the MX285051A/MX269051A, it is necessary to load (start up) and select the MX285051A/MX269051A.

2.2.1 Launching application

The MX285051A/MX269051A startup procedure is described below.

Note:

The XXX indicates the MX285051A/MX269051A 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.

2.2.2 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.

2.3 Initialization and Calibration

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

2.3.1 Initialization

After selecting the MX285051A/MX269051A, 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).

2.3.2 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, executes the performance test, 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 executable, refer to *MS2850A Signal Analyzer Operation Manual (Mainframe Operation)* or *MS2690A/MS2691A/MS2692A Signal Analyzer Operation Manual (Mainframe Operation)*.

Chapter 3 Measurement

This chapter describes the measurement function, the parameter contents and setting methods for the MX285051A-011/021/061/071 and MX269051A-011/061.

3.1 Basic Operation

3.1.1 Screen layout

This section describes the screen layout for the MX285051A-011/021/061/071 and MX269051A-011/061.

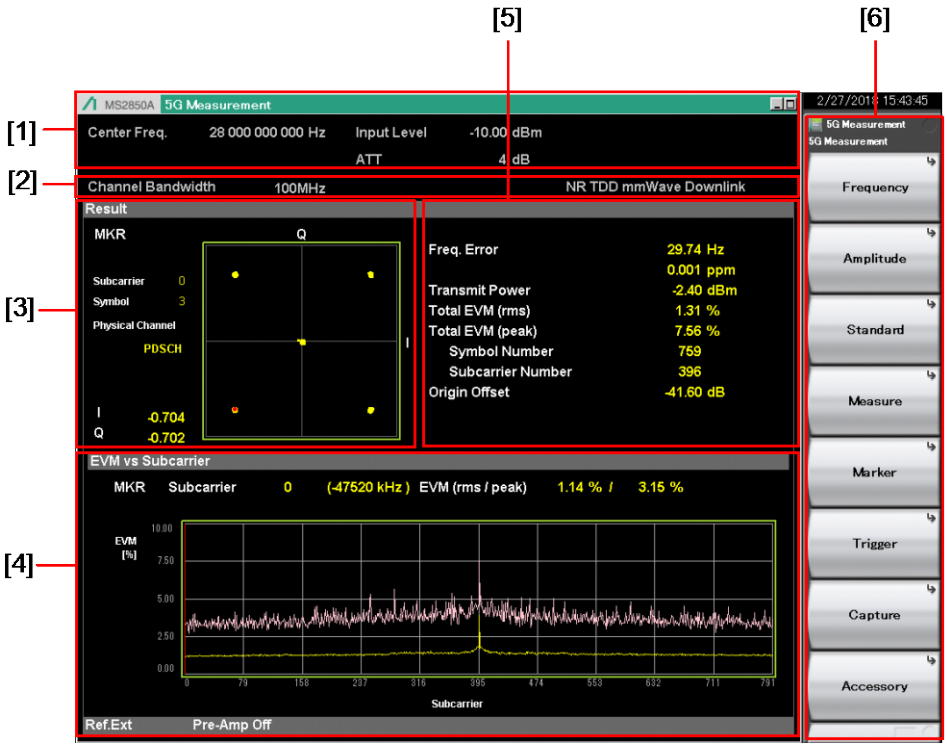


Figure 3.1.1-1 Screen Layout

[1] Measurement parameter
Displays the set parameters.

[2] Status message
Displays the status of signals.

[3] Constellation
Displays a constellation of the selected symbol.

[4] Graph window
Displays a graph of the measurement results.

[5] Result window
Displays measurement results.

[6] Function menu
Displays the functions executable with the function keys.

3.1.2 Function menu

This section describes the main function menu on the main screen.

Table 3.1.2-1 Main function menu

Function Key	Menu Display	Function
Page 1	5G Measurement	Press **5G Measurement** to display.
F1	Frequency	Sets the frequency Refer to 3.2 “Frequency Function Menu”
F2	Amplitude	Sets the level and attenuator. Refer to 3.3 “Amplitude Function Menu”
F3	Standard	Selects the measurement signal. Refer to 3.5 “Standard Setting”
F4	Measure	Sets measurement items. Refer to 3.6 “NR TDD sub-6GHz Downlink / NR TDD mmWave Downlink,” 3.7 “NR TDD sub-6GHz Uplink / NR TDD mmWave Uplink”
F5	Marker	Sets a marker. Refer to 3.8 “Setting Maker”
F6	Trigger	Sets a trigger. Refer to 3.9 “Setting Trigger”
F7	Capture	Configures settings for IQ data capture. Refer to 3.4 “Capture IQ Data Function Menu”
F8	Accessory	Sets other functions. Refer to 5.1 “Selecting Other Functions”

3.1.3 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, respectively.

Single

Following capture of an input signal based on the settings of Capture Time, the selected measurement items are measured only for the measurement count (Storage Count) before measurement is stopped.

<Procedure>

1. Press 

.

Continuous

Following capture of an input signal based on the settings of Capture Time, the selected measurement items are continuously measured for the measurement count (Storage Count). Measurement will continue even if parameters are changed or the window display is changed. Measurement will be stopped if another application is selected or if the Replay function is executed.

<Procedure>

1. Press 

.

Note:

The two measurement modes are not available when the Replay function is executed. If the Replay function is executed, analysis is started when an IQ data file is specified.

Refer to 4.2 “Replay Function”

3.2 Frequency Function Menu

Configure the frequency settings in the Frequency function menu that is displayed by pressing F1 (Frequency) on the main function menu. Also, press Frequency to display the Frequency function menu and open the Center Frequency dialog box.

Note:

You cannot set any frequency when the Replay function is executed.

■Center Frequency

Summary Sets the center frequency.

Setting range

MS2850A 100 MHz to the upper limit of the mainframe

MS269xA See the following table.

Option	077/177	078/178	067/167	Setting frequency range
MS2690A	✓/X	✓/X		100 MHz to 6 GHz
MS2691A	X	X		100 MHz to 13.5 GHz
	✓	✓/X		100 MHz to 6 GHz
MS2692A	X	X	✓/X	100 MHz to 26.5 GHz
	✓	✓/X	✓	100 MHz to 26.5 GHz
	✓	✓/X	X	100 MHz to 6 GHz

✓ : Installed

X : Not installed

✓/X : Installed or Not installed

■RF Spectrum

Summary Sets whether to measure with IQ spectrum reversed.

Options Norm. Measures without IQ spectrum reversed.

Rvs. Measures with IQ spectrum reversed.

3.3 Amplitude Function Menu

Configure the level settings in the Amplitude function menu that is displayed by pressing F2 (Amplitude) on the main function menu. Also, press Amplitude to display the Amplitude function menu and open the Input Level dialog box.

Note:

You cannot set a level when the Replay function is executed.

■Input Level

Summary Sets the input level from the target DUT.

Range For Pre-Amp: On:
(–80.00 + Offset Value) to (10.00 + Offset Value) dBm
For Pre-Amp: Off:
(–60.00 + Offset Value) to (30.00 + Offset Value) dBm

■Attenuator (Auto/Manual)

Summary Selects automatic setting or manual setting of the input attenuator.

Options Auto The input attenuator is automatically set.
Manual The input attenuator is manually set.

■Attenuator

Summary Sets the input attenuator manually.

Range

Table 3.3-1 Input attenuator setting range (When Pre-amp is set to Off)

Attenuator Manual	
Lower limit	**Upper limit**
Logic* ($\alpha = 0, \beta = 1, \gamma = 2$) The minimum value is 0 dB.	60 dB

Table 3.3-2 Input attenuator setting range (When Pre-amp is set to On)

Attenuator Manual	
Lower limit	**Upper limit**
Logic* ($\alpha = 20, \beta = 21, \gamma = 22$) The minimum value is 20 dB	60 dB

*: The following rules apply:

<1> If the reference level is 0 or if it is divisible by 2.
Attenuator (dB) = RL*1 + α

<2> Not <1>, and INT (RL)*2 is an odd number.
Attenuator (dB) = INT (RL)*2 + β

<3> Not <1>, and INT (RL) is an even number.

Attenuator (dB) = INT (RL)*2 + γ

*1: Reference level (dBm)

*2: Maximum integer not exceeding reference level.

■Pre-Amp

Summary Sets On/Off for the Pre-Amp function.

Options On Enables the Pre-Amp function.

Off Disables the Pre-Amp function.

■Auto Range

Summary Sets the input level and attenuator value so that the EVM measurement results are optimal according to the input level. On/Off for the Pre-Amp does not change from the setting value.

■Offset

Summary Sets On/Off for the Offset function.

Options On Enables the offset function.

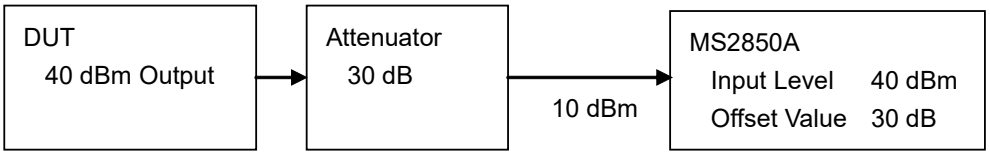
Off Disables the offset function.

■Offset Value

Summary Sets the level offset coefficient.

Range –99.99 to 99.99 dB

Setting example



3.4 Capture IQ Data Function Menu

Configure the IQ data settings in the Capture function menu that is displayed by pressing F7 (Capture) on the main function menu.

Table 3.4-1 Capture function menu

Function Key	Menu Display	Function
Page 1	Capture	Press **Capture** to display.
F1	Capture Time	Switches between the two capture modes of IQ data. Options: Auto, Manual
F2	Capture Time Length	Sets the capture time length of IQ data in frame unit. Range: 1, 2 [frame]
F3	Save Captured Data	Saves the captured IQ data. Refer to Chapter 4 “Digitize Function”
F4	Replay	Replays the captured IQ data. Refer to Chapter 4 “Digitize Function”
F5	Stop Replaying	Stops replaying the captured IQ data. Refer to Chapter 4 “Digitize Function”

3.4.1 Setting capture time

The capture time is calculated by the following formula.

Capture time [ms] = (Capture Time Length [frame] + 1) × 10 [ms] + α

α: Processing time margin for analysis

3.4.2 Averaging IQ data

The following is the method for averaging IQ data.

In the Auto mode, capture of one frame starts at the trigger timing. After the measurement is completed, capture of another frame starts at the next trigger timing. The average and maximum values are calculated from the measurement results at each storage count. The frames of multiple measurements are not necessarily consecutive.
The storage count and the capture count are the same in single measurement. In continuous measurement, the average and maximum values are calculated from the last data of the storage count after measurement has been performed the number of times corresponding to the storage count.

3.5 5G Standard Setting

Set the 5G Standard in the Standard function menu that is displayed by pressing F3 (Standard) on the main function menu.

Table 3.5-1 Standard function menu

Function Key	Menu Display	Function
Page 1	Standard	Press **Standard** to display.
F3	NR TDD sub-6GHz Downlink	Sets 5G Standard to NR TDD sub-6GHz Downlink. It is available when MX285051A-011/MX269051A-011 is installed.
F4	NR TDD mmWave Downlink	Sets 5G Standard to NR TDD mmWave Downlink. It is available when MX285051A-021 is installed.
F5	NR TDD sub-6GHz Uplink	Sets 5G Standard to NR TDD sub-6GHz Uplink. It is available when MX285051A-061/MX269051A-061 is installed.
F6	NR TDD mmWave Uplink	Sets 5G Standard to NR TDD mmWave Uplink. It is available when MX285051A-071 is installed.

3.6 NR TDD sub-6GHz Downlink / NR TDD mmWave Downlink

To set the measurement items, press F4 (Measure) on the main function menu or Measure to display the Measure function menu.

Table 3.6-1 Measure function menu
(NR TDD sub-6GHz Downlink / NR TDD mmWave Downlink)

Function Key	Menu Display	Function
Page 1	Measure	Press **Measure** to display.
F1	Modulation Analysis	Switches the measurement function to Modulation Analysis. It is available when MX285051A-011/MX269051A-011 or MX285051A-021 is installed.
F2	Carrier Aggregation Analysis	Switches the measurement function to Carrier Aggregation Analysis. It is available when MX285051A-021 is installed and Standard is NR TDD mmWave Downlink.

3.6.1 Modulation Analysis

To set modulation analysis items, press F1 (Modulation Analysis) on the Measure function menu to display the Modulation Analysis function menu.

The Modulation Analysis function menu consists of two pages that are toggled by pressing →.

Table 3.6.1-1 Modulation Analysis function menu

Function Key	Menu Display	Function
Page 1	Modulation Analysis	Press **Modulation Analysis** to display.
F1	Analysis Time	Sets measurement position. Refer to 3.6.1.1 "Analysis Time"
F2	Basic Settings	Sets the basic parameters for such as each channel and signal. Refer to 3.6.1.2 "Basic Settings"
F7	Advanced Settings	Sets the detailed parameters for modulation analysis. Refer to 3.6.1.3 "Advanced Settings"
Page 2	Modulation Analysis	Press **Modulation Analysis** and then → to display.
F1	Trace	Sets the trace. Refer to 3.6.1.4, 3.6.1.5, 3.6.1.6 "Trace"

3.6.1.1 Analysis Time

Set the measurement position in the Analysis Time function menu that is displayed by pressing F1 (Analysis Time) on page 1 of the Modulation Analysis function menu.

Table 3.6.1.1-1 Analysis Time function menu

Function Key	Menu Display	Function
Page 1	Analysis Time	Press **Analysis Time** to display.
F1	Starting Slot Number	Sets the starting slot number. It is fixed to 0 Slot in the MX285051A-011/MX269051A-011 and MX285051A-021.
F2	Measurement Interval	Sets the analysis slot length. Following values are fixed. For NR TDD sub-6GHz Downlink, Subcarrier Spacing = 15 kHz: 10 Slots Subcarrier Spacing = 30 kHz: 20 Slots Subcarrier Spacing = 60 kHz: 40 Slots For NR TDD mmWave Downlink, Subcarrier Spacing = 60 kHz: 40 Slots Subcarrier Spacing = 120 kHz: 80 Slots

The following table lists the slots per frame according to the Subcarrier Spacing.

Table 3.6.1.1-2 Number of Slots per Frame

Subcarrier Spacing	Slots/Frame
15 kHz	10
30 kHz	20
60 kHz	40
120 kHz	80

3.6.1.2 Basic Settings

Set the basic parameters for modulation analysis of such as each channel and signal. The Basic Settings function menu and a dialog box to set the parameters for each channel and signal are displayed by pressing F2 (Basic Settings) on page 1 of the Modulation Analysis function menu.

Table 3.6.1.2-1 Basic Settings function menu

Function Key	Menu Display	Function
Page 1	Basic Settings	Press **Basic Settings** to display.
F1	Frame Parameter	Displays a tab to set the parameters for Frame Parameter. Refer to Table 3.6.1.2-3 Frame Parameter
F2	SS-Block	Displays a tab to set the parameters for SS-Block. Refer to Table 3.6.1.2-5 SS-Block
F3	PDCCH/DM-RS	Displays a tab to set the parameters for PDCCH/DM-RS. Refer to Table 3.6.1.2-6 PDCCH/DM-RS
F4	PDSCH/DM-RS	Displays a tab to set the parameters for PDSCH/DM-RS. Refer to Table 3.6.1.2-7 PDSCH/DM-RS
F6	Restore Default Values	Restores the parameters in the dialog box to the default values.
F7	Set	Sets the parameters specified at the dialog box.
F8	Cancel	Cancels the parameters specified at the dialog box.

Table 3.6.1.2-2 Common Settings

Dialog Box	Function
Number of Carriers	Sets the number of carriers. Refer to "Number of Carriers" in 3.6.1.3 "Advanced Settings" for the range.
Reference Carrier	Sets the reference carrier for analysis. If the reference carrier is changed, the parameters displayed in the dialog box are also changed. Refer to "Reference Carrier" in 3.6.1.3 "Advanced Settings" for the range.
Carrier State	Displays whether to enable or disable Component Carrier.
Frequency Offset	Displays the frequency offset of Component Carrier. Refer to "Frequency Offset" in 3.6.1.3 "Advanced Settings" for the range.
Copy to All CC	Copies the parameter of Reference Carrier to other Component Carriers. However, the frequency offset is not copied.

Table 3.6.1.2-3 Frame Parameter

Dialog Box	Function
Test Model	Selects Test Model conforming to TS38.141(2018-12). For NR TDD sub-6GHz Downlink, OFF, NR-FR1-TM1.1, NR-FR1-TM1.2, NR-FR1-TM2, NR-FR1-TM2a, NR-FR1-TM3.1, NR-FR1-TM3.1a, NR-FR1-TM3.2, NR-FR1-TM3.3 For NR TDD mmWave Downlink, OFF, NR-FR2-TM1.1, NR-FR2-TM2, NR-FR2-TM3.1
Subcarrier Spacing	Sets the Subcarrier Spacing. For NR TDD sub-6GHz Downlink, Options: 15 kHz, 30 kHz, 60 kHz For NR TDD mmWave Downlink, Options: 60 kHz, 120 kHz
Number of RBs	Sets the Resource Block numbers of the target signal. Number of RBs is set to the default value when switching the Standard. For NR TDD sub-6GHz Downlink, Options: Subcarrier Spacing = 15 kHz: 25, 52, 79, 106, 133, 160, 216, 270 Subcarrier Spacing = 30 kHz: 11, 24, 38, 51, 65, 78, 106, 133, 162, 189, 217, 245, 273 Subcarrier Spacing = 60 kHz: 11, 18, 24, 31, 38, 51, 65, 79, 93, 107, 121, 135 For NR TDD mmWave Downlink, Options: Subcarrier Spacing = 60 kHz: 66, 132, 264 Subcarrier Spacing = 120 kHz: 32, 66, 132, 264
Channel Bandwidth	Displays the Cannel Bandwidth of the target signal set by the Number of RBs.
Cell ID	Sets the Cell ID. Range: 0 to 1007
Synchronization Mode	Sets the synchronized signal. Options: SS Sets Synchronization Signal for the synchronized signal. DM-RS for PDSCH Sets Demodulation Reference Signal for PDSCH for the synchronized signal.
Phase Compensation	Sets whether to enable or disable Phase Compensation. Phase Compensation sets whether to enable (ON) or disable (OFF) phase compensation during upconversion defined in the 3GPP NR standard (TS 38.211, V15.1.0 or later). Upconversion formula for ON: $\mathrm{Re}\left\{ s_l^{(p,\mu)}(t) \cdot e^{j2\pi f_0 \left(t - t_{\mathrm{start},l}^{\mu} - N_{\mathrm{CP},l}^{\mu} T_c\right)} \right\}$ Upconversion formula for OFF: $\mathrm{Re}\left\{ s_l^{(p,\mu)}(t) \cdot e^{j2\pi f_0 t} \right\}$ For details, refer to 5.4 in TS 38.211 (V15.1.0 or later).

The following table shows the relation between the Number of RBs setting and the Channel Bandwidth at each Subcarrier Spacing.

Table 3.6.1.2-4 Relationship Between Number of RBs and Channel Bandwidth

Subcarrier Spacing	Number of RBs	Channel Bandwidth
15 kHz	25	5 MHz
	52	10 MHz
	79	15 MHz
	106	20 MHz
	133	25 MHz
	160*1	30 MHz
	216*1	40 MHz
	270*1	50 MHz
30 kHz	11	5 MHz
	24	10 MHz
	38	15 MHz
	51	20 MHz
	65	25 MHz
	78*1	30 MHz
	106*1	40 MHz
	133*1	50 MHz
	162*2	60 MHz
	189*2	70 MHz
	217*2	80 MHz
	245*2	90 MHz
	273*2	100 MHz
60 kHz (MX285051A-011/ MX269051A-011)	11	10 MHz
	18	15 MHz
	24	20 MHz
	31	25 MHz
	38*1	30 MHz
	51*1	40 MHz
	65*1	50 MHz
	79*2	60 MHz
	93*2	70 MHz
	107*2	80 MHz
	121*2	90 MHz
	135*2	100 MHz
60 kHz (MX285051A-021)	66	50 MHz
	132	100 MHz
	264	200 MHz
120 kHz	32	50 MHz
	66	100 MHz
	132	200 MHz
	264*3	400 MHz

*1: For MS269xA, this is available when MS269xA-077/177 is installed.

*2: For MS269xA, this is available when MS269xA-078/178 is installed.

*3: For MS2850A, this is available when MS2850A-033/133 is installed.

Table 3.6.1.2-5 SS-Block

Dialog Box	Function
Enable	Sets whether to enable or disable SS-Block. When set to disable, no measurement result of SS-Block is displayed. Fixed disable in the following condition. Number of RBs < 20, Subcarrier Spacing = 60 kHz
SS-Block Subcarrier Spacing	This parameter is fixed and cannot be changed. Displays the same value of the Subcarrier Spacing of the Frame Parameter.
SS-Block Candidate	Sets the position of the SS-Block in the time direction. For NR TDD sub-6GHz Downlink, Options: Subcarrier Spacing = 15 kHz: CaseA (L=4), CaseA (L=8) Subcarrier Spacing = 30 kHz: CaseB (L=4), CaseB (L=8), CaseC (L=4), CaseC (L=8) For NR TDD mmWave Downlink, Options: Subcarrier Spacing = 120 kHz: CaseD (L=64)
Antenna Port	Sets the Antenna Port for SS-Block. It is fixed to 4000.
SSB Subcarrier Offset	Sets the Subcarrier Offset in the RB to map the SS-Block. Range: 0 to 11
SSB RB Offset	Sets the RB Offset to map the SS-Block. Range: 0 to Number of RBs – 20 (SSB Subcarrier Offset = 0) 0 to Number of RBs – 20 – 1 (SSB Subcarrier Offset > 0)
Delta SSB Center to CF	Displays the offset between the center of SS Block and the center of Carrier Frequency.
Periodicity	Sets the SS-Block Periodicity. Options: 10 ms 20 ms (Only when Capture Length is 2 Frames)
Analysis Frame Number	Sets the analysis target frame number in SS synchronization. The frame in which SS Block is mapped is numbered 0. Options: 0 1 (Only when SS-Block Periodicity is 20 ms)

Table 3.6.1.2-5 SS-Block (Cont'd)

Dialog Box	Function
P-SS Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the Primary Synchronization Signal power. Fixed to Auto.
P-SS Power Boosting	Sets the level of the Primary Synchronization Signal. This parameter is fixed and cannot be changed.
S-SS Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the Secondary Synchronization Signal power. Fixed to Auto.
S-SS Power Boosting	Sets the level of the Secondary Synchronization Signal. This parameter is fixed and cannot be changed.
PBCH Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the PBCH power. Fixed to Auto.
PBCH Power Boosting	Sets the PBCH level. This parameter is fixed and cannot be changed.
SS-Block Transmission	Enables or disables SS-Block by Index. Options: Enable, Disable For NR TDD mmWave Downlink, all indexes are fixed to Enable.

Table 3.6.1.2-6 PDCCH/DM-RS

Dialog Box	Function
Slot	Selects the Slot number for which the parameter of PDCCH/DM-RS is to be set. For NR TDD sub-6GHz Downlink, Range: Subcarrier Spacing = 15 kHz: 0 to 9 Subcarrier Spacing = 30 kHz: 0 to 19 Subcarrier Spacing = 60 kHz: 0 to 39 For NR TDD mmWave Downlink, Range: Subcarrier Spacing = 60 kHz: 0 to 39 Subcarrier Spacing = 120 kHz: 0 to 79
Enable	Enables or disables the PDCCH/DM-RS for the selected Slot. No measurement result of the PDDCH/DM-RS of the disabled Slot is displayed.
Antenna Port	Sets the Antenna Port for PDCCH/DM-RS. It is fixed to 2000.
PDCCH Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the PDCCH power for DM-RS. Fixed to Auto.
PDCCH Power Boosting	Sets the PDCCH level of the DM-RS. This parameter is fixed and cannot be changed.
Number of Symbols	This is the number of symbols for PDCCH. This parameter is fixed and cannot be changed.
Copy to All Slot	Copies the setting of the selected Slot to all the Slots.

Table 3.6.1.2-7 PDSCH/DM-RS

Dialog Box	Function
Slot	Selects the Slot number for which the parameter of PDSCH/DM-RS is to be set. For NR TDD sub-6GHz Downlink, Range: Subcarrier Spacing = 15 kHz: 0 to 9 Subcarrier Spacing = 30 kHz: 0 to 19 Subcarrier Spacing = 60 kHz: 0 to 39 For NR TDD mmWave Downlink, Range: Subcarrier Spacing = 60 kHz: 0 to 39 Subcarrier Spacing = 120 kHz: 0 to 79
Enable	Enables or disables the PDSCH/DM-RS for the selected Slot. No measurement result of the PDSCH/DM-RS of the disabled Slot is displayed.
Antenna Port	Sets the Antenna Port. Antenna Port settings are common to all Slots. Options: 1000, 1001, 1002, 1003
Modulation Scheme	Selects the modulation scheme for the PDSCH. Options: QPSK, 16QAM, 64QAM, 256QAM, Auto
PDSCH Mapping Type	Sets the Mapping Type of PDSCH. Options: typeA, typeB
Start Symbol	Sets the Mapping Start Symbol of PDSCH. When the PDSCH Mapping Type is typeA Range: 0 to DMRS typeA pos When the PDSCH Mapping Type is typeB Range: 0 to 12
Number of Symbols	Sets the number of symbols for PDSCH. Range: 2 to 14 – PDSCH Start Symbol
PDSCH Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the PDSCH power for DM-RS. Options: Auto, Manual
PDSCH Power Boosting	Sets the PDSCH level of the DM-RS. The following values are set when PDSCH Power Boosting is Auto.
DM-RS typeA-pos	Sets the DM-RS typeA-pos. This parameter is settable only when PDSCH Mapping Type is typeA. Options: 2, 3
DM-RS config-type	Sets the DM-RS config type. It is fixed to 1.
DM-RS add-pos	Sets the DM-RS add-pos. Options: 0, 1, 2, 3

DMRS CDM Group without Data	DMRS Config Type	PDSCH Level (dB)
1	1	0.000
2	1	–3.000

Table 3.6.1.2-7 PDSCH/DM-RS (Cont'd)

Dialog Box	Function
CDM Group Without Data	Sets the DM-RS associated with PDSCH. Options: 1, 2 It is fixed to 2 when Antenna Port is 1002 or 1003.
PDSCH PT-RS	Enables or disables the PDSCH PT-RS. It is fixed to disable.
PT-RS Time Density	Sets the PT-RS Time Density. Options: 1, 2, 4
PT-RS Freq. Density	Sets the PT-RS Freq. Density. Options: 2, 4
PT-RS RE Offset	Sets the PT-RS RE Offset. Options: 00, 01, 10, 11
PDSCH RBs Allocation Auto Detect	Enables or disables the auto detection of the RBs that are allocated to PDSCH. Options: Enable, Disable
PDSCH RBs Allocation Start RB	Sets the Start RB of the RBs that are allocated to PDSCH. Rang: 0 to Number Of RBs – 1
PDSCH RBs Allocation Number of RBs	Sets the number of the RBs that are allocated to PDSCH. Rang: 1 to Number Of RBs – PDSCH Allocation Start RB
Copy to All Slot	Copies the setting of selected Slot to all the Slots.

3.6.1.3 Advanced Settings

Set the advanced parameters for modulation analysis. The Advanced Settings function menu is displayed by pressing F7 (Advanced Settings) on page 1 of the Modulation Analysis function menu.

Table 3.6.1.3-1 Advanced Settings function menu

<table>
<tr><th>Function Key</th><th>Menu Display</th><th>Function</th></tr>
<tr><td>Page 1</td><td>Advanced Settings</td><td>Press Advanced Settings to display.</td></tr>
<tr><td>F1</td><td>Equalizer Use data</td><td>Selects whether or not to include resource elements other than Reference Signal at calculation of the transmission path loss.
Options:
On Includes resource elements other than Reference Signal at calculation of the transmission path loss.
Off Does not include resource elements other than Reference Signal at calculation of the transmission path loss.</td></tr>
<tr><td>F2</td><td>Amplitude Tracking</td><td>Selects On/Off for Amplitude Tracking.
Options: On, Off</td></tr>
<tr><td>F3</td><td>Phase Tracking</td><td>Selects On/Off for Phase Tracking.
Options: On, Off</td></tr>
<tr><td>F4</td><td>Timing Tracking</td><td>Selects On/Off for Timing Tracking.
Options: On, Off</td></tr>
<tr><td>F6</td><td>Number of Carriers</td><td>Sets the number of carriers.
Range: 0 to
Refer to Table 3.6.2.2-3 for the maximum range value.</td></tr>
<tr><td>F7</td><td>Reference Carrier</td><td>Sets the reference carrier for analysis.
Range: 0 to (Number of Carriers – 1)</td></tr>
<tr><td>F8</td><td>Frequency Offset</td><td>Displays the frequency offset of Component Carrier.
Resolution: 10 kHz
Range:
<table>
<tr><th>Option</th><th>Center Frequency</th><th>Range [MHz]</th></tr>
<tr><td>Without MS2850A-033/133</td><td>–</td><td>–127.5 to +127.5</td></tr>
<tr><td>With MS2850A-033/133</td><td>–</td><td rowspan="2">–255 to +255</td></tr>
<tr><td rowspan="2">With MS2850A-034/134</td><td>< 4.2 GHz</td></tr>
<tr><td>≥ 4.2 GHz</td><td>–500 to +500</td></tr>
</table></td></tr>
</table>

Table 3.6.1.3-1 Advanced Settings function menu (Cont'd)

Function Key	Menu Display	Function
Page 2	Advanced Settings	Press **Advanced Settings** and then → to display.
F1	Multicarrier Filter	When measuring the multicarrier signal, sets whether to filter the reference carrier. Options: On, Off It is fixed to On when Number of Carriers > 1.
F2	EVM Window	Turns On or Off the EVM Window. Options: On Displays the worst among the EVM High and EVM Low values as the measurement result. However, the EVM Mid result is displayed in graph. Off Displays the EVM Mid. Refer to Figure 3.6.1.3-1 "EVM Window"

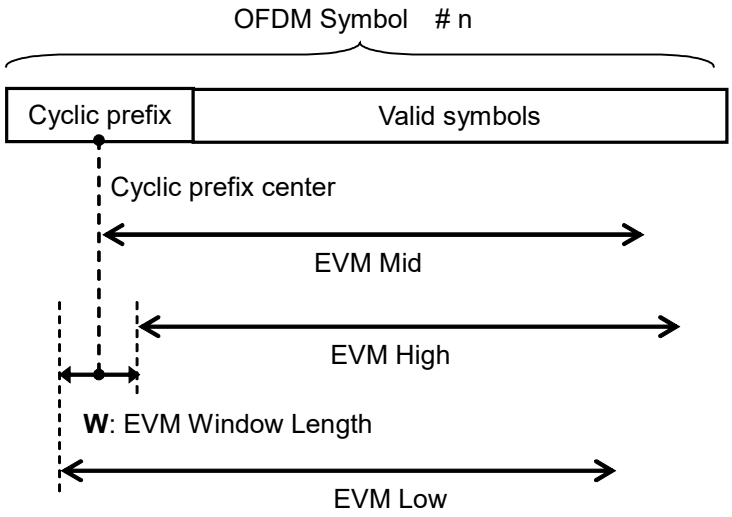


Figure 3.6.1.3-1 EVM Window

3.6.1.4 Trace (EVM vs Subcarrier, EVM vs Symbol, Spectral Flatness)

Set Trace in the Trace function menu that is displayed by pressing F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace.

When EVM vs Subcarrier, EVM vs Symbol, or Spectral Flatness is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.6.1.4-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: EVM vs Subcarrier Displays EVM vs Subcarrier in a graph window. EVM vs Symbol Displays EVM vs Symbol in a graph window. Spectral Flatness Displays Spectral Flatness in a graph window. Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window.
F3	Scale	Sets vertical scale of graphical result. Refer to Table 3.6.1.4-2 Scale function menu
F4	Storage	Sets storage method. Refer to Table 3.6.1.4-3 Storage function menu
F6	Subcarrier Number	Sets the subcarrier number of Marker position and EVM vs Symbol displayed. Range: 0 to (Number of RBs × 12 – 1)
F7	Symbol Number	Sets the symbol number of Marker position and EVM vs Subcarrier displayed. For NR TDD sub-6GHz Downlink, Range: Subcarrier Spacing = 15 kHz: 0 to 139 Subcarrier Spacing = 30 kHz: 0 to 279 Subcarrier Spacing = 60 kHz: 0 to 559 For NR TDD mmWave Downlink, Range: Subcarrier Spacing = 60 kHz: 0 to 559 Subcarrier Spacing = 120 kHz: 0 to 1119

Table 3.6.1.4-1 Trace function menu (Cont'd)

Function Key	Menu Display	Function
F8	EVM vs Subcarrier View	Displayed when EVM vs Subcarrier is selected by F1: Trace Mode. Sets whether to enable averaging in EVM vs Subcarrier, and the display type. Options: Each Symbol Displays EVM vs Subcarrier of Symbol set in Symbol Number when EVM vs Subcarrier is displayed. Averaged over all Symbols Displays EVM vs Subcarrier of the analysis slot length set in Measurement Interval. Graph View Selects a graph display type of EVM vs Subcarrier from the average (RMS), and the average value and peak value (RMS&Peak).
	EVM vs Symbol View	Displayed when EVM vs Symbol is selected by F1: Trace Mode. Sets whether to enable averaging in EVM vs Symbol, and the display type. Options: Each Subcarrier Displays EVM vs Symbol of Subcarrier set in Subcarrier Number when EVM vs Symbol is displayed. Averaged over all Subcarrier Displays EVM vs Symbol in all subcarriers. Graph View Selects a graph display type of EVM vs Subcarrier from the average (RMS), and the average value and peak value (RMS&Peak).
	Spectral Flatness Type	Displayed when Spectral Flatness is selected by F1: Trace Mode. Sets type of Spectral Flatness displayed. Options: Amplitude Displays Amplitude in Spectral Flatness. Phase Displays Phase in Spectral Flatness.

Table 3.6.1.4-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB
F2	EVM Scale	Sets the upper limit for the EVM scale. Range: 2%, 5%, 10%, 20% (in %) –40 dB, –20 dB, 0 dB (in dB)
F3	Flatness Scale	Sets a scale of Spectral Flatness. Options: Amplitude Sets the upper and lower limit values of Amplitude in Spectral Flatness (±10 dB, ±3 dB, ±1 dB). Phase Sets the upper and lower limit values of Phase in Spectral Flatness (±60 deg, ±20 deg, ±6 deg).

Table 3.6.1.4-3 Storage function menu

Function Key	Menu Display	Function
Page 1	Storage	Press **Storage** to display.
F1	Mode	Sets the storage mode. Options: Off Updates data per measurement. Average Displays the average per measurement. Average & Max Displays the average and maximum values per measurement.
F2	Count	Sets the measurement count. Range: 2 to 9999

3.6.1.5 Trace (Power vs RB, EVM vs RB)

Set Trace in the Trace function menu that is displayed by pressing F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace.

When Power vs RB or EVM vs RB is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.6.1.5-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: EVM vs Subcarrier Displays EVM vs Subcarrier in a graph window. EVM vs Symbol Displays EVM vs Symbol in a graph window. Spectral Flatness Displays Spectral Flatness in a graph window. Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window.
F3	Scale	Sets vertical scale of a graphical result. Refer to Table 3.6.1.5-2 Scale function menu
F6	Slot Number	Sets the slot number of Marker position, Power vs RB, and EVM vs RB displayed. For NR TDD sub-6GHz Downlink, Range: Subcarrier Spacing = 15 kHz: 0 to 9 Subcarrier Spacing = 30 kHz: 0 to 19 Subcarrier Spacing = 60 kHz: 0 to 39 For NR TDD mmWave Downlink, Range: Subcarrier Spacing = 60 kHz: 0 to 39 Subcarrier Spacing = 120 kHz: 0 to 79
F7	Resource Block Number	Sets the resource block number of Marker position, Power vs RB, and EVM vs RB displayed. Range: 0 to Number of RBs – 1

Table 3.6.1.5-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB
F2	EVM Scale	Sets the upper limit for the EVM scale. Range: 2%, 5%, 10%, 20% (in %) –40 dB, –20 dB, 0 dB (in dB) ***Note:*** EVM Scale is valid only for EVM vs RB.

3.6.1.6 Trace (Summary)

Set Trace in the Trace function menu that is displayed by pressing F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace.

When Summary is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.6.1.6-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: EVM vs Subcarrier Displays EVM vs Subcarrier in a graph window. EVM vs Symbol Displays EVM vs Symbol in a graph window. Spectral Flatness Displays Spectral Flatness in a graph window. Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window.
F3	Scale	Sets the unit of EVM measurement result. Refer to Table 3.6.1.6-2 Scale function menu
F4	Storage	Sets the storage mode. Refer to Table 3.6.1.6-3 Storage function menu

Table 3.6.1.6-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB

Table 3.6.1.6-3 Storage function menu

Function Key	Menu Display	Function
Page 1	Storage	Press **Storage** to display.
F1	Mode	Sets the storage mode. Options: Off Updates data per measurement. Average Displays the average per measurement. Average & Max Displays the average and maximum values per measurement.
F2	Count	Sets the measurement count. Range: 2 to 9999

3.6.2 Carrier Aggregation Analysis

To set modulation analysis items, press F1 (Carrier Aggregation Analysis) on the Measure function menu to display the Carrier Aggregation Analysis function menu.

The Carrier Aggregation Analysis function menu consists of two pages that are toggled by pressing →.

Table 3.6.2-1 Carrier Aggregation Analysis function menu

Function Key	Menu Display	Function
Page 1	Carrier Aggregation Analysis	Press **Carrier Aggregation Analysis** to display.
F1	Analysis Time	Sets measurement position. Refer to 3.6.2.1 "Analysis Time"
F2	Basic Settings	Sets the basic parameters for such as each channel and signal. Refer to 3.6.2.2 "Basic Settings"
F7	Advanced Settings	Sets the detailed parameters for modulation analysis. Refer to 3.6.2.3 "Advanced Settings"
Page 2	Carrier Aggregation Analysis	Press **Carrier Aggregation Analysis** and then → to display.
F1	Trace	Sets the trace. Refer to 3.6.2.4, 3.6.2.5 "Trace"

3.6.2.1 Analysis Time

Set the measurement position in the Analysis Time function menu that is displayed by pressing F1 (Analysis Time) on page 1 of the Carrier Aggregation Analysis function menu.

Table 3.6.2.1-1 Analysis Time function menu

Function Key	Menu Display	Function
Page 1	Analysis Time	Press **Analysis Time** to display.
F1	Starting Slot Number	Sets the starting slot number. It is fixed to 0 Slot.
F2	Measurement Interval	Sets the analysis slot length. Subcarrier Spacing = 60 kHz: 40 Slots Subcarrier Spacing = 120 kHz: 80 Slots

3.6.2.2 Basic Settings

Set basic parameters for modulation analysis, such as the number of Component Carriers, and parameters of channel and signal for each Component Carrier. The Basic Settings function menu and a dialog box to set the parameters for each channel and signal are displayed by pressing F2 (Basic Settings) on page 1 of the Carrier Aggregation Analysis function menu.

The menus and the dialog boxes displayed are the same as described in 3.6.1.2 “Basic Settings”.

However, if the firmware 14.00.00 or earlier is installed on the mainframe, the menus and dialog boxes shown in Table 3.6.2.2-1, Table 3.6.2.2-2, Table 3.6.2.2-4, and 3.6.2.2-5 are displayed.

Table 3.6.2.2-1 Basic Settings function menu

Function Key	Menu Display	Function
Page 1	Basic Settings	Press **Basic Settings** to display.
F1	Carrier Settings	Displays the Carrier Settings tab. Refer to Table 3.6.2.2-2 Carrier Settings
F2	Component Carrier Settings	Displays the Component Carrier Settings tab. Refer to Table 3.6.2.2-4 Component Carrier Settings
F3	Detail Settings	Displays the Detail Settings tab. Refer to Table 3.6.2.2-5 Detail Settings
F6	Restore Default Values	Restores the parameters in the dialog box to the default values.
F7	Set	Sets the parameters specified at the dialog box.
F8	Cancel	Cancels the parameters specified at the dialog box.

Table 3.6.2.2-2 Carrier Settings

Dialog Box	Function
Number of Carriers	Sets the number of carriers. Range: 0 to Refer to Table 3.6.2.2-3 for the maximum range value.
Reference Carrier	Sets the reference carrier for analysis. Range: 0 to (Number of Carriers – 1)
Phase Compensation	Sets whether to enable or disable Phase Compensation. Phase Compensation sets whether to enable (ON) or disable (OFF) phase compensation during upconversion defined in the 3GPP NR standard (TS 38.211, V15.1.0 or later). Upconversion formula for ON: $\mathrm{Re}\left\{ s_l^{(p,\mu)}(t) \cdot e^{j2\pi f_0 \left(t - t_{\mathrm{start},l}^{\mu} - N_{\mathrm{CP},l}^{\mu} T_c\right)} \right\}$ Upconversion formula for OFF: $\mathrm{Re}\left\{ s_l^{(p,\mu)}(t) \cdot e^{j2\pi f_0 t} \right\}$ For details, refer to 5.4 in TS 38.211 (V15.1.0 or later).

The following table shows the maximum number of carriers.

Table 3.6.2.2-3 Maximum Number of Carriers

	Channel Bandwidth	Maximum Number of Carriers
Without MS2850A-033/133	50 MHz	5
	100 MHz	2
	200 MHz	1
With MS2850A-033/133	50 MHz	8
	100 MHz	5
	200 MHz	2
	400 MHz	1
With MS2850A-034/134	50 MHz	8
	100 MHz	8
	200 MHz	4
	400 MHz	2

Table 3.6.2.2-4 Component Carrier Settings

Dialog Box	Function
CC#0 to CC#7	Sets whether to enable or disable Component Carrier. The measurement results of the disabled Component Carriers are not displayed.
The following items are displayed for each CC.	
Frequency Offset	Displays the frequency offset of Component Carrier. It is calculated automatically using the following formula. (CC number – ((Number of Carriers – 1) / 2)) × Carrier Spacing The Carrier Spacing values applied to the formula are as below. Number of RB = 32: 49.92 MHz Number of RB = 64: 99.96 MHz Number of RB = 132: 199.92 MHz Number of RB = 264: 399.96 MHz
Subcarrier Spacing	Sets the Subcarrier Spacing Options: 120 kHz
Number of RBs	Sets the Resource Block numbers of the target signal. Number of RBs is set to the default value when switching the Standard. Options: Subcarrier Spacing = 120 kHz: 32, 66, 132, 264
Channel Bandwidth	Displays the Cannel Bandwidth of the target signal set by the Number of RBs.
Cell ID	Sets the Cell ID. Range: 0 to 1007
Synchronization Mode	Sets the synchronized signal. Options: SS Sets Synchronization Signal for the synchronized signal. DM-RS for PDSCH Sets Demodulation Reference Signal for PDSCH for the synchronized signal.

Table 3.6.2.2-5 Detail Settings

Dialog Box	Function
The following items are displayed for each CC.	
SS-Block	
On/Off	Sets whether to enable or disable SS-Block.
SS-Block Subcarrier Spacing	This parameter is fixed and cannot be changed. Displays the same value of the Subcarrier Spacing of the Component Carrier Settings.
SS-Block Candidate	Sets the position of the SS-Block in the time direction. CaseD (L = 64) It is fixed.
Antenna Port	Sets the Antenna Port for SS-Block. It is fixed to 4000.
SSB Start RB Number	Sets the Resource Block to start the mapping of SS-Block. Calculated automatically from the Number of RBs of the Component Carrier Settings, and cannot be changed.
P-SS Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the Primary Synchronization Signal power. Fixed to Auto.
P-SS Power Boosting	Sets the level of the Secondary Synchronization Signal. This parameter is fixed and cannot be changed.
S-SS Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the Secondary Synchronization Signal power. Fixed to Auto.
S-SS Power Boosting	Sets the level of the Secondary Synchronization Signal. This parameter is fixed and cannot be changed.
PBCH Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the PBCH power. Fixed to Auto.
PBCH Power Boosting	Sets the PBCH level. This parameter is fixed and cannot be changed.
Slot	Selects the Slot where the PDCCH/DM-RS or PDSCH/DM-RS is to be set for the specified Component Carrier.
Copy to All Slots in this CC	Copies the Slot setting to all the Slots for the same Component Carrier.
Copy to All Slots in All CC	Copies the specified Slot setting to all Slots for all Component Carriers.
PDCCH/DM-RS	
On/Off	Sets whether to enable or disable PDCCH/DM-RS for the specified slot.
Antenna Port	Sets the Antenna Port for PDCCH/DM-RS. It is fixed to 2000.
PDCCH Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the PDCCH power for DM-RS. Fixed to Auto.
PDCCH Power Boosting	Sets the PDCCH level of the DM-RS. This parameter is fixed and cannot be changed.

Table 3.6.2.2-5 Detail Settings (Cont'd)

Dialog Box	Function
The following items are displayed for each CC.	
PDSCH/DM-RS	
On/Off	Sets whether to enable or disable PDSCH/DM-RS for the specified slot.
Antenna Port	Sets the Antenna Port. Antenna Port settings are common to all Slots. Options: 1000, 1001, 1002, 1003
Modulation Scheme	Selects the modulation scheme for the PDSCH. Options: QPSK, 16QAM, 64QAM, 256QAM, Auto
PDSCH Mapping Type	Sets the Mapping Type of PDSCH. Options: typeA, typeB
Start Symbol	Sets the Mapping Start Symbol of PDSCH. When the PDSCH Mapping Type is typeA, it is fixed to 2. When the PDSCH Mapping Type is typeB, it is fixed to 0.
End symbol	Sets the Mapping End Symbol for the PDSCH. It is fixed to 13.
DM-RS typeA-pos	Sets the DM-RS typeA-pos. It is fixed to 2.
DM-RS config-type	Sets the DM-RS config type. It is fixed to 1.
DM-RS add-pos	Sets the DM-RS add-pos. It is fixed to 0.
PDSCH Power Boosting (Auto/Manual)	Selects automatic detection and manual setting of the PDSCH power for DM-RS. Fixed to Manual.
PDSCH Power Boosting	Sets the PDSCH level of the DM-RS.
PDSCH PT-RS	Sets the DM-RS add-pos. It is fixed to 0.
PT-RS Time Density	Sets the PT-RS Time Density. It is fixed to 1.
PT-RS Freq. Density	Sets the PT-RS Freq. Density. It is fixed to 2.

3.6.2.3 Advanced Settings

Set the advanced parameters for modulation analysis. The Advanced Settings function menu is displayed by pressing F7 (Advanced Settings) on page 1 of the Carrier Aggregation Analysis function menu.

Table 3.6.2.3-1 Advanced Settings function menu

Function Key	Menu Display	Function
Page 1	Advanced Settings	Press **Advanced Settings** to display.
F1	Equalizer Use data	Selects whether or not to include resource elements other than Reference Signal at calculation of the transmission path loss. Options: On Includes resource elements other than Reference Signal at calculation of the transmission path loss. Off Does not include resource elements other than Reference Signal at calculation of the transmission path loss.
F2	Amplitude Tracking	Selects On/Off for Amplitude Tracking. Options: On, Off
F3	Phase Tracking	Selects On/Off for Phase Tracking. Options: On, Off
F4	Timing Tracking	Selects On/Off for Timing Tracking. Options: On, Off
Page 2	Advanced Settings	Press **Advanced Settings** and then → to display.
F1	Multicarrier Filter	When measuring the multicarrier signal, sets whether to filter the reference carrier. Options: On, Off It is fixed to On when Number of Carriers > 1.
F2	EVM Window	Turns On or Off the EVM Window. Options: On Displays the worst among the EVM High and EVM Low values as the measurement result. However, the EVM Mid result is displayed in graph. Off Displays the EVM Mid. Refer to Figure 3.6.1.3-1 “EVM Window”

3.6.2.4 Trace (Power vs RB, EVM vs RB)

Set Trace in the Trace function menu that is displayed by pressing F1 (Trace) on page 2 of the Carrier Aggregation Analysis function menu or Trace.

When Power vs RB or EVM vs RB is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.6.2.4-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window.
F3	Scale	Sets vertical scale of a graphical result. Refer to Table 3.6.2.4-2 Scale function menu
F5	Carrier Number	Sets the carrier number Range: 0 to (Number of Carriers – 1)
F6	Slot Number	Sets the slot number of Marker position, Power vs RB, and EVM vs RB displayed. Range: Subcarrier Spacing = 60 kHz: 0 to 39 Subcarrier Spacing = 120 kHz: 0 to 79
F7	Resource Block Number	Sets the resource block number of Marker position, Power vs RB, and EVM vs RB displayed. Range: 0 to Number of RBs – 1

Table 3.6.2.4-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB
F2	EVM Scale	Sets the upper limit for the EVM scale. Range: 2%, 5%, 10%, 20% (in %) –40 dB, –20 dB, 0 dB (in dB) ***Note:*** EVM Scale is valid only for EVM vs RB.

3.6.2.5 Trace (Summary)

Set Trace in the Trace function menu that is displayed by pressing F1 (Trace) on page 2 of the Carrier Aggregation Analysis function menu or Trace.

When Summary is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.6.2.5-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window.
F3	Scale	Sets the unit of EVM measurement result. Refer to Table 3.6.2.5-2 Scale function menu

Table 3.6.2.5-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB

3.7 NR TDD sub-6GHz Uplink / NR TDD mmWave Uplink

To set the measurement items, press F4 (Measure) on the main function menu or Measure to display the Measure function menu.

Table 3.7-1 Measure function menu (NR TDD sub-6GHz Uplink/NR TDD mmWave Uplink)

Function Key	Menu Display	Function
Page 1	Measure	Press **Measure** to display.
F1	Modulation Analysis	Switches the measurement function to Modulation Analysis. It is available when MX285051A-061/MX269051A-061 or MX285051A-071 is installed.

3.7.1 Modulation Analysis

To set modulation analysis items, press F1 (Modulation Analysis) on the Measure function menu to display the Modulation Analysis function menu.

The Modulation Analysis function menu consists of two pages that are toggled by pressing →.

Table 3.7.1-1 Modulation Analysis function menu

Function Key	Menu Display	Function
Page 1	Modulation Analysis	Press **Modulation Analysis** to display.
F1	Analysis Time	Sets measurement position. Refer to 3.7.1.1 "Analysis Time"
F2	Basic Settings	Sets Basic parameters. Refer to 3.7.1.2 "Basic Settings"
F7	Advanced Settings	Sets the parameters for each channel and signal. Refer to 3.7.1.3 "Advanced Settings"
Page 2	Modulation Analysis	Press **Modulation Analysis** and then → to display.
F1	Trace	Sets the trace. Refer to 3.7.1.4, 3.7.1.5, 3.7.1.6 "Trace"

3.7.1.1 Analysis Time

Set the measurement position in the Analysis Time function menu that is displayed by pressing F1 (Analysis Time) on page 1 of the Modulation Analysis function menu.

Table 3.7.1.1-1 Analysis Time function menu

Function Key	Menu Display	Function
Page 1	Analysis Time	Press **Analysis Time** to display.
F1	Starting Slot Number	Sets the measurement start position. It is fixed to 0 slot in the MX285051A-061/MX269051A-061 and MX285051A-071.
F2	Measurement Interval	Sets the analysis slot length. It is fixed to the following values. For NR TDD sub-6GHz Uplink, Subcarrier Spacing = 15 kHz: 10 Slots Subcarrier Spacing = 30 kHz: 20 Slots Subcarrier Spacing = 60 kHz: 40 Slots For NR TDD mmWave Uplink, Subcarrier Spacing = 60 kHz: 40 Slots Subcarrier Spacing = 120 kHz: 80 Slots

The following table lists the slots per frame according to the Subcarrier Spacing.

Table 3.7.1.1-2 Number of Slots per Frame

Subcarrier Spacing	Slots/Frame
15 kHz	10
30 kHz	20
60 kHz	40
120 kHz	80

3.7.1.2 Basic Settings

Set the basic parameters for modulation analysis. The Basic Settings function menu is displayed by pressing F1 (Basic Settings) on page 1 of the Modulation Analysis function menu.

Table 3.7.1.2-1 Basic Settings function menu

Function Key	Menu Display	Function
Page 1	Basic Settings	Press **Basic Settings** to display.
F1	Frame Parameter	Displays a tab to set the parameters for Frame Parameter. Refer to Table 3.7.1.2-2 Frame Parameter
F2	PUSCH/DM-RS	Displays a tab to set the parameters for PUSCH/DM-RS. Refer to Table 3.7.1.2-4 PUSCH/DM-RS
F6	Restore Default Values	Restores the parameters in the dialog box to the default values.
F7	Set	Sets the parameters specified at the dialog box.
F8	Cancel	Cancels the parameters specified at the dialog box.

Table 3.7.1.2-2 Frame Parameter

Dialog Box	Function
Subcarrier Spacing	Sets the Subcarrier Spacing. For NR TDD sub-6GHz Uplink, Options: 15 kHz, 30 kHz, 60 kHz For NR TDD mmWave Uplink, Options: 60 kHz, 120 kHz
Number of RBs	Sets the number of the resource blocks for the target signal. Number of RBs is set to the default value when switching the Standard. For NR TDD sub-6GHz Uplink, Options: Subcarrier Spacing = 15 kHz: 25, 52, 79, 106, 133, 160, 216, 270 Subcarrier Spacing = 30 kHz: 11, 24, 38, 51, 65, 78, 106, 133, 162, 189, 217, 245, 273 Subcarrier Spacing = 60 kHz: 11, 18, 24, 31, 38, 51, 65, 79, 93, 107, 121, 135 For NR TDD mmWave Uplink, Options: Subcarrier Spacing = 60 kHz: 66, 132, 264 Subcarrier Spacing = 120 kHz: 32, 66, 132, 264
Channel Bandwidth	Displays the channel bandwidth of the target signal set by the Number of RBs.
Cell ID	Sets the Cell ID. Options: 0 to 1007
Phase Compensation	Sets whether to enable or disable Phase Compensation. Phase Compensation sets whether to enable (ON) or disable (OFF) phase compensation during upconversion defined in the 3GPP NR standard (TS 38.211, V15.1.0 or later). Upconversion formula for ON: $\mathrm{Re}\left\{ s_l^{(p,\mu)}(t) \cdot e^{j2\pi f_0 \left(t - t_{\mathrm{start},l}^{\mu} - N_{\mathrm{CP},l}^{\mu} T_c\right)} \right\}$ Upconversion formula for OFF: $\mathrm{Re}\left\{ s_l^{(p,\mu)}(t) \cdot e^{j2\pi f_0 t} \right\}$ For details, refer to 5.4 in TS 38.211 (V15.1.0 or later).

The following table shows the relation between the Number of RBs setting and the Channel Bandwidth at each Subcarrier Spacing.

Table 3.7.1.2-3 Relationship Between Number of RBs and Channel Bandwidth

Subcarrier Spacing	Number of RBs	Channel Bandwidth
15 kHz	25	5 MHz
	52	10 MHz
	79	15 MHz
	106	20 MHz
	133	25 MHz
	160*1	30 MHz
	216*1	40 MHz
	270*1	50 MHz
30 kHz	11	5 MHz
	24	10 MHz
	38	15 MHz
	51	20 MHz
	65	25 MHz
	78*1	30 MHz
	106*1	40 MHz
	133*1	50 MHz
	162*2	60 MHz
	189*2	70 MHz
	217*2	80 MHz
	245*2	90 MHz
	273*2	100 MHz
60 kHz (MX285051A-061 /MX269051A-061)	11	10 MHz
	18	15 MHz
	24	20 MHz
	31	25 MHz
	38*1	30 MHz
	51*1	40 MHz
	65*1	50 MHz
	79*2	60 MHz
	93*2	70 MHz
	107*2	80 MHz
	121*2	90 MHz
	135*2	100 MHz
60 kHz (MX285051A-071)	66	50 MHz
	132	100 MHz
	264	200 MHz
120 kHz	32	50 MHz
	66	100 MHz
	132	200 MHz
	264*3	400 MHz

*1: For MS269xA, this is available only when MS269xA-077/177 is installed.
*2: For MS269xA, this is available only when MS269xA-078/178 is installed.
*3: For MS2850A, this is available only when MS2850A-033/133 is installed.

Table 3.7.1.2-4 PUSCH/DM-RS

<table>
<tr><th>Dialog Box</th><th>Function</th></tr>
<tr><td>Slot</td><td>Selects the Slot number for which the parameters for the PUSCH/DM-RS is to be displayed.
For NR TDD sub-6GHz Uplink,
Range: Subcarrier Spacing = 15 kHz: 0 to 9
Subcarrier Spacing = 30 kHz: 0 to 19
Subcarrier Spacing = 60 kHz: 0 to 39
For NR TDD mmWave Uplink,
Range: Subcarrier Spacing = 60 kHz: 0 to 39
Subcarrier Spacing = 120 kHz: 0 to 79</td></tr>
<tr><td>Enable</td><td>Enables or disables the PUSCH/DM-RS at the selected Slot.
No measurement result of the PUSCH/DM-RS of the disabled Slot is displayed.</td></tr>
<tr><td>Antenna Port</td><td>Sets the Antenna Port.
Antenna Port settings are common to all Slots.
Options: 1000, 1001, 1002, 1003</td></tr>
<tr><td>Modulation Scheme</td><td>Selects the modulation scheme for the PUSCH.
Options: QPSK, 16QAM, 64QAM, 256QAM, Auto</td></tr>
<tr><td>PUSCH Mapping Type</td><td>Sets the Mapping Type of PUSCH.
Options: typeA, typeB</td></tr>
<tr><td>Start Symbol</td><td>Sets the Mapping Start Symbol of PUSCH.
When the PUSCH Mapping Type is typeA,
Range: 0 to DM-RS typeA-pos
When the PUSCH Mapping Type is typeB,
Range: 0 to 12.</td></tr>
<tr><td>Number of Symbols</td><td>Sets the number of symbols for PUSCH.
Range: 2 to 14-PUSCH Start Symbols</td></tr>
<tr><td>PUSCH Power Boosting (Auto/Manual)</td><td>Selects automatic detection and manual setting of the PUSCH Power of DM-RS.
Options: Auto, Manual</td></tr>
<tr><td>PUSCH Power Boosting</td><td>Sets the PUSCH level of the DM-RS.
The following values are set when PUSCH Power Boosting is Auto.
<table>
<tr><th>DMRS CDM Group without Data</th><th>DMRS Config Type</th><th>PUSCH Level (dB)</th></tr>
<tr><td>1</td><td>1</td><td>0.000</td></tr>
<tr><td>2</td><td>1</td><td>–3.000</td></tr>
</table></td></tr>
<tr><td>DM-RS typeA-pos</td><td>Sets the DM-RS typeA-pos.
This parameter is settable only when PUSCH Mapping Type is typeA.
Options: 2, 3</td></tr>
<tr><td>DM-RS config-type</td><td>Sets the DM-RS config type. It is fixed to 1.</td></tr>
<tr><td>DM-RS add-pos</td><td>Sets the DM-RS add-pos.
Options: 0, 1, 2, 3</td></tr>
</table>

Table 3.7.1.2-5 PUSCH/DM-RS

Dialog Box	Function
CDM Group Without Data	Sets the DM-RS associated with PUSCH. Options: 1, 2 It is fixed to 2 when Antenna Port is 1002 or 1003.
PUSCH PT-RS	Enables or disables the PUSCH PT-RS. It is fixed to disable.
PT-RS Time Density	Sets the PT-RS Time Density. Options: 1, 2, 4
PT-RS Freq. Density	Sets the PT-RS Freq. Density. Options: 2, 4
PT-RS RE Offset	Sets the PT-RS RE Offset. Options: 00, 01, 10, 11
PUSCH RBs Allocation Auto Detect	Enables or disables the auto detection of the RBs that are allocated to PUSCH. Options: Enable, Disable
PUSCH RBs Allocation Start RB	Sets the Start RB of the RBs that are allocated to PUSCH. Range: 0 to Number Of RBs – 1
PUSCH RBs Allocation Number of RBs	Sets the number of the RBs that are allocated to PUSCH. Range: 1 to Number Of RBs – PUSCH Allocation Start RB
Copy to All Slot	Copies the setting of the selected Slot to all the Slots.

3.7.1.3 Advanced Settings

Set the advanced parameters for modulation analysis. The Advanced Settings function menu is displayed by pressing F7 (Advanced Settings) on page 1 of the Modulation Analysis function menu.

Table 3.7.1.3-1 Advanced Settings function menu

Function Key	Menu Display	Function
Page 1	Advanced Settings	Press **Advanced Settings** to display.
F1	Equalizer Use data	Selects whether or not to include resource elements other than Reference Signal at calculation of the transmission path loss. Options: On Includes resource elements other than Reference Signal at calculation of the transmission path loss. Off Does not include resource elements other than Reference Signal at calculation of the transmission path loss.
F2	Amplitude Tracking	Selects On/Off for Amplitude Tracking. Options: On, Off
F3	Phase Tracking	Selects On/Off for Phase Tracking. Options: On, Off
F4	Timing Tracking	Selects On/Off for Timing Tracking. Options: On, Off
Page 2	Advanced Settings	Press **Advanced Settings** and then → to display.
F1	Multicarrier Filter	When measuring the multicarrier signal, sets whether to filter the reference carrier. Options: On, Off
F2	EVM Window	Turns On or Off the EVM Window. Options: On Displays the worst among the EVM High and EVM Low values as the measurement result. However, the EVM Mid result is displayed in graph. Off Displays the EVM Mid. Refer to Figure 3.6.1.3-1 "EVM Window"

3.7.1.4 Trace (EVM vs Subcarrier, EVM vs Symbol, Spectral Flatness)

Set Trace in the Trace function menu that is displayed by pressing F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace.

When EVM vs Subcarrier, EVM vs Symbol, or Spectral Flatness is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.7.1.4-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: EVM vs Subcarrier Displays EVM vs Subcarrier in a graph window. EVM vs Symbol Displays EVM vs Symbol in a graph window. Spectral Flatness Displays Spectral Flatness in a graph window. Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window.
F3	Scale	Sets vertical scale of graphical result. Refer to Table 3.7.1.4-2 Scale function menu
F4	Storage	Sets storage method. Refer to Table 3.7.1.4-3 Storage function menu
F6	Subcarrier Number	Sets the subcarrier number of Marker position and EVM vs Symbol displayed. Range: 0 to (Number of RBs × 12 – 1)
F7	Symbol Number	Sets the symbol number of Marker position and EVM vs Subcarrier displayed. For NR TDD sub-6GHz Uplink, Range: Subcarrier Spacing = 15 kHz: 0 to 139 Subcarrier Spacing = 30 kHz: 0 to 279 Subcarrier Spacing = 60 kHz: 0 to 559 For NR TDD mmWave Uplink, Range: Subcarrier Spacing = 60 kHz: 0 to 559 Subcarrier Spacing = 120 kHz: 0 to 1119

Table 3.7.1.4-1 Trace function menu (Cont'd)

Function Key	Menu Display	Function
F8	EVM vs Subcarrier View	Displayed when EVM vs Subcarrier is selected by F1: Trace Mode. Sets whether to enable averaging in EVM vs Subcarrier, and the display type. Options: Each Symbol Displays EVM vs Subcarrier of Symbol set in Symbol Number when EVM vs Subcarrier is displayed. Averaged over all Symbols Displays EVM vs Subcarrier of the analysis slot length set in Measurement Interval. Graph View Selects a graph display type of EVM vs Subcarrier from the average (RMS), and the average value and peak value (RMS&Peak).
	EVM vs Symbol View	Displayed when EVM vs Symbol is selected by F1: Trace Mode. Sets whether to enable averaging in EVM vs Symbol, and the display type. Options: Each Subcarrier Displays EVM vs Symbol of Subcarrier set in Subcarrier Number when EVM vs Symbol is displayed. Averaged over all Subcarriers Displays EVM vs Symbol in all subcarriers. Graph View Selects a graph display type of EVM vs Subcarrier from the average (RMS), and the average value and peak value (RMS&Peak).
	Spectral Flatness Type	Displayed when Spectral Flatness is selected by F1: Trace Mode. Sets type of Spectral Flatness displayed. Options: Amplitude Displays Amplitude in Spectral Flatness. Phase Displays Phase in Spectral Flatness.

Table 3.7.1.4-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB
F2	EVM Scale	Sets the upper limit for the EVM scale. Range: 2%, 5%, 10%, 20% (in %) –40 dB, –20 dB, 0 dB (in dB)
F3	Flatness Scale	Sets a scale of Spectral Flatness. Options: Amplitude Sets the upper and lower limit values of Amplitude in Spectral Flatness (±10 dB, ±3 dB, ±1 dB). Phase Sets the upper and lower limit values of Phase in Spectral Flatness (±60 deg, ±20 deg, ±6 deg).

Table 3.7.1.4-3 Storage function menu

Function Key	Menu Display	Function
Page 1	Storage	Press **Storage** to display.
F1	Mode	Sets the storage mode. Options: Off Updates data per measurement. Average Displays the average per measurement. Average & Max Displays the average and maximum values per measurement.
F2	Count	Sets the measurement count. Range: 2 to 9999

3.7.1.5 Trace (Power vs RB, EVM vs RB)

To set Trace, press F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace to display the Trace function menu.

When Power vs RB or EVM vs RB is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.7.1.5-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: EVM vs Subcarrier Displays EVM vs Subcarrier in a graph window. EVM vs Symbol Displays EVM vs Symbol in a graph window. Spectral Flatness Displays Spectral Flatness in a graph window. Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window.
F3	Scale	Sets vertical scale of a graphical result. Refer to Table 3.7.1.5-2 Scale function menu
F6	Slot Number	Sets the slot number of Marker position, Power vs RB, and EVM vs RB displayed. For NR TDD sub-6GHz Uplink, Range: Subcarrier Spacing = 15 kHz: 0 to 9 Subcarrier Spacing = 30 kHz: 0 to 19 Subcarrier Spacing = 60 kHz: 0 to 39 For NR TDD mmWave Uplink, Range: Subcarrier Spacing = 60 kHz: 0 to 39 Subcarrier Spacing = 120 kHz: 0 to 79
F7	Resource Block Number	Sets the resource block number of Marker position, Power vs RB, and EVM vs RB displayed. Range: 0 to Number of RBs – 1

Table 3.7.1.5-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB
F2	EVM Scale	Sets the upper limit for the EVM scale. Range: 2%, 5%, 10%, 20% (in %) –40 dB, –20 dB, 0 dB (in dB) ***Note:*** EVM Scale is valid only for EVM vs RB.

3.7.1.6 Trace (Summary)

Set Trace in the Trace function menu that is displayed by pressing F1 (Trace) on page 2 of the Modulation Analysis function menu or Trace. When Summary is selected by F1: Trace Mode, the function menu is as shown in the following table.

Table 3.7.1.6-1 Trace function menu

Function Key	Menu Display	Function
Page 1	Trace	Press **Trace** to display.
F1	Trace Mode	Sets a graphical result in the graph window. ***Note:*** The Trace function menu configuration changes depending on the settings of this function. Options: EVM vs Subcarrier Displays EVM vs Subcarrier in a graph window. EVM vs Symbol Displays EVM vs Symbol in a graph window. Spectral Flatness Displays Spectral Flatness in a graph window. Power vs RB Displays Power vs Resource Block in a graph window. EVM vs RB Displays EVM vs Resource Block in a graph window. Summary Displays EVM and power of each channel in a graph window. ***Note:*** The constellation is not displayed when Trace Mode is set to Summary.
F3	Scale	Sets the unit of EVM measurement result. Refer to Table 3.7.1.6-2 Scale function menu
F4	Storage	Sets the storage mode. Refer to Table 3.7.1.6-3 Storage function menu

Table 3.7.1.6-2 Scale function menu

Function Key	Menu Display	Function
Page 1	Scale	Press **Scale** to display.
F1	EVM Unit	Sets the unit of EVM. Options: %, dB

Table 3.7.1.6-3 Storage function menu

Function Key	Menu Display	Function
Page 1	Storage	Press **Storage** to display.
F1	Mode	Sets the storage mode. Options: Off Updates data per measurement. Average Displays the average per measurement. Average & Max Displays the average and maximum values per measurement.
F2	Count	Sets the measurement count. Range: 2 to 9999

3.8 Setting Marker

Configure the marker settings in the Marker function menu that is displayed by pressing F5 (Marker) on the main function menu or Marker. Also, press Peak Search to display page 2 of the Marker function menu.

The Marker function menu consists of 2 pages that are toggled by pressing →.

Note:

When Trace Mode is set to Summary, settings related to the marker function cannot be configured.

Table 3.8-1 Marker function menu

Function Key	Menu Display	Function
Page 1	Marker	Press **Marker** to display.
F1	Marker	Sets On/Off for the marker function. Option: On Enables the marker function. Off Disables the marker function.
F5	Constellation Marker Number	Displayed when Modulation Analysis is selected by the Measure function menu. Sets the position of the resource element targeted for the marker. ***Note:*** This setting is enabled only for Power vs RB and EVM vs RB. Range: Number of resource elements detected as 0 to PDSCH or PUSCH.
	Carrier Number	Displayed when Carrier Aggregation Analysis is selected by the Measure function menu. Sets the carrier number targeted for the marker. ***Note:*** This setting is enabled only for Power vs RB and EVM vs RB. Range: 0 to Number of Carriers – 1

Table 3.8-1 Marker function menu (Cont'd)

Function Key	Menu Display	Function
F6	Subcarrier Number	Displayed when Trace Mode is other than Power vs RB or EVM vs RB. Sets the position of the subcarrier targeted for the marker. Range: 0 to (Number of RBs × 12 – 1)
	Slot Number	Displayed when Trace Mode is Power vs RB or EVM vs RB. Sets the slot number to be displayed. For NR TDD sub-6GHz Downlink or NR TDD sub-6GHz Uplink, Range: Subcarrier Spacing = 15 kHz: 0 to 9 Subcarrier Spacing = 30 kHz: 0 to 19 Subcarrier Spacing = 60 kHz: 0 to 39 For NR TDD mmWave Downlink or NR TDD mmWave Uplink, Range: Subcarrier Spacing = 60 kHz: 0 to 39 Subcarrier Spacing = 120 kHz: 0 to 79
F7	Symbol Number	Displayed when Trace Mode is other than Power vs RB or EVM vs RB. Sets the position of the symbol targeted for the marker. For NR TDD sub-6GHz Downlink or NR TDD sub-6GHz Uplink, Range: Subcarrier Spacing = 15 kHz: 0 to 139 Subcarrier Spacing = 30 kHz: 0 to 279 Subcarrier Spacing = 60 kHz: 0 to 559 For NR TDD mmWave Downlink or NR TDD mmWave Uplink, Range: Subcarrier Spacing = 60 kHz: 0 to 559 Subcarrier Spacing = 120 kHz: 0 to 1119
	Resource Block Number	Displayed when Trace Mode is Power vs RB or EVM vs RB. Sets the resource block number to be displayed. Range: 0 to Number of RBs – 1

Table 3.8-1 Marker function menu (Cont'd)

Function Key	Menu Display	Function
Page 2	Marker	Press **Marker** and then → to display.
F1	Peak Search	Moves the marker to the maximum level point within the measurement range. When there are multiple maximum level points, the point corresponding to the smallest value (left side of the scale) on the horizontal axis (Subcarrier, Symbol, or Resource Block) is selected. ***Note:*** When Trace Mode is set to Power vs Resource Block and there are multiple maximum level points, the point corresponding to the smallest values on the horizontal and vertical (Slot) axes is selected.
F2	Next Peak	Moves the marker to the next largest level point after the current marker level within the measurement range. When there are multiple points, the point corresponding to the smallest value (left side of the scale) on the horizontal axis is selected. However, if the point is the same value as the marker level, the marker is moved to the next maximum point to the horizontal axis position of the marker. ***Note:*** When Trace Mode is set to Power vs Resource Block, the point corresponding to the smallest values on the horizontal and vertical axes is selected.
F3	Dip Search	Moves the marker to the minimum level position within the measurement range. When there are multiple minimum level points, the greatest point (right side of the scale) on the horizontal axis is selected. ***Note:*** When Trace Mode is set to Power vs Resource Block and there are multiple minimum level points, the greatest point on the horizontal axis and vertical axis is selected.
F4	Next Dip	Moves the marker to the minimum level point next to the current marker level within the measurement range. When there are multiple points, the greatest point (right side of the scale) on the horizontal axis is selected. However, if the point is the same value as the marker level, the marker is moved to the next minimum point to the horizontal axis position of the marker. ***Note:*** When Trace Mode is set to Power vs Resource Block, the greatest point on the horizontal axis and vertical axis is selected.

3.9 Setting Trigger

Configure the trigger settings in the Trigger function menu that is displayed by pressing F6 (Trigger) on the main function menu or Trigger/Gate.

Note:

You cannot set a trigger when the Replay function is executed.

Refer to 4.2 “Replay Function”

Table 3.9-1 Trigger function menu

Function Key	Menu Display	Function
Page 1	Trigger	Press **Trigger** to display.
F1	Trigger Switch	Sets the trigger synchronization On/Off. Options: On Enables the trigger function. Off Disables the trigger function.
F2	Trigger Source	Sets the trigger source. Options: MS2850A External Starts measurement by the trigger input from an external trigger. External2 Starts measurement by the trigger input from an external trigger 2. MS269xA External Starts measurement by the trigger input from an external trigger. SG Marker Starts measurement by the timing of the Vector Signal Generator option.
F3	Trigger Slope	Sets the trigger polarity. Options: Rise Synchronizes with rising edge of the trigger. Fall Synchronizes with falling edge of the trigger.
F8	Trigger Delay	Sets the trigger delay. Range: MS2850A –6.4 to +6.4 s (With MS2850A-032) –3.2 to +3.2 s (With MS2850A-033/133) –1.6 to +1.6 s (With MS2850A-034/134) MS269xA –2 to +2 s (Without MS269xA-077/177) –500 to +500 ms (With MS269xA-077/177)

3.10 EVM Display (Modulation Analysis)

EVM analysis results are displayed according to the storage mode setting. When setting to Off, the analysis results are displayed every time. When setting to Average, the average values of analysis results are displayed. When setting to Average & Max, the average and maximum value of analysis results are displayed.

Refer to 3.6.1.4 “Trace”

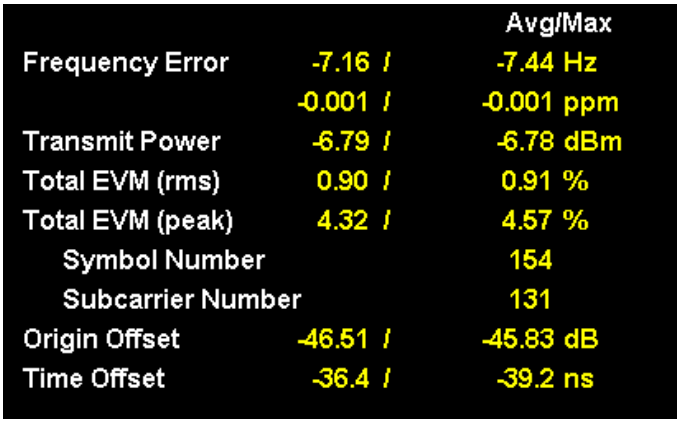


Figure 3.10-1 Result window

■Frequency Error

Summary Displays the average frequency error in the range set in Starting Slot Number and Measurement Interval.

Refer to 3.6.1.4 “Trace”

■Transmit Power

Summary Displays the mean power value including Cyclic Prefix in the bandwidth defined by Channel Bandwidth in the range set in Starting Slot Number and Measurement Interval.

■Total EVM (rms)

Summary Displays the root mean square EVM of all subcarriers within the range determined by Starting Slot Number and Measurement Interval.
Switches between % and dB according to settings of EVM Unit.

Refer to 3.6.1.4 “Trace”

■Total EVM (peak)

Summary Displays the maximum EVM of all subcarriers and all symbols in the range set in Starting Slot Number and Measurement Interval.
Switches between % and dB according to the settings of the EVM Unit.

■Symbol Number

Summary Displays the symbol number of Total EVM (peak).

■Subcarrier Number

Summary Displays the subcarrier number of Total EVM (peak).

■Origin Offset

Summary Displays the average origin offset in the range set in Starting Slot Number and Measurement Interval.

■Time Offset

Summary Displays the time offset between the trigger input and the head of the frame.
This is enabled in the following situations:

- When Trigger Switch is On.
- When the Replay function is executed and when the Storage Mode is Off.

3.11 Constellation Display (Modulation Analysis)

For the MX285051A-011/021/061/071 and MX269051A-011/061, the constellation parameters depend on the Trace Mode settings.

3.11.1 Constellation (EVM vs Subcarrier, EVM vs Symbol, Spectral Flatness)

The constellation is displayed.

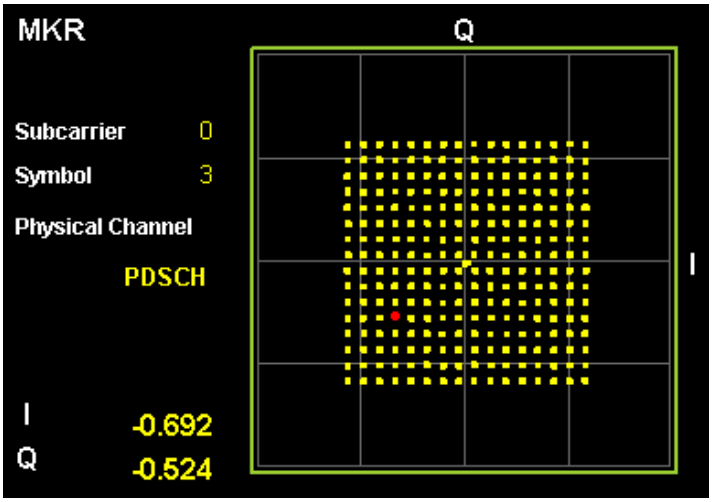


Figure 3.11.1-1 Constellation display

■Graph display

Summary This graph shows a constellation for all subcarriers of the symbols specified by Symbol Number.
The marker-selected subcarrier is displayed in red.

Refer to 3.6.1.4 “Trace”

■MKR Subcarrier

Summary Displays the marker-selected subcarrier number. The marker can be moved with the cursor key or the rotary knob.

■MKR I/Q

Summary Displays the amplitude value of I/Q of the marker-selected subcarrier. The marker can be moved with the cursor key or the rotary knob.
The amplitude value is normalized in the value in which that of Reference Signal is set to 1.0.

■MKR Symbol

Summary Displays the symbol number set in Constellation Symbol Number.

■MKR Physical Channel

Summary Displays the type of physical channel for the resource element selected by the marker.

3.11.2 Constellation (Power vs RB, EVM vs RB)

The PDSCH constellations specified by Slot Number or Resource Block Number are displayed.

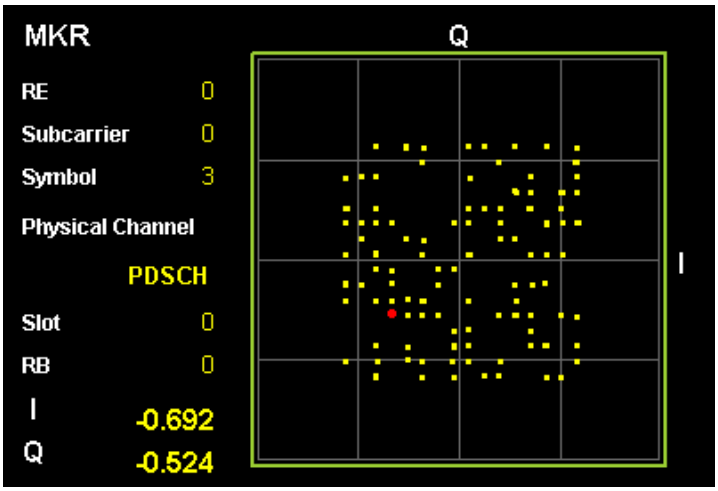


Figure 3.11.2-1 Constellation display

■Displaying Graph

Summary Displays overlapping the constellations of all resource elements of the resource block that is determined by the Slot Number and Resource Block Number settings.
The resource element selected by the marker is displayed in red.

Refer to 3.6.1.5 “Trace”

■MKR Resource Element Number (RE)

Summary Displays the number of the resource element selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.

■MKR Subcarrier

Summary Displays the subcarrier number of the resource element selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.

■MKR Symbol

Summary Displays the symbol number of the resource element selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.

■MKR I/Q

Summary Displays the I/Q amplitude value of the resource element selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.
The amplitude value is normalized to the value obtained by setting the amplitude value of Reference Signal to 1.0.

■MKR Physical Channel

Summary Displays the type of physical channel for the resource element selected by the marker.

■Slot Number

Summary Displays the slot number set by Slot Number.

■Resource Block Number (RB)

Summary Displays the resource block number set by Resource Block Number.

3.12 EVM vs Subcarrier Display (Modulation Analysis)

EVM for each subcarrier is displayed.

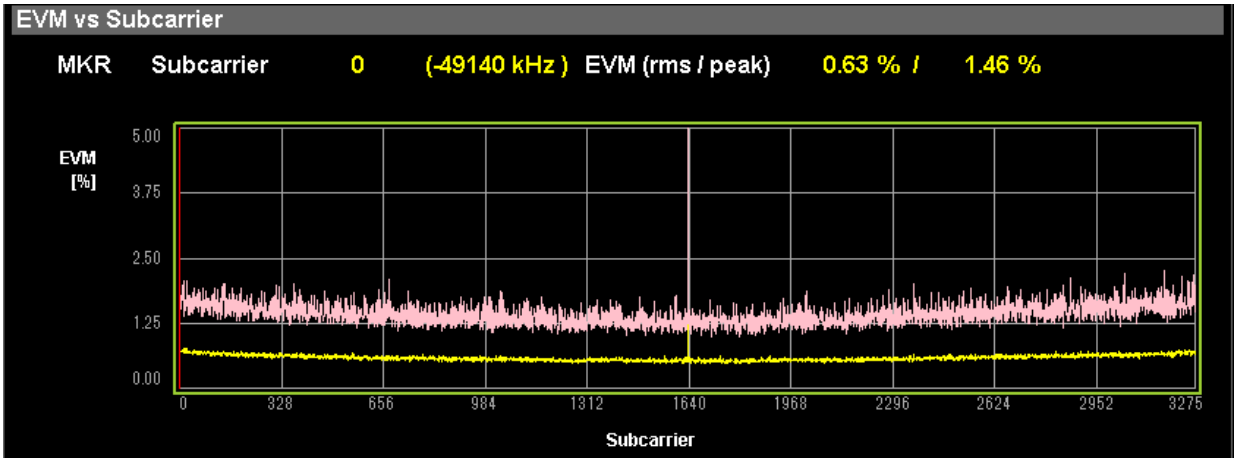


Figure 3.12-1 EVM vs Subcarrier display (Averaged over Symbols)

■Graph display

Summary Displays EVM for each subcarrier. EVM for each subcarrier is based on settings of EVM vs Subcarrier View.
The marker-selected subcarrier is displayed in red.

Refer to 3.6.1.4 “Trace”

■MKR Subcarrier

Summary Displays the marker-selected subcarrier number. The marker can be moved with the cursor key or the rotary knob.

■MKR EVM

Summary Displays EVM of the marker-selected subcarrier.
The EVM value is submitted to the settings of EVM vs Subcarrier View.

■MKR Symbol

Summary Displays the symbol number set in EVM vs Subcarrier Symbol Number.

Note:

Displays it only when the settings of EVM vs Subcarrier View is Each Symbol.

3.13 EVM vs Symbol Display (Modulation Analysis)

EVM for each Symbol is displayed.

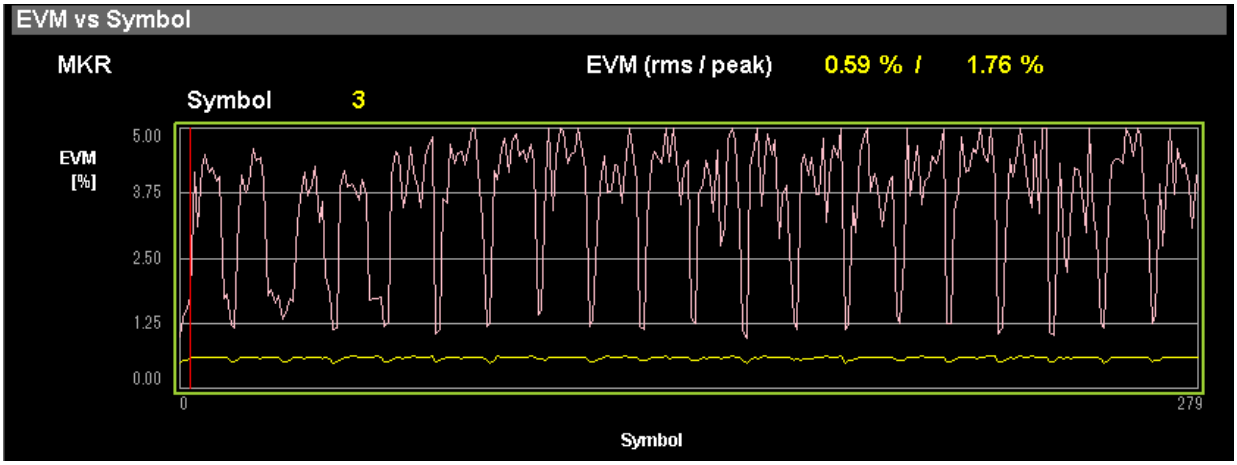


Figure 3.13-1 EVM vs Symbol display (Averaged over Subcarriers)

■Graph display

Summary Displays EVM for each symbol. EVM of each symbol is based on settings of EVM vs Symbol View.
The symbol selected by the marker is displayed in red.
Refer to 3.6.1.4 “Trace”

■MKR Symbol

Summary Displays the marker-selected symbol number. The marker can be moved with the cursor key or the rotary knob.

■MKR EVM

Summary Displays the average EVM of all subcarriers in the marker-selected symbol. The EVM value is submitted to the settings of EVM vs Symbol View.

■MKR Subcarrier

Summary Displays the subcarrier number set in EVM vs Symbol Subcarrier Number.

Note:

Displays it only when the settings of EVM vs Symbol View are Each Subcarrier.

3.14 Spectral Flatness Display (Modulation Analysis)

The measurement results of Spectral Flatness are displayed.

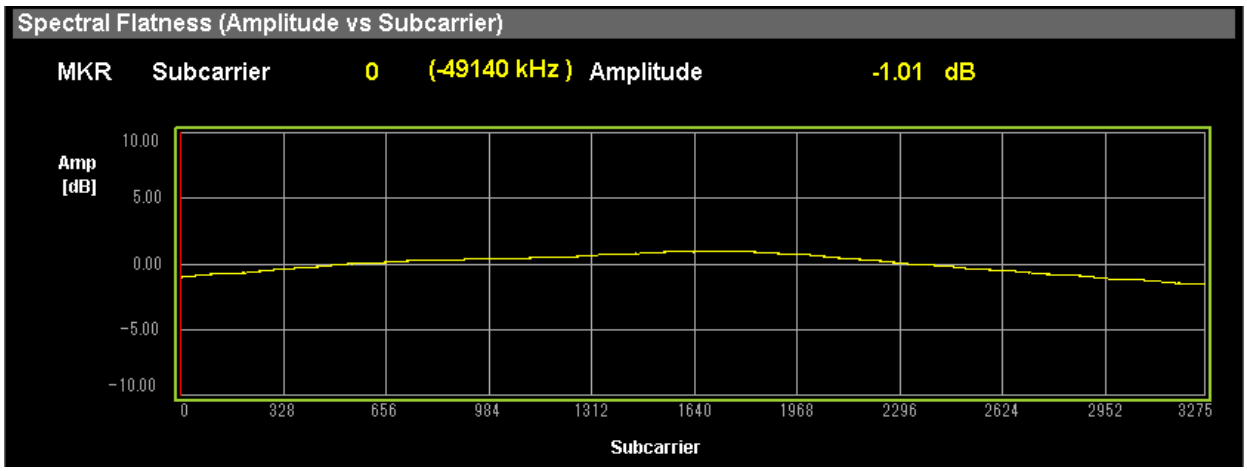


Figure 3.14-1 Amplitude of Spectral Flatness display

■Graph display

Summary Displays the Spectral Flatness value of an input signal. This Spectral Flatness value is based on the average in the range set in Starting Slot Number and Measurement Interval. The marker-selected subcarrier is displayed in red.

■MKR Subcarrier

Summary Displays the marker-selected subcarrier number. The marker can be moved with the cursor key or the rotary knob.

■MKR Amplitude

Summary Displays Amplitude of Spectral Flatness in the marker-selected subcarrier.

■MKR Phase

Summary Displays the Phase of Spectral Flatness in the marker-selected subcarrier.

3.15 Power vs Resource Block Display (Modulation Analysis)

Displays the power for each resource block.

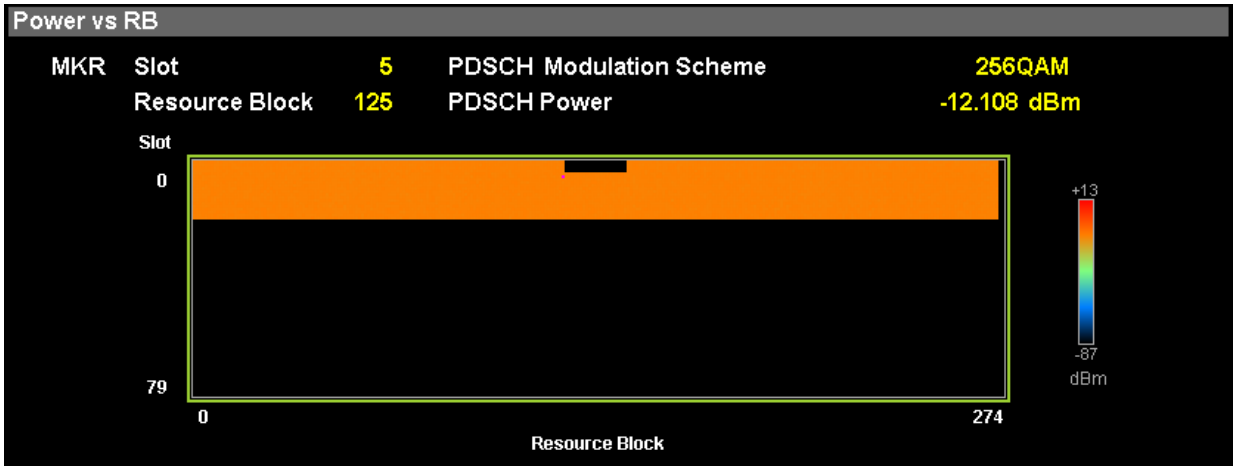


Figure 3.15-1 Power vs Resource Block display

■Displaying Graph

Summary Displays the power for each resource block.
The resource block selected by the marker is displayed in pink frame.

■MKR Slot

Summary Displays the number of the slot set by Slot Number.

■MKR Resource Block

Summary Displays the number of the resource block selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.

■MKR Resource Block Power

Summary Displays the power of the resource block selected by the marker.

■MKR Resource Block Modulation Scheme

Summary Displays the Modulation Scheme of the resource block selected by the marker.

3.16 EVM vs Resource Block Display (Modulation Analysis)

EVM for each resource block is displayed.

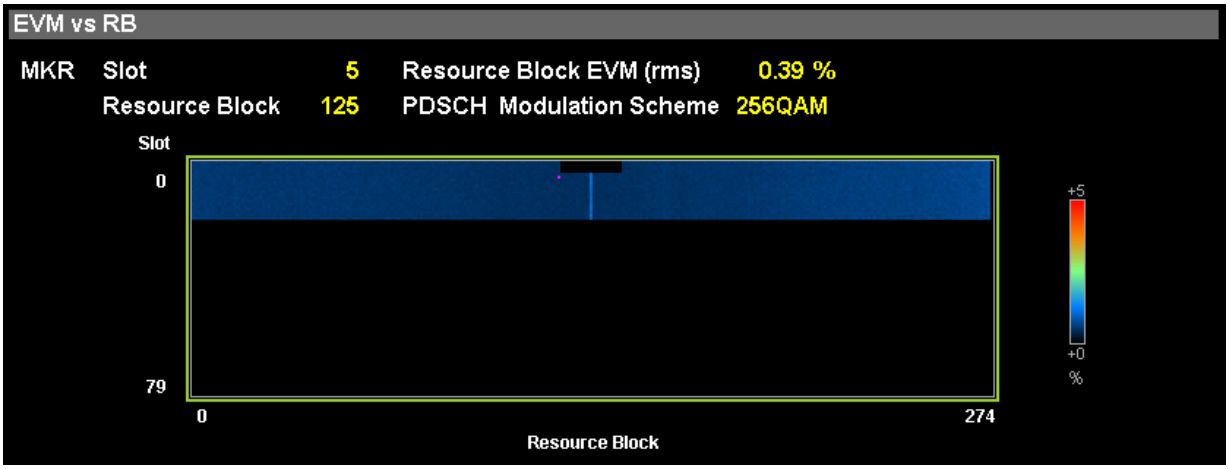


Figure 3.16-1 EVM vs Resource Block display

■Displaying Graph

Summary Displays EVM for each resource block.
The symbol selected by the marker is displayed in a pink frame.

■MKR Slot

Summary Displays the number of the slot set by Slot Number.

■MKR Resource Block

Summary Displays the number of the resource block selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.

■MKR Resource Block EVM

Summary Displays EVM of the resource block selected by the marker.

■MKR Resource Block Modulation Scheme

Summary Displays Modulation Scheme of the resource block selected by the marker.

3.17 Summary Display (Modulation Analysis)

EVM and power of each channel are displayed.

■Channel Summary

Summary Displays the average EVM, average Power, and peak EVM of the input signal for each channel. The channels that are excluded in Advanced Setting are not displayed.

Avg EVM (rms): Average EVM

Max EVM (peak): Peak EVM and its Subcarrier, and Symbol

Avg Power: Average Power

Channel: Input signal channels

For NR TDD sub-6GHz Downlink
or NR TDD mmWave Downlink,
P-SS
S-SS
PBCH
DM-RS (PBCH)
PDSCH (QPSK/16QAM/64QAM/256QAM)
DM-RS (PDSCH)
PDCCH
DM-RS (PDCCH)

For NR TDD sub-6GHz Uplink
or NR TDD mmWave Uplink,
PUSCH (QPSK/16QAM/64QAM/256QAM)
DM-RS (PUSCH)

■Symbol Clock Error, IQ Skew, IQ Imbalance, IQ Quad Error

Summary Displays the symbol clock error, IQ skew, IQ imbalance, and IQ quadrature error.

■Cell ID

Summary Displays the cell ID.

3.18 Power vs Resource Block Display (Carrier Aggregation)

Displays the power for each resource block.

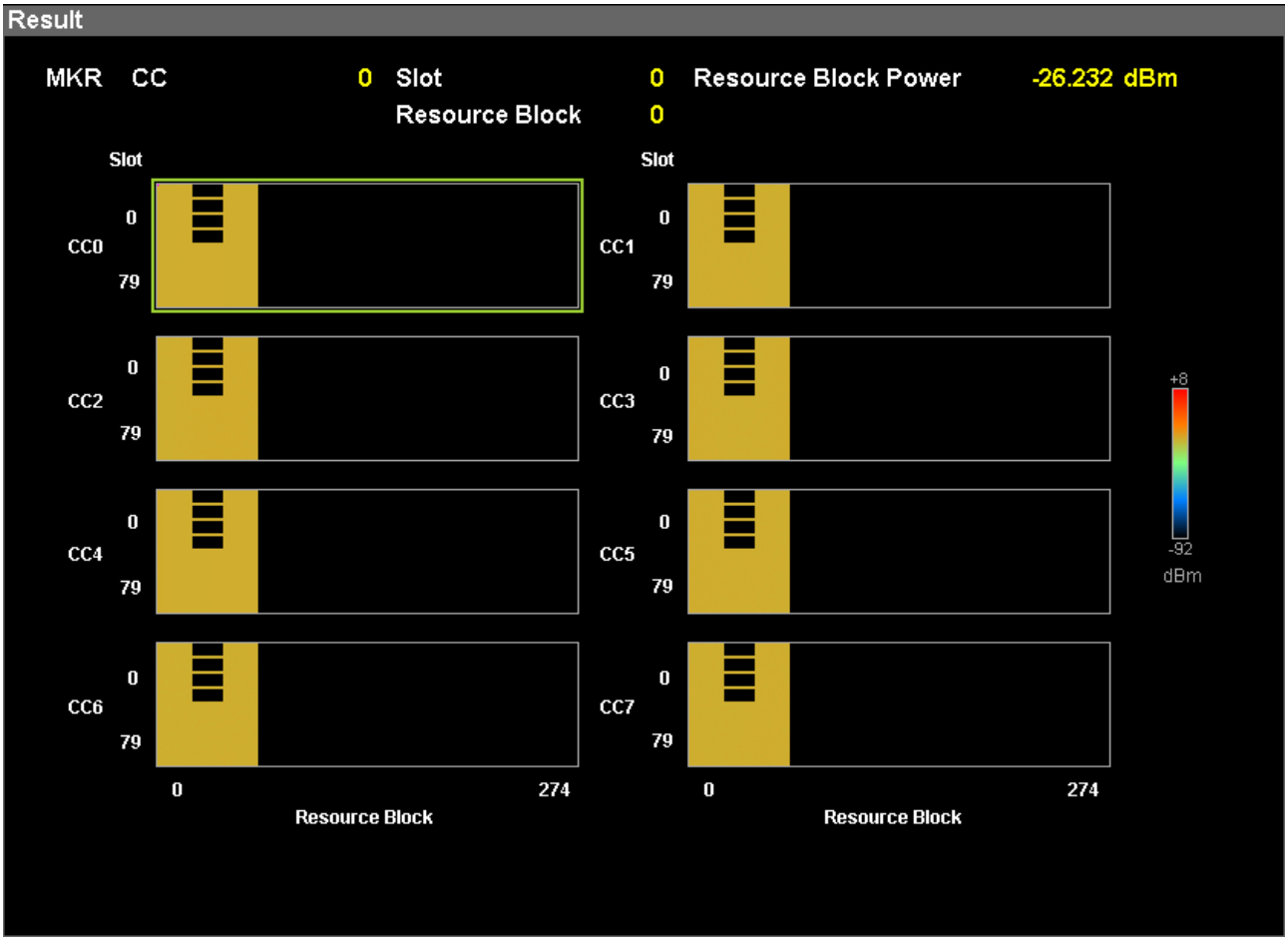


Figure 3.18-1 Power vs Resource Block display

■Displaying Graph

Summary Displays the power for each resource block.
The resource block selected by the marker is displayed in pink frame.

■MKR CC

Summary Displays the CC number set by Carrier Number.

■MKR Slot

Summary Displays the slot number set by Slot Number.

■MKR Resource Block

Summary Displays the resource block number selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.

■MKR Resource Block Power

Summary Displays the power of the resource block selected by the marker.

3.19 EVM vs Resource Block Display (Carrier Aggregation)

EVM for each resource block is displayed.

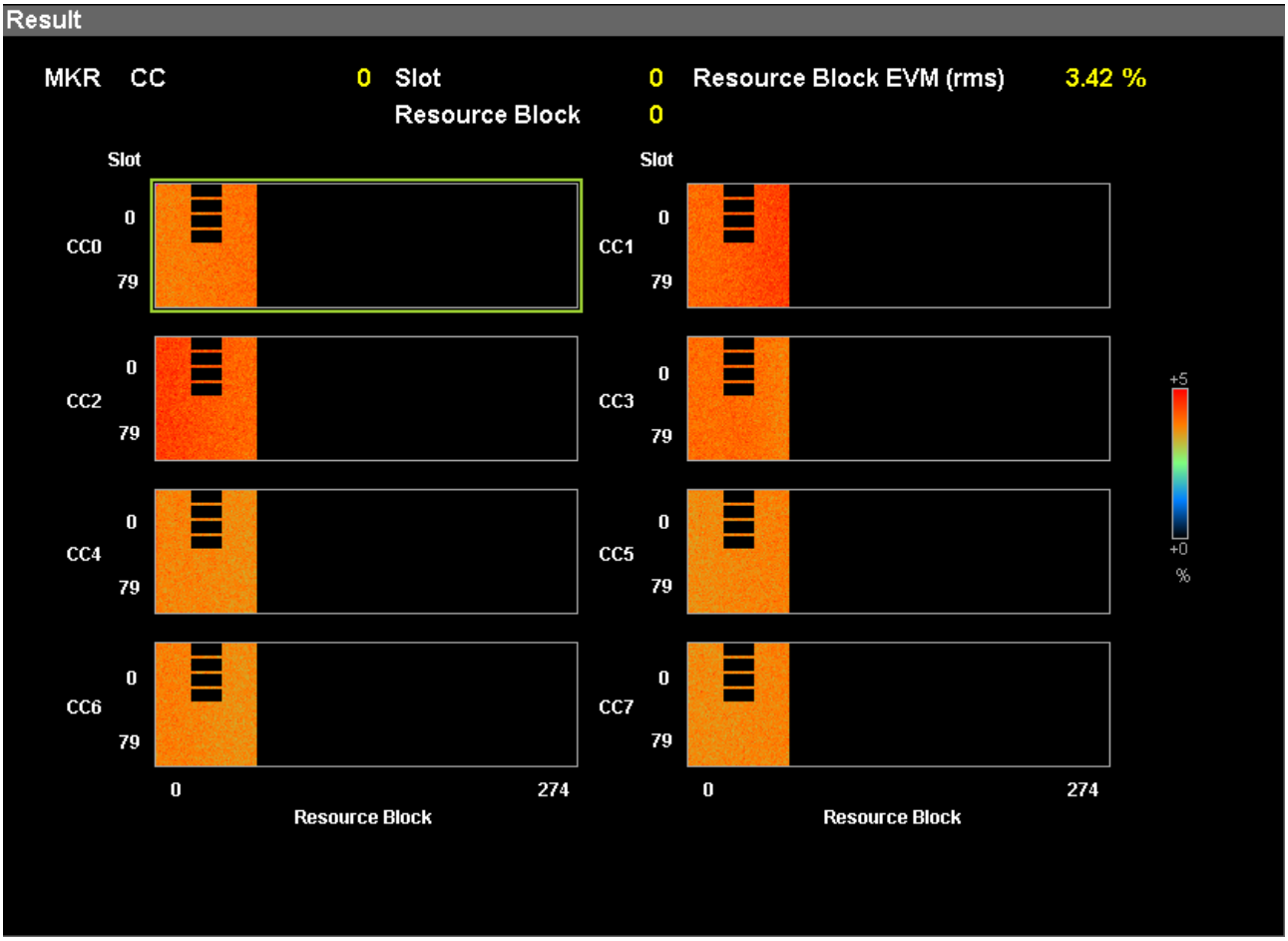


Figure 3.19-1 EVM vs Resource Block display

■Displaying Graph

Summary Displays EVM for each resource block.
The symbol selected by the marker is displayed in a pink frame.

■MKR CC

Summary Displays the CC number set by Carrier Number.

■MKR Slot

Summary Displays the slot number set by Slot Number.

■MKR Resource Block

Summary Displays the number of the resource block selected by the marker. The marker can be moved by using the cursor keys or the rotary knob.

■MKR Resource Block EVM

Summary Displays EVM of the resource block selected by the marker.

3.20 Summary Display (Carrier Aggregation)

The following measurement values are displayed.

Tx Total Power

Summary Displays the total Transmit power of all CCs.

Tx Power Flatness

Summary Displays the difference between the maximum and minimum values of transmit power among CCs of the input signals.

Frequency Error

Transmit Power

EVM (rms)

EVM (peak)

Timing Difference

Chapter 4 Digitize Function

This chapter describes how to save IQ data to an external memory and replay the stored IQ data.

4.1 Saving IQ Data

After pressing F7 (Capture) on the Main function menu, press F3 (Save Captured Data) to display the Save Captured Data function menu.

Table 4.1-1 Save Captured Data function menu

Function Key	Menu Display	Function
Page 1	Save Captured Data	Displayed by pressing **Save Captured Data.**
F1	Device	Selects the location of the file to be saved.
F2	File Name	Sets the name of the file to be saved.
F3	Output Rate	Sets the rate of the output data.
F7	Exec Digitize	Executes saving.
F8	Close	Closes the Save Captured Data function menu.

The IQ data stored in the internal memory at the time of execution of this function is saved to the external memory.

Example: To save IQ data

<Procedure>

1. Press F7 (Capture) on the main function menu.
2. Press F3 (Save Captured Data).
3. Press F1 (Device) on the Save Captured Data function menu to select a data file for saving the IQ data.
4. Press F2 (File Name) to set the file name.
5. Press F7 (Exec Digitize) to save the IQ data.

When save processing is executed, the following files are created.

- "[File Name].dgz" Data file (binary format)
- "[File Name].xml" Data information file (XML format)

The IQ data row is saved to the data file. The information on the saved data is saved to the data information file.

If a file name was not specified, the file is automatically named "Digitize *date_sequential number*". The sequential number range is from 000 to 999.

Files are saved to the following directory of the target drive specified using F1 (Device).
\Anritsu Corporation\Signal Analyzer\User Data\Digitized Data\5G Measurement
Up to 1000 files can be saved in a folder.

4.1.1 Format of data information file

The information on the saved IQ data is recorded in the data information file. Table 4.1.1-1 shows the details of the recorded parameters.

Table 4.1.1-1 Format of data information file

Item	Descriptions
CaptureDate	Day/Month/Year of the captured data in the "DD/MM/YYYY" format.
CaptureTime	Data captured time in "HH/MM/SS" format
FileName	Data file name
Format	Data format, fixed to "Float"
CaptureSample	Number of samples of the recorded data [Sample]
Condition	Error status of the recorded data "Normal": No error "OverLoad": Level over
TriggerPosition	Trigger occurrence position [Sample] The start point of the recorded data is 0.
CenterFrequency	Center frequency [Hz]
SpanFrequency	Frequency span [Hz]
SamplingClock	Sampling rate [Hz]
PreselectorBandMode	Frequency band switch mode "Normal": Normal mode (fixed)
ReferenceLevel	Reference level [dBm] Note that this value does not include the reference level offset.
AttenuatorLevel	Attenuator value [dB]
InternalGain	Internal gain value [dB] This is an internal parameter.
PreAmp	Gain value obtained by PreAmp [dB]
IQReverse	IQ reverse setting, fixed to "Normal"
TriggerSwitch	Trigger On/Off setting "FreeRun":Trigger is not used "Triggered":Trigger is used

Table 4.1.1-1 Format of data information file (Cont'd)

Item	Descriptions
TriggerSource	Trigger source "External": External trigger "External2": External trigger 2 "SGMarker" : SG Marker trigger
TriggerLevel	Trigger level [dBm] Note that this value does not include the reference level offset. It is in dBm units, even if the scale mode is Lin.
TriggerDelay	Trigger delay time [s] It is the relative time from the trigger input position to the start point of the recorded data.
IQReference0dBm	Reference IQ amplitude value that indicates 0 dB Fixed to "1".
ExternalReferenceDisp	Reference signal information "Ref.Int":Internal reference signal "Ref.Ext":External reference signal "Ref.Int Unlock":Internal reference signal is unlocked. "Ref.Ext Unlock":External reference signal is unlocked.
Correction Factor	Correction value of correction function [dB] The correction factor is added to the IQ data in a data file. 0.000 is automatically set when the Correction function is set to Off.
Terminal	Signal input terminal "RF": RF terminal
ReferencePosition	0-second reference position Indicates the 0-second reference position using the digitized data point position. During Replay function execution, the reference position is displayed as 0 s.
Trigger Slope	Selects the edge where the trigger is generated (rise or fall). "Rise": Rising edge "Fall": Falling edge
5GMeasurement Standard	Standard "NRDownlinkSub6Ghz": NR TDD sub-6GHz Downlink "NRDownlinkMmWave": NR TDD mmWave Downlink "NRUplinkSub6Ghz": NR TDD sub-6GHz Uplink "NRUplinkMmWave": NR TDD mmWave Uplink
5GMeasurement AttenuatorLevel	Attenuator value [dB] when the attenuator is set to Manual.

4.1.2 Format of data file

The data file is created in binary format. From the beginning of the file, I-phase data and Q-phase data are recorded by 4 bytes. The I-phase data and Q-phase data are recorded as a float type (IEEE real*4).

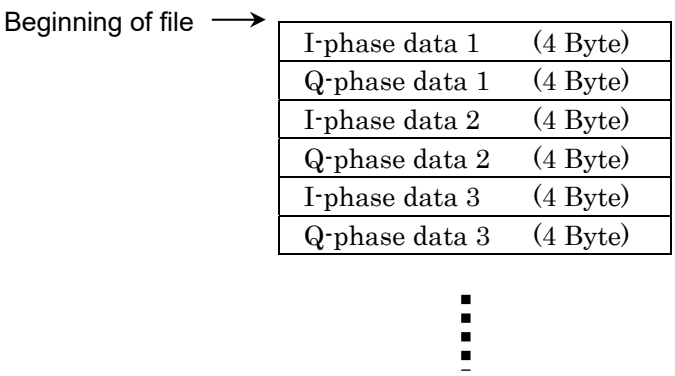


Figure 4.1.2-1 Format of data file

The IQ data can be converted to power based on the following formula:

$$P = 10Log_{10}\left(I^2 + Q^2\right)$$

P: Power [dBm]
I: I-phase data
Q: Q-phase data

4.2 Replay Function

The Replay function enables the saved IQ data to be reanalyzed .After pressing F7 (Capture) on the main function menu, press F4 (Replay) to display the Replay function menu.

Table 4.2-1 Replay Function Menu

Function Key	Menu Display	Function
Page 1	Replay	Press **Replay** to display.
F1	Device	Selects the drive in which the target file is stored.
F2	Application	Selects the name of the application used to save the target file.
F7	Select File	Selects the target file. After selecting the file, the Replay function is executed.
F8	Close	Closes the Replay function menu.

4.2.1 Starting Replay Function

Start the Replay function using the following procedure:

<Procedure>

1. Press F7 (Capture) on the main function menu.
2. Press F4 (Replay) on the Capture function menu.
3. Press F1 (Device) on the Replay function menu and select the drive in which the target file is stored.
4. Press F2 (Application) and select the application used to save the target file.
5. Press F7 (Select File) to display the file selection dialog box. The Replay function starts after a file is selected. Then, Replaying is displayed on the screen.

Notes:

- MX285051A-011/061 performs the Replay function only for an IQ data file whose sampling rate is 162.5 MHz.
- MX285051A-021 performs the Replay function only for an IQ data file whose sampling rate is 162.5 MHz, 325 MHz, 650 MHz, or 1300 MHz.
- MX285051A-071 performs the Replay function only for an IQ data file whose sampling rate is 162.5 MHz, 325 MHz, or 650 MHz.
- MX269051A-011/061 performs the Replay function only for an IQ data file whose sampling rate is 50 MHz, 100 MHz, or 200 MHz.
- Once Replay starts, the settings are initialized except for the parameters specified in Table 4.1.1-1.

4.2.2 Display During Replay Function Execution

Replay Error Info. is displayed if the target IQ data file meets the following conditions:

- Frequency reference is Unlocked when IQ data is saved.
- Level Over occurs when IQ data is saved.

4.2.3 Restriction During Replay Function Execution

The functions shown in Table 4.2.3-1 are disabled when Replay is executed.

Table 4.2.3-1 Functions Restricted During Replay

Function
Center Frequency
Input Level
Attenuator Auto/Manual
Attenuator
Pre Amp
Trigger Switch
Trigger Source
Trigger Slope
Trigger Delay
Continuous Measurement
Single Measurement
Erase Warm Up Message

4.2.4 Conditions for IQ Data Files That Can Be Replayed

Table 4.2.4-1 shows the conditions for IQ data files for which replay analysis can be performed.

Table 4.2.4-1 IQ data file that can be replayed

Name	Value
Format	I, Q (32-bit Float Binary format)
Sampling rate	MX285051A-011/061 162.5 MHz MX269051A-011/061 200 MHz (With MS269xA-078/178) 100 MHz (Only with MS269xA-077/177) 50 MHz (Without MS269xA-077/177) MX285051A-021 162.5 MHz, 325 MHz, 650 MHz, (With MS2850A-033/133) 1300 MHz (With MS2850A-034/134) MX285051A-071 162.5 MHz, 325 MHz, 650 MHz, (With MS2850A-033/133)
Sample numbers	22.2 ms or more

4.2.5 Stopping Replay

Stop the Replay function using the following procedure:

<Procedure>

1. Press F7 (Capture) on the main function menu.
2. Press F5 (Stop Replaying) to stop the Replay function.

Chapter 5 Performance Test

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

5.1 Overview of Performance Test

5.1.1 Performance test

Performance tests are performed as part of preventive maintenance in order to prevent the performance of the MS2850A from being degraded before it occurs.

Use performance tests when required for acceptance inspection, routine inspection and performance verification after repairs. Perform items deemed critical at regular intervals as preventive maintenance. Perform the following performance tests for acceptance inspection, routine inspection and performance verification after repairs.

- Carrier frequency accuracy
- Residual EVM

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

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 PDF version.

5.1.2 Instruments for Performance test

Table 5.1.2-1 lists measuring instruments for performance tests.

Table 5.1.2-1 List of measuring instruments for performance test

Required Performance	Recommended Instruments
● Frequency range: 800 MHz to 28 GHz (MX285051A) 600 MHz to 5 GHz (MX269051A) Resolution: 1 Hz available ● Output level range: –30 to –10 dBm (MX285051A) –25 to –10 dBm (MX269051A) Resolution: 0.1 dB available ● Modulation Bandwidth: more than 100 MHz	Vector signal generator
The output level of the vector signal generator is adjustable in the ranges below. MX285051A: –30 dBm±0.1 dB –15 dBm±0.1 dB –10 dBm±0.1 dB MX269051A: –25 dBm±0.1 dB –10 dBm±0.1 dB Not required if the vector signal generator has the above transmission power accuracy.	Power meter

5.2 Performance Test Items

Warm up the subject testing device and measuring instruments for at least 30 minutes except where directed, in order to stabilize them sufficiently before running performance tests. Demonstrating maximum measurement accuracy requires, in addition to the above, conducting performance tests under ambient temperatures, little AC power supply voltage fluctuations, as well as the absence of noise, vibrations, dust, humidity or other problems.

5.2.1 Methods for testing MX285051A-011/MX269051A-011 and MX285051A-061/MX269051A-061

(1) Test target standards

- Carrier frequency accuracy
- Residual EVM

(2) Measuring instrument for tests

- Vector signal generator
- Power meter

(3) Setup

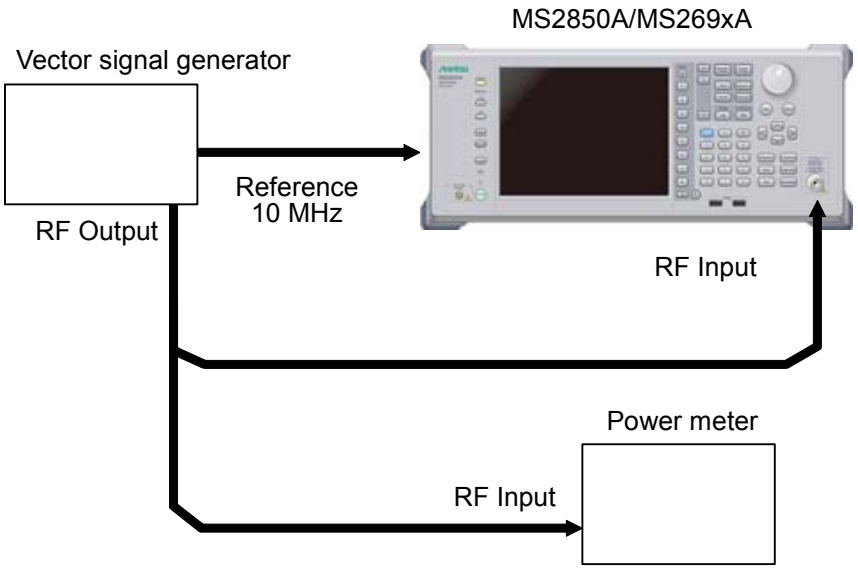


Figure 5.2.1-1 Performance test

(4) Test procedure

(a) Signal source adjustment

1. Input the 10 MHz reference signal output from the signal generator to the Reference Input connector.
2. Output the following signals from the vector signal generator.

For MX285051A-011/MX269051A-011, output the 5G NR downlink signals as below.

Subcarrier Spacing	15 kHz		30 kHz		
Channel Bandwidth	**25 MHz**	**50 MHz**	**25 MHz**	**50 MHz**	**100 MHz**
MX285051A-011	–	✓	–	–	✓
MX269051A-011					
Without MS269xA-077/177	✓	–	✓	–	–
Only with MS269xA-077/177	–	✓	–	✓	–
With MS269xA-078/178	–	✓	–	–	✓

For MX285051A-061/MX269051A-061, output the 5G NR uplink signals as below.

Subcarrier Spacing	15 kHz		30 kHz		
Channel Bandwidth	**25 MHz**	**50 MHz**	**25 MHz**	**50 MHz**	**100 MHz**
MX285051A-061	–	✓	–	–	✓
MX269051A-061					
Without MS269xA-077/177	✓	–	✓	–	–
Only with MS269xA-077/177	–	✓	–	✓	–
With MS269xA-078/178	–	✓	–	–	✓

3. Input the vector signal generator output signal into the power meter, and adjust the generator's output level to the values below.

–10 dBm±0.1 dB (Pre-amp. turns off, or not installed)
–30 dBm±0.1 dB (Pre-amp. turns on, MX285051A)
–25 dBm±0.1 dB (Pre-amp. turns on, MX269051A)

(b) Settings of the MS2850A or MS269xA

1. Turn On the power switch on the front panel then wait until the internal temperature stabilizes.

2. Press Application Switch, then press the menu function key displaying the character string "5G Measurement."
3. Press F3 (Standard) and select the following 5G standards for testing.
   MX285051A-011/MX269051A-011:
   F3 (NR TDD sub-6GHz Downlink)
   MX285051A-061/MX269051A-061:
   F5 (NR TDD sub-6GHz Uplink)
4. Press Preset.
5. Press F1 (Preset) to perform initialization.
6. Press F1 (Modulation Analysis) in the Measure Function menu and press F2 (Basic Settings) to display Basic Settings.
7. Press F1 (Frame Parameter) to display the Frame Parameter Setup tab. Then set the following parameters according to the signals output from vector signal generator.
   Subcarrier Spacing
   Number of RBs
8. Press Cal.
9. Press F1 (SIGANA All) to perform calibration.
10. Press F8 (Close).
11. Press Frequency, enter the frequency output by the vector signal generator using the numeric keypad, then press Enter.
12. If the Input Level dialog box is displayed when pressing Amplitude, press F8 (Close) and then press F5 (Auto Range).
13. Press Trace then press F4 (Storage) and press F1 (Mode) to choose Average using the cursor key or the rotary knob, then press Enter.
14. Press F2 (Count), enter the measurement count, using the numeric keypad, then press Enter.
15. Press Single to measure.
    When measuring the carrier frequency accuracy, select **Auto** for **Reference Signal**. When measuring the residual vector error, select **Fixed to Internal**.
    Press F3 (System Settings) after pressing System Config to display the System Settings screen. Select and set Reference Signal with cursor key, and then press F7 (Set).
16. Confirm whether the measured Frequency Error (carrier frequency accuracy) is within the specifications.
17. Confirm whether the measured EVM (residual vector error) value is within the specifications.

(5) Test Result

■MX285051A-011/061

Table 5.2.1-1 Carrier frequency accuracy (Pre-amp. turns off, or not installed.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz					
800 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
4199.999999 MHz					
4200 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz					
800 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
4199.999999 MHz					
4200 MHz					
5000 MHz					

Table 5.2.1-2 Residual EVM (Pre-amp. turns off, or not installed.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz				
800 MHz		1.0% (rms)	0.1% (rms)	
4199.999999 MHz				
4200 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz				
800 MHz		1.0% (rms)	0.1% (rms)	
4199.999999 MHz				
4200 MHz				
5000 MHz				

Table 5.2.1-3 Carrier frequency accuracy (Pre-amp. turns on.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz					
800 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
4199.999999 MHz					
4200 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz					
800 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
4199.999999 MHz					
4200 MHz					
5000 MHz					

Table 5.2.1-4 Residual EVM (Pre-amp. turns on.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz				
800 MHz		1.0% (rms)	0.1% (rms)	
4199.999999 MHz				
4200 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz				
800 MHz		1.0% (rms)	0.1% (rms)	
4199.999999 MHz				
4200 MHz				
5000 MHz				

■MX269051A-011/061

Table 5.2.1-5 Carrier frequency accuracy (Without MS269xA-077/177, and Pre-amp. turns off or not installed.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 25 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2399.999999 MHz					
2400 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 25 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2399.999999 MHz					
2400 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					

Table 5.2.1-6 Residual EVM (Without MS269xA-077/177, and Pre-amp. turns off or not installed.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 25 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2399.999999 MHz				
2400 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 25 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2399.999999 MHz				
2400 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				

Table 5.2.1-7 Carrier frequency accuracy (Without MS269xA-077/177 and Pre-amp. turns on.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 25 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2399.999999 MHz					
2400 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 25 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2399.999999 MHz					
2400 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					

Table 5.2.1-8 Residual EVM (Without MS269xA-077/177 and Pre-amp. turns on.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 25 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2399.999999 MHz				
2400 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 25 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2399.999999 MHz				
2400 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				

Table 5.2.1-9 Carrier frequency accuracy (Only with MS269xA-077/177, and Pre-amp. turns off or not installed.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 50 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					

Table 5.2.1-10 Residual EVM (Only with MS269xA-077/177, and Pre-amp. turns off or not installed.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 50 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				

Table 5.2.1-11 Carrier frequency accuracy (Only with MS269xA-077/177 and Pre-amp. turns on.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 50 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					

Table 5.2.1-12 Residual EVM (Only with MS269xA-077/177 and Pre-amp. turns on.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 50 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				

Table 5.2.1-13 Carrier frequency accuracy (With MS269xA-078/178, and Pre-amp. turns off or not installed.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					

Table 5.2.1-14 Residual EVM (With MS269xA-078/178, and Pre-amp. turns off or not installed.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				

Table 5.2.1-15 Carrier frequency accuracy (With MS269xA-078/178 and Pre-amp. turns on.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz					
600 MHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	
2199.999999 MHz					
2200 MHz					
3999.999999 MHz					
4000 MHz					
5000 MHz					

Table 5.2.1-16 Residual EVM (With MS269xA-078/178 and Pre-amp. turns on.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
Subcarrier Spacing 15 kHz, Channel Bandwidth 50 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				
Subcarrier Spacing 30 kHz, Channel Bandwidth 100 MHz				
600 MHz		1.0% (rms)	0.1% (rms)	
2199.999999 MHz				
2200 MHz				
3999.999999 MHz				
4000 MHz				
5000 MHz				

5.2.2 Methods for testing MX285051A-021 and MX285051A-071

(1) Test target standards

- Carrier frequency accuracy
- Residual EVM

(2) Measuring instrument for tests

- Vector signal generator
- Power meter

(3) Setup

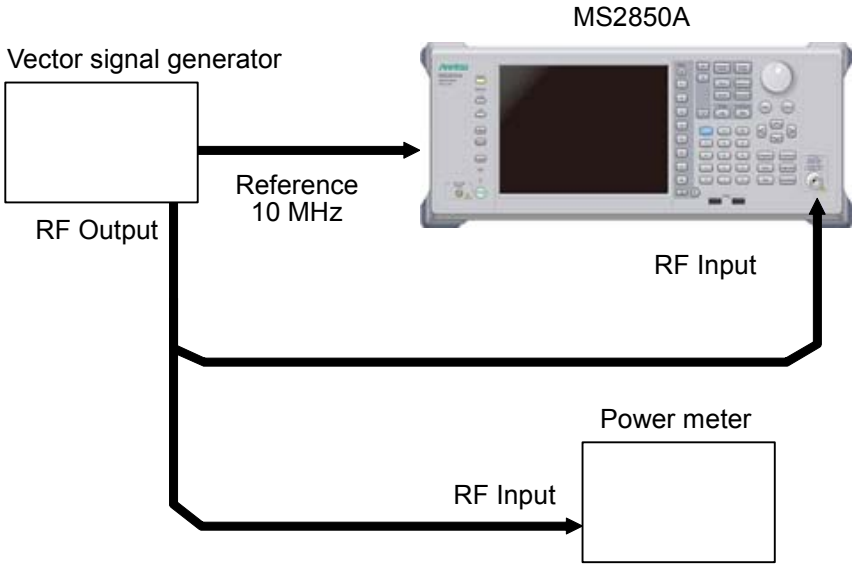


Figure 5.2.2-1 Performance test

(4) Test procedure

(a) Signal source adjustment

1. Input the 10 MHz reference signal output from the signal generator to the Reference Input connector.
2. Output the following signals from the vector signal generator.

   For MX285051A-021, output the 5G NR downlink signals as below.

Subcarrier Spacing	Channel Bandwidth
120 kHz	100 MHz

   For MX285051A-071, output the 5G NR uplink signals as below.

Subcarrier Spacing	Channel Bandwidth
120 kHz	100 MHz

3. Input the vector signal generator output signal into the power meter, and adjust the generator's output level to the values below.

   –15 dBm±0.1 dB (Pre-amp. turns off, or not installed)
   –30 dBm±0.1 dB (Pre-amp. turns on)

(b) Settings of the MS2850A

1. Turn On the power switch on the front panel then wait until the internal temperature stabilizes.
2. Press Application Switch, then press the menu function key displaying the character string "5G Measurement."
3. Press F3 (Standard) and select the following 5G standards for testing.
   MX285051A-021: F4 (NR TDD mmWave Downlink)
   MX285051A-071: F6 (NR TDD mmWave Uplink)
4. Press Preset.
5. Press F1 (Preset) to perform initialization.
6. Press F1 (Modulation Analysis) in the Measure Function menu and press F2 (Basic Settings) to display Basic Settings.

7. Press F1 (Frame Parameter) to display the Frame Parameter Setup tab. Then set the following parameters according to the signals output from vector signal generator.

   Subcarrier Spacing
   Number of RBs

8. Press Cal.
9. Press F1 (SIGANA All) to perform calibration.
10. Press F8 (Close).
11. Press Frequency, enter the frequency output by the vector signal generator using the numeric keypad, then press Enter.
12. If the Input Level dialog box is displayed when pressing Amplitude, press F8 (Close) and then press F5 (Auto Range).
13. Press Trace then press F4 (Storage) and press F1 (Mode) to choose Average using the cursor key or the rotary knob, then press Enter.
14. Press F2 (Count), enter the measurement count, using the numeric keypad, then press Enter.
15. Press Single to measure.

    When measuring the carrier frequency accuracy, select **Auto** for **Reference Signal**. When measuring the residual vector error, select **Fixed to Internal**.

    Press F3 (System Settings) after pressing System Config to display the System Settings screen. Select and set Reference Signal with cursor key, and then press F7 (Set).
16. Confirm whether the measured Frequency Error (carrier frequency accuracy) is within the specifications.
17. Confirm whether the measured EVM (residual vector error) value is within the specifications.

(5) Test Result

Table 5.2.2-1 Carrier frequency accuracy (Pre-amp. turns off or not installed.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
28 GHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	

Table 5.2.2-2 Residual EVM (Pre-amp. turns off or not installed.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
28 GHz		2.0% (rms)	0.1% (rms)	

Table 5.2.2-3 Carrier frequency accuracy (Pre-amp. turns on.)

Frequency	Min. limit	Deviation (Hz)	Max. limit	Uncertainty	Pass/Fail
28 GHz	–10.0 Hz		+10.0 Hz	±1.0 Hz	

Table 5.2.2-4 Residual EVM (Pre-amp. turns on.)

Frequency	Measured value [% (rms)]	Max. limit	Uncertainty	Pass/Fail
28 GHz		2.0% (rms)	0.1% (rms)	

Chapter 6 Other Functions

This chapter describes other functions of this application.

6.1 Selecting Other Functions

Pressing F8 (Accessory) on the main function menu displays the Accessory function menu.

Table 6.1-1 Accessory function menu

Function Keys	Menu Display	Function
F1	Title	Sets the title character string.
F2	Title (On/Off)	Displays (On) or hides (Off) the title character string.
F4	Erase Warm Up Message	Erases the warmup message display.

6.2 Setting Title

A title of up to 32 characters can be displayed on the screen. (Character strings of up to 17 characters can be displayed on a function menu. The maximum number of characters to be displayed on the top of the function menu varies according to character string.)

<Procedure>

1. Press F8 (Accessory) on the main function menu.
2. Press F1 (Title) to display the character string input screen. Select a character using the rotary knob, and enter it by pressing Enter. Enter the title by repeating this operation. When the title is entered, press F7 (Set).
3. Press F2 (Title) and then select "Off " to hide the title.

6.3 Erasing Warmup Message

The warmup message (Warm Up), which is displayed upon power-on and indicates that the level and frequency are not stable, can be deleted.

<Procedure>

1. Press F8 (Accessory) on the main function menu.
2. Press F4 (Erase Warm Up Message) to erase the warmup message.

Appendix A Error Messages

Table A-1 Error Messages

Message	Description
Out of range.	The settable range is exceeded.
Not available in Summary Trace.	This operation is invalid when Active Trace is in the Summary state.
No file to read.	There is no file that can be read.
File read error.	File reading has failed.
File format error.	The file format is invalid.
Write error.	File writing has failed.
Number of the letters over.	This operation is invalid because the maximum number of characters has been exceeded.
The model of the main instrument is different.	This operation is invalid because the specified model name does not match.
The option configuration is different.	This operation is invalid because the option configuration does not match.
File Open error.	Failed to open the specified file.
File Close error.	Failed to close the file.
Empty File Name	No character is entered.
Save File Limit < 100	The save destination contains the maximum number of files (100).
Cannot find device.	The specified device could not be found.
Search error	A search error has occurred.
Not available when Capture Time is set to Auto.	This operation is invalid when Capture Time is set to Auto.
File not found.	The specified file could not be found.
Cannot find device.	The specified device could not be found.
Selected item is empty.	The selected item (file, etc.) could not be found.

Table A-1 Error Messages (Cont'd)

Message	Description
Only available while replaying.	This operation is invalid when the Replay function is not executed.
Shortage of data samples in IQ data file.	Analysis cannot be performed because the number of data samples of the IQ data file is less than the minimum number of data samples required for analysis.
Unsupported SpanFrequency.	The frequency span is not supported.
Unsupported SamplingClock.	The sampling rate is not supported.
Not available if not re-capture after changing common parameter.	This operation is invalid when recapture is not executed after common parameter change.
Not available during measurement.	This operation is invalid during measurement.
Invalid character	—

Appendix B Measurable Signal

This appendix describes the configuration of the signal that can be measured by the MX285051A-011/021/061/071 and MX269051A-011/061.

B.1 Overview of Signal

Table B.1-1 and B.1-2 show the minimum requirements of the signals that the MX285051A-011/021/061/071 and MX269051A-011/061 can measure. To measure with the MX285051A-011/021/061/071 and MX269051A-011/061, check that the input signal satisfies the conditions in Table B.1-1 and B.1-2 and that the MX285051A-011/021/061/071 and MX269051A-011/061 settings match these conditions.

Table B.1-1 Signal measurable with the MX285051A-011/MX269051A-011/MX285051A-021 (Minimum requirements)

Item	Contents
Wireless Standard	3GPP TS 38.211 (2018-09)
Channel Bandwidth	MX285051A-011/MX269051A-011 ・ For Subcarrier Spacing = 15 kHz 5 MHz(25), 10 MHz(52), 15 MHz(79), 20 MHz(106), 25 MHz(133), 30 MHz(160), 40 MHz(216), 50 MHz(270) ・ For Subcarrier Spacing = 30 kHz 5 MHz(11), 10 MHz(24), 15 MHz(38), 20 MHz(51), 25 MHz(65), 30 MHz(78), 40 MHz(106), 50 MHz(133), 60 MHz(162), 70 MHz(189), 80 MHz(217), 90 MHz(245), 100 MHz(273) ・ For Subcarrier Spacing = 60 kHz 10 MHz(11), 15 MHz(18), 20 MHz(24), 25 MHz(31), 30 MHz(38), 40 MHz(51), 50 MHz(65), 60 MHz(79), 70 MHz(93), 80 MHz(107), 90 MHz(121), 100 MHz(135) MX285051A-021 ・ For Subcarrier Spacing = 60 kHz 50 MHz(66), 100 MHz(132), 200 MHz(264) ・ For Subcarrier Spacing = 120 kHz 50 MHz(32), 100 MHz(66), 200 MHz(132), 400 MHz(264) Numbers in parentheses indicate the numbers of resource blocks.
Subcarrier Spacing	MX285051A-011/MX269051A-011 15 kHz, 30 kHz, 60 kHz MX285051A-021 60 kHz, 120 kHz
Measurable Maximum Number of Carriers	MX285051A-011/MX269051A-011: 1 MX285051A-021: 8 (when Channel Bandwidth is 100 MHz.)

Table B.1-1 Signal measurable with the MX285051A-011/MX269051A-011/MX285051A-021 (Minimum requirements) (Cont'd)

Item	Contents
Physical Channels	PBCH PDSCH PDCCH
Physical Signals	Primary synchronization signal Secondary synchronization signal Demodulation reference signals for PBCH Demodulation reference signals for PDSCH Demodulation reference signals for PDCCH
Others	• Two or more slots should be mapped to measure PDSCH. • The following channels or signals must be mapped. PDSCH, Demodulation reference signals for PDSCH, or SS-Block

Table B.1-2 Signal measurable with the MX285051A-061/MX269051A-061/MX285051A-071 (Minimum requirements)

Item	Contents
Wireless Standard	3GPP TS 38.211 (2018-09)
Channel Bandwidth	MX285051A-061/MX269051A-061 ・ For Subcarrier Spacing = 15 kHz 5 MHz(25), 10 MHz(52), 15 MHz(79), 20 MHz(106), 25 MHz(133), 30 MHz(160), 40 MHz(216), 50 MHz(270) ・ For Subcarrier Spacing = 30 kHz 5 MHz(11), 10 MHz(24), 15 MHz(38), 20 MHz(51), 25 MHz(65), 30 MHz(78), 40 MHz(106), 50 MHz(133), 60 MHz(162), 70 MHz(189), 80 MHz(217), 90 MHz(245), 100 MHz(273) ・ For Subcarrier Spacing = 60 kHz 10 MHz(11), 15 MHz(18), 20 MHz(24), 25 MHz(31), 30 MHz(38), 40 MHz(51), 50 MHz(65), 60 MHz(79), 70 MHz(93), 80 MHz(107), 90 MHz(121), 100 MHz(135) MX285051A-071 ・ For Subcarrier Spacing = 60 kHz 50 MHz(66), 100 MHz(132), 200 MHz(264) ・ For Subcarrier Spacing = 120 kHz 50 MHz(32), 100 MHz(66), 200 MHz(132), 400 MHz(264) Numbers in parentheses indicate the numbers of resource blocks.
Subcarrier Spacing	MX285051A-061/MX269051A-061 15 kHz, 30 kHz, 60 kHz MX285051A-021 60 kHz, 120 kHz
Measurable Maximum Number of Carriers	1
Physical Channels	PUSCH
Physical Signals	Demodulation reference signals for PUSCH
Others	・ Two or more slots should be mapped to measure PUSCH. ・ The following channels or signals must be mapped. PUSCH, Demodulation reference signals for PUSCH

Appendix C Initial Value List

C.1 Common Settings

Frequency	
Carrier Frequency	28.00 GHz (MX285051A) 3.75 GHz (MX269051A)
RF Spectrum	Normal
Amplitude	
Input Level	–10.00 dBm
Attenuator Auto/Manual	Auto
Attenuator Value	4 dB
Pre-Amp	Off
Offset	Off
Offset Value	0.00 dB
Advanced Settings	
Equalizer Use Data	Off
Amplitude Tracking	On
Phase Tracking	On
Timing Tracking	Off
Multicarrier Filter	On
EVM Window	Off
Trace	
Trace Mode	EVM vs Subcarrier
Scale	
EVM Unit	%
EVM Scale	5%
Flatness Scale	10 dB
Storage	
Mode	Off
Count	10
Subcarrier Number	0 Subcarrier
Symbol Number	3 Symbol
EVM vs Subcarrier View	Averaged over all Symbols
Graph View	RMS&Peak
EVM vs Symbol View	Averaged over all Subcarriers
Graph View	RMS&Peak
Spectral Flatness Type	Amplitude
Slot Number	0
Resource Block Number	0

Marker	
Marker	On
Subcarrier Number	0 Subcarrier
Symbol Number	3 Symbol
Trigger	
Trigger Switch	Off
Trigger Source	External
Trigger Slope	Rise
Trigger Delay	0 s
Accessory	
Title	On, “5G Measurement”

C.2 MX285051A-011/MX269051A-011

Modulation Analysis	
Analysis Time	
Starting Slot Number	0 Slot
Measurement Interval	20 Slot
Basic Settings	
Frame Parameter	
Test Model	Off
Subcarrier Spacing	30 kHz
Number of RBs	273
Channel Bandwidth	100 MHz
Cell ID	0
Synchronization Mode	SS
Phase Compensation	On
SS Block	
Enable	On
SS-Block Subcarrier Spacing	30 kHz
SS-Block Candidate	Case B (L=8)
Antenna Port	4000
SSB Subcarrier Offset	6
SSB RB Offset	126
Periodicity	10 ms
Analysis Frame Number	0
P-SS Power Boosting	Auto
P-SS Power Boosting Value	0.000 dB
S-SS Power Boosting	Auto
S-SS Power Boosting Value	0.000 dB
PBCH Power Boosting	Auto
PBCH Power Boosting Value	0.000 dB
SS-Block Transmission	All On
PDCCH/DM-RS (all slots are set as below)	
Enable	On
Antenna Port	2000
PDCCH Power Boosting	Auto
PDCCH Power Boosting Value	0.000 dB
Number of Symbols	2
PDSCH/DM-RS (all slots are set as below)	
Enable	On
Antenna Port	1000
Modulation Scheme	Auto
PDSCH Mapping Type	type A
Start symbol	2

Number of Symbols	12
DM-RS typeA-pos	2
DM-RS config-type	1
DM-RS add-pos	0
DM-RS CDM Group Without Data	2
PDSCH Power Boosting	Auto
PDSCH Power Boosting Value	–3.000 dB
PDSCH PTRS	Off
PDSCH PTRS Time Density	1
PDSCH PTRS Freq. Density	2
PDSCH PTRS RE Offset	00
PDSCH RBs Allocation Auto Detect	Enable
PDSCH RBs Allocation Start RB	0
PDSCH RBs Allocation Number of RBs	273

C.3 MX285051A-021

Modulation Analysis	
Analysis Time	
Starting Slot Number	0 Slot
Measurement Interval	80 Slot
Basic Settings	
Frame Parameter	
Test Model	Off
Subcarrier Spacing	120 kHz
Number of RBs	132
Channel Bandwidth	200 MHz
Cell ID	0
Synchronization Mode	SS
Phase Compensation	On
SS Block	
Enable	On
SS-Block Subcarrier Spacing	120 kHz
SS-Block Candidate	Case D (L=64)
Antenna Port	4000
SSB Subcarrier Offset	0
SSB RB Offset	56
Periodicity	10 ms
Analysis Frame Number	0
P-SS Power Boosting	Auto
P-SS Power Boosting Value	0.000 dB
S-SS Power Boosting	Auto
S-SS Power Boosting Value	0.000 dB
PBCH Power Boosting	Auto
PBCH Power Boosting Value	0.000 dB
SS-Block Transmission	All On
PDCCH/DM-RS (all slots are set as below)	
Enable	On
Antenna Port	2000
PDCCH Power Boosting	Auto
PDCCH Power Boosting Value	0.000 dB
Number of Symbols	2
PDSCH/DM-RS (all slots are set as below)	
Enable	On
Antenna Port	1000
Modulation Scheme	Auto
PDSCH Mapping Type	type A
Start symbol	2

Number of Symbols	12
DM-RS typeA-pos	2
DM-RS config-type	1
DM-RS add-pos	0
DM-RS CDM Group Without Data	2
PDSCH Power Boosting	Auto
PDSCH Power Boosting Value	–3.000 dB
PDSCH PTRS	Off
PDSCH PTRS Time Density	1
PDSCH PTRS Freq. Density	2
PDSCH PTRS RE Offset	00
PDSCH RBs Allocation Auto Detect	Enable
PDSCH RBs Allocation Start RB	0
PDSCH RBs Allocation Number of RBs	132

Carrier Aggregation Analysis

Analysis Time

Starting Slot Number	0 Slot
Measurement Interval	80 Slot

Basic Settings

Carrier Settings

Number of Carriers	1
Reference Carrier	0
Phase Compensation	On

Component Carrier Settings

Valid for CC #0 only	
Frequency Offset	0.000 MHz
Subcarrier Spacing	120 kHz
Number of RBs	132
Channel Bandwidth	200 MHz
Cell ID	0
Synchronization Mode	SS

Detail Settings

SS Block	On
SS-Block Subcarrier Spacing	120 kHz
SS-Block Candidate	Case D (L = 64)
Antenna Port	4000
SSB Subcarrier Offset	0
SSB RB Offset	56
Periodicity	10 ms
Analysis Frame Number	0
P-SS Power Boosting	Auto
P-SS Power Boosting Value	0.000 dB

S-SS Power Boosting	Auto
S-SS Power Boosting Value	0.000 dB
PBCH Power Boosting	Auto
PBCH Power Boosting Value	0.000 dB
SS-Block Transmission	All On

PDCCH/DM-RS (All slots are set as below.)

Enable	On
Antenna Port	2000
PDCCH Power Boosting	Auto
PDCCH Power Boosting Value	0.000 dB
Number of Symbols	2

PDSCH/DM-RS (All slots are set as below.)

Enable	On
Antenna Port	1000
Modulation Scheme	Auto
PDSCH Mapping Type	type A
Start symbol	2
Number of Symbols	12
DM-RS typeA-pos	2
DM-RS config-type	1
DM-RS add-pos	0
DM-RS CDM Group Without Data	2
PDSCH Power Boosting	Auto
PDSCH Power Boosting Value	–3.000 dB
PDSCH PTRS	Off
PDSCH PTRS Time Density	1
PDSCH PTRS Freq. Density	2
PDSCH PTRS RE Offset	00
PDSCH RBs Allocation Auto Detect	Enable
PDSCH RBs Allocation Start RB	0
PDSCH RBs Allocation Number of RBs	132

C.4 MX285051A-061/MX269051A-061

Modulation Analysis
Analysis Time

Starting Slot Number	0 Slot
Measurement Interval	20 Slot

Basic Settings
Frame Parameter

Subcarrier Spacing	30 kHz
Number of RBs	273
Channel Bandwidth	100 MHz
Cell ID	0
Phase Compensation	On

PUSCH/DM-RS (all slots are set as below)

Enable	On
Antenna Port	1000
Modulation Scheme	Auto
PUSCH Mapping Type	type A
Start symbol	0
Number of Symbols	14
DM-RS typeA-pos	2
DM-RS config-type	1
DM-RS add-pos	0
DM-RS CDM Group Without Data	2
PUSCH Power Boosting	Auto
PUSCH Power Boosting Value	–3.000 dB
PUSCH PTRS	Off
PUSCH PTRS Time Density	1
PUSCH PTRS Freq. Density	2
PUSCH PTRS RE Offset	00
PUSCH RBs Allocation Auto Detect	Enable
PUSCH RBs Allocation Start RB	0
PUSCH RBs Allocation Number of RBs	273

C.5 MX285051A-071

Modulation Analysis
Analysis Time

Starting Slot Number	0 Slot
Measurement Interval	80 Slot

Basic Settings
Frame Parameter

Subcarrier Spacing	120 kHz
Number of RBs	132
Channel Bandwidth	200 MHz
Cell ID	0
Phase Compensation	On

PUSCH/DM-RS (all slots are set as below)

Enable	On
Antenna Port	1000
Modulation Scheme	Auto
PUSCH Mapping Type	type A
Start symbol	0
Number of Symbols	14
DM-RS typeA-pos	2
DM-RS config-type	1
DM-RS add-pos	0
DM-RS CDM Group Without Data	2
PUSCH Power Boosting	Auto
PUSCH Power Boosting Value	–3.000 dB
PUSCH PTRS	Off
PUSCH PTRS Time Density	1
PUSCH PTRS Freq. Density	2
PUSCH PTRS RE Offset	00
PUSCH RBs Allocation Auto Detect	Enable
PUSCH RBs Allocation Start RB	0
PUSCH RBs Allocation Number of RBs	132