# MX887065A
# Category M FDD Uplink
# TX Measurement
# Operation Manual

**Fifth Edition**

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided in the MT8870A Universal Wireless Test Set Operation Manual. Please also refer to it before using the equipment.**
- **Keep this manual with the equipment.**

**ANRITSU CORPORATION**

Document No.: M-W3936AE-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.

MX887065A
Category M FDD Uplink TX Measurement
Operation Manual

22 December 2017 (First Edition)
21 January 2022 (Fifth Edition)

Copyright © 2017-2022, ANRITSU CORPORATION.
All rights reserved. No part of this manual may be reproduced without the prior written permission of the publisher.
The operational instructions of this manual may be changed without prior notice.
Printed in Japan

# 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 damage or financial loss of the customer due to the use of or a failure to use this equipment, unless the damage or loss is caused due to Anritsu Corporation’s intentional or gross negligence.

# Anritsu Corporation Contact

In the event of this equipment malfunctions, please 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.

## Notes On Export Management

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

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

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

# Software End-User License Agreement (EULA)

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

## Article 1. Grant of License and Limitations

1. You may not sell, transfer, rent, lease, lend, disclose, sublicense, or otherwise distribute this Software to third parties, whether or not paid therefor.
2. You may make one copy of this Software for backup purposes only.
3. You are not permitted to reverse engineer, disassemble, decompile, modify or create derivative works of this Software.
4. This EULA allows you to install one copy of this Software on one piece of Equipment.

## Article 2. Disclaimers

To the extent not prohibited by law, in no event shall Anritsu be liable for direct, or any incidental, special, indirect or consequential damages whatsoever, including, without limitation, damages for loss of profits, loss of data, business interruption or any other commercial damages or losses, and damages claimed by third parties, arising out of or related to your use or inability to use this Software, unless the damages are caused due to Anritsu's intentional or gross negligence.

## Article 3. Limitation of Liability

1. If a fault (bug) is discovered in this Software, making this Software unable to operate as described in the operation manual or specifications even though you have used this Software as described in the manual, Anritsu shall at its own discretion, fix the bug, or replace the software, or suggest a workaround, free-of-charge, provided, however, that the faults caused by the following items and any of your lost or damaged data whatsoever shall be excluded from repair and the warranty.
   i) If this Software is deemed to be used for purposes not described in the operation manual or specifications.
   ii) If this Software has been used in conjunction with other non-Anritsu-approved software.
   iii) If this Software or the Equipment has been modified, repaired, or otherwise altered without Anritsu's prior approval.
   iv) For any other reasons out of Anritsu's direct control and responsibility, such as but not limited to, natural disasters, software virus infections, or any devices other than this Equipment, etc.
2. Expenses incurred for transport, hotel, daily allowance, etc., for on-site repairs or replacement by Anritsu engineers necessitated by the above faults shall be borne by you.
3. The warranty period for faults listed in Section 1 of this Article shall be either 6 months from the date of purchase of this Software or 30 days after the date of repair or replacement, whichever is longer.

### Article 4. Export Restrictions

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

### Article 5. Change of Terms

Anritsu may change without your approval the terms of this EULA if the changes are for the benefit of general customers, or are reasonable in light of the purpose of this EULA and circumstances of the changes. At the time of change, Anritsu will inform you of those changes and its effective date, as a general rule 45 days, in advance on its website, or in writing or by e-mail.

### Article 6. Termination

1. Anritsu may terminate this EULA immediately if you violate any conditions described herein. This EULA shall also be terminated immediately by Anritsu if there is any good reason that it is deemed difficult to continue this EULA, such as your violation of Anritsu copyrights, patents, etc. or any laws and ordinances, or if it turns out that you belong to an antisocial organization or has a socially inappropriate relationship with members of such organization.
2. You and Anritsu may terminate this EULA by a written notice to the other party 30 days in advance.

### Article 7. Damages

If Anritsu suffers any damages or 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.

### Article 8. Responsibility after Termination

Upon termination of this EULA in accordance with Article 6, you shall cease all uses 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.

### Article 9. Negotiation for Dispute Resolution

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

### Article 10. Governing Law and Court of Jurisdiction

This EULA shall be governed by and interpreted in accordance with the laws of Japan without regard to the principles of the conflict of laws thereof, and any disputes arising from or in relation to this EULA that cannot be resolved by negotiation described in Article 9 shall be subject to and be settled by the exclusive agreed jurisdiction of the Tokyo District Court of Japan.

### Revision History:

February 29th, 2020
December 17th, 2021

## 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 flash drive 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.

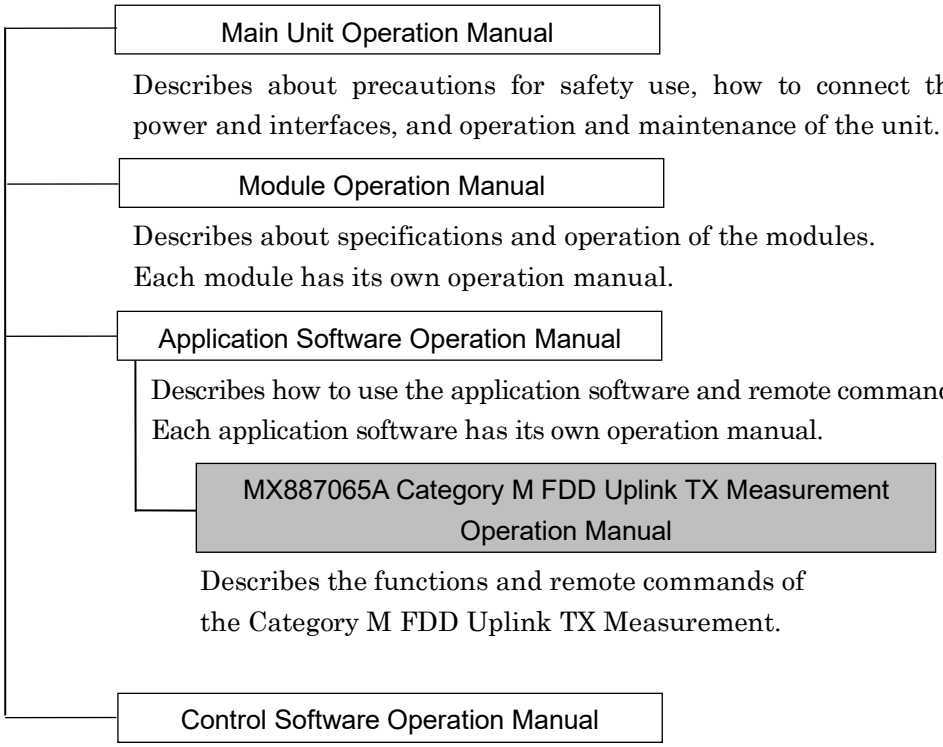
# About This Manual

This manual mainly describes the operation of the MX887065A Category M FDD Uplink TX Measurement.

Products related to the MT8870A Universal Wireless Test Set include:

- MT8870A Universal Wireless Test Set (main unit)
- Modules installed in the MT8870A
- Application software installed in the MT8870A
- Control software installed in a PC to control the MT8870A remotely

These products are referred to as the "Universal Wireless Test Set Series". The operation manuals for the Universal Wireless Test Set Series consist of separate documents for the main unit, module(s), application software, and control software, as shown below. ▭ represents this manual.

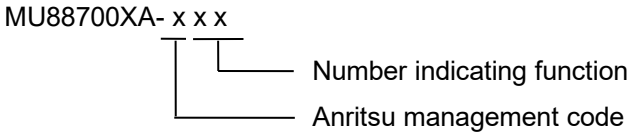


# Convention Used in This Manual

Except where there is a good reason to do otherwise, this manual assumes the use of MT8870A and MU887000A.
Note that the descriptions in this manual also apply to MT8872A, MU887001A, or MU887002A. MU887000A/01A means the MU887000A or MU887001A.

Additionally, the Anritsu management code of the options described in this manual is "0" unless there is a reason.

The option number: The option number is indicated by three digits.



# Table of Contents

**About This Manual ..... I**

**Chapter 1 Outline ..... 1-1**

1.1 Outline ..... 1-2
1.2 Composition ..... 1-3
1.3 License Registration ..... 1-4
1.4 Abbreviations ..... 1-4

**Chapter 2 Fundamental Measurement ..... 2-1**

2.1 Common Operations ..... 2-2
2.2 Transmit Power ..... 2-17
2.3 Occupied Bandwidth ..... 2-19
2.4 Spectrum Emission Mask ..... 2-21
2.5 Adjacent Channel Leakage Power Ratio ..... 2-26
2.6 Modulation Analysis ..... 2-27
2.7 Capturing Waveform Data ..... 2-39
2.8 Sample Programs ..... 2-41

**Chapter 3 Void**

**Chapter 4 SCPI Command Reference..... 4-1**
4.1 List of Commands ..... 4-2
4.2 Details of Commands ..... 4-20

**Chapter 5 Native Command Reference .... 5-1**
5.1 List of Commands ..... 5-2
5.2 Details of Commands ..... 5-18

**Chapter 6 Performance Test..... 6-1**
6.1 Outline ..... 6-2
6.2 Instruments for Testing Performance..... 6-3
6.3 Calibration (MX887065A) ..... 6-5
6.4 Performance Tests (MX887065A) ..... 6-11
6.5 Servicing ..... 6-35

**Appendix A Specifications..... A-1**

**Index ..... Index-1**

# Chapter 1 Outline



This chapter outlines the MX887065A Category M FDD Uplink TX Measurement. Refer to Appendix A "Specifications" for the software functions and performance.

1.1 Outline ..... 1-2
1.2 Composition ..... 1-3
1.3 License Registration ..... 1-4
1.4 Abbreviations ..... 1-4

# 1.1 Outline

The MX887065A Category M FDD Uplink TX Measurement (hereafter MX887065A) adds the Category M FDD wireless measurement function to the MU887000A TRX Test Module.

The MX887065A supports setting of an arbitrary waveform pattern for sending as the Category M FDD downlink signal. Regardless of the uplink signal information, the modulated waveform pattern loaded from memory is sent as the downlink signal (Non-signalling method).

The Signalling method, which detects the Uplink signal information, such as call processing with the mobile station, and changes the Downlink signal modulation, is not supported.

The signal sent from the MU887000A to the mobile station is the downlink signal and the signal sent from the mobile station to the MU887000A is the uplink signal.

When conducting the RX measurement by the MX887065A, execute throughput measurement by the mobile station.

# 1.2 Composition

The composition of the MX887065A is shown in Table 1.2-1.

**Table 1.2-1 MX887065A Composition**

| Item | Model/Code | Name | Qty | Remarks |
|---|---|---|---|---|
| Software | | Storage media (DVD, etc.) | 1 | |
| | MX887065A | Category M FDD Uplink TX Measurement | | License file included on storage media (DVD, etc.) |
| | W3936AE | MX887065A Category M FDD Uplink TX Measurement Operation Manual | | English, on storage media (DVD, etc.) |

## 1.3 License Registration

Before the MX887065A can be used, the software license must be registered in the MT8870A.

Refer to Chapter 8 "Utility Tool" in *the MU887000A TRX Test Module Operation Manual* for the license registration procedure.

## 1.4 Abbreviations

The abbreviations used in this manual are listed in Table 1.4-1.

**Table 1.4-1 Abbreviations**

| Abbreviation | Name |
|---|---|
| ACLR | Adjacent Channel Leakage Ratio |
| CATM | Category M |
| CQI | Channel Quality Indicator |
| DL | Downlink |
| E-UMTS | Evolved UMTS Terrestrial Radio Access |
| EVM | Error Vector Magnitude |
| FDD | Frequency Division Duplex |
| LTE | Long Term Evolution |
| NS | Network Signalling value |
| OBW | Occupied Bandwidth |
| PUCCH | Physical Uplink Control Channel |
| PUSCH | Physical Uplink Shared Channel |
| RB | Resource Block |
| RMC | Reference Measurement Channel |
| SEM | Spectrum Emission Mask |
| SIB | System Information Block |
| TPC | Total Power Control |
| TS | Technical Specification |
| UL | Uplink |
| UMTS | Universal Mobile Telecommunication System |

# Chapter 2 Fundamental Measurement

This chapter describes the fundamental functions and commands of the MX887065A. For details of the commands, refer to Chapter 4 “SCPI Command Reference” and Chapter 5 “Native Command Reference”.


2.1 Common Operations ..... 2-2
2.1.1 Selecting application ..... 2-2
2.1.2 Setting ports ..... 2-2
2.1.3 Frequency and level ..... 2-3
2.1.4 Setting transmission signal ..... 2-4
2.1.5 Waveform patterns ..... 2-5
2.1.6 Setting Category M signals ..... 2-5
2.1.7 Setting measurement ..... 2-13
2.1.8 Starting/stopping measurement ..... 2-14
2.2 Transmit Power ..... 2-17
2.3 Occupied Bandwidth ..... 2-19
2.4 Spectrum Emission Mask ..... 2-21
2.5 Adjacent Channel Leakage Power Ratio ..... 2-26
2.6 Modulation Analysis ..... 2-27
2.6.1 Frequency Error ..... 2-28
2.6.2 EVM ..... 2-29
2.6.3 Carrier leakage ..... 2-30
2.6.4 Rho ..... 2-30
2.6.5 In-band emissions for non-allocated RB ..... 2-31
2.6.6 IQ Imbalance ..... 2-33
2.6.7 Spectrum Flatness ..... 2-34
2.7 Capturing Waveform Data ..... 2-39
2.8 Sample Programs ..... 2-41
2.8.1 Spectrum Emission Mask ..... 2-41
2.8.2 Modulation Analysis ..... 2-46

# 2.1 Common Operations

This section describes operations that are common to the measurements. Both Native and SCPI commands are described in the introduction to commands.

## 2.1.1 Selecting application

Switch the MU887000A application software to cellular by setting the parameter to CELLULAR using the following command.

```
SYSSEL
:INSTrument[:SELect]
```

Switch the MX887065A measurement standard using the following command. Set the parameter to CATM when a function described in Section 2.2, “Transmit Power” to Section 2.6, “Modulation Analysis” is to be used.

• Setting Measurement Mode

```
STDSEL
:CONFigure:CELLular:MEASurement:STANdard
```

## 2.1.2 Setting ports

Set the MU887000A test ports to be used. The following command sets both the test port for outputting the downlink signal and the test port for inputting the uplink signals.

```
PORT
:ROUTe:PORT:CONNect:DIRection
```

## 2.1.3 Frequency and level

### Frequency

Set the frequency and channel of the measured signal using the following commands.

The signal sent from the MU887000A to the mobile station is the downlink signal and the signal sent from the mobile station to the MU887000A is the uplink signal.

- Uplink Channel
  ULCHAN
  :CONFigure:CELLular:MEASurement:RFSettings:ULCHannel
- Uplink Frequency (mobile station Tx)
  ULFREQ
  TXFREQ
  :CONFigure:CELLular:MEASurement:RFSettings:FREQuency
- Downlink Channel
  DLCHAN
  :CONFigure:CELLular:MEASurement:RFSettings:DLCHannel
- Downlink Frequency (mobile station Rx)
  DLFREQ
  RXFREQ
  :CONFigure:CELLular:GENerator:RFSettings:FREQuency

### Level

Set the level of the signal sent (Tx) from and received (Rx) by the MU887000A using the following commands.

- Output Level
  OLVL
  :CONFigure:CELLular:GENerator:RFSettings:LEVel
- Input Level
  ILVL
  :CONFigure:CELLular:MEASurement:RFSettings:LEVel

Cable loss correction

The loss of coaxial cables can be corrected for the output, input, and measured levels.

Refer to Chapter 3 Basic Operation in the *MU887000A TRX Test Module Operation Manual* for an explanation of the commands and loss correction data.

## 2.1.4 Setting transmission signal

To transmit the waveform pattern from MU887000A by using the Cellular application software, load the waveform file into the waveform memory, and then follow the procedure below:

1. Select the waveform file in the waveform memory.
2. Select the waveform pattern in the waveform file selected in step 1.
3. Set the Modulation On/Off and Output On/Off.

Use the following commands to select waveform file and waveform pattern and to set modulation and output On and Off.

- Output On/Off
  `LVL`
  `:CONFigure:CELLular:GENerator:RFSettings:STATe`
- Modulation On/Off
  `MOD`
  `:CONFigure:CELLular:GENerator:BBMode`
- Waveform File Select
  `PACKAGE`
  `:CONFigure:CELLular:GENerator:ARB:PACKage:SELect`
- Waveform Pattern Select
  `DLPAT`
  `:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect`
  `DLPAT_SYNC`
  `:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect:SYNC`

Use the following commands to load the waveform file into the waveform memory.

Refer to Chapter 5 SCPI Command Reference in the *MU887000A TRX Test Module Operation Manual*.

- To load waveform file into the waveform memory
  `:SOURce:GPRF:GENerator:ARB:FILE:LOAD`
- To query the file name in the waveform memory
  `:SOURce:GPRF:GENerator:ARB:WAVeform:NAME`
- To optimize the waveform memory capacity

:SOURce:GPRF:GENerator:ARB:WAVeform:DEFRag

- To delete waveform file in the waveform memory
  :SOURce:GPRF:GENerator:ARB:WAVeform:DELete
- To query the waveform memory free space
  :SOURce:GPRF:GENerator:ARB:WAVeform:FREE



## 2.1.5 Waveform patterns

To send a Category M waveform pattern, specify a file in the MV887065A Category M FDD Downlink Waveform files as the waveform file.

Refer to Chapter 3, "Waveform File Details" in the *Waveform File for Cellular Application Operation Manual* for an explanation of the MV887065A Category M FDD Downlink Waveform files.

## 2.1.6 Setting Category M signals

Set the following items to configure the Category M signal.

### Frame Structure

The frame structure of the Category M signal was defined for FDD and TDD. Only FDD is available for MX887065A.

### Duplex Mode

Only Half Duplex is available for MX887065A.

### Channel Bandwidth

An Category M system has a variable transmission bandwidth called the channel bandwidth. The specified channel bandwidth values are:
1.4, 3, 5, 10, 15, 20 MHz
Set the channel bandwidth of the measurement target signal.

### Channel configuration

Select the target physical channel from the following:

| | |
|---|---|
| PUSCH | Physical Uplink Shared Channel |
| PUCCH | Physical Uplink Control Channel |

### Channel Coding

Sets the channel configuration. To perform TX test based on the measurement standards, set to RMC (Reference Measurement Channel based on TS36.521-1). Only RMC can be set on the MX887065A.

Reference measurement signal modulation

The Reference Measurement Channel (RMC) signal for measuring the wireless performance of Category M mobile station is specified in TS 36.521-1 Annex A.

Uplink reference measurement signal is defined for each modulation scheme, and the QPSK or 16QAM modulation scheme is specified as the measurement target signal.

UL_RMC MCS Index

Sets MCS of Uplink. When MCS Index is set, modulation scheme is changed automatically.

**Table 2.1.6-1 Relation Between MCS Index of UL RMC and Modulation Scheme**

| MCS Index $I_{MCS}$ | Modulation scheme |
|---|---|
| 0 to 10 | QPSK |
| 11 to 15 | 16QAM |

RMC Start RB Number

RMC Number of RBs

The Category M system has subcarrier signals at 15-kHz intervals and a set of 12 subcarriers is called a Resource Block (RB).

The target RB is specified using the start RB number and the number of RBs.

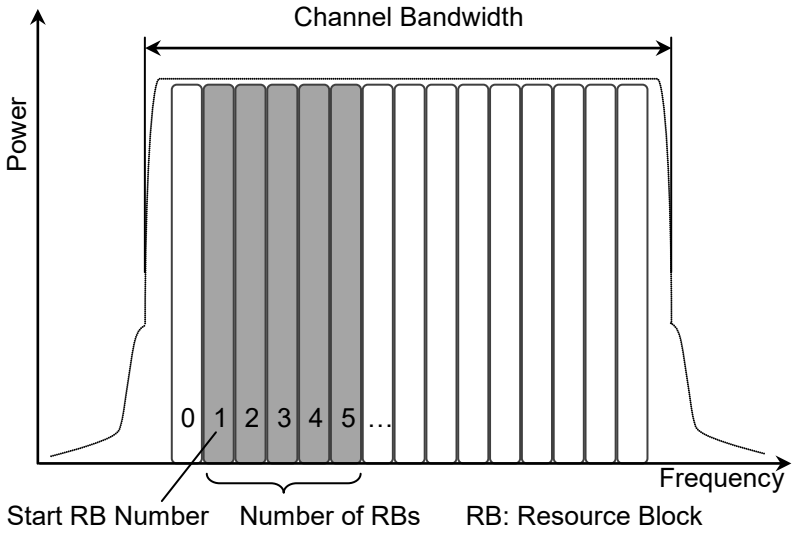



**Figure 2.1.6-1 Target Resource Blocks**

### Channel Quality Indicator RB Number

Set the RB number for the mobile station to transmit the Downlink signal Channel Quality Indicator (CQI). The CQI is transmitted in the PUSCH, so the RB number determines the PUCCH position.

### Uplink and Downlink Channels

The frequency of the signals sent and received by the MU887000A is set by the channel numbers as specified in TS 36.101 5.7.3 Carrier frequency and EARFCN.

If the Uplink Channel Number setting is changed, the Downlink Channel Number, Downlink Frequency, Uplink Frequency, and Frame Structure are changed as well.

Changing Downlink Channel Number setting changes the Uplink Channel Number, Downlink Frequency, Uplink Frequency, and Frame Structure settings.

However, the Uplink Frequency and channel number are not changed interlocking with the Downlink Frequency change and vice versa.

The following table below shows the relationship between the Downlink Channel Number and Uplink Channel Number settings.

**Table 2.1.6-2 Relationship between Uplink Channel Number and Downlink Channel Number**

| Downlink Channel Number ($N_{DL}$) | Uplink Channel Number ($N_{UL}$) |
|---|---|
| dl_ch | ul_ch |
| 0 to 4949 | ul_ch = dl_ch + 18000 |
| 5010 to 5379 | ul_ch = dl_ch + 18000 |
| 5730 to 7399 | ul_ch = dl_ch + 18000 |
| 7500 to 9659 | ul_ch = dl_ch + 18000 |
| 9770 to 9919 | ul_ch = dl_ch + 17890 |
| 36000 to 46789 | ul_ch = dl_ch |
| 65536 to 67135 | ul_ch = dl_ch + 65536 |
| 70366 to 70545 | ul_ch = dl_ch + 63636 |

The Operating Bandwidth (Band) and the following values are determined referring to Table 2.1.6-3, based on the Uplink Channel Number ($N_{UL}$) and the Downlink Channel Number ($N_{DL}$).

Downlink lower limit frequency ($F_{DL\_low}$), Downlink offset number ($N_{Offs\text{-}DL}$), Uplink lower limit frequency ($F_{UL\_low}$), Uplink offset number ($N_{Offs\text{-}UL}$)

When Downlink Channel Number is changed, the MX887065A executes the following processes:

1. Determines values of following parameters based on Downlink Channel Number ($N_{DL}$) and Table 2.1.6-3

   Downlink lower limit frequency ($F_{DL\_low}$),
   Downlink offset number ($N_{Offs\text{-}DL}$)

2. Calculates Downlink frequency ($F_{DL}$) from following equation using the above values:

   $F_{DL} = F_{DL\_low} + 0.1(N_{DL} - N_{Offs\text{-}DL})$

3. Sets Downlink frequency at MU887000A

4. Determines Uplink Channel Number ($N_{UL}$) based on Downlink Channel Number ($N_{DL}$) and Table 2.1.6-2

5. Determines values of following parameters based Uplink Channel Number ($N_{UL}$) and Table 2.1.6-3

   Uplink lower limit frequency ($F_{UL\_low}$),
   Uplink offset number ($N_{Offs\text{-}UL}$)

6. Calculates Uplink Frequency ($F_{UL}$) from following equation using the above values:

   $F_{UL} = F_{UL\_low} + 0.1(N_{UL} - N_{Offs\text{-}UL})$

7. Sets Uplink frequency ($F_{UL}$) at MU887000A

When Uplink Channel is changed, the MX887065A executes the following processing:

1. Determines values of following parameters based on Uplink Channel Number ($N_{UL}$) and Table 2.1.6-3.

   Uplink lower limit frequency ($F_{UL\_low}$),
   Uplink offset number ($N_{Offs\text{-}UL}$)

2. Calculates Uplink frequency ($F_{UL}$) from following equation using the above values:

   $F_{UL} = F_{UL\_low} + 0.1(N_{UL} - N_{Offs\text{-}UL})$

3. Sets Uplink frequency at MU887000A

4. Determines Downlink Channel Number ($N_{DL}$) based on Uplink Channel Number ($N_{UL}$) and Table 2.1.6-2

5. Determines values of following parameters based on Downlink Channel Number ($N_{DL}$) and Table 2.1.6-3:

   Downlink lower limit frequency ($F_{DL\_low}$),
   Downlink offset number ($N_{Offs\text{-}DL}$)

6. Calculates Downlink frequency ($F_{DL}$) from following equation using the above values:

   $F_{DL} = F_{DL\_low} + 0.1(N_{DL} - N_{Offs\text{-}DL})$

7. Sets Downlink frequency at MU887000A

**Table 2.1.6-3 E-UTRA Channel Numbers and Default Mobile Station TX-RX Frequency Separation (Reprinted from Table 5.7.3-1 and Table 5.7.4-1 of 3GPP TS36.101)**

| Band | Freq Separation (MHz) | Downlink | | | Uplink | | |
|---|---|---|---|---|---|---|---|
| | | $F_{DL\_low}$ (MHz) | $N_{Offs-DL}$ | Range of $N_{DL}$ | $F_{UL\_low}$ (MHz) | $N_{Offs-UL}$ | Range of $N_{UL}$ |
| 1 | 190 | 2110 | 0 | 0 to 599 | 1920 | 18000 | 18000 to 18599 |
| 2 | 80 | 1930 | 600 | 600 to 1199 | 1850 | 18600 | 18600 to 19199 |
| 3 | 95 | 1805 | 1200 | 1200 to 1949 | 1710 | 19200 | 19200 to 19949 |
| 4 | 400 | 2110 | 1950 | 1950 to 2399 | 1710 | 19950 | 19950 to 20399 |
| 5 | 45 | 869 | 2400 | 2400 to 2649 | 824 | 20400 | 20400 to 20649 |
| 6 | 45 | 875 | 2650 | 2650 to 2749 | 830 | 20650 | 20650 to 20749 |
| 7 | 120 | 2620 | 2750 | 2750 to 3449 | 2500 | 20750 | 20750 to 21449 |
| 8 | 45 | 925 | 3450 | 3450 to 3799 | 880 | 21450 | 21450 to 21799 |
| 9 | 95 | 1844.9 | 3800 | 3800 to 4149 | 1749.9 | 21800 | 21800 to 22149 |
| 10 | 400 | 2110 | 4150 | 4150 to 4749 | 1710 | 22150 | 22150 to 22749 |
| 11 | 48 | 1475.9 | 4750 | 4750 to 4949 | 1427.9 | 22750 | 22750 to 22949 |
| 12 | 30 | 729 | 5010 | 5010 to 5179 | 699 | 23010 | 23010 to 23179 |
| 13 | –31 | 746 | 5180 | 5180 to 5279 | 777 | 23180 | 23180 to 23279 |
| 14 | –30 | 758 | 5280 | 5280 to 5379 | 788 | 23280 | 23280 to 23379 |
| … | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 17 | 30 | 734 | 5730 | 5730 to 5849 | 704 | 23730 | 23730 to 23849 |
| 18 | 45 | 860 | 5850 | 5850 to 5999 | 815 | 23850 | 23850 to 23999 |
| 19 | 45 | 875 | 6000 | 6000 to 6149 | 830 | 24000 | 24000 to 24149 |
| 20 | –41 | 791 | 6150 | 6150 to 6449 | 832 | 24150 | 24150 to 24449 |
| 21 | 48 | 1495.9 | 6450 | 6450 to 6599 | 1447.9 | 24450 | 24450 to 24599 |
| 22 | 48 | 3510 | 6600 | 6600 to 7399 | 3410 | 24600 | 24600 to 25399 |
| 23 | 100 | 2180 | 7500 | 7500 to 7699 | 2000 | 25500 | 25500 to 25699 |
| 24 | 180 | 1525 | 7700 | 7700 to 8039 | 1626.5 | 25700 | 25700 to 26039 |
| 25 | –101.5 | 1930 | 8040 | 8040 to 8689 | 1850 | 26040 | 26040 to 26689 |
| 26 | 45 | 859 | 8690 | 8690 to 9039 | 814 | 26690 | 26690 to 27039 |
| 27 | 45 | 852 | 9040 | 9040 to 9209 | 807 | 27040 | 27040 to 27209 |
| 28 | 55 | 758 | 9210 | 9210 to 9659 | 703 | 27210 | 27210 to 27659 |
| 29 | N/A | 717 | 9660 | 9660 to 9769 | N/A | N/A | N/A |
| 30 | 45 | 2350 | 9770 | 9770 to 9869 | 2305 | 27660 | 27660 to 27759 |
| 31 | 10 | 462.5 | 9870 | 9870 to 9919 | 452.5 | 27760 | 27760 to 27809 |
| 32 | N/A | 1452 | 9920 | 9920 to 10359 | N/A | N/A | N/A |

**Table 2.1.6-3 E-UTRA Channel Numbers and Default UE TX-RX Frequency Separation (Reprinted from Table 5.7.3-1 and Table 5.7.4-1 of 3GPP TS36.101) (Cont'd)**

| Band | Freq Separation (MHz) | Downlink | | | Uplink | | |
|---|---|---|---|---|---|---|---|
| | | $F_{DL\_low}$ (MHz) | $N_{Offs-DL}$ | Range of $N_{DL}$ | $F_{UL\_low}$ (MHz) | $N_{Offs-UL}$ | Range of $N_{UL}$ |
| 33 | 0 | 1900 | 36000 | 36000 to 36199 | 1900 | 36000 | 36000 to 36199 |
| 34 | 0 | 2010 | 36200 | 36200 to 36349 | 2010 | 36200 | 36200 to 36349 |
| 35 | 0 | 1850 | 36350 | 36350 to 36949 | 1850 | 36350 | 36350 to 36949 |
| 36 | 0 | 1930 | 36950 | 36950 to 37549 | 1930 | 36950 | 36950 to 37549 |
| 37 | 0 | 1910 | 37550 | 37550 to 37749 | 1910 | 37550 | 37550 to 37749 |
| 38 | 0 | 2570 | 37750 | 37750 to 38249 | 2570 | 37750 | 37750 to 38249 |
| 39 | 0 | 1880 | 38250 | 38250 to 38649 | 1880 | 38250 | 38250 to 38649 |
| 40 | 0 | 2300 | 38650 | 38650 to 39649 | 2300 | 38650 | 38650 to 39649 |
| 41 | 0 | 2496 | 39650 | 39650 to 41589 | 2496 | 39650 | 39650 to 41589 |
| 42 | 0 | 3400 | 41590 | 41590 to 43589 | 3400 | 41590 | 41590 to 43589 |
| 43 | 0 | 3600 | 43590 | 43590 to 45589 | 3600 | 43590 | 43590 to 45589 |
| 44 | 0 | 703 | 45590 | 45590 to 46589 | 703 | 45590 | 45590 to 46589 |
| 45 | 0 | 1447 | 46590 | 46590 to 46789 | 1447 | 46590 | 46590 to 46789 |
| … | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 65 | 190 | 2110 | 65536 | 65536 to 66435 | 1920 | 131072 | 131072 to 131971 |
| 66 | 400 | 2110 | 66436 | 66436 to 67335 | 1710 | 131972 | 131972 to 132671 |
| 67 | N/A | 738 | 67336 | 67336 to 67535 | N/A | N/A | N/A |
| … | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 85 | 30 | 728 | 70366 | 70366 to 70545 | 698 | 134002 | 134002 to 134181 |
| … | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 252*1 | N/A | 5150 | 255144 | 255144 to 256143 | N/A | N/A | N/A |
| 255*1 | N/A | 5725 | 260894 | 260894 to 262143 | N/A | N/A | N/A |

Group Hopping
Turns On or Off Group Hopping

Cell ID
Sets the Cell ID

Use the following commands to set the Category M signals

- Frame Structure
  `FRAMETYPE`
  `:CONFigure:CELLular:LTE:FSTRucture`
- Duplex Mode
  `DUPLEXMODE`
  `:CONFigure:CELLular:CATM:DUPLex`

- Channel Coding
  `CHCODING`
  `:CONFigure:CELLular:CATM:CHCoding`
- RMC Configuration
  `CHCONFIG`
  `:CONFigure:CELLular:CATM:CTYPe`
- nRB-CQI
  `NRBCQI`
  `:CONFigure:CELLular:CATM:RBCQi`
- Channel Bandwidth
  `BANDWIDTH`
  `:CONFigure:CELLular:CATM:CBANdwidth`
- UL RMC Narrowband Index
  `ULRMC_NARROW`
  `:CONFigure:CELLular:CATM:NARRowband`
- UL RMC Number of RB
  `ULRMC_RB`
  `:CONFigure:CELLular:CATM:RBALlocation:NRB`
- UL RMC Starting RB
  `ULRB_START`
  `:CONFigure:CELLular:CATM:RBALlocation:ORB`
- UL RMC MCS Index
  `ULIMCS`
  `:CONFigure:CELLular:CATM:MCS`
- UL RMC Modulation
  `ULRMC_MOD`
  `:CONFigure:CELLular:CATM:MODulation:MSCHeme`
- Group Hopping On/Off
  `GROUPHOP`
  `:CONFigure:CELLular:CATM:GHOPping`
- Cell ID
  `CELLID`
  `:CONFigure:CELLular:CATM:CID`
- Cyclic Shift
  `CSHIFT`
  `:CONFigure:CELLular:CATM:CSHift`
- Delta SS
  `DELTASS`
  `:CONFigure:CELLular:CATM:DSS`

### 2.1.7 Setting measurement

Set the following measurement items.

- Trigger Source
  TRGSRC
  :TRIGger:CELLular:CATM:FUNDamental:SOURce
- Trigger Level
  TRGLVL
  :TRIGger:CELLular:CATM:FUNDamental:LEVel
- Trigger Delay
  TRGDLY
  :TRIGger:CELLular:CATM:FUNDamental:DELay
- Trigger Timeout
  TRGTOUT
  :TRIGger:CELLular:CATM:FUNDamental:TOUT

Use the following command when not measuring.

- Setting all measurement items to off
  ALLMEASITEMS_OFF
  :CONFigure:CELLular:CATM:FUNDamental:AMITems:OFF

## 2.1.8 Starting/stopping measurement

### Starting measurement

To start measurement, send the following command.
The status indication lamp 3 of MU887000A is on during the execution of measurement or analysis. For the explanation of the status lamp, refer to Appendix D "Status Indication of lamps" in *the MU887000A TRX Test Module Operation Manual*.

```
SNGLS
:INITiate:CELLular:MEASurement:SINGle

SWP
```

### Stopping measurement

To stop measurement, send the following command.

```
MEASSTOP
:ABORt:CELLular:MEASurement
```

### Checking measurement status

Query the measurement status and errors using the following commands.

```
TXMSTAT
MSTAT
:FETCh:CELLular:MEASurement:STATe
```

**Table 2.1.8-1 Query Response**

| Response | Description |
|---|---|
| 0 | Measurement completed normally |
| 2 | Level exceeded<br>The MU887000A receive level is higher than the set input level. |
| 5 | Synchronization word not detected<br>No reference signal was detected for Uplink frame synchronization. |
| 9 | Measurement in progress or not executed |
| 12 | Tx measurement timeout<br>No trigger occurred before measurement timed out. |

The measurement status and errors can be queried using the status registers.
Refer to Chapter 3 “Fundamental Operation” in the *MU887000A TRX Test Module Operation Manual* for an explanation of the status registers.
The allocations of MX887065A status registers are described in the following tables.



Native command mode

**Table 2.1.8-2 Bit Definition of End Event Status Register (Signal Generator)**

| Bit | Description |
|---|---|
| 7 to 1 | Not used and always set to 0. |
| 0 | Changed to 1 at end of reading waveform file |

**Table 2.1.8-3 Bit Definition of End Event Status Register (Measurement)**

| Bit | Description |
|---|---|
| 7 to 2 | Not used and always set to 0. |
| 1 | Changed to 1 after trigger prepared |
| 0 | Changed to 1 when measurement preparation completed |

**Table 2.1.8-4 Bit Definition of Error Event Status Register (Signal Generator)**

| Bit | Description |
|---|---|
| 7 to 1 | Not used and always set to 0. |
| 0 | Changed to 1 at error in read waveform file |

**Table 2.1.8-5 Bit Definition of Error Event Status Register (Measurement)**

| Bit | Description |
|---|---|
| 7 to 3 | Not used and always set to 0. |
| 2 | Changed to 1 at measurement timeout |
| 1 | Changed to 1 when measurement result under level |
| 0 | Changed to 1 when measurement result over level |

SCPI Command mode

**Table 2.1.8-6 Bit Definition of Signal Generator Status Register**

| Bit | Description |
|---|---|
| 16 to 1 | Not used and always set to 0. |
| 0 | Changed to 1 while reading file |

**Table 2.1.8-7 Bit Definition of Measurement Status Register**

| Bit | Description |
|---|---|
| 16 to 2 | Not used and always set to 0. |
| 1 | Changed to 1 while preparing trigger |
| 0 | Changed to 1 during measurement |

**Table 2.1.8-8 Bit Definition of Signal Generator Questionable Register**

| Bit | Description |
|---|---|
| 16 to 1 | Not used and always set to 0. |
| 0 | Changed to 1 at error in read file |

**Table 2.1.8-9 Bit Definition of Measurement Questionable Register**

| Bit | Description |
|---|---|
| 16 to 3 | Not used and always set to 0. |
| 2 | Changed to 1 at measurement timeout |
| 1 | Changed to 1 when measurement result under level |
| 0 | Changed to 1 when measurement result over level |

# 2.2 Transmit Power

The Tx Power measurement measures the power in the bandwidth specified in Table 5.4.2-1 of 3GPP TS36.521-1.



**Table 2.2-1 Transmit Power Measurement Bandwidth (MHz)**

| Channel Bandwidth | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
|---|---|---|---|---|---|---|
| Tx Power | 1.4 | 3 | 5 | 10 | 15 | 20 |
| Channel Power | 1.08 | 2.7 | 4.5 | 9.0 | 13.5 | 18 |

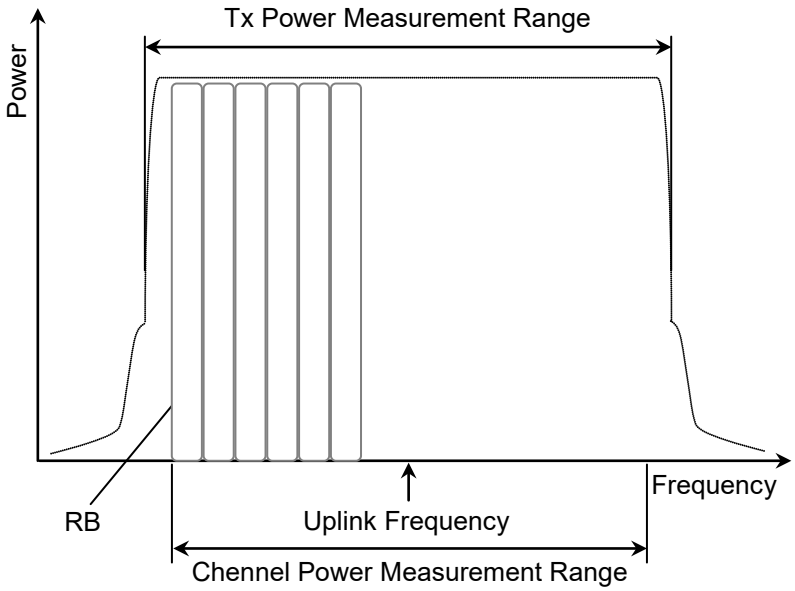



**Figure 2.2-1 Tx Power Measurement Range**

Set the following parameter to measure the Tx Power.

Measurement enable and measurement count

Enable Tx Power measurement and specify the measurement count. The Tx Power is measured for 1 subframe (1 ms, Excluding Guard period) at each measurement count.

```
PWR_SET
:CONFigure:CELLular:CATM:FUNDamental:POWer:SET
```

Use the following commands to query the Tx power measurement results.

- Tx Power
  `POWER`
  `:FETCh:CELLular:CATM:FUNDamental:POWer:TXPower`
- Channel Power
  `CHPWR`
  `:FETCh:CELLular:CATM:FUNDamental:POWer:CHPower`

# 2.3 Occupied Bandwidth

Occupied Bandwidth is the bandwidth with a specific proportion of the total measured power.

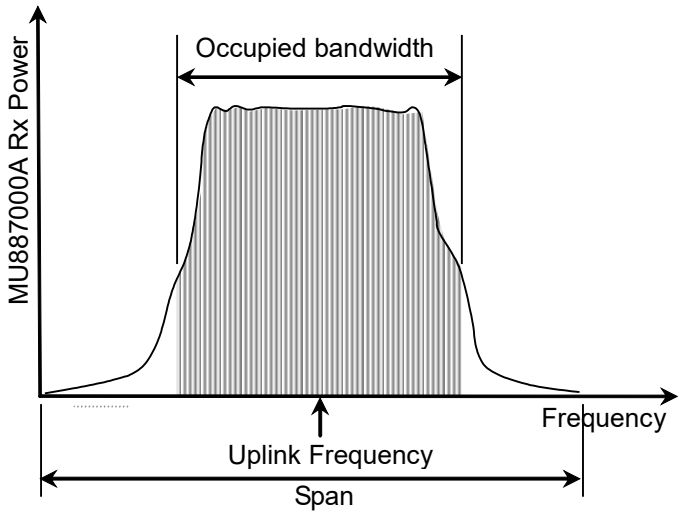



**Figure 2.3-1 Occupied Bandwidth**

The Occupied Bandwidth measurement settings are:

Span

The frequency span is determined by the channel bandwidth setting, referring to Section 2.1.6 “Setting Category M signals”.

**Table 2.3-1 Occupied Bandwidth Measurement Frequency Range**

| Channel Bandwidth | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
|---|---|---|---|---|---|---|
| Span (MHz) | 3.697 | 7.671 | 12.729 | 25.374 | 38.019 | 50.663 |

Occupied Bandwidth power ratio

The power ratio (occupied ratio) for determining the Occupied Bandwidth is 99.9%.

Measurement enable and measurement count

Enable Occupied Bandwidth measurement and specify the measurement count.

The Occupied Bandwidth is measured for 1 subframe (1 ms, Excluding Guard period) at each measurement count.

```
OBW_SET
:CONFigure:CELLular:CATM:FUNDamental:OBW:SET
```

Use the following command to query the results of Occupied Bandwidth measurement.

- OBW Result

  `OBW`

  `:FETCh:CELLular:CATM:FUNDamental:OBW`

- OBW Frequency Result

  `OBWFREQ`

  `:FETCh:CELLular:CATM:FUNDamental:OBW:FREQuency`

# 2.4 Spectrum Emission Mask

Spectrum Emission Mask measurement measures the peak level and margin at the conditions specified in TS 36.521-1 6.6.2.1EA Spectrum Emission Mask for UE category M1.

When using the MX887065A, the spectrum emission mask frequency ranges are called Range 1, Range 2, Range 3, and Range 4 starting sequentially from the end of the channel bandwidth.

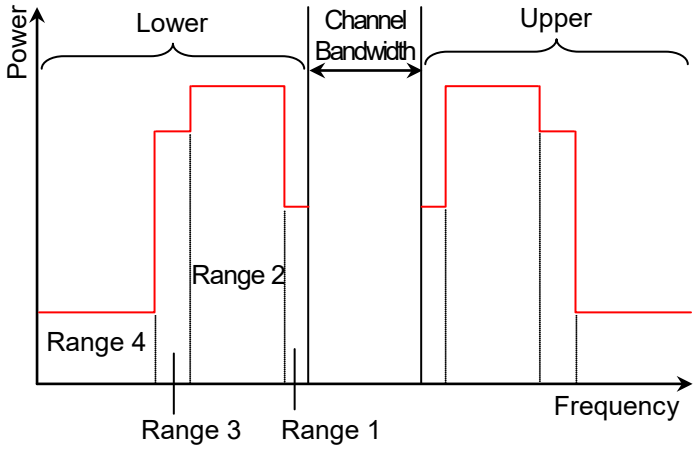



**Figure 2.4-1 Mask Range of Spectrum Emission Mask**

**Table 2.4-1 Frequency Ranges of Range 1 to 4**

| | | Frequency Ranges | | | |
|---|---|---|---|---|---|
| additionalSpectrumEmission | Channel Bandwidth (MHz) | Range 1 | Range 2 | Range 3 | Range 4 |
| NS_01<br>NS_02<br>NS_03<br>NS_04<br>NS_05 | 1.4 | 0 to 1 MHz | 1 to 2.5 MHz | 2.5 to 2.8 MHz | ----- |
| | 3.0 | 0 to 1 MHz | 1 to 5 MHz | 5 to 6 MHz | ----- |
| | 5 | 0 to 1 MHz | 1 to 5 MHz | 5 to 6 MHz | 6 to 10 MHz |
| | 10 | 0 to 1 MHz | 1 to 5 MHz | 5 to 10 MHz | 10 to 15 MHz |
| | 15 | 0 to 1 MHz | 1 to 5 MHz | 5 to 15 MHz | 15 to 20 MHz |
| | 20 | 0 to 1 MHz | 1 to 5 MHz | 5 to 20 MHz | 20 to 25 MHz |
| Measurement bandwidth | | 30 kHz | 1 MHz | 1 MHz | 1 MHz |
| NS_06<br>NS_07 | 1.4 | 0 to 0.1 MHz | 0.1 to 1 MHz | 1 to 2.5 MHz | 2.5 to 2.8 MHz |
| | 3.0 | 0 to 0.1 MHz | 0.1 to 1 MHz | 1 to 5 MHz | 5 to 6 MHz |
| | 5 | 0 to 0.1 MHz | 0.1 to 1 MHz | 1 to 6 MHz | 6 to 10 MHz |
| | 10 | 0 to 0.1 MHz | 0.1 to 1 MHz | 1 to 10 MHz | 10 to 15 MHz |
| Measurement bandwidth | | 30 kHz | 100 kHz | 1 MHz | 1 MHz |

The Spectrum Emission Mask settings are:

Measurement enable and measurement count

Enable Spectrum Emission Mask measurement and specify the measurement count.
The Spectrum Emission Mask is measured for 1 subframe (1 ms, Excluding Guard period) at each measurement count.

AddtionalSpectrumEmission

Set the Network Signal Value for Additional Spectrum Emission. Then the frequency ranges change to the values shown in Table 2.4-1, and the limits change to the values shown in Table 2.4-2, depending on the setting.

**Table 2.4-2 Spectrum Emission Limit of Range 1 to 4**

| additional SpectrumEmission | Range | Spectrum emission limit (dBm)/ Channel bandwidth | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| NS_03 | 1 | –8.5 | –11.5 | –13.5 | –16.5 | –18.5 | –19.5 |
| | 2 | –11.5 | –11.5 | –11.5 | –11.5 | –11.5 | –11.5 |
| | 3 | –23.5 | –23.5 | –11.5 | –11.5 | –11.5 | –11.5 |
| | 4 | --- | --- | –23.5 | –23.5 | –23.5 | –23.5 |
| **additional SpectrumEmission** | **Range** | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | |
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| NS_04 | 1 | –8.5 | –11.5 | –13.5 | –16.5 | –18.5 | –19.5 |
| | 2 | –11.5 | –11.5 | –11.5 | –11.5 | –11.5 | –11.5 |
| | 3 | –23.5 | –23.5 | –23.5 | –23.5 | –23.5 | –23.5 |
| | 4 | --- | --- | –23.5 | –23.5 | –23.5 | –23.5 |
| **additional SpectrumEmission** | **Range** | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | |
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| NS_06<br>NS_07 | 1 | –11.5 | –11.5 | –13.5 | –16.5 | –18.5 | –19.5 |
| | 2 | –11.5 | –11.5 | –11.5 | –11.5 | –8.5 | –8.5 |
| | 3 | –11.5 | –11.5 | –11.5 | –11.5 | –11.5 | –11.5 |
| | 4 | –23.5 | –23.5 | –23.5 | –23.5 | –23.5 | –23.5 |
| **additional SpectrumEmission** | **Range** | **Spectrum emission limit (dBm)/ Channel bandwidth** | | | | | |
| | | **1.4 MHz** | **3 MHz** | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** |
| Other than above | 1 | –8.5 | –11.5 | –13.5 | –16.5 | –18.5 | –19.5 |
| | 2 | –8.5 | –8.5 | –8.5 | –8.5 | –8.5 | –8.5 |
| | 3 | –23.5 | –23.5 | –11.5 | –11.5 | –11.5 | –11.5 |
| | 4 | --- | --- | –23.5 | –23.5 | –23.5 | –23.5 |

The results of the spectrum emission mask measurement are:

- Pass/fail result
  If the spectrum is at the mask level or below, the result is PASS. If it exceeds the mask level, the result is FAIL.
- Peak level and frequency at each level
- Margin
  This is the minimum level difference from the threshold. The applicable threshold depends on the signal level.

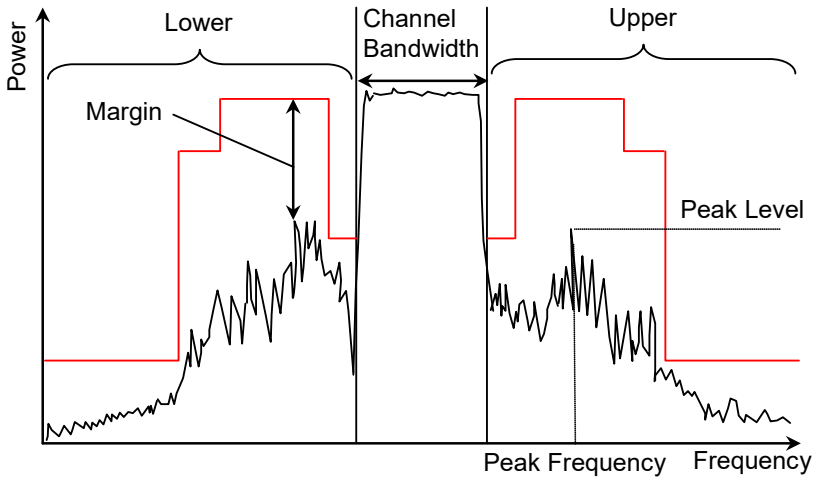



**Figure 2.4-2 Spectrum Emission Mask Measurement Result**

**Table 2.4-3 Frequency Ranges for Measurement Results**

NS_06, NS_07

| | Frequency Difference from Channel Bandwidth $\Delta f_{OOB}$ (MHz) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bandwidth (MHz)** | **0-0.1** | **0.1-1** | **1-2.5** | **2.5-2.8** | **2.8-5** | **5-6** | **6-10** | **10-15** |
| 1.4 | ✓ | ✓ | ✓ | ✓ | | | | |
| 3.0 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 10 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Measurement Bandwidth | 30 kHz | 100 kHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz |
| Frequency Range | 1, –1 | 2, –2 | 3, –3 | 4, –4 | 5, –5 | 6, –6 | 7, –7 | 8, –8 |

Other than above

| Bandwidth (MHz) | Frequency Difference from Channel Bandwidth $\Delta f_{OOB}$ (MHz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **0-1** | **1-2.5** | **2.5-2.8** | **2.8-5** | **5-6** | **6-10** | **10-15** | **15-20** | **20-25** |
| 1.4 | ✓ | ✓ | ✓ | | | | | | |
| 3.0 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | |
| 5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| 10 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 15 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 20 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Measurement Bandwidth | 30 kHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz | 1 MHz |
| Frequency Range | 1, –1 | 2, –2 | 3, –3 | 4, –4 | 5, –5 | 6, –6 | 7, –7 | 8, –8 | 9, –9 |

Use the following commands to set the spectrum emission mask measurement.

- Measurement ON/OFF and Measurement Count
  `SEM_SET`
  `:CONFigure:CELLular:CATM:FUNDamental:SEMask:SET`
- AddtionalSpectrumEmission
  `SIB2_NS`
  `:CONFigure:CELLular:CATM:FUNDamental:SEMask:ASEMission`

The commands for querying the spectrum emission mask measurement results are:

- Evaluation Result
  `SEMPASS`
  `:FETCh:CELLular:CATM:FUNDamental:SEMask:JUDGement`
- Peak Level and Frequency
  `WORST_SEM_LV`
  `:FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel`
  `TTL_WORST_SEM_LV`
  `:FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:TTL`
- Margin and Frequency
  `WORST_SEM`
  `:FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin`
  `TTL_WORST_SEM`
  `:FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:TTL`

- Peak Level and Frequency (Detail)
  WORST_SEM_DET_LV
  :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail
  TTL_WORST_SEM_DET_LV
  :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail:TTL
- Margin and Frequency (Detail)
  WORST_SEM_DET
  :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail
  TTL WORST SEM DET
  :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail:TTL

# 2.5 Adjacent Channel Leakage Power Ratio

Adjacent Channel Leakage Power Ratio (ACLR) is the ratio of in-band power to the power leaking to adjacent channels.

The E-UTRA (LTE) and UTRA (W-CDMA) bands are specified for adjacent channels. The power leaking to the two adjacent channels is measured for UTRA.

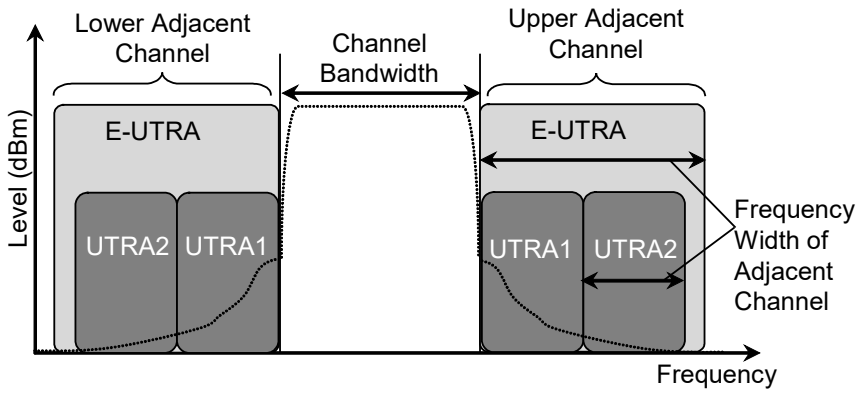



**Figure 2.5-1 Adjacent Channels for ACLR Measurement**

The ACLR measurement parameters are:

The frequency range of the adjacent channels varies with the channel bandwidth.

**Table 2.5-1 Adjacent Channel Measurement Bandwidth (MHz)**

| Channel Bandwidth | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
|---|---|---|---|---|---|---|
| UTRA | 3.84 | 3.84 | 3.84 | 3.84 | 3.84 | 3.84 |
| E-UTRA | 1.08 | 2.7 | 4.5 | 9.0 | 13.5 | 18 |

Measurement enable and measurement count
Enable ACLR measurement and specify the measurement count.
The Adjacent Channel Leakage Power Ratio is measured for 1 subframe (1 ms, Excluding Guard period) at each measurement count.

```
ACLR_SET
:CONFigure:CELLular:CATM:FUNDamental:ACLR:SET
```

Use the following command to query the results of the ACLR measurement.

```
ACLR
:FETCh:CELLular:CATM:FUNDamental:ACLR
```

# 2.6 Modulation Analysis

Modulation analysis measures:

- Frequency Error
- EVM
- Carrier Leakage
- Waveform Quality (Rho)
- In-band Emissions for Non-Allocated RB
- IQ Imbalance
- Spectrum Flatness

Use the following command to enable modulation analysis measurement and specify the measurement count.
Modulation analysis of 1 slot (0.5 ms, Excluding Guard period) is performed at each measurement count.

```
MOD_SET
:CONFigure:CELLular:CATM:FUNDamental:MODulation:SET
```

### 2.6.1 Frequency Error

Frequency error measurement measures the carrier frequency and frequency error at Uplink.

Set the uplink frequency as the reference frequency for error measurement by referring to Section 2.1.3 “Frequency and level”.

Use the following commands to query the frequency error measurement results:

- Carrier Frequency
  `CARRF`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:CFRequency`
- Frequency Error
  `CFERR`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor`
- Worst Value of Frequency Error
  `CFERR_WORST`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor:WORSt`

The worst value is either the maximum or minimum frequency error, whichever is the larger absolute value.

## 2.6.2 EVM

Error Vector Magnitude (EVM) is the magnitude ratio of the error vector to the reference vector. The error vector is the difference between the vector of the measured signal and the reference vector.
The difference in phase between the vector of the measured signal and the reference vector is called the phase error while the difference in magnitude is called the magnitude error.

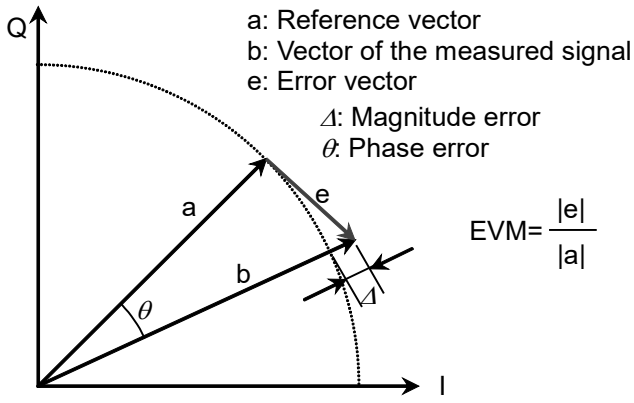



**Figure 2.6.2-1 Definition of EVM**

Query the EVM measurement result using the following commands:

- EVM
  `EVM`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:EVM`
- Peak EVM
  `PVECTERR`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:PEVM`
- EVM of the Reference Signal
  `RSEVM`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:RSEVm`
- Phase Error
  `PHASEERR`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:PHERror`
- Magnitude Error
  `MAGTDERR`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:MERRor`

The reference signal is defined in TS 36.211 5.5.2 “Demodulation Reference Signal”.
The target symbol for EVM measurement differs with RMC Configuration as described in Section 2.1.6 “Setting Category M signals”. (PUSCH and PUCCH measurements are available, but PRACH measurement is not.)

PUSCH: Measures reference signal of EVM. Symbols other than the reference signal are the target for EVM and peak EVM measurement.

PUCCH: All Symbols are the target for EVM and peak EVM measurements. EVM of the reference signal cannot be measured.

## 2.6.3 Carrier leakage

Query the mobile station carrier leakage measurement result using the following command:

- Carrier Leakage Result

  `CARRLEAK`

  `:FETCh:CELLular:CATM:FUNDamental:MODulation:CARLeakage`

## 2.6.4 Rho

Waveform quality (ρ: Rho) shows the correlation between an ideal noiseless waveform and the measured signal. It is 1 when both signals match each other.
The approximate relationship between Rho and EVM is:

$$\rho \approx \frac{1}{1+EVM^2}$$

Query the Rho measurement results using the following command:

`RHO`

`:FETCh:CELLular:CATM:FUNDamental:MODulation:RHO`

## 2.6.5 In-band emissions for non-allocated RB

The In-band Emission for Non-Allocated RB is the ratio between the signal power of the allocated RBs and the signal power in the non-allocated RBs.
TS 36.521-1 6.5.2.3EA "In-band Emission for non-allocated RB for UE category M1" specifies three measurement ranges: Carrier Leakage, General, and IQ Image.



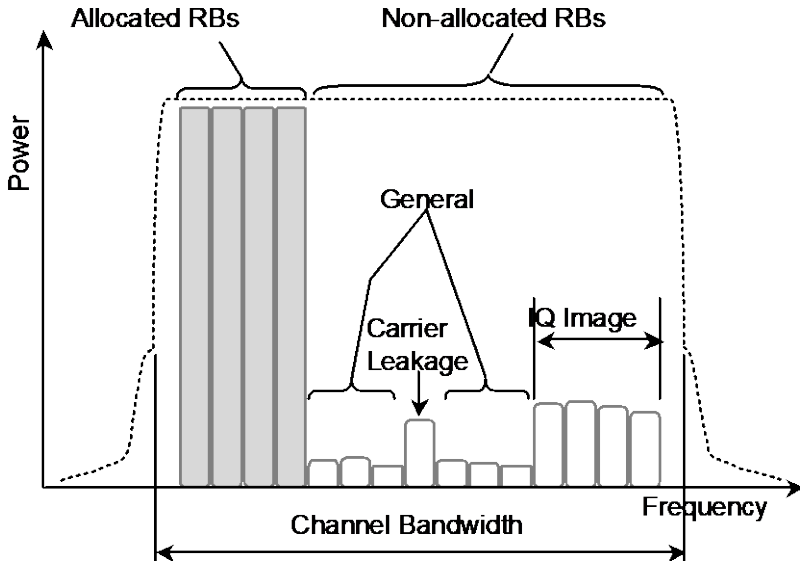



**Figure 2.6.5-1 In-band Emission Measurement Range**

Set the allocated RB using Narrowbands Index, UL RMC Number of RB, and UL RMC Starting RB as described in Section 2.1.6 "Setting Category M signals".

Query the In-band Emissions for Non-Allocated RB measurement results using the following commands:

- Carrier Leakage
  `INBANDE_LEAK`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:CARLeakage`
- General
  `INBANDE_GEN`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:GENeral`
- IQ Image
  `INBANDE_IMG`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:IQIMage`

- In-Band Emissions limit - General
  `INBANDE_GENUL`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:GENeral`
- In-Band Emissions limit - IQ Image
  `INBANDE_IMG`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:IQIMage`
- In-Band Emissions limit - Carrier Leakage
  `INBANDE_LEAKUL`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:CARLeakage`
- In-Band Emissions margin
  `INBANDE_MARG`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:MARGin`
- In-Band Emissions Measured Item
  `INBANDEITEM`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:ITEM`
- In-Band Emissions Judgement
  `INBANDEPASS`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:JUDGement`

## 2.6.6 IQ Imbalance

Query the IQ Imbalance measurement result using the following command:

- IQ Imbalance (%) Result
  `IQIMB_PER`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:PERCent`

- IQ Imbalance (dB) Result
  `IQIMB_DB`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:DB`

IQ Imbalance measurement is performed only under the following conditions.

**Table 2.6.6-1 IQ Imbalance measurement conditions**

| Item | RMC Configuration | IBEM_CLFR | Channel Bandwidth | UL RMC Number of RB |
|---|---|---|---|---|
| Setting | PUSCH | NBC | All | 6 |
| | | CFR | 1.4 MHz | 6 |

## 2.6.7 Spectrum Flatness

Spectrum Flatness measurement measures the maximum and minimum values of the relative level of the subcarriers.

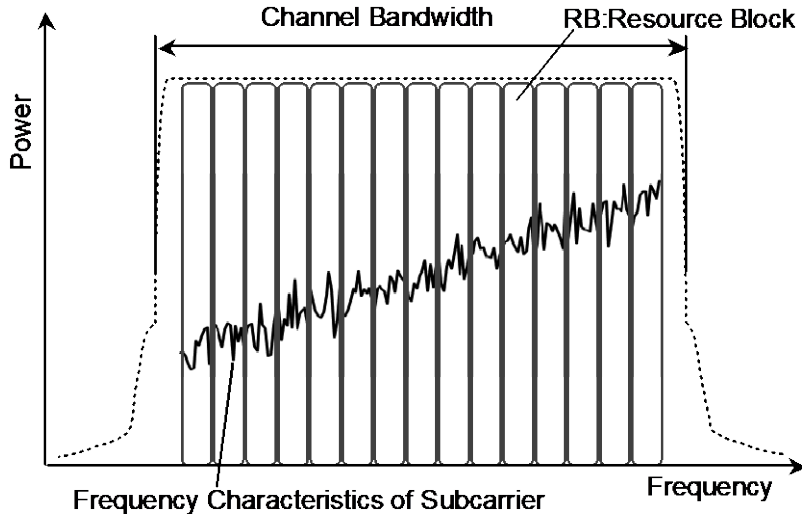



**Figure 2.6.7-1 Measurement Range of Spectrum Flatness**

TS 36.521-1 6.5.2.4EA EVM equalizer spectrum flatness for UE category M1 specifies two separate frequency ranges (Range 1 and Range 2) in the operation band with individual limit values.
Range 1 covers the range of 3 MHz or higher, and Range 2 covers the range lower than 3 MHz from both ends of the operation band.

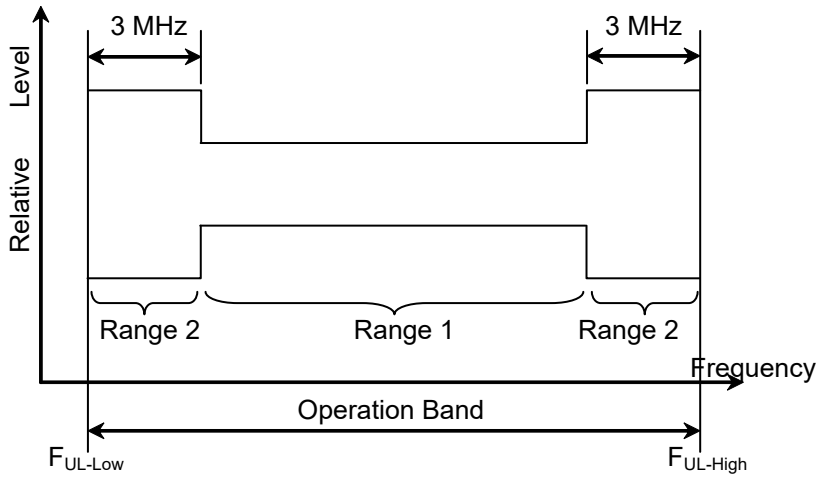



**Figure 2.6.7-2 Standard Range of Spectrum Flatness**

The measured data varies depending on where the target channel bandwidth is located in the operation band.

When the measurement range is within Range 1, the maximum value, minimum value, and ripple (maximum value – minimum value) of Range 1 are measured.

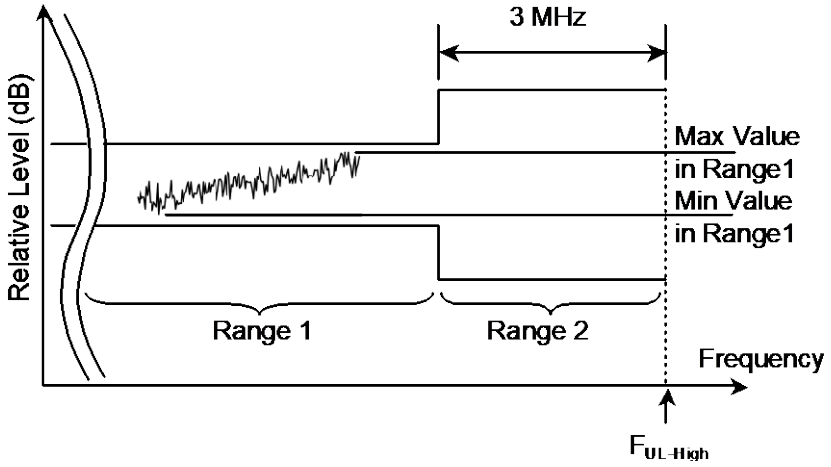



**Figure 2.6.7-3 Channel Bandwidth in Range 1**

When the measurement range is within Range 2, the maximum value, minimum value, and ripple (maximum value – minimum value) of Range 2 are measured.

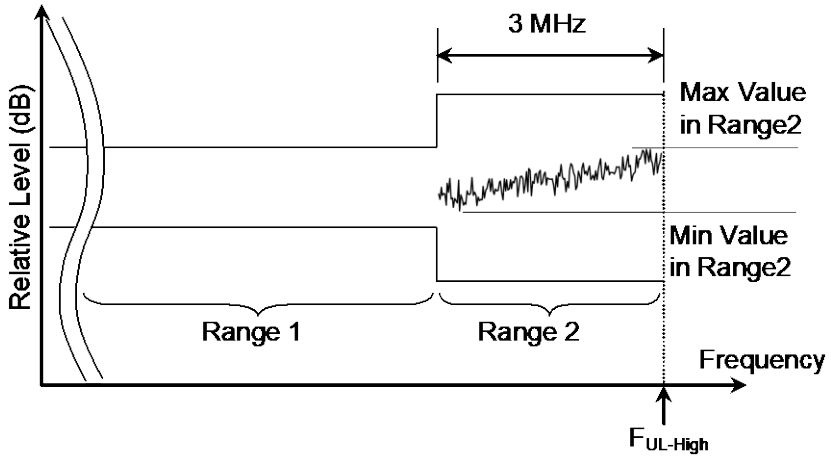



**Figure 2.6.7-4 Channel Bandwidth in Range 2**

When the measurement range crosses both Range 1 and Range 2, the following values are measured:
Maximum value, Minimum value,
and Ripple (maximum value – minimum value) of Range 1
Maximum value, Minimum value,
and Ripple (maximum value – minimum value) of Range 2
Difference between maximum value of Range 2
and minimum value of Range 1
Difference between maximum value of Range 1
and minimum value of Range 2

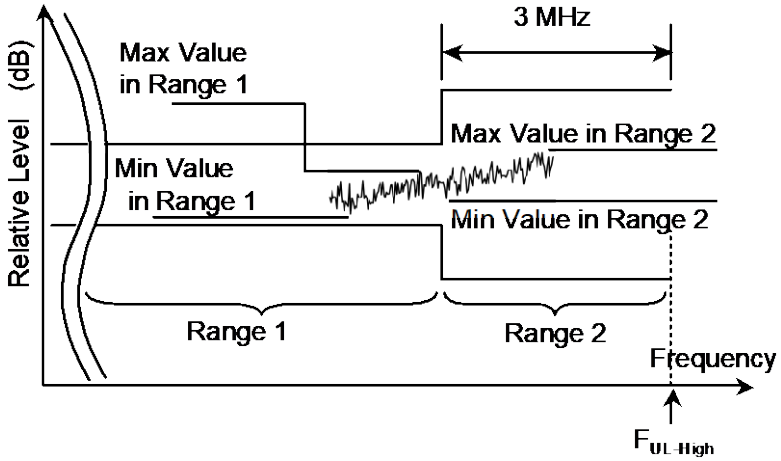



**Figure 2.6.7-5 Channel Bandwidth Crossing Range 1 and Range 2**

The MX887065A measures the frequency characteristics of the subcarrier for the number of times specified for modulation analysis.
The maximum and minimum values of the level are recorded for each subcarrier, like peak hold and minimum hold for a spectrum analyzer.

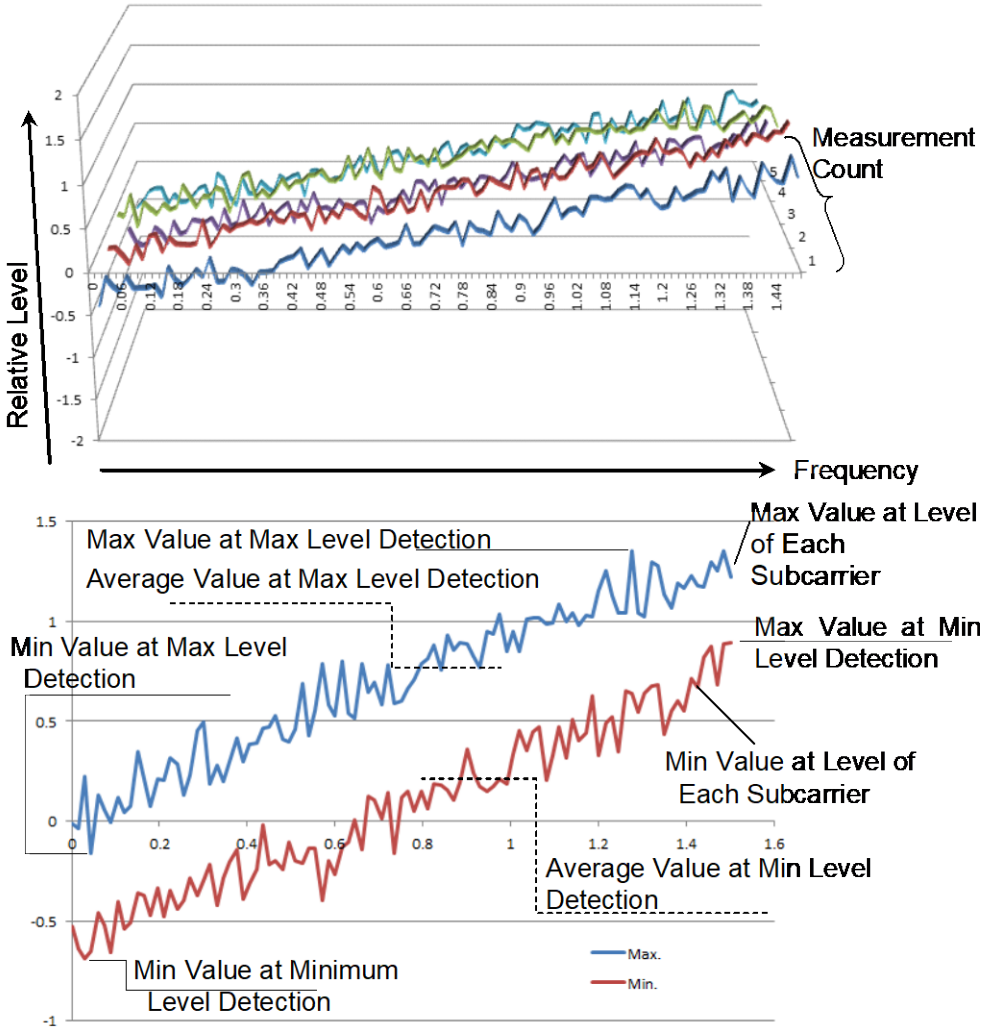



**Figure 2.6.7-6 Types of Spectrum Flatness Measurement Results**

- Operation band
  The threshold line for spectrum flatness is determined by setting the operation band.
  BAND
  :CONFigure:CELLular:CATM:FUNDamental:BAND

Query the spectrum flatness measurement results using the following commands:

- Range 1 Maximum Value
  SPECFLAT1_P
  :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness
  :R1P

- Range 1 Minimum Value
  `SPECFLAT1_M`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1M`
- Range 1 Worst Value
  `SPECFLAT1`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1`
- Range 1 Ripple
  `SPECFLAT_RP1`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP1`
- Range 2 Maximum Value
  `SPECFLAT2_P`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2P`
- Range 2 Minimum Value
  `SPECFLAT2_M`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2M`
- Range 2 Worst Value
  `SPECFLAT2`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2`
- Range 2 Ripple
  `SPECFLAT_RP2`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP2`
- Range 2 Maximum Value – Range 1 Minimum Value
  `SPECFLAT_RP21`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP21`
- Range 1 Maximum Value – Range 2 Minimum Value
  `SPECFLAT_RP12`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP12`
- Spectrum Flatness Measured Item
  `SPECFLATITEM`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:ITEM`
- Spectrum Flatness Judgement
  `SPECFLATPPPASS`
  `:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:JUDGement`

# 2.7 Capturing Waveform Data

The following command is used to capture the waveform data after measurement has been completed.

- Waveform

  WAVEFMEAS

  :FETCh:CELLular:CATM:FUNDamental:TRACe

The query parameter, data interval and number of data for capturing the waveform data for each measurement item are listed in the following table.

**Table 2.7-1 Waveform Data Type and Data Interval**

| Measurement Item | Query Parameter | Data Interval |
|---|---|---|
| Occupied Bandwidth | 1 | 5.625 kHz |
| Spectrum Emission Mask | 2 | 5.625 kHz |
| Constellation (I) | 3 | Subcarrier (15 kHz) |
| Constellation (Q) | 4 | |
| EVM (Average) | 5 | Subcarrier (15 kHz) |
| EVM (Maximum) | 6 | |
| Phase Error (Average) | 7 | Subcarrier (15 kHz) |
| Phase Error (Maximum) | 8 | |
| Magnitude Error (Average) | 9 | Subcarrier (15 kHz) |
| Magnitude Error (Maximum) | 10 | |
| In-band Emissions dB (Average) | 11 | Resource Block (180 kHz) |
| dB (Maximum) | 12 | |
| dBc (Average) | 13 | |
| dBc (Maximum) | 14 | |
| Spectrum Flatness (Average) | 15 | Subcarrier (15 kHz) |
| (Maximum) | 16 | |
| (Minimum) | 17 | |

The number of waveform data varies depending on the channel bandwidth setting.

**Table 2.7-2 Channel Bandwidth and Number of Data**

| | Channel Bandwidth (MHz) | | | | | |
|---|---|---|---|---|---|---|
| **Measurement Item** | **1.4** | **3** | **5** | **10** | **15** | **20** |
| Occupied Bandwidth | 655 | 1359 | 2255 | 4495 | 6735 | 8975 |
| Spectrum Emission Mask | 1135 | 2255 | 3695 | 5487 | 7247 | 9039 |
| Constellation | 72 | 180 | 300 | 600 | 900 | 1200 |
| EVM | 72 | 180 | 300 | 600 | 900 | 1200 |
| Phase Error | 72 | 180 | 300 | 600 | 900 | 1200 |
| Magnitude Error | 72 | 180 | 300 | 600 | 900 | 1200 |
| In-band Emissions | 6 | 15 | 25 | 50 | 75 | 100 |
| Spectrum Flatness | 72 | 180 | 300 | 600 | 900 | 1200 |

# 2.8 Sample Programs

This section describes sample programs using the free Tera Term software.
For the Tera Term communication settings of, refer to Section 2.3.1 "Ethernet" in the *MU887000A TRX Test Module Operation Manual*.



## 2.8.1 Spectrum Emission Mask

An example of Spectrum Emission Mask measurement using the Native command mode is described here.
The sample program on the following pages can be executed as a Tera Term macro. Refer to the Tera Term Help file for how to execute the macro.

### Processing Flow

1. Set the application software type to the MX887065A.
2. Set the following measurement conditions.

| | |
|---|---|
| Test Port | Port 1 |
| Input Level | –10 dBm |
| Uplink Frequency | 1940 MHz |
| Frame Configuration | FDD |
| Duplex Mode | Half Duplex |
| Channel Bandwidth | 1.4 MHz |
| Channel Configuration | PUSCH |
| RMC Modulation scheme | QPSK |
| Narrowband Index | 0 |
| Starting RB Number | 0 |
| Number of RB | 6 |
| Tx Power Measurement | OFF |
| Occupied Bandwidth Measurement | OFF |
| Spectrum Emission Mask Measurement | ON, 100 times |
| Adjacent Channel Leakage Power Ratio Measurement | OFF |
| Modulation Analysis | OFF |

3. Start measurement.
4. Read the measurement status.
5. Query measurement results after measurement is completed.

```
; Sample program for Spectrum Emission Mask
; Anritsu Corporation March,2012
; Macro for Tera Term Version 4.69
;
; set local echo to on
setecho 1
flushrecv
; time out 3 second
timeout=3

; Set language to "Native".
sendln 'SYST:LANG NAT'
call check_error_code

; Set application type to "Cellular".
sendln 'SYSSEL CELLULAR'
call check_error_code

; Set standard to "CATM".
sendln 'STDSEL CATM'
call check_error_code

; Set test port to "Port1".
sendln 'PORT PORT1,PORT1'
call check_error_code

; Set Input Range to "-10 dBm".
sendln 'ILVL -10'
call check_error_code

; Set center frequency to "1940 MHz".
sendln 'ULFREQ 1940MHZ'
call check_error_code

; Set Frame Structure to "FDD".
sendln 'FRAMETYPE FDD'
call check_error_code

; Set Duplex Mode to "Half Duplex".
sendln 'DUPLEXMODE HALF'
call check_error_code
```

```
; Set Channel Bandwidth to "1.4MHz".
sendln 'BANDWIDTH 1.4MHZ'
call check_error_code

; Set RMC Configuration to "PUSCH".
sendln 'CHCONFIG PUSCH'
call check_error_code

; Set RMC Modulation to "QPSK".
sendln 'ULRMC_MOD QPSK'
call check_error_code

; Set Narrowband Index to "0".
sendln 'ULRMC_NARROW 0'
call check_error_code

; Set Starting RB Number to "0".
sendln 'ULRB_START 0'
call check_error_code

; Set Count of RB to "6".
sendln 'ULRMC_RB 6'
call check_error_code

; Set Measurement of Tx Power to "OFF".
sendln 'PWR_SET OFF'
call check_error_code

; Set Measurement of Occupied Bandwidth to "OFF".
sendln 'OBW_SET OFF'
call check_error_code

; Set Measurement of Spectrum Emission Mask to "ON","100 times".
sendln 'SEM_SET ON,100'
call check_error_code

; Set Measurement of Adjacent Channel Leakage power Ratio to "OFF".
sendln 'ACLR_SET OFF'
call check_error_code

; Set Measurement of Modulation Analysis to "OFF".
sendln 'MOD_SET OFF'
call check_error_code
```

```
; Start measurement
sendln 'SNGLS'
call check_error_code

; waiting measurement up to 10 second
for i 1 10

  sendln 'MSTAT?'
  pause 1; wait 1 second
  recvln
  recvln
  ;call check_response ; debug
  if result=0 goto _timeout
  if result=1 then
         break
  endif
  call check_error_code
next

; Query Judgement
sendln 'SEMPASS?'
call check_error_code

; Query Peak level and frequency in each range
sendln 'TTL_WORST_SEM_LV?'
call check_error_code

; Query Margin in each range
sendln 'TTL_WORST_SEM?'
call check_error_code

; Query Spectrum data
sendln 'WAVEFMEAS? 2,0,1135'
call check_error_code

messagebox  'Macro end successfully' 'Finish'

End

;       ------------ subroutines -----------

:check_error_code
  ; query error
  sendln 'SYSERR?'
```

```
  waitln 'No error'

  ; in case of timeout
  if result=0 goto _timeout
  ; in case of error occurring
  if result=2 then
         e_message='Error code = '
         strconcat e_message inputstr
         messagebox  e_message 'Command Error occurred'
         end
  endif

  ; in case of no error

return

:check_response

  ;for debug
  messagebox inputstr 'debug1'
  int2str result_str result
  messagebox result_str 'debug2'

  return

:_timeout
  messagebox  'No response from MT8870A.' 'Time out!'
  call check_error_code
  End
```

## 2.8.2 Modulation Analysis

An example of modulation analysis using the SCPI command mode is described here.

The sample program on the following pages can be executed as a Tera Term macro. Refer to the Tera Term Help file for how to execute the macro.

### Processing Flow

1. Set the application software type to the MX887065A.
2. Set the following measurement conditions.

| | |
|---|---|
| Test Port | Port 2 |
| Input Level | –20 dBm |
| Uplink Frequency | 1940 MHz |
| Frame Structure | FDD |
| Duplex Mode | Half Duplex |
| Channel Bandwidth | 5 MHz |
| Channel Configuration | PUSCH |
| RMC Modulation scheme | QPSK |
| Narrowband Index | 0 |
| Starting RB Number | 0 |
| Number of RB | 1 |
| Tx Power | OFF |
| Occupied Bandwidth Measurement | OFF |
| Spectrum Emission Mask Measurement | OFF |
| Adjacent Channel Leakage Power Ratio Measurement | OFF |
| Modulation Analysis | ON, 200 times |

3. Start measurement.
4. Read the measurement status.
5. Query the following measurement results when measurement is completed.

| | |
|---|---|
| Frequency | |
| Frequency Error | |
| EVM | |
| Peak EVM | |
| Reference Signal EVM | |
| Phase Error | |
| Magnitude Error | |
| Carrier Leakage | |
| IQ Imbalance | |
| Waveform Quality | |
| In-band Emissions | General, IQ Image, Carrier Leakage |
| Spectrum Flatness | Maximum, Minimum, Ripple, Worst value of Range 1 |
| | Maximum, Minimum, Ripple, Worst value of Range 2 |
| | Difference between maximum value of Range 2 and minimum value of Range 1 |
| | Difference between maximum value of Range 1 and minimum value of Range 2 |

```
; Sample program for Modulation Analysis
; Anritsu Corporation March,2012
; Macro for Tera Term Version 4.69
;
; set local echo to on
setecho 1
flushrecv
; time out 3 second
timeout=3

; Set language to "SCPI".
sendln 'SYST:LANG SCPI'
call check_error_code

; Set application type to "Cellular".
sendln ':INST CELLULAR'
call check_error_code

; Set standard to "CATM".
sendln ':CONF:CELL:MEAS:STAN CATM'
call check_error_code

; Set test port to "Port2".
sendln ':ROUT:PORT:CONN:DIR PORT2,PORT2'
call check_error_code

; Set channel to "9750".
sendln ':CONF:CELL:MEAS:RFS:ULCH 9750'
call check_error_code

; Set Input Level to "-20 dBm".
sendln ':CONF:CELL:MEAS:RFS:LEV -20'

; Set Frame Structure to "FDD".
sendln ':CONF:CELL:CATM:FSTR FDD'
call check_error_code

; Set Duplex Mode to "Half Duplex".
sendln ':CONF:CELL:CATM:DUPL HALF'
call check_error_code
```

```
; Set Channel Bandwidth to "5MHz".
sendln ':CONF:CELL:CATM:CBAN 5MHZ'
call check_error_code

; Set RMC Configuration to "PUSCH".
sendln ':CONF:CELL:CATM:CTYP PUSCH'
call check_error_code

; Set RMC Modulation to "QPSK".
sendln ':CONF:CELL:CATM:MOD:MSCH QPSK'
call check_error_code

; Set Narrowband Index to "0".
sendln ':CONF:CELL:CATM:NARR 0'
call check_error_code

; Set Starting RB Number to "3.75kHz".
sendln ':CONF:CELL:CATM:RBAL:ORB 0'
call check_error_code

; Set Count of RB to "1".
sendln ':CONF:CELL:CATM:RBAL:NRB 1'
call check_error_code

; Set Measurement of Transmit Power to "OFF".
sendln ':CONF:CELL:CATM:FUND:POW:SET OFF'
call check_error_code

; Set Measurement of Occupied Bandwidth to "OFF".
sendln ':CONF:CELL:CATM:FUND:OBW:SET OFF'
call check_error_code

; Set Measurement of Spectrum Emission Mask to "OFF".
sendln ':CONF:CELL:CATM:FUND:SEM:SET OFF'
call check_error_code

; Set Measurement of Adjacent Channel Leakage power Ratio to "OFF".
sendln ':CONF:CELL:CATM:FUND:ACLR:SET OFF'
call check_error_code

; Set Measurement of Modulation Analysis to "ON","200 times".
sendln ':CONF:CELL:CATM:FUND:MOD:SET ON,200'
call check_error_code
```

```
; ! Note !
; Output the RF power of Device under test.

; Start measurement
sendln ':INIT:CELL:MEAS:SING'
call check_error_code

; waiting measurement up to 10 second
for i 1 10

  sendln ':FETC:CELL:MEAS:STAT?'
  pause 1; wait 1 second
  recvln
  recvln
  ;call check_response ; debug
  if result=0 goto _timeout
  if result=1 then
         break
  endif
  call check_error_code
next

; Query Frequency
sendln ':FETC:CELL:CATM:FUND:MOD:CFR? AVG'
call check_error_code

; Query Frequency Error
sendln ':FETC:CELL:CATM:FUND:MOD:FERR? TTL'
call check_error_code

; Query EVM
sendln ':FETC:CELL:CATM:FUND:MOD:EVM? TTL'
call check_error_code

; Query Peak EVM
sendln ':FETC:CELL:CATM:FUND:MOD:PEVM? TTL'
call check_error_code

; Query Demodulation Reference Signal EVM
sendln ':FETC:CELL:CATM:FUND:MOD:RSEV? TTL'
call check_error_code
```

```
; Query Phase Error
sendln ':FETC:CELL:CATM:FUND:MOD:PHER? TTL'
call check_error_code

; Query Magnitude Error
sendln ':FETC:CELL:CATM:FUND:MOD:MERR? TTL'
call check_error_code

; Query Carrier Leakage
sendln ':FETC:CELL:CATM:FUND:MOD:CARL? TTL'
call check_error_code

; Query IQ Imbalance
sendln ':FETC:CELL:CATM:FUND:MOD:IQIM:DB? TTL'
call check_error_code

; Query Waveform Quality
sendln ':FETC:CELL:CATM:FUND:MOD:RHO? TTL'
call check_error_code

; Query Inband Emission - General
sendln ':FETC:CELL:CATM:FUND:MOD:IEM:GEN? TTL'
call check_error_code

; Query Inband Emission – IQ Image
sendln ':FETC:CELL:CATM:FUND:MOD:IEM:IQIM? TTL'
call check_error_code

; Query Inband Emission – Carrier Leakage
sendln ':FETC:CELL:CATM:FUND:MOD:IEM:CARL? TTL'
call check_error_code

; Query Spectrum Flatness – Range 1 Maximum
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:R1P? TTL'
call check_error_code

; Query Spectrum Flatness – Range 1 Minimum
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:R1M? TTL'
call check_error_code

; Query Spectrum Flatness – Range 1 Worst
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:R1?'
call check_error_code
```

```
; Query Spectrum Flatness - Range 1 Ripple
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:RP1? TTL'
call check_error_code

; Query Spectrum Flatness - Range 2 Maximum
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:R2P? TTL'
call check_error_code

; Query Spectrum Flatness - Range 2 Minimum
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:R2M? TTL'
call check_error_code

; Query Spectrum Flatness - Range 2 Worst
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:R2?'
call check_error_code

; Query Spectrum Flatness - Range 2 Ripple
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:RP2? TTL'
call check_error_code

; Query Spectrum Flatness - Range 2 Max to Range 1 Min
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:RP21? TTL'
call check_error_code

; Query Spectrum Flatness - Range 1 Max to Range 2 Min
sendln ':FETC:CELL:CATM:FUND:MOD:ESFL:RP12? TTL'
call check_error_code

messagebox  'Macro end successfully' 'Finish'

End

;       ------------ subroutines -----------

:check_error_code
  ; query error
  sendln ':SYSTem:ERRor?'
  waitln 'No error'
```

```
  ; in case of timeout
  if result=0 goto _timeout
  ; in case of error occurring
  if result=2 then
         e_message='Error code = '
         strconcat e_message inputstr
         messagebox  e_message 'Command Error occurred'
         end
  endif

  ; in case of no error

return

:check_response

  ;for debug
  messagebox inputstr 'debug1'
  int2str result_str result
  messagebox result_str 'debug2'

  return

:_timeout
  messagebox  'No response from MT8870A.' 'Time out!'
  call check_error_code
  End


  messagebox result_str 'debug2'

  return

:_timeout
  messagebox  'No response from MT8870A.' 'Time out!'
  call check_error_code
  End
```

# Chapter 4 SCPI Command Reference

This chapter describes the details of SCPI commands.
To switch to the SCPI command mode, send the command SYST:LANG SCPI.


4.1 List of Commands ..... 4-2
4.1.1 Common commands ..... 4-3
4.1.2 Fundamental measurement commands ..... 4-5
4.2 Details of Commands ..... 4-20
4.2.1 Common commands ..... 4-21
4.2.2 Fundamental measurement commands ..... 4-36

# 4.1 List of Commands

The following table shows the rules for describing messages.

| | |
|---|---|
| [ ] | Messages or parameters in square brackets can be omitted. |
| \| | Choose one of several choices.<br>A \| B \| C \| D indicates a choice of A, B, C, and D. |
| { } | Curly brackets are used to group options.<br>For A \| B({C \| D}), choose A, B(C), or B(D). |

### 4.1.1 Common commands

Operation Status Register

| Function | Command | Query | Response |
|---|---|---|---|
| Measurement Operation Status Register Query | ----- | :STATus:OPERation:MEASure[:EVENt]? | <mosr> |

Questionable Register

| Function | Command | Query | Response |
|---|---|---|---|
| Measurement Questionable Status Register Query | ----- | :STATus:QUEStionable:MEASure[:EVENt]? | <mqsr> |

Common

| Function | Command | Query | Response |
|---|---|---|---|
| Standard Select | :CONFigure:CELLular:MEASurement:STANdard <std> | :CONFigure:CELLular:MEASurement:STANdard? | <std> |
| Set Connect Port Direction | :ROUTe:PORT:CONNect:DIRection <input>,<output>[,<output>,…,<output>] | :ROUTe:PORT:CONNect:DIRection? | <input>,<output>[,<output>,…,<output>] |

Measurement

| Function | Command | Query | Response |
|---|---|---|---|
| Measurement Stop | :ABORt:CELLular:MEASurement | ----- | ----- |
| Measurement Status | ----- | :FETCh:CELLular:MEASurement:STATe? | <m_status> |
| Measurement Start | :INITiate:CELLular:MEASurement:SINGle | ----- | ----- |

Common Parameters

| Function | Command | Query | Response |
|---|---|---|---|
| Output Level On/Off | :CONFigure:CELLular:GENerator:RFSettings:STATe <on_off> | :CONFigure:CELLular:GENerator:RFSettings:STATe? | <on_off> |
| Output Signal Modulation | :CONFigure:CELLular:GENerator:BBMode <on_off> | :CONFigure:CELLular:GENerator:BBMode? | <on_off> |
| Waveform File Select | :CONFigure:CELLular:GENerator:ARB:PACKage:SELect <pac> | :CONFigure:CELLular:GENerator:ARB:PACKage:SELect? | <pac> |
| Waveform Pattern Select | :CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect <pat> | :CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect? | <pat> |
| Waveform Pattern Select (SYNC) | :CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect:SYNC <pat> | :CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect:SYNC? | <pat> |

System

| Function | Command | Query | Response |
|---|---|---|---|
| Application Select | :INSTrument[:SELect] <app> | :INSTrument[:SELect]? | <app> |
| Language Selection of Remote Command | :SYSTem:LANGuage <mode> | :SYSTem:LANGuage? | <mode> |

## 4.1.2 Fundamental measurement commands

Common Parameters

| Function | Command | Query | Response |
|---|---|---|---|
| Channel Bandwidth | :CONFigure:CELLular:CATM:CBANdwidth <bandwidth> | :CONFigure:CELLular:CATM:CBANdwidth? | <bandwidth> |
| Uplink Channel | :CONFigure:CELLular:MEASurement:RFSettings:ULCHannel <ul_ch> | :CONFigure:CELLular:MEASurement:RFSettings:ULCHannel? | <ul_ch> |
| Uplink Frequency | :CONFigure:CELLular:MEASurement:RFSettings:FREQuency <ul_freq> | :CONFigure:CELLular:MEASurement:RFSettings:FREQuency? | <ul_freq> |
| Downlink Channel | :CONFigure:CELLular:MEASurement:RFSettings:DLCHannel <dl_ch> | :CONFigure:CELLular:MEASurement:RFSettings:DLCHannel? | <dl_ch> |
| Downlink Frequency | :CONFigure:CELLular:GENerator:RFSettings:FREQuency <dl_freq> | :CONFigure:CELLular:GENerator:RFSettings:FREQuency? | <dl_freq> |
| Operation Band | :CONFigure:CELLular:CATM:FUNDamental:BAND <band> | :CONFigure:CELLular:CATM:FUNDamental:BAND? | <band> |
| Input Level | :CONFigure:CELLular:MEASurement:RFSettings:LEVel <level> | :CONFigure:CELLular:MEASurement:RFSettings:LEVel? | <level> |
| Output Level (Total) | :CONFigure:CELLular:GENerator:RFSettings:LEVel <level> | :CONFigure:CELLular:GENerator:RFSettings:LEVel? | <level> |
| Output Level (Total 1.4 MHz) | :CONFigure:CELLular:GENerator:RFSettings:LEVel:NARRowband <level> | :CONFigure:CELLular:GENerator:RFSettings:LEVel:NARRowband? | <level> |

Category M Setting

| Function | Command | Query | Response |
|---|---|---|---|
| Frame Structure | :CONFigure:CELLular:CATM:FSTRucture <mode> | :CONFigure:CELLular:CATM:FSTRucture? | <mode> |
| Duplex Mode | :CONFigure:CELLular:CATM:DUPLex <mode> | :CONFigure:CELLular:CATM:DUPLex? | <mode> |
| Channel Coding | :CONFigure:CELLular:CATM:CHCoding <object> | :CONFigure:CELLular:CATM:CHCoding? | <object> |
| RMC Configuration | :CONFigure:CELLular:CATM:CTYPe <val> | :CONFigure:CELLular:CATM:CTYPe? | <val> |
| nRB-CQI | :CONFigure:CELLular:CATM:RBCQi <value> | :CONFigure:CELLular:CATM:RBCQi? | <value> |
| UL RMC Narrowband Index | :CONFigure:CELLular:CATM:NARRowband <index> | :CONFigure:CELLular:CATM:NARRowband? | <index> |
| UL RMC Number of RB | :CONFigure:CELLular:CATM:RBALlocation:NRB <ul_rmc_rb> | :CONFigure:CELLular:CATM:RBALlocation:NRB? | <ul_rmc_rb> |
| UL RMC Starting RB | :CONFigure:CELLular:CATM:RBALlocation:ORB <ulrb> | :CONFigure:CELLular:CATM:RBALlocation:ORB? | <ulrb> |
| UL RMC MCS Index | :CONFigure:CELLular:CATM:MCS <ulimcs> | ---- | ---- |
| UL RMC Modulation | :CONFigure:CELLular:CATM:MODulation:MSCHeme <ul_rmc_mod> | :CONFigure:CELLular:CATM:MODulation:MSCHeme? | <ul_rmc_mod> |

Category M Setting (Cont'd)

| Function | Command | Query | Response |
|---|---|---|---|
| Group Hopping | :CONFigure:CELLular:CATM:GHOPping <on_off> | :CONFigure:CELLular:CATM:GHOPping? | <on_off> |
| Cell ID | :CONFigure:CELLular:CATM:CID <id> | :CONFigure:CELLular:CATM:CID? | <id> |
| Cyclic Shift | :CONFigure:CELLular:CATM:CSHift <val> | :CONFigure:CELLular:CATM:CSHift? | <val> |
| Delta SS | :CONFigure:CELLular:CATM:DSS <val> | :CONFigure:CELLular:CATM:DSS? | <val> |
| RB Search | :CONFigure:CELLular:CATM:FUNDamental:RBSearch <on_off> | :CONFigure:CELLular:CATM:FUNDamental:RBSearch? | <on_off> |
| In-band Emissions/ EVM Carrier Leakage Frequency | :CONFigure:CELLular:CATM:FUNDamental:IEMissions:CLFRequency <clf> | :CONFigure:CELLular:CATM:FUNDamental:IEMissions:CLFRequency? | <clf> |
| Trigger Source | :TRIGger:CELLular:CATM:FUNDamental:SOURce <source> | :TRIGger:CELLular:CATM:FUNDamental:SOURce? | <source> |
| Trigger Level | :TRIGger:CELLular:CATM:FUNDamental:LEVel <level> | :TRIGger:CELLular:CATM:FUNDamental:LEVel? | <level> |
| Trigger Delay | :TRIGger:CELLular:CATM:FUNDamental:DELay <delay> | :TRIGger:CELLular:CATM:FUNDamental:DELay? | <delay> |
| Trigger Timeout | :TRIGger:CELLular:CATM:FUNDamental:TOUT <time> | :TRIGger:CELLular:CATM:FUNDamental:TOUT? | <time> |

Fundamental Measurement Parameter

| Function | Command | Query | Response |
|---|---|---|---|
| Power Measurement On/Off and Meas. Count | :CONFigure:CELLular:CATM:FUNDamental:POWer:SET <on_off>[,<avg_count>] | :CONFigure:CELLular:CATM:FUNDamental:POWer:SET? | <on_off>,<avg_count> |
| OBW On/Off and Meas. Count | :CONFigure:CELLular:CATM:FUNDamental:OBW:SET <on_off>[,<avg_count>] | :CONFigure:CELLular:CATM:FUNDamental:OBW:SET? | <on_off>,<avg_count> |
| SEM On/Off and Meas. Count | :CONFigure:CELLular:CATM:FUNDamental:SEMask:SET <on_off>[,<avg_count>] | :CONFigure:CELLular:CATM:FUNDamental:SEMask:SET? | <on_off>,<avg_count> |
| ACLR On/Off and Meas. Count | :CONFigure:CELLular:CATM:FUNDamental:ACLR:SET <on_off>[,<avg_count>] | :CONFigure:CELLular:CATM:FUNDamental:ACLR:SET? | <on_off>,<avg_count> |
| Modulation Analysis On/Off and Meas. Count | :CONFigure:CELLular:CATM:FUNDamental:MODulation:SET <on_off>[,<avg_count>] | :CONFigure:CELLular:CATM:FUNDamental:MODulation:SET? | <on_off>,<avg_count> |
| All Measurement Items Off | :CONFigure:CELLular:CATM:FUNDamental:AMITems:OFF | ---- | ---- |
| additionalSpectrumEmission | :CONFigure:CELLular:CATM:FUNDamental:SEMask:ASEMission <sib2_ns> | :CONFigure:CELLular:CATM:FUNDamental:SEMask:ASEMission? | <sib2_ns> |

Result (Power Measurement, Occupied Bandwidth)

| Function | Command | Query | Response |
|---|---|---|---|
| Tx Power Result | ---- | :FETCh:CELLular:CATM:FUNDamental:POWer:TXPower?<br>[<mode>] | <pwr> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<pwr(1)>,<pwr(2)>,...,<pwr(s)><br><mode>=IND<br>AVG when mode is omitted |
| Channel Power Result | ---- | :FETCh:CELLular:CATM:FUNDamental:POWer:CHPower?<br>[<mode>] | <pwr> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<pwr(1)>,<pwr(2)>,...,<pwr(s)><br><mode=IND<br>AVG when mode is omitted |
| OBW Result | ---- | :FETCh:CELLular:CATM:FUNDamental:OBW? | <bw> |
| OBW Frequency Result | ---- | :FETCh:CELLular:CATM:FUNDamental:OBW:FREQuency?<br><pos> | <freq> |

Result (Spectrum Emission Mask)

| Function | Command | Query | Response |
|---|---|---|---|
| SEM Judgement | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:JUDGement? | <judgement> |
| SEM Worst Value | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel? <range> | <level>,<freq> |
| SEM Worst Value (All range) | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:TTL? | <level(-1)>,<freq(-1)>,…,<level(-4)>,<freq(-4)>,<br><level(1)>,freq(1)>,…,level(4)>,freq(4)> |
| SEM Template Margin | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin? <range> | <margin>,<freq> |
| SEM Template Margin (All range) | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:TTL? | <margin(-1)>,<freq(-1)>,…,<margin(-4)>,<freq(-4)>,<br><margin(1)>,<freq(1)>,…,<margin(4)>,<freq(4)> |
| SEM Worst Value (Detail) | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail? <range> | <level>,<freq> |
| SEM Worst Value (Detail) (All range) | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail:TTL? | <level(-1)>,<freq(-1)>,…,<level(-9)>,<freq(-9)>,<br><level(1)>,<freq(1)>,…,<level(9)>,<freq(9)> |
| SEM Template Margin (Detail) | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail? <range> | <margin>,<freq> |
| SEM Template Margin (Detail) (All range) | ---- | :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail:TTL? | <margin(-1)>,<freq(-1)>,…,<margin(-9)>,<freq(-9)>,<br><margin(1)>,<freq(1)>,…,<margin(9)>,<freq(9)> |

Result (Adjacent Channel Power)

| Function | Command | Query | Response |
|---|---|---|---|
| ACLR Result | ---- | :FETCh:CELLular:CATM:FUNDamental:ACLR? <mode> | <aclr(E-UTRA_LOW)>,<aclr(E-UTRA_UP)>,<br><aclr(UTRA_LOW2)>,<aclr(UTRA_LOW1)>,<br><aclr(UTRA_UP1)>,<aclr(UTRA_UP2)><br><mode>=AVG,MAX,MIN<br><avg(E-UTRA_LOW)>,<avg(E-UTRA_UP)>,<br><avg(UTRA_LOW2)>,<avg(UTRA_LOW1)>,<br><avg(UTRA_UP1)>,<avg(UTRA_UP2)>,<br><max(E-UTRA_LOW)>,<max(E-UTRA_UP)>,<br><max(UTRA_LOW2)>,<max(UTRA_LOW1)>,<br><max(UTRA_UP1)>,<max (UTRA_UP2)>,<br><min(E-UTRA_LOW)>,<min(E-UTRA_UP)>,<br><min(UTRA_LOW2)>,<min(UTRA_LOW1)>,<br><min(UTRA_UP1)>,<min(UTRA_UP2)><br><mode>=TTL |

Result (Modulation Analysis)

| Function | Command | Query | Response |
|---|---|---|---|
| Carrier Frequency Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:CFRequency? <mode> | <freq> |
| Carrier Frequency Error Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor? <mode> | <freq_ppm>,<freq_Hz><br><mode>=AVG,MAX,MIN,DVT<br><avg_ppm>,<avg_Hz>,<max_ppm>,<max_Hz>,<br><min_ppm>,<min_Hz><br><mode>=TTL |
| Worst Carrier Frequency Error Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor:WORSt? | <freq_ppm>,<freq_Hz> |
| EVM Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:EVM? [<mode>] | <evm> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<evm(1)>,…,<evm[s]><br><mode>=IND<br>AVG when <mode> is omitted. |
| EVM Result (Low) | | :FETCh:CELLular:CATM:FUNDamental:MODulation:EVML? [<mode>] | <evm> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<evm(1)>,…,<evm[s]><br><mode>=IND<br>AVG when <mode> is omitted. |
| EVM Result (High) | | :FETCh:CELLular:CATM:FUNDamental:MODulation:EVMH? [<mode>] | <evm> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<evm(1)>,…,<evm[s]><br><mode>=IND<br>AVG when <mode> is omitted. |

Result (Modulation Analysis) (Cont'd)

| Function | Command | Query | Response |
|---|---|---|---|
| Reference Signal EVM Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:RSEVm? [<mode>] | <rsevm> <mode=>AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<rsevm(1)>,…,<rsevm[s]><br><mode>=IND<br>AVG when <mode> is omitted. |
| Peak EVM Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:PEVM? [<mode>] | <pevm> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>AVG when <mode> is omitted. |
| Phase Error Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:PHERror? [<mode>] | <phase> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>AVG when <mode> is omitted. |
| Magnitude Error Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:MERRor? [<mode>] | <magnitude> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>AVG when <mode> is omitted. |
| Carrier Leakage Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:CARLeakage? [<mode>] | <cleakage> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>AVG when <mode> is omitted. |
| Rho Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:RHO? [<mode>] | <rho> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>AVG when <mode> is omitted. |

Result (In-band emissions for non allocated RB)

| Function | Command | Query | Response |
|---|---|---|---|
| In-Band Emissions Measured Item | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:ITEM? | <flag> |
| In-Band Emissions Judgement | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:JUDGement? | <judgement> |
| In-Band Emissions (General) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:GENeral? [<mode>] | <ibe> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<ibe(1)>,…,<ibe[s]><br><mode>=IND<br>MAX when <mode> is omitted. |
| In-Band Emissions limit (General) | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:GENeral? | <level> |
| In-Band Emissions (IQ Image) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:IQIMage? [<mode>] | <ibe> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<ibe(1)>,…,<ibe[s]><br><mode>=IND<br>MAX when <mode> is omitted. |
| In-Band Emissions limit (IQ Image) | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:IQIMage? | <level> |

Result (In-band emissions for non allocated RB (Cont'd), IQ Imbalance)

| Function | Command | Query | Response |
|---|---|---|---|
| In-Band Emissions (Carrier Leakage) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:CARLeakage? [<mode>] | <ibe> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<ibe(1)>,…,<ibe[s]><br><mode>=IND<br>MAX when <mode> is omitted. |
| In-Band Emissions limit (Carrier Leakage) | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:CARLeakage? | <level> |
| In-Band Emissions Margin | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:MARGin? | <margin> |
| IQ Imblance (%) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:PERCent? [<mode>] | <percent> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>AVG when <mode> is omitted. |
| IQ Imblance (dB) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:DB? [<mode>] | <level> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>AVG when <mode> is omitted. |

Result (Spectrum flatness)

| Function | Command | Query | Response |
|---|---|---|---|
| Spectrum Flatness Measured Item | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:ITEM? | <flag> |
| Spectrum Flatness Judgement | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:JUDGement? | <judgement> |
| Spectrum Flatness (≥3 MHz (RP1)) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP1? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<sflatness(1)>,…,<sflatness(s)><br><mode>=IND<br>MAX when <mode> is omitted. |
| Spectrum Flatness (RP12) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP12? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<sflatness(1)>,…,<sflatness(s)><br><mode>=IND<br>MAX when <mode> is omitted. |
| Spectrum Flatness (<3 MHz (RP2)) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP2? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<sflatness(1)>,…,<sflatness(s)><br><mode>=IND<br>MAX when <mode> is omitted. |
| Spectrum Flatness (RP21) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP21? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br><s>,<sflatness(1)>,…,<sflatness(s)><br><mode>=IND<br>MAX when <mode> is omitted. |

Result (Spectrum flatness) (Cont'd)

| Function | Command | Query | Response |
|---|---|---|---|
| Spectrum Flatness (≥3 MHz) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1? | <worst> |
| Spectrum Flatness (≥3 MHz (R1 –)) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1M? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>MIN when <mode> is omitted. |
| Spectrum Flatness (≥3 MHz (R1 +)) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1P? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>MAX when <mode> is omitted. |
| Spectrum Flatness (<3 MHz) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2? | <worst> |
| Spectrum Flatness (<3 MHz (R2 –)) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2M? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>MIN when <mode> is omitted. |
| Spectrum Flatness (<3 MHz (R2 +)) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2P? [<mode>] | <sflatness> <mode>=AVG,MAX,MIN,DVT<br><avg>,<max>,<min> <mode>=TTL<br>MAX when <mode> is omitted. |

Result (Spectrum flatness) (Cont'd)

| Function | Command | Query | Response |
|---|---|---|---|
| Spectrum Flatness (RP Total) Result | ---- | :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP? [<mode>] | <sflat(RP1)>,<sflat(RP2)>,<sflat(RP12)>,<sflat(RP21)> <mode>=AVG,MAX,MIN,DVT<br><avg(RP1)>,<avg(RP2)>,<avg(RP12)>,<avg(RP21)>,<br><max(RP1)>,<max(RP2)>,<max(RP12)>,<max(RP21)>,<br><min(RP1)>,<min(RP2)>,<min(RP12)>,<min(RP21)><br><mode>=TTL<br><s>,<sflat(RP1)(1)>,<sflat(RP2)(1)>,<sflat(RP12)(1)>,<sflat(RP21)(1)>,...,<sflat(RP1)(s)>,<sflat(RP2)(s)>,<sflat(RP12)(s)>,<sflat(RP21)(s)><br><mode>=IND<br>MAX when <mode> is omitted. |

Result (Waveform)

| Function | Command | Query | Response |
|---|---|---|---|
| Waveform | ---- | :FETCh:CELLular:CATM:FUNDamental:TRACe?<format>,<position>,<length>[,<symbol>] | <data(1)>,…,<data(length)> |

# 4.2 Details of Commands

This section describes the commands in alphabetical order.

■ Terms in this command list

EX ..... Command name (header)

Example ..... Command function name

Function ..... Command function

Command..... Programming command syntax

Query ..... Query syntax

Response .....Response syntax

Parameter ..... Parameter definition

Details ..... Command restrictions and others

Example of Use..... Command usage example

Related Commands .....Introduction of related commands

■ Suffix Code list

| Suffix Code | Unit | Suffix Code | Unit |
|---|---|---|---|
| DB | dB | MHZ | MHz |
| DBM | dBm | MS | ms |
| GHZ | GHz | MZ | MHz |
| GZ | GHz | NS | ns |
| HZ | Hz | S | s |
| KHZ | kHz | US | μs |
| KZ | kHz | | |

### 4.2.1 Common commands

## :ABORt:CELLular:MEASurement

Measurement Stop

Function

Stops the current measurement.

Command

```
:ABORt:CELLular:MEASurement
```

Example of Use

To stop the current measurement:

```
:ABOR:CELL:MEAS
```

## :CONFigure:CELLular:GENerator:ARB:PACKage:SELect

Waveform File Select

### Function

Selects and queries the waveform file for arbitrary waveform signal used at Downlink signal.

### Command

```
:CONFigure:CELLular:GENerator:ARB:PACKage:SELect <pac>
```

### Query

```
:CONFigure:CELLular:GENerator:ARB:PACKage:SELect?
```

### Response

```
<pac>
```

### Parameter

<pac> Waveform file

### Details

The name of the file used from the waveform files loaded into waveform memory is set by this command.

### Example of Use

To set the waveform file 1 from waveform files loaded in waveform memory:

```
:CONF:CELL:GEN:ARB:PACK:SEL "PAC1"
:CONF:CELL:GEN:ARB:PACK:SEL?
> PAC1
```

### Related command

Use the following command to load the waveform file into waveform memory.
SOUR:GPRF:GEN:ARB:FILE:LOAD
For details of the command, refer to Chapter 5 "SCPI Command Reference" in the *MU887000A TRX Test Module Operation Manual*.
:SOURce:GPRF:GENerator:ARB:FILE:LOAD
The following command can be used to query the names of waveform files that have been loaded into waveform memory.
SOUR:GPRF:GEN:ARB:WAV:NAME?
For details of the command, refer to Chapter 5 "SCPI Command Reference" in the *MU887000A TRX Test Module Operation Manual*.
:SOURce:GPRF:GENerator:ARB:WAVeform:NAME?

Use the following commands to select a waveform pattern to use from the waveform patterns included in the waveform file configured using the command described in this section.
:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect
:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect:SYNC
:CONFigure:CELLular:SEQuence:RFSettings:TRX

## :CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect

Waveform Pattern Select

### Function

Selects a waveform pattern to use from patterns included in waveform file.
When the command received, the signal is immediately switched regardless of the frame cycle of signal, so the frame cycle is not continued.
This command is also used to query the currently selected waveform pattern.

### Command

```
:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect <pat>
```

### Query

```
:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect?
```

### Response

```
<pat>
```

### Parameter

| | |
|---|---|
| <pat> | Waveform pattern |
| PAT1 to PATn | Waveform pattern number (n: waveform information file group range) |
| Default | PAT1 |

### Details

Select the waveform pattern for RF output signal in waveform file.
The pattern number is the same as the group number. Refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

### Example of Use

To output the waveform pattern to 1:

```
:CONF:CELL:GEN:ARB:WAV:PATT:SEL PAT1
:CONF:CELL:GEN:ARB:WAV:PATT:SEL?
> PAT1
```

### Related command

Waveform file for arbitrary waveform signal selection or query
:CONFigure:CELLular:GENerator:ARB:PACKage:SELect

### Remarks

The group number depends on the selected waveform file.
For details of the waveform pattern, refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

## :CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect:SYNC

Waveform Pattern Select (SYNC)

### Function

Selects a waveform pattern to use from patterns included in waveform file.
When the command received, the signal is switched according to the frame cycle of signal so that the frame cycle is continued.
This command is also used to query the currently selected waveform pattern.

### Command

```
:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect:SYNC <pat>
```

### Query

```
:CONFigure:CELLular:GENerator:ARB:WAVeform:PATTern:SELect:SYNC?
```

### Response

```
<pat>
```

### Parameter

| | |
|---|---|
| <pat> | Waveform pattern |
| PAT1 to PATn | Waveform pattern number (n: waveform information file group range) |
| Default | PAT1 |

### Details

Select the waveform pattern for RF output signal in waveform file.
The pattern number is the same as the group number. Refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

### Example of Use

To output the waveform pattern to 1:

```
:CONF:CELL:GEN:ARB:WAV:PATT:SEL:SYNC PAT1
:CONF:CELL:GEN:ARB:WAV:PATT:SEL:SYNC?
> PAT1
```

### Related command

Waveform file for arbitrary waveform signal selection or query
:CONFigure:CELLular:GENerator:ARB:PACKage:SELect

### Remarks

The group number depends on the selected waveform file.
For details of the waveform pattern, refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

## :CONFigure:CELLular:GENerator:BBMode

Output Signal Modulation

### Function

Sets or queries RF signal output modulation.

### Command

```
:CONFigure:CELLular:GENerator:BBMode <on_off>
```

### Query

```
:CONFigure:CELLular:GENerator:BBMode?
```

### Response

```
<on_off>
```

### Parameter

| | |
|---|---|
| <on_off> | Enables/disables modulation. |
| ON | Enables RF output signal modulation. |
| OFF | Disables RF output signal modulation. |
| Default | ON |

### Example of Use

To turn on the modulation.

```
:CONF:CELL:GEN:BBM ON
:CONF:CELL:GEN:BBM?
> ON
```

## :CONFigure:CELLular:GENerator:RFSettings:STATe

Output Level On/Off

### Function

Sets or queries RF signal output ON/OFF.

### Command

```
:CONFigure:CELLular:GENerator:RFSettings:STATe <on_off>
```

### Query

```
:CONFigure:CELLular:GENerator:RFSettings:STATe?
```

### Response

```
<on_off>
```

### Parameter

| | |
|---|---|
| <on_off> | Enables/disables RF signal output. |
| ON | Enables RF signal output. |
| OFF | Disables RF signal output. |
| Default | ON |

### Example of Use

To enable RF signal output at Test port:

```
:CONF:CELL:GEN:RFS:STAT ON
:CONF:CELL:GEN:RFS:STAT?
> ON
```

## :CONFigure:CELLular:MEASurement:STANdard

Standard Select

### Function

Sets or queries the measurement standard.

### Command

```
:CONFigure:CELLular:MEASurement:STANdard <std>
```

### Query

```
:CONFigure:CELLular:MEASurement:STANdard?
```

### Response

```
<std>
```

### Parameter

| <std> | Measurement standard | |
|---|---|---|
| COMMON | Common measurement | (requires MX887010A) |
| WCDMA | W-CDMA | (requires MX887011A) |
| GSM | GSM | (requires MX887012A) |
| LTE | LTE | (requires MX887013A or MX887014A) |
| CDMA2000 | CDMA2000 1x | (requires MX887015A) |
| EVDO | CDMA2000 1xEVDO | (requires MX887016A) |
| TDSCDMA | TD-SCDMA | (requires MX887017A) |
| NR | NR sub-6GHz | (requires MX887018A or MX887019A) |
| CATM | Category M | (requires MX887065A) |
| NBIOT | NB-IoT | (requires MX887067A) |
| LTEV2X | LTE-V2X | (requires MX887068A) |
| SEQUENCE | Sequence measurement | (requires MX887010A) |
| SEQ | Sequence measurement | (requires MX887010A) |
| Default | COMMON | |

### Example of Use

To switch the measurement standard to SEQUENCE:

```
:CONF:CELL:MEAS:STAN SEQUENCE
:CONF:CELL:MEAS:STAN?
> SEQUENCE
```

### Remarks

This parameter must be set to CATM to execute the commands described in Section 4.2.2 “Fundamental measurement commands”.

# :FETCh:CELLular:MEASurement:STATe?

Measurement Status

## Function

Queries the measurement status.

## Query

```
:FETCh:CELLular:MEASurement:STATe?
```

## Response

```
<m_status>
```

## Parameter

| | |
|---|---|
| <m_status> | Measurement status |
| 0 | Completed measurement |
| 2 | Over level |
| 5 | Synchronization word not detected |
| 9 | Measurement in progress or not measured |
| 12 | Tx measurement timeout |

## Details

This command can be used while measurement is in progress or suspended.

## Example of Use

To query current measurement status:

```
:FETC:CELL:MEAS:STAT?
> 0
```

## :INITiate:CELLular:MEASurement:SINGle

Measurement Start

### Function

Sets the parameters for both specified measurement and signal transmission and executes measurement.

### Command

```
:INITiate:CELLular:MEASurement:SINGle
```

### Details

Sending this command executes one measurement execution.
Sending this command during measurement, aborts measurement once and restarts it.
ESR2 must be polled or sync processing via *WAI is required to determine the timing of measurement completion.

### Example of Use

To start measurement:

```
:INIT:CELL:MEAS:SING
```

### Related command

ESR2
For the details of the event status register, refer to Chapter 3 “Fundamental Operation” in the *MU887000A TRX Test Module Operation Manual*.

## :INSTrument[:SELect]

Application Select

### Function

Sets or queries the type of application software to execute.

### Command

```
:INSTrument[:SELect] <app>
```

### Query

```
:INSTrument[:SELect]?
```

### Response

```
<app>
```

### Parameter

| | | |
|---|---|---|
| <app> | | Type of application software |
| | CELLULAR | Cellular Application<br>When using MX887010A, MX887011A, MX887012A, MX887013A, MX887014A, MX887015A, MX887016A, MX887017A, MX887018A, MX887019A, MX887065A, MX887067A, or MX887068A |
| | SRW | SRW Application<br>When using MX887030A, MX887031A, MX887032A, MX887033A, MX887040A, or MX887050A |
| | LRWPAN | IEEE 802.15.4 application<br>When using MX887060A |
| | ZWAVE | Z-Wave application<br>MX887061A |
| | FMAUDIO | FM AUDIO application<br>When using MX887070A |

*Note:* MU887002A does not support MX887070A.

### Details

Set the parameter to CELLULAR and send the command before using the MX887065A.

### Example of Use

To set the application software to CELLULAR:

```
:INST CELLULAR
:INST?
> CELLULAR
```

### Remarks

When using the MX887065A, set the application to CELLULAR using the :INSTrument[:SELect] command, and then set the standard to CATM using the :CONFigure:CELLular:MEASurement:STANdard command.

## :ROUTe:PORT:CONNect:DIRection

Set Connect Port Direction

### Function

Sets or queries the test ports for inputting and outputting RF signals.
Multiple output test port can be set for MU887002A.

### Command

`:ROUTe:PORT:CONNect:DIRection <input>,<output>` MU887000A, MU887001A

`:ROUTe:PORT:CONNect:DIRection <input>,<output>[,<output>,…,<output>]` MU887002A

### Query

`:ROUTe:PORT:CONNect:DIRection?`

### Response

| | |
|---|---|
| <input>,<output> | MU887000A, MU887001A |
| <input>,<output>[,<output>,…,<output>] | MU887002A |

### Parameters

| | | |
|---|---|---|
| <input> | Input Test Port No. | |
| Range | Test Port 1 to 4 | (MU887000A) |
| | Test Port 1 to 4 | (MU887001A) |
| | OFF, Test Port 1 to 12 | (MU887002A) |
| PORT1 | Test Port 1 | |
| … | … | |
| PORT12 | Test Port 12 | |
| OFF | No any Input Test Ports | (MU887002A) |
| Default | PORT1 | |
| <output> | Output Test Port No. | |
| Range | Test Port 1 to 4 | (MU887000A) |
| | Test Port 1 to 4 | (MU887001A) |
| | Test Port 1 to 12 | (MU887002A) |
| PORT1 | Test Port 1 | |
| … | … | |
| PORT12 | Test Port 12 | |
| Default | PORT1 | |

### Details

For MU887000A,
Test Port 1 and Test Port 2 can be set for both input and output.
Test Port 3 and Test Port 4 can be set for either input or output.
For MU887001A, Test Port 1 to Test Port 4 can be set for both input and output.
For MU887002A, Test Port 1 to Test Port 12 can be set for both input and output.

Example of Use

To set Test Port 1 as RF signal input test port and Test Port 2 as RF signal output test port:

```
:ROUT:PORT:CONN:DIR PORT1,PORT2
:ROUT:PORT:CONN:DIR?
> PORT1,PORT2
```

To set No any Input Test Ports and Test Port 4, Test Port 6, Test Port 10 as RF signal output test ports:

```
:ROUT:PORT:CONN:DIR OFF,PORT10,PORT4,PORT6
:ROUT:PORT:CONN:DIR?
> OFF,PORT4,PORT6,PORT10
```

## :SYSTem:LANGuage

Language Selection of Remote Command

### Function

Switches the language mode of remote control commands.

### Command

```
:SYSTem:LANGuage <mode>
```

### Query

```
:SYSTem:LANGuage?
```

### Response

```
<mode>
```

### Parameter

| | |
|---|---|
| <mode> | Language mode |
| NAT | Native |
| SCPI | SCPI |
| Default | NAT |

### Example of Use

To switch the language mode of remote control commands to Native.

```
:SYST:LANG NAT
:SYST:LANG?
>NAT
```

## :STATus:OPERation:MEASure[:EVENt]?

Measurement Operation Status Register Query

### Function

Queries content of measurement operation status register.
The event occurrence can be identified using the retrieved value.

### Query

```
:STATus:OPERation:MEASure[:EVENt]?
```

### Response

```
<mosr>
```

### Parameter

| | |
|---|---|
| <mosr> | Measurement operation status register |
| Range | 0 to 65535 |
| Value = bit0 + bit1 + ... + bit15 | |
| bit0 = $2^0$ = 1 | Measurement in progress |
| bit1 = $2^1$ = 2 | Preparing trigger |
| bit2 = $2^2$ = 4 | Unused |
| bit3 = $2^3$ = 8 | Unused |
| bit4 = $2^4$ = 16 | Unused |
| bit5 = $2^5$ = 32 | Unused |
| bit6 = $2^6$ = 64 | Unused |
| bit7 = $2^7$ = 128 | Unused |
| bit8 = $2^8$ = 256 | Unused |
| bit9 = $2^9$ = 512 | Unused |
| bit10 = $2^{10}$ = 1024 | Unused |
| bit11 = $2^{11}$ = 2048 | Unused |
| bit12 = $2^{12}$ = 4096 | Unused |
| bit13 = $2^{13}$ = 8192 | Unused |
| bit14 = $2^{14}$ = 16384 | Unused |
| bit15 = $2^{15}$ = 32768 | Unused |

### Details

The sum of the values for bits of the occurring event from the values $2^0$ = 1, $2^1$ = 2 to $2^{15}$ = 32768, that correspond to the measurement operation status register bits 0, 1 to 15 becomes the response.

### Example of Use

To query content of measurement status event register:

```
:STAT:OPER:MEAS?
> 1
```

## :STATus:QUEStionable:MEASure[:EVENt]?

Measurement Questionable Status Register Query

### Function

Queries content of measurement questionable status register. The event occurrence can be identified using the retrieved value.

### Query

```
:STATus:QUEStionable:MEASure[:EVENt]?
```

### Response

<mqsr>

### Parameter

| | |
|---|---|
| <mqsr> | Measurement questionable status register |
| Range | 0 to 65535 |
| Value = bit0 + bit1 + ... + bit15 | |
| bit0 = $2^0$ = 1 | Over level |
| bit1 = $2^1$ = 2 | Under level |
| bit2 = $2^2$ = 4 | Timeout |
| bit3 = $2^3$ = 8 | Unused |
| bit4 = $2^4$ = 16 | Unused |
| bit5 = $2^5$ = 32 | Unused |
| bit6 = $2^6$ = 64 | Unused |
| bit7 = $2^7$ = 128 | Unused |
| bit8 = $2^8$ = 256 | Unused |
| bit9 = $2^9$ = 512 | Unused |
| bit10 = $2^{10}$ = 1024 | Unused |
| bit11 = $2^{11}$ = 2048 | Unused |
| bit12 = $2^{12}$ = 4096 | Unused |
| bit13 = $2^{13}$ = 8192 | Unused |
| bit14 = $2^{14}$ = 16384 | Unused |
| bit15 = $2^{15}$ = 32768 | Unused |

### Details

The sum of the values for bits of the occurring event from the values $2^0$ = 1, $2^1$ = 2 to $2^{15}$ = 32768, that correspond to the measurement questionable status register bits 0, 1 to 15 becomes the response.

### Example of Use

To query content of measurement questionable status register:

```
:STAT:QUES:MEAS?
> 0
```

## 4.2.2 Fundamental measurement commands

### :CONFigure:CELLular:CATM:CBANdwidth

Channel Bandwidth

**Function**

Sets or queries the Channel Bandwidth.

**Command**

```
:CONFigure:CELLular:CATM:CBANdwidth <bandwidth>
```

**Query**

```
:CONFigure:CELLular:CATM:CBANdwidth?
```

**Response**

```
<bandwidth>
```

**Parameter**

| <bandwidth> | Bandwidth |
|---|---|
| 1.4MHZ | 1.4 MHz |
| 3MHZ | 3 MHz |
| 5MHZ | 5 MHz |
| 10MHZ | 10 MHz |
| 15MHZ | 15 MHz |
| 20MHZ | 20 MHz |
| Default | 1.4MHZ |

**Example of Use**

To set the channel bandwidth to 1.4 MHz:

```
:CONF:CELL:CATM:CBAN 1.4MHZ
:CONF:CELL:CATM:CBAN?
> 1.4MHZ
```

**Remarks**

When the channel bandwidth is updated, Narrowband Index, Number of RB, Starting RB, and Output Level (Total) are changed accordingly.

Narrowband Index is reset to 0, Number of RB is reset to 6, Starting RB is reset to 0.

## :CONFigure:CELLular:CATM:CHCoding

Channel Coding

### Function

Sets or queries the channel coding.

### Command

```
:CONFigure:CELLular:CATM:CHCoding <object>
```

### Query

```
:CONFigure:CELLular:CATM:CHCoding?
```

### Response

```
<object>
```

### Parameter

| | |
|---|---|
| <object> | Target for channel coding |
| RMC | Reference Measurement Channel |
| Default | RMC |

### Examples of Use

To set the channel coding to RMC:

```
:CONF:CELL:CATM:CHC RMC
:CONF:CELL:CATM:CHC?
> RMC
```

## :CONFigure:CELLular:CATM:CID

Cell ID

### Function

Sets or queries the Cell ID.

### Command

```
:CONFigure:CELLular:CATM:CID <id>
```

### Query

```
:CONFigure:CELLular:CATM:CID?
```

### Response

```
<id>
```

### Parameter

| | |
|---|---|
| <id> | Cell ID |
| Range | 0 to 503 |
| Resolution | 1 |
| Default | 0 |
| Suffix code | None |

### Example of Use

To set the Cell ID to 0:

```
:CONF:CELL:CATM:CID 0
:CONF:CELL:CATM:CID?
> 0
```

## :CONFigure:CELLular:CATM:CSHift

Cyclic Shift

### Function

Sets or queries the Cyclic Shift.

### Command

```
:CONFigure:CELLular:CATM:CSHift <val>
```

### Query

```
:CONFigure:CELLular:CATM:CSHift?
```

### Response

```
<val>
```

### Parameter

| | |
|---|---|
| <val> | Enables/disables Cyclic Shift |
| ON | Enables Cyclic Shift |
| OFF | Disables Cyclic Shift |
| AUTO | Sets the Cyclic Shift to Auto. |
| Default | ON |

### Example of Use

To enable the Cyclic Shift:

```
:CONF:CELL:CATM:CSH ON
:CONF:CELL:CATM:CSH?
> ON
```

## :CONFigure:CELLular:CATM:CTYPe

RMC Configuration

### Function

Sets or queries the channel configuration of uplink signal when Channel Coding is RMC.

### Command

```
:CONFigure:CELLular:CATM:CTYPe <val>
```

### Query

```
:CONFigure:CELLular:CATM:CTYPe?
```

### Response

```
<val>
```

### Parameter

| <val> | RMC channel configuration |
|---|---|
| PUSCH | PUSCH |
| PUCCH | PUCCH |
| Default | PUSCH |

### Example of Use

To set the channel configuration of uplink signal to PUSCH:

```
:CONF:CELL:CATM:CTYP PUSCH
:CONF:CELL:CATM:CTYP?
> PUSCH
```

# :CONFigure:CELLular:CATM:DSS

Delta SS

### Function

Sets or queries the Delta SS.

### Command

```
:CONFigure:CELLular:CATM:DSS <val>
```

### Query

```
:CONFigure:CELLular:CATM:DSS?
```

### Response

```
<val>
```

### Parameter

| | |
|---|---|
| <val> | Delta SS |
| Range | 0 to 29 |
| Resolution | 1 |
| Default | 0 |
| Suffix code | None |

### Example of Use

To set the Delta SS to 0:

```
:CONF:CELL:CATM:DSS 0
:CONF:CELL:CATM:DSS?
> 0
```

## :CONFigure:CELLular:CATM:DUPLex

Duplex Mode

### Function

Sets or queries the Duplex Mode.

### Command

```
:CONFigure:CELLular:CATM:DUPLex <mode>
```

### Query

```
:CONFigure:CELLular:CATM:DUPLex?
```

### Response

```
<mode>
```

### Parameter

| | |
|---|---|
| <mode> | Duplex Mode |
| HALF | Half Duplex |
| Default | HALF |

### Example of Use

To set the Duplex Mode to HALF:

```
:CONF:CELL:CATM:DUPL HALF
:CONF:CELL:CATM:DUPL?
> HALF
```

## :CONFigure:CELLular:CATM:FSTRucture

Frame Structure

### Function

Sets or queries the frame structure.
This setting determines the duplex mode.

### Command

```
:CONFigure:CELLular:CATM:FSTRucture <mode>
```

### Query

```
:CONFigure:CELLular:CATM:FSTRucture?
```

### Response

```
<mode>
```

### Parameter

| | |
|---|---|
| <mode> | Frame Structure |
| FDD | Frequency Division Multiplexing |
| Default | FDD |

### Example of Use

To set the frame structure to FDD:

```
:CONF:CELL:CATM:FSTR FDD
:CONF:CELL:CATM:FSTR?
> FDD
```

# :CONFigure:CELLular:CATM:FUNDamental:ACLR:SET

ACLR On/Off and Meas. Count

## Function

Sets or queries the ACLR measurement On/Off state and measurement count.

## Command

```
:CONFigure:CELLular:CATM:FUNDamental:ACLR:SET <on_off>[,<avg_count>]
```

## Query

```
:CONFigure:CELLular:CATM:FUNDamental:ACLR:SET?
```

## Response

```
<on_off>,<avg_count>
```

## Parameters

| | |
|---|---|
| <on_off> | Enables/disables measurement. |
| ON | Enables measurement |
| OFF | Disables measurement |
| Default | ON |
| <avg_count> | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

## Examples of Use

To set the ACLR measurement to OFF:

```
:CONF:CELL:CATM:FUND:ACLR:SET OFF
:CONF:CELL:CATM:FUND:ACLR:SET?
> OFF
```

## :CONFigure:CELLular:CATM:FUNDamental:AMITems:OFF

All Measurement Items Off

### Function

Sets all fundamental measurement items to off at one time.

### Command

```
:CONFigure:CELLular:CATM:FUNDamental:AMITems:OFF
```

### Example of Use

To set all fundamental measurement items to off at one time:

```
:CONF:CELL:CATM:FUND:AMIT:OFF
```

## :CONFigure:CELLular:CATM:FUNDamental:BAND

Operation band

### Function

Sets or queries the operation band.

### Command

```
:CONFigure:CELLular:CATM:FUNDamental:BAND <band>
```

### Query

```
:CONFigure:CELLular:CATM:FUNDamental:BAND?
```

### Response

```
<band>
```

### Parameter

| | |
|---|---|
| <band> | Operation band |
| Range | 0 to 256 |
| Resolution | 1 |
| Default | 1 |

### Example of Use

To query the operation band:

```
:CONF:CELL:CATM:FUND:BAND 1
:CONF:CELL:CATM:FUND:BAND?
> 1
```

Remarks

"0" is returned when the uplink or downlink channel number is set, but the set band is not found in Table 2.1.6-3.

When setting the operation band, change UL and DL channels as the following table.

| Band | UL Channel | DL Channel | Band | UL Channel | DL Channel | Band | UL Channel | DL Channel |
|---|---|---|---|---|---|---|---|---|
| 0 | Not changed | 4980 | … | Not changed | Not changed | 31 | 27785 | 9895 |
| 1 | 18300 | 300 | 17 | 23790 | 5790 | 32 | Not changed | 10140 |
| 2 | 18900 | 900 | 18 | 23925 | 5925 | … | | |
| 3 | 19575 | 1575 | 19 | 24075 | 6075 | 65 | 131522 | 65986 |
| 4 | 20175 | 2175 | 20 | 24300 | 6300 | 66 | 132422 | 66886 |
| 5 | 20525 | 2525 | 21 | 24525 | 6525 | 67 | Not changed | 67436 |
| 6 | 20700 | 2700 | 22 | 25000 | 7000 | 68 | 132822 | 67686 |
| 7 | 21100 | 3100 | 23 | 25600 | 7600 | 69 | Not changed | 68086 |
| 8 | 21625 | 3625 | 24 | 25870 | 7870 | 70 | 133047 | 68461 |
| 9 | 21975 | 3975 | 25 | 26365 | 8365 | 71 | 133297 | 68761 |
| 10 | 22450 | 4450 | 26 | 26865 | 8865 | … | Not changed | Not changed |
| 11 | 22850 | 4850 | 27 | 27125 | 9125 | 85 | 134092 | 70456 |
| 12 | 23095 | 5095 | 28 | 27435 | 9435 | … | Not changed | Not changed |
| 13 | 23230 | 5230 | 29 | Not changed | 9715 | 252 | Not changed | 255644 |
| 14 | 23330 | 5330 | 30 | 27710 | 9820 | … | Not changed | Not changed |
| | | | | | | 255 | Not changed | 261494 |

## :CONFigure:CELLular:CATM:FUNDamental:IEMissions:CLFRequency

In-band Emissions/EVM Carrier Leakage Frequency

### Function

Sets and queries the position of Carrier Leakage Frequency of the UE in the In-band Emission/EVM measurement

### Command

```
:CONFigure:CELLular:CATM:FUNDamental:IEMissions:CLFRequency <clf>
```

### Query

```
:CONFigure:CELLular:CATM:FUNDamental:IEMissions:CLFRequency?
```

### Response

```
<clf>
```

### Parameter

| | | |
|---|---|---|
| <clf> | | Position of Carrier Leakage Frequency |
| | CFR | Carrier Frequency |
| | NBC | Narrow Band Center |
| | Default | CFR |

### Details

CFR: The In-band Emission/EVM measurement is performed, treating the resource block located at the center frequency of Aggregated Channel Bandwidth as the carrier leakage frequency.

NBC: The In-band Emission/EVM measurement is performed, treating the center of assigned Narrow Band Index (6RB) as the carrier leakage frequency.

### Example of Use

To set the position of Carrier Leakage Frequency to CFR:

```
:CONF:CELL:CATM:FUND:IEM:CLFR CFR
:CONF:CELL:CATM:FUND:IEM:CLFR?
> CFR
```

# :CONFigure:CELLular:CATM:FUNDamental:MODulation:SET

Modulation Analysis On/Off and Meas. Count

## Function

Sets or queries the Modulation Analysis On/Off state and measurement count.

## Command

```
:CONFigure:CELLular:CATM:FUNDamental:MODulation:SET <on_off>[,<avg_count>]
```

## Query

```
:CONFigure:CELLular:CATM:FUNDamental:MODulation:SET?
```

## Response

```
<on_off>,<avg_count>
```

## Parameters

| | |
|---|---|
| <on_off> | Enables/disables measurement. |
| ON | Enables measurement. |
| OFF | Disables measurement. |
| Default | OFF |
| <avg_count> | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

## Example of Use

To set the Modulation Analysis to On and measurement count to 200:

```
:CONF:CELL:CATM:FUND:MOD:SET ON,200
:CONF:CELL:CATM:FUND:MOD:SET?
> ON,200
```

# :CONFigure:CELLular:CATM:FUNDamental:OBW:SET

OBW On/Off and Meas. Count

## Function

Sets or queries the OBW (Occupied Bandwidth) measurement On/Off state and measurement count.

## Command

```
:CONFigure:CELLular:CATM:FUNDamental:OBW:SET <on_off>[,<avg_count>]
```

## Query

```
:CONFigure:CELLular:CATM:FUNDamental:OBW:SET?
```

## Response

```
<on_off>,<avg_count>
```

## Parameters

| | |
|---|---|
| <on_off> | Enables/disables measurement. |
| ON | Enables measurement. |
| OFF | Disables measurement. |
| Default | ON |
| <avg_count> | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

## Example of Use

To set OBW measurement on and set the measurement count to 50:

```
:CONF:CELL:CATM:FUND:OBW:SET ON,50
:CONF:CELL:CATM:FUND:OBW:SET?
> ON,50
```

## :CONFigure:CELLular:CATM:FUNDamental:POWer:SET

Power Measurement On/Off and Meas. Count

### Function

Sets or queries the Tx Power Measurement On/Off state and measurement count.

### Command

```
:CONFigure:CELLular:CATM:FUNDamental:POWer:SET <on_off>[,<avg_count>]
```

### Query

```
:CONFigure:CELLular:CATM:FUNDamental:POWer:SET?
```

### Response

```
<on_off>,<avg_count>
```

### Parameters

| | |
|---|---|
| <on_off> | Enables/disables measurement. |
| ON | Enables measurement. |
| OFF | Disables measurement. |
| Default | ON |
| <avg_count> | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

### Example of Use

To set Tx Power measurement ON and set the measurement count to 200:

```
:CONF:CELL:CATM:FUND:POW:SET ON,200
:CONF:CELL:CATM:FUND:POW:SET?
> ON,200
```

## :CONFigure:CELLular:CATM:FUNDamental:RBSearch

RB Search

### Function

Sets or queries the RB Search On/Off state.

### Command

```
:CONFigure:CELLular:CATM:FUNDamental:RBSearch <on_off>
```

### Query

```
:CONFigure:CELLular:CATM:FUNDamental:RBSearch?
```

### Response

```
<on_off>
```

### Parameter

| | | |
|---|---|---|
| <on_off> | | RB Search On/Off |
| | ON | Enables RB Search.<br>Detects the Resource Block automatically in 20 MHz bandwidth. |
| | OFF | Disables RB Search.<br>Measures the Resource Block specified by Narrowband Index. |
| | Default | OFF |

### Example of Use

To enable the RB Search:

```
:CONF:CELL:CATM:FUND:RBS ON
:CONF:CELL:CATM:FUND:RBS?
> ON
```

## :CONFigure:CELLular:CATM:FUNDamental:SEMask:ASEMission

additionalSpectrumEmission

### Function

Sets or queries the additionalSpectrumEmission in SIB2.
This setting determines the Spectrum Emission Mask frequency range.

### Command

```
:CONFigure:CELLular:CATM:FUNDamental:SEMask:ASEMission <sib2_ns>
```

### Query

```
:CONFigure:CELLular:CATM:FUNDamental:SEMask:ASEMission?
```

### Response

```
<sib2_ns>
```

### Parameter

| <sib2_ns> | additionalSpectrumEmission |
|---|---|
| NS_01 | NS_01 |
| NS_02 | NS_02 |
| NS_03 | NS_03 |
| ... | |
| NS_31 | NS_31 |
| NS_32 | NS_32 |
| Default | NS_01 |

### Example of Use

To set the additionalSpectrumEmission in SIB2 to NS_02:

```
:CONF:CELL:CATM:FUND:SEM:ASEM NS_02
:CONF:CELL:CATM:FUND:SEM:ASEM?
> NS_02
```

# :CONFigure:CELLular:CATM:FUNDamental:SEMask:SET

SEM On/Off and Meas. Count

## Function

Sets or queries the SEM (Spectrum Emission Mask) Measurement On/Off state and measurement count.

## Command

```
:CONFigure:CELLular:CATM:FUNDamental:SEMask:SET <on_off>[,<avg_count>]
```

## Query

```
:CONFigure:CELLular:CATM:FUNDamental:SEMask:SET?
```

## Response

```
<on_off>,<avg_count>
```

## Parameters

| | |
|---|---|
| <on_off> | Enables/disables the measurement. |
| ON | Enables the measurement. |
| OFF | Disables the measurement. |
| Default | OFF |
| <avg_count> | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

## Example of Use

To set the SEM measurement to On and set the measurement count to 100:

```
:CONF:CELL:CATM:FUND:SEM:SET ON,100
:CONF:CELL:CATM:FUND:SEM:SET?
> ON,100
```

## :CONFigure:CELLular:CATM:GHOPping

Group Hopping

### Function

Sets or queries the Group Hopping On/Off state.

### Command

```
:CONFigure:CELLular:CATM:GHOPping <on_off>
```

### Query

```
:CONFigure:CELLular:CATM:GHOPping?
```

### Response

```
<on_off>
```

### Parameter

| | |
|---|---|
| <on_off> | Enables/disables Group hopping. |
| ON | Enables Group hopping. |
| OFF | Disables Group hopping. |
| Default | ON |

### Example of Use

To enable Group hopping:

```
:CONF:CELL:CATM:GHOP ON
:CONF:CELL:CATM:GHOP?
> ON
```

## :CONFigure:CELLular:CATM:MCS

UL RMC MCS Index

### Function

Sets or queries the MCS Index of Uplink signal.

### Command

```
:CONFigure:CELLular:CATM:MCS <ulimcs>
```

### Parameter

| | |
|---|---|
| <ulimcs> | UL MCS Index |
| Range | 0 to 15 |
| Resolution | 1 |
| Default | None |
| Suffix code | None |

### Details

When the UL RMC MCS Index is set, Modulation scheme is set according to Table 2.1.6-1 “Relation Between MCS Index of UL RMC and Modulation”.

### Example of Use

To set the UL RMC MCS Index to 1:

```
:CONF:CELL:CATM:MCS 1
```

## :CONFigure:CELLular:CATM:MODulation:MSCHeme

UL RMC Modulation

### Function

Sets or queries the Modulation scheme of uplink signal.
When the MCS Index is updated, the this parameter is changed accordingly.

### Command

```
:CONFigure:CELLular:CATM:MODulation:MSCHeme <ul_rmc_mod>
```

### Query

```
:CONFigure:CELLular:CATM:MODulation:MSCHeme?
```

### Response

```
<ul_rmc_mod>
```

### Parameter

| <ul_rmc_mod> | Modulation scheme |
|---|---|
| QPSK | QPSK |
| 16QAM | 16QAM |
| Default | QPSK |

### Example of Use

To set the Modulation scheme to QPSK:

```
:CONF:CELL:CATM:MOD:MSCH QPSK
:CONF:CELL:CATM:MOD:MSCH?
> QPSK
```

## :CONFigure:CELLular:CATM:NARRowband

ULRMC Narrowband Index

### Function

Sets or queries the Narrowband Index.

### Command

```
:CONFigure:CELLular:CATM:NARRowband <index>
```

### Query

```
:CONFigure:CELLular:CATM:NARRowband?
```

### Response

```
<index>
```

### Parameter

| | | |
|---|---|---|
| <index> | Narrowband Index value | |
| Range | 0 | (Channel Bandwidth = 1.4 MHz) |
| | 0 to 1 | (Channel Bandwidth = 3 MHz) |
| | 0 to 3 | (Channel Bandwidth = 5 MHz) |
| | 0 to 7 | (Channel Bandwidth = 10 MHz) |
| | 0 to 11 | (Channel Bandwidth = 15 MHz) |
| | 0 to 15 | (Channel Bandwidth = 20 MHz) |
| Resolution | 1 | |
| Default | 0 | |
| Suffix code | None | |

### Example of Use

To set the Narrowband Index to 0:

```
:CONF:CELL:CATM:NARR 0
:CONF:CELL:CATM:NARR?
> 0
```

### Remarks

The Narrowband Index is reset to 0 when the channel bandwidth is updated.

## :CONFigure:CELLular:CATM:RBALlocation:NRB

UL RMC Number of RB

### Function

Sets or queries the number of assigned RBs (Resource Blocks) at Uplink RMC.

### Command

```
:CONFigure:CELLular:CATM:RBALlocation:NRB <ul_rmc_rb>
```

### Query

```
:CONFigure:CELLular:CATM:RBALlocation:NRB?
```

### Response

```
<ul_rmc_rb>
```

### Parameter

| | |
|---|---|
| <ul_rmc_rb> | Number of RBs |
| Range | 0 to 6 |
| Resolution | 1 |
| Default | 6 |
| Suffix code | None |

### Example of Use

To set the number of RBs to 1.

```
:CONF:CELL:CATM:RBAL:NRB 1
:CONF:CELL:CATM:RBAL:NRB?
> 1
```

### Remarks

The number of RBs is reset to 6 when the channel bandwidth is updated.

# :CONFigure:CELLular:CATM:RBALlocation:ORB

UL RMC Starting RB

## Function

Sets or queries the start number for Uplink signal RB.

## Command

```
:CONFigure:CELLular:CATM:RBALlocation:ORB <ulrb>
```

## Query

```
:CONFigure:CELLular:CATM:RBALlocation:ORB?
```

## Response

```
<ulrb>
```

## Parameter

| | | |
|---|---|---|
| <ulrb> | | RB start number |
| | Range | 0 to (6 – RBn)<br>RBn is set using the ULRMC_RB command. |
| | Resolution | 1 |
| | Default | 0 |
| | Suffix code | None |

## Example of Use

To set the RB start number to 0:

```
:CONF:CELL:CATM:RBAL:ORB 0
:CONF:CELL:CATM:RBAL:ORB?
> 0
```

## Remarks

The RB start number is reset to 0 when the channel bandwidth is updated.

The RB start number is reset to 0 when the number of RB is updated.

## :CONFigure:CELLular:CATM:RBCQi

nRB-CQI

### Function

Sets or queries the nRB-CQI.

### Command

```
:CONFigure:CELLular:CATM:RBCQi <value>
```

### Query

```
:CONFigure:CELLular:CATM:RBCQi?
```

### Response

```
<value>
```

### Parameter

| | |
|---|---|
| <value> | nRB-CQI |
| Range | 0 to 8 |
| Resolution | 1 |
| Suffix code | None |
| Default | 0 |

### Details

The number of RBs to send the Uplink PUCCH signal is set.

### Example of Use

To set the nRB-CQI to 3:

```
:CONF:CELL:CATM:RBCQ 3
:CONF:CELL:CATM:RBCQ?
> 3
```

# :CONFigure:CELLular:GENerator:RFSettings:FREQuency

Downlink Frequency

## Function

Sets or queries the downlink frequency.

## Command

```
:CONFigure:CELLular:GENerator:RFSettings:FREQuency <dl_freq>
```

## Query

```
:CONFigure:CELLular:GENerator:RFSettings:FREQuency?
```

## Response

```
<dl_fleq>
```

## Parameter

| | | |
|---|---|---|
| <dl_fleq> | | Downlink frequency |
| | Range | 400 000 000 to 3800.000 000 Hz (MU887000A/01A)<br>400 000 000 to 6000 000 000 Hz (With MU887000A/01A-001)<br>400 000 000 to 6000 000 000 Hz (MU887002A) |
| | Resolution | 1 Hz |
| | Suffix code | HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted) |
| | Default | 2140 000 000 Hz |
| | Unit | Hz |

## Details

This sets the Rx frequency for the mobile station.

Updating the Downlink Frequency setting does not affect the Downlink Channel setting.

## Example of Use

To set the downlink frequency to 2140 MHz:

```
:CONF:CELL:GEN:RFS:FREQ 2140MHZ
:CONF:CELL:GEN:RFS:FREQ?
>2140000000
```

## :CONFigure:CELLular:GENerator:RFSettings:LEVel

Output Level (Total)

### Function

Sets or queries the total output level of all channels.

### Command

```
:CONFigure:CELLular:GENerator:RFSettings:LEVel <level>
```

### Query

```
:CONFigure:CELLular:GENerator:RFSettings:LEVel?
```

### Response

```
<level>
```

### Parameter

| | | |
|---|---|---|
| <level> | Output level | |
| Range | | |
| MU887000A | 400 MHz ≤ frequency ≤ 3800 MHz | |
| | –130.0 to –10.0 dBm | (Port 1/Port 2) |
| | –120.0 to 0.0 dBm | (Port 3/Port 4) |
| | 3800 MHz < frequency ≤ 6000 MHz | |
| | –130.0 to –18.0 dBm | (Port 1/Port 2) |
| | –120.0 to –8.0 dBm | (Port 3/Port 4) |
| MU887001A | 400 MHz ≤ frequency ≤ 3800 MHz | |
| | –130.0 to –10.0 dBm | (Port 1 to Port 4) |
| | 3800 MHz < frequency ≤ 6000 MHz | |
| | –130.0 to –18.0 dBm | (Port 1 to Port 4) |
| MU887002A | 400 MHz < frequency ≤ 6000 MHz | |
| | –130.0 to 0.0 dBm | (Port 1 to Port 12) |
| Resolution | 0.1 dB | |
| Suffix Code | DBM (uses dBm when omitted) | |
| Default | –66.4 dBm | |
| Unit | dBm | |

### Details

For MU887000A, the setting range varies with the output test port setting.
If cable loss correction is set to ON, the setting range of the output level is the range of values with subtracted cable loss.
If the cable loss is 5 dB and frequency ≤ 3800 MHz,
the Port 1/Port 2 setting range is –135.0 to –15.0 dBm.

| | | |
|---|---|---|
| Range | –130.0 – Cable loss to –10.0 – Cable loss [dBm] | (Port 1/Port 2) |
| | –120.0 – Cable loss to 0.0 – Cable loss [dBm] | (Port 3/Port 4) |

Example of Use

To set the output level to –50.0 dBm:

```
:CONF:CELL:GEN:RFS:LEV -50.0
:CONF:CELL:GEN:RFS:LEV?
> -50.0
```

Related Commands

[:ROUTe]:EXTLoss:TABLe:SWITch

:CALCulate:EXTLoss:TABLe:SETTing

:CALCulate:EXTLoss:TABLe:VALue

For details of the commands, refer to Chapter 5 "SCPI Command Reference" in the *MU887000A TRX Test Module Operation Manual*.

Remarks

When the Output Level (Total) is updated, Output Level (Total 1.4 MHz) is changed accordingly.

Output Level (Total 1.4 MHz) = Output Level (Total) – 10log10(nSC/72)

| Channel Bandwidth | nSC | 10log10(nSC/72)<br>Round to one decimal place |
|---|---|---|
| 1.4 MHz | 72 | 0 |
| 3 MHz | 180 | 4.0 |
| 5 MHz | 300 | 6.2 |
| 10 MHz | 600 | 9.2 |
| 15 MHz | 900 | 10.9 |
| 20 MHz | 1200 | 12.2 |

## :CONFigure:CELLular:GENerator:RFSettings:LEVel:NARRowband

Output Level (Total 1.4 MHz)

### Function

Sets or queries the output level of Narrowband total (dBm/1.4 MHz).

### Command

```
:CONFigure:CELLular:GENerator:RFSettings:LEVel:NARRowband <level>
```

### Query

```
:CONFigure:CELLular:GENerator:RFSettings:LEVel:NARRowband?
```

### Response

```
<level>
```

### Parameter

<level> Output level

| | |
|---|---|
| Range | Refer to the following table. |
| Resolution | 0.1 dB/1.4 MHz |
| Default | –66.4 dBm |
| Suffix code | DBM, (uses dBm when omitted) |
| Unit | dBm |

| Channel Bandwidth | MU887000A Port 1/2 MU887001A Port 1 to 4 | MU887000A Port 3/4 | MU887002A TRX 1/2 Port 1 to 12 |
|---|---|---|---|
| 1.4 MHz | –130.0 to –10.0 dBm | –120.0 to 0.0 dBm | –130.0 to 0.0 dBm |
| 3 MHz | –134.0 to –14.0 dBm | –124.0 to –4.0 dBm | –134.0 to –4.0 dBm |
| 5 MHz | –136.2 to –16.2 dBm | –126.2 to –6.2 dBm | –136.2 to –6.2 dBm |
| 10 MHz | –139.2 to –19.2 dBm | –129.2 to –9.2 dBm | –139.2 to –9.2 dBm |
| 15 MHz | –140.9 to –20.9 dBm | –130.9 to –10.9 dBm | –140.9 to –10.9 dBm |
| 20 MHz | –142.2 to –22.2 dBm | –132.2 to –12.2 dBm | –142.2 to –12.2 dBm |

### Details

The setting range varies with the output port setting.
When the Cable Loss Calibration is ON, the cable loss is subtracted from the output level setting range.

### Example of Use

To set the output level to –50.0 dBm:

```
:CONF:CELL:GEN:RFS:LEV:NARR -50.0
:CONF:CELL:GEN:RFS:LEV:NARR?
>-50.0
```

Related Commands

[:ROUTe]:EXTLoss:TABLe:SWITch
:CALCulate:EXTLoss:TABLe:SETTing
:CALCulate:EXTLoss:TABLe:VALue
For details of the commands, refer to Chapter 5 "SCPI Command Reference" in the *MU887000A TRX Test Module Operation Manual*.

Remarks

When the Output Level (Total 1.4 MHz) is updated, Output Level (Total) is changed accordingly.
Output Level (Total) = Output Level (Total 1.4 MHz) + 10log10(nSC/72)

| Channel Bandwidth | nSC | 10log10(nSC/72)<br>Round to one decimal place |
|---|---|---|
| 1.4 MHz | 72 | 0 |
| 3 MHz | 180 | 4.0 |
| 5 MHz | 300 | 6.2 |
| 10 MHz | 600 | 9.2 |
| 15 MHz | 900 | 10.9 |
| 20 MHz | 1200 | 12.2 |

When changing Channel Bandwidth, if the set value exceeds the upper limit or falls below the lower limit, the value is rounded to the limit.

## :CONFigure:CELLular:MEASurement:RFSettings:DLCHannel

Downlink Channel

### Function

Sets or queries the Downlink Channel.

### Command

```
:CONFigure:CELLular:MEASurement:RFSettings:DLCHannel <dl_ch>
```

### Query

```
:CONFigure:CELLular:MEASurement:RFSettings:DLCHannel?
```

### Response

```
<dl_ch>
```

### Parameter

| | |
|---|---|
| <dl_ch> | Downlink Channel |
| Range | 0 to 262143 |
| Resolution | 1 |
| Default | 300 |
| Suffix code | None |

### Details

When the Downlink Channel is updated, Operation Band, Uplink Channel, Downlink Frequency and Uplink Frequency are changed accordingly.
For the relationship between the channel and frequency settings refer to Table 2.1.6-2 “Relationship between Uplink Channel Number and Downlink Channel Number” and Table 2.1.6-3 “E-UTRA Channel Numbers and Default UE TX-RX Frequency Separation”.

### Example of Use

To set the Downlink Channel to 300:

```
:CONF:CELL:MEAS:RFS:DLCH 300
:CONF:CELL:MEAS:RFS:DLCH?
> 300
```

# :CONFigure:CELLular:MEASurement:RFSettings:FREQuency

Uplink Frequency

## Function

Sets or queries the uplink frequency.

## Command

```
:CONFigure:CELLular:MEASurement:RFSettings:FREQuency <ul_freq>
```

## Query

```
:CONFigure:CELLular:MEASurement:RFSettings:FREQuency?
```

## Response

```
<ul_freq>
```

## Parameter

| | | |
|---|---|---|
| <ul_freq> | | Uplink frequency |
| | Range | 400 000 000 to 3800 000 000 Hz (MU887000A/01A)<br>400 000 000 to 6000 000 000 Hz (With MU887000A/01A-001)<br>400 000 000 to 6000 000 000 Hz (MU887002A) |
| | Resolution | 1 Hz |
| | Suffix code | HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted) |
| | Default | 1950 000 000 Hz |
| | Unit | Hz |

## Details

This sets the Tx frequency for the mobile station.

Updating this Uplink frequency does not affect the Uplink Channel parameters.

## Example of Use

To set the Uplink frequency to 1950 MHz:

```
:CONF:CELL:MEAS:RFS:FREQ 1950MHZ
:CONF:CELL:MEAS:RFS:FREQ?
>1950000000
```

## :CONFigure:CELLular:MEASurement:RFSettings:LEVel

Input Level

### Function

Sets or queries the input level of the input test port.

### Command

```
:CONFigure:CELLular:MEASurement:RFSettings:LEVel <level>
```

### Query

```
:CONFigure:CELLular:MEASurement:RFSettings:LEVel?
```

### Response

```
<level>
```

### Parameter

| | |
|---|---|
| <level> | Input level of PCC |
| Range | |
| MU887000A | –65.0 to +35.0 dBm (Port 1/Port 2) |
| | –65.0 to +25.0 dBm (Port 3/Port 4) |
| MU887001A | –65.0 to +35.0 dBm (Port 1 to Port 4) |
| MU887002A | –65.0 to +35.0 dBm (Port 1 to Port 12) |
| Resolution | 0.1 dB |
| Suffix Code | DBM (uses dBm when omitted) |
| Default | –1.0 dBm |
| Unit | dBm |

### Details

For MU887000A, the setting range varies according to the input test port setting.
If cable loss correction is set to ON, the setting range of the input level is the range of values with added cable loss.
If the cable loss is 5 dB, the MU887000A Port 1/Port 2 setting range is –60.0 to +40.0 dBm.

| | | |
|---|---|---|
| Range | –65.0 + Cable loss to +35.0 + Cable loss [dBm] | (Port 1/Port 2) |
| | –65.0 + Cable loss to +25.0 + Cable loss [dBm] | (Port 3/Port 4) |

### Example of Use

To set the input level to –10.0 dBm:

```
:CONF:CELL:MEAS:RFS:LEV -10.0
:CONF:CELL:MEAS:RFS:LEV?
>-10.0
```

### Related Commands

[:ROUTe]:EXTLoss:TABLe:SWITch
:CALCulate:EXTLoss:TABLe:SETTing
:CALCulate:EXTLoss:TABLe:VALue
For details of the commands, refer to Chapter 5 “SCPI Command Reference” in the *MU887000A TRX Test Module Operation Manual*.

## :CONFigure:CELLular:MEASurement:RFSettings:ULCHannel

Uplink Channel

### Function

Sets or queries the Uplink Channel.

### Command

```
:CONFigure:CELLular:MEASurement:RFSettings:ULCHannel <ul_ch>
```

### Query

```
:CONFigure:CELLular:MEASurement:RFSettings:ULCHannel?
```

### Response

```
<ul_ch>
```

### Parameter

| | |
|---|---|
| <ul_ch> | Uplink Channel |
| Range | 0 to 262143 |
| Resolution | 1 |
| Suffix code | None |
| Default | 18300 |

### Details

When the Uplink Channel is updated, the related Operation Band, Downlink Channel, Uplink Frequency, Downlink Frequency are changed accordingly.
For the relationship between the parameter and frequency settings of channels refer to Table 2.1.6-2 “Relationship between Uplink Channel Number and Downlink Channel Number” and to Table 2.1.6-3 “E-UTRA Channel Numbers and Default UE TX-RX Frequency Separation”.

### Example of Use

To set the Uplink Channel to 18300:

```
:CONF:CELL:MEAS:RFS:ULCH 18300
:CONF:CELL:MEAS:RFS:ULCH?
> 18300
```

## :FETCh:CELLular:CATM:FUNDamental:ACLR?

ACLR Result

### Function

Queries the result of ACLR (Adjacent Channel Leakage Power Ratio) measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:ACLR? <mode>
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<aclr(E-UTRA_LOW)>,<aclr(E-UTRA_UP)>,<aclr(UTRA_LOW2)>,<aclr(UTRA_LOW1)>,
<aclr(UTRA_UP1)>,<aclr(UTRA_UP2)>
```

When <mode> = TTL,

```
<avg(E-UTRA_LOW)>,<avg(E-UTRA_UP)>,
<avg(UTRA_LOW2)>,<avg(UTRA_LOW1)>,<avg(UTRA_UP1)>,<avg(UTRA_UP2)>,
<max(E-UTRA_LOW)>,<max(E-UTRA_UP)>,
<max(UTRA_LOW2)>,<max(UTRA_LOW1)>,<max(UTRA_UP1)>,<max(UTRA_UP2)>,
<min(E-UTRA_LOW)>,<min(E-UTRA_UP)>,
<min(UTRA_LOW2)>,<min(UTRA_LOW1)>,<min(UTRA_UP1)>,<min(UTRA_UP2)>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| <aclr(offset)> | Result of Adjacent Channel Leakage Power Ratio measurement in specified Storage mode |
| <avg(offset)> | ACLR measurement result (Average) |
| <max(offset)> | ACLR measurement result (Maximum) |
| <min(offset)> | ACLR measurement result (Minimum) |
| Resolution | 0.01dB |
| Response unit | dB |

### Details

The measurement bandwidth of the target adjacent channel varies with the channel bandwidth setting.

### Example of Use

To query the average of ACLR measurement result:

```
:FETC:CELL:CATM:FUND:ACLR? AVG
> -61.23,-30.06,-65.68,-62.44,-65.68,-62.44
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:CARLeakage?

Carrier Leakage Result

### Function

Queries the Carrier Leakage (Origin offset) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:CARLeakage? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT

```
<cleakage>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| <cleakage> | Carrier Leakage measurement result in specified Storage mode |
| <avg> | Carrier Leakage measurement result (Average) |
| <max> | Carrier Leakage measurement result (Maximum) |
| <min> | Carrier Leakage measurement result (Minimum) |
| Resolution | 0.01 dB |
| Unit | dBc |

### Example of Use

To query the average of Carrier Leakage measurement result:

```
:FETC:CELL:CATM:FUND:MOD:CARL? AVG
> 20.00
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:CFRequency?

Carrier Frequency Result

### Function

Queries the Carrier Frequency measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:CFRequency? <mode>
```

### Response

```
<freq>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| <freq> | Carrier frequency |
| Resolution | 1 Hz |
| Unit | Hz |

### Example of Use

To query the result of Carrier Frequency measurement:

```
:FETC:CELL:CATM:FUND:MOD:CFR? AVG
> 1951000000
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:EVM?

EVM Result

### Function

Queries the EVM (Error Vector Magnitude) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:EVM? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT

<evm>

When <mode> = TTL,

<avg>,<max>,<min>

When <mode> = IND,

<s>,<evm(1)>,<evm(2)>,...,<evm(s)>

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| <evm> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <evm(n)> | n-th EVM measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| <s> | Number of valid measurement results |

### Example of Use

To query the average of EVM measurement result:

```
:FETC:CELL:CATM:FUND:MOD:EVM? AVG
> 1.50
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:EVMH?

EVM Result (High)

### Function

Queries the EVM (Error Vector Magnitude) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:EVMH? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT

```
<evm>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

When <mode> = IND,

```
<s>,<evm(1)>,<evm(2)>,...,<evm(s)>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| <evm> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <evm(n)> | n-th EVM measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| <s> | Number of valid measurement results |

### Example of Use

To query the average of EVM measurement result:

```
:FETC:CELL:CATM:FUND:MOD:EVMH? AVG
> 1.50
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:EVML?

EVM Result (Low)

### Function

Queries the EVM (Error Vector Magnitude) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:EVML? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT

```
<evm>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

When <mode> = IND,

```
<s>,<evm(1)>,<evm(2)>,...,<evm(s)>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| <evm> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <evm(n)> | n-th EVM measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| <s> | Number of valid measurement results |

### Example of Use

To query the average of EVM measurement result:

```
:FETC:CELL:CATM:FUND:MOD:EVML? AVG
> 1.50
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:ITEM?

Spectrum Flatness Measured Item

### Function

Queries whether a spectrum flatness measurement item(s) is measured or not.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:ITEM??
```

### Response

```
<flag>
```

### Parameter

| | |
|---|---|
| <flag> | Measured/Not measured flag (0 to 3)<br>Returns the sum of the following measurement items. |
| 0 | Not measured |
| 1 | ≥ 3 MHz area |
| 2 | < 3 MHz area |
| Unit | None |

### Example of Use

To query whether each spectrum flatness measurement items is measured or not.

```
:FETC:CELL:CATM:FUND:MOD:ESFL:ITEM?
> 2
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:JUDGement?

Spectrum Flatness Judgement

### Function

Queries the judgement of Spectrum Flatness measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:JUDGement?
```

### Response

```
<judgement>
```

### Parameter

| | |
|---|---|
| <judgement> | Judgement |
| PASS | Pass |
| FAIL | Fail |
| – | Not measured |

### Example of Use

To query the judgement of Spectrum Flatness measurement result:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:JUDG?
> PASS
```

### Remarks

Queries a pass/fail judgement result only when the corresponding test parameter is selected.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1?

Spectrum Flatness (≥ 3 MHz) Result

### Function

Queries the worst value in the Spectrum Flatness measurement result in Range 1.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1?
```

### Response

```
<worst>
```

### Parameter

| | |
|---|---|
| <worst> | Worst value in Range 1 |
| Resolution | 0.01 dB |
| Unit | dB |

### Details

The worst value should be either the maximum or minimum of the Flatness measurement results in Range 1, whichever has a larger absolute value.

### Example of Use

To query the worst value in the Spectrum Flatness measurement result in Range 1:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:R1?
> 0.04
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1M?

Spectrum Flatness (≥ 3 MHz (R1 –)) Result

### Function

Queries the minimum value in the Spectrum Flatness measurement result in Range 1.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1M? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Minimum |
| <sflatness> | Minimum value in Range 1 in specified Storage mode. |
| <avg> | Minimum value in Range 1 (Average) |
| <max> | Minimum value in Range 1 (Maximum) |
| <min> | Minimum value in Range 1 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of minimum value in the Spectrum Flatness measurement result in Range 1:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:R1M? AVG
> 0.04
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1P?

Spectrum Flatness (≥ 3 MHz (R1 +)) Result

### Function

Queries the maximum value in the Spectrum Flatness measurement result in Range 1.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R1P? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Maximum |
| <sflatness> | Maximum value in Range 1 in specified Storage mode. |
| <avg> | Maximum value in Range 1 (Average) |
| <max> | Maximum value in Range 1 (Maximum) |
| <min> | Maximum value in Range 1 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of maximum value in the Spectrum Flatness measurement result in Range 1:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:R1P? AVG
> 0.04
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2?

Spectrum Flatness (<3 MHz) Result

### Function

Queries the worst value in the Spectrum Flatness measurement result in Range 2.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2?
```

### Response

```
<worst>
```

### Parameter

| | |
|---|---|
| <worst> | Worst value in Range 2 |
| Resolution | 0.01 dB |
| Unit | dB |

### Details

The worst value should be either the maximum or minimum of the Flatness measurement results in Range 2, whichever has a larger absolute value.

### Example of Use

To query the worst value in the Spectrum Flatness measurement result in Range 2:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:R2?
> 0.04
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2M?

Spectrum Flatness (<3 MHz (R2 –)) Result

### Function

Queries the minimum value in the Spectrum Flatness measurement result in Range 2.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2M? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Minimum |
| <sflatness> | Minimum value in Range 2 in specified Storage mode. |
| <avg> | Minimum value in Range 2 (Average) |
| <max> | Minimum value in Range 2 (Maximum) |
| <min> | Minimum value in Range 2 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of minimum value in the Spectrum Flatness measurement result in Range 2:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:R2M? AVG
> 0.04
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2P?

Spectrum Flatness (<3 MHz (R2 +)) Result

### Function

Queries the maximum value in the Spectrum Flatness measurement result in Range 2.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:R2P? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Maximum |
| <sflatness> | Maximum value in Range 2 in specified Storage mode. |
| <avg> | Maximum value in Range 2 (Average) |
| <max> | Maximum value in Range 2 (Maximum) |
| <min> | Maximum value in Range 2 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of maximum value in the Spectrum Flatness measurement result in Range 2:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:R2P? AVG
> 0.04
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP?

Spectrum Flatness (RP Total) Result

### Function

Queries all ripple values in the Spectrum Flatness measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflat(RP1)>,<sflat(RP2)>,<sflat(RP12)>,<sflat(RP21)>
```

<mode> = TTL

```
<avg(RP1)>,<avg(RP2)>,<avg(RP12)>,<avg(RP21)>,
<max(RP1)>,<max(RP2)>,<max(RP12)>,<max(RP21)>,
<min(RP1)>,<min(RP2)>,<min(RP12)>,<min(RP21)>
```

<mode> = IND

```
<s>,<sflat(RP1)(1)>,<sflat(RP2)(1)>,<sflat(RP12)(1)>,<sflat(RP21)(1)>,
...,<sflat(RP1)(s)>,<sflat(RP2)(s)>,<sflat(RP12)(s)>,<sflat(RP21)(s)>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| <sflat> | Ripple value in specified Storage mode. |
| <avg> | Ripple value (Average) |
| <max> | Ripple value (Maximum) |
| <min> | Ripple value (Minimum) |
| <sflat(n)> | Nth ripple value (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| <s> | Measurement count |

### Example of Use

To query the average of every ripple values in the Spectrum Flatness measurement result:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:RP? AVG
> 0.04,0.03,0.06,0.05
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP1?

Spectrum Flatness (≥ 3 MHz (RP1)) Result

### Function

Queries the ripple values in the Spectrum Flatness measurement result in Range 1.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP1? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

<mode> = IND

```
<s>,<sflatness(1)>,<sflatness(2)>,...,<sflatness(s)>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| <sflatness> | Ripple value in Range 1 in specified Storage mode. |
| <avg> | Ripple value in Range 1 (Average) |
| <max> | Ripple value in Range 1 (Maximum) |
| <min> | Ripple value in Range 1 (Minimum) |
| <sflatness(n)> | Nth ripple value in Range 1 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| <s> | Measurement count |

### Example of Use

To query the average of ripple values in the Spectrum Flatness measurement result in Range 1:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:RP1? AVG
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP12?

Spectrum Flatness (RP12) Result

### Function

Queries the difference between the maximum value in Range 1 and the minimum value in Range 2 of the Spectrum Flatness measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP12? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

<mode> = IND

```
<s>,<sflatness(1)>,<sflatness(2)>,...,<sflatness(s)>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| <sflatness> | Difference between the maximum value in Range 1 and the minimum value in Range 2 in specified Storage mode. |
| <avg> | Difference between the maximum value in Range 1 and the minimum value in Range 2 (Average) |
| <max> | Difference between the maximum value in Range 1 and the minimum value in Range 2 (Maximum) |
| <min> | Difference between the maximum value in Range 1 and the minimum value in Range 2 (Minimum) |
| <sflatness(n)> | Nth difference between the maximum value in Range 1 and the minimum value in Range 2 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| <s> | Measurement count |

### Example of Use

To query the average of difference between the maximum value in Range 1 and the minimum value in Range 2:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:RP12? AVG
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP2?

Spectrum Flatness (<3 MHz (RP2)) Result

### Function

Queries the ripple values in the Spectrum Flatness measurement result in Range 2.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP2? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

<mode> = IND

```
<s,<sflatness(1)>,<sflatness(2)>,...,<sflatness(s)>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| <sflatness> | Ripple value in Range 2 in specified Storage mode. |
| <avg> | Ripple value in Range 2 (Average) |
| <max> | Ripple value in Range 2 (Maximum) |
| <min> | Ripple value in Range 2 (Minimum) |
| <sflatness(n)> | Nth ripple value in Range 2 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| <s> | Measurement count |

### Example of Use

To query the average of ripple values in the Spectrum Flatness measurement result in Range 2:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:RP2? AVG
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP21?

Spectrum Flatness (RP21) Result

### Function

Queries the difference between the maximum value in Range 2 and the minimum value in Range 1 of the Spectrum Flatness measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:ESFLatness:RP21? [<mode>]
```

### Response

<mode> = AVG, MAX, MIN, DVT

```
<sflatness>
```

<mode> = TTL

```
<avg>,<max>,<min>
```

<mode> = IND

```
<s,<sflatness(1)>,<sflatness(2)>,...,<sflatness(s)>
```

### Parameter

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| <sflatness> | Difference between the maximum value in Range 2 and the minimum value in Range 1 in specified Storage mode. |
| <avg> | Difference between the maximum value in Range 2 and the minimum value in Range 1 (Average) |
| <max> | Difference between the maximum value in Range 2 and the minimum value in Range 1 (Maximum) |
| <min> | Difference between the maximum value in Range 2 and the minimum value in Range 1 (Minimum) |
| <sflatness(n)> | Nth difference between the maximum value in Range 2 and the minimum value in Range 1 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| <s> | Measurement count |

Example of Use

To query the average of difference between the maximum value in Range 2 and the minimum value in Range 1:

```
:FETC:CELL:CATM:FUND:MOD:ESFL:RP21? AVG
> 0.04
```

Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor?

Carrier Frequency Error Result

### Function

Queries the Frequency Error measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor? <mode>
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<freq_ppm>,<freq_Hz>
```

When <mode> = TTL,

```
<avg_ppm>,<avg_Hz>,<max_ppm>,<max_Hz>,<min_ppm>,<min_Hz>
```

### Parameters

| | | |
|---|---|---|
| <mode> | Storage mode | |
| AVG | Average | |
| MAX | Maximum | |
| MIN | Minimum | |
| TTL | Average・Maximum・Minimum | |
| DVT | Standard deviation | |
| <avg_ppm> | Measurement result in ppm (Average) | |
| <avg_Hz> | Measurement result in Hz (Average) | |
| <max_ppm> | Measurement result in ppm (Maximum) | |
| <max_Hz> | Measurement result in Hz (Maximum) | |
| <min_ppm> | Measurement result in ppm (Minimum) | |
| <min_Hz> | Measurement result in Hz (Minimum) | |
| <freq_ppm> | Measurement result in ppm in specified Storage mode | |
| <freq_Hz> | Measurement results in Hz in specified Storage mode | |
| Resolution | 0.01 ppm | (Measurement result in ppm) |
| | 0.1 Hz | (Measurement result in Hz) |
| Unit | ppm | (Measurement result in ppm) |
| | Hz | (Measurement result in Hz) |

### Example of Use

To query the average of Frequency Error measurement result:

```
:FETC:CELL:CATM:FUND:MOD:FERR? AVG
> 0.03,60.0
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor:WORSt?

Worst Carrier Frequency Error Result

### Function

Queries the worst value in Frequency Error measurement results.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:FERRor:WORSt?
```

### Response

```
<freq_ppm>,<freq_Hz>
```

### Parameters

| | | |
|---|---|---|
| <freq_ppm> | | Worst value in Frequency Error measurement results in ppm |
| | Resolution | 0.01 ppm |
| | Unit | ppm |
| <freq_Hz> | | Worst value in Frequency Error measurement results in Hz |
| | Resolution | 0.1 Hz |
| | Unit | Hz |

### Example of Use

To query the worst value in Frequency Error measurement results:

```
:FETC:CELL:CATM:FUND:MOD:FERR:WORS?
> 0.03,60.0
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:CARLeakage?

In-Band Emissions (Carrier Leakage) Result

### Function

Queries the In-band emissions (Carrier Leakage) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:CARLeakage?
[<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<ibe>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

When <mode> = IND,

```
<s>,<ibe(1)>,<ibe(2)>,...,<ibe(s)>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| <ibe> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <ibe(n)> | Nth value in In-Band Emissions (Carrier Leakage) measurement result (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| <s> | Number of valid measurement results |

### Example of Use

To query the maximum of in-band emissions (Carrier Leakage) measurement result:

```
:FETC:CELL:CATM:FUND:MOD:IEM:CARL? MAX
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:GENeral?

In-Band Emissions (General) Result

### Function

Queries in-band emissions (General) for non-allocated RB measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:GENeral? [<mode>]
```

### Response

When <mode> =AVG, MAX, MIN, DVT,

<ibe>

When <mode> = TTL,

<avg>,<max>,<min>

When <mode> = IND,

<s>,<ibe(1)>,<ibe(2)>,...,<ibe(s)>

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| <ibe> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <ibe(n)> | Nth value in In-Band Emissions (General) measurement result (n = 1 to s) |
| Unit | dB |
| Resolution | 0.01 dB |
| <s> | Number of valid measurement results |

### Example of Use

To query the maximum of in-band emissions (General) measurement result:

```
:FETC:CELL:CATM:FUND:MOD:IEM:GEN? MAX
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:ITEM?

In-Band Emissions Measured Item

### Function

Queries whether each in-band emission measurement item is measured or not.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:ITEM?
```

### Response

```
<flag>
```

### Parameter

| | | |
|---|---|---|
| <flag> | | Measured/Not measured flag (0 to 7) |
| | | Returns the sum of the following measurement items. |
| | 0 | Not measured |
| | 1 | Measure General |
| | 2 | Measure IQ Image |
| | 4 | Measure Carrier Leakage |
| | Unit | None |

### Example of Use

To query whether each in-band emission measurement item is measured or not.

```
:FETC:CELL:CATM:FUND:MOD:IEM:ITEM?
> 4
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:IQIMage?

In-Band Emissions (IQ Image) Result

### Function

Queries in-band emissions (IQ Image) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:IQIMage? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<ibe>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

When <mode> = IND,

```
<s>,<ibe(1)>,<ibe(2)>,...,<ibe(s)>
```

### Parameters

| | | |
|---|---|---|
| <mode> | | Storage mode |
| | AVG | Average |
| | MAX | Maximum |
| | MIN | Minimum |
| | TTL | Average・Maximum・Minimum |
| | DVT | Standard deviation |
| | IND | Individual measurement result |
| | Omitted | Maximum |
| <ibe> | | Measurement result in specified Storage mode |
| <avg> | | Measurement result (Average) |
| <max> | | Measurement result (Maximum) |
| <min> | | Measurement result (Minimum) |
| <ibe(n)> | | Nth value in In-Band Emissions (IQ Image) measurement result (n = 1 to s) |
| | Resolution | 0.01 dB |
| | Unit | dB |
| <s> | | Number of valid measurement results |

### Example of Use

To query the maximum of in-band emissions (IQ Image) measurement result:

```
:FETC:CELL:CATM:FUND:MOD:IEM:IQIM? MAX
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:JUDGement?

In-Band Emissions Judgement

### Function

Queries the judgement on the in-band emission measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:JUDGement?
```

### Response

```
<judgement>
```

### Parameter

| | |
|---|---|
| <judgement> | Judgement |
| PASS | Pass |
| FAIL | Fail |
| – | Not measured |

### Example of Use

To query the judgement on the in-band emission measurement result:

```
:FETC:CELL:CATM:FUND:MOD:IEM:JUDG?
> PASS
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:CARLeakage?

In-Band Emissions limit (Carrier Leakage)

### Function

Queries the limit of in-band emission (Carrier Leakage).

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:CARLeakage?
```

### Response

```
<level>
```

### Parameter

| | |
|---|---|
| <level> | Limit |
| Resolution | 0.1 dB |
| Unit | dBc |

### Example of Use

To query the limit of in-band emission (Carrier Leakage).

```
:FETC:CELL:CATM:FUND:MOD:IEM:LIM:CARL?
> 1.4
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:GENeral?

In-Band Emissions limit (General)

### Function

Queries the limit of the in-band emission (General).

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:GENeral?
```

### Response

```
<level>
```

### Parameter

| | |
|---|---|
| <level> | Limit |
| Resolution | 0.1 dB |
| Unit | dB |

### Example of Use

To query the limit of in-band emission (General):

```
:FETC:CELL:CATM:FUND:MOD:IEM:LIMit:GEN?
> 2.4
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:IQIMage?

In-Band Emissions limit (IQ Image)

### Function

Queries the limit of in-band emission (IQ Image).

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:LIMit:IQIMage?
```

### Response

```
<level>
```

### Parameter

| | |
|---|---|
| <level> | Limit |
| Resolution | 0.1 dB |
| Unit | dB |

### Example of Use

To query the limit of in-band emission (IQ Image).

```
:FETC:CELL:CATM:FUND:MOD:IEM:LIM:IQIM?
> 1.4
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:MARGin?

In-Band Emissions Margin

### Function

Queries the worst margin in the entire bandwidth for in-band emission measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IEMissions:MARGin?
```

### Response

```
<margin>
```

### Parameter

| | |
|---|---|
| <margin> | Worst margin |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

Queries the worst margin in the entire bandwidth of in-band emission measurement:

```
:FETC:CELL:CATM:FUND:MOD:IEM:MARG?
> 1.40
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:DB?

IQ Imbalance (dB) Result

### Function

Queries the IQ Imbalance measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:DB? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<magnitude>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| <magnitude> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of IQ Imbalance measurement result:

```
:FETC:CELL:CATM:FUND:MOD:IQIM:DB? AVG
> 0.05
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:PERCent?

IQ Imbalance (%) Result

### Function

Queries the IQ Imbalance measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:IQIMbalance:PERCent? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<percent>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| <percent> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| Resolution | 0.01% |
| Unit | % |

### Example of Use

To query the average of IQ Imbalance measurement result:

```
:FETC:CELL:CATM:FUND:MOD:IQIM:PERC? AVG
> 0.05
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:MERRor?

Magnitude Error Result

### Function

Queries the Magnitude Error measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:MERRor? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<magnitude>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| <magnitude> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| Resolution | 0.01% |
| Unit | % |

### Example of Use

To query the average of Magnitude Error measurement result:

```
:FETC:CELL:CATM:FUND:MOD:MERR? AVG
> 1.05
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:PEVM?

Peak EVM Result

### Function

Queries the peak EVM (Error Vector Magnitude) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:PEVM? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

<pevm>

When <mode> = TTL,

<avg>,<max>,<min>

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| <pevm> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| Resolution | 0.01% |
| Unit | % |

### Example of Use

To query the average of Peak EVM measurement result:

```
:FETC:CELL:CATM:FUND:MOD:PEVM? AVG
> 1.75
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:PHERror?

Phase Error Result

### Function

Queries the Phase Error measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:PHERror? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<phase>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| <phase> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| Resolution | 0.01 degree |
| Unit | degree |

### Example of Use

To query the average of Phase Error measurement result:

```
:FETC:CELL:CATM:FUND:MOD:PHER? AVG
> 1.55
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:RHO?

Rho Result

### Function

Queries the Rho (waveform quality) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:RHO? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<rho>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| <rho> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| Resolution | 0.00001 |

### Example of Use

To query the average of Signal Quality measurement (Rho) result:

```
:FETC:CELL:CATM:FUND:MOD:RHO? AVG
> 0.00004
```

## :FETCh:CELLular:CATM:FUNDamental:MODulation:RSEVm?

Reference Signal EVM Result

### Function

Queries the EVM measurement result of Reference Signal.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:MODulation:RSEVm? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

```
<rsevm>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

When <mode> = IND,

```
<s>,<rsevm(1)>,<rsevm(2)>,...,<rsevm(s)>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| <rsevm> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <rsevm(n)> | The n-th Measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| <s> | Number of valid measurement results |

### Example of Use

To query the average of Reference Signal EVM measurement result:

```
:FETC:CELL:CATM:FUND:MOD:RSEV? AVG
> 1.51
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:OBW?

OBW Result

### Function

Queries the OBW (Occupied Bandwidth) measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:OBW?
```

### Response

```
<bw>
```

### Parameter

| | | |
|---|---|---|
| <bw> | | Occupied Bandwidth |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Example of Use

To query the OBW measurement result:

```
:FETC:CELL:CATM:FUND:OBW?
> 1080000
```

## :FETCh:CELLular:CATM:FUNDamental:OBW:FREQuency?

OBW Frequency Result

### Function

Queries the upper, lower and center frequency of OBW (Occupied Bandwidth) measurement results.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:OBW:FREQuency? <pos>
```

### Response

```
<freq>
```

### Parameters

| | |
|---|---|
| <pos> | Offset type |
| UPPER | Upper frequency |
| LOWER | Lower frequency |
| CENTER | Center frequency |
| <freq> | Offset frequency |
| Resolution | 0.1 Hz |
| Unit | Hz |

### Example of Use

To query the upper frequency of OBW measurement result:

```
:FETC:CELL:CATM:FUND:OBW:FREQ? UPPER
> 1951920000.0
```

## :FETCh:CELLular:CATM:FUNDamental:POWer:CHPower?

Channel Power Result

### Function

Queries the Channel Power measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:POWer:CHPower? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN or DVT,

```
<pwr>
```

When <mode> = TTL,

```
<avg>,<max>,<min>
```

When <mode> = IND,

```
<s>,<pwr(1)>,<pwr(2)>,<pwr(3)>,…,<pwr(s)>
```

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Average |
| <pwr> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <pwr(n)> | The n-th measurement result (n=1 to s) |
| Resolution | 0.01 dB |
| Unit | dBm |
| <s> | Number of valid measurement results |

### Example of Use

To query the average of Channel Power measurement result:

```
:FETC:CELL:CATM:FUND:POW:CHP? AVG
> -20.00
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:POWer:TXPower?

Tx Power Result

### Function

Queries the Tx Power measurement result.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:POWer:TXPower? [<mode>]
```

### Response

When <mode> = AVG, MAX, MIN, DVT,

<pwr>

When <mode> = TTL,

<avg>,<max>,<min>

When <mode> = IND

<s>,<pwr(1)>,<pwr(2)>,...,<pwr(s)>

### Parameters

| | |
|---|---|
| <mode> | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| <pwr> | Measurement result in specified Storage mode |
| <avg> | Measurement result (Average) |
| <max> | Measurement result (Maximum) |
| <min> | Measurement result (Minimum) |
| <pwr(n)> | The n-th Measurement result (n=1 to s) |
| Resolution | 0.01 dB |
| Unit | dBm |
| <s> | Number of valid measurement results |

### Example of Use

To query the Tx Power measurement result:

```
:FETC:CELL:CATM:FUND:POW:TXP? AVG
> -20.00
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## :FETCh:CELLular:CATM:FUNDamental:SEMask:JUDGement?

SEM Judgement

### Function

Queries the judgement result of SEM (Spectrum Emission Mask) measurement.
Fail when any part of spectrum exceeds limit, otherwise Pass.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:JUDGement?
```

### Response

```
<judgement>
```

### Parameter

| | |
|---|---|
| <judgement> | Judgement result |
| PASS | Pass |
| FAIL | Fail |
| – | Not measured |

### Example of Use

To query the judgement result of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:JUDG?
> PASS
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel?

SEM Worst Value

### Function

Queries the worst spectrum level with offset frequency in the specified frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel? <range>
```

### Response

```
<level>,<freq>
```

### Parameter

| | |
|---|---|
| <range> | Frequency Range |
| Range | –4 to –1, 1 to 4 |
| Resolution | 1 |
| Suffix code | None |
| <level> | Worst spectrum level in the specified frequency range |
| Resolution | 0.01 dB |
| Unit | dB |
| <freq> | Offset frequency of the worst spectrum level in the specified frequency range |
| Resolution | 1 Hz |
| Unit | Hz |

### Details

The frequency range varies according to the channel bandwidth.
Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4” for Frequency ranges.

### Example of Use

To query the worst spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:LEV? 1
> -20.01,705
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail?

SEM Worst Value (Detail)

### Function

Queries the worst spectrum level with offset frequency in the specified frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail? <range>
```

### Response

```
<level>,<freq>
```

### Parameter

| | |
|---|---|
| <range> | Frequency Range |
| Range | –9 to –1, 1 to 9 |
| Resolution | 1 |
| Suffix code | None |
| <level> | Worst spectrum level in the specified frequency range |
| Resolution | 0.01 dB |
| Unit | dB |
| <freq> | Offset frequency of the worst spectrum level in the specified frequency range |
| Resolution | 1 Hz |
| Unit | Hz |

### Details

Refer to Table 2.4-3 “Frequency Ranges for Measurement Results” for Frequency ranges.

### Example of Use

To query the worst spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:LEV:DET? 1
> -20.01,705
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail:TTL?

SEM Worst Value (Detail) (All range)

### Function

Queries the worst spectrum level with offset frequency in each frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:DETail:TTL?
```

### Response

```
<level(-1)>,<freq(-1)>,…,<level(-9)>,<freq(-9)>,<level(1)>,<freq(1)>,…,
<level(9)>,<freq(9)>
```

### Parameters

| | | |
|---|---|---|
| <level(n)> | | Worst spectrum level in each frequency range<br>(Frequency range: n = –9 to –1, 1 to 9) |
| | Resolution | 0.01 dB |
| | Unit | dBm |
| <freq(n)> | | Offset frequency of the worst spectrum level in each frequency range<br>(Frequency range: n = –9 to –1, 1 to 9) |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Details

Refer to Table 2.4-3 “Frequency ranges of Range 1 to Range 9 (Detail)” for Frequency ranges.

### Example of Use

To query the worst spectrum level with offset frequency in each frequency range of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:LEV:DET:TTL?
> -94.90,-855000,-79.73,-1500000,-79.82,-2300000,-78.96,-4300000,
-79.62,-5500000,-79.54,-9500000,-79.47,-14500000,-79.54,-19500000,
-79.42,-23500000,-93.80,735000,-77.64,2000000,-77.61,2300000,
-9.48,4500000,-72.78,5500000,-77.38,6500000,-78.50,12500000,
-78.60,16500000,-78.73,22500000
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:TTL?

SEM Worst Value (All range)

### Function

Queries the worst spectrum level with offset frequency in each frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:LEVel:TTL?
```

### Response

```
<level(-1)>,<freq(-1)>,…,<level(-4)>,<freq(-4)>,<level(1)>,<freq(1)>,…,
<level(4)>,<freq(4)>
```

### Parameters

| | | |
|---|---|---|
| <level(n)> | | Worst spectrum level in each frequency range<br>(Frequency range: n = –4 to –1, 1 to 4) |
| | Resolution | 0.01 dB |
| | Unit | dBm |
| <freq(n)> | | Offset frequency of the worst spectrum level in each frequency range<br>(Frequency range: n = –4 to –1, 1 to 4) |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Details

Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4 (General)” for Frequency ranges.

### Example of Use

To query the worst spectrum level with offset frequency in each frequency range of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:LEV:TTL?
> -20.0, 30, -20.0, 30, -20.0, 30, -20.0, 30, -20.0, 30, -20.0, 30, -20.0,
30, -20.0, 30
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin?

SEM Template Margin

### Function

Queries the worst margin from the template of the spectrum level with offset frequency in the specified frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin? <range>
```

### Response

```
<margin>,<freq>
```

### Parameter

| | |
|---|---|
| <range> | Frequency Range |
| Range | –4 to –1, 1 to 4 |
| Resolution | 1 |
| Suffix code | None |
| <margin> | Worst margin in the specified frequency range |
| Resolution | 0.01 dB |
| Unit | dB |
| <freq> | Offset frequency of the worst margin in the specified frequency range |
| Resolution | 1 Hz |
| Unit | Hz |

### Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4” for Frequency ranges.

### Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:MARG? 1
> -20.01,705
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail?

SEM Template Margin (Detail)

### Function

Queries the worst margin from the template of the spectrum level with offset frequency in the specified frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail? <range>
```

### Response

```
<margin>,<freq>
```

### Parameter

| | |
|---|---|
| <range> | Frequency Range |
| Range | –9 to –1, 1 to 9 |
| Resolution | 1 |
| Suffix code | None |
| <margin> | Worst margin in the specified frequency range |
| Resolution | 0.01 dB |
| Unit | dB |
| <freq> | Offset frequency of the worst margin in the specified frequency range |
| Resolution | 1 Hz |
| Unit | Hz |

### Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
Refer to Table 2.4-3 “Frequency Ranges for Measurement Results” for Frequency ranges.

### Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:MARG:DET? 1
> -20.01,705
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail:TTL?

SEM Template Margin (Detail) (All range)

### Function

Queries the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:DETail:TTL?
```

### Response

```
<margin(-1)>,<freq(-1)>,…,<margin(-9)>,<freq(-9)>,<margin(1)>,<freq(1)>,…,
<margin(9)>,<freq(9)>
```

### Parameters

| | | |
|---|---|---|
| <margin(n)> | | Worst margin in each frequency range<br>(Frequency range: n= –9 to –1, 1 to 9) |
| | Resolution | 0.01 dB |
| | Unit | dB |
| <freq(n)> | | Offset frequency of the worst margin in each frequency range<br>(Frequency range: n= –9 to –1, 1 to 9) |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
The frequency range varies according to the channel bandwidth.
Refer to Table 2.4-3 “Frequency ranges of Range 1 to Range 9 (Detail)” for Frequency ranges.

### Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:MARG:DET:TTL?
> -20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000
```

## :FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:TTL?

SEM Template Margin (All range)

### Function

Queries the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement.

### Query

```
:FETCh:CELLular:CATM:FUNDamental:SEMask:MARGin:TTL?
```

### Response

```
<margin(-1)>,<freq(-1)>,…,<margin(-4)>,<freq(-4)>,<margin(1)>,<freq(1)>,…,
<margin(4)>,<freq(4)>
```

### Parameters

| | | |
|---|---|---|
| <margin(n)> | | Worst margin in each frequency range<br>(Frequency range: n= –4 to –1, 1 to 4) |
| | Resolution | 0.01 dB |
| | Unit | dB |
| <freq(n)> | | Offset frequency of the worst margin in each frequency range<br>(Frequency range: n= –4 to –1, 1 to 4) |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4” for Frequency ranges.

### Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement:

```
:FETC:CELL:CATM:FUND:SEM:MARG:TTL?
> -20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20
```

## :FETCh:CELLular:CATM:FUNDamental:TRACe?

Waveform

Function

Queries the spectrum waveform data of each measurement result.

Query

```
:FETCh:CELLular:CATM:FUNDamental:TRACe? <format>,<position>,<length>[,<symbol>]
```

Response

```
<data(1)>,…,<data(length)>
```

Parameter

| <format> | format | <format> | format |
|---|---|---|---|
| 1 | Occupied Bandwidth | 11 | In-band Emissions (dB) (average) |
| 2 | Spectrum Emission Mask | 12 | In-band Emissions (dB) (maximum) |
| 3 | Constellation (I) | 13 | In-band Emissions (dBc) (average) |
| 4 | Constellation (Q) | 14 | In-band Emissions (dBc) (maximum) |
| 5 | EVM (average) | 15 | Spectrum Flatness (average) |
| 6 | EVM (maximum) | 16 | Spectrum Flatness (maximum) |
| 7 | Phase Error (average) | 17 | Spectrum Flatness (minimum) |
| 8 | Phase Error (maximum) | | |
| 9 | Magnitude Error (average) | | |
| 10 | Magnitude Error (maximum) | | |

<position> Start point of waveform data

Range

| | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|
| format | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Occupied Bandwidth | 0 to 654 | 0 to 1358 | 0 to 2254 | 0 to 4494 | 0 to 6734 | 0 to 8974 |
| Spectrum Emission Mask | 0 to 1134 | 0 to 2254 | 0 to 3694 | 0 to 5486 | 0 to 7246 | 0 to 9038 |
| Constellation<br>EVM<br>Phase Error<br>Magnitude Error<br>Spectrum Flatness | 0 to 71 | 0 to 179 | 0 to 299 | 0 to 599 | 0 to 899 | 0 to 1199 |
| In-band Emissions | 0 to 5 | 0 to 14 | 0 to 24 | 0 to 49 | 0 to 74 | 0 to 99 |

Resolution 1

Suffix code None

<length> Number of read data

Range

| format | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Occupied Bandwidth | 1 to 655 | 1 to 1359 | 1 to 2255 | 1 to 4495 | 1 to 6735 | 1 to 8975 |
| Spectrum Emission Mask | 1 to 1135 | 1 to 2255 | 1 to 3695 | 1 to 5487 | 1 to 7247 | 1 to 9039 |
| Constellation<br>EVM<br>Phase Error<br>Magnitude Error<br>Spectrum Flatness | 1 to 72 | 1 to 180 | 1 to 300 | 1 to 600 | 1 to 900 | 1 to 1200 |
| In-band Emissions | 1 to 6 | 1 to 15 | 1 to 25 | 1 to 50 | 1 to 75 | 1 to 100 |

Resolution 1

Suffix code None

<symbol> Position of SC-FDMA symbol

Range 0 to 6 (Constellation, EVM, Phase Error, Magnitude Error)

<data(n)> Waveform data

Resolution
- 0.01 dB (Occupied Bandwidth, Spectrum Emission Mask, In-band Emissions, Spectrum Flatness)
- 0.01 deg. (Phase Error)
- 0.01 % (EVM, Magnitude Error)
- 0.0001 (Constellation)

Unit
- dBm (Spectrum Emission Mask)
- dB (Occupied Bandwidth, In-band Emissions (dB), Spectrum Flatness)
- dBc (In-band Emissions (dBc) )
- degree (Phase Error)
- % (EVM, Magnitude Error)
- None (Constellation)

### Details

Refer to Table 2.7-1 “Waveform Data Type and Data Interval” for Data Interval.
When RMC Configuration is PUCCH, format 3 through 17 are all “Not measured”.

### Example of Use

To query the Occupied Bandwidth of 20 data from 25 of each measurement:

```
:FETC:CELL:CATM:FUND:TRAC? 1,25,20
> -42.12,-40.14,…,-41.22
```

## :TRIGger:CELLular:CATM:FUNDamental:DELay

Trigger Delay

### Function

Sets or queries the Trigger Delay.

### Command

```
:TRIGger:CELLular:CATM:FUNDamental:DELay <delay>
```

### Query

```
:TRIGger:CELLular:CATM:FUNDamental:DELay?
```

### Response

<delay>

### Parameters

| | |
|---|---|
| <delay> | Trigger Delay |
| Range | 0.000 to 10.000 ms |
| Resolution | 0.001 ms |
| Suffix code | S MS US NS (uses ms when omitted) |
| Default | 0.000 ms |
| Unit | ms |

### Example of Use

To set the Trigger Delay to 0.001 ms:

```
:TRIG:CELL:CATM:FUND:DEL 0.001
:TRIG:CELL:CATM:FUND:DEL?
> 0.001
```

## :TRIGger:CELLular:CATM:FUNDamental:LEVel

Trigger Level

### Function

Sets or queries the Trigger Level.

### Command

```
:TRIGger:CELLular:CATM:FUNDamental:LEVel <level>
```

### Query

```
:TRIGger:CELLular:CATM:FUNDamental:LEVel?
```

### Response

```
<level>
```

### Parameters

| | |
|---|---|
| <level> | Trigger Level |
| Range | –40 to 0 dB |
| Resolution | 1 dB |
| Suffix code | DB |
| Default | –30 dB |
| Unit | dB |

### Details

This command is available when trigger source is set to Rise Config.

### Example of Use

To set the Trigger Level to –30 dB:

```
:TRIG:CELL:CATM:FUND:LEV -30
:TRIG:CELL:CATM:FUND:LEV?
> -30
```

## :TRIGger:CELLular:CATM:FUNDamental:SOURce

Trigger Source

### Function

Sets or queries the Trigger Source.

### Command

```
:TRIGger:CELLular:CATM:FUNDamental:SOURce <source>
```

### Query

```
:TRIGger:CELLular:CATM:FUNDamental:SOURce?
```

### Response

```
<source>
```

### Parameters

| | |
|---|---|
| <source> | Trigger Source |
| FRAME | Frame |
| RISE_CONFIG | Rise Config |
| Default | RISE_CONFIG |

### Example of Use

To set the Trigger Source to Rise Config:

```
:TRIG:CELL:CATM:FUND:SOUR RISE_CONFIG
:TRIG:CELL:CATM:FUND:SOUR?
> RISE_CONFIG
```

# :TRIGger:CELLular:CATM:FUNDamental:TOUT

Trigger Timeout

## Function

Sets or queries the Trigger Timeout.

## Command

```
:TRIGger:CELLular:CATM:FUNDamental:TOUT <time>
```

## Query

```
:TRIGger:CELLular:CATM:FUNDamental:TOUT?
```

## Response

```
<time>
```

## Parameters

| | |
|---|---|
| <time> | Trigger Timeout |
| Range | 1 to 60 s |
| Unit | s |
| Resolution | 1 s |
| Suffix code | NS, US, MS, S (uses s when omitted) |
| Default | 10 s |

## Example of Use

To set the Trigger Timeout to 10 s:

```
:TRIG:CELL:CATM:FUND:TOUT 10
:TRIG:CELL:CATM:FUND:TOUT?
> 10
```

# Chapter 5 Native Command Reference

This chapter describes the details of Native commands.
To switch to the Native command mode, send the command SYST:LANG NAT.


5.1 List of Commands ..... 5-2
5.1.1 Common commands ..... 5-3
5.1.2 Fundamental measurement commands ..... 5-5
5.2 Details of Commands ..... 5-18
5.2.1 Common commands ..... 5-19
5.2.2 Fundamental measurement commands ..... 5-35

# 5.1 List of Commands

The following table shows the rules for describing messages.

| | |
|---|---|
| [ ] | Messages or parameters in square brackets can be omitted. |
| \| | Choose one of several choices.<br>A \| B \| C \| D indicates a choice of A, B, C, and D. |
| { } | Curly brackets are used to group options.<br>For A \| B({C \| D}), choose A, B(C), or B(D). |

## 5.1.1 Common commands

Common

| Function | Command | Query | Response |
|---|---|---|---|
| Standard Select | STDSEL std | STDSEL? | std |
| Set Connect Port Direction | PORT input,output[,output,…,output] | PORT? | input,output[,output,…,output] |

Measurement

| Function | Command | Query | Response |
|---|---|---|---|
| Measurement Stop | MEASSTOP | ----- | ----- |
| Measurement Status | ----- | MSTAT | m_status |
| Tx Measurement Status | ----- | TXMSTAT? | m_status |
| Measurement Start | SNGLS | ----- | ----- |
| Measurement Start (Synchronization) | SWP | SWP? | status |
| End Event Status (Measurement) Register Query | ----- | ESR2? | register |
| Error Event Status (Measurement) Register Query | ----- | ESR3? | register |

Common Parameters

| Function | Command | Query | Response |
|---|---|---|---|
| Output Level On/Off | LVL on_off | LVL? | on_off |
| Output Signal Modulation | MOD on_off | MOD? | on_off |
| Waveform File Select | PACKAGE pac | PACKAGE? | pac |
| Waveform Pattern Select | DLPAT pat | DLPAT? | pat |
| Waveform Pattern Select (SYNC) | DLPAT_SYNC pat | DLPAT_SYNC? | pat |

System

| Function | Command | Query | Response |
|---|---|---|---|
| Application Select | SYSSEL app | SYSSEL? | app |
| Language Selection of Remote Command | SYST:LANG mode | SYST:LANG? | mode |

## 5.1.2 Fundamental measurement commands

Common Parameters

| Function | Command | Query | Response |
|---|---|---|---|
| Channel Bandwidth | BANDWIDTH bandwidth | BANDWIDTH? | bandwidth |
| Uplink Channel | ULCHAN ul_ch | ULCHAN? | ul_ch |
| Uplink Frequency | ULFREQ ul_freq<br>TXFREQ ul_freq | ULFREQ?<br>TXFREQ? | ul_freq |
| Downlink Channel | DLCHAN dl_ch | DLCHAN? | dl_ch |
| Downlink Frequency | DLFREQ dl_freq<br>RXFREQ dl_freq | DLFREQ?<br>RXFREQ? | dl_freq |
| Operation Band | BAND band | BAND? | band |
| Input Level | ILVL level | ILVL? | Input Level |
| Output Level (Total) | OLVL level | OLVL? | level |
| Output Level ( Total 1.4 MHz) | OLVL_NB level | OLVL_NB? | level |

Category M Setting

| Function | Command | Query | Response |
|---|---|---|---|
| Frame Structure | FRAMETYPE mode | FRAMETYPE? | mode |
| Duplex Mode | DUPLEXMODE mode | DUPLEXMODE? | mode |
| Channel Coding | CHCODING object | CHCODING? | object |
| RMC Configuration | CHCONFIG val | CHCONFIG? | val |
| nRB-CQI | NRBCQI value | NRBCQI? | value |
| UL RMC Narrowband Index | ULRMC_NARROW index | ULRMC_NARROW? | index |
| UL RMC Number of RB | ULRMC_RB ul_rmc_rb | ULRMC_RB? | ul_rmc_rb |
| UL RMC Starting RB | ULRB_START ulrb | ULRB_START? | ulrb |
| UL RMC MCS Index | ULIMCS ulimcs | ---- | ---- |
| UL RMC Modulation | ULRMC_MOD ul_rmc_mod | ULRMC_MOD? | ul_rmc_mod |
| Group Hopping | GROUPHOP on_off | GROUPHOP? | on_off |
| Cell ID | CELLID id | CELLID? | id |
| Cyclic Shift | CSHIFT val | CSHIFT? | val |
| Delta SS | DELTASS val | DELTASS? | val |
| RB Search | RBSEARCH on_off | RBSEARCH? | on_off |
| In-band Emissions/ EVM Carrier Leakage Frequency | IBEM_CLFR clf | IBEM_CLFR? | clf |
| Trigger Source | TRGSRC source | TRGSRC? | source |
| Trigger Level | TRGLVL level | TRGLVL? | level |
| Trigger Delay | TRGDLY delay | TRGDLY? | delay |
| Trigger Timeout | TRGTOUT time | TRGTOUT? | time |

Fundamental Measurement Parameters

| Function | Command | Query | Response |
|---|---|---|---|
| Power Measurement On/Off and Meas. Count | PWR_SET on_off[,avg_count] | PWR_SET? | on_off,avg_count |
| OBW On/Off and Meas. Count | OBW_SET on_off[,avg_count] | OBW_SET? | on_off,avg_count |
| SEM On/Off and Meas. Count | SEM_SET on_off[,avg_count] | SEM_SET? | on_off,avg_count |
| ACLR On/Off and Meas. Count | ACLR_SET on_off[,avg_count] | ACLR_SET? | on_off,avg_count |
| Modulation Analysis On/Off and Meas. Count | MOD_SET on_off[,avg_count] | MOD_SET? | on_off,avg_count |
| All Measurement Items Off | ALLMEASITEMS_OFF | ---- | ---- |
| additionalSpectrumEmission | SIB2_NS sib2_ns | SIB2_NS? | sib2_ns |

Result (Power Measurement, Occupied Bandwidth)

| Function | Command | Query | Response |
|---|---|---|---|
| Tx Power Result | ---- | POWER? [mode] | pwr mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,pwr(1),pwr(2),...,pwr(s) mode=IND<br>AVG when mode is omitted |
| Channel Power Result | ---- | CHPWR? [mode] | pwr mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,pwr(1),pwr(2),...,pwr(s) mode=IND<br>AVG when mode is omitted |
| OBW Result | ---- | OBW? | bw |
| OBW Frequency Result | ---- | OBWFREQ? pos | freq |

Result (Spectrum Emission Mask)

| Function | Command | Query | Response |
|---|---|---|---|
| SEM Judgement | ---- | SEMPASS? | judgement |
| SEM Worst Value | ---- | WORST_SEM_LV? range | level,freq |
| SEM Worst Value (All range) | ---- | TTL_WORST_SEM_LV? | level(-1),freq(-1),…,level(-4),freq(-4), level(1),freq(1),…,level(4),freq(4) |
| SEM Template Margin | ---- | WORST_SEM? range | margin,freq |
| SEM Template Margin (All range) | ---- | TTL_WORST_SEM? | margin(-1),freq(-1),…,margin(-4),freq(-4) ,margin(1),freq(1),…,margin(4),freq(4) |
| SEM Worst Value (Detail) | ---- | WORST_SEM_DET_LV? range | level,freq |
| SEM Worst Value (Detail) (All range) | ---- | TTL_WORST_SEM_DET_LV? | level(-1),freq(-1),…,level(-9),freq(-9), level(1),freq(1),…,level(9),freq(9) |
| SEM Template Margin (Detail) | ---- | WORST_SEM_DET? range | margin,freq |
| SEM Template Margin (Detail) (All range) | ---- | TTL_WORST_SEM_DET? | margin(-1),freq(-1),…,margin(-4),freq(-4) ,margin(1),freq(1),…,margin(4),freq(4) |

Result (Adjacent Channel Power)

| Function | Command | Query | Response |
|---|---|---|---|
| ACLR Result | ---- | ACLR? mode | aclr(E-UTRA_LOW),aclr(E-UTRA_UP),<br>aclr(UTRA_LOW2),aclr(UTRA_LOW1),<br>aclr(UTRA_UP1),aclr(UTRA_UP2)<br>mode=AVG,MAX,MIN<br>avg(E-UTRA_LOW),avg(E-UTRA_UP),avg(UTRA_LOW2),<br>avg(UTRA_LOW1),avg(UTRA_UP1),avg(UTRA_UP2),<br>max(E-UTRA_LOW),max(E-UTRA_UP),max(UTRA_LOW2),<br>max(UTRA_LOW1),max(UTRA_UP1),max (UTRA_UP2),<br>min(E-UTRA_LOW),min(E-UTRA_UP),min(UTRA_LOW2),<br>min(UTRA_LOW1),min(UTRA_UP1),min(UTRA_UP2)<br>mode=TTL |

Result (Modulation Analysis)

| Function | Command | Query | Response |
|---|---|---|---|
| Carrier Frequency Result | ---- | CARRF? AVG | freq |
| Carrier Frequency Error Result | ---- | CFERR? mode | freq_ppm,freq_Hz<br>mode=AVG,MAX,MIN,DVT<br>avg_ppm,avg_Hz,max_ppm,max_Hz,min_ppm,min_Hz<br>mode=TTL |
| Worst Carrier Frequency Error Result | ---- | CFERR_WORST? | freq_ppm,freq_Hz |
| EVM Result | ---- | EVM? [mode] | evm mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,evm(1),…,evm[s] mode=IND<br>AVG when mode is omitted |
| EVM Result (Low) | | EVM_L? [mode] | evm mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,evm(1),…,evm[s] mode=IND<br>AVG when mode is omitted |
| EVM Result (High) | | EVM_H? [mode] | evm mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,evm(1),…,evm[s] mode=IND<br>AVG when mode is omitted |

Result (Modulation Analysis) (Cont'd)

| Function | Command | Query | Response |
|---|---|---|---|
| Reference Signal EVM Result | ---- | RSEVM? [mode] | rsevm mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,rsevm(1),…,rsevm[s] mode=IND<br>AVG when mode is omitted |
| Peak EVM Result | ---- | PVECTERR? [mode] | pevm mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>AVG when mode is omitted |
| Phase Error Result | ---- | PHASEERR? [mode] | phase mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>AVG when mode is omitted |
| Magnitude Error Result | ---- | MAGTDERR? [mode] | magnitude mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>AVG when mode is omitted |
| Carrier Leakage Result | ---- | CARRLEAK? [mode] | cleakage mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>AVG when mode is omitted |
| Rho Result | ---- | RHO? [mode] | rho mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>AVG when mode is omitted |

Result (In-band emissions for non allocated RB)

| Function | Command | Query | Response |
|---|---|---|---|
| In-Band Emissions Measured Item | ---- | INBANDEITEM? | flag |
| In-Band Emissions Judgement | ---- | INBANDEPASS? | judgement |
| In-Band Emissions (General) Result | ---- | INBANDE_GEN? [mode] | ibe mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,ibe(1),…,ibe[s] mode=IND<br>AVG when mode is omitted |
| In-Band Emissions limit (General) | ---- | INBANDE_GENUL? | level |
| In-Band Emissions (IQ Image) Result | ---- | INBANDE_IMG? [mode] | ibe mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,ibe(1),…,ibe[s] mode=IND<br>AVG when mode is omitted |
| In-Band Emissions limit (IQ Image) | ---- | INBANDE_IMGUL? | level |

Result (In-band emissions for non allocated RB (Cont'd), IQ Imbalance)

| Function | Command | Query | Response |
|---|---|---|---|
| In-Band Emissions (Carrier Leakage) Result | ---- | INBANDE_LEAK? [mode] | ibe mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,ibe(1),…,ibe[s] mode=IND<br>MAX when mode is omitted |
| In-Band Emissions limit (Carrier Leakage) | ---- | INBANDE_LEAKUL? | level |
| In-Band Emissions Margin | ---- | INBANDE_MARG? | margin |
| IQ Imbalance (%) Result | ---- | IQIMB_PER? [mode] | percent mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>AVG when mode is omitted |
| IQ Imbalance (dB) Result | ---- | IQIMB_DB? [mode] | level mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>AVG when mode is omitted |

Result (Spectrum flatness)

| Function | Command | Query | Response |
|---|---|---|---|
| Spectrum Flatness Measured Item | ---- | SPECFLATITEM? | flag |
| Spectrum Flatness Judgement | ---- | SPECFLATPPPASS? | judgement |
| Spectrum Flatness (≥3 MHz (RP1)) Result | ---- | SPECFLAT_RP1? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,sflatness(1),…,sflatness(s) mode=IND<br>MAX when mode is omitted |
| Spectrum Flatness (RP12) Result | ---- | SPECFLAT_RP12? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,sflatness(1),…,sflatness(s) mode=IND<br>MAX when mode is omitted |
| Spectrum Flatness (<3 MHz (RP2)) Result | ---- | SPECFLAT_RP2? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,sflatness(1),…,sflatness(s) mode=IND<br>MAX when mode is omitted |
| Spectrum Flatness (RP21) Result | ---- | SPECFLAT_RP21? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>s,sflatness(1),…,sflatness(s) mode=IND<br>MAX when mode is omitted |

Result (Spectrum flatness) (Cont'd)

| Function | Command | Query | Response |
|---|---|---|---|
| Spectrum Flatness (≥3 MHz) Result | ---- | SPECFLAT1? | worst |
| Spectrum Flatness (≥3 MHz (R1 –)) Result | ---- | SPECFLAT1_M? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>MIN when mode is omitted |
| Spectrum Flatness (≥3 MHz (R1 +)) Result | ---- | SPECFLAT1_P? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>MAX when mode is omitted |
| Spectrum Flatness (<3 MHz) Result | ---- | SPECFLAT2? | worst |
| Spectrum Flatness (<3 MHz (R2 –)) Result | ---- | SPECFLAT2_M? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>MIN when mode is omitted |
| Spectrum Flatness (<3 MHz (R2 +)) Result | ---- | SPECFLAT2_P? [mode] | sflatness mode=AVG,MAX,MIN,DVT<br>avg,max,min mode=TTL<br>MAX when mode is omitted |
| Spectrum Flatness (RP Total) Result | ---- | SPECFLAT_RP? [mode] | sflat(RP1),sflat(RP2),sflat(RP12),sflat(RP21) mode=AVG,MAX,MIN,DVT<br>avg(RP1),avg(RP2),avg(RP12),avg(RP21),<br>max(RP1),max(RP2),max(RP12),max(RP21),<br>min(RP1),min(RP2),min(RP12),min(RP21) mode=TTL<br>s,sflat(RP1)(1),sflat(RP2)(1),sflat(RP12)(1),sflat(RP21)(1),...,sflat(RP1)(s),sflat(RP2)(s),sflat(RP12)(s),sflat(RP21)(s) mode=IND<br>MAX when mode is omitted |

Result (Waveform)

| Function | Command | Query | Response |
|---|---|---|---|
| Waveform | ---- | WAVEFMEAS? format,position,length[,symbol] | data(1),…,data(length) |

# 5.2 Details of Commands

This section describes the commands in alphabetical order.

■ Terms in this command list

EX ..... Command name (header)

Example ..... Command function name

Function ..... Command function

Command ..... Programming command syntax

Query ..... Query syntax

Response ..... Response syntax

Parameter ..... Parameter definition

Details ..... Command restrictions and others

Example of Use ..... Command usage example

Related Commands ..... Introduction of related commands

■ Suffix Code list

| Suffix Code | Unit | Suffix Code | Unit |
|---|---|---|---|
| DB | dB | MHZ | MHz |
| DBM | dBm | MS | ms |
| GHZ | GHz | MZ | MHz |
| GZ | GHz | NS | ns |
| HZ | Hz | S | s |
| KHZ | kHz | US | μs |
| KZ | kHz | | |

## 5.2.1 Common commands

### DLPAT

Waveform Pattern Select

#### Function

Selects a waveform pattern to use from patterns included in waveform file.
When the command received, the signal is immediately switched regardless of the frame cycle of signal, so the frame cycle is not continued.
This command is also used to query the currently selected waveform pattern.

#### Command

```
DLPAT pat
```

#### Query

```
DLPAT?
```

#### Response

```
pat
```

#### Parameter

| | | |
|---|---|---|
| pat | | Waveform pattern |
| | PAT1 to PATn | Waveform pattern number (n: waveform information file group range) |
| | Default | PAT1 |

#### Details

Select the waveform pattern for RF output signal in waveform file.
The pattern number is the same as the group number. Refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

#### Example of Use

To output the waveform pattern to 1:

```
DLPAT PAT1
DLPAT?
> PAT1
```

#### Related command

Waveform file for arbitrary waveform signal selection or query
PACKAGE

#### Remarks

The group number depends on the selected waveform file.
For details of the waveform pattern, refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

# DLPAT_SYNC

Waveform Pattern Select (SYNC)

### Function

Selects a waveform pattern to use from patterns included in waveform file.
When the command received, the signal is switched according to the frame cycle of signal so that the frame cycle is continued.
This command is also used to query the currently selected waveform pattern.

### Command

```
DLPAT_SYNC pat
```

### Query

```
DLPAT_SYNC?
```

### Response

```
pat
```

### Parameter

| | |
|---|---|
| pat | Waveform pattern |
| PAT1 to PATn | Waveform pattern number (n: waveform information file group range) |
| Default | PAT1 |

### Details

Select the waveform pattern for RF output signal in waveform file.
The pattern number is the same as the group number. Refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

### Example of Use

To output the waveform pattern to 1:

```
DLPAT_SYNC PAT1
DLPAT_SYNC?
> PAT1
```

### Related command

Waveform file for arbitrary waveform signal selection or query
PACKAGE

### Remarks

The group number depends on the selected waveform file.
For details of the waveform pattern, refer to Chapter 3, "Waveform File Details" in the *Waveform Files for Cellular Application Operation Manual*.

## ESR2?

End Event Status (Measurement) Register Query

### Function

Queries the end event status register (measurement).
The event occurrence can be identified using the retrieved value.

### Query

```
ESR2?
```

### Response

```
register
```

| | |
|---|---|
| register | End event status register (measurement) |
| Range | 0 to 255 |
| | |
| register | Value = bit0 + bit1 + ... + bit7 |
| bit0 = $2^0$ = 1 | End of measurement |
| bit1 = $2^1$ = 2 | Trigger preparation completed |
| bit2 = $2^2$ = 4 | Unused (reserved for application use) |
| bit3 = $2^3$ = 8 | Unused (reserved for application use) |
| bit4 = $2^4$ = 16 | Unused (reserved for application use) |
| bit5 = $2^5$ = 32 | Unused (reserved for application use) |
| bit6 = $2^6$ = 64 | Unused (reserved for application use) |
| bit7 = $2^7$ = 128 | Unused (reserved for application use) |

### Details

The sum of the values for bits of the occurring event from the values $2^0$ = 1, $2^1$ = 2, $2^2$ = 4, $2^3$ = 8, $2^4$ = 16, $2^5$ = 32, $2^6$ = 64, and $2^7$ = 128, that correspond to the end event status register (measurement) bits 0, 1, 2, 3, 4, 5, 6, and 7 becomes the response.

### Example of Use

To query the end event status register (measurement) value:

```
ESR2?
> 0
```

# ESR3?

Error Event Status (Measurement) Register Query

## Function

Queries the error event status register (measurement).
The event occurrence can be identified using the retrieved value.

## Query

```
ESR3?
```

## Response

```
register
```

| | |
|---|---|
| register | Error event status register (measurement) |
| Range | 0 to 255 |
| | |
| register | Value = bit0 + bit1 + ... + bit7 |
| bit0 = $2^0$ = 1 | Over level |
| bit1 = $2^1$ = 2 | Under level |
| bit2 = $2^2$ = 4 | Timeout |
| bit3 = $2^3$ = 8 | Unused (reserved for application use) |
| bit4 = $2^4$ = 16 | Unused (reserved for application use) |
| bit5 = $2^5$ = 32 | Unused (reserved for application use) |
| bit6 = $2^6$ = 64 | Unused (reserved for application use) |
| bit7 = $2^7$ = 128 | Unused (reserved for application use) |

## Details

The sum of the values for bits of the occurring event from the values $2^0$ = 1, $2^1$ = 2, $2^2$ = 4, $2^3$ = 8, $2^4$ = 16, $2^5$ = 32, $2^6$ = 64, and $2^7$ = 128, that correspond to the error event status register (measurement) bits 0, 1, 2, 3, 4, 5, 6, and 7 becomes the response.

## Example of Use

To query the error event status register (measurement) value:

```
ESR3?
> 4
```

## LVL

### Output Level On/Off

#### Function

Sets or queries RF signal output ON/OFF.

#### Command

```
LVL on_off
```

#### Query

```
LVL?
```

#### Response

```
on_off
```

#### Parameter

| | |
|---|---|
| on_off | Enables/disables RF signal output. |
| ON | Enables RF signal output. |
| OFF | Disables RF signal output. |
| Default | ON |

#### Example of Use

To output RF signals at Test port:

```
LVL ON
LVL?
> ON
```

## MEASSTOP

### Measurement Stop

#### Function

Stops the current measurement.

#### Command

```
MEASSTOP
```

#### Example of Use

To stop the current measurement:

```
MEASSTOP
```

# MOD

Output Signal Modulation

### Function

Sets or queries RF signal output modulation.

### Command

```
MOD on_off
```

### Query

```
MOD?
```

### Response

```
on_off
```

### Parameter

| | | |
|---|---|---|
| on_off | | Enables/disables modulation. |
| | ON | Enables RF output signal modulation. |
| | OFF | Disables RF output signal modulation. |
| | Default | ON |

### Example of Use

To turn on the modulation.

```
MOD ON
MOD?
> ON
```

## MSTAT?

Measurement Status

### Function

Queries the measurement status.

### Query

```
MSTAT?
```

### Response

```
m_status
```

### Parameter

| | |
|---|---|
| m_status | Measurement status |
| 0 | Completed measurement |
| 2 | Over level |
| 5 | Synchronization word not detected |
| 9 | Measurement in progress or not measured |
| 12 | Tx measurement timeout |

### Details

This command can be used while measurement is in progress or suspended.

### Example of Use

To query current measurement status:

```
MSTAT?
> 0
```

# PACKAGE

Waveform File Select

### Function

Selects and queries the waveform file for arbitrary waveform signal used at Downlink signal.

### Command

```
PACKAGE pac
```

### Query

```
PACKAGE?
```

### Response

```
pac
```

### Parameter

| | |
|---|---|
| pac | Waveform file |

### Details

The name of the file used from the waveform files loaded into waveform memory is set by this command.

### Example of Use

To set the waveform file 1 from waveform files loaded in waveform memory:

```
PACKAGE "PAC1"
PACKAGE?
> PAC1
```

### Related command

Use the following command to load the waveform file into waveform memory.
SOUR:GPRF:GEN:ARB:FILE:LOAD
For details of the command, refer to Chapter 5 "SCPI Command Reference" in the *MU887000A TRX Test Module Operation Manual*.
:SOURce:GPRF:GENerator:ARB:FILE:LOAD
The following command can be used to query the names of waveform files that have been loaded into waveform memory.
SOUR:GPRF:GEN:ARB:WAV:NAME?
For details of the command, refer to Chapter 5 "SCPI Command Reference" in the *MU887000A TRX Test Module Operation Manual*.
:SOURce:GPRF:GENerator:ARB:WAVeform:NAME?

Use the following commands to select a waveform pattern to use from the waveform patterns included in the waveform file configured using the command described in this section.
DLPAT, DLPAT_SYNC, SEQTRX

# PORT

Set Connect Port Direction

## Function

Sets or queries the test ports for inputting and outputting RF signals.
Multiple output test port can be set for MU887002A.

## Command

| | |
|---|---|
| `PORT input,output` | MU887000A, MU887001A |
| `PORT input,output[,output,…,output]` | MU887002A |

## Query

```
PORT?
```

## Response

| | |
|---|---|
| input,output | MU887000A, MU887001A |
| input,output[,output,…,output] | MU887002A |

## Parameters

| | | |
|---|---|---|
| input | Input Test Port No. | |
| Range | Test Port 1 to 4 | (MU887000A) |
| | Test Port 1 to 4 | (MU887001A) |
| | OFF, Test Port 1 to 12 | (MU887002A) |
| PORT1 | Test Port 1 | |
| … | … | |
| PORT12 | Test Port 12 | |
| OFF | No any Input Test Ports | (MU887002A) |
| Default | PORT1 | |
| output | Output Test Port No. | |
| Range | Test Port 1 to 4 | (MU887000A) |
| | Test Port 1 to 4 | (MU887001A) |
| | Test Port 1 to 12 | (MU887002A) |
| PORT1 | Test Port 1 | |
| … | … | |
| PORT12 | Test Port 12 | |
| Default | PORT1 | |

## Details

For MU887000A,
Test Port 1 and Test Port 2 can be set for both input and output.
Test Port 3 and Test Port 4 can be set for either input or output.
For MU887001A, Test Port 1 to Test Port 4 can be set for both input and output.
For MU887002A, Test Port 1 to Test Port 12 can be set for both input and output.

Example of Use

To set Test Port 1 as RF signal input test port and Test Port 2 as RF signal output test port:

```
PORT PORT1,PORT2
PORT?
> PORT1,PORT2
```

To set No any Input Test Ports and Test Port 4, Test Port 6, Test Port 10 as RF signal output test ports:

```
PORT OFF,PORT10,PORT4,PORT6
PORT?
> OFF,PORT4,PORT6,PORT10
```

## SNGLS

Measurement Start

### Function

Sets the parameters for both specified measurement and signal transmission and executes measurement.

### Command

```
SNGLS
```

### Details

Sending this command executes one measurement execution.
Sending this command during measurement, aborts measurement once and restarts it.
ESR2 must be polled or sync processing via *WAI is required to determine the timing of measurement completion.

### Example of Use

To start measurement:

```
SNGLS
```

### Related command

ESR2
For the details of the event status register, refer to Chapter 3 “Fundamental Operation” in the *MU887000A TRX Test Module Operation Manual*.

# STDSEL

Standard Select

### Function

Sets or queries the measurement standard.

### Command

```
STDSEL std
```

### Query

```
STDSEL?
```

### Response

```
std
```

### Parameter

| | | |
|---|---|---|
| std | Measurement standard | |
| COMMON | Common measurement | (requires MX887010A) |
| WCDMA | W-CDMA | (requires MX887011A) |
| GSM | GSM | (requires MX887012A) |
| LTE | LTE | (requires MX887013A or MX887014A) |
| CDMA2000 | CDMA2000 1x | (requires MX887015A) |
| EVDO | CDMA2000 1xEVDO | (requires MX887016A) |
| TDSCDMA | TD-SCDMA | (requires MX887017A) |
| NR | NR sub-6GHz | (requires MX887018A or MX887019A) |
| CATM | Category M | (requires MX887065A) |
| NBIOT | NB-IoT | (requires MX887067A) |
| LTEV2X | LTE-V2X | (requires MX887068A) |
| SEQUENCE | Sequence measurement | (requires MX887010A) |
| SEQ | Sequence measurement | (requires MX887010A) |
| Default | COMMON | |

### Example of Use

To switch the measurement standard to SEQUENCE:

```
STDSEL SEQUENCE
STDSEL?
> SEQUENCE
```

### Remarks

This parameter must be set to CATM to execute the commands described in Section 5.2.2 “Fundamental measurement commands”.

# SYSSEL

Application Select

## Function

Sets or queries the type of application software to execute.

## Command

```
SYSSEL app
```

## Query

```
SYSSEL?
```

## Response

```
app
```

## Parameter

| | | |
|---|---|---|
| app | | Type of application software |
| | CELLULAR | Cellular Application<br>When using MX887010A, MX887011A, MX887012A, MX887013A, MX887014A, MX887015A, MX887016A, MX887017A, MX887018A, MX887019A, MX887065A, MX887067A, or MX887068A |
| | SRW | Short Range Wireless application<br>When using MX887030A, MX887031A, MX887032A, MX887033A, MX887040A, or MX887050A |
| | LRWPAN | IEEE 802.15.4 application<br>When using MX887060A |
| | ZWAVE | Z-Wave application<br>When using MX887061A |
| | FMAUDIO | FM AUDIO application<br>When using MX887070A |

*Note:* MU887002A does not support MX887070A.

## Details

Set the parameter to CELLULAR and send the command before using the MX887065A.

## Example of Use

To set the application software to CELLULAR:

```
SYSSEL CELLULAR
SYSSEL?
> CELLULAR
```

## Remarks

When using the MX887065A, set the application to CELLULAR using the SYSSEL command, and then set the standard to CATM using the STDSEL command.

## SYST:LANG

Language Selection of Remote Command

### Function

Switches the language mode of remote control commands.

### Command

```
SYST:LANG mode
```

### Query

```
SYST:LANG?
```

### Response

```
mode
```

### Parameter

| | |
|---|---|
| mode | Language mode |
| NAT | Native |
| SCPI | SCPI |
| Default | NAT |

### Example of Use

To switch the language mode of remote control commands to Native.

```
SYST:LANG NAT
SYST:LANG?
>NAT
```

## SWP

Measurement Start (Synchronization)

### Function

Sets the parameters of the measurement and signal transmission, and executes the measurement.

The following command is not processed until the measurement ends, so the MX887065A and the controller can synchronize.

Queries the measurement end.

### Command

```
SWP
```

### Query

```
SWP?
```

### Response

```
status
```

### Parameter

| | |
|---|---|
| status | Measurement status |
| 0 | Measurement finished |
| 1 | Measurement in progress |

### Details

When this command is sent, the measurement is performed only once.

To average, the measurements are performed for the specified average count (number of measurements to average).

### Example of Use

To start the measurement.

```
SWP
```

# TXMSTAT?

Tx Measurement Status

### Function

Queries the Tx measurement status.

### Query

```
TXMSTAT?
```

### Response

```
m_status
```

### Parameter

| | |
|---|---|
| m_status | Measurement status |
| 0 | Measurement completed |
| 2 | Over level |
| 5 | Synchronization word not detected |
| 9 | Measurement in progress or not measured |
| 12 | Tx measurement timeout |

### Details

This command can be used while measurement is in progress or suspended.

### Example of Use

To query current Tx measurement status:

```
TXMSTAT?
> 0
```

## 5.2.2 Fundamental measurement commands

### ACLR?

ACLR Result

#### Function

Queries the result of ACLR (Adjacent Channel Leakage Power Ratio) measurement.

#### Query

```
ACLR? mode
```

#### Response

When mode = AVG, MAX, MIN, DVT,

```
aclr(E-UTRA_LOW),aclr(E-UTRA_UP),aclr(UTRA_LOW2),aclr(UTRA_LOW1),
aclr(UTRA_UP1),aclr(UTRA_UP2)
```

When mode = TTL,

```
avg(E-UTRA_LOW),avg(E-UTRA_UP),avg(UTRA_LOW2),avg(UTRA_LOW1),avg(UTRA_UP1),avg(UTRA_UP2),
max(E-UTRA_LOW),max(E-UTRA_UP),max(UTRA_LOW2),max(UTRA_LOW1),max(UTRA_UP1),max(UTRA_UP2),
min(E-UTRA_LOW),min(E-UTRA_UP),min(UTRA_LOW2),min(UTRA_LOW1),min(UTRA_UP1),min(UTRA_UP2)
```

#### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| aclr(offset) | Result of Adjacent Channel Leakage Power Ratio measurement in specified Storage mode |
| avg(offset) | ACLR measurement result (Average) |
| max(offset) | ACLR measurement result (Maximum) |
| min(offset) | ACLR measurement result (Minimum) |
| Resolution | 0.01dB |
| Response unit | dB |

#### Details

The measurement bandwidth of the target adjacent channel varies with the channel bandwidth setting.

#### Example of Use

To query the average of ACLR measurement result:

```
ACLR? AVG
> -61.23,-30.06,-65.68,-62.44,-65.68,-62.44
```

# ACLR_SET

ACLR On/Off and Meas. Count

## Function

Sets or queries the ACLR measurement On/Off state and measurement count.

## Command

```
ACLR_SET on_off[,avg_count]
```

## Query

```
ACLR_SET?
```

## Response

```
on_off,avg_count
```

## Parameters

| | |
|---|---|
| on_off | Enables/disables measurement. |
| ON | Enables measurement |
| OFF | Disables measurement |
| Default | ON |
| avg_count | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

## Examples of Use

To set the ACLR measurement to OFF:

```
ACLR_SET OFF
ACLR_SET?
> OFF
```

## ALLMEASITEMS_OFF

All Measurement Items Off

### Function

Sets all fundamental measurement items to off at one time.

### Command

```
ALLMEASITEMS_OFF
```

### Example of Use

To set all fundamental measurement items to off at one time:

```
ALLMEASITEMS_OFF
```

## BAND

Operation band

### Function

Sets or queries the operation band.

### Command

```
BAND band
```

### Query

```
BAND?
```

### Response

```
band
```

### Parameter

| | |
|---|---|
| band | Operation band |
| Range | 0 to 256 |
| Resolution | 1 |
| Default | 1 |

### Example of Use

To query the operation band:

```
BAND 1
BAND?
> 1
```

Remarks

"0" is returned when the uplink or downlink channel number is set, but the set band is not found in Table 2.1.6-3.

When setting the operation band, change UL and DL channels as the following table.

| Band | UL Channel | DL Channel | Band | UL Channel | DL Channel | Band | UL Channel | DL Channel |
|---|---|---|---|---|---|---|---|---|
| 0 | Not changed | 4980 | … | Not changed | Not changed | 31 | 27785 | 9895 |
| 1 | 18300 | 300 | 17 | 23790 | 5790 | 32 | Not changed | 10140 |
| 2 | 18900 | 900 | 18 | 23925 | 5925 | … | | |
| 3 | 19575 | 1575 | 19 | 24075 | 6075 | 65 | 131522 | 65986 |
| 4 | 20175 | 2175 | 20 | 24300 | 6300 | 66 | 132422 | 66886 |
| 5 | 20525 | 2525 | 21 | 24525 | 6525 | 67 | Not changed | 67436 |
| 6 | 20700 | 2700 | 22 | 25000 | 7000 | 68 | 132822 | 67686 |
| 7 | 21100 | 3100 | 23 | 25600 | 7600 | 69 | Not changed | 68086 |
| 8 | 21625 | 3625 | 24 | 25870 | 7870 | 70 | 133047 | 68461 |
| 9 | 21975 | 3975 | 25 | 26365 | 8365 | 71 | 133297 | 68761 |
| 10 | 22450 | 4450 | 26 | 26865 | 8865 | … | Not changed | Not changed |
| 11 | 22850 | 4850 | 27 | 27125 | 9125 | 85 | 134092 | 70456 |
| 12 | 23095 | 5095 | 28 | 27435 | 9435 | … | Not changed | Not changed |
| 13 | 23230 | 5230 | 29 | Not changed | 9715 | 252 | Not changed | 255644 |
| 14 | 23330 | 5330 | 30 | 27710 | 9820 | … | Not changed | Not changed |
| | | | | | | 255 | Not changed | 261494 |

# BANDWIDTH

Channel Bandwidth

### Function

Sets or queries the Channel Bandwidth.

### Command

```
BANDWIDTH bandwidth
```

### Query

```
BANDWIDTH?
```

### Response

```
bandwidth
```

### Parameter

| bandwidth | Bandwidth |
|---|---|
| 1.4MHZ | 1.4 MHz |
| 3MHZ | 3 MHz |
| 5MHZ | 5 MHz |
| 10MHZ | 10 MHz |
| 15MHZ | 15 MHz |
| 20MHZ | 20 MHz |
| Default | 1.4MHZ |

### Example of Use

To set the channel bandwidth to 1.4 MHz:

```
BANDWIDTH 1.4MHZ
BANDWIDTH?
> 1.4MHZ
```

### Remarks

When the channel bandwidth is updated, Narrowband Index, Number of RB, Starting RB, and Output Level (Total) are changed accordingly.

Narrowband Index is reset to 0, Number of RB is reset to 6, Starting RB is reset to 0.

## CARRF?

Carrier Frequency Result

### Function

Queries the Carrier Frequency measurement result.

### Query

```
CARRF? mode
```

### Response

```
freq
```

### Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| freq | Carrier frequency |
| Resolution | 1 Hz |
| Unit | Hz |

### Example of Use

To query the result of Carrier Frequency measurement:

```
CARRF?
> 1951000000
```

# CARRLEAK?

Carrier Leakage Result

## Function

Queries the Carrier Leakage (Origin offset) measurement result.

## Query

```
CARRLEAK? [mode]
```

## Response

When mode = AVG, MAX, MIN, DVT

```
cleakage
```

When mode = TTL,

```
avg,max,min
```

## Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| cleakage | Carrier Leakage measurement result in specified Storage mode |
| avg | Carrier Leakage measurement result (Average) |
| max | Carrier Leakage measurement result (Maximum) |
| min | Carrier Leakage measurement result (Minimum) |
| Resolution | 0.01 dB |
| Unit | dBc |

## Example of Use

To query the average of Carrier Leakage measurement result:

```
CARRLEAK? AVG
> 20.00
```

## CELLID

Cell ID

### Function

Sets or queries the Cell ID.

### Command

```
CELLID id
```

### Query

```
CELLID?
```

### Response

```
id
```

### Parameter

| | |
|---|---|
| id | Cell ID |
| Range | 0 to 503 |
| Resolution | 1 |
| Default | 0 |
| Suffix code | None |

### Example of Use

To set the Cell ID to 0:

```
CELLID 0
CELLID?
> 0
```

## CFERR?

Carrier Frequency Error Result

### Function

Queries the Frequency Error measurement result.

### Query

```
CFERR? mode
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
freq_ppm,freq_Hz
```

When mode = TTL,

```
avg_ppm,avg_Hz,max_ppm,max_Hz,min_ppm,min_Hz
```

### Parameters

| | | |
|---|---|---|
| mode | Storage mode | |
| AVG | Average | |
| MAX | Maximum | |
| MIN | Minimum | |
| TTL | Average・Maximum・Minimum | |
| DVT | Standard deviation | |
| avg_ppm | Measurement result in ppm (Average) | |
| avg_Hz | Measurement result in Hz (Average) | |
| max_ppm | Measurement result in ppm (Maximum) | |
| max_Hz | Measurement result in Hz (Maximum) | |
| min_ppm | Measurement result in ppm (Minimum) | |
| min_Hz | Measurement result in Hz (Minimum) | |
| freq_ppm | Measurement result in ppm in specified Storage mode | |
| freq_Hz | Measurement results in Hz in specified Storage mode | |
| Resolution | 0.01 ppm | (Measurement result in ppm) |
| | 0.1 Hz | (Measurement result in Hz) |
| Unit | ppm | (Measurement result in ppm) |
| | Hz | (Measurement result in Hz) |

### Example of Use

To query the average of Frequency Error measurement result:

```
CFERR? AVG
> 0.03,60.0
```

## CFERR_WORST?

Worst Carrier Frequency Error Result

### Function

Queries the worst value in Frequency Error measurement results.

### Query

```
CFERR_WORST?
```

### Response

```
freq_ppm,freq_Hz
```

### Parameters

| | |
|---|---|
| freq_ppm | Worst value in Frequency Error measurement results in ppm |
| Resolution | 0.01 ppm |
| Unit | ppm |
| freq_Hz | Worst value in Frequency Error measurement results in Hz |
| Resolution | 0.1 Hz |
| Unit | Hz |

### Example of Use

To query the worst value in Frequency Error measurement results:

```
CFERR_WORST?
> 0.03,60.0
```

# CHCODING

Channel Coding

### Function

Sets or queries the channel coding.

### Command

```
CHCODING object
```

### Query

```
CHCODING?
```

### Response

```
object
```

### Parameter

| | | |
|---|---|---|
| object | | Target for channel coding |
| | RMC | Reference Measurement Channel |
| | Default | RMC |

### Examples of Use

To set the channel coding to RMC:

```
CHCODING RMC
CHCODING?
> RMC
```

# CHCONFIG

RMC Configuration

## Function

Sets or queries the channel configuration of uplink signal when Channel Coding is RMC.

## Command

```
CHCONFIG val
```

## Query

```
CHCONFIG?
```

## Response

```
val
```

## Parameter

| | |
|---|---|
| val | RMC channel configuration |
| PUSCH | PUSCH |
| PUCCH | PUCCH |
| Default | PUSCH |

## Example of Use

To set the channel configuration of uplink signal to PUSCH:

```
CHCONFIG PUSCH
CHCONFIG?
> PUSCH
```

# CHPWR?

Channel Power Result

### Function

Queries the Channel Power measurement result.

### Query

```
CHPWR? [mode]
```

### Response

When mode = AVG, MAX, MIN or DVT,

```
pwr
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,pwr(1),pwr(2),pwr(3),…,pwr(s)
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Average |
| pwr | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| pwr(n) | The n-th measurement result (n=1 to s) |
| Resolution | 0.01 dB |
| Unit | dBm |
| s | Number of valid measurement results |

### Example of Use

To query the average of Channel Power measurement result:

```
CHPWR? AVG
> -20.00
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# CSHIFT

Cyclic Shift

### Function

Sets or queries the Cyclic Shift.

### Command

```
CSHIFT val
```

### Query

```
CSHIFT?
```

### Response

```
val
```

### Parameter

| | |
|---|---|
| val | Enables/disables Cyclic Shift |
| ON | Enables Cyclic Shift |
| OFF | Disables Cyclic Shift |
| AUTO | Sets the Cyclic Shift to Auto. |
| Default | ON |

### Example of Use

To enable the Cyclic Shift:

```
CSHIFT ON
CSHIFT?
> ON
```

# DELTASS

Delta SS

### Function

Sets or queries the Delta SS.

### Command

```
DELTASS val
```

### Query

```
DELTASS?
```

### Response

```
val
```

### Parameter

| | |
|---|---|
| val | Delta SS |
| Range | 0 to 29 |
| Resolution | 1 |
| Default | 0 |
| Suffix code | None |

### Example of Use

To set the Delta SS to 0:

```
DELTASS 0
DELTASS?
> 0
```

# DLCHAN

Downlink Channel

## Function

Sets or queries the Downlink Channel.

## Command

```
DLCHAN dl_ch
```

## Query

```
DLCHAN?
```

## Response

```
dl_ch
```

## Parameter

| | |
|---|---|
| dl_ch | Downlink Channel |
| Range | 0 to 262143 |
| Resolution | 1 |
| Default | 300 |
| Suffix code | None |

## Details

When the Downlink Channel is updated, Operation Band, Uplink Channel, Downlink Frequency and Uplink Frequency are changed accordingly.
For the relationship between the channel and frequency settings refer to Table 2.1.6-2 “Relationship between Uplink Channel Number and Downlink Channel Number” and Table 2.1.6-3 “E-UTRA Channel Numbers and Default UE TX-RX Frequency Separation”.

## Example of Use

To set the Downlink Channel to 300:

```
DLCHAN 300
DLCHAN?
> 300
```

# DLFREQ

Downlink Frequency

## Function

Sets or queries the downlink frequency.

## Command

```
DLFREQ dl_freq
```

## Query

```
DLFREQ?
```

## Response

```
dl_fleq
```

## Parameter

| | |
|---|---|
| dl_freq | Downlink frequency |
| Range | 400 000 000 to 3800.000 000 Hz (MU887000A/01A)<br>400 000 000 to 6000 000 000 Hz (With MU887000A/01A-001)<br>400 000 000 to 6000 000 000 Hz (MU887002A) |
| Resolution | 1 Hz |
| Suffix code | HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted) |
| Default | 2140 000 000 Hz |
| Unit | Hz |

## Details

This sets the Rx frequency for the mobile station.

Updating the Downlink Frequency setting does not affect the Downlink Channel setting.

## Example of Use

To set the downlink frequency to 2140 MHz:

```
DLFREQ 2140MHZ
DLFREQ?
>2140000000
```

# DUPLEXMODE

Duplex Mode

## Function

Sets or queries the Duplex Mode.

## Command

```
DUPLEXMODE mode
```

## Query

```
DUPLEXMODE?
```

## Response

```
mode
```

## Parameter

| | |
|---|---|
| mode | Duplex Mode |
| HALF | Half Duplex |
| Default | HALF |

## Example of Use

To set the Duplex Mode to HALF:

```
DUPLEXMODE HALF
DUPLEXMODE?
> HALF
```

# EVM?

## EVM Result

### Function

Queries the EVM (Error Vector Magnitude) measurement result.

### Query

```
EVM? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT

```
evm
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,evm(1),evm(2),...,evm(s)
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| evm | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| evm(n) | n-th EVM measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| s | Number of valid measurement results |

### Example of Use

To query the average of EVM measurement result:

```
EVM? AVG
> 1.50
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## EVM_H?

EVM Result (High)

### Function

Queries the EVM (Error Vector Magnitude) measurement result.

### Query

```
EVM_H? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT

```
evm
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,evm(1),evm(2),...,evm(s)
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| evm | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| evm(n) | n-th EVM measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| s | Number of valid measurement results |

### Example of Use

To query the average of EVM measurement result:

```
EVM_H? AVG
> 1.50
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# EVM_L?

EVM Result (Low)

## Function

Queries the EVM (Error Vector Magnitude) measurement result.

## Query

```
EVM_L? [mode]
```

## Response

When mode = AVG, MAX, MIN, DVT

```
evm
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,evm(1),evm(2),...,evm(s)
```

## Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| evm | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| evm(n) | n-th EVM measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| s | Number of valid measurement results |

## Example of Use

To query the average of EVM measurement result:

```
EVM_L? AVG
> 1.50
```

## Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# FRAMETYPE

Frame Structure

## Function

Sets or queries the frame structure.

This setting determines the duplex mode.

## Command

```
FRAMETYPE mode
```

## Query

```
FRAMETYPE?
```

## Response

```
mode
```

## Parameter

| | | |
|---|---|---|
| mode | | Frame Structure |
| | FDD | Frequency Division Multiplexing |
| | Default | FDD |

## Example of Use

To set the frame structure to FDD:

```
FRAMETYPE FDD
FRAMETYPE?
> FDD
```

# GROUPHOP

Group Hopping

## Function

Sets or queries the Group Hopping On/Off state.

## Command

```
GROUPHOP on_off
```

## Query

```
GROUPHOP?
```

## Response

```
on_off
```

## Parameter

| | | |
|---|---|---|
| on_off | | Enables/disables Group hopping. |
| | ON | Enables Group hopping. |
| | OFF | Disables Group hopping. |
| | Default | ON |

## Example of Use

To enable Group hopping:

```
GROUPHOP ON
GROUPHOP?
> ON
```

# IBEM_CLFR

In-band Emissions/EVM Carrier Leakage Frequency

### Function

Sets and queries the position of Carrier Leakage Frequency of the UE in the In-band Emission/EVM measurement

### Command

```
IBEM_CLFR clf
```

### Query

```
IBEM_CLFR?
```

### Response

```
clf
```

### Parameter

| | | |
|---|---|---|
| clf | | Position of Carrier Leakage Frequency |
| | CFR | Carrier Frequency |
| | NBC | Narrow Band Center |
| | Default | CFR |

### Details

CFR: The In-band Emission/EVM measurement is performed, treating the resource block located at the center frequency of Aggregated Channel Bandwidth as the carrier leakage frequency.

NBC: The In-band Emission/EVM measurement is performed, treating the center of assigned Narrow Band Index (6RB) as the carrier leakage frequency.

### Example of Use

To set the position of Carrier Leakage Frequency to CFR:

```
IBEM_CLFR CFR
IBEM_CLFR?
> CFR
```

# ILVL

Input Level

## Function

Sets or queries the input level of the input test port.

## Command

```
ILVL level
```

## Query

```
ILVL?
```

## Response

```
level
```

## Parameter

| | | |
|---|---|---|
| level | | Input level of PCC |
| | Range | |
| | MU887000A | –65.0 to +35.0 dBm (Port 1/Port 2) |
| | | –65.0 to +25.0 dBm (Port 3/Port 4) |
| | MU887001A | –65.0 to +35.0 dBm (Port 1 to Port 4) |
| | MU887002A | –65.0 to +35.0 dBm (Port 1 to Port 12) |
| | Resolution | 0.1 dB |
| | Suffix Code | DBM (uses dBm when omitted) |
| | Default | –1.0 dBm |
| | Unit | dBm |

## Details

For MU887000A, the setting range varies with the input test port setting.
If cable loss correction is set to ON, the setting range of the input level is the range of values with added cable loss.
If the cable loss is 5 dB, the MU887000A Port 1/Port 2 setting range is –60.0 to +40.0 dBm.

| | | |
|---|---|---|
| Range | –65.0 + Cable loss to +35.0 + Cable loss [dBm] | (Port 1/Port 2) |
| | –65.0 + Cable loss to +25.0 + Cable loss [dBm] | (Port 3/Port 4) |

## Example of Use

To set the input level to –10.0 dBm:

```
ILVL -10.0
ILVL?
>-10.0
```

## Related Commands

EXTLOSSW
LOSSTBL
LOSSTBLVAL
For details of the commands, refer to Chapter 6 “Native Command Reference” in the *MU887000A TRX Test Module Operation Manual*.

## INBANDEITEM?

In-Band Emissions Measured Item

### Function

Queries whether each in-band emission measurement item is measured or not.

### Query

```
INBANDEITEM?
```

### Response

```
flag
```

### Parameter

| | | |
|---|---|---|
| flag | | Measured/Not measured flag (0 to 7)<br>Returns the sum of the following measurement items. |
| | 0 | Not measured |
| | 1 | Measure General |
| | 2 | Measure IQ Image |
| | 4 | Measure Carrier Leakage |
| | Unit | None |

### Example of Use

To query whether each in-band emission measurement item is measured or not.

```
INBANDEITEM?
> 4
```

# INBANDEPASS?

In-Band Emissions Judgement

## Function

Queries the judgement on the in-band emission measurement result.

## Query

```
INBANDEPASS?
```

## Response

```
judgement
```

## Parameter

| | |
|---|---|
| judgement | Judgement |
| PASS | Pass |
| FAIL | Fail |
| – | Not measured |

## Example of Use

To query the judgement on the in-band emission measurement result:

```
INBANDEPASS?
> PASS
```

# INBANDE_GEN?

In-Band Emissions (General) Result

## Function

Queries in-band emissions (General) for non-allocated RB measurement result.

## Query

```
INBANDE_GEN? [mode]
```

## Response

When mode =AVG, MAX, MIN, DVT,

```
ibe
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,ibe(1),ibe(2),...,ibe(s)
```

## Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| ibe | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| ibe(n) | Nth value in In-Band Emissions (General) measurement result (n = 1 to s) |
| Unit | dB |
| Resolution | 0.01 dB |
| s | Number of valid measurement results |

## Example of Use

To query the maximum of in-band emissions (General) measurement result:

```
INBANDE_GEN? MAX
> 0.04
```

## Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# INBANDE_GENUL?

In-Band Emissions limit (General)

## Function

Queries the limit of the in-band emission (General).

## Query

```
INBANDE_GENUL?
```

## Response

```
level
```

## Parameter

| | |
|---|---|
| level | Limit |
| Resolution | 0.1 dB |
| Unit | dB |

## Example of Use

To query the limit of in-band emission (General):

```
INBANDE_GENUL?
> 2.4
```

## INBANDE_IMG?

In-Band Emissions (IQ Image) Result

### Function

Queries in-band emissions (IQ Image) measurement result.

### Query

```
INBANDE_IMG? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
ibe
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,ibe(1),ibe(2),...,ibe(s)
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| ibe | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| ibe(n) | Nth value in In-Band Emissions (IQ Image) measurement result (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| s | Number of valid measurement results |

### Example of Use

To query the maximum of in-band emissions (IQ Image) measurement result:

```
INBANDE_IMG? MAX
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## INBANDE_IMGUL?

In-Band Emissions limit (IQ Image)

### Function

Queries the limit of in-band emission (IQ Image).

### Query

```
INBANDE_IMGUL?
```

### Response

```
level
```

### Parameter

| | |
|---|---|
| level | Limit |
| Resolution | 0.1 dB |
| Unit | dB |

### Example of Use

To query the limit of in-band emission (IQ Image).

```
INBANDE_IMGUL?
> 1.4
```

## INBANDE_LEAK?

In-Band Emissions (Carrier Leakage) Result

### Function

Queries the In-band emissions (Carrier Leakage) measurement result.

### Query

```
INBANDE_LEAK? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
ibe
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,ibe(1),ibe(2),...,ibe(s)
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| ibe | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| ibe(n) | Nth value in In-Band Emissions (Carrier Leakage) measurement result (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| s | Number of valid measurement results |

### Example of Use

To query the maximum of in-band emissions (Carrier Leakage) measurement result:

```
INBANDE_LEAK? MAX
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## INBANDE_LEAKUL?

In-Band Emissions limit (Carrier Leakage)

### Function

Queries the limit of in-band emission (Carrier Leakage).

### Query

```
INBANDE_LEAKUL?
```

### Response

```
level
```

### Parameter

| | |
|---|---|
| level | Limit |
| Resolution | 0.1 dB |
| Unit | dBc |

### Example of Use

To query the limit of in-band emission (Carrier Leakage).

```
INBANDE_LEAKUL?
> 1.4
```

# INBANDE_MARG?

In-Band Emissions Margin

## Function

Queries the worst margin in the entire bandwidth for in-band emission measurement.

## Query

```
INBANDE_MARG?
```

## Response

```
margin
```

## Parameter

| | |
|---|---|
| margin | Worst margin |
| Resolution | 0.01 dB |
| Unit | dB |

## Example of Use

Queries the worst margin in the entire bandwidth of in-band emission measurement:

```
INBANDE_MARG?
> 1.40
```

## IQIMB_DB?

IQ Imbalance (dB) Result

### Function

Queries the IQ Imbalance measurement result.

### Query

```
IQIMB_DB? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
magnitude
```

When mode = TTL,

```
avg,max,min
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| magnitude | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of IQ Imbalance measurement result:

```
IQIMB_DB? AVG
> 0.05
```

## IQIMB_PER?

IQ Imbalance (%) Result

### Function

Queries the IQ Imbalance measurement result.

### Query

```
IQIMB_PER? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
percent
```

When mode = TTL,

```
avg,max,min
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| percent | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| Resolution | 0.01% |
| Unit | % |

### Example of Use

To query the average of IQ Imbalance measurement result:

```
IQIMB_PER? AVG
> 0.05
```

# MAGTDERR?

Magnitude Error Result

### Function

Queries the Magnitude Error measurement result.

### Query

```
MAGERR? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
magnitude
```

When mode = TTL,

```
avg,max,min
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| magnitude | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| Resolution | 0.01% |
| Unit | % |

### Example of Use

To query the average of Magnitude Error measurement result:

```
MAGTDERR? AVG
> 1.05
```

# MOD_SET

Modulation Analysis On/Off and Meas. Count

### Function

Sets or queries the Modulation Analysis On/Off state and measurement count.

### Command

```
MOD_SET on_off[,avg_count]
```

### Query

```
MOD_SET?
```

### Response

```
on_off,avg_count
```

### Parameters

| | |
|---|---|
| on_off | Enables/disables measurement. |
| ON | Enables measurement. |
| OFF | Disables measurement. |
| Default | OFF |
| avg_count | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

### Example of Use

To set the Modulation Analysis to On and measurement count to 200:

```
MOD_SET ON,200
MOD_SET?
> ON,200
```

# NRBCQI

nRB-CQI

## Function

Sets or queries the nRB-CQI.

## Command

```
NRBCQI value
```

## Query

```
NRBCQI?
```

## Response

```
value
```

## Parameter

| | |
|---|---|
| value | nRB-CQI |
| Range | 0 to 8 |
| Resolution | 1 |
| Suffix code | None |
| Default | 0 |

## Details

This command sets the number of RBs to send the Uplink PUCCH signal.

## Example of Use

To set the nRB-CQI to 3:

```
NRBCQI 3
NRBCQI?
> 3
```

## OBW?

OBW Result

### Function

Queries the OBW (Occupied Bandwidth) measurement result.

### Query

```
OBW?
```

### Response

```
bw
```

### Parameter

| | | |
|---|---|---|
| bw | | Occupied Bandwidth |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Example of Use

To query the OBW measurement result:

```
OBW?
> 1080000
```

# OBWFREQ?

OBW Frequency Result

## Function

Queries the upper, lower and center frequency of OBW (Occupied Bandwidth) measurement results.

## Query

```
OBWFREQ? pos
```

## Response

```
freq
```

## Parameters

| | |
|---|---|
| pos | Offset type |
| UPPER | Upper frequency |
| LOWER | Lower frequency |
| CENTER | Center frequency |
| freq | Offset frequency |
| Resolution | 0.1 Hz |
| Unit | Hz |

## Example of Use

To query the upper frequency of OBW measurement result:

```
OBWFREQ? UPPER
> 1951920000.0
```

# OBW_SET

OBW On/Off and Meas. Count

## Function

Sets or queries the OBW (Occupied Bandwidth) measurement On/Off state and measurement count.

## Command

```
OBW_SET on_off[,avg_count]
```

## Query

```
OBW_SET?
```

## Response

```
on_off,avg_count
```

## Parameters

| | |
|---|---|
| on_off | Enables/disables measurement. |
| ON | Enables measurement. |
| OFF | Disables measurement. |
| Default | ON |
| avg_count | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

## Example of Use

To set OBW measurement on and set the measurement count to 50:

```
OBW_SET ON,50
OBW_SET?
> ON,50
```

# OLVL

Output Level (Total)

## Function

Sets or queries the total output level of all channels.

## Command

```
OLVL level
```

## Query

```
OLVL?
```

## Response

```
level
```

## Parameter

level Output level

Range

| | | |
|---|---|---|
| MU887000A | 400 MHz ≤ frequency ≤ 3800 MHz | |
| | –130.0 to –10.0 dBm | (Port 1/Port 2) |
| | –120.0 to 0.0 dBm | (Port 3/Port 4) |
| | 3800 MHz < frequency ≤ 6000 MHz | |
| | –130.0 to –18.0 dBm | (Port 1/Port 2) |
| | –120.0 to –8.0 dBm | (Port 3/Port 4) |
| MU887001A | 400 MHz ≤ frequency ≤ 3800 MHz | |
| | –130.0 to –10.0 dBm | (Port 1 to Port 4) |
| | 3800 MHz < frequency ≤ 6000 MHz | |
| | –130.0 to –18.0 dBm | (Port 1 to Port 4) |
| MU887002A | 400 MHz < frequency ≤ 6000 MHz | |
| | –130.0 to 0.0 dBm | (Port 1 to Port 12) |

| | |
|---|---|
| Resolution | 0.1 dB |
| Suffix Code | DBM (uses dBm when omitted) |
| Default | –66.4 dBm |
| Unit | dBm |

## Details

For MU887000A, the setting range varies with the output test port setting.
If cable loss correction is set to ON, the setting range of the output level is the range of values with subtracted cable loss.
If the cable loss is 5 dB and frequency ≤ 3800 MHz,
the MU887000A Port 1 /Port 2 setting range is –135.0 to –15.0 dBm.

| | |
|---|---|
| Range | –130.0 – Cable loss to –10.0 – Cable loss [dBm] (Port 1/Port 2) |
| | –120.0 – Cable loss to 0.0 – Cable loss [dBm] (Port 3/Port 4) |

### Example of Use

To set the output level to –50.0 dBm:

```
OLVL -50.0
OLVL?
> -50.0
```

### Related Commands

EXTLOSSW
LOSSTBL
LOSSTBLVAL
For details of the commands, refer to Chapter 6 “Native Command Reference” in the *MU887000A TRX Test Module Operation Manual*.

### Remarks

When the Output Level (Total) is updated, the Output Level (Total 1.4 MHz) is changed accordingly.
Output Level (Total 1.4 MHz) = Output Level (Total) – 10log10(nSC/72)

| Channel Bandwidth | nSC | 10log10(nSC/72)<br>Round to one decimal place |
|---|---|---|
| 1.4 MHz | 72 | 0 |
| 3 MHz | 180 | 4.0 |
| 5 MHz | 300 | 6.2 |
| 10 MHz | 600 | 9.2 |
| 15 MHz | 900 | 10.9 |
| 20 MHz | 1200 | 12.2 |

# OLVL_NB

Output Level (Total 1.4 MHz)

### Function

Sets or queries the output level of Narrowband total (dBm/1.4 MHz).

### Command

```
OLVL_NB level
```

### Query

```
OLVL_NB?
```

### Response

```
level
```

### Parameter

level Output level

| | |
|---|---|
| Range | Refer to the following table. |
| Resolution | 0.1 dB/1.4 MHz |
| Default | –66.4 dBm |
| Suffix code | DBM, (uses dBm when omitted) |
| Unit | dBm |

| Channel Bandwidth | MU887000A Port 1/2 MU887001A Port 1 to 4 | MU887000A Port 3/4 | MU887002A TRX 1/2 Port 1 to 12 |
|---|---|---|---|
| 1.4 MHz | –130.0 to –10.0 dBm | –120.0 to 0.0 dBm | –130.0 to 0.0 dBm |
| 3 MHz | –134.0 to –14.0 dBm | –124.0 to –4.0 dBm | –134.0 to –4.0 dBm |
| 5 MHz | –136.2 to –16.2 dBm | –126.2 to –6.2 dBm | –136.2 to –6.2 dBm |
| 10 MHz | –139.2 to –19.2 dBm | –129.2 to –9.2 dBm | –139.2 to –9.2 dBm |
| 15 MHz | –140.9 to –20.9 dBm | –130.9 to –10.9 dBm | –140.9 to –10.9 dBm |
| 20 MHz | –142.2 to –22.2 dBm | –132.2 to –12.2 dBm | –142.2 to –12.2 dBm |

### Details

The setting range varies with the output port setting.
When the Cable Loss Calibration is ON, the cable loss is subtracted from the output level setting range.

### Example of Use

To set the output level to –50.0 dBm:

```
OLVL_NB -50.0
OLVL_NB?
>-50.0
```

Related Commands

EXTLOSSW
LOSSTBL
LOSSTBLVAL
For details of the commands, refer to Chapter 6 “Native Command Reference” in the *MU887000A TRX Test Module Operation Manual*.

Remarks

When the Output Level (Total 1.4 MHz) is updated, the Output Level (Total) is changed accordingly.
Output Level (Total) = Output Level (Total 1.4 MHz) + 10log10(nSC/72)

| Channel Bandwidth | nSC | 10log10(nSC/72)<br>Round to one decimal place |
|---|---|---|
| 1.4 MHz | 72 | 0 |
| 3 MHz | 180 | 4.0 |
| 5 MHz | 300 | 6.2 |
| 10 MHz | 600 | 9.2 |
| 15 MHz | 900 | 10.9 |
| 20 MHz | 1200 | 12.2 |

When changing Channel Bandwidth, if the set value exceeds the upper limit or falls below the lower limit, the value is rounded to the limit.

# PHASEERR?

## Phase Error Result

### Function

Queries the Phase Error measurement result.

### Query

```
PHASEERR? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
phase
```

When mode = TTL,

```
avg,max,min
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| phase | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| Resolution | 0.01 degree |
| Unit | degree |

### Example of Use

To query the average of Phase Error measurement result:

```
PHASEERR? AVG
> 1.55
```

## POWER?

Tx Power Result

### Function

Queries the Tx Power measurement result.

### Query

```
POWER? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
pwr
```

When mode = TTL,

```
avg,max,min
```

When mode = IND

```
s,pwr(1),pwr(2),...,pwr(s)
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| pwr | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| pwr(n) | The n-th Measurement result (n=1 to s) |
| Resolution | 0.01 dB |
| Unit | dBm |
| s | Number of valid measurement results |

### Example of Use

To query the Tx Power measurement result:

```
POWER? AVG
> -20.00
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# PVECTERR?

Peak EVM Result

## Function

Queries the peak EVM (Error Vector Magnitude) measurement result.

## Query

```
PVECTERR? [mode]
```

## Response

When mode = AVG, MAX, MIN, DVT,

```
pevm
```

When mode = TTL,

```
avg,max,min
```

## Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| pevm | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| Resolution | 0.01% |
| Unit | % |

## Example of Use

To query the average of Peak EVM measurement result:

```
PVECTERR? AVG
> 1.75
```

# PWR_SET

Power Measurement On/Off and Meas. Count

## Function

Sets or queries the Tx Power Measurement On/Off state and measurement count.

## Command

```
PWR_SET on_off[,avg_count]
```

## Query

```
PWR_SET?
```

## Response

```
on_off,avg_count
```

## Parameters

| | |
|---|---|
| on_off | Enables/disables measurement. |
| ON | Enables measurement. |
| OFF | Disables measurement. |
| Default | ON |
| avg_count | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

## Example of Use

To set Tx Power measurement ON and set the measurement count to 200:

```
PWR_SET ON,200
PWR_SET?
> ON,200
```

# RBSEARCH

RB Search

## Function

Sets or queries the RB Search On/Off state.

## Command

```
RBSEARCH on_off
```

## Query

```
RBSEARCH?
```

## Response

```
on_off
```

## Parameter

| | | |
|---|---|---|
| on_off | | RB Search On/Off |
| | ON | Enables RB Search.<br>Detects the Resource Block automatically in 20 MHz bandwidth. |
| | OFF | Disables RB Search.<br>Measures the Resource Block specified by Narrowband Index. |
| | Default | OFF |

## Example of Use

To enable the RB Search:

```
RBSEARCH ON
RBSEARCH?
> ON
```

## RHO?

### Rho Result

#### Function

Queries the Rho (waveform quality) measurement result.

#### Query

```
RHO? [mode]
```

#### Response

When mode = AVG, MAX, MIN, DVT,

```
rho
```

When mode = TTL,

```
avg,max,min
```

#### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Average |
| rho | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| Resolution | 0.00001 |

#### Example of Use

To query the average of Signal Quality measurement (Rho) result:

```
RHO? AVG
> 0.00004
```

# RSEVM?

Reference Signal EVM Result

### Function

Queries the EVM measurement result of Reference Signal.

### Query

```
RSEVM? [mode]
```

### Response

When mode = AVG, MAX, MIN, DVT,

```
rsevm
```

When mode = TTL,

```
avg,max,min
```

When mode = IND,

```
s,rsevm(1),rsevm(2),...,rsevm(s)
```

### Parameters

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| IND | Individual measurement result |
| DVT | Standard deviation |
| Omitted | Average |
| rsevm | Measurement result in specified Storage mode |
| avg | Measurement result (Average) |
| max | Measurement result (Maximum) |
| min | Measurement result (Minimum) |
| rsevm(n) | The n-th Measurement result (n=1 to s) |
| Resolution | 0.01% |
| Unit | % |
| s | Number of valid measurement results |

### Example of Use

To query the average of Reference Signal EVM measurement result:

```
RSEVM? AVG
> 1.51
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# RXFREQ

Downlink Frequency

## Function

Sets or queries the downlink frequency.

## Command

```
RXFREQ dl_freq
```

## Query

```
RXFREQ?
```

## Response

```
dl_freq
```

## Parameter

| | | |
|---|---|---|
| dl_freq | | Downlink frequency |
| | Range | 400 000 000 to 3800 000 000 Hz (MU887000A/01A)<br>400 000 000 to 6000 000 000 Hz (With MU887000A/01A-001)<br>400 000 000 to 6000 000 000 Hz (MU887002A) |
| | Resolution | 1 Hz |
| | Suffix code | HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted) |
| | Default | 2140 000 000 Hz |
| | Unit | Hz |

## Details

This sets the Rx frequency for the mobile station.

Updating the Downlink Frequency setting does not affect the Downlink Channel setting.

## Example of Use

To set the downlink frequency to 2140 MHz:

```
RXFREQ 2140MHZ
RXFREQ?
>2140000000
```

## SEMPASS?

SEM Judgement

### Function

Queries the judgement result of SEM (Spectrum Emission Mask) measurement.
Fail when any part of spectrum exceeds limit, otherwise Pass.

### Query

```
SEMPASS?
```

### Response

```
judgement
```

### Parameter

| | |
|---|---|
| judgement | Judgement result |
| PASS | Pass |
| FAIL | Fail |
| – | Not measured |

### Example of Use

To query the judgement result of SEM measurement:

```
SEMPASS?
> PASS
```

## SEM_SET

SEM On/Off and Meas. Count

### Function

Sets or queries the SEM (Spectrum Emission Mask) Measurement On/Off state and measurement count.

### Command

```
SEM_SET on_off[,avg_count]
```

### Query

```
SEM_SET?
```

### Response

```
on_off,avg_count
```

### Parameters

| | |
|---|---|
| on_off | Enables/disables the measurement. |
| ON | Enables the measurement. |
| OFF | Disables the measurement. |
| Default | OFF |
| avg_count | Measurement count |
| Range | 1 to 500 |
| Resolution | 1 |
| Suffix code | None |
| Default | 1 |

### Example of Use

To set the SEM measurement to On and set the measurement count to 100:

```
SEM_SET ON,100
SEM_SET?
> ON,100
```

## SIB2_NS

additionalSpectrumEmission

### Function

Sets or queries the additionalSpectrumEmission in SIB2.
This setting determines the Spectrum Emission Mask frequency range.

### Command

```
SIB2_NS sib2_ns
```

### Query

```
SIB2_NS?
```

### Response

```
sib2_ns
```

### Parameter

| sib2_ns | additionalSpectrumEmission |
|---|---|
| NS_01 | NS_01 |
| NS_02 | NS_02 |
| NS_03 | NS_03 |
| … | |
| NS_31 | NS_31 |
| NS_32 | NS_32 |
| Default | NS_01 |

### Example of Use

To set the additionalSpectrumEmission in SIB2 to NS_02:

```
SIB2_NS NS_02
SIB2_NS?
> NS_02
```

## SPECFLAT1?

Spectrum Flatness (≥ 3 MHz) Result

### Function

Queries the worst value in the Spectrum Flatness measurement result in Range 1.

### Query

```
SPECFLAT1?
```

### Response

```
worst
```

### Parameter

| | |
|---|---|
| worst | Worst value in Range 1 |
| Resolution | 0.01 dB |
| Unit | dB |

### Details

The worst value should be either the maximum or minimum of the Flatness measurement results in Range 1, whichever has a larger absolute value.

### Example of Use

To query the worst value in the Spectrum Flatness measurement result in Range 1:

```
SPECFLAT1?
> 0.04
```

## SPECFLAT1_M?

Spectrum Flatness (≥ 3 MHz (R1 –)) Result

### Function

Queries the minimum value in the Spectrum Flatness measurement result in Range 1.

### Query

```
SPECFLAT1_M? [mode]
```

### Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

### Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Minimum |
| sflatness | Minimum value in Range 1 in specified Storage mode. |
| avg | Minimum value in Range 1 (Average) |
| max | Minimum value in Range 1 (Maximum) |
| min | Minimum value in Range 1 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of minimum value in the Spectrum Flatness measurement result in Range 1:

```
SPECFLAT1_M? AVG
> 0.04
```

## SPECFLAT1_P?

Spectrum Flatness (≥ 3 MHz (R1 +)) Result

### Function

Queries the maximum value in the Spectrum Flatness measurement result in Range 1.

### Query

```
SPECFLAT1_P? [mode]
```

### Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

### Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Maximum |
| sflatness | Maximum value in Range 1 in specified Storage mode. |
| avg | Maximum value in Range 1 (Average) |
| max | Maximum value in Range 1 (Maximum) |
| min | Maximum value in Range 1 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of maximum value in the Spectrum Flatness measurement result in Range 1:

```
SPECFLAT1_P? AVG
> 0.04
```

## SPECFLAT2?

Spectrum Flatness (<3 MHz) Result

### Function

Queries the worst value in the Spectrum Flatness measurement result in Range 2.

### Query

```
SPECFLAT2?
```

### Response

```
worst
```

### Parameter

| | |
|---|---|
| worst | Worst value in Range 2 |
| Resolution | 0.01 dB |
| Unit | dB |

### Details

The worst value should be either the maximum or minimum of the Flatness measurement results in Range 2, whichever has a larger absolute value.

### Example of Use

To query the worst value in the Spectrum Flatness measurement result in Range 2:

```
SPECFLAT2?
> 0.04
```

## SPECFLAT2_M?

Spectrum Flatness (<3 MHz (R2 –)) Result

### Function

Queries the minimum value in the Spectrum Flatness measurement result in Range 2.

### Query

```
SPECFLAT2_M? [mode]
```

### Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

### Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Minimum |
| sflatness | Minimum value in Range 2 in specified Storage mode. |
| avg | Minimum value in Range 2 (Average) |
| max | Minimum value in Range 2 (Maximum) |
| min | Minimum value in Range 2 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

### Example of Use

To query the average of minimum value in the Spectrum Flatness measurement result in Range 2:

```
SPECFLAT2_M? AVG
> 0.04
```

# SPECFLAT2_P?

Spectrum Flatness (<3 MHz (R2 +)) Result

## Function

Queries the maximum value in the Spectrum Flatness measurement result in Range 2.

## Query

```
SPECFLAT2_P? [mode]
```

## Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

## Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| Omitted | Maximum |
| sflatness | Maximum value in Range 2 in specified Storage mode. |
| avg | Maximum value in Range 2 (Average) |
| max | Maximum value in Range 2 (Maximum) |
| min | Maximum value in Range 2 (Minimum) |
| Resolution | 0.01 dB |
| Unit | dB |

## Example of Use

To query the average of maximum value in the Spectrum Flatness measurement result in Range 2:

```
SPECFLA21_P? AVG
> 0.04
```

## SPECFLATITEM?

Spectrum Flatness Measured Item

### Function

Queries whether a spectrum flatness measurement item(s) is measured or not.

### Query

```
SPECFLATITEM?
```

### Response

```
flag
```

### Parameter

| | | |
|---|---|---|
| flag | | Measured/Not measured flag (0 to 3)<br>Returns the sum of the following measurement items. |
| | 0 | Not measured |
| | 1 | ≥ 3 MHz area |
| | 2 | < 3 MHz area |
| | Unit | None |

### Example of Use

To query whether a spectrum flatness measurement item(s) is measured or not.

```
SPECFLATITEM?
> 2
```

# SPECFLATPPPASS?

Spectrum Flatness Judgement

### Function

Queries the judgement of Spectrum Flatness measurement result.

### Query

```
SPECFLATPPPASS?
```

### Response

```
judgement
```

### Parameter

| | |
|---|---|
| judgement | Judgement |
| PASS | Pass |
| FAIL | Fail |
| – | Not measured |

### Example of Use

To query the judgement of Spectrum Flatness measurement result:

```
SPECFLATPPPASS?
> PASS
```

### Remarks

Queries a pass/fail judgement result only when the corresponding test parameter is selected.

## SPECFLAT_RP?

Spectrum Flatness (RP Total) Result

### Function

Queries all ripple values in the Spectrum Flatness measurement result.

### Query

```
SPECFLAT_RP? [mode]
```

### Response

mode = AVG, MAX, MIN, DVT

```
sflat(RP1),sflat(RP2),sflat(RP12),sflat(RP21)
```

mode = TTL

```
avg(RP1),avg(RP2),avg(RP12),avg(RP21),
max(RP1),max(RP2),max(RP12),max(RP21),
min(RP1),min(RP2),min(RP12),min(RP21)
```

mode = IND

```
s,sflat(RP1)(1),sflat(RP2)(1),sflat(RP12)(1),sflat(RP21)(1),
...,sflat(RP1)(s),sflat(RP2)(s),sflat(RP12)(s),sflat(RP21)(s)
```

### Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| sflat | Ripple value in specified Storage mode. |
| avg | Ripple value (Average) |
| max | Ripple value (Maximum) |
| min | Ripple value (Minimum) |
| sflat(n) | Nth ripple value (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| s | Measurement count |

### Example of Use

To query the average of every ripple value in the Spectrum Flatness measurement result:

```
SPECFLAT_RP? AVG
> 0.04,0.03,0.06,0.05
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# SPECFLAT_RP1?

Spectrum Flatness (≥ 3 MHz (RP1)) Result

## Function

Queries the ripple value(s) in the Spectrum Flatness measurement result in Range 1.

## Query

```
SPECFLAT_RP1? [mode]
```

## Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

mode = IND

```
s,sflatness(1),sflatness(2),...,sflatness(s)
```

## Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| sflatness | Ripple value in Range 1 in specified Storage mode. |
| avg | Ripple value in Range 1 (Average) |
| max | Ripple value in Range 1 (Maximum) |
| min | Ripple value in Range 1 (Minimum) |
| sflatness(n) | Nth ripple value in Range 1 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| s | Measurement count |

## Example of Use

To query the average of ripple values in the Spectrum Flatness measurement result in Range 1:

```
SPECFLAT_RP1? AVG
> 0.04
```

## Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## SPECFLAT_RP12?

Spectrum Flatness (RP12) Result

### Function

Queries the difference between the maximum value in Range 1 and the minimum value in Range 2 of the Spectrum Flatness measurement result.

### Query

```
SPECFLAT_RP12? [mode]
```

### Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

mode = IND

```
s,sflatness(1),sflatness(2),...,sflatness(s)
```

### Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| sflatness | Difference between the maximum value in Range 1 and the minimum value in Range 2 in specified Storage mode. |
| avg | Difference between the maximum value in Range 1 and the minimum value in Range 2 (Average) |
| max | Difference between the maximum value in Range 1 and the minimum value in Range 2 (Maximum) |
| min | Difference between the maximum value in Range 1 and the minimum value in Range 2 (Minimum) |
| sflatness(n) | Nth difference between the maximum value in Range 1 and the minimum value in Range 2 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| s | Measurement count |

Example of Use

To query the average of difference between the maximum value in Range 1 and the minimum value in Range 2:

```
SPECFLAT_RP12? AVG
> 0.04
```

Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

## SPECFLAT_RP2?

Spectrum Flatness (<3 MHz (RP2)) Result

### Function

Queries the ripple value(s) in the Spectrum Flatness measurement result in Range 2.

### Query

```
SPECFLAT_RP2? [mode]
```

### Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

mode = IND

```
s,sflatness(1),sflatness(2),...,sflatness(s)
```

### Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| sflatness | Ripple value in Range 2 in specified Storage mode. |
| avg | Ripple value in Range 2 (Average) |
| max | Ripple value in Range 2 (Maximum) |
| min | Ripple value in Range 2 (Minimum) |
| sflatness(n) | Nth ripple value in Range 2 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| s | Measurement count |

### Example of Use

To query the average of ripple values in the Spectrum Flatness measurement result in Range 2:

```
SPECFLAT_RP2? AVG
> 0.04
```

### Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# SPECFLAT_RP21?

Spectrum Flatness (RP21) Result

## Function

Queries the difference between the maximum value in Range 2 and the minimum value in Range 1 of the Spectrum Flatness measurement result.

## Query

```
SPECFLAT_RP21? [mode]
```

## Response

mode = AVG, MAX, MIN, DVT

```
sflatness
```

mode = TTL

```
avg,max,min
```

mode = IND

```
s,sflatness(1),sflatness(2),...,sflatness(s)
```

## Parameter

| | |
|---|---|
| mode | Storage mode |
| AVG | Average |
| MAX | Maximum |
| MIN | Minimum |
| TTL | Average・Maximum・Minimum |
| DVT | Standard deviation |
| IND | Individual measurement result |
| Omitted | Maximum |
| sflatness | Difference between the maximum value in Range 2 and the minimum value in Range 1 in specified Storage mode. |
| avg | Difference between the maximum value in Range 2 and the minimum value in Range 1 (Average) |
| max | Difference between the maximum value in Range 2 and the minimum value in Range 1 (Maximum) |
| min | Difference between the maximum value in Range 2 and the minimum value in Range 1 (Minimum) |
| sflatness(n) | Nth difference between the maximum value in Range 2 and the minimum value in Range 1 (n = 1 to s) |
| Resolution | 0.01 dB |
| Unit | dB |
| s | Measurement count |

Example of Use

To query the average of difference between the maximum value in Range 2 and the minimum value in Range 1:

```
SPECFLAT_RP21? AVG
> 0.04
```

Remarks

By specifying the argument IND, the measurement results for the average count can be queried.

# TTL_WORST_SEM?

SEM Template Margin (All range)

## Function

Queries the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement.

## Query

```
TTL_WORST_SEM?
```

## Response

```
margin(-1),freq(-1),…,margin(-4),freq(-4),margin(1),freq(1),…,
margin(4),freq(4)
```

## Parameters

| | | |
|---|---|---|
| margin(n) | | Worst margin in each frequency range<br>(Frequency range: n= –4 to –1, 1 to 4) |
| | Resolution | 0.01 dB |
| | Unit | dB |
| freq(n) | | Offset frequency of the worst margin in each frequency range<br>(Frequency range: n= –4 to –1, 1 to 4) |
| | Resolution | 1 Hz |
| | Unit | Hz |

## Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4” for Frequency ranges.

## Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement:

```
TTL_WORST_SEM?
> -20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20,-20.0,20
```

# TTL_WORST_SEM_DET?

SEM Template Margin (Detail) (All range)

## Function

Queries the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement.

## Query

```
TTL_WORST_SEM_DET?
```

## Response

```
margin(-1),freq(-1),…,margin(-9),freq(-9),margin(1),freq(1),…,
margin(9),freq(9)
```

## Parameters

| | |
|---|---|
| margin(n) | Worst margin in each frequency range<br>(Frequency range: n= –9 to –1, 1 to 9) |
| Resolution | 0.01 dB |
| Unit | dB |
| freq(n) | Offset frequency of the worst margin in each frequency range<br>(Frequency range: n= –9 to –1, 1 to 9) |
| Resolution | 1 Hz |
| Unit | Hz |

## Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
The frequency range varies according to the channel bandwidth.
Refer to Table 2.4-3 “Frequency ranges of Range 1 to Range 9 (Detail)” for Frequency ranges.

## Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in each frequency range of SEM measurement:

```
TTL_WORST_SEM_DET?
> -20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,-20.0,1900000000,
-20.0,1900000000,-20.0,1900000000
```

# TTL_WORST_SEM_DET_LV?

SEM Worst Value (Detail) (All range)

## Function

Queries the worst spectrum level with offset frequency in each frequency range of SEM measurement.

## Query

```
TTL_WORST_SEM_DET_LV?
```

## Response

```
level(-1),freq(-1),…,level(-9),freq(-9),level(1),freq(1),…,
level(9),freq(9)
```

## Parameters

| | | |
|---|---|---|
| level(n) | | Worst spectrum level in each frequency range<br>(Frequency range: n = –9 to –1, 1 to 9) |
| | Resolution | 0.01 dB |
| | Unit | dBm |
| freq(n) | | Offset frequency of the worst spectrum level in each frequency range<br>(Frequency range: n = –9 to –1, 1 to 9) |
| | Resolution | 1 Hz |
| | Unit | Hz |

## Details

Refer to Table 2.4-3 “Frequency ranges of Range 1 to Range 9 (Detail)” for Frequency ranges.

## Example of Use

To query the worst spectrum level with offset frequency in each frequency range of SEM measurement:

```
TTL_WORST_SEM_DET_LV?
> -94.90,-855000,-79.73,-1500000,-79.82,-2300000,-78.96,-4300000,
-79.62,-5500000,-79.54,-9500000,-79.47,-14500000,-79.54,-19500000,
-79.42,-23500000,-93.80,735000,-77.64,2000000,-77.61,2300000,
-9.48,4500000,-72.78,5500000,-77.38,6500000,-78.50,12500000,
-78.60,16500000,-78.73,22500000
```

## TTL_WORST_SEM_LV?

SEM Worst Value (All range)

### Function

Queries the worst spectrum level with offset frequency in each frequency range of SEM measurement.

### Query

```
TTL_WORST_SEM_LV?
```

### Response

```
level(-1),freq(-1),…,level(-4),freq(-4),level(1),freq(1),…,
level(4),freq(4)
```

### Parameters

| | | |
|---|---|---|
| level(n) | | Worst spectrum level in each frequency range<br>(Frequency range: n = –4 to –1, 1 to 4) |
| | Resolution | 0.01 dB |
| | Unit | dBm |
| freq(n) | | Offset frequency of the worst spectrum level in each frequency range<br>(Frequency range: n = –4 to –1, 1 to 4) |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Details

Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4 (General)” for Frequency ranges.

### Example of Use

To query the worst spectrum level with offset frequency in each frequency range of SEM measurement:

```
TTL_WORST_SEM_LV?
> -20.0, 30, -20.0, 30, -20.0, 30, -20.0, 30, -20.0, 30, -20.0, 30, -20.0,
30, -20.0, 30
```

# TRGDLY

Trigger Delay

## Function

Sets or queries the Trigger Delay.

## Command

```
TRGDLY delay
```

## Query

```
TRGDLY?
```

## Response

delay

## Parameters

| | |
|---|---|
| delay | Trigger Delay |
| Range | 0.000 to 10.000 ms |
| Resolution | 0.001 ms |
| Suffix code | S MS US NS (uses ms when omitted) |
| Default | 0.000 ms |
| Unit | ms |

## Example of Use

To set the Trigger Delay to 0.001 ms:

```
TRGDLY 0.001
TRGDLY?
> 0.001
```

# TRGLVL

Trigger Level

## Function

Sets or queries the Trigger Level.

## Command

```
TRGLVL level
```

## Query

```
TRGLVL?
```

## Response

```
level
```

## Parameters

| | |
|---|---|
| level | Trigger Level |
| Range | –40 to 0 dB |
| Resolution | 1 dB |
| Suffix code | DB |
| Default | –30 dB |
| Unit | dB |

## Details

This command is available when trigger source is set to Rise Config.

## Example of Use

To set the Trigger Level to –30 dB:

```
TRGLVL -30
TRGLVL?
> -30
```

# TRGSRC

Trigger Source

## Function

Sets or queries the Trigger Source.

## Command

```
TRGSRC source
```

## Query

```
TRGSRC?
```

## Response

source

## Parameters

| | |
|---|---|
| source | Trigger Source |
| FRAME | Frame |
| RISE_CONFIG | Rise Config |
| Default | RISE_CONFIG |

## Example of Use

To set the Trigger Source to Rise Config:

```
TRGSRC RISE_CONFIG
TRGSRC?
> RISE_CONFIG
```

# TRGTOUT

Trigger Timeout

## Function

Sets or queries the Trigger Timeout.

## Command

```
TRGTOUT time
```

## Query

```
TRGTOUT?
```

## Response

```
time
```

## Parameters

| | |
|---|---|
| time | Trigger Timeout |
| Range | 1 to 60 s |
| Unit | s |
| Resolution | 1 s |
| Suffix code | NS, US, MS, S (uses s when omitted) |
| Default | 10 s |

## Example of Use

To set the Trigger Timeout to 10 s:

```
TRGTOUT 10
TRGTOUT?
> 10
```

# TXFREQ

Uplink Frequency

## Function

Sets or queries the uplink frequency.

This command has the same function as ULFREQ.

## Command

```
TXFREQ ul_freq
```

## Query

```
TXFREQ?
```

## Response

```
ul_freq
```

## Parameter

| | |
|---|---|
| ul_freq | Uplink frequency |
| Range | 400 000 000 to 3800 000 000 Hz (MU887000A/01A)<br>400 000 000 to 6000 000 000 Hz (With MU887000A/01A-001)<br>400 000 000 to 6000 000 000 Hz (MU887002A) |
| Resolution | 1 Hz |
| Suffix code | HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted) |
| Default | 1950 000 000 Hz |
| Unit | Hz |

## Details

This sets the Tx frequency for the mobile station.

Updating this Uplink frequency does not affect the Uplink Channel parameters.

## Example of Use

To set the Uplink frequency to 1950 MHz:

```
TXFREQ 1950MHZ
TXFREQ?
>1950000000
```

# ULCHAN

Uplink Channel

### Function

Sets or queries the Uplink Channel.

### Command

```
ULCHAN ul_ch
```

### Query

```
ULCHAN?
```

### Response

```
ul_ch
```

### Parameter

| | |
|---|---|
| ul_ch | Uplink Channel |
| Range | 0 to 262143 |
| Resolution | 1 |
| Suffix code | None |
| Default | 18300 |

### Details

When the Uplink Channel is updated, the related Operation Band, Downlink Channel, Uplink Frequency, Downlink Frequency are changed accordingly.
For the relationship between the parameter and frequency settings of channels refer to Table 2.1.6-2 “Relationship between Uplink Channel Number and Downlink Channel Number” and to Table 2.1.6-3 “E-UTRA Channel Numbers and Default UE TX-RX Frequency Separation”.

### Example of Use

To set the Uplink Channel to 18300:

```
ULCHAN 18300
ULCHAN?
> 18300
```

# ULFREQ

Uplink Frequency

### Function

Sets or queries the Uplink frequency.

### Command

```
ULFREQ ul_freq
```

### Query

```
ULFREQ?
```

### Response

```
ul_fleq
```

### Parameter

| | |
|---|---|
| ul_freq | Uplink frequency |
| Range | 400 000 000 to 3800 000 000 Hz (MU887000A/01A)<br>400 000 000 to 6000 000 000 Hz (With MU887000A/01A-001)<br>400 000 000 to 6000 000 000 Hz (MU887002A) |
| Resolution | 1 Hz |
| Suffix code | HZ, KHZ, KZ, MHZ, MZ, GHZ, GZ (uses Hz when omitted) |
| Default | 1950 000 000 Hz |
| Unit | Hz |

### Details

This sets the Tx frequency for the mobile station.

Updating this Uplink frequency does not affect the Uplink Channel parameters.

### Example of Use

To set the Uplink frequency to 1950 MHz:

```
ULFREQ 1950MHZ
ULFREQ?
>1950000000
```

# ULIMCS

UL RMC MCS Index

## Function

Sets or queries the MCS Index of Uplink signal.

## Command

```
ULIMCS ulimcs
```

## Parameter

| | |
|---|---|
| ulimcs | UL MCS Index |
| Range | 0 to 15 |
| Resolution | 1 |
| Default | None |
| Suffix code | None |

## Details

When the UL RMC MCS Index is set, Modulation scheme is set according to Table 2.1.6-1 “Relation Between MCS Index of UL RMC and Modulation”.

## Example of Use

To set the UL RMC MCS Index to 1:

```
ULIMCS 1
```

# ULRB_START

UL RMC Starting RB

### Function

Sets or queries the start number for Uplink signal RB.

### Command

```
ULRB_START ulrb
```

### Query

```
ULRB_START?
```

### Response

```
ulrb
```

### Parameter

| | |
|---|---|
| ulrb | RB start number |
| Range | 0 to (6 – RBn)<br>RBn is set using the ULRMC_RB command. |
| Resolution | 1 |
| Default | 0 |
| Suffix code | None |

### Example of Use

To set the RB start number to 0:

```
ULRB_START 0
ULRB_START?
> 0
```

### Remarks

The RB start number is reset to 0 when the channel bandwidth is updated.
The RB start number is reset to 0 when the number of RB is updated.

# ULRMC_MOD

UL RMC Modulation

## Function

Sets or queries the Modulation scheme of uplink signal.

When the MCS Index is updated, the this parameter is changed accordingly.

## Command

```
ULRMC_MOD ul_rmc_mod
```

## Query

```
ULRMC_MOD?
```

## Response

```
ul_rmc_mod
```

## Parameter

| ul_rmc_mod | Modulation scheme |
|---|---|
| QPSK | QPSK |
| 16QAM | 16QAM |
| Default | QPSK |

## Example of Use

To set the Modulation scheme to QPSK:

```
ULRMC_MOD QPSK
ULRMC_MOD?
> QPSK
```

# ULRMC_NARROW

ULRMC Narrowband Index

### Function

Sets or queries the Narrowband Index.

### Command

```
ULRMC_NARROW index
```

### Query

```
ULRMC_NARROW?
```

### Response

```
index
```

### Parameter

| | | |
|---|---|---|
| Index | Narrowband Index value | |
| Range | 0 | (Channel Bandwidth = 1.4 MHz) |
| | 0 to 1 | (Channel Bandwidth = 3 MHz) |
| | 0 to 3 | (Channel Bandwidth = 5 MHz) |
| | 0 to 7 | (Channel Bandwidth = 10 MHz) |
| | 0 to 11 | (Channel Bandwidth = 15 MHz) |
| | 0 to 15 | (Channel Bandwidth = 20 MHz) |
| Resolution | 1 | |
| Default | 0 | |
| Suffix code | None | |

### Example of Use

To set the Narrowband Index to 0:

```
ULRMC_NARROW 0
ULRMC_NARROW?
> 0
```

### Remarks

The Narrowband Index is reset to 0 when the channel bandwidth is updated.

## ULRMC_RB

UL RMC Number of RB

### Function

Sets or queries the number of assigned RBs (Resource Blocks) at Uplink RMC.

### Command

```
ULRMC_RB ul_rmc_rb
```

### Query

```
ULRMC_RB?
```

### Response

```
ul_rmc_rb
```

### Parameter

| | |
|---|---|
| ul_rmc_rb | Number of RBs |
| Range | 0 to 6 |
| Resolution | 1 |
| Default | 6 |
| Suffix code | None |

### Example of Use

To set the number of RBs to 1.

```
ULRMC_RB 1
ULRMC_RB?
> 1
```

### Remarks

The number of RBs is reset to 6 when the channel bandwidth is updated.

# WAVEFMEAS?

Waveform

## Function

Queries the spectrum waveform data of each measurement result.

## Query

```
WAVEFMEAS? format,position,length[,symbol]
```

## Response

```
data(1),data(2),…,data(length)
```

## Parameter

| format | format | format | format |
|---|---|---|---|
| 1 | Occupied Bandwidth | 11 | In-band Emissions (dB) (average) |
| 2 | Spectrum Emission Mask | 12 | In-band Emissions (dB) (maximum) |
| 3 | Constellation (I) | 13 | In-band Emissions (dBc) (average) |
| 4 | Constellation (Q) | 14 | In-band Emissions (dBc) (maximum) |
| 5 | EVM (average) | 15 | Spectrum Flatness (average) |
| 6 | EVM (maximum) | 16 | Spectrum Flatness (maximum) |
| 7 | Phase Error (average) | 17 | Spectrum Flatness (minimum) |
| 8 | Phase Error (maximum) | | |
| 9 | Magnitude Error (average) | | |
| 10 | Magnitude Error (maximum) | | |

position Start point of waveform data

Range

| | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|
| format | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Occupied Bandwidth | 0 to 654 | 0 to 1358 | 0 to 2254 | 0 to 4494 | 0 to 6734 | 0 to 8974 |
| Spectrum Emission Mask | 0 to 1134 | 0 to 2254 | 0 to 3694 | 0 to 5486 | 0 to 7246 | 0 to 9038 |
| Constellation<br>EVM<br>Phase Error<br>Magnitude Error<br>Spectrum Flatness | 0 to 71 | 0 to 179 | 0 to 299 | 0 to 599 | 0 to 899 | 0 to 1199 |
| In-band Emissions | 0 to 5 | 0 to 14 | 0 to 24 | 0 to 49 | 0 to 74 | 0 to 99 |

Resolution 1

Suffix code None

length Number of read data

Range

| format | Channel Bandwidth | | | | | |
|---|---|---|---|---|---|---|
| | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| Occupied Bandwidth | 1 to 655 | 1 to 1359 | 1 to 2255 | 1 to 4495 | 1 to 6735 | 1 to 8975 |
| Spectrum Emission Mask | 1 to 1135 | 1 to 2255 | 1 to 3695 | 1 to 5487 | 1 to 7247 | 1 to 9039 |
| Constellation<br>EVM<br>Phase Error<br>Magnitude Error<br>Spectrum Flatness | 1 to 72 | 1 to 180 | 1 to 300 | 1 to 600 | 1 to 900 | 1 to 1200 |
| In-band Emissions | 1 to 6 | 1 to 15 | 1 to 25 | 1 to 50 | 1 to 75 | 1 to 100 |

Resolution 1

Suffix code None

symbol Position of SC-FDMA symbol

Range 0 to 6 (Constellation, EVM, Phase Error, Magnitude Error)

data(n) Waveform data

Resolution
- 0.01 dB (Occupied Bandwidth, Spectrum Emission Mask, In-band Emissions, Spectrum Flatness)
- 0.01 deg. (Phase Error)
- 0.01 % (EVM, Magnitude Error)
- 0.0001 (Constellation)

Unit
- dBm (Spectrum Emission Mask)
- dB (Occupied Bandwidth, In-band Emissions (dB), Spectrum Flatness)
- dBc (In-band Emissions (dBc) )
- degree (Phase Error)
- % (EVM, Magnitude Error)
- None (Constellation)

### Details

Refer to Table 2.7-1 “Waveform Data Type and Data Interval” for Data Interval.
When RMC Configuration is PUCCH, format 3 through 17 are all “Not measured”.

### Example of Use

To query the Occupied Bandwidth of 20 data from 25 of each measurement:

```
WAVEFMEAS? 1,25,20
> -42.12,-40.14,…,-41.22
```

# WORST_SEM?

SEM Template Margin

## Function

Queries the worst margin from the template of the spectrum level with offset frequency in the specified frequency range of SEM measurement.

## Query

```
WORST_SEM? range
```

## Response

```
margin,freq
```

## Parameter

| | |
|---|---|
| range | Frequency Range |
| Range | –4 to –1, 1 to 4 |
| Resolution | 1 |
| Suffix code | None |
| margin | Worst margin in the specified frequency range |
| Resolution | 0.01 dB |
| Unit | dB |
| freq | Offset frequency of the worst margin in the specified frequency range |
| Resolution | 1 Hz |
| Unit | Hz |

## Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4” for Frequency ranges.

## Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
WORST_SEM? 1
> -20.01,705
```

# WORST_SEM_DET?

SEM Template Margin (Detail)

## Function

Queries the worst margin from the template of the spectrum level with offset frequency in the specified frequency range of SEM measurement.

## Query

```
WORST_SEM_DET? range
```

## Response

```
margin,freq
```

## Parameter

| | |
|---|---|
| range | Frequency Range |
| Range | –9 to –1, 1 to 9 |
| Resolution | 1 |
| Suffix code | None |
| margin | Worst margin in the specified frequency range |
| Resolution | 0.01 dB |
| Unit | dB |
| freq | Offset frequency of the worst margin in the specified frequency range |
| Resolution | 1 Hz |
| Unit | Hz |

## Details

The margin is calculated as (limit value – measured value).
If the measured value exceeds the limit value, the margin becomes negative.
Refer to Table 2.4-3 “Frequency Ranges for Measurement Results” for Frequency ranges.

## Example of Use

To query the worst margin from the template of the spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
WORST_SEM_DET? 1
> -20.01,705
```

# WORST_SEM_DET_LV?

SEM Worst Value (Detail)

## Function

Queries the worst spectrum level with offset frequency in the specified frequency range of SEM measurement.

## Query

```
WORST_SEM_DET_LV? range
```

## Response

```
level,freq
```

## Parameter

| | |
|---|---|
| range | Frequency Range |
| Range | –9 to –1, 1 to 9 |
| Resolution | 1 |
| Suffix code | None |
| level | Worst spectrum level in the specified frequency range |
| Resolution | 0.01 dB |
| Unit | dB |
| freq | Offset frequency of the worst spectrum level in the specified frequency range |
| Resolution | 1 Hz |
| Unit | Hz |

## Details

Refer to Table 2.4-3 “Frequency Ranges for Measurement Results” for Frequency ranges.

## Example of Use

To query the worst spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
WORST_SEM_DET_LV? 1
> -20.01,705
```

## WORST_SEM_LV?

SEM Worst Value

### Function

Queries the worst spectrum level with offset frequency in the specified frequency range of SEM measurement.

### Query

```
WORST_SEM_LV? range
```

### Response

```
level,freq
```

### Parameter

| | | |
|---|---|---|
| range | | Frequency Range |
| | Range | –4 to –1, 1 to 4 |
| | Resolution | 1 |
| | Suffix code | None |
| level | | Worst spectrum level in the specified frequency range |
| | Resolution | 0.01 dB |
| | Unit | dB |
| freq | | Offset frequency of the worst spectrum level in the specified frequency range |
| | Resolution | 1 Hz |
| | Unit | Hz |

### Details

The frequency range varies according to the channel bandwidth.
Refer to Table 2.4-1 “Frequency ranges of Range 1 to Range 4” for Frequency ranges.

### Example of Use

To query the worst spectrum level with offset frequency in Frequency Range 1 of SEM measurement:

```
WORST_SEM_LV? 1
> -20.01,705
```

# Chapter 6 Performance Test

This chapter explains how to setup the measuring instruments required for the MX887065A Category M FDD performance tests as well as the test procedures.


6.1 Outline ..... 6-2
6.2 Instruments for Testing Performance ..... 6-3
6.3 Calibration (MX887065A) ..... 6-5
6.3.1 SG Calibration (CW) ..... 6-5
6.3.2 SG Calibration (MOD) ..... 6-7
6.3.3 Linearity Calibration ..... 6-8
6.3.4 Measurement Frequencies ..... 6-10
6.4 Performance Tests (MX887065A) ..... 6-11
6.4.1 Tx Power Measurement Accuracy (CW) ..... 6-12
6.4.2 Frequency/Modulation ..... 6-15
6.4.3 In-band Emissions ..... 6-17
6.4.4 Adjacent Channel Leakage Power Ratio (ACLR) ..... 6-19
6.4.5 Sample Format for Test Result Sheets ..... 6-21
6.5 Servicing ..... 6-35

# 6.1 Outline

The performance tests are performed to assure that the MU887000A performance does not deteriorate. Test the performance of the MU887000A at the initial acceptance inspection, at periodic inspections, and after repairs. Test important items periodically to assure the performance. This chapter explains the following test items.

- Tx Power measurement accuracy (CW)
- Frequency/modulation measurement — Carrier frequency accuracy, Residual EVM
- In-Band Emission measurement
- Adjacent Channel Leakage Power Ratio measurement (ACLR)

We recommend testing the performance periodically once or twice a year.

If the test results do not meet the specifications, 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.

**⚠ CAUTION**

**Warm-up the MU887000A and the required measuring instruments for at least 30 minutes (except when specified otherwise) to stabilize them. To achieve the highest accuracy, the test should be performed at room temperature using a power supply with as little voltage fluctuation as possible in an environment free from noise, vibration, dust and humidity.**

# 6.2 Instruments for Testing Performance

The following table lists the measuring instruments required for testing the MU887000A performance and the specifications for each instrument.

**Table 6.2-1 Measuring Instruments for Performance Tests**

| Test Item | Required Specifications* | Recommendation |
|---|---|---|
| Tx Power Measurements<br>● Measurement Accuracy (CW) | Signal Generator<br>● Frequency Range:<br>MU887000A/01A: 600 to 3800 MHz<br>With MU887000A/01A-001: 600 to 4200 MHz<br>MU887002A: 600 to 4200 MHz<br>● Frequency Resolution: 1 Hz<br>● Output Level Range<br>Unmodulated: –110 to +17 dBm<br>Resolution: 0.01 dB | Vector Signal Generator (MG3710E)<br>Upper Frequency 6 GHz (MG3710E-036) |
| | Signal Analyzer<br>● Frequency Range:<br>MU887000A/01A: 600 to 3800 MHz<br>With MU887000A/01A-001: 600 to 4200 MHz<br>MU887002A: 600 to 4200 MHz<br>● Frequency Resolution: 1 Hz<br>● Level Range: –130 to +30 dBm<br>● Level Accuracy: ±0.05 dB<br>● External Reference Input: (10 MHz) | Signal Analyzer (MS2690A or MS2830A)<br>Upper Frequency 6 GHz (MS2830A-041)<br>Preamplifier (MS2690A-008 or MS2830A-008) |
| | Power Meter<br>● Frequency Range:<br>MU887000A/01A: 600 to 3800 MHz<br>With MU887000A/01A-001: 600 to 4200 MHz<br>MU887002A: 600 to 4200 MHz<br>● Level Accuracy: ±0.02 dB<br>● Level Resolution: 0.01 dB | Power Meter (ML2437A) |
| | Power Sensor<br>● Frequency Range:<br>MU887000A/01A: 600 to 3800 MHz<br>With MU887000A/01A-001: 600 to 4200 MHz<br>MU887002A: 600 to 4200 MHz<br>● Level Range: –40 to +20 dBm<br>● Input Connector: N type | Power Sensor (MA2442D) |

*: The performance covers the test item measurement range.

**Table 6.2-1 Measuring Instruments for Performance Tests (Cont'd)**

| Test Item | Required Specifications* | Recommendation |
|---|---|---|
| Frequency/Modulation Measurements<br>● Carrier Frequency Accuracy<br>● Residual EVM<br>Adjacent Channel Leakage Power Ratio<br>In-Band Emissions | Signal generator supporting output of 3GPP Category M modulation signals<br>Same as above | Same as above |
| | Power Meter<br>Same as above | Same as above |
| | Power Sensor<br>● Frequency Range:<br>MU887000A/01A: 600 to 3800 MHz<br>With MU887000A/01A-001: 600 to 4200 MHz<br>MU887002A: 600 to 4200 MHz<br>● Level Range: –30 to +20 dBm<br>● Input Connector: N type | Power Sensor (MA24002A) |
| Common | Attenuator (for MU887000A/01A) | 3-dB Attenuator (AT-103) |
| | Attenuator (for MU887002A) | 3-dB Attenuator (BW-N3W5+)<br>6-dB Attenuator (BW-N6W5+) |

# 6.3 Calibration (MX887065A)

This section explains how to obtain the calibration values of the instrument used for the performance tests.

## 6.3.1 SG Calibration (CW)

This section explains how to obtain the calibration values of the CW (unmodulated) signal source.

(1) Measuring instruments

- Vector signal generator: MG3710E
- Power Meter: ML2437A
- Power Sensor: MA2442D
- Attenuator:

| | | | |
|---|---|---|---|
| For MU887000A/01A | 3 dB: | AT-103 | 2 sets |
| For MU887002A | 3 dB: | BW-N3W5+ | |
| | 6 dB: | BW-N6W5+ | |

(2) Setup

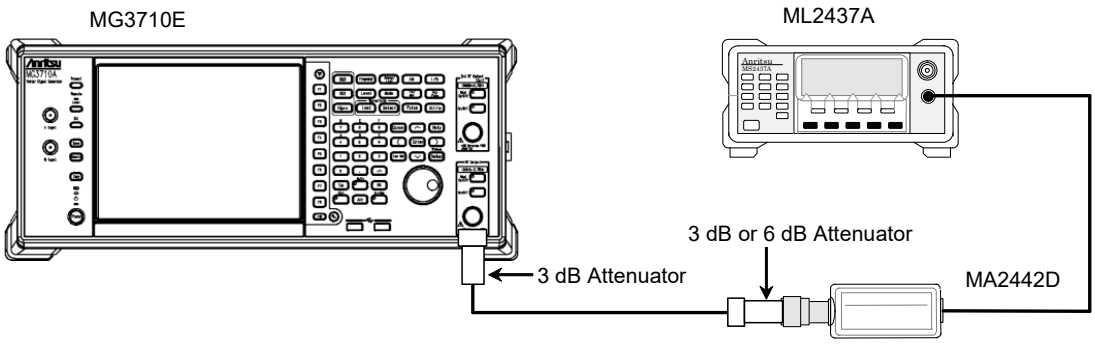



**Figure 6.3.1-1 SG Calibration (CW)**

(3) Test Procedure

1. Setup the instruments as shown in Figure 6.3.1-1.
2. Set the vector signal generator (SG) as follows:
   Modulation: OFF
   Output frequency: 599.99 MHz (600 MHz –10 kHz)
   Output level: MU887000A/01A: 6 dBm (0 dBm + 6 dB)
   MU887002A: 9 dBm (0 dBm + 9 dB)
3. Adjust the SG output level so that the level measurement value of the power meter is 0 dBm, and obtain the calibration values for the setting frequency and setting level.
4. Set frequencies in accordance with the table in 6.3.4, “Measurement Frequencies”, and obtain the calibration values of each frequency.
5. Replace 0 dBm with –10 dBm and –20 dBm at step 2, repeat steps 2 to 4 respectively, and obtain the calibration values.

## 6.3.2 SG Calibration (MOD)

This section explains how to obtain the calibration values of the modulation wave signal source.

(1) Measuring instruments

- Vector signal generator: MG3710E
- Power Meter: ML2437A
- Power sensor: MA24002A
- Attenuator:

| | | | |
|---|---|---|---|
| For MU887000A/01A | 3 dB: | AT-103 | 2 sets |
| For MU887002A | 3 dB: | BW-N3W5+ | |
| | 6 dB: | BW-N6W5+ | |

(2) Setup

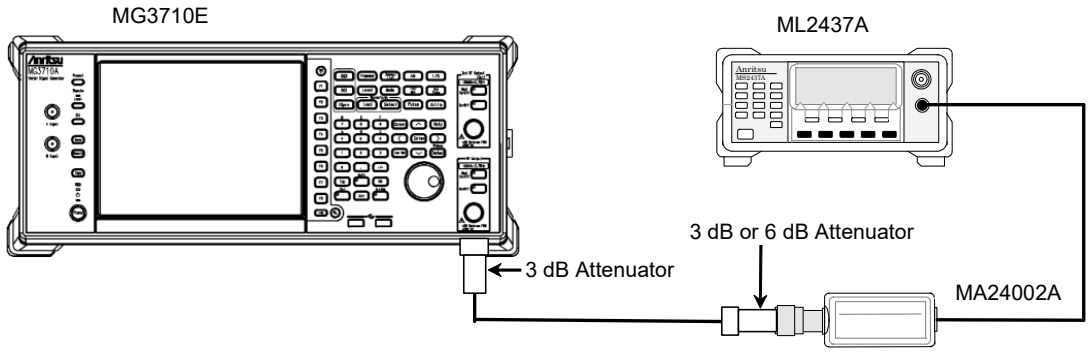



**Figure 6.3.2-1 SG Calibration (MOD)**

(3) Test procedure

1. Setup the instruments as shown in Figure 6.3.2-1.
2. Set the vector signal generator (SG) as follows:

| | | |
|---|---|---|
| Modulation: | ON | |
| Modulation wave: | Analyzable waveform pattern in 6.4.2 "Frequency/Moduration". | |
| Output frequency: | 599.99 MHz (600 MHz –10 kHz) | |
| Output level: | MU887000A/01A: | –4 dBm (–10 dBm + 6 dB) |
| | MU887002A: | –1 dBm (–10 dBm + 9 dB) |

3. Adjust the SG output level so that the level measurement value of the power meter is –10 dBm, and obtain the calibration values for the setting frequency and setting level.
4. Set frequencies in accordance with the table in 6.3.4, "Measurement Frequencies", and obtain the calibration values of each frequency.

## 6.3.3 Linearity Calibration

This section explains how to obtain the calibration values for linearity.

(1) Measuring instruments

- Vector signal generator: MG3710E
- Signal Analyzer: MS269xA or MS2830A
- Attenuator:

| | | | |
|---|---|---|---|
| For MU887000A/01A | 3 dB: | AT-103 | 2 sets |
| For MU887002A | 3 dB: | BW-N3W5+ | |
| | 6 dB: | BW-N6W5+ | |

(2) Setup

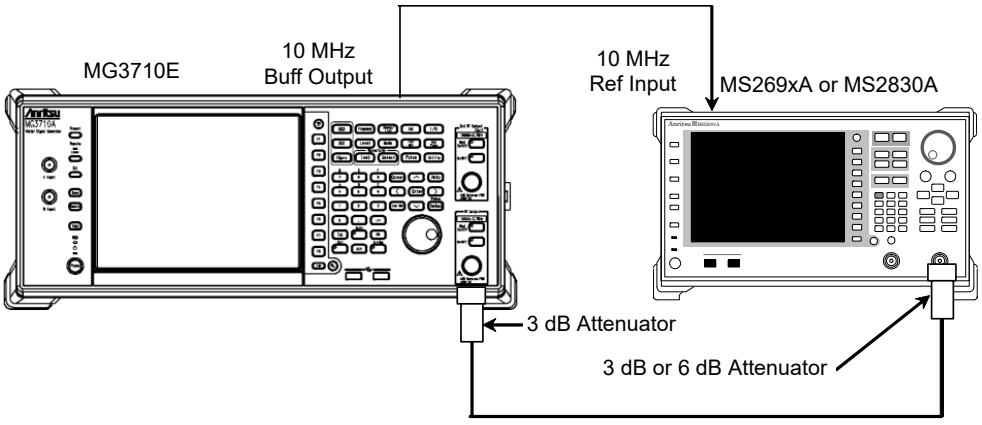



**Figure 6.3.3-1 Linearity Calibration**

(3) Test procedure

1. Setup the instruments as shown in Figure 6.3.3-1.
2. Set the signal analyzer (SA) as shown in #1 of Table 6.3.3-1 “Signal Analyzer Settings”.
3. Set the vector signal generator (SG) as follows:

   Modulation: OFF

   Output frequency: 599.99 MHz (600 MHz –10 kHz)

   Output level: Setting level when the level measurement value of the power meter is 0 dBm in the SG calibration (Section 6.3.1)
4. Connect the output of the SG to the SA and measure the SG output level with the SA (A dBm).
5. Decrease the SG output level in 10-dB steps down to 40 dB and measure the level at each step (B dBm). (The calibration value is B – A.)

6. Set frequencies in accordance with the table in 6.3.4, “Measurement Frequencies”, and obtain the calibration values of each frequency.
7. Set the SA as shown in #2 of Table 6.3.3-1 “Signal Analyzer Settings”.
8. Replace 0 dBm with –20 dBm at step 3, and repeat steps 3 to 6.

**Table 6.3.3-1 Signal Analyzer Settings**

| | MS269xA or MS2830A | | | | | | |
|---|---|---|---|---|---|---|---|
| | Application Switch | RBW | Zone Width | Time Length | ATT | Preamp | Ref Lev |
| #1 | Signal Analyzer | 100Hz | 781.3Hz | AUTO | 20dB | OFF | 0dBm |
| #2 | Signal Analyzer | 100Hz | 781.3Hz | AUTO | 0dB | OFF | –20dBm |

## 6.3.4 Measurement Frequencies

Table 6.3.4-1 lists the frequencies set in the performance tests for the calibration and calibrated test system. The 4000 MHz and more frequency is measured only when MU887000A-001 is installed, or MU887002A.

**Table 6.3.4-1 Measurement Point and Frequency**

| Meas. Point | Frequency (MHz) | Meas. Point | Frequency (MHz) |
|---|---|---|---|
| 1 | 600 | 8 | 2200 |
| 2 | 700 | 9 | 2700 |
| 3 | 880 | 10 | 3400 |
| 4 | 940 | 11 | 3600 |
| 5 | 1000 | 12 | 3800 |
| 6 | 1800 | 13 | 4000 |
| 7 | 2000 | 14 | 4200 |

***Note:***

Add an offset of –10 kHz to the frequency in the above table and set the frequency as SG output frequency, except for the measurement described in section 6.4.2, 6.4.3 and 6.4.4.

# 6.4 Performance Tests (MX887065A)

Common test items

The following list shows the common settings for each measurement at the MU887000A.

| | |
|---|---|
| Application Select: | Cellular |
| Standard Select: | CATM |
| Channel Coding: | RMC |
| Channel Bandwidth: | 20 MHz |
| RMC Configuration: | PUSCH |
| Uplink RMC Modulation: | QPSK |

## 6.4.1 Tx Power Measurement Accuracy (CW)

This test is related to the accuracy of Tx power measurements.

(1) Test specifications

MU887000A Test Port 1/2
MU887001A Test Port 1 to 4
(600 MHz ≤ Frequency ≤ 2700 MHz, 3400 MHz ≤ Frequency ≤ 3800 MHz)

| Measurement Accuracy | Input Level | Temperature |
|---|---|---|
| ±0.5 dB | –20 dBm ≤, ≤ +35 dBm | 10 to 40°C |
| ±0.7 dB | –50 dBm ≤, < –20 dBm | 10 to 40°C |
| ±0.9 dB | –60 dBm ≤, < –50 dBm | 10 to 40°C |

MU887002A TRX 1/2 Test Port 1 to 12
(600 MHz ≤ Frequency ≤ 2700 MHz, 3400 MHz ≤ Frequency ≤ 3800 MHz)

| Measurement Accuracy | Input Level | Temperature |
|---|---|---|
| ±0.5 dB | –20 dBm ≤, ≤+35 dBm | 20 to 30°C |
| ±0.7 dB | –50 dBm ≤, <–20 dBm | 20 to 30°C |
| ±0.9 dB | –60 dBm ≤, <–50 dBm | 20 to 30°C |

MU887000A Test Port 1/2
MU887001A Test Port 1 to 4
MU887002A TRX 1/2 Test Port 1 to 12
(3800 MHz < Frequency ≤ 4200 MHz)

| Measurement Accuracy | Input Level | Temperature |
|---|---|---|
| ±0.7 dB | –20 dBm ≤, ≤ +35 dBm | 20 to 30°C |
| ±0.9 dB | –50 dBm ≤, < –20 dBm | 20 to 30°C |
| ±1.1 dB | –60 dBm ≤, < –50 dBm | 20 to 30°C |

MU887000A Test Port 3/4
(600 MHz ≤ Frequency ≤ 2700 MHz, 3400 MHz ≤ Frequency ≤ 3800 MHz)

| Measurement Accuracy | Input Level | Temperature |
|---|---|---|
| ±0.7 dB | –20 dBm ≤, ≤ +25 dBm | 10 to 40°C |
| ±0.9 dB | –50 dBm ≤, < –20 dBm | 10 to 40°C |
| ±1.1 dB | –60 dBm ≤, < –50 dBm | 10 to 40°C |

MU887000A Test Port 3/4
(3800 MHz < Frequency ≤ 4200 MHz)

| Measurement Accuracy | Input Level | Temperature |
|---|---|---|
| ±0.7 dB | –20 dBm ≤, ≤ +25 dBm | 20 to 30°C |
| ±0.9 dB | –50 dBm ≤, < –20 dBm | 20 to 30°C |
| ±1.1 dB | –60 dBm ≤, < –50 dBm | 20 to 30°C |

(2) Measuring instruments

- Vector signal generator: MG3710E
- Attenuator:

| | | | |
|---|---|---|---|
| For MU887000A/01A | 3 dB: | AT-103 | 2 sets |
| For MU887002A | 3 dB: | BW-N3W5+ | |
| | 6 dB: | BW-N6W5+ | |

(3) Setup

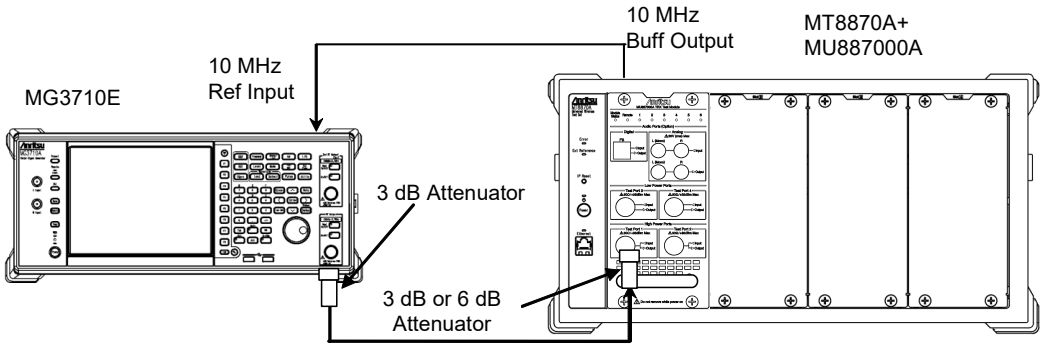



**Figure 6.4.1-1 Setup for Measuring Amplitude Measurement Accuracy**

(4) Test procedure

This test is measured at the following Test Ports.
When testing other than Test Port 1, read "Test Port 1" in the following procedure as the port to be tested.
MU887000A: Test Port 1, 2, 3, 4
MU887001A: Test Port 1, 2, 3, 4
MU887002A: TRX 1: Test Port 1, 2, TRX 2: Test Port 1, 2

1. Setup the instruments as shown in Figure 6.4.2-1.
2. Set the MU887000A as follows:

| | |
|---|---|
| Connect port: | Test Port 1 |
| Output level ON/OFF: | OFF |
| Input level: | –10 dBm |
| Uplink frequency: | 600 MHz |
| Trigger Source | Free Run (TRGSRC FREE_CW) |
| Turn Off All measurement: | OFF |
| Tx Power measurement: | ON, 1 time |

3. Set the Vector signal generator (SG) as follows:

| | |
|---|---|
| Modulation: | OFF |
| Output frequency: | 599.99 MHz |
| Output level: | –10 dBm (This output level reflects the calibration value for item 6.3.1.) |

4. Change the frequency of the MU887000A and SG according to Table 6.3.4 “Measurement Frequencies” and measure the Tx power.

   Tx Power Measurement Results: Average value

5. Change the SG output level and MU887000A input level each to –50, and –60 dBm and repeat steps 2 to 4 over and measure the Tx power. (This output level reflects the calibration value for item 6.3.3.)

6. Change the Connect port setting for the connection with the MU887000A successively, and repeat steps 2 to 5 over.

## 6.4.2 Frequency/Modulation

This test is related to the following modulation analyses.

- Carrier frequency accuracy
- Residual EVM

(1) Test specifications

| | Measurement Accuracy |
|---|---|
| Carrier frequency accuracy | ±(Set frequency × Reference oscillator accuracy + 15 Hz) |
| Residual EVM | ≤ 2.5% (rms) |

MU887000A Test Port 1/2,
MU887000A Test Port 1 to 4
MU887002A TRX 1/2 Test Port 1 to 12
Input Level range: –40 dBm ≤, ≤ +35 dBm
MU887000A Test Port 3/4
Input Level range: –40 dBm ≤, ≤ +25 dBm

(2) Measuring instruments

- Vector signal generator: MG3710E
- Attenuator:
  For MU887000A/01A 3 dB: AT-103 2 sets
  For MU887002A 3 dB: BW-N3W5+
  6 dB: BW-N6W5+

(3) Setup

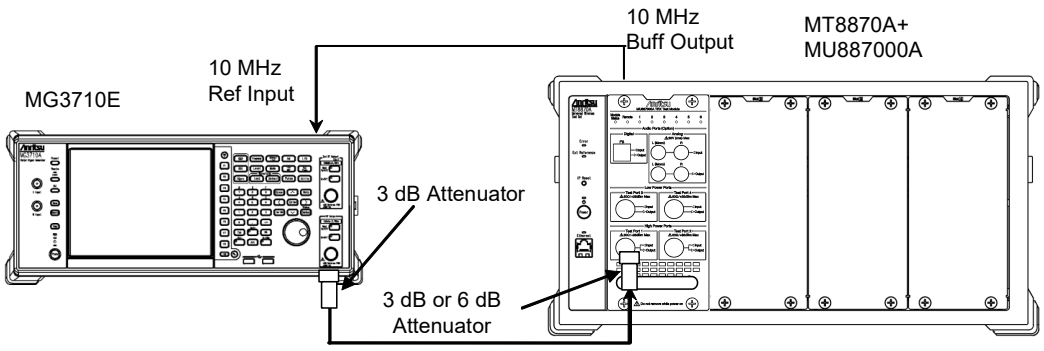



**Figure 6.4.2-1 Setup for Measuring Frequency/Modulation**

(4) Test procedure

This test is measured at the following Test Ports.
When testing other than Test Port 1, read "Test Port 1" in the following procedure as the port to be tested.
MU887000A: Test Port 1, 2, 3, 4
MU887001A: Test Port 1, 2, 3, 4
MU887002A: TRX 1: Test Port 1, 2, TRX 2: Test Port 1, 2

1 Setup the instruments as shown in Figure 6.4.2-1.

2. Set the MU887000A as follows:

| | |
|---|---|
| Connect port: | Test Port 1 |
| Output level ON/OFF: | OFF |
| Input level: | –30 dBm |
| Uplink frequency: | 600 MHz |
| Trigger Source: | Rise Config |
| Trigger Level: | Input Level – 10 dB |
| UL RMC Narrowband Index: | 0 |
| UL RMC Number of RB: | 6 |
| Turn Off All measurement: | OFF |
| Modulation Analysis measurement: | ON, 20 times |

3. Set the Vector signal generator (SG) as follows:

| | |
|---|---|
| Modulation: | ON |
| Modulation wave: | Analyzable waveform pattern in Step 2 above. |
| Output frequency: | 600 MHz |
| Output level: | –30 dBm (This output level reflects the calibration value for item 6.3.2.) |

4. Measure the frequency error and EVM.

| | |
|---|---|
| Carrier Frequency Error Result: | Worst value |
| EVM Result: | Average value |

5. Change the MU887000A and SG frequencies according to 6.3.4 "Measurement Frequencies" and repeat steps 2 to 4 over.

6. Change the SG output level and the MU887000A input level to –40 dBm and measure by repeating steps 2 to 5 over. (This output level reflects the calibration value for item 6.3.2.)

7. Change the Connect port setting for the connection with the MU887000A successively, and repeat steps 2 to 6 over.

## 6.4.3 In-band Emissions

This test is related to in-band emissions.

(1) Test specifications

(600 MHz ≤ Frequency ≤ 2700 MHz, 3400 MHz ≤ Frequency ≤ 4200 MHz)

| | |
|---|---|
| In-Band Emissions | ≤ –40 dBc |

Input level: ≥ –10 dBm

Allocated RB ≤ 18

(2) Measuring instruments

- Vector signal generator: MG3710E
- Attenuator:

For MU887000A/01A 3 dB: AT-103 2 sets

For MU887002A 3 dB: BW-N3W5+

6 dB: BW-N6W5+

(3) Setup

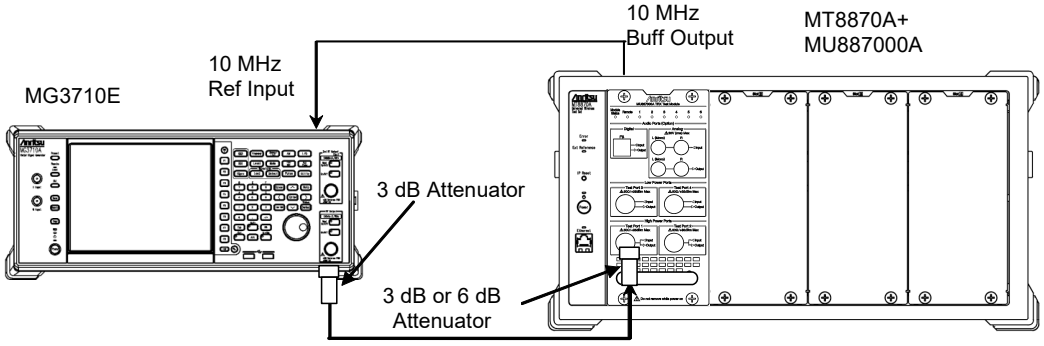



**Figure 6.4.3-1 In-Band Emissions Measurement Setup**

(4) Test procedure

This test is measured at the following Test Ports.
When testing other than Test Port 1, read "Test Port 1" in the following procedure as the port to be tested.
MU887000A: Test Port 1, 2, 3, 4
MU887001A: Test Port 1, 2, 3, 4
MU887002A: TRX 1: Test Port 1, 2, TRX 2: Test Port 1, 2

1. Setup the instruments as shown in Figure 6.4.3-1.
2. Set the MU887000A as follows:

| | |
|---|---|
| Connect port: | Test Port 1 |
| Output level ON/OFF: | OFF |
| Input level: | –10 dBm |
| Uplink frequency: | 600 MHz |
| Trigger Source: | Rise Config |
| Trigger Level: | Input Level – 10 dB |
| UL RMC Narrowband Index: | 0 |
| UL RMC Number of RB: | 1 |
| Turn Off All measurement: | OFF |
| Modulation Analysis measurement: | ON, 20 times |

3. Set the Vector signal generator (SG) as follows:

| | |
|---|---|
| Modulation: | ON |
| Modulation wave: | Analyzable waveform pattern in Step 2 above. |
| Output frequency: | 600 MHz |
| Output level: | –10 dBm (This output level reflects the calibration value for item 6.3.2.) |

4. Measure the in-band emissions and read the following value:

   In-band emissions (General) Result: Max value

5. Change the MU887000A and SG frequencies according to 6.3.4 "Measurement Frequencies" and repeat steps 2 to 4 over.
6. Change the Connect port setting for the connection with the MU887000A successively, and repeat steps 2 to 5 over.

## 6.4.4 Adjacent Channel Leakage Power Ratio (ACLR)

This test is related to Adjacent Channel Leakage Power Ratio measurements.

(1) Test specifications

(600 MHz ≤ Frequency ≤ 2700 MHz, 3400 MHz ≤ Frequency ≤ 4200 MHz)

| Adjacent Channel Leakage Power Ratio | Measurement Point |
|---|---|
| ≥ 45 dB | E-UTRA ACLR1 |
| ≥ 50 dB | UTRA ALCR1 |
| ≥ 55 dB | UTRA ALCR2 |

MU887000A Test Port 1/2
MU887001A Test Port 1 to 4
Input Level range: –10 dBm ≤, ≤ +35 dBm
MU887002A TRX 1/2 Test Port 1 to 12
600 MHz ≤ frequency ≤ 2700 MHz
Input Level range: –10 dBm ≤, ≤ +35 dBm
3400 MHz ≤ frequency ≤ 4200 MHz
Input Level range: –14 dBm ≤, ≤ +35 dBm
MU887000A Test Port 3/4
Input Level range: –10 dBm ≤, ≤ +25 dBm

(2) Measuring instruments

- Vector signal Generator: MG3710E
- Attenuator:
  For MU887000A/01A 3 dB: AT-103 2 sets
  For MU887002A 3 dB: BW-N3W5+
  6 dB: BW-N6W5+

(3) Setup

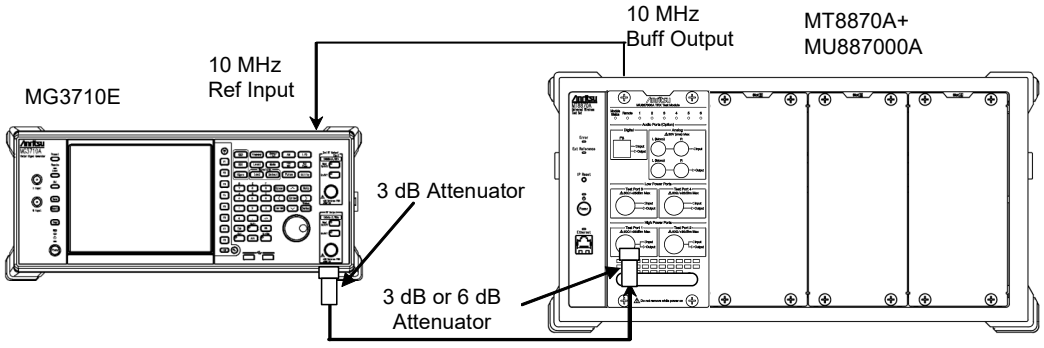



**Figure 6.4.4-1 Setup for Measuring Adjacent Channel Leakage Power Ratio**

(4) Test procedure

This test is measured at the following Test Ports.
When testing other than Test Port 1, read "Test Port 1" in the following procedure as the port to be tested.
MU887000A: Test Port 1, 2, 3, 4
MU887001A: Test Port 1, 2, 3, 4
MU887002A: TRX 1: Test Port 1, 2, TRX 2: Test Port 1, 2

1. Setup the instruments as shown in Figure 6.4.4-1.
2. Set the MU887000A as follows:

   Connect port: Test Port 1
   Output level ON/OFF: OFF
   Input level: –10 dBm
   For MU887002A, 3400 MHz ≤ frequency: –14 dBm
   Uplink frequency: 600 MHz
   Trigger Source: Rise Config
   Trigger Level: Input Level – 10 dB
   UL RMC Narrowband Index: 0
   UL RMC Number of RB: 6
   Turn Off All measurement: OFF
   ACLR measurement: ON, 20 times

3. Set the Vector signal generator (SG) as follows:

   Modulation: ON
   Modulation wave: Analyzable waveform pattern in Step 2 above.
   Output frequency: 600 MHz
   Output level: –10 dBm
   (This output level reflects the calibration value for item 6.3.2.)
   For MU887002A, 3400 MHz ≤ frequency: –14 dBm
   (Obtained by subtracting 4 dB from the output level where the correction value in 6.3.2 is reflected)

4. Measure the Adjacent Channel Leakage Power and read the following value:

   ACLR Result: Max value

5. Change the MU887000A and SG frequencies according to 6.3.4 "Measurement Frequencies" and repeat steps 2 to 4 over.
6. Change the Connect port setting for the connection with the MU887000A successively, and repeat steps 2 to 5 over.

### 6.4.5 Sample Format for Test Result Sheets

Use the following test result sheets when testing the MX887065A performance. Duplicate these sheets as necessary for tests.

| | | | |
|---|---|---|---|
| Test location | | Report No. | |
| | | Date | |
| | | Person-in-charge | |

Model:

| | | | |
|---|---|---|---|
| Serial No. | | Ambient temperature | °C |
| Power source frequency | Hz | Relative humidity | % |

Remarks

SG Calibration (CW)

**SG Calibration Value (CW)**

MG3710E Unmodulated Wave

| Frequency (MHz) | SG Setting (dBm) | | |
|---|---|---|---|
| | 0 dBm | –10 dBm | –20 dBm |
| 600 | | | |
| 700 | | | |
| 880 | | | |
| 940 | | | |
| 1000 | | | |
| 1800 | | | |
| 2000 | | | |
| 2200 | | | |
| 2700 | | | |
| 3400 | | | |
| 3600 | | | |
| 3800 | | | |
| 4000 | | | |
| 4200 | | | |

SG Calibration (MOD)

**SG Calibration Value (MOD)**

MG3710E Modulation Wave

| Frequency (MHz) | SG Setting (dBm) |
|---|---|
| | –10 dBm |
| 600 | |
| 700 | |
| 880 | |
| 940 | |
| 1000 | |
| 1800 | |
| 2000 | |
| 2200 | |
| 2700 | |
| 3400 | |
| 3600 | |
| 3800 | |
| 4000 | |
| 4200 | |

Linearity Calibration

**Linearity Calibration**

| Frequency (MHz) | SG Level (dBm) | SA Measured Value (dBm) | Calibration Value (C) (B) – (A) (dB) | SG Level (dBm) | SA Measured Value (dBm) | Calibration Value (C) (B) – (A) (dB) |
|---|---|---|---|---|---|---|
| 600 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 700 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 880 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 940 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 1000 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 1800 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |

Linearity Calibration (Cont'd)

**Linearity Calibration (Cont'd)**

| Frequency (MHz) | SG Level (dBm) | SA Measured Value (dBm) | Calibration Value (C) (B) – (A) (dB) | SG Level (dBm) | SA Measured Value (dBm) | Calibration Value (C) (B) – (A) (dB) |
|---|---|---|---|---|---|---|
| 2000 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 2200 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 2700 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 3400 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 3600 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 3800 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |

Linearity Calibration (Cont'd)

**Linearity Calibration (Cont'd)**

| Frequency (MHz) | SG Level (dBm) | SA Measured Value (dBm) | Calibration Value (C) (B) – (A) (dB) | SG Level (dBm) | SA Measured Value (dBm) | Calibration Value (C) (B) – (A) (dB) |
|---|---|---|---|---|---|---|
| 4000 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |
| 4200 | 0 | (A) | | –20 | (A) | |
| | –10 | (B) | | –30 | (B) | |
| | –20 | (B) | | –40 | (B) | |
| | –30 | (B) | | –50 | (B) | |
| | –40 | (B) | | –60 | (B) | |

Tx Power Measurement Accuracy (CW)

**Tx Power Measurement Accuracy**

**MU887000A Port 1/2, MU887001A Port 1 to 4, MU887002A TRX 1/2 Port 1/2**

Input Level: –10 dBm (Item 6.3.1 Calibration Value)

| Frequency (MHz) | MX887065A Measured Value (Pow) (dBm) | Measurement Accuracy (dB) | | | |
|---|---|---|---|---|---|
| | | Lo Limit | Measurement Accuracy –10 – (Pow) | Hi Limit | Measurement uncertainty |
| 600 | | –0.5 | | +0.5 | ±0.15 |
| 700 | | | | | |
| 880 | | | | | |
| 940 | | | | | |
| 1000 | | | | | |
| 1800 | | | | | |
| 2000 | | | | | |
| 2200 | | | | | |
| 2700 | | | | | |
| 3400 | | | | | |
| 3600 | | | | | |
| 3800 | | | | | |
| 4000 | | –0.7 | | +0.7 | 0.33 |
| 4200 | | | | | |

Tx Power Measurement Accuracy (CW) (Cont'd)

**Tx Power Measurement Accuracy**

**MU887000A Port 1/2, MU887001A Port 1 to 4, MU887002A TRX 1/2 Port 1/2**

Input Level: –50 dBm (Item 6.3.3 Calibration Value)

| Frequency (MHz) | Item 6.3.3 –50 dBm Calibration Value (C) (dB) | MX887065A Measured Value (Pow) (dBm) | Measurement Accuracy (dB) | | | |
|---|---|---|---|---|---|---|
| | | | Lo Limit | Measurement Accuracy –20 + (C) – (Pow) | Hi Limit | Measurement uncertainty |
| 600 | | | –0.7 | | +0.7 | ±0.14 |
| 700 | | | | | | |
| 880 | | | | | | |
| 940 | | | | | | |
| 1000 | | | | | | |
| 1800 | | | | | | |
| 2000 | | | | | | |
| 2200 | | | | | | |
| 2700 | | | | | | |
| 3400 | | | | | | |
| 3600 | | | | | | |
| 3800 | | | | | | |
| 4000 | | | –0.9 | | +0.9 | ±0.33 |
| 4200 | | | | | | |

Tx Power Measurement Accuracy (CW) (Cont'd)

**Tx Power Measurement Accuracy**

**MU887000A Port 1/2, MU887001A Port 1 to 4, MU887002A TRX 1/2 Port 1/2**

Input Level :–60 dBm (Item 6.3.3 Calibration Value)

| Frequency (MHz) | Item 6.3.3 –60 dBm Calibration Value (C) (dB) | MX887065A Measured Value (Pow) (dBm) | Measurement Accuracy (dB) | | | |
|---|---|---|---|---|---|---|
| | | | Lo Limit | Measurement Accuracy –20 + (C) – (Pow) | Hi Limit | Measurement uncertainty |
| 600 | | | –0.9 | | +0.9 | ±0.14 |
| 700 | | | | | | |
| 880 | | | | | | |
| 940 | | | | | | |
| 1000 | | | | | | |
| 1800 | | | | | | |
| 2000 | | | | | | |
| 2200 | | | | | | |
| 2700 | | | | | | |
| 3400 | | | | | | |
| 3600 | | | | | | |
| 3800 | | | | | | |
| 4000 | | | –1.1 | | +1.1 | ±0.33 |
| 4200 | | | | | | |

Tx Power Measurement Accuracy (CW) (Cont'd)

**Tx Power Measurement Accuracy MU887000A Port 3/4**

Input Level: –10 dBm (Item 6.3.1 Calibration Value)

| Frequency (MHz) | MX887065A Measured Value (Pow) (dBm) | Measurement Accuracy (dB) | | | |
|---|---|---|---|---|---|
| | | Lo Limit | Measurement Accuracy –10 – (Pow) | Hi Limit | Measurement uncertainty |
| 600 | | –0.7 | | +0.7 | ±0.17 |
| 700 | | | | | |
| 880 | | | | | |
| 940 | | | | | |
| 1000 | | | | | |
| 1800 | | | | | |
| 2000 | | | | | |
| 2200 | | | | | |
| 2700 | | | | | |
| 3400 | | | | | |
| 3600 | | | | | |
| 3800 | | | | | |
| 4000 | | –0.7 | | +0.7 | ±0.28 |
| 4200 | | | | | |

**Tx Power Measurement Accuracy MU887000A Port 3/4**

Input Level: –50 dBm (Item 6.3.3 Calibration Value)

| Frequency (MHz) | 6 Item 6.3.3 –50 dBm Calibration Value (C) (dB) | MX887065A Measured Value (Pow) (dBm) | Measurement Accuracy (dB) | | | |
|---|---|---|---|---|---|---|
| | | | Lo Limit | Measurement Accuracy –20 + (C) – (Pow) | Hi Limit | Measurement uncertainty |
| 600 | | | –0.9 | | +0.9 | ±0.14 |
| 700 | | | | | | |
| 880 | | | | | | |
| 940 | | | | | | |
| 1000 | | | | | | |
| 1800 | | | | | | |
| 2000 | | | | | | |
| 2200 | | | | | | |
| 2700 | | | | | | |
| 3400 | | | | | | |
| 3600 | | | | | | |
| 3800 | | | | | | |
| 4000 | | | –0.9 | | +0.9 | ±0.20 |
| 4200 | | | | | | |

Tx Power Measurement Accuracy (CW) (Cont'd)

**Tx Power Measurement Accuracy MU887000A Port 3/4**

Input Level :–60 dBm (Item 6.3.3 Calibration Value)

| Frequency (MHz) | Item 6.3.3 –60 dBm Calibration Value (C) (dB) | MX887065A Measured Value (Pow) (dBm) | Measurement Accuracy (dB) | | | |
|---|---|---|---|---|---|---|
| | | | Lo Limit | Measurement Accuracy –20 + (C) – (Pow) | Hi Limit | Measurement uncertainty |
| 600 | | | –1.1 | | +1.1 | ±0.14 |
| 700 | | | | | | |
| 880 | | | | | | |
| 940 | | | | | | |
| 1000 | | | | | | |
| 1800 | | | | | | |
| 2000 | | | | | | |
| 2200 | | | | | | |
| 2700 | | | | | | |
| 3400 | | | | | | |
| 3600 | | | | | | |
| 3800 | | | | | | |
| 4000 | | | –1.1 | | +1.1 | ±0.20 |
| 4200 | | | | | | |

Frequency/Modulation Measurement

**Residual EVM/Carrier Frequency Accuracy**

Input Level: –30 dBm / –40 dBm

| Frequency (MHz) | Residual EVM (%) | | | Carrier Frequency Accuracy (Hz) | | |
|---|---|---|---|---|---|---|
| | Measured Value | Spec. | Measurement uncertainty | Measured Value | Spec. | Measurement uncertainty |
| 600 | | ≤ 2.5 | ±0.1 | | ±15.0 | ±2.6 |
| 700 | | | | | | |
| 880 | | | | | | |
| 940 | | | | | | |
| 1000 | | | | | | |
| 1800 | | | | | | |
| 2000 | | | | | | |
| 2200 | | | | | | |
| 2700 | | | | | | |
| 3400 | | | | | | |
| 3600 | | | | | | |
| 3800 | | | | | | |
| 4000 | | ≤ 2.5 | ±0.1 | | ±15.0 | ±3.8 |
| 4200 | | | | | | |

In-Band Emission Measurement

**In-Band Emission**

| Frequency (MHz) | Input Level: –10 dBm | |
|---|---|---|
| | Measured Value (dB) | Spec. |
| 600 | | ≤–40 dBc |
| 700 | | |
| 880 | | |
| 940 | | |
| 1000 | | |
| 1800 | | |
| 2000 | | |
| 2200 | | |
| 2700 | | |
| 3400 | | |
| 3600 | | |
| 3800 | | |
| 4000 | | |
| 4200 | | |

Adjacent Channel Leakage Power Measurement (ACLR)

**Adjacent Channel Leakage Power (Cont'd)**

Input Level: –10 dBm / –14 dBm

| Frequency (MHz) | Adjacent Channel Leakage Power Ratio (dB) | | | | | |
|---|---|---|---|---|---|---|
| | Band | | | | | |
| | UTRA (-2) | UTRA (-1) | UTRA (+1) | UTRA (+2) | E-UTRA (-1) | E-UTRA (+1) |
| 600 | | | | | | |
| 700 | | | | | | |
| 880 | | | | | | |
| 940 | | | | | | |
| 1000 | | | | | | |
| 1800 | | | | | | |
| 2000 | | | | | | |
| 2200 | | | | | | |
| 2700 | | | | | | |
| 3400 | | | | | | |
| 3600 | | | | | | |
| 3800 | | | | | | |
| 4000 | | | | | | |
| 4200 | | | | | | |
| Spec. (dB) | ≥ 55 dB | ≥ 50 dB | ≥ 50 dB | ≥ 55 dB | ≥ 45 dB | ≥ 45 dB |
| Measurement uncertainty | 1 dB | | | | | |

# 6.5 Servicing

If any unit is found to be broken or does not operate as described in the specifications, 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.

When requesting repair, supply the following information:

(a) Model name and serial number marked on rear panel

(b) Failure symptoms

(c) Person to contact about nature of failure and repair completion notification

(d) Software version

# Appendix A Specifications

This appendix lists the specifications of the MX887065A Category M FDD Uplink TX Measurement. Refer to section 1.2 “Composition” for details of the product configuration.

This section explains the specifications of MX887065A Category M FDD Uplink.

These specifications assume use of the system at a constant temperature after warming-up the instruments for 30 minutes. The abbreviation (typ.) indicates the reference data at 20 to 30°C and is not a guaranteed value.
For MU887002A, when the ports 1 and 2 of TRX 1 or TRX 2 satisfy the specifications, the specifications of the ports 3 to 12 of the same TRX are guaranteed by design.

**Table A-1 MX887065A Specifications**

| Item | Specification |
|---|---|
| Common Items | |
| Frequency | 600 to 2700 MHz, 3400 to 3800 MHz (MU887000A/01A)<br>600 to 2700 MHz, 3400 to 4200 MHz (MU887000A/01A-001)<br>600 to 2700 MHz, 3400 to 4200 MHz (MU887002A) |
| Measuring Object | PUSCH, PUCCH |

**Table A-1 MX887065A Specifications (Cont'd)**

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Tx Power Measurement<br>Input Level Range</td><td>
MU887000A Port 1, Port 2: –65.0 to +35.0 dBm<br>
Port 3, Port 4: –65.0 to +25.0 dBm<br>
MU887001A Port 1 to 4: –65.0 to +35.0 dBm<br>
MU887002A TRX 1/2, Port 1 to 12: –65.0 to +35.0 dBm<br>
Measurement Accuracy<br>
MU887000A Port 1, Port 2: After calibration, 20 to 30°C<br>
MU887001A Port 1 to 4: After calibration, 20 to 30°C<br>
MU887002A TRX 1/2 Port 1 to 12: After calibration, 20 to 30°C<br>
Frequency: 600 MHz ≤ f ≤ 2700 MHz, 3400 MHz ≤ f ≤ 3800 MHz
<table>
<tr><th>Input Level</th><th>Measurement Accuracy</th></tr>
<tr><td>–20 to +35 dBm</td><td>±0.3 dB (typ.)</td></tr>
</table>
MU887000A Port 1, Port 2: After calibration, 10 to 40°C<br>
MU887001A Port 1 to 4: After calibration, 10 to 40°C<br>
MU887002A TRX 1/2 Port 1 to 12: After calibration, 20 to 30°C<br>
Frequency: 600 MHz ≤ f ≤ 2700 MHz, 3400 MHz ≤ f ≤ 3800 MHz
<table>
<tr><th>Input Level</th><th>Measurement Accuracy</th></tr>
<tr><td>–20 to +35 dBm</td><td>±0.5 dB</td></tr>
<tr><td>–50 to –20 dBm</td><td>±0.7 dB</td></tr>
<tr><td>–60 to –50 dBm</td><td>±0.9 dB</td></tr>
</table>
MU887000A Port 1, Port 2: After calibration, 20 to 30°C<br>
MU887001A Port 1 to 4: After calibration, 20 to 30°C<br>
MU887002A TRX 1/2 Port 1 to 12: After calibration, 20 to 30°C<br>
Frequency: 3800 MHz < f ≤ 4200 MHz
<table>
<tr><th>Input Level</th><th>Measurement Accuracy</th></tr>
<tr><td>–20 to +35 dBm</td><td>±0.7 dB</td></tr>
<tr><td>–50 to –20 dBm</td><td>±0.9 dB</td></tr>
<tr><td>–60 to –50 dBm</td><td>±1.1 dB</td></tr>
</table>
MU887000A Port 3, Port 4: After calibration, 10 to 40°C<br>
Frequency: 600 MHz ≤ f ≤ 2700 MHz, 3400 MHz ≤ f ≤ 3800 MHz
<table>
<tr><th>Input Level</th><th>Measurement Accuracy</th></tr>
<tr><td>–20 to +25 dBm</td><td>±0.7 dB</td></tr>
<tr><td>–50 to –20 dBm</td><td>±0.9 dB</td></tr>
<tr><td>–60 to –50 dBm</td><td>±1.1 dB</td></tr>
</table>
MU887000A Port 3, Port 4: After calibration, 20 to 30°C<br>
Frequency: 3800 MHz < f ≤ 4200 MHz
<table>
<tr><th>Input Level</th><th>Measurement Accuracy</th></tr>
<tr><td>–20 to +25 dBm</td><td>±0.7 dB</td></tr>
<tr><td>–50 to –20 dBm</td><td>±0.9 dB</td></tr>
<tr><td>–60 to –50 dBm</td><td>±1.1 dB</td></tr>
</table>
</td></tr>
</table>

**Table A-1 MX887065A Specifications (Cont'd)**

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Modulation Analysis<br>Input Level Range</td><td>MU887000A Port 1, Port 2: –40.0 to +35.0 dBm<br>Port 3, Port 4: –40.0 to +25.0 dBm<br>MU887001A Port 1 to 4: –40.0 to +35.0 dBm<br>MU887002A TRX 1/2, Port 1 to 12: –40.0 to +35.0 dBm</td></tr>
<tr><td>Carrier Frequency Accuracy</td><td>±(Set frequency × Reference oscillator accuracy + 15 Hz)<br>Frequency: 600 MHz ≤ f ≤ 2700 MHz, 3400 MHz ≤ f ≤ 4200 MHz</td></tr>
<tr><td>Modulation accuracy</td><td>Residual Vector Error: ≤ 2.5%<br>Frequency: 600 MHz ≤ f ≤ 2700 MHz, 3400 MHz ≤ f ≤ 4200 MHz<br>(20 averaging times)</td></tr>
<tr><td>In-Band Emissions</td><td>≤ –40 dBc (Input Level ≥ –10 dBm, Allocated RB ≤ 18)<br>Frequency: 600 MHz ≤ f ≤ 2700 MHz, 3400 MHz ≤ f ≤ 4200 MHz</td></tr>
<tr><td>Occupied Bandwidth<br>Input Level Range</td><td>MU887000A Port 1, Port 2: –10.0 to +35.0 dBm<br>Port 3, Port 4: –10.0 to +25.0 dBm<br>MU887001A Port 1 to 4: –10.0 to +35.0 dBm<br>MU887002A TRX 1/2, Port 1 to 12: –10.0 to +35.0 dBm</td></tr>
<tr><td>Adjacent Channel Leakage Power Ratio<br>Input Level Range</td><td>MU887000A Port 1, Port 2: –10.0 to +35.0 dBm<br>Port 3, Port 4: –10.0 to +25.0 dBm<br>MU887001A Port 1 to 4: –10.0 to +35.0 dBm<br>MU887002A TRX 1/2, Port 1 to 12:<br>600 MHz ≤ frequency ≤ 2700 MHz –10.0 to +35.0 dBm<br>3400 MHz ≤ frequency ≤ 4200 MHz –14.0 to +35.0 dBm</td></tr>
<tr><td>Measurement Range</td><td>Frequency: 600 MHz ≤ f ≤ 2700 MHz, 3400 MHz ≤ f ≤ 4200 MHz
<table>
<tr><th>Adjacent Channel</th><th>Measurement Range</th></tr>
<tr><td>E-UTRA ACLR1</td><td>≥ 45 dB</td></tr>
<tr><td>UTRA ACLR1</td><td>≥ 50 dB</td></tr>
<tr><td>UTRA ACLR2</td><td>≥ 55 dB</td></tr>
</table></td></tr>
<tr><td>Spectrum Emission Mask (SEM)<br>Input Level Range</td><td>MU887000A Port 1, Port 2: –10.0 to +35.0 dBm<br>Port 3, Port 4: –10.0 to +25.0 dBm<br>MU887001A Port 1 to 4: –10.0 to +35.0 dBm<br>MU887002A TRX 1/2, Port 1 to 12: –10.0 to +35.0 dBm</td></tr>
</table>

# Index

References are page numbers.


## A

Abbreviations ..... 1-4
Adjacent Channel Leakage Power Ratio.....2-26

## C

Cable loss correction..... 2-4
Carrier leakage.....2-30
composition..... 1-3

## E

Error Vector Magnitude .....2-29
EVM.....2-29

## F

Frequency ..... 2-3
Frequency error.....2-28

## I

In-band Emission for Non-Allocated RB .....2-31

## L

Level ..... 2-3

## M

Magnitude error .....2-29
Margin .....2-23
Modulation analysis .....2-27

## N

Native
- Category M Setting..... 5-6
- Common ..... 5-3
- Common Parameter..... 5-4, 5-5
- Fundamental Measurement Parameter .... 5-7
- Measurement ..... 5-3
- Result..... 5-8
- System..... 5-4

## O

Occupied Bandwidth .....2-19

## P

Peak level .....2-23
performance tests ..... 6-2
- Phase error..... 2-29

## Q

Questionable Register ..... 2-16

## R

Reference signal ..... 2-30
Rho..... 2-30

## S

Sample program ..... 2-41
SCPI
- Category M Setting ..... 4-6, 4-7
- Common Parameter ..... 4-3, 4-4, 4-5
- Fundamental Measurement Parameter .... 4-8
- Measurement ..... 4-3
- Result ..... 4-9
- System..... 4-4

Specifications.....A-1
Spectrum Emission Mask..... 2-21
Spectrum Flatness..... 2-34
Status Register .....2-15, 2-16

## T

Transmit Power ..... 2-17

## W

Waveform data..... 2-39
Waveform file..... 2-4
Waveform quality ..... 2-30