

Anritsu envision : ensure

Universal Wireless Test Set

MT8870A





For Production Lines for Smartphones and Wireless Modules

The remarkable success of smartphones and IoT is driving demand for faster inspection speeds on smartphone and communication module production lines and this market trend is expected to continue. Coupled with this, wireless communication standards are continuing to evolve and develop, leading to a growing range of specifications.

In these circumstances, terminal and module makers are looking to increase line efficiency while assuring smooth and flexible support for the various new standards.

With support for up to four test modules, the Universal Wireless Test Set MT8870A is the ideal cost-effective solution for high-efficiency inspection lines.



**WLAN
802.11ax**



High Performance Coupled with Flexibility and Expandability



MU887000A / 01A



TRX Test Module
MU887000A



TRX Test Module
MU887000A
with MU887000A-002 (Audio)



TRX Test Module
MU887001A



TRX Test Module
MU887001A
with MU887001A-002 (Audio)

Future-proof Inspection Lines

Mobile terminal manufacturers require not only production line efficiency but also the flexibility to adapt to changes in wireless standards. The MT8870A is the ideal instrument to meet these needs.



1 Built-in Signal Generator and Signal Analyzer in Each Test Module

The TRX Test Module MU887000A/01A (MU88700xA) has been developed for communication terminal device inspection lines. Each installed test module has an independent high-performance signal generator and signal analyzer.



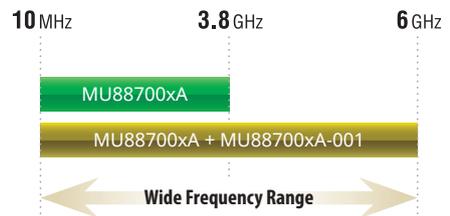
2 160 MHz Wide Bandwidth

To support the WLAN 802.11ac (Wave 2) and LTE-Advanced wireless standards requiring bandwidths of 100 MHz or more, the MU88700xA incorporates a signal generator and signal analyzer with a bandwidth of 160 MHz.



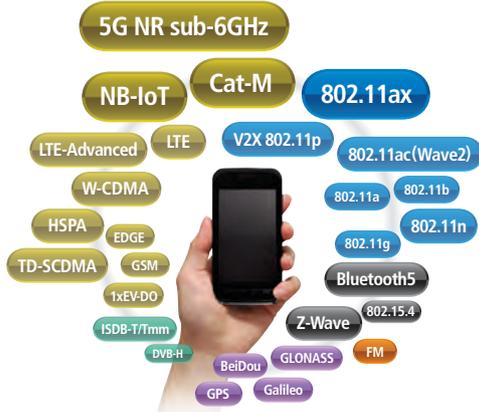
3 Wide Frequency Range from 10 MHz to 6 GHz (option)

The MU88700xA signal generator and signal analyzer cover a frequency range from 10 MHz to 3.8 GHz (extended to 6 GHz as option), assuring flexible support for new wireless standards.



4 Each Test Module Supports Multiple Wireless Standards

One MU88700xA supports multiple wireless communication standards.



| Wireless Standards | Specifications |
|-----------------------------------|---|
| 5G NR sub-6GHz | 3GPP TS 38.101-1V15.0.0 (2017-12) |
| W-CDMA/HSDPA | 3GPP TS 34.121-1 3GPP TS 25.141 |
| GSM/EDGE | 3GPP TS 51.010-1 |
| LTE/LTE-Advanced/ NB-IoT/Cat-M | 3GPP TS 36.521-1 3GPP TS 36.141 |
| CDMA2000 | 3GPP2 TSG-C.S0011-C |
| 1xEV-DO | 3GPP2 TSG-C.S0033-B |
| TD-SCDMA | 3GPP TS 34.122 |
| WLAN | IEEE 802.11a/b/g/n/p/ac (Wave 2)/ax |
| Bluetooth® | Basic Rate/EDR/Bluetooth low energy (Bluetooth v5.0) |
| ZigBee | IEEE 802.15.4 |
| Z-Wave | ITU-T G.9959 |
| FM | RDS (IEC 62106 Edition 2.0) |
| GPS | GPS standard Positioning Service Signal |
| Galileo | European GNSS (Galileo) Open Service Signal In Space Interface Control Document |
| GLONASS | GLONASS ICD Navigational radiosignal In bands L1, L2 |
| BeiDou | BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal (Version 2.0) |
| DVB-H | ETSI EN300 744 |
| ISDB-T/Tmm | ARIB STD-B31/B46 |

Each standard is supported easily using a cost-effective licensing scheme

Licenses are obtained by adding TX measurement software packages and waveform files.



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TRX Test Module MU88700A/01A Features

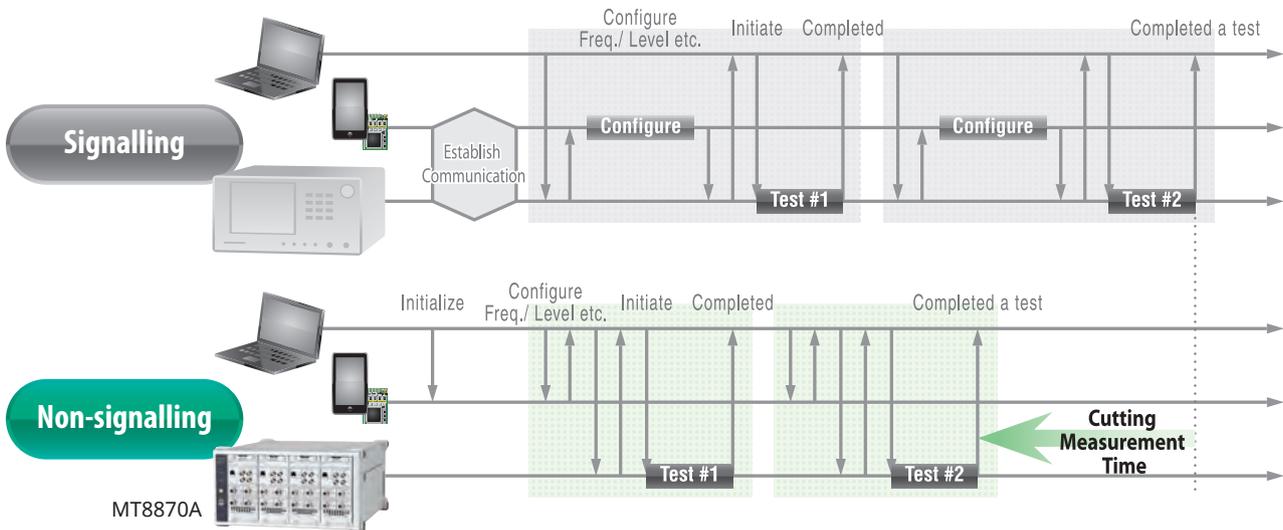
Integration with Leading-edge High-speed Measurement Methods

Times for manufacturing and testing mobile terminals have been slashed using leading-edge hardware architecture and parallel measurement technology. Additionally, multiple items for batch measurement processing can be freely selected for any number of repeat measurements.

Batch measurement of selected items greatly simplifies and speeds up key tests.

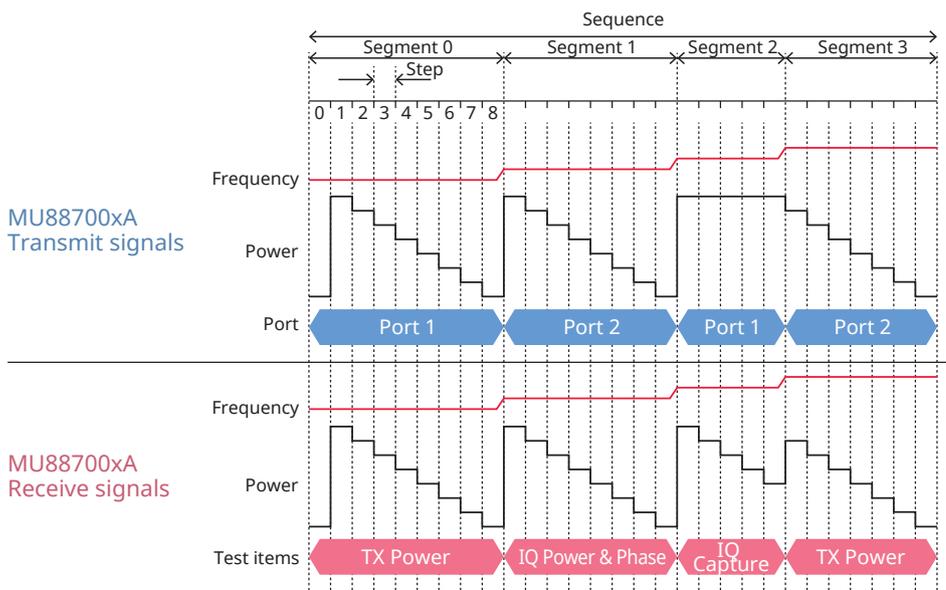
Non-signalling Measurement Support

The MT8870A performs measurements in a non-signalling environment. As shown in the figure below, alleviating the need to establish direct communication with the DUT brings considerable savings in both time and manufacturing costs.



Sequence Measurement (Mobile Communication Terminals)

- For mobile terminals supporting sequence measurements (list mode), TRX tests are performed in accordance with a sequence table (list) where measurement conditions are recorded while changing the test conditions.
- Since each measurement is executed at high speed in accordance with a predetermined sequence without using remote control commands, line tact times are greatly reduced, increasing line throughput and efficiency.



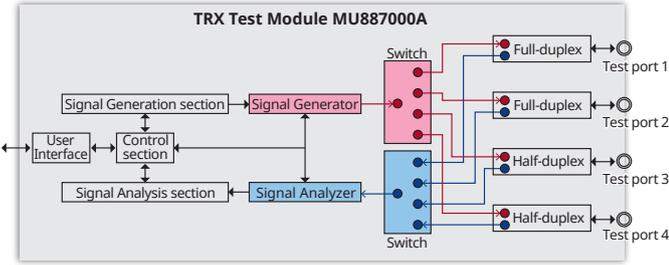
TRX Test Module MU887000A/01A Features

Four Test Ports per Module

Each MU887000A has two duplex and two half-duplex RF connectors.

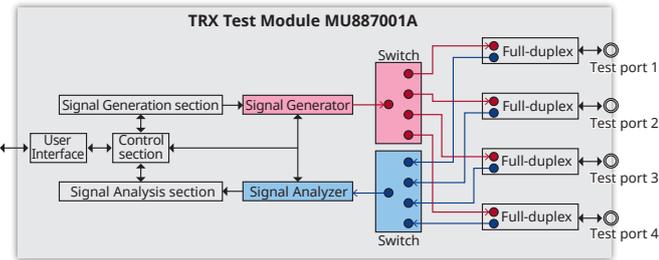
The duplex ports (Test port 1 and 2) incorporate dividers at the front end to support simultaneous tests in both TX and RX directions when testing typical wireless standards.

The half-duplex ports (Test port 3 and 4) incorporate switches at the front end to switch between each test port when used either for TX or RX tests. These half-duplex ports have higher sensitivity than the full-duplex ports and are ideal for low-level wireless signals.



The MU887001A has four duplex RF connectors.

Each MU887001A has four duplex RF connectors so that the test module can connect four mobile terminals at once to test them by high speed switching with the internal RF switches. Also the isolation performance between each test port is better than MU887000A.



The four test ports can be used for level calibration because they have high level accuracy over a wide frequency range from 10 MHz to 6 GHz (option). Internal switches can switch the TRX ports between input and output. Normally, simultaneous coupling measurements of multiple antennas require troublesome calibration corrections when using the required external dividers and external switches. With four test ports each incorporating the internal switch level deviation, the MU88700xA supports high level accuracy measurements over a wide frequency range.

Test Port and Wireless Technology

MU887000A

| | Test port 1 and 2 | Test port 3 and 4 |
|---|---|---|
| Name | High power port | Low power port |
| Connector | N (female) | N (female) |
| Type (Configuration) | Duplex (divider) | Half-duplex (switch) |
| Outline | Support simultaneous use of VSG and VSA required for measuring mobile terminal standards | Do not support simultaneous use of VSA and VSG each of which must be used separately High accuracy supports measurement of low-level signals |
| Wireless Standards and Recommended Port | 5G NR TDD sub-6GHz, LTE/LTE-Advanced FDD/TDD, W-CDMA, GSM/EDGE, CDMA2000/1xEV-DO, TD-SCDMA, NB-IoT, Category M, WLAN 802.11a/b/g/n/p/ac/ax*, Bluetooth*, IEEE 802.15.4*, Z-Wave, FM/RDS, GPS, Galileo, GLONASS, BeiDou, DVB-T, ISDB-T/Tmm | Cellular Diversity, WLAN 802.11a/b/g/n/p/ac/ax, Bluetooth, IEEE 802.15.4, Z-Wave, FM/RDS, GPS, Galileo, GLONASS, BeiDou, DVB-T, ISDB-T/Tmm |

MU887001A

| | Test port 1 to 4 |
|---|--|
| Name | High power port |
| Connector | N (female) |
| Type (Configuration) | Duplex (divider) |
| Outline | Support simultaneous use of VSG and VSA required for measuring mobile terminal standards |
| Wireless Standards and Recommended Port | 5G NR TDD sub-6GHz, LTE/LTE-Advanced FDD/TDD, W-CDMA, GSM/EDGE, CDMA2000/1xEV-DO, TD-SCDMA, NB-IoT, Category M, WLAN 802.11a/b/g/n/p/ac/ax, Bluetooth, IEEE 802.15.4, Z-Wave, FM/RDS, GPS, Galileo, GLONASS, BeiDou, DVB-T, ISDB-T/Tmm |

*: Since test ports 1 and 2 have higher input levels than ports 3 and 4, use ports 3 and 4 when the MU88700xA input level is low.

TRX Test Module MU887000A/01A Features

Built-in Audio Analyzer/Audio Generator

Installing the Audio Measurement Hardware MU88700xA-002 in the MU88700xA supports a built-in audio analyzer and audio generator.

The MU88700xA-002 supports both analog and digital audio. The stereo and monaural analog audio inputs and outputs of a communications device can be measured using the four BNC connectors (input and output for both left and right channels). Additionally, digital audio communications modules without analog audio inputs and outputs are supported without needing an AD/DC converter using the RJ-45 connector on the MU88700xA to measure digital audio signals using the standard inter-IC Sound (I2S) format.



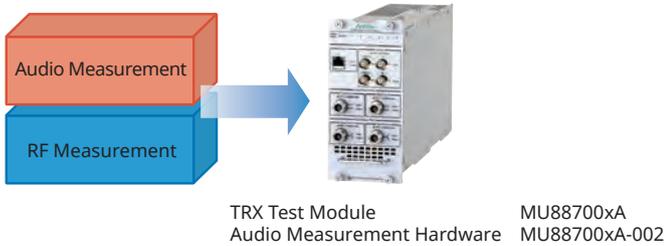
Ease of Configuration

Line capacity can change from week to week or month to month, depending on customers' needs and the specifications of the device under test. The number of test modules installed*1 in the MT8870A can be tailored to meet changes in line test stations and items, keeping the line efficiency high without needing major configuration changes to the line and stations.

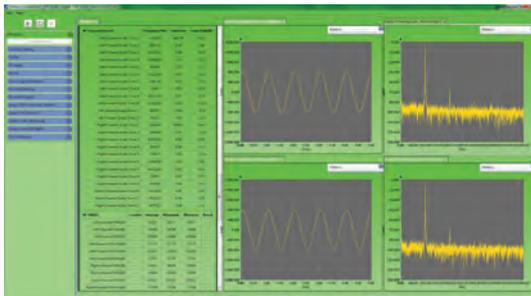


*1: Test modules cannot be hot-swapped with the power on.

The MU88700xA-002 solution saves spaces and cuts costs by combining RF and audio measurements into one unit, eliminating the need for separate production lines for RF measurements and audio measurements.



*: The audio analyzer and audio generator functions cannot be used simultaneously.



CombiView Audio Measurement Screen

One License Supports Four Modules



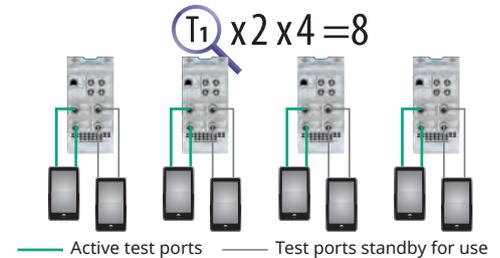
The TX measurement software packages and waveforms can each be licensed separately. One license can be used for up to four TRX test modules, cutting test equipment costs. A TX measurement software package is required for TX tests for each communication standard and a waveform is required for RX tests.

Flexible Test System Configuration

Up to
8
Units

Simultaneous 8 Units Connection:

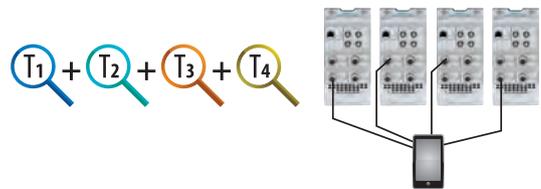
Since LTE/LTE-Advanced mobiles have RX diversity antenna, both TRX and RX diversity antennas must be adjusted and tested. The MU88700xA supports four ports in one module for connecting two LTE/LTE-Advanced terminals. Up to four modules can be installed in one MT8870A, supporting connection of up to eight LTE/LTE-Advanced terminals and simultaneous testing up to four terminals.



Up to
4
Measurement
Types

Four Simultaneous Measurements:

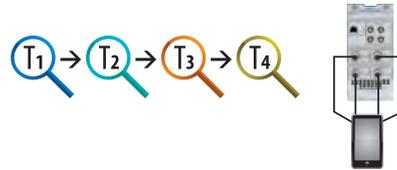
Recent smartphones support various wireless interfaces, such as Bluetooth® and WLAN, in addition to cellular. Test times are cut by testing multiple wireless standards simultaneously.



Continuous
Measurements
by
1
Module

Continuous Measurements of Multiple Communications Standards:

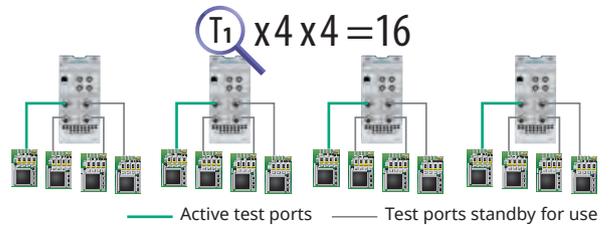
Licensing the TX measurement software packages and waveforms support continuous multiple measurements with one MU88700xA.



Up to
16
Test Devices

16 Simultaneous Connections:

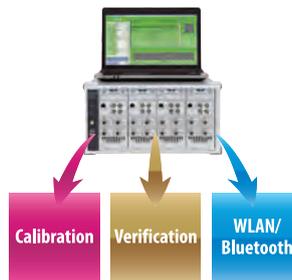
Each MU88700xA has four test ports. Up to four test modules can be installed in one MT8870A, supporting simultaneous connection of 16 test devices. This versatility eliminates the need for external combiners and also reduces test fixture calibration.



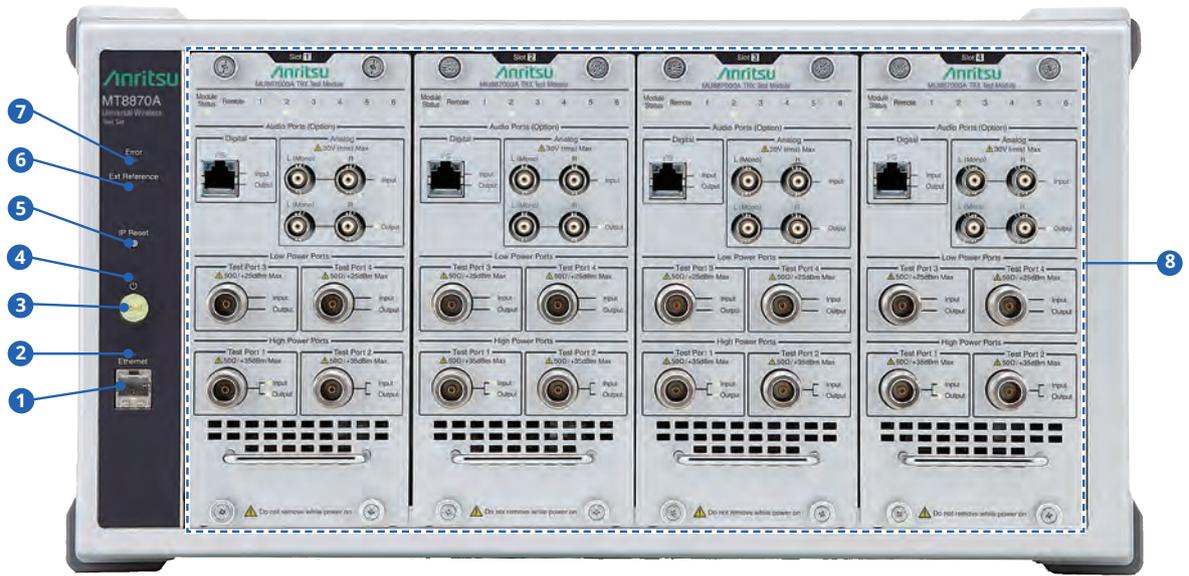
POINT

Supports Flexible Line Changes

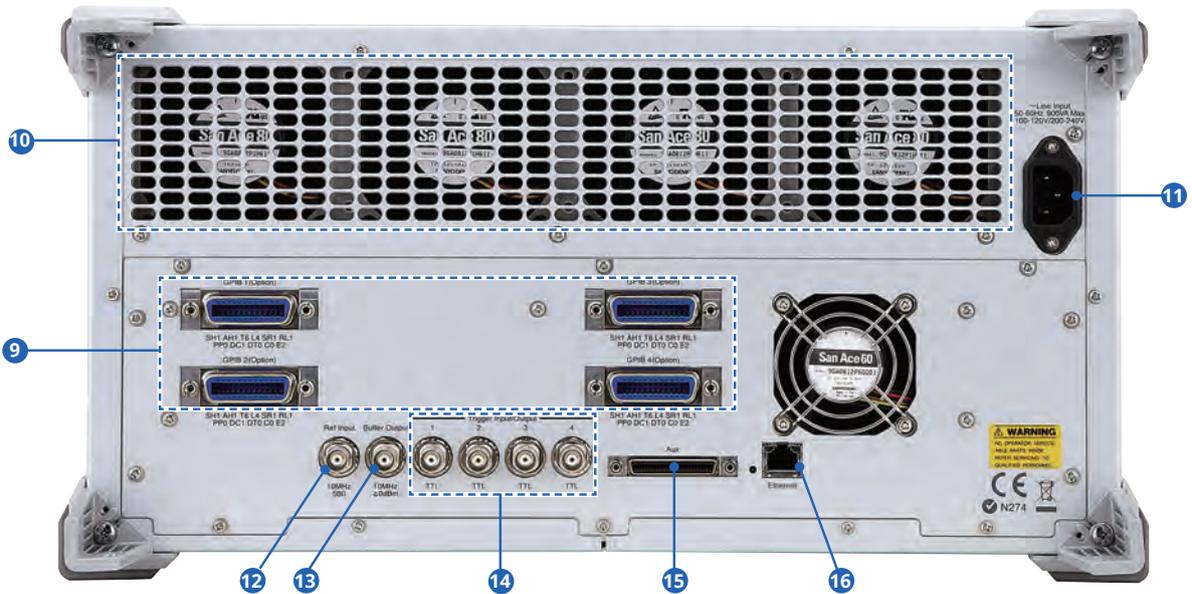
Generally, wireless device production lines are divided into different processing stages such as calibration, inspection, and function testing. Using different equipment at each stage causes problems, such as different test times, as well as the need to provide spare capacity to cover any faults at each process. Since the MT8870A has high versatility due to its modular configuration, it minimizes the need for spare capacity when reconfiguring the production line, etc.



Universal Wireless Test Set MT8870A Panel Layout



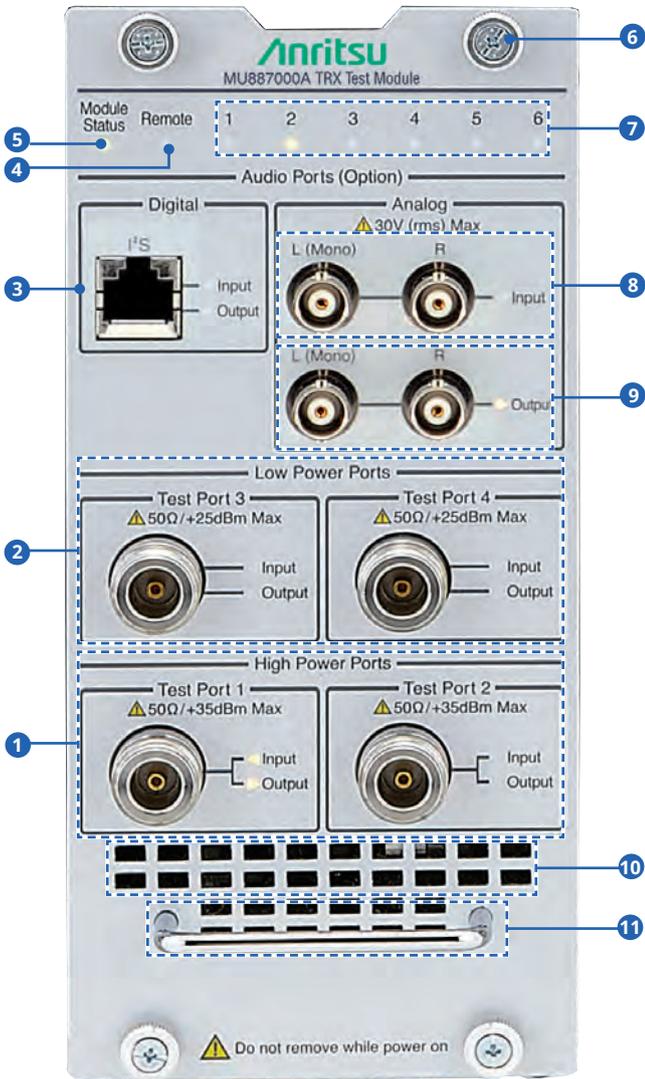
Front panel



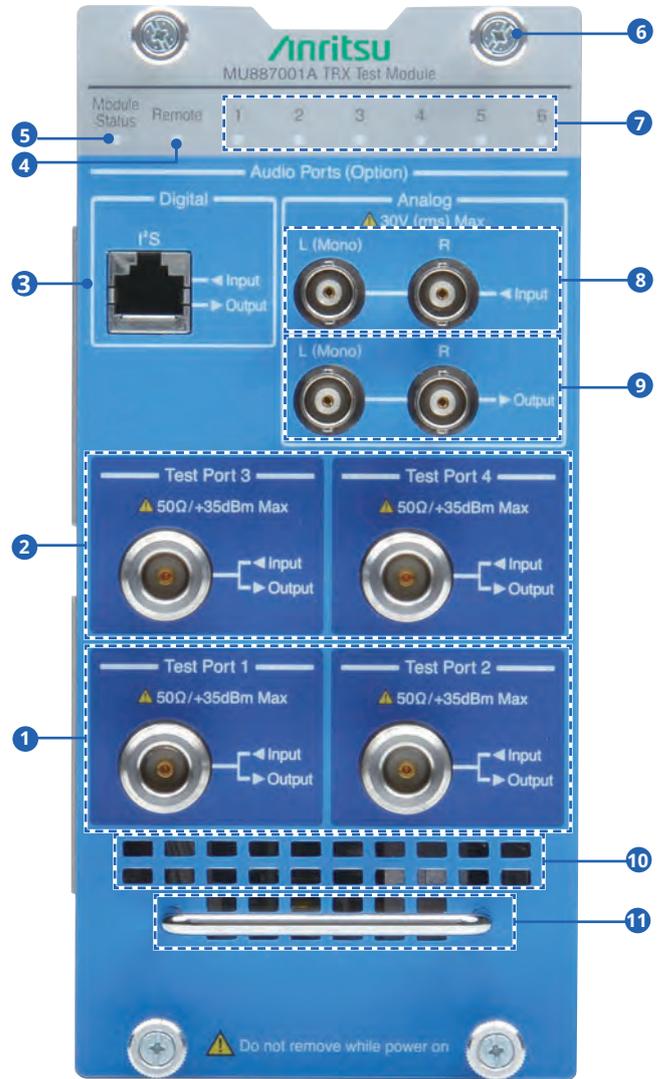
Rear panel

- | | |
|--|---|
| 1 Ethernet Connector | 9 GPIB Connector (option) |
| 2 Access Lamp | 10 Cooling Fan |
| 3 Power Switch | 11 Power Cord Connector |
| 4 Standby Lamp | 12 External Reference Signal Input (ref input) |
| 5 IP Address Reset Button (IP reset) | 13 Reference Signal Output (buffer output) |
| 6 External Reference Signal Lamp (ext. reference) | 14 Trigger Input/Output Connector |
| 7 Error Lamp | 15 AUX Connector |
| 8 Slot 1 to 4 | 16 Ethernet Connector |

TRX Test Module MU887000A/01A Panel Layout



MU887000A



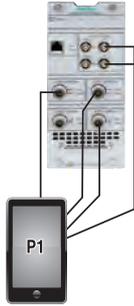
MU887001A

- ① Test Port 1, 2
- ② Test Port 3, 4
- ③ Digital Audio Input/Output (option)
- ④ Remote Lamp (remote)
- ⑤ Status Lamp (module status)
- ⑥ Mounting screws
- ⑦ Status Lamp (1 to 6)
- ⑧ Analog Audio Input (option)
- ⑨ Analog Audio Output (option)
- ⑩ Vent
- ⑪ Handle

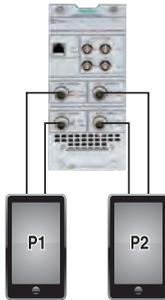
Universal Wireless Test Set MT8870A Applications

Smartphones

Smartphone Measurement (Simultaneous Measurement of Multiple Wireless Technologies)



P1 Load 5G NR sub6 LTE Diversity WLAN/BT FM GPS/GLONASS Unload



P1 Load 5G NR sub6 LTE Diversity Unload
P2 Setup Load 5G NR sub6 LTE Diversity Unload

Two TRX Test Modules can be used to measure multiple wireless technologies in one smartphone.

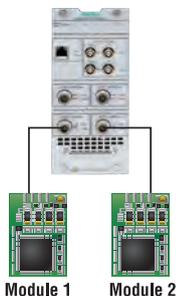
The multiple antennas for the various wireless technologies in the smartphone are connected all at one time to execute measurements in parallel, greatly reducing the problems of moving smartphones between test stations and re-booting time for smartphone.

Recommended Configuration

| Model | Description | Qty. |
|---------------|---|------|
| MT8870A | Universal Wireless Test Set | 1 |
| MU88700xA | TRX Test Module | 1 |
| MU88700xA-001 | 6 GHz Frequency Extension | 1 |
| MU88700xA-002 | Audio Measurement Hardware | 1 |
| MX887010A | Cellular Standards Sequence Measurement | 1 |
| MX887013A | LTE FDD Uplink TX Measurement | 1 |
| MX887013A-001 | LTE-Advanced FDD Uplink CA TX Measurement | 1 |
| MX887019A | NR TDD sub-6GHz Uplink Measurement | 1 |
| MX887030A | WLAN 802.11b/g/a/n TX Measurement | 1 |
| MX887031A | WLAN 802.11ac TX Measurement | 1 |
| MX887033A | WLAN 802.11ax TX Measurement | 1 |
| MX887040A | Bluetooth TX Measurement | 1 |
| MX887040A-001 | DLE TX Measurement | 1 |
| MX887040A-002 | 2LE TX Measurement | 1 |
| MX887040A-003 | BLR TX Measurement | 1 |
| MX887070A | FM/Audio TRX Measurement | 1 |
| MX887090A | Multi-DUT Measurement scheduler | 1 |
| MV887013A | LTE FDD Downlink Waveforms | 1 |
| MV887019A | NR TDD sub-6GHz Downlink Waveforms | 1 |
| MV887030A | WLAN 802.11b/g/a/n Waveforms | 1 |
| MV887031A | WLAN 802.11ac Waveforms | 1 |
| MV887033A | WLAN 802.11ax Waveforms | 1 |
| MV887040A | Bluetooth Waveforms | 1 |
| MV887040A-001 | DLE Waveforms | 1 |
| MV887040A-002 | 2LE Waveforms | 1 |
| MV887040A-003 | BLR Waveforms | 1 |
| MV887070A | FM RDS Waveforms | 1 |
| MV887100A | GPS Waveforms | 1 |
| MV887100A | Galileo Waveforms | 1 |
| MV887102A | GLONASS Waveforms | 1 |
| MV887103A | BeiDou Waveforms | 1 |

Cellular LPWA Devices

NB-IoT Module Measurement



Module 1 Load Category M/NB-IoT Unload
Module 2 Load Category M/NB-IoT Unload

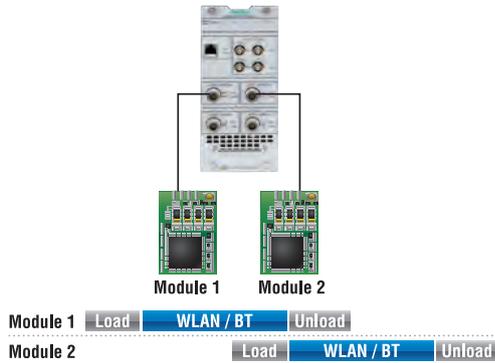
Recommended Configuration

| Model | Description | Qty. |
|-----------|---|------|
| MT8870A | Universal Wireless Test Set | 1 |
| MU88700xA | TRX Test Module | 1 |
| MX887010A | Cellular Standards Sequence Measurement | 1 |
| MX887065A | Category M FDD Uplink TX Measurement | 1 |
| MX887067A | NB-IoT Uplink TX Measurement | 1 |
| MX887090A | Multi-DUT Measurement scheduler | 1 |
| MV887065A | Category M FDD Downlink Waveforms | 1 |
| MV887067A | NB-IoT Downlink Waveforms | 1 |

Universal Wireless Test Set MT8870A Applications

Connectivity Devices

Combo Module Measurement

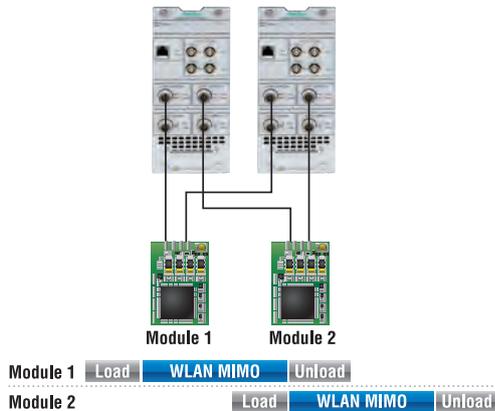


One TRX Test Module can be used to measure WLAN 802.11b/g/a/n/p/ac, 11ac (Wave 2), 11ax and Bluetooth v5 modules.

Recommended Configuration

| Model | Description | Qty. |
|---------------|-----------------------------------|------|
| MT8870A | Universal Wireless Test Set | 1 |
| MU88700xA | TRX Test Module | 1 |
| MU88700xA-001 | 6 GHz Frequency Extension | 1 |
| MX887030A | WLAN 802.11b/g/a/n TX Measurement | 1 |
| MX887031A | WLAN 802.11ac TX Measurement | 1 |
| MX887032A | WLAN 802.11p TX Measurement | 1 |
| MX887033A | WLAN 802.11ax TX Measurement | 1 |
| MX887040A | Bluetooth TX Measurement | 1 |
| MX887040A-001 | DLE TX Measurement | 1 |
| MX887040A-002 | 2LE TX Measurement | 1 |
| MX887040A-003 | BLR TX Measurement | 1 |
| MX887090A | Multi-DUT Measurement scheduler | 1 |
| MV887030A | WLAN 802.11b/g/a/n Waveforms | 1 |
| MV887031A | WLAN 802.11ac Waveforms | 1 |
| MV887032A | WLAN 802.11p Waveforms | 1 |
| MV887033A | WLAN 802.11ax Waveforms | 1 |
| MV887040A | Bluetooth Waveforms | 1 |
| MV887040A-001 | DLE Waveforms | 1 |
| MV887040A-002 | 2LE Waveforms | 1 |
| MV887040A-003 | BLR Waveforms | 1 |

WLAN 2x2 MIMO Module Measurement (True MIMO)



Using two TRX Test Modules supports True MIMO measurement of WLAN 802.11n and 11ac 2x2 MIMO modules.

Recommended Configuration

| Model | Description | Qty. |
|---------------|-----------------------------------|------|
| MT8870A | Universal Wireless Test Set | 1 |
| MU88700xA | TRX Test Module | 2 |
| MU88700xA-001 | 6 GHz Frequency Extension | 2 |
| MX887030A | WLAN 802.11b/g/a/n TX Measurement | 1 |
| MX887031A | WLAN 802.11ac TX Measurement | 1 |
| MX887090A | Multi-DUT Measurement scheduler | 1 |
| MV887030A | WLAN 802.11b/g/a/n Waveforms | 1 |
| MV887031A | WLAN 802.11ac Waveforms | 1 |

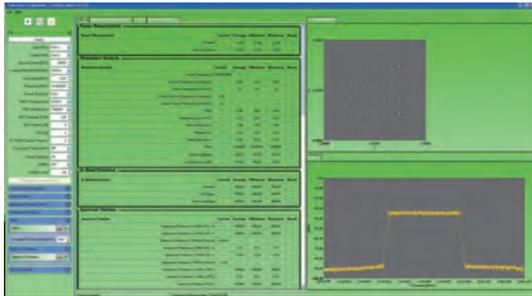
Universal Wireless Test Set MT8870A PC Applications

CombiView

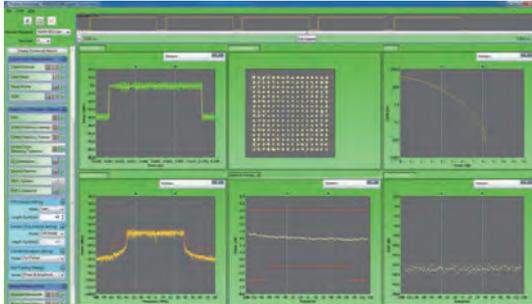
CombiView is a PC application used to control the MT8870A and display graphical and numerical test results. It has the following functions:

Key Features

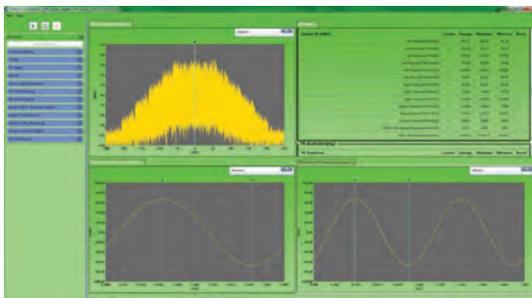
- Graphical display of TX measurement results using Windows interface
- Remote control of MT8870A (MU88700xA) via Ethernet and GPIB (option)
- Setting of MT8870A (MU88700xA)
- Signal generator interface for RX tests



LTE FDD Uplink TX Measurement with Cellular Application Applet



WLAN 802.11ac TX Measurement with SRW Application Applet



Audio Measurement with FM/Audio Application Applet

Utility Tool

The utility tool is a PC application used to detect the network and perform firmware updates.

Key Features

- Displays details of MT8870A and MU88700xA TRX Test Module(s) detected on network
- TRX Test Module MU88700xA firmware upgrade
- Waveform file transfer
- License registration



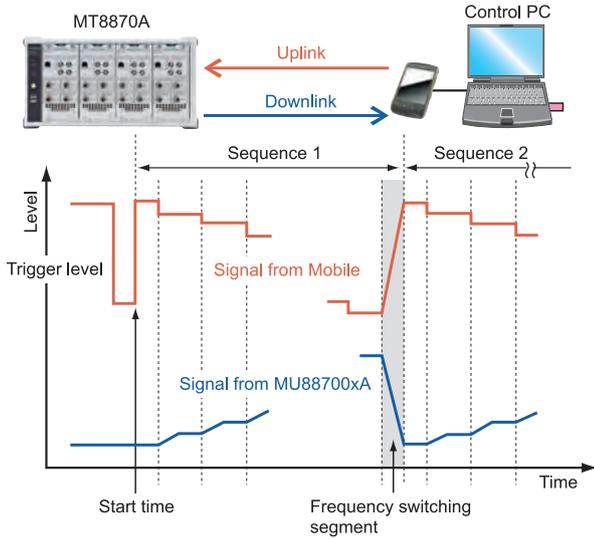
Cellular Measurement Solution

Cellular Standards Sequence Measurement MX887010A

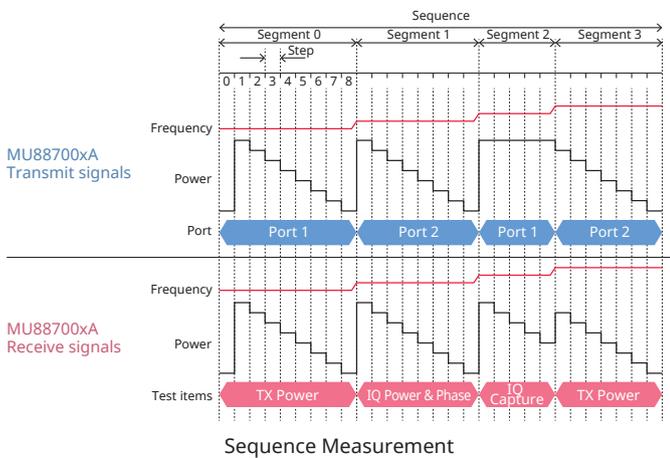
Installing the Cellular Standards Sequence Measurement software MX887010A package in the MT8870A can be operated with preconfigured frequency and level in a sequence list to the signal generator and signal analyzer.

This software is able to greatly reduce calibration and verification time in conjunction with a chipset that supports capability for high-speed calibration and sequence measurement.

- ★1: Sequence measurement requires TX Measurement software MX88701xA
- ★2: Requires Waveforms MV88701xA for downlink signal modulation waveforms



TRX vs. Frequency Measurement



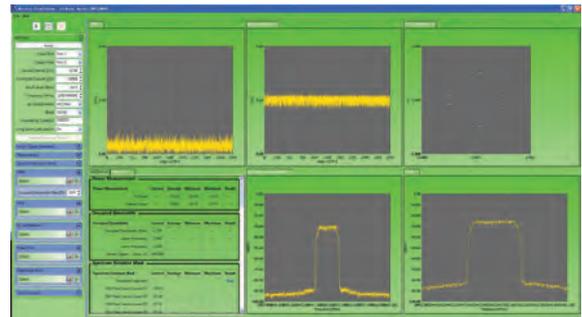
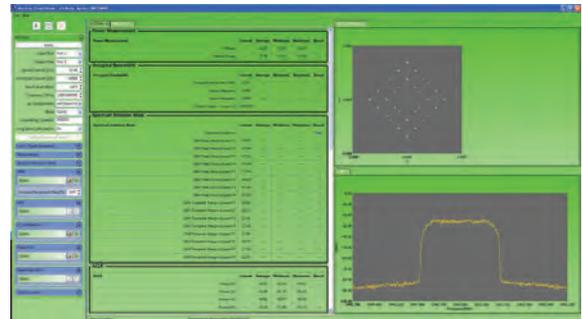
W-CDMA/HSPA Uplink TX Measurement W-CDMA/HSPA Downlink Waveforms

MX887011A MV887011A

Installing the W-CDMA/HSPA Uplink TX Measurement software MX887011A in the MT8870A provides support for the following 3GPP W-CDMA and HSPA related TX characteristics measurements.

- TX Power
- Frequency Error
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Additionally, the package of W-CDMA/HSPA Downlink Waveforms MV887011A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.



W-CDMA/HSPA Uplink TX Measurement using CombiView

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series

Cellular Measurement Solution (continued)

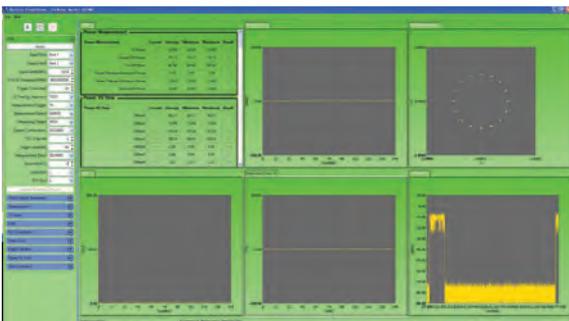
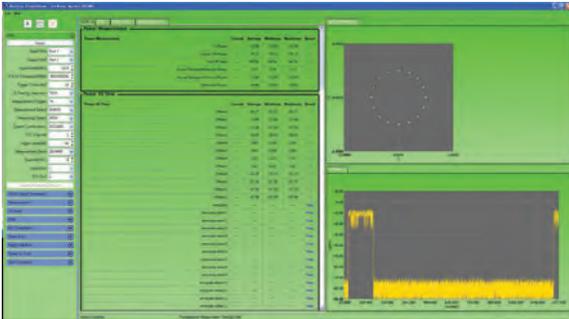
GSM/EDGE Uplink TX Measurement GSM/EDGE Downlink Waveforms

MX887012A
MV887012A

Installing the GSM/EDGE Uplink TX Measurement software MX887012A in the MT8870A provides support for the following 3GPP GSM and EDGE related TX characteristics measurements.

- TX Power
- Power vs. Time
- TX Frequency
- Phase Error
- EVM
- Origin Offset
- Output RF Spectrum

Additionally, the package of GSM/EDGE Downlink Waveforms MV887012A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.



GSM/EDGE Uplink TX Measurement using CombiView

LTE FDD Uplink TX Measurement LTE-Advanced FDD Uplink CA TX Measurement LTE FDD Downlink Waveforms

MX887013A
MX887013A-001
MV887013A

Installing the LTE FDD Uplink TX Measurement software MX887013A in the MT8870A provides support for the following 3GPP LTE FDD related TX characteristics measurements.

- TX Power
- Frequency Error
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Installing the LTE-Advanced FDD Uplink CA TX Measurement software MX887013A-001, extend LTE-Advanced Uplink CA (Carrier Aggregation) measurement on existing LTE FDD TX measurement software. Additionally, the package of LTE FDD Downlink Waveforms MV887013A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.

LTE TDD Uplink TX Measurement LTE-Advanced TDD Uplink CA TX Measurement LTE TDD Downlink Waveforms

MX887014A
MX887014A-001
MV887014A

Installing the LTE TDD Uplink TX Measurement software MX887014A in the MT8870A provides support for the following 3GPP LTE TDD related TX characteristics measurements.

- TX Power
- Frequency Deviation
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Installing the LTE-Advanced TDD Uplink CA TX Measurement software MX887014A-001, extend LTE Uplink CA (Carrier Aggregation) measurement on existing LTE TDD TX measurement software. Additionally, the package of LTE TDD Downlink Waveforms MV887014A contains downlink signals required for non-signaling measurements, sending the downlink signal for production is as easy as selecting the waveform file.

CDMA2000 Reverse Link TX Measurement CDMA2000 Forward Link Waveforms

MX887015A
MV887015A

Installing the CDMA2000 Reverse Link TX Measurement software MX887015A in the MT8870A provides support for the following 3GPP2 CDMA2000 related TX characteristics measurements.

- TX Power
- Modulation Analysis
- Occupied Bandwidth
- Code Domain Power
- Spurious Emissions

Additionally, the package of CDMA2000 Forward Link Waveforms MV887015A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series

Cellular Measurement Solution (continued)

1xEV-DO Reverse Link TX Measurement 1xEV-DO Forward Link Waveforms

**MX887016A
MV887016A**

Installing the 1xEV-DO Reverse Link TX Measurement software MX887016A in the MT8870A provides support for the following 3GPP2 CDMA2000 1xEV-DO related TX characteristics measurements.

- TX Power
- Modulation Analysis
- Occupied Bandwidth
- Code Domain Power
- Spurious Emissions

Additionally, the package of 1xEV-DO Forward Link Waveforms MV887016A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.

TD-SCDMA Uplink TX Measurement TD-SCDMA Downlink Waveforms

**MX887017A
MV887017A**

Installing the TD-SCDMA Uplink TX Measurement software MX887017A in the MT8870A provides support for the following 3GPP TD-SCDMA (1.28 Mcps TDD) related TX characteristics measurements.

- TX Power
- Frequency Deviation
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Additionally, the package of TD-SCDMA Downlink Waveforms MV887017A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.

NR TDD sub-6GHz Uplink TX Measurement NR TDD sub-6GHz Downlink Waveforms

**MX887019A
MV887019A**

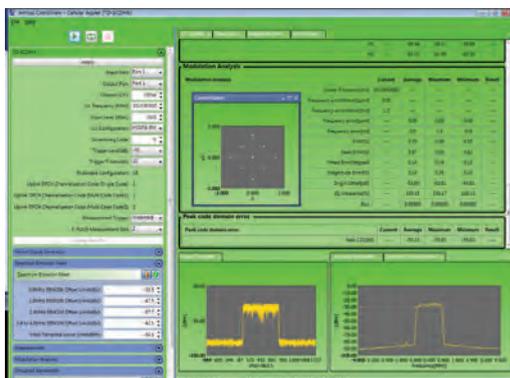
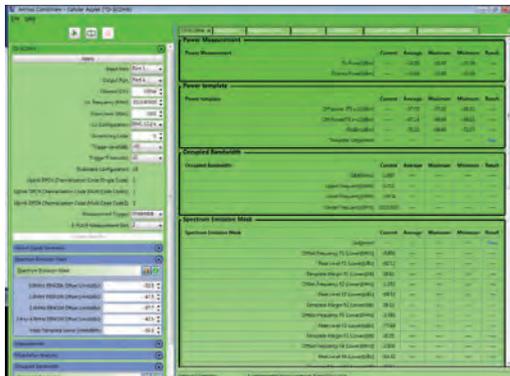
Installing the NR TDD sub-6GHz Uplink Measurement MX887019A in the MT8870A provides support for the following 3GPP 5G NR TDD sub-6GHz related TX characteristics measurements.

- TX Power
- Frequency Deviation
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Additionally, the package of NR TDD sub-6GHz Downlink Waveforms MV887019A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.



NR TDD sub-6GHz Uplink TX Measurement using CombiView



TD-SCDMA Uplink TX Measurement using CombiView

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series

Cellular Measurement Solution (continued)

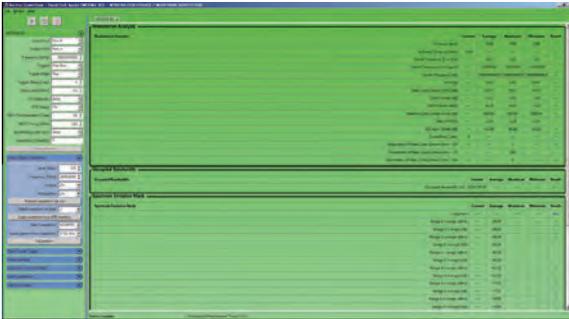
W-CDMA/HSPA Downlink TX Measurement W-CDMA/HSPA Uplink Waveforms

**MX887021A
MV887021A**

Installing the W-CDMA/HSPA Downlink TX Measurement software MX887021A in the MT8870A provides support for the following 3GPP W-CDMA and HSPA related TX characteristics measurements.

- TX Power
- Frequency Deviation
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Additionally, the package of W-CDMA/HSPA Uplink Waveforms MV887021A contains uplink signals required for non-signaling measurements, sending the uplink signal for production is as easy as selecting the waveform file.



W-CDMA/HSPA Downlink TX Measurements using CombiView

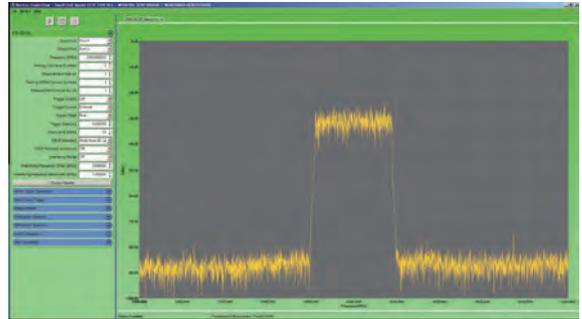
LTE FDD Downlink TX Measurement LTE FDD Uplink Waveforms

**MX887023A
MV887023A**

Installing the LTE FDD Downlink TX Measurement software MX887023A in the MT8870A provides support for the following 3GPP LTE FDD related TX characteristics measurements.

- TX Power
- Frequency Deviation
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Additionally, the package of LTE FDD Uplink Waveforms MV887023A contains uplink signals required for non-signaling measurements, sending the uplink signal for production is as easy as selecting the waveform file.



LTE FDD Downlink TX Measurements using CombiView

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series

Cellular-IoT Measurement Solution (Cellular-LPWA Solution)

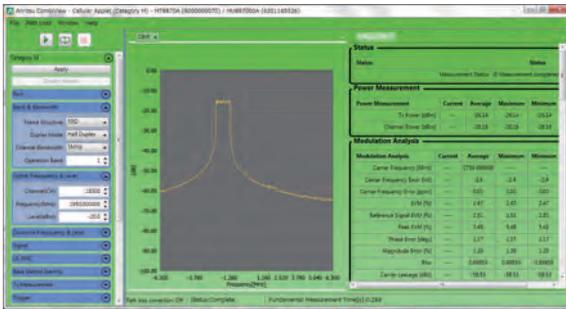
Category M FDD Uplink TX Measurement Category M FDD Downlink Waveforms

**MX887065A
MV887065A**

Installing the Category M FDD Uplink TX Measurement software MX887065A in the MT8870A provides support for the following 3GPP LTE Category M related TX characteristics measurements.

- TX Power
- Frequency Error
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Additionally, the package of Category M FDD Downlink Waveforms MV887065A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.



Category M FDD Uplink TX Measurement using CombiView

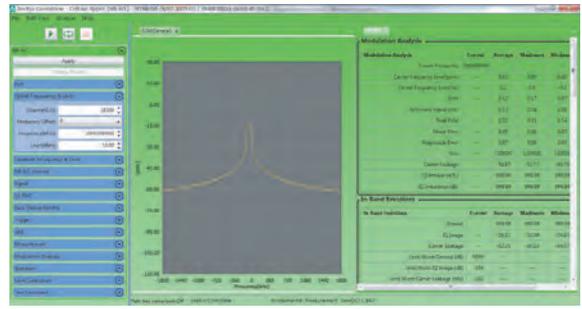
NB-IoT Uplink TX Measurement NB-IoT Downlink Waveforms

**MX887067A
MV887067A**

Installing the NB-IoT Uplink TX Measurement software MX887067A in the MT8870A provides support for the following 3GPP LTE NB-IoT related TX characteristics measurements.

- TX Power
- Frequency Error
- Occupied Bandwidth
- Spectrum Mask
- Adjacent Channel Leakage Power
- Modulation Analysis

Additionally, the package of NB-IoT Downlink Waveforms MV887067A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.



NB-IoT Uplink TX Measurement using CombiView

WLAN Measurement Solution

WLAN 802.11b/g/a/n TX Measurement WLAN 802.11b/g/a/n Waveforms

MX887030A
MV887030A

The MT8870A/MU88700xA supports non-signalling transmitter and receiver tests for all WLAN 802.11b/g/a/n-compliant devices. The 6 GHz Frequency Extension option MU88700xA-001 is required to measure 802.11a/n in 5 GHz band.

Transmitter Test

Installing the MX887030A in the MT8870A provides support for measurement of key IEEE 802.11 - March 2012 : 802.11b TX Test using all installed TRX test modules.

802.11b TX Measurement

IEEE 802.11 TX characteristics

| 802.11b | Test Items |
|----------|---------------------------------------|
| 17.4.7.2 | Transmit Power Levels |
| 17.4.7.3 | Transmit Power Level Control |
| 17.4.7.4 | Transmit Spectrum Mask |
| 17.4.7.5 | Transmit Center Frequency Tolerance |
| 17.4.7.6 | Chip Clock Frequency Tolerance |
| 17.4.7.7 | Transmit power-on and power-down ramp |
| 17.4.7.8 | RF Carrier Suppression |
| 17.4.7.9 | Transmit Modulation Accuracy |

Additional 802.11b Measurements

| Test Items |
|-------------------------|
| Power crest factor |
| CCDF |
| IQ offset |
| Phase & magnitude error |
| Occupied bandwidth |
| Power spectral density |

802.11g/a/n TX Measurement

IEEE 802.11a/g/n TX Test

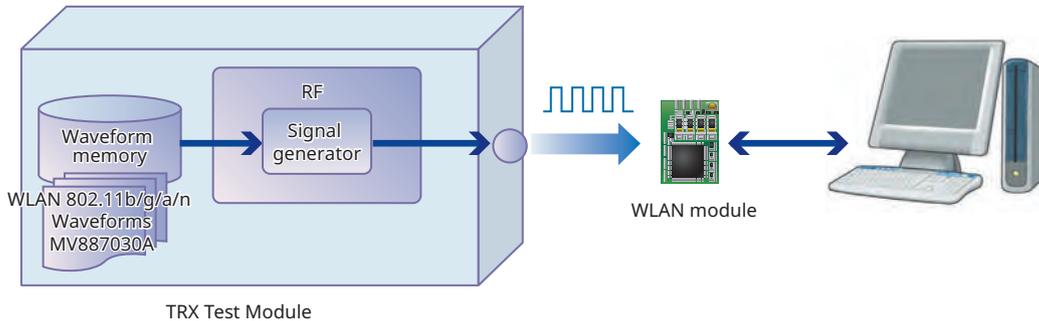
| 802.11a | 802.11g | 802.11n | Test Items |
|------------|---------------------|-------------|--------------------------------------|
| 18.3.9.2 | 19.4.8.2 | 20.3.20.3 | Transmit Power Levels |
| 18.3.9.3 | 19.5.5 | 20.3.20.1 | Transmit Spectrum Mask |
| 18.3.9.5 | 19.4.8.3 | 20.3.20.4 | Transmit center frequency tolerance |
| 18.3.9.6 | 19.4.8.4 | 20.3.20.6 | Symbol Clock frequency tolerance |
| 18.3.9.7.2 | 19.4.8 (18.3.9.7.2) | 20.3.20.7.2 | Transmitter center frequency leakage |
| 18.3.9.7.3 | 19.4.8 (18.3.9.7.3) | 20.3.20.2 | Transmitter spectral flatness |
| 18.3.9.7.4 | 19.4.8 (18.3.9.7.4) | 20.3.20.7.3 | Transmitter constellation error |
| 18.3.9.8 | 19.4.8 (18.3.9.8) | 20.3.20.7.4 | Transmitter modulation accuracy test |

Additional 802.11g/a/n Measurements

| Test Items |
|------------------------|
| Power crest factor |
| CCDF |
| Occupied bandwidth |
| Power spectral density |

Receiver Test

The MV887030A application provides support for transmission of WLAN 802.11b/g/a/n signals from the vector signal generator to the device under test (DUT). The number of received packets can then be read using the chipset vendor's control software.



Waveform Parameter

| 802.11 Standard | Data Rate/Modulation | Bandwidth | Packet Length | Remarks |
|-----------------|--------------------------------------|-------------------|-------------------|------------------------------|
| 802.11b | 11, 5.5, 2, 1 Mbps | - | 1024 or 100 bytes | Long preamble |
| 802.11a/g | 54, 48, 36, 24, 18, 12, 9 and 6 Mbps | - | 1000 or 100 bytes | |
| 802.11n | MCS 0 to 7 and 32 | 20 MHz and 40 MHz | 4096 or 500 bytes | Nss: 1, Guard interval: Long |

802.11b RX Measurement

IEEE 802.11b RX Test

| 802.11b | Test Items |
|----------|--|
| 17.4.8.2 | Receiver minimum input level sensitivity |
| 17.4.8.3 | Receiver maximum input level |

802.11g/a/n RX Measurement

IEEE 802.11a/g/n RX Test

| 802.11a | 802.11g | 802.11n | Test Items |
|-----------|---------|-----------|--|
| 18.3.10.2 | 19.5.2 | 20.3.21.1 | Receiver minimum input level sensitivity |
| 18.3.10.5 | 19.5.4 | 20.3.21.4 | Receiver maximum input level |

WLAN Measurement Solution

WLAN 802.11ac TX Measurement WLAN 802.11ac Waveforms

MX887031A
MV887031A

The MT8870A/MU88700xA supports non-signalling transmitter and receiver tests for all WLAN 802.11ac-compliant devices. The 6 GHz Frequency Extension option MU88700xA-001 is required.

Transmitter Test

Installing the WLAN 802.11ac TX Measurement software MX887031A in the MT8870A supports in-band wireless measurements defined by the IEEE 802.11ac on all installed TRX test modules.

802.11ac TX Measurement

IEEE 802.11ac TX Test

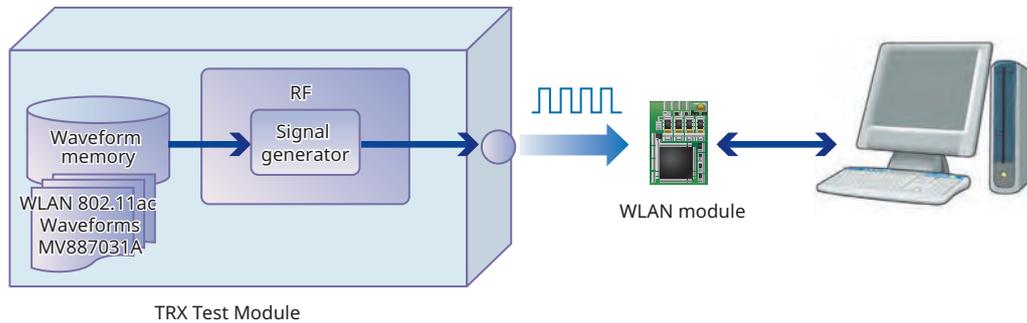
| 802.11ac | Test Items |
|-------------|--|
| 22.3.18.1 | Transmit spectrum mask |
| 22.3.18.2 | Spectral flatness |
| 22.3.18.3 | Transmit center frequency tolerance |
| 22.3.18.3 | Symbol Clock frequency tolerance |
| 22.3.18.4 | Modulation accuracy |
| 22.3.18.4.2 | Transmitter center frequency leakage |
| 22.3.18.4.3 | Transmitter constellation error |
| 22.3.18.4.4 | Transmitter modulation accuracy (EVM) test |
| | Transmit power level |

Additional 802.11ac Measurements

| Test Items |
|------------------------|
| Power crest factor |
| CCDF |
| Occupied bandwidth |
| Power spectral density |

Receiver Test

The MV887031A application provides support for transmission of WLAN 802.11ac signals from the vector signal generator to the device under test. The number of received packets can then be read using the chipset vendor's control software.



Waveform Parameter

| 802.11 Standard | Data Rate/Modulation | Bandwidth | Packet Length | Remarks |
|-----------------|----------------------|---------------------|-------------------|------------------------------|
| 802.11ac | MCS 0 to 9 | 20, 40, 80, 160 MHz | 4096 or 500 bytes | Nss: 1, Guard interval: Long |

802.11ac RX Measurement

IEEE 802.11ac RX Test

| 802.11ac | Test Items |
|-----------|--|
| 22.3.19.1 | Receiver minimum input level sensitivity |
| 22.3.19.4 | Receiver maximum input level |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series

V2X Measurement Solution

WLAN 802.11p TX Measurement WLAN 802.11p Waveforms

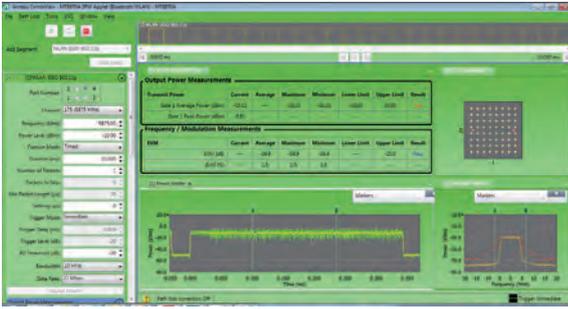
MX887032A MV887032A

The MT8870A/MU88700xA supports non-signalling TRX tests for all WLAN 802.11p-compliant communications devices. The 6 GHz Frequency Extension option MU88700xA-001 is required to measure 802.11p in 5.9 GHz band.

Transmitter Test

Installing the WLAN 802.11p TX Measurement software MX887032A in the MT8870A supports in-band wireless measurements for the 700 MHz and 5.9 GHz bands defined by IEEE 802.11p.

Using the CombiView PC application displays graphs of WLAN 802.11p TX measurements.



WLAN 802.11p TX Measurement using CombiView

802.11p TX Measurement

IEEE 802.11p TX Test

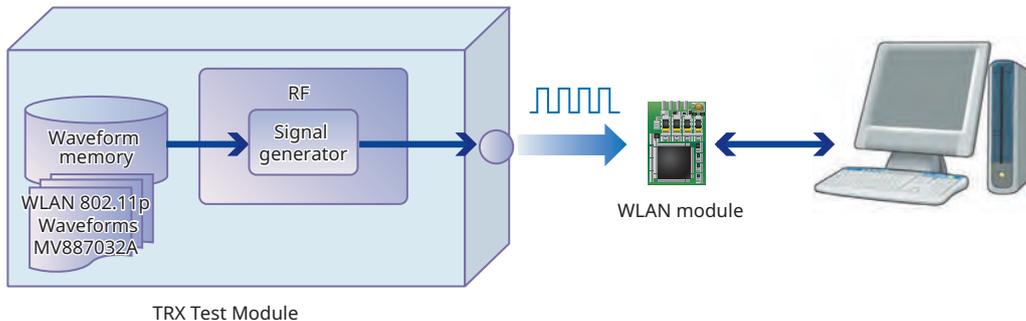
| 802.11p | Test Items |
|------------|--------------------------------------|
| 18.3.9.2 | Transmit power levels |
| 18.3.9.3 | Transmit spectrum mask |
| 18.3.9.5 | Transmit center frequency tolerance |
| 18.3.9.6 | Symbol clock frequency tolerance |
| 18.3.9.7.2 | Transmitter center frequency leakage |
| 18.3.9.7.3 | Transmitter spectral flatness |
| 18.3.9.7.4 | Transmitter constellation error |

Additional 802.11p Measurements

| Test Items |
|------------------------|
| Power crest factor |
| CCDF |
| Occupied bandwidth |
| Power spectral density |

Receiver Test

The MV887032A supports non-signalling RX tests of WLAN 802.11p devices under test (DUT) by sending WLAN 802.11p test signals from the MU88700xA installed in the vector signal generator. Reading the number of packets received by the DUT requires the chipset vendor's control software.



TRX Test Module

Waveform Parameter

| Bandwidth | Data Rate | Packet Length |
|-----------|--|---------------|
| 5 MHz | 1.5, 2.25, 3, 4.5, 6, 9, 12, 13.5 Mbps | 1000 bytes |
| 10 MHz | 3, 4.5, 6, 9, 12, 18, 24, 27 Mbps | 1000 bytes |
| 20 MHz | 6, 9, 12, 18, 24, 36, 48, 54 Mbps | 1000 bytes |

802.11p RX Measurement

IEEE 802.11p RX Test

| 802.11p | Test Items |
|-----------|------------------------------------|
| 18.3.10.2 | Receiver minimum input sensitivity |
| 18.3.10.5 | Receiver maximum input level |

WLAN MIMO Measurement Solution

WLAN 802.11n/11ac MIMO Measurement Function

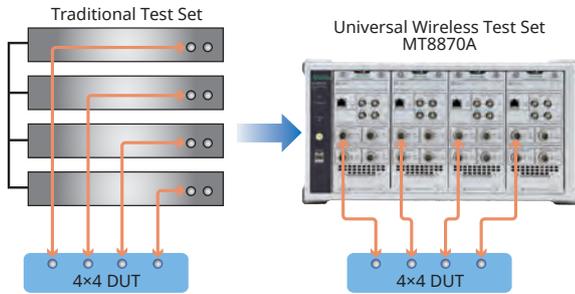
Installing the MU88700xA*1 in the MT8870A with the installed WLAN TRX Measurement software supports easy set-up and measurement of up to 4x4 WLAN MIMO devices.

*1: Requires 6 GHz Frequency Extension option MU88700xA-001 when measuring WLAN 802.11n (5 GHz) or 802.11ac



Normally, measuring each antenna of a MIMO device (streaming) requires a system set-up composed of up to four measuring instruments of the same type as well as synchronized timing of the signal generators required for MIMO measurement and the 10-MHz reference signal generators, plus complex cable connections to control each measuring instrument.

This type of system set-up is not only troublesome for technicians performing MIMO measurements, but also wastes man hours and money. Integrating the MU88700xA into the MT8870A main frame solves the problems of synchronizing signals over external cables experienced with conventional MIMO measurement systems to simplify system set-up and slash time and costs.



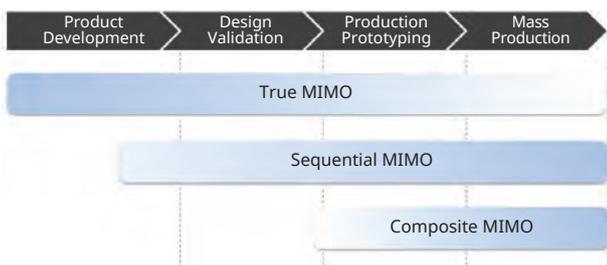
The MX887030A and MV887030A are required for WLAN 802.11n MIMO measurements.

The MX887031A and MV887031A are required for WLAN 802.11ac MIMO measurements*2.

*2: Supports up to 4x4 MIMO WLAN 802.11ac measurements

MIMO Measurement Solutions

The MT8870A is the ideal MIMO measurement solution for WLAN MIMO devices at every stage from R&D to production.



True MIMO

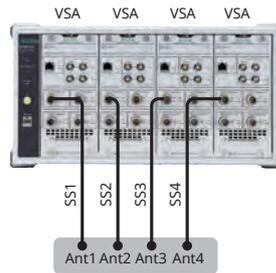
Features

The MT8870A supports parallel measurement of WLAN device streaming characteristics using multiple MU88700xA units installed in the main frame.

It is ideal for performing streaming measurements from each antenna under conditions closely mimicking a real usage environment at the R&D and design stages. There is no need for troublesome external cable connections, because the timing of each MU88700xA unit and the 10-MHz reference frequency are synchronized by the internal connections, offering easy True MIMO measurement.

Transmitter Test

- DUT transmits four MIMO signals simultaneously.
- MU88700xA in each slot tests each antenna (stream)
- Fully independent measurements with parallel processing by each MU88700xA
- Test results
 - Each TX power (Cross power), EVM, Spectral mask, etc.



Test sequence:

- Antenna 1
- Antenna 2
- Antenna 3
- Antenna 4

Test results:

- Antenna 1: EVM_1, Power_1, Spectral mask_1 ...
- Antenna 2: EVM_2, Power_2, Spectral mask_2 ...
- Antenna 3: EVM_3, Power_3, Spectral mask_3 ...
- Antenna 4: EVM_4, Power_4, Spectral mask_4 ...

Receiver Test

- Sends test packets for each antenna to TRX Test Module in each slot
- Test results
 - RX sensitivity of each antenna
- Synchronization
 - 10-MHz reference frequency
 - Digital timing

Note: RF local frequency sync. not supported



All spatial streams must be synchronized to the start of the packet.

WLAN MIMO Measurement Solution (continued)

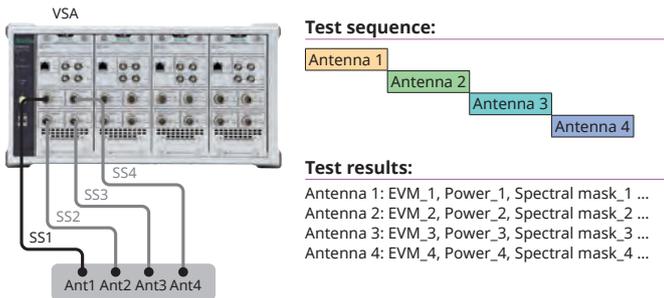
Sequential MIMO

Features

WLAN device MIMO measurements at R&D design require stream measurements from each antenna. Although True MIMO measurement supports an environment in which each antenna is measured simultaneously in parallel, the cost is high because multiple MU88700xA units are required. Since one MU88700xA can support up to four test ports, the Sequential MIMO measurement functions helps cut costs by switching between antennas to perform accurate sequential measurement of each antenna of the MIMO device.

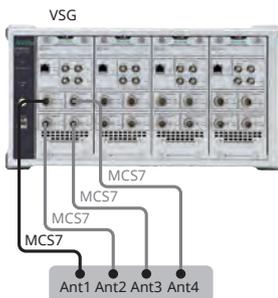
Transmitter Test

- DUT transmits four MIMO signals simultaneously
 - MT8870A switches connected test port and performs TRX test at each antenna (stream)
 - Test results
 - Each TX power (Cross power^{*3}), EVM, Spectral mask, etc.
- *3: There are limitation on the combination of test ports used for cross power measurements.



Receiver Test

- MT8870A switches test port and sends test signal to each antenna to perform RX sensitivity test
- Waveform uses SISO signal
- Test results
 - RX test for each antenna



Composite MIMO

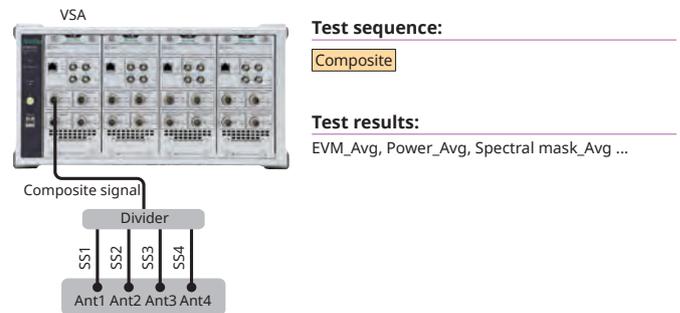
Features

Production-line operators urgently need ways to cut production costs by shortening tact times through reduced measurement times. MIMO device measurement methods currently focus on measuring each antenna one-by-one but viewed from the perspective of reduced tact time and lower costs, production lines could achieve better efficiency and profits with one single measurement of all MIMO device antennas instead of separate measurements of all antennas (total streaming). Installing the MT8870A with one MU88700xA supports use of the Composite MIMO measurement function to measure WLAN RF characteristics at one time by combining and dividing multiple MIMO signals using an external divider (combiner)*.

- *: Recommended product
Mini-Circuits, ZN4PD1-63 + (Frequency range: 2000 MHz to 6000 MHz)

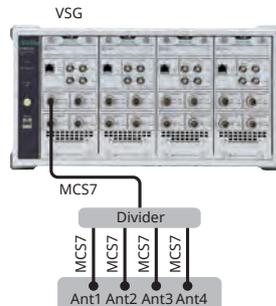
Transmitter Test

- DUT transmits three MIMO signals simultaneously
- MT8870A receives composite test signal via combiner, which combines each streaming MIMO signal output from each antenna, and evaluates RF characteristics
- Test results
 - Composite power (individual powers)
 - Composite EVM and spectral mask values



Receiver Test

- Diversity test (SISO signal)
- Transmits test signal from MT8870A and splits into identical signals at divider (combiner) for input to each antenna
- Since same signal received by multiple antennas, performs better evaluation than RX sensitivity results obtained from one antenna
- Test results
 - RX sensitivity (result is one value only; test specifications of sensitivity changed by number of antennas)



WLAN Measurement Solution

WLAN 802.11ax TX Measurement WLAN 802.11ax Waveforms

MX887033A
MV887033A

The MT8870A/MU88700xA supports non-signalling transmitter and receiver tests for all WLAN 802.11ax-compliant devices. The 6 GHz Frequency Extension option MU88700xA-001 is required.

Transmitter Test

Installing the WLAN 802.11ax TX Measurement software MX887033A in the MT8870A supports in-band wireless measurements defined by the latest IEEE 802.11ax/D1.3 standard on all installed TRX test modules. The 802.11ax 20/40/80 MHz bandwidths and 1024QAM (MCS10/11) modulation method are supported.

Using the CombiView PC application bundle displays graphs of 802.11ax TX measurements.



WLAN 11ax TX Measurement using CombiView

802.11 ax TX Measurement

IEEE P802.11ax/D1.3 802.11ax

| Chapter | Measurement Item |
|-------------|--|
| 28.3.18.1 | Transmit spectral mask |
| 28.3.18.2 | Spectral flatness |
| 28.3.18.3 | Transmit center frequency and symbol clock frequency tolerance |
| 28.3.18.4.2 | Transmit center frequency leakage |
| 28.3.18.4.3 | Transmitter constellation error |
| 28.3.18.4.4 | Transmitter modulation accuracy (EVM) test |

Receiver Test

The MV887031A application provides support for transmission of WLAN 802.11ax signals from the vector signal generator to the device under test.

The number of received packets can then be read using the chipset vendor's control software.

Waveform Parameter

| 802.11 Standard | Data Rate/Modulation | Bandwidth | Packet Length | Remarks |
|-----------------|----------------------|----------------|---------------|--------------------------------|
| 802.11ax | MCS 0 to 11 | 20, 40, 80 MHz | 4096 bytes | Nss: 1, Guard interval: 800 ns |

802.11 ax RX Measurement

IEEE P802.11ax/D1.3 802.11ax

| Chapter | Measurement Item |
|-----------|------------------------------------|
| 28.3.17.2 | Receiver minimum input sensitivity |
| 28.3.17.5 | Receiver maximum input level |

Bluetooth Measurement Solution

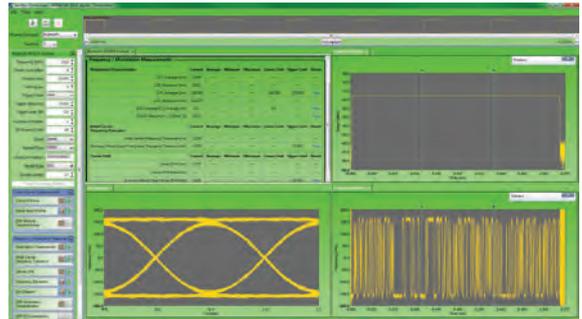
| | |
|---------------------------------|----------------------|
| Bluetooth TX Measurement | MX887040A |
| DLE TX Measurement | MX887040A-001 |
| 2LE TX Measurement | MX887040A-002 |
| BLE TX Measurement | MX887040A-003 |
| Bluetooth Waveforms | MV887040A |
| DLE Waveforms | MV887040A-001 |
| 2LE Waveforms | MV887040A-002 |
| BLR Waveforms | MV887040A-003 |

The MT8870A/MU88700xA supports non-signalling transmitter and receiver tests for Basic Rate (BR), Enhanced Data Rate (EDR) and Bluetooth low-energy (BLE) devices.

Transmitter Test

The Bluetooth TX Measurement software MX887040A has two Bluetooth TX test modes. The SIG Standard mode measures TX test packets sent from the device under test according to the Bluetooth RF Test Specifications. In SIG standard mode, the system returns only measurements that are compatible with the payload type of the captured packets. In Speed Test mode, the system returns results for all enabled measurements regardless of the packet payload.

Because the Speed Test mode supports all BR/EDR measurements for individual packet types, it is ideal for rapid testing on production lines.



Bluetooth TX Measurement using CombiView

Bluetooth TX Measurement

Basic Rate and Enhanced Data Rate (EDR)

Basic Rate measurements and Enhanced Data Rate measurements made in compliance with Bluetooth RF Test Specification RF-PHY.TS.5.0.0

| Specification | Test Items |
|-------------------|---|
| TP/TRM/CA/BV-01-C | Output Power |
| TP/TRM/CA/BV-03-C | Power Control |
| TP/TRM/CA/BV-05-C | TX Output Spectrum 20 dB Bandwidth |
| TP/TRM/CA/BV-06-C | TX Output Spectrum Adjacent Channel Power |
| TP/TRM/CA/BV-07-C | Modulation Characteristics |
| TP/TRM/CA/BV-08-C | Initial Carrier Frequency Tolerance |
| TP/TRM/CA/BV-09-C | Carrier Frequency Drift |
| TP/TRM/CA/BV-10-C | EDR Relative Transmit Power] |
| TP/TRM/CA/BV-11-C | EDR Carrier Frequency Stability and Modulation Accuracy |
| TP/TRM/CA/BV-12-C | EDR Differential Phase Encoding |
| TP/TRM/CA/BV-13-C | EDR In-band Spurious Emissions |
| TP/TRM/CA/BV-14-C | Enhanced Power Control |

Bluetooth Low Energy

Bluetooth low energy measurements made in compliance with Bluetooth RF Test Specification RF-PHY.TS.5.0.0

| Specification | Test Items |
|----------------------|--|
| TP/TRM-LE/CA/BV-01-C | Output power |
| TP/TRM-LE/CA/BV-05-C | Modulation Characteristics, uncoded data at 1 Msym/s |
| TP/TRM-LE/CA/BV-06-C | Carrier frequency offset and drift, uncoded data at 1 Msym/s |
| TP/TRM-LE/CA/BV-09-C | Stable Modulation Characteristics, uncoded data at 1 Msym/s |
| TP/TRM-LE/CA/BV-10-C | Modulation Characteristics at 2 Msym/s |
| TP/TRM-LE/CA/BV-11-C | Stable Modulation Characteristics at 2 Msym/s |
| TP/TRM-LE/CA/BV-12-C | Carrier frequency offset and drift at 2 Msym/s |
| TP/TRM-LE/CA/BV-13-C | Modulation Characteristics, LE Coded (S = 8) |
| TP/TRM-LE/CA/BV-14-C | Carrier frequency offset and drift, LE Coded (S = 8) |

Graphical Displays (BR/BLE)

| Graphs |
|---------------------|
| Power Burst profile |
| Frequency deviation |
| Eye diagram |
| Spectral profile |

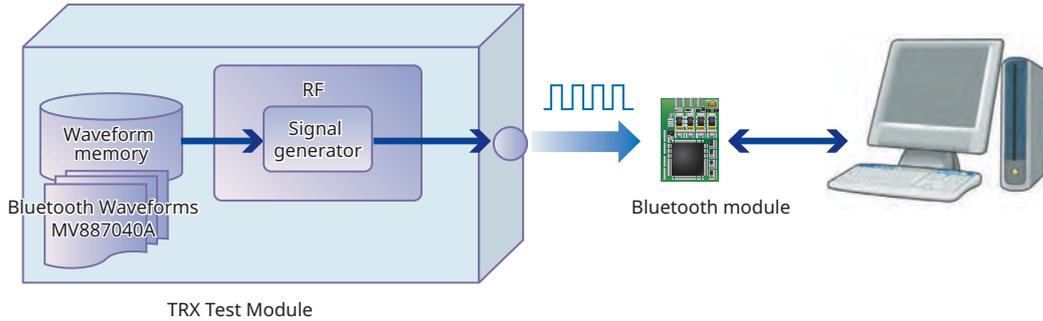
Graphical Displays (EDR)

| |
|--------------------------|
| Power burst profile |
| Frequency deviation |
| IQ constellation diagram |
| DEVM against symbol |
| Vector diagram |
| Spectral profile |

Bluetooth Measurement Solution (continued)

Receiver Test

The MV887040A application provides support for transmission of Bluetooth signals from the vector signal generator to the device under test. The number of received packets can then be read using the chipset vendor's control software.



Standard Waveforms

| Bluetooth | Waveform Type |
|----------------------------|-------------------------------------|
| Basic Rate (BR) | DH1/DH3/DH5 |
| Enhanced Data Rate (EDR) | 2-DH1/2-DH3/2-DH5/3-DH1/3-DH3/3-DH5 |
| Bluetooth Low Energy (BLE) | BLE/PER Report Integrity Test |
| Others | GFSK/PSK CW (Interference Waveform) |

Bluetooth RX Measurement

Basic Rate and Enhanced Data Rate (EDR)

Basic Rate measurements and Enhanced Data Rate measurements made in compliance with Bluetooth RF Test Specification RF-PHY.TS.5.0.0

| Specification | Test Items |
|-------------------|-----------------------------------|
| TP/RCV/CA/BV-01-C | Sensitivity - single slot packets |
| TP/RCV/CA/BV-02-C | Sensitivity - multi-slot packets |
| TP/RCV/CA/BV-06-C | Maximum Input Level |
| TP/RCV/CA/BV-07-C | EDR Sensitivity |
| TP/RCV/CA/BV-08-C | EDR BER Floor Performance |
| TP/RCV/CA/BV-10-C | EDR Maximum Input Level |

Bluetooth Low Energy

Bluetooth low energy measurements made in compliance with Bluetooth RF Test Specification RF-PHY.TS.5.0.0

| Specification | Test Items |
|----------------------|---|
| TP/RCV-LE/CA/BV-01-C | Receiver sensitivity, uncoded data at 1 Msym/s |
| TP/RCV-LE/CA/BV-06-C | Maximum input signal level, uncoded data at 1 Msym/s |
| TP/RCV-LE/CA/BV-07-C | PER Report Integrity, uncoded data at 1 Msym/s |
| TP/RCV-LE/CA/BV-08-C | Receiver sensitivity at 2 Msym/s |
| TP/RCV-LE/CA/BV-12-C | Maximum input signal level at 2 Msym/s |
| TP/RCV-LE/CA/BV-14-C | Receiver sensitivity at 1 Msym/s, Stable Modulation Index |
| TP/RCV-LE/CA/BV-18-C | Maximum input signal level, uncoded data at 1 Msym/s, Stable Modulation Index |
| TP/RCV-LE/CA/BV-19-C | PER Report Integrity, uncoded data at 1 Msym/s, Stable Modulation Index |
| TP/RCV-LE/CA/BV-20-C | Receiver sensitivity at 2 Msym/s, Stable Modulation Index |
| TP/RCV-LE/CA/BV-24-C | Maximum input signal level at 2 Msym/s, Stable Modulation Index |
| TP/RCV-LE/CA/BV-26-C | Receiver sensitivity, LE Coded (S = 2) |
| TP/RCV-LE/CA/BV-27-C | Receiver sensitivity, LE Coded (S = 8) |
| TP/RCV-LE/CA/BV-32-C | Receiver sensitivity, LE Coded (S = 2), Stable Modulation Index |
| TP/RCV-LE/CA/BV-33-C | Receiver sensitivity, LE Coded (S = 8), Stable Modulation Index |

Simple Test Solution

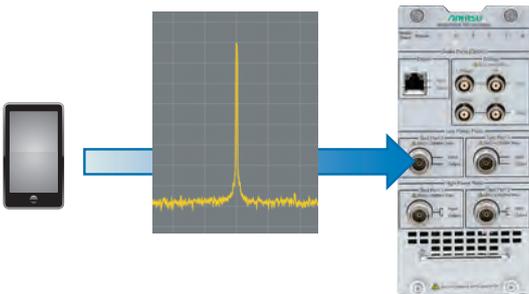
Short Range Wireless Average Power and Frequency Measurement MX887050A

Installing the Short Range Wireless Average Power and Frequency Measurement software MX887050A in the MT8870A provides support for simple tests for WLAN and Bluetooth connectivity wireless. The MX887050A supports CW power and frequency measurements on unmodulated signals and on signals modulated using the methods shown in the table below.

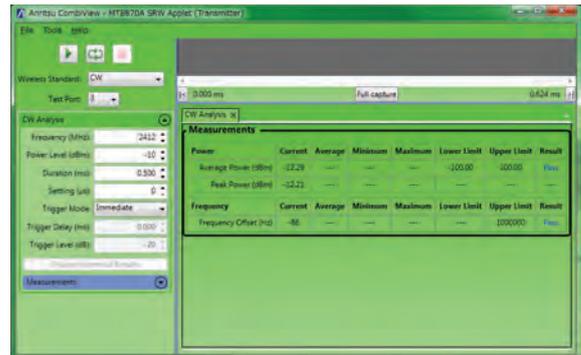
MX887050A is also utilized for the RF calibration test of connectivity devices using unmodulated signals.

| Supported Modulation Methods | |
|------------------------------|------------|
| WLAN | DSSS, OFDM |
| Bluetooth | GFSK, PSK |

For Simple Tests



Short Range Wireless Average Power and Frequency Measurement MX887050A



CW Measurement using CombiView

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series

IEEE 802.15.4 Measurement Solution

IEEE 802.15.4 TX Measurement
IEEE 802.15.4 Waveforms

MX887060A
MV887060A

The MT8870A/MU88700xA support IEEE 802.15.4-recommended O-QPSK modulation signal TRX tests of communications devices.

Transmitter Test

Installing the IEEE 802.15.4 TX Measurement software MX887060A in the MT8870A supports measurement of the key TX characteristics recommended by the IEEE 802.15.4 standard released in 2011.

802.15.4 TX Measurement

IEEE 802.15.4 - 2011: 802.15.4 TX Measurements

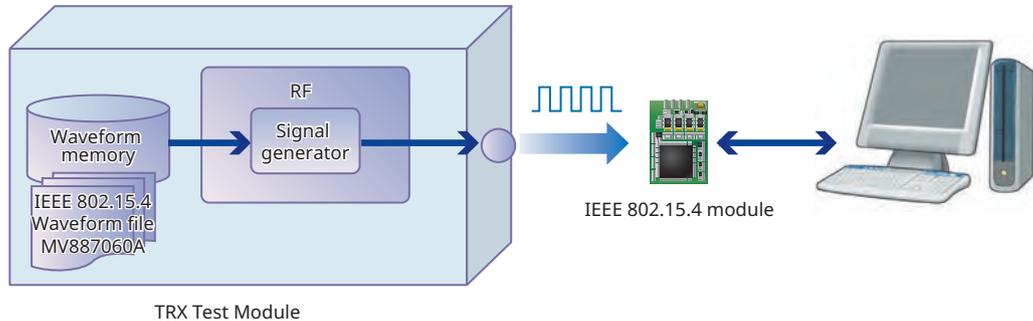
| 802.15.4 | Test Items |
|----------|--|
| 10.3.2 | Transmit power spectral density (PSD) mask |
| 10.3.3 | Symbol rate |
| 10.3.7 | RX-to-TX turnaround time |
| 10.3.8 | Error vector magnitude (EVM) |
| 10.3.9 | Transmit center frequency tolerance |
| 10.3.10 | Transmit power |

Graphical Displays

| |
|-----------------------|
| Spectral mask |
| Constellation diagram |
| Power vs. Time |

Receiver Test

With a vector signal generator built into the MU88700xA, transmitting the test signal from the selected package of IEEE 802.15.4 Waveforms MV887060A supports RX tests of IEEE 802.15.4 devices. The specified number of packets is sent from the MU88700xA to the device under test (DUT). The chipset developer's control software is required to capture packets received by the DUT.



Waveform Parameter

| Waveform Name | Modulation | Band | Data Rate | Chip Rate | Filter | Signal Length |
|-----------------------|------------|----------|-----------|--------------|------------------------------|---------------|
| MV887060A_ZB2450_0001 | O-QPSK | 2450 MHz | 250 kbps | 2000 kchip/s | Half-sine | 1664 chip |
| MV887060A_ZB2450_0002 | O-QPSK | 2450 MHz | 250 kbps | 2000 kchip/s | Half-sine | 1024 chip |
| MV887060A_ZB915_0001 | O-QPSK | 915 MHz | 250 kbps | 1000 kchip/s | Half-sine | 832 chip |
| MV887060A_ZB915_0002 | O-QPSK | 915 MHz | 250 kbps | 1000 kchip/s | Half-sine | 1024 chip |
| MV887060A_ZB868_0001 | O-QPSK | 868 MHz | 100 kbps | 400 kchip/s | Half-sine | 832 chip |
| MV887060A_ZB868_0002 | O-QPSK | 868 MHz | 100 kbps | 400 kchip/s | Half-sine | 1024 chip |
| MV887060A_ZB780_0001 | O-QPSK | 780 MHz | 250 kbps | 1000 kchip/s | Raised cosine (roll-off 0.8) | 832 chip |
| MV887060A_ZB780_0002 | O-QPSK | 780 MHz | 250 kbps | 1000 kchip/s | Raised cosine (roll-off 0.8) | 1024 chip |

802.15.4 RX Measurement

IEEE 802.15.4 - 2011: 802.15.4 RX Measurements

| 802.15.4 | Test Items |
|----------|---|
| 10.3.4 | Receiver sensitivity |
| 10.3.11 | Receiver maximum input level of required signal |

Z-Wave Measurement Solution

Z-Wave TX Measurements Z-Wave Waveforms

MX887061A
MV887061A

The MT8870A/MU88700xA supports non-signalling TRX tests of ITU-T G.9959-compliant communications devices.

Transmitter Test

Installing the Z-Wave TX Measurement software MX887061A in the MT8870A supports the key TX measurements defined by ITU-T G.9959 - 2012.

ITU-T G.9959 TX Measurement

ITU-T G.9959 2012 TX Measurements

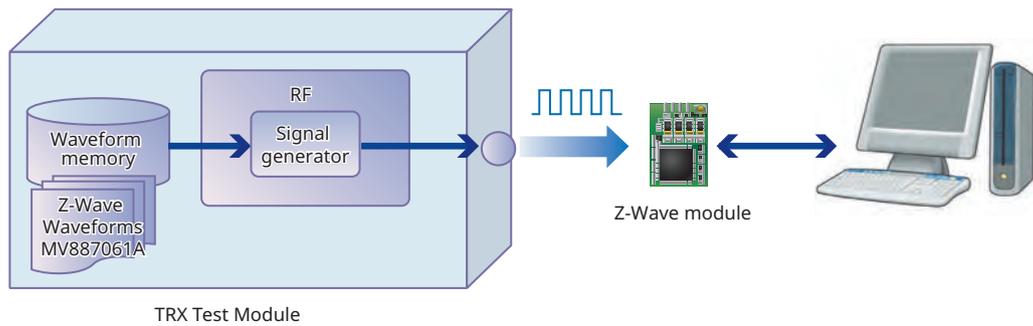
| ITU-T G.9959 | Test Items |
|--------------|--|
| 7.1.2.2 | Data rates |
| 7.1.2.5.1 | Transmit frequency error |
| 7.1.2.5.2 | Transmit power adjustments (conducted) |

Graphical Displays

| |
|--------------------|
| Data table |
| Power vs. Time |
| Frequency vs. Time |

Receiver Test

The MV887061A supports RX tests of Z-Wave devices under test (DUT) by sending Z-Wave test signals from the MU88700xA installed in the vector signal generator. Reading the number of packets received by the DUT requires the chipset vendor's control software.



Waveform Parameter

| Waveform Name | Modulation | Data Rate | Bit Rate | Symbol Rate | Filter | PPDU | Preamble Sequence | SFD | PSDU |
|----------------------|------------|-----------|----------|-------------|-------------------|-----------------------|-------------------|--------|----------------------------------|
| MV887061A_ZW_R1_0001 | 2FSK | R1 | 9.6 kbps | 19.2 kbaud | Gaussian (BT=1.0) | 26 bytes (208 bits) | 10 bytes | 1 byte | 14 bytes (incl. MPSU 4 bytes) |
| MV887061A_ZW_R2_0001 | 2FSK | R2 | 40 kbps | 40 kbaud | Gaussian (BT=1.0) | 35 bytes (280 bits) | 20 bytes | 1 byte | 14 bytes (incl. MPSU 4 bytes) |
| MV887061A_ZW_R3_0001 | 2FSK | R3 | 100 kbps | 100 kbaud | Gaussian (BT=0.6) | 40 bytes (320 bits) | 24 bytes | 1 byte | 15 bytes (incl. MPSU 4 bytes) |
| MV887061A_ZW_R1_0002 | 2FSK | R1 | 9.6 kbps | 19.2 kbaud | Gaussian (BT=1.0) | 76 bytes (608 bits) | 10 bytes | 1 byte | 64 bytes (incl. MPSU 54 bytes) |
| MV887061A_ZW_R2_0002 | 2FSK | R2 | 40 kbps | 40 kbaud | Gaussian (BT=1.0) | 85 bytes (680 bits) | 20 bytes | 1 byte | 64 bytes (incl. MPSU 54 bytes) |
| MV887061A_ZW_R3_0002 | 2FSK | R3 | 100 kbps | 100 kbaud | Gaussian (BT=0.6) | 211 bytes (1688 bits) | 40 bytes | 1 byte | 170 bytes (incl. MPSU 159 bytes) |

ITU-T G.9959 RX Measurement

ITU-T G.9959 2012 RX Measurement

| 802.15.4 | Test Items |
|--------------|----------------------|
| ITU-T G.9959 | Test Items |
| 7.1.2.5.3 | Receiver sensitivity |

Receiver Measurement Solution

MV8871xxA Series Waveforms

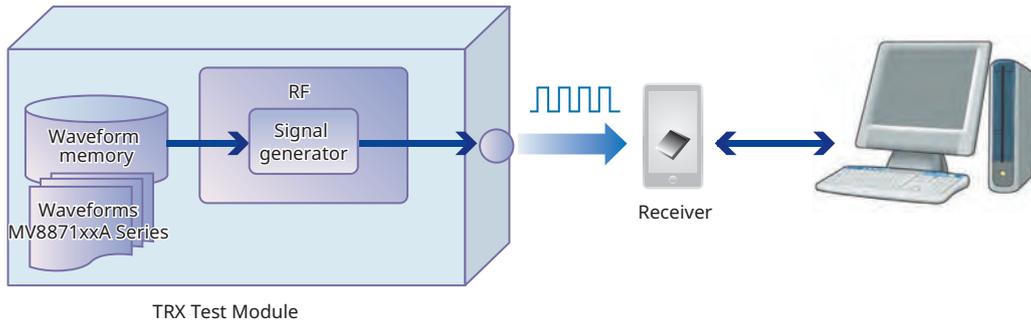
The MT8870A/MU88700xA supports RX tests of receivers using the various common communications technologies in widespread use today.

RX Test Using Waveforms

The Waveforms MV8871xxA series is a file of waveforms for generating any output waveform standardized by each communications technology. Saving and selecting these files in the internal waveform memory of the MU88700xA makes it easy to output a signal for any waveform pattern from the built-in vector signal generator.

Waveform file generated from the MU88700xA vector signal generator can be used to run sensitivity tests and simple BER RX tests* on GPS and digital broadcast equipment supporting mobile terminals and communications appliances.

*: An external attenuator is required when running RX tests at lower levels than the lower output limit of the signal generator.



Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series

Main Specifications of MV8871xxA Series Waveforms

GPS Waveforms MV887100A

| | | |
|------------------------------------|---|-----------------------------------|
| Waveform File Name | MV887100A_GPS_0002 | MV887100A_GPS_0003 |
| Application | Sensitivity test/BER measurement | Parity detection/Sensitivity test |
| Transmitted Data Modulation Method | BPSK | |
| Satellite ID Number | 1 | |
| Reference Standard | GLOBAL POSITIONING SYSTEM STANDARD POSITIONING SERVICE SIGNAL SPECIFICATION | |

Galileo Waveforms MV887101A

| | | |
|------------------------------------|---|--|
| Waveform File Name | MV887101A_GALILEO_0001 | |
| Application | Parity detection/Sensitivity test | |
| Transmitted Data Modulation Method | QPSK or CBOC (depending on selecting waveforms) | |
| Satellite ID Number | 1 | |
| Reference Standard | European GNSS (Galileo) Open Service Signal In Space Interface Control Document | |

GLONASS Waveforms MV887102A

| | | |
|------------------------------------|--|---|
| Waveform File Name | MV887102A_GLONASS_0001 | MV887102A_GLONASS_010x MV887102A_GLONASS_011x |
| Application | Sensitivity test/BER measurement | Simultaneous GPS and GLONASS measurements*1, C/No measurements |
| Transmitted Data Modulation Method | BPSK | BPSK |
| Satellite ID Number | 3 | - |
| Reference Standard | INTERFACE CONTROL DOCUMENT Navigational radio signal In bands L1, L2 Edition 5.1 | |

*1: MV887100A GPS waveforms license is required to perform simultaneous GPS and GLONASS measurements.

BeiDou Waveform MV887103A

| | | |
|------------------------------------|---|--|
| Waveform File Name | MV887103A_BEIDOU_0002 | |
| Application | Parity detection/Sensitivity test | |
| Transmitted Data Modulation Method | QPSK (Only I phase) | |
| Satellite ID Number | 1, 6 (depending on selected waveforms) | |
| Reference Standard | BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal (Version 2.0) | |

DVB-H Waveforms MV887110A

| | | |
|------------------------------------|----------------------------------|--|
| Waveform File Name | MV887110A_DVBH_0001 | |
| Application | Simple BER measurement | |
| Transmitted Data | PN9fix*2 | |
| Transmitted Data Modulation Method | QPSK | |
| Encoding Rate | 2/3 | |
| System Bandwidth | 8 MHz | |
| Cell ID | 0x0000 | |
| Reference Standard | ETSI EN 300 744 V1.5.1 (2004-11) | |

*2: fix indicates the PN sequence is not continued if the waveform is regenerated from the first position.

ISDB-T Waveforms MV887111A

| | | | | |
|------------------------------------|--|---------------------------------|------------------------------|--|
| Waveform File Name | MV887111A_ISDBT_0001 | MV887111A_ISDBT_0002 | MV887111A_ISDBT_0003 | MV887111A_ISDBT_0004 |
| Application | Device evaluation | Video and audio evaluation*3 | | Simple BER measurement |
| Waveform Cycle/Group | 2 [Frame] | 40 [Frame] | 40 [Frame] | 4 [Frame] |
| Transmitted Data | PN23fix*4 | | | |
| Transmitted Data Modulation Method | Layer A: 64QAM and Layer A: QPSK Layer B: 64QAM | Layer A: QPSK Layer B: 64QAM | | Layer A: QPSK or 16QAM Layer B: 64QAM |
| Guard Interval | 1/8 | | | |
| Encoding Rate | No Encoding | Layer A: 2/3 Layer B: 7/8 | Layer A: 2/3 Layer B: 3/4 | Layer A: 2/3 or 1/2 Layer B: 3/4 or 7/8 |
| Mode | 3 | | | |
| Reference Standard | ARIB STD-B31 | | | |

*3: RX not guaranteed for all receivers

*4: fix indicates the PN sequence is not continued if the waveform is regenerated from the first position.

ISDB-Tmm Waveforms MV887112A

| | | | | |
|------------------------------------|--|--|--|--|
| Waveform File Name | MV887112A_ISDBTmm_SSpatA_000x_0M (x = 1 to 6) MV887112A_ISDBTmm_SSpatA_000x_8M (x = 1 to 6) MV887112A_ISDBTmm_SSpatC_000x_0M (x = 7 to 12) MV887112A_ISDBTmm_SSpatC_000x_8M (x = 7 to 12) The XXXX_8M waveform pattern is a waveform with the file name XXXX_0M to which an 8-MHz offset has been added. | | | |
| Application | Simple BER measurement | | | |
| Waveform Cycle/Group | 4 [Frame] | | | |
| Transmitted Data | PN23fix*5 | | | |
| Transmitted Data Modulation Method | QPSK or 16QAM | | | |
| Waveform Format | A type or C type | | | |
| Guard Interval | 1/4 | | | |
| Encoding Rate | 1/2 or 2/3 | | | |
| Mode | 3 | | | |
| Reference Standard | ARIB STD-B46 | | | |

*5: fix indicates the PN sequence is not continued if the waveform is regenerated from the first position.

Consult Anritsu for details about each waveforms.

FM/RDS Measurement Solution

FM/Audio TRX Measurement
FM RDS Waveforms
(RDS: Radio Data System)

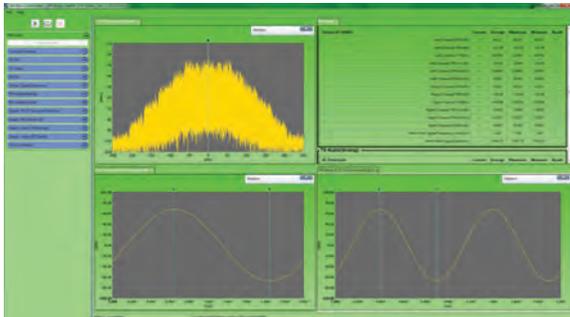
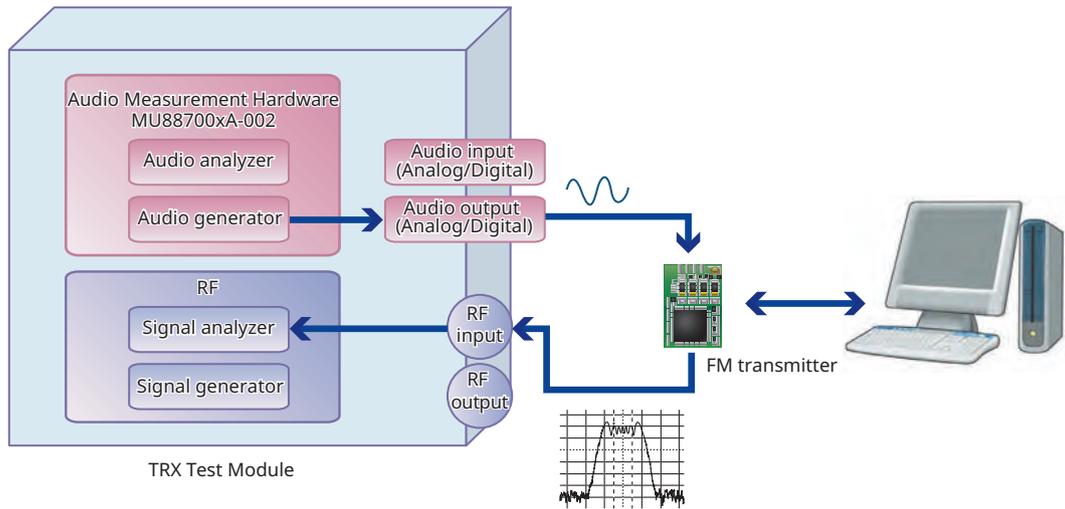
MX887070A
MV887070A

The MT8870A/MU88700xA supports TRX tests of FM transceivers and adding an option also supports audio tests.

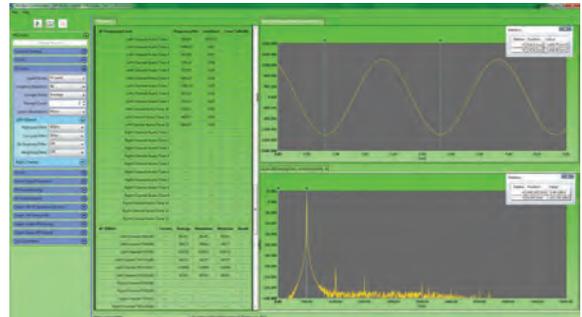
FM Transmitter Test

Installing the Audio Measurement Hardware MU88700xA-002 in the MU88700xA outputs either analog or digital format audio signals for up to 8 multi-tones (stereo left and right channels) from the output connector. The audio signal is available for input to the FM transmitter audio input connector.

The FM/Audio TRX Measurement software MX887070A is used with the built-in signal analyzer of the MU88700xA to execute various audio tests, such as measurement of RF frequency, level and frequency deviation of audio FM signals output from FM transmitters, as well as AF signal frequency, level (up to 12 multi-tones), distortion, stereo crosstalk, etc., when using AF signal waveforms, and analysis of internal data and output of RDS data by decoding data when receiving RDS waveforms.



FM Transmitter Test using CombiView



FM Receiver Test using CombiView
(device audio output measurement)

| RDS | Detail |
|---------------------------------|--|
| RDS Total Data Size(byte/block) | 143 Byte, 44 blocks |
| RDS Error Rate(%) | 0 |
| RDS RTU(HEX) | 3408652072750963062002267754209609782094796d707320979657220746885209c617a792026469172e**** |

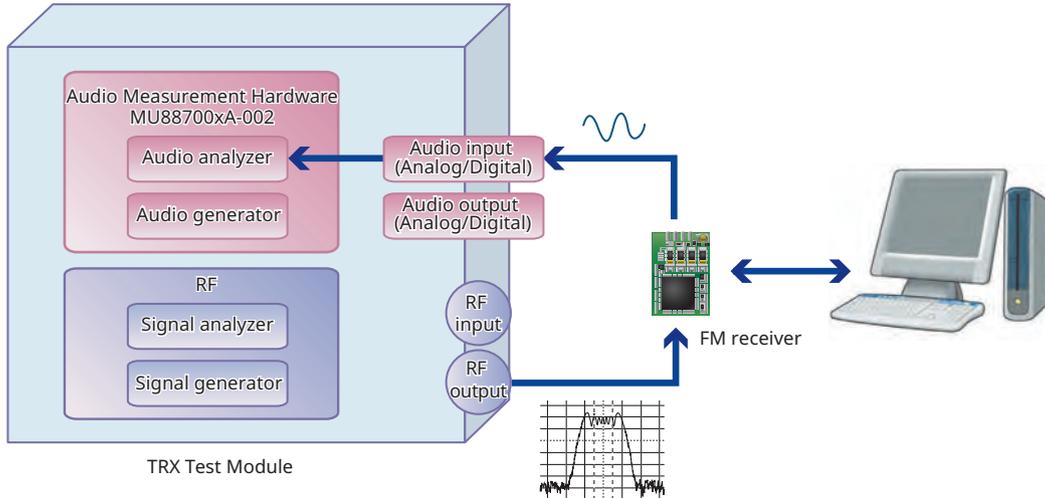
RDS Measurement Results using CombiView

FM/RDS Measurement Solution (continued)

FM Receiver Test

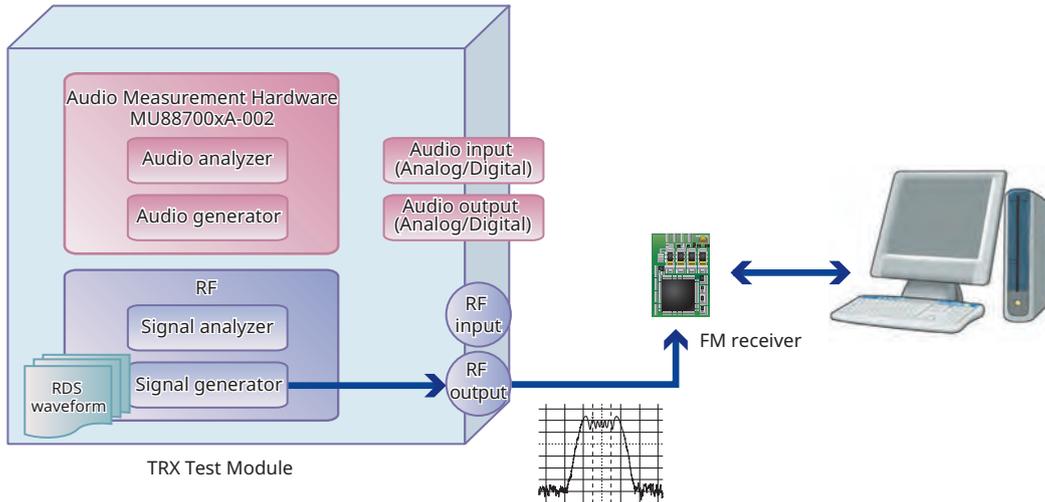
To test FM receivers using the FM/Audio TRX Measurement software MX887070A, the specified test audio signal is frequency modulated and a signal is output from the vector signal generator.

Installing the Audio Measurement Hardware MU88700xA-002 in the MU88700xA inputs either analog or digital format audio signals output from the FM receiver to the built-in audio analyzer of the MU88700xA to perform audio tests including AF signal frequency and level (up to 12 multi-tones), distortion rate, stereo crosstalk, etc.



FM Receiver Test RDS (Radio Data System)

Loading the FM RDS Waveforms MV887070A supports output of waveforms including transmitted data such as radio text data from the built-in vector signal generator based on the FM RDS (Radio Data System) standard.



Main Specifications of FM RDS Waveforms

| Waveform File Name | MV887070A_FMRDS_0001 | MV887070A_FMRDS_0002 | MV887070A_FMRDS_0003 | MV887070A_FMRDS_0004 |
|--------------------|--------------------------|----------------------|----------------------|----------------------|
| Application | DUT RDS RX function test | | | DUT RX test |
| AF Left Channel | Tone Count | 1 | | |
| | Tone Frequency | 1 kHz | | |
| | Tone Deviation | 75 kHz × 0.9 | | |
| AF Right Channel | Tone Count | 1 | | |
| | Tone Frequency | 2 kHz | | |
| | Tone Deviation | 75 kHz × 0.9 | | |
| Pilot Deviation | 75 kHz × 0.1 | | | |
| RDS Deviation | 75 kHz × 0.05 | | | |
| Reference Standard | IEC 62106 Edition 2.0 | | | |

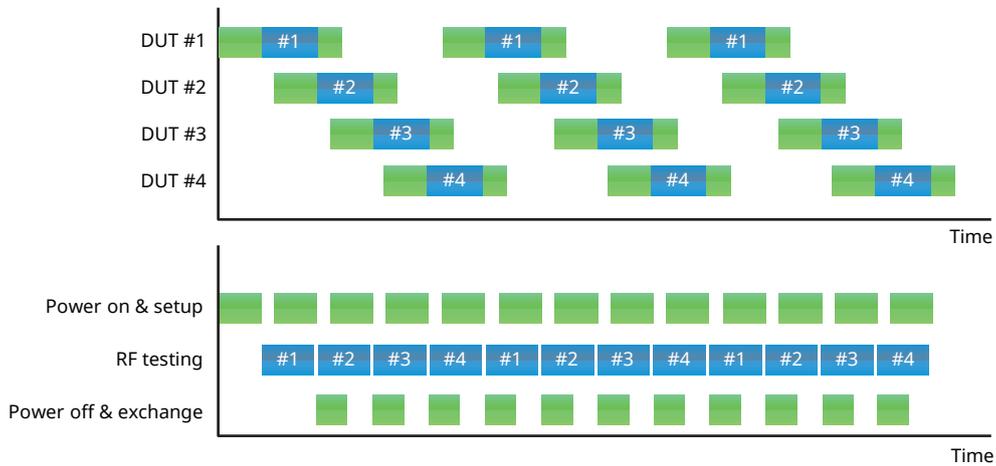
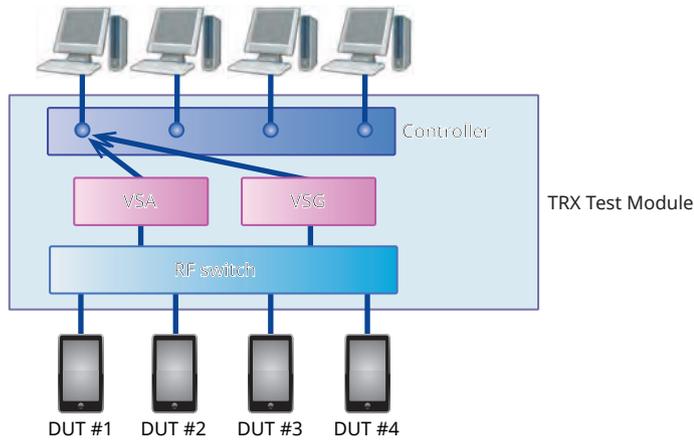
Consult Anritsu for details about the FM RDS waveform file.

High Speed Measurement Solution

Multi-DUT Measurement Scheduler

Installing the Multi-DUT Measurement Scheduler software MX887090A in one MU88700xA with built-in dedicated control offers functions for operating multiple measurement systems virtually by managing software and hardware. Optimizing measuring instrument operations like this helps cut DUT production costs.

*: Multi-DUT Measurement Scheduler software does not support for W-CDMA/HSPA Downlink TX Measurement MX887021A, LTE FDD Downlink TX Measurement MX887023A, IEEE 802.15.4 TX Measurement MX887060A, Z-Wave TX Measurement MX887061A, FM/Audio TRX Measurement MX887070A.



Universal Wireless Test Set MT8870A Specifications

Electrical Characteristics

| | |
|-------------------------------|--|
| Number of Slots | 4 |
| Internal Reference Oscillator | <p>Starting characteristics 25°C, Referenced to frequency at 24-hour after power-on $\pm 5 \times 10^{-7}$ (2 minutes after power-on) $\pm 5 \times 10^{-8}$ (5 minutes after power-on)</p> <p>Aging rate: $\pm 1 \times 10^{-7}$/year Temperature characteristics: $\pm 2 \times 10^{-8}$ (+5° to +45°C) Initial calibration accuracy +20° to +30°C, 1 hour after power-on $\pm 2.2 \times 10^{-8}$</p> |
| Connector | <p>External reference input Connector: BNC-J (rear panel), 50Ω (nom.) Frequency: 10 MHz Operating range: ± 1 ppm Input level: -15 to +20 dBm, 50Ω (AC coupling)</p> <p>Reference signal output Connector: BNC-J (rear panel), 50Ω (nom.) Frequency: 10 MHz Output level: ≥ 0 dBm (AC coupling)</p> <p>Trigger Input/Output switching: Trigger input/output selectable Connector: BNC-J (rear panel, 4 ports) Input/Output level: TTL level</p> <p>Ethernet controller Control from external controller (excluding power-on/off) Ethernet (1000BASE-T) Connector: RJ-45 (front panel, rear panel) GPIB (with MT8870A-001) Connector: IEEE488 bus connector (rear panel, 4 ports) AUX Connector: 50-pin (correspond to DX10BM-50S, rear panel)</p> |

General

| | | |
|---------------------|---|------------------------------------|
| Dimensions and Mass | <p>426 (W) × 221.5 (H) × 498 (D) mm (excluding projections) ≤ 11.5 kg (excluding all options and test modules) ≤ 30.0 kg (including options and test modules)</p> | |
| Power Supply | <p>Power voltage: 100 V(ac) to 120 V(ac)/200 V(ac) to 240 V(ac) Frequency: 50 Hz/60 Hz Power consumption: ≤ 900 VA (including all options and test modules)</p> | |
| Temperature Range | +5° to +45°C (operating), -20° to +60°C (storage) | |
| CE | EMC | 2014/30/EU, EN61326-1, EN61000-3-2 |
| | LVD | 2014/35/EU, EN61010-1 |
| | RoHS | 2011/65/EU, EN50581 |

TRX Test Module MU887000A Specifications

Input/Output Connector

| | |
|---------------|--|
| RF Test Ports | <p>Number of ports 4</p> <p>Connector N (female)</p> <p>Impedance 50Ω (nom.)</p> <p>VSWR</p> <p>Test port 1 and 2</p> <ul style="list-style-type: none"> <1.5 (10 MHz ≤ f < 400 MHz) <1.2 (400 MHz ≤ f ≤ 2.7 GHz) <1.3 (2.7 GHz < f ≤ 3.8 GHz) <1.5 (3.8 GHz < f ≤ 6.0 GHz) <p>Test port 3 and 4</p> <ul style="list-style-type: none"> <1.8 (10 MHz ≤ f < 30 MHz) <1.5 (30 MHz ≤ f ≤ 3.8 GHz) <1.6 (3.8 GHz < f ≤ 6.0 GHz) <p>Maximum input level</p> <ul style="list-style-type: none"> +35 dBm (Test port 1 and 2) +25 dBm (Test port 3 and 4) |
| AF Test Ports | <p>Ports Analog port, Digital port</p> <p>Connector Analog port: BNC (female) Digital port: RJ-45</p> |

Signal Generator

| | |
|-------------------|---|
| Frequency | <p>Setting range</p> <ul style="list-style-type: none"> 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887000A-001) <p>Setting Resolution 1 Hz</p> <p>Accuracy Depends on MT8870A reference oscillator accuracy</p> |
| Amplitude | <p>Setting range</p> <p>Test port 1 and 2</p> <ul style="list-style-type: none"> -130 to -10 dBm (≤3.8 GHz) -130 to -18 dBm (>3.8 GHz) <p>Test port 3 and 4</p> <ul style="list-style-type: none"> -120 to 0 dBm (≤3.8 GHz) -120 to -8 dBm (>3.8 GHz) <p>Setting Resolution 0.1 dB</p> <p>Accuracy CW, After CAL, 10° to 40°C</p> <p>Test port 1 and 2</p> <p>Output level: ≥-120 dBm (≤3.8 GHz), ≥-100 dBm (>3.8 GHz)</p> <ul style="list-style-type: none"> ±1.3 dB (10 MHz ≤ f < 400 MHz) (Signal Analyzer input level: +15 dBm) ±1.0 dB, ±0.7 dB (typ.) (400 MHz ≤ f ≤ 3.8 GHz) ±1.3 dB, ±1.0 dB (typ.) (3.8 GHz < f ≤ 6.0 GHz) <p>Test port 3 and 4</p> <p>Output level: ≥ -110 dBm</p> <ul style="list-style-type: none"> ±1.3 dB (10 MHz ≤ f < 400 MHz) ±1.0 dB, ±0.7 dB (typ.) (400 MHz ≤ f ≤ 3.8 GHz) ±1.3 dB, ±0.7 dB (typ.) (3.8 GHz < f ≤ 6.0 GHz) |
| Spurious Response | <p>Harmonic distortion <-25 dBc</p> |
| Vector Modulation | <p>Bandwidth 160 MHz (max.)</p> |

Signal Analyzer

| | |
|-----------|---|
| Frequency | <p>Setting range</p> <ul style="list-style-type: none"> 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887000A-001) <p>Resolution 0.1 Hz</p> |
|-----------|---|

TRX Test Module MU887001A Specifications

Input/Output Connector

| | |
|---------------|--|
| RF Test Ports | <p>Number of ports 4</p> <p>Connector N (female)</p> <p>Impedance 50Ω (nom.)</p> <p>VSWR <1.5 ($10 \text{ MHz} \leq f < 400 \text{ MHz}$) <1.2 ($400 \text{ MHz} \leq f \leq 2.7 \text{ GHz}$) <1.3 ($2.7 \text{ GHz} < f \leq 3.8 \text{ GHz}$) <1.5 ($3.8 \text{ GHz} < f \leq 6.0 \text{ GHz}$)</p> <p>Maximum input level +35 dBm</p> |
| AF Test Ports | <p>Ports Analog port, Digital port</p> <p>Connector Analog port: BNC (female) Digital port: RJ-45</p> |

Signal Generator

| | |
|-------------------|---|
| Frequency | <p>Setting range 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887001A-001)</p> <p>Setting Resolution 1 Hz</p> <p>Accuracy Depends on MT8870A reference oscillator accuracy</p> |
| Amplitude | <p>Setting range -130 to -10 dBm ($\leq 3.8 \text{ GHz}$) -130 to -18 dBm ($> 3.8 \text{ GHz}$)</p> <p>Setting Resolution 0.1 dB</p> <p>Accuracy CW, After CAL, 10° to 40°C Output level: $\geq -120 \text{ dBm}$ ($\leq 3.8 \text{ GHz}$), $\geq -100 \text{ dBm}$ ($> 3.8 \text{ GHz}$) $\pm 1.3 \text{ dB}$ ($10 \text{ MHz} \leq f < 400 \text{ MHz}$) (Signal Analyzer input level: +15 dBm) $\pm 1.0 \text{ dB}$, $\pm 0.7 \text{ dB}$ (typ.) ($400 \text{ MHz} \leq f \leq 3.8 \text{ GHz}$) $\pm 1.3 \text{ dB}$, $\pm 1.0 \text{ dB}$ (typ.) ($3.8 \text{ GHz} < f \leq 6.0 \text{ GHz}$)</p> |
| Spurious Response | <p>Harmonic distortion $< -25 \text{ dBc}$</p> |
| Vector Modulation | <p>Bandwidth 160 MHz (max.)</p> |

TRX Test Module MU887001A Specifications

Signal Analyzer

| | |
|---------------------|--|
| Frequency | <p>Setting range 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887001A-001)</p> <p>Resolution 0.1 Hz</p> |
| Amplitude | <p>Setting range CW -65 to +15 dBm (10 MHz ≤ f < 350 MHz) -65 to +35 dBm (350 MHz ≤ f ≤ 6.0 GHz)</p> <p>Resolution 0.01 dB</p> <p>Accuracy CW, After CAL, Measurement bandwidth: 300 kHz, RBW: 100 kHz 10 MHz ≤ f < 400 MHz, Signal Generator: Off, +10° to +40°C ±0.7 dB (-30 dBm ≤ p ≤ +15 dBm) ±0.9 dB (-55 dBm ≤ p < -30 dBm) ±1.1 dB (-65 dBm ≤ p < -55 dBm) 400 MHz ≤ f ≤ 3.8 GHz, +10° to +40°C ±0.5 dB, ±0.3 dB (typ.) (-30 dBm ≤ p ≤ +35 dBm) ±0.7 dB (-55 dBm ≤ p < -30 dBm) ±0.9 dB (-65 dBm ≤ p < -55 dBm) 3.8 GHz < f ≤ 6.0 GHz, +20° to +30°C ±0.7 dB (-30 dBm ≤ p ≤ +35 dBm) ±0.9 dB (-55 dBm ≤ p < -30 dBm) ±1.1 dB (-65 dBm ≤ p < -55 dBm)</p> <p>Linearity CW, Measurement bandwidth: 300 kHz, RBW: 100 kHz ±0.2 dB (0 to -40 dB, ≥ -55 dBm) ±0.4 dB (0 to -40 dB, ≥ -65 dBm)</p> |
| Modulation Analysis | <p>Maximum bandwidth 25 MHz (10 MHz ≤ f < 500 MHz) 80 MHz (500 MHz ≤ f < 1.9 GHz) 160 MHz (1.9 GHz ≤ f ≤ 6.0 GHz)</p> |

General

| | | |
|---------------------|---|------------------------------------|
| Interface | <p>Trigger Trigger signals input/output at trigger connectors (rear panel)</p> <p>Remote control Ethernet: via MT8870A interface GPIB: with MT8870A GPIB option (MT8870A-001) Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2</p> | |
| Dimensions and Mass | <p>90 (W) × 193.6 (H) × 325 (D) mm (excluding projections) ≤5 kg (including options)</p> | |
| CE | EMC | 2014/30/EU, EN61326-1, EN61000-3-2 |
| | LVD | 2014/35/EU, EN61010-1 |
| | RoHS | 2011/65/EU, EN50581 |

Audio Measurement Hardware MU887001A-002

| | |
|---------------|---|
| Analog Audio | <p>Audio generator Frequency range: 20 Hz to 20 kHz Output level range: 0 (off), 1 mV to 5 V_{peak} (100 kΩ termination) Impedance: 1Ω (AC coupling) (nom.)</p> <p>Audio analyzer Frequency range: 20 Hz to 20 kHz Input level range: 1 mV_{peak} to 5 V_{peak} (30 V rms max.) Impedance: 100 kΩ (AC coupling)</p> |
| Digital Audio | <p>Audio generator Frequency range: 20 Hz to 20 kHz (Sampling rate: 44.1 kHz, 48 kHz) 20 Hz to 14 kHz (Sampling rate: 32 kHz) 20 Hz to 7 kHz (Sampling rate: 16 kHz)</p> <p>Bit resolution: 16 bits/24 bits</p> <p>Audio analyzer Sampling rate: 16, 32, 44.1, 48 kHz Bit resolution: 16 bits/24 bits</p> |

Cellular Standards Sequence Measurement MX887010A

| Common Item | <p>Measuring object W-CDMA/TD-SCDMA/GSM/LTE/LTE-Advanced uplink, CDMA2000/1xEV-DO reverse link</p> <p>Frequency range 400 MHz to 6.0 GHz</p> | | | | | | | | | | | | | | | | | | |
|----------------------------|--|------|-----|-------|--------------------------------------|---------|------------------------------|-------|--------------------------------|--------|--------------------------------|--------|----------------------------------|--------|---------------------------------|---------|---------------------------------|---------|---------------------------------|
| Spectrum Monitor | <p>Analysis time 1 ms, 10 ms</p> <p>Span 1, 2.5, 5, 10, 25, 50, 100, 160 MHz</p> <p>RBW</p> <table border="1"> <thead> <tr> <th>Span</th> <th>RBW</th> </tr> </thead> <tbody> <tr> <td>1 MHz</td> <td>100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz</td> </tr> <tr> <td>2.5 MHz</td> <td>1 kHz, 3 kHz, 10 kHz, 30 kHz</td> </tr> <tr> <td>5 MHz</td> <td>3 kHz, 10 kHz, 30 kHz, 100 kHz</td> </tr> <tr> <td>10 MHz</td> <td>3 kHz, 10 kHz, 30 kHz, 100 kHz</td> </tr> <tr> <td>25 MHz</td> <td>10 kHz, 30 kHz, 100 kHz, 300 kHz</td> </tr> <tr> <td>50 MHz</td> <td>30 kHz, 100 kHz, 300 kHz, 1 MHz</td> </tr> <tr> <td>100 MHz</td> <td>30 kHz, 100 kHz, 300 kHz, 1 MHz</td> </tr> <tr> <td>160 MHz</td> <td>30 kHz, 100 kHz, 300 kHz, 1 MHz</td> </tr> </tbody> </table> <p>Detection mode Average, Peak</p> <p>Power measurement bandwidth Range: 0.001 MHz to (setting span) MHz, Resolution: 0.001 MHz</p> | Span | RBW | 1 MHz | 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz | 2.5 MHz | 1 kHz, 3 kHz, 10 kHz, 30 kHz | 5 MHz | 3 kHz, 10 kHz, 30 kHz, 100 kHz | 10 MHz | 3 kHz, 10 kHz, 30 kHz, 100 kHz | 25 MHz | 10 kHz, 30 kHz, 100 kHz, 300 kHz | 50 MHz | 30 kHz, 100 kHz, 300 kHz, 1 MHz | 100 MHz | 30 kHz, 100 kHz, 300 kHz, 1 MHz | 160 MHz | 30 kHz, 100 kHz, 300 kHz, 1 MHz |
| Span | RBW | | | | | | | | | | | | | | | | | | |
| 1 MHz | 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz | | | | | | | | | | | | | | | | | | |
| 2.5 MHz | 1 kHz, 3 kHz, 10 kHz, 30 kHz | | | | | | | | | | | | | | | | | | |
| 5 MHz | 3 kHz, 10 kHz, 30 kHz, 100 kHz | | | | | | | | | | | | | | | | | | |
| 10 MHz | 3 kHz, 10 kHz, 30 kHz, 100 kHz | | | | | | | | | | | | | | | | | | |
| 25 MHz | 10 kHz, 30 kHz, 100 kHz, 300 kHz | | | | | | | | | | | | | | | | | | |
| 50 MHz | 30 kHz, 100 kHz, 300 kHz, 1 MHz | | | | | | | | | | | | | | | | | | |
| 100 MHz | 30 kHz, 100 kHz, 300 kHz, 1 MHz | | | | | | | | | | | | | | | | | | |
| 160 MHz | 30 kHz, 100 kHz, 300 kHz, 1 MHz | | | | | | | | | | | | | | | | | | |
| Multiple Power Measurement | <p>Number of steps 10 to 100 steps</p> <p>Power step time 0.5, 1, 2, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80 ms</p> <p>Filter type Low-pass filter: 1.23, 1.4, 3, 5, 10, 15, 20 MHz RRC filter: 3.84 MHz</p> <p>Measurement window Range: 1 to 90%, Resolution 1%</p> <p>Trigger level -40 to 0 dB (based on the input level)</p> | | | | | | | | | | | | | | | | | | |
| TX/RX vs. Frequency | <p>Segment duration Range: 1 to 80 ms, Resolution: 1 ms</p> <p>Measurement filter Low-pass filter: 1.23, 1.4, 3, 5, 10, 15, 20 MHz RRC filter: 3.84 MHz</p> <p>Measurement window Range: 1 to 90%, Resolution: 1%</p> <p>Number of segment 1 to 1600</p> <p>Number of sequence 1 to 400</p> | | | | | | | | | | | | | | | | | | |
| Narrowband Power vs. Time | <p>Segment duration Range: 200 μs to 20000 μs, Resolution: 1 μs</p> <p>Measurement bandwidth 15 kHz</p> <p>Measurement window Range: 1 to 90%, Resolution: 1%</p> <p>Number of segment 1 to 1000</p> | | | | | | | | | | | | | | | | | | |
| IQ Capturing | <p>Time span Range: 1000 μs to 10000 μs, Resolution : 1 μs</p> <p>Measurement bandwidth Low-pass filter: 100, 300, 500 kHz, 1, 3, 5, 20 MHz Gaussian filter: 1 MHz</p> | | | | | | | | | | | | | | | | | | |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

W-CDMA/HSPA Uplink TX Measurement MX887011A

| | |
|--------------------------------------|--|
| Common Item | <p>Measuring object W-CDMA uplink</p> <p>Frequency range 400 MHz to 2.7 GHz</p> |
| RF Power | <p>Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-55 to -25 dBm) ±0.9 dB (-65 to -55 dBm) MU887000A test port 3 and 4 ±0.7 dB (-25 to +25 dBm) ±0.9 dB (-55 to -25 dBm) ±1.1 dB (-65 to -55 dBm)</p> <p>Linearity 0 to 40 dB ±0.2 dB (≥-55 dBm) ±0.4 dB (≥-65 dBm)</p> <p>Relative level accuracy At the power level difference within 2 dB, ≥-55 dBm, 0 to 40 dB ±0.1 dB (typ.)</p> |
| Frequency/ Modulation Analysis | <p>Input level range -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 10 Hz)</p> <p>Modulation accuracy Residual EVM: at input of single DPCCCH and single DPDCH ≤2.5%</p> |
| Occupied Bandwidth | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>OBW ratio 80.0 to 99.9%</p> |
| Adjacent Channel Leakage Power Ratio | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement points ±5 MHz, ±10 MHz</p> <p>Measurement range ≥50 dB (±5 MHz), ≥55 dB (±10 MHz)</p> |

GSM/EDGE Uplink TX Measurement MX887012A

| | |
|----------------------------------|--|
| Common Item | Measuring object Normal burst (GMSK, 8PSK) Frequency range 400 MHz to 2.0 GHz |
| RF Power | Input level range Average power of burst signal -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4) Measurement accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) MU887000A test port 3 and 4 ±0.7 dB (-30 to +25 dBm) Linearity ±0.2 dB (≥-30 dBm, 0 to 40 dB) Carrier off power ≥65 dB (≥-10 dBm), ≥45 dB (-30 to -10 dBm) |
| Frequency/Modulation Measurement | Input level range Average power of burst signal -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4) Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy Residual phase error (GMSK) ≤0.5°rms (f ≥500 MHz), ≤0.7°rms (f <500 MHz) ≤2° peak Residual EVM (8PSK) ≤1.5% rms |
| Output RF Spectrum Measurement | Input level range Average power of burst signal -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) Measurement point ±100 kHz, ±200 kHz, ±250 kHz, ±400 kHz, ±600 kHz, ±800 kHz, ±1000 kHz, ±1200 kHz, ±1600 kHz, ±1800 kHz, ±2000 kHz Measurement range of due to modulation Average of 10 measurements ≤-55 dB (200 kHz, 250 kHz offset), ≤-66 dB (≥400 kHz offset) Measurement range of switching transient ≤-57 dB (≥400 kHz offset) |

LTE FDD Uplink TX Measurement MX887013A

LTE TDD Uplink TX Measurement MX887014A

| | |
|--------------------------------------|---|
| Common Item | <p>Measuring object PUSCH, PUCCH</p> <p>Frequency range 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz 600 MHz to 2.7 GHz, 3.4 GHz to 4.2 GHz (with MU88700xA-001/101 option)</p> |
| RF Power | <p>Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz, After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test ports ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-50 to -20 dBm) ±0.9 dB (-60 to -50 dBm) MU887000A test port 3 and 4 ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) 3.8 GHz to 4.2 GHz, After CAL, 20° to 30°C MU887000A all test ports and MU887001A all test ports ±0.7 dB (-20 to +35 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm)</p> <p>Linearity 0 to 40 dB ±0.2 dB (≥-50 dBm) ±0.4 dB (≥-60 dBm)</p> <p>Relative level accuracy At the power level difference within 2 dB ±0.1 dB (typ.)</p> |
| Frequency/Modulation Measurement | <p>Input level range -40 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -40 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 15 Hz)</p> <p>Modulation accuracy Residual EVM (average of 20 measurements) ≤2.5%</p> <p>In-band emission Input level: ≥-10 dBm, Allocated RB: ≤18 ≤-40 dBc</p> |
| Occupied Bandwidth | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>OBW ratio 80.0 to 99.9%</p> |
| Adjacent Channel Leakage Power Ratio | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement range ≥45 dB (E-UTRA ACLR1), ≥50 dB (UTRA ACLR1), ≥55 dB (UTRA ACLR2)</p> |
| Spectrum Emission Mask | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

LTE-Advanced FDD Uplink CA TX Measurement MX887013A-001

LTE-Advanced TDD Uplink CA TX Measurement MX887014A-001

| | |
|--------------------------------------|---|
| Common Item | <p>Measuring object PUSCH</p> <p>Frequency range 698 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz 698 MHz to 2.7 GHz, 3.4 GHz to 4.2 GHz (with MU88700xA-001/101 option)</p> |
| RF Power | <p>Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test ports) -65 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy MU887000A test port 1 and 2, MU887001A all test ports Excluding when measuring Intraband Contiguous CA SCC and PCC + SCC 698 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz , After CAL, 10° to 40°C ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-50 to -20 dBm) ±0.9 dB (-60 to -50 dBm) 3.8 GHz to 4.2 GHz, After CAL, 10° to 40°C ±0.7 dB (-20 to +35 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) MU887000A test port 1 and 2, MU887001A all test ports When measuring Intraband Contiguous CA SCC and PCC + SCC 698 MHz to 2.7 GHz, After CAL, 10° to 40°C ±0.5 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.7 dB (-50 to +35 dBm) ±0.9 dB (-60 to -50 dBm) 3.4 GHz to 3.8 GHz, After CAL, 10° to 40°C 3.8 GHz to 4.2 GHz, After CAL, 20° to 30°C ±1.0 dB (-50 to +35 dBm) ±1.3 dB (-60 to -50 dBm) MU887000A test port 3 and 4 Excluding when measuring Intraband Contiguous CA SCC and PCC + SCC 698 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz , After CAL, 10° to 40°C 3.8 GHz to 4.2 GHz , After CAL, 20° to 30°C ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) MU887000A test port 3 and 4 When measuring Intraband Contiguous CA SCC and PCC + SCC 698 MHz to 2.7 GHz, After CAL, 10° to 40°C ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) 3.4 GHz to 3.8 GHz, After CAL, 10° to 40°C 3.8 GHz to 4.2 GHz, After CAL, 20° to 30°C ±1.0 dB (-50 to +25 dBm) ±1.3 dB (-60 to -50 dBm)</p> <p>Linearity 0 to 30 dB, 20 to 30°C ±0.2 dB (≥-50 dBm) ±0.4 dB (≥-60 dBm)</p> |
| Frequency/Modulation Measurement | <p>Input level range -40 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test ports) -40 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 15 Hz)</p> <p>Modulation accuracy Residual EVM (average of 20 measurements) ≤2.5%</p> <p>In-band emission Input level: ≥-10 dBm, Allocated RB: ≤18 ≤-40 dBc</p> |
| Occupied Bandwidth | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test ports) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>OBW ratio 80.0 to 99.9%</p> |
| Adjacent Channel Leakage Power Ratio | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test ports) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement range ≥45 dB (E-UTRA ACLR1), ≥50 dB (UTRA ACLR1), ≥55 dB (UTRA ACLR2)</p> |
| Spectrum Emission Mask | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test ports) -10 to +25 dBm (MU887000A test port 3 and 4)</p> |

CDMA2000 Reverse Link TX Measurement MX887015A

| | |
|----------------------------------|--|
| Common Item | <p>Measuring object Reverse RC-1/2/3/4</p> <p>Frequency range 400 MHz to 2.7 GHz</p> |
| RF Power | <p>Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-55 to -25 dBm) ±0.9 dB (-65 to -55 dBm) MU887000A test port 3 and 4 ±0.7 dB (-25 to +25 dBm) ±0.9 dB (-55 to -25 dBm) ±1.1 dB (-65 to -55 dBm)</p> <p>Linearity 0 to 40 dB ±0.2 dB (≥-55 dBm) ±0.4 dB (≥-65 dBm)</p> |
| Frequency/Modulation Measurement | <p>Input level range -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 10 Hz)</p> <p>Waveform quality >0.999</p> |
| Code Domain Power Measurement | <p>Reverse RC3 or RC4</p> <p>Input level range -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy ±0.2 dB (Code power: ≥-15 dBc), ±0.4 dB (Code power: ≥-23 dBc)</p> |
| Occupied Bandwidth | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>OBW ratio 80.0 to 99.9%</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

1xEV-DO Reverse Link TX Measurement MX887016A

| | |
|----------------------------------|--|
| Common Item | <p>Measuring object Reverse link Rev. 0/Rev. A</p> <p>Frequency range 400 MHz to 2.7 GHz</p> |
| RF Power | <p>Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-55 to -25 dBm) ±0.9 dB (-65 to -55 dBm) MU887000A test port 3 and 4 ±0.7 dB (-25 to +25 dBm) ±0.9 dB (-55 to -25 dBm) ±1.1 dB (-65 to -55 dBm)</p> <p>Linearity 0 to 40 dB ±0.2 dB (≥-55 dBm) ±0.4 dB (≥-65 dBm)</p> |
| Frequency/Modulation Measurement | <p>Input level range -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 10 Hz)</p> <p>Waveform quality >0.999</p> |
| Code Domain Power Measurement | <p>Input level range -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy ±0.2 dB (Code power: ≥-15 dBc), ±0.4 dB (Code power: ≥-23 dBc)</p> |
| Occupied Bandwidth | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>OBW ratio 80.0 to 99.9%</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

TD-SCDMA Uplink TX Measurement MX887017A

| | |
|--------------------------------------|--|
| Common Item | <p>Measuring object TD-SCDMA uplink</p> <p>Frequency range 400 MHz to 2.7 GHz</p> |
| RF Power | <p>Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-55 to -25 dBm) ±0.9 dB (-65 to -55 dBm) MU887000A test port 3 and 4 ±0.7 dB (-25 to +25 dBm) ±0.9 dB (-55 to -25 dBm) ±1.1 dB (-65 to -55 dBm)</p> <p>Linearity 0 to 40 dB ±0.2 dB (≥-55 dBm) ±0.4 dB (≥-65 dBm)</p> |
| Frequency/Modulation Measurement | <p>Input level range -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 10 Hz)</p> <p>Modulation accuracy Residual EVM (at input of single code) ≤2.5%</p> |
| Occupied Bandwidth | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>OBW ratio 99.0%</p> |
| Adjacent Channel Leakage Power Ratio | <p>Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Measurement points ±1.6 MHz, ±3.2 MHz</p> <p>Measurement range ≥50 dB (±1.6 MHz), ≥55 dB (±3.2 MHz)</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

NR TDD sub-6 GHz Uplink TX Measurement MX887019A

| Common Item | Measuring object PUSCH Channel Bandwidth (MHz) 20, 25, 40, 50, 60, 80, 100 Modulation QPSK, 16QAM, 64QAM | | | | | | | | | | | | | | | | |
|----------------------------------|--|-------------------------|----------------------------|----|-----|----|-----|----|-----|----|-----|----|-------|----|-----|-----|-----|
| RF Power | Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4) Measurement accuracy MU887000A test port 1 and 2, MU887001A all test port 600 MHz to 2.7 GHz, After CAL, 10° to 40°C ±0.5 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.7 dB (-20 to +35 dBm) ±0.7 dB (-50 to -20 dBm) ±0.9 dB (-60 to -50 dBm) 3.3 GHz to 3.8 GHz, After CAL, 10° to 40°C ±1.0 dB (-50 to +35 dBm) ±1.3 dB (-60 to -50 dBm) 3.8 GHz to 5.0 GHz, After CAL, 20° to 30°C ±1.0 dB (-50 to +35 dBm) ±1.3 dB (-60 to -50 dBm) MU887000A test port 3 and 4 600 MHz to 2.7 GHz, After CAL, 10° to 40°C ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) 3.3 GHz to 3.8 GHz, After CAL, 10° to 40°C ±1.0 dB (-50 to +25 dBm) ±1.3 dB (-60 to -50 dBm) 3.8 GHz to 5.0 GHz, After CAL, 20° to 30°C ±1.0 dB (-50 to +25 dBm) ±1.3 dB (-60 to -50 dBm) | | | | | | | | | | | | | | | | |
| Frequency/Modulation Measurement | Input level range Minimum output power* to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) Minimum output power* to +25 dBm (MU887000A test port 3 and 4) *: Minimum output power <table border="1" data-bbox="416 1283 979 1549"> <thead> <tr> <th>Channel Bandwidth (MHz)</th> <th>Minimum output power (dBm)</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>-40</td> </tr> <tr> <td>25</td> <td>-39</td> </tr> <tr> <td>40</td> <td>-37</td> </tr> <tr> <td>50</td> <td>-36</td> </tr> <tr> <td>60</td> <td>-35.2</td> </tr> <tr> <td>80</td> <td>-34</td> </tr> <tr> <td>100</td> <td>-33</td> </tr> </tbody> </table> Carrier frequency accuracy 600 MHz to 2.7 GHz ± (Setting frequency × Reference oscillator accuracy) + 15 Hz 3.3 GHz to 5.0 GHz ± (Setting frequency × Reference oscillator accuracy) + 36 Hz Modulation accuracy Residual EVM (average of 20 measurements) -25 dBm < Input Level Range ≤2.5% Minimum output power ≤ Input Level Range ≤ -25 dBm ≤3.0% (600 MHz ≤ Frequency ≤ 2.7 GHz, 3.3 GHz ≤ Frequency ≤ 4.2 GHz) ≤3.0% (4.2 GHz < Frequency ≤ 5.0 GHz, 20° to 30°C) | Channel Bandwidth (MHz) | Minimum output power (dBm) | 20 | -40 | 25 | -39 | 40 | -37 | 50 | -36 | 60 | -35.2 | 80 | -34 | 100 | -33 |
| Channel Bandwidth (MHz) | Minimum output power (dBm) | | | | | | | | | | | | | | | | |
| 20 | -40 | | | | | | | | | | | | | | | | |
| 25 | -39 | | | | | | | | | | | | | | | | |
| 40 | -37 | | | | | | | | | | | | | | | | |
| 50 | -36 | | | | | | | | | | | | | | | | |
| 60 | -35.2 | | | | | | | | | | | | | | | | |
| 80 | -34 | | | | | | | | | | | | | | | | |
| 100 | -33 | | | | | | | | | | | | | | | | |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

| | |
|--------------------------------------|---|
| Occupied Bandwidth | <p>Frequency range</p> <ul style="list-style-type: none"> Channel Bandwidth \leq 60 MHz <ul style="list-style-type: none"> 600 MHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) 60 MHz < Channel Bandwidth <ul style="list-style-type: none"> 2.0 GHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) <p>Input level range</p> <ul style="list-style-type: none"> -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) |
| Adjacent Channel Leakage Power Ratio | <p>Frequency range</p> <ul style="list-style-type: none"> Channel Bandwidth \leq 60 MHz <ul style="list-style-type: none"> 600 MHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) 60 MHz < Channel Bandwidth <ul style="list-style-type: none"> 2.0 GHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) <p>Input level range</p> <ul style="list-style-type: none"> -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) <p>Measurement range</p> <ul style="list-style-type: none"> \geq48 dB (NR ACLR), \geq45 dB (UTRA ACLR1), \geq48 dB (UTRA ACLR2) |
| Spectrum Emission Mask | <p>Frequency range</p> <ul style="list-style-type: none"> Channel Bandwidth \leq 60 MHz <ul style="list-style-type: none"> 600 MHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) 60 MHz < Channel Bandwidth <ul style="list-style-type: none"> 2.0 GHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) <p>Input level range</p> <ul style="list-style-type: none"> -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

W-CDMA/HSPA Downlink TX Measurement MX887021A

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|--------------------------------------|---|
| Common Item | Measuring object W-CDMA/HSPA downlink Frequency range 600 MHz to 2.7 GHz |
| RF Power | Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4) Measurement accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) MU887000A test port 3 and 4 ±0.7 dB (-15 to +25 dBm) |
| Frequency/Modulation Measurement | Input level range -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4) Carrier frequency accuracy Average of 10 measurements, test model 4 signals ± (Setting frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy Average of 10 measurements, test model 4 signals ≤1% |
| Adjacent Channel Leakage Power Ratio | Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) Measurement points ±5 MHz, ±10 MHz Measurement range ≥55 dB (UTRA Adj./Alt.) |

LTE FDD Downlink TX Measurement MX887023A

| | |
|--------------------------------------|--|
| Common Item | Measuring object LTE FDD downlink signal Frequency range 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz |
| RF Power | Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4) Measurement accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) MU887000A test port 3 and 4 ±0.7 dB (-15 to +25 dBm) |
| Frequency/Modulation Measurement | Input level range -15 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -15 to +25 dBm (MU887000A test port 3 and 4) Carrier frequency accuracy Measurement interval: 10, test model 3.1 signals ± (Setting frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy Residual EVM Measurement interval: 10, Test model 3.1 signals, Channel bandwidth: 3, 5, 10, 15, 20 MHz ≤1% |
| Adjacent Channel Leakage Power Ratio | Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) Measurement range Channel bandwidth: 1.4, 3, 5 MHz ≥54 dB (E-UTRA Adj.), ≥57 dB (E-UTRA Alt.) Channel bandwidth: 10, 15, 20 MHz ≥50 dB (E-UTRA Adj./Alt.) Full channel bandwidth ≥54 dB (UTRA Adj./Alt.) |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

W-CDMA/HSPA Downlink Waveforms MV887011A

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|-----|--|
| EVM | $\leq 3\%$ rms (400 MHz $\leq f \leq$ 2.7 GHz) |
|-----|--|

GSM/EDGE Downlink Waveforms MV887012A

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|-------------|--|
| Phase Error | $\leq 1^\circ$ rms (400 MHz $\leq f \leq$ 2.7 GHz, GMSK) |
| EVM | $\leq 1.8\%$ rms (400 MHz $\leq f \leq$ 2.7 GHz, 8PSK) |

LTE FDD Downlink Waveforms MV887013A

| | |
|-------------------|--|
| Max. Output Level | MU887000A test port 1 and 2, MU887001A all test port -12 dBm ($f \leq$ 3.8 GHz), -20 dBm ($f >$ 3.8 GHz) MU887000A test port 3 and 4 -2 dBm ($f \leq$ 3.8 GHz), -10 dBm ($f >$ 3.8 GHz) |
| EVM | $\leq 2\%$ rms (400 MHz $\leq f \leq$ 2.7 GHz), $\leq 3\%$ rms (3.4 GHz $\leq f \leq$ 3.8 GHz), $\leq 4\%$ rms (3.8 GHz $< f \leq$ 6.0 GHz) |

LTE TDD Downlink Waveforms MV887014A

| | |
|-------------------|--|
| Max. Output Level | MU887000A test port 1 and 2, MU887001A all test port -12 dBm ($f \leq$ 3.8 GHz), -20 dBm ($f >$ 3.8 GHz) MU887000A test port 3 and 4 -2 dBm ($f \leq$ 3.8 GHz), -10 dBm ($f >$ 3.8 GHz) |
| EVM | $\leq 2\%$ rms (400 MHz $\leq f \leq$ 2.7 GHz), $\leq 3\%$ rms (3.4 GHz $\leq f \leq$ 3.8 GHz), $\leq 4\%$ rms (3.8 GHz $< f \leq$ 6.0 GHz) |

CDMA2000 Forward Link Waveforms MV887015A

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|------------------|--|
| Waveform Quality | > 0.99 (400 MHz $\leq f \leq$ 2.7 GHz) |
|------------------|--|

1xEV-DO Forward Link Waveforms MV887016A

| | |
|------------------|---|
| Waveform Quality | > 0.99 (400 MHz $\leq f \leq$ 2.7 GHz, Pilot channel) |
|------------------|---|

TD-SCDMA Downlink Waveforms MV887017A

| | |
|-----|--|
| EVM | $\leq 3\%$ rms (400 MHz $\leq f \leq$ 2.7 GHz) |
|-----|--|

NR TDD sub-6GHz Downlink Waveforms MV887019A

| | |
|-------------------|--|
| Max. Output Level | MU887000A test port 1 and 2, MU887001A all test port -10 dBm ($f \leq$ 3.8 GHz), -18 dBm ($f >$ 3.8 GHz) MU887000A test port 3 and 4 0 dBm ($f \leq$ 3.8 GHz), -8 dBm ($f >$ 3.8 GHz) |
| EVM | $\leq 2\%$ rms (600 MHz $\leq f \leq$ 2.7 GHz), $\leq 3\%$ rms (3.3 GHz $\leq f \leq$ 3.8 GHz), $\leq 4\%$ rms (3.8 GHz $< f \leq$ 5.0 GHz) |

WLAN 802.11b/g/a/n TX Measurement MX887030A

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| Common Item | <p>Measuring object WLAN signal packet</p> <p>Frequency range 2.4 GHz band: 2412 MHz to 2484 MHz 5 GHz band: 4920 MHz to 5825 MHz (required MU88700xA-001)</p> |
| RF Power | <p>Input level range -65 to +25 dBm (MU887000A test port 3 and 4) -55 to +35 dBm (MU887001A all test port)</p> <p>Accuracy After CAL, 20° to 30°C ±0.7 dB (-30 dBm ≤ p ≤ +25 dBm), ±1.0 dB (-50 dBm ≤ p < -30 dBm) (MU887000A) ±0.7 dB (-20 dBm ≤ p ≤ +35 dBm), ±1.0 dB (-40 dBm ≤ p < -20 dBm) (MU887001A)</p> <p>Bandwidth 40 MHz, 20 MHz (802.11n) 20 MHz (802.11a/b/g)</p> <p>Capture time 1.34 s</p> <p>Pre-trigger 1.33 s</p> <p>Resolution (time domain profile) 5 ns/sample</p> <p>CCDF CCDF defined as a percentage of samples against dB, where percentage of samples is normalized to the average power in the 'gate', and dB is defined as the relative value of samples greater than the average.</p> <p>Power distribution value A single numeric value called the power distribution value defines the number of dB above the average power below which a user defined percentage of the total number of samples falls.</p> |
| Spectral Profile Measurement | <p>Span ±65 MHz (802.11n) ±35 MHz (802.11a/b/g)</p> <p>Capture time 50 μs</p> <p>Measurement range (RBW: 100 kHz) -27 to +25 dBm (MU887000A) -17 to +35 dBm (MU887001A)</p> <p>Linearity CW, RBW: 100 kHz, Same as level linearity (MU887000A test port 3 and 4, MU887001A all test port) ±0.2 dB (≥ -55 dBm, -40 to 0 dB)</p> <p>Resolution 0.1 dB</p> <p>Bandwidth 100 kHz</p> |
| EVM (Modulation accuracy) | <p>Measurement range -20 to +25 dBm (MU887000A) -10 to +35 dBm (MU887001A)</p> <p>Residual EVM Signal level: >-20 dBm (MU887000A), >-10 dBm (MU887001A), Averaged over 20 packets <-28 dB (DSSS) <-40 dB (OFDM, Channel estimation: FULLPACKET)</p> <p>EVM data format dB, %</p> <p>Resolution 0.1% or 0.1 dB, All limit checking in dB to 0.1 dB resolution</p> <p>Speed >20 readings/second</p> |
| DSSS EVM Measurement Setting | <p>RX filter type None, Gaussian, Root raised cosine</p> <p>Gaussian filter setting BT BT 0.3 to 1.0, Resolution: 0.1</p> <p>Root raised cosine filter setting α 0.30 to 1.00, Resolution: 0.01</p> <p>Measurement start It shall be possible to measure EVM from the first data chip of the packet</p> <p>Measurement method Header or payload. Header measures the EVM of the first 1000 chips of the PLCP preamble and header.</p> <p>User specified measurement range 220 to 11000 chips</p> <p>Measurement functional range Measurement only possible if channel frequency error <±150 kHz (±60 ppm)</p> <p>Carrier lock Phase tracking automatically applied as per carrier lock 802.11-2007 18.4.7.8</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

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| <p>OFDM EVM Measurement Setting</p> | <p>Channel estimation User selection of Long training sequence or Full packet. User specified measurement range 16 symbols (min.), 1000 symbols (max.) OFDM pilot tracking "Phase tracking only" or "Phase and Amplitude tracking". Peak and Average EVM on all sub-carriers, dB or percentage Peak and Average on each sub-carrier – frequency domain % vs. sub-carrier EVM vs. Symbol – time domain % vs. Symbol number, 1 to max</p> |
| <p>DSSS Additional Measurement</p> | <p>Transmit center frequency tolerance Definition: Average frequency of the DSSS carrier signal Accuracy: \pm (Setting frequency \times Reference oscillator accuracy + 1 kHz) Resolution: Hz to no decimal places, ppm to one decimal place Chip clock frequency tolerance Definition: Frequency error relative to the 11 MHz chip clock. Measurement averaged over a fully coded DSSS packet with minimum payload length 3300 chips, 300 μs Display format: Hz, ppm Range: \pm50 ppm Resolution: Hz to no decimal places, ppm to one decimal place Data analysis width: 20 μs (220 chips) (min.) User specified measurement range: 3300 to 30250 chips Transmit power-on and power down ramp Definition: Time for burst to transit from 10 to 90% or 90 to 10% of linear power. Data outputs: 10%, 90%, Delta values Resolution: 5 ns RF carrier suppression Method: IEEE Std 802.11-2007 (18.4.7.7), IQ offset method IEEE method: Relative level of the carrier to the highest sideband for a 10101010 test pattern with scrambler disabled, data rate 2 Mbps. IQ offset method: Calculated from the relative values of the peak frequency response and the channel center frequency with the data rate processing gain.</p> |
| <p>OFDM Additional Measurement</p> | <p>Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz, ppm Accuracy: \pm (Setting frequency \times Reference oscillator accuracy + 1 kHz) (>1 ms packet) Resolution: Hz to no decimal places, ppm to one decimal place Symbol clock frequency tolerance Definition: Frequency error relative to the 250 kHz symbol clock as per 19.4.7.3/17.3.9.5 Measurement averaged over a fully coded OFDM packet with a minimum payload length of 16 symbols (64 μs) Data output format: Hz, ppm Range: \pm40 ppm Resolution: ppm to one decimal place User specified measurement range: 16- (define numbers) Transmitter center frequency leakage Definition: Measurement of the leakage of the center carrier Data output format: dB Resolution: dB to two decimal places Transmitter spectral flatness Definition: Measurement of RF sub-carrier power level Unit of measurement: dB</p> |
| <p>Additional Measurement (DSSS and OFDM)</p> | <p>Power spectral density The maximum power measured in a 1 MHz bandwidth within the occupied bandwidth of the signal Occupied bandwidth Measures the frequency range within which the specified percentage power is contained Occupied bandwidth percentage range 1 to 99%</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

WLAN 802.11ac TX Measurement MX887031A

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| Common Item | <p>Measuring object WLAN signal packet</p> <p>Frequency range 5 GHz band: 4920 MHz to 5825 MHz (required MU88700xA-001)</p> |
| RF Power | <p>Input level range -65 to +25 dBm (MU887000A test port 3 and 4) -55 to +35 dBm (MU887001A all test port)</p> <p>Accuracy After CAL, 20° to 30°C ±0.7 dB (-30 dBm ≤ p ≤ +25 dBm), ±1.0 dB (-50 dBm ≤ p < -30 dBm) (MU887000A) ±0.7 dB (-20 dBm ≤ p ≤ +35 dBm), ±1.0 dB (-40 dBm ≤ p < -20 dBm) (MU887001A)</p> <p>Bandwidth 160, 80, 40, 20 MHz</p> <p>Capture time 1.34 s</p> <p>Pre-trigger 1.33 s</p> <p>Resolution (time domain profile) 5 ns/sample</p> <p>CCDF CCDF defined as a percentage of samples against dB, where percentage of samples is normalized to the average power in the 'gate', and dB is defined as the relative value of samples greater than the average.</p> <p>Power distribution value A single numeric value called the power distribution value defines the number of dB above the average power below which a user defined percentage of the total number of samples falls.</p> |
| Spectral Profile Measurement | <p>Spectral profile measurement span ±80 MHz</p> <p>Capture time 50 μs</p> <p>Measurement range (RBW: 100 kHz) -27 to +25 dBm (MU887000A) -17 to +35 dBm (MU887001A)</p> <p>Linearity CW, RBW: 100 kHz, Same as level linearity (MU887000A test port 3 and 4, MU887001A all test port) ±0.2 dB (≥ -55 dBm, -40 to 0 dB)</p> <p>Resolution 0.1 dB</p> <p>Bandwidth 100 kHz</p> |
| EVM (Modulation Accuracy) | <p>EVM measurement range -20 to +25 dBm (MU887000A) -10 to +35 dBm (MU887001A)</p> <p>Residual EVM (Bandwidth: ≤80 MHz) Signal level: >-10 dBm (MU887000A), 0 dBm (MU887001A), Averaged over 20 packets, Channel estimation: FULLPACKET <-38 dB</p> <p>EVM data format dB, %</p> <p>Resolution 0.1% or 0.1 dB, All limit checking in dB to 0.1 dB resolution</p> <p>Speed >20 readings/second</p> |
| OFDM EVM Measurement Setting | <p>Channel estimation User selection of long training sequence or full packet.</p> <p>User specified measurement range 16 symbols (min.), 1000 symbols (max.)</p> <p>OFDM pilot tracking "Phase tracking only" or "Phase and Amplitude tracking".</p> <p>Peak and Average EVM on all sub-carriers, dB or percentage</p> <p>Peak and Average on each sub-carrier - frequency domain % vs. sub-carrier</p> <p>EVM vs. Symbol - time domain % vs. Symbol number, 1 to max.</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

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|-----------------------------|--|
| OFDM Additional Measurement | <p>Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz, ppm Accuracy: \pm (Setting frequency \times Reference oscillator accuracy + 1 kHz) (>1 ms packet) Resolution: Hz to no decimal places, ppm to one decimal places</p> <p>Symbol clock frequency tolerance Definition: Frequency error relative to the 250 kHz symbol clock as per 19.4.7.3/17.3.9.5 Measurement averaged over a fully coded OFDM packet with a minimum payload length of 16 symbols (64 μs) Data output format: Hz, ppm Range: \pm40 ppm Resolution: ppm to one decimal places User specified measurement range: 16- (Define numbers)</p> <p>Transmitter center frequency leakage Definition: Measurement of the leakage of the center carrier Data output format: dB Resolution: dB to two decimal places</p> <p>Transmitter spectral flatness Definition: Measurement of RF sub-carrier power level Unit of measurement: dB</p> |
|-----------------------------|--|

WLAN 802.11p TX Measurement MX887032A (Automotive Connectivity V2X)

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|------------------------------|---|
| Common Item | <p>Measuring object WLAN single packet</p> <p>Frequency range 715 MHz to 765 MHz 902 MHz to 928 MHz 5725 MHz to 5925 MHz (required MU88700xA-001 option)</p> |
| RF Power | <p>Input level range -65 to +25 dBm (MU887000A test port 3 and 4) -55 to +35 dBm (MU887001A all test port)</p> <p>Measurement accuracy After CAL, 20 to 30°C \pm0.7 dB (-30 dBm \leq p \leq +25 dBm), \pm1.0 dB (-50 dBm \leq p < -30 dBm) (MU887000A) \pm0.7 dB (-20 dBm \leq p \leq +35 dBm), \pm1.0 dB (-40 dBm \leq p < -20 dBm) (MU887001A)</p> <p>Bandwidth 5, 10, 20 MHz</p> |
| EVM (Modulation Accuracy) | <p>Measurement range -20 to +25 dBm (MU887000A) -10 to +35 dBm (MU887001A)</p> <p>Residual EVM (OFDM) Signal level: $>$-20 dBm (MU887000A), $>$-10 dBm (MU887001A), Averaged over 20 packets, Channel estimation: FULLPACKET $<$-40 dB</p> <p>EVM data format dB or %</p> <p>Measurement resolution 0.1% or 0.1 dB, All limit checking in dB to 0.1 dB resolution</p> |
| OFDM EVM Measurement Setting | <p>Channel estimation User selection of Long training sequence or Full packet</p> <p>User specified measurement range 16 symbols (min.), 1000 symbols (max.)</p> <p>OFDM pilot tracking "Phase tracking only" or "Phase and amplitude tracking", default: Phase tracking only</p> <p>Peak and average EVM on all sub-carriers, dB or percentage Peak and average on each sub-carrier - frequency domain % vs. sub-carrier EVM vs. Symbol - time domain % vs. Symbol number, 1 to max</p> |
| OFDM Additional Measurement | <p>Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz and ppm Measurement accuracy: \pm (Setting frequency \times Reference oscillator accuracy + 1 kHz) (packet: >1 ms) Resolution: Hz to no decimal places, ppm to 1 decimal place</p> <p>Transmit center frequency leakage Definition: Measurement of the leakage of the center carrier Data output format: dB Resolution: dB to two decimal places</p> <p>Transmitter spectral flatness Definition: Measurement of RF sub-carrier power level Data output format: dB</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

WLAN 802.11ax TX Measurement MX887033A

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|------------------------------|---|
| Common Item | <p>Measuring object WLAN signal packet</p> <p>Frequency range 5 GHz Band: (required MU88700xA-001) 80 MHz BW: 4920 MHz to 5775 MHz 40 MHz BW: 4920 MHz to 5795 MHz 20 MHz BW: 4920 MHz to 5825 MHz</p> <p>2.4 GHz Band: 40 MHz BW: 2412 MHz to 2472 MHz 20 MHz BW: 2412 MHz to 2484 MHz</p> |
| RF Power | <p>Input level range -65 to +25 dBm (MU887000A test port 3 and 4) -55 to +35 dBm (MU887001A all test port)</p> <p>Accuracy After CAL, 20° to 30°C ±0.7 dB (-30 dBm ≤ p ≤ +25 dBm), ±1.0 dB (-50 dBm ≤ p < -30 dBm) (MU887000A) ±0.7 dB (-20 dBm ≤ p ≤ +35 dBm), ±1.0 dB (-40 dBm ≤ p < -20 dBm) (MU887001A)</p> <p>Bandwidth 80, 40, 20 MHz</p> <p>Capture time 1.34 s</p> <p>Pre-trigger 1.33 s</p> <p>Resolution (time domain profile) 5 ns/sample</p> <p>CCDF CCDF defined as a percentage of samples against dB, where percentage of samples is normalized to the average power in the 'gate', and dB is defined as the relative value of samples greater than the average.</p> <p>Power distribution value A single numeric value called the power distribution value defines the number of dB above the average power below which a user defined percentage of the total number of samples falls.</p> |
| Spectral Profile Measurement | <p>Spectral profile measurement span ±80 MHz</p> <p>Capture time 50 μs</p> <p>Measurement range (RBW: 100 kHz) -27 to +25 dBm (MU887000A) -17 to +35 dBm (MU887001A)</p> <p>Linearity CW, RBW: 100 kHz, Same as level linearity (MU887000A test port 3 and 4, MU887001A all test port) ±0.2 dB (≥ -55 dBm, -40 to 0 dB)</p> <p>Resolution 0.1 dB</p> <p>Bandwidth 100 kHz</p> |
| EVM (Modulation Accuracy) | <p>EVM measurement range -20 to +25 dBm (MU887000A) -10 to +35 dBm (MU887001A)</p> <p>Residual EVM (Bandwidth: ≤80 MHz) 20° to 30°C Signal level: >-10 dBm (MU887000A), 0 dBm (MU887001A), averaged over 20 packets, where each packet is no less than 16 data OFDM symbols long. And for each subcarrier except Pilots, all data OFDM symbol should have same data field pattern. Channel estimation: FULLPACKET, Measured at 5210 MHz <-45 dB</p> <p>EVM data format dB, %</p> <p>Resolution 0.1% or 0.1 dB, All limit checking in dB to 0.1 dB resolution</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

| | |
|------------------------------|---|
| OFDM EVM Measurement Setting | <p>Channel estimation User selection of long training sequence or full packet. User specified measurement range 16 symbols (min.), 1000 symbols (max.) OFDM pilot tracking "Phase tracking only" or "Phase and Amplitude tracking". Peak and Average EVM on all sub-carriers, dB or percentage Peak and Average on each sub-carrier – frequency domain % vs. sub-carrier EVM vs. Symbol – time domain % vs. Symbol number, 1 to max.</p> |
| OFDM Additional Measurement | <p>Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz, ppm Accuracy: \pm (Setting frequency \times Reference oscillator accuracy + 1 kHz) (>1 ms packet) Resolution: Hz to no decimal places, ppm to one decimal places Symbol clock frequency tolerance Definition: Frequency error relative to the symbol clock depends on Signal's Guard interval. If GI is 0.8 us, Symbol Clock is $(1 / (12.8 \text{ us} + 0.8 \text{ us})) = 73.529 \text{ kHz}$ approx. If GI is 1.6 us, Symbol Clock is $(1 / (12.8 \text{ us} + 1.6 \text{ us})) = 69.444 \text{ kHz}$ approx. If GI is 3.2 us, Symbol Clock is $(1 / (12.8 \text{ us} + 3.2 \text{ us})) = 62.500 \text{ kHz}$ approx. Measurement averaged over a fully coded OFDM packet with a minimum payload length of 16 symbols. Data output format: Hz, ppm Range: ± 40 ppm Resolution: ppm to one decimal places User specified measurement range: 16- (Define numbers) Transmitter center frequency leakage Definition: Measurement of the leakage of the center carrier Data output format: dB Resolution: dB to two decimal places Transmitter spectral flatness Definition: Measurement of RF sub-carrier power level Unit of measurement: dB</p> |

Bluetooth TX Measurement MX887040A

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|-----------------------------|--|
| Common Item | <p>Measuring object Bluetooth signal packet (DH-1, 3, 5 2-DH-1, 3, 5 3-DH-1, 3, 5 LE) Frequency range 2402 MHz to 2480 MHz Measurement mode 'SIG Standard' Supports RF measurements on selected packet types as per the Bluetooth SIG RF test specification.</p> |
| RF Power | <p>Input level range -65 to +25 dBm (MU887000A test port 3 and 4) -55 to +35 dBm (MU887001A all test port) Measurement accuracy After CAL, 20° to 30°C $\pm 0.7 \text{ dB}$ ($-30 \text{ dBm} \leq p \leq +25 \text{ dBm}$), $\pm 1.0 \text{ dB}$ ($-50 \text{ dBm} \leq p < -30 \text{ dBm}$) (MU887000A) $\pm 0.7 \text{ dB}$ ($-20 \text{ dBm} \leq p \leq +35 \text{ dBm}$), $\pm 1.0 \text{ dB}$ ($-40 \text{ dBm} \leq p \leq -20 \text{ dBm}$) (MU887001A)</p> |
| EDR Relative Transmit Power | <p>Input level range -35 to +25 dBm (MU887000A) -25 to +35 dBm (MU887001A) Measurement Value Maximum, Minimum, Average differential power Relative power measurement range Relative power measurement range between the GFSK and $\pi/4$-DQPSK, 8-DSPK sections of the packet. Bandwidth 1.3 MHz (IF filter response 'flat' fc $\pm 550 \text{ kHz}$) Resolution (time domain) 0.01 dB</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

| | |
|--|---|
| Bluetooth Modulation | <p>GFSK, $\pi/4$-DQPSK, 8-DSPK</p> <p>Input level range -20 to +25 dBm (MU887000A) -10 to +35 dBm (MU887001A)</p> <p>Residual DEVM Signal level: >-20 dBm (MU887000A), >-10 dBm (MU887001A), Averaged over 10 packets <5%</p> <p>Resolution 0.1%</p> <p>GFSK Deviation measurement range: 0 to 350 kHz Accuracy: Modulation index: 0.32, Signal level: >-20 dBm (MU887000A), >-10 dBm (MU887001A), Averaged over 10 packets 1% ($\pm 0.01 \times$ expected deviation [Hz]) (nom.)</p> <p>Initial carrier frequency tolerance Input level range: -35 to +25 dBm (MU887000A) -25 to +35 dBm (MU887001A)</p> <p>Initial frequency range: 0 to ± 150 kHz Resolution: 1 kHz</p> <p>Carrier-frequency drift Input signal range: -35 to +25 dBm (MU887000A) -25 to +35 dBm (MU887001A)</p> <p>Frequency drift range: 0 to ± 200 kHz Time settings: 50 μs, >2000 μs</p> |
| EDR Carrier Frequency Stability | <p>Measurement range ± 100 kHz</p> <p>Resolution 1 kHz</p> <p>Accuracy Signal level: >-20 dBm (MU887000A), >-10 dBm (MU887001A), Averaged over 10 packets \pm (Setting frequency \times Reference oscillator accuracy + 500 Hz)</p> <p>Displayed results Initial frequency error ω_i, Frequency error ω_o, Frequency error $\omega_i + \omega_o$</p> |
| EDR Modulation Accuracy | <p>RMS DEVM range 0 to 30% ($\pi/4$-DQPSK), 0 to 20% (8-DSPK)</p> <p>Peak DEVM range 0 to 50% ($\pi/4$-DQPSK), 0 to 30% (8-DSPK)</p> |
| BLE Modulation Characteristics | <p>GFSK</p> <p>Input level range -35 to +25 dBm (MU887000A) -25 to +35 dBm (MU887001A)</p> <p>Frequency deviation range 0 to ± 500 kHz peak</p> <p>Resolution 1 kHz</p> <p>Accuracy Modulation index: 0.5, Signal level: >-20 dBm (MU887000A), >-10 dBm (MU887001A), Averaged over 10 packets 1% ($\pm 0.01 \times$ expected deviation [Hz]) (nom.)</p> |
| BLE Carrier Frequency Offset and Drift | <p>Input level range -35 to +25 dBm (MU887000A) -25 to +35 dBm (MU887001A)</p> <p>Frequency range 0 to ± 500 kHz</p> <p>Accuracy Signal level: >-20 dBm (MU887000A), >-10 dBm (MU887001A), Averaged over 10 packets \pm (Setting frequency \times Reference oscillator accuracy + 500 Hz)</p> <p>Displayed results Carrier frequency error, Frequency drift, Drift rate</p> |

Short Range Wireless Average Power and Frequency Measurement MX887050A

| | |
|---|---|
| <p>RF Power (CW and Continuously Modulated)</p> | <p>Frequency range 2.4 GHz band: 2402 MHz to 2484 MHz 5 GHz band: 4920 MHz to 5825 MHz (require MU88700xA-001)</p> <p>Input level range -65 to +25 dBm (MU887000A test port 3 and 4) -55 to +35 dBm (MU887001A all test port)</p> <p>Accuracy After CAL 400 MHz ≤ f < 3.8 GHz, 10° to 40°C ±0.7 dB (-30 ≤ p ≤ +25 dBm) ±0.9 dB (-55 ≤ p < -30 dBm) ±1.1 dB (-65 ≤ p < -55 dBm) 3.8 GHz ≤ f ≤ 6 GHz, 20° to 30°C ±0.7 dB (-30 ≤ p ≤ +25 dBm) ±0.9 dB (-55 ≤ p < -30 dBm) ±1.1 dB (-65 ≤ p < -55 dBm)</p> <p>Linearity CW, RBW: 100 kHz ±0.2 dB (≥ -55 dBm, -40 to 0 dB)</p> |
| <p>Frequency (CW)</p> | <p>Input level range -35 to +25 dBm (MU887000A) -25 to +35 dBm (MU887001A)</p> <p>Frequency range 0 to ±500 kHz</p> <p>Accuracy ± (Setting frequency × Reference oscillator accuracy + 500 Hz)</p> |

IEEE 802.15.4 TX Measurement MX887060A

| | |
|----------------------------|---|
| <p>Common Item</p> | <p>Frequency range 440 MHz to 2500 MHz</p> |
| <p>RF Power</p> | <p>Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.), ±0.5 dB (-25 to +35 dBm) ±0.7 dB (-55 to -25 dBm) ±0.9 dB (-65 to -55 dBm) MU887000A test port 3 and 4 ±0.7 dB (-25 to +25 dBm) ±0.9 dB (-55 to -25 dBm) ±1.1 dB (-65 to -55 dBm)</p> |
| <p>Modulation Analysis</p> | <p>Input level range Analysis length: 1000 chips or more -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4)</p> <p>Modulation accuracy Residual EVM ≤ 1.5%</p> <p>Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 20 Hz)</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

Z-Wave TX Measurement MX887061A

| | |
|---------------------|---|
| Common Item | Frequency range 440 MHz to 1000 MHz |
| RF Power | Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4) Accuracy After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.), ±0.5 dB (-25 to +35 dBm) ±0.7 dB (-55 to -25 dBm) ±0.9 dB (-65 to -55 dBm) MU887000A test port 3 and 4 ±0.7 dB (-25 to +25 dBm) ±0.9 dB (-55 to -25 dBm) ±1.1 dB (-65 to -55 dBm) |
| Modulation Analysis | Input level range Analysis length: 200 bits -30 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -30 to +25 dBm (MU887000A test port 3 and 4) Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 20 Hz) |

Category M FDD Uplink TX Measurement MX887065A

| | |
|----------------------------------|--|
| Common Item | Measuring Object PUSCH, PUCCH Frequency Range 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz 600 MHz to 2.7 GHz, 3.4 GHz to 4.2 GHz (with MU88700xA-001/101 option) |
| RF Power | Input Level Range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4) Measurement Accuracy 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz, After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-50 to -20 dBm) ±0.9 dB (-60 to -50 dBm) MU887000A test port 3 and 4 ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) 3.8 GHz to 4.2 GHz, After CAL, 20° to 30°C MU887000A test port 1 and 2, MU887001A all test port ±0.7 dB (-20 to +35 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) MU887000A test port 3 and 4 ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) |
| Frequency/Modulation Measurement | Input Level Range -40 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -40 to +25 dBm (MU887000A test port 3 and 4) Carrier Frequency Accuracy ± (Setting frequency × Reference oscillator accuracy + 15 Hz) Modulation Analysis Residual EVM: Average of 20 measurements ≤2.5% In-Band Emission In signal condition with Input Level ≥-10 dBm ≤-40 dBc |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

| | |
|--------------------------------------|--|
| Occupied bandwidth | Input Level Range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) |
| Adjacent channel leakage power ratio | Input Level Range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) Measurement Range ≥45 dB (E-UTRA ACLR1) ≥50 dB (UTRA ACLR1) ≥55 dB (UTRA ACLR2) |
| Spectrum Emission Mask | Input Level Range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) |

NB-IoT Uplink TX Measurement MX887067A

| | |
|--------------------------------------|--|
| Common Item | Measuring object NPUSCH Frequency range 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz 600 MHz to 2.7 GHz, 3.4 GHz to 4.2 GHz (with MU88700xA-001/101 option) |
| RF Power | Input level range -65 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -65 to +25 dBm (MU887000A test port 3 and 4) Measurement accuracy 600 MHz to 2.7 GHz, 3.4 GHz to 3.8 GHz, After CAL, 10° to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (-20 to +35 dBm, 20° to 30°C) ±0.5 dB (-20 to +35 dBm) ±0.7 dB (-50 to -20 dBm) ±0.9 dB (-60 to -50 dBm) MU887000A test port 3 and 4 ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) 3.8 GHz to 4.2 GHz, After CAL, 20° to 30°C MU887000A test port 1 and 2, MU887001A all test port ±0.7 dB (-20 to +35 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) MU887000A test port 3 and 4 ±0.7 dB (-20 to +25 dBm) ±0.9 dB (-50 to -20 dBm) ±1.1 dB (-60 to -50 dBm) |
| Frequency/Modulation Measurement | Input level range -40 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -40 to +25 dBm (MU887000A test port 3 and 4) Carrier frequency accuracy ±(Setting frequency × Reference oscillator accuracy + 15 Hz) Modulation analysis Residual EVM: Average of 20 measurements ≤1% In-band emission In signal condition with Input Level ≥-10 dBm ≤-40 dBc |
| Occupied bandwidth | Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) |
| Adjacent channel leakage power ratio | Input level range -10 to +35 dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25 dBm (MU887000A test port 3 and 4) Measurement range ≥47 dB (GSM ACLR) ≥50 dB (UTRA ACLR) |
| Spectrum Emission Mask | Input level range -10 to +35dBm (MU887000A test port 1 and 2, MU887001A all test port) -10 to +25dBm (MU887000A test port 3 and 4) |

WLAN 802.11b/g/a/n Waveforms MV887030A

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|-----|--|
| EVM | <p>802.11b Packet length: 1024 byte, Gaussian filter: BT 0.5 ≤-38 dB rms (2402 MHz to 2484 MHz)</p> <p>802.11g Packet length: 1000 byte, 20° to 30°C ≤-40 dB rms (2402 MHz to 2484 MHz)</p> <p>802.11a Packet length: 1000 byte, 20° to 30°C ≤-38 dB rms (4920 MHz to 5825 MHz)</p> <p>802.11n Packet length: 4096 byte, Long guard interval, Channel bandwidth: 40 MHz, 20° to 30°C ≤-40 dB rms (2402 MHz to 2484 MHz) ≤-38 dB rms (4920 MHz to 5825 MHz)</p> |
|-----|--|

Bluetooth Waveforms MV887040A

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|-----------|---|
| Deviation | Frequency: 2402 MHz to 2480 MHz, GFSK modulation 1% ($\pm 0.01 \times$ deviation Hz) (nom.) |
| DEVm | Frequency: 2402 MHz to 2480 MHz, $\pi/4$ -DQPSK, 8-DPSK modulation <5% rms |

IEEE 802.15.4 Waveforms MV887060A

| | |
|-----|---------------------------------|
| EVM | 440 MHz ≤ f ≤ 2500 MHz ≤3.0% |
|-----|---------------------------------|

Z-Wave Waveforms MV887061A

| | |
|-----|---------------------------------|
| EVM | 440 MHz ≤ f ≤ 2500 MHz ≤3.0% |
|-----|---------------------------------|

Category M FDD Downlink Waveforms MV887065A

| | |
|-------------------|--|
| Max. Output Level | MU887000A test port 1 and 2, MU887001A all test port -12 dBm (f ≤ 3.8 GHz), -20 dBm (f > 3.8 GHz) MU887000A test port 3 and 4 -2 dBm (f ≤ 3.8 GHz), -10 dBm (f > 3.8 GHz) |
|-------------------|--|

NB-IoT Downlink Waveforms MV887067A

| | |
|-------------------|--|
| Max. Output Level | MU887000A test port 1 and 2, MU887001A all test port -12 dBm (f ≤ 3.8 GHz), -20 dBm (f > 3.8 GHz) MU887000A test port 3 and 4 -2 dBm (f ≤ 3.8 GHz), -10 dBm (f > 3.8 GHz) |
|-------------------|--|

ISDB-Tmm Waveforms MV887112A

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|-----|---|
| MER | Frequency: 214.714285 MHz ≥37 dB (total) |
|-----|---|

FM/Audio TRX Measurement MX887070A

FM Signal Measurements

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|-----------------|--|
| Common Item | <p>Target signals FM/FM stereo/RDS (Radio Data System) signals</p> <p>Frequency range 65 MHz to 110 MHz</p> |
| TX Measurements | <p>Measurement functions</p> <ul style="list-style-type: none"> Amplitude Carrier frequency Frequency deviation Occupied bandwidth Pilot frequency deviation Audio frequency deviation Audio frequency Pilot frequency THD THD+N/SINAD SNR <p>Audio filter</p> <ul style="list-style-type: none"> Low-pass: Off, 3 kHz, 15 kHz, 20 kHz, 30 kHz High-pass: Off, 20 Hz, 100 Hz, 400 Hz De-emphasis: Off, 50 μs, 75 μs Bandpass (Weighting filter): Off, A-Weighting (IEC 61672: 2003), C-Message, CCITT (ITU-T O.41) <p>Input level range -30 to +15 dBm</p> <p>Level accuracy 10° to 40°C, Measurement bandwidth: 1.2 MHz, -30 dBm \leq p \leq +15 dBm \pm0.7 dB</p> <p>Carrier frequency accuracy FM monaural modulation, Tone: 1 kHz, Deviation: 75 kHz \pm (Setting frequency \times Reference oscillator accuracy + 1 Hz)</p> <p>FM deviation range 1 kHz to 100 kHz</p> <p>Residual FM Monaural modulation, Tone: 1 kHz, Deviation: 75 kHz, Demodulation bandwidth: 20 Hz to 15 kHz, using De-emphasis filter (50 μs) >55 dB</p> <p>Demodulation signal analysis No. of FFT points: 65536 Sampling rate: 152 kHz FFT window function: Hanning window</p> |
| RX Measurements | <p>Measurement functions</p> <ul style="list-style-type: none"> FM waveform output <p>Modulation method FM Monaural, FM stereo</p> <p>Frequency deviation Setting range: 20 kHz to 100 kHz</p> <p>Distortion 65 MHz to 110 MHz, (SINAD, 20 Hz to 15 kHz, Emphasis on, Monaural), Tone: 1 kHz, Deviation: 75 kHz >50 dB (SINAD)</p> <p>Resolution: 0.1 Hz</p> <p>Internal modulation signal</p> <ul style="list-style-type: none"> AF tone <ul style="list-style-type: none"> L channel (Mono): 1 to 8 tones R channel: 1 to 8 tones <p>Frequency range 20 Hz to 20 kHz, Resolution: 0.1 Hz</p> |

Measurement Software MX8870xxA Series/Waveforms MV887xxxA Series Specifications

Audio Signal Measurements

With MU88700xA-002 Audio Measurement Hardware installed, TRX measurements of analog audio signal from AF input/output connector or digital audio signal from AF digital connector

| | |
|-----------------|---|
| TX Measurements | <p>Measurement functions</p> <ul style="list-style-type: none"> Amplitude Frequency Distortion ratio measurement Crosstalk THD THD+N/SINAD SNR <p>Analog measurements</p> <p>All single-tone measurement standard values</p> <p>Impedance: 100 kΩ (AC coupling)</p> <p>Frequency</p> <ul style="list-style-type: none"> Frequency range: 20 Hz to 20 kHz <p>Input level</p> <ul style="list-style-type: none"> Level range: 1 mVpeak to 5 Vpeak (30 V rms, max.) Setting range: 50 mVpeak, 500 mVpeak, 5 Vpeak Level accuracy: ± 0.4 dB (20° to 30°C) <p>THD+N (total harmonic distortion + noise)</p> <ul style="list-style-type: none"> <-60 dB (at 1 kHz, 2 Vpeak, 20 Hz to 20 kHz bandwidth, 5 Vpeak range, 20° to 30°C) <p>Crosstalk</p> <ul style="list-style-type: none"> L/R: >60 dB <p>AF signal analysis</p> <ul style="list-style-type: none"> Sampling rate: 192 kHz No. of FFT points: 65536 FFT window function: Hanning window <p>Digital measurement</p> <p>All single-tone measurement standard values</p> <p>Bit resolution: 16 bits/24 bits</p> <p>Sampling rate</p> <ul style="list-style-type: none"> Frequency: 16, 32, 44.1, 48 kHz <p>AF signal analysis</p> <ul style="list-style-type: none"> No. of FFT points: 16384 (sampling rates of 48 kHz, 44.1 kHz) 8192 (sampling rate of 32 kHz) 4096 (sampling rate of 16 kHz) FFT window function: Hanning window |
| RX Measurement | <p>Analog measurements</p> <p>All single-tone measurement standard values</p> <p>Impedance: 1 Ω (AC coupling) (nom.)</p> <p>Output waveform: Single tone, Multi-tone</p> <p>Frequency</p> <ul style="list-style-type: none"> Frequency range: 20 Hz to 20 kHz Frequency resolution: 0.01 Hz <p>Output level</p> <ul style="list-style-type: none"> Level range: 0 (off), 1 mV to 5 Vpeak (100 kΩ termination) Resolution: 1 mV (≤ 5 Vpeak) 100 μV (≤ 500 mVpeak) 10 μV (≤ 50 mVpeak) Accuracy: ± 0.3 dB (at 1 kHz, 100 kΩ termination, 20° to 30°C) <p>Maximum output current</p> <ul style="list-style-type: none"> 100 mA (nom.) (Do not do short circuit) <p>THD+N (Total harmonic distortion + noise)</p> <ul style="list-style-type: none"> <-60 dB (at 1 kHz, 1 Vpeak, 20 Hz to 20 kHz bandwidth, 100 kΩ termination, 20° to 30°C) <p>Digital measurement</p> <p>All single-tone measurement standard values</p> <p>Output waveform: Single tone, Multi-tone</p> <p>Frequency</p> <ul style="list-style-type: none"> Frequency range: 20 Hz to 20 kHz (44.1 kHz, 48 kHz sampling) 20 Hz to 14 kHz (32 kHz sampling) 20 Hz to 7 kHz (16 kHz sampling) <p>Resolution: 0.01 Hz</p> <p>Output level</p> <ul style="list-style-type: none"> Level range: Full scale to (Full scale - 40 dB) Resolution: 0.1 dB <p>Bit resolution: 16 bits/24 bits</p> <p>Sampling rate</p> <ul style="list-style-type: none"> Frequency: 16, 32, 44.1, 48 kHz |

Universal Wireless Test Set MT8870A Specifications Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

| Model/Order No. | Name |
|-----------------|---|
| MT8870A | Main frame Universal Wireless Test Set |
| B0666A | Standard accessories Power Cord: 1 pc Blank Panel: 0 to 4 pcs*1 DVD-R: 1 pc |
| MX880050A | CombiView (DVD-R) |
| MX880051A | Cellular Application Applet (DVD-R) |
| MX880052A | SRW Application Applet (DVD-R) |
| MX880053A | FM/Audio Application Applet (DVD-R) |
| MX880054A | Signal Generator Application Applet (DVD-R) |
| MX880055A | Small Cell Application Applet (DVD-R) |
| MX880056A | IEEE 802.15.4 Application Applet (DVD-R) |
| MX887900A | MT8870A Utility Tool (DVD-R) |
| W3605AE | MT8870A Operation Manual (DVD-R) |
| W3606AE | MU887000A Operation Manual (DVD-R) |
| MT8870A-001 | Options GPIB Control |
| MT8870A-101 | GPIB Control Retrofit |
| MT8870A-ES210 | Warranty 2 Years Extended Warranty Service |
| MT8870A-ES310 | 3 Years Extended Warranty Service |
| MT8870A-ES510 | 5 Years Extended Warranty Service |
| B0666A | Application parts Blank Panel |
| B0664A | Rack Mount Kit (MT8870A) |
| B0665A | Carrying Case (MT8870A) |
| B0669A | Front Cover for 1MW5U (MT8870A) |
| J0006 | GPIB Cable, 0.5 m |
| J0007 | GPIB Cable, 1.0 m |
| J0008 | GPIB Cable, 2.0 m |
| J0127A | Coaxial Cord, 1 m (BNC-P · RG-58A/U · BNC-P) |
| J0127B | Coaxial Cord, 2.0 m (BNC-P · RG-58A/U · BNC-P) |
| J0127C | Coaxial Cord, 0.5 m (BNC-P · RG-58A/U · BNC-P) |
| J0576B | Coaxial Cord, 1.0 m (N-P · 5D-2W · N-P) |
| J0576D | Coaxial Cord, 2.0 m (N-P · 5D-2W · N-P) |
| J0322A | Coaxial Cord, 0.5 m (SMA-P · SMA-P, DC to 18 GHz, 50Ω) |
| J0322B | Coaxial Cord, 1.0 m (SMA-P · SMA-P, DC to 18 GHz, 50Ω) |
| J0322C | Coaxial Cord, 1.5 m (SMA-P · SMA-P, DC to 18 GHz, 50Ω) |
| J0322D | Coaxial Cord, 2.0 m (SMA-P · SMA-P, DC to 18 GHz, 50Ω) |
| J0004 | Coaxial Adapter (N-P · SMA-J) |
| J1261A | Ethernet Cable (Shield type, Straight, 1 m) |
| J1261B | Ethernet Cable (Shield type, Straight, 3 m) |
| J1261C | Ethernet Cable (Shield type, Crossover, 1 m) |
| J1261D | Ethernet Cable (Shield type, Crossover, 3 m) |
| J1941A | 2way Low Amplitude Error Divider |
| J1942A | 4way Low Amplitude Error Divider |

*1: Installed in empty slots

| Model/Order No. | Name |
|-----------------|--|
| MN8116A | Application instruments Multi-Port Switch (16 ports) |
| MN8116A-001 | 16 Port Expansion Bank |
| MN8116A-101 | 16 Port Expansion Bank Retrofit |
| MN8116A-ES210 | Warranty 2 Years Extended Warranty Service |
| MN8116A-ES310 | 3 Years Extended Warranty Service |
| MN8116A-ES510 | 5 Years Extended Warranty Service |

| Model/Order No. | Name |
|-----------------|--|
| MU887000A | Test module TRX Test Module |
| MU887001A | TRX Test Module |
| W3606AE | Standard accessories DVD-R: 1 pc MU887000A Operation Manual (DVD-R) |
| MU887000A-001 | Options 6 GHz Frequency Extension |
| MU887000A-101 | 6 GHz Frequency Extension Retrofit |
| MU887000A-002 | Audio Measurement Hardware |
| MU887000A-102 | Audio Measurement Hardware Retrofit |
| MU887001A-001 | 6 GHz Frequency Extension |
| MU887001A-101 | 6 GHz Frequency Extension Retrofit |
| MU887001A-002 | Audio Measurement Hardware |
| MU887001A-102 | Audio Measurement Hardware Retrofit |
| MU887000A-ES210 | Warranty 2 Years Extended Warranty Service |
| MU887000A-ES310 | 3 Years Extended Warranty Service |
| MU887000A-ES510 | 5 Years Extended Warranty Service |
| MU887001A-ES210 | 2 Years Extended Warranty Service |
| MU887001A-ES310 | 3 Years Extended Warranty Service |
| MU887001A-ES510 | 5 Years Extended Warranty Service |

| Model/Order No. | Name |
|-----------------|--|
| MX887010A | Measurement software Cellular Standards Sequence Measurement |
| MX887011A | W-CDMA/HSPA Uplink TX Measurement |
| MX887012A | GSM/EDGE Uplink TX Measurement |
| MX887013A | LTE FDD Uplink TX Measurement |
| MX887013A-001 | LTE-Advanced FDD Uplink CA TX Measurement |
| MX887014A | LTE TDD Uplink TX Measurement |
| MX887014A-001 | LTE-Advanced TDD Uplink CA TX Measurement |
| MX887015A | CDMA2000 Reverse Link TX Measurement |
| MX887016A | 1xEV-DO Reverse Link TX Measurement |
| MX887017A | TD-SCDMA Uplink TX Measurement |
| MX887019A | NR TDD sub-6GHz Uplink TX Measurement |
| MX887021A | W-CDMA/HSPA Downlink TX Measurement |
| MX887023A | LTE FDD Downlink TX Measurement |
| MX887030A | WLAN 802.11b/g/a/n TX Measurement*2 |
| MX887031A | WLAN 802.11ac TX Measurement*2 |
| MX887032A | WLAN 802.11p TX Measurement*2 |
| MX887033A | WLAN 802.11ax TX Measurement*2 |
| MX887040A | Bluetooth TX Measurement |
| MX887040A-001 | DLE TX Measurement*3 |
| MX887040A-002 | 2LE TX Measurement*3, *4 |
| MX887040A-003 | BLR TX Measurement*3, *4 |
| MX887050A | Short Range Wireless Average Power and Frequency Measurement |
| MX887060A | IEEE 802.15.4 TX Measurement |
| MX887061A | Z-Wave TX Measurement |
| MX887065A | Category M FDD Uplink TX Measurement |
| MX887067A | NB-IoT Uplink TX Measurement |
| MX887070A | FM/Audio TRX Measurement*5 |
| MX887090A | Multi-DUT Measurement Scheduler |

Universal Wireless Test Set MT8870A Specifications Ordering Information

| Model/Order No. | Name |
|------------------|------------------------------------|
| Waveforms | |
| MV887011A | W-CDMA/HSPA Downlink Waveforms |
| MV887012A | GSM/EDGE Downlink Waveforms |
| MV887013A | LTE FDD Downlink Waveforms |
| MV887014A | LTE TDD Downlink Waveforms |
| MV887015A | CDMA2000 Forward Link Waveforms |
| MV887016A | 1xEV-DO Forward Link Waveforms |
| MV887017A | TD-SCDMA Downlink Waveforms |
| MV887019A | NR TDD sub-6GHz Downlink Waveforms |
| MV887021A | W-CDMA/HSPA Uplink Waveforms |
| MV887023A | LTE FDD Uplink Waveforms |
| MV887030A | WLAN 802.11b/g/a/n Waveforms*2 |
| MV887031A | WLAN 802.11ac Waveforms*2 |
| MV887032A | WLAN 802.11p Waveforms |
| MV887033A | WLAN 802.11ax Waveforms*2 |
| MV887040A | Bluetooth Waveforms |
| MV887040A-001 | DLE Waveforms*6 |
| MV887040A-002 | 2LE Waveforms*6, *7 |
| MV887040A-003 | BLR Waveforms*6, *7 |
| MV887060A | IEEE 802.15.4 Waveforms |
| MV887061A | Z-Wave Waveforms |
| MV887065A | Category M FDD Downlink Waveforms |
| MV887067A | NB-IoT Downlink Waveforms |
| MV887070A | FM RDS Waveforms |
| MV887100A | GPS Waveforms |
| MV887101A | Galileo Waveforms |
| MV887102A | GLONASS Waveforms |
| MV887103A | BeiDou Waveforms |
| MV887110A | DVB-H Waveforms |
| MV887111A | ISDB-T Waveforms |
| MV887112A | ISDB-Tmm Waveforms |

*2: Requires MU88700xA-001 for 5 GHz (802.11a/n/p/ac) frequency measurements

*3: Requires MX887040A

*4: Requires MX887040A-001

*5: Requires MU88700xA-002 for audio signal measurements

*6: Requires MV887040A

*7: Requires MV887040A-001

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