Product Brochure

Anritsu envision:ensure

Universal Wireless Test Set

MT8870A

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Excellent Eco Product

For Production Lines for Smartphones and Wireless Modules

In recent years, wireless communication has become increasingly popular, not only for smartphones, but also for cars and IoT terminals equipped with communication functions, and the market is continuing to expand. 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.


Anritsu
WLAN
802.11ax
LTE-V2X

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

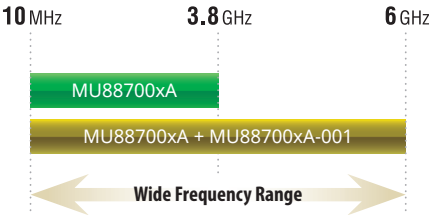
The TRX Test Module MU887000A/01A (MU88700xA) has been developed for communication terminal device inspection lines. Each installed test module has an independent high-performance signal generator and signal analyzer.

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.



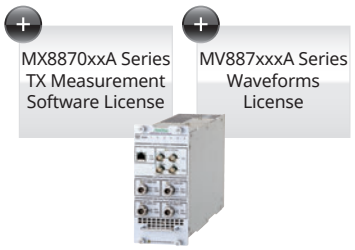
4 Each Test Module Supports Multiple Wireless Standards

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/ LTE-V2X/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)
QZSS	Quasi-Zenith Satellite System Interface Specification
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.



TRX Test Module
MU887000A/MU887001A

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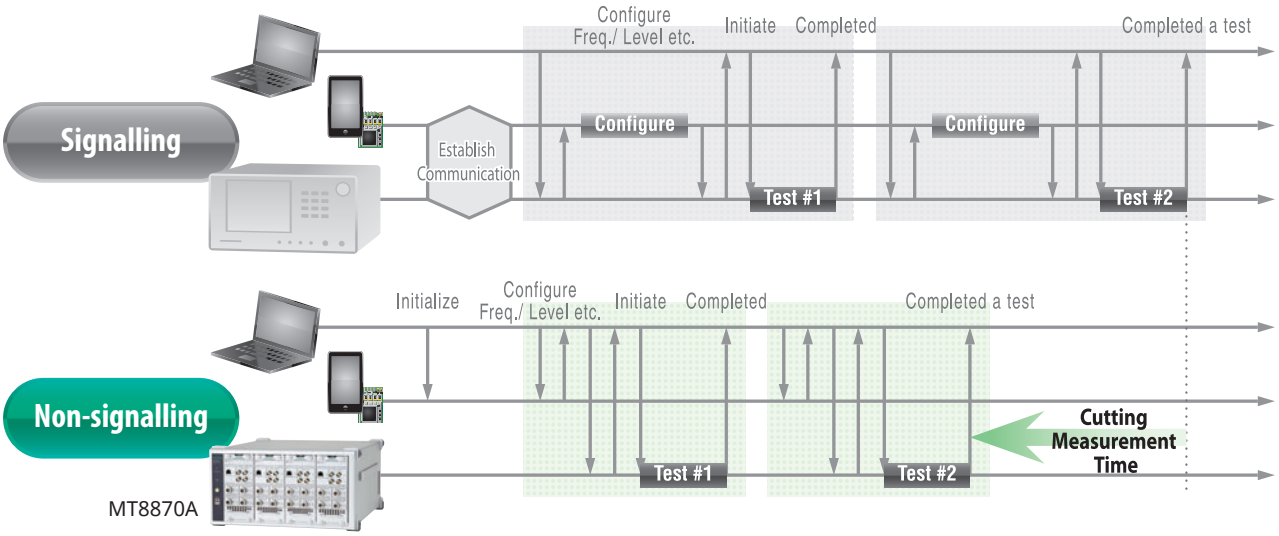
Integration with Leading-edge High-speed Measurement Methods

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.

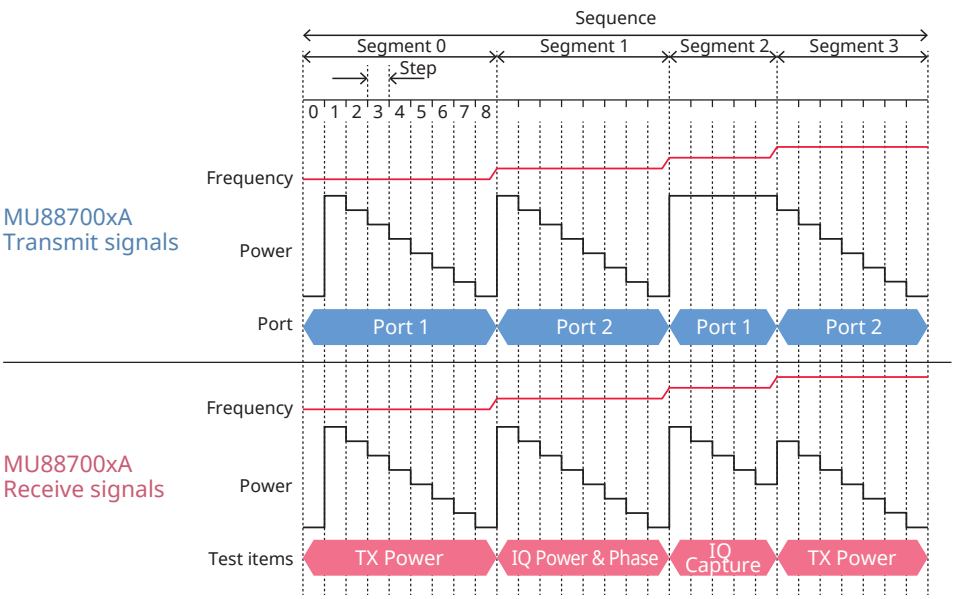
Non-signalling Measurement Support

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.



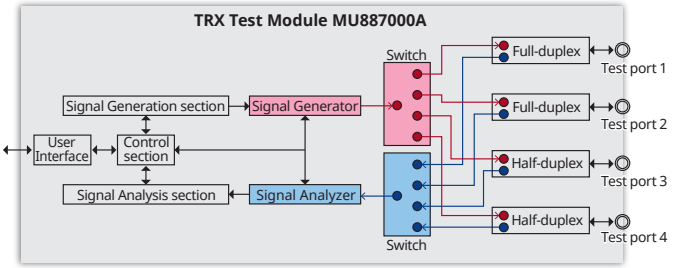
TRX Test Module MU887000A/01A Features

Four Test Ports per Module

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

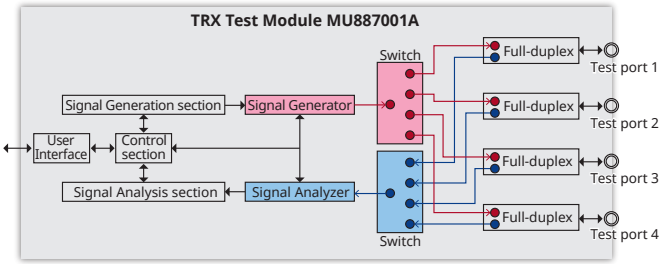
The duplex ports (Test port 1 and 2) incorporate dividers at the front end to support simultaneous tests in both TX and RX directions when testing typical wireless standards.

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 FDD/TDD sub-6GHz, LTE/LTE-Advanced FDD/TDD, LTE-V2X, 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, QZSS, 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, QZSS, 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 FDD/TDD sub-6GHz, LTE/LTE-Advanced FDD/TDD, LTE-V2X, 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, QZSS, DVB-T, ISDB-T/Tmm

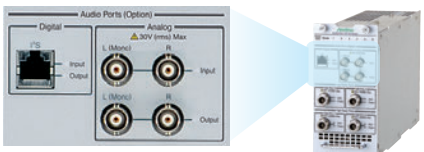
*: Since test ports 1 and 2 have higher input levels than ports 3 and 4, use ports 3 and 4 when the MU88700xA input level is low.

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.

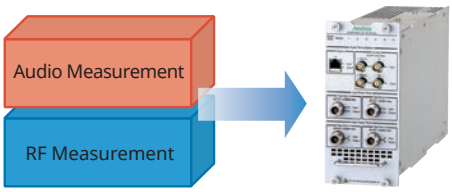
The MU88700xA-002 supports both analog and digital audio. The stereo and monaural analog audio inputs and outputs of a communications device can be measured using the four BNC connectors (input and output for both left and right channels). Additionally, digital audio communications modules without analog 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.



Audio Measurement Hardware
MU88700xA-002

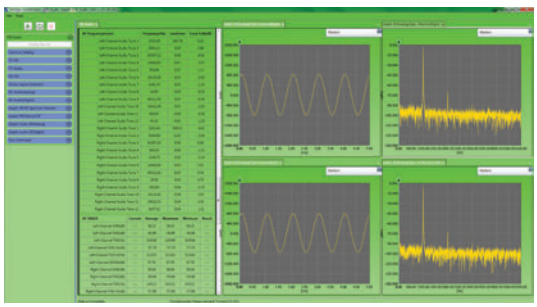
TRX Test Module
MU88700xA

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.



TRX Test Module
Audio Measurement Hardware MU88700xA-002

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



CombiView Audio Measurement Screen

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.

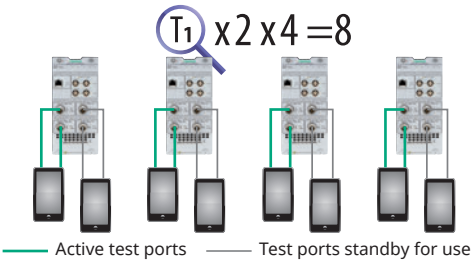
One License Supports Four Modules

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

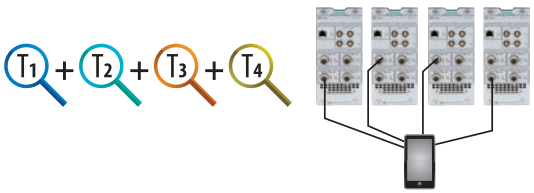
Up to 8 Units

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.



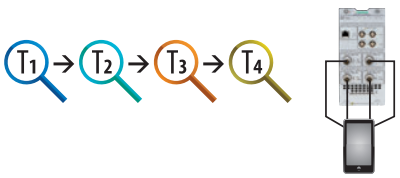
Up to 4 Measurement Types

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.



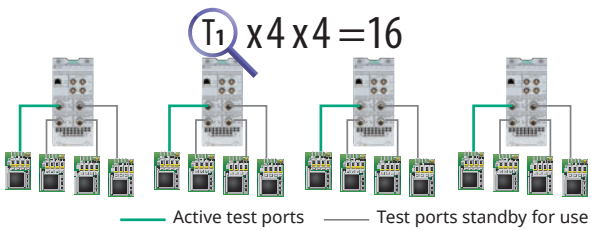
Continuous Measurements by 1 Module

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

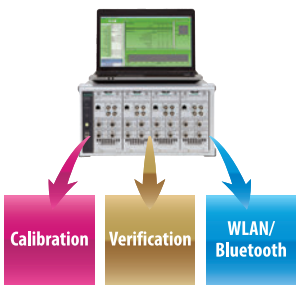
16 Simultaneous Connections:
Each MU88700xA has four test ports. Up to four test modules can be installed in one MT8870A, supporting simultaneous connection of 16 test devices.
This versatility eliminates the need for external combiners and also reduces test fixture calibration.



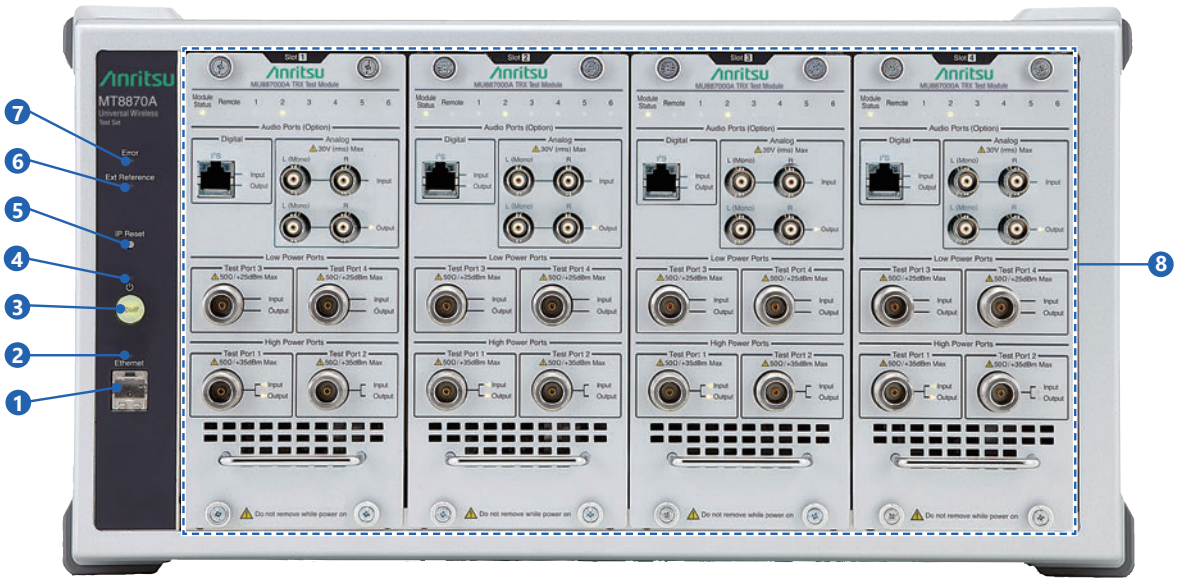
POINT

Supports Flexible Line Changes

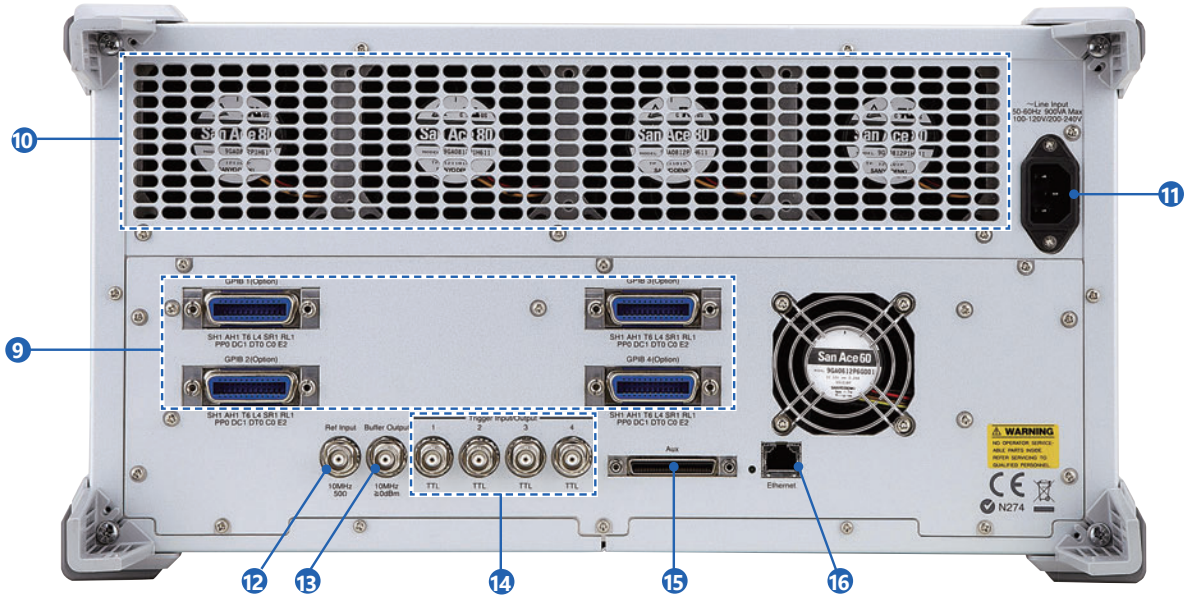
Generally, wireless device production lines are divided into different processing stages such as calibration, inspection, and function testing. Using different equipment at each stage causes problems, such as different test times, as well as the need to provide spare capacity to cover any faults at each 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



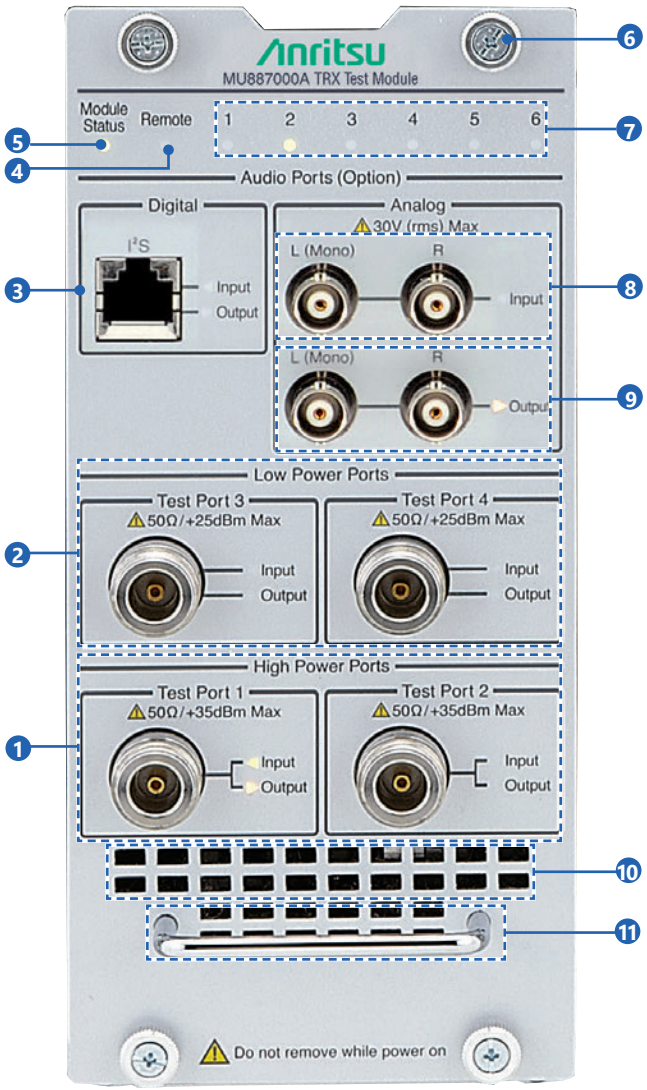
Front panel



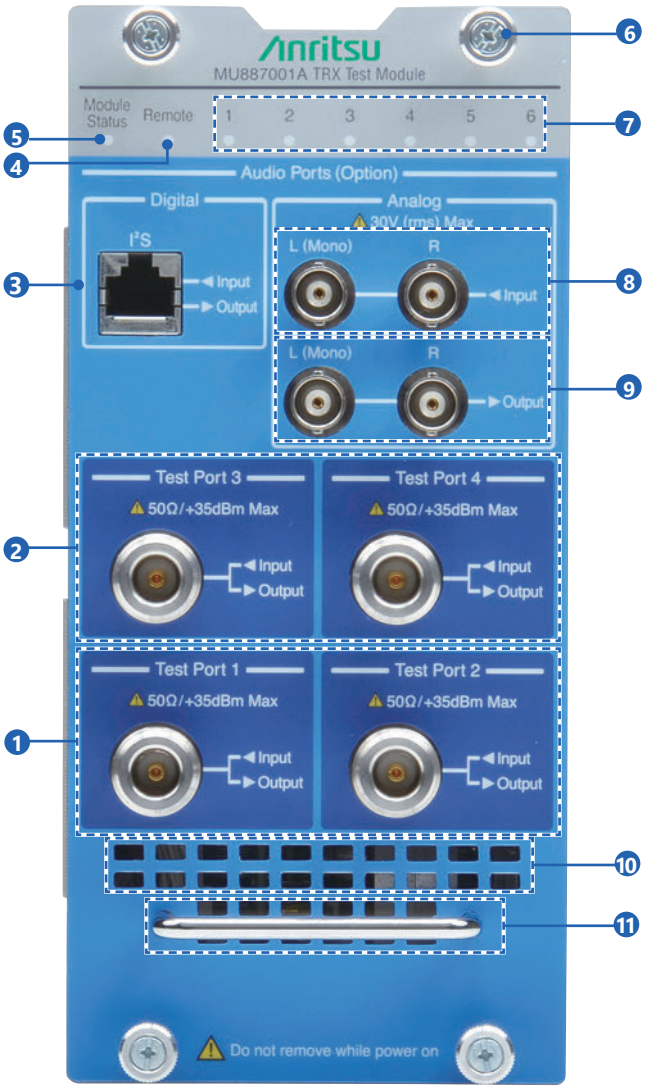
Rear panel

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

TRX Test Module MU887000A/01A Panel Layout



MU887000A



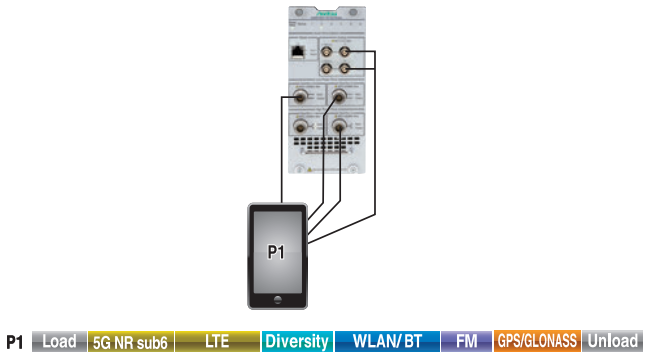
MU887001A

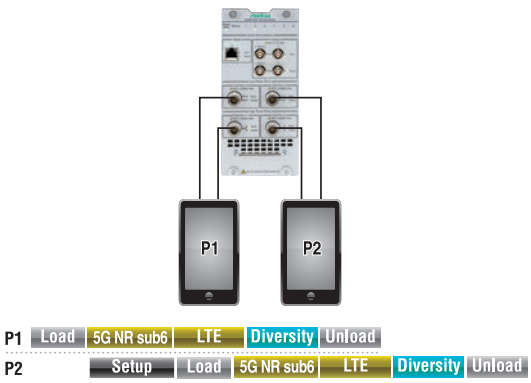
❶ Test Port 1, 2
❷ Test Port 3, 4
❸ Digital Audio Input/Output (option)
❹ Remote Lamp (remote)
❺ Status Lamp (module status)
❻ Mounting screws
❼ Status Lamp (1 to 6)
❽ Analog Audio Input (option)
❾ Analog Audio Output (option)
❿ Vent
⓫ Handle

Universal Wireless Test Set MT8870A Applications

Smartphones/Automotive

Smartphone/Automotive Measurement (Simultaneous Measurement of Multiple Wireless Technologies)





Two TRX Test Modules can be used to measure multiple wireless technologies in one wireless device or module.

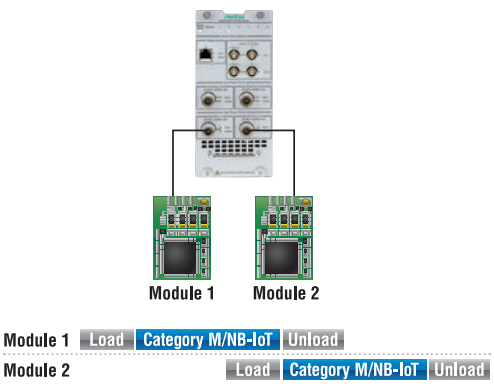
The multiple antennas for the various wireless technologies in the wireless device or module are connected all at one time to execute measurements in parallel, greatly reducing the problems of moving smartphones between test stations and re-booting time for smartphone.

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
MX887018A	NR FDD sub-6GHz Uplink 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
MX887068A	LTE-V2X TX Measurement	1
MX887070A	FM/Audio TRX Measurement	1
MX887090A	Multi-DUT Measurement scheduler	1
MV887013A	LTE FDD Downlink Waveforms	1
MV887018A	NR FDD sub-6GHz 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
MV887068A	LTE-V2X Waveforms	1
MV887070A	FM RDS Waveforms	1
MV887100A	GPS Waveforms	1
MV887100A-002	GPS L5 Waveforms	1
MV887101A	Galileo Waveforms	1
MV887102A	GLONASS Waveforms	1
MV887103A	BeiDou Waveforms	1
MV887104A	QZSS Waveforms	1

Cellular LPWA Devices

NB-IoT Module Measurement

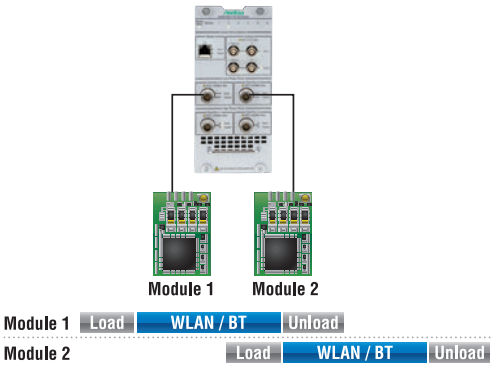


Recommended Configuration

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

Connectivity Devices

Combo Module Measurement

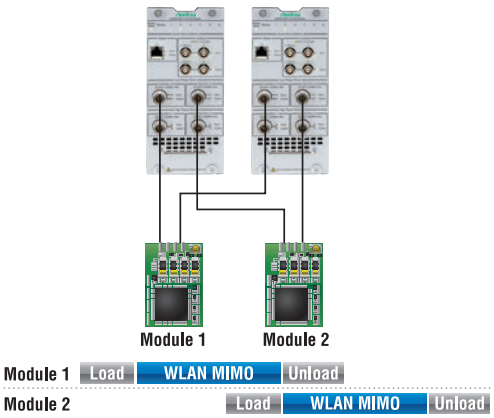


One TRX Test Module can be used to measure WLAN 802.11b/g/a/n/p/ac, 11ac (Wave 2), 11ax and Bluetooth v5 modules.

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 2×2 MIMO Module Measurement (True MIMO)



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

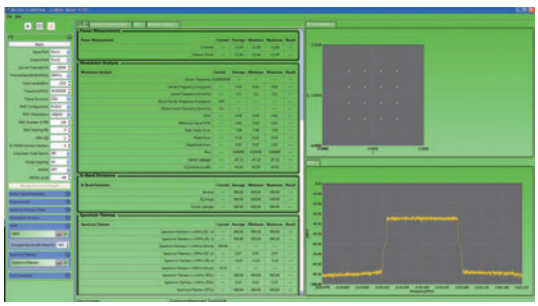
Universal Wireless Test Set MT8870A PC Applications

CombiView

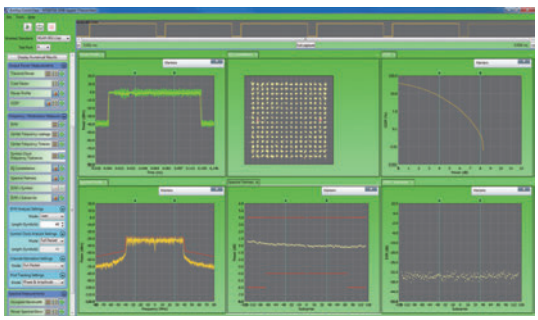
CombiView is a PC application used to control the MT8870A and display graphical and numerical test results.
It has the following functions:

Key Features

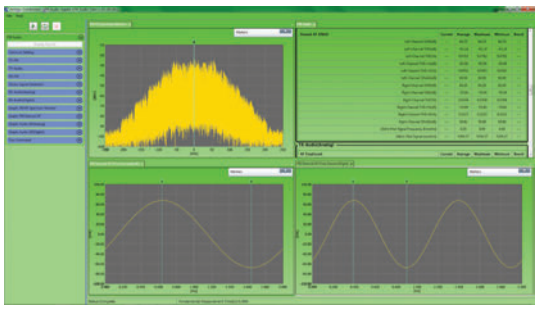
- Graphical display of TX measurement results using Windows interface
- Remote control of MT8870A (MU88700xA) via Ethernet and GPIB (option)
- Setting of MT8870A (MU88700xA)
- Signal generator interface for RX tests



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

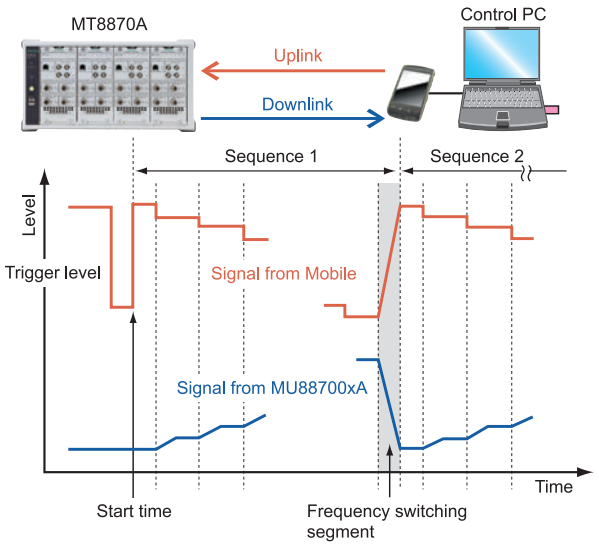
Cellular Measurement Solution

Cellular Standards Sequence Measurement MX887010A

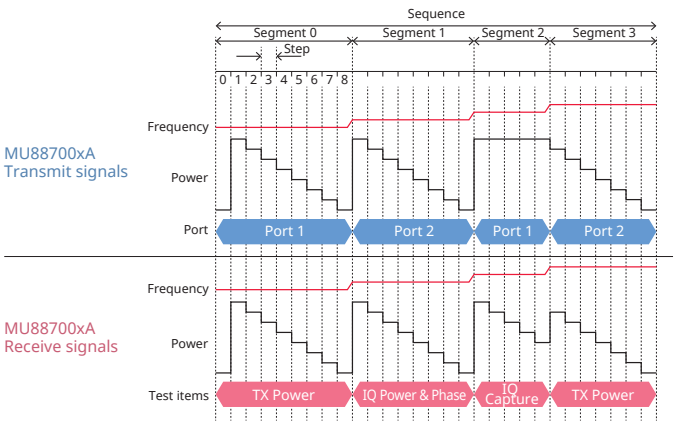
Installing the Cellular Standards Sequence Measurement software MX887010A package in the MT8870A can be operated with preconfigured frequency and level in a sequence list to the signal generator and signal analyzer.

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



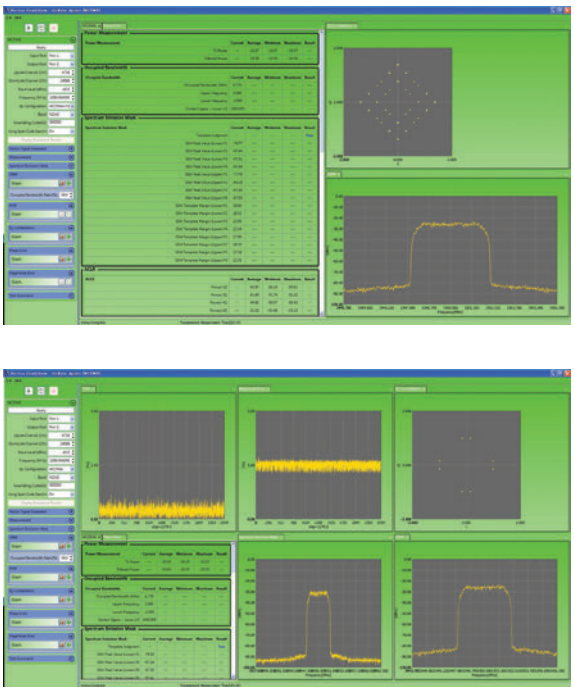
Sequence Measurement

W-CDMA/HSPA Uplink TX Measurement MX887011A
W-CDMA/HSPA Downlink Waveforms 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

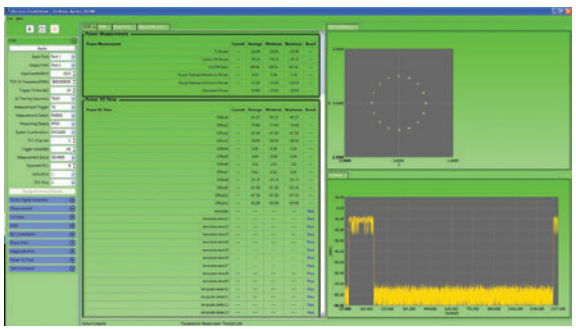
Cellular Measurement Solution (continued)

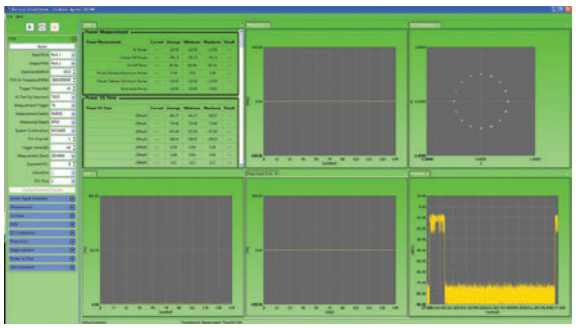
GSM/EDGE Uplink TX Measurement **MX887012A**
GSM/EDGE Downlink Waveforms **MV887012A**

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 **MX887013A**
LTE-Advanced FDD Uplink CA TX Measurement **MX887013A-001**
LTE FDD Downlink Waveforms **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 **MX887014A**
LTE-Advanced TDD Uplink CA TX Measurement **MX887014A-001**
LTE TDD Downlink Waveforms **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 **MX887015A**
CDMA2000 Forward Link Waveforms **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.

Cellular Measurement Solution (continued)

1xEV-DO Reverse Link TX Measurement **MX887016A**
1xEV-DO Forward Link Waveforms **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

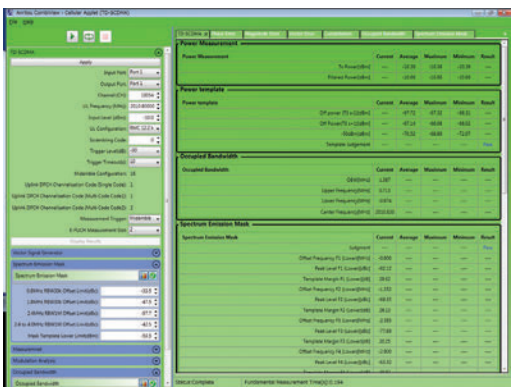
Additionally, the package of 1xEV-DO Forward Link Waveforms MV887016A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.

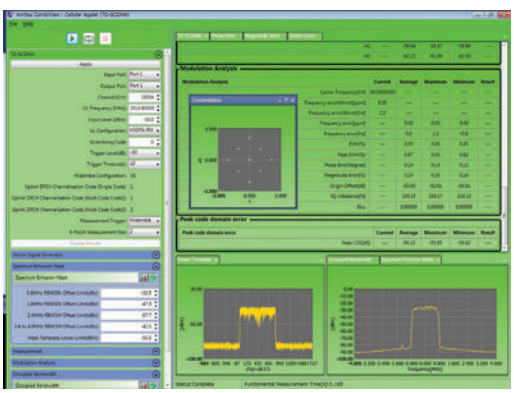
TD-SCDMA Uplink TX Measurement **MX887017A**
TD-SCDMA Downlink Waveforms **MV887017A**

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.





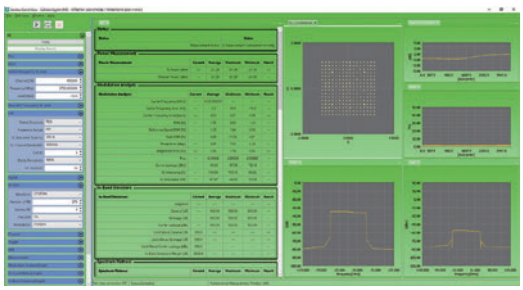
TD-SCDMA Uplink TX Measurement using CombiView

NR FDD sub-6GHz Uplink TX Measurement **MX887018A**
NR FDD sub-6GHz Downlink Waveforms **MV887018A**

Installing the NR FDD sub-6GHz Uplink Measurement MX887018A in the MT8870A provides support for the following 3GPP 5G NR FDD 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 FDD sub-6GHz Downlink Waveforms MV887018A contains downlink signals required for non-signaling measurements, sending the downlink signal for production is as easy as selecting the waveform file.



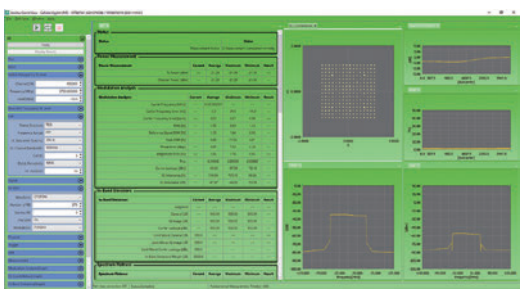
NR FDD sub-6GHz Uplink TX Measurement using CombiView

NR TDD sub-6GHz Uplink TX Measurement **MX887019A**
NR TDD sub-6GHz Downlink Waveforms **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

Cellular Measurement Solution (continued)

W-CDMA/HSPA Downlink TX Measurement **MX887021A**
W-CDMA/HSPA Uplink Waveforms **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

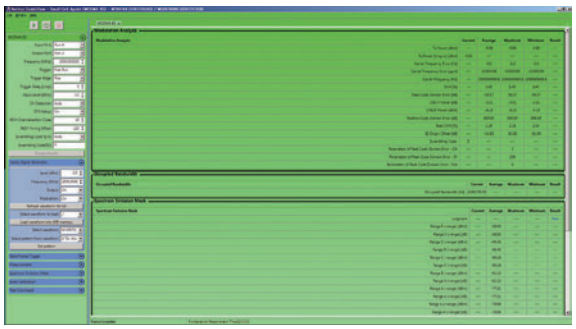
Additionally, the package of W-CDMA/HSPA Uplink Waveforms MV887021A contains uplink signals required for non-signaling measurements, sending the uplink signal for production is as easy as selecting the waveform file.

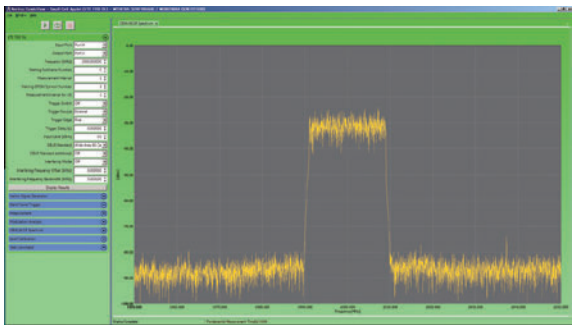
LTE FDD Downlink TX Measurement **MX887023A**
LTE FDD Uplink Waveforms **MV887023A**

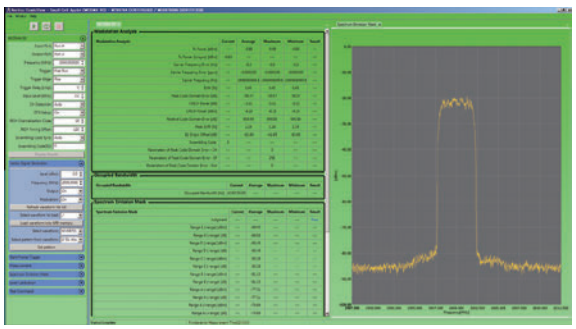
Installing the LTE FDD Downlink TX Measurement software MX887023A in the MT8870A provides support for the following 3GPP LTE FDD related TX characteristics measurements.

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

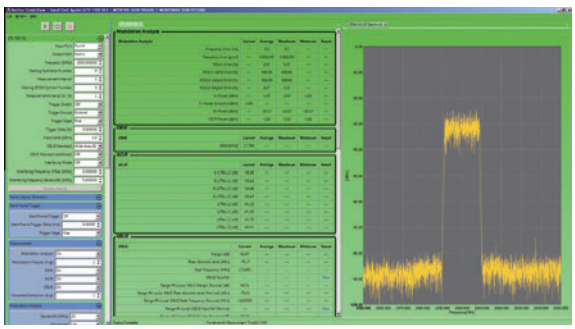
Additionally, the package of LTE FDD Uplink Waveforms MV887023A contains uplink signals required for non-signaling measurements, sending the uplink signal for production is as easy as selecting the waveform file.







W-CDMA/HSPA Downlink TX Measurements using CombiView



LTE FDD Downlink TX Measurements using CombiView

Cellular-IoT Measurement Solution (Cellular-LPWA Solution)

Category M FDD Uplink TX Measurement **MX887065A**
Category M FDD Downlink Waveforms **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

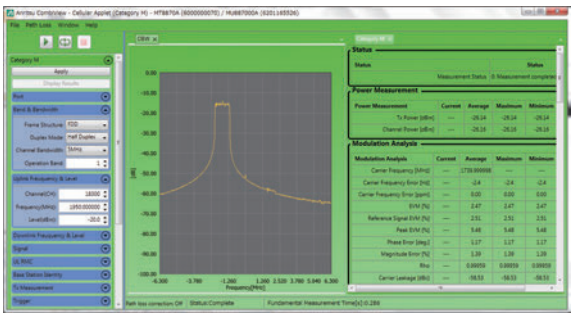
Additionally, the package of Category M FDD Downlink Waveforms MV887065A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.

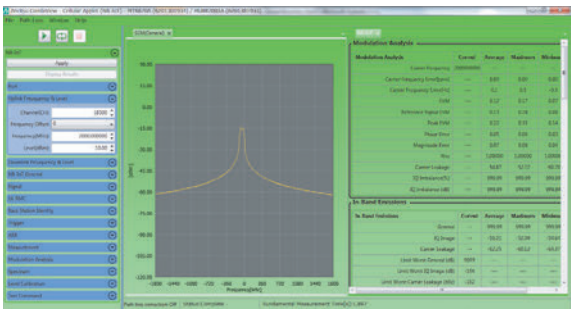
NB-IoT Uplink TX Measurement **MX887067A**
NB-IoT Downlink Waveforms **MV887067A**

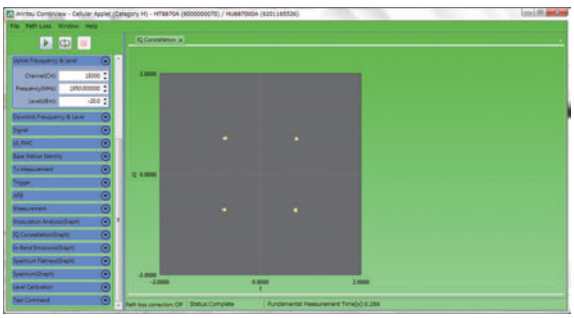
Installing the NB-IoT Uplink TX Measurement software MX887067A in the MT8870A provides support for the following 3GPP LTE NB-IoT related TX characteristics measurements.

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

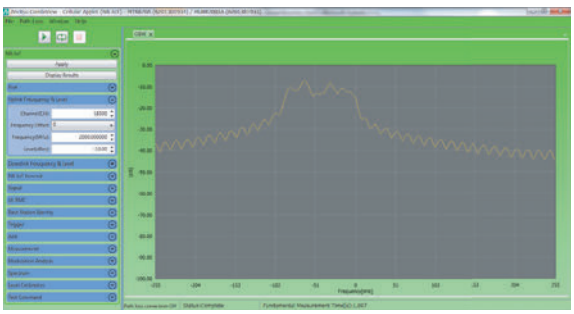
Additionally, the package of NB-IoT Downlink Waveforms MV887067A contains downlink signals required for non-signaling measurements; sending the downlink signal for production is as easy as selecting the waveform file.







Category M FDD Uplink TX Measurement using CombiView



NB-IoT Uplink TX Measurement using CombiView

WLAN Measurement Solution

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

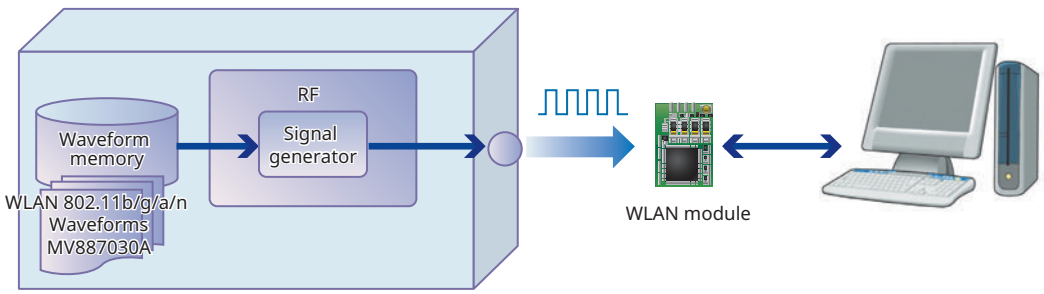
802.11a	802.11g	802.11n	Test Items
18.3.9.2	19.4.8.2	20.3.20.3	Transmit Power Levels
18.3.9.3	19.5.5	20.3.20.1	Transmit Spectrum Mask
18.3.9.5	19.4.8.3	20.3.20.4	Transmit center frequency tolerance
18.3.9.6	19.4.8.4	20.3.20.6	Symbol Clock frequency tolerance
18.3.9.7.2	19.4.8 (18.3.9.7.2)	20.3.20.7.2	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.



TRX Test Module

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 **MX887031A**
WLAN 802.11ac Waveforms **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

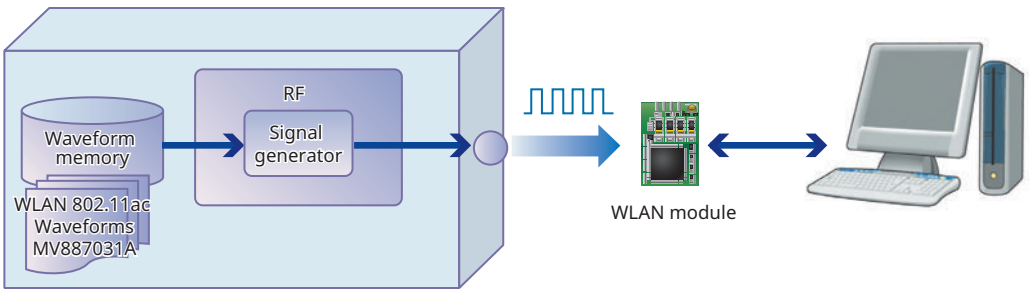
802.11ac	Test Items
22.3.18.1	Transmit spectrum mask
22.3.18.2	Spectral flatness
22.3.18.3	Transmit center frequency tolerance
22.3.18.3	Symbol Clock frequency tolerance
22.3.18.4	Modulation accuracy
22.3.18.4.2	Transmitter center frequency leakage
22.3.18.4.3	Transmitter constellation error
22.3.18.4.4	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.



TRX Test Module

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

V2X Measurement Solution

WLAN 802.11p TX Measurement **MX887032A**
WLAN 802.11p Waveforms **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

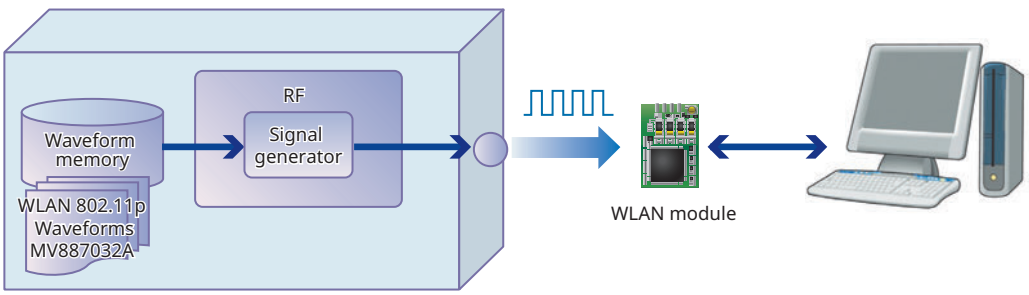
802.11p	Test Items
18.3.9.2	Transmit power levels
18.3.9.3	Transmit spectrum mask
18.3.9.5	Transmit center frequency tolerance
18.3.9.6	Symbol clock frequency tolerance
18.3.9.7.2	Transmitter center frequency leakage
18.3.9.7.3	Transmitter spectral flatness
18.3.9.7.4	Transmitter constellation error

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

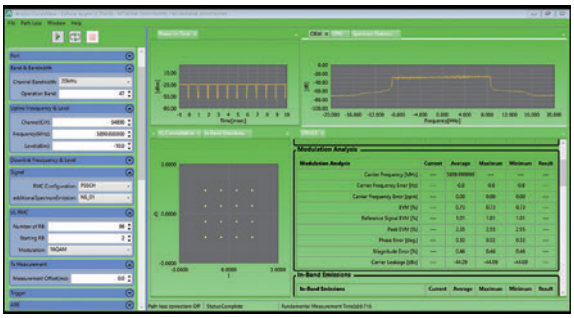
V2X Measurement Solution

LTE-V2X Tx Measurement MX887068A
LTE-V2X Waveforms MV887068A

LTE-V2X Tx characteristics specified by 3GPP can be measured by installing the LTE-V2X Tx Measurement MX887068A software.

Tx Power
Frequency Deviation
Occupied Frequency Bandwidth
Spectrum Emission Mask
Adjacent Channel Leakage Power
Modulation Analysis

In addition, the bundled LTE-V2X Waveforms MV887068A package includes general RF test signal waveform files required for non-signaling manufacturing for easy output of RF test signals at manufacturing simply by selecting the waveform file.



LTE-V2X Tx Measurement using CombiView

WLAN MIMO Measurement Solution

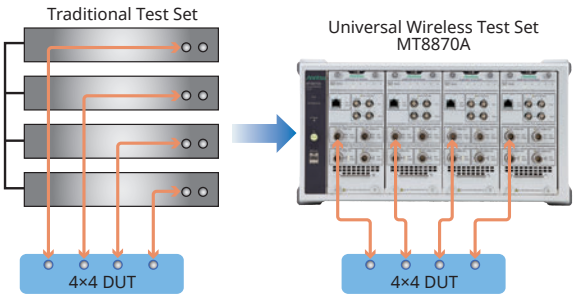
WLAN 802.11n/11ac MIMO Measurement Function

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



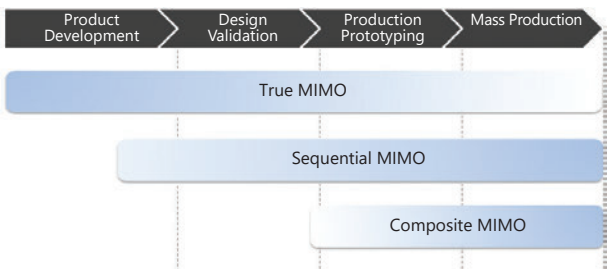
The MX887030A and MV887030A are required for WLAN 802.11n MIMO measurements.

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

*2: Supports up to 4×4 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

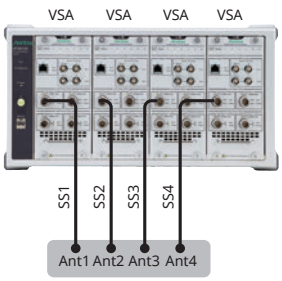
Features

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

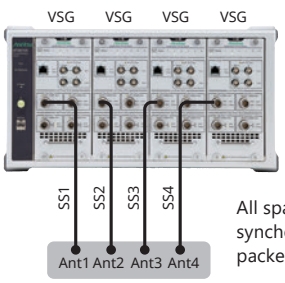
Test results:

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 synchoronized to the start of the packet.

WLAN MIMO Measurement Solution (continued)

Sequential MIMO

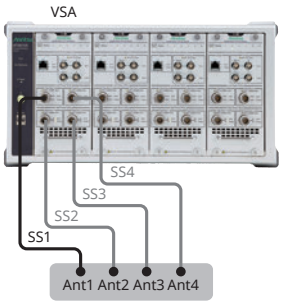
Features

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.

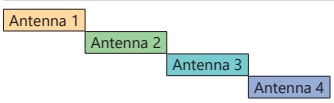
Transmitter Test

- 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.



Test sequence:

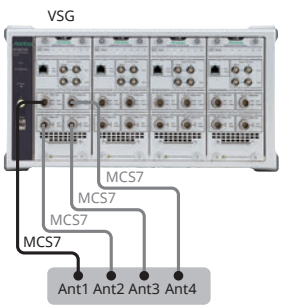


Test results:

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

- 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

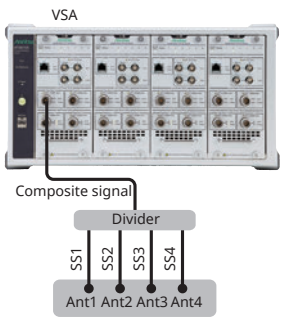
Features

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



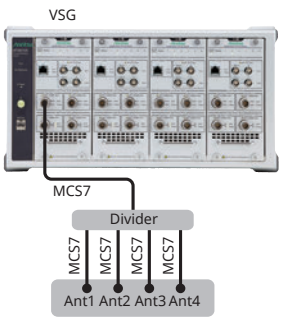
Test sequence:

Test results:

EVM_Avg, Power_Avg, Spectral mask_Avg ...

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

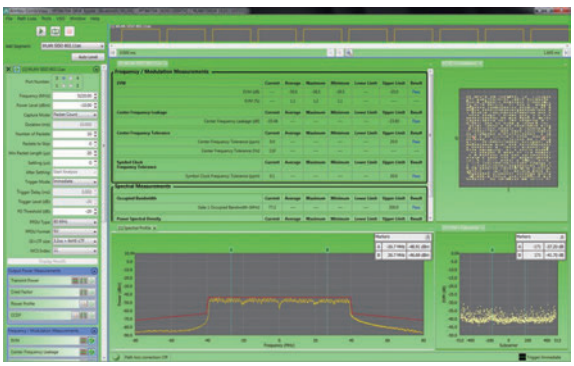
WLAN 802.11ax TX Measurement **MX887033A**
WLAN 802.11ax Waveforms **MV887033A**

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

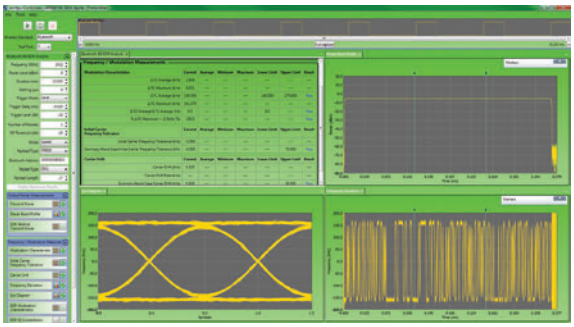
Bluetooth TX Measurement	**MX887040A**
DLE TX Measurement	**MX887040A-001**
2LE TX Measurement	**MX887040A-002**
BLE TX Measurement	**MX887040A-003**
Bluetooth Waveforms	**MV887040A**
DLE Waveforms	**MV887040A-001**
2LE Waveforms	**MV887040A-002**
BLR Waveforms	**MV887040A-003**

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

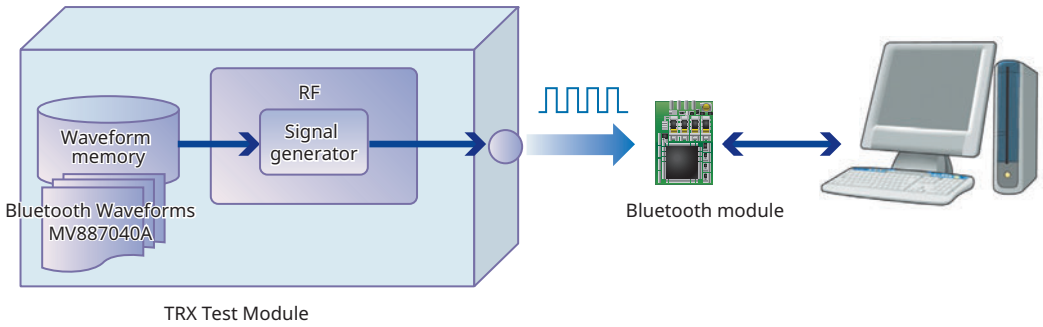
Graphical Displays (EDR)

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

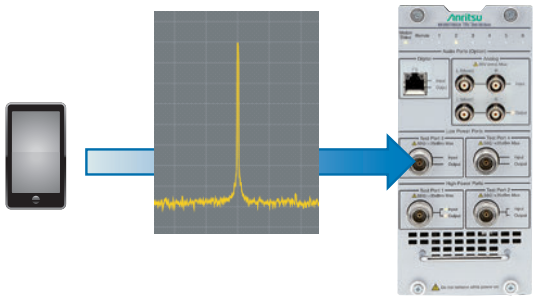
Simple Test Solution

Short Range Wireless Average Power and Frequency Measurement MX887050A

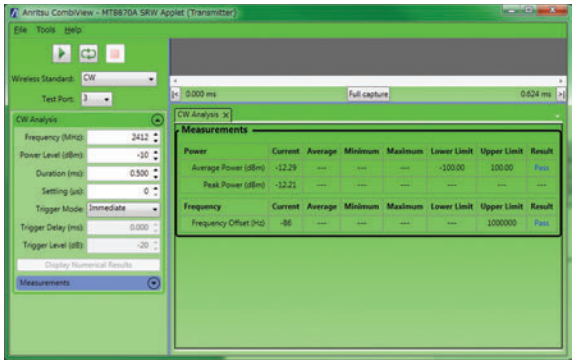
Installing the Short Range Wireless Average Power and Frequency Measurement software MX887050A in the MT8870A provides support for simple tests for WLAN and Bluetooth connectivity wireless. The MX887050A supports CW power and frequency measurements on unmodulated signals and on signals modulated using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

IEEE 802.15.4 Measurement Solution

IEEE 802.15.4 TX Measurement **MX887060A**
IEEE 802.15.4 Waveforms **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

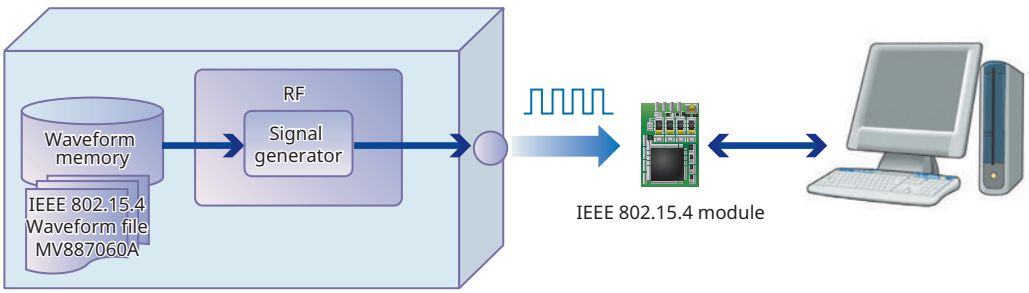
802.15.4	Test Items
10.3.2	Transmit power spectral density (PSD) mask
10.3.3	Symbol rate
10.3.7	RX-to-TX turnaround time
10.3.8	Error vector magnitude (EVM)
10.3.9	Transmit center frequency tolerance
10.3.10	Transmit power

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.



TRX Test Module

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 **MX887061A**
Z-Wave Waveforms **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

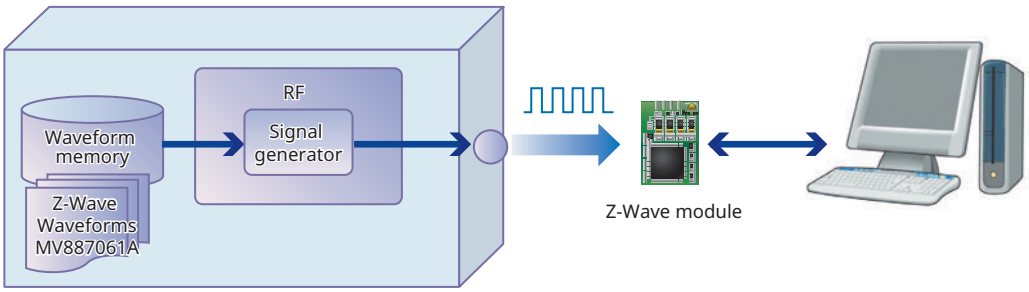
ITU-T G.9959	Test Items
7.1.2.2	Data rates
7.1.2.5.1	Transmit frequency error
7.1.2.5.2	Transmit power adjustments (conducted)

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.



TRX Test Module

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	14b ytes (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

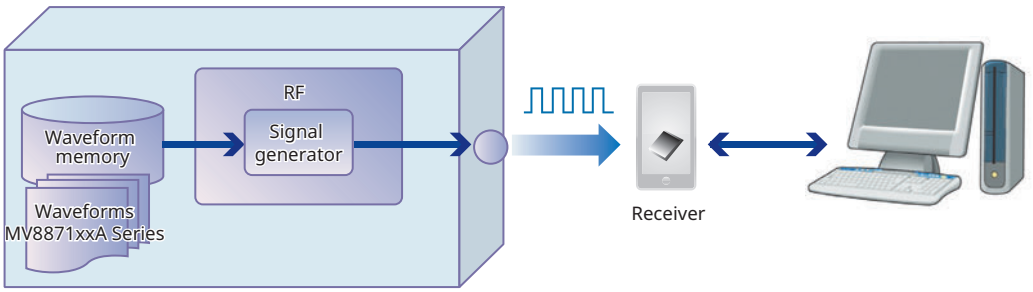
The MT8870A/MU88700xA supports RX tests of receivers using the various common communications technologies in widespread use today.

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.



TRX Test Module

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	

GPS L5 Waveforms MV887100A-002

Waveform File Name	MV887100A_GPS_0040
Application	Sensitivity test
Transmitted Data Modulation Method	BPSK
Satellite ID Number	1
Reference Standard	GLOBAL POSITIONING SYSTEM STANDARD POSITIONING SERVICE SIGNAL SPECIFICATION

*: MV887100A GPS waveforms license is required.

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)

QZSS Waveforms MV887104A

Waveform File Name	MV887104A_QZSS_0001
Application	Parity detection/Sensitivity test/BER measurement
Transmitted Data Modulation Method	BPSK
Satellite ID Number	193
Reference Standard	Quasi-Zenith Satellite System Interface Specification

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.

Main Specifications of MV8871xxA Series Waveforms

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

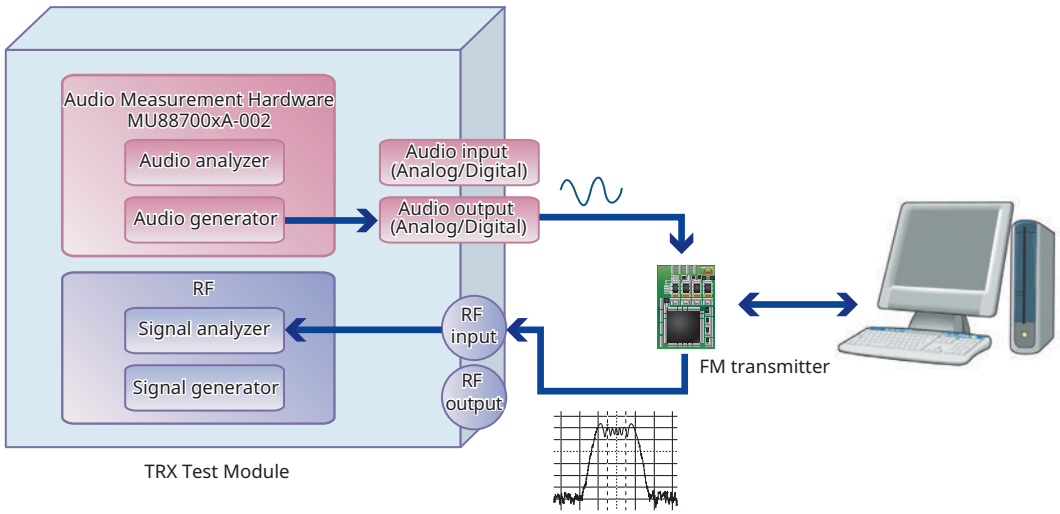
FM/Audio TRX Measurement **MX887070A**
FM RDS Waveforms **MV887070A**
(RDS: Radio Data System)

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

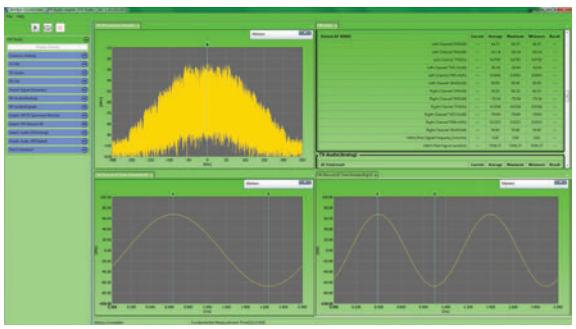
FM Transmitter Test

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.

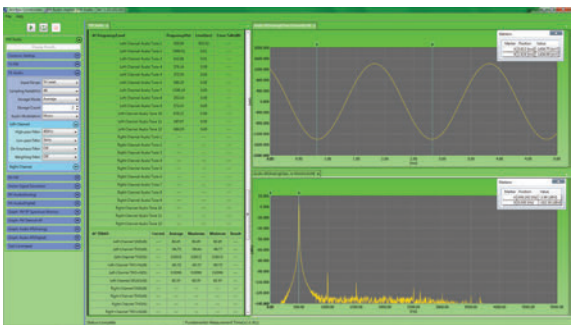
The FM/Audio TRX Measurement software MX887070A is used with the built-in signal analyzer of the MU88700xA to execute various audio tests, such as measurement of RF frequency, level and frequency deviation of audio FM signals output from FM transmitters, as well as AF signal frequency, level (up to 12 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.



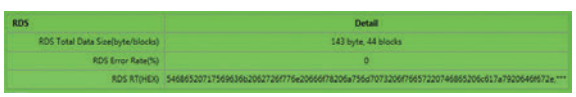
TRX Test Module



FM Transmitter Test using CombiView



FM Receiver Test using CombiView
(device audio output measurement)



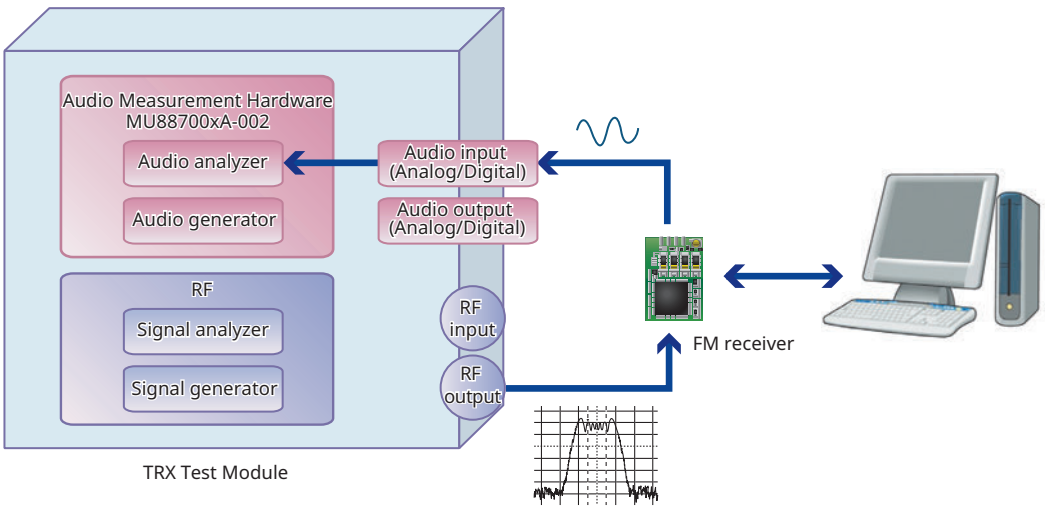
RDS Measurement Results using CombiView

FM/RDS Measurement Solution (continued)

FM Receiver Test

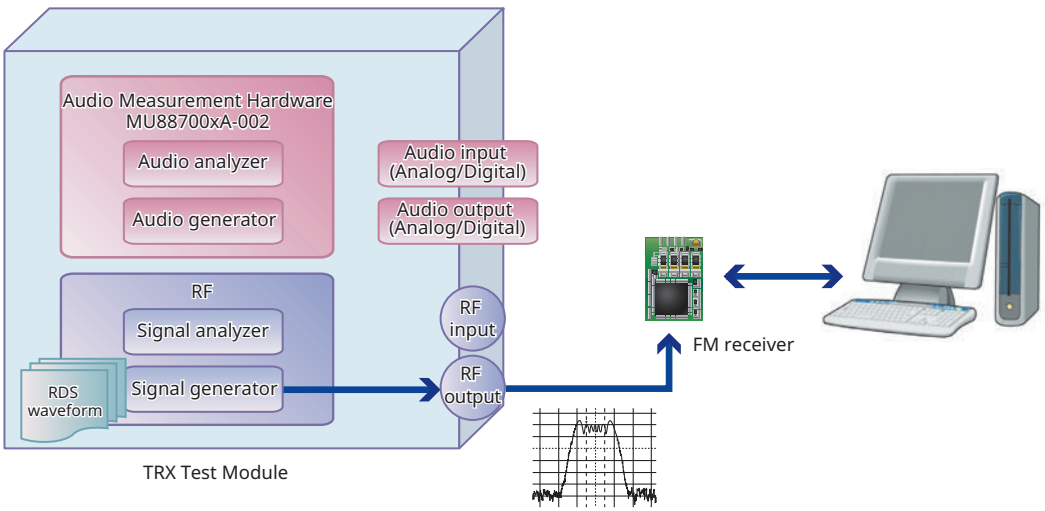
To test FM receivers using the FM/Audio TRX Measurement software MX887070A, the specified test audio signal is frequency modulated and a signal is output from the vector signal generator.

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			

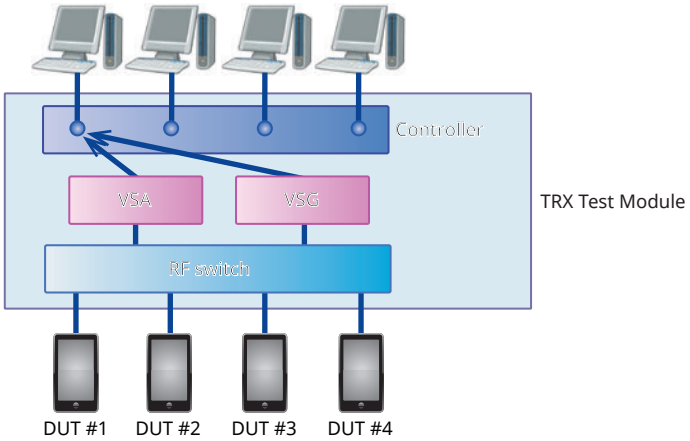
Consult Anritsu for details about the FM RDS waveform file.

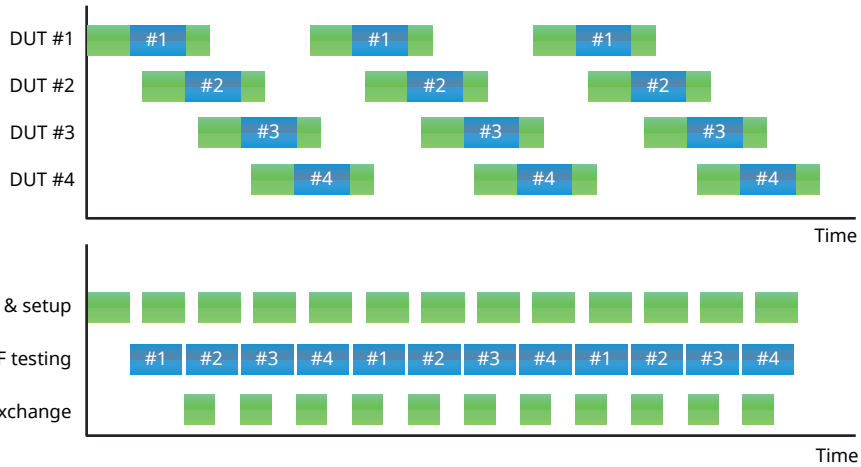
High Speed Measurement Solution

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, FM/Audio TRX Measurement MX887070A.





Electrical Characteristics

Number of Slots	4
Internal Reference Oscillator	Starting characteristics 25°C, Referenced to frequency at 24-hour after power-on ±5 × 10^{-7} (2 minutes after power-on) ±5 × 10^{-8} (5 minutes after power-on) Aging rate: ±1 × 10^{-7}/year Temperature characteristics: ±2 × 10^{-8} (+5°C to +45°C) Initial calibration accuracy +20°C to +30°C, 1 hour after power-on ±2.2 × 10^{-8}
Connector	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) Reference signal output Connector: BNC-J (rear panel), 50Ω (nom.) Frequency: 10 MHz Output level: ≥0 dBm (AC coupling) Trigger Input/Output switching: Trigger input/output selectable Connector: BNC-J (rear panel, 4 ports) Input/Output level: TTL level 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)

General

Dimensions and Mass		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)
Power Supply		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)
Temperature Range		+5°C to +45°C (operating), –20°C 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

Input/Output Connector

RF Test Ports	Number of ports 4 Connector N (female) Impedance 50Ω (nom.) VSWR Test port 1 and 2 <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) Test port 3 and 4 <1.8 (10 MHz ≤ f < 30 MHz) <1.5 (30 MHz ≤ f ≤ 3.8 GHz) <1.6 (3.8 GHz < f ≤ 6.0 GHz) Maximum input level +35 dBm (Test port 1 and 2) +25 dBm (Test port 3 and 4)
AF Test Ports	Ports Analog port, Digital port Connector Analog port: BNC (female) Digital port: RJ-45

Signal Generator

Frequency	Setting range 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887000A-001) Setiing Resolution 1 Hz Accuracy Depends on MT8870A reference oscillator accuracy
Amplitude	Setting range Test port 1 and 2 –130 to –10 dBm (≤3.8 GHz) –130 to –18 dBm (>3.8 GHz) Test port 3 and 4 –120 to 0 dBm (≤3.8 GHz) –120 to –8 dBm (>3.8 GHz) Setiing Resolution 0.1 dB Accuracy CW, After CAL, 10°C to 40°C Test port 1 and 2 Output level: ≥–120 dBm (≤3.8 GHz), ≥–100 dBm (>3.8 GHz) ±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) Test port 3 and 4 Output level: ≥ –110 dBm ±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	Harmonic distortion <–25 dBc
Vector Modulation	Bandwidth 160 MHz (max.)

Signal Analyzer

Frequency	Setting range 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887000A-001) Resolution 0.1 Hz

Amplitude	Setting range CW Test port 1 and 2 –65 to +15 dBm (10 MHz ≤ f < 350 MHz) –65 to +35 dBm (350 MHz ≤ f ≤ 6.0 GHz) Test port 3 and 4 –65 to +15 dBm (10 MHz ≤ f < 350 MHz) –65 to +25 dBm (350 MHz ≤ f ≤ 6.0 GHz) Resolution 0.01 dB Accuracy CW, After CAL, Measurement bandwidth: 300 kHz, RBW: 100 kHz Test port 1 and 2 10 MHz ≤ f < 400 MHz, Signal Generator: Off, +10°C 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°C 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°C 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) Test port 3 and 4 10 MHz ≤ f < 400 MHz, +10°C 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°C to +40°C ±0.7 dB (–30 dBm ≤ p ≤ +25 dBm) ±0.9 dB (–55 dBm ≤ p < –30 dBm) ±1.1 dB (–65 dBm ≤ p < –55 dBm) 3.8 GHz < f ≤ 6.0 GHz, +20°C to +30°C ±0.7 dB (–30 dBm ≤ p ≤ +25 dBm) ±0.9 dB (–55 dBm ≤ p < –30 dBm) ±1.1 dB (–65 dBm ≤ p < –55 dBm) 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)
Modulation Analysis	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)

General

Interface		Trigger Trigger signals input/output at trigger connectors (rear panel) 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
Dimensions and Mass		90 (W) × 193.6 (H) × 325 (D) mm (excluding projections) ≤5 kg (including options)
CE	EMC	2014/30/EU, EN61326-1, EN61000-3-2
	LVD	2014/35/EU, EN61010-1
	RoHS	2011/65/EU, EN50581

Audio Measurement Hardware MU887000A-002

Analog Audio	Audio generator Frequency range: 20 Hz to 20 kHz Output level range: 0 (off), 1 mV to 5 Vpeak (100 kΩ termination) Impedance: 1Ω (AC coupling) (nom.) Audio analyzer Frequency range: 20 Hz to 20 kHz Input level range: 1 mVpeak to 5 Vpeak (30 V rms max.) Impedance: 100 kΩ (AC coupling)
Digital Audio	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) Bit resolution: 16 bits/24 bits Audio analyzer Sampling rate: 16, 32, 44.1, 48 kHz Bit resolution: 16 bits/24 bits

TRX Test Module MU887001A Specifications

Input/Output Connector

RF Test Ports	Number of ports 4 Connector N (female) Impedance 50Ω (nom.) VSWR <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) Maximum input level +35 dBm
AF Test Ports	Ports Analog port, Digital port Connector Analog port: BNC (female) Digital port: RJ-45

Signal Generator

Frequency	Setting range 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887001A-001) Setiing Resolution 1 Hz Accuracy Depends on MT8870A reference oscillator accuracy
Amplitude	Setting range –130 to –10 dBm (≤3.8 GHz) –130 to –18 dBm (>3.8 GHz) Setiing Resolution 0.1 dB Accuracy CW, After CAL, 10°C to 40°C Output level: ≥–120 dBm (≤3.8 GHz), ≥–100 dBm (>3.8 GHz) ±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)
Spurious Response	Harmonic distortion <–25 dBc
Vector Modulation	Bandwidth 160 MHz (max.)

TRX Test Module MU887001A Specifications

Signal Analyzer

Frequency	Setting range 10 MHz to 3.8 GHz 10 MHz to 6.0 GHz (with MU887001A-001) Resolution 0.1 Hz
Amplitude	Setting range CW –65 to +15 dBm (10 MHz ≤ f < 350 MHz) –65 to +35 dBm (350 MHz ≤ f ≤ 6.0 GHz) Resolution 0.01 dB Accuracy CW, After CAL, Measurement bandwidth: 300 kHz, RBW: 100 kHz 10 MHz ≤ f < 400 MHz, Signal Generator: Off, +10°C 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°C 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°C 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) 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)
Modulation Analysis	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)

General

Interface		Trigger Trigger signals input/output at trigger connectors (rear panel) 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
Dimensions and Mass		90 (W) × 193.6 (H) × 325 (D) mm (excluding projections) ≤5 kg (including options)
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	Audio generator Frequency range: 20 Hz to 20 kHz Output level range: 0 (off), 1 mV to 5 Vpeak (100 kΩ termination) Impedance: 1Ω (AC coupling) (nom.) Audio analyzer Frequency range: 20 Hz to 20 kHz Input level range: 1 mVpeak to 5 Vpeak (30 V rms max.) Impedance: 100 kΩ (AC coupling)
Digital Audio	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) Bit resolution: 16 bits/24 bits Audio analyzer Sampling rate: 16, 32, 44.1, 48 kHz Bit resolution: 16 bits/24 bits

Cellular Standards Sequence Measurement MX887010A

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

W-CDMA/HSPA Uplink TX Measurement MX887011A

Common Item	Measuring object W-CDMA uplink Frequency range 400 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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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) Linearity 0 to 40 dB ±0.2 dB (≥–55 dBm) ±0.4 dB (≥–65 dBm) Relative level accuracy At the power level difference within 2 dB, ≥–55 dBm, 0 to 40 dB ±0.1 dB (typ.)
Frequency/ Modulation Analysis	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 ± (Setting frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy Residual EVM: at input of single DPCCH and single DPDCH ≤2.5%
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) OBW ratio 80.0 to 99.9%
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 ≥50 dB (±5 MHz), ≥55 dB (±10 MHz)

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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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	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°C to 40°C MU887000A test port 1 and 2, MU887001A all test ports ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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°C 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) Linearity 0 to 40 dB ±0.2 dB (≥–50 dBm) ±0.4 dB (≥–60 dBm) Relative level accuracy At the power level difference within 2 dB ±0.1 dB (typ.)
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 accuracy Residual EVM (average of 20 measurements) ≤2.5% In-band emission Input level: ≥–10 dBm, Allocated RB: ≤18 ≤–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) OBW ratio 80.0 to 99.9%
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)

LTE-Advanced FDD Uplink CA TX Measurement MX887013A-001
LTE-Advanced TDD Uplink CA TX Measurement MX887014A-001

Common Item	Measuring object PUSCH 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)
RF Power	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) 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°C to 40°C ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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°C 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°C to 40°C ±0.5 dB (typ.) (–20 to +35 dBm, 20°C 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°C to 40°C 3.8 GHz to 4.2 GHz, After CAL, 20°C 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°C to 40°C 3.8 GHz to 4.2 GHz , After CAL, 20°C 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°C 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°C to 40°C 3.8 GHz to 4.2 GHz, After CAL, 20°C to 30°C ±1.0 dB (–50 to +25 dBm) ±1.3 dB (–60 to –50 dBm) Linearity 0 to 30 dB, 20 to 30°C ±0.2 dB (≥–50 dBm) ±0.4 dB (≥–60 dBm)
Frequency/Modulation Measurement	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) Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 15 Hz) Modulation accuracy Residual EVM (average of 20 measurements) ≤2.5% In-band emission Input level: ≥–10 dBm, Allocated RB: ≤18 ≤–40 dBc
Occupied Bandwidth	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) OBW ratio 80.0 to 99.9%
Adjacent Channel Leakage Power Ratio	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) 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 ports) –10 to +25 dBm (MU887000A test port 3 and 4)

CDMA2000 Reverse Link TX Measurement MX887015A

Common Item	Measuring object Reverse RC-1/2/3/4 Frequency range 400 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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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) Linearity 0 to 40 dB ±0.2 dB (≥–55 dBm) ±0.4 dB (≥–65 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 ± (Setting frequency × Reference oscillator accuracy + 10 Hz) Waveform quality >0.999
Code Domain Power Measurement	Reverse RC3 or RC4 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) Measurement accuracy ±0.2 dB (Code power: ≥–15 dBc), ±0.4 dB (Code power: ≥–23 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) OBW ratio 80.0 to 99.9%

1xEV-DO Reverse Link TX Measurement MX887016A

Common Item	Measuring object Reverse link Rev. 0/Rev. A Frequency range 400 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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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) Linearity 0 to 40 dB ±0.2 dB (≥–55 dBm) ±0.4 dB (≥–65 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 ± (Setting frequency × Reference oscillator accuracy + 10 Hz) Waveform quality >0.999
Code Domain Power 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) Measurement accuracy ±0.2 dB (Code power: ≥–15 dBc), ±0.4 dB (Code power: ≥–23 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) OBW ratio 80.0 to 99.9%

TD-SCDMA Uplink TX Measurement MX887017A

Common Item	Measuring object TD-SCDMA uplink Frequency range 400 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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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) Linearity 0 to 40 dB ±0.2 dB (≥–55 dBm) ±0.4 dB (≥–65 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 ± (Setting frequency × Reference oscillator accuracy + 10 Hz) Modulation accuracy Residual EVM (at input of single code) ≤2.5%
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) OBW ratio 99.0%
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 ±1.6 MHz, ±3.2 MHz Measurement range ≥50 dB (±1.6 MHz), ≥55 dB (±3.2 MHz)

NR FDD sub-6GHz Uplink TX Measurement MX887018A
NR TDD sub-6GHz Uplink TX Measurement MX887019A

<table>
<tr><td>Common Item</td><td>Measuring object
PUSCH
Channel Bandwidth (MHz)
5, 10, 15, 20, 25, 40, 50, 60, 80, 100
Modulation
π/2BPSK, QPSK, 16QAM, 64QAM</td></tr>
<tr><td>RF Power</td><td>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°C to 40°C
±0.5 dB (typ.) (–20 to +35 dBm, 20°C 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°C 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°C 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°C 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°C 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°C to 30°C
±1.0 dB (–50 to +25 dBm)
±1.3 dB (–60 to –50 dBm)</td></tr>
<tr><td>Frequency/Modulation Measurement</td><td>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>
<tr><th>Channel Bandwidth (MHz)</th><th>Minimum output power (dBm)</th></tr>
<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>
</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°C to 30°C)</td></tr>
</table>

Occupied Bandwidth	Frequency range Channel Bandwidth ≤ 60 MHz 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 2.0 GHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) 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	Frequency range Channel Bandwidth ≤ 60 MHz 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 2.0 GHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) 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 ≥42 dB (NR ACLR), ≥45 dB (UTRA ACLR1), ≥48 dB (UTRA ACLR2)
Spectrum Emission Mask	Frequency range Channel Bandwidth ≤ 60 MHz 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 2.0 GHz to 2.7 GHz, 3.3 GHz to 3.8 GHz 3.8 GHz to 5.0 GHz (MU887000A-001 option) 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)

W-CDMA/HSPA Downlink TX Measurement MX887021A

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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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.)

W-CDMA/HSPA Downlink Waveforms MV887011A

EVM	≤3% rms (400 MHz ≤ f ≤ 2.7 GHz)

GSM/EDGE Downlink Waveforms MV887012A

Phase Error	≤1° rms (400 MHz ≤ f ≤ 2.7 GHz, GMSK)
EVM	≤1.8% rms (400 MHz ≤ f ≤ 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 ≤ 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)
EVM	≤2% rms (400 MHz ≤ f ≤ 2.7 GHz), ≤3% rms (3.4 GHz ≤ f ≤ 3.8 GHz), ≤4% rms (3.8 GHz < f ≤ 6.0 GHz)

LTE TDD Downlink Waveforms MV887014A

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)
EVM	≤2% rms (400 MHz ≤ f ≤ 2.7 GHz), ≤3% rms (3.4 GHz ≤ f ≤ 3.8 GHz), ≤4% rms (3.8 GHz < f ≤ 6.0 GHz)

CDMA2000 Forward Link Waveforms MV887015A

Waveform Quality	>0.99 (400 MHz ≤ f ≤ 2.7 GHz)

1xEV-DO Forward Link Waveforms MV887016A

Waveform Quality	>0.99 (400 MHz ≤ f ≤ 2.7 GHz, Pilot channel)

TD-SCDMA Downlink Waveforms MV887017A

EVM	≤3% rms (400 MHz ≤ f ≤ 2.7 GHz)

NR FDD sub-6GHz Downlink Waveforms MV887018A
NR TDD sub-6GHz Downlink Waveforms MV887019A

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

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

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

OFDM EVM Measurement Setting	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
DSSS Additional Measurement	Transmit center frequency tolerance Definition: Average frequency of the DSSS carrier signal Accuracy: ± (Setting frequency × 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: ±50 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.
OFDM Additional Measurement	Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz, ppm Accuracy: ± (Setting frequency × 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: ±40 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
Additional Measurement (DSSS and OFDM)	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%

WLAN 802.11ac TX Measurement MX887031A

Common Item	Measuring object WLAN signal packet Frequency range 5 GHz band: 4920 MHz to 5825 MHz (required MU88700xA-001)
RF Power	Input level range –65 to +25 dBm (MU887000A test port 3 and 4) –55 to +35 dBm (MU887001A all test port) Accuracy After CAL, 20°C 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) Bandwidth 160, 80, 40, 20 MHz Capture time 1.34 s Pre-trigger 1.33 s Resolution (time domain profile) 5 ns/sample 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. 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.
Spectral Profile Measurement	Spectral profile measurement span ±80 MHz Capture time 50 µs Measurement range (RBW: 100 kHz) –27 to +25 dBm (MU887000A) –17 to +35 dBm (MU887001A) 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) Resolution 0.1 dB Bandwidth 100 kHz
EVM (Modulation Accuracy)	EVM measurement range –20 to +25 dBm (MU887000A) –10 to +35 dBm (MU887001A) Residual EVM (Bandwidth: ≤80 MHz) Signal level: >–10 dBm (MU887000A), 0 dBm (MU887001A), Averaged over 20 packets, Channel estimation: FULLPACKET <–38 dB EVM data format dB, % Resolution 0.1% or 0.1 dB, All limit checking in dB to 0.1 dB resolution Speed >20 readings/second
OFDM EVM Measurement Setting	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.

OFDM Additional Measurement	Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz, ppm Accuracy: ± (Setting frequency × 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 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: ±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

WLAN 802.11p TX Measurement MX887032A (Automotive Connectivity V2X)

Common Item	Measuring object WLAN single packet Frequency range 715 MHz to 765 MHz 902 MHz to 928 MHz 5725 MHz to 5925 MHz (required MU88700xA-001 option)
RF Power	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 ±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) Bandwidth 5, 10, 20 MHz
EVM (Modulation Accuracy)	Measurement range –20 to +25 dBm (MU887000A) –10 to +35 dBm (MU887001A) Residual EVM (OFDM) Signal level: >–20 dBm (MU887000A), >–10 dBm (MU887001A), Averaged over 20 packets, Channel estimation: FULLPACKET <–40 dB EVM data format dB or % Measurement resolution 0.1% or 0.1 dB, All limit checking in dB to 0.1 dB resolution
OFDM EVM Measurement Setting	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”, default: Phase tracking only 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
OFDM Additional Measurement	Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz and ppm Measurement accuracy: ± (Setting frequency × Reference oscillator accuracy + 1 kHz) (packet: >1 ms) Resolution: Hz to no decimal places, ppm to 1 decimal place Transmit 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 Data output format: dB

WLAN 802.11ax TX Measurement MX887033A

Common Item	Measuring object WLAN signal packet 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 2.4 GHz Band: 40 MHz BW: 2412 MHz to 2472 MHz 20 MHz BW: 2412 MHz to 2484 MHz
RF Power	Input level range –65 to +25 dBm (MU887000A test port 3 and 4) –55 to +35 dBm (MU887001A all test port) Accuracy After CAL, 20°C 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) Bandwidth 80, 40, 20 MHz Capture time 1.34 s Pre-trigger 1.33 s Resolution (time domain profile) 5 ns/sample 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. 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.
Spectral Profile Measurement	Spectral profile measurement span ±80 MHz Capture time 50 µs Measurement range (RBW: 100 kHz) –27 to +25 dBm (MU887000A) –17 to +35 dBm (MU887001A) 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) Resolution 0.1 dB Bandwidth 100 kHz
EVM (Modulation Accuracy)	EVM measurement range –20 to +25 dBm (MU887000A) –10 to +35 dBm (MU887001A) Residual EVM (Bandwidth: ≤80 MHz) 20°C 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 EVM data format dB, % Resolution 0.1% or 0.1 dB, All limit checking in dB to 0.1 dB resolution

OFDM EVM Measurement Setting	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.
OFDM Additional Measurement	Transmit center frequency tolerance Definition: Average frequency of the OFDM carrier signal Data output format: Hz, ppm Accuracy: ± (Setting frequency × 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 us + 0.8 us)) = 73.529 kHz approx. If GI is 1.6 us, Symbol Clock is (1 / (12.8 us + 1.6 us)) = 69.444 kHz approx. If GI is 3.2 us, Symbol Clock is (1 / (12.8 us + 3.2 us)) = 62.500 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

Bluetooth TX Measurement MX887040A

Common Item	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.
RF Power	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°C 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)
EDR Relative Transmit Power	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 π/4-DQPSK, 8-DSPK sections of the packet. Bandwidth 1.3 MHz (IF filter response 'flat' fc ±550 kHz) Resolution (time domain) 0.01 dB

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

Short Range Wireless Average Power and Frequency Measurement MX887050A

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

IEEE 802.15.4 TX Measurement MX887060A

Common Item	Frequency range 440 MHz to 2500 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°C 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: 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) Modulation accuracy Residual EVM ≤1.5% Carrier frequency accuracy ± (Setting frequency × Reference oscillator accuracy + 20 Hz)

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°C 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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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°C 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

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°C to 40°C MU887000A test port 1 and 2, MU887001A all test port ±0.3 dB (typ.) (–20 to +35 dBm, 20°C 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°C 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)

LTE-V2X Tx Measurement MX887068A

Common Item	Measuring object PSSCH Frequency range 5855 MHz to 5925 MHz (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 After CAL, 20°C to 30°C MU887000A test port 1 and 2, MU887001A all test port ±0.7 dB (–20 to +35 dBm) ±1.1 dB (–50 to –20 dBm) MU887000A test ports 3, 4 ±0.7 dB (–30 to +25 dBm) ±1.1 dB (–50 to –30 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 20°C to 30°C ± (Setting Frequency × Reference Oscillator Accuracy + 36 Hz) Modulation analysis Residual EVM: Average of 20 measurements 20°C to 30°C ≤2.5% In-band emission In signal condition with Input Level ≥–10 dBm, Allocated RB ≤18 20°C to 30°C ≤–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 20°C to 30°C ≥42 dB (E-UTRA ACLR1)
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)

WLAN 802.11b/g/a/n Waveforms MV887030A

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

Bluetooth Waveforms MV887040A

Deviation	Frequency: 2402 MHz to 2480 MHz, GFSK modulation 1% (±0.01 × deviation Hz) (nom.)
DEVM	Frequency: 2402 MHz to 2480 MHz, π/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)

LTE-V2X Waveform Files MV887068A

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

MER	Frequency: 214.714285 MHz ≥37 dB (total)

FM/Audio TRX Measurement MX887070A

FM Signal Measurements

Common Item	Target signals FM/FM stereo/RDS (Radio Data System) signals Frequency range 65 MHz to 110 MHz
TX Measurements	Measurement functions Amplitude Carrier frequency Frequency deviation Occupied bandwidth Pilot frequency deviation Audio frequency deviation Audio frequency Pilot frequency THD THD+N/SINAD SNR Audio filter 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) Input level range –30 to +15 dBm Level accuracy 10°C to 40°C, Measurement bandwidth: 1.2 MHz, –30 dBm ≤ p ≤ +15 dBm ±0.7 dB Carrier frequency accuracy FM monaural modulation, Tone: 1 kHz, Deviation: 75 kHz ± (Setting frequency × Reference oscillator accuracy + 1 Hz) FM deviation range 1 kHz to 100 kHz 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 Demodulation signal analysis No. of FFT points: 65536 Sampling rate: 152 kHz FFT window function: Hanning window
RX Measurements	Measurement functions FM waveform output Modulation method FM Monaural, FM stereo Frequency deviation Setting range: 20 kHz to 100 kHz Distortion 65 MHz to 110 MHz, (SINAD, 20 Hz to 15 kHz, Emphasis on, Monaural), Tone: 1 kHz, Deviation: 75 kHz >50 dB (SINAD) Resolution: 0.1 Hz Internal modulation signal AF tone L channel (Mono): 1 to 8 tones R channel: 1 to 8 tones Frequency range 20 Hz to 20 kHz, Resolution: 0.1 Hz

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	Measurement functions Amplitude Frequency Distortion ratio measurement Crosstalk THD THD+N/SINAD SNR Analog measurements All single-tone measurement standard values Impedance: 100 kΩ (AC coupling) Frequency Frequency range: 20 Hz to 20 kHz Input level 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°C to 30°C) THD+N (total harmonic distortion + noise) <–60 dB (at 1 kHz, 2 Vpeak, 20 Hz to 20 kHz bandwidth, 5 Vpeak range, 20°C to 30°C) Crosstalk L/R: >60 dB AF signal analysis Sampling rate: 192 kHz No. of FFT points: 65536 FFT window function: Hanning window Digital measurement All single-tone measurement standard values Bit resolution: 16 bits/24 bits Sampling rate Frequency: 16, 32, 44.1, 48 kHz AF signal analysis 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	Analog measurements All single-tone measurement standard values Impedance: 1 Ω (AC coupling) (nom.) Output waveform: Single tone, Multi-tone Frequency Frequency range: 20 Hz to 20 kHz Frequency resolution: 0.01 Hz Output level 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°C to 30°C) Maximum output current 100 mA (nom.) (Do not do short circuit) THD+N (Total harmonic distortion + noise) <–60 dB (at 1 kHz, 1 Vpeak, 20 Hz to 20 kHz bandwidth, 100 kΩ termination, 20°C to 30°C) Digital measurement All single-tone measurement standard values Output waveform: Single tone, Multi-tone Frequency 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) Resolution: 0.01 Hz Output level Level range: Full scale to (Full scale – 40 dB) Resolution: 0.1 dB Bit resolution: 16 bits/24 bits Sampling rate 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
	Main frame
MT8870A	Universal Wireless Test Set
	Standard Accessories
	Power Cord: 1 pc
B0666B	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)
	Options
MT8870A-001	GPIB Control
MT8870A-101/201	GPIB Control Retrofit
	Warranty
MT8870A-ES210	2 Years Extended Warranty Service
MT8870A-ES310	3 Years Extended Warranty Service
MT8870A-ES510	5 Years Extended Warranty Service
	Application Parts
B0666B	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
	Application Instruments
MN8116A	Multi-Port Switch (16 ports)
MN8116A-001	16 Port Expansion Bank
MN8116A-101	16 Port Expansion Bank Retrofit
	Warranty
MN8116A-ES210	2 Years Extended Warranty Service
MN8116A-ES310	3 Years Extended Warranty Service
MN8116A-ES510	5 Years Extended Warranty Service

Model/Order No.	Name
	Test Module
MU887000A	TRX Test Module
MU887001A	TRX Test Module
	Standard Accessories
	DVD-R: 1 pc
W3606AE	MU887000A Operation Manual (DVD-R)
	Options
MU887000A-001	6 GHz Frequency Extension
MU887000A-101/201	6 GHz Frequency Extension Retrofit
MU887000A-002	Audio Measurement Hardware
MU887000A-102/202	Audio Measurement Hardware Retrofit
MU887001A-001	6 GHz Frequency Extension
MU887001A-101/201	6 GHz Frequency Extension Retrofit
MU887001A-002	Audio Measurement Hardware
MU887001A-102/202	Audio Measurement Hardware Retrofit
	Warranty
MU887000A-ES210	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
	Measurement Software
MX887010A	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
MX887018A	NR FDD sub-6GHz 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
MX887068A	LTE-V2X Tx Measurement*5
MX887070A	FM/Audio TRX Measurement*6
MX887090A	Multi-DUT Measurement Scheduler

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
MV887018A	NR FDD sub-6GHz 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*7
MV887040A-002	2LE Waveforms*7, *8
MV887040A-003	BLR Waveforms*7, *8
MV887060A	IEEE 802.15.4 Waveforms
MV887061A	Z-Wave Waveforms
MV887065A	Category M FDD Downlink Waveforms
MV887067A	NB-IoT Downlink Waveforms
MV887068A	LTE-V2X Waveforms*5
MV887070A	FM RDS Waveforms
MV887100A	GPS Waveforms
MV887100A-002	GPS L5 Waveforms*9
MV887101A	Galileo Waveforms
MV887102A	GLONASS Waveforms
MV887103A	BeiDou Waveforms
MV887104A	QZSS 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-001
*6: Requires MU88700xA-002 for audio signal measurements
*7: Requires MV887040A
*8: Requires MV887040A-001
*9: Requires MV887100A

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