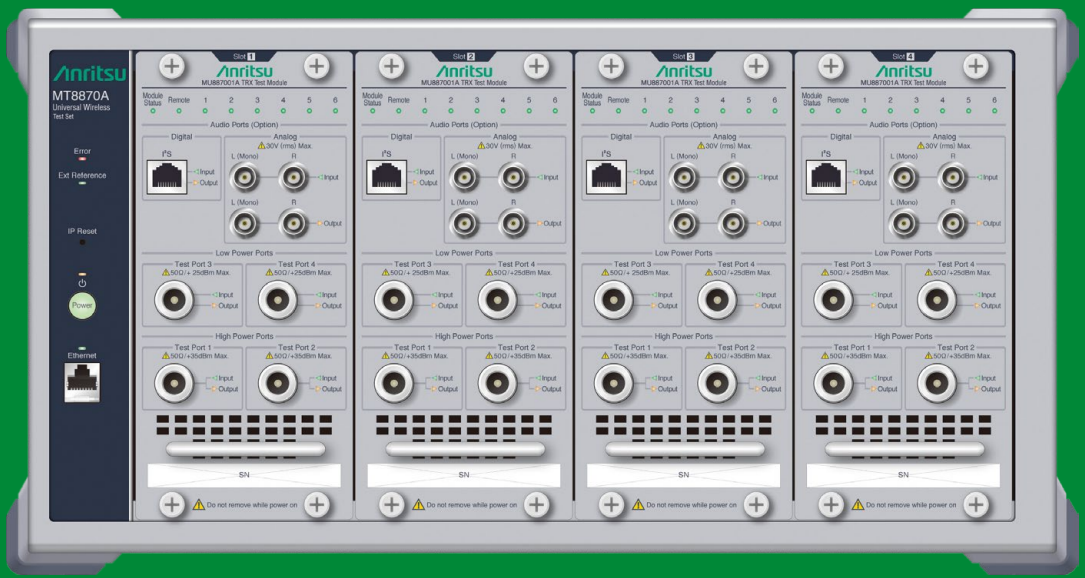
Operation Manual

MV887030/31/32/33/40A

Short Range Wireless Waveform Options for the MT8870A



Operation Manual

MV887030A/ 31A/ 32A/ 33A/ 40A Short Range Wireless Waveform Options for the MT8870A

Anritsu Limited
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P/N: M-W3622AE
Revision: G
Modified: January 2018

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Anritsu affixes the CE conformity marking to the following product(s) in accordance with Council Decision 768/2008/EC to indicate that they conform to the EMC and LVD directives of the European Union.

CE Marking

1. Product Model

Software:

MV887030A WLAN 802.11b/g/a/n Waveforms

MV887031A WLAN 802.11ac Waveforms

MV887032A WLAN 802.11p Waveforms

MV887033A WLAN 802.11ax Waveforms

MV887040A Bluetooth Waveforms

2. Applied Directive and Standards

When the MV887030A WLAN 802.11b/g/a/n Waveforms, MV887031A WLAN 802.11ac Waveforms, MV887032A WLAN 802.11p Waveforms, MV887033A WLAN 802.11ax Waveforms, or MV887040A Bluetooth Waveforms is installed in the MU887000A and MT8870A, the applied directive and standards of this unit conform to those of the MT8870A Universal Wireless Test Set.

Note on Main Frame

Contact Anritsu for the latest information about the MT8870A Universal Wireless Test Set to be used with the MV887030A WLAN 802.11b/g/a/n Waveforms, MV887031A WLAN 802.11ac Waveforms, MV887032A WLAN 802.11p Waveforms, MV887033A WLAN 802.11ax Waveforms, or MV887040A Bluetooth Waveforms.

RCM Conformity Marking

Anritsu affixes the RCM mark to the following product(s) in accordance with the regulations to indicate that they conform to the EMC framework of Australia/New Zealand.

RCM Marking

1. Product Model

Software:

MV887030A WLAN 802.11b/g/a/n Waveforms

MV887031A WLAN 802.11ac Waveforms

MV887032A WLAN 802.11p Waveforms

MV887033A WLAN 802.11ax Waveforms

MV887040A Bluetooth Waveforms

2. Applied Directive and Standards

When the MV887030A WLAN 802.11b/g/a/n Waveforms, MV887031A WLAN 802.11ac Waveforms, MV887032A WLAN 802.11p Waveforms, MV887033A WLAN 802.11ax Waveforms, or MV887040A Bluetooth Waveforms is installed in the MU887000A and MT8870A, the applied directive and standards of this unit conform to those of the MT8870A Universal Wireless Test Set.

Note on Main Frame

Contact Anritsu for the latest information about the MT8870A Universal Wireless Test Set to be used with the MV887030A WLAN 802.11b/g/a/n Waveforms, MV887031A WLAN 802.11ac Waveforms, MV887032A WLAN 802.11p Waveforms, MV887033A WLAN 802.11ax Waveforms, or MV887040A Bluetooth Waveforms.

Table of Contents

Chapter 1 — General Information

1-1 About this Manual

This manual provides details of the short range wireless (SRW) waveforms for use with the MT8870A Universal Wireless Test Set.

The waveform files can be transmitted from the MT8870A to the device under test (DUT) for use in SRW receiver testing.

There are three SRW waveform packages:

- WLAN 802.11a/b/g/n (MV887030A)
- WLAN 802.11ac (MV887031A)
- WLAN 802.11p (MV887032A)
- WLAN 802.11ax (MV887033A)
- Bluetooth BR/EDR/LE (MV887040A, MV887040A-001 (in case of more than 37 bytes payload))
- Bluetooth 2LE (MV887040A, MV887040A-002, MV887040A-001 (in case of more than 37 bytes payload))
- Bluetooth BLR (MV887040A, MV887040A-003, MV887040A-001 (in case of more than 37 bytes payload))

Each package contains a selection of waveform files that have been pre-configured at differing standards, data rates, and modulation patterns.

1-2 SRW Receiver Testing

Waveform file selection and transmission to the DUT can be performed in two ways:

- Using Vector Signal Generator (VSG) tool within CombiView. Refer to chapter 2 for details.
- Using remote SCPI commands to directly control the vector signal generator application within the MT8870A module. Refer to chapter 3 for details.

In both cases, the receiver sensitivity of the DUT is calculated using the chipset vendor's host control software to read the number of received packets.

Chapter 2 — Using the CombiView VSG Tool

2-1 Receiver Testing

CombiView includes the vector signal generator (VSG) to provide receiver testing functionality for the CW, wireless LAN, and *Bluetooth* standards.

To use the VSG you must purchase and register the appropriate MV8870xxA waveform option. Three options are available:

- Option MV887030A: Waveform files for WLAN 802.11b/g/n/a
- Option MV887031A: Waveform files for WLAN 802.11ac
- Option MV887032A: Waveform files for WLAN 802.11p
- Option MV887033A: Waveform files for WLAN 802.11ax
- Option MV887040A: Waveform files for *Bluetooth*

  To use Bluetooth Low Energy signal more than 37 bytes payload, you also must purchase the option below.

  - Option MV887040A-001: Waveform files for Bluetooth LE more than 37 bytes payload

  To use Bluetooth Low Energy 2Mbps (2LE) signal, you also must purchase the option below.

  - Option MV887040A-002: Waveform files for Bluetooth 2LE

  To use Bluetooth Low Energy Long Range (BLR) signal, you also must purchase the option below.

  - Option MV887040A-003: Waveform files for Bluetooth BLR

Each optional package contains a selection of waveform files that have been pre-configured at differing standards, data rates, and modulation patterns.

Note	A full list of the waveform files provided with each SRW option is provided in chapter 4.

During receiver testing, the Vector Signal Generator tool is used to select a waveform file and to transmit a defined sequence of packets to the DUT receiver.

The receiver sensitivity is calculated using the chipset vendor's software to count the number of frames or packets received in comparison to the number sent.

2-2 Configuring and Running Receiver Tests

1. Within CombiView, at **VSG**, select the port being used to connect to the DUT.
2. Select **VSG** > **Configure VSG** to open the VSG Settings window shown below.

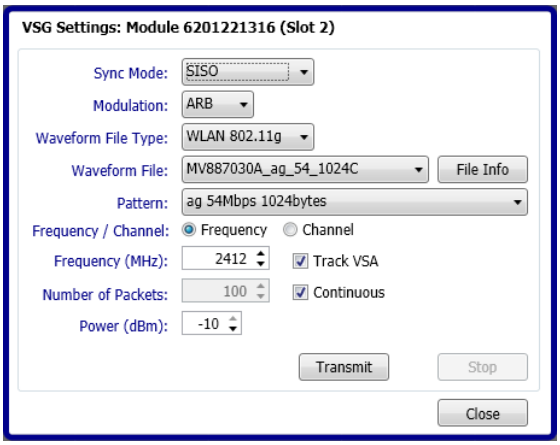

Figure 2-1. VSG Settings

3. At **Sync Mode** select **SISO** unless doing true MIMO testing. Refer to the CombiView Operation Manual for full details.
4. At **Modulation** select **ARB**.
5. At **Waveform File Type**, select the wireless standard.
6. At **Waveform File**, select the waveform to be transmitted.
7. At **Pattern**, set the data pattern.

Note	Most waveform files for SRW applications contain only one pattern. However files designed for MIMO testing may contain two or more patterns that correspond to the spatial streams comprising the MIMO signal. To transmit this kind of signal you use the same waveform file on each module (spatial stream) and select a different pattern on each module's VSG. For True MIMO receiver testing, the VSGs must be synchronized. See Chapter 10 of the *CombiView Short Range Wireless Applet Operation Manual* (M-W3618AE) for details.

8. Set **frequency** or **channel**.
9. If required, select **Track VSA**. If selected, changes to the VSG frequency are communicated to the VSA, and changes to the VSA frequency are communicated to the VSG. If cleared, the VSA and VSG frequency settings are independent. Note that the VSA cannot be set to frequencies below 1.9 GHz when no MX887032A license.
10. Set a specific **Number of Packets** to be transmitted or select **Continuous** to play the waveform repeatedly until you click **Stop**.
11. Set the transmission power.
12. Click **Transmit** to start transmission of the waveform to the DUT.

2-3 Calculating the Error Rate

Receiver sensitivity is calculated using the chipset vendor's software to count the number of packets or bits received in comparison to the number sent.

Bluetooth Measurements

The receiver sensitivity for *Bluetooth* basic rate and enhanced data rate signals is based on the calculation of Bit Error Rate (BER). BER is an expression of the number of bits that were received in error and is calculated using the formula below:

(1- (Number of bits correctly received / Number of bits sent)) x 100%.

The receiver sensitivity for *Bluetooth* low energy signals is based on the calculation of Packet Error Rate (PER). PER is an expression of the number of packets that were received in error and is calculated using the formula below:

(1- (Number of packets correctly received / Number of packets sent)) x 100%.

WLAN Measurements

DUT receiver measurements are based on the calculation of Packet Error Rate (PER) or Frame Reception Rate (FRR).

PER is an expression of the number of packets that were received in error and is calculated using the formula below:

(1- (Number of packets correctly received / Number of packets sent)) x 100%.

FRR is an expression of the number of packets that were successfully received. FRR is specified by the CTIA and Wi-Fi Alliance in the CWG Test Plan used to evaluate the RF Performance of Wi-Fi Mobile Converged Devices. FRR is calculated using the formula below:

(Number of packets correctly received / Number of packets sent) x 100%.

Chapter 3 — Using Remote Commands

3-1 Overview

Receiver tests can be performed using remote SCPI commands to control the vector signal generator application within the MT8870A module.

The example below shows how to select a *Bluetooth* waveform file (provided with MV887040A) and output it from port 1 at -70 dBm on a frequency of 2402 MHz.

Note	Further details on the vector signal generator application and the modes of operation can be found in the MU887000A TRX Test Module Operation Manual.

1. Set the VSG operation mode to “normal” for use with remote commands.

:SOURce:GPRF:GENerator:MODE NORmal

2. Set the frequency to 2402 MHz.

:SOURce:GPRF:GENerator:RFSetting:FREQuency 2402MHz

3. Set the level to -70 dBm.

:SOURce:GPRF:GENerator:RFSettings:LEVel -70

4. Turn on modulation.

:SOURce:GPRF:GENerator:BBMode ARB

5. Load the waveform file to memory.

:SOURce:GPRF:GENerator:ARB:FILE:LOAD “MV887040A_DH3_3SlotOff”

6. Select port 1 as the output port.

:ROUte:PORT:CONNect:DIRection PORT2, PORT1

7. Turn on signal output.

:SOURce:GPRF:GENerator:STATe ON

8. Check that the output level is within acceptable limits.

:SOURce:GPRF:GENerator:RFSettings:LEVel:SETTing?

9. Stop the signal output.

:SOURce:GPRF:GENerator:STATe OFF

Note	Refer to the MU887000A TRX Test Module Operation Manual for further information about controlling the VSG application.

3-2 Calculating the Error Rate

Receiver sensitivity is calculated by using the chipset vendor's software to count the number of packets or bits received in comparison to the number sent.

Bluetooth Measurements

The receiver sensitivity for *Bluetooth* basic rate and enhanced data rate signals is based on the calculation of Bit Error Rate (BER). BER is an expression of the number of bits that were received in error and is calculated using the formula below:

(1- (Number of bits correctly received / Number of bits sent)) x 100%.

The receiver sensitivity for *Bluetooth* low energy signals is based on the calculation of Packet Error Rate (PER). PER is an expression of the number of packets that were received in error and is calculated using the formula below:

(1- (Number of packets correctly received / Number of packets sent)) x 100%.

WLAN Measurements

DUT receiver measurements are based on the calculation of Packet Error Rate (PER) or Frame Reception Rate (FRR).

PER is an expression of the number of packets that were received in error and is calculated using the formula below:

(1- (Number of packets correctly received / Number of packets sent)) x 100%.

FRR is an expression of the number of packets that were successfully received. FRR is specified by the CTIA and Wi-Fi Alliance in the CWG Test Plan used to evaluate the RF Performance of Wi-Fi Mobile Converged Devices. FRR is calculated using the formula below:

(Number of packets correctly received / Number of packets sent) x 100%.

Chapter 4 — Waveform Files

4-1 802.11a/b/g/n Waveform Patterns (option MV887030A)

Note	All 802.11a/b/g/n waveforms are prefixed with MV887030A_. Waveforms ending in "_Q" are customer-variant files.

802.11b

Table 4-1. 802.11b WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
b_11_1024L	11		1024	b	Long	-
b_5P5_1024L	5.5		1024	b	Long	-
b_5P5_100L	5.5		100	b	Long	-
b_2_100L	2		100	b	Long	-
b_2_1024L /	2		1024	b	Long	-
b_1_100L	1		100	b	Long	-
b_1_1024L /	1		1024	b	Long	-
b_2_100S_Q	2		100	b	Short	-
b_2_1024S_Q	2		1024	b	Short	-
b_5P5_100S_Q	5.5		100	b	Short	-
b_5P5_1024S_Q	5.5		1024	b	Short	-
b_11_100S_Q	11		100	b	Short	-
b_11_1024S_Q	11		1024	b	Short	-

802.11a/g

Table 4-2. 802.11a/g WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
ag_54_1024	54		1024	b	-	-
ag_54_1000	54		1000	b	-	-
ag_48_1000	48		1000	b	-	-
ag_36_1000	36		1000	b	-	-
ag_24_1000	24		1000	b	-	-

Table 4-2. 802.11a/g WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
ag_18_1000	18		1000	b	-	-
ag_12_1000	12		1000	b	-	-
ag_9_100	9		100	b	-	-
ag_9_1000	9		1000	b	-	-
ag_6_100	6		100	b	-	-
ag_6_1000	6		1000	b	-	-

802.11n

Table 4-3. 802.11n WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
n_MCS7_20_4096L	MCS7	20	4096	b	Long	-
n_MCS7_20_4096S	MCS7	20	4096	b	Short	-
n_MCS7_20_1024L	MCS7	20	1024	b	Long	-
n_MCS7_40_4096L	MCS7	40	4096	b	Long	-
n_MCS7_40_4096S	MCS7	40	4096	b	Short	-
n_MCS7_40_1024L	MCS7	40	1024	b	Long	-
n_MCS6_20_4096L	MCS6	20	4096	b	Long	-
n_MCS6_40_4096L	MCS6	40	4096	b	Long	-
n_MCS5_20_4096L	MCS5	20	4096	b	Long	-
n_MCS5_40_4096L	MCS5	40	4096	b	Long	-
n_MCS4_20_4096L	MCS4	20	4096	b	Long	-
n_MCS4_20_500L	MCS4	20	500	b	Long	-
n_MCS4_40_4096L	MCS4	40	4096	b	Long	-
n_MCS4_40_500L	MCS4	40	500	b	Long	-
n_MCS3_20_4096L	MCS3	20	4096	b	Long	-
n_MCS3_20_500L	MCS3	20	500	b	Long	-
n_MCS3_40_4096L	MCS3	40	4096	b	Long	-
n_MCS3_40_500L	MCS3	40	500	b	Long	-
n_MCS2_20_4096L	MCS2	20	4096	b	Long	-
n_MCS2_20_500L	MCS2	20	500	b	Long	-
n_MCS2_40_4096L	MCS2	40	4096	b	Long	-
n_MCS2_40_500L	MCS2	40	500	b	Long	-

Table 4-3. 802.11n WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
n_MCS1_20_4096L	MCS1	20	4096	b	Long	-
n_MCS1_20_500L	MCS1	20	500	b	Long	-
n_MCS1_40_4096L	MCS1	40	4096	b	Long	-
n_MCS1_40_500L	MCS1	40	500	b	Long	-
n_MCS0_20_4096L	MCS0	20	4096	b	Long	-
n_MCS0_20_500L	MCS0	20	500	b	Long	-
n_MCS0_40_4096L	MCS0	40	4096	b	Long	-
n_MCS0_40_500L	MCS0	40	500	b	Long	-
n_MCS32_40_4096L	MCS32	40	4096	b	Long	-

4-2 802.11ac Waveform Patterns (option MV887031A)

Note All 802.11ac waveforms are prefixed with MV887031A_.

Table 4-4. 802.11ac WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
ac_MCS9_40_4096L	MCS9	40	4096	b	Long	1
ac_MCS9_40_1024L	MCS9	40	1024	b	Long	1
ac_MCS9_80_4096L	MCS9	80	4096	b	Long	1
ac_MCS9_80_1024L	MCS9	80	1024	b	Long	1
ac_MCS9_160_4096L	MCS9	160	4096	b	Long	1
ac_MCS8_20_4096L	MCS8	20	4096	b	Long	1
ac_MCS8_20_1024L	MCS8	20	1024	b	Long	1
ac_MCS8_40_4096L	MCS8	40	4096	b	Long	1
ac_MCS8_40_1024L	MCS8	40	1024	b	Long	1
ac_MCS8_80_4096L	MCS8	80	4096	b	Long	1
ac_MCS8_80_1024L	MCS8	80	1024	b	Long	1
ac_MCS8_160_4096L	MCS8	160	4096	b	Long	1
ac_MCS7_20_4096L	MCS7	20	4096	b	Long	1
ac_MCS7_40_4096L	MCS7	40	4096	b	Long	1
ac_MCS7_80_4096L	MCS7	80	4096	b	Long	1
ac_MCS7_160_4096L	MCS7	160	4096	b	Long	1
ac_MCS6_20_4096L	MCS6	20	4096	b	Long	1
ac_MCS6_40_4096L	MCS6	40	4096	b	Long	1
ac_MCS6_80_4096L	MCS6	80	4096	b	Long	1
ac_MCS6_160_4096L	MCS6	160	4096	b	Long	1
ac_MCS5_20_4096L	MCS5	20	4096	b	Long	1
ac_MCS5_40_4096L	MCS5	40	4096	b	Long	1
ac_MCS5_80_4096L	MCS5	80	4096	b	Long	1
ac_MCS5_160_4096L	MCS5	160	4096	b	Long	1
ac_MCS4_20_4096L	MCS4	20	4096	b	Long	1
ac_MCS4_20_500L	MCS4	20	500	b	Long	1
ac_MCS4_40_4096L	MCS4	40	4096	b	Long	1
ac_MCS4_40_500L	MCS4	40	500	b	Long	1
ac_MCS4_80_4096L	MCS4	80	4096	b	Long	1
ac_MCS4_80_500L	MCS4	80	500	b	Long	1
ac_MCS4_160_4096L	MCS4	160	4096	b	Long	1

Table 4-4. 802.11ac WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
ac_MCS4_160_500L	MCS4	160	500	b	Long	1
ac_MCS3_20_4096L	MCS3	20	4096	b	Long	1
ac_MCS3_20_500L	MCS3	20	500	b	Long	1
ac_MCS3_40_4096L	MCS3	40	4096	b	Long	1
ac_MCS3_40_500L	MCS3	40	500	b	Long	1
ac_MCS3_80_4096L	MCS3	80	4096	b	Long	1
ac_MCS3_80_500L	MCS3	80	500	b	Long	1
ac_MCS3_160_4096L	MCS3	160	4096	b	Long	1
ac_MCS3_160_500L	MCS3	160	500	b	Long	1
ac_MCS2_20_4096L	MCS2	20	4096	b	Long	1
ac_MCS2_20_500L	MCS2	20	500	b	Long	1
ac_MCS2_40_4096L	MCS2	40	4096	b	Long	1
ac_MCS2_40_500L	MCS2	40	500	b	Long	1
ac_MCS2_80_4096L	MCS2	80	4096	b	Long	1
ac_MCS2_80_500L	MCS2	80	500	b	Long	1
ac_MCS2_160_4096L	MCS2	160	4096	b	Long	1
ac_MCS2_160_500L	MCS2	160	500	b	Long	1
ac_MCS1_20_4096L	MCS1	20	4096	b	Long	1
ac_MCS1_20_500L	MCS1	20	500	b	Long	1
ac_MCS1_40_4096L	MCS1	40	4096	b	Long	1
ac_MCS1_40_500L	MCS1	40	500	b	Long	1
ac_MCS1_80_4096L	MCS1	80	4096	b	Long	1
ac_MCS1_80_500L	MCS1	80	500	b	Long	1
ac_MCS1_160_4096L	MCS1	160	4096	b	Long	1
ac_MCS1_160_500L	MCS1	160	500	b	Long	1
ac_MCS0_20_4096L	MCS0	20	4096	b	Long	1
ac_MCS0_20_500L	MCS0	20	500	b	Long	1
ac_MCS0_40_4096L	MCS0	40	4096	b	Long	1
ac_MCS0_40_500L	MCS0	40	500	b	Long	1
ac_MCS0_80_4096L	MCS0	80	4096	b	Long	1
ac_MCS0_80_500L	MCS0	80	500	b	Long	1
ac_MCS0_160_4096L	MCS0	160	4096	b	Long	1
ac_MCS0_160_500L	MCS0	160	500	b	Long	1

4-3 802.11p Waveform Patterns (option MV887032A)

Table 4-5. 802.11p WLAN Waveforms

Waveform	Data rates / modulation	Bandwidth (MHz)	Packet length (byte)	Broadcast / Unicast	Preamble / Guard Interval	Nss
p_54_20_1000	54	20	1000	b	-	-
p_48_20_1000	48	20	1000	b	-	-
p_36_20_1000	36	20	1000	b	-	-
p_24_20_1000	24	20	1000	b	-	-
p_18_20_1000	18	20	1000	b	-	-
p_12_20_1000	12	20	1000	b	-	-
p_9_20_1000	9	20	1000	b	-	-
p_6_20_1000	6	20	1000	b	-	-
p_27_10_1000	27	10	1000	b	-	-
p_24_10_1000	24	10	1000	b	-	-
p_18_10_1000	18	10	1000	b	-	-
p_12_10_1000	12	10	1000	b	-	-
p_9_10_1000	9	10	1000	b	-	-
p_6_10_1000	6	10	1000	b	-	-
p_4p5_10_1000	4.5	10	1000	b	-	-
p_3_10_1000	3	10	1000	b	-	-
p_13p5_5_1000	13.5	5	1000	b	-	-
p_12_5_1000	12	5	1000	b	-	-
p_9_5_1000	9	5	1000	b	-	-
p_6_5_1000	6	5	1000	b	-	-
p_4p5_5_1000	4.5	5	1000	b	-	-
p_3_5_1000	3	5	1000	b	-	-
p_2p25_5_1000	2.25	5	1000	b	-	-
p_1p5_5_1000	1.5	5	1000	b	-	-

4-4 802.11ax Waveform Patterns (option MV887033A)

Note All 802.11ax waveforms are prefixed with MV887033A_.

Table 4-6. 802.11ax WLAN Waveforms

Waveform	PPDU format	Data rate / modulation	Bandwidth (MHz)	PDSU length (Octet)	FEC encoders	DCM	Nss
ax_SU_MCS11_80_4096_08LTFx2L *1	HE-SU	MCS11	80	4096	LDPC	Off	1
ax_SU_MCS10_80_4096_08LTFx2L *1	HE-SU	MCS10	80	4096	LDPC	Off	1
ax_SU_MCS9_80_4096_08LTFx2L *1	HE-SU	MCS9	80	4096	LDPC	Off	1
ax_SU_MCS8_80_4096_08LTFx2L *1	HE-SU	MCS8	80	4096	LDPC	Off	1
ax_SU_MCS7_80_4096_08LTFx2L *1	HE-SU	MCS7	80	4096	LDPC	Off	1
ax_SU_MCS6_80_4096_08LTFx2L *1	HE-SU	MCS6	80	4096	LDPC	Off	1
ax_SU_MCS5_80_4096_08LTFx2L *1	HE-SU	MCS5	80	4096	LDPC	Off	1
ax_SU_MCS4_80_4096_08LTFx2L *1	HE-SU	MCS4	80	4096	LDPC	Off	1
ax_SU_MCS3_80_4096_08LTFx2L *1	HE-SU	MCS3	80	4096	LDPC	Off	1
ax_SU_MCS2_80_4096_08LTFx2L *1	HE-SU	MCS2	80	4096	LDPC	Off	1
ax_SU_MCS1_80_4096_08LTFx2L *1	HE-SU	MCS1	80	4096	LDPC	Off	1
ax_SU_MCS0_80_4096_08LTFx2L *1	HE-SU	MCS0	80	4096	LDPC	Off	1
ax_SU_MCS11_40_4096_08LTFx2L *1	HE-SU	MCS11	40	4096	LDPC	Off	1
ax_SU_MCS10_40_4096_08LTFx2L *1	HE-SU	MCS10	40	4096	LDPC	Off	1
ax_SU_MCS9_40_4096_08LTFx2L *1	HE-SU	MCS9	40	4096	LDPC	Off	1
ax_SU_MCS8_40_4096_08LTFx2L *1	HE-SU	MCS8	40	4096	LDPC	Off	1
ax_SU_MCS7_40_4096_08LTFx2L *1	HE-SU	MCS7	40	4096	LDPC	Off	1
ax_SU_MCS6_40_4096_08LTFx2L *1	HE-SU	MCS6	40	4096	LDPC	Off	1
ax_SU_MCS5_40_4096_08LTFx2L *1	HE-SU	MCS5	40	4096	LDPC	Off	1
ax_SU_MCS4_40_4096_08LTFx2L *1	HE-SU	MCS4	40	4096	LDPC	Off	1
ax_SU_MCS3_40_4096_08LTFx2L *1	HE-SU	MCS3	40	4096	LDPC	Off	1
ax_SU_MCS2_40_4096_08LTFx2L *1	HE-SU	MCS2	40	4096	LDPC	Off	1
ax_SU_MCS1_40_4096_08LTFx2L *1	HE-SU	MCS1	40	4096	LDPC	Off	1
ax_SU_MCS0_40_4096_08LTFx2L *1	HE-SU	MCS0	40	4096	LDPC	Off	1
ax_SU_MCS11_20_4096_08LTFx2B *1	HE-SU	MCS11	20	4096	BCC	Off	1

Table 4-6. 802.11ax WLAN Waveforms

Waveform	PPDU format	Data rate / modulation	Bandwidth (MHz)	PDSU length (Octet)	FEC encoders	DCM	Nss
ax_SU_MCS10_20_4096_08LTFx2B *1	HE-SU	MCS10	20	4096	BCC	Off	1
ax_SU_MCS9_20_4096_08LTFx2B *1	HE-SU	MCS9	20	4096	BCC	Off	1
ax_SU_MCS8_20_4096_08LTFx2B *1	HE-SU	MCS8	20	4096	BCC	Off	1
ax_SU_MCS7_20_4096_08LTFx2B *1	HE-SU	MCS7	20	4096	BCC	Off	1
ax_SU_MCS6_20_4096_08LTFx2B *1	HE-SU	MCS6	20	4096	BCC	Off	1
ax_SU_MCS5_20_4096_08LTFx2B *1	HE-SU	MCS5	20	4096	BCC	Off	1
ax_SU_MCS4_20_4096_08LTFx2B *1	HE-SU	MCS4	20	4096	BCC	Off	1
ax_SU_MCS3_20_4096_08LTFx2B *1	HE-SU	MCS3	20	4096	BCC	Off	1
ax_SU_MCS2_20_4096_08LTFx2B *1	HE-SU	MCS2	20	4096	BCC	Off	1
ax_SU_MCS1_20_4096_08LTFx2B *1	HE-SU	MCS1	20	4096	BCC	Off	1
ax_SU_MCS0_20_4096_08LTFx2B *1	HE-SU	MCS0	20	4096	BCC	Off	1

*1: non-STBC mode, 800ns GI, 2x HE-LTF.

4-5 WLAN Packet Definition

Idle time before rising edge (us): 0
Idle time after falling edge (us): 30
3 MAC addresses: ff:ff:ff:ff:ff:ff
20:22:22:22:22:02
50:55:55:55:55:05
Payload type: PN9
Scrambled: yes
b Filter type: Gaussian bt=0.5
n/ac PPDU format: mixed
Broadcast: yes

4-6 Bluetooth Waveform Patterns (option MV887040A)

Note	All *Bluetooth* waveforms are prefixed with MV887040A_. Waveforms ending in "_Q" are customer-variant files.

Table 4-7. Bluetooth Waveforms

Waveform	Data rate (Mbps)	Modulation	Filter	Packet type
DH1*1	1	GFSK*4	Gaussian*5	DH1
DH3*1	1	GFSK*4	Gaussian*5	DH3
DH5*1	1	GFSK*4	Gaussian*5	DH5
2-DH1*1	2	π/4-DQPSK	Root Nyquist*6	2-DH1
2-DH3*1	2	π/4-DQPSK	Root Nyquist*6	2-DH3
2-DH5*1	2	π/4-DQPSK	Root Nyquist*6	2-DH5
3-DH1*1	3	8-DPSK	Root Nyquist*6	3-DH1
3-DH3*1	3	8-DPSK	Root Nyquist*6	3-DH3
3-DH5*1	3	8-DPSK	Root Nyquist*6	3-DH5
GFSK-PN15*3	1	GFSK*4	Gaussian*5	No packet format
PI_4_DQPSK-PN15*3	2	π/4-DQPSK	Root Nyquist*6	No packet format
8DPSK-PN15*3	3	8DPSK	Root Nyquist*6	No packet format
BLE*1	1	GFSK*9	Gaussian*5	BLE Reference Signal
BLE_CRC_corrupted*1	1	GFSK*9	Gaussian*5	BLE Reference Signal
BLE_255*10	1	GFSK*9	Gaussian*5	BLE Payload 255 bytes
2LE_37*11	2	GFSK*9	Gaussian*5	2LE Payload 37 bytes
2LE_255*10,*11	2	GFSK*9	Gaussian*5	2LE Payload 255 bytes
BLR_S2_37*12	1	GFSK*9	Gaussian*5	BLR Payload 37 bytes
BLR_S2_255*10,*12	1	GFSK*9	Gaussian*5	BLR Payload 255 bytes
BLR_S8_37*12	1	GFSK*9	Gaussian*5	BLR Payload 37 bytes
BLR_S8_255*10,*12	1	GFSK*9	Gaussian*5	BLR Payload 255 bytes
GFSK-PN15_BLE*3	1	GFSK*9	Gaussian*5	No packet format
2-DH1C_Q	2	π/4-DQPSK	Root Nyquist*6	2-DH1
2-DH3C_Q	2	π/4-DQPSK	Root Nyquist*6	2-DH3

Table 4-7. Bluetooth Waveforms

Waveform	Data rate (Mbps)	Modulation	Filter	Packet type
2-DH5C_Q	2	π/4-DQPSK	Root Nyquist*6	2-DH5
3-DH1C_Q	3	8-DPSK	Root Nyquist*6	3-DH1
3-DH3C_Q	3	8-DPSK	Root Nyquist*6	3-DH3
3-DH5C_Q	3	8-DPSK	Root Nyquist*6	3-DH5
BLE_Q	1	GFSK*9	Gaussian*5	BLE Reference Signal
DH1C_Q	1	GFSK*4	Gaussian*5	DH1
DH3C_Q	1	GFSK*4	Gaussian*5	DH3
DH5C_Q	1	GFSK*4	Gaussian*5	DH5

*1: PN9 data is inserted into the payload body.

*2: PN9 data is inserted to all areas that do not have a packet format.

*3: PN15 data is inserted to all areas that do not have a packet format.

*4: Modulation index = 0.32

*5: Bandwidth time (BT) = 0.5

*6: Roll-off rate $\beta = 0.4$

*7: Use in RF-PHY.TS/4.0.0 RCV-LE/CA/07/C (PER Report Integrity) with intentional CRC errors in every other packet is assumed.

*8: Refer to Section 3.11.4.

*9: Modulation index = 0.5

*10: MV887040A-001 is needed.

*11: MV887040A-002 is needed.

*12: MV887040A-003 is needed.

4-7 Bluetooth Packet Definition

Am_addr: 7 (standard waveforms), 0 (_Q waveforms)

Flow: 1

Arqn: 0

Seqn: 0

Uap: 0x6b

Lap: 0xc6967e

Logical channel: 0

Logical flow: 0

4-8 Zero Waveform Patterns

Note	The zero waveform is included in all of the SRW waveform packages (MV887030A, MV887031A, and MV887040A)

Table 4-8. Zero Waveforms

Waveform	Output	Pattern Length
ZERO_200000000Hz_100000p	No signal	500 us

Appendix A — Specification

A-1 MV887030A

Name

WLAN 802.11b/g/a/n waveforms

Structure

The items below are provided on the product DVD etc. The waveform files are also pre-installed on the MU887000A TRX Test Module.

WLAN 802.11b/g/a/n Waveforms files: 56

WLAN 802.11b/g/a/n Waveforms license files: 1

Operation Manual: 1

EVM

802.11b

Packet Length 1024 byte

Frequency: 2402 MHz to 2484 MHz

Gaussian filter BT 0.5

EVM: ≤ –38 dB rms

802.11g

Packet Length 1000 byte

Frequency: 2402 MHz to 2484 MHz

Operating temperature 20°C to 30°C

EVM: ≤ –40 dB rms

802.11a

Packet Length 1000 byte

Frequency: 4920 MHz to 5825 MHz

Operating temperature 20°C to 30°C

EVM: ≤ –38 dB rms

802.11n (2402 MHz to 2484 MHz)

Packet Length 4096 byte, Long Guard Interval, Channel bandwidth 40 MHz

Operating temperature 20°C to 30°C

EVM: ≤ –40 dB rms

802.11n (4920 MHz to 5825 MHz)

Packet Length 4096 byte, Long Guard Interval, Channel bandwidth 40 MHz

Operating temperature 20°C to 30°C

EVM: ≤ –38 dB rms

A-2 MV887031A

Name

WLAN 802.11ac waveforms

Structure

The items below are provided on the product DVD etc. The waveform files are also pre-installed on the MU887000A TRX Test Module.

WLAN 802.11ac Waveforms files: 65

WLAN 802.11ac Waveforms license files: 1

Operation Manual: 1

A-3 MV887032A

Name

WLAN 802.11p waveforms

Structure

The items below are provided on the product DVD etc. The waveform files are also pre-installed on the MU887000A TRX Test Module.

WLAN 802.11p Waveforms files: 25

WLAN 802.11p Waveforms license files: 1

Operation Manual: 1

A-4 MV887033A

Name

WLAN 802.11ax waveforms

Structure

The items below are provided on the product DVD etc. The waveform files are also pre-installed on the MU887000A TRX Test Module.

WLAN 802.11ax Waveforms files: 36

WLAN 802.11ax Waveforms license files: 1

Operation Manual: 1

A-5 MV887040A

Name

Bluetooth waveforms

Structure

The items below are provided on the product DVD etc. The waveform files are also pre-installed on the MU887000A TRX Test Module.

Bluetooth waveforms files: 33 (including one file for MV887040A-001, two files for MV887040A-002, and four files for MV887040A-003)

Bluetooth waveforms license files: 1

Operation Manual: 1

Deviation

Frequency: 2402 MHz to 2480 MHz

GFSK modulation

Nominal: 1% (+/–0.01 x deviation Hz)

DEVM

Frequency: 2402 MHz to 2480 MHz

π/4-DQPSK or 8-DPSK modulation

<5% rms

Anritsu

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