

# RF MEASUREMENT REPORT

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**FCC ID:** P27GPONHGU

**Applicant:** Sercomm Corporation

**Product:** GPON HGU

**Model No.:** PM4264S, FG6222RXXXXXXXXX  
(the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, a to z, "blank" or "-", for the marketing purpose)

**Brand Name:** Sercomm, Radisys

**FCC Classification:** Unlicensed National Information Infrastructure (NII)

**FCC Rule Part(s):** Part 15 Subpart E (Section 15.407)

**Result:** Complies

**Received Date:** 2022-11-23

**Test Date:** 2022-11-25 ~ 2023-02-03

**Reviewed By:** \_\_\_\_\_

**Approved By:** \_\_\_\_\_



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB789033. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

### Revision History

Report No.	Version	Description	Issue Date	Note
2211RSU063-U3	Rev. 01	Initial Report	2023-02-06	Valid

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## CONTENTS

Description	Page
<b>1. General Information .....</b>	<b>6</b>
1.1. Applicant.....	6
1.2. Manufacturer .....	6
1.3. Testing Facility .....	6
1.4. Product Information .....	7
1.5. Radio Specification under Test.....	7
1.6. Working Frequencies.....	8
1.7. Antenna Details .....	9
<b>2. Test Configuration.....</b>	<b>10</b>
2.1. Test Mode .....	10
2.2. Test System Connection Diagram .....	11
2.3. Test System Details .....	11
2.4. Test Software.....	11
2.5. Applied Standards .....	12
2.6. Test Environment Condition .....	12
<b>3. Antenna Requirements .....</b>	<b>13</b>
<b>4. Measuring Instrument.....</b>	<b>14</b>
<b>5. Decision Rules and Measurement Uncertainty .....</b>	<b>16</b>
5.1. Decision Rules .....	16
5.2. Measurement Uncertainty .....	16
<b>6. Test Result .....</b>	<b>17</b>
6.1. Summary .....	17
6.2. 26dB & 99% Bandwidth Measurement.....	18
6.2.1. Test Limit .....	18
6.2.2. Test Procedure .....	18
6.2.3. Test Setting.....	18
6.2.4. Test Setup .....	19
6.2.5. Test Result.....	19
6.3. 6dB Bandwidth Measurement .....	20
6.3.1. Test Limit .....	20
6.3.2. Test Procedure .....	20
6.3.3. Test Setting.....	20
6.3.4. Test Setup .....	20
6.3.5. Test Result.....	20
6.4. Output Power Measurement .....	21

6.4.1.	Test Limit .....	21
6.4.2.	Test Procedure .....	21
6.4.3.	Test Setting.....	21
6.4.4.	Test Setup .....	21
6.4.5.	Test Result.....	21
6.5.	Transmit Power Control Measurement.....	22
6.5.1.	Test Limit .....	22
6.5.2.	Test Procedure .....	22
6.5.3.	Test Setting.....	22
6.5.4.	Test Setup .....	22
6.5.5.	Test Result.....	22
6.6.	Power Spectral Density Measurement .....	23
6.6.1.	Test Limit .....	23
6.6.2.	Test Procedure .....	23
6.6.3.	Test Setting.....	23
6.6.4.	Test Setup .....	24
6.6.5.	Test Result.....	24
6.7.	Frequency Stability Measurement.....	25
6.7.1.	Test Limit .....	25
6.7.2.	Test Procedure .....	25
6.7.3.	Test Setup .....	25
6.7.4.	Test Result.....	26
6.8.	Radiated Spurious Emission Measurement .....	27
6.8.1.	Test Limit .....	27
6.8.2.	Test Procedure .....	27
6.8.3.	Test Setting.....	27
6.8.4.	Test Setup .....	29
6.8.5.	Test Result.....	30
6.9.	Radiated Restricted Band Edge Measurement .....	31
6.9.1.	Test Limit .....	31
6.9.2.	Test Procedure .....	33
6.9.3.	Test Setting.....	33
6.9.4.	Test Setup .....	34
6.9.5.	Test Result.....	34
6.10.	AC Conducted Emissions Measurement.....	35
6.10.1.	Test Limit .....	35
6.10.2.	Test Setup .....	35
6.10.3.	Test Result.....	35

<b>Appendix A – Test Result.....</b>	<b>36</b>
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A.1	Duty Cycle Test Result.....	36
A.2	26dB Bandwidth Test Result.....	38
A.3	6dB Bandwidth Test Result.....	56
A.4	Output Power Test Result .....	62
A.5	Power Spectral Density Test Result.....	64
A.6	Frequency Stability Test Result .....	99
A.7	Radiated Spurious Emission Test Result.....	100
A.8	Radiated Restricted Band Edge Test Result.....	177
A.9	AC Conducted Emissions Test Result .....	299
<b>Appendix B – Test Setup Photograph .....</b>		<b>301</b>
<b>Appendix C – EUT Photograph .....</b>		<b>302</b>



#### 1.4. Product Information

Product Name	GPON HGU
Model No.	PM4264S, FG6222RXXXXXXXX (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, a to z, "blank" or "-", for the marketing purpose)
EUT Identification No. or Serial No.	SCOM220E73F4
Wi-Fi Specification	802.11a/b/g/n/ac/ax
Antenna Information	Refer to Section 1.7
Power Supply	12VDC
Accessory	
Adapter	Model: MSA-C1500CS12.0-18J-US Input: 100-240V 50/60Hz 0.7A max Output: 12.0V-1.5A
<p>Note 1: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.</p> <p>Note 2: The different product models are only market requirement. The hardware and software of the products are the same, so we chose FG6222R to do all the tests.</p>	

#### 1.5. Radio Specification under Test

Frequency Range	For 802.11a/n-HT20/ac-VHT20/ax-HE20: 5180~5240MHz, 5260~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40/ax-HE40: 5190~5230MHz, 5270~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80/ax-HE80: 5210MHz, 5290MHz, 5530MHz, 5610 MHz, 5690MHz, 5775MHz
Type of Modulation	802.11a/n/ac: OFDM 802.11ax: OFDMA
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.7Mbps 802.11ax: up to 2402Mbps

## 1.6. Working Frequencies

### 802.11a/n-HT20/ac-VHT20/ax-HE20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	144	5720 MHz	149	5745 MHz
153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	--	--	--	--

### 802.11n-HT40/ac-VHT40/ax-HE40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
142	5710 MHz	151	5755 MHz	159	5795 MHz

### 802.11ac-VHT80/ax-HE80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	138	5690 MHz	155	5775 MHz



### 1.7. Antenna Details

Antenna Type	Frequency Band (MHz)	T <sub>X</sub> Paths	Max Antenna Gain (dBi)	CDD Directional Gain (dBi)	
				For Power	For PSD
PIFA Antenna	2412 ~ 2462	2	2.70	2.70	5.71
	5180 ~ 5240	2	3.60	3.60	6.61
	5260 ~ 5320	2	3.60	3.60	6.61
	5500 ~ 5720	2	3.90	3.90	6.91
	5745 ~ 5825	2	3.30	3.30	6.31

**Remark:**

1. The EUT supports Cyclic Delay Diversity (CDD) mode and CDD signals are correlated.

If all antennas have the same gain,  $G_{ANT}$ , Directional gain =  $G_{ANT} + \text{Array Gain}$ , where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,  
Array Gain =  $10 \log (N_{ANT} / N_{SS})$  dB;
- For power measurements on IEEE 802.11 devices,  
Array Gain = 0 dB for  $N_{ANT} \leq 4$ ;

## 2. Test Configuration

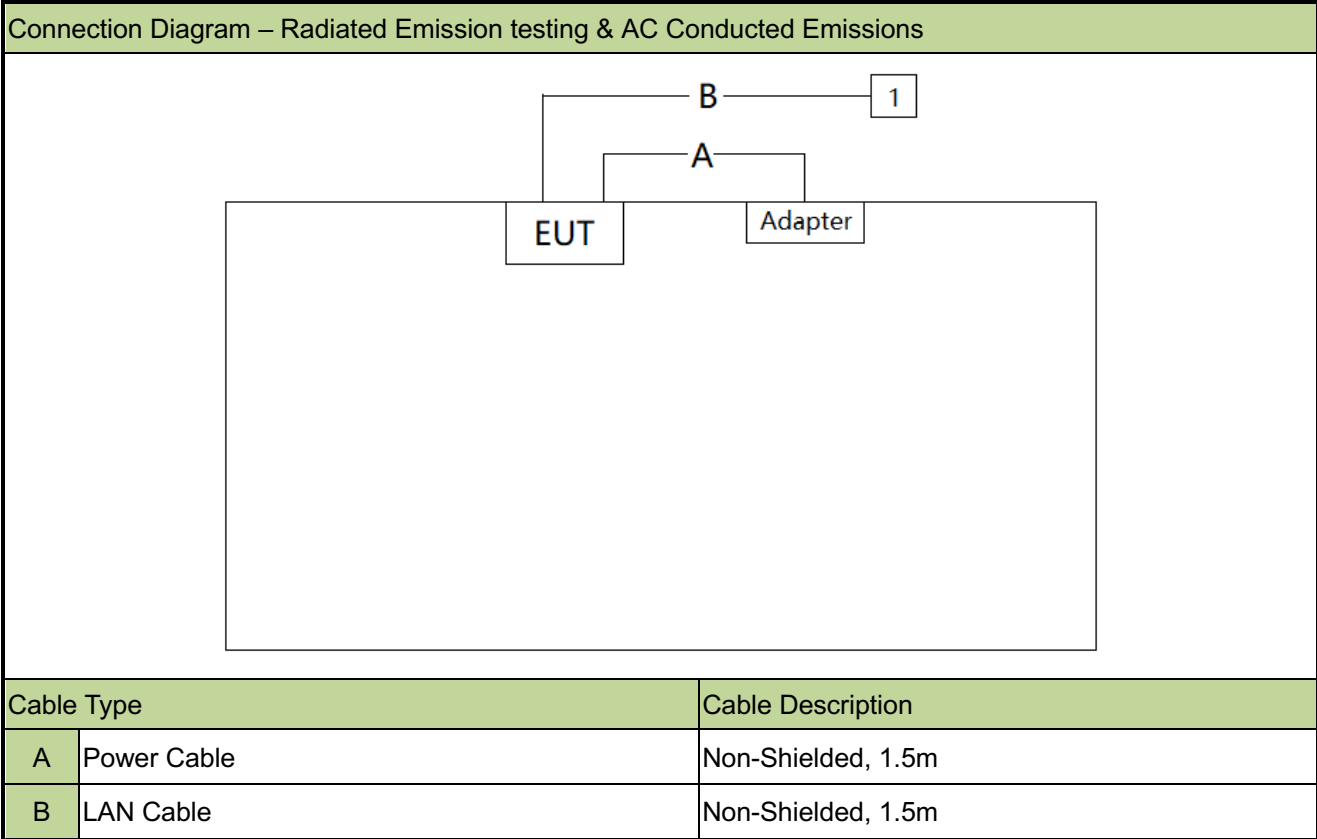
### 2.1. Test Mode

Mode 1: Transmit by 802.11a (6Mbps)
Mode 2: Transmit by 802.11ac-VHT20 (MCS5)
Mode 3: Transmit by 802.11ac-VHT40 (MCS5)
Mode 4: Transmit by 802.11ac-VHT80 (MCS0)
Mode 5: Transmit by 802.11ax-HE20 (MCS6)
Mode 6: Transmit by 802.11ax-HE40 (MCS6)
Mode 7: Transmit by 802.11ax-HE80 (MCS0)

Note: Due to the same modulation between 802.11n and 802.11ac, so 802.11n-HT20 and HT40 are covered by 802.11ac-VHT20 and VHT40 in this report, meanwhile, power setting for 802.11n-HT20 and HT40 will not be greater than 802.11ac-VHT20 and VHT40.

## 2.2. Test System Connection Diagram

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.



## 2.3. Test System Details

Product	Manufacturer	Model No.
1 Notebook	Lenovo	E495

## 2.4. Test Software

The test utility software used during testing was "MP\_AX.exe", and the version was 1.1.13.0.

## 2.5. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.407
- KDB 789033 D02v02r01
- KDB 662911 D01v02r01
- ANSI C63.10-2013

## 2.6. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~ 75%RH

### 3. Antenna Requirements

**Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna of the device is **permanently attached**.
- There are no provisions for connection to an external antenna.

**Conclusion:**

The unit complies with the requirement of §15.203.

#### 4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2023-12-22	SIP-AC1
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2023-11-07	SIP-AC1
Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2023-07-13	SIP-AC1
Thermohygrometer	testo	608-H1	MRTSUE06616	1 year	2023-11-01	SIP-AC1
Thermohygrometer	testo	608-H1	MRTSUE06620	1 year	2023-11-27	SIP-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE07028	1 year	2023-11-25	SIP-AC1
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2023-06-01	SIP-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06645	1 year	2023-07-30	SIP-AC1
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2022-12-29	SIP-AC2
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2023-03-14	SIP-AC1/SIP-AC2
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2023-06-01	SIP-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2023-10-10	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06598	1 year	2023-11-05	SIP-AC2
Preamplifier	EMCI	EMC051845SE	MRTSUE06601	1 year	2023-11-22	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06623	1 year	2023-11-27	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06624	1 year	2023-11-27	SIP-AC2
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06647	1 year	2023-07-13	SIP-AC2
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2022-12-23	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06648	1 year	2023-10-22	SIP-AC2
Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2023-10-25	SIP-AC3
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2023-06-08	SIP-AC3
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06599	1 year	2023-10-13	SIP-AC3
Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2023-07-30	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2023-11-01	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2023-11-27	SIP-AC3
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2023-01-13	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2023-12-22	SIP-AC3
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2023-06-01	SIP-SR2
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2023-06-01	SIP-SR2
Thermohygrometer	testo	608-H1	MRTSUE06621	1 year	2023-11-27	SIP-SR2
Shielding Room	MIX-BEP	SIP-SR2	MRTSUE06949	5 years	2024-10-23	SIP-SR2
Signal Analyzer	Keysight	N9010B	MRTSUE06558	1 year	2023-06-01	SIP-TR1
Thermohygrometer	testo	608-H1	MRTSUE11022	1 year	2023-11-01	SIP-TR1
USB Power Sensor	Agilent	U2021XA	MRTSUE06030	1 year	2023-10-08	SIP-TR1

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Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Agilent Power Panel	V R03.09.00	Power
Controller_MF 7802BS	1.02	RE Antenna&turntable

## 5. Decision Rules and Measurement Uncertainty

### 5.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

### 5.2. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$ .

<b>AC Conducted Emission Measurement</b>
Measurement Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
<b>Radiated Disturbance</b>
Measurement Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 9kHz~30MHz: 2.60dB 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.28dB 1GHz~40GHz: 4.98dB
<b>Spurious Emissions, Conducted</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 2.3 dB
<b>Output Power</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 1.5 dB
<b>Power Spectrum Density</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 2.3 dB
<b>Occupied Bandwidth</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 3.2 %



## 6. Test Result

### 6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.407(a)	26dB Bandwidth	Conducted	Pass
15.407(e)	6dB Bandwidth		Pass
15.407(a)(1)(ii), (2), (3)(i)	Maximum Conducted Output Power		Pass
15.407(h)(1)	Transmit Power Control		Pass
15.407(a)(1)(ii), (2), (3)(i), (12)	Peak Power Spectral Density		Pass
15.407(b)(1), (2), (3), (4)(i)	Undesirable Emissions		Pass
15.205, 15.209 15.407(b)(8), (9), (10)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Radiated	Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

#### Remark:

- The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- Output power test was verified over all data rates of each mode (data refers to operational description), and then choose the maximum power output for final test of each channel.
- For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.

## 6.2. 26dB & 99% Bandwidth Measurement

### 6.2.1. Test Limit

N/A

### 6.2.2. Test Procedure

KDB 789033 D02v02r01- Section II)C)1) (26dB Bandwidth)

KDB 789033 D02v02r01- Section II)D) (99% Bandwidth)

### 6.2.3. Test Setting

#### 26dB Bandwidth

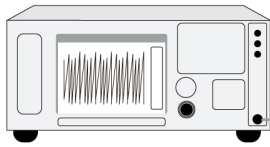
1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth
2. RBW = approximately 1% of the emission bandwidth.
3. VBW > RBW
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission.  
Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### 99% Bandwidth

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 1% to 5% of the OBW
3. VBW  $\geq 3 \times$  RBW
4. Span = 1.5 times to 5 times the OBW
5. Detector = peak
6. Trace mode = max hold
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument.

#### 6.2.4. Test Setup

Spectrum Analyzer



DC Block  
&  
Attenuator



#### 6.2.5. Test Result

Refer to Appendix A.2.

### 6.3. 6dB Bandwidth Measurement

#### 6.3.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

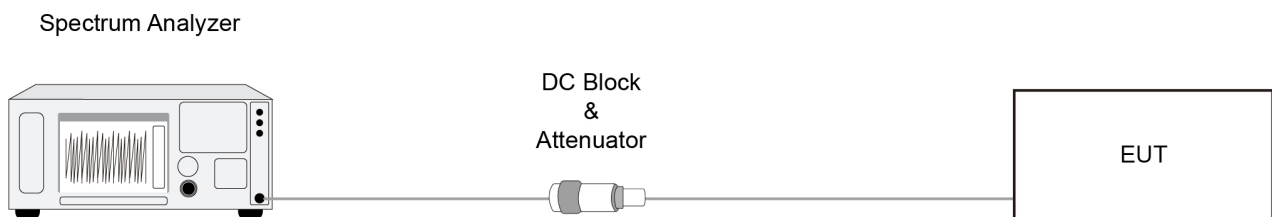
#### 6.3.2. Test Procedure

KDB 789033 D02v02r01- Section II)C)2)

#### 6.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW  $\geq 3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 6.3.4. Test Setup



#### 6.3.5. Test Result

Refer to Appendix A.3.

## 6.4. Output Power Measurement

### 6.4.1. Test Limit

For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm).

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 6.4.2. Test Procedure

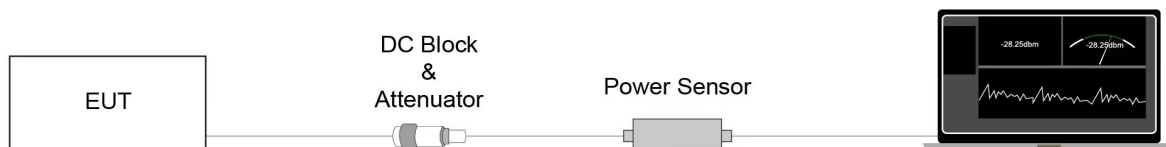
KDB 789033D02v02r01- Section II)E)3)b) Method PM-G

### 6.4.3. Test Setting

#### Average Power Measurement

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

### 6.4.4. Test Setup



### 6.4.5. Test Result

Refer to Appendix A.4.

## 6.5. Transmit Power Control Measurement

### 6.5.1. Test Limit

The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.

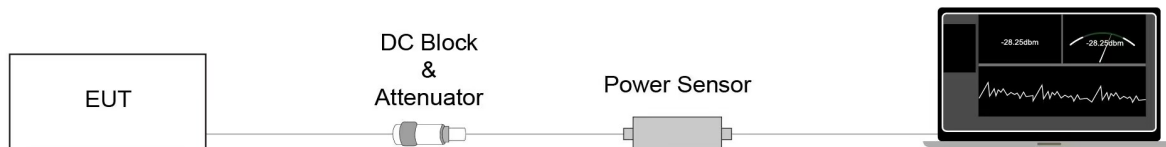
### 6.5.2. Test Procedure

KDB 789033 D02v01- Section II(E)3)b) Method PM-G

### 6.5.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

### 6.5.4. Test Setup



### 6.5.5. Test Result

Device supports TPC mechanism, details refer to the operational description.

## **6.6. Power Spectral Density Measurement**

### **6.6.1. Test Limit**

For the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **6.6.2. Test Procedure**

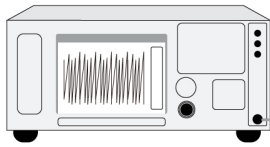
KDB 789033 D02v02r01-Section II(F)

### **6.6.3. Test Setting**

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz (510kHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz)
4. VBW = 3 × RBW
5. Number of sweep points  $\geq 2 \times (\text{span} / \text{RBW})$
6. Detector = power averaging (Average)
7. Sweep time = auto
8. Trigger = free run
9. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
10. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
11. Add  $10 \cdot \log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \cdot \log(1/0.25) = 6$  dB if the duty cycle is 25 percent.

#### 6.6.4. Test Setup

Spectrum Analyzer



DC Block  
&  
Attenuator



#### 6.6.5. Test Result

Refer to Appendix A.5.



## 6.7. Frequency Stability Measurement

### 6.7.1. Test Limit

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

### 6.7.2. Test Procedure

#### Frequency Stability Under Temperature Variations:

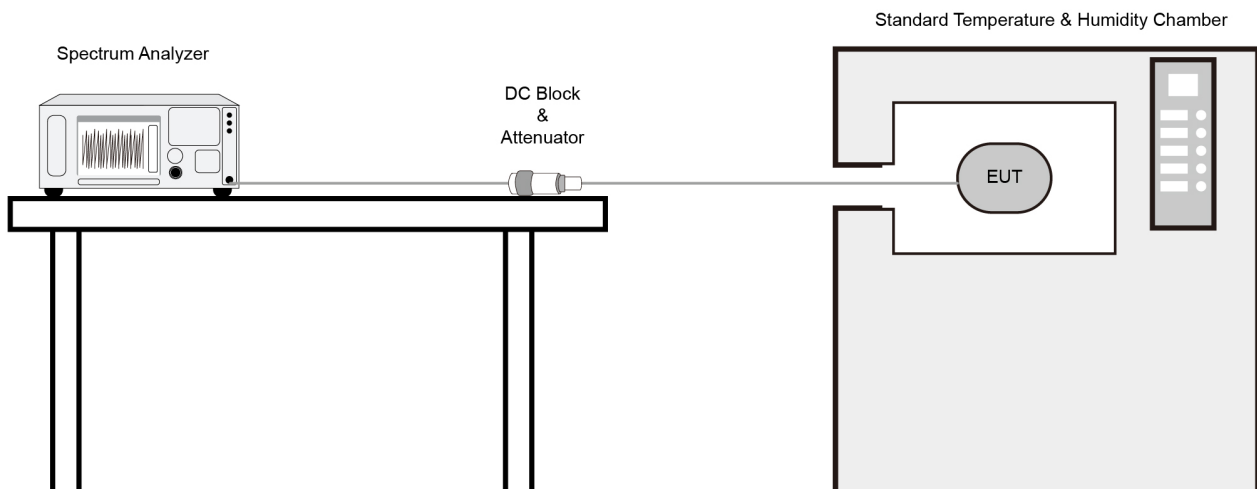
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

#### Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.

### 6.7.3. Test Setup



#### **6.7.4. Test Result**

Refer to Appendix A.6.

## 6.8. Radiated Spurious Emission Measurement

### 6.8.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

### 6.8.2. Test Procedure

KDB 789033 D02v02r01- Section II)G)

### 6.8.3. Test Setting

**Table 1 - RBW as a function of frequency**

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000MHz	1MHz

**Quasi-Peak Measurements below 1GHz**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

**Peak Measurements above 1GHz**

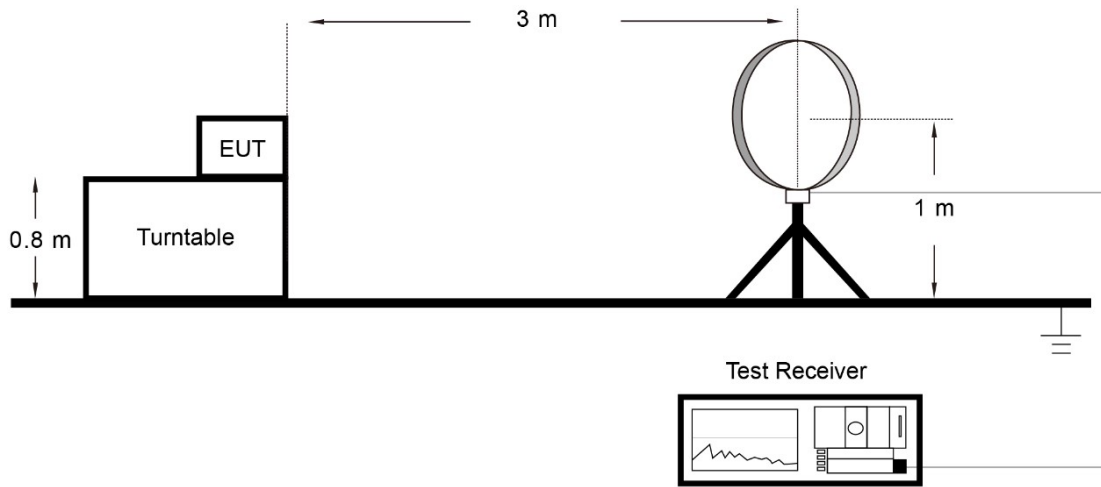
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

**Average Measurements above 1GHz (Method VB)**

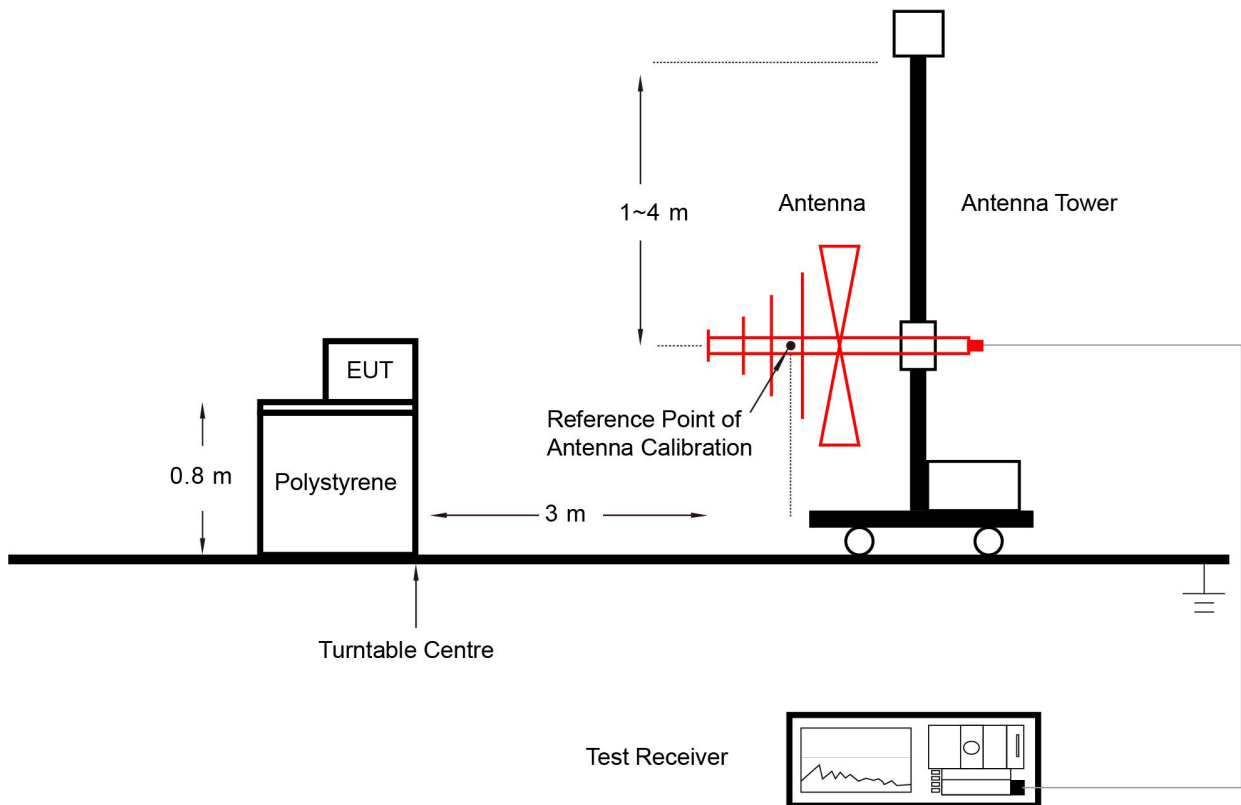
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10 Hz.  
If the EUT duty cycle is  $< 98\%$ , set VBW  $\geq 1/T$ . T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

### 6.8.4. Test Setup

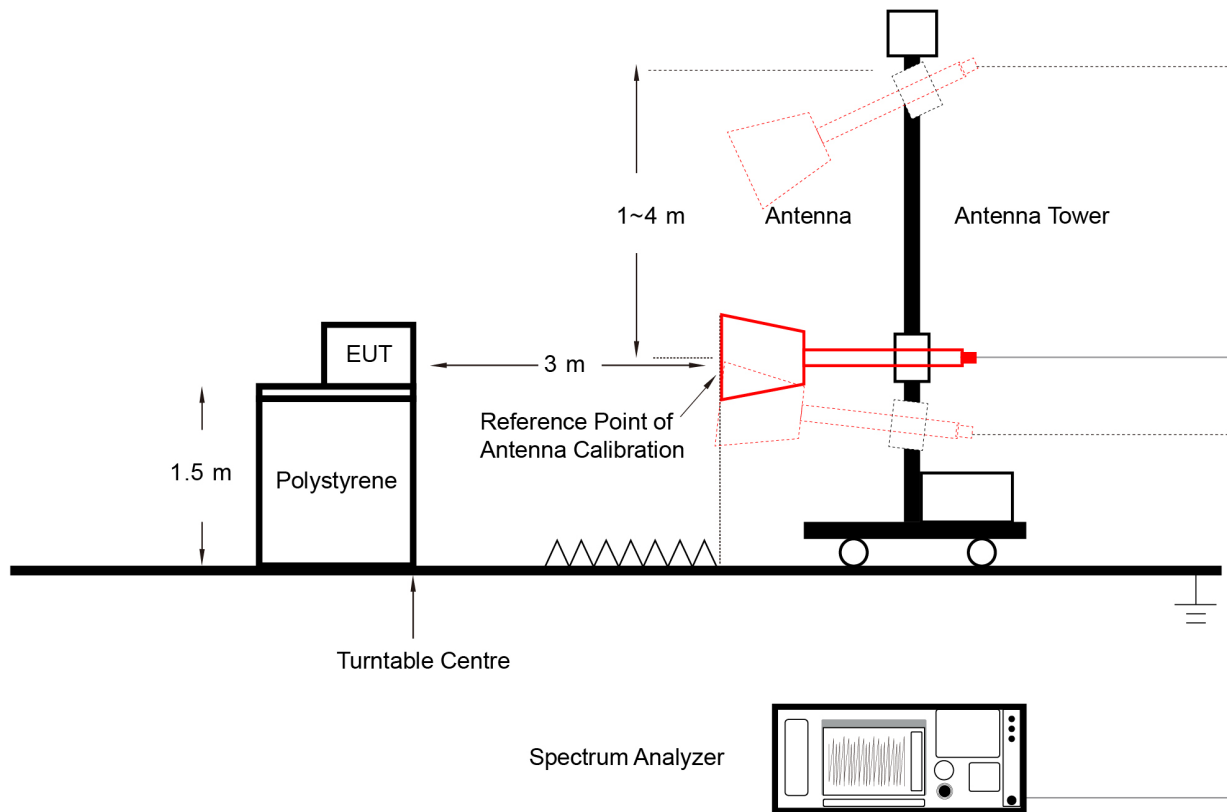
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.8.5. Test Result

Refer to Appendix A.7.

## 6.9. Radiated Restricted Band Edge Measurement

### 6.9.1. Test Limit

#### For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41	--	--	--

**For 15.407(b) requirement:**

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Refer to KDB 789033 D02v02r01 G)2)c), as specified in § 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a maximum emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in § 15.407(b)(4)). However, an out-of-band emission that complies with both the peak and average limits of § 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz maximum emission limit.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3



### 6.9.2. Test Procedure

KDB 789033 D02v02r01- Section II)G)

### 6.9.3. Test Setting

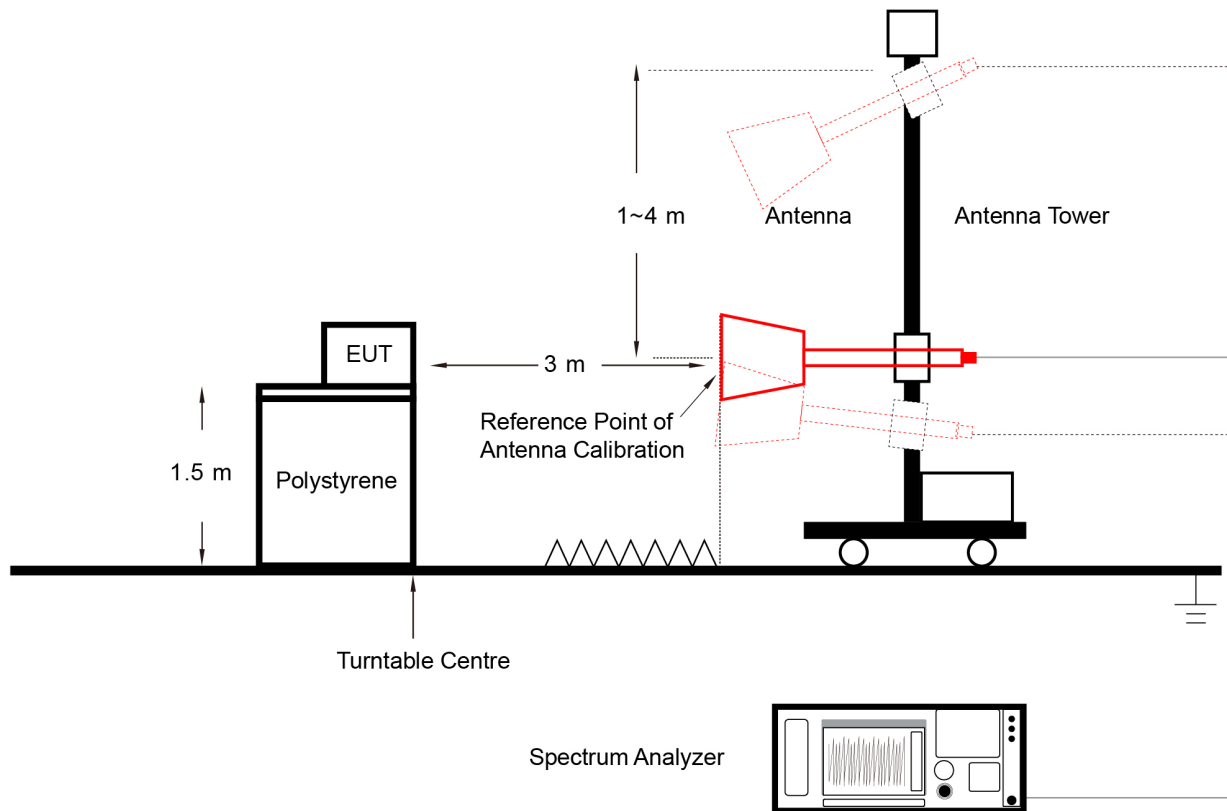
#### **Peak Measurements above 1GHz**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

#### **Average Measurements above 1GHz (Method VB)**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; if the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10Hz
4. If the EUT duty cycle is  $< 98\%$ , set VBW  $\geq 1/T$ . T is the minimum transmission duration
5. Detector = Peak
6. Sweep time = Auto
7. Trace mode = Max hold
8. Trace was allowed to stabilize

### 6.9.4. Test Setup



### 6.9.5. Test Result

Refer to Appendix A.8.

## 6.10. AC Conducted Emissions Measurement

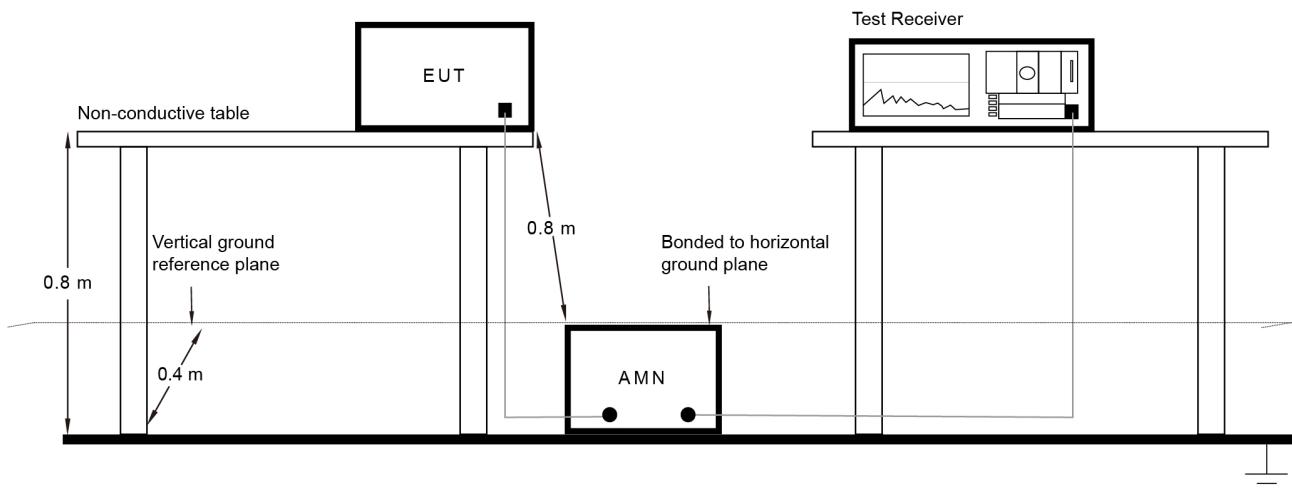
### 6.10.1. Test Limit

FCC Part 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

### 6.10.2. Test Setup



### 6.10.3. Test Result

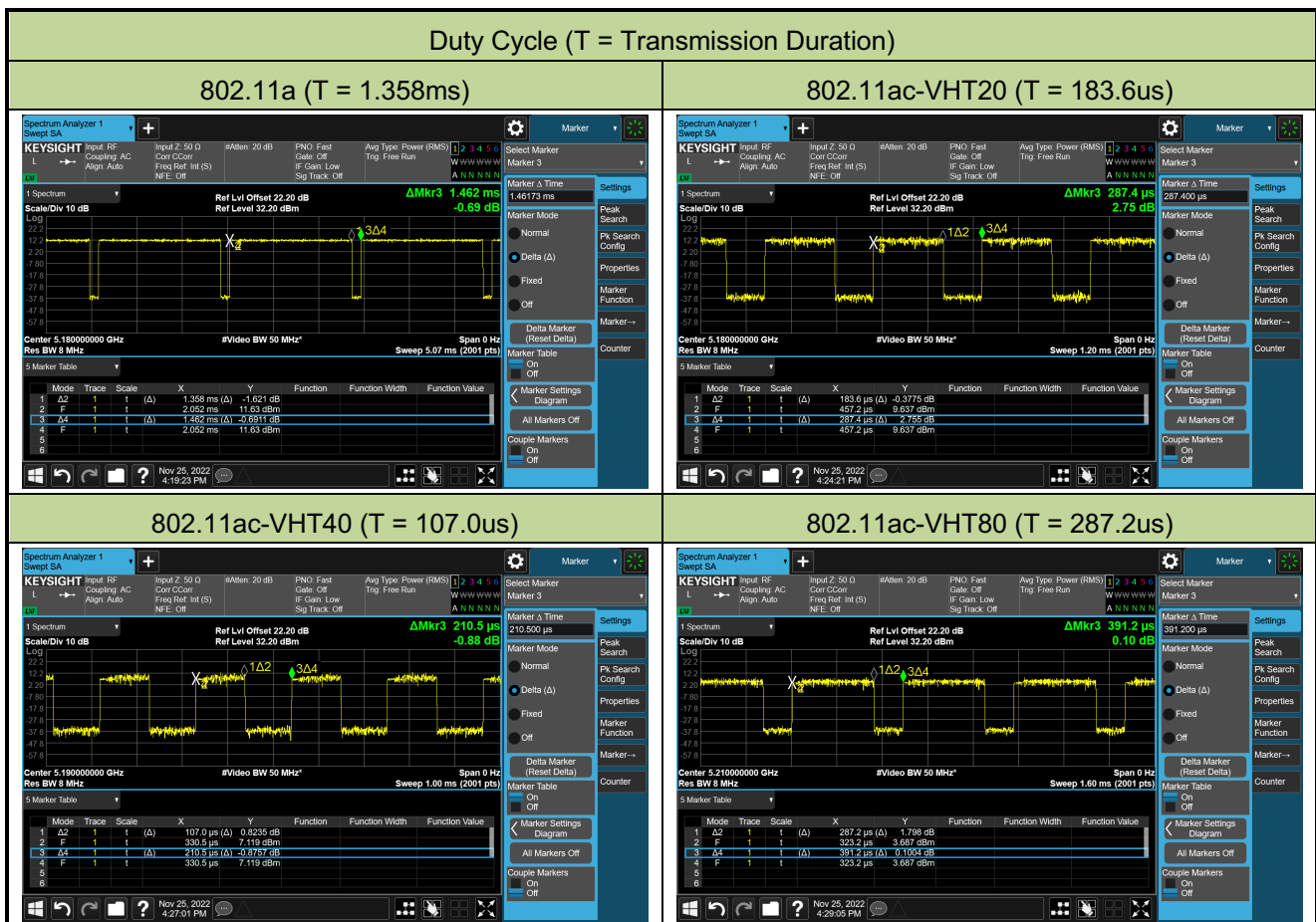
Refer to Appendix A.9.

## Appendix A – Test Result

### A.1 Duty Cycle Test Result

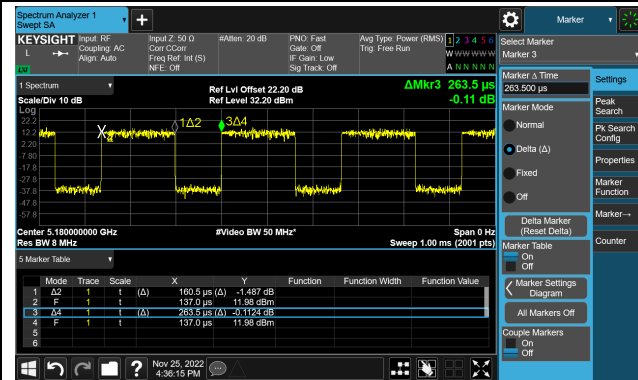
Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2022-11-25		

Test Mode	Duty Cycle
802.11a	92.89%
802.11ac-VHT20	63.88%
802.11ac-VHT40	50.83%
802.11ac-VHT80	73.42%
802.11ax-HE20	60.91%
802.11ax-HE40	51.64%
802.11ax-HE80	72.96%

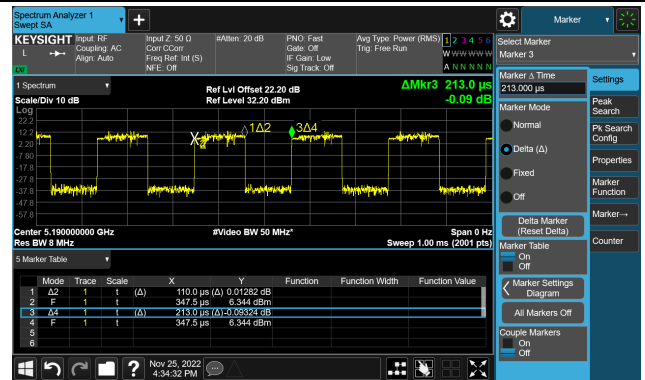


Duty Cycle (T = Transmission Duration)

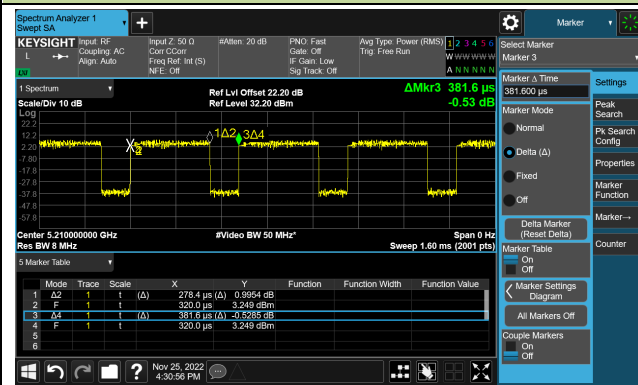
802.11ax-HE20 (T = 160.5us)



802.11ax-HE40 (T = 110.0us)



802.11ax-HE80 (T = 278.4us)



**A.2 26dB Bandwidth Test Result**

Test Site	SIP-TR1	Test Engineer	Alisa Deng
Test Date	2022-12-05		

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	6Mbps	36	5180	20.05	16.419
11a	6Mbps	44	5220	20.02	16.424
11a	6Mbps	48	5240	20.06	16.427
11a	6Mbps	52	5260	20.17	16.414
11a	6Mbps	60	5300	20.02	16.412
11a	6Mbps	64	5320	20.09	16.416
11a	6Mbps	100	5500	20.00	16.407
11a	6Mbps	116	5580	20.06	16.414
11a	6Mbps	140	5700	20.14	16.441
11a	6Mbps	144	5720	20.11	16.417
11a	6Mbps	149	5745	20.32	16.425
11a	6Mbps	157	5785	20.17	16.436
11a	6Mbps	165	5825	20.21	16.442
11ac-VHT20	MCS5	36	5180	20.59	17.590
11ac-VHT20	MCS5	44	5220	20.60	17.619
11ac-VHT20	MCS5	48	5240	20.50	17.623
11ac-VHT20	MCS5	52	5260	20.49	17.629
11ac-VHT20	MCS5	60	5300	20.70	17.628
11ac-VHT20	MCS5	64	5320	20.59	17.619
11ac-VHT20	MCS5	100	5500	20.67	17.603
11ac-VHT20	MCS5	116	5580	20.64	17.615
11ac-VHT20	MCS5	140	5700	20.66	17.632
11ac-VHT20	MCS5	144	5720	20.61	17.633
11ac-VHT20	MCS5	149	5745	20.65	17.649
11ac-VHT20	MCS5	157	5785	20.67	17.644
11ac-VHT20	MCS5	165	5825	20.56	17.601

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
11ac-VHT40	MCS5	38	5190	40.71	36.083
11ac-VHT40	MCS5	46	5230	41.24	36.110
11ac-VHT40	MCS5	54	5270	41.13	36.064
11ac-VHT40	MCS5	62	5310	40.95	36.089
11ac-VHT40	MCS5	102	5510	40.86	36.082
11ac-VHT40	MCS5	110	5550	41.56	36.129
11ac-VHT40	MCS5	134	5670	41.63	36.126
11ac-VHT40	MCS5	142	5710	41.36	36.118
11ac-VHT40	MCS5	151	5755	41.26	36.138
11ac-VHT40	MCS5	159	5795	41.05	36.129
11ac-VHT80	MCS0	42	5210	83.92	75.683
11ac-VHT80	MCS0	58	5290	83.57	75.727
11ac-VHT80	MCS0	106	5530	83.86	75.667
11ac-VHT80	MCS0	122	5610	84.33	75.634
11ac-VHT80	MCS0	138	5690	84.31	75.663
11ac-VHT80	MCS0	155	5775	84.01	75.592
11ax-HE20	MCS6	36	5180	21.42	18.808
11ax-HE20	MCS6	44	5220	21.40	18.822
11ax-HE20	MCS6	48	5240	21.51	18.823
11ax-HE20	MCS6	52	5260	21.52	18.806
11ax-HE20	MCS6	60	5300	21.60	18.823
11ax-HE20	MCS6	64	5320	21.68	18.790
11ax-HE20	MCS6	100	5500	21.70	18.807
11ax-HE20	MCS6	116	5580	21.57	18.807
11ax-HE20	MCS6	140	5700	21.45	18.813
11ax-HE20	MCS6	144	5720	21.41	18.798
11ax-HE20	MCS6	149	5745	21.28	18.820
11ax-HE20	MCS6	157	5785	21.36	18.820
11ax-HE20	MCS6	165	5825	21.82	18.835

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
11ax-HE40	MCS6	38	5190	41.52	37.700
11ax-HE40	MCS6	46	5230	41.58	37.683
11ax-HE40	MCS6	54	5270	41.36	37.679
11ax-HE40	MCS6	62	5310	41.56	37.675
11ax-HE40	MCS6	102	5510	41.55	37.679
11ax-HE40	MCS6	110	5550	41.61	37.700
11ax-HE40	MCS6	134	5670	41.54	37.707
11ax-HE40	MCS6	142	5710	41.67	37.702
11ax-HE40	MCS6	151	5755	41.74	37.716
11ax-HE40	MCS6	159	5795	46.50	37.782
11ax-HE80	MCS0	42	5210	80.59	76.770
11ax-HE80	MCS0	58	5290	80.28	76.708
11ax-HE80	MCS0	106	5530	80.17	76.622
11ax-HE80	MCS0	122	5610	80.48	76.637
11ax-HE80	MCS0	138	5690	80.73	76.785
11ax-HE80	MCS0	155	5775	80.37	76.749

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	F <sub>H</sub> (MHz)	Limit (MHz)
802.11a	6Mbps	48	5240	5248.21	< 5250
802.11ac-VHT20	MCS5	48	5240	5248.81	< 5250
802.11ac-VHT40	MCS5	46	5230	5248.06	< 5250
802.11ac-VHT80	MCS0	42	5210	5247.84	< 5250
802.11ax-HE20	MCS6	48	5240	5249.41	< 5250
802.11ax-HE40	MCS6	46	5230	5248.84	< 5250
802.11ax-HE80	MCS0	42	5210	5248.39	< 5250

Note:  $F_H = \text{Centre frequency} + 99\% \text{ OBW} / 2$ .

For example, 802.11a 5240MHz,  $F_H = 5240 \text{ MHz} + 16.427 \text{ MHz} / 2 = 5248.21 \text{ MHz}$ .