MEASUREMENT REPORT

FCC PART 15.255

FCC ID:	2ARPAJW-PTP6030
Applicant:	Shenzhen Jaguar Wave Technology LTD
Application Type:	Certification
Product:	Outdoor 60GHz PTP
Model No.:	JW-PTP6030
Brand Name:	JAGUAR WAVE
FCC Classification:	Part 15 Low Power Transceiver, Rx Verified (DXT)
FCC Rule Part(s):	FCC PART 15.255
Test Procedure(s):	ANSI C63.10-2013
Test Date:	September 19 ~ October 26, 2020

Reviewed By: Vincent Yu

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2009RSU045-U1	Rev. 01	Initial Report	02-05-2021	Valid

CONTENTS

1. GENERAL INFORMATION

1.1. Applicant

Shenzhen Jaguar Wave Technology LTD

Unit 1002/1003, Block 2A, Tongtai Times Center, No.6259 Baoan Road, Fuhai Street, Baoan District, Shenzhen City, P.R.China

1.2. Manufacturer

Shenzhen Jaguar Wave Technology LTD

Unit 1002/1003, Block 2A, Tongtai Times Center, No.6259 Baoan Road, Fuhai Street, Baoan District, Shenzhen City, P.R.China

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**	
	Laboratory Location (Suzhou - Wuzhong)	
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China	
	Laboratory Location (Suzhou - SIP)	
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China	
	Laboratory Accreditations	
	A2LA: 3628.01	CNAS: L10551
	FCC: CN1166	ISED: CN0001
	VCCI: R-20025, G-20034, C-20020, T-20020	
☐	**Test Site – MRT Shenzhen Laboratory**	
	Laboratory Location (Shenzhen)	
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China	
	Laboratory Accreditations	
	A2LA: 3628.02	CNAS: L10551
	FCC: CN1284	ISED: CN0105
☐	**Test Site – MRT Taiwan Laboratory**	
	Laboratory Location (Taiwan)	
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)	
	Laboratory Accreditations	
	TAF: L3261-190725	
	FCC: 291082, TW3261	ISED: TW3261

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Outdoor 60GHz PTP
Model No.	JW-PTP6030
Transmitting Frequency	58.32GHz ~ 64.80GHz
Channel Space:	2.16GHz
Channel Number	4
Date Rate:	MCS1 ~ MCS9
Antenna Gain	25dBi
Accessories	
Adapter	Model No.: G0298C-120-300 Input Power: 100 - 240V ~ 50/60Hz, 1.0A MAX Output Power: 12VDC 3A

Note: Above information is declared by manufacturer.

2.2. Test Mode

Test Mode	Mode 1: Transmit by 58.32GHz (MCS 1)
	Mode 2: Transmit by 60.48GHz (MCS 1)
	Mode 4: Transmit by 64.80GHz (MCS 1)

2.3. Operation Frequency and Channel List

Channel	Frequency	Channel	Frequency
1	58.32 GHz	2	60.48 GHz
3	62.64 GHz	4	64.80 GHz

2.4. Test Environment Condition

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

2.5. Description of Test Software

The test utility software used during testing was “PuTTY.exe”, and the version was “0.74”

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 this 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. TEST EQUIPMENT CALIBRATION DATA

Spectral Power Density / RF Output Power / Occupied Channel Bandwidth / Unwanted Emissions - SIP-AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/09/03
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2020/12/17
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06648	1 year	2020/12/17
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2020/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2020/11/15
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2020/11/13
Micro-Wave Antenna	MI-WWAVE	261U-25	MRTSUE06273	N/A	N/A
Micro-Wave Antenna	MI-WWAVE	261E-25	MRTSUE06276	N/A	N/A
Micro-Wave Antenna	MI-WWAVE	261F-25	MRTSUE06275	N/A	N/A
Micro-Wave Antenna	MI-WWAVE	261G	MRTSUE06274	N/A	N/A
Standard Gain Horn Antenna	A-INFOMW	LB-10-25-A	MRTSUE06410	N/A	N/A
Standard Gain Horn Antenna	A-INFOMW	LB-15-25-A	MRTSUE06409	N/A	N/A
Waveguide Harmonic Mixer	Keysight	M1970V	MRTSUE06271	N/A	N/A
Waveguide Harmonic Mixer	Keysight	M1970W	MRTSUE06272	N/A	N/A
RF Signal Generator	Keysight	E8257D	MRTSUE06453	N/A	N/A
SA Extension Module	Keysight	N9029AV06	MRTSUE06368	N/A	N/A
SA Extension Module	Keysight	N9029AV05	MRTSUE06367	N/A	N/A
SA Extension Module	Keysight	N9029AV03	MRTSUE06366	N/A	N/A
Millimeter wave signal source frequency expander	Keysight	E8257DV15	MRTSUE06456	N/A	N/A
RF Detector	SAGE	STD-15SF-NI	MRTSUE06466	N/A	N/A
Oscilloscope	Agilent	DSO-X 6002A	MRTSUE06107	1 year	2021/04/14
Thermal Hygrometer	testo	608-H1	MRTSUE06624	1 year	2020/12/29
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2020/12/25

Conducted Emission - SIP-SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2021/09/09
Thermal Hygrometer	testo	608-H1	MRTSUE06621	1 year	2020/12/29

Software	Version	Function
EMI Software	V3	EMI Test Software

5. 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.

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB

6. TEST RESULT

6.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.255(e)	6dB Occupied Bandwidth	N/A	Radiated	Pass	Section 6.2
15.255(c)	EIRP Power	Average Power < 40dBm Peak Power < 43dBm		Pass	Section 6.3
15.255(e)	Conducted Output Power	< 500mW		Pass	Section 6.4
15.255(d)	Transmitter Spurious Emissions	Refer to Section 6.5		Pass	Section 6.5
15.255(f)	Frequency stability	Within the frequency band 57-71GHz		Pass	Section 6.6
15.255(h)	Group Installation	Refer to Section 6.7	N/A	Pass	Section 6.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 6.8

Notes:

1. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case data is shown in the report.
2. The EUT is configured to operate at the Modulation and Coding Scheme index (MCS) giving the maximum output power in this report. The assessment data are shown in section 6.3.

6.2. 6dB Occupied Bandwidth

6.2.1. Test Limit

N/A

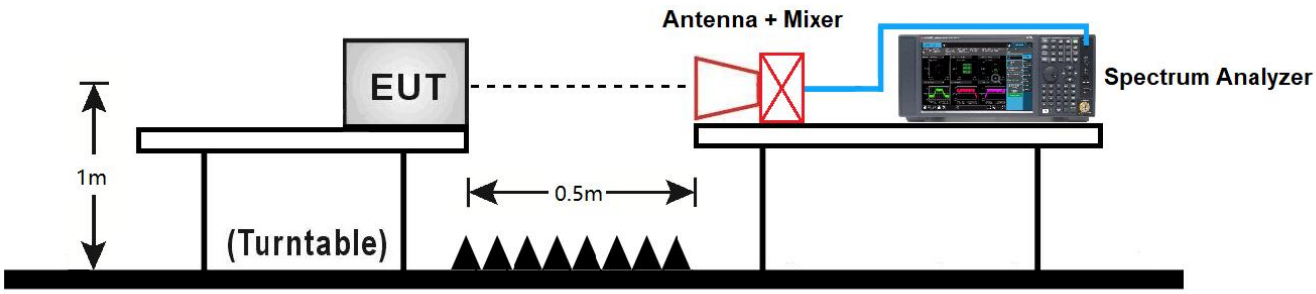
6.2.2. Test Procedure used

ANSI C63.10-2013 Section 9.3

6.2.3. Test Setting

1. Span = approximately two times to three times the EBW, centered on the carrier frequency
2. RBW = 8MHz
3. VBW = 50MHz
4. Detector function = Peak
5. Sweep time = auto
6. Trace mode = max hold.
7. The EUT shall be transmitting at its maximum data rate. Allow the trace to stabilize.
8. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure the specified dB down one side of the emission.
9. Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker- delta frequency reading at this point is the specified emission bandwidth.

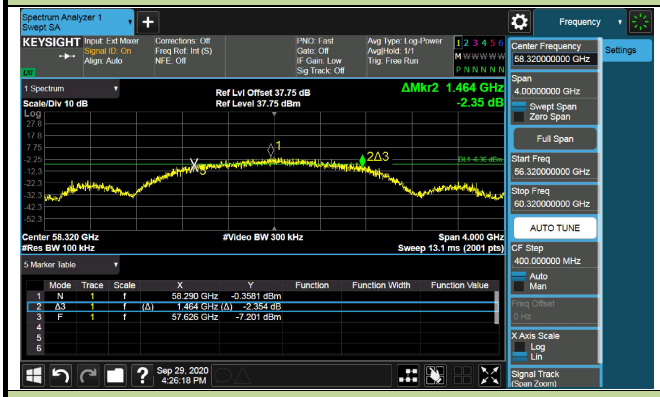
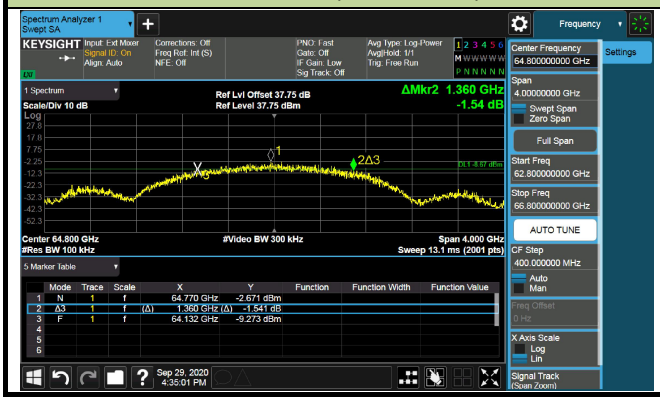
6.2.4. Test Setup



6.2.5. Test Result

Product	Outdoor 60GHz PTP	Test Engineer	Ternence Wang
Test Site	SIP-AC2	Test Date	2020/09/29

Channel No.	Frequency (GHz)	Date Rate	6dB Bandwidth (GHz)
1	58.32	MCS 1	1.46
2	60.48	MCS 1	1.38
4	64.80	MCS 1	1.36

<table>
<tr><th colspan="2">6dB Bandwidth</th></tr>
<tr><td>Channel 1 (58.32GHz)</td><td>Channel 2 (60.48GHz)</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Channel 4 (64.80GHz)</td><td></td></tr>
<tr><td> 
</td><td></td></tr>
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6.3. EIRP Power

6.3.1.Test Limit

Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropic radiated power (EIRP): the average power of any emission shall not exceed 40dBm and the peak power of any emission shall not exceed 43dBm.

6.3.2.Test Procedure used

ANSI C63.10-2013 Section 9.11

Note: Far-field boundary calculation as below.

According to ANSI C63.10-2013, Clause 9, for mm-wave measurements, L >> λ and a more suitable formula for the far-field boundary distance: $R_{(Far\ Field)} = 2L^2/\lambda$

- L is the largest antenna dimension of the transmit antenna in m
- λ is the wavelength in m

Far-field boundary calculation				
Channel No.	Frequency (GHz)	λ (m)	L (m)	$R_{(Far\ Field)}$ (m)
1	58.32	0.0051	0.03	0.35
2	60.48	0.0050	0.03	0.36
3	62.64	0.0048	0.03	0.38
4	64.80	0.0046	0.03	0.39

The measurement was performed at a minimum distance of 0.50m > $R_{(Far\ Field)}$

6.3.3.Test Setting

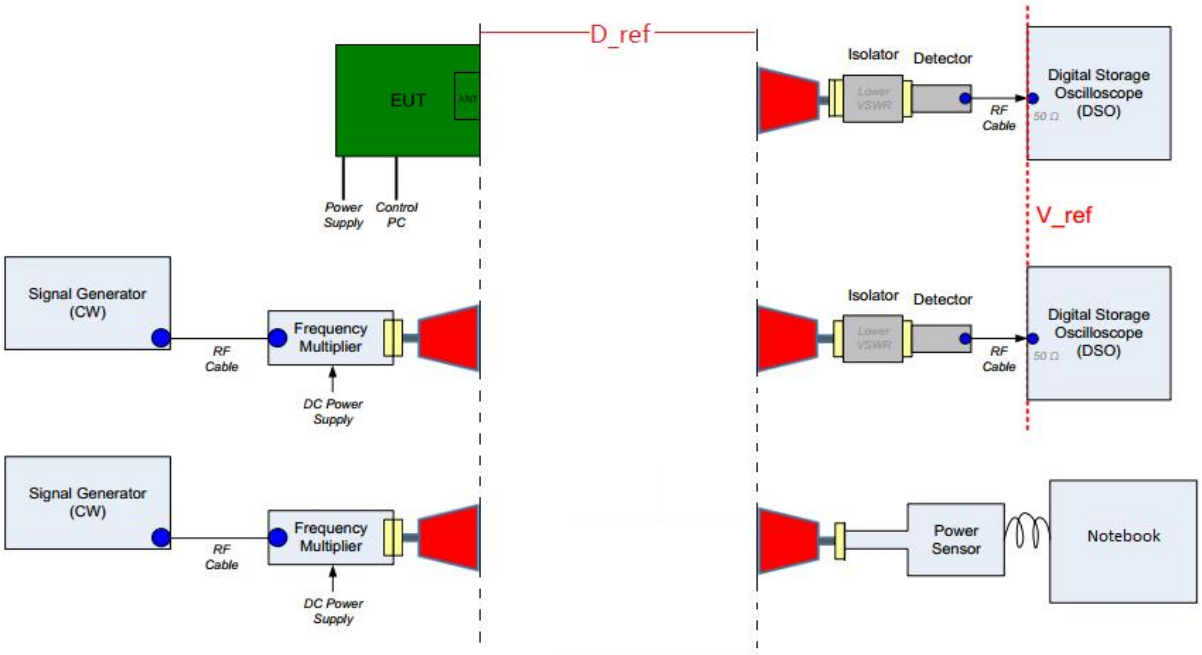
1. Connect the test antenna for the fundamental frequency band to the mm-wave RF detector. Place the test horn in the main beam of the EUT at 0.3m. Connect the video output of the detector to the 50Ω input of a DSO. Set the sampling rate of the DSO to at least twice the cutoff frequency of any LPF used or to at least twice the signal bandwidth without a LPF. Adjust the memory depth, the triggering, and the sweep speed to obtain a display that is representative of the signal considering the type of modulation.
2. Record the average and peak voltages from the DSO.
3. Replace the EUT with mm-wave source to the RF input port of the instrumentation system. The mm-wave source shall be unmodulated.
4. Adjust the frequency of the mm-wave source to the center of the frequency range occupied by the transmitter. Adjust the amplitude of the mm-wave source such that the DSO indicates a voltage

equal to the peak voltage recorded in step 2.

5. Without changing any settings, replace the DSO with the mm-wave power meter. Measure and note the power.

6. Repeat step 4 and step 5 for the average voltage recorded in step 2.

6.3.4. Test Setup



6.3.5.Test Results

Power output test was verified over all data rates, and then choose the maximum power output (Gray Marker) for final test of each channel.

Output power at various data rates for Channel 1 (58.32GHz):

Channel No.	Frequency (GHz)	Date Rate	Average EIRP (dBm)
1	58.32	MCS 1	32.99
		MCS 2	32.74
		MCS 3	32.58
		MCS 4	32.23
		MCS 5	32.19
		MCS 6	32.10
		MCS 7	31.97
		MCS 8	31.90
		MCS 9	31.82

Product	Outdoor 60GHz PTP	Test Engineer	Ternence Wang
Test Site	SIP-AC2	Test Date	2020/10/12

Channel No.	Frequency (GHz)	Date Rate	D (m)	Measured Voltage (mV)	P_R (dBm)	G_R (dBi)	EIRP (W)	EIRP (dBm)	Limit (dBm)	Result
Peak EIRP										
1	58.32	MCS 1	0.50	-31.69	-3.15	24.49	2.5663	34.09	43	Pass
2	60.48	MCS 1	0.50	-35.92	-5.62	24.34	1.6177	32.09	43	Pass
4	64.80	MCS 1	0.50	-41.33	-7.99	24.79	0.9701	29.87	43	Pass
Average EIRP										
1	58.32	MCS 1	0.50	-28.78	-4.25	24.49	1.9921	32.99	40	Pass
2	60.48	MCS 1	0.50	-29.93	-6.94	24.34	1.1937	30.77	40	Pass
4	64.80	MCS 1	0.50	-34.81	-9.70	24.79	0.6544	28.16	40	Pass

Note:

The measured power level (P_R) is converted to EIRP using Friis equation:

$$EIRP\ (W) = P_T * G_T = (P_R / G_R) * (4 * Pi * D / \lambda)^2$$

- P_R is the equivalent power measured at the output of the test antenna, in W
- λ is the wavelength of the emission under investigation, in m
- G_R is the linear gain of the test antenna, $G_{R\ (Numeric)}$ = 10^(dBi / 10)
- D is the measurement distance, in m

6.4. Conducted Output Power

6.4.1.Test Limit

The peak transmitter conducted output power shall not exceed 500mW.

Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500mW times their emission bandwidth divided by 100MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer.

6.4.2.Test Procedure used

ANSI C63.10-2013 Section 9.11

6.4.3.Test Procedure

For peak measurements, calculate the peak conducted output power from the peak EIRP using below equation:

$$P_{cond} = EIRP_{Linear} / G_{EUT}$$

Where

P_{cond} is the conducted output power, in W

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in W

G_{EUT} is numeric gain of the EUT radiating element (antenna)

6.4.4.Test Setup

N/A

6.4.5.Test Result

Product	Outdoor 60GHz PTP	Test Engineer	Ternence Wang
Test Site	SIP-AC2	Test Date	2020/10/12

Channel No.	Frequency (GHz)	Date Rate	Peak EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	Limit (mW)	Result
1	58.32	MCS 1	34.09	25.00	9.09	8.11	500	Pass
2	60.48	MCS 1	32.09	25.00	7.09	5.12	500	Pass
4	64.80	MCS 1	29.87	25.00	4.87	3.07	500	Pass

Note: The 6dB Bandwidth is greater than 100MHz, so the limit of the Output Power is 500mW.

6.5. Transmitter Spurious Emissions

6.5.1.Test Limit

Limits on spurious emissions:

1. Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

2. Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90pW/cm^2 at a distance of 3 meters.

3. The levels of the spurious emissions shall not exceed the level of the fundamental emission.

FCC Part 15.209 Limit		
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 80	100**	3
80 ~ 216	150**	3
216 ~ 960	200**	3
Above 960	500	3
Note 1: The lower limit shall apply at the transition frequency. Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system. Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m).		

6.5.2.Test Procedure used

ANSI C63.10-2013 Section 9.12 and Section 9.13

6.5.3.Test Procedure

Measurement of harmonic and spurious emissions above 40 GHz

1. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer.
2. Set spectrum analyzer RBW = 1MHz, VBW = 3MHz, average detector.
3. Maximize all observed emissions. Note the maximum power indicated on the spectrum analyzer. Adjust this reading, if necessary, by the conversion loss of the external mixer used at the frequency under investigation and the external mixer IF cable loss.
4. Calculate the maximum field strength of the emission at the measurement distance
5. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit
6. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

Measurement of harmonic and spurious emissions below 40 GHz

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

Table 1 - RBW as a function of frequency

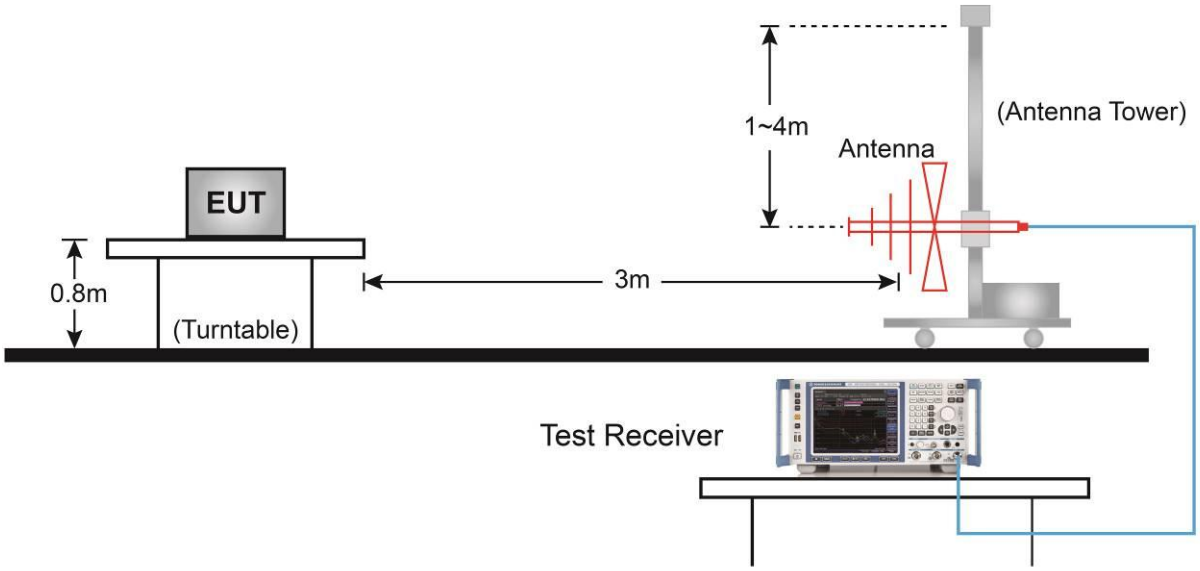
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

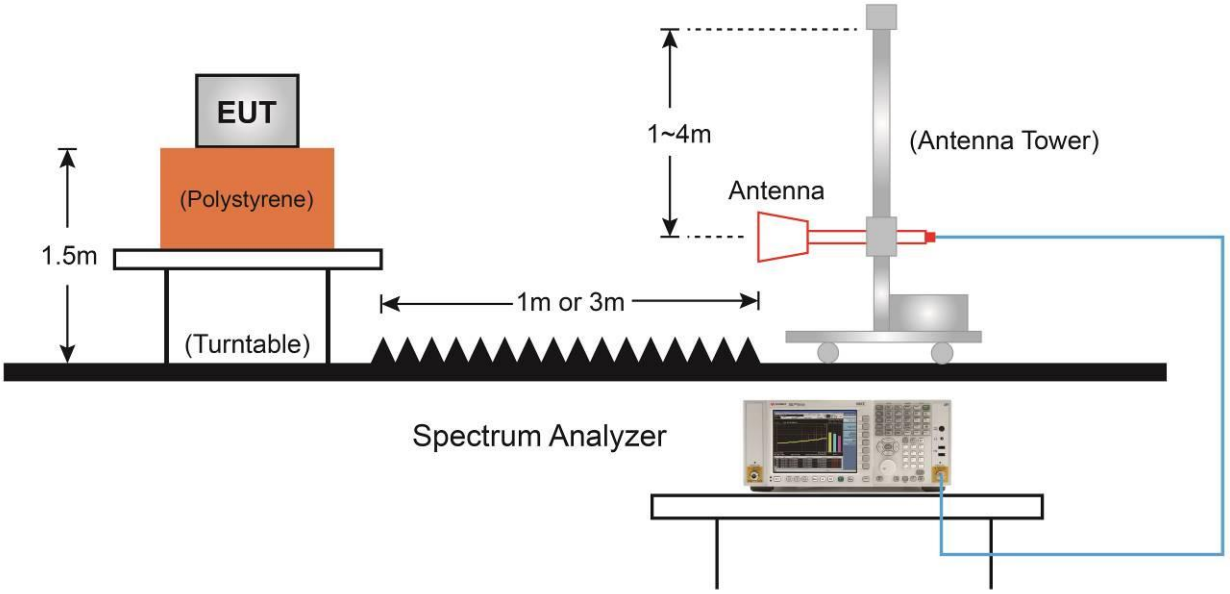
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to “Voltage” regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

6.5.4.Test Setup

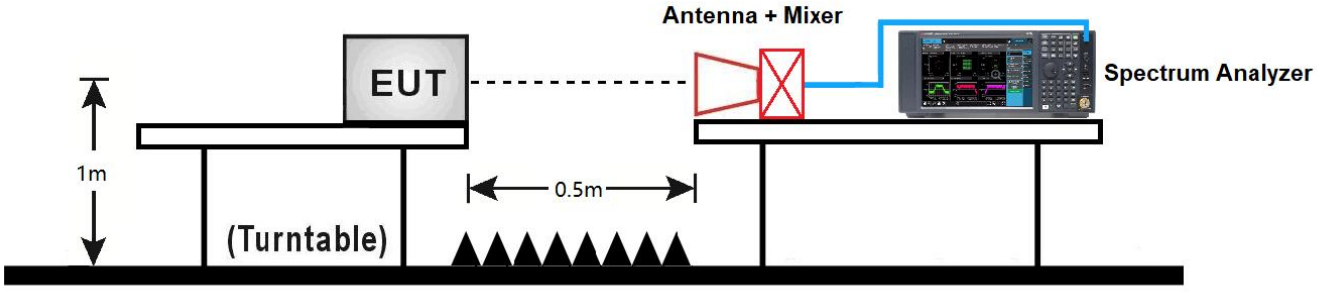
Below 1GHz Test Setup:



1GHz ~ 40GHz Test Setup:



Above 40GHz Test Setup:



6.5.5.Test Result

Product	Outdoor 60GHz PTP	Test Engineer	Ternence Wang
Test Site	SIP-AC2	Test Date	2020/09/19 ~ 2020/10/26
Test Range	Below 40GHz		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Channel 1 (58.32GHz)							
15832.5	46.2	3.8	50.0	74.0	-24.0	Peak	Horizontal
17600.5	49.1	5.3	54.4	74.0	-19.6	Peak	Horizontal
17600.2	44.5	5.3	49.8	54.0	-4.2	Average	Horizontal
26965.0	57.2	-7.4	49.8	74.0	-24.2	Peak	Horizontal
30617.0	58.7	-9.2	49.5	74.0	-24.5	Peak	Horizontal
14081.5	49.5	0.9	50.4	74.0	-23.6	Peak	Vertical
16045.0	46.5	3.7	50.2	74.0	-23.8	Peak	Vertical
26800.0	57.1	-7.5	49.6	74.0	-24.4	Peak	Vertical
29484.0	59.1	-9.0	50.1	74.0	-23.9	Peak	Vertical
Channel 2 (60.48GHz)							
15730.5	46.9	3.4	50.3	74.0	-23.7	Peak	Horizontal
17600.5	49.3	5.3	54.6	74.0	-19.4	Peak	Horizontal
17600.2	45.1	5.3	50.4	54.0	-3.6	Average	Horizontal
26976.0	56.9	-7.3	49.6	74.0	-24.4	Peak	Horizontal
29781.0	58.2	-9.0	49.2	74.0	-24.8	Peak	Horizontal
15688.0	47.7	2.5	50.2	74.0	-23.8	Peak	Vertical
16750.5	47.1	4.4	51.5	74.0	-22.5	Peak	Vertical
26822.0	56.7	-7.2	49.5	74.0	-24.5	Peak	Vertical
31970.0	60.4	-9.4	51.0	74.0	-23.0	Peak	Vertical

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Channel 4 (64.80GHz)							
15722.0	50.8	0.0	50.8	74.0	-23.2	Peak	Horizontal
17600.5	48.8	5.3	54.1	74.0	-19.9	Peak	Horizontal
17600.1	45.0	5.3	50.3	54.0	-3.7	Average	Horizontal
26822.0	57.1	-7.2	49.9	74.0	-24.1	Peak	Horizontal
29473.0	59.2	-8.9	50.3	74.0	-23.7	Peak	Horizontal
15654.0	47.6	2.7	50.3	74.0	-23.7	Peak	Vertical
17158.5	47.6	4.6	52.2	74.0	-21.8	Peak	Vertical
26910.0	56.6	-6.7	49.9	74.0	-24.1	Peak	Vertical
31002.0	59.7	-9.3	50.4	74.0	-23.6	Peak	Vertical

Note:

1. Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

   Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

2. Average measurement was not performed when the peak level lower than average limit.

Product	Outdoor 60GHz PTP	Test Engineer	Ternence Wang
Test Site	SIP-AC2	Test Date	2020/09/19 ~ 2020/10/26
Test Range	40GHz ~ 200GHz		

Frequency (GHz)	Reading Level @ 0.5m (dBμV)	Factor (dB)	Measure Level @ 0.5m (dBμV/m)	Measure Level @ 3m (dBμV/m)	Power Density (pW/cm^2)	Limit (pW/cm^2)	Result
Channel 1 (58.32GHz)							
49.1	25.4	45.8	71.2	55.6	0.1	90.0	Pass
65.5	32.7	41.4	74.1	58.5	0.2	90.0	Pass
83.6	40.0	44.3	84.3	68.7	2.0	90.0	Pass
127.6	14.2	57.6	71.8	56.2	0.1	90.0	Pass
147.6	8.7	60.2	68.9	53.3	0.1	90.0	Pass
Channel 2 (60.48GHz)							
49.2	26.0	45.7	71.7	56.1	0.1	90.0	Pass
66.9	32.8	41.6	74.4	58.8	0.2	90.0	Pass
84.0	43.3	44.3	87.6	72.0	4.2	90.0	Pass
111.9	13.9	58.5	72.4	56.8	0.1	90.0	Pass
192.0	14.6	60.9	75.5	59.9	0.3	90.0	Pass
Channel 4 (64.80GHz)							
49.0	25.5	46.3	71.8	56.2	0.1	90.0	Pass
71.4	32.1	42.3	74.4	58.8	0.2	90.0	Pass
94.6	36.6	44.3	80.9	65.3	0.9	90.0	Pass
114.8	13.8	57.8	71.6	56.0	0.1	90.0	Pass
140.0	15.4	60.1	75.5	59.9	0.3	90.0	Pass

Note:

1. Measure Level @ 0.5m = Reading Level @0.5m + Factor

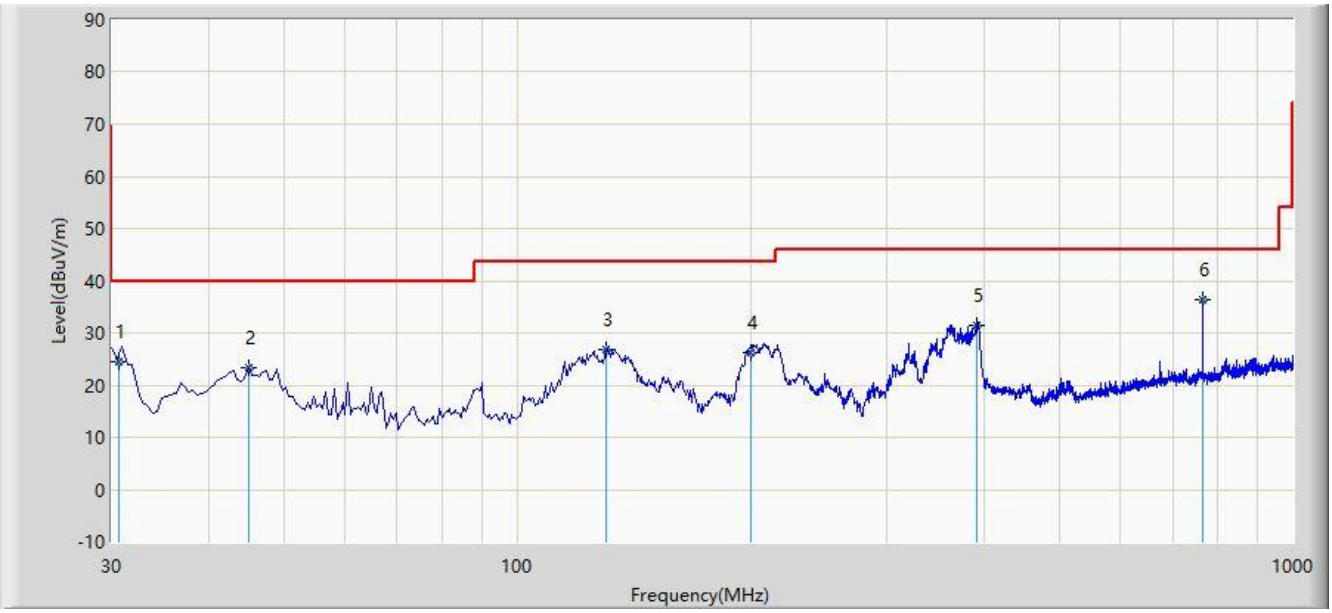
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)

2. Measure Level @ 3m = Measure Level @ 0.5m + 20 * log(0.5m / 3m)

3. Power Density = $(10^8 / 377) * \{10^{[(\text{Measure Level @3m } -120) / 20]}\}^2$

The Radiated Emission below 1GHz:

Site: SIP-AC2	Time: 2020/09/21 - 18:45
Limit: FCC_Part15.209_RSE(3m)	Engineer: Stephen Dong
Probe: AC2_VULB 9168 _20-2000MHz-yuanqu	Polarity: Horizontal
EUT: Outdoor 60GHz PTP	Power: AC 120V/60Hz
Test Mode: Transmit at channel 1 - 58.32GHz	



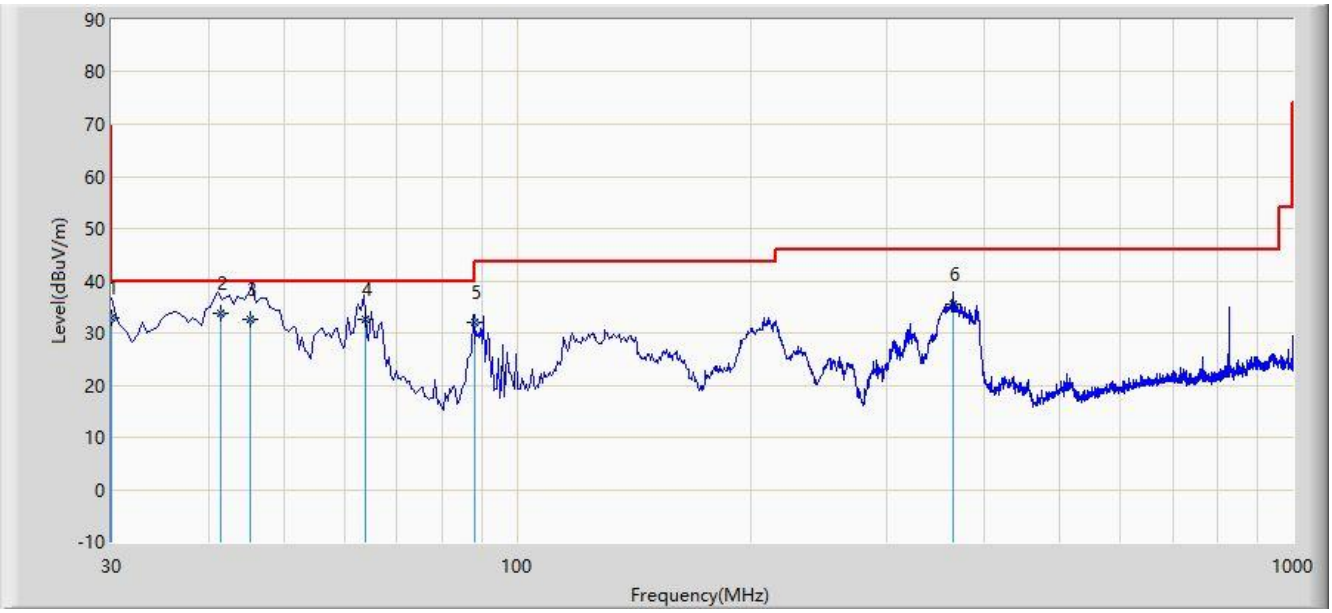
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			30.640	24.526	11.046	-15.474	40.000	13.480	QP
2			45.150	23.431	9.460	-16.569	40.000	13.972	QP
3			130.463	26.743	13.400	-16.757	43.500	13.343	QP
4			200.041	26.114	15.569	-17.386	43.500	10.545	QP
5			391.455	31.500	16.010	-14.500	46.000	15.491	QP
6		*	765.344	36.293	14.600	-9.707	46.000	21.693	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

Site: SIP-AC2	Time: 2020/09/21 - 18:49
Limit: FCC_Part15.209_RSE(3m)	Engineer: Stephen Dong
Probe: AC2_VULB 9168 _20-2000MHz-yuanqu	Polarity: Vertical
EUT: Outdoor 60GHz PTP	Power: AC 120V/60Hz
Test Mode: Transmit at channel 1 - 58.32GHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			30.012	32.901	19.450	-7.099	40.000	13.452	QP
2		*	41.540	33.686	19.460	-6.314	40.000	14.226	QP
3			45.343	32.561	18.600	-7.439	40.000	13.960	QP
4			63.634	32.558	20.151	-7.442	40.000	12.407	QP
5			88.015	31.957	22.125	-11.543	43.500	9.832	QP
6			365.640	35.644	20.646	-10.356	46.000	14.998	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

6.6. Frequency Stability

6.6.1.Test Limit

Fundamental emissions must be contained within the frequency bands 57 - 71GHz during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

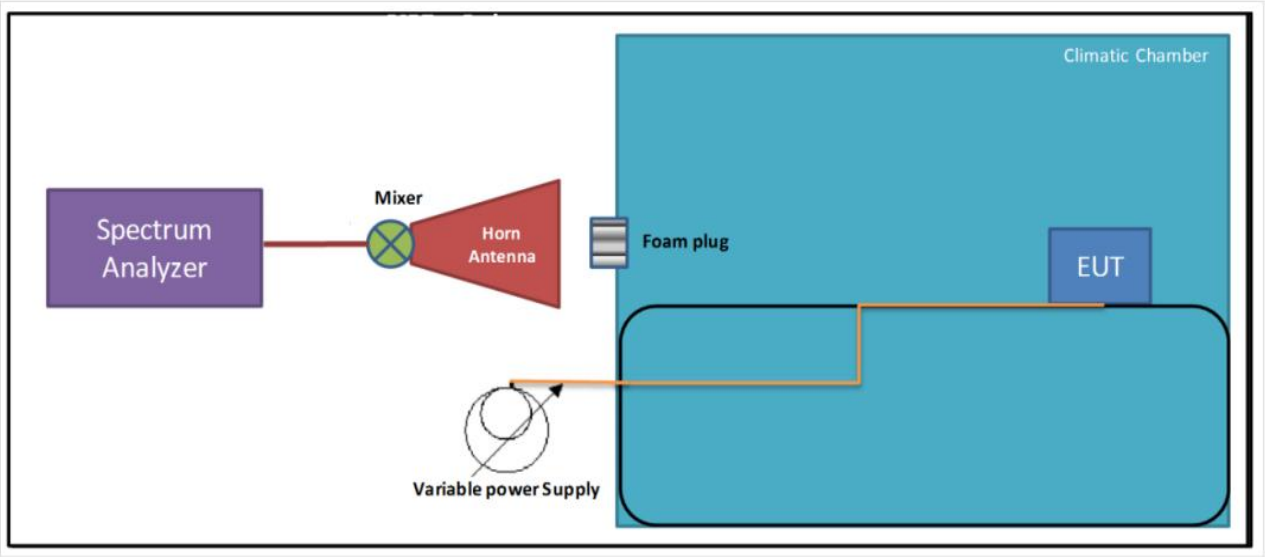
6.6.2.Test Procedure used

ANSI C63.10-2013 Section 9.14

6.6.3.Test Procedure

1. Arrange EUT and test equipment according Section 6.6.4.
2. With the EUT at ambient temperature and voltage source set to the EUT nominal operating voltage (100%), record the spectrum mask of the EUT emission on the spectrum analyzer.
3. Vary EUT power supply between 85% and 115% of nominal, and record the frequency excursion of the EUT emission mask.
4. Set the power supply to 100% nominal setting, and raise EUT operating temperature to 50 °C.
5. Record the frequency excursion of the EUT emission mask.
6. Repeat step 5 at each 10°C increment down to -20 °C.

6.6.4.Test Setup



6.6.5.Test Result

Product	Outdoor 60GHz PTP	Test Engineer	Ternence Wang
Test Mode	Carrier Mode	Test Site	SIP-AC2

Voltage (%)	Power (VAC)	Temp (℃)	Channel 1 (GHz)	Channel 4 (GHz)	Limit (GHz)	Result
100%	120	- 20	58.320050	64.800077	57 ~ 71	Pass
		- 10	58.319987	64.799920	57 ~ 71	Pass
		0	58.320091	64.800031	57 ~ 71	Pass
		+ 10	58.320083	64.800092	57 ~ 71	Pass
		+ 20 (Ref)	58.319951	64.800052	57 ~ 71	Pass
		+ 30	58.319907	64.799988	57 ~ 71	Pass
		+ 40	58.319957	64.799928	57 ~ 71	Pass
		+ 50	58.319950	64.799983	57 ~ 71	Pass
115%	138	+ 20	58.319997	64.800080	57 ~ 71	Pass
85%	102	+ 20	58.319971	64.799975	57 ~ 71	Pass

6.7. Group Installation

6.7.1.Test Limit

Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

6.7.2.Test Procedure used

N/A

6.7.3.Test Procedure

N/A

6.7.4.Test Setup

N/A

6.7.5.Test Result

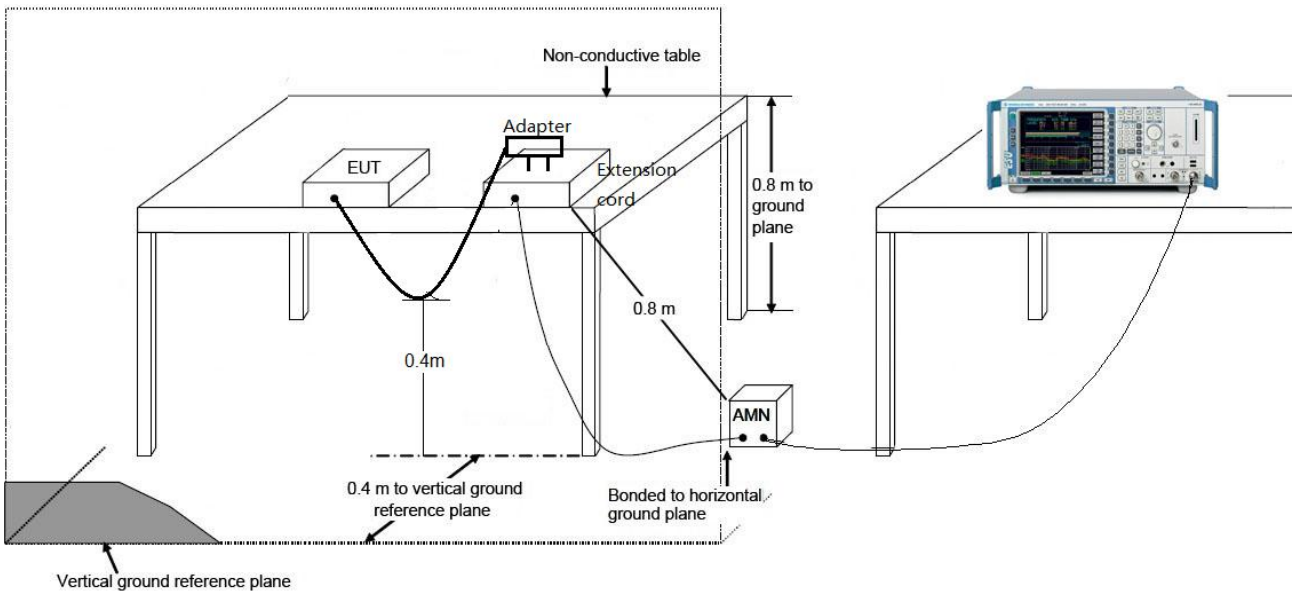
The frequency, amplitude and phase of the transmit signal are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array.

6.8. AC Conducted Emissions Measurement

6.8.1.Test Limit

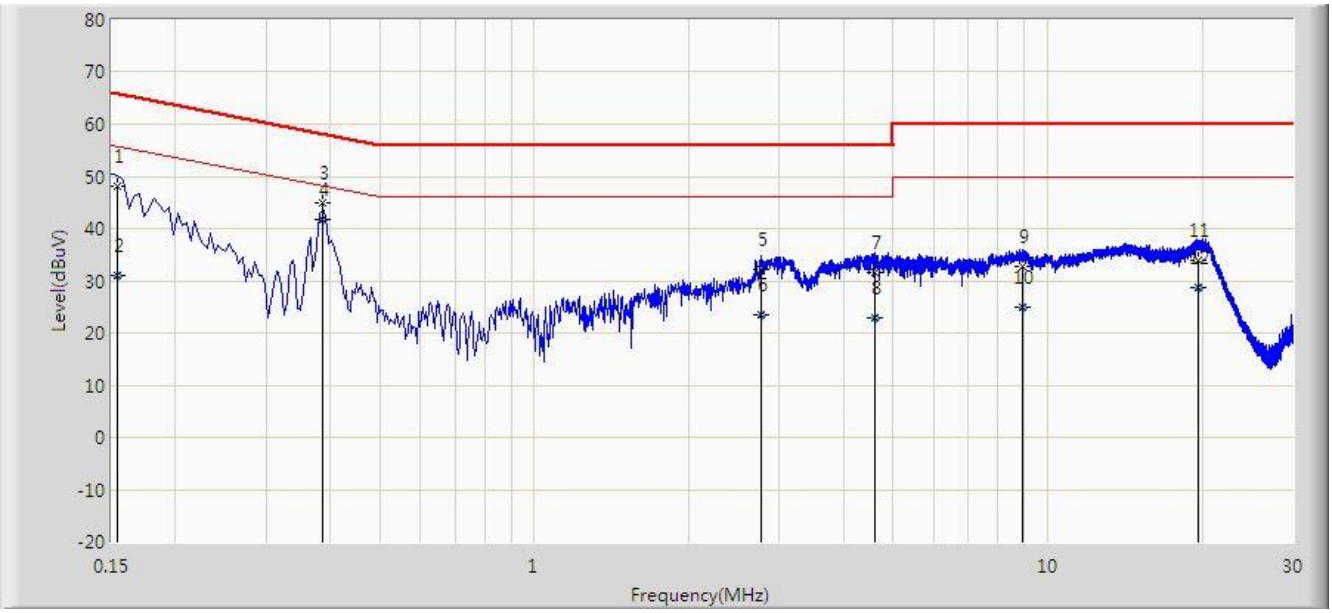
FCC 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 ~ 0.50	66 ~ 56	56 ~ 46
0.50 ~ 5.0	56	46
5.0 ~ 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

6.8.2.Test Setup



6.8.3.Test Result

Site: SIP-SR2	Time: 2020/09/25 - 17:03
Limit: FCC_Part15.107_CE_AC Power_ClassB	Engineer: Kyrie Xie
Probe: ENV216_101684_Filter On	Polarity: Line
EUT: Outdoor 60GHz PTP	Power: AC 120V/60Hz
Test Mode 1	

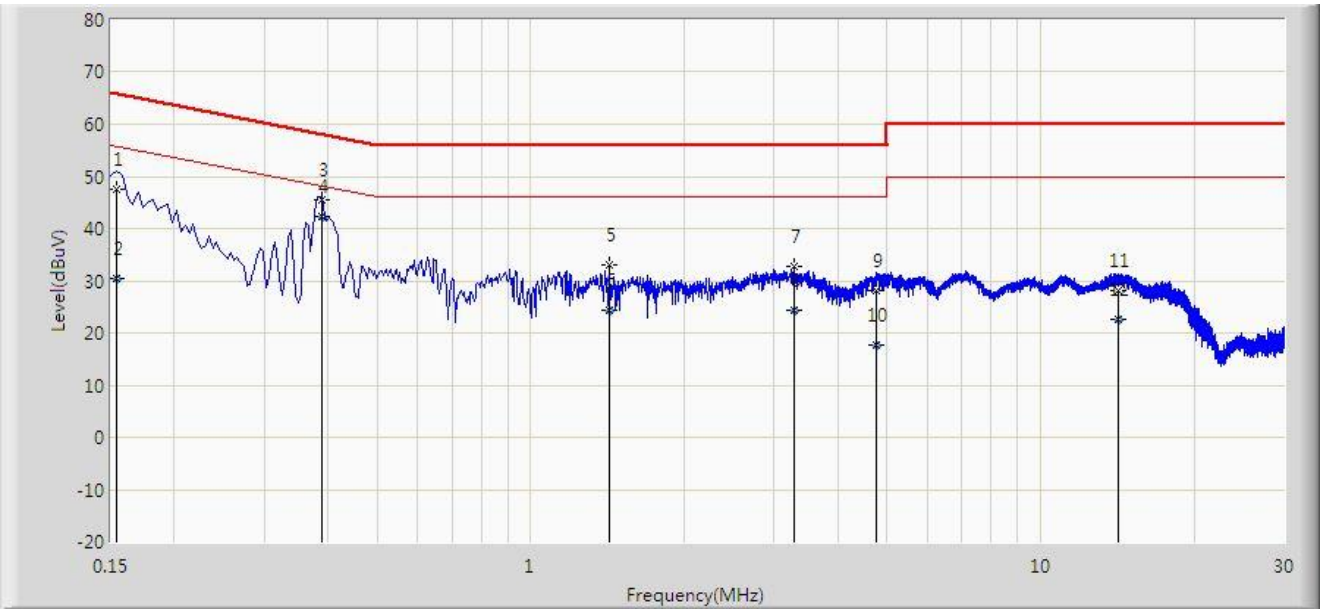


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.154	48.162	37.458	-17.620	65.781	10.704	QP
2			0.154	31.127	20.424	-24.654	55.781	10.704	AV
3			0.386	44.882	34.791	-13.268	58.149	10.090	QP
4		*	0.386	41.813	31.722	-6.337	48.149	10.090	AV
5			2.762	32.061	22.150	-23.939	56.000	9.911	QP
6			2.762	23.452	13.540	-22.548	46.000	9.911	AV
7			4.610	31.653	21.795	-24.347	56.000	9.858	QP
8			4.610	22.852	12.994	-23.148	46.000	9.858	AV
9			8.942	32.771	22.841	-27.229	60.000	9.930	QP
10			8.942	24.935	15.004	-25.065	50.000	9.930	AV
11			19.690	34.049	23.977	-25.951	60.000	10.072	QP
12			19.690	28.729	18.657	-21.271	50.000	10.072	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SIP-SR2	Time: 2020/09/25 - 17:09
Limit: FCC_Part15.107_CE_AC Power_ClassB	Engineer: Kyrie Xie
Probe: ENV216_101684_Filter On	Polarity: Neutral
EUT: Outdoor 60GHz PTP	Power: AC 120V/60Hz
Test Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.154	47.625	36.905	-18.157	65.781	10.720	QP
2			0.154	30.423	19.704	-25.358	55.781	10.720	AV
3			0.390	45.417	35.300	-12.646	58.064	10.118	QP
4		*	0.390	42.217	32.100	-5.846	48.064	10.118	AV
5			1.430	32.986	23.028	-23.014	56.000	9.959	QP
6			1.430	24.234	14.275	-21.766	46.000	9.959	AV
7			3.274	32.691	22.768	-23.309	56.000	9.923	QP
8			3.274	24.484	14.561	-21.516	46.000	9.923	AV
9			4.774	28.118	18.240	-27.882	56.000	9.878	QP
10			4.774	17.575	7.697	-28.425	46.000	9.878	AV
11			14.210	28.088	18.051	-31.912	60.000	10.037	QP
12			14.210	22.617	12.580	-27.383	50.000	10.037	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

7. CONCLUSION

The data collected relate only the item(s) tested and show that this device is in compliance with Part 15C of the FCC Rules.

The End