



Shenzhen CTA Testing Technology Co., Ltd.

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street,
Bao'an District, Shenzhen, China

TEST REPORT FCC PART 15.407

Report Reference No. : CTA24092500702

FCC ID. : R66-HBR6303M

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Date of issue

Sep. 27, 2024

Testing Laboratory Name

Shenzhen CTA Testing Technology Co., Ltd.

Address

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community,
Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name

Hisense Broadband Multimedia Technologies Co.,Ltd

Address

No.218 Qianwangang Road, Economy & Technology Development
Zone, Qingdao, China

Test specification

Standard

FCC Part 15.407: UNLICENSED NATIONAL INFORMATION
INFRASTRUCTURE DEVICES

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Test item description

TV Stick, Smart TV Stick

Trade Mark

Hisense, Xiber

Manufacturer

Hisense Broadband Multimedia Technologies Co.,Ltd

Model/Type reference

HBR6303M

Listed Models

HBR6303M-M1, HBR6303M-F0, HBR6303M-F1, HBR6303M-F2,
HBR6303M-F3, HBR6303M-F4, HBR6303M-F5, HBR6303M-F6,
HBR6303M-F7, HBR6303M-F8, HBR6303M-F9,

Modulation Type

DSSS, OFDM

Operation Frequency

From 5180MHz to 5320MHz, 5500MHz to 5700MHz, 5745MHz to
5825MHz

Rating

DC 12.0V From external circuit

Result

PASS

TEST REPORT

Equipment under Test : TV Stick, Smart TV Stick

Model /Type : HBR6303M

Series Model No. HBR6303M-M1, HBR6303M-F0, HBR6303M-F1, HBR6303M-F2,
HBR6303M-F3, HBR6303M-F4, HBR6303M-F5, HBR6303M-F6,
HBR6303M-F7, HBR6303M-F8, HBR6303M-F9,

Applicant : Hisense Broadband Multimedia Technologies Co.,Ltd

Address : No.218 Qianwangang Road, Economy & Technology Development
Zone, Qingdao, China

Manufacturer : Hisense Broadband Multimedia Technologies Co.,Ltd

Address : No.218 Qianwangang Road, Economy & Technology Development
Zone, Qingdao, China

Test Result:	PASS
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.407](#): UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE DEVICES.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB 789033 D02](#): GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Sep. 22, 2024
Testing commenced on	:	Sep. 22, 2024
Testing concluded on	:	Sep. 27, 2024

2.2. Product Description

Product Name:	TV Stick, Smart TV Stick
Model/Typereference:	HBR6303M
Power supply:	DC 12.0V From external circuit
Adapter information:	Model: JYSY015A-1201000E Input: AC 100-240V 50/60Hz 0.5A Output: DC 12.0V 1.0A 12.0W
testing sample ID:	CTA240925007-1# (Engineer sample) CTA240925007-2# (Normal sample)
Hardware version:	001
Software version:	1007
WIFI	
WLAN	Supported 802.11 a/n/ac/ax
Modulation Type	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT20: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT40: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT80: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT160: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ax HE20: OFDMA (64QAM, 16QAM, 256QAM, 1024QAM, QPSK, BPSK) IEEE 802.11ax HE40: OFDMA (64QAM, 16QAM, 256QAM, 1024QAM, QPSK, BPSK) IEEE 802.11ax HE80: OFDMA (64QAM, 16QAM, 256QAM, 1024QAM, QPSK, BPSK) IEEE 802.11ax HE160: OFDMA (64QAM, 16QAM, 256QAM, 1024QAM, QPSK, BPSK)
Operation frequency	IEEE 802.11a:5180--5320MHz,5500-5700MHz,5745-5825MHz IEEE 802.11n HT20: 5180--5320MHz,5500-5700MHz,5745-5825MHz IEEE 802.11n HT40: 5190-5310MHz,5510-5670MHz,5755-5795MHz IEEE 802.11ac/ax20: 5180--5320MHz,5500-5700MHz,5745-5825MHz IEEE 802.11ac/ax40: 5190-5310MHz,5510-5670MHz,5755-5795MHz IEEE 802.11ac/ax80:5210MHz,5290MHz,5530MHz,5775MHz IEEE 802.11ac/ax160: 5250MHz, 5570MHz
Antenna type:	External antenna
Antenna gain:	5.13 dBi for Ant 1 and 5.04 dBi for Ant2 and 5.06 dBi for Ant3
Directional gain	Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10})^2 / NANT]$ dBi Directional gain=9.8dBi

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	☐ 230V / 50 Hz	☐ 120V / 60Hz
		☒ 12 V DC	☐ 24 V DC
		☐ Other (specified in blank below)	

DC 12.0V From external circuit

2.4. Short description of the Equipment under Test (EUT)

This is a TV Stick, Smart TV Stick.

For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

The application provider specific test software to control sample in continuous TX and RX.

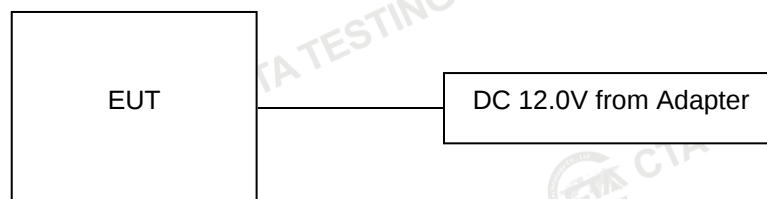
IEEE 802.11a/ac20/ax20/ac40/ax40/ac80/ax80/n20/n40/ac160/ax160:

U-NII-1 and U-NII-2A		U-NII-1 and U-NII-2A		U-NII-1 and U-NII-2A		U-NII-1 and U-NII-2A	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210	50	5250
40	5200	46	5230				
44	5220						
48	5240						
52	5260	54	5270	58	5290	50	5250
56	5280	62	5310				
60	5300						
64	5320						

U-NII-2C		U-NII-2C		U-NII-2C		U-NII-2C	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510	106	5530	114	5570
104	5520	110	5550				
108	5540	118	5590				
112	5560	126	5630				
116	5580	134	5670				
120	5600						
124	5620						
128	5640						
132	5660						
136	5680						
140	5700						

U-NII-3		U-NII-3		U-NII-3		U-NI-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775		
153	5765	159	5795				
157	5785						
161	5805						
165	5825						

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
\$15.203	Antenna gain	802.11ac	☒ Lowest ☒ Middle ☒ Highest	802.11ac	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
\$15.407(a)	Power spectral density	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
\$15.407(a)	Spectrum bandwidth – 26 dB bandwidth	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
\$15.407(e)	Spectrum bandwidth – 6 dB bandwidth	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
\$15.407(a)	Maximum output power	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/ax20/ac40/ax40/ac80/ac160/ax8	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies

		ax80/ax160 802.11n HT20/40		0/ax160 802.11n HT20/40						
§15.407(b)	Band edge compliance conducted	802.11a/ac20/ ax20/ac40/ax4 0/ac80/ac160/ ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Highest	802.11a/ac20/a x20/ac40/ax40/ ac80/ac160/ax8 0/ax160 802.11n HT20/40	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.407(b)	Band edge compliance radiated	802.11a/ac20/ ax20/ac40/ax4 0/ac80/ac160/ ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Highest	802.11a/ac20/a x20/ac40/ax40/ ac80/ac160/ax8 0/ax160 802.11n HT20/40	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.407(a)	TX spurious emissions conducted	-/-	-/-	-/-	-/-	☐	☐	☒	☐	complies
§15.407(a)	TX spurious emissions radiated	802.11a/ac20/ ax20/ac40/ax4 0/ac80/ac160/ ax80/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	802.11a/ac20/a x20/ac40/ax40/ ac80/ac160/ax8 0/ax160 802.11n HT20/40	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.407(g)	Frequency Stability	-/-	-/-	-/-	-/-	☒	☐	☐	☐	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	☐	☐	☒	☐	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	802.11a/ac20/ ax20/ac40/ax4 0/ac80/ac160/ ax80/ax160 802.11n HT20/40	-/-	802.11ac	-/-	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	802.11a/ac20/ ax20/ac40/ax4 0/ac80/ac160/ ax80/ax160 802.11n HT20/40	-/-	802.11ac	-/-	☒	☐	☐	☐	complies

Remark:

1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. :

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	3.02 dB	(1)
Radiated Emission	30~1000MHz	4.06 dB	(1)

Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)
Output Peak power	30MHz~18GHz	0.55 dB	(1)
Power spectral density	/	0.57 dB	(1)
Spectrum bandwidth	/	1.1%	(1)
Radiated spurious emission (30MHz-1GHz)	30~1000MHz	4.10 dB	(1)
Radiated spurious emission (1GHz-18GHz)	1~18GHz	4.32 dB	(1)
Radiated spurious emission (18GHz-40GHz)	18-40GHz	5.54 dB	(1)

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2024/08/03	2025/08/02
LISN	R&S	ENV216	CTA-314	2024/08/03	2025/08/02
EMI Test Receiver	R&S	ESPI	CTA-307	2024/08/03	2025/08/02
EMI Test Receiver	R&S	ESCI	CTA-306	2024/08/03	2025/08/02
Spectrum Analyzer	Agilent	N9020A	CTA-301	2024/08/03	2025/08/02
Spectrum Analyzer	R&S	FSU	CTA-337	2024/08/03	2025/08/02
Spectrum Analyzer	R&S	FSV40	CTA-368	2024/08/03	2025/08/02
Vector Signal generator	Agilent	N5182A	CTA-305	2024/08/03	2025/08/02
Analog Signal Generator	R&S	SML03	CTA-304	2024/08/03	2025/08/02
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	R&S	CTA-302	2024/08/03	2025/08/02
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2024/08/03	2025/08/02
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2023/10/17	2024/10/16
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2023/10/13	2024/10/12
Loop Antenna	Zhinan	ZN30900C	CTA-311	2023/10/17	2024/10/16
Horn Antenna	Beijing Hangwei Dayang	OBH100400	CTA-336	2023/10/17	2024/10/16
Amplifier	Schwarzbeck	BBV 9745	CTA-312	2024/08/03	2025/08/02
Amplifier	Taiwan chengyi	EMC051845B	CTA-313	2024/08/03	2025/08/02
Directional coupler	NARDA	4226-10	CTA-303	2024/08/03	2025/08/02
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2024/08/03	2025/08/02
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2024/08/03	2025/08/02

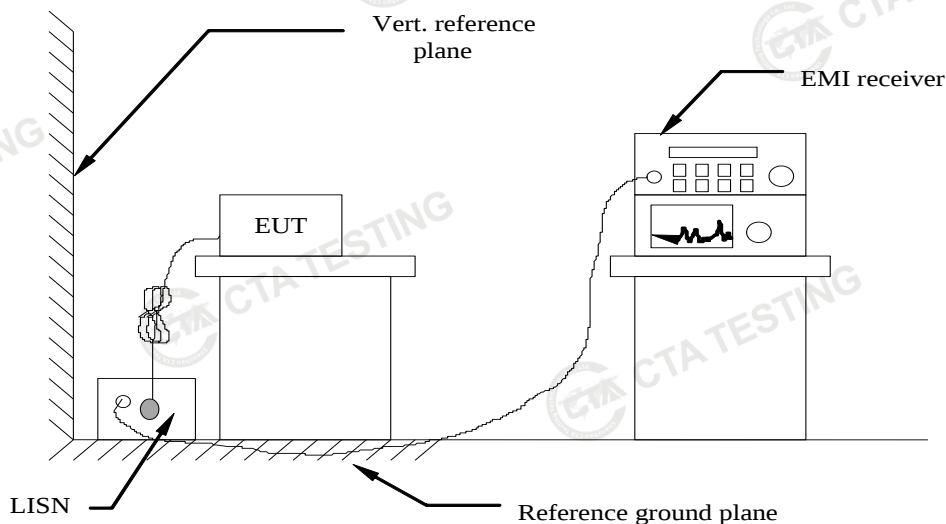
Automated filter bank	Tonscend	JS0806-F	CTA-404	2024/08/03	2025/08/02
Power Sensor	Agilent	U2021XA	CTA-405	2024/08/03	2025/08/02
Amplifier	Schwarzbeck	BBV9719	CTA-406	2024/08/03	2025/08/02

Test Equipment	Manufacturer	Model No.	Version number	Calibration Date	Calibration Due Date
EMI Test Software	Tonscend	TS®JS32-RE	5.0.0.2	N/A	N/A
EMI Test Software	Tonscend	TS®JS32-CE	5.0.0.1	N/A	N/A
RF Test Software	Tonscend	TS®JS1120-3	3.1.65	N/A	N/A
RF Test Software	Tonscend	TS®JS1120	3.1.46	N/A	N/A

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received DC 12V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST RESULTS

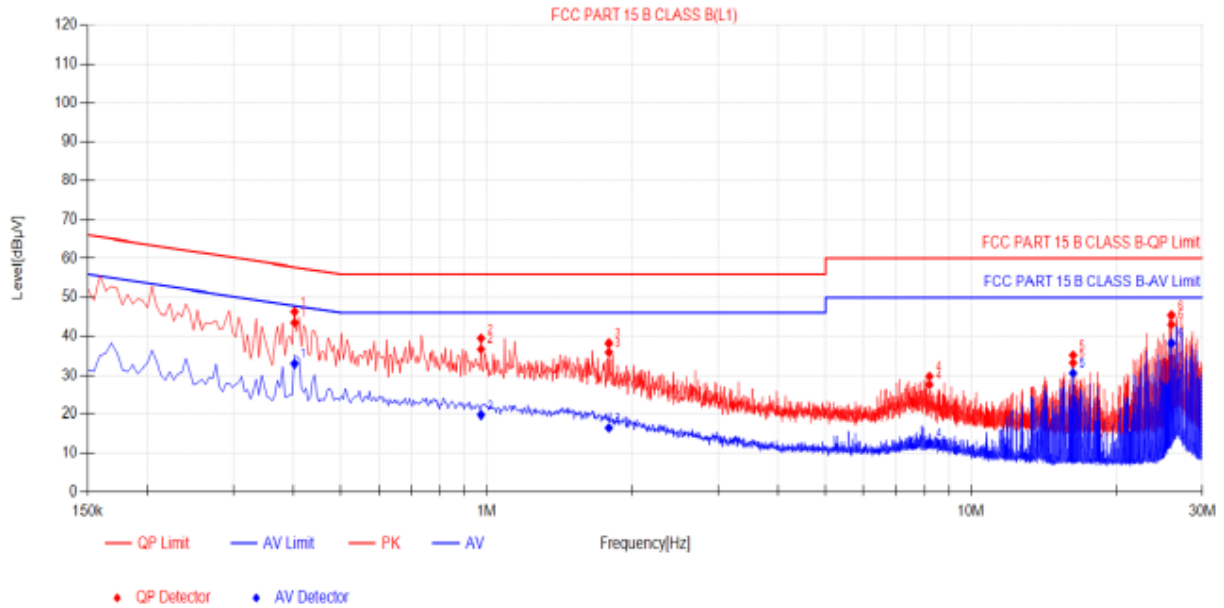
Remark: We measured Conducted Emission at all mode in AC 120V/60Hz, the worst case was recorded .

Power supply:

DC 12.0V From
Adapter AC 120V/60Hz

Polarization

L



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading[dB μV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.402	9.87	33.68	43.55	57.81	14.26	23.06	32.93	47.81	14.88	PASS
2	0.9735	9.94	26.79	36.73	56.00	19.27	9.86	19.80	46.00	26.20	PASS
3	1.788	9.91	26.00	35.91	56.00	20.09	6.59	16.50	46.00	29.50	PASS
4	8.1915	10.28	17.25	27.53	60.00	32.47	2.35	12.63	50.00	37.37	PASS
5	16.2285	10.33	22.80	33.13	60.00	26.87	20.26	30.59	50.00	19.41	PASS
6	25.8765	10.53	32.54	43.07	60.00	16.93	27.73	38.26	50.00	11.74	PASS

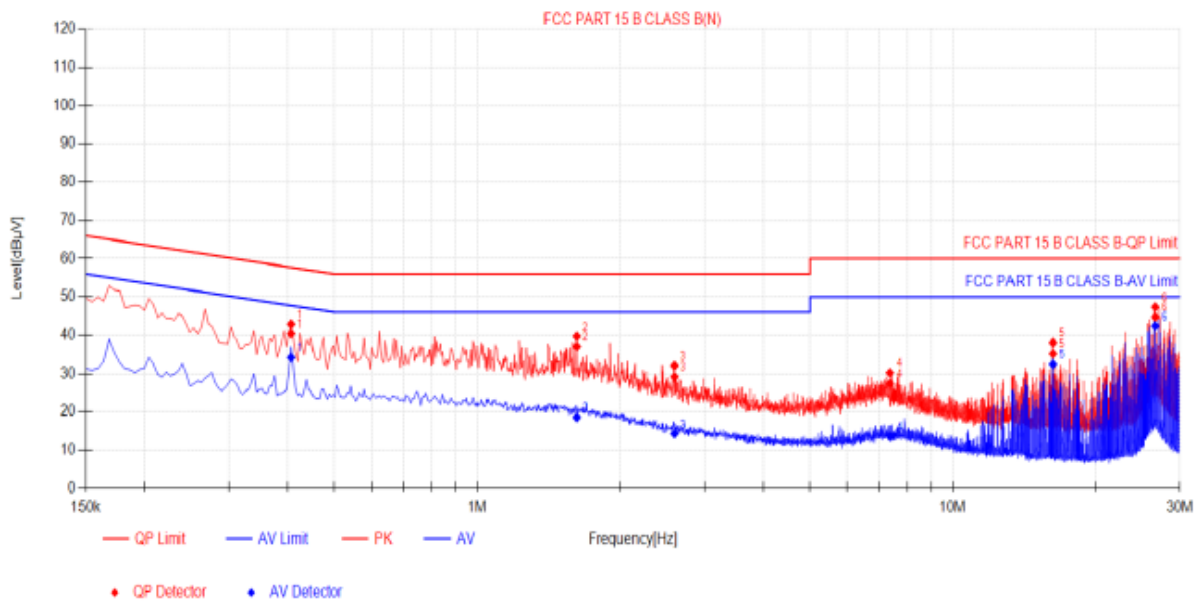
Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)

2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)

4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

Power supply:	DC 5.0V From Adapter AC 120V/60Hz	Polarization	N
---------------	--------------------------------------	--------------	---



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading[dB μV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.4065	9.94	30.42	40.36	57.72	17.36	24.26	34.20	47.72	13.52	PASS
2	1.617	10.15	26.94	37.09	56.00	18.91	8.40	18.55	46.00	27.45	PASS
3	2.5935	10.14	19.03	29.17	56.00	26.83	4.12	14.26	46.00	31.74	PASS
4	7.386	10.42	17.00	27.42	60.00	32.58	3.12	13.54	50.00	36.46	PASS
5	16.2285	10.45	24.72	35.17	60.00	24.83	21.95	32.40	50.00	17.60	PASS
6	26.61	10.75	34.00	44.75	60.00	15.25	31.71	42.46	50.00	7.54	PASS

Note:1). QP Value (dBμV) = QP Reading (dBμV) + Factor (dB)

2). Factor (dB) = insertion loss of LISN (dB) + Cable loss (dB)

3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)

4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

4.2. Radiated Emission

Limit

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) 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.
- (2) 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.
- (3) 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.
- (4) 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.

Undesirable emission limits

Requirement	Limit(EIRP)	Limit (Field strength at 3m) Note1
15.407(b)(1)	PK:-27(dBm/MHz)	PK:68.2(dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)		

Note1: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$

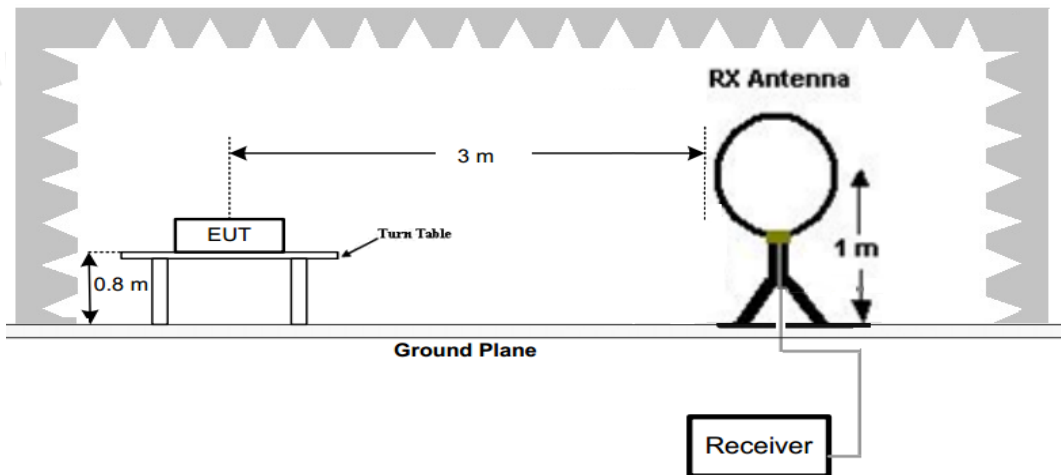
- (5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209
- (6) In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

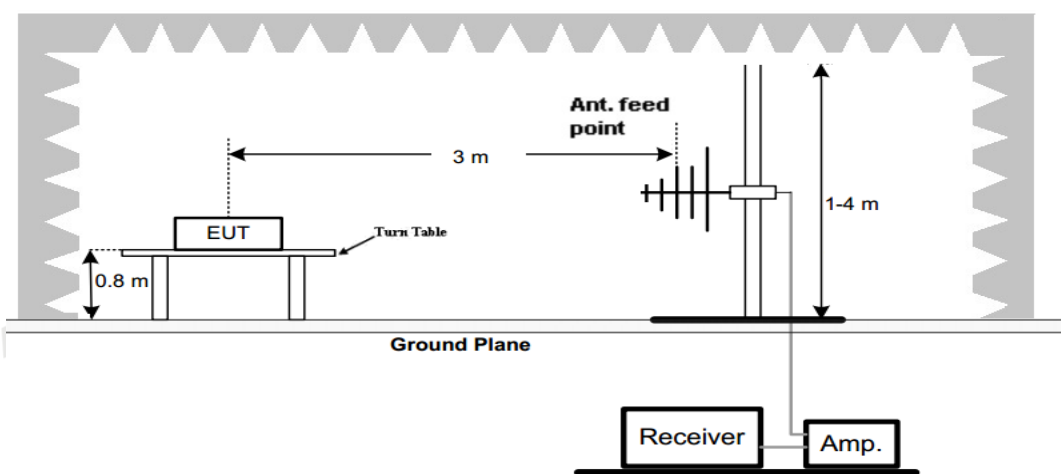
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

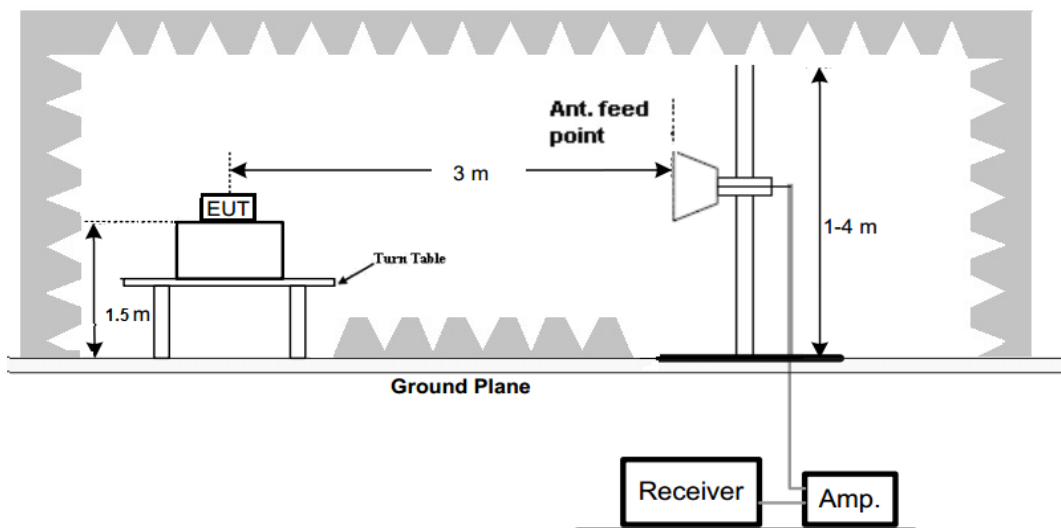
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

- Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
- Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until all frequency measurements have been completed.
- Radiated emission test frequency band from 9KHz to 40GHz.
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

- Setting test receiver/spectrum as following table states:

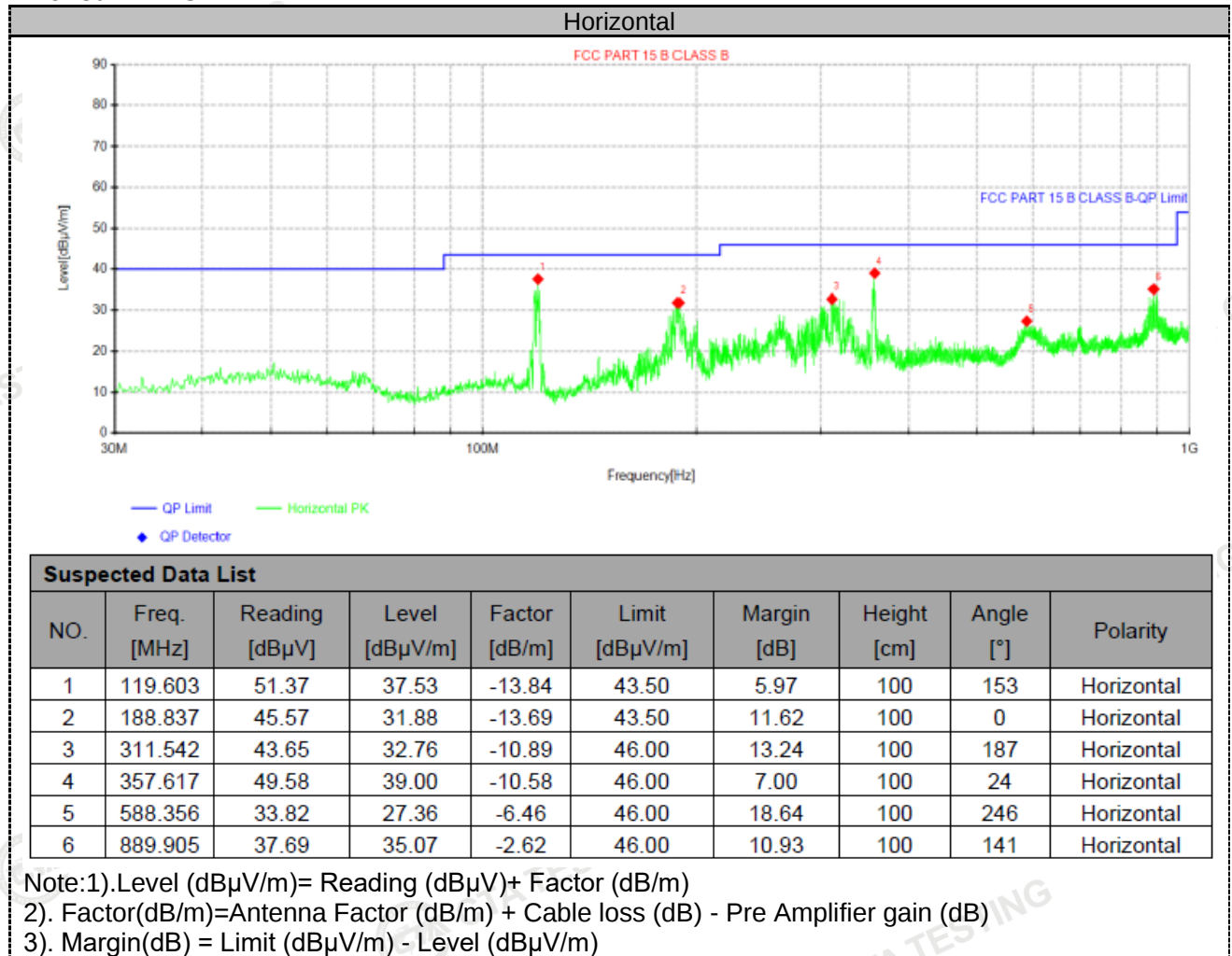
Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

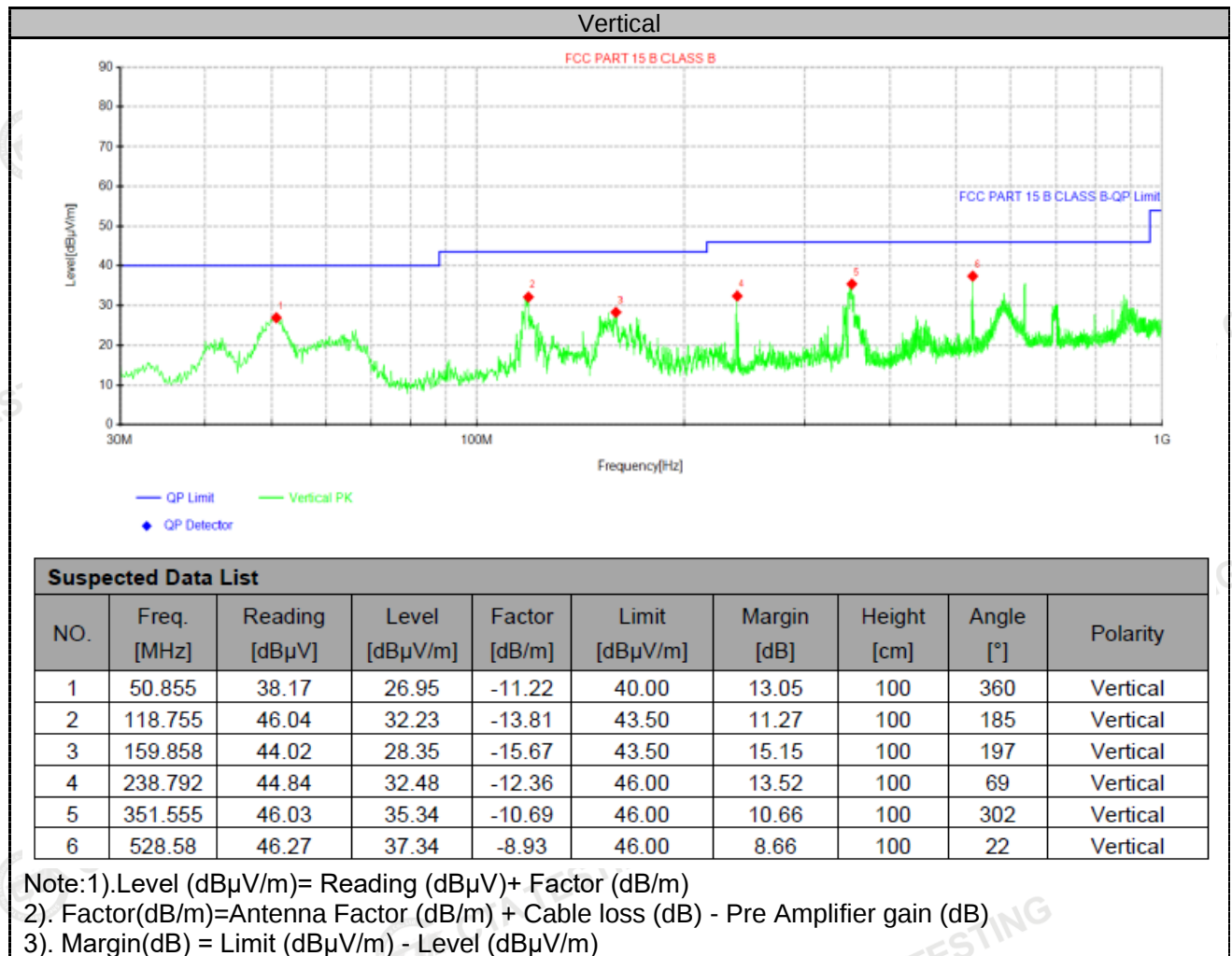
TEST RESULTS

Remark:

- This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
- All 802.11a / 802.11n/ac/ax (HT20) /802.11n/ac/ax (HT40)/ 802.11ac/ax (HT80) / 802.11ac/ax (HT160) modes have been tested for above 1GHz test, for below 1GHz test, only the worst case 802.11a low channel of U-NII 1 band was recorded.
- All 802.11a / 802.11n/ac/ax (HT20) /802.11n/ac/ax (HT40)/ 802.11ac/ax (HT80) / 802.11ac/ax (HT160) modes have been tested for above 1GHz test, for above 1GHz test, only the worst case 802.11a was recorded.
- Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz





For 1GHz to 40GHz

Note: All MIMO and 802.11a / 802.11n/ac/ax (HT20) /802.11n/ac/ax (HT40)/ 802.11ac/ax (HT80) /802.11ac /ax (HT160) modes have been tested for above 1GHz test, only the worst case 802.11n MIMO was recorded.

5150-5250MHz:***U-NII 1 & 802.11a Mode (above 1GHz)***

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
36.00 5180MHz	5150.00	58.33	PK	H	68.20	9.87	61.76	33.04	5.45	41.92	-3.43
	5150.00	49.70	AV	H	54.00	4.30	53.13	33.04	5.45	41.92	-3.43
	10360.00	51.05	PK	H	68.20	17.15	38.83	38.83	10.12	45.28	3.67
	--	--	--	--	--	--	--	--	--	--	--
44.00 5220MHz	10440.00	53.68	PK	H	68.20	14.52	50.00	38.85	10.13	45.3	3.68
	--	--	--	--	--	--	--	--	--	--	--
48.00 5240MHz	5350.50	58.41	PK	H	68.20	9.79	61.68	32.84	5.97	42.08	-3.27
	5350.50	48.18	AV	H	54.00	5.82	51.45	32.84	5.97	42.08	-3.27
	10480.00	53.26	PK	H	68.20	14.94	49.52	38.89	10.19	45.34	3.74

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
36.00 5180MHz	5150.00	54.22	PK	V	68.20	13.98	57.65	33.04	5.45	41.92	-3.43
	5150.00	47.66	AV	V	54.00	6.34	51.09	33.04	5.45	41.92	-3.43
	10360.00	53.74	PK	V	68.20	14.46	50.07	38.83	10.12	45.28	3.67
	--	--	--	--	--	--	--	--	--	--	--
44.00 5220MHz	10440.00	53.65	PK	V	68.20	14.55	49.97	38.85	10.13	45.3	3.68
	--	--	--	--	--	--	--	--	--	--	--
48.00 5240MHz	5350.50	58.03	PK	V	68.20	10.17	61.30	32.84	5.97	42.08	-3.27
	5350.50	49.54	AV	V	54.00	4.46	52.81	32.84	5.97	42.08	-3.27
	10480.00	52.29	PK	V	68.20	15.91	48.55	38.89	10.19	45.34	3.74

5260-5320MHz:***U-NII 1 & 802.11a Mode (above 1GHz)***

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
52.00 5260MHz	5150.00	58.27	PK	H	68.20	9.93	61.70	33.04	5.45	41.92	-3.43
	5150.00	40.71	AV	H	54.00	13.29	44.14	33.04	5.45	41.92	-3.43
	10520.00	51.13	PK	H	68.20	17.07	38.83	38.91	10.2	45.35	3.76
	--	--	--	--	--	--	--	--	--	--	--
60.00 5300MHz	10600.00	52.78	PK	H	68.20	15.42	49.03	38.92	10.21	45.38	3.75
	--	--	--	--	--	--	--	--	--	--	--
64.00 5320MHz	5350.50	54.08	PK	H	68.20	14.12	57.35	32.84	5.97	42.08	-3.27
	5350.50	39.19	AV	H	54.00	14.81	42.46	32.84	5.97	42.08	-3.27
	10480.00	52.09	PK	H	68.20	16.11	48.33	38.94	10.23	45.41	3.76

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
52.00 5260MHz	5150.00	59.91	PK	H	68.20	8.29	63.34	33.04	5.45	41.92	-3.43
	5150.00	40.79	AV	H	54.00	13.21	44.22	33.04	5.45	41.92	-3.43
	10520.00	52.24	PK	H	68.20	15.96	38.83	38.91	10.2	45.35	3.76
	--	--	--	--	--	--	--	--	--	--	--
60.00 5300MHz	10600.00	53.38	PK	H	68.20	14.82	49.63	38.92	10.21	45.38	3.75
	--	--	--	--	--	--	--	--	--	--	--
64.00 5320MHz	5350.50	57.84	PK	H	68.20	10.36	61.11	32.84	5.97	42.08	-3.27
	5350.50	40.44	AV	H	54.00	13.56	43.71	32.84	5.97	42.08	-3.27
	10480.00	53.12	PK	H	68.20	15.08	49.36	38.94	10.23	45.41	3.76

5500-5700MHz:

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
	5460.00	59.06	PK	V	68.20	9.14	61.88	33.39	6.01	42.22	-2.82
100.00	5460.00	48.64	AV	V	54.00	5.36	51.46	33.39	6.01	42.22	-2.82
5500MHz	11000.00	53.36	PK	V	68.20	14.84	48.93	39.12	10.85	45.54	4.43
	--	--	--	--	--	--	--	--	--	--	--
120.00	11160.00	52.21	PK	V	68.20	15.99	47.75	39.07	10.87	45.48	4.46
5580MHz	--	--	--	--	--	--	--	--	--	--	--
140.00	5855.00	56.53	PK	V	68.20	11.67	58.72	33.91	6.17	42.27	-2.19
5700MHz	5855.00	45.42	AV	V	54.00	8.58	47.61	33.91	6.17	42.27	-2.19
	11400.00	53.27	PK	V	68.20	14.93	48.79	39.05	10.9	45.47	4.48

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
	5460.00	57.21	PK	V	68.20	10.99	60.03	33.39	6.01	42.22	-2.82
100.00	5460.00	46.42	AV	V	54.00	7.58	49.24	33.39	6.01	42.22	-2.82
5500MHz	11000.00	53.02	PK	V	68.20	15.18	48.59	39.12	10.85	45.54	4.43
	--	--	--	--	--	--	--	--	--	--	--
120.00	11160.00	53.97	PK	V	68.20	14.23	49.51	39.07	10.87	45.48	4.46
5580MHz	--	--	--	--	--	--	--	--	--	--	--
140.00	5855.00	55.94	PK	V	68.20	12.26	58.13	33.91	6.17	42.27	-2.19
5700MHz	5855.00	44.08	AV	V	54.00	9.92	46.27	33.91	6.17	42.27	-2.19
	11400.00	53.13	PK	V	68.20	15.07	48.65	39.05	10.9	45.47	4.48

5725-5850MHz:

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
	5720.00	56.72	PK	H	68.20	11.48	59.50	33.42	6.04	42.24	-2.78
149.00	5720.00	48.80	AV	H	54.00	5.20	51.58	33.42	6.04	42.24	-2.78
5745MHz	11490.00	50.09	PK	H	68.20	18.11	45.61	39.02	10.91	45.45	4.48
	--	--	--	--	--	--	--	--	--	--	--
157.00	11570.00	53.51	PK	H	68.20	14.69	49.06	38.93	10.95	45.43	4.45
5785MHz	--	--	--	--	--	--	--	--	--	--	--
165.00	5855.00	57.04	PK	H	68.20	11.16	59.23	33.91	6.17	42.27	-2.19
5825MHz	5855.00	48.55	AV	H	54.00	5.45	50.74	33.91	6.17	42.27	-2.19
	11650.00	52.12	PK	H	68.20	16.08	47.54	38.83	11.16	45.41	4.58

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
	5720.00	57.08	PK	V	68.20	11.12	59.86	33.42	6.04	42.24	-2.78
149.00	5720.00	49.32	AV	V	54.00	4.68	52.10	33.42	6.04	42.24	-2.78
5745MHz	11490.00	53.46	PK	V	68.20	14.74	48.98	39.02	10.91	45.45	4.48
	--	--	--	--	--	--	--	--	--	--	--
157.00	11570.00	53.52	PK	V	68.20	14.68	49.07	38.93	10.95	45.43	4.45
5785MHz	--	--	--	--	--	--	--	--	--	--	--
165.00	5855.00	58.35	PK	V	68.20	9.85	60.54	33.91	6.17	42.27	-2.19
5825MHz	5855.00	49.89	AV	V	54.00	4.11	52.08	33.91	6.17	42.27	-2.19
	11650.00	53.40	PK	V	68.20	14.80	48.82	38.83	11.16	45.41	4.58

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the other emission levels were very low against the limit.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
6. Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11ac/ax VHT20 ,IEEE 802.11ac/ax VHT40 and IEEE 802.11ac/ax VHT80, IEEE 802.11ac/ax VHT160;

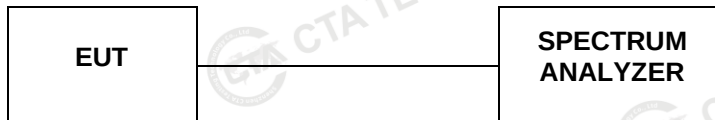
4.3. For Conducted Band edge Measurement

The test results have included the antenna gain

Please refer to Appendix E.

4.4. Duty Cycle

TEST CONFIGURATION



TEST PROCEDURE

According to KDB789033 D02 General UNII Test Procedures New Rules v01 B Duty Cycle (x), Transmission Duration (T):

- a. A diode detector and an oscilloscope that together have sufficiently short response time to permit accurate measurements of the on and off times of the transmitted signal
- b. The zero-span mode on a spectrum analyzer or EMI receiver, if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set $RBW \geq EBW$ if possible; otherwise, set RBW to the largest available value. Set $VBW \geq RBW$. Set detector = peak or average. The zerospan measurement method shall not be used unless both RBW and VBW are $> 50/T$, where T is defined in section II.B.1.a), and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T 16.7 microseconds.)

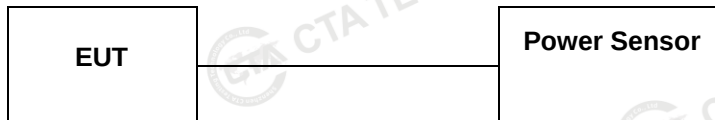
TEST RESULTS

For reporting purpose only.

Please refer to Appendix B.

4.5. Maximum Average Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB789033 D02 General UNII Test Procedures New Rules v01 Section E3 Measurement using a Power Meter (PM):

- a. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied
 1. The EUT is configured to transmit continuously or to transmit with a constant duty cycle
 2. At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
 3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- b. If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in section II.B
- c. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

Adjust the measurement in dBm by adding $10 \log(1/x)$ where x is the duty cycle (e.g., $10 \log(1/0.25)$ if the duty cycle is 25 percent).

LIMIT

According to §15.407(a): The maximum output power should be not exceed follow:

Frequency Range (MHz)	Limit
5150-5250	Fixed: 1 Watt (30dBm) Mobile and portable: 250mW (24dBm)
5250-5350	250mW (24dBm)
5470-5725	250mW (24dBm)
5725-5850	1 Watt (30dBm)
Note: The maximum e.i.r.p at any elevation angle above 30 degrees as measured from the horizon must not exceed 125mW(21dBm)	

TEST RESULTS

Please refer to Appendix C.

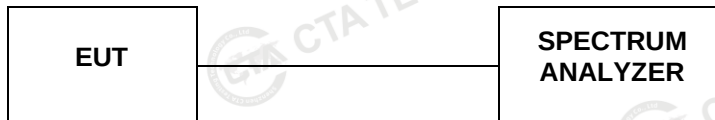
MIMO:

Test Mode	Frequency[MHz]	Antenna1 [dBm]	Antenna2 [dBm]	Antenna3 [dBm]	MIMO [dBm]	Limit [dBm]	Verdict
11N20SISO	5180	12.63	12.03	12.02	17.01	26.2	PASS
	5220	12.92	11.89	11.99	17.06	26.2	PASS
	5240	12.20	11.41	11.50	16.49	26.2	PASS
	5260	12.02	11.41	11.90	16.56	20.2	PASS
	5300	11.93	11.58	12.20	16.68	20.2	PASS
	5320	12.31	12.18	12.36	17.06	20.2	PASS
	5500	13.21	12.15	12.22	17.33	20.2	PASS
	5580	11.96	11.19	11.49	16.33	20.2	PASS
	5700	11.65	11.36	11.48	16.27	20.2	PASS
	5745	11.25	10.89	11.44	15.97	26.2	PASS
	5785	12.18	12.02	12.40	16.97	26.2	PASS
11N40SISO	5825	11.38	11.19	11.46	16.12	26.2	PASS
	5190	11.40	11.04	12.32	16.39	26.2	PASS
	5230	12.42	11.58	12.04	16.80	26.2	PASS
	5270	12.69	12.06	12.07	17.05	20.2	PASS
	5310	12.50	12.40	12.36	17.19	20.2	PASS
	5510	12.73	12.68	12.69	17.47	20.2	PASS
	5550	12.03	11.93	12.18	16.82	20.2	PASS
	5670	11.78	11.98	12.02	16.70	20.2	PASS
11AC20SISO	5755	11.54	11.36	11.38	16.20	26.2	PASS
	5795	12.51	12.35	12.36	17.18	26.2	PASS
	5180	13.22	11.56	12.15	17.14	26.2	PASS
	5220	12.87	11.96	11.95	17.05	26.2	PASS
	5240	12.29	11.61	12.15	16.80	26.2	PASS
	5260	12.02	11.47	11.46	16.43	20.2	PASS
	5300	11.97	12.20	12.20	16.90	20.2	PASS
	5320	12.36	12.85	12.82	17.45	20.2	PASS
	5500	12.38	12.10	12.25	17.02	20.2	PASS
	5580	11.35	11.16	11.36	16.06	20.2	PASS
	5700	11.31	11.40	12.14	16.40	20.2	PASS
11AC40SISO	5745	11.74	11.96	12.00	16.67	26.2	PASS
	5785	12.71	12.61	12.59	17.41	26.2	PASS
	5825	11.21	11.68	12.15	16.47	26.2	PASS
	5190	12.55	11.16	12.21	16.78	26.2	PASS
	5230	12.45	11.64	11.58	16.68	26.2	PASS
	5270	12.75	12.56	12.25	17.30	20.2	PASS
	5310	12.76	12.50	12.61	17.40	20.2	PASS
	5510	12.70	12.66	12.82	17.50	20.2	PASS
11AC80SISO	5550	12.31	12.10	12.05	16.93	20.2	PASS
	5670	11.75	11.58	11.58	16.41	20.2	PASS
	5755	11.40	11.28	10.96	15.99	26.2	PASS
	5795	11.87	11.83	12.32	16.78	26.2	PASS
11AC160SISO	5210	11.97	11.64	11.58	16.50	26.2	PASS
	5290	12.52	12.79	12.50	17.38	20.2	PASS
	5530	12.21	11.84	11.79	16.72	20.2	PASS
	5775	11.97	11.70	11.84	16.61	26.2	PASS
11AX20SISO	5250_UNII-1	8.06	7.64	7.99	12.67	26.2	PASS
	5250_UNII-2A	9.58	9.82	10.08	14.60	20.2	PASS
	5570	9.29	9.11	10.03	14.27	20.2	PASS
	5180	11.88	11.67	11.82	16.56	26.2	PASS
	5220	13.06	11.97	12.16	17.19	26.2	PASS
	5240	12.48	11.84	11.90	16.85	26.2	PASS
	5260	12.32	12.04	11.76	16.82	20.2	PASS
	5300	12.21	11.91	12.11	16.85	20.2	PASS
	5320	12.55	12.43	12.61	17.30	20.2	PASS
	5500	12.35	12.29	12.44	17.13	20.2	PASS
	5580	11.57	11.50	11.64	16.34	20.2	PASS
11AX40SISO	5700	11.55	11.72	11.63	16.41	20.2	PASS
	5745	11.86	11.88	11.97	16.67	26.2	PASS
	5785	12.97	12.88	12.86	17.67	26.2	PASS
	5825	11.38	12.18	12.20	16.71	26.2	PASS
	5190	12.77	11.34	11.68	16.75	26.2	PASS
	5230	12.65	12.36	11.96	17.10	26.2	PASS
	5270	12.76	12.31	12.81	17.40	20.2	PASS
11AX40SISO	5310	12.94	12.72	12.43	17.47	20.2	PASS

	5510	12.24	11.92	11.69	16.73	20.2	PASS
	5550	11.62	11.29	11.15	16.13	20.2	PASS
	5670	11.85	12.18	12.12	16.82	20.2	PASS
	5755	12.08	11.54	11.60	16.52	26.2	PASS
	5795	12.14	11.87	12.60	16.99	26.2	PASS
11AX80SISO	5210	12.17	11.60	11.44	16.52	26.2	PASS
	5290	12.96	12.51	12.60	17.47	20.2	PASS
	5530	12.08	12.09	12.12	16.87	20.2	PASS
	5775	12.10	11.98	12.24	16.88	26.2	PASS
11AX160SISO	5250_UNII-1	6.91	5.59	6.34	11.08	26.2	PASS
	5250_UNII-2A	8.33	7.58	8.35	12.87	20.2	PASS
	5570	7.48	7.30	7.61	12.24	20.2	PASS

4.6. Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 789033 D02 General UNII Test Procedures New Rules v01 F: The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission

- Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power...”. (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
- Use the peak search function on the instrument to find the peak of the spectrum and record its value.
- Make the following adjustments to the peak value of the spectrum, if applicable:
 - If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.
 - If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
- The result is the Maximum PSD over 1 MHz reference bandwidth.
- For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:
 - Set $RBW \geq 1/T$, where T is defined in section II.B.I.a).
 - Set $VBW \geq 3 \text{ RBW}$.
 - If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/\text{RBW})$ to the measured result, whereas $\text{RBW} (< 500 \text{ KHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10\log(1\text{MHz}/\text{RBW})$ to the measured result, whereas $\text{RBW} (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since $\text{RBW}=100 \text{ KHz}$ is available on nearly all spectrum analyzers.
- Adjust the measurement in dBm by adding $10 \log(1/x)$ where x is the duty cycle (e.g., $10 \log(1/0.25)$ if the duty cycle is 25 percent).

LIMIT

According to §15.407(a): The maximum output power should be not exceed follow:

Frequency Range (MHz)	Limit
5150-5250	Other then Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz
5250-5350	11dBm/MHz
5470-5725	11dBm/MHz
5725-5850	30dBm/500kHz

TEST RESULTS

Please refer to Appendix D.

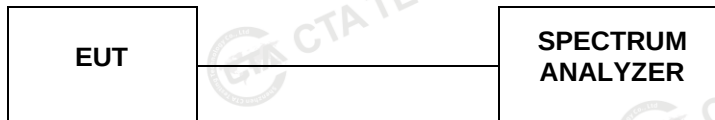
MIMO:

TestMode	Frequency[MHz]	Antenna 1 [dBm/MHz]	Antenna 2 [dBm/MHz]	Antenna 3 [dBm/MHz]	MIMO [dBm/MHz]	Limit[dBm/MHz]	Verdict
11N20SISO	5180	1.91	1.30	1.25	6.27	13.2	PASS
	5220	2.29	1.18	1.19	6.36	13.2	PASS
	5240	1.31	0.46	0.53	5.56	13.2	PASS
	5260	1.39	0.67	1.24	5.88	7.2	PASS
	5300	1.10	0.81	1.33	5.86	7.2	PASS
	5320	1.62	1.55	1.60	6.36	7.2	PASS
	5500	2.42	1.42	1.60	6.61	7.2	PASS
	5580	1.04	0.38	0.82	5.53	7.2	PASS
	5700	0.84	0.67	0.64	5.49	7.2	PASS
	5745	-2.29	-2.51	-2.03	2.50	26.2	PASS
	5785	-1.34	-1.40	-1.01	3.52	26.2	PASS
11N40SISO	5825	-2.04	-2.45	-2.15	2.56	26.2	PASS
	5190	-1.79	-1.97	-0.68	3.33	13.2	PASS
	5230	-0.65	-1.26	-0.85	3.86	13.2	PASS
	5270	-0.07	-0.86	-0.83	4.20	7.2	PASS
	5310	-0.22	-0.66	-0.58	4.29	7.2	PASS
	5510	-0.20	-0.45	-0.35	4.44	7.2	PASS
	5550	-0.97	-1.09	-0.90	3.79	7.2	PASS
	5670	-1.53	-1.30	-1.34	3.38	7.2	PASS
11AC20SISO	5755	-4.44	-4.74	-4.65	0.16	26.2	PASS
	5795	-3.63	-3.63	-3.66	1.13	26.2	PASS
	5180	2.10	0.77	1.42	6.24	13.2	PASS
	5220	2.16	1.08	1.55	6.39	13.2	PASS
	5240	1.52	0.83	1.44	6.05	13.2	PASS
	5260	1.32	0.86	1.41	5.97	7.2	PASS
	5300	1.29	1.55	1.55	6.24	7.2	PASS
	5320	1.87	2.24	2.70	7.05	7.2	PASS
	5500	1.60	1.44	1.56	6.31	7.2	PASS
	5580	0.68	0.46	0.75	5.40	7.2	PASS
	5700	0.55	0.51	1.34	5.59	7.2	PASS
	5745	-1.64	-1.57	-1.65	3.15	26.2	PASS
	5785	-0.40	-0.98	-0.52	4.14	26.2	PASS
11AC40SISO	5825	-1.89	-1.69	-1.30	3.15	26.2	PASS
	5190	-0.31	-1.92	-0.56	3.90	13.2	PASS
	5230	-0.43	-1.45	-1.35	3.72	13.2	PASS
	5270	-0.18	-0.19	-0.84	4.38	7.2	PASS
	5310	-0.34	-0.22	-0.43	4.44	7.2	PASS
	5510	-0.31	-0.10	-0.23	4.56	7.2	PASS
	5550	-0.54	-0.87	-0.82	4.03	7.2	PASS
	5670	-1.41	-1.55	-1.42	3.31	7.2	PASS
11AC80SISO	5755	-4.42	-4.32	-4.99	0.20	26.2	PASS
	5795	-3.78	-3.83	-3.47	1.08	26.2	PASS
	5210	-4.08	-4.28	-4.57	0.47	13.2	PASS
	5290	-3.12	-2.96	-3.50	1.58	7.2	PASS
11AC160SISO	5530	-3.62	-4.14	-4.38	0.74	7.2	PASS
	5775	-6.46	-6.61	-6.65	-1.80	26.2	PASS
	5250_UNII-1	-6.18	-5.99	-5.83	-1.23	13.2	PASS
	5250_UNII-2A	-6.17	-5.64	-5.90	-1.13	7.2	PASS
11AX20SISO	5570	-8.29	-8.14	-7.54	-3.21	7.2	PASS
	5180	0.93	0.97	0.70	5.64	13.2	PASS
	5220	2.08	1.32	1.21	6.33	13.2	PASS
	5240	1.64	1.53	0.86	6.13	13.2	PASS
	5260	1.33	1.38	0.87	5.97	7.2	PASS
	5300	1.22	0.90	1.19	5.88	7.2	PASS
	5320	1.64	1.54	1.73	6.41	7.2	PASS
	5500	1.51	1.48	1.40	6.23	7.2	PASS
	5580	0.68	0.64	0.78	5.47	7.2	PASS
	5700	0.46	0.90	0.36	5.35	7.2	PASS
	5745	-2.12	-1.55	-1.88	2.93	26.2	PASS
	5785	-0.77	-0.80	-1.09	3.89	26.2	PASS
11AX40SISO	5825	-2.20	-1.24	-1.80	3.04	26.2	PASS
	5190	-0.42	-1.52	-1.00	3.81	13.2	PASS
	5230	-0.21	-0.49	-0.70	4.31	13.2	PASS
	5270	-0.27	-0.53	-0.27	4.42	7.2	PASS
11AX40SISO	5310	-0.37	-0.50	-0.53	4.31	7.2	PASS

	5510	-0.92	-1.22	-1.38	3.60	7.2	PASS
	5550	-1.76	-1.81	-1.93	2.94	7.2	PASS
	5670	-1.34	-1.08	-0.82	3.70	7.2	PASS
	5755	-3.92	-4.62	-4.48	0.44	26.2	PASS
	5795	-3.55	-3.94	-3.40	1.15	26.2	PASS
11AX80SISO	5210	-3.60	-4.42	-4.89	0.50	13.2	PASS
	5290	-2.66	-3.15	-3.10	1.81	7.2	PASS
	5530	-3.76	-4.12	-4.11	0.78	7.2	PASS
	5775	-6.12	-6.79	-6.46	-1.68	26.2	PASS
11AC160SISO	5250 UNII-1	-7.56	-8.86	-7.92	-3.31	13.2	PASS
	5250 UNII-2A	-6.91	-9.05	-7.78	-3.05	7.2	PASS
	5570	-9.92	-11.07	-10.92	-5.83	7.2	PASS

4.7. 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

According to KDB789033 D02 General UNII Test Procedures New Rules v01 for one of the following procedures may be used for section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize
- 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.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

LIMIT

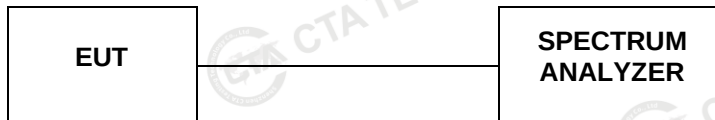
For Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz

TEST RESULTS

Please refer to Appendix A3.

4.8. 26dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

According to KDB789033 D02 General UNII Test Procedures New Rules v01 for one of the following procedures may be used for Emission Bandwidth (EBW) measurement:

- Set RBW = 300 kHz (approximately 1% of the emission bandwidth).
- Set the video bandwidth (VBW) = 1000 KHz (VBW > RBW)
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize
- 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%.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

LIMIT

No Limits for 26dBc Bandwidth

TEST RESULTS

Please refer to Appendix A1.

4.9. Frequency Stability

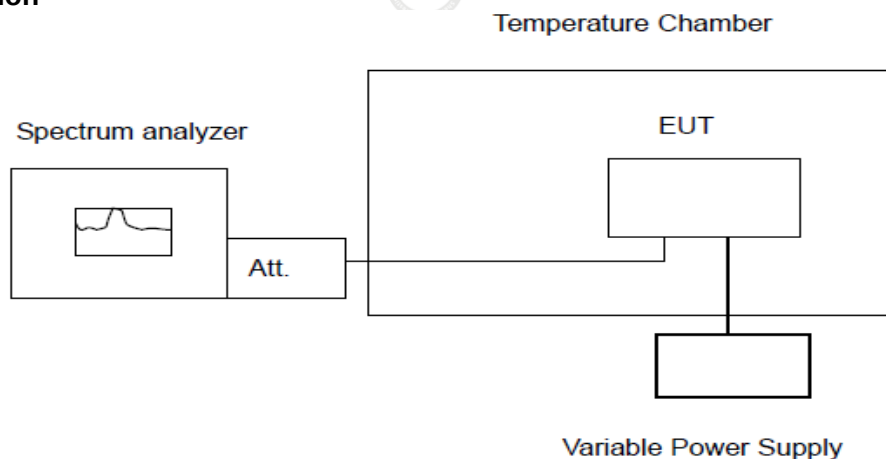
Standard Applicable

According to FCC §15.407(g) "Manufacturers 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 users manual."

According to FCC §2.1055(a) "The frequency stability shall be measured with variation of ambient temperature as follows:"

- (1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
- (2) From -20° to $+50^{\circ}$ centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.
- (3) From 0° to $+50^{\circ}$ centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.

Test Configuration



Test Procedure

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 degree operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30° degree. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10 degree increased per stage until the highest temperature of $+50^{\circ}$ degree reached.

Test Results

PASS

Note: Measured all conditions and recorded worst case.

IEEE 802.11a Mode / 5180 – 5240 MHz / 5180 MHz

Environment Temperature (Degree)	Voltage (Vdc)	Measured Frequency (MHz)	Limit Range (MHz)	Test Results
20	138	5179.978256	5150 – 5250	PASS
20	102	5179.997774	5150 – 5250	PASS
50	120	5179.971667	5150 – 5250	PASS
40	120	5179.924980	5150 – 5250	PASS
30	120	5179.943198	5150 – 5250	PASS
20	120	5179.919210	5150 – 5250	PASS
10	120	5179.918359	5150 – 5250	PASS
0	120	5179.954331	5150 – 5250	PASS
-10	120	5179.946430	5150 – 5250	PASS
-20	120	5179.913974	5150 – 5250	PASS
-30	120	5179.934661	5150 – 5250	PASS

IEEE 802.11ac VHT20 Mod / 5260 – 5320 MHz / 5260 MHz

Environment Temperature (Degree)	Voltage (V)	Measured Frequency (MHz)	Limit Range (MHz)	Test Results
20	138	5260.010334	5250 – 5350	PASS
20	102	5260.034089	5250 – 5350	PASS
50	120	5260.093309	5250 – 5350	PASS
40	120	5260.085569	5250 – 5350	PASS
30	120	5260.012754	5250 – 5350	PASS
20	120	5260.062639	5250 – 5350	PASS
10	120	5260.022972	5250 – 5350	PASS
0	120	5260.071827	5250 – 5350	PASS
-10	120	5260.034045	5250 – 5350	PASS
-20	120	5260.048028	5250 – 5350	PASS
-30	120	5260.092283	5250 – 5350	PASS

IEEE 802.11ac VHT20 Mode / 5500 – 5700 MHz / 5500 MHz

Environment Temperature (Degree)	Voltage (V)	Measured Frequency (MHz)	Limit Range (MHz)	Test Results
20	138	5500.046615	5470 – 5725	PASS
20	102	5500.071357	5470 – 5725	PASS
50	120	5500.085038	5470 – 5725	PASS
40	120	5500.015041	5470 – 5725	PASS
30	120	5500.053333	5470 – 5725	PASS
20	120	5500.019492	5470 – 5725	PASS
10	120	5500.078852	5470 – 5725	PASS
0	120	5500.077338	5470 – 5725	PASS
-10	120	5500.023928	5470 – 5725	PASS
-20	120	5500.052432	5470 – 5725	PASS
-30	120	5500.081313	5470 – 5725	PASS

IEEE 802.11a Mode / 5745 – 5825 MHz / 5745 MHz

Environment Temperature (Degree)	Voltage (Vdc)	Measured Frequency (MHz)	Limit Range (MHz)	Test Results
20	138	5744.972024	5725 – 5850	PASS
20	102	5744.993557	5725 – 5850	PASS
50	120	5744.931005	5725 – 5850	PASS
40	120	5744.909366	5725 – 5850	PASS
30	120	5744.960183	5725 – 5850	PASS
20	120	5744.930572	5725 – 5850	PASS
10	120	5744.958692	5725 – 5850	PASS
0	120	5744.927221	5725 – 5850	PASS
-10	120	5744.921356	5725 – 5850	PASS
-20	120	5744.926044	5725 – 5850	PASS
-30	120	5744.951738	5725 – 5850	PASS

4.10. Antenna Requirement

Standard Applicable

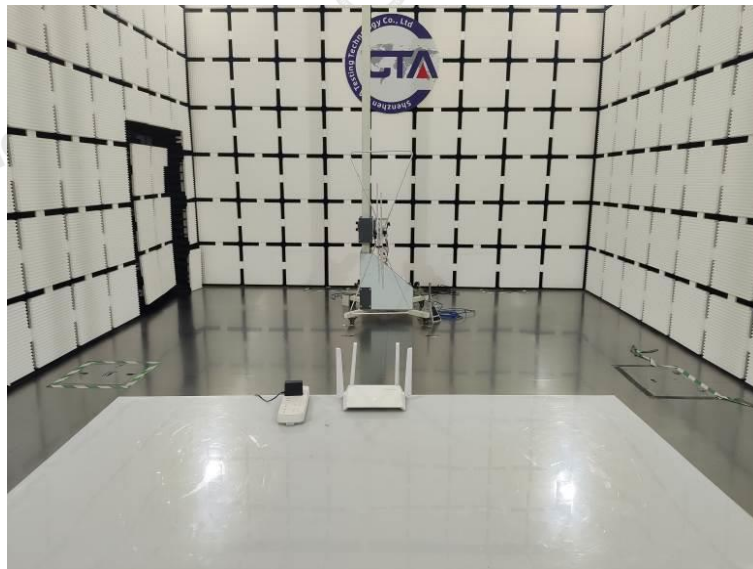
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.407 (a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Antenna Information

The maximum gain of antenna were Antenna 1:5.52 dBi, Antenna 2:5.68 dBi, Antenna 3:5.52 dBi, External antenna, It meets the requirements of 15.203.

5. Test Setup Photos of the EUT



6. External and Internal Photos of the EUT

Reference to the test report No. CTA24092500701

.....End of Report.....