Microtest
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Test Report

Report No.:	MTi230620023-04E1
Date of issue:	2023-09-18
Applicant:	Ningbo Fulman Communication Technology Co., Ltd
Product:	Wireless HDMI Transmitter and Receiver
Model(s):	ADC
FCC ID:	2A7Z4-ADC

Shenzhen Microtest Co., Ltd.

http://www.mtitest.com

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Instructions

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2. The test results in this test report are only responsible for the samples submitted

3. This test report is invalid without the seal and signature of the laboratory.

4. This test report is invalid if transferred, altered, or tampered with in any form without authorization.

5. Any objection to this test report shall be submitted to the laboratory within 15 days from the date of receipt of the report.

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Test Result Certification	
Applicant:	**Ningbo Fulman Communication Technology Co., Ltd**
Address:	No.98 Yuanzhong Road, Xiangshan Economic Development Zone, Ningbo, Zhejiang Province, China
Manufacturer:	**Ningbo Fulman Communication Technology Co., Ltd**
Address:	No.98 Yuanzhong Road, Xiangshan Economic Development Zone, Ningbo, Zhejiang Province, China
Product description	
Product name:	Wireless HDMI Transmitter and Receiver
Trademark:	VENTION
Model name:	ADC
Series Model:	N/A
Standards:	FCC 47 CFR Part 15.407
Test method:	ANSI C63.10-2013 KDB 789033 D02 v02r01
Date of Test	
Date of test:	2023-07-11 ~ 2023-09-18
Test result:	Pass

Test Engineer : David. Lee

(David Lee)

Reviewed By: : Leon chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 General Description

1.1 Description of the EUT

Product name:	Wireless HDMI Transmitter and Receiver
Model name:	ADC
Series Model:	N/A
Model difference:	N/A
Electrical rating:	Input: DC 5V
Hardware version:	TX: SG-G102-8360B-TX-V2 RX: SG-G102-68B-RX-V2
Software version:	TX: 15488004 RX: 22155002
Accessories:	Cable: 1.USB-A to Type-C cable(1.0m) 2.USB-A to Type-C cable(0.85m) 3.HDMI extension cord(0.5m)
Test sample(s) number:	MTi230620023-04S001
Note:The difference between the receiving device and the transmitting device is that the software version, the hardware version and the screen printing are not the same. Only the transmitting equipment was tested	
RF specification:	
Operation frequency:	U-NII-1: 5150 MHz to 5250 MHz U-NII-3: 5725 MHz to 5850 MHz
Modulation type:	OFDM with BPSK/QPSK/16QAM/64QAM
Date Rate:	802.11a: 6,9,12,18,24,36,48,54Mbps; 802.11n(HT20): MCS0-MCS15
Antenna(s) information:	Antenna type: PIFA antenna Antenna Gain: U-NII-1 Gain: 2.98 dBi U-NII-3 Gain: 2.98 dBi

1.2 Description of test modes

1.2.1 Operation channel list

For U-NII-1 band:					
20 MHz bandwidth		--		--	
Channel Number	Frequency (MHz)	--	--	--	--
36	5180	--	--	--	--
40	5200	--	--	--	--
44	5220	--	--	--	--
48	5240	--	--	--	--

For U-NII-3 band:					
20 MHz bandwidth		--		--	
Channel Number	Frequency (MHz)	--	--	--	--
149	5745	--	--	--	--
153	5765	--	--	--	--
157	5785	--	--	--	--
161	5805	--	--	--	--
165	5825	--	--	--	--

The test software has been used to control EUT for working in engineering mode, that enables selectable channel, and capable of continuous transmitting mode.

Test Software:	MPTOOL

For U-NII-1 band:			
802.11a		**802.11n20**	
Channel	Power setting	Channel	Power setting
36	DEF	36	DEF
40	DEF	40	DEF
48	DEF	48	DEF

For U-NII-3 band:			
802.11a		**802.11n20**	
Channel	Power setting	Channel	Power setting
149	DEF	149	DEF
157	DEF	157	DEF
165	DEF	165	DEF

1.3 Environmental conditions for testing

Environment of test site:

Temperature:	15ºC~35ºC
Humidity:	20 % RH ~ 75 % RH

Test Conditions	Voltage (VDC)	Temperature (°C)
LV	4.25	-30
NV	5.00	-20
HV	5.75	-10
/	/	0
/	/	10
/	/	20
/	/	30
/	/	40
/	/	50

1.4 Description of support units

Support equipment list			
Description	Model	Serial No.	Manufacturer
Adapter	HW-090200CH0	/	Huizhou BYD Electronics Co., Ltd.
Support cable list			
Description	Length (m)	From	To
/	/	/	/

2 Measurement uncertainty

Parameter	Measurement uncertainty
AC power line conducted emission (9 kHz~30 MHz)	±2.5 dB
Occupied Bandwidth	±3 %
Conducted RF output power	±0.16 dB
Conducted spurious emissions	±0.21 dB
Radiated emission (9 kHz ~ 30 MHz)	±4.0 dB
Radiated emission (30 MHz~1 GHz)	±4.2 dB
Radiated emission (above 1 GHz)	±4.3 dB
Power spectral density	±0.16 dB
Frequency Stability	±1 ppm

Note: the measurement uncertainty is calculated and correspond to a factor k = 2 (which provide confidence levels of 95.45 %)

3 Summary of Test Result

No.	FCC reference	Description of test	Result
1	§15.203 & 15.407	Antenna requirement	Pass
2	§ 15.207	AC power line conducted emissions	Pass
4	§15.407(b)	Radiation Spurious Emissions	Pass
5	§15.407(a)	26dB emission bandwidth	Pass
6	§15.407(e)	6dB emission bandwidth	Pass
7	§15.407(a)	RF output power	Pass
8	§15.407(a)	Power spectral density	Pass
9	§15.407(b)	Conducted Spurious Emission	Pass
10	§15.407(b)	Conducted band edge	Pass
11	§15.407(g)	Frequency Stability	Pass

4 Test Laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No.7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868
FCC Registration No.:	448573

5 Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due
MTi-E002	EMI Test Receiver	R&S	ESCI3	101368	2023/04/26	2024/04/25
MTi-E023	Artificial power network	Schwarzbeck	NSLK8127	NSLK8127# 841	2023/05/04	2024/05/03
MTi-E025	Artificial power network	Schwarzbeck	NSLK8127	8127183	2023/04/26	2024/04/25
MTi-E043	EMI test receiver	R&S	ESCI7	101166	2023/04/26	2024/04/25
MTi-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00044	2021/05/30	2024/05/29
MTi-E044	Broadband antenna	Schwarzbeck	VULB9163	9163-1338	2021/05/30	2024/05/29
MTi-E045	Horn antenna	Schwarzbeck	BBHA9120D	9120D-2278	2021/05/30	2024/05/29
MTi-E047	Pre-amplifier	Hewlett-Packard	8447F	3113A06184	2023/04/26	2024/04/25
MTi-E048	Pre-amplifier	Agilent	8449B	3008A01120	2023/05/04	2024/05/03
MTi-E120	Broadband antenna	Schwarzbeck	VULB9163	9163-1419	2021/05/30	2024/05/29
MTi-E121	Pre-amplifier	Hewlett-Packard	8447D	2944A09365	2023/05/04	2024/05/03
MTi-E123	Pre-amplifier	Agilent	8449B	3008A04723	2023/05/04	2024/05/03
MTi-E135	Horn antenna	Schwarzbeck	BBHA 9170	00987	2021/05/30	2024/05/29
MTi-E136	Pre-amplifier	Space-Dtronics	EWLAN1840 G-G45	210405001	/	/
MTi-E062	PXA Signal Analyzer	Agilent	N9030A	MY5135029 6	2023/04/25	2024/04/24
MTi-E067	RF Control Unit	Tonscend	JS0806-1	19D8060152	2023/04/26	2024/04/25
MTi-E068	RF Control Unit	Tonscend	JS0806-2	19D8060153	2023/04/26	2024/04/25
MTi-E069	Band Reject Filter Group	Tonscend	JS0806-F	19D8060160	2023/05/04	2024/05/03
MTi-E010S	EMI Measurement Software	Farad	EZ-EMC Ver. EMEC-3A1	/	/	/
MTi-E014S	RF Test System	Tonscend	TS®JS1120 V2.6.88.0330	/	/	/

Note: the calibration interval of the test equipment is 12 or 24 months and the calibrations are traceable to international system unit(SI)

6 Test Result

6.1 Antenna requirement

15.203 requirement

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. 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Description of the antenna of EUT

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

Conclusion:

The EUT complies with the requirement of § 15.203.

6.2 AC power line conducted emissions

6.2.1 Limits

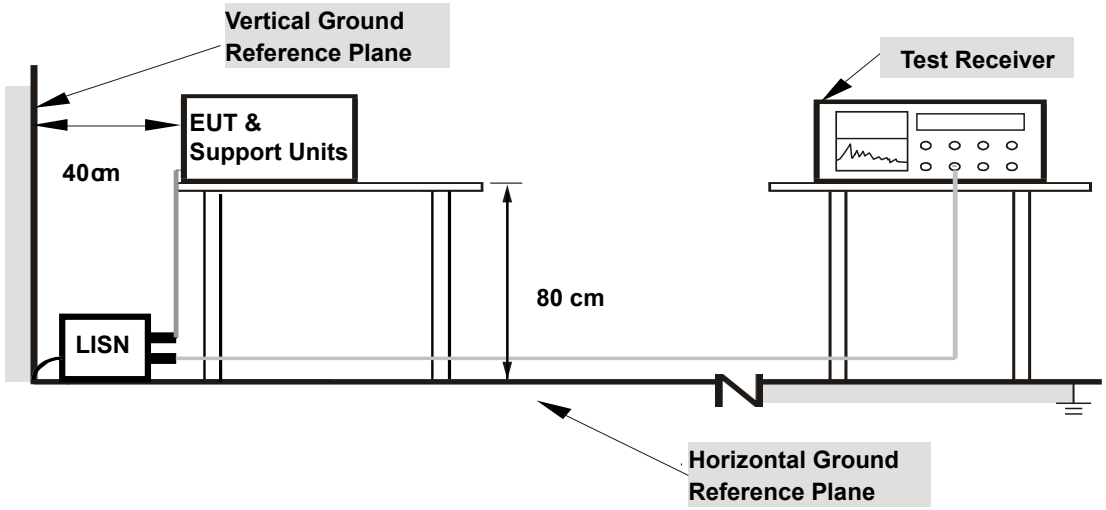
Frequency (MHz)	Detector type / Bandwidth	Limit-Quasi-peak dBµV	Limit-Average dBµV
0.15 -0.5	Average / 9 kHz	66 to 56	56 to 46
0.5 -5		56	46
5 -30		60	50

Note 1: the limit decreases with the logarithm of the frequency in the range of 0.15 MHz to 0.5 MHz.

6.2.2 Test Procedures

a) The test setup is refer to the standard ANSI C63.10-2013.
b) The EUT is connected to the main power through a line impedance stabilization network (LISN). All support equipment is powered from additional LISN(s).
c) Emissions were measured on each current carrying line of the EUT using an EMI test receiver connected to the LISN powering the EUT.
d) The test receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes described in Item 1.2.
e) The test data of the worst-case condition(s) was recorded.

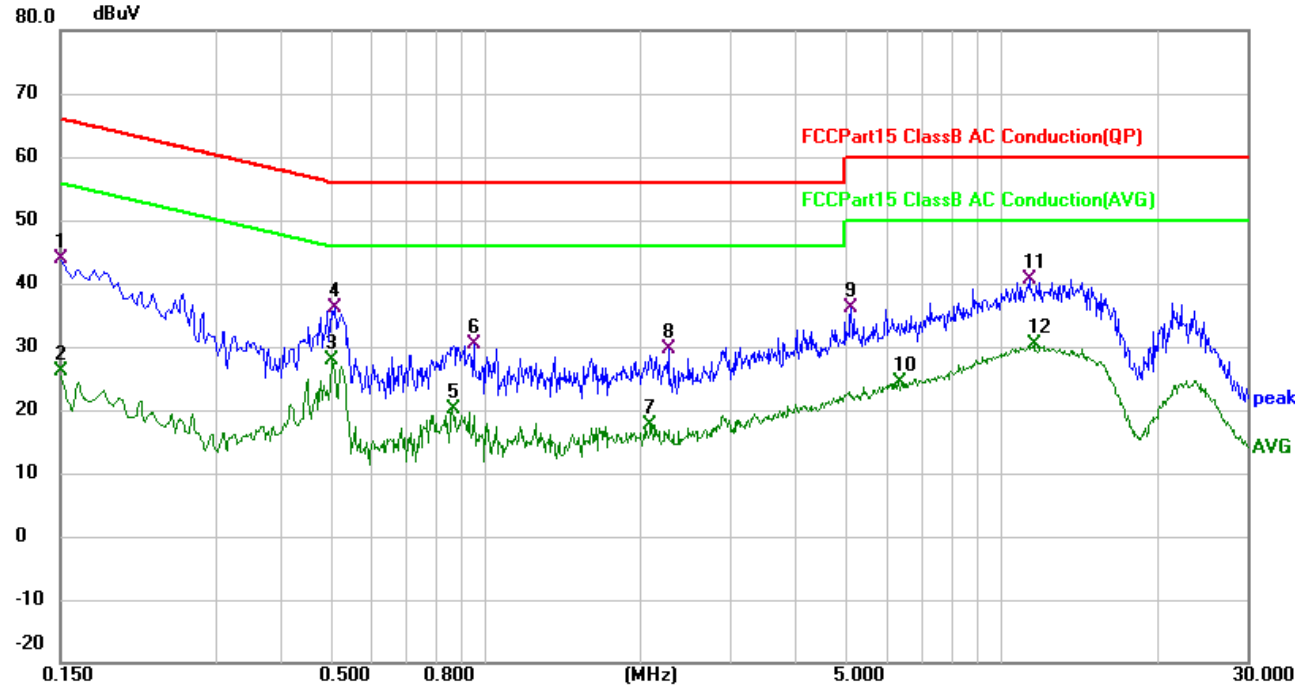
6.2.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the test setup.

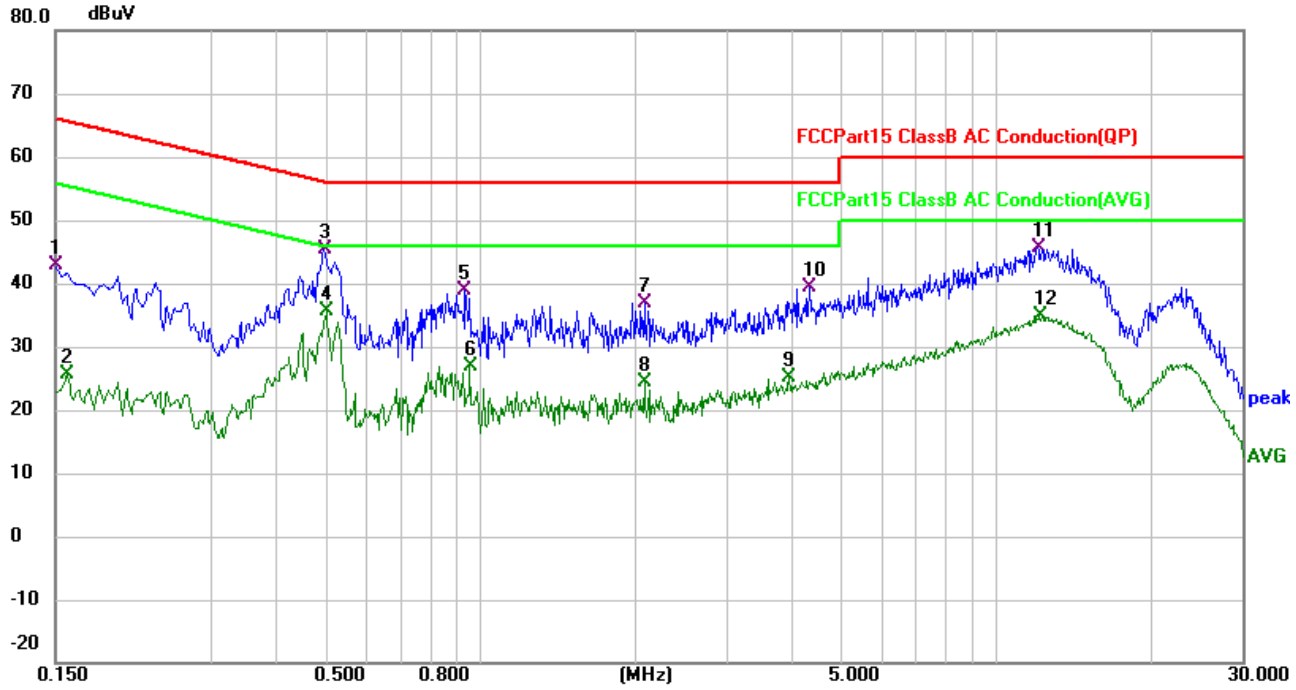
6.2.4 Test Result

Test mode:	TX	Phase:	L
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	33.66	10.28	43.94	66.00	-22.06	QP
2		0.1500	15.86	10.28	26.14	56.00	-29.86	AVG
3	*	0.5060	16.51	11.34	27.85	46.00	-18.15	AVG
4		0.5100	24.71	11.34	36.05	56.00	-19.95	QP
5		0.8620	8.12	12.11	20.23	46.00	-25.77	AVG
6		0.9500	18.05	12.31	30.36	56.00	-25.64	QP
7		2.0900	7.65	10.03	17.68	46.00	-28.32	AVG
8		2.2659	19.52	10.08	29.60	56.00	-26.40	QP
9		5.1300	25.87	10.26	36.13	60.00	-23.87	QP
10		6.3340	14.14	10.28	24.42	50.00	-25.58	AVG
11		11.3660	30.21	10.43	40.64	60.00	-19.36	QP
12		11.5700	19.94	10.45	30.39	50.00	-19.61	AVG

Test mode:	TX	Phase:	N
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	32.69	10.29	42.98	66.00	-23.02	QP
2		0.1580	15.38	10.28	25.66	55.57	-29.91	AVG
3		0.4980	34.09	11.32	45.41	56.03	-10.62	QP
4	*	0.5020	24.26	11.32	35.58	46.00	-10.42	AVG
5		0.9340	26.71	12.20	38.91	56.00	-17.09	QP
6		0.9540	14.68	12.24	26.92	46.00	-19.08	AVG
7		2.0860	26.41	10.46	36.87	56.00	-19.13	QP
8		2.0860	14.02	10.46	24.48	46.00	-21.52	AVG
9		3.9740	14.77	10.28	25.05	46.00	-20.95	AVG
10		4.3500	29.02	10.28	39.30	56.00	-16.70	QP
11		12.0140	35.18	10.38	45.56	60.00	-14.44	QP
12		12.1540	24.59	10.39	34.98	50.00	-15.02	AVG

6.3 Radiated spurious emission

6.3.1 Limits

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 solely in the 5.725-5.850 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.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

§ 15.209 Radiated emission limits at restricted bands:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note 1: the tighter limit applies at the band edges.
Note 2: the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector

§ 15.35 (b) requirements:
When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

According to ANSI C63.10-2013, the tests shall be performed in the frequency range shown in the following table:

Frequency range of measurements for unlicensed wireless device

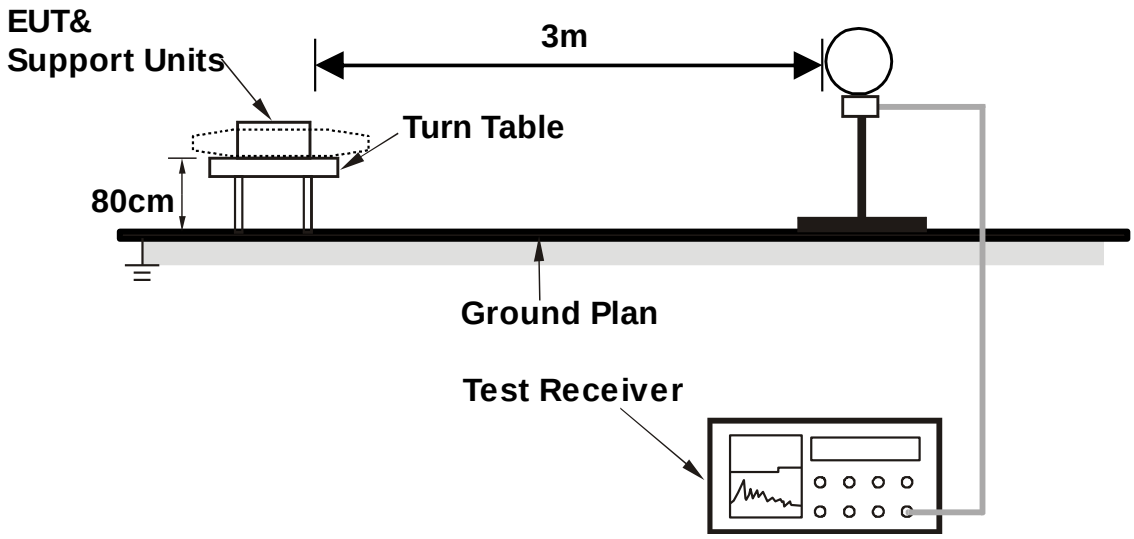
Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

Frequency range of measurements for unlicensed wireless device with digital device

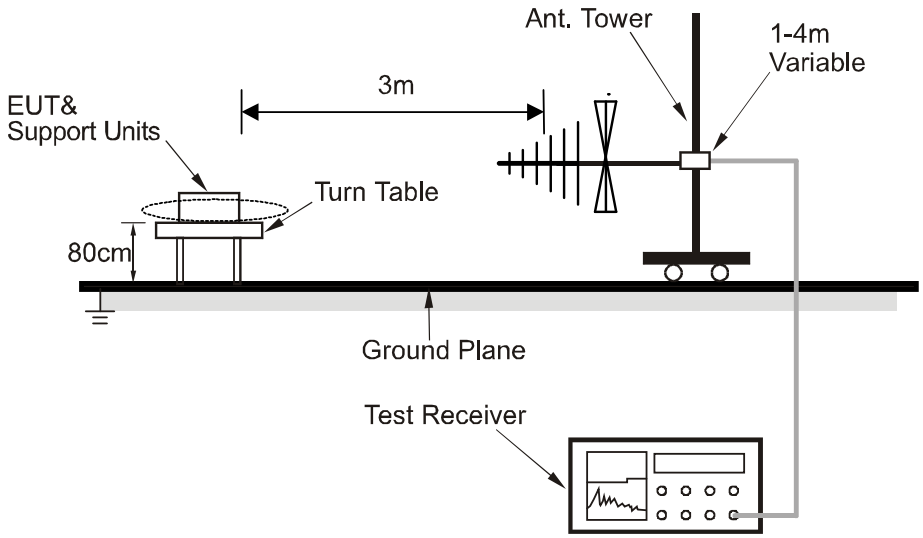
Highest frequency generated or used in the device or on which the device operates or tunes	Upper frequency range of measurement
Below 1.705 MHz	30 MHz
1.705 MHz to 108 MHz	1000 MHz
108 MHz to 500 MHz	2000 MHz
500 MHz to 1000 MHz	5000 MHz
Above 1000 MHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower

6.3.2 Test setup

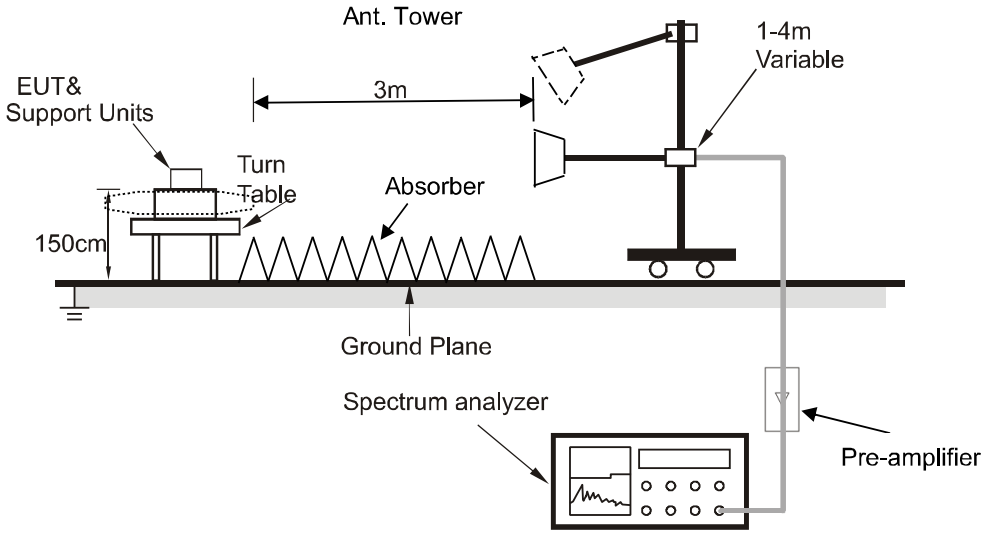
Below 30MHz:



30MHz~1GHz:



Above 1GHz:



For the actual test configuration, please refer to the related item – Photographs of the test setup.

6.3.3 Test procedure

a) Test method: ANSI C63.10-2013 Sections 6.3, 6.4, 6.5 and 6.6; KDB 789033 D02 v02r01 Sections G3, G4, G5, and G6.
b) The EUT is placed on an on-conducting table 0.8 meters above the ground plane for measurement below 1GHz, 1.5 meters above the ground plane for measurement above 1GHz.
c) Emission blew 18 GHz were measured at a 3 meters test distance, above 18 GHz were measured at 1-meter test distance with the application of a distance correction factor
d) The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Test instrument setup

Frequency	Test receiver / Spectrum analyzer setting
9 kHz ~ 150 kHz	Quasi Peak / RBW: 200 Hz
150 kHz ~ 30 MHz	Quasi Peak / RBW: 9 kHz
30 MHz ~ 1 GHz	Quasi Peak / RBW: 120 kHz
Above 1 GHz	Peak / RBW: 1 MHz, VBW: 3MHz, Peak detector AVG / RBW: 1 MHz, VBW: 3MHz, Average detector

6.3.4 Test results

Notes:

All emissions that are in the restricted bands specified in §15.205 are subject to the limit of §15.209.

All spurious emissions that are outside of the restricted bands are subject to a peak emission limit of § 15.407(b). And for above 1000 MHz, the field strength shall be computed as follows:

E [dBμV/m] = EIRP [dBm] + 95.2, for test distance = 3 m

All channels, modes and modulations/data rates were investigated among all U-NII bands. Only the worst-case results shown in the report.

For blew 30MHz tests, there were no emissions found within 20dB of the limit.

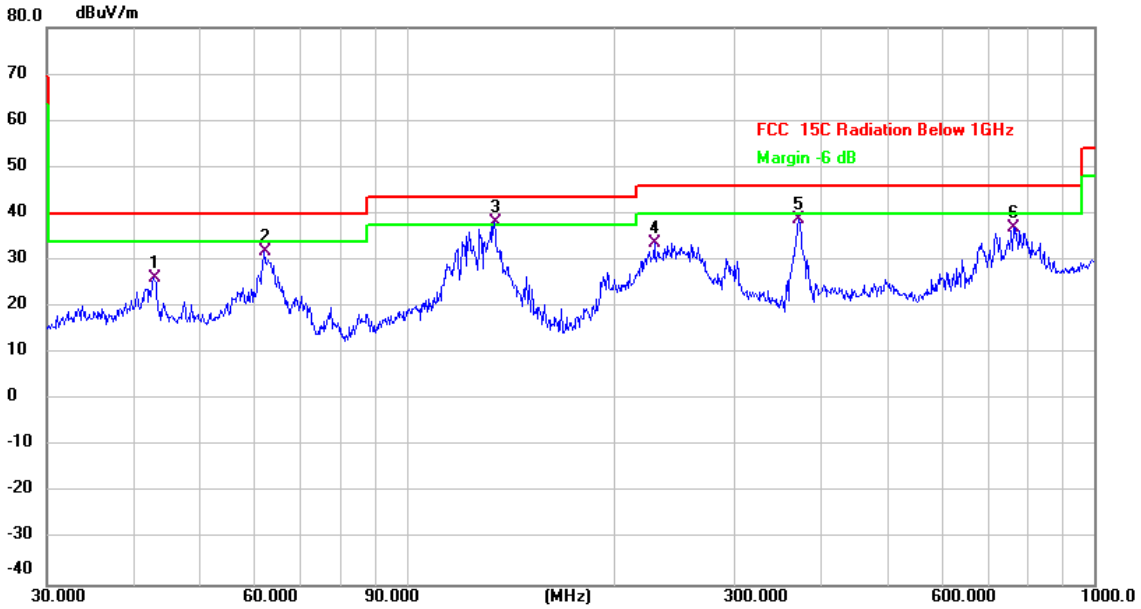
Calculation formula:

Measurement (dBμV/m) = Reading Level (dBμV) + Correct Factor (dB/m)

Over (dB) = Measurement (dBμV/m) – Limit (dBμV/m)

Radiated emissions between 30MHz – 1GHz

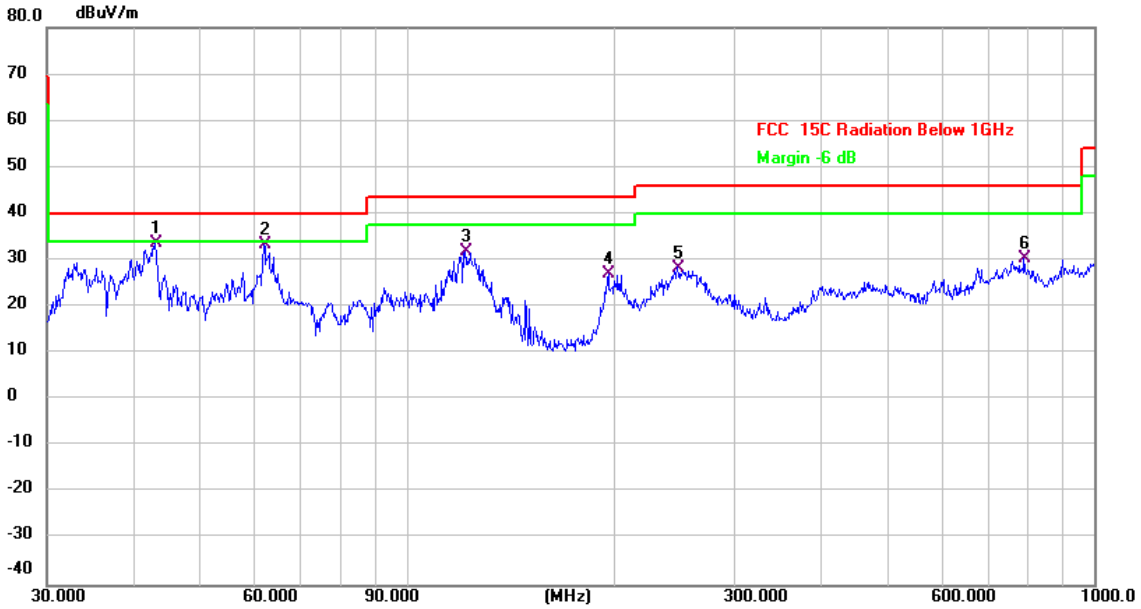
Test mode:	TX U-NII-1-802.11a-5240	Polarization:	Horizontal
Power supply:	DC 5V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		42.8998	32.86	-6.80	26.06	40.00	-13.94	QP
2		61.9951	39.21	-7.32	31.89	40.00	-8.11	QP
3	*	134.0882	50.11	-12.03	38.08	43.50	-5.42	QP
4		229.2931	38.41	-4.83	33.58	46.00	-12.42	QP
5		372.0045	45.82	-6.95	38.87	46.00	-7.13	QP
6		763.3757	35.62	1.31	36.93	46.00	-9.07	QP

Radiated emissions between 30MHz – 1GHz

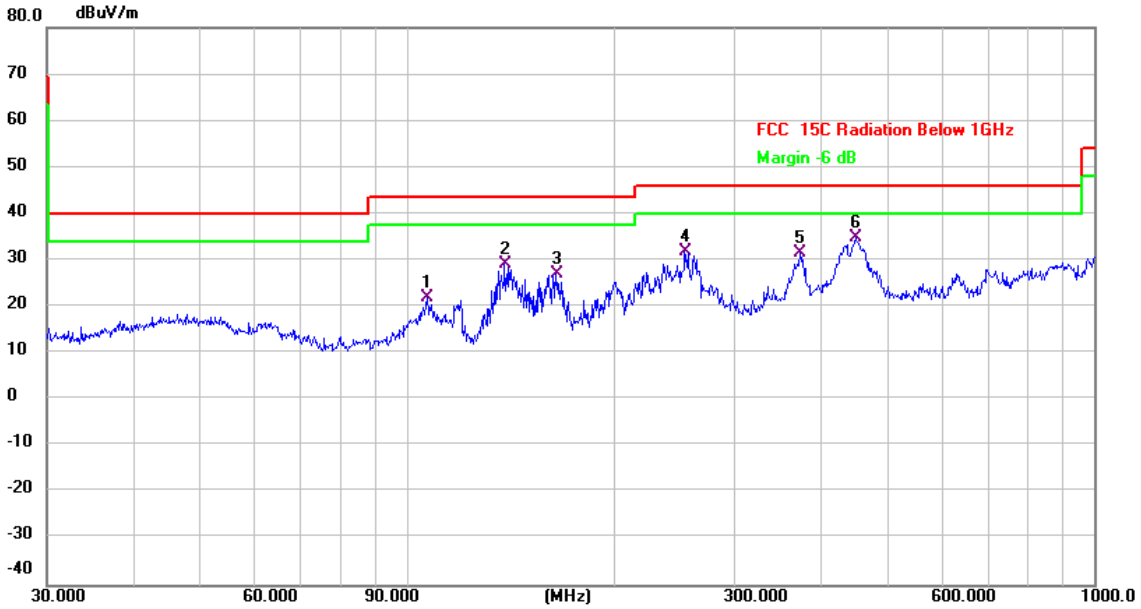
Test mode:	TX U-NII-1-802.11a-5240	Polarization:	Vertical
Power supply:	DC 5V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	43.0505	40.27	-6.75	33.52	40.00	-6.48	QP
2		61.9951	40.68	-7.32	33.36	40.00	-6.64	QP
3		121.5486	42.62	-10.63	31.99	43.50	-11.51	QP
4		196.5098	37.26	-10.32	26.94	43.50	-16.56	QP
5		247.6819	35.95	-7.55	28.40	46.00	-17.60	QP
6		790.6188	29.33	1.12	30.45	46.00	-15.55	QP

Radiated emissions between 30MHz – 1GHz

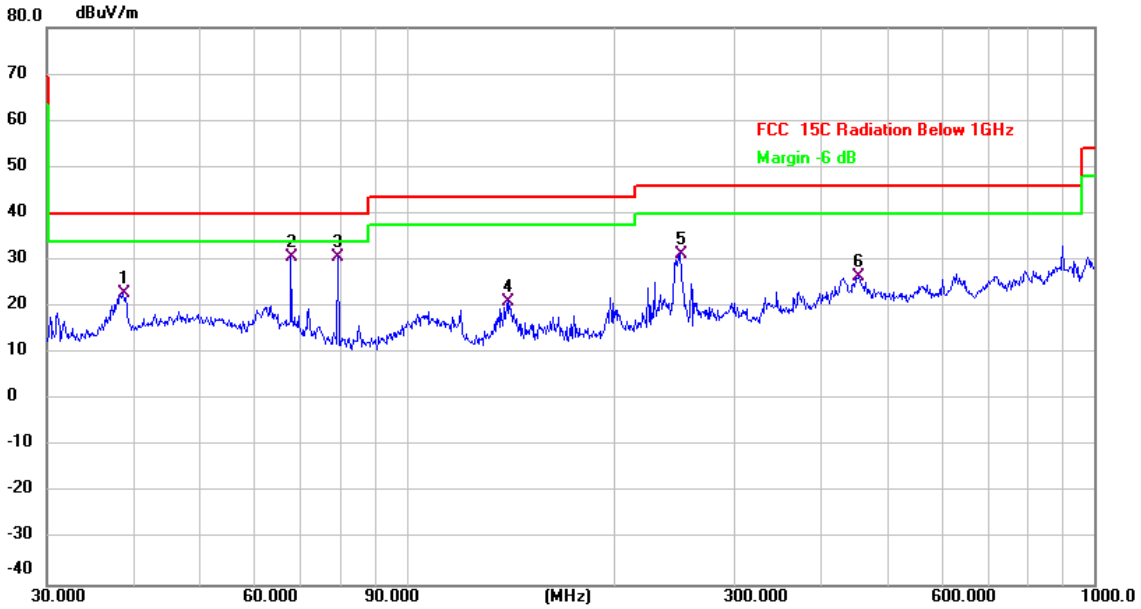
Test mode:	TX U-NII-3-802.11a-5745	Polarization:	Horizontal
Power supply:	DC 5V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		107.1337	28.98	-7.04	21.94	43.50	-21.56	QP
2		138.8735	39.07	-9.85	29.22	43.50	-14.28	QP
3		164.9075	38.06	-11.10	26.96	43.50	-16.54	QP
4		253.8367	39.30	-7.57	31.73	46.00	-14.27	QP
5		373.3112	36.00	-4.59	31.41	46.00	-14.59	QP
6	*	449.5558	39.06	-4.17	34.89	46.00	-11.11	QP

Radiated emissions between 30MHz – 1GHz

Test mode:	TX U-NII-3-802.11a-5745	Polarization:	Vertical
Power supply:	DC 5V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		38.7518	31.96	-8.98	22.98	40.00	-17.02	QP
2		67.9129	41.44	-10.87	30.57	40.00	-9.43	QP
3	*	79.5209	43.61	-12.97	30.64	40.00	-9.36	QP
4		140.3421	30.96	-9.76	21.20	43.50	-22.30	QP
5		250.3012	39.13	-7.73	31.40	46.00	-14.60	QP
6		454.3100	30.61	-4.09	26.52	46.00	-19.48	QP

Radiated emissions 1 GHz ~ 18 GHz (U-NII-1 band)

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11a – CH36 (5180 MHz)							
10360.00	46.11	6.93	53.04	74.00	-20.96	Peak	V
10360.00	36.17	6.93	43.10	54.00	-10.90	AVG	V
15540.00	45.80	13.65	59.45	74.00	-14.55	Peak	V
15540.00	35.57	13.65	49.22	54.00	-4.78	AVG	V
10360.00	43.10	6.93	50.03	74.00	-23.97	Peak	H
10360.00	33.29	6.93	40.22	54.00	-13.78	AVG	H
15540.00	44.61	13.65	58.26	74.00	-15.74	Peak	H
15540.00	34.66	13.65	48.31	54.00	-5.69	AVG	H
802.11a – CH40 (5200 MHz)							
10400.00	44.59	6.98	51.57	74.00	-22.43	Peak	V
10400.00	34.28	6.98	41.26	54.00	-12.74	AVG	V
15600.00	45.76	13.69	59.45	74.00	-14.55	Peak	V
15600.00	35.53	13.69	49.22	54.00	-4.78	AVG	V
10400.00	43.36	6.98	50.34	74.00	-23.66	Peak	H
10400.00	33.24	6.98	40.22	54.00	-13.78	AVG	H
15600.00	45.00	13.69	58.69	74.00	-15.31	Peak	H
15600.00	34.63	13.69	48.32	54.00	-5.68	AVG	H
802.11a – CH48 (5240 MHz)							
10480.00	45.45	7.00	52.45	74.00	-21.55	Peak	V
10480.00	35.26	7.00	42.26	54.00	-11.74	AVG	V
15720.00	45.70	13.63	59.33	74.00	-14.67	Peak	V
15720.00	35.39	13.63	49.02	54.00	-4.98	AVG	V
10480.00	43.25	7.00	50.25	74.00	-23.75	Peak	H
10480.00	33.12	7.00	40.12	54.00	-13.88	AVG	H
15720.00	45.87	13.63	59.50	74.00	-14.50	Peak	H
15720.00	35.59	13.63	49.22	54.00	-4.78	AVG	H

Radiated emissions 18 GHz ~ 40 GHz (U-NII-1 band)

Frequency	Reading Level	Correct Factor	Dist. Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	dB	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11a – CH36 (5180 MHz)								
20720	64.28	-7.9	-9.5	46.88	74	-27.12	Peak	V
20720	51.64	-7.9	-9.5	34.24	54	-19.76	AVG	V
36430	60.96	4.44	-9.5	55.90	74	-18.10	Peak	V
36430	50.69	4.44	-9.5	45.63	54	-8.37	AVG	V
20720	62.68	-7.9	-9.5	45.28	74	-28.72	Peak	H
20720	50.83	-7.9	-9.5	33.43	54	-20.57	AVG	H
36430	59.24	4.44	-9.5	54.18	74	-19.82	Peak	H
36430	51.37	4.44	-9.5	46.31	54	-7.69	AVG	H
802.11a – CH40 (5200 MHz)								
20800	60.36	-7.89	-9.5	42.97	74	-31.03	Peak	V
20800	51.16	-7.89	-9.5	33.77	54	-20.23	AVG	V
36430	60.34	4.44	-9.5	55.28	74	-18.72	Peak	V
36430	50.83	4.44	-9.5	45.77	54	-8.23	AVG	V
20800	61.74	-7.89	-9.5	44.35	74	-29.65	Peak	H
20800	52.82	-7.89	-9.5	35.43	54	-18.57	AVG	H
36430	58.81	4.44	-9.5	53.75	74	-20.25	Peak	H
36430	48.90	4.44	-9.5	43.84	54	-10.16	AVG	H
802.11a – CH48 (5240 MHz)								
20960	61.90	-7.87	-9.5	44.53	74	-29.47	Peak	V
20960	52.28	-7.87	-9.5	34.91	54	-19.09	AVG	V
36430	61.17	4.44	-9.5	56.11	74	-17.89	Peak	V
36430	49.71	4.44	-9.5	44.65	54	-9.35	AVG	V
20960	61.02	-7.87	-9.5	43.65	74	-30.35	Peak	H
20960	51.01	-7.87	-9.5	33.64	54	-20.36	AVG	H
36430	59.18	4.44	-9.5	54.12	74	-19.88	Peak	H
36430	51.14	4.44	-9.5	46.08	54	-7.92	AVG	H

Notes:

For above 18GHz tests, the test distance is 1m.

Radiated emissions 1 GHz ~ 18 GHz (U-NII-3 band)

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11a – CH149 (5745 MHz)							
11490.000	46.14	9.24	55.38	74.00	-18.62	Peak	V
11490.000	29.94	9.24	39.18	54.00	-14.82	AVG	V
17235.000	44.08	13.34	57.42	74.00	-16.58	Peak	V
17235.000	33.95	13.34	47.29	54.00	-6.71	AVG	V
11490.000	43.98	9.24	53.22	74.00	-20.78	Peak	H
11490.000	33.91	9.24	43.15	54.00	-10.85	AVG	H
17235.000	44.63	13.34	57.97	74.00	-16.03	Peak	H
17235.000	33.99	13.34	47.33	54.00	-6.67	AVG	H
802.11a – CH157 (5785 MHz)							
11568.000	47.80	9.43	57.23	74.00	-16.77	Peak	V
11568.000	37.72	9.43	47.15	54.00	-6.85	AVG	V
17355.000	43.16	13.44	56.60	74.00	-17.40	Peak	V
17355.000	32.79	13.44	46.23	54.00	-7.77	AVG	V
11568.000	41.70	9.43	51.13	74.00	-22.87	Peak	H
11568.000	31.59	9.43	41.02	54.00	-12.98	AVG	H
17355.000	43.29	13.44	56.73	74.00	-17.27	Peak	H
17355.000	32.95	13.44	46.39	54.00	-7.61	AVG	H
802.11a – CH165 (5825 MHz)							
11650.000	45.84	9.51	55.35	74.00	-18.65	Peak	V
11650.000	35.61	9.51	45.12	54.00	-8.88	AVG	V
17475.000	43.74	13.76	57.50	74.00	-16.50	Peak	V
17475.000	33.64	13.76	47.40	54.00	-6.60	AVG	V
11650.000	42.59	9.51	52.10	74.00	-21.90	Peak	H
11650.000	32.55	9.51	42.06	54.00	-11.94	AVG	H
17475.000	43.32	13.76	57.08	74.00	-16.92	Peak	H
17475.000	33.34	13.76	47.10	54.00	-6.90	AVG	H

Radiated emissions 18 GHz ~ 40 GHz (U-NII-3 band)

Frequency	Reading Level	Correct Factor	Dist. Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	dB	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11a – CH149 (5745 MHz)								
22980	63.22	-7.9	-9.5	45.82	74	-28.18	Peak	V
22980	51.33	-7.9	-9.5	33.93	54	-20.07	AVG	V
36430	59.46	4.44	-9.5	54.40	74	-19.60	Peak	V
36430	50.01	4.44	-9.5	44.95	54	-9.05	AVG	V
20720	62.10	-7.9	-9.5	44.70	74	-29.30	Peak	H
20720	49.91	-7.9	-9.5	32.51	54	-21.49	AVG	H
36430	60.54	4.44	-9.5	55.48	74	-18.52	Peak	H
36430	50.89	4.44	-9.5	45.83	54	-8.17	AVG	H
802.11a – CH157 (5785 MHz)								
23140	61.34	-5.22	-9.5	46.62	74	-27.38	Peak	V
23140	51.70	-5.22	-9.5	36.98	54	-17.02	AVG	V
36430	60.56	4.44	-9.5	55.50	74	-18.50	Peak	V
36430	49.67	4.44	-9.5	44.61	54	-9.39	AVG	V
23140	60.34	-7.89	-9.5	42.95	74	-31.05	Peak	H
23140	51.78	-7.89	-9.5	34.39	54	-19.61	AVG	H
36430	59.22	4.44	-9.5	54.16	74	-19.84	Peak	H
36430	50.57	4.44	-9.5	45.51	54	-8.49	AVG	H
802.11a – CH165 (5825 MHz)								
23300	60.51	-5.25	-9.5	45.76	74	-28.24	Peak	V
23300	50.92	-5.25	-9.5	36.17	54	-17.83	AVG	V
36430	61.14	4.44	-9.5	56.08	74	-17.92	Peak	V
36430	50.70	4.44	-9.5	45.64	54	-8.36	AVG	V
23300	60.52	-7.87	-9.5	43.15	74	-30.85	Peak	H
23300	50.50	-7.87	-9.5	33.13	54	-20.87	AVG	H
36430	59.81	4.44	-9.5	54.75	74	-19.25	Peak	H
36430	50.39	4.44	-9.5	45.33	54	-8.67	AVG	H

Notes:

For above 18GHz tests, the test distance is 1m.

Radiated emissions at band edge – U-NII-1 band

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11a – CH36 (5180 MHz)							
4500.000	45.74	-0.91	44.83	74.00	-29.17	Peak	V
4500.000	36.27	-0.91	35.36	54.00	-18.64	AVG	V
5150.000	53.74	1.92	55.66	74.00	-18.34	Peak	V
5150.000	39.80	1.92	41.72	54.00	-12.28	AVG	V
4500.000	44.94	-0.91	44.03	74.00	-29.97	Peak	H
4500.000	36.46	-0.91	35.55	54.00	-18.45	AVG	H
5150.000	64.41	1.92	66.33	74.00	-7.67	Peak	H
5150.000	44.95	1.92	46.87	54.00	-7.13	AVG	H
802.11a – CH48 (5240 MHz)							
5350.000	46.57	2.03	48.60	74.00	-25.40	Peak	V
5350.000	36.94	2.03	38.97	54.00	-15.03	AVG	V
5460.000	46.62	2.14	48.76	74.00	-25.24	Peak	V
5460.000	37.24	2.14	39.38	54.00	-14.62	AVG	V
5350.000	48.81	2.03	50.84	74.00	-23.16	Peak	H
5350.000	39.00	2.03	41.03	54.00	-12.97	AVG	H
5460.000	47.74	2.14	49.88	74.00	-24.12	Peak	H
5460.000	38.89	2.14	41.03	54.00	-12.97	AVG	H

Radiated emissions at band edge – U-NII-1 band

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11n20 – CH36 (5180 MHz)							
4500.000	45.86	-0.91	44.95	74.00	-29.05	Peak	V
4500.000	36.36	-0.91	35.45	54.00	-18.55	AVG	V
5150.000	51.56	1.92	53.48	74.00	-20.52	Peak	V
5150.000	38.91	1.92	40.83	54.00	-13.17	AVG	V
4500.000	46.67	-0.91	45.76	74.00	-28.24	Peak	H
4500.000	36.34	-0.91	35.43	54.00	-18.57	AVG	H
5150.000	58.58	1.92	60.50	74.00	-13.50	Peak	H
5150.000	42.89	1.92	44.81	54.00	-9.19	AVG	H
802.11n20 – CH48 (5240 MHz)							
5350.000	45.84	2.03	47.87	74.00	-26.13	Peak	V
5350.000	37.09	2.03	39.12	54.00	-14.88	AVG	V
5460.000	46.82	2.14	48.96	74.00	-25.04	Peak	V
5460.000	37.31	2.14	39.45	54.00	-14.55	AVG	V
5350.000	50.16	2.03	52.19	74.00	-21.81	Peak	H
5350.000	38.84	2.03	40.87	54.00	-13.13	AVG	H
5460.000	48.49	2.14	50.63	74.00	-23.37	Peak	H
5460.000	38.79	2.14	40.93	54.00	-13.07	AVG	H

Radiated emissions at band edge – U-NII-3 band

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11a – CH149 (5745 MHz)							
5650.000	45.88	1.86	47.74	68.20	-20.46	Peak	V
5700.000	47.40	1.71	49.11	105.20	-56.09	Peak	V
5720.000	60.47	1.69	62.16	110.80	-48.64	Peak	V
5725.000	65.04	1.67	66.71	122.20	-55.49	Peak	V
5650.000	48.26	1.86	50.12	68.20	-18.08	Peak	H
5700.000	56.09	1.71	57.80	105.20	-47.40	Peak	H
5720.000	71.43	1.69	73.12	110.80	-37.68	Peak	H
5725.000	80.06	1.67	81.73	122.20	-40.47	Peak	H
802.11a – CH165 (5825 MHz)							
5850.000	64.52	1.54	66.06	122.20	-56.14	Peak	V
5855.000	61.03	1.55	62.58	110.80	-48.22	Peak	V
5875.000	48.12	1.53	49.65	105.20	-55.55	Peak	V
5925.000	47.59	1.44	49.03	68.20	-19.17	Peak	V
5850.000	71.92	1.54	73.46	122.20	-48.74	Peak	H
5855.000	66.91	1.55	68.46	110.80	-42.34	Peak	H
5875.000	51.85	1.53	53.38	105.20	-51.82	Peak	H
5925.000	48.77	1.44	50.21	68.20	-17.99	Peak	H

Radiated emissions at band edge – U-NII-3 band

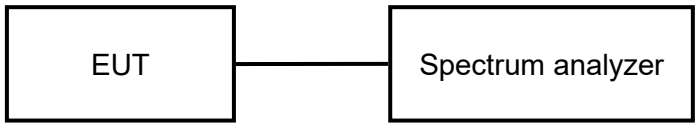
Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
802.11n20 – CH149 (5745 MHz)							
5650.000	46.52	1.86	48.38	68.20	-19.82	Peak	V
5700.000	47.15	1.71	48.86	105.20	-56.34	Peak	V
5720.000	57.66	1.69	59.35	110.80	-51.45	Peak	V
5725.000	62.48	1.67	64.15	122.20	-58.05	Peak	V
5650.000	48.47	1.86	50.33	68.20	-17.87	Peak	H
5700.000	55.89	1.71	57.60	105.20	-47.60	Peak	H
5720.000	69.82	1.69	71.51	110.80	-39.29	Peak	H
5725.000	76.98	1.67	78.65	122.20	-43.55	Peak	H
802.11 n20 – CH165 (5825 MHz)							
5850.000	66.66	1.54	68.20	122.20	-54.00	Peak	V
5855.000	59.65	1.55	61.20	110.80	-49.60	Peak	V
5875.000	48.71	1.53	50.24	105.20	-54.96	Peak	V
5925.000	48.58	1.44	50.02	68.20	-18.18	Peak	V
5850.000	68.58	1.54	70.12	122.20	-52.08	Peak	H
5855.000	63.31	1.55	64.86	110.80	-45.94	Peak	H
5875.000	50.06	1.53	51.59	105.20	-53.61	Peak	H
5925.000	49.33	1.44	50.77	68.20	-17.43	Peak	H

6.4 Emission bandwidth (26dB bandwidth)

6.4.1 Limits

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 , and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

6.4.2 Test setup



6.4.3 Test procedure

Test method: KDB 789033 D02 v02r01 Section C.1.

6.4.4 Test results

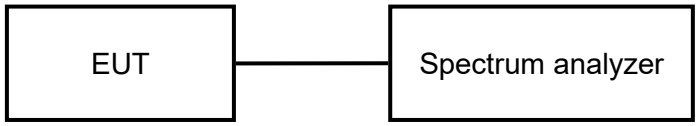
Note: See the Appendix A1

6.5 Emission bandwidth (6dB bandwidth)

6.5.1 Limits

Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

6.5.2 Test setup



6.5.3 Test procedure

Test method: KDB 789033 D02 v02r01 Section C.2.

6.5.4 Test results

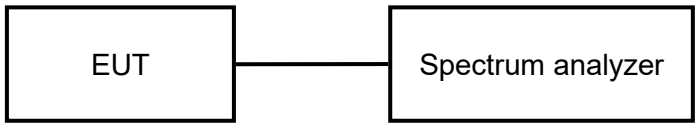
Note: See the Appendix A2

6.6 Duty Cycle

6.6.1 Limits

None, for reporting purposes only.

6.6.2 Test setup



6.6.3 Test procedure

Test method: ANSI C63.10 section 12.2.

6.6.4 Test Results

Note: see the Appendix B

6.7 Maximum conducted output power

6.7.1 Limits

5.15 - 5.25 GHz band

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

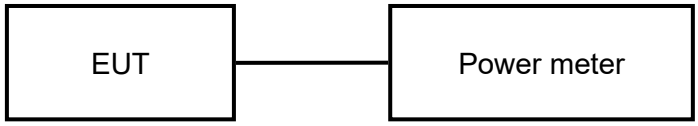
5.25-5.35 GHz and 5.47-5.725 GHz band

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 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.725-5.85 GHz band

For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.7.2 Test setup



6.7.3 Test procedure

Test method: 789033 D02 v02r01 Section E.3.a (Method PM)

6.7.4 Test results

Note: See the Appendix C

6.8 Power spectral density

6.8.1 Limits

5.15 - 5.25 GHz band

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

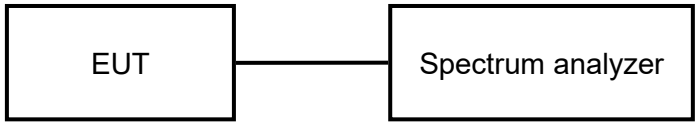
5.25-5.35 GHz and 5.47-5.725 GHz band

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 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.725-5.85 GHz band

For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.8.2 Test setup



6.8.3 Test procedure

Test method: KDB 789033 D02 v02r01 Section F.

6.8.4 Test results

Note: See the Appendix D

6.9 Conducted spurious emissions

6.9.1 Limits

Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

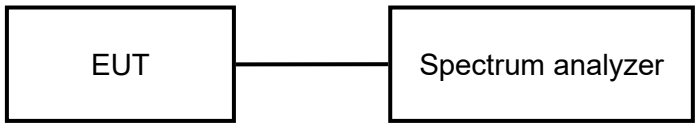
For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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 solely in the 5.725-5.850 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.

6.9.2 Test setup



6.9.3 Test procedure

Spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

6.9.4 Test results

Note: See the Appendix E

6.10 Conducted band edge

6.10.1 Limits

Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

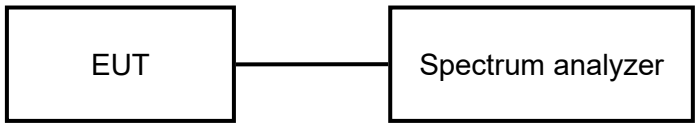
For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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 solely in the 5.725-5.850 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.

6.10.2 Test setup



6.10.3 Test procedure

Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
Repeat above procedures until all measured frequencies were complete.

6.10.4 Test results

Note: See the Appendix F

6.11 Frequency Stability

6.11.1 Limits

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.

6.11.2 Test Procedures

Test method: ANSI C63.10-2013 Clause 6.8.

6.11.3 Test results

Note: See the Appendix G

Photographs of the Test Setup

See the Appendix – Test Setup Photos.

Photographs of the EUT

See the Appendix - EUT Photos.

----End of Report----