Shenzhen HTT Technology Co., Ltd.

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15 SUBPART E 15.407

Report Reference No.....:	**HTT202206069F04**	
FCC ID..... :	**2ASU3-P-1**	
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Date of issue.....:	Jul.13,2022	
Testing Laboratory Name .....:	**Shenzhen HTT Technology Co.,Ltd.**	
Address .....:	1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road,Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China	
Applicant's name.....:	**Vela Optoelectronics (Suzhou) Co., Ltd**	
Address .....:	Building B, Advanced Laser (Equipment) Industrial Park, Xinchuang Daxin Zhen, Zhangjiagang, Suzhou, Jiangsu province, China	
Test specification .....**:**		
Standard .....:	**FCC Part 15 Subpart E 15.407**	
TRF Originator.....:	Shenzhen Global Test Service Co.,Ltd.	

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Test item description .....:	**HANDHELD LIBS**
Trade Mark .....:	PEGASUSLIBS
Manufacturer .....:	**Vela Optoelectronics (Suzhou) Co., Ltd**
Model/Type reference.....:	P-1
Listed Models .....:	P-1PLUS, P-1PRO, P-1CUSTOM, P-2, P-2PLUS, P-2PRO, P-2CUSTOM, P-3, P-3PLUS, P-3PRO, P-3CUSTOM
Modulation .....:	OFDM
Frequency.....	From 5180MHz-5240MHz, 5745MHz-5825MHz
Ratings .....:	DC 14.8V From Battery
Result.....:	**PASS**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

TEST REPORT

Equipment under Test	:	HANDHELD LIBS
Model /Type	:	P-1
Serial Models	:	P-1PLUS, P-1PRO, P-1CUSTOM, P-2, P-2PLUS, P-2PRO, P-2CUSTOM, P-3, P-3PLUS, P-3PRO, P-3CUSTOM
Applicant	:	Vela Optoelectronics (Suzhou) Co., Ltd
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Address	:	Building B, Advanced Laser (Equipment) Industrial Park, Xinchuang Road, Daxin Zhen, Zhangjiagang, Suzhou, Jiangsu province, China
Manufacturer	:	Vela Optoelectronics (Suzhou) Co., Ltd
Address	:	Building B, Advanced Laser (Equipment) Industrial Park, Xinchuang Road, Daxin Zhen, Zhangjiagang, Suzhou, Jiangsu province, China

Test Result:	**PASS**

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 Subpart E—Unlicensed National Information Infrastructure Devices
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
KDB789033 D02: General UNII Test Procedures New Rules v01r02

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Jun.20,2022
Testing commenced on	:	Jul.13,2022
Testing concluded on	:	Jul.13,2022

2.2 Product Description

Product Description:	HANDHELD LIBS	
Model:	P-1	
Power supply:	DC 14.8V From Battery	
Adapter Information	Mode: vela 1608-2 Input: AC100-240V, 50/60Hz, 1.5A Output: DC 16.8, 2000mA	
testing sample ID：	HTT202206069-1# (Engineer sample), HTT202206069-2# (Normal sample)	
WIFI		
Supported type:	40MHz system	80MHz system
	802.11n	802.11ac
Operation frequency:	5190MHz-5230MHz 5755MHz-5795MHz	5210MHz 5775MHz
Modulation:	OFDM	OFDM
Channel number:	4	2
Channel separation:	40MHz	80MHz
Antenna type:	PCB antenna	
Antenna gain:	0 dBi	

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 14.8V From Battery

2.4 Short description of the Equipment under Test (EUT)

This is a HANDHELD LIBS.

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

2.5 EUT operation mode

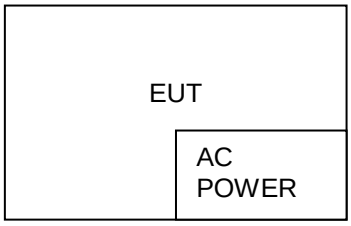
The Applicant provides communication tools software (AT command) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.
All test performed at the low, middle and high of operational frequency range of each mode.

Operation Frequency List WIFI on 5G Band：

Operating band	40MHz		80MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)
U-NII 1 (5150MHz-5250MHz)	38	5190	42	5210
	46	5230		
U-NII 3 (5725MHz-5850MHz)	151	5755	155	5775
	159	5795		
	--	--	--	--

Note: The line display in grey is those Channels/Frequencies select to test in this report for each operation mode.

2.6 Block Diagram of Test Setup



2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended 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 HTT Technology Co.,Ltd.
1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road,Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

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

FCC-Registration No.: 779513 Designation Number: CN1319
Shenzhen HTT 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.: 6435.01
Shenzhen HTT 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:
Radiated Emission:

Temperature:	25 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

AC Power Conducted Emission

Temperature:	24 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

3.4 Test Description

FCC Requirement		
FCC Part 15.207	AC Power Conducted Emission	N/A
FCC Part 15.407(a)	Emission Bandwidth(26dBm Bandwidth)	PASS Note1
FCC Part 15.407(e)	Minimum Emission Bandwidth(6dBm Bandwidth)	PASS Note2
FCC Part 15.407(a)	Maximum Conducted Output Power	PASS
FCC Part 15.407(a)	Peak Power Spectral Density	PASS
FCC Part 15.407(g)	Frequency Stability	PASS
FCC Part 15.407(b)	Undesirable emission	PASS
FCC Part 15.407(b)/15.205/15.209	Radiated Emissions	PASS
FCC Part 15.407(h)	Dynamic Frequency Selection	N/A Note 3
FCC Part 15.203/15.247(b)	Antenna Requirement	PASS

Note 1: Apply to U-NII 1 band.
Note 2: Apply to U-NII 3 band only.
Note 3: This device not work in DFS band.

Data Rate Used:
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.

Test Items	Mode	Data Rate
Maximum Conducted Output Power Power Spectral Density Emission Bandwidth(26dBm Bandwidth) Minimum Emission Bandwidth(6dBm Bandwidth) Undesirable emission Frequency Stability	11n(40MHz),11ac(40MHz)/OFDM	15.0Mbps
	11ac(80MHz)/OFDM	65.0Mbps

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 HTT 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 HTT Technology Co.,Ltd.:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

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

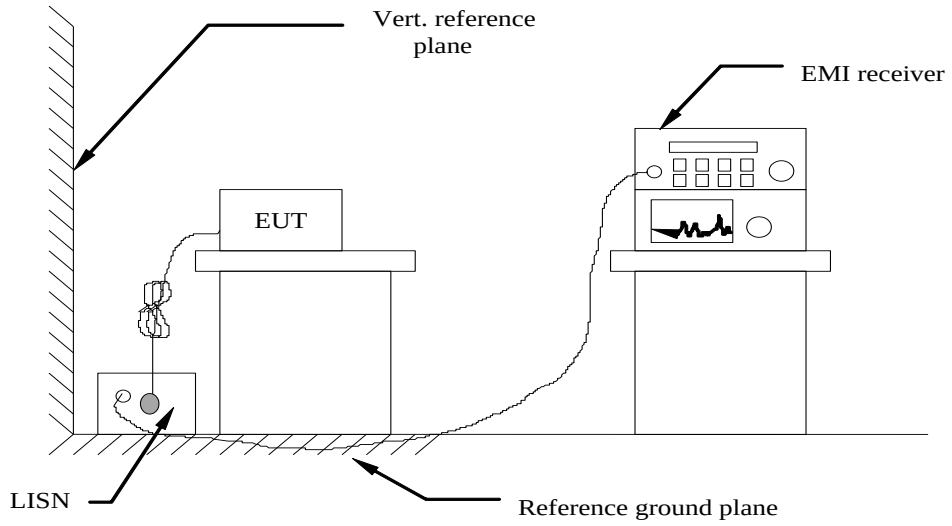
3.6 Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	Shenzhen C.R.T technology co., LTD	9*6*6	HTT-E028	Aug. 10 2020	Aug. 09 2024
2	Control Room	Shenzhen C.R.T technology co., LTD	4.8*3.5*3.0	HTT-E030	Aug. 10 2020	Aug. 09 2024
3	EMI Test Receiver	Rohde&Schwar	ESCI7	HTT-E022	May 23 2022	May 22 2023
4	Spectrum Analyzer	Rohde&Schwar	FSP	HTT-E037	May 23 2022	May 22 2023
5	Coaxial Cable	ZDecl	ZT26-NJ-NJ-0.6M	HTT-E018	May 23 2022	May 22 2023
6	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-2M	HTT-E019	May 23 2022	May 22 2023
7	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-0.6M	HTT-E020	May 23 2022	May 22 2023
8	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-8.5M	HTT-E021	May 23 2022	May 22 2023
9	Composite logarithmic antenna	Schwarzbeck	VULB 9168	HTT-E017	Aug. 22 2021	Aug. 21 2022
10	Horn Antenna	Schwarzbeck	BBHA9120D	HTT-E016	Aug. 22 2021	Aug. 21 2022
11	Loop Antenna	Zhinan	ZN30900C	HTT-E039	Aug. 22 2021	Aug. 21 2022
12	Horn Antenna	Beijing Hangwei Dayang	OBH100400	HTT-E040	Aug. 22 2021	Aug. 21 2022
13	low frequency Amplifier	Sonoma Instrument	310	HTT-E015	May 23 2022	May 22 2023
14	high-frequency Amplifier	HP	8449B	HTT-E014	May 23 2022	May 22 2023
15	Variable frequency power supply	Shenzhen Anbiao Instrument Co., Ltd	ANB-10VA	HTT-082	May 23 2022	May 22 2023
16	EMI Test Receiver	Rohde & Schwarz	ESCS30	HTT-E004	May 23 2022	May 22 2023
17	Artificial Mains	Rohde & Schwarz	ESH3-Z5	HTT-E006	May 23 2022	May 22 2023
18	Artificial Mains	Rohde & Schwarz	ENV-216	HTT-E038	May 23 2022	May 22 2023
19	Cable Line	Robinson	Z302S-NJ-BNCJ-1.5M	HTT-E001	May 23 2022	May 22 2023
20	Attenuator	Robinson	6810.17A	HTT-E007	May 23 2022	May 22 2023
21	Variable frequency power supply	Shenzhen Yanghong Electric Co., Ltd	YF-650（5KVA）	HTT-E032	May 23 2022	May 22 2023
22	Control Room	Shenzhen C.R.T technology co., LTD	8*4*3.5	HTT-E029	May 23 2022	May 22 2023
23	DC power supply	Agilent	E3632A	HTT-E023	May 23 2022	May 22 2023
24	EMI Test Receiver	Agilent	N9020A	HTT-E024	May 23 2022	May 22 2023
25	Analog signal generator	Agilent	N5181A	HTT-E025	May 23 2022	May 22 2023
26	Vector signal generator	Agilent	N5182A	HTT-E026	May 23 2022	May 22 2023
27	Power sensor	Keysight	U2021XA	HTT-E027	May 23 2022	May 22 2023
28	Temperature and humidity meter	Shenzhen Anbiao Instrument Co., Ltd	TH10R	HTT-074	May 23 2022	May 22 2023
29	Radiated Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
30	Conducted Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
31	RF Test Software	panshanrf	TST	N/A	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 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

The EUT is powered by the Battery,So this test item is not applicable for the EUT.

4.2 Radiated Emissions

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:

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

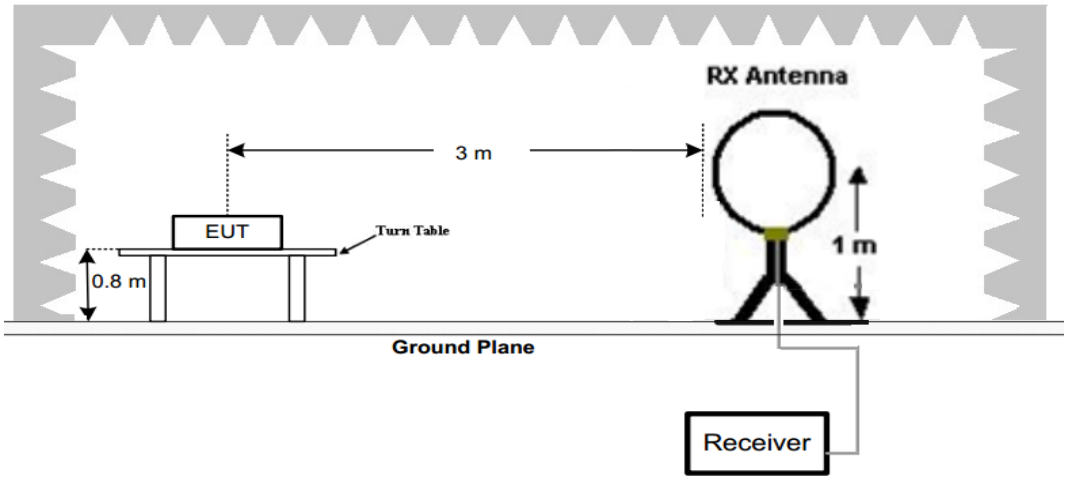
(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209
(6)In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

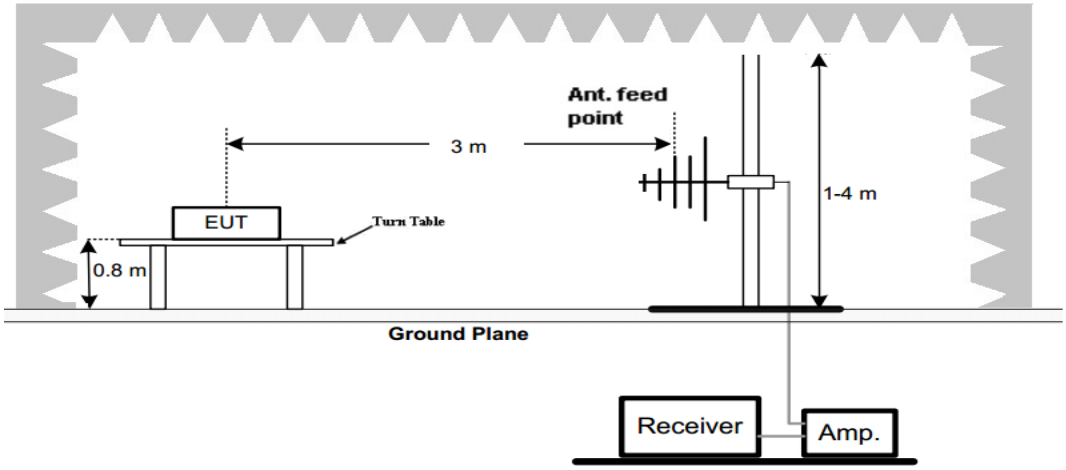
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

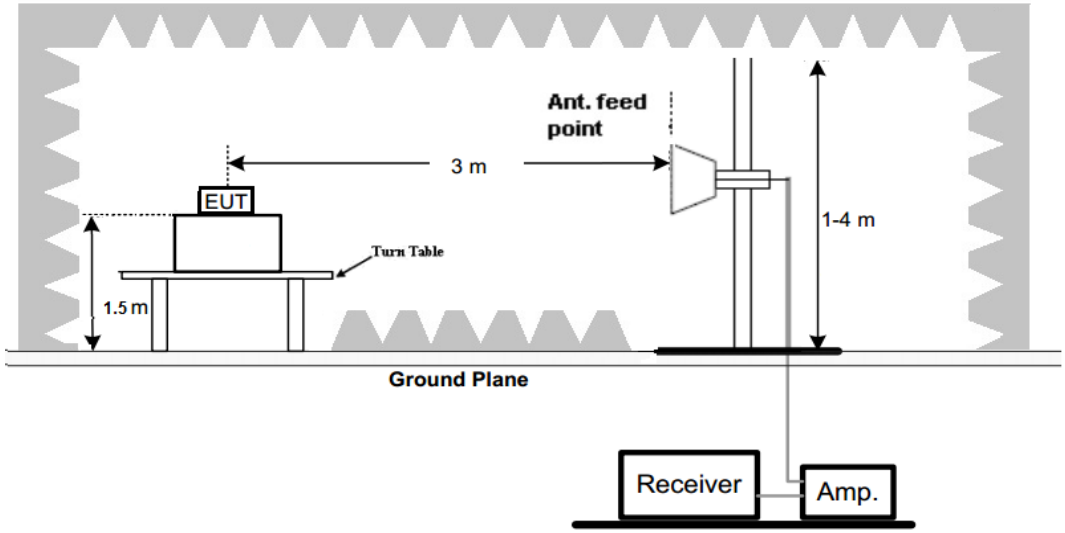
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



Test Procedure

1. 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.
2. 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
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 40GHz.
6. 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 Anternna	1

7. 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:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
1. All *802.11n (HT40)/ 802.11ac (HT80)* modes have been tested for below 1GHz test, only the worst case *802.11n (HT40)* low channel of U-NII 1 band was recorded.
2. All *802.11n (HT40)/ 802.11ac (HT80)* modes have been tested for above 1GHz test, only the worst case *802.11n (HT40)* was recorded.
3. 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

Horizontal

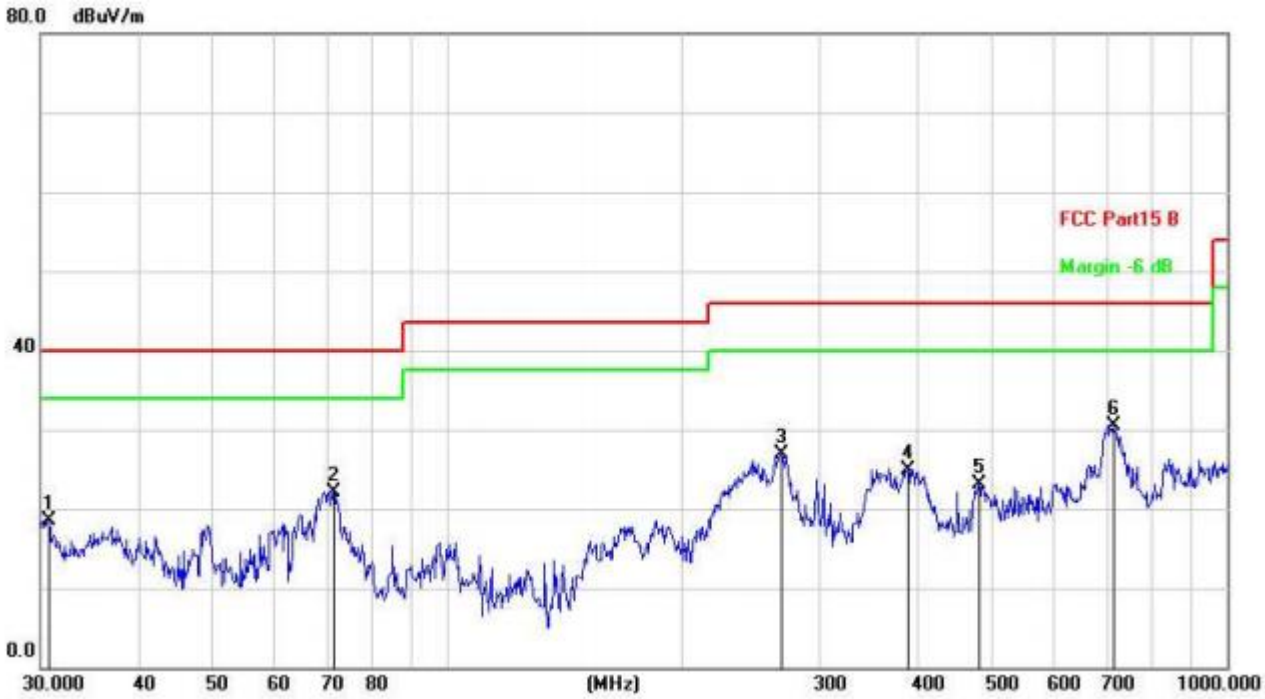
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1		142.3240	41.00	-17.82	23.18	43.50	-20.32	QP
2		183.8437	48.76	-19.80	28.96	43.50	-14.54	QP
3		260.1444	54.48	-18.68	35.80	46.00	-10.20	QP
4	*	379.9141	55.58	-17.38	38.20	46.00	-7.80	QP
5		473.8346	39.48	-14.17	25.31	46.00	-20.69	QP
6		716.6820	39.28	-8.44	30.84	46.00	-15.16	QP

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

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1		30.7454	36.95	-18.52	18.43	40.00	-21.57	QP
2		71.3300	42.42	-20.24	22.18	40.00	-17.82	QP
3		267.5455	44.92	-18.07	26.85	46.00	-19.15	QP
4		389.3548	40.08	-15.21	24.87	46.00	-21.13	QP
5		480.5276	37.36	-14.25	23.11	46.00	-22.89	QP
6	*	714.1734	38.95	-8.54	30.41	46.00	-15.59	QP

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

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

For 1GHz to 40GHz

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

U-NII 1 & 802.11n(HT40) (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)
	5150.00	56.32	PK	H	68.20	11.88	59.75	33.04	5.45	41.92	-3.43
38.00	5150.00	46.10	AV	H	54.00	7.90	49.53	33.04	5.45	41.92	-3.43
(5190MHz)	10380.00	52.30	PK	H	68.20	15.90	38.83	38.83	10.12	45.28	3.67
	--	--	--	--	--	--	--	--	--	--	--
46.00	5350.50	47.59	PK	H	68.20	20.61	50.86	32.84	5.97	42.08	-3.27
(5230MHz)	10460.00	53.16	PK	H	68.20	15.04	49.42	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)
	5150.00	55.69	PK	V	68.20	12.51	59.12	33.04	5.45	41.92	-3.43
38.00	5150.00	47.16	AV	V	54.00	6.84	50.59	33.04	5.45	41.92	-3.43
(5190MHz)	10380.00	52.30	PK	V	68.20	15.90	48.63	38.83	10.12	45.28	3.67
	--	--	--	--	--	--	--	--	--	--	--
46.00	5350.50	52.33	PK	V	68.20	15.87	55.60	32.84	5.97	42.08	-3.27
(5230MHz)	10460.00	53.14	PK	V	68.20	15.06	49.40	38.89	10.19	45.34	3.74
	--	--	--	--	--	--	--	--	--	--	--

U-NII 3 & 802.11n (HT40) 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)
	5720.00	57.15	PK	H	68.20	11.05	59.93	33.42	6.04	42.24	-2.78
151.00	5720.00	45.32	AV	H	54.00	8.68	48.10	33.42	6.04	42.24	-2.78
(5755MHz)	11510.00	51.69	PK	H	68.20	16.51	47.21	39.02	10.91	45.45	4.48
	--	--	--	--	--	--		--	--	--	--
159.00	5855.00	52.13	PK	H	68.20	16.07	54.32	33.91	6.17	42.27	-2.19
(5795MHz)	11590.00	53.15	PK	H	68.20	15.05	48.57	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	54.42	PK	V	68.20	13.78	57.20	33.42	6.04	42.24	-2.78
151.00	5720.00	46.01	AV	V	54.00	7.99	48.79	33.42	6.04	42.24	-2.78
(5755MHz)	11510.00	48.27	PK	V	68.20	19.93	43.79	39.02	10.91	45.45	4.48
	--	--	--	--	--	--	--	--	--	--	--
159.00	5855.00	51.24	PK	V	68.20	16.96	53.43	33.91	6.17	42.27	-2.19
(5795MHz)	11590.00	52.30	PK	V	68.20	15.90	47.72	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 15Mbps at IEEE 802.11n HT40; MCS0 at IEEE 802.11ac VHT80;

4.3 Maximum Conducted Average Output Power

Limit

For the band 5.15-5.25 GHz.
(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

(iv) 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.

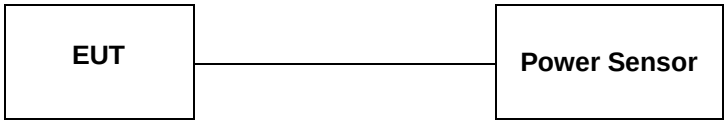
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

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

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

U-NII 1

Type	Channel	Output power (dBm)	Limit (dBm)	Result
802.11n(HT40)	38	6.22	24.0	Pass
	46	6.97		
802.11ac(HT80)	42	7.15	24.0	Pass

U-NII 3

Type	Channel	Output power (dBm)	Limit (dBm)	Result
802.11n(HT40)	151	3.05	30.00	Pass
	159	3.98		
802.11ac(HT80)	155	3.58	30.00	Pass

4.4 Power Spectral Density

Limit

(1) For the band 5.15 - 5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. [note1]

(2) For the 5.25 - 5.35 GHz and 5.47 - 5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. [note1]

(3) For the band 5.725 - 5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. [note1, note2]

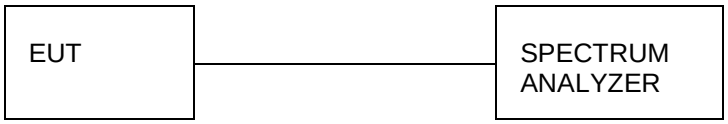
Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 1MHz for U-NII 1, U-NII 2A, U-NII C band and 510KHz for U-NII 3 band.
3. Set the VBW ≥ 3× RBW.
4. Set the span to encompass the entire EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.

Test Configuration



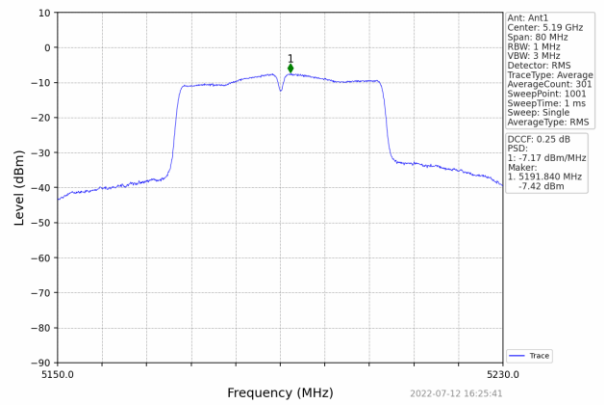
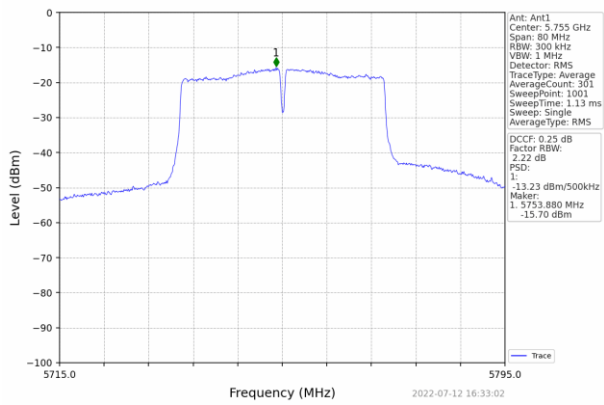
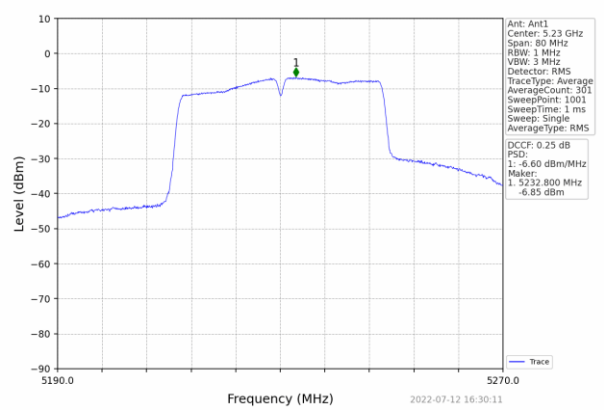
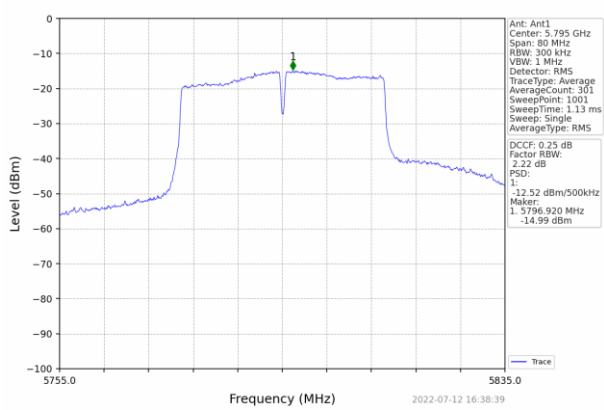
Test Results

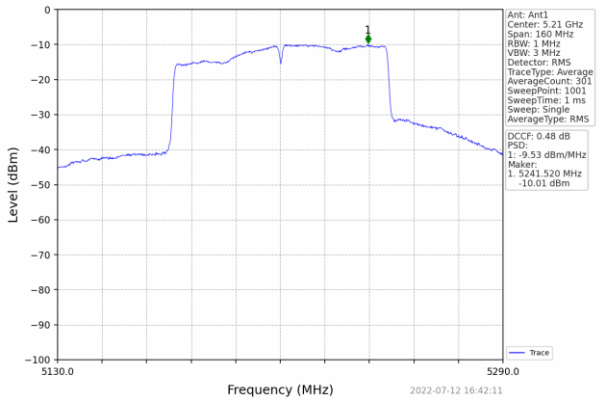
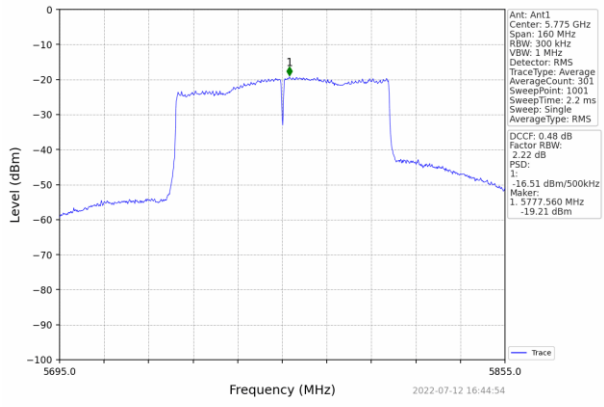
Type	Bands	Channel	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Result
802.11n (HT40)	U-NII 1	38	-7.17	11.0	Pass
		46	-6.60		
802.11ac (HT80)	U-NII 1	42	-9.53		

Type	Bands	Channel	Power Spectral Density (dBm/300KHz)	Power Spectral Density (dBm/500KHz)	Limit (dBm/500KHz)	Result
802.11n (HT40)	U-NII 3	151	-13.23	-11.01	30.0	Pass
		159	-12.52	-10.30		
802.11ac (HT80)	U-NII 3	155	-16.51	-14.29		

Remark: P.S.D(dBm/500KHz)= P.S.D(dBm/300KHz)+10 log (500 kHz/300KHz).

Test plot as follows

802.11n(HT40)	
U-NII 1	*U-NII 3*
	
CH38	*CH151*
	
CH46	*CH159*

802.11ac(HT80)	
U-NII 1	*U-NII 3*
	
CH42	*CH155*

4.5 Emission Bandwidth (26dB Bandwidth)

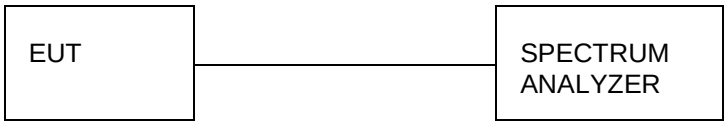
Limit

N/A

Test Procedure

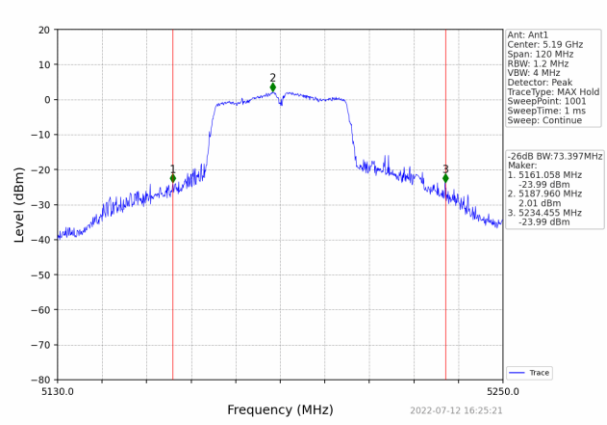
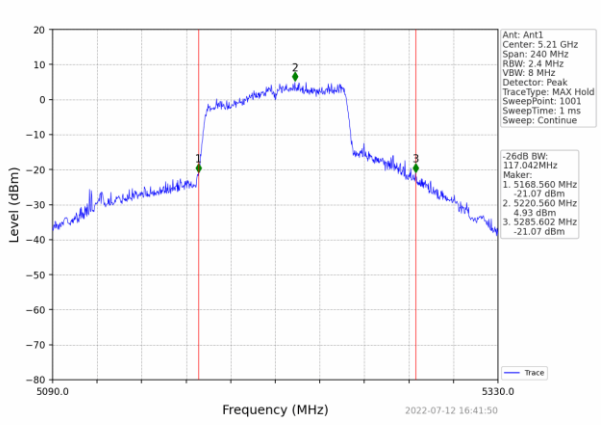
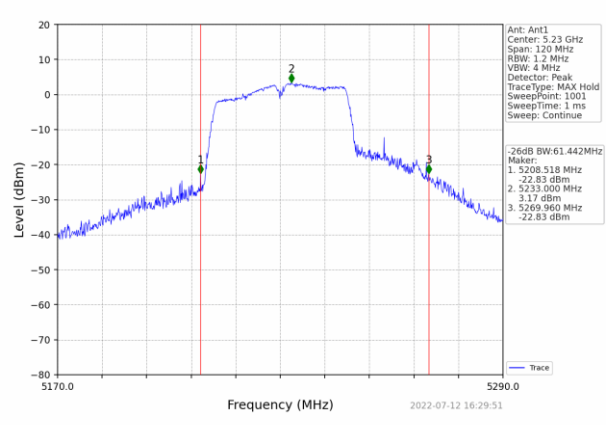
1. Set resolution bandwidth (RBW) = approximately 1 % of the EBW.
2. Set the video bandwidth (VBW) > RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW / EBW ratio is approximately 1 %.

Test Configuration



Test Results

Type	Bands	Channel	26dB Bandwidth (MHz)	Limit (MHz)	Result
802.11n(HT40)	U-NII 1	38	73.397	N/A	Pass
		46	61.442		
802.11ac(HT80)	U-NII 1	42	117.042		

802.11n(HT40)	*802.11ac(HT80)*
	
CH38	*CH42*
	
CH46	

4.6 Minimum Emission Bandwidth (6dB Bandwidth)

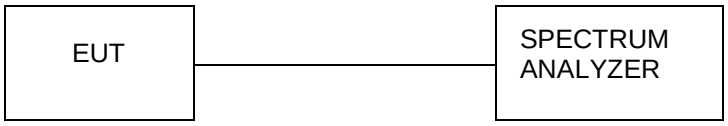
Limit

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

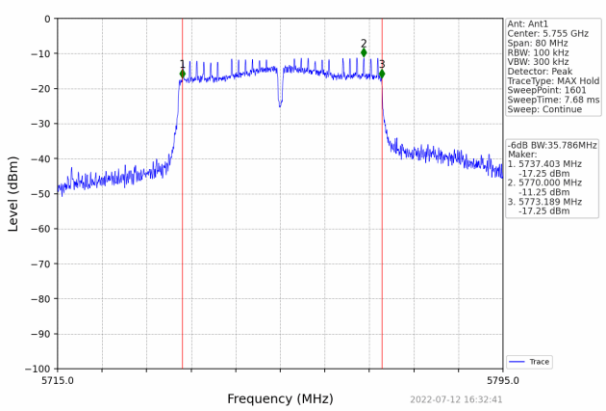
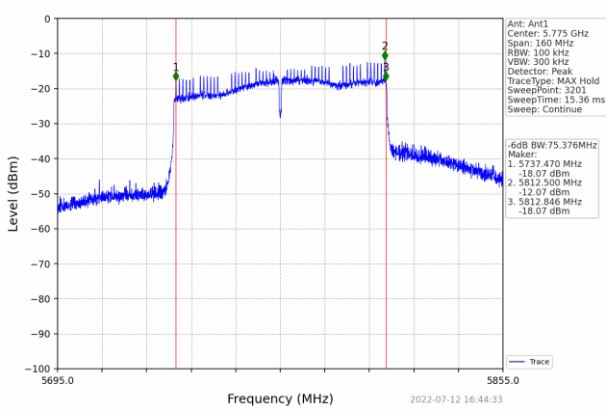
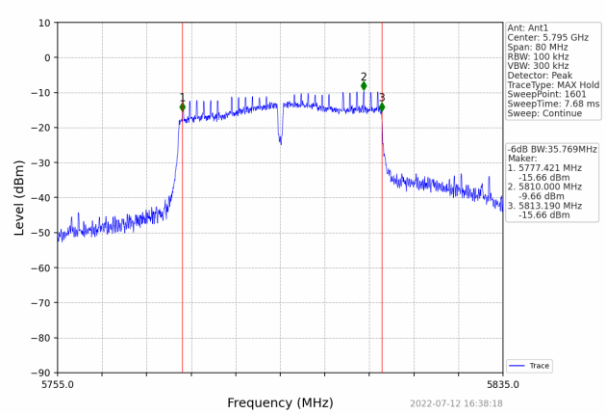
1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth 3 x RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Configuration



Test Results

Type	Bands	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11n(HT40)	U-NII 3	151	35.786	≥500KHz	Pass
		159	35.769		
802.11ac(HT80)	U-NII 3	155	75.376		

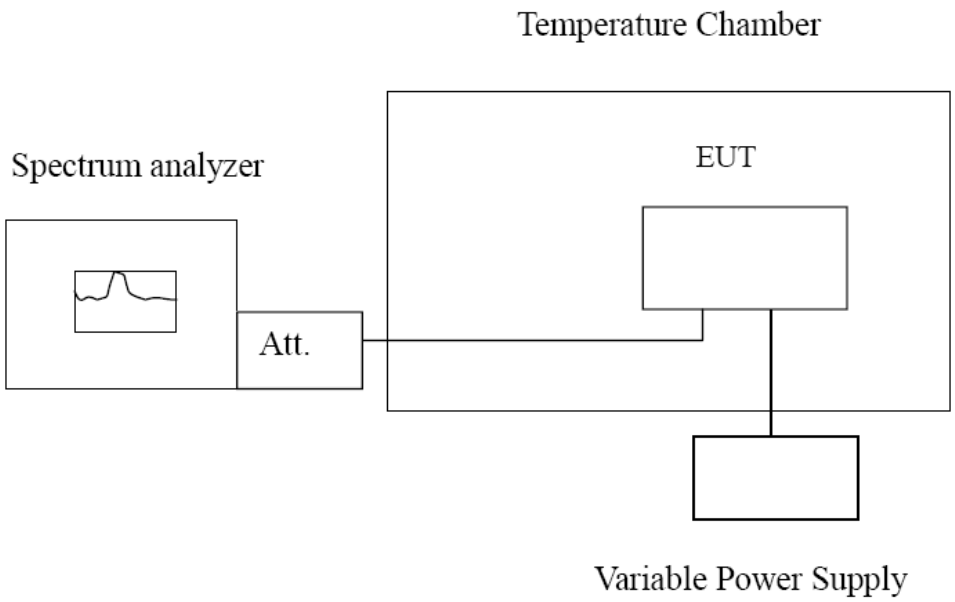
802.11n(HT40)	*802.11ac(HT80)*
	
CH151	*CH155*
	
CH159	

4.7 Frequency Stability

LIMIT

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.

TEST CONFIGURATION



TEST PROCEDURE

Frequency Stability under Temperature Variations:
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20℃ operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

Frequency Stability under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

TEST RESULTS

Record worst case as below:

U-NII 1						
Mode	Frequency (MHz)	Temperature (°C)	Voltage (VAC)	Measured Frequency (MHz)	Limit (MHz)	Verdict
802.11n (HT40)	5190	20	12.58	5190.040	5174.929 to 5205.071	Pass
			14.80	5190.160	5174.929 to 5205.071	Pass
			17.02	5190.160	5174.929 to 5205.071	Pass
		-30	14.80	5190.120	5174.929 to 5205.071	Pass
		50	14.80	5190.160	5174.929 to 5205.071	Pass
	5230	20	12.58	5230.200	5215.184 to 5244.816	Pass
			14.80	5230.000	5215.184 to 5244.816	Pass
			17.02	5230.120	5215.184 to 5244.816	Pass
		-30	14.80	5230.000	5215.184 to 5244.816	Pass
		50	14.80	5230.160	5215.184 to 5244.816	Pass
802.11ac (VHT80)	5210	20	12.58	5210.150	5179.399 to 5240.601	Pass
			14.80	5210.075	5179.399 to 5240.601	Pass
			17.02	5210.150	5179.399 to 5240.601	Pass
		-30	14.80	5210.075	5179.399 to 5240.601	Pass
		50	14.80	5210.075	5179.399 to 5240.601	Pass

U-NII 3						
Mode	Frequency (MHz)	Temperature (°C)	Voltage (VAC)	Measured Frequency (MHz)	Limit (MHz)	Verdict
802.11n (HT40)	5755	20	12.58	5755.080	5740.149 to 5769.851	Pass
			14.80	5755.120	5740.149 to 5769.851	Pass
			17.02	5755.160	5740.149 to 5769.851	Pass
		-30	14.80	5755.160	5740.149 to 5769.851	Pass
		50	14.80	5755.120	5740.149 to 5769.851	Pass
	5795	20	12.58	5795.120	5780.125 to 5809.875	Pass
			14.80	5795.080	5780.125 to 5809.875	Pass
			17.02	5795.080	5780.125 to 5809.875	Pass
		-30	14.80	5795.080	5780.125 to 5809.875	Pass
		50	14.80	5795.120	5780.125 to 5809.875	Pass
802.11ac (VHT80)	5775	20	12.58	5775.225	5744.361 to 5805.639	Pass
			14.80	5775.225	5744.361 to 5805.639	Pass
			17.02	5775.150	5744.361 to 5805.639	Pass
		-30	14.80	5775.225	5744.361 to 5805.639	Pass
		50	14.80	5775.225	5744.361 to 5805.639	Pass

5 Test Setup Photos of the EUT

Reference to the **appendix I** for details.

6 Photos of the EUT

Reference to the **appendix II** for details.

**********End of Report**********