FCC Part 15C&RSS-247 TEST REPORT

FCC ID: YGM-E300A

IC:21567-E300A

Product	:	**Alexa Ceiling Amplifier**
Model Name	:	**E300A**
Brand	:	
Report No.	:	**NCT23034169-2**

Prepared for

Armour Home Electronics Limited

Woodside 2, Dunmow Road, Bishop's Stortford, Hertfordshire, CM23 5RG UNITED KINGDOM

Prepared by

Shenzhen NCT Testing Technology Co., Ltd.

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1 TEST RESULT CERTIFICATION

Applicant’s name	:	Armour Home Electronics Limited
Address	:	Woodside 2, Dunmow Road, Bishop's Stortford, Hertfordshire, CM23 5RG UNITED KINGDOM
Manufacture's name	:	Armour Home Electronics Limited
Address	:	Woodside 2, Dunmow Road, Bishop's Stortford, Hertfordshire, CM23 5RG UNITED KINGDOM
Product name	:	Alexa Ceiling Amplifier
Model name	:	E300A
Additional model	:	N/A
Standards	:	FCC CFR Title 47 Part 15 Subpart C Section 15.407 ANSI C63.10:2013 KDB 789033 D02 v01r02 RSS-247 Issue 3, February 2017 RSS-GEN Issue 5 April 2018 Amendment 2(February 2021)
Test procedure	:	ANSI C63.10:2013
Test Date	:	Sep. 02 ~ Oct. 18, 2023
Date of Issue	:	Oct. 18, 2023
Test Result	:	Pass

This device described above has been tested by NCT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

Hugh Zhang

Hugh Zhang / Engineer

Technical Manager:

Henry Wang

Henry Wang / Manager

Contents

2Test Summary

FCC Part15 (15.407) , Subpart E (5.2G&5.8G)		
Standard Section	**Test Item**	**Result**
15.407(b), 15.209 RSS-247 6.2 RSS-Gen §8.9&8.10	Radiated Spurious Emission	PASS
15.207 RSS-Gen 8.8 RSS-247 3.1	Conducted Emission	PASS
15.407 (a) 15.407 (e) RSS-247 6.2 RSS-Gen 6.7	99% , 6dB and 26dB Bandwidth	PASS
15.407 (a) RSS-247 6.2	Maximum Conducted Output Power	PASS
15.407(b) RSS-247 6.2	Band Edge	PASS
15.407 (a) RSS-247 6.2	Power Spectral Density	PASS
15.407(g) RSS-Gen 8.11	Frequency Stability	PASS
15.407(c), RSS-247 Section 5.2(b)	Iransmission in case of Absence of Information	PASS
15.203 RSS-Gen 6.8	Antenna Requirement	PASS

Remark:

1. “N/A” denotes test is not applicable in this Test Report.

3TEST FACILITY

Site Description

EMC Lab. : Accredited by CNAS, 2022-09-27

The certificate is valid until 2028.01.07

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L8251

Designation Number: CN1347

Test Firm Registration Number: 894804

Accredited by A2LA, June 14, 2023

The Certificate Registration Number is 6837.01

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0150

Company Number: 30806

Name of Firm : Shenzhen NCT Testing Technology Co., Ltd.

Site Location : A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, People's Republic of China

4General Information

4.1General Description of E.U.T.

Product Name:	Alexa Ceiling Amplifier
Model No.:	E300A
Sample ID	N/A
Sample(s) Status:	Engineer sample
Operation Frequency:	WIFI 5.2G: 5180MHz~5240MHz WIFI 5.8G: 5745MHz~5825MHz
Modulation type:	802.11a(OFDM): BPSK,QPSK,16-QAM,64-QAM 802.11n(OFDM): BPSK,QPSK,16-QAM,64-QAM 802.11ac(OFDM): BPSK,QPSK,16-QAM,64-QAM,256-QAM
Antenna Type:	PCB Antenna
Antenna gain:	5.9 dBi
Hardware Version:	24
Software Version:	2628.0001.0
SWITCHING POWER ADAPTER:	Manufacturer: Dongguan YiDai Power Technology Co., LTD Model:TD-ZN2200150-6B Input: 100-240V~ 50/60Hz 1.5A Max Output: DC 22.0V/1.5A, 33W
Remark:	Remark：the Antenna gain is provided by customer from Antenna spec. and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant. 2.4G Wifi &BT antenna and 5G Wifi antenna cannot transmit at the same time. 2.4G WLAN and BT share the same antenna port and cannot transmit simultaneously.

Frequency and Channel list for 802.11 a/n(HT20)/n(HT40)/ac (VH20)/ac(VH40)/ac(VH80):

802.11a/n/ac Frequency Channel					
20MHz		40MHz		80MHz	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230	155	5775
44	5220	151	5755		
48	5240	159	5795		

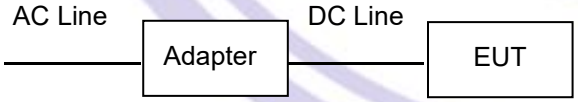
149	5745				
153	5765				
157	5785				
161	5805				
165	5825				

Test Frequency and Channel for 802.11 a/n(HT20)/n(HT40)/ac (VH20)/ac(VH40)/ac(VH80):

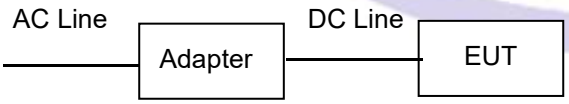
802.11a/n/ac Frequency Channel						
	Lowest Frequency		Middle Frequency		Highest Frequency	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
802.11 a/n(HT20)/ac(VH20)	36	5180	40	5200	48	5240
802.11 n(HT40)/ac(VH40)	38	5190	-	-	46	5230
802.11 ac(VH80)	-	-	42	5210	-	-
802.11 a/n(HT20)/ac(VH20)	149	5745	157	5785	165	5825
802.11 n(HT40)/ac(VH40)	151	5755	-	-	159	5795
802.11 ac(VH80)	-	-	155	5775	-	-

4.2Test Setup Configuration

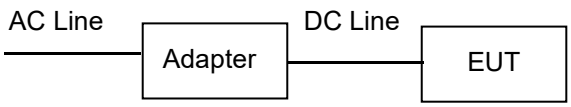
Conducted Emission



Radiated Emission



Conducted Spurious



4.3Test Mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Test Software	DutApi-w8887-BrdigeEth
Power level setup	< 0 dBm

5Equipment During Test

5.1Equipments List

Conducted emission Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	944 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESPI	101604	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	ENV 216	102796	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	VN1-13S	004023	CRANAGE	2023/6/21	2024/6/20
Cable	RG223-1500MM	NA	RG	2023/6/21	2024/6/20

Radiated emission & Radio Frequency Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESCI	101178	Rohde & Schwarz	2023/6/21	2024/6/20
Spectrum Analyze（10Hz-26.5GHz）	N9020A	MY50510202	Agilent	2023/6/21	2024/6/20
Amplifi（30MHz-1GHz）	BBV 9743 B	00374	SCHNARZBECK	2023/6/21	2024/6/20
Bilog Antenna（30MHz-1GHz）	VULB9162	00473	SCHNARZBECK	2023/3/19	2025/3/18
Horn antenna（1GHz-18GHz）	BBHA 9120 D	02622	SCHNARZBECK	2023/3/19	2025/3/18
Pream plifier（1GHz-18GHz）	BBV 9718D	0024	SCHNARZBECK	2023/6/21	2024/6/20
Spectrum Analyze（10Hz-40GHz）	FSV 40	100952	Rohde & Schwarz	2023/6/21	2024/6/20
Pream plifier（15GHz-40GHz）	BBV 9721	0056	SCHNARZBECK	2023/6/21	2024/6/20
Broadband Antenna（18GHz-40GHz）	SAS-574	588	A.H.System	2023/3/19	2025/3/18
Loop Antenna (9KHz-30MHz)	FMZB1519B	014	SCHNARZBECK	2023/6/21	2024/6/20

Amplifier (9KHz-30MHz)	CVP 9222 C	00109	SCHNARZBECK	2023/6/21	2024/6/20
Power Sensor	TR1029-2	512364	SCHNARZBECK	2023/6/21	2024/6/20
RF Swith	TR1029-1	512364	SCHNARZBECK	2023/6/21	2024/6/20
Cable	DA800-4000MM	NA	DA	2023/6/21	2024/6/20
Cable	DA800-11000MM	NA	DA	2023/6/21	2024/6/20

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	AUDIX	e3	6.120718
2	EMC radiation test system	AUDIX	e3	6.120718
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

5.2Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

5.3Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Alexa Ceiling Amplifier	Q ACOUSTICS, Q	E300A	N/A	EUT
E-2	Notebook	Lenovo	LN-A0403A3C	36001672	AE

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

6Conducted Emission

Test Requirement:	:	FCC CFR 47 Part 15 Section 15.207
Test Method:	:	ANSI C63.10:2013
Test Result:	:	PASS
Frequency Range:	:	150kHz to 30MHz
Class/Severity:	:	Class B
Detector:	:	Peak for pre-scan (9kHz Resolution Bandwidth)

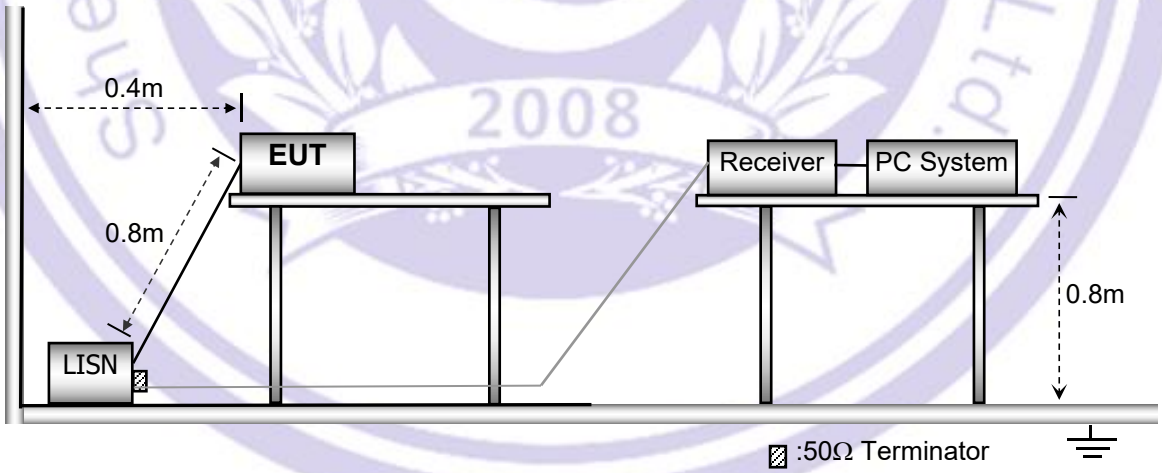
6.1E.U.T. Operation

Operating Environment **:**

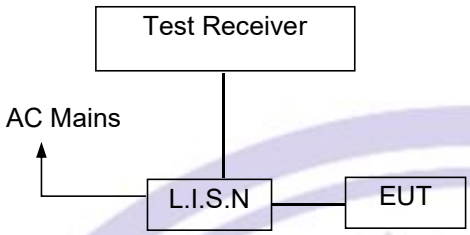
Temperature:	:	23.2°C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.12 kPa
Test Voltage	:	AC 120V/60Hz

6.2EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



6.3Test SET-UP (Block Diagram of Configuration)



6.4Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.5Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.6Measurement Description

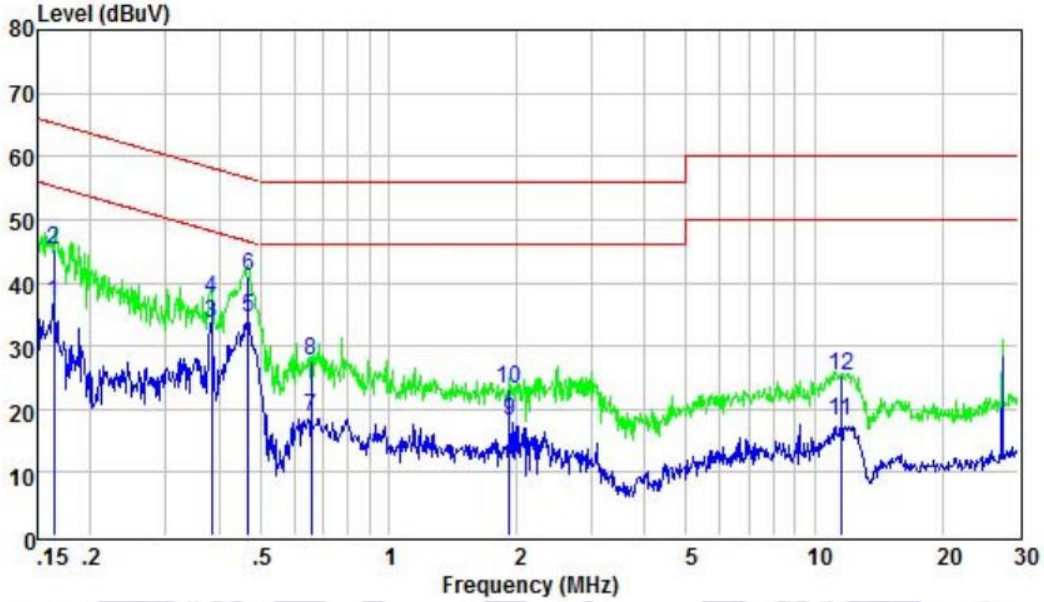
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7Conducted Emission Test Result

Pass

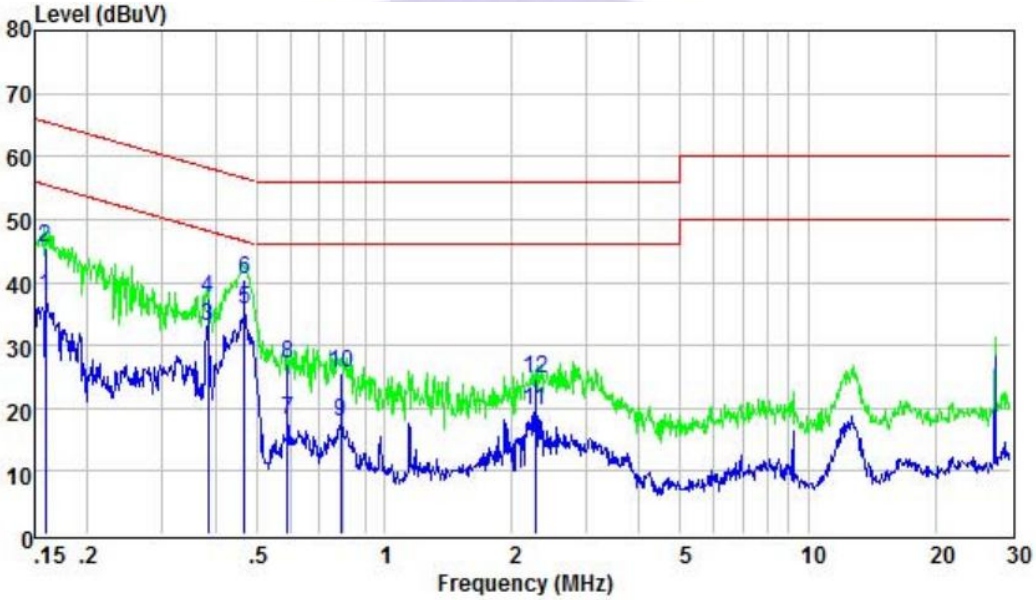
Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (802.11a) are recorded in the following pages and the others modulation methods do not exceed the limits.

Temperature:	26°C	Relative Humidity:	54%
Pressure:	101kPa	Phase :	L
Test Voltage :	DC 22V From adapter input AC 120V/60Hz		



	Freq	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dB	
1	0.16	36.88	9.63	0.05	55.25	-18.37	Average
2	0.16	45.27	9.63	0.05	65.25	-19.98	QP
3	0.39	33.61	9.66	0.05	48.17	-14.56	Average
4	0.39	37.47	9.66	0.05	58.17	-20.70	QP
5	0.47	34.63	9.68	0.05	46.54	-11.91	Average
6	0.47	41.08	9.68	0.05	56.54	-15.46	QP
7	0.66	18.59	9.65	0.05	46.00	-27.41	Average
8	0.66	27.59	9.65	0.05	56.00	-28.41	QP
9	1.92	18.27	9.59	0.06	46.00	-27.73	Average
10	1.92	23.27	9.59	0.06	56.00	-32.73	QP
11	11.50	18.21	9.62	0.10	50.00	-31.79	Average
12	11.50	25.21	9.62	0.10	60.00	-34.79	QP

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	N
Test Voltage :	DC 22V From adapter input AC 120V/60Hz		



	Freq	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dB	
1	0.16	37.82	9.59	0.05	55.52	-17.70	Average
2	0.16	45.59	9.59	0.05	65.52	-19.93	QP
3	0.39	33.03	9.61	0.05	48.17	-15.14	Average
4	0.39	37.48	9.61	0.05	58.17	-20.69	QP
5	0.47	35.73	9.63	0.05	46.54	-10.81	Average
6	0.47	40.59	9.63	0.05	56.54	-15.95	QP
7	0.59	18.11	9.63	0.05	46.00	-27.89	Average
8	0.59	27.11	9.63	0.05	56.00	-28.89	QP
9	0.79	17.70	9.63	0.05	46.00	-28.30	Average
10	0.79	25.70	9.63	0.05	56.00	-30.30	QP
11	2.27	19.59	9.59	0.06	46.00	-26.41	Average
12	2.27	24.59	9.59	0.06	56.00	-31.41	QP

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor

7Radiated Spurious Emissions

Test Requirement	:	FCC CFR47 Part 15 Section 15.209 & 15.407 RSS-Gen §8.9, RSS-Gen §8.10
Test Method	:	ANSI C63.10:2013
Test Result	:	PASS
Measurement Distance	:	3m
Limit	:	See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))}$ + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))}$ + 40
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)}$ + 40
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1EUT Operation

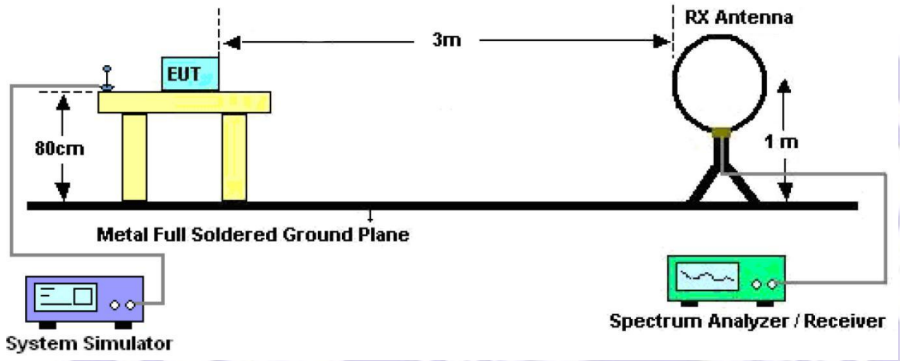
Operating Environment :

Temperature	:	24.5 °C
Humidity	:	55.5% RH
Atmospheric Pressure	:	101.3kPa
Test Voltage	:	AC 120V60Hz

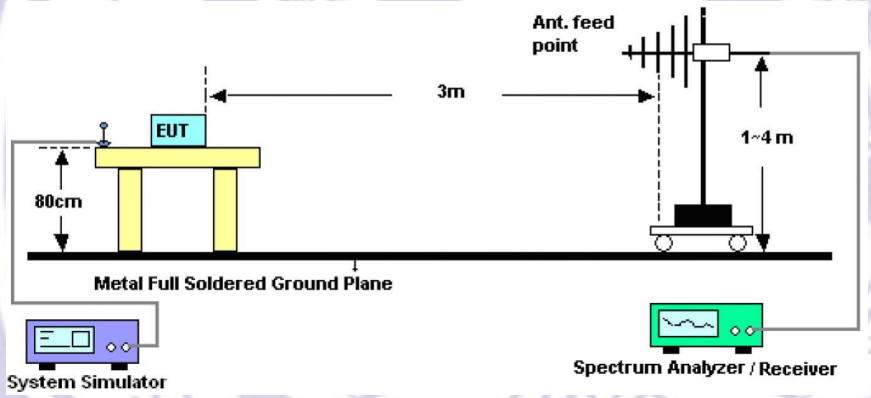
7.2Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

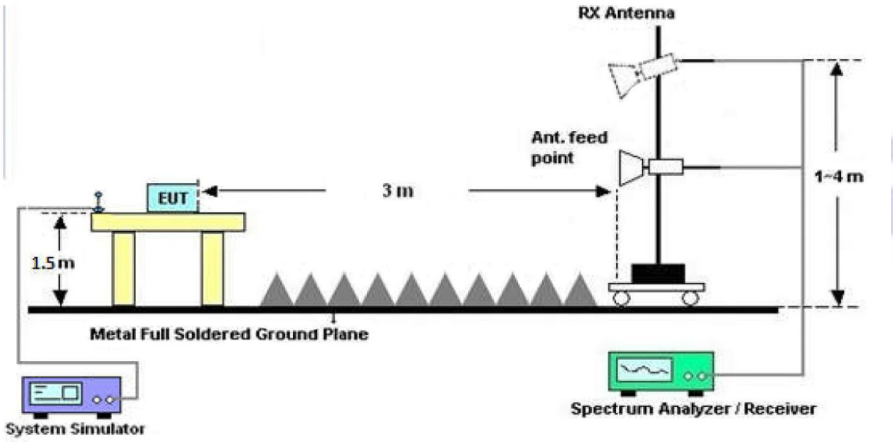
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3Spectrum Analyzer Setup

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / *10Hz* for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

7.4Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

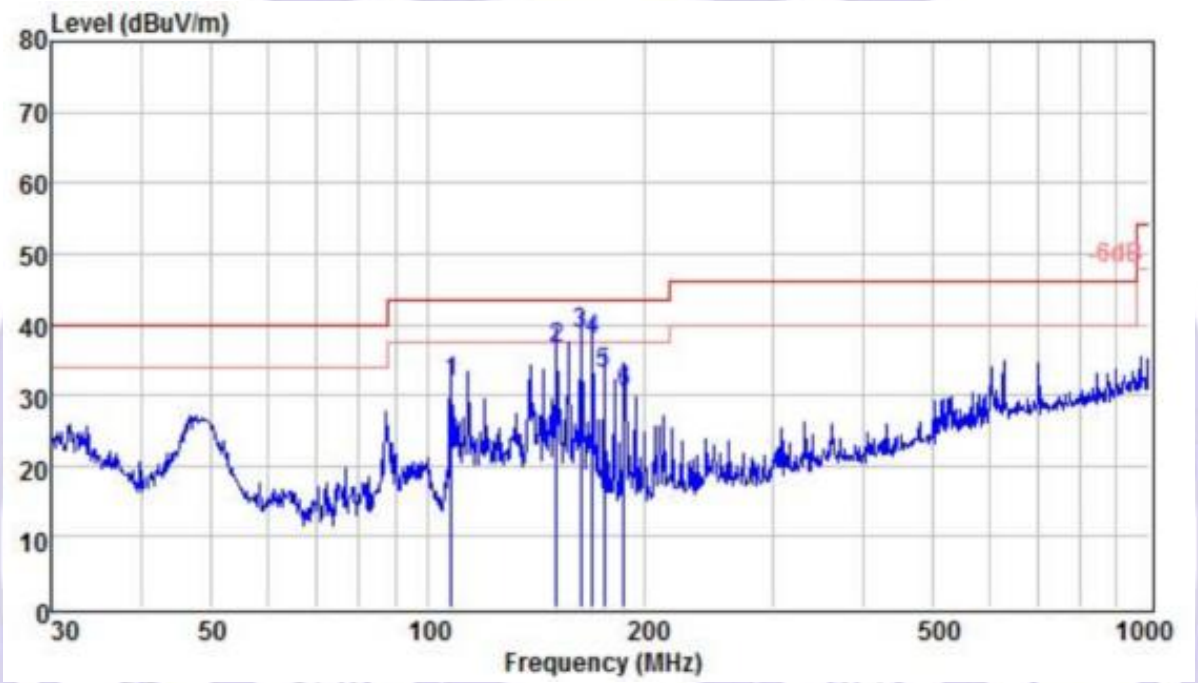
The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Please refer to the following test plots,Low Channel Worst case 802.11a for record:

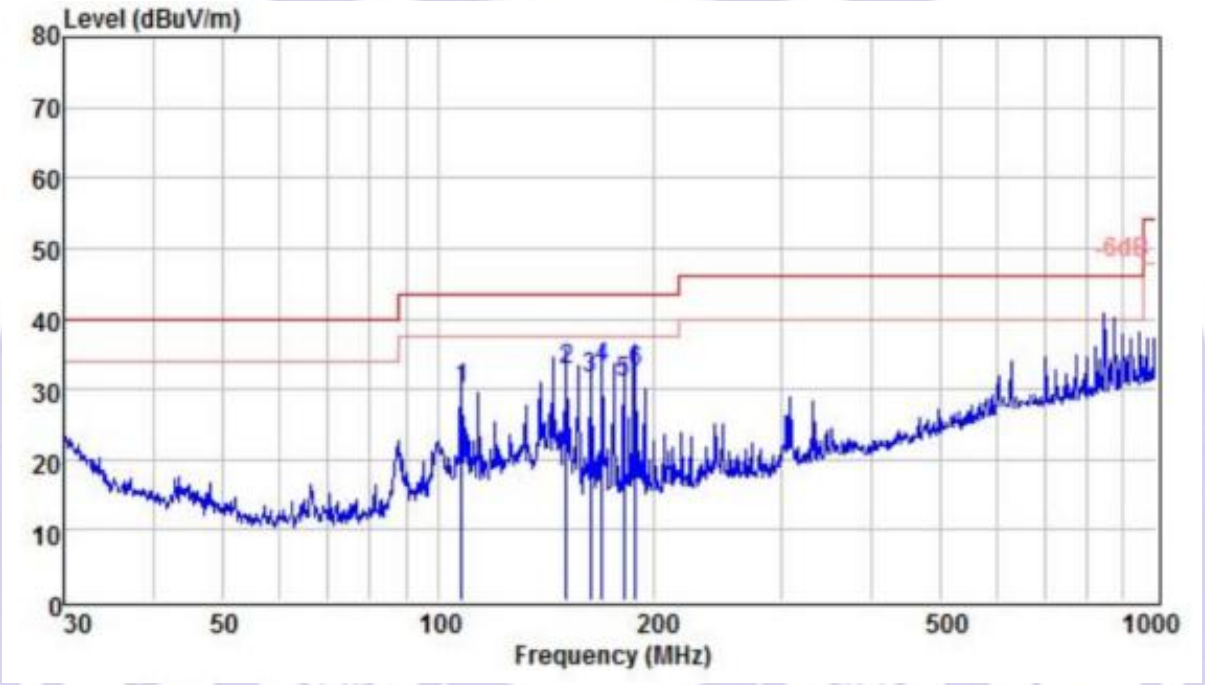
Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage:	DC 22V From adapter input AC 120V/60Hz		



	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	107.51	21.56	9.37	0.77	31.70	43.50	-11.80	QP
2	150.54	26.61	9.01	0.82	36.44	43.50	-7.06	QP
3 !	162.61	28.41	9.43	0.84	38.68	43.50	-4.82	QP
4 !	169.01	26.79	10.01	0.84	37.64	43.50	-5.86	QP
5	175.04	21.99	10.25	0.85	33.09	43.50	-10.41	QP
6	187.10	19.40	10.19	0.86	30.45	43.50	-13.05	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	Horizontal
Test Voltage:	DC 22V From adapter input AC 120V/60Hz		



	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	107.51	19.99	9.30	0.77	30.06	43.50	-13.44	QP
2	150.54	22.78	9.00	0.82	32.60	43.50	-10.90	QP
3	162.61	21.15	9.65	0.84	31.64	43.50	-11.86	QP
4	169.01	22.22	10.10	0.84	33.16	43.50	-10.34	QP
5	181.28	19.73	10.40	0.85	30.98	43.50	-12.52	QP
6	187.75	21.37	10.10	0.86	32.33	43.50	-11.17	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Test Frequency 1GHz-40GHz

802.11a

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:5180MHz									
V	10360	44.32	32.29	8.39	38.9	59.32	74	-14.68	PK
V	10360	24.63	32.29	8.39	38.9	39.63	54	-14.37	AV
V	15540	40.31	31.19	9.62	40.37	59.11	74	-14.89	PK
V	15540	20.36	31.19	9.62	40.37	39.16	54	-14.84	AV
V	20720	39.42	27.02	7.20	38.98	58.58	74	-15.42	PK
V	20720	19.32	27.02	7.20	38.98	38.48	54	-15.52	AV
V	25900	38.74	27.10	7.56	40.18	59.38	74	-14.62	PK
V	25900	18.32	27.10	7.56	40.18	38.96	54	-15.04	AV
H	10360	44.31	32.29	8.39	38.9	59.31	74	-14.69	PK
H	10360	24.72	32.29	8.39	38.9	39.72	54	-14.28	AV
H	15540	40.63	31.19	9.62	40.37	59.43	74	-14.57	PK
H	15540	20.72	31.19	9.62	40.37	39.52	54	-14.48	AV
H	20720	39.72	27.02	7.20	38.98	58.88	74	-15.12	PK
H	20720	19.34	27.02	7.20	38.98	38.5	54	-15.5	AV
H	25900	38.63	27.10	7.56	40.18	59.27	74	-14.73	PK
H	25900	18.42	27.10	7.56	40.18	39.06	54	-14.94	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:5200MHz									
V	10400	40.36	32.26	8.48	38.90	55.48	74	-18.52	PK
V	10400	20.32	32.26	8.48	38.90	35.44	54	-18.56	AV
V	15600	36.45	31.08	9.67	40.61	55.65	74	-18.35	PK
V	15600	16.32	31.08	9.67	40.61	35.52	54	-18.48	AV
V	20800	36.12	27.03	7.24	39.03	55.36	74	-18.64	PK
V	20800	16.75	27.03	7.24	39.03	35.99	54	-18.01	AV
V	26000	35.75	27.10	7.58	40.34	56.57	74	-17.43	PK
V	26000	15.97	27.10	7.58	40.34	36.79	54	-17.21	AV
H	10460	41.33	32.26	8.48	38.90	56.45	74	-17.55	PK
H	10460	20.15	32.26	8.48	38.90	35.27	54	-18.73	AV
H	15690	36.45	31.08	9.67	40.61	55.65	74	-18.35	PK
H	15690	16.14	31.08	9.67	40.61	35.34	54	-18.66	AV
H	20920	36.12	27.03	7.24	39.03	55.36	74	-18.64	PK
H	20920	16.75	27.03	7.24	39.03	35.99	54	-18.01	AV
H	26150	35.63	27.10	7.58	40.34	56.45	74	-17.55	PK
H	26150	15.32	27.10	7.58	40.34	36.14	54	-17.86	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:5240MHz									
V	10480	46.36	32.23	8.56	38.90	61.59	74	-12.41	PK
V	10480	26.75	32.23	8.56	38.90	41.98	54	-12.02	AV
V	15720	42.63	30.97	9.73	40.85	62.24	74	-11.76	PK
V	15720	22.74	30.97	9.73	40.85	42.35	54	-11.65	AV
V	20960	42.96	27.03	7.26	39.06	62.25	74	-11.75	PK
V	20960	22.36	27.03	7.26	39.06	41.65	54	-12.35	AV
V	26200	41.63	27.10	7.61	40.40	62.54	74	-11.46	PK
V	26200	21.37	27.10	7.61	40.40	42.28	54	-11.72	AV
H	10480	46.32	32.23	8.56	38.90	61.55	74	-12.45	PK
H	10480	20.12	32.23	8.56	38.90	35.35	54	-18.65	AV
H	15720	36.42	30.97	9.73	40.85	56.03	74	-17.97	PK
H	15720	22.74	30.97	9.73	40.85	42.35	54	-11.65	AV
H	20960	39.32	27.03	7.26	39.06	58.61	74	-15.39	PK
H	20960	22.63	27.03	7.26	39.06	41.92	54	-12.08	AV
H	26200	41.32	27.10	7.61	40.40	62.23	74	-11.77	PK
H	26200	17.33	27.10	7.61	40.40	38.24	54	-15.76	AV

802.11a

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:5745MHz									
V	11490	44.42	32.70	7.72	38.59	58.03	74	-15.97	PK
V	11490	26.32	32.70	7.72	38.59	39.93	54	-14.07	AV
V	17235	46.63	31.74	9.44	39.29	63.62	74	-10.38	PK
V	17235	21.63	31.74	9.44	39.29	38.62	54	-15.38	AV
V	22980	42.36	26.93	6.64	37.94	60.01	74	-13.99	PK
V	22980	19.26	26.93	6.64	37.94	36.91	54	-17.09	AV
V	28725	39.63	27.10	7.90	39.32	59.75	74	-14.25	PK
V	28725	21.63	27.10	7.90	39.32	41.75	54	-12.25	AV
H	11490	42.23	32.70	7.72	38.59	55.84	74	-18.16	PK
H	11490	26.23	32.70	7.72	38.59	39.84	54	-14.16	AV
H	17235	39.63	31.74	9.44	39.29	56.62	74	-17.38	PK
H	17235	24.23	31.74	9.44	39.29	41.22	54	-12.78	AV
H	22980	42.53	26.93	6.64	37.94	60.18	74	-13.82	PK
H	22980	19.65	26.93	6.64	37.94	37.3	54	-16.7	AV
H	28725	40.42	27.10	7.90	39.32	60.54	74	-13.46	PK
H	28725	32.53	43.10	7.90	39.32	36.65	54	-17.35	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:5785MHz									
V	11570	45.23	32.69	7.73	38.62	58.89	74	-15.11	PK
V	11570	25.36	32.69	7.73	38.62	39.02	54	-14.98	AV
V	17355	41.36	31.72	9.45	39.28	58.37	74	-15.63	PK
V	17355	21.63	31.72	9.45	39.28	38.64	54	-15.36	AV
V	23140	41.32	26.93	6.73	37.96	59.08	74	-14.92	PK
V	23140	21.42	26.93	6.73	37.96	39.18	54	-14.82	AV
V	28925	38.62	27.10	7.94	39.30	58.76	74	-15.24	PK
V	28925	18.34	27.10	7.94	39.30	38.48	54	-15.52	AV
H	11570	45.23	32.69	7.73	38.62	58.89	74	-15.11	PK
H	11570	25.31	32.69	7.73	38.62	38.97	54	-15.03	AV
H	17355	41.25	31.72	9.45	39.28	58.26	74	-15.74	PK
H	17355	21.85	31.72	9.45	39.28	38.86	54	-15.14	AV
H	23140	41.62	26.93	6.73	37.96	59.38	74	-14.62	PK
H	23140	21.85	26.93	6.73	37.96	39.61	54	-14.39	AV
H	28925	38.42	27.10	7.94	39.30	58.56	74	-15.44	PK
H	28925	18.17	27.10	7.94	39.30	38.31	54	-15.69	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:5825MHz									
V	11650	45.32	32.66	7.74	38.68	59.08	74	-14.92	PK
V	11650	25.41	32.66	7.74	38.68	39.17	54	-14.83	AV
V	17475	41.32	31.68	9.48	39.26	58.38	74	-15.62	PK
V	17475	21.36	31.68	9.48	39.26	38.42	54	-15.58	AV
V	23300	41.75	26.94	6.91	37.99	59.71	74	-14.29	PK
V	23300	21.96	26.94	6.91	37.99	39.92	54	-14.08	AV
V	29125	38.14	27.10	7.89	39.50	58.43	74	-15.57	PK
V	29125	18.63	27.10	7.89	39.50	38.92	54	-15.08	AV
H	11650	45.87	32.66	7.74	38.68	59.63	74	-14.37	PK
H	11650	25.67	32.66	7.74	38.68	39.43	54	-14.57	AV
H	17475	41.96	31.68	9.48	39.26	59.02	74	-14.98	PK
H	17475	21.74	31.68	9.48	39.26	38.8	54	-15.2	AV
H	23300	41.95	26.94	6.91	37.99	59.91	74	-14.09	PK
H	23300	21.42	26.94	6.91	37.99	39.38	54	-14.62	AV
H	29125	38.15	27.10	7.89	39.50	58.44	74	-15.56	PK
H	29125	18.63	27.10	7.89	39.50	38.92	54	-15.08	AV

Remark:
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
4. The worst mode is 802.11a, only the worst data is recorded.

8POWER SPECTRAL DENSITY TEST

8.1 Test Standard and Limit

According to FCC §15.407(3)

(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 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(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 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.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, 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.

(2) 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.

(3) For the band 5.725-5.85 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi

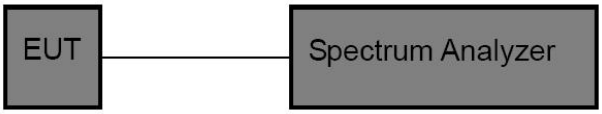
without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

According to RSS-247 6.2

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

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

8.2 Test Setup



8.3 Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,

2. Spectrum Setting:

   RBW > the 20 dB bandwidth of the emission being measured

   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

   VBW ≥ RBW

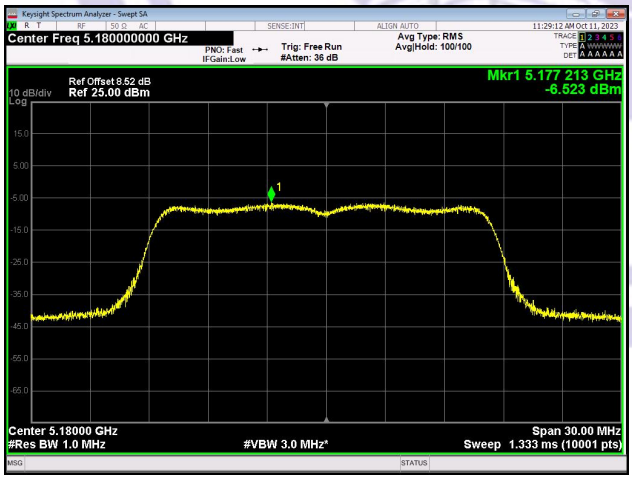
   Sweep = auto

   Detector function = peak

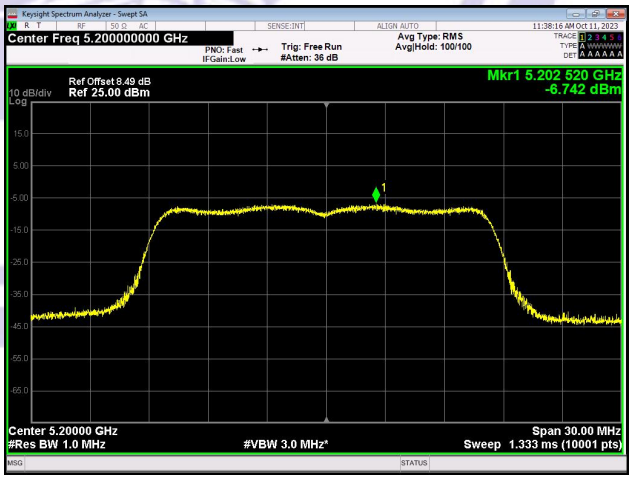
   Trace = max hold

8.4Test Data

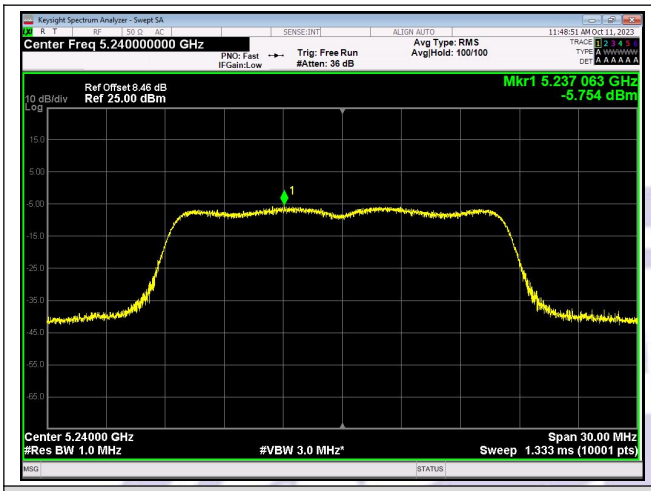
Test mode	Test Channel (MHz)	PSD [dBm/1MHz]	Total PSD [dBm/1MHz]	Limit [dBm/1MHz]	Result
		ANT			
802.11a	5180	-6.523	-2.496	11	Pass
	5200	-6.742	-2.715		Pass
	5240	-5.754	-1.727		Pass
802.11n(HT20)	5180	-7.473	-3.754		Pass
	5200	-6.818	-3.099		Pass
	5240	-6.097	-2.378		Pass
802.11n(HT40)	5190	-10.449	-10.083		Pass
	5230	-9.334	-8.968		Pass
802.11ac(VH20)	5180	-6.812	-6.628		Pass
	5200	-7.203	-7.019		Pass
	5240	-5.983	-5.799		Pass
802.11ac(VH40)	5190	-9.868	-9.502		Pass
	5230	-9.369	-9.003		Pass
802.11ac(VH80)	5210	-15.170	-15.17		Pass



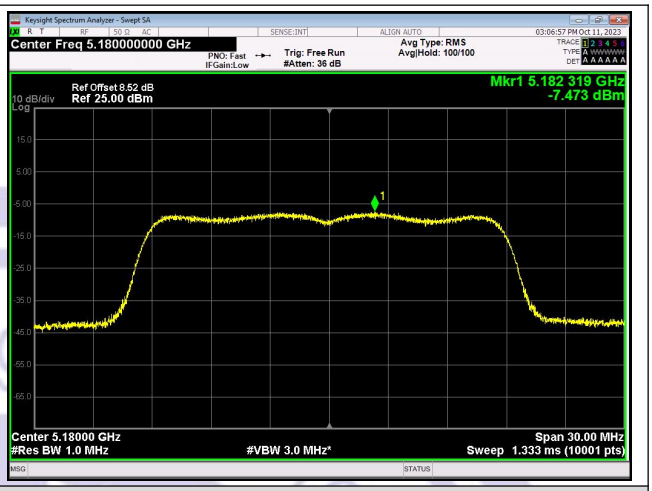
IEEE 802.11a_Channel 36_20MHz_Antenna 0



IEEE 802.11a_Channel 40_20MHz_Antenna 0



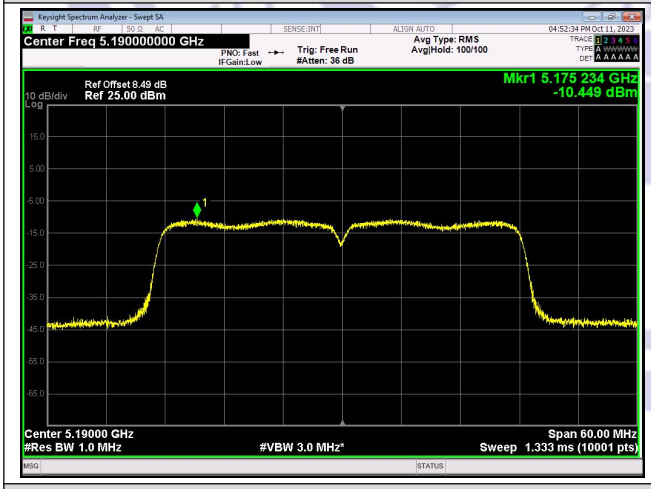
IEEE 802.11a_Channel 48_20MHz_Antenna 0



IEEE 802.11n_Channel 36_20MHz_Antenna 0

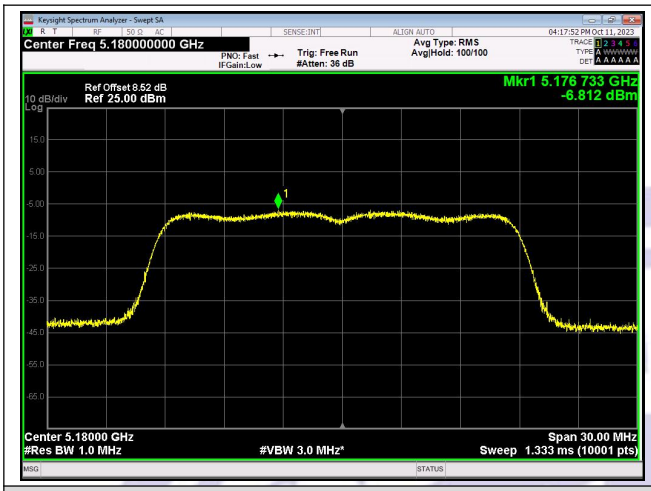
IEEE 802.11n_Channel 40_20MHz_Antenna 0

IEEE 802.11n_Channel 48_20MHz_Antenna 0

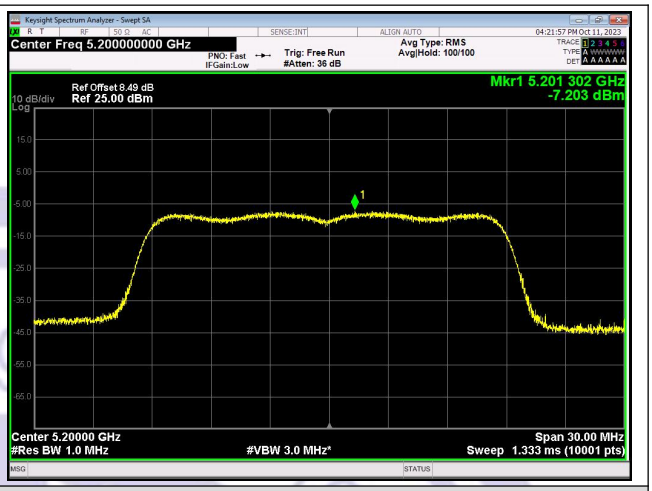


IEEE 802.11n_Channel 38_40MHz_Antenna 0

IEEE 802.11n_Channel 46_40MHz_Antenna 0



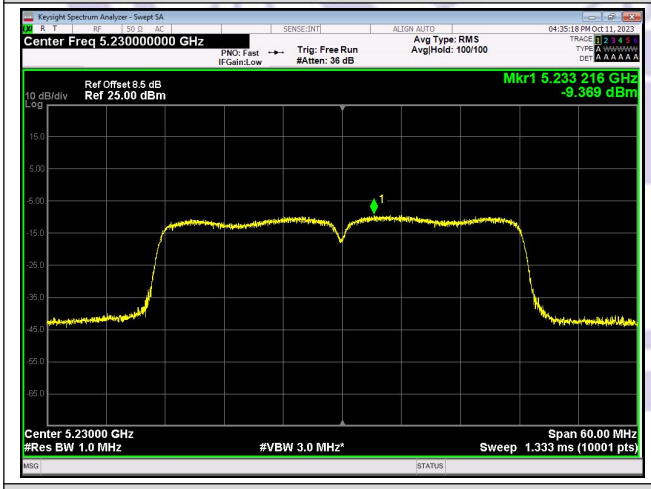
IEEE 802.11ac_Channel 36_20MHz_Antenna 0



IEEE 802.11ac_Channel 40_20MHz_Antenna 0

IEEE 802.11ac_Channel 48_20MHz_Antenna 0

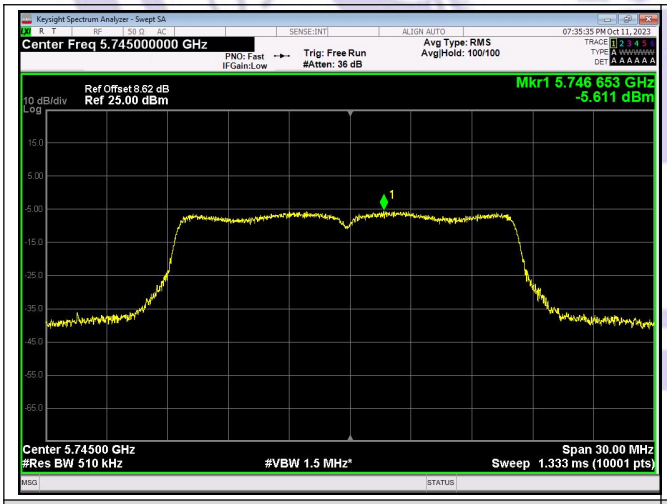
IEEE 802.11ac_Channel 38_40MHz_Antenna 0



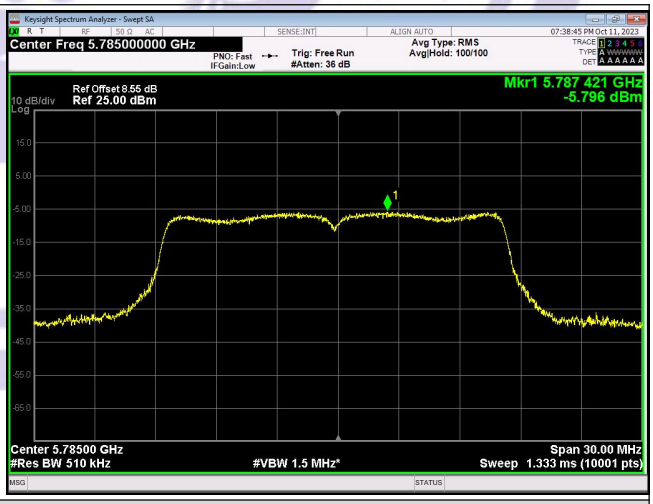
IEEE 802.11ac_Channel 46_40MHz_Antenna 0

IEEE 802.11ac_Channel 42_80MHz_Antenna 0

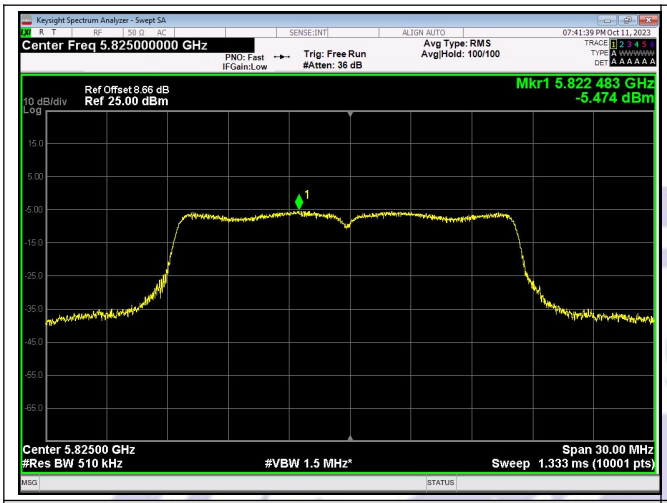
Test mode	Test Channel (MHz)	PSD [dBm/500kHz]	Total PSD [dBm/500kHz]	Limit (dBm/500 kHz)	Result
		ANT 1			
802.11a	5745	-5.611	-1.553	11	Pass
	5785	-5.796	-1.738		Pass
	5825	-5.474	-1.416		Pass
802.11n(HT20)	5745	-6.911	-6.727		Pass
	5785	-6.627	-6.443		Pass
	5825	-6.442	-6.258		Pass
802.11n(HT40)	5755	-11.224	-11.22		Pass
	5795	-10.209	-10.205		Pass
802.11ac(VH20)	5745	-8.428	-8.243		Pass
	5785	-8.511	-8.326		Pass
	5825	-7.909	-7.724		Pass
802.11ac(VH40)	5755	-10.859	-3.889		Pass
	5795	-10.391	-3.421		Pass
802.11ac(VH80)	5775	-15.760	-15.781		Pass



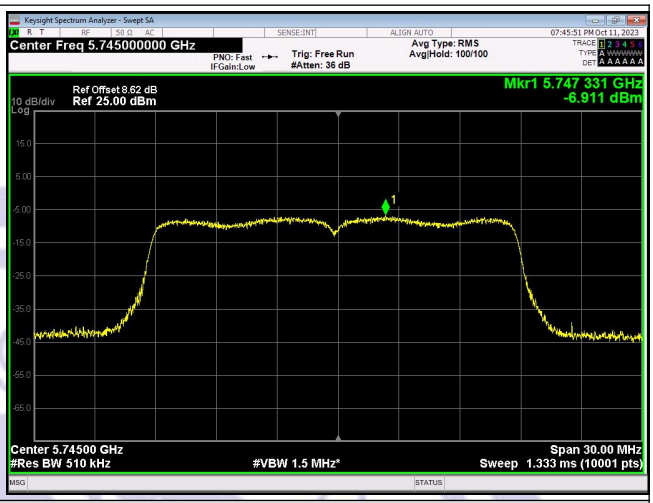
IEEE 802.11a_Channel 149_20MHz_Antenna 0



IEEE 802.11a_Channel 157_20MHz_Antenna 0

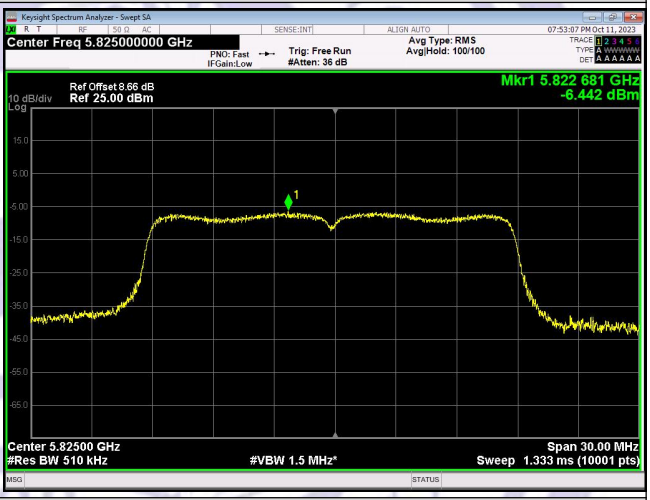


IEEE 802.11a_Channel 165_20MHz_Antenna 0

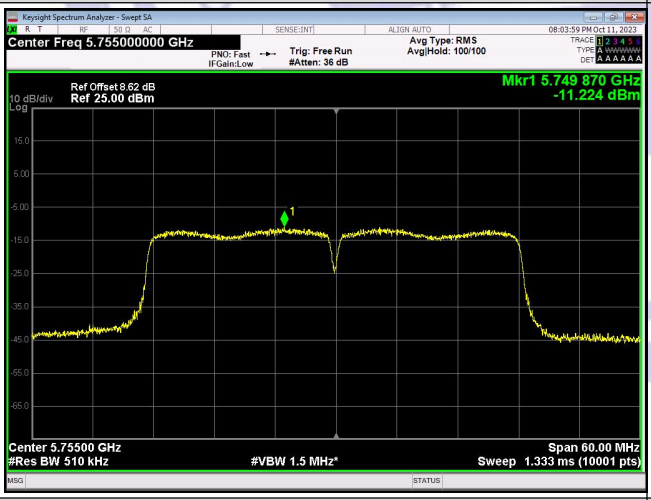


IEEE 802.11n_Channel 149_20MHz_Antenna 0

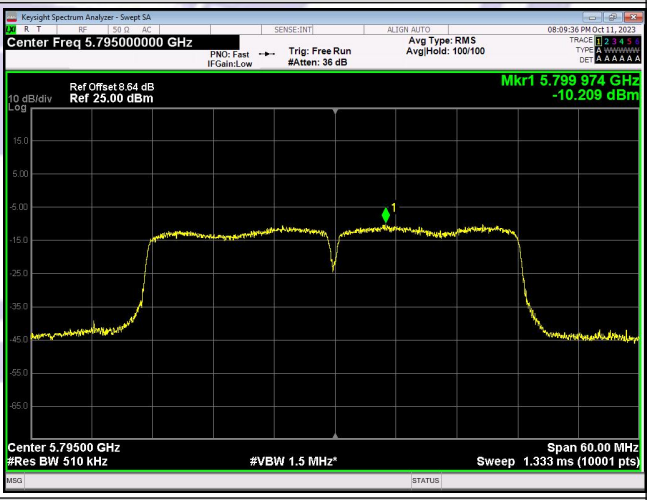
IEEE 802.11n_Channel 157_20MHz_Antenna 0



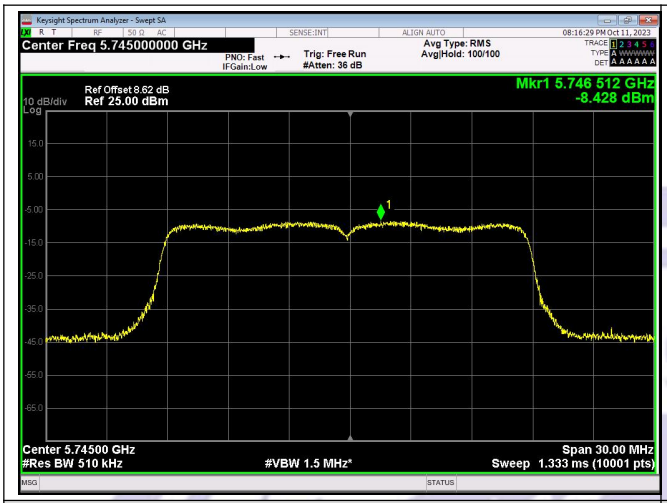
IEEE 802.11n_Channel 165_20MHz_Antenna 0



IEEE 802.11n_Channel 151_40MHz_Antenna 0



IEEE 802.11n_Channel 159_40MHz_Antenna 0



IEEE 802.11ac_Channel 149_20MHz_Antenna 0

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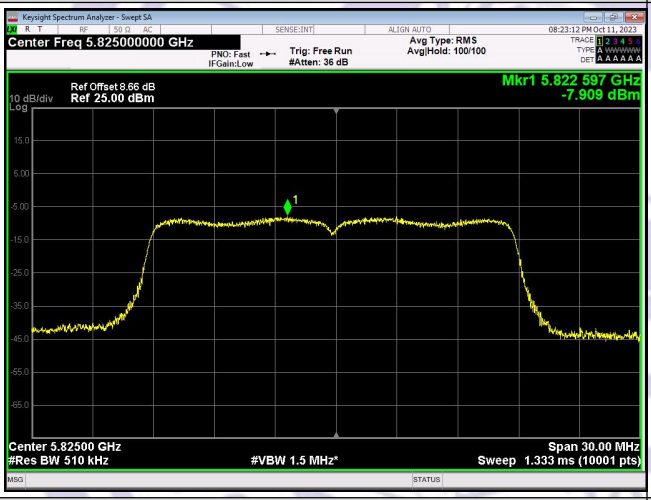
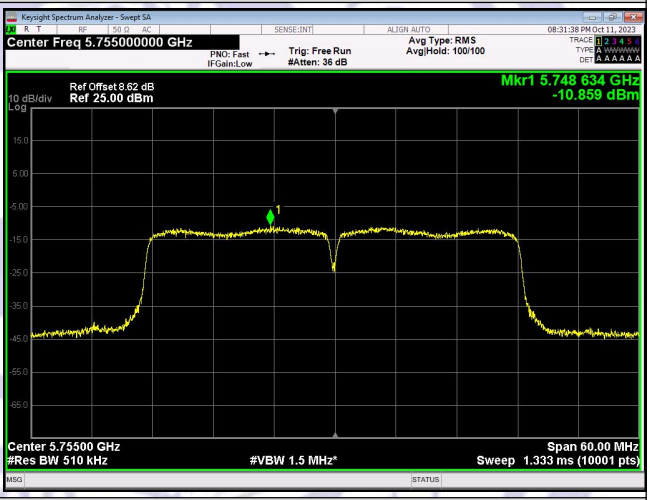


IEEE 802.11ac_Channel 165_20MHz_Antenna 0



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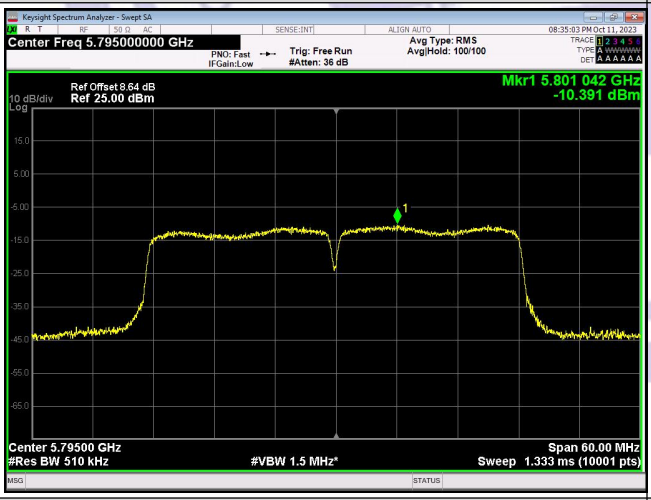
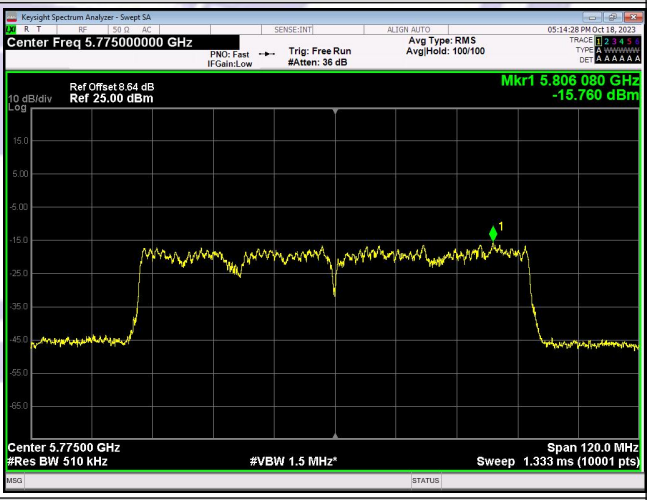


IEEE 802.11ac_Channel 159_40MHz_Antenna 0



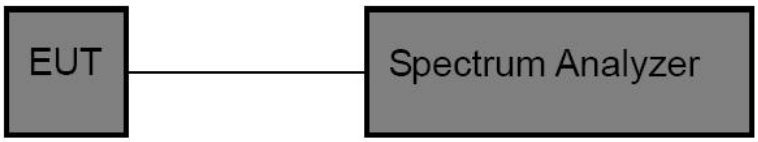
IEEE 802.11ac_Channel 155_80MHz_Antenna 0

926DB & 6DB & 99% Emission Bandwidth Test

9.1 Test Standard

Test Standard	FCC Part15 C Section 15.407, RSS-247
	The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band, the minimum bandwidth 6 dB bandwidth of U-NII devices shall be at least 500KHz. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

9.2 Test Setup



9.3Test Procedure

a) Set RBW = 1000KHz.

b) Set the VBW > RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) 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.

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.

2. Set span = 1.5 times to 3.3 times the OBW.

3. Set RBW = 1 % to 5 % of the OBW

4. Set VBW ≥ 3 · RBW

5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

6. Use the 99 % power bandwidth function of the instrument (if available).

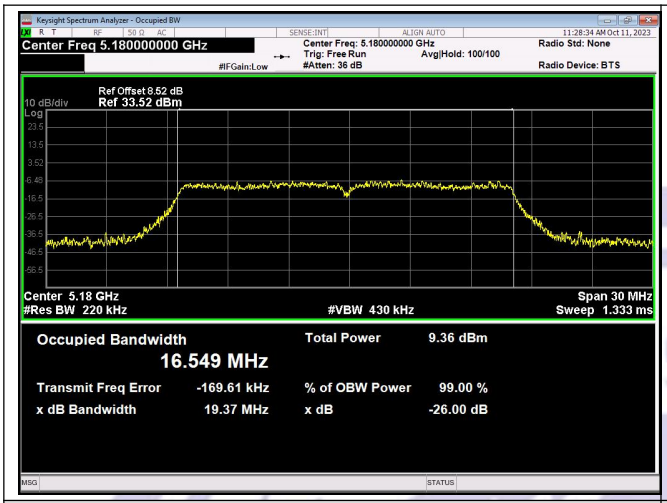
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

9.4Test Data

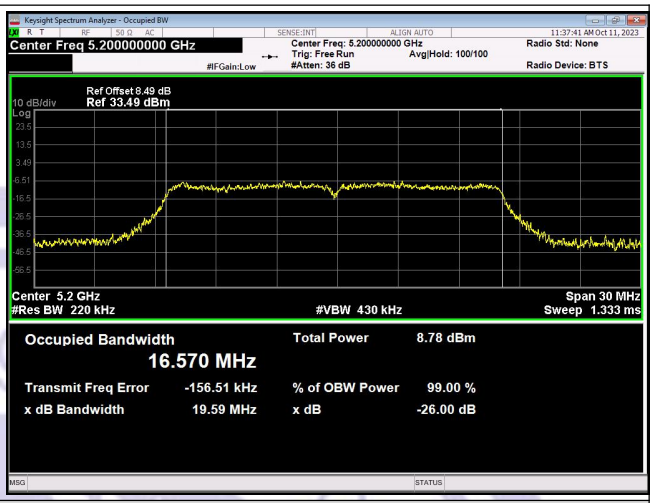
	Test Channel	26dB Bandwidth (MHz)	Result
		ANT	
802.11a	5180	19.37	Pass
	5200	19.59	Pass
	5240	19.67	Pass
802.11n HT20	5180	19.83	Pass
	5200	19.83	Pass
	5240	20.29	Pass
802.11n HT40	5190	50.79	Pass
	5230	50.34	Pass

802.11ac VHT20	5180	20.08	Pass
	5200	19.79	Pass
	5240	19.83	Pass
802.11ac VHT40	5190	52.49	Pass
	5230	50.21	Pass
802.11ac VHT80	5210	90.62	Pass

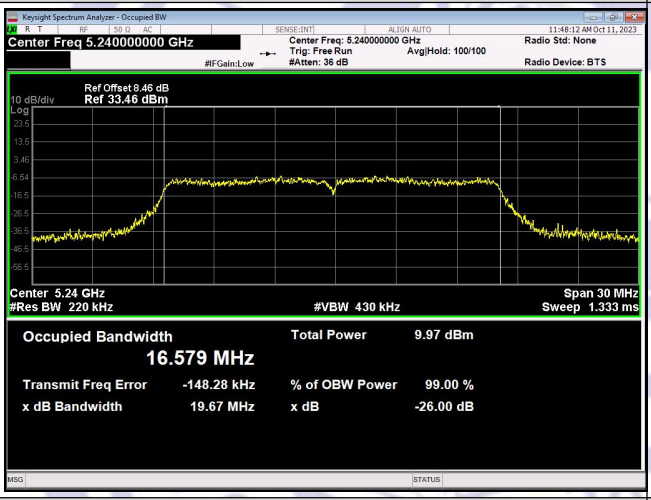
	Test Channel	26dB Bandwidth (MHz)	Result
		ANT	
802.11a	5745	22.46	Pass
	5785	21.31	Pass
	5825	20.88	Pass
802.11n HT20	5745	20.04	Pass
	5785	20.19	Pass
	5825	26.07	Pass
802.11n HT40	5755	51.55	Pass
	5795	52.11	Pass
802.11ac VHT20	5745	19.88	Pass
	5785	21.20	Pass
	5825	20.58	Pass
802.11ac VHT40	5755	53.39	Pass
	5795	53.01	Pass
802.11ac VHT80	5775	97.95	Pass



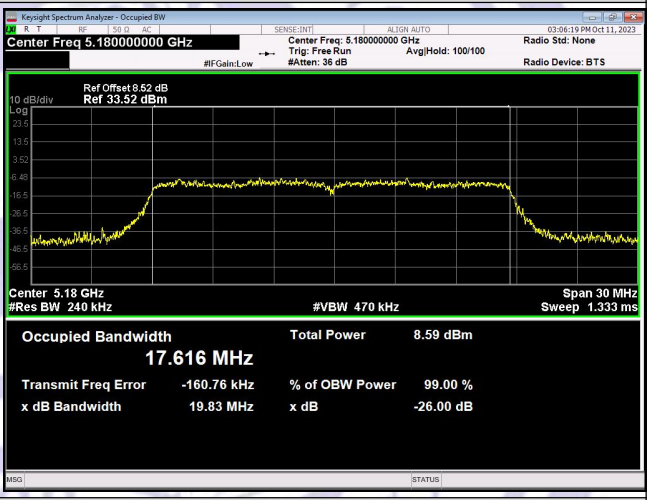
IEEE 802.11a_Channel 36_20MHz_Antenna 0



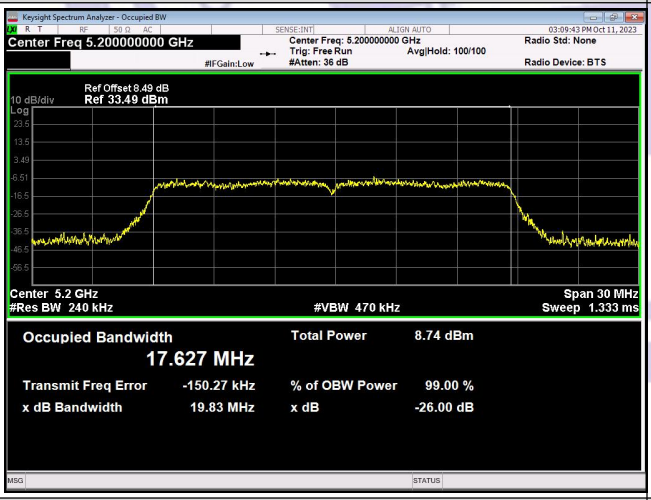
IEEE 802.11a_Channel 40_20MHz_Antenna 0



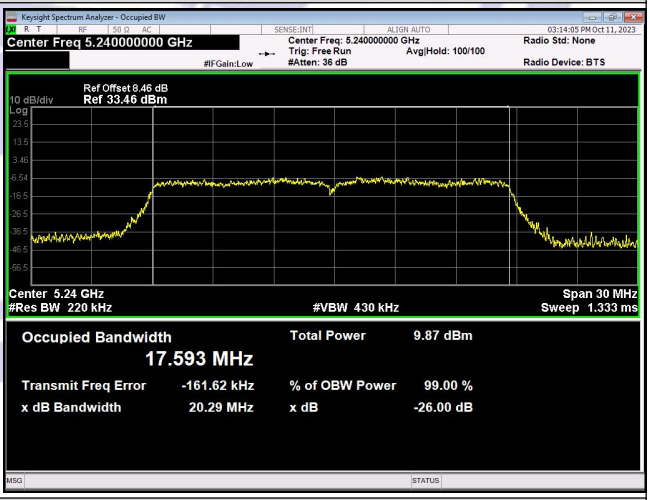
IEEE 802.11a_Channel 48_20MHz_Antenna 0



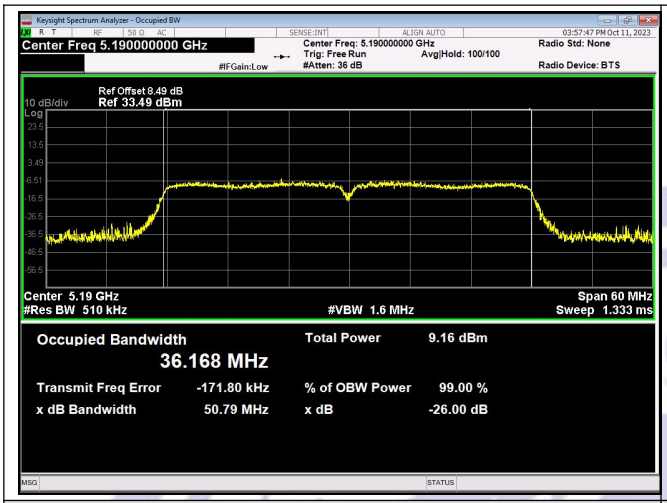
IEEE 802.11n_Channel 36_20MHz_Antenna 0



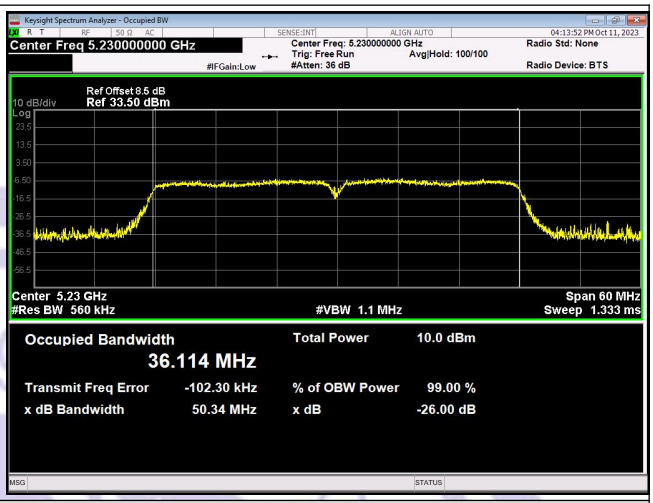
IEEE 802.11n_Channel 40_20MHz_Antenna 0



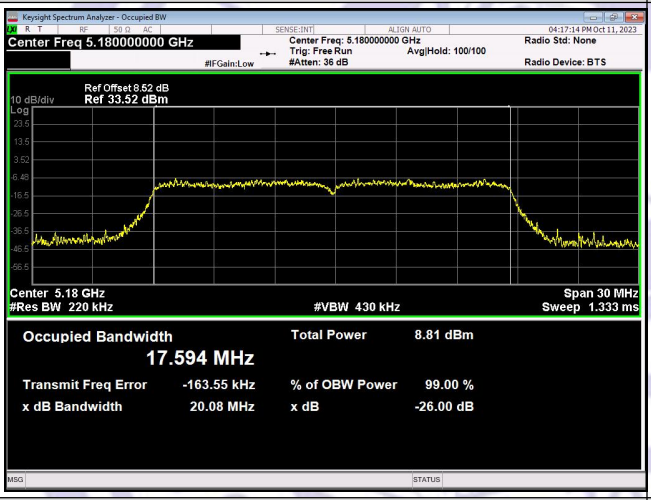
IEEE 802.11n_Channel 48_20MHz_Antenna 0



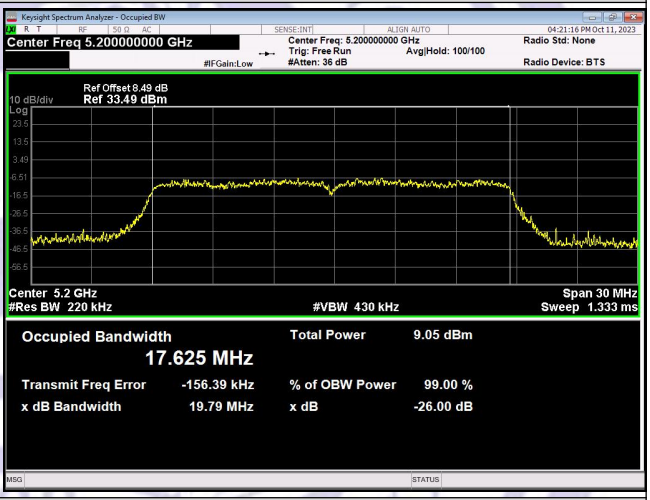
IEEE 802.11n_Channel 38_40MHz_Antenna 0



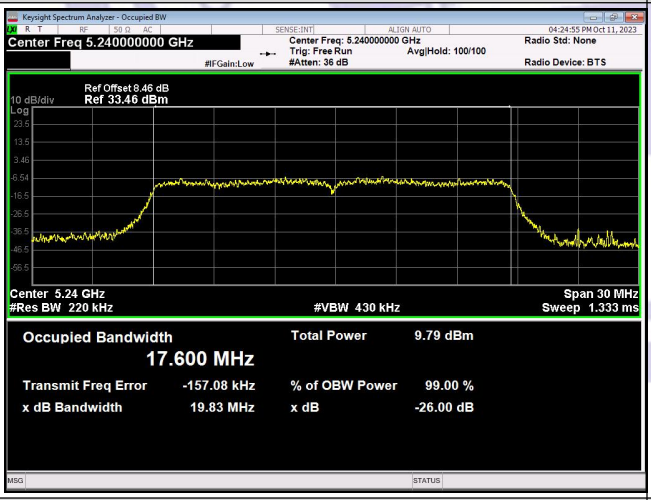
IEEE 802.11n_Channel 46_40MHz_Antenna 0



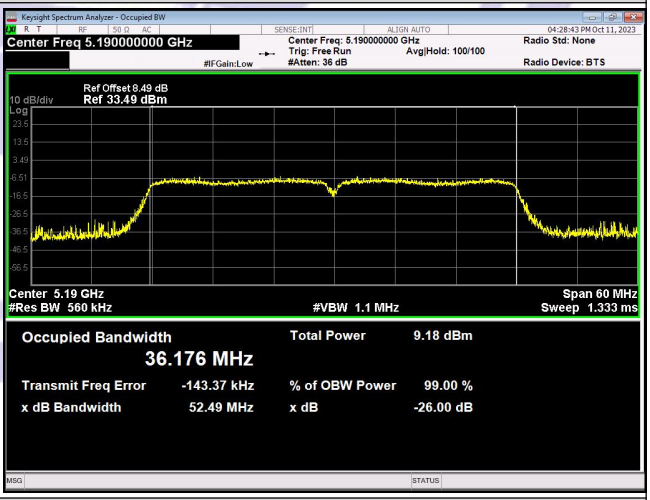
IEEE 802.11ac_Channel 36_20MHz_Antenna 0



IEEE 802.11ac_Channel 40_20MHz_Antenna 0



IEEE 802.11ac_Channel 48_20MHz_Antenna 0



IEEE 802.11ac_Channel 38_40MHz_Antenna 0