FCC Test Report

Client Name	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan
Product Name	:	QuattroPod
Date	:	Mar. 29, 2019

Shenzhen Anbotek Compliance Laboratory Limited

Contents

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TEST REPORT

Applicant	:	Winner Wave Limited
Manufacturer	:	Winner Wave Limited
Product Name	:	QuattroPod
Model No.	:	T02
Trade Mark	:	QuattroPod
Rating(s)	:	Input: DC 5V, 0.9A
Test Standard(s)	:	**FCC Part15 Subpart E 2018, Paragraph 15.407**
Test Method(s)	:	**ANSI C63.10: 2013, KDB 789033 D02 General UNII Test Procedures New Rules v02r01**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart E requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt Mar. 14, 2019

Date of Test Mar. 14~29, 2019

Prepared By

(Engineer / Oliay Yang)

Reviewer

(Supervisor / Snowy Meng)

Approved & Authorized Signer

(Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan
Manufacturer	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan
Factory	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan

1.2. Description of Device (EUT)

Product Name	:	QuattroPod	
Model No.	:	T02	
Trade Mark	:	QuattroPod	
Test Power Supply	:	AC 120V, 60Hz for adapter	
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)	
Product Description	:	Operation Frequency:	5180MHz~5240MHz
		Number of Channel:	4 Channels for 802.11ac(HT20) 2 Channels for 802.11ac(HT40) 1 Channels for 802.11ac(HT80)
		Modulation Type:	OFDM with BPSK/QPSK/16QAM/64QAM/ 256QAM for 802.11ac
		Antenna Type:	PCB Antenna
		Antenna Gain(Peak):	1 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

Notebook	:	Manufacturer: FUJITSU LIMITED M/N: LH531 S/N: 518127-01R2300775 DC Rating: DC 19V, 4.22A CE , FCC DOC, CCC Adapter: M/N: ADP-602HA Input: 100V-240V~ 50/60Hz, 1.5A Output: DC 19V, 3.16A

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Mode	Test channel	Frequency (MHz)
OFDM(802.11ac20)	CH 36	5180MHz
	CH 40	5200MHz
	CH 48	5240MHz
OFDM(802.11ac40)	CH 38	5190MHz
	CH 46	5230MHz
OFDM(802.11ac80)	CH 42	5210MHz

Note:
1. The measurements are performed at the highest, middle, lowest available channels.
2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
3. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω, Cable Loss: 1.0 dB
4. The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is more than 98%

1.5. List of channels

802.11ac20

Channel	Freq. (MHz)	Channel	Freq. (MHz)
36	5180	44	5220
40	5200	48	5240

802.11ac40

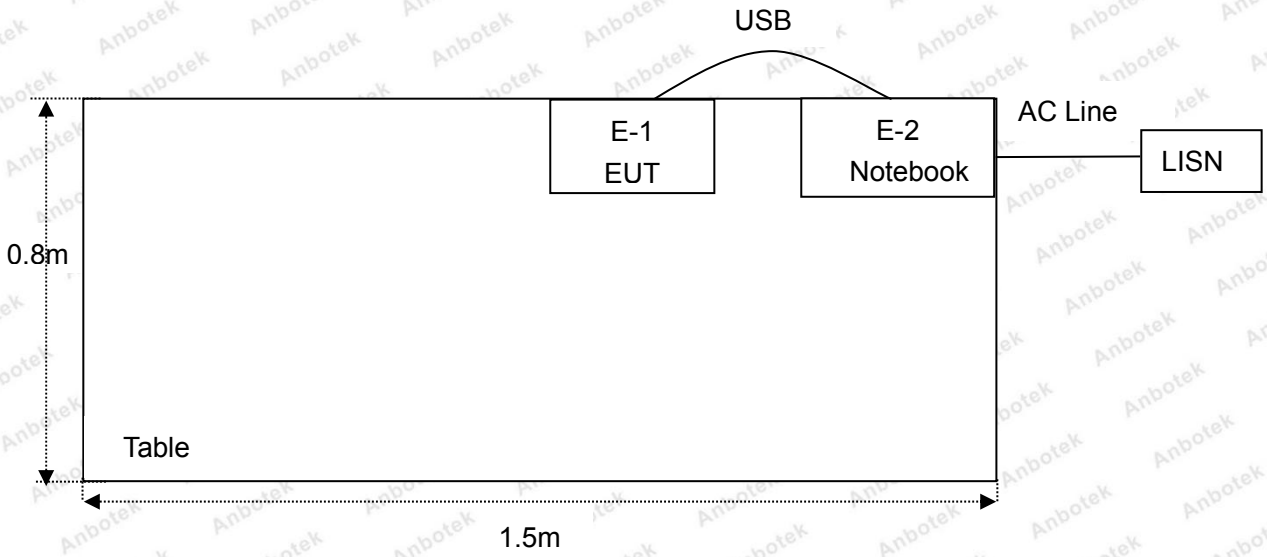
Channel	Freq. (MHz)	Channel	Freq. (MHz)
38	5190	46	5230

802.11ac80

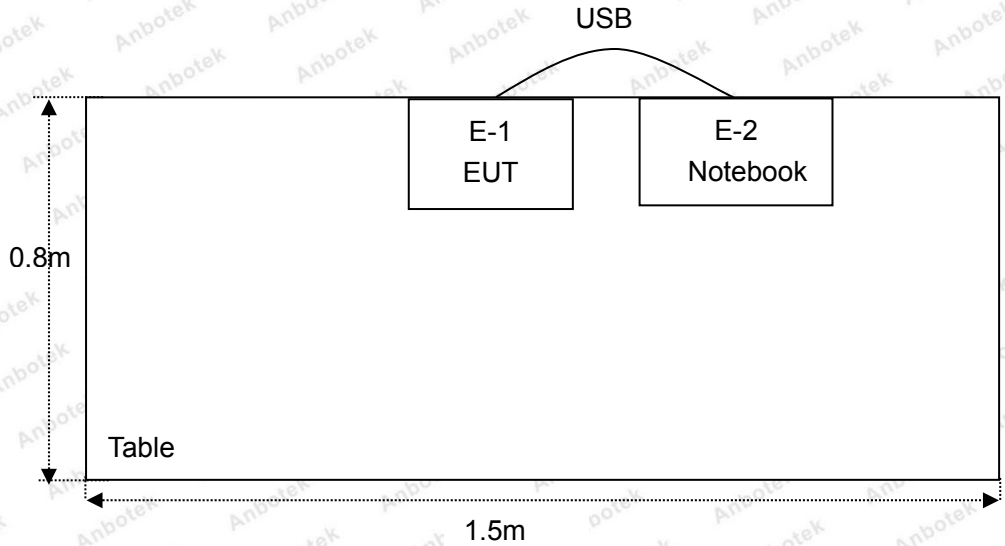
Channel	Freq. (MHz)
42	5210

1.6. Description Of Test Setup

CE



RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 05, 2018	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI3	101604	Nov. 05, 2018	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 05, 2018	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 05, 2018	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 05, 2018	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 19, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 20, 2018	1 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Nov. 20, 2018	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 05, 2018	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 05, 2018	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 05, 2018	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 05, 2018	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 05, 2018	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 05, 2018	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Apr. 02, 2018	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Nov. 01, 2018	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

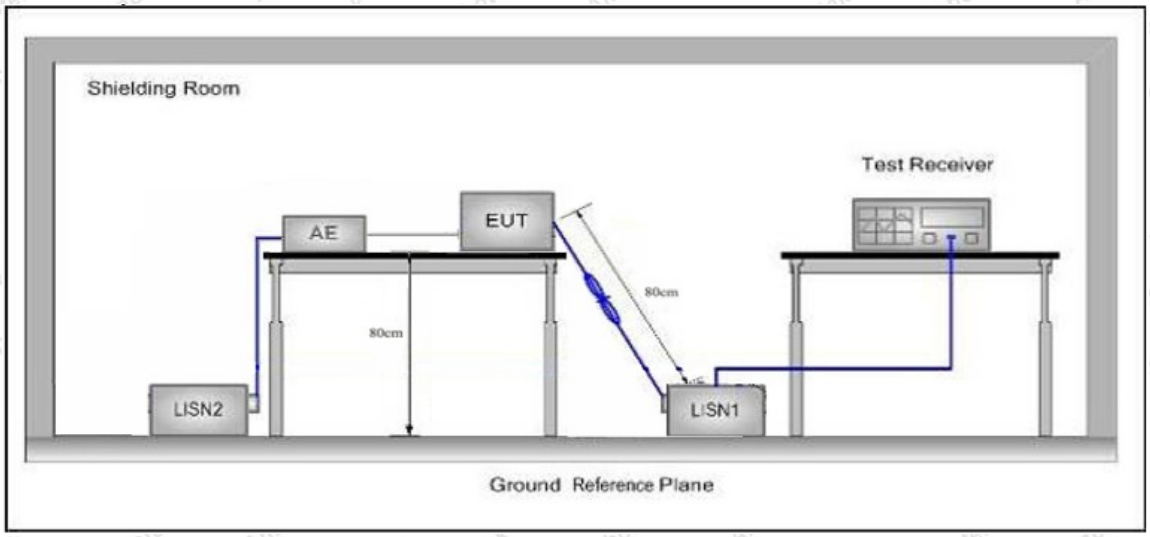
Standard	Test Type	Result
15.207 & 15.407	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.407(b)	Band Edge	PASS
15.407(a)(5)	Occupy Bandwidth	PASS
15.407(a)(1)(3)	Maximum Conducted Output Power	PASS
15.407(a)(1)	Peak Power Spectral Density	PASS
15.203/15.407g	Antenna Requirement	PASS

3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207&15.407		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

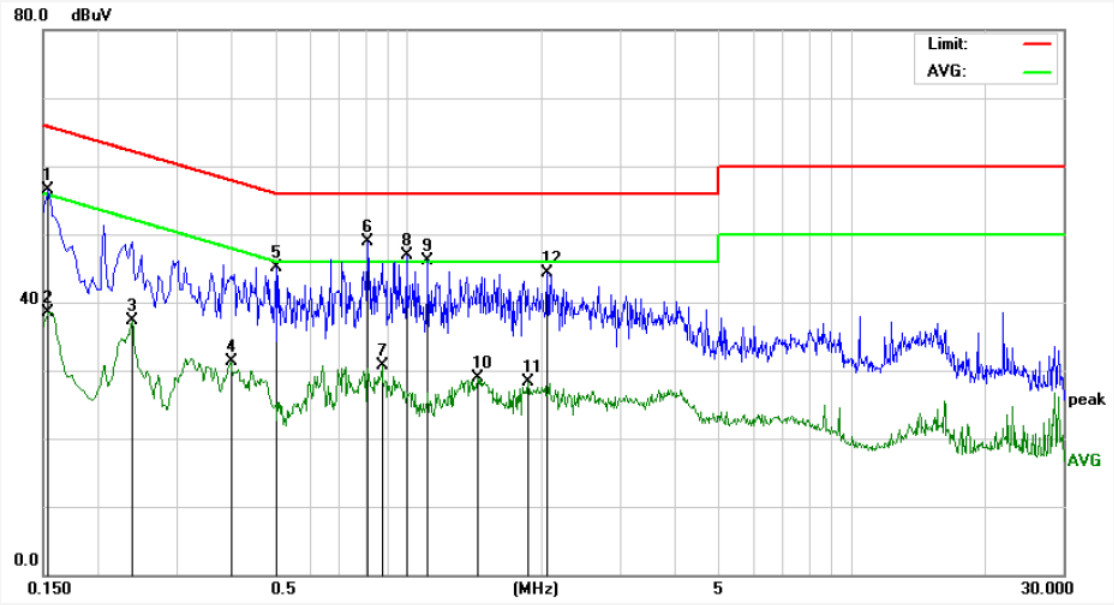
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages

Conducted Emission Test Data

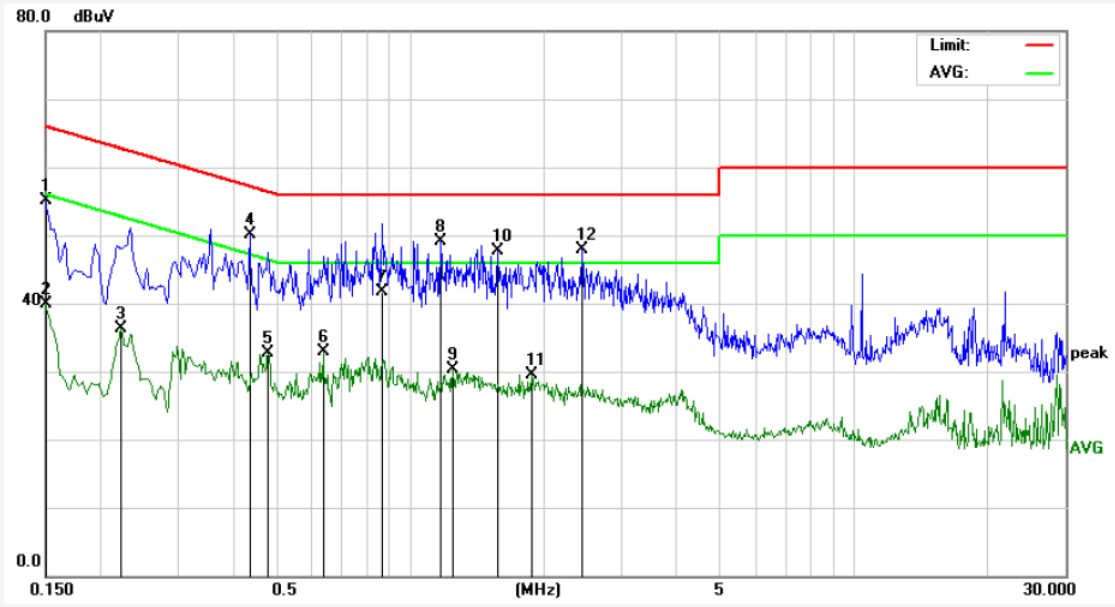
Test Site:	1# Shielded Room
Operating Condition:	Keeping TX+Charging Mode
Test Specification:	AC 120V, 60Hz for adapter
Comment:	Live Line
	Tem.: 24.3℃ Hum.: 58%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1539	36.65	19.90	56.55	65.78	-9.23	QP	
2	0.1539	18.69	19.90	38.59	55.78	-17.19	AVG	
3	0.2380	17.32	19.89	37.21	52.16	-14.95	AVG	
4	0.3980	11.37	19.93	31.30	47.89	-16.59	AVG	
5	0.5020	25.11	19.98	45.09	56.00	-10.91	QP	
6	0.8100	28.81	20.07	48.88	56.00	-7.12	QP	
7	0.8740	10.70	20.09	30.79	46.00	-15.21	AVG	
8	0.9940	26.69	20.12	46.81	56.00	-9.19	QP	
9	1.1060	25.92	20.12	46.04	56.00	-9.96	QP	
10	1.4380	8.81	20.13	28.94	46.00	-17.06	AVG	
11	1.8620	8.09	20.14	28.23	46.00	-17.77	AVG	
12	2.0579	24.25	20.14	44.39	56.00	-11.61	QP	

Conducted Emission Test Data

Test Site:	1# Shielded Room
Operating Condition:	Keeping TX+Charging Mode
Test Specification:	AC 120V, 60Hz for adapter
Comment:	Neutral Line
	Tem.: 24.3℃ Hum.: 58%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1500	35.26	19.90	55.16	65.99	-10.83	QP	
2	0.1500	19.95	19.90	39.85	55.99	-16.14	AVG	
3	0.2220	16.35	19.89	36.24	52.74	-16.50	AVG	
4	0.4340	30.25	19.95	50.20	57.18	-6.98	QP	
5	0.4780	12.68	19.97	32.65	46.37	-13.72	AVG	
6	0.6340	12.92	20.02	32.94	46.00	-13.06	AVG	
7	0.8660	21.54	20.08	41.62	56.00	-14.38	QP	
8	1.1700	28.96	20.12	49.08	56.00	-6.92	QP	
9	1.2460	10.18	20.12	30.30	46.00	-15.70	AVG	
10	1.5700	27.60	20.13	47.73	56.00	-8.27	QP	
11	1.8740	9.44	20.14	29.58	46.00	-16.42	AVG	
12	2.4420	27.68	20.15	47.83	56.00	-8.17	QP	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.407				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	68.2	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

(3)Above 1GHz limit:E[dBμV/m] = EIRP[dBm] + 95.2=68.2 dBuV/m, for EIPR[dBm]=-27dBm.

4.2. Test Setup

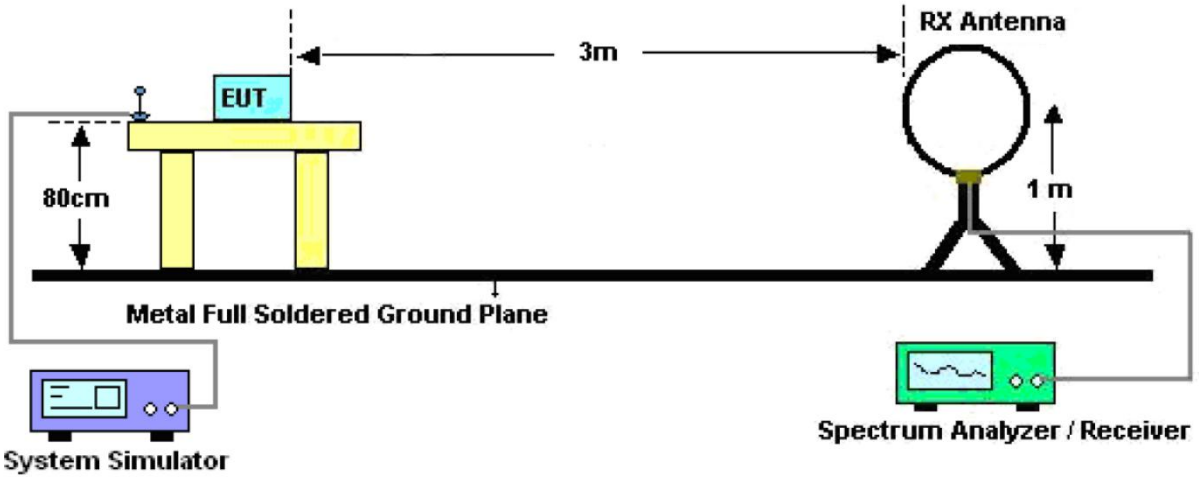


Figure 1. Below 30MHz

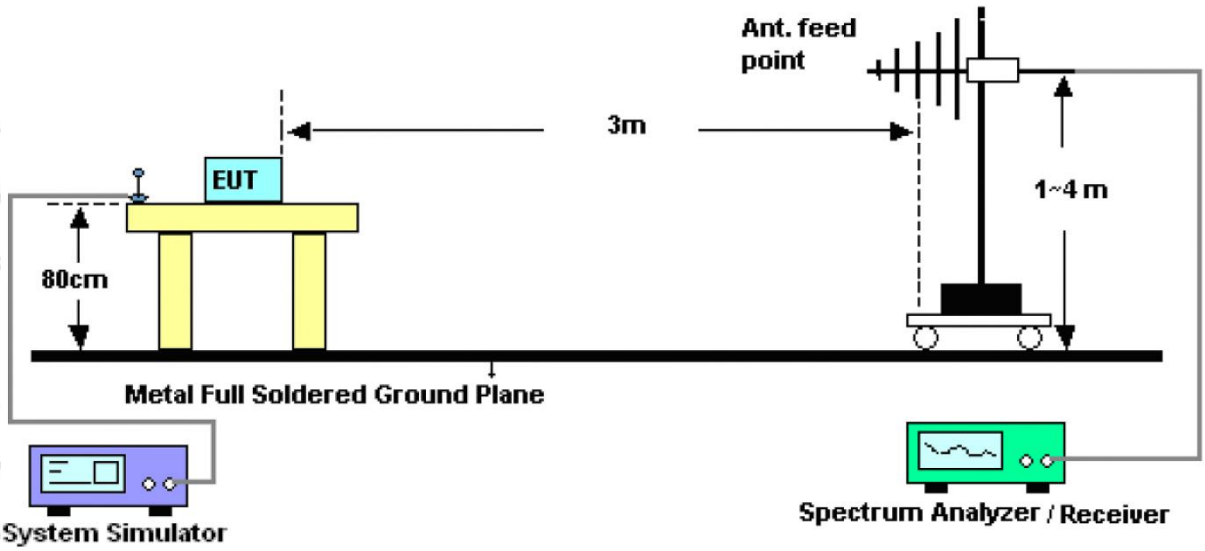


Figure 2. 30MHz to 1GHz

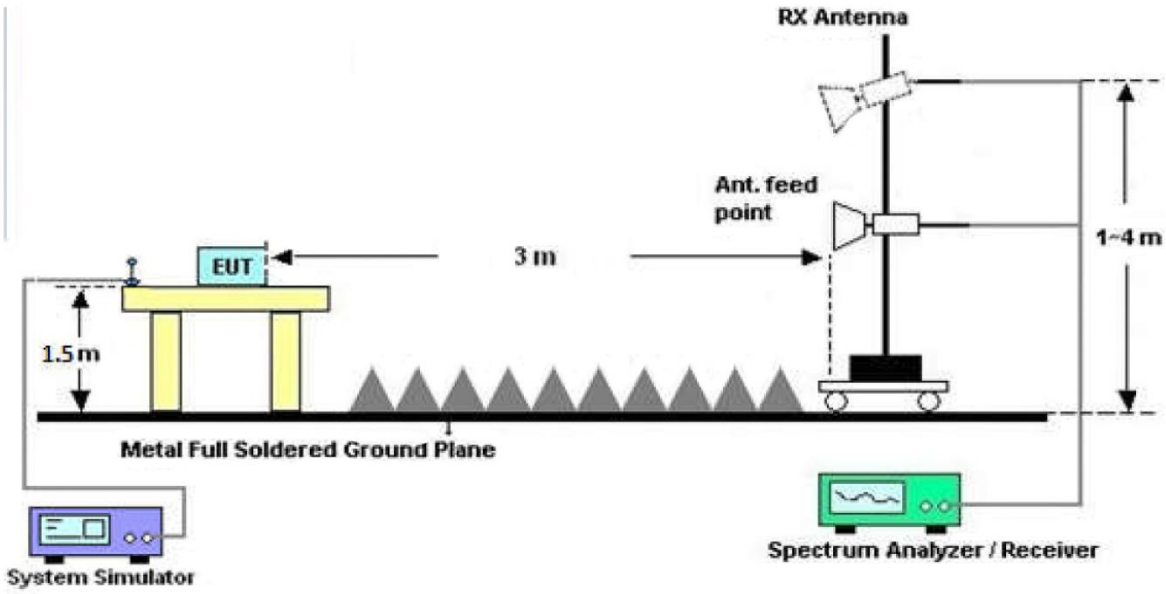


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.
.
For above 1GHz, Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

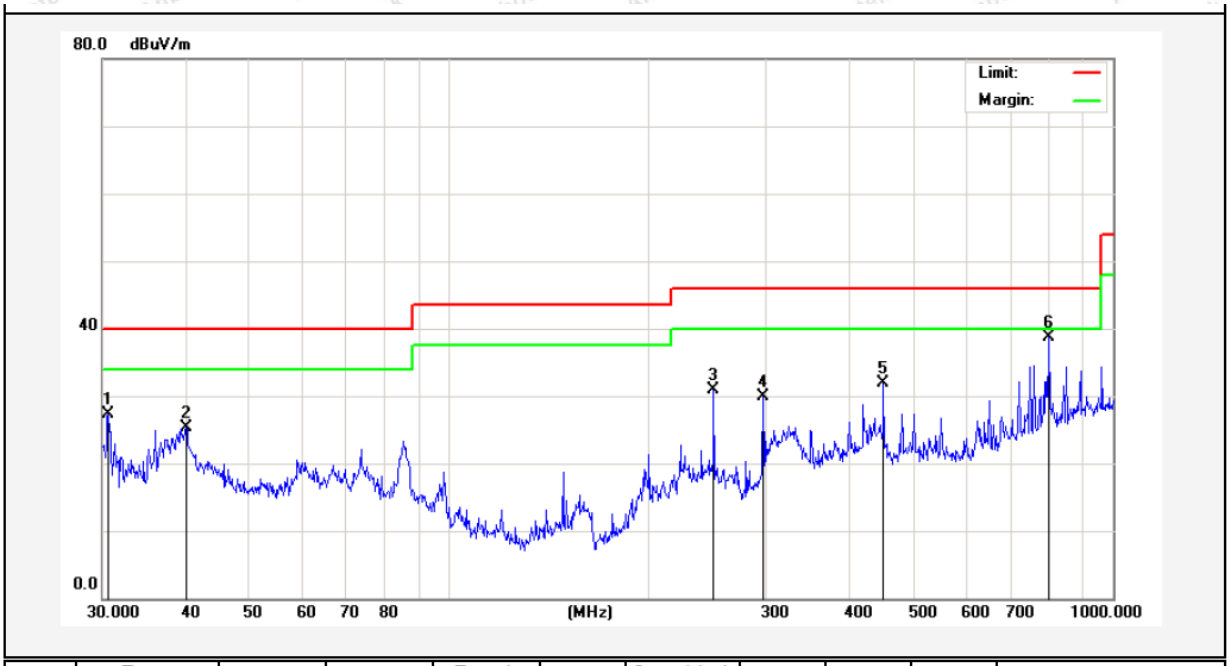
PASS

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan all modes, and found the 802.11ac20 CH01 which is the worst case, only the worst case is recorded in the report.

Test Results (30~1000MHz)

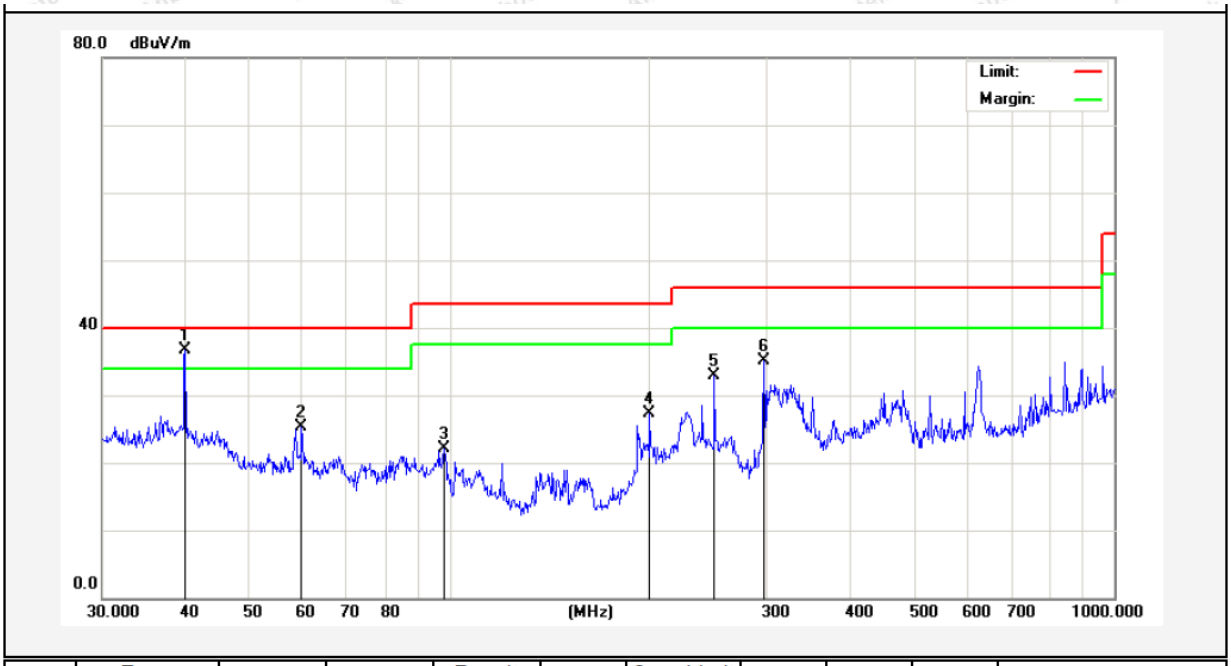
Job No.:	SZAWW190313005-01	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	AC 120V, 60Hz for adapter
Test Mode:	802.11ac20 CH01	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.6379	43.85	-16.61	27.24	40.00	-12.76	QP	300	12	
2	40.1347	35.78	-10.42	25.36	40.00	-14.64	QP	300	41	
3	250.3012	49.45	-18.56	30.89	46.00	-15.11	QP	300	227	
4	297.2241	47.64	-17.76	29.88	46.00	-16.12	QP	300	304	
5	451.1350	44.15	-12.15	32.00	46.00	-14.00	QP	300	247	
6	801.7863	45.22	-6.54	38.68	46.00	-7.32	QP	300	330	

Test Results (30~1000MHz)

Job No.:	SZAWW190313005-01	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	AC 120V, 60Hz for adapter
Test Mode:	802.11ac20 CH01	Polarization:	Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	39.9942	47.04	-10.37	36.67	40.00	-3.33	QP	300	1	
2	59.8588	40.72	-15.38	25.34	40.00	-14.66	QP	300	117	
3	98.1419	38.00	-15.86	22.14	43.50	-21.36	QP	300	235	
4	199.9856	43.23	-15.87	27.36	43.50	-16.14	QP	300	181	
5	250.3012	46.93	-14.04	32.89	46.00	-13.11	QP	300	338	
6	297.2241	49.81	-14.76	35.05	46.00	-10.95	QP	300	314	

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Hotline 400-003-0500 www.anbotek.com

Test Results (Above 1000MHz)

Test mode:	IEEE 802.11ac20	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	42.32	31.98	17.08	33.91	57.47	68.20	-10.73	V
15540.00	36.54	32.65	20.03	34.85	54.37	68.20	-13.83	V
10360.00	37.98	31.98	17.08	33.91	53.13	68.20	-15.07	H
15540.00	34.88	32.65	20.03	34.85	52.71	68.20	-15.49	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10360.00	33.65	31.98	17.08	33.91	48.80	54.00	-5.20	V
15540.00	30.14	32.65	20.03	34.85	47.97	54.00	-6.03	V
10360.00	30.22	31.98	17.08	33.91	45.37	54.00	-8.63	H
15540.00	27.98	32.65	20.03	34.85	45.81	54.00	-8.19	H

Test mode:	IEEE 802.11ac20	Test channel:	Mid CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	40.73	32.44	17.18	33.91	56.44	68.20	-11.76	V
15600.00	37.41	32.78	20.12	34.86	55.45	68.20	-12.75	V
10400.00	39.22	32.44	17.18	33.91	54.93	68.20	-13.27	H
15600.00	36.10	32.78	20.12	34.86	54.14	68.20	-14.06	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10400.00	30.35	32.44	17.18	33.91	46.06	54.00	-7.94	V
15600.00	27.49	32.78	20.12	34.86	45.53	54.00	-8.47	V
10400.00	29.42	32.44	17.18	33.91	45.13	54.00	-8.87	H
15600.00	27.15	32.78	20.12	34.86	45.19	54.00	-8.81	H

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Tel:(86)755-26066440 Fax:(86)755-26014772 Email:service@anbotek.com
Hotline 400-003-0500 www.anbotek.com

Test mode:	IEEE 802.11ac20	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	40.34	32.59	18.02	33.92	57.03	68.20	-11.17	V
15720.00	38.56	32.87	20.15	34.88	56.70	68.20	-11.50	V
10480.00	39.22	32.59	18.02	33.92	55.91	68.20	-12.29	H
15720.00	37.25	32.87	20.15	34.88	55.39	68.20	-12.81	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10480.00	30.17	32.59	18.02	33.92	46.86	54.00	-7.14	V
15720.00	28.14	32.87	20.15	34.88	46.28	54.00	-7.72	V
10480.00	28.85	32.59	18.02	33.92	45.54	54.00	-8.46	H
15720.00	27.42	32.87	20.15	34.88	45.56	54.00	-8.44	H

Test mode:	IEEE 802.11ac40	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10380.00	37.48	31.98	17.08	33.91	52.63	68.20	-15.57	V
15570.00	35.27	32.65	20.03	34.85	53.10	68.20	-15.10	V
10380.00	37.21	31.98	17.08	33.91	52.36	68.20	-15.84	H
15570.00	35.53	32.65	20.03	34.85	53.36	68.20	-14.84	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10380.00	31.24	31.98	17.08	33.91	46.39	54.00	-7.61	V
15570.00	28.35	32.65	20.03	34.85	46.18	54.00	-7.82	V
10380.00	30.34	31.98	17.08	33.91	45.49	54.00	-8.51	H
15570.00	27.69	32.65	20.03	34.85	45.52	54.00	-8.48	H

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Test mode:	IEEE 802.11ac40	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10460.00	41.78	32.59	18.02	33.92	58.47	68.20	-9.73	V
15690.00	38.47	32.87	20.15	34.88	56.61	68.20	-11.59	V
10460.00	39.27	32.59	18.02	33.92	55.96	68.20	-12.24	H
15690.00	37.42	32.87	20.15	34.88	55.56	68.20	-12.64	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10460.00	31.78	32.59	18.02	33.92	48.47	54.00	-5.53	V
15690.00	28.89	32.87	20.15	34.88	47.03	54.00	-6.97	V
10460.00	30.27	32.59	18.02	33.92	46.96	54.00	-7.04	H
15690.00	28.35	32.78	20.12	34.86	46.39	54.00	-7.61	H

Test mode:	IEEE 802.11ac80	Test channel:	

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10420.00	41.29	32.44	17.18	33.91	57.00	68.20	-11.20	V
15630.00	36.49	32.78	20.12	34.86	54.53	68.20	-13.67	V
10420.00	38.73	32.44	17.18	33.91	54.44	68.20	-13.76	H
15630.00	35.47	32.78	20.12	34.86	53.51	68.20	-14.69	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
10420.00	31.21	32.44	17.18	33.91	46.92	54.00	-7.08	V
15630.00	27.62	32.78	20.12	34.86	45.66	54.00	-8.34	V
10420.00	30.45	32.44	17.18	33.91	46.16	54.00	-7.84	H
15630.00	30.73	32.78	20.12	34.86	48.77	54.00	-5.23	H

Note:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss–Preamplifier Factor

Radiated Band Edge:

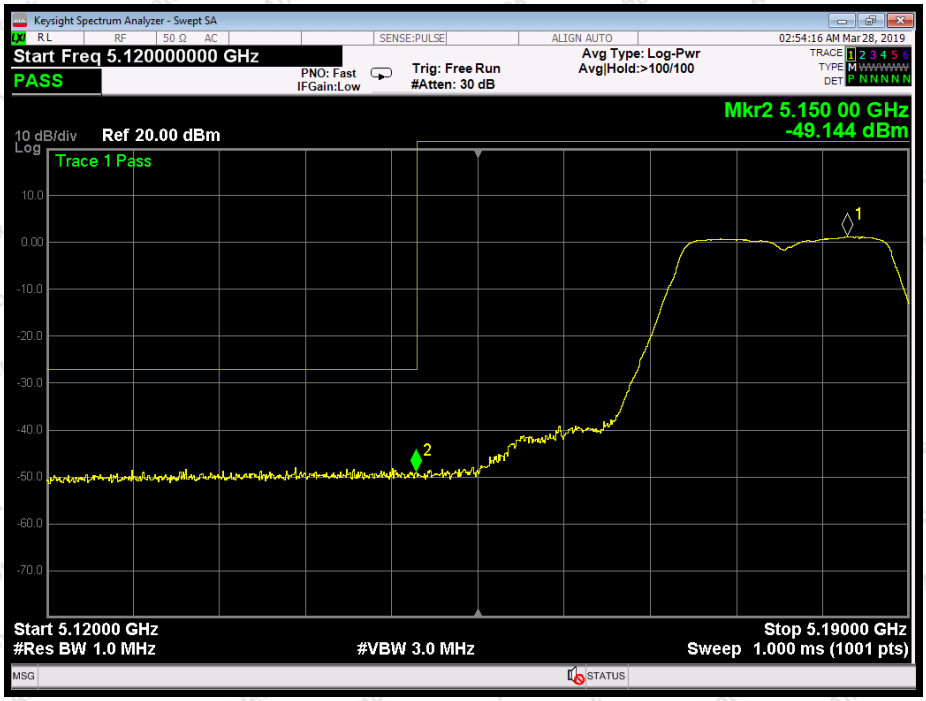
Test Mode: 802.11ac20								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.29	28.65	13.58	31.04	52.48	68.20	-15.72	H
5350.00	42.64	29.16	14.68	31.96	54.52	68.20	-13.68	H
5150.00	43.31	28.65	13.58	31.04	54.50	68.20	-13.70	V
5350.00	42.77	29.16	14.68	31.96	54.65	68.20	-13.55	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	33.78	28.65	13.58	31.04	44.97	54.00	-9.03	H
5350.00	34.64	29.16	14.68	31.96	46.52	54.00	-7.48	H
5150.00	34.12	28.65	13.58	31.04	45.31	54.00	-8.69	V
5350.00	35.44	29.16	14.68	31.96	47.32	54.00	-6.68	V

Test Mode: 802.11ac40								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.25	28.65	13.58	31.04	52.44	68.20	-15.76	H
5350.00	42.37	29.16	14.68	31.96	54.25	68.20	-13.95	H
5150.00	41.54	28.65	13.58	31.04	52.73	68.20	-15.47	V
5350.00	43.41	29.16	14.68	31.96	55.29	68.20	-12.91	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	33.47	28.65	13.58	31.04	44.66	54.00	-9.34	H
5350.00	34.61	29.16	14.68	31.96	46.49	54.00	-7.51	H
5150.00	33.62	28.65	13.58	31.04	44.81	54.00	-9.19	V
5350.00	35.01	29.16	14.68	31.96	46.89	54.00	-7.11	V

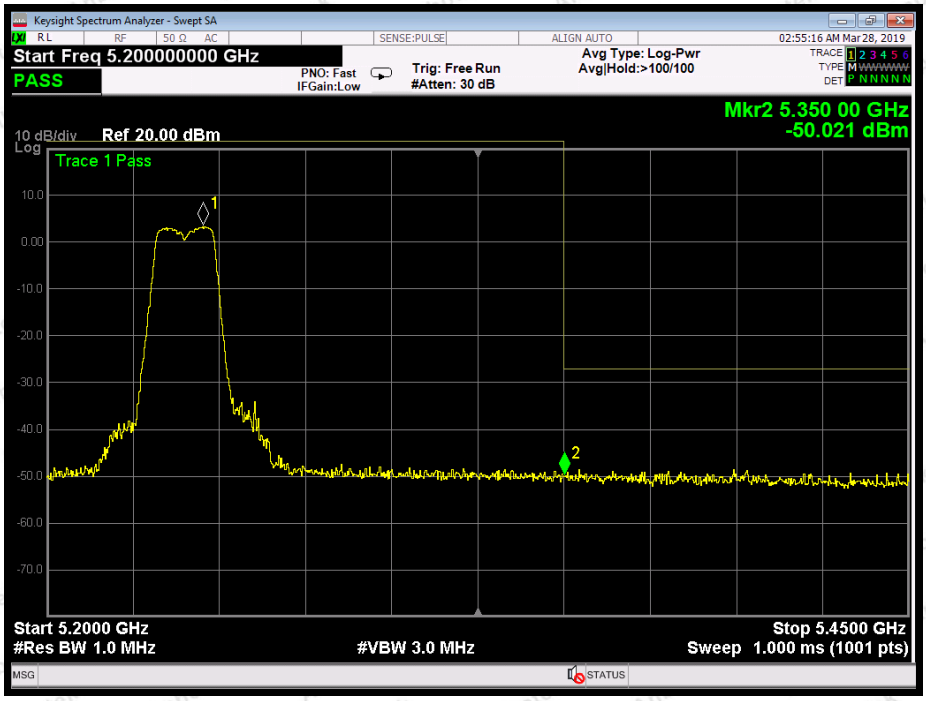
Test Mode: 802.11ac80								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.63	28.65	13.58	31.04	52.82	68.20	-15.38	H
5350.00	42.49	29.16	14.68	31.96	54.37	68.20	-13.83	H
5150.00	41.21	28.65	13.58	31.04	52.40	68.20	-15.80	V
5350.00	43.82	29.16	14.68	31.96	55.70	68.20	-12.50	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	33.65	28.65	13.58	31.04	44.84	54.00	-9.16	H
5350.00	34.45	29.16	14.68	31.96	46.33	54.00	-7.67	H
5150.00	33.72	28.65	13.58	31.04	44.91	54.00	-9.09	V
5350.00	35.31	29.16	14.68	31.96	47.19	54.00	-6.81	V

For conducted test:

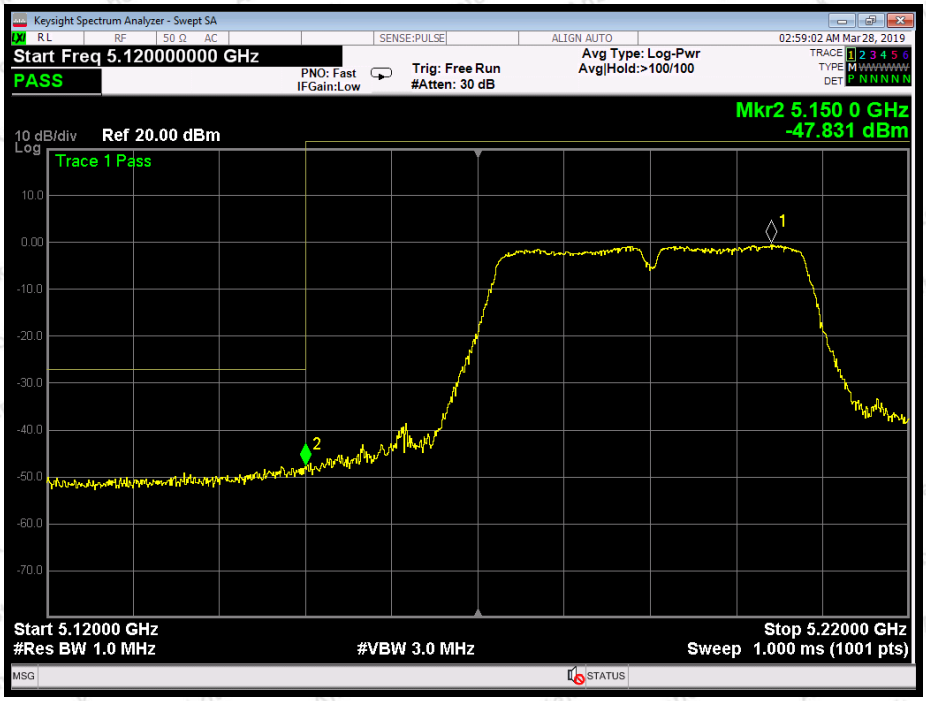
802.11ac(20): Band Edge, Left Side



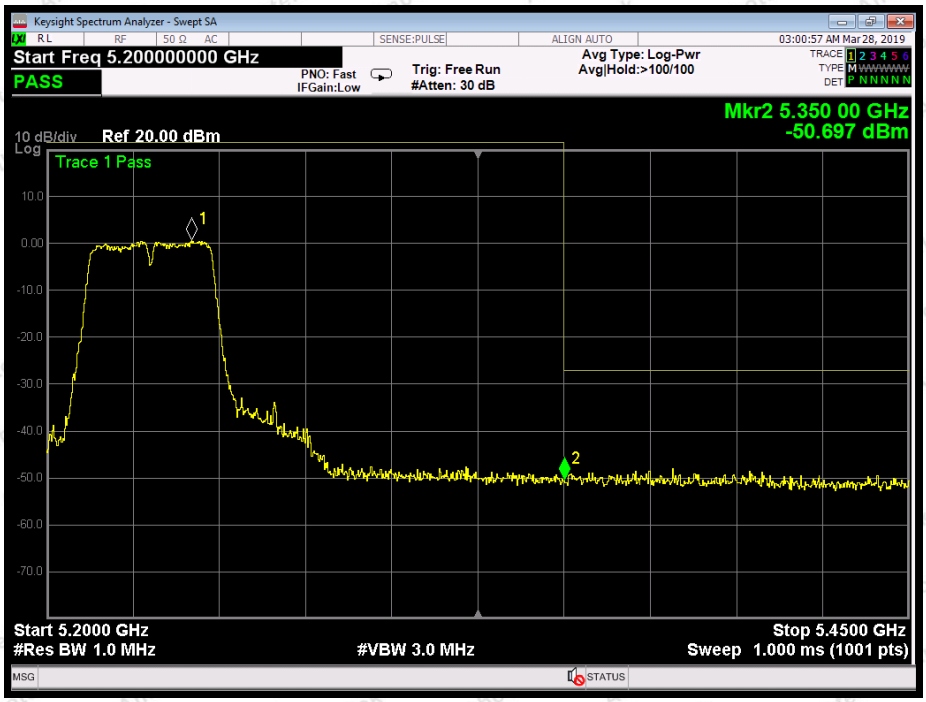
802.11ac(20): Band Edge, Right Side



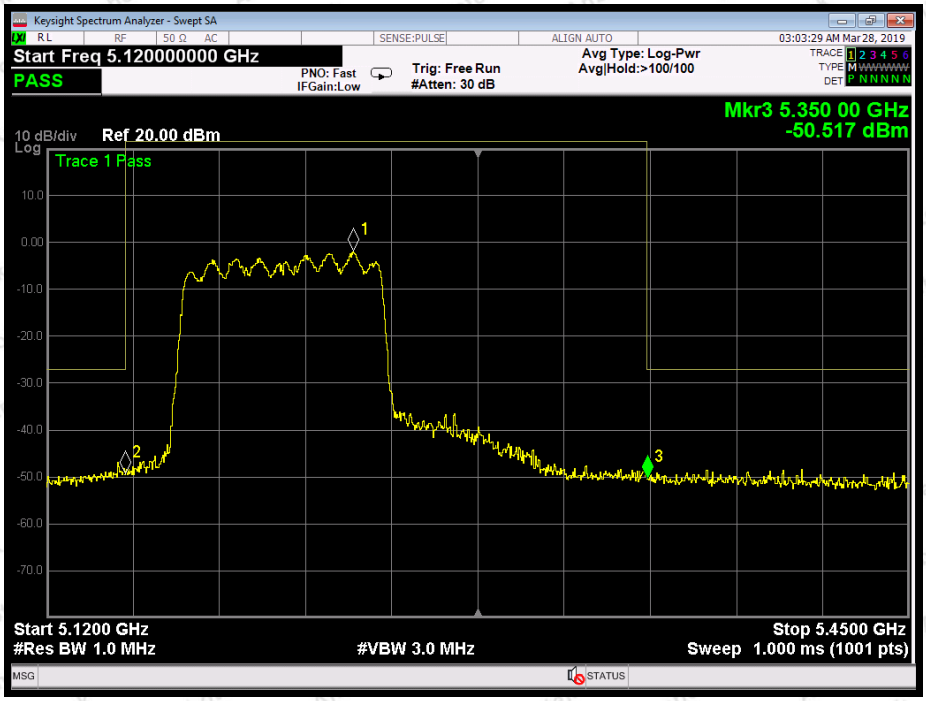
802.11ac(40): Band Edge, Left Side



802.11ac(40): Band Edge, Right Side



802.11ac(80): Band Edge, Left Side&Right Side

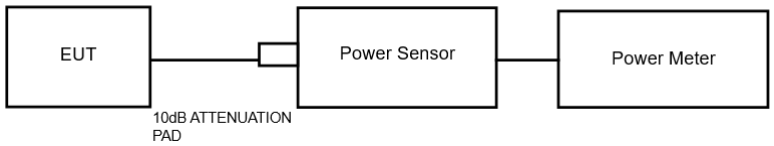


5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a)(1) (3)
Test Limit	24dBm

5.2. Test Setup



5.3. Test Procedure

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

5.4. Test Data

Test Item	:	Max. peak output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V, 60Hz for adapter	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

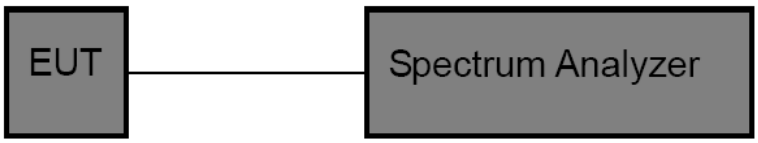
Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11ac20	5180	12.19	24.00	PASS
	5200	12.77	24.00	PASS
	5240	**14.06**	24.00	PASS
802.11ac40	5190	12.52	24.00	PASS
	5230	12.97	24.00	PASS
802.11ac80	5210	13.36	24.00	PASS

6. Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.407 (a)(5)

6.2. Test Setup



6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3. Set the spectrum analyzer as:

26 dB &99%bandwidth

RBW = approximately 1% of the emission bandwidth;
Set the VBW＞RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

6 dB bandwidth

RBW = 100kHz;
Set the video bandwidth (VBW) ≥ 3 RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

4. Measure the maximum width of the emission that is 26dB /6dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer.

5. Repeat until all the rest channels are investigated.

6.4. Test Data

Test Item	:	6dB &26dB BW	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V, 60Hz for adapter	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11ac20	5180	17.70	>0.5MHz	PASS
	5200	17.72		PASS
	5240	17.77		PASS
802.11ac40	5190	36.47		PASS
	5230	36.48		PASS
802.11ac80	5210	74.85		PASS

Mode	Channel Frequency (MHz)	26dB BW(MHz)	99%Bandwidth (MHz)
802.11ac20	5180	21.28	17.714
	5200	21.16	17.710
	5240	21.41	17.730
802.11ac40	5190	41.79	36.176
	5230	41.66	36.147
802.11ac80	5210	81.07	75.058

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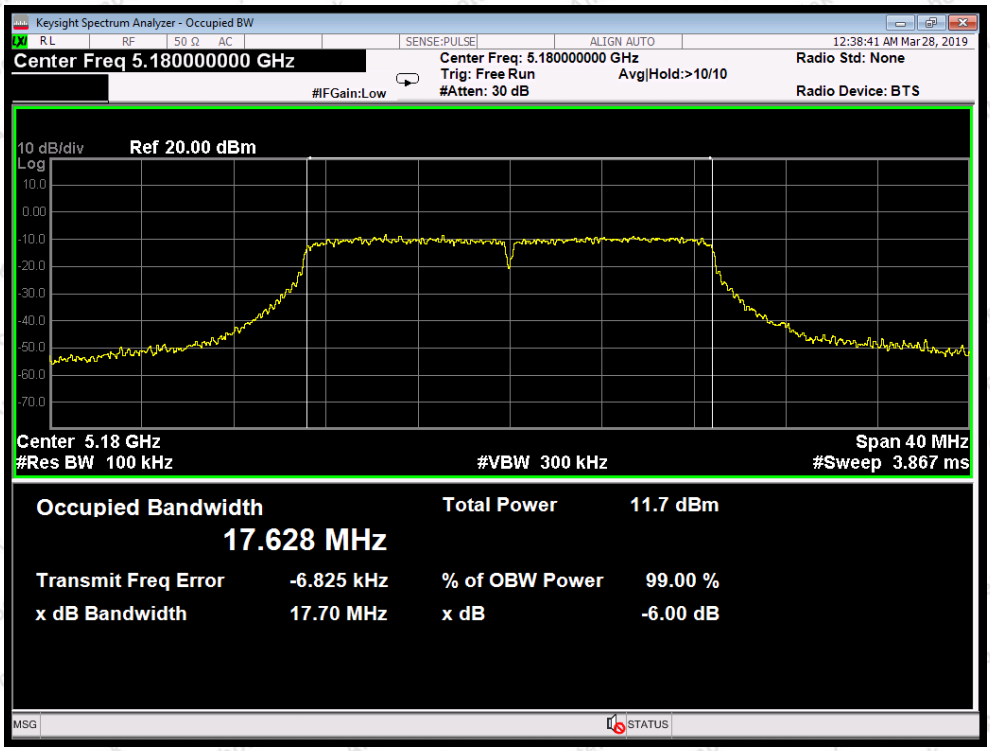
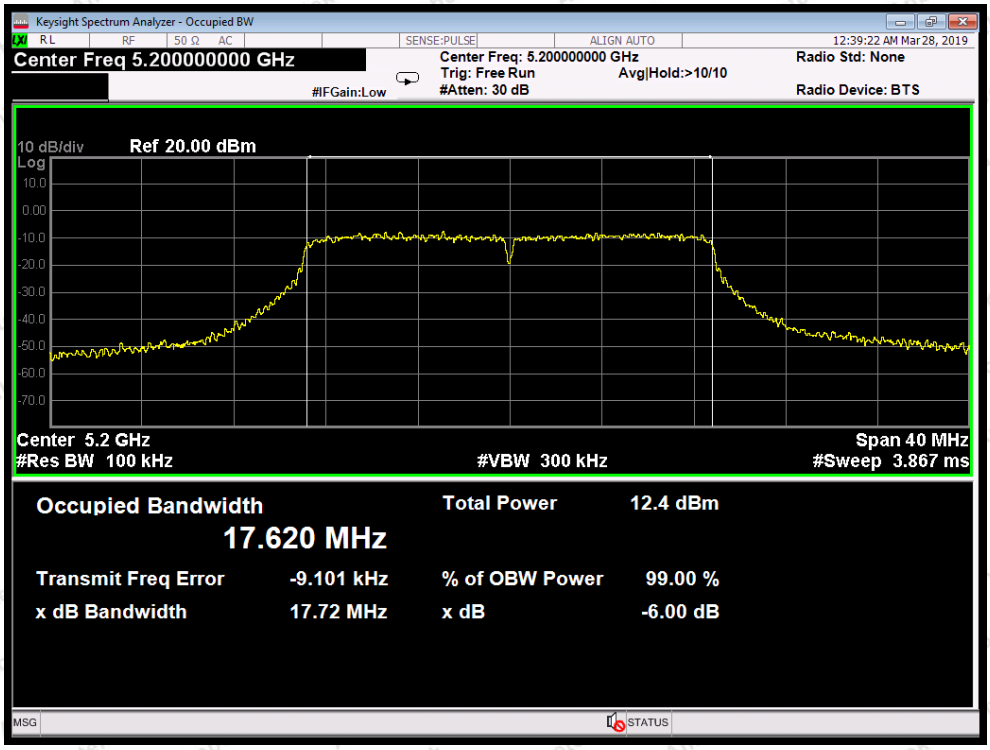
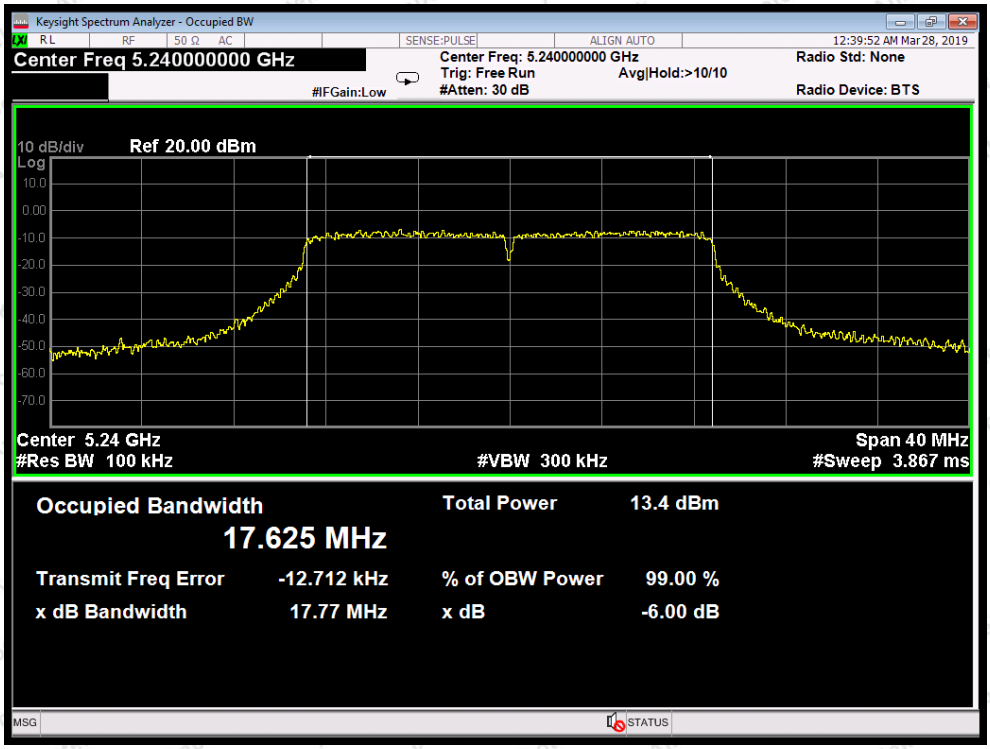
6dB Bandwidth



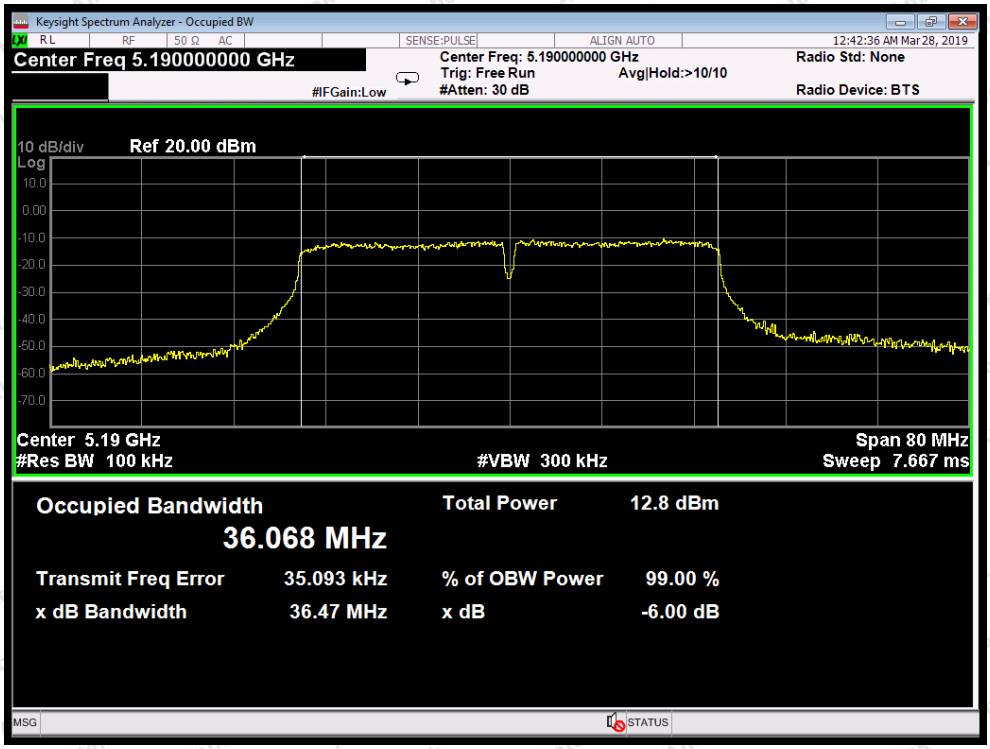
Test Mode: 802.11ac20--Low



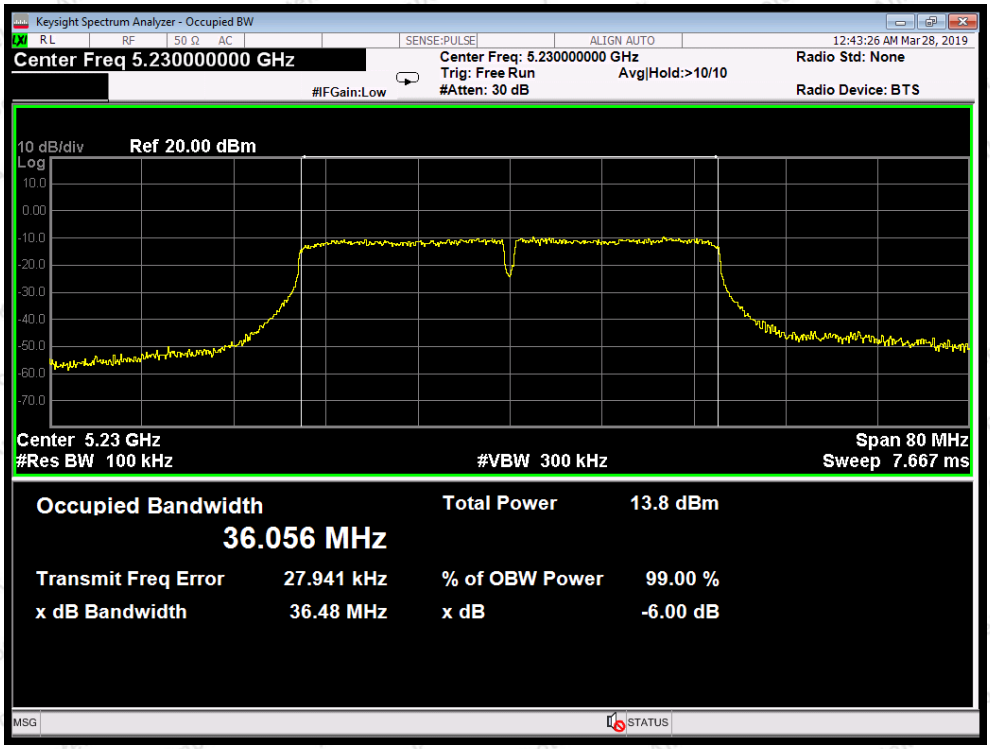
Test Mode: 802.11ac20---Middle



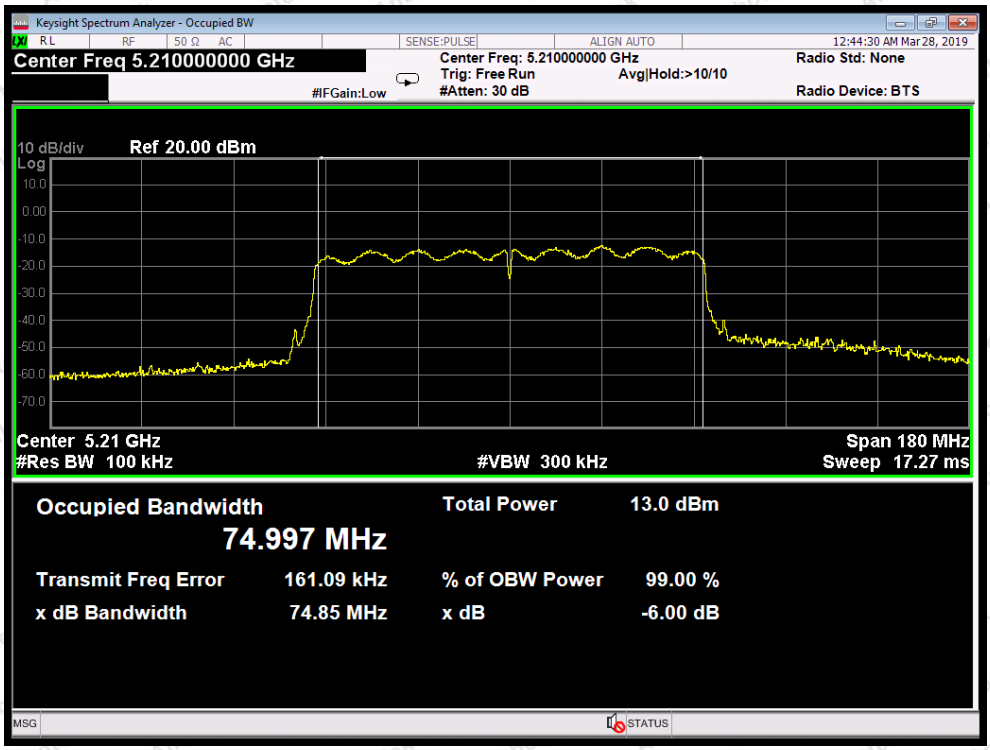
Test Mode: 802.11ac20---High



Test Mode: 802.11ac40---Low

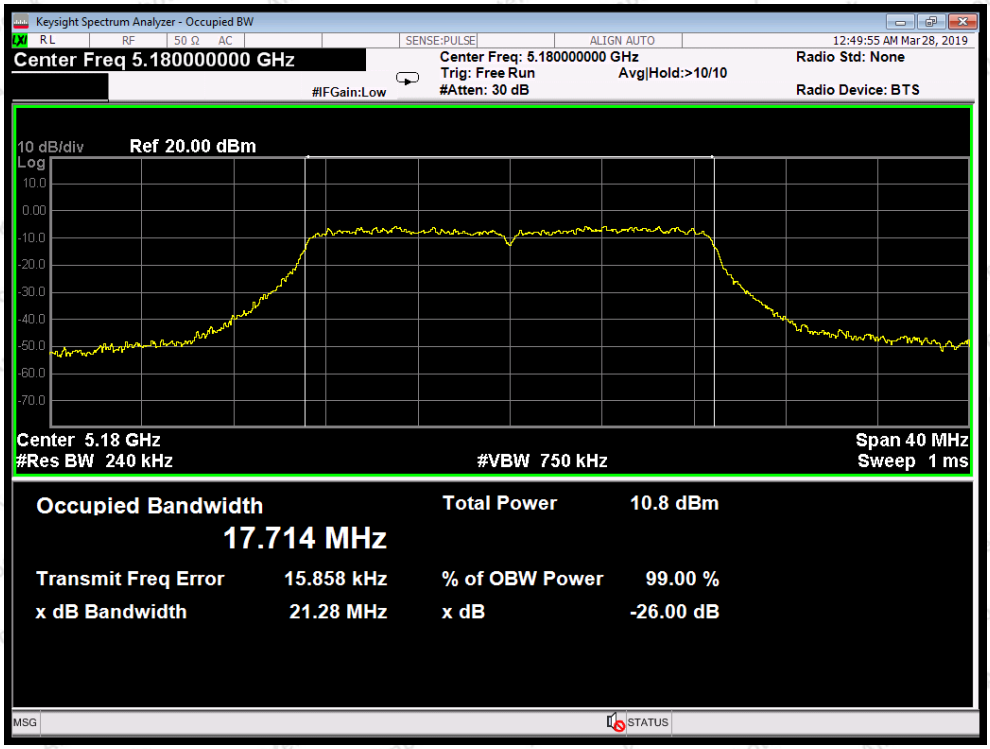


Test Mode: 802.11ac40---High

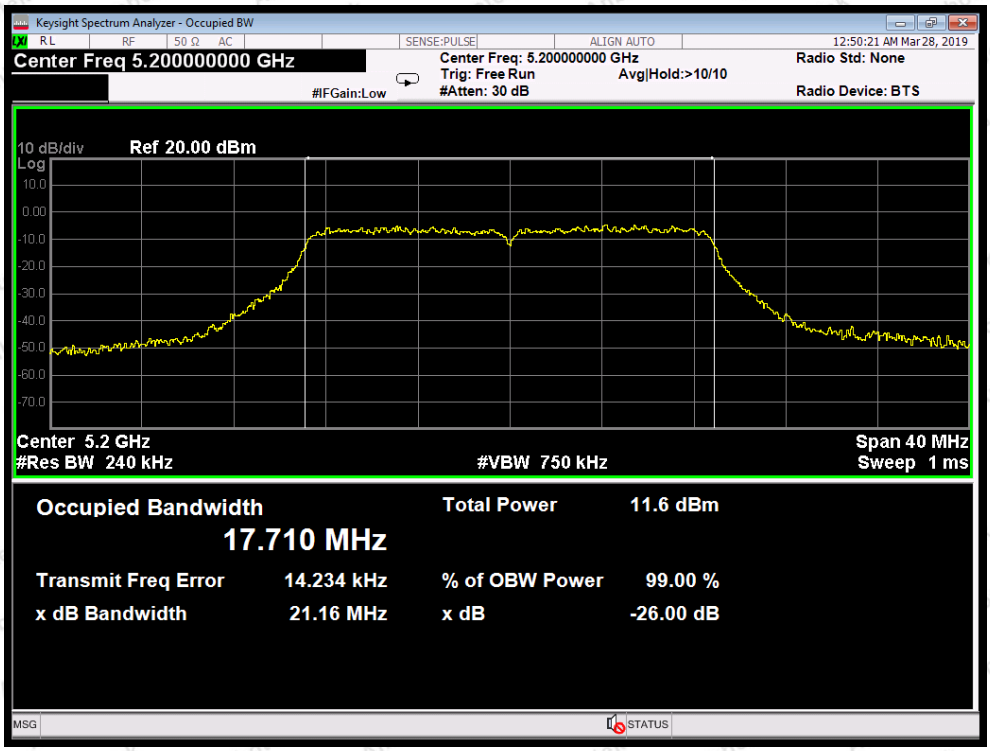


Test Mode: 802.11ac80

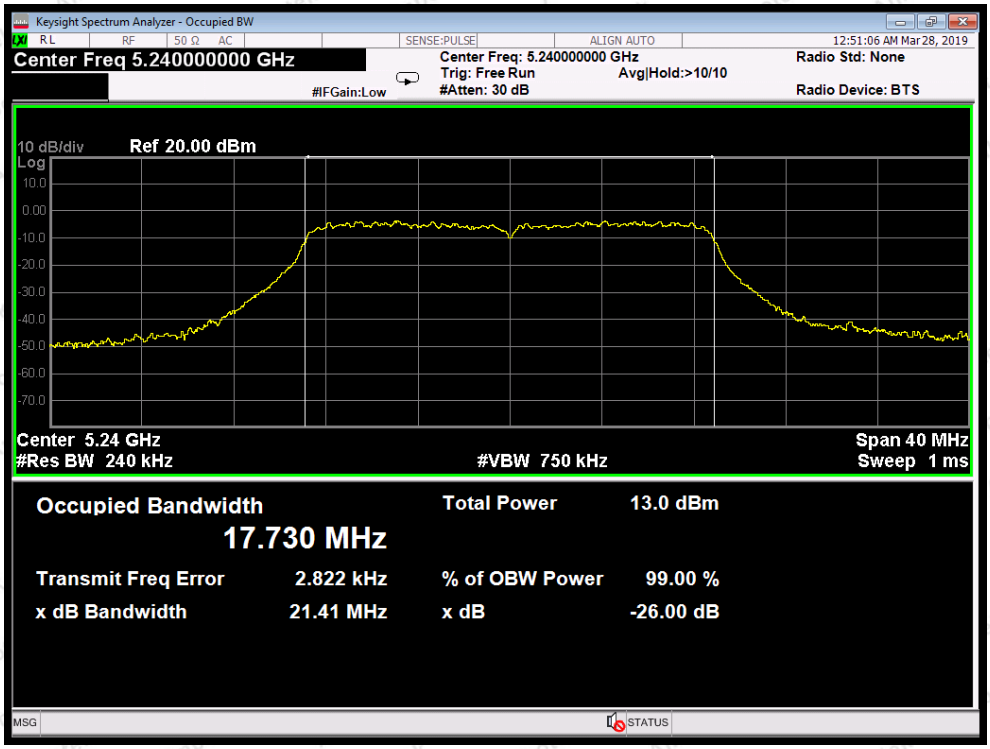
26dB &99% Bandwidth



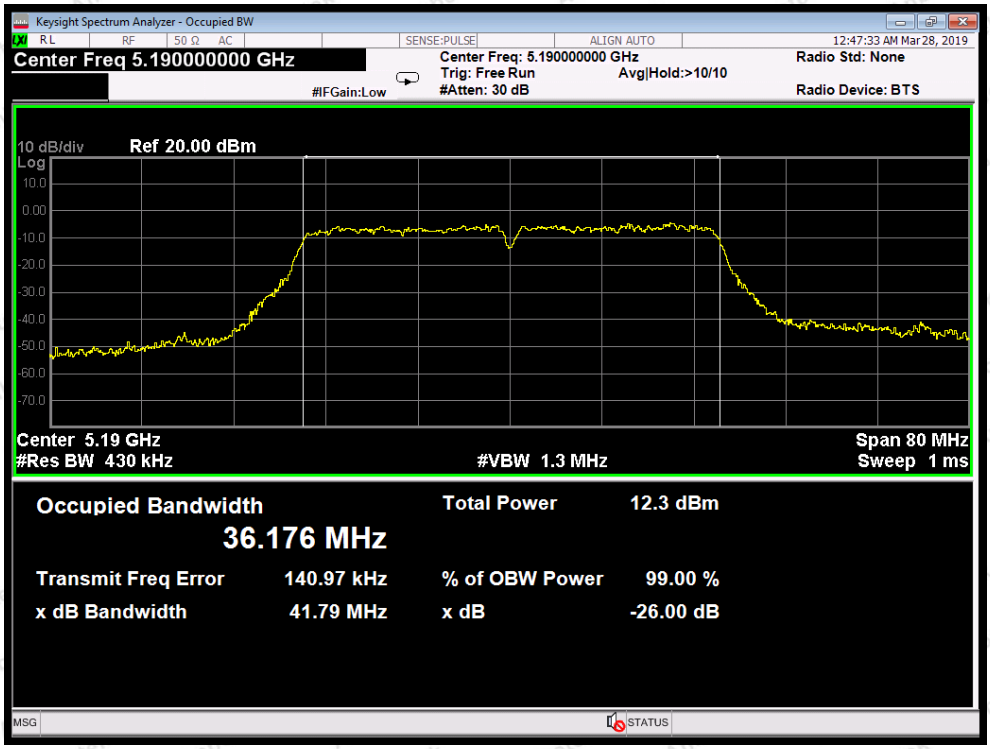
Test Mode: 802.11ac20--Low



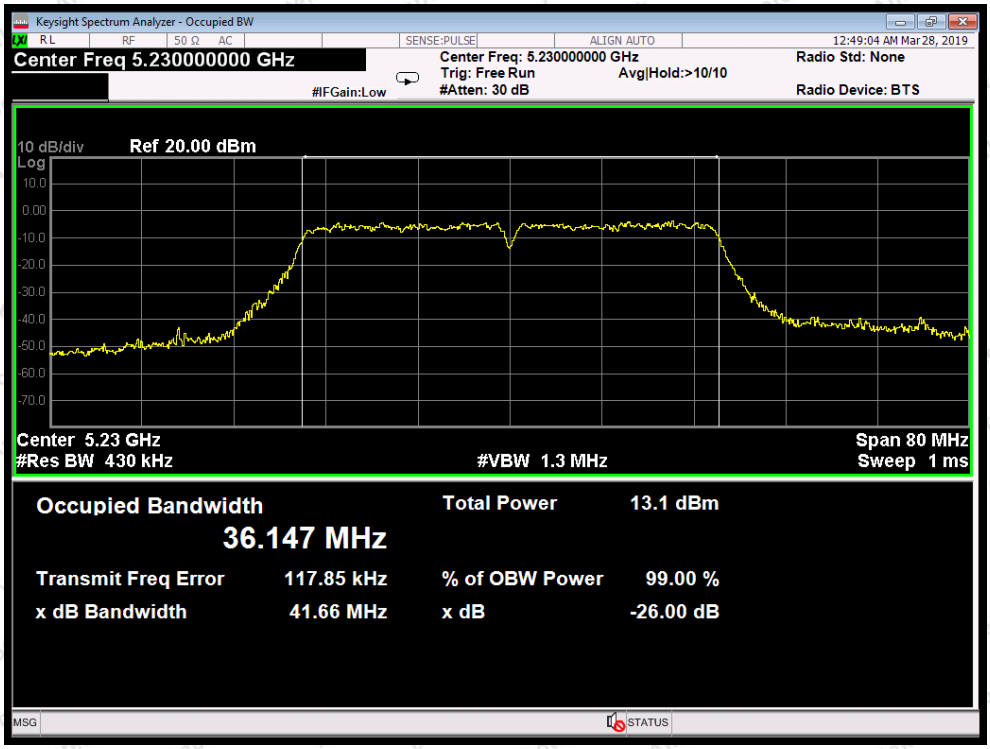
Test Mode: 802.11ac20---Middle



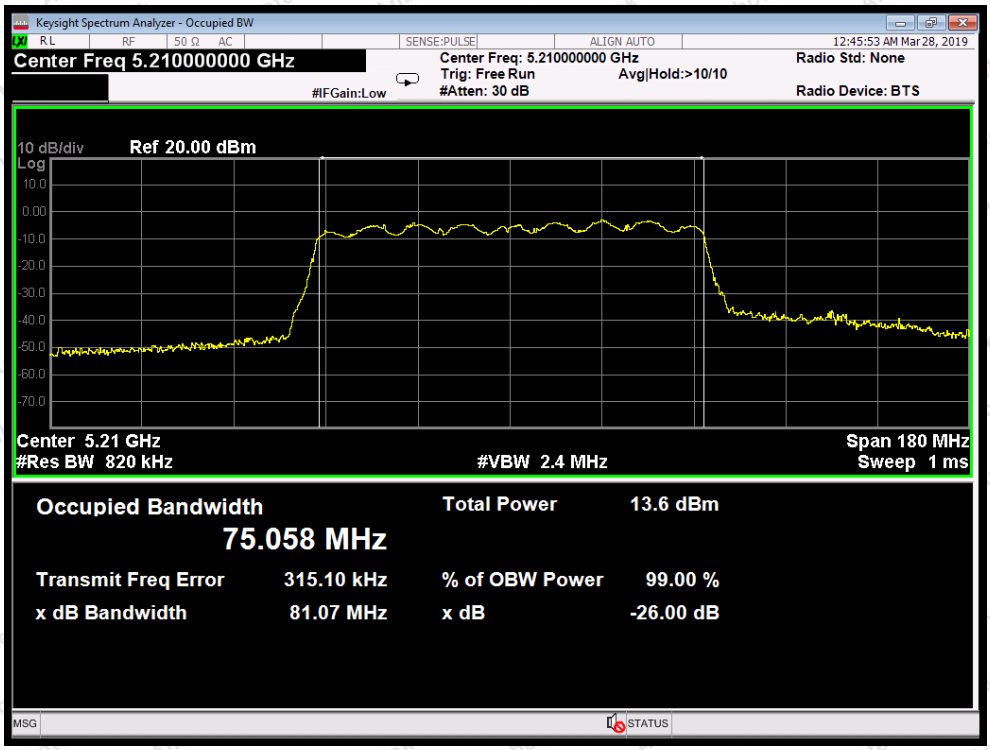
Test Mode: 802.11ac20---High



Test Mode: 802.11ac40---Low



Test Mode: 802.11ac40---High



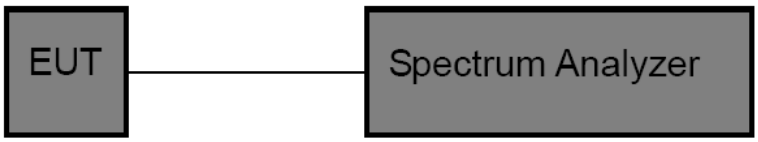
Test Mode: 802.11ac80

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a) (1)
Test Limit	11 dBm/MHz

7.2. Test Setup



7.3. Test Procedure

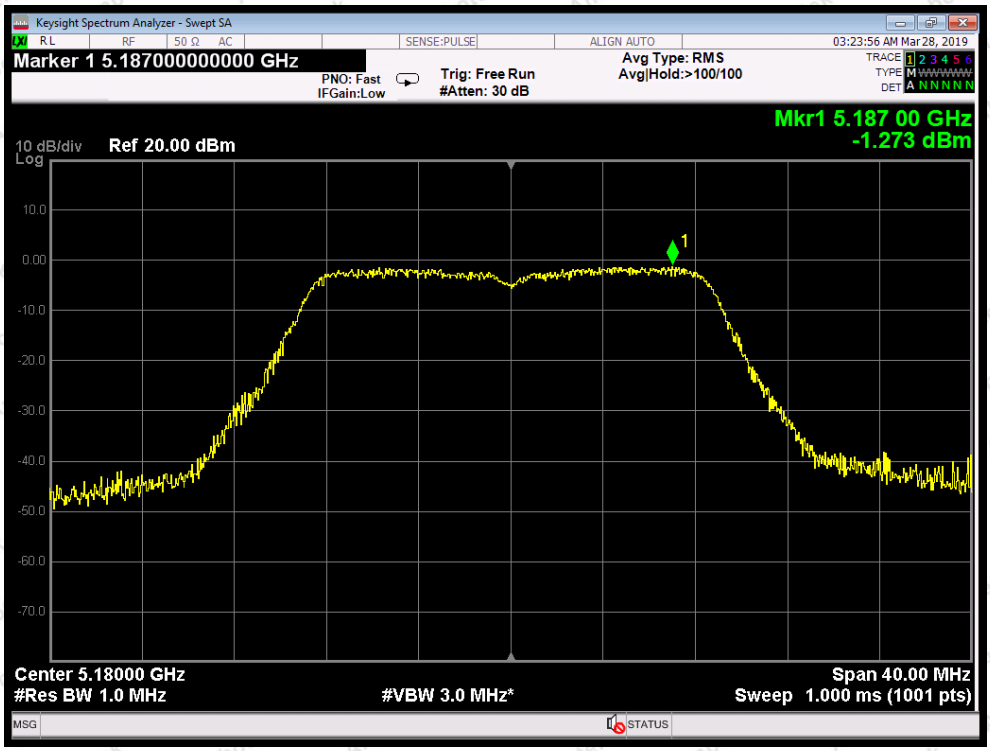
For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz).

1. The EUT is directly connected to the spectrum analyzer;
2. Set RBW =1MHz;
3. Set VBW ≥ 3 RBW=3MHz;
3. Set the span to encompass the entire emissions bandwidth (EBW) of the signal;
5. Detector=RMS;
6. Sweep time= auto couple;
7. Trace mode=max. hold;

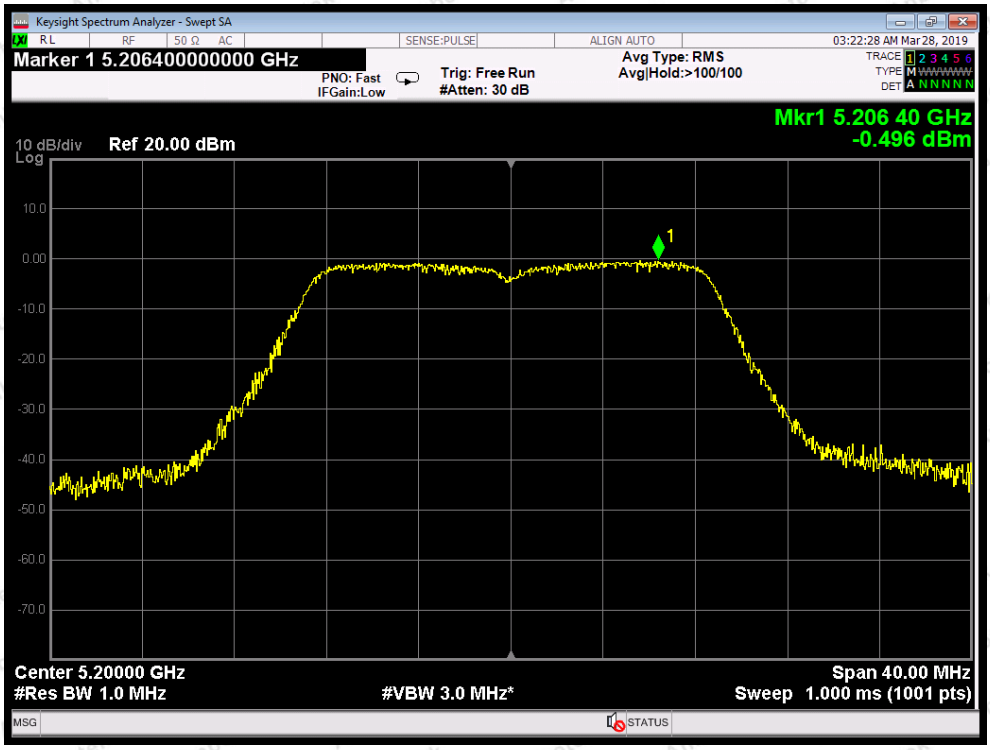
7.4. Test Data

Test Item	:	Power Spectral Density	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V, 60Hz for adapter	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

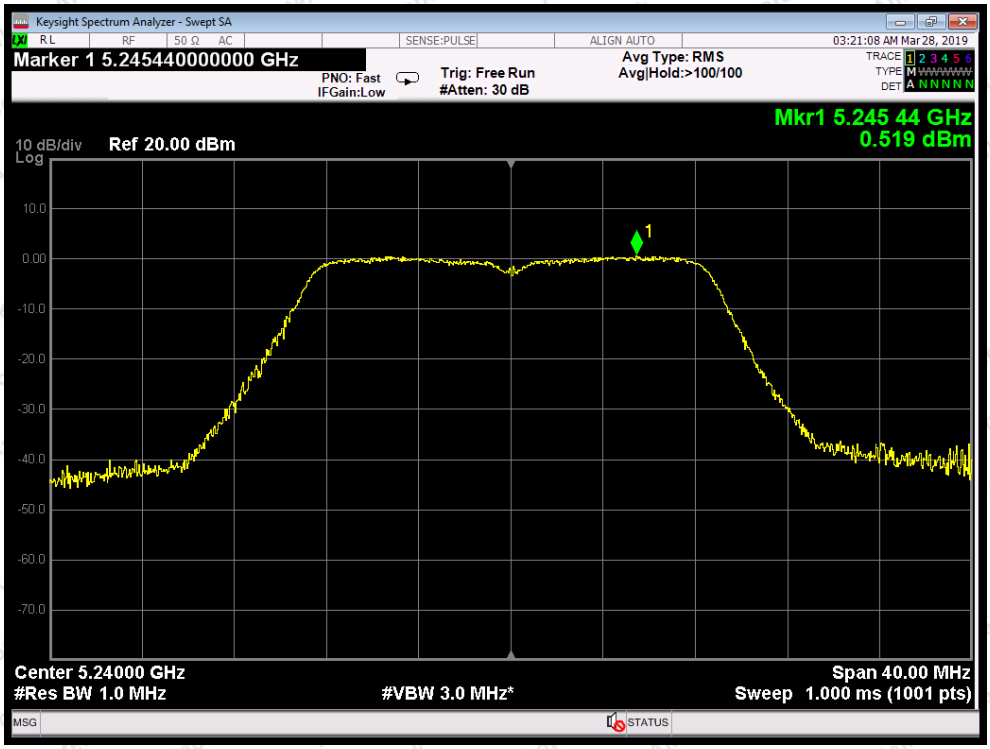
Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm/MHz)	Limit	Results
802.11ac20	5180	-1.273	11 dBm/MHz	PASS
	5200	-0.496		PASS
	5240	0.519		PASS
802.11ac40	5190	-3.334		PASS
	5230	-2.363		PASS
802.11ac80	5210	-4.924		PASS



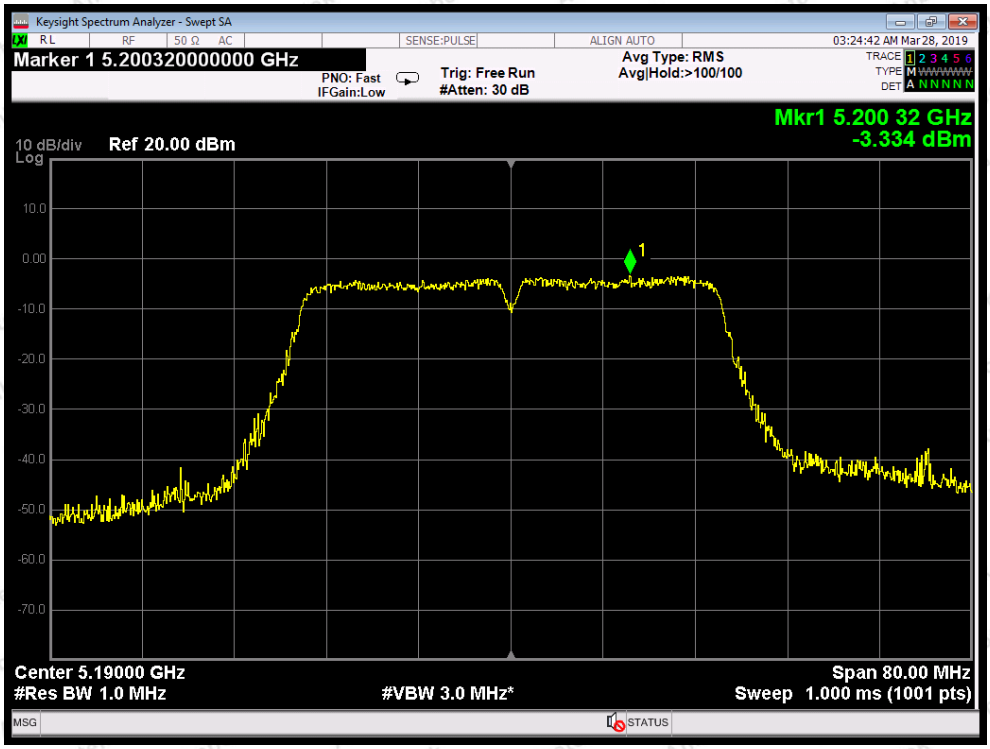
Test Mode: 802.11ac20--Low



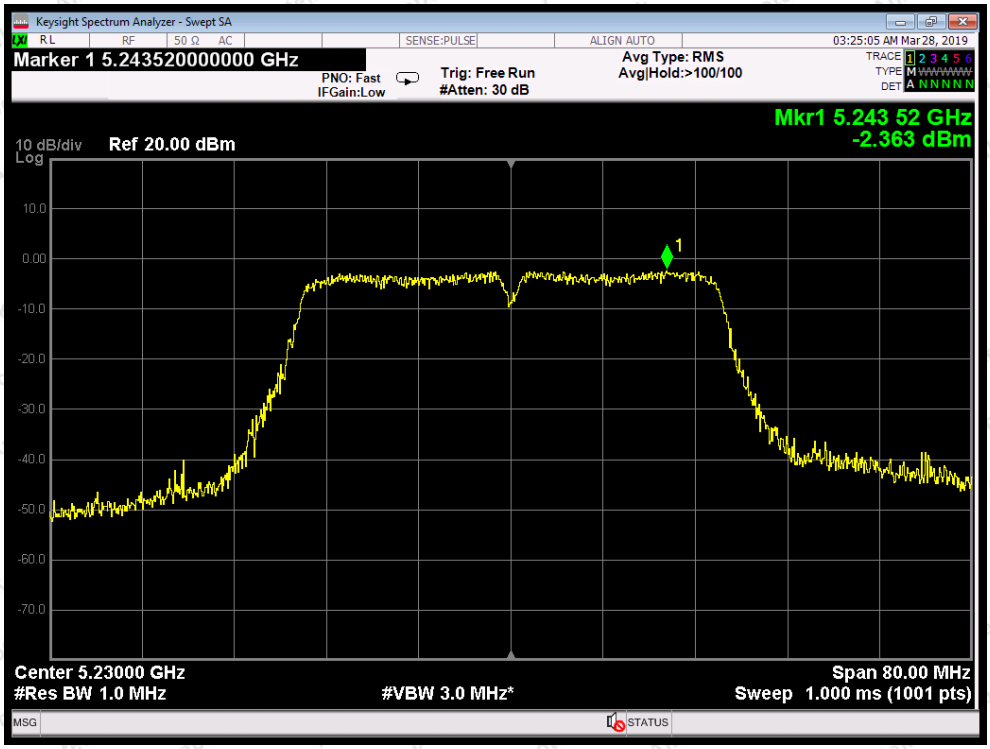
Test Mode: 802.11ac20---Middle



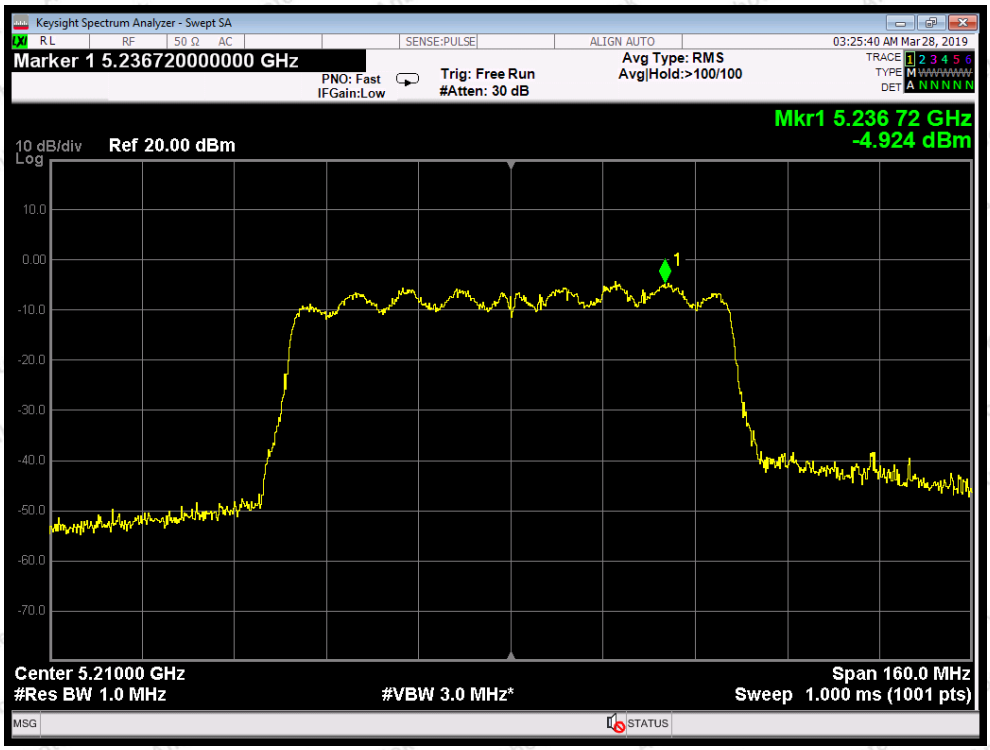
Test Mode: 802.11ac20---High



Test Mode: 802.11ac40---Low



Test Mode: 802.11ac40---High



Test Mode: 802.11ac80

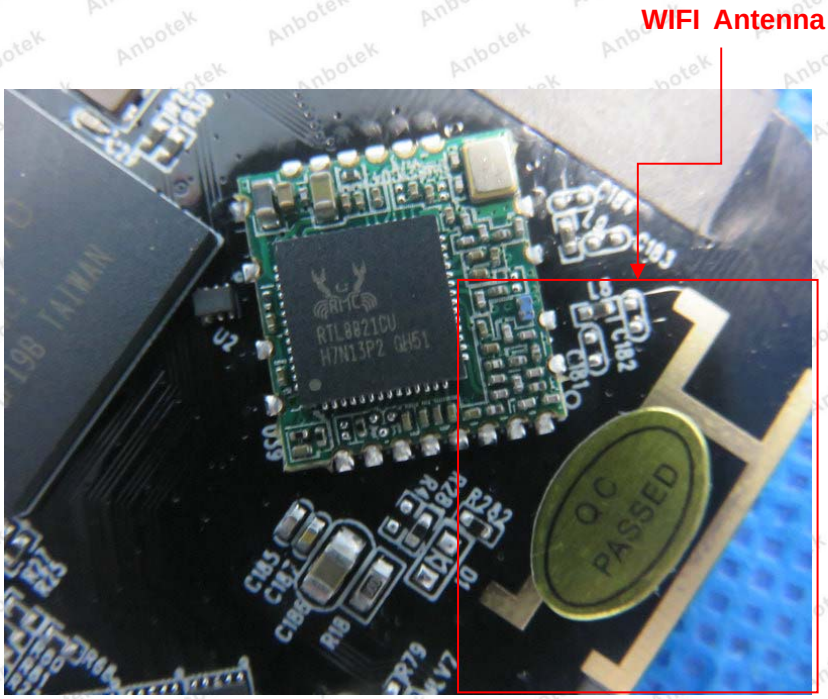
8. Antenna Requirement

8.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /15.407
Requirement	1) 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, 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. 2) 15.407 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, or §15.221. 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.

8.2. Antenna Connected Construction

The antenna is a PCB Antenna which permanently attached, and the best case gain of the antenna is 1 dBi. It complies with the standard requirement.



APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Test

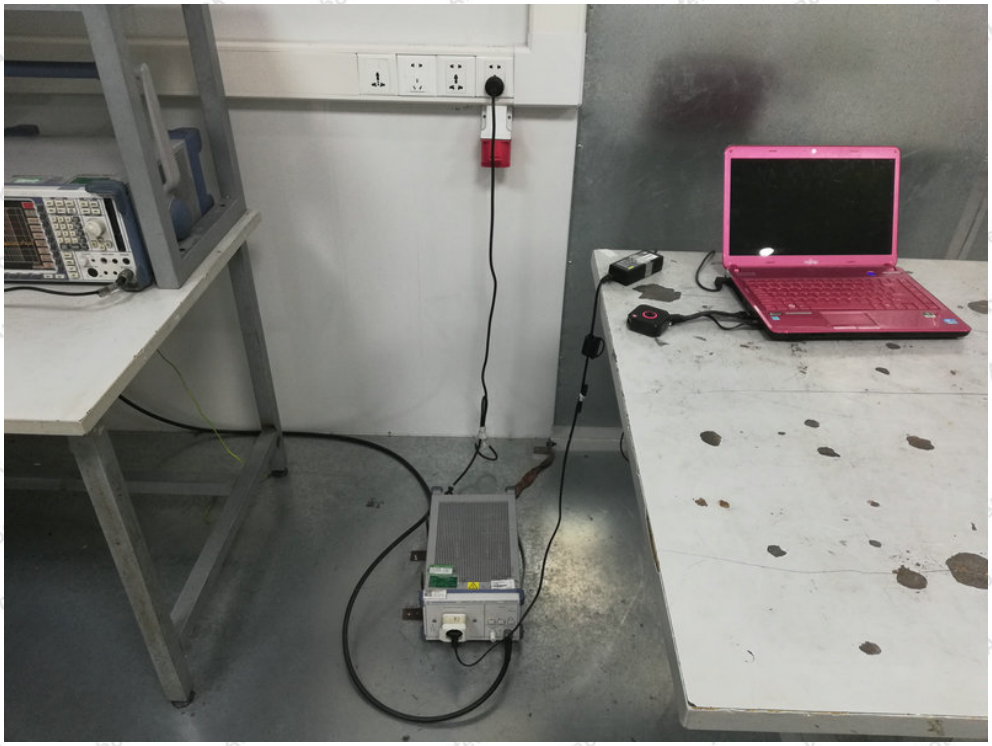
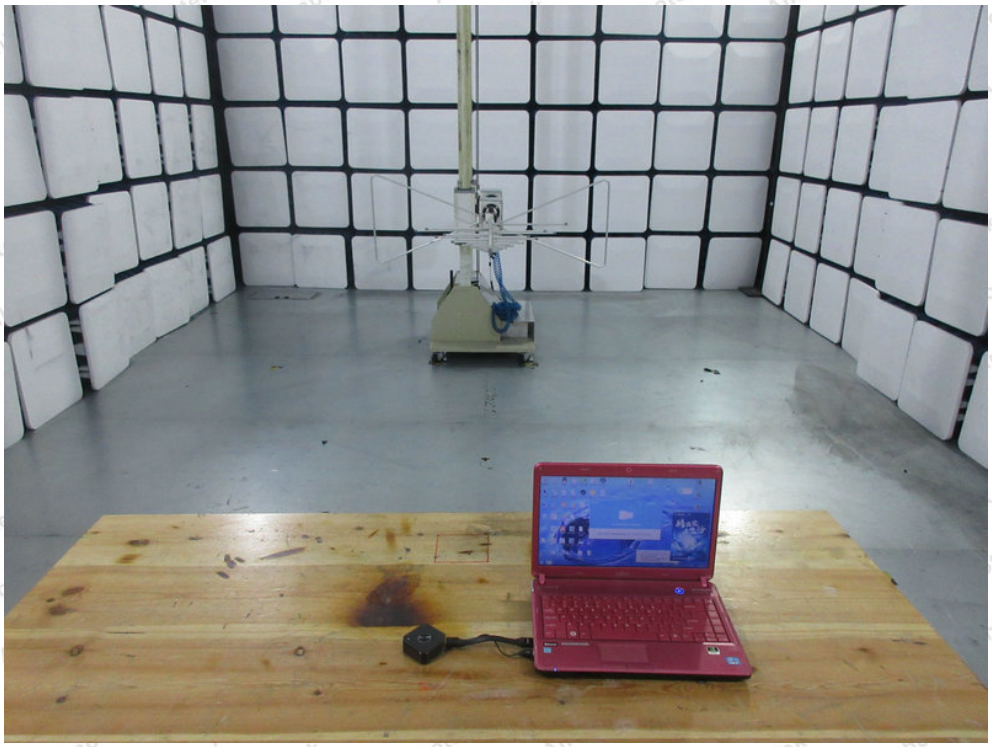
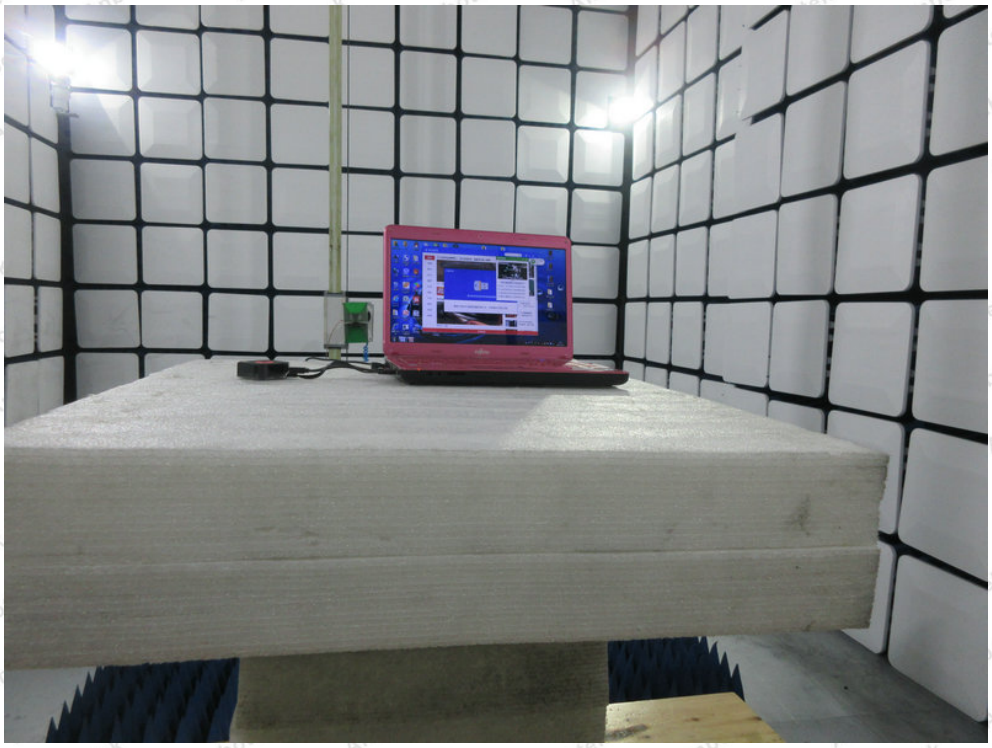


Photo of Radiation Emission Test





APPENDIX II -- EXTERNAL PHOTOGRAPH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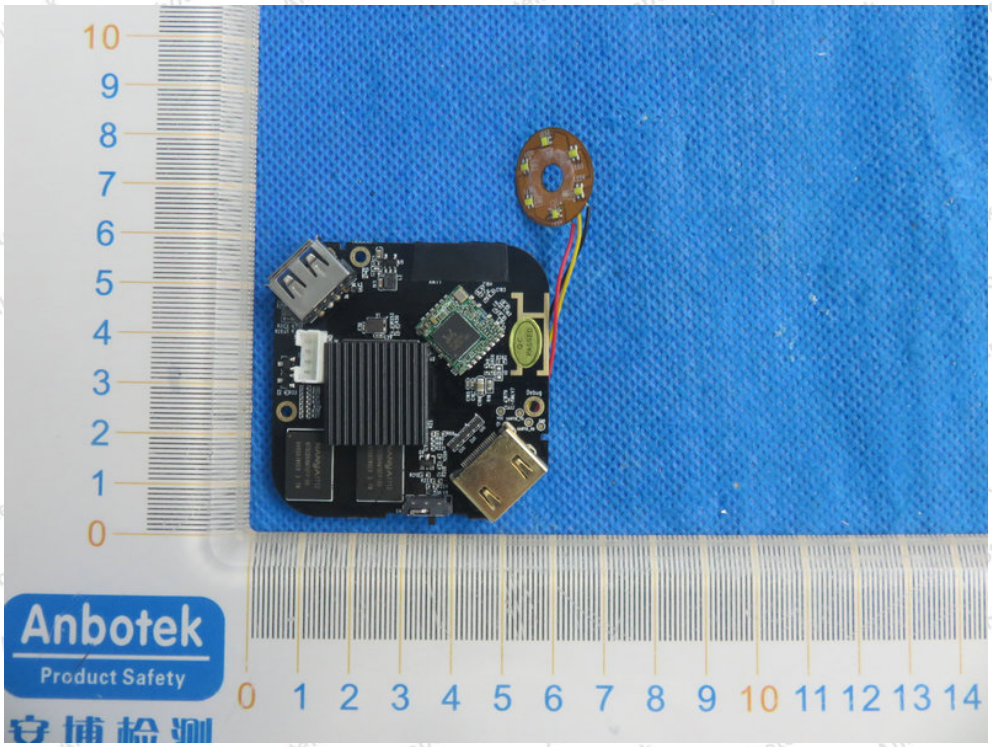
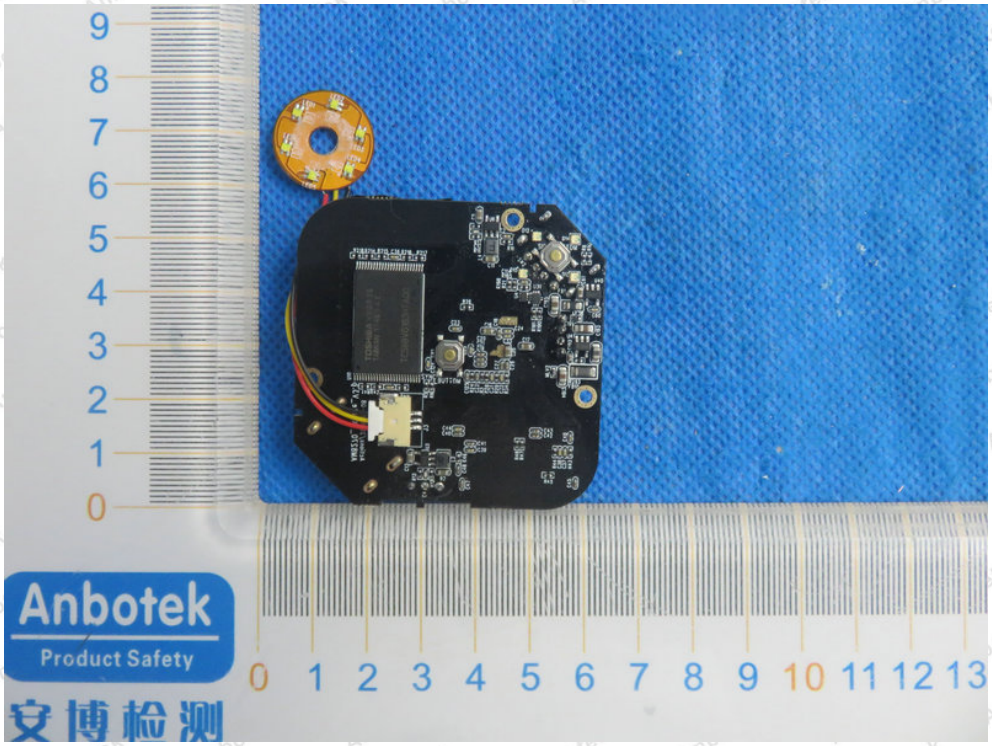
APPENDIX III -- INTERNAL PHOTOGRAPH

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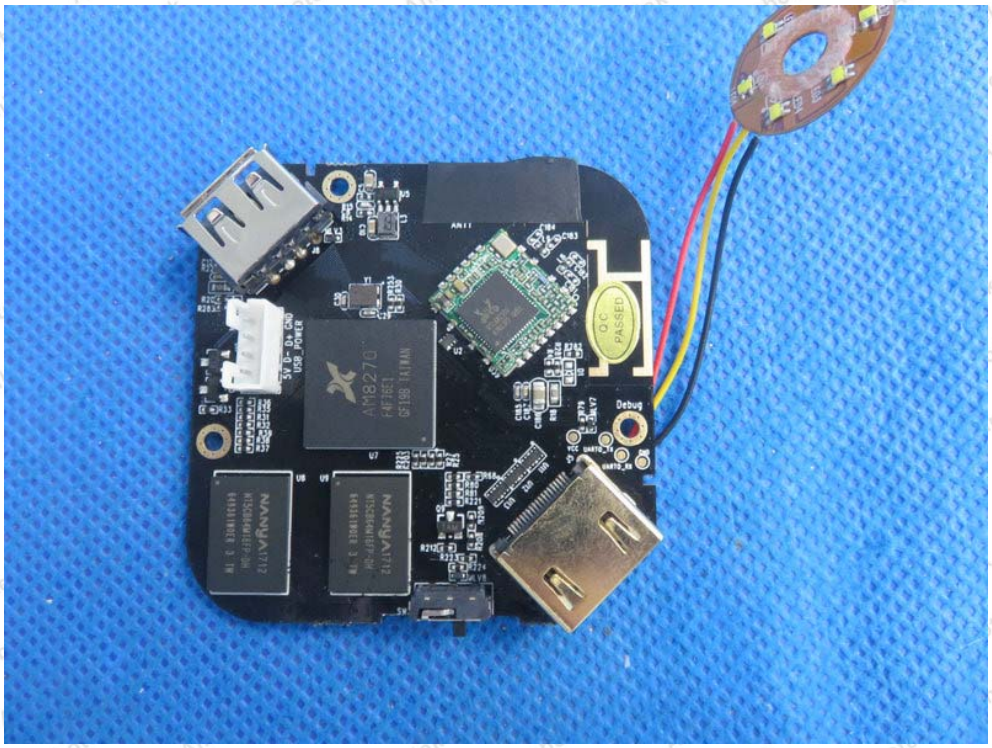

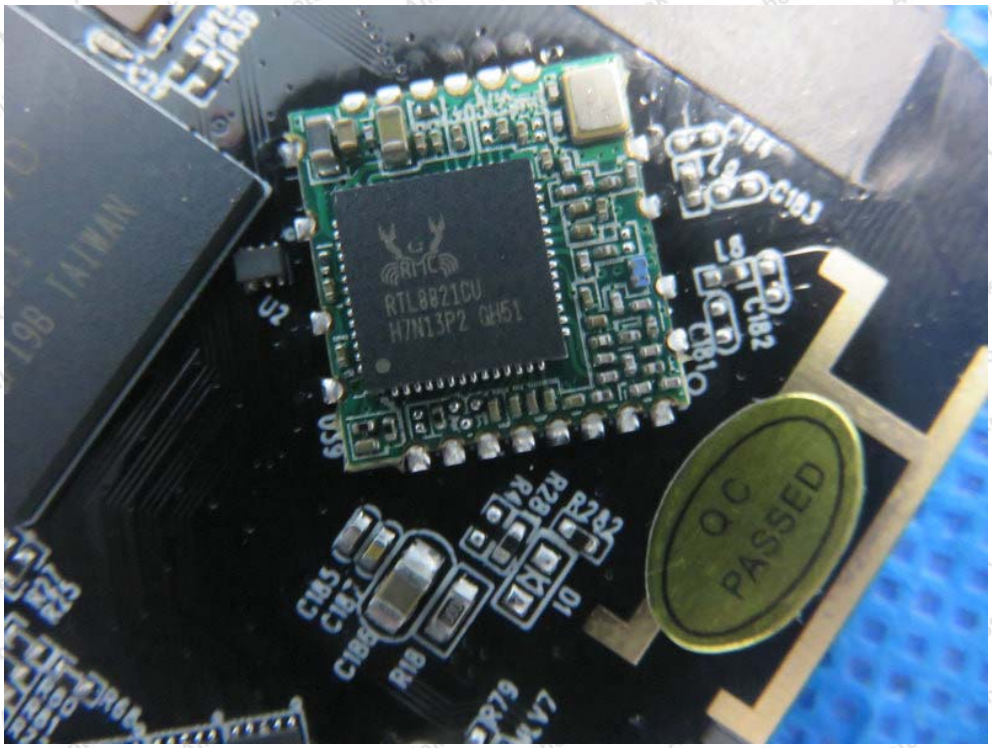

---------- End of Report ----------