

TEST REPORT

FCC ID: 2AB7K-Z6010

Product: Zolo Mojo

Model No.: Z6010

Additional Model No.: N/A

Trade Mark: ZOLO

Report No.: TCT171025E002

Issued Date: Oct. 26, 2017

Issued for:

Anker Technology Co., Limited
Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok, Kowloon,
Hong Kong

Issued By:

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Appendix A: Photographs of Test Setup

Appendix B: Photographs of EUT

1. Test Certification

Product:	Zolo Mojo
Model No.:	Z6010
Additional Model No.:	N/A
Trade Mark:	ZOLO
Applicant:	Anker Technology Co., Limited
Address:	Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok, Kowloon, Hong Kong
Manufacturer:	TCL Technoly Electronics(Huizhou) Co., Ltd.
Address:	Section 37, Zhongkai High-tech Development Zone, Huizhou City, Guang Dong Province, China.
Date of Test:	Sept. 21, 2017 - Oct. 15, 2017
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407: 2017 KDB789033 D02 General U-NII Test Procedures New Rules v01r04

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Jin Wang

Date:

Oct. 15, 2017

Reviewed By:



Joe Zhou

Date:

Oct. 26, 2017

Approved By:



Tomsin

Date:

Oct. 26, 2017



2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Maximum Conducted Output Power	§15.407(a) §2.1046	PASS
6dB Emission Bandwidth	§15.407(a) §2.1049	PASS
26dB Emission Bandwidth& 99% Occupied Bandwidth	§15.407(a) §2.1049	PASS
Power Spectral Density	§15.407(a)	PASS
Band edge	§15.407(a)	PASS
Radiated Emission	§15.407(a) §2.1053	PASS
Frequency Stability	§15.407(g) §2.1055	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product:	Zolo Mojo
Model No.:	Z6010
Additional Model No.:	N/A
Trade Mark:	ZOLO
Operation Frequency:	Band I: 5180MHz-5240MHz; 5190MHz-5230MHz. Band IV: 5745MHz-5825MHz; 5755MHz-5795MHz.
Channel Bandwidth:	802.11a/n(HT20): 20MHz 802.11n(HT40): 40MHz
Modulation Technology:	Orthogonal Frequency Division Multiplexing(OFDM)
Modulation Type	64QAM, 16QAM, BPSK, QPSK
Antenna Type:	Internal Antenna
Antenna Gain:	3.61dBi
Power Supply:	AC 120V/60Hz
Adapter:	Adapter Information: Model: Z60-A00 Input: 100-240Va.c., 50-60Hz, 0.45A Output: 9.0Vd.c., 1.5A

Operation Frequency each of channel

20MHz		40MHz	
Channel	Frequency	Channel	Frequency
36	5180	38	5190
40	5200	46	5230
44	5220	151	5755
48	5240	159	5790
149	5745		
153	5765		
157	5785		
161	5805		
165	5825		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11a/n (HT20)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	149	Low	5745
40	Mid	5200	157	Mid	5785
48	High	5240	165	High	5825

For 802.11n (HT40)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
38	Low	5190	151	Low	5755
46	High	5230	159	High	5795

4. Genera Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 100%)
The sample was placed 0.8m/1.5m for blow/above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:	
Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11a	6 Mbps
802.11n(HT20)	MCS0
802.11n(HT40)	MCS0
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation

4.2. Description 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.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$

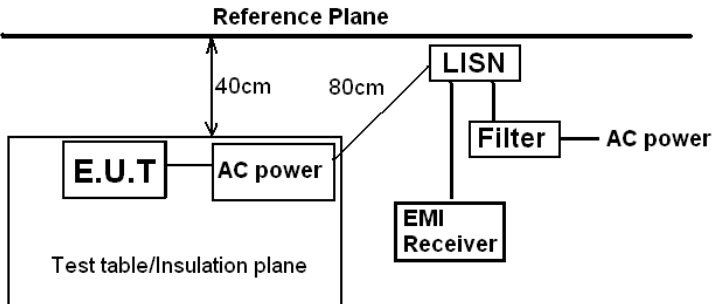
6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
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.	
E.U.T Antenna:	
The WIFI antenna is an internal antenna which permanently attached, and the best case gain of the antenna is 3.61dBi .	
 WIFI/BT Antenna	

6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	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
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													
Test Setup:	Reference Plane  Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m														
Test Mode:	Tx Mode														
Test Procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.														
Test Result:	PASS														

6.2.2. Test Instruments

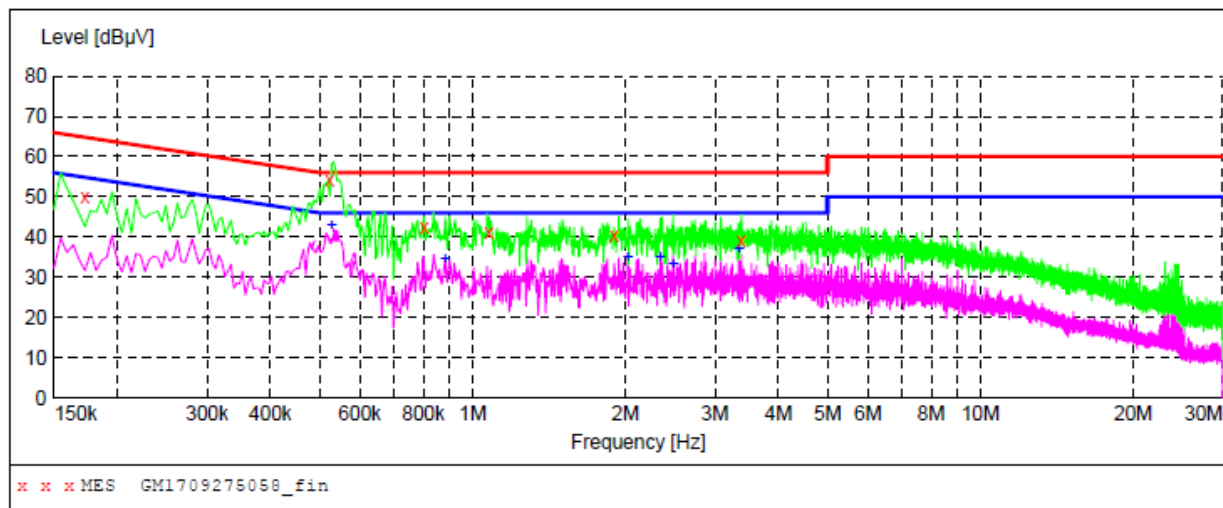
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.3. Test data

Please refer to following diagram for individual

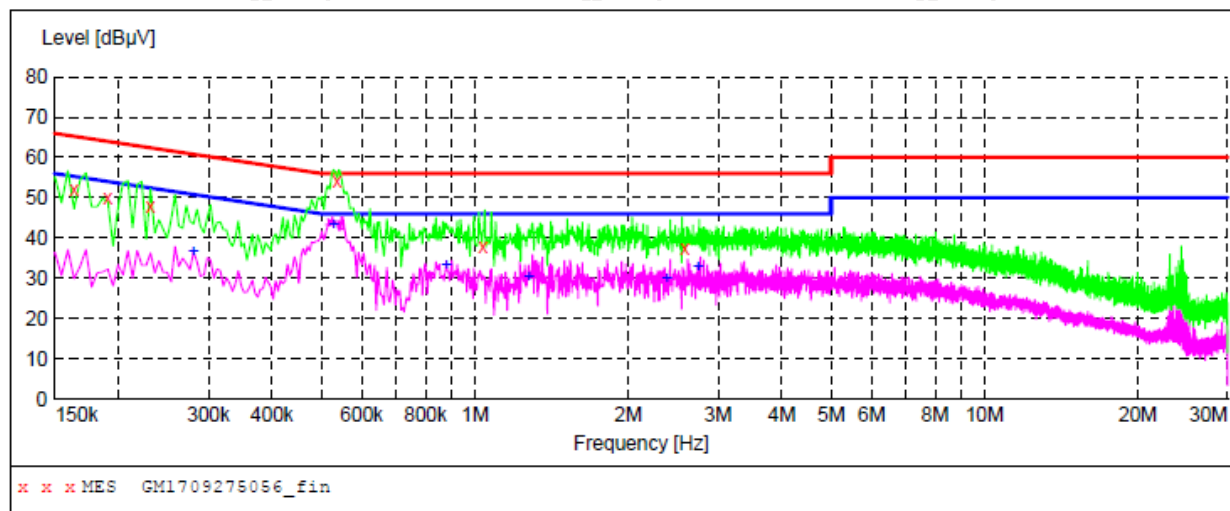
Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.172500	49.90	10.4	65	14.9	QP	L1	GND
0.523500	54.10	10.2	56	1.9	QP	L1	GND
0.802500	42.30	10.2	56	13.7	QP	L1	GND
1.077000	41.10	10.2	56	14.9	QP	L1	GND
1.900500	40.30	10.2	56	15.7	QP	L1	GND
3.381000	39.10	10.3	56	16.9	QP	L1	GND

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.528000	43.30	10.2	46	2.7	AV	L1	GND
0.883500	34.50	10.1	46	11.5	AV	L1	GND
2.022000	34.90	10.2	46	11.1	AV	L1	GND
2.341500	35.00	10.2	46	11.0	AV	L1	GND
2.485500	33.40	10.2	46	12.6	AV	L1	GND
3.345000	36.90	10.3	46	9.1	AV	L1	GND

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.163500	52.00	10.4	65	13.3	QP	N	GND
0.190500	50.00	10.3	64	14.0	QP	N	GND
0.231000	47.70	10.3	62	14.7	QP	N	GND
0.537000	54.00	10.2	56	2.0	QP	N	GND
1.036500	37.80	10.2	56	18.2	QP	N	GND
2.584500	37.30	10.2	56	18.7	QP	N	GND

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.280500	36.40	10.2	51	14.4	AV	N	GND
0.528000	44.30	10.2	46	1.7	AV	N	GND
0.879000	33.20	10.1	46	12.8	AV	N	GND
1.275000	30.50	10.2	46	15.5	AV	N	GND
2.377500	30.00	10.2	46	16.0	AV	N	GND
2.742000	33.00	10.2	46	13.0	AV	N	GND

Remark:

Transd = Cable lose+ PULSE LIMITER factor + ARTIFICIAL MAINS factor; Margin= Limit - Level

6.3. Maximum Conducted Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407(a)& Part 2 J Section 2.1046						
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section E						
Limit:	<table border="1"> <thead> <tr> <th>Frequency Band (MHz)</th><th>Limit</th></tr> </thead> <tbody> <tr> <td>5150-5250</td><td>250mW for client devices</td></tr> <tr> <td>5725-5850</td><td>1 W</td></tr> </tbody> </table>	Frequency Band (MHz)	Limit	5150-5250	250mW for client devices	5725-5850	1 W
Frequency Band (MHz)	Limit						
5150-5250	250mW for client devices						
5725-5850	1 W						
Test Setup:	 The diagram illustrates the test setup. On the left is a green box labeled 'Power meter'. A cable connects it to a small white box labeled 'Attenuator'. Another cable connects the attenuator to a yellow box labeled 'EUT' (Equipment Under Test).						
Test Mode:	Transmitting mode with modulation						
Test Procedure:	1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section E, 3, a 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 5. Measure the conducted output power and record the results in the test report.						
Test Result:	PASS						
Remark:	Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power						

6.3.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
Power Meter	Agilent	N1911A	MY45101557	Sep. 27, 2018
Power Sensor	Agilent	N1922A	MY44124432	Sep. 27, 2018
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-03	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

Configuration Band I (5150 - 5250 MHz)				
Mode	Test channel	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)	Result
11a	CH36	17.06	24	PASS
11a	CH40	17.30	24	PASS
11a	CH48	17.46	24	PASS
11n(HT20)	CH36	16.20	24	PASS
11n(HT20)	CH40	16.27	24	PASS
11n(HT20)	CH48	16.69	24	PASS
11n(HT40)	CH38	16.05	24	PASS
11n(HT40)	CH46	16.45	24	PASS

Configuration Band IV (5725 - 5850 MHz)				
Mode	Test channel	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)	Result
11a	CH149	17.72	30	PASS
11a	CH157	17.96	30	PASS
11a	CH165	16.97	30	PASS
11n (HT20)	CH149	15.38	30	PASS
11n (HT20)	CH157	15.76	30	PASS
11n (HT20)	CH165	14.51	30	PASS
11n (HT40)	CH151	12.43	30	PASS
11n (HT40)	CH159	12.38	30	PASS

6.4. 6dB Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407(e)& Part 2 J Section 2.1049
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C
Limit:	>500kHz
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 4. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-03	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

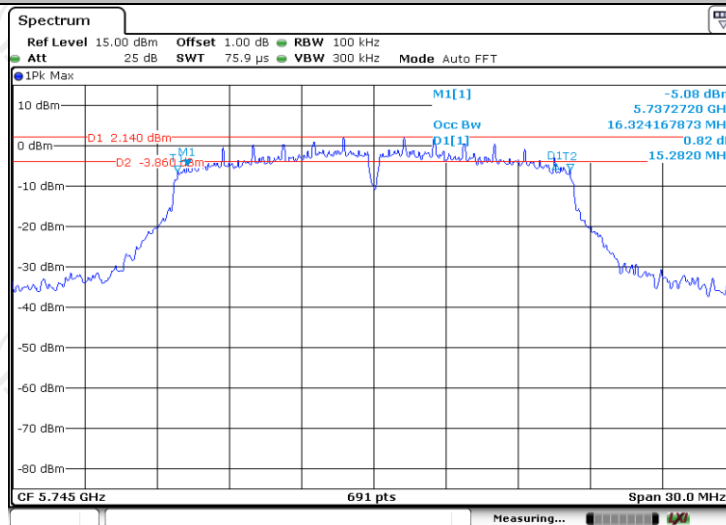
6.4.3. Test data

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11a	CH149	5745	15.28	0.5	PASS
11a	CH157	5785	15.11	0.5	PASS
11a	CH161	5825	15.11	0.5	PASS
11n(HT20)	CH149	5745	15.11	0.5	PASS
11n(HT20)	CH157	5785	15.76	0.5	PASS
11n(HT20)	CH161	5825	15.41	0.5	PASS
11n(HT40)	CH151	5755	35.17	0.5	PASS
11n(HT40)	CH159	5795	35.25	0.5	PASS

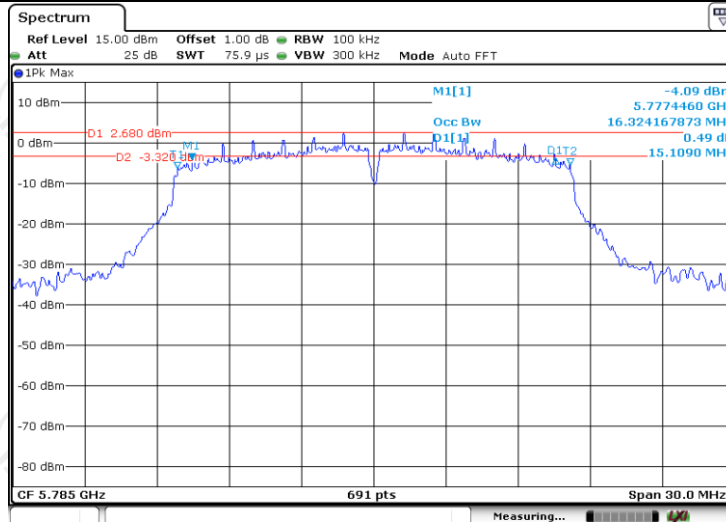
Test plots as follows:

Band IV (5725 – 5850 MHz)

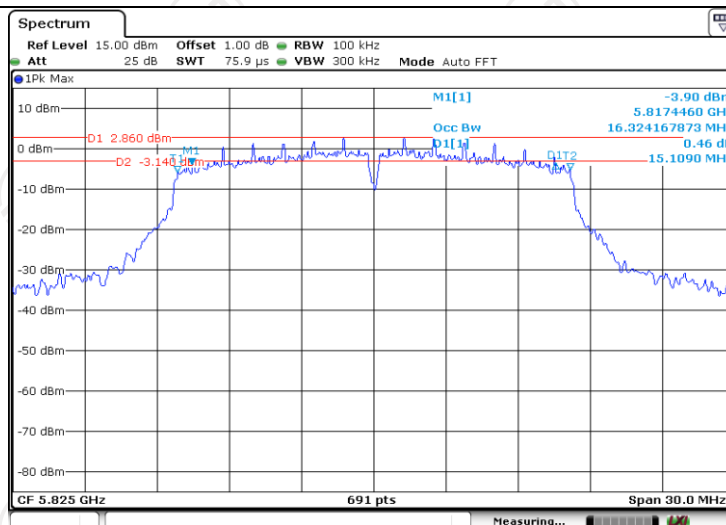
802.11a



Low

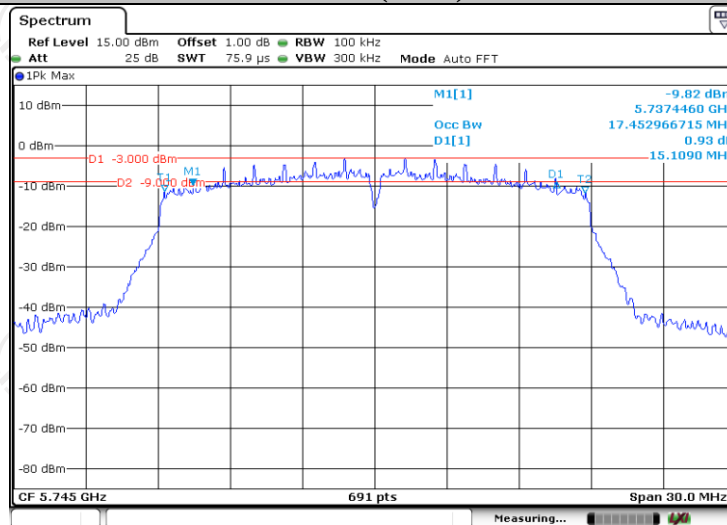


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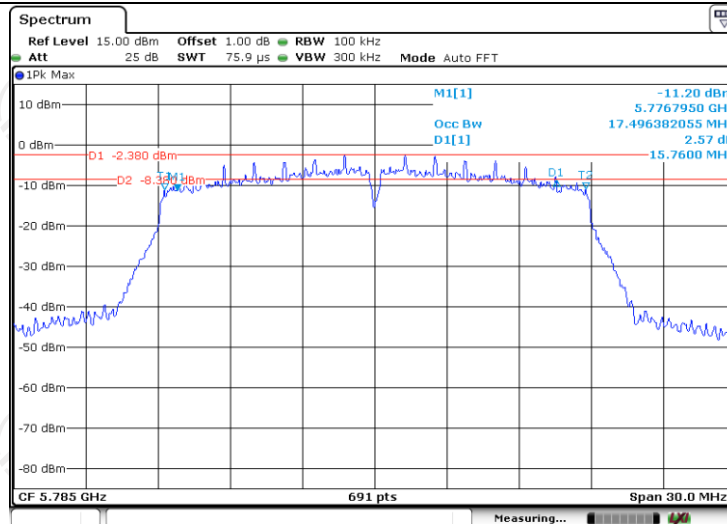


High

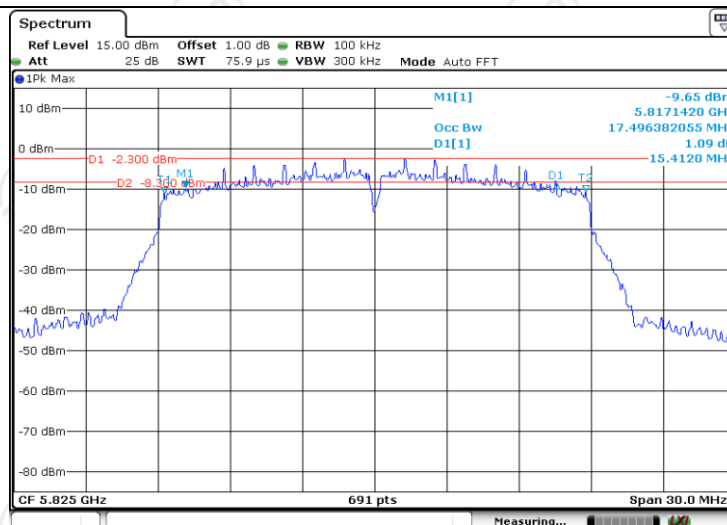
802.11n(HT20)



Low

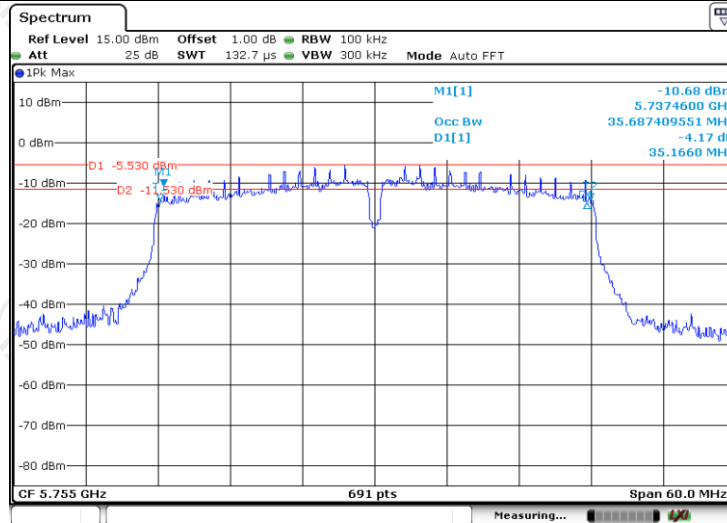


Mid

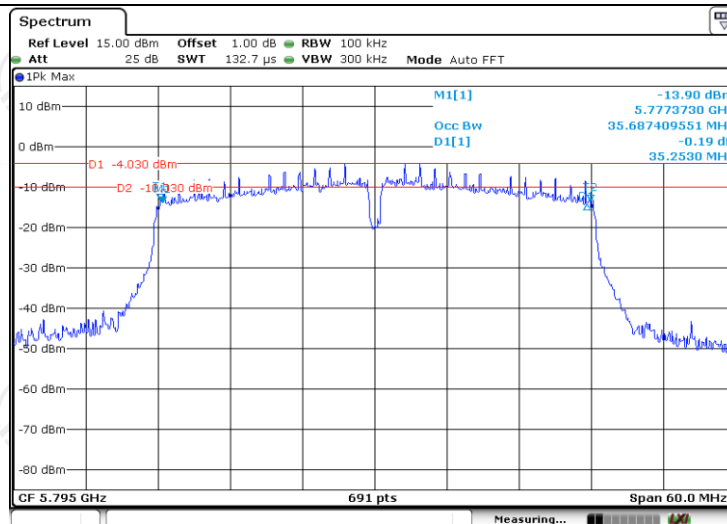


High

802.11n(HT40)



Low



High

6.5. 26dB Bandwidth and 99% Occupied Bandwidth

6.5.1. Test Specification

Test Requirement:	47 CFR Part 15C Section 15.407 (a)& Part 2 J Section 2.1049
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section D
Limit:	No restriction limits
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section D 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. 4. Measure and record the results in the test report.
Test Result:	PASS

6.5.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.5.3. Test data

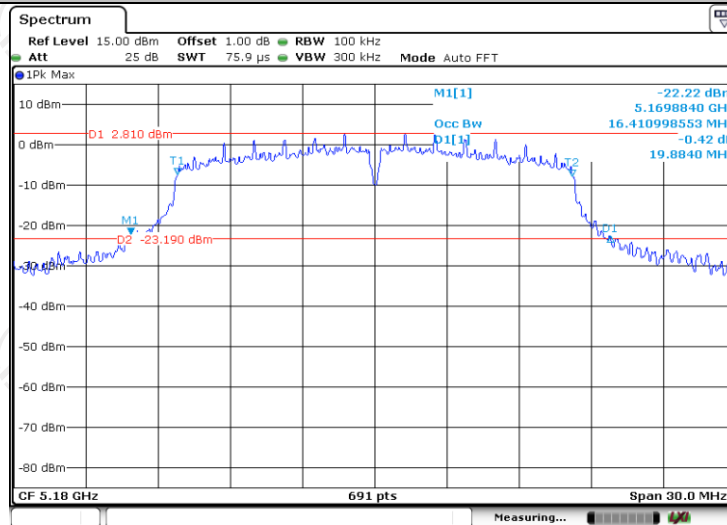
Band I

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	19.88	16.41
11a	CH40	5200	18.97	16.37
11a	CH48	5240	18.97	16.32
11n(HT20)	CH36	5180	19.45	17.45
11n(HT20)	CH40	5200	19.36	17.45
11n(HT20)	CH48	5240	19.36	17.45
11n(HT40)	CH38	5190	38.12	35.69
11n(HT40)	CH46	5230	38.03	35.77

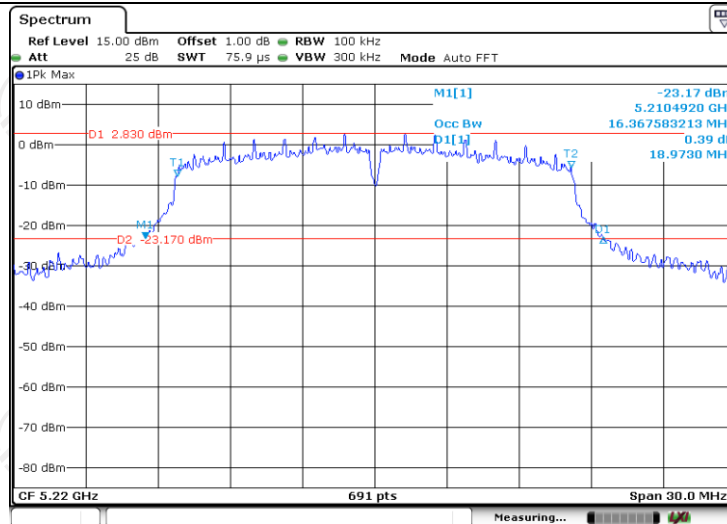
Test plots as follows:

Band I (5150 – 5250 MHz)

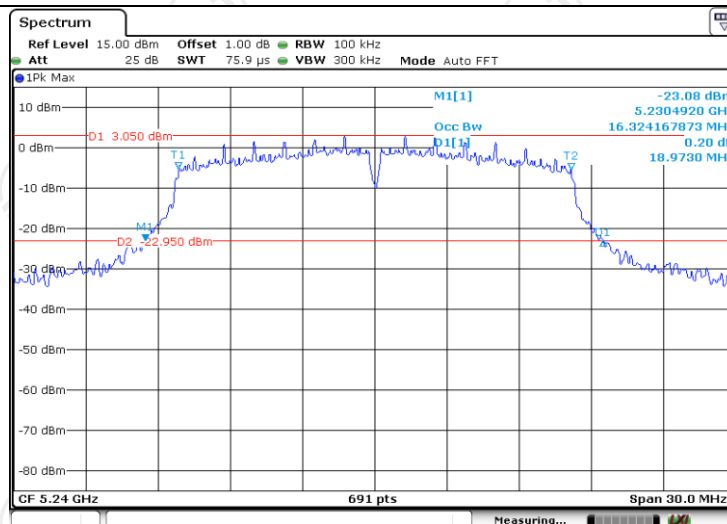
802.11a



Low

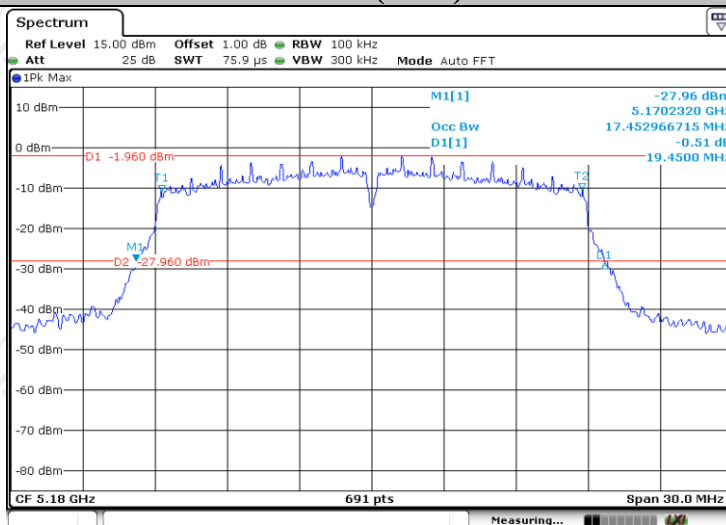


Mid

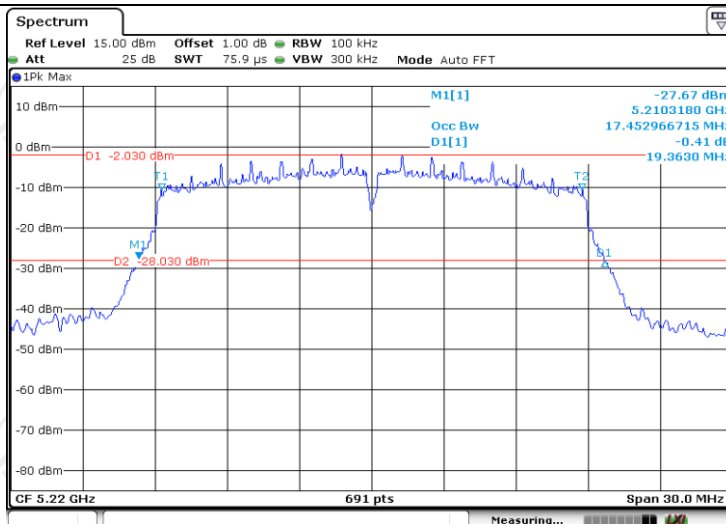


High

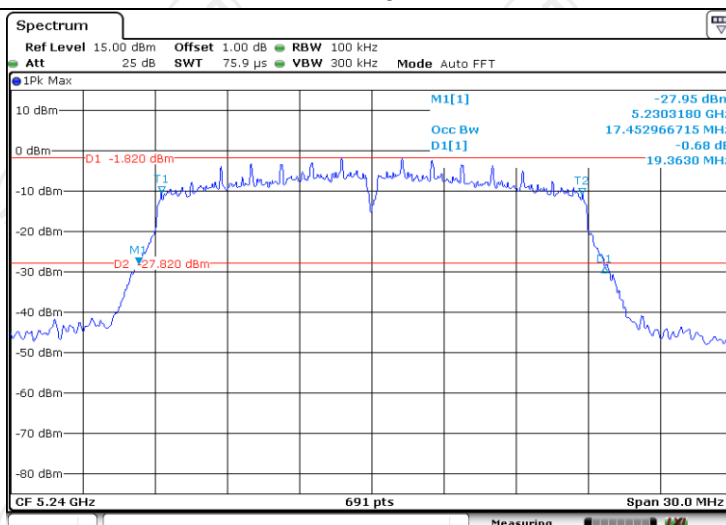
802.11n(HT20)



Low

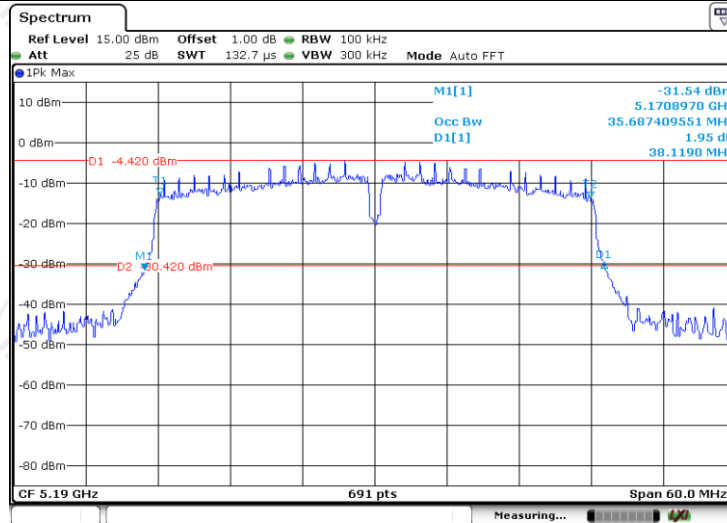


Mid

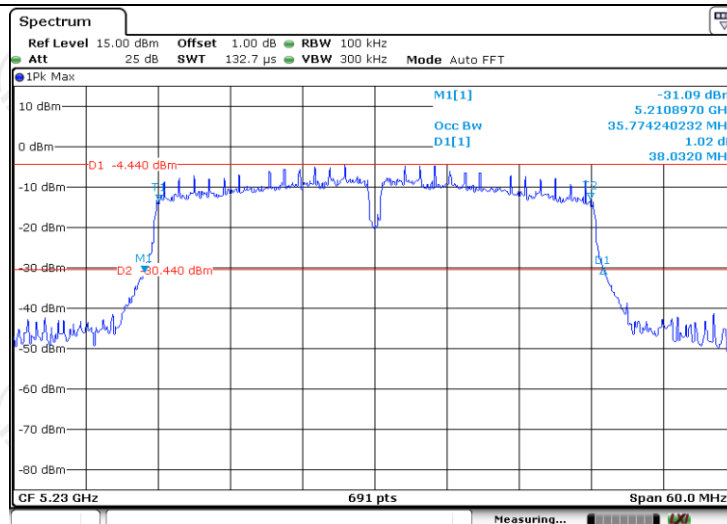


High

802.11n(HT40)



Low



High

6.6. Power Spectral Density

6.6.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section F
Limit:	$\leq 11.00\text{dBm/MHz}$ for Band I 5150MHz-5250MHz $\leq 30.00\text{dBm/500KHz}$ for Band IV 5725MHz-5850MHz The e.i.r.p spectral density for Band I 5150MHz – 5250 MHz should not exceed 10dBm/MHz
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth. 1. Set RBW = 510 kHz/1 MHz, VBW $\geq 3 \times$ RBW, Sweep time = Auto, Detector = RMS. 2. Allow the sweeps to continue until the trace stabilizes. 3. Use the peak marker function to determine the maximum amplitude level. 4. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.
Test Result:	PASS

6.6.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-03	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.6.3. Test data

Configuration Band I (5150 - 5250 MHz)				
Mode	Test channel	Power Spectral Density	Limit (dBm/MHz)	Result
11a	CH36	0.15	11	PASS
11a	CH40	-0.14	11	PASS
11a	CH48	0.30	11	PASS
11n(HT20)	CH36	0.98	11	PASS
11n(HT20)	CH40	0.94	11	PASS
11n(HT20)	CH48	1.40	11	PASS
11n(HT40)	CH38	-2.44	11	PASS
11n(HT40)	CH46	-1.60	11	PASS

Configuration Band IV (5725 - 5850 MHz)				
Mode	Test channel	Power Spectral Density	Limit (dBm/500kHz)	Result
11a	CH149	-0.20	30	PASS
11a	CH157	-1.07	30	PASS
11a	CH161	-1.48	30	PASS
11n(HT20)	CH149	-1.18	30	PASS
11n(HT20)	CH157	-1.76	30	PASS
11n(HT20)	CH161	-2.62	30	PASS
11n(HT40)	CH151	-3.39	30	PASS
11n(HT40)	CH159	-4.69	30	PASS

Test plots as follows:

Band I (5150 – 5250 MHz)

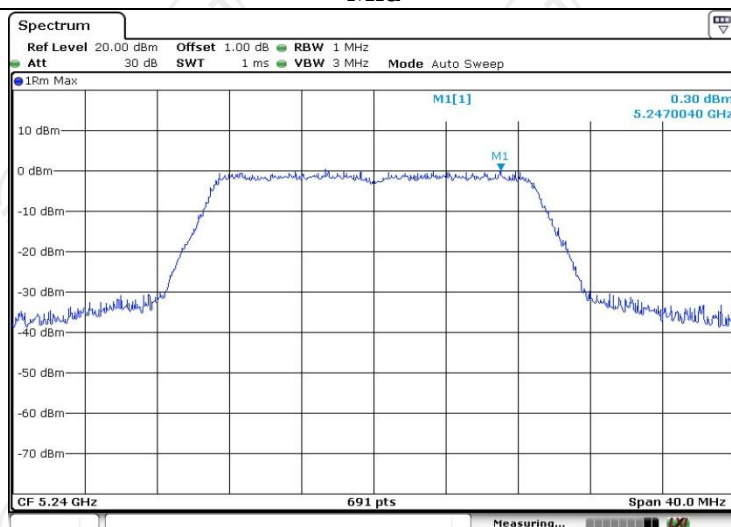
802.11a



Low



Mid

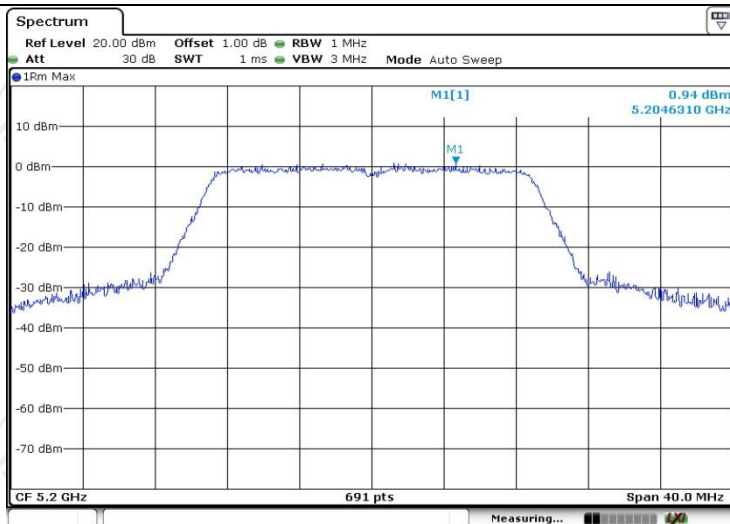


High

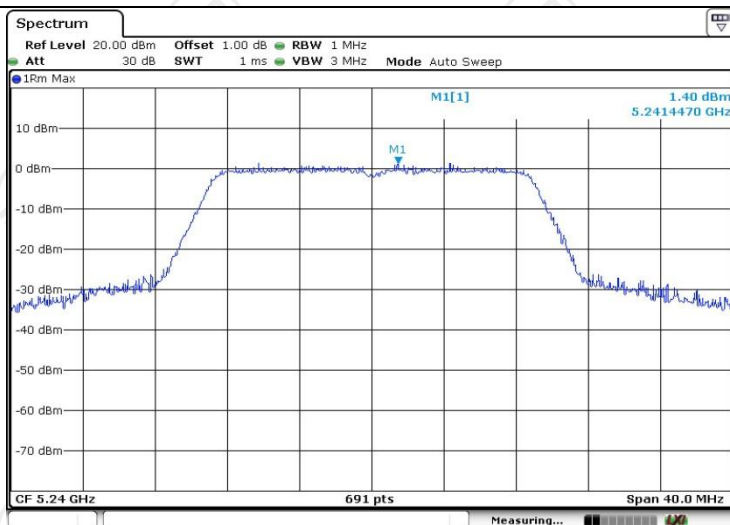
802.11n(HT20)



Low



Mid



High

802.11n(HT40)



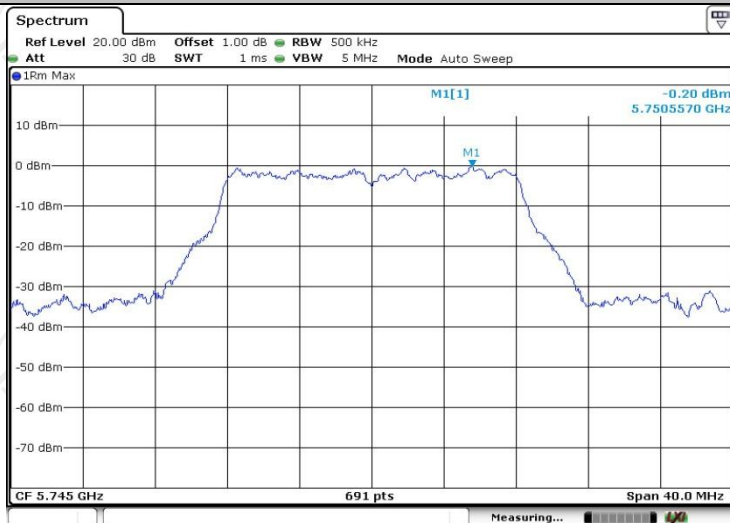
Low



High

Band IV (5725 – 5850 MHz)

802.11a



Low



Mid



High

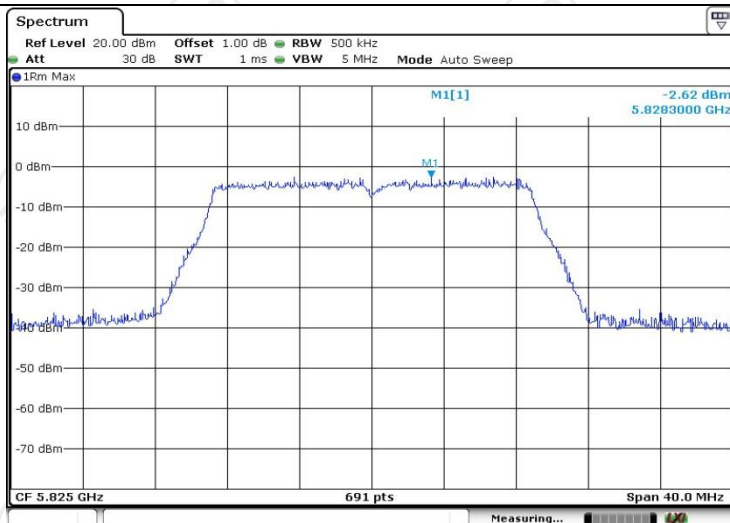
802.11n(HT20)



Low



Mid

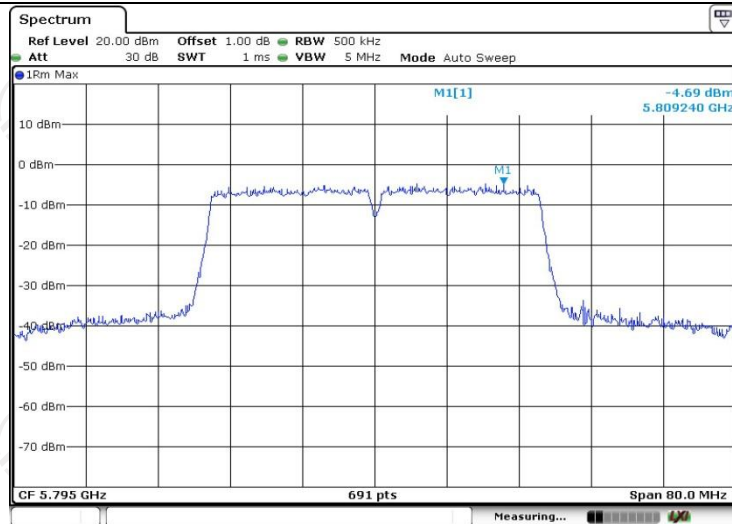


High

802.11n(HT40)



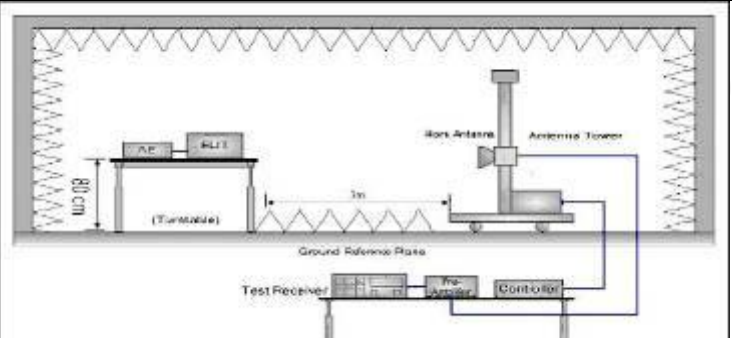
Low



High

6.7. Band edge

6.7.1. Test Specification

Test Requirement:	FCC CFR47 Part 15E Section 15.407
Test Method:	ANSI C63.10 2013
Limit:	For band I&II&III: $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 68.2$ dB$\mu V/m$, for EIRP(dBm)= -27dBm For band IV(5715-5725MHz&5850-5860MHz): $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 78.2$ dB$\mu V/m$, for EIRP(dBm)= -17dBm; For band IV(other un-restricted band): $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 68.2$ dB$\mu V/m$, for EIRP(dBm)= -27dBm
Test Setup:	 The diagram illustrates the test setup. A rotating table (labeled 'Turntable') holds the EUT (Equipment Under Test) at a height of 0.8m. The table is rotated 360 degrees. A ground reference plane is positioned 3m away from the EUT. An antenna is mounted on a tower at a height of 0.8m. The test receiver system, including a Test Receiver, Pre-Amplifier, and Controller, is connected to the antenna.
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have

	10dB margin would be re-tested one by one using peak, quasipeak or average method as specified and then reported in a data sheet.
Test Result:	PASS

6.7.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ	200061	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHW ARZ	FSP40	100056	Sep. 27, 2018
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

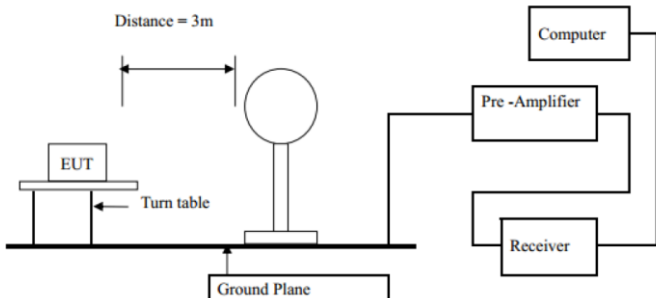
6.7.3. Test Data

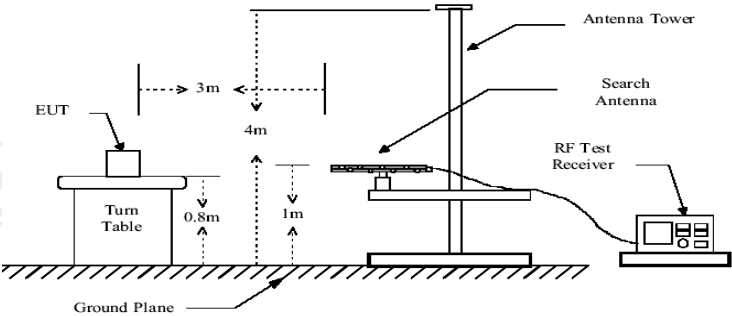
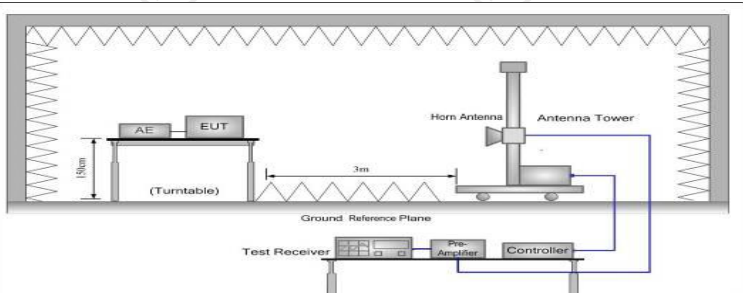
Band edge emission									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5150.00	15.98	31.56	9.79	0.00	57.33	68.20	-10.87	Horizontal	Peak
5150.00	15.87	31.56	9.79	0.00	57.22	68.20	-10.98	Vertical	Peak
5150.00	5.24	31.56	9.79	0.00	46.59	54.00	-7.41	Horizontal	Average
5150.00	5.36	31.56	9.79	0.00	46.71	54.00	-7.29	Vertical	Average
5350.00	16.04	32.04	10.06	0.00	58.14	68.20	-10.06	Horizontal	Peak
5350.00	15.67	32.04	10.06	0.00	57.77	68.20	-10.43	Vertical	Peak
5350.00	5.34	32.04	10.06	0.00	47.44	54.00	-6.56	Horizontal	Average
5350.00	5.24	32.04	10.06	0.00	47.34	54.00	-6.66	Vertical	Average

Band edge emission									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5460.00	16.01	32.29	10.17	0.00	58.47	68.20	-9.73	Horizontal	Peak
5460.00	16.29	32.29	10.17	0.00	58.75	68.20	-9.45	Vertical	Peak
5460.00	1.22	32.29	10.17	0.00	43.68	54.00	-10.32	Horizontal	Average
5460.00	1.35	32.29	10.17	0.00	43.81	54.00	-10.19	Vertical	Average
7250.00	15.68	36.00	11.91	0.00	63.59	68.20	-4.61	Horizontal	Peak
7250.00	16.31	36.00	11.91	0.00	64.22	68.20	-3.98	Vertical	Peak
7250.00	1.35	36.00	11.91	0.00	49.26	54.00	-4.74	Horizontal	Average
7250.00	1.11	36.00	11.91	0.00	49.02	54.00	-4.98	Vertical	Average

6.8. Spurious Emission

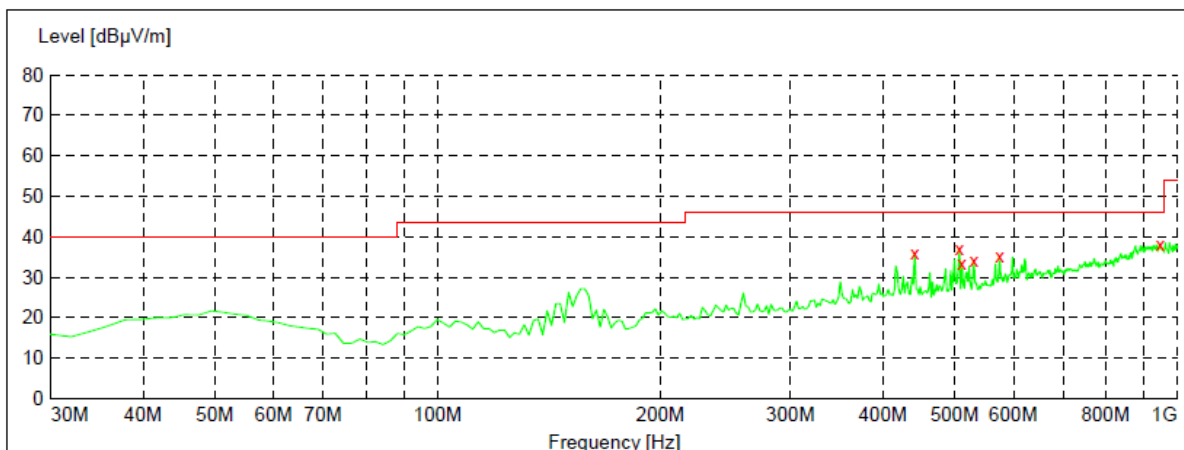
6.8.1.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205				
Test Method:	KDB 789033 D02 v01r04				
Frequency Range:	9kHz to 40GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Operation mode:	Transmitting mode with modulation				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Peak		1MHz	10Hz	Average Value	
Limit:	Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,				
	Frequency		Field Strength (microvolts/meter)		Measurement Distance (meters)
	0.009-0.490		2400/F(KHz)		300
	0.490-1.705		24000/F(KHz)		30
	1.705-30		30		30
	30-88		100		3
	88-216		150		3
	216-960		200		3
	Above 960		500		3
	Frequency		Limit (dBuV/m @3m)		Detector
	Above 1G		74.0		Peak
			54.0		Average
Test setup:	For radiated emissions below 30MHz				
					

	30MHz to 1GHz  Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test results:	PASS

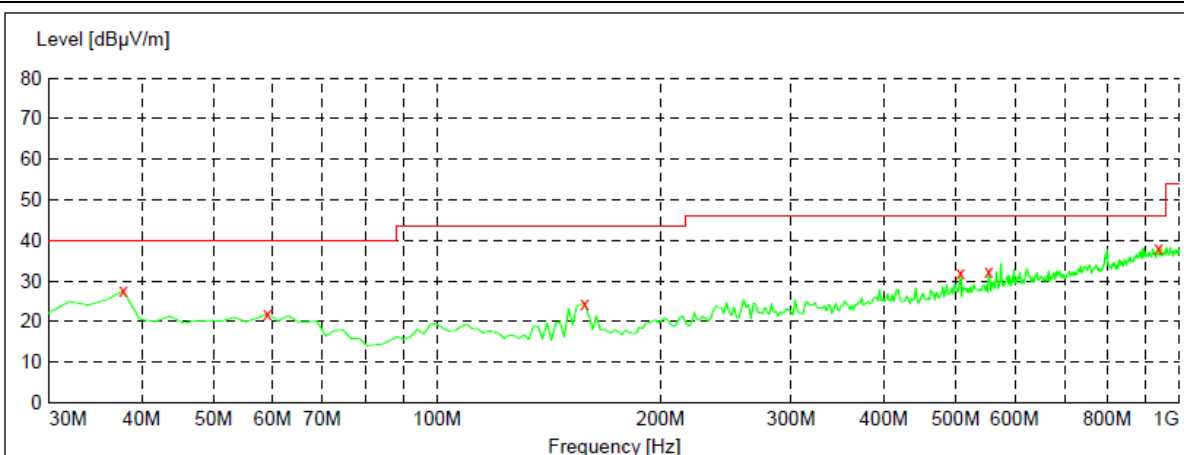
6.8.2. Test Data

Please refer to following diagram for individual
Below 1GHz



x x x MES GM1709276096_red

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
441.280000	36.10	-3.4	46.0	9.9	QP	100.0	345.00	HORIZONTAL
507.240000	37.20	-1.6	46.0	8.8	QP	100.0	304.00	HORIZONTAL
511.120000	33.30	-1.5	46.0	12.7	QP	100.0	315.00	HORIZONTAL
530.520000	34.20	-1.1	46.0	11.8	QP	100.0	275.00	HORIZONTAL
575.140000	35.20	0.0	46.0	10.8	QP	100.0	345.00	HORIZONTAL
947.620000	38.00	7.2	46.0	8.0	QP	100.0	86.00	HORIZONTAL



x x x MES GM1709276095_red

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
37.760000	27.60	-10.8	40.0	12.4	QP	100.0	142.00	VERTICAL
59.100000	21.90	-9.8	40.0	18.1	QP	100.0	7.00	VERTICAL
158.040000	24.40	-13.5	43.5	19.1	QP	100.0	222.00	VERTICAL
507.240000	32.20	-1.6	46.0	13.8	QP	100.0	273.00	VERTICAL
553.800000	32.50	-0.7	46.0	13.5	QP	100.0	232.00	VERTICAL
937.920000	38.20	7.1	46.0	7.8	QP	100.0	232.00	VERTICAL

Remark: 1. Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

2. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

Above 1GHz

Band I for Low									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1110.01	35.87	24.33	4.46	36.61	40.98	74.00	-33.02	Vertical	Peak
1768.62	35.48	25.50	5.90	37.07	42.14	74.00	-31.86	Vertical	Peak
4332.85	34.45	30.44	9.07	37.59	46.40	74.00	-27.60	Vertical	Peak
9909.80	31.54	38.35	13.59	34.30	59.58	74.00	-14.42	Vertical	Peak
1814.22	21.94	38.35	13.59	34.30	49.58	54.00	-4.42	Horizontal	Peak
3534.54	34.36	25.62	5.98	37.15	38.81	74.00	-35.19	Horizontal	Peak
7981.72	34.96	28.77	8.17	38.36	43.54	74.00	-30.46	Horizontal	Peak
7981.72	31.50	36.70	12.39	34.58	56.01	74.00	-17.99	Horizontal	Average
10374.42	22.49	36.70	12.39	34.58	47.00	54.00	-7.00	Horizontal	Peak
10374.42	39.57	38.61	13.59	35.53	66.24	74.00	-7.76	Horizontal	Average

Band I for Mid									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1795.84	36.15	25.58	5.95	37.13	42.49	74.00	-31.51	Vertical	Peak
3096.33	36.47	28.54	7.60	38.22	43.87	74.00	-30.13	Vertical	Peak
4524.47	34.65	30.92	9.34	37.35	47.56	74.00	-26.44	Vertical	Peak
7900.86	32.54	36.61	12.78	34.80	57.13	74.00	-16.87	Vertical	Peak
7900.86	20.51	36.61	12.78	34.80	45.10	54.00	-9.90	Vertical	Average
1353.80	36.71	24.58	4.92	36.49	39.72	74.00	-34.28	Horizontal	Peak
2179.15	34.69	26.78	6.42	37.34	40.55	74.00	-33.45	Horizontal	Peak
6992.14	30.97	35.80	11.84	34.80	53.81	74.00	-20.19	Horizontal	Peak
11084.27	32.81	39.19	13.54	33.68	61.86	74.00	-12.14	Horizontal	Peak
11084.27	22.26	39.19	13.54	33.68	51.31	54.00	-2.69	Horizontal	Average

Band I for High									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1795.84	35.78	25.58	5.95	37.13	42.49	74.00	-31.51	Vertical	Peak
3096.33	36.15	28.54	7.60	38.22	43.87	74.00	-30.13	Vertical	Peak
4524.47	34.65	30.92	9.34	37.35	47.56	74.00	-26.44	Vertical	Peak
7900.86	32.54	36.61	12.78	34.80	57.13	74.00	-16.87	Vertical	Peak
7900.86	21.44	36.61	12.78	34.80	46.03	54.00	-7.97	Vertical	Average
1353.80	36.71	24.58	4.92	36.49	39.72	74.00	-34.28	Horizontal	Peak
2179.15	34.69	26.78	6.42	37.34	40.55	74.00	-33.45	Horizontal	Peak
6992.14	31.97	35.80	11.84	34.80	54.81	74.00	-19.19	Horizontal	Peak
6992.14	22.96	35.80	11.84	34.80	45.80	54.00	-8.20	Horizontal	Average
11084.27	32.81	39.19	13.54	33.68	61.86	74.00	-12.14	Horizontal	Peak
11084.27	21.11	39.19	13.54	33.68	50.16	54.00	-3.84	Horizontal	Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. Measuring frequencies from 1 GHz to 40GHz of highest fundamental frequency.

Band IV for Low									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1963.18	36.45	26.00	6.21	37.27	40.98	74.00	-33.02	Vertical	Peak
3883.62	35.07	29.31	8.62	38.18	44.82	74.00	-29.18	Vertical	Peak
8770.01	33.11	37.59	13.07	34.32	59.45	74.00	-14.55	Vertical	Peak
8770.01	20.61	37.59	13.07	34.32	47.05	54.00	-6.95	Vertical	Average
11084.27	32.94	39.19	13.54	33.68	61.99	74.00	-12.01	Vertical	Peak
11084.27	19.21	39.19	13.54	33.68	48.26	54.00	-5.74	Vertical	Average
1795.84	38.52	25.58	5.95	37.13	42.92	74.00	-31.08	Horizontal	Peak
3184.25	36.86	28.58	7.70	38.20	44.94	74.00	-29.06	Horizontal	Peak
8002.06	32.75	36.72	12.30	34.53	57.24	74.00	-16.76	Horizontal	Peak
8002.06	19.52	36.72	12.30	34.53	44.01	54.00	-9.99	Horizontal	Average
10062.31	32.78	38.44	13.55	33.71	61.06	74.00	-12.94	Vertical	Peak
10062.31	21.78	38.44	13.55	33.71	50.06	54.00	-3.94	Vertical	Average

Band IV for Mid									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1605.55	35.00	25.04	5.58	36.73	40.11	74.00	-33.89	Vertical	Peak
3333.55	34.55	28.64	7.88	38.43	43.66	74.00	-30.34	Vertical	Peak
8355.94	31.90	37.06	12.83	34.32	57.47	74.00	-16.53	Vertical	Peak
8355.94	19.75	37.06	12.83	34.32	45.32	54.00	-9.68	Vertical	Average
12024.96	31.17	39.10	14.65	33.28	61.64	74.00	-12.36	Vertical	Peak
12024.96	19.93	39.10	14.65	33.28	50.50	54.00	-3.50	Vertical	Average
1431.78	36.40	24.64	5.09	36.50	39.63	74.00	-34.37	Horizontal	Peak
2487.56	34.87	27.85	6.83	37.87	41.68	74.00	-32.32	Horizontal	Peak
7840.75	32.32	36.54	13.06	34.96	56.96	74.00	-17.04	Horizontal	Peak
7840.75	21.32	36.54	13.06	34.96	45.96	54.00	-8.04	Horizontal	Average
8703.29	33.49	37.51	13.00	34.40	59.60	74.00	-14.40	Horizontal	Peak
8703.29	23.19	37.51	13.00	34.40	49.30	54.00	-4.70	Horizontal	Average

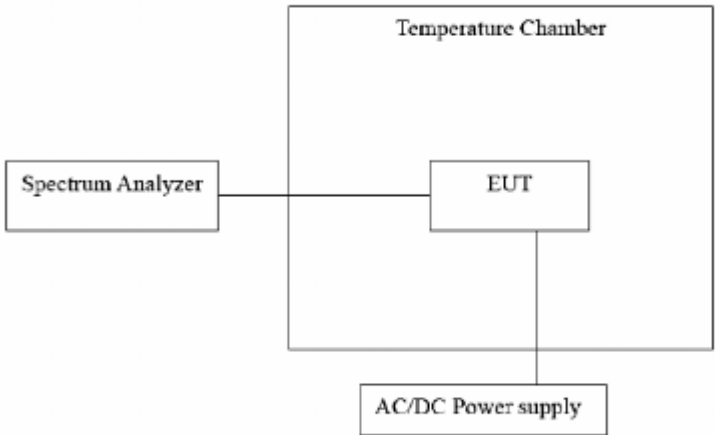
Band IV for High									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1276.82	35.46	24.50	4.79	36.53	39.07	74.00	-34.93	Vertical	Peak
2657.76	34.48	28.10	7.04	37.99	41.63	74.00	-32.37	Vertical	Peak
3913.39	34.95	29.36	8.66	38.16	44.81	74.00	-29.19	Vertical	Peak
8927.68	32.53	37.80	13.23	34.36	59.20	74.00	-14.80	Vertical	Peak
8927.68	23.33	37.80	13.23	34.36	50.00	54.00	-4.00	Vertical	Average
1800.42	37.64	25.58	5.96	37.14	42.04	74.00	-31.96	Horizontal	Peak
3200.50	35.97	28.58	7.72	38.20	44.07	74.00	-29.93	Horizontal	Peak
9111.35	33.44	37.94	13.42	35.21	59.59	74.00	-14.41	Horizontal	Peak
9111.35	22.93	37.94	13.42	35.21	49.08	54.00	-4.92	Horizontal	Average
11140.85	32.20	39.17	13.51	33.52	61.36	74.00	-12.64	Horizontal	Peak
11140.85	21.17	39.17	13.51	33.52	50.33	54.00	-3.67	Horizontal	Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. Measuring frequencies from 1 GHz to 40GHz of highest fundamental frequency.

6.9. Frequency Stability Measurement

6.9.1. Test Specification

Test Requirement:	FCC Part15 Section 15.407(g) &Part2 J Section 2.1055
Test Method:	ANSI C63.10: 2013
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.
Test Setup:	 <pre> graph LR SA[Spectrum Analyzer] --- EUT[EUT] subgraph TC [Temperature Chamber] EUT end EUT --- P[AC/DC Power supply] </pre>
Test Procedure:	The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
Test Result:	PASS
Remark:	Pre-scan was performed at Antenna 0 and Antenna 1, the worst case was found. Only the test data of Antenna 0 was shown in this report.

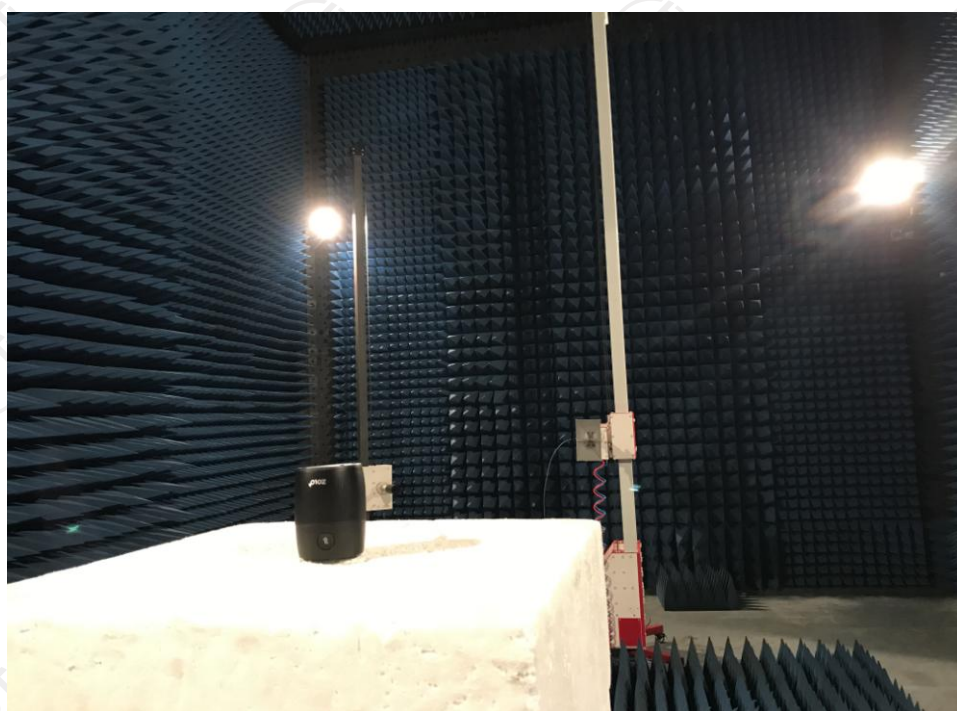
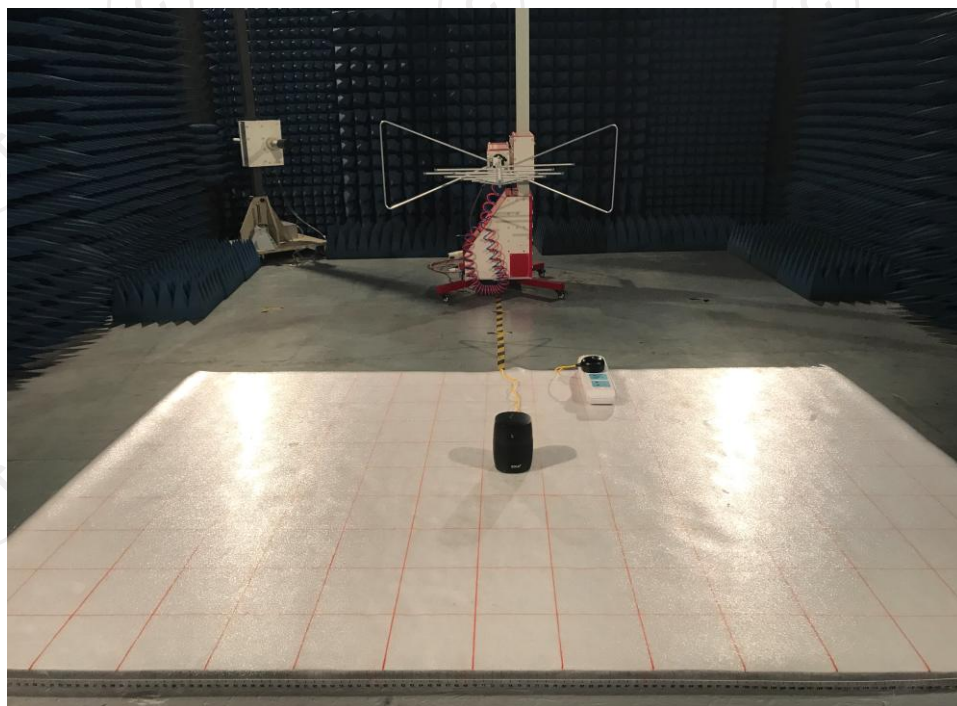
Test plots as follows:

Band I for 802.11a Low					
Voltage(%)	Power(VDC)	TEMP(°C)	Test Frequency (MHz)	Freq.Dev (MHz)	Deviation (ppm)
100%	5	-30	5180	0.0029	0.56
100%		-20	5180	0.0029	0.56
100%		-10	5180	0.0029	0.56
100%		0	5180	0.0029	0.56
100%		10	5180	0.0029	0.56
100%		20	5180	0.0029	0.56
100%		30	5180	0.0029	0.56
100%		40	5180	0.0029	0.56
100%		50	5180	0.0029	0.56
Low Battery power	5.5	20	5180	0.0029	0.56
High Battery power	4.5	20	5180	0.0029	0.56

Band IV for 802.11a Low					
Voltage(%)	Power(VDC)	TEMP(°C)	Test Frequency (MHz)	Freq.Dev (MHz)	Deviation (ppm)
100%	5	-30	5745	0.0029	0.50
100%		-20	5745	0.0029	0.50
100%		-10	5745	0.0029	0.50
100%		0	5745	0.0029	0.50
100%		10	5745	0.0029	0.50
100%		20	5745	0.0029	0.50
100%		30	5745	0.0029	0.50
100%		40	5745	0.0029	0.50
100%		50	5745	0.0029	0.50
Low Battery power	5.5	20	5745	0.0029	0.50
High Battery power	4.5	20	5745	0.0029	0.50

Appendix A: Photographs of Test Setup

Radiated Emission



CE



Appendix B: Photographs of EUT

Refer to the test report No.: TRE1710007001.

*******END OF REPORT*******