TEST REPORT

Product	:	INTELLIGENT AUTOMOTIVE DIAGNOSTIC ANALYZER, INTELLIGENT KEY PROGRAMMING TOOL
Trade mark	:	OTOFIX
Model/Type reference	:	D1 Lite, D1, IM1
Serial Number	:	N/A
Report Number	:	EED32M80160303
FCC ID	:	WQ8MAXIBASBT609
Date of Issue	:	Feb. 25, 2021
Test Standards	:	47 CFR Part 15 Subpart E
Test result	:	PASS

Prepared for:

Autel Intelligent Tech. Corp., Ltd.
7th-8th, 10th Floor, Bldg. B1, Zhiyuan,
Xueyuan Rd. Xili, Nanshan, Shenzhen, 518055,China

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District,
Shenzhen, Guangdong, China
TEL: +86-755-3368 3668
FAX: +86-755-3368 3385

Compiled by: Tom Chen Reviewed by: Aaron Ma

Aaron Ma

Approved by: David Wang Date: Feb. 25, 2021

David Wang

Check No.:7427291220

2 Content

1 COVER PAGE 1
2 CONTENT 2
3 VERSION 3
4 TEST SUMMARY 4
5 GENERAL INFORMATION 5
5.1 CLIENT INFORMATION 5
5.2 GENERAL DESCRIPTION OF EUT 5
5.3 TEST CONFIGURATION 7
5.4 TEST ENVIRONMENT 7
5.5 DESCRIPTION OF SUPPORT UNITS 8
5.6 TEST LOCATION 8
5.7 DEVIATION FROM STANDARDS 8
5.8 ABNORMALITIES FROM STANDARD CONDITIONS 8
5.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER 8
5.10 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2) 8
6 EQUIPMENT LIST 9
7 RADIO TECHNICAL REQUIREMENTS SPECIFICATION 11
7.1 ANTENNA REQUIREMENT 11
7.2 AC POWER LINE CONDUCTED EMISSIONS 12
7.3 MAXIMUM CONDUCTED OUTPUT POWER 15
7.4 6DB EMISSION BANDWIDTH 16
7.5 26DB EMISSION BANDWIDTH AND 99% OCCUPIED BANDWIDTH 17
7.6 MAXIMUM POWER SPECTRAL DENSITY 18
7.7 FREQUENCY STABILITY 19
7.8 RADIATED EMISSION 20
7.9 RADIATED EMISSION WHICH FALL IN THE RESTRICTED BANDS 31
8 APPENDIX A 50
PHOTOGRAPHS OF TEST SETUP 51
PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS 53

3 Version

Version No.	Date	Description
00	Feb. 25, 2021	Original

4 Test Summary

Test Item	Test Requirement	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart E Section 15.407 (b)(6)	PASS
Duty Cycle	47 CFR Part 15 Subpart E Section 15.407	PASS
Maximum Conducted Output Power	47 CFR Part 15 Subpart E Section 15.407 (a)	PASS
26dB emission bandwidth	47 CFR Part 15 Subpart E Section 15.407 (a)	PASS
99% Occupied bandwidth	\	PASS
6dB emission bandwidth	47 CFR Part 15 Subpart E Section 15.407 (e)	PASS
Maximum Power Spectral Density	47 CFR Part 15 Subpart E Section 15.407 (a)	PASS
Frequency stability	47 CFR Part 15 Subpart E Section 15.407 (g)	PASS
Radiated Emissions	47 CFR Part 15 Subpart E Section 15.407 (b)	PASS
Radiated Emissions which fall in the restricted bands	47 CFR Part 15 Subpart E Section 15.407 (b)	PASS

Remark:
Company Name and Address shown on Report, the sample(s) and sample Information were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.

Model No.: D1 Lite, D1, IM1

Three models are the same except model name since the applicant changed for different market and customer, Only the model IM1 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models.

5 General Information

5.1 Client Information

Applicant:	Autel Intelligent Tech. Corp., Ltd.
Address of Applicant:	7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan, Shenzhen, 518055, China
Manufacturer:	Autel Intelligent Tech. Corp., Ltd.
Address of Manufacturer:	7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan, Shenzhen, 518055, China
Factory 1:	Autel Intelligent Technology Corp., Ltd. Guangming Branch
Address of Factory 1:	7F&6F, East Wing, Building 2, and 6F of Electronical Building, Yanxiang Industrial Zone, Gaoxin Rd, Dongzhou Community of Guangming New District, Shenzhen
Factory 2:	AUTEL VIETNAM COMPANY LIMITED
Address of Factory 2:	4th Floor, Factory#6, Land#CN1, An Duong Industrial Zone, Hong Phong Township, An Duong County, Hai Phong, Viet Nam

5.2 General Description of EUT

Product Name:	INTELLIGENT AUTOMOTIVE DIAGNOSTIC ANALYZER, INTELLIGENT KEY PROGRAMMING TOOL	
Model No.:	IM1	
Add Model No.:	D1 Lite, D1	
Trade mark:	OTOFIX	
Product Type:	☐ Mobile ☒ Portable ☐ Fix Location	
Type of Modulation:	IEEE 802.11a: OFDM (BPSK, QPSK, 16QAM, 64QAM) IEEE 802.11n(HT20/HT40): OFDM (BPSK, QPSK, 16QAM, 64QAM) IEEE 802.11ac(VHT20/VHT40/VHT80): OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)	
Operating Frequency	U-NII-1: 5180-5240MHz U-NII-3: 5745-5825MHz	
Antenna Type:	FPC antenna	
Antenna Gain:	8.75dBi	
Power Supply:	SWITCHING AC/DC POWER ADAPTER	MODEL:GME10C-050200FUu INPUT:100-240V~,50/60Hz ,0.28A OUTPUT:5V⎓2A,10W
	Battery	Model: TB2021 Capacity: 5800mAh/22.33Wh Nominal Voltage: 3.85V
Test voltage:	Battery 3.85V	
Sample Received Date:	Dec. 29, 2020	
Sample tested Date:	Dec. 29, 2020 to Feb. 25, 2021	

Operation Frequency each of channel

802.11a/802.11n/802.11ac (20MHz) Frequency/Channel Operations:

U-NII-1		U-NII-3	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
36	5180	149	5745
40	5200	153	5765
44	5220	157	5785
48	5240	161	5805
-	-	165	5825

802.11n/802.11ac (40MHz) Frequency/Channel Operations:

U-NII-1		U-NII-3	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
38	5190	151	5755
46	5230	159	5795

802.11ac (80MHz) Frequency/Channel Operations:

U-NII-1		U-NII-3	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
42	5210	155	5775

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:

5.3 Test Configuration

EUT Test Software Settings:		
Software:	CMD	
EUT Power Grade:	Default	
Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.		
Test Mode:		
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	
802.11ac(VHT20)	MCS0	
802.11ac(VHT40)	MCS0	
802.11ac(VHT80)	MCS0	

5.4 Test Environment

Operating Environment:		
Radiated Spurious Emissions:		
Temperature:	22~25.0 °C	
Humidity:	50~55 % RH	
Atmospheric Pressure:	1010mbar	
Conducted Emissions:		
Temperature:	22~25.0 °C	
Humidity:	50~55 % RH	
Atmospheric Pressure:	1010mbar	
RF Conducted:		
Humidity:	50~55 % RH	
Atmospheric Pressure:	1010mbar	
Temperature:	NT (Normal Temperature)	22~25.0 °C
	LT (Low Temperature)	0 °C
	HT (High Temperature)	50.0 °C
Working Voltage of the EUT:	NV (Normal Voltage)	3.85 V
	LV (Low Voltage)	3.5 V
	HV (High Voltage)	4.3 V

5.5 Description of Support Units

The EUT has been tested with associated equipment below.

Associated equipment name		Manufacture	model	S/N serial number	Supplied by	Certification
AE	Notebook	DELL	DELL 3490	D245DX2	DELL	CE&FCC

5.6 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer

None.

5.10 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	3.3dB (9kHz-30MHz)
		4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
		3.4dB (18GHz-40GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

6 Equipment List

Conducted disturbance Test					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Receiver	R&S	ESCI	100435	04-28-2020	04-27-2021
Temperature/ Humidity Indicator	Defu	TH128	/	---	---
LISN	R&S	ENV216	100098	03-05-2020	03-04-2021
Barometer	changchun	DYM3	1188	---	---

RF test system					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Spectrum Analyzer	Keysight	N9010A	MY54510339	02-17-2020 02-16-2021	02-16-2021 02-15-2022
Signal Generator	Keysight	N5182B	MY53051549	02-17-2020 02-16-2021	02-16-2021 02-15-2022
Temperature/ Humidity Indicator	biaozhi	HM10	1804186	06-29-2020	06-28-2021
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	---	---
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	---	---
DC Power	Keysight	E3642A	MY56376072	02-17-2020 02-16-2021	02-16-2021 02-15-2022
PC-1	Lenovo	R4960d	---	---	---
Power unit	R&S	OSP120	101374	02-17-2020 02-16-2021	02-16-2021 02-15-2022
RF control unit	JS Tonscend	JS0806-2	158060006	02-17-2020 02-16-2021	02-16-2021 02-15-2022
BT&WI-FI Automatic test software	JS Tonscend	JS1120-3	---	---	---

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	05-16-2020	05-15-2021
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-16-2020	10-15-2021
Multi device Controller	maturo	NCD/070/10711 112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	06-29-2020	06-28-2021
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---

3M full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
RSE Automatic test software	JS Tonscend	JS36-RSE	10166	---	---
Receiver	Keysight	N9038A	MY57290136	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9020B	MY57111112	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9030B	MY57140871	03-05-2020	03-04-2021
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-25-2018	04-24-2021
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-25-2018	04-24-2021
Horn Antenna	ETS-LINDGREN	3117	00057407	07-10-2018	07-09-2021
Preamplifier	EMCI	EMC184055SE	980596	05-20-2020	05-19-2021
Preamplifier	EMCI	EMC001330	980563	04-22-2020	04-21-2021
Preamplifier	JS Tonscend	980380	EMC051845 SE	01-09-2020 01-08-2021	01-08-2021 01-07-2022
Temperature/ Humidity Indicator	biaozhi	GM1360	EE1186631	04-27-2020	04-26-2021
Fully Anechoic Chamber	TDK	FAC-3	---	01-17-2018 01-09-2021	01-16-2021 01-08-2024
Filter bank	JS Tonscend	JS0806-F	188060094	04-10-2018	04-09-2021
Cable line	Times	SFT205-NMSM-2.50M	394812-0001	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	---	---
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	---	---
Cable line	Times	EMC104-NMNM-1000	SN160710	---	---
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	---	---
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	---	---
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	---	---
Cable line	Times	HF160-KMKM-3.00M	393493-0001	---	---

7 Radio Technical Requirements Specification

7.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203
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.	
EUT Antenna:	Please see Internal photos
The antenna is FPC antenna. The best case gain of the antenna is 8.85dBi.	

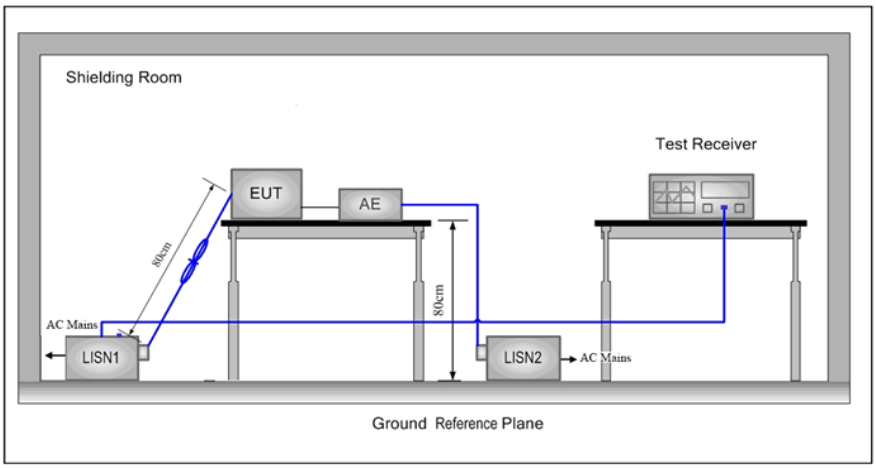
7.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto
Limit:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Setup:



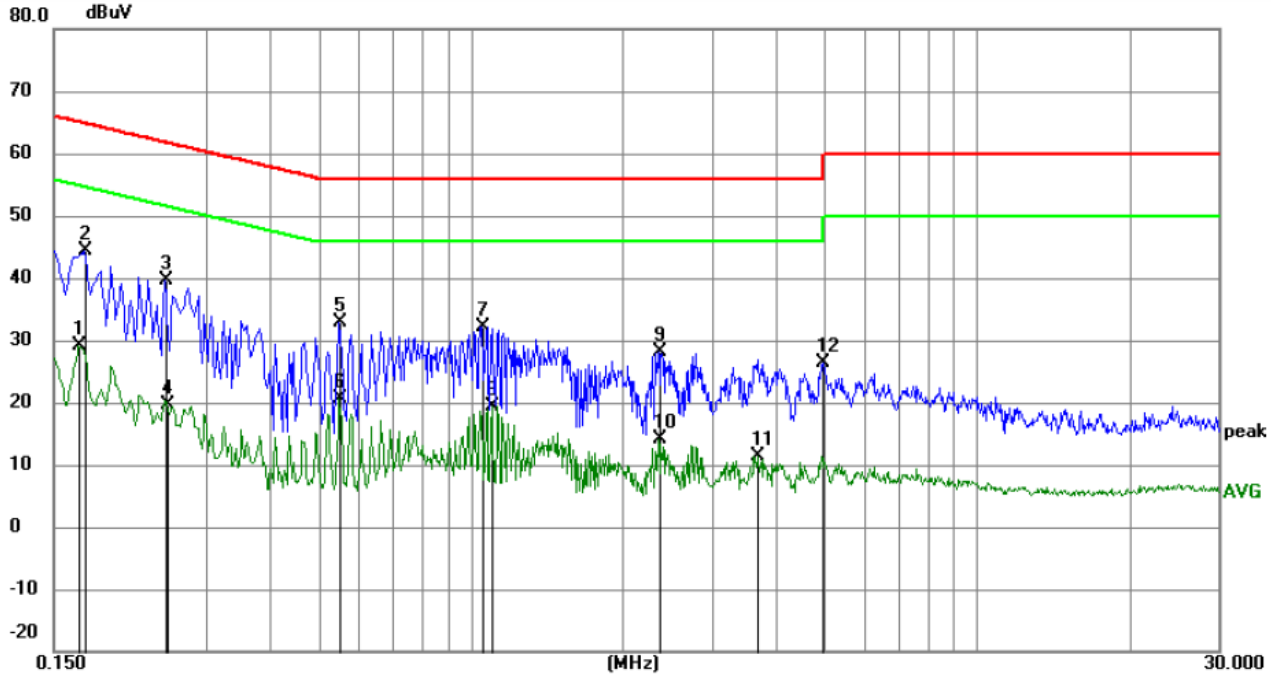
Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) 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 Mode:	All modes were tested, only the worse case lowest channel of 6Mbps for 802.11a was recorded in the report.
Test Results:	Pass

Measurement Data

Live line:

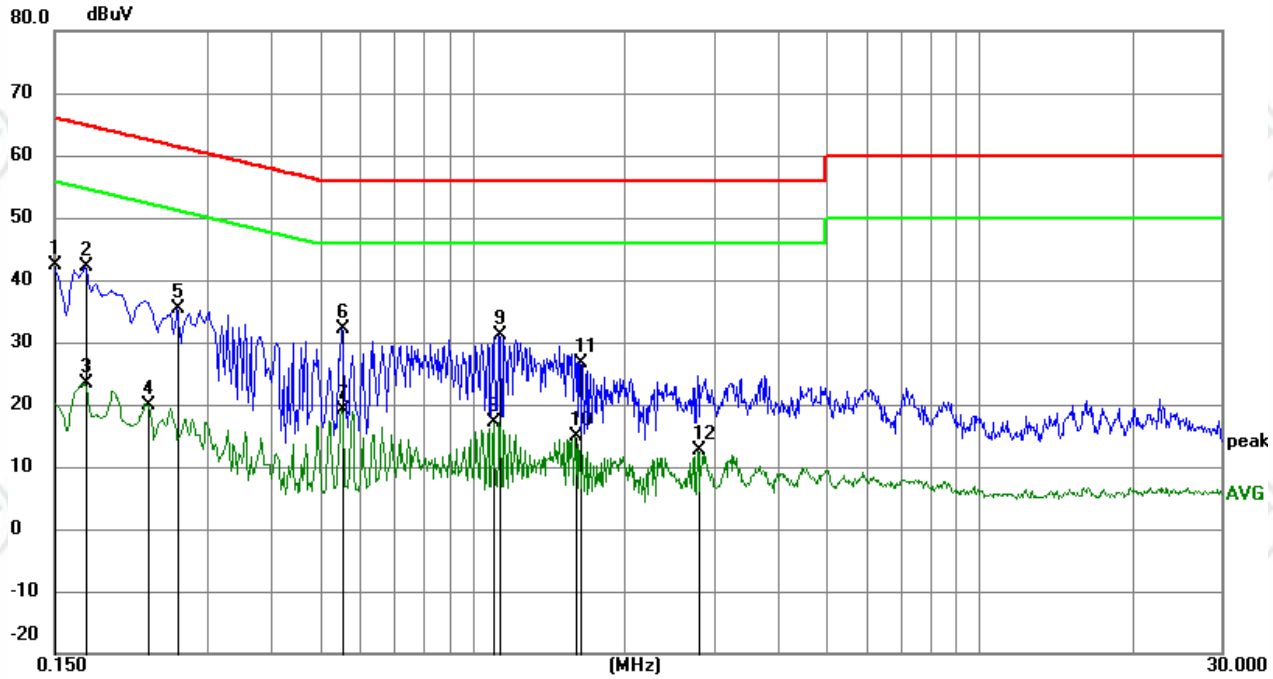


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1680	19.22	9.87	29.09	55.06	-25.97	AVG	
2	*	0.1725	34.55	9.87	44.42	64.84	-20.42	peak	
3		0.2490	29.54	9.97	39.51	61.79	-22.28	peak	
4		0.2508	9.59	9.97	19.56	51.73	-32.17	AVG	
5		0.5505	22.99	10.01	33.00	56.00	-23.00	peak	
6		0.5505	10.74	10.01	20.75	46.00	-25.25	AVG	
7		1.0500	22.34	9.83	32.17	56.00	-23.83	peak	
8		1.1040	9.45	9.83	19.28	46.00	-26.72	AVG	
9		2.3460	18.39	9.79	28.18	56.00	-27.82	peak	
10		2.3460	4.45	9.79	14.24	46.00	-31.76	AVG	
11		3.6915	1.66	9.78	11.44	46.00	-34.56	AVG	
12		4.9605	16.68	9.78	26.46	56.00	-29.54	peak	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:

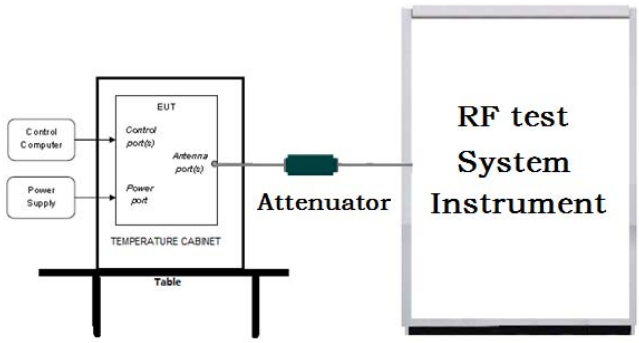


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	32.51	9.87	42.38	66.00	-23.62	peak	
2	*	0.1725	32.37	9.87	42.24	64.84	-22.60	peak	
3		0.1725	13.52	9.87	23.39	54.84	-31.45	AVG	
4		0.2280	10.07	9.93	20.00	52.52	-32.52	AVG	
5		0.2625	25.48	10.00	35.48	61.35	-25.87	peak	
6		0.5550	22.01	10.02	32.03	56.00	-23.97	peak	
7		0.5550	9.01	10.02	19.03	46.00	-26.97	AVG	
8		1.1040	7.31	9.83	17.14	46.00	-28.86	AVG	
9		1.1310	21.32	9.82	31.14	56.00	-24.86	peak	
10		1.5990	5.02	9.81	14.83	46.00	-31.17	AVG	
11		1.6305	16.94	9.80	26.74	56.00	-29.26	peak	
12		2.7869	2.76	9.79	12.55	46.00	-33.45	AVG	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

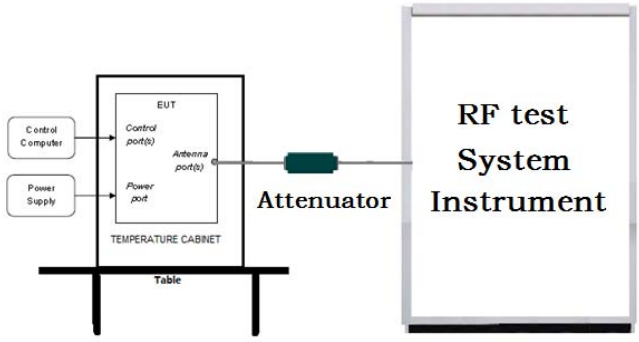
7.3 Maximum Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section E
Test Setup:	
Test Procedure:	1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v02r01 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. 4. Measure the conducted output power and record the results in the test report.
Limit:	

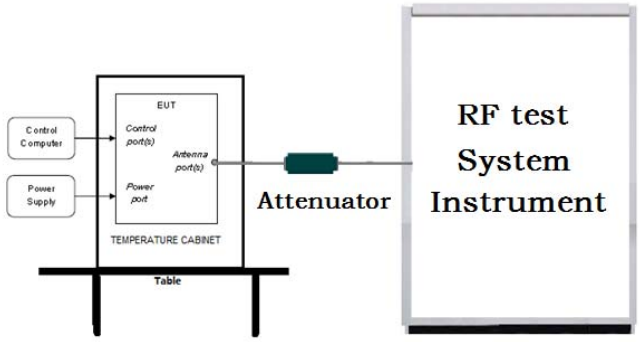
Frequency band (MHz)	Limit
5150-5250	≤1W(30dBm) for master device
	≤250mW(24dBm) for client device
5725-5850	≤1W(30dBm)
Remark:	* Where B is the 26dB emission bandwidth in MHz The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Test Mode:	Transmitting mode with modulation
Test Results:	Refer to Appendix A

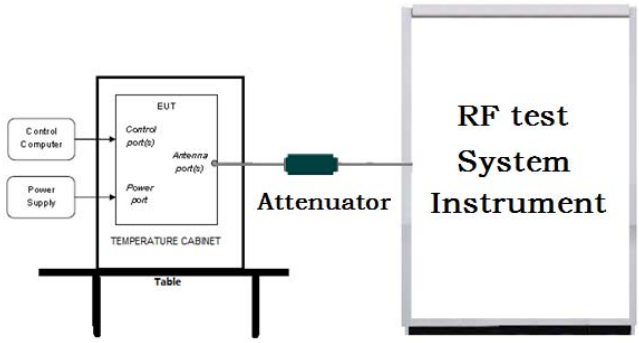
7.4 6dB Emission Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.407 (e)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 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.
Limit:	≥ 500 kHz
Test Mode:	Transmitting mode with modulation
Test Results:	Refer to Appendix A

7.5 26dB Emission Bandwidth and 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section D
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 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.
Limit:	No restriction limits
Test Mode:	Transmitting mode with modulation
Test Results:	Refer to Appendix A

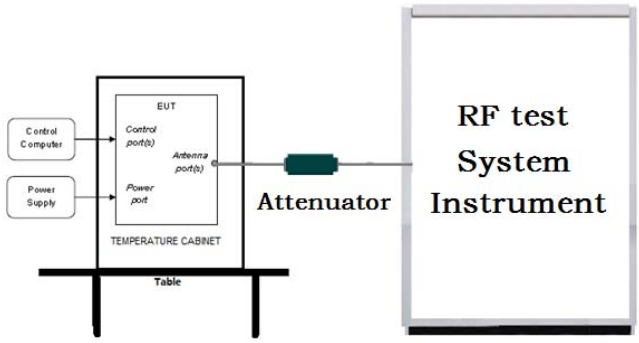
7.6 Maximum Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section F
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
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 ≥ 3*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.
Limit:	

Frequency band (MHz)	Limit
5150-5250	≤17dBm in 1MHz for master device
	≤11dBm in 1MHz for client device
5725-5850	≤30dBm in 500kHz
Remark:	The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.

Test Mode:	Transmitting mode with modulation
Test Results:	Refer to Appendix A

7.7 Frequency Stability

Test Requirement:	47 CFR Part 15C Section 15.407 (g)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	1.The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. 2. Turn the EUT on and couple its output to a spectrum analyzer. 3. 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. 4. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. 5. 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.
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 45 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 Mode:	Transmitting mode with modulation
Test Results:	Refer to Appendix A

7.8 Radiated Emission

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.407 (b)
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Receiver Setup:	

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10kHz	Average

Limit:

Frequency	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-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

*(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing

	an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. Note: (i) EIRP = ((E*d)^2) / 30 where: • E is the field strength in V/m; • d is the measurement distance in meters; • EIRP is the equivalent isotropically radiated power in watts. (ii) Working in dB units, the above equation is equivalent to: EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77 (iii) Or, if d is 3 meters: EIRP[dBm] = E[dBμV/m] - 95.2
Test Setup:	

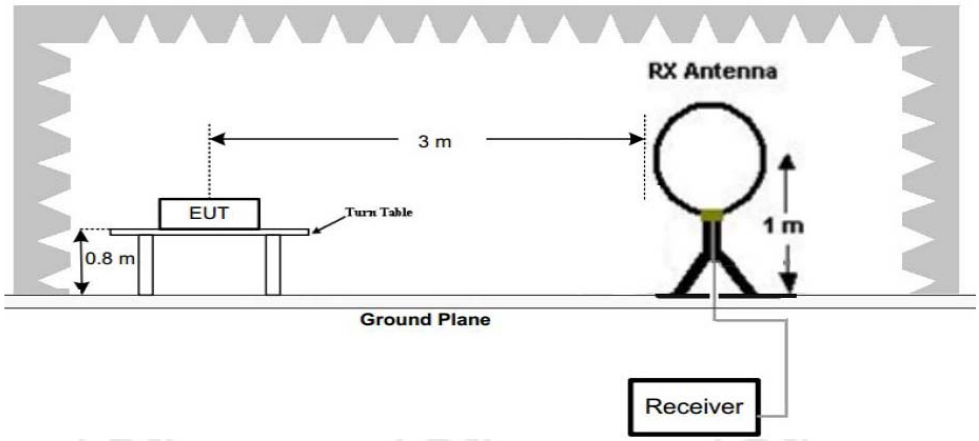


Figure 1. Below 30MHz

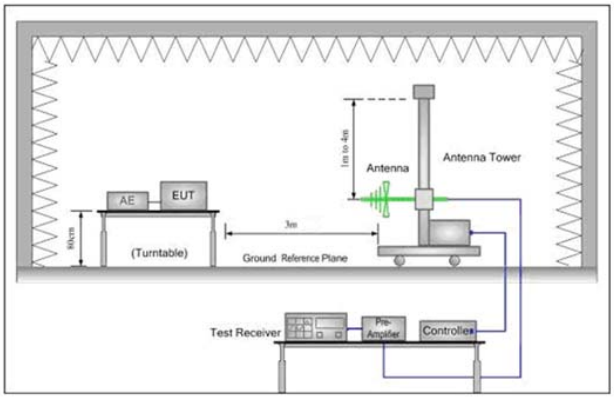


Figure 2. 30MHz to 1GHz

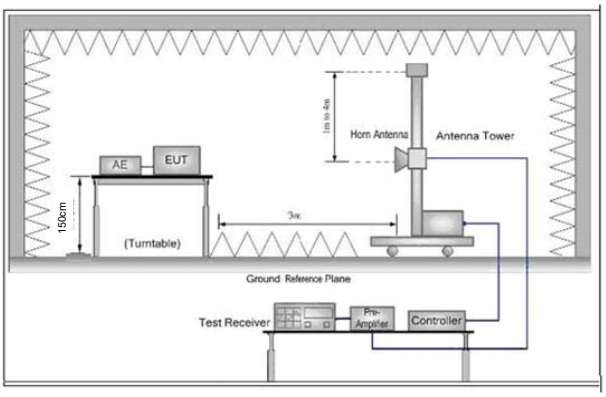


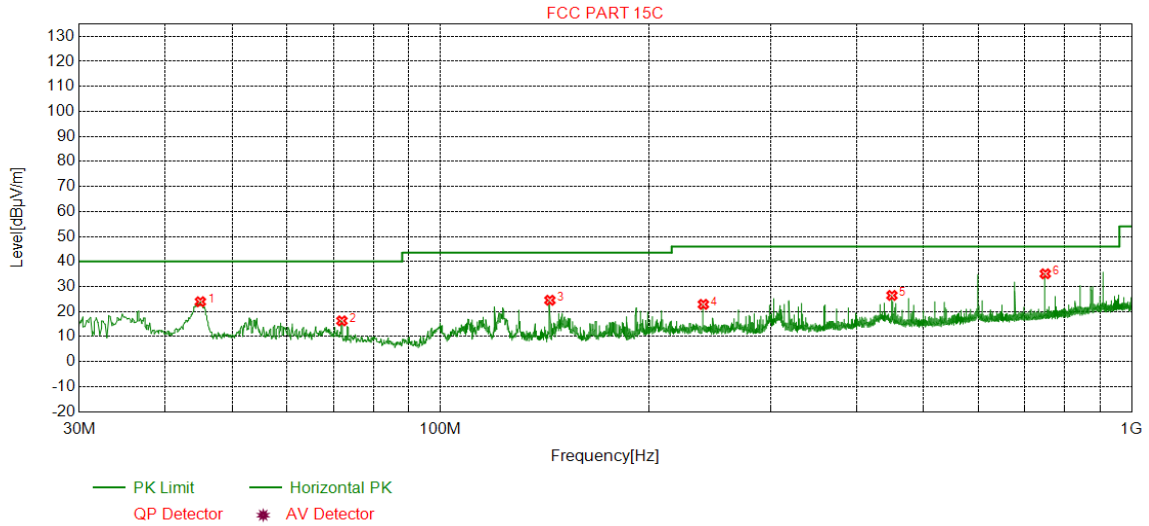
Figure 3. Above 1 GHz

Test Procedure:	a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. Note: For the radiated emission test above 1GHz:

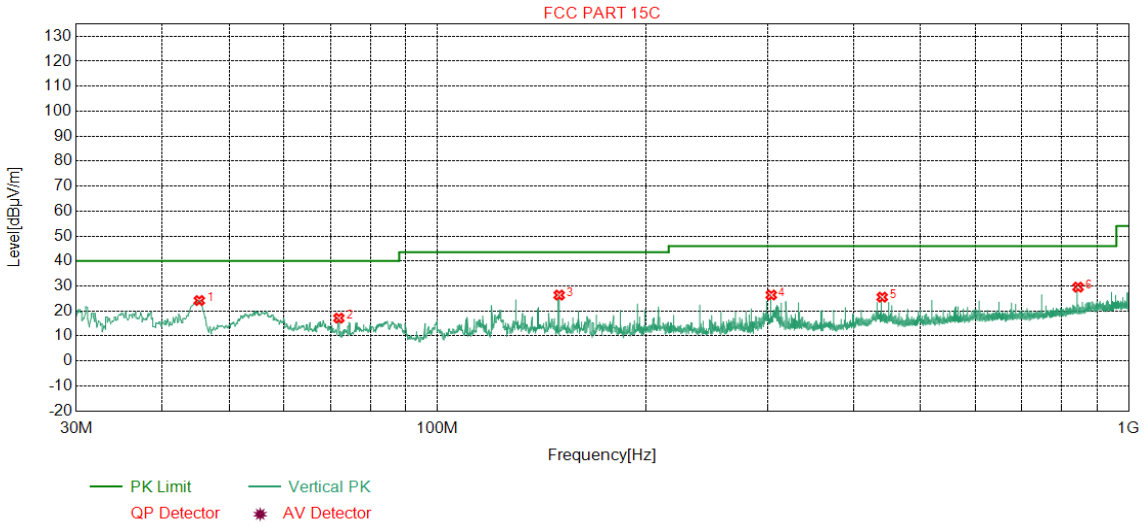
	Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. 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. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. 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. d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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. g. Test the EUT in the lowest channel, the middle channel and the highest channel h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete.
Test Mode:	Transmitting mode with modulation
Test Results:	Pass

Radiated Spurious Emissions test Data:
Radiated Emission below 1GHz

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes, only the worst case middle channel of 6Mbps for 802.11a was recorded in the report.



Suspected List											
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	44.9395	13.19	0.75	-31.71	41.70	23.93	40.00	16.07	Pass	Horizontal	Peak
2	72.0052	8.62	0.97	-32.02	38.72	16.29	40.00	23.71	Pass	Horizontal	Peak
3	143.9864	7.34	1.41	-31.99	47.76	24.52	43.50	18.98	Pass	Horizontal	Peak
4	240.0260	11.94	1.84	-31.90	40.99	22.87	46.00	23.13	Pass	Horizontal	Peak
5	449.9550	16.20	2.51	-31.89	39.63	26.45	46.00	19.55	Pass	Horizontal	Peak
6	750.0060	20.35	3.29	-32.04	43.50	35.10	46.00	10.90	Pass	Horizontal	Peak



Suspected List											
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	45.2305	13.20	0.75	-31.73	41.96	24.18	40.00	15.82	Pass	Vertical	Peak
2	72.0052	8.62	0.97	-32.02	39.57	17.14	40.00	22.86	Pass	Vertical	Peak
3	150.0010	7.55	1.45	-32.01	49.37	26.36	43.50	17.14	Pass	Vertical	Peak
4	304.0524	13.29	2.07	-31.60	42.64	26.40	46.00	19.60	Pass	Vertical	Peak
5	439.9630	16.04	2.48	-31.88	38.89	25.53	46.00	20.47	Pass	Vertical	Peak
6	844.9785	21.44	3.50	-31.82	36.42	29.54	46.00	16.46	Pass	Vertical	Peak

Transmitter Emission above 1GHz

Remark: During the test, the Radiates Emission from 1GHz to 40GHz was performed in all modes,
for 20MHz Occupied Bandwidth, 802.11 a mode was the worst case;
for 40MHz Occupied Bandwidth, 802.11 n(HT40) mode was the worst case;
for 80MHz Occupied Bandwidth, 802.11 ac(VHT80) mode was the worst case;
only the worst case was in the report.

Mode:			802.11 a Transmitting					Channel:		5180 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1304.7305	28.20	3.33	-42.78	50.19	38.94	68.2	29.26	Pass	H	PK
2	1833.3333	30.60	3.91	-42.79	49.55	41.27	68.2	26.93	Pass	H	PK
3	2564.3564	32.50	4.83	-43.10	50.32	44.55	68.2	23.65	Pass	H	PK
4	3930.1430	33.74	6.25	-43.01	49.30	46.28	68.2	21.92	Pass	H	PK
5	7535.0518	36.59	6.45	-42.12	48.77	49.69	68.2	18.51	Pass	H	PK
6	9055.4278	37.69	6.74	-42.01	48.51	50.93	68.2	17.27	Pass	H	PK
7	1344.3344	28.24	3.33	-42.73	50.27	39.11	68.2	29.09	Pass	V	PK
8	1726.0726	29.89	3.89	-42.67	48.93	40.04	68.2	28.16	Pass	V	PK
9	2203.5204	31.98	4.40	-43.16	49.80	43.02	68.2	25.18	Pass	V	PK
10	3789.8790	33.63	6.07	-43.04	49.52	46.18	68.2	22.02	Pass	V	PK
11	6348.7349	35.87	8.68	-42.53	49.04	51.06	68.2	17.14	Pass	V	PK
12	8869.6935	37.41	6.87	-42.00	48.49	50.77	68.2	17.43	Pass	V	PK

Mode:			802.11 a Transmitting					Channel:		5200 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1353.6854	28.25	3.33	-42.72	51.99	40.85	68.2	27.35	Pass	H	PK
2	2339.3839	32.18	4.66	-43.13	50.57	44.28	68.2	23.92	Pass	H	PK
3	3071.5072	33.23	5.50	-43.10	49.00	44.63	68.2	23.57	Pass	H	PK
4	3803.0803	33.64	6.13	-43.04	49.99	46.72	68.2	21.48	Pass	H	PK
5	6346.5347	35.87	8.67	-42.53	48.63	50.64	68.2	17.56	Pass	H	PK
6	8830.5915	37.33	6.89	-42.01	48.15	50.36	68.2	17.84	Pass	H	PK
7	1413.0913	28.31	3.36	-42.74	49.71	38.64	68.2	29.56	Pass	V	PK
8	2176.0176	31.95	4.37	-43.17	49.02	42.17	68.2	26.03	Pass	V	PK
9	3048.9549	33.22	5.48	-43.10	49.25	44.85	68.2	23.35	Pass	V	PK
10	3922.4422	33.74	6.26	-43.02	49.78	46.76	68.2	21.44	Pass	V	PK
11	6481.8482	35.90	8.59	-42.50	48.45	50.44	68.2	17.76	Pass	V	PK
12	8944.4472	37.58	6.86	-42.01	47.71	50.14	68.2	18.06	Pass	V	PK

Mode:			802.11 a Transmitting					Channel:		5240 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1273.9274	28.17	3.24	-42.81	50.83	39.43	68.2	28.77	Pass	H	PK
2	2474.6975	32.36	4.70	-43.10	50.36	44.32	68.2	23.88	Pass	H	PK
3	3800.3300	33.64	6.12	-43.04	49.70	46.42	68.2	21.78	Pass	H	PK
4	5015.4015	34.52	7.09	-42.80	51.00	49.81	68.2	18.39	Pass	H	PK
5	7011.2006	36.11	6.28	-42.19	48.24	48.44	68.2	19.76	Pass	H	PK
6	8369.4185	36.55	6.63	-42.06	49.33	50.45	68.2	17.75	Pass	H	PK
7	1326.7327	28.23	3.33	-42.76	51.21	40.01	68.2	28.19	Pass	V	PK
8	2321.7822	32.15	4.67	-43.13	49.28	42.97	68.2	25.23	Pass	V	PK
9	3772.2772	33.62	5.99	-43.05	50.89	47.45	68.2	20.75	Pass	V	PK
10	5002.7503	34.50	7.07	-42.79	51.00	49.78	68.2	18.42	Pass	V	PK
11	6360.2860	35.87	8.65	-42.52	48.95	50.95	68.2	17.25	Pass	V	PK
12	9325.1163	37.63	6.71	-42.06	49.19	51.47	68.2	16.73	Pass	V	PK

Mode:			802.11 n(HT40) Transmitting					Channel:		5190 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1281.6282	28.18	3.26	-42.80	50.19	38.83	68.2	26.09	Pass	H	PK
2	2055.5556	31.78	4.31	-43.19	49.21	42.11	68.2	23.91	Pass	H	PK
3	2764.5765	32.82	4.96	-43.10	49.61	44.29	68.2	21.59	Pass	H	PK
4	3849.2849	33.68	6.31	-43.03	49.65	46.61	68.2	18.92	Pass	H	PK
5	5009.3509	34.51	7.08	-42.80	50.49	49.28	68.2	17.61	Pass	H	PK
6	8901.3201	37.48	6.91	-42.00	48.20	50.59	68.2	29.3	Pass	H	PK
7	1363.0363	28.26	3.33	-42.72	50.03	38.90	68.2	24.4	Pass	V	PK
8	2515.4015	32.42	4.77	-43.09	49.70	43.80	68.2	18.8	Pass	V	PK
9	5028.6029	34.53	7.10	-42.79	50.56	49.40	68.2	17.82	Pass	V	PK
10	5831.1331	35.53	8.38	-42.60	49.07	50.38	68.2	18.81	Pass	V	PK
11	7460.8730	36.56	6.50	-42.11	48.44	49.39	68.2	18.13	Pass	V	PK
12	8830.0165	37.33	6.89	-42.01	47.86	50.07	68.2	26.09	Pass	V	PK

Mode:			802.11 n(HT40) Transmitting					Channel:		5230 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1342.6843	28.24	3.33	-42.74	50.55	39.38	68.2	28.82	Pass	H	PK
2	2113.3113	31.86	4.50	-43.18	48.83	42.01	68.2	26.19	Pass	H	PK
3	3054.4554	33.22	5.48	-43.09	49.29	44.90	68.2	23.3	Pass	H	PK
4	5014.3014	34.51	7.08	-42.79	50.99	49.79	68.2	18.41	Pass	H	PK
5	6438.3938	35.89	8.47	-42.51	49.37	51.22	68.2	16.98	Pass	H	PK
6	9106.6053	37.68	6.65	-42.03	48.63	50.93	68.2	17.27	Pass	H	PK
7	1566.0066	28.84	3.55	-42.97	49.35	38.77	68.2	29.43	Pass	V	PK
8	2698.0198	32.72	4.89	-43.11	50.25	44.75	68.2	23.45	Pass	V	PK
9	3898.2398	33.72	6.26	-43.02	50.37	47.33	68.2	20.87	Pass	V	PK
10	5018.7019	34.52	7.09	-42.80	51.05	49.86	68.2	18.34	Pass	V	PK
11	6379.5380	35.88	8.58	-42.52	48.39	50.33	68.2	17.87	Pass	V	PK
12	8519.5010	36.64	6.66	-42.00	48.69	49.99	68.2	18.21	Pass	V	PK

Mode:			802.11 ac(VHT80) Transmitting					Channel:		5210 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1401.5402	28.30	3.33	-42.68	49.89	38.84	68.2	29.36	Pass	H	PK
2	2564.3564	32.50	4.83	-43.10	50.26	44.49	68.2	23.71	Pass	H	PK
3	3826.1826	33.66	6.22	-43.03	50.26	47.11	68.2	21.09	Pass	H	PK
4	5030.2530	34.53	7.10	-42.79	50.58	49.42	68.2	18.78	Pass	H	PK
5	6122.6623	35.82	8.48	-42.58	49.19	50.91	68.2	17.29	Pass	H	PK
6	9036.4518	37.69	6.77	-42.00	47.91	50.37	68.2	17.83	Pass	H	PK
7	1454.3454	28.35	3.44	-42.91	50.25	39.13	68.2	29.07	Pass	V	PK
8	2692.5193	32.71	4.88	-43.10	50.38	44.87	68.2	23.33	Pass	V	PK
9	3776.6777	33.62	6.01	-43.05	50.00	46.58	68.2	21.62	Pass	V	PK
10	4992.2992	34.50	7.08	-42.80	50.77	49.55	68.2	18.65	Pass	V	PK
11	6006.6007	35.80	8.22	-42.59	49.31	50.74	68.2	17.46	Pass	V	PK
12	8794.3647	37.25	6.96	-42.00	48.73	50.94	68.2	17.26	Pass	V	PK

Mode:			802.11 a Transmitting					Channel:		5745 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1922.9923	31.19	4.16	-43.01	49.50	41.84	68.20	26.36	Pass	H	PK
2	3866.8867	33.69	6.29	-43.02	50.18	47.14	68.20	21.06	Pass	H	PK
3	4999.4499	34.50	7.07	-42.80	50.85	49.62	68.20	18.58	Pass	H	PK
4	8531.0354	36.67	6.67	-42.00	49.61	50.95	68.20	17.25	Pass	H	PK
5	14609.574	40.24	9.20	-41.70	49.28	57.02	68.20	11.18	Pass	H	PK
6	2695.8196	32.71	4.89	-43.10	50.03	44.53	68.20	23.67	Pass	H	PK
7	3932.3432	33.75	6.25	-43.01	49.95	46.94	68.20	21.26	Pass	V	PK
8	5025.8526	34.53	7.10	-42.80	51.22	50.05	68.20	18.15	Pass	V	PK
9	10213.980	38.10	7.15	-42.06	49.15	52.34	68.20	15.86	Pass	V	PK
10	12432.095	39.56	7.94	-41.90	50.22	55.82	68.20	12.38	Pass	V	PK
11	17540.736	42.67	12.47	-40.99	50.34	64.49	68.20	3.71	Pass	V	PK
12	2695.8196	32.71	4.89	-43.10	50.03	44.53	68.20	23.67	Pass	V	PK

Mode:			802.11 a Transmitting					Channel:		5785 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	2344.3344	32.18	4.66	-43.13	49.60	43.31	68.20	24.89	Pass	H	PK
2	3852.0352	33.68	6.31	-43.03	50.21	47.17	68.20	21.03	Pass	H	PK
3	5045.6546	34.55	7.12	-42.79	50.34	49.22	68.20	18.98	Pass	H	PK
4	7410.8607	36.51	6.45	-42.12	49.57	50.41	68.20	17.79	Pass	H	PK
5	14552.836	40.22	9.06	-41.70	49.63	57.21	68.20	10.99	Pass	H	PK
6	17572.171	42.64	12.40	-40.99	49.98	64.03	68.20	4.17	Pass	H	PK
7	2451.5952	32.33	4.67	-43.11	50.36	44.25	68.20	23.95	Pass	V	PK
8	3935.6436	33.75	6.25	-43.01	49.29	46.28	68.20	21.92	Pass	V	PK
9	5013.2013	34.51	7.08	-42.79	51.33	50.13	68.20	18.07	Pass	V	PK
10	11250.583	38.75	7.72	-42.00	49.15	53.62	68.20	14.58	Pass	V	PK
11	14440.129	40.14	9.49	-41.70	49.22	57.15	68.20	11.05	Pass	V	PK
12	17570.638	42.64	12.41	-40.99	51.04	65.10	68.20	3.10	Pass	V	PK

Mode:			802.11 a Transmitting					Channel:		5825 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	2694.1694	32.71	4.88	-43.10	49.77	44.26	68.20	23.94	Pass	H	PK
2	3938.3938	33.75	6.25	-43.01	49.81	46.80	68.20	21.40	Pass	H	PK
3	5005.5006	34.51	7.08	-42.81	50.70	49.48	68.20	18.72	Pass	H	PK
4	11360.224	38.82	7.52	-42.00	49.76	54.10	68.20	14.10	Pass	H	PK
5	16523.301	42.30	10.18	-41.59	50.14	61.03	68.20	7.17	Pass	H	PK
6	17572.171	42.64	12.40	-40.99	49.92	63.97	68.20	4.23	Pass	H	PK
7	2684.2684	32.69	4.87	-43.09	49.78	44.25	68.20	23.95	Pass	V	PK
8	3881.1881	33.70	6.28	-43.02	49.52	46.48	68.20	21.72	Pass	V	PK
9	5009.9010	34.51	7.08	-42.80	50.96	49.75	68.20	18.45	Pass	V	PK
10	12505.700	39.60	7.84	-41.90	49.33	54.87	68.20	13.33	Pass	V	PK
11	15909.160	41.72	11.47	-42.10	49.77	60.86	68.20	7.34	Pass	V	PK
12	17579.071	42.64	12.36	-40.99	49.90	63.91	68.20	4.29	Pass	V	PK

Mode:			802.11 n(HT40) Transmitting					Channel:		5755 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	2425.1925	32.30	4.66	-43.12	50.94	44.78	68.20	23.42	Pass	H	PK
2	3802.5303	33.64	6.13	-43.04	49.92	46.65	68.20	21.55	Pass	H	PK
3	4995.0495	34.50	7.08	-42.80	50.84	49.62	68.20	18.58	Pass	H	PK
4	11236.015	38.74	7.68	-42.00	48.69	53.11	68.20	15.09	Pass	H	PK
5	16467.331	42.27	10.15	-41.62	50.31	61.11	68.20	7.09	Pass	H	PK
6	17577.538	42.64	12.36	-40.98	50.45	64.47	68.20	3.73	Pass	H	PK
7	2114.9615	31.86	4.49	-43.17	49.88	43.06	68.20	25.14	Pass	V	PK
8	3844.3344	33.68	6.29	-43.04	49.57	46.50	68.20	21.70	Pass	V	PK
9	5023.1023	34.52	7.09	-42.78	51.07	49.90	68.20	18.30	Pass	V	PK
10	11216.847	38.73	7.62	-42.00	49.35	53.70	68.20	14.50	Pass	V	PK
11	15893.826	41.69	11.57	-42.10	49.17	60.33	68.20	7.87	Pass	V	PK
12	17452.563	42.65	11.59	-41.03	50.05	63.26	68.20	4.94	Pass	V	PK

Mode:			802.11 n(HT40) Transmitting					Channel:		5795 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	2457.6458	32.34	4.68	-43.11	49.98	43.89	68.20	24.31	Pass	H	PK
2	3088.5589	33.24	5.52	-43.11	48.75	44.40	68.20	23.80	Pass	H	PK
3	5008.2508	34.51	7.08	-42.80	50.45	49.24	68.20	18.96	Pass	H	PK
4	7433.8623	36.53	6.47	-42.11	50.16	51.05	68.20	17.15	Pass	H	PK
5	14437.062	40.14	9.47	-41.70	49.26	57.17	68.20	11.03	Pass	H	PK
6	17578.305	42.64	12.36	-40.99	50.62	64.63	68.20	3.57	Pass	H	PK
7	2452.1452	32.33	4.67	-43.10	50.67	44.57	68.20	23.63	Pass	V	PK
8	3805.8306	33.64	6.14	-43.03	49.84	46.59	68.20	21.61	Pass	V	PK
9	5006.6007	34.51	7.08	-42.80	50.67	49.46	68.20	18.74	Pass	V	PK
10	12382.258	39.53	7.90	-41.90	49.40	54.93	68.20	13.27	Pass	V	PK
11	16552.436	42.29	10.39	-41.58	50.38	61.48	68.20	6.72	Pass	V	PK
12	17574.471	42.64	12.38	-40.98	50.32	64.36	68.20	3.84	Pass	V	PK

Mode:			802.11 ac(VHT80) Transmitting					Channel:		5775 MHz	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	2561.0561	32.50	4.83	-43.10	50.17	44.40	68.20	23.80	Pass	H	PK
2	3919.6920	33.74	6.26	-43.02	49.64	46.62	68.20	21.58	Pass	H	PK
3	5008.8009	34.51	7.08	-42.80	50.37	49.16	68.20	19.04	Pass	H	PK
4	11893.859	39.22	7.60	-41.93	48.57	53.46	68.20	14.74	Pass	H	PK
5	15903.793	41.71	11.63	-42.10	49.65	60.89	68.20	7.31	Pass	H	PK
6	17548.403	42.66	12.52	-40.99	49.92	64.11	68.20	4.09	Pass	H	PK
7	1640.8141	29.33	3.79	-42.80	50.47	40.79	68.20	27.41	Pass	V	PK
8	3077.0077	33.23	5.51	-43.10	49.10	44.74	68.20	23.46	Pass	V	PK
9	3911.4411	33.73	6.26	-43.02	49.87	46.84	68.20	21.36	Pass	V	PK
10	11262.850	38.76	7.70	-42.00	50.25	54.71	68.20	13.49	Pass	V	PK
11	15934.462	41.77	10.73	-42.10	50.26	60.66	68.20	7.54	Pass	V	PK
12	17550.703	42.66	12.53	-40.99	50.62	64.82	68.20	3.38	Pass	V	PK

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

2) Scan from 9kHz to 40GHz, the disturbance above 18GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

7.9 Radiated Emission which fall in the restricted bands

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.407 (b)
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Receiver Setup:	

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10kHz	Average

Limit:

Frequency	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-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

*(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated

emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Note:
(i) EIRP = ((E*d)^2) / 30
where:
• E is the field strength in V/m;
• d is the measurement distance in meters;
• EIRP is the equivalent isotropically radiated power in watts.
(ii) Working in dB units, the above equation is equivalent to:
EIRP[dBm] = E[dBμV/m] + 20 log(d[meters]) - 104.77
(iii) Or, if d is 3 meters:
EIRP[dBm] = E[dBμV/m] - 95.2

Test Setup:

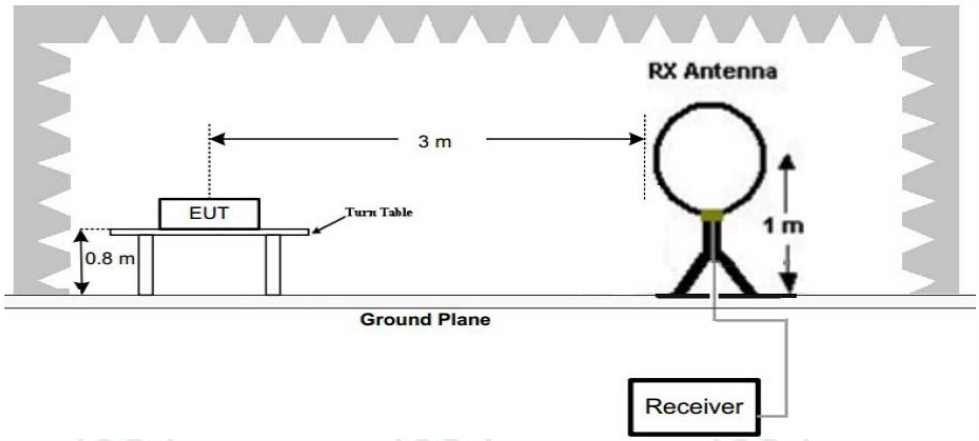


Figure 1. Below 30MHz

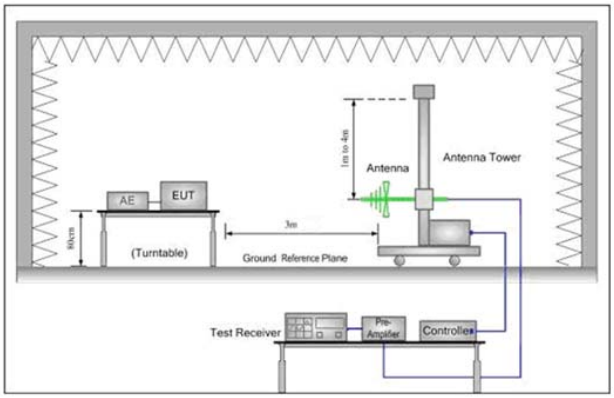


Figure 2. 30MHz to 1GHz

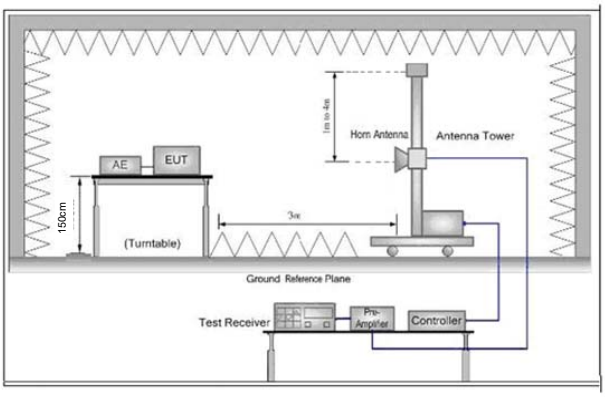


Figure 3. Above 1 GHz

Test Procedure:

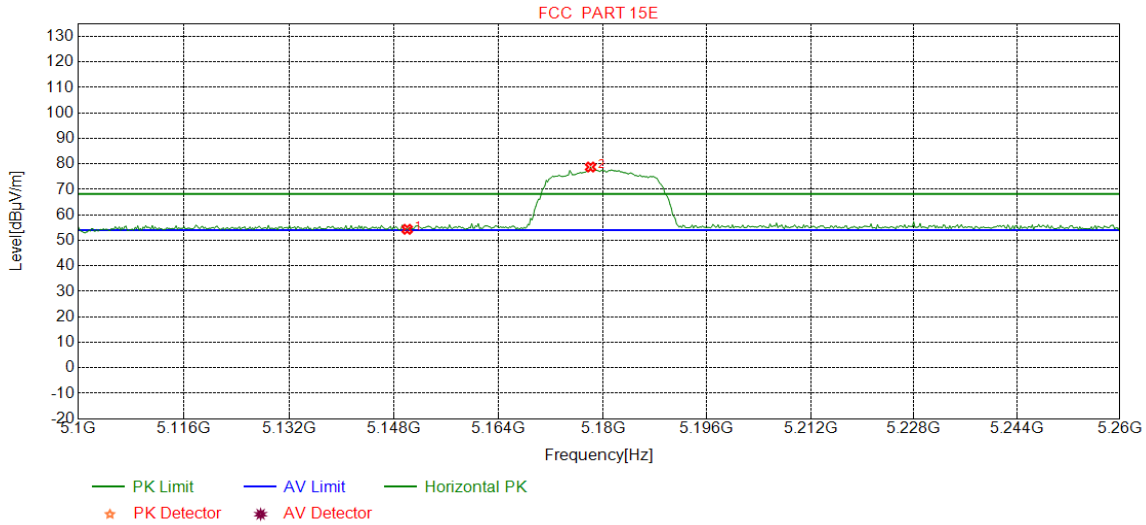
j. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

	Note: 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. k. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. l. 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. m. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. n. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. o. 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. p. Test the EUT in the lowest channel, the Highest channel q. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. r. Repeat above procedures until all frequencies measured was complete.
Test Mode:	Transmitting mode with modulation
Test Results:	Pass

Test Data:

Mode:	802.11 a	Channel:	5180 MHz
Remark:	PK		

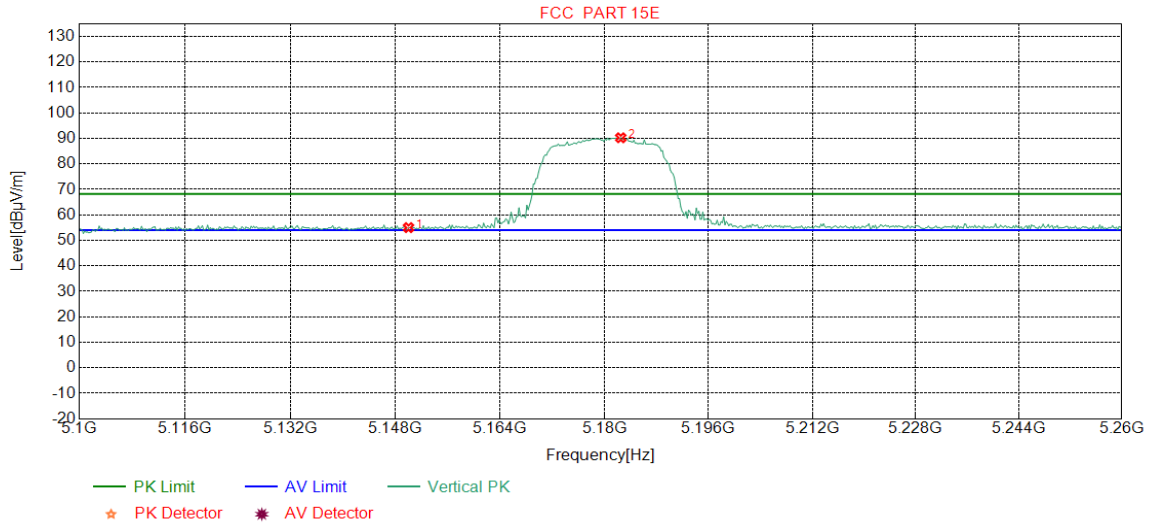
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	47.36	54.35	68.20	13.85	Pass	Horizontal
2	5178.0976	34.68	15.36	-42.74	71.49	78.79	68.20	-10.59	Pass	Horizontal

Mode:	802.11 a	Channel:	5180 MHz
Remark:	PK		

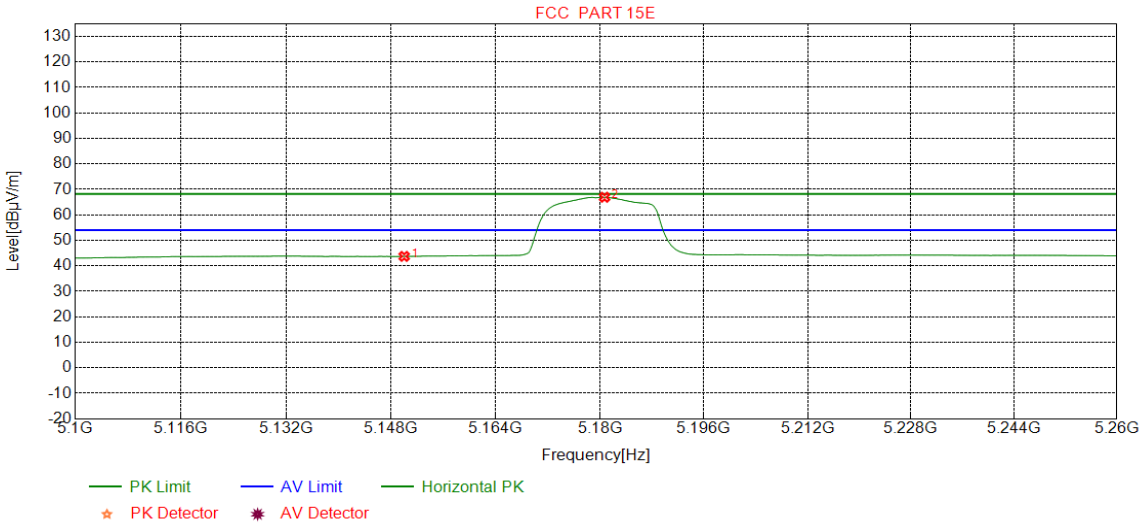
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	48.02	55.01	68.20	13.19	Pass	Vertical
2	5182.5031	34.68	15.40	-42.73	82.92	90.27	68.20	-22.07	Pass	Vertical

Mode:	802.11 a	Channel:	5180 MHz
Remark:	AV		

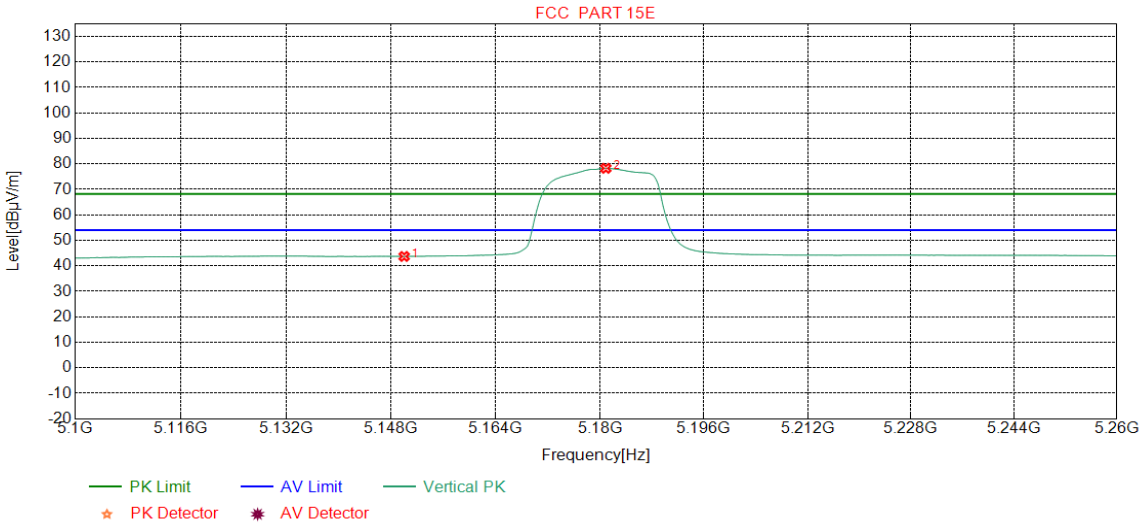
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	36.74	43.73	54.00	10.27	Pass	Horizontal
2	5180.7009	34.68	15.38	-42.73	59.60	66.93	54.00	-12.93	Pass	Horizontal

Mode:	802.11 a	Channel:	5180 MHz
Remark:	AV		

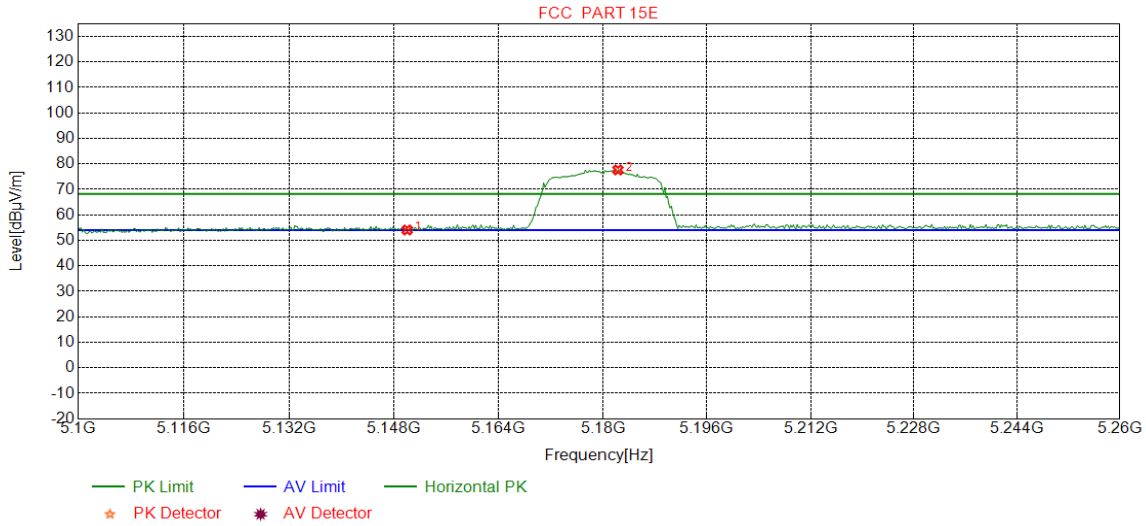
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	36.72	43.71	54.00	10.29	Pass	Vertical
2	5180.9011	34.68	15.38	-42.72	70.95	78.29	54.00	-24.29	Pass	Vertical

Mode:	802.11 n(HT20)	Channel:	5180 MHz
Remark:	PK		

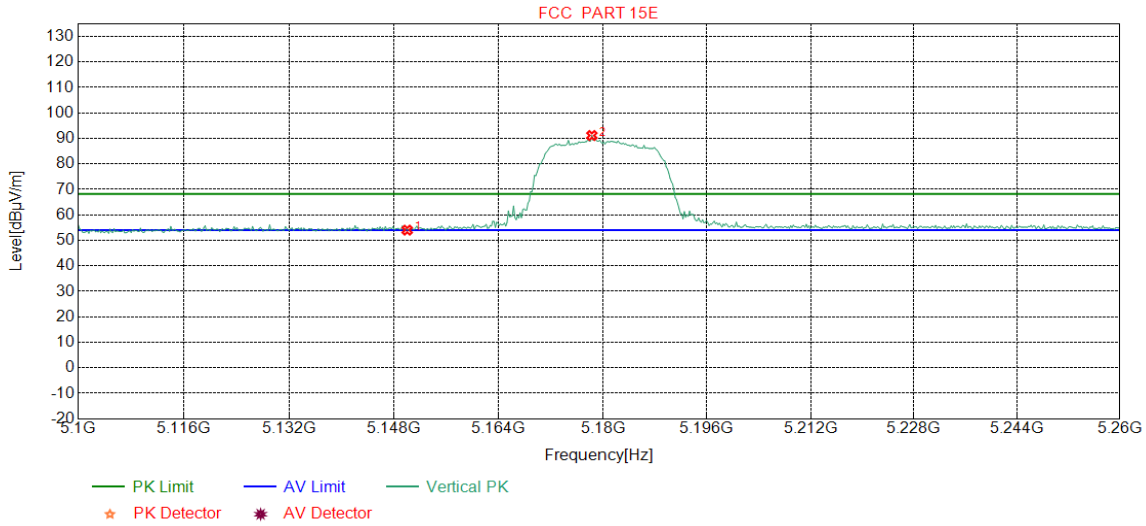
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	47.10	54.09	68.20	14.11	Pass	Horizontal
2	5182.3029	34.68	15.40	-42.73	70.30	77.65	68.20	-9.45	Pass	Horizontal

Mode:	802.11 n(HT20)	Channel:	5180 MHz
Remark:	PK		

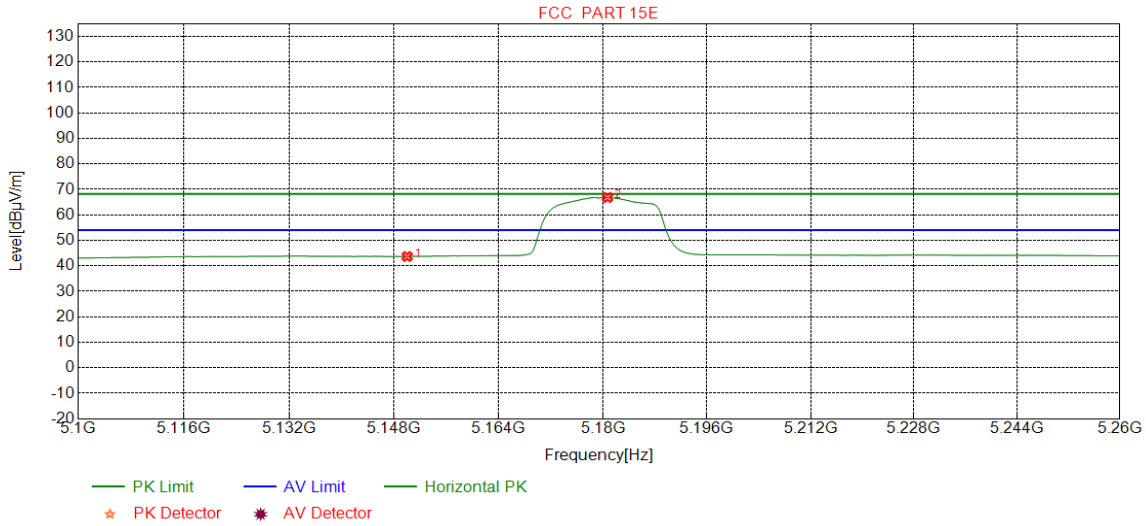
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	47.05	54.04	68.20	14.16	Pass	Vertical
2	5178.2979	34.68	15.36	-42.73	83.85	91.16	68.20	-22.96	Pass	Vertical

Mode:	802.11 n(HT20)	Channel:	5180 MHz
Remark:	AV		

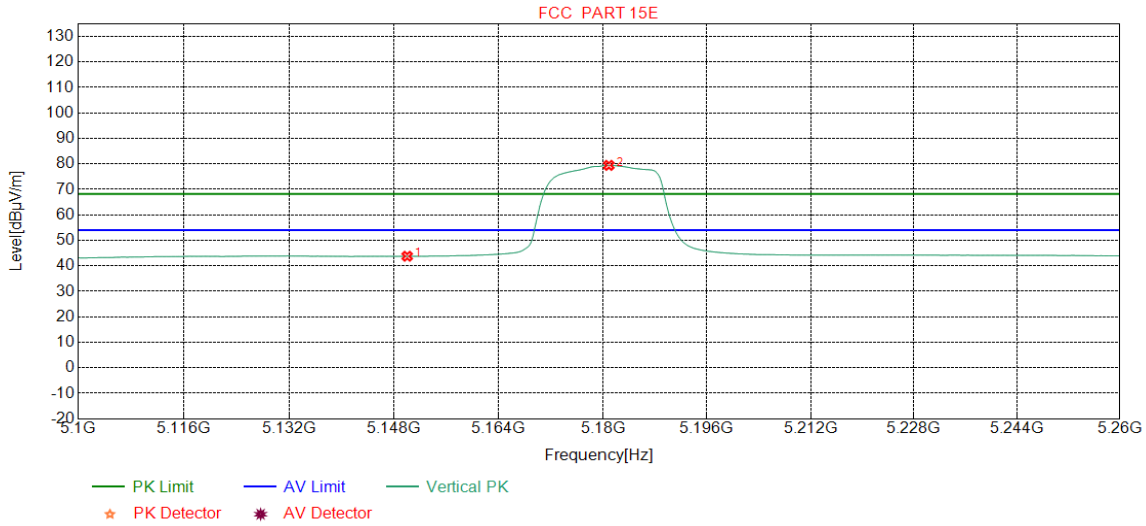
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	36.72	43.71	54.00	10.29	Pass	Horizontal
2	5180.7009	34.68	15.38	-42.73	59.52	66.85	54.00	-12.85	Pass	Horizontal

Mode:	802.11 n(HT20)	Channel:	5180MHz
Remark:	AV		

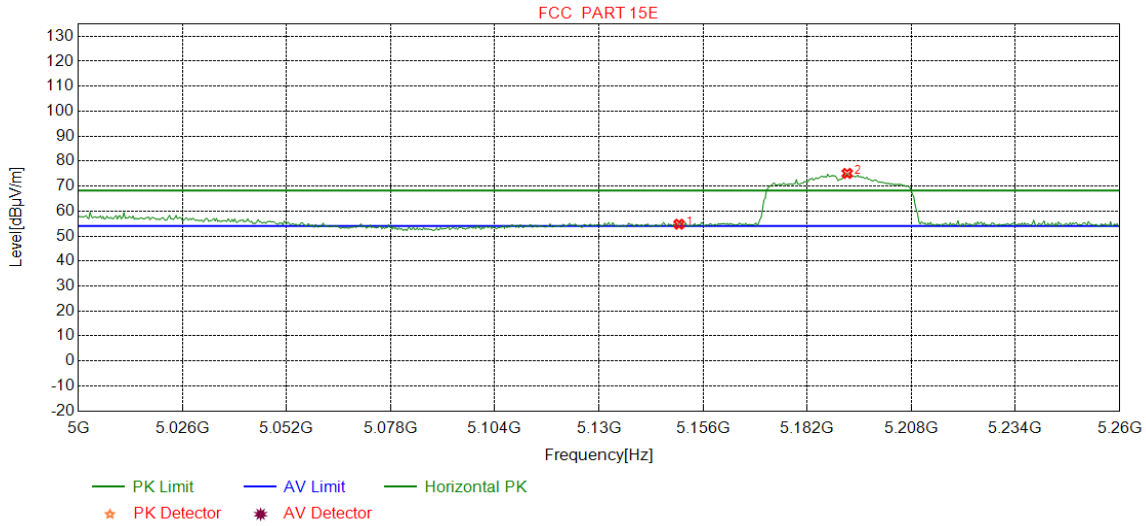
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	36.79	43.78	54.00	10.22	Pass	Vertical
2	5180.9011	34.68	15.38	-42.72	72.10	79.44	54.00	-25.44	Pass	Vertical

Mode:	802.11 n(HT40)	Channel:	5190MHz
Remark:	PK		

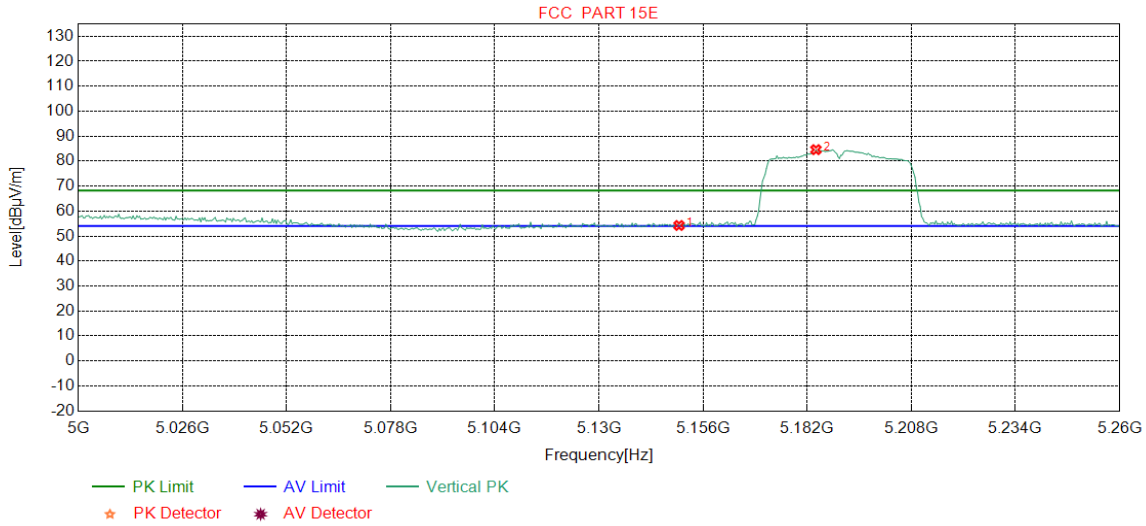
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	47.76	54.75	68.20	13.45	Pass	Horizontal
2	5191.9900	34.69	15.49	-42.72	67.63	75.09	68.20	-6.89	Pass	Horizontal

Mode:	802.11 n(HT40)	Channel:	5190MHz
Remark:	PK		

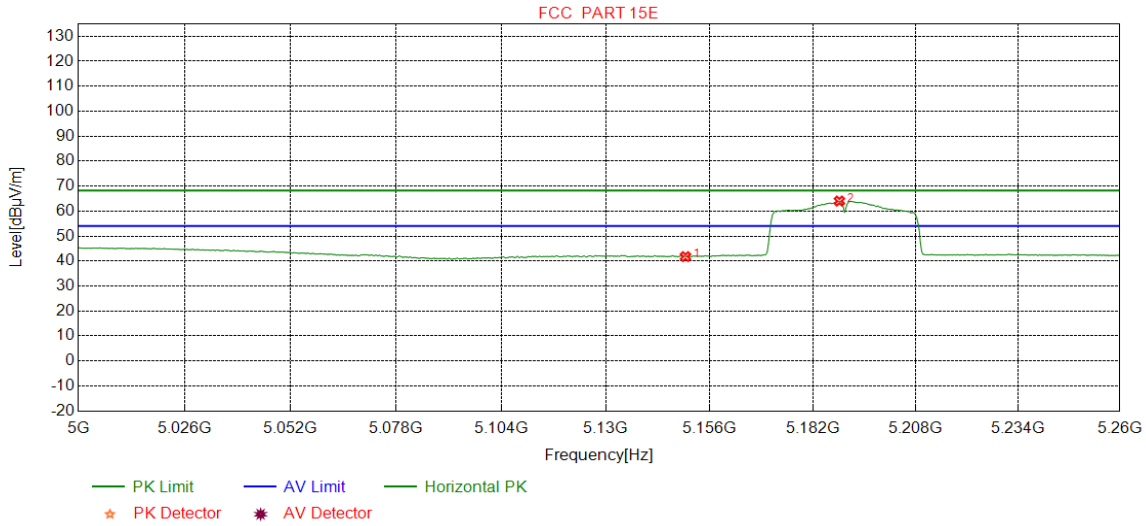
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	47.25	54.24	68.20	13.96	Pass	Vertical
2	5184.1802	34.68	15.41	-42.72	77.23	84.60	68.20	-16.40	Pass	Vertical

Mode:	802.11 n(HT40)	Channel:	5190MHz
Remark:	AV		

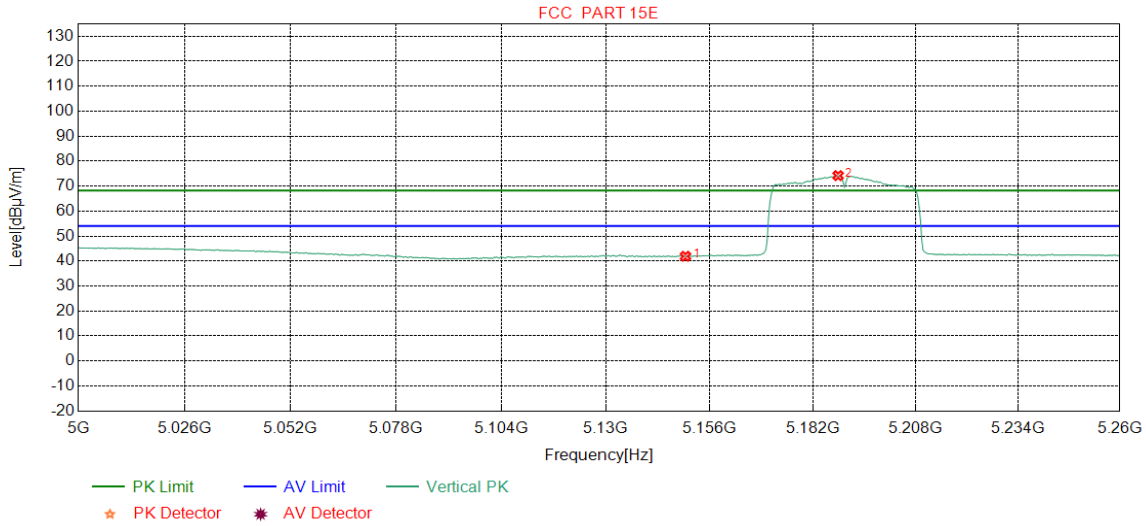
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	34.78	41.77	54.00	12.23	Pass	Horizontal
2	5188.7359	34.69	15.46	-42.73	56.60	64.02	54.00	-10.02	Pass	Horizontal

Mode:	802.11 n(HT40)	Channel:	5190MHz
Remark:	AV		

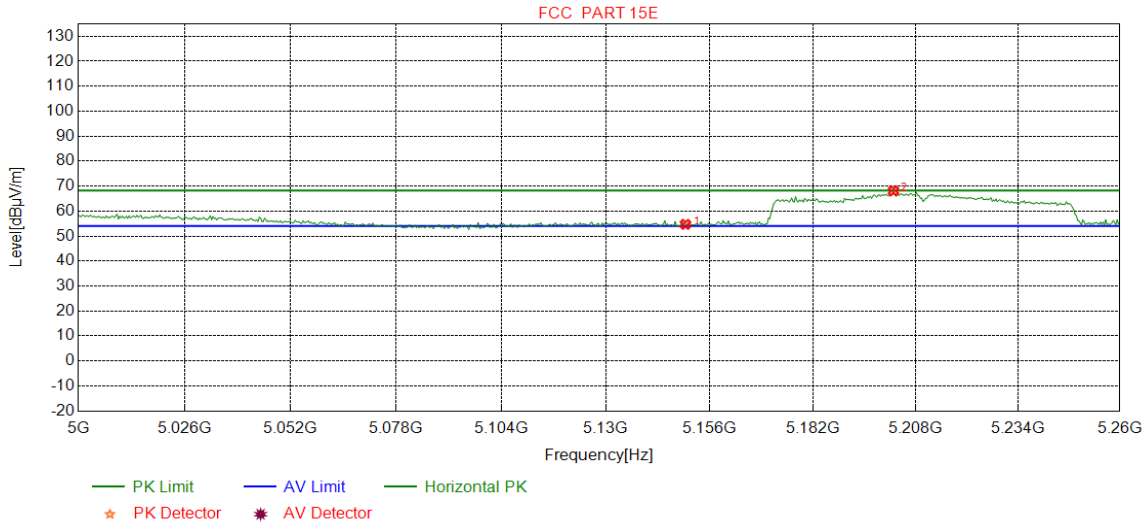
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	34.91	41.90	54.00	12.10	Pass	Vertical
2	5188.4105	34.69	15.46	-42.73	66.78	74.20	54.00	-20.20	Pass	Vertical

Mode:	802.11 ac(VHT80) Transmitting	Channel:	5210MHz
Remark:	PK		

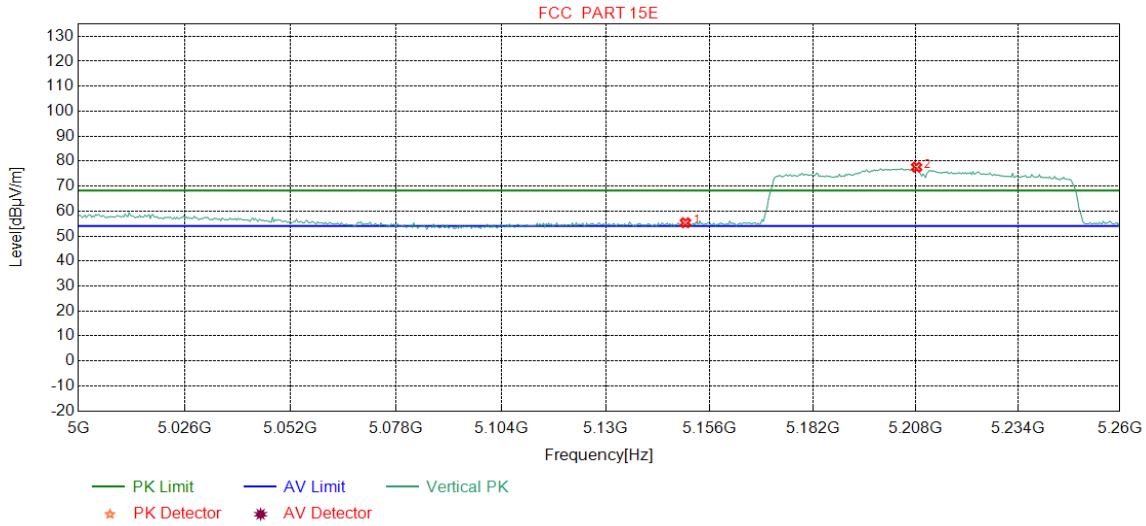
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	47.70	54.69	68.20	13.51	Pass	Horizontal
2	5202.4030	34.70	15.56	-42.72	60.57	68.11	68.20	0.09	Pass	Horizontal

Mode:	802.11 ac(VHT80)	Channel:	5210MHz
Remark:	PK		

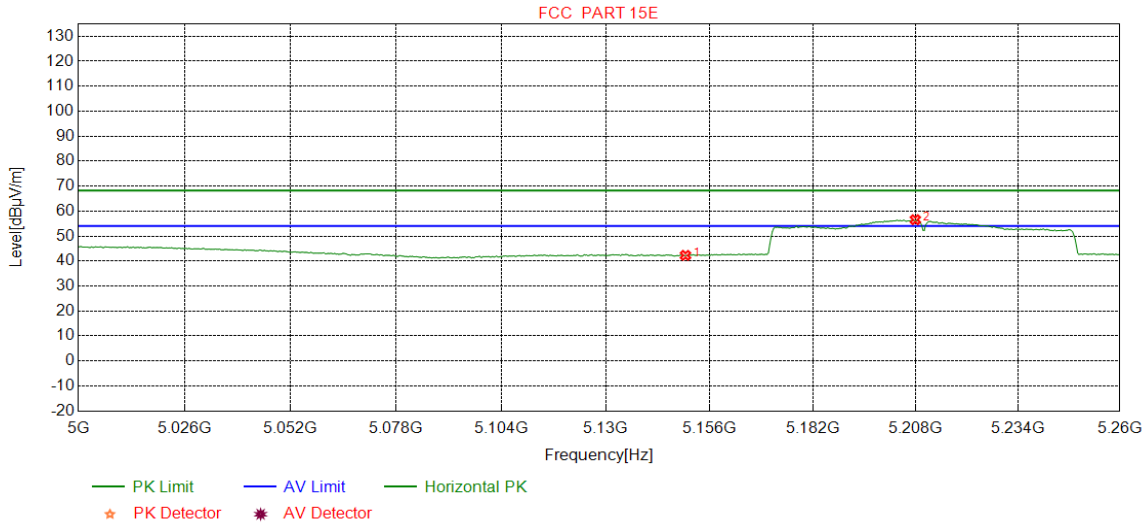
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	48.33	55.32	68.20	12.88	Pass	Vertical
2	5208.2603	34.71	15.53	-42.71	70.05	77.58	68.20	-9.38	Pass	Vertical

Mode:	802.11 ac(VHT80)	Channel:	5210MHz
Remark:	AV		

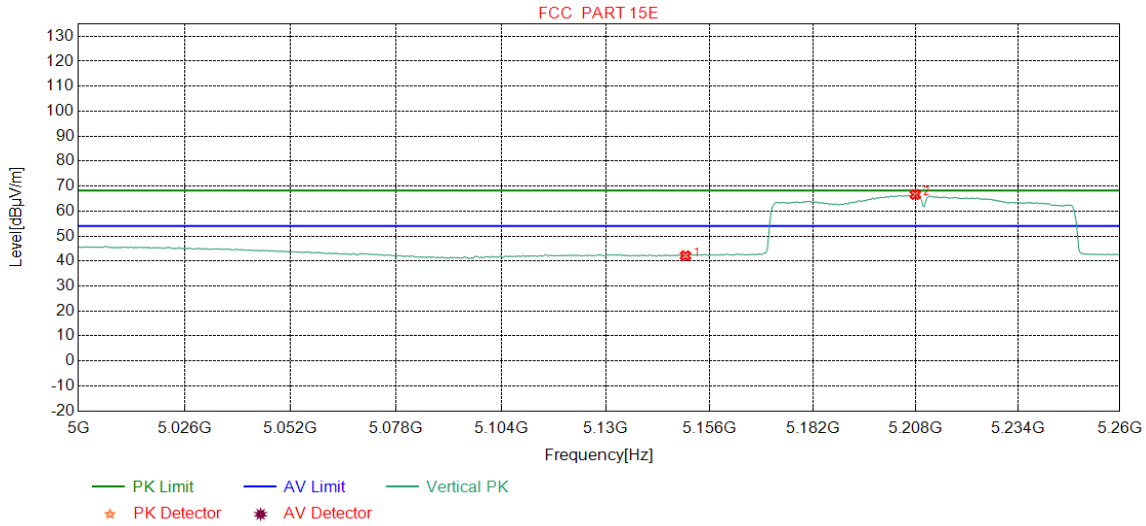
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	35.28	42.27	54.00	11.73	Pass	Horizontal
2	5207.9349	34.71	15.54	-42.72	49.02	56.55	54.00	-2.55	Pass	Horizontal

Mode:	802.11ac(VHT80)	Channel:	5210MHz
Remark:	AV		

Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity
1	5150.0000	34.65	15.08	-42.74	35.14	42.13	54.00	11.87	Pass	Vertical
2	5207.9349	34.71	15.54	-42.72	59.10	66.63	54.00	-12.63	Pass	Vertical

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

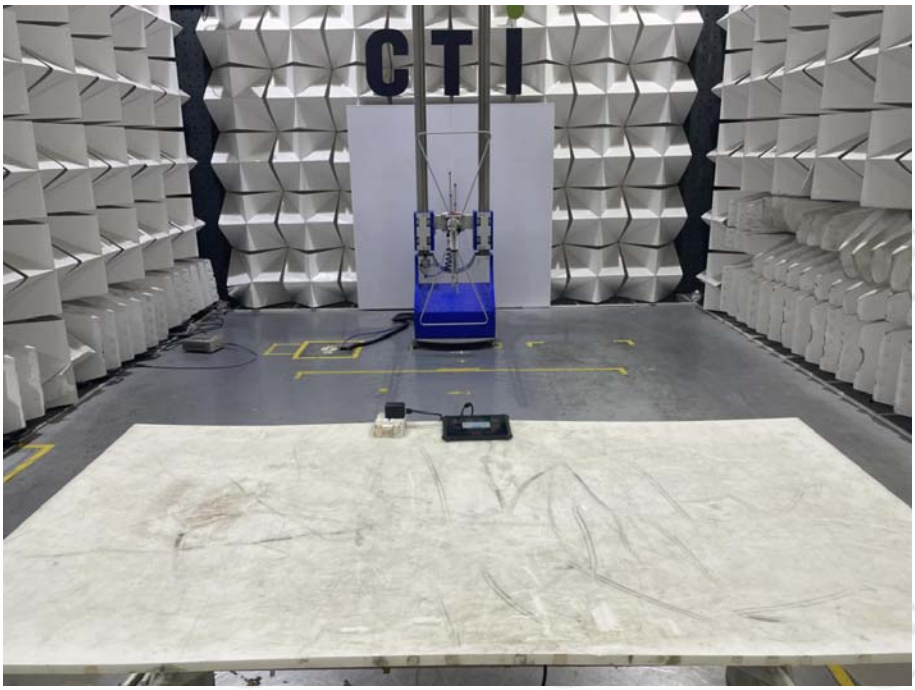
2) Scan from 1GHz to 25GHz, the disturbance above 13GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

8 Appendix A

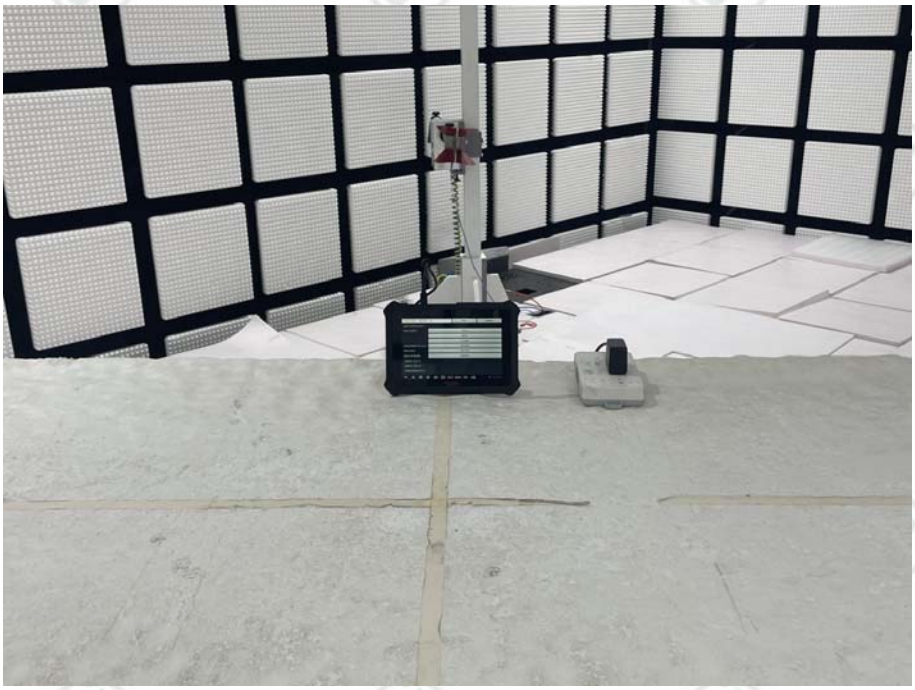
Refer to Appendix: 5G WIFI of EED32M80160304

PHOTOGRAPHS OF TEST SETUP

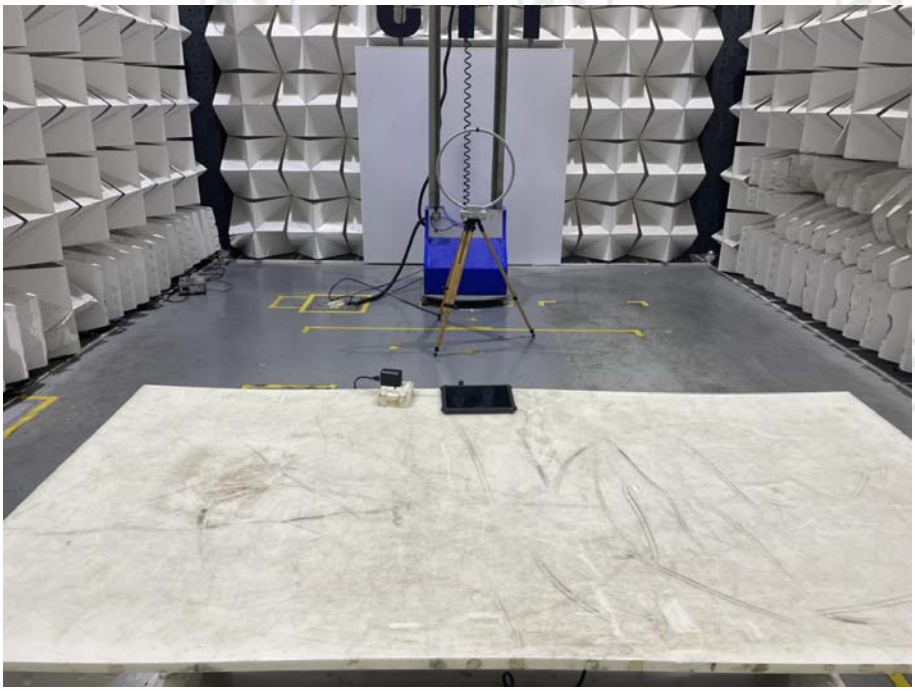
Test model No. IM1



Radiated spurious emission Test Setup-1(Below 1GHz)



Radiated spurious emission Test Setup-2(Above 1GHz)



Radiated spurious emission Test Setup-3(Below 30MHz)

PHOTOGRAPHS OF EUT Constructional Details

Refer to Report No. EED32M80160301 for EUT external and internal photos.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.

*** End of Report ***