



Test Report No.:
FCC2023-0055-RF1

TEST REPORT

FCC ID : 2AK43E25
Applicant : Guangzhou Rigal Electronics Co., Ltd.
Product Name : Multimedia projector /LCD INTELLIGENT
PROJECTOR
Model No. : E25, B1, Exx, Exy, Ixx, Ixy, Bxy, Heyup Boxe Lite

CVC Testing Technology Co., Ltd.

Applicant		Name: Guangzhou Rigal Electronics Co., Ltd.	
		Address: No.3-1, Ruixiang Road, Huadu District, Guangzhou	
Manufacturer		Name: Guangzhou Rigal Electronics Co., Ltd.	
		Address: No.3-1, Ruixiang Road, Huadu District, Guangzhou	
Equipment Under Test		Product Name : Multimedia projector /LCD INTELLIGENT PROJECTOR Model No. : E25 Trade mark : N/A Serial no. : 000165233801001 Sampling : 1-1	
Date of Receipt.	2023.9.1	Date of Testing	2023.9.22
Test Specification		Test Result	
FCC CFR47 Part 15C (2020) Radio Frequency Devices ANSI C63.10 (2013) KDB 558074 D01 DTS Meas Guidance v05 KDB 662911 D01 Multiple Transmitter Output v02r01		PASS	
Evaluation of Test Result		The equipment under test was found to comply with the requirements of the standards applied. Seal of CVC Issue Date: 2023.10.31	
Approved by: Chen Huawen 		Reviewed by: Xu Zhenfei 	
		Tested by: Lu Weiji 	
Other Aspects: NONE.			
Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested			
Note: This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC .			

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1. General Product Information

1.1 General information

Product Name	Multimedia projector /LCD INTELLIGENT PROJECTOR
Model No.	E25
Additional model	B1, Heyup Boxe Lite, Exx(x represents the numbers 0-9), Exy(x represents numbers 0-9, y represents letters a-z or A-Z), lxx(x represents the numbers 0-9), lxy(x represents numbers 0-9, y represents letters a-z or A-Z), Bxy(x represents numbers 0-9, y represents letters a-z or A-Z)
Power Supply	AC100-240V, 50/60Hz
Serial Number(SN)	000165233801001
firmware	v1.0.0
software	v2.1.2
specific power settings	Bluetooth(LE_1M, LE_2M): Default IEEE 802.11b: 9 IEEE 802.11g: 9 IEEE 802.11n(20MHz): 9 IEEE 802.11n(40MHz): 9 IEEE 802.11ax(20MHz): 9 IEEE 802.11ax(40MHz): 9
Antenna Type	Internal antenna
Antenna Connector	A detachable antenna
Antenna Gain	WIFI: 1.71 dBi (provided by client) Bluetooth: 1.97 dBi (provided by client)
Beamforming gain	Unsupported (provided by client)
Frequency Range	Bluetooth(LE_1M, LE_2M): 2402~2480MHz IEEE 802.11b/g/n/ax(20MHz): 2412~2462MHz IEEE 802.11n/ax(40MHz): 2422~2452MHz
Channel Number	Bluetooth(LE_1M, LE_2M):40 Channels IEEE 802.11b/g/n/ax (20MHz): 11 Channels IEEE 802.11n/ax(40MHz): 7 Channels
Type of Modulation	Bluetooth(LE_1M, LE_2M):GFSK IEEE 802.11b: DSSS (CCK,DQPSK,DBPSK); IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK); IEEE 802.11n(HT20 and HT40) : OFDM (64QAM, 16QAM,QPSK,BPSK); IEEE 802.11ax(HT20 and HT40) : OFDM (1024QAM, 256QAM, 64QAM, 16QAM,QPSK,BPSK);
Max. Conducted Power	Bluetooth(LE_1M): 7.95 dBm Bluetooth(LE_2M): 7.96 dBm IEEE 802.11b: 17.07 dBm IEEE 802.11g: 20.94 dBm IEEE 802.11n(20MHz): 20.92 dBm IEEE 802.11n(40MHz): 20.42 dBm IEEE 802.11ax(20MHz): 22.02 dBm IEEE 802.11ax(40MHz): 21.40 dBm
Operate Temp.Range	5~30°C
Note: 1. The information of the EUT is declared by the manufacturer. 2. The laboratory is not responsible for the product technical specification provided by the client. 3. The product model of this application are E25,B1,Heyup Boxe Lite, Exx(x represents the numbers 0-9), Exy(x represents numbers 0-9, y represents letters a-z or A-Z), lxx(x represents the numbers	

0-9), lxy(x represents numbers 0-9, y represents letters a-z or A-Z), Bxy(x represents numbers 0-9, y represents letters a-z or A-Z). The material difference between the parts and the parts in the product model for inspection is shown in the table below:

No	Model	Difference	Remarks
1	E25	1. Only the appearance color difference is different. 2. All three nameplates can be sold on each model.	Inspection model
2	B1		Coverage model
3	Heyup Boxe Lite		Coverage model
4	Exx		Coverage model
5	Exy		Coverage model
6	lxy		Coverage model
7	lxx		Coverage model
8	Bxy		Coverage model

All the tests carried out on model E25.

Factory: Guangzhou Rigal Electronics Co., Ltd.

Address: No.3-1, Ruixiang Road, Huadu District, Guangzhou

2. Test Sites

2.1 Test Facilities

The tests and measurements refer to this report were performed by RF testing Lab. of CVC Testing Technology Co., Ltd.

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, Guangdong, 510663, People's Republic of China

Telephone : +86-20-32293888

Fax : +86-20-32293889

FCC(Test firm designation number: CN1282)

IC(Test firm CAB identifier number: CN0103)

2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

2.3 List of Test and Measurement Instruments

Refer to **Appendix X**.

3. Test Configuration

3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Test Mode	Antenna Delivery	Test Channel
Bluetooth(LE_1M)	1TX / 1RX	0,19,39
Bluetooth(LE_2M)	1TX / 1RX	0,19,39
IEEE 802.11b	1TX / 1RX	1,6,11
IEEE 802.11g	1TX / 1RX	1,6,11
IEEE 802.11n 20 SISO	1TX / 1RX	1,6,11
IEEE 802.11n 40 SISO	1TX / 1RX	3,6,9
IEEE 802.11ax 20 SISO	1TX / 1RX	1,6,11
IEEE 802.11ax 40 SISO	1TX / 1RX	3,6,9

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate and different channels. Preliminary tests have been done on all the configurations for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates and channels are shown as following table.

Test Mode	Data Rate		
	Antenna 1	Antenna 2	MIMO
Bluetooth(LE_1M)	1	/	/
Bluetooth(LE_2M)	2	/	/
IEEE 802.11b	1	/	/
IEEE 802.11g	6	/	/
IEEE 802.11n 2.4GHz 20MHz	MCS 0	/	/
IEEE 802.11n 2.4GHz 40MHz	MCS 0	/	/
IEEE 802.11ax 2.4GHz 20MHz	MCS 0	/	/
IEEE 802.11ax 2.4GHz 40MHz	MCS 0	/	/

Test Items	Test Antennas	Test Modes	Test Channels
Conducted Emissions	Antenna 1	IEEE 802.11ax 20	1
Radiated Emissions	Antenna 1	IEEE 802.11ax 20 Bluetooth(LE_2M)	1/ 0
Radiated Emissions (Band Edge)	Antenna 1	IEEE 802.11ax 20 Bluetooth(LE_2M)	1,11/ 0,39
Maximum conducted output power	Antenna 1	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40/ IEEE 802.11ax 20/ IEEE 802.11ax 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 1,6,11/ 3,6,9
Minimum 6 dB bandwidth	Antenna 1	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40/ IEEE 802.11ax 20/ IEEE 802.11ax 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 1,6,11/ 3,6,9
Occupied Channel Bandwidth	Antenna 1	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40/ IEEE 802.11ax 20/ IEEE 802.11ax 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 1,6,11/ 3,6,9
Band Edge Measurement	Antenna 1	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40/ IEEE 802.11ax 20/ IEEE 802.11ax 40	0,39/ 0,39/ 1,11/ 1,11/ 1,11/ 3,9/ 1,11/ 3,9
Maximum Power spectral density	Antenna 1	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40/ IEEE 802.11ax 20/ IEEE 802.11ax 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 1,6,11/ 3,6,9
Spurious RF Conducted Emissions	Antenna 1	Bluetooth(LE_1M)/ Bluetooth(LE_2M)/ IEEE 802.11b/ IEEE 802.11g/ IEEE 802.11n 20/ IEEE 802.11n 40/ IEEE 802.11ax 20/ IEEE 802.11ax 40	0,19,39/ 0,19,39/ 1,6,11/ 1,6,11/ 1,6,11/ 3,6,9/ 1,6,11/ 3,6,9

3.2 Duty cycle

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
11B	Ant1	2412	12.22	12.30	99.35	---	---
		2437	12.21	12.25	99.67	---	---
		2462	12.21	12.44	98.15	---	---
11G	Ant1	2412	2.03	2.19	92.69	---	---
		2437	2.03	2.18	93.12	---	---
		2462	2.03	2.14	94.86	---	---
11N20SISO	Ant1	2412	1.89	2.07	91.30	---	---
		2437	1.89	2.03	93.10	---	---
		2462	1.89	2.34	80.77	---	---
11N40SISO	Ant1	2422	0.93	1.04	89.42	---	---
		2437	0.93	1.06	87.74	---	---
		2452	0.93	1.05	88.57	---	---
11AX20SISO	Ant1	2412	1.46	1.60	91.25	---	---
		2437	1.46	1.68	86.90	---	---
		2462	1.45	1.58	91.77	---	---
11AX40SISO	Ant1	2422	0.75	0.87	86.21	---	---
		2437	0.75	0.87	86.21	---	---
		2452	0.75	0.98	76.53	---	---
BLE_1M	Ant1	2402	2.12	2.50	84.80	---	---
		2440	2.12	2.50	84.80	---	---
		2480	2.12	2.50	84.80	---	---
BLE_2M	Ant1	2402	1.07	1.88	56.91	---	---
		2440	1.07	1.88	56.91	---	---
		2480	1.07	1.88	56.91	---	---

4. Summary of measurement results

Summary of measurements of results	Clause in FCC rules	Verdict	Note
Conducted Emissions	15.207	PASS	/
Radiated Emissions	15.247(d),15.205,15.209	PASS	/
Maximum conducted output power	15.247(b)(3)	PASS	Appendix C of WIFI2.4G_ diagram and Appendix C of BLE_ diagram
Minimum 6 dB bandwidth	15.247(a)(2)	PASS	Appendix A of WIFI2.4G_ diagram and Appendix A of BLE_ diagram
Occupied Channel Bandwidth	15.247(a)(2)	PASS	Appendix B of WIFI2.4G_ diagram and Appendix B of BLE_ diagram
Band Edge Measurement	15.247(d)	PASS	Appendix E of WIFI2.4G_ diagram and Appendix E of BLE_ diagram
Maximum Power spectral density	15.247(e)	PASS	Appendix D of WIFI2.4G_ diagram and Appendix D of BLE_ diagram
Spurious RF Conducted Emissions	15.247(d)	PASS	Appendix F of WIFI2.4G_ diagram and Appendix F of BLE_ diagram
Antenna Requirement	15.203	PASS	See note 1

Note 1: According to 15.203, it is considered sufficient to comply with the provisions of this section.

5. Measurement procedure

5.1 Conducted Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was setup according to ANSI C63.10, 2013 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

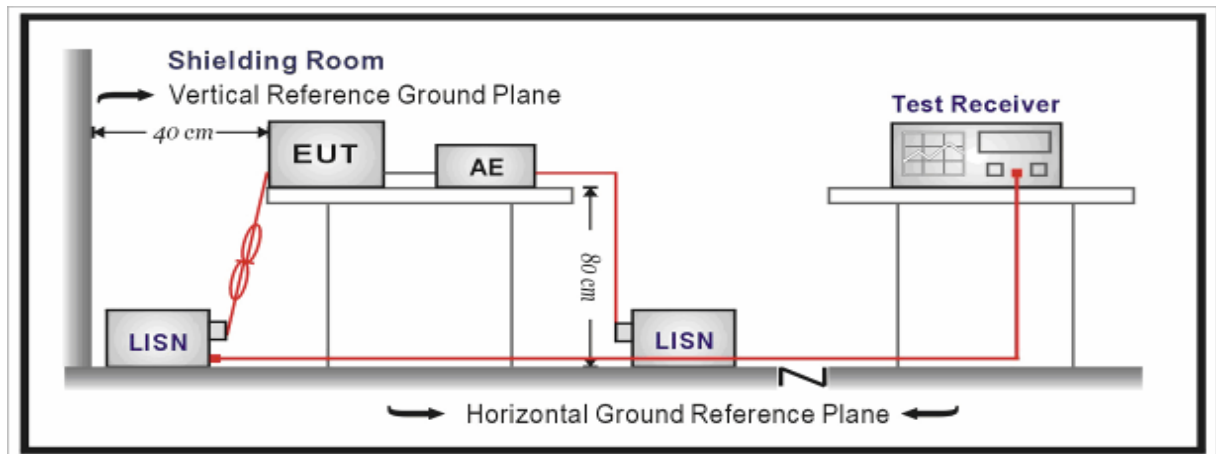
Limits:

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Test Setup:



Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Level = Reading + Factor.

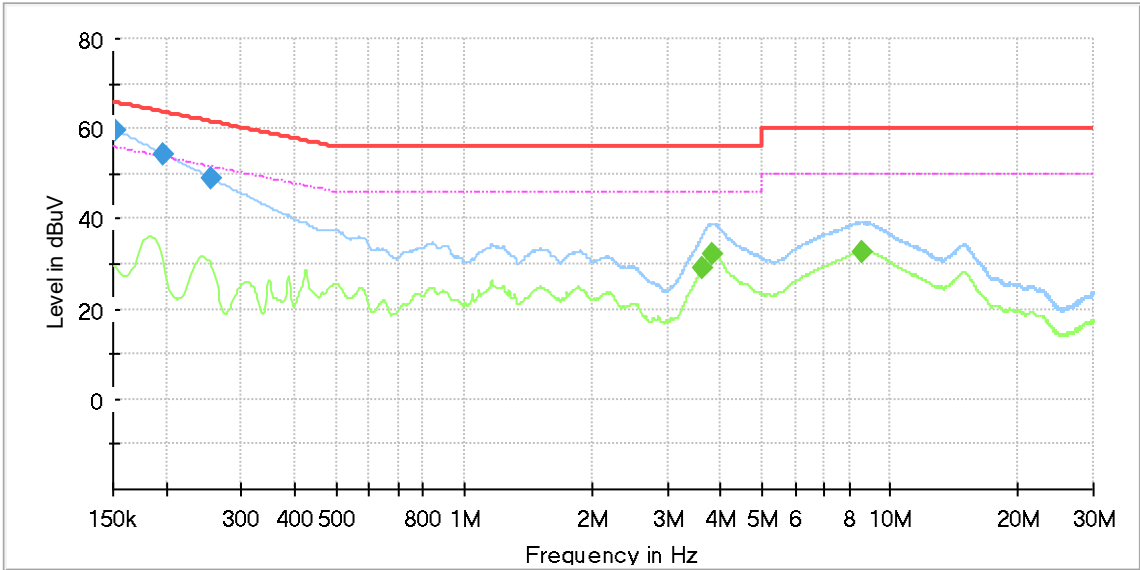
Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 3.12$ dB.

During the test, the Conducted Emission from 150kHz to 30MHz was performed in all modes with all channels, and all antennas. 802.11ax20, Channel 1, Antenna1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

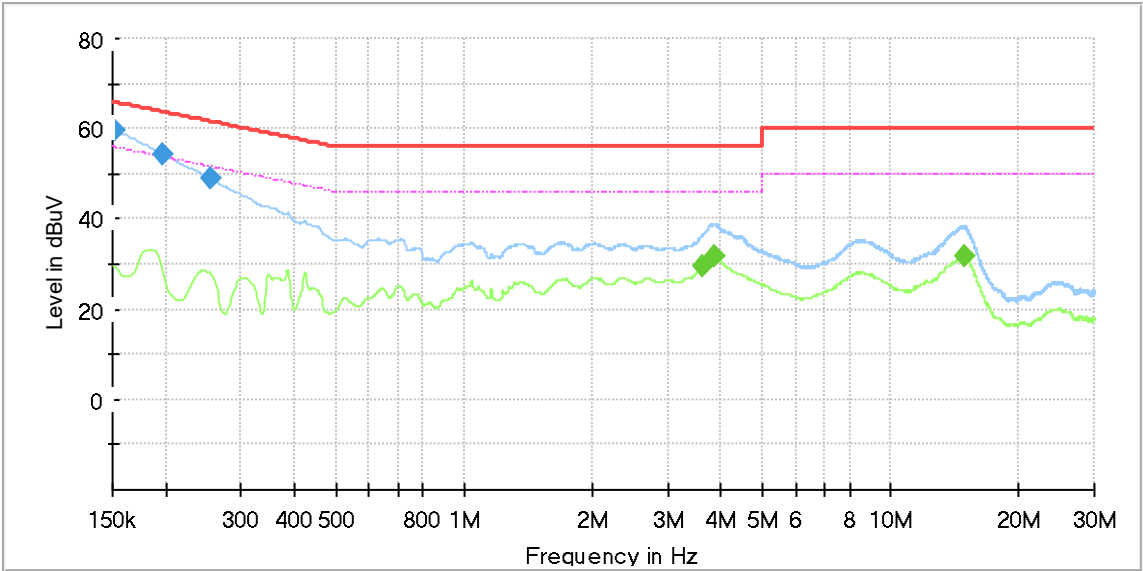
Power Line	L
Test channel	Worst-Case

Suspected List							
Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
0.152	19.5	40.1	59.6	65.9	6.3	QP	PASS
0.197	19.5	34.9	54.4	63.7	9.3	QP	PASS
0.256	19.4	29.7	49.1	61.6	12.5	QP	PASS
3.602	19.5	9.5	29.0	46.0	17.0	AV	PASS
3.811	19.5	12.9	32.4	46.0	13.6	AV	PASS
8.610	19.6	13.3	32.9	50.0	17.1	AV	PASS



Power Line	N
Test channel	Worst-Case

Suspected List							
Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
0.152	19.5	40.1	59.6	65.9	6.3	QP	PASS
0.197	19.5	34.8	54.3	63.7	9.4	QP	PASS
0.256	19.4	29.6	49.0	61.6	12.6	QP	PASS
3.602	19.6	9.8	29.4	46.0	16.6	AV	PASS
3.860	19.6	12.3	31.9	46.0	14.1	AV	PASS
14.910	20.1	11.7	31.8	50.0	18.2	AV	PASS



5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was setup and tested according to ANSI C63.10, 2013.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from Antenna to the EUT was 3 meters.

The Antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

Limits:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

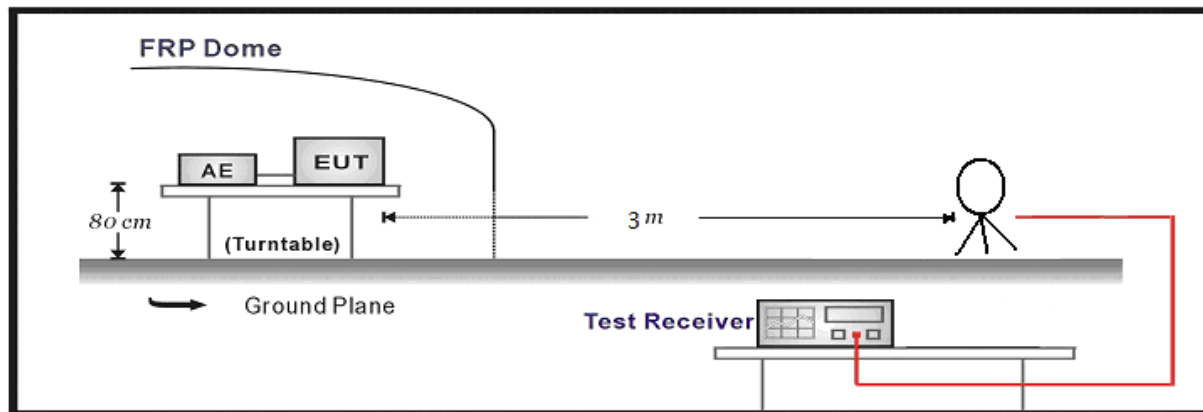
Frequency	Limit ($\mu\text{V/m}$)	Limit ($\text{dB}\mu\text{V/m @3m}$)	Remark
0.009MHz-0.490MHz	2400/F(kHz)@300m	20lg(240000/F(kHz))	Quasi-peak Level
0.490MHz~1.705MHz	24000/F(kHz)@30m	20lg(240000/F(kHz))	Quasi-peak Level
1.705MHz~30.0MHz	30@30m	49.54	Quasi-peak Level
30MHz-88MHz	100@3m	40.0	Quasi-peak Level
88MHz-216MHz	150@3m	43.5	Quasi-peak Level
216MHz-960MHz	200@3m	46.0	Quasi-peak Level
960MHz-1GHz	500@3m	54.0	Quasi-peak Level
Above 1GHz	500@3m	54.0	Average Level
	5000@3m	74.0	Peak Level

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

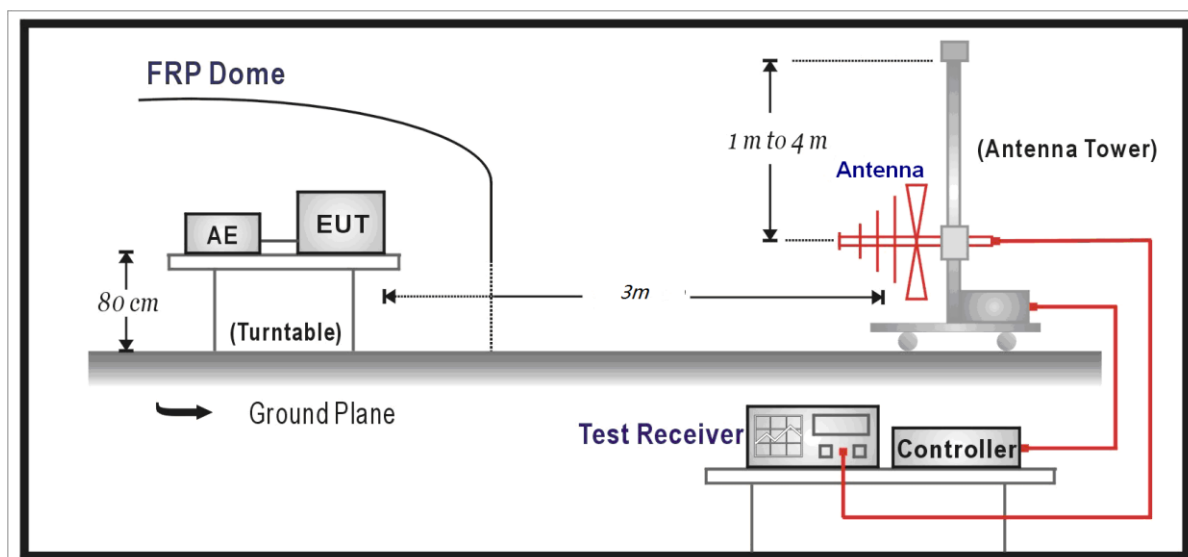
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.
12.57675-12.57725	322-335.4	3600-4400	/
13.36-13.41	/	/	/

Test Setup:

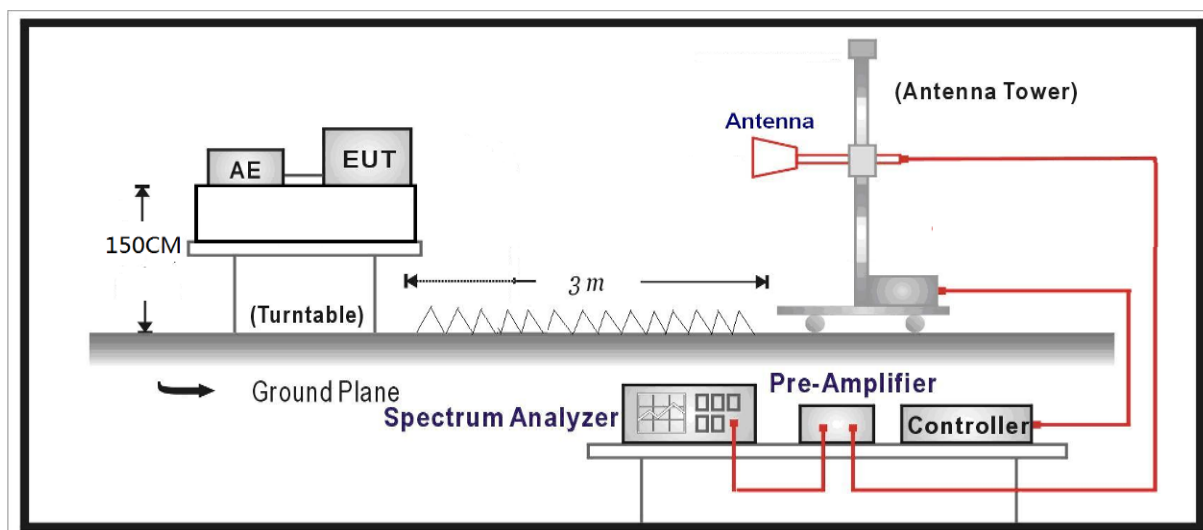
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



Measurement Data:

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

Final Level = Reading - Factor

Factor = Preamplifier Factor – Antenna Factor–Cable Loss

Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test Results:

SPURIOUS EMISSIONS:

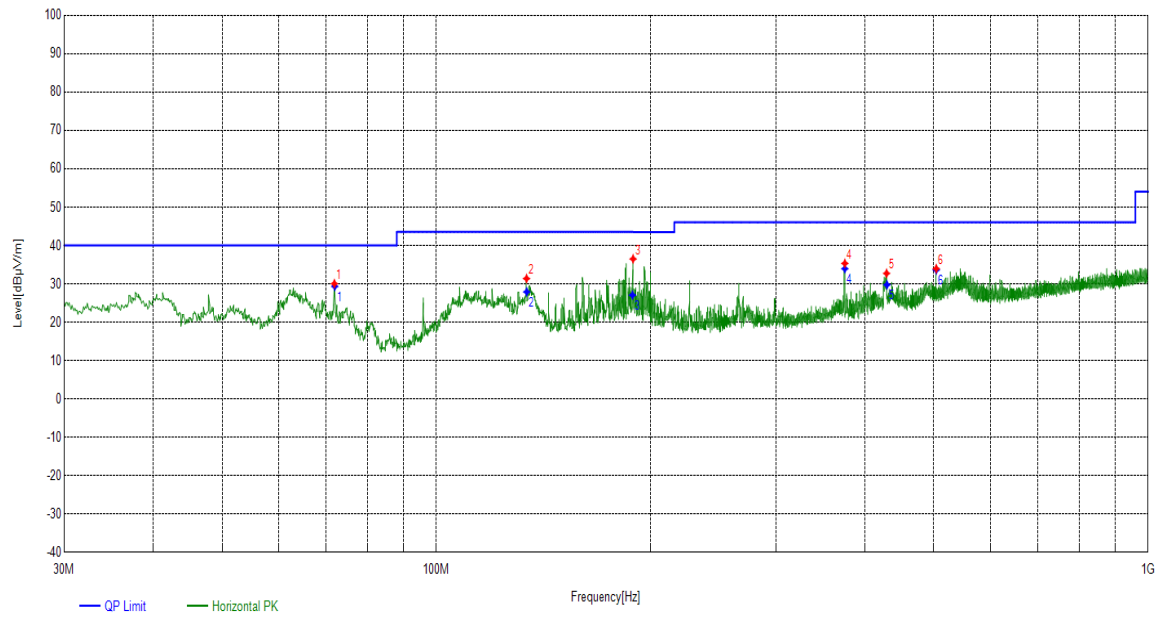
WIFI:

During the test, the Radiates Emission from 9kHz to 40GHz was performed in WIFI all modes with all channels and all antennas. 802.11ax20, Channel 1, Antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
71.9082	Horizontal	17.86	12.17	30.03	40.00	9.97	PK	100	360	PASS
133.8974	Horizontal	19.54	11.82	31.36	43.50	12.14	PK	100	33	PASS
188.9989	Horizontal	18.00	18.48	36.48	43.50	7.02	PK	100	138	PASS
374.9665	Horizontal	23.31	12.00	35.31	46.00	10.69	PK	100	79	PASS
429.1949	Horizontal	24.73	7.98	32.71	46.00	13.29	PK	100	112	PASS
503.9894	Horizontal	26.72	7.23	33.95	46.00	12.05	PK	100	170	PASS

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

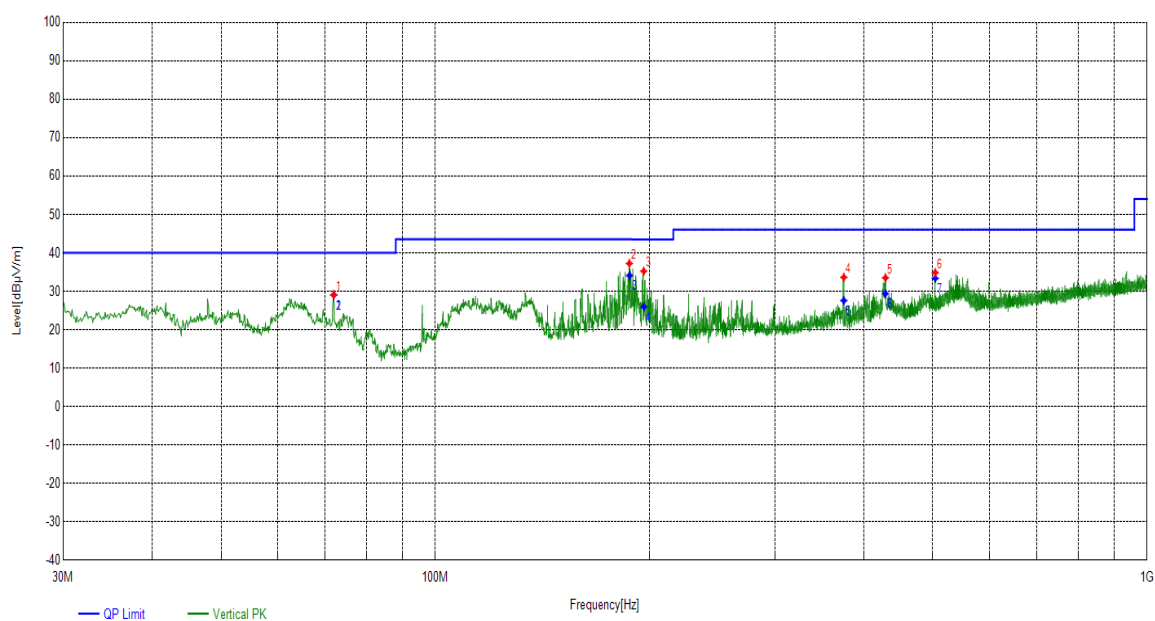
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
71.9988	Horizontal	17.86	29.31	40.00	10.69	230	24	PASS	
133.9671	Horizontal	19.54	27.89	43.51	15.62	120	33	PASS	
188.6023	Horizontal	18.00	27.05	43.50	16.45	110	138	PASS	
374.9774	Horizontal	23.31	33.93	46.01	12.08	170	79	PASS	
429.7228	Horizontal	24.73	29.73	46.01	16.28	50	112	PASS	
503.9749	Horizontal	26.72	33.60	46.01	12.41	210	170	PASS	



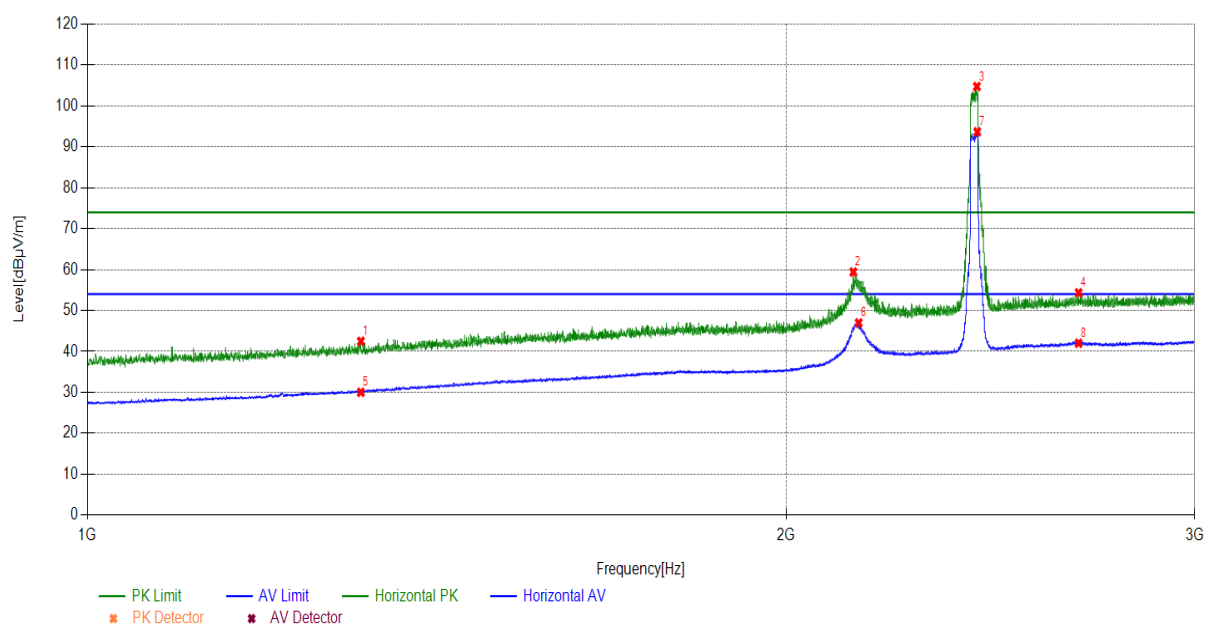
Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
72.0052	Vertical	17.84	11.22	29.06	40.00	10.94	PK	100	72	PASS
187.3497	Vertical	18.25	18.97	37.22	43.50	6.28	PK	100	145	PASS
196.2746	Vertical	17.53	17.69	35.22	43.50	8.28	PK	100	138	PASS
374.9665	Vertical	23.31	10.32	33.63	46.01	12.38	PK	100	99	PASS
429.0009	Vertical	24.73	8.76	33.49	46.01	12.52	PK	100	106	PASS
503.9894	Vertical	26.72	8.12	34.84	46.01	11.17	PK	100	184	PASS

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
72.0031	Vertical	17.84	29.01	40.00	10.99	30	72	PASS	
187.4853	Vertical	18.25	34.10	43.50	9.40	110	145	PASS	
196.4535	Vertical	17.53	25.94	43.50	17.56	70	138	PASS	
374.9394	Vertical	23.31	27.58	46.01	18.43	130	99	PASS	
429.0133	Vertical	24.73	29.36	46.01	16.65	200	106	PASS	
503.9749	Vertical	26.72	33.36	46.01	12.65	120	184	PASS	

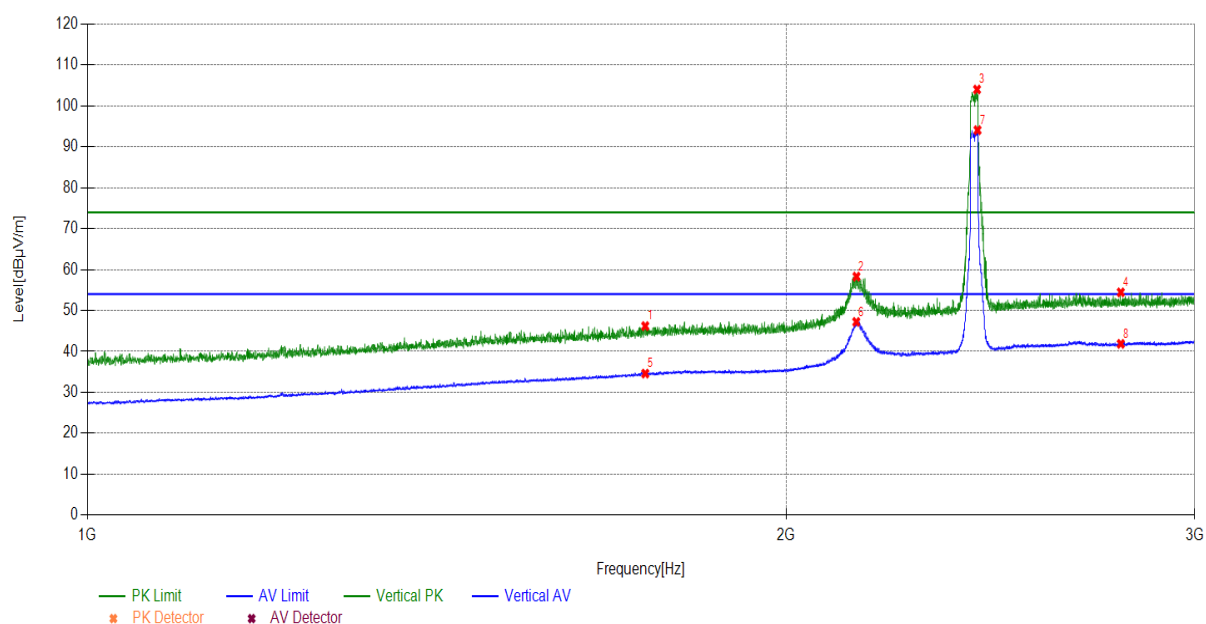


Radiates Emission		1G~3G							
Test channel		Worst-Case							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
1311.6312	28.98	13.51	42.49	74.00	31.51	PK	150	358	PASS
2138.1138	34.79	24.63	59.42	74.00	14.58	PK	150	280	PASS
2416.9417	37.41	67.31	104.72	74.00	-30.72	PK	150	97	---
2673.7674	38.41	15.93	54.34	74.00	19.66	PK	150	195	PASS
1311.6312	28.98	1.06	30.04	54.00	23.96	AV	150	182	PASS
2149.515	34.93	12.05	46.98	54.00	7.02	AV	150	280	PASS
2417.9418	37.42	56.24	93.66	54.00	-39.66	AV	150	97	---
2673.7674	38.41	3.62	42.03	54.00	11.97	AV	150	195	PASS



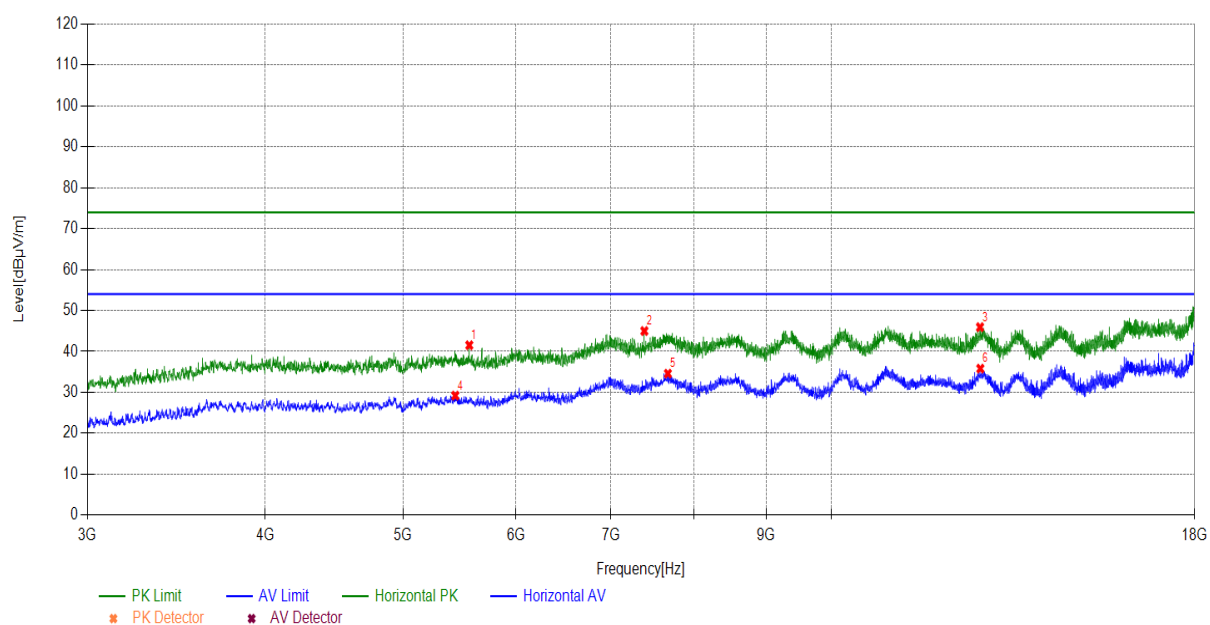
Note: The signal beyond the limit is carrier

Radiates Emission		1G~3G							
Test channel		Worst-Case							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
1739.2739	32.56	13.65	46.21	74.00	27.79	PK	150	183	PASS
2144.7145	34.87	23.42	58.29	74.00	15.71	PK	150	281	PASS
2417.3417	37.41	66.59	104.00	74.00	-30.00	PK	150	98	---
2787.9788	38.75	15.69	54.44	74.00	19.56	PK	150	55	PASS
1739.2739	32.56	2.04	34.60	54.00	19.40	AV	150	254	PASS
2144.3144	34.86	12.36	47.22	54.00	6.78	AV	150	281	PASS
2418.5419	37.42	56.65	94.07	54.00	-40.07	AV	150	98	---
2787.9788	38.75	3.12	41.87	54.00	12.13	AV	150	359	PASS



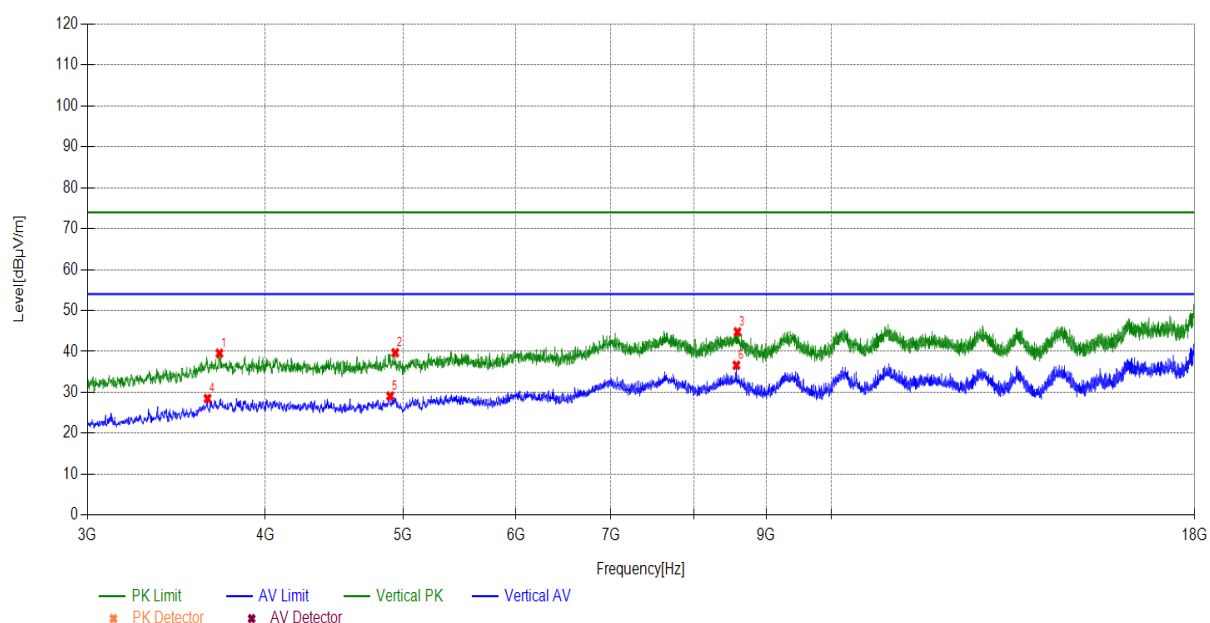
Note: The signal beyond the limit is carrier

Radiates Emission		3G~18G							
Test channel		Worst-Case							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
5565.2565	3.05	38.48	41.53	74.00	32.47	PK	150	150	PASS
7387.9388	8.24	36.76	45.00	74.00	29.00	PK	150	140	PASS
12717.9718	12.53	33.42	45.95	74.00	28.05	PK	150	100	PASS
5440.7441	2.61	26.61	29.22	54.00	24.78	AV	150	10	PASS
7674.4674	8.38	26.21	34.59	54.00	19.41	AV	150	10	PASS
12723.9724	12.55	23.27	35.82	54.00	18.18	AV	150	10	PASS



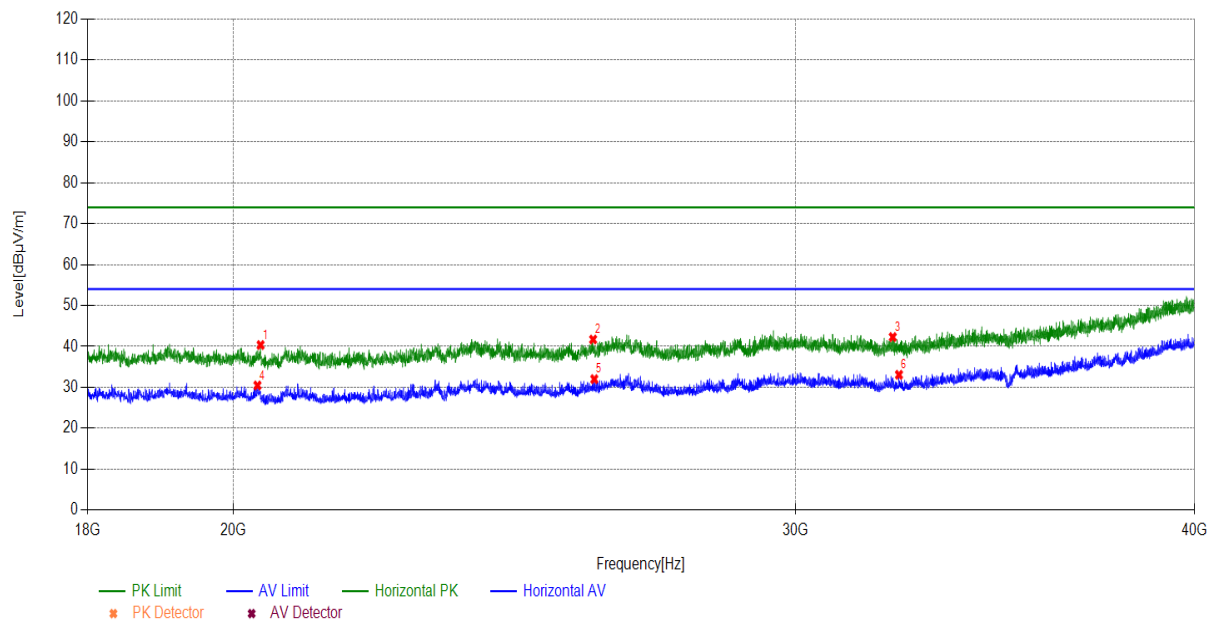
Note: The signal beyond the limit is carrier

Radiates Emission		3G~18G							
Test channel		Worst-Case							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3714.0714	-0.67	40.23	39.56	74.00	34.44	PK	150	220	PASS
4936.6937	1.19	38.49	39.68	74.00	34.32	PK	150	60	PASS
8589.559	9.18	35.59	44.77	74.00	29.23	PK	150	290	PASS
3643.5644	-0.77	29.28	28.51	54.00	25.49	AV	150	10	PASS
4896.1896	1.01	28.11	29.12	54.00	24.88	AV	150	10	PASS
8574.5575	9.17	27.47	36.64	54.00	17.36	AV	150	10	PASS

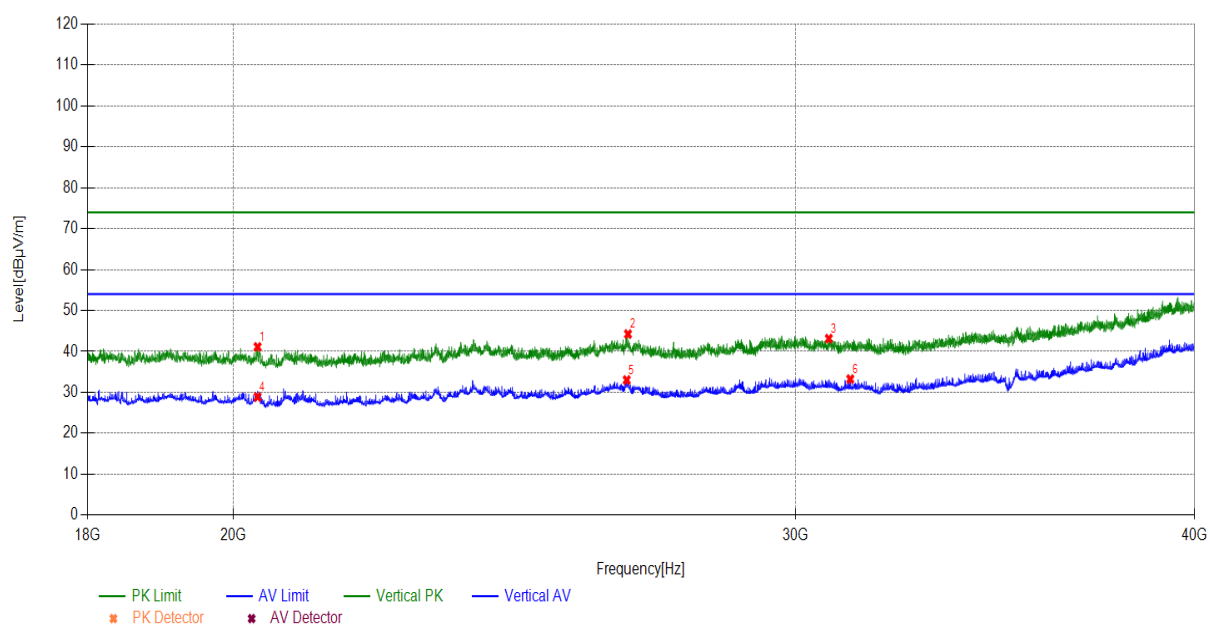


Note: The signal beyond the limit is carrier

Radiates Emission		18G~40G							
Test channel		Worst-Case							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
20393.8394	1.44	38.92	40.36	74.00	33.64	PK	150	20	PASS
25920.7921	4.47	37.24	41.71	74.00	32.29	PK	150	40	PASS
32173.8174	5.97	36.34	42.31	74.00	31.69	PK	150	110	PASS
20347.6348	1.42	29.06	30.48	54.00	23.52	AV	150	10	PASS
25942.7943	4.48	27.55	32.03	54.00	21.97	AV	150	130	PASS
32319.0319	6.03	27.06	33.09	54.00	20.91	AV	150	70	PASS



Radiates Emission		18G~40G							
Test channel		Worst-Case							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
20349.835	1.42	39.69	41.11	74.00	32.89	PK	150	180	PASS
26580.8581	4.73	39.53	44.26	74.00	29.74	PK	150	130	PASS
30723.8724	6.37	36.77	43.14	74.00	30.86	PK	150	90	PASS
20349.835	1.42	27.47	28.89	54.00	25.11	AV	150	120	PASS
26556.6557	4.72	28.31	33.03	54.00	20.97	AV	150	10	PASS
31203.5204	6.18	27.07	33.25	54.00	20.75	AV	150	10	PASS



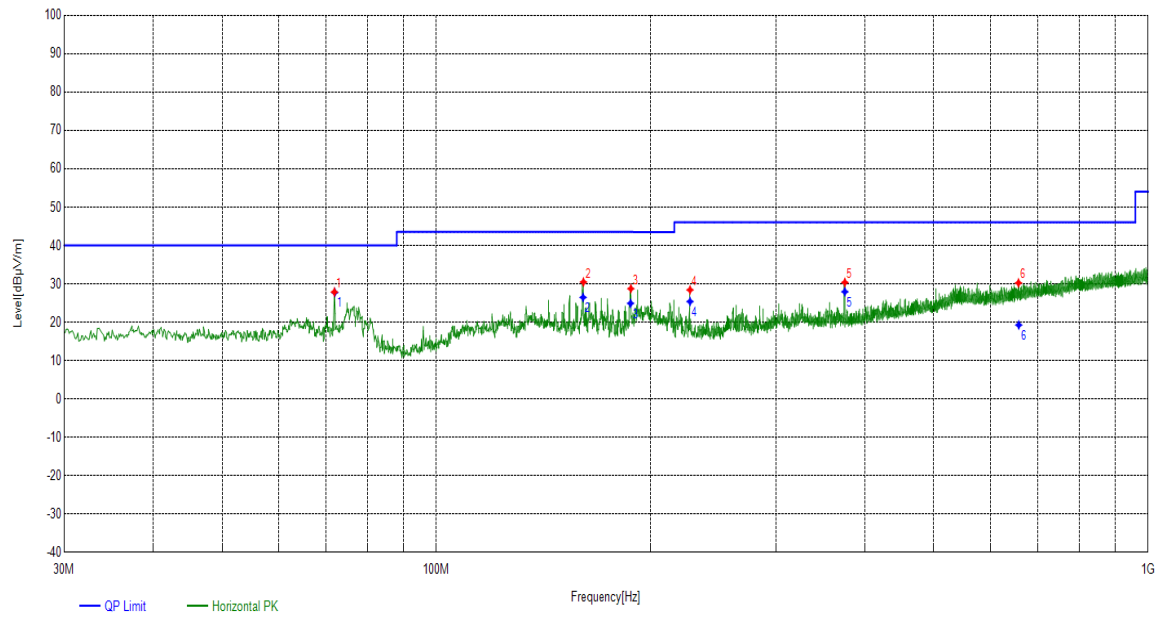
Bluetooth(Low Energy):

During the test, the Radiates Emission from 9kHz to 40GHz was performed in Bluetooth(Low Energy) all modes with all channels and all antennas. BLE(2Mbps), channel 0, antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
71.9082	Horizontal	17.86	9.99	27.85	40.00	12.15	PK	100	167	PASS
160.9631	Horizontal	20.83	9.62	30.45	43.50	13.05	PK	100	67	PASS
187.6408	Horizontal	18.21	10.52	28.73	43.50	14.77	PK	100	140	PASS
227.2207	Horizontal	18.45	9.96	28.41	46.00	17.59	PK	100	160	PASS
374.9665	Horizontal	23.31	7.05	30.36	46.00	15.64	PK	100	87	PASS
657.5558	Horizontal	29.67	0.55	30.22	46.00	15.78	PK	100	317	PASS

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

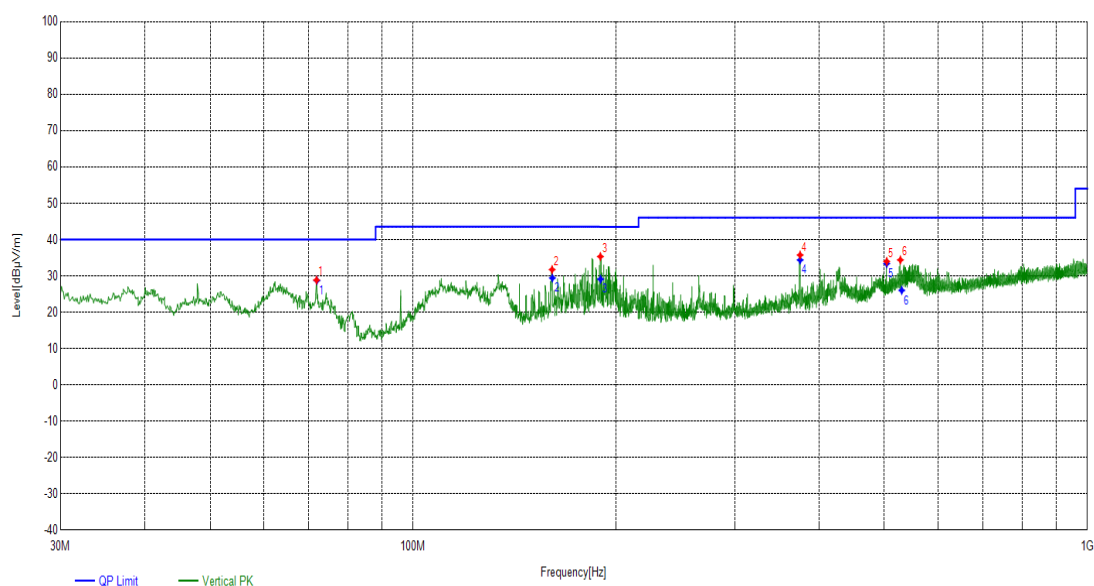
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
72.0019	Horizontal	17.86	27.73	40.00	12.27	175	167	PASS	
160.7744	Horizontal	20.83	26.46	43.51	17.05	155	67	PASS	
187.4534	Horizontal	18.21	24.91	43.50	18.59	155	140	PASS	
227.2371	Horizontal	18.45	25.38	46.02	20.64	155	160	PASS	
374.9991	Horizontal	23.31	27.93	46.01	18.08	187	87	PASS	
658.2124	Horizontal	29.67	19.26	46.01	26.75	124	317	PASS	



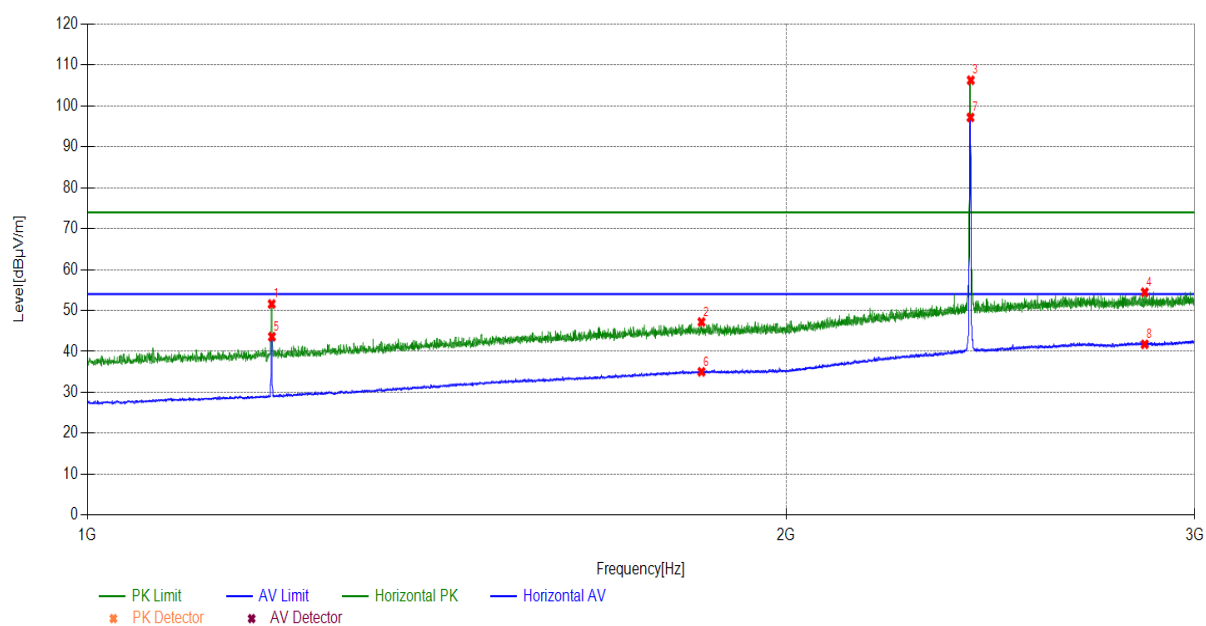
Radiates Emission			9k~1G							
Test channel			Worst-Case							
Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
71.9082	Vertical	17.86	10.97	28.83	40.00	11.17	PK	100	47	PASS
160.7691	Vertical	20.84	10.88	31.72	43.51	11.79	PK	100	145	PASS
189.581	Vertical	17.92	17.39	35.31	43.50	8.19	PK	100	145	PASS
374.9665	Vertical	23.31	12.41	35.72	46.01	10.29	PK	100	60	PASS
503.9894	Vertical	26.72	7.25	33.97	46.01	12.04	PK	100	184	PASS
528.0478	Vertical	27.23	7.14	34.37	46.01	11.64	PK	100	164	PASS

Note: 9kHz~30MHz have been test and test data more than 20dB margin.

Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
72.0092	Vertical	17.86	28.71	40.00	11.29	120	47	PASS	
160.9064	Vertical	20.84	29.40	43.51	14.11	110	145	PASS	
189.6935	Vertical	17.92	29.08	43.50	14.42	90	145	PASS	
374.9882	Vertical	23.31	34.36	46.01	11.65	30	60	PASS	
503.9676	Vertical	26.72	33.37	46.01	12.64	160	184	PASS	
530.5696	Vertical	27.23	26.00	46.01	20.01	210	164	PASS	

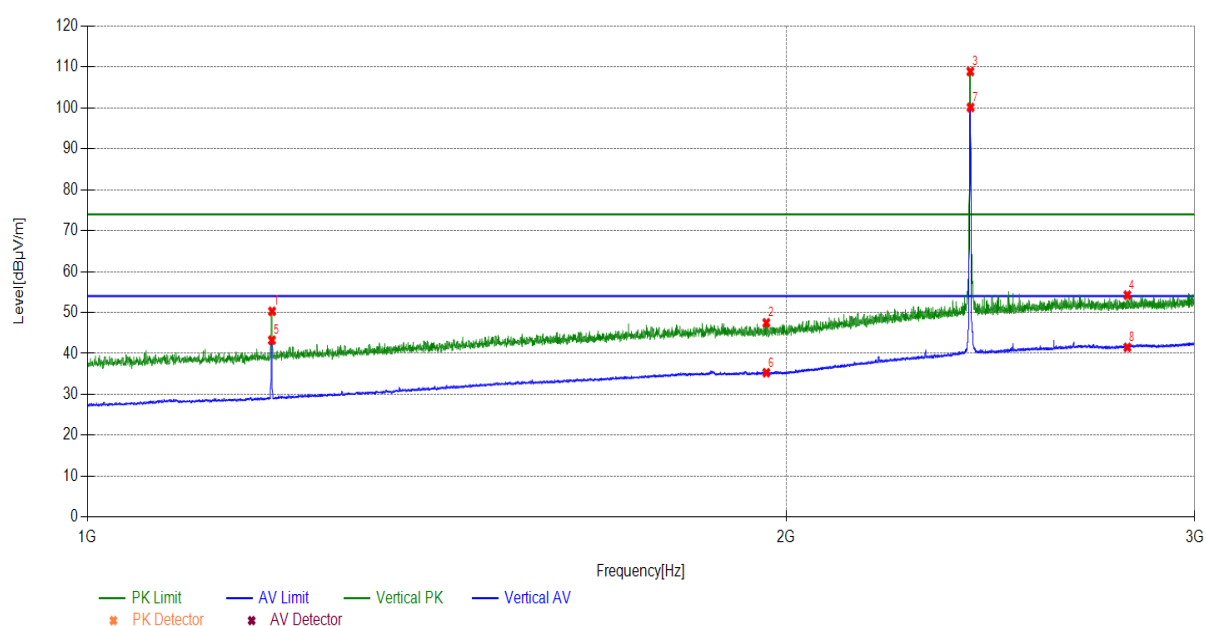


Radiates Emission		1G~3G							
Test channel		Worst-Case							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
1200.6201	27.92	23.69	51.61	74.00	22.39	PK	150	56	PASS
1839.0839	33.04	14.16	47.20	74.00	26.80	PK	150	42	PASS
2402.3402	37.34	68.92	106.26	74.00	-32.26	PK	150	84	---
2854.9855	38.97	15.50	54.47	74.00	19.53	PK	150	169	PASS
1200.8201	27.92	15.68	43.60	54.00	10.40	AV	150	70	PASS
1839.0839	33.04	1.99	35.03	54.00	18.97	AV	150	311	PASS
2401.7402	37.34	59.84	97.18	54.00	-43.18	AV	150	99	---
2854.9855	38.97	2.78	41.75	54.00	12.25	AV	150	169	PASS



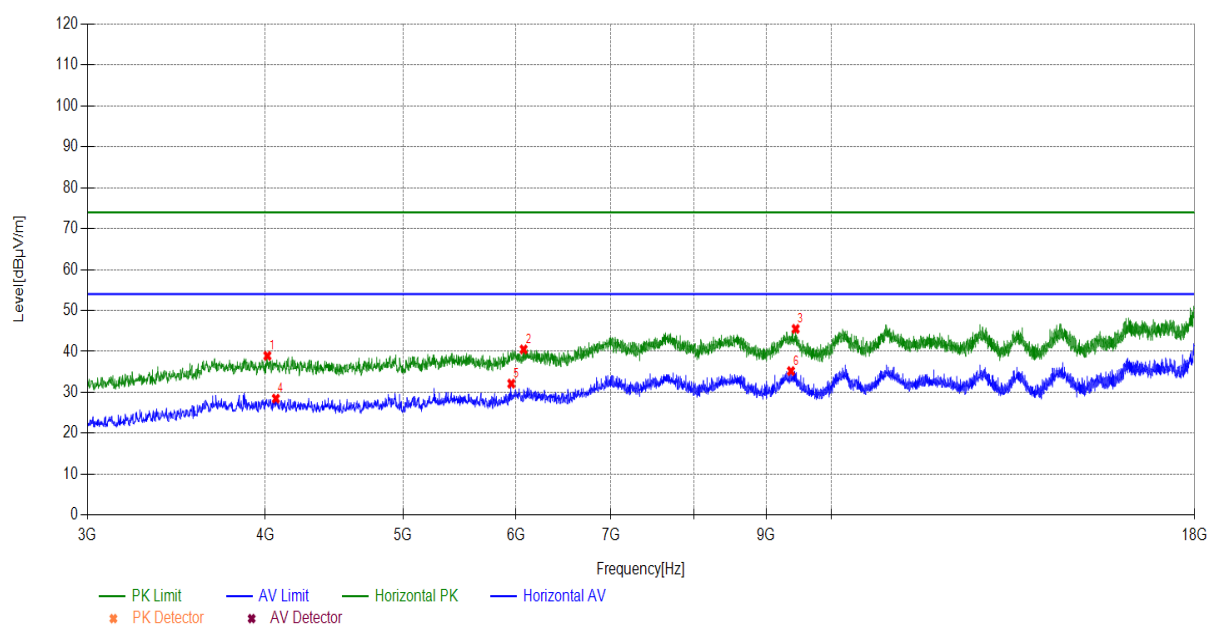
Note: The signal beyond the limit is carrier

Radiates Emission		1G~3G							
Test channel		Worst-Case							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
1201.0201	27.92	22.38	50.30	74.00	23.70	PK	150	161	PASS
1961.2961	33.09	14.41	47.50	74.00	26.50	PK	150	246	PASS
2401.3401	37.34	71.55	108.89	74.00	-34.89	PK	150	119	---
2806.1806	38.81	15.46	54.27	74.00	19.73	PK	150	302	PASS
1200.8201	27.92	15.32	43.24	54.00	10.76	AV	150	161	PASS
1961.2961	33.09	2.20	35.29	54.00	18.71	AV	150	218	PASS
2401.7402	37.34	62.77	100.11	54.00	-46.11	AV	150	218	---
2806.1806	38.81	2.68	41.49	54.00	12.51	AV	150	218	PASS

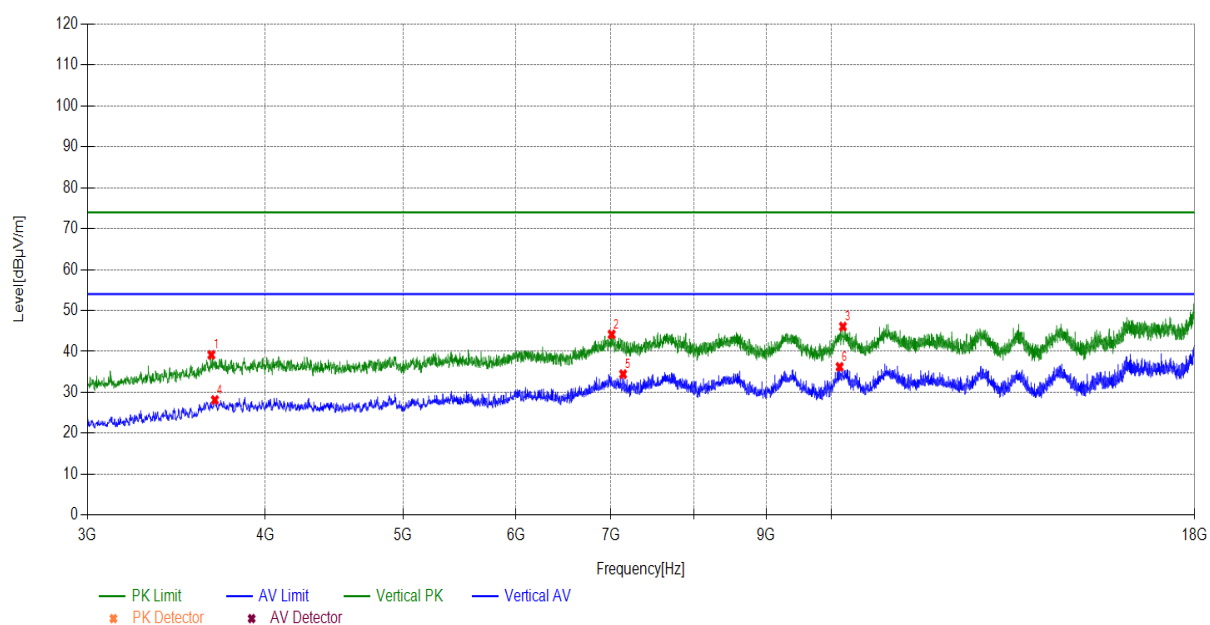


Note: The signal beyond the limit is carrier

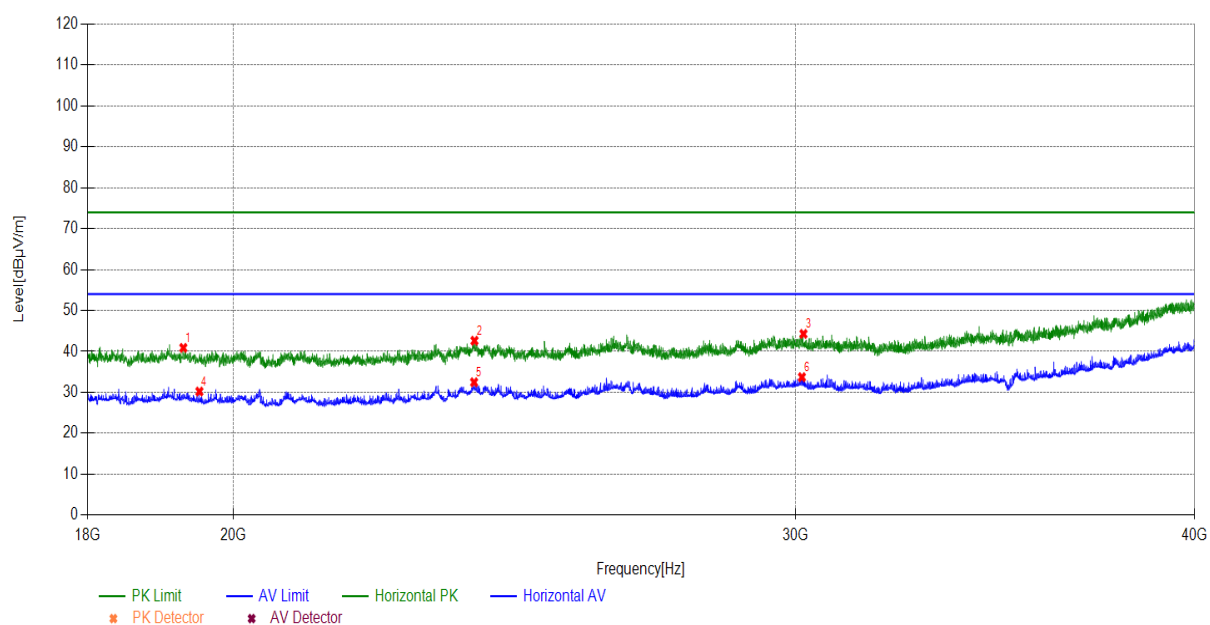
Radiates Emission		3G~18G							
Test channel		Worst-Case							
polarization		Horizontal							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
4014.1014	-0.15	39.10	38.95	74.00	35.05	PK	150	110	PASS
6076.8077	5.01	35.50	40.51	74.00	33.49	PK	150	360	PASS
9437.1437	11.18	34.34	45.52	74.00	28.48	PK	150	90	PASS
4069.607	-0.21	28.70	28.49	54.00	25.51	AV	150	10	PASS
5956.7957	4.78	27.37	32.15	54.00	21.85	AV	150	30	PASS
9366.6367	10.89	24.33	35.22	54.00	18.78	AV	150	10	PASS



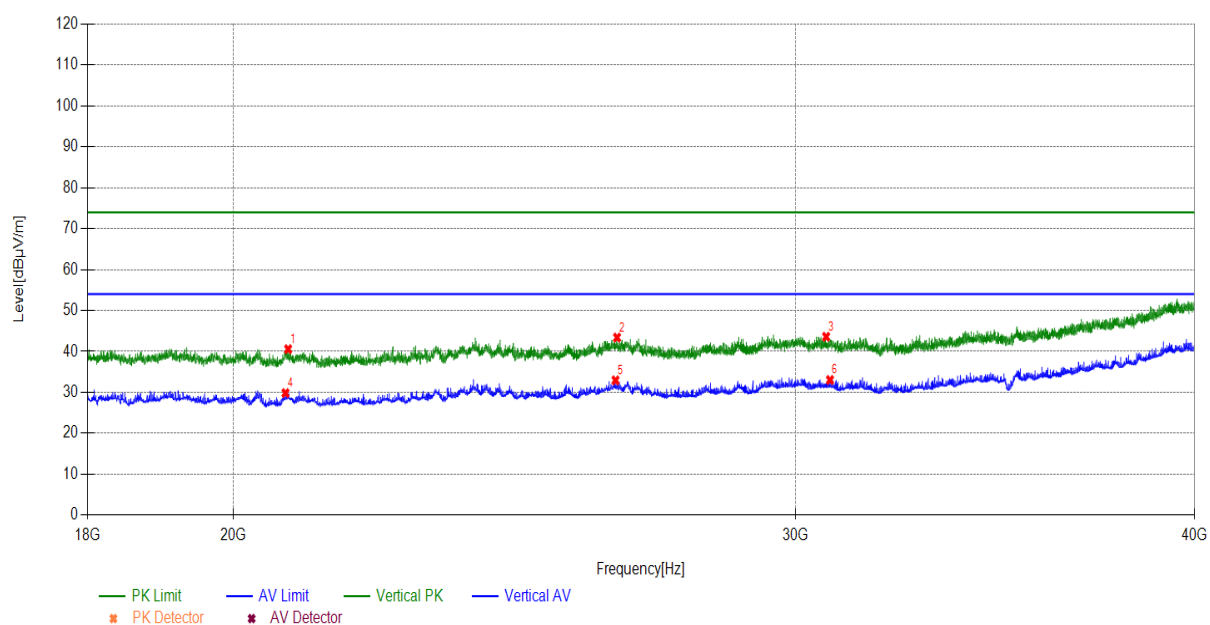
Radiates Emission		3G~18G							
Test channel		Worst-Case							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
3666.0666	-0.74	39.91	39.17	74.00	34.83	PK	150	340	PASS
7006.9007	8.01	36.16	44.17	74.00	29.83	PK	150	70	PASS
10187.2187	11.76	34.33	46.09	74.00	27.91	PK	150	220	PASS
3687.0687	-0.71	28.86	28.15	54.00	25.85	AV	150	110	PASS
7137.4137	8.05	26.41	34.46	54.00	19.54	AV	150	70	PASS
10133.2133	11.69	24.55	36.24	54.00	17.76	AV	150	10	PASS



Radiates Emission		18G~40G							
Test channel		Worst-Case							
polarization		Horizontal							
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
19289.3289	1.34	39.54	40.88	74.00	33.12	PK	150	80	PASS
23795.3795	3.54	39.10	42.64	74.00	31.36	PK	150	310	PASS
30167.2167	6.62	37.67	44.29	74.00	29.71	PK	150	210	PASS
19513.7514	1.32	28.91	30.23	54.00	23.77	AV	150	70	PASS
23788.7789	3.53	28.94	32.47	54.00	21.53	AV	150	40	PASS
30134.2134	6.64	27.09	33.73	54.00	20.27	AV	150	220	PASS



Radiates Emission		18G~40G							
Test channel		Worst-Case							
polarization		Vertical							
Suspected List									
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
20803.0803	1.58	38.99	40.57	74.00	33.43	PK	150	180	PASS
26371.8372	4.65	38.76	43.41	74.00	30.59	PK	150	330	PASS
30664.4664	6.40	37.21	43.61	74.00	30.39	PK	150	90	PASS
20763.4763	1.57	28.28	29.85	54.00	24.15	AV	150	220	PASS
26343.2343	4.64	28.31	32.95	54.00	21.05	AV	150	170	PASS
30750.275	6.36	26.69	33.05	54.00	20.95	AV	150	40	PASS

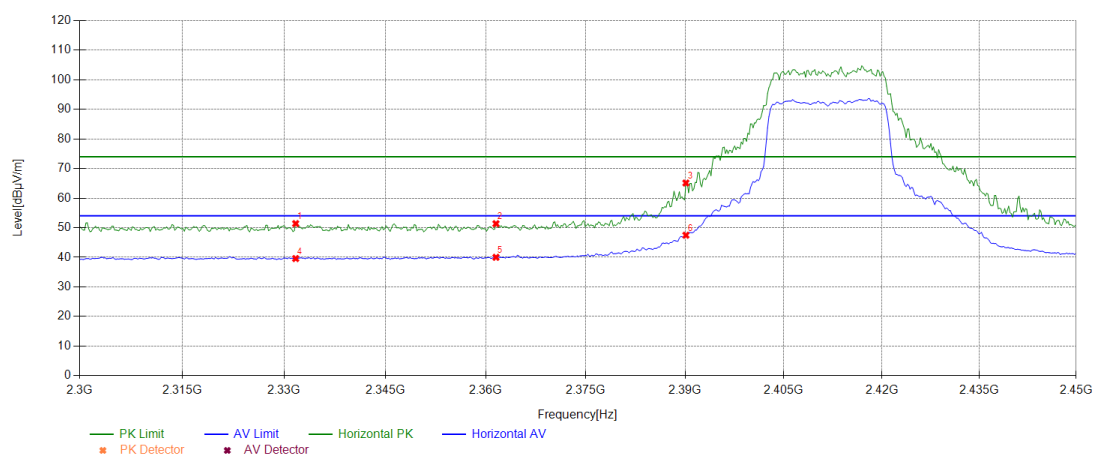


Band Edge:

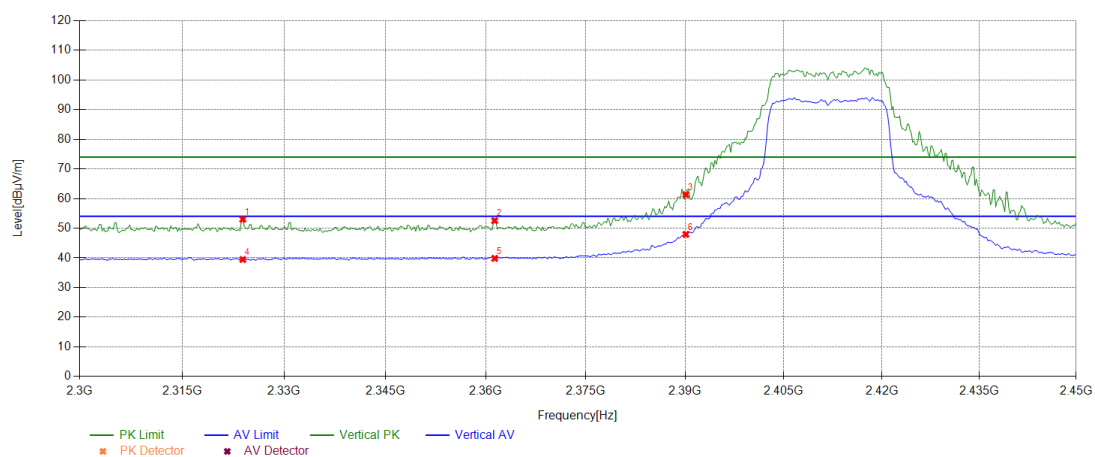
During the test, the Band Edge was performed in WIFI all modes with all channels and all antennas.

802.11ax20, Antenna1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

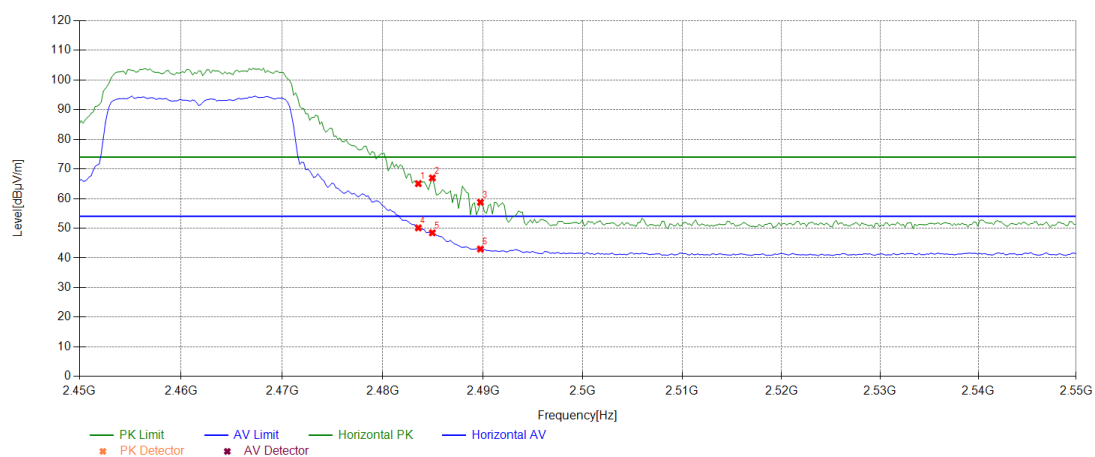
Test mode			802.11ax20						
Test channel			Lowest channel						
polarization			Horizontal						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2331.7332	36.72	14.68	51.40	74.00	22.60	PK	150	322	PASS
2361.5362	36.99	14.37	51.36	74.00	22.64	PK	150	40	PASS
2390.139	37.24	27.88	65.12	74.00	8.88	PK	150	139	PASS
2331.7332	36.72	2.86	39.58	54.00	14.42	AV	150	12	PASS
2361.5362	36.99	3.03	40.02	54.00	13.98	AV	150	358	PASS
2390.139	37.24	10.23	47.47	54.00	6.53	AV	150	97	PASS



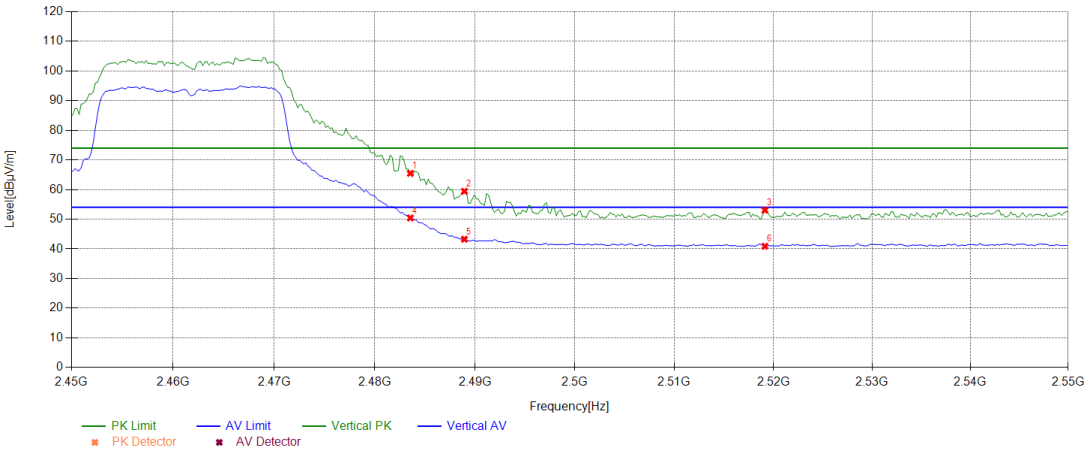
Test mode			802.11ax20						
Test channel			Lowest channel						
polarization			Vertical						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2323.9324	36.65	16.37	53.02	74.00	20.98	PK	150	55	PASS
2361.3361	36.99	15.57	52.56	74.00	21.44	PK	150	359	PASS
2390.139	37.24	24.06	61.30	74.00	12.70	PK	150	140	PASS
2323.9324	36.65	2.81	39.46	54.00	14.54	AV	150	55	PASS
2361.3361	36.99	2.86	39.85	54.00	14.15	AV	150	41	PASS
2390.139	37.24	10.67	47.91	54.00	6.09	AV	150	98	PASS



Test mode			802.11ax20						
Test channel			Highest channel						
polarization			Horizontal						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.72	27.31	65.03	74.00	8.97	PK	150	42	PASS
2484.9485	37.73	29.24	66.97	74.00	7.03	PK	150	57	PASS
2489.749	37.75	21.01	58.76	74.00	15.24	PK	150	57	PASS
2483.5484	37.72	12.40	50.12	54.00	3.88	AV	150	57	PASS
2484.9485	37.73	10.73	48.46	54.00	5.54	AV	150	226	PASS
2489.749	37.75	5.23	42.98	54.00	11.02	AV	150	57	PASS

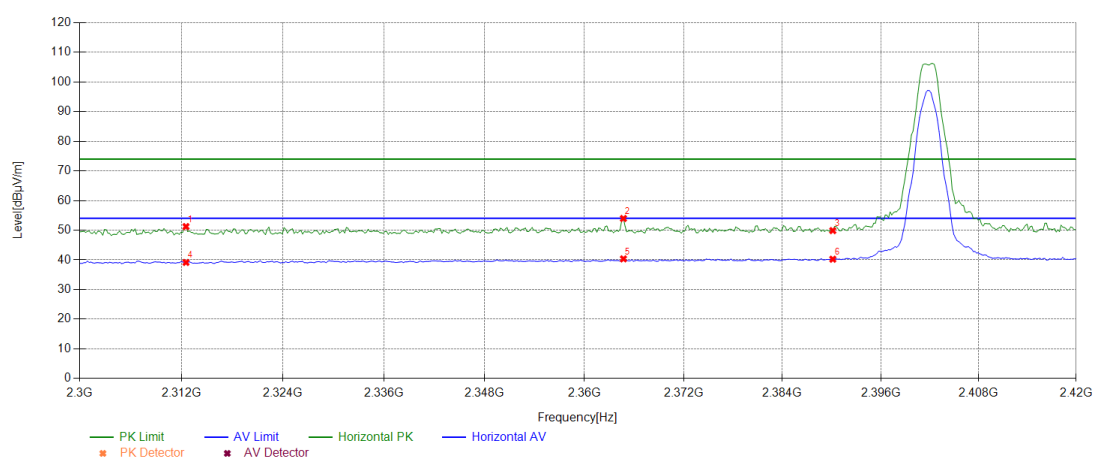


Test mode			802.11ax20						
Test channel			Highest channel						
polarization			Vertical						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.72	27.76	65.48	74.00	8.52	PK	150	68	PASS
2488.9489	37.74	21.68	59.42	74.00	14.58	PK	150	350	PASS
2519.1519	37.87	15.18	53.05	74.00	20.95	PK	150	40	PASS
2483.5484	37.72	12.72	50.44	54.00	3.56	AV	150	223	PASS
2488.9489	37.74	5.53	43.27	54.00	10.73	AV	150	237	PASS
2519.1519	37.87	3.02	40.89	54.00	13.11	AV	150	237	PASS

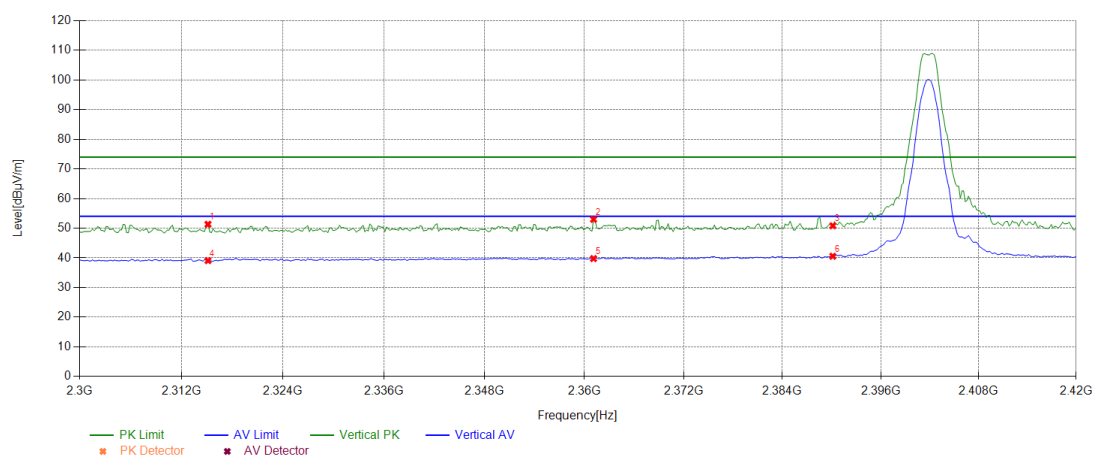


During the test, the Band Edge was performed in BLE all modes with all channels and all antennas. BLE(2Mbps), Antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

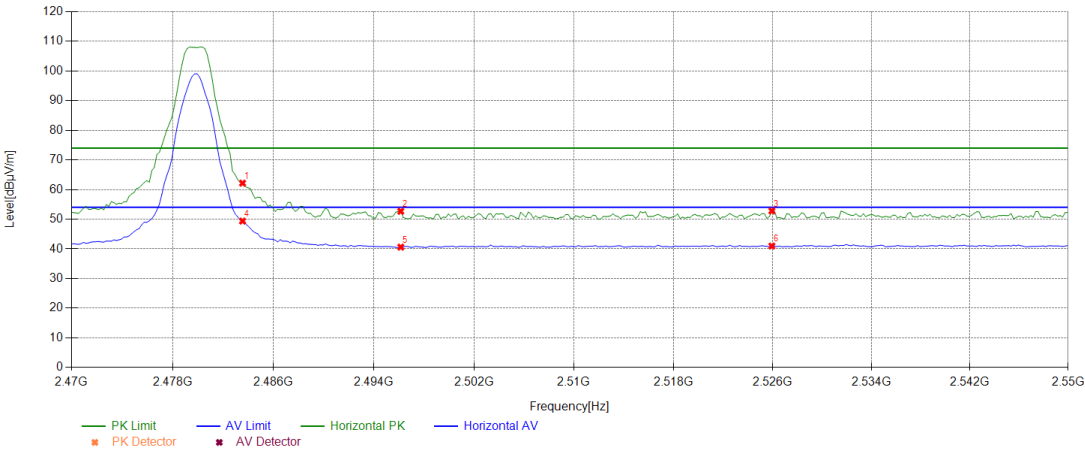
Test mode			BLE(2Mbps)						
Test channel			Lowest channel						
polarization			Horizontal						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2312.5313	36.55	14.68	51.23	74.00	22.77	PK	150	3	PASS
2364.7365	37.02	16.94	53.96	74.00	20.04	PK	150	99	PASS
2390.139	37.24	12.64	49.88	74.00	24.12	PK	150	296	PASS
2312.5313	36.55	2.59	39.14	54.00	14.86	AV	150	14	PASS
2364.7365	37.02	3.34	40.36	54.00	13.64	AV	150	240	PASS
2390.139	37.24	2.99	40.23	54.00	13.77	AV	150	28	PASS



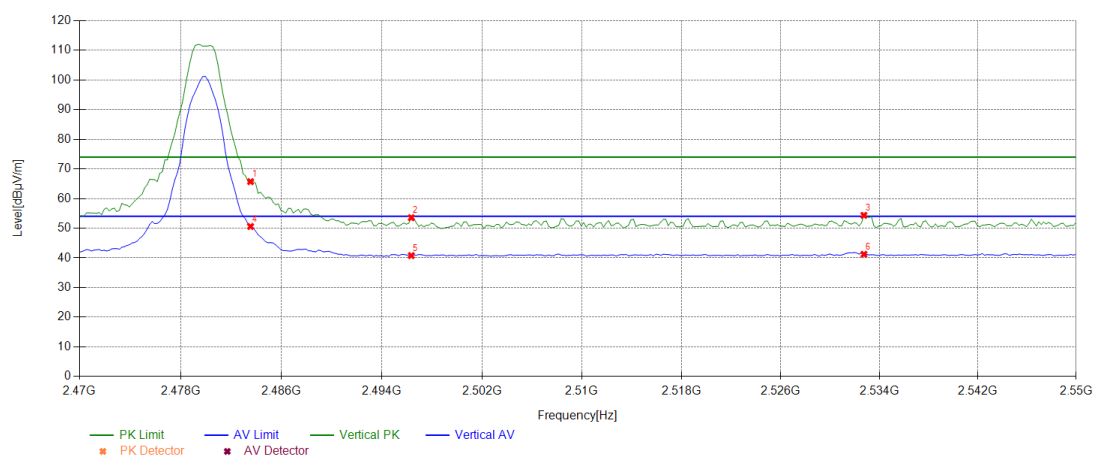
Test mode		BLE(2Mbps)							
Test channel		Lowest channel							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2315.1315	36.57	14.76	51.33	74.00	22.67	PK	150	147	PASS
2361.1361	36.98	16.02	53.00	74.00	21.00	PK	150	76	PASS
2390.139	37.24	13.59	50.83	74.00	23.17	PK	150	218	PASS
2315.1315	36.57	2.52	39.09	54.00	14.91	AV	150	176	PASS
2361.1361	36.98	2.80	39.78	54.00	14.22	AV	150	204	PASS
2390.139	37.24	3.32	40.56	54.00	13.44	AV	150	302	PASS



Test mode			BLE(2Mbps)						
Test channel			Highest channel						
polarization			Horizontal						
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.72	24.45	62.17	74.00	11.83	PK	150	318	PASS
2496.1496	37.78	14.91	52.69	74.00	21.31	PK	150	90	PASS
2525.9526	37.90	14.89	52.79	74.00	21.21	PK	150	133	PASS
2483.5484	37.72	11.67	49.39	54.00	4.61	AV	150	318	PASS
2496.1496	37.78	2.82	40.60	54.00	13.40	AV	150	318	PASS
2525.9526	37.90	3.07	40.97	54.00	13.03	AV	150	104	PASS



Test mode		BLE(2Mbps)							
Test channel		Highest channel							
polarization		Vertical							
Suspected List									
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.72	28.00	65.72	74.00	8.28	PK	150	128	PASS
2496.3496	37.78	15.78	53.56	74.00	20.44	PK	150	360	PASS
2532.7533	37.92	16.42	54.34	74.00	19.66	PK	150	128	PASS
2483.5484	37.72	12.89	50.61	54.00	3.39	AV	150	128	PASS
2496.3496	37.78	2.99	40.77	54.00	13.23	AV	150	128	PASS
2532.7533	37.92	3.29	41.21	54.00	12.79	AV	150	143	PASS



5.3 Maximum conducted output power

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was tested according to DTS test procedure of ANSI C63.10 for compliance to FCC 47CFR 15.247 requirements. The maximum conducted output power using ANSI C63.10 section 11.9.2.3 AVGPM Average power meter method.

1. Power meter and sensor's minimum video bandwidth is 50MHz, larger than 802.11n(40MHz) bandwidth;
2. Fast responding diode sensors respond immediately to changes in power level to reduce total test time.
3. Use average detector to test.

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. The Average detector is used. We use Maximum Average Conducted Output Power Level Method AVGSA-2 in KDB 558074 D01 /KDB662911 D01 for this test.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

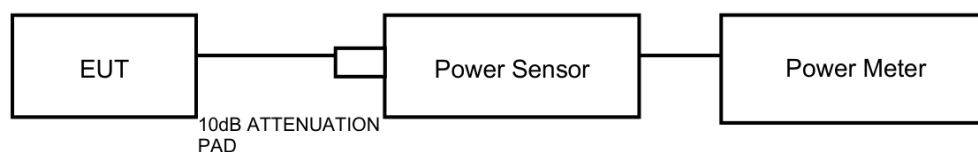
Limits:

Average Output Power	$\leq 1W$ (30dBm)
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Note: the conducted output power limit specified above is based on the use the antennas with directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated Levels above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.44$ dB.

Test Results:

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	17.07	≤ 30	PASS
	Ant1	2437	16.33	≤ 30	PASS
	Ant1	2462	16.93	≤ 30	PASS
11G	Ant1	2412	20.25	≤ 30	PASS
	Ant1	2437	20.23	≤ 30	PASS
	Ant1	2462	20.94	≤ 30	PASS
11N20SISO	Ant1	2412	20.15	≤ 30	PASS
	Ant1	2437	20.20	≤ 30	PASS
	Ant1	2462	20.92	≤ 30	PASS
11N40SISO	Ant1	2422	19.89	≤ 30	PASS
	Ant1	2437	20.26	≤ 30	PASS
	Ant1	2452	20.42	≤ 30	PASS
11AX20SISO	Ant1	2412	21.20	≤ 30	PASS
	Ant1	2437	21.32	≤ 30	PASS
	Ant1	2462	22.02	≤ 30	PASS
11AX40SISO	Ant1	2422	20.86	≤ 30	PASS
	Ant1	2437	21.24	≤ 30	PASS
	Ant1	2452	21.40	≤ 30	PASS
BLE_1M	Ant1	2402	7.95	≤ 30	PASS
	Ant1	2440	7.11	≤ 30	PASS
	Ant1	2480	6.78	≤ 30	PASS
BLE_2M	Ant1	2402	7.96	≤ 30	PASS
	Ant1	2440	7.12	≤ 30	PASS
	Ant1	2480	6.79	≤ 30	PASS

5.4 Minimum 6 dB Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 100 kHz; VBW is set to 300 kHz on spectrum analyzer.

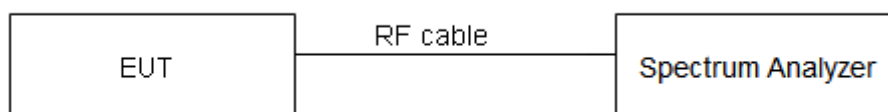
Detector=Peak, Trace mode=Max hold.

Limits:

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

Minimum 6dB Bandwidth	≥ 500 kHz
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Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results:

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	7.56	2408.44	2416.00	≥0.5	PASS
		2437	7.08	2433.44	2440.52	≥0.5	PASS
		2462	7.56	2458.44	2466.00	≥0.5	PASS
11G	Ant1	2412	16.36	2403.80	2420.16	≥0.5	PASS
		2437	16.32	2428.84	2445.16	≥0.5	PASS
		2462	16.36	2453.80	2470.16	≥0.5	PASS
11N20SISO	Ant1	2412	17.56	2403.20	2420.76	≥0.5	PASS
		2437	17.56	2428.20	2445.76	≥0.5	PASS
		2462	17.56	2453.20	2470.76	≥0.5	PASS
11N40SISO	Ant1	2422	36.32	2403.84	2440.16	≥0.5	PASS
		2437	36.32	2418.84	2455.16	≥0.5	PASS
		2452	36.32	2433.84	2470.16	≥0.5	PASS
11AX20SISO	Ant1	2412	18.96	2402.52	2421.48	≥0.5	PASS
		2437	19.00	2427.48	2446.48	≥0.5	PASS
		2462	19.00	2452.48	2471.48	≥0.5	PASS
11AX40SISO	Ant1	2422	38.00	2402.96	2440.96	≥0.5	PASS
		2437	38.08	2417.96	2456.04	≥0.5	PASS
		2452	38.16	2432.88	2471.04	≥0.5	PASS
BLE_1M	Ant1	2402	0.66	2401.66	2402.32	≥0.5	PASS
		2440	0.66	2439.66	2440.32	≥0.5	PASS
		2480	0.66	2479.66	2480.32	≥0.5	PASS
BLE_2M	Ant1	2402	1.23	2401.34	2402.57	≥0.5	PASS
		2440	1.24	2439.34	2440.57	≥0.5	PASS
		2480	1.23	2479.34	2480.57	≥0.5	PASS

5.5 Occupied Channel Bandwidth

Ambient condition:

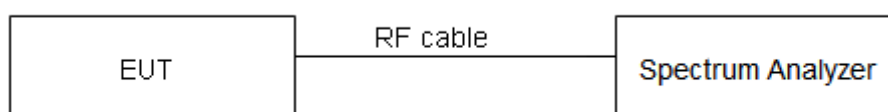
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 50 kHz; VBW is set to 200 kHz on spectrum analyzer.

Detector=Peak, Trace mode=Max hold.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results:

TestMode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	12.507	---	---
		2437	12.388	---	---
		2462	12.507	---	---
11G	Ant1	2412	18.501	---	---
		2437	18.621	---	---
		2462	18.422	---	---
11N20SISO	Ant1	2412	19.58	---	---
		2437	19.58	---	---
		2462	19.62	---	---
11N40SISO	Ant1	2422	37.882	---	---
		2437	37.962	---	---
		2452	38.042	---	---
11AX20SISO	Ant1	2412	19.86	---	---
		2437	19.86	---	---
		2462	19.74	---	---
11AX40SISO	Ant1	2422	38.601	---	---
		2437	38.601	---	---
		2452	38.601	---	---
BLE_1M	Ant1	2402	1.059	---	---
		2440	1.039	---	---
		2480	1.063	---	---
BLE_2M	Ant1	2402	2.094	---	---
		2440	2.086	---	---
		2480	2.102	---	---

5.6 Band Edge Measurement

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

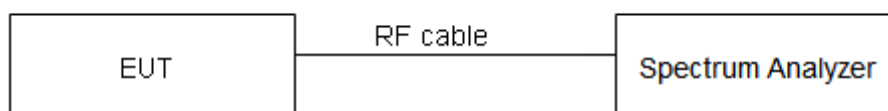
Method of Measurement:

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer.

Limits:

Rule Part 15.247(d) specifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 936 \text{ Hz}$, $2 \text{ GHz}-3 \text{ GHz} = 1.407 \text{ dB}$.

Test Results:

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	6.92	-39.52	≤ -13.08	PASS
		High	2462	6.90	-49.37	≤ -13.1	PASS
11G	Ant1	Low	2412	1.32	-27.21	≤ -18.68	PASS
		High	2462	1.89	-42.9	≤ -18.11	PASS
11N20SISO	Ant1	Low	2412	1.18	-25.78	≤ -18.82	PASS
		High	2462	1.82	-39.38	≤ -18.18	PASS
11N40SISO	Ant1	Low	2422	-2.47	-29.95	≤ -22.47	PASS
		High	2452	-2.23	-38.31	≤ -22.23	PASS
11AX20SISO	Ant1	Low	2412	1.13	-27.15	≤ -18.87	PASS
		High	2462	1.99	-37.82	≤ -18.01	PASS
11AX40SISO	Ant1	Low	2422	-2.34	-31.71	≤ -22.34	PASS
		High	2452	-2.05	-35.78	≤ -22.05	PASS
BLE_1M	Ant1	Low	2402	7.92	-38.59	≤ -12.08	PASS
		High	2480	6.66	-45.6	≤ -13.34	PASS
BLE_2M	Ant1	Low	2402	6.71	-23.72	≤ -13.29	PASS
		High	2480	5.77	-44.73	≤ -14.23	PASS

5.7 Maximum Power Spectral Density

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

Method of Measurement:

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation. The Average detector is used. We use Method AVGPSD-2 in KDB 558074 D01 for this test.

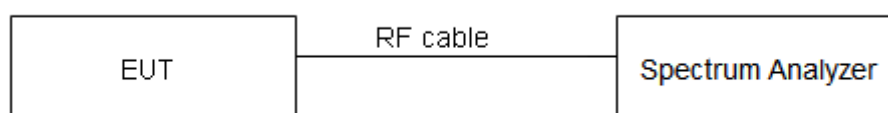
The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Limits:

Rule Part 15.247(e) specifies that" For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Maximum Power Spectral Density	$\leq 8 \text{ dBm} / 3\text{kHz}$
--------------------------------	------------------------------------

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.75\text{dB}$.

Test Results:

TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	6.84	≤8	PASS
		2437	6.25	≤8	PASS
		2462	6.71	≤8	PASS
11G	Ant1	2412	-12.53	≤8	PASS
		2437	-12.51	≤8	PASS
		2462	-11.81	≤8	PASS
11N20SISO	Ant1	2412	-11.79	≤8	PASS
		2437	-12.14	≤8	PASS
		2462	-11.77	≤8	PASS
11N40SISO	Ant1	2422	-16.24	≤8	PASS
		2437	-15.78	≤8	PASS
		2452	-15.54	≤8	PASS
11AX20SISO	Ant1	2412	-12.87	≤8	PASS
		2437	-12.71	≤8	PASS
		2462	-12.47	≤8	PASS
11AX40SISO	Ant1	2422	-16.87	≤8	PASS
		2437	-16.75	≤8	PASS
		2452	-16.96	≤8	PASS
BLE_1M	Ant1	2402	-8.87	≤8	PASS
		2440	-9.66	≤8	PASS
		2480	-9.88	≤8	PASS
BLE_2M	Ant1	2402	-11.67	≤8	PASS
		2440	-12.46	≤8	PASS
		2480	-12.77	≤8	PASS

5.8 Spurious RF Conducted Emissions

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.2kPa

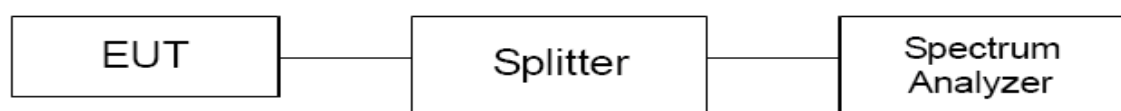
Method of Measurement:

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to 100kHz and VBW to 300 kHz, Sweep is set to AUTO .The test is in transmitting mode.

Limits:

Rule Part 15.247(d) pacifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

Test Results:

TestMode	Antenna	Channel	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	7.16	7.16	---	PASS
			30~1000	7.16	-60.81	≤ -12.84	PASS
			1000~26500	7.16	-49.4	≤ -12.84	PASS
		2437	Reference	6.59	6.59	---	PASS
			30~1000	6.59	-60.95	≤ -13.41	PASS
			1000~26500	6.59	-49.85	≤ -13.41	PASS
		2462	Reference	6.87	6.87	---	PASS
			30~1000	6.87	-60.54	≤ -13.13	PASS
			1000~26500	6.87	-49.68	≤ -13.13	PASS
11G	Ant1	2412	Reference	1.17	1.17	---	PASS
			30~1000	1.17	-61	≤ -18.83	PASS
			1000~26500	1.17	-49.77	≤ -18.83	PASS
		2437	Reference	1.32	1.32	---	PASS
			30~1000	1.32	-60.73	≤ -18.68	PASS
			1000~26500	1.32	-48.39	≤ -18.68	PASS
		2462	Reference	1.88	1.88	---	PASS
			30~1000	1.88	-61.24	≤ -18.12	PASS
			1000~26500	1.88	-47.86	≤ -18.12	PASS
11N20SISO	Ant1	2412	Reference	1.20	1.20	---	PASS
			30~1000	1.20	-60.27	≤ -18.8	PASS
			1000~26500	1.20	-49.72	≤ -18.8	PASS
		2437	Reference	1.25	1.25	---	PASS
			30~1000	1.25	-60.43	≤ -18.75	PASS
			1000~26500	1.25	-48.36	≤ -18.75	PASS
		2462	Reference	2.10	2.10	---	PASS
			30~1000	2.10	-60.5	≤ -17.9	PASS
			1000~26500	2.10	-49.58	≤ -17.9	PASS
11N40SISO	Ant1	2422	Reference	-2.68	-2.68	---	PASS
			30~1000	-2.68	-57.86	≤ -22.68	PASS
			1000~26500	-2.68	-49.48	≤ -22.68	PASS
		2437	Reference	-2.11	-2.11	---	PASS
			30~1000	-2.11	-58.12	≤ -22.11	PASS
			1000~26500	-2.11	-45.84	≤ -22.11	PASS
		2452	Reference	-2.09	-2.09	---	PASS
			30~1000	-2.09	-58.66	≤ -22.09	PASS
			1000~26500	-2.09	-49.49	≤ -22.09	PASS
11AX20SISO	Ant1	2412	Reference	1.13	1.13	---	PASS
			30~1000	1.13	-60.41	≤ -18.87	PASS
			1000~26500	1.13	-49.47	≤ -18.87	PASS
		2437	Reference	1.18	1.18	---	PASS
			30~1000	1.18	-60.98	≤ -18.82	PASS
			1000~26500	1.18	-49.09	≤ -18.82	PASS
		2462	Reference	2.15	2.15	---	PASS

11AX40SISO	Ant1		30~1000	2.15	-61.21	≤ -17.85	PASS
			1000~26500	2.15	-48.08	≤ -17.85	PASS
			Reference	-2.34	-2.34	---	PASS
		2422	30~1000	-2.34	-57.51	≤ -22.34	PASS
			1000~26500	-2.34	-49.85	≤ -22.34	PASS
			Reference	-2.07	-2.07	---	PASS
		2437	30~1000	-2.07	-57.93	≤ -22.07	PASS
			1000~26500	-2.07	-50.35	≤ -22.07	PASS
			Reference	-1.92	-1.92	---	PASS
		2452	30~1000	-1.92	-59.12	≤ -21.92	PASS
			1000~26500	-1.92	-49.94	≤ -21.92	PASS

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	7.93	7.93	---	PASS
			30~1000	7.93	-61.17	≤ -12.07	PASS
			1000~26500	7.93	-45.24	≤ -12.07	PASS
		2440	Reference	7.03	7.03	---	PASS
			30~1000	7.03	-60.35	≤ -12.97	PASS
			1000~26500	7.03	-46.68	≤ -12.97	PASS
		2480	Reference	6.73	6.73	---	PASS
			30~1000	6.73	-60.6	≤ -13.27	PASS
			1000~26500	6.73	-45.89	≤ -13.27	PASS
BLE_2M	Ant1	2402	Reference	6.88	6.88	---	PASS
			30~1000	6.88	-60.63	≤ -13.12	PASS
			1000~26500	6.88	-46.28	≤ -13.12	PASS
		2440	Reference	6.00	6.00	---	PASS
			30~1000	6.00	-60.38	≤ -14	PASS
			1000~26500	6.00	-47.84	≤ -14	PASS
		2480	Reference	5.73	5.73	---	PASS
			30~1000	5.73	-61.12	≤ -14.27	PASS
			1000~26500	5.73	-46.6	≤ -14.27	PASS

6. Appendix X

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
Spectrum Analyzer	FSV40	101580	DZ-000238-3	R&S	2024/04/22
Comprehensive Test Instrument	CMW270	100304	DZ-000240-1	R&S	2023/12/06
Analog Signal Generator	SMB100A	181858	DZ-000238-2	R&S	2024/05/29
Vector Signal Generator	SGT100A	111661	DZ-000238-1	R&S	2024/05/29
RF Radio Frequency Switch	JS0806-2	19H9080187	DZ-000241	Tonscend	2024/05/29
Programmable DC Power Supply	E3644A	MY58036222	DZ-000178	KEYSIGHT	2024/04/12
3m Semi-Anechoic Chamber	FACT-4	ST08035	WKNA-0024	ETS	2024/12/12
5m Semi-Anechoic Chamber	SAC-5	SAC-5-2.0	EM-000557	COMTEST	2024/11/02
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2024/02/22
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2024/02/22
EMI Test Receiver	ESR7	102235	VG DY-0956	R&S	2024/02/22
loop antenna	HLA 6121	540046	EM-000546	TESEQ	2024/06/05
Broadband Antenna	VULB 9168	01537	EM-000736-1	SCHWAR ZBECK	2024/04/24
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWAR ZBECK	2024/06/10
Waveguide Horn Antenna	HF906	360306/008	EM-000093	R&S	2024/02/24
Waveguide Horn Antenna	BBHA9170	00949	DZ-000209-2	SCHWAR ZBECK	2024/08/05
Bandstop Filters	SW-BSF-2400-100-7-A1	/	EM-000495	/	2024/08/29
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2023/12/06
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWAR ZBECK	2024/06/04
EMI Test Receiver	ESR3	102394	VG DY-0705	R&S	2024/04/22
LISN	NSLK 8127	8127644	EM-000370	SCHWAR ZBECK	2024/07/27
Plus Limiter (#2)	VTSD 9561	9561-F017	EM-000367	SCHWAR ZBECK	2024/09/03
Shielding Room(#2)	GP1A	001	WKNF-0006	LEINING	2024/08/07
Temperature and humidity meter	MHO-C201	/	DZ-000249-2	Seconds test	2024/09/23

The End

Important

1. The test report is invalid without the official stamp of CVC;
2. Any part photocopies of the test report are forbidden without the written permission from CVC;
3. The test report is invalid without the signatures of Author and Reviewer;
4. The test report is invalid if altered;
5. Objections to the test report must be submitted to CVC within 15 days;
6. Generally, commission test is responsible for the tested samples only;
7. As for the test result, “—” or “ N/A” means “not applicable”, “ / ”means “not testing”, “P” means “pass” and “F” means “fail”.

***The test data and test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA symbol is not presented. ***

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