ACCREDITED
CERTIFICATE #5473.01

Test Report No.:
FCC2022-0077-RF1

TEST REPORT

FCC ID	:	2AWMK-BTP-T9
Applicant	:	Guangzhou Pinzhong Electronic Technology Co.,Ltd.
Product Name	:	BEITONG ZEUS 2 ANALOG OPTICAL SWITCHES ELITE GAMEPAD
Mode No.	:	BTP-T9

CVC Testing Technology Co., Ltd.

广州检测技术有限公司
检验检测专用章

Applicant	**Name:** Guangzhou Pinzhong Electronic Technology Co.,Ltd. **Address:** Room 611-612, Greenland Center of Financial city, No.662, Huangpu Avenue Middle Road. Tianhe District, Guangzhou City.
Manufacturer	**Name:** Guangzhou Pinzhong Electronic Technology Co.,Ltd. **Address:** Room 611-612, Greenland Center of Financial city, No.662, Huangpu Avenue Middle Road. Tianhe District, Guangzhou City.
Equipment Under Test	**Product Name :** BEITONG ZEUS 2 ANALOG OPTICAL SWITCHES ELITE GAMEPAD **Model No. :** BTP-T9 **Trade mark :** BEITONG **Serial no. :** — **Sampling :** 1-1

Date of Receipt.	2022.12.16	Date of Testing	2023.06.27

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** **Date of issue:** **April 7, 2023;Correction 1: July 4, 2023**

Approved by:	Reviewed by:	Tested by:
Chen HuaWen	**Xu Zhenfei**	**Lu Weiji**

Other Aspects: NONE.

Abbreviations: Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested

Note 1: This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of **CVC**.
Note 2: The original Test Report No.FCC2022-0077-RF1 was issued dated on April 7, 2023.
Correction 1 to Report No.FCC2022-0077-RF1 was made dated on July 4, 2023 due tosome editorial mistakes and detailed on P9.

TABLE OF CONTENTS

1. GENERAL PRODUCT INFORMATION 4

1.1 GENERAL INFORMATION 4

2. TEST SITES 5

2.1 TEST FACILITIES 5
2.2 DESCRIPTION OF NON-STANDARD METHOD AND DEVIATIONS 5
2.3 LIST OF TEST AND MEASUREMENT INSTRUMENTS 5

3. TEST CONFIGURATION 6

3.1 TEST MODE 6
3.2 DUTY CYCLE 8

4. SUMMARY OF MEASUREMENT RESULTS 9

5. MEASUREMENT PROCEDURE 10

5.1 CONDUCTED EMISSION 10
5.2 RADIATED EMISSION 14
5.3 MAXIMUM CONDUCTED OUTPUT POWER 31
5.4 MINIMUM 6 DB BANDWIDTH 33
5.5 OCCUPIED CHANNEL BANDWIDTH 35
5.6 BAND EDGE MEASUREMENT 37
5.7 MAXIMUM POWER SPECTRAL DENSITY 39
5.8 SPURIOUS RF CONDUCTED EMISSIONS 41

6. APPENDIX A 43

1. General Product Information

1.1 General information

Product Name	BEITONG ZEUS 2 ANALOG OPTICAL SWITCHES ELITE GAMEPAD	
Model No.	BTP-T9	
Additional model	N/A	
Power Supply	Rated voltage	DC 5.0V
	Battery voltage	DC 3.7V
Serial Number(SN)	K22K25004633	
firmware	V2.52	
software	V1.02	
specific power settings	Bluetooth(Low Energy):1.5	
Antenna Type	Internal Antenna	
Antenna Connector	A permanently attached antenna	
Antenna Gain	2.63 dBi (provided by client)	
Beamforming gain	Unsupported (provided by client)	
Frequency Range	Bluetooth(Low Energy): 2402~2480MHz	
Channel Number	Bluetooth(Low Energy):40 Channels	
Type of Modulation	Bluetooth(Low Energy):GFSK	
Max. Conducted Power	Bluetooth(Low Energy): 1.35 dBm	
Operate Temp.Range	-20~40℃	

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.

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 A**.

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

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 configuration 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)	1	/	/

Test Items	Test Antennas	Test Modes	Test Channels
Conducted Emissions	Antenna 1	Bluetooth(LE_2M)	0
Radiated Emissions	Antenna 1	Bluetooth(LE_2M)	0
Radiated Emissions (Band Edge)	Antenna 1	Bluetooth(LE_2M)	0,39
Maximum conducted output power	Antenna 1	Bluetooth(LE_1M), Bluetooth(LE_2M)	0,19,39
Minimum 6 dB bandwidth	Antenna 1	Bluetooth(LE_1M), Bluetooth(LE_2M)	0,19,39
Occupied Channel Bandwidth	Antenna 1	Bluetooth(LE_1M), Bluetooth(LE_2M)	0,19,39
Band Edge Measurement	Antenna 1	Bluetooth(LE_1M), Bluetooth(LE_2M)	0,39
Maximum Power spectral density	Antenna 1	Bluetooth(LE_1M), Bluetooth(LE_2M)	0,19,39
Spurious RF Conducted Emissions	Antenna 1	Bluetooth(LE_1M), Bluetooth(LE_2M)	0,19,39

3.2 Duty cycle

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
BLE_1M	Ant1	2402	50.00	50.00	100	---	---
		2440	50.00	50.00	100	---	---
		2480	50.00	50.00	100	---	---
BLE_2M	Ant1	2402	50.00	50.00	100	---	---
		2440	50.00	50.00	100	---	---
		2480	50.00	50.00	100	---	---

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 D of FCC-2022-0077-RF1_Test diagram
Minimum 6 dB bandwidth	15.247(a)(2)	PASS	Appendix B of FCC-2022-0077-RF1_Test diagram
Occupied Channel Bandwidth	15.247(a)(2)	PASS	Appendix C of FCC-2022-0077-RF1_Test diagram
Band Edge Measurement	15.247(d)	PASS	Appendix F of FCC-2022-0077-RF1_Test diagram
Maximum Power spectral density	15.247(e)	PASS	Appendix E of FCC-2022-0077-RF1_Test diagram
Spurious RF Conducted Emissions	15.247(d)	PASS	Appendix G of FCC-2022-0077-RF1_Test 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%	101.5kPa

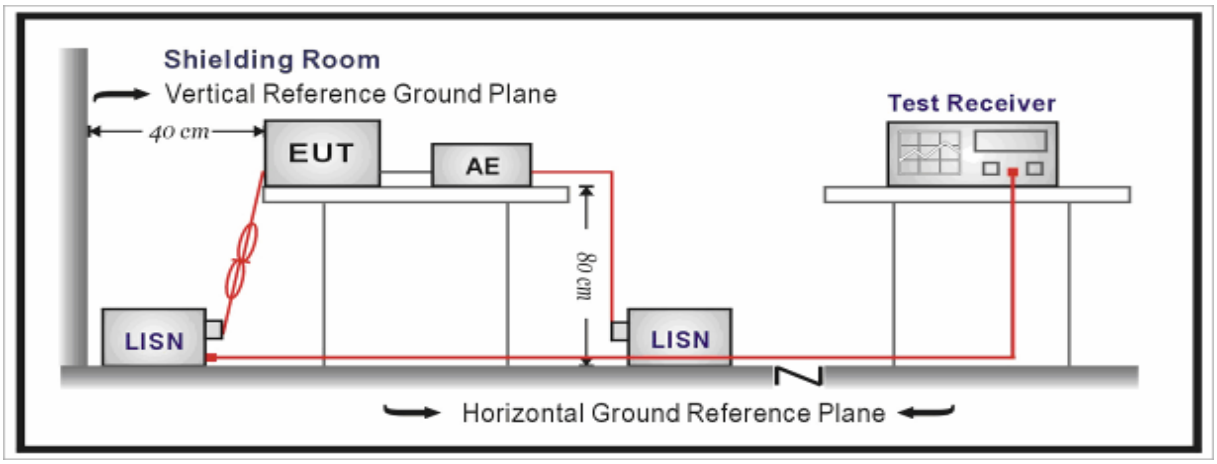
Method of Measurement:

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：

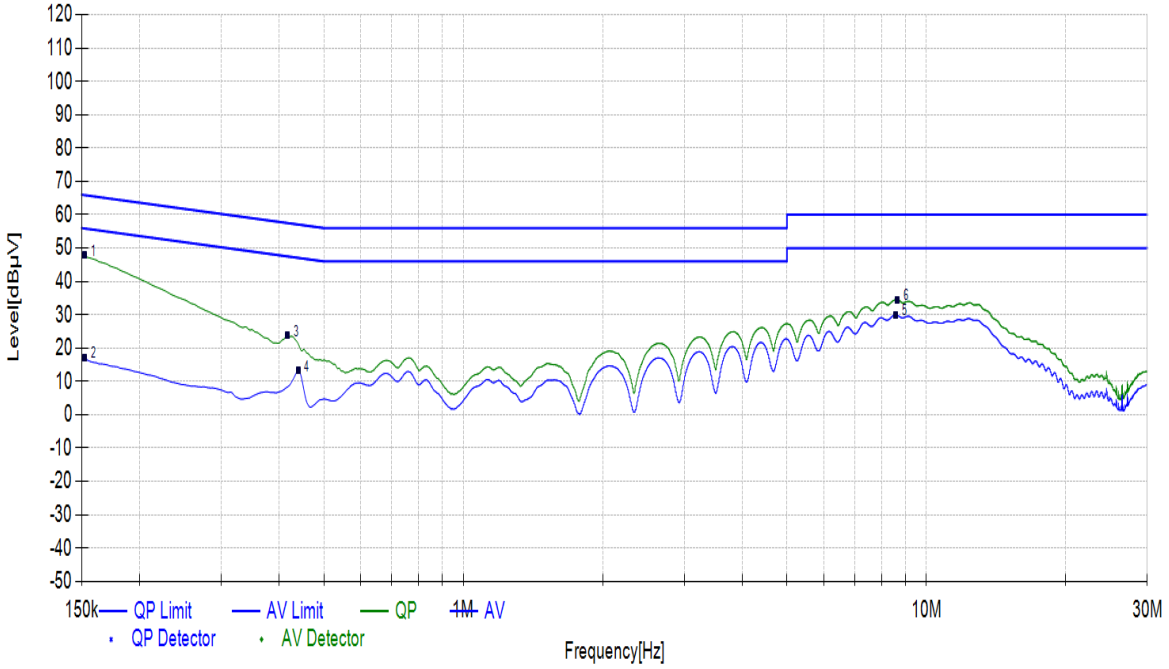
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96. U= 3.12 dB.

Test Results:

During the test, the Conducted Emission from 150KHz to 30MHz was performed in all modes with all channels, and all antennas. Bluetooth(LE_2M), Channel 0, Antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

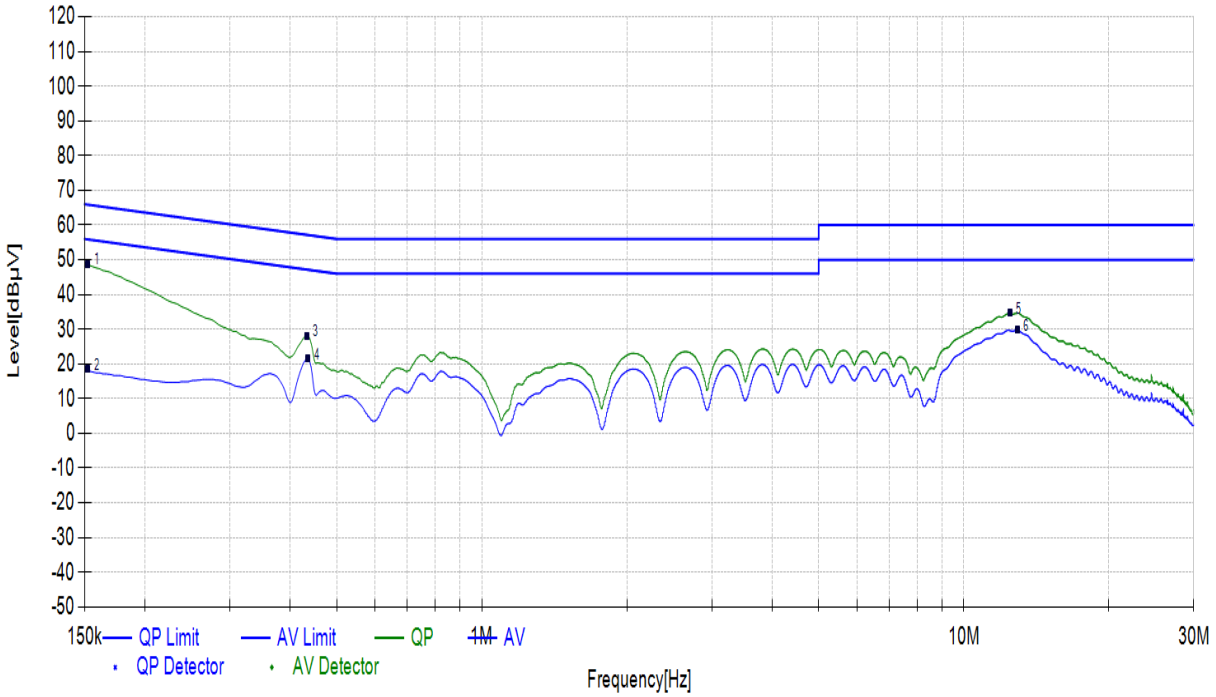
Power Line	L
Test channel	Worst-Case

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
6	8.6505	10.53	24.04	34.57	60.00	25.43	QP	PASS
1	0.1523	10.29	37.50	47.79	65.88	18.09	QP	PASS
3	0.4178	10.30	13.38	23.68	57.49	33.81	QP	PASS
4	0.4403	10.30	2.96	13.26	47.06	33.80	AV	PASS
5	8.5853	10.53	19.47	30.00	50.00	20.00	AV	PASS
2	0.1523	10.29	6.79	17.08	55.88	38.80	AV	PASS



Power Line	N
Test channel	Worst-Case

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
1	0.1523	10.28	38.46	48.74	65.88	17.14	QP	PASS
3	0.4335	10.29	17.87	28.16	57.19	29.03	QP	PASS
5	12.4620	10.62	24.08	34.70	60.00	25.30	QP	PASS
2	0.1523	10.28	8.12	18.40	55.88	37.48	AV	PASS
4	0.4358	10.29	11.27	21.56	47.14	25.58	AV	PASS
6	12.9120	10.63	19.14	29.77	50.00	20.23	AV	PASS



5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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)).

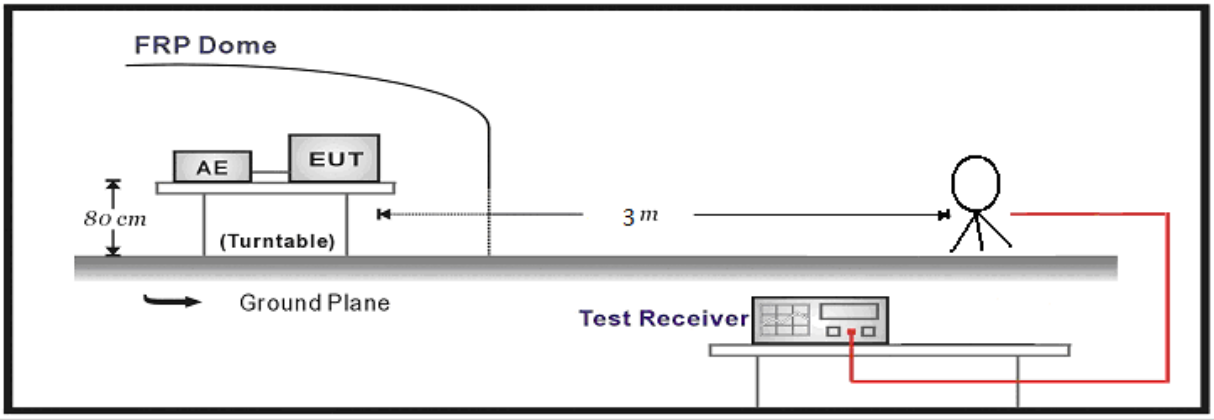
Frequency	Limit (µV/m)	Limit (dBµV/m @3m)	Remark
0.009MHz-0.490MHz	2400/F(kHz)@300m	20lg(240000/F(kHz))	Quasi-peak Level
0.490MHz~1.705MHz	24000/F(kHz)@30m	20lg(240000/F(kHz))	Quasi-peak Level
1.705MHz~30.0MHz	30@30m	49.54	Quasi-peak Level
30MHz-88MHz	100@3m	40.0	Quasi-peak Level
88MHz-216MHz	150@3m	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:

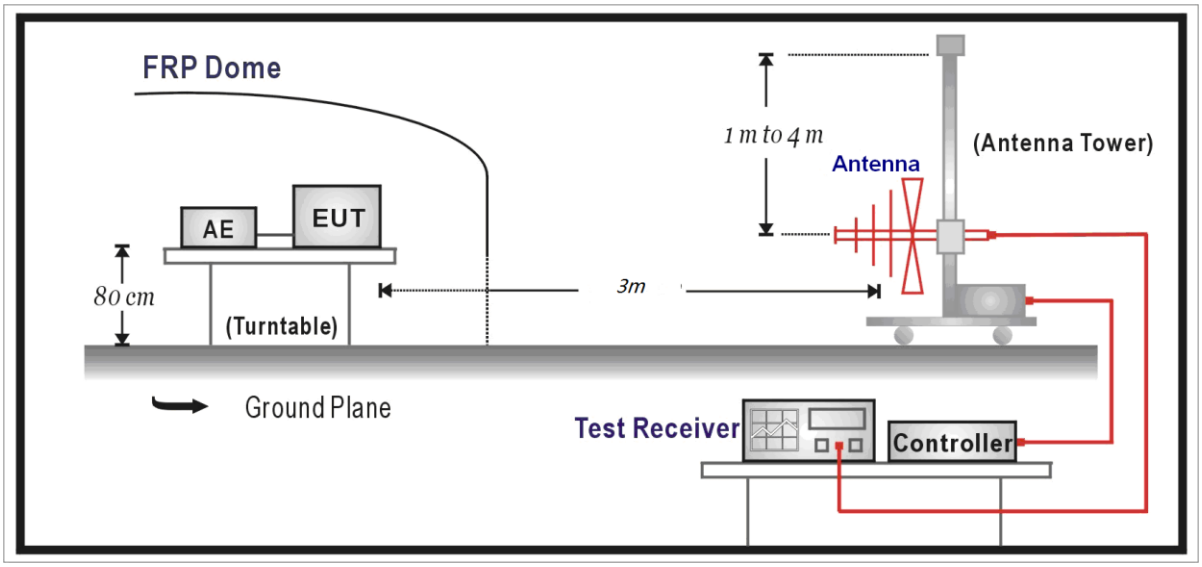
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	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:

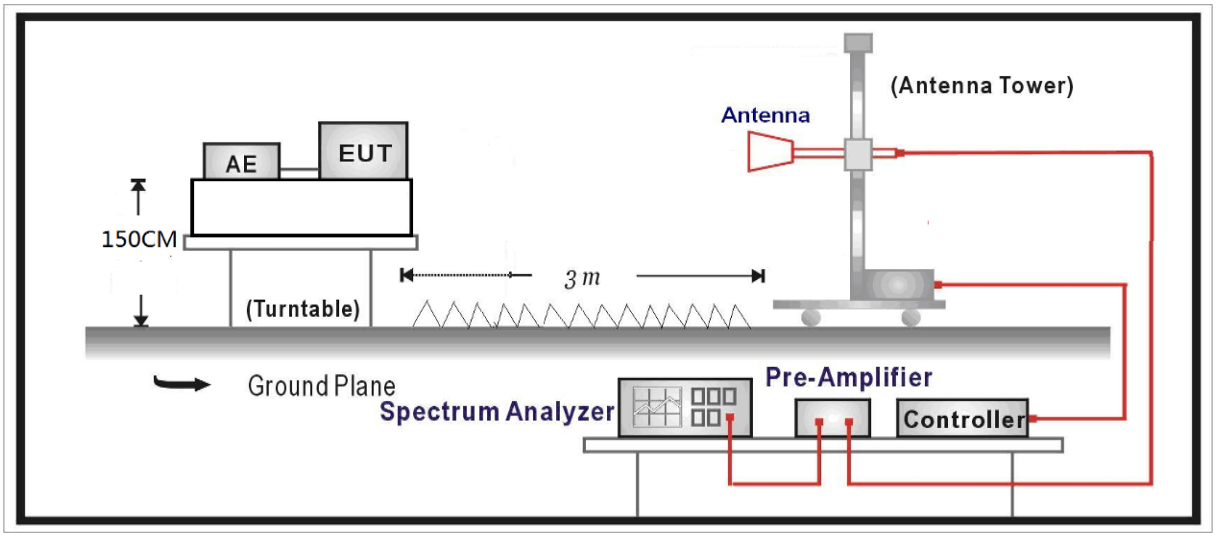
Below 30MHz Test Setup:



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

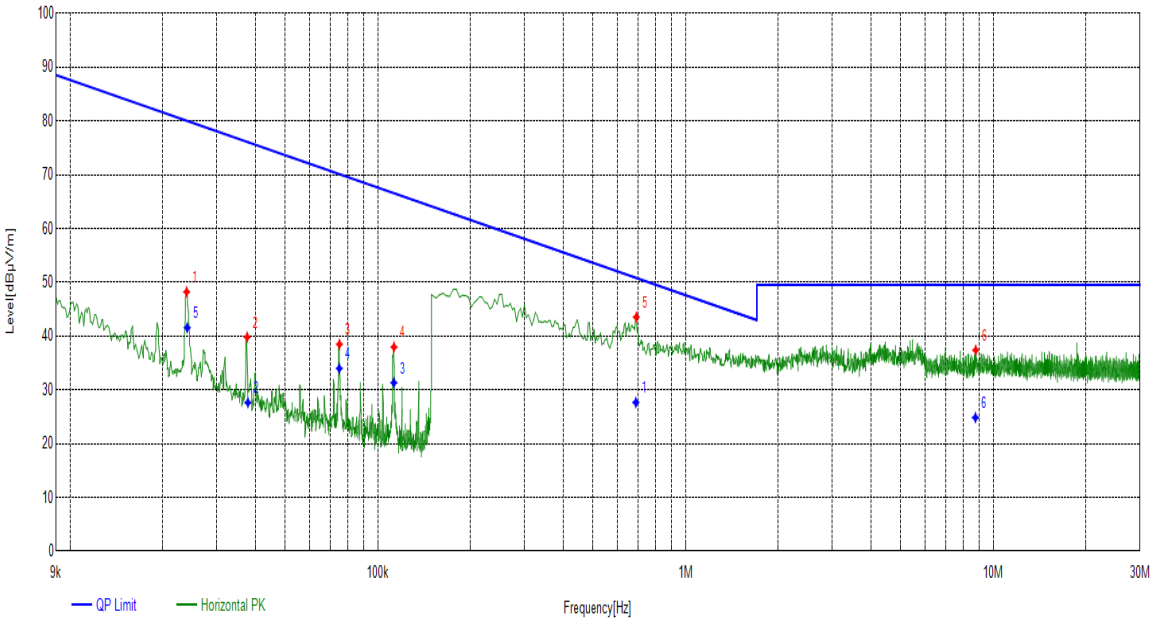
Test Results:

SPURIOUS EMISSIONS：

During the test, the Radiates Emission from 9KHz to 30MHz was performed in all modes with all channels and all antennas. Bluetooth(LE_2M), Channel 0, Antenna 1, X axis are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Radiated Emission	9KHz-30MHz
Polarity	X axis
Test channel	Worst-Case

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/ Fail
0.6890	X axis	19.68	27.65	50.84	23.19	100	15	PASS
0.0378	X axis	19.63	27.63	76.06	48.43	100	65	PASS
0.1127	X axis	19.70	31.33	66.57	35.24	100	115	PASS
0.0749	X axis	19.68	33.98	70.11	36.13	100	245	PASS
0.0240	X axis	19.62	41.55	79.99	38.44	100	275	PASS
8.7491	X axis	19.80	24.84	49.54	24.70	100	295	PASS

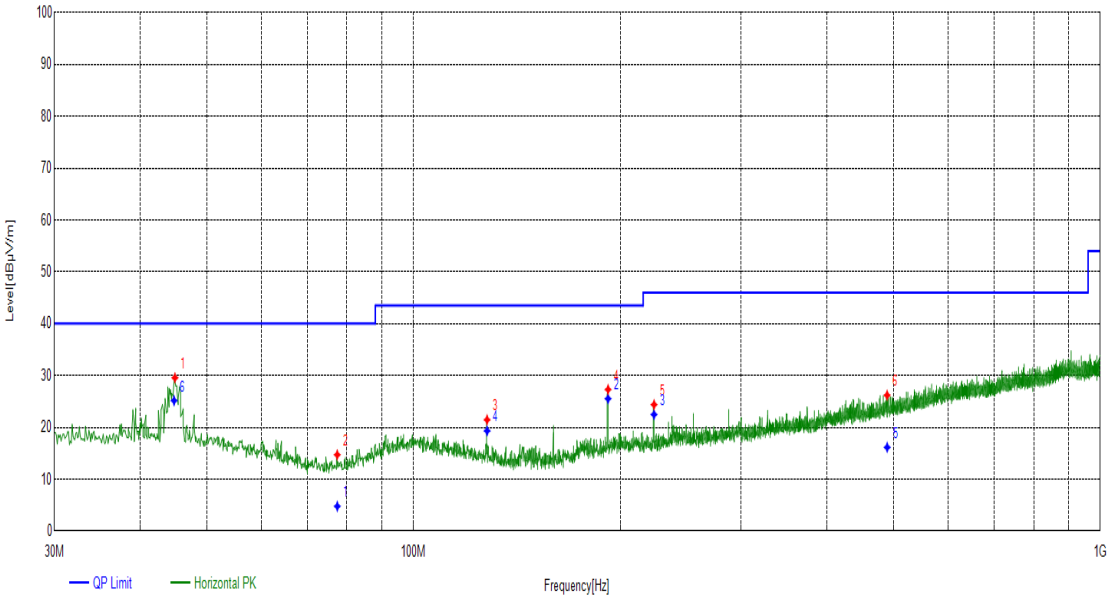


Bluetooth(Low Energy):

During the test, the Radiates Emission from 30MHz to 40GHz was performed in Bluetooth(Low Energy) all modes with all channels and all antennas. Bluetooth(LE_2M), Channel 0, Antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

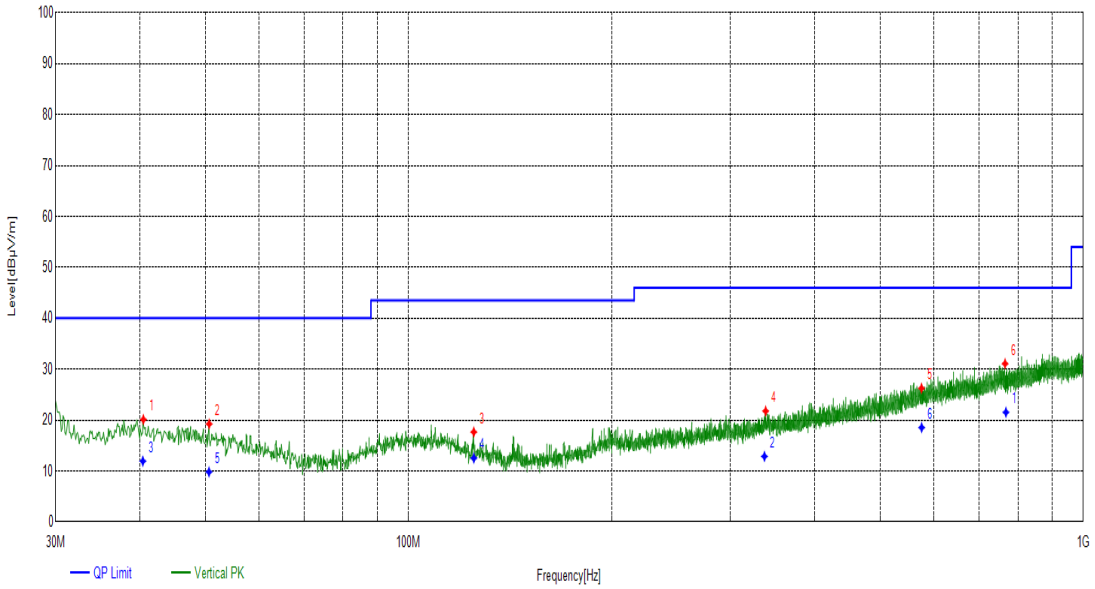
Radiates Emission	30M~1G
Test channel	Worst-Case
Polarity	Horizontal

Final Data List							
Frequency [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
77.4511	15.69	4.78	40.00	35.22	230	255	PASS
192.0007	18.33	25.53	43.50	17.97	250	218	PASS
223.9999	19.20	22.48	46.00	23.52	270	203	PASS
127.9965	16.91	19.33	43.50	24.17	220	202	PASS
489.4825	25.54	16.15	46.00	29.85	110	174	PASS
44.8133	20.88	25.16	40.00	14.84	140	17	PASS



Radiates Emission	30M~1G
Test channel	Worst-Case
Polarity	Vertical

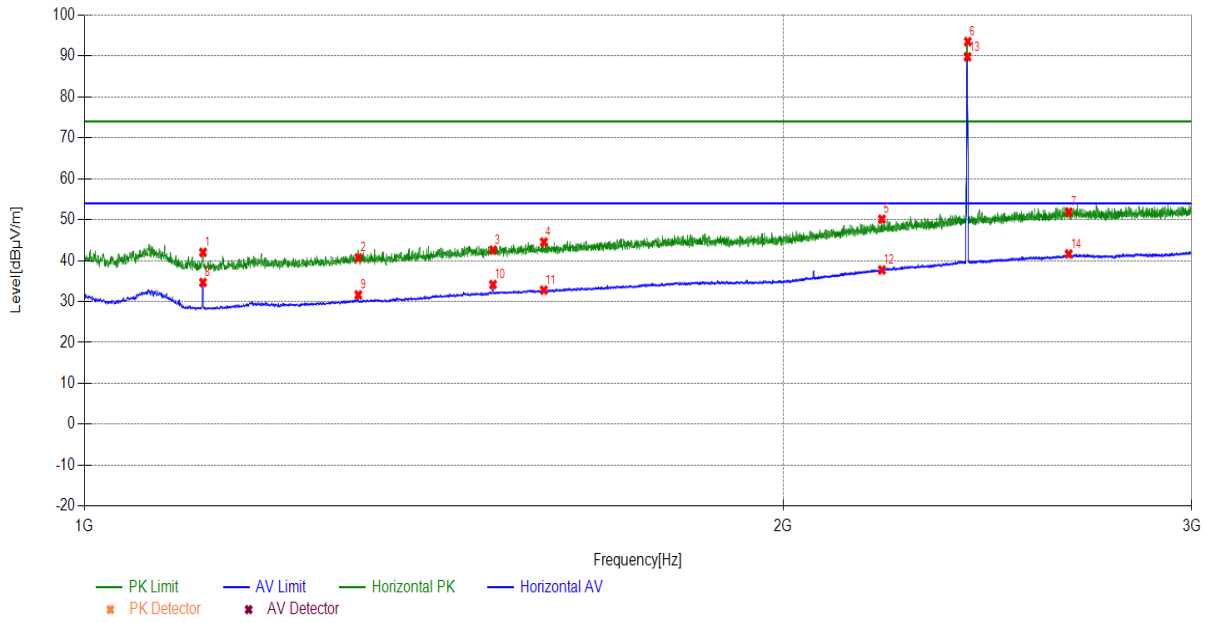
Final Data List							
Frequency [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
767.9270	30.67	21.53	46.00	24.47	130	65	PASS
336.8917	22.75	12.87	46.00	33.13	130	75	PASS
40.4055	21.13	11.94	40.00	28.06	210	175	PASS
124.9996	17.21	12.54	43.50	30.96	220	195	PASS
50.6316	20.45	9.82	40.00	30.18	270	285	PASS
576.0516	27.55	18.54	46.00	27.46	150	325	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]	Detector	Height [cm]	Angle deg	Pass/Fail
1124.8125	27.25	14.77	42.02	74.00	31.98	PK	150	118	PASS
1312.2312	28.98	11.68	40.66	74.00	33.34	PK	150	118	PASS
1499.85	30.95	11.63	42.58	74.00	31.42	PK	150	132	PASS
1577.4577	31.37	13.15	44.52	74.00	29.48	PK	150	19	PASS
2206.1206	35.60	14.52	50.12	74.00	23.88	PK	150	331	PASS
2402.3402	37.34	56.16	93.50	74.00	-19.50	PK	150	345	---
2655.3655	38.36	13.49	51.85	74.00	22.15	PK	150	357	PASS
1124.8125	27.25	7.41	34.66	54.00	19.34	AV	150	104	PASS
1312.2312	28.98	2.65	31.63	54.00	22.37	AV	150	90	PASS
1499.85	30.95	3.21	34.16	54.00	19.84	AV	150	90	PASS
1577.4577	31.37	1.42	32.79	54.00	21.21	AV	150	331	PASS
2206.1206	35.60	2.11	37.71	54.00	16.29	AV	150	161	PASS
2401.7402	37.34	52.44	89.78	54.00	-35.78	AV	150	331	---
2655.3655	38.36	3.29	41.65	54.00	12.35	AV	150	118	PASS

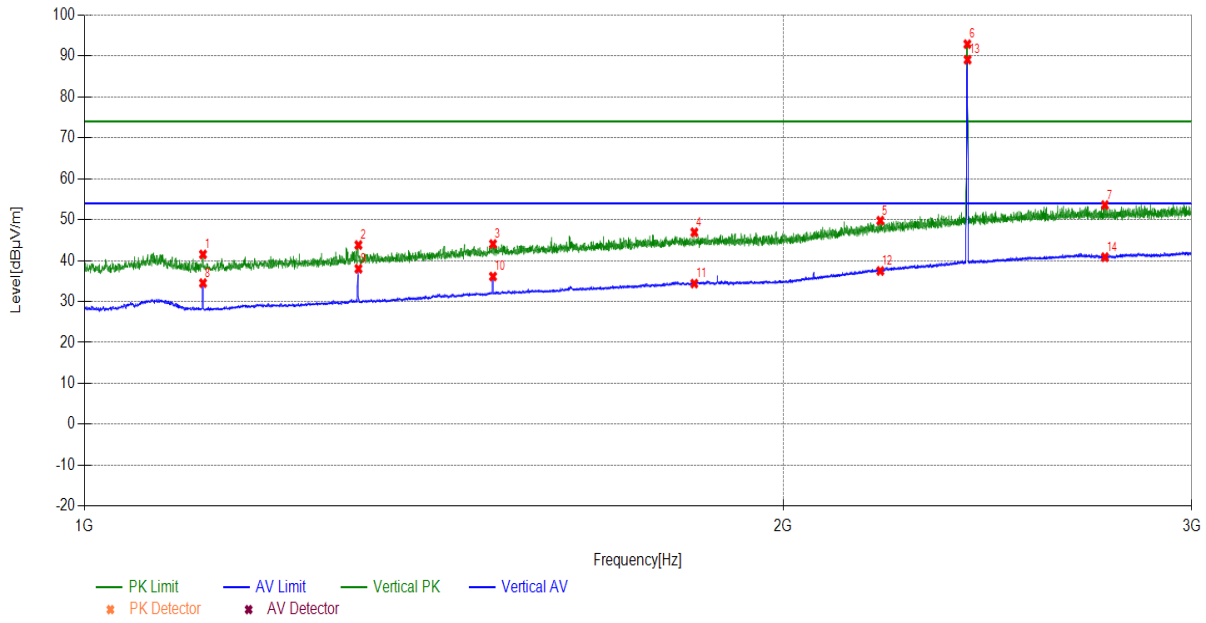


Note: The signal beyond the limit is carrier

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]	Detector	Height [cm]	Angle deg	Pass/ Fail
1124.8125	27.25	14.27	41.52	74.00	32.48	PK	150	131	PASS
1312.4312	28.98	14.84	43.82	74.00	30.18	PK	150	88	PASS
1499.85	30.95	13.10	44.05	74.00	29.95	PK	150	88	PASS
1831.4831	33.04	13.87	46.91	74.00	27.09	PK	150	330	PASS
2202.7203	35.57	14.20	49.77	74.00	24.23	PK	150	230	PASS
2401.3401	37.34	55.54	92.88	74.00	-18.88	PK	150	88	---
2752.5753	38.65	14.92	53.57	74.00	20.43	PK	150	117	PASS
1124.8125	27.25	7.25	34.50	54.00	19.50	AV	150	59	PASS
1312.4312	28.98	9.03	38.01	54.00	15.99	AV	150	117	PASS
1499.85	30.95	5.17	36.12	54.00	17.88	AV	150	117	PASS
1831.4831	33.04	1.35	34.39	54.00	19.61	AV	150	345	PASS
2202.7203	35.57	1.90	37.47	54.00	16.53	AV	150	159	PASS
2401.9402	37.34	51.74	89.08	54.00	-35.08	AV	150	88	---
2752.5753	38.65	2.19	40.84	54.00	13.16	AV	150	259	PASS

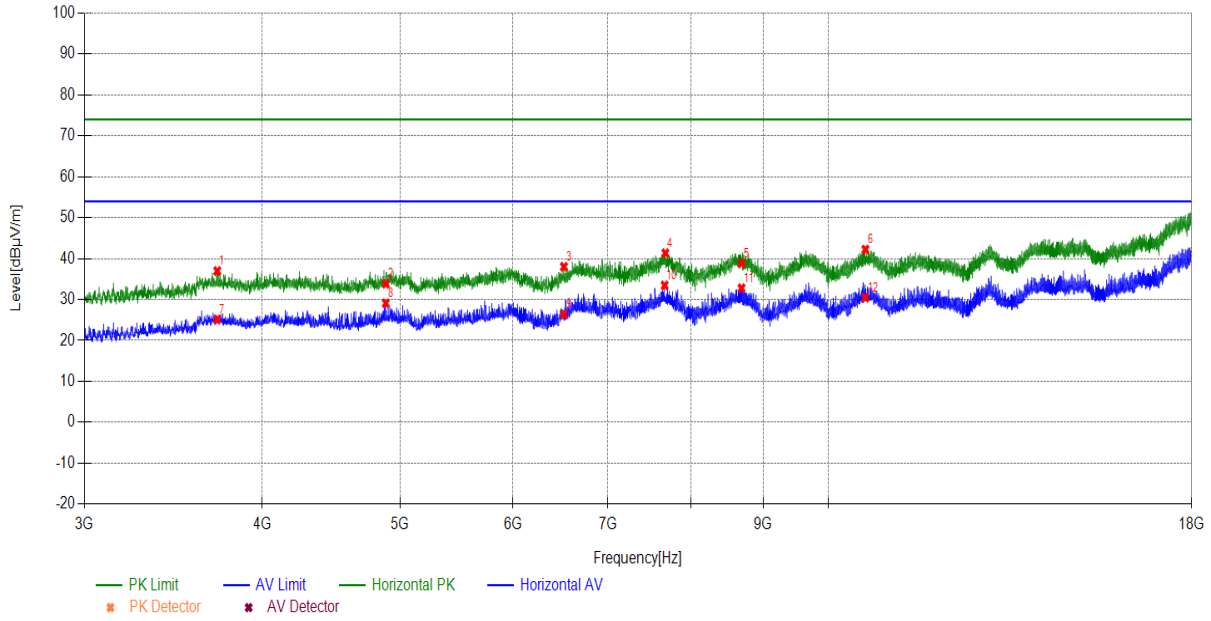


Note: The signal beyond the limit is carrier

Radiates Emission	3G~18G
Test channel	Worst-Case
polarization	Horizontal

Suspected List

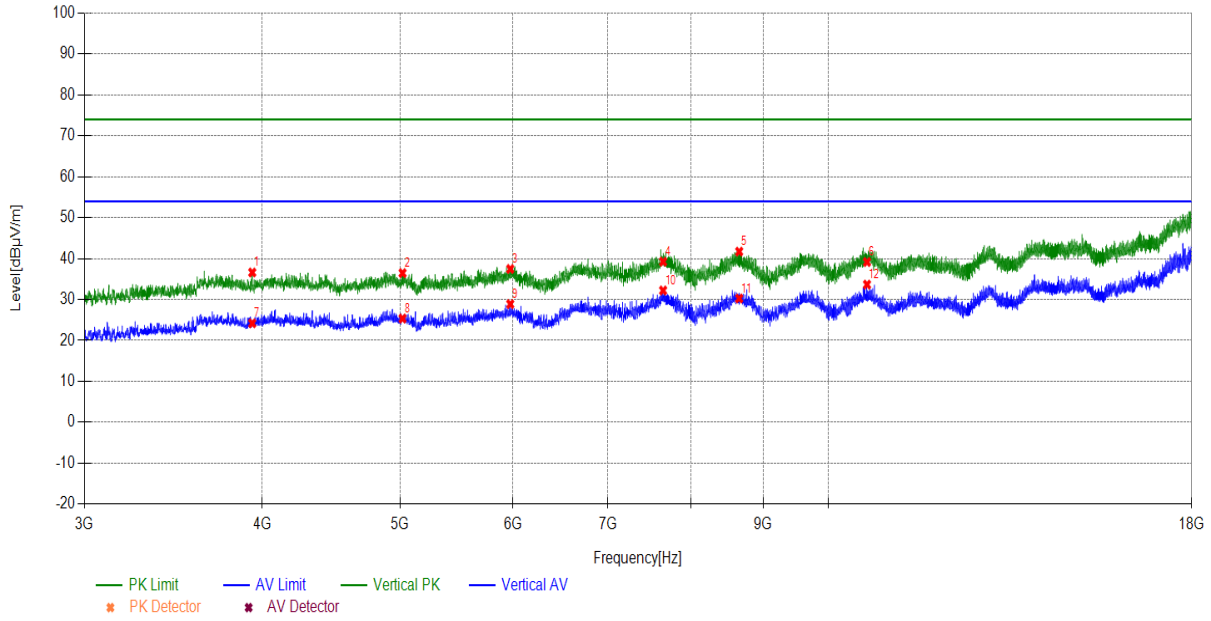
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
3719.286	-2.97	39.95	36.98	74.00	37.02	PK	150	330	PASS
4885.5943	-1.63	35.48	33.85	74.00	40.15	PK	150	90	PASS
6517.6759	2.66	35.37	38.03	74.00	35.97	PK	150	270	PASS
7680.984	5.25	36.08	41.33	74.00	32.67	PK	150	260	PASS
8687.5344	6.03	32.80	38.83	74.00	35.17	PK	150	320	PASS
10616.6308	8.10	34.12	42.22	74.00	31.78	PK	150	240	PASS
3719.286	-2.97	28.14	25.17	54.00	28.83	AV	150	20	PASS
4885.5943	-1.63	30.74	29.11	54.00	24.89	AV	150	10	PASS
6517.6759	2.66	23.69	26.35	54.00	27.65	AV	150	30	PASS
7671.2336	5.24	28.24	33.48	54.00	20.52	AV	150	10	PASS
8687.5344	6.03	26.75	32.78	54.00	21.22	AV	150	10	PASS
10616.6308	8.10	22.38	30.48	54.00	23.52	AV	150	170	PASS



Radiates Emission	3G~18G
Test channel	Worst-Case
polarization	Vertical

Suspected List

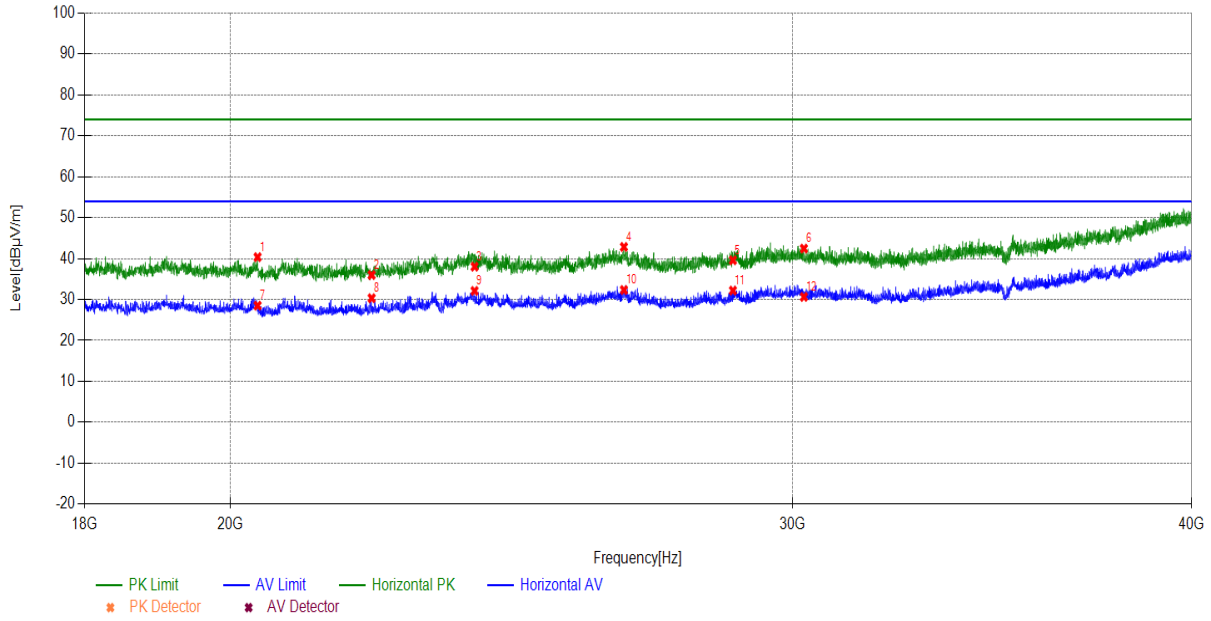
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
3936.0468	-2.67	39.29	36.62	74.00	37.38	PK	150	80	PASS
5019.851	-1.15	37.62	36.47	74.00	37.53	PK	150	40	PASS
5975.3988	2.13	35.35	37.48	74.00	36.52	PK	150	30	PASS
7652.4826	5.24	34.01	39.25	74.00	34.75	PK	150	110	PASS
8655.2828	6.00	35.72	41.72	74.00	32.28	PK	150	210	PASS
10644.3822	8.08	31.09	39.17	74.00	34.83	PK	150	50	PASS
3936.0468	-2.67	26.87	24.20	54.00	29.80	AV	150	100	PASS
5019.851	-1.15	26.51	25.36	54.00	28.64	AV	150	30	PASS
5975.3988	2.13	26.76	28.89	54.00	25.11	AV	150	10	PASS
7652.4826	5.24	26.98	32.22	54.00	21.78	AV	150	10	PASS
8655.2828	6.00	24.26	30.26	54.00	23.74	AV	150	30	PASS
10644.3822	8.08	25.57	33.65	54.00	20.35	AV	150	10	PASS



Radiates Emission	18G~40G
Test channel	Worst-Case
polarization	Horizontal

Suspected List

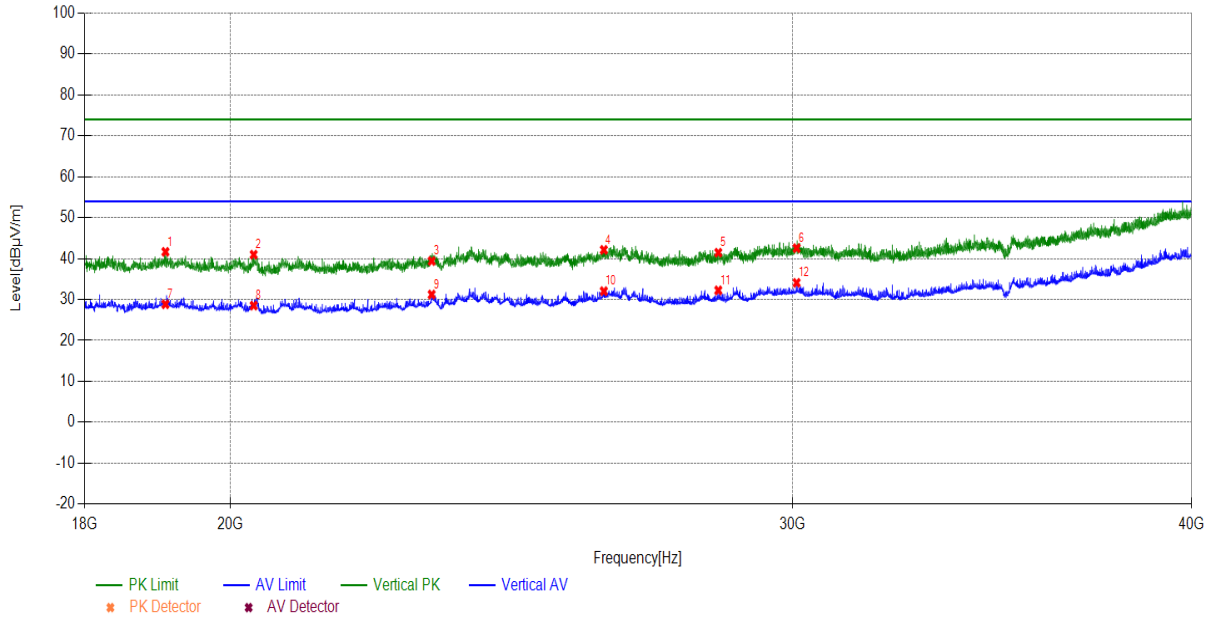
Frequency[MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
20393.8394	1.44	38.92	40.36	74.00	33.64	PK	150	50	PASS
22143.0143	2.04	33.95	35.99	74.00	38.01	PK	150	100	PASS
23848.1848	3.58	34.45	38.03	74.00	35.97	PK	150	40	PASS
26561.0561	4.72	38.14	42.86	74.00	31.14	PK	150	90	PASS
28732.6733	5.84	33.78	39.62	74.00	34.38	PK	150	50	PASS
30242.0242	6.59	35.86	42.45	74.00	31.55	PK	150	100	PASS
20393.8394	1.44	27.07	28.51	54.00	25.49	AV	150	20	PASS
22143.0143	2.04	28.29	30.33	54.00	23.67	AV	150	30	PASS
23848.1848	3.58	28.53	32.11	54.00	21.89	AV	150	60	PASS
26561.0561	4.72	27.61	32.33	54.00	21.67	AV	150	50	PASS
28732.6733	5.84	26.35	32.19	54.00	21.81	AV	150	40	PASS
30242.0242	6.59	24.06	30.65	54.00	23.35	AV	150	40	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]	Detector	Height [cm]	Angle deg	Pass/Fail
19082.5083	1.35	40.31	41.66	74.00	32.34	PK	150	50	PASS
20336.6337	1.42	39.55	40.97	74.00	33.03	PK	150	100	PASS
23122.1122	3.00	36.41	39.41	74.00	34.59	PK	150	40	PASS
26178.2178	4.57	37.57	42.14	74.00	31.86	PK	150	90	PASS
28431.2431	5.66	35.80	41.46	74.00	32.54	PK	150	50	PASS
30083.6084	6.66	35.90	42.56	74.00	31.44	PK	150	100	PASS
19082.5083	1.35	27.50	28.85	54.00	25.15	AV	150	60	PASS
20336.6337	1.42	27.10	28.52	54.00	25.48	AV	150	230	PASS
23122.1122	3.00	28.22	31.22	54.00	22.78	AV	150	290	PASS
26178.2178	4.57	27.48	32.05	54.00	21.95	AV	150	20	PASS
28431.2431	5.66	26.58	32.24	54.00	21.76	AV	150	250	PASS
30083.6084	6.66	27.43	34.09	54.00	19.91	AV	150	300	PASS



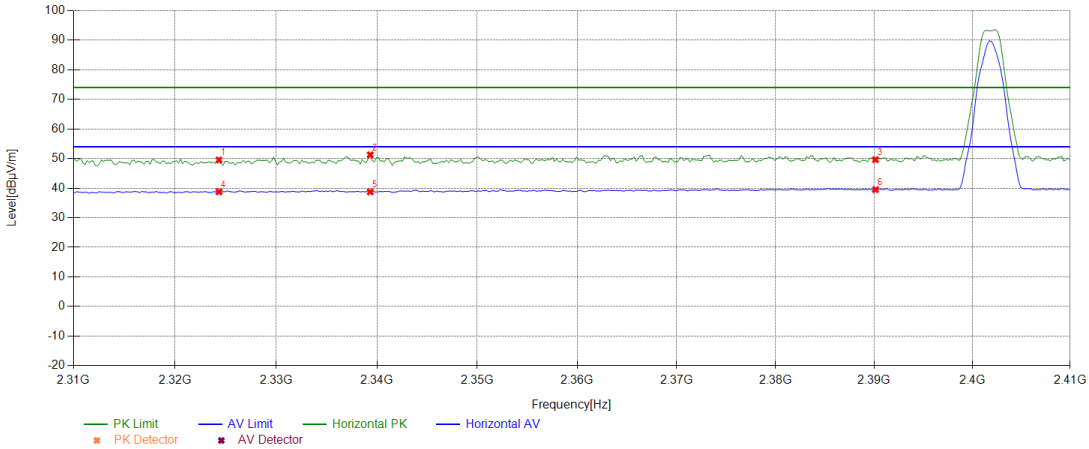
Band Edge:

During the test, the Band Edge was performed in BLE all modes with all channels and all antennas. Bluetooth(LE_2M), Antenna 1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Test mode	Bluetooth(LE_2M)
Test channel	Lowest channel
polarization	Horizontal

Suspected List

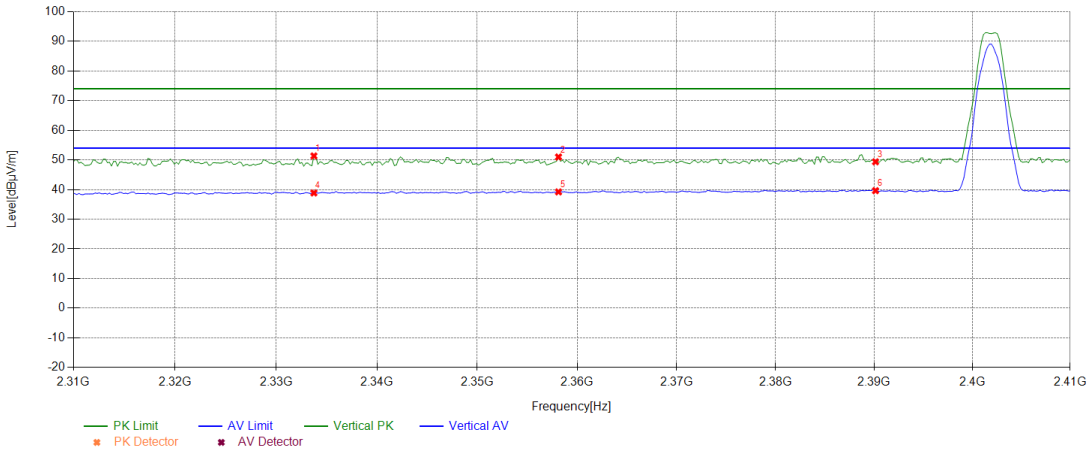
Frequency [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/ Fail
2324.3324	36.66	12.87	49.53	74.00	24.47	PK	150	317	PASS
2339.3339	36.79	14.46	51.25	74.00	22.75	PK	150	357	PASS
2390.139	37.24	12.37	49.61	74.00	24.39	PK	150	175	PASS
2324.3324	36.66	2.11	38.77	54.00	15.23	AV	150	331	PASS
2339.3339	36.79	1.95	38.74	54.00	15.26	AV	150	118	PASS
2390.139	37.24	2.25	39.49	54.00	14.51	AV	150	118	PASS



Test mode	Bluetooth(LE_2M)
Test channel	Lowest channel
polarization	Vertical

Suspected List

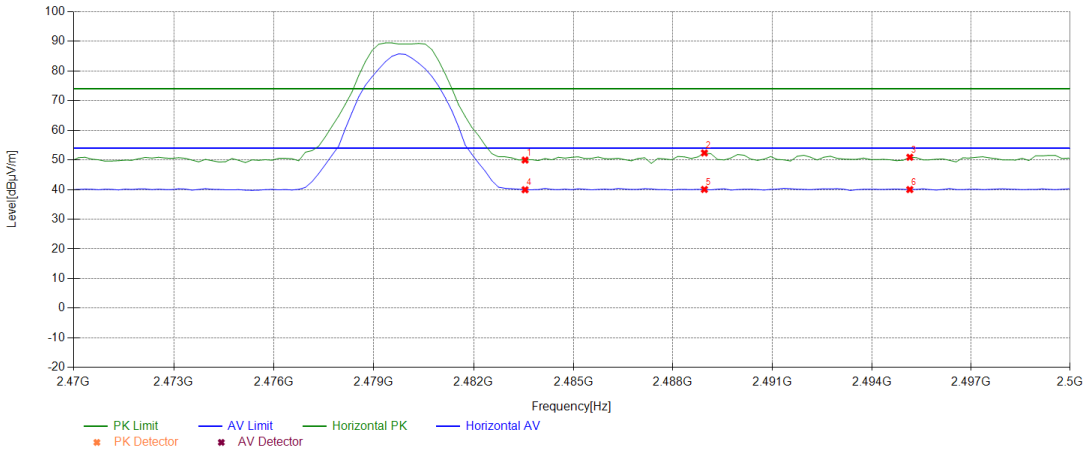
Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/ Fail
2333.7334	36.74	14.59	51.33	74.00	22.67	PK	150	316	PASS
2358.1358	36.96	14.02	50.98	74.00	23.02	PK	150	59	PASS
2390.139	37.24	12.12	49.36	74.00	24.64	PK	150	316	PASS
2333.7334	36.74	2.14	38.88	54.00	15.12	AV	150	187	PASS
2358.1358	36.96	2.26	39.22	54.00	14.78	AV	150	5	PASS
2390.139	37.24	2.40	39.64	54.00	14.36	AV	150	259	PASS



Test mode	Bluetooth(LE_2M)
Test channel	Highest channel
polarization	Horizontal

Suspected List

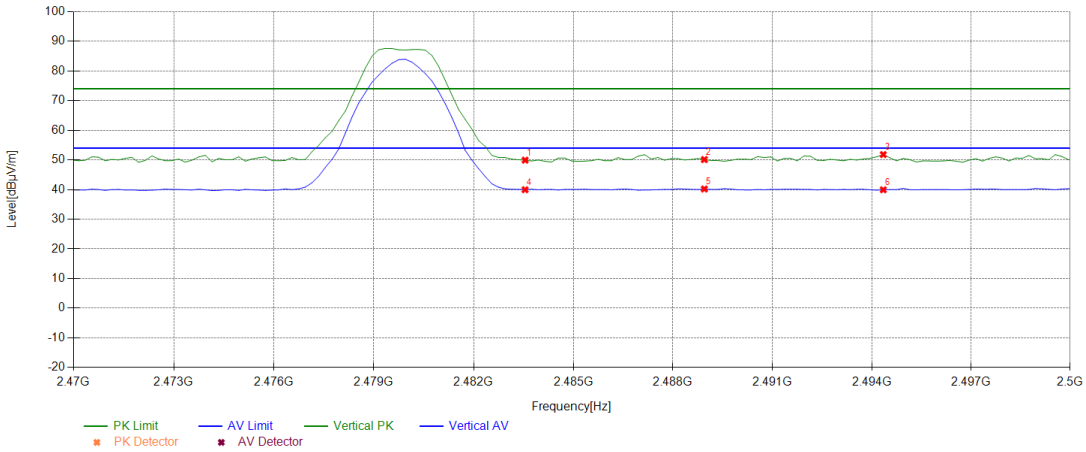
Frequency [MHz]	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/ Fail
2483.5484	37.72	12.24	49.96	74.00	24.04	PK	150	72	PASS
2488.9489	37.74	14.61	52.35	74.00	21.65	PK	150	185	PASS
2495.1495	37.77	13.12	50.89	74.00	23.11	PK	150	360	PASS
2483.5484	37.72	2.22	39.94	54.00	14.06	AV	150	341	PASS
2488.9489	37.74	2.30	40.04	54.00	13.96	AV	150	185	PASS
2495.1495	37.77	2.23	40.00	54.00	14.00	AV	150	242	PASS



Test mode	Bluetooth(LE_2M)
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	12.20	49.92	74.00	24.08	PK	150	317	PASS
2488.9489	37.74	12.37	50.11	74.00	23.89	PK	150	132	PASS
2494.3494	37.77	14.03	51.80	74.00	22.20	PK	150	18	PASS
2483.5484	37.72	2.23	39.95	54.00	14.05	AV	150	345	PASS
2488.9489	37.74	2.45	40.19	54.00	13.81	AV	150	231	PASS
2494.3494	37.77	2.16	39.93	54.00	14.07	AV	150	330	PASS



5.3 Maximum conducted output power

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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.

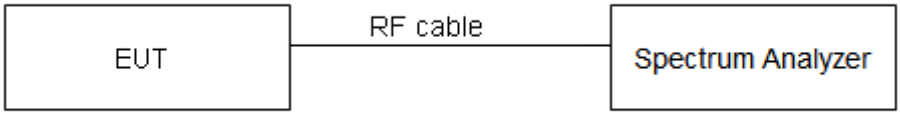
Limits:

Average Output Power	≤ 1W (30dBm)

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
BLE_1M	Ant1	2402	0.77	≤30	PASS
	Ant1	2440	1.12	≤30	PASS
	Ant1	2480	1.34	≤30	PASS
BLE_2M	Ant1	2402	0.76	≤30	PASS
	Ant1	2440	1.13	≤30	PASS
	Ant1	2480	1.35	≤30	PASS

5.4 Minimum 6 dB Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

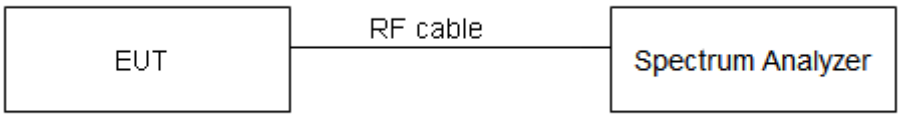
The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 100 kHz; VBW is set to 300 kHz on spectrum analyzer.
Detector=Peak, Trace mode=Max hold.

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

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
BLE_1M	Ant1	2402	0.66	2401.68	2402.35	≥0.5	PASS
		2440	0.66	2439.68	2440.35	≥0.5	PASS
		2480	0.66	2479.68	2480.34	≥0.5	PASS
BLE_2M	Ant1	2402	1.39	2401.32	2402.70	≥0.5	PASS
		2440	1.39	2439.32	2440.70	≥0.5	PASS
		2480	1.39	2479.31	2480.70	≥0.5	PASS

5.5 Occupied Channel Bandwidth

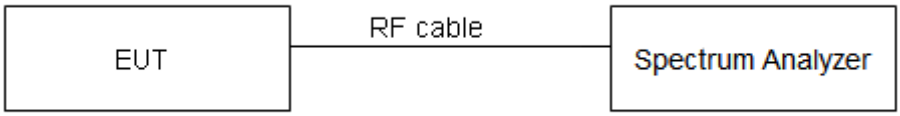
Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.015	2401.505	2402.520	---	---
		2440	1.019	2439.505	2440.524	---	---
		2480	1.015	2479.505	2480.520	---	---
BLE_2M	Ant1	2402	2.018	2401.005	2403.023	---	---
		2440	2.038	2438.993	2441.031	---	---
		2480	2.03	2479.001	2481.031	---	---

5.6 Band Edge Measurement

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

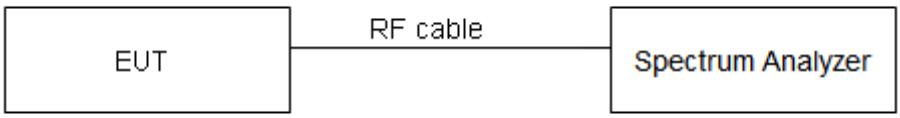
Method of Measurement:

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 Hz, 2 GHz-3 GHz = 1.407 dB.

Test Results:

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	0.60	-48.46	≤-19.4	PASS
		High	2480	1.08	-48.1	≤-18.92	PASS
BLE_2M	Ant1	Low	2402	-1.14	-35.35	≤-21.14	PASS
		High	2480	-0.05	-46.84	≤-20.05	PASS

5.7 Maximum Power Spectral Density

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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.

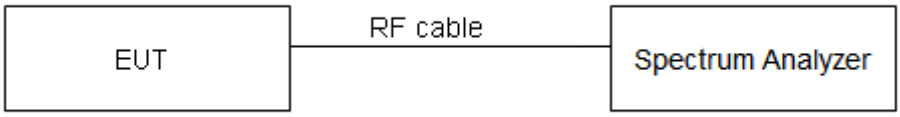
The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

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	≤ 8 dBm / 3kHz

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= 0.75dB.

Test Results:

TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-8.99	≤8	PASS
		2440	-7.27	≤8	PASS
		2480	-6.3	≤8	PASS
BLE_2M	Ant1	2402	-11.86	≤8	PASS
		2440	-10.75	≤8	PASS
		2480	-10.79	≤8	PASS

5.8 Spurious RF Conducted Emissions

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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 to100kHz 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
BLE_1M	Ant1	2402	Reference	0.62	0.62	---	PASS
			30~1000	0.62	-59.59	≤-19.38	PASS
			1000~26500	0.62	-49.21	≤-19.38	PASS
		2440	Reference	0.97	0.97	---	PASS
			30~1000	0.97	-59.46	≤-19.03	PASS
			1000~26500	0.97	-47.84	≤-19.03	PASS
		2480	Reference	1.11	1.11	---	PASS
			30~1000	1.11	-60.21	≤-18.89	PASS
			1000~26500	1.11	-47.98	≤-18.89	PASS
BLE_2M	Ant1	2402	Reference	-0.63	-0.63	---	PASS
			30~1000	-0.63	-60.12	≤-20.63	PASS
			1000~26500	-0.63	-49.18	≤-20.63	PASS
		2440	Reference	-0.26	-0.26	---	PASS
			30~1000	-0.26	-59.75	≤-20.26	PASS
			1000~26500	-0.26	-49.19	≤-20.26	PASS
		2480	Reference	-0.13	-0.13	---	PASS
			30~1000	-0.13	-59.88	≤-20.13	PASS
			1000~26500	-0.13	-49.07	≤-20.13	PASS

6. Appendix A

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	VGDY-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	SCHWARZBECK	2024/04/24
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2024/06/10
Waveguide Horn Antenna	HF906	360306/008	EM-000093	R&S	2024/02/24
Waveguide Horn Antenna	BBHA9170	00949	EM-000383	SCHWARZBECK	2023/08/26
Bandstop Filters	SW-BSF-2400-100-7-A1	/	EM-000495	/	2023/08/30
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2023/12/06
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2024/06/04
EMI Test Receiver	ESR3	102394	VGDY-0705	R&S	2024/04/22
LISN	NSLK 8127	8127644	VGDY-0150	SCHWARZBECK	2023/09/03
Plus Limiter（#2）	VTSD 9561	9561-F017	VGDY-0152	SCHWARZBECK	2024/09/03
Shielding Room(#2)	GP1A	001	WKNF-0006	LEINING	2024/08/07

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.

Address: No.3,Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, China (Test location)
Post Code：510663 Tel：020-32293888
FAX：020 32293889 E-mail：office@cvc.org.cn