TEST REPORT

Product	:	robosen Mega Optimus Prime
Trade mark	:	robosen
Model/Type reference	:	QTZ-40-T-01
Serial Number	:	N/A
Report Number	:	EED32N80049701
FCC ID	:	2ATNWOP40
Date of Issue	:	Mar. 01, 2021
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

Robosen Robotics (ShenZhen) Co., Ltd.
A2306, Bldg 11, Shenzhen Bay ECO-Tech Park,
No.16,Gaoxin South Science and Tech Rd.,
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Prepared by:

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Reviewed by: Aaron Ma — Aaron Ma

Approved by: David Wang — David Wang

Date: Mar. 01, 2021

Check No.:4124270121

2 Version

Version No.	Date	Description
00	Mar. 01, 2021	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15Subpart C Section 15.247 (e)	ANSI C63.10-2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
Radiated Spurious Emissions	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS

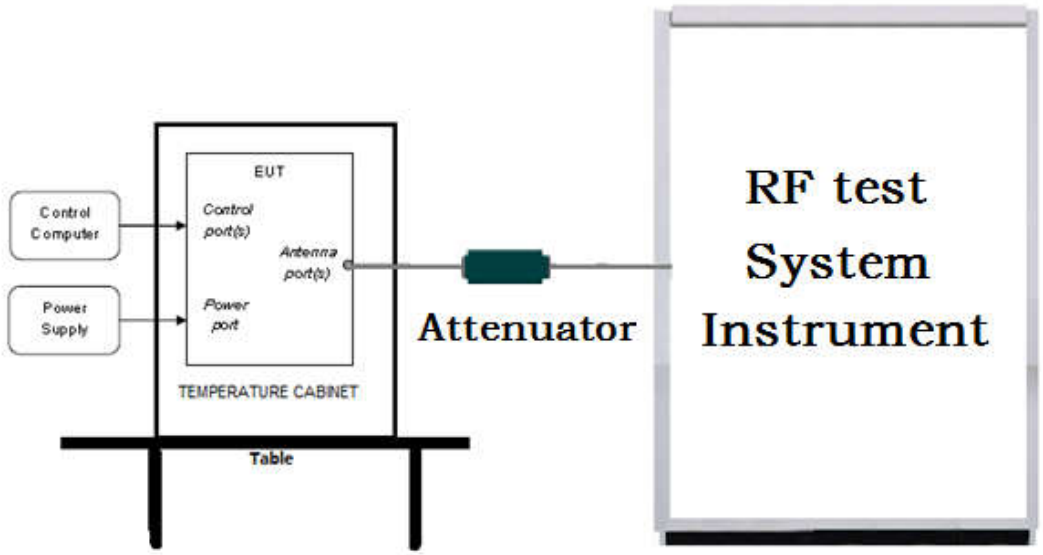
Remark:
Test according to ANSI C63.4-2014 & ANSI C63.10-2013.
Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.

4 Content

5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

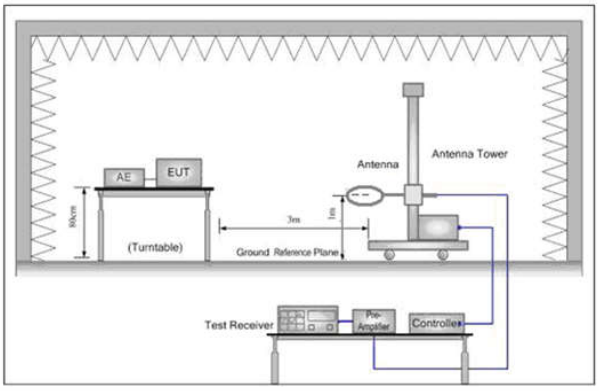


Figure 1. Below 30MHz

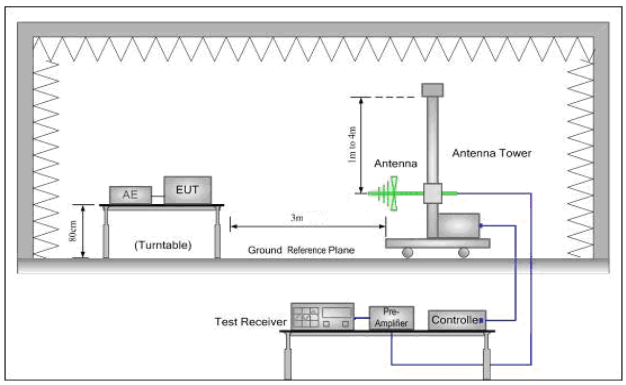


Figure 2. 30MHz to 1GHz

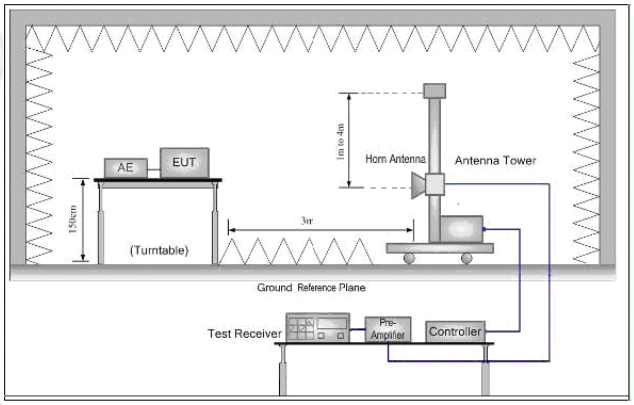
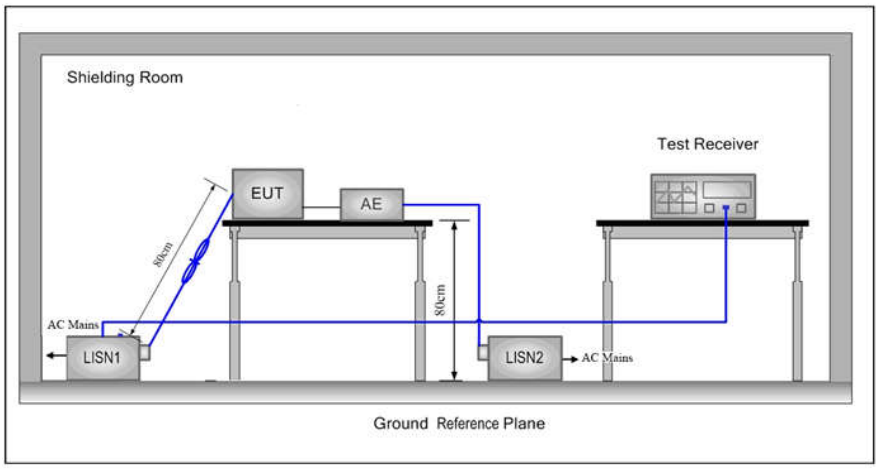


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	24.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar

5.3 Test Condition

Test channel:

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
GFSK	2402MHz ~2480 MHz	Channel 0	Channel 19	Channel 39
		2402MHz	2440MHz	2480MHz
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.			

6 General Information

6.1 Client Information

Applicant:	Robosen Robotics (ShenZhen) Co., Ltd.
Address of Applicant:	A2306,Bldg 11, Shenzhen Bay ECO-Tech Park, No.16,Gaoxin South Science and Tech Rd., Nanshan Dist., Shenzhen,Guangdong,China
Manufacturer:	Robosen Robotics (ShenZhen) Co., Ltd.
Address of Manufacturer:	A2306,Bldg 11, Shenzhen Bay ECO-Tech Park, No.16,Gaoxin South Science and Tech Rd., Nanshan Dist., Shenzhen,Guangdong,China
Factory:	Dongguan Viya Electronics Co., Ltd.
Address of Factory:	7, Yihong Road, Yan Tian, Fengguang Dongguan City, Guangdong, China

6.2 General Description of EUT

Product Name:	robosen Mega Optimus Prime	
Model No.(EUT):	QTZ-40-T-01	
Trade mark:	robosen	
EUT Supports Radios application:	4.2 BT Single mode, 2402MHz to 2480MHz	
Power Supply:	Battery	KPL523653-35 12000mAh 11.1V 13.32Wh
		KPL723046-3S 12000mAh 11.1V 13.32Wh
	Adapter	GFD24-1262000U INPUT:100-240V 50/60Hz 1.0A OUTPUT:12.6V 2A
Sample Received Date:	Jan. 15, 2021	
Sample tested Date:	Jan. 15, 2021 to Mar. 01, 2021	

6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	4.2
Modulation Technique:	DSSS
Modulation Type:	GFSK
Number of Channel:	40
Test Power Grade:	Default
Test Software of EUT:	BeeMPTool
Antenna Type and Gain:	Type:PCB Antenna Gain: 3dBi
Test Voltage:	DC 5V

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
2	2406MHz	12	2426MHz	22	2446MHz	32	2466MHz
3	2408MHz	13	2428MHz	23	2448MHz	33	2468MHz
4	2410MHz	14	2430MHz	24	2450MHz	34	2470MHz
5	2412MHz	15	2432MHz	25	2452MHz	35	2472MHz
6	2414MHz	16	2434MHz	26	2454MHz	36	2474MHz
7	2416MHz	17	2436MHz	27	2456MHz	37	2476MHz
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz

6.4 Description of Support Units

The EUT has been tested with associated equipment below.

Associated equipment name		Manufacturer	Model	S/N serial number	Certification	Supplied by
AE1	Notebook	DELL	DELL 3490	D245DX2	CE & FCC	DELL

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd
Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.
FCC Designation No.: CN1164

6.6 Deviation from Standards

None.

6.7 Abnormalities from Standard Conditions

None.

6.8 Other Information Requested by the Customer

None.

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

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

7 Equipment List

RF test system					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Spectrum Analyzer	Keysight	N9010A	MY54510339	12-28-2020	12-27-2021
Signal Generator	Keysight	N5182B	MY53051549	12-28-2020	12-27-2021
Temperature/ Humidity Indicator	biaozhi	HM10	1804186	06-29-2020	06-28-2021
High-pass filter	Sinoscite	FL3CX03WG18N M12-0398-002	---	---	---
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	---	---
DC Power	Keysight	E3642A	MY56376072	12-28-2020	12-27-2021
PC-1	Lenovo	R4960d	---	---	---
BT&WI-FI Automatic control	R&S	OSP120	101374	12-28-2020	12-27-2021
RF control unit	JS Tonscend	JS0806-2	158060006	12-28-2020	12-27-2021
BT&WI-FI Automatic test software	JS Tonscend	JS1120-3	---	---	---

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

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	10-17-2020	10-16-2021
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-16-2020	10-15-2021
Multi device Controller	maturo	NCD/070/10711112	---	---	---
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	06-29-2020	06-28-2021
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---

3M full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
RSE Automatic test software	JS Tonscend	JS36-RSE	10166	---	---
Receiver	Keysight	N9038A	MY57290136	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9020B	MY57111112	03-05-2020	03-04-2021
Spectrum Analyzer	Keysight	N9030B	MY57140871	03-05-2020	03-04-2021
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-25-2018	04-24-2021
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-25-2018	04-24-2021
Horn Antenna	ETS-LINDGREN	3117	00057407	07-10-2018	07-09-2021
Preamplifier	EMCI	EMC184055SE	980596	05-20-2020	05-19-2021
Preamplifier	EMCI	EMC001330	980563	04-22-2020	04-21-2021
Preamplifier	JS Tonscend	980380	EMC051845 SE	12-31-2020	12-30-2021
Temperature/ Humidity Indicator	biaozhi	GM1360	EE1186631	04-27-2020	04-26-2021
Fully Anechoic Chamber	TDK	FAC-3	---	01-17-2018 01-07-2021	01-16-2021 01-06-2024
Filter bank	JS Tonscend	JS0806-F	188060094	04-10-2018	04-09-2021
Cable line	Times	SFT205-NMSM-2.50M	394812-0001	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	---	---
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	---	---
Cable line	Times	EMC104-NMNM-1000	SN160710	---	---
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	---	---
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	---	---
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	---	---
Cable line	Times	HF160-KMKM-3.00M	393493-0001	---	---

8 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

Test Results List:

Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Note 1
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Note 1
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	Note 1
Part15C Section 15.247(d)	ANSI C63.10	RF Conducted Spurious Emissions	PASS	Note 1
Part15C Section 15.247 (e)	ANSI C63.10	Power Spectral Density	PASS	Note 1
Part15C Section 15.203/15.247 (c)	ANSI C63.10	Antenna Requirement	PASS	Appendix A)
Part15C Section 15.207	ANSI C63.10	AC Power Line Conducted Emission	PASS	Appendix B)
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix C)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix D)
Note 1: The test data please refer to Appendix: Bluetooth LE of EED32N80049701				

Appendix A): Antenna Requirement

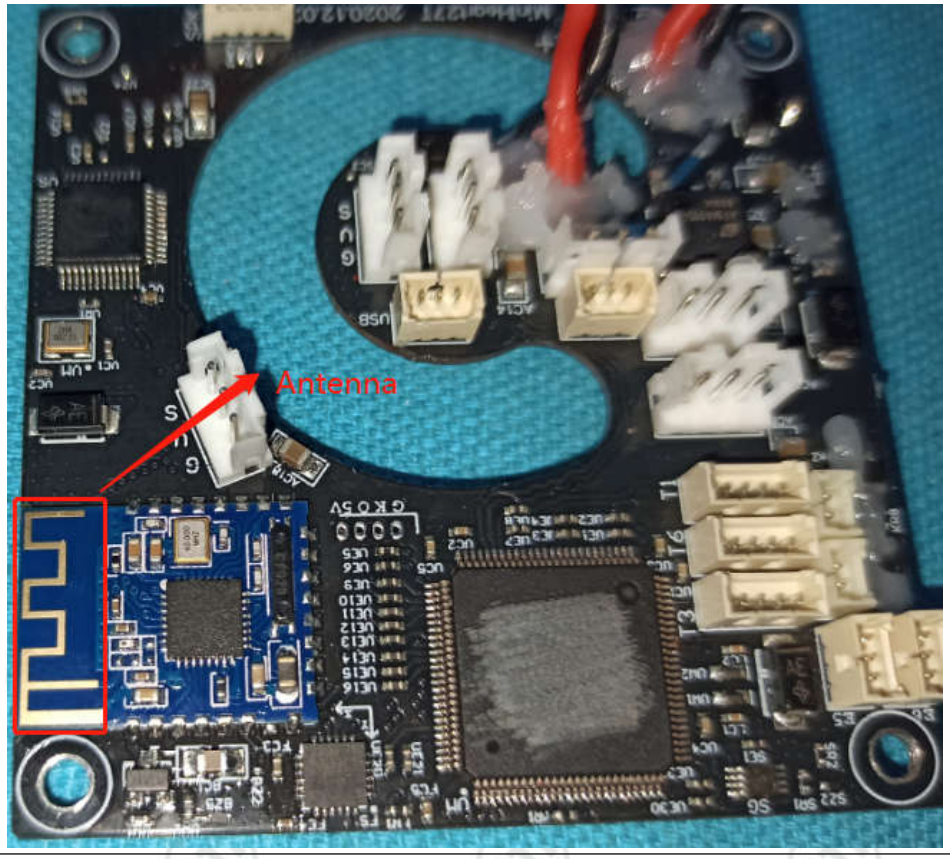
15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:



The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3 dBi.

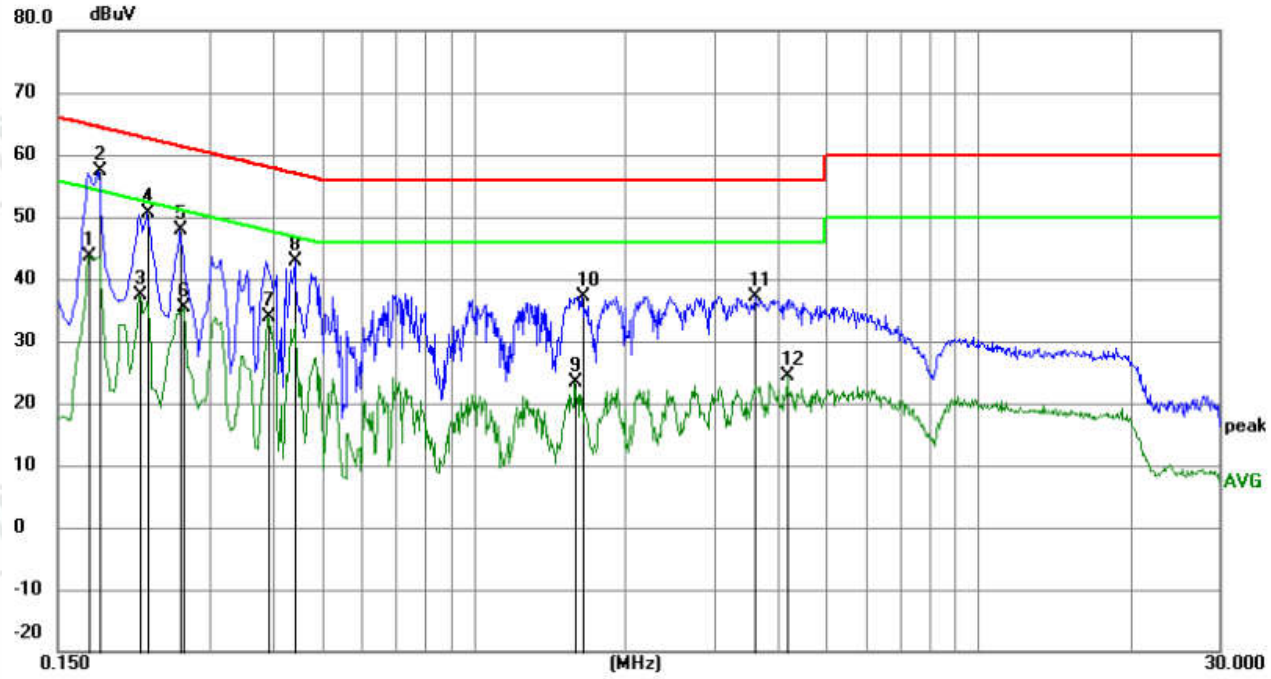
Appendix B): AC Power Line Conducted Emission

<table>
<tr><td>Test Procedure:</td><td>Test frequency range :150KHz-30MHz
1)The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3)The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.
NOTE : The lower limit is applicable at the transition frequency</td></tr>
</table>

Measurement Data

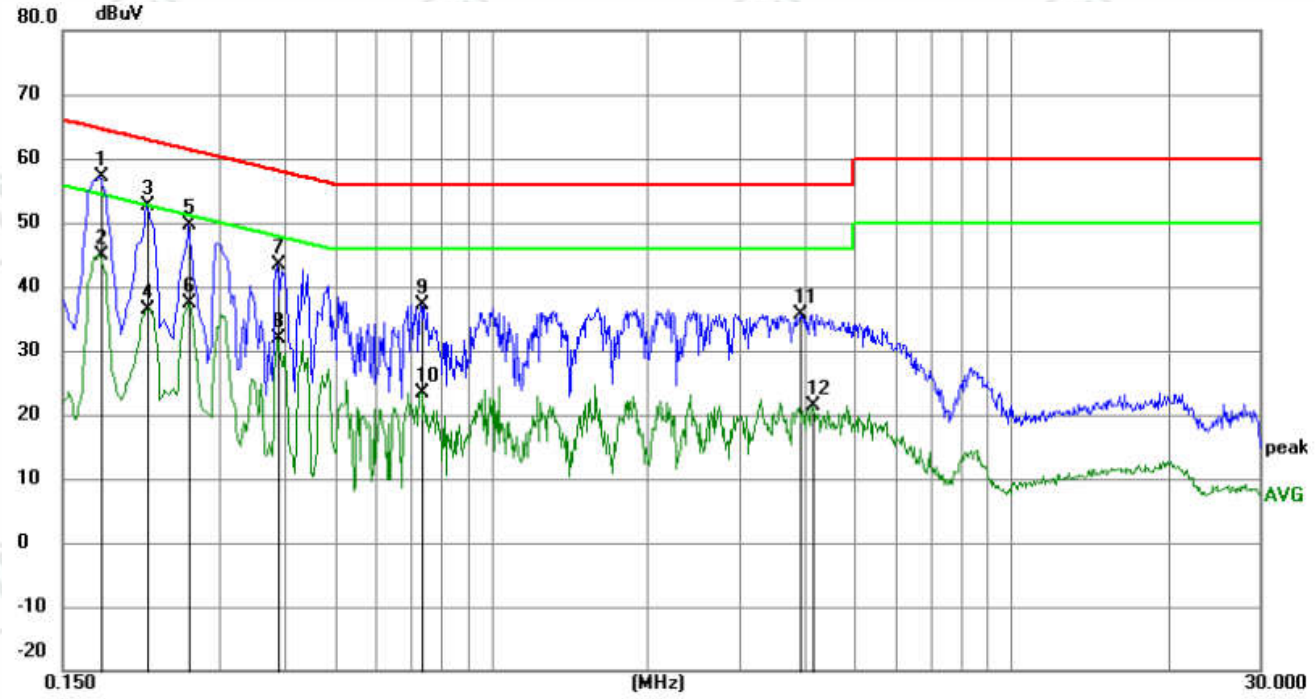
An initial pre-scan was performed on the live and neutral lines with peak detector.
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1725	33.76	9.87	43.63	54.84	-11.21	AVG	
2	*	0.1815	47.55	9.87	57.42	64.42	-7.00	QP	
3		0.2175	27.57	9.90	37.47	52.91	-15.44	AVG	
4		0.2265	40.65	9.92	50.57	62.58	-12.01	QP	
5		0.2625	37.80	10.00	47.80	61.35	-13.55	QP	
6		0.2670	25.27	10.00	35.27	51.21	-15.94	AVG	
7		0.3930	23.93	9.98	33.91	48.00	-14.09	AVG	
8		0.4425	32.87	9.96	42.83	57.01	-14.18	QP	
9		1.5900	13.53	9.81	23.34	46.00	-22.66	AVG	
10		1.6395	27.34	9.80	37.14	56.00	-18.86	QP	
11		3.6150	27.34	9.78	37.12	56.00	-18.88	QP	
12		4.2000	14.65	9.78	24.43	46.00	-21.57	AVG	

Neutral line:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1770	47.27	9.87	57.14	64.63	-7.49	QP	
2		0.1770	35.02	9.87	44.89	54.63	-9.74	AVG	
3		0.2175	42.81	9.90	52.71	62.91	-10.20	QP	
4		0.2175	26.56	9.90	36.46	52.91	-16.45	AVG	
5		0.2625	39.73	10.00	49.73	61.35	-11.62	QP	
6		0.2625	27.44	10.00	37.44	51.35	-13.91	AVG	
7		0.3885	33.45	9.98	43.43	58.10	-14.67	QP	
8		0.3885	21.79	9.98	31.77	48.10	-16.33	AVG	
9		0.7350	27.36	9.87	37.23	56.00	-18.77	QP	
10		0.7350	13.63	9.87	23.50	46.00	-22.50	AVG	
11		3.9300	25.96	9.78	35.74	56.00	-20.26	QP	
12		4.1369	11.49	9.78	21.27	46.00	-24.73	AVG	

Notes:

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

Appendix C): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

Test method Refer as KDB 558074 D01 , Section 12.1

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. . Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

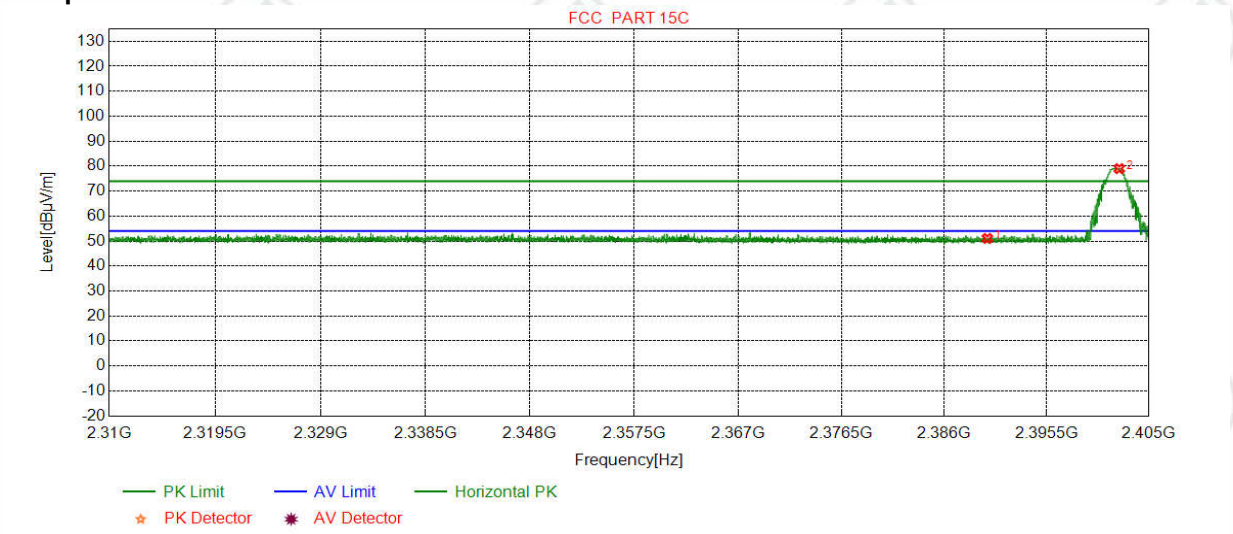
Limit:

Frequency	Limit (dBμV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test plot as follows:

Mode:	BLE GFSK Transmitting	Channel:	2402
Remark:	PK		

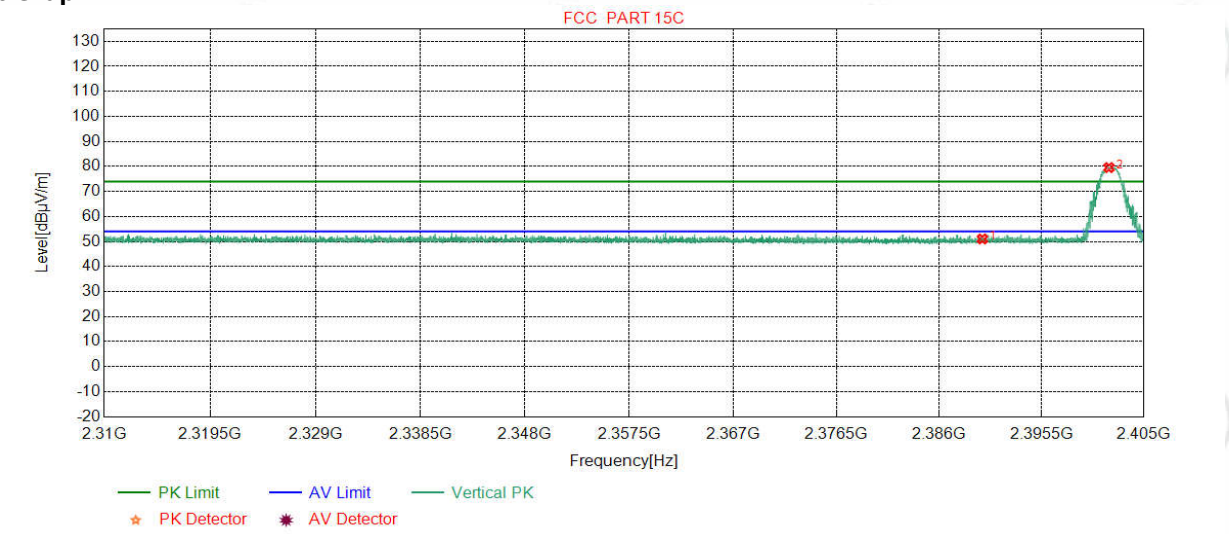
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	48.55	51.05	74.00	22.95	Pass	Horizontal
2	2402.2512	32.26	13.31	-43.12	76.55	79.00	74.00	-5.00	Pass	Horizontal

Mode:	BLE GFSK Transmitting	Channel:	2402
Remark:	PK		

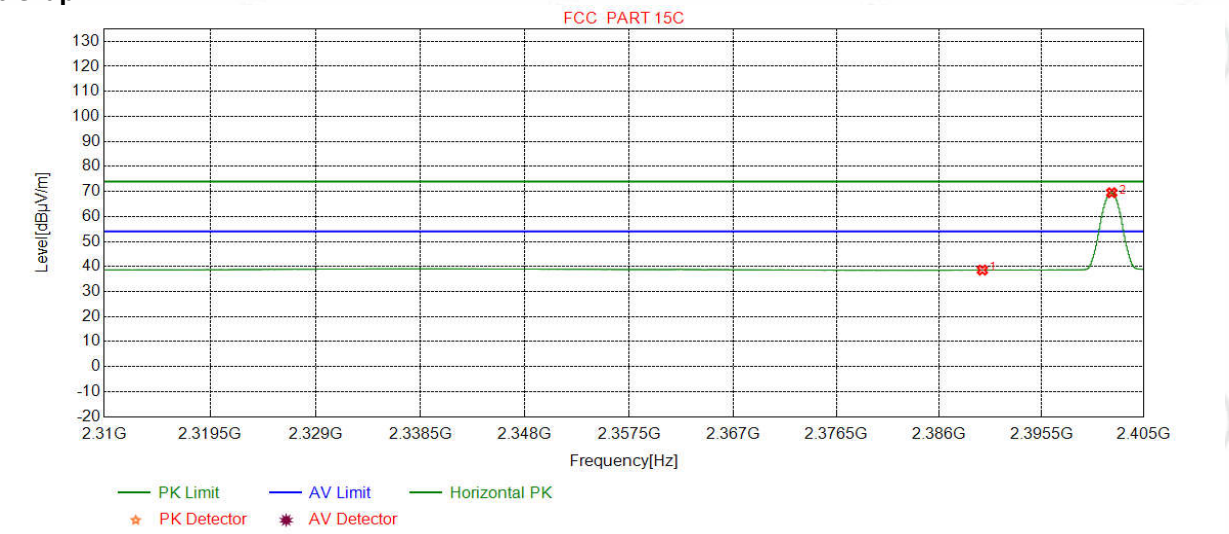
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	48.51	51.01	74.00	22.99	Pass	Vertical
2	2401.7571	32.26	13.31	-43.12	77.10	79.55	74.00	-5.55	Pass	Vertical

Mode:	BLE GFSK Transmitting	Channel:	2402
Remark:	AV		

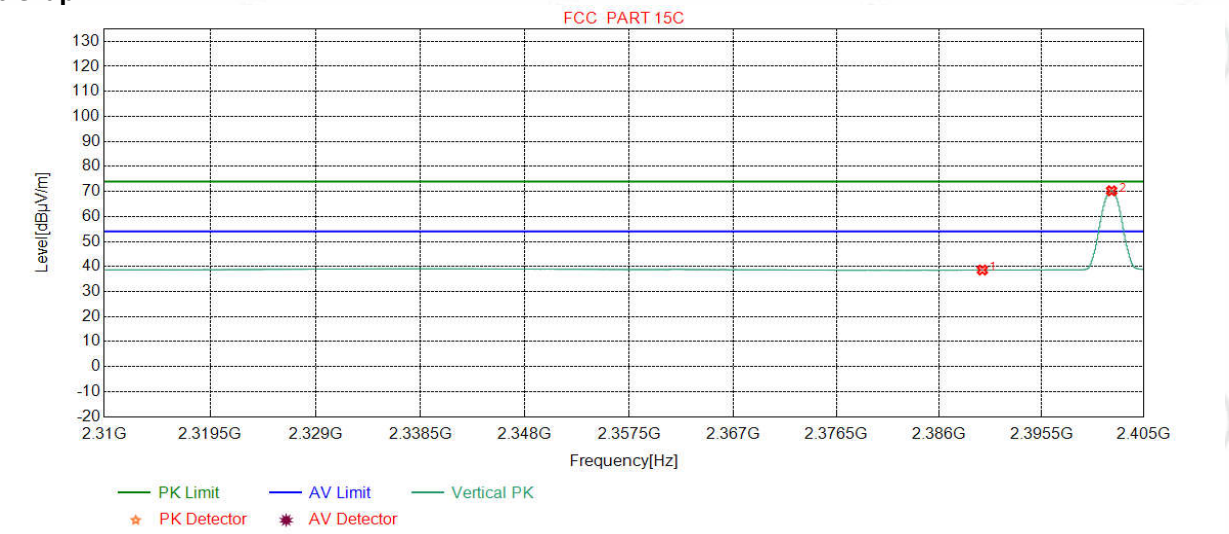
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	36.08	38.58	54.00	15.42	Pass	Horizontal
2	2402.0168	32.26	13.31	-43.12	67.06	69.51	54.00	-15.51	Pass	Horizontal

Mode:	BLE GFSK Transmitting	Channel:	2402
Remark:	AV		

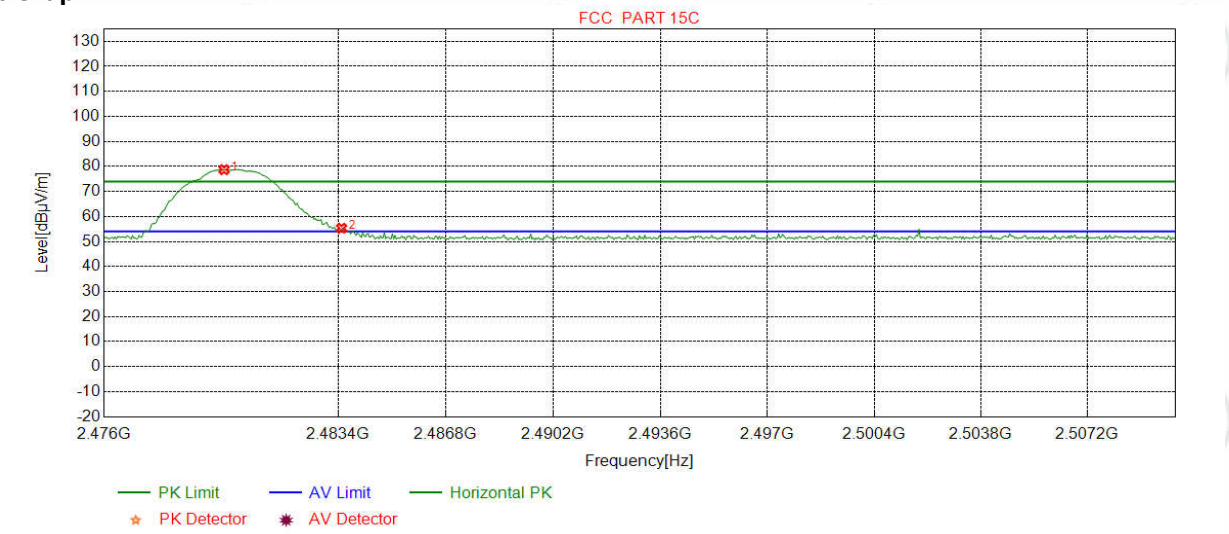
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-43.12	36.11	38.61	54.00	15.39	Pass	Vertical
2	2402.0041	32.26	13.31	-43.12	67.81	70.26	54.00	-16.26	Pass	Vertical

Mode:	BLE GFSK Transmitting	Channel:	2480
Remark:	PK		

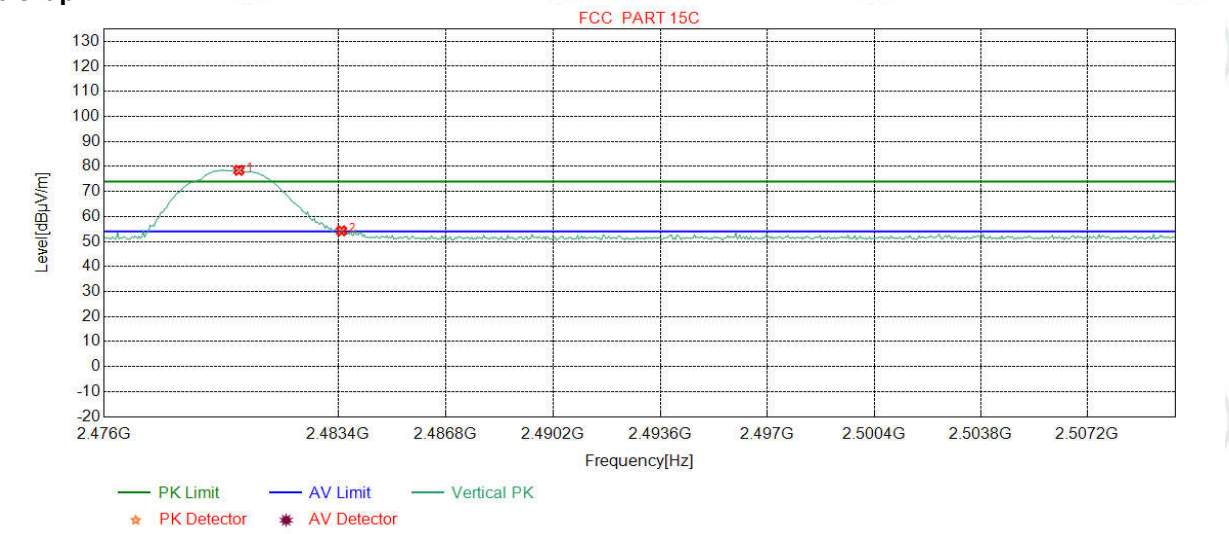
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2479.7872	32.37	13.39	-43.10	76.06	78.72	74.00	-4.72	Pass	Horizontal
2	2483.5000	32.38	13.38	-43.11	52.66	55.31	74.00	18.69	Pass	Horizontal

Mode:	BLE GFSK Transmitting	Channel:	2480
Remark:	PK		

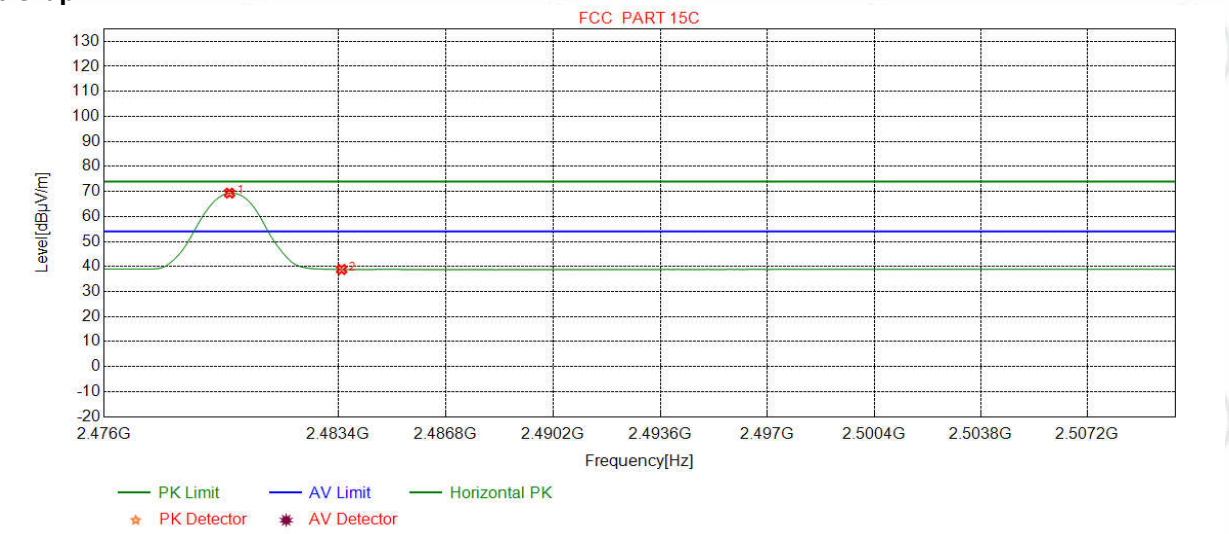
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2480.2553	32.37	13.39	-43.10	75.78	78.44	74.00	-4.44	Pass	Vertical
2	2483.5000	32.38	13.38	-43.11	51.60	54.25	74.00	19.75	Pass	Vertical

Mode:	BLE GFSK Transmitting	Channel:	2480
Remark:	AV		

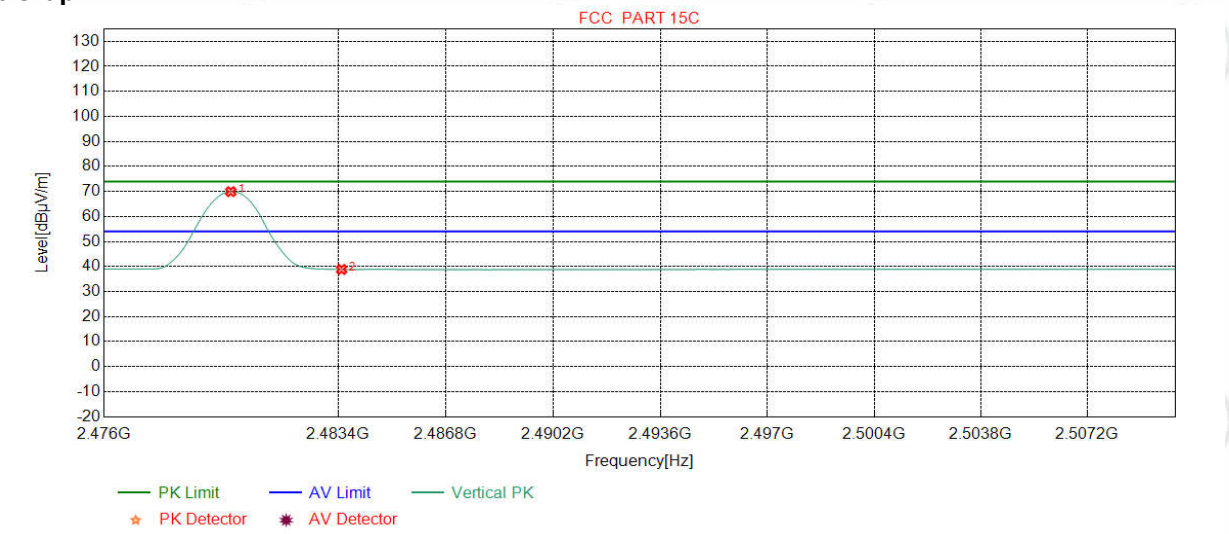
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2479.9574	32.37	13.39	-43.10	66.69	69.35	54.00	-15.35	Pass	Horizontal
2	2483.5000	32.38	13.38	-43.11	36.17	38.82	54.00	15.18	Pass	Horizontal

Mode:	BLE GFSK Transmitting	Channel:	2480
Remark:	AV		

Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity
1	2480.0000	32.37	13.39	-43.10	67.27	69.93	54.00	-15.93	Pass	Vertical
2	2483.5000	32.38	13.38	-43.11	36.19	38.84	54.00	15.16	Pass	Vertical

Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

Appendix D) Radiated Spurious Emissions

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

Test method Refer as KDB 558074 D01 , Section 12.1

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

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

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

Radiated Spurious Emissions test Data:

Radiated Emission below 1GHz

Mode:			BLE GFSK Transmitting					Channel:		2440	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity	Remark
1	36.5967	11.21	0.67	-31.38	52.44	32.94	40.00	7.06	Pass	H	PK
2	45.7156	13.20	0.76	-31.77	51.66	33.85	40.00	6.15	Pass	H	PK
3	197.7298	10.68	1.66	-31.92	56.36	36.78	43.50	6.72	Pass	H	PK
4	479.9310	16.68	2.61	-31.90	43.00	30.39	46.00	15.61	Pass	H	PK
5	600.0290	19.00	2.96	-31.50	41.63	32.09	46.00	13.91	Pass	H	PK
6	844.9785	21.44	3.50	-31.82	36.85	29.97	46.00	16.03	Pass	H	PK
7	35.5296	10.87	0.66	-31.41	52.42	32.54	40.00	7.46	Pass	V	PK
8	45.5216	13.20	0.76	-31.76	50.40	32.60	40.00	7.40	Pass	V	PK
9	130.0170	7.70	1.33	-32.02	53.59	30.60	43.50	12.90	Pass	V	PK
10	240.0260	11.94	1.84	-31.90	52.45	34.33	46.00	11.67	Pass	V	PK
11	487.9828	16.81	2.64	-31.89	42.08	29.64	46.00	16.36	Pass	V	PK
12	838.3818	21.36	3.50	-31.91	46.56	39.51	46.00	6.49	Pass	V	PK

Transmitter Emission above 1GHz

Mode:			BLE GFSK Transmitting					Channel:		2402	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBµV]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Result	Polarity	Remark
1	1327.8328	28.23	2.79	-42.76	54.79	43.05	74.00	30.95	Pass	H	PK
2	1814.6815	30.48	3.34	-42.75	50.67	41.74	74.00	32.26	Pass	H	PK
3	3069.0046	33.23	4.79	-43.10	50.11	45.03	74.00	28.97	Pass	H	PK
4	5024.1349	34.52	4.85	-42.79	50.26	46.84	74.00	27.16	Pass	H	PK
5	7206.2804	36.31	5.81	-42.16	52.02	51.98	74.00	22.02	Pass	H	PK
6	10596.506	38.52	6.92	-42.00	49.42	52.86	74.00	21.14	Pass	H	PK
7	1328.2328	28.23	2.79	-42.76	59.43	47.69	74.00	26.31	Pass	V	PK
8	1937.8938	31.29	3.42	-43.05	55.32	46.98	74.00	27.02	Pass	V	PK
9	3006.0004	33.20	4.92	-43.10	50.05	45.07	74.00	28.93	Pass	V	PK
10	5004.1336	34.50	4.82	-42.79	50.01	46.54	74.00	27.46	Pass	V	PK
11	7205.2804	36.31	5.82	-42.17	53.79	53.75	74.00	20.25	Pass	V	PK
12	10628.508	38.53	6.97	-42.00	48.88	52.38	74.00	21.62	Pass	V	PK

Mode:			BLE GFSK Transmitting					Channel:		2440	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1331.6332	28.23	2.79	-42.75	52.28	40.55	74.00	33.45	Pass	H	PK
2	1996.4997	31.68	3.47	-43.20	53.89	45.84	74.00	28.16	Pass	H	PK
3	5061.1374	34.56	4.86	-42.78	50.71	47.35	74.00	26.65	Pass	H	PK
4	7320.2880	36.42	5.85	-42.14	52.29	52.42	74.00	21.58	Pass	H	PK
5	8396.3598	36.56	6.32	-42.04	50.28	51.12	74.00	22.88	Pass	H	PK
6	10413.494	38.38	7.15	-42.02	49.11	52.62	74.00	21.38	Pass	H	PK
7	1331.6332	28.23	2.79	-42.75	58.28	46.55	74.00	27.45	Pass	V	PK
8	1914.4914	31.14	3.42	-42.99	54.96	46.53	74.00	27.47	Pass	V	PK
9	3986.0657	33.79	4.33	-43.00	49.62	44.74	74.00	29.26	Pass	V	PK
10	5007.1338	34.51	4.83	-42.80	51.70	48.24	74.00	25.76	Pass	V	PK
11	7321.2881	36.42	5.85	-42.13	53.30	53.44	74.00	20.56	Pass	V	PK
12	10422.494	38.39	7.12	-42.01	48.60	52.10	74.00	21.90	Pass	V	PK

Mode:			BLE GFSK Transmitting					Channel:		2480	
NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1333.0333	28.23	2.80	-42.75	52.36	40.64	74.00	33.36	Pass	H	PK
2	1681.8682	29.60	3.18	-42.70	50.92	41.00	74.00	33.00	Pass	H	PK
3	2176.7177	31.95	3.65	-43.17	51.21	43.64	74.00	30.36	Pass	H	PK
4	3911.0607	33.73	4.34	-43.02	49.54	44.59	74.00	29.41	Pass	H	PK
5	7439.2960	36.54	5.85	-42.11	51.54	51.82	74.00	22.18	Pass	H	PK
6	9601.4401	37.64	6.61	-42.10	49.96	52.11	74.00	21.89	Pass	H	PK
7	1331.6332	28.23	2.79	-42.75	59.82	48.09	74.00	25.91	Pass	V	PK
8	1975.8976	31.54	3.45	-43.14	55.80	47.65	74.00	26.35	Pass	V	PK
9	3202.0135	33.28	4.64	-43.10	49.58	44.40	74.00	29.60	Pass	V	PK
10	5013.1342	34.51	4.84	-42.80	50.53	47.08	74.00	26.92	Pass	V	PK
11	7441.2961	36.54	5.85	-42.11	53.25	53.53	74.00	20.47	Pass	V	PK
12	9785.4524	37.71	6.61	-42.10	49.28	51.50	74.00	22.50	Pass	V	PK

Note:

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

Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.