Shenzhen Huatongwei International Inspection Co., Ltd.
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TEST REPORT

Report Reference No. ..... :	**TRE1703020702**	R/C…….: 54045
FCC ID ..... :	**2AFZJ-CODE100H**	
Applicant's name ..... :	**Marshall Amplification Plc**	
Address.....:	Denbigh Road, Bletchley, Milton Keynes, MK1 IDQ, United Kingdom	
Manufacturer.....:	Marshall Amplification Plc	
Address.....:	Denbigh Road, Bletchley, Milton Keynes, MK1 1DQ,United Kingdom	
Test item description ..... :	**MD116D Guitar Amplifiers**	
Trade Mark .....:	Marshall	
Model/Type reference.....:	CODE100H	
Listed Model(s) .....:	-	
Standard ..... :	**FCC CFR Title 47 Part 15 Subpart C Section 15.247**	
Date of receipt of test sample……...:	Dec. 28,2016	
Date of testing……:	Dec. 29,2016-Mar. 29,2017	
Date of issue……...:	Mar. 30,2017	
Result……...:	**PASS**	

Compiled by (position+printedname+signature)...:	File administrators Shayne Zhu	Shayne Zhu
Supervised by (position+printedname+signature)....:	Project Engineer Jeff Sun	Jeff Sun
Approved by (position+printedname+signature)....:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd.**
Address.....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS AND REPORT VERSION

1.1. Applicable Standards

The tests were performed according to following standards:
FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10:2013:American National Standard for Testing Unlicensed Wireless Devices

KDB558074 D01 DTS Meas Guidance v04:Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247

1.2. Report Version

Version No.	Date of issue	Description
00	Mar. 30,2017	Original

2. TEST DESCRIPTION

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
Conducted Emissions (AC Mains)	15.207	Pass
Conducted Peak Output Power	15.247 (b)(3)	Pass
Power Spectral Density	15.247 (e)	Pass
6dB Bandwidth	15.247 (a)(2)	Pass
Restricted Band	15.247(d)/15.205	Pass
Spurious Emissions	15.247(d)/15.209	Pass

Note: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	Marshall Amplification Plc
Address:	Denbigh Road, Bletchley, Milton Keynes, MK1 IDQ, United Kingdom
Manufacturer:	Marshall Amplification Plc
Address:	Denbigh Road, Bletchley, Milton Keynes, MK1 1DQ,United Kingdom

3.2. Product Description

Name of EUT	MD116D Guitar Amplifiers
Trade Mark:	Marshall
Model No.:	CODE100H
Listed Model(s):	-
Power supply:	AC 120V/60Hz
Adapter information:	-
Bluetooth	
Version:	Supported BT4.0+BLE
Modulation:	GFSK
Operation frequency:	2402MHz - 2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	Internal Antenna
Antenna gain:	0.5dBi

3.3. Operation State

➢ **Frequency list**

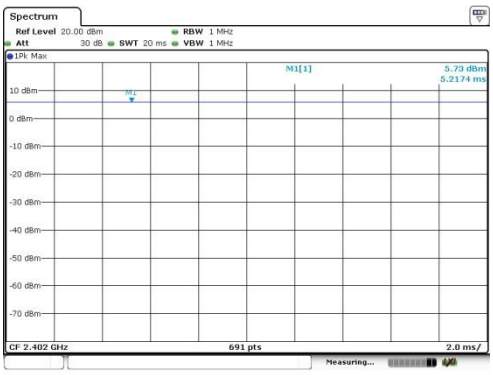
40 channels are provided for bluetooth LE mode:

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

➢ **Test channel**

Channel	Frequcncy (MHz)
0	2402
19	2440
39	2480

➢ **Test mode**

For RF test items	
The engineering test program was provided and enabled to make EUT continuous transmit(duty cycle>98%).	
	100% duty cycle for continuous transmit
For AC power line conducted emissions:	
The EUT was set to connect with large package sizes transmission.	

3.4. EUT Configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	N/A	Manufacturer :	N/A
		Model No. :	N/A
○	N/A	Manufacturer :	N/A
		Model No. :	N/A

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. TEST ENVIRONMENT

4.1. Address Of The Test Laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

4.2. Test Facility

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

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

A2LA-Lab Cert. No. 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until March 31, 2017.

FCC-Registration No.: 317478

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

IC-Registration No.: 5377B-1

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B-1 on Dec.03, 2014, valid time is until Dec.03, 2017.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
lative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.4. Statement Of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 “Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1” and TR-100028-02 “Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2” and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system according to ISO/IEC 17025. Further more, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Here after the best measurement capability for Shenzhen Huatongwei is reported:

Test Items	MeasurementUncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-40 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	---------	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.5. Test Equipment

Conducted Emission (AC Main)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	R&S	ESCI	101247	2016/11/13
2	Artificial Mains	Shwarzbeck	NNLK 8121	573	2016/11/13
3	Pulse Limiter	R&S	ESH3-Z2	101488	2016/11/13
4	Test Software	R&S	ES-K1	N/A	N/A
5	Test cable	ENVIROFLEX	3651	1101902	2016/11/13

Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2016/11/13
2	Power Meter	Anritsu	ML2480B	100798	2016/11/13
3	Power Sensor	Anritsu	MA2411B	100258	2016/11/13
4	Test cable	FARPU	MCX-J	N/A	2016/11/13
5	Temporary antenna connector	D-LENP	NJ-SMAK	N/A	2016/11/13

NOTE:The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Restricted Band / Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
2	RF Test Panel	Rohde&Schwarz	TS / RSP	335015/0017	N/A
3	EMI Test Software	Rohde&Schwarz	ESK1	N/A	N/A
4	Loop Antenna	Rohde&Schwarz	HZ-9	838622\013	2016/11/13
5	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2016/11/13
6	Horn Antenna	ShwarzBeck	9120D	1011	2016/11/13
7	Broadband Horn Antenna	Shwarzbeck	BBHA9170	BBHA9170472	2016/11/13
8	Preamplifier	Shwarzbeck	BBV9742	9742-196	2016/11/13
9	Broadband Preamplifer	Shwarzbeck	BBV 9721	9721-102	2016/11/13
10	Broadband Preamplifer	Shwarzbeck	BBV 9718	9718-247	2016/11/13
11	Turn Table	MATURO	TT2.0	/	N/A
12	Antenna Mast	MATURO	TAM-4.0-P	/	N/A
13	EMI Test Software	Audix	E3	N/A	N/A
14	Test Software	R&S	ES-K1	N/A	N/A
15	Test cable	Siva Cables Italy	RG 58A/U	W14.02	2016/11/13

The Cal.Interval was one year

5. TEST CONDITIONS AND RESULTS

5.1. Antenna Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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 shall be considered sufficient to comply with the provisions of this section. 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.

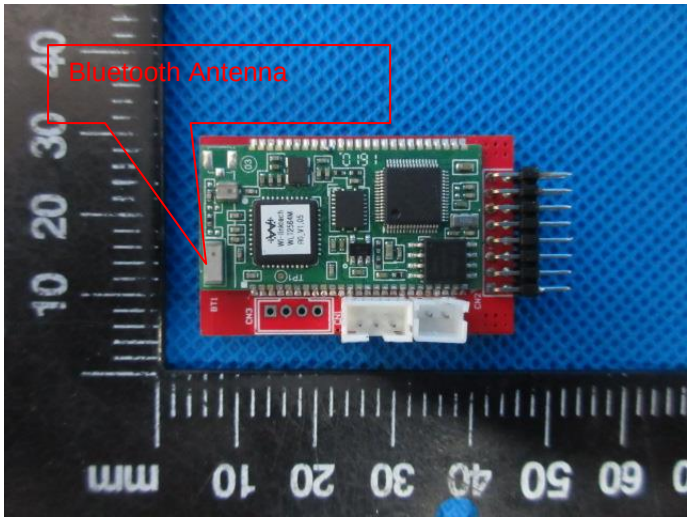
FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) 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 RESULTS

☒ **Passed** ☐ **Not Applicable**

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



5.2. Conducted Emissions (AC Mains)

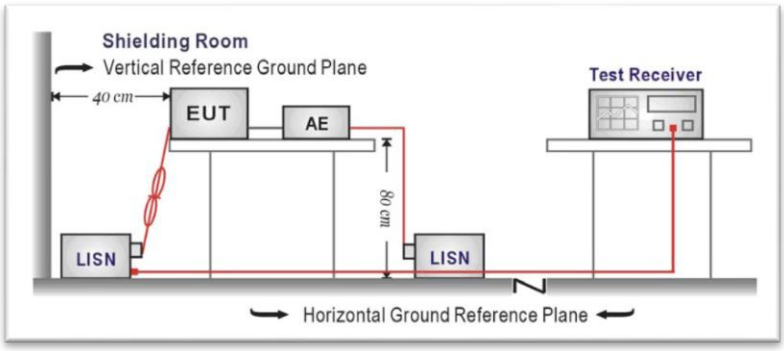
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

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

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT was placed on a plat form of nominal size, 1 m by 1.5 m, raised 10 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 10 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50ohm / 50uH coupling impedance for the measuring equipment.
4. 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)
5. 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.
6. 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.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

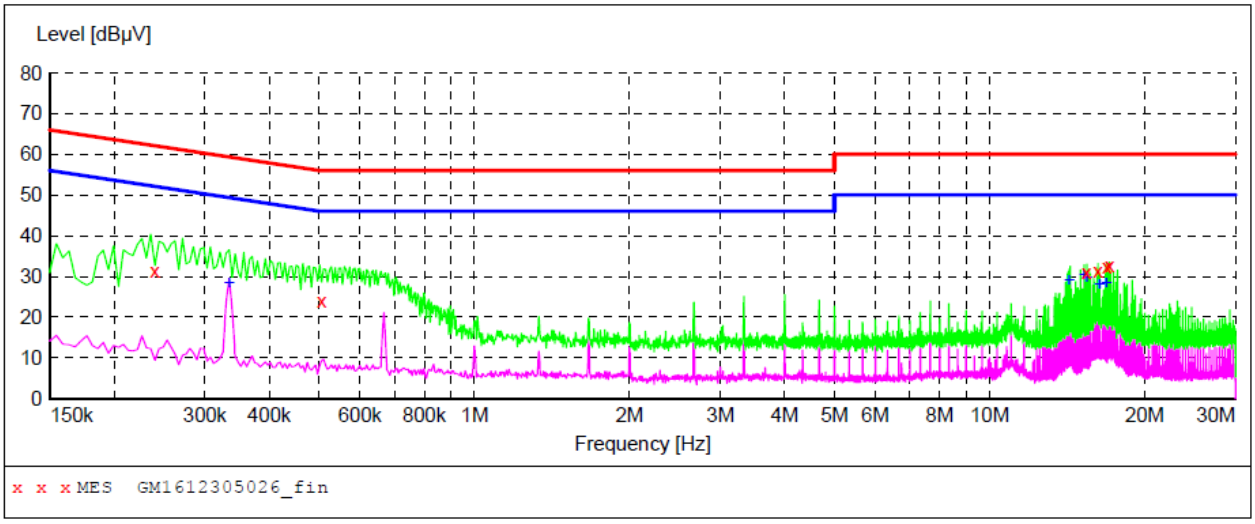
TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Test Line:	L



MEASUREMENT RESULT: "GM1612305026_fin"

12/30/2016 1:20PM

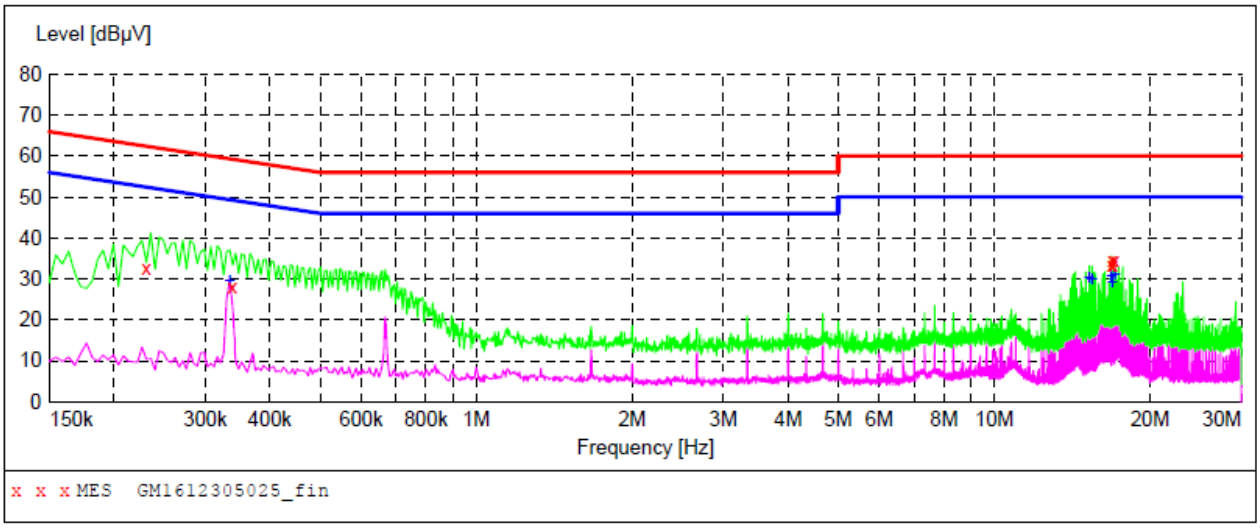
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.240000	31.30	10.3	62	30.8	QP	L1	GND
0.505500	23.90	10.2	56	32.1	QP	L1	GND
15.436500	31.00	10.5	60	29.0	QP	L1	GND
16.228500	31.20	10.5	60	28.8	QP	L1	GND
16.899000	32.40	10.5	60	27.6	QP	L1	GND
17.083500	32.70	10.5	60	27.3	QP	L1	GND

MEASUREMENT RESULT: "GM1612305026_fin2"

12/30/2016 1:20PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.334500	28.20	10.2	49	21.1	AV	L1	GND
14.275500	29.10	10.5	50	20.9	AV	L1	GND
15.252000	30.20	10.5	50	19.8	AV	L1	GND
15.436500	29.70	10.5	50	20.3	AV	L1	GND
16.341000	28.10	10.5	50	21.9	AV	L1	GND
16.840500	28.20	10.5	50	21.8	AV	L1	GND

Test Line:	N



MEASUREMENT RESULT: "GM1612305025_fin"

12/30/2016 1:15PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.231000	32.60	10.3	62	29.8	QP	N	GND
0.339000	28.30	10.2	59	30.9	QP	N	GND
16.840500	33.50	10.5	60	26.5	QP	N	GND
16.899000	34.50	10.5	60	25.5	QP	N	GND
16.962000	33.30	10.5	60	26.7	QP	N	GND
17.083500	34.70	10.5	60	25.3	QP	N	GND

MEASUREMENT RESULT: "GM1612305025_fin2"

12/30/2016 1:15PM

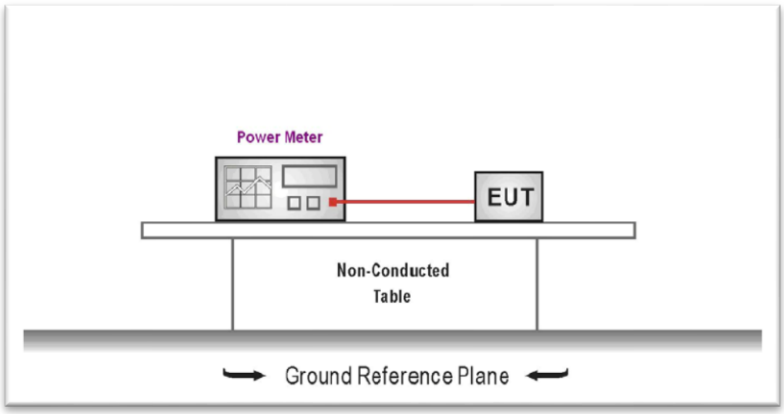
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.334500	29.50	10.2	49	19.8	AV	N	GND
15.252000	30.40	10.5	50	19.6	AV	N	GND
15.436500	30.00	10.5	50	20.0	AV	N	GND
16.840500	30.70	10.5	50	19.3	AV	N	GND
16.903500	29.40	10.5	50	20.6	AV	N	GND
17.083500	31.00	10.5	50	19.0	AV	N	GND

5.3. Conducted Peak Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): **30dBm**:

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47CFR 15.247 requirements.
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
3. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector
4. Record the measurement data.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

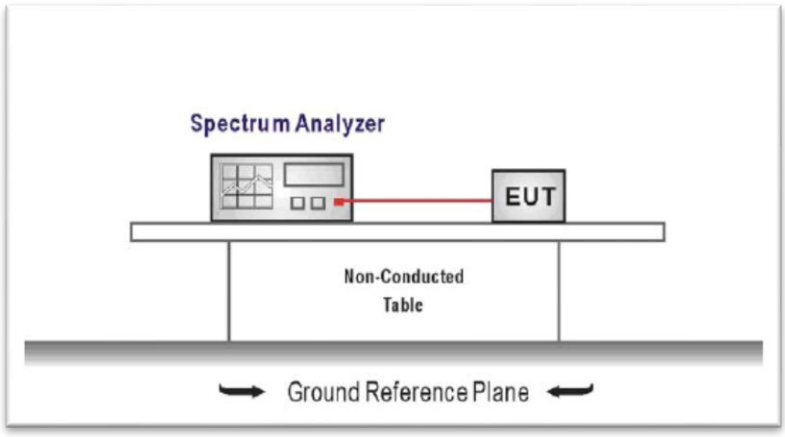
Type	Channel	Output power (dBm)	Limit (dBm)	Result
BT-BLE	00	8.83	30.00	Pass
	19	9.03		
	39	9.29		

5.4. Power Spectral Density

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e):
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.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input,
2. Configure the spectrum analyzer as shown below:
   Center frequency=DTS channel center frequency
   Span =1.5 times the DTS bandwidth
   RBW = 3 kHz ≤ RBW ≤ 100 kHz, VBW ≥ 3 × RBW
   Sweep time = auto couple
   Detector = peak
   Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
4. Use the peak marker function to determine the maximum amplitude level within the RBW.
5. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST MODE:

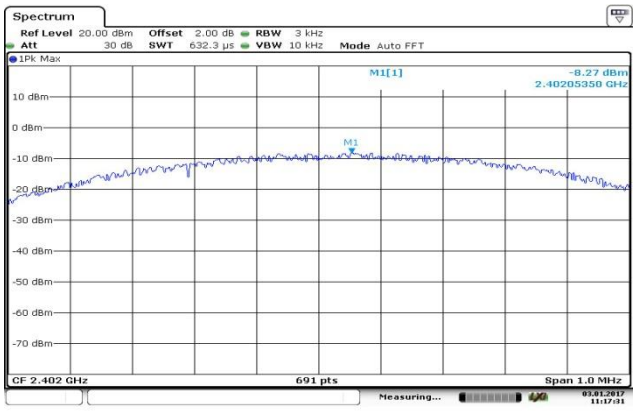
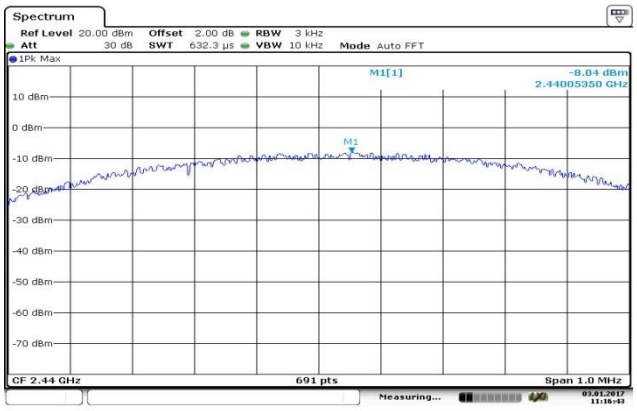
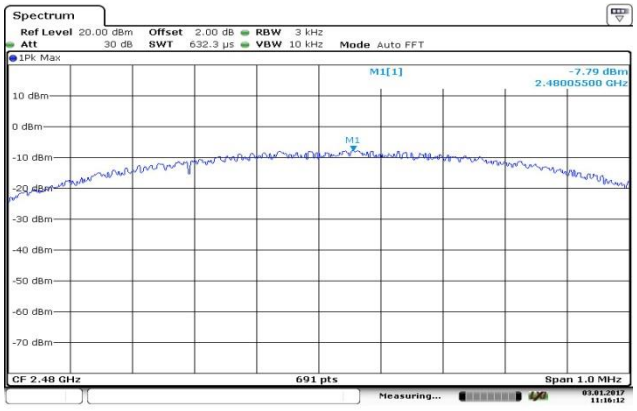
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Type	Channel	Power SpectralDensity(dBm/3KHz)	Limit (dBm/3KHz)	Result
BT-BLE	00	-8.27	8.00	Pass
	19	-8.04		
	39	-7.79		

Test plot as follows:

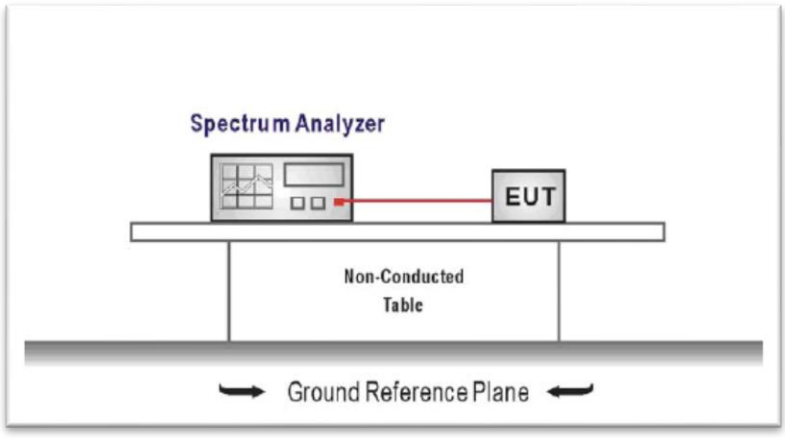
<table>
<tr><th colspan="2">BT-BLE</th></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>CH00</td><td>CH19</td></tr>
<tr><td> 
</td><td>No Plot</td></tr>
<tr><td>CH39</td><td>-</td></tr>
</table>

5.5. 6dB Bandwidth

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):
For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
   Center Frequency =DTS channel center frequency
   Span=2 x DTS bandwidth
   RBW = 100 kHz, VBW ≥ 3 × RBW
   Sweep time= auto couple
   Detector = Peak
   Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outer most amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission, and record the pertinent measurements.

TEST MODE:

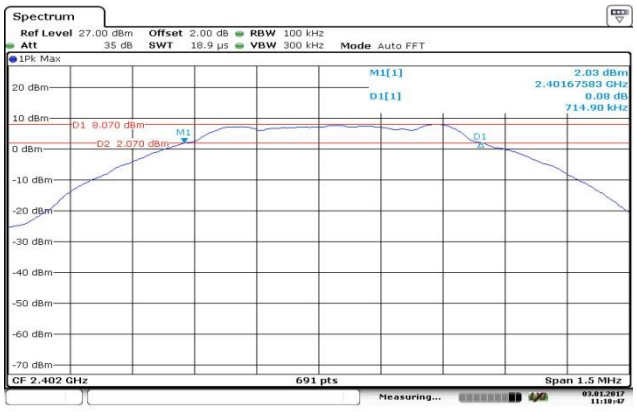
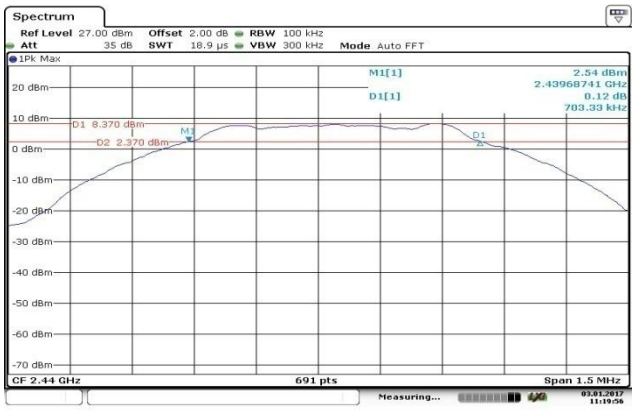
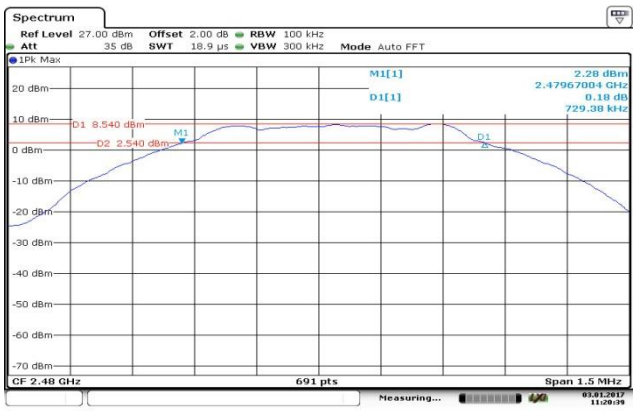
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Type	Channel	6dB Bandwidth (KHz)	Limit (KHz)	Result
BT-BLE	00	714.90	⩾500	Pass
	19	703.33		
	39	729.38		

Test plot as follows:

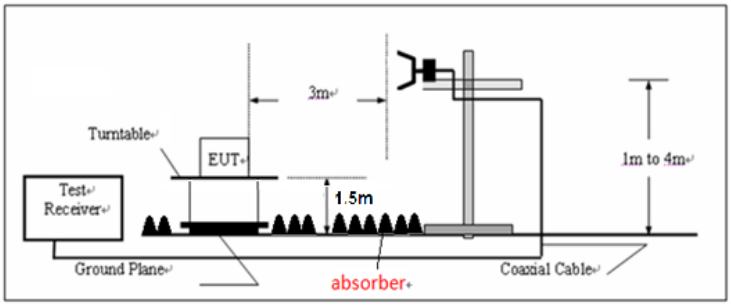
<table>
<tr><th colspan="2">BT-BLE</th></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>CH00</td><td>CH19</td></tr>
<tr><td> 
</td><td>No Plot</td></tr>
<tr><td>CH39</td><td>-</td></tr>
</table>

5.6. Restricted Band

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1) The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2) The EUT is placed on a turn table which is 1.5 meter above ground plane. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3) The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4) 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.
5) The receiver set as follow:
   RBW=1MHz, VBW=3MHz for Peak value
   RBW=1MHz, VBW=3MHz for Average value.

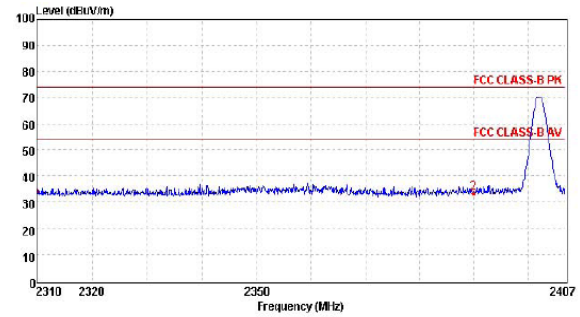
TEST MODE:
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

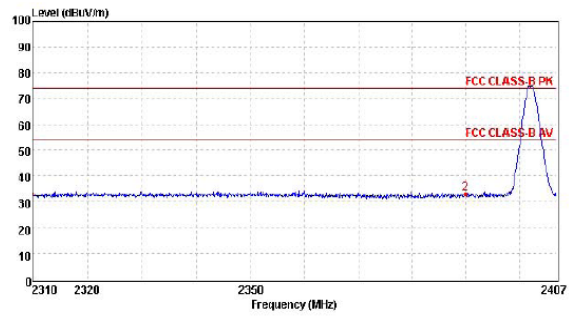
Note:
1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor

CH00 for BT-BLE Vertical-Peak



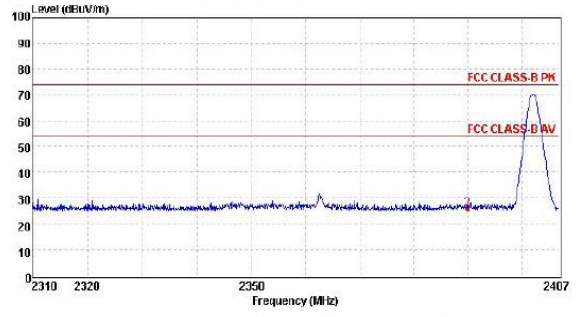
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	38.47	27.27	6.62	37.65	34.71	74.00	-39.29	Peak
2	2390.00	36.91	27.53	6.75	37.87	33.32	74.00	-40.68	Peak

CH00 for BT-BLE Horizontal- Peak



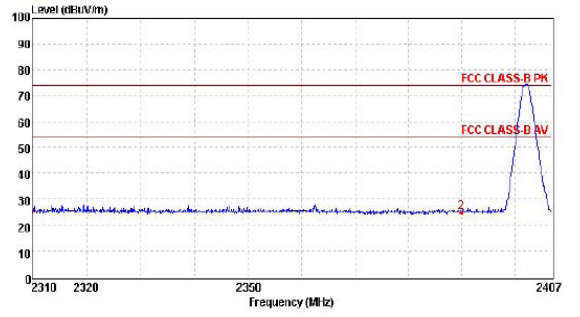
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	36.84	27.27	6.62	37.65	33.08	74.00	-40.92	Peak
2	2390.00	36.82	27.53	6.75	37.87	33.23	74.00	-40.77	Peak

CH00 for BT-BLE Vertical-Average



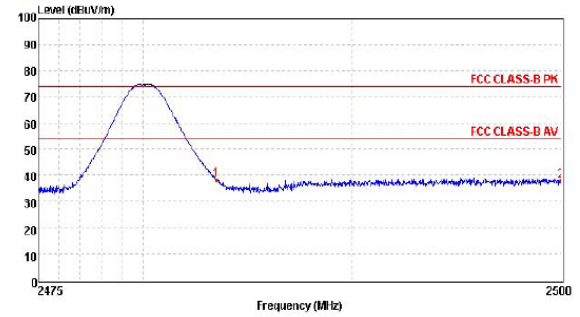
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	31.75	27.27	6.62	37.65	27.99	54.00	-26.01	Average
2	2390.00	29.18	27.53	6.75	37.87	25.59	54.00	-28.41	Average

CH00 for BT-BLE Horizontal- Average



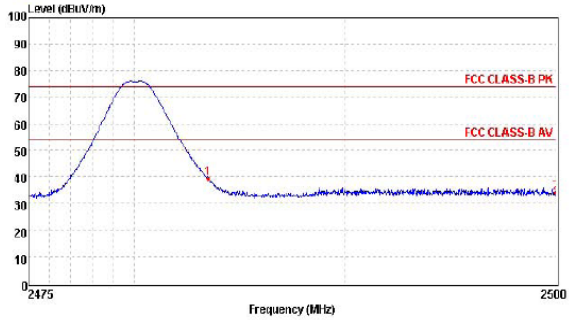
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	29.22	27.27	6.62	37.65	25.46	54.00	-28.54	Average
2	2390.00	28.66	27.53	6.75	37.87	25.07	54.00	-28.93	Average

CH39 for BT-BLE Vertical-Peak



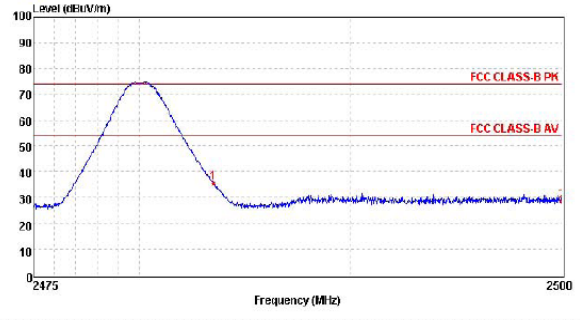
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	41.45	27.85	6.83	37.87	38.26	74.00	-35.74	Peak
2	2500.00	41.19	27.90	6.84	37.87	38.06	74.00	-35.94	Peak

CH39 for BT-BLE Horizontal- Peak



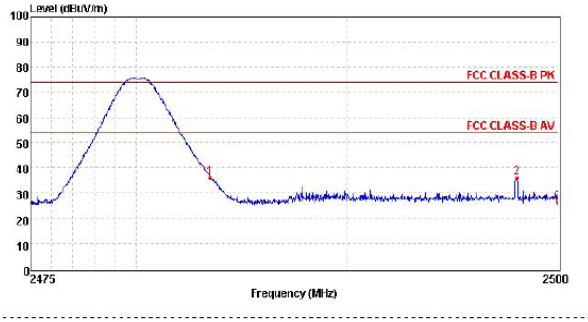
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	42.49	27.85	6.83	37.87	39.30	74.00	-34.70	Peak
2	2500.00	37.18	27.90	6.84	37.87	34.05	74.00	-39.95	Peak

CH39 for BT-BLE Vertical-Average



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	39.02	27.85	6.83	37.87	35.83	54.00	-18.17	Average
2	2500.00	31.75	27.90	6.84	37.87	28.62	54.00	-25.38	Average

CH39 for BT-BLE Horizontal- Average



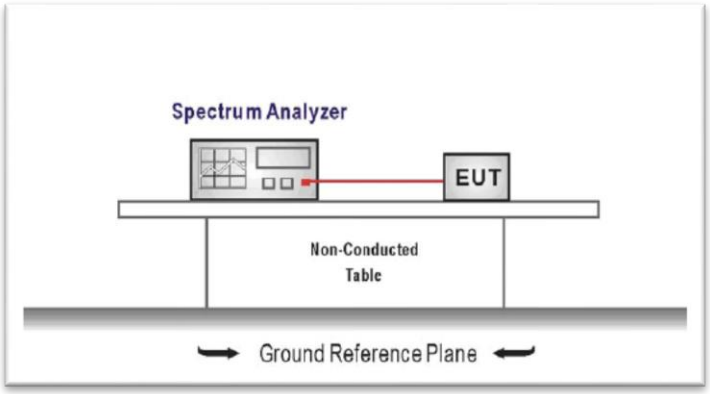
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	39.27	27.85	6.83	37.87	36.08	54.00	-17.92	Average
2	2498.04	39.16	27.90	6.84	37.87	36.03	54.00	-17.97	Average
3	2500.00	29.37	27.90	6.84	37.87	26.24	54.00	-27.76	Average

5.7. Band Edge and Spurious Emission (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section15.247 (d):
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, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Establish a reference level by using the following procedure
   Center frequency=DTS channel center frequency
   The span = 1.5 times the DTS bandwidth.
   RBW = 100 kHz, VBW ≥ 3 x RBW
   Detector = peak, Sweep time = auto couple, Trace mode = max hold
   Allow trace to fully stabilize
   Use the peak marker function to determine the maximum PSD level

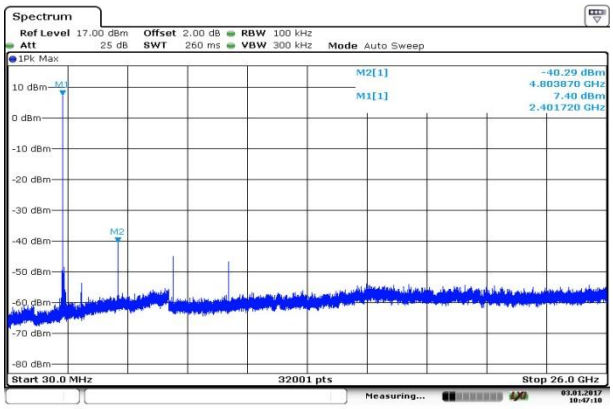
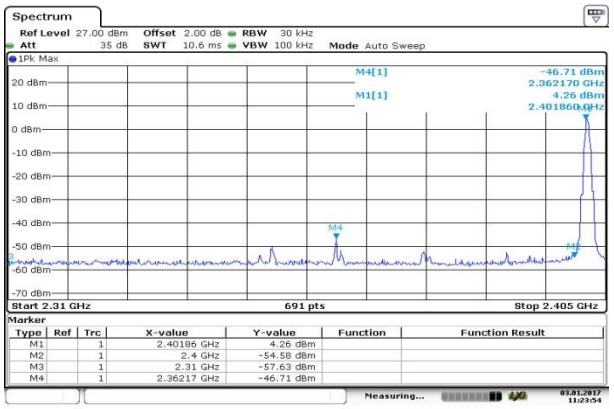
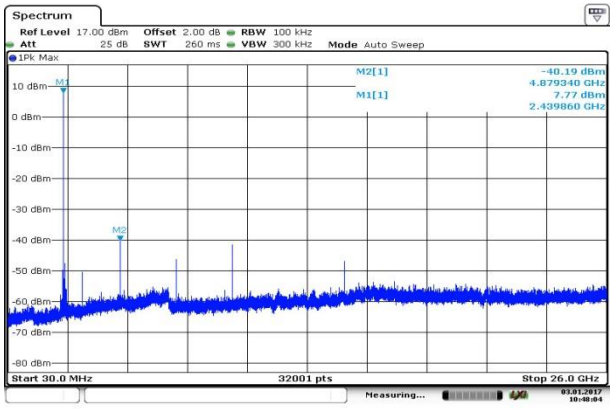
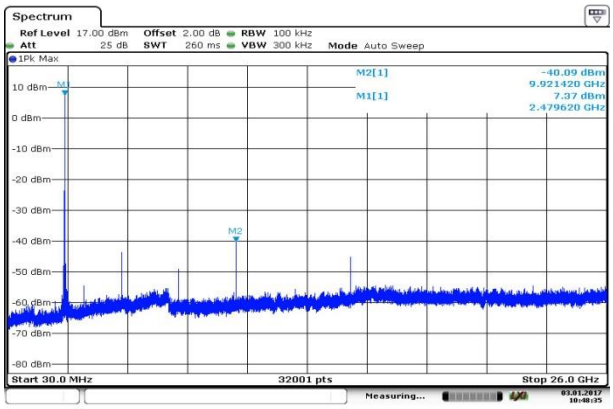
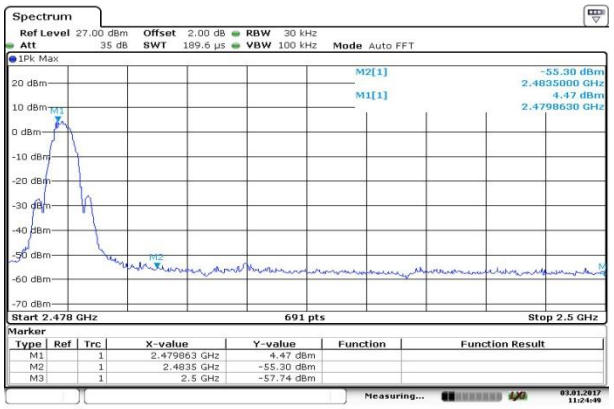
   Note: the channel found to contain the maximum PSD level can be used to establish the reference level.
3. Emission level measurement
   Set the center frequency and span to encompass frequency range to be measured
   RBW = 100 kHz, VBW ≥ 3 x RBW
   Detector = peak, Sweep time = auto couple, Trace mode = max hold
   Allow trace to fully stabilize
   Use the peak marker function to determine the maximum amplitude level.
4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
5. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emissions relative to the limit.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

BT-BLE	
	
CH00-SE	*CH00-Band edge*
	*No Plot*
CH19-SE	-
	
CH39-SE	*CH39-Band edge*

5.8. Spurious Emissions (radiated)

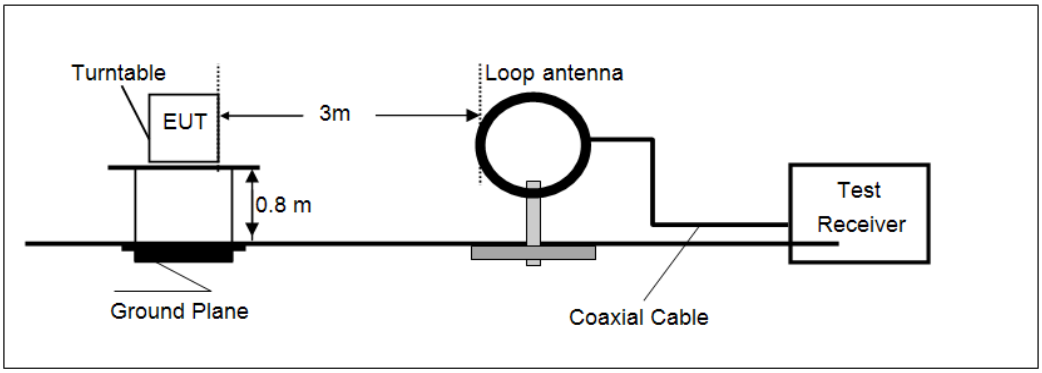
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

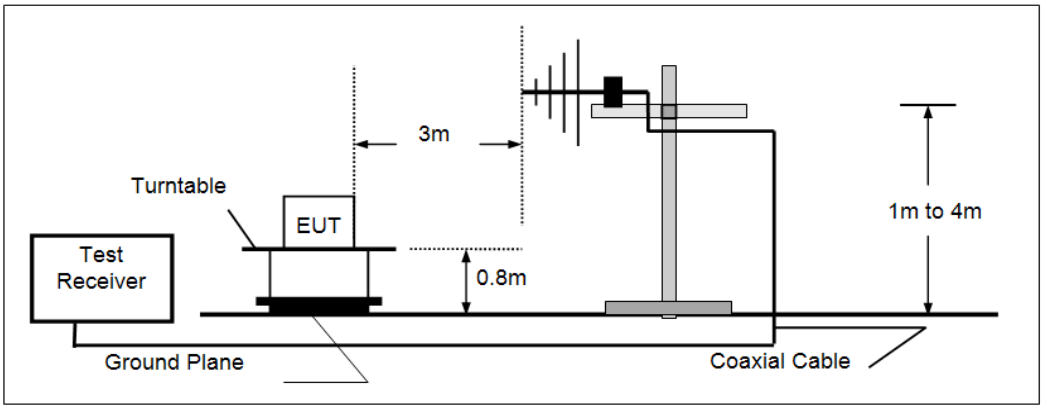
Frequency	Limit (dBuV/m @3m)	Value
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

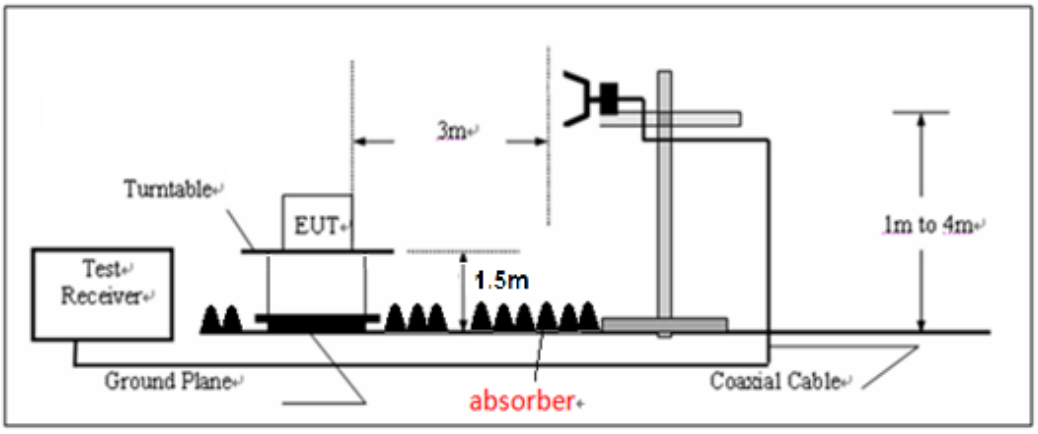
➢ 9KHz ~30MHz



➢ 30MHz ~ 1GHz



➢ Above 1GHz



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground plane. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna.
5. Use the following spectrum analyzer settings
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Below 1GHz, RBW=120KHz, VBW=300KHz, Sweep=auto, Detector function=peak, Trace=max hold; *If the emission level of the EUT measured by the peak detectoris 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, theemission measurement will be repeated using the quasi-peak detector and reported.*
   (3) Above 1GHz, RBW=1MHz, VBW=3MHz Peak detetor for Peak value
   RBW=1MHz, VBW=3MHz RMS detetor for Average value.

Remark: “floor-standing equipment” Where possible, the antenna(s) of the EUT shall be located at a height of 1.5 m above the floor, and the intentional radiator circuitry shall be located within the system at a height of at least 0.8 m above the floor.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

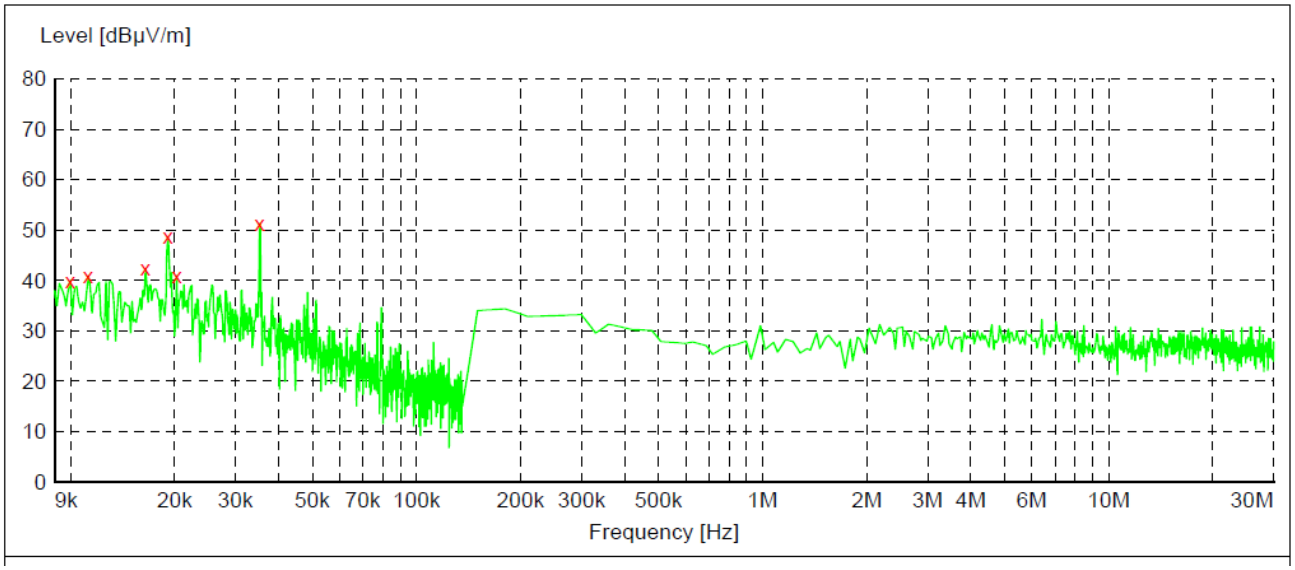
☒ **Passed** ☐ **Not Applicable**

Note:

1) Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2) The emission levels of other frequencies are very lower than the limit and not show in test report.
3) The‘ 9kHz~30MHz‘ test result comform to open field sites calibrate result.

➢ **9kHz ~ 30MHz**

Test mode	*Worst case mode*	*Polarization*	*Horizontal*



Frequency MHz	*Level dBµV/m*	*Transd dB*	*Limit (dBµV/m @3m)*	*Margin dB*	*Det.*	*Result*
0.009967	*39.57*	*22.3*	*127.63*	*88.06*	Avg.	*Pass*
0.012626	*41.02*	*22.3*	*125.58*	*84.56*	Avg.	*Pass*
0.017282	*42.35*	*22.2*	*122.85*	*80.50*	Avg.	*Pass*
0.019015	*48.52*	*22.1*	*122.02*	*73.50*	Avg.	*Pass*
0.021562	*41.09*	*22.1*	*120.93*	*79.84*	Avg.	*Pass*
0.035464	*51.35*	*21.9*	*116.61*	*65.26*	Avg.	*Pass*

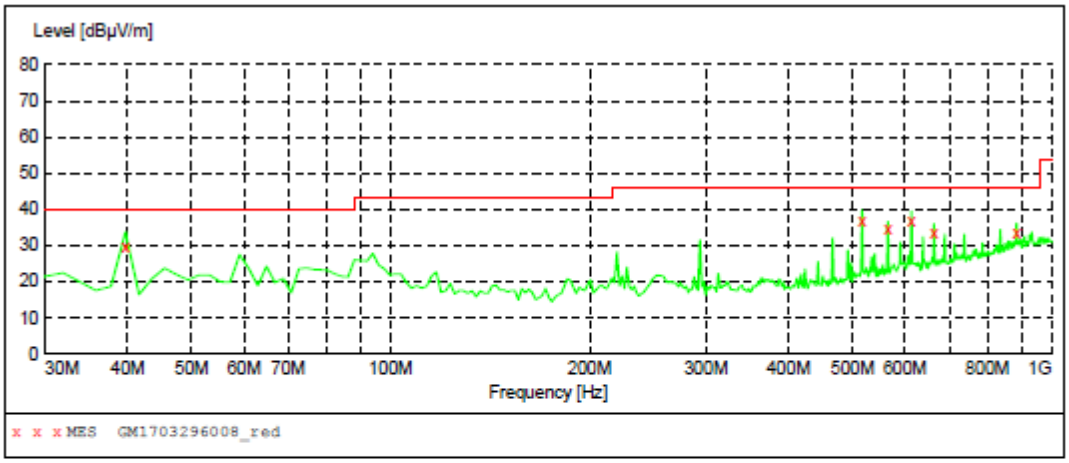
Remark:

1. Level =Receiver Read level+ Transd
2. Transd=Antenna Factor+Cable Loss
3. The loop antenna rotated about both vertical and horizontal to find the maximum emission, so only the worst position (horizontal) was reported.
4. According to the clause 15.31(2),Limit (dBuV/m @3m)= Limit (dBuV/m @300m)+40log(300m/3m)

5.§15.209(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

➢ **30MHz ~ 1GHz**

Worst case mode	Vertical

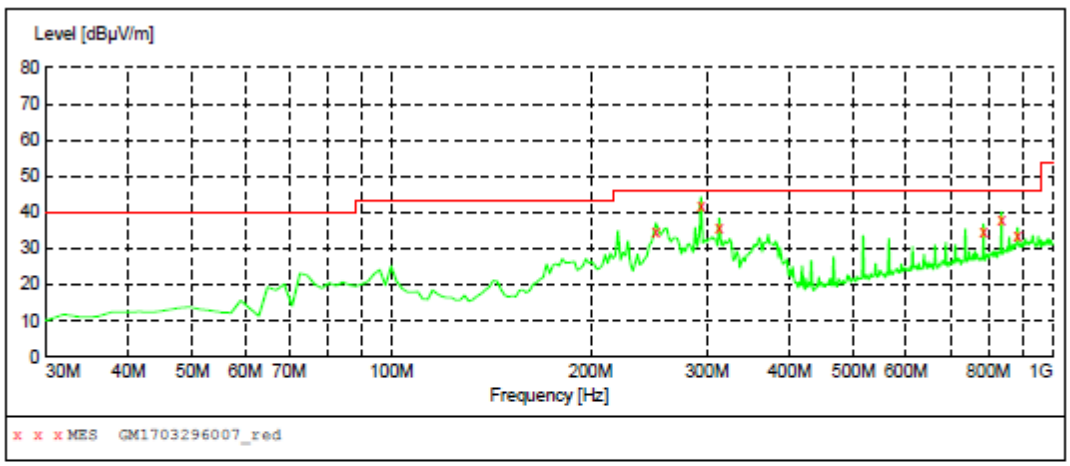


MEASUREMENT RESULT: "GM1703296008_red"

3/29/2017 9:18AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
39.700000	30.70	-17.0	40.0	9.3	QP	100.0	110.00	VERTICAL
516.940000	37.60	-7.2	46.0	8.4	QP	100.0	158.00	VERTICAL
565.440000	34.70	-5.8	46.0	11.3	QP	100.0	199.00	VERTICAL
613.940000	37.50	-4.5	46.0	8.5	QP	100.0	169.00	VERTICAL
664.380000	34.00	-3.7	46.0	12.0	QP	100.0	199.00	VERTICAL
885.540000	34.20	0.8	46.0	11.8	QP	100.0	272.00	VERTICAL

Worst case mode	Horizontal



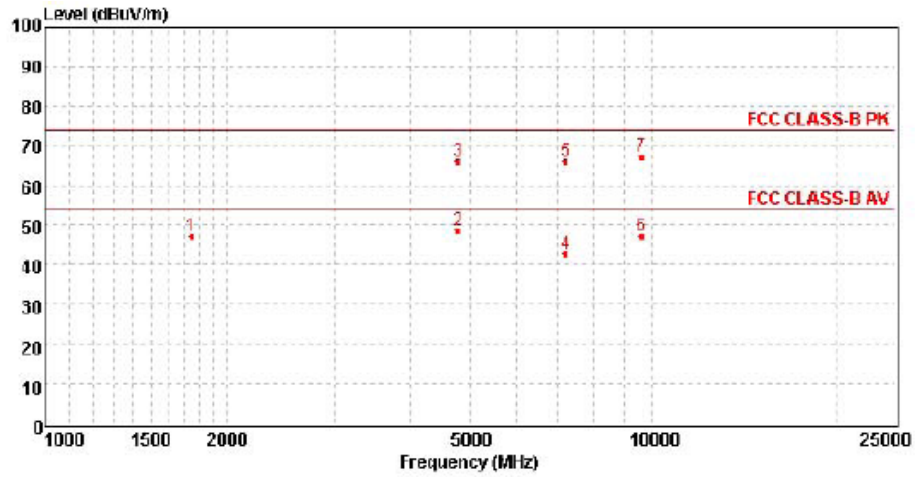
MEASUREMENT RESULT: "GM1703296007_red"

3/29/2017 9:15AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
251.160000	35.00	-14.3	46.0	11.0	QP	100.0	198.00	HORIZONTAL
293.840000	42.30	-13.1	46.0	3.7	QP	100.0	187.00	HORIZONTAL
313.240000	36.40	-12.6	46.0	9.6	QP	100.0	198.00	HORIZONTAL
786.600000	34.80	-1.4	46.0	11.2	QP	100.0	173.00	HORIZONTAL
837.040000	38.10	-0.3	46.0	7.9	QP	100.0	173.00	HORIZONTAL
885.540000	33.70	0.8	46.0	12.3	QP	100.0	271.00	HORIZONTAL

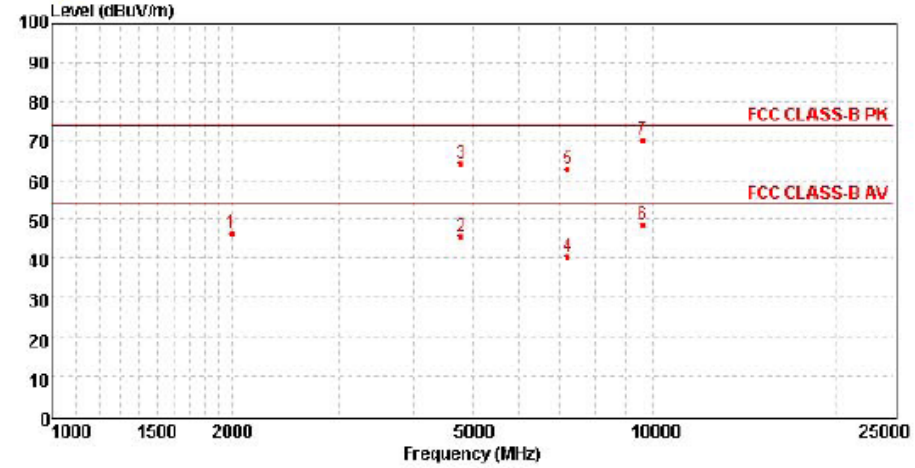
➢ **Above 1GHz**

CH00 for BT-BLE	Vertical



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1746.90	53.05	25.44	5.86	37.03	47.32	74.00	-26.68	Peak
2	4804.10	44.93	31.09	9.54	36.95	48.61	54.00	-5.39	Average
3	4804.11	62.58	31.09	9.54	36.95	66.26	74.00	-7.74	Peak
4	7221.14	29.97	35.98	11.88	35.05	42.78	54.00	-11.22	Average
5	7221.15	53.46	35.98	11.88	35.05	66.27	74.00	-7.73	Peak
6	9613.42	30.42	38.17	13.73	35.20	47.12	54.00	-6.88	Average
7	9613.43	50.60	38.17	13.73	35.20	67.30	74.00	-6.70	Peak

CH00 for BT-BLE	Horizontal

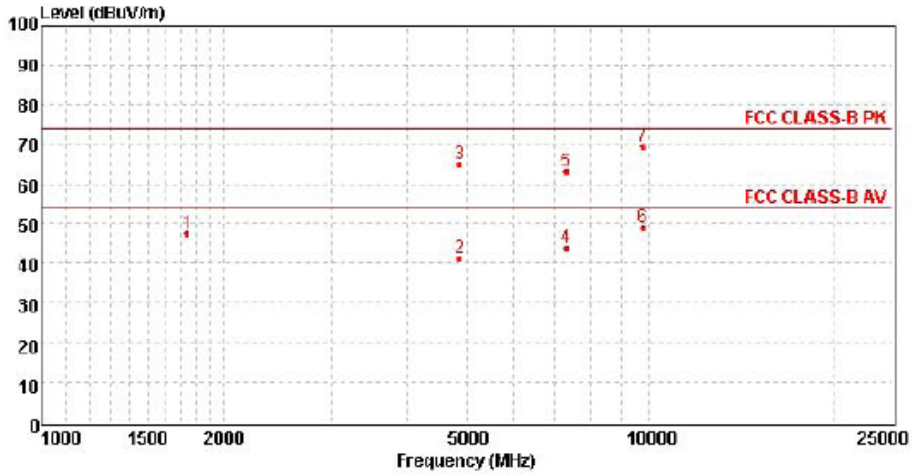


Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1995.31	51.33	26.09	6.26	37.30	46.38	74.00	-27.62	Peak
2	4804.10	42.02	31.09	9.54	36.95	45.70	54.00	-8.30	Average
3	4804.11	60.52	31.09	9.54	36.95	64.20	74.00	-9.80	Peak
4	7221.14	27.73	35.98	11.88	35.05	40.54	54.00	-13.46	Average
5	7221.15	50.11	35.98	11.88	35.05	62.92	74.00	-11.08	Peak
6	9613.42	32.14	38.17	13.73	35.20	48.84	54.00	-5.16	Average
7	9613.43	53.64	38.17	13.73	35.20	70.34	74.00	-3.66	Peak

Remark:

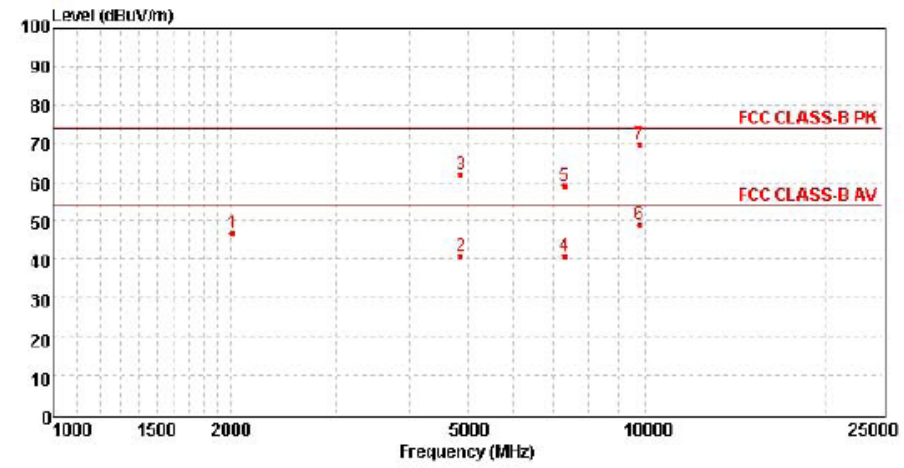
1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The peak level is lower than average limit(54dBuV/m), this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

CH19 for BT-BLE	Vertical



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1741.86	53.43	25.43	5.85	37.02	47.69	74.00	-26.31	Peak
2	4888.15	37.31	31.14	9.60	36.71	41.34	54.00	-12.66	Average
3	4888.15	61.02	31.14	9.60	36.71	65.05	74.00	-8.95	Peak
4	7326.27	30.58	36.07	11.99	34.92	43.72	54.00	-10.28	Average
5	7326.27	50.01	36.07	11.99	34.92	63.15	74.00	-10.85	Peak
6	9781.60	32.81	38.27	13.65	35.64	49.09	54.00	-4.91	Average
7	9781.60	53.29	38.27	13.65	35.64	69.57	74.00	-4.43	Peak

CH19 for BT-BLE	Horizontal

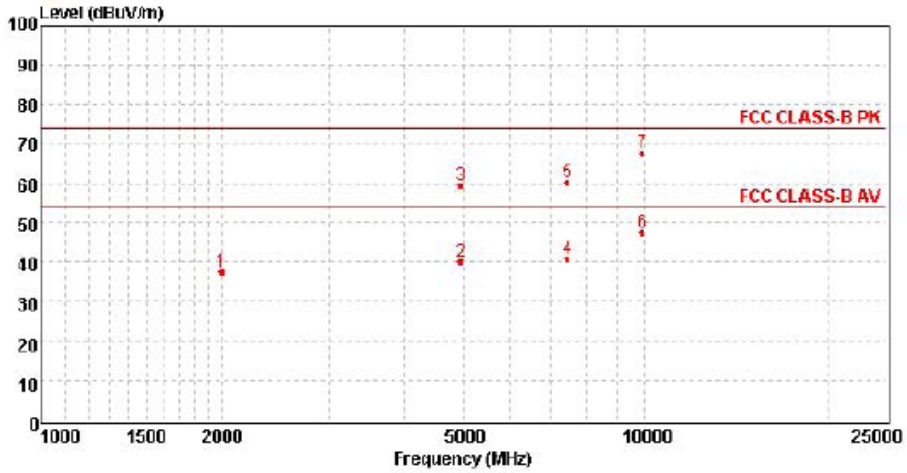


Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2012.69	51.82	26.15	6.28	37.30	46.95	74.00	-27.05	Peak
2	4888.15	36.85	31.14	9.60	36.71	40.88	54.00	-13.12	Average
3	4888.15	57.96	31.14	9.60	36.71	61.99	74.00	-12.01	Peak
4	7326.27	27.91	36.07	11.99	34.92	41.05	54.00	-12.95	Average
5	7326.27	45.86	36.07	11.99	34.92	59.00	74.00	-15.00	Peak
6	9781.60	32.73	38.27	13.65	35.64	49.01	54.00	-4.99	Average
7	9781.60	53.71	38.27	13.65	35.64	69.99	74.00	-4.01	Peak

Remark:

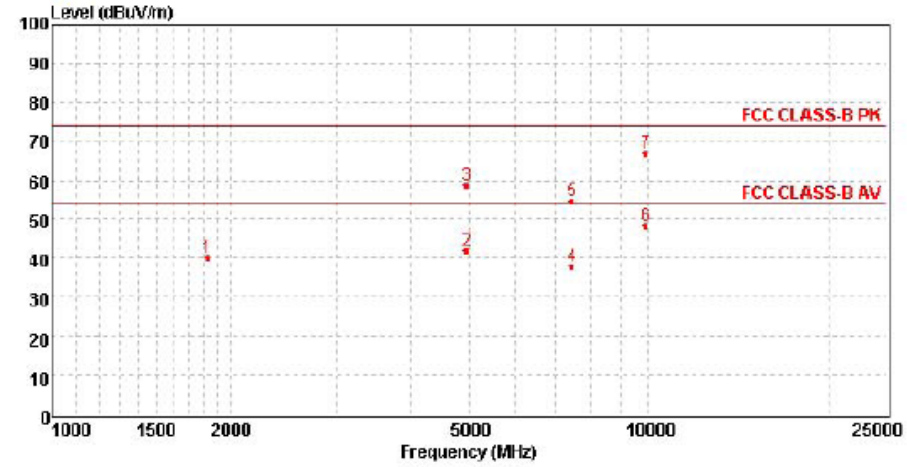
1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The peak level is lower than average limit(54dBuV/m), this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

CH39 for BT-BLE	Vertical



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1995.31	42.68	26.09	6.26	37.30	37.73	74.00	-36.27	Peak
2	4959.31	35.92	31.18	9.64	36.51	40.23	54.00	-13.77	Average
3	4959.31	55.28	31.18	9.64	36.51	59.59	74.00	-14.41	Peak
4	7454.43	27.39	36.17	12.25	34.86	40.95	54.00	-13.05	Average
5	7454.43	46.64	36.17	12.25	34.86	60.20	74.00	-13.80	Peak
6	9923.99	29.81	38.35	13.58	34.12	47.62	54.00	-6.38	Average
7	9923.99	49.94	38.35	13.58	34.12	67.75	74.00	-6.25	Peak

CH39 for BT-BLE	Horizontal



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1824.30	45.82	25.65	6.00	37.16	40.31	74.00	-33.69	Peak
2	4959.31	37.80	31.18	9.64	36.51	42.11	54.00	-11.89	Average
3	4959.31	54.25	31.18	9.64	36.51	58.56	74.00	-15.44	Peak
4	7454.43	24.43	36.17	12.25	34.86	37.99	54.00	-16.01	Average
5	7454.43	41.04	36.17	12.25	34.86	54.60	74.00	-19.40	Peak
6	9923.99	30.34	38.35	13.58	34.12	48.15	54.00	-5.85	Average
7	9923.99	48.92	38.35	13.58	34.12	66.73	74.00	-7.27	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The peak level is lower than average limit(54dBuV/m), this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

6. TEST SETUP PHOTOS OF THE EUT

Reference to Test Report TRE1703020701

.....End of Report.....