



TEST REPORT

Report Reference No..... :	TRE1711009002	R/C..... : 98058
FCC ID..... :	YAMMD61XVHF	
Applicant's name..... :	Hytera Communications Corporation Limited	
Address..... :	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, China	
Manufacturer..... :	Hytera Communications Corporation Limited	
Address..... :	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, China	
Test item description	Digital Mobile Radio	
Trade Mark	Hytera	
Model/Type reference..... :	MD615 VHF	
Listed Model(s)	MD612 VHF, MD616 VHF, MD618 VHF	
Standard	FCC CFR Title 47 Part 15 Subpart C Section 15.247	
Date of receipt of test sample..... :	Nov. 16, 2017	
Date of testing..... :	Nov. 17, 2017 – Jan. 19, 2018	
Date of issue..... :	Jan. 19, 2018	
Result..... :	PASS	
Compiled by (Position+Printed name+Signature) :	File administrators Shayne Zhu	<i>Shayne Zhu</i>
Supervised by (Position+Printed name+Signature) :	Project Engineer Cary Luo	<i>Cary Luo</i>
Approved by (Position+Printed name+Signature) :	RF Manager Hans Hu	<i>Hans Hu</i>
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	

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The test report merely corresponds to the test sample.

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1. TEST STANDARDS AND REPORT VERSION

1.1. Test 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

[KDB 558074 D01 DTS Meas Guidance v04](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2018-01-19	Original

2. TEST DESCRIPTION

Test Item	FCC Rule	Result	Test Engineer
Antenna requirement	15.203/15.247(c)	Pass	Hongquan Li
Line Conducted Emissions (AC Main)	15.207	N/A	N/A
Conducted Peak Output Power	15.247(b)(3)	Pass	Hongquan Li
Power Spectral Density	15.247(e)	Pass	Hongquan Li
6dB Bandwidth	15.247(a)(2)	Pass	Hongquan Li
Restricted band	15.247(d)/15.205	Pass	Hongquan Li
Spurious Emissions	15.247(d)/15.209	Pass	Hongquan Li

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

3. SUMMARY

3.1. Client Information

Applicant:	Hytera Communications Corporation Limited
Address:	Hytera Tower, Hi-Tech Industrial Park North,9108# Beihuan Road, Nanshan District, Shenzhen, China
Manufacturer:	Hytera Communications Corporation Limited
Address:	Hytera Tower, Hi-Tech Industrial Park North,9108# Beihuan Road, Nanshan District, Shenzhen, China

3.2. Product Description

Name of EUT:	Digital Mobile Radio
Trade Mark:	Hytera
Model No.:	MD615 VHF
Listed Model(s):	MD612 VHF, MD616 VHF, MD618 VHF
Power supply:	DC 13.6V
Adapter information:	-
Hardware version:	A
Software version:	V1.01.13.001
Bluetooth	
Version:	Supported BT4.0+BLE
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	Internal Antenna
Antenna gain:	0dBi

3.3. Operation state

➤ Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

Channel	Frequency (MHz)
00	2402
01	2404
:	:
19	2440
:	:
38	2478
39	2480

➤ Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).
For AC power line conducted emissions:
The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.
For RF test axis
EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

3.4. EUT configuration

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

- - supplied by the manufacturer
- - supplied by the lab

/	Manufacturer:	/
	Model No.:	/
/	Manufacturer:	/
	Model No.:	/

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

4.2. Test Facility

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.

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.

FCC-Registration No.: 762235

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 with Registration No. 762235.

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.

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
Relative 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 measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to ISO/IEC 17025. Furthermore, 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 International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.39 dB	(1)
Radiated Emissions 30~1000MHz	4.24 dB	(1)
Radiated Emissions 1~18GHz	5.16 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)

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

4.1. Equipments Used during the Test

Conducted Emissions						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	EMI Test Receiver	R&S	ESCI	101247	11/11/2017	11/10/2018
2	Artificial Mains	SCHWARZBECK	NNLK 8121	573	11/11/2017	11/10/2018
3	2-Line V-Network	R&S	ESH3-Z5	100049	11/11/2017	11/10/2018
4	Pulse Limiter	R&S	ESH3-Z2	101488	11/11/2017	11/10/2018
5	RF Connection Cable	HUBER+SUHNER	EF400	N/A	11/21/2017	11/20/2018
6	Test Software	R&S	ES-K1	N/A	N/A	N/A

Radiated Emissions						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	EMI Test Receiver	R&S	ESCI	101247	11/11/2017	11/10/2018
2	Loop Antenna	R&S	HFH2-Z2	100020	11/20/2017	11/19/2018
3	Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	538	4/5/2017	4/4/2018
4	Preamplifier	SCHWARZBECK	BBV 9743	9743-0022	10/18/2017	10/17/2018
5	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	11/21/2017	11/20/2018
6	EMI Test Software	R&S	ESK1	N/A	N/A	N/A
7	Spectrum Analyzer	R&S	FSP40	100597	11/11/2017	11/10/2018
8	Horn Antenna	SCHWARZBECK	9120D	1011	3/27/2017	3/26/2018
9	Horn Antenna	SCHWARZBECK	BBHA9170	25841	3/27/2017	3/26/2018
10	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-248	10/18/2017	10/17/2018
11	High pass filter	Compliance Direction systems	BSU-6	34202	11/11/2017	11/10/2018
12	RF Connection Cable	HUBER+SUHNER	RE-7-FH	N/A	11/21/2017	11/20/2018
13	EMI Test Software	Audix	E3	N/A	N/A	N/A
14	Turntable	MATURO	TT2.0	/	N/A	N/A
15	Antenna Mast	MATURO	TAM-4.0-P	/	N/A	N/A

RF Conducted Test						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	Spectrum Analyzer	R&S	FSV40	100048	11/11/2017	11/10/2018
2	EXA Signal Analyzer	Agilent	N9020A	184247	9/22/2017	9/21/2018
3	Power Meter	Agilent	U2021XA	178231	9/22/2017	9/21/2018
4	OSP	R&S	OSP120	101317	N/A	N/A

The Cal.Interval was one year.

5. TEST CONDITIONS AND RESULTS

5.1. Antenna Requirement

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, 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.

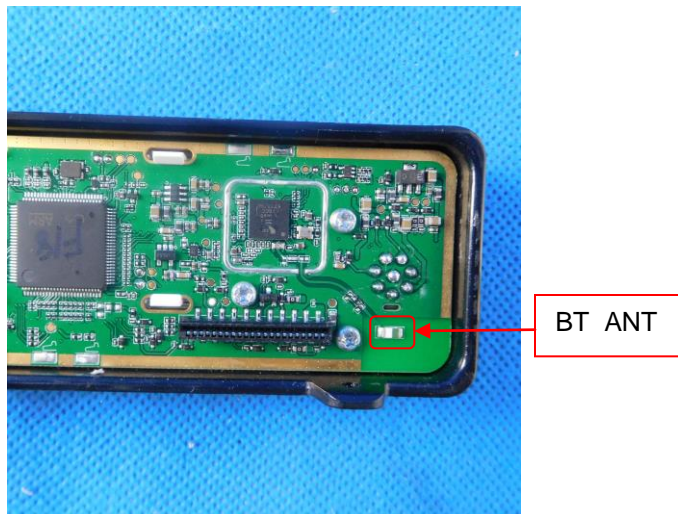
FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400-2483.5 MHz band that is 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 0 dBi, please refer to the below antenna photo.



5.2. Conducted Emissions (AC Main)

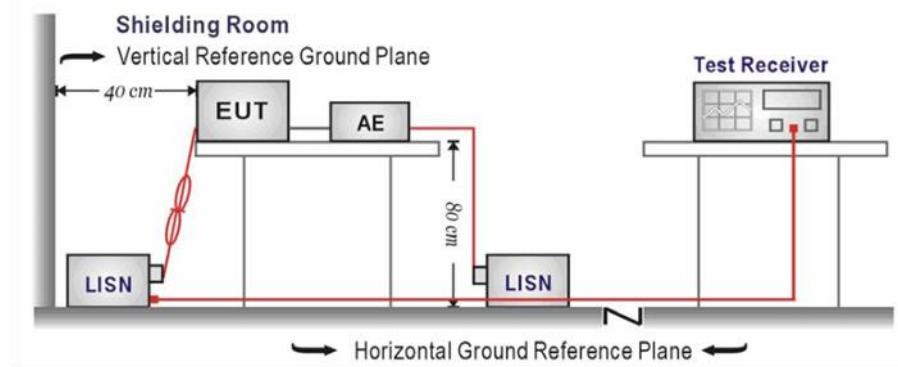
LIMIT

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 requirements.
2. 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.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /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

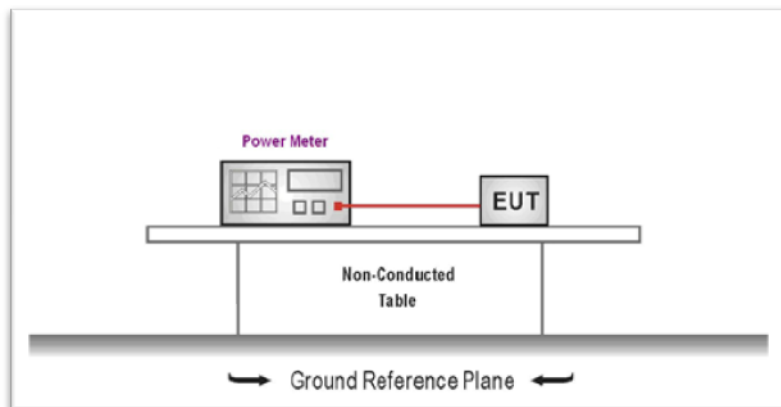
☐ Passed ☒ Not Applicable

5.3. Conducted Peak Output Power

LIMIT

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

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47 CFR 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**

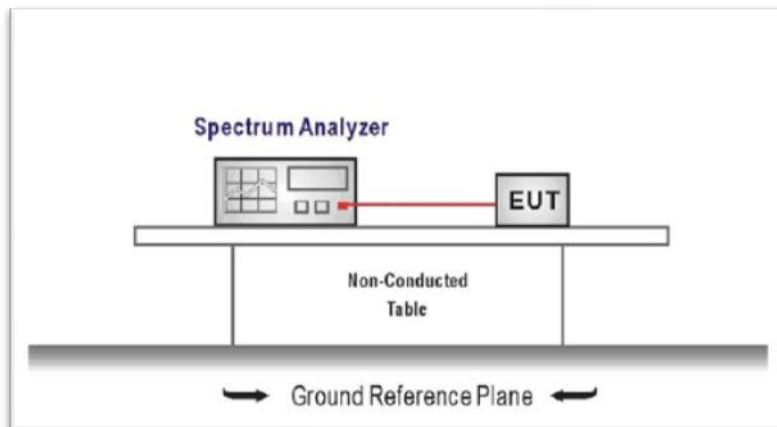
Type	Channel	Output power (dBm)	Limit (dBm)	Result
BT-BLE	00	4.39	≤30.00	Pass
	19	5.01		
	39	4.71		

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
 $RBW = 3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$, $VBW \geq 3 \times RBW$
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 wave form 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:

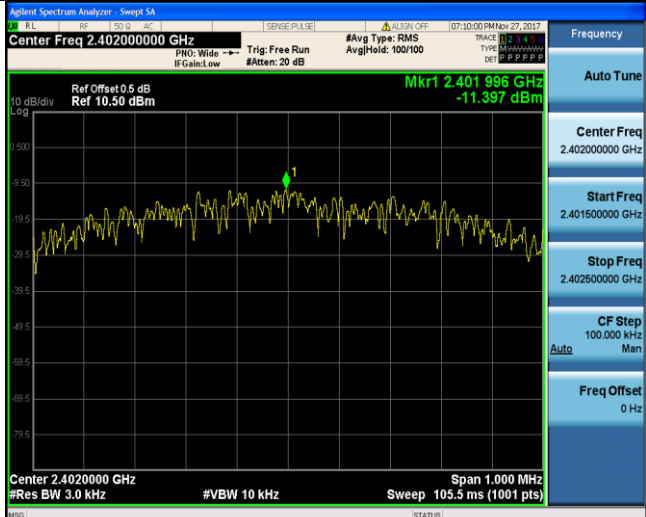
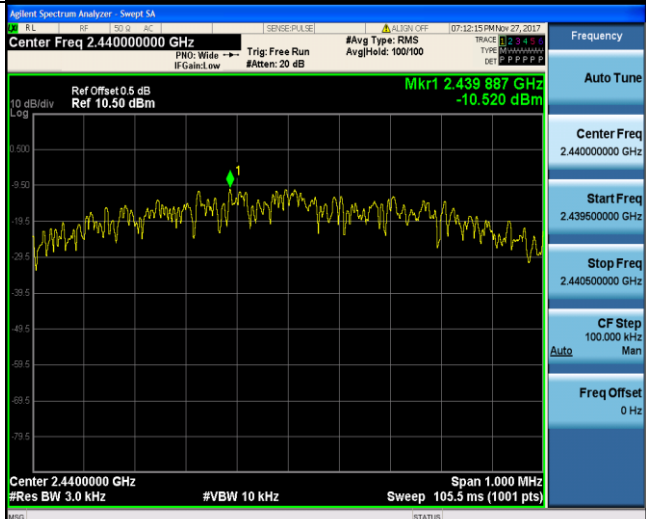
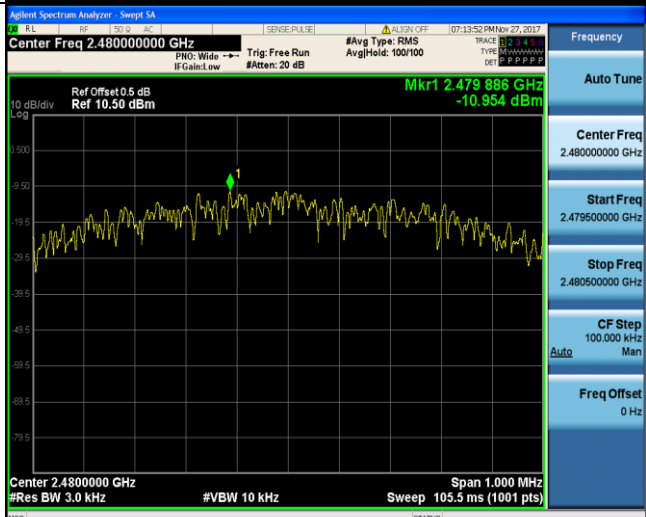
Please refer to the clause 3.3

TEST RESULTS

☒ Passed ☐ Not Applicable

Type	Channel	Power Spectral Density(dBm/RBW)	Limit (dBm/RBW)	Result
BT-BLE	00	-11.40	≤8.00	Pass
	19	-10.52		
	39	-10.95		

Test plot as follows:

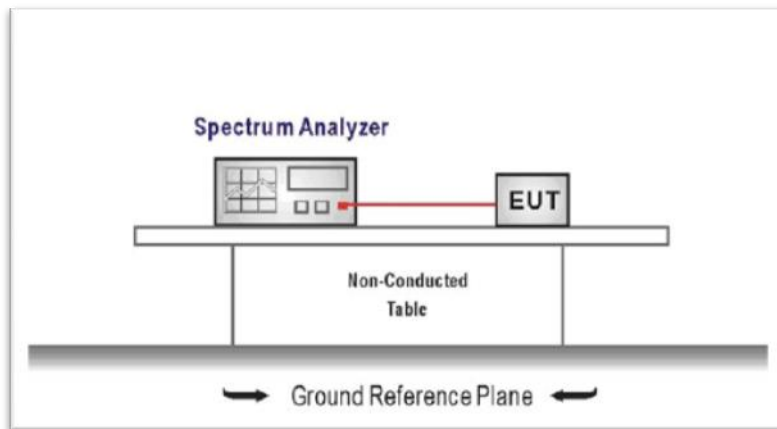
CH00		
CH19		
CH39		

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 $\geq 3 \times$ 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 outermost 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:

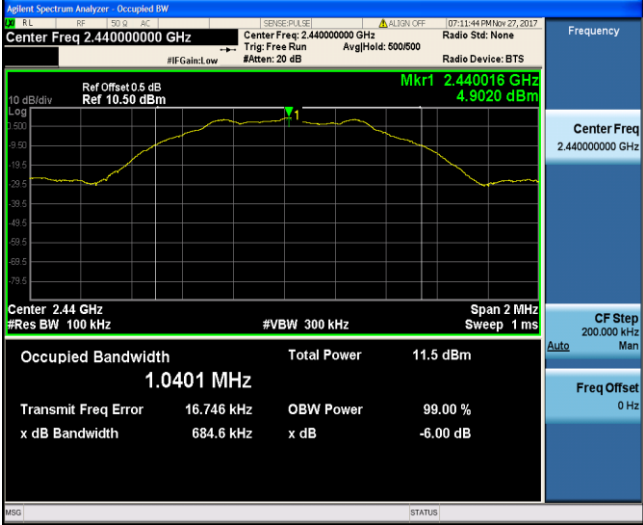
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Type	Channel	6dB Bandwidth(MHz)	Limit (MHz)	Result
BT-BLE	00	0.69	≥ 0.5	Pass
	19	0.68		
	39	0.68		

Test plot as follows:

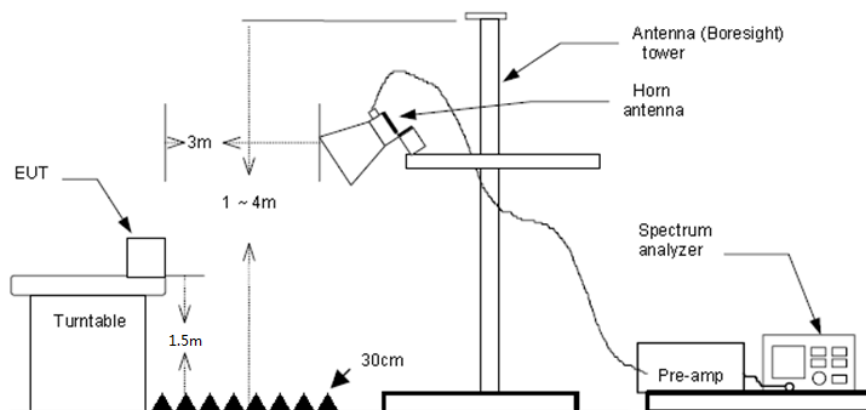
CH00	 <p>The screenshot shows a spectrum analyzer interface for channel CH00. The center frequency is 2.402000000 GHz. The main display shows a spectral plot with a peak at 2.402014 GHz (4.3122 dBm). The occupied bandwidth is 1.0422 MHz. The total power is 10.9 dBm. The transmit frequency error is 22.339 kHz, and the OBW power is 99.00%.</p> <table border="1"><thead><tr><th>Parameter</th><th>Value</th></tr></thead><tbody><tr><td>Center Freq</td><td>2.402000000 GHz</td></tr><tr><td>CF Step</td><td>200.000 kHz</td></tr><tr><td>Freq Offset</td><td>0 Hz</td></tr><tr><td>Occupied Bandwidth</td><td>1.0422 MHz</td></tr><tr><td>Total Power</td><td>10.9 dBm</td></tr><tr><td>Transmit Freq Error</td><td>22.339 kHz</td></tr><tr><td>OBW Power</td><td>99.00 %</td></tr><tr><td>x dB Bandwidth</td><td>692.8 kHz</td></tr><tr><td>x dB</td><td>-6.00 dB</td></tr></tbody></table>	Parameter	Value	Center Freq	2.402000000 GHz	CF Step	200.000 kHz	Freq Offset	0 Hz	Occupied Bandwidth	1.0422 MHz	Total Power	10.9 dBm	Transmit Freq Error	22.339 kHz	OBW Power	99.00 %	x dB Bandwidth	692.8 kHz	x dB	-6.00 dB
Parameter	Value																				
Center Freq	2.402000000 GHz																				
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Transmit Freq Error	22.339 kHz																				
OBW Power	99.00 %																				
x dB Bandwidth	692.8 kHz																				
x dB	-6.00 dB																				
CH19	 <p>The screenshot shows a spectrum analyzer interface for channel CH19. The center frequency is 2.440000000 GHz. The main display shows a spectral plot with a peak at 2.440016 GHz (4.9020 dBm). The occupied bandwidth is 1.0401 MHz. The total power is 11.5 dBm. The transmit frequency error is 16.746 kHz, and the OBW power is 99.00%.</p> <table border="1"><thead><tr><th>Parameter</th><th>Value</th></tr></thead><tbody><tr><td>Center Freq</td><td>2.440000000 GHz</td></tr><tr><td>CF Step</td><td>200.000 kHz</td></tr><tr><td>Freq Offset</td><td>0 Hz</td></tr><tr><td>Occupied Bandwidth</td><td>1.0401 MHz</td></tr><tr><td>Total Power</td><td>11.5 dBm</td></tr><tr><td>Transmit Freq Error</td><td>16.746 kHz</td></tr><tr><td>OBW Power</td><td>99.00 %</td></tr><tr><td>x dB Bandwidth</td><td>684.6 kHz</td></tr><tr><td>x dB</td><td>-6.00 dB</td></tr></tbody></table>	Parameter	Value	Center Freq	2.440000000 GHz	CF Step	200.000 kHz	Freq Offset	0 Hz	Occupied Bandwidth	1.0401 MHz	Total Power	11.5 dBm	Transmit Freq Error	16.746 kHz	OBW Power	99.00 %	x dB Bandwidth	684.6 kHz	x dB	-6.00 dB
Parameter	Value																				
Center Freq	2.440000000 GHz																				
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Transmit Freq Error	16.746 kHz																				
OBW Power	99.00 %																				
x dB Bandwidth	684.6 kHz																				
x dB	-6.00 dB																				
CH39	 <p>The screenshot shows a spectrum analyzer interface for channel CH39. The center frequency is 2.480000000 GHz. The main display shows a spectral plot with a peak at 2.480016 GHz (4.5566 dBm). The occupied bandwidth is 1.0402 MHz. The total power is 11.1 dBm. The transmit frequency error is 14.447 kHz, and the OBW power is 99.00%.</p> <table border="1"><thead><tr><th>Parameter</th><th>Value</th></tr></thead><tbody><tr><td>Center Freq</td><td>2.480000000 GHz</td></tr><tr><td>CF Step</td><td>200.000 kHz</td></tr><tr><td>Freq Offset</td><td>0 Hz</td></tr><tr><td>Occupied Bandwidth</td><td>1.0402 MHz</td></tr><tr><td>Total Power</td><td>11.1 dBm</td></tr><tr><td>Transmit Freq Error</td><td>14.447 kHz</td></tr><tr><td>OBW Power</td><td>99.00 %</td></tr><tr><td>x dB Bandwidth</td><td>680.7 kHz</td></tr><tr><td>x dB</td><td>-6.00 dB</td></tr></tbody></table>	Parameter	Value	Center Freq	2.480000000 GHz	CF Step	200.000 kHz	Freq Offset	0 Hz	Occupied Bandwidth	1.0402 MHz	Total Power	11.1 dBm	Transmit Freq Error	14.447 kHz	OBW Power	99.00 %	x dB Bandwidth	680.7 kHz	x dB	-6.00 dB
Parameter	Value																				
Center Freq	2.480000000 GHz																				
CF Step	200.000 kHz																				
Freq Offset	0 Hz																				
Occupied Bandwidth	1.0402 MHz																				
Total Power	11.1 dBm																				
Transmit Freq Error	14.447 kHz																				
OBW Power	99.00 %																				
x dB Bandwidth	680.7 kHz																				
x dB	-6.00 dB																				

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 Emissions 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. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned 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 Peak detector for Peak value.
RBW=1MHz, VBW=3MHz RMS detector 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
- 2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

BT-BLE					CH00				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2310.00	33.24	28.05	6.62	37.65	30.26	74.00	-43.74	Vertical	Peak
2390.03	44.17	27.65	6.75	37.87	40.70	74.00	-33.30	Vertical	
2310.00	33.40	28.05	6.62	37.65	30.42	74.00	-43.58	Horizontal	
2390.23	40.69	27.65	6.75	37.87	37.22	74.00	-36.78	Horizontal	

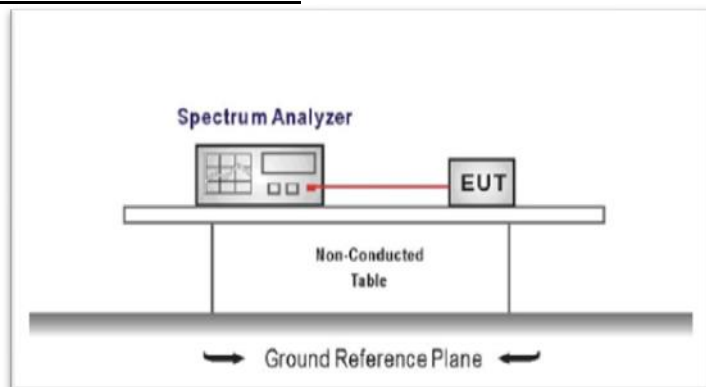
BT-BLE					CH39				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2483.50	38.17	27.26	6.83	37.87	34.39	74.00	-39.61	Vertical	Peak
2500.00	36.76	27.20	6.84	37.87	32.93	74.00	-41.07	Vertical	
2483.50	43.30	27.26	6.83	37.87	39.52	74.00	-34.48	Horizontal	
2500.00	32.15	27.20	6.84	37.87	28.32	74.00	-45.68	Horizontal	

5.7. Band edge and Spurious Emissions (conducted)

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 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 $\geq 3 \times$ 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 that 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 $\geq 3 \times$ 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 emission 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 emission relative to the limit.


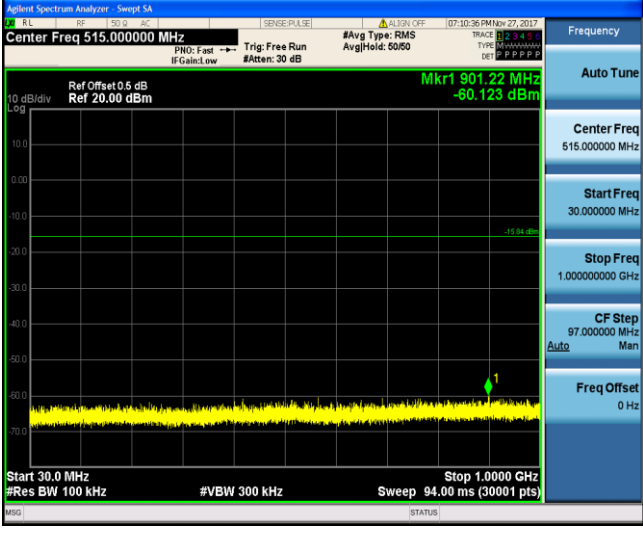
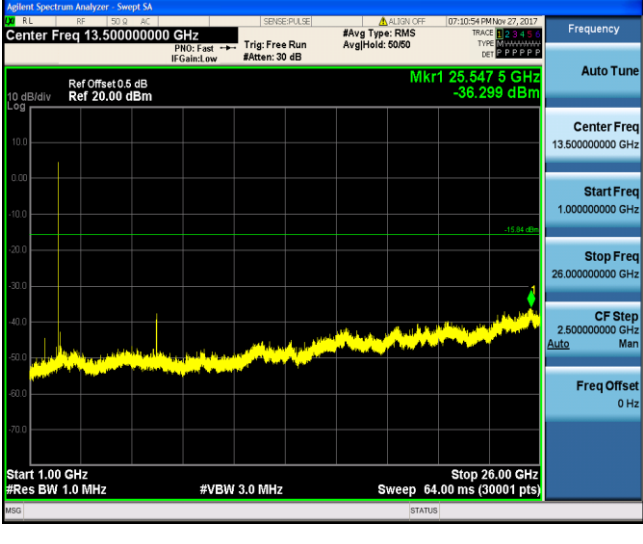
TEST MODE:

Please refer to the clause 3.3

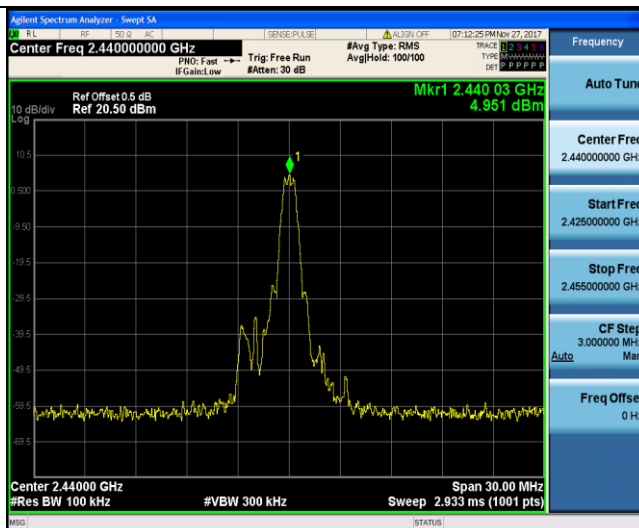
TEST RESULTS

☒ Passed ☐ Not Applicable

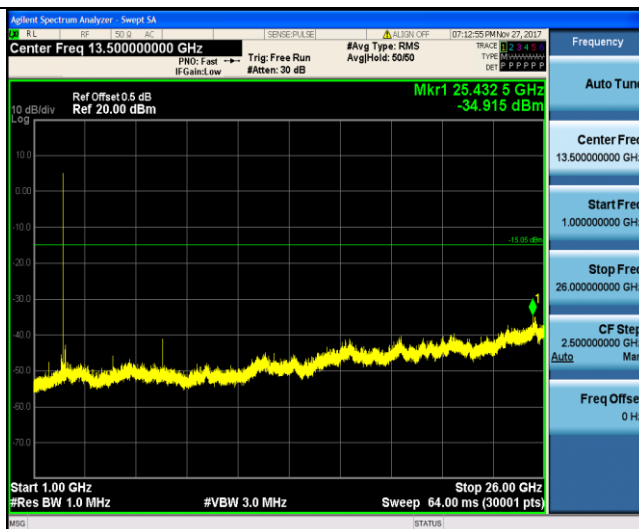
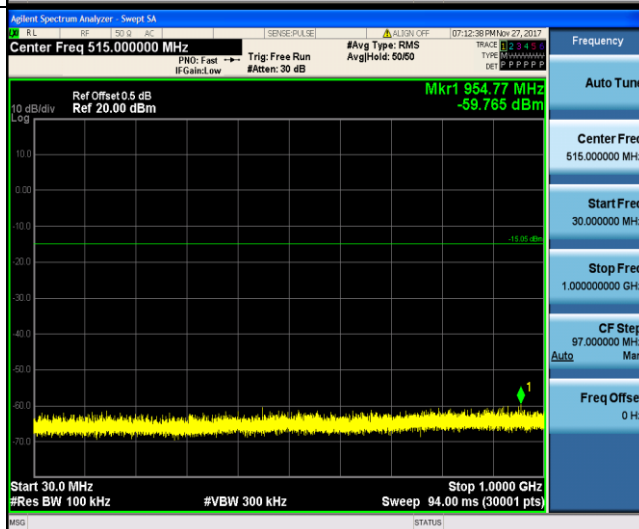
Test Item:	Band edge																																																																																																					
CH00	<div><div><div><div><div>Agilent Spectrum Analyzer - Sweep SA</div><div>Center Freq 2.357500000 GHz</div><div>Ref Offset 0.5 dB Ref 10.50 dBm</div><div>Mkr5 2.399 965 GHz -38.635 dBm</div><div>Start 2.31000 GHz #Res BW 100 kHz</div><div>Stop 2.40500 GHz #VBW 300 kHz Sweep 9.133 ms (1001 pts)</div><div><table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.402 065 GHz</td><td>-4.366 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.400 000 GHz</td><td>-38.635 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.390 000 GHz</td><td>-70.274 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.310 000 GHz</td><td>-69.838 dBm</td><td></td><td></td><td></td></tr><tr><td>5</td><td>N</td><td>1</td><td>f</td><td>2.399 965 GHz</td><td>-38.635 dBm</td><td></td><td></td><td></td></tr></table></div></div></div><div><div>Frequency</div><div>Auto Tune</div><div>Center Freq 2.357500000 GHz</div><div>Start Freq 2.310000000 GHz</div><div>Stop Freq 2.405000000 GHz</div><div>CF Step 9.500000 MHz Man</div><div>Freq Offset 0 Hz</div></div></div></div> <tr><td>CH39</td><td><div><div><div><div><div>Agilent Spectrum Analyzer - Sweep SA</div><div>Center Freq 2.489000000 GHz</div><div>Ref Offset 0.5 dB Ref 10.50 dBm</div><div>Mkr4 2.483 522 GHz -57.820 dBm</div><div>Start 2.47800 GHz #Res BW 100 kHz</div><div>Stop 2.50000 GHz #VBW 300 kHz Sweep 2.133 ms (1001 pts)</div><div><table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.480 024 GHz</td><td>-4.695 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.483 500 GHz</td><td>-57.898 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.500 000 GHz</td><td>-70.223 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.483 522 GHz</td><td>-57.820 dBm</td><td></td><td></td><td></td></tr></table></div></div></div><div><div>Frequency</div><div>Auto Tune</div><div>Center Freq 2.489000000 GHz</div><div>Start Freq 2.478000000 GHz</div><div>Stop Freq 2.500000000 GHz</div><div>CF Step 2.200000 MHz Man</div><div>Freq Offset 0 Hz</div></div></div></div></td></tr>	MNR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.402 065 GHz	-4.366 dBm				2	N	1	f	2.400 000 GHz	-38.635 dBm				3	N	1	f	2.390 000 GHz	-70.274 dBm				4	N	1	f	2.310 000 GHz	-69.838 dBm				5	N	1	f	2.399 965 GHz	-38.635 dBm				CH39	<div><div><div><div><div>Agilent Spectrum Analyzer - Sweep SA</div><div>Center Freq 2.489000000 GHz</div><div>Ref Offset 0.5 dB Ref 10.50 dBm</div><div>Mkr4 2.483 522 GHz -57.820 dBm</div><div>Start 2.47800 GHz #Res BW 100 kHz</div><div>Stop 2.50000 GHz #VBW 300 kHz Sweep 2.133 ms (1001 pts)</div><div><table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.480 024 GHz</td><td>-4.695 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.483 500 GHz</td><td>-57.898 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.500 000 GHz</td><td>-70.223 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.483 522 GHz</td><td>-57.820 dBm</td><td></td><td></td><td></td></tr></table></div></div></div><div><div>Frequency</div><div>Auto Tune</div><div>Center Freq 2.489000000 GHz</div><div>Start Freq 2.478000000 GHz</div><div>Stop Freq 2.500000000 GHz</div><div>CF Step 2.200000 MHz Man</div><div>Freq Offset 0 Hz</div></div></div></div>	MNR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.480 024 GHz	-4.695 dBm				2	N	1	f	2.483 500 GHz	-57.898 dBm				3	N	1	f	2.500 000 GHz	-70.223 dBm				4	N	1	f	2.483 522 GHz	-57.820 dBm			
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Test Item:	SE
Reference level CH00	
CH00	
	

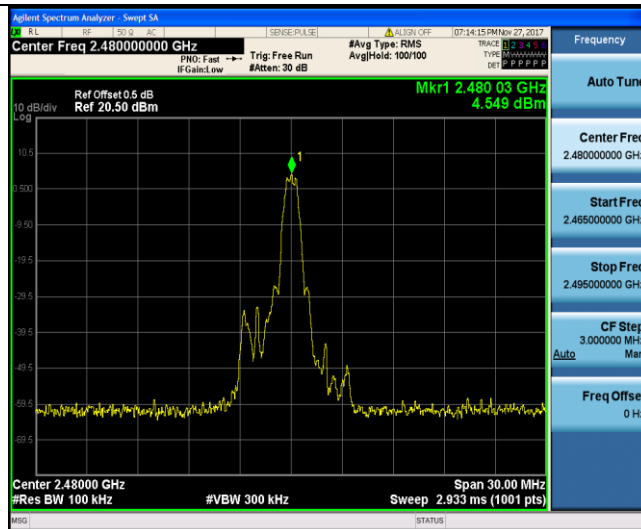
Reference level CH19



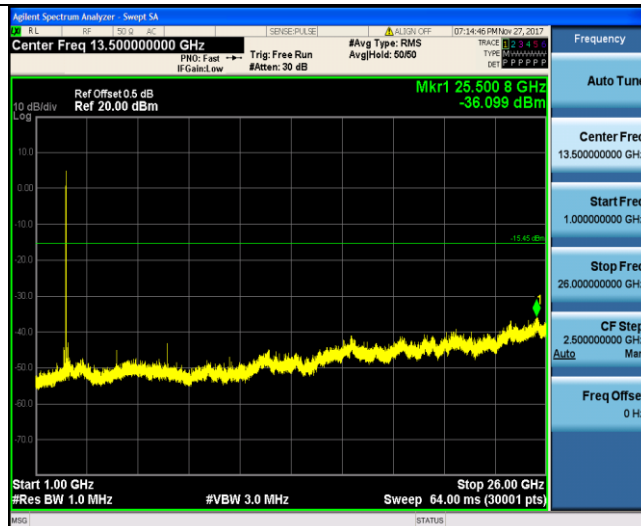
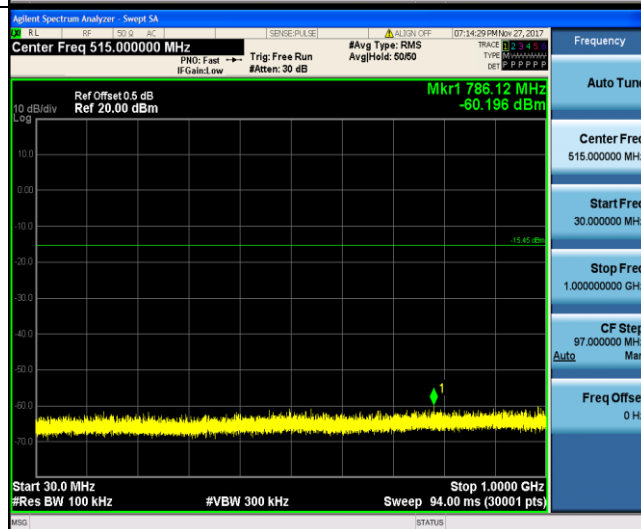
CH19



Reference level CH39



CH39



5.8. Spurious Emissions (radiated)

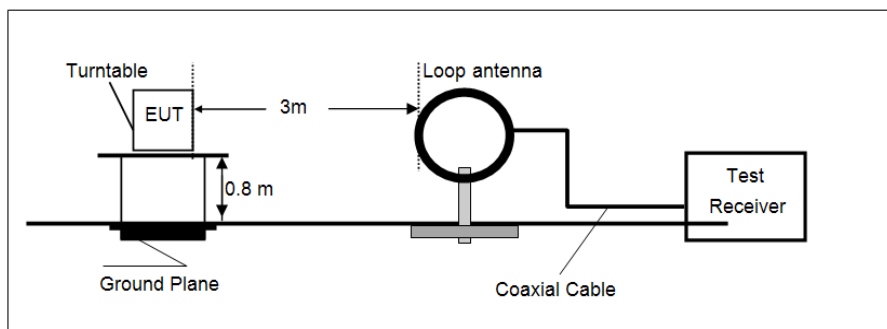
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

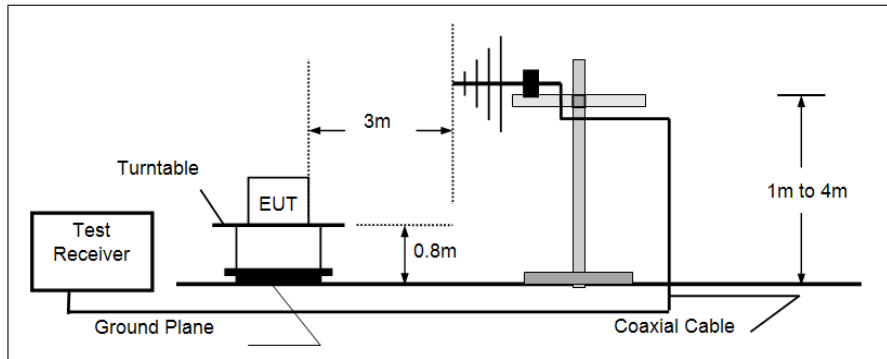
Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

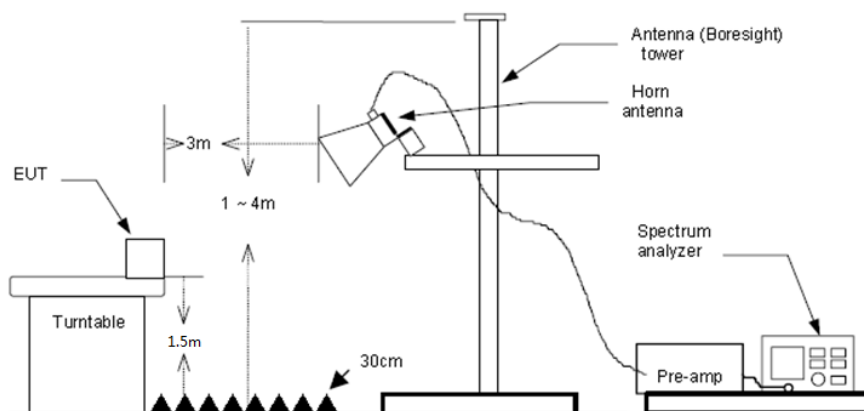
- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



- Above 1 GHz



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 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned 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. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz, RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold; If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) Above 1GHz, RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

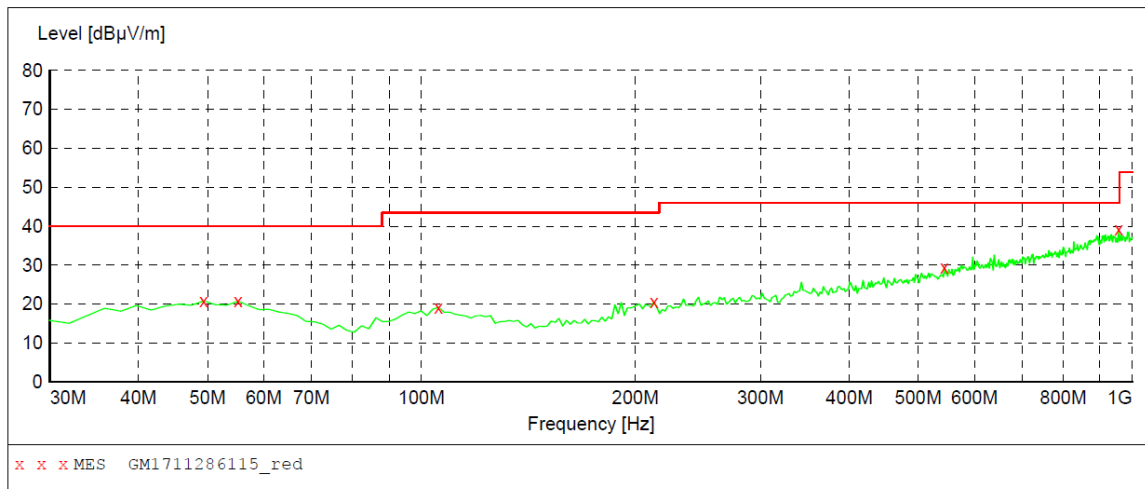
Note:

- 1) Above 1GHz 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.
- **9 kHz ~ 30 MHz**
The EUT was pre-scanned the frequency band (9 kHz ~ 30 MHz), found the radiated level lower than the limit, so don't show on the report.
- **30 MHz ~ 1000 MHz**
Have pre-scan all modulation mode, found the BT-BLE mode CH39 which it was worst case, so only the worst case's data on the test report.

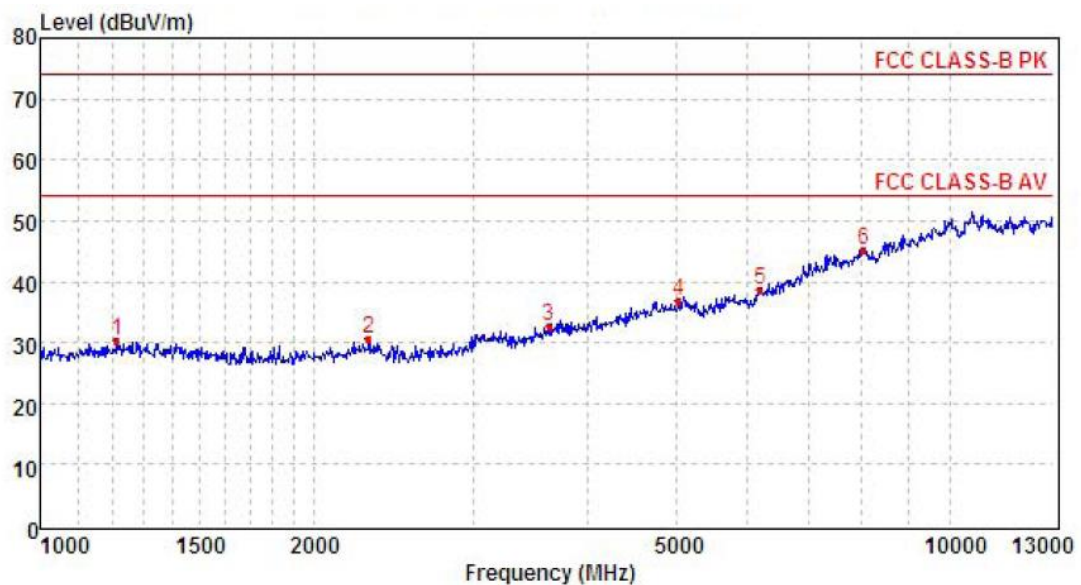
➤ 30 MHz ~ 1 GHz

Polarization:

Vertical



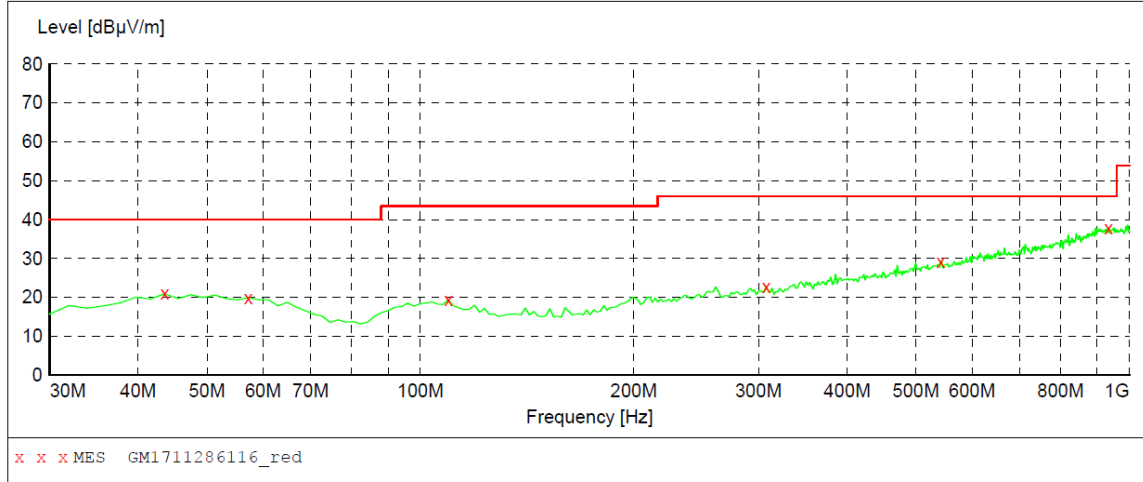
Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.400000	20.80	-8.7	40.0	19.2	QP	100.0	0.00	VERTICAL
55.220000	20.80	-9.2	40.0	19.2	QP	100.0	174.00	VERTICAL
105.660000	19.20	-10.5	43.5	24.3	QP	100.0	72.00	VERTICAL
212.360000	20.60	-10.4	43.5	22.9	QP	100.0	241.00	VERTICAL
544.100000	29.50	-0.9	46.0	16.5	QP	100.0	292.00	VERTICAL
957.320000	39.20	7.3	46.0	6.8	QP	100.0	162.00	VERTICAL



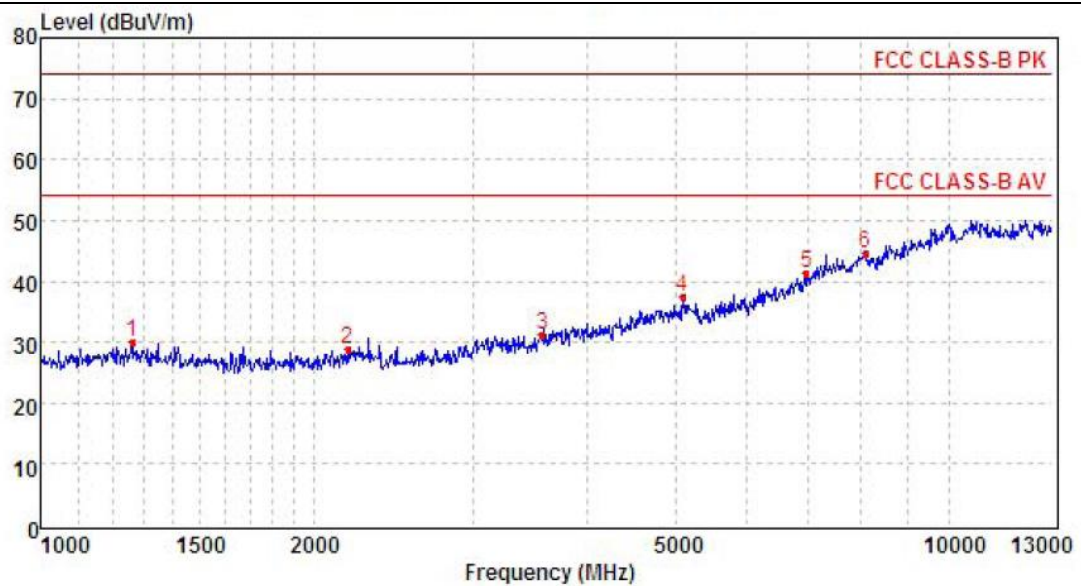
Mark	Frequency MHz	Reading dbuv/m	Antenna db	Cable db	Preamp db	Level dbuv/m	Limit dbuv/m	Over limit	Remark
1	1215.23	36.0	26.3	4.7	36.6	30.4	74.0	-43.6	Peak
2	2295.71	33.5	28.1	6.6	37.6	30.6	74.0	-43.4	Peak
3	3624.10	33.3	29.3	8.3	38.3	32.6	74.0	-41.4	Peak
4	5032.51	31.8	31.6	9.7	36.4	36.7	74.0	-37.3	Peak
5	6194.61	30.1	32.9	11.0	35.3	38.7	74.0	-35.3	Peak
6	8047.04	30.2	37.1	12.4	34.5	45.2	74.0	-28.8	Peak

Polarization:

Horizontal



Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.580000	21.00	-9.1	40.0	19.0	QP	100.0	251.00	HORIZONTAL
57.160000	19.90	-9.4	40.0	20.1	QP	100.0	319.00	HORIZONTAL
109.540000	19.40	-10.8	43.5	24.1	QP	100.0	279.00	HORIZONTAL
307.420000	22.80	-7.1	46.0	23.2	QP	300.0	27.00	HORIZONTAL
542.160000	29.30	-0.9	46.0	16.7	QP	100.0	13.00	HORIZONTAL
934.040000	37.90	7.1	46.0	8.1	QP	100.0	27.00	HORIZONTAL



Mark	Frequency MHz	Reading dbuv/m	Antenna db	Cable db	Preamp db	Level dbuv/m	Limit dbuv/m	Over limit	Remark
1	1262.90	35.5	26.2	4.8	36.5	30.0	74.0	-44.0	Peak
2	2180.92	32.4	27.4	6.4	37.3	28.9	74.0	-45.1	Peak
3	3568.75	32.0	29.2	8.2	38.3	31.1	74.0	-42.9	Peak
4	5097.46	32.1	31.9	9.7	36.3	37.4	74.0	-36.6	Peak
5	6970.36	29.3	35.1	11.8	34.8	41.4	74.0	-32.6	Peak
6	8088.42	29.7	37.0	12.5	34.5	44.7	74.0	-29.3	Peak

➤ Above 1 GHz

BT-BLE					CH00				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2092.18	47.82	26.67	6.35	37.32	43.52	74.00	-30.48	Vertical	Peak
3192.37	38.14	28.80	7.71	38.20	36.45	74.00	-37.55	Vertical	
4809.50	45.50	31.58	9.55	36.93	49.70	74.00	-24.30	Vertical	
7209.02	37.16	36.21	11.87	35.07	50.17	74.00	-23.83	Vertical	
1791.27	43.85	25.38	5.94	37.12	38.05	74.00	-35.95	Horizontal	Peak
3893.52	36.75	29.69	8.63	38.17	36.90	74.00	-37.10	Horizontal	
4809.50	44.34	31.58	9.55	36.93	48.54	74.00	-25.46	Horizontal	
7209.02	36.25	36.21	11.87	35.07	49.26	74.00	-24.74	Horizontal	

BT-BLE					CH19				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2980.33	37.85	28.58	7.47	38.24	35.66	74.00	-38.34	Vertical	Peak
4883.52	45.11	31.43	9.59	36.73	49.40	74.00	-24.60	Vertical	
7319.96	35.97	36.30	11.99	34.92	49.34	74.00	-24.66	Vertical	
7702.28	31.19	36.10	13.00	35.03	45.26	74.00	-28.74	Vertical	
1597.40	40.92	24.92	5.56	36.72	34.68	74.00	-39.32	Horizontal	Peak
3579.82	34.54	29.24	8.24	38.30	33.72	74.00	-40.28	Horizontal	
4883.52	44.77	31.43	9.59	36.73	49.06	74.00	-24.94	Horizontal	
7319.96	37.80	36.30	11.99	34.92	51.17	74.00	-22.83	Horizontal	

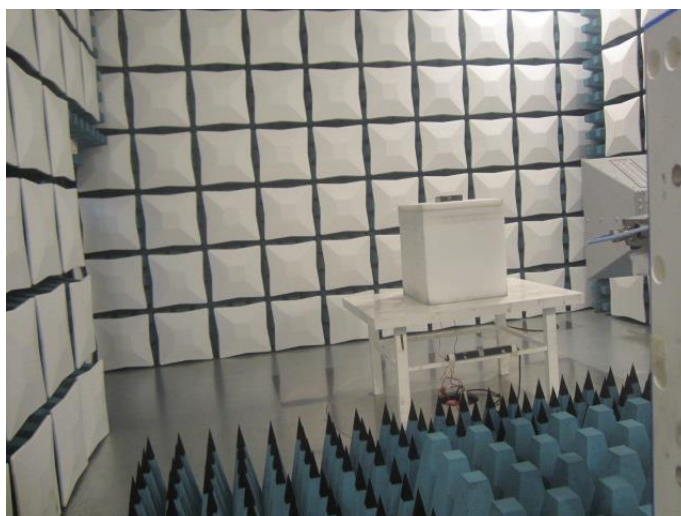
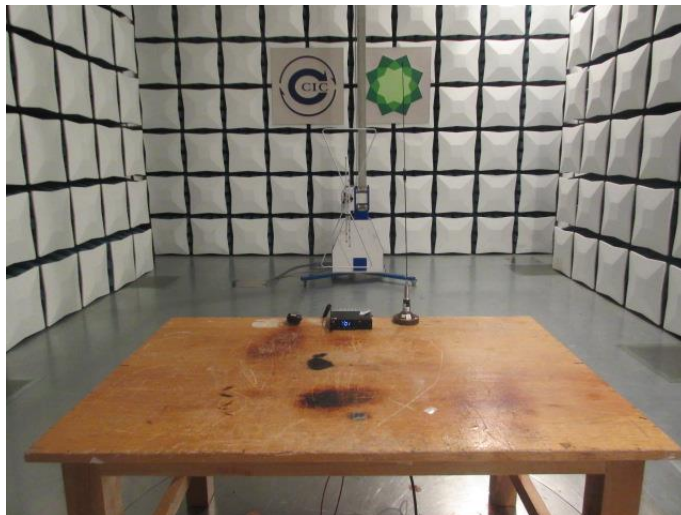
BT-BLE					CH39				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1795.84	39.97	25.39	5.95	37.13	34.18	74.00	-39.82	Vertical	Peak
3844.28	32.98	29.64	8.56	38.20	32.98	74.00	-41.02	Vertical	
4958.68	45.11	31.46	9.64	36.52	49.69	74.00	-24.31	Vertical	
6730.19	29.56	34.14	11.52	35.12	40.10	74.00	-33.90	Vertical	
1609.65	40.84	24.93	5.59	36.74	34.62	74.00	-39.38	Horizontal	Peak
3973.62	34.18	29.70	8.74	38.13	34.49	74.00	-39.51	Horizontal	
4958.68	42.65	31.46	9.64	36.52	47.23	74.00	-26.77	Horizontal	
7190.69	31.40	36.14	11.86	35.07	44.33	74.00	-29.67	Horizontal	

Remark:

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

6. TEST SETUP PHOTOS

Radiated Emission:



7. External and Internal Photos of the EUT

Reference to Test Report No.: TRE1711009001.

-----End of Report-----