TEST REPORT

Reference No.	:	WTF19F06038197E
FCC ID	:	2AREA-LC2
Applicant	:	Lume Cube Inc
Address	:	2870 Whiptail Loop East, Suite 103, Carlsbad, Ca 92010, USA
Manufacturer	:	Victory Telecom (Huizhou) Ltd.
Address	:	Building A, No.18, Shuiyuan Industrial District, Ruhu Town, Huizhou City 516021, Guangdong Province, P.R. China
Product Name	:	Bluetooth control camera light
Model No.	:	LC2
Standards	:	FCC CFR47 Part 15 Subpart C (Section 15.247): 2017
Date of Receipt sample	:	2019-06-12
Date of Test	:	2019-08-26
Date of Issue	:	2019-08-26
Test Result	:	Pass

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.
The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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Tested by: Approved by:

Roy Hong / Project Engineer

Danny Zhou / Manager

1 Test Summary

Test Items	Test Requirement	Result
Radiated Emissions	15.247 15.205(a) 15.209(a)	Pass
Conducted Emissions	15.207(a)	Pass
6dB Bandwidth	15.247(a)(2)	Pass
Maximum Peak Output Power	15.247(b)(3),(4)	Pass
Power Spectral Density	15.247€	Pass
Band Edge	15.247(d)	Pass
Antenna Requirement	15.203	Pass
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	Pass

Remark:

Pass	Test item meets the requirement
Fail	Test item does not meet the requirement
N/A	Test case does not apply to the test object

2 Contents

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTF19F06038197E	2019-06-12	2019-08-26	2019-08-26	Original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product Name ..... : Bluetooth control camera light

Model No. ..... : LC2

Model Description ..... : ---

Operation Frequency ..... : 2402-2480MHz, 40 channels in total

Bluetooth Version ..... : Bluetooth 4.0 Single mode (BLE)

Modulation Type ..... : GFSK

Antenna Type PCB Printed Antenna

The Lowest Oscillator ..... : 16MHz

Antenna Gain ..... : 0dBi

4.2 Details of E.U.T.

Technical Data ..... : Battery 3.7V

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	**2**	2404	**3**	2406	**4**	2408
5	2410	**6**	2412	**7**	2414	**8**	2416
9	2418	**10**	2420	**11**	2422	**12**	2424
13	2426	**14**	2428	**15**	2430	**16**	2432
17	2434	**18**	2436	**19**	2438	**20**	2440
21	2442	**22**	2444	**23**	2446	**24**	2448
25	2450	**26**	2452	**27**	2454	**28**	2456
29	2458	**30**	2460	**31**	2462	**32**	2464
33	2466	**34**	2468	**35**	2470	**36**	2472
37	2474	**38**	2476	**39**	2478	**40**	2480

4.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	BLE	11 Mbps	1/21/10	TX
Power Spectral Density	BLE	11 Mbps	1/21/10	TX
Band Edge	BLE	11 Mbps	1/21/10	TX
6dB Bandwidth	BLE	11 Mbps	1/21/10	TX
Transmitter Spurious Emissions	BLE	11 Mbps	1/21/10	TX

Note :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

4.5 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 21895-1**

Waltek Services (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration IC number:21895-1, Nov. 14, 2016.

- **FCC – Registration No.: 820106**

Waltek Services (Foshan) 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 820106, August 16, 2018

- **FCC – Designation No.: CN5034**

Waltek Services (Foshan) 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. Designation No. CN5034.

- **NVLAP – Lab Code: 600191-0**

Waltek Services (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal Date**	**Cal Due Date**
1.	EMI Test Receiver	RS	ESCI	101178	2019-01-18	2020-01-17
2.	LISN	RS	ENV216	101215	2019-01-10	2020-01-09
3.	Cable	HUBER+SUHNER	CBL2-NN-3M	223NN322	2019-01-10	2020-01-09
4.	Test Software	FARATRONIC	EZ-EMC	EMEC-3AA	-	-
3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer	Agilent	N9020A	MY48011796	2019-01-26	2020-01-25
2.	Active Loop Antenna	SCHWARZBECK	FMZB1519B	00004	2019-01-26	2020-01-25
3.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9162	9162-117	2019-01-26	2020-01-25
4.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	2019-01-26	2020-01-25
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2019-01-26	2020-01-25
6.	Amplifier	Lunar E M	LNA1G18-40	20160501002	2019-01-26	2020-01-25
7.	Coaxial Cable (below 1GHz)	H+S	CBL3-NN-12+3 m	214NN320	2019-01-10	2020-01-09
8.	Coaxial Cable (above 1GHz)	Times-Micorwave	CBL5-NN	-	2019-01-10	2020-01-09
9.	Test Software	FARATRONIC	EZ-EMC	EMEC-3AA	-	-
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	Spectrum Analyzer	Agilent	N9020A	MY48011796	2019-01-26	2020-01-25
2.	Spectrum Analyzer	R&S	FSP40	100501	2019-01-26	2020-01-25
3.	Vector Signal Generator	Agilent	N5182A	MY50141533	2019-01-26	2020-01-25
4.	Analog Signal Generator	Agilent	N5181A	MY48180720	2019-01-26	2020-01-26
5.	Environmental Chamber	KSON	THS-D4C-100	5244K	2019-01-26	2020-01-26
6.	Test Software	FARATRONIC	EZ-EMC	EMEC-3AA	-	-

5.2 Measurement Uncertainty

Conducted Emission (150kHz-30MHz)

Input quantity	X_i	Uncertainty of x_i		$u(X_i)$	C_i	$C_i u(X_i)$ (dB)
		dB	Probability distribution function			
Receiver reading	V_r	±0.36	K=2	0.18	1	0.18
Attenuation: AMN-receiver	a_c	±0.20	K=2	0.10	1	0.10
AMN voltage division factor	F_{AMN}	±0.20	K=2	0.10	1	0.10
Receiver corrections:						
Sine wave voltage	δV_{sw}	±1.0	K=2	0.50	1	0.50
Pulse amplitude response	δV_{pa}	±0.0		0.00	1	0.00
Pulse repetition rate response	δV_{pr}	±0.0		0.00	1	0.00
Noise floor proximity	δV_{nf}	±0.05		0.00	1	0.00
Mismatch: AMN-receiver	δM	+0.7/-0.8	U-shaped	0.53	1	0.53
AMN impedance	δZ	+2.6/-2.7	Triangular	1.08	1	1.08
Note: $V = V_r + a_c + F_{AMN} + \delta F_{AMN} + \delta V_{sw} + \delta V_{pa} + \delta V_{pr} + \delta V_{nf} + \delta M + \delta Z$ $U(V) = 2u_c(V) = \mathbf{2.66}dB$						

Radiated Emission (30MHz-1GHz)

Input quantity	X_i	Uncertainty of x_i		$u(X_i)$	C_i	$C_iu(X_i)$ (dB)
		dB	Probability distribution function			
Receiver reading	V_r	±0.36	K=2	0.18	1	0.18
Attenuation: antenna-receiver	a_c	±0.10	K=2	0.05	1	0.05
Antenna facotr	F_a	±1.6	K=2	0.8	1	0.8
Receiver corrections:						
Sine wave voltage	δV_{sw}	±1.0	K=2	0.5	1	0.5
Pulse amplitude response	δV_{pa}	±0.6	Rectangular	0.35	1	0.35
Pulse repetition rate response	δV_{pr}	±1.5	Rectangular	0.87	1	0.87
Noise floor proximity	δV_{nf}	±0.5	K=2	0.25	1	0.25
Mismatch: antenna-receiver	δM	+0.9/-1.0	U-shaped	0.67	1	0.67
Antenna corrections:						
AF frequency interpolation	δF_{af}	±0.3	Rectangular	0.17	1	0.17
AF variation due to FAR influence	δF_{ah}	±0.5	Rectangular	0.29	1	0.29
Directivity difference	δF_{adir}	±0.0		0.00	1	0.00
Phase centre location	δF_{aph}	±0.0		0.00	1	0.00
Cross-polarization	δF_{acp}	±0.0		0.00	1	0.00
Balance	δF_{abal}	±0.3	Rectangular	0.17	1	0.17
Site corrections:						
Site imperfections	δA_N	±4.0	Triangular	1.63	1	1.63
Separation distance	δd	±0.3	Rectangular	0.17	1	0.17
Table height	δh	±0.1	K=2	0.05	1	0.05
Note: $E= V_r + a_c + F_a + \delta V_{sw} + \delta V_{pa} + \delta V_{pr} + \delta V_{nf} + \delta M + \delta F_{af} + \delta F_{ah} + \delta F_{adir} + \delta F_{aph} + \delta F_{acp} + \delta F_{abal} + \delta A_N + \delta d + \delta h$ $U(E)=2u_c(E)=\mathbf{4.56}dB$						

Radiated Spurious Emissions (25MHz-1GHz)

Input quantity	X_i	Uncertainty of x_i		$u(x_i)$ dB	c_i	$c_i u(x_i)$ dB
		dB	Probability distribution function			
Receiver reading	V_r	±0.4	k=2	0.20	1	0.20
Attenuation: antenna-receiver	a_c	±0.5	k=2	0.25	1	0.25
Cable loss and correction	L_{ac}	±1.6	k=2	0.80	1	0.80
Receiver corrections:						
Sine wave voltage	δV_{sw}	±0.9	k=2	0.45	1	0.45
Pulse amplitude response	δV_{pa}	±0.6	Rectangular	0.35	1	0.35
Pulse repetition rate response	δV_{pr}	±0.6	Rectangular	0.35	1	0.35
Noise floor proximity	δV_{nf}	+1.0/0.0	U-shaped	0.58	1	0.58
Mismatch: antenna-receiver	δM	+0.9/--1.0	U-shaped	0.67	1	0.67
Site imperfections	δMD	±3.0	Triangular	1.14	1	1.23
Reproducibility of measurement operation	δp	±0.60	k=2	0.30	1	0.30
Separation distance	δd	±0.3	Rectangular	0.17	1	0.17
Table height	δh	±0.1	k=2	0.05	1	0.05
Note: $E = V_r + a_c + L_{ac} + \delta V_{sw} + \delta V_{pa} + \delta V_{pr} + \delta V_{nf} + \delta M + \delta MD + \delta p + \delta d + \delta h$ $U(E) = 2u_c(E) = \mathbf{3.80}$dB						

Radiated Spurious Emissions (1GHz-18GHz)

Input quantity	X_i	Uncertainty of x_i		$u(x_i)$ dB	c_i	$c_i u(x_i)$ dB
		dB	Probability distribution function			
Receiver reading	V_r	±0.40	k=2	0.20	1	0.20
Attenuation: antenna-receiver	a_c	±0.80	k=2	0.40	1	0.40
Cable loss and correction	L_{ac}	±2.40	k=2	1.20	1	1.20
Mismatch: Preamplifiers - Signal Analyzers	δM_{ps}	+1.2/-1.4	U-shaped	0.92	1	0.92
Mismatch:antenna-receiver	δM_{ac}	+1.3/-1.5	U-shaped	1.00	1	1.00
Receiver corrections:						
Sine wave voltage	δV_{sw}	±0.9	k=2	0.45	1	0.45
Pulse amplitude response	δV_{pa}	±0.6	Rectangular	0.35	1	0.35
Pulse repetition rate response	δV_{pr}	±0.6	Rectangular	0.35	1	0.35
Noise floor proximity	δV_{nf}	+1.0/0.0	U-shaped	0.58	1	0.58
Site imperfections	$\delta Svswr$	±3.0	Triangular	1.22	1	1.22
Effect of setup table material	δANT	±1.0	Rectangular	0.58	1	0.58
Reproducibility of measurement operation	δp	±0.60	k=2	0.30	1	0.30
Note: $E = V_r + a_c + L_{ac} + \delta M_{ps} + \delta M_{ac} + \delta V_{sw} + \delta V_{pa} + \delta V_{pr} + \delta V_{nf} + \delta Svswr + \delta ANT + \delta p$ $U(E) = 2u_c(E) = \mathbf{4.97}$dB						

6 Conducted Emission

Test Requirement ..... : FCC CFR 47 Part 15 Section 15.207

Test Method ..... : ANSI C63.10:2013

Test Result ..... : PASS

Frequency Range ..... : 150kHz to 30MHz

Class/Severity ..... : Class B

Limit ..... : 66-56 dBμV between 0.15MHz & 0.5MHz

56 dBμV between 0.5MHz & 5MHz

60 dBμV between 5MHz & 30MHz

Detector ..... : Peak for pre-scan (9kHz Resolution Bandwidth)

6.1 E.U.T. Operation

Operating Environment:

Temperature ..... : 25°C

Humidity ..... : 60 % RH

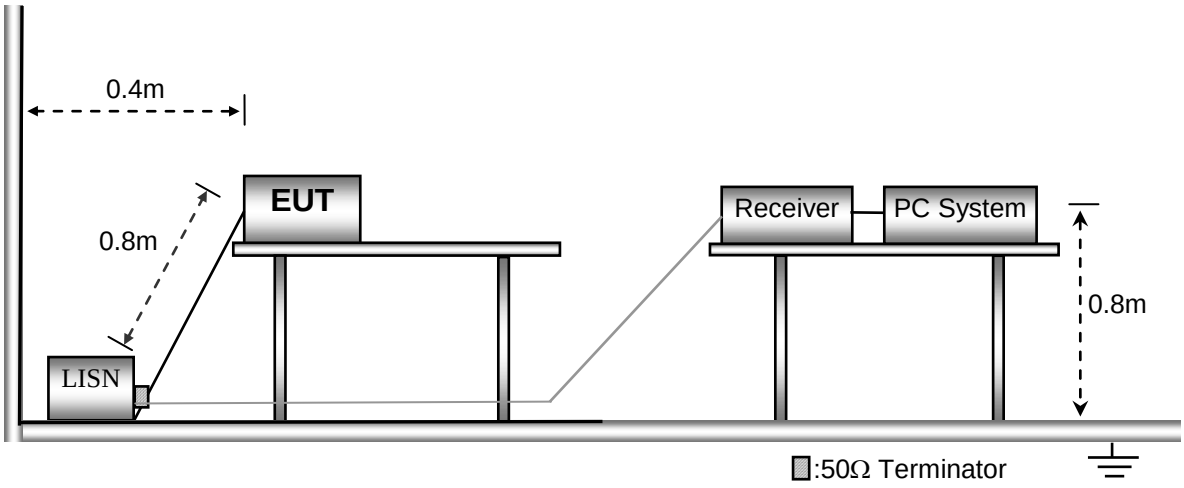
Atmospheric Pressure ..... : 101.2kPa

EUT Operation:

The test was performed in Transmitting mode, the test data were shown in the report.

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



6.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.4 Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF(Voltage Division Facotr), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Measurement=Reading Level+Correct Factor

Correct Facotor=LISN VDF+Cable Loss

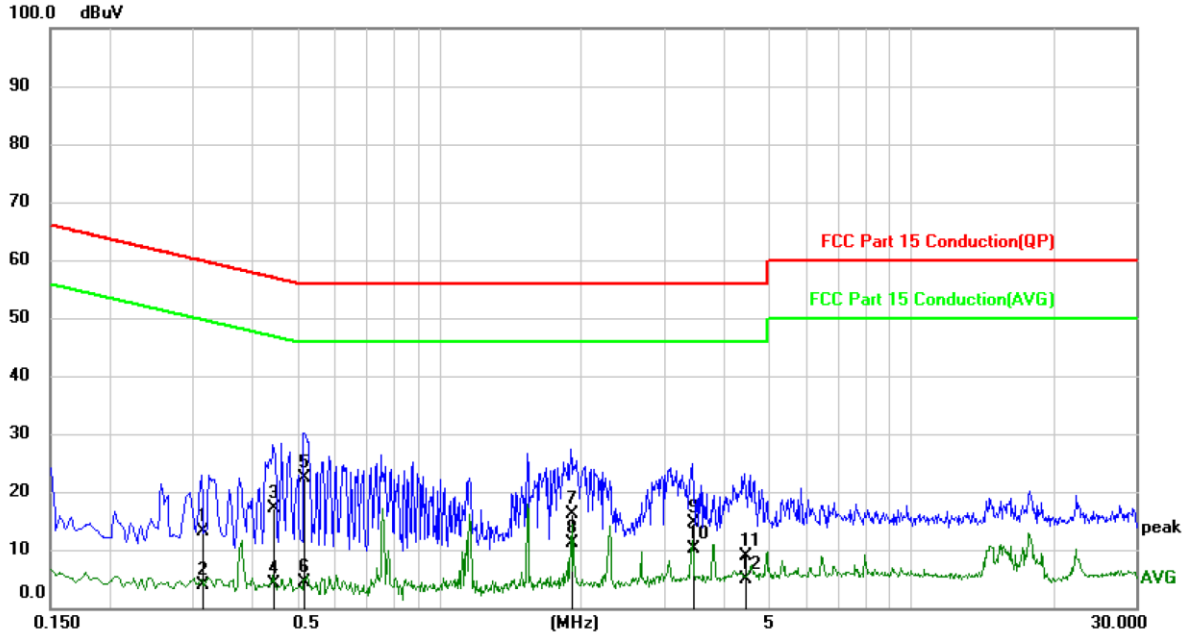
The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin=Limit-Measurement

6.5 Conducted Emission Test Result

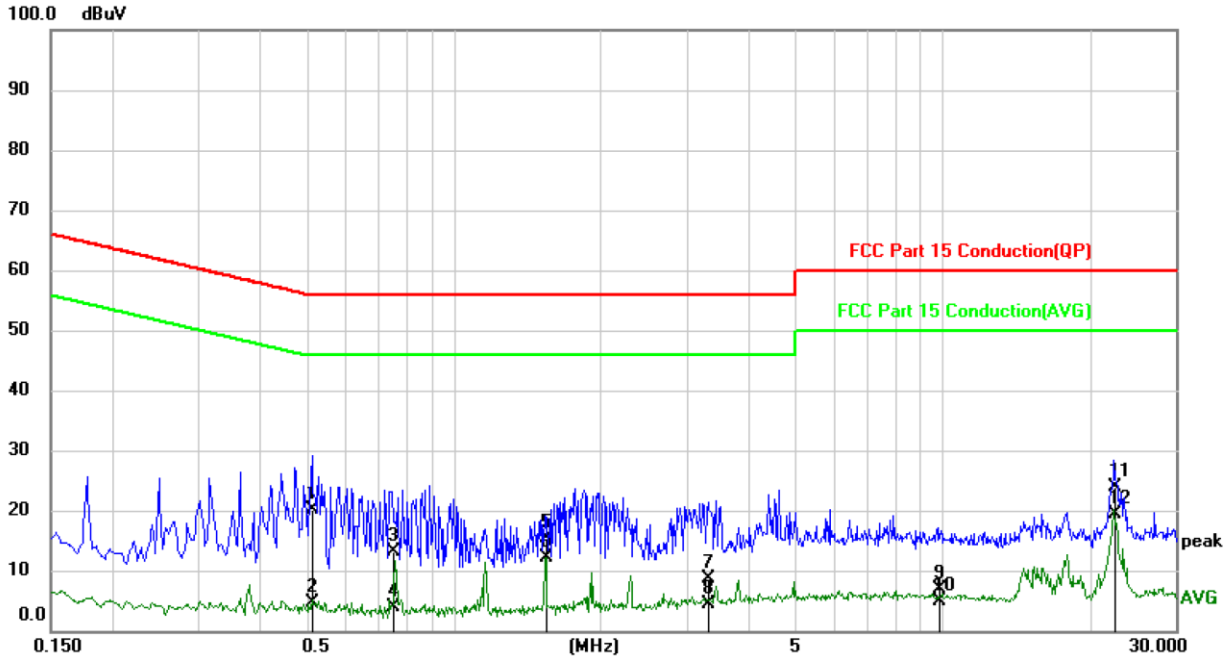
An initial pre-scan was performed on the live and neutral lines.

Live Line :



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3140	3.59	9.59	13.18	59.86	-46.68	QP	
2		0.3140	-5.82	9.59	3.77	49.86	-46.09	AVG	
3		0.4460	7.53	9.59	17.12	56.95	-39.83	QP	
4		0.4460	-5.54	9.59	4.05	46.95	-42.90	AVG	
5	*	0.5180	12.70	9.59	22.29	56.00	-33.71	QP	
6		0.5180	-5.18	9.59	4.41	46.00	-41.59	AVG	
7		1.9060	6.45	9.62	16.07	56.00	-39.93	QP	
8		1.9060	1.40	9.62	11.02	46.00	-34.98	AVG	
9		3.4500	4.85	9.66	14.51	56.00	-41.49	QP	
10		3.4500	0.42	9.66	10.08	46.00	-35.92	AVG	
11		4.4340	-0.77	9.68	8.91	56.00	-47.09	QP	
12		4.4340	-4.68	9.68	5.00	46.00	-41.00	AVG	

Neutral Line :



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.5140	10.55	9.59	20.14	56.00	-35.86	QP	
2		0.5140	-5.05	9.59	4.54	46.00	-41.46	AVG	
3		0.7500	3.65	9.60	13.25	56.00	-42.75	QP	
4		0.7500	-5.78	9.60	3.82	46.00	-42.18	AVG	
5		1.5420	5.66	9.62	15.28	56.00	-40.72	QP	
6		1.5420	2.62	9.62	12.24	46.00	-33.76	AVG	
7		3.3180	-1.03	9.65	8.62	56.00	-47.38	QP	
8		3.3180	-5.32	9.65	4.33	46.00	-41.67	AVG	
9		9.8220	-2.96	9.81	6.85	60.00	-53.15	QP	
10		9.8220	-4.95	9.81	4.86	50.00	-45.14	AVG	
11		22.4780	13.86	10.08	23.94	60.00	-36.06	QP	
12	*	22.4780	9.23	10.08	19.31	50.00	-30.69	AVG	

7 Radiated Emissions

Test Requirement .....: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method .....: ANSI C63.10:2013

Test Result .....: PASS

Measurement Distance .....: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment:

Temperature.....: 23.5 °C

Humidity .....: 52.1 % RH

Atmospheric Pressure .....: 101.2kPa

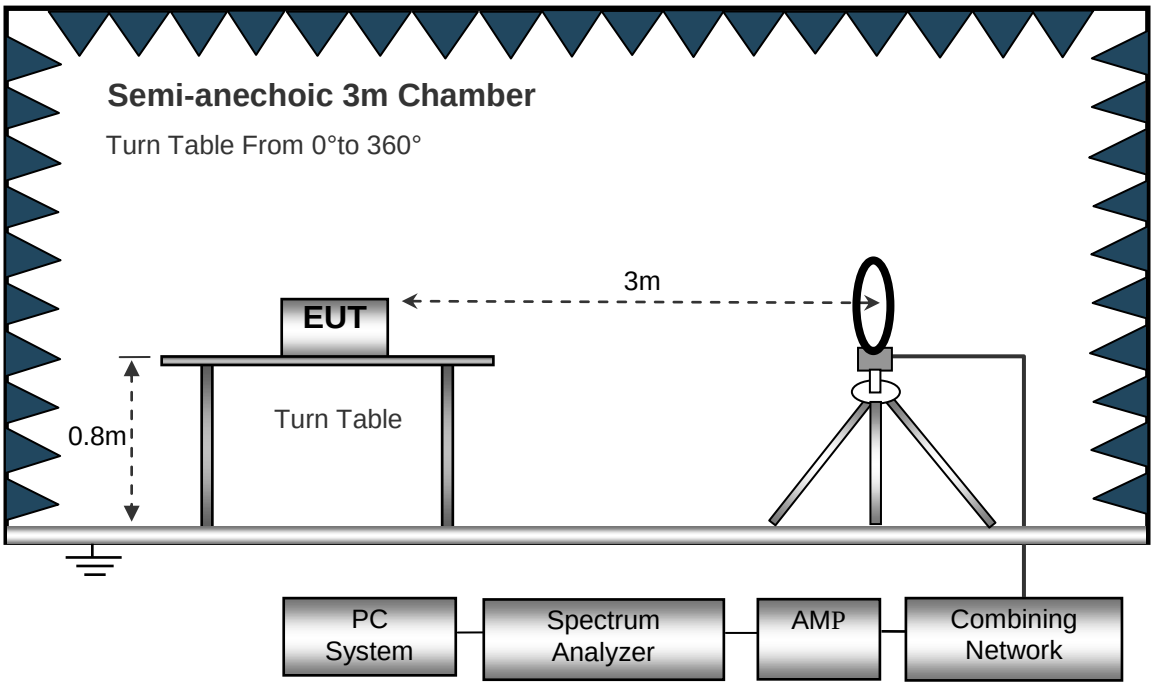
EUT Operation:

The test was performed in transmitting mode, the test data were shown in the report.

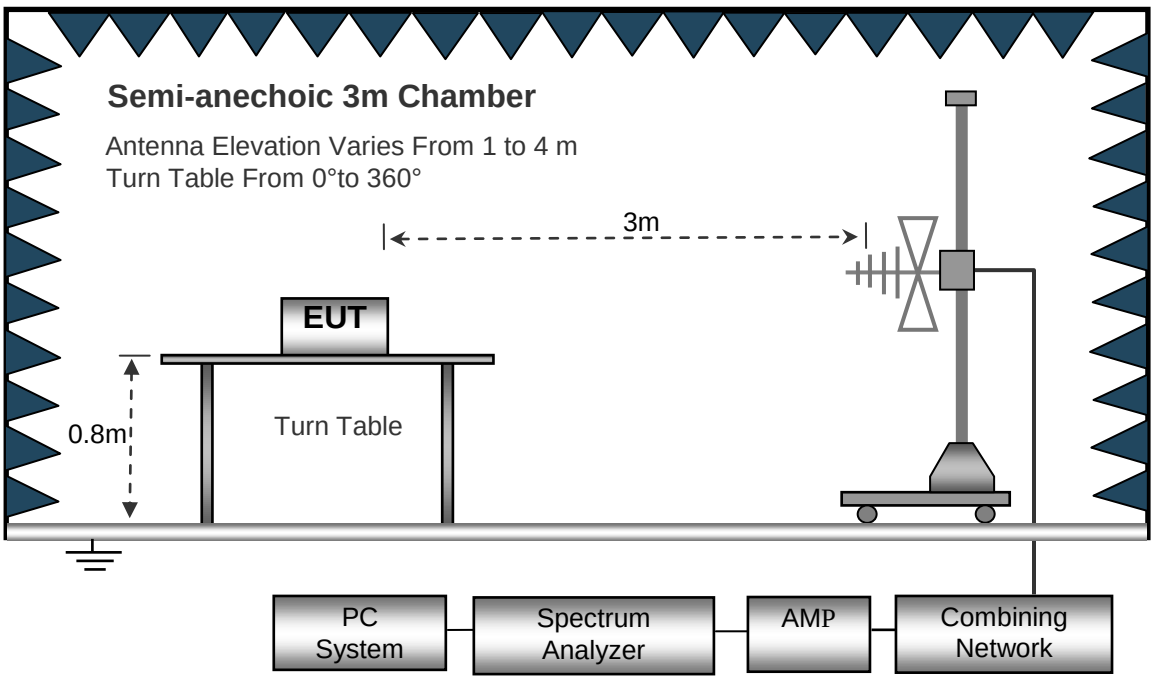
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

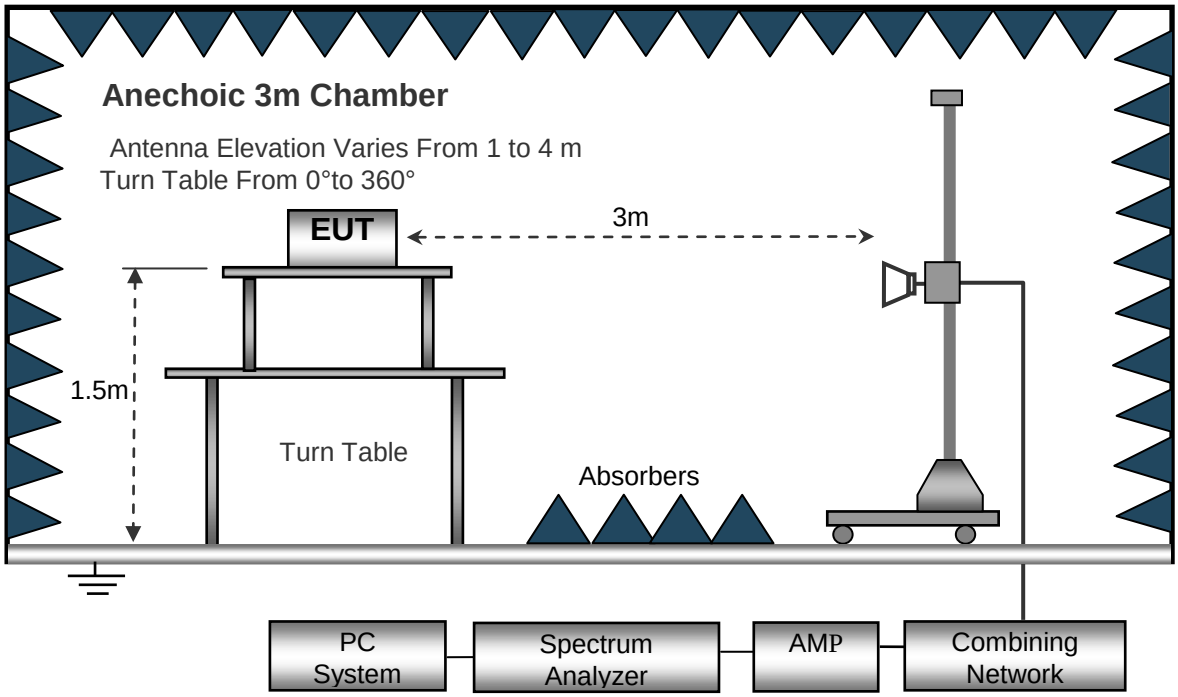
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed	:	Auto
IF Bandwidth	:	10kHz
Video Bandwidth	:	10kHz
Resolution Bandwidth	:	10kHz

30MHz ~ 1GHz

Sweep Speed	:	Auto
Detector	:	PK
Resolution Bandwidth	:	100kHz
Video Bandwidth	:	300kHz

Above 1GHz

Sweep Speed	:	Auto
Detector	:	PK
Resolution Bandwidth	:	1MHz
Video Bandwidth	:	3MHz
Detector	:	Ave.
Resolution Bandwidth	:	1MHz
Video Bandwidth	:	10Hz

7.4 Test Procedure

1) The EUT is placed on a turntable, which is above ground plane.
2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3) EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4) Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5) And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6) Repeat above procedures until the measurements for all frequencies are complete.
7) The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8) A 2.4GHz high –pass filter is used druing radiated emissions above 1GHz measurement.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

7.6 Summary of Test Results

Test Frequency : 26KHz to 30MHz
The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~ 18GHz

Frequency (MHz)	Receiver Reading (dBμV/m)	Detector (PK/QP/AVG)	Turn table Angle (°)	RX Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247	
				Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
BLE_Low Channel_2402MHz									
77.87	13.27	QP	216	1.1	H	9.57	22.84	40	-17.16
77.87	11.43	QP	267	1.8	V	9.67	21.10	40	-18.90
1685.00	49.75	PK	169	1.4	H	-13.73	36.02	74	-37.98
1685.00	38.18	AVG	248	1.2	H	-13.73	24.45	54	-29.55
2190.00	50.53	PK	116	1.1	V	-13.32	37.21	74	-36.79
2190.00	39.03	AVG	263	1.5	V	-13.32	25.71	54	-28.29
5925.00	53.64	PK	276	1.6	H	-4.46	49.18	74	-24.82
5925.00	41.55	AVG	162	1.7	H	-4.46	37.09	54	-16.91
3885.00	52.33	PK	187	1.2	V	-9.26	43.07	74	-30.93
3885.00	41.55	AVG	208	1.7	V	-9.26	32.29	54	-21.71

Frequency (MHz)	Receiver Reading (dBμV/m)	Detector (PK/QP/AVG)	Turn table Angle (°)	RX Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247	
				Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
BLE_Middle Channel_2442MHz									
107.13	13.98	QP	217	1.5	H	11.56	25.54	40	-14.46
107.13	14.32	QP	183	1.8	V	10.96	25.28	40	-14.72
1681.16	51.31	PK	154	1.6	H	-13.74	37.57	74	-36.43
1681.16	44.48	AVG	197	1.2	H	-13.74	30.74	54	-23.26
2915.76	50.12	PK	235	1.3	V	-11.27	38.85	74	-35.15
2915.76	41.41	AVG	276	1.5	V	-11.27	30.14	54	-23.86
12366.85	42.12	PK	135	1.4	H	8.85	50.97	74	-23.03
12366.85	35.34	AVG	287	1.2	H	8.85	44.19	54	-9.81
8663.04	44.06	PK	204	1.8	V	1.89	45.95	74	-28.05
8663.04	35.09	AVG	147	1.7	V	1.89	36.98	54	-17.02

Frequency (MHz)	Receiver Reading (dBμV/m)	Detector (PK/QP/AVG)	Turn table Angle (°)	RX Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247	
				Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
BLE_High Channel_2480MHz									
201.39	22.16	QP	151	1.1	H	13.03	35.19	40	-4.81
201.39	13.60	QP	203	1.8	V	13.16	26.76	40	-13.24
1495.00	46.45	PK	286	1.7	H	-13.77	32.68	74	-41.32
1495.00	30.29	AVG	165	1.8	H	-13.77	16.52	54	-37.48
3320.00	48.00	PK	215	1.2	V	-8.26	39.74	74	-34.26
3320.00	30.63	AVG	114	1.5	V	-8.26	22.37	54	-31.63
5805.00	50.93	PK	230	1.6	H	-0.82	50.11	74	-23.89
5805.00	34.23	AVG	117	1.8	H	-0.82	33.41	54	-20.59
2110.00	46.53	PK	280	1.5	V	-12.22	34.31	74	-39.69
2110.00	29.66	AVG	286	1.3	V	-12.22	17.44	54	-36.56

Test Frequency: 18GHz~25GHz

The measurements were more than 20 dB below the limit and not reported.

8 Band Edge Measurement

Test Requirement .....: FCC CFR47 Part 15 Section 15.247

Test Method .....: 558074 D01 DTS Meas Guidance v03r05

Test Result .....: Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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 Mode.....: Transmitting

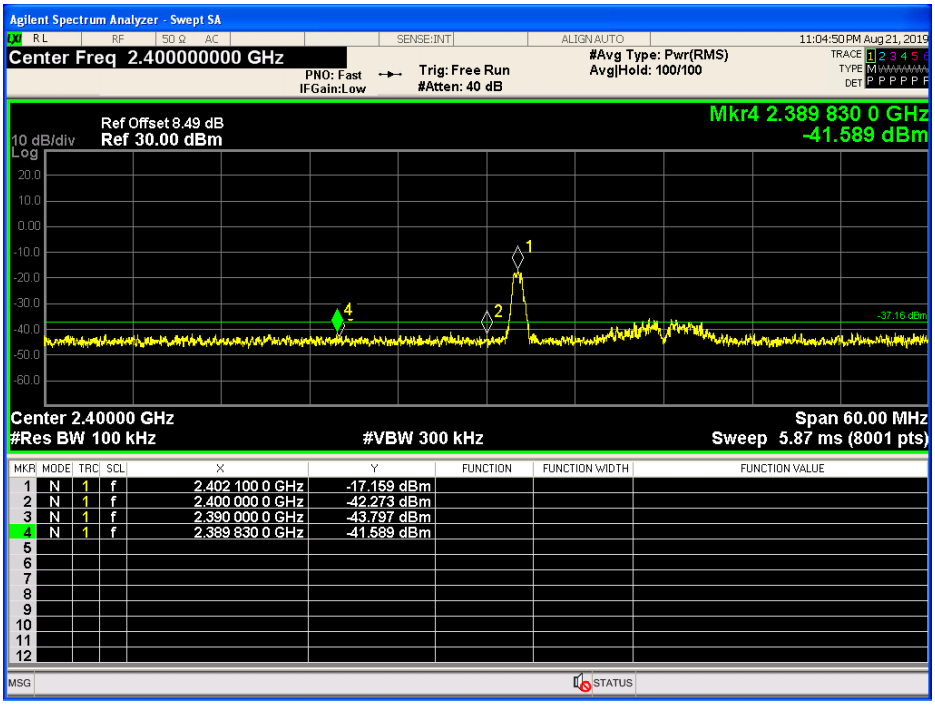
8.1 Test Produce

1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5) Repeat above procedures until all measured frequencies were complete.

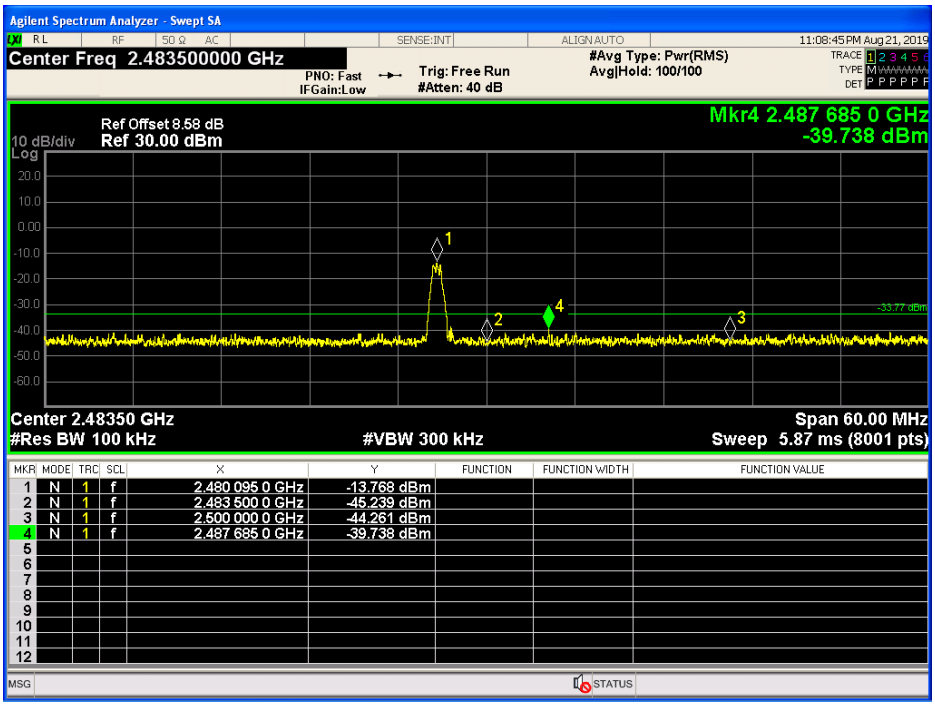
8.2 Test Result

Test result plots as follows:

TX BLE: Band edge-left side



TX BLE Band edge-right side



9 6 dB Bandwidth Measurement

Test Requirement .....: FCC CFR47 Part 15 Section 15.247

Test Method .....: 558074 D01 DTS Meas Guidance v03r05

9.1 Test Procedure

1) Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

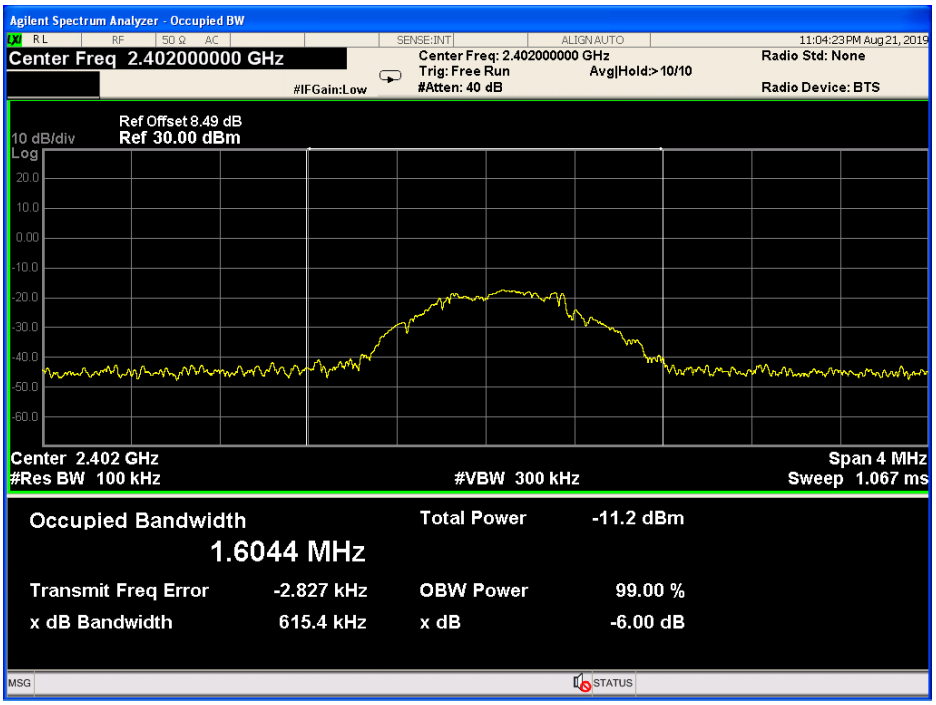
2) Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

9.2 Test Result

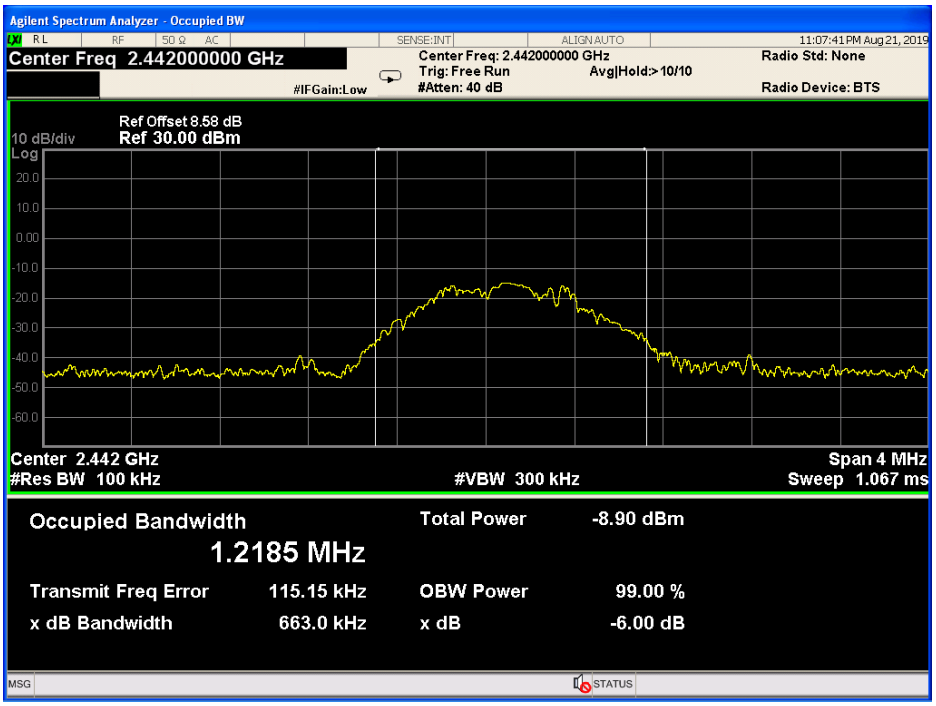
Test Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Bandwidth (MHz)	Result
BLE	2402	1.6044	0.6154	PASS
BLE	2442	1.2185	0.6630	PASS
BLE	2480	1.1613	0.6532	PASS

Test result plot as follows:

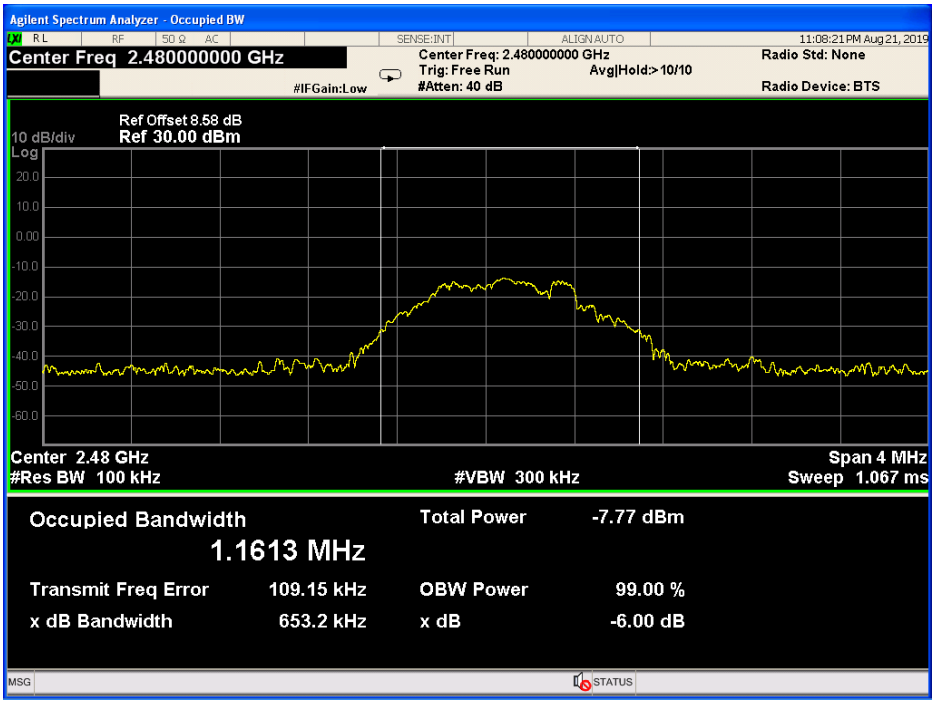
Mode: BLE channel 2402MHz



Mode: BLE channel 2442MHz



Mode: BLE channel 2480MHz



10 Maximum Peak Output Power

Test Requirement .....: FCC CFR47 Part 15 Section 15.247

Test Method .....: 558074 D01 DTS Meas Guidance v03r05

10.1 Test Procedure

558074 D01 DTS Meas Guidance v03r05 section 9.1.2

1) Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2) Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.

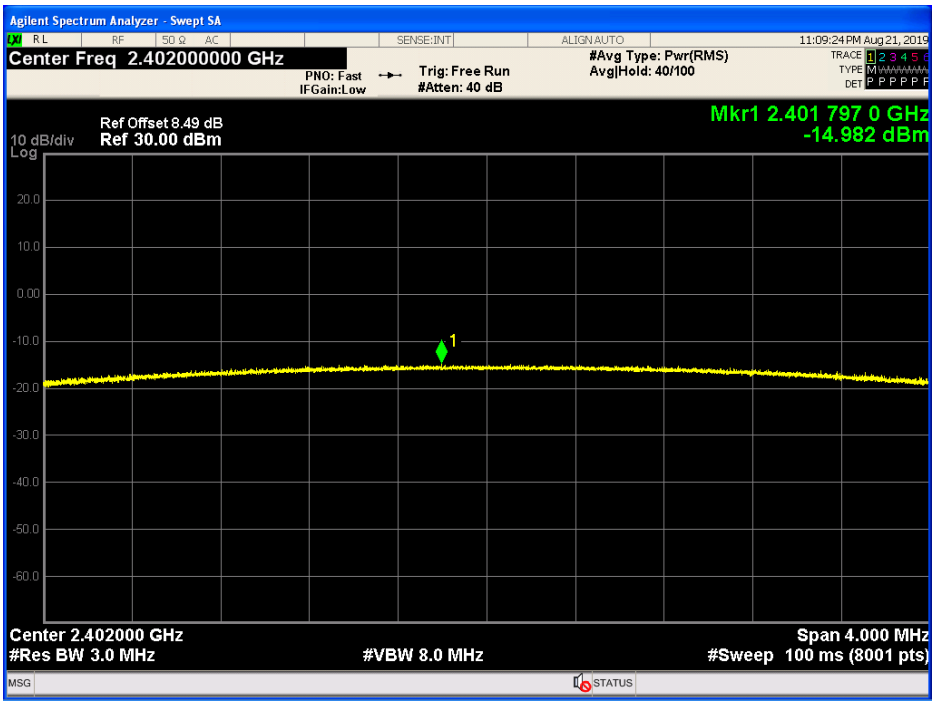
3) Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result

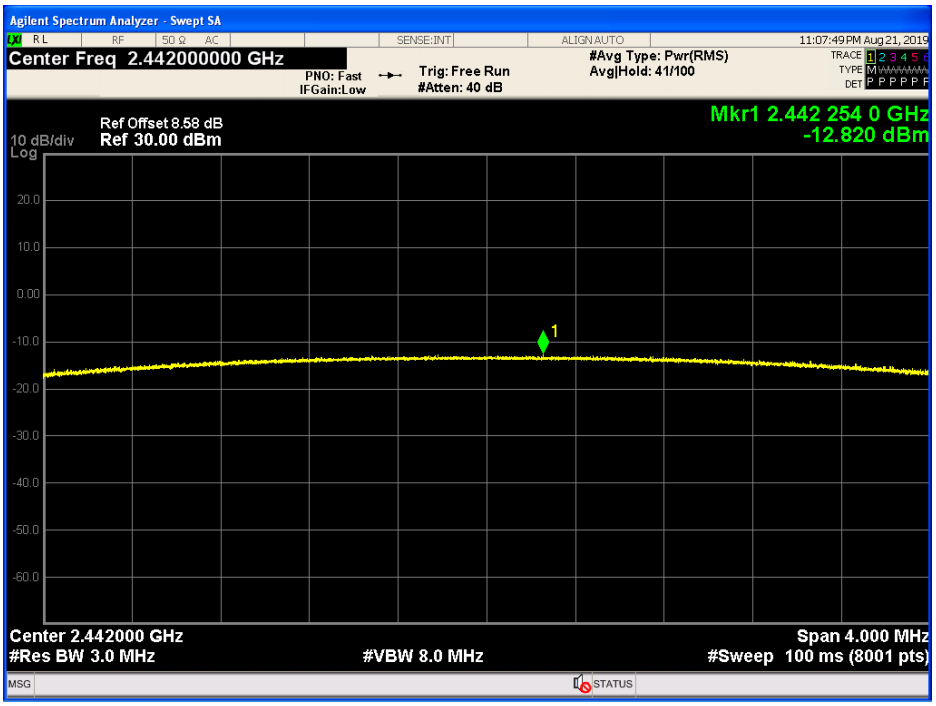
Test Mode	Test Channel	Conducted Peak Output Power (dBm)	Limit (dBm)	Result
BLE	2402	-14.982	30	PASS
BLE	2442	-12.820	30	PASS
BLE	2480	-12.083	30	PASS

Test result plot as follows:

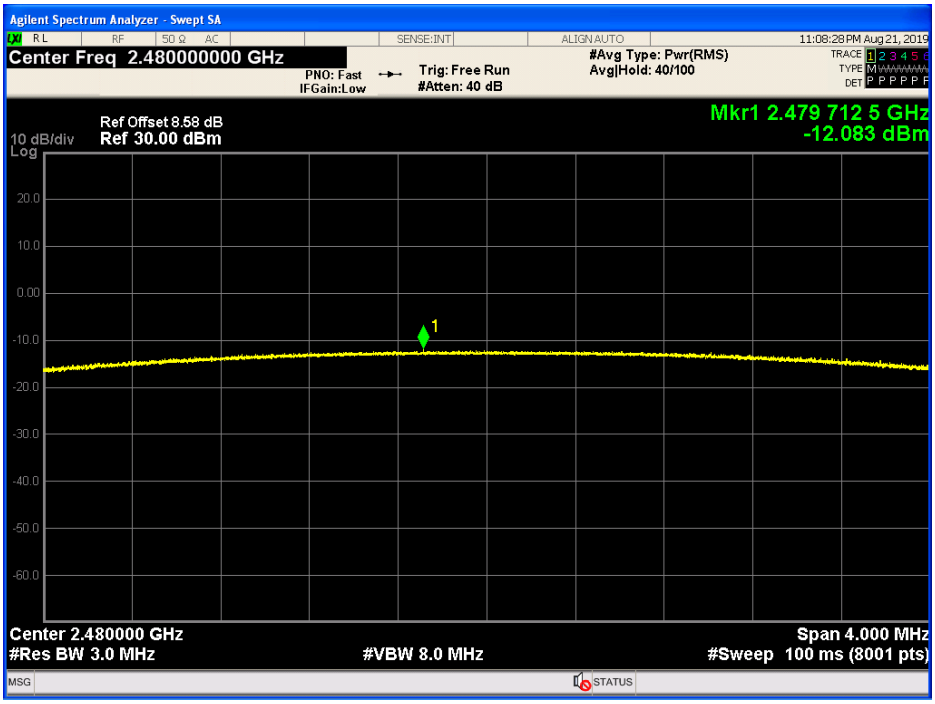
Mode: BLE channel 2402MHz



Mode: BLE channel 2442MHz



Mode: BLE channel 2480MHz



11 Power Spectral density

Test Requirement .....: FCC CFR47 Part 15 Section 15.247

Test Method .....: 558074 D01 DTS Meas Guidance v03r05

11.1 Test Procedure

558074 D01 DTS Meas Guidance v03r05 section 10.2

1) Remove the antenna from the EUT and then connect a low RF cable from the antenna port

2) to the spectrum.

3) Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

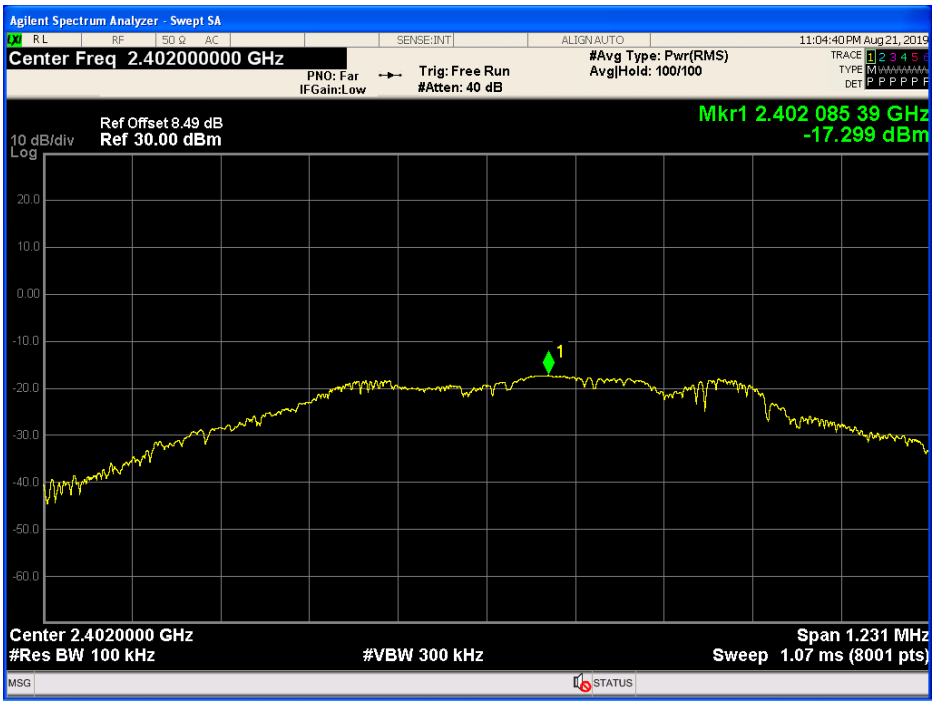
4) Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.2 Test Result

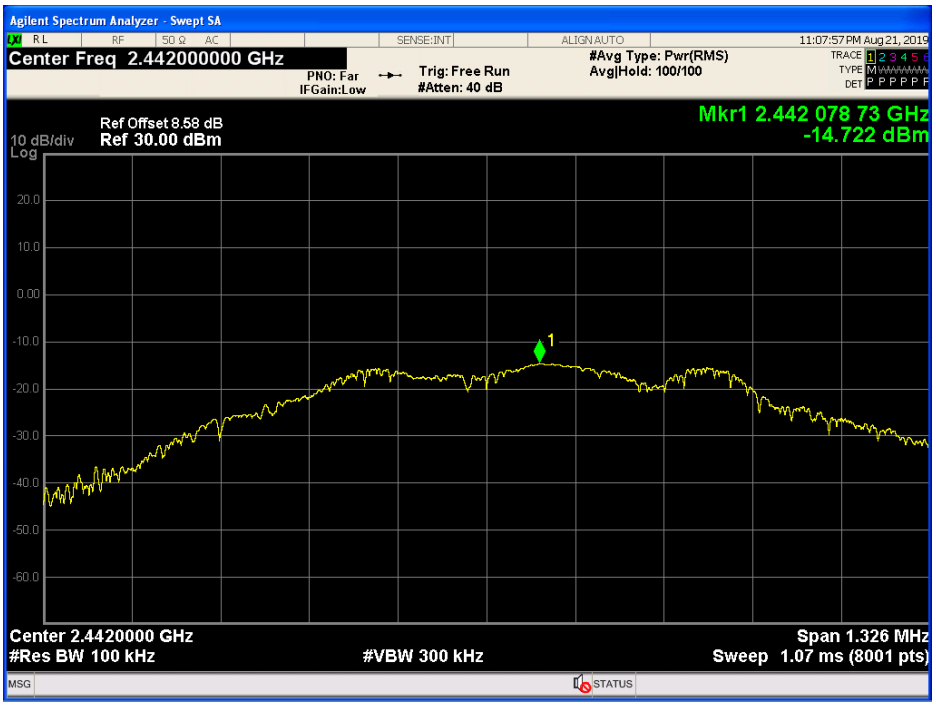
Test Mode	Test Channel	PSD(dBm/MHz)	Limit (dBm/MHz)	Verdict
BLE	2402	-17.299	8.00	PASS
BLE	2442	-14.722	8.00	PASS
BLE	2480	-13.862	8.00	PASS

Test result plot as follows:

Mode: BLE channel 2402MHz



Mode: BLE channel 2442MHz



Mode: BLE channel 2480MHz

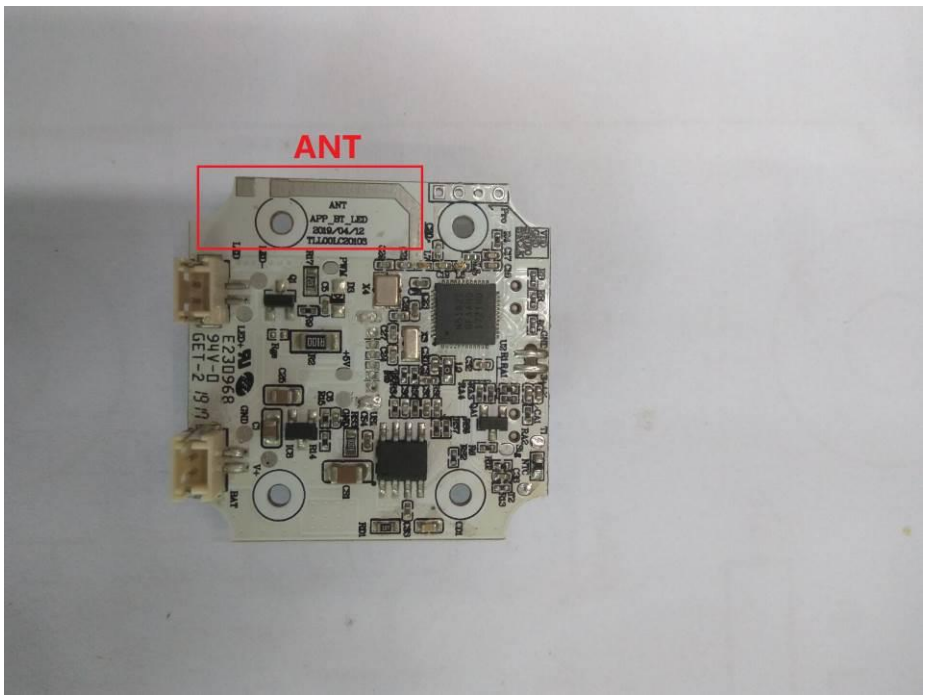
12 Antenna Requirement

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 shall be considered sufficient to comply with the provisions of this section. The manufacture 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221.Further ,this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR 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.

Result:

The EUT has one PCB Printed Antenna, the gain is 0dBi meets the requirements of FCC Subpart C 15.203.



13 RF Exposure

Test Requirement .....: FCC Part 1.1307

Test Method .....: FCC Part 2.1091

13.1 Requirements

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

13.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100,000	/	/	5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

13.3 MPE Calculation Method

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)

P = output power to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

From the peak EUT RF output power, the minimum mobile separation distance, R=20cm, as well as the gain of the used antenna, the RF power density can be obtained

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
0	1	-12.083	0.062	0.000012341	1

14 Photographs - Test Setup

14.1 Photographs - Radiated Emission

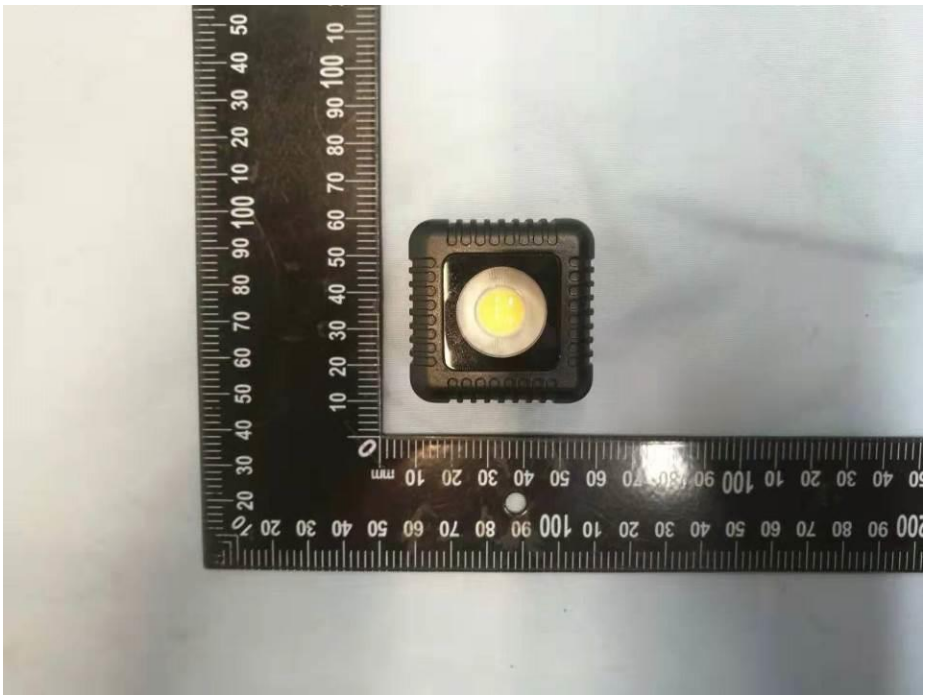
Test frequency from 30MHz to 1GHz

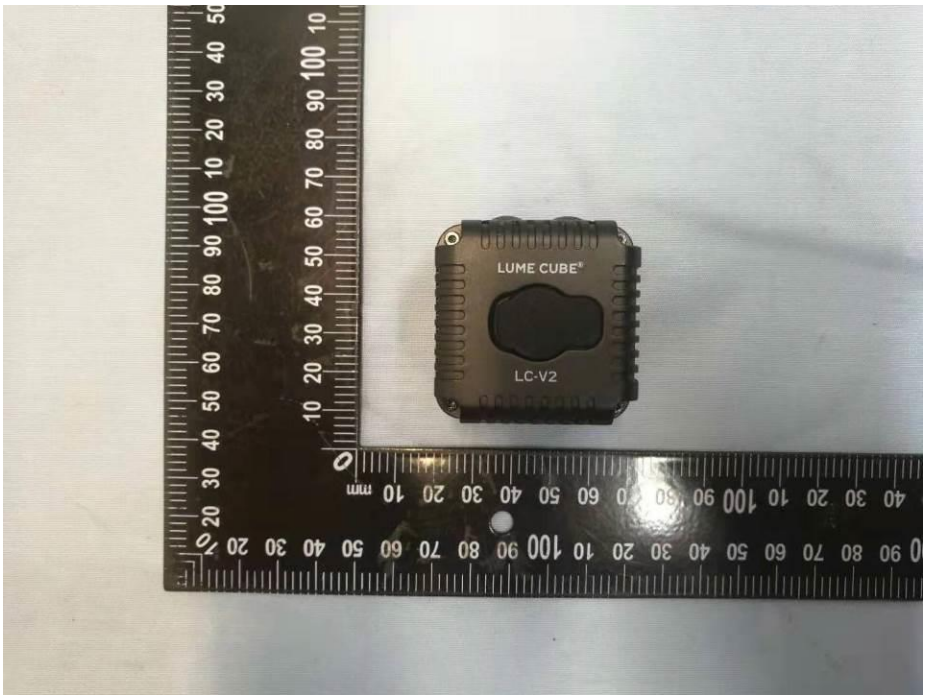
Test frequency above 1GHz

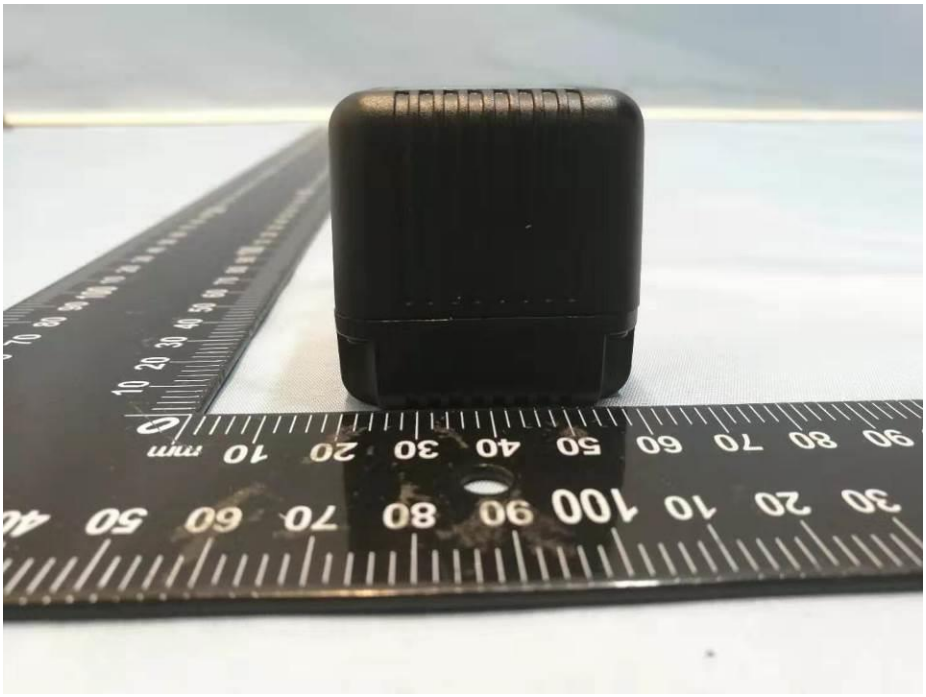
14.2 Photographs - Conducted Emission

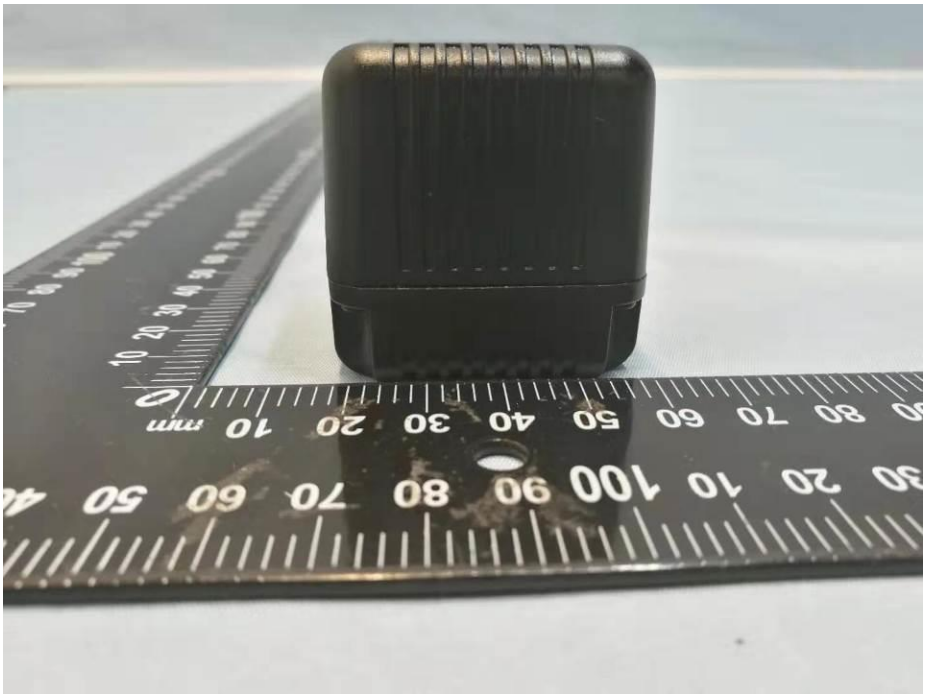
15 Photographs - Constructional Details

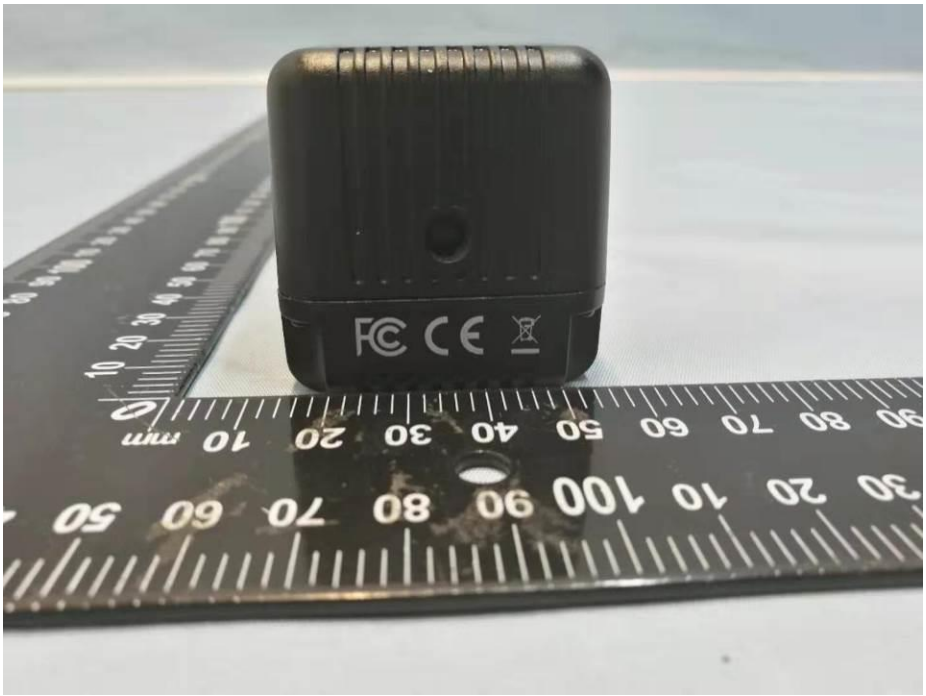
15.1 EUT – External Photos



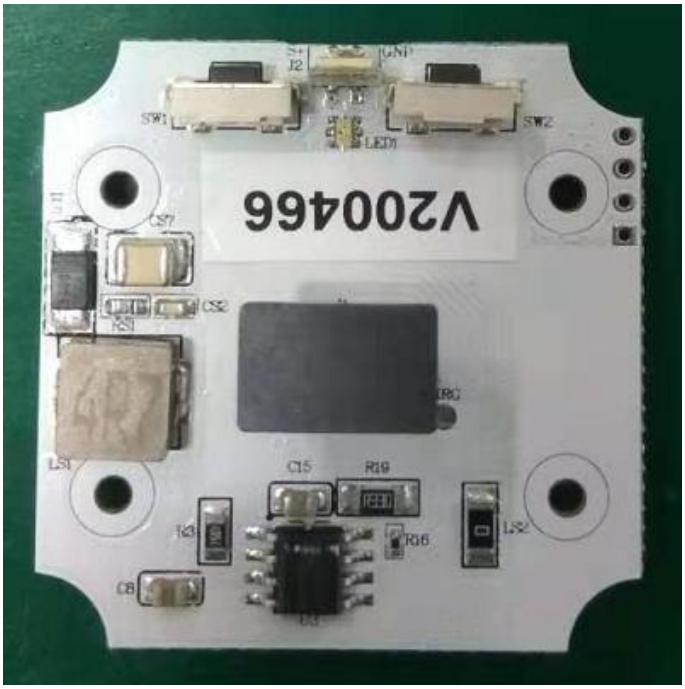


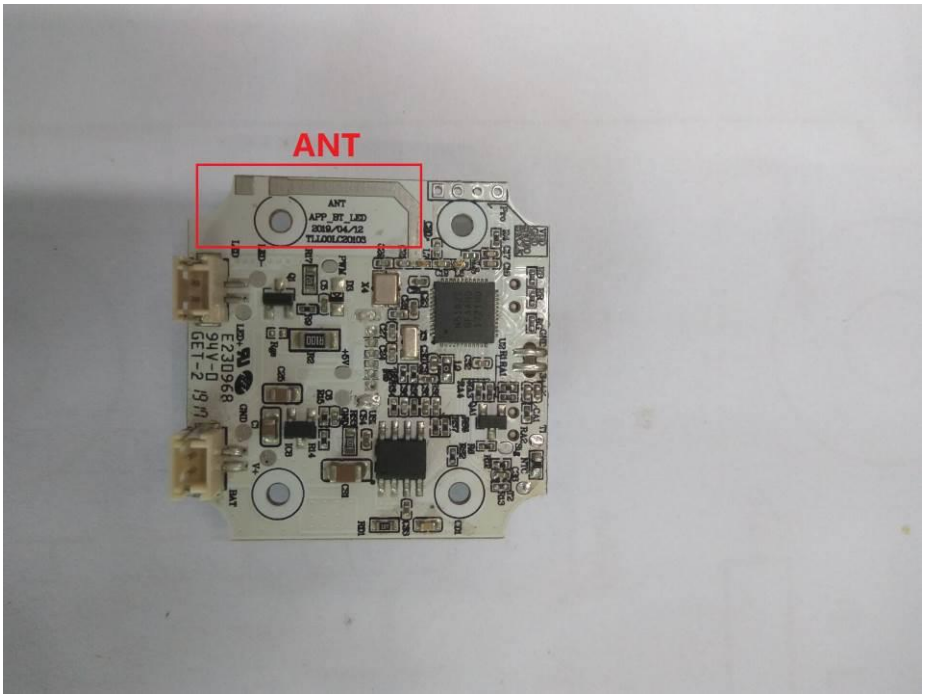





FC CE

15.2 EUT – Internal Photos

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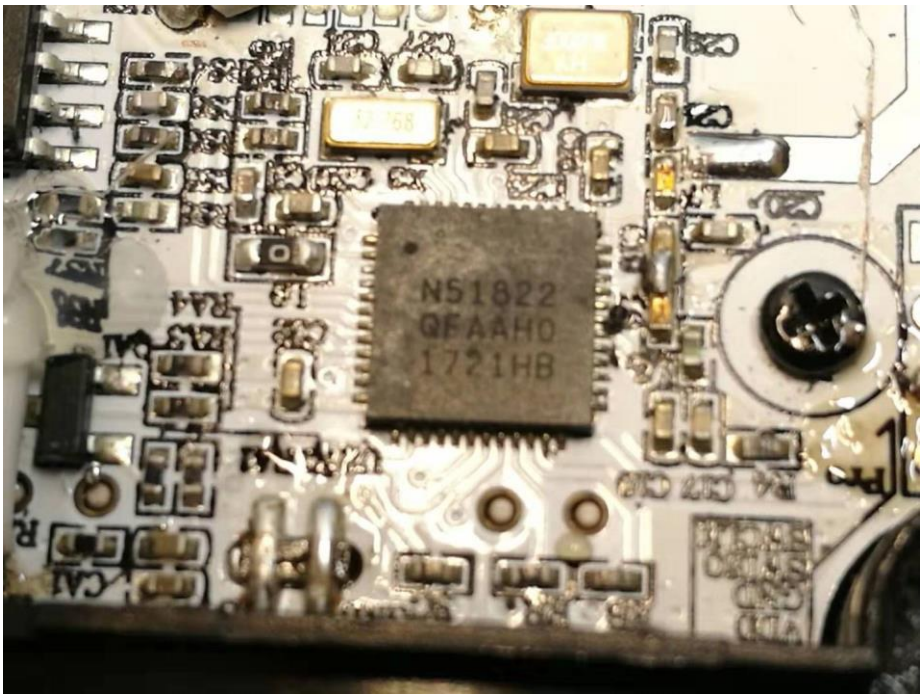
N51822
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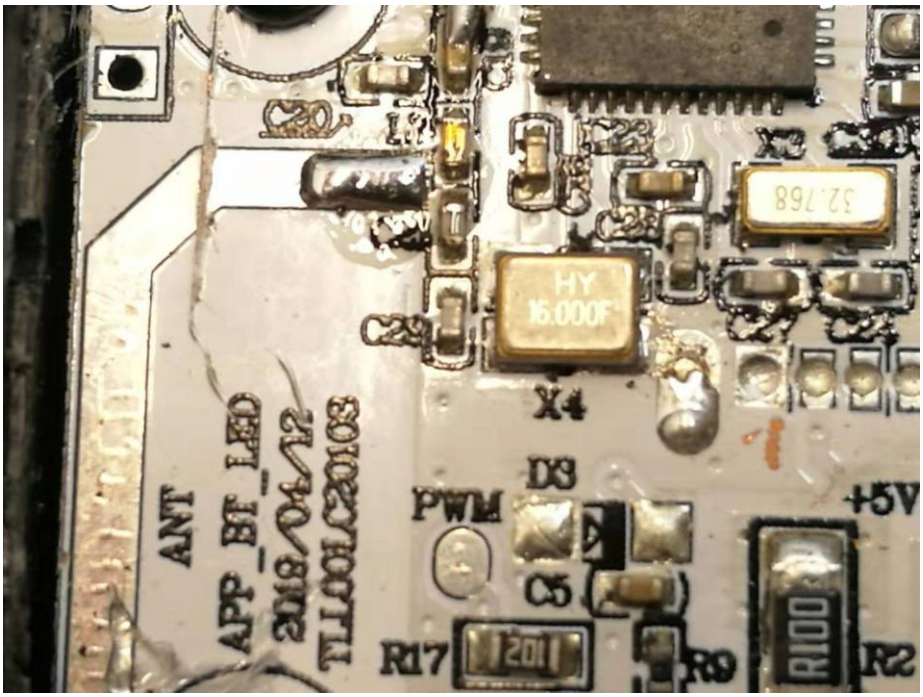
1721HB



======End of Report======