TEST REPORT

Product	:	Casambi BLE Module
Trade mark	:	N/A
Model/Type reference	:	RFM-CSB-3
Serial Number	:	N/A
Report Number	:	EED32K00144501
FCC ID	:	2AJML-EUCSB3
Date of Issue	:	Jul. 10, 2018
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

EULUM DESIGN, LLC

6131-B Kellers Church Road, Pipersville, PA 18947 USA

Prepared by:

Centre Testing International Group Co., Ltd.
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	Kevin yang (Reviewer)		Sheek Luo (Lab supervisor)
Date:	Jul. 10, 2018		Check No.:2448774568

CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. Report Seal

2 Version

Version No.	Date	Description
00	Jul. 10, 2018	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
6dB Occupied Bandwidth	47 CFR Part 15Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Power Spectral Density	47 CFR Part 15Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
RF Conducted Spurious Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Radiated Spurious Emissions	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Remark: Test according to ANSI C63.4-2014 & ANSI C63.10-2013. The tested sample(s) and the sample information are provided by the client.			

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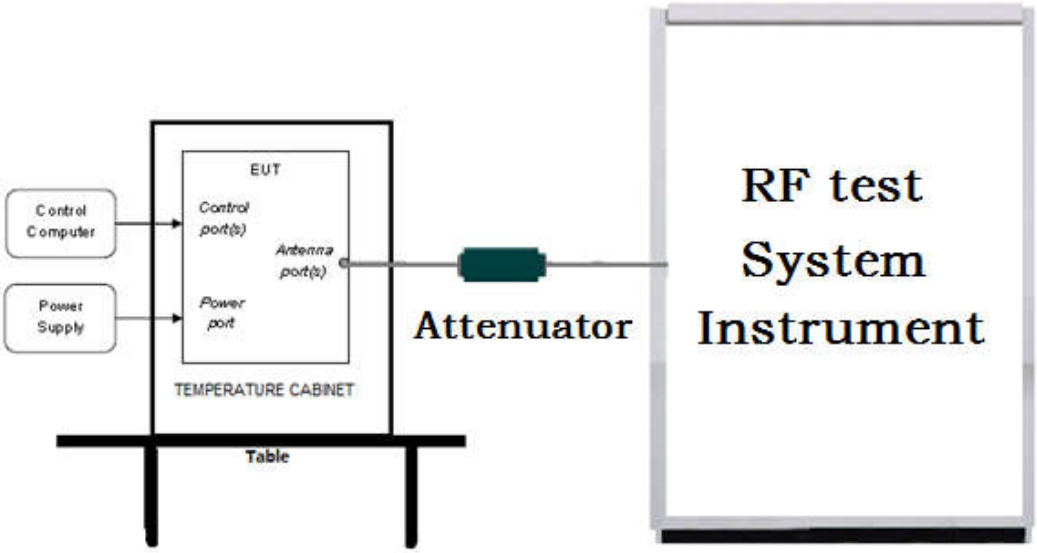
5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

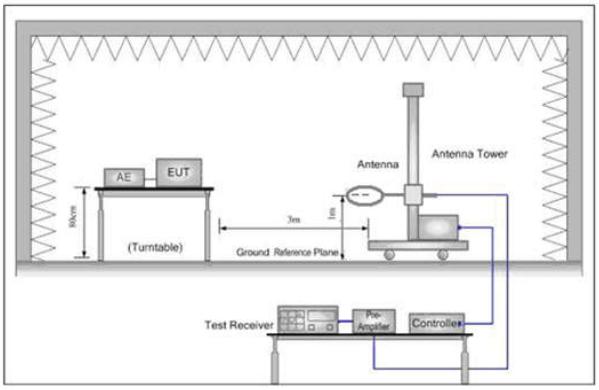


Figure 1. Below 30MHz

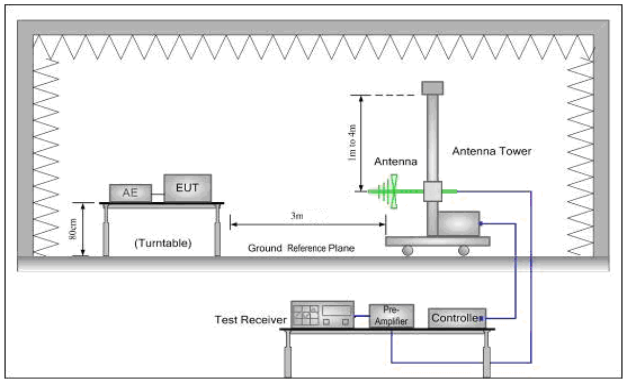


Figure 2. 30MHz to 1GHz

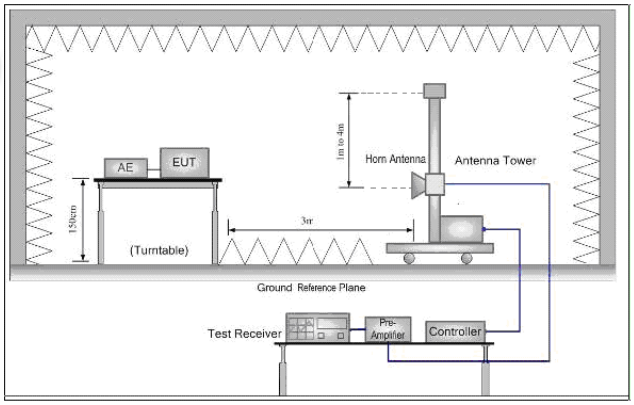
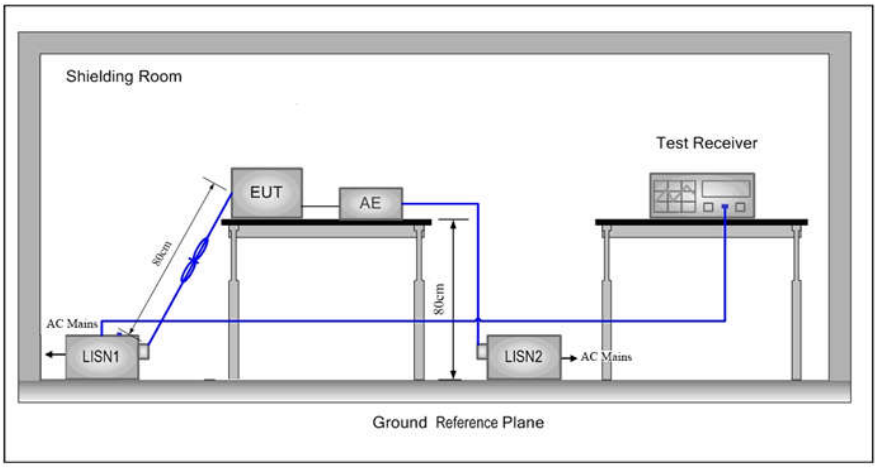


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	58% RH
Atmospheric Pressure:	1010mbar

5.3 Test Condition

Test channel:

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
GFSK	2402MHz ~2480 MHz	Channel 1	Channel 20	Channel 40
		2402MHz	2440MHz	2480MHz
Transmitting mode:	The EUT transmitted the continuous signal at the specific channel(s).			

6 General Information

6.1 Client Information

Applicant:	EULUM DESIGN, LLC
Address of Applicant:	6131-B Kellers Church Road, Pipersville, PA 18947 USA
Manufacturer:	EULUM DESIGN, LLC
Address of Manufacturer:	6131-B Kellers Church Road, Pipersville, PA 18947 USA
Factory:	EULUM DESIGN, LLC
Address of Factory:	6131-B Kellers Church Road, Pipersville, PA 18947 USA

6.2 General Description of EUT

Product Name:	Casambi BLE Module
Model No.(EUT):	RFM-CSB-3
Trade mark:	N/A
EUT Supports Radios application:	4.0 BT Single mode, 2402-2480MHz
Power Supply:	DC 3.3V
Sample Received Date:	Jun. 11, 2018
Sample tested Date:	Jun. 11, 2018 to Jul. 10, 2018

6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	4.0
Modulation Type:	GFSK
Number of Channel:	40
Firmware version:	v22.1(manufacturer declare)
Hardware version:	EU-CBM-3 Revision A(manufacturer declare)
Antenna Type and Gain:	Chip Antenna and 1.3dBi
Test Voltage:	DC 3.3V

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	11	2422MHz	21	2442MHz	31	2462MHz
2	2404MHz	12	2424MHz	22	2444MHz	32	2464MHz
3	2406MHz	13	2426MHz	23	2446MHz	33	2466MHz
4	2408MHz	14	2428MHz	24	2448MHz	34	2468MHz
5	2410MHz	15	2430MHz	25	2450MHz	35	2470MHz
6	2412MHz	16	2432MHz	26	2452MHz	36	2472MHz
7	2414MHz	17	2434MHz	27	2454MHz	37	2474MHz
8	2416MHz	18	2436MHz	28	2456MHz	38	2476MHz
9	2418MHz	19	2438MHz	29	2458MHz	39	2478MHz
10	2420MHz	20	2440MHz	30	2460MHz	40	2480MHz

6.4 Description of Support Units

The EUT has been tested independently.

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.
FCC Designation No.: CN1164

6.6 Deviation from Standards

None.

6.7 Abnormalities from Standard Conditions

None.

6.8 Other Information Requested by the Customer

None.

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

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.31dB (30MHz-1GHz)
		0.57dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-12.75GHz)
4	Conduction emission	3.6dB (9kHz to 150kHz)
		3.2dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	2.8%
7	DC power voltages	0.025%

7 Equipment List

RF test system					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Signal Generator	Keysight	E8257D	MY53401106	03-13-2018	03-12-2019
Spectrum Analyzer	Keysight	N9010A	MY54510339	03-13-2018	03-12-2019
Signal Generator	Keysight	N5182B	MY53051549	03-13-2018	03-12-2019
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-10-2018	01-09-2019
power meter & power sensor	R&S	OSP120	101374	04-11-2018	04-10-2019
RF control unit	JS Tonscend	JS0806-2	2015860006	03-13-2018	03-12-2019

Conducted disturbance Test					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Receiver	R&S	ESCI	100435	05-25-2018	05-24-2019
Temperature/ Humidity Indicator	Belida	TT-512	A19	01-24-2018	01-23-2019
LISN	R&S	ENV216	100098	05-11-2018	05-10-2019

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-04-2016	06-03-2019
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	9163-484	06-05-2018	06-04-2019
Preamplifier	JS Tonscend	EMC051845SE	980380	01-19-2018	01-18-2019
Horn Antenna	ETS-LINDGREN	3117	00057407	07-20-2015	07-18-2018
Loop Antenna	ETS	6502	00071730	06-22-2017 06-21-2018	06-21-2018 06-20-2019
Spectrum Analyzer	R&S	FSP40	100416	05-11-2018	05-10-2019
Receiver	R&S	ESCI	100435	05-25-2018	05-24-2019
LISN	schwarzbeck	NNBM8125	81251547	05-11-2018	05-10-2019
LISN	schwarzbeck	NNBM8125	81251548	05-11-2018	05-10-2019
Signal Generator	Agilent	E4438C	MY45095744	03-13-2018	03-12-2019
Signal Generator	Keysight	E8257D	MY53401106	03-13-2018	03-12-2019
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-02-2018	05-01-2019
Communication test set	Agilent	E5515C	GB47050533	03-16-2018	03-15-2019
Cable line	Fulai(7M)	SF106	5219/6A	01-10-2018	01-09-2019
Cable line	Fulai(6M)	SF106	5220/6A	01-10-2018	01-09-2019
Cable line	Fulai(3M)	SF106	5216/6A	01-10-2018	01-09-2019
Cable line	Fulai(3M)	SF106	5217/6A	01-10-2018	01-09-2019
Communication test set	R&S	CMW500	152394	03-16-2018	03-15-2019
High-pass filter	Sinoscite	FL3CX03WG18NM12-0398-002	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX01CA09CL12-0395-001	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX01CA08CL12-0393-001	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX02CA04CL12-0396-002	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX02CA03CL12-0394-001	---	01-10-2018	01-09-2019

8 Radio Technical Requirements Specification

Reference documents for testing:

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

Test Results List:

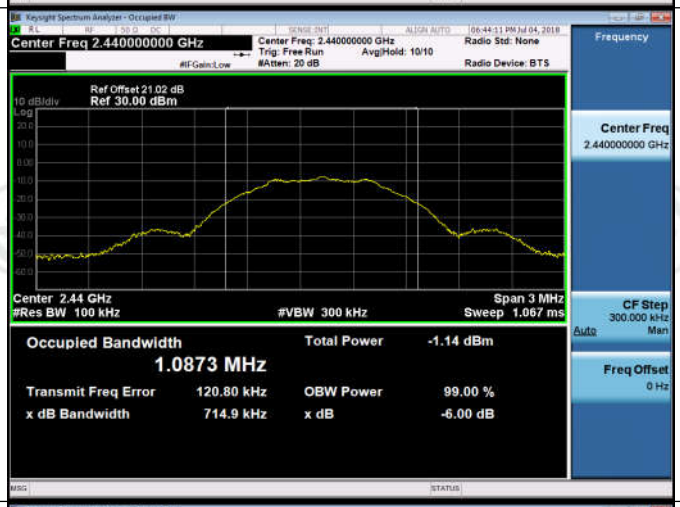
Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10	Power Spectral Density	PASS	Appendix E)
Part15C Section 15.203/15.247 (c)	ANSI C63.10	Antenna Requirement	PASS	Appendix F)
Part15C Section 15.207	ANSI C63.10	AC Power Line Conducted Emission	PASS	Appendix G)
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix H)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix I)

Appendix A): 6dB Occupied Bandwidth

Test Result

Mode	Channel	6dB Bandwidth [MHz]	99% OBW[MHz]	Verdict	Remark
BLE	LCH	0.6995	1.0766	PASS	Peak detector
BLE	MCH	0.7149	1.0873	PASS	
BLE	HCH	0.6992	1.0807	PASS	

Test Graphs

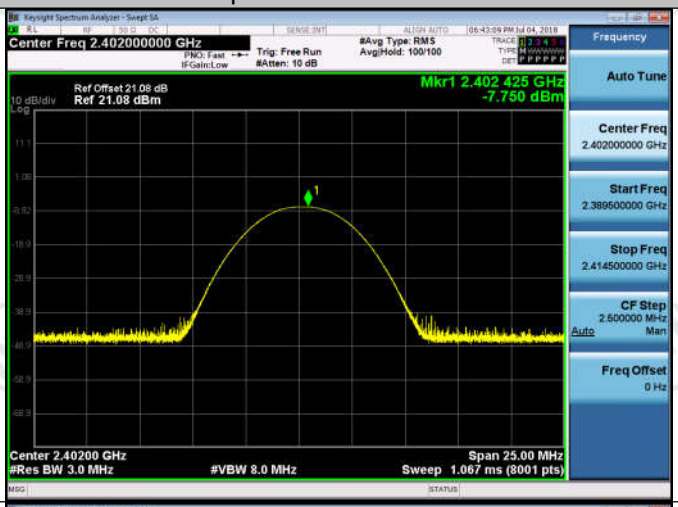
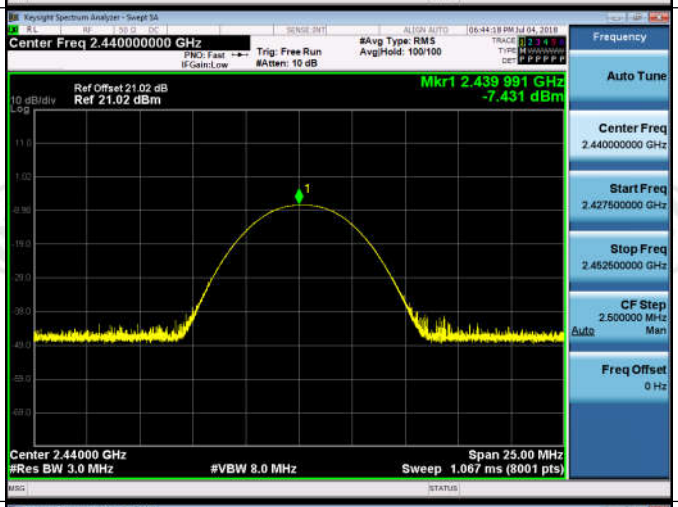
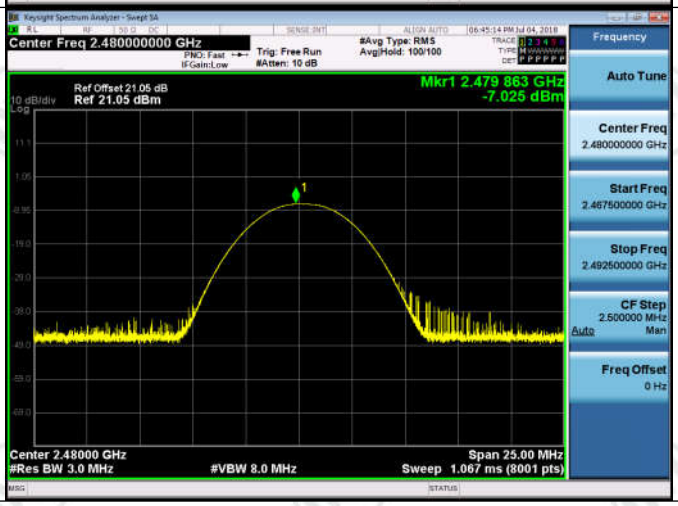
	Graphs	
LCH		
MCH		
HCH		

Appendix B): Conducted Peak Output Power

Test Result

Mode	Channel	Conduct Peak Power[dBm]	Verdict
BLE	LCH	-7.75	PASS
BLE	MCH	-7.431	PASS
BLE	HCH	-7.025	PASS

Test Graphs

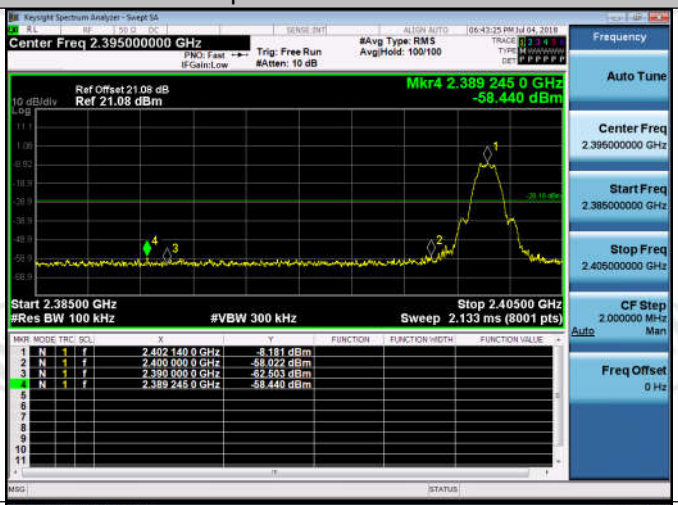
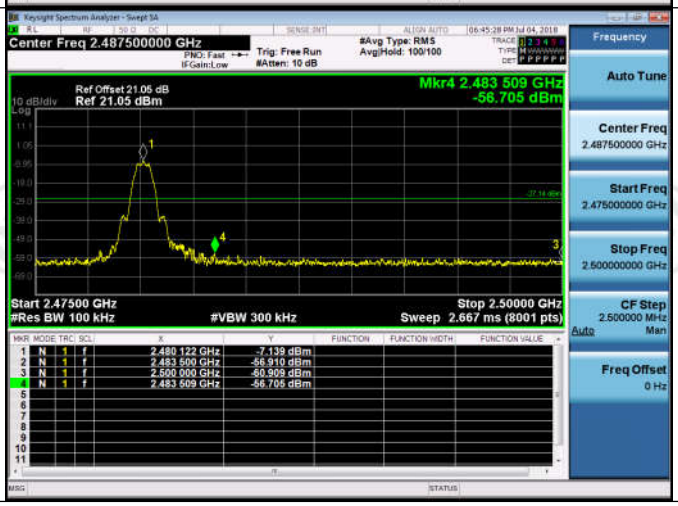
Graphs			
LCH			
MCH			
HCH			

Appendix C): Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	LCH	-8.181	-58.440	-28.18	PASS
BLE	HCH	-7.139	-56.705	-27.14	PASS

Test Graphs

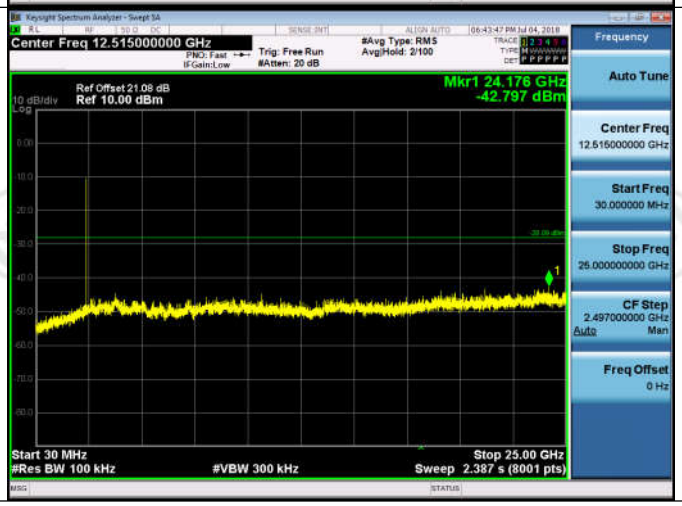
Graphs			
LCH			
HCH			

Appendix D): RF Conducted Spurious Emissions

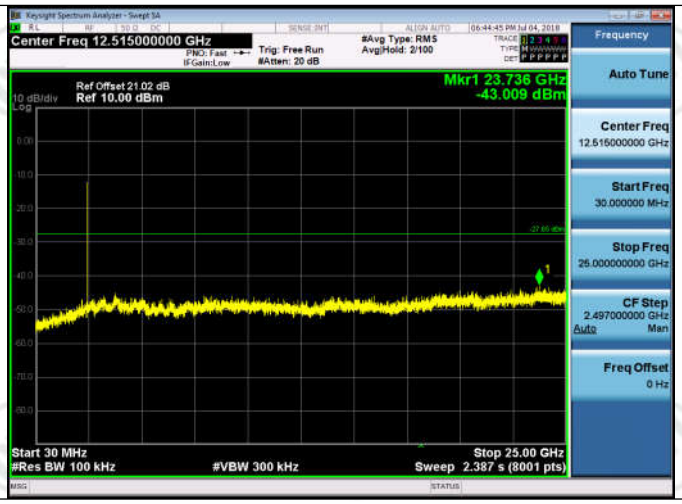
Result Table

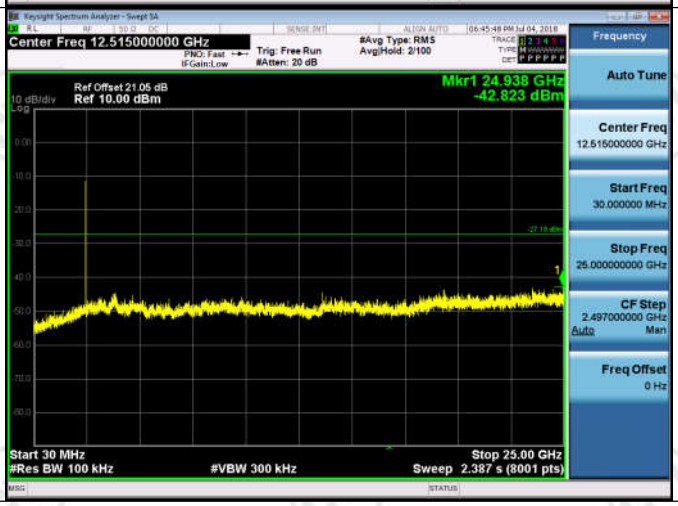
Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
BLE	LCH	-8.087	<Limit	PASS
BLE	MCH	-7.65	<Limit	PASS
BLE	HCH	-7.189	<Limit	PASS

Test Graphs

BLE_LCH_Graphs	
Pref/BLE/LCH	
Puw/BLE/LCH	

BLE_MCH_Graphs	
Pref/BLE/MCH	

Puw/BLE/MCH			

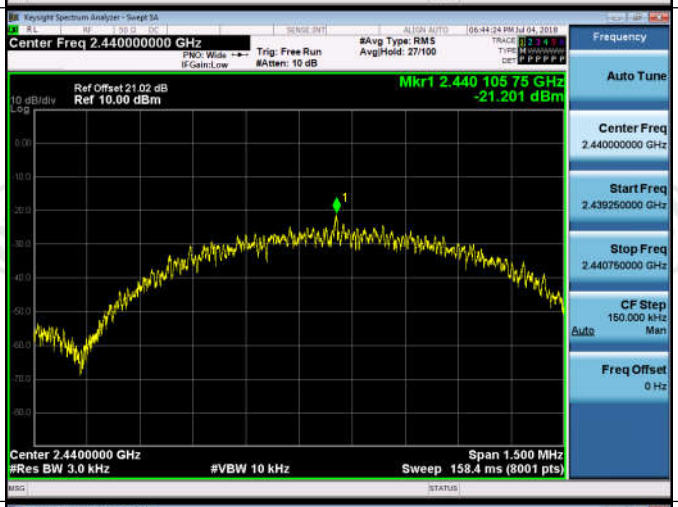
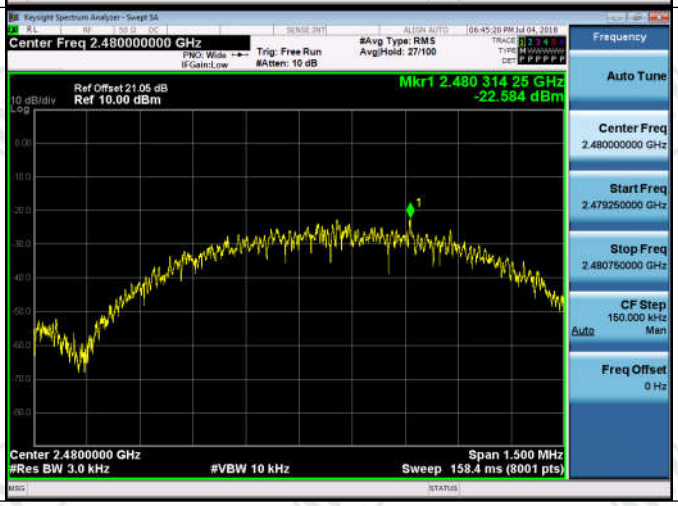
BLE_HCH_Graphs			
Pref/BLE/HCH			
Puw/BLE/HCH			

Appendix E): Power Spectral Density

Result Table

Mode	Channel	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE	LCH	-23.171	8	PASS
BLE	MCH	-21.201	8	PASS
BLE	HCH	-22.584	8	PASS

Test Graphs

		Graphs	
LCH			
MCH			
HCH			

Appendix F): Antenna Requirement

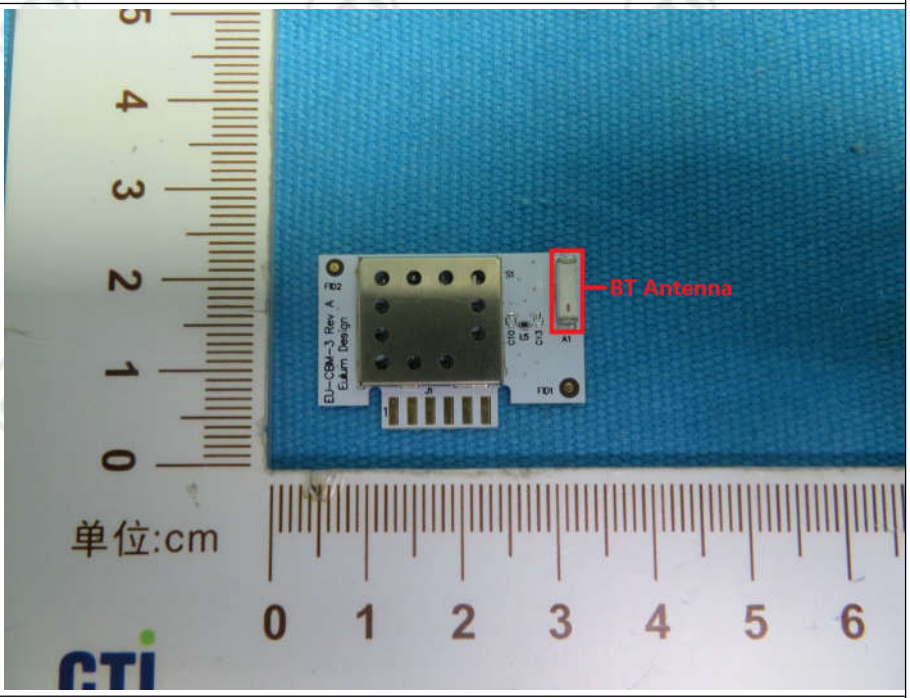
15.203 requirement:

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

15.247(b) (4) requirement:

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

EUT Antenna:



The antenna is chip Antenna and no consideration of replacement. The best case gain of the antenna is 1.3dBi.

Appendix G): AC Power Line Conducted Emission

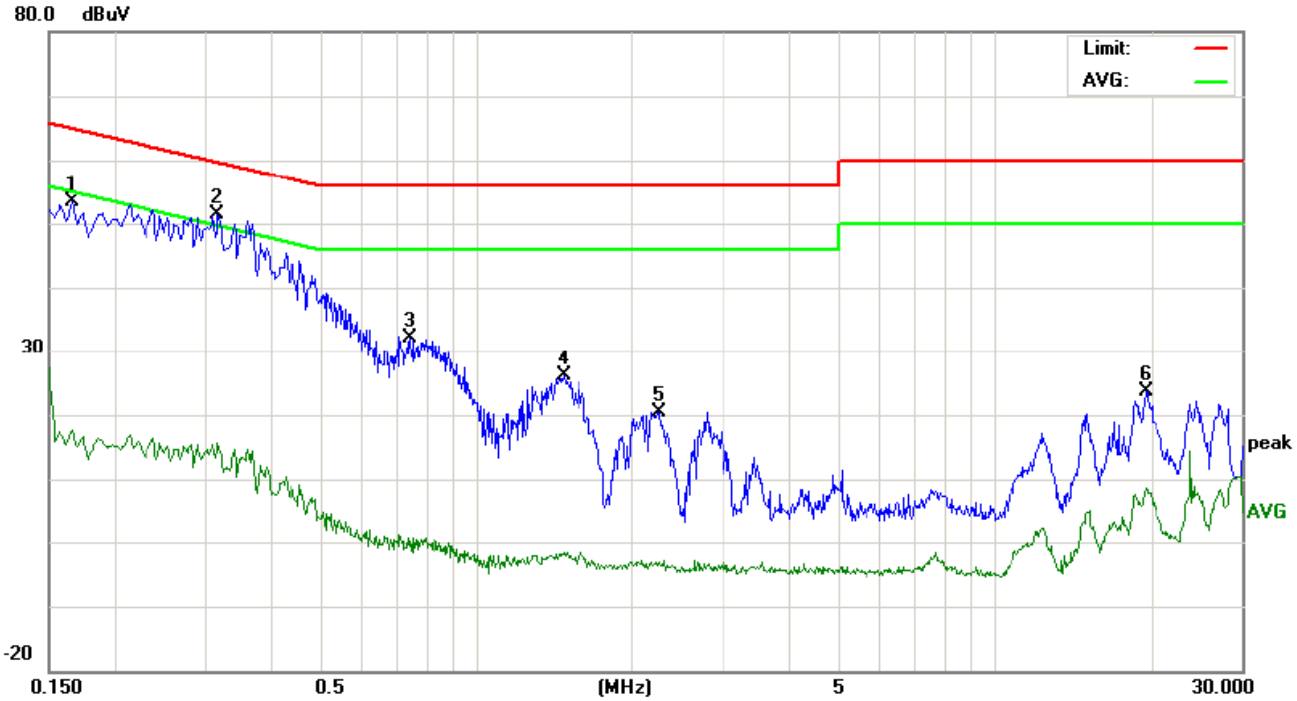
<table>
<tr><td>Test Procedure:</td><td>Test frequency range :150KHz-30MHz
1)The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance.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

Measurement Data

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

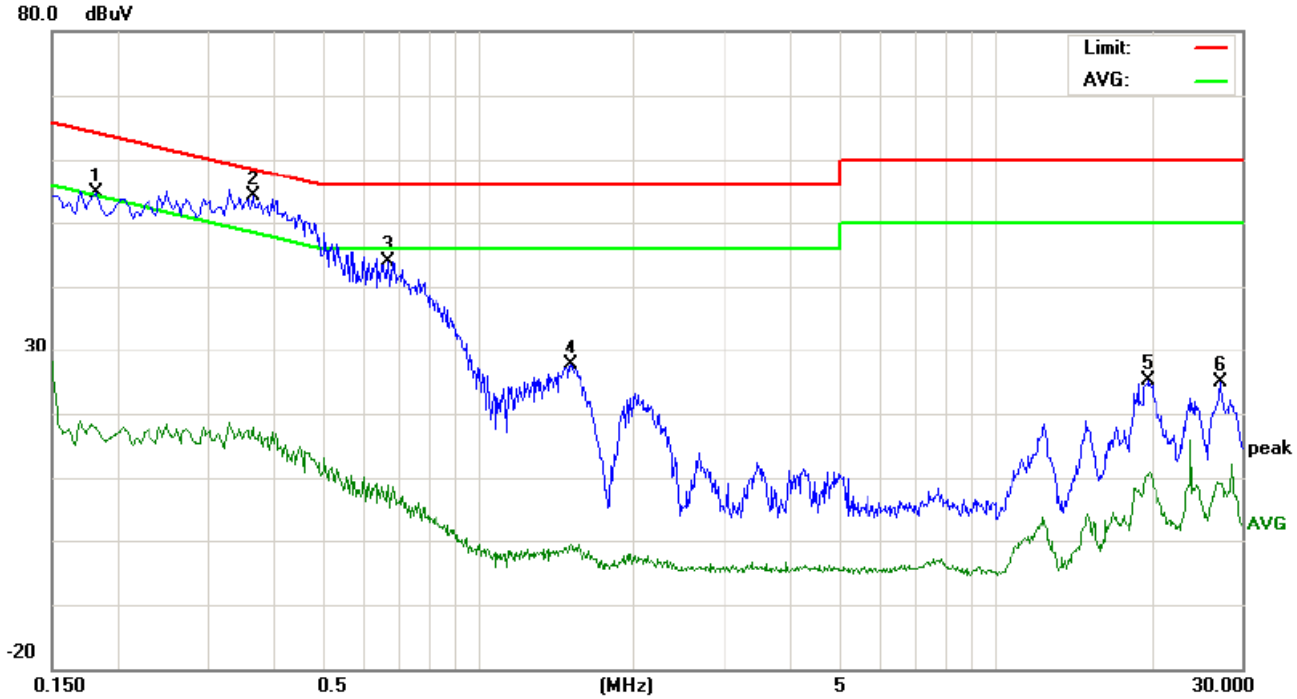
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1660	42.32	37.35	17.63	9.75	52.07	47.10	27.38	65.15	55.15	-18.05	-27.77	P	
2	0.3180	41.61	36.45	5.79	9.77	51.38	46.22	15.56	59.76	49.76	-13.54	-34.20	P	
3	0.7460	22.38	17.85	-9.51	9.75	32.13	27.60	0.24	56.00	46.00	-28.40	-45.76	P	
4	1.4740	16.32	12.48	-11.4	9.72	26.04	22.20	-1.71	56.00	46.00	-33.80	-47.71	P	
5	2.2580	10.68	6.57	-12.7	9.71	20.39	16.28	-3.05	56.00	46.00	-39.72	-49.05	P	
6	19.6100	13.66	8.66	-1.34	10.06	23.72	18.72	8.72	60.00	50.00	-41.28	-41.28	P	

Neutral line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1819	44.83	39.63	5.70	9.73	54.56	49.36	15.43	64.39	54.39	-15.03	-38.96	P	
2	0.3660	44.40	39.52	2.82	9.76	54.16	49.28	12.58	58.59	48.59	-9.31	-36.01	P	
3	0.6700	34.20	30.03	-9.90	9.75	43.95	39.78	-0.15	56.00	46.00	-16.22	-46.15	P	
4	1.5100	17.81	12.06	-10.3	9.72	27.53	21.78	-0.67	56.00	46.00	-34.22	-46.67	P	
5	19.8340	14.98	10.52	-2.92	10.06	25.04	20.58	7.14	60.00	50.00	-39.42	-42.86	P	
6	27.3540	14.67	10.24	-1.96	10.24	24.91	20.48	8.28	60.00	50.00	-39.52	-41.72	P	

Notes:

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

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

Receiver Setup:

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

Test Procedure:

Below 1GHz test procedure as below:

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

Above 1GHz test procedure as below:

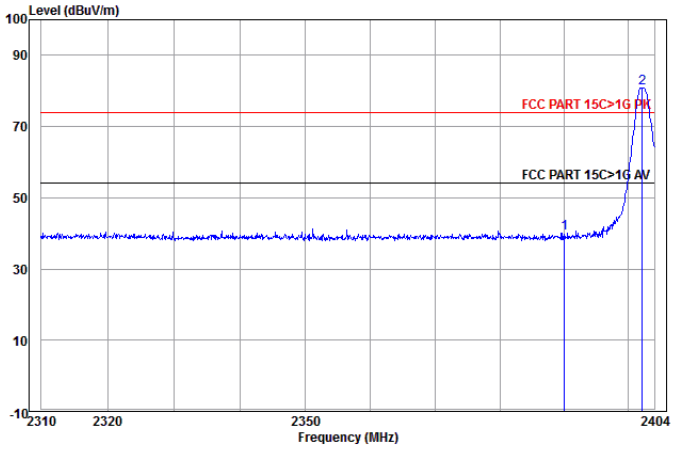
g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. . Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are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

Limit:

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

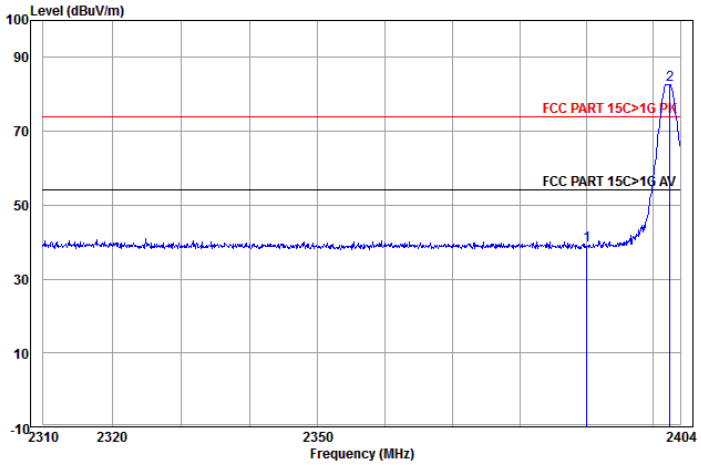
Test plot as follows:

Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Horizontal	Remark: Peak



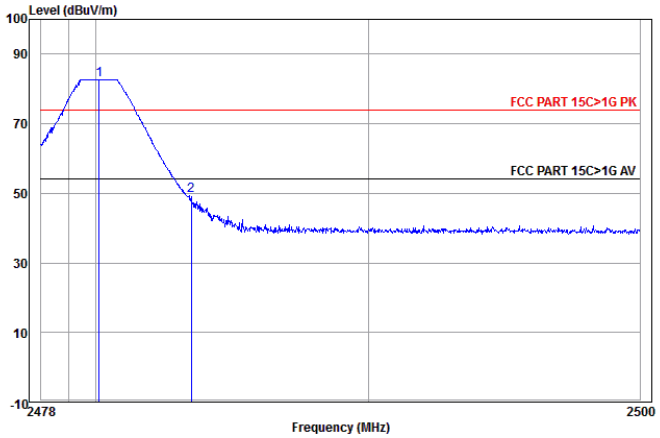
	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	3.07	44.03	48.39	39.96	74.00	-34.04	Horizontal	Peak
2 pp	2402.120	32.56	3.07	44.04	89.32	80.91	74.00	6.91	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Vertical	Remark: Peak



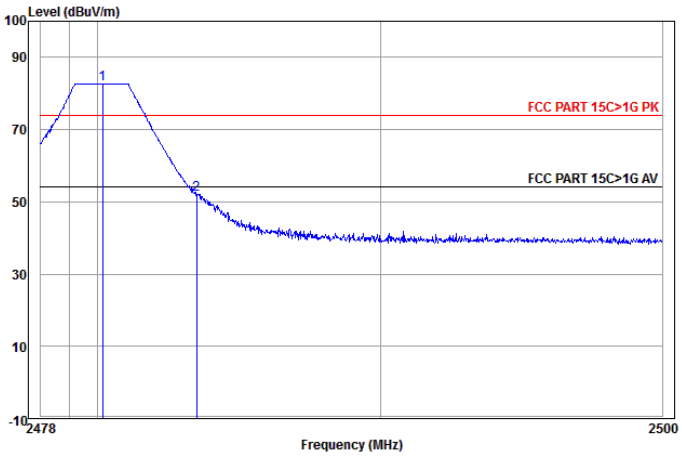
	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	3.07	44.03	47.58	39.15	74.00	-34.85	Vertical	Peak
2 pp	2402.466	32.56	3.08	44.04	91.00	82.60	74.00	8.60	Vertical	Peak

Worse case mode:	GFSK		
Frequency: 2480MHz	Test channel: Highest	Polarization: Horizontal	Remark: Peak



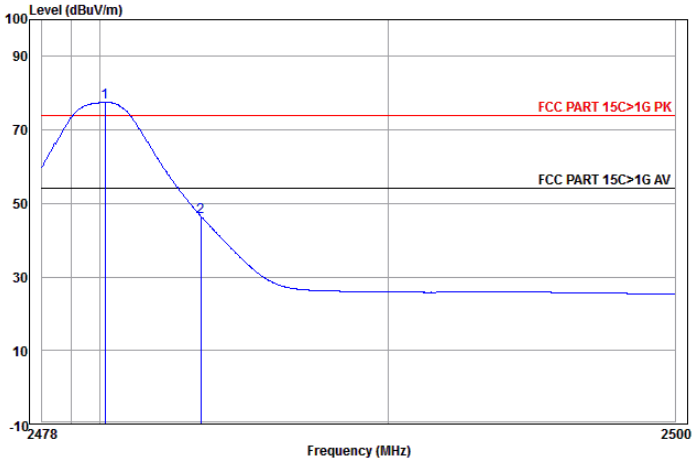
	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.125	32.71	3.12	44.14	91.00	82.69	74.00	8.69	Horizontal	Peak
2	2483.500	32.71	3.12	44.14	57.61	49.30	74.00	-24.70	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2480MHz	Test channel: Highest	Polarization: Vertical	Remark: Peak



	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.191	32.71	3.12	44.14	91.00	82.69	74.00	8.69	Vertical	Peak
2	2483.500	32.71	3.12	44.14	60.43	52.12	74.00	-21.88	Vertical	Peak

Worse case mode:	GFSK		
Frequency: 2480MHz	Test channel: Highest	Polarization: Vertical	Remark: Average



	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.191	32.71	3.12	44.14	85.81	77.50	54.00	23.50	Vertical	Average
2	2483.500	32.71	3.12	44.14	54.60	46.29	54.00	-7.71	Vertical	Average

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

Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

Appendix I): Radiated Spurious Emissions

Receiver Setup:

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

Test Procedure:

Below 1GHz test procedure as below:

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

Above 1GHz test procedure as below:

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

Limit:

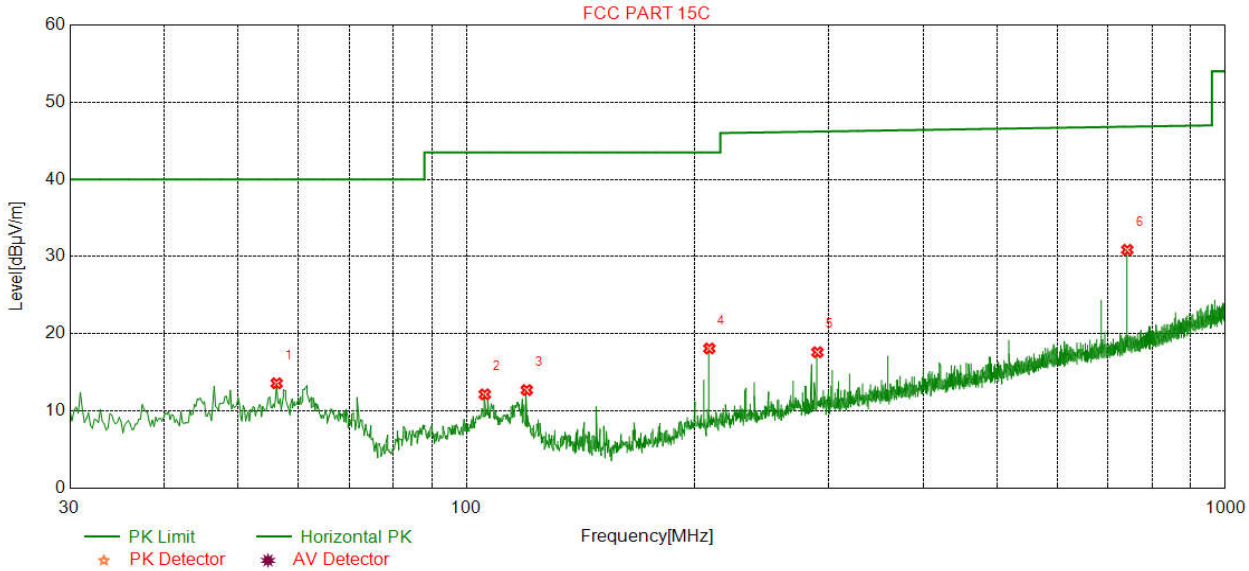
Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz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

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

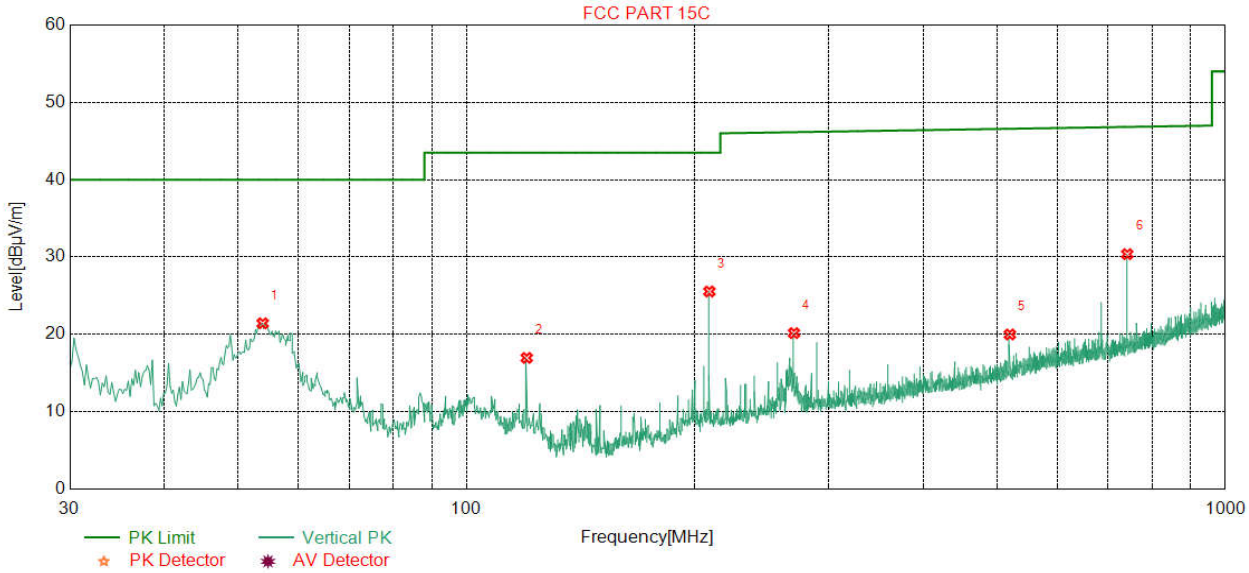
Radiated Spurious Emissions test Data:

Radiated Emission below 1GHz

Test mode: Transmitting



NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Remark
1	56.1952	32.61	13.60	-19.01	40.00	26.40	Horizontal	QP
2	105.6751	32.08	12.17	-19.91	43.50	31.33	Horizontal	QP
3	120.0340	34.29	12.72	-21.57	43.50	30.78	Horizontal	QP
4	208.9038	37.21	18.11	-19.10	43.50	25.39	Horizontal	QP
5	290.0120	34.47	17.62	-16.85	46.20	28.58	Horizontal	QP
6	742.5105	39.46	30.88	-8.58	46.83	15.95	Horizontal	QP



NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity	Remark
1	53.8668	40.12	21.44	-18.68	40.00	18.56	Vertical	QP
2	120.0340	38.54	16.97	-21.57	43.50	26.53	Vertical	QP
3	208.9038	44.65	25.55	-19.10	43.50	17.95	Vertical	QP
4	270.0260	37.49	20.17	-17.32	46.15	25.98	Vertical	QP
5	519.9480	31.80	20.00	-11.80	46.59	26.59	Vertical	QP
6	742.5105	38.96	30.38	-8.58	46.83	16.45	Vertical	QP

Transmitter Emission above 1GHz

Worse case mode:		GFSK		Test channel:	Lowest	Remark: Peak	
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4804.000	45.13	50.30	5.17	74.00	23.70	Horizontal
2	7206.000	29.69	41.70	12.01	74.00	32.30	Horizontal
3	7683.3933	32.07	45.60	13.53	74.00	28.40	Horizontal
4	9608.000	30.82	46.11	15.29	74.00	27.89	Horizontal
5	11753.4503	31.73	50.81	19.08	74.00	23.19	Horizontal
6	12010.000	28.35	47.12	18.77	74.00	26.88	Horizontal
7	4804.000	43.80	48.97	5.17	74.00	25.03	Vertical
8	7206.000	32.38	44.39	12.01	74.00	29.61	Vertical
9	8406.9157	33.69	48.25	14.56	74.00	25.75	Vertical
10	9608.000	29.34	44.63	15.29	74.00	29.37	Vertical
11	11772.9523	30.68	49.74	19.06	74.00	24.26	Vertical
12	12010.000	25.26	44.03	18.77	74.00	29.97	Vertical

Worse case mode:		GFSK		Test channel:	Middle	Remark: Peak	
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4880.000	45.31	51.18	5.87	74.00	22.82	Horizontal
2	7320.000	30.50	42.80	12.30	74.00	31.20	Horizontal
3	8431.2931	32.77	47.33	14.56	74.00	26.67	Horizontal
4	9760.000	30.73	46.30	15.57	74.00	27.70	Horizontal
5	11278.5779	30.95	50.32	19.37	74.00	23.68	Horizontal
6	12200.000	27.47	46.55	19.08	74.00	27.45	Horizontal
7	4880.000	44.55	50.41	5.86	74.00	23.59	Vertical
8	7320.000	30.74	43.04	12.30	74.00	30.96	Vertical
9	8387.4137	33.99	48.36	14.37	74.00	25.64	Vertical
10	9760.000	31.58	47.15	15.57	74.00	26.85	Vertical
11	11207.3957	31.45	50.56	19.11	74.00	23.44	Vertical
12	12200.000	28.13	47.21	19.08	74.00	26.79	Vertical

Worse case mode:		GFSK		Test channel:	Highest	Remark: Peak	
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4960.000	44.52	50.48	5.96	74.00	23.52	Horizontal
2	7440.000	28.53	41.05	12.52	74.00	32.95	Horizontal
3	8370.8371	32.55	46.66	14.11	74.00	27.34	Horizontal
4	9920.000	28.26	44.06	15.80	74.00	29.94	Horizontal
5	11252.2502	31.50	50.55	19.05	74.00	23.45	Horizontal
6	12400.000	28.75	48.00	19.25	74.00	26.00	Horizontal
7	4960.000	43.44	49.39	5.95	74.00	24.61	Vertical
8	7440.000	30.44	42.96	12.52	74.00	31.04	Vertical
9	8406.9157	34.45	49.01	14.56	74.00	24.99	Vertical
10	9920.000	29.07	44.87	15.80	74.00	29.13	Vertical
11	11818.7819	31.99	50.86	18.87	74.00	23.14	Vertical
12	12400.000	28.27	47.52	19.25	74.00	26.48	Vertical

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

Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

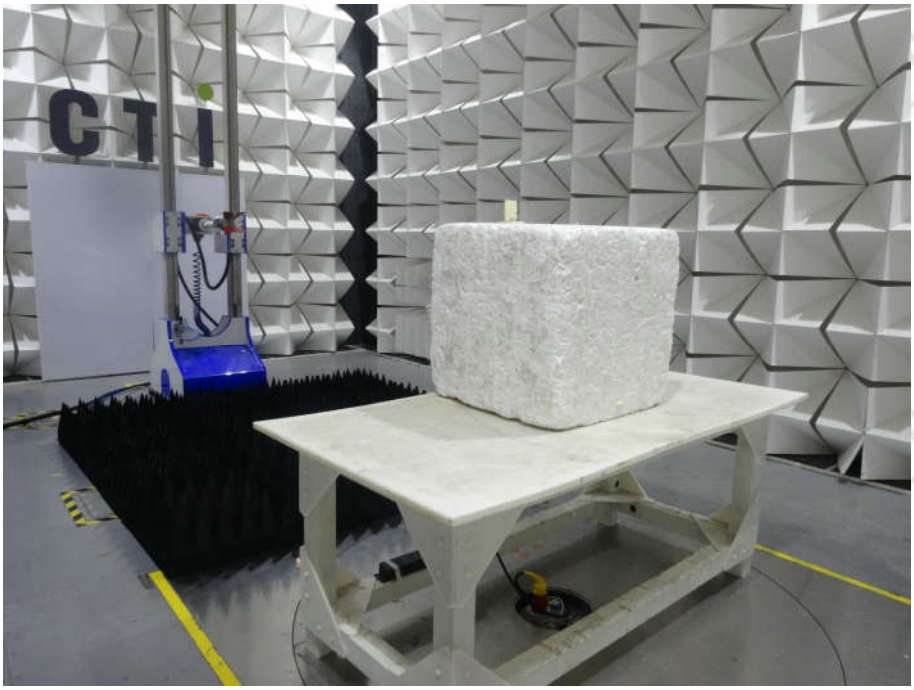
2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below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

PHOTOGRAPHS OF TEST SETUP

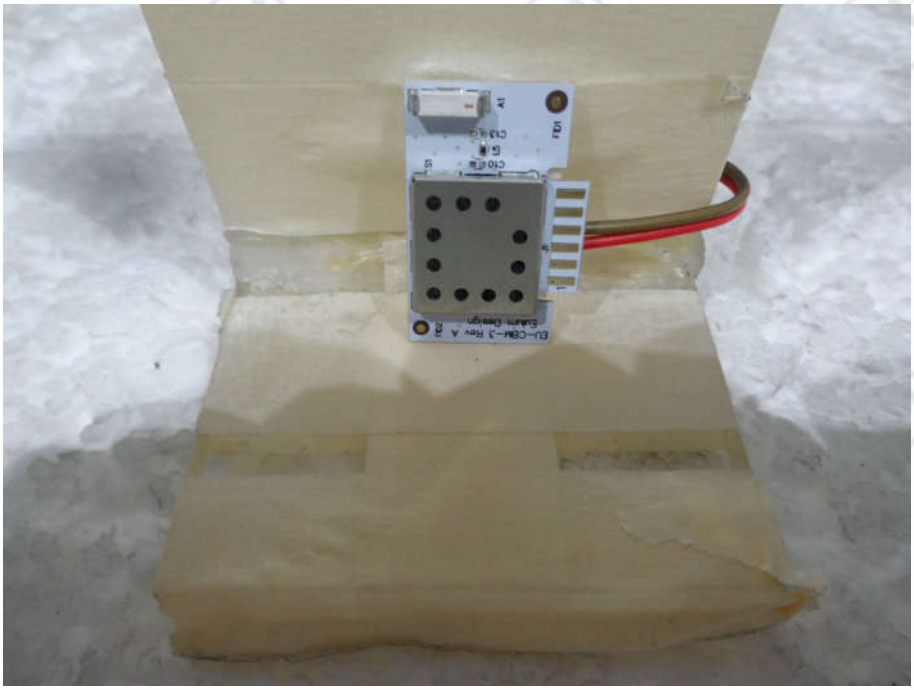
Test model No.: RFM-CSB-3

Radiated spurious emission Test Setup-1(9k-30M)

Radiated spurious emission Test Setup-2(30M-1G)

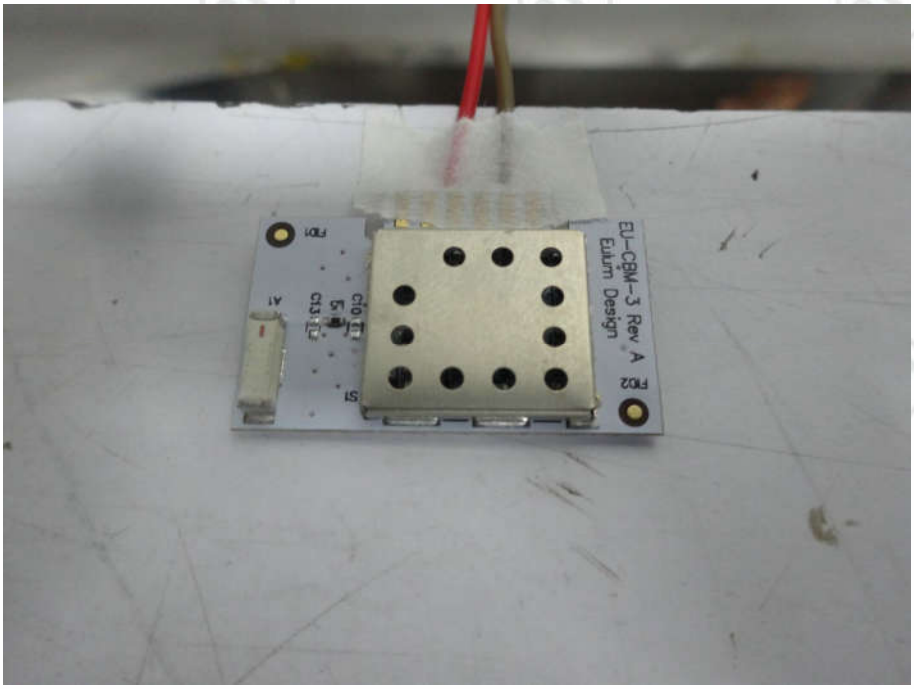


Radiated spurious emission Test Setup-3(Above 1GHz)



Radiated spurious emission Test Setup-4(Close up)

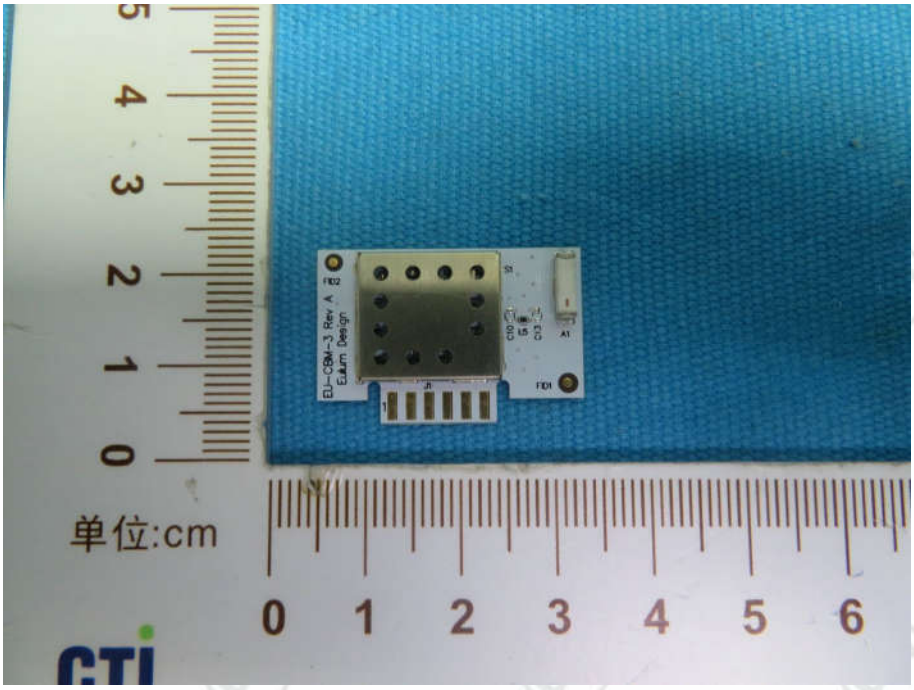
Conducted Emissions Test Setup



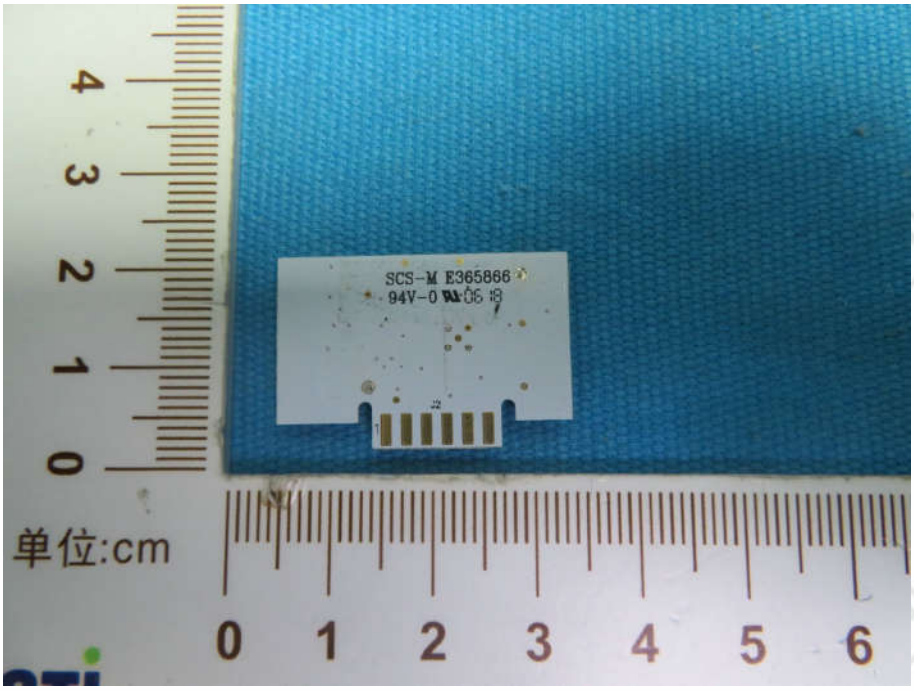
Conducted Emissions Test Setup(Close up)

PHOTOGRAPHS OF EUT Constructional Details

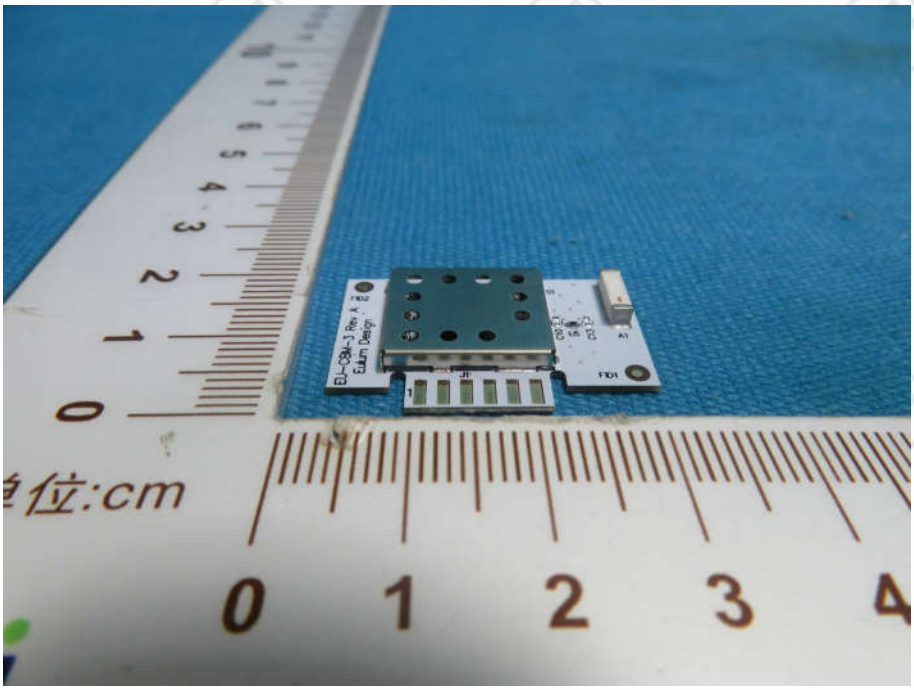
Test model No.: RFM-CSB-3



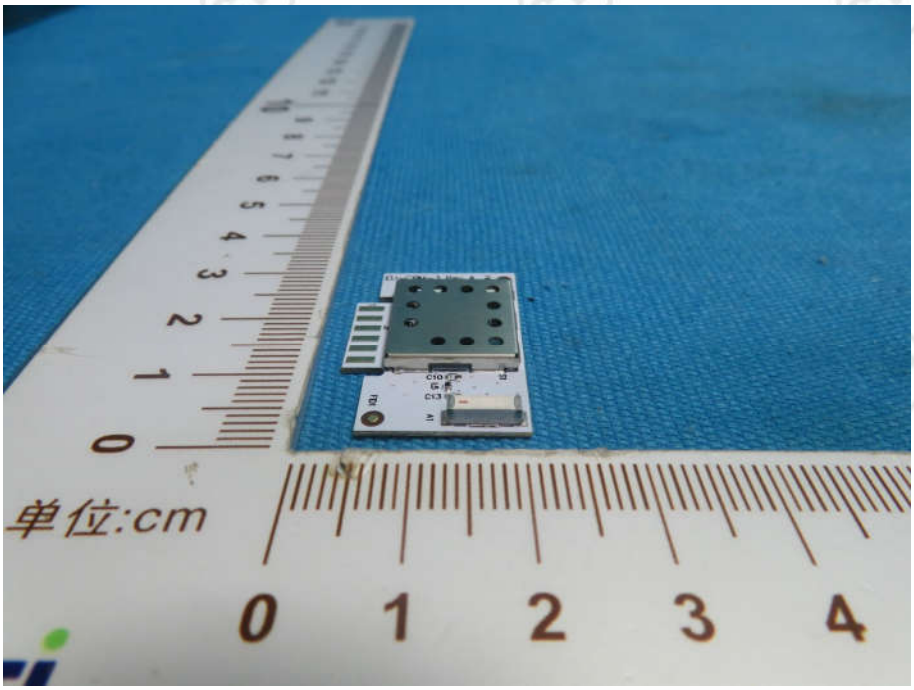
View of Product-1



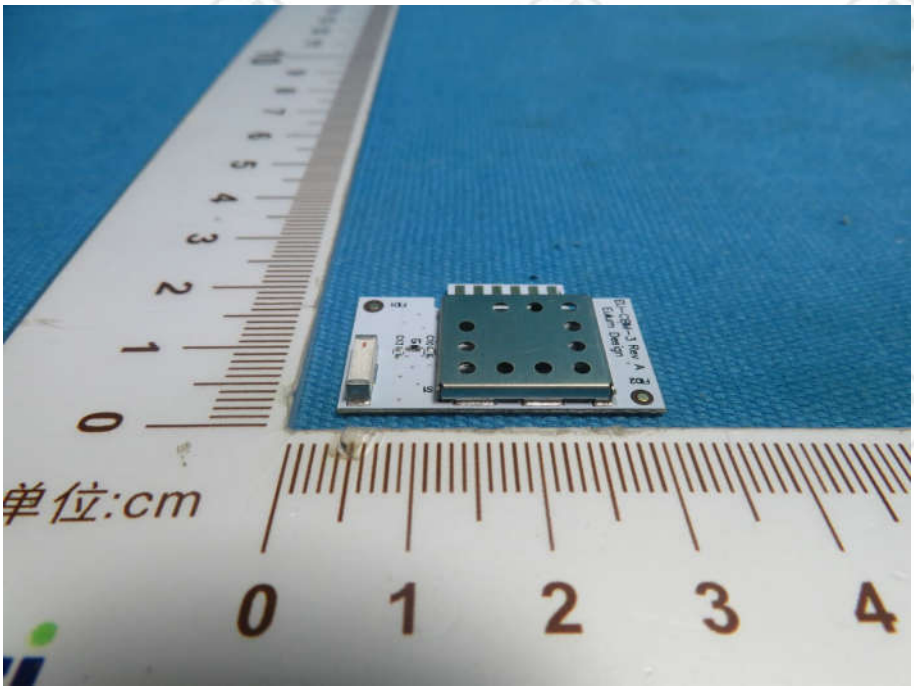
View of Product-2



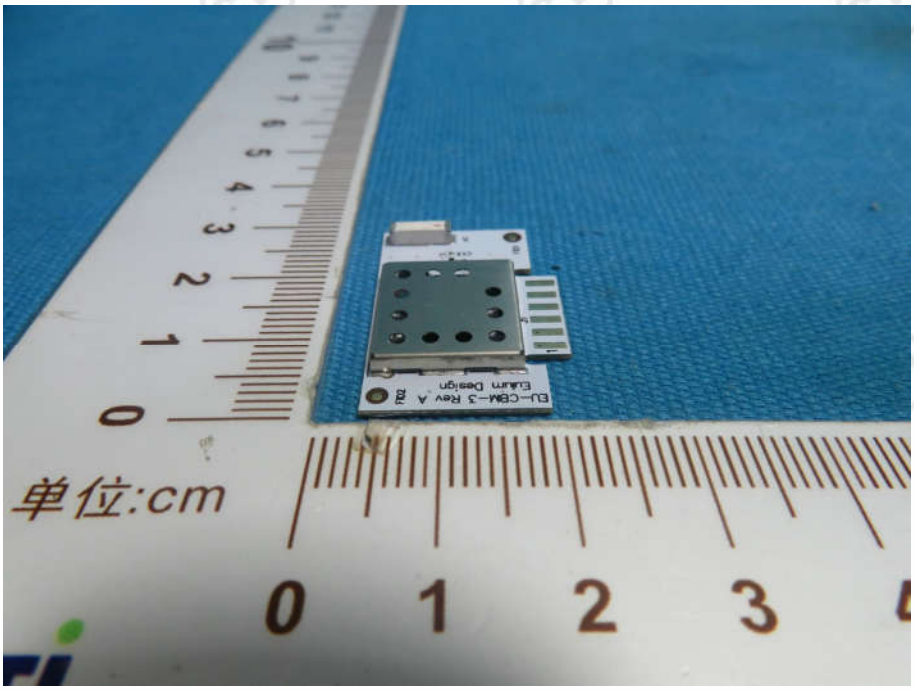
View of Product-3



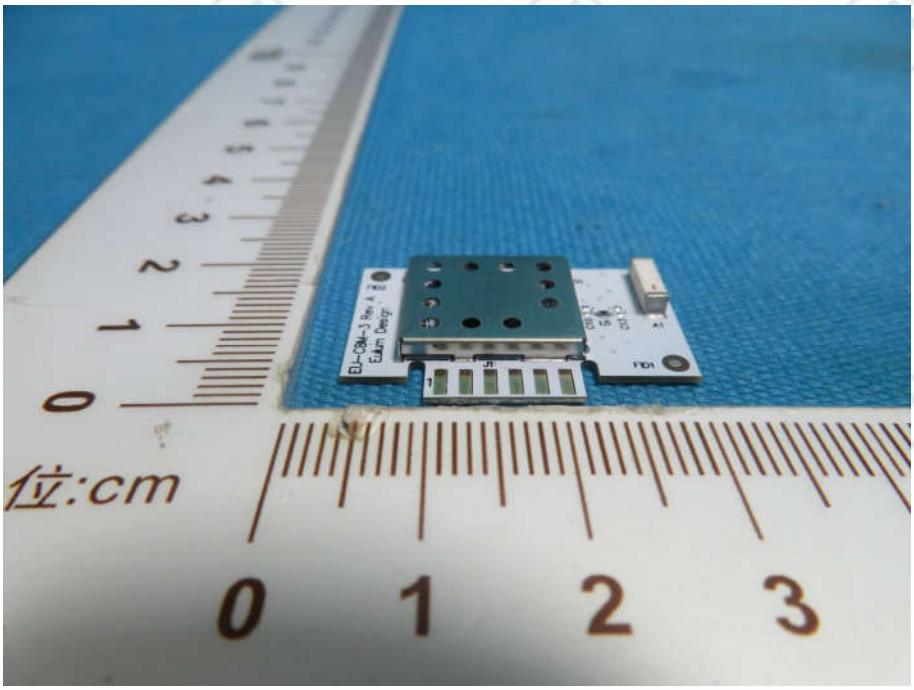
View of Product-4



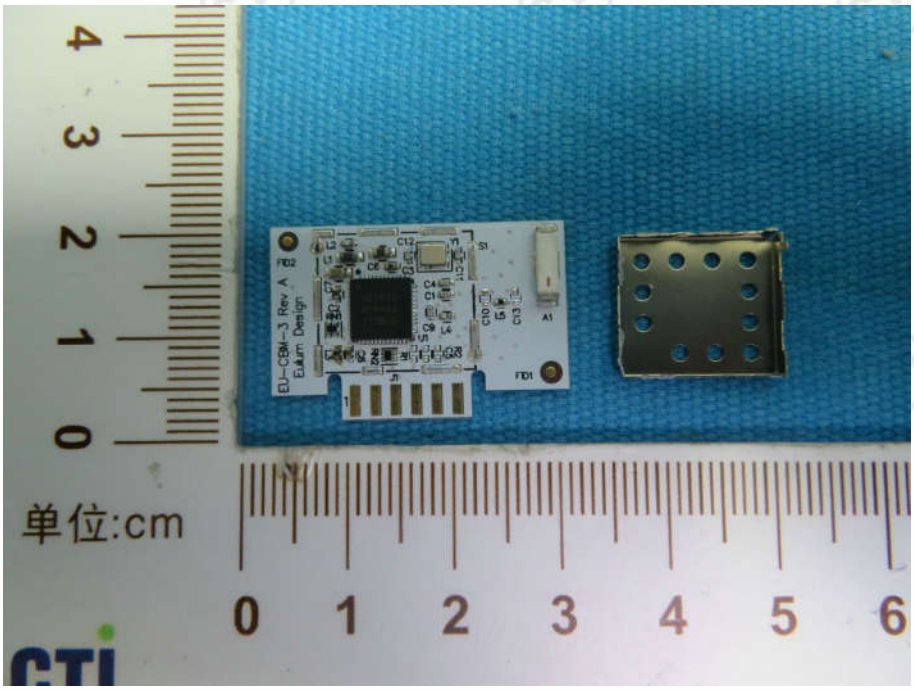
View of Product-5



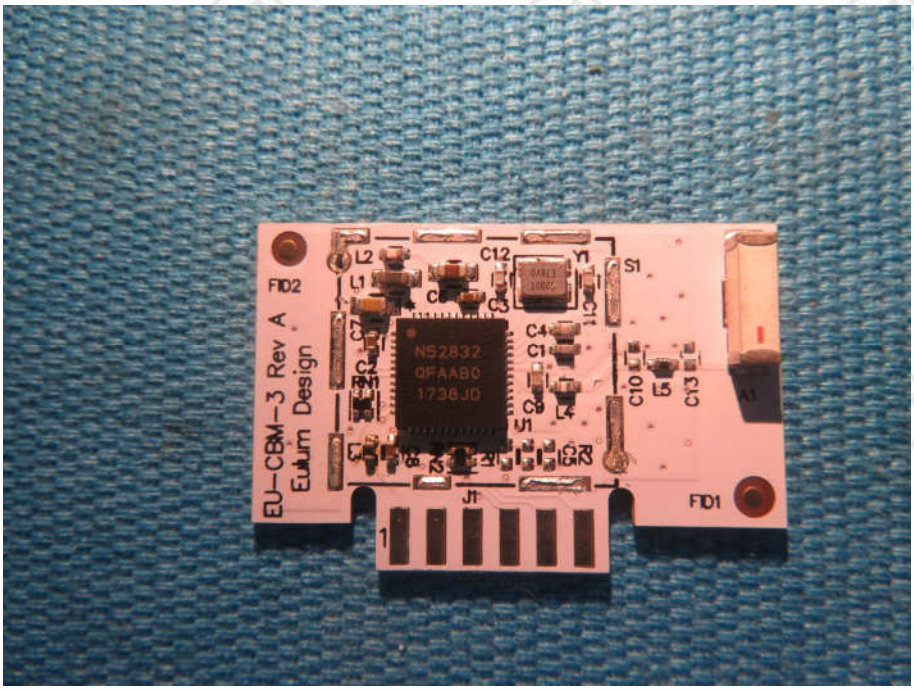
View of Product-6



View of Product-7



View of Product-8



View of Product-9

*** End of Report ***

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