TEST REPORT

Product	:	ECH relay
Trade mark	:	ECH
Model/Type reference	:	Refer to chapter 3
Serial Number	:	N/A
Report Number	:	EED32J00120202
FCC ID	:	2AJOC-ECHC1
Date of Issue:	:	Oct. 20, 2017
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

ECH (Changzhou) Medical Instrument Co., ltd.
No. 65, West Huiling Rd., Zouqu County Zhonglou District, Changzhou, Jiangsu

Prepared by:

Centre Testing International Group Co., Ltd.
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Tested By:	Tom chen (Test Project)	Compiled by:	Kevin Ian (Project Engineer)
Reviewed by:	Kevin yang (Reviewer)	Approved by:	Sheek Luo (Lab supervisor)
Date:	Oct. 20, 2017		Check No.: :2827502834

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2 Version

Version No.	Date	Description
00	Oct. 20, 2017	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10-2013 KDB 558074 D01v04	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10-2013 KDB 558074 D01v04	PASS

Remark:The tested sample(s) and the sample information are provided by the client.
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radiated Frequency.
CH: In this whole report CH means channel.
Volt: In this whole report Volt means Voltage.
Temp: In this whole report Temp means Temperature.
Humid: In this whole report Humid means humidity.
Press: In this whole report Press means Pressure.
According to whether there are Ethernet, they can be divided into two categories. There are the Ethernet for one kind, the other kind without Ethernet.The models without the Ethernet, there will be the Bluetooth and WLAN.The models with the Ethernet also have Bluetooth and WLAN. but if the Ethernet is connected to the router,the WLAN will can't transfer data by firmware.Except the color and the appearance are different, all of them are the same.

The Model No. Below with the Ethernet,only the model ECH-c1-WLSD-C was tested,since except the color of appearance are different, all the others are the same.
Model No.:ECH-c1-WLSD-C,ECH-c1-WLSD-B, ECH-c1-WL-C, ECH-c1-WL-B, ECH-c1-WLD-B,ECH-c1-WLD-C, ECH-c1-WSD-B, ECH-c1-WSD-C, ECH-c1-W-B, ECH-c1-W-C, ECH-c1-WD-C, ECH-c1-WD-B.

The Model No. Below without the Ethernet,only the model ECH-c1-LSD-C was tested,except the color of appearance are different, all the others are the same.
Model No.:ECH-c1-LSD-C, ECH-c1-LSD-B, ECH-c1-L-C, ECH-c1-L-B, ECH-c1-LD-C, ECH-c1-LD-B.

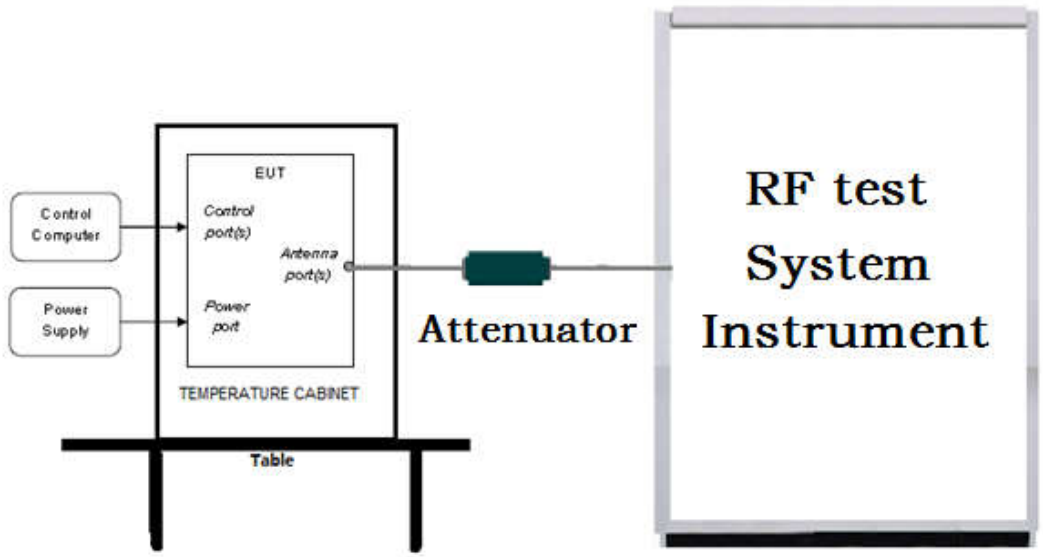
The model ECH-c1-WLSD-C were fully tested, the model ECH-c1-LSD-C was only tested the Output Power and the Radiated Spurious Emissions,other tests data please refer to the model ECH-c1-WLSD-C.

4 Content

5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

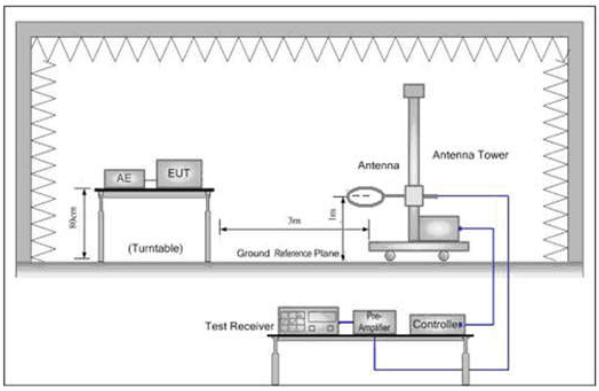


Figure 1. Below 30MHz

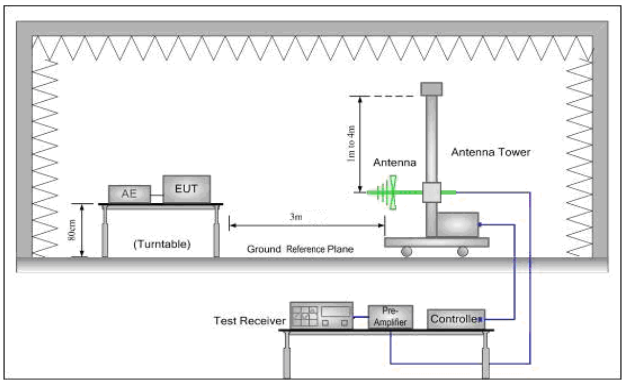


Figure 2. 30MHz to 1GHz

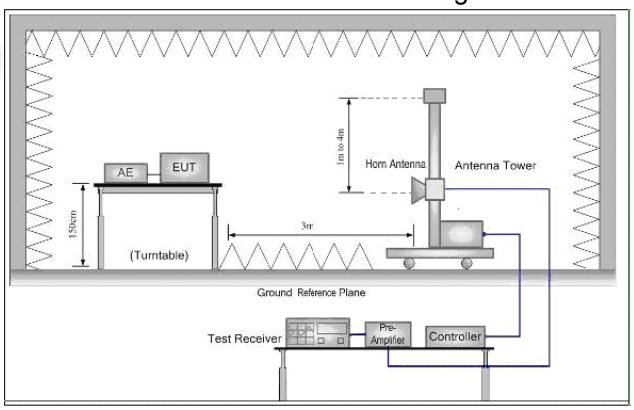
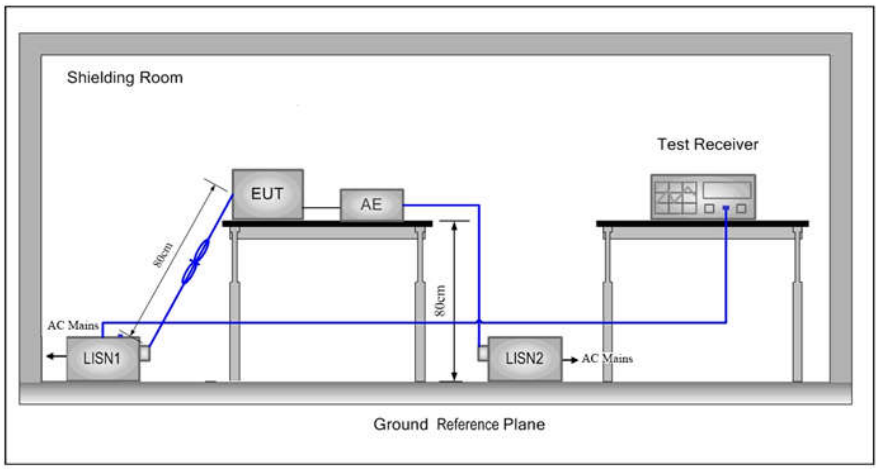


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	25.4 °C
Humidity:	51 % 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	Channel40
		2402MHz	2440MHz	2480MHz
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.			

6 General Information

6.1 Client Information

Applicant:	ECH (Changzhou) Medical Instrument Co., ltd.
Address of Applicant:	No. 65, West Huiling Rd., Zouqu County Zhonglou District, Changzhou, Jiangsu
Manufacturer:	ECH (Changzhou) Medical Instrument Co., ltd.
Address of Manufacturer:	No. 65, West Huiling Rd., Zouqu County Zhonglou District, Changzhou, Jiangsu
Factory:	Shanghai Chenguo Electronic Technology Co., Ltd.
Address of Factory:	Shanghai Fengxian Fengpu Industrial Zone, 518 Far East Road

6.2 General Description of EUT

Product Name:	ECH relay
Model No.(EUT):	Refer to chapter 3
Test Model No.:	ECH-c1-WLSD-C,ECH-c1-LSD-C
Trade mark:	ECH
EUT Supports Radios application	BT: 4.0 BT Signal mode, 2402-2480MHz Wi-Fi: 802.11 b/g/n(20M), 2412MHz-2462MHz
Power Supply:	DC 5V by USB port
USB Micro-B Plug cable:	137.5cm(Unshielded)
Sample Received Date:	Jun. 16, 2017
Sample tested Date:	Jun. 16, 2017 to Sep. 13, 2017

6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	4.0
Modulation Technique:	DSSS
Modulation Type:	GFSK
Number of Channel:	40
Test Power Grade:	N/A
Test Software of EUT:	N/A
Antenna Type and Gain::	Antenna Type: PCB antenna, Gain: 3dBi
Test Voltage:	AC 120V, 60Hz

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 with associated equipment below.

Associated equipment name		Manufacture	model	serial number	Supplied by
AE1	Power Adapter	TIANYIN electronics CO., LTD.	TPA-46050200UU	N/A	CTI

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China518101
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.

FCC Designation No.: CN1164

FCC-Registration No.: 886427

Centre Testing International Group 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 886427.

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	03-14-2017	03-13-2018
Communication test set test set	Agilent	N4010A	MY51400230	03-14-2017	03-13-2018
Spectrum Analyzer	Keysight	N9010A	MY54510339	03-14-2017	03-13-2018
Signal Generator	Keysight	N5182B	MY53051549	03-14-2017	03-13-2018
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-11-2017	01-10-2018
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	01-11-2017	01-10-2018
DC Power	Keysight	E3642A	MY54436035	03-14-2017	03-13-2018
PC-1	Lenovo	R4960d	---	04-01-2017	03-31-2018
power meter & power sensor	R&S	OSP120	101374	03-14-2017	03-13-2018
RF control unit	JS Tonscend	JS0806-2	158060006	03-14-2017	03-13-2018
BT&WI-FI Automatic test software	JS Tonscend	JS1120-2	---	03-14-2017	03-13-2018

Conducted disturbance Test					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Receiver	R&S	ESCI	100009	06-14-2017	06-13-2018
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-08-2017	05-07-2018
Communication test set	Agilent	E5515C	GB47050534	03-14-2017	03-13-2018
Communication test set	R&S	CMW500	152394	03-14-2017	03-13-2018
LISN	R&S	ENV216	100098	06-13-2017	06-12-2018
LISN	schwarzbeck	NNLK8121	8121-529	06-13-2017	06-12-2018
Voltage Probe	R&S	ESH2-Z3	--	06-13-2017	06-11-2020
Current Probe	R&S	EZ17	100106	06-13-2017	06-12-2018
ISN	TESEQ GmbH	ISN T800	30297	02-23-2017	02-22-2018

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	---	06-05-2016	06-05-2019
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	9163-484	05-23-2017	05-22-2018
Microwave Preamplifier	Agilent	8449B	3008A02425	02-16-2017	02-15-2018
Horn Antenna	ETS-LINDGREN	3117	00057407	07-20-2015	07-18-2018
Loop Antenna	ETS	6502	00071730	06-22-2017	06-21-2019
Microwave Preamplifier	A.H.SYSTEMS	PAP-1840-60	6041.6042	06-30-2015	06-28-2018
Horn Antenna	A.H.SYSTEMS	SAS-574 374	---	06-30-2015	06-28-2018
Spectrum Analyzer	R&S	FSP40	100416	06-13-2017	06-12-2018
Receiver	R&S	ESCI	100435	06-14-2017	06-13-2018
Multi device Controller	maturo	NCD/070/10711112	---	01-11-2017	01-10-2018
LISN	schwarzbeck	NNBM8125	81251547	06-13-2017	06-12-2018
LISN	schwarzbeck	NNBM8125	81251548	06-13-2017	06-12-2018
Signal Generator	Agilent	E4438C	MY45095744	03-14-2017	03-13-2018
Signal Generator	Keysight	E8257D	MY53401106	03-14-2017	03-13-2018
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-08-2017	05-07-2018
Communication test set	Agilent	E5515C	GB47050534	03-14-2017	03-13-2018
Cable line	Fulai(7M)	SF106	5219/6A	01-11-2017	01-10-2018
Cable line	Fulai(6M)	SF106	5220/6A	01-11-2017	01-10-2018
Cable line	Fulai(3M)	SF106	5216/6A	01-11-2017	01-10-2018
Cable line	Fulai(3M)	SF106	5217/6A	01-11-2017	01-10-2018
Communication test set	R&S	CMW500	152394	03-14-2017	03-13-2018
High-pass filter	Sinoscite	FL3CX03WG18NM12-0398-002	---	01-11-2017	01-10-2018
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX01CA09CL12-0395-001	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX01CA08CL12-0393-001	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX02CA04CL12-0396-002	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX02CA03CL12-0394-001	---	01-11-2017	01-10-2018

8 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C (2015)	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

Test Results List:

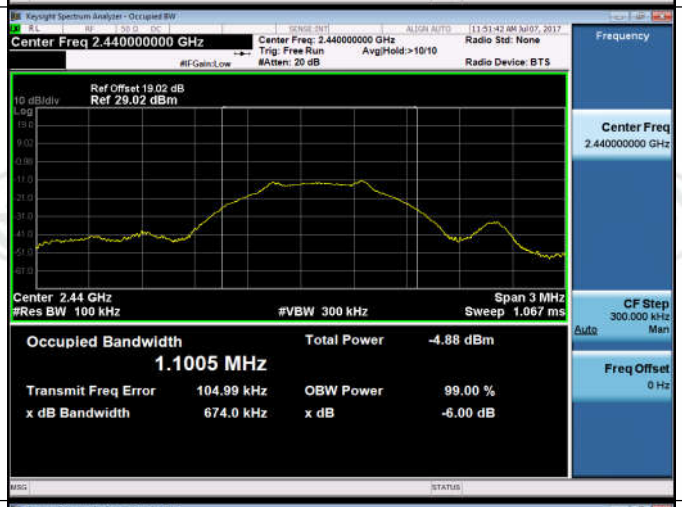
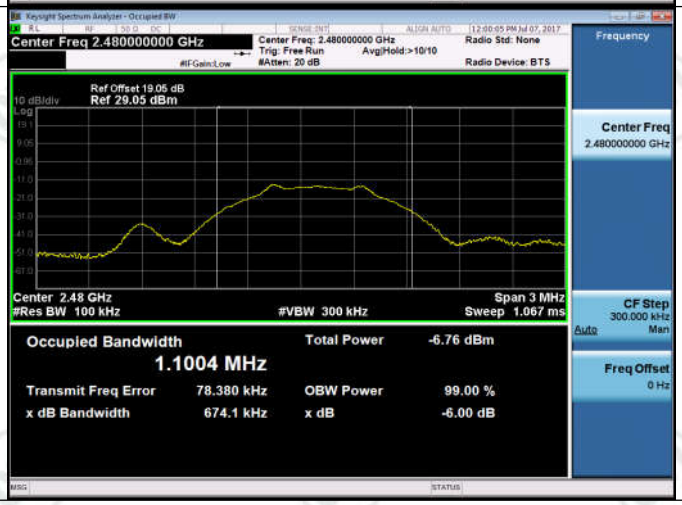
Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10/ KDB 558074	6dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (b)(3)	ANSI C63.10/ KDB 558074	Conducted Peak Output Power	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10/ KDB 558074	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10/ KDB 558074	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10/ KDB 558074	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	0.6937	1.1083	PASS	Peak detector
BLE	MCH	0.6740	1.1005	PASS	
BLE	HCH	0.6741	1.1004	PASS	

Test Graphs

Graphs		
LCH		
MCH		
HCH		

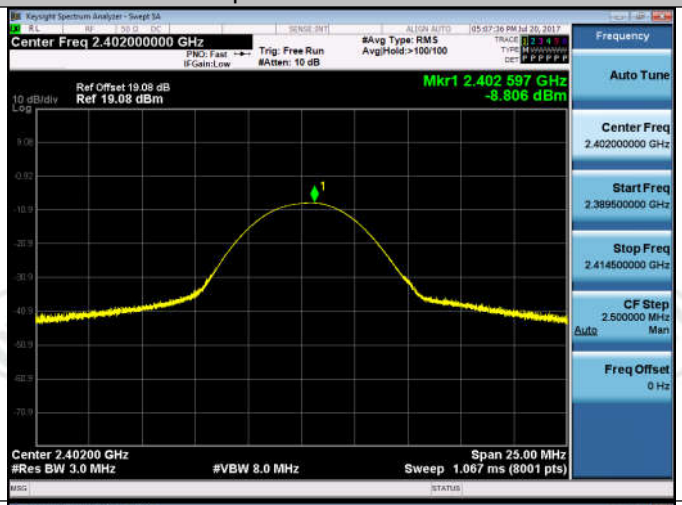
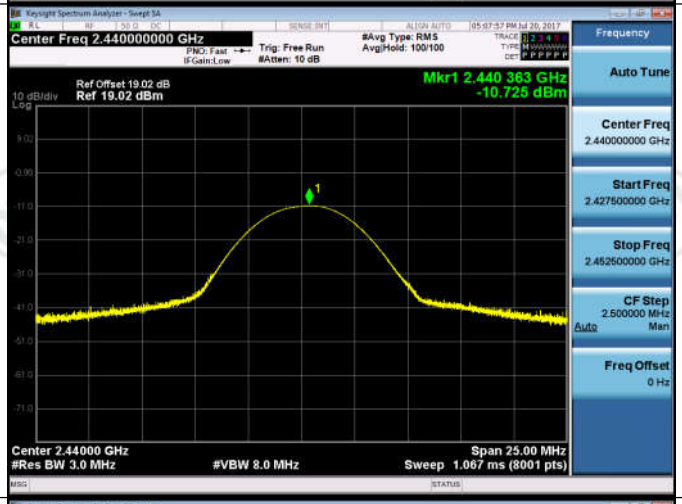
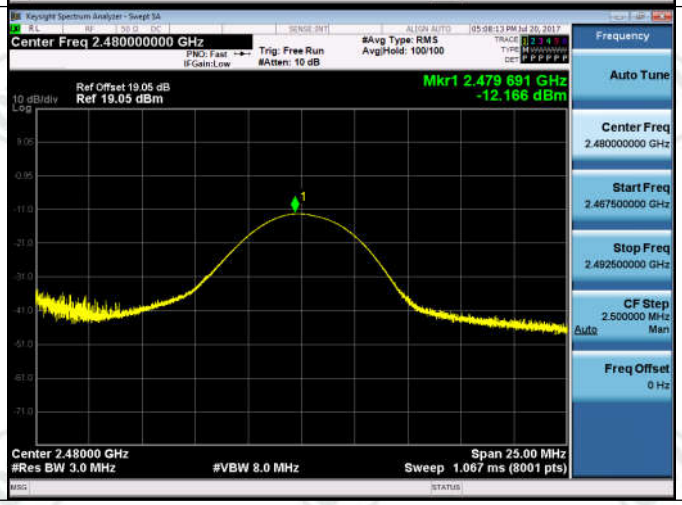
Appendix B): Conducted Peak Output Power

Test Model No.:ECH-c1-WLSD-C

Test Result

Mode	Channel	Conduct Peak Power[dBm]	Verdict
BLE	LCH	-8.806	PASS
BLE	MCH	-10.725	PASS
BLE	HCH	-12.166	PASS

Test Graphs

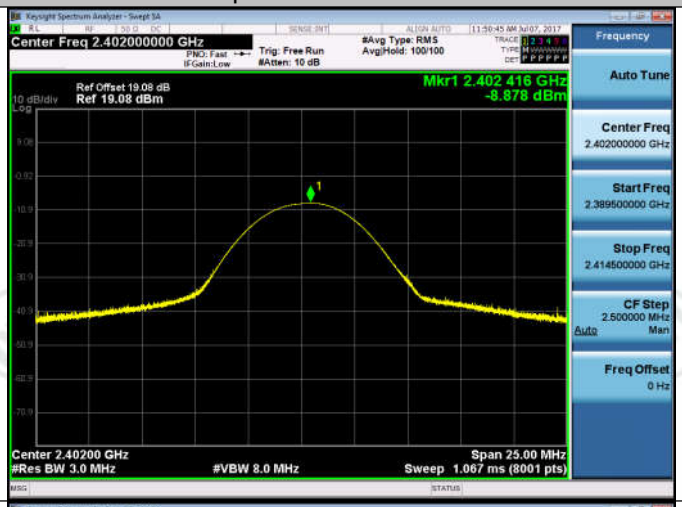
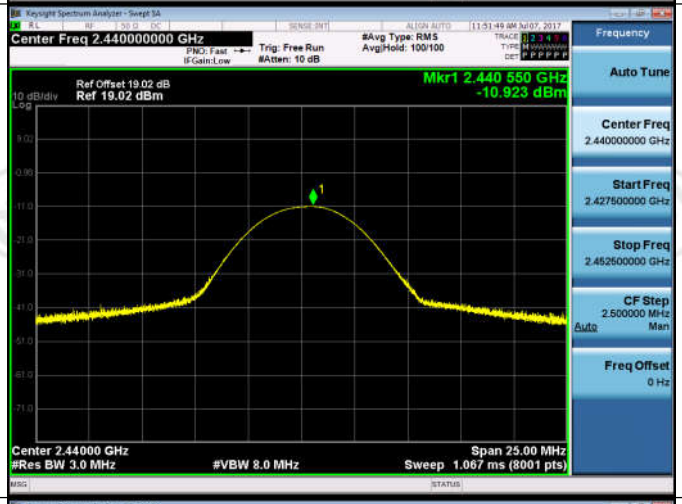
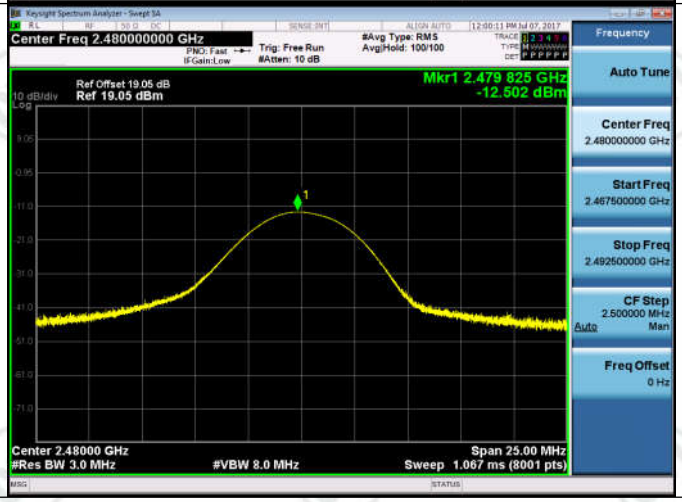
Graphs		
LCH		
MCH		
HCH		

Test Model No.:ECH-c1-LSD-C

Test Result

Mode	Channel	Conduct Peak Power[dBm]	Verdict
BLE	LCH	-8.878	PASS
BLE	MCH	-10.923	PASS
BLE	HCH	-12.502	PASS

Test Graphs

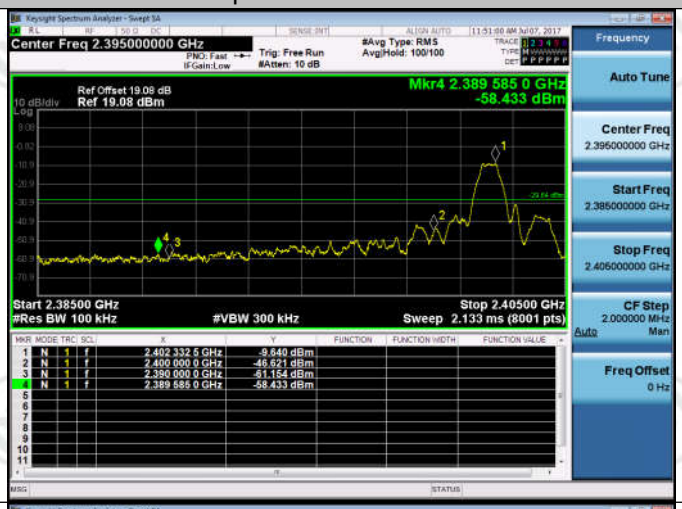
Graphs			
LCH			
MCH			
HCH			

Appendix C): Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	LCH	-9.640	-58.433	-29.64	PASS
BLE	HCH	-14.085	-52.725	-34.09	PASS

Test Graphs

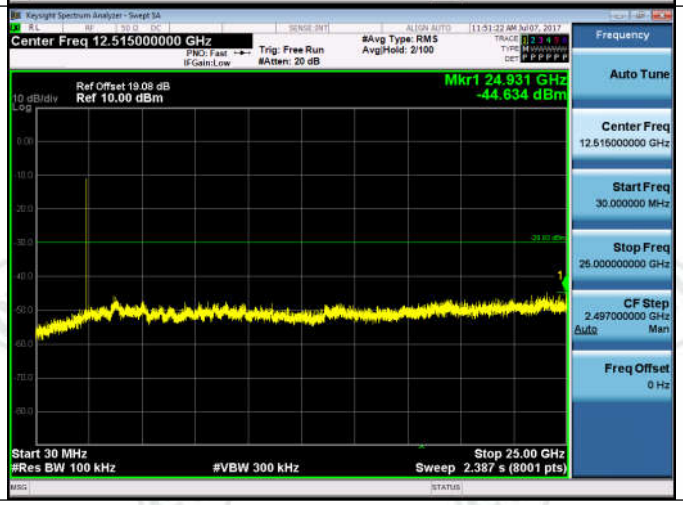
Graphs		
LCH		
HCH		

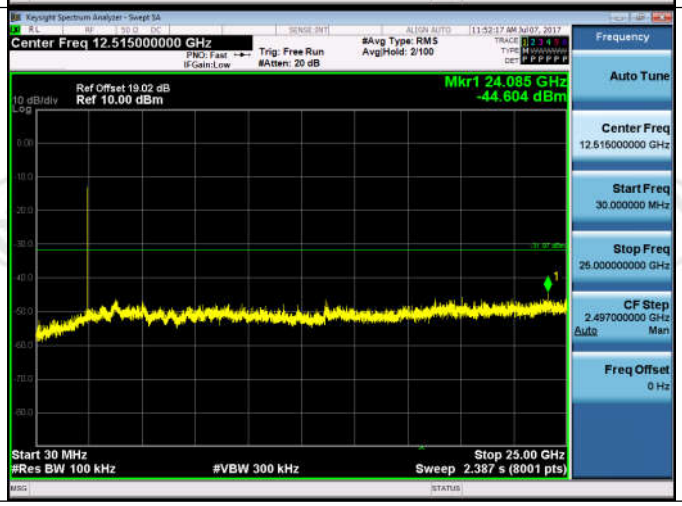
Appendix D): RF Conducted Spurious Emissions

Result Table

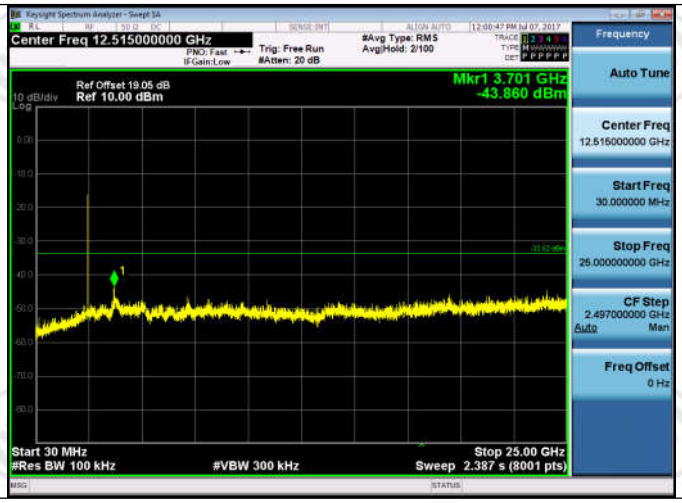
Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
BLE	LCH	-9.929	<Limit	PASS
BLE	MCH	-11.974	<Limit	PASS
BLE	HCH	-13.517	<Limit	PASS

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		

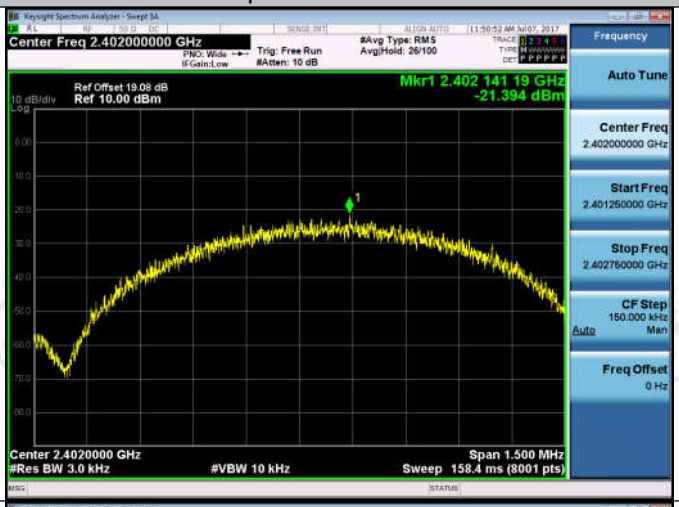
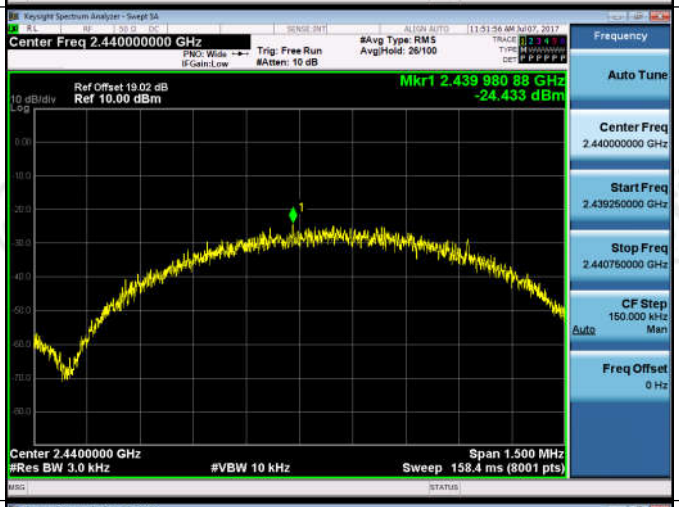
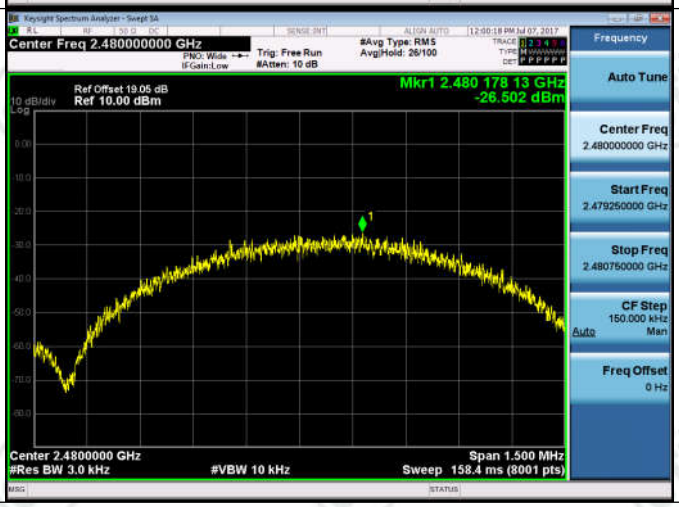
Puw/BLE/HCH	 Center Freq 12.515000000 GHz Trig: Free Run #Atten: 20 dB #Avg Type: RMS Avg|Hold: 2/100 Ref Offset 19.05 dB 10 dB/div Ref 10.00 dBm Mkr1 3.701 GHz -43.860 dBm Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Stop 25.00 GHz Sweep 2.387 s (8001 pts) Frequency Auto Tune Center Freq 12.515000000 GHz Start Freq 30.000000 MHz Stop Freq 26.000000000 GHz CF Step 2.497000000 GHz Auto Man Freq Offset 0 Hz	

Appendix E): Power Spectral Density

Result Table

Mode	Channel	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE	LCH	-21.394	8	PASS
BLE	MCH	-24.433	8	PASS
BLE	HCH	-26.502	8	PASS

Test Graphs

Graphs			
LCH			
MCH			
HCH			

Appendix F): Antenna Requirement

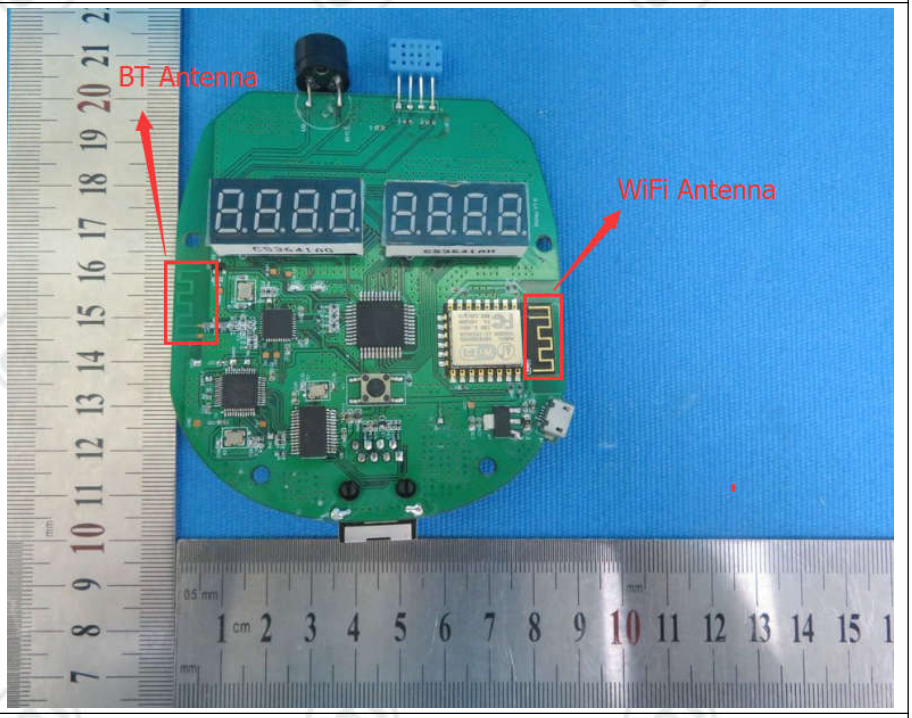
15.203 requirement:

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

Appendix G): AC Power Line Conducted Emission

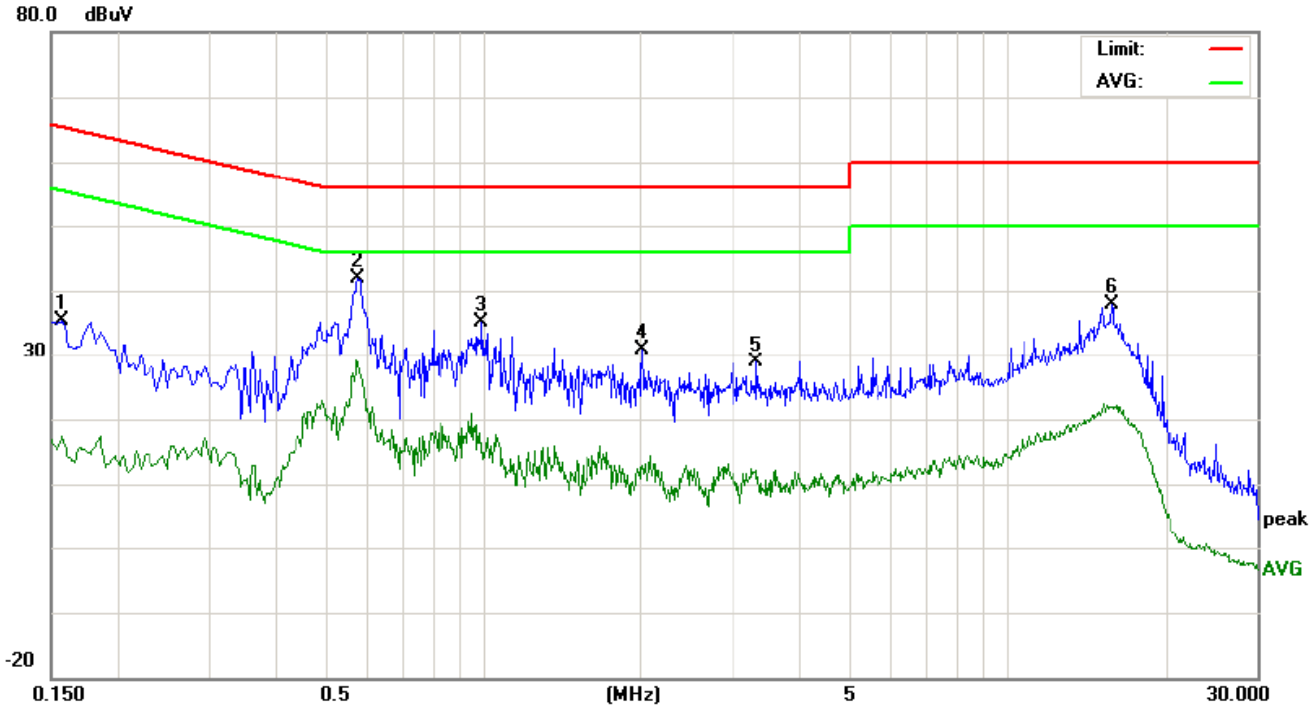
<table>
<tr><td>Test Procedure:</td><td>Test frequency range :150KHz-30MHz
1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. 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 (dBuV)</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.

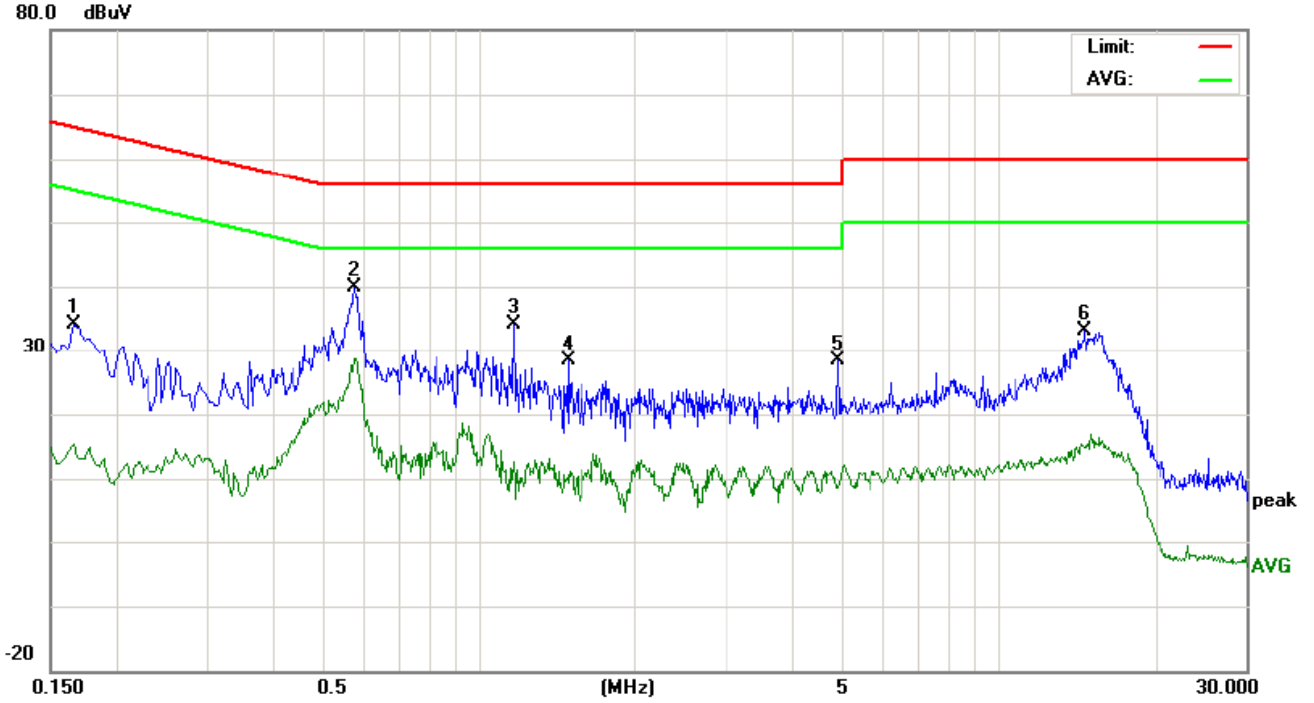
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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	0.1580	25.50	21.77	5.80	9.76	35.26	31.53	15.56	65.56	55.56	-34.03	-40.00	P	
2	0.5780	32.02	29.12	18.18	9.74	41.76	38.86	27.92	56.00	46.00	-17.14	-18.08	P	
3	0.9980	25.45	16.94	4.74	9.62	35.07	26.56	14.36	56.00	46.00	-29.44	-31.64	P	
4	2.0180	21.24	12.31	2.11	9.72	30.96	22.03	11.83	56.00	46.00	-33.97	-34.17	P	
5	3.3420	19.27	9.32	-2.09	9.68	28.95	19.00	7.59	56.00	46.00	-37.00	-38.41	P	
6	15.8060	27.77	20.20	9.99	10.03	37.80	30.23	20.02	60.00	50.00	-29.77	-29.98	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	0.1660	24.27	19.51	3.78	9.75	34.02	29.26	13.53	65.15	55.15	-35.89	-41.62	P	
2	0.5780	30.20	26.33	17.87	9.74	39.94	36.07	27.61	56.00	46.00	-19.93	-18.39	P	
3	1.1660	24.56	10.63	-0.55	9.64	34.20	20.27	9.09	56.00	46.00	-35.73	-36.91	P	
4	1.4819	18.73	8.16	0.14	9.67	28.40	17.83	9.81	56.00	46.00	-38.17	-36.19	P	
5	4.9100	18.71	6.68	-1.11	9.62	28.33	16.30	8.51	56.00	46.00	-39.70	-37.49	P	
6	14.7340	23.21	13.38	3.00	10.00	33.21	23.38	13.00	60.00	50.00	-36.62	-37.00	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	120 kHz	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 table 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:

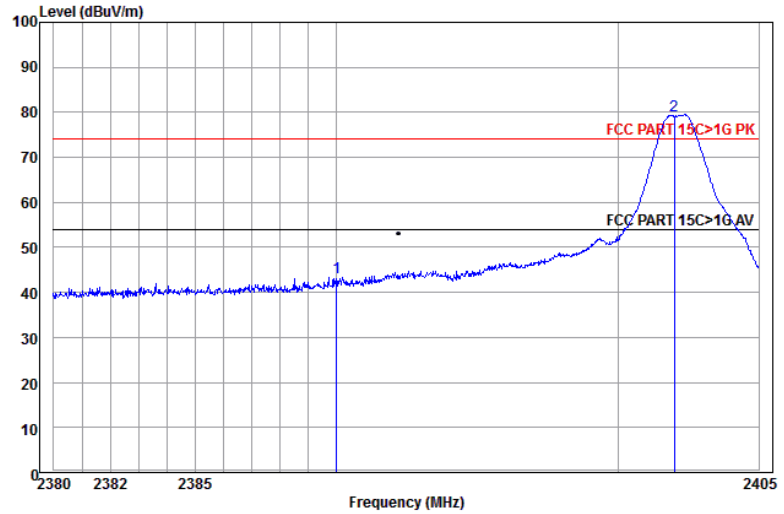
g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. . Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are 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 (dBuV/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

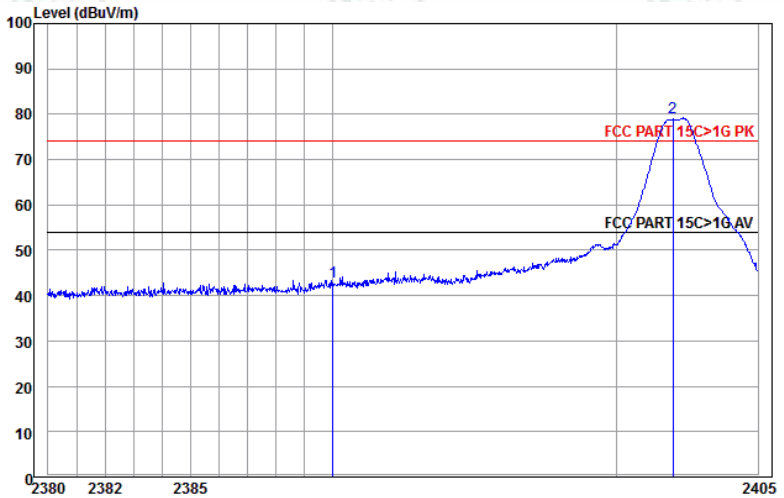
Test plot as follows:

Worse case mode:	GFSK		
Frequency: 2390.0MHz	Test channel: Lowest	Polarization: Horizontal	Remark: Peak



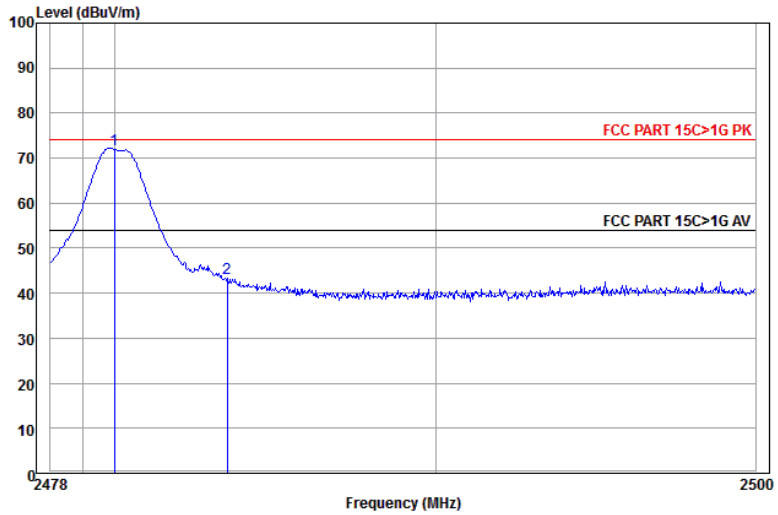
	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	44.03	3.07	51.80	43.37	74.00	-30.63	Horizontal	Peak
2 pp	2402.000	32.56	44.04	3.07	87.73	79.32	74.00	5.32	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2390.0MHz	Test channel: Lowest	Polarization: Vertical	Remark: Peak



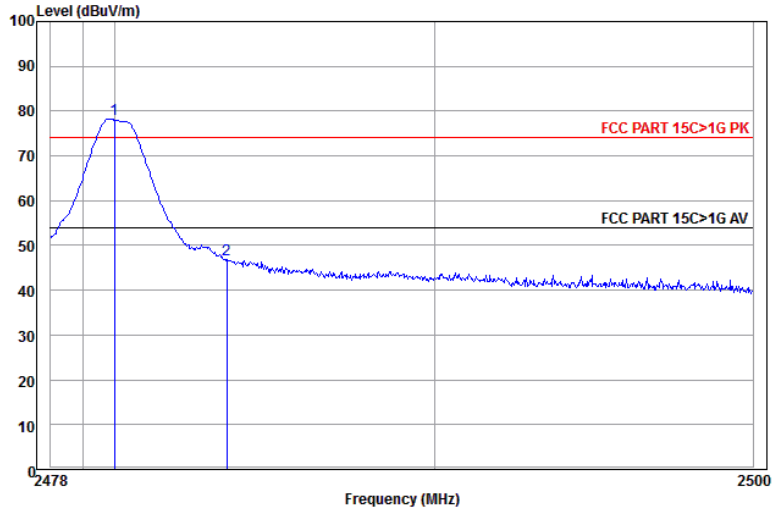
	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	44.03	3.07	51.61	43.18	74.00	-30.82	Vertical	Peak
2 pp	2402.000	32.56	44.04	3.07	87.57	79.16	74.00	5.16	Vertical	Peak

Worse case mode:	GFSK		
Frequency: 2483.5MHz	Test channel: Highest	Polarization: Horizontal	Remark: Peak



	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.000	32.71	44.14	3.12	80.19	71.88	74.00	-2.12	Horizontal	Peak
2	2483.500	32.71	44.14	3.12	51.69	43.38	74.00	-30.62	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2483.5MHz	Test channel: Highest	Polarization: Vertical	Remark: Peak



	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.000	32.71	44.14	3.12	86.52	78.21	74.00	4.21	Vertical	Peak
2	2483.500	32.71	44.14	3.12	55.31	47.00	74.00	-27.00	Vertical	Peak

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

Final Test Level =Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

Appendix 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	120 kHz	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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table 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 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
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 (dBuV/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

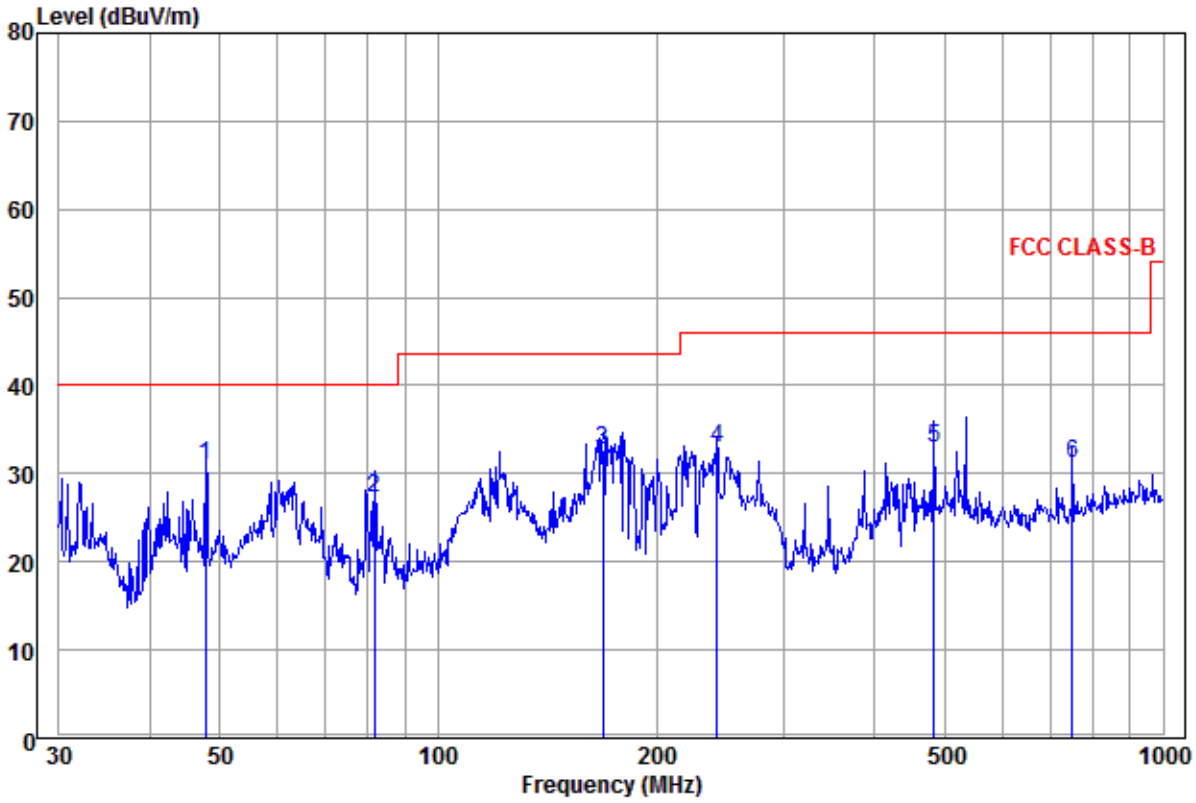
Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Radiated Spurious Emissions test Data:

Radiated Emission below 1GHz

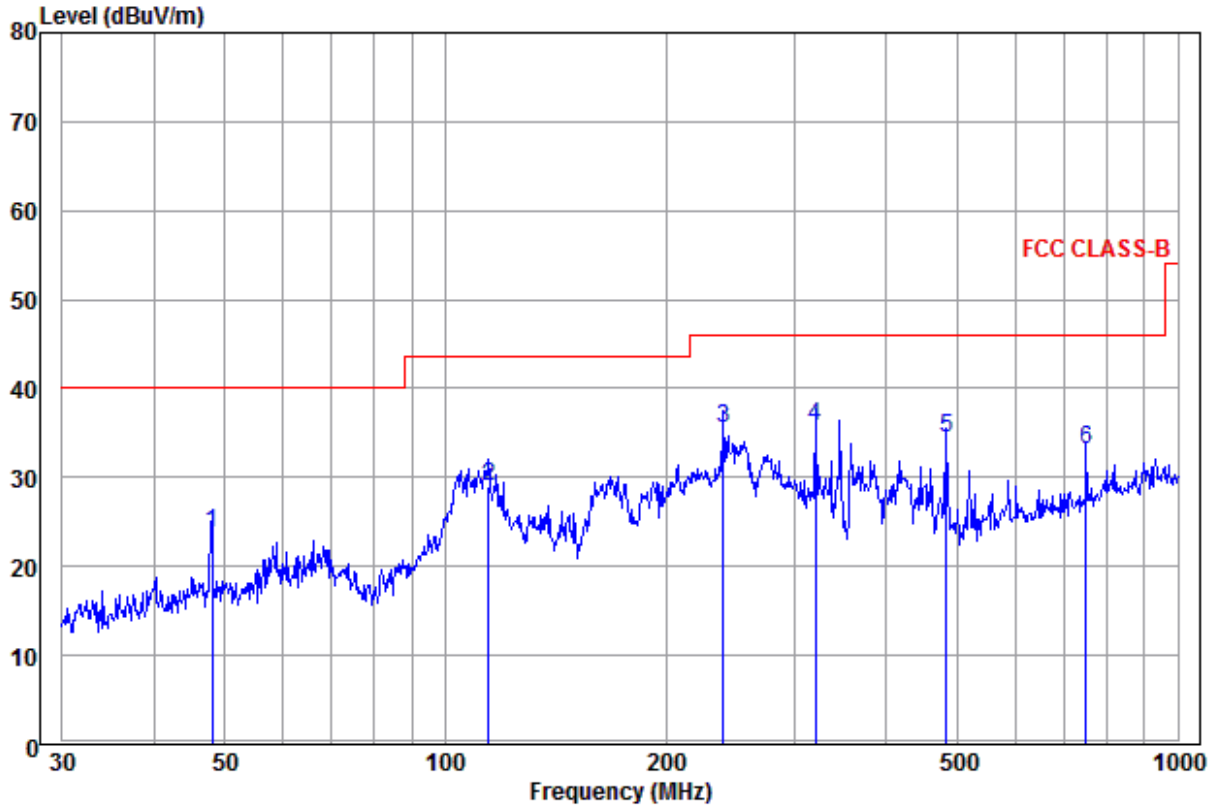
Test Model No.:ECH-c1-WLSD-C

30MHz~1GHz (QP)		
Test mode:	Transmitting	Vertical



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	47.826	13.12	0.10	17.74	30.96	40.00	-9.04	Vertical	QP
2	81.783	7.49	0.42	19.42	27.33	40.00	-12.67	Vertical	QP
3	169.005	9.13	0.81	22.81	32.75	43.50	-10.75	Vertical	QP
4	242.525	11.86	1.31	19.80	32.97	46.00	-13.03	Vertical	QP
5	483.910	16.92	1.50	14.57	32.99	46.00	-13.01	Vertical	QP
6	750.108	20.00	2.51	8.57	31.08	46.00	-14.92	Vertical	QP

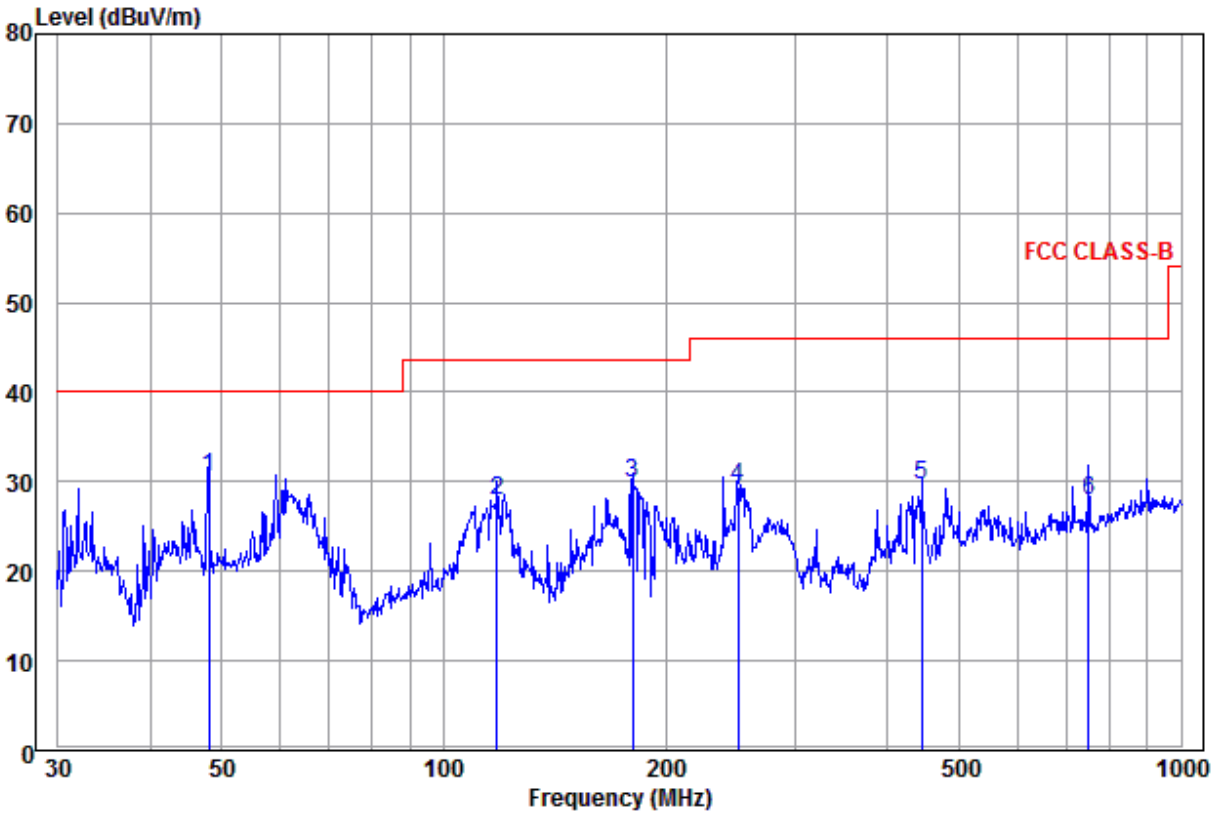
Test mode:	Transmitting	Horizontal



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	47.994	13.13	0.10	10.45	23.68	40.00	-16.32	Horizontal	QP
2	114.515	10.00	0.60	18.36	28.96	43.50	-14.54	Horizontal	QP
3	239.987	11.82	1.30	22.42	35.54	46.00	-10.46	Horizontal	QP
4 pp	319.937	13.92	1.17	20.57	35.66	46.00	-10.34	Horizontal	QP
5	483.910	16.92	1.50	16.09	34.51	46.00	-11.49	Horizontal	QP
6	750.108	20.00	2.51	10.60	33.11	46.00	-12.89	Horizontal	QP

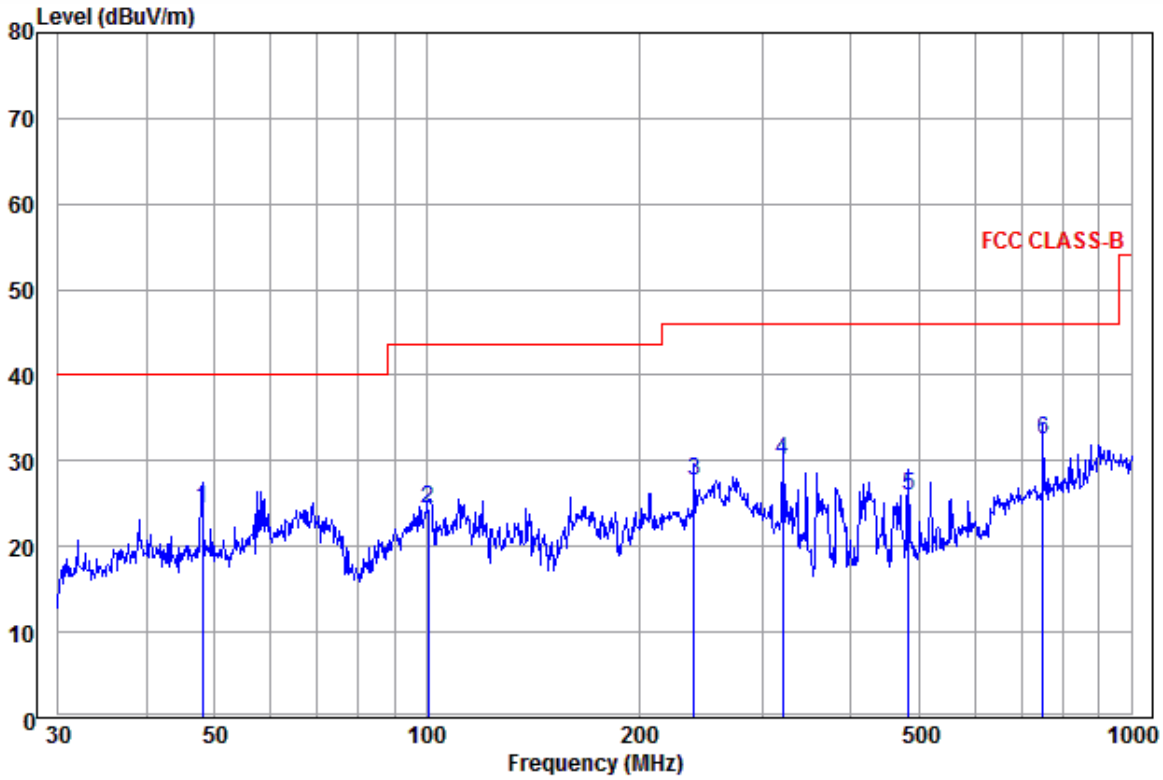
Test Model No.:ECH-c1-LSD-C

30MHz~1GHz (QP)		
Test mode:	Transmitting	Vertical



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	47.994	13.13	0.10	17.33	30.56	40.00	-9.44	Vertical	QP
2	118.186	9.74	0.60	17.65	27.99	43.50	-15.51	Vertical	QP
3	180.649	9.87	0.93	19.15	29.95	43.50	-13.55	Vertical	QP
4	251.180	12.04	1.33	16.05	29.42	46.00	-16.58	Vertical	QP
5	444.851	16.22	1.46	11.86	29.54	46.00	-16.46	Vertical	QP
6	750.108	20.00	2.51	5.35	27.86	46.00	-18.14	Vertical	QP

Test mode:	Transmitting	Horizontal



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	47.994	13.13	0.10	11.17	24.40	40.00	-15.60	Horizontal	QP
2	100.581	11.05	0.59	12.81	24.45	43.50	-19.05	Horizontal	QP
3	239.987	11.82	1.30	14.63	27.75	46.00	-18.25	Horizontal	QP
4	319.937	13.92	1.17	14.99	30.08	46.00	-15.92	Horizontal	QP
5	483.910	16.92	1.50	7.56	25.98	46.00	-20.02	Horizontal	QP
6 pp	750.108	20.00	2.51	9.97	32.48	46.00	-13.52	Horizontal	QP

Transmitter Emission above 1GHz

Test Model No.:ECH-c1-WLSD-C

Worse case mode:		GFSK		Test channel:		Lowest			
Frequency (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Cable Loss (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1201.000	30.23	44.38	1.86	45.60	33.31	74.00	-40.69	Pass	H
2443.622	32.64	44.09	3.10	44.85	36.50	74.00	-37.50	Pass	H
4804.000	34.69	44.60	5.98	45.35	41.42	74.00	-32.58	Pass	H
7206.000	36.42	44.77	6.97	43.84	42.46	74.00	-31.54	Pass	H
9608.000	37.88	45.58	6.98	43.22	42.50	74.00	-31.50	Pass	H
11782.550	39.54	44.88	10.58	42.44	47.68	74.00	-26.32	Pass	H
1201.000	30.23	44.38	1.86	45.43	33.14	74.00	-40.86	Pass	V
2352.076	32.46	43.98	3.05	44.97	36.50	74.00	-37.50	Pass	V
4804.000	34.69	44.60	5.98	48.74	44.81	74.00	-29.19	Pass	V
7206.000	36.42	44.77	6.97	46.64	45.26	74.00	-28.74	Pass	V
9608.000	37.88	45.58	6.98	43.02	42.30	74.00	-31.70	Pass	V
11963.890	39.59	44.90	10.84	42.94	48.47	74.00	-25.53	Pass	V

Worse case mode:		GFSK		Test channel:		Middle			
Frequency (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Cable Loss (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1222.743	30.28	44.35	1.90	44.83	32.66	74.00	-41.34	Pass	H
2076.259	31.88	43.61	2.89	44.76	35.92	74.00	-38.08	Pass	H
4880.000	34.85	44.60	6.13	44.95	41.33	74.00	-32.67	Pass	H
7320.000	36.43	44.87	6.85	42.94	41.35	74.00	-32.65	Pass	H
9760.000	38.05	45.55	7.12	43.20	42.82	74.00	-31.18	Pass	H
11872.880	39.56	44.89	10.71	42.41	47.79	74.00	-26.21	Pass	H
1273.572	30.40	44.28	1.97	44.26	32.35	74.00	-41.65	Pass	V
1814.218	31.42	43.67	2.65	45.02	35.42	74.00	-38.58	Pass	V
4880.000	34.85	44.60	6.13	45.92	42.30	74.00	-31.70	Pass	V
7320.000	36.43	44.87	6.85	47.15	45.56	74.00	-28.44	Pass	V
9760.000	38.05	45.55	7.12	41.64	41.26	74.00	-32.74	Pass	V
11515.680	39.46	44.85	10.20	42.15	46.96	74.00	-27.04	Pass	V

Worse case mode:		GFSK		Test channel:		Highest			
Frequency (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Cable Loss (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1213.441	30.26	44.37	1.88	44.23	32.00	74.00	-42.00	Pass	H
2102.853	31.93	43.65	2.90	45.38	36.56	74.00	-37.44	Pass	H
4960.000	35.02	44.60	6.29	44.49	41.20	74.00	-32.80	Pass	H
7440.000	36.45	44.97	6.73	42.80	41.01	74.00	-32.99	Pass	H
9920.000	38.22	45.52	7.26	41.88	41.84	74.00	-32.16	Pass	H
11842.690	39.55	44.88	10.67	41.92	47.26	74.00	-26.74	Pass	H
1260.670	30.37	44.30	1.95	44.80	32.82	74.00	-41.18	Pass	V
2081.550	31.89	43.62	2.89	44.69	35.85	74.00	-38.15	Pass	V
4960.000	35.02	44.60	6.29	49.19	45.90	74.00	-28.10	Pass	V
7440.000	36.45	44.97	6.73	45.87	44.08	74.00	-29.92	Pass	V
9920.000	38.22	45.52	7.26	43.71	43.67	74.00	-30.33	Pass	V
11752.600	39.53	44.88	10.54	42.12	47.31	74.00	-26.69	Pass	V

Test Model No.:ECH-c1-LSD-C

Worse case mode:		GFSK		Test channel:		Lowest			
Frequency (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Cable Loss (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1479.955	30.83	44.02	2.26	44.32	33.39	74.00	-40.61	Pass	H
3184.250	33.43	44.68	3.53	43.16	35.44	74.00	-38.56	Pass	H
4804.000	34.69	44.60	5.98	44.35	40.42	74.00	-33.58	Pass	H
7206.000	36.42	44.77	6.97	42.42	41.04	74.00	-32.96	Pass	H
9608.000	37.88	45.58	6.98	42.22	41.50	74.00	-32.50	Pass	H
11428.080	39.43	44.84	10.07	41.75	46.41	74.00	-27.59	Pass	H
1286.606	30.43	44.26	1.99	44.43	32.59	74.00	-41.41	Pass	V
3184.250	33.43	44.68	3.53	45.05	37.33	74.00	-36.67	Pass	V
4804.000	34.69	44.60	5.98	47.74	43.81	74.00	-30.19	Pass	V
7206.000	36.42	44.77	6.97	45.64	44.26	74.00	-29.74	Pass	V
9608.000	37.88	45.58	6.98	42.52	41.80	74.00	-32.20	Pass	V
11663.190	39.50	44.87	10.41	41.88	46.92	74.00	-27.08	Pass	V

Worse case mode:		GFSK		Test channel:		Middle			
Frequency (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Cable Loss (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1360.714	30.59	44.17	2.10	43.66	32.18	74.00	-41.82	Pass	H
1963.180	31.65	43.53	2.80	42.66	33.58	74.00	-40.42	Pass	H
4880.000	34.85	44.60	6.13	43.95	40.33	74.00	-33.67	Pass	H
7320.000	36.43	44.87	6.85	41.94	40.35	74.00	-33.65	Pass	H
9760.000	38.05	45.55	7.12	42.20	41.82	74.00	-32.18	Pass	H
11633.540	39.49	44.86	10.37	40.82	45.82	74.00	-28.18	Pass	H
1428.142	30.73	44.08	2.19	42.47	31.31	74.00	-42.69	Pass	V
2081.550	31.89	43.62	2.89	43.15	34.31	74.00	-39.69	Pass	V
4880.000	34.85	44.60	6.13	44.92	41.30	74.00	-32.70	Pass	V
7320.000	36.43	44.87	6.85	46.15	44.56	74.00	-29.44	Pass	V
9760.000	38.05	45.55	7.12	41.66	41.28	74.00	-32.72	Pass	V
12086.330	39.57	44.87	10.86	40.24	45.80	74.00	-28.20	Pass	V

Worse case mode:		GFSK		Test channel:		Highest			
Frequency (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Cable Loss (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1251.079	30.35	44.31	1.94	43.21	31.19	74.00	-42.81	Pass	H
2304.663	32.36	43.92	3.02	42.24	33.70	74.00	-40.30	Pass	H
4960.000	35.02	44.60	6.29	43.49	40.20	74.00	-33.80	Pass	H
7440.000	36.45	44.97	6.73	41.76	39.97	74.00	-34.03	Pass	H
9920.000	38.22	45.52	7.26	41.06	41.02	74.00	-32.98	Pass	H
12303.620	39.51	44.81	10.77	40.63	46.10	74.00	-27.90	Pass	H
1147.354	30.10	44.46	1.77	43.72	31.13	74.00	-42.87	Pass	V
2334.183	32.42	43.96	3.04	43.28	34.78	74.00	-39.22	Pass	V
4960.000	35.02	44.60	6.29	48.20	44.91	74.00	-29.09	Pass	V
7440.000	36.45	44.97	6.73	44.87	43.08	74.00	-30.92	Pass	V
9920.000	38.22	45.52	7.26	42.71	42.67	74.00	-31.33	Pass	V
12210.020	39.53	44.83	10.81	40.27	45.78	74.00	-28.22	Pass	V

Note:

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

Final Test Level =Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

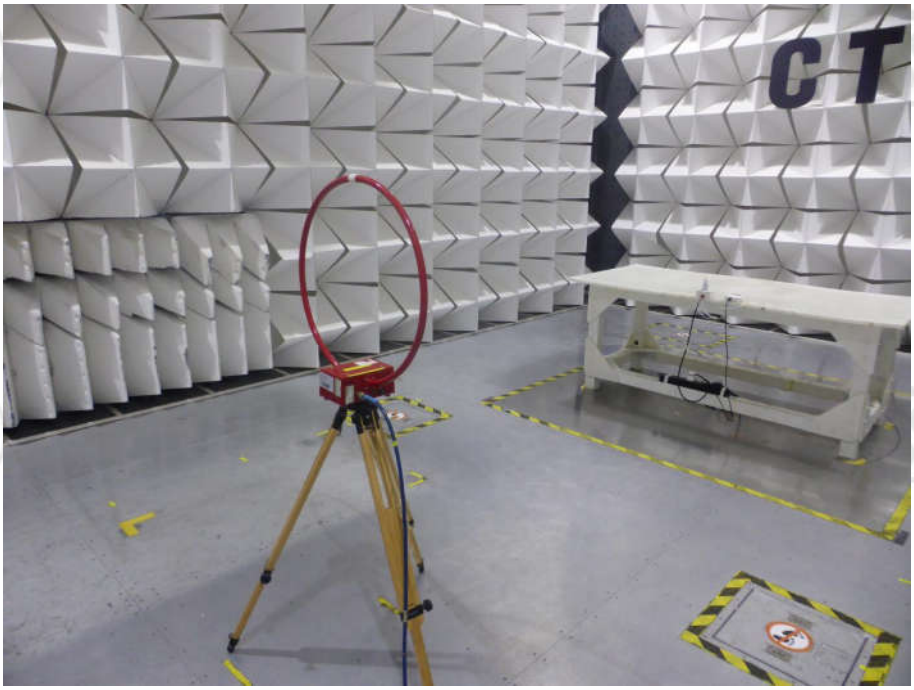
2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below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

PHOTOGRAPHS OF TEST SETUP

Test model No.:ECH-c1-WLSD-C

Radiated spurious emission Test Setup-1 (Below 1GHz)

Radiated spurious emission Test Setup-2(Above 1GHz)



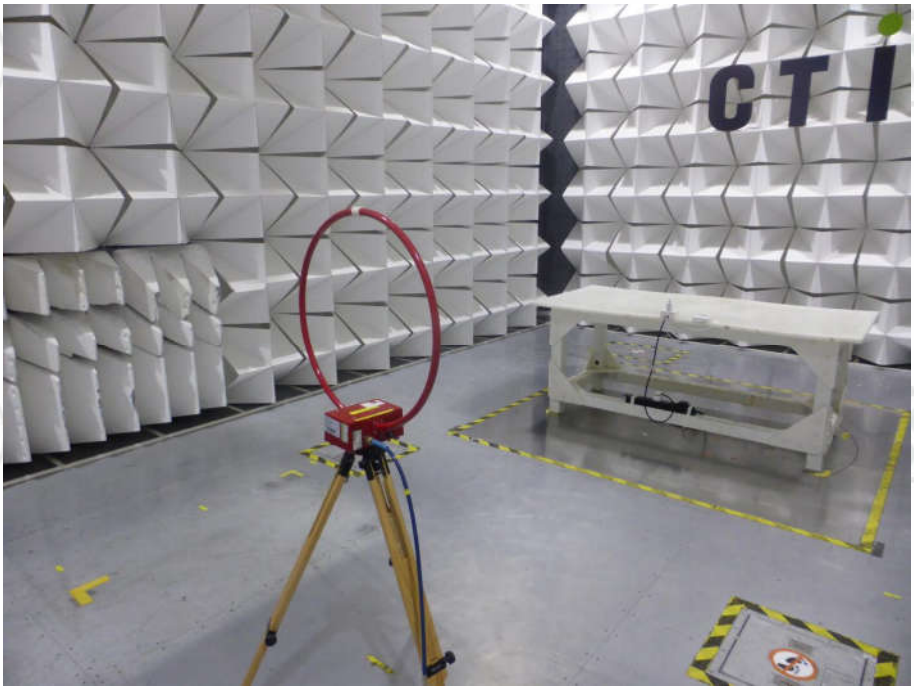
Radiated spurious emission Test Setup-3 (Below 30MHz)

Conducted Emissions Test Setup

Test model No.:ECH-c1-LSD-C

Radiated spurious emission Test Setup-1 (Below 1GHz)

Radiated spurious emission Test Setup-2(Above 1GHz)



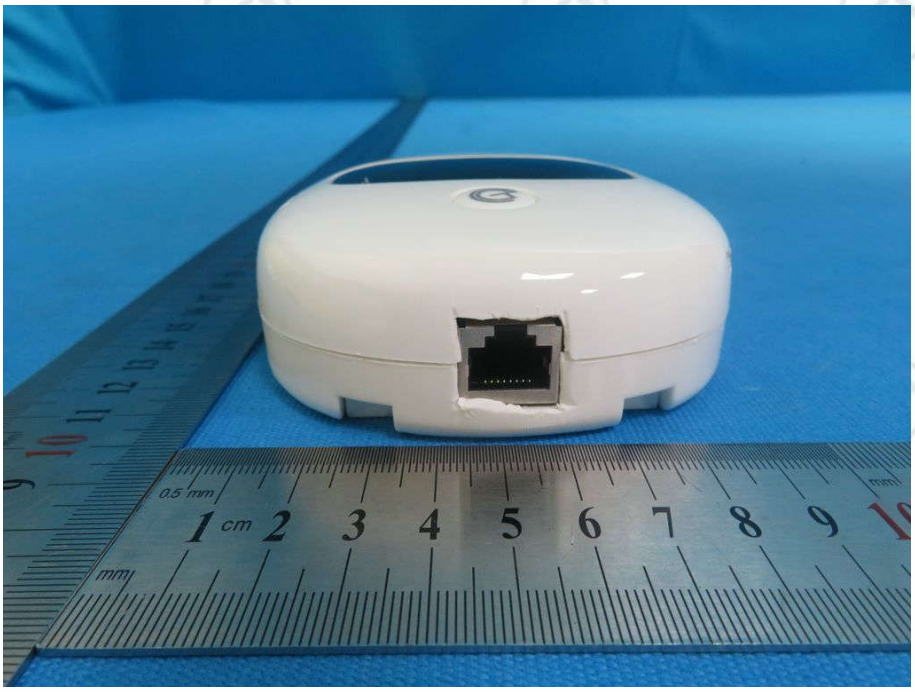
Radiated spurious emission Test Setup-3 (Below 30MHz)

PHOTOGRAPHS OF EUT Constructional Details

Test model No.:ECH-c1-WLSD-C

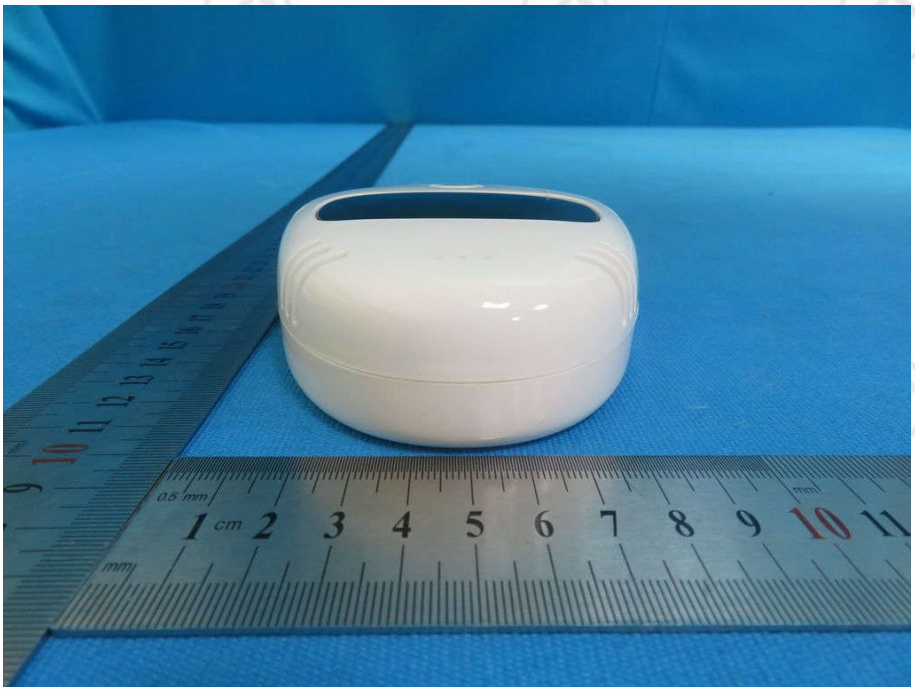
View of Product-1

View of Product-2



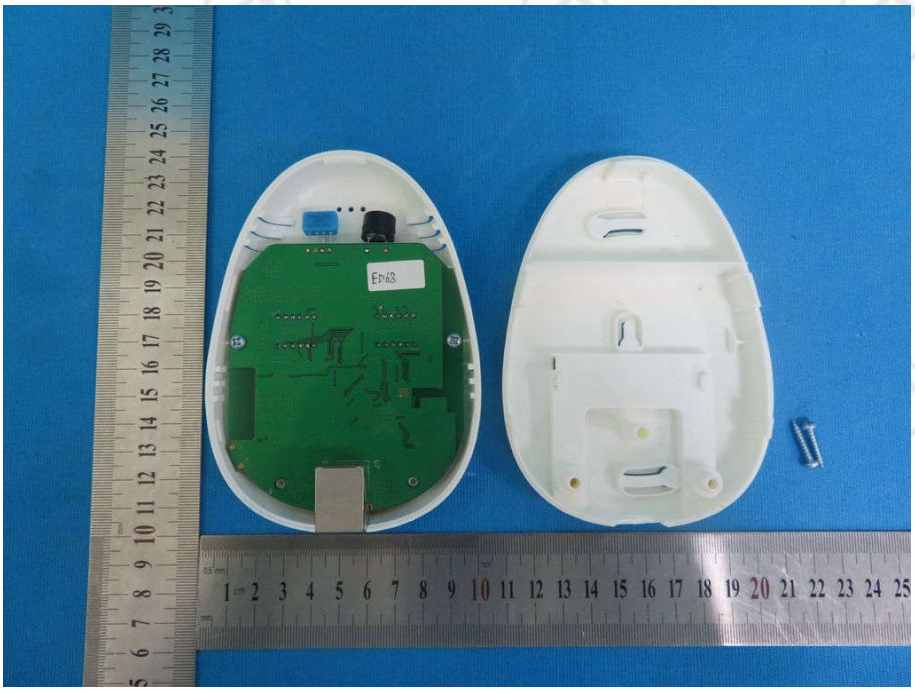
View of Product-3

View of Product-4

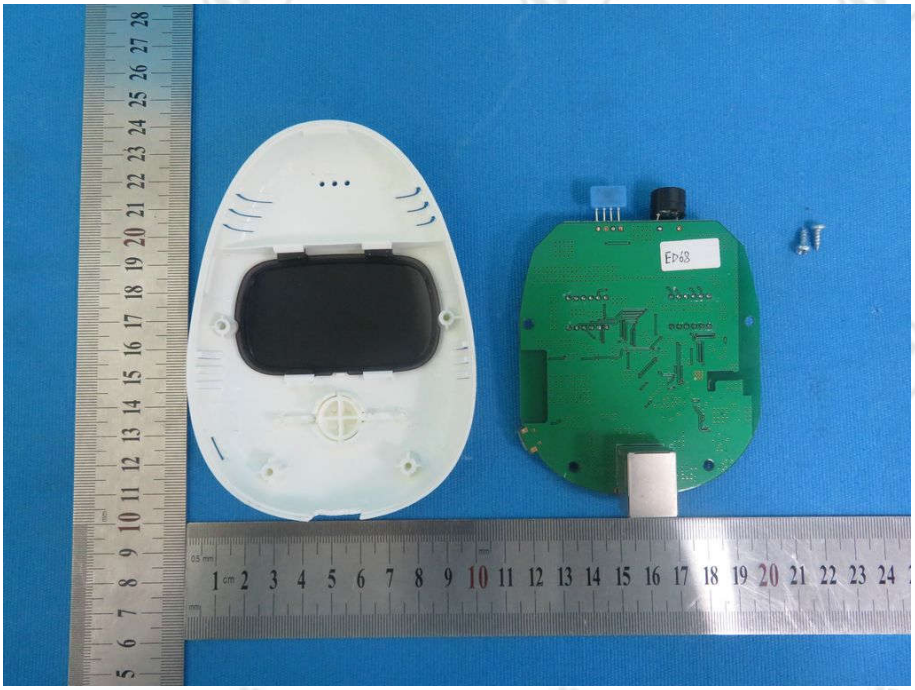


View of Product-5

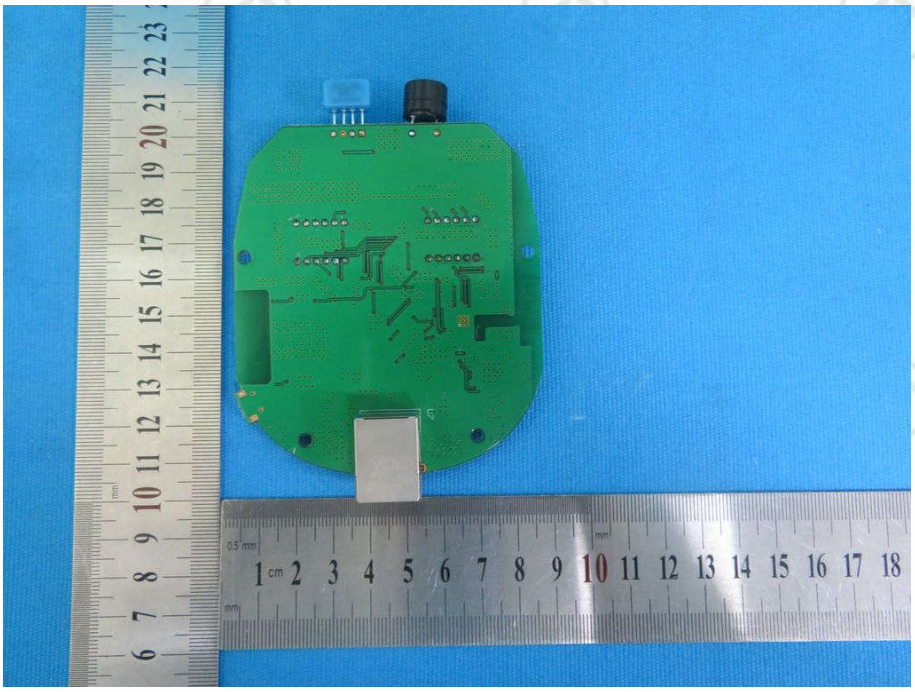
View of Product-6



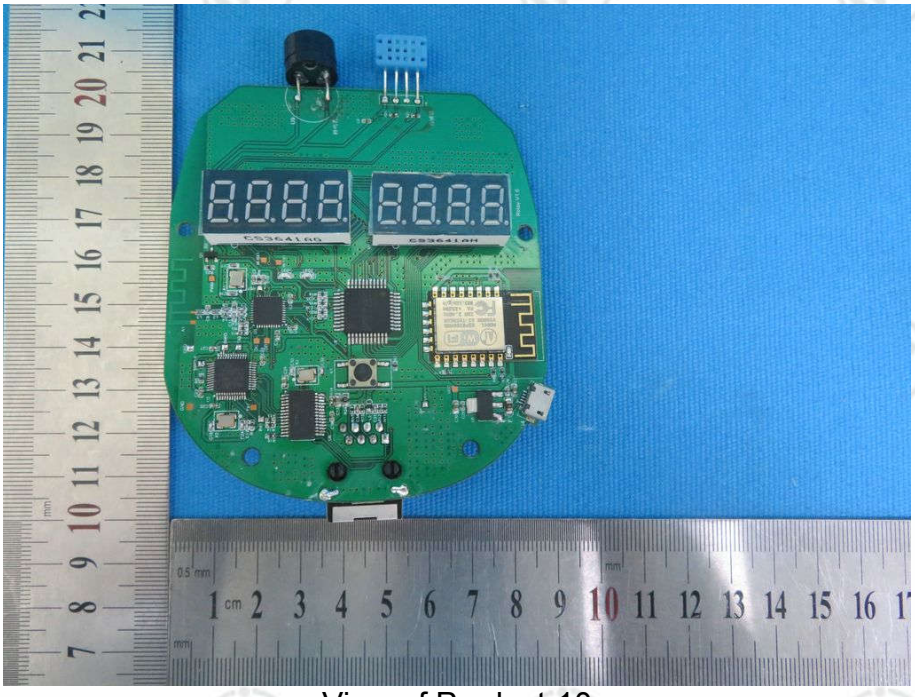
View of Product-7



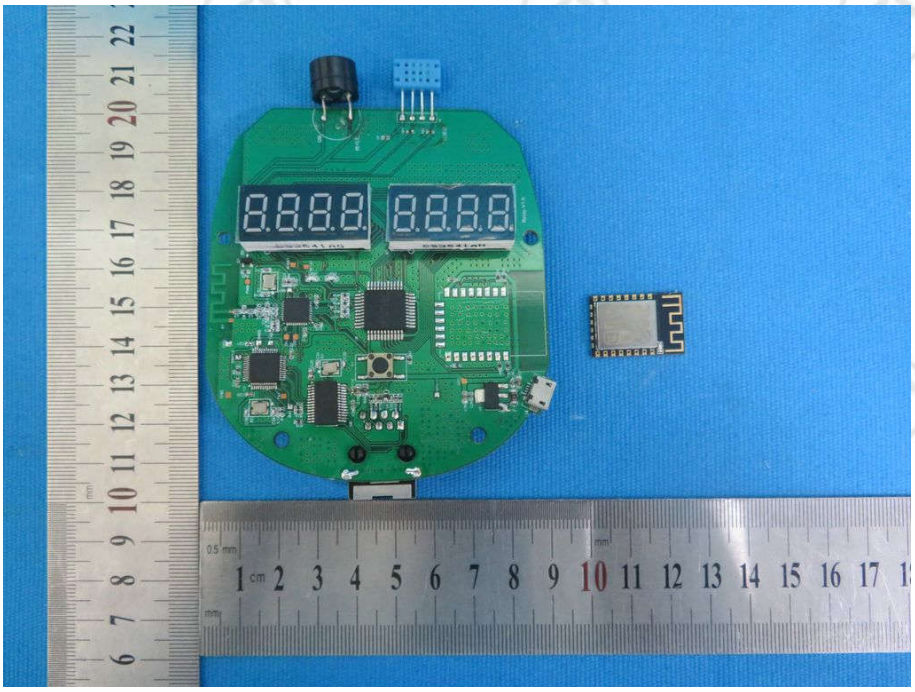
View of Product-8



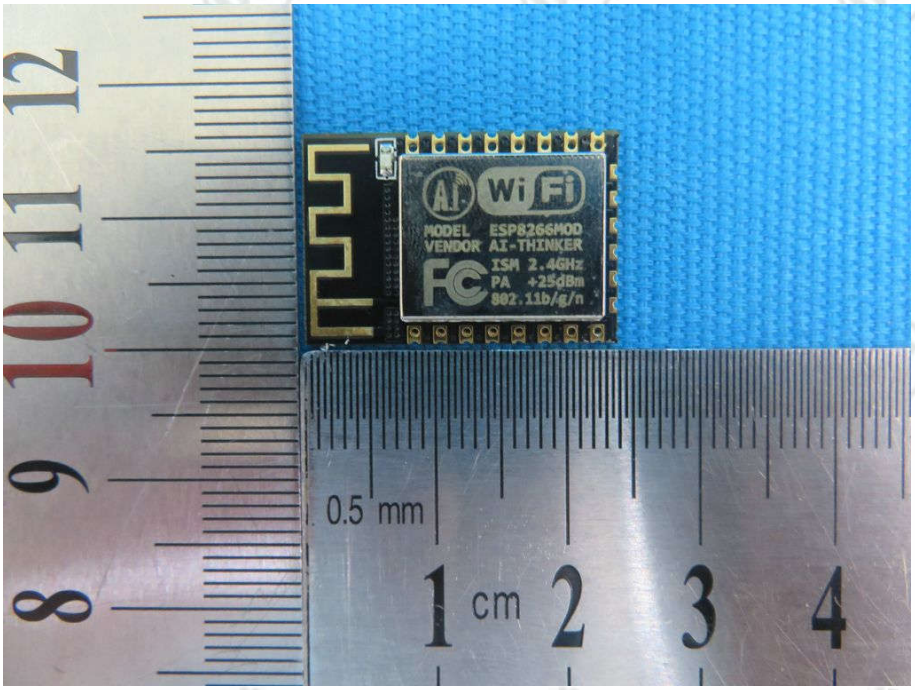
View of Product-9



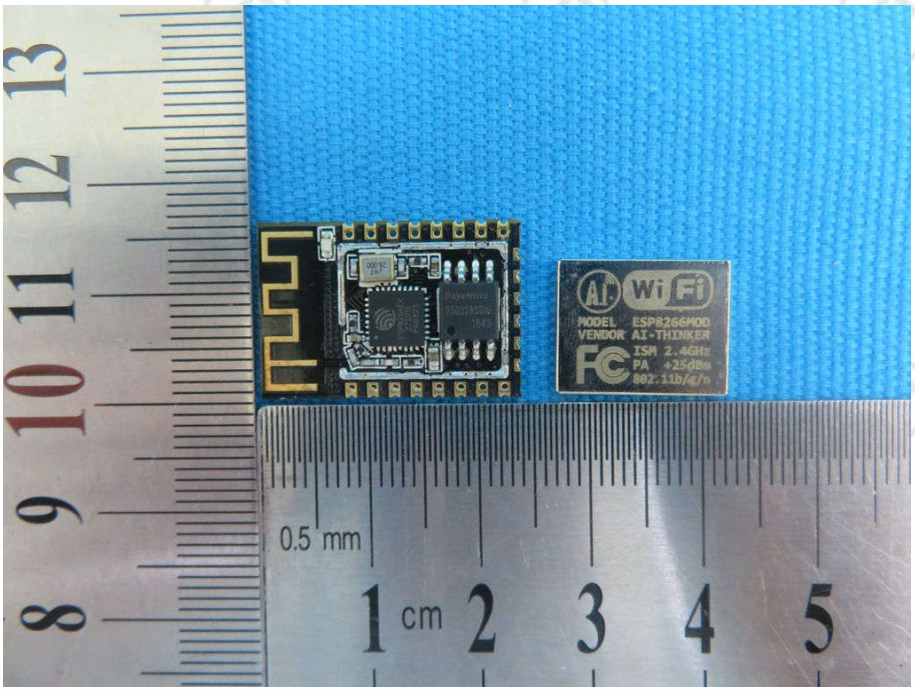
View of Product-10



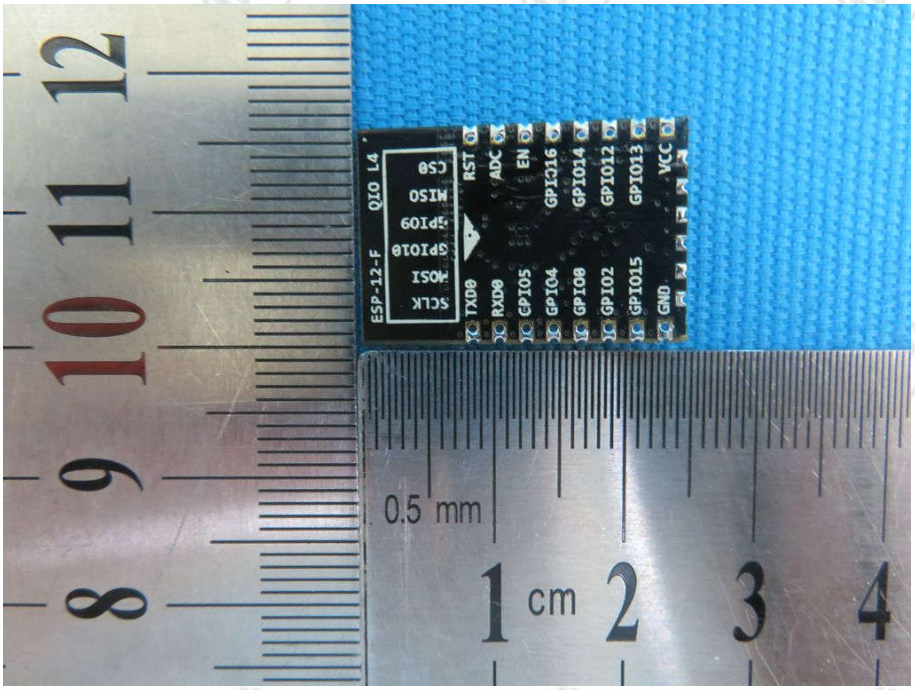
View of Product-11



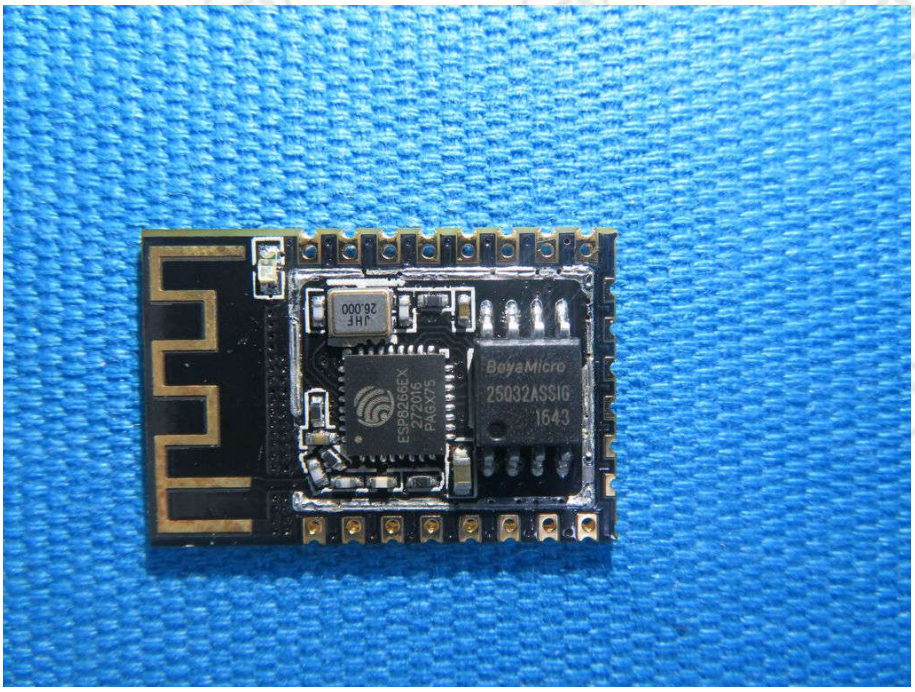
View of Product-12



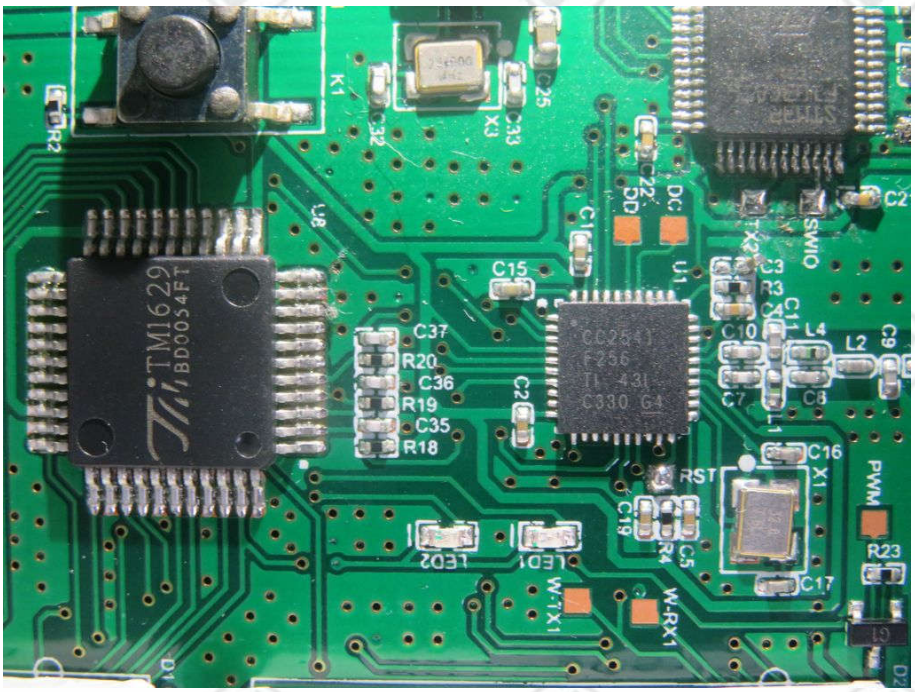
View of Product-13



View of Product-14



View of Product-15



View of Product-16

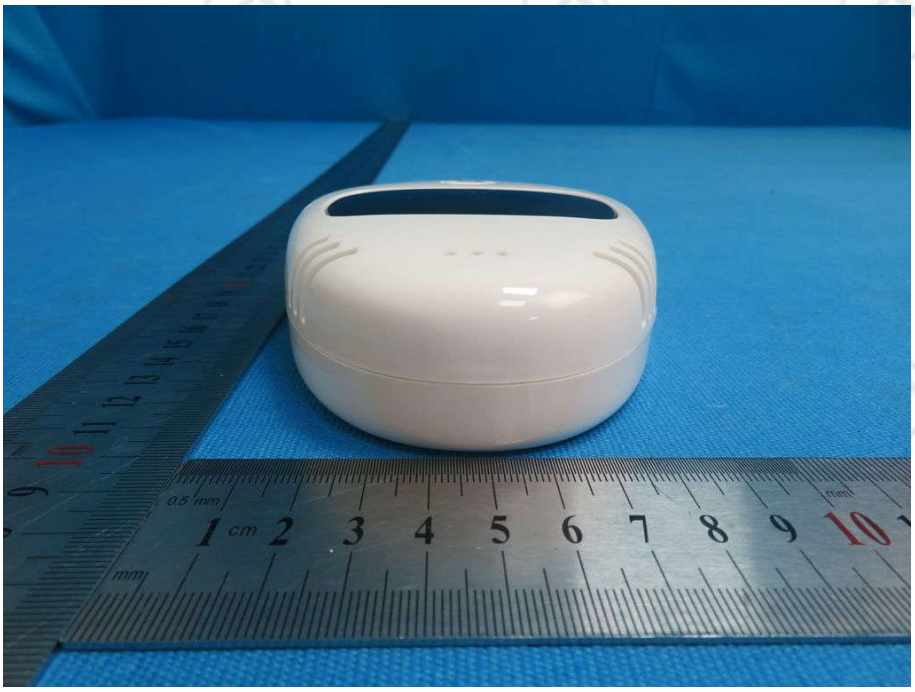
Test model No.: ECH-c1-LSD-C

View of Product-1

View of Product-2

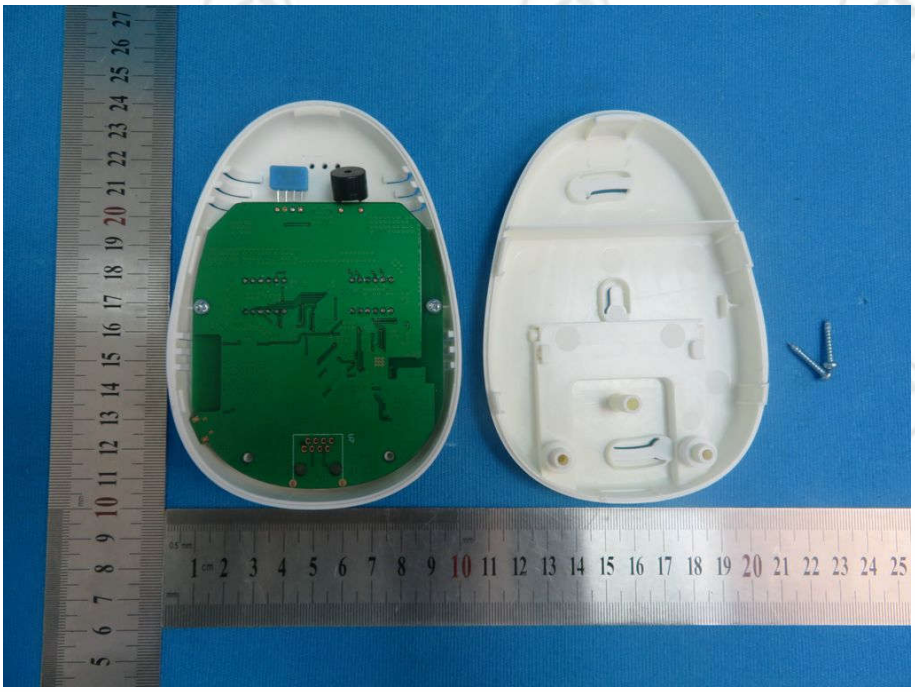
View of Product-3

View of Product-4



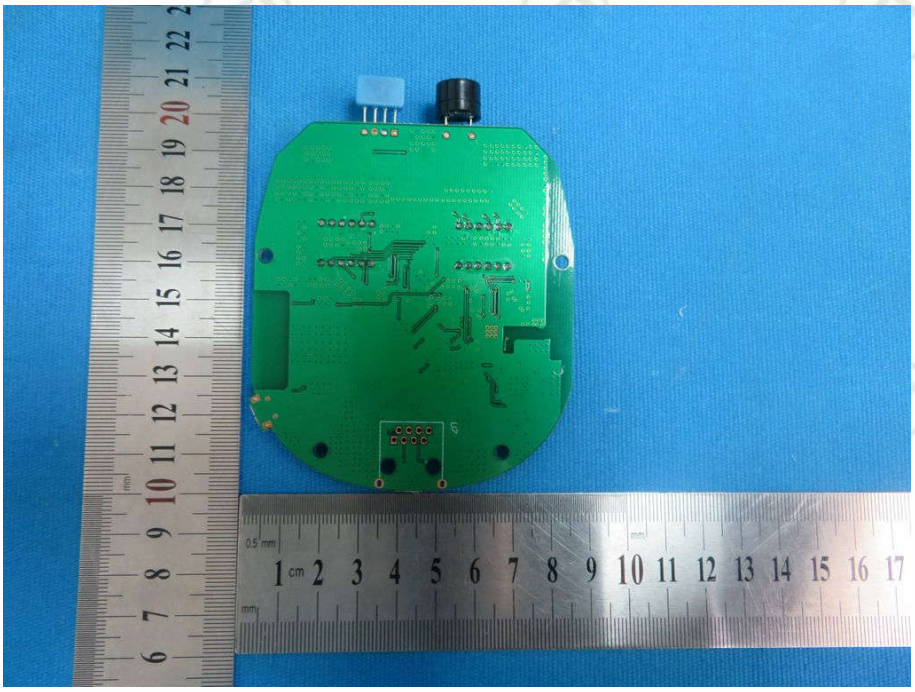
View of Product-5

View of Product-6

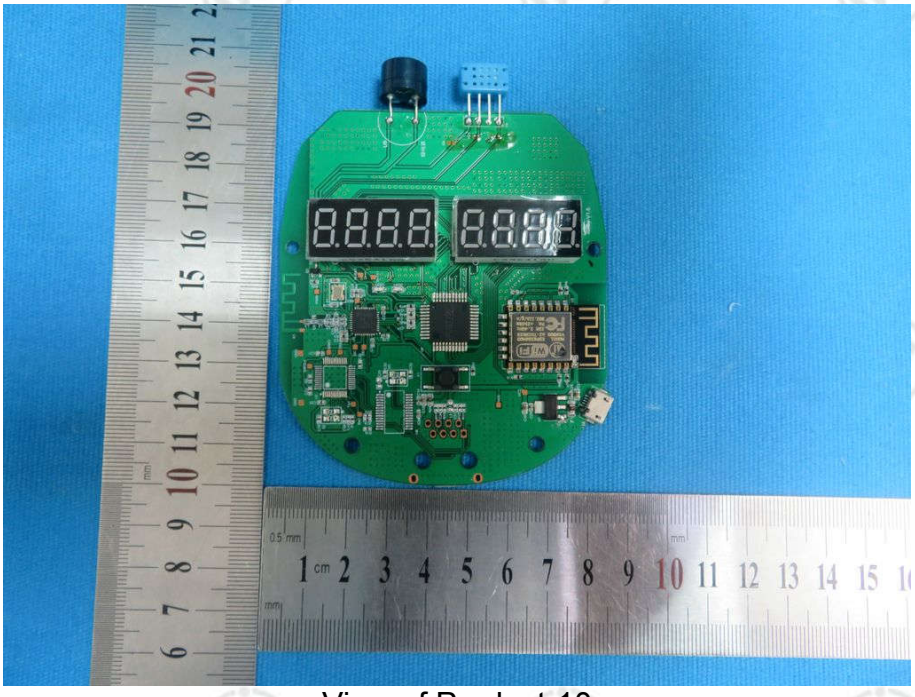


View of Product-7

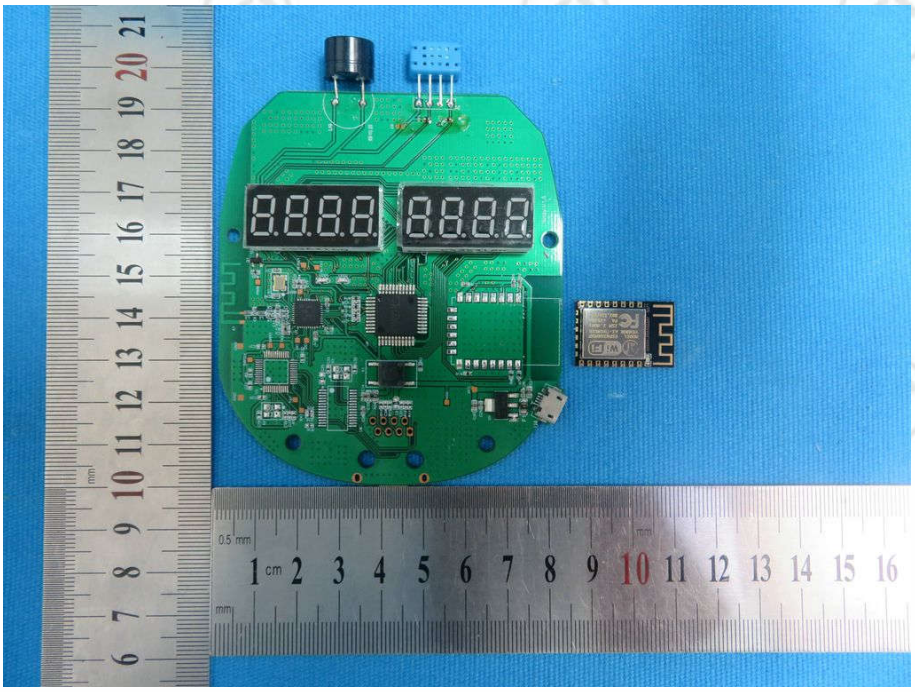
View of Product-8



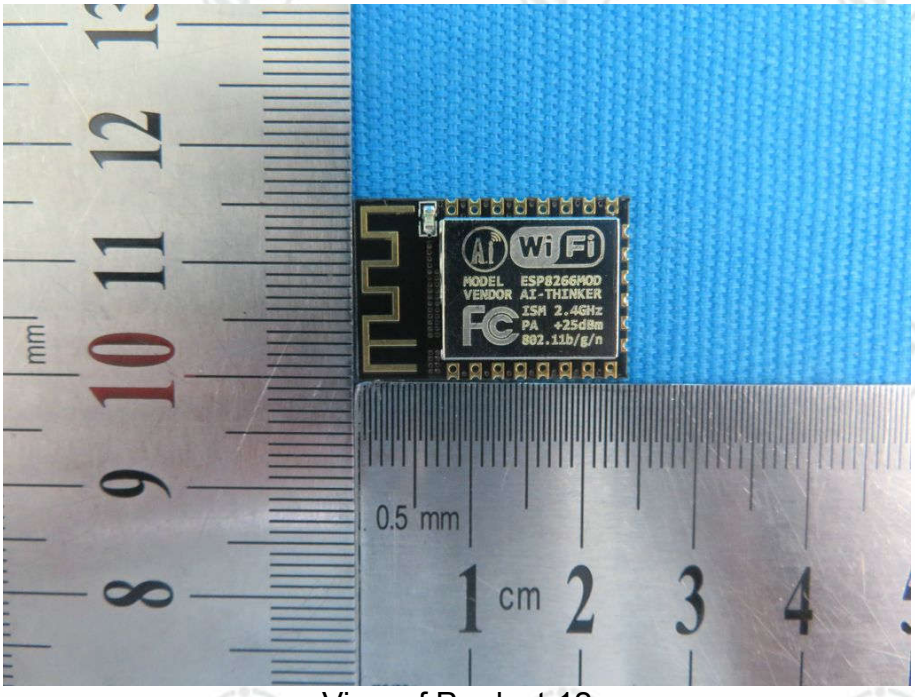
View of Product-9



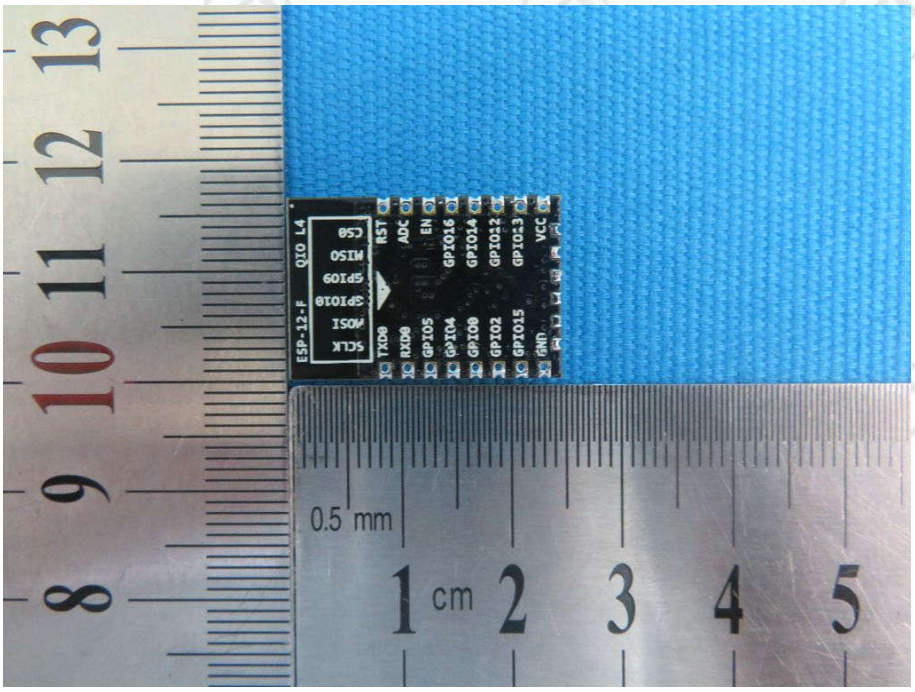
View of Product-10



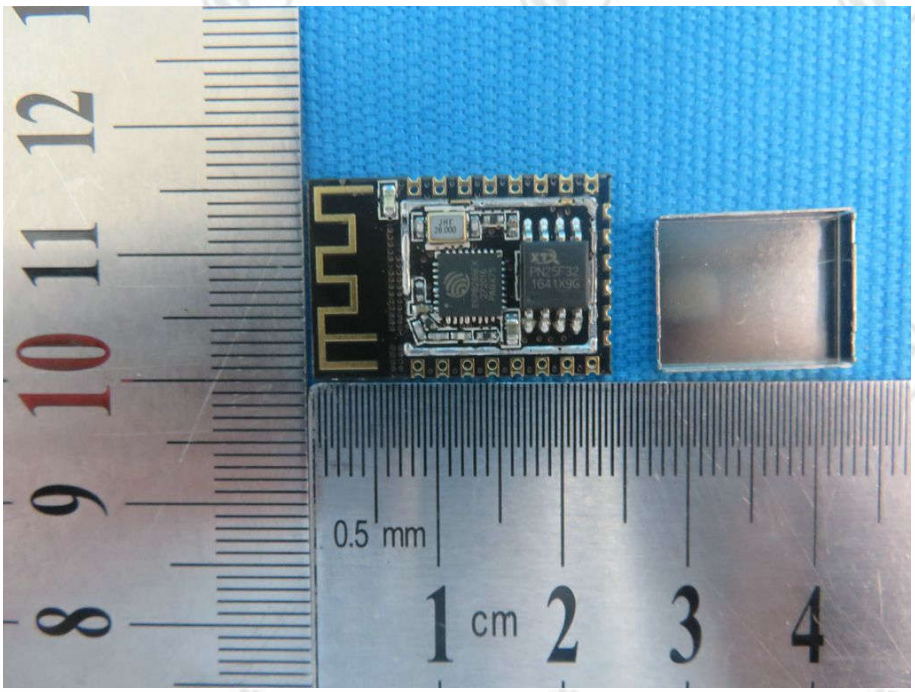
View of Product-11



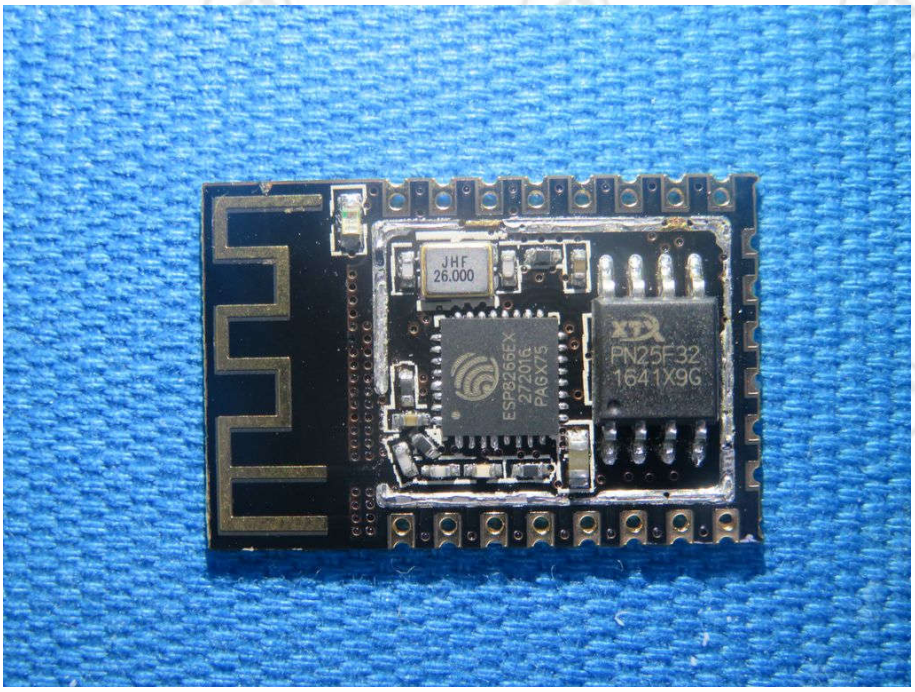
View of Product-12



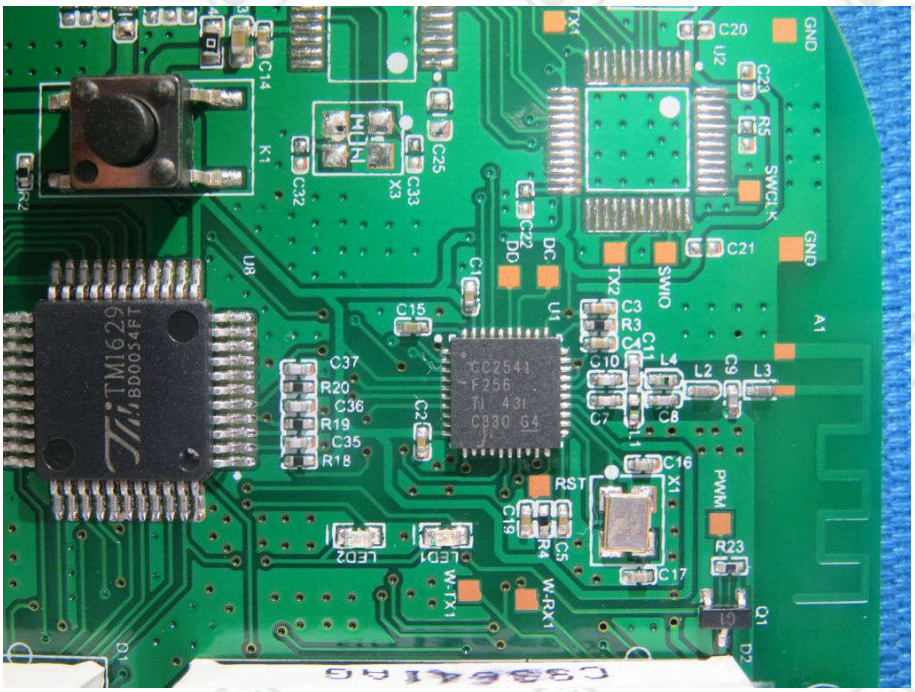
View of Product-13



View of Product-14



View of Product-15



View of Product-16

*** End of Report ***

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