

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640 Fax: +86-755-26648637 Website: www.cga-cert.com

+86-755-26648637 Report Template Version: V03
: www.cqa-cert.com Report Template Revision Date: Mar.1st, 2017

FCC Test Report

Report No.: CQASZ20180700089E-01

Applicant: FUZHOU EMAX ELECTRONIC CO., LTD

Address of Applicant: Building #12-#16, CangShan Industrial Area, JuYuanZhou JinShan District,

FuZhou, China.

Manufacturer: FUZHOU EMAX ELECTRONIC CO., LTD

Address of Manufacturer: Building #12-#16, CangShan Industrial Area, JuYuanZhou JinShan District,

FuZhou, China.

Equipment Under Test (EUT):

Product: Smart Cooking Thermometer

Model No.: EM2255, SM55

Test Model No.: EM2255

Brand Name: N/A

FCC ID: WEC-EM2255

 Standards:
 47 CFR Part 15, Subpart C

 Date of Test:
 2018-07-30 to 2018-08-02

Date of Issue: 2018-08-02

Test Result : PASS*

Tested By:

Martin Let

Reviewed By:

(Jack Ai)

(Martin Lee)

Approved By:

(Jack Ai)



The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

^{*} In the configuration tested, the EUT complied with the standards specified above.





1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20180700089E-01	Rev.01	Initial report	2018-08-02



2 Test Summary

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

N/A: Not Applicable, the EUT was working by battery.



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4 General Information

4.1 Client Information

Applicant:	FUZHOU EMAX ELECTRONIC CO., LTD	
Address of Applicant:	Building #12-#16, CangShan Industrial Area, JuYuanZhou JinSha District, FuZhou, China.	
Manufacturer:	FUZHOU EMAX ELECTRONIC CO., LTD	
Address of Manufacturer:	Building #12-#16, CangShan Industrial Area, JuYuanZhou JinShan District, FuZhou, China.	

4.2 General Description of EUT

Product Name:	Smart Cooking Thermometer
Model No.:	EM2255, SM55
Test Model No.:	EM2255
Trade Mark:	N/A
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Type:	GFSK
Number of Channel:	40
Sample Type:	Portable production
Test Software of EUT:	CC2541_BLE-Device Control Panel (manufacturer declare)
Antenna Type:	Integral antenna
Antenna Gain:	2.0dBi
EUT Power Supply:	2*AA DC3V

Note:

All model: EM2255, SM55

Only the model EM2255 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.



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

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel (CH0)	2402MHz
The middle channel (CH19)	2440MHz
The highest channel (CH39)	2480MHz



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4.3 Test Environment

Operating Environment	Operating Environment:		
Temperature:	25.0 °C		
Humidity:	53 % RH		
Atmospheric Pressure:	1010mbar		
Test Mode:	Use test software (CC2541_BLE-Device Control Panel) to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.		
	Note: In the process of transmitting of EUT, the duty cycle >98%.		

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
PC	Lenovo	ThinkPad E450c	Provide by lab	ID

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** guality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

Test	Range	Uncertainty	Notes
Radiated Emission	Below 1GHz	±5.12dB	(1)
Radiated Emission	Above 1GHz	±4.60dB	(1)
Conducted Disturbance	0.15~30MHz	±3.34dB	(1)

⁽¹⁾This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.6 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China



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4.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations: IC Registration No.: 22984-1

The 3m Semi-anechoic chamber of Shenzhen Huaxia Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

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

• CNAS (No. CNAS L5785)

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

A2LA (Certificate No. 4742.01)

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• FCC Registration No.: 522263

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen 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 No.:522263

4.8 Deviation from Standards

None.

4.9 Other Information Requested by the Customer

None.





4.10Equipment List

				Instrument	Calibration
Item	Test Equipment	Manufacturer	Model No.	No.	Due Date
1	EMI Test Receiver	R&S	ESR7	CQA-005	2018/9/24
2	Spectrum analyzer	R&S	FSU26	CQA-038	2018/9/24
			AFS4-		
3	Preamplifier	MITEQ	00010300-18-	CQA-035	2018/9/24
			10P-4		
			AMF-6D-		
4	Preamplifier	MITEQ	02001800-29-	CQA-036	2018/9/24
			20P		
5	Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2019/3/21
6	Bilog Antenna	R&S	HL562	CQA-011	2018/9/24
7	Horn Antenna	R&S	HF906	CQA-012	2018/9/24
8	Horn Antenna	R&S	BBHA 9170	CQA-088	2018/9/24
	Coax cable	000	DE 1 04	004.077	0040/0/04
9	(9KHz~40GHz)	CQA	RE-low-01	CQA-077	2018/9/24
40	Coax cable		DE List 00	004.070	0040/0/04
10	(9KHz~40GHz)	CQA	RE-high-02	CQA-078	2018/9/24
11	Antenna Connector	CQA	RFC-01	CQA-080	2018/9/24
12	Power divider	CQA	PWD-2533- 02-SMA-79	CQA-067	2018/9/29
13	RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2018/9/24
14	EMI Test Receiver	R&S	ESPI3	CQA-005	2018/9/24
15	LISN	R&S	ENV216	CQA-003	2018/9/24
16	Coaxial cable (9KHz~300MHz)	CQA	N/A	CQA-C009	2018/10/17

Note:

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





5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement: 47 CFR Part 15C Section 15.203 /247(c)

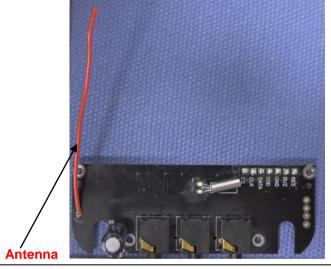
15.203 requirement:

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:

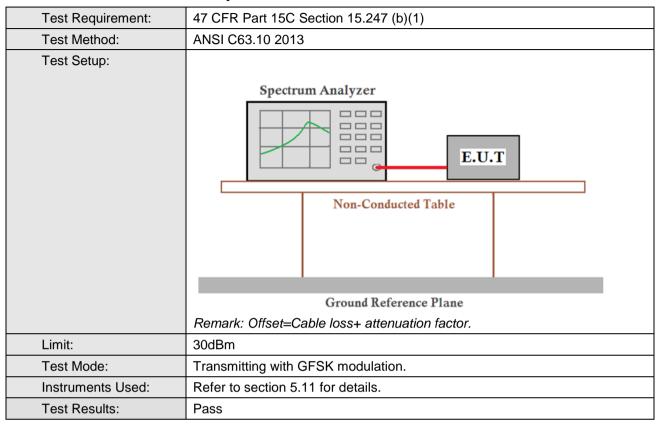


The antenna is integral antenna. The best case gain of the antenna is 2.0dBi.





5.2 Conducted Peak Output Power

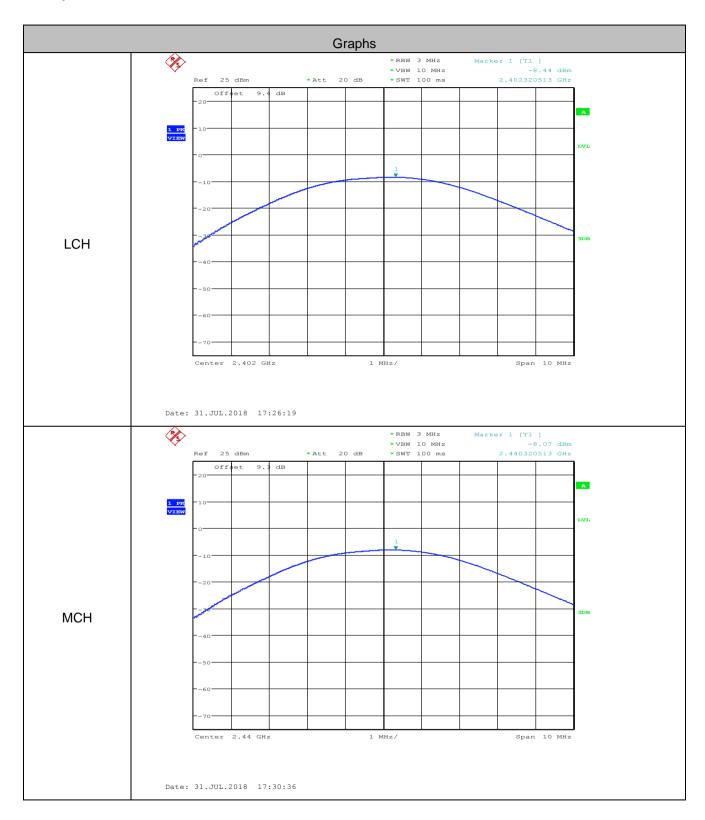


Measurement Data

GFSK mode					
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result		
Lowest	-8.44	30.00	Pass		
Middle	-8.07	30.00	Pass		
Highest	-7.53	30.00	Pass		



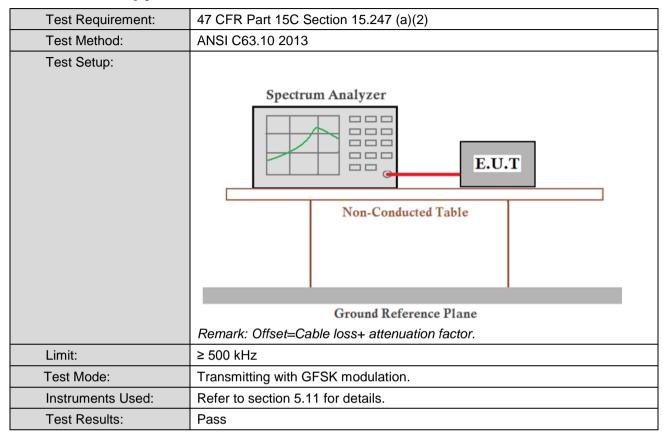
Test plot as follows:







5.3 6dB Occupy Bandwidth

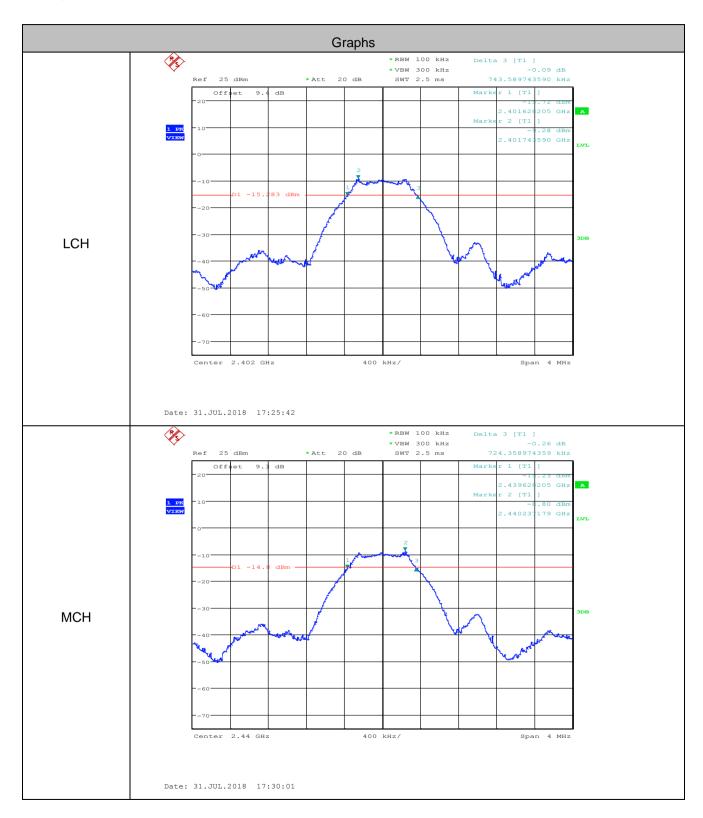


Measurement Data

	GFSK mode								
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result						
Lowest	0.744	≥500	Pass						
Middle	0.724	≥500	Pass						
Highest	0.731	≥500	Pass						



Test plot as follows:

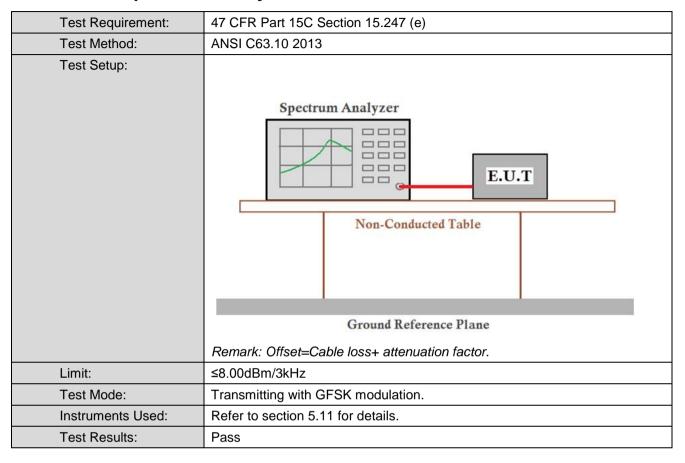








5.4 Power Spectral Density

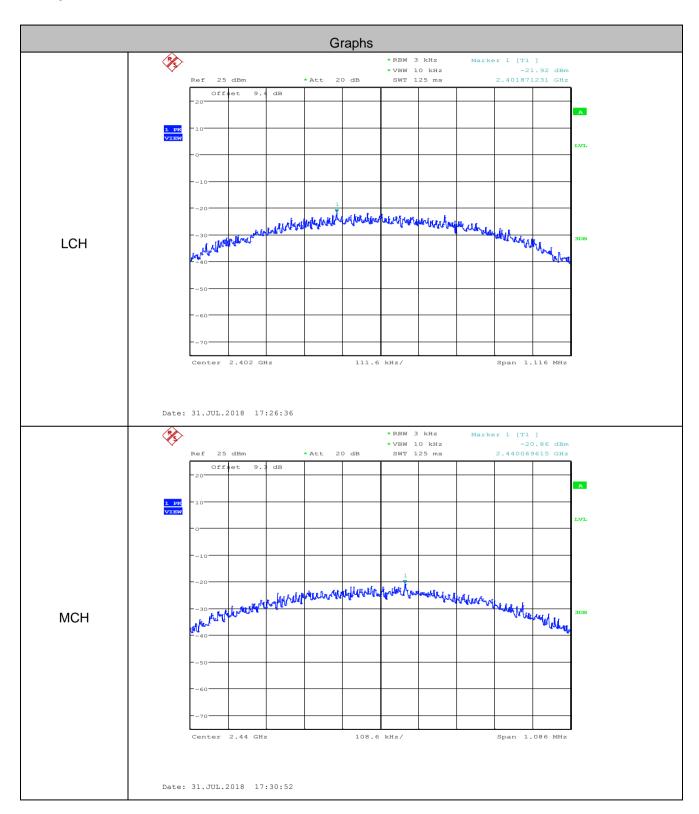


Measurement Data

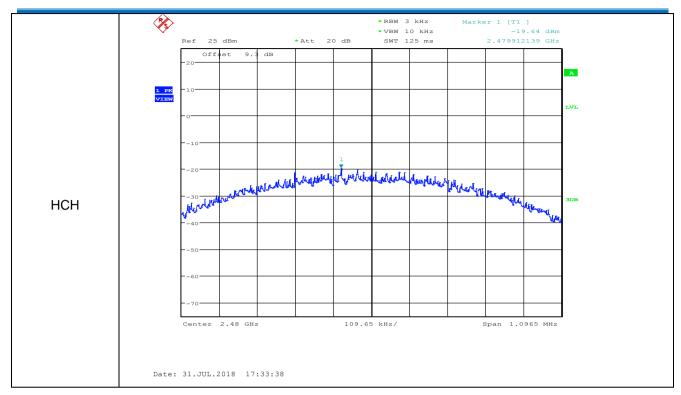
	GFSK mode									
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result							
Lowest	-21.920	≤8.00	Pass							
Middle	-20.860	≤8.00	Pass							
Highest	-19.640	≤8.00	Pass							



Test plot as follows:



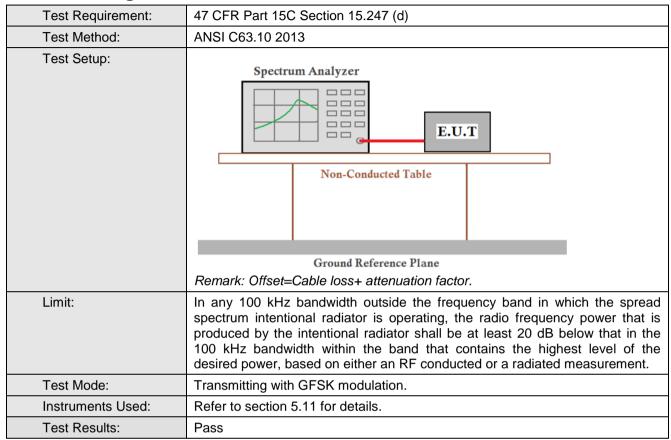








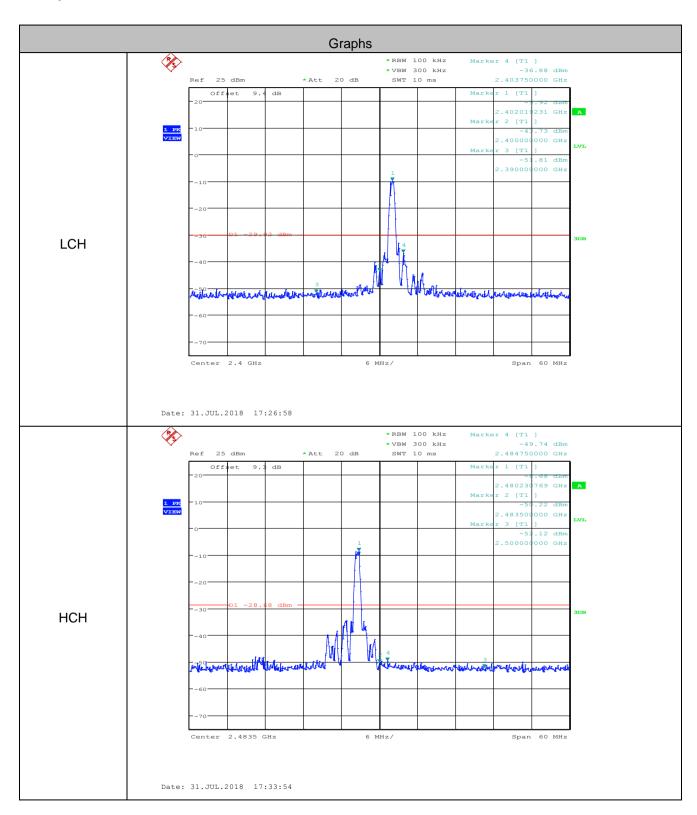
5.5 Band-edge for RF Conducted Emissions



GFSK mode									
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dDm)	Result					
Chamilei	Frequency(MHZ)	Emission Level(abm)	Limit(dBm)	Resuit					
Lowest	2400	-43.730	-29.92	Pass					
Highest	2483.5	-50.220	-28.68	Pass					



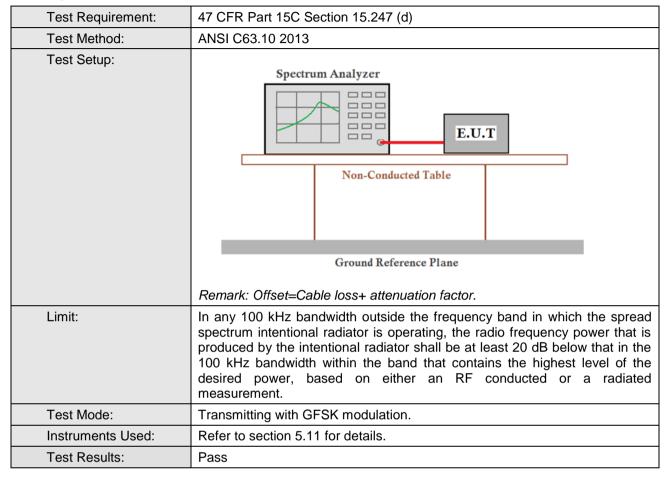
Test plot as follows:





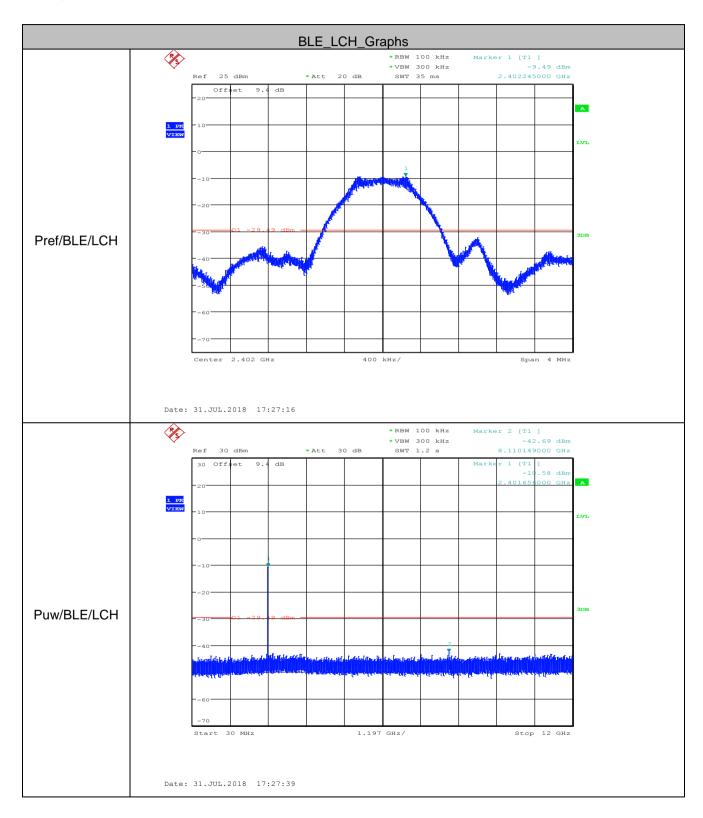


5.6 Spurious RF Conducted Emissions

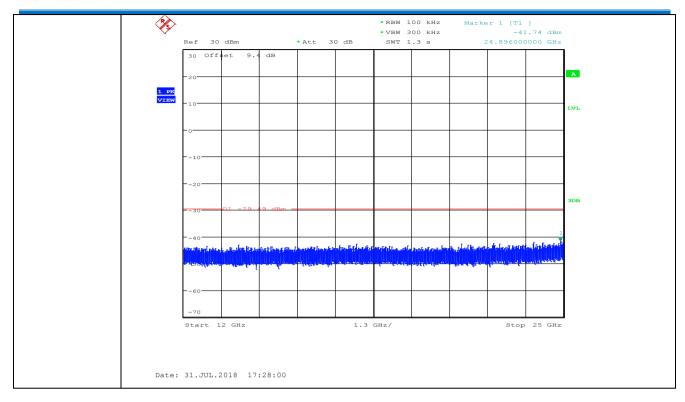


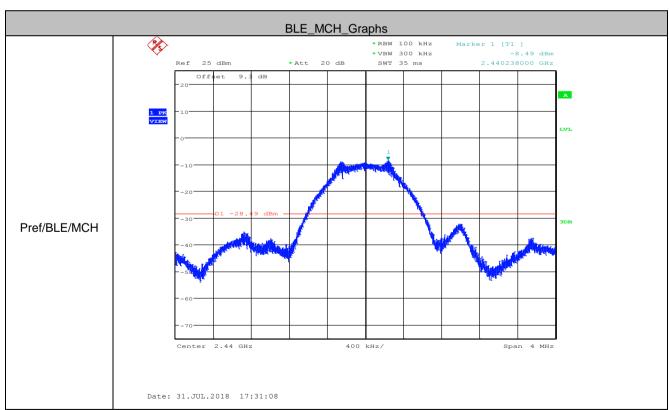


Test plot as follows:

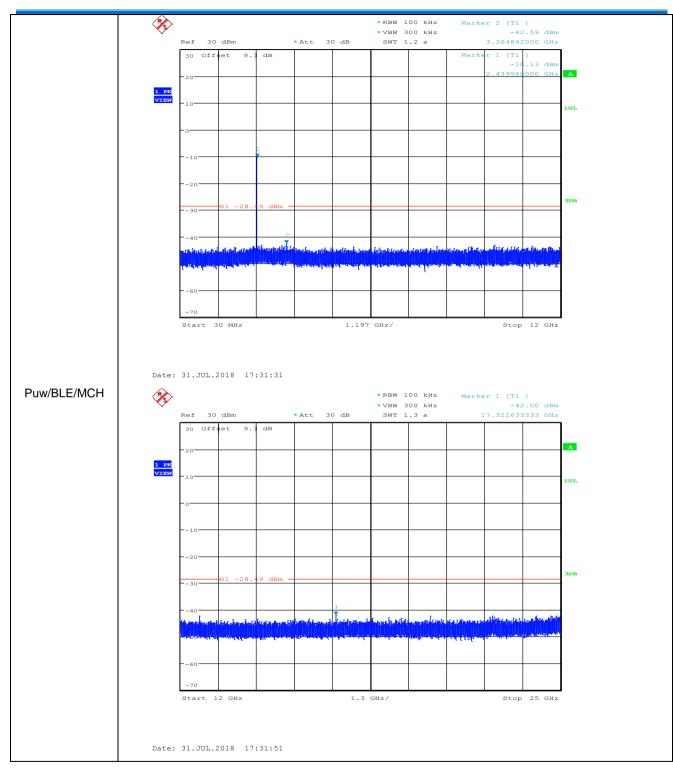




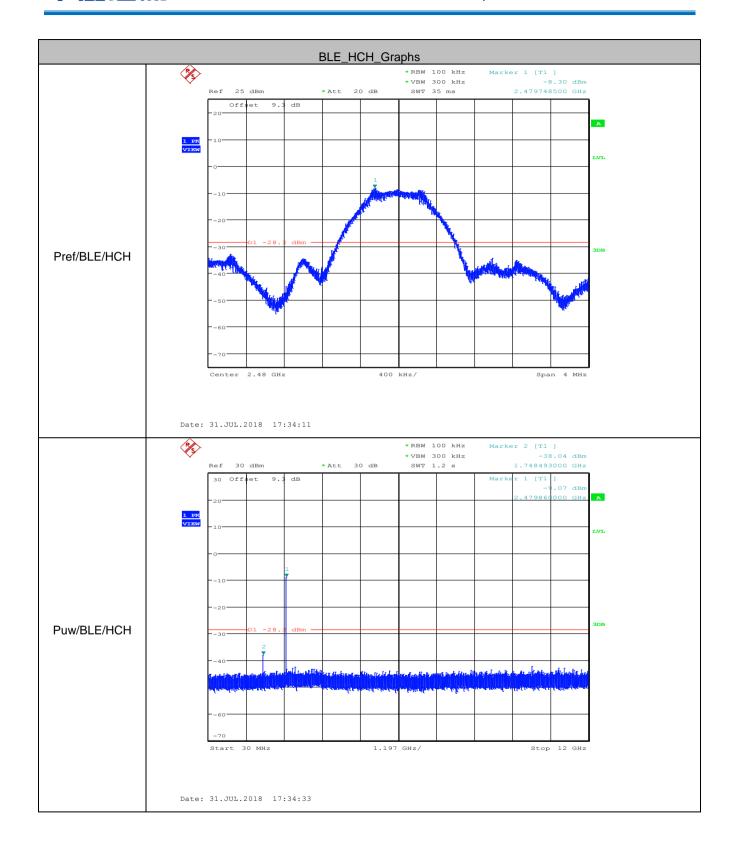






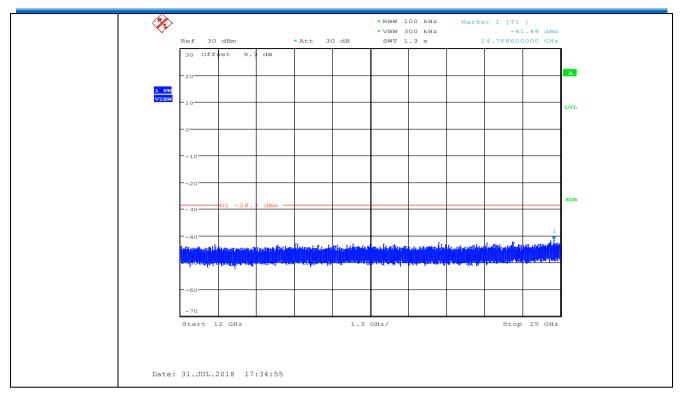








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Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.



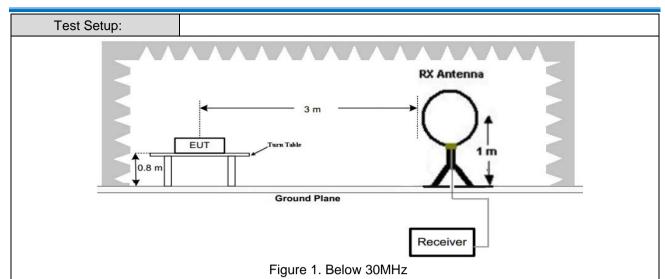


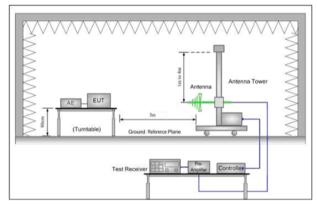
5.7 Radiated Spurious Emission & Restricted bands

5.7.1 Spurious Emissions									
Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205								
Test Method:	ANSI C63.10 2013								
Test Site:	Measurement Distance	: 3m	n (Semi-Anech	noic Cham	ber	.)			
Receiver Setup:	Frequency Detector			RBW		VBW	Remark		
	0.009MHz-0.090MH	z	Peak	10kHz	<u>z</u>	30kHz	Peak		
	0.009MHz-0.090MH	z	Average	10kHz	<u>z</u>	30kHz	Average		
	0.090MHz-0.110MH	Z	Quasi-peak	10kHz	<u> </u>	30kHz	Quasi-peak		
	0.110MHz-0.490MH	Z	Peak	10kHz	<u>z</u>	30kHz	Peak		
	0.110MHz-0.490MH	Z	Average	10kHz	<u>z</u>	30kHz	Average		
	0.490MHz -30MHz	Quasi-peak	10kHz	<u>z</u>	30kHz	Quasi-peak			
	30MHz-1GHz Quasi-peak		100 kH	lz	300kHz	Quasi-peak			
	Above 10Hz	Peak	1MHz	:	3MHz	Peak			
	Above 1GHz		Peak	1MHz	<u>.</u>	10Hz	Average		
Limit:	Frequency		eld strength crovolt/meter)	Limit (dBuV/m)		Remark	Measuremen distance (m)		
	0.009MHz-0.490MHz	2	400/F(kHz)	-		-	300		
	0.490MHz-1.705MHz	24	1000/F(kHz)	-		-	30		
	1.705MHz-30MHz		30	-		-	30		
	30MHz-88MHz		100	40.0	Ō	uasi-peak	3		
	88MHz-216MHz		150	43.5	Q	uasi-peak	3		
	216MHz-960MHz	200	46.0	Q	uasi-peak	3			
	960MHz-1GHz	500	54.0	Qı	uasi-peak	3			
	Above 1GHz 500 54.0 Average 3						3		
	Note: 15.35(b), frequency emissions is limit applicable to the epeak emission level race	20c quip	IB above the loment under t	maximum est. This p	per	mitted ave	rage emission		



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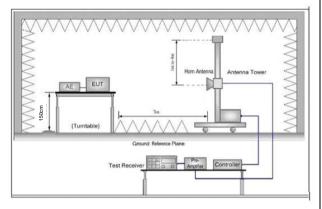


Figure 2. 30MHz to 1GHz

Figure 3. Above 1 GHz

Test Procedure:

- a. 1) Below 1G: 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.
 - 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 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.

Note: For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

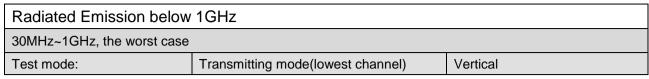
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the

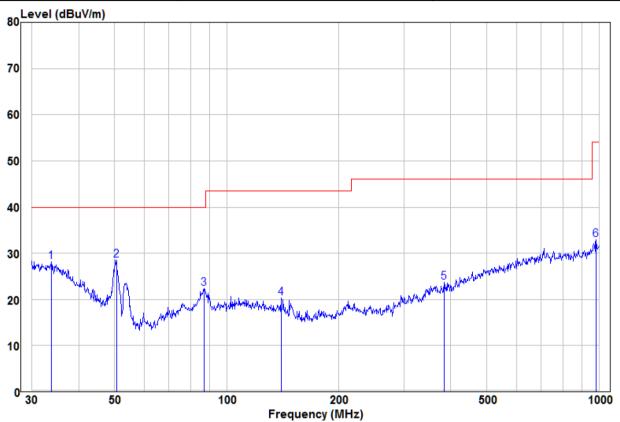


	measurement.
	d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to 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. g. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz)
	h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
	i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test	Transmitting with GFSK modulation.
Mode:	Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation.
	Pretest the EUT at Transmitting mode, found the Transmitting mode which it
	is worse case.
	For below 1GHz part, through pre-scan, the worst case is the highest
	channel.
	Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.11 for details.
Test Results:	Pass





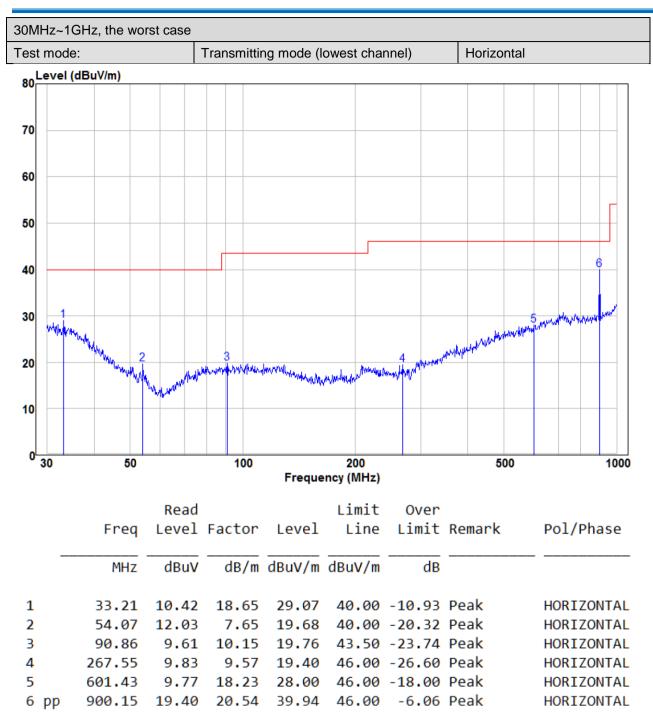




	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	33.80	9.57	18.61	28.18	40.00	-11.82	Peak	VERTICAL
2 pp	50.59	19.43	9.14	28.57	40.00	-11.43	Peak	VERTICAL
3	86.81	12.26	10.05	22.31	40.00	-17.69	Peak	VERTICAL
4	139.85	11.87	8.38	20.25	43.50	-23.25	Peak	VERTICAL
5	383.93	9.77	13.90	23.67	46.00	-22.33	Peak	VERTICAL
6	982.62	10.57	22,40	32.97	54.00	-21.03	Peak	VERTICAL









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Transmitter Emission above 1GHz

Worse case mode:		GFSK		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
2390	56.21	-9.2	47.01	74	-26.99	Peak	Н
2400	54.27	-9.39	44.88	74	-29.12	Peak	Н
4804	53.37	-4.33	49.04	74	-24.96	Peak	Н
7206	50.02	1.01	51.03	74	-22.97	Peak	Н
2390	52.73	-9.2	43.53	74	-30.47	Peak	V
2400	51.40	-9.39	42.01	74	-31.99	Peak	V
4804	53.15	-4.33	48.82	74	-25.18	Peak	V
7206	50.22	1.01	51.23	74	-22.77	Peak	V

Worse case m	Worse case mode:		GFSK		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V	
4880	50.84	-4.11	46.73	74	-27.27	peak	Н	
7320	50.89	1.51	52.40	74	-21.60	peak	Н	
4880	53.66	-4.11	49.55	74	-24.45	peak	V	
7320	48.83	1.51	50.34	74	-23.66	peak	V	

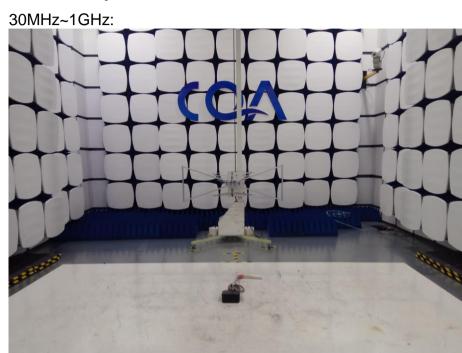
Worse case m	ode:	GFSK		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
2483.5	56.92	-9.29	47.63	74	-26.37	Peak	Н
4960	52.63	-4.04	48.59	74	-25.41	Peak	Н
7440	49.27	1.57	50.84	74	-23.16	Peak	Н
2483.5	56.33	-9.29	47.04	74	-26.96	Peak	V
4960	50.41	-4.04	46.37	74	-27.63	Peak	V
7440	48.50	1.57	50.07	74	-23.93	Peak	V

Remark:

- 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 + Antenna Factor + Cable Factor Preamplifier Factor
- 2) Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

6 Photographs - EUT Test Setup

6.1 Radiated Spurious Emission









7 Photographs - EUT Constructional Details







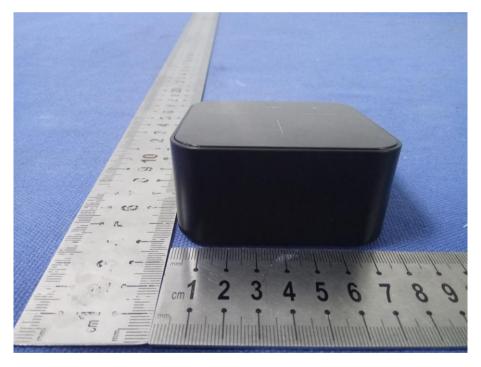








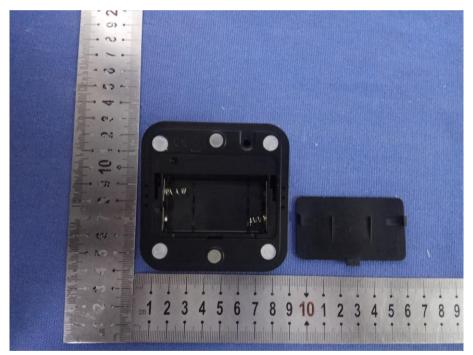






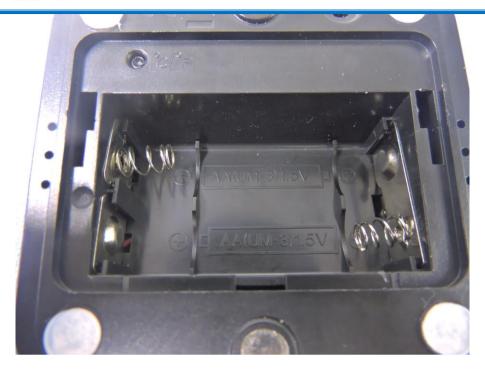








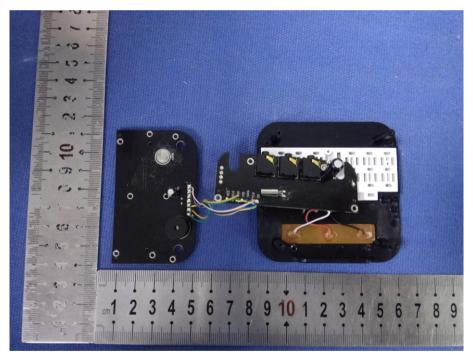






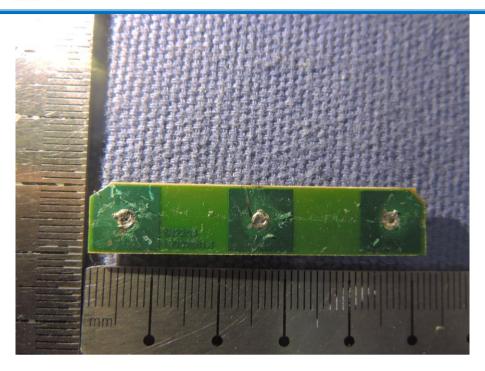


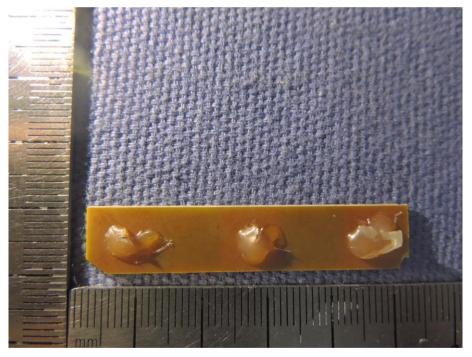




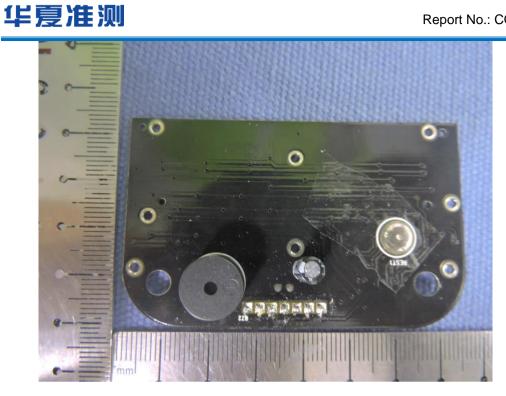


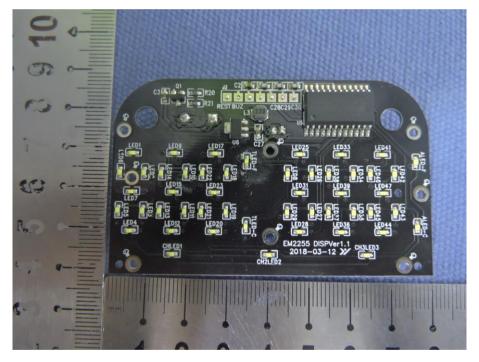






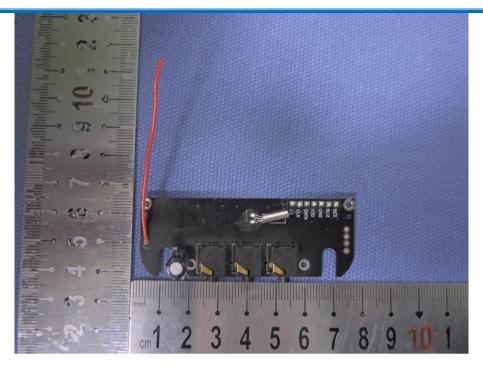


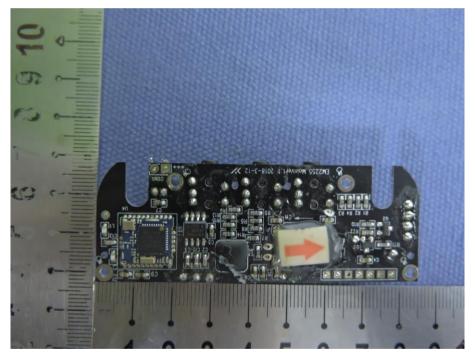






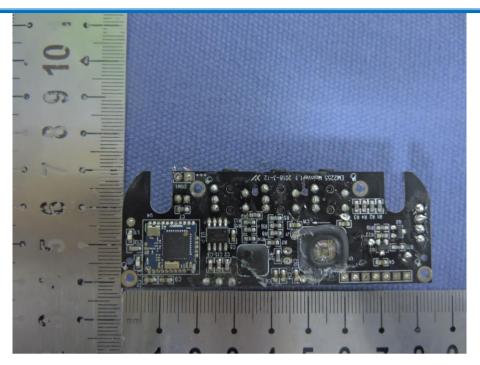


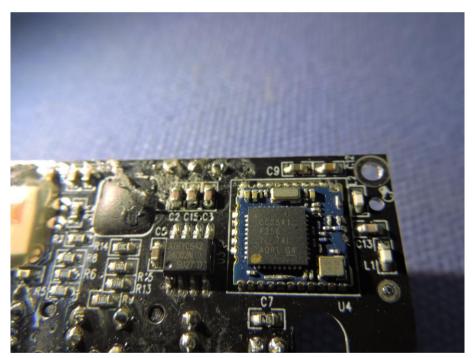












The End