

TEST REPORT

Product : Voice Lighted Mirror
Trade mark : Kohler
99571-VLAN-NA,
Model/Type reference : 99572-VLAN-NA,
99573-VLAN-NA
Serial Number : N/A
Report Number : EED32K00040201
FCC ID : N82-KOHLER026
Date of Issue : Apr. 13, 2018
Test Standards : 47 CFR Part 15Subpart C
Test result : PASS

Prepared for:
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444 Highland Drive, Kohler, Wisconsin 53044 USA

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Date:

Apr. 13, 2018

Check No.:3096379408



2 Version

Version No.	Date	Description
00	Apr. 13, 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	PASS
6dB Occupied Bandwidth	47 CFR Part 15Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15Subpart C Section 15.247 (e)	ANSI C63.10-2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013	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.

Model No.:99571-VLAN-NA, 99572-VLAN-NA, 99573-VLAN-NA

Only the model 99571-VLAN-NA was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being the appearance and size.

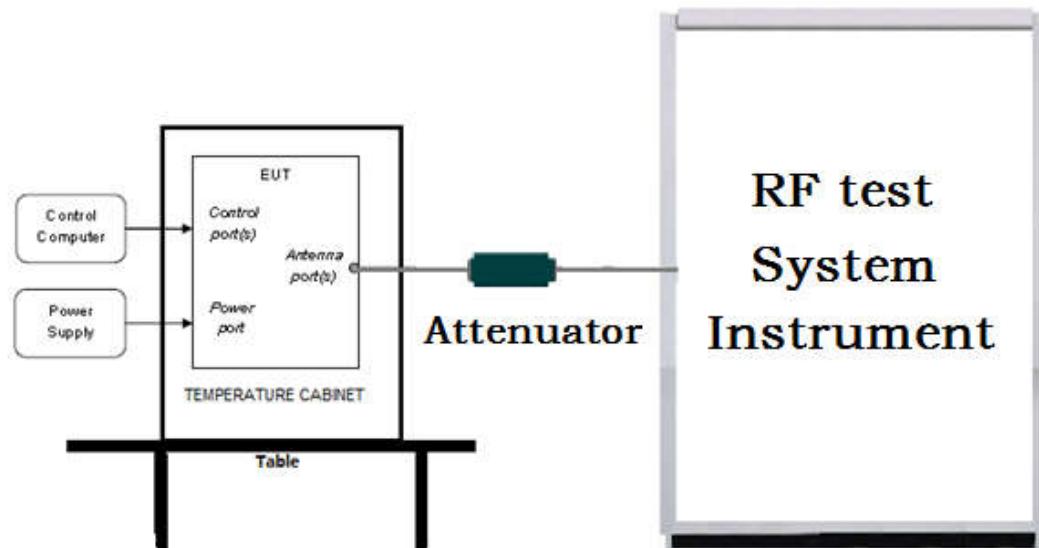
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5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

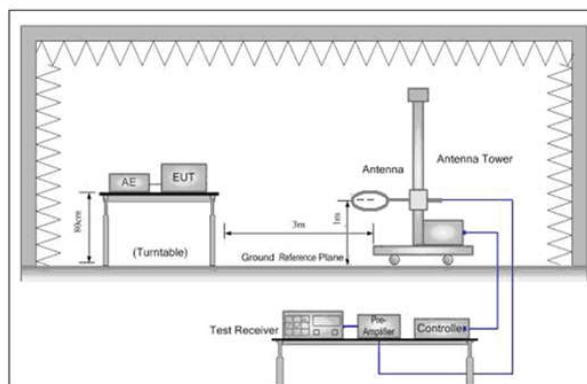


Figure 1. Below 30MHz

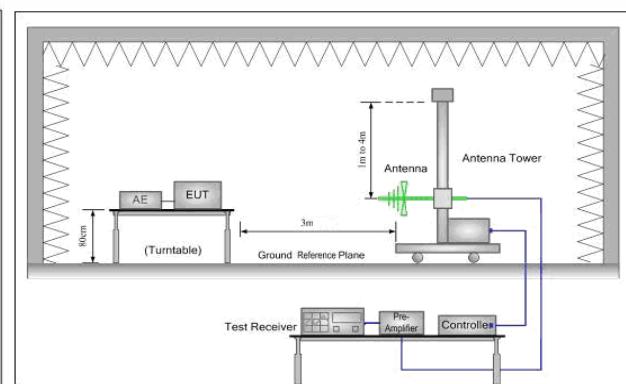


Figure 2. 30MHz to 1GHz

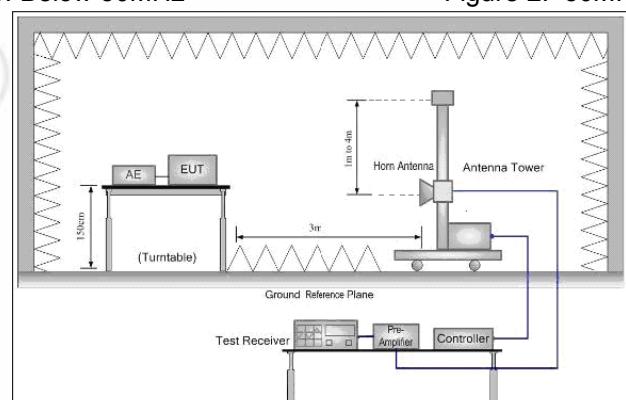
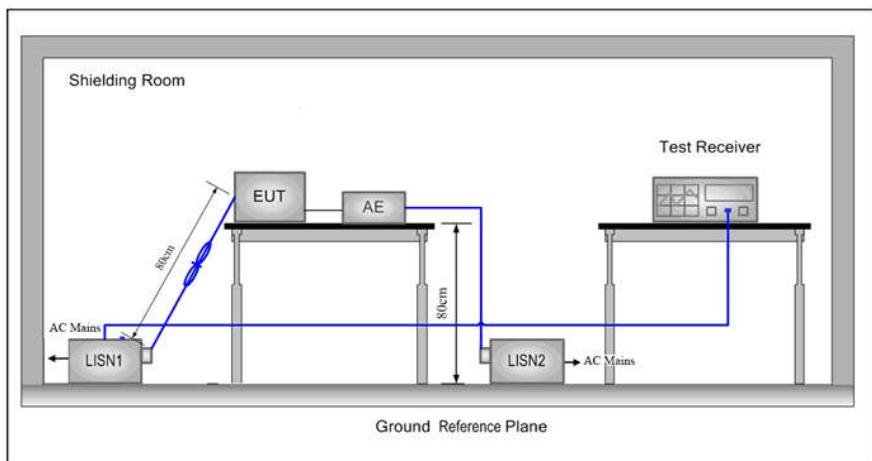


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:

Temperature:	24.1 °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
TX mode:	The EUT transmitted the continuous signal at the specific channel(s).			

6 General Information

6.1 Client Information

Applicant:	Kohler Co.
Address of Applicant:	444 Highland Drive, Kohler, Wisconsin 53044 USA
Manufacturer:	Kohler Co.
Address of Manufacturer:	444 Highland Drive, Kohler, Wisconsin 53044 USA

6.2 General Description of EUT

Product Name:	Voice Lighted Mirror
Model No.(EUT):	99571-VLAN-NA, 99572-VLAN-NA, 99573-VLAN-NA
Test Model No.:	99571-VLAN-NA
Trade mark:	Kohler
EUT Supports Radios application:	BT 4.0 Dual mode, 2402-2480MHz; WiFi 802.11b/g/n(20MHz)/n(40MHz) ,2412-2472MHz;
Hardware Version:	V02A(manufacturer declare)
Firmware version:	V29(manufacturer declare)
Power Supply:	AC 120V, 60Hz
Sample Received Date:	Mar. 02, 2018
Sample tested Date:	Mar. 02, 2018 to Apr. 12, 2018

6.3 Product Specification subjective to this standard

Operation Frequency:	BT: 4.0Dual mode, 2402-2480MHz; WiFi 802.11b/g/n(20MHz)/n(40MHz) ,2412-2462MHz;
Bluetooth Version:	4.0
Modulation Type:	GFSK
Number of Channel:	40
Sample Type:	Fixed production
Test Power Grade:	N/A
Test Software of EUT:	(manufacturer declare)RTLBAPP.exe
Antenna Type and Gain:	Type: Balun antenna; Gain:2.5dBi
Test Voltage:	AC 120V, 60Hz

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	FL3CX03WG 18NM12-0398-002	---	01-10-2018	01-09-2019
DC Power	Keysight	E3642A	MY54426035	03-13-2018	03-12-2019
power meter & power sensor	R&S	OSP120	101374	03-13-2018	03-12-2019
RF control unit	JS Tonscend	JS0806-2	158060006	03-13-2018	03-12-2019
Temperature / Humidity Indicator	Defu	TH128	---	07-08-2017	07-07-2018

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	---	06-04-2016	06-03-2019
Spectrum Analyzer	Agilent	E4443A	MY45300910	11-16-2017	11-15-2018
Receiver	R&S	ESCI	100435	06-14-2017	06-13-2018
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-618	08-15-2017	08-14-2018
Horn Antenna	ETS-LINGREN	3117	00057407	07-20-2015	07-18-2018
Spectrum Analyzer	R&S	FSP40	100416	06-13-2017	06-12-2018
Microwave Preamplifier	JS Tonscend	EMC051845 SE	980380	01-19-2018	01-18-2019
Loop Antenna	ETS-LINDGREN	6502	00071730	06-22-2017	06-21-2019
Double ridge horn antenna	A.H.SYSTEMS	SAS-574	6042	06-30-2015	06-28-2018
Pre-amplifier	A.H.SYSTEMS	PAP-1840-60	6041	06-30-2015	06-28-2018
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-08-2017	05-07-2018

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	06-14-2017	06-13-2018
LISN	schwarzbeck	NNLK8121	8121-529	06-13-2017	06-12-2018

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 Unlicensed Wireless Devices

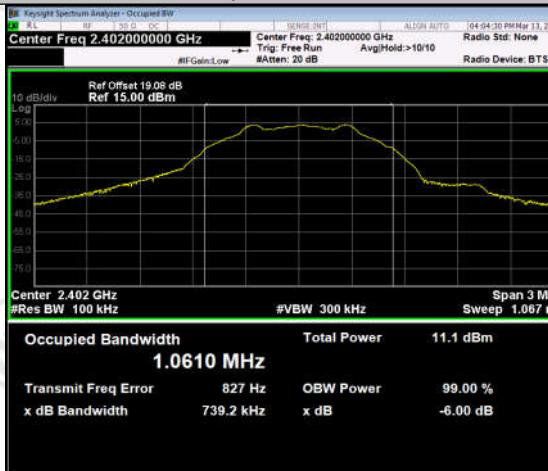
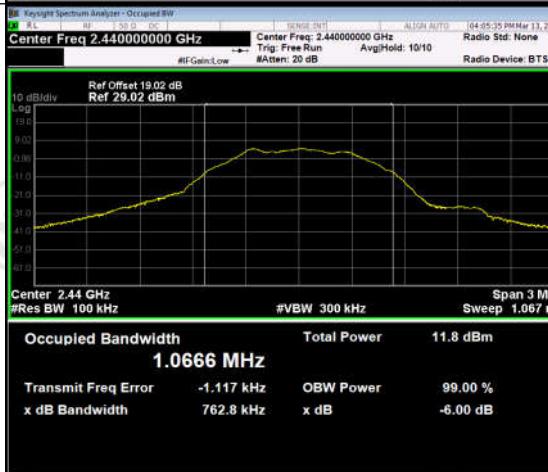
Test Results List:

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	0.7392	1.0610	PASS	Peak detector
BLE	MCH	0.7628	1.0666	PASS	
BLE	HCH	0.7548	1.0621	PASS	

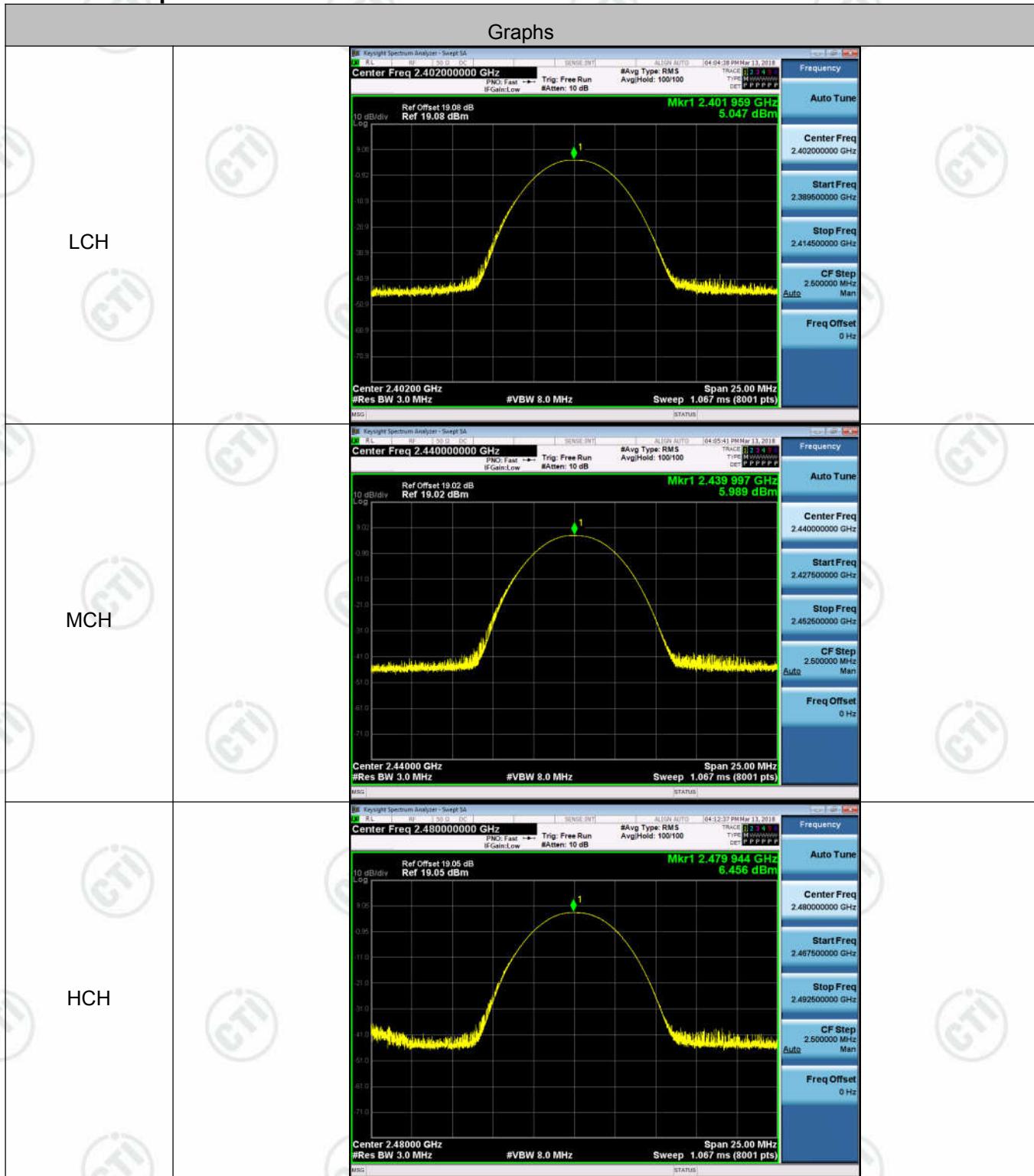
Test Graphs

		Graphs	
LCH		 <p>Keightight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.402000000 GHz</p> <p>Ref Offset 19.08 dB Ref 15.00 dBm</p> <p>10 dB/div</p> <p>Center 2.402 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms</p> <p>Occupied Bandwidth 1.0610 MHz</p> <p>Total Power 11.1 dBm</p> <p>Transmit Freq Error 827 Hz OBW Power 99.00 %</p> <p>x dB Bandwidth 739.2 kHz x dB -6.00 dB</p> <p>CF Step 300.000 kHz Man</p> <p>Freq Offset 0 Hz</p>	
MCH		 <p>Keightight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.440000000 GHz</p> <p>Ref Offset 19.02 dB Ref 29.02 dBm</p> <p>10 dB/div</p> <p>Center 2.44 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms</p> <p>Occupied Bandwidth 1.0666 MHz</p> <p>Total Power 11.8 dBm</p> <p>Transmit Freq Error -1.117 kHz OBW Power 99.00 %</p> <p>x dB Bandwidth 762.8 kHz x dB -6.00 dB</p> <p>CF Step 300.000 kHz Man</p> <p>Freq Offset 0 Hz</p>	
HCH		 <p>Keightight Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.480000000 GHz</p> <p>Ref Offset 19.05 dB Ref 29.05 dBm</p> <p>10 dB/div</p> <p>Center 2.48 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms</p> <p>Occupied Bandwidth 1.0621 MHz</p> <p>Total Power 12.6 dBm</p> <p>Transmit Freq Error -918 Hz OBW Power 99.00 %</p> <p>x dB Bandwidth 754.8 kHz x dB -6.00 dB</p> <p>CF Step 300.000 kHz Man</p> <p>Freq Offset 0 Hz</p>	

Appendix B): Conducted Peak Output Power**Test Result**

Mode	Channel	Conduct Peak Power[dBm]	Verdict
BLE	LCH	5.047	PASS
BLE	MCH	5.989	PASS
BLE	HCH	6.456	PASS

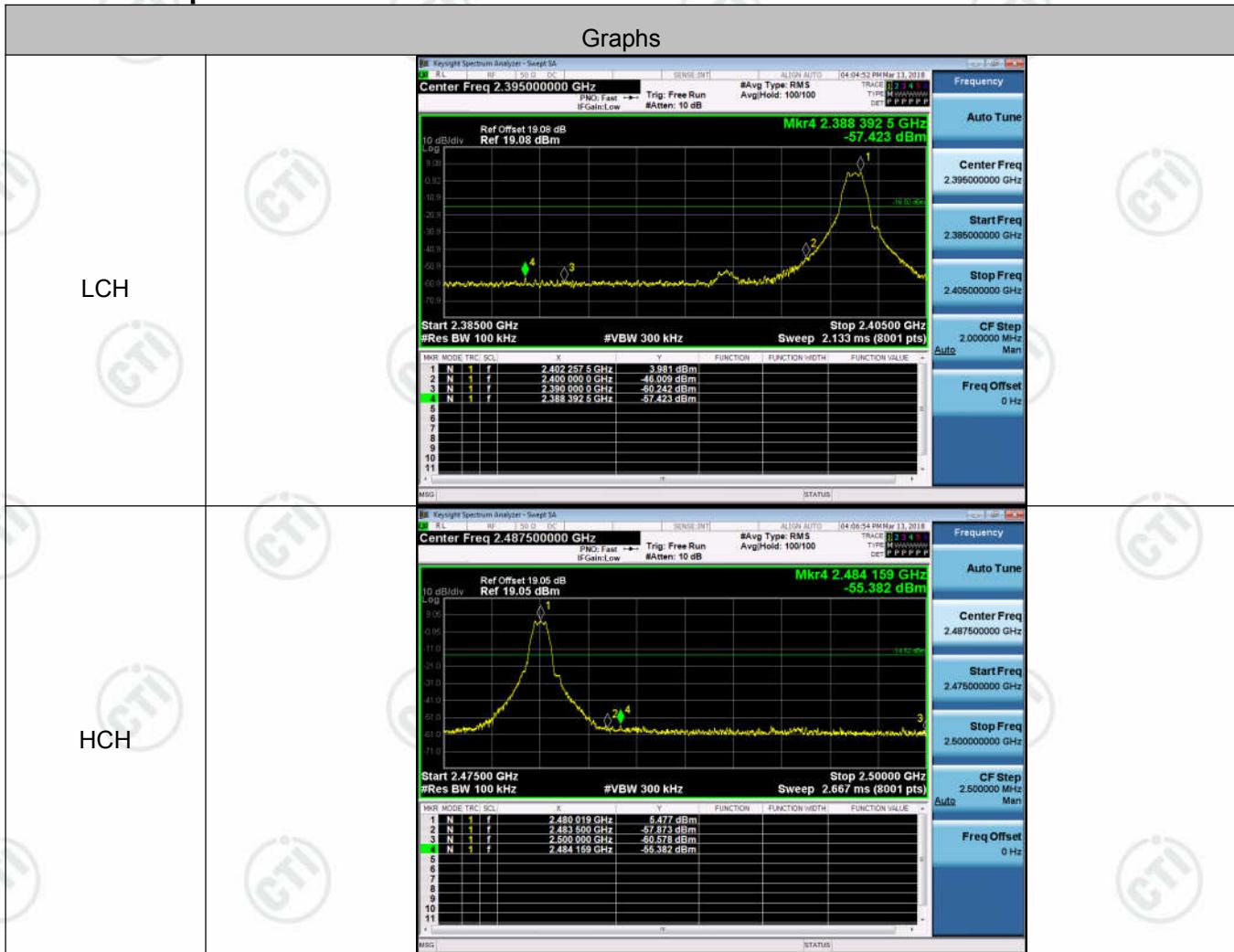
Test Graphs



Appendix C): Band-edge for RF Conducted Emissions**Result Table**

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	LCH	3.981	-57.423	-16.02	PASS
BLE	HCH	5.477	-55.382	-14.52	PASS

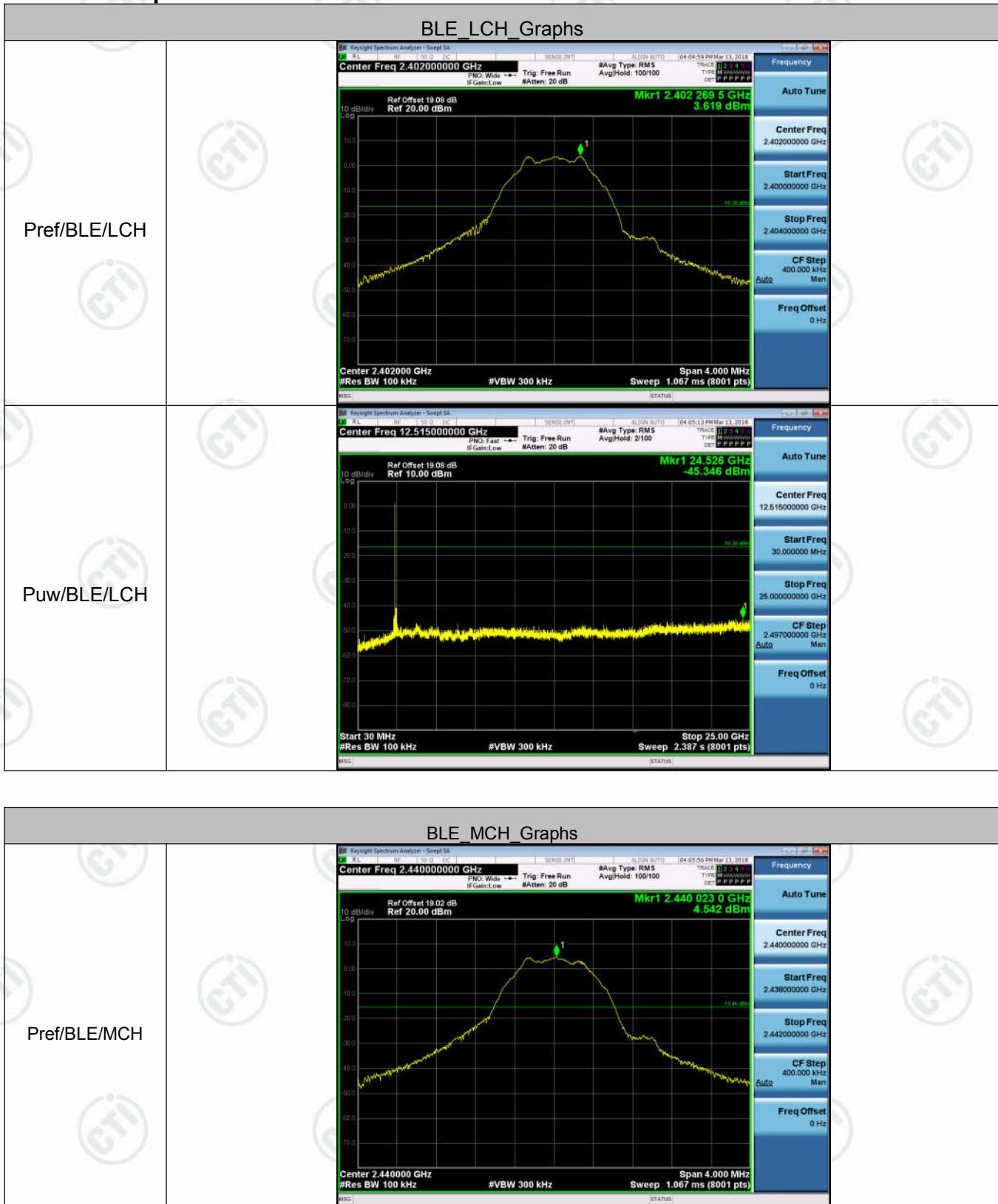
Test Graphs

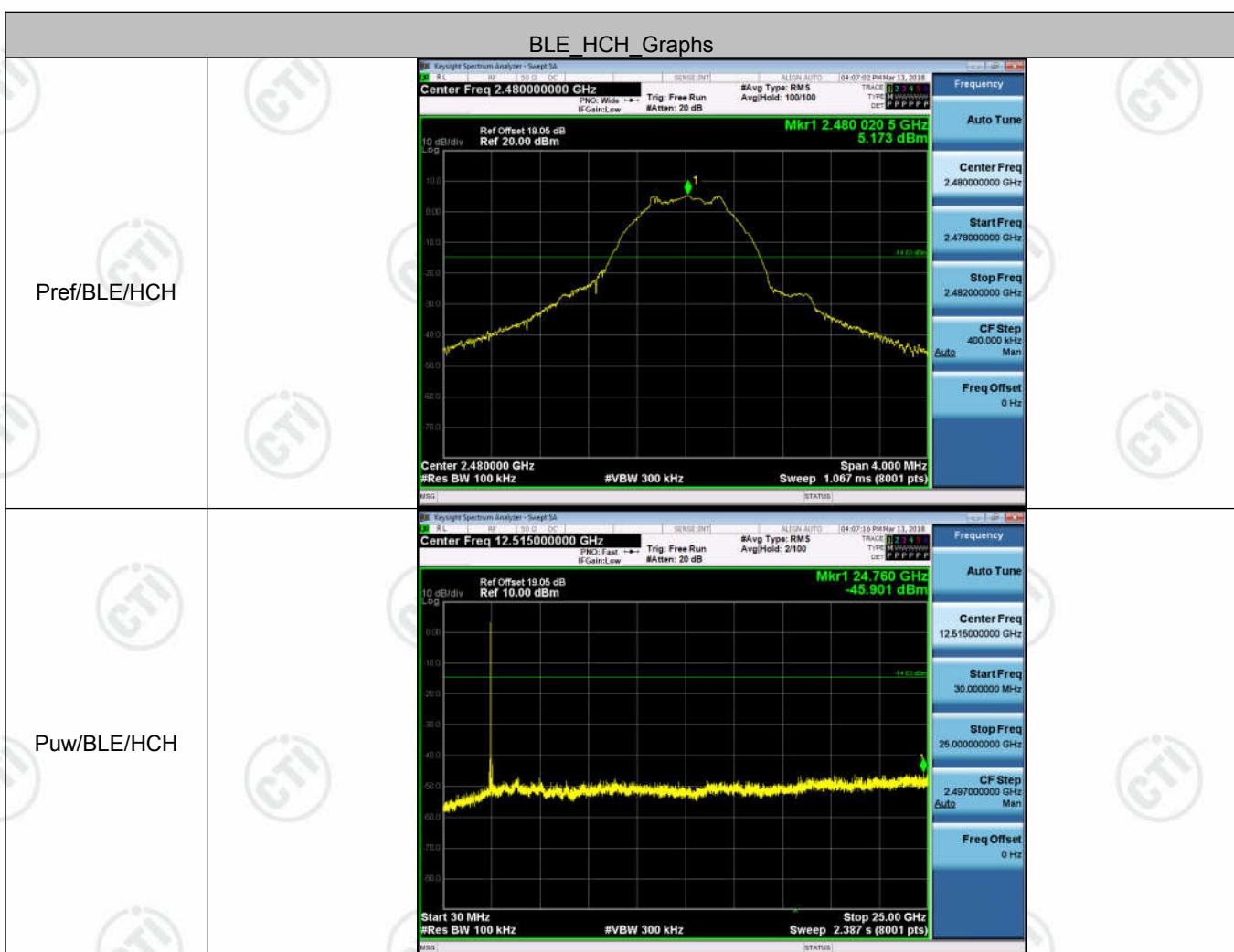
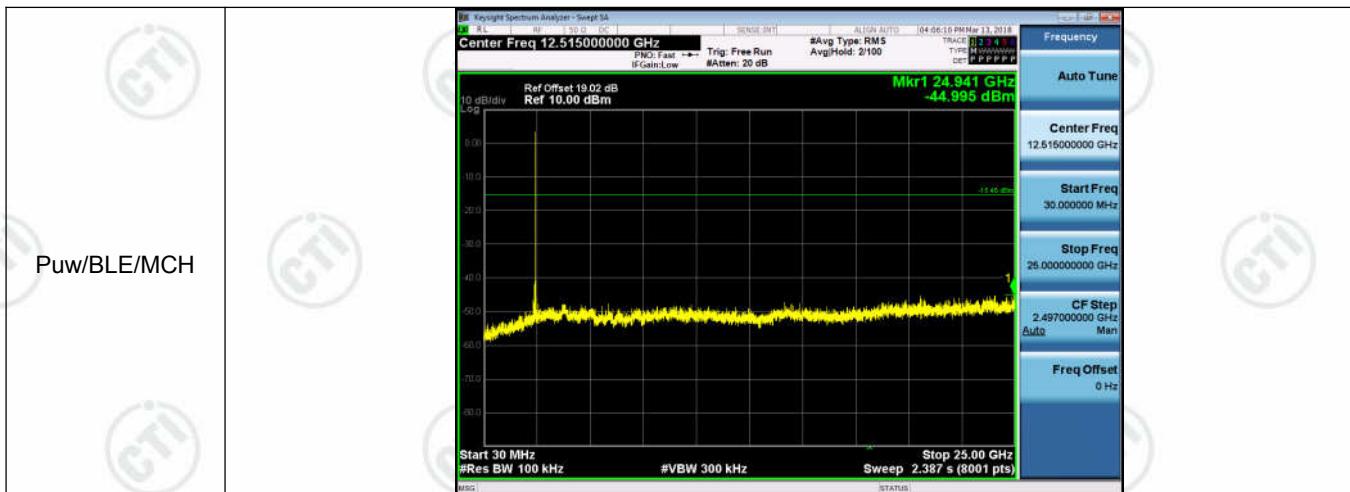


Appendix D): RF Conducted Spurious Emissions**Result Table**

Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
BLE	LCH	3.619	<Limit	PASS
BLE	MCH	4.542	<Limit	PASS
BLE	HCH	5.173	<Limit	PASS

Test Graphs





Appendix E): Power Spectral Density**Result Table**

Mode	Channel	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE	LCH	-11.605	8	PASS
BLE	MCH	-9.836	8	PASS
BLE	HCH	-10.029	8	PASS

Test Graphs



Appendix F): Antenna Requirement

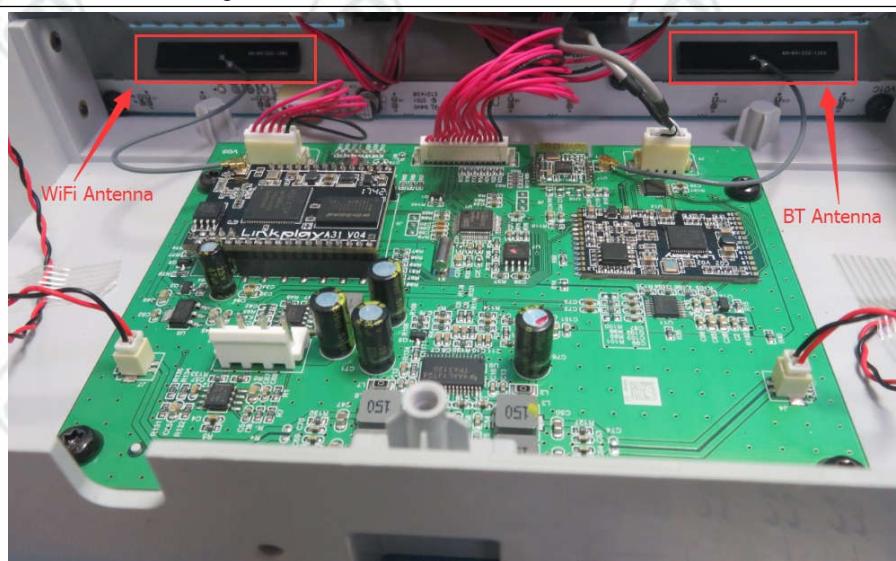
15.203 requirement:

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 attached to the inner shell of the EUT and no consideration of replacement. The best case gain of the antenna is 2.5dBi.

Appendix G): AC Power Line Conducted Emission

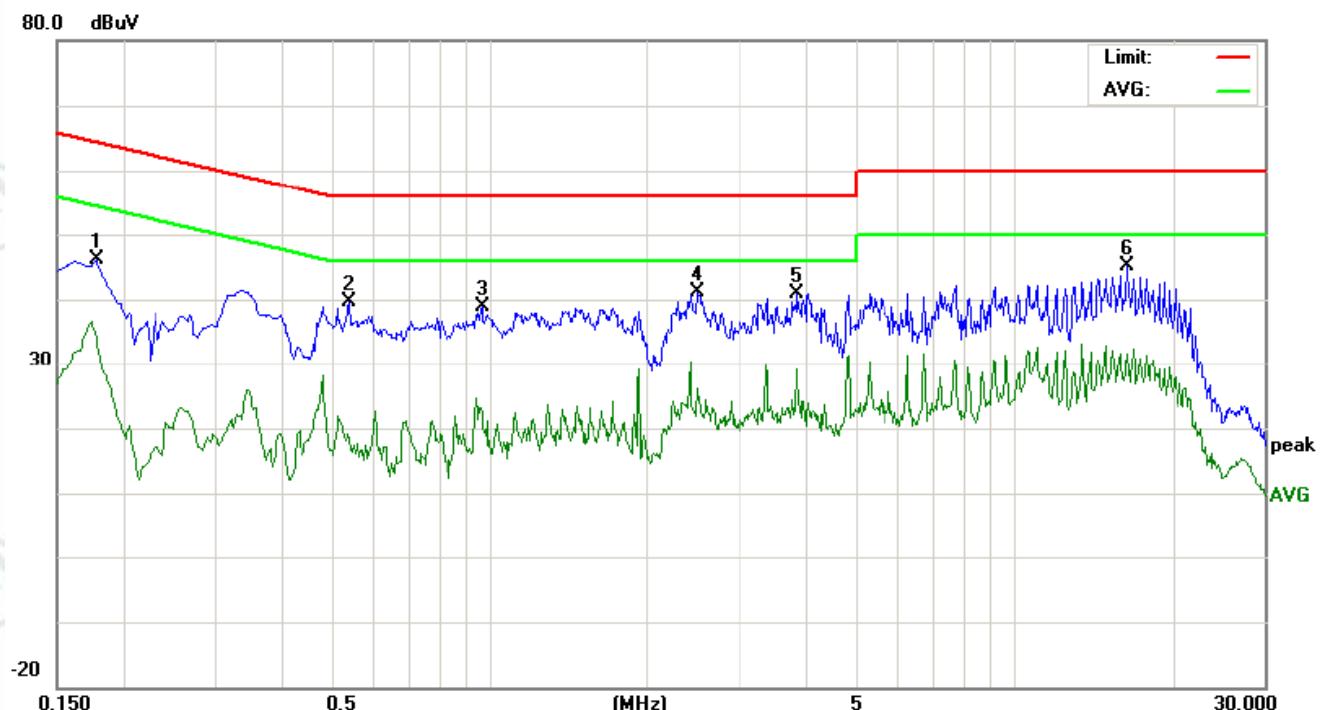
Test Procedure:	Test frequency range :150KHz-30MHz 1)The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. 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.																
Limit:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>* 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</p>			Frequency range (MHz)	Limit (dB μ V)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dB μ V)																
	Quasi-peak	Average															
0.15-0.5	66 to 56*	56 to 46*															
0.5-5	56	46															
5-30	60	50															

Measurement Data

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

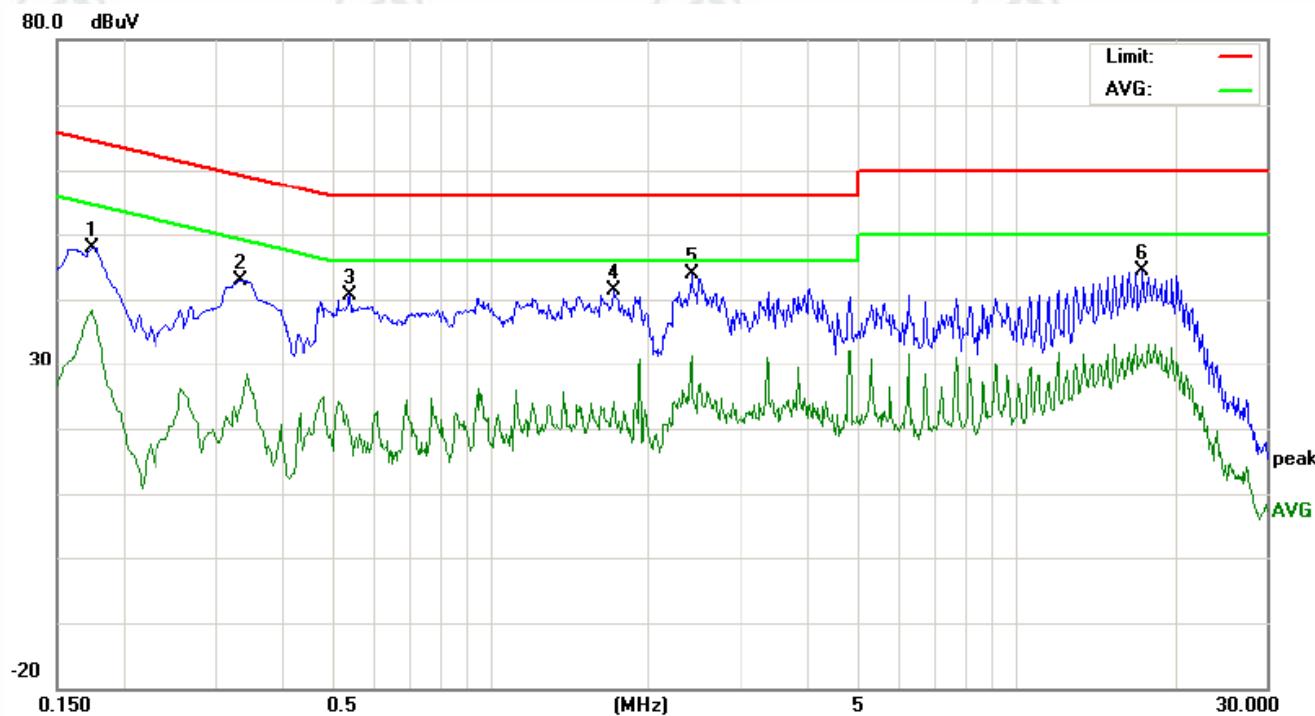
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		
		MHz	Peak	QP		peak	QP	Avg	QP	Avg	QP	Avg	P/F
1	0.1780	36.30	30.85	24.65	9.73	46.03	40.58	34.38	64.57	54.57	-23.99	-20.19	P
2	0.5420	29.81	24.95	8.99	9.73	39.54	34.68	18.72	56.00	46.00	-21.32	-27.28	P
3	0.9700	29.04	25.04	12.63	9.73	38.77	34.77	22.36	56.00	46.00	-21.23	-23.64	P
4	2.4980	31.45	27.65	16.47	9.70	41.15	37.35	26.17	56.00	46.00	-18.65	-19.83	P
5	3.8660	31.21	26.21	15.83	9.66	40.87	35.87	25.49	56.00	46.00	-20.13	-20.51	P
6	16.4140	35.07	30.78	21.62	10.02	45.09	40.80	31.64	60.00	50.00	-19.20	-18.36	P

Neutral line:



No.	Freq. MHz	Reading (dBuV)			Correct Factor		Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	peak	QP	Avg	QP	Avg	QP	Avg	QP	Avg	
1	0.1740	38.15	34.22	28.57	9.74	47.89	43.96	38.31	64.76	54.76	-20.80	-16.45	P		
2	0.3339	33.13	28.00	13.68	9.77	42.90	37.77	23.45	59.35	49.35	-21.58	-25.90	P		
3	0.5420	30.91	25.74	10.50	9.73	40.64	35.47	20.23	56.00	46.00	-20.53	-25.77	P		
4	1.7300	31.57	27.17	14.49	9.72	41.29	36.89	24.21	56.00	46.00	-19.11	-21.79	P		
5	2.4140	34.14	30.06	20.05	9.71	43.85	39.77	29.76	56.00	46.00	-16.23	-16.24	P		
6	17.3900	34.39	29.61	21.54	10.03	44.42	39.64	31.57	60.00	50.00	-20.36	-18.43	P		

Notes:

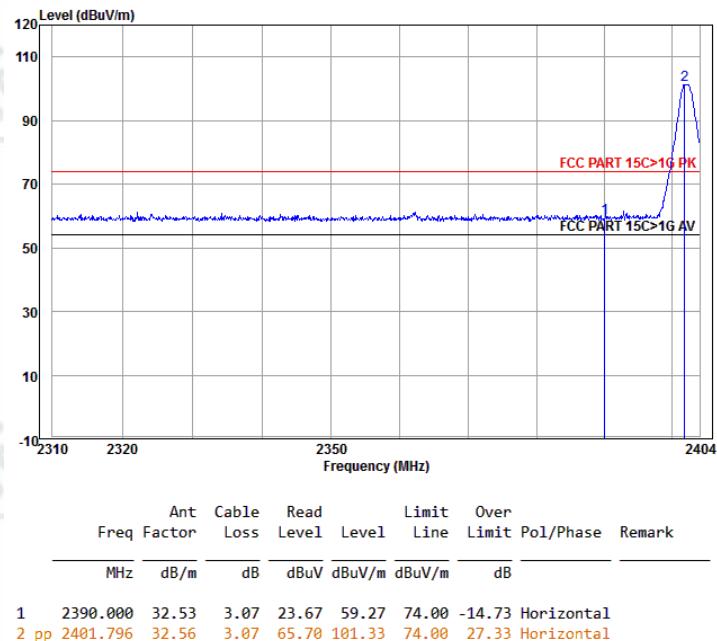
1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

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: <ul style="list-style-type: none"> a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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: <ul style="list-style-type: none"> 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 (dB μ V/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:

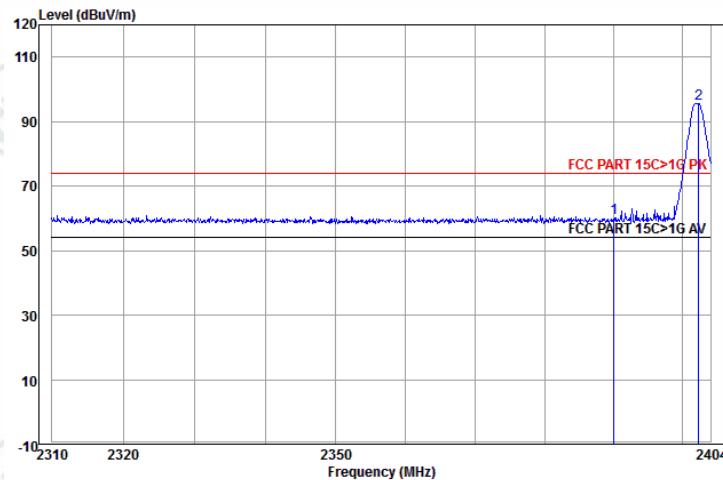
Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Horizontal	Remark: Peak



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

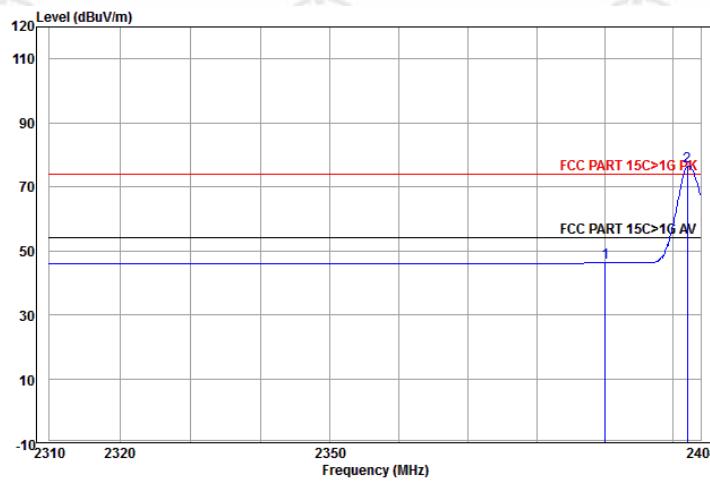


Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Vertical	Remark: Peak



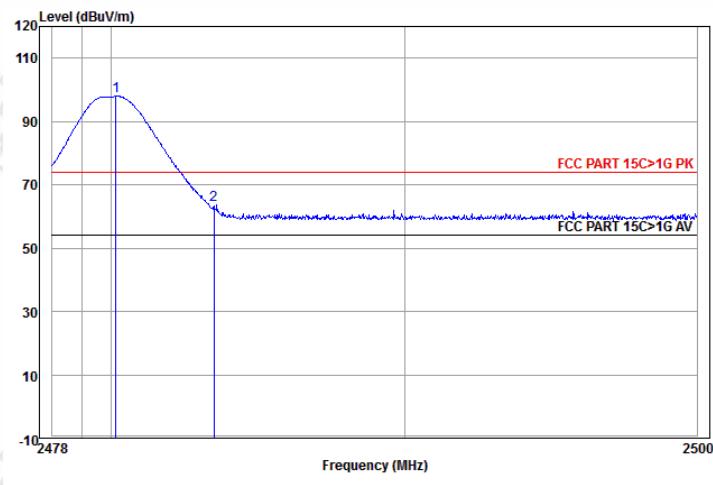
	Ant Freq	Cable Factor	Read Loss	Limit Level	Line Limit	Over Limit	Over Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2390.000	32.53	3.07	24.64	60.24	74.00	-13.76	Vertical
2 pp	2402.275	32.56	3.08	60.01	95.65	74.00	21.65	Vertical

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



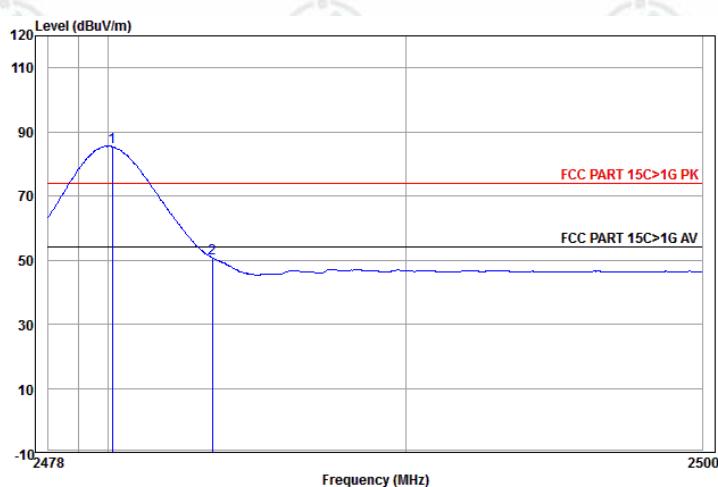
	Ant Freq	Cable Factor	Read Loss	Limit Level	Line Limit	Over Limit	Over Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2390.000	32.53	3.07	10.63	46.23	54.00	-7.77	Vertical Average
2 pp	2402.083	32.56	3.07	40.89	76.52	54.00	22.52	Vertical Average

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



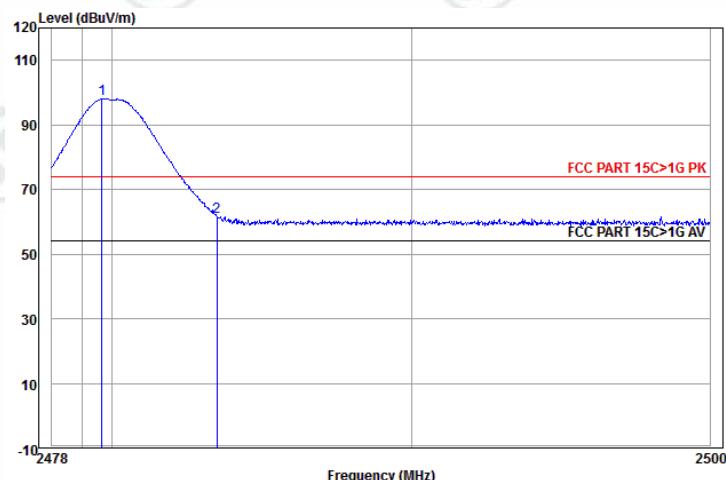
Freq	Ant Factor	Ant	Cable	Read	Limit	Over	Remark
		MHz	dB/m	dB	dBuV	dBuV/m	
1 pp	2480.169	32.71	3.12	62.14	97.97	74.00	23.97 Horizontal
2	2483.500	32.71	3.12	27.98	63.81	74.00	-10.19 Horizontal

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



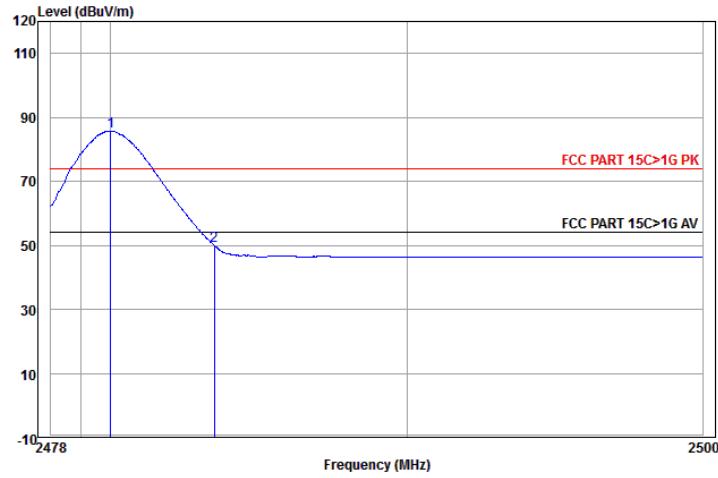
Freq	Ant Factor	Ant	Cable	Read	Limit	Over	Remark
		MHz	dB/m	dB	dBuV	dBuV/m	
1 pp	2480.147	32.71	3.12	49.54	85.37	54.00	31.37 Horizontal Average
2	2483.500	32.71	3.12	14.68	50.51	54.00	-3.49 Horizontal Average

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



Freq	Ant Factor	Cable Loss	Read Level	Limit Level	Limit Line	Over Limit	Pol/Phase	Remark
MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2479.665	32.71	3.12	62.25	98.08	74.00	24.08	Vertical
2	2483.500	32.71	3.12	25.85	61.68	74.00	-12.32	Vertical

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



Freq	Ant Factor	Cable Loss	Read Level	Limit Level	Limit Line	Over Limit	Pol/Phase	Remark
MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.016	32.71	3.12	49.82	85.65	54.00	31.65	Vertical Average
2	2483.500	32.71	3.12	13.91	49.74	54.00	-4.26	Vertical Average

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	120kHz	300kHz	Quasi-peak	
Above 1GHz		Peak	1MHz	3MHz	Peak	
		Peak	1MHz	10Hz	Average	

Test Procedure:

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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:

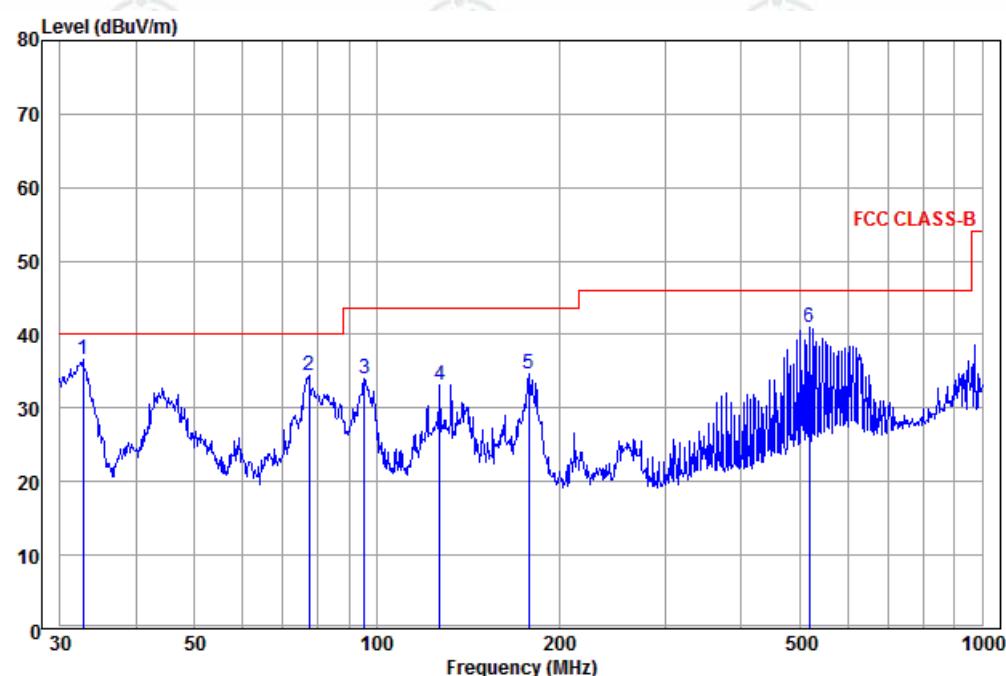
- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
- Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- The radiation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

Limit:	Frequency	Field strength (microvolt/meter)	Limit (dB μ V/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.

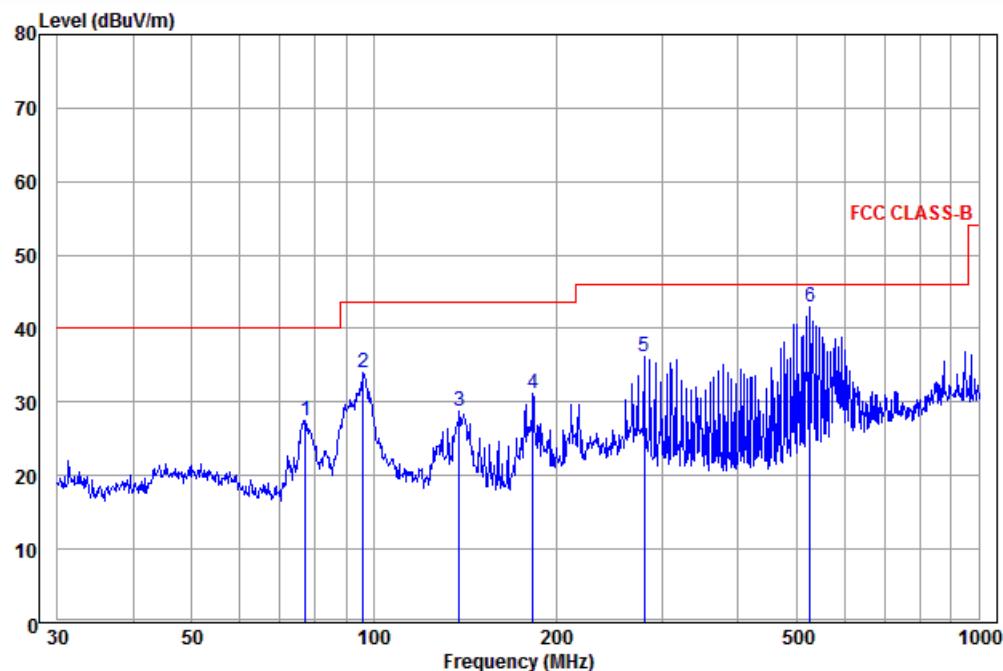
**Radiated Spurious Emissions test Data:
Radiated Emission below 1GHz**

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



Freq	Ant Factor	Cable Loss	Read Level	Limit Level	Limit		Over Line Limit	Over Pol/Phase	Remark
					MHz	dB/m	dB	dBuV	dBuV/m
1 pp	32.749	12.48	0.08	24.03	36.59	40.00	-3.41	Vertical	QP
2	77.321	9.06	0.38	25.00	34.44	40.00	-5.56	Vertical	QP
3	95.427	11.79	0.51	21.72	34.02	43.50	-9.48	Vertical	QP
4	127.218	10.30	0.60	22.21	33.11	43.50	-10.39	Vertical	QP
5	178.133	10.41	0.90	23.24	34.55	43.50	-8.95	Vertical	QP
6	519.065	17.25	1.53	22.19	40.97	46.00	-5.03	Vertical	QP

Test mode:	Transmitting	Horizontal
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Freq	Ant Factor	Cable Loss	Read Level	Level	Limit		Over Line Limit	Over Pol/Phase	Remark
					MHz	dB/m	dB	dBuV	dBuV/m
1	77.051	9.11	0.37	18.01	27.49	40.00	-12.51	Horizontal	QP
2	96.099	11.90	0.52	21.53	33.95	43.50	-9.55	Horizontal	QP
3	138.387	9.54	0.61	18.69	28.84	43.50	-14.66	Horizontal	QP
4	183.201	10.68	0.95	19.51	31.14	43.50	-12.36	Horizontal	QP
5	280.024	13.10	1.17	21.86	36.13	46.00	-9.87	Horizontal	QP
6 pp	526.397	17.39	1.53	23.99	42.91	46.00	-3.09	Horizontal	QP

Transmitter Emission above 1GHz

Worse case mode:		GFSK		Test channel:		Lowest	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Level (dB μ V/m)	Limit Line (dB μ V/m)	Over Limit (dB)	Result	Antenna Polaxis
1257.465	30.36	1.95	44.30	49.00	37.01	74.00	-36.99	Pass	H
1514.252	30.90	2.31	43.98	48.93	38.16	74.00	-35.84	Pass	H
4804.000	34.69	5.98	44.60	48.44	44.51	74.00	-29.49	Pass	H
5986.509	35.89	7.43	44.50	48.56	47.38	74.00	-26.62	Pass	H
7206.000	36.42	6.97	44.77	48.85	47.47	74.00	-26.53	Pass	H
9608.000	37.88	6.98	45.58	45.56	44.84	74.00	-29.16	Pass	H
1176.935	30.17	1.82	44.42	48.20	35.77	74.00	-38.23	Pass	V
1814.218	31.42	2.65	43.67	48.01	38.41	74.00	-35.59	Pass	V
4804.000	34.69	5.98	44.60	48.43	44.50	74.00	-29.50	Pass	V
5986.509	35.89	7.43	44.50	49.08	47.90	74.00	-26.10	Pass	V
7206.000	36.42	6.97	44.77	47.67	46.29	74.00	-27.71	Pass	V
9608.000	37.88	6.98	45.58	46.00	45.28	74.00	-28.72	Pass	V

Worse case mode:		GFSK		Test channel:		Middle	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Level (dB μ V/m)	Limit Line (dB μ V/m)	Over Limit (dB)	Result	Antenna Polaxis
1263.883	30.38	1.96	44.29	48.53	36.58	74.00	-37.42	Pass	H
1773.127	31.35	2.61	43.71	48.83	39.08	74.00	-34.92	Pass	H
4880.000	34.85	6.13	44.60	49.01	45.39	74.00	-28.61	Pass	H
5971.290	35.88	7.41	44.50	49.66	48.45	74.00	-25.55	Pass	H
7320.000	36.43	6.85	44.87	47.92	46.33	74.00	-27.67	Pass	H
9760.000	38.05	7.12	45.55	47.75	47.37	74.00	-26.63	Pass	H
1260.670	30.37	1.95	44.30	48.54	36.56	74.00	-37.44	Pass	V
1533.648	30.93	2.33	43.96	49.24	38.54	74.00	-35.46	Pass	V
1814.218	31.42	2.65	43.67	48.35	38.75	74.00	-35.25	Pass	V
4880.000	34.85	6.13	44.60	48.21	44.59	74.00	-29.41	Pass	V
7320.000	36.43	6.85	44.87	47.42	45.83	74.00	-28.17	Pass	V
9760.000	38.05	7.12	45.55	47.78	47.40	74.00	-26.60	Pass	V

Worse case mode:		GFSK		Test channel:		Highest	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Level (dB μ V/m)	Limit Line (dB μ V/m)	Over Limit (dB)	Result	Antenna Polaxis
1267.104	30.38	1.96	44.29	48.26	36.31	74.00	-37.69	Pass	H
1557.252	30.98	2.36	43.93	48.49	37.90	74.00	-36.10	Pass	H
4960.000	35.02	6.29	44.60	47.61	44.32	74.00	-29.68	Pass	H
6017.064	35.91	7.44	44.50	48.88	47.73	74.00	-26.27	Pass	H
7440.000	36.45	6.73	44.97	47.11	45.32	74.00	-28.68	Pass	H
9920.000	38.22	7.26	45.52	46.99	46.95	74.00	-27.05	Pass	H
1406.496	30.68	2.16	44.11	47.64	36.37	74.00	-37.63	Pass	V
2070.980	31.86	2.88	43.60	48.14	39.28	74.00	-34.72	Pass	V
4960.000	35.02	6.29	44.60	48.10	44.81	74.00	-29.19	Pass	V
6001.768	35.90	7.44	44.50	48.62	47.46	74.00	-26.54	Pass	V
7440.000	36.45	6.73	44.97	46.57	44.78	74.00	-29.22	Pass	V
9920.000	38.22	7.26	45.52	46.86	46.82	74.00	-27.18	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:

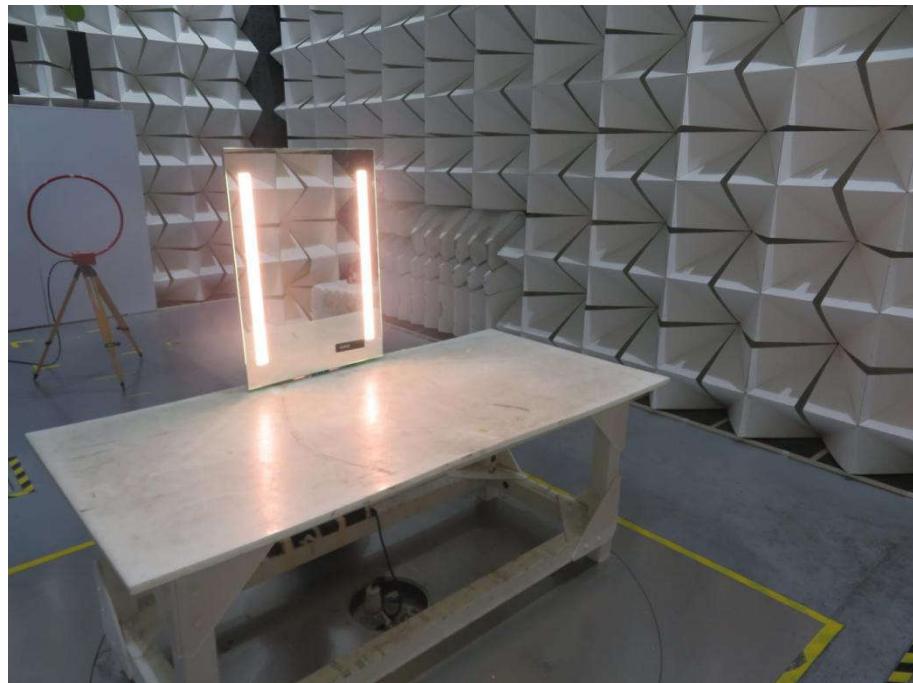
Final Test Level =Receiver Reading -Correct Factor

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.: 99571-VLAN-NA



Radiated spurious emission Test Setup-1(Below 30MHz)



Radiated emission Test Setup-2(30MHz-1GHz)



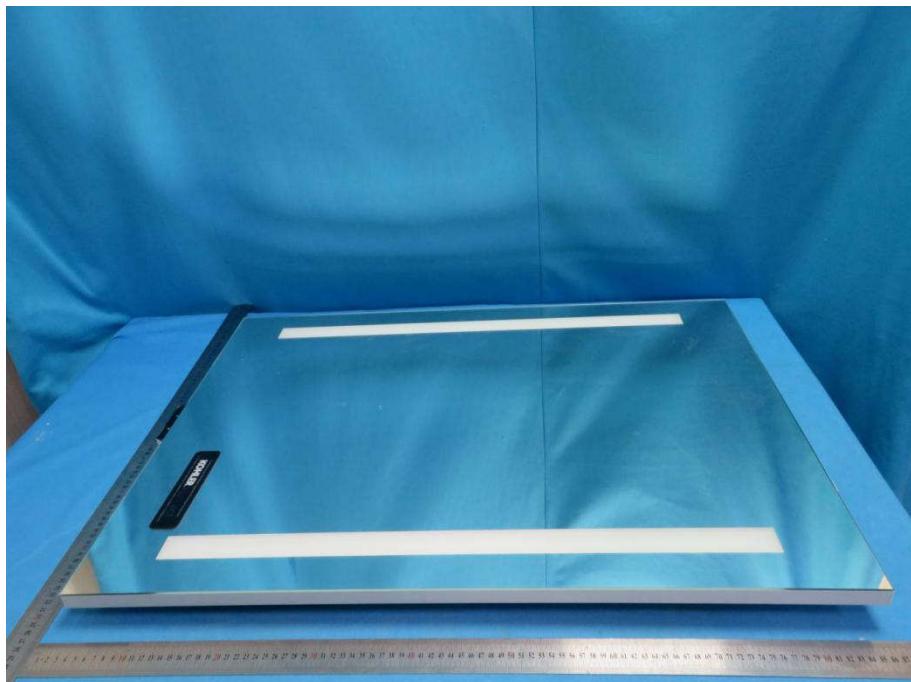
Radiated spurious emission Test Setup-3(Above 1GHz)



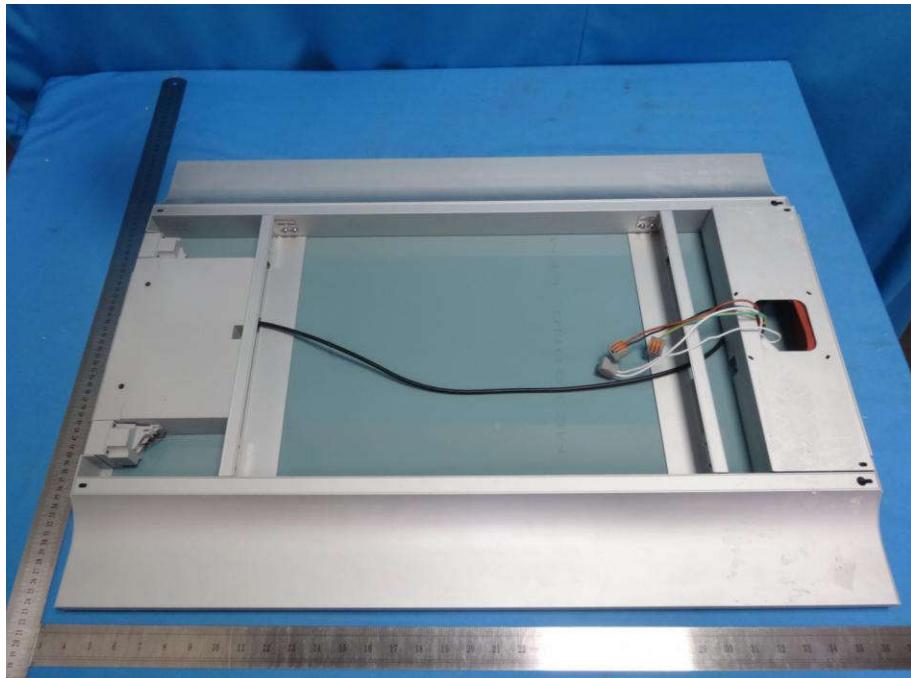
Conducted Emissions Test Setup

PHOTOGRAPHS OF EUT Constructional Details

Test model No.: 99571-VLAN-NA



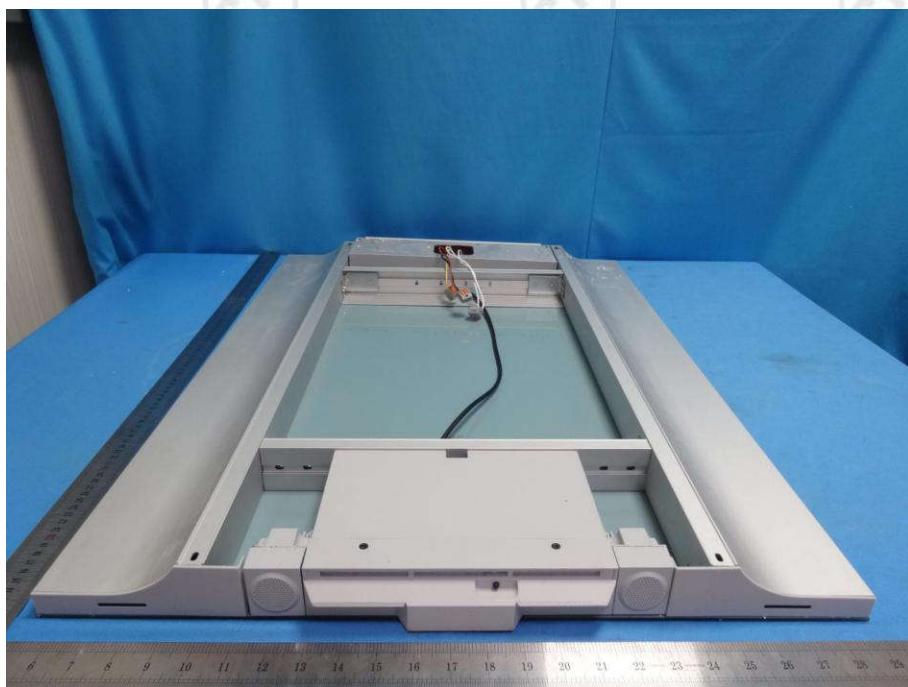
View of Product-1



View of Product-2



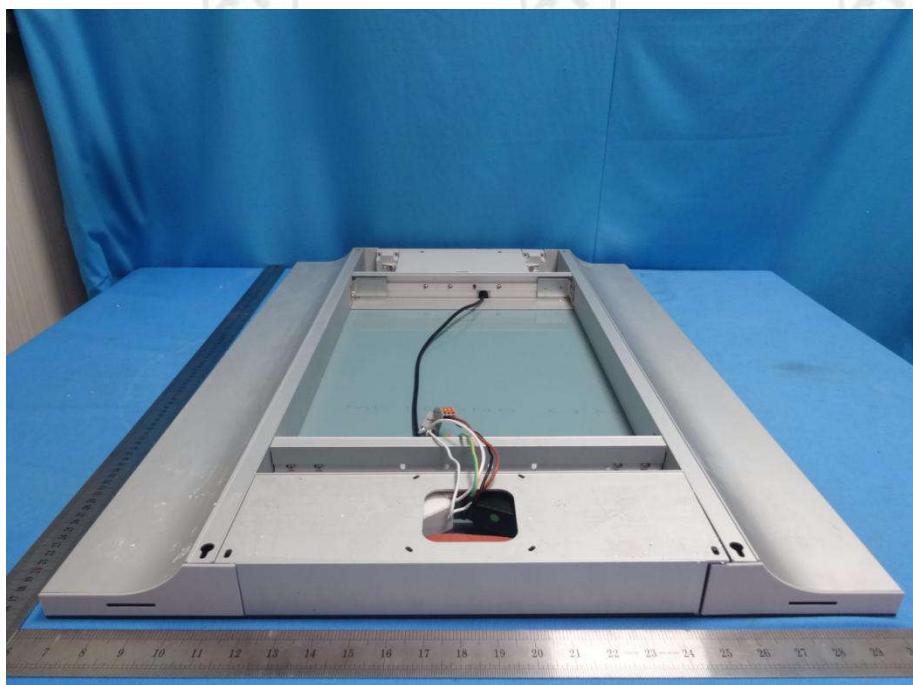
View of Product-3



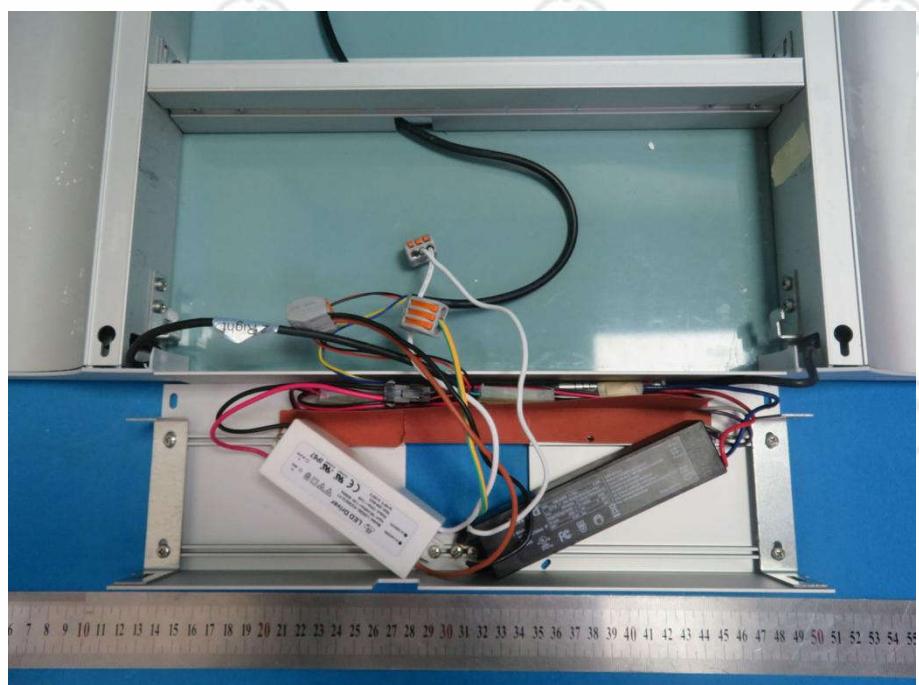
View of Product-4



View of Product-5



View of Product-6



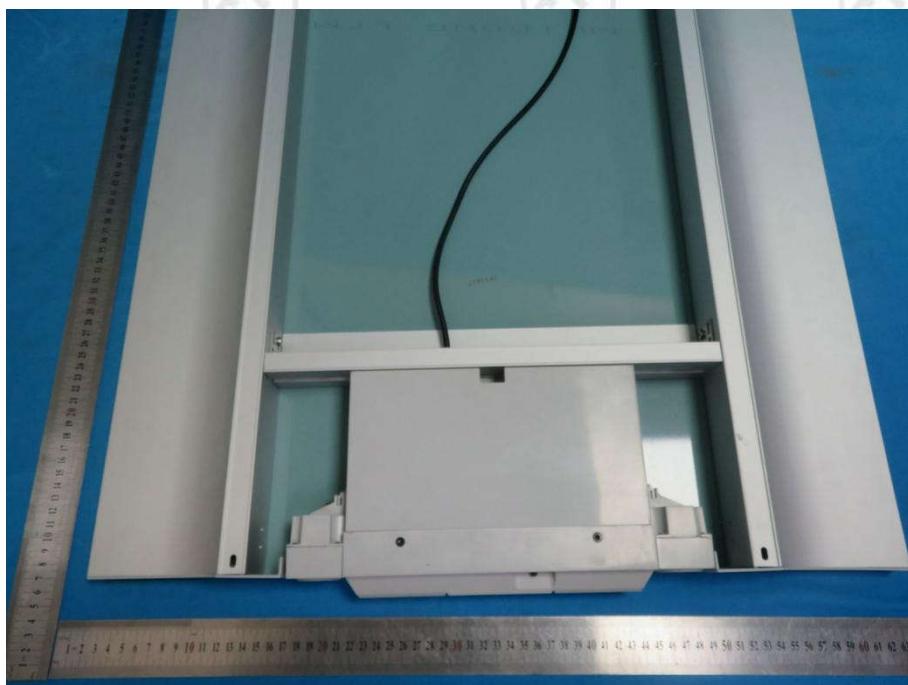
View of Product-7



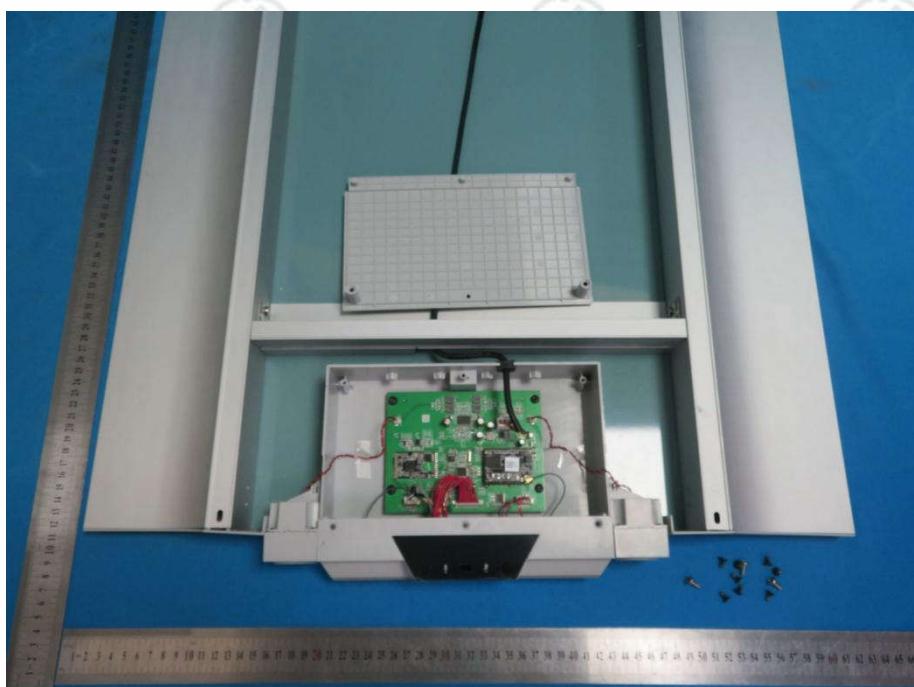
View of Product-8



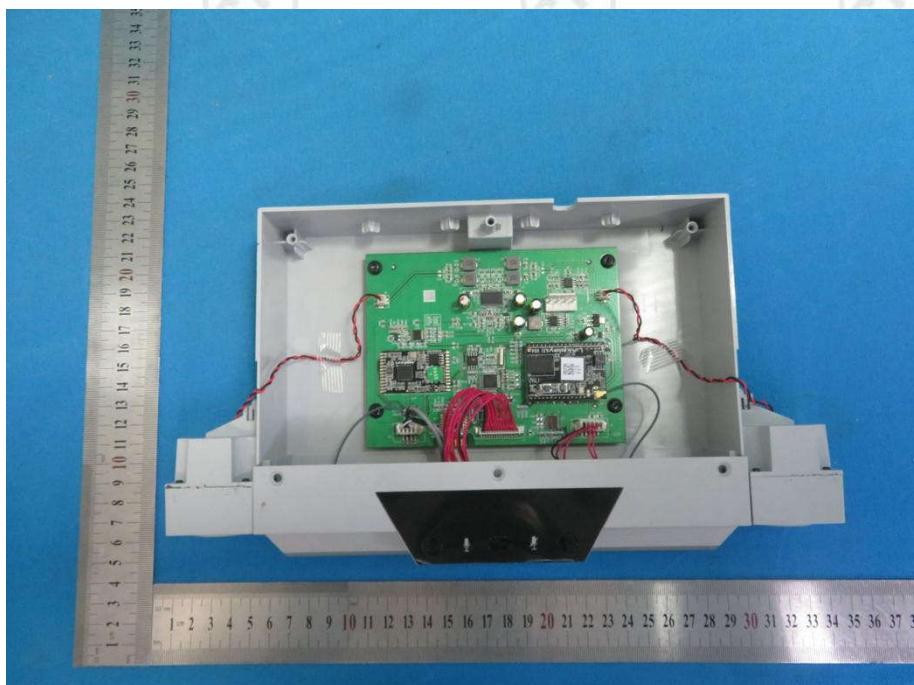
View of Product-9



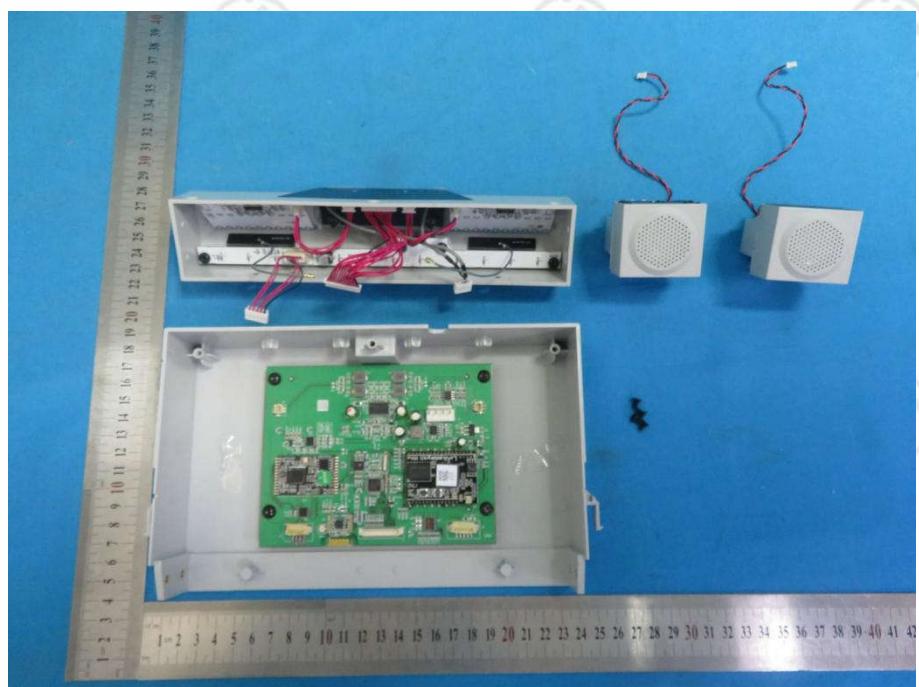
View of Product-10



View of Product-11



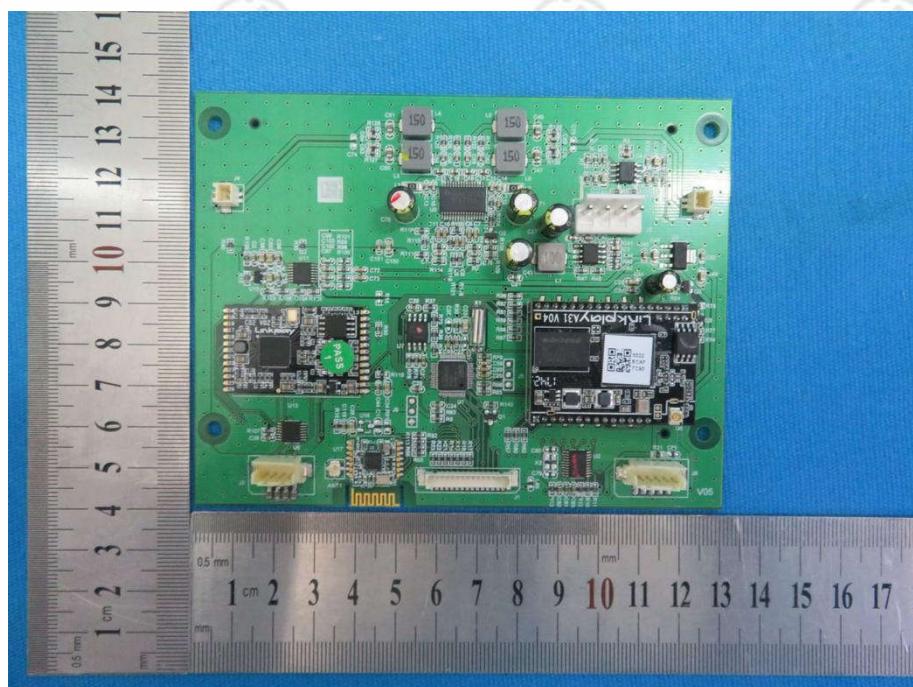
View of Product-12



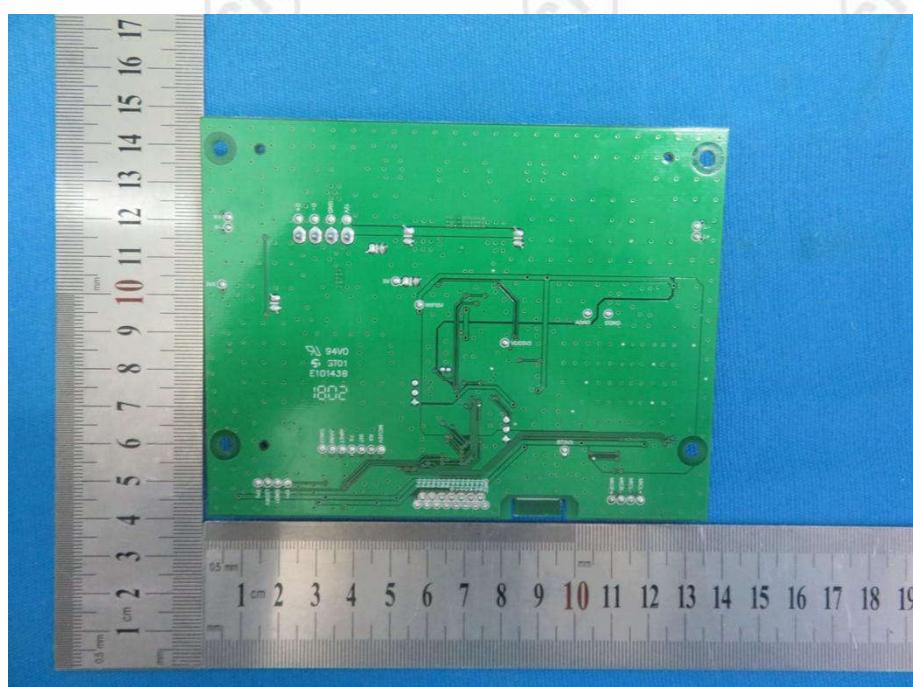
View of Product-13



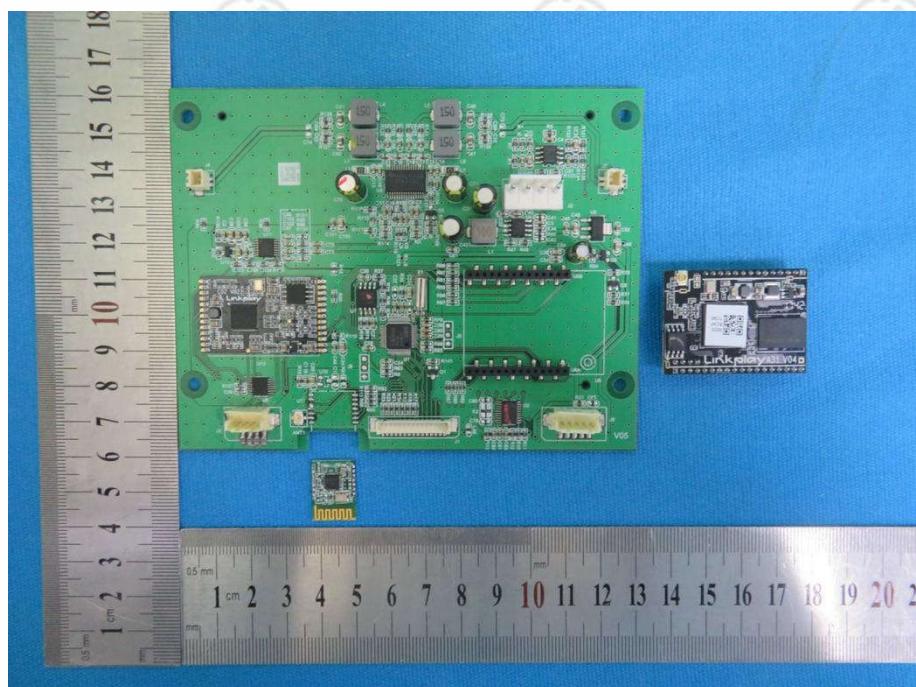
View of Product-14



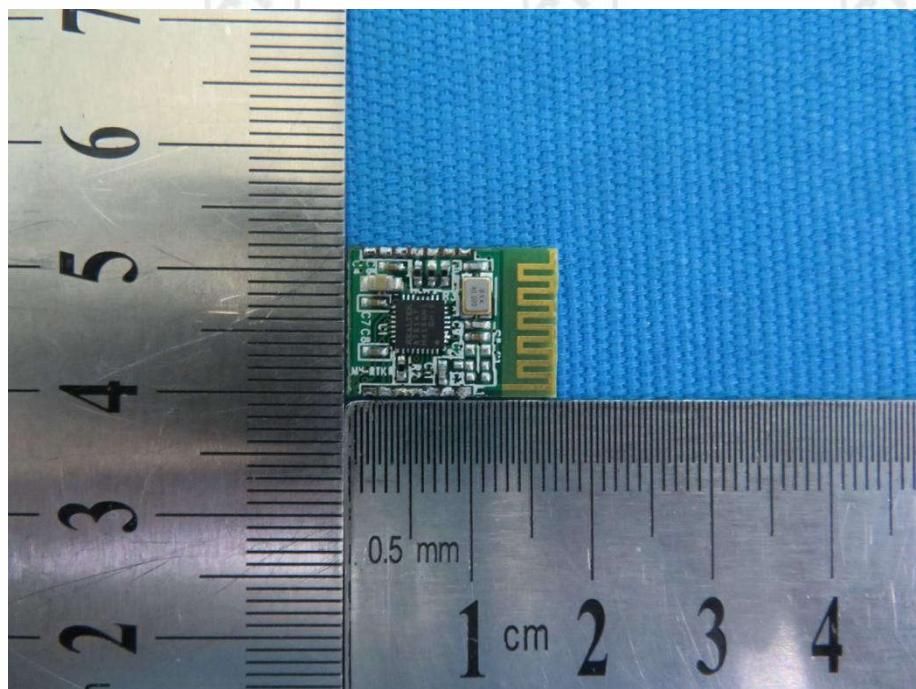
View of Product-15



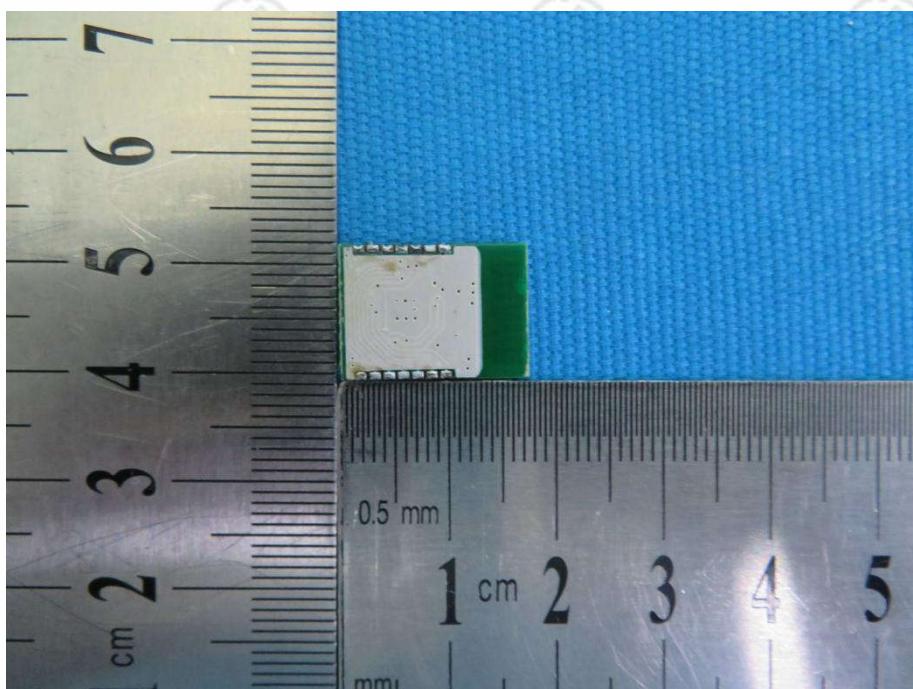
View of Product-16



View of Product-17



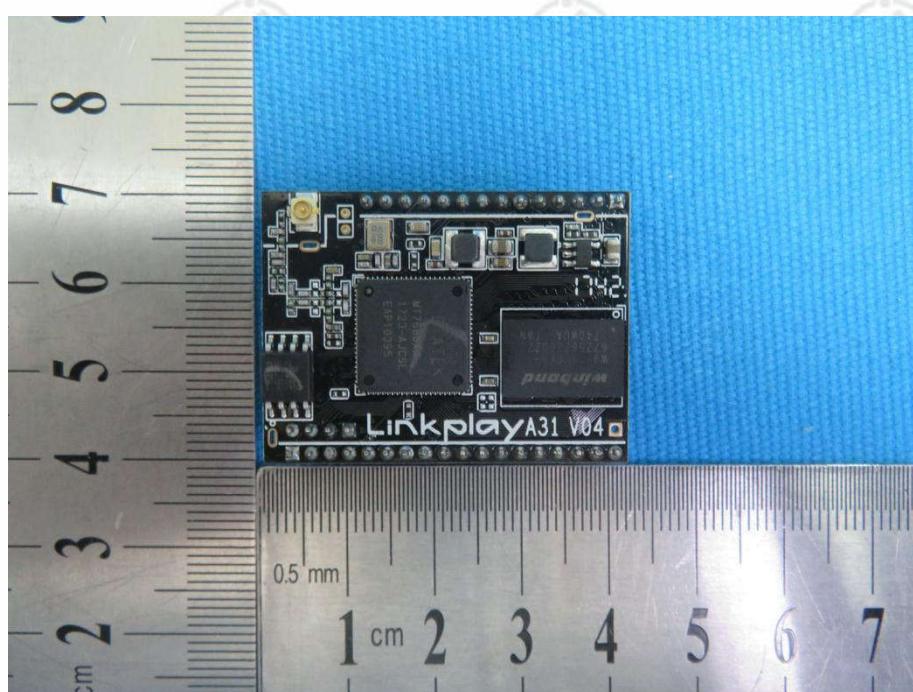
View of Product-18



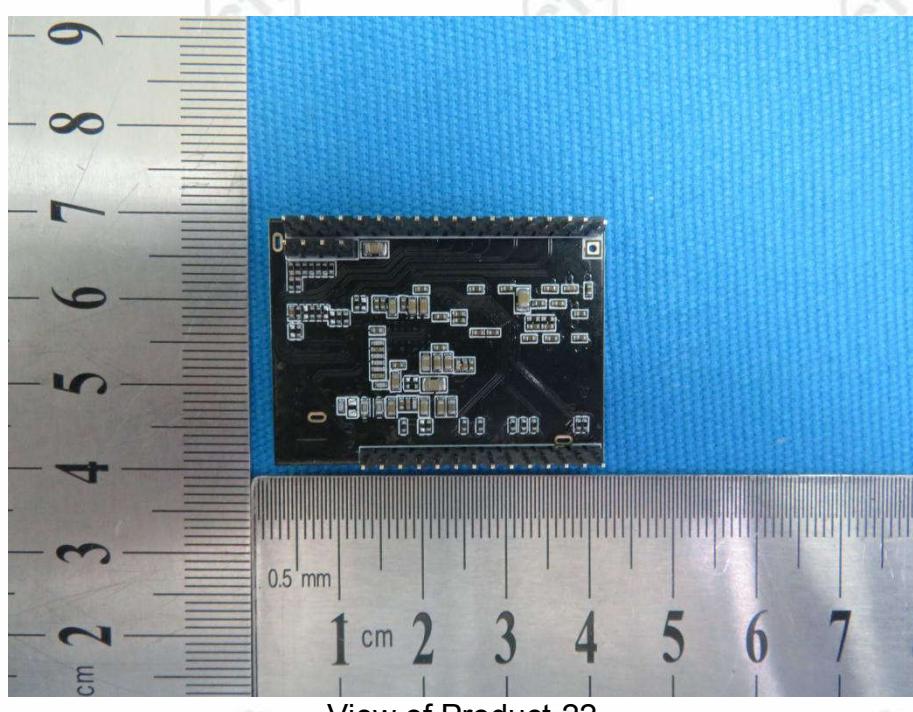
View of Product-19



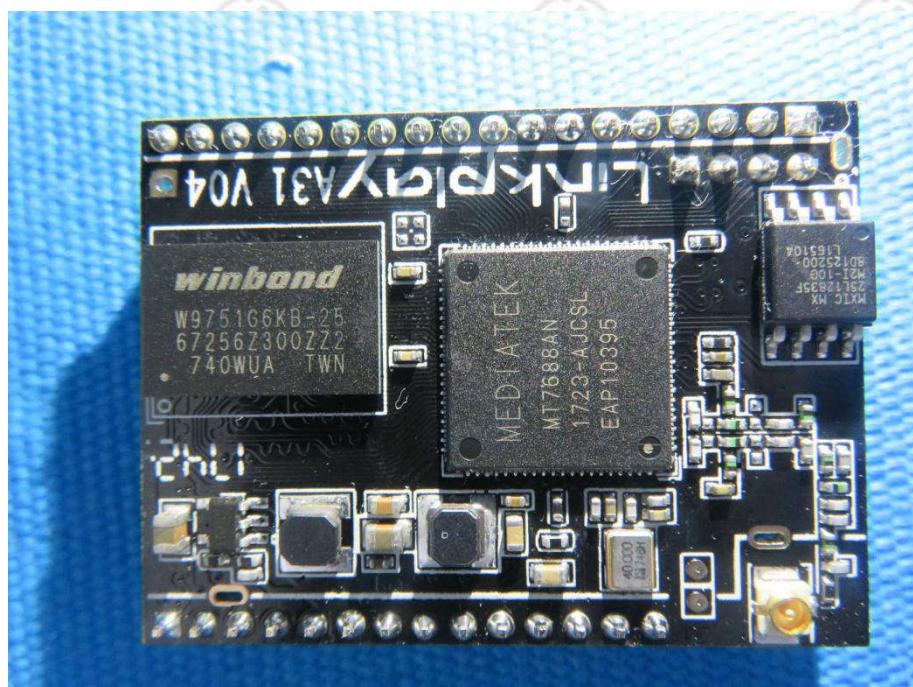
View of Product-20



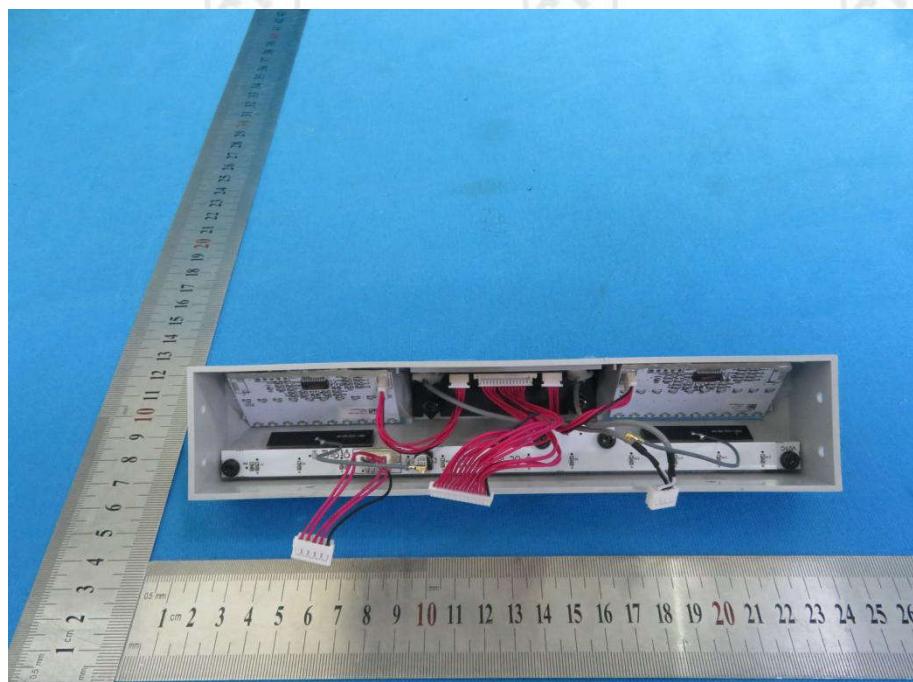
View of Product-21



View of Product-22



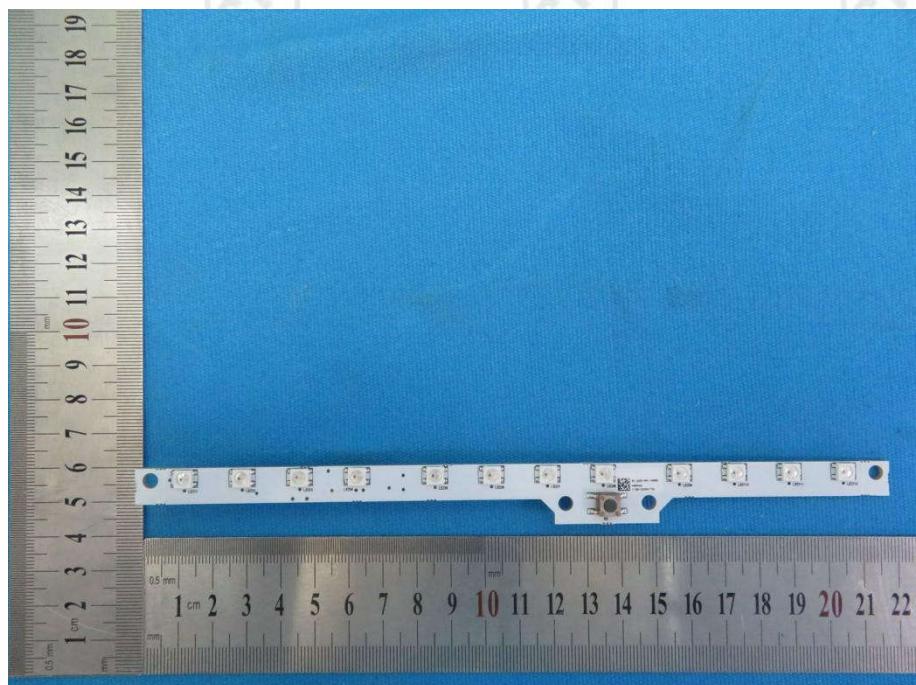
View of Product-23



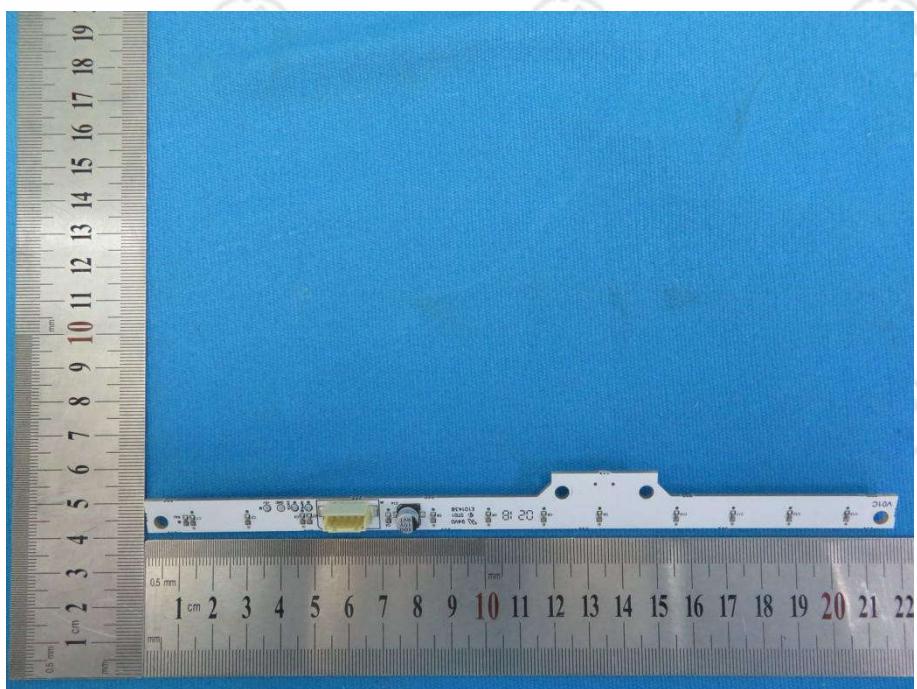
View of Product-24



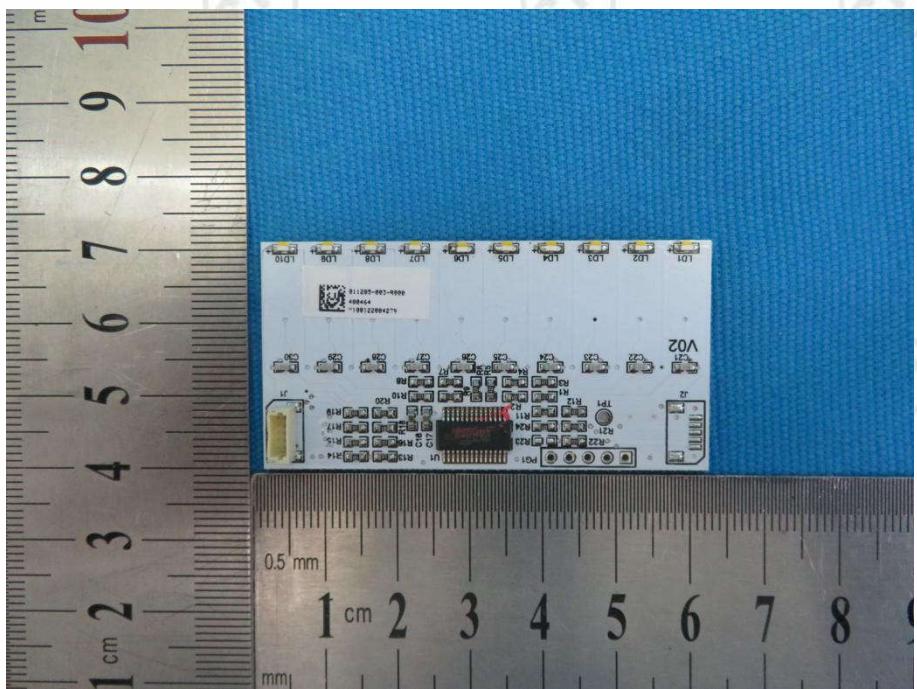
View of Product-25



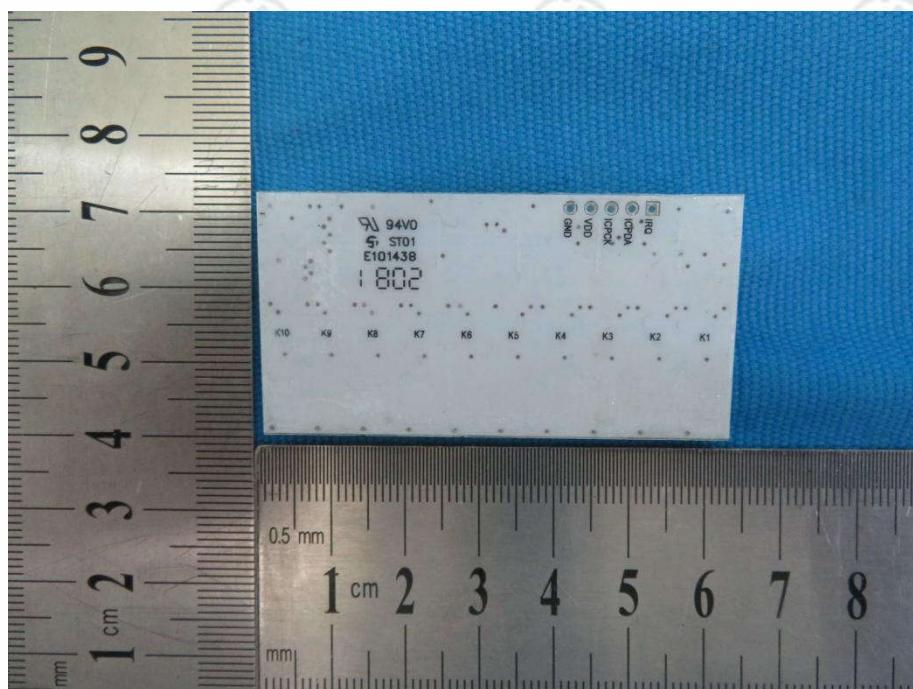
View of Product-26



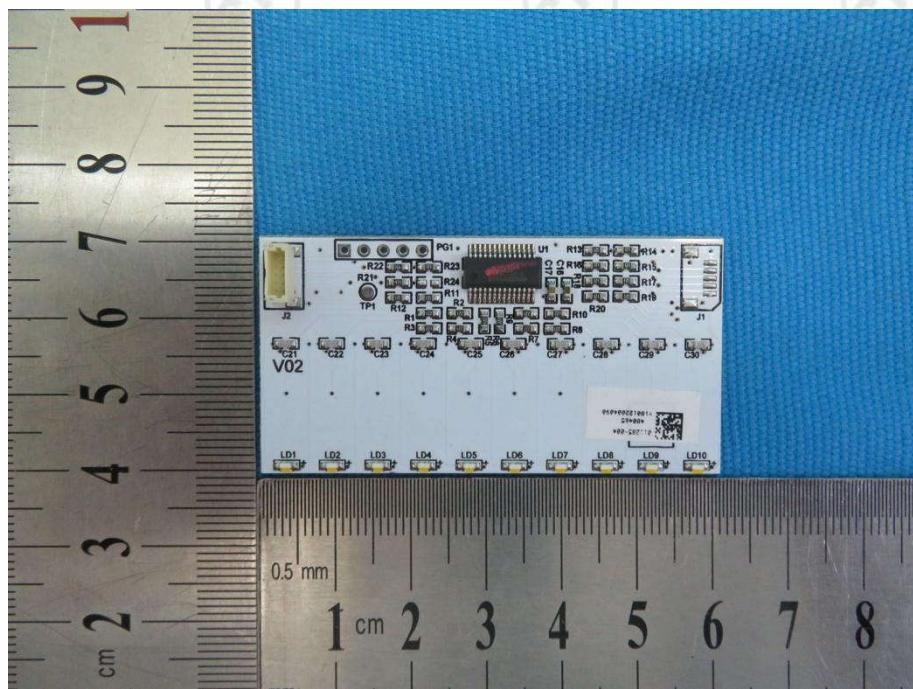
View of Product-27



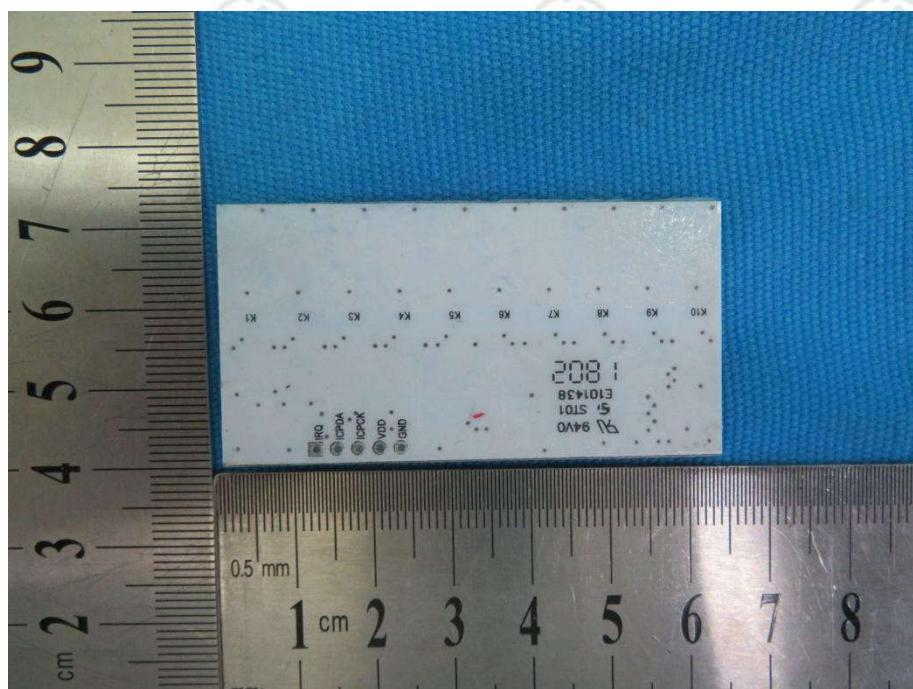
View of Product-28



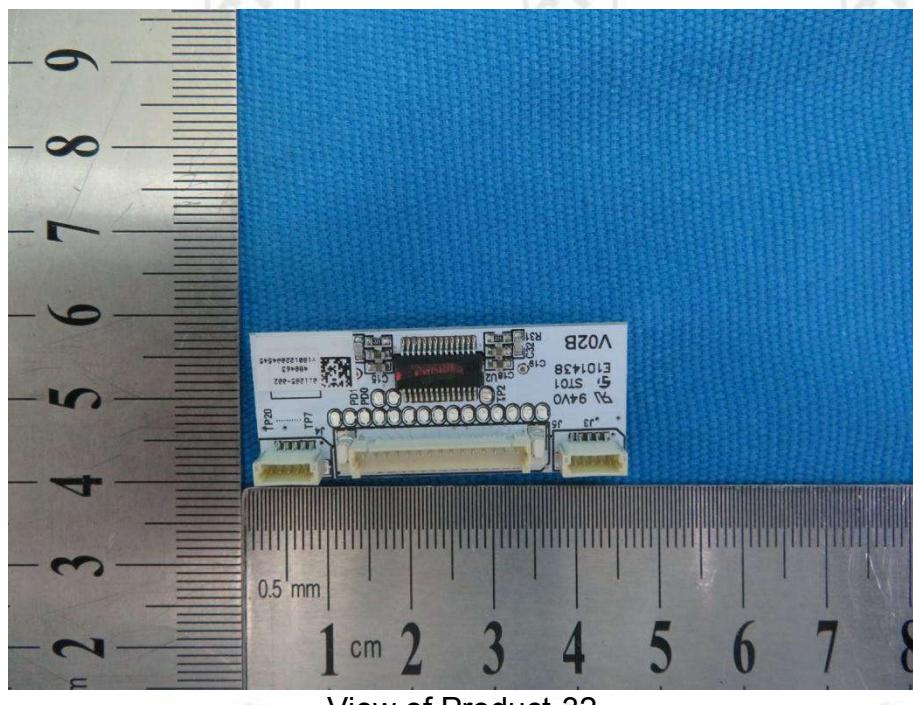
View of Product-29



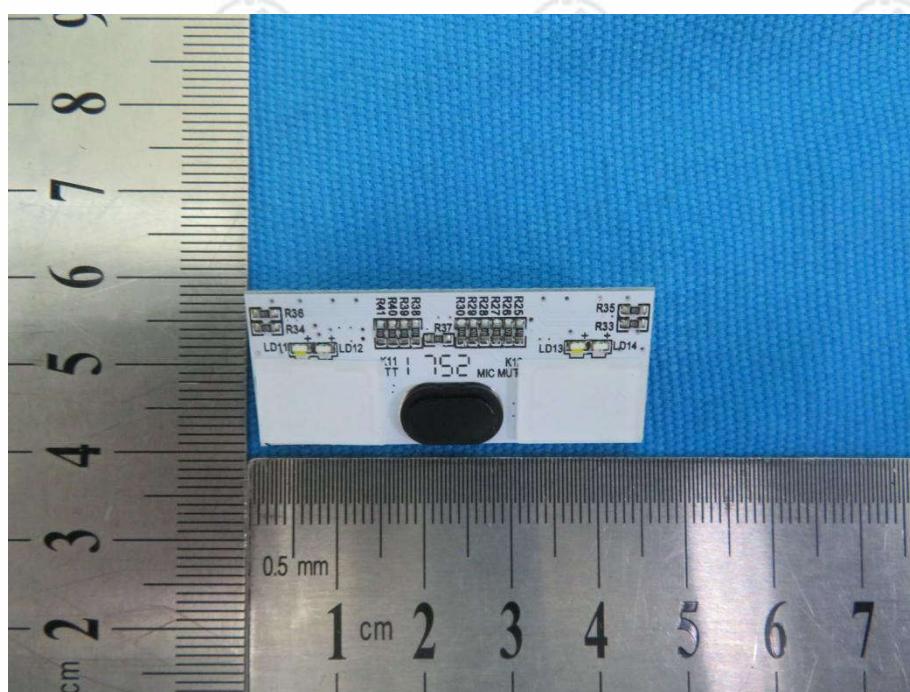
View of Product-30



View of Product-31



View of Product-32



View of Product-33

*** End of Report ***

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