

# RF TEST REPORT



Report No.: 17070172-FCC-R

Supersede Report No.: N/A

Applicant	Homestar Corporation	
Product Name	Electric fireplace	
Model No.	TED23 G3	
Serial No.	TED20 G3, TED25 G3, TED26 G3, TED28 G3, TED20 BC, TED23 BC, TED25 BC, TED26 BC, TED28 BC	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	March 22 to 29, 2017	
Issue Date	March 30, 2017	
Test Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Equipment complied with the specification		<input checked="" type="checkbox"/>
Equipment did not comply with the specification		<input type="checkbox"/>
Vera Zhang	David Huang	
Vera Zhang Test Engineer	David Huang Checked By	
This test report may be reproduced in full only		
Test result presented in this test report is applicable to the tested sample only		

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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## Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

### Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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## 1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070172-FCC-R	NONE	Original	March 30, 2017

## 2. Customer information

Applicant Name	Homestar Corporation
Applicant Add	18 Qi An Rd, Homestar Industrial Campus, Fuzhou, Fujian, China
Manufacturer	Homestar Corporation
Manufacturer Add	18 Qi An Rd, Homestar Industrial Campus, Fuzhou, Fujian, China

## 3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0
Test Software of Conducted Emission	EZ-EMC(ver.lcp-03A1)

#### **4. Equipment under Test (EUT) Information**

Description of EUT: Electric fireplace

Main Model: TED23 G3

Serial Model: TED20 G3, TED25 G3, TED26 G3, TED28 G3, TED20 BC, TED23 BC, TED25 BC, TED26 BC, TED28 BC

Date EUT received: March 21, 2017

Test Date(s): March 22 to 29, 2017

Equipment Category : DTS

Antenna Gain: 1.66dBi

Antenna Type: PCB antenna

Type of Modulation: GFSK

RF Operating Frequency (ies): 2402-2480 MHz

Max. Output Power: -0.778dBm

Number of Channels: 40CH

Port: Power Port

Trade Name : N/A

Input Power: Spec: AC 120V, 60Hz, 1500Watts

FCC ID: 2ALNGHOMESTAR-TEDBC

## 5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247 (a)(2)	DTS (6 dB) CHANNEL BANDWIDTH	Compliance
§15.247(b)(3)	Conducted Maximum Output Power	Compliance
§15.247(e)	Power Spectral Density	Compliance
§15.247(d)	Band-Edge & Unwanted Emissions into Restricted Frequency Bands	Compliance
§15.207 (a),	AC Power Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

### Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band-Edge & Unwanted Emissions into Restricted Frequency Bands and Radiated Emissions & Unwanted Emissions into Restricted Frequency Bands	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

## **6. Measurements, Examination And Derived Results**

### **6.1 Antenna Requirement**

#### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **Antenna Connector Construction**

The EUT has 1 antenna:

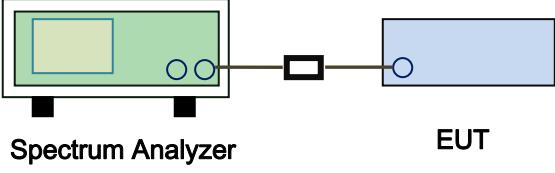
A permanently attached PCB antenna for Bluetooth/WIFI/BLE, the gain is 1.66dBi for BLE.

**The antenna meets up with the ANTENNA REQUIREMENT.**

**Result:** Compliance.

## 6.2 DTS (6 dB) Channel Bandwidth

Temperature	23°C
Relative Humidity	57%
Atmospheric Pressure	1020mbar
Test date :	March 23, 2017
Tested By :	Vera Zhang

Spec	Item	Requirement	Applicable
§ 15.247(a)(2)	a)	6dB BW $\geq$ 500kHz;	<input checked="" type="checkbox"/>
RSS Gen(4.6.1)	b)	99% BW: For FCC reference only; required by IC.	<input checked="" type="checkbox"/>
Test Setup		 <b>Spectrum Analyzer</b> <b>EUT</b>	
Test Procedure		<p>558074 D01 DTS MEAS Guidance v03r03, 8.1 DTS bandwidth</p> <p><u>6dB Emission bandwidth measurement procedure</u></p> <ul style="list-style-type: none"> <li>- Set RBW = 100 kHz.</li> <li>- Set the video bandwidth (VBW) <math>\geq</math> 3 RBW.</li> <li>- Detector = Peak.</li> <li>- Trace mode = max hold.</li> <li>- Sweep = auto couple.</li> <li>- Allow the trace to stabilize.</li> </ul> <p>Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.</p>	
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

**Test Data**     Yes       N/A

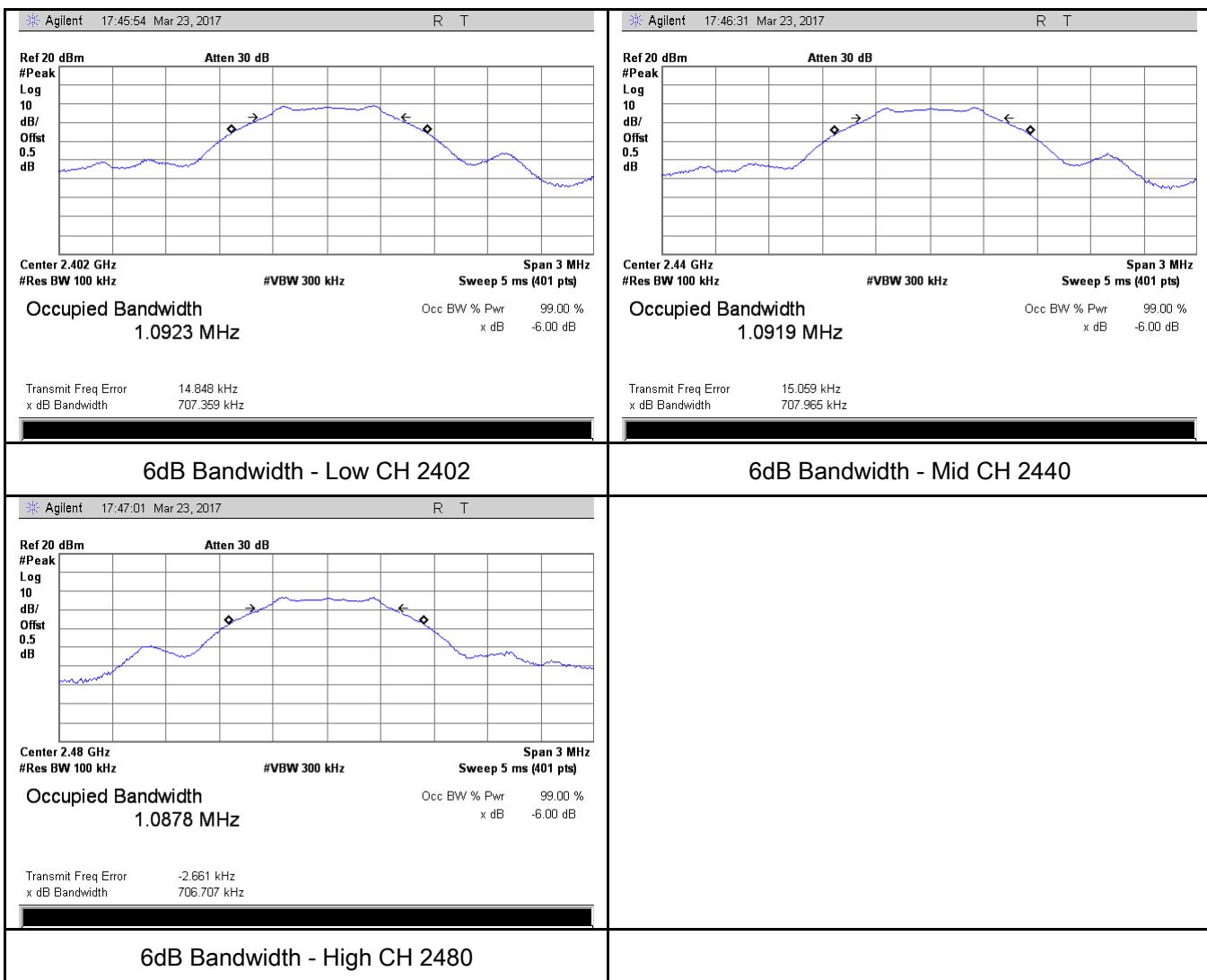
**Test Plot**     Yes (See below)       N/A

## 6dB Bandwidth measurement result

### Test Data

CH	Frequency (MHz)	6dB Bandwidth (kHz)	99% Occupied Bandwidth (MHz)
Low	2402	707.359	1.0923
Mid	2440	707.965	1.0919
High	2480	706.707	1.0878

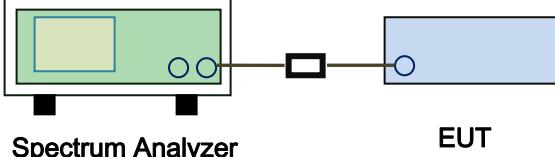
### Test Plots



### 6.3 Maximum Output Power

Temperature	23°C
Relative Humidity	57%
Atmospheric Pressure	1020mbar
Test date :	March 23, 2017
Tested By :	Vera Zhang

#### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3),RSS210 (A8.4)	a)	FHSS in 2400-2483.5MHz with $\geq$ 75 channels: $\leq$ 1 Watt	<input type="checkbox"/>
	b)	FHSS in 5725-5850MHz: $\leq$ 1 Watt	<input type="checkbox"/>
	c)	For all other FHSS in the 2400-2483.5MHz band: $\leq$ 0.125 Watt.	<input type="checkbox"/>
	d)	FHSS in 902-928MHz with $\geq$ 50 channels: $\leq$ 1 Watt	<input type="checkbox"/>
	e)	FHSS in 902-928MHz with $\geq$ 25 & $<$ 50 channels: $\leq$ 0.25 Watt	<input type="checkbox"/>
	f)	DTS in 902-928MHz, 2400-2483.5MHz: $\leq$ 1 Watt	<input checked="" type="checkbox"/>
Test Setup		 <b>Spectrum Analyzer</b> <b>EUT</b>	
Test Procedure		<p>558074 D01 DTS MEAS Guidance v03r03, 9.1.2 Integrated band power method</p> <p>Maximum output power measurement procedure</p> <ol style="list-style-type: none"> <li>Set the RBW <math>\geq</math> DTS bandwidth.</li> <li>Set VBW <math>\geq</math> <math>3 \times</math> RBW.</li> <li>Set span <math>\geq</math> <math>3 \times</math> RBW</li> <li>Sweep time = auto couple.</li> <li>Detector = peak.</li> <li>Trace mode = max hold.</li> <li>Allow trace to fully stabilize.</li> <li>Use peak marker function to determine the peak amplitude level.</li> </ol>	
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data  Yes  N/A

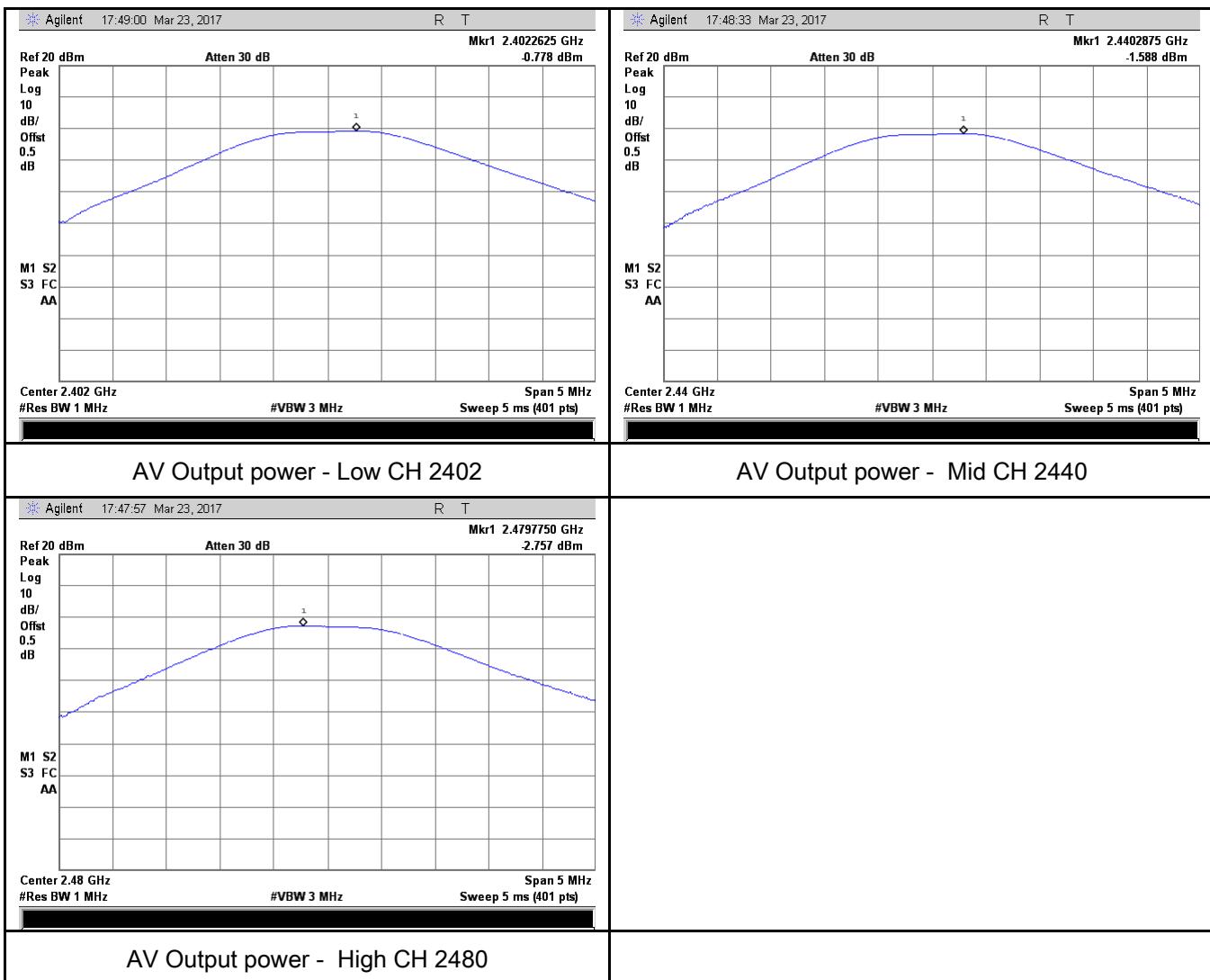
Test Plot  Yes (See below)  N/A

### Output Power measurement result

#### Test Data

Type	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	Low	2402	-0.778	30	Pass
	Mid	2440	-1.588	30	Pass
	High	2480	-2.757	30	Pass

#### Test Plots



## 6.4 Power Spectral Density

Temperature	23°C
Relative Humidity	57%
Atmospheric Pressure	1020mbar
Test date :	March 23, 2017
Tested By :	Vera Zhang

Test Data  Yes

N/A

**Test Plot**  Yes (See below)

N/A

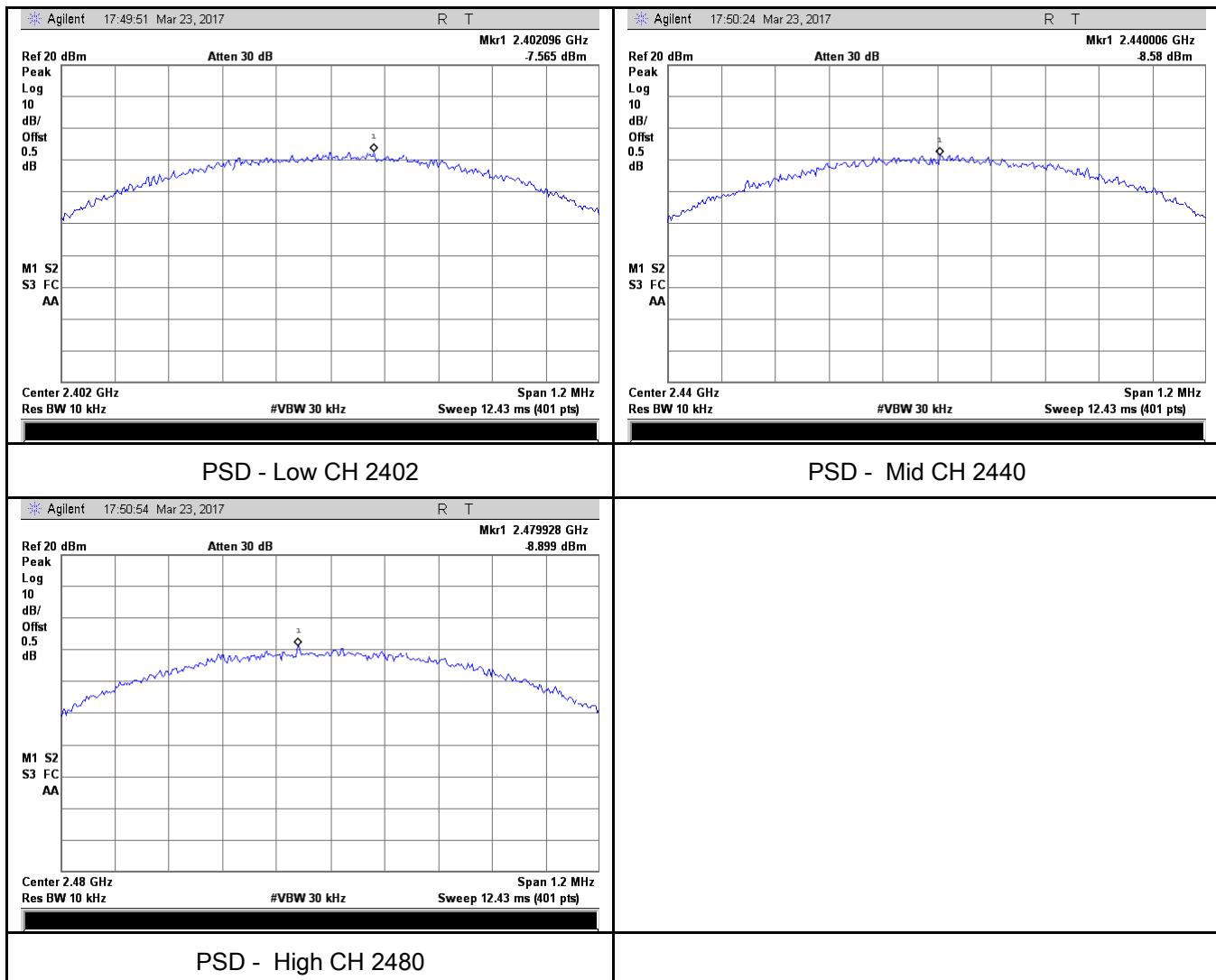
## Power Spectral Density measurement result

### Test Data

Type	CH	Freq (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Result
PSD	Low	2402	-7.565	-5.23	-12.795	8	Pass
	Mid	2440	-8.580	-5.23	-13.810	8	Pass
	High	2480	-8.899	-5.23	-14.129	8	Pass

Note: factor=10log(3/10)=-5.23

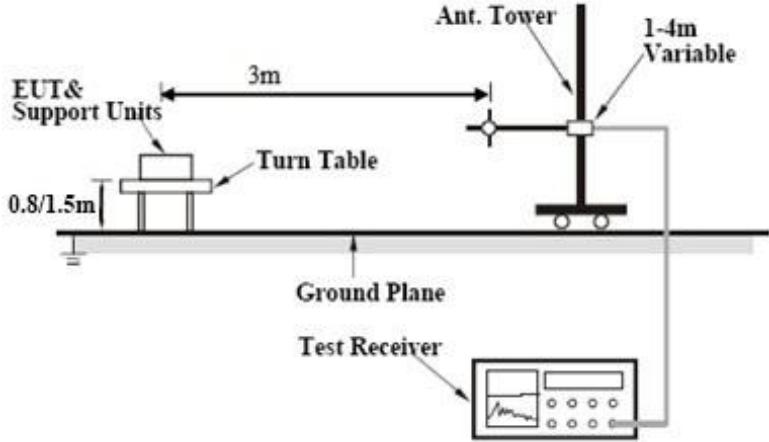
### Test Plots



## 6.5 Band-Edge & Unwanted Emissions into Restricted Frequency Bands

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1024mbar
Test date :	March 24, 2017
Tested By :	Vera Zhang

### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(d)	a)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.	<input checked="" type="checkbox"/>
Test Setup	 <p>The diagram illustrates the test setup. A Turn Table is positioned on a Ground Plane. An EUT &amp; Support Units is placed on the turn table. A vertical Ant. Tower is mounted on the turn table, with a 1-4m Variable height adjustment. A Test Receiver is connected to the Ant. Tower, receiving signals from the EUT.</p>		
Test Procedure	<p>Radiated Method Only</p> <ul style="list-style-type: none"> <li>- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.</li> <li>- 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.</li> </ul>		

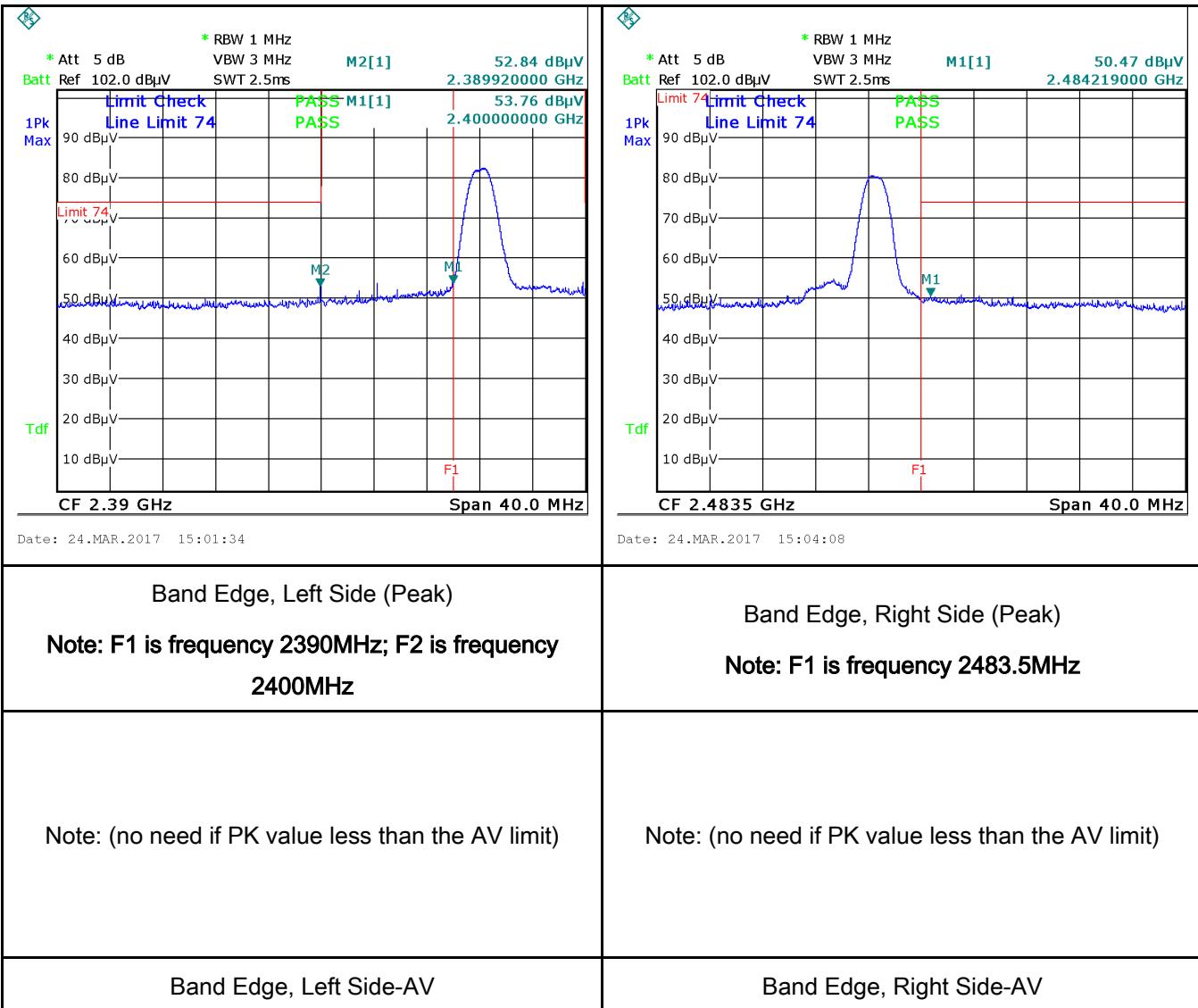
	<ul style="list-style-type: none"> <li>- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:           <ul style="list-style-type: none"> <li>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</li> <li>b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.</li> <li>c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</li> </ul> </li> <li>- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.</li> <li>- 5. Repeat above procedures until all measured frequencies were complete.</li> </ul>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data     Yes       N/A

Test Plot     Yes (See below)       N/A

## Test Plots

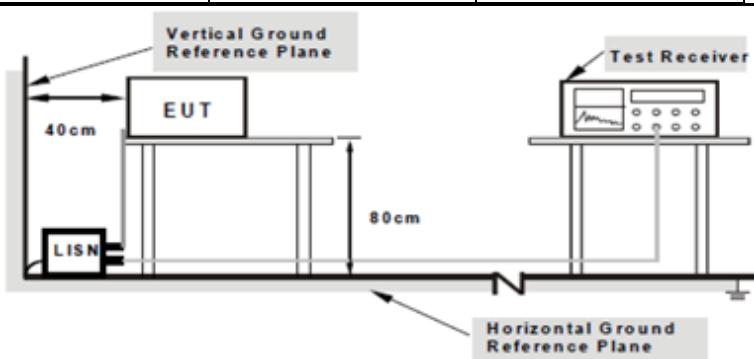
### Band Edge measurement result



## 6.6 AC Power Line Conducted Emissions

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1024mbar
Test date :	March 24, 2017
Tested By :	Vera Zhang

### Requirement(s):

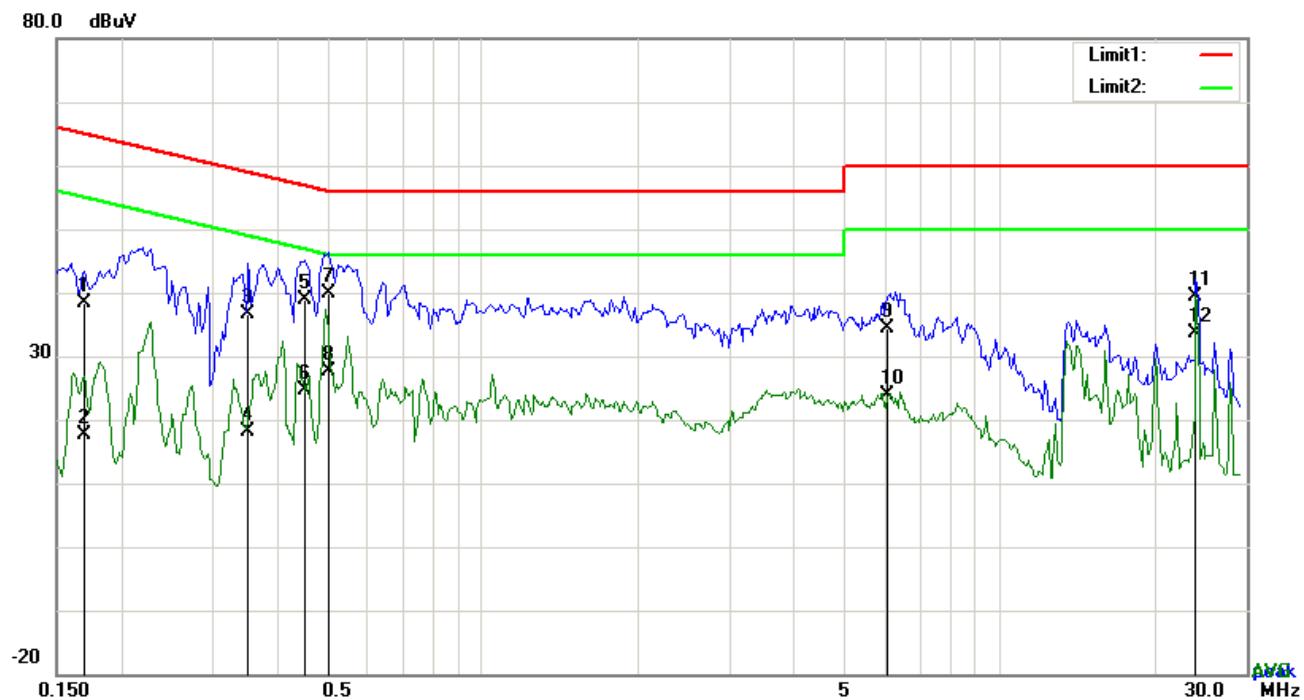
Spec	Item	Requirement	Applicable														
47CFR§15.207, RSS210 (A8.1)	a)	<p>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dB<math>\mu</math>V)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 ~ 0.5</td> <td>66 – 56</td> <td>56 – 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>	Frequency ranges (MHz)	Limit (dB $\mu$ V)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50	<input checked="" type="checkbox"/>
Frequency ranges (MHz)	Limit (dB $\mu$ V)																
	QP	Average															
0.15 ~ 0.5	66 – 56	56 – 46															
0.5 ~ 5	56	46															
5 ~ 30	60	50															
Test Setup	 <p><b>Note:</b> 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p>																
Procedure	<ol style="list-style-type: none"> <li>The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.</li> <li>The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.</li> <li>The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss</li> </ol>																

	coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data       Yes       N/A

Test Plot       Yes (See below)       N/A

**Test Mode:** Transmitting Mode

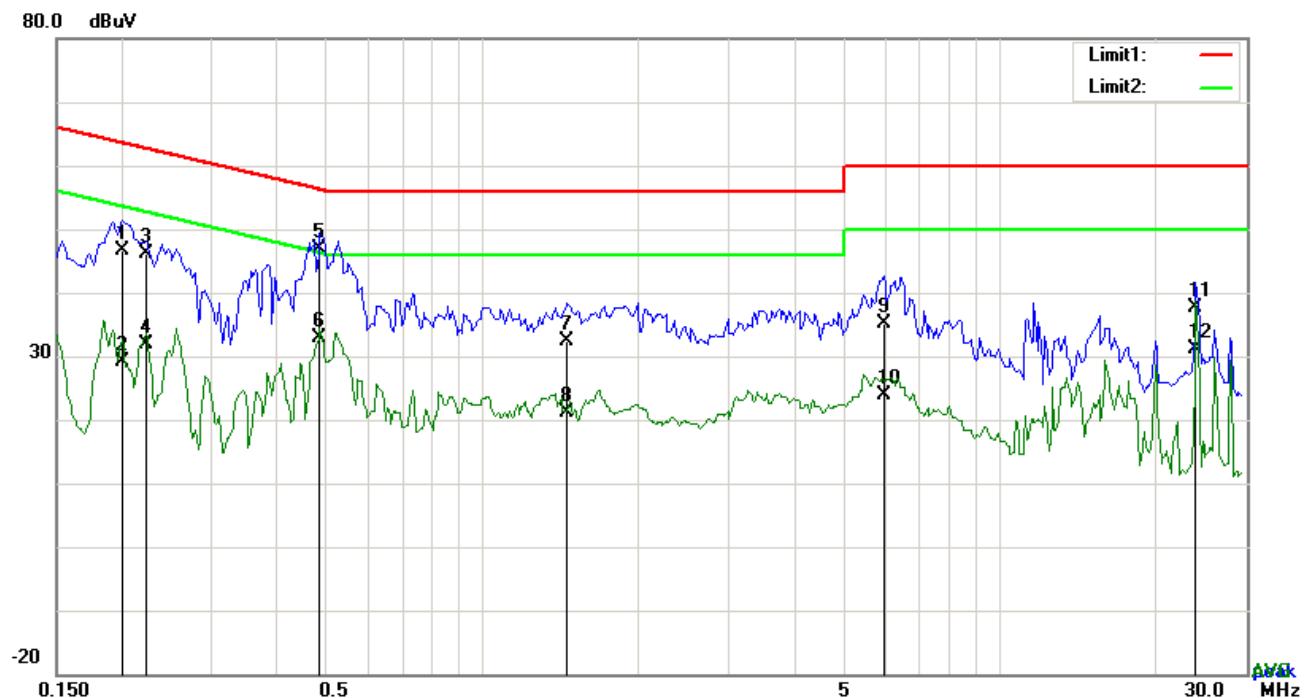


***Test Data***

**Phase Line Plot at 120Vac, 60Hz**

No.	P/L	Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Corrected (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
1	L1	0.1695	28.33	QP	10.03	38.36	64.98	-26.62
2	L1	0.1695	7.68	AVG	10.03	17.71	54.98	-37.27
3	L1	0.3528	26.64	QP	10.03	36.67	58.90	-22.23
4	L1	0.3528	8.20	AVG	10.03	18.23	48.90	-30.67
5	L1	0.4542	28.95	QP	10.03	38.98	56.80	-17.82
6	L1	0.4542	14.52	AVG	10.03	24.55	46.80	-22.25
7	L1	0.5049	29.83	QP	10.03	39.86	56.00	-16.14
8	L1	0.5049	17.60	AVG	10.03	27.63	46.00	-18.37
9	L1	6.0693	24.23	QP	10.09	34.32	60.00	-25.68
10	L1	6.0693	13.79	AVG	10.09	23.88	50.00	-26.12
11	L1	23.9898	28.99	QP	10.38	39.37	60.00	-20.63
12	L1	23.9898	23.36	AVG	10.38	33.74	50.00	-16.26

**Test Mode:** Transmitting Mode



**Test Data**

Phase Neutral Plot at 120Vac, 60Hz

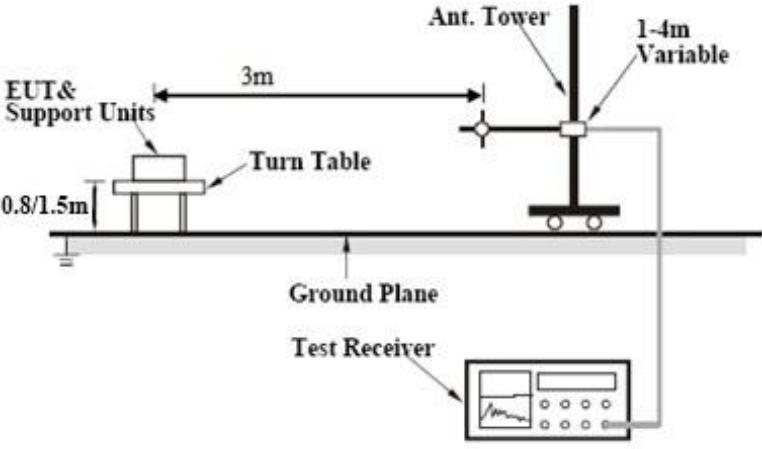
No.	P/L	Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Corrected (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
1	N	0.2007	36.50	QP	10.02	46.52	63.58	-17.06
2	N	0.2007	19.07	AVG	10.02	29.09	53.58	-24.49
3	N	0.2241	36.04	QP	10.02	46.06	62.67	-16.61
4	N	0.2241	21.93	AVG	10.02	31.95	52.67	-20.72
5	N	0.4854	36.83	QP	10.02	46.85	56.25	-9.40
6	N	0.4854	22.98	AVG	10.02	33.00	46.25	-13.25
7	N	1.4565	22.42	QP	10.03	32.45	56.00	-23.55
8	N	1.4565	11.18	AVG	10.03	21.21	46.00	-24.79
9	N	5.9718	25.02	QP	10.08	35.10	60.00	-24.90
10	N	5.9718	13.90	AVG	10.08	23.98	50.00	-26.02
11	N	23.9742	27.19	QP	10.32	37.51	60.00	-22.49
12	N	23.9742	20.80	AVG	10.32	31.12	50.00	-18.88

## 6.7 Radiated Emissions & Restricted Band

Temperature	25°C
Relative Humidity	57%
Atmospheric Pressure	1024mbar
Test date :	March 24, 2017
Tested By :	Vera Zhang

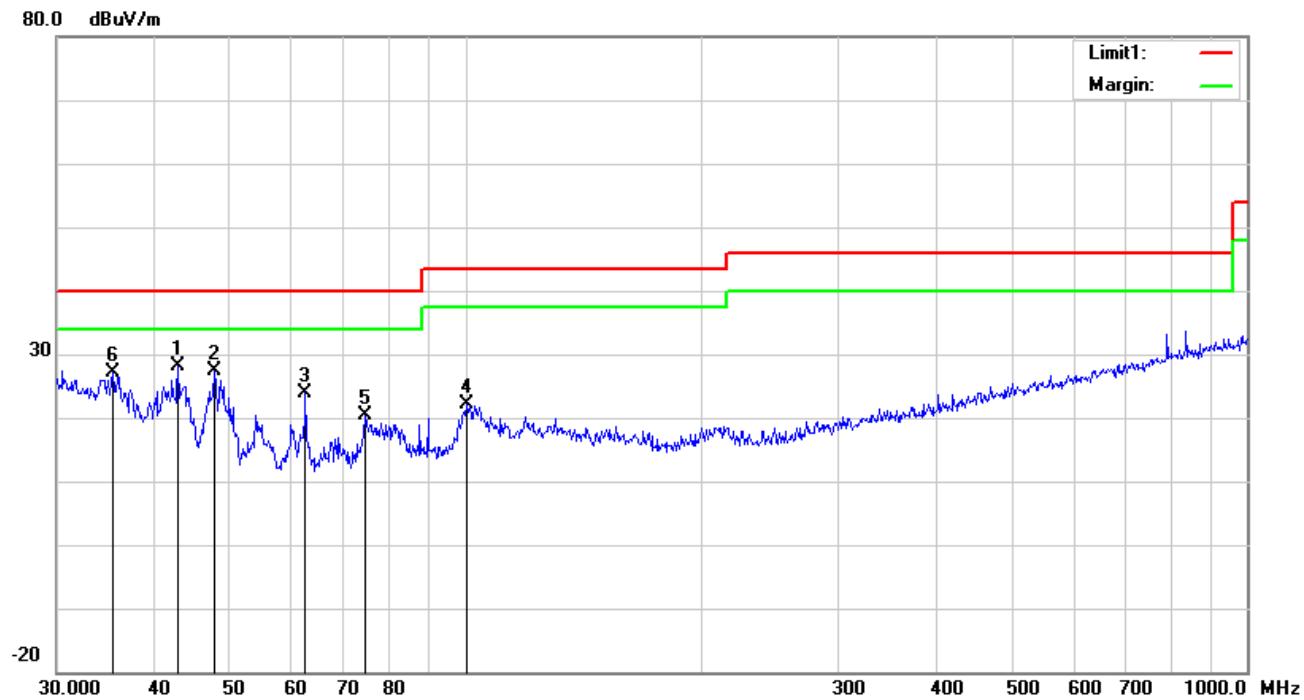
### Requirement(s):

Spec	Item	Requirement	Applicable										
47CFR§15. 247(d), RSS210 (A8.5)	a)	<p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (<math>\mu</math>V/m)</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>100</td> </tr> <tr> <td>88 – 216</td> <td>150</td> </tr> <tr> <td>216 - 960</td> <td>200</td> </tr> <tr> <td>Above 960</td> <td>500</td> </tr> </tbody> </table>	Frequency range (MHz)	Field Strength ( $\mu$ V/m)	30 – 88	100	88 – 216	150	216 - 960	200	Above 960	500	<input checked="" type="checkbox"/>
Frequency range (MHz)	Field Strength ( $\mu$ V/m)												
30 – 88	100												
88 – 216	150												
216 - 960	200												
Above 960	500												
b)	<p>For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required</p> <p><input checked="" type="checkbox"/> 20 dB down <input type="checkbox"/> 30 dB down</p>	<input checked="" type="checkbox"/>											
	c)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>										

Test Setup	 <p>The diagram illustrates the test setup. A Turn Table is positioned on a Ground Plane. A vertical Ant. Tower is mounted on the Turn Table, with a 1-4m Variable height adjustment. The distance between the EUT &amp; Support Units and the Ant. Tower is 3m. The EUT &amp; Support Units are mounted on the Turn Table at a height of 0.8/1.5m. A Test Receiver is connected to the Ant. Tower to measure emissions.</p>
Procedure	<ol style="list-style-type: none"> <li>1. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> <li>a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>b. The EUT was then rotated to the direction that gave the maximum emission.</li> <li>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</li> <li>4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.  The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</li> <li>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol>
Remark	Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n – HT20-2437MHz mode.
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Test Data	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> N/A
Test Plot	<input checked="" type="checkbox"/> Yes (See below) <input type="checkbox"/> N/A

Test Mode:	Transmitting Mode
------------	-------------------

Below 1GHz



**Test Data**

**Vertical Polarity Plot @3m**

No.	P/L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degr ee
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	H	42.8998	37.56	peak	11.99	22.29	0.77	28.03	40.00	-11.97	100	264
2	H	47.8260	39.61	peak	9.36	22.34	0.78	27.41	40.00	-12.59	100	270
3	H	62.4314	37.94	peak	7.42	22.40	0.81	23.77	40.00	-16.23	100	286
4	H	100.2286	32.84	peak	10.44	22.32	1.12	22.08	43.50	-21.42	100	77
5	H	74.3955	34.19	peak	7.71	22.40	0.96	20.46	40.00	-19.54	100	318
6	H	35.3750	31.44	peak	17.28	22.25	0.76	27.23	40.00	-12.77	200	162

## Below 1GHz



## Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBuV/m)	Detect or	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degr ee
1	V	50.2325	47.87	peak	8.37	22.38	0.80	34.66	40.00	-5.34	100	63
2	V	36.5092	36.84	peak	16.45	22.26	0.77	31.80	40.00	-8.20	200	158
3	V	101.2885	40.31	peak	10.63	22.32	1.13	29.75	43.50	-13.75	100	54
4	V	80.9275	38.13	peak	7.64	22.41	1.05	24.41	40.00	-15.59	100	109
5	V	210.7860	32.43	peak	11.95	22.36	1.57	23.59	43.50	-19.91	100	48
6	V	136.4598	30.81	peak	12.83	22.40	1.25	22.49	43.50	-21.01	100	229

**Above 1GHz**

<b>Test Mode:</b>	<b>Transmitting Mode</b>
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**Low Channel (2402 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4804	38.46	AV	V	33.83	6.86	31.72	47.43	54	-6.57
4804	38.17	AV	H	33.83	6.86	31.72	47.14	54	-6.86
4804	48.51	PK	V	33.83	6.86	31.72	57.48	74	-16.52
4804	47.39	PK	H	33.83	6.86	31.72	56.36	74	-17.64
17796	24.53	AV	V	45.03	11.21	32.38	48.39	54	-5.61
17796	24.03	AV	H	45.03	11.21	32.38	47.89	54	-6.11
17796	41.25	PK	V	45.03	11.21	32.38	65.11	74	-8.89
17796	40.84	PK	H	45.03	11.21	32.38	64.7	74	-9.3

**Middle Channel (2440 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4880	39.17	AV	V	33.86	6.82	31.82	48.03	54	-5.97
4880	38.73	AV	H	33.86	6.82	31.82	47.59	54	-6.41
4880	48.54	PK	V	33.86	6.82	31.82	57.4	74	-16.6
4880	47.66	PK	H	33.86	6.82	31.82	56.52	74	-17.48
17813	25.13	AV	V	45.15	11.18	32.41	49.05	54	-4.95
17813	24.57	AV	H	45.15	11.18	32.41	48.49	54	-5.51
17813	40.89	PK	V	45.15	11.18	32.41	64.81	74	-9.19
17813	40.27	PK	H	45.15	11.18	32.41	64.19	74	-9.81

High Channel (2480 MHz)

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4960	38.75	AV	V	33.9	6.76	31.92	47.49	54	-6.51
4960	38.11	AV	H	33.9	6.76	31.92	46.85	54	-7.15
4960	49.23	PK	V	33.9	6.76	31.92	57.97	74	-16.03
4960	48.48	PK	H	33.9	6.76	31.92	57.22	74	-16.78
17794	24.67	AV	V	45.22	11.35	32.38	48.86	54	-5.14
17794	23.58	AV	H	45.22	11.35	32.38	47.77	54	-6.23
17794	41.29	PK	V	45.22	11.35	32.38	65.48	74	-8.52
17794	40.7	PK	H	45.22	11.35	32.38	64.89	74	-9.11

**Note:**

- 1, The testing has been conformed to  $10*2480\text{MHz}=24,800\text{MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>AC Line Conducted</b>					
EMI test receiver	ESCS30	8471241027	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>
LISN	ISN T800	34373	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	<input checked="" type="checkbox"/>
Transient Limiter	LIT-153	531118	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
<b>RF conducted test</b>					
Agilent ESA-E SERIES	E4407B	MY45108319	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/25/2018	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/20/2016	09/19/2017	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>

## Annex B. EUT And Test Setup Photographs

### Annex B.i. Photograph: EUT External Photo

Whole Package View



EUT - Front View



EUT - Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View



**Annex B.ii. Photograph: EUT Internal Photo**

Cover Off - Top View 1



Cover Off - Top View 2



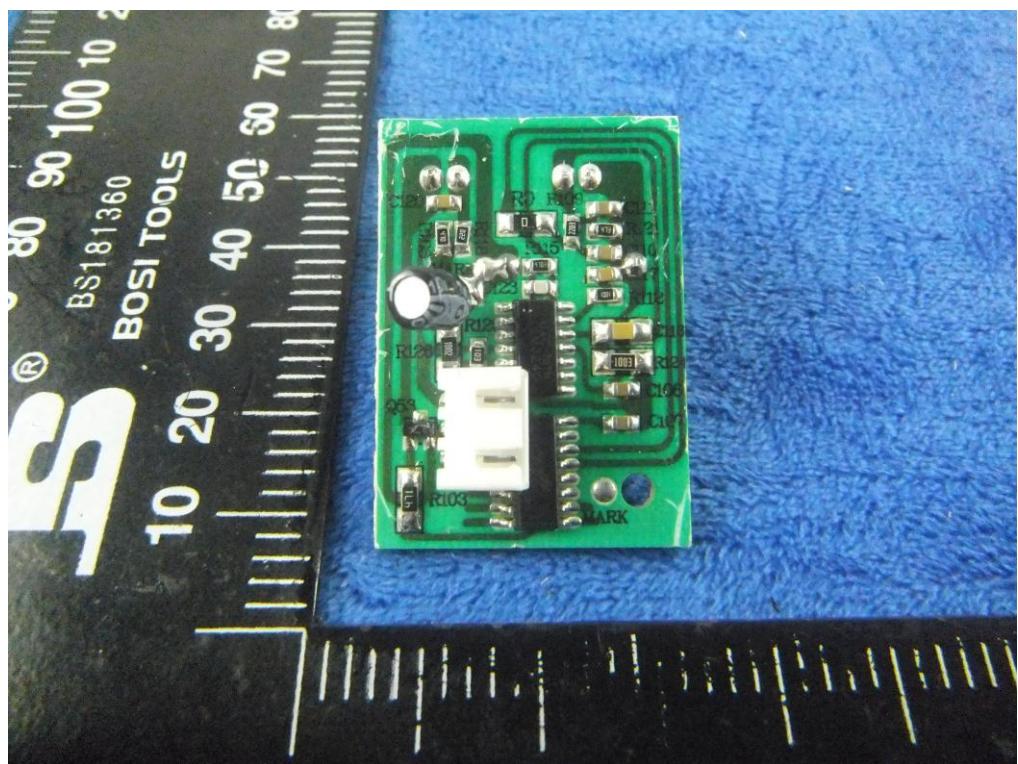
Mainboard - Front View



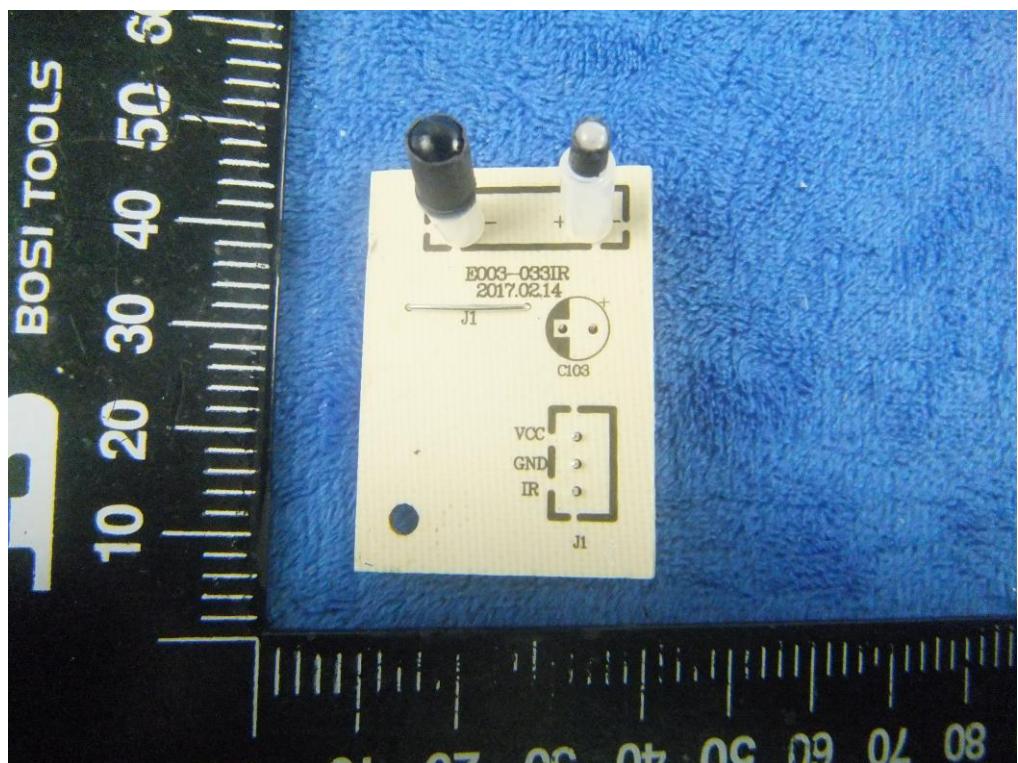
Mainboard – Rear View



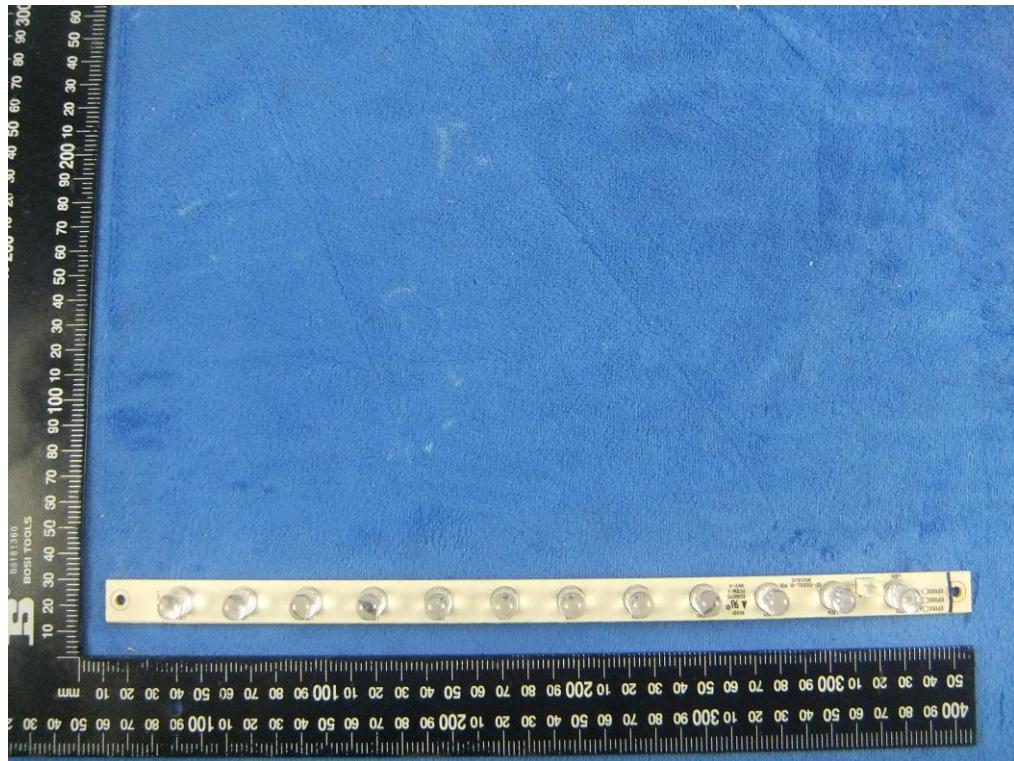
Small Board - Front View



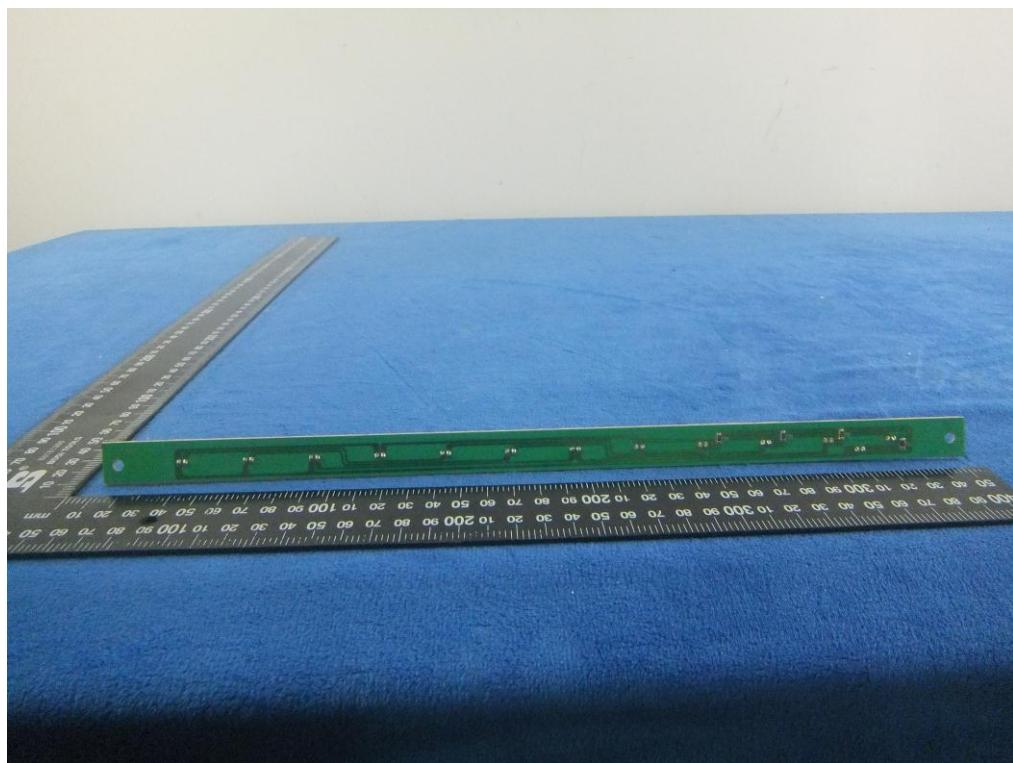
Small Board – Rear View



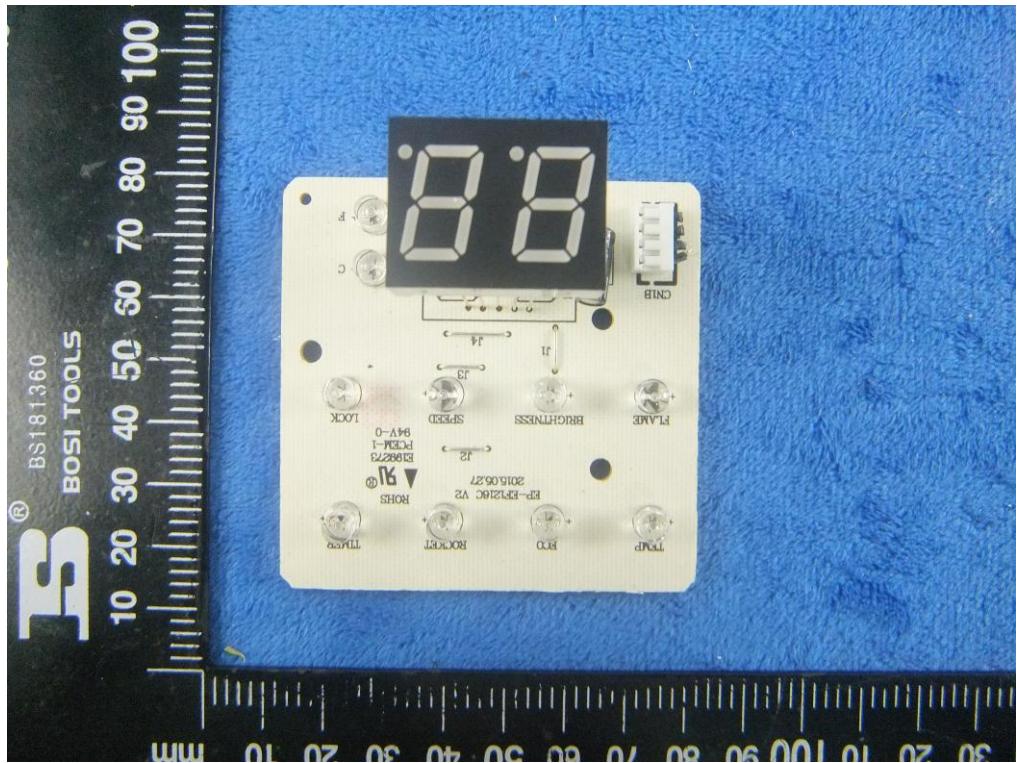
LED Board 1 – Front View



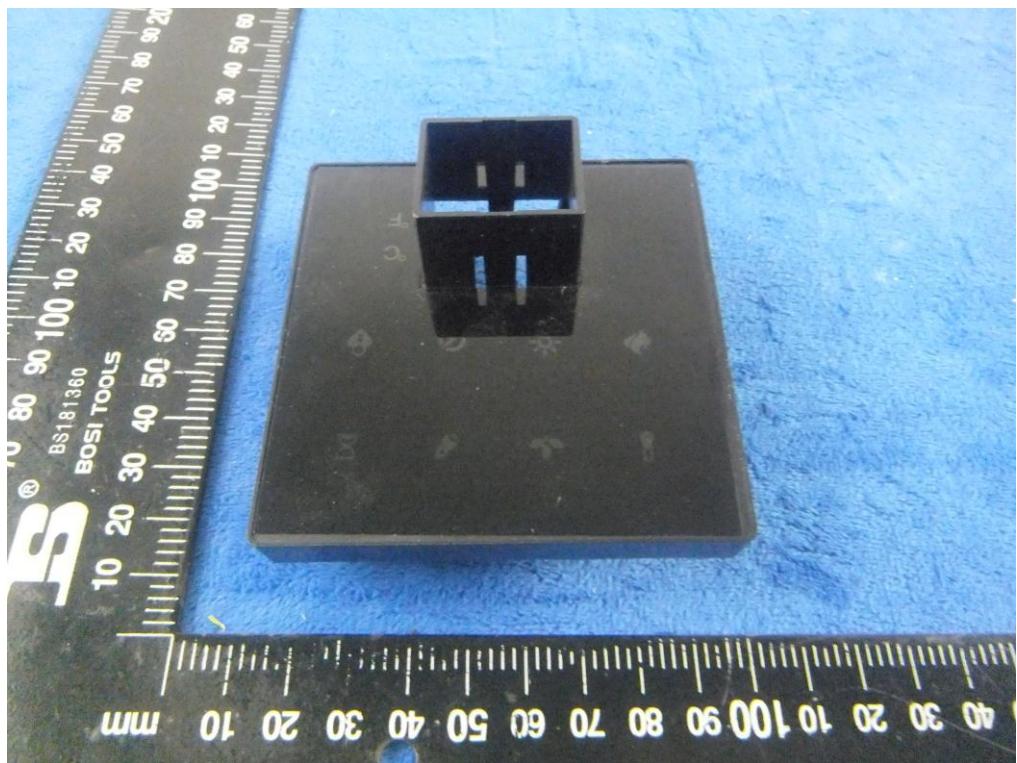
LED Board 1 – Rear View



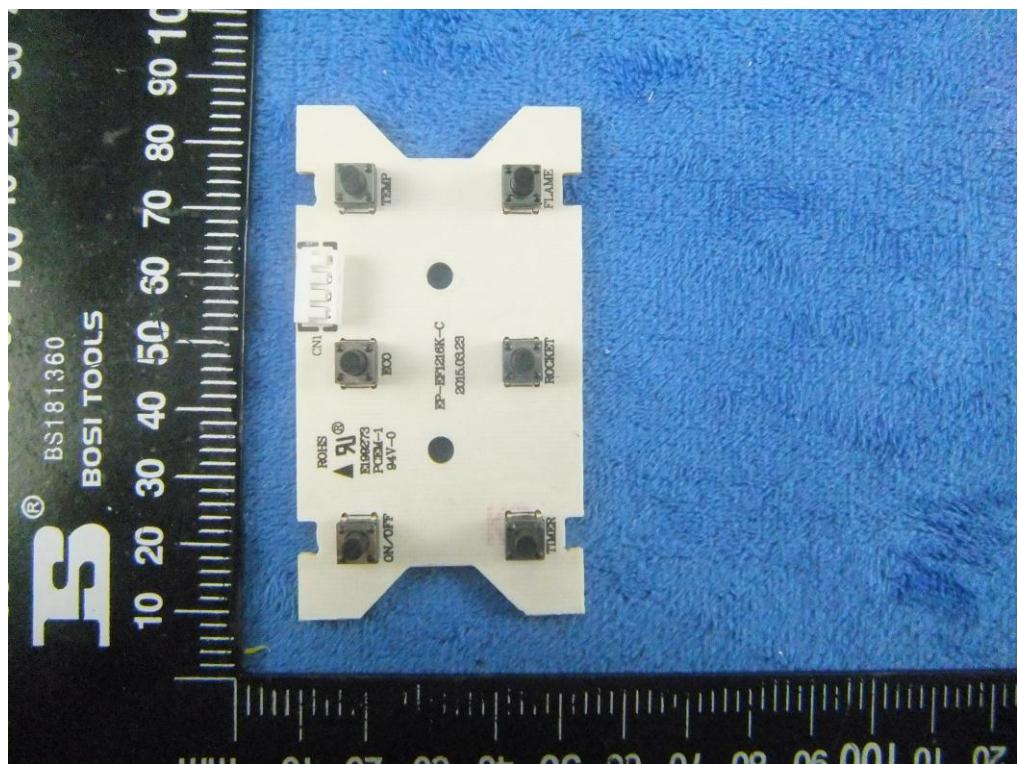
## LED Board 2 – Front View



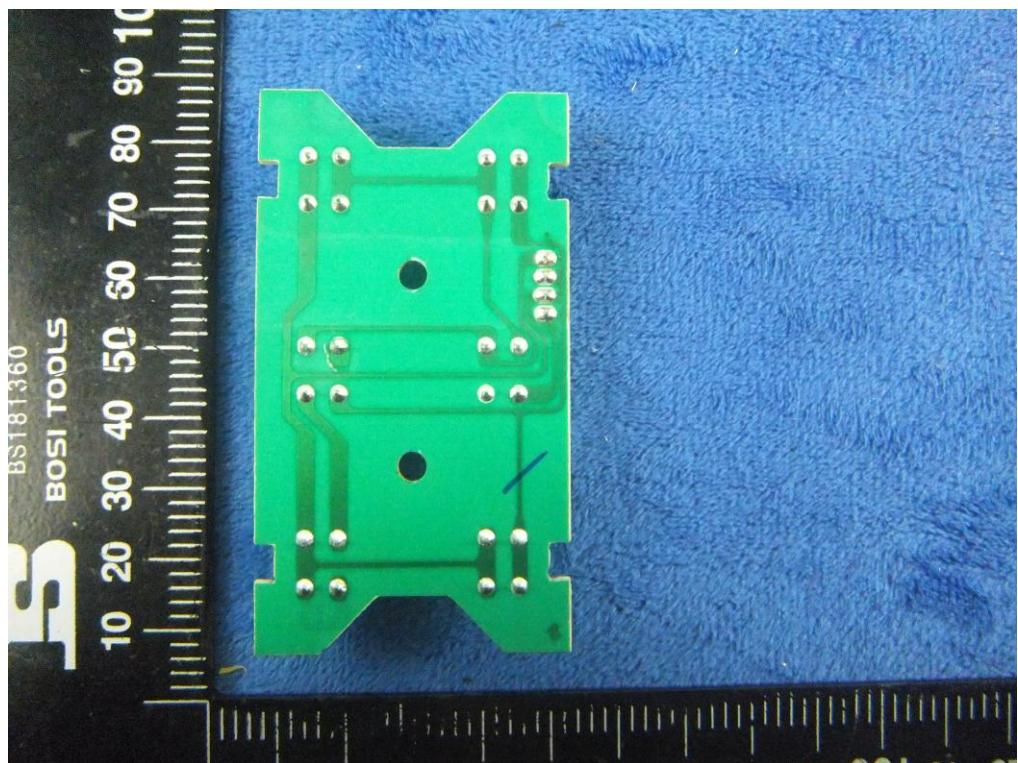
## LED Board 2 – Rear View



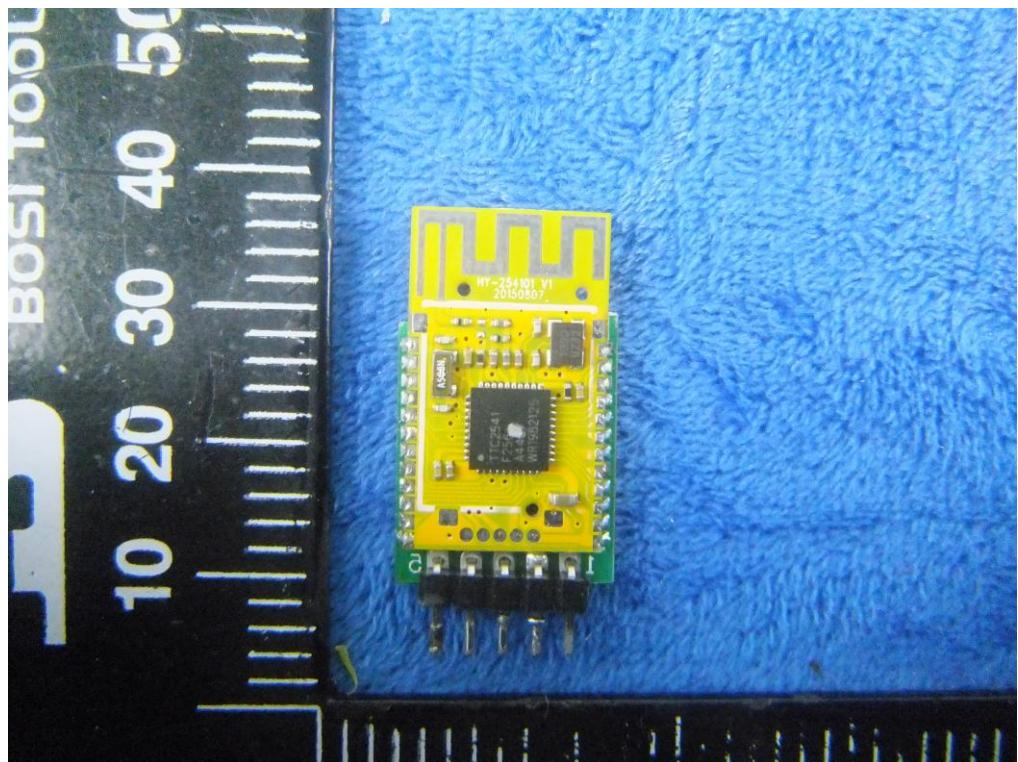
Button Board – Front View



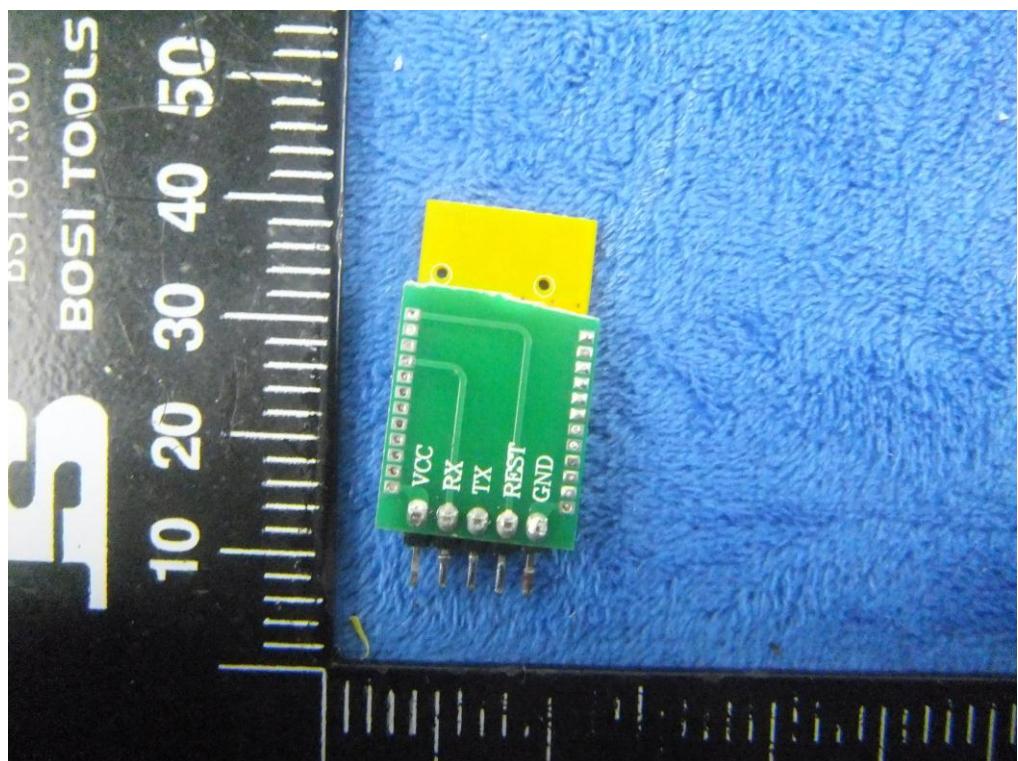
Button Board – Rear View



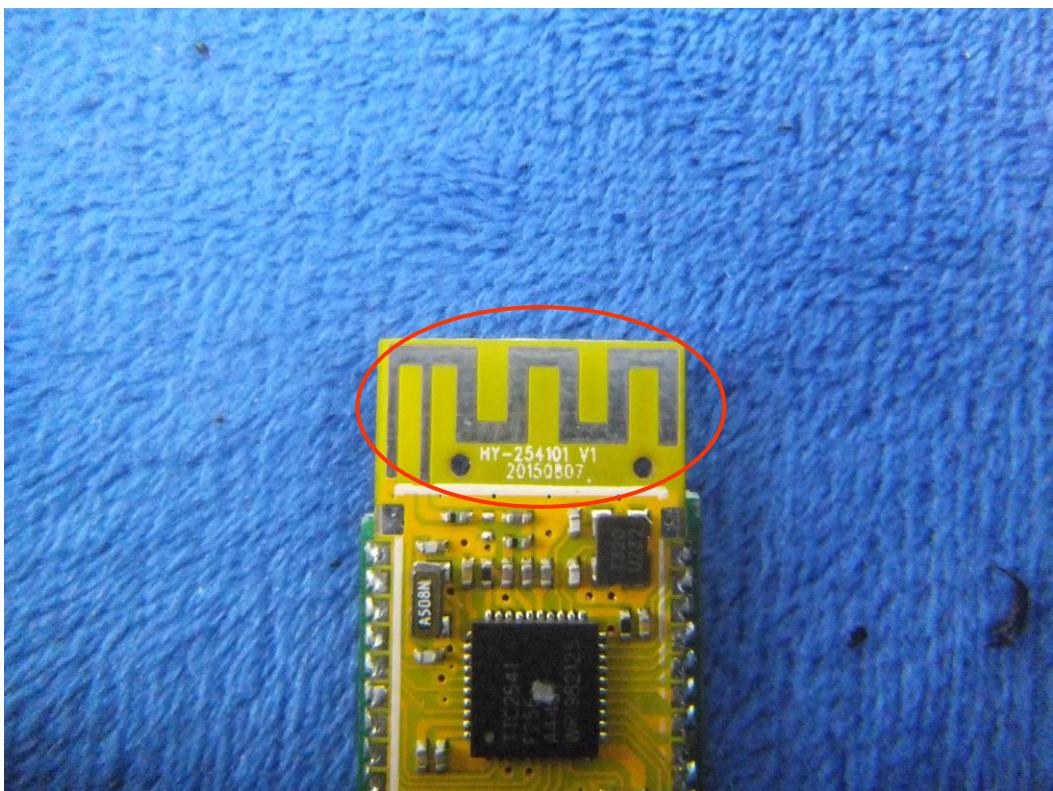
Antenna Board – Front View



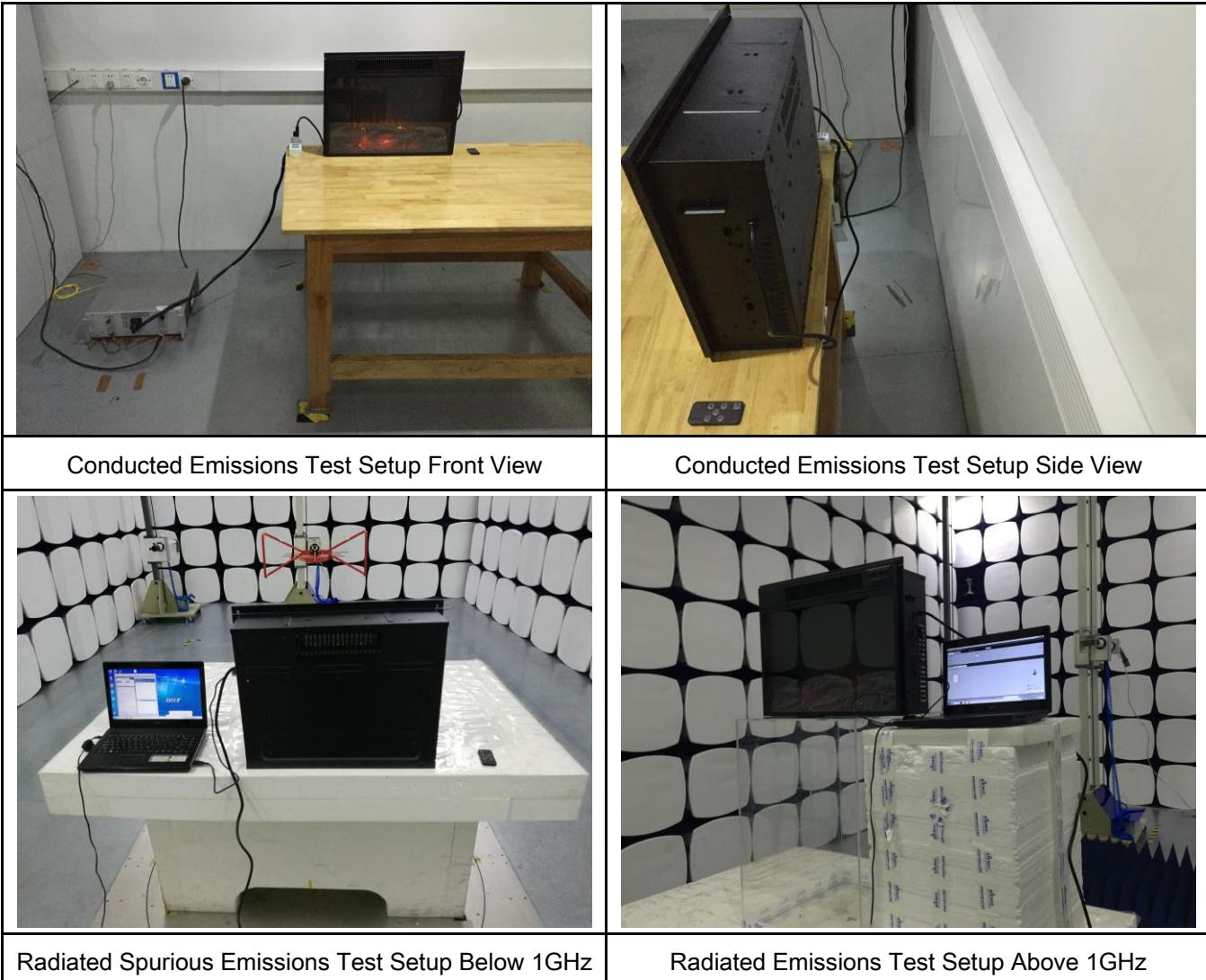
Antenna Board – Rear View



Antenna View



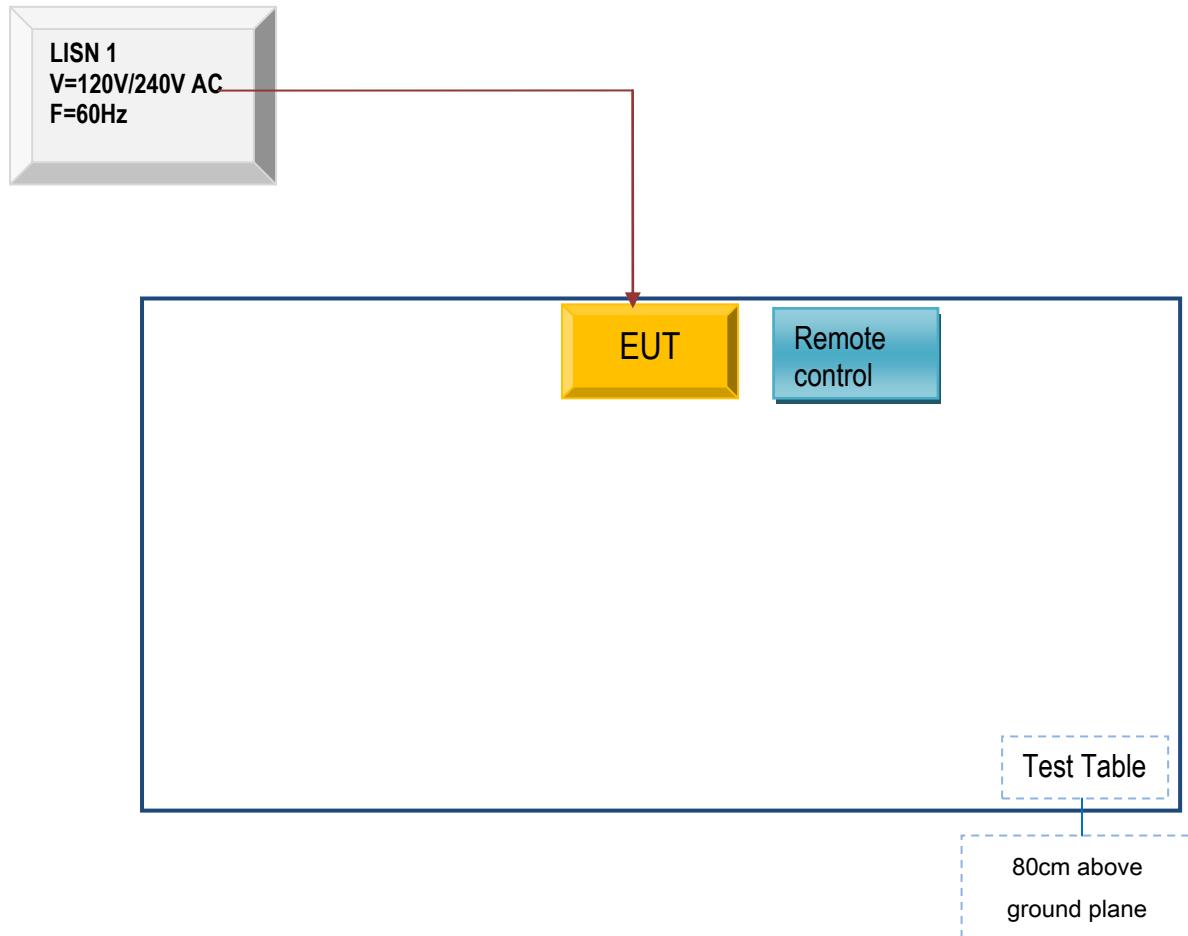
**Annex B.iii. Photograph: Test Setup Photo**



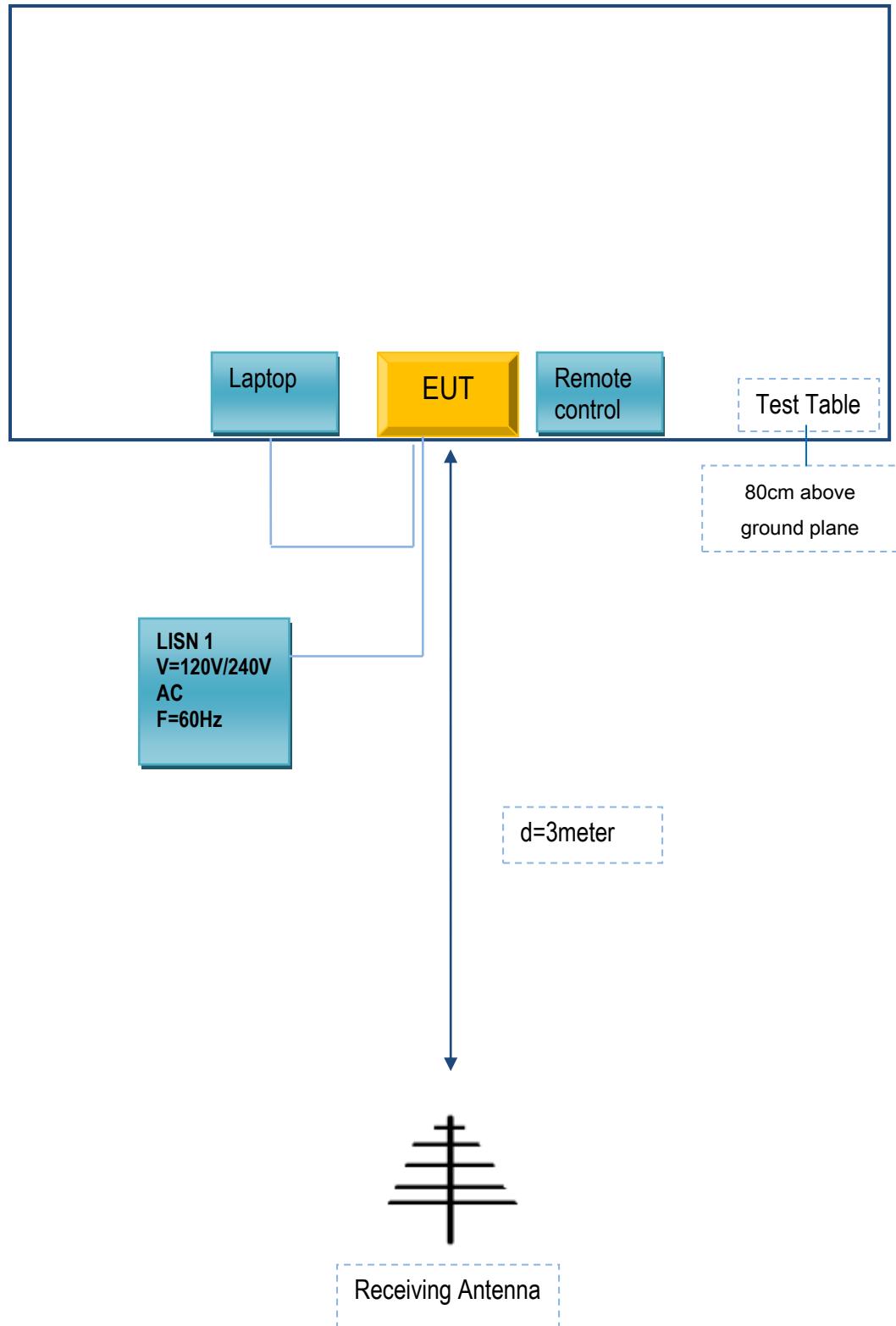
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

### Annex C.ii. TEST SET UP BLOCK

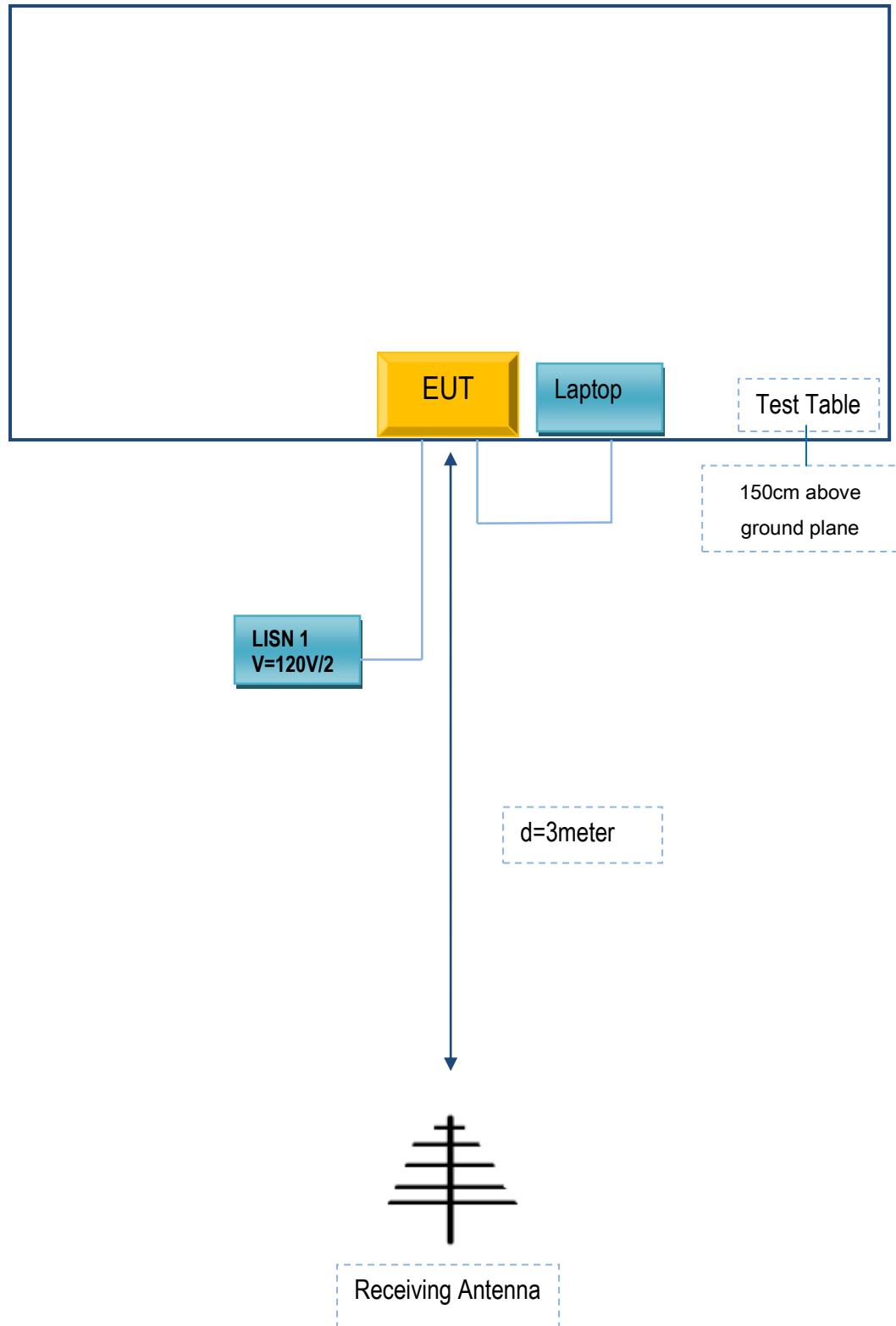
Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions ( Below 1GHz ) .



Block Configuration Diagram for Radiated Emissions ( Above 1GHz ) .



## Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

### Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
Lenovo	Laptop	E40	LR-1EHRX

### Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	2m	JX120051274

## Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see the attachment

## Annex E. DECLARATION OF SIMILARITY

### Homestar Corporation

To: 775 Montague Expressway Milpitas, CA 95035,USA

### Declaration Letter

For our business issue and marketing requirement, we would like to list 10 models on the FCC reports, as following:

Main Model No	Serial Model No	Difference
TED23 G3	TED20 G3, TED25 G3, TED26 G3, TED28 G3, TED20 BC, TED23 BC, TED25 BC, TED26 BC. TED28 BC	<b>TED23 G3 &amp; TED23 BC:</b> The PCB board, circuit, structure and internal of these models are the same, only the model number is different.  <b>TED20 G3, TED25 G3, TED26 G3, TED28 G3, TED20 BC, TED23 BC, TED26 BC, TED28 BC :</b> the PCB board, circuit, structure and internal of these models are the same as TED23 G3 & TED23 BC ,only Size difference between all of these models,

Thank you!

Sincerely,

Client's signature:  2017.4.1

Client's name / title: Crystal /Product Manager

Contact information / address : 18 Qi An Rd, Homestar Industrial Campus, Fuzhou, Fujian, China