RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: 17020360-FCC-R1
Supersede Report No.: N/A

Applicant	**Raycan Technology Co., Ltd. (Suzhou)**
Product Name	**Area radiation monitor**
Main Model	**RadWall**
Serial Model	**RadWall-H, RadWall-W, RadWall-Ne**
Test Standard	**FCC Part 15.247: 2017, ANSI C63.10: 2013**
Test Date	**December 19 to December December 27, 2017**
Issue Date	**December 27, 2017**
Test Result	**☒ Pass ☐ Fail**
Equipment complied with the specification	☒
Equipment did not comply with the specification	☐

Trety Lu	Deon Dai	
Trety Lu **Test Engineer**	**Deon Dai** **Engineer Reviewer**	

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Test result presented in this test report is applicable to the tested sample only

Issued by:
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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
17020360-FCC-R1	NONE	Original	December 27, 2017

2. Customer information

Applicant Name	Raycan Technology Co., Ltd. (Suzhou)
Applicant Add	Bldg 17, 8 Jinfeng Road, SND, Suzhou
Manufacturer	Raycan Technology Co., Ltd. (Suzhou)
Manufacturer Add	Bldg 17, 8 Jinfeng Road, SND, Suzhou

3. Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	694825
IC Test Site No.	4842B-1
Test Software	EZ_EMC

4. Equipment under Test (EUT) Information

Description of EUT:	Area radiation monitor
Main Model:	RadWall
Serial Model:	RadWall-H, RadWall-W, RadWall-Ne
Date EUT received:	December 06, 2017
Test Date(s):	December 19 to December 27, 2017
Output Max power	Zigbee: 21.251dBm
Antenna Gain:	Zigbee:3 dBi
Type of Modulation:	Zigbee: QPSK
RF Operating Frequency (ies):	Zigbee:2405-2480 MHz
Number of Channels:	Zigbee:16CH
Port:	Power Port, USB Port
Input Power:	AC/DC Adapter: Model: SK02T-0500200U INPUT: 100-240V~50/60Hz 0.35A OUTPUT: DC5V 2A Battery: DC3.7V 4000mAh 14.8Wh
Trade Name :	RAYCAN
FCC ID:	2ALQQ-RADWALL

Operating channel list

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	2405	14	2475
01	2410	15	2480
02	2415		
03	2420		
04	2425		
05	2430		
06	2435		
07	2440		
08	2445		
09	2450		
10	2455		
11	2460		
12	2465		
13	2470		

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
§15.247 (i), §2.1091	RF Exposure	Compliance
§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 Non-Restricted Frequency Bands	Compliance
§15.207 (a),	Power Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

Measurement Uncertainty

Test Item	Description	Uncertainty
Radiated Emissions	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)	3.952dB

6. Measurements, Examination And Derived Results

6.1 RF Exposure

The EUT is a portable device, thus requires RF exposure evaluation;
Please refer to SIEMIC RF Exposure Report: 17020360-FCC-H1.

6.2 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.

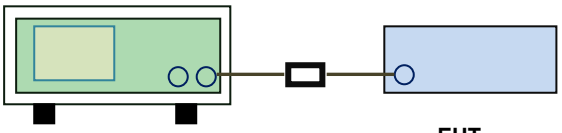
Antenna Connector Construction

Antenna must be permanently attached to the unit, it meets up with the ANTENNA REQUIREMENT.

Result: Compliant.

6.3 DTS (6 dB) Channel Bandwidth

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	December 19, 2017
Tested By :	Trety Lu

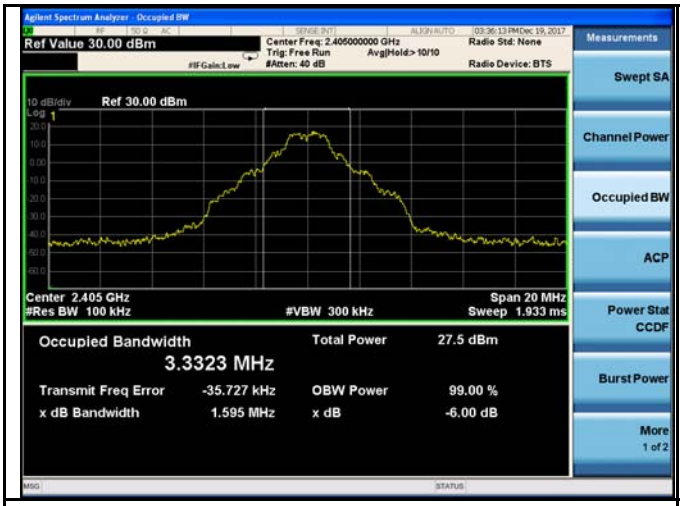
Spec	Item	Requirement	Applicable
§ 15.247(a)(2) RSS Gen (4.6.1)	a)	6dB BW≥500kHz;	☒
	b)	20dB BW: For FCC reference only; required by IC.	☐
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance V04, 8.1 DTS bandwidth 6dB Emission bandwidth measurement procedure - Set RBW = 100 kHz. - Set the video bandwidth (VBW) ≥ 3 x RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. 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.		
Remark			
Result	☒Pass ☐Fail		
Test Data	☒Yes ☐N/A		
Test Plot	☒Yes (See below) ☐N/A		

6dB Bandwidth measurement result

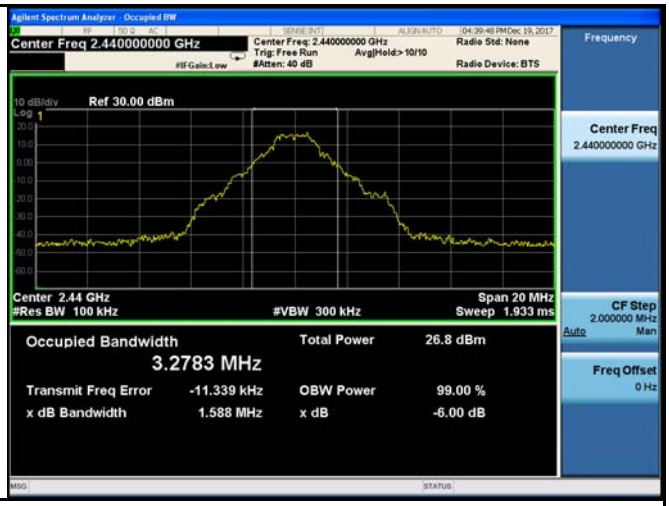
Type	Test mode	CH	Freq (MHz)	Result (MHz)	Limit (MHz)	Result
6dB BW	Zigbee	Low	2405	1.595	≥0.5	Pass
		Mid	2440	1.588	≥0.5	Pass
		High	2480	1.671	≥0.5	Pass

Test Plots

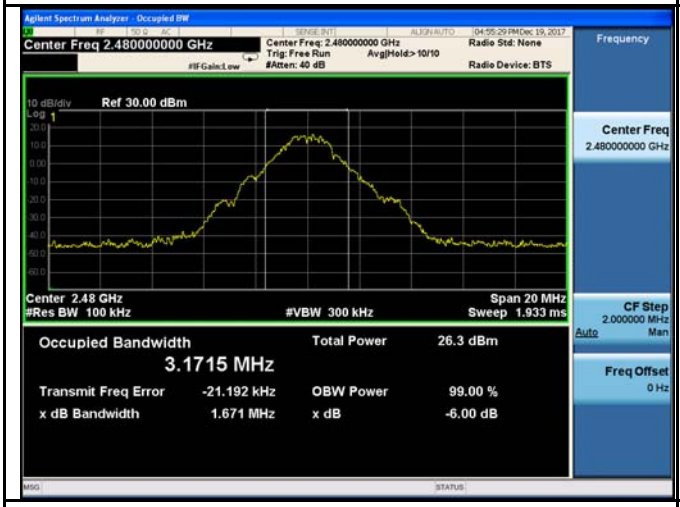
6dB Bandwidth measurement result



6dB Bandwidth - Low CH 2405



6dB Bandwidth - Mid CH 2440

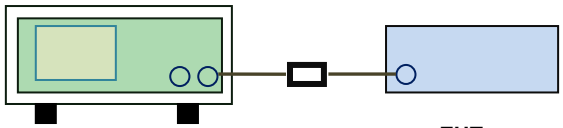


6dB Bandwidth - High CH 2480

6.4 Maximum Output Power

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	December 19, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b)(2),RSS210 (A8.4)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤1 Watt	☐
	b)	FHSS in 5725-5850MHz: ≤1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤0.125 Watt.	☐
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤0.25 Watt	☐
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤1 Watt	☒
Test Setup	 **Spectrum Analyzer** **EUT**		
Test Procedure	558074 D01 DTS Meas Guidance V04, 9.1.2 Integrated band power method Maximum output power measurement procedure a) Set the RBW ≥ DTS bandwidth. b) Set VBW ≥ 3 × RBW. c) Set span ≥ 3 x RBW d) Sweep time = auto couple. e) Detector = peak. f) Trace mode = max hold. g) Allow trace to fully stabilize. h) Use peak marker function to determine the peak amplitude level.		
Remark			
Result	☒Pass ☐Fail		
Test Data	☒Yes ☐N/A		
Test Plot	☒Yes (See below) ☐N/A		

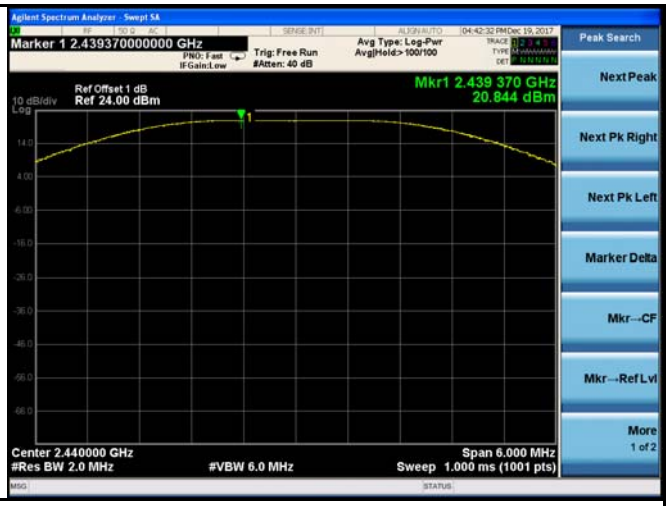
Output Power measurement result

Type	Test mode	CH	Freq (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	Zigbee	Low	2405	21.251	30	Pass
		Mid	2440	20.844	30	Pass
		High	2480	20.377	30	Pass

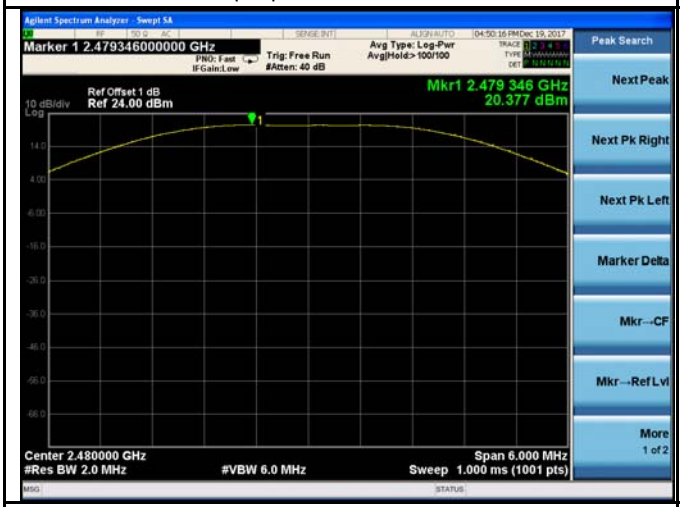
Test Plots

Output Power measurement result

Output power - Low CH 2405



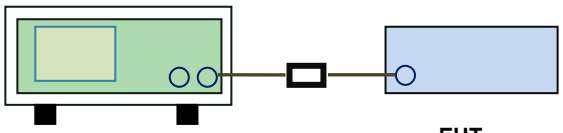
Output power - Mid CH 2440



Output power - High CH 2480

6.5 Power Spectral Density

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	December 19, 2017
Tested By :	Trety Lu

Spec	Item	Requirement	Applicable
§15.247(e)	a)	The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	☒
Test Setup			
Test Procedure	558074 D01 DTS MEAS Guidance V04 10.2 power spectral density method power spectral density measurement procedure a) Set analyzer center frequency to DTS channel center frequency. b) Set the span to 1.5 times the DTS bandwidth. c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz. d) Set the VBW ≥ 3 × RBW. e) Detector = peak. f) Sweep time = auto couple. g) Trace mode = max hold. h) Allow trace to fully stabilize. i) Use the peak marker function to determine the maximum amplitude level within the RBW. j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.		
Remark			
Result	☒ Pass ☐ Fail		
Test Data	☒ Yes ☐ N/A		

Power Spectral Density measurement result

Type	Test mode	CH	Freq (MHz)	PSD (dBm)	Limit (dBm)	Result
PSD	Zigbee	Low	2405	7.942	8	Pass
		Mid	2440	7.805	8	Pass
		High	2480	5.456	8	Pass

Test Plots

Power Spectral Density measurement result

PSD - Low CH 2405

PSD - Mid CH 2440

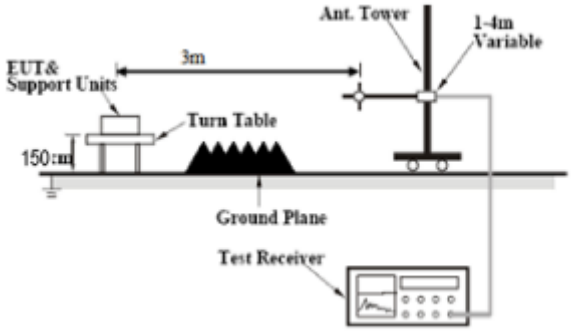
PSD - High CH 2480

6.6 Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	December 26, 2017
Tested By :	Trety Lu

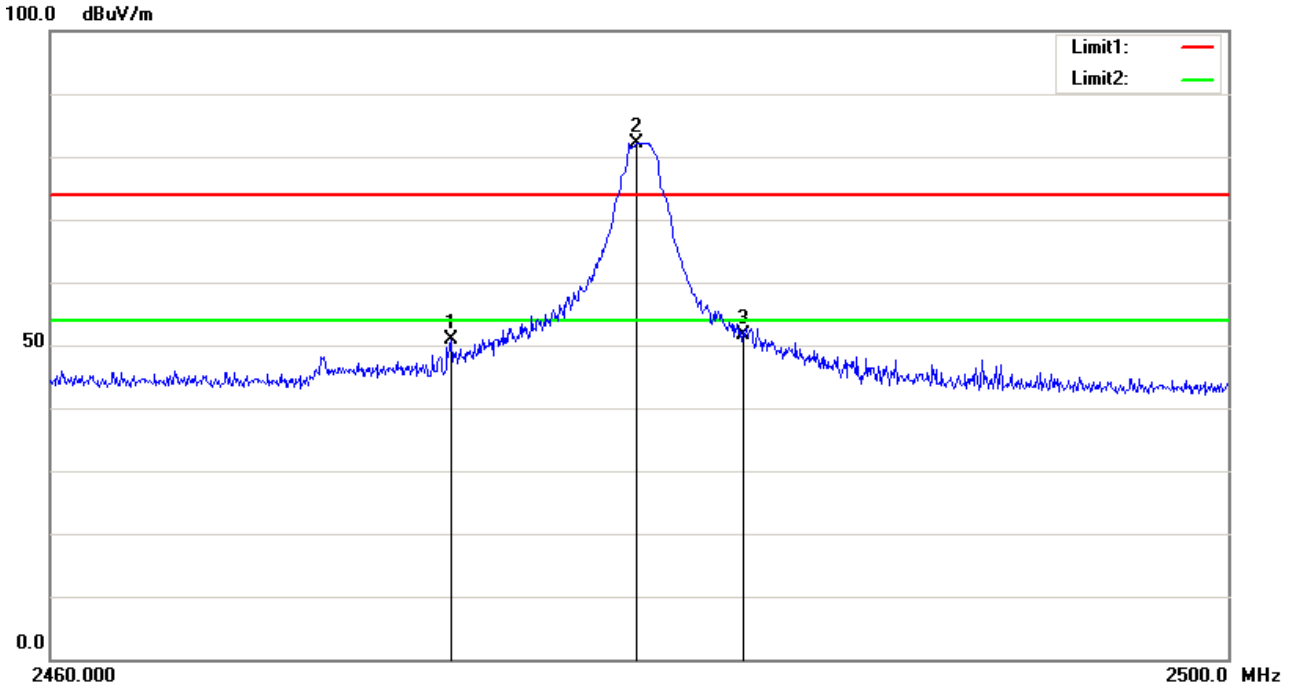
Requirement(s):

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.	☒

Test Setup	
Test Procedure	Radiated Method Only - 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - 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. - 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: a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi Peak detection at frequency below 1GHz. b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz. c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth for Average detection (AV) as below at frequency above 1GHz. ■ 1/T kHz (Duty cycle < 98%) □ 10 Hz (Duty cycle > 98%) - 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. - 5. Repeat above procedures until all measured frequencies were complete.
Remark	
Result	☒ Pass ☐ Fail
Test Data	☒ Yes ☐ N/A
Test Plot	☒ Yes (See below) ☐ N/A

Test Plots
Band Edge measurement result

Test Mode:	Transmitting Zigbee Mode

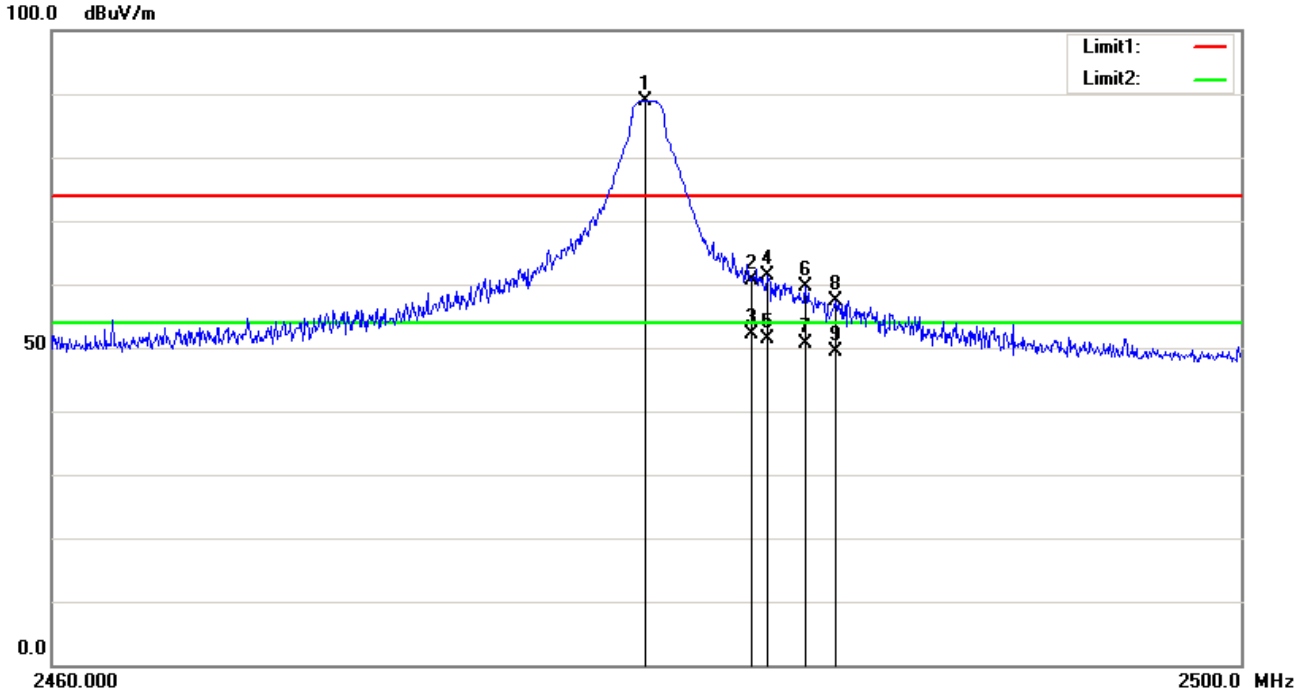


Test Data

GFSK-Right Side-V

No.	Frequency (MHz)	Reading (dBµV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2473.560	67.91	peak	31.58	52.62	4.05	50.92	74.00	-23.08	200	271
2	2479.840	99.08	peak	31.59	52.62	4.06	82.11	74.00	8.11	200	216
3	2483.500	68.66	peak	31.59	52.63	4.06	51.68	74.00	-22.32	200	216

Test Mode:	Transmitting Zigbee Mode

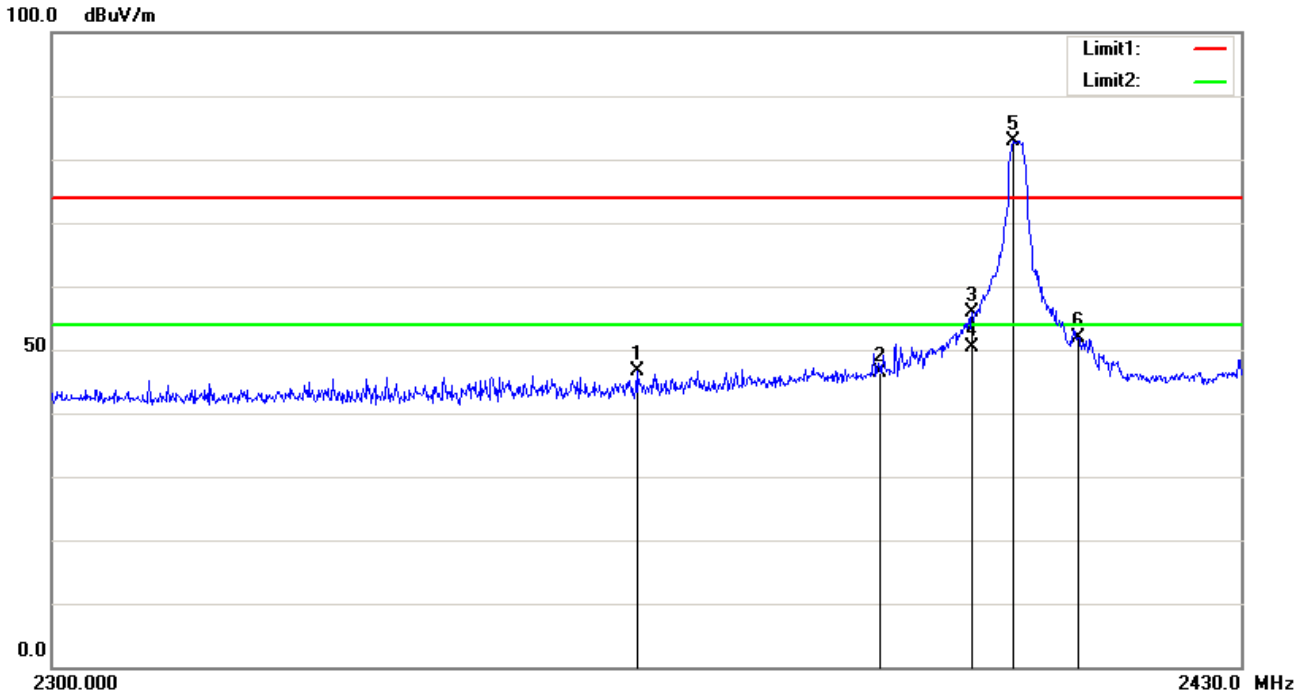


Test Data

GFSK-Right Side-H

No.	Frequency (MHz)	Reading (dBµV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2479.880	105.88	peak	31.59	52.62	4.06	88.91	74.00	14.91	200	271
2	2483.500	77.52	peak	31.59	52.63	4.06	60.54	74.00	-13.46	200	271
3	2483.500	69.15	AVG	31.59	52.63	4.06	52.17	54.00	-1.83	200	285
4	2484.040	78.26	peak	31.59	52.63	4.06	61.28	74.00	-12.72	200	271
5	2484.040	68.47	AVG	31.59	52.63	4.06	51.49	54.00	-2.51	200	271
6	2485.320	76.53	peak	31.59	52.63	4.06	59.55	74.00	-14.45	200	271
7	2485.320	67.62	AVG	31.59	52.63	4.06	50.64	54.00	-3.36	200	271
8	2486.320	74.31	peak	31.59	52.63	4.06	57.33	74.00	-16.67	200	271
9	2486.320	66.36	AVG	31.59	52.63	4.06	49.38	54.00	-4.62	200	271

Test Mode:	Transmitting Zigbee Mode

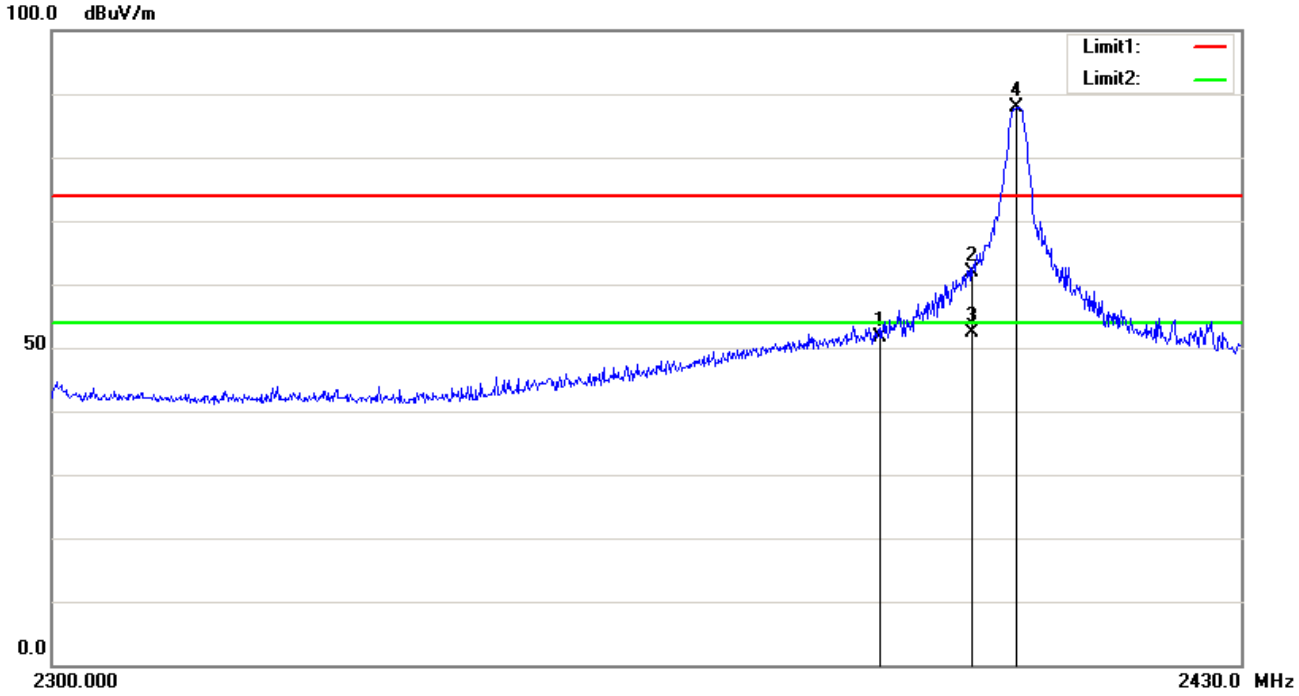


Test Data

GFSK-Left Side-V

No.	Frequency (MHz)	Reading (dBµV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2363.180	63.52	peak	31.52	52.53	4.05	46.56	74.00	-27.44	100	186
2	2390.000	63.35	peak	31.53	52.55	4.02	46.35	74.00	-27.65	100	19
3	2400.000	72.78	peak	31.54	52.56	4.01	55.77	74.00	-18.23	100	359
4	2400.000	67.44	AVG	31.54	52.56	4.01	50.43	54.00	-3.57	100	359
5	2404.520	99.96	peak	31.54	52.56	4.01	82.95	74.00	8.95	100	243
6	2411.800	68.90	peak	31.55	52.57	4.02	51.90	74.00	-22.10	200	229

Test Mode:	Transmitting Zigbee Mode



Test Data

GFSK-Left Side-H

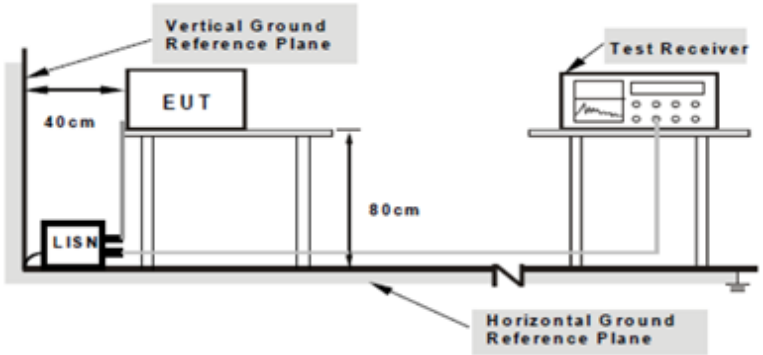
No.	Frequency (MHz)	Reading (dBµV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)
1	2390.000	68.63	peak	31.53	52.55	4.02	51.63	74.00	-22.37	200	156
2	2400.000	78.87	peak	31.54	52.56	4.01	61.86	74.00	-12.14	100	241
3	2400.000	69.35	AVG	31.54	52.56	4.01	52.34	54.00	-1.66	100	241
4	2404.910	104.93	peak	31.54	52.56	4.01	87.92	74.00	13.92	200	208

6.7 Power Line Conducted Emissions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	December 26, 2017
Tested By :	Trety Lu

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.207, RSS210 (A8.1)</td><td>a)</td><td>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.

Class A Limit
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>79</td><td>66</td></tr>
<tr><td>0.5 ~ 30</td><td>73</td><td>60</td></tr>
</table>
Class B Limit
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<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>
</table></td><td>☒</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

Note: 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.</td></tr>
<tr><td>Procedure</td><td colspan="3">1. 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.
2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss 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).</td></tr>
<tr><td>Remark</td><td colspan="3"></td></tr>
<tr><td>Result</td><td colspan="3">☒Pass ☐Fail</td></tr>
</table>

Test Data	☒Yes ☐N/A
Test Plot	☒Yes (See below) ☐N/A

Data sample

No.	Frequency	Reading	Detector	Lisn/Isn	Ps_Lmt	Cab_L	Result	Limit	Margin
	(MHz)	(dBμV)		(dB}	(dB)	(dB)	(dBμV)	(dBμV)	(dB)

Frequency (MHz) = Emission frequency in MHz

Reading (dBμV) = Receiver Reading Value

Detector=Quasi Peak Detector or Average Detector

Lisn/ISN= Insertion loss of LISN

Ps_Lmt= Insertion loss of transient limiter (The transient limiter included 10dB attenuation)

Cab_L= cable loss

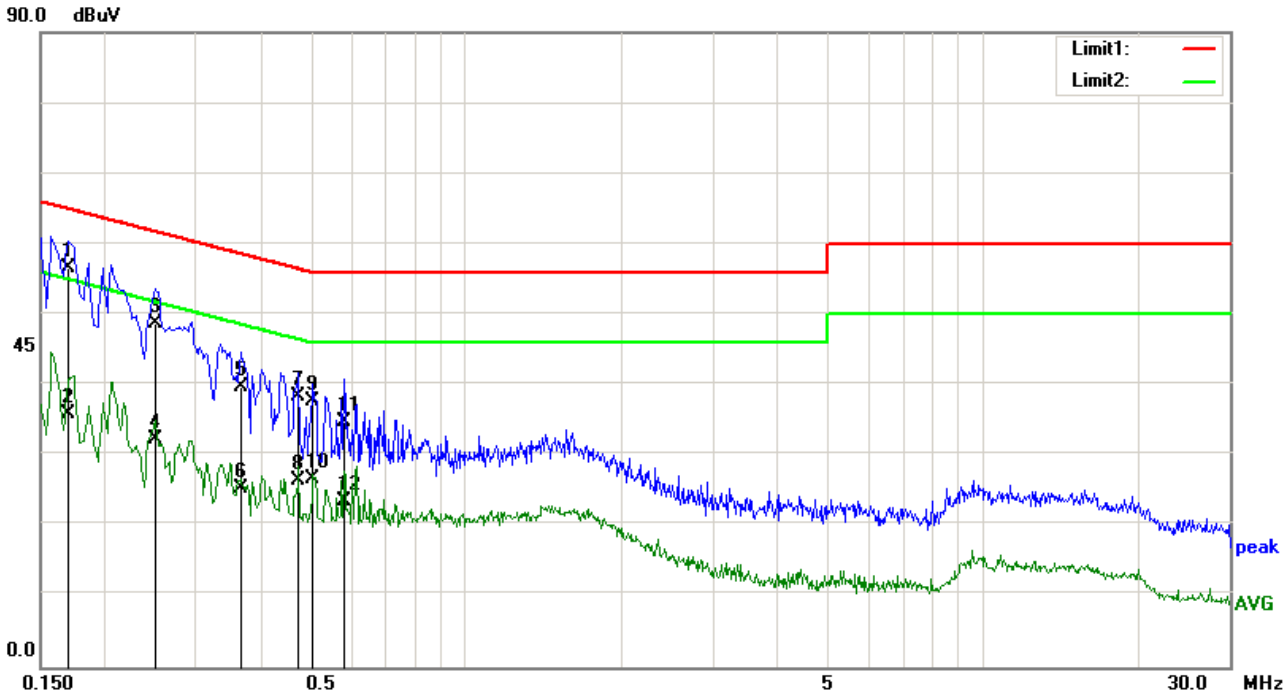
Result (dBμV) = Reading Value + Corrected Value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

Margin (dB) = Result (dBμV) – limit (dBμV)

Test Mode:	Transmitting Zigbee Mode

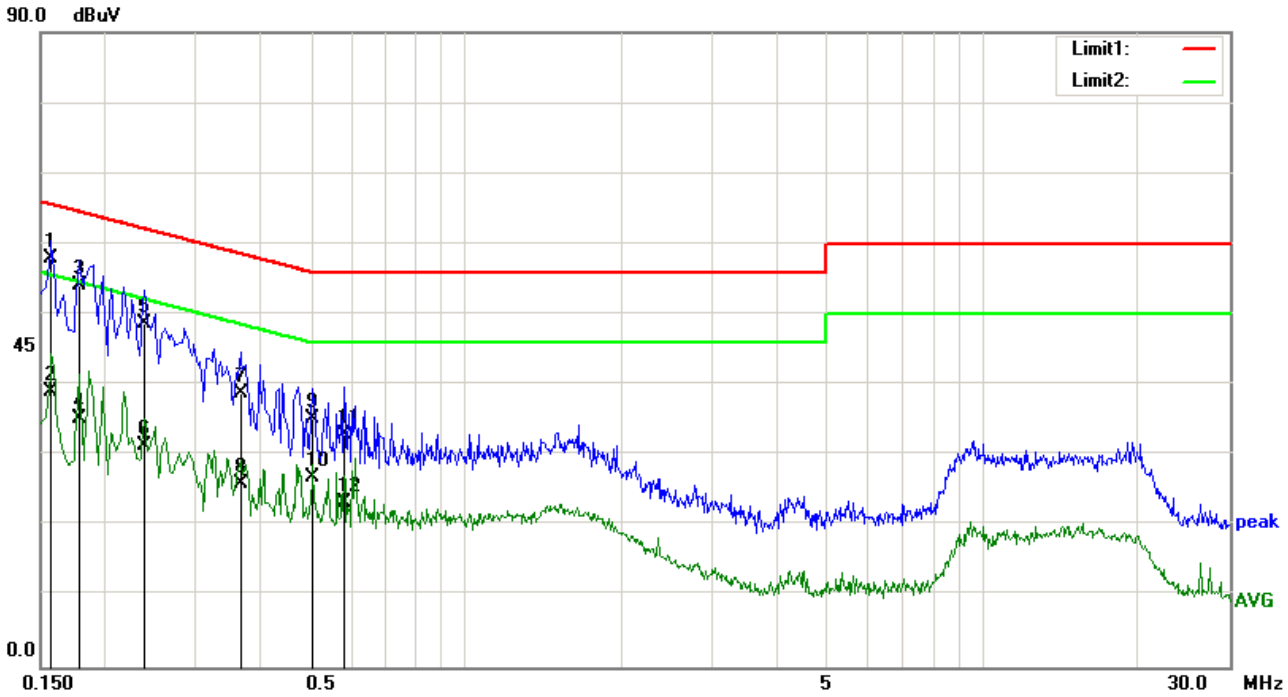


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/lsn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1700	46.14	QP	0.10	-10.00	0.33	56.57	64.96	-8.39
2	0.1700	25.38	AVG	0.10	-10.00	0.33	35.81	54.96	-19.15
3	0.2500	38.46	QP	0.10	-10.00	0.20	48.76	61.76	-13.00
4	0.2500	21.93	AVG	0.10	-10.00	0.20	32.23	51.76	-19.53
5	0.3660	29.34	QP	0.11	-10.00	0.20	39.65	58.59	-18.94
6	0.3660	15.00	AVG	0.11	-10.00	0.20	25.31	48.59	-23.28
7	0.4740	28.04	QP	0.12	-10.00	0.21	38.37	56.44	-18.07
8	0.4740	16.04	AVG	0.12	-10.00	0.21	26.37	46.44	-20.07
9	0.5060	27.25	QP	0.12	-10.00	0.21	37.58	56.00	-18.42
10	0.5060	16.27	AVG	0.12	-10.00	0.21	26.60	46.00	-19.40
11	0.5820	24.48	QP	0.12	-10.00	0.21	34.81	56.00	-21.19
12	0.5820	13.13	AVG	0.12	-10.00	0.21	23.46	46.00	-22.54

Test Mode:	Transmitting Zigbee Mode

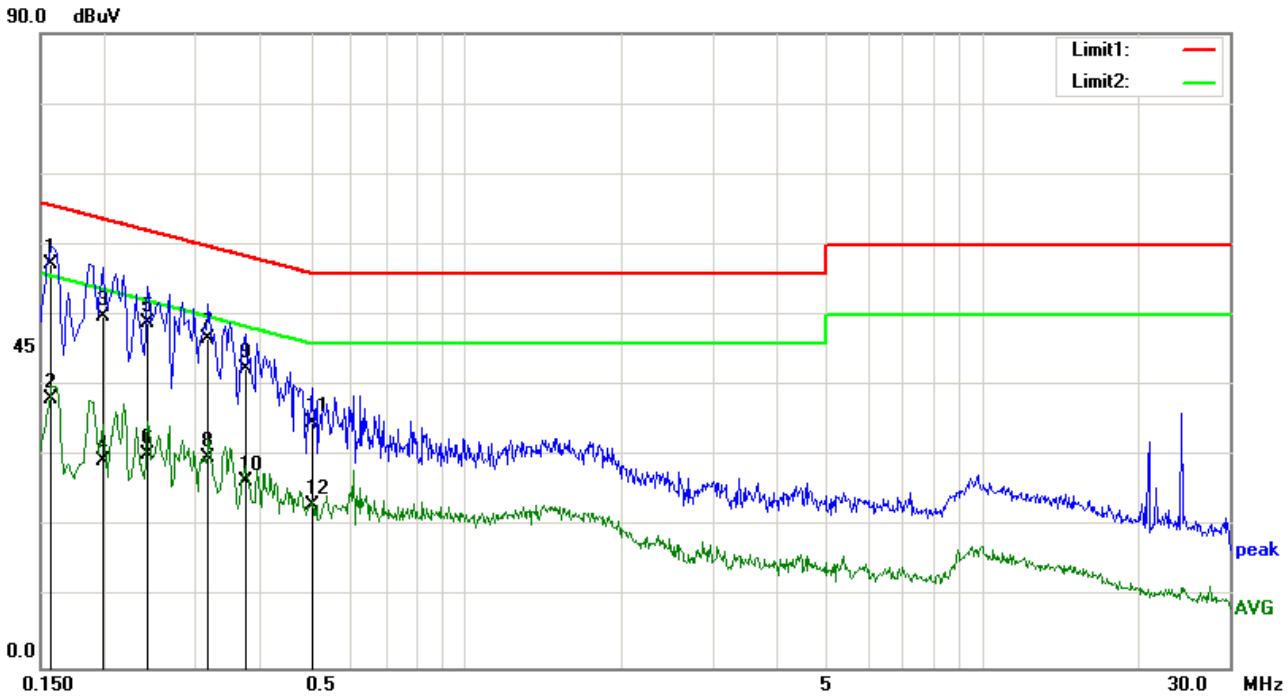


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/lsn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1580	47.41	QP	0.11	-10.00	0.35	57.87	65.57	-7.70
2	0.1580	28.58	AVG	0.11	-10.00	0.35	39.04	55.57	-16.53
3	0.1780	43.70	QP	0.10	-10.00	0.32	54.12	64.58	-10.46
4	0.1780	24.75	AVG	0.10	-10.00	0.32	35.17	54.58	-19.41
5	0.2380	38.33	QP	0.10	-10.00	0.22	48.65	62.17	-13.52
6	0.2380	21.06	AVG	0.10	-10.00	0.22	31.38	52.17	-20.79
7	0.3660	28.41	QP	0.11	-10.00	0.20	38.72	58.59	-19.87
8	0.3660	15.65	AVG	0.11	-10.00	0.20	25.96	48.59	-22.63
9	0.5020	24.92	QP	0.11	-10.00	0.21	35.24	56.00	-20.76
10	0.5020	16.46	AVG	0.11	-10.00	0.21	26.78	46.00	-19.22
11	0.5820	22.60	QP	0.11	-10.00	0.21	32.92	56.00	-23.08
12	0.5820	12.89	AVG	0.11	-10.00	0.21	23.21	46.00	-22.79

Test Mode:	Transmitting Zigbee Mode

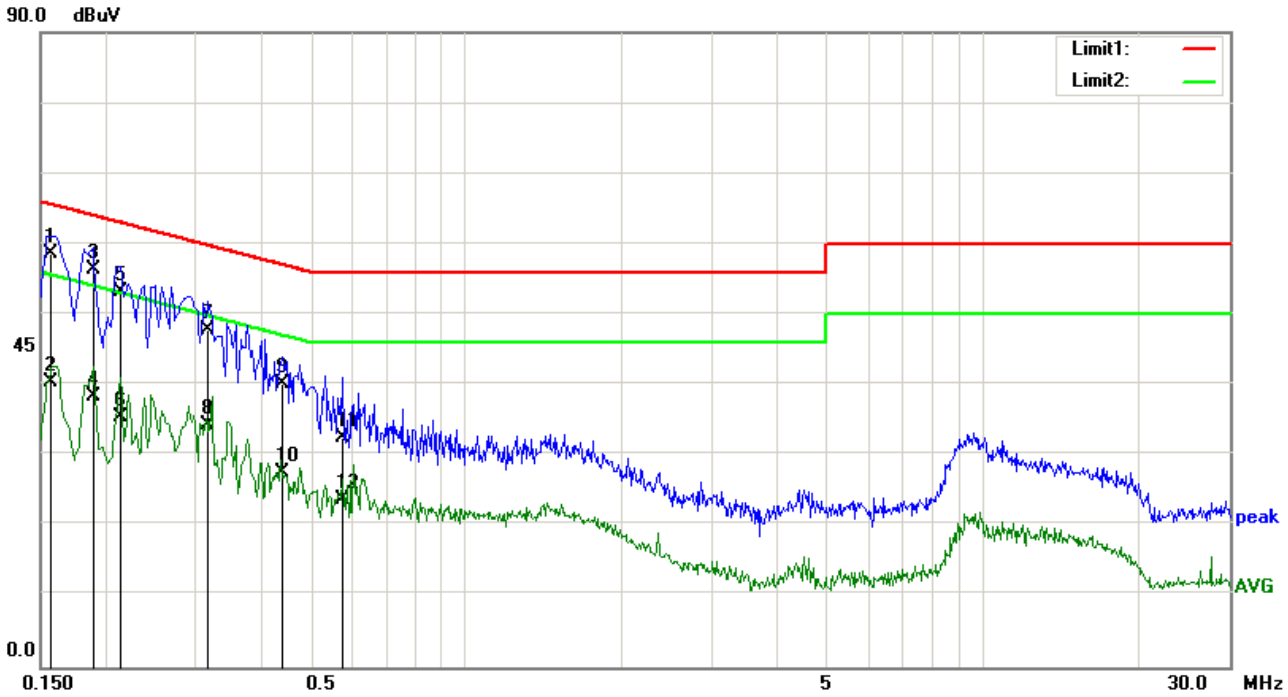


Test Data

Phase Line Plot at 230Vac, 50Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/lsn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1580	46.72	QP	0.10	-10.00	0.35	57.17	65.57	-8.40
2	0.1580	27.79	AVG	0.10	-10.00	0.35	38.24	55.57	-17.33
3	0.1980	39.49	QP	0.10	-10.00	0.28	49.87	63.69	-13.82
4	0.1980	19.07	AVG	0.10	-10.00	0.28	29.45	53.69	-24.24
5	0.2420	38.57	QP	0.10	-10.00	0.21	48.88	62.03	-13.15
6	0.2420	19.85	AVG	0.10	-10.00	0.21	30.16	52.03	-21.87
7	0.3180	36.39	QP	0.11	-10.00	0.20	46.70	59.76	-13.06
8	0.3180	19.48	AVG	0.11	-10.00	0.20	29.79	49.76	-19.97
9	0.3740	32.02	QP	0.11	-10.00	0.20	42.33	58.41	-16.08
10	0.3740	16.12	AVG	0.11	-10.00	0.20	26.43	48.41	-21.98
11	0.5020	24.39	QP	0.12	-10.00	0.21	34.72	56.00	-21.28
12	0.5020	12.84	AVG	0.12	-10.00	0.21	23.17	46.00	-22.83

Test Mode:	Transmitting Zigbee Mode



Test Data

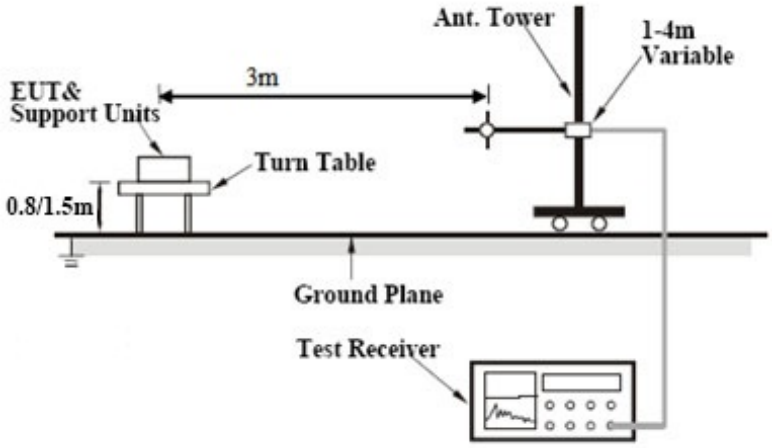
Phase Neutral Plot at 230Vac, 50Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.1580	48.17	QP	0.11	-10.00	0.35	58.63	65.57	-6.94
2	0.1580	29.98	AVG	0.11	-10.00	0.35	40.44	55.57	-15.13
3	0.1900	46.01	QP	0.10	-10.00	0.30	56.41	64.04	-7.63
4	0.1900	27.90	AVG	0.10	-10.00	0.30	38.30	54.04	-15.74
5	0.2140	42.76	QP	0.10	-10.00	0.26	53.12	63.05	-9.93
6	0.2140	25.17	AVG	0.10	-10.00	0.26	35.53	53.05	-17.52
7	0.3180	37.50	QP	0.10	-10.00	0.20	47.80	59.76	-11.96
8	0.3180	24.01	AVG	0.10	-10.00	0.20	34.31	49.76	-15.45
9	0.4420	29.89	QP	0.11	-10.00	0.21	40.21	57.02	-16.81
10	0.4420	17.29	AVG	0.11	-10.00	0.21	27.61	47.02	-19.41
11	0.5780	22.30	QP	0.11	-10.00	0.21	32.62	56.00	-23.38
12	0.5780	13.45	AVG	0.11	-10.00	0.21	23.77	46.00	-22.23

6.8 Radiated Emissions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	December 21 to December 27, 2017
Tested By :	Trety Lu

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS210 (A8.5)	a)	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 **Class A Limit** Frequency range (MHz) / Field Strength (μV/m) 30 – 88 / 90 88 – 216 / 150 216 – 960 / 210 Above 960 / 300 **Class B Limit** Frequency range (MHz) / Field Strength (μV/m) 30 – 88 / 100 88 – 216 / 150 216 – 960 / 200 Above 960 / 500	☒
Test Setup			
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 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: a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 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 with Peak detection for Average Measurement as below at frequency above 1GHz. ■ 1/T kHz (Duty cycle < 98%) □ 10 Hz (Duty cycle > 98%)		

	5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	
Result	☒Pass ☐Fail
Test Data	☒Yes ☐N/A
Test Plot	☒Yes (See below) ☐N/A

Data sample

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBμV/m)		(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(cm)	(°)

Frequency (MHz) = Emission frequency in MHz

Reading (dBμV/m) = Receiver Reading Value

Detector= Peak Detector or Quasi Peak Detector

Ant_F=Antenna Factor

PA_G=Pre-Amplifier Gain

Cab_L=Cable Loss

Result (dBμV/m) = Read ing Value + Corrected Value

Limit (dBμV/m) = Limit stated in standard

Height (cm) = Height of Receiver antenna

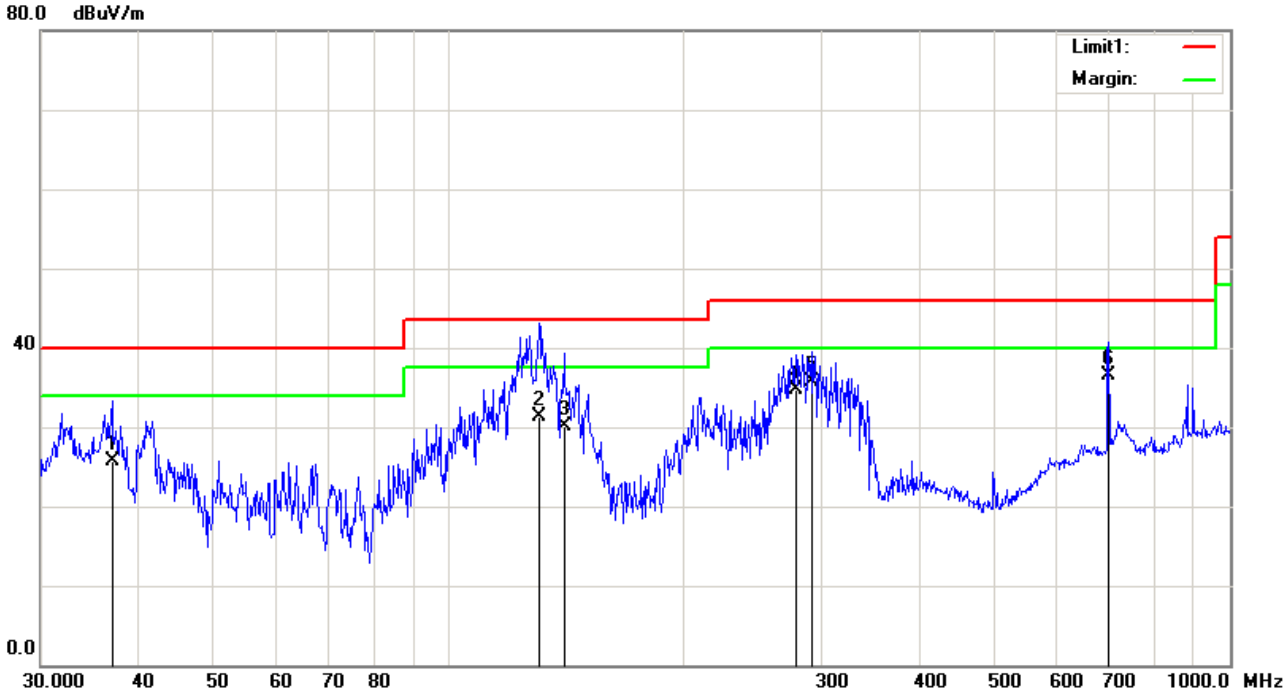
Degree = Turn table degree

Calculation Formula:

Margin (dB) = Result (dBμV/m) – limit (dBμV/m)

Test Mode:	Transmitting Zigbee Mode -Low Channel

Below 1GHz



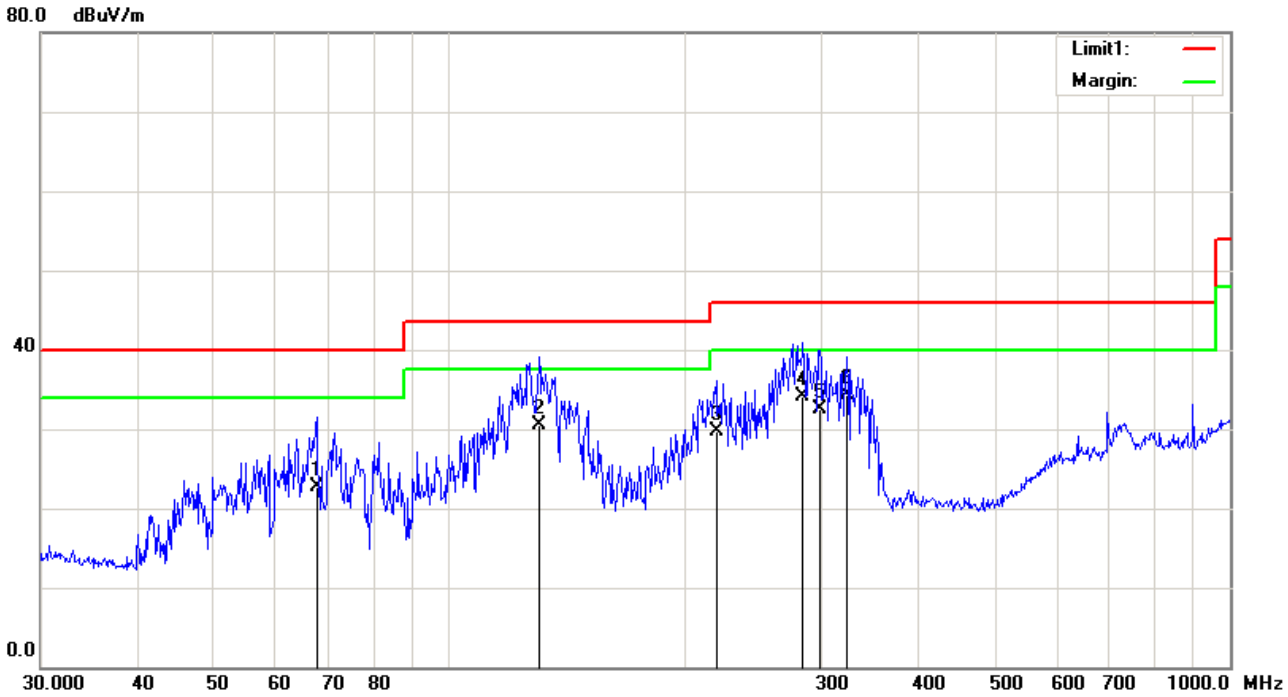
Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	37.0249	52.76	QP	17.51	45.66	1.00	25.61	40.00	-14.39	100	358
2	130.3789	60.62	QP	16.22	47.33	1.87	31.38	43.50	-12.12	100	291
3	140.3421	63.67	QP	12.48	47.96	1.99	30.18	43.50	-13.32	100	252
4	278.0669	65.63	QP	14.93	48.43	2.66	34.79	46.00	-11.21	200	357
5	291.0360	66.32	QP	14.94	48.36	2.72	35.62	46.00	-10.38	100	169
6	699.3046	55.07	QP	22.57	45.40	4.25	36.49	46.00	-9.51	100	273

Test Mode:	Transmitting Zigbee Mode -Low Channel

Below 1GHz

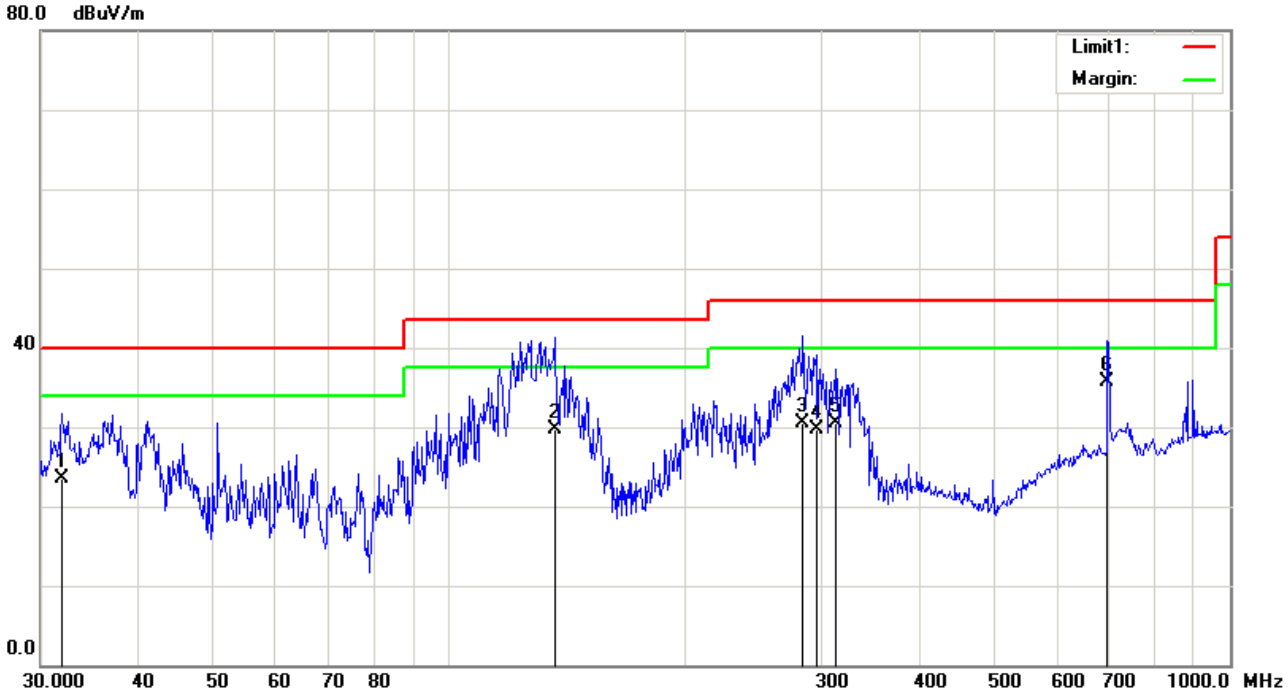


Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	67.6751	58.58	QP	10.43	47.77	1.41	22.65	40.00	-17.35	300	212
2	130.3789	60.78	QP	15.25	47.33	1.87	30.57	43.50	-12.93	200	137
3	219.8449	61.05	QP	14.09	47.82	2.36	29.68	46.00	-16.32	200	222
4	283.9792	63.58	QP	16.34	48.42	2.69	34.19	46.00	-11.81	200	359
5	298.2681	61.11	QP	16.84	48.29	2.76	32.42	46.00	-13.58	300	276
6	323.3204	63.42	QP	16.69	48.72	2.88	34.27	46.00	-11.73	200	203

Test Mode:	Transmitting Zigbee Mode -Middle Channel

Below 1GHz



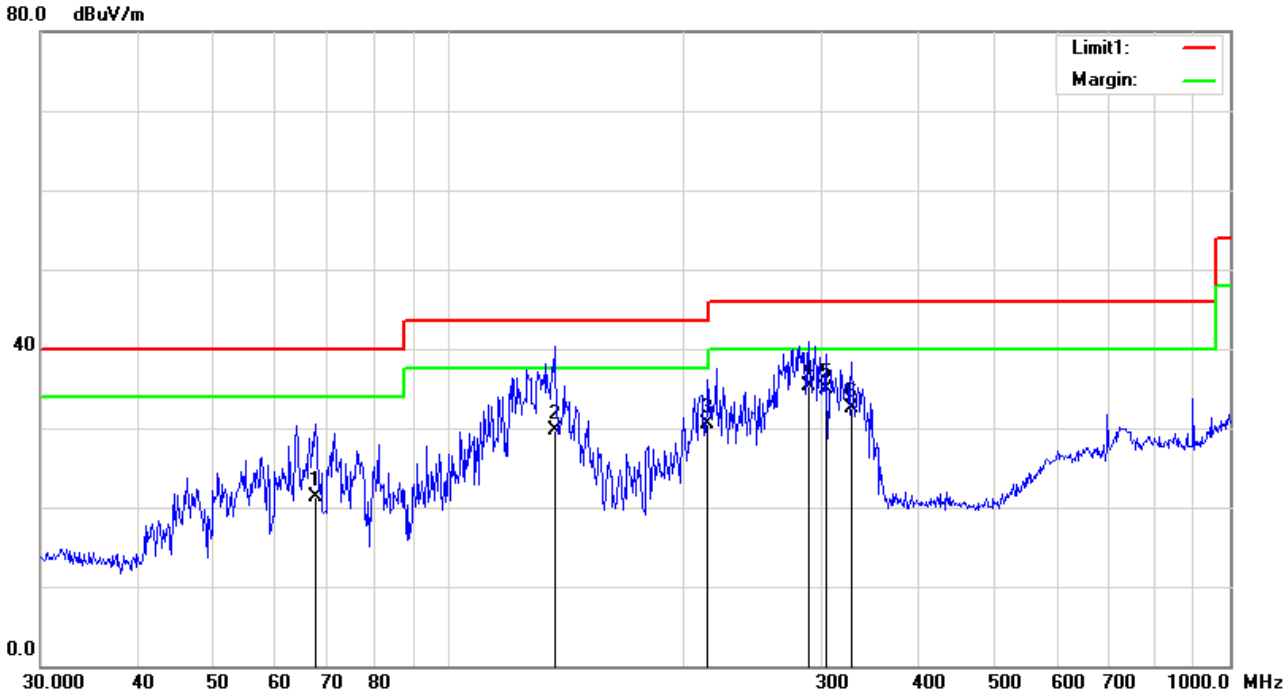
Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	31.9546	47.89	QP	20.46	45.67	0.91	23.59	40.00	-16.41	100	122
2	136.4598	61.59	QP	13.82	47.73	1.95	29.63	43.50	-13.87	100	244
3	283.9792	61.38	QP	14.93	48.42	2.69	30.58	46.00	-15.42	200	299
4	295.1469	60.30	QP	14.95	48.32	2.74	29.67	46.00	-16.33	100	359
5	313.2760	60.98	QP	15.22	48.54	2.83	30.49	46.00	-15.51	200	202
6	696.8567	54.60	QP	22.52	45.59	4.24	35.77	46.00	-10.23	100	278

Test Mode:	Transmitting Zigbee Mode -Middle Channel

Below 1GHz

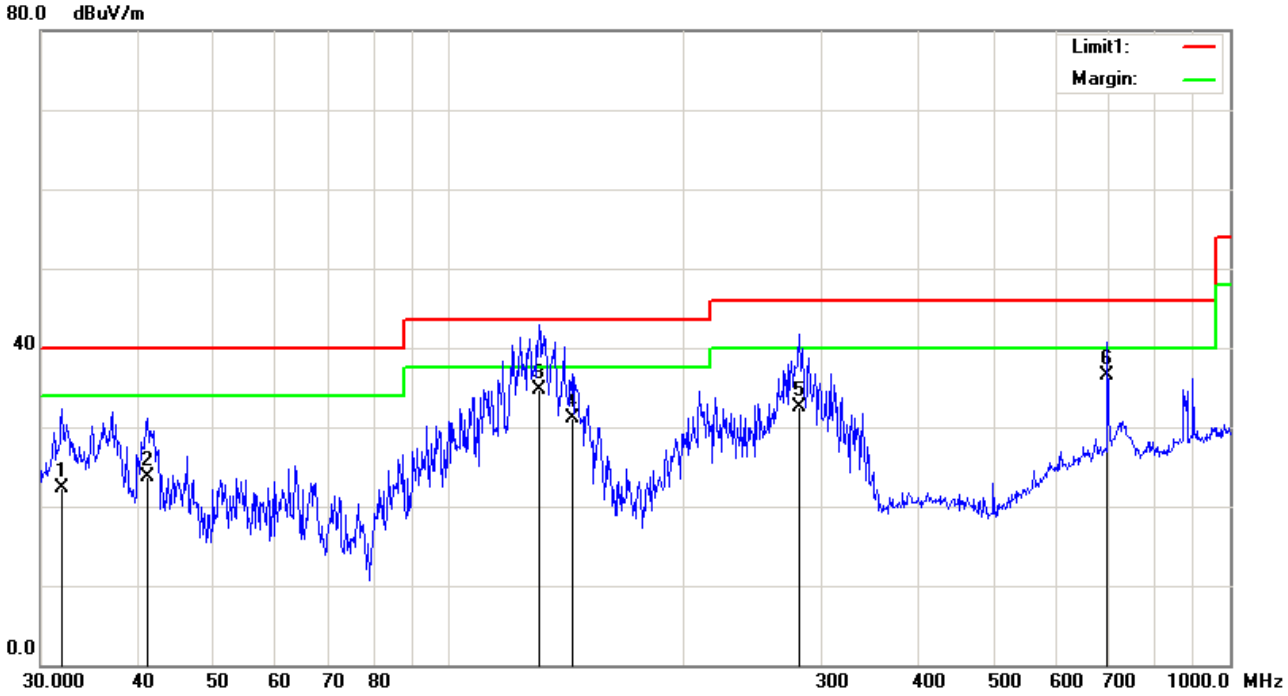


Horizontal Polarity Plot @3m

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	67.4382	57.31	QP	10.40	47.76	1.40	21.35	40.00	-18.65	300	90
2	136.4598	62.58	QP	12.88	47.73	1.95	29.68	43.50	-13.82	200	147
3	214.5143	62.00	QP	13.90	47.69	2.33	30.54	43.50	-12.96	200	203
4	289.0021	64.54	QP	16.51	48.37	2.71	35.39	46.00	-10.61	200	15
5	303.5437	63.52	QP	16.87	48.34	2.78	34.83	46.00	-11.17	200	270
6	327.8873	61.70	QP	16.65	48.77	2.90	32.48	46.00	-13.52	300	218

Test Mode:	Transmitting Zigbee Mode -High Channel

Below 1GHz



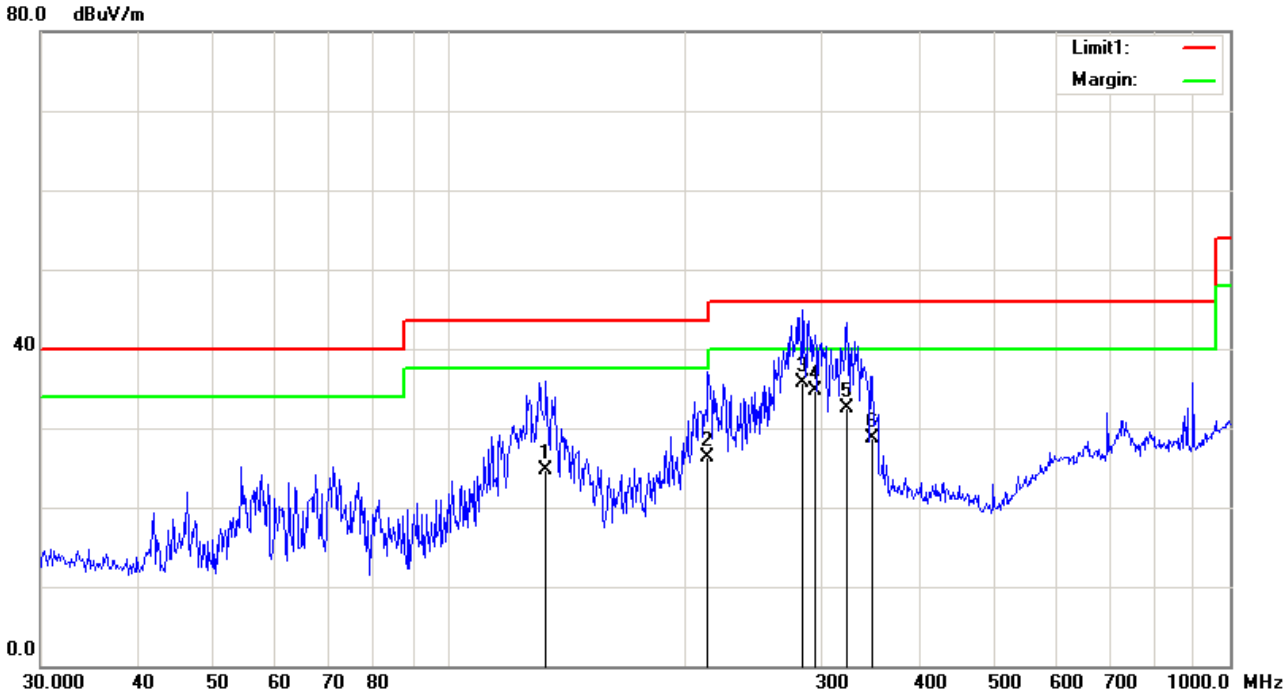
Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	31.9546	46.69	QP	20.46	45.67	0.91	22.39	40.00	-17.61	100	0
2	41.1320	53.36	QP	15.02	45.77	1.07	23.68	40.00	-16.32	200	6
3	130.3789	63.86	QP	16.22	47.33	1.87	34.62	43.50	-8.88	200	226
4	143.8295	64.08	QP	13.03	47.97	2.04	31.18	43.50	-12.32	100	221
5	281.0075	63.30	QP	14.93	48.45	2.67	32.45	46.00	-13.55	100	30
6	696.8567	55.26	QP	22.52	45.59	4.24	36.43	46.00	-9.57	200	284

Test Mode:	Transmitting Zigbee Mode -High Channel

Below 1GHz



Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	133.1511	56.11	QP	14.17	47.51	1.90	24.67	43.50	-18.83	200	110
2	214.5143	57.84	QP	13.90	47.69	2.33	26.38	43.50	-17.12	100	227
3	283.9792	65.06	QP	16.34	48.42	2.69	35.67	46.00	-10.33	100	360
4	294.1137	63.59	QP	16.69	48.33	2.74	34.69	46.00	-11.31	200	215
5	323.3204	61.60	QP	16.69	48.72	2.88	32.45	46.00	-13.55	200	207
6	348.0274	58.05	QP	16.47	48.85	2.99	28.66	46.00	-17.34	100	219

Test Mode:	Transmitting Zigbee Mode -Low Channel

Above 1GHz
Vertical

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBµV/m)		(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(cm)	(°)
1	1850.000	57.69	AVG	30.43	51.53	4.00	40.59	54.00	-13.41	100	74
2	3329.000	61.24	peak	31.58	52.86	4.87	44.83	74.00	-29.17	100	203
3	4808.000	62.38	peak	33.18	53.35	6.10	48.31	74.00	-25.69	100	114
4	8004.000	56.39	peak	36.58	54.73	7.85	46.09	74.00	-27.91	100	117
5	10554.000	55.58	peak	38.58	53.05	9.37	50.48	74.00	-23.52	200	114
6	13920.000	52.18	AVG	42.02	52.12	9.10	51.18	54.00	-2.82	200	130

Horizontal

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBµV/m)		(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(cm)	(°)
1	1867.000	57.98	AVG	30.53	51.61	3.99	40.89	54.00	-13.11	100	246
2	3329.000	62.55	peak	31.58	52.86	4.87	46.14	74.00	-27.86	100	31
3	4808.000	63.83	peak	33.18	53.35	6.10	49.76	74.00	-24.24	100	153
4	8106.000	56.96	peak	36.07	54.53	7.96	46.46	74.00	-27.54	100	44
5	11030.000	56.12	peak	38.41	53.22	9.54	50.85	74.00	-23.15	100	360
6	13733.000	53.14	AVG	41.83	52.07	9.23	52.13	54.00	-1.87	200	292

Test Mode:	Transmitting Zigbee Mode -Middle Channel

Above 1GHz

Vertical

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1867.000	58.43	AVG	30.53	51.61	3.99	41.34	54.00	-12.66	200	2
2	3329.000	61.30	peak	31.58	52.86	4.87	44.89	74.00	-29.11	200	283
3	4876.000	61.44	peak	33.33	53.66	6.00	47.11	74.00	-26.89	100	224
4	8038.000	55.78	peak	36.41	54.66	7.89	45.42	74.00	-28.58	200	360
5	11081.000	56.02	peak	38.43	53.22	9.60	50.83	74.00	-23.17	200	68
6	14022.000	51.66	AVG	42.06	52.16	9.06	50.62	54.00	-3.38	100	309

Horizontal

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1884.000	58.46	AVG	30.63	51.69	3.99	41.39	54.00	-12.61	200	193
2	3329.000	62.54	peak	31.58	52.86	4.87	46.13	74.00	-27.87	200	23
3	4876.000	62.71	peak	33.33	53.66	6.00	48.38	74.00	-25.62	200	134
4	11030.000	55.31	peak	38.41	53.22	9.54	50.04	74.00	-23.96	100	29
5	13172.000	54.76	peak	40.88	51.87	9.56	53.33	74.00	-20.67	200	351
6	14056.000	54.73	peak	42.01	52.19	9.08	53.63	74.00	-20.37	100	13

Test Mode:	Transmitting Zigbee Mode -High Channel

Above 1GHz

Vertical

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1867.000	70.34	peak	30.53	51.61	3.99	53.25	74.00	-20.75	200	359
2	4961.000	62.88	peak	33.51	54.04	5.88	48.23	74.00	-25.77	100	188
3	8089.000	55.68	peak	36.16	54.56	7.95	45.23	74.00	-28.77	100	261
4	10316.000	55.09	peak	38.64	53.42	9.31	49.62	74.00	-24.38	200	189
5	14039.000	50.55	AVG	42.04	52.18	9.07	49.48	54.00	-4.52	100	78
6	15501.000	54.07	peak	39.50	50.01	10.17	53.73	74.00	-20.27	100	337

Horizontal

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	1867.000	70.99	peak	30.53	51.61	3.99	53.90	74.00	-20.10	100	288
2	3329.000	62.07	peak	31.58	52.86	4.87	45.66	74.00	-28.34	100	28
3	4961.000	63.78	peak	33.51	54.04	5.88	49.13	74.00	-24.87	200	130
4	8140.000	56.21	peak	35.90	54.46	8.00	45.65	74.00	-28.35	200	137
5	11081.000	55.53	peak	38.43	53.22	9.60	50.34	74.00	-23.66	100	347
6	13852.000	54.80	peak	41.95	52.10	9.15	53.80	74.00	-20.20	100	149

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions					
R&S EMI Test Receiver	ESPI3	101216	05/03/2017	05/02/2018	☒
Transient Limiter	LIT-153	531021	10/30/2017	10/29/2018	☒
V-LISN	ESH3-Z5	838979/005	05/15/2017	05/14/2018	☒
SIEMIC EZ_EMC Conducted Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	☒
RF conducted test					
Spectrum Analyzer	N9010A	MY47191130	05/03/2017	05/02/2018	☒
Radiated Emissions					
Spectrum Analyzer	N9010A	MY47191130	05/03/2017	05/02/2018	☒
R&S EMI Receiver	ESPI3	101216	05/03/2017	05/02/2018	☒
Antenna (30MHz~6GHz)	JB6	A121411	10/31/2017	10/31/2018	☒
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	11/15/2016	11/14/2018	☒
Hp Pre-Amplifier	8447F	1937A01160	10/31/2017	10/30/2018	☒
Agilent Pre-Amplifier	8449B	N/A	10/31/2017	10/30/2018	☒
SIEMIC EZ_EMC Radiated Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	☒

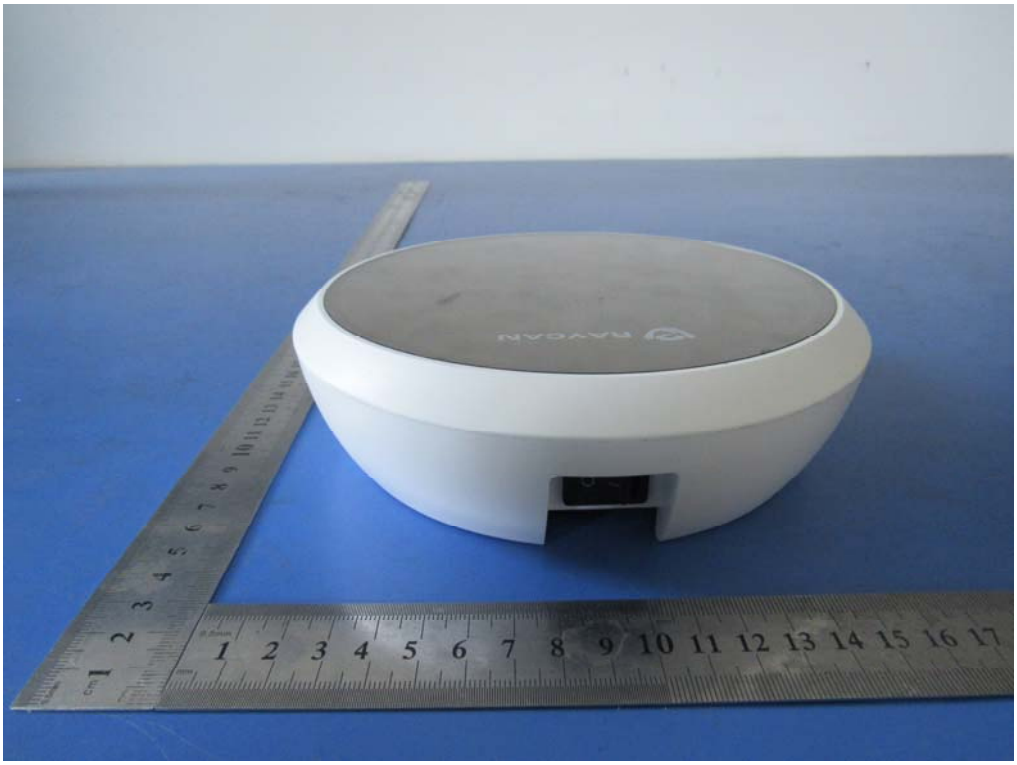
Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photos

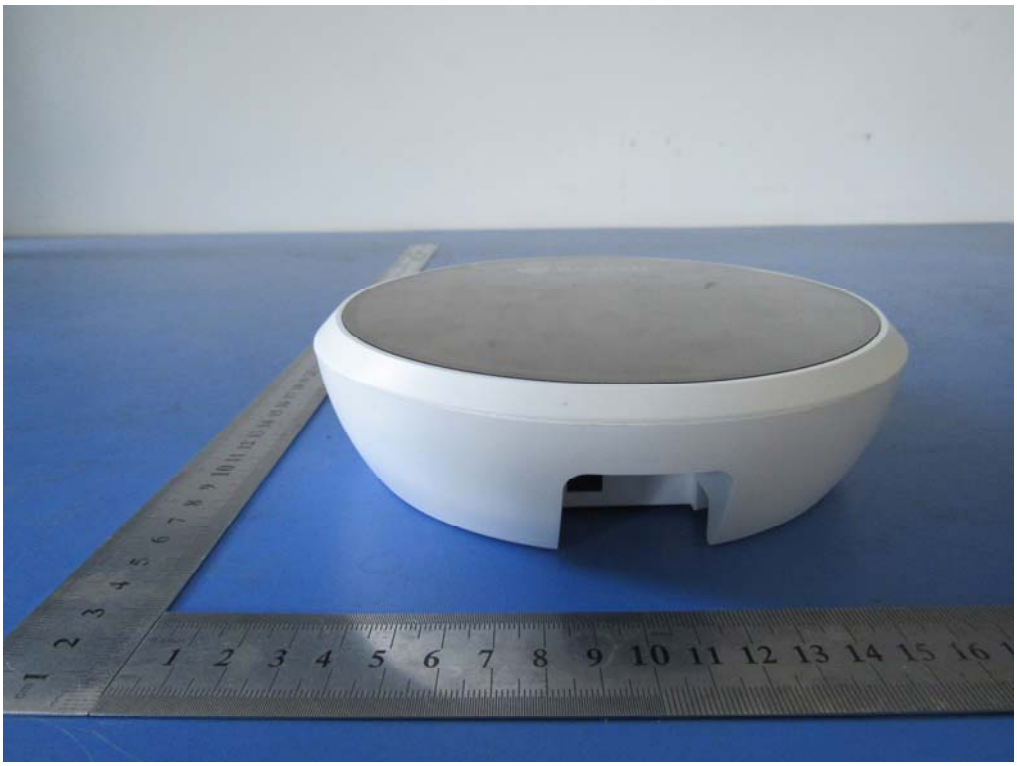
All Packages - Front View

EUT - Front View

EUT - Rear View



EUT - Top View

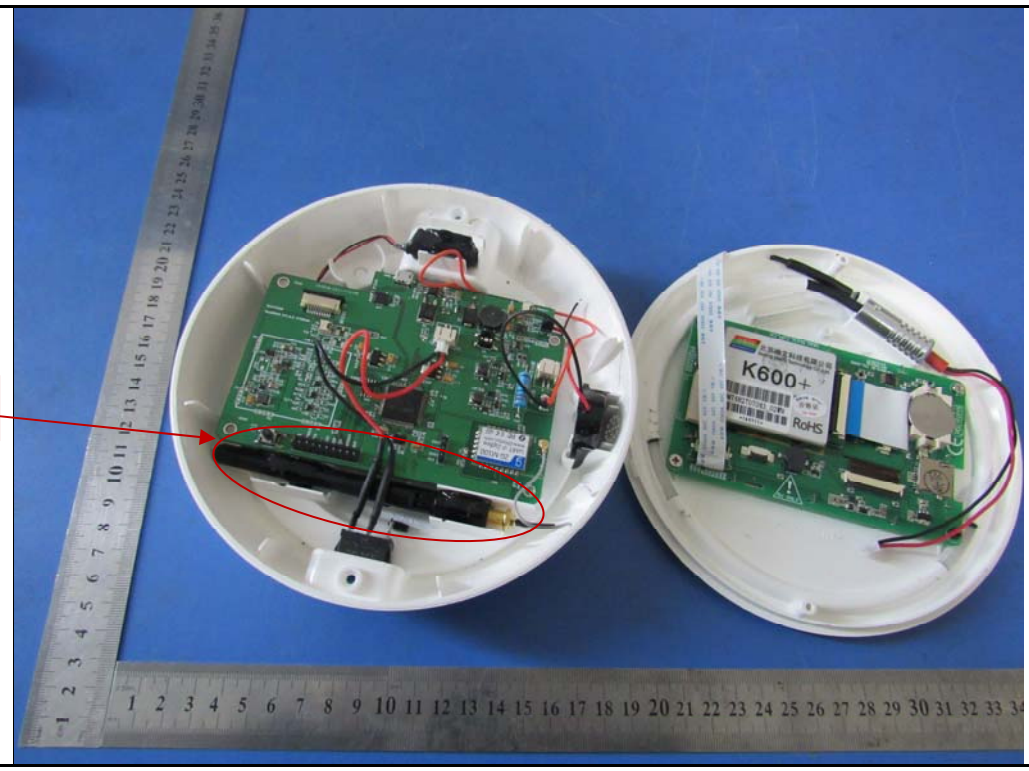


EUT - Bottom View

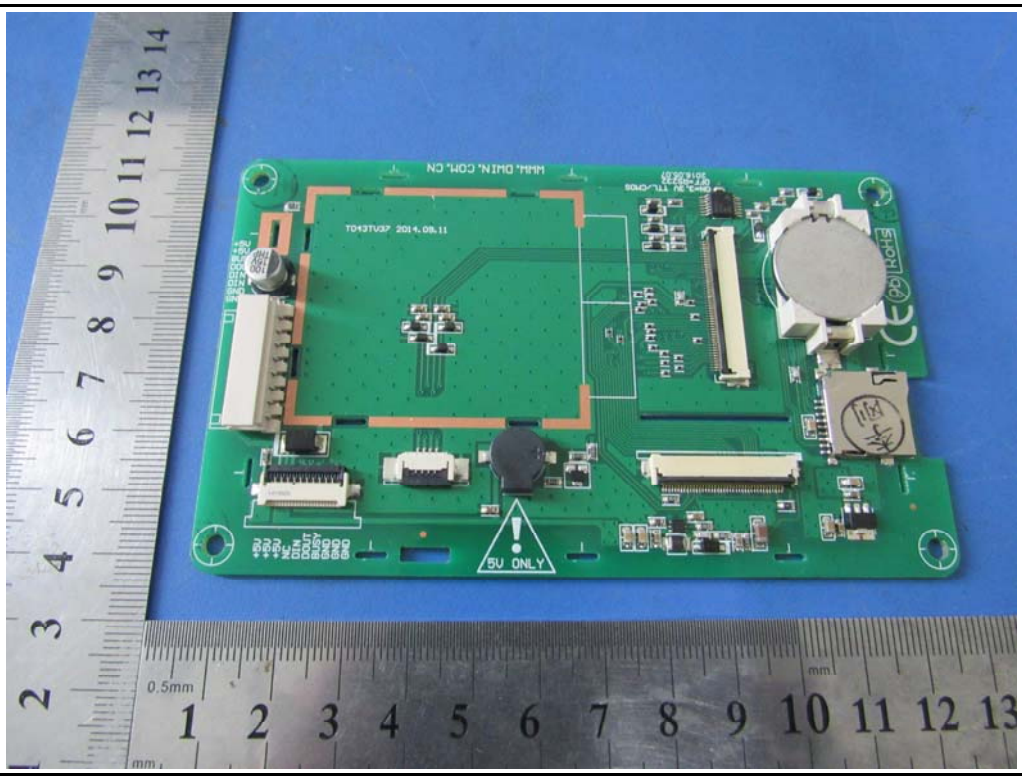
EUT - Left View

EUT - Right View

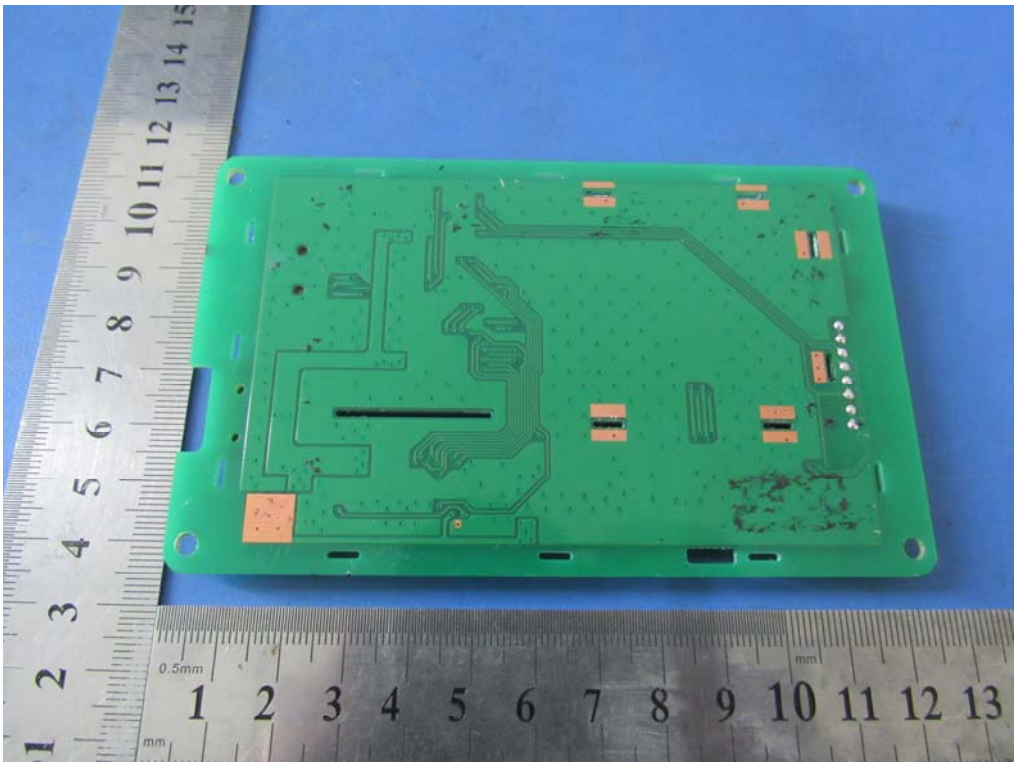
Annex B.ii. Photograph: EUT Internal Photos



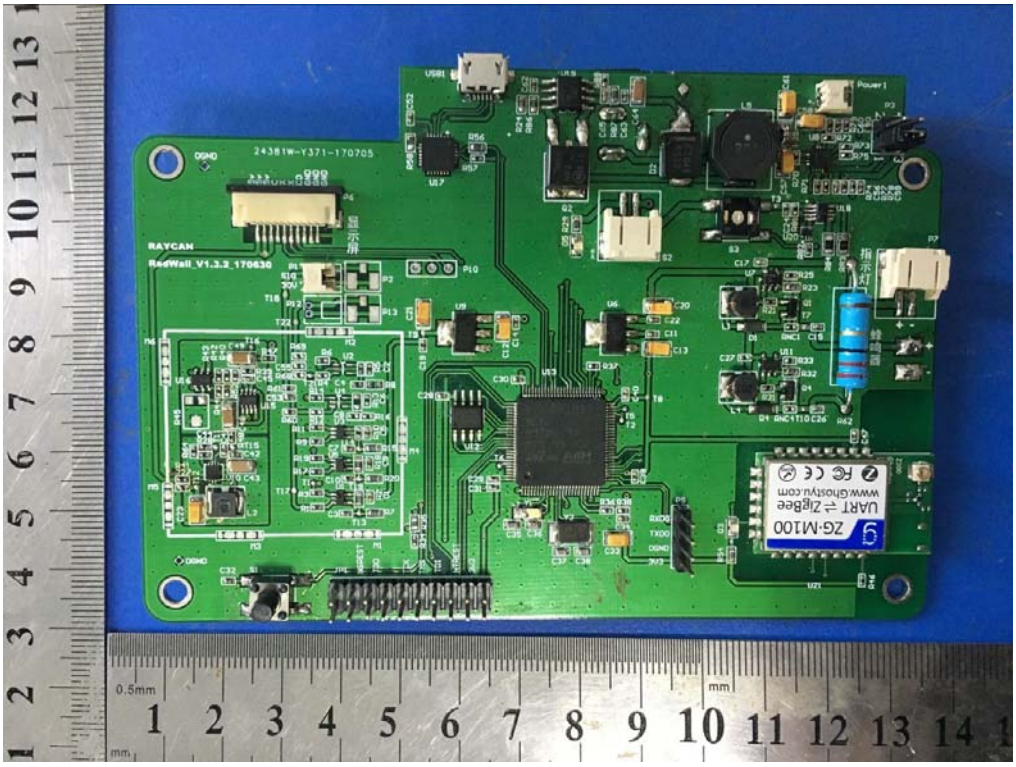
EUT – Uncover Front View



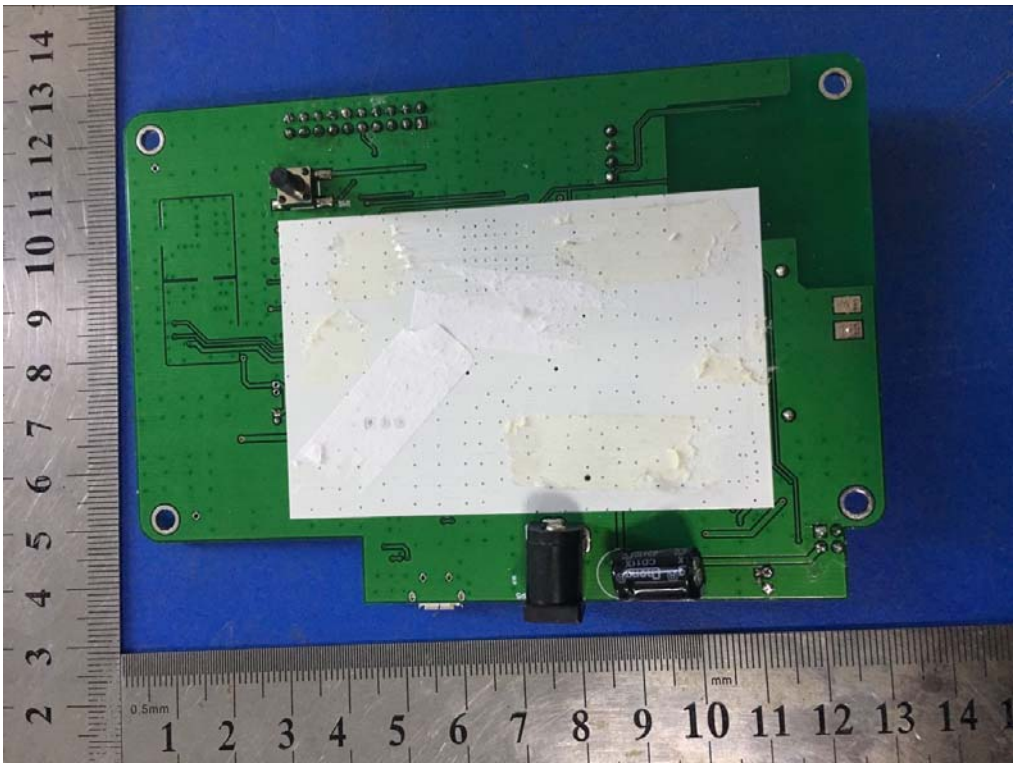
EUT – PCBA 1 Front View



EUT - PCBA 1 Rear View

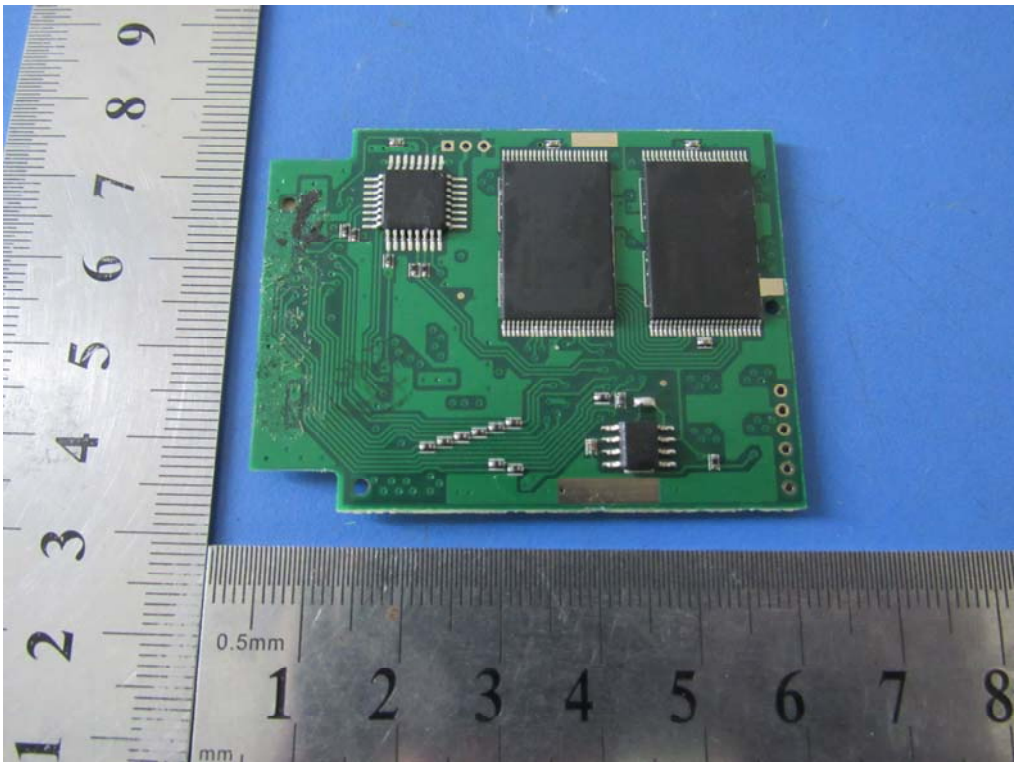


EUT – PCBA 2 Front View

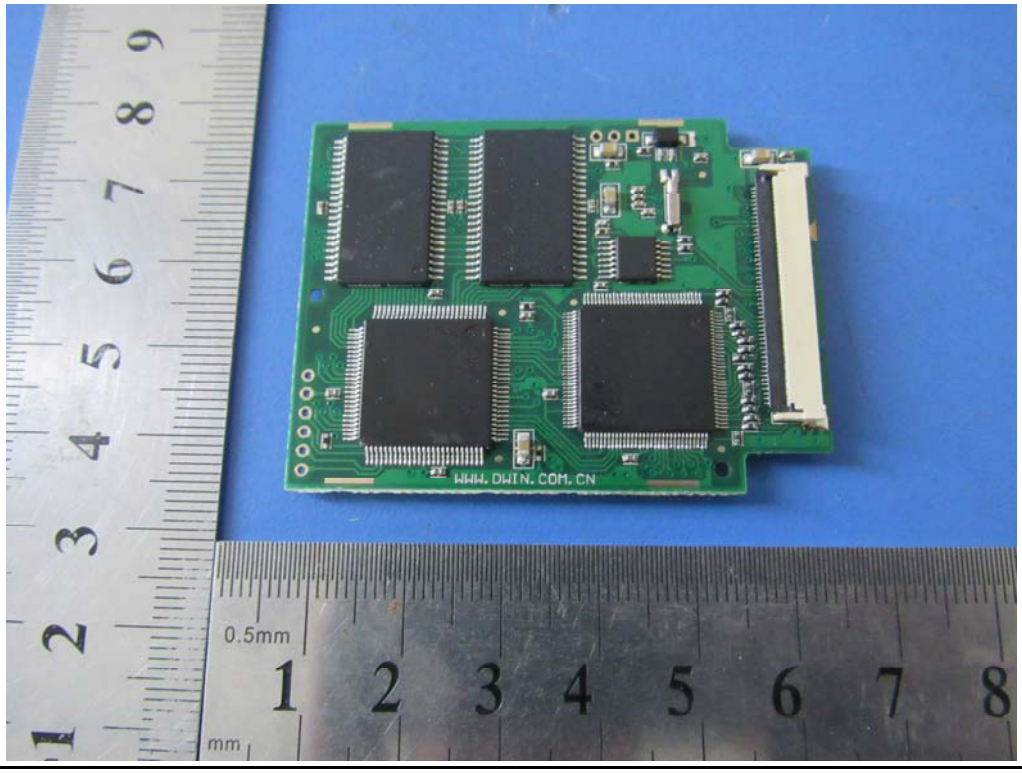


EUT - PCBA 2 Rear View

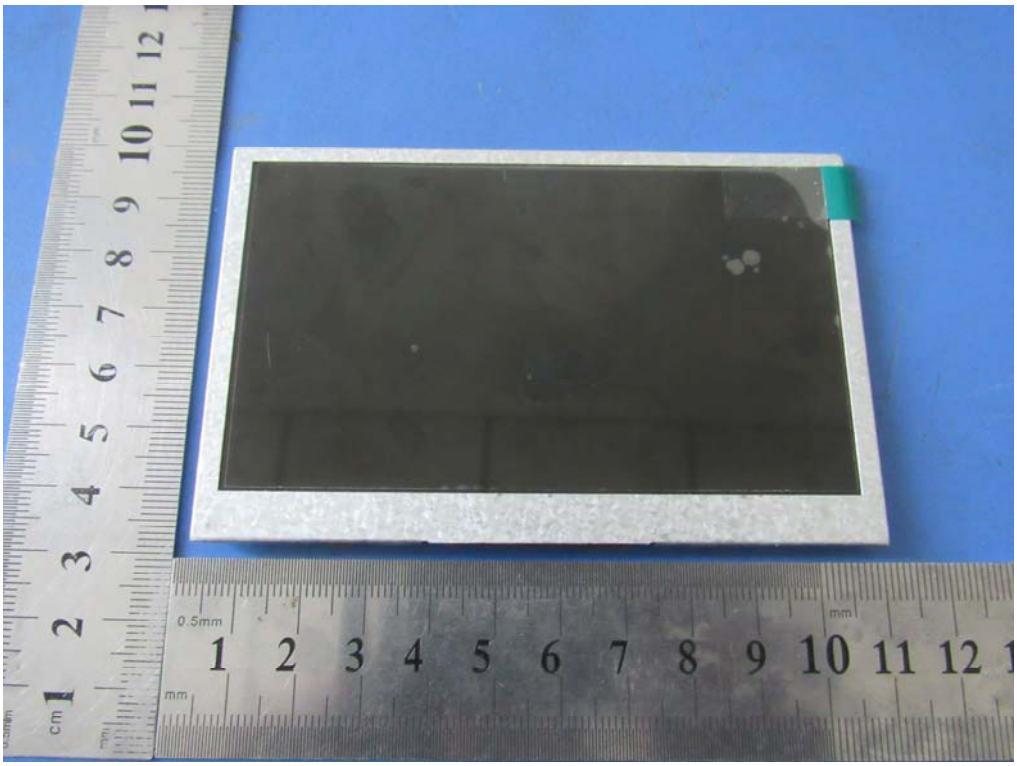
EUT – PCBA 3 Front View



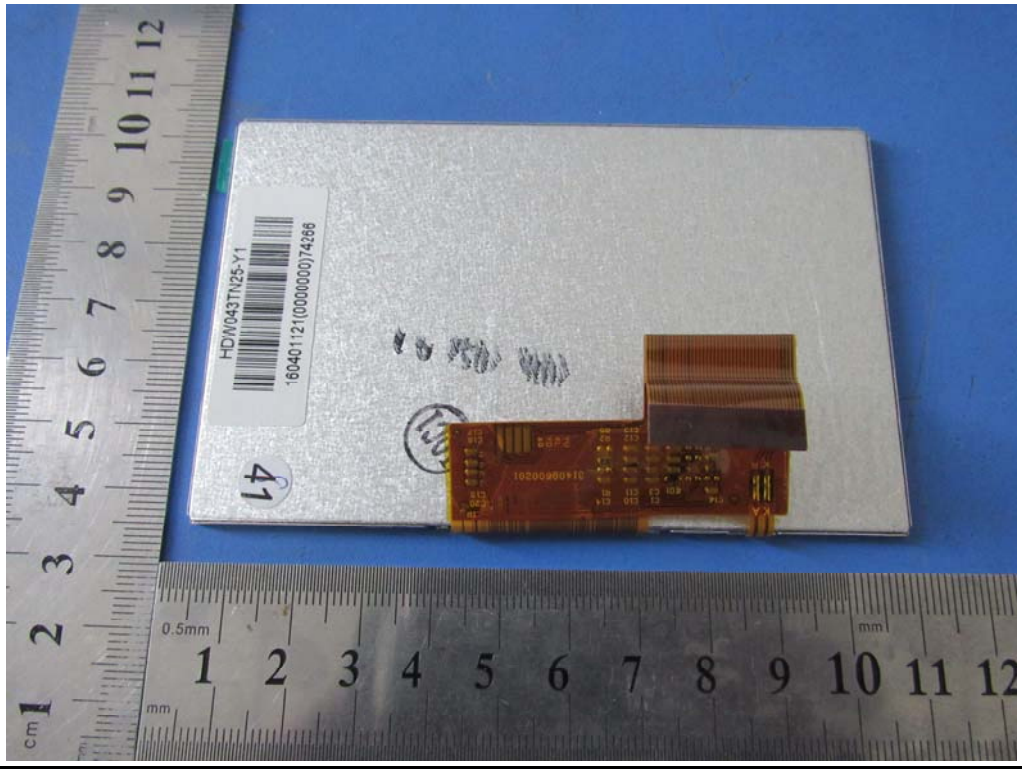
EUT - PCBA 3 Rear View



EUT – PCBA 3 Shielding Off Front View

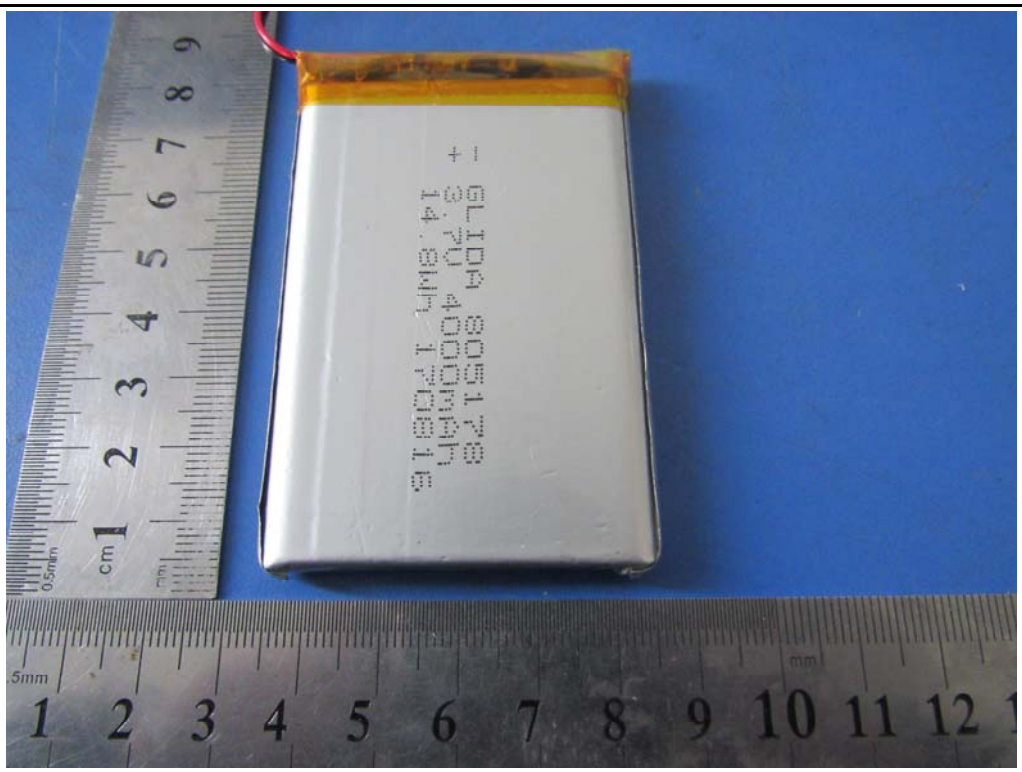


EUT – LCD Front View



EUT – LCD Rear View

EUT – Modular Front View



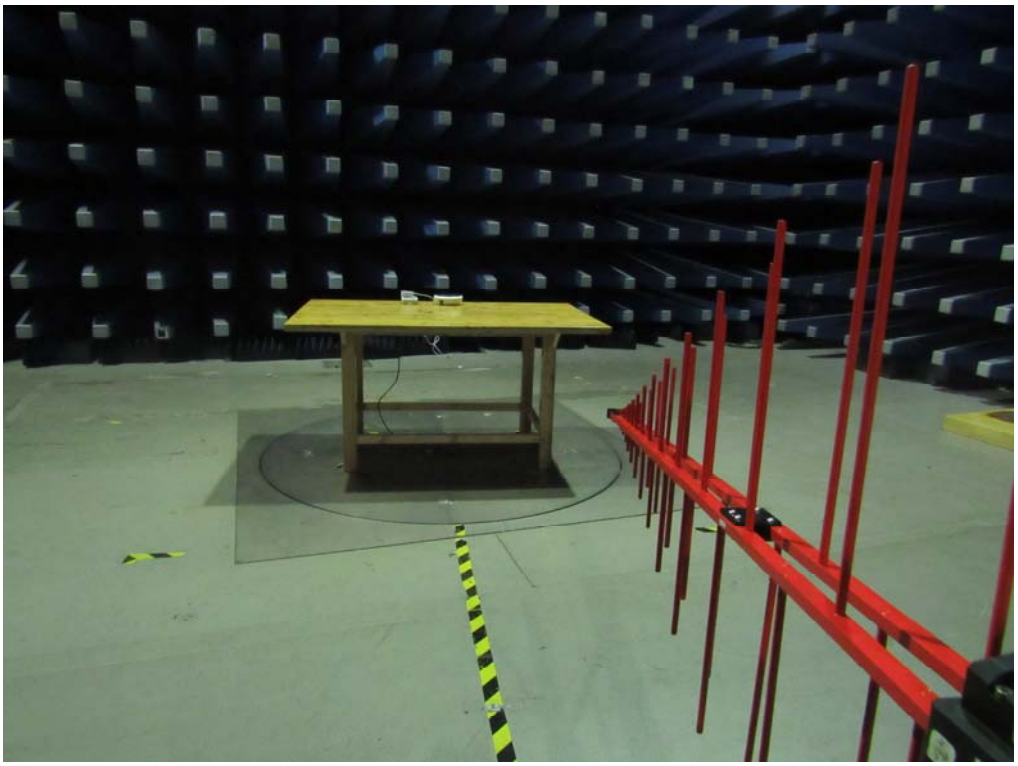
EUT – Battery Front View

EUT – Battery Rear View

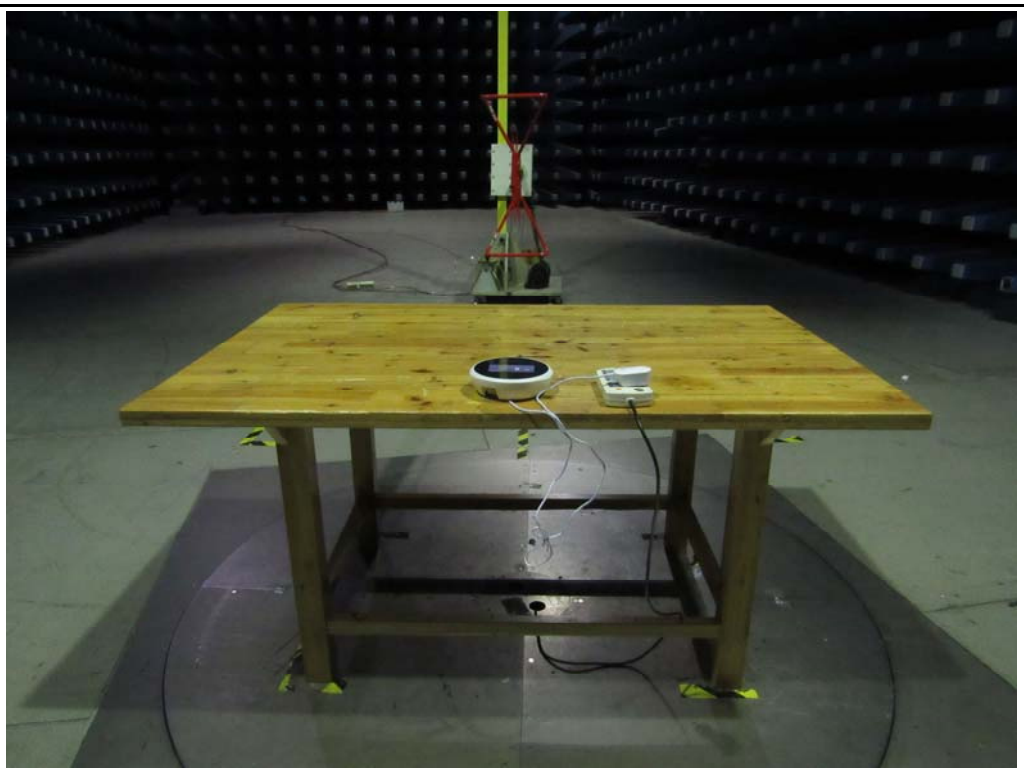
Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Test Setup Front View

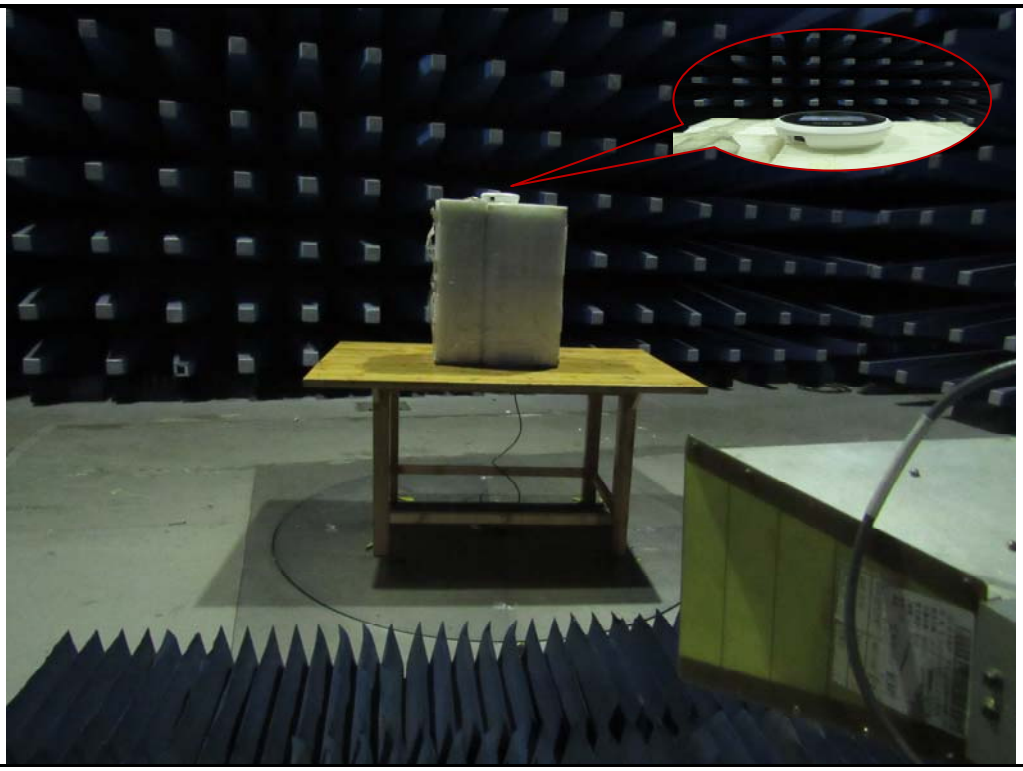
Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz Front View



Radiated Spurious Emissions Test Setup Below 1GHz Rear View

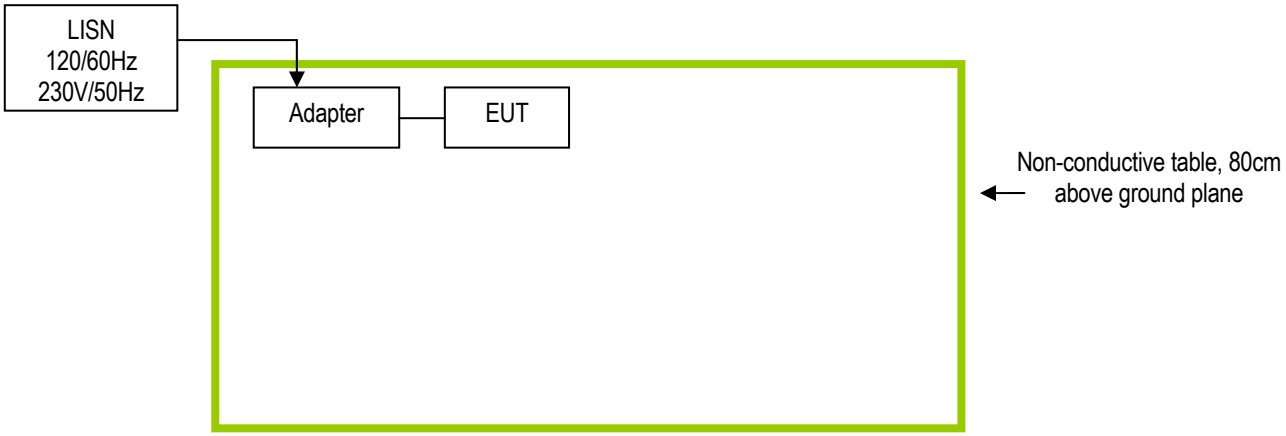


Radiated Spurious Emissions Test Setup Above 1GHz

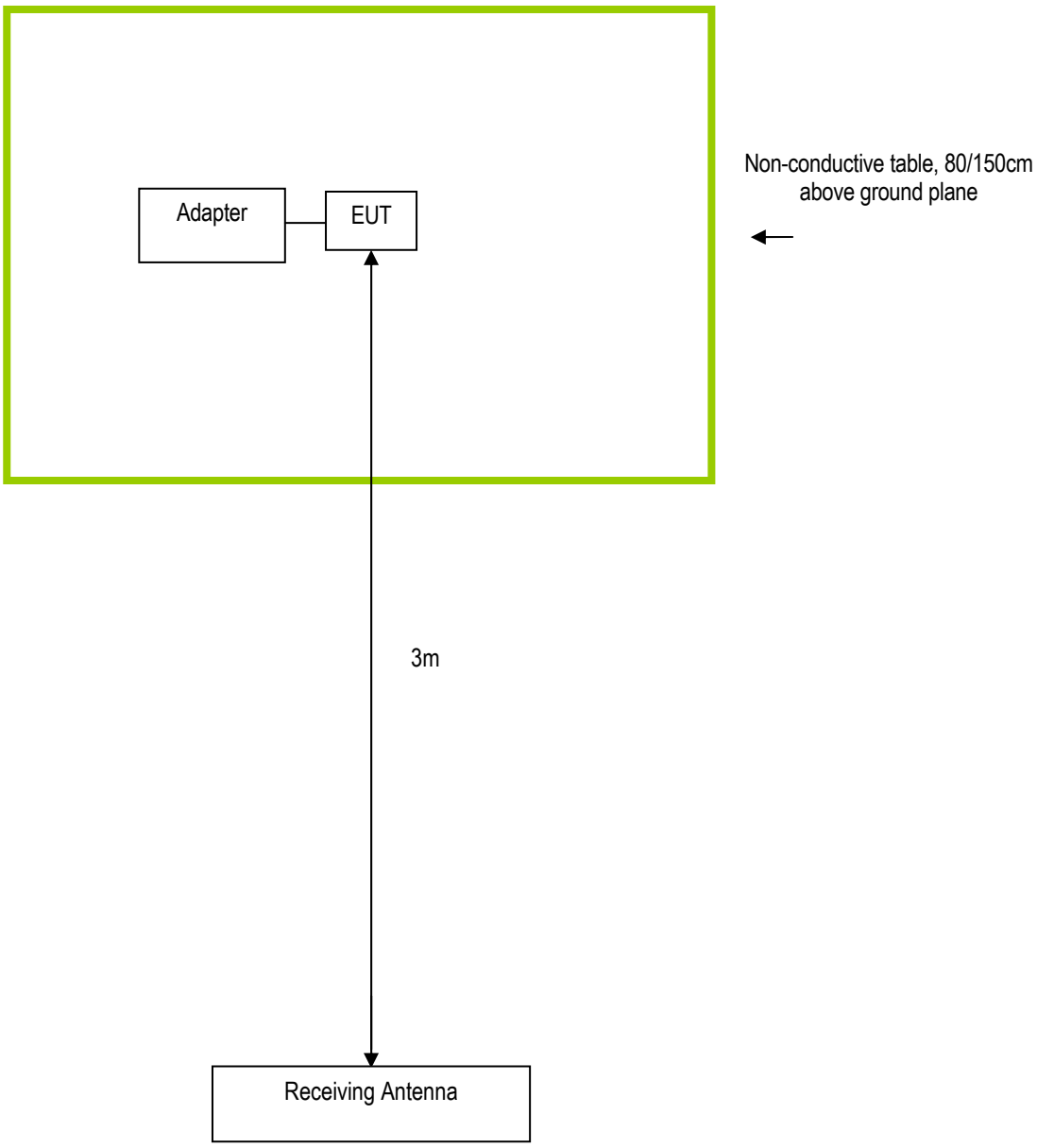
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

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

Manufacturer	Equipment Description	Model
N/A	Control Board	430 down load_v1.0.1_170731
DELL	Laptop	Inspiron 14-3443

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY

Request letter

RadWall:

1/2

Model	Schematics	MCU	detectors	communication	PCB	shell
RadWall-H	same	STM32	7*7*21YSO	Zigbee/2.4G,5DB	same	same
RadWall-W	same	STM32	3.4*3.4*21YSO	Zigbee/2.4G,5DB	same	same
RadWall-Ne	same	STM32	LiI-Eu/10×10	Zigbee/2.4G,5DB	same	same

FCC ID:2ALQQ-RADWALL

These detectors are used to measure ionizing radiation which have no effect on RF function.