RF TEST REPORT

Report No.: 16021285-FCC-R1
Supersede Report No.: N/A

Applicant	Ningbo Lumiaudio Electronic Technology LTD
Product Name	SMART AROMA DIFFUSER BLUETOOTH LED LAMP SPEAKER
Main Model	ALS-01
Serial Model	ALS-02; ALS-03; ALS-04; ALS-05; ALS-06; ALS-07; ALS-08
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013
Test Date	November 28 to November 29, 2016
Issue Date	December 05, 2016
Test Result	☒ Pass ☐ Fail
Equipment complied with the specification	☒
Equipment did not comply with the specification	☐

Amos.Xia	Miro Bao	
Amos Xia Test Engineer	Miro Bao Checked By	

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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

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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
16021285-FCC-R1	NONE	Original	December 05, 2016

2. Customer information

Applicant Name	Ningbo Lumiaudio Electronic Technology LTD
Applicant Add	22/F., Building 1,Lisi Plaza, Huifeng East Road ,Ningbo,China 315100
Manufacturer	Ningbo Lumiaudio Electronic Technology LTD
Manufacturer Add	22/F., Building 1,Lisi Plaza, Huifeng East Road ,Ningbo,China 315100

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.	986914
IC Test Site No.	4842B-1
Test Software	EZ_EMC

Channel List:

Type		Channel No.	Frequency (MHz)	Available (Y/N)
Blue Tooth	(BDR, EDR) 2402-2480MHz	0	2402	Y
		1	2403	Y
		2	2404	Y
		…	…	Y
		39	2441	Y
		40	2442	Y
		…	…	Y
		77	2479	Y
		78	2480	Y

4. Equipment under Test (EUT) Information

Description of EUT:	SMART AROMA DIFFUSER BLUETOOTH LED LAMP SPEAKER
Main Model:	ALS-01
Serial Model:	ALS-02; ALS-03; ALS-04; ALS-05; ALS-06; ALS-07; ALS-08
Date EUT received:	October 19, 2016
Test Date(s):	November 28 to November 29, 2016
Equipment Category :	DSS
Antenna Gain:	Bluetooth: -0.68dBi
Type of Modulation:	Bluetooth: GFSK&π/4DQPSK
RF Operating Frequency (ies):	Bluetooth: 2402-2480 MHz
Max. Output Power:	-4.450dBm
Number of Channels:	Bluetooth: 79CH
Port:	Power Port
Power:	Model: WT24-2401000-G Input: 100-240V~50/60Hz 1.6A Output: DC24V 1.0A
Trade Name :	N/A
FCC ID:	2AKKHALS

Note: the difference between these models please refers to Annex E. DECLARATION OF SIMILARITY in this report.

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)(1)	Channel Separation	Compliance
§15.247(a)(1)	20 dB Bandwidth	Compliance
§15.247(b)(1)	Peak Output Power	Compliance
§15.247(a)(1)(iii)	Number of Hopping Channel	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(d)	Band Edge& Restricted Band	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions& Restricted Band	Compliance

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Conducted Emissions &Radiated Spurious 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)	1.634dB / 3.952dB

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 PIFA antenna for Bluetooth, the gain is -0.68dBi for Bluetooth.

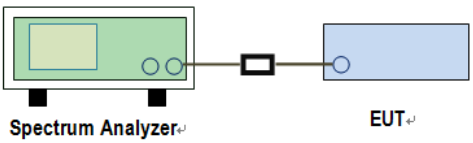
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

Temperature	25℃
Relative Humidity	53%
Atmospheric Pressure	1001mbar
Test date :	November 28, 2016
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(a)(1)	a)	Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - The EUT must have its hopping function enabled - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) ≥1% of the span - Video (or Average) Bandwidth (VBW) ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.		
Remark			
Result	☒Pass ☐Fail		

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

Channel Separation measurement result

Type/ Modulation	CH	CH Frequency (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	0.996	0.9511	Pass
	Adjacency Channel	2403			
	Mid Channel	2441	0.996	0.9532	Pass
	Adjacency Channel	2440			
	High Channel	2480	0.996	0.9591	Pass
	Adjacency Channel	2479			
CH Separation π/4 DQPSK	Low Channel	2402	0.996	0.878	Pass
	Adjacency Channel	2403			
	Mid Channel	2441	1.008	0.879	Pass
	Adjacency Channel	2440			
	High Channel	2480	1.002	0.878	Pass
	Adjacency Channel	2479			

Test Plots

Channel Separation measurement result

GFSK - Low Channel

GFSK - Middle Channel

GFSK - High Channel

π/4 DQPSK - Low Channel

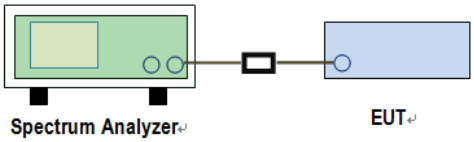
π/4 DQPSK - Middle Channel

π/4 DQPSK - High Channel

6.3 20dB Bandwidth

Temperature	24℃
Relative Humidity	53%
Atmospheric Pressure	1001mbar
Test date :	November 28, 2016
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)	a)	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW ≥1% of the 20 dB bandwidth - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold. - The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).		
Remark			
Result	☒Pass ☐Fail		

Test Data ☒Yes ☐N/A

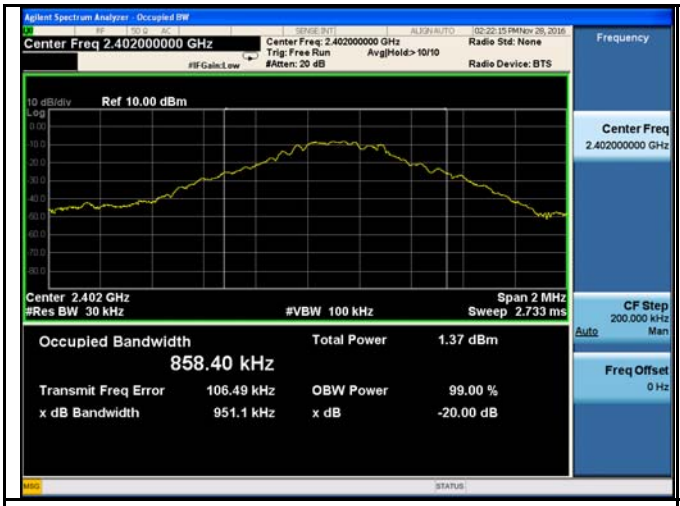
Test Plot ☒Yes (See below) ☐N/A

Measurement result

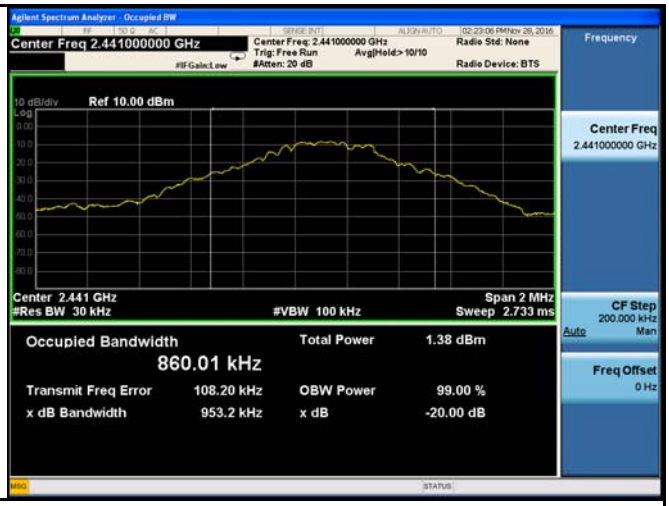
Modulation	CH	CH Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GFSK	Low	2402	0.9511	0.8584
	Mid	2441	0.9532	0.8600
	High	2480	0.9591	0.9022
π/4 DQPSK	Low	2402	1.317	1.1677
	Mid	2441	1.319	1.1674
	High	2480	1.317	1.1692

Test Plots

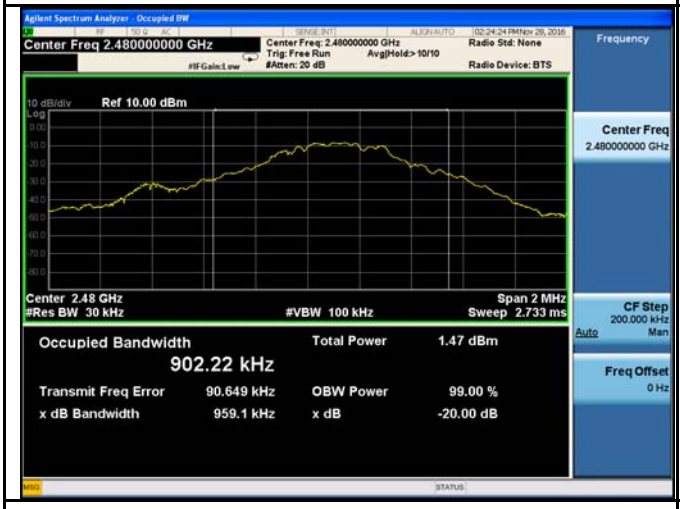
20dB Bandwidth measurement result



GFSK - Low Channel



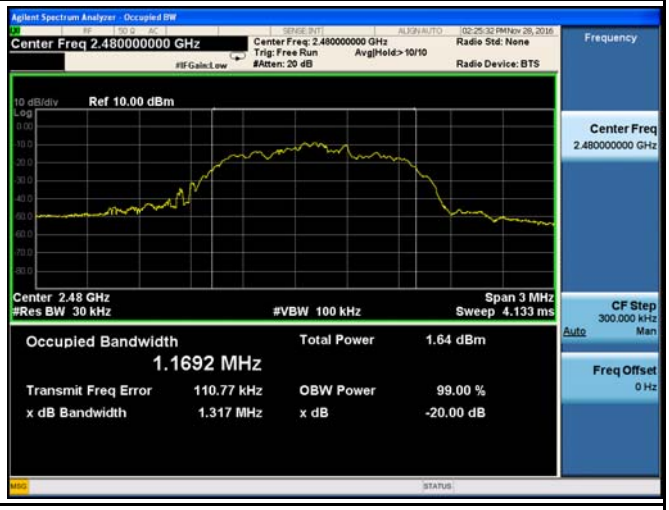
GFSK - Middle Channel



GFSK - High Channel

π/4 DQPSK - Low Channel

π/4 DQPSK - Middle Channel

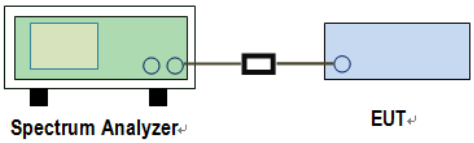


π/4 DQPSK - High Channel

6.4 Peak Output Power

Temperature	24℃
Relative Humidity	53%
Atmospheric Pressure	1001mbar
Test date :	November 28, 2016
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3)	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)	DTS in 902-928MHz, 2400-2483.5MHz: ≤1 Watt	☐
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel - RBW > the 20 dB bandwidth of the emission being measured - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. - Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (see the note above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot. A peak responding power meter may be used instead of a spectrum analyzer.		
Remark			
Result	☒Pass ☐Fail		

Test Data ☒Yes ☐N/A

Test Plot ☒Yes (See below) ☐N/A

Peak Output Power measurement result

Type	Modulation	CH	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Limit (mW)	Result
Output power	GFSK	Low	2402	-5.581	0.277	1000	Pass
		Mid	2441	-5.350	0.292	1000	Pass
		High	2480	-4.497	0.355	1000	Pass
	π/4 DQPSK	Low	2402	-4.454	0.359	125	Pass
		Mid	2441	-4.450	0.359	125	Pass
		High	2480	-4.479	0.357	125	Pass

Test Plots
Output Power measurement result

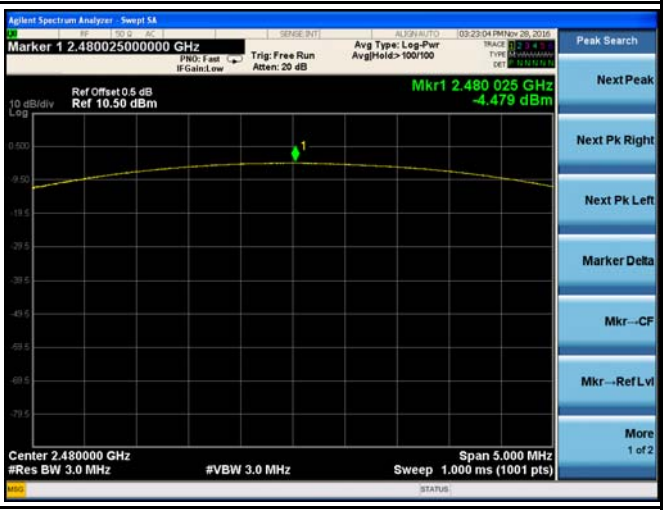
GFSK Output power - Low CH 2402

GFSK Output power - Mid CH 2441

GFSK Output power - High CH 2480

π/4 DQPSK Output power - Low CH 2402

π/4 DQPSK Output power - Mid CH 2441

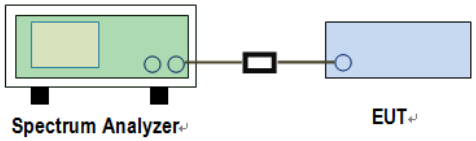


π/4 DQPSK Output power - High CH 2480

6.5 Number of Hopping Channel

Temperature	24℃
Relative Humidity	53%
Atmospheric Pressure	1001mbar
Test date :	November 28, 2016
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a) (1)(iii)	a)	FHSS in 2400-2483.5MHz ≥ 15 channels	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings: The EUT must have its hopping function enabled. - Span = the frequency band of operation - RBW ≥1% of the span - VBW ≥RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow trace to fully stabilize. - It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).		
Remark			
Result	☒Pass ☐Fail		

Test Data ☒Yes ☐N/A

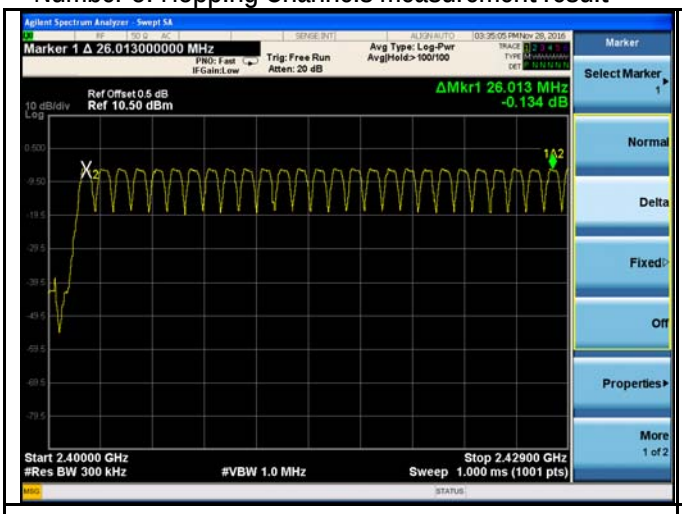
Test Plot ☒Yes (See below) ☐N/A

Number of Hopping Channel measurement result

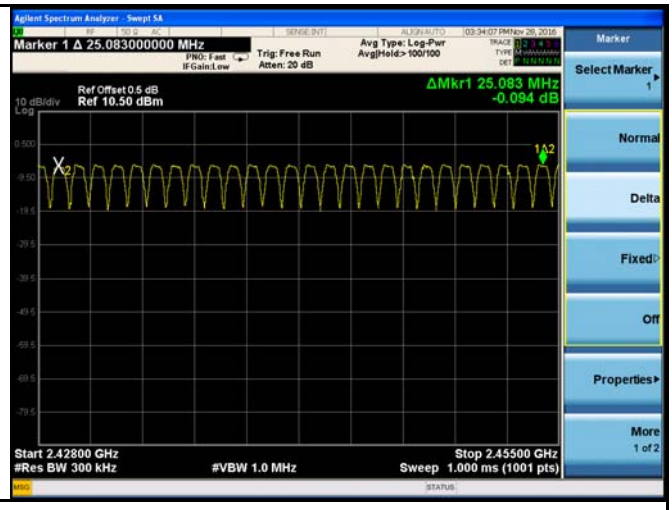
Type	Modulation	Frequency Range	Number of Hopping Channel	Limit
Number of Hopping Channel	GFSK	2400-2483.5	79	15
	π/4 DQPSK	2400-2483.5	79	15

Test Plots

Number of Hopping Channels measurement result

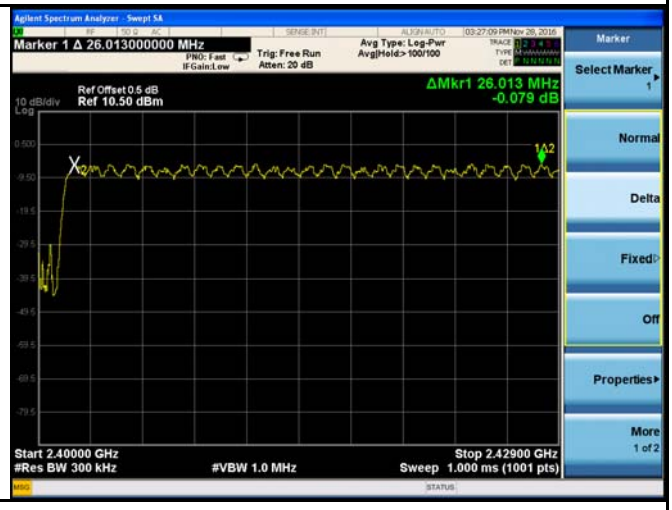


GFSK-1

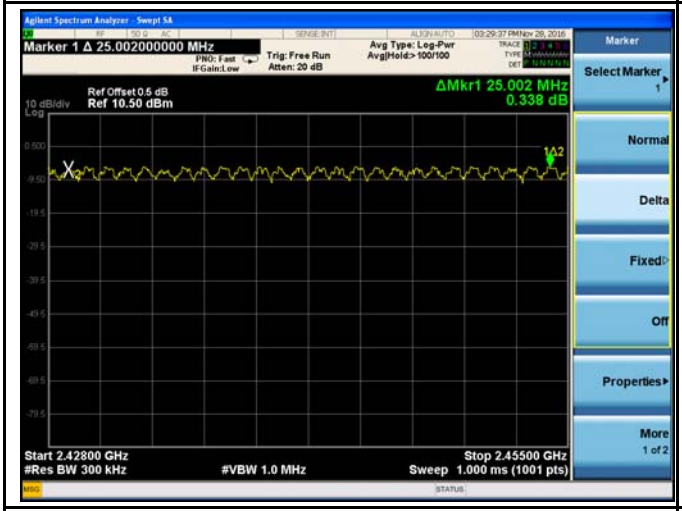


GFSK-2

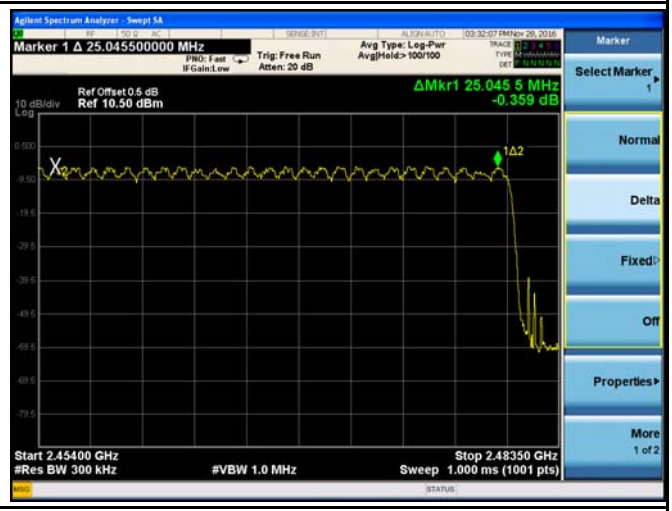
GFSK-3



π/4DQPSK-1



π/4DQPSK-2

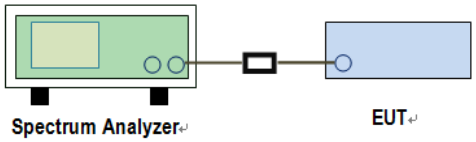


π/4DQPSK-3

6.6 Time of Occupancy (Dwell Time)

Temperature	24℃
Relative Humidity	53%
Atmospheric Pressure	1001mbar
Test date :	November 28, 2016
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	Dwell Time < 0.4s	☒
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer - Span = zero span, centered on a hopping channel - RBW = 1 MHz - VBW ≥RBW - Sweep = as necessary to capture the entire dwell time per hopping channel - Detector function = peak - Trace = max hold - use the marker-delta function to determine the dwell time		
Remark			
Result	☒Pass ☐Fail		

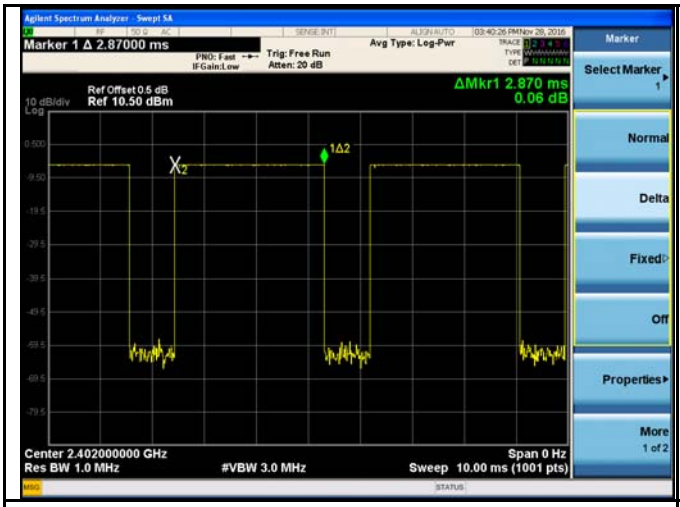
Test Data ☒Yes ☐N/A

Test Plot ☒Yes (See below) ☐N/A

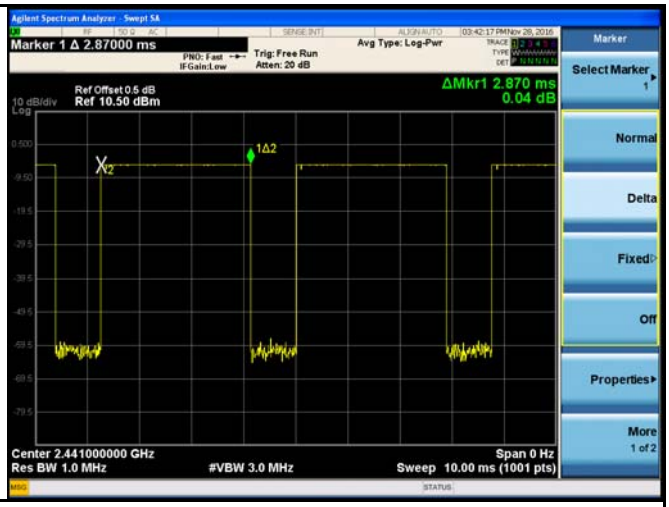
Dwell Time measurement result

Type	Modulation	CH	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
Dwell Time	GFSK	Low	2.870	306.133	400	Pass
		Mid	2.870	306.133	400	Pass
		High	2.870	306.133	400	Pass
	π/4 DQPSK	Low	2.860	305.067	400	Pass
		Mid	2.860	305.067	400	Pass
		High	2.880	307.200	400	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6						

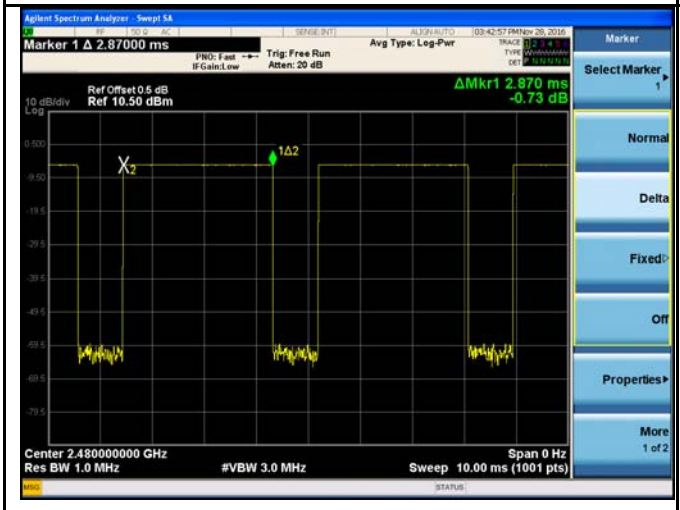
Test Plots
Dwell Time measurement result



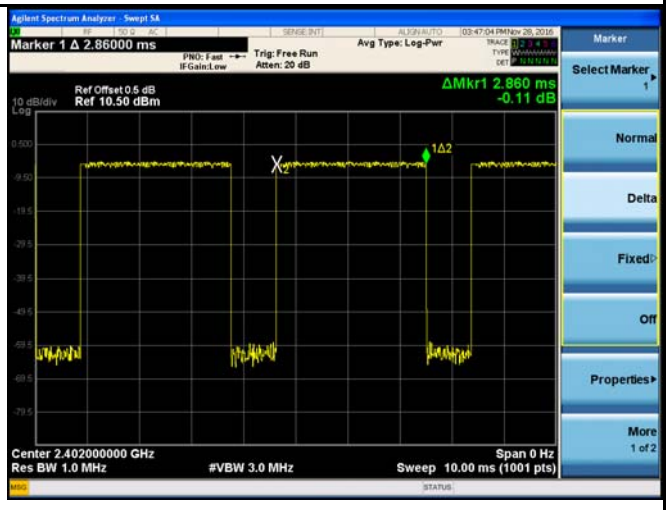
GFSK - Low CH 2402



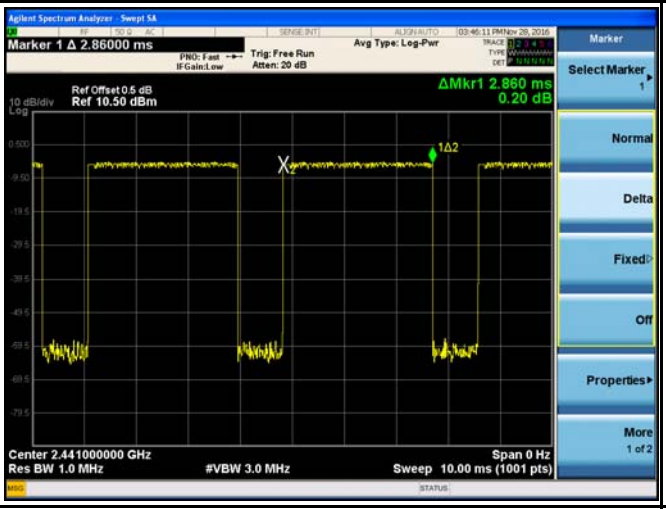
GFSK - Mid CH 2441



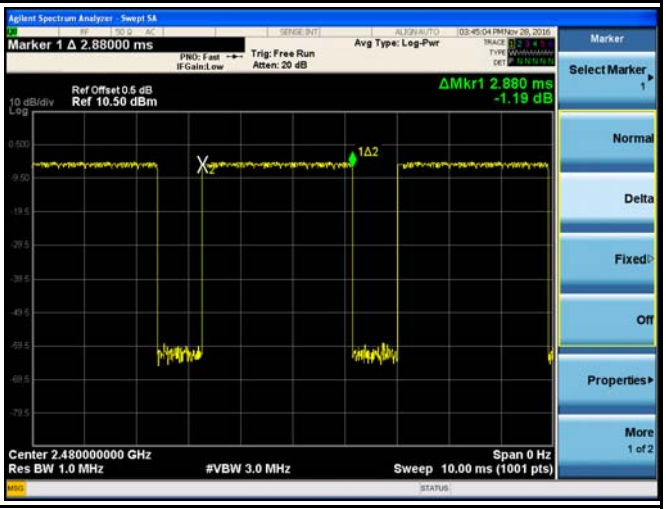
GFSK - High CH 2480



π/4 DQPSK - Low CH 2402



π/4 DQPSK - Mid CH 2441



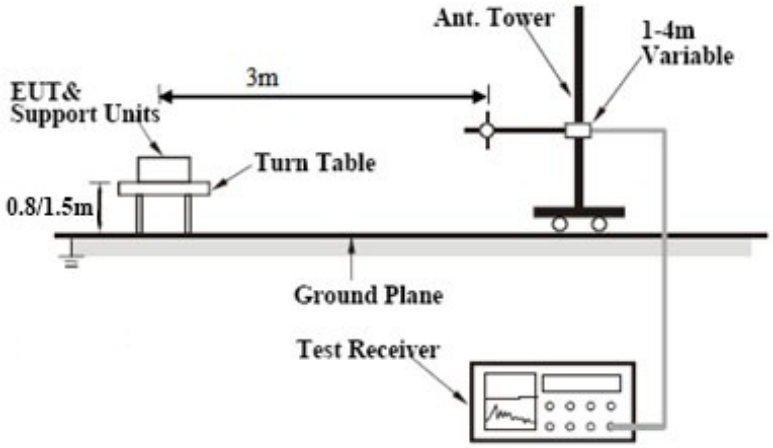
π/4 DQPSK - High CH 2480

6.7 Band Edge & Restricted Band

Temperature	22℃
Relative Humidity	55%
Atmospheric Pressure	1013mbar
Test date :	October 30 to October 31, 2016
Tested By :	Amos Xia

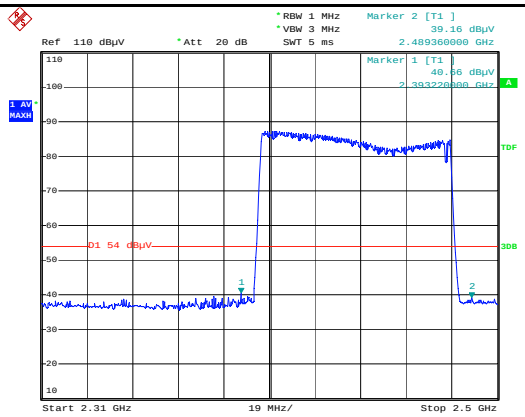
Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	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.	☒

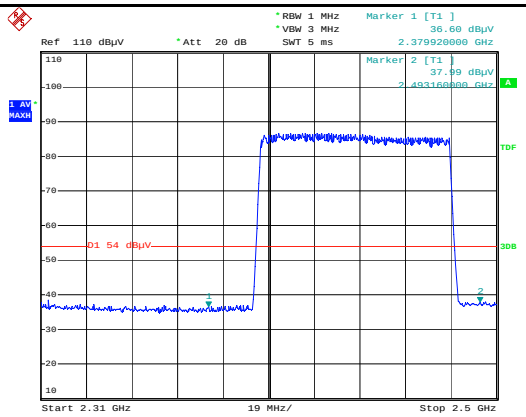
Test Setup	
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only - 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - 2. Position the EUT without connection to measurement 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 Quasiy Peak detection at frequency below 1GHz. 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. 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. - 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

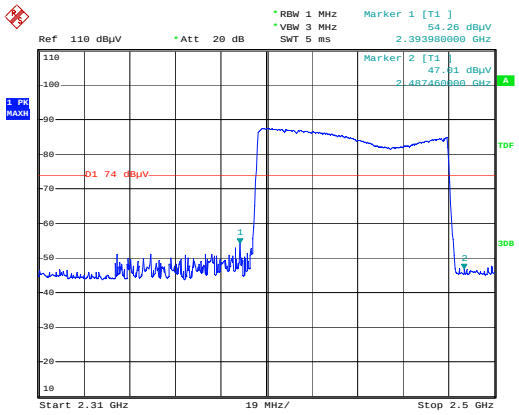
Test Data ☐Yes ☒N/A
Test Plot ☒Yes (See below) ☐N/A
Test Plots
GFSK Mode:



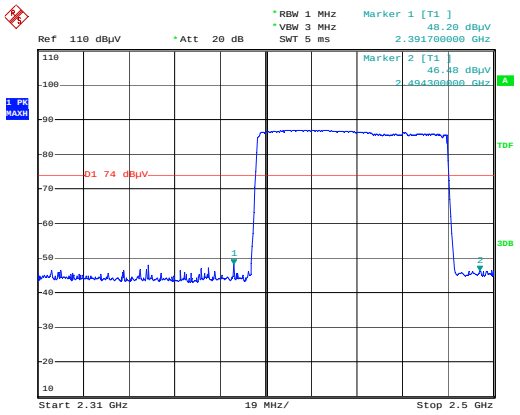
GFSK-Hopping AV-V



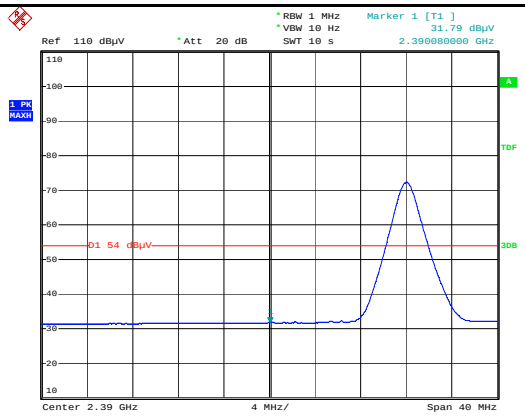
GFSK-Hopping AV-H



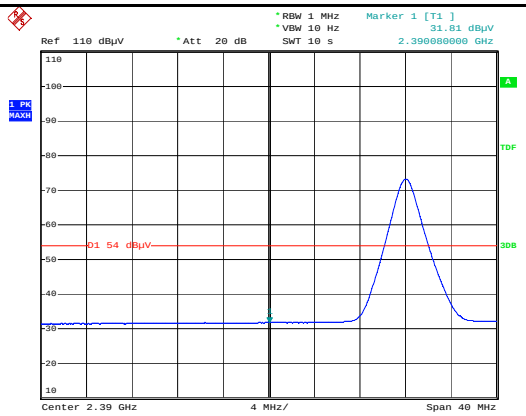
GFSK-Hopping Peak-V



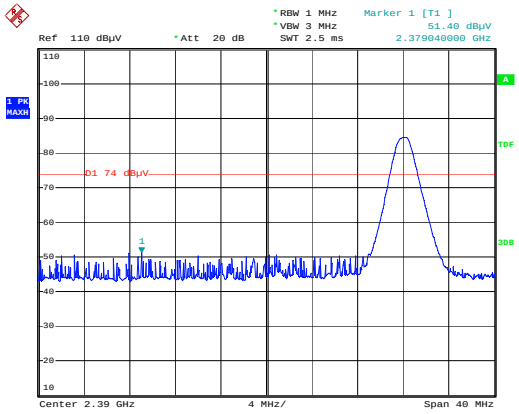
GFSK-Hopping Peak-H



GFSK-Left Side-AV-V

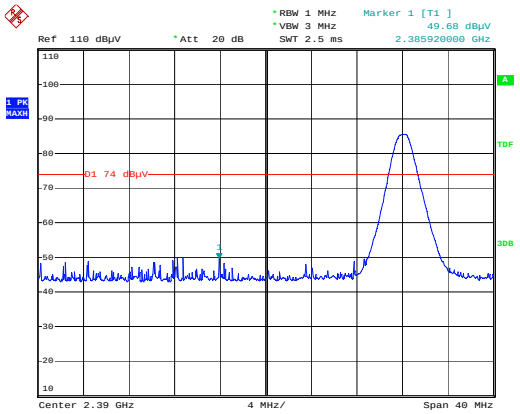


GFSK-Left Side-AV-H



Date: 28.NOV.2016 17:48:07

GFSK-Left Side-Peak-V



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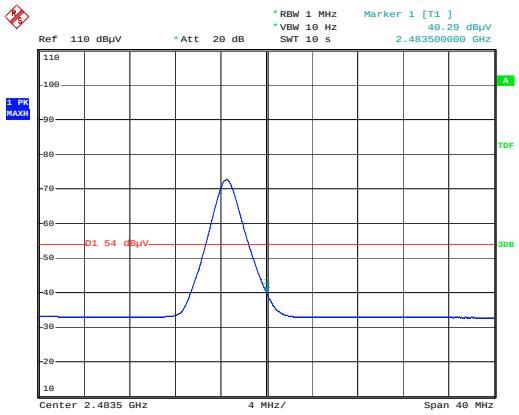
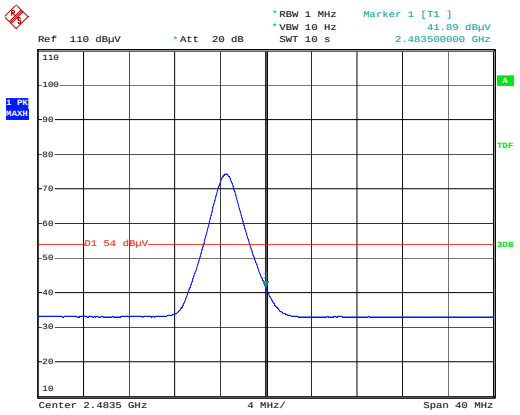
GFSK-Left Side-Peak-H



Date: 28.NOV.2016 17:52:39

GFSK-Right Side-AV-V



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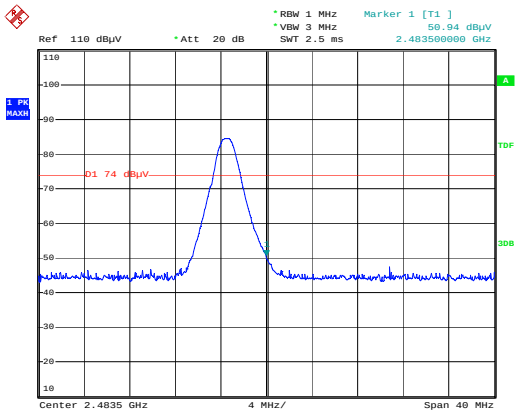
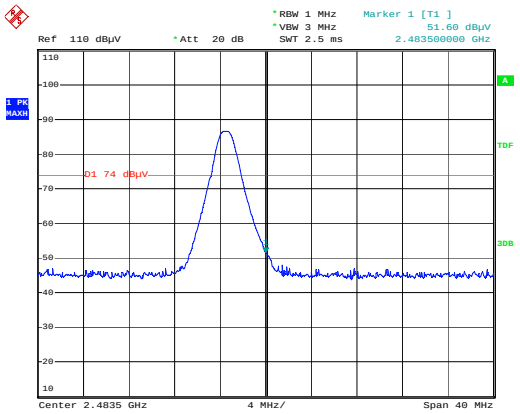
GFSK-Right Side-AV-H



Date: 28.NOV.2016 17:53:53

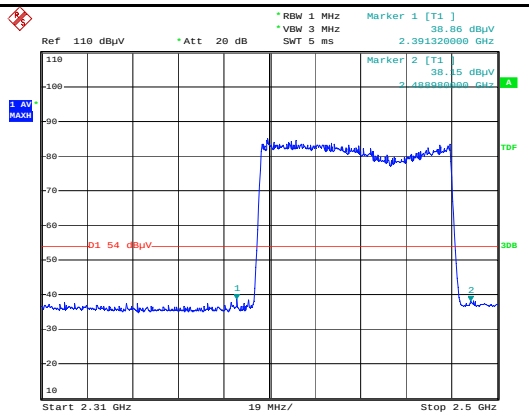
GFSK-Right Side-Peak-V



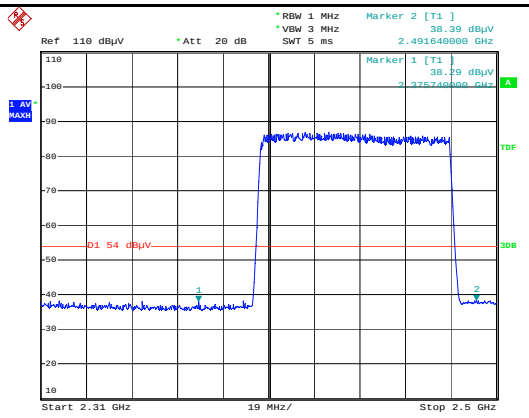
Date: 28.NOV.2016 17:53:38

GFSK-Right Side-Peak-H

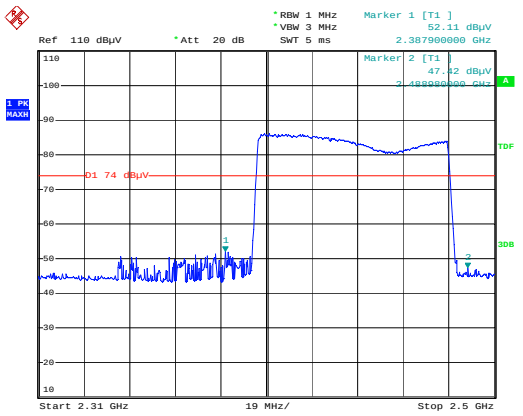
π /4DQPSK Mode



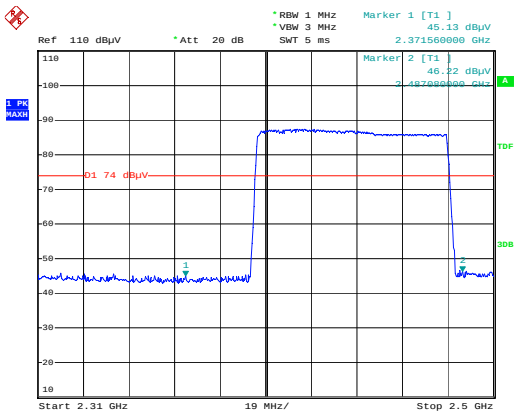
π /4DQPSK-Hopping AV-V



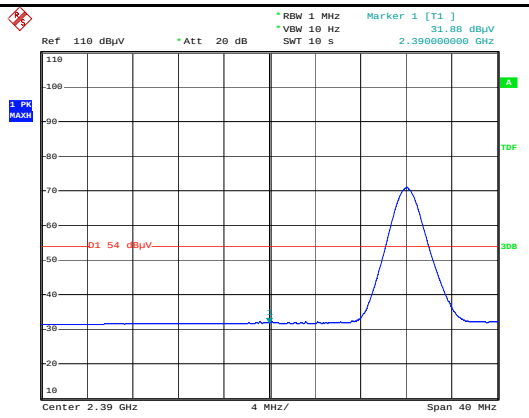
π /4DQPSK-Hopping AV-H



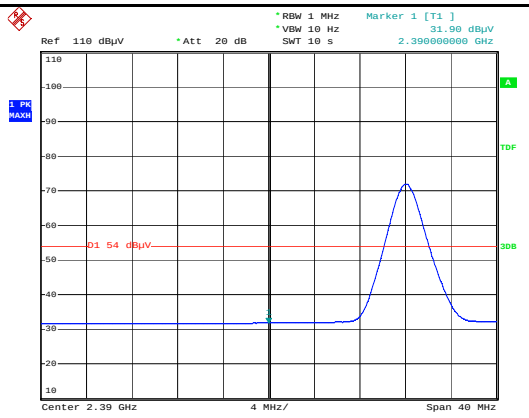
π /4DQPSK-Hopping Peak-V



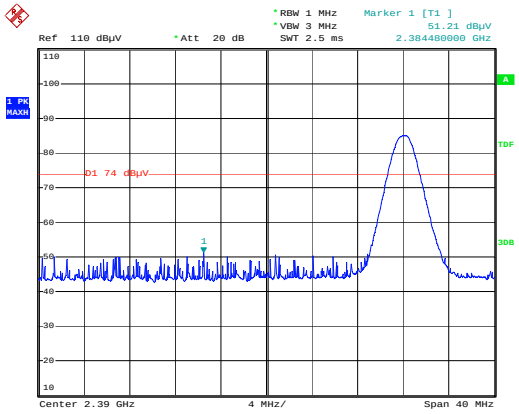
π /4DQPSK-Hopping Peak-H



π /4DQPSK-Left Side-AV-V



π /4DQPSK-Left Side-AV-H



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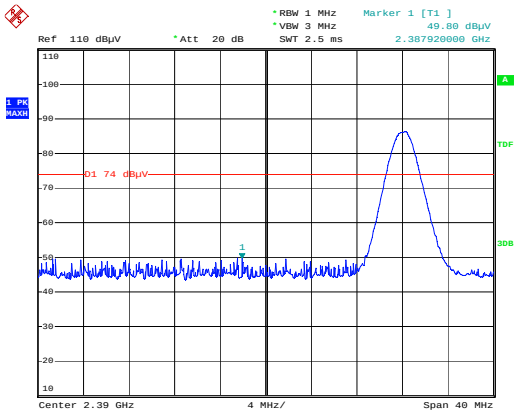
π /4DQPSK-Left Side-Peak-V



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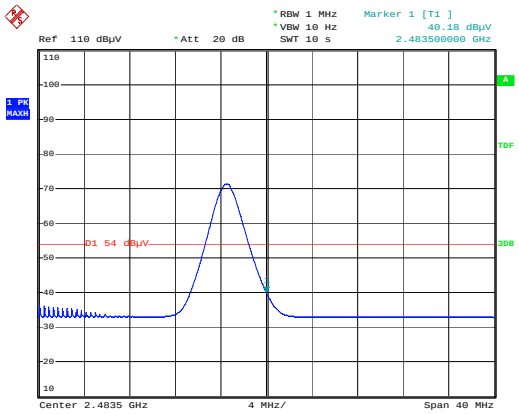
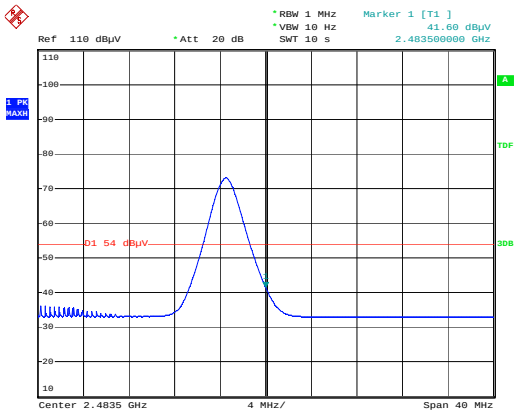
π /4DQPS -Left Side-Peak-H



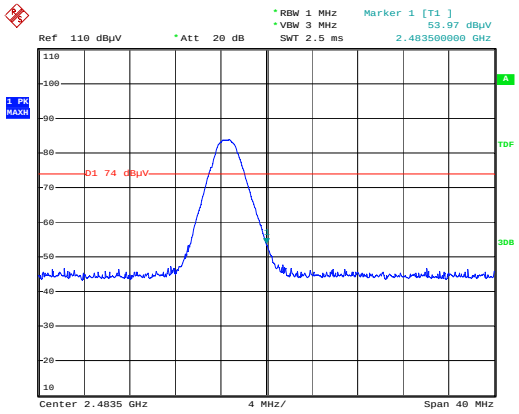
Date: 28.NOV.2016 17:57:03

π /4DQPSK-Right Side-AV-V



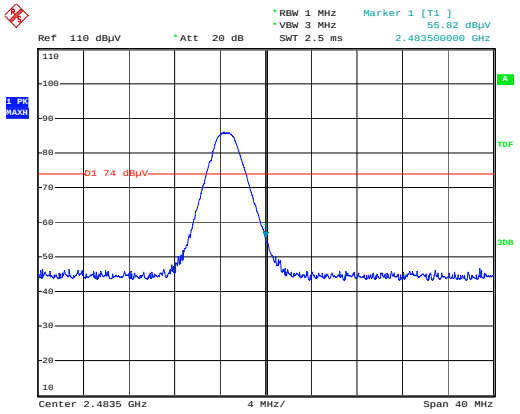
Date: 28.NOV.2016 17:56:38

π /4DQPSK-Right Side-AV-H



Date: 28.NOV.2016 17:55:44

π /4DQPSK-Right Side-Peak-V



Date: 28.NOV.2016 17:56:09

π /4DQPSK-Right Side-Peak-H

6.8 AC Power Line Conducted Emissions

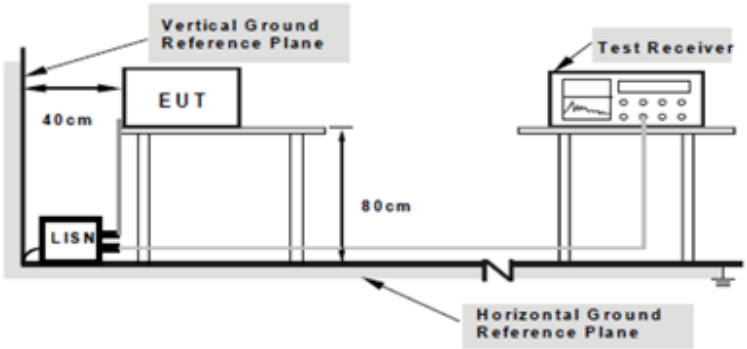
Temperature	25℃
Relative Humidity	55%
Atmospheric Pressure	1013mbar
Test date :	November 29, 2016
Tested By :	Amos Xia

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.207, RSS210 (A8.1)	a)	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.	☒

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Test Setup



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.

Procedure

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).

Remark

Result ☒Pass ☐Fail

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

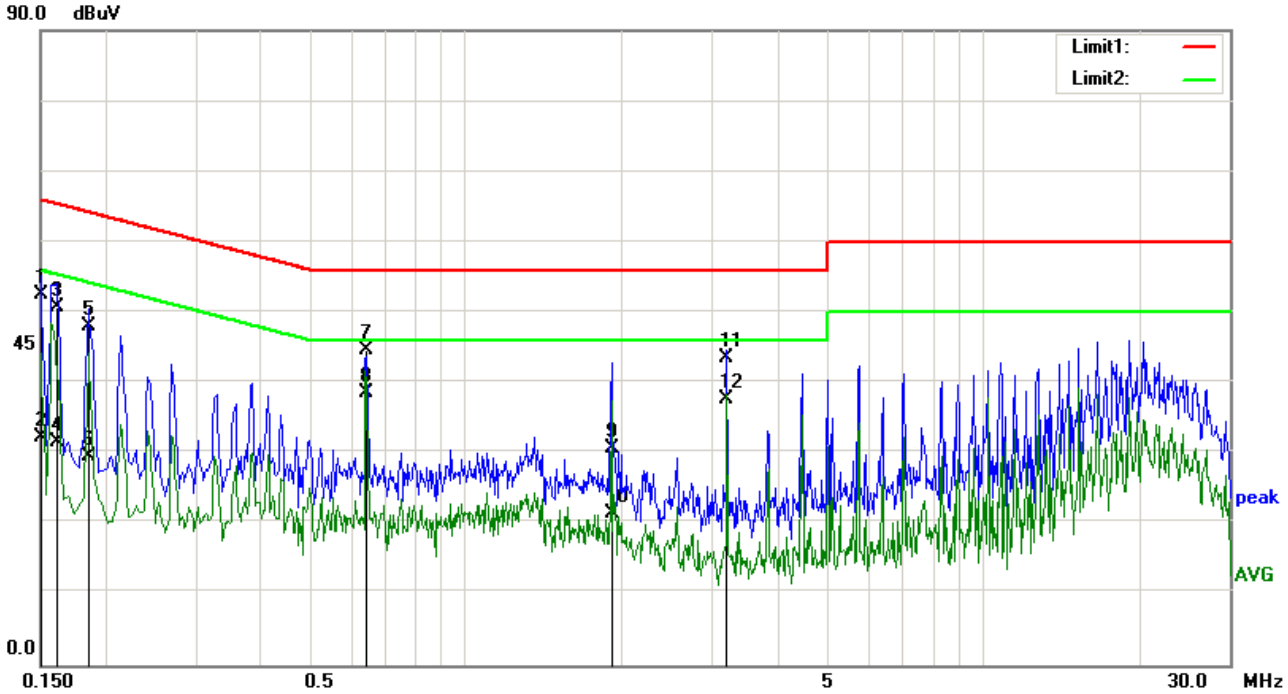
Result (dBμV) = Reading Value + Corrected Value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

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

Test Mode:	Bluetooth Mode

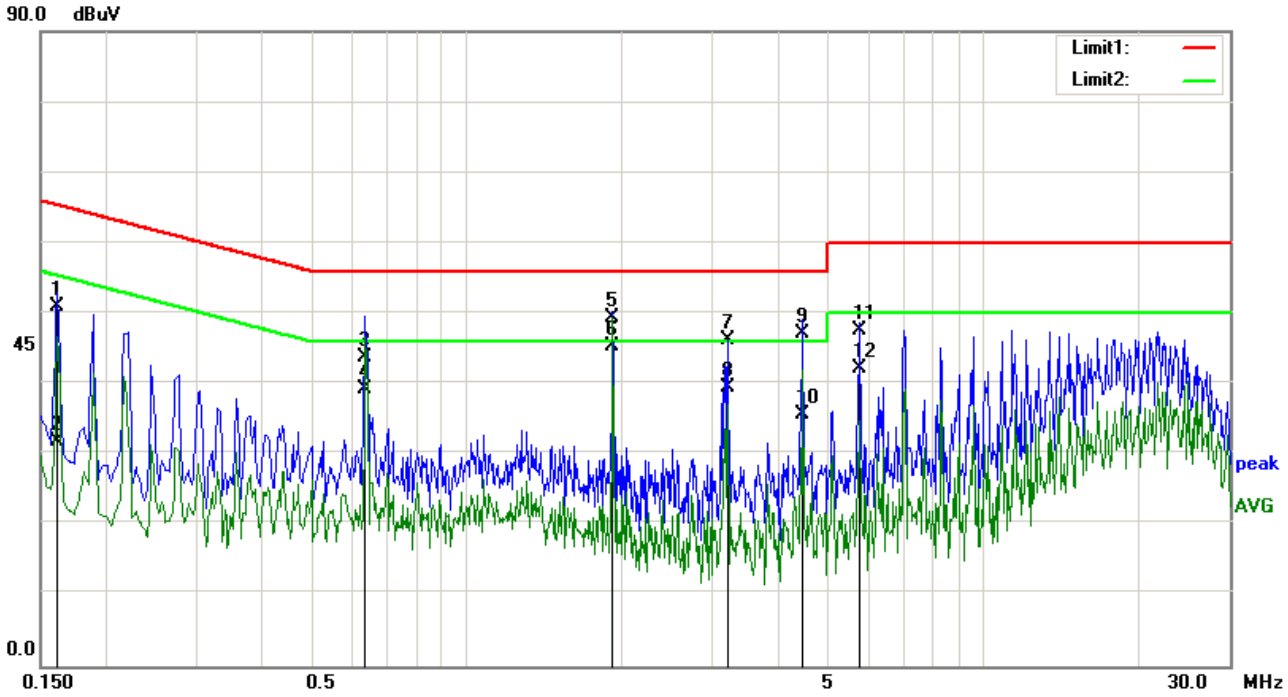


Test Data

Phase Line Plot at AC 120V 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.1500	42.00	QP	0.10	-10.00	0.36	52.46	66.00	-13.54
2	0.1500	21.87	AVG	0.10	-10.00	0.36	32.33	56.00	-23.67
3	0.1620	40.35	QP	0.10	-10.00	0.34	50.79	65.36	-14.57
4	0.1620	21.12	AVG	0.10	-10.00	0.34	31.56	55.36	-23.80
5	0.1860	37.54	QP	0.10	-10.00	0.30	47.94	64.21	-16.27
6	0.1860	19.22	AVG	0.10	-10.00	0.30	29.62	54.21	-24.59
7	0.6420	34.41	QP	0.13	-10.00	0.20	44.74	56.00	-11.26
8	0.6420	28.35	AVG	0.13	-10.00	0.20	38.68	46.00	-7.32
9	1.9140	20.45	QP	0.16	-10.00	0.19	30.80	56.00	-25.20
10	1.9140	11.14	AVG	0.16	-10.00	0.19	21.49	46.00	-24.51
11	3.2020	33.00	QP	0.20	-10.00	0.24	43.44	56.00	-12.56
12	3.2020	27.32	AVG	0.20	-10.00	0.24	37.76	46.00	-8.24

Test Mode:	Bluetooth Mode

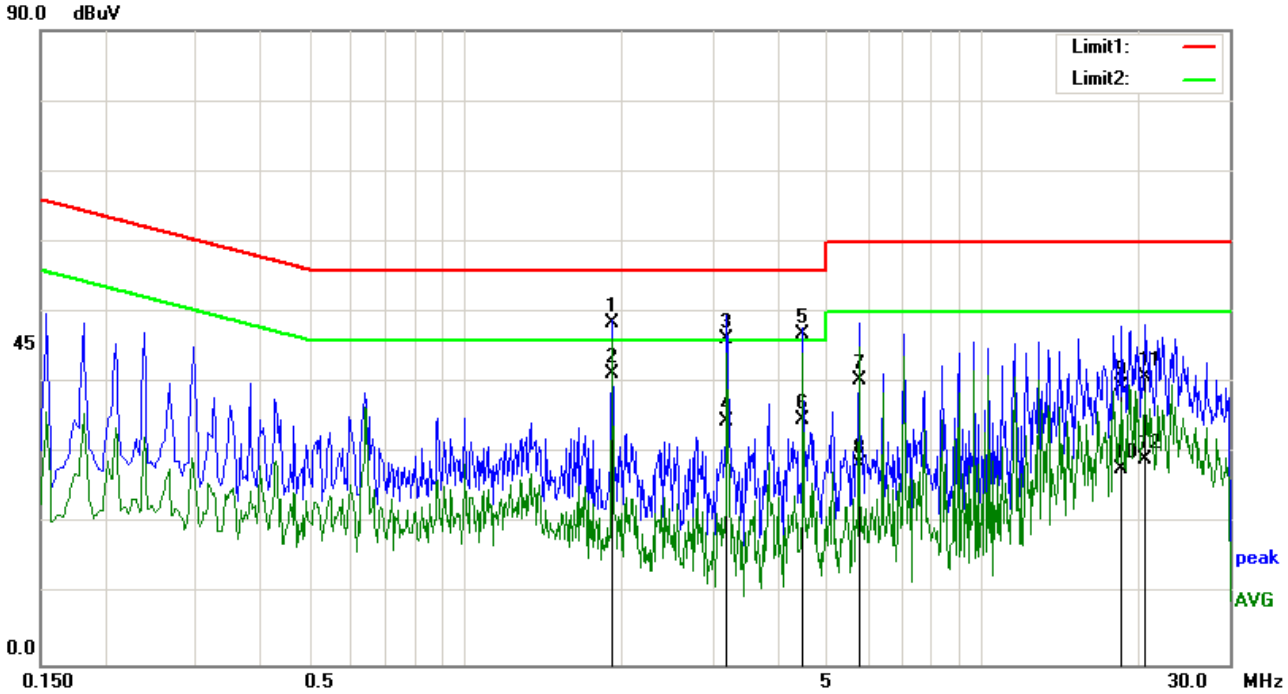


Test Data

Phase Neutral Plot at AC 120V 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.1620	40.47	QP	0.11	-10.00	0.34	50.92	65.36	-14.44
2	0.1620	21.40	AVG	0.11	-10.00	0.34	31.85	55.36	-23.51
3	0.6380	33.39	QP	0.12	-10.00	0.20	43.71	56.00	-12.29
4	0.6380	28.95	AVG	0.12	-10.00	0.20	39.27	46.00	-6.73
5	1.9260	39.04	QP	0.17	-10.00	0.19	49.40	56.00	-6.60
6	1.9260	35.08	AVG	0.17	-10.00	0.19	45.44	46.00	-0.56
7	3.2140	35.71	QP	0.21	-10.00	0.24	46.16	56.00	-9.84
8	3.2140	29.15	AVG	0.21	-10.00	0.24	39.60	46.00	-6.40
9	4.4940	36.57	QP	0.26	-10.00	0.28	47.11	56.00	-8.89
10	4.4940	25.20	AVG	0.26	-10.00	0.28	35.74	46.00	-10.26
11	5.7780	36.93	QP	0.33	-10.00	0.31	47.57	60.00	-12.43
12	5.7780	31.58	AVG	0.33	-10.00	0.31	42.22	50.00	-7.78

Test Mode:	Bluetooth Mode

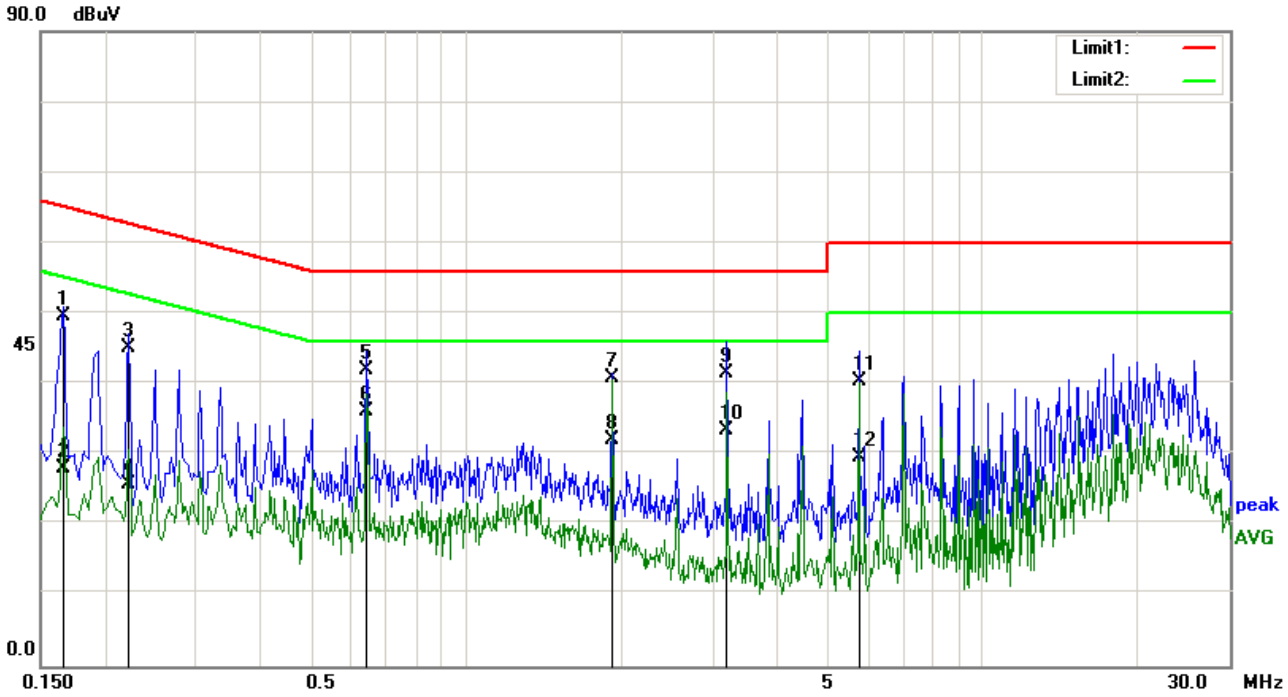


Test Data

Phase Line Plot at AC 240V 50Hz

No.	Frequency (MHz)	Reading (dBμV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	1.9220	38.08	QP	0.16	-10.00	0.19	48.43	56.00	-7.57
2	1.9220	30.91	AVG	0.16	-10.00	0.19	41.26	46.00	-4.74
3	3.2060	35.76	QP	0.20	-10.00	0.24	46.20	56.00	-9.80
4	3.2060	24.04	AVG	0.20	-10.00	0.24	34.48	46.00	-11.52
5	4.4860	36.30	QP	0.25	-10.00	0.28	46.83	56.00	-9.17
6	4.4860	24.15	AVG	0.25	-10.00	0.28	34.68	46.00	-11.32
7	5.7700	29.87	QP	0.32	-10.00	0.31	40.50	60.00	-19.50
8	5.7700	17.85	AVG	0.32	-10.00	0.31	28.48	50.00	-21.52
9	18.5740	28.03	QP	1.02	-10.00	0.53	39.58	60.00	-20.42
10	18.5740	16.14	AVG	1.02	-10.00	0.53	27.69	50.00	-22.31
11	20.4980	29.01	QP	1.10	-10.00	0.65	40.76	60.00	-19.24
12	20.4980	17.35	AVG	1.10	-10.00	0.65	29.10	50.00	-20.90

Test Mode:	Bluetooth Mode



Test Data

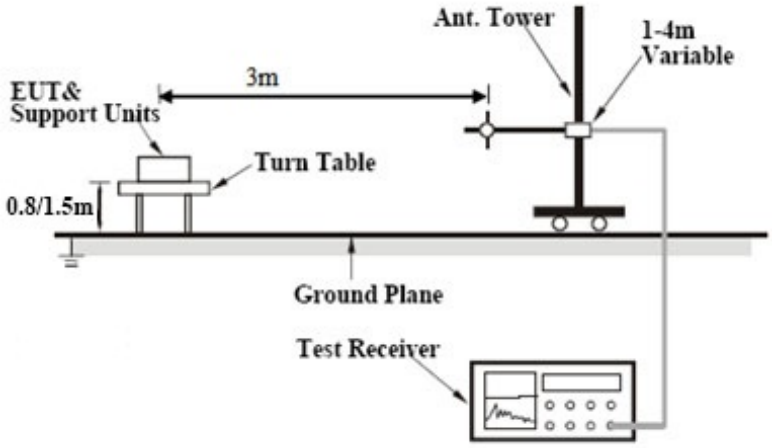
Phase Neutral Plot at AC 240V 50Hz

No.	Frequency (MHz)	Reading (dBμV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	0.1660	39.17	QP	0.11	-10.00	0.33	49.61	65.16	-15.55
2	0.1660	17.67	AVG	0.11	-10.00	0.33	28.11	55.16	-27.05
3	0.2220	34.87	QP	0.10	-10.00	0.24	45.21	62.74	-17.53
4	0.2220	15.51	AVG	0.10	-10.00	0.24	25.85	52.74	-26.89
5	0.6420	31.65	QP	0.12	-10.00	0.20	41.97	56.00	-14.03
6	0.6420	25.85	AVG	0.12	-10.00	0.20	36.17	46.00	-9.83
7	1.9220	30.43	QP	0.17	-10.00	0.19	40.79	56.00	-15.21
8	1.9220	21.80	AVG	0.17	-10.00	0.19	32.16	46.00	-13.84
9	3.1980	31.13	QP	0.21	-10.00	0.24	41.58	56.00	-14.42
10	3.1980	22.92	AVG	0.21	-10.00	0.24	33.37	46.00	-12.63
11	5.7620	29.66	QP	0.33	-10.00	0.31	40.30	60.00	-19.70
12	5.7620	18.95	AVG	0.33	-10.00	0.31	29.59	50.00	-20.41

6.9 Radiated Spurious Emissions & Restricted Band

Temperature	25℃
Relative Humidity	55%
Atmospheric Pressure	1013mbar
Test date :	November 29, 2016
Tested By :	Amos Xia

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.205, §15.209, §15.247(d)</td><td>a)</td><td>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
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (μV/m)</th></tr>
<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>
</table></td><td>☒</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 
</td></tr>
<tr><td>Procedure</td><td colspan="3">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 is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.
5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</td></tr>
<tr><td>Remark</td><td colspan="3"></td></tr>
</table>

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

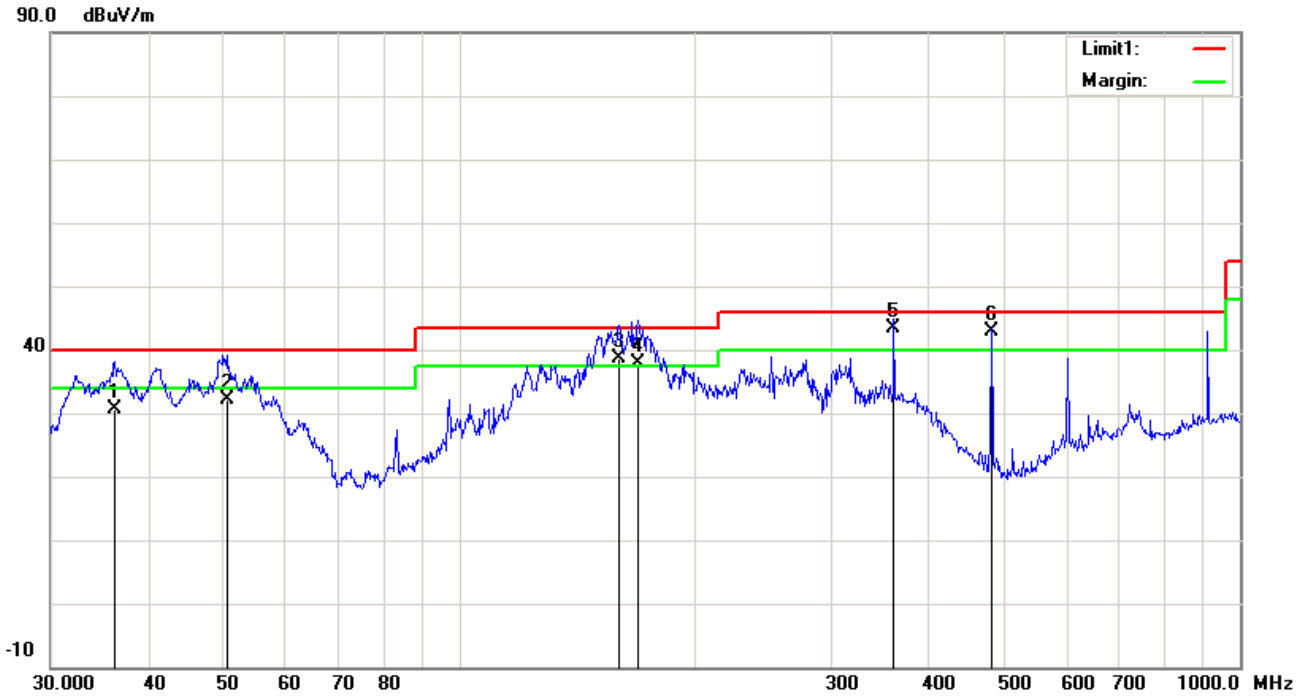
Height (cm) = Height of Receiver antenna

Degree = Turn table degree

Calculation Formula:
Margin (dB) = Result (dBμV/m) – limit (dBμV/m)

Test Mode:	Bluetooth Mode

Below 1GHz



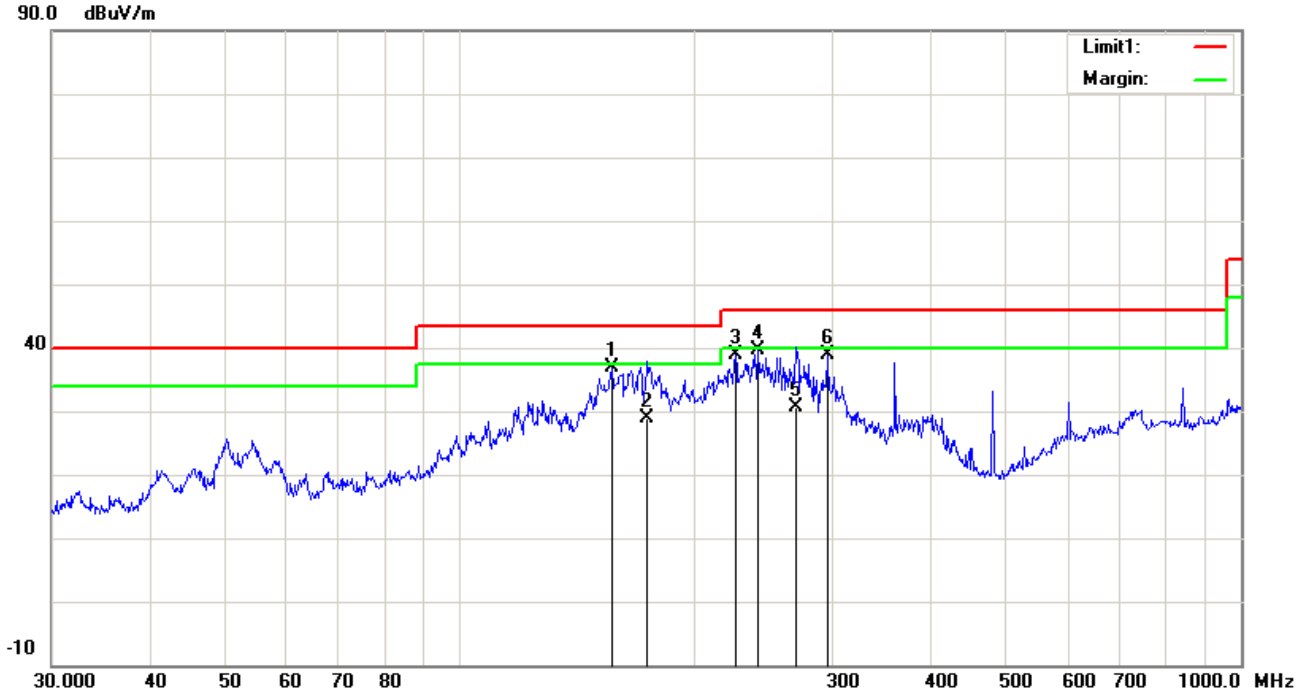
Test Data

Vertical Polarity Plot @3m

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	36.2541	57.43	QP	17.96	45.65	0.98	30.72	40.00	-9.28	100	347
2	50.4089	68.47	QP	9.00	46.47	1.25	32.25	40.00	-7.75	100	177
3	160.3457	70.49	QP	13.37	47.25	2.07	38.68	43.50	-4.82	100	303
4	169.5990	67.88	QP	14.36	46.52	2.09	37.81	43.50	-5.69	100	295
5	360.4477	72.95	QP	16.19	48.75	3.05	43.44	46.00	-2.56	200	269
6	480.5276	72.91	QP	15.65	49.25	3.49	42.80	46.00	-3.20	100	228

Test Mode:	Bluetooth Mode

Below 1GHz

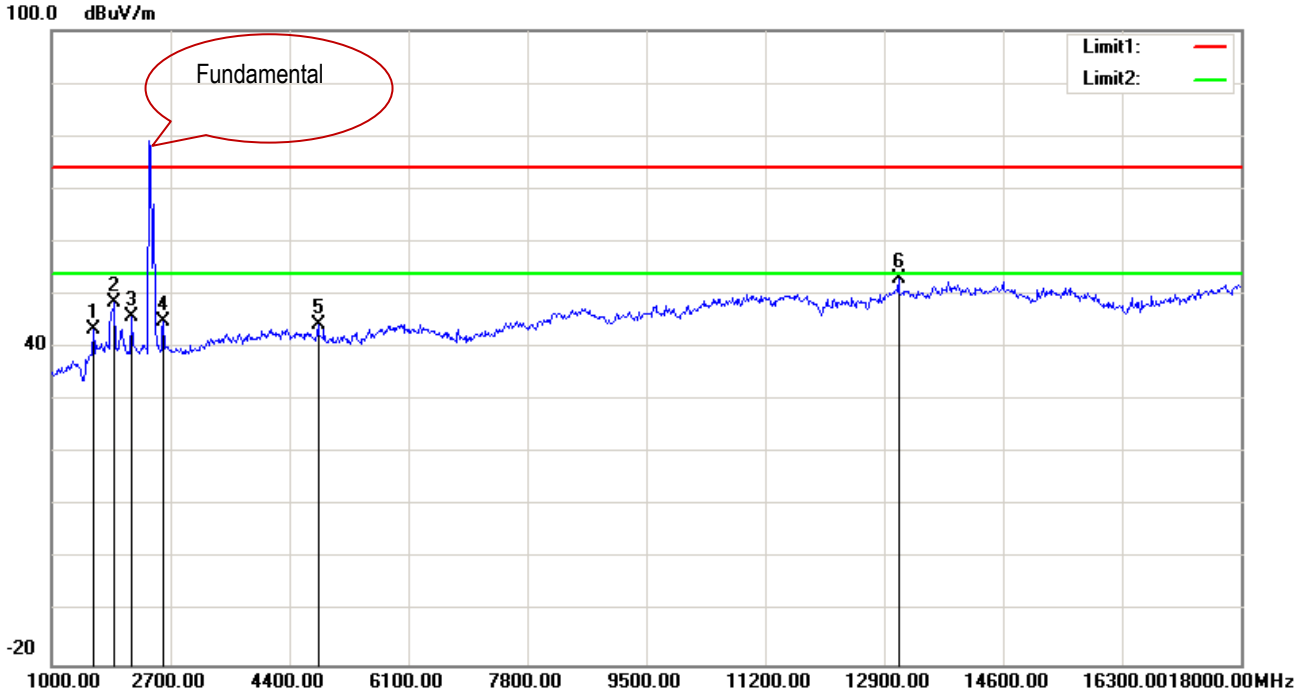


Test Data

Horizontal Polarity Plot @3m

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	156.4578	69.75	peak	12.68	47.53	2.08	36.98	43.50	-6.52	200	262
2	173.8135	60.99	QP	12.28	46.42	2.12	28.97	43.50	-14.53	199	262
3	225.3080	69.89	peak	14.28	47.69	2.39	38.87	46.00	-7.13	200	243
4	240.8304	69.76	peak	14.82	47.36	2.46	39.68	46.00	-6.32	200	290
5	269.4284	60.44	QP	15.83	48.29	2.62	30.60	46.00	-15.40	100	0
6	295.1469	67.79	peak	16.73	48.32	2.74	38.94	46.00	-7.06	200	285

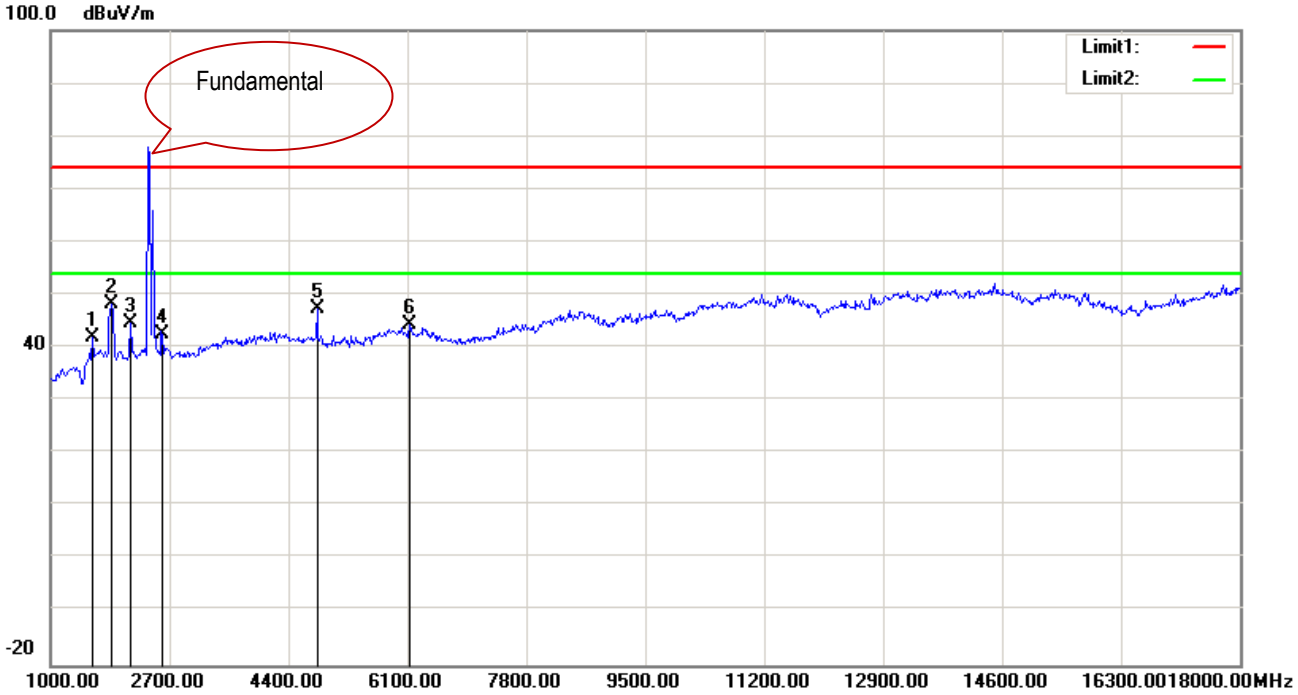
Test Mode:	Bluetooth Mode- Above 1GHz (GFSK Mode Worst Case)



Vertical Polarity @3m-2402MHz

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	1595.000	64.58	peak	25.40	50.31	3.91	43.58	74.00	-30.42	161	360
2	1901.000	69.68	peak	26.68	51.77	3.98	48.57	74.00	-25.43	200	267
3	2139.000	66.48	peak	27.71	52.35	4.13	45.97	74.00	-28.03	200	200
4	2598.000	64.31	peak	29.26	52.67	4.13	45.03	74.00	-28.97	100	14
5	4808.000	58.62	peak	33.12	53.35	6.10	44.49	74.00	-29.51	100	195
6	13104.000	56.16	peak	39.02	51.84	9.60	52.94	74.00	-21.06	200	55

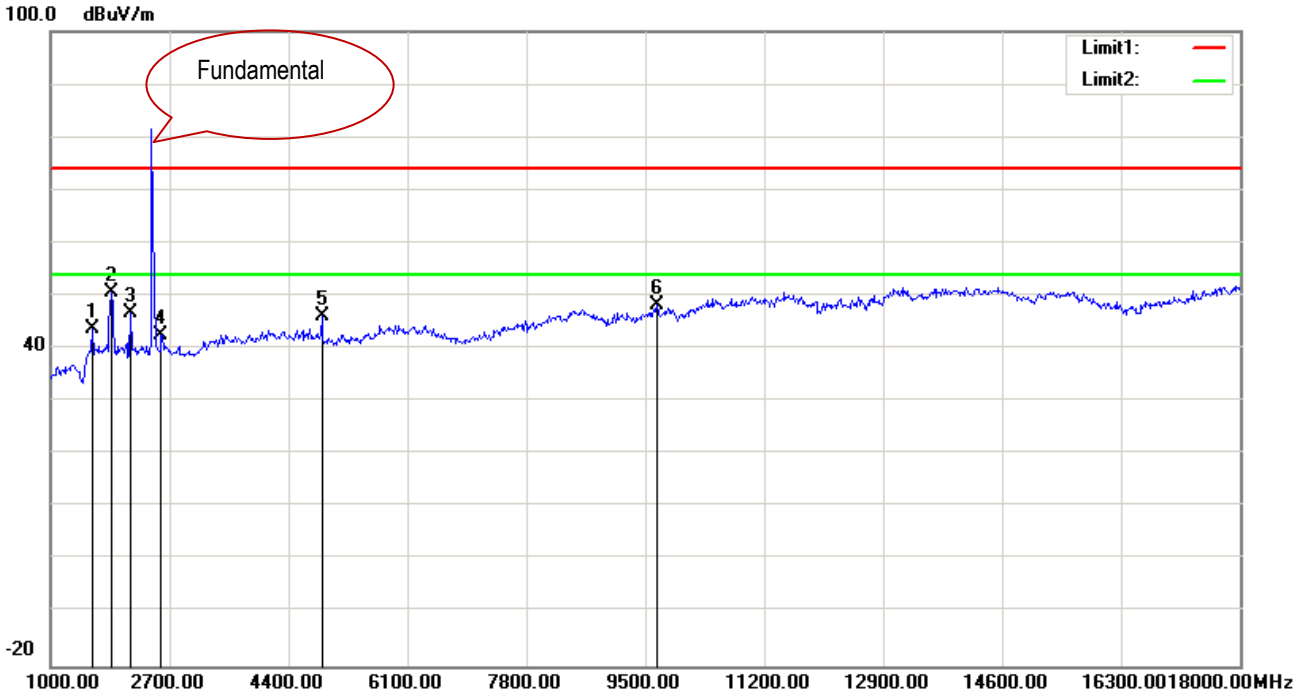
Note: *The data above 18 GHz which below 20 dB to the limit was not recorded.*



Horizontal Polarity Plot @3m-2402MHz

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	1780.000	46.33	peak	26.18	35.05	4.01	41.47	74.00	-32.53	100	153
2	2145.000	43.86	peak	27.74	35.07	4.14	40.67	74.00	-33.33	100	71
3	2340.000	42.70	peak	28.60	35.10	4.07	40.27	74.00	-33.73	100	1
4	4040.000	39.72	peak	32.29	34.66	5.98	43.33	74.00	-30.67	200	1
5	4650.000	40.38	peak	32.65	34.95	6.15	44.23	74.00	-29.77	100	273
6	5830.000	41.11	peak	34.06	36.56	6.04	44.65	74.00	-29.35	100	306

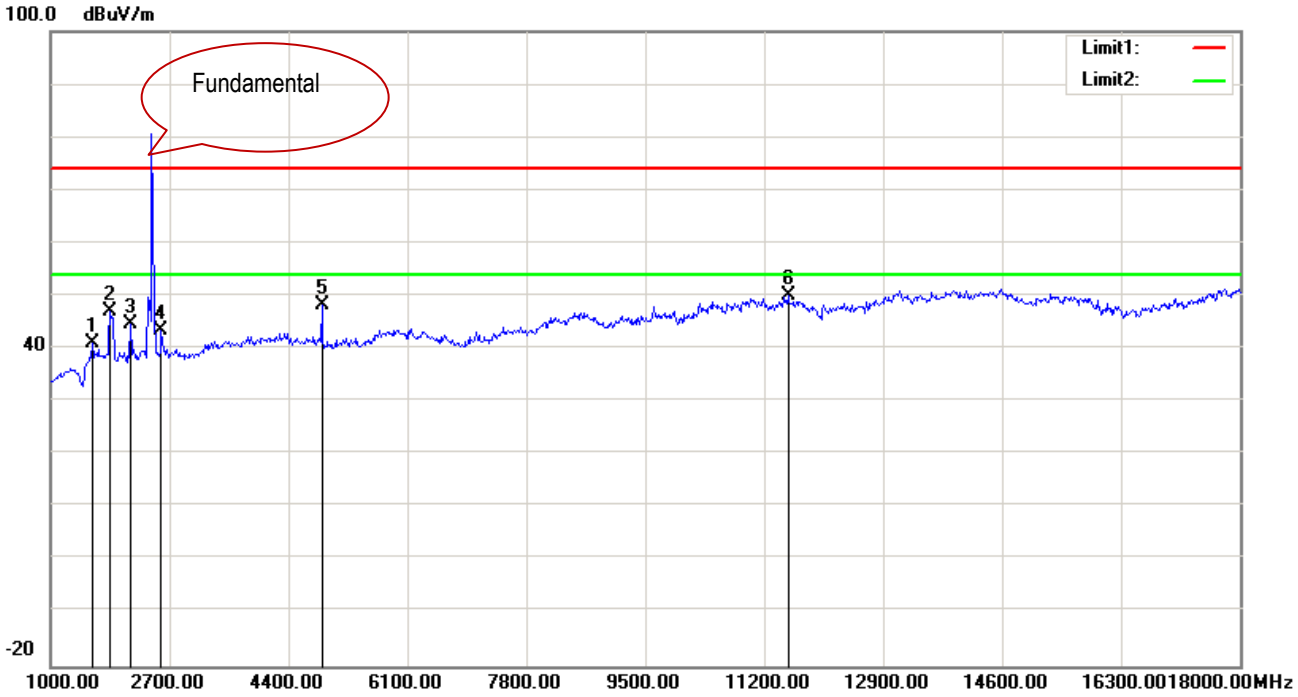
Note: *The data above 18 GHz which below 20 dB to the limit was not recorded.*



Vertical Polarity @3m-2441MHz

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	1595.000	64.67	peak	25.40	50.31	3.91	43.67	74.00	-30.33	100	258
2	1867.000	71.63	peak	26.54	51.61	3.99	50.55	74.00	-23.45	200	181
3	2139.000	67.24	peak	27.71	52.35	4.13	46.73	74.00	-27.27	100	142
4	2581.000	61.85	peak	29.27	52.67	4.12	42.57	74.00	-31.43	100	333
5	4876.000	60.58	peak	33.33	53.66	6.00	46.25	74.00	-27.75	200	262
6	9670.000	55.70	peak	37.40	53.86	8.99	48.23	74.00	-25.77	200	40

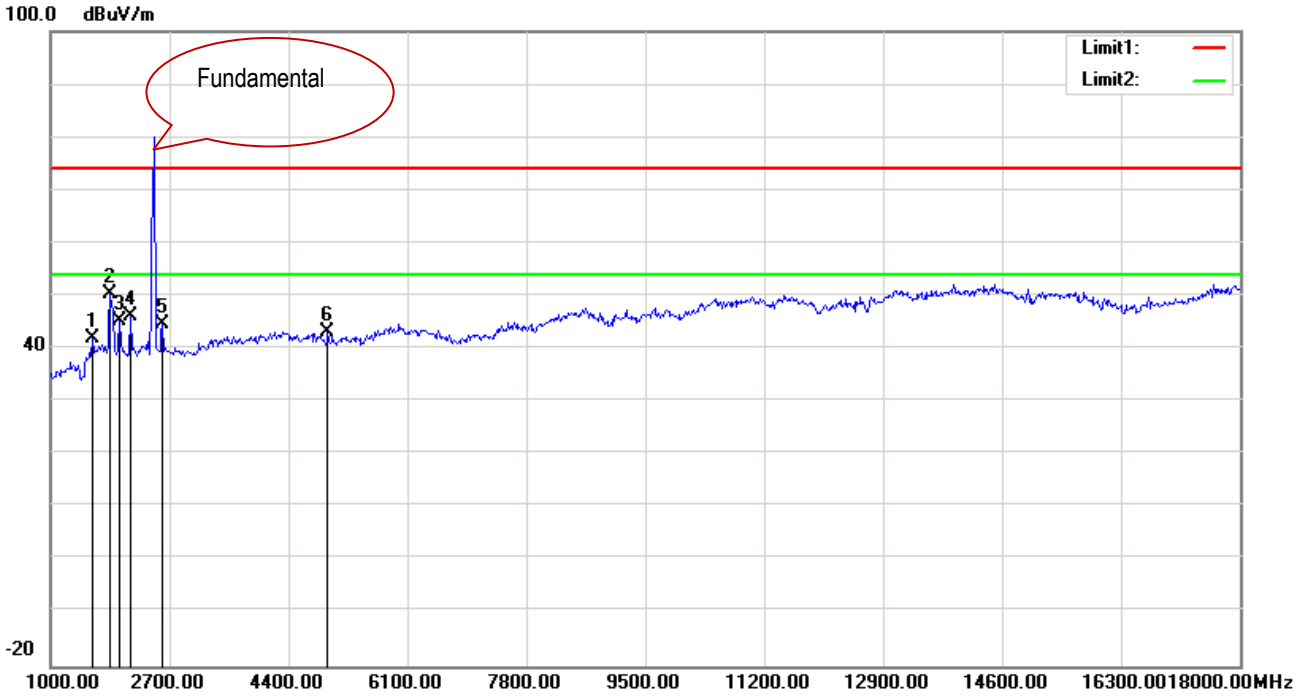
Note: *The data above 18 GHz which below 20 dB to the limit was not recorded.*



Horizontal Polarity Plot @3m-2441MHz

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	1595.000	62.08	peak	25.40	50.31	3.91	41.08	74.00	-32.92	100	238
2	1850.000	68.11	peak	26.47	51.53	4.00	47.05	74.00	-26.95	100	154
3	2139.000	65.19	peak	27.71	52.35	4.13	44.68	74.00	-29.32	200	215
4	2581.000	62.60	peak	29.27	52.67	4.12	43.32	74.00	-30.68	200	22
5	4876.000	62.56	peak	33.33	53.66	6.00	48.23	74.00	-25.77	100	249
6	11540.000	54.71	peak	38.40	53.21	10.08	49.98	74.00	-24.02	100	81

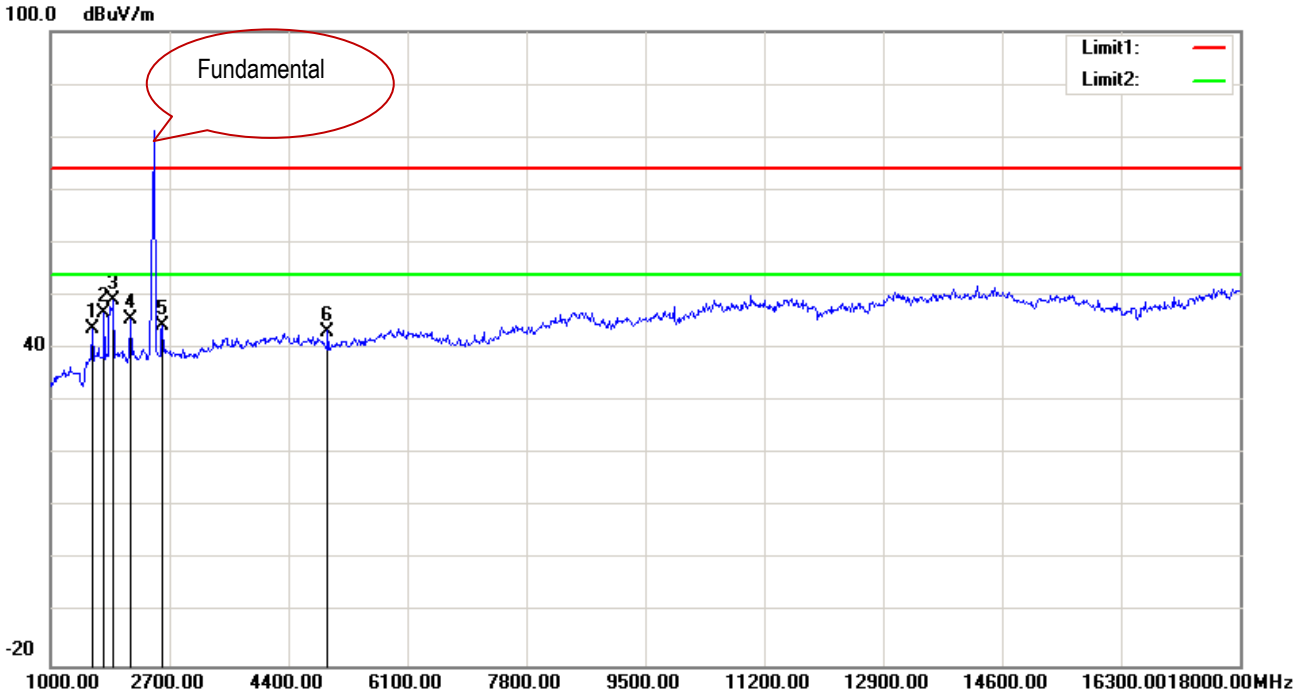
Note: *The data above 18 GHz which below 20 dB to the limit was not recorded.*



Vertical Polarity @3m-2480MHz

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	1595.000	63.09	peak	25.40	50.31	3.91	42.09	74.00	-31.91	101	360
2	1850.000	71.28	peak	26.47	51.53	4.00	50.22	74.00	-23.78	99	208
3	1986.000	66.43	peak	27.04	52.17	3.95	45.25	74.00	-28.75	99	311
4	2139.000	66.71	peak	27.71	52.35	4.13	46.20	74.00	-27.80	99	25
5	2598.000	63.93	peak	29.26	52.67	4.13	44.65	74.00	-29.35	101	360
6	4961.000	57.87	peak	33.58	54.04	5.88	43.29	74.00	-30.71	200	262

Note: *The data above 18 GHz which below 20 dB to the limit was not recorded.*



Horizontal Polarity Plot @3m-2480MHz

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	1595.000	64.89	peak	25.40	50.31	3.91	43.89	74.00	-30.11	100	238
2	1765.000	67.78	peak	26.11	51.12	4.01	46.78	74.00	-27.22	100	163
3	1901.000	70.34	peak	26.68	51.77	3.98	49.23	74.00	-24.77	100	360
4	2139.000	66.20	peak	27.71	52.35	4.13	45.69	74.00	-28.31	100	73
5	2598.000	63.61	peak	29.26	52.67	4.13	44.33	74.00	-29.67	200	207
6	4961.000	57.88	peak	33.58	54.04	5.88	43.30	74.00	-30.70	100	249

Note: *X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.*

Note: *The data above 18 GHz which below 20 dB to the limit was not recorded.*

Annex A. TEST INSTRUMENT

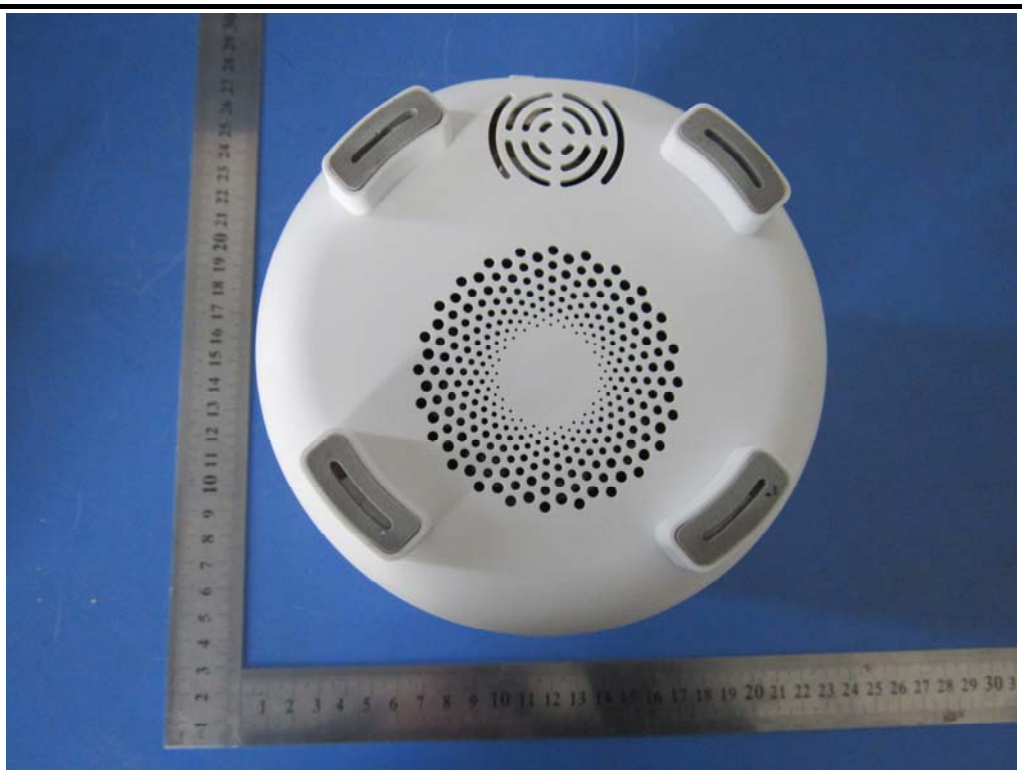
Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions					
R&S EMI Test Receiver	ESPI3	101216	03/31/2016	03/31/2017	☒
V-LISN	ESH3-Z5	838979/005	03/31/2016	03/31/2017	☒
SIEMIC EZ_EMC Conducted Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	☒
RF conducted test					
R&S EMI Receiver	ESPI3	101216	03/31/2016	03/31/2017	☒
Radiated Emissions					
Agilent Technologies Spectrum Analyzer	N9010A	MY47191130	03/11/2016	03/10/2017	☒
R&S EMI Receiver	ESPI3	101216	03/31/2016	03/31/2017	☒
Antenna (30MHz~6GHz)	JB6	A121411	10/20/2016	10/20/2017	☒
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	10/09/2016	10/08/2017	☒
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/20/2016	10/20/2017	☒
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/20/2016	10/20/2017	☒
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 Photo

All Packages- Front View

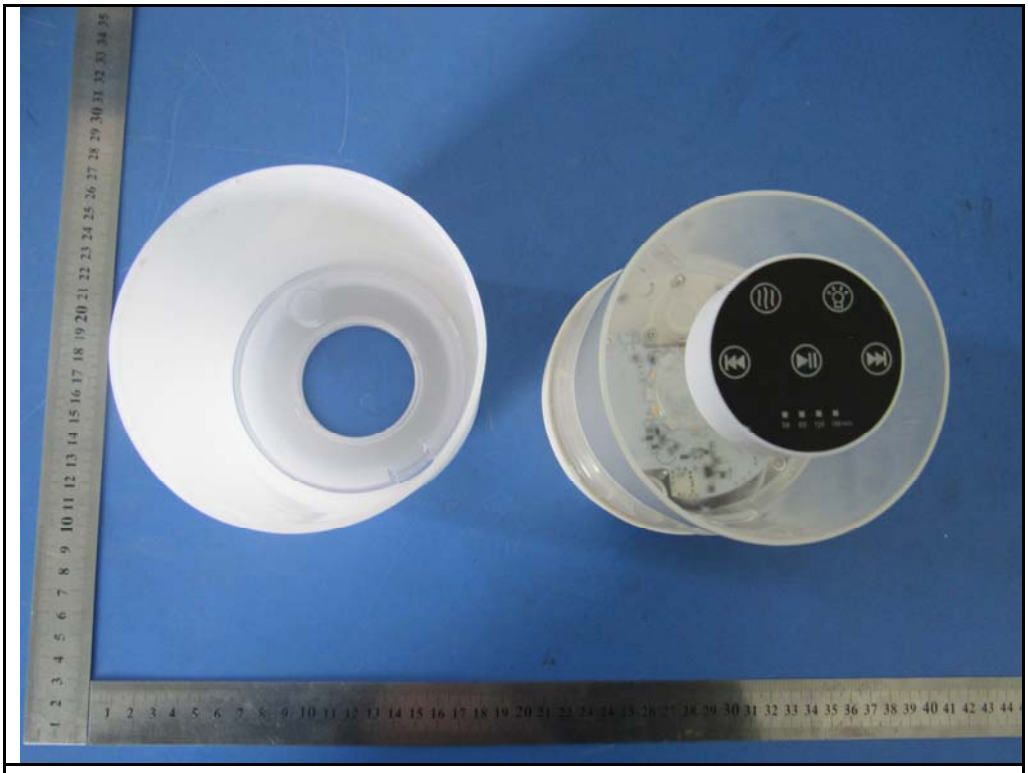
EUT- Top View



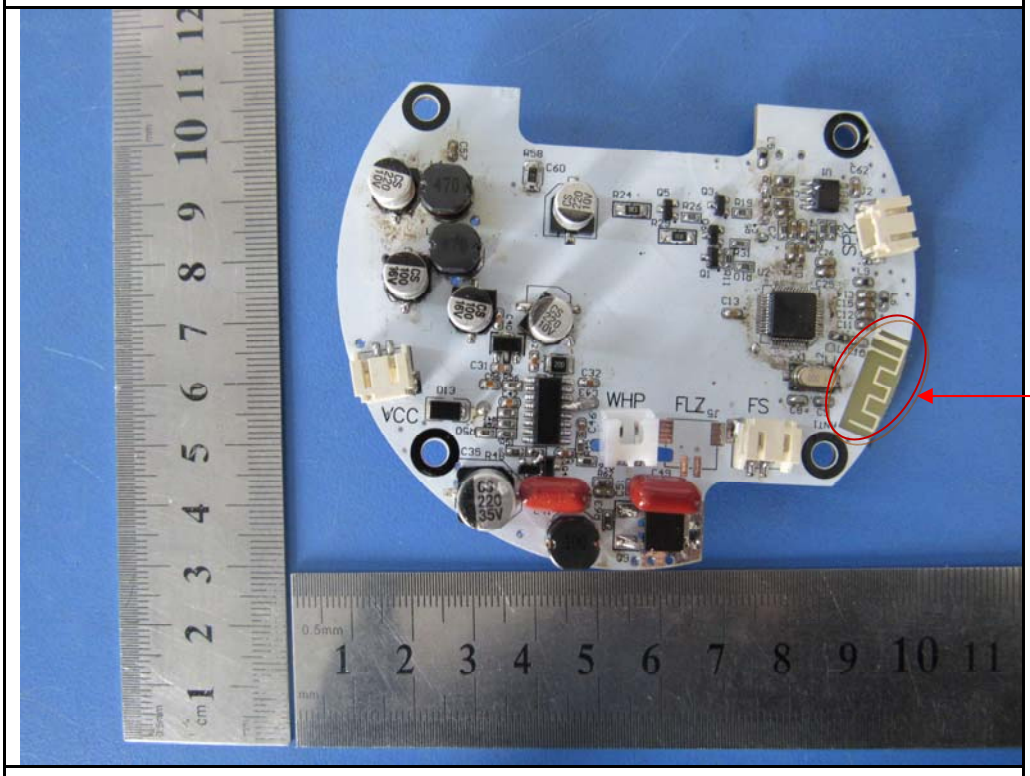
EUT- Bottom View

EUT- Side View

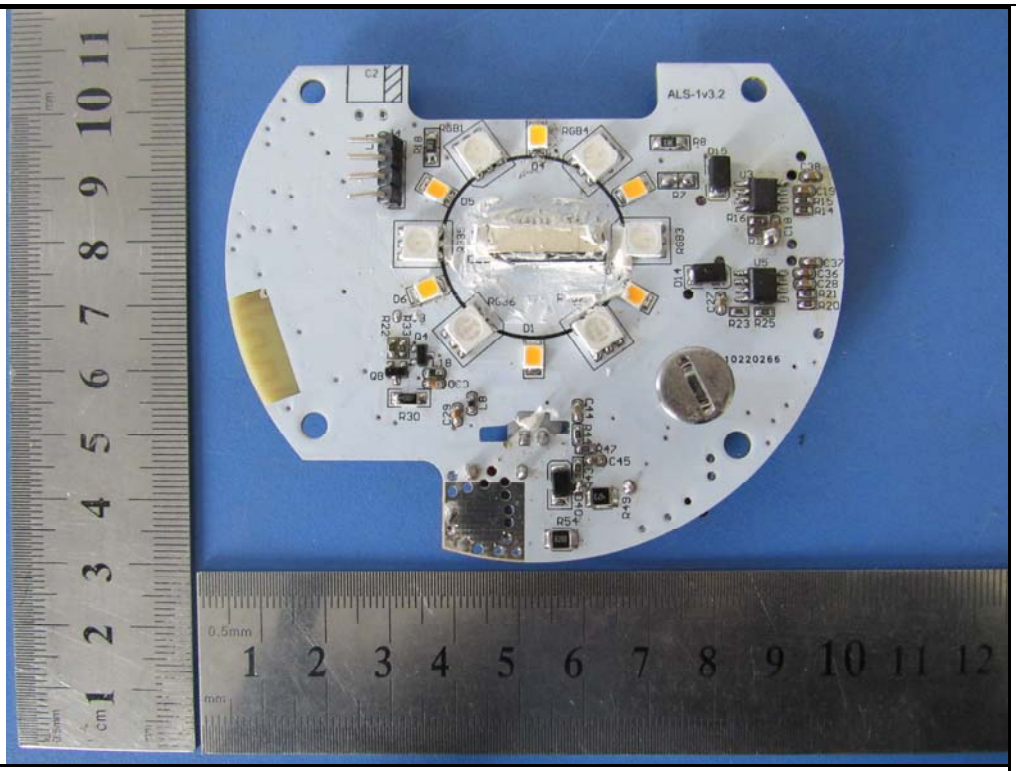
Annex B.ii. Photograph: EUT Internal Photo



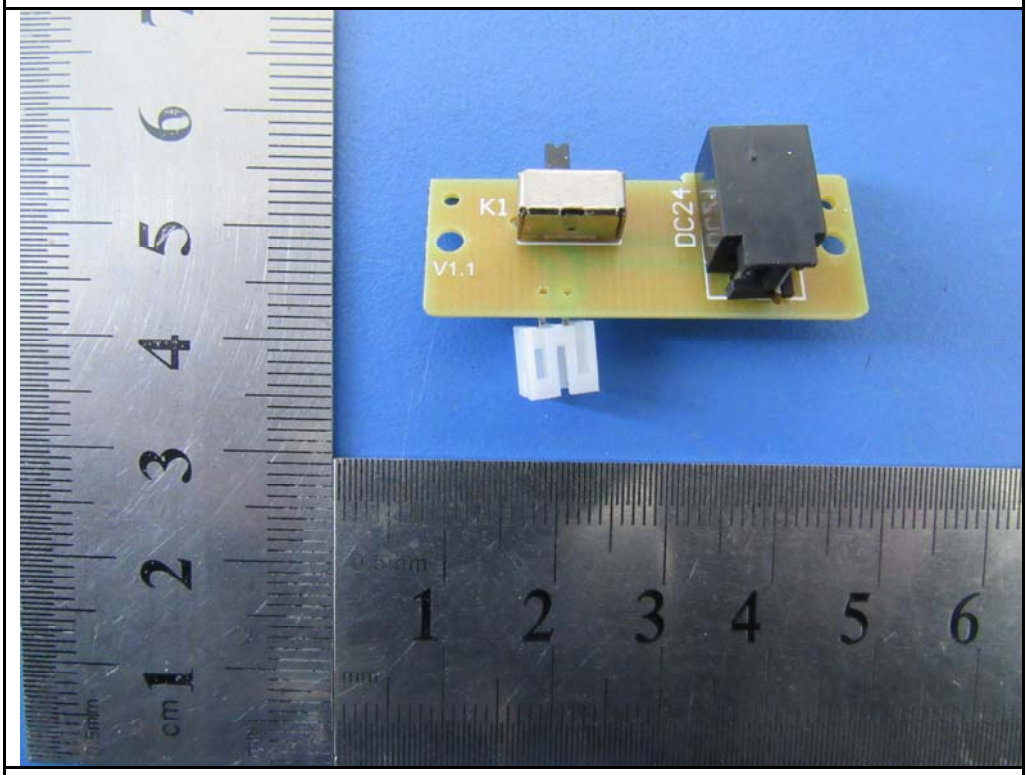
EUT Uncover - Front View



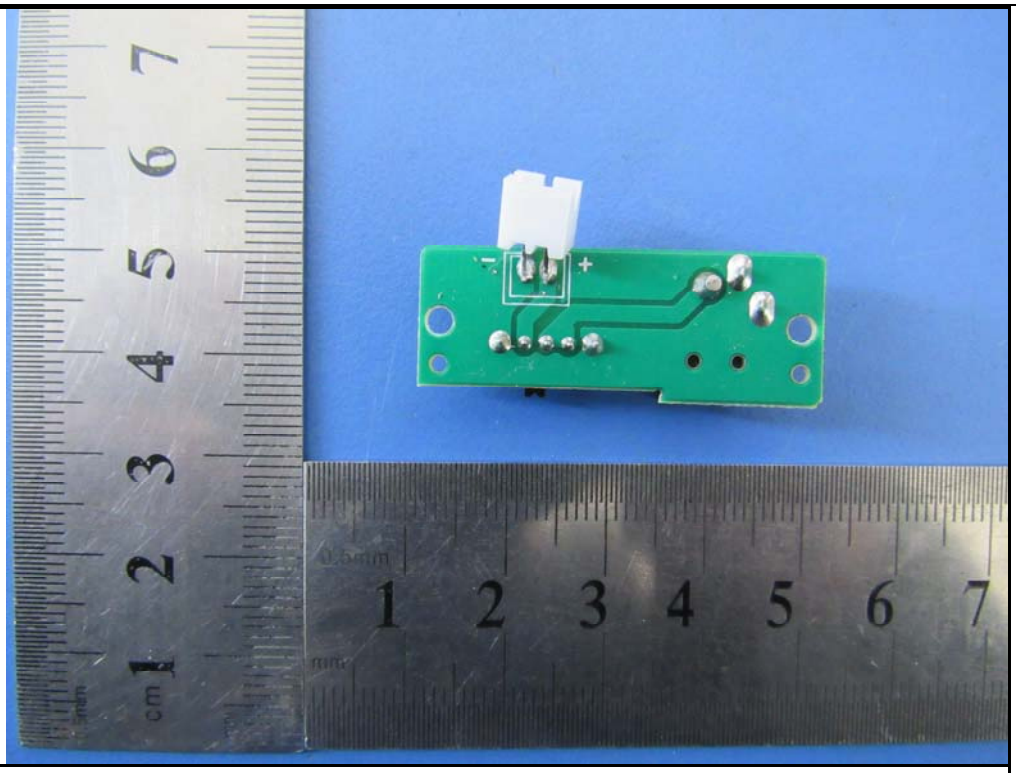
PCBA 1 – Front View



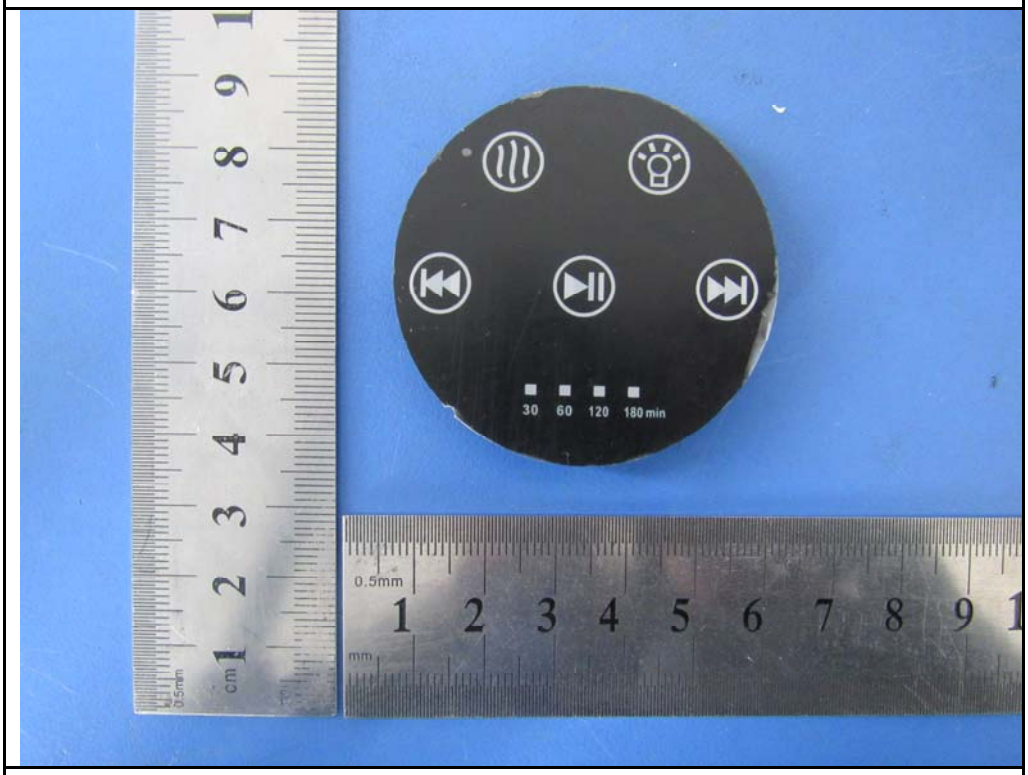
PCBA 1 – Rear View



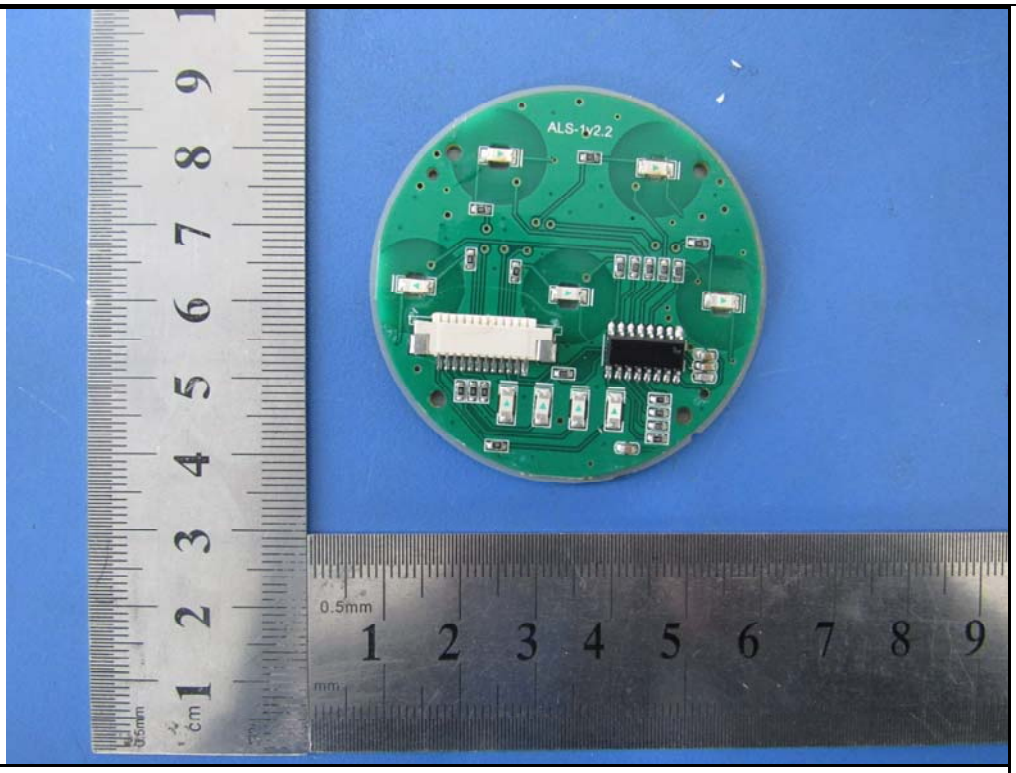
PCBA 2 – Front View



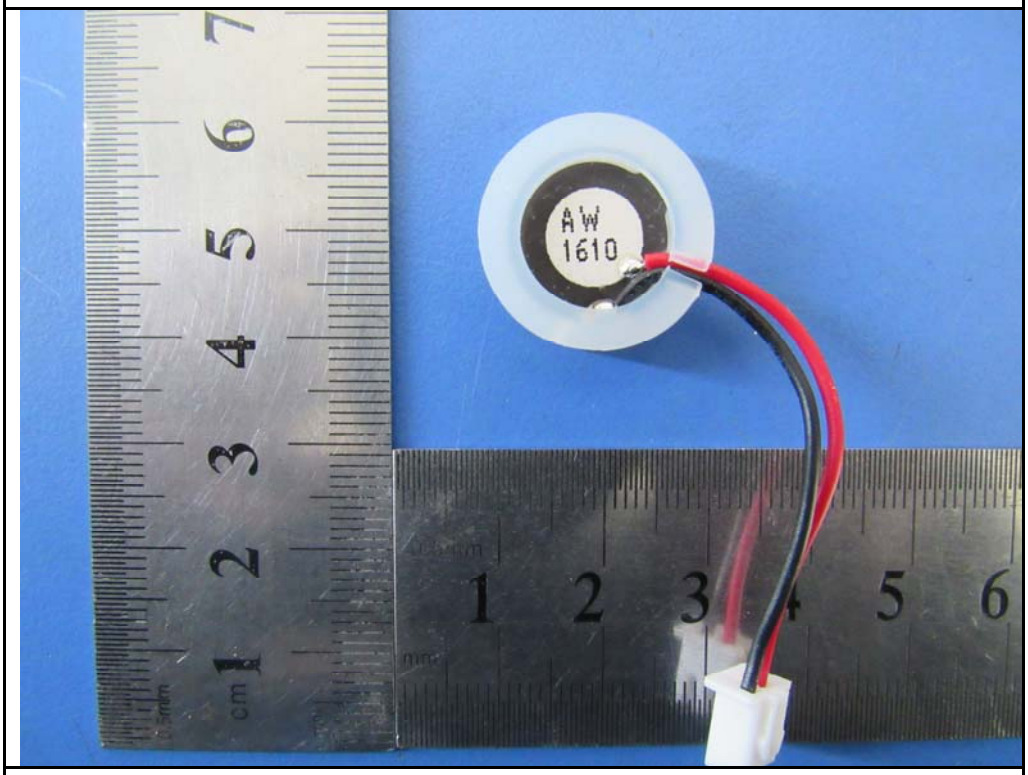
PCBA 2 – Rear View



EUT Control Panel Front View



EUT Control Panel Rear View

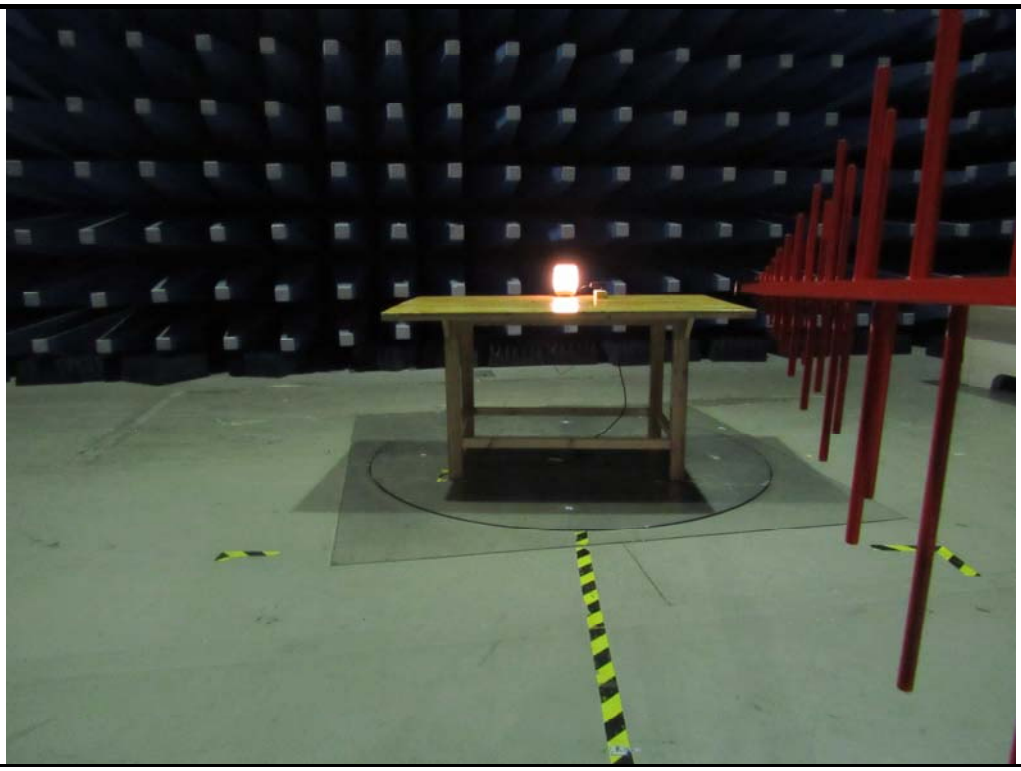


EUT Atomized tablet Front View

Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Test Setup Front View

Conducted Emissions Test Setup Side View



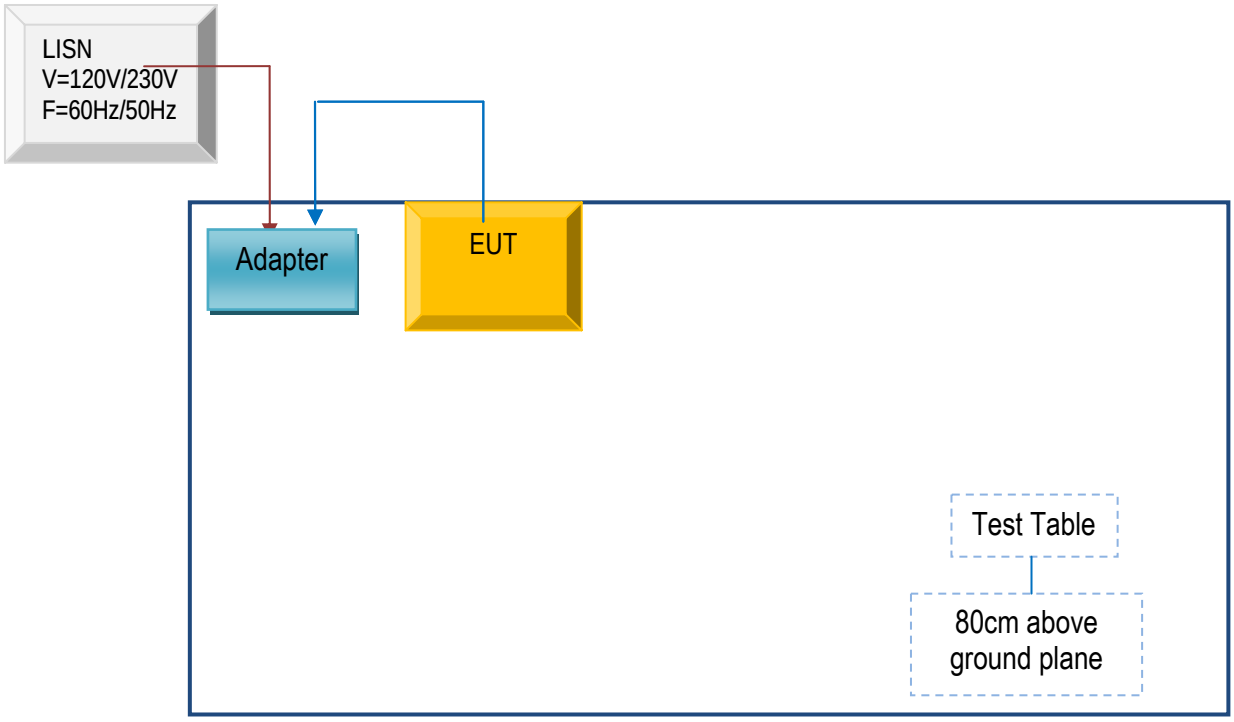
Radiated Spurious Emissions Test Setup Below 1GHz

Radiated Spurious Emissions Test Setup Above 1GHz

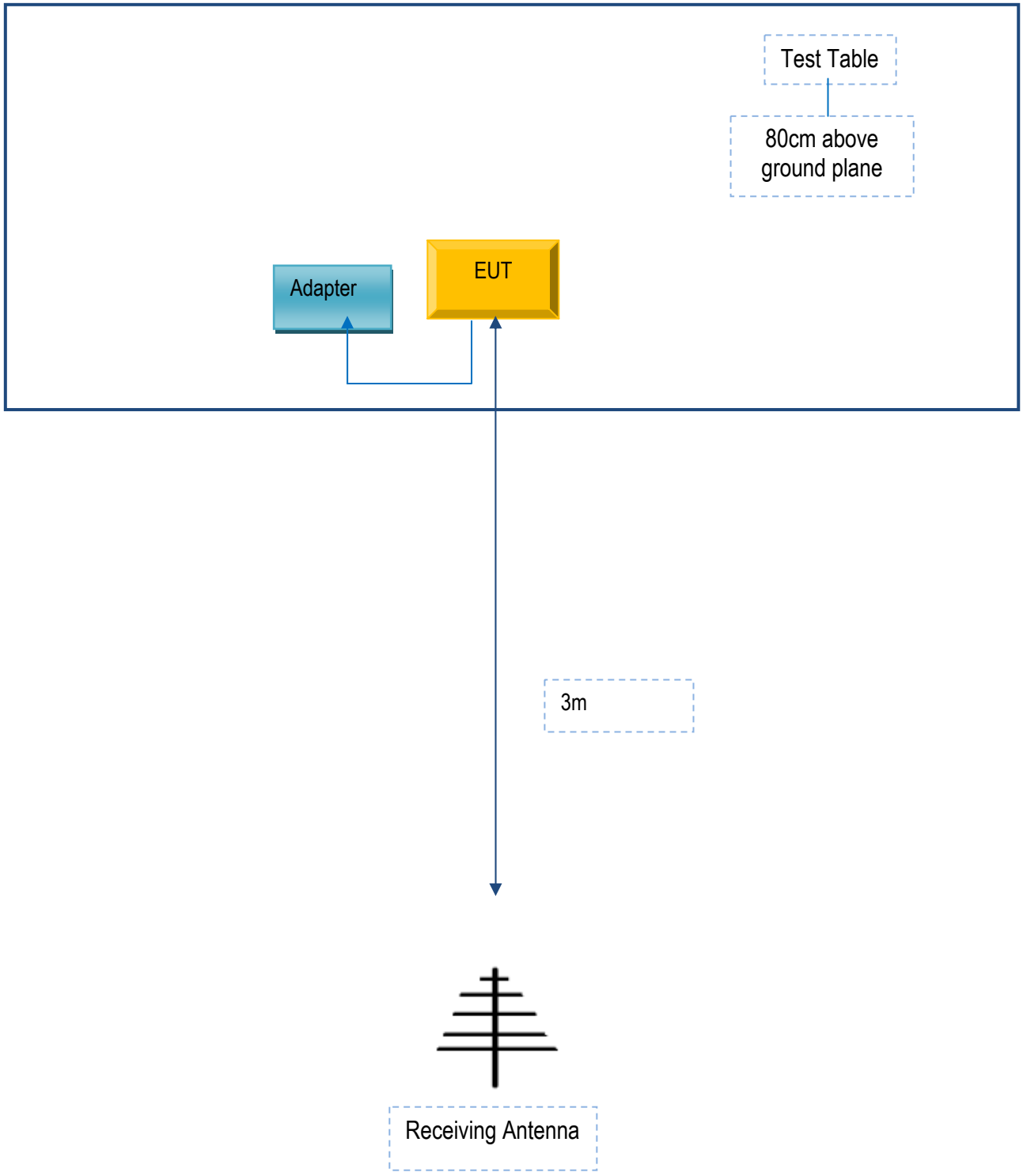
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

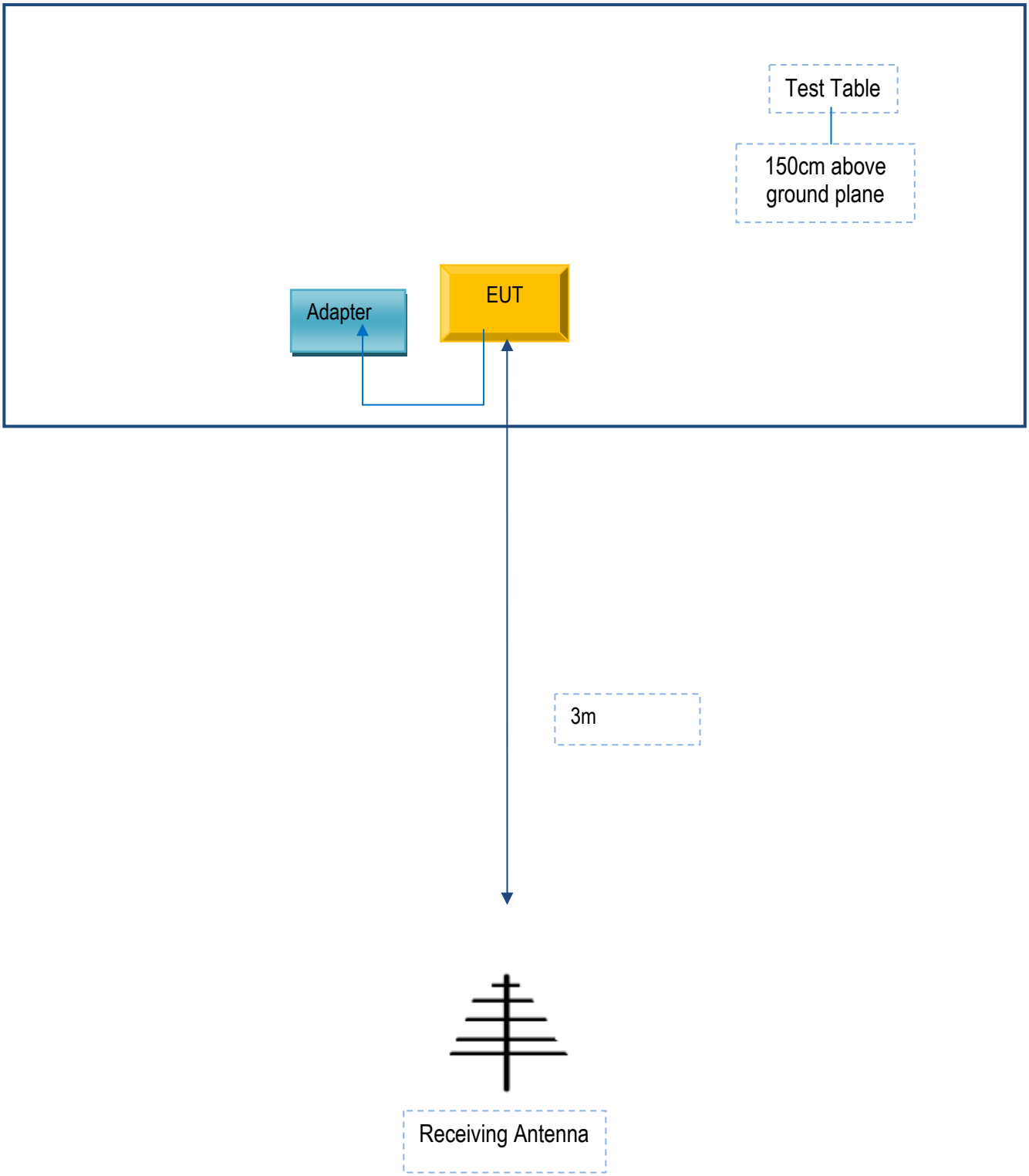
Block Configuration Diagram for AC Line Conducted Emissions



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
N/A	N/A	N/A	N/A

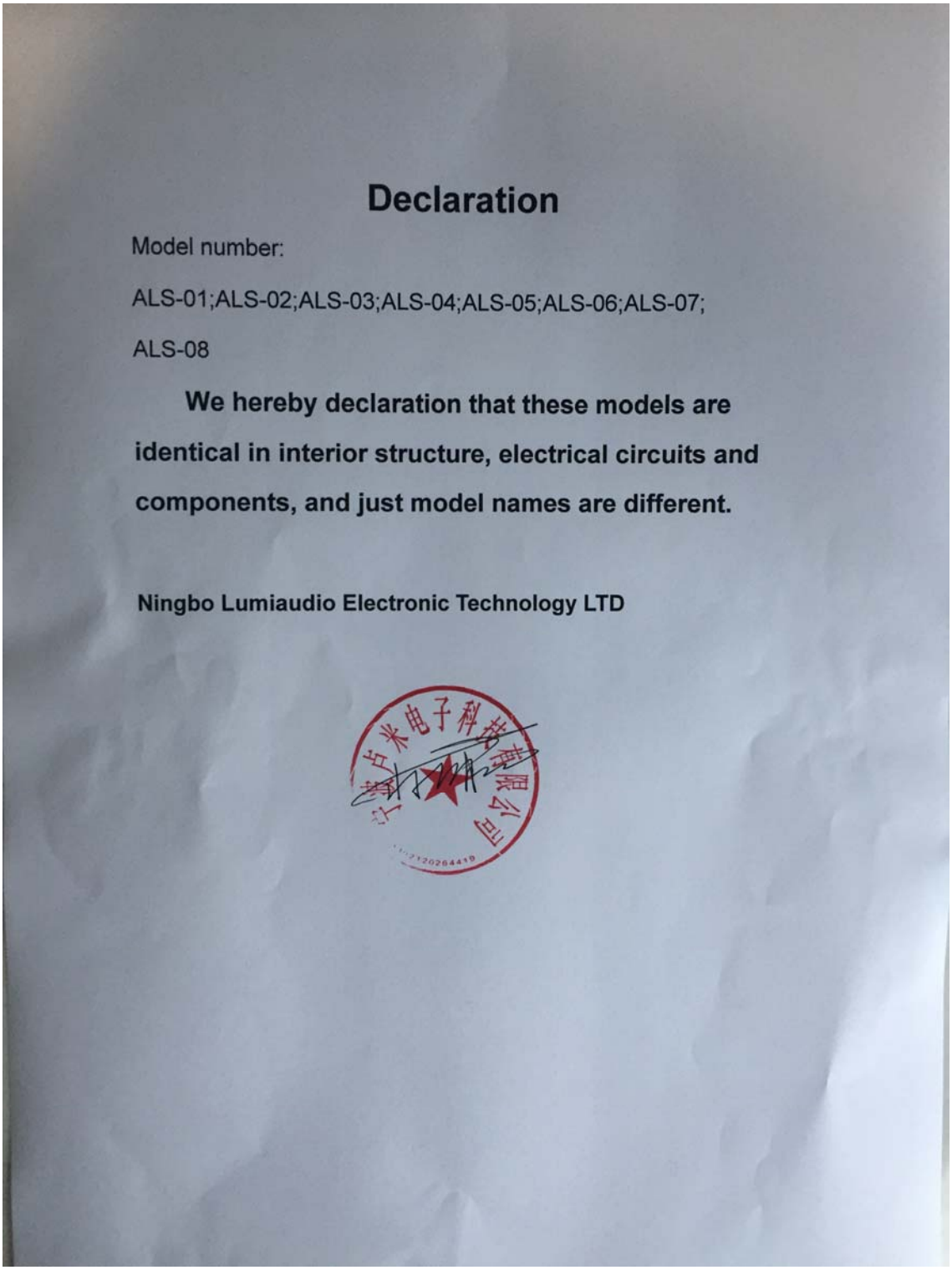
Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
Power Cable	Un-shielding	No	1.8m	42T441636200034

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY



Declaration

Model number:

ALS-01;ALS-02;ALS-03;ALS-04;ALS-05;ALS-06;ALS-07;

ALS-08

We hereby declaration that these models are identical in interior structure, electrical circuits and components, and just model names are different.

Ningbo Lumiaudio Electronic Technology LTD