RF TEST REPORT

SIEMIC
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Report No.: 15020148-FCC-R1
Supersede Report No.: N/A

Applicant	Jiangsu SWR Science & Technology Co.,Ltd
Product Name	SenseDisc Data Logger
Main Model	SD00
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2013
Test Date	April 11 to April 15, 2015
Issue Date	April 15, 2015
Test Result	☑ **Pass** ☐ **Fail**
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Deon Dai	Herve Idoko	
Deon Dai **Test Engineer**	**Herve Idoko** **Checked By**	

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

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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
15020148-FCC-R1	NONE	Original	April 15, 2015

2. Customer information

Applicant Name	Jiangsu SWR Science & Technology Co.,Ltd
Applicant Add	NO.14 Junnong Road,Qinhuai District ,Nanjing,Jiangsu Province,China
Manufacturer	Jiangsu SWR Science & Technology Co.,Ltd
Manufacturer Add	NO.14 Junnong Road,Qinhuai District ,Nanjing,Jiangsu Province,China

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	Labview of SIEMIC version 1.0

4. Equipment under Test (EUT) Information

Description of EUT:	SenseDisc Data Logger
Main Model:	SD00
Serial Model:	SD0010, SD0020, SD0030, SD0040, SD0050
Date EUT received:	March 20, 2015
Test Date(s):	April 11 to April 15, 2015
Output Max power	0.994 dBm (1.26mW)
Antenna Gain:	Bluetooth&BLE: 2 dBi
Type of Modulation:	Bluetooth: GFSK&π/4-DQPSK&8DPSK BLE: GFSK
RF Operating Frequency (ies):	Bluetooth&BLE: 2402-2480 MHz(TX/RX)
Number of Channels:	Bluetooth: 79CH BLE: 40CH
Port:	USB Port, Sensor Port
Input Power:	Adapter: Model: XHY050100UCB Input: AC 100-240V 50/60Hz 0.3A MAX Output: DC 5V 1.0A Battery: 3.7V 1800mAh
Trade Name :	SenseDisc
FCC ID:	2AEEJ-SD

Note: the difference between these models please refer to **Annex E. DECLARATION OF SIMILARITY.**

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), §2.1093	RF Exposure	Compliance
§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	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions	Compliance

Measurement Uncertainty

Emissions		
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 protable device, thus requires RF exposure evaluation;
Please refer to SIEMIC RF Exposure Report: 15020148-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.

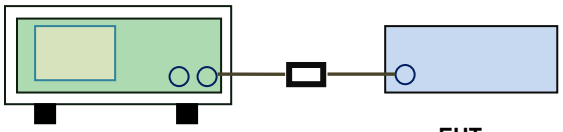
Antenna Connector Construction

The EUT has 1 antennas:
A PIFA antenna for Bluetooth/BLE, the gain is 2 dBi for Bluetooth/BLE.
Result: Compliance.

6.3 Channel Separation

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 07, 2015
Tested By :	Deon Dai

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 Freq (MHz)	CH Separation (MHz)	Limit (MHz)	Result
CH Separation GFSK	Low Channel	2402	0.993	0.554	Pass
	Adjacency Channel	2403			
	Mid Channel	2441	0.993	0.552	Pass
	Adjacency Channel	2440			
	High Channel	2480	0.990	0.554	Pass
	Adjacency Channel	2479			
CH Separation π/4-DQPSK	Low Channel	2402	1.002	0.832	Pass
	Adjacency Channel	2403			
	Mid Channel	2441	1.002	0.835	Pass
	Adjacency Channel	2440			
	High Channel	2480	1.002	0.833	Pass
	Adjacency Channel	2479			
CH Separation 8DPSK	Low Channel	2402	1.002	0.837	Pass
	Adjacency Channel	2403			
	Mid Channel	2441	1.002	0.844	Pass
	Adjacency Channel	2440			
	High Channel	2480	1.002	0.845	Pass
	Adjacency Channel	2479			

Test Plots
Channel Separation measurement result

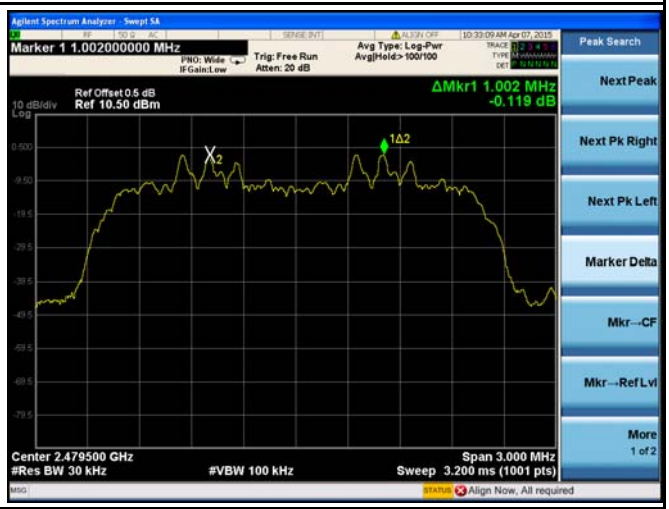
GFSK - Low Channel

GFSK - Middle Channel

GFSK - High Channel

π/4-DQPSK - Low Channel

π/4-DQPSK - Middle Channel



π/4-DQPSK - High Channel

8DPSK - Low Channel

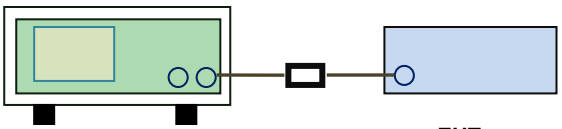
8DPSK - Middle Channel

8DPSK - High Channel

6.4 20dB Bandwidth

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 07, 2015
Tested By :	Deon Dai

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		

20dB Bandwidth measurement result

Type	Modulation	CH	CH Freq (MHz)	20dB Bandwidth(MHz)
20dB BW	GFSK	Low	2402	0.554
		Mid	2441	0.552
		High	2480	0.554
	π/4-DQPSK	Low	2402	1.248
		Mid	2441	1.252
		High	2480	1.250
	8DPSK	Low	2402	1.256
		Mid	2441	1.266
		High	2480	1.268

Test Plots

20dB Bandwidth measurement result

GFSK - Low Channel

GFSK - Middle Channel

GFSK - High Channel

π/4-DPSK - Low Channel

π/4-DQPSK - Middle Channel

π/4-DQPSK - High Channel

8DPSK - Low Channel

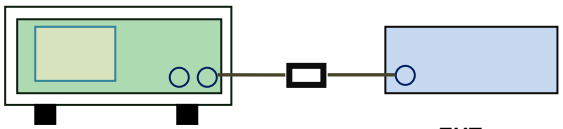
8DPSK - Middle Channel

8DPSK - High Channel

6.5 Peak Output Power

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 07, 2015
Tested By :	Deon Dai

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (2)	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	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		

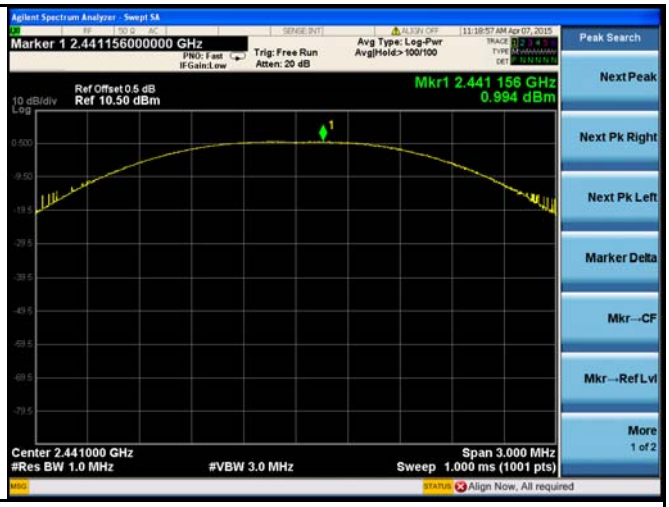
Peak Output Power measurement result

Type	Modulation	CH	Freq (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Limit (mW)	Result
Output Power	GFSK	Low	2402	0.474	1.12	1000	Pass
		Mid	2441	0.994	1.26	1000	Pass
		High	2480	0.784	1.20	1000	Pass
	π/4-DQPSK	Low	2402	-0.819	0.83	125	Pass
		Mid	2441	-0.429	0.91	125	Pass
		High	2480	-0.359	0.92	125	Pass
	8DPSK	Low	2402	-0.452	0.90	125	Pass
		Mid	2441	-0.082	0.98	125	Pass
		High	2480	-0.031	0.99	125	Pass

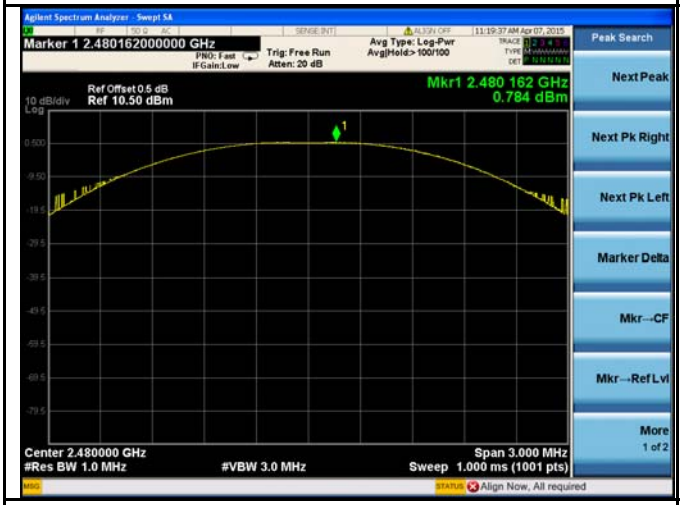
Test Plots

Output Power measurement result

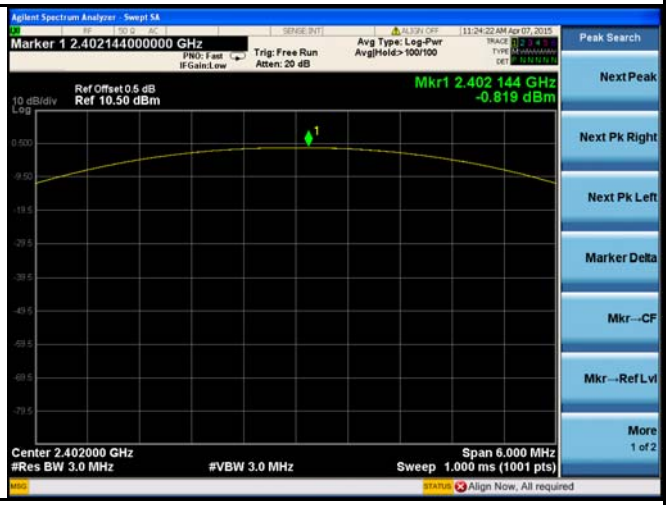
GFSK Output power - Low CH 2402



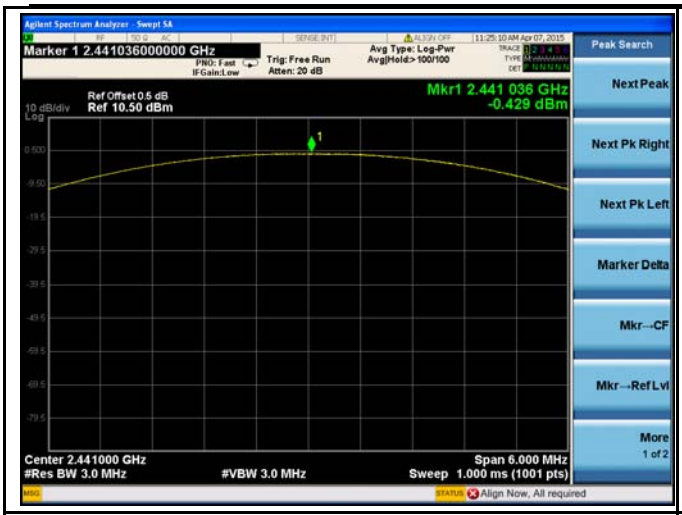
GFSK Output power - Mid CH 2441



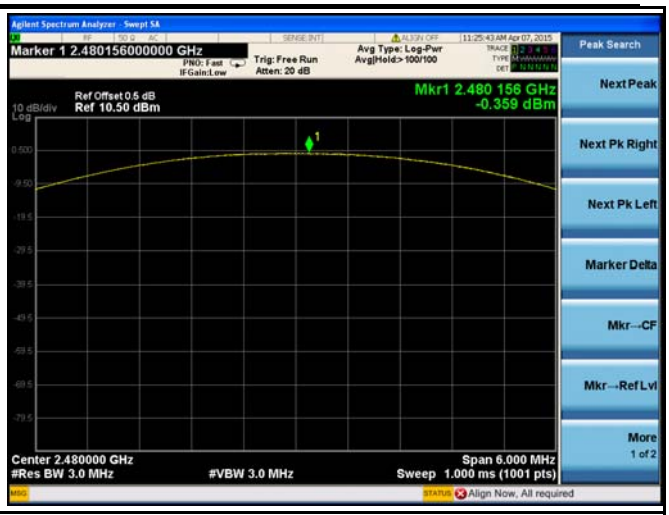
GFSK Output power - High CH 2480



π/4-DQPSK Output power - Low CH 2402

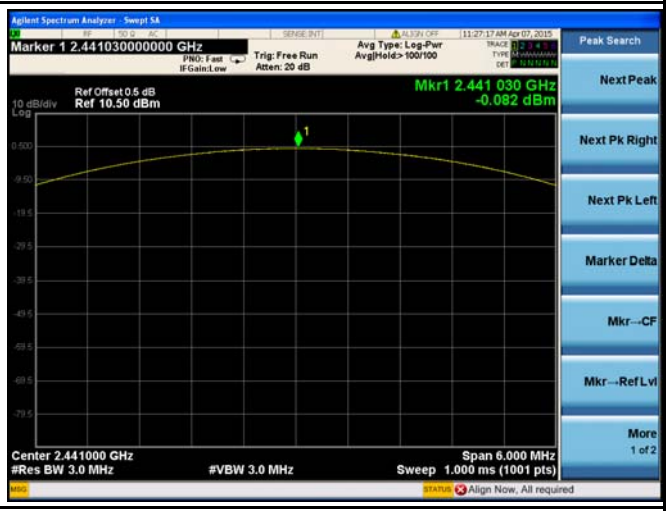


π/4-DQPSK Output power - Mid CH 2441



π/4-DQPSK Output power - High CH 2480

8DPSK Output power - Low CH 2402



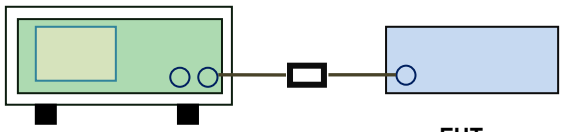
8DPSK Output power - Mid CH 2441

8DPSK Output power - High CH 2480

6.6 Number of Hopping Channel

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 07, 2015
Tested By :	Deon Dai

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		

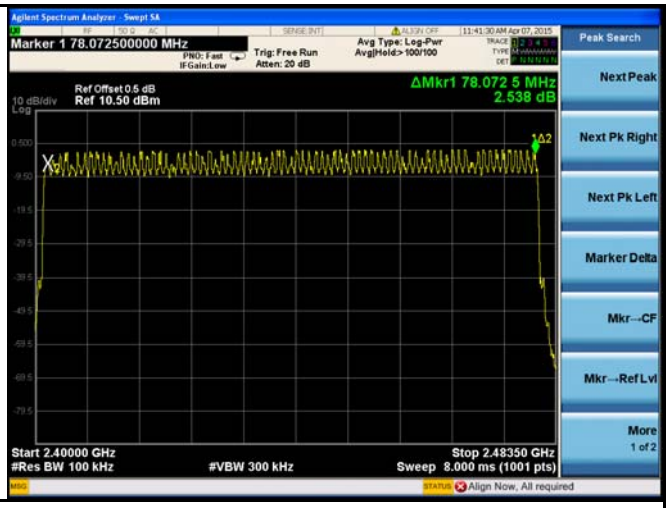
Number of Hopping Channel measurement result

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
	8-DPSK	2400-2483.5	79	15

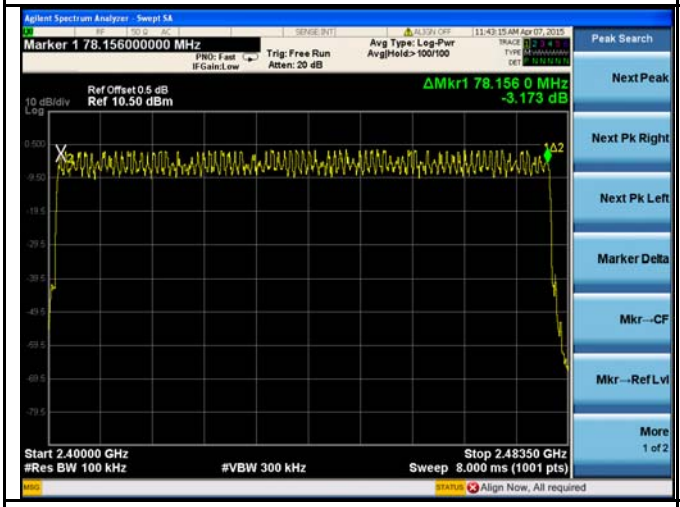
Test Plots

Number of Hopping Channels measurement result

GFSK



π/4-DQPSK

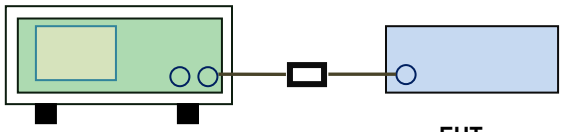


8DPSK

6.7 Time of Occupancy (Dwell Time)

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 07, 2015
Tested By :	Deon Dai

Requirement(s):

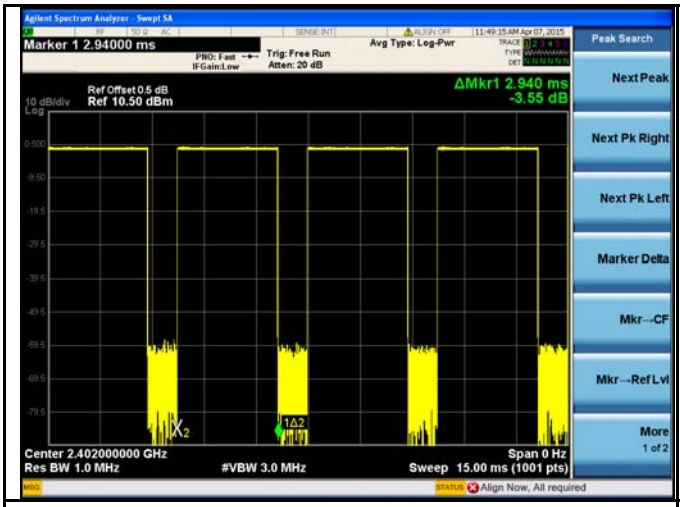
Spec	Item	Requirement	Applicable
§15.247(a)(1)(iii)	a)	Dwell Time < 0.4s	☑
Test Setup			
Test Procedure	The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer - Span = zero span, centered on a hopping channel - RBW = 1 MHz - VBW ≥RBW - Sweep = as necessary 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

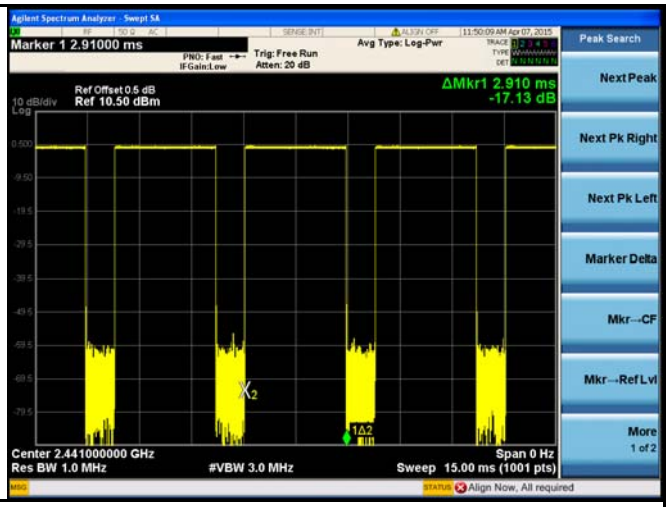
Type	Modulation	CH	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
Dwell Time(DH5)	GFSK	Low	2.94	0.31360	0.4	Pass
		Mid	2.91	0.31040	0.4	Pass
		High	2.91	0.31040	0.4	Pass
	π/4-DQPSK	Low	2.94	0.31360	0.4	Pass
		Mid	2.94	0.31360	0.4	Pass
		High	2.91	0.31040	0.4	Pass
	8DPSK	Low	2.94	0.31360	0.4	Pass
		Mid	2.94	0.31360	0.4	Pass
		High	2.94	0.31360	0.4	Pass
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second						

Test Plots

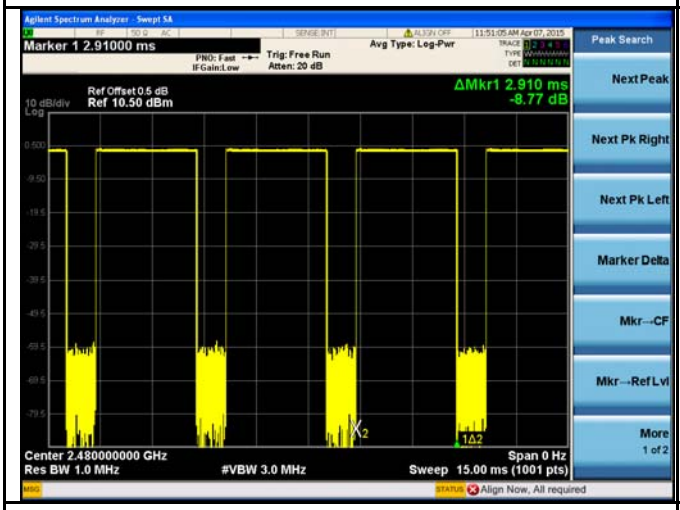
Dwell Time measurement result



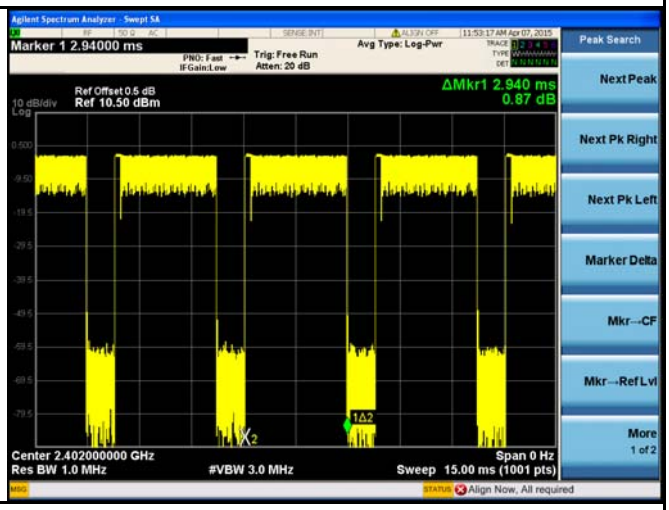
GFSK - Low CH 2402



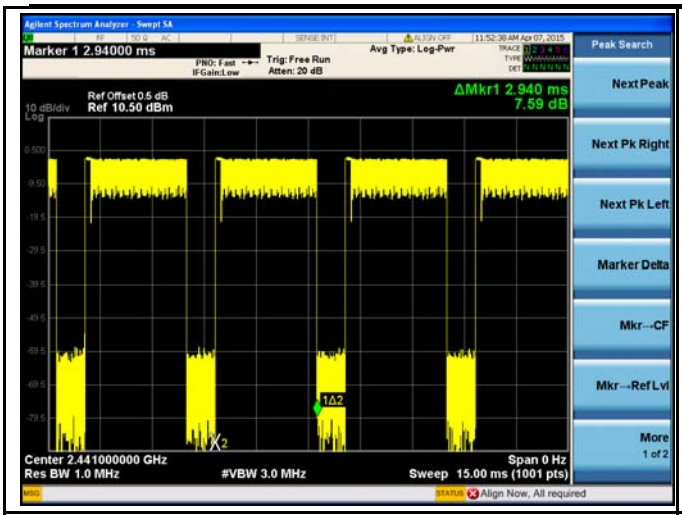
GFSK - Mid CH 2441



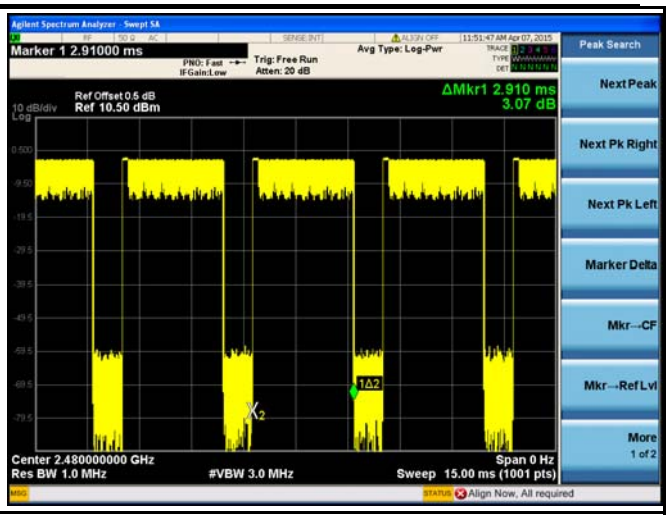
GFSK - High CH 2480



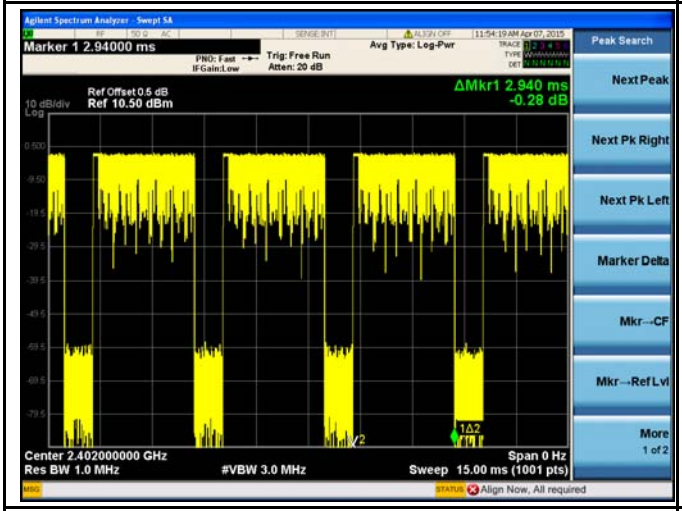
π/4 DQPSK - Low CH 2402



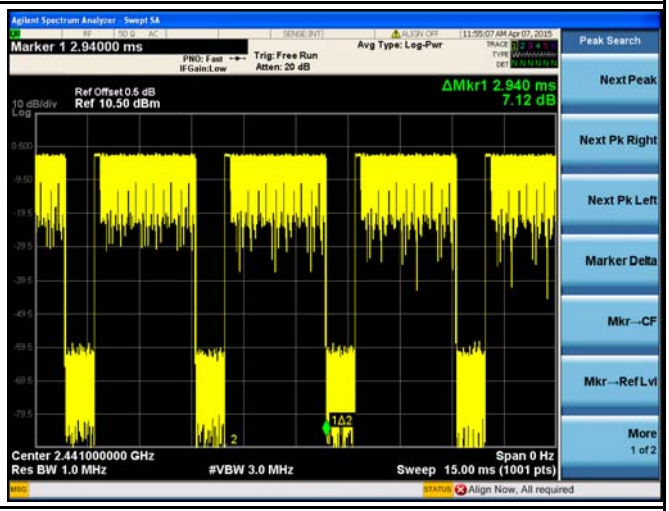
π/4 DQPSK - Mid CH 2441



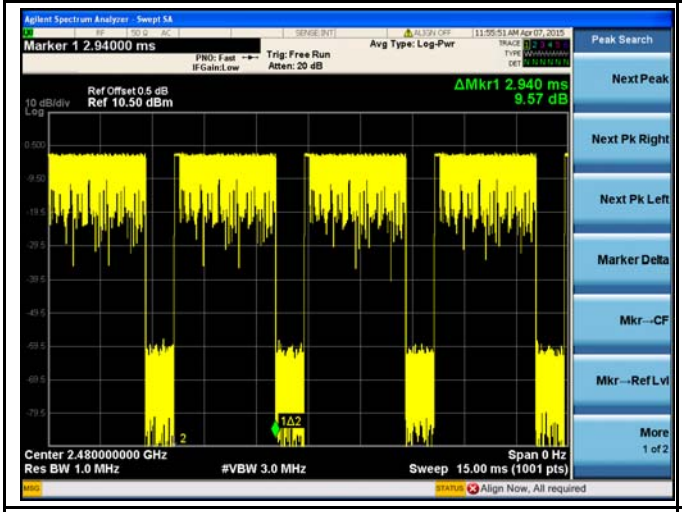
π/4 DQPSK - High CH 2480



8DPSK - Low CH 2402



8DPSK - Mid CH 2441



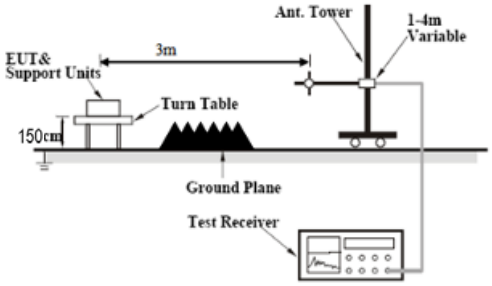
8DPSK - High CH 2480

6.8 Band Edge

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 15, 2015
Tested By :	Deon Dai

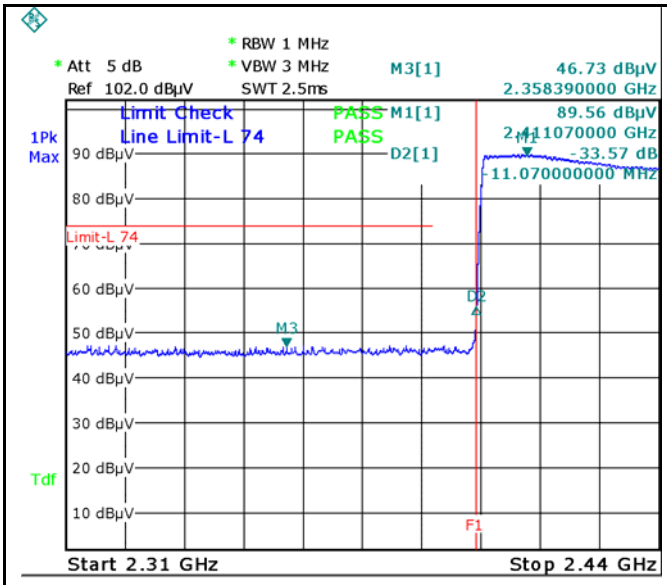
Requirement(s):

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 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

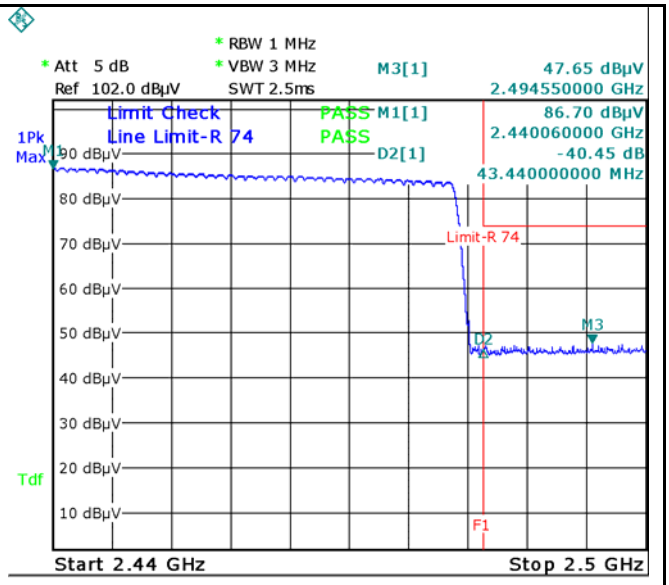
Test Plots

GFSK Mode:



GFSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



GFSK-Hopping Right Side-PK

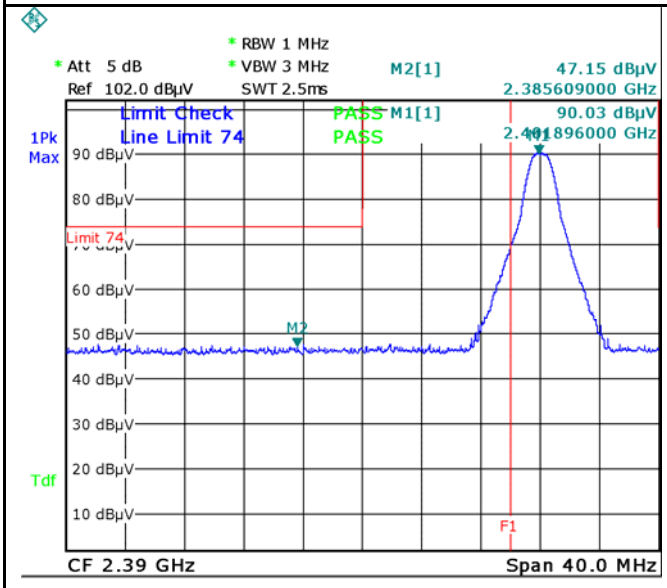
Note: F1 is frequency 2483.5MHz

GFSK-Hopping Left Side-AV

(no need if PK value less than the AV limit)

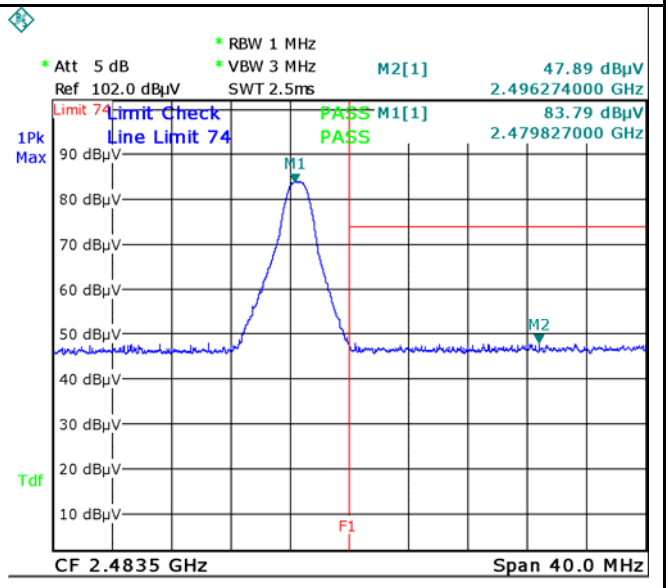
GFSK-Hopping Right Side-AV

(no need if PK value less than the AV limit)



GFSK-Left Side-PK

Note: F1 is frequency 2400MHz



GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

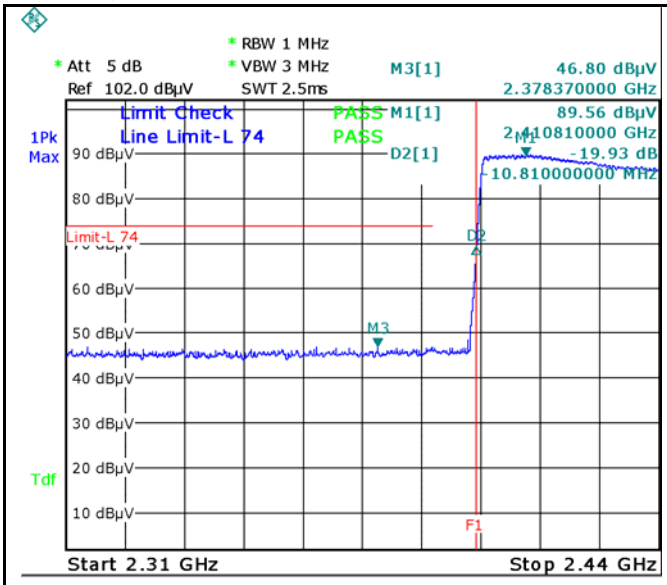
GFSK-Left Side-AV

(no need if PK value less than the AV limit)

GFSK-Right Side-AV

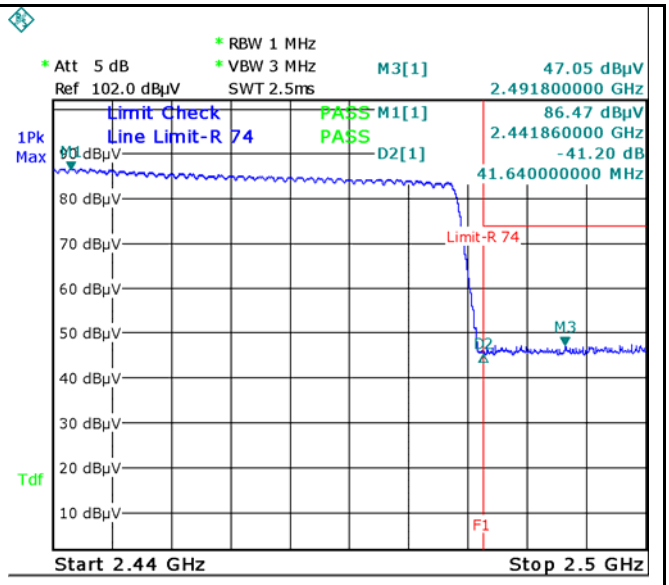
(no need if PK value less than the AV limit)

π/4 DQPSK Mode:



π/4 DQPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



π/4 DQPSK-Hopping Right Side-PK

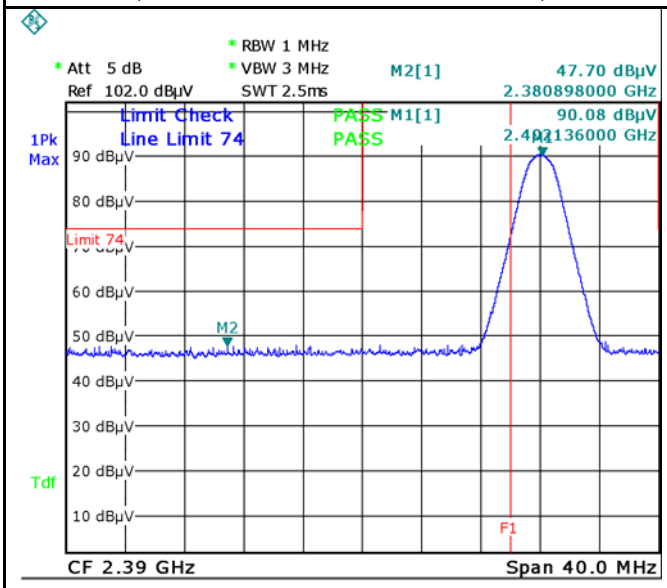
Note: F1 is frequency 2483.5MHz

π/4 DQPSK-Hopping Left-AV

(no need if PK value less than the AV limit)

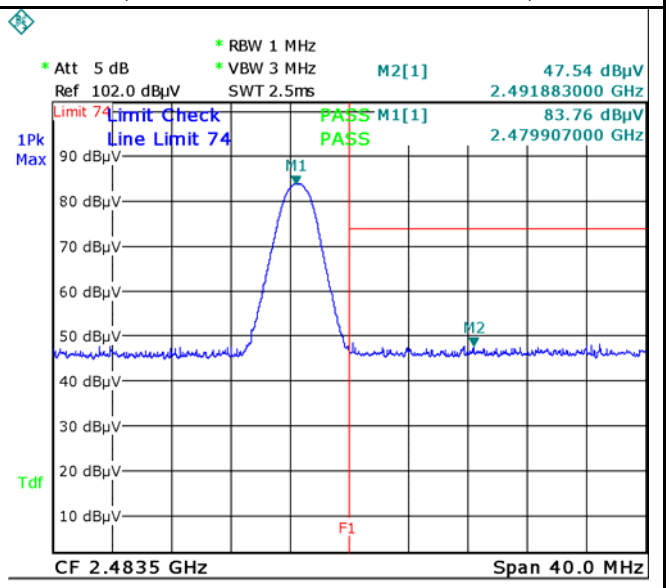
π/4 DQPSK-Hopping Right-AV

(no need if PK value less than the AV limit)



π/4 DQPSK-Left Side-PK

Note: F1 is frequency 2400MHz



π/4 DQPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

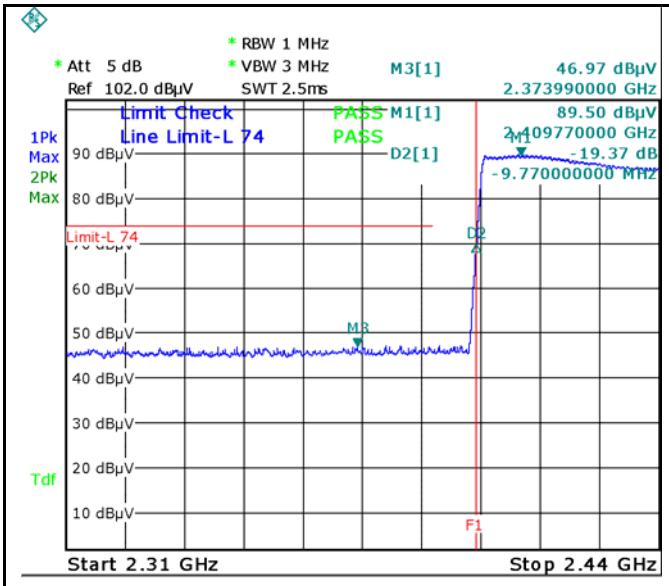
π/4 DQPSK-Left Side-AV

(no need if PK value less than the AV limit)

π/4 DQPSK-Right Side-AV

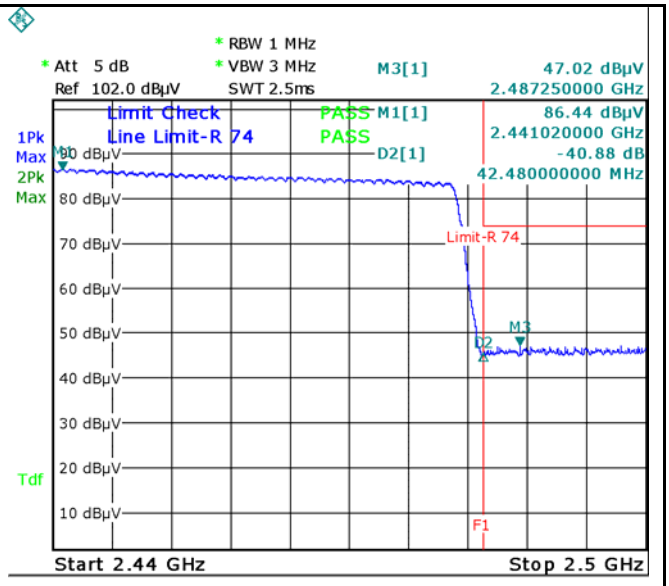
(no need if PK value less than the AV limit)

8DPSK Mode:



8DPSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Hopping Right Side-PK

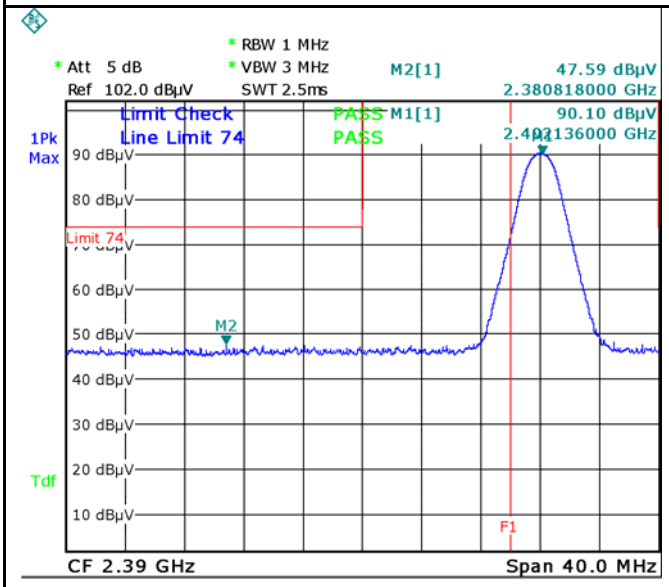
Note: F1 is frequency 2483.5MHz

8DPSK-Hopping Left-AV

(no need if PK value less than the AV limit)

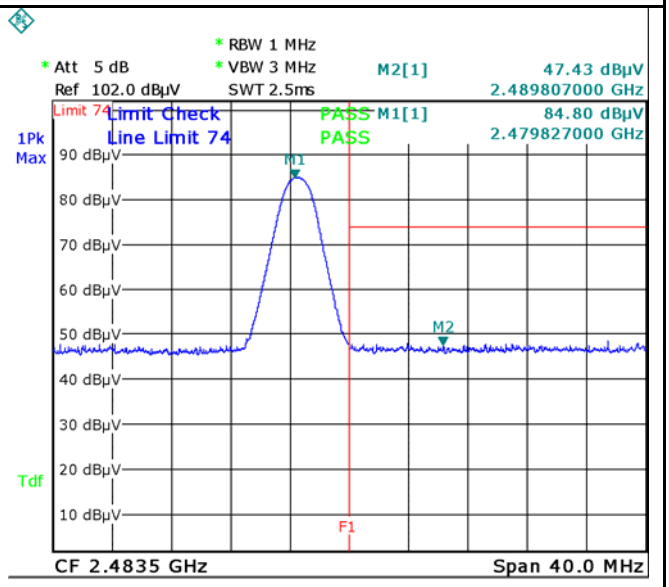
8DPSK-Hopping Right-AV

(no need if PK value less than the AV limit)



8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz



8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

8DPSK-Left Side-AV

(no need if PK value less than the AV limit)

8DPSK-Right Side-AV

(no need if PK value less than the AV limit)

6.9 AC Power Line Conducted Emissions

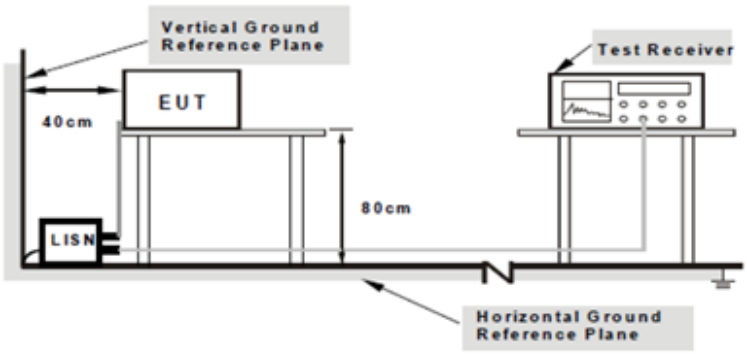
Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	March 25, 2015
Tested By :	Deon Dai

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

- 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, as shown in Annex B.
- The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
- The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
- All other supporting equipment was powered separately from another main supply.

Remark	
Result	☑ Pass ☐ Fail
Test Data	☑ Yes ☐ N/A
Test Plot	☑ Yes (See below) ☐ N/A

Data sample

Frequency (MHz)	Quasi-Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Factors (dB)
xxx	56.21	66.00	-9.79	39.20	56.00	-16.80	12.22

Frequency (MHz) = Emission frequency in MHz

Quais-Peak/Average (dBμV/m)=Receiver Reading(dBμV/m)+ Factor(dB)

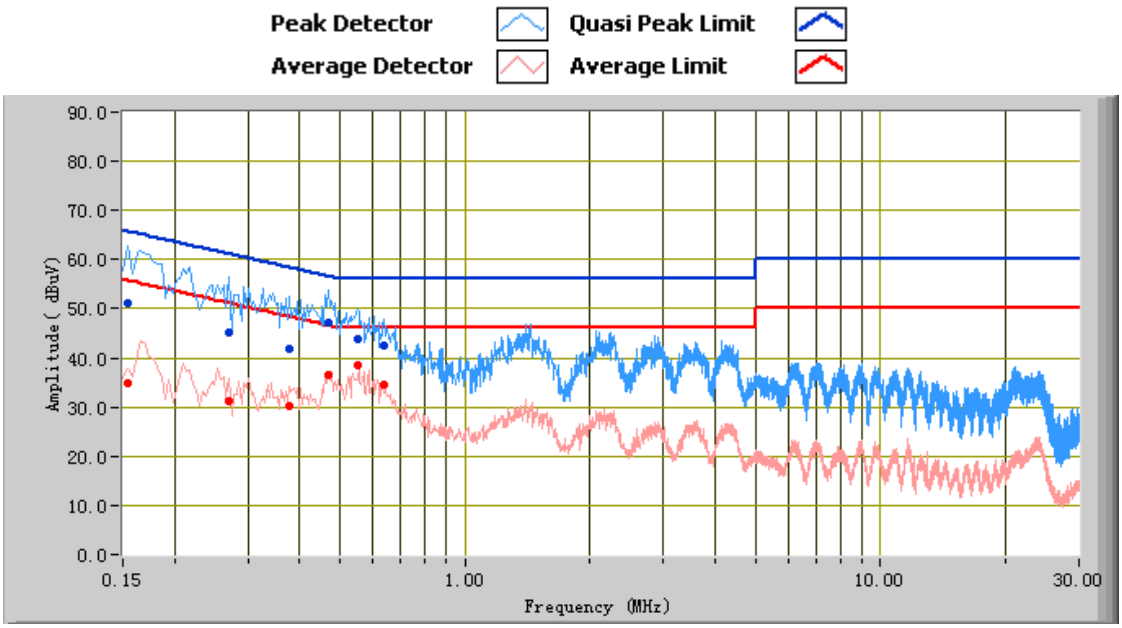
Limit(dBμV/m)=Limit stated in standard

Factor (dB)= cable loss+ Insertion loss of LISN+ Insertion loss of transient limiter (The transient limiter included 10dB attenuation)

Calculation Formula:

Margin (dB)=Quasi Peak / Average (dBμV/m) – limit (dBμV/m)

Test Mode:	Charging & GFSK Transmitting (Worse Case)

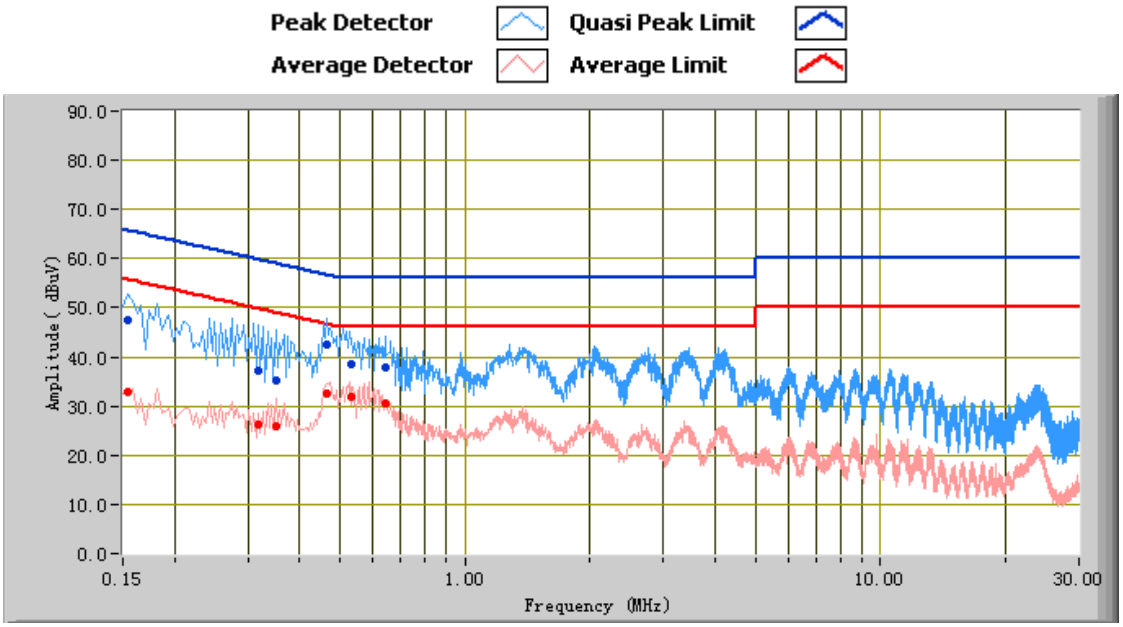


Test Data

Phase Line Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.47	47.25	56.51	-9.26	36.42	46.51	-10.10	11.13
0.15	51.03	65.78	-14.75	35.02	55.78	-20.76	12.16
0.27	45.06	61.12	-16.06	31.27	51.12	-19.85	11.42
0.38	41.94	58.32	-16.38	30.08	48.32	-18.24	11.27
0.55	43.98	56.00	-12.02	38.53	46.00	-7.47	11.05
0.64	42.59	56.00	-13.41	34.42	46.00	-11.58	10.98

Test Mode:	Charging & GFSK Transmitting (Worse Case)

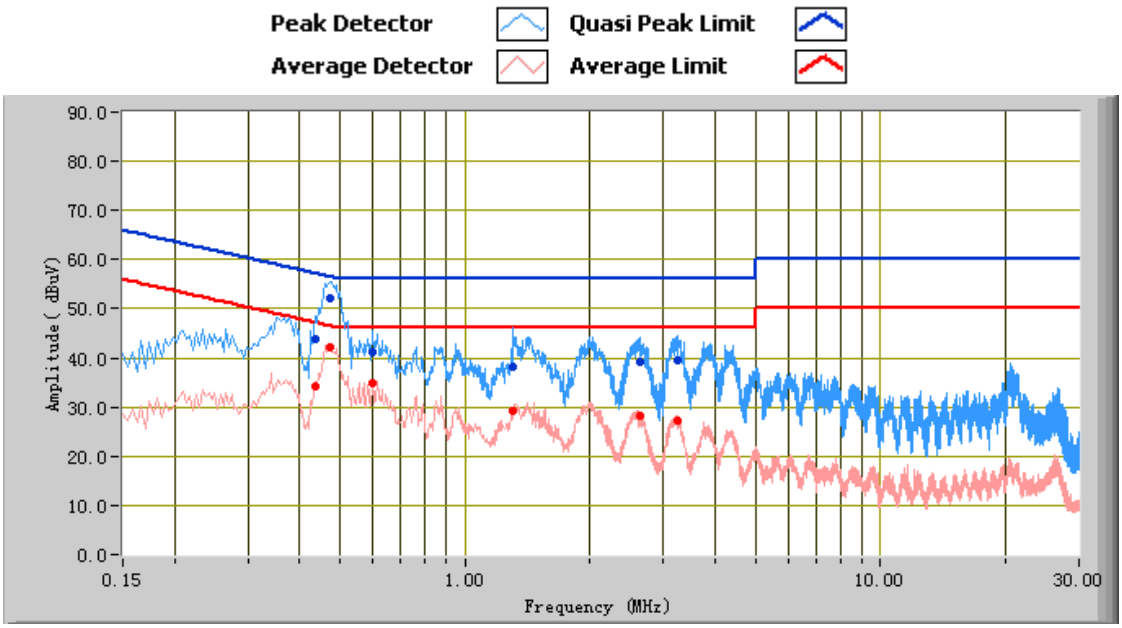


Test Data

Phase Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.47	42.53	56.59	-14.06	32.58	46.59	-14.01	11.11
0.64	37.82	56.00	-18.18	30.56	46.00	-15.44	10.96
0.53	38.53	56.00	-17.47	31.85	46.00	-14.15	11.03
0.15	47.34	65.78	-18.45	32.75	55.78	-23.03	12.15
0.32	37.11	59.76	-22.65	26.18	49.76	-23.58	11.35
0.35	35.28	58.96	-23.68	25.90	48.96	-23.06	11.30

Test Mode:	Charging & GFSK Transmitting (Worse Case)

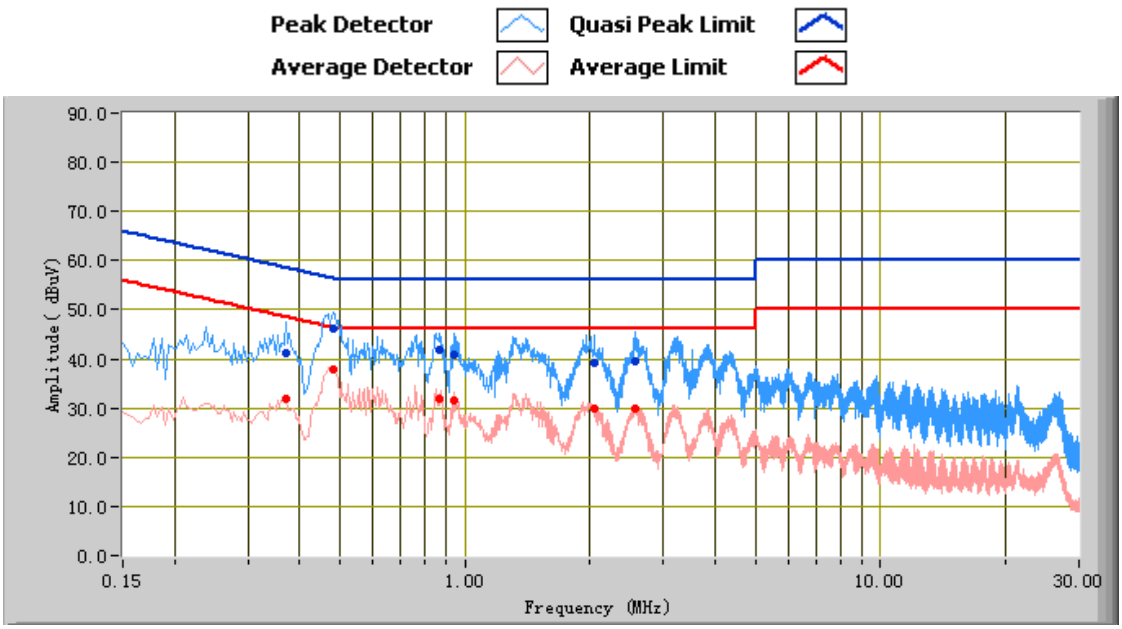


Test Data

Phase Line Plot at 230Vac, 50Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.47	52.04	56.44	-4.41	42.31	46.44	-4.14	11.12
0.43	43.99	57.18	-13.19	34.20	47.18	-12.98	11.18
1.31	38.35	56.00	-17.65	29.35	46.00	-16.65	10.74
0.60	41.25	56.00	-14.75	34.83	46.00	-11.17	11.01
3.26	39.63	56.00	-16.37	27.27	46.00	-18.73	10.88
2.63	39.16	56.00	-16.84	28.18	46.00	-17.82	10.88

Test Mode:	Charging & GFSK Transmitting (Worse Case)



Test Data

Phase Neutral Plot at 230Vac, 50Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.48	46.22	56.30	-10.09	37.71	46.30	-8.59	11.09
2.55	39.65	56.00	-16.35	30.01	46.00	-15.99	10.93
0.87	41.69	56.00	-14.31	31.83	46.00	-14.17	10.79
0.94	40.79	56.00	-15.21	31.51	46.00	-14.49	10.74
0.37	41.09	58.50	-17.41	31.84	48.50	-16.66	11.27
2.04	39.09	56.00	-16.91	29.98	46.00	-16.02	10.92

6.10 Radiated Spurious Emissions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 11, 2015
Tested By :	Deon Dai

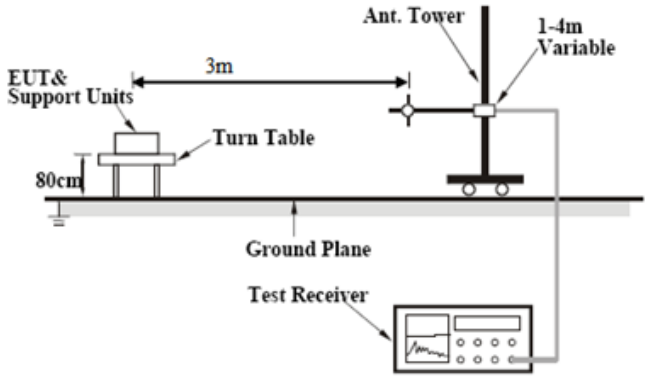
Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.205, §15.209, §15.247(d)	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	☑

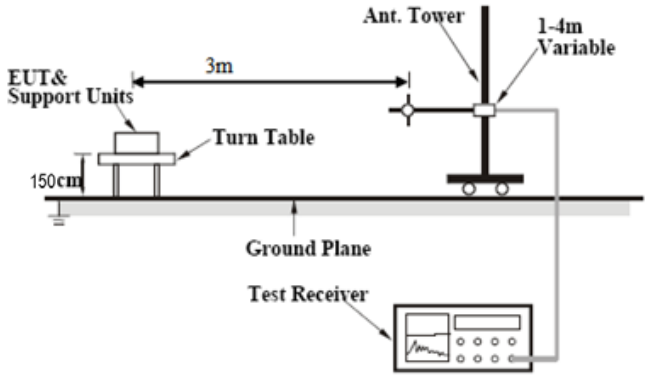
Frequency range (MHz)	Field Strength (μV/m)
30 – 88	100
88 – 216	150
216 960	200
Above 960	500

Test Setup

A: Frequency Below 1000MHz:



B: Frequency Above1000MHz:



Procedure

The test follows FCC Public Notice DA 00-705 Measurement Guidelines.

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 characterisation. 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 polarisation (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. ■ 1/T kHz (Duty cycle < 98%) □ 10 Hz (Duty cycle > 98%) 3. A Quasi-peak measurement was then made for that frequency point. 4. 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

Frequency (MHz)	Quasi Peak (dBμV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBμV/m)	Margin (dB)
xxx	32.23	181.00	H	350.00	-38.23	40.00	-7.77

Frequency (MHz) = Emission frequency in MHz

Quais-Peak (dBμV/m)= Receiver Reading(dBμV/m)+ Factor(dB)

Azimuth=Position of turn table

Polarity=Polarity of Receiver antenna

Height(cm)= Height of Receiver antenna

Factor (dB)=Antenna factor + cable loss- antenna gain

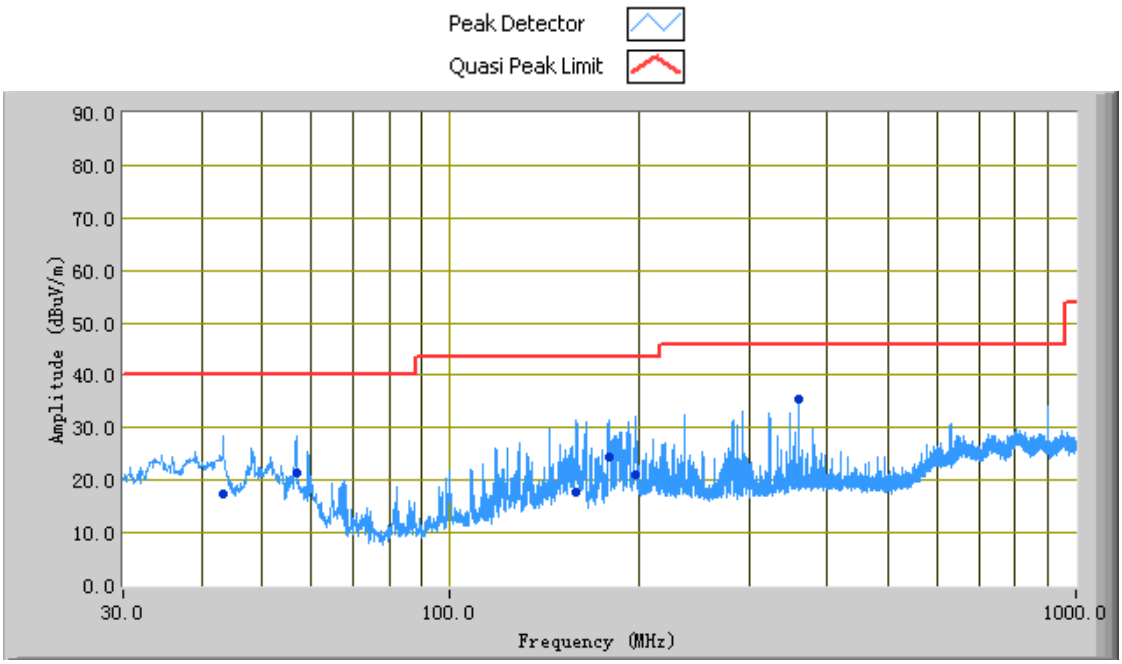
Limit (dBμV/m)=Limit stated in standard

Calculation Formula:

Margin (dB)=Quasi Peak (dBμV/m) – limit (dBμV/m)

Test Mode:	Charging & GFSK Transmitting (Worse Case)

(Below 1GHz)



Test Data

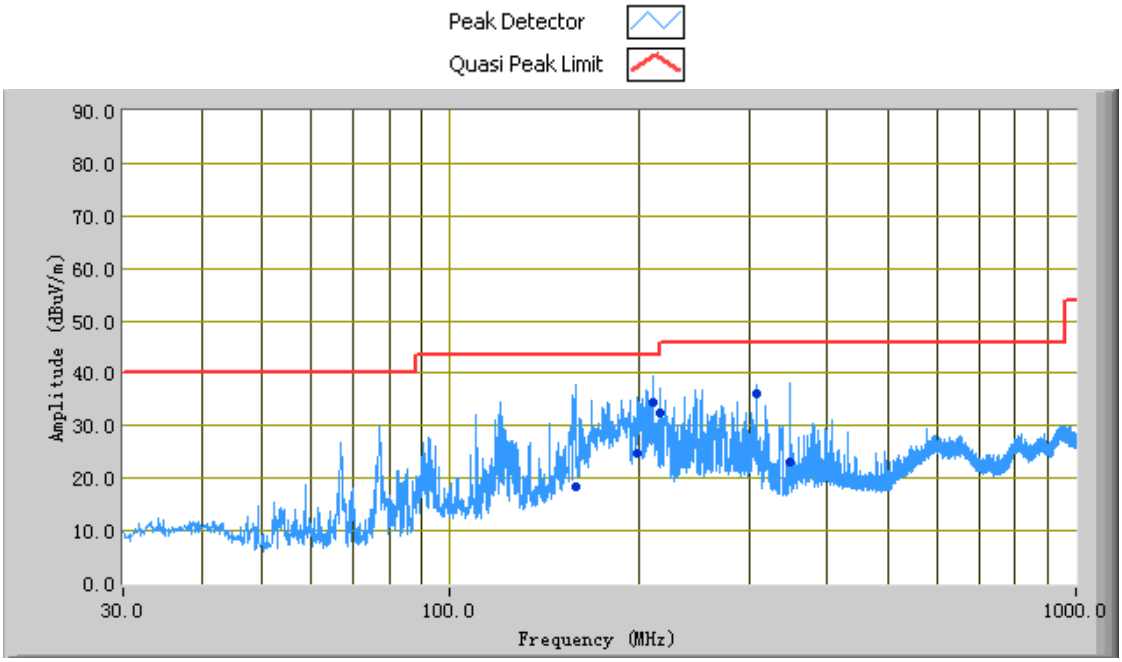
Vertical Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
360.00	35.42	166.00	V	140.00	-28.39	46.00	-10.58
56.64	21.38	15.00	V	132.00	-36.46	40.00	-18.62
197.64	21.05	22.00	V	129.00	-32.00	43.50	-22.45
43.41	17.49	336.00	V	316.00	-31.02	40.00	-22.51
180.01	24.58	359.00	V	229.00	-31.71	43.50	-18.92
159.39	17.74	346.00	V	227.00	-31.36	43.50	-25.76

Note: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not recorded.

Test Mode:	Charging & GFSK Transmitting (Worse Case)

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
210.90	34.39	3.00	H	149.00	-30.71	43.50	-9.11
158.85	18.40	144.00	H	278.00	-31.47	43.50	-25.10
216.00	32.36	180.00	H	158.00	-30.32	43.50	-11.14
349.90	22.99	79.00	H	329.00	-29.70	46.00	-23.01
199.56	24.84	20.00	H	253.00	-31.54	43.50	-18.66
308.72	36.01	2.00	H	143.00	-29.33	46.00	-9.99

Note: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not recorded.

Test Mode:	GFSK Transmitting(Worse Case)

Note: Other modes were verified, only the result of worst case basic rate mode was presented.

Low Channel (2402 MHz)

Frequency (MHz)	Substituted level (dBμV/m)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4804	34.33	AV	V	33.83	6.86	31.72	43.30	54	-10.70
4804	36.91	AV	H	33.83	6.86	31.72	45.88	54	-8.12
4804	45.82	PK	V	33.83	6.86	31.72	54.79	74	-19.21
4804	46.11	PK	H	33.83	6.86	31.72	55.08	74	-18.92

Middle Channel (2441 MHz)

Frequency (MHz)	Substituted level (dBμV/m)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4882	36.28	AV	V	33.86	6.82	31.82	45.14	54	-8.86
4882	37.39	AV	H	33.86	6.82	31.82	46.25	54	-7.75
4882	47.32	PK	V	33.86	6.82	31.82	56.18	74	-17.82
4882	46.58	PK	H	33.86	6.82	31.82	55.44	74	-18.56

High Channel (2480 MHz)

Frequency (MHz)	Substituted level (dBμV/m)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	35.19	AV	V	33.9	6.76	31.92	43.93	54	-10.07
4960	36.44	AV	H	33.9	6.76	31.92	45.18	54	-8.82
4960	47.46	PK	V	33.9	6.76	31.92	56.20	74	-17.80
4960	45.72	PK	H	33.9	6.76	31.92	54.46	74	-19.54

Annex A. TEST INSTRUMENT

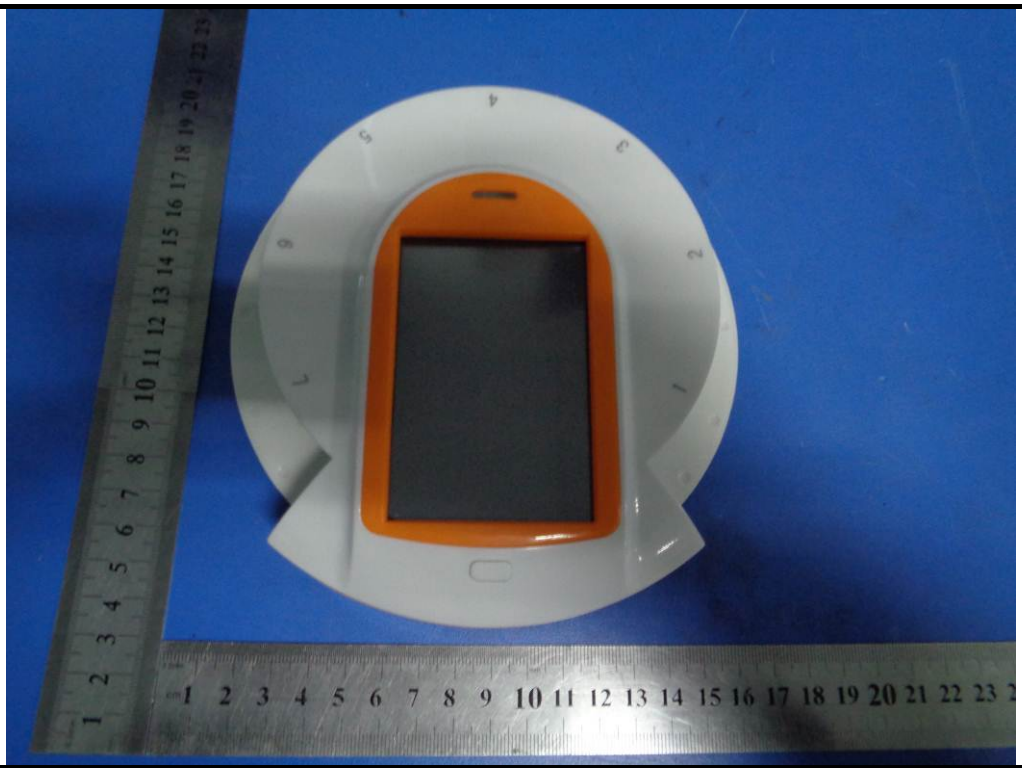
Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions Emission					
R&S EMI Test Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
V-LISN	ESH3-Z5	838979/005	09/27/2014	09/26/2015	☑
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/09/2014	10/08/2015	☑
SIEMIC Labview Conducted Emissions software	V1.0	N/A	N/A	N/A	☑
RF conducted test					
R&S EMI Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
Power Splitter	1#	1#	02/02/2015	02/01/2016	☑
Hp Spectrum Analyzer	8563E	3821A09023	10/09/2014	10/08/2015	☑
Temperature/Humidity Chamber	1007H	N/A	01/07/2015	01/06/2016	☑
Radiated Emissions					
Hp Spectrum Analyzer	8563E	3821A09023	10/09/2014	10/08/2015	☑
R&S EMI Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
Antenna (30MHz~6GHz)	JB6	A121411	04/15/2014	04/14/2015	☑
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	11/15/2014	11/14/2015	☑
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/09/2014	10/08/2015	☑
Horn Antenna (18~40GHz)	AH-840	101013	04/22/2014	04/22/2015	☑
Microwave Pre-Amp (18~40GHz)	PA-840	181250	05/29/2014	05/28/2015	☑
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2014	10/26/2015	☑
MITEQ Pre-Amplifier (0.1 ~ 18GHz)	AMF-7D-00101800-30-10P	1451709	10/27/2014	10/26/2015	☑
SIEMIC Labview Radiated Emissions software	V1.0	N/A	N/A	N/A	☑

Annex B. EUT And Test Setup Photographs

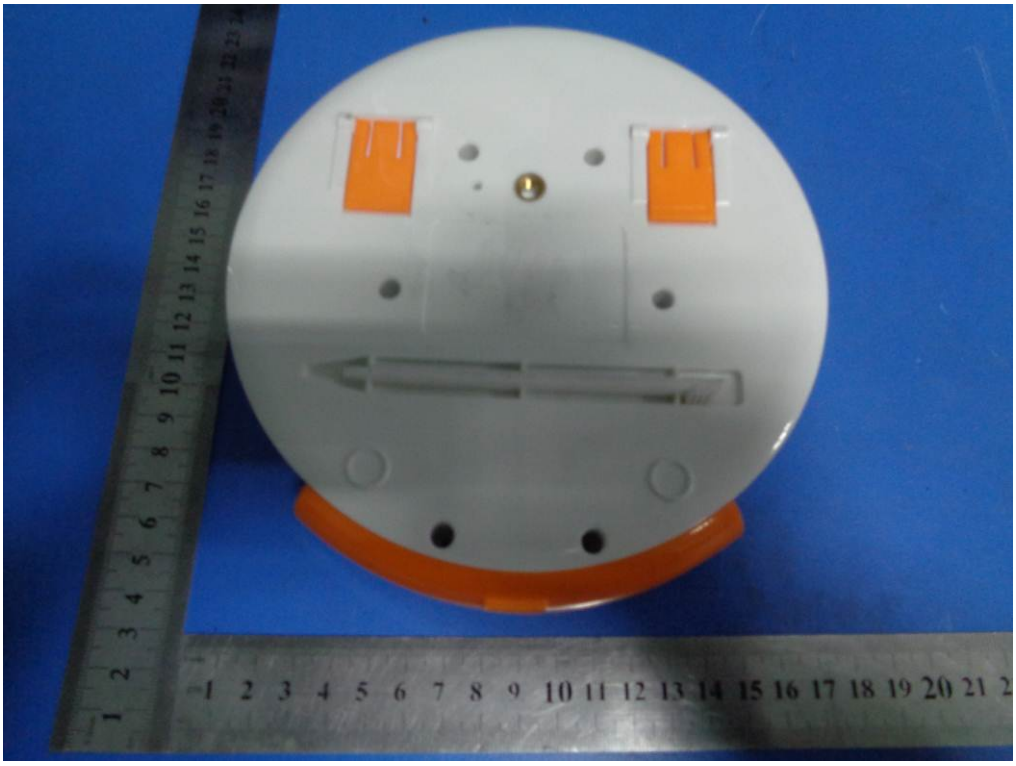
Annex B.i. Photograph: EUT External Photo

Whole Package - Top View 1

Whole Package - Top View 2

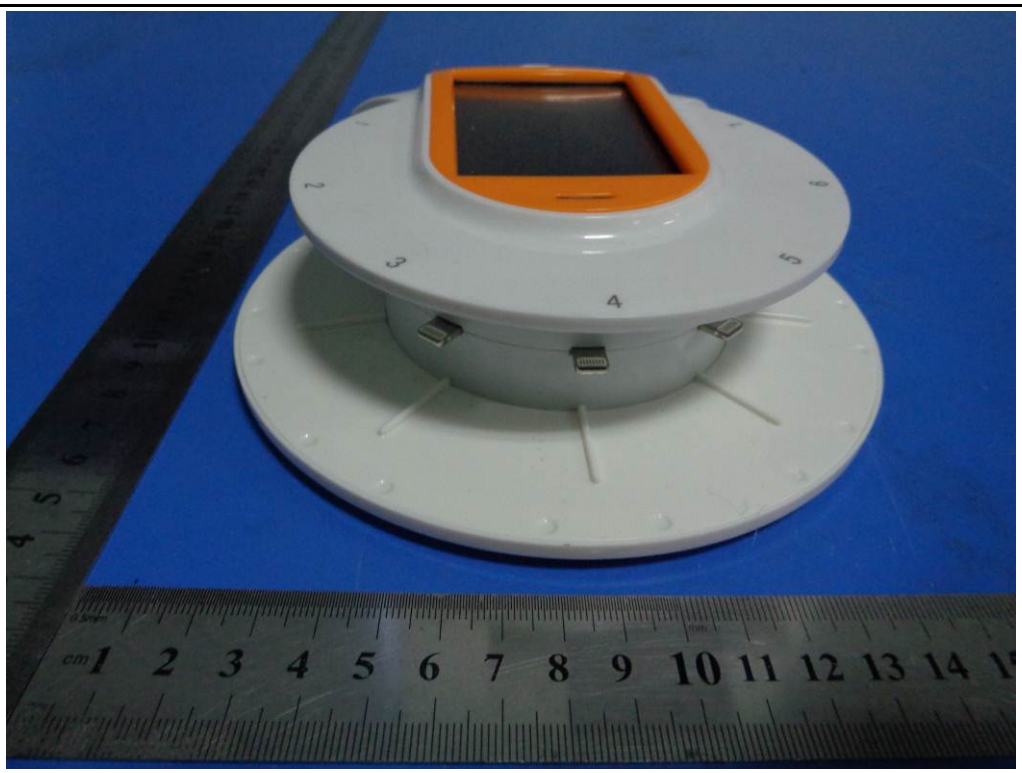


EUT - Front View

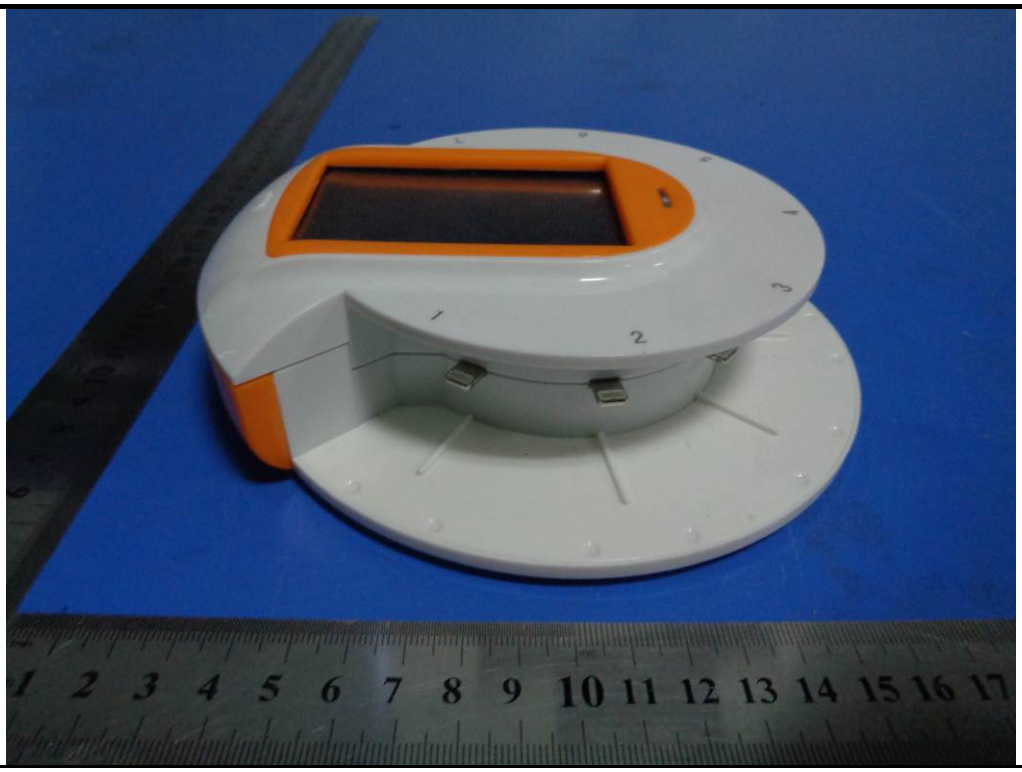


EUT - Rear View

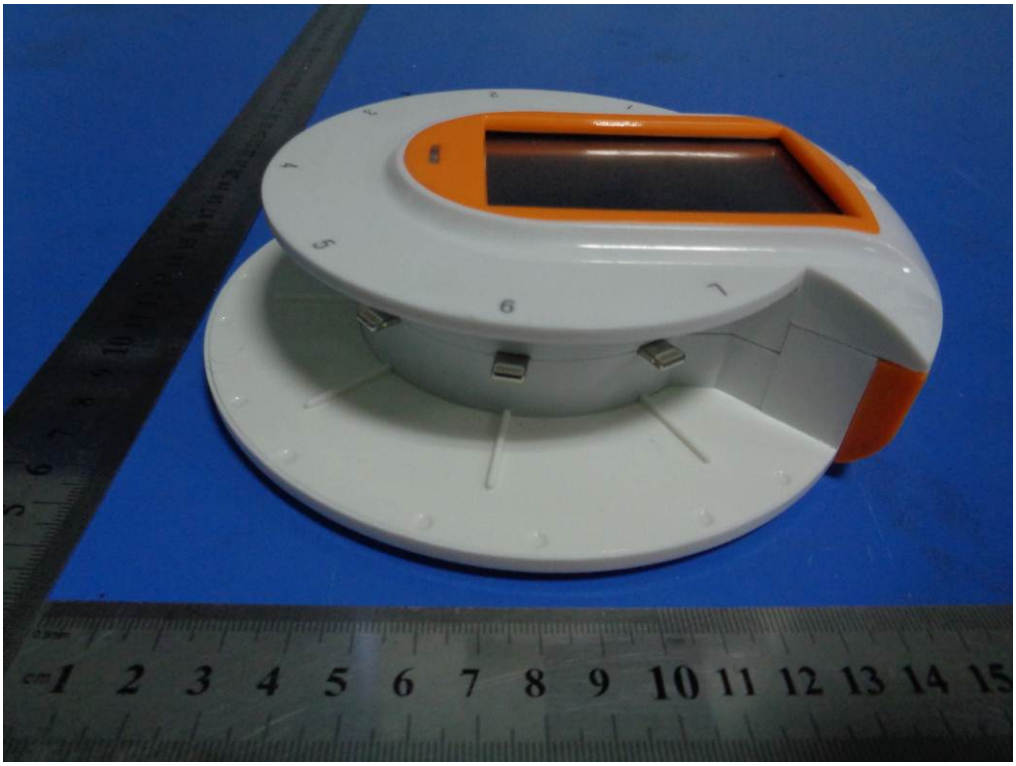
EUT - Top View



EUT - Bottom View

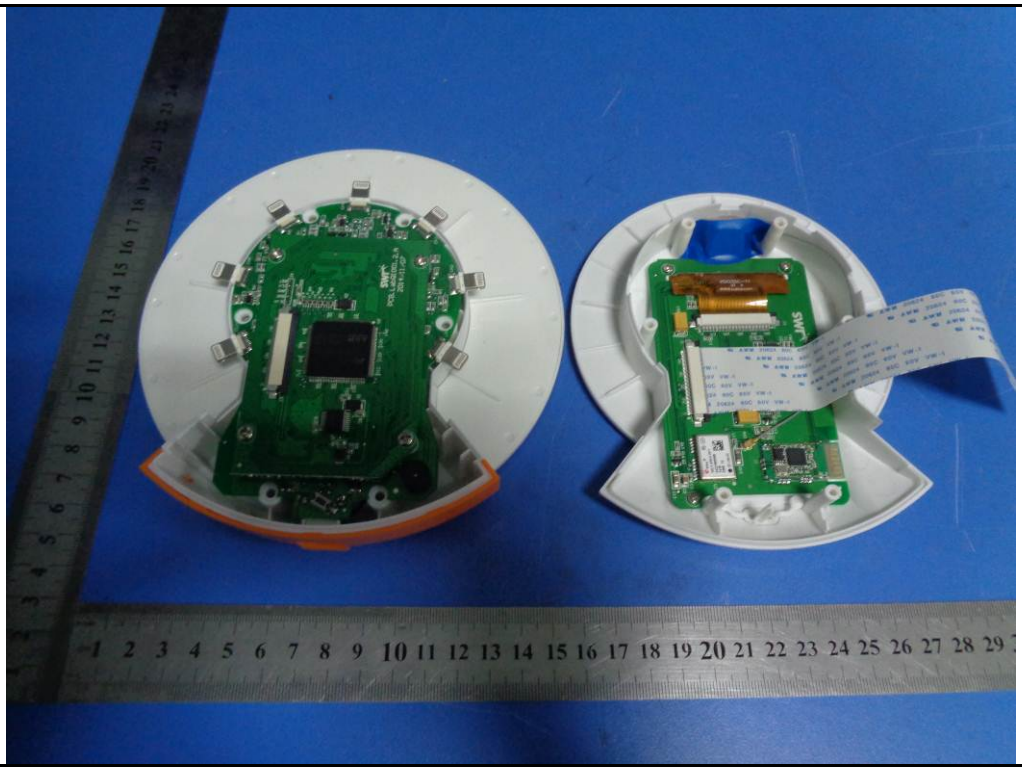


EUT – Left View

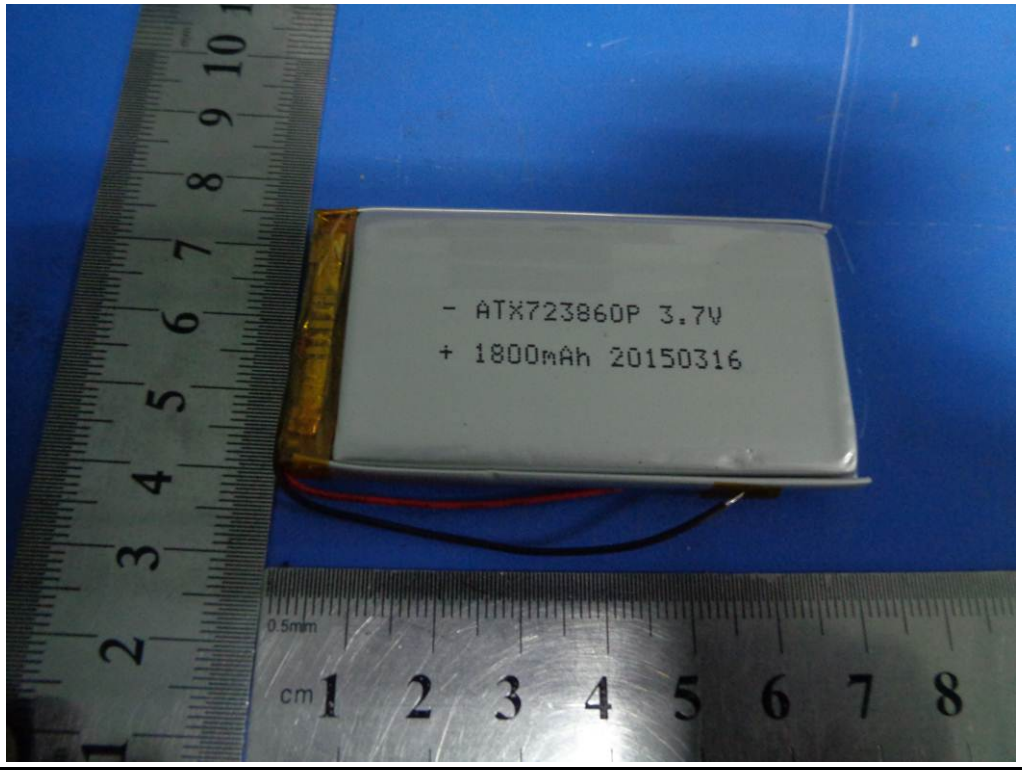


EUT – Right View

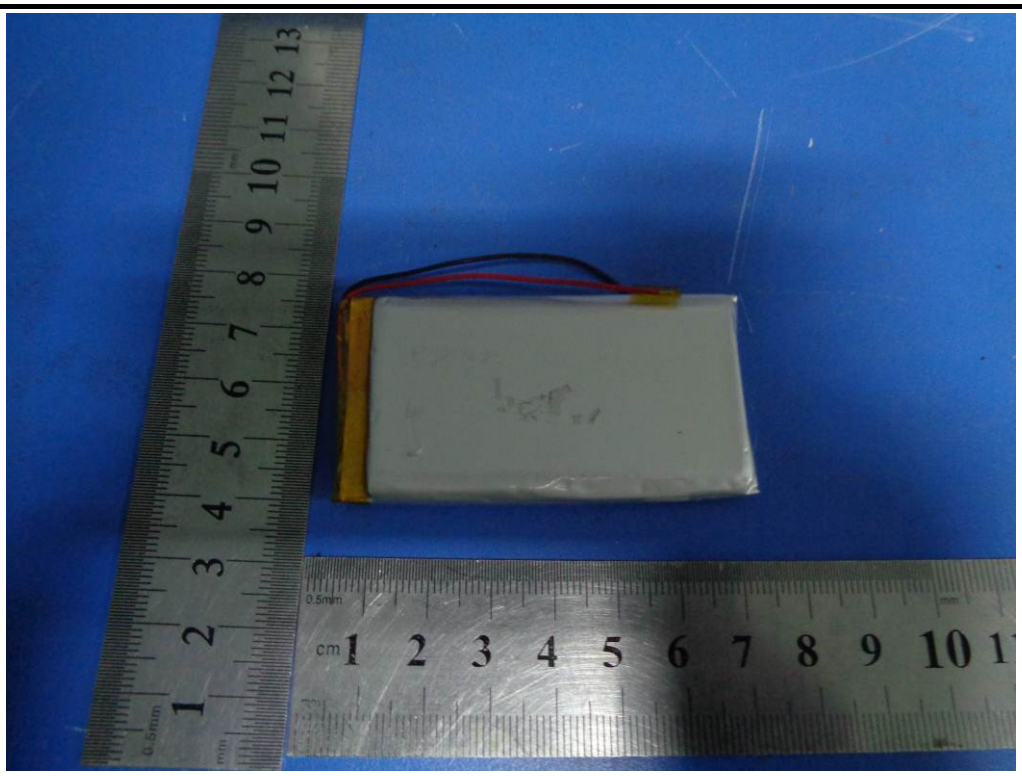
Annex B.ii. Photograph: EUT Internal Photo



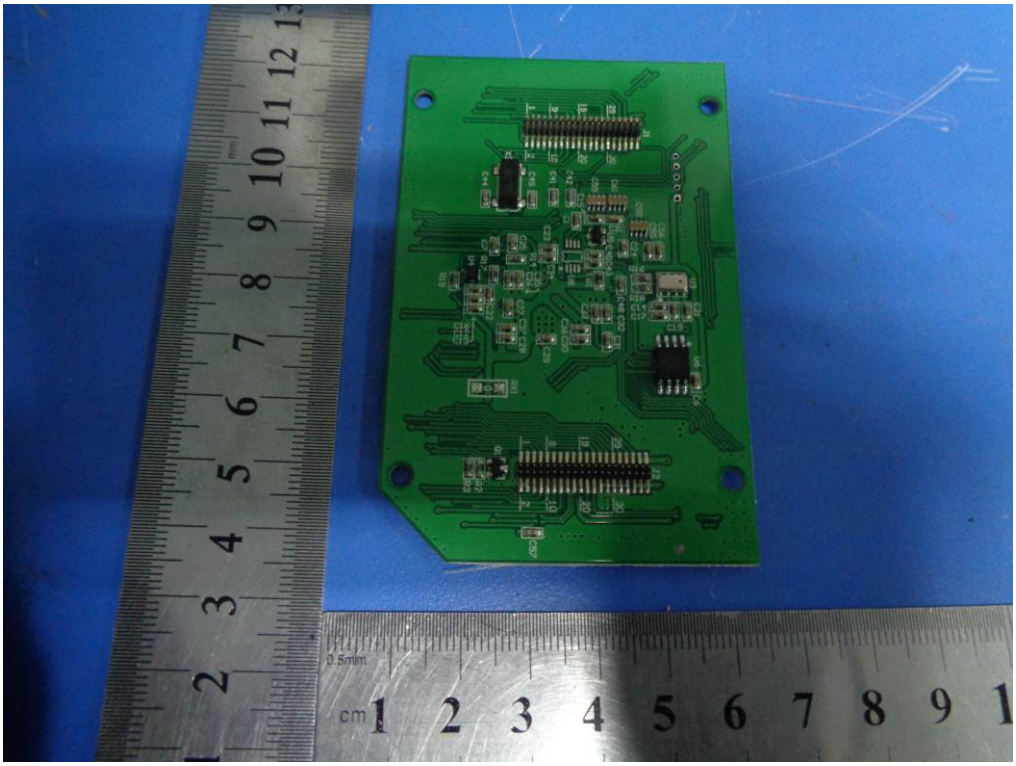
EUT – Uncover Front View



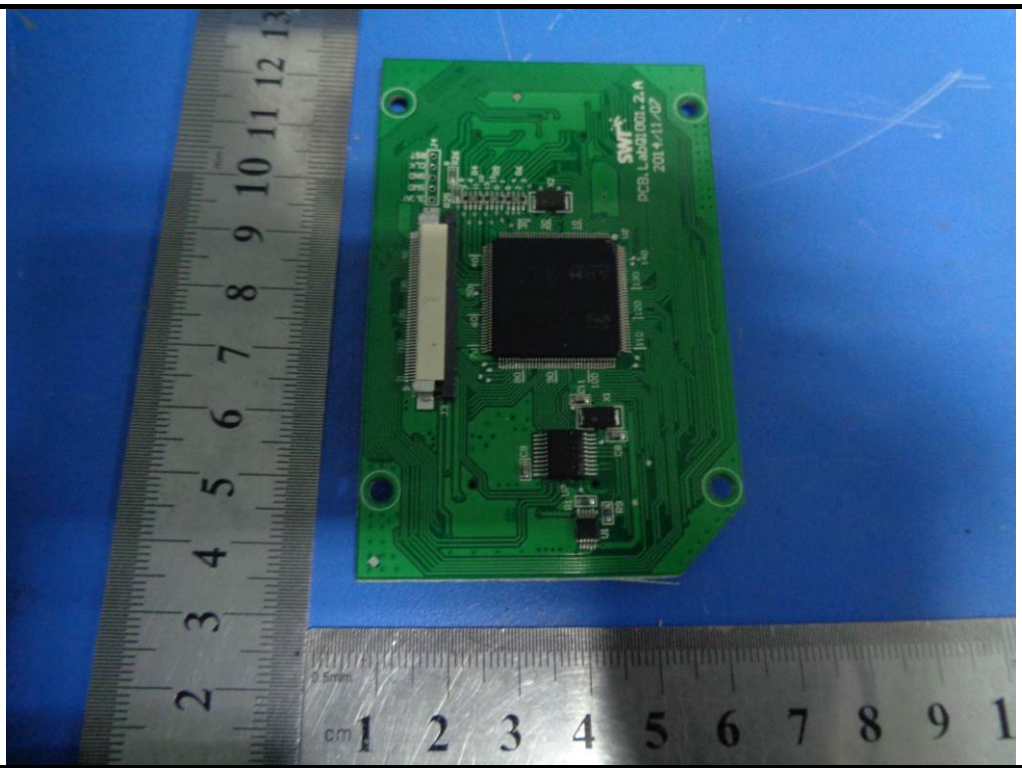
EUT – Battrey Front View



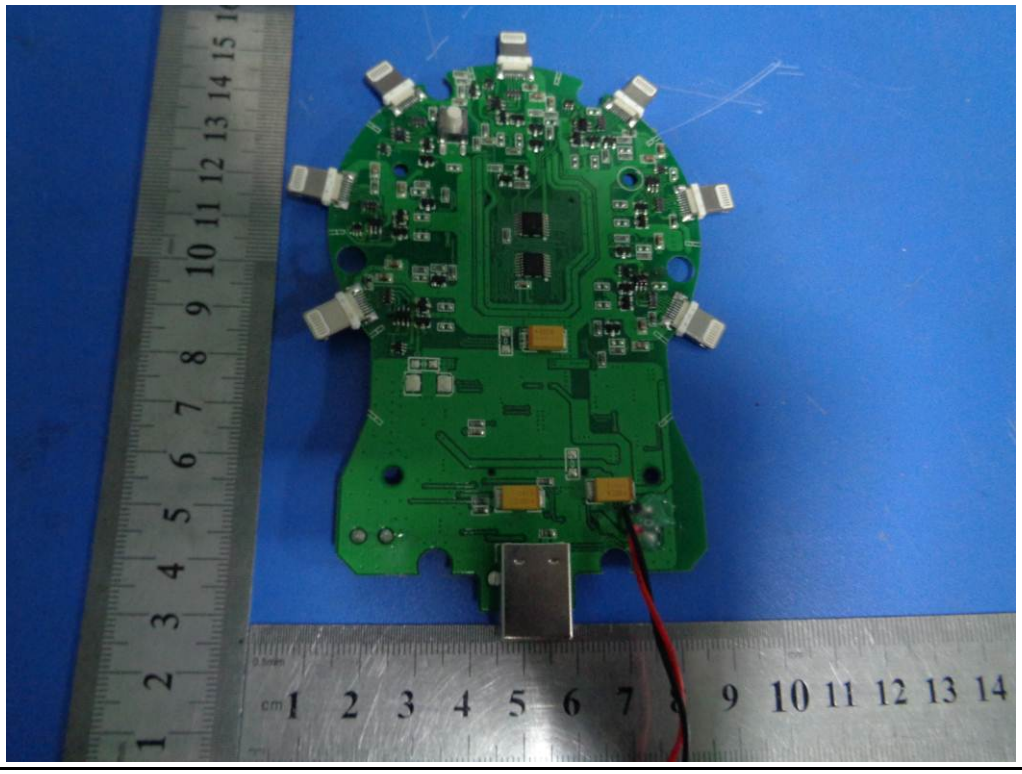
EUT – Battrey Rear View



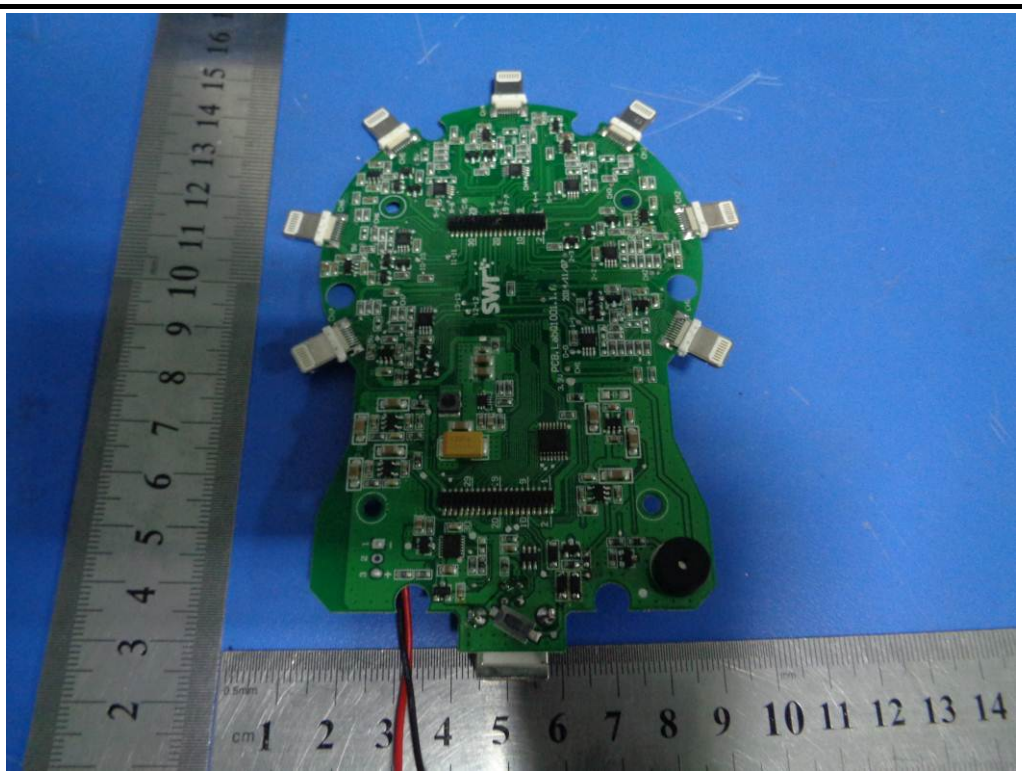
EUT – PCBA 1 Front View



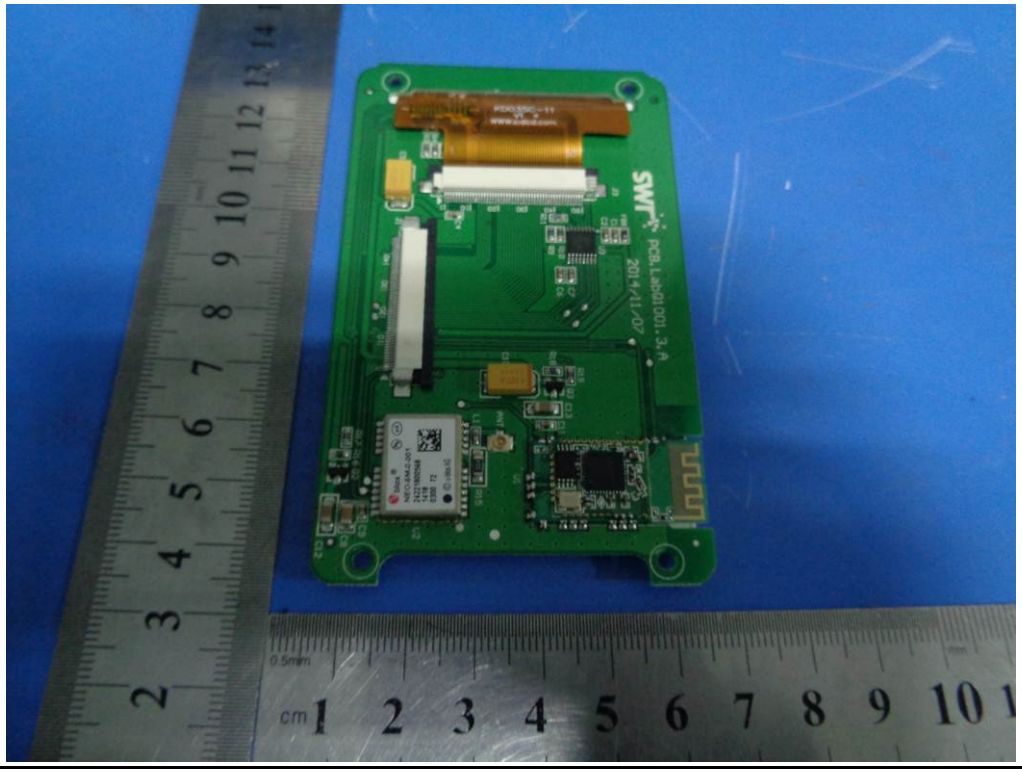
EUT – PCBA 1 Rear View



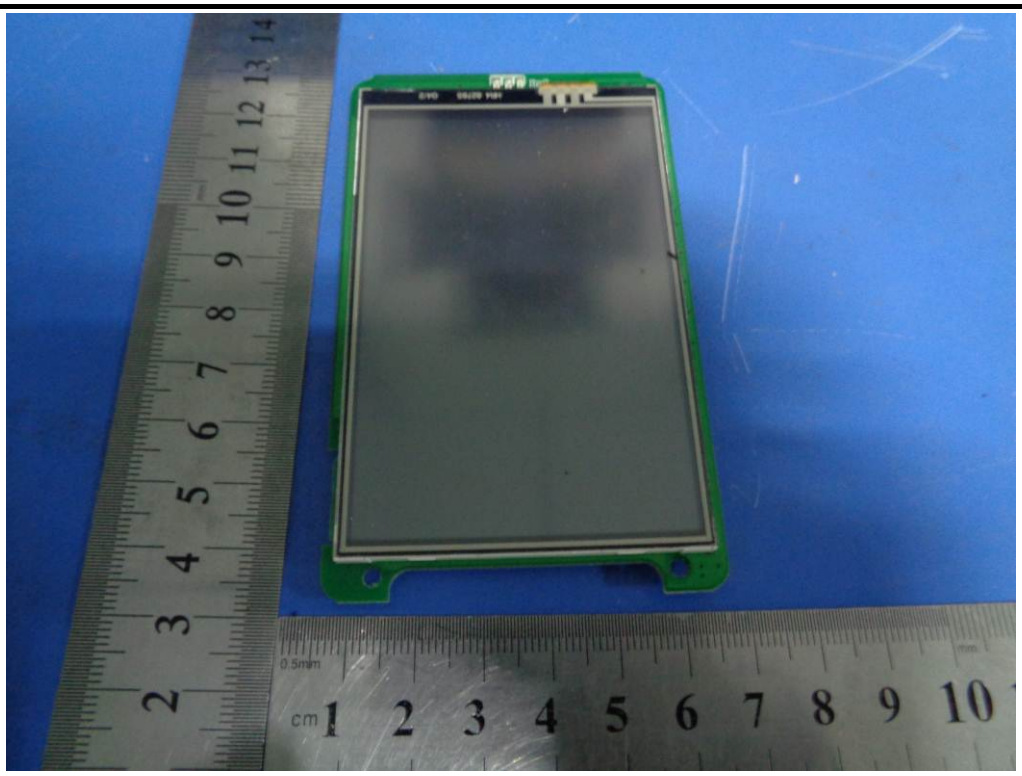
EUT – PCBA 2 Front View



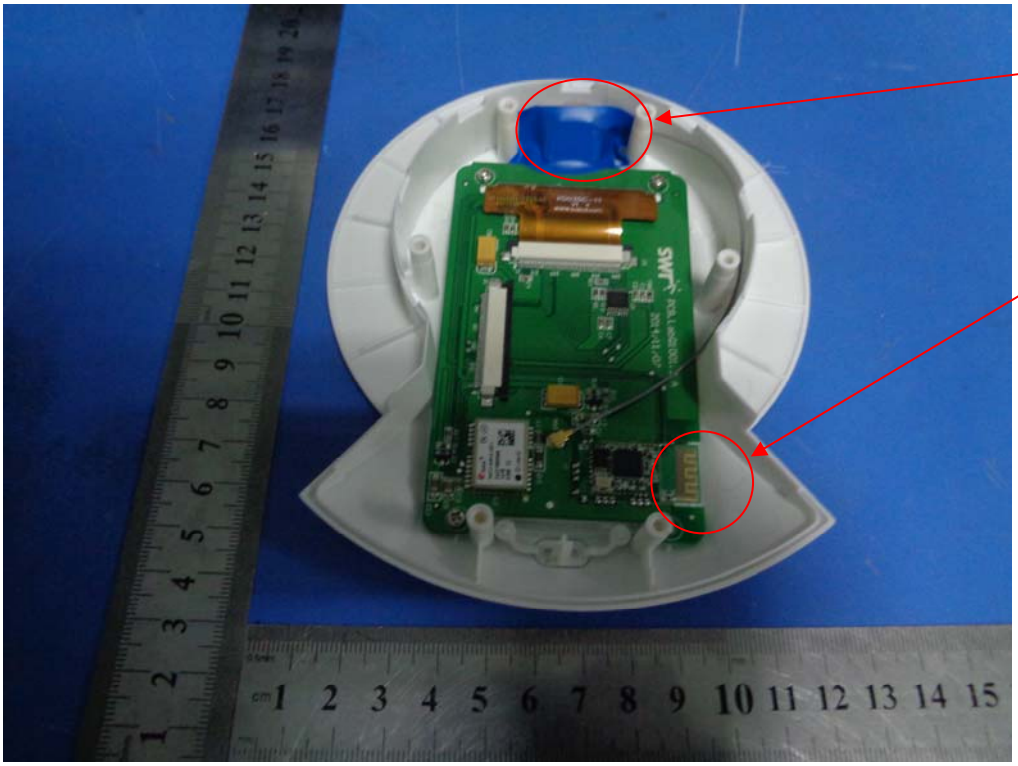
EUT – PCBA 2 Rear View



EUT – PCBA 3 Front View



EUT – PCBA 3 Rear View

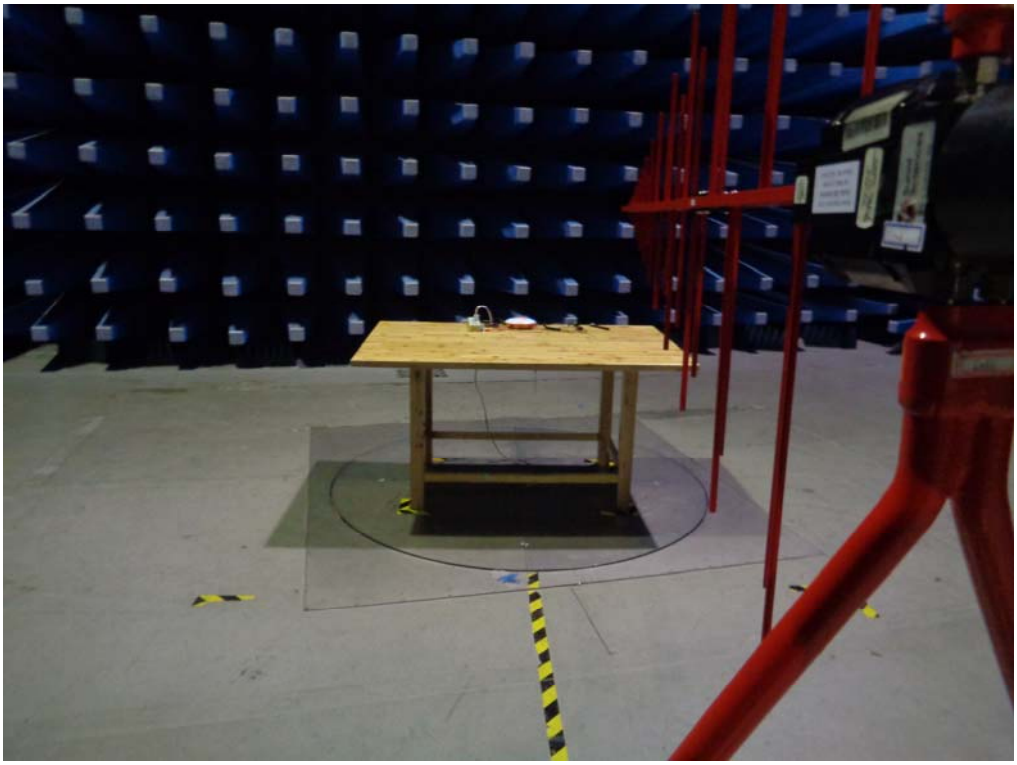


Antenna – Front View

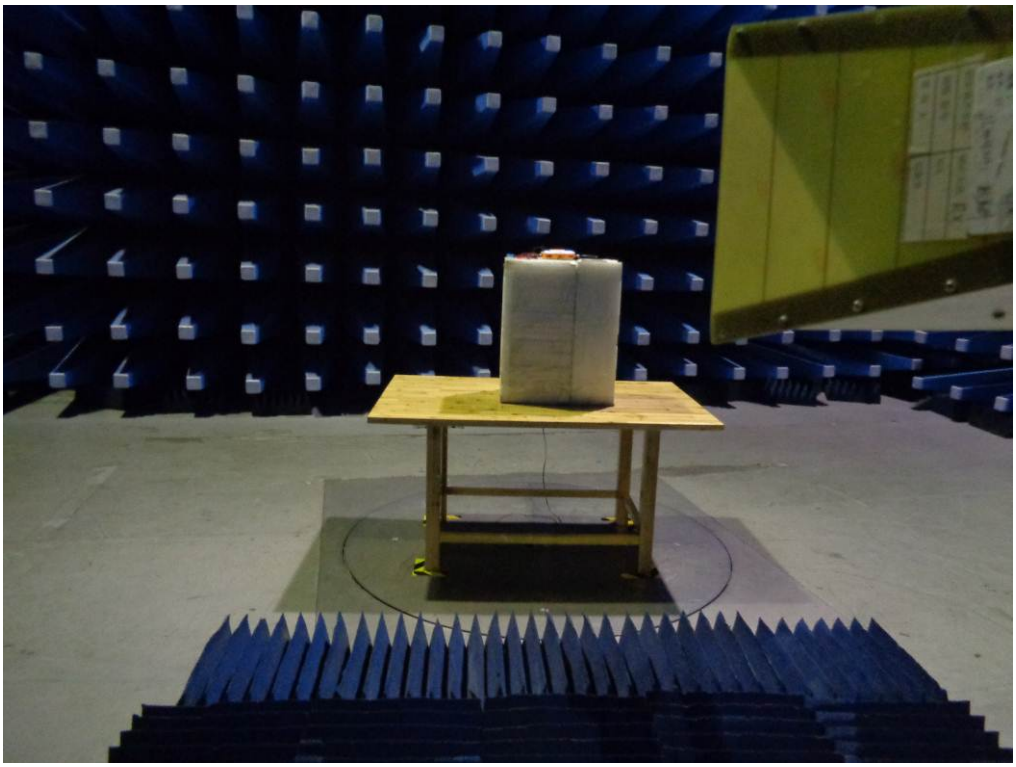
Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Test Setup – Front View

Conducted Emissions Test Setup – Side View



Radiated Spurious Emissions Test Setup Below 1GHz

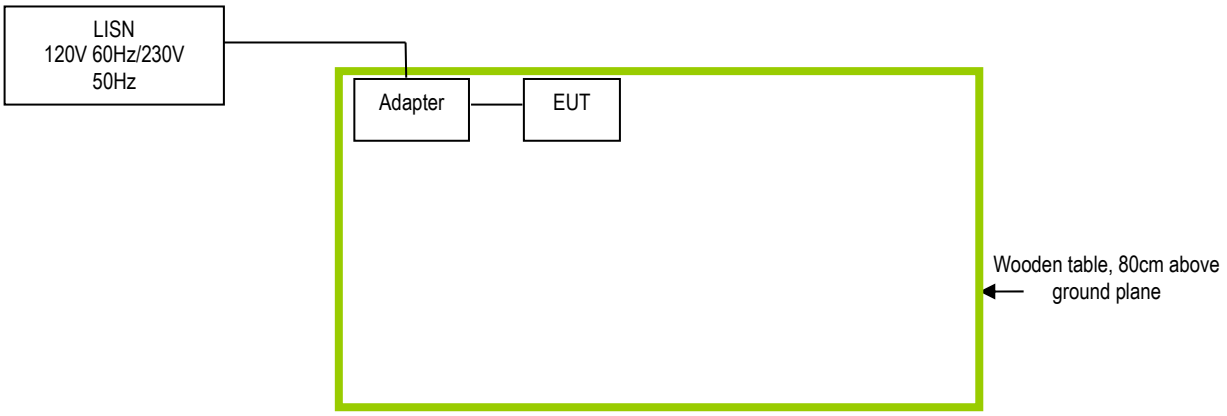


Radiated Spurious Emissions Test Setup above 1GHz

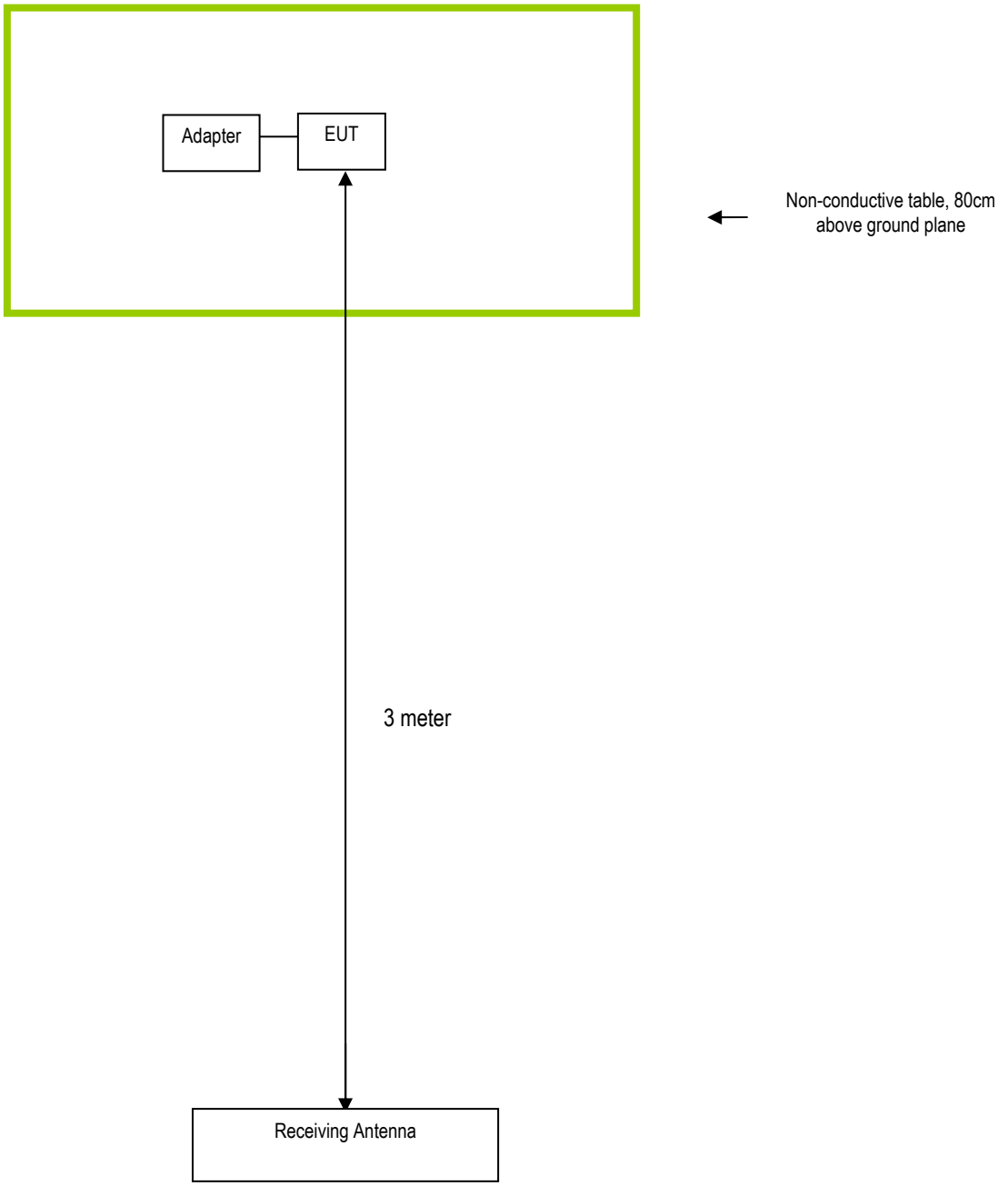
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions



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	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY

Five Models of SenseDisc							
Sensors			Models				
No.	Name	SD00	SD0010 Basic	SD0020 Advanced	SD0030 Physics	SD0040 Biochemistry	SD0050 Environment
			(yellow)	(orange)	(grey)	(blue)	(green)
1	Voltage sensor						
2	Current sensor						
3	Temperature sensor						
4	Motion sensor						
5	Force sensor						
6	Photogate sensor						
7	Sound level sensor						
8	Air pressure sensor						
9	Humidity sensor						
10	Light sensor						
11	DO sensor						
12	pH sensor						
13	Conductivity sensor						
14	Heart rate sensor						
15	Thermocouple sensor						
16	mV sensor						
17	UV sensor						
18	UI						
Built-in sensors	GPS						
	Ambient temperature						
	Barometer						
	Accelerometer(3 Axis)						

For our business issue and marketing requirement, we would like to list different model numbers on the FCC reports and certification as following:modelSD00，model SD0010, model SD0020, model SD0030, model SD0040 model SD0050.The five models have the same Circuits, and PCB. The difference of these models are have different sensor and color, the different sensor does not affect the RF power . FCC ID：2AEEJ-SD

Client's signature 

Client's name / title Ningjiang Xiao /Manager

Contact information / address Jiangsu SWR Science & Technology Co.,Ltd

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