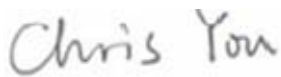


RF TEST REPORT



Report No.: 15070085-FCC-R1

Supersede Report No.: N/A

Applicant	Changsha SunSky Electronic Design & Development Co., Ltd.	
Product Name	Voting Keypad	
Model No.	M40L	
Test Standard	FCC Part 15.249: 2014; C63.10: 2013	
Test Date	Mar. 31 to Apr. 13, 2015	
Issue Date	Apr. 13, 2015	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification ☒		
Equipment did not comply with the specification ☐		
		
Wiky Jam Test Engineer	Chris You Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 Email: China@siemic.com.cn

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

Test Report No.	15070085-FCC-R1
Page	3 of 29

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CONTENTS

1. REPORT REVISION HISTORY	5
2. CUSTOMER INFORMATION	5
3. TEST SITE INFORMATION	5
4. EQUIPMENT UNDER TEST (EUT) INFORMATION	6
5. TEST SUMMARY	7
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS	8
6.1 ANTENNA REQUIREMENT	8
6.2 AC LINE CONDUCTED EMISSIONS	9
6.3 RADIATED SPURIOUS EMISSIONS	11
6.4 FIELD STRENGTH MEASUREMENT	16
6.5 20DB BANDWIDTH TESTING	18
6.6 BAND EDGE	20
ANNEX A. TEST INSTRUMENT	22
ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS	23
ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT	26
ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST	28
ANNEX E. DECLARATION OF SIMILARITY	29

1. Report Revision History

Report No.	Report Version	Description	Issue Date
15070085-FCC-R1	NONE	Original	Apr. 13, 2015

2. Customer information

Applicant Name	Changsha SunSky Electronic Design & Development Co., Ltd.
Applicant Add	Room1024, Building A, Biaozi Business Center No. 198 Xiang Fu Road, Changsha, China
Manufacturer	Changsha SunSky Electronic Design & Development Co., Ltd.
Manufacturer Add	Room1024, Building A, Biaozi Business Center No. 198 Xiang Fu Road, Changsha, China

3. Test site information

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

4. Equipment under Test (EUT) Information

Description of EUT: Voting Keypad

Main Model: M40L

Serial Model: N/A

Date EUT received: Mar. 25, 2015

Test Date(s): Mar. 31 to Apr. 13, 2015

Antenna Gain: 1.8 dBi

Type of Modulation: GFSK

RF Operating Frequency (ies): 2403-2465 MHz

Input Power: DC 3V Supply by Battery

Trade Name :  SunVote®

FCC ID: WSVSUNVOTEKEY40

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
§15.207(a)	AC Line Conducted Emissions	N/A
§15.205, §15.209, §15.249(a), §15.249(d)	Radiated Fundamental / Radiated Spurious Emissions	Compliance
§15.249(a)	Field Strength Measurement	Compliance
§15.249©	20 dB Bandwidth	Compliance
§15.249(d)	Band Edge	Compliance

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and 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)	+5.6dB/-4.5dB
-	-	-

6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

6.1 Antenna Requirement

Standard Requirement:

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

Antenna Connector Construction

A permanently attached PCB antenna, the gain is 1.8 dBi.

Test Result: Pass

6.2 AC Line Conducted Emissions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	----
Tested By :	Wiky Jam

Spec	Item	Requirement	Applicable														
§15.207	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.	☒														
		<table><tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBµV)</th></tr><tr><th>QP</th><th>Average</th></tr><tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 46</td></tr><tr><td>0.5 ~ 5</td><td>56</td><td>46</td></tr><tr><td>5 ~ 30</td><td>60</td><td>50</td></tr></table>		Frequency ranges (MHz)	Limit (dBµV)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50
		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.															

Test Report No.	15070085-FCC-R1
Page	10 of 29

	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 ☒ N/A

Test Data ☐ Yes ☒ N/A

Test Plot ☐ Yes (See below) ☒ N/A

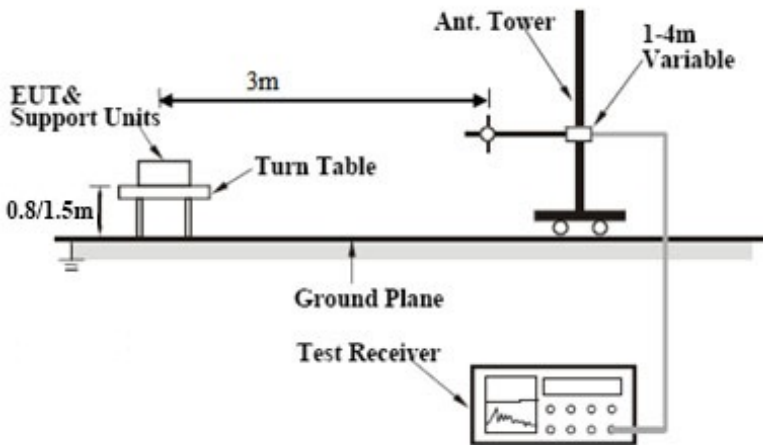
Note: Battery Operated

6.3 Radiated Spurious Emissions

Temperature	24°C
Relative Humidity	60%
Atmospheric Pressure	1012 mbar
Test date :	Mar. 31, 2015
Tested By :	Wiky Jam

Requirement(s):

Spec	Requirement	Applicable															
§15.209, §15.205, §15.249(a) & §15.249(d)	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. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following: <table border="1"> <thead> <tr> <th>Fundamental frequency</th><th>Field strength of fundamental (millivolts/meter)</th><th>Field strength of harmonics (microvolts/meter)</th></tr> </thead> <tbody> <tr> <td>902– 928 MHz</td><td>50</td><td>500</td></tr> <tr> <td>2400– 2483.5 MHz</td><td>50</td><td>500</td></tr> <tr> <td>5725– 5875 MHz</td><td>50</td><td>500</td></tr> <tr> <td>24.0– 24.25 GHz</td><td>250</td><td>2500</td></tr> </tbody> </table>	Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)	902– 928 MHz	50	500	2400– 2483.5 MHz	50	500	5725– 5875 MHz	50	500	24.0– 24.25 GHz	250	2500	☒
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)															
902– 928 MHz	50	500															
2400– 2483.5 MHz	50	500															
5725– 5875 MHz	50	500															
24.0– 24.25 GHz	250	2500															

Test Setup	
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Procedure	- Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function - For emission frequencies measured below 1GHz, a pre-scan is performed in a
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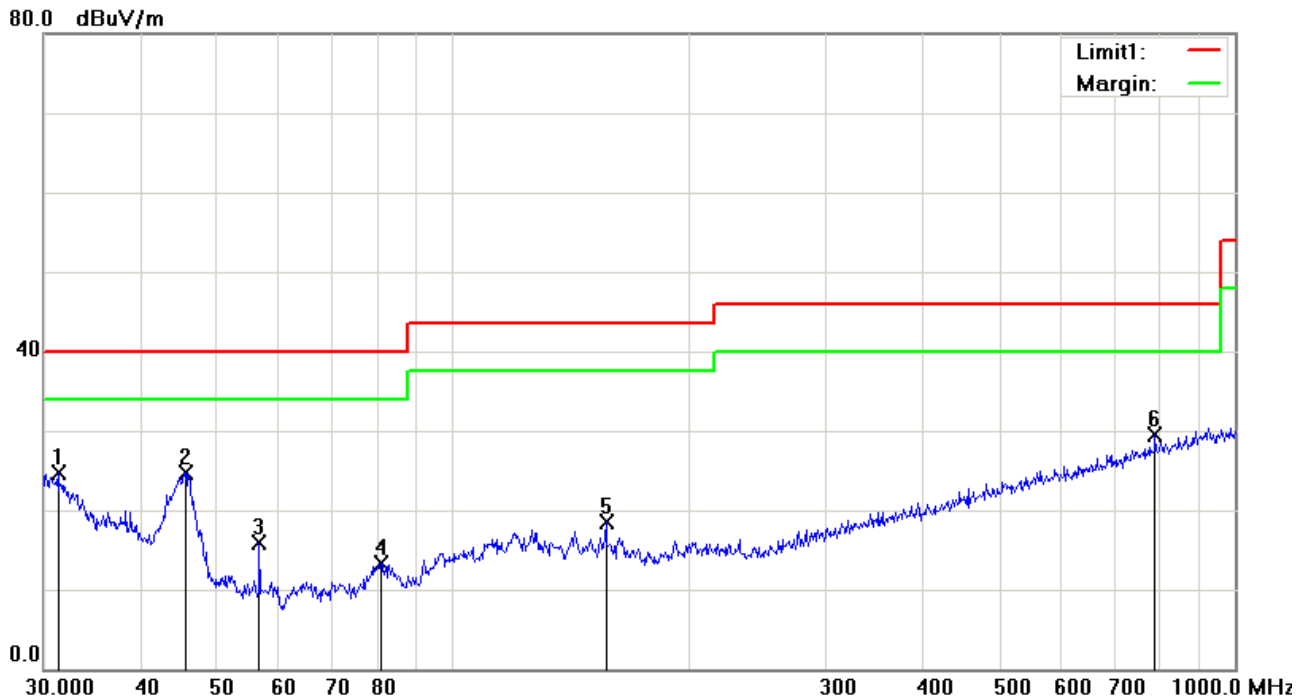
Test Report No.	15070085-FCC-R1
Page	12 of 29

	shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1GHZ, a pre-scan also be performed with a meter measuring distance before final test. - For emission frequencies measured below and above 1GHz, set the spectrum analyzer on a 100kHz and 1MHz resolution bandwidth respectively for each frequency measured in step 2. - The search antenna is to be raised and lowered over a range from 1 to 4m in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, the change the orientation of EUT on the test table over a range from 0 to 360°. With a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. - Repeat step 4 until all frequencies need to be measured was complete. - Repeat step5 with search antenna in vertical polarized orientations.
Remark	
Result	☒ Pass ☐ Fail

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

Test Mode: Transmitting Mode

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBμV/m)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
1	H	31.2893	25.87	peak	-1.20	24.67	40.00	-15.33	185	360
2	H	45.5348	26.41	peak	-1.71	24.70	40.00	-15.30	200	357
3	H	56.5929	29.91	peak	-13.96	15.95	40.00	-24.05	100	134
4	H	80.9275	27.10	peak	-13.72	13.38	40.00	-26.62	173	360
5	H	157.0074	26.89	peak	-8.31	18.58	43.50	-24.92	200	245
6	H	790.6188	26.48	peak	3.06	29.54	46.00	-16.46	200	196



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBμV/m)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
1	V	37.5479	27.82	peak	-5.77	22.05	40.00	-17.95	100	4
2	V	40.2757	31.40	peak	-7.71	23.69	40.00	-16.31	199	360
3	V	56.0007	34.41	peak	-14.13	20.28	40.00	-19.72	100	353
4	V	81.2117	34.95	peak	-13.77	21.18	40.00	-18.82	100	79
5	V	85.8984	31.89	peak	-13.77	18.12	40.00	-21.88	100	319
6	V	790.6188	27.09	peak	3.40	30.49	46.00	-15.51	200	280

Above 1GHz

Low Channel (2403 MHz)

Frequency (MHz)	SA Reading (dBμV)	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)
4806	31.29	AV	V	33.82	4.87	27.32	42.66	54	-11.34
4806	33.68	AV	H	33.82	4.87	27.32	45.05	54	-8.95
4806	38.51	PK	V	33.82	4.87	27.32	49.88	74	-24.12
4806	37.56	PK	H	33.82	4.87	27.32	48.93	74	-25.07

Middle Channel (2433 MHz)

Frequency (MHz)	SA Reading (dBμV)	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)
4866	31.64	AV	V	33.84	4.87	26.32	44.03	54	-9.97
4866	32.05	AV	H	33.84	4.87	26.32	44.44	54	-9.56
4866	36.28	PK	V	33.84	4.87	26.32	48.67	74	-25.33
4866	35.91	PK	H	33.84	4.87	26.32	48.3	74	-25.7

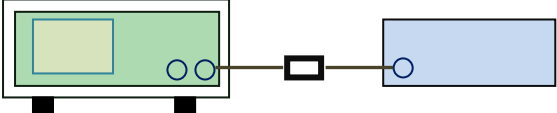
High Channel (2465 MHz)

Frequency (MHz)	SA Reading (dBμV)	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)
4930	31.44	AV	V	33.86	4.87	26.72	43.45	54	-10.55
4930	33.51	AV	H	33.86	4.87	26.72	45.52	54	-8.48
4930	36.98	PK	V	33.86	4.87	26.72	48.99	74	-25.01
4930	36.17	PK	H	33.86	4.87	26.72	48.18	74	-25.82

6.4 Field Strength Measurement

Temperature	23°C
Relative Humidity	59%
Atmospheric Pressure	1011 mbar
Test date :	Apr. 13, 2015
Tested By :	Wiky Jam

Requirement(s):

Spec	Requirement	Applicable															
§15.249(a)	<table border="1"> <thead> <tr> <th>Fundamental frequency</th><th>Field strength of fundamental (millivolts/ meter)</th><th>Field strength of harmonics (microvolts/ meter)</th></tr> </thead> <tbody> <tr> <td>902–928 MHz</td><td>50</td><td>500</td></tr> <tr> <td>2400–2483.5 MHz</td><td>50</td><td>500</td></tr> <tr> <td>5725–5875 MHz</td><td>50</td><td>500</td></tr> <tr> <td>24.0–24.25 GHz</td><td>250</td><td>2500</td></tr> </tbody> </table>	Fundamental frequency	Field strength of fundamental (millivolts/ meter)	Field strength of harmonics (microvolts/ meter)	902–928 MHz	50	500	2400–2483.5 MHz	50	500	5725–5875 MHz	50	500	24.0–24.25 GHz	250	2500	☒
Fundamental frequency	Field strength of fundamental (millivolts/ meter)	Field strength of harmonics (microvolts/ meter)															
902–928 MHz	50	500															
2400–2483.5 MHz	50	500															
5725–5875 MHz	50	500															
24.0–24.25 GHz	250	2500															
Test Setup	 Spectrum Analyzer EUT																
Test Procedure	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.																
Remark																	
Result	☒ Pass ☐ Fail																

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Report No.	15070085-FCC-R1
Page	17 of 29

Test Mode:	Transmitting Mode
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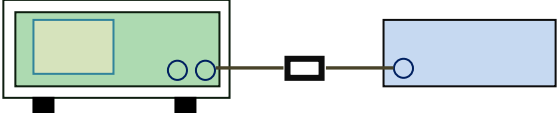
Field Strength Measurement

Frequency (MHz)	SA Reading (dBμV)	Detector (PK/AV)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)
2403	80.35	AV	33.86	4.56	26.72	92.05	94
2403	85.45	PK	33.86	4.56	26.72	97.15	114
2433	80.04	AV	33.86	4.87	26.70	92.07	94
2433	85.36	PK	33.86	4.87	26.70	97.39	114
2465	80.93	AV	33.86	4.95	26.59	93.15	94
2465	85.61	PK	33.86	4.95	26.59	97.83	114

6.5 20dB Bandwidth Testing

Temperature	24°C
Relative Humidity	58%
Atmospheric Pressure	1009 mbar
Test date :	Apr. 02, 2015
Tested By :	Wiky Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§15.215(c)	a)	Radiated Emissions Measurement Uncertainty All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz (3m & 10m) & 1GHz above (3m) is +5.6/-4.5dB.	☒
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value. - Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth. - Repeat above procedures until all frequencies measured were complete.		
Remark			

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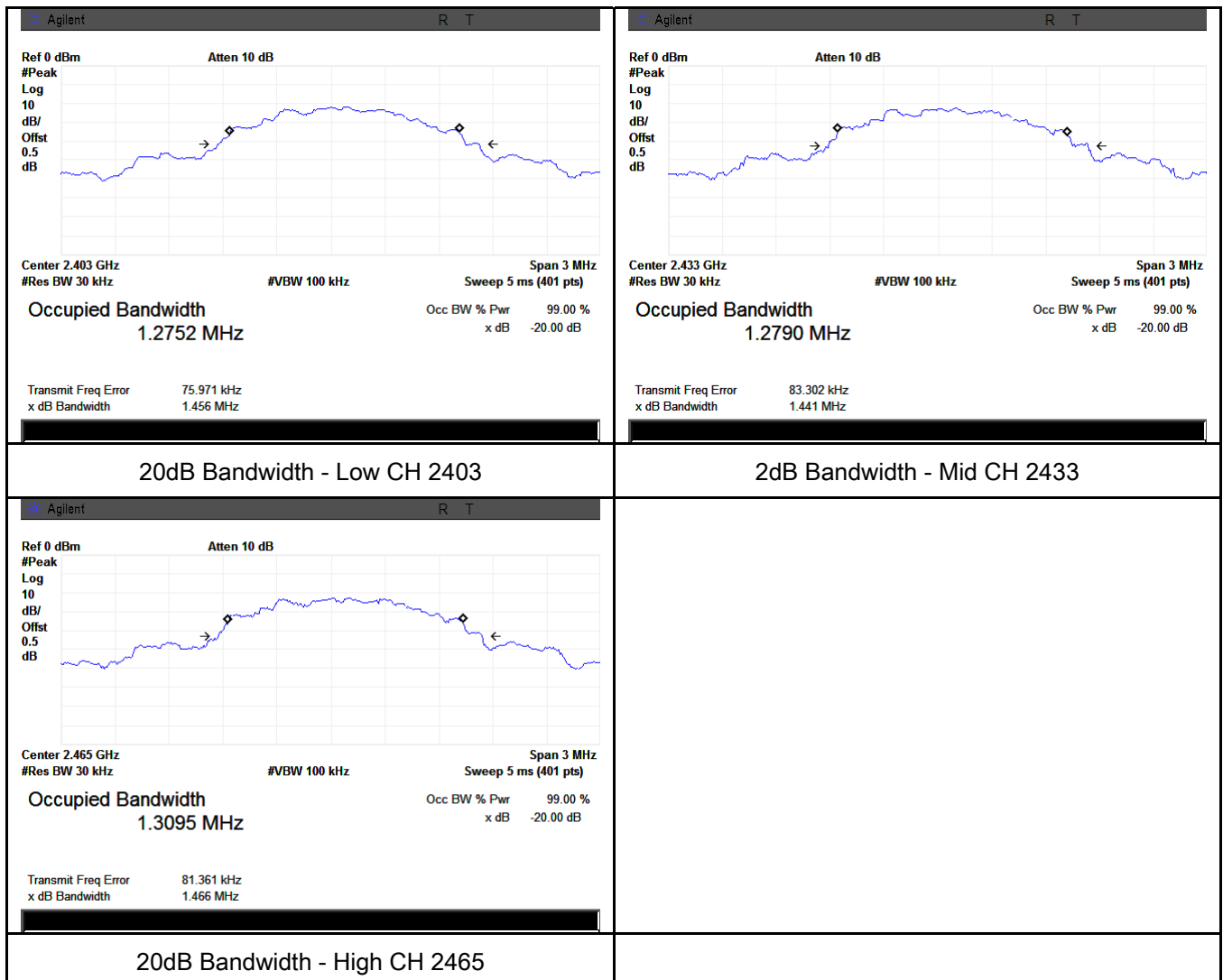
Test Data	☒ Yes	☐ N/A
Test Plot	☒ Yes (See below)	☐ N/A

20dB Bandwidth measurement result

CH	Fundamental Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low	2403	1.456	Pass
Middle	2433	1.441	Pass
High	2465	1.466	Pass

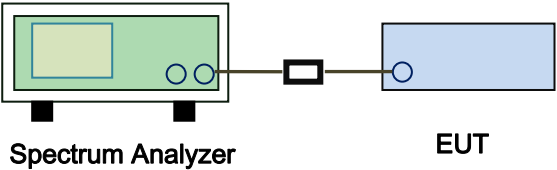
Test Plots

20dB Bandwidth measurement result



6.6 Band Edge

Temperature	24°C
Relative Humidity	60%
Atmospheric Pressure	1012mbar
Test date :	Mar. 31, 2015
Tested By :	Wiky Jam

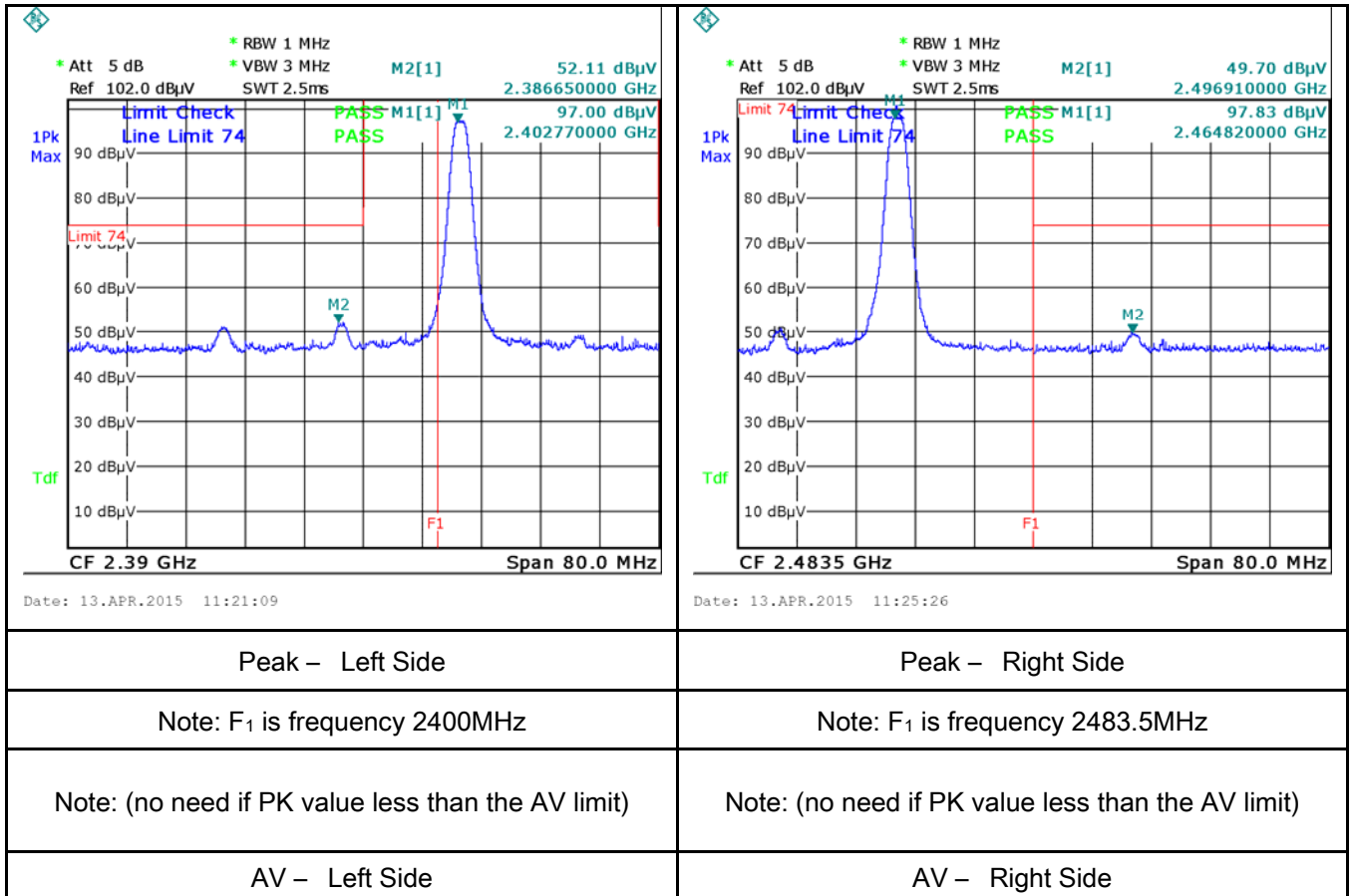
Spec	Item	Requirement	Applicable
§15.249(d)	a)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.	☒
Test Setup	 Spectrum Analyzer EUT		
Test Procedure	- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - 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. - Set both RBW and VBW of spectrum analyzer to 1MHz. - 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. - Repeat above procedures until all measured frequencies were complete.		
Remark			
Result	☒ Pass ☐ Fail		

Test Report No.	15070085-FCC-R1
Page	21 of 29

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

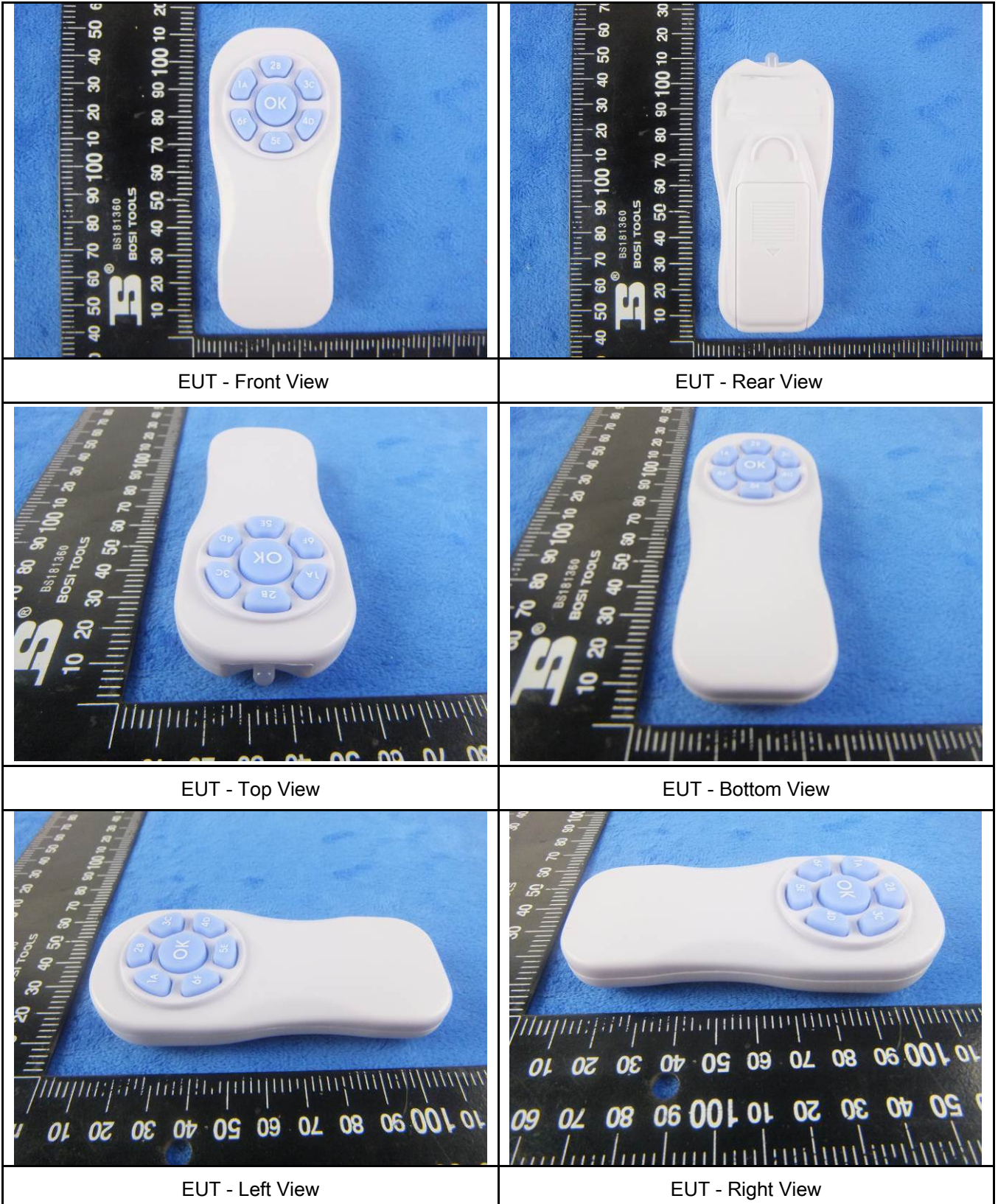


Annex A. TEST INSTRUMENT

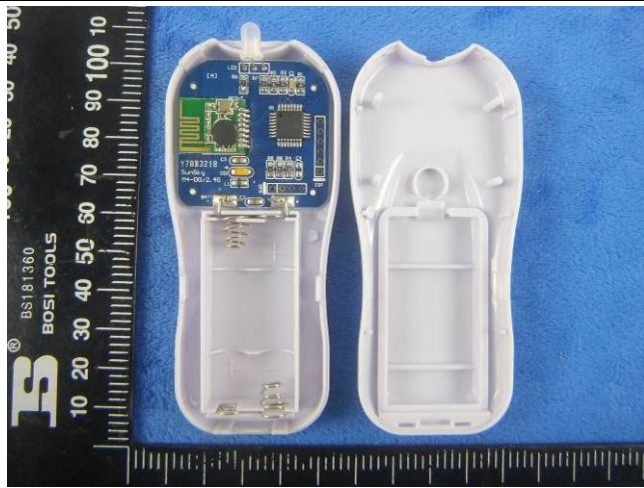
Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/18/2014	09/17/2015	☒
Line Impedance	LI-125A	191106	09/26/2014	09/25/2015	☒
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	☒
LISN	ISN T800	34373	09/26/2014	09/25/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☒
Transient Limiter	LIT-153	531118	09/02/2014	09/01/2015	☒
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/18/2014	09/17/2015	☒
Power Splitter	1#	1#	09/02/2014	09/01/2015	☒
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	☒
Radiated Emissions					
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	☒
Positioning Controller	UC3000	MF780208282	11/20/2014	11/19/2015	☒
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2014	09/01/2015	☒
Microwave Preamplifier (0.5 ~ 18GHz)	PAM-118	443008	09/02/2014	09/01/2015	☒
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	☒
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	☒
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	☒

Annex B. EUT And Test Setup Photographs

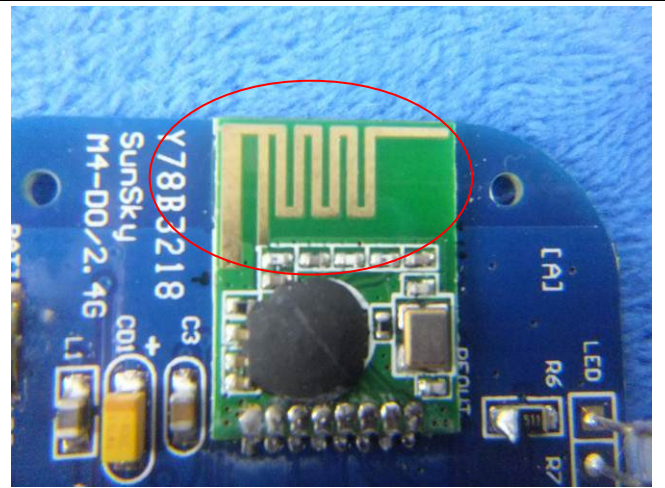
Annex B.i. Photograph: EUT External Photo



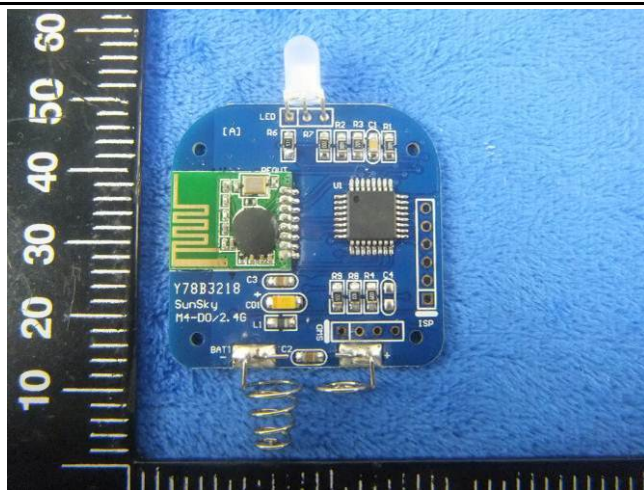
Annex B.ii. Photograph: EUT Internal Photo



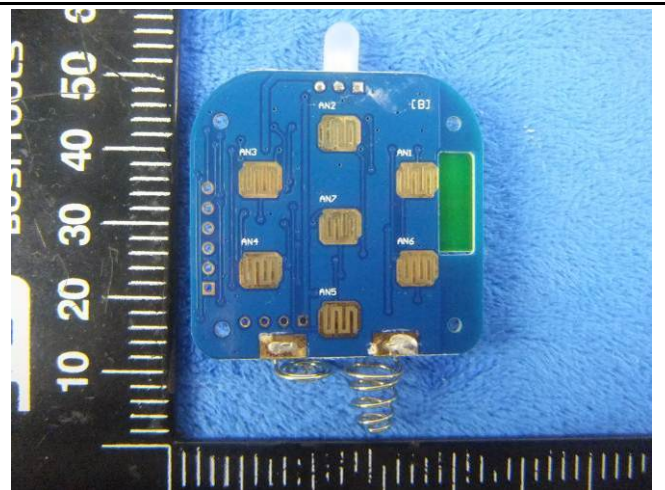
Cover off - Front View



Antenna View



Mainboard - Front View

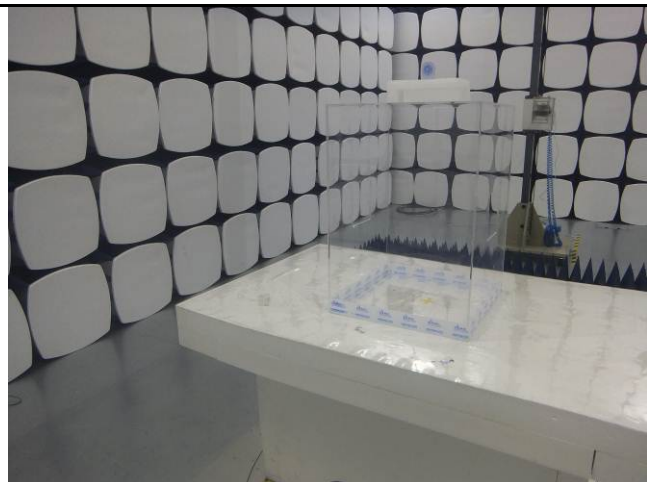


Mainboard - Rear View

Annex B.iii. Photograph: Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz

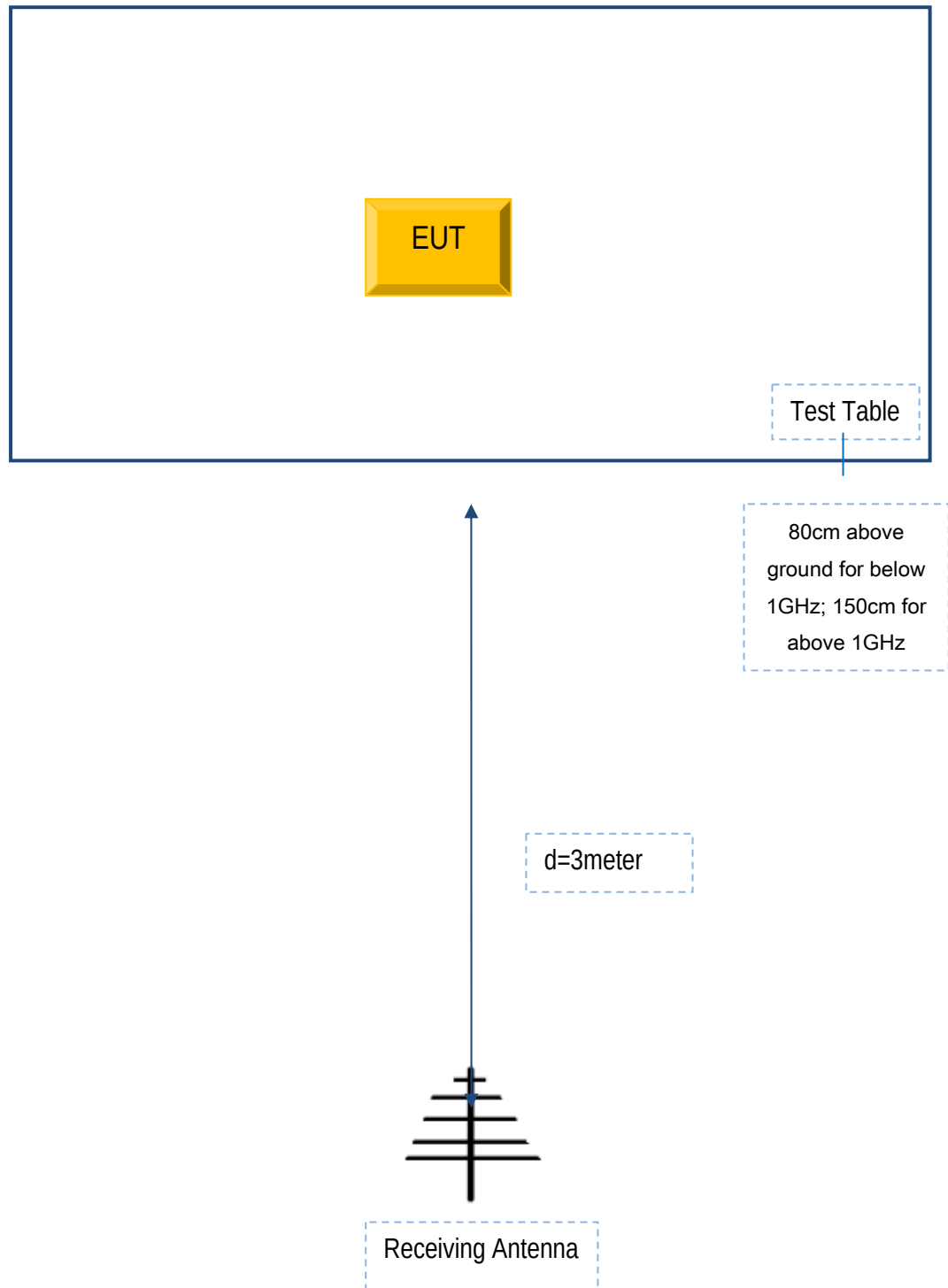


Radiated Spurious Emissions Test Setup Above
1GHz

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions



Test Report No.	15070085-FCC-R1
Page	27 of 29

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

Test Report No.	15070085-FCC-R1
Page	28 of 29

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

Please see attachment

Test Report No.	15070085-FCC-R1
Page	29 of 29

Annex E. DECLARATION OF SIMILARITY

N/A