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.	an Chris You		
Wiky Ja Test Engir	1925年 1926年 19		

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

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

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES	
	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park	
Lab Address	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	



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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



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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,	Radiated Fundamental	Compliance	
§15.249(a), §15.249(d)	/ Radiated Spurious Emissions		
§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	
-	-	-	



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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



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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.			>
		Frequency ranges	Limit (dBμV)	
		(MHz)	QP	Average	
		0.15 ~ 0.5	66 – 56	56 – 46	
		0.5 ~ 5	56	46	
		5 ~ 30	60	50	
Test Setup	Horizontal Ground Reference Plane Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm				
	The EUT and supporting equipment were set up in accordance with the requirements				
Procedure	 of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table. 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. 				



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	4.	All other sup	porting equipmen	t were powered separately from another main supply.
	5.	The EUT wa	as switched on and	d allowed to warm up to its normal operating condition.
	6.	A scan was	made on the NEU	TRAL line (for AC mains) or Earth line (for DC power)
		over the req	uired frequency ra	ange using an EMI test receiver.
	7.	High peaks,	relative to the limi	it line, The EMI test receiver was then tuned to the
		selected free	quencies and the r	necessary measurements made with a receiver
		bandwidth s	etting of 10 kHz.	
	8.	Step 7 was f	then repeated for t	the LIVE line (for AC mains) or DC line (for DC power).
Remark				
Result		Pass	☐ Fail	V N/A
Test Data	Yes	3	V N/A	

Note: Battery Operated

Test Plot Yes (See below) N/A



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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,	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:				
§15.205, §15.249(a) & §15.249(d)	Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)	V	
	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	Ant. Tower 1-4m Variable Support Units Turn Table				
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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	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	
Roman	
Result	Pass Fail

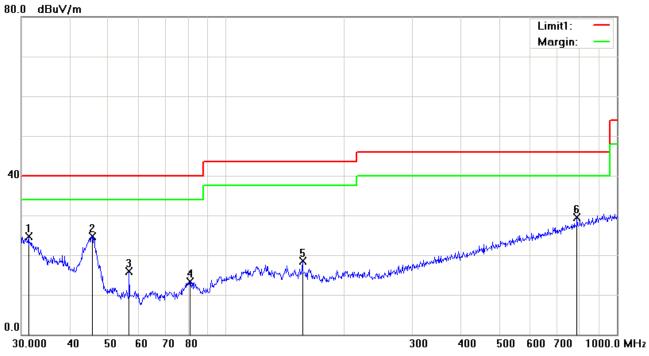
Test Data	Yes	□ _{N/A}
Test Plot	Yes (See below)	$\square_{N/A}$



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Test Mode: Transmitting Mode

(Below 1GHz)



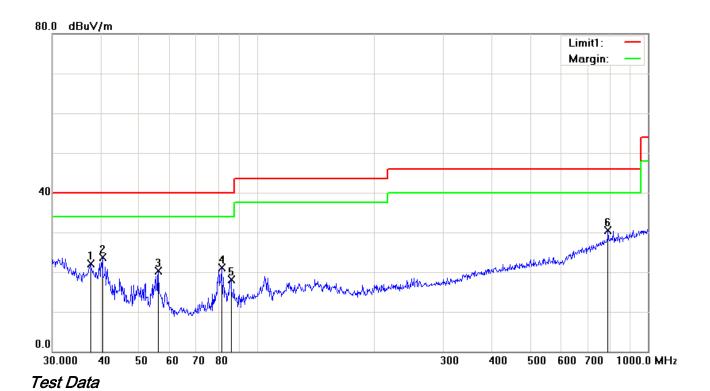
Test Data

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	Η	31.2893	25.87	peak	-1.20	24.67	40.00	-15.33	185	360
2	Н	45.5348	26.41	peak	-1.71	24.70	40.00	-15.30	200	357
3	Н	56.5929	29.91	peak	-13.96	15.95	40.00	-24.05	100	134
4	Н	80.9275	27.10	peak	-13.72	13.38	40.00	-26.62	173	360
5	Н	157.0074	26.89	peak	-8.31	18.58	43.50	-24.92	200	245
6	Н	790.6188	26.48	peak	3.06	29.54	46.00	-16.46	200	196



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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



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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	Η	33.82	4.87	27.32	45.05	54	-8.95
4806	38.51	PK	٧	33.82	4.87	27.32	49.88	74	-24.12
4806	37.56	PK	Н	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	Н	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	Н	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	Н	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	Н	33.86	4.87	26.72	48.18	74	-25.82



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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			Applicable
§15.249(a)	Fundamental frequency	Field strength of fundamental (millivolts/ meter)	Field strength of harmonics (microvolts/ meter)	×.
	902–928 MHz 2400–2483.5 MHz 5725–5875 MHz 24.0–24.25 GHz	50 50 50 250	500 500 500 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,			
Remark	whichever is the lesser attenuation	on.		
Result	Pass			

Test Data	Yes	□ _{N/A}
Test Plot	Yes (See below)	□ _{N/A}



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Test Mode: Transmitting Mode

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



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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		·		



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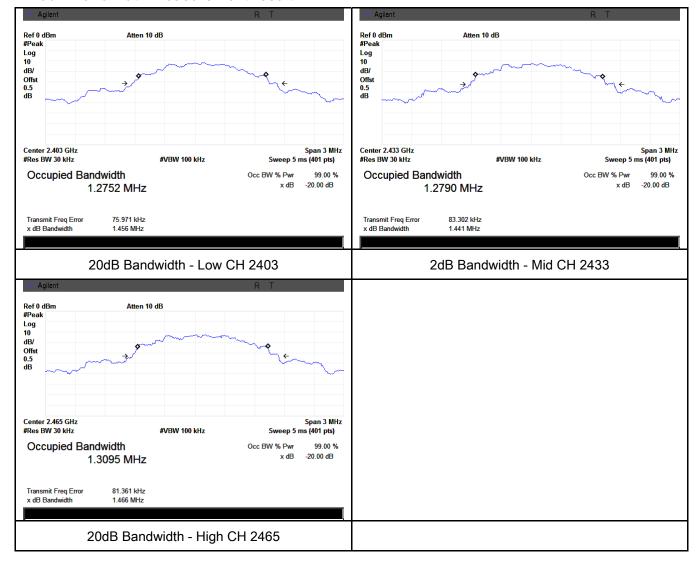
Result	Pass	Fail
Test Data	Yes	N/A
Test Plot	Yes (See below)	□ _{N/A}

20dB Bandwidth measurement result

СН	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





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6.6 Band Edge

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

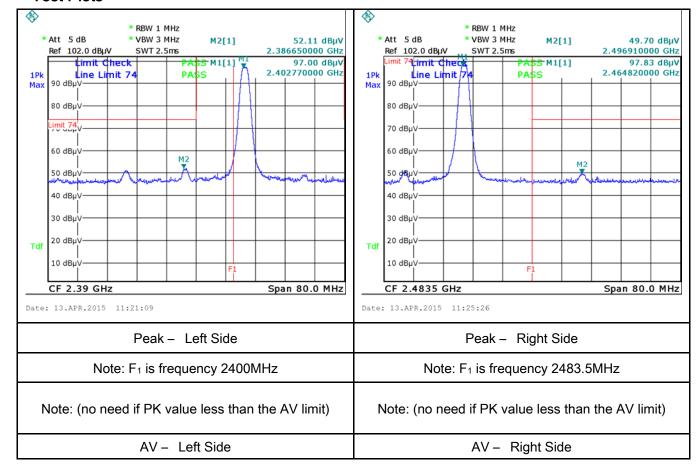
Spec	Item	Requirement	Applicable
§15.249(d)	a)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.	
Test Setup		Spectrum Analyzer EUT	
Test Procedure	- - -	Check the calibration of the measuring instrument using eith internal calibrator or a known signal from an external general Position the EUT without connection to measurement instrument on the Rotated table and turn on the EUT and make it operator transmitting mode. Then set it to Low Channel and High Chaits operating range, and make sure the instrument is operator range. Set both RBW and VBW of spectrum analyzer to 1MHz. Measure the highest amplitude appearing on spectral displace as a reference level. Plot the graph with marking the highest edge frequency. Repeat above procedures until all measured frequencies we	tor. ment. Put it te in annel within ed in its linear by and set it point and
Remark			
Result	Pas	ss Fail	



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Test Data	Data Yes	
Test Plot	Yes (See below)	□ _{N/A}

Test Plots





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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	<u><</u>
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	<u><</u>
LISN	ISN T800	34373	09/26/2014	09/25/2015	<u><</u>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	N
Transient Limiter	LIT-153	531118	09/02/2014	09/01/2015	V
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/18/2014	09/17/2015	<u><</u>
Power Splitter	1#	1#	09/02/2014	09/01/2015	<u> </u>
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	<u><</u>
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	V
Microwave Preamplifier (0.5 ~ 18GHz)	PAM-118	443008	09/02/2014	09/01/2015	V
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	V
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	K
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	V



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Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo



EUT - Front View

EUT - Rear View





EUT - Top View

EUT - Bottom View



EUT - Left View



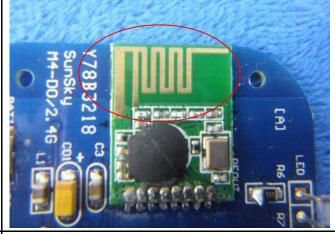
EUT - Right View



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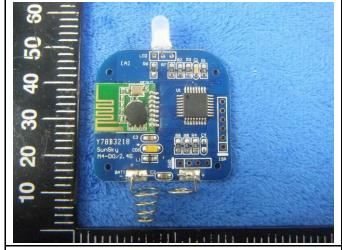
Annex B.ii. Photograph: EUT Internal Photo



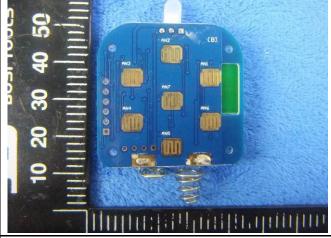


Cover off - Front View





Mainborad - Front View

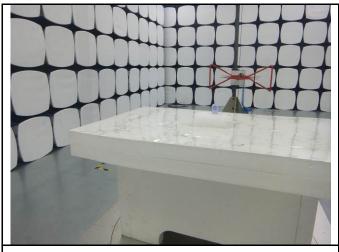


Mainborad - Rear View

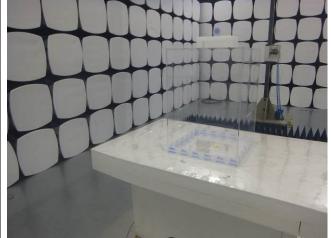


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Annex B.iii. Photograph: Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz



Radiated Spurious Emissions Test Setup Above 1GHz

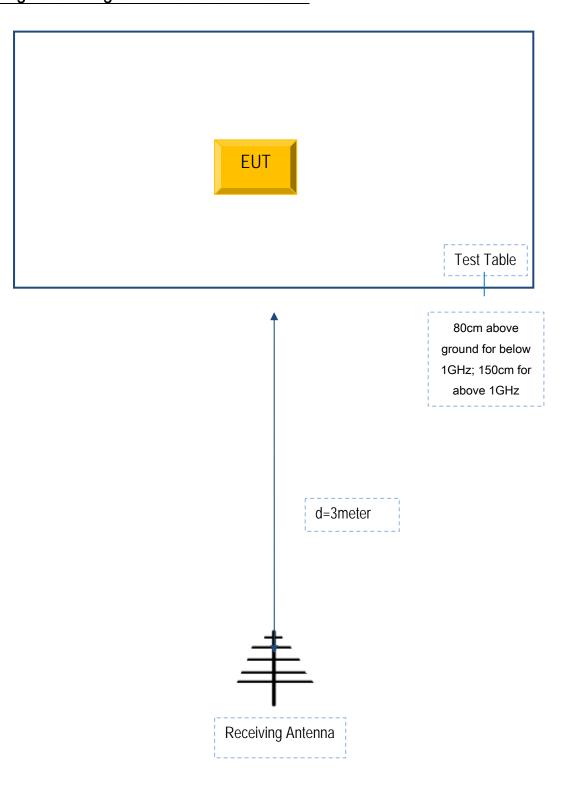


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Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions





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Annex C. il. 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



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

Please see attachment



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Annex E. DECLARATION OF SIMILARITY

N/A