FCC/ISED RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Ring Keypad

ISSUED TO
LEEDARSON LIGHTING CO., LTD.

Xingtai Industrial Zone, Changtai County, Zhangzhou, Fujian, China

Report No.:	BL-SZ17C0281-601
EUT Name:	Ring Keypad
Model Name:	4AK1S70EN0
Brand Name:	LEEDARSON
Test Standard:	47 CFR Part 15 Subpart C
	RSS-210 Issue 9 (2016-8)
	RSS-Gen Issue 4 (2014-11)
FCC ID:	2AB2Q-BHAKP001
ISED Number:	10256A-BHAKP001
Test conclusion:	Pass
Test Date:	Dec. 22, 2017 ~ Dec. 27, 2017
Date of Issue:	Jan. 02, 2018

Tested by: Hu Chao
Hu Chao
(Engineer)
Date Jan. 02, 2018

Approved by:
Liao Jianming
(Technical Director)
Date Jan. 02, 2018

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Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jan. 02, 2018	Initial Issue

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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation(A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20 to 25℃
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

(1) The test report reference to the report template version v6.6.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	LEEDARSON LIGHTING CO., LTD.
Address	Xingtai Industrial Zone, Changtai County, Zhangzhou, Fujian, China

2.2 Manufacturer Information

Manufacturer	LEEDARSON LIGHTING CO., LTD.
Address	Xingtai Industrial Zone, Changtai County, Zhangzhou, Fujian, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Ring Keypad
Model Name Under Test	4AK1S70EN0
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A
Network and Wireless connectivity	Z-WAVE 908.4~916 MHz

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	Great Power
	Model No.	GSP454487
	Serial No.	N/A
	Capacitance	2200 mAh
	Rated Voltage	3.7 V
	Limit Charge Voltage	4.2 V
Ancillary Equipment 2	Adapter	
	Brand Name	INNOV
	Model No.	IVP0500-1000U
	Serial No.	N/A
	Rated Input	100-240 V~, 0.5 A, 50/60 Hz
	Rated Output	5 V⎓ 1 A
Ancillary Equipment 3	USB Cable	
	Length (Approx.)	2.0 m

2.6 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

Modulation Type	Z-WAVE
Product Type	☒ Mobile ☐ Portable ☐ Fix Location
Frequency Range	902 MHz to 927 MHz
Tested Channel	Low (908.4 MHz), Middle (908.42 MHz), High (916 MHz)
Antenna Type	PCB Antenna
Antenna Gain	2.7 dBi (In test items related to antenna gain, the final results reflect this figure.)

2.7 Additional Instructions

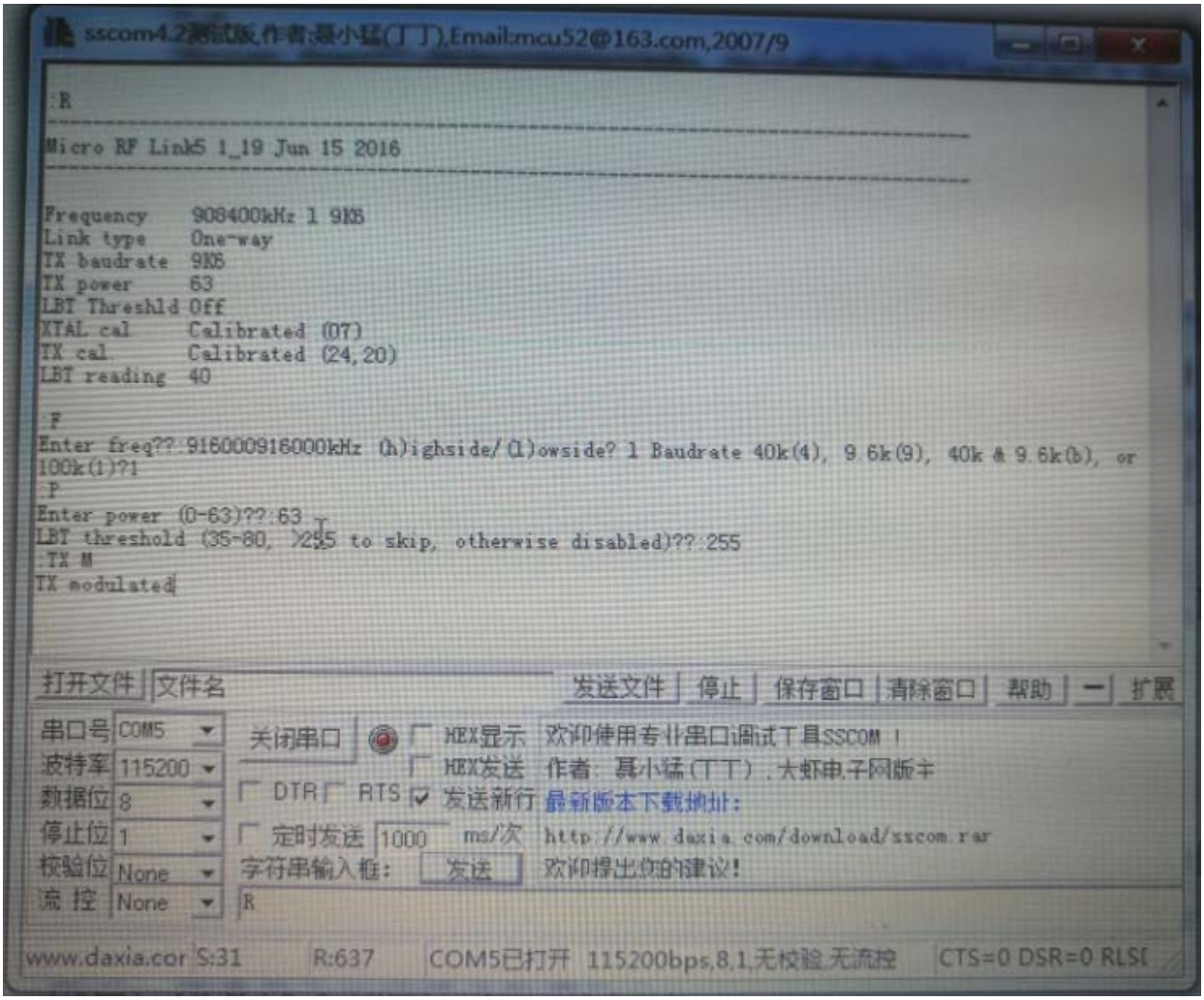
EUT Software Settings:

Mode	☒ Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power level setup in software			
Test Software Version	SSCOM3.2		
Support Units (Software installation media)	Description	Manufacturer	Model
	Laptop	Lenovo	E31-80
Mode	Channel	Frequency (MHz)	Soft Set
GFSK	High	916	Power parameter Settings is 63
	Middle	908.42	
	Low	908.4	

Run Software:



3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-16 Edition)	Intentional Radiators
2	RSS-Gen (Issue 4, Nov. 2014)	General Requirements for Compliance of Radio Apparatus
3	RSS-210 (Issue 9, August 2016)	Licence-Exempt Radio Apparatus: Category I Equipment
4	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	ISED Part No.	Test Result	Verdict	Remark
1	Antenna Requirement	15.203	RSS-Gen 8.3	--	Pass	Note[1]
2	20 dB and 99% Bandwidth	15.215(c)	RSS-Gen 6.6	ANNEX A.1	N/A	--
3	AC Conducted Emission	15.207	RSS-Gen 8.8	ANNEX A.2	N/A	--
4	Radiated Spurious Emission	15.249(a)	RSS-210 B.10 RSS-Gen 8.9	ANNEX A.3	Pass	Note[2]
5	Band Edge(Restricted-band band-edge)	15.249(a)	RSS-210 B.10 RSS-Gen 8.10	ANNEX A.4	Pass	Note[2]

Note[1]: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note[2]: This report is difference test, So only test the Radiated Spurious Emission and Band Edge (Restricted-band band-edge).

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	45% - 55%	
Atmospheric Pressure	100 kPa - 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
Working Voltage of the EUT	NV (Normal Voltage)	5 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2017.06.22	2018.06.21
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	177746	2017.06.22	2018.06.21
Signal Generator	ROHDE&SCHWARZ	SMB100A	260592	2017.06.22	2018.06.21
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2017.06.22	2018.06.21
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2017.11.08	2018.11.07
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2017.06.22	2018.06.21
LISN	SCHWARZBECK	NSLK 8127	8127-687	2017.06.22	2018.06.21
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2017.06.22	2018.06.21
Power Splitter	KMW	DCPD-LDC	1305003215	--	--
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2017.06.22	2018.06.21
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2017.06.22	2018.06.21
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2017.06.22	2018.06.21
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2017.06.22	2018.06.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2017.06.22	2018.06.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2017.06.22	2018.06.21
Test Antenna-Horn(15-26.5 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2017.06.22	2018.06.21
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2019.02.20
Anechoic Chamber	EMC TECHNOLOGY LTD	21.1m*11.6m*7.35m	N/A	2016.08.09	2018.08.08
Shielded Enclosure	ChangNing	CN-130701	130703	--	--
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2017.06.22	2018.06.21
Power Amplifier	OPHIR RF	5225F	1037	2017.02.17	2018.02.16

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Power Amplifier	OPHIR RF	5273F	1016	2017.02.17	2018.02.16
Directional Coupler	Werlantone	C5982-10	109275	N/A	N/A
Directional Coupler	Werlantone	CHP-273E	S00801z-01	N/A	N/A
Feld Strength Meter	Narda	EP601	511WX51129	2017.02.23	2018.02.22
Mouth Simulator	B&K	4227	2423931	2017.11.14	2018.11.13
Sound Calibrator	B&K	4231	2430337	2017.11.08	2018.11.07
Sound Level Meter	B&K	NL-20	00844023	2017.11.10	2018.11.09
Ear Simulator	B&K	4185	2409449	2017.11.14	2018.11.13
Ear Simulator	B&K	4195	2418189	2017.11.14	2018.11.13
Audio analyzer	B&K	UPL 16	100129	2017.11.07	2018.11.06

4.3 Measurement Uncertainty

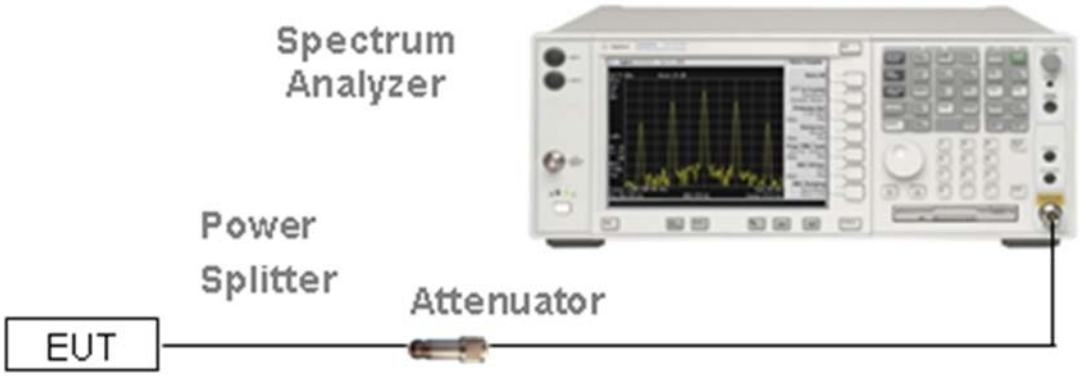
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Occupied Channel Bandwidth	±4%
RF output power, conducted	±1.4 dB
Power Spectral Density, conducted	±2.5 dB
Unwanted Emissions, conducted	±2.8 dB
All emissions, radiated	±5.4 dB
Temperature	±1°C
Humidity	±4%

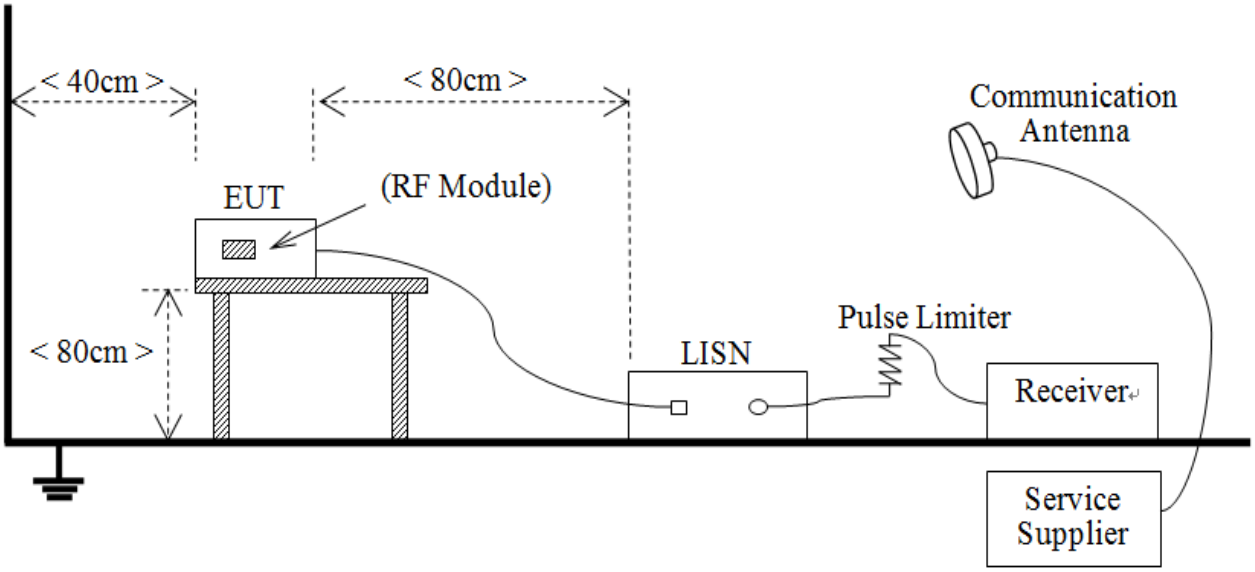
4.4 Description of Test Setup

4.4.1 For Antenna Port Test



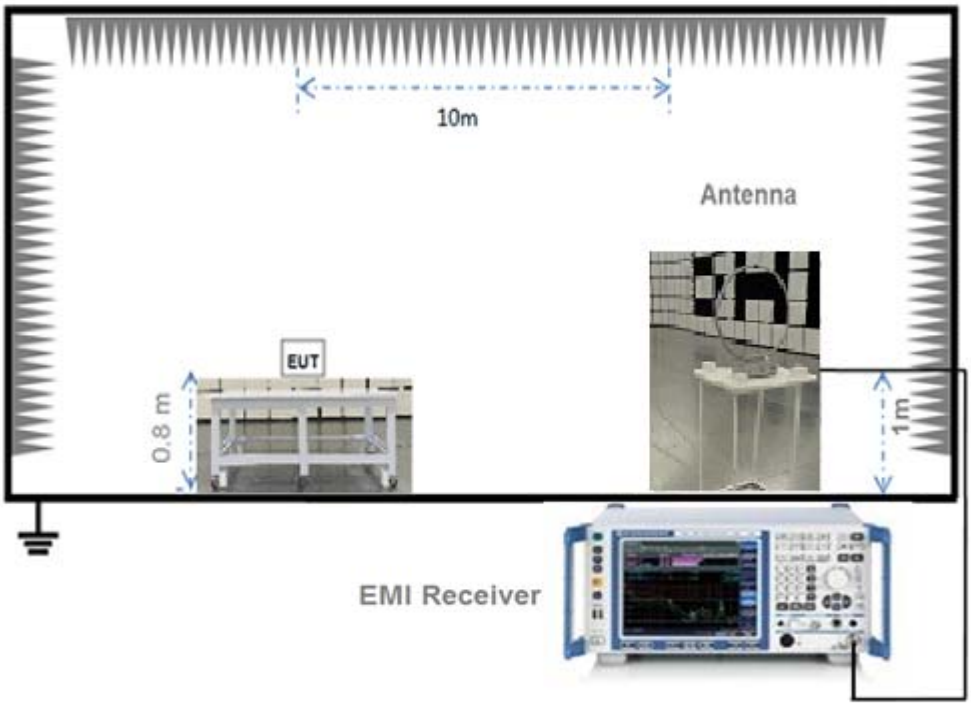
(Diagram 1)

4.4.2 For AC Power Supply Port Test



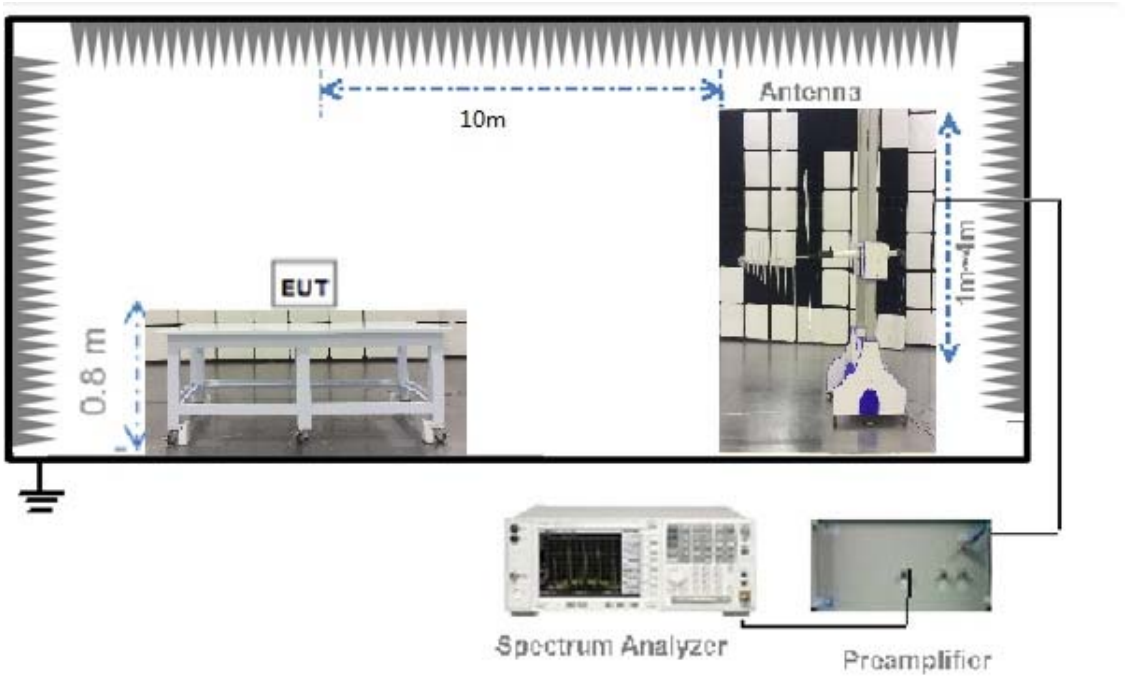
(Diagram 2)

4.4.3 For Radiated Test (Below 30 MHz)



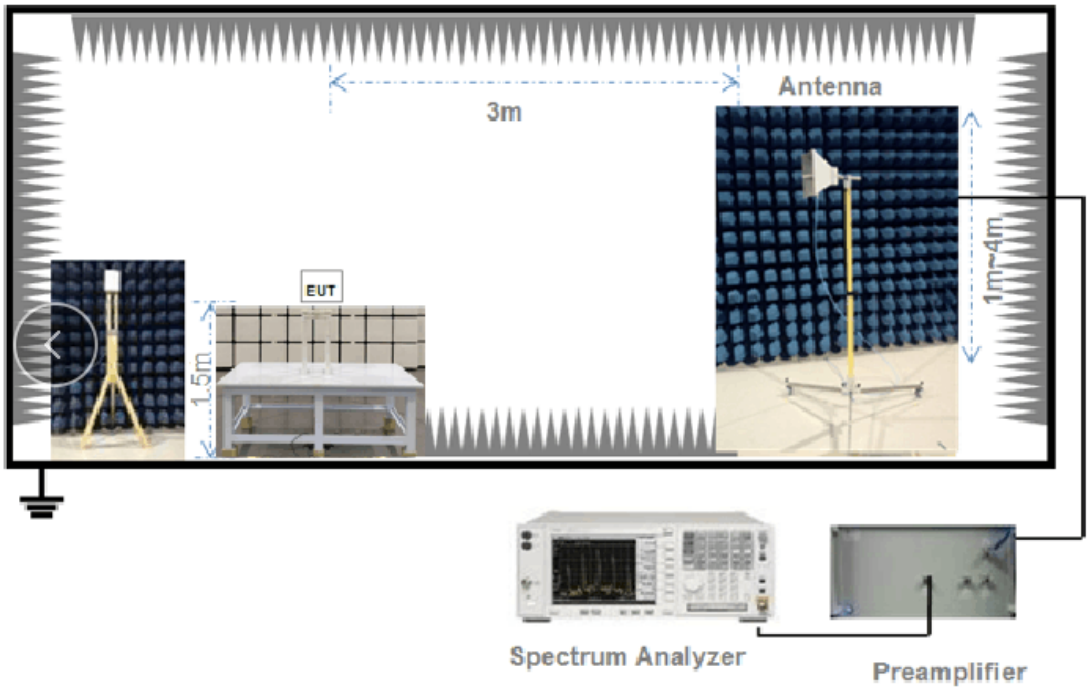
(Diagram 3)

4.4.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

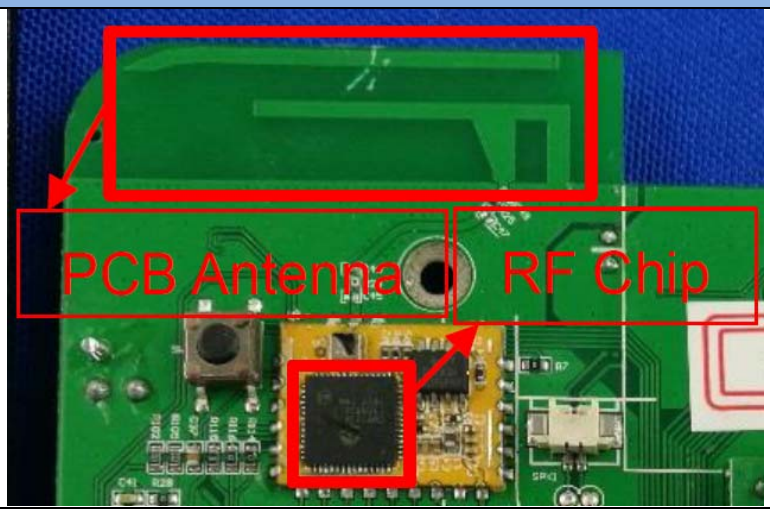
FCC §15.203 & 15.247(b); RSS-Gen 8.3

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 use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.
If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

Reference Documents	Item
Photo	

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 20 dB and 99% Bandwidth

5.2.1 Limit

FCC §15.215(c);

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

RSS-Gen 6.6

The emission bandwidth (×dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated × dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3× the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured

5.2.2 Test Setups

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

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

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 AC Conducted Emission

5.3.1 Limit

FCC §15.207; RSS-Gen 8.8

For an intentional radiator 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 within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.3.2 Test Setups

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Radiated Spurious Emission

5.4.1 Limit

FCC §15.249(a); RSS-210 B.10& RSS-Gen 8.9

Except as provided in paragraph (a) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (μV/m)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500

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.

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

2. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.4.2 Test Setups

See section 4.4.2-4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented. The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.
Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.4.4 Test Result

Please refer to ANNEX A.3.

5.5 Band Edge (Restricted-band band-edge)

5.5.1 Limit

FCC §15.249(a); RSS-210 B.10&RSS-Gen 8.10

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

5.5.2 Test Setups

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.5.4 Test Result

Please refer to ANNEX A.4.

ANNEX A TEST RESULT

A.1 20dB and 99% bandwidth

Note: Not applicable.

A.2 AC Conducted Emission

Note: Not applicable.

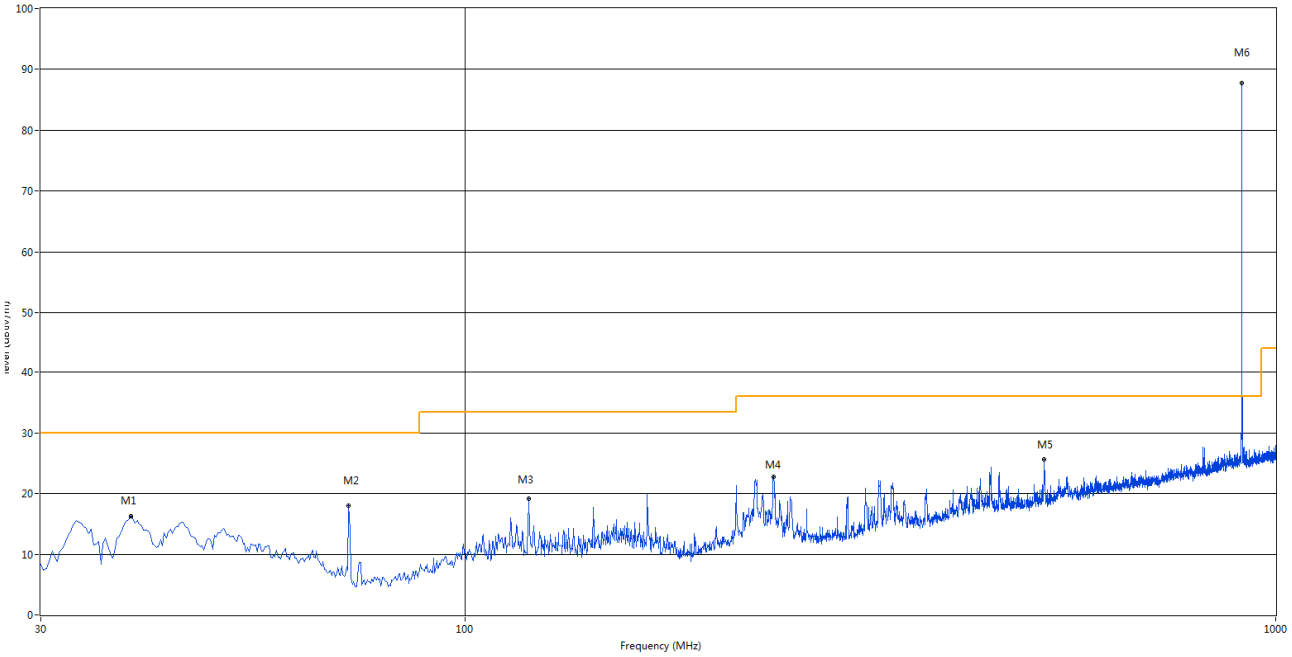
A.3 Radiated Emission

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

Test Data and Plots (30 MHz ~ 1 GHz)

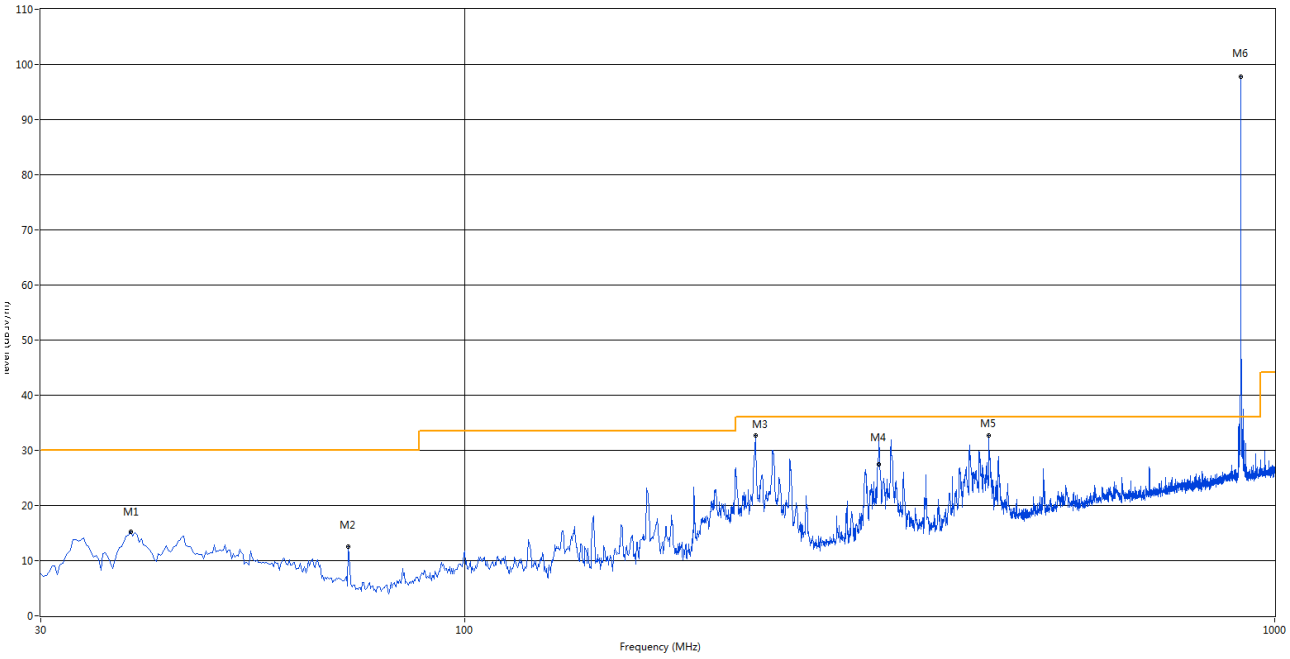
Note: The bold frequency is the fundamental.

Low Channel 30 MHz to 1 GHz, ANT V



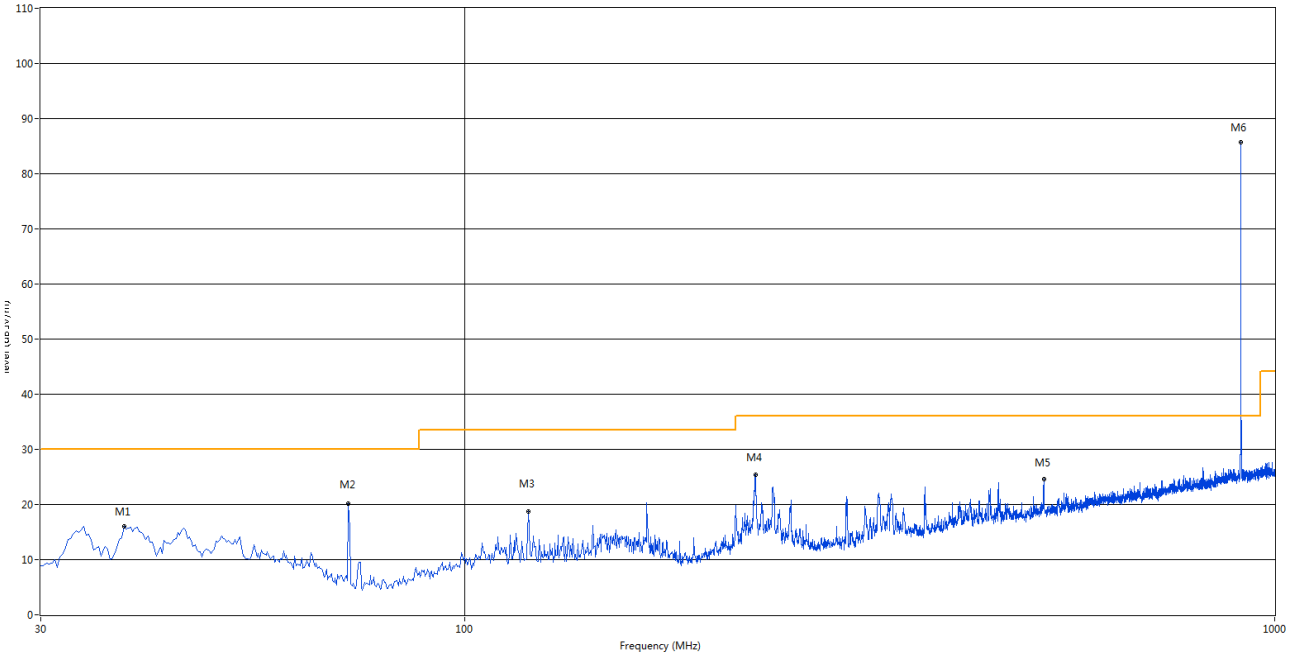
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	38.730	16.24	-26.72	30.0	13.76	Peak	275.00	100	Vertical	Pass
2	71.952	18.00	-29.89	30.0	12.00	Peak	237.00	300	Vertical	Pass
3	119.967	19.11	-27.95	33.5	14.39	Peak	0.00	200	Vertical	Pass
4	240.248	22.75	-24.29	36.0	13.25	Peak	306.00	100	Vertical	Pass
5	517.910	25.58	-17.15	36.0	10.42	Peak	193.00	300	Vertical	Pass
6	908.335	87.74	-10.84	36.0	-51.74	Peak	142.00	300	Vertical	N/A

Low Channel 30 MHz to 1 GHz, ANT H



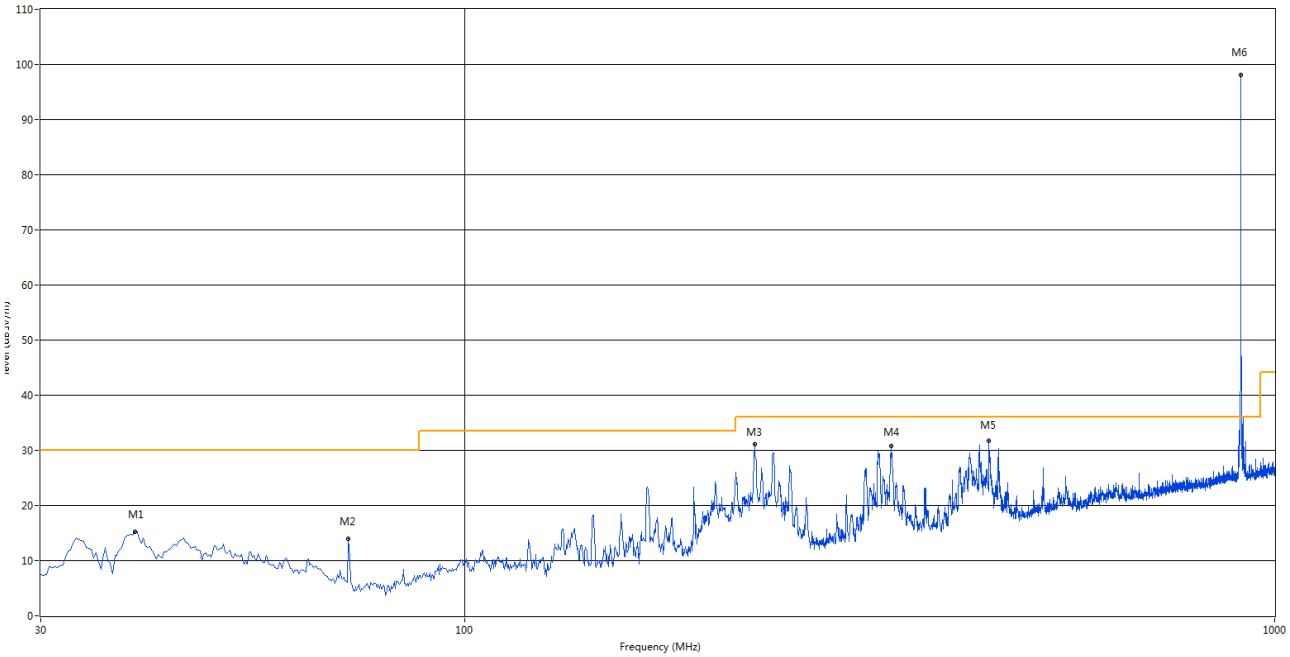
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	38.730	14.55	-26.72	30.0	15.45	Peak	0.00	300	Horizontal	Pass
2	71.952	12.47	-29.89	30.0	17.53	Peak	293.00	300	Horizontal	Pass
3	228.608	32.58	-24.85	36.0	3.42	Peak	350.00	300	Horizontal	Pass
4	324.388	32.54	-21.90	36.0	3.46	Peak	86.00	216	Horizontal	N/A
4*	324.388	27.50	-21.90	36.0	8.50	QP	86.00	216	Horizontal	Pass
5	443.948	32.58	-18.80	36.0	3.42	Peak	312.00	200	Horizontal	Pass
6	908.335	97.86	-10.84	36.0	-61.86	Peak	86.00	100	Horizontal	N/A

Middle Channel 30 MHz to 1 GHz, ANT V



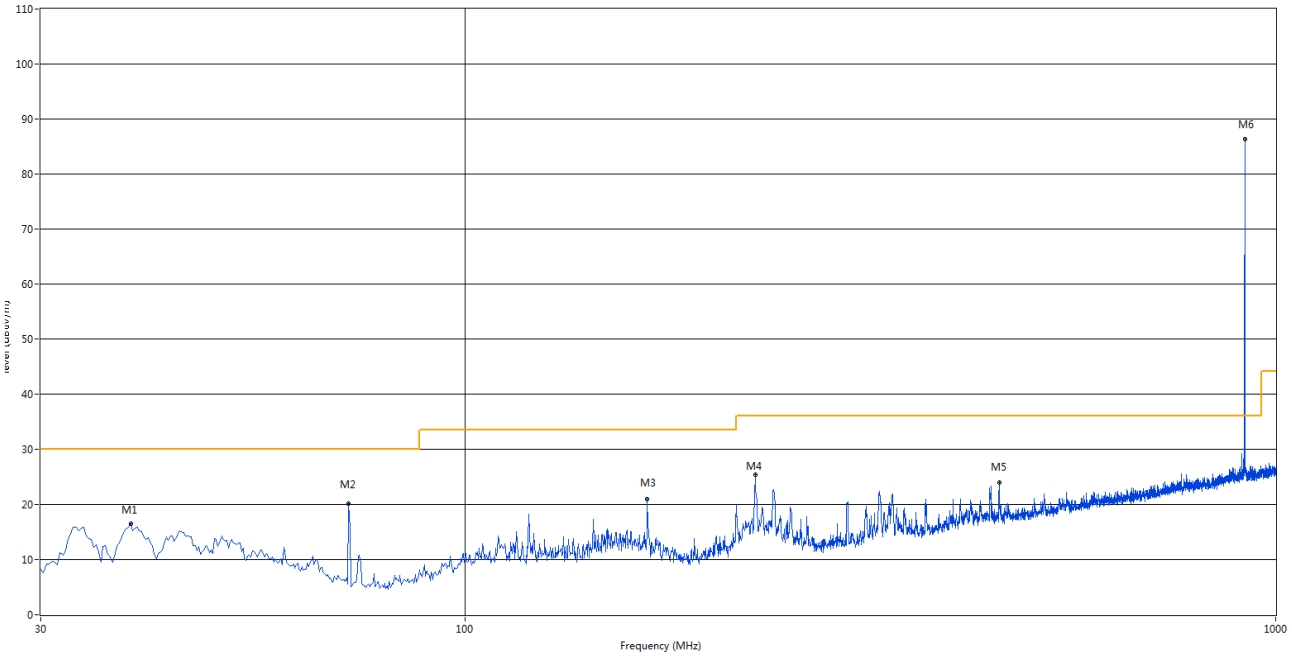
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	38.002	16.05	-26.86	30.0	13.95	Peak	300.00	100	Vertical	Pass
2	71.952	20.11	-29.89	30.0	9.89	Peak	274.00	200	Vertical	Pass
3	119.967	18.68	-27.95	33.5	14.82	Peak	1.00	100	Vertical	Pass
4	228.608	25.30	-24.85	36.0	10.70	Peak	281.00	100	Vertical	Pass
5	519.122	24.52	-17.08	36.0	11.48	Peak	212.00	100	Vertical	Pass
6	908.335	85.69	-10.84	36.0	-49.69	Peak	237.00	200	Vertical	N/A

Middle Channel 30 MHz to 1 GHz, ANT H



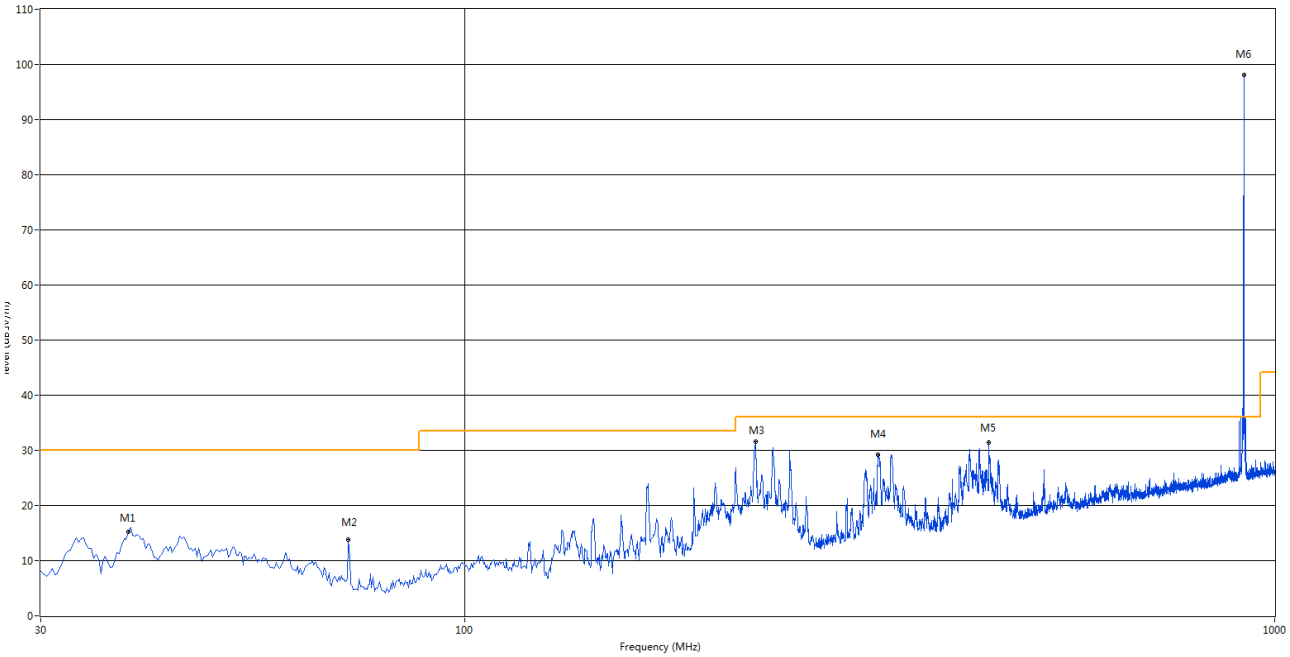
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	39.215	15.16	-26.59	30.0	14.84	Peak	360.00	300	Horizontal	Pass
2	71.952	14.02	-29.89	30.0	15.98	Peak	275.00	300	Horizontal	Pass
3	228.122	31.03	-24.91	36.0	4.97	Peak	161.00	300	Horizontal	Pass
4	336.520	30.74	-21.42	36.0	5.26	Peak	104.00	300	Horizontal	Pass
5	444.190	31.75	-18.78	36.0	4.25	Peak	325.00	200	Horizontal	Pass
6	908.335	98.08	-10.84	36.0	-62.08	Peak	73.00	100	Horizontal	N/A

High Channel 30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	38.730	16.41	-26.72	30.0	13.59	Peak	293.00	100	Vertical	Pass
2	71.952	20.10	-29.89	30.0	9.90	Peak	262.00	200	Vertical	Pass
3	167.982	20.94	-28.40	33.5	12.56	Peak	149.00	100	Vertical	Pass
4	228.122	25.33	-24.91	36.0	10.67	Peak	281.00	100	Vertical	Pass
5	456.073	23.91	-18.70	36.0	12.09	Peak	130.00	100	Vertical	Pass
6	916.095	86.38	-10.70	36.0	-50.38	Peak	193.00	200	Vertical	N/A

High Channel 30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	38.487	15.17	-26.78	30.0	14.83	Peak	0.00	300	Horizontal	Pass
2	71.952	12.07	-29.89	30.0	17.93	Peak	281.00	200	Horizontal	Pass
3	228.608	31.61	-24.85	36.0	4.39	Peak	319.00	200	Horizontal	Pass
4	323.910	29.09	-21.98	36.0	6.91	Peak	92.00	200	Horizontal	Pass
5	443.948	31.46	-18.80	36.0	4.54	Peak	306.00	200	Horizontal	Pass
6	916.095	98.08	-10.70	36.0	-62.08	Peak	98.00	100	Horizontal	N/A

Test Data and Plots (1 GHz ~ 10th Harmonic)

Note [1]: The marked is the harmonic signal.

Note [2]: Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Note [3]: 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.

Note [4]: Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20 dB from the applicable limit) and considered that's already beyond the background noise floor.

Note [5]: Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

LOW CHANNEL 1 GHz to 10 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1209.500	42.75	-10.21	74.0	31.25	Peak	176.00	150	Vertical	Pass
2	1913.500	53.89	-9.12	74.0	20.11	Peak	356.00	150	Vertical	Pass
3	1995.500	54.45	-7.59	74.0	19.55	Peak	0.00	150	Vertical	Pass
4	2724.000	49.35	-3.36	74.0	24.65	Peak	105.00	150	Vertical	Pass
5	4540.500	51.61	0.35	74.0	22.39	Peak	69.00	150	Vertical	Pass
6	5865.000	54.95	4.35	74.0	19.05	Peak	131.00	150	Vertical	N/A
6**	5865.000	22.27	4.35	54.0	31.73	AV	131.00	150	Vertical	Pass

LOW CHANNEL 1 GHz to 10 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1814.500	47.69	-10.01	74.0	26.31	Peak	69.00	150	Horizontal	Pass Note 1
2	1991.500	52.21	-8.00	74.0	21.79	Peak	255.00	150	Horizontal	Pass
3	2870.500	49.59	-1.57	74.0	24.41	Peak	34.00	150	Horizontal	Pass
4	3623.250	49.37	1.70	74.0	24.63	Peak	88.00	150	Horizontal	Pass
5	4541.250	53.68	0.25	74.0	20.32	Peak	273.00	150	Horizontal	Pass
6	5919.750	53.54	4.70	74.0	20.46	Peak	344.00	150	Horizontal	Pass

MIDDLE CHANNEL 1 GHz to 10 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1209.500	42.12	-10.21	74.0	31.88	Peak	210.00	150	Vertical	Pass
2	1852.500	49.98	-9.69	74.0	24.02	Peak	219.00	150	Vertical	Pass Note 1
3	1994.500	54.30	-7.67	74.0	19.70	Peak	356.00	150	Vertical	Pass
3**	1994.500	35.25	-7.67	54.0	18.75	AV	356.00	150	Vertical	N/A
4	2589.500	49.77	-2.03	74.0	24.23	Peak	359.00	150	Vertical	Pass
5	4542.000	52.40	0.29	74.0	21.60	Peak	61.00	150	Vertical	Pass
6	5917.500	53.84	4.93	74.0	20.16	Peak	238.00	150	Vertical	Pass

MIDDLE CHANNEL 1 GHz to 10 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1293.000	42.69	-10.25	74.0	31.31	Peak	184.00	150	Horizontal	Pass
2	1816.500	47.15	-9.84	74.0	26.85	Peak	78.00	150	Horizontal	Pass Note 1
3	2618.000	49.81	-2.46	74.0	24.19	Peak	263.00	150	Horizontal	Pass
4	3618.750	48.40	1.43	74.0	25.60	Peak	114.00	150	Horizontal	Pass
5	4542.000	53.08	0.29	74.0	20.92	Peak	273.00	150	Horizontal	Pass
6	5935.500	54.32	4.73	74.0	19.68	Peak	141.00	150	Horizontal	N/A
6**	5935.500	21.86	4.73	54.0	32.14	AV	141.00	150	Horizontal	Pass

HIGH CHANNEL 1 GHz to 10 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1339.500	43.34	-10.18	74.0	30.66	Peak	326.00	150	Vertical	Pass
2	1913.500	52.41	-9.12	74.0	21.59	Peak	10.00	150	Vertical	Pass
3	1995.000	57.95	-7.63	74.0	16.05	Peak	0.00	150	Vertical	N/A
3**	1995.000	36.61	-7.63	54.0	17.39	AV	0.00	150	Vertical	Pass
4	3771.750	48.60	0.40	74.0	25.40	Peak	131.00	150	Vertical	Pass
5	4580.250	52.49	0.95	74.0	21.51	Peak	175.00	150	Vertical	Pass
6	5882.250	53.68	5.05	74.0	20.32	Peak	52.00	150	Vertical	Pass

HIGH CHANNEL 1 GHz to 10 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1237.000	42.17	-10.44	74.0	31.83	Peak	26.00	150	Horizontal	Pass
2	1828.000	49.53	-10.19	74.0	24.47	Peak	79.00	150	Horizontal	Pass Note 1
3	1991.500	50.50	-8.00	74.0	23.50	Peak	264.00	150	Horizontal	Pass
4	2864.000	50.47	-1.64	74.0	23.53	Peak	326.00	150	Horizontal	Pass
5	4579.500	52.12	0.89	74.0	21.88	Peak	263.00	150	Horizontal	Pass
6	5859.750	54.37	4.53	74.0	19.63	Peak	157.00	150	Horizontal	N/A
6**	5859.750	21.47	4.53	54.0	32.53	AV	157.00	150	Horizontal	Pass

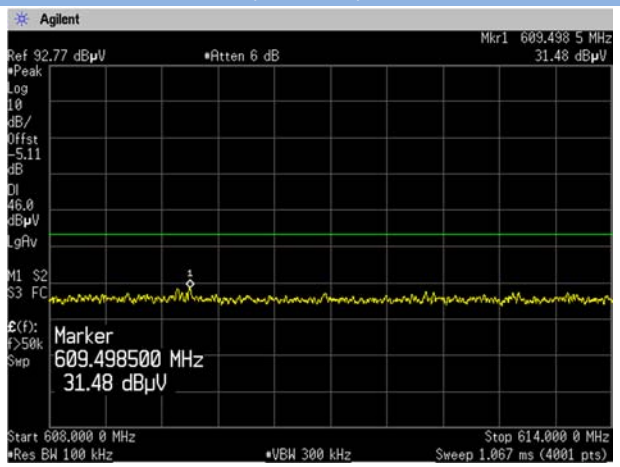
A.4 Band Edge (Restricted-band band-edge)

Test Data and Test Plots

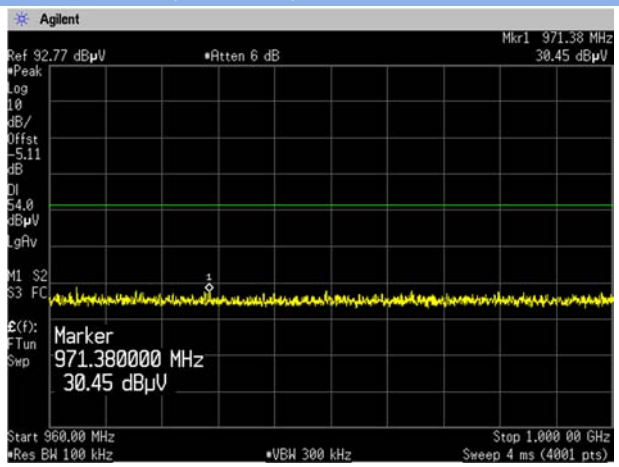
Note: The test data all are tested in the vertical and horizontal antenna which the trace is max hold. So these plots have shown the worst case.

Test Mode	Test Channel	Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark	Verdict
Z-WAVE	Low	609.498500	31.48	46	14.52	QP	Pass
Z-WAVE	MIDDLE	971.380000	30.45	54	23.55	QP	Pass
Z-WAVE	HIGH	1158.220000	40.32	74	33.68	PEAK	Pass

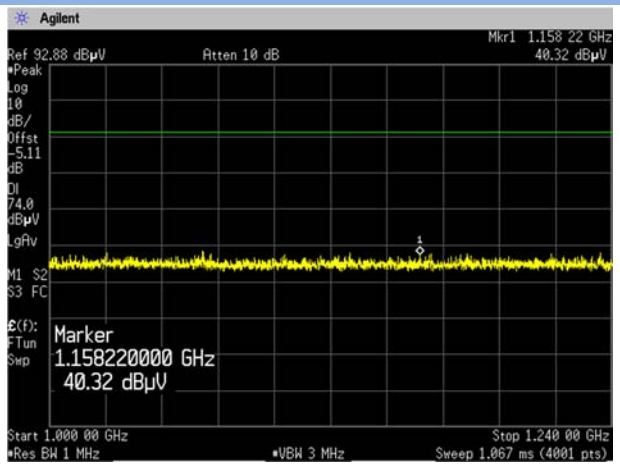
LOW CHANNEL, PEAK(608-614)



HIGH CHANNEL(960-1000)



HIGH CHANNEL(1000-1240)



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ17C0281-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL- SZ17C0281-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL- SZ17C0281-AI.PDF”.

--END OF REPORT--