

FCC
RF
TEST REPORT

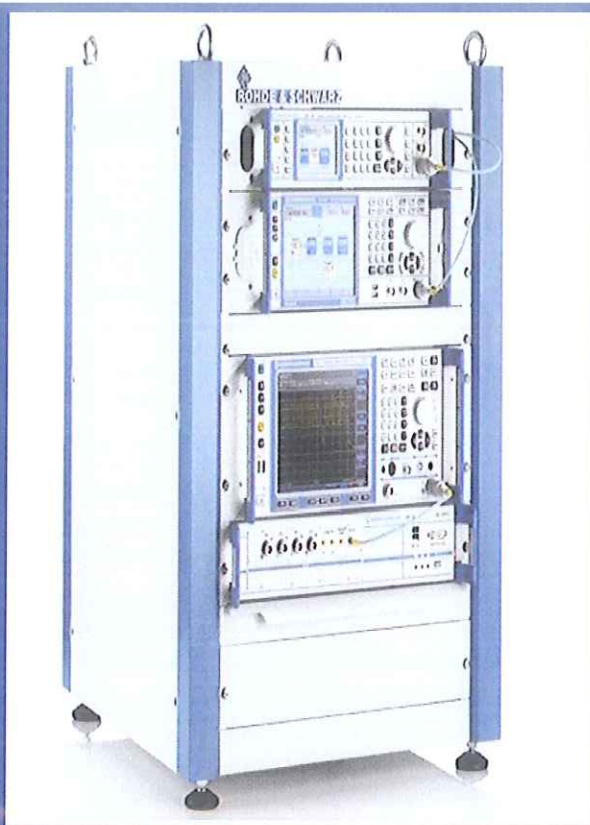
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
LTE Digital Mobile Handset

ISSUED TO
ZTE Corporation

ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District,
Shenzhen, Guangdong, P. R. China



Tested by:

Cao Shaoqiong
(Engineer)

Date Nov. 08, 2016

Approved by:

Liao Jianming
(Technical director)

Date Nov. 08, 2016

Report No.: BL-SZ1680474-602

EUT Type: LTE Digital Mobile Handset

Model Name: ZTE Blade A210

Brand Name: ZTE

Test Standard: 47 CFR Part 15 Subpart C

FCC ID: SRQ-A210

Test conclusion: Pass

Test Date: Sep. 02, 2016 ~ Sep. 08, 2016

Date of Issue: Nov. 08, 2016

NOTE: This test report can be duplicated completely for the legal use with the approval of the applicant; it shall not be reproduced except in full, without the written approval of Shenzhen BALUN Technology Co., Ltd. BALUN Laboratory. Any objections should be raised within thirty days from the date of issue. To validate the report, please visit BALUN website.

Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
<u>Rev. 01</u>	<u>Nov. 08, 2016</u>	<u>Initial Issue</u>

TABLE OF CONTENTS

1	ADMINISTRATIVE DATA (GENERAL INFORMATION)	6
1.1	Identification of the Testing Laboratory	6
1.2	Identification of the Responsible Testing Location	6
1.3	Laboratory Condition	6
1.4	Announce	6
2	PRODUCT INFORMATION	7
2.1	Applicant Information	7
2.2	Manufacturer Information	7
2.3	Factory Information	7
2.4	General Description for Equipment under Test (EUT)	7
2.5	Ancillary Equipment	8
2.6	Technical Information	8
2.7	Additional Instructions	9
3	SUMMARY OF TEST RESULTS	10
3.1	Test Standards	10
3.2	Verdict	10
4	GENERAL TEST CONFIGURATIONS	11
4.1	Test Environments	11
4.2	Test Equipment List	11
4.3	Measurement Uncertainty	12
4.4	Description of Test Setup	12
4.4.1	For Antenna Port Test	12
4.4.2	For AC Power Supply Port Test	13
4.4.3	For Radiated Test (Below 30 MHz)	13
4.4.4	For Radiated Test (30 MHz-1 GHz)	14
4.4.5	For Radiated Test (Above 1 GHz)	14

4.5	Measurement Results Explanation Example.....	15
4.5.1	For conducted test items:	15
4.5.2	For radiated band edges and spurious emission test:.....	15
5	TEST ITEMS.....	16
5.1	Antenna Requirements.....	16
5.1.1	Standard Applicable	16
5.1.2	Antenna Anti-Replacement Construction	16
5.1.3	Antenna Gain	16
5.2	Number of Hopping Frequency	17
5.2.1	Limit.....	17
5.2.2	Test Setup.....	17
5.2.3	Test Procedure.....	17
5.2.4	Test Result	17
5.3	Peak Output Power and E.I.R.P.....	18
5.3.1	Test Limit.....	18
5.3.2	Test Setup.....	18
5.3.3	Test Procedure.....	18
5.3.4	Test Result	18
5.4	Occupied Bandwidth	19
5.4.1	Limit.....	19
5.4.2	Test Setup.....	19
5.4.3	Test Procedure.....	19
5.4.4	Test Result	19
5.5	Carrier Frequency Separation	20
5.5.1	Limit.....	20
5.5.2	Test Setup.....	20
5.5.3	Test Procedure.....	20
5.5.4	Test Result	20
5.6	Time of Occupancy (Dwell time)	21
5.6.1	Limit.....	21
5.6.2	Test Setup.....	21
5.6.3	Test Procedure.....	21

5.6.4	Test Result	21
5.7	Conducted Spurious Emission & Authorized-band band-edge	22
5.7.1	Limit.....	22
5.7.2	Test Setup	22
5.7.3	Test Procedure.....	22
5.7.4	Test Result	22
5.8	Conducted Emission	23
5.8.1	Limit.....	23
5.8.2	Test Setup	23
5.8.3	Test Procedure.....	23
5.8.4	Test Result	23
5.9	Radiated Spurious Emission	24
5.9.1	Limit.....	24
5.9.2	Test Setup	24
5.9.3	Test Procedure.....	24
5.9.4	Test Result	25
5.10	Band Edge (Restricted-band band-edge).....	26
5.10.1	Limit.....	26
5.10.2	Test Setup	26
5.10.3	Test Procedure	26
5.10.4	Test Result	26
ANNEX A	TEST RESULT	27
A.1	Number of Hopping Frequency	27
A.2	Peak Output Power	27
A.3	20 dB and 99% bandwidth	27
A.4	Hopping Frequency Separation.....	27
A.5	Average Time of Occupancy	27
A.6	Conducted Spurious Emissions & Authorized-band band-edge	27
A.7	Conducted Emissions.....	28
A.8	Radiated Emission	30
A.9	Band Edge(Restricted-band band-edge).....	33
ANNEX B	TEST SETUP PHOTOS	34

ANNEX C EUT EXTERNAL PHOTOS34

ANNEX D EUT INTERNAL PHOTOS34

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
Fax Number	+86 755 6182 4271

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 has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625. 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°C
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

- (1) The test report reference to the report template version v3.1.
- (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	ZTE Corporation
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P. R. China

2.2 Manufacturer Information

Manufacturer	ZTE Corporation
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P. R. China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Type	LTE Digital Mobile Handset
Model Name Under Test	ZTE Blade A210
Series Model Name	BGH Joy A20
Description of Model name differentiation	The equipment mode ZTE Blade A210 and BGH Joy A20 are the EUT model, the electrical parameters and internal structure of circuit are same. Only the model name is different.
Hardware Version	A210_V1AMB_B
Software Version	A210_Chileclaro_1.01
Dimensions (Approx.)	134.8 × 67.5 × 10.15 mm
Weight (Approx.)	150 g
Network and Wireless connectivity	2G Network GSM/GPRS/EDGE 850/1900 MHz 3G Network WCDMA/ HSDPA/HSUPA Band II/V 4G Network FDD LTE Band 4/7 Bluetooth 3.0, Bluetooth 4.0, GPS, FM, WIFI 802.11b, 802.11g, 802.11n20, 802.11 n40

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	Li3822T43P3h675053
	Serial No.	N/A
	Capacitance	2200 mAh
	Rated Voltage	3.8 V
	Extreme Voltage	4.2 V
Ancillary Equipment 2	Charger	
	Brand Name	N/A
	Model No.	STC-A22O50I1000USBA-C
	Rated Input	100-240 V~, 300 mA, 50/60 Hz
	Rated Output	5 V $\overline{=}$, 1 A
Ancillary Equipment 3	Earphone (SF-837KM-28)	
	Length (Approx.)	1.2 m
Ancillary Equipment 4	Earphone (EF-A216-308)	
	Length (Approx.)	1.2 m
Ancillary Equipment 5	USB Data Cable	
	Length (Approx.)	1.0 m

2.6 Technical Information

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

Modulation Technology	FHSS
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Transfer Rate	1 Mbps, 2 Mbps, 3 Mbps
Frequency Range	The frequency range used is 2402 MHz – 2480 MHz; The frequency block is 2400 MHz to 2483.5 MHz.
Number of channel	79 (at intervals of 1 MHz)
Tested Channel	0 (2402 MHz), 39 (2441 MHz), 78 (2480 MHz).
Antenna Type	PIFA Antenna
Antenna Gain	2.1 dBi (All involve the antenna gain test item, has been included in the final results)
About the Product	The equipment is LTE Digital Mobile Handset, it contains Bluetooth 3.0 and Bluetooth 4.0 Low Energy (BLE) operating at 2.4 GHz ISM band. Only the Bluetooth 3.0 was tested in this report.

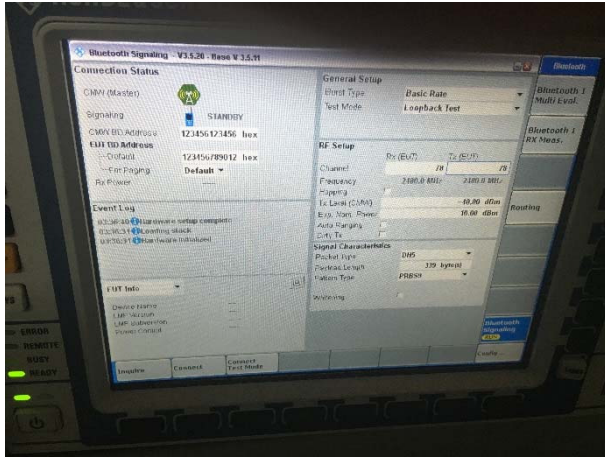
2.7 Additional Instructions

EUT Software Settings:

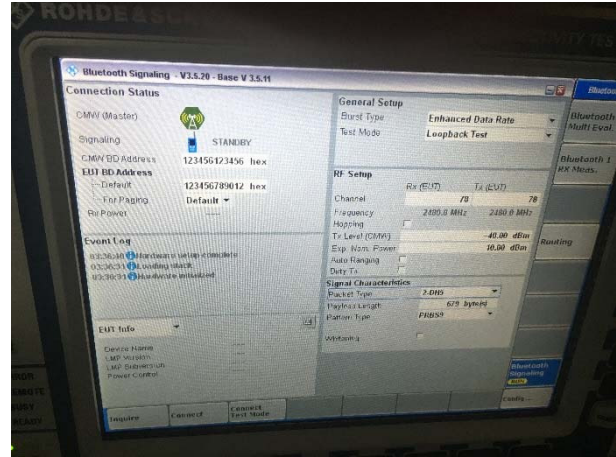
Mode	☒ Bluetooth test mode loop back enabled. EUT is controlled over CBT / CMU.
------	---

Run Software:

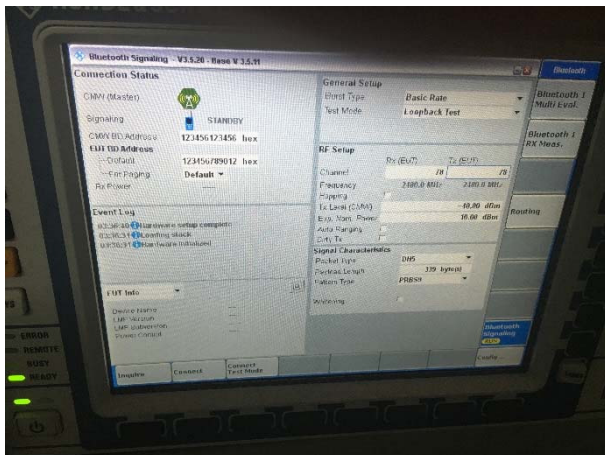
DH5



2DH5



3DH5



3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-15 Edition)	Miscellaneous Wireless Communications Services
2	FCC PUBLIC NOTICE DA 00-705 (Mar. 30, 2000)	Filling and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	Channel	Test Result	Verdict
1	Antenna Requirement	15.203	N/A	--	Pass ^{Note 1}
2	Number of Hopping Frequency	15.247(a)	Hopping Mode	ANNEX A.1	Pass ^{Note 3}
3	Peak Output Power	15.247(b)	Low/Middle/High	ANNEX A.2	Pass ^{Note 3}
4	Occupied Bandwidth	15.247(a)	Low/Middle/High	ANNEX A.3	Pass ^{Note 3}
5	Carrier Frequency Separation	15.247(a)	Hopping Mode	ANNEX A.4	Pass ^{Note 3}
6	Time of Occupancy (Dwell time)	15.247(a)	Hopping Mode	ANNEX A.5	Pass ^{Note 3}
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	Low/Middle/High	ANNEX A.6	Pass ^{Note 3}
8	Conducted Emission	15.207	Low/Middle/High	ANNEX A.7	Pass
9	Radiated Spurious Emission	15.209 15.247(d)	Hopping Mode, Low/Middle/High	ANNEX A.8	Pass
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	Hopping Mode, Low/Middle/High	ANNEX A.9	Pass ^{Note 3}

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

Note 2: GFSK, $\pi/4$ -DQPSK and 8-DPSK are tested, but only GFSK and 8-DPSK are shown in this report (except Peak Output Power).

Note 3: Based on the initial report (the test report No. is BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016), changed charger, So The test item of Antenna Requirement, Number of Hopping Frequency, Peak Output Power, Occupied Bandwidth, Carrier Frequency Separation, Time of Occupancy (Dwell time), Conducted Spurious Emission & Authorized-band band-edge and Band Edge(Restricted-band band-edge) please refer to the Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016 and only evaluated CE emission and RSE below 1GHz.

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)	20°C to +25°C
Working Voltage of the EUT	NV (Normal Voltage)	3.8 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2016.07.13	2017.07.12
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	177746	2016.07.13	2017.07.12
Signal Generator	ROHDE&SCHWARZ	SMB100A	260592	2016.07.13	2017.07.12
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2016.07.13	2017.07.12
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2016.10.15	2017.10.14
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2016.07.05	2017.07.04
LISN	SCHWARZBECK	NSLK 8127	8127-687	2016.07.05	2017.07.04
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2016.07.13	2017.07.12
Power Splitter	KMW	DCPD-LDC	1305003215	--	--
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2016.07.13	2017.07.12
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2016.07.13	2017.07.12
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2016.07.13	2017.07.12
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2015.07.22	2017.07.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2015.07.22	2017.07.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21
Test Antenna-Horn(15-26.5 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2015.07.22	2017.07.21
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2015.02.28	2017.02.27
Shielded Enclosure	ChangNing	CN-130701	130703	--	--

4.3 Measurement Uncertainty

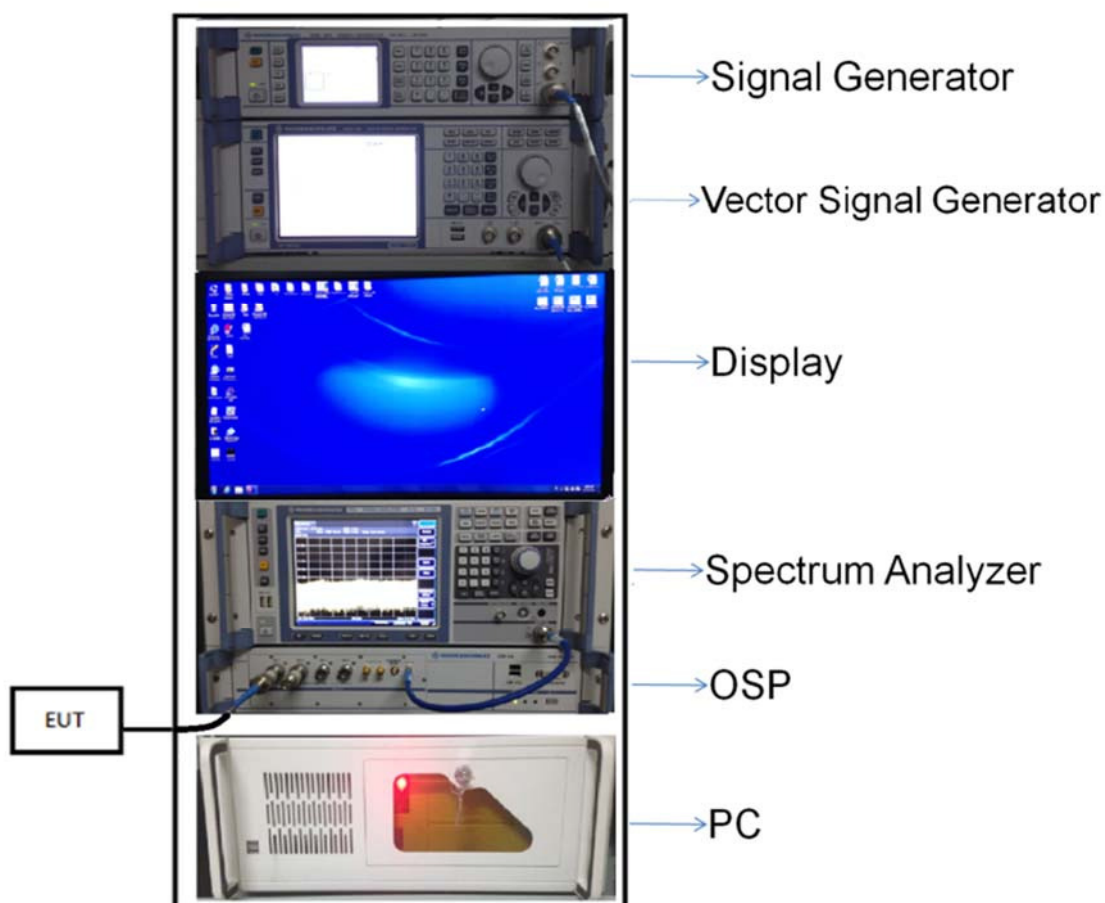
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

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	$\pm 4\%$
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	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 4\%$

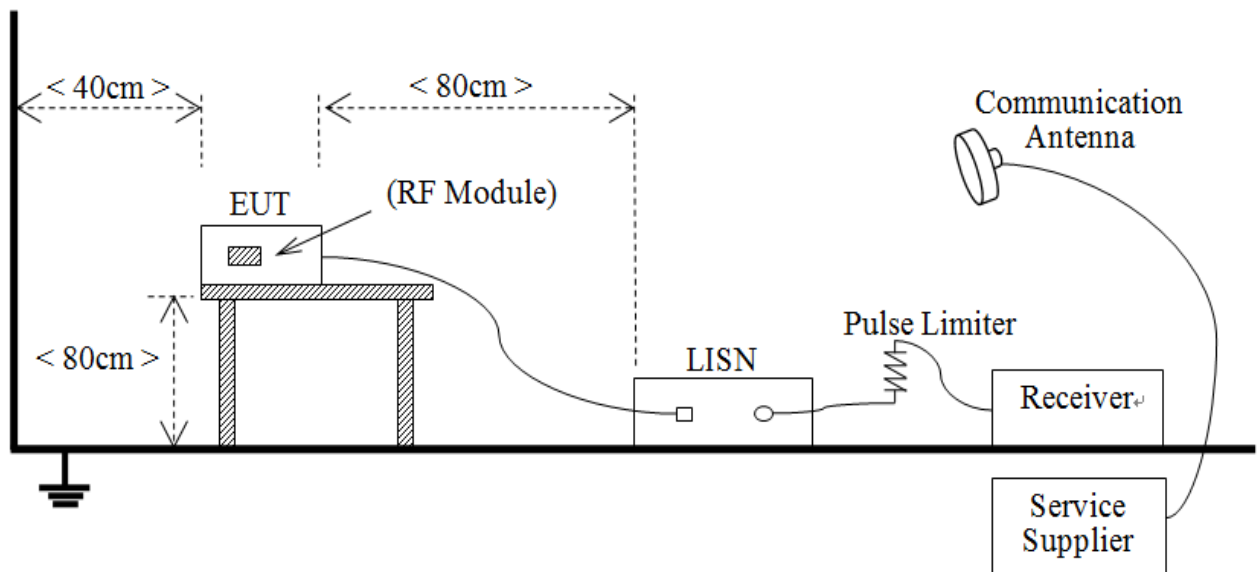
4.4 Description of Test Setup

4.4.1 For Antenna Port Test



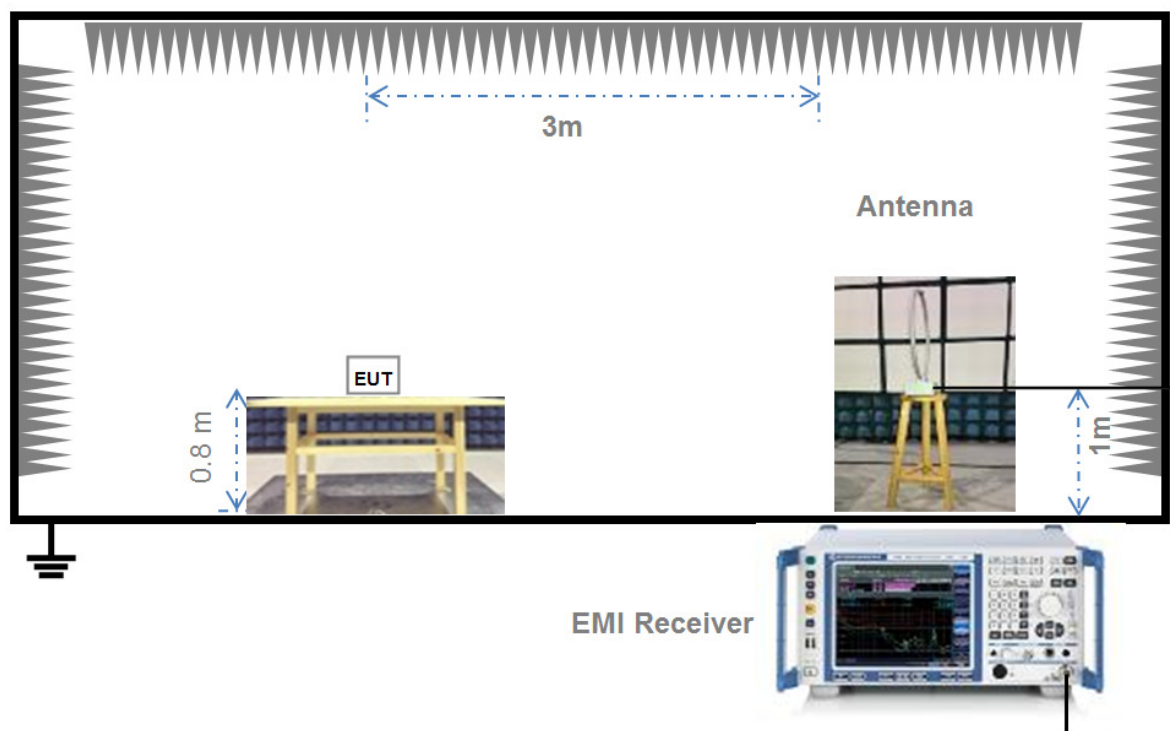
(Diagram 1)

4.4.2 For AC Power Supply Port Test



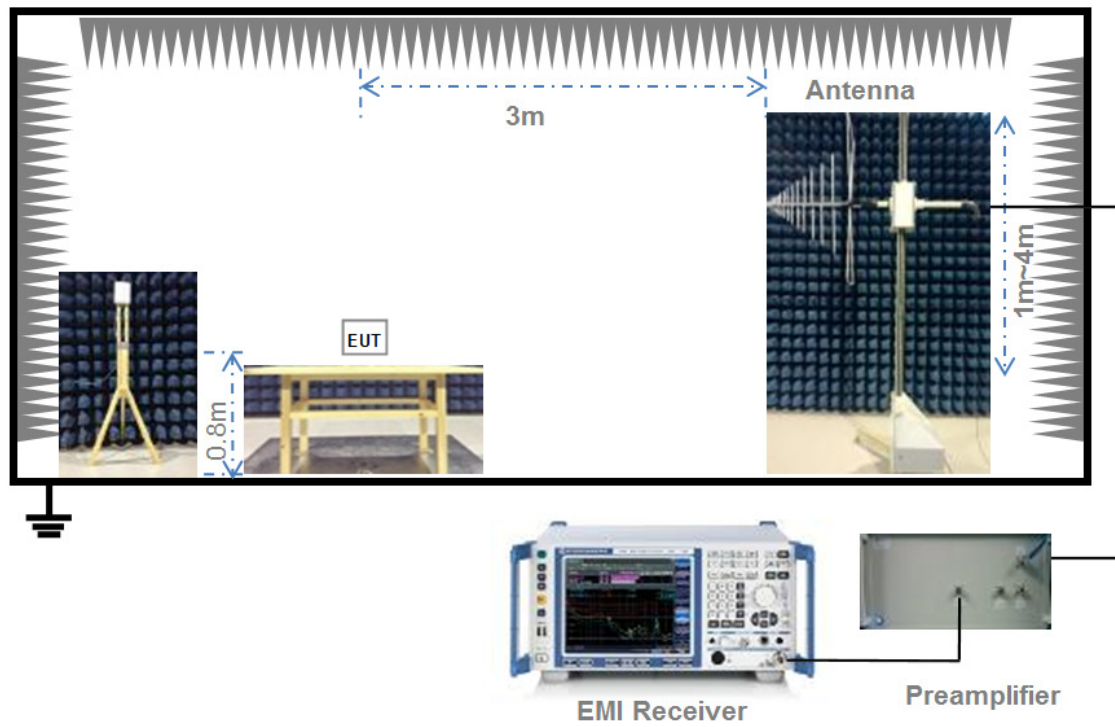
(Diagram 2)

4.4.3 For Radiated Test (Below 30 MHz)



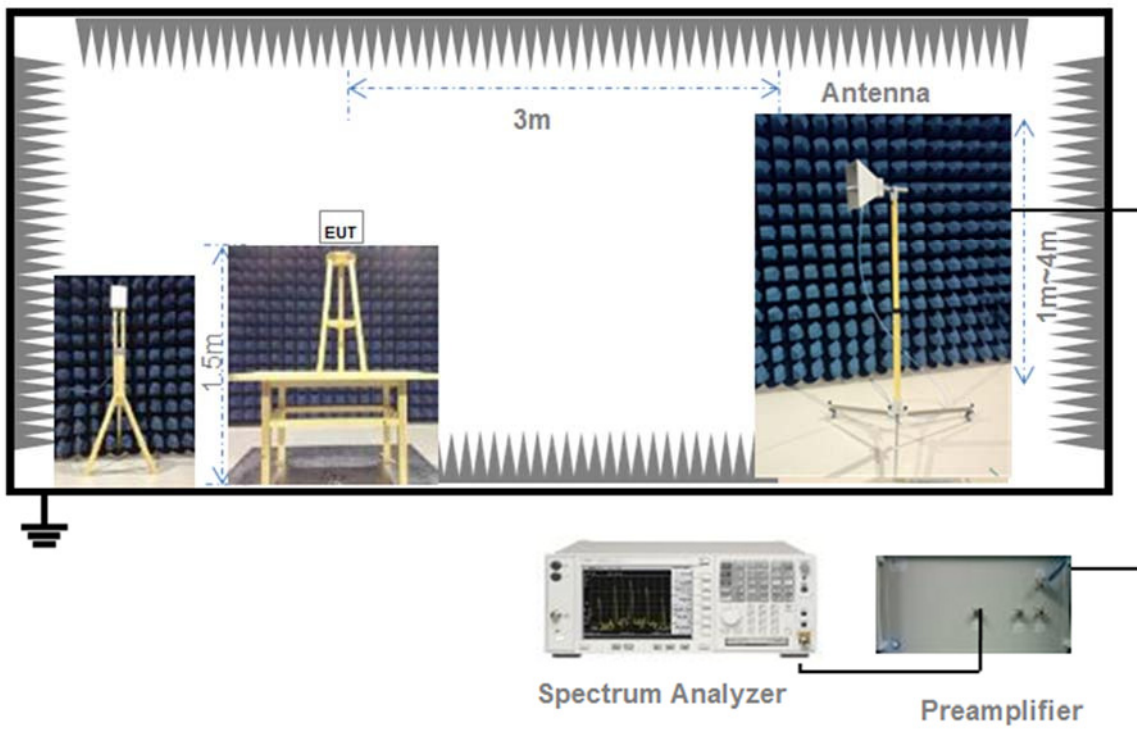
(Diagram 3)

4.4.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.5 Measurement Results Explanation Example

4.5.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

4.5.2 For radiated band edges and spurious emission test:

Per part 15.35(c), the EUT Bluetooth average emission level could be determined by the peak emission level applying duty cycle correction factor, to represent averaging over the whole pulse train.

The average level is derived from the peak level corrected with "Duty cycle correction factor".

Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + Duty cycle correction factor (dB)

Duty cycle correction factor (dB) = $20 * \log (\text{Duty cycle})$.

Duty cycle = on time / 100 milliseconds

On time = dwell time * hopping number in 100 ms

For example: bluetooth with dwell time 2.9 ms and 3 hops in 100 ms, then

Duty cycle correction factor (dB) = $20 * \log ((2.9 * 3) / 100) = -21.21 \text{ dB}$

Following shows an average computation example with duty cycle correction factor = -21.21 dB, and the peak emission level is 45.61 dBuV/m.

Example:

Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + duty cycle correction factor (dB)
= $45.61 + (-21.21) = 24.4 \text{ (dBuV/m)}$

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Standard Applicable

FCC §15.203 & 15.247(b); RSS-247, 5.4 (6)

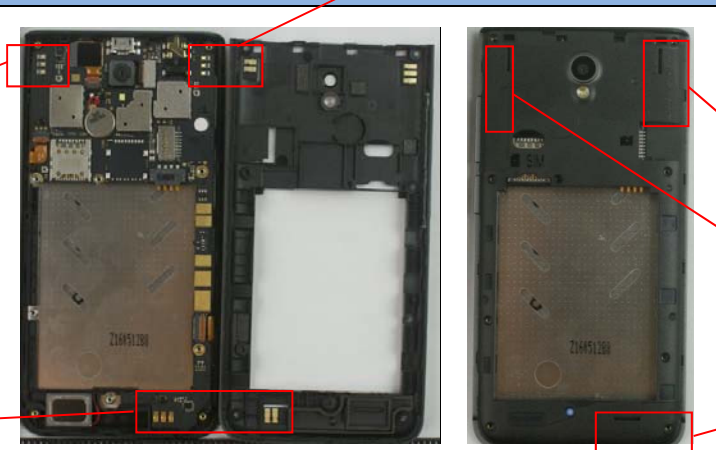
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply 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 An embedded-in	The antenna is welded on the mainboard, can't be replaced by the consumer

Reference Documents	Item
Photo	 BT/WIFI Antenna point Diversity Antenna Point WWAN Antenna Point PIFA Antenna-BT/WIFI Diversity Antenna WWAN Antenna

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 Number of Hopping Frequency

5.2.1 Limit

FCC §15.247(a) (1) (iii); RSS-247, 5.1 (4)

Frequency hopping systems operating in the 2400 MHz to 2483.5 MHz bands shall use at least 15 hopping frequencies.

5.2.2 Test Setup

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

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW $\geq$ 1% of the span

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 Peak Output Power and E.I.R.P

5.3.1 Test Limit

FCC § 15.247(b)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247, 5.4 (2)

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

5.3.2 Test Setup

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 Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

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 $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Occupied Bandwidth

5.4.1 Limit

FCC §15.247(a); RSS-247, 5.1 (1)

Measurement of the 20dB bandwidth of the modulated signal.

5.4.2 Test Setup

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

5.4.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW = in the range of 1% to 5% of the OBW

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.4.4 Test Result

Please refer to ANNEX A.3.

5.5 Carrier Frequency Separation

5.5.1 Limit

FCC §15.247(a); RSS-247, 5.1 (2)

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. Alternatively, Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.5.2 Test Setup

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

5.5.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) $\geq$ 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.

5.5.4 Test Result

Please refer to ANNEX A.4.

5.6 Time of Occupancy (Dwell time)

5.6.1 Limit

FCC §15.247(a); RSS-247, 5.1 (4)

Frequency hopping systems in the 2400 MHz - 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.6.2 Test Setup

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

5.6.3 Test Procedure

The average time of occupancy on any channel within the Period can be calculated with formulas:

For DH1 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 2) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH3 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 4) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH5 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

5.6.4 Test Result

Please refer to ANNEX A.5

5.7 Conducted Spurious Emission & Authorized-band band-edge

5.7.1 Limit

FCC §15.247(d); RSS-247, 5.5

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.

5.7.2 Test Setup

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

5.7.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.7.4 Test Result

Please refer to ANNEX A.6.

5.8 Conducted Emission

5.8.1 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 50 μ H/50 Ω line impedance stabilization network (LISN).

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

5.8.2 Test Setup

See section 4.4.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.8.3 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. Refer to recorded points and plots below.

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.

5.8.4 Test Result

Please refer to ANNEX A.7.

5.9 Radiated Spurious Emission

5.9.1 Limit

FCC §15.209&15.247(d); RSS-247, 5.5

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).

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. Field Strength (dBμV/m) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.
2. In the emission tables above, the tighter limit applies at the band edges.
3. 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 20dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.9.2 Test Setup

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.

5.9.3 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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ 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.

5.9.4 Test Result

Please refer to ANNEX A.8.

5.10 Band Edge (Restricted-band band-edge)

5.10.1 Limit

FCC §15.209&15.247(d)

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).

5.10.2 Test Setup

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.

5.10.3 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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ 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.

5.10.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

A.1 Number of Hopping Frequency

The Number of Hopping Frequency result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.1 Number of Hopping Frequency Test Result.

A.2 Peak Output Power

The Peak Output Power result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.2 Peak Output Power Test Result.

A.3 20 dB and 99% bandwidth

The 20 dB and 99% bandwidth result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.3 20 dB and 99% bandwidth Test Result.

A.4 Hopping Frequency Separation

The Hopping Frequency Separation result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.4 Hopping Frequency Separation Test Result.

A.5 Average Time of Occupancy

The Overage Time of Occupancy result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.5 Overage Time of Occupancy Test Result.

A.6 Conducted Spurious Emissions & Authorized-band band-edge

The Conducted Spurious Emissions & Authorized-band band-edge result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.6 Conducted Spurious Emissions & Authorized-band band-edge Test Result.

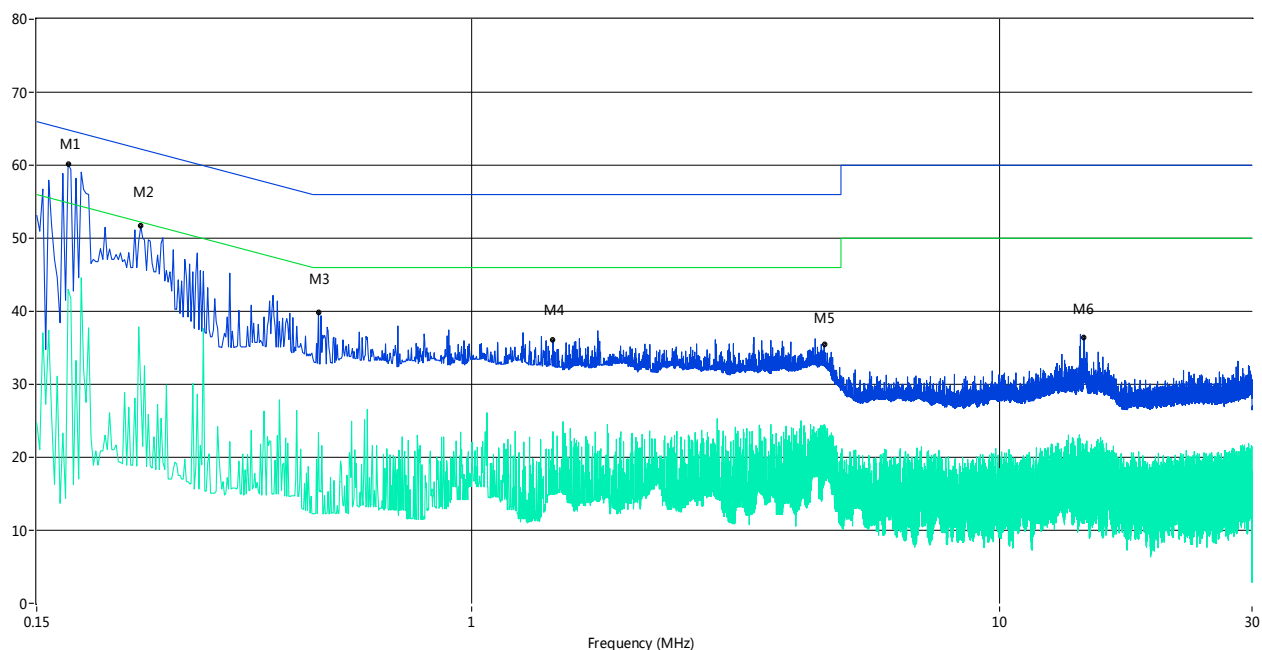
A.7 Conducted Emissions

Note 1: The EUT is working in the Normal link mode.

Note 2: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

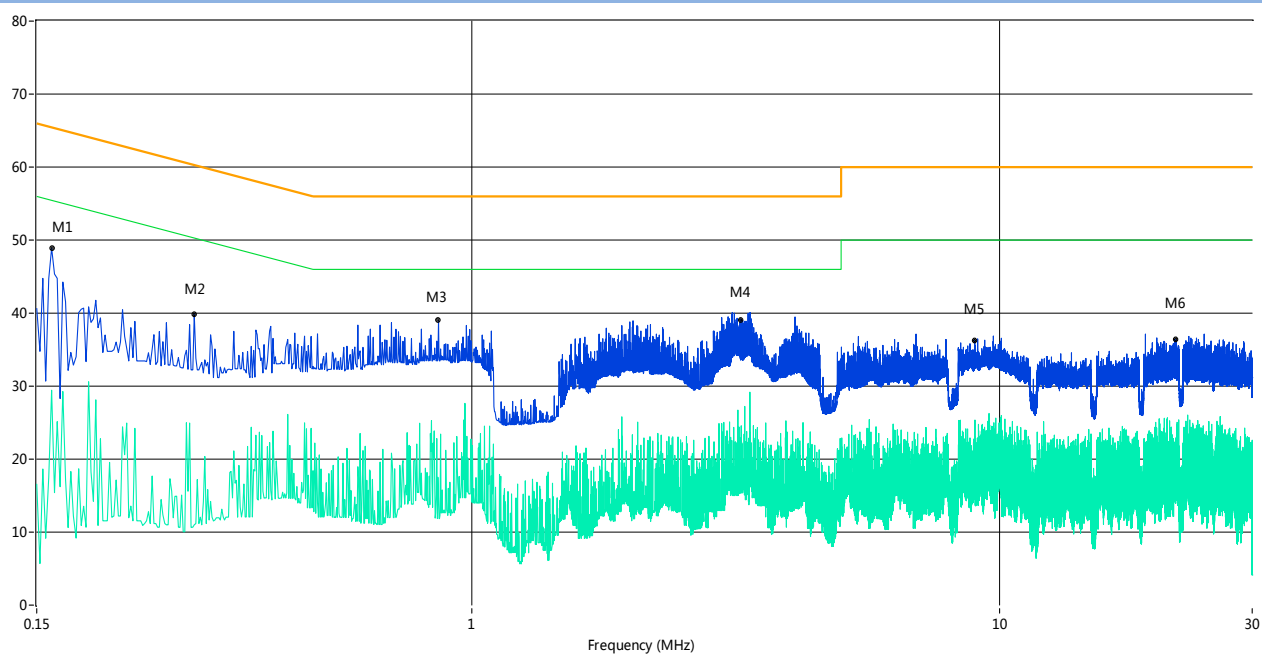
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.17	60.1	11.00	65.4	5.30	Peak	L Line	Pass
1**	0.17	43.0	11.00	55.4	12.40	AV	L Line	Pass
2	0.24	51.7	11.00	63.5	11.80	Peak	L Line	Pass
2**	0.24	29.4	11.00	53.5	24.10	AV	L Line	Pass
3	0.51	39.8	11.00	56.0	16.20	Peak	L Line	Pass
3**	0.51	23.4	11.00	46.0	22.60	AV	L Line	Pass
4	1.42	36.0	11.00	56.0	20.00	Peak	L Line	Pass
4**	1.42	23.5	11.00	46.0	22.50	AV	L Line	Pass
5	4.65	35.4	11.00	56.0	20.60	Peak	L Line	Pass
5**	4.65	24.5	11.00	46.0	21.50	AV	L Line	Pass
6	14.43	37.2	11.00	60.0	22.80	Peak	L Line	Pass
6**	14.43	5.9	11.00	50.0	44.10	AV	L Line	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.16	48.9	11.00	65.7	16.80	Peak	N Line	Pass
1**	0.16	29.5	11.00	55.7	26.20	AV	N Line	Pass
2	0.30	39.8	11.00	61.8	22.00	Peak	N Line	Pass
2**	0.30	8.4	11.00	51.8	43.40	AV	N Line	Pass
3	0.86	39.0	11.00	56.0	17.00	Peak	N Line	Pass
3**	0.86	14.6	11.00	46.0	31.40	AV	N Line	Pass
4	3.23	39.1	11.00	56.0	16.90	Peak	N Line	Pass
4**	3.23	20.6	11.00	46.0	25.40	AV	N Line	Pass
5	8.96	36.2	11.00	60.0	23.80	Peak	N Line	Pass
5**	8.96	18.8	11.00	50.0	31.20	AV	N Line	Pass
6	21.44	36.4	11.00	60.0	23.60	Peak	N Line	Pass
6**	21.44	7.3	11.00	50.0	42.70	AV	N Line	Pass

A.8 Radiated Emission

Note 1: The symbol of "--" in the table which means not application.

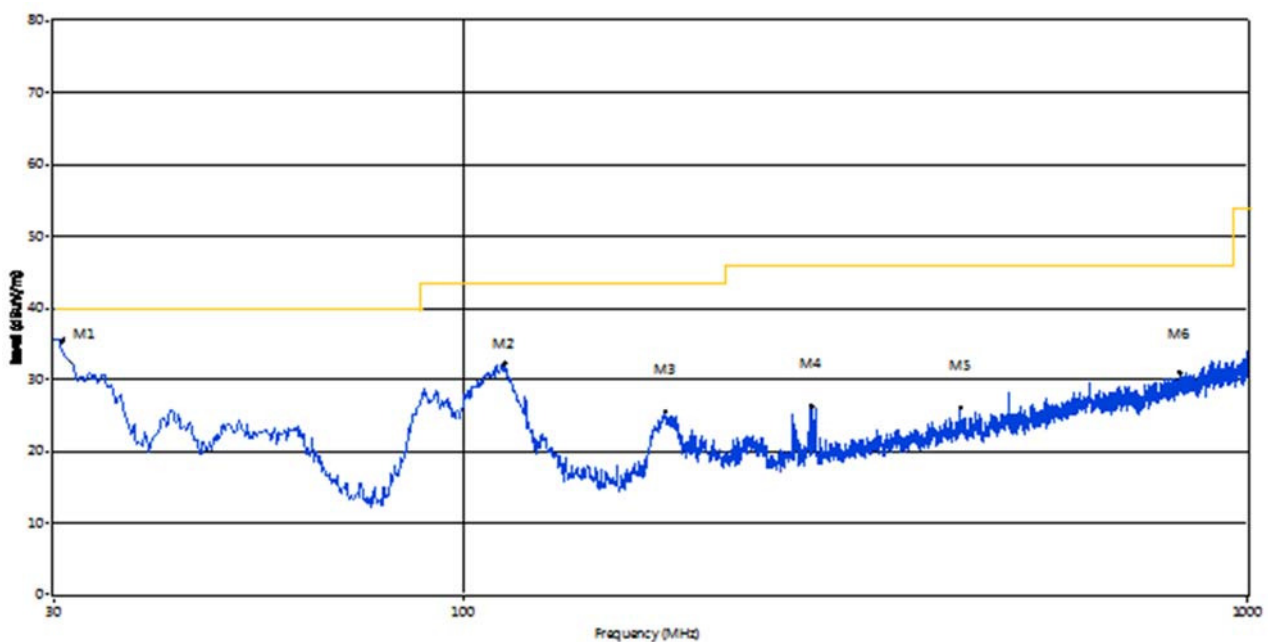
Note 2: For the test data above 1 GHz, according the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: The EUT is working in the Normal link mode below 1 GHz.

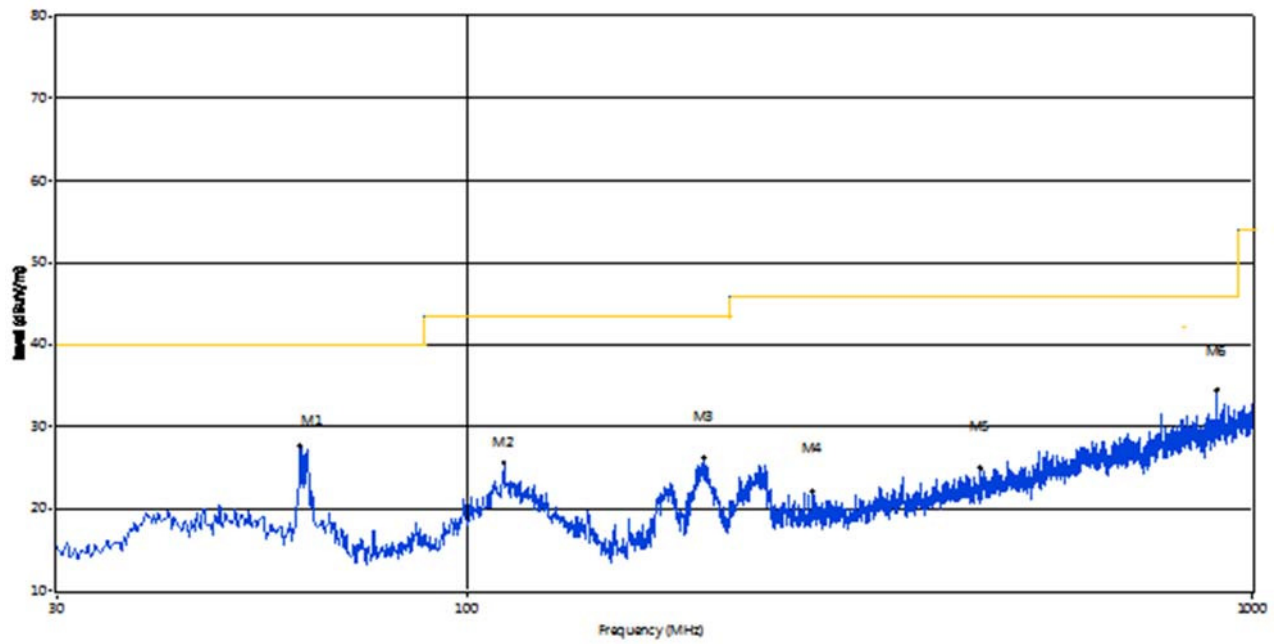
Test Data and Plots

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.

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	31.70	35.70	-21.93	40.0	4.30	Peak	40.05	100	Vertical	Pass
2	112.91	32.14	-20.67	43.5	11.36	Peak	205.18	100	Vertical	Pass
3	180.80	25.43	-22.07	43.5	18.07	Peak	352.25	100	Vertical	Pass
4	277.53	26.28	-18.40	46.0	19.72	Peak	270.13	100	Vertical	Pass
5	430.27	26.02	-14.61	46.0	19.98	Peak	324.89	100	Vertical	Pass
6	818.65	30.92	-7.16	46.0	15.08	Peak	274.73	100	Vertical	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	61.27	27.67	-20.32	40.0	12.33	Peak	62.35	100	Horizontal	Pass
2	111.46	25.57	-20.47	43.5	17.93	Peak	37.70	100	Horizontal	Pass
3	199.95	26.15	-20.22	43.5	17.35	Peak	327.33	100	Horizontal	Pass
4	275.59	22.11	-18.48	46.0	23.89	Peak	66.35	100	Horizontal	Pass
5	449.90	24.93	-14.47	46.0	21.07	Peak	102.24	100	Horizontal	Pass
6	899.87	34.45	-5.56	46.0	11.55	Peak	90.62	100	Horizontal	Pass

Note: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

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

Note: The Radiated Emission result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.8 Radiated Emission Test Result.

A.9 Band Edge(Restricted-band band-edge)

The Band Edge (Restricted-band band-edge) result reference from original test report: Report No. BL-SZ1650193-602, and it issued by Shenzhen BALUN Technology Co., Ltd. On June 12, 2016, section A.9 Band Edge (Restricted-band band-edge) Test Result.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ1680474-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ1680474-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ1680474-AI.PDF”.

--END OF REPORT--