

FCC/ISED

RF

TEST REPORT

ISSUED BY  
Shenzhen BALUN Technology Co., Ltd.



FOR  
**Rugged Smart Phone**

ISSUED TO  
Shenzhen UniStrong Science & Technology Co., Ltd.

B, 4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen,  
China



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(Engineer)

Date: Nov 28, 2018

Approved by: Wei Yanquan  
Wei Yanquan  
(Chief Engineer)

Date: Nov 28, 2018

Report No.: BL-EC18B0146-402  
EUT Name: Rugged Smart Phone  
Model Name: UT12  
Brand Name: UniStrong  
Test Standard: 47 CFR Part 15 Subpart C  
RSS-210 Issue 9 (2016-8)  
RSS-Gen Issue 5 (2018-4)  
FCC ID: 2AOPD-UT10  
ISED Number: 11546A-UT10

Test Conclusion: Pass  
Test Date: Nov. 12, 2018 ~ Nov. 13, 2018  
Date of Issue: Nov. 28, 2018

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### Revision History

| Version        | Issue Date           | Revisions Content                                           |
|----------------|----------------------|-------------------------------------------------------------|
| <u>Rev. 01</u> | <u>Nov. 20, 2018</u> | <u>Initial Issue</u>                                        |
| <u>Rev. 02</u> | <u>Nov. 28, 2018</u> | <u>Update test standard version and related information</u> |

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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 | <p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.</p> <p>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.</p> <p>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.</p> |
| 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°C to 25°C       |
| Ambient Relative Humidity | 45% to 55%         |
| Ambient Pressure          | 100 kPa to 102 kPa |

### 1.4 Announce

- (1) The test report reference to the report template version v6.2.
- (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 | Shenzhen UniStrong Science & Technology Co., Ltd.                     |
| Address   | B, 4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China |

### 2.2 Manufacturer Information

|              |                                                                       |
|--------------|-----------------------------------------------------------------------|
| Manufacturer | Shenzhen UniStrong Science & Technology Co., Ltd.                     |
| Address      | B, 4-4Factory, Zhengcheng Road, FuyongBaoan District, Shenzhen, China |

### 2.3 Factory Information

|         |     |
|---------|-----|
| Factory | N/A |
| Address | N/A |

### 2.4 General Description for Equipment under Test (EUT)

|                                           |                    |
|-------------------------------------------|--------------------|
| EUT Name                                  | Rugged Smart Phone |
| Model Name Under Test                     | UT12               |
| 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                |

### 2.5 Ancillary Equipment

|                       |                      |                             |
|-----------------------|----------------------|-----------------------------|
| Ancillary Equipment 1 | Battery              |                             |
|                       | Brand Name           | SJYEnergy                   |
|                       | Model No.            | BA7800                      |
|                       | Serial No.           | N/A                         |
|                       | Capacity             | 8000 mAh                    |
|                       | Rated Voltage        | 3.8 V                       |
|                       | Limit Charge Voltage | 4.35 V                      |
| Ancillary Equipment 2 | Adapter              |                             |
|                       | Brand Name           | N/A                         |
|                       | Model No.            | ASUC71W                     |
|                       | Serial No.           | N/A                         |
|                       | Rated Input          | 100-240 V~, 0.7 A, 50/60 Hz |
|                       | Rated Output         | 5 V= 3 A                    |
| Ancillary Equipment 3 | USB Cable            |                             |
|                       | Model No.            | N/A                         |
|                       | Length (Approx.)     | 0.8 m                       |

## 2.6 Technical Information

|                                   |                                                                                                                                                                                                                                                                                            |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network and Wireless connectivity | 2G Network GSM/GPRS/EGPRS 850/900/1800/1900 MHz;<br>3G Network WCDMA/HSDPA/HSUPA Band 1/2/5/8;<br>CDMA Band Class 0;<br>EVDO Rel. 0/Rev. A Band Class 0;<br>4G Network LTE FDD Band 1/2/3/4/5/7/8/17/20/28;<br>LTE TDD Band 38/40/41;<br>Bluetooth, WIFI, GPS, GLONASS, NFC, BDS, 5.8G SRD |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                         |                                                                                                                          |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Modulation Type         | ASK                                                                                                                      |
| Product Type            | <input type="checkbox"/> Mobile<br><input checked="" type="checkbox"/> Portable<br><input type="checkbox"/> Fix Location |
| Frequency Range         | 13.56 MHz                                                                                                                |
| Receiver Categorization | 3                                                                                                                        |
| Number of channel       | 1                                                                                                                        |
| Tested Channel          | 1                                                                                                                        |
| Antenna Type            | PIFA Antenna                                                                                                             |

### 3 SUMMARY OF TEST RESULTS

#### 3.1 Test Standards

| No. | Identity                                          | Document Title                                                     |
|-----|---------------------------------------------------|--------------------------------------------------------------------|
| 1   | 47 CFR Part 15,<br>Subpart C<br>(10-1-17 Edition) | Miscellaneous Wireless Communications Services                     |
| 2   | ANSI C63.10-2013                                  | American National Standard for Testing Unlicensed Wireless Devices |
| 3   | RSS-Gen<br>(Issue 5, Apr. 2018)                   | General Requirements for Compliance of Radio Apparatus             |
| 4   | RSS-210<br>(Issue 9, August 2016)                 | Licence-Exempt Radio Apparatus: Category I Equipment               |

#### 3.2 Verdict

| No. | Description                                | FCC Part No.        | ISED Part No. | Test Result | Verdict                |
|-----|--------------------------------------------|---------------------|---------------|-------------|------------------------|
| 1   | Antenna Requirement                        | 15.203              | RSS-Gen 6.8   | --          | Pass <sup>Note 1</sup> |
| 2   | Emissions Bandwidth                        | 15.215              | RSS-Gen 6.7   | ANNEX A.1   | Pass                   |
| 3   | Field Strength of<br>Fundamental Emissions | 15.225(a)           | RSS-210 B.6   | ANNEX A.2   | Pass                   |
| 4   | Radiated Emissions                         | 15.225(d)<br>15.209 | RSS-210 B.6   | ANNEX A.3   | Pass                   |
| 5   | Frequency Stability                        | 15.225(e)           | RSS-210 B.6   | ANNEX A.4   | Pass                   |
| 6   | Conducted Emission                         | 15.207              | RSS-Gen 8.8   | ANNEX A.5   | Pass                   |

Note 1: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203 & RSS-Gen 8.3.

Note 2: The only difference between the EUT (test samples in this report) and test sample in report BL-EC17C0360-402, which was issued by Shenzhen BALUN Technology Co., Ltd. on Apr. 02, 2018, is product information. Just changed the information as below:

1. Difference WIFI and 4G antenna;
2. Difference size of shell and appearance;
3. Difference camera;
4. Difference LCD screen;

And others hardware circuit and software were all the same. So just Radiated Emission (30 MHz ~ 1GHz) was retested in this report, Other test items please refer to the BL-EC17C0360-402, which was issued by Shenzhen BALUN Technology Co., Ltd. on Apr. 02, 2018.

## 4 GENERAL TEST CONFIGURATIONS

### 4.1 Test Environments

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

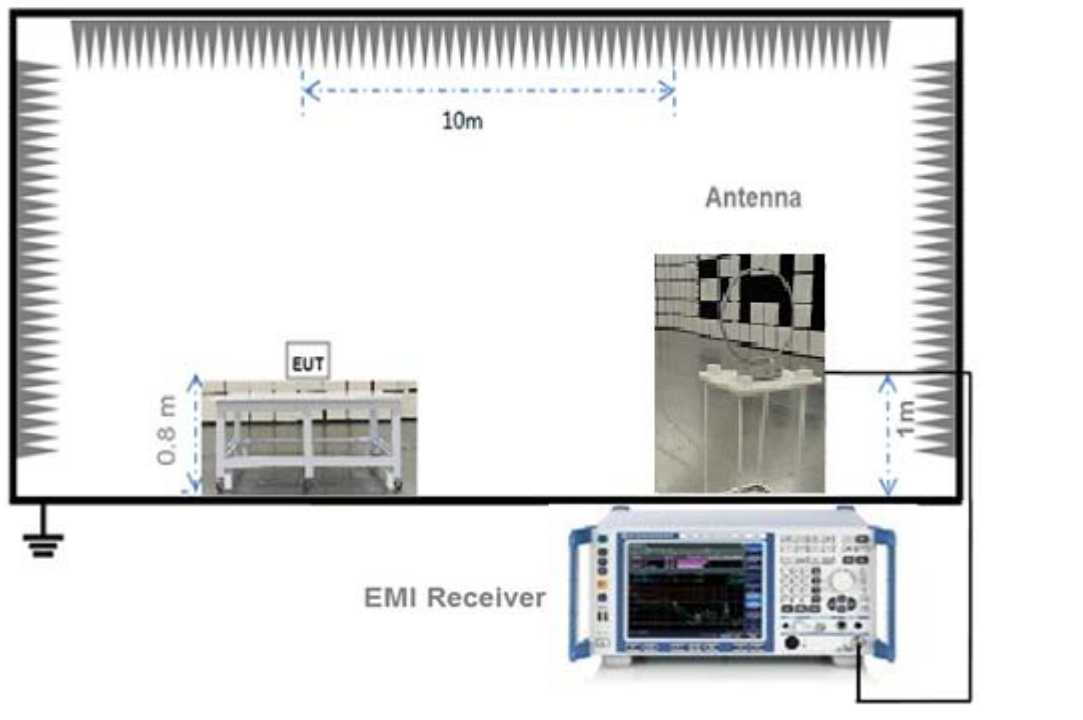
|                            |                         |                |
|----------------------------|-------------------------|----------------|
| Relative Humidity          | 45% to 55%              |                |
| Atmospheric Pressure       | 100 kPa to 102 kPa      |                |
| Temperature                | NT (Normal Temperature) | +22°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     | 2018.06.11 | 2019.06.10 |
| Vector Signal Generator           | ROHDE&SCHWARZ           | SMBV100A          | 260592     | 2018.06.11 | 2019.06.10 |
| Signal Generator                  | ROHDE&SCHWARZ           | SMB100A           | 177746     | 2018.06.11 | 2019.06.10 |
| Switch Unit with OSP-B157         | ROHDE&SCHWARZ           | OSP120            | 101270     | 2018.06.11 | 2019.06.10 |
| Spectrum Analyzer                 | AGILENT                 | E4440A            | MY45304434 | 2018.11.06 | 2019.11.05 |
| EMI Receiver                      | ROHDE&SCHWARZ           | ESRP              | 101036     | 2018.06.13 | 2019.06.12 |
| LISN                              | SCHWARZBECK             | NSLK 8127         | 8127-687   | 2018.06.13 | 2019.06.12 |
| Bluetooth Tester                  | ROHDE&SCHWARZ           | CBT               | 101005     | 2018.06.11 | 2019.06.10 |
| Power Splitter                    | KMW                     | DCPD-LDC          | 1305003215 | --         | --         |
| Power Sensor                      | ROHDE&SCHWARZ           | NRP-Z21           | 103971     | 2018.06.11 | 2019.06.10 |
| Attenuator (20 dB)                | KMW                     | ZA-S1-201         | 110617091  | --         | --         |
| Attenuator (6 dB)                 | KMW                     | ZA-S1-61          | 1305003189 | --         | --         |
| DC Power Supply                   | ROHDE&SCHWARZ           | HMP2020           | 018141664  | 2018.06.21 | 2019.06.20 |
| Temperature Chamber               | ANGELANTIONI SCIENCE    | NTH64-40A         | 1310       | 2018.06.26 | 2019.06.25 |
| Test Antenna-Rod(9 kHz-30 MHz)    | SCHWARZBECK             | VAMP 9243         | 9243-556   | 2017.11.07 | 2019.11.08 |
| Test Antenna-Loop(9 kHz-30 MHz)   | SCHWARZBECK             | FMZB 1519         | 1519-037   | 2017.07.22 | 2019.07.21 |
| Test Antenna-Bi-Log(30 MHz-3 GHz) | SCHWARZBECK             | VULB 9163         | 9163-624   | 2018.07.11 | 2019.07.10 |
| Test Antenna-Horn(1-18 GHz)       | SCHWARZBECK             | BBHA 9120D        | 9120D-1148 | 2018.06.21 | 2019.06.20 |
| Test Antenna-Horn(15-26.5 GHz)    | SCHWARZBECK             | BBHA 9170         | 9170-305   | 2018.06.21 | 2019.06.20 |
| Anechoic Chamber                  | EMC Electronic Co., Ltd | 9m*6m*6m          | N/A        | 2017.02.21 | 2019.02.20 |
| Anechoic Chamber                  | EMC TECHNOLOGY LTD      | 21.1m*11.6m*7.35m | N/A        | 2017.02.21 | 2019.02.20 |
| Shielded Enclosure                | ChangNing               | CN-130701         | 130703     | --         | --         |
| Test Software                     | BALUN                   | BL410_E           | V18.626    | --         | --         |

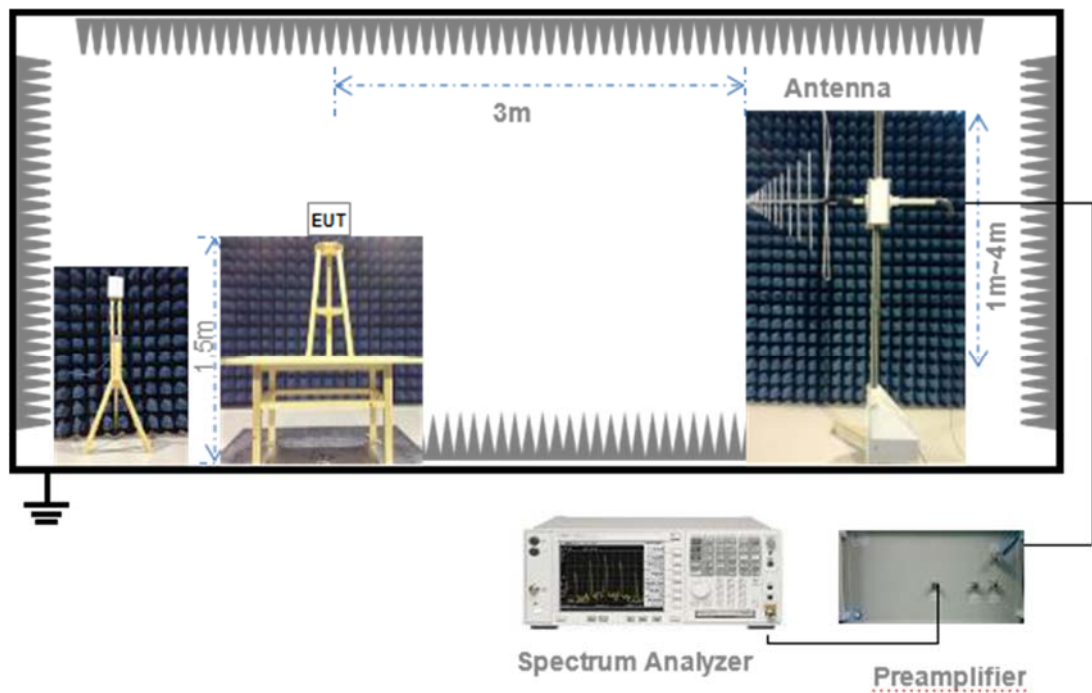
## Description of Test Setup

### 4.2.1 For Radiated Test (Below 30 MHz)



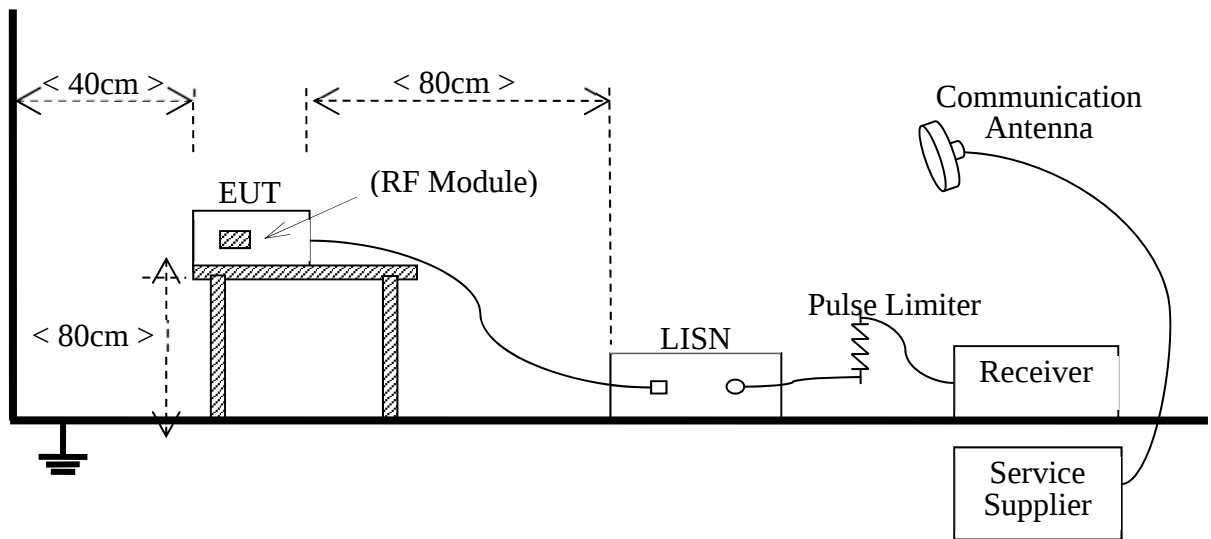
(Diagram 1)

### 4.2.2 For Radiated Test (30 MHz-1 GHz)



(Diagram 2)

#### 4.2.3 For AC Power Supply Port Test



(Diagram 3)

## 5 TEST ITEMS

### 5.1 Antenna Requirements

#### 5.1.1 Relevant Standards

##### FCC §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 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.

##### RSS-Gen 6.8

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

### 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. |

## 5.2 Emission Bandwidth

### 5.2.1 Definition

15.215(c);

Intentional radiators operating under the alternative provisions to the general emission limits 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 6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample” . However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold” ) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

### 5.2.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.2.3 Test Procedure

The 20dB bandwidth is measured with a spectrum analyzer connected via a receiver antenna placed near the EUT

while the EUT is operating in transmission mode.

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth

RBW  $\geq$  1% of the 20 dB bandwidth & RBW = 1% to 5% OBW

VBW  $\geq$  RBW & VBW = 3\* RBW

Sweep = auto

Detector function = peak

Trace = max hold

#### 5.2.4 Test Result

Please refer to ANNEX A.1

### 5.3 Field Strength of Fundamental Emissions and Radiated Emissions

#### 5.3.1 Limit

FCC §15.225(a), (b), (c); RSS-210 B.6

According to FCC section 15.225, for <30 MHz, Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10 KHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT)

There was no detected Restricted bands and Radiated suprious emission below 30MHz. The 30m limit was converted to 3m Limit using square factor(x) as it was found by measurements as follows; 3 m Limit(dBuV/m) =  $20\log(X)+40\log(30/3)= 20\log(15848)+40\log(30/3) = 124\text{dBuV}$

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 range (MHz) | Field Strength@30m |                          | Field Strength@10m       | Field Strength@3m        |
|-----------------------|--------------------|--------------------------|--------------------------|--------------------------|
|                       | $\mu\text{V/m}$    | $\text{dB}\mu\text{V/m}$ | $\text{dB}\mu\text{V/m}$ | $\text{dB}\mu\text{V/m}$ |
| Below 13.110          | 30                 | 29.5                     | 48.58                    | 69.5                     |
| 13.110 ~ 13.410       | 106                | 40.5                     | 59.58                    | 80.5                     |
| 13.410 ~ 13.553       | 334                | 50.5                     | 69.58                    | 90.5                     |
| 13.553 ~13.567        | 15848              | 84                       | 103.08                   | 124                      |
| 13.567 ~ 13.710       | 334                | 50.5                     | 69.58                    | 90.5                     |
| 13.710 ~14.010        | 106                | 40.5                     | 59.58                    | 80.5                     |
| Above 14.010          | 30                 | 29.5                     | 48.58                    | 69.5                     |

NOTE:

1. Field Strength ( $\text{dB}\mu\text{V/m}$ ) =  $20*\log[\text{Field Strength } (\mu\text{V/m})]$ .
2. In the emission tables above, the tighter limit applies at the band edges.

FCC §15.225(d)

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 ( $\mu\text{V/m}$ ) |
|-----------------|------------------------------------|
| 0.009 - 0.490   | $2400/\text{F(kHz)}$               |
| 0.490 - 1.705   | $24000/\text{F(kHz)}$              |
| 1.705 - 30.0    | 30                                 |
| 30 - 88         | 100                                |
| 88 - 216        | 150                                |
| 216 - 960       | 200                                |
| Above 960       | 500                                |

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).

### 5.3.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.3.3 Test Procedure

The 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

### 5.3.4 Test Result

Please refer to ANNEX A.2

NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain (dB)

3. Over limit = Results – Limit.

## 5.4 Frequency Tolerance

### 5.4.1 Limit

FCC §15.225(e)

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

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(a) at the temperatures of  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ),  $+20^{\circ}\text{C}$  ( $+68^{\circ}\text{F}$ ) and  $+50^{\circ}\text{C}$  ( $+122^{\circ}\text{F}$ ), and at the manufacturer's rated supply voltage; and

(b) at the temperature of  $+20^{\circ}\text{C}$  ( $+68^{\circ}\text{F}$ ) and at  $\pm 15\%$  of the manufacturer's rated supply voltage.

If the frequency stability limits are only met within a temperature range that is smaller than the  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  range specified in (a), the frequency stability requirement will be deemed to be met if the transmitter is automatically prevented from operating outside this smaller temperature range and if the published operating characteristics for the equipment are revised to reflect this restricted temperature range.

### 5.4.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.4.3 Test Procedure

1. The test is performed in a Temperature Chamber.
2. The EUT is configured as MS + DC Power Supply.

### 5.4.4 Test Result

Please refer to ANNEX A.4.

## 5.5 Conducted Emission

### 5.5.1 Limit

FCC §15.207; RSS-Gen

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 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

| Frequency range<br>(MHz) | Conducted Limit (dB $\mu$ V) |          |
|--------------------------|------------------------------|----------|
|                          | Quai-peak                    | Average  |
| 0.15 - 0.50              | 66 to 56                     | 56 to 46 |
| 0.50 - 5                 | 56                           | 46       |
| 0.50 - 30                | 60                           | 50       |

### 5.5.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

### 5.5.3 Test Procedure

The 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.

### 5.5.4 Test Result

Please refer to ANNEX A.5.

NOTE:

1. Results (dB $\mu$ V/m) = Reading (dB $\mu$ V) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor = Insertion loss + Cable loss

3. Over limit = Results – Limit.

## ANNEX A TEST RESULT

### A.1 Emission Bandwidth

Note: Emission Bandwidth result reference from original test report: BL-EC17C0360-402 (issued by Shenzhen BALUN Technology Co., Ltd. On Apr. 02, 2018) A.1 Emission Bandwidth.

### A.2 Field Strength of Fundamental Emissions

Note: Field Strength of Fundamental Emissions result reference from original test report: BL-EC17C0360-402 (issued by Shenzhen BALUN Technology Co., Ltd. On Apr. 02, 2018) A.2 Field Strength of Fundamental Emissions.

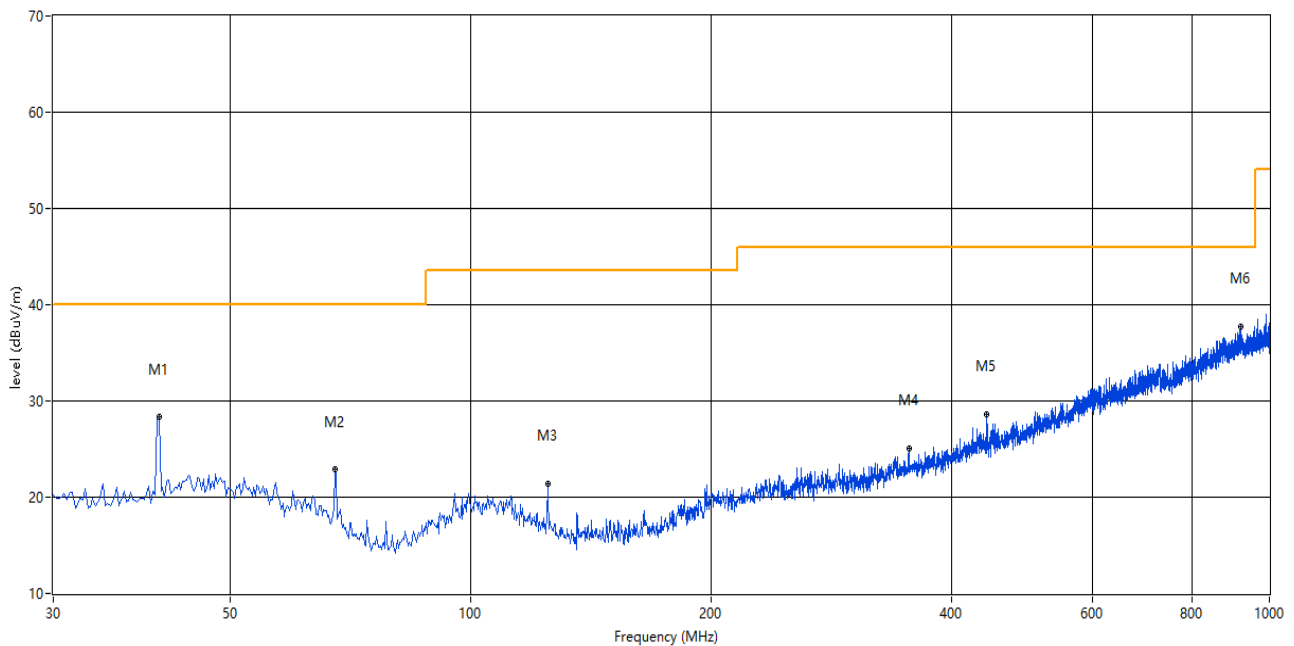
### A.3 Radiated Emissions

Note: This frequency which near 13.560 MHz with circle should be ignored because they are NFC carrier frequency.  
The Data and Plots (9 kHz ~ 30 MHz)(at 10m chamber)

Note: Radiated Emissions (9 kHz ~ 30 MHz)(at 10m chamber) result reference from original test report: BL-EC17C0360-402 (issued by Shenzhen BALUN Technology Co., Ltd. On Apr. 02, 2018) A.3 Radiated Emissions (9 kHz ~ 30 MHz)(at 10m chamber).

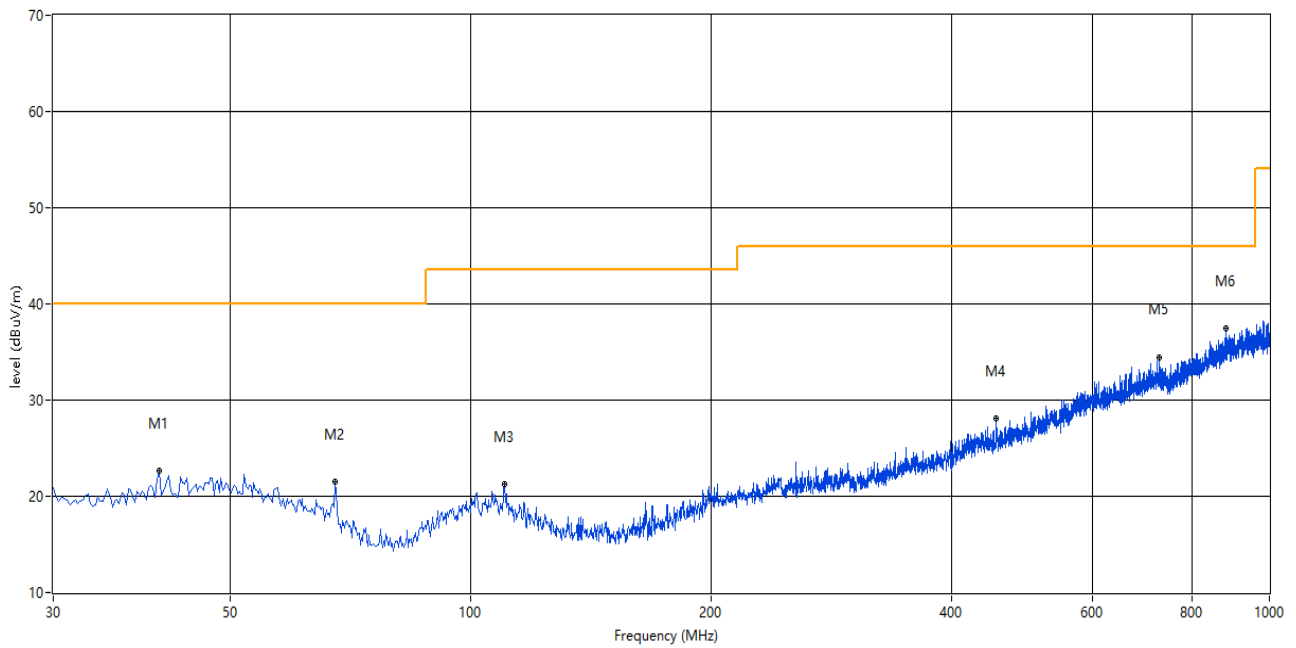
#### Test Data and Plots (30 MHz ~ 10th Harmonic)(at 3m chamber)

Above 30 MHz ANT-V



| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT      | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|----------|---------|
| 40.667             | 28.31                     | --                          | --                           | -27.11         | --                   | 40.0                 | --                   | 11.69          | 299.40    | 100            | Vertical | Pass    |
| 67.578             | 22.88                     | --                          | --                           | -29.93         | --                   | 40.0                 | --                   | 17.12          | 296.70    | 100            | Vertical | Pass    |
| 124.794            | 21.33                     | --                          | --                           | -30.98         | --                   | 43.5                 | --                   | 22.17          | 353.80    | 100            | Vertical | Pass    |
| 353.657            | 25.08                     | --                          | --                           | -25.23         | --                   | 46.0                 | --                   | 20.92          | 360.00    | 200            | Vertical | Pass    |
| 442.147            | 28.61                     | --                          | --                           | -23.14         | --                   | 46.0                 | --                   | 17.39          | 358.00    | 100            | Vertical | Pass    |
| 919.753            | 37.73                     | --                          | --                           | -13.22         | --                   | 46.0                 | --                   | 8.27           | 0.00      | 300            | Vertical | Pass    |

### Below 30 MHz ANT -H



| Frequency<br>(MHz) | Peak<br>Level<br>(dBuV/m) | Q-peak<br>Level<br>(dBuV/m) | Average<br>Level<br>(dBuV/m) | Factor<br>(dB) | PK Limit<br>(dBuV/m) | QP Limit<br>(dBuV/m) | AV Limit<br>(dBuV/m) | Margin<br>(dB) | Table (o) | Height<br>(cm) | ANT        | Verdict |
|--------------------|---------------------------|-----------------------------|------------------------------|----------------|----------------------|----------------------|----------------------|----------------|-----------|----------------|------------|---------|
| 40.667             | 22.65                     | --                          | --                           | -27.11         | --                   | 40.0                 | --                   | 17.35          | 360.00    | 300            | Horizontal | Pass    |
| 67.578             | 21.52                     | --                          | --                           | -29.93         | --                   | 40.0                 | --                   | 18.48          | 360.00    | 300            | Horizontal | Pass    |
| 110.247            | 21.25                     | --                          | --                           | -28.75         | --                   | 43.5                 | --                   | 22.25          | 0.00      | 100            | Horizontal | Pass    |
| 455.239            | 28.11                     | --                          | --                           | -22.87         | --                   | 46.0                 | --                   | 17.89          | 294.80    | 200            | Horizontal | Pass    |
| 728.468            | 34.43                     | --                          | --                           | -16.93         | --                   | 46.0                 | --                   | 11.57          | 208.70    | 300            | Horizontal | Pass    |
| 882.659            | 37.44                     | --                          | --                           | -13.81         | --                   | 46.0                 | --                   | 8.56           | 181.70    | 300            | Horizontal | Pass    |

#### A.4 Frequency Stability

Note: Frequency Stability result reference from original test report: BL-EC17C0360-402 (issued by Shenzhen BALUN Technology Co., Ltd. On Apr. 02, 2018) A.4 Frequency Stability.

#### A.5 Conducted Emissions

Note: Conducted Emissions result reference from original test report: BL-EC17C0360-402 (issued by Shenzhen BALUN Technology Co., Ltd. On Apr. 02, 2018) A.5 Conducted Emissions.

## **ANNEX B TEST SETUP PHOTOS**

Please refer the document “BL-EC18B0146-AE2.PDF”.

## **ANNEX C EUT EXTERNAL PHOTOS**

Please refer the document “BL-EC18B0146--AW.PDF”.

## **ANNEX D EUT INTERNAL PHOTOS**

Please refer the document “BL-EC18B0146--AI.PDF”.

--END OF REPORT--