# FCC PART 15B, CLASS B

# TEST REPORT

For

# BTECH (BaoFeng Tech)

702 N Industrial Ave Arlington, SD 57212 United States.

## FCC ID: 2AGNDUV-5001

| Report Type: | Product Type: |
|---|---|
| Original Report | Dual Band Scanning Receiver |

| | |
|---|---|
| **Test Engineer:** | Billy Li |
| **Report Number:** | RSZ160107811-00 |
| **Report Date:** | 2016-01-18 |
| **Reviewed By:** | Suny Sun<br>EMC Manager |
| **Prepared By:** | Bay Area Compliance Laboratories Corp. (Shenzhen)<br>6/F, the 3rd Phase of WanLi Industrial Building<br>ShiHua Road, FuTian Free Trade Zone<br>Shenzhen, Guangdong, China<br>Tel: +86-755-33320018<br>Fax: +86-755-33320008<br>www.baclcorp.com.cn |

# TABLE OF CONTENTS

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

The *BTECH (BaoFeng Tech)* 's product, model number: *UV-5001 (FCC ID: 2AGNDUV-5001)* or the "EUT" in this report was a Dual Band Scanning Receiver, which was measured approximately: 17.0 cm (L) x 14.0 cm (W) x 4.0 cm (H), rated with input voltage: DC 13.8V. The highest operating frequency is 520 MHz.

Technical specifications:

| | | |
|---|---|---|
| Frequency Range (MHz): | | 136-174 (Rx); 400-520 (Rx). |
| Memory Channels | : | 200 |
| Frequency Step (kHz) | : | 2.5K/5.0K/6.25K/10.0K/12.5K/25.0K |
| Sensitivity | : | ≤0.25uV (Broadband); ≤0.35μV (Narrow band). |

**All measurement and test data in this report was gathered from production sample serial number: 1601072 (Assigned by Shenzhen BACL).The EUT supplied by the applicant was received on 2016-01-07.*

## Objective

This test report is prepared on behalf of *BTECH (BaoFeng Tech)* in accordance with Part 2-Subpart J, Part 15-Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of the EUT with FCC Part 15 B.

## Related Submittal(s)/Grant(s)

No related submittal(s).

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.81 dB for 30MHz-1GHz, and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

## Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on October 31, 2013. The

facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in a manufacturer testing fashion.

EUT operation mode: Receiving

## EUT Exercise Software

No exercise software was used.

## Special Accessories

No special accessory.

## Equipment Modifications

No modification was made to the EUT tested.

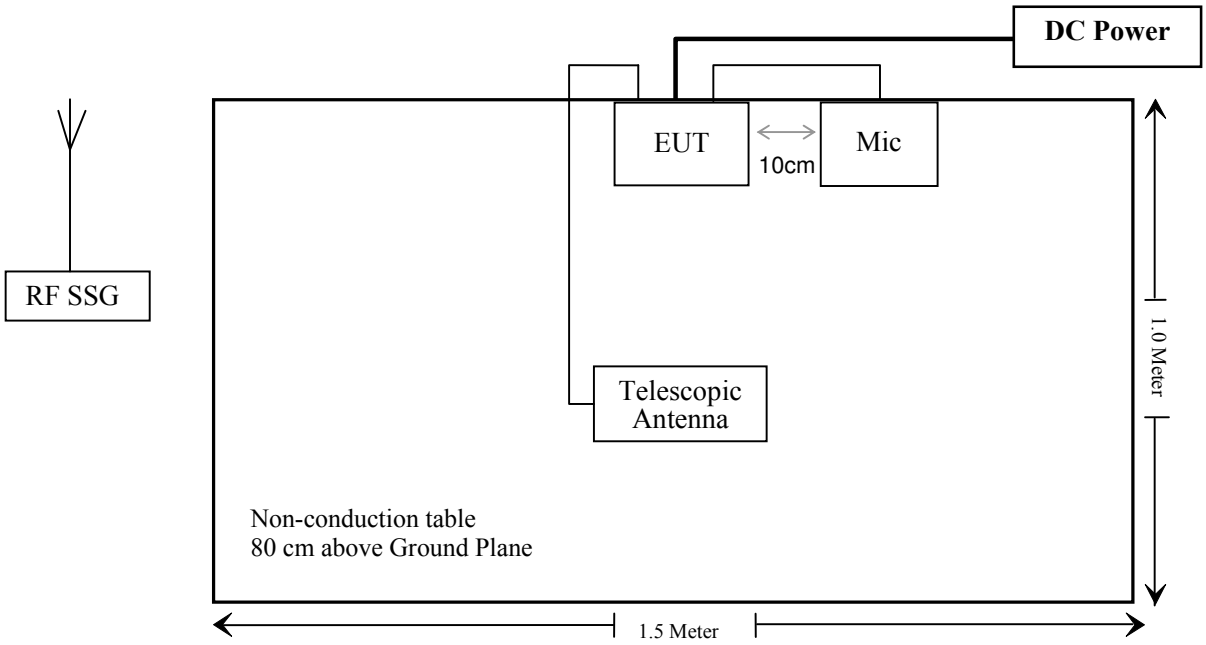
## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| GW instek | DC power | GPS-3030DD | EM832096 |
| R&S | RF SSG | SMU200A | 103866 |

## External I/O Cable

| Cable Description | Length (m) | From/Port | To |
|---|---|---|---|
| Un-Shielding Detachable DC Cable | 1.5 | DC power | EUT |
| Un-Shielding Detachable Signal Cable | 0.55 | EUT | Mic |

**Block Diagram of Test Setup**



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Results |
|---|---|---|
| §15.107 | AC Line Conducted Emissions | Not Applicable |
| §15.109 | Radiated Spurious Emissions | Compliance |
| §15.121 | Compliance for Scanning Receiver | Compliance |

# FCC §15.109 - RADIATED SPURIOUS EMISSIONS

## Applicable Standard

FCC §15.109

## Measurement Uncertainty

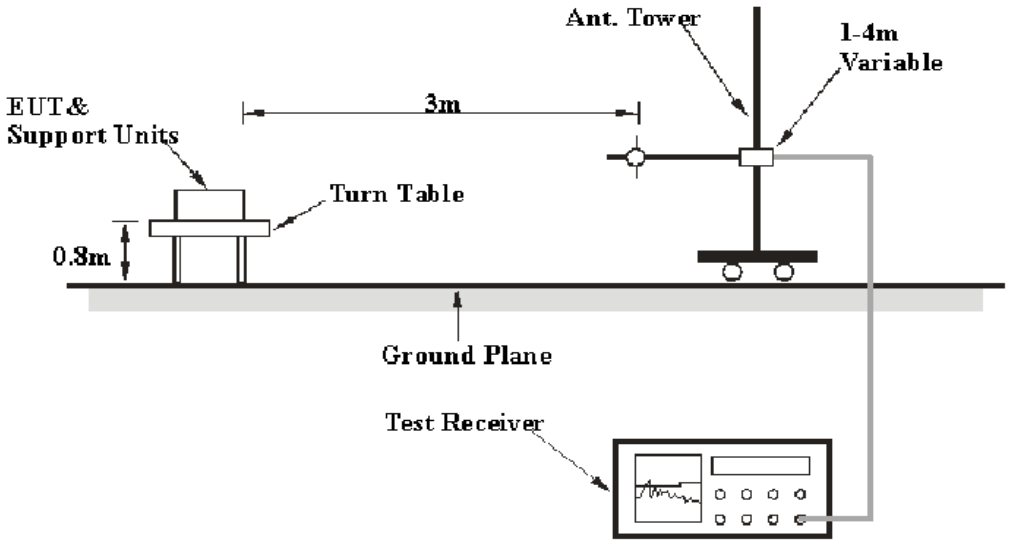
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.81 dB for 30MHz-1GHz and 4.88 dB for above 1GHz, 1.95dB for conducted measurement at antenna port. And the uncertainty will not be taken into consideration for the test data recorded in the report

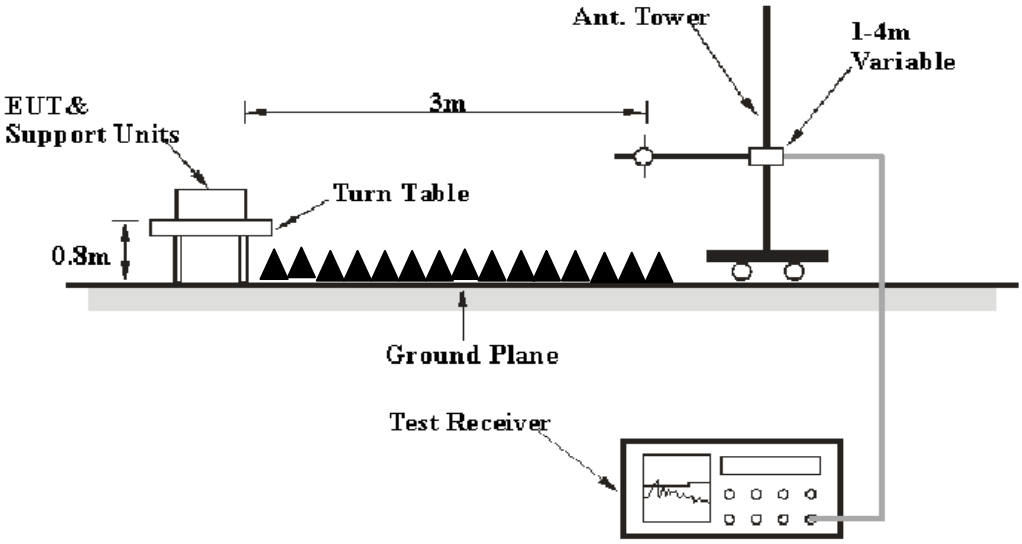
| Frequency | Polarity | Measurement uncertainty |
|---|---|---|
| 30 MHz~200 MHz | Horizontal | 4.04 dB (k=2, 95% level of confidence) |
| | Vertical | 4.52 dB (k=2, 95% level of confidence) |
| 200 MHz~1 GHz | Horizontal | 4.72 dB (k=2, 95% level of confidence) |
| | Vertical | 5.81 dB (k=2, 95% level of confidence) |
| 1 GHz~6 GHz | Horizontal/Vertical | 4.64 dB (k=2, 95% level of confidence) |
| Above 6 GHz | Horizontal/Vertical | 4.88 dB (k=2, 95% level of confidence) |

## EUT Setup

**Below 1 GHz:**



**Above 1GHz:**




The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15.109 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Detector |
|---|---|---|---|---|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz | 120 kHz | QP |
| Above 1 GHz | 1MHz | 3 MHz | / | PK |
| | 1MHz | 10 Hz | / | Ave. |

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| TDK | Chamber | Chamber A | 2# | 2013-10-15 | 2016-10-15 |
| HP | Amplifier | HP8447E | 1937A01046 | 2015-05-06 | 2016-05-06 |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 101120 | 2015-12-15 | 2016-12-14 |
| Sunol Sciences | Broadband Antenna | JB1 | A040904-2 | 2014-12-07 | 2017-12-06 |
| Rohde & Schwarz | Auto test Software | EMC32 | V9.10 | NCR | NCR |
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 8386001028 | 2015-12-11 | 2016-12-11 |
| Mini | Pre-Amplifier | ZVA-183-S+ | 5969001149 | 2015-04-23 | 2016-04-23 |
| A.H.System | Horn Antenna | SAS-200/571 | 135 | 2015-08-18 | 2018-08-17 |
| TDK | Chamber | Chamber B | 1# | 2013-07-23 | 2016-07-22 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.109 Class B, the worst margin reading as below:

**16.23 dB** at **30.181562 MHz** in the **Vertical** polarization mode and Frequency 155.0MHz( Middle)

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than $U_{cispr}$, if $L_m$ is less than $L_{lim}$, it implies that the EUT complies with the limit.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 20.4 ℃ |
| **Relative Humidity:** | 54 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Billy Li on 2016-01-11.*

### 30 MHz – 5GHz:

**EUT Operation Mode: Scanning Mode**

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBμV/m) | FCC Part 15B | |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/Ave.) | | Height (m) | Polar (H/V) | | | Limit (dBμV/m) | Margin (dB) |
| Scanning 136-174MHz / 400-520 MHz band. | | | | | | | | | |
| 30.125438 | 22.07 | QP | 220 | 1.05 | V | 0.10 | 22.17 | 40 | 17.83 |
| 38.543125 | 24.60 | QP | 301 | 1.75 | H | -5.80 | 18.80 | 40 | 21.20 |
| 47.752436 | 27.15 | QP | 224 | 1.14 | V | -12.50 | 14.65 | 40 | 25.35 |
| 693.126000 | 21.94 | QP | 105 | 1.21 | V | 0.40 | 22.34 | 46 | 23.66 |
| 1535.60 | 47.60 | PK | 198 | 2.36 | H | -10.41 | 37.19 | 74 | 36.81 |
| 1535.60 | 25.36 | Ave. | 198 | 2.36 | H | -10.41 | 14.95 | 54 | 39.05 |
| 1839.00 | 49.24 | PK | 58 | 1.23 | H | -13.21 | 36.03 | 74 | 37.97 |
| 1839.00 | 23.17 | Ave. | 58 | 1.23 | H | -13.21 | 9.96 | 54 | 44.04 |

**EUT Operation Mode: Receiving Mode**

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBμV/m) | FCC Part 15B | |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector (PK/QP/Ave.) | | Height (m) | Polar (H/V) | | | Limit (dBμV/m) | Margin (dB) |
| Frequency 136.5MHz（Low） | | | | | | | | | |
| 30.081768 | 22.57 | QP | 231 | 1.19 | V | 0.10 | 22.67 | 40 | 17.33 |
| 37.543125 | 24.10 | QP | 308 | 1.91 | H | -5.80 | 18.30 | 40 | 21.70 |
| 44.301500 | 24.96 | QP | 10 | 1.00 | V | -10.50 | 14.46 | 40 | 25.54 |
| 693.126740 | 21.54 | QP | 138 | 1.32 | V | 0.40 | 21.84 | 46 | 24.16 |
| 1536.00 | 48.63 | PK | 223 | 2.40 | H | -10.41 | 38.22 | 74 | 35.78 |
| 1536.00 | 26.41 | Ave. | 223 | 2.40 | H | -10.41 | 16.00 | 54 | 38.00 |
| 1839.10 | 48.25 | PK | 47 | 1.40 | H | -13.21 | 35.04 | 74 | 38.96 |
| 1839.10 | 23.07 | Ave. | 47 | 1.40 | H | -13.21 | 9.86 | 54 | 44.14 |
| Frequency 155.0MHz（Middle） | | | | | | | | | |
| 30.181562 | 23.67 | QP | 211 | 1.17 | V | 0.10 | 23.77 | 40 | **16.23** |
| 37.643235 | 24.15 | QP | 278 | 1.92 | H | -5.80 | 18.35 | 40 | 21.65 |
| 44.191550 | 24.91 | QP | 76 | 1.05 | V | -10.50 | 14.41 | 40 | 25.59 |
| 693.436560 | 21.89 | QP | 154 | 1.23 | V | 0.40 | 22.29 | 46 | 23.71 |
| 1537.10 | 47.68 | PK | 251 | 2.45 | H | -10.41 | 37.27 | 74 | 36.73 |
| 1537.10 | 25.41 | Ave. | 251 | 2.45 | H | -10.41 | 15.00 | 54 | 39.00 |
| 1838.50 | 50.25 | PK | 87 | 1.48 | H | -13.21 | 37.04 | 74 | 36.96 |
| 1838.50 | 24.17 | Ave. | 87 | 1.48 | H | -13.21 | 10.96 | 54 | 43.04 |
| Frequency 173.5MHz（High） | | | | | | | | | |
| 31.281568 | 23.07 | QP | 198 | 1.21 | V | 0.10 | 23.17 | 40 | 16.83 |
| 36.743425 | 24.35 | QP | 296 | 1.97 | H | -5.80 | 18.55 | 40 | 21.45 |
| 45.161900 | 25.91 | QP | 45 | 1.05 | V | -10.50 | 15.41 | 40 | 24.59 |
| 693.325750 | 22.84 | QP | 156 | 1.26 | V | 0.40 | 23.24 | 46 | 22.76 |
| 1535.60 | 48.58 | PK | 213 | 2.45 | H | -10.41 | 38.17 | 74 | 35.83 |
| 1535.60 | 26.36 | Ave. | 213 | 2.45 | H | -10.41 | 15.95 | 54 | 38.05 |
| 1839.05 | 49.79 | PK | 82 | 1.45 | H | -13.21 | 36.58 | 74 | 37.42 |
| 1839.05 | 23.67 | Ave. | 82 | 1.45 | H | -13.21 | 10.46 | 54 | 43.54 |
| Frequency 400.5MHz（Low） | | | | | | | | | |
| 33.338625 | 25.34 | QP | 101 | 1.63 | V | -2.70 | 22.64 | 40 | 17.36 |
| 38.543125 | 23.10 | QP | 278 | 1.91 | H | -5.80 | 17.30 | 40 | 22.70 |
| 47.752125 | 28.16 | QP | 216 | 1.08 | V | -12.50 | 15.66 | 40 | 24.34 |
| 695.457100 | 23.94 | QP | 127 | 1.32 | V | 0.40 | 24.34 | 46 | 21.66 |
| 1536.80 | 47.63 | PK | 210 | 2.43 | H | -10.41 | 37.22 | 74 | 36.78 |
| 1536.80 | 25.41 | Ave. | 210 | 2.43 | H | -10.41 | 15.00 | 54 | 39.00 |
| 1839.50 | 48.24 | PK | 67 | 1.39 | H | -13.21 | 31.03 | 74 | 38.97 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1839.50 | 24.17 | Ave. | 67 | 1.39 | H | -13.21 | 10.96 | 54 | 43.04 |
| Frequency 460.0MHz（ Middle） | | | | | | | | | |
| 33.338625 | 25.34 | QP | 75 | 1.67 | V | -2.70 | 22.64 | 40 | 17.36 |
| 38.543635 | 24.20 | QP | 314 | 1.83 | H | -5.80 | 18.40 | 40 | 21.60 |
| 47.752125 | 29.66 | QP | 241 | 1.12 | V | -12.50 | 17.16 | 40 | 22.84 |
| 695.227800 | 22.94 | QP | 129 | 1.37 | V | 0.40 | 23.34 | 46 | 22.66 |
| 1536.90 | 49.63 | PK | 218 | 2.46 | H | -10.41 | 39.22 | 74 | 34.78 |
| 1536.90 | 27.41 | Ave. | 218 | 2.46 | H | -10.41 | 17.00 | 54 | 37.00 |
| 1839.70 | 49.74 | PK | 98 | 1.41 | H | -13.21 | 36.53 | 74 | 37.47 |
| 1839.70 | 24.17 | Ave. | 98 | 1.41 | H | -13.21 | 10.96 | 54 | 43.04 |
| Frequency 519.5MHz（High） | | | | | | | | | |
| 33.338625 | 23.84 | QP | 86 | 1.54 | V | -2.70 | 21.14 | 40 | 18.86 |
| 38.543125 | 24.65 | QP | 325 | 1.87 | H | -5.80 | 18.85 | 40 | 21.15 |
| 47.752125 | 30.11 | QP | 226 | 1.15 | V | -12.50 | 17.61 | 40 | 22.39 |
| 695.731500 | 22.89 | QP | 118 | 1.36 | V | 0.40 | 23.29 | 46 | 22.71 |
| 1536.20 | 49.13 | PK | 209 | 2.38 | H | -10.41 | 38.72 | 74 | 35.28 |
| 1536.20 | 27.46 | Ave. | 209 | 2.38 | H | -10.41 | 17.05 | 54 | 36.95 |
| 1839.60 | 49.89 | PK | 83 | 1.42 | H | -13.21 | 36.68 | 74 | 37.32 |
| 1839.60 | 24.12 | Ave. | 83 | 1.42 | H | -13.21 | 10.91 | 54 | 43.09 |

**Note:**

1) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
2) Corrected Amplitude = Correction Factor + Reading
3) Margin = Limit - Corrected Amplitude

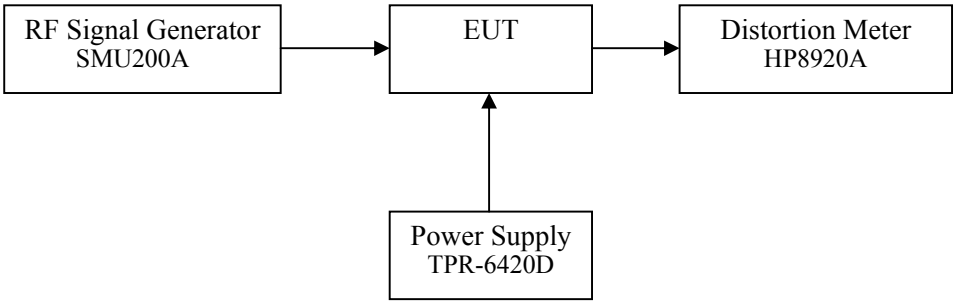
# FCC §15.121 - COMPLIANCE FOR SCANNING RECEIVER

## Applicable Standard

FCC §15.121

## EUT Setup

For FCC §15.121(b) Scanning Receiver Cellular Band Rejection Test




## Test Procedure

1) Connected the EUT as shown in the above block diagram.
2) Apply a RF signal to the receiver input port at lowest, middle and highest channel frequencies of receiver operation band.
3) Adjust the audio output level of the receiver to it's rated value with the distortion less than 10%.
4) Adjust the RF Signal Generator Output Power to produce 12 dB SINAD without the audio output power dropping by more than 3 dB.This output level of the RF SG at each channel frequency is the sensitivity of the receiver.
5) Select the lowest or worse-case sensitivity level for all of the bands as the reference sensitivity.
6) Adjust the RF Signal Generator output to a level of +60 dB above the reference sensitivity obtained in step 5) and its frequency to the frequency points in the cellular band.
7) Set the Receiver squelch to threshold, the signal required to open the squelch must be lower than the reference sensitivity level.
8) Set the receiver in a scanning mode and allow it to scan through it's complete receiving range.
9) If the receiver unsquelched or stopped on any frequency, receiving at this frequency, then adjust the signal generator output level until 12 dB SINAD is produced, this level is the spurious value and the difference between the reference sensitivity and the spurious value is the rejection ratio and must be at least 38dB.
10) Repeat above procedure at the frequencies 824.5, 836.0, and 848.5 MHz for the mobile band, and 869.1, 881.5, and 893.5MHz for the cellular base band.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Generator | SMU200A | 103866 | 2015-11-16 | 2016-11-15 |
| HP | RF Communications Test Set | HP8920A | 3438A05201 | 2015-06-14 | 2016-06-13 |
| Long Wei | DC Power Supply | TPR-6420D | 398363 | NCR | NCR |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## Test Results Summary

Comply with FCC 121(a):
– Please refer to the technical informations or the attestation letter conforming compliance with this requirement.

Comply with FCC 121(b):
– Please refer to the following Scanning Receiver Cellular Band Rejection Test Result.

Comply with FCC 121(c):
– Not applicable.

Comply with FCC 121(d):
–Please refer to the User Manual.

Comply with FCC 121(e):
– This Scanning Receiver is not assembled from kits or marketed in kit form.

Comply with FCC 121(f):
–Please refer to the label of the product.

## Test Data

For FCC §15.121(b) Scanning Receiver Cellular Band Rejection

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 20.4 ℃ |
| **Relative Humidity:** | 54 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Billy Li on 2016-01-11.*

*EUT Operation Mode: Scanning+Receiving Mode*

Scanning Receiver Cellular Band Rejection Test Data:

| EUT's Scanning Frequency Band (MHz) | Test Frequencies of Cellular Band (MHz) | Spurious Value of Cellular Frequencies for 12 dB SINAD (dBm) | Reference Sensitivity for 12 dB SINAD (dBm) | Rejection Ratio (dB) | Rejection Ratio Limit (dB) |
|---|---|---|---|---|---|
| 136–174, 400–520 | 824.5, 836.0, 848.5, 869.1, 881.5, 893.5 | > -51.2 | -116.5 | < -65.3 | **< -38.0** |

Note: Rejection Ratio = Reference Sensitivity - Spurious Value

## Result

Compliance with the requirements specified in Part 15.121 for scanning receiver.

******* END OF REPORT *******