

FCC PART 15B, CLASS B TEST REPORT

For

BTECH (BaoFeng Tech)

702 N Industrial Ave, Arlington, SD 57212, United States

FCC ID: 2AGNDUV-2501-220

Report Type: Original Report	Product Type: Dual Band Scanning Receiver
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Report Number: <u>RSZ160107810-00</u>	
Report Date: <u>2016-01-18</u>	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *BTECH (BaoFeng Tech)*'s product, model number: *UV-2501+220 (FCC ID: 2AGNDUV-2501-220)* or the "EUT" in this report was a *Dual Band Scanning Receiver*, which was measured approximately: 118mm (L) × 98 mm (W) × 35 mm (H), rated with input voltage: DC13.8 V. The highest operating frequency is 520 MHz.

Technical specifications:

Frequency Range (MHz):	136-174 (Rx), 210-230(Rx), 400-520 (Rx).
Memory Channels	: 200
Frequency Step (kHz)	: 5.0K/6.25K/10.0K/12.5K/15K/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: 1601071 (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 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.

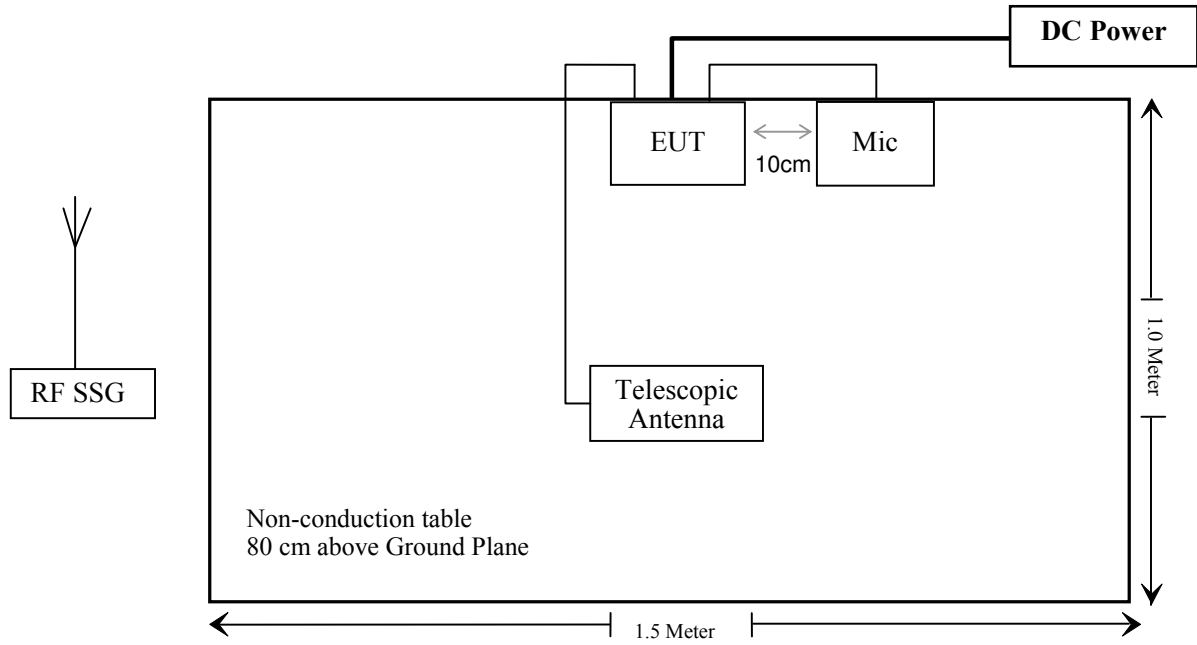
Support Equipment List and Details

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	1.50	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

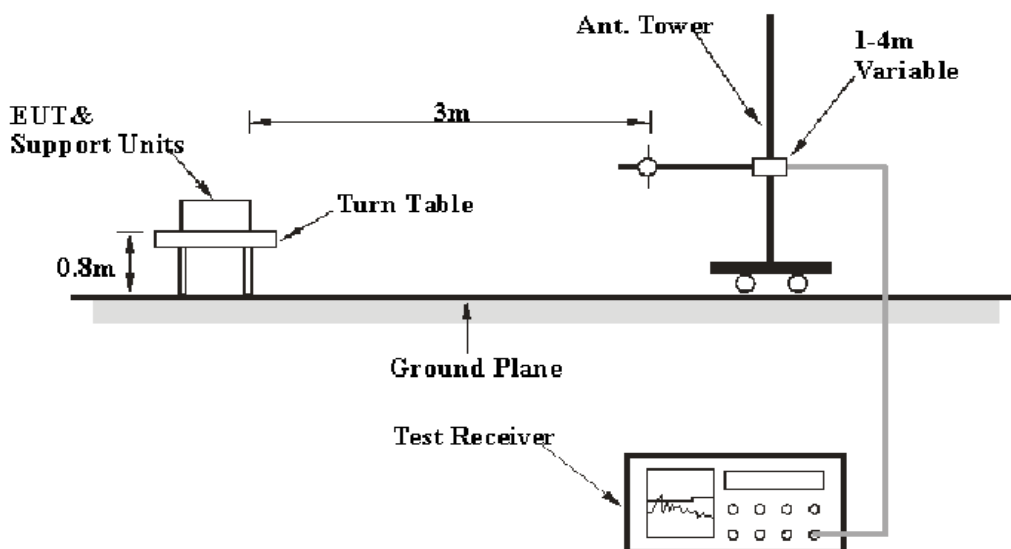
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency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

Based on CISPR 16-4-2:2011, the expanded 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

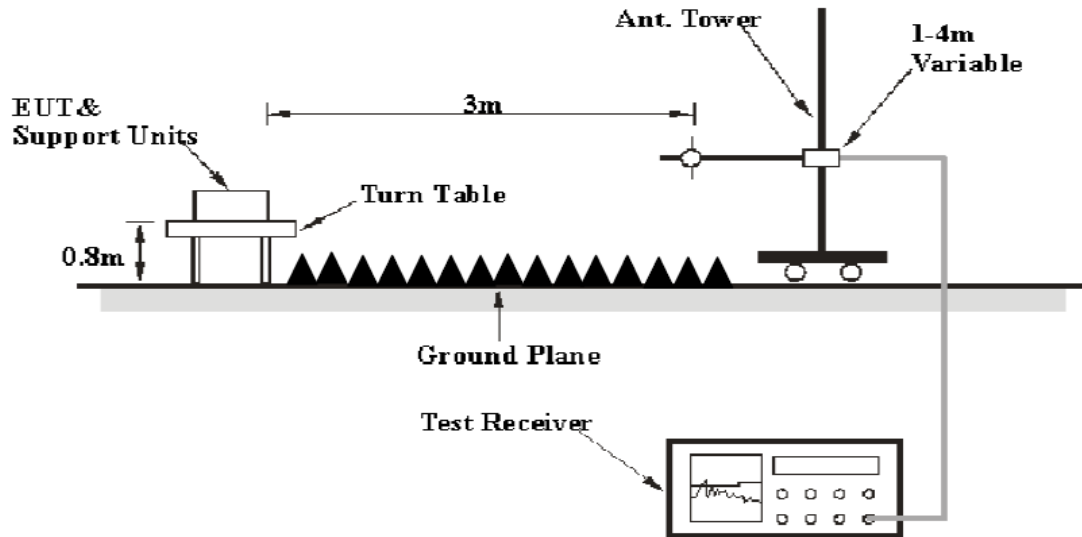
Frequency	Polarity	Measurement uncertainty
30 MHz~200 MHz	Horizontal	4.04 dB (k=2, 95% level of confidence)
	Vertical	4.52 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	Horizontal	4.72 dB (k=2, 95% level of confidence)
	Vertical	5.81 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	Horizontal/Vertical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



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
HP	Amplifier	HP8447E	1937A01046	2015-05-06	2016-05-06
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2015-11-03	2016-11-03
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
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
TDK	Chamber	Chamber A	2#	2015-10-15	2018-10-15
TDK	Chamber	Chamber B	1#	2015-07-22	2018-07-22
R&S	Auto test Software	EMC32	V9.10	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).

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

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:

18.77 dB at 30.591123 MHz in the Vertical polarization mode

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

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

In BACL, $U_{(L_m)}$ 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:	23 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Billy Li on 2016-01-15.

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/210-230MHz /400-520 MHz band.									
30.594315	20.63	QP	116.0	3.1	V	-0.40	20.23	40.00	19.77
37.324821	24.88	QP	131.0	1.8	H	-5.50	19.38	40.00	20.62
198.815346	13.00	QP	125.0	2.9	V	-8.20	5.00	43.30	38.70
805.725250	23.85	QP	151.0	1.1	V	1.80	25.65	46.00	20.35
1495.000000	52.32	PK	105.0	1.7	V	-10.53	41.79	74.00	32.21
1495.000000	26.55	Ave.	105.0	1.7	V	-10.53	16.02	54.00	37.98
1735.100000	49.20	PK	128.0	2.0	H	-10.46	38.74	74.00	35.26
1735.100000	28.82	Ave.	128.0	2.0	H	-10.46	18.36	54.00	37.64

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)									
30.591123	21.63	QP	102.0	3.2	V	-0.40	21.23	40.00	18.77
36.862875	23.55	QP	28.0	1.0	H	-5.40	18.15	40.00	21.85
198.795625	13.20	QP	143.0	2.8	V	-8.20	5.00	43.50	38.50
805.725250	23.85	QP	144.0	1.0	V	1.80	25.65	46.00	20.35
1493.000000	51.39	PK	24.0	1.8	V	-10.41	40.98	74.00	33.02
1493.000000	26.48	Ave.	24.0	1.8	V	-10.41	16.07	54.00	37.93
1738.000000	50.21	PK	28.0	1.1	H	-10.62	39.59	74.00	34.41
1738.000000	27.54	Ave.	28.0	1.1	H	-10.62	16.92	54.00	37.08
Frequency 155.0MHz (Middle)									
30.874578	21.21	QP	271.0	2.1	V	-0.40	20.81	40.00	19.19

37.324325	23.88	QP	147.0	1.9	H	-5.50	18.38	40.00	21.62
199.124733	13.20	QP	158.0	1.2	V	-8.30	4.90	43.50	38.60
806.221345	24.87	QP	165.0	1.1	V	1.8	26.67	46.00	19.33
1494.000000	53.21	PK	94.0	2.1	V	-10.44	42.77	74.00	31.23
1494.000000	26.48	Ave.	94.0	2.1	V	-10.44	16.04	54.00	37.96
1739.000000	49.65	PK	29.0	1.2	H	-10.62	39.03	74.00	34.97
1739.000000	26.88	Ave.	29.0	1.2	H	-10.62	16.26	54.00	37.74
Frequency 173.5MHz (High)									
31.456782	21.95	QP	201.0	2.5	V	-0.8	21.15	40.00	18.85
36.457821	23.22	QP	88.0	1.4	H	-5.1	18.12	40.00	21.88
199.546821	15.55	QP	323.0	2.4	V	-8.3	7.25	43.50	36.25
806.221345	24.87	QP	165.0	1.1	V	1.8	26.67	46.00	19.33
1496.000000	52.64	PK	120.0	1.4	V	-10.54	42.10	74.00	31.90
1496.000000	26.89	Ave.	120.0	1.4	V	-10.54	16.35	54.00	37.65
1735.000000	50.21	PK	131.0	1.9	H	-10.46	39.75	74.00	34.25
1735.000000	27.81	Ave.	131.0	1.9	H	-10.46	17.35	54.00	36.65
Frequency 210.5MHz (Low)									
30.874567	21.26	QP	246.0	1.2	V	-0.40	20.86	40.00	19.14
37.324368	23.83	QP	147.0	1.5	H	-5.50	18.33	40.00	21.67
577.694023	21.48	QP	47.0	3.6	H	-1.90	19.58	46.00	26.42
806.221353	24.82	QP	157.0	1.2	V	1.8	26.62	46.00	19.38
1494.200000	53.26	PK	101.0	2.0	V	-10.44	42.82	74.00	31.18
1494.200000	26.49	Ave.	101.0	2.0	V	-10.44	16.05	54.00	37.95
1738.500000	49.63	PK	56.0	1.1	H	-10.62	39.01	74.00	34.99
1738.500000	26.89	Ave.	56.0	1.1	H	-10.62	16.27	54.00	37.73
Frequency 220.5MHz (Middle)									
30.874988	21.76	QP	223.0	1.1	V	-0.40	21.36	40.00	18.64
37.324565	23.88	QP	118.0	1.4	H	-5.50	18.38	40.00	21.62
577.694420	21.28	QP	85.0	3.2	H	-1.90	19.38	46.00	26.22
806.221695	24.52	QP	132.0	1.1	V	1.8	26.32	46.00	19.68
1494.100000	53.16	PK	105.0	2.1	V	-10.44	42.72	74.00	31.28
1494.100000	26.69	Ave.	105.0	2.1	V	-10.44	16.25	54.00	37.75
1738.300000	49.65	PK	79.0	1.2	H	-10.62	39.03	74.00	34.97
1738.300000	26.86	Ave.	79.0	1.2	H	-10.62	16.24	54.00	37.76
Frequency 229.5MHz (High)									
30.874583	21.21	QP	212.0	1.1	V	-0.40	20.81	40.00	19.19
37.324372	23.82	QP	139.0	1.3	H	-5.50	18.32	40.00	21.68
577.694036	21.45	QP	68.0	3.2	H	-1.90	19.55	46.00	26.45
806.221565	24.84	QP	143.0	1.3	V	1.8	26.64	46.00	19.36
1494.100000	53.26	PK	106.0	2.1	V	-10.44	42.82	74.00	31.18
1494.100000	26.46	Ave.	106.0	2.1	V	-10.44	16.02	54.00	37.98
1738.200000	49.65	PK	96.0	1.2	H	-10.62	39.03	74.00	34.97
1738.200000	26.86	Ave.	96.0	1.2	H	-10.62	16.24	54.00	37.76
Frequency 400.5MHz (Low)									

37.162576	24.15	QP	76.0	1.1	H	-5.40	18.75	40.00	21.25
125.167000	14.79	QP	341.0	2.1	H	-6.70	8.09	43.50	35.41
577.694000	20.48	QP	13.0	3.7	H	-1.90	18.58	46.00	27.42
806.425950	24.05	QP	124.0	1.2	V	1.80	25.85	46.00	20.15
1493.500000	51.59	PK	56.0	1.5	V	-10.41	41.18	74.00	32.82
1493.500000	26.68	Ave.	56.0	1.5	V	-10.41	16.27	54.00	37.73
1738.300000	51.21	PK	98.0	1.2	H	-10.62	40.59	74.00	33.41
1738.300000	28.14	Ave.	98.0	1.2	H	-10.62	17.52	54.00	36.48
Frequency 460.0MHz (Middle)									
37.546812	23.65	QP	82.0	1.5	H	-5.40	18.25	40.00	21.75
126.548768	16.54	QP	235.0	2.3	H	-6.50	10.04	43.50	33.46
580.548789	20.11	QP	112.0	3.2	H	-1.80	18.31	46.00	27.69
808.546873	23.45	QP	213.0	2.3	V	1.90	25.35	46.00	20.65
1495.000000	51.32	PK	99.0	1.8	V	-10.53	40.79	74.00	33.21
1495.000000	25.55	Ave.	99.0	1.8	V	-10.53	15.02	54.00	38.98
1736.000000	50.87	PK	175.0	1.1	H	-10.6	40.27	74.00	33.73
1736.000000	28.13	Ave.	175.0	1.1	H	-10.6	17.53	54.00	36.47
Frequency 519.5MHz (High)									
38.451245	22.45	QP	312.0	3.0	H	-5.60	16.85	40.00	23.15
126.546248	17.21	QP	164.0	2.1	H	-6.40	10.81	43.50	32.69
579.546812	22.12	QP	110.0	1.8	H	-1.90	20.22	46.00	25.78
806.784412	22.48	QP	68.0	1.6	V	1.80	24.28	46.00	21.72
1493.000000	52.12	PK	78.0	1.5	V	-10.41	41.71	74.00	32.29
1493.000000	26.78	Ave.	78.0	1.5	V	-10.41	16.37	54.00	37.63
1737.000000	50.97	PK	247.0	1.7	H	-10.56	40.41	74.00	33.59
1737.000000	27.84	Ave.	247.0	1.7	H	-10.56	17.28	54.00	36.72

Note:

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

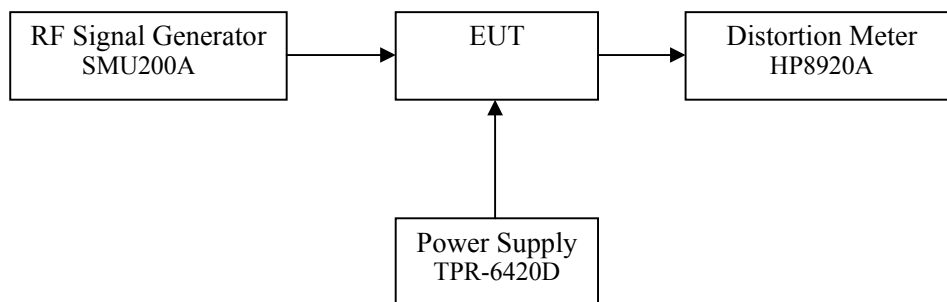
FCC §15.121 - COMPLIANCE FOR SCANNING RECEIVER

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 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Billy Li on 2016-01-15.

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, 210-230, 400-520	824.5, 836.0, 848.5, 869.1, 881.5, 893.5	> -52.1	-116.8	< -64.7	< -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 *******