




FCC PART 15B, CLASS B TEST REPORT

For

Kangaroo Media Inc

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FCC ID: 2ATRP-SWITCH

Report Type: Original Report	Product Type: SWITCH
Report Number: RSZ191202004-00	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	SWITCH
Tested Model	SWITCH
Multiple Model	SWITCH RACER
Voltage Range	DC 3V
Highest operating frequency	470 MHz
Date of Test	2020/01/14~2020/01/15
Sample serial number	RSZ191202004-EM-S (Assigned by BACL, Shenzhen)
Received date	2019-12-02
Sample/EUT Status	Good condition

Notes: This series products model: SWITCH and SWITCH RACER are identical schematics, Model SWITCH was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

Objective

This test report is prepared on behalf of *Kangaroo Media Inc* in accordance with Part 2-Subpart J, Part 15-Subparts A, 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)/Grant(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

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 test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will be taken into consideration for the test data recorded in the report

Parameter		uncertainty
Emissions, radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

EUT operation mode 1: Analog Receiving

EUT operation mode 2: Digital Receiving

EUT operation mode 3: Scanning

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

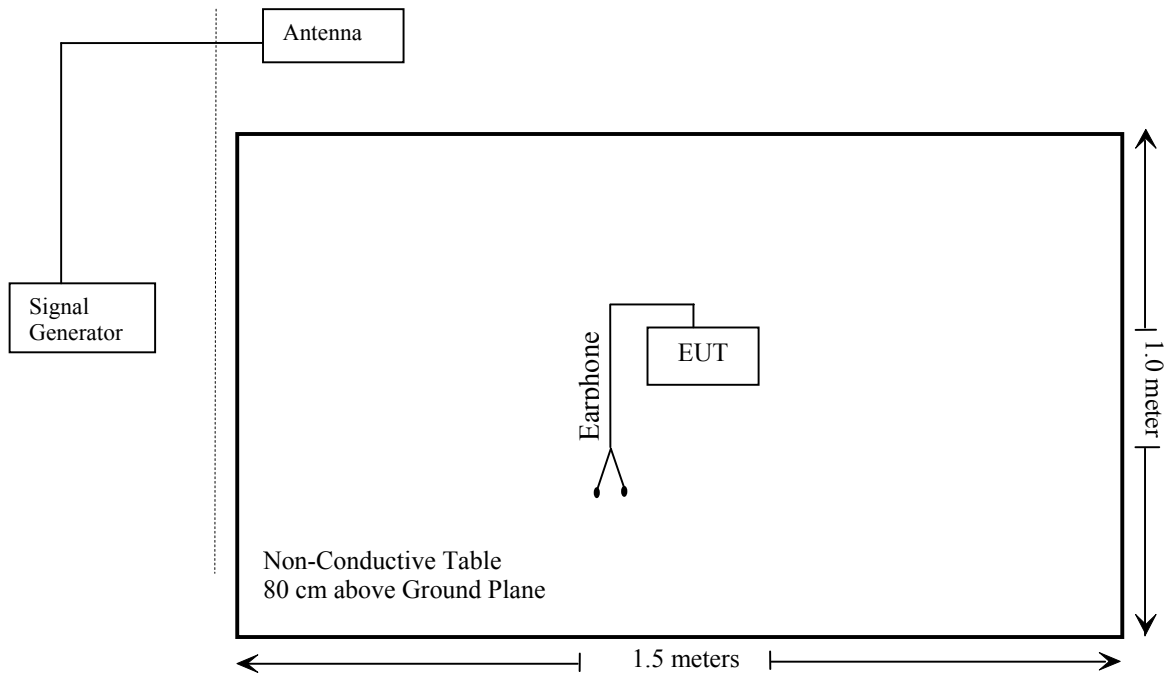
Manufacturer	Description	Model	Serial Number
Un-known	Earphone	Un-known	Un-known
HP	Signal Generator	8648C	3426A01345

External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielded detachable signal cable	10.0	Antenna	Signal Generator
Un-shielding Un-etchable Earphone Cable	1.2	EUT	Earphone

Block Diagram of Test Setup

For Radiated Emissions:



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

Note: Not Applicable: The EUT is powered by battery only.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
/	Cable 2	RF Cable 2	/	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/07/21
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Insulated Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
/	RF Cable	W1101-EQ1 OUT	/	2019/11/29	2020/11/28
HP	Signal Generator	8648C	3426A01345	2019-7-10	2020-7-9
AEROFLEX	Digital radio tester	3920	100636779	2019-6-23	2020-6-22
HP Agilent	RF Communication test set	8920A	3325UC0859	2019/7/9	2020/7/8

* **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).

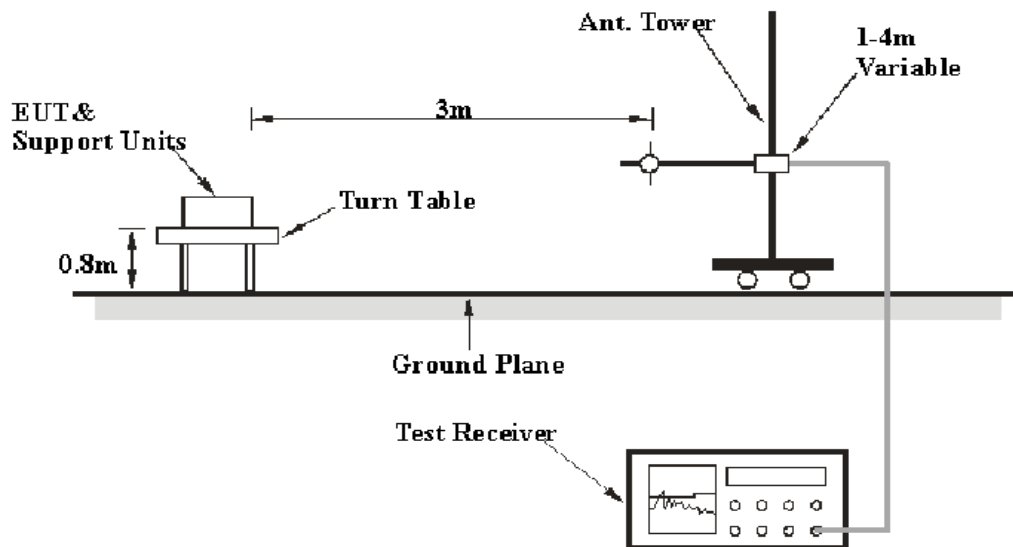
FCC §15.109 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

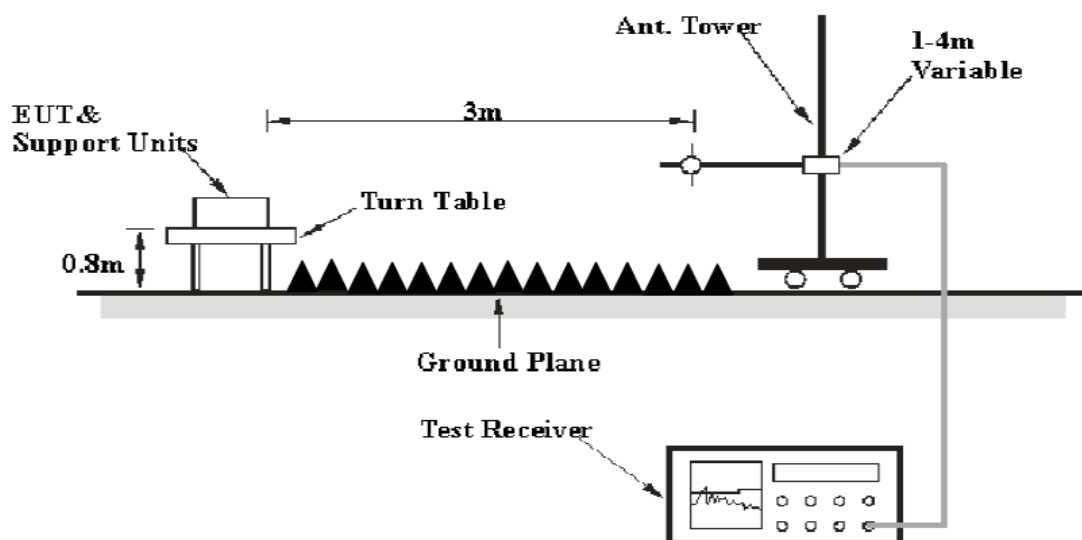
FCC §15.109

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 2 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	Measurement
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.

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,

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

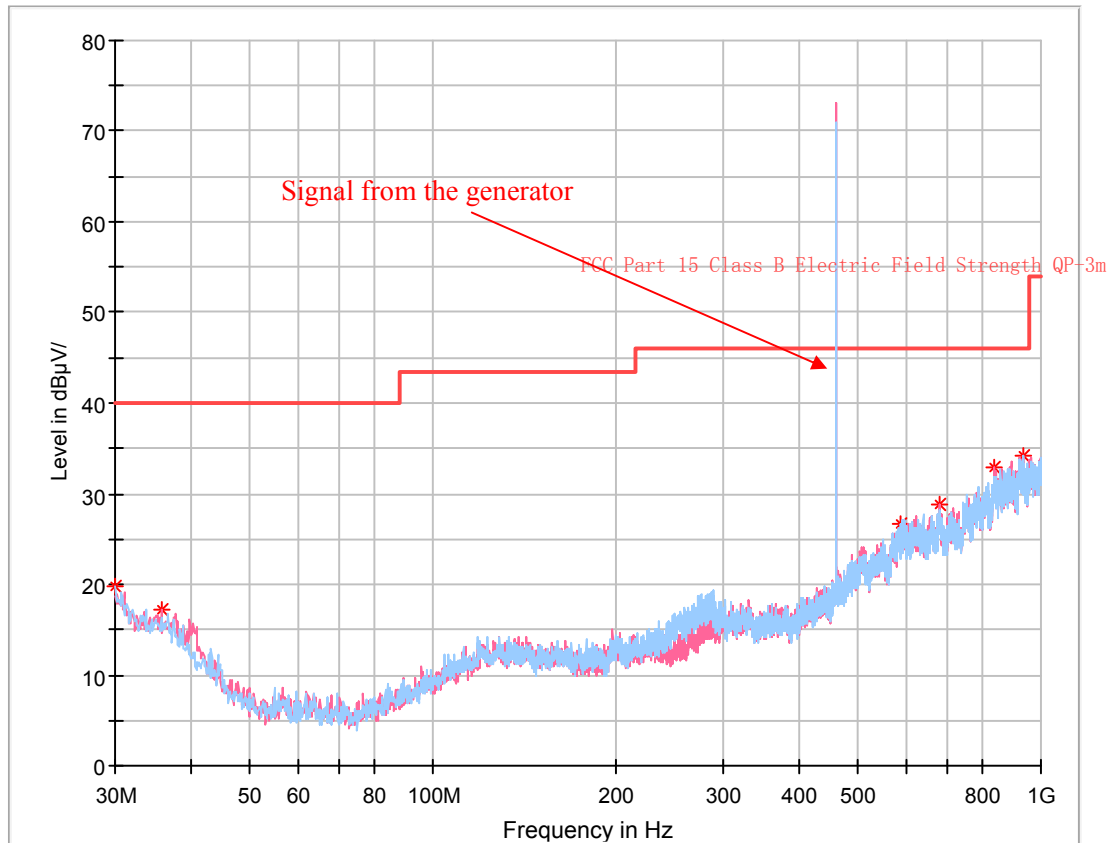
Temperature:	22~23 °C
Relative Humidity:	52~55 %
ATM Pressure:	101.0 kPa

The testing was performed by Zero Yan on 2020-01-15 and Alen He on 2020-01-14.

EUT operation mode 1: Analog Receiving

Note : Pre-scan with low/middle/high channel frequency (450.0125MHz,460MHz,469.9875MHz), and worst case is 469.9875MHz, the test data as below :

30 MHz~1 GHz:

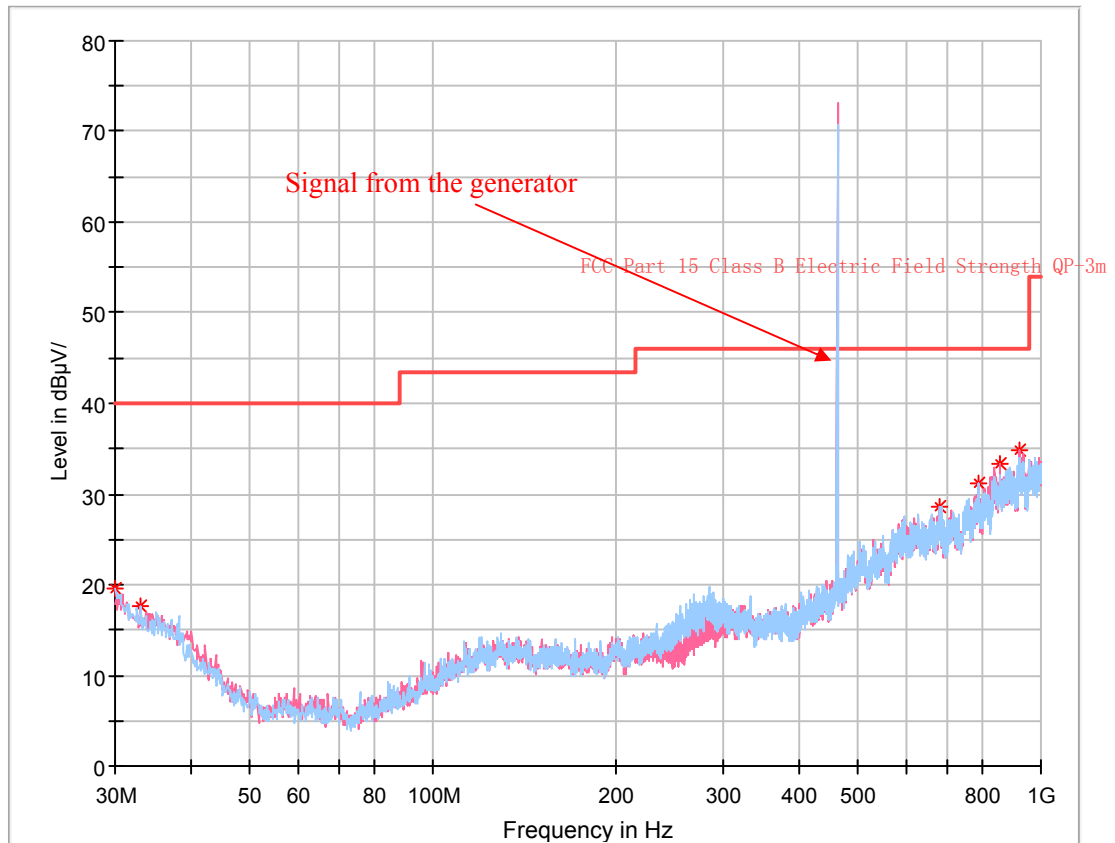


Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
30.000000	19.88	100.0	H	235.0	-7.6	40.00	20.12
35.820000	17.20	400.0	V	217.0	-11.1	40.00	22.80
589.811250	26.64	100.0	H	76.0	-2.1	46.00	19.36
680.385000	28.76	300.0	V	161.0	-1.4	46.00	17.24
838.495000	32.82	100.0	V	144.0	2.8	46.00	13.18
932.827500	34.28	300.0	H	178.0	4.8	46.00	11.72

EUT operation mode 2: Digital Receiving

Note : Pre-scan with low/middle/high channel frequency (450.0125MHz,460MHz,469.9875MHz), and worst case is 469.9875MHz, the test data as below :

30 MHz~1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
30.000000	19.67	400.0	H	119.0	-7.6	40.00	20.33
33.031250	17.58	100.0	H	32.0	-9.4	40.00	22.42
683.295000	28.50	200.0	H	114.0	-1.4	46.00	17.50
789.752500	31.12	300.0	H	224.0	1.4	46.00	14.88
856.925000	33.27	100.0	V	253.0	3.2	46.00	12.73
920.702500	34.81	300.0	V	306.0	4.6	46.00	11.19

EUT operation mode 3: Scanning

30 MHz~1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
30.242500	19.92	300.0	H	282.0	-7.8	40.00	20.08
35.092500	17.27	300.0	V	36.0	-10.6	40.00	22.73
594.782500	27.81	100.0	V	292.0	-1.8	46.00	18.19
682.567500	28.60	200.0	V	0.0	-1.4	46.00	17.40
836.312500	33.08	300.0	V	103.0	2.7	46.00	12.92
934.646250	35.43	400.0	V	228.0	4.8	46.00	10.57

1 GHz – 2 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBuV/m)	FCC Part 15B	
	Reading (dB μ V)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBuV/m)	Margin (dB)
1718.60	47.37	PK	313	2.2	H	-2.11	45.26	74	28.74
1718.60	44.49	Ave.	313	2.2	H	-2.11	42.38	54	11.62
1718.60	49.56	PK	102	2.2	V	-2.11	47.45	74	26.55
1718.60	46.32	Ave.	102	2.2	V	-2.11	44.21	54	9.79

Note:

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

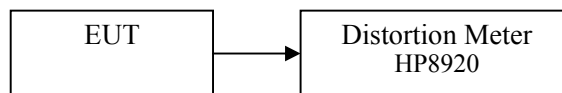
FCC §15.121 - COMPLIANCE FOR SCANNING RECEIVER

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 in a scanning mode and allow it to scan through it's preset frequencies.
- 8) 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.
- 9) 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 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 User Manual.

Test Data

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

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Alen He on 2020-01-15.

EUT Operation Mode: Scanning+Receiving Mode

Scanning Receiver Cellular Band Rejection Test Data:

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)
450–470	824.5,836.0,848.5, 869.1,881.5,893.5	> -8	-71.5	< -63.5	< -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 *******