FCC PART 15.249

TEST REPORT

For

Xiamen Four-Faith Communication Technology Co., Ltd.

11th Floor,A-06 Area,No.370,Chengyi Street,Jimei,Xiamen,Fujian,China.

FCC ID: 2ALUW-F8L10T

Report Type:	Product Name:
Original Report	F8L10T LoRa Terminal

Report Number:	RXM170912050-00B
Report Date:	2017-10-26
Reviewed By:	Jerry Zhang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Xiamen Four-Faith Communication Technology Co., Ltd.*** 's product, model number: ***F8L10T (FCC ID: 2ALUW-F8L10T)*** (the "EUT") in this report was a ***F8L10T LoRa Terminal,*** which was measured approximately: 10.1cm (L) x 7.4 cm (W) x 2.3 cm (H), rated input voltage: DC12.0V from a adapter.

Adapter Information:
Model: ASSA53A-120150
Input: AC100-240V, 50/60Hz, 0.6A
Output: DC12.0V, 1.5A

**All measurement and test data in this report was gathered from production sample serial number: 170912050 (Assigned by BACL,Dongguan). The EUT was received on 2017-09-12.*

Objective

This type approval report is prepared on behalf of ***Xiamen Four-Faith Communication Technology Co., Ltd.*** in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

N/A

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

Bay Area Compliance Laboratories Corp. (Dongguan) has been accredited to ISO 17025 by CNAS(Lab code: L5662). And accredited to ISO 17025 by NVLAP(Test Laboratory Accreditation Certificate Number 500069-0), the FCC Designation No. CN5002 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Dongguan) was registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

The device`s rated bandwidth is 125kHz, employs 25 channels as below list:

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	903	14	916
2	904	15	917
3	905	16	918
4	906	17	919
5	907	18	920
6	908	19	921
7	909	20	922
8	910	21	923
9	911	22	924
10	912	23	925
11	913	24	926
12	914	25	927
13	915	/	/

EUT was tested with Channel 1, 13 and 25.

The device supports 6 levels Transmission Speed: 0.3~5.5 kbps, that determined by Spread Factor and Coding Rate, test was performed with the highest transmission speed rate 5.5 kbps since it is the maximum duty cycle determined by crossed all Transmission Speed levels.

EUT Exercise Software

The software: LoraConfig_v1.1.0& sscom5.13 was used in test for change the test channels, the maximum power was configured by system default setting.

Equipment Modifications

No modifications were made to the EUT.

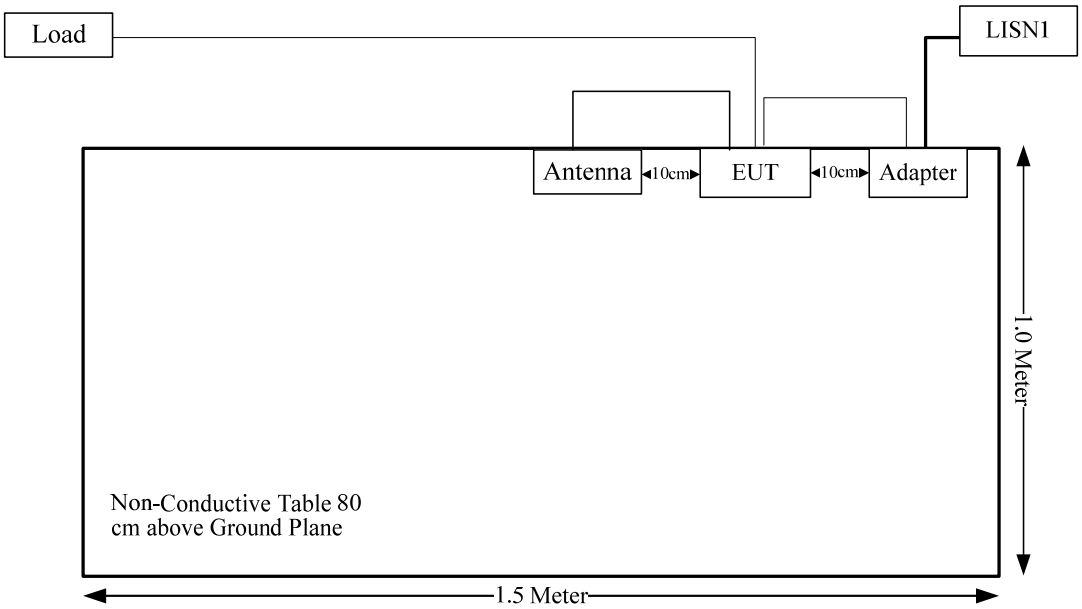
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	Load	N/A	N/A

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
Adapter Cable	no	no	1.48	Adapter	EUT
Signal Cable	no	no	10	EUT	Load
Antenna Cable	no	no	2.1	EUT	Antenna

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Compliance
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Antenna Connector Construction

The EUT has one external monopole antenna with SMA antenna, and the antenna gain is 2 dBi, the device installed by professional installer, fulfill the requirement of this section. Please refer to the EUT photos.

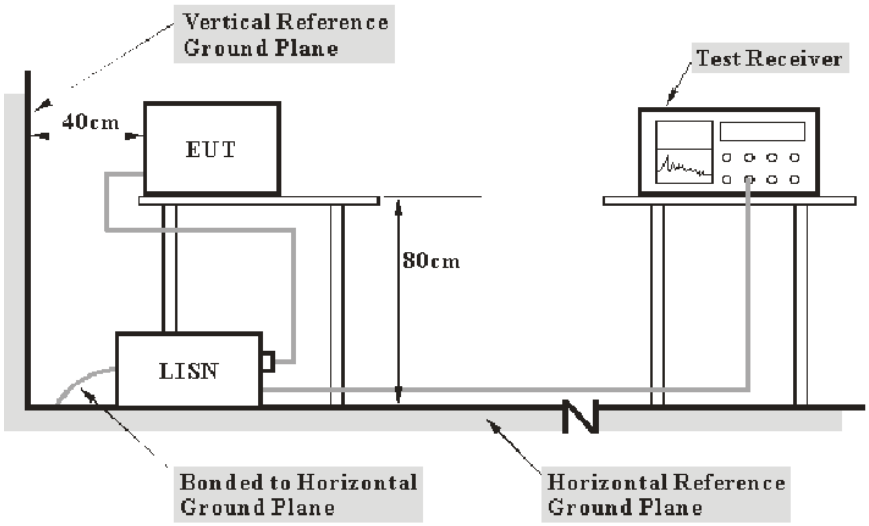
Result: Compliant.

FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

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

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

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

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2016-12-08	2017-12-08
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-01	2018-09-01
R&S	Two-line V-network	ENV 216	3560.6550.12	2016-12-08	2017-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	2m	C0200/01	2017-09-05	2018-09-05

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

Test Data

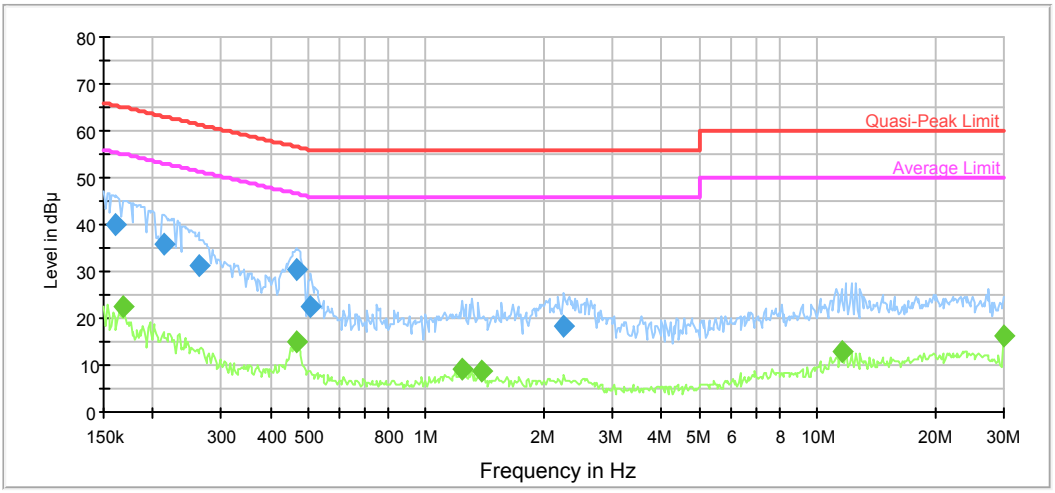
Environmental Conditions

Temperature:	27.9 °C
Relative Humidity:	39 %
ATM Pressure:	100.4 kPa

The testing was performed by Alex You on 2017-09-28.

Test Mode: *Transmitting*

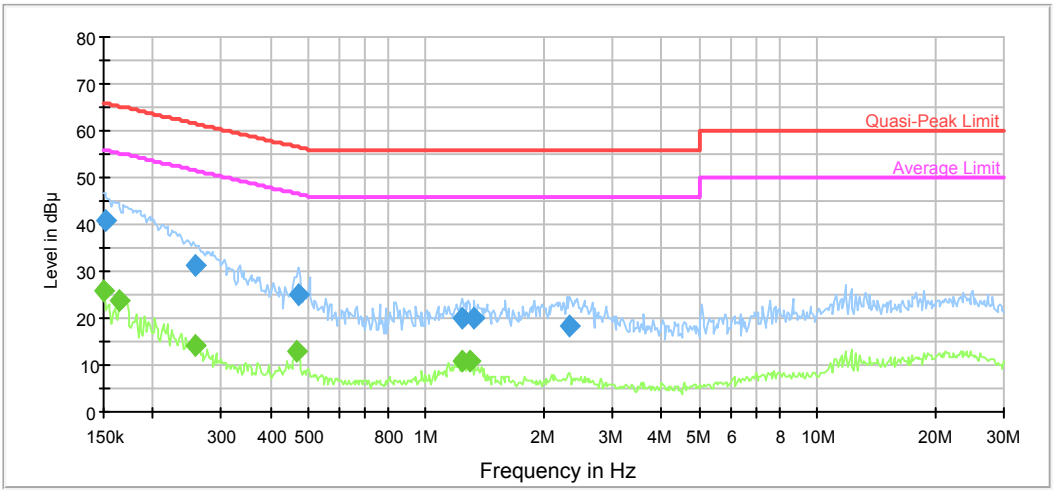
AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.161152	40.0	9.000	L1	11.0	25.4	65.4	Compliance
0.212988	35.8	9.000	L1	10.5	27.3	63.1	Compliance
0.262017	31.3	9.000	L1	10.3	30.1	61.4	Compliance
0.465037	30.4	9.000	L1	9.9	26.2	56.6	Compliance
0.507637	22.4	9.000	L1	9.9	33.6	56.0	Compliance
2.252540	18.2	9.000	L1	9.8	37.8	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.169044	22.3	9.000	L1	10.9	32.7	55.0	Compliance
0.468757	15.0	9.000	L1	9.9	31.5	46.5	Compliance
1.239175	9.4	9.000	L1	9.8	36.6	46.0	Compliance
1.385415	8.7	9.000	L1	9.7	37.3	46.0	Compliance
11.536699	12.8	9.000	L1	9.9	37.2	50.0	Compliance
30.000000	16.2	9.000	L1	10.2	33.8	50.0	Compliance

AC120V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	40.7	9.000	N	11.2	25.2	65.9	Compliance
0.255827	31.1	9.000	N	10.3	30.5	61.6	Compliance
0.472507	24.8	9.000	N	9.9	31.7	56.5	Compliance
1.239175	20.2	9.000	N	9.8	35.8	56.0	Compliance
1.331304	19.8	9.000	N	9.7	36.2	56.0	Compliance
2.325491	18.2	9.000	N	9.8	37.8	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	25.8	9.000	N	11.2	30.2	56.0	Compliance
0.165051	23.7	9.000	N	11.0	31.5	55.2	Compliance
0.257874	14.0	9.000	N	10.3	37.5	51.5	Compliance
0.468757	12.7	9.000	N	9.9	33.8	46.5	Compliance
1.239175	10.9	9.000	N	9.8	35.1	46.0	Compliance
1.289541	10.7	9.000	N	9.8	35.3	46.0	Compliance

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

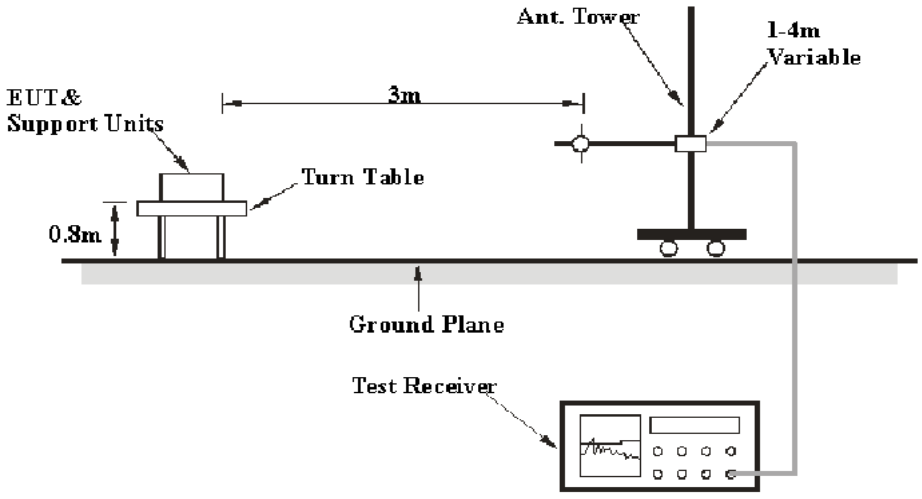
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

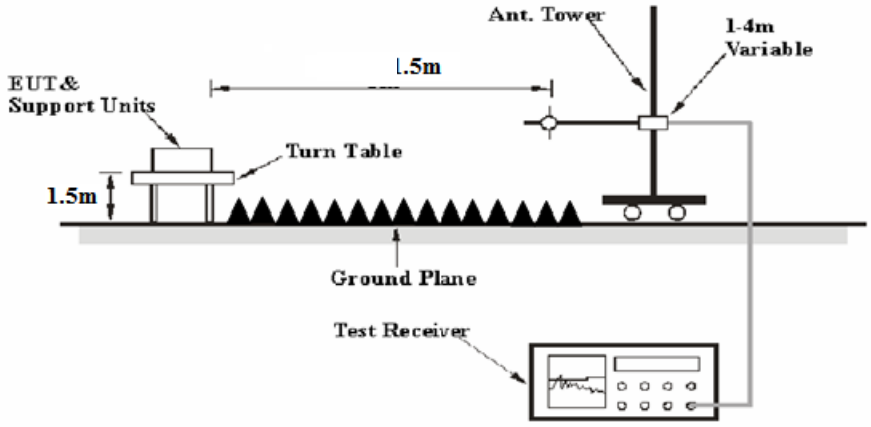
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters distance, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

Test Equipment Setup

The system was investigated from 30 MHz to 10 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

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 detection mode from 30 MHz to 1GHz, peak and average detection mode 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:

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 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit –Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2014-11-06	2017-11-06
HP	Amplifier	8447D	2727A05902	2016-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2016-12-08	2017-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Unknown	Coaxial Cable	Chamber A-1	4m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber B-1	0.75m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber A-2	10m	2017-09-01	2018-09-01
Unknown	Coaxial Cable	Chamber B-2	8m	2017-09-01	2018-09-01
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

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

Test Data

Environmental Conditions

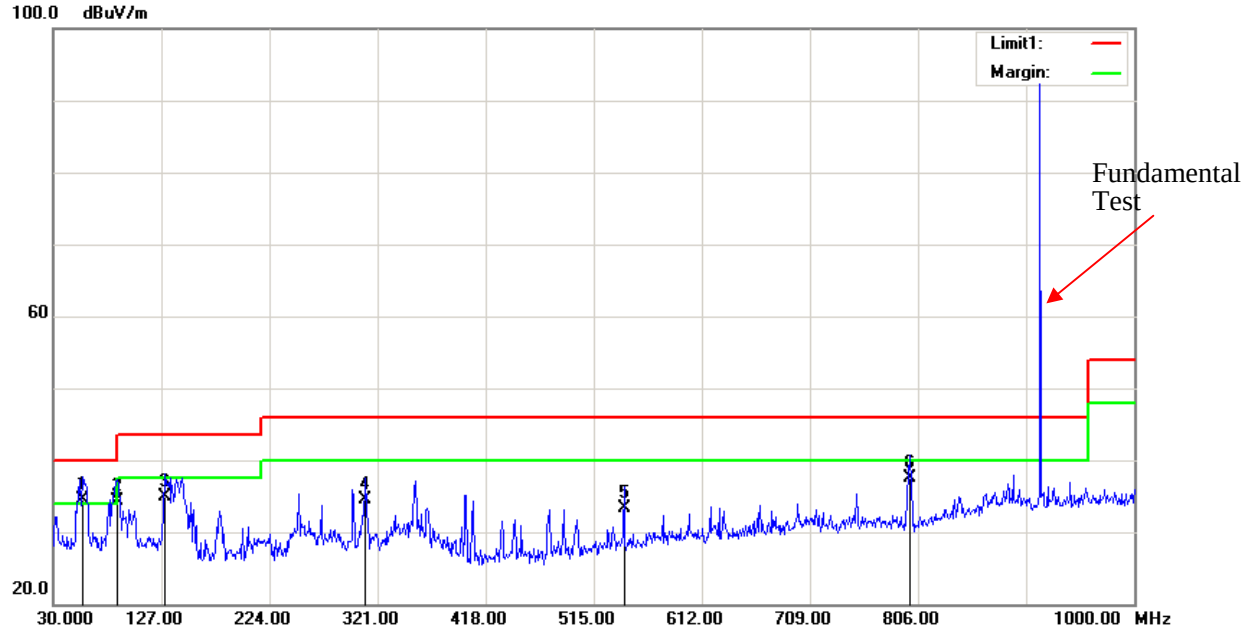
Temperature:	27.9 °C
Relative Humidity:	39 %
ATM Pressure:	100.4kPa

The testing was performed by Blake Yang on 2017-09-28.

Test Mode: Transmitting

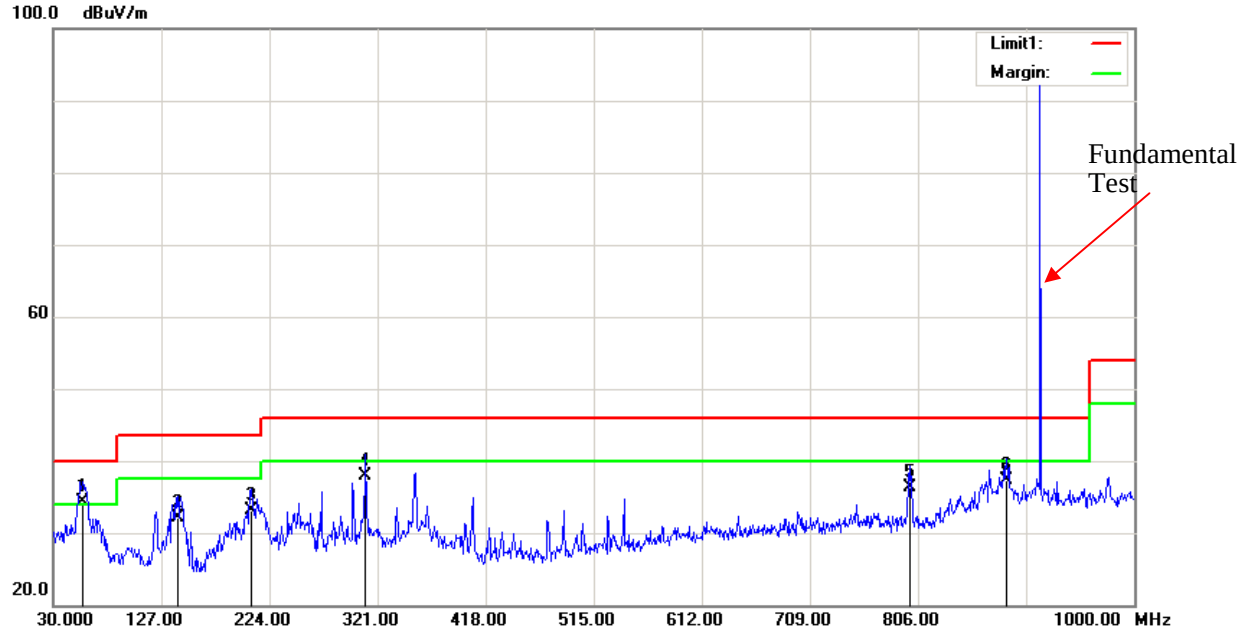
1) 30MHz-1GHz(Middle channel was the worst)**:**

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
56.1900	48.08	QP	-13.58	34.50	40.00	5.50
87.2300	46.85	QP	-12.65	34.20	40.00	5.80
129.9100	42.12	QP	-7.12	35.00	43.50	8.50
310.3300	38.82	QP	-4.32	34.50	46.00	11.50
542.1600	31.82	QP	1.48	33.30	46.00	12.70
798.2400	31.94	QP	5.66	37.60	46.00	8.40

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
56.1900	47.78	QP	-13.58	34.20	40.00	5.80
141.5500	38.67	QP	-6.57	32.10	43.50	11.40
207.5100	41.27	QP	-8.17	33.10	43.50	10.40
310.3300	42.22	QP	-4.32	37.90	46.00	8.10
798.2400	30.54	QP	5.66	36.20	46.00	9.80
885.5400	29.40	QP	7.90	37.30	46.00	8.70

2) Fundamental& Bandedge:

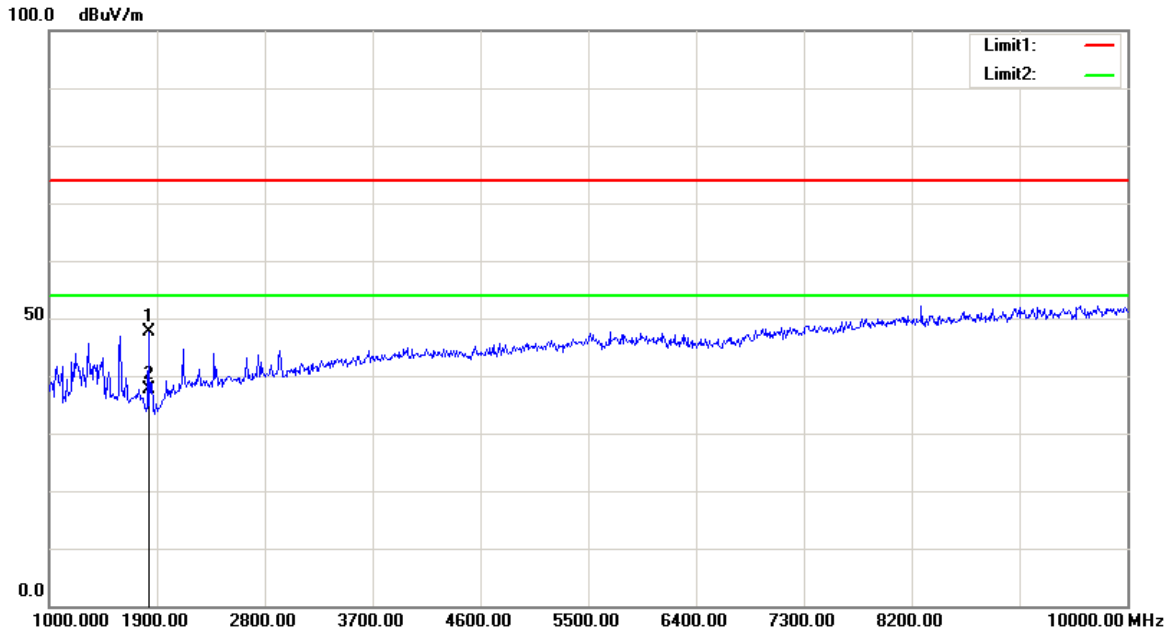
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB(1/m))					
Low Channel: 903 MHz									
903.00	64.00	QP	H	22.36	4.29	0.00	90.65	94.00	3.35
903.00	65.00	QP	V	22.36	4.29	0.00	91.65	94.00	2.35
902.00	12.36	QP	V	22.34	4.29	0.00	38.99	46.00	7.01
Middle Channel: 915 MHz									
915.00	61.40	QP	H	22.40	4.21	0.00	88.01	94.00	5.99
915.00	66.30	QP	V	22.40	4.21	0.00	92.91	94.00	1.09
High Channel: 927 MHz									
927.00	60.30	QP	H	22.54	4.35	0.00	87.19	94.00	6.81
927.00	64.50	QP	V	22.54	4.35	0.00	91.39	94.00	2.61
928.00	13.50	QP	V	22.56	4.34	0.00	40.40	46.00	5.6

3) 1GHz-10GHz

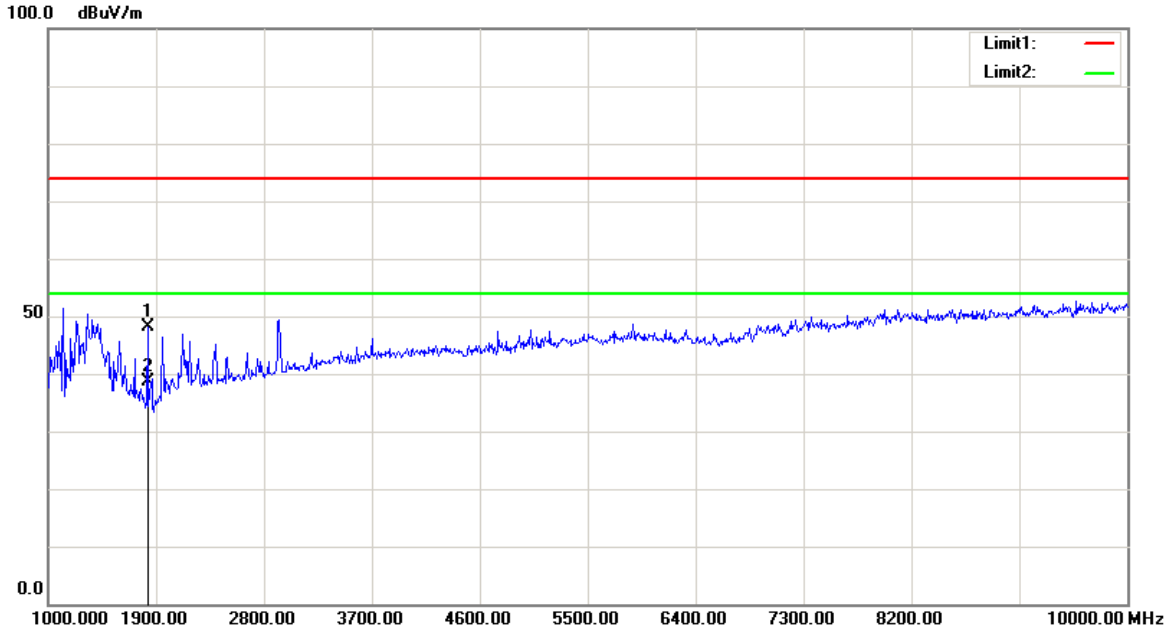
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB(1/m))					
Low Channel: 903 MHz									
1804.00	48.94	PK	H	26.48	1.66	35.90	41.18	74.00	32.82
1804.00	32.85	AV	H	26.48	1.66	35.90	25.09	54.00	28.91
2706.00	46.87	PK	H	29.04	1.87	36.47	41.31	74.00	32.69
2706.00	31.62	AV	H	29.04	1.87	36.47	26.06	54.00	27.94
3608.00	46.53	PK	H	31.54	2.41	37.11	43.37	74.00	30.63
3608.00	31.48	AV	H	31.54	2.41	37.11	28.32	54.00	25.68
2188.00	45.67	PK	H	27.68	1.75	36.17	38.93	74.00	35.07
2188.00	31.29	AV	H	27.68	1.75	36.17	24.55	54.00	29.45
Middle Channel: 915 MHz									
1830.00	49.37	PK	H	26.59	1.66	35.95	41.67	74.00	32.33
1830.00	33.69	AV	H	26.59	1.66	35.95	25.99	54.00	28.01
2745.00	48.23	PK	H	29.18	1.91	36.51	42.81	74.00	31.19
2745.00	32.84	AV	H	29.18	1.91	36.51	27.42	54.00	26.58
3660.00	47.53	PK	H	31.65	2.50	37.06	44.62	74.00	29.38
3660.00	32.45	AV	H	31.65	2.50	37.06	29.54	54.00	24.46
1996.00	47.39	PK	H	27.28	1.73	36.20	40.2	74.00	33.8
1996.00	32.37	AV	H	27.28	1.73	36.20	25.18	54.00	28.82
2245.00	46.52	PK	H	27.79	1.75	36.28	39.78	74.00	34.22
2245.00	31.34	AV	H	27.79	1.75	36.28	24.6	54.00	29.4
High Channel: 927 MHz									
1856.00	50.14	PK	H	26.70	1.66	36.00	42.5	74.00	31.5
1856.00	35.49	AV	H	26.70	1.66	36.00	27.85	54.00	26.15
2784.00	47.68	PK	H	29.32	1.94	36.55	42.39	74.00	31.61
2784.00	32.46	AV	H	29.32	1.94	36.55	27.17	54.00	26.83
3712.00	46.83	PK	H	31.77	2.57	37.02	44.15	74.00	29.85
3712.00	32.18	AV	H	31.77	2.57	37.02	29.5	54.00	24.5
2215.00	45.82	PK	H	27.73	1.75	36.20	39.1	74.00	34.9
2215.00	31.67	AV	H	27.73	1.75	36.20	24.95	54.00	29.05

Worst plots(*TX mode middle channel*)

Horizontal



Vertical



FCC §15.215(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, 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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
3. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2017-03-02	2018-03-02
Unknown	Coaxial Cable	0.1m	C-1	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	24.9~25.3 °C
Relative Humidity:	36~39 %
ATM Pressure:	101.3~101.4 kPa

The testing was performed by David Huang from 2017-10-24 to 2017-10-25

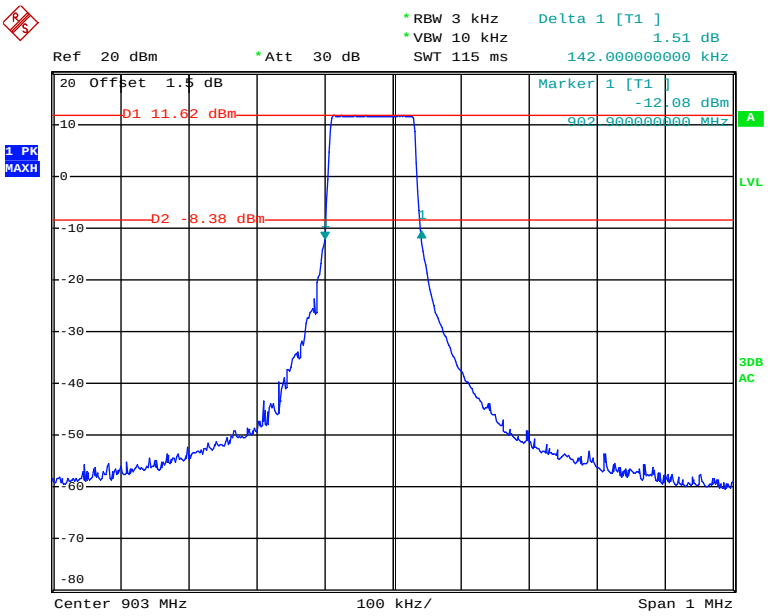
Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting

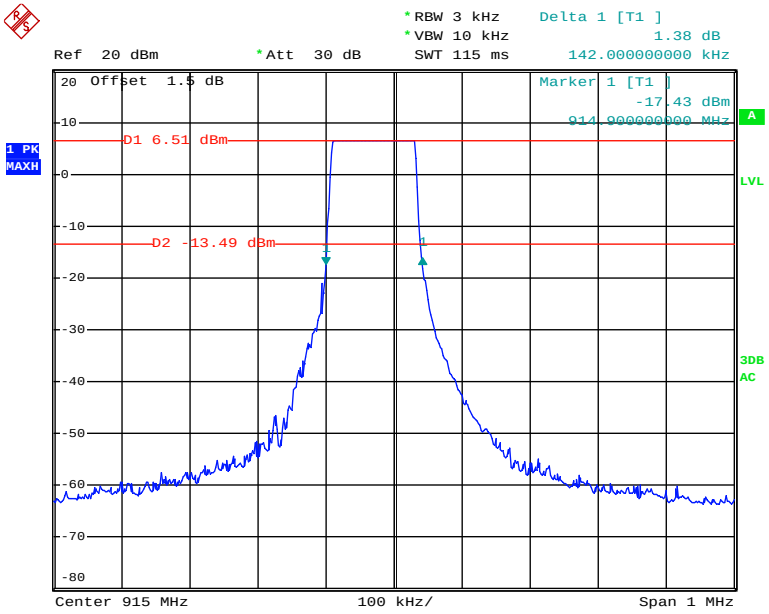
Channel	Frequency (MHz)	20 dB Bandwidth (KHz)
Low	903	142
Middle	915	142
High	927	140

Low Channel



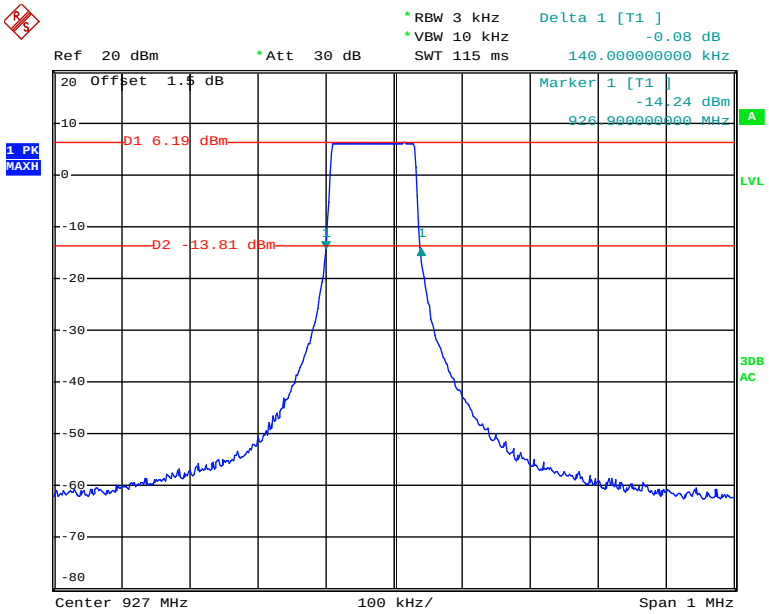
Date: 24.OCT.2017 23:45:30

Middle Channel



Date: 25.OCT.2017 21:54:25

High Channel



Date: 24.OCT.2017 23:27:38

******* End of Report *******