



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 15.247

TEST REPORT

For

Radiocontrolli SRL

Via Carditello 10 P.co Nuovo Villaggio 6, 81050 San Tammaro –CE Italy

FCC ID: 2ANH5--RC-S2LP-915


Report Type: Original Report	Product Name: Transceiver module
Report Number: <u>RBJ191201050-00</u>	
Report Date: <u>2020-04-27</u>	
Reviewed By: <u>Ivan Cao</u> Assistant 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.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
OBJECTIVE.....	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY.....	4
MEASUREMENT UNCERTAINTY.....	5
TEST FACILITY.....	5
DECLARATIONS.....	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION.....	6
EUT EXERCISE SOFTWARE.....	6
EQUIPMENT MODIFICATIONS.....	6
SUPPORT EQUIPMENT LIST AND DETAILS.....	6
SUPPORT CABLE LIST AND DETAILS.....	7
BLOCK DIAGRAM OF TEST SETUP.....	7
SUMMARY OF TEST RESULTS.....	8
FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE).....	9
APPLICABLE STANDARD.....	9
FCC §15.203 - ANTENNA REQUIREMENT.....	10
APPLICABLE STANDARD.....	10
ANTENNA INFORMATION AND CONNECTOR CONSTRUCTION.....	10
FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS.....	11
APPLICABLE STANDARD.....	11
EUT SETUP.....	11
EMI TEST RECEIVER SETUP.....	11
TEST PROCEDURE.....	11
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	12
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST DATA.....	12
FCC §15.209, §15.205 & §15.247(d)- SPURIOUS EMISSIONS.....	15
APPLICABLE STANDARD.....	15
EUT SETUP.....	15
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP.....	16
TEST PROCEDURE.....	16
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	16
TEST EQUIPMENT LIST AND DETAILS.....	17
TEST DATA.....	17
FCC §15.247(a) (1) - CHANNEL SEPARATION TEST.....	24
APPLICABLE STANDARD.....	24
TEST EQUIPMENT LIST AND DETAILS.....	24
TEST PROCEDURE.....	24
TEST DATA.....	24
RSS-247 CLUASE 5.1– 20 dB BANDWIDTH TESTING.....	27
APPLICABLE STANDARD.....	27

TEST PROCEDURE27
 TEST EQUIPMENT LIST AND DETAILS.....27
 TEST DATA27

FCC §15.247(a) (1) (i) - QUANTITY OF HOPPING CHANNEL TEST30
 APPLICABLE STANDARD30
 TEST PROCEDURE30
 TEST EQUIPMENT LIST AND DETAILS.....30
 TEST DATA30

FCC §15.247(a) (1) (i) - TIME OF OCCUPANCY (DWELL TIME).....32
 APPLICABLE STANDARD32
 TEST PROCEDURE32
 TEST EQUIPMENT LIST AND DETAILS.....32
 TEST DATA32

FCC §15.247(b) (2) - PEAK OUTPUT POWER MEASUREMENT35
 APPLICABLE STANDARD35
 TEST PROCEDURE35
 TEST EQUIPMENT LIST AND DETAILS.....35
 TEST DATA35

FCC §15.247(d)- BAND EDGES TESTING37
 APPLICABLE STANDARD37
 TEST PROCEDURE37
 TEST EQUIPMENT LIST AND DETAILS.....37
 TEST DATA38

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Transceiver module
EUT Model:	RC-S2LP-915
Operation Frequency:	915.6MHz~925.4MHz
Maximum Peak Output Power (Conducted):	13.66 dBm
Modulation Type:	GFSK
Rated Input Voltage:	DC 1.8~3.6V
Serial Number:	RBJ191201050-RF-S2
EUT Received Date:	2019/12/25
EUT Received Status:	Good

Objective

This report is prepared on behalf of *Radiocontrolli SRL* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the EUT compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No related submittal.

Test Methodology

All measurements detailed in this test report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices" and KDB 558074 D01 15.247 Meas Guidance v05r02.

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

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1 °C
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)

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

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.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier : CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “△”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA, or any agency of the U.S. Government.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode, which was provided by manufacturer.

The device was a hopping transmitter, employs 50 hopping channels:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	915.6	14	918.2	27	920.8	40	923.4
2	915.8	15	918.4	28	921	41	923.6
3	916	16	918.6	29	921.2	42	923.8
4	916.2	17	918.8	30	921.4	43	924
5	916.4	18	919	31	921.6	44	924.2
6	916.6	19	919.2	32	921.8	45	924.4
7	916.8	20	919.4	33	922	46	924.6
8	917	21	919.6	34	922.2	47	924.8
9	917.2	22	919.8	35	922.4	48	925
10	917.4	23	920	36	922.6	49	925.2
11	917.6	24	920.2	37	922.8	50	925.4
12	917.8	25	920.4	38	923	/	/
13	918	26	920.6	39	923.2	/	/

Frequency 915.6 MHz, 920.4 MHz and 925.4 MHz were selected to test.

EUT Exercise Software

The software "S2-LP DK-Setup-1.2.1.exe" was used for testing and the maximum power was configured as below:

Channel	Frequency (MHz)	Power Level Setting
Low	915.6	Default
Middle	920.4	Default
High	925.6	Default

Equipment Modifications

No modification was made to the EUT.

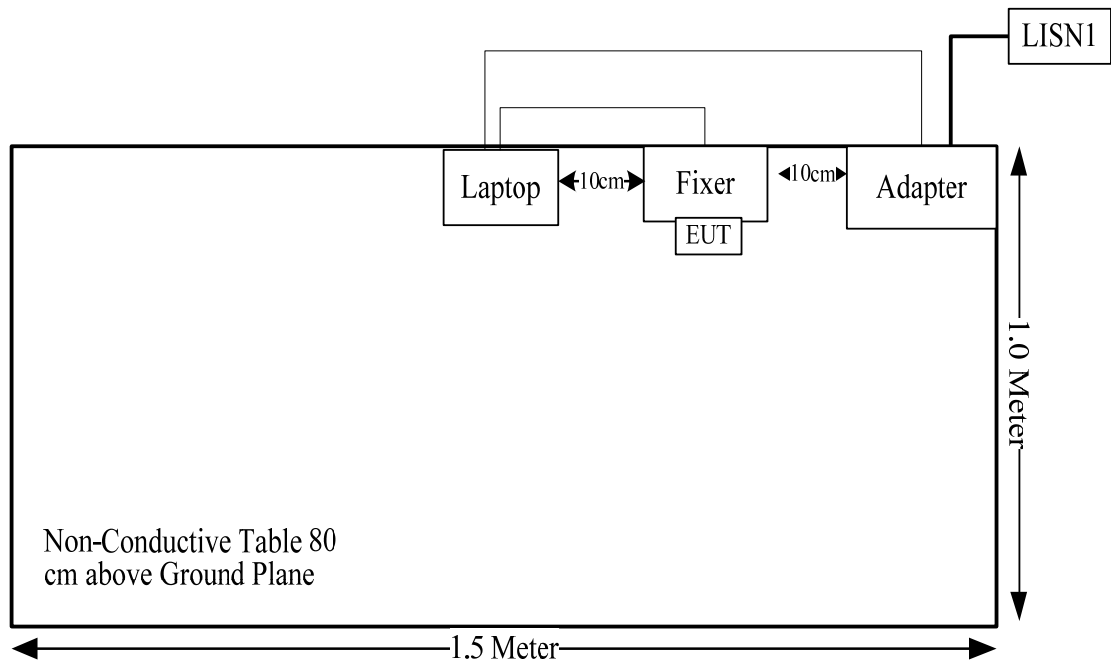
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Lenovo	Laptop	Thinkpad E450	PF-0MRADG
Unknown	Test Fixer	Unknown	RBJ191201050-RF-S9

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	Yes	No	1.0	Test Board	Laptop

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
§15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
FCC §15.203	Antenna Requirement	Compliance
FCC §15.207 (a)	AC Line Conducted Emissions	Compliance
FCC §15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
FCC §15.247 (a)(1)	Emission Bandwidth	Compliance
FCC §15.247(a)(1)	Channel Separation Test	Compliance
FCC§15.247(a)(1)(i)	Time of Occupancy (Dwell Time)	Compliance
FCC§15.247(a)(1)(i)	Quantity of hopping channel Test	Compliance
FCC§15.247(b)(2)	Peak Output Power Measurement	Compliance
FCC§15.247(d)	Band Edges	Compliance

FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
915.6-925.4	6	3.98	14	25.12	20.00	0.02	0.61

Result: The device meet FCC MPE at 20 cm distance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Information And Connector Construction

The EUT has one antenna use a unique type of connector to attach to the EUT, fulfill the requirement of this section. Please refer to below information and the EUT photos:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
Monopole	50	6 dBi/902~928MHz

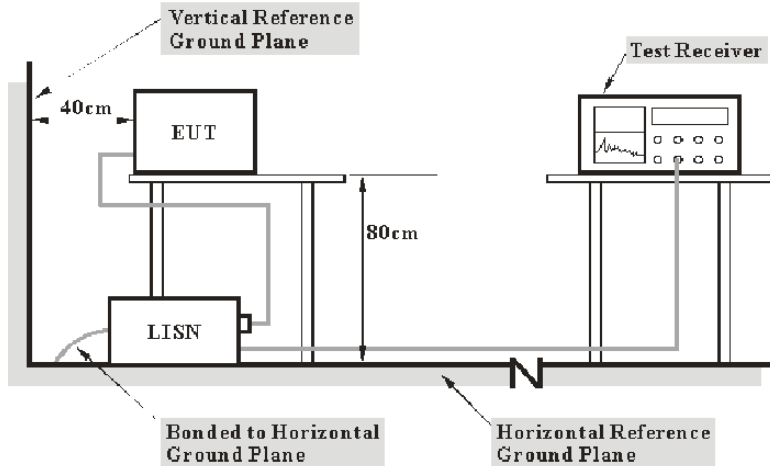
Result: Compliance.

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 limits.

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 outlet of 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:

$$V_C = V_R + A_C + VDF$$

Herein,

V_C : corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

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:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	LISN	ENV 216	101614	2019-09-12	2020-09-12
R&S	EMI Test Receiver	ESCI	101121	2019-05-09	2020-05-09

* **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

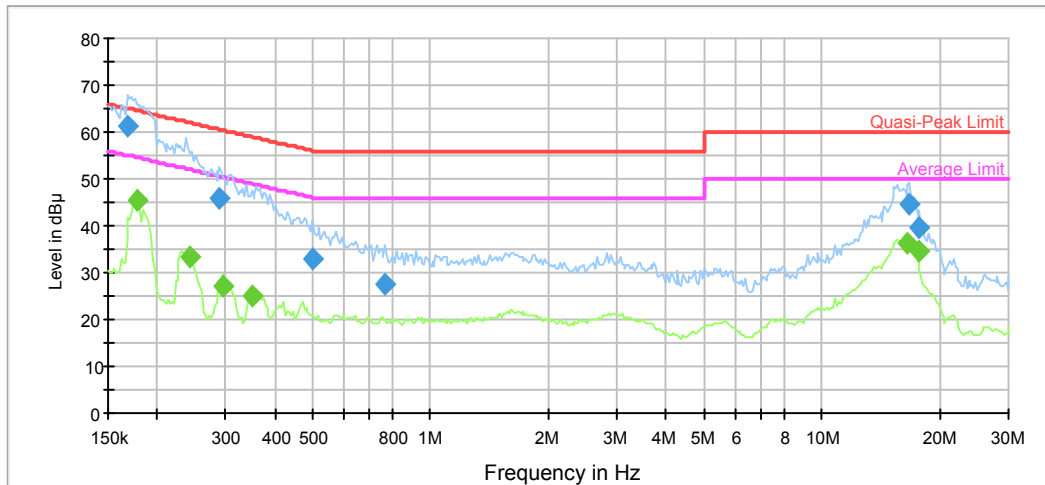
Environmental Conditions

Temperature:	26°C
Relative Humidity:	59%
ATM Pressure:	102.1kPa
Test by:	Calvin Chen
Test Date:	2020-04-27

Test Result: Compliance

Test Mode: Transmitting

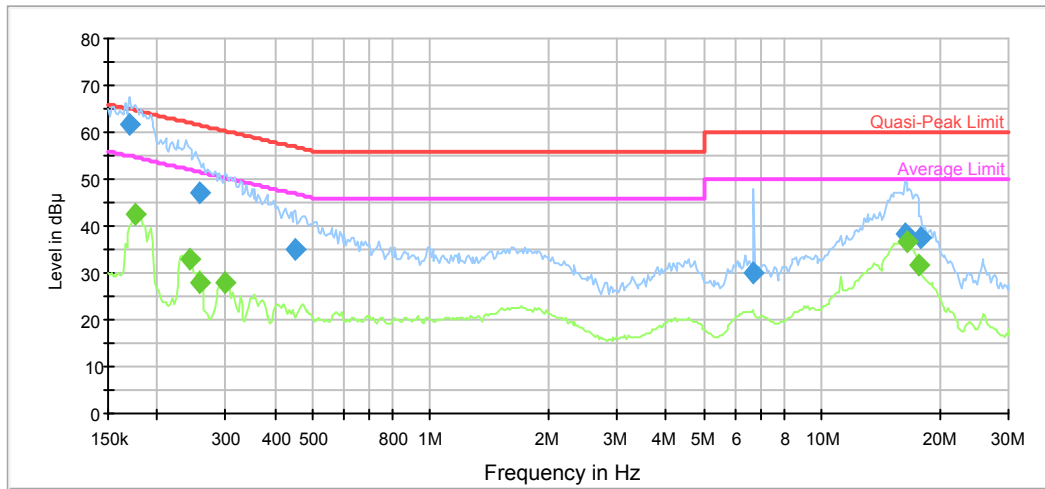
AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.169024	61.1	9.000	L1	9.7	3.9	65.0
0.289269	45.6	9.000	L1	9.7	14.9	60.5
0.500009	32.8	9.000	L1	9.7	23.2	56.0
0.767003	27.6	9.000	L1	9.7	28.4	56.0
16.765740	44.7	9.000	L1	10.2	15.3	60.0
17.797171	39.7	9.000	L1	10.2	20.3	60.0

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.177646	45.5	9.000	L1	9.7	9.1	54.6
0.241834	33.2	9.000	L1	9.7	18.8	52.0
0.295084	27.2	9.000	L1	9.7	23.2	50.4
0.349469	25.2	9.000	L1	9.7	23.8	49.0
16.599742	36.2	9.000	L1	10.2	7.8	50.0
17.797171	34.4	9.000	L1	10.2	15.6	50.0

AC120V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.170714	61.6	9.000	N	9.7	3.3	64.9
0.256712	47.2	9.000	N	9.7	14.3	61.5
0.452652	34.8	9.000	N	9.6	22.0	56.8
6.712068	29.9	9.000	N	9.7	30.1	60.0
16.272662	38.4	9.000	N	10.0	21.6	60.0
17.975142	37.6	9.000	N	10.1	22.4	60.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.175887	42.5	9.000	N	9.7	12.2	54.7
0.241834	32.8	9.000	N	9.7	19.2	52.0
0.256712	28.0	9.000	N	9.7	23.5	51.5
0.298034	28.0	9.000	N	9.7	22.3	50.3
16.599742	36.6	9.000	N	10.0	13.4	50.0
17.797171	31.6	9.000	N	10.1	18.4	50.0

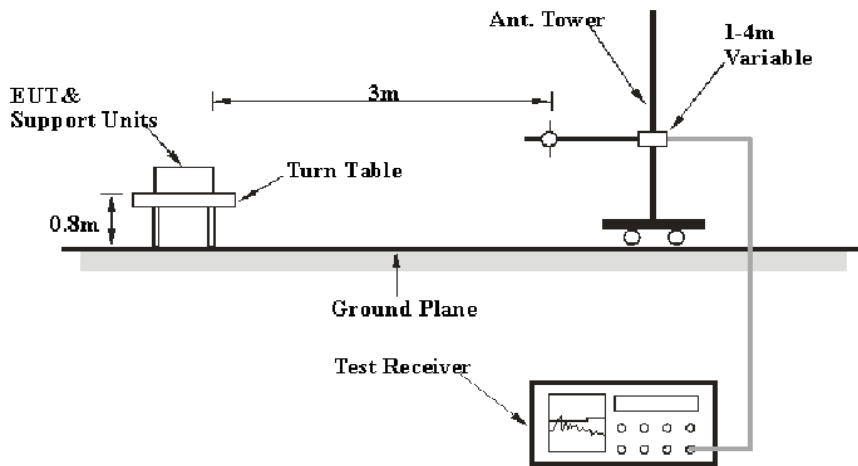
FCC §15.209, §15.205 & §15.247(d)- SPURIOUS EMISSIONS

Applicable Standard

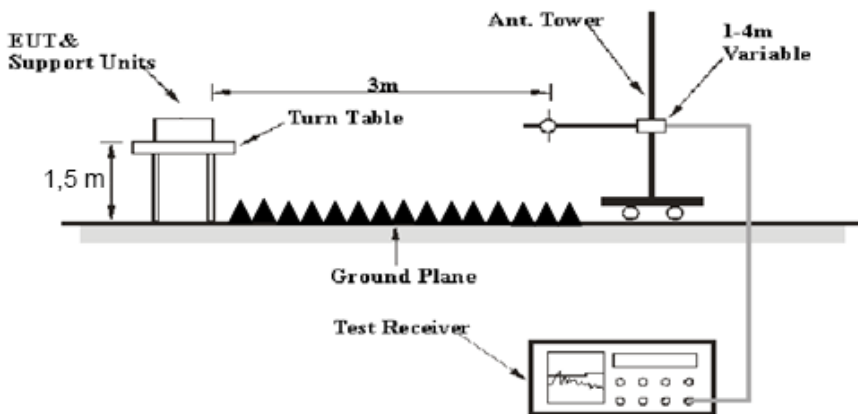
FCC §15.247 (d); §15.209; §15.205.

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 3 meters chamber test site A, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 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 & Spectrum Analyzer 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.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz - 1 GHz, peak and average detection 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 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation Below 1GHz					
R&S	EMI Test Receiver	ESR3	102453	2019-09-12	2020-09-12
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2019-05-06	2020-05-06
HP	Amplifier	8447D	2727A05902	2019-09-05	2020-09-05
Radiation Above 1GHz					
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-05-09	2020-05-09
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2019-09-05	2020-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2019-09-05	2020-09-05
E-Microwave	Band-stop Filters	OBSF-900-930-S	OE01602312	2019-06-16	2020-06-16

* **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

Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	24.6°C	24.6°C
Relative Humidity:	51%	51%
ATM Pressure:	101.4 kPa	101.4 kPa
Tester:	Vern Shen	Filex Wang
Test Date:	2020-03-27	2020-03-27

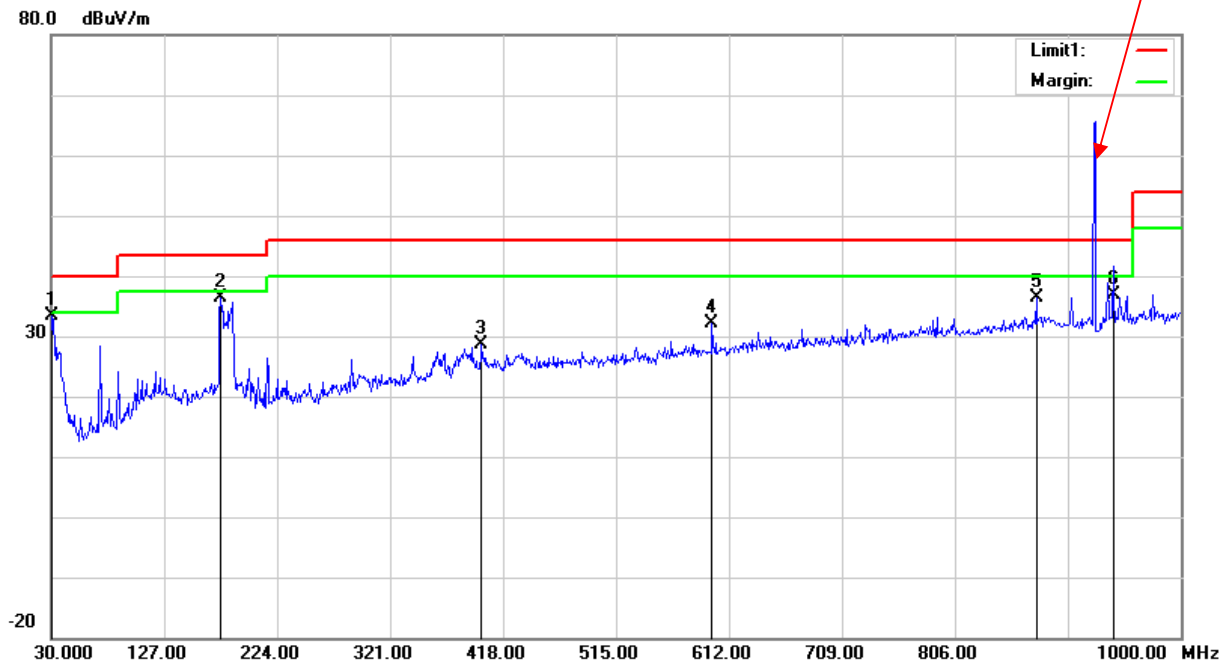
Test Mode: Transmitting(per test X,Y,Z Axis, the worst was Y and record in this report)

Test Result: Compliance. Please refer to the following table and plots.

1) 30MHz-1GHz (high channel was the worst)

Horizontal:

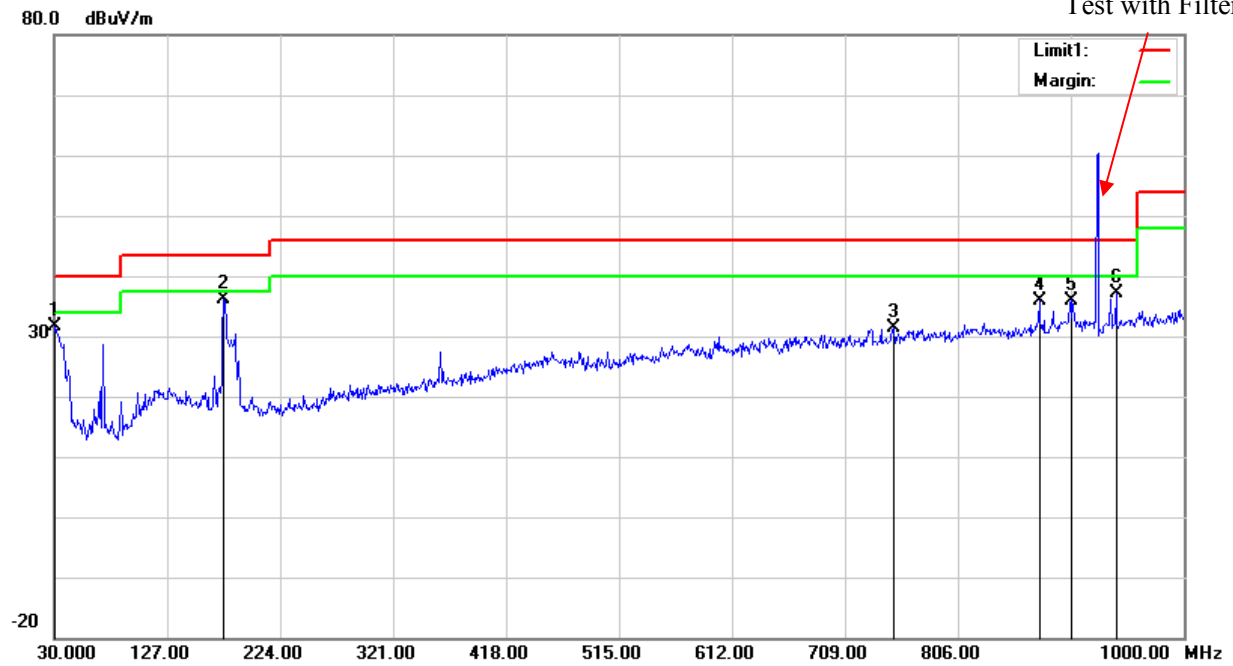
Fundamental
Test with Filter



Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	32.45	peak	0.91	33.36	40.00	6.64
175.5000	43.19	peak	-6.88	36.31	43.50	7.19
399.5700	30.75	peak	-2.03	28.72	46.00	17.28
597.4500	31.12	peak	0.93	32.05	46.00	13.95
875.8400	37.09	peak	-0.60	36.49	46.00	9.51
941.8000	36.16	QP	0.76	36.92	46.00	9.08

Vertical:

Fundamental
Test with Filter



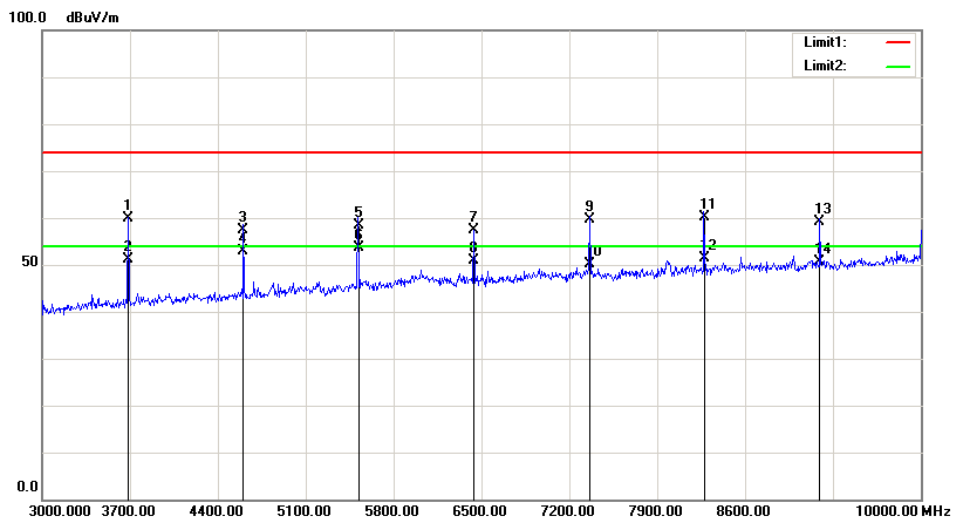
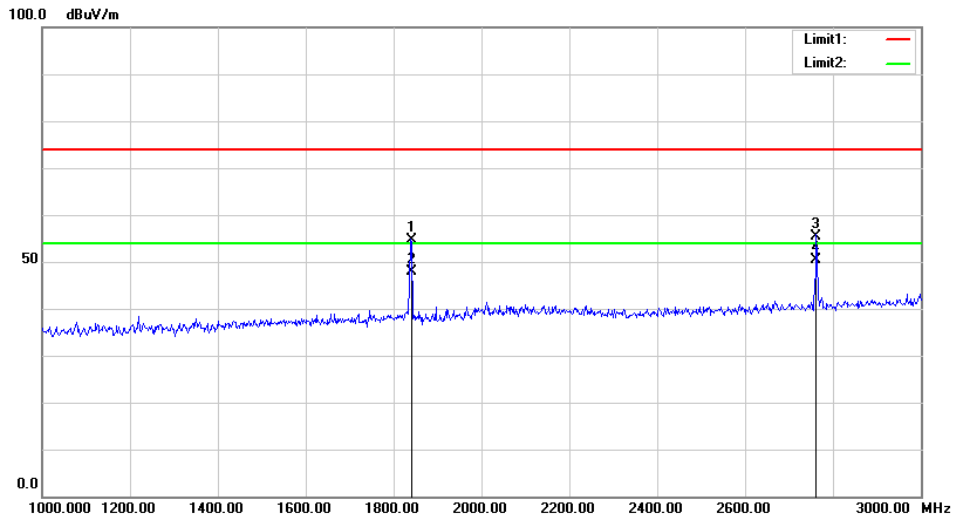
Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	30.74	peak	0.91	31.65	40.00	8.35
175.5000	43.08	peak	-6.88	36.20	43.50	7.30
750.7100	27.63	peak	3.66	31.29	46.00	14.71
875.8400	36.40	peak	-0.60	35.80	46.00	10.20
903.9700	35.84	peak	0.16	36.00	46.00	10.00
941.8000	36.46	peak	0.76	37.22	46.00	8.78

2) Bandedge, and above 1GHz:

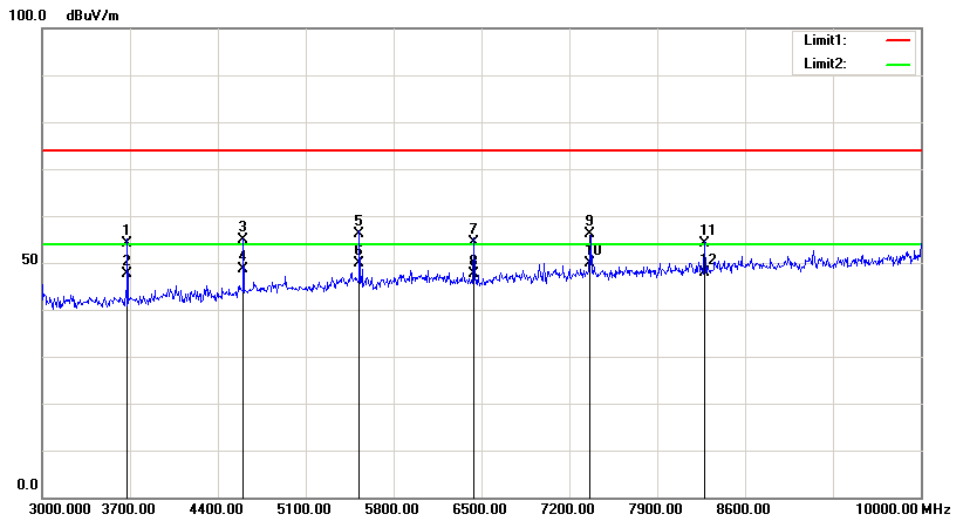
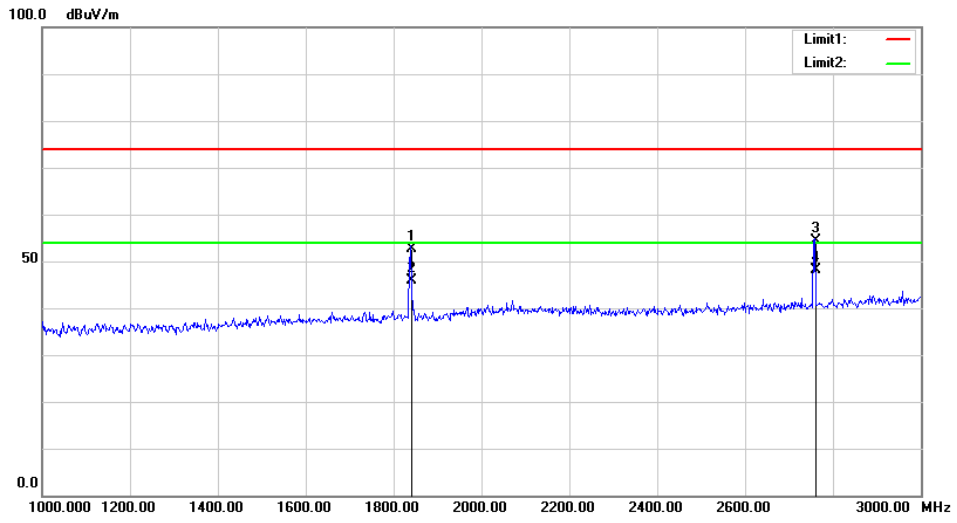
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 915.6 MHz									
915.60	82.70	QP	H	22.40	4.22	0.00	109.32	N/A	N/A
915.60	77.28	QP	V	22.40	4.22	0.00	103.90	N/A	N/A
902.00	14.40	QP	H	22.34	4.29	0.00	41.03	46.00	4.97
1831.20	52.36	PK	H	26.59	1.66	25.91	54.70	74.00	19.30
1831.20	46.24	AV	H	26.59	1.66	25.91	48.58	54.00	5.42
2746.80	50.54	PK	H	29.19	1.91	26.10	55.54	74.00	18.46
2746.80	44.62	AV	H	29.19	1.91	26.10	49.62	54.00	4.38
3662.40	50.17	PK	H	31.66	2.51	25.93	58.41	74.00	15.59
3662.40	44.06	AV	H	31.66	2.51	25.93	52.30	54.00	1.70
4578.00	48.14	PK	H	32.46	3.08	25.77	57.91	74.00	16.09
4578.00	43.02	AV	H	32.46	3.08	25.77	52.79	54.00	1.21
5493.60	46.25	PK	H	34.09	3.55	25.31	58.58	74.00	15.42
5493.60	39.74	AV	H	34.09	3.55	25.31	52.07	54.00	1.93
6409.20	43.47	PK	H	34.22	4.58	25.08	57.19	74.00	16.81
6409.20	38.14	AV	H	34.22	4.58	25.08	51.86	54.00	2.14
7324.80	43.02	PK	H	36.04	4.61	25.73	57.94	74.00	16.06
7324.80	36.47	AV	H	36.04	4.61	25.73	51.39	54.00	2.61
8240.40	43.54	PK	H	37.09	4.96	26.06	59.53	74.00	14.47
8240.40	36.54	AV	H	37.09	4.96	26.06	52.53	54.00	1.47
9156.00	40.25	PK	H	37.76	5.57	25.70	57.88	74.00	16.12
9156.00	32.47	AV	H	37.76	5.57	25.70	50.10	54.00	3.90
Middle Channel: 920.4 MHz									
920.40	80.00	QP	H	22.41	4.29	0.00	106.70	N/A	N/A
920.40	75.87	QP	V	22.41	4.29	0.00	102.57	N/A	N/A
1840.80	52.34	PK	H	26.63	1.66	25.95	54.68	74.00	19.32
1840.80	45.54	AV	H	26.63	1.66	25.95	47.88	54.00	6.12
2761.20	50.33	PK	H	29.24	1.92	26.10	55.39	74.00	18.61
2761.20	45.37	AV	H	29.24	1.92	26.10	50.43	54.00	3.57
3681.60	51.67	PK	H	31.70	2.55	25.92	60.00	74.00	14.00
3681.60	42.86	AV	H	31.70	2.55	25.92	51.19	54.00	2.81
4602.00	47.54	PK	H	32.50	3.10	25.79	57.35	74.00	16.65
4602.00	43.17	AV	H	32.50	3.10	25.79	52.98	54.00	1.02
5522.40	46.10	PK	H	34.11	3.55	25.27	58.49	74.00	15.51
5522.40	41.19	AV	H	34.11	3.55	25.27	53.58	54.00	0.42
6442.80	43.62	PK	H	34.21	4.64	25.17	57.30	74.00	16.70
6442.80	37.24	AV	H	34.21	4.64	25.17	50.92	54.00	3.08
7363.20	44.12	PK	H	36.14	4.55	25.77	59.04	74.00	14.96
7363.20	35.22	AV	H	36.14	4.55	25.77	50.14	54.00	3.86
8283.60	43.99	PK	H	37.14	4.99	26.06	60.06	74.00	13.94
8283.60	35.39	AV	H	37.14	4.99	26.06	51.46	54.00	2.54
9204.00	41.45	PK	H	37.78	5.59	25.67	59.15	74.00	14.85
9204.00	32.82	AV	H	37.78	5.59	25.67	50.52	54.00	3.48

High Channel: 925.4 MHz									
925.40	83.00	QP	H	22.51	4.36	0.00	109.87	N/A	N/A
925.40	77.38	QP	V	22.51	4.36	0.00	104.25	N/A	N/A
928.00	14.90	QP	H	22.56	4.34	0.00	41.80	46.00	4.20
1850.80	51.56	PK	H	26.67	1.66	25.99	53.90	74.00	20.10
1850.80	45.34	AV	H	26.67	1.66	25.99	47.68	54.00	6.32
2776.20	51.19	PK	H	29.29	1.93	26.09	56.32	74.00	17.68
2776.20	45.72	AV	H	29.29	1.93	26.09	50.85	54.00	3.15
3701.60	49.37	PK	H	31.74	2.58	25.91	57.78	74.00	16.22
3701.60	44.21	AV	H	31.74	2.58	25.91	52.62	54.00	1.38
4627.00	46.99	PK	H	32.55	3.08	25.77	56.85	74.00	17.15
4627.00	42.17	AV	H	32.55	3.08	25.77	52.03	54.00	1.97
5552.40	46.05	PK	H	34.12	3.56	25.23	58.50	74.00	15.50
5552.40	40.34	AV	H	34.12	3.56	25.23	52.79	54.00	1.21
6477.80	43.77	PK	H	34.20	4.71	25.25	57.43	74.00	16.57
6477.80	39.09	AV	H	34.20	4.71	25.25	52.75	54.00	1.25
7403.20	42.82	PK	H	36.25	4.48	25.81	57.74	74.00	16.26
7403.20	37.77	AV	H	36.25	4.48	25.81	52.69	54.00	1.31
8328.60	44.84	PK	H	37.19	5.03	26.07	60.99	74.00	13.01
8328.60	36.94	AV	H	37.19	5.03	26.07	53.09	54.00	0.91
9254.00	39.50	PK	H	37.80	5.62	25.63	57.29	74.00	16.71
9254.00	32.82	AV	H	37.80	5.62	25.63	50.61	54.00	3.39

Worst plots(High channel)
Horizontal



Vertical



FCC §15.247(a) (1) - CHANNEL SEPARATION TEST

Applicable Standard

According to FCC §15.247(a) (1).

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2019-08-03	2020-08-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	Each time	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 Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	23°C
Relative Humidity:	57%
ATM Pressure:	101.3 Pa
Tester:	Severn Zhu
Test Date:	2020-04-06

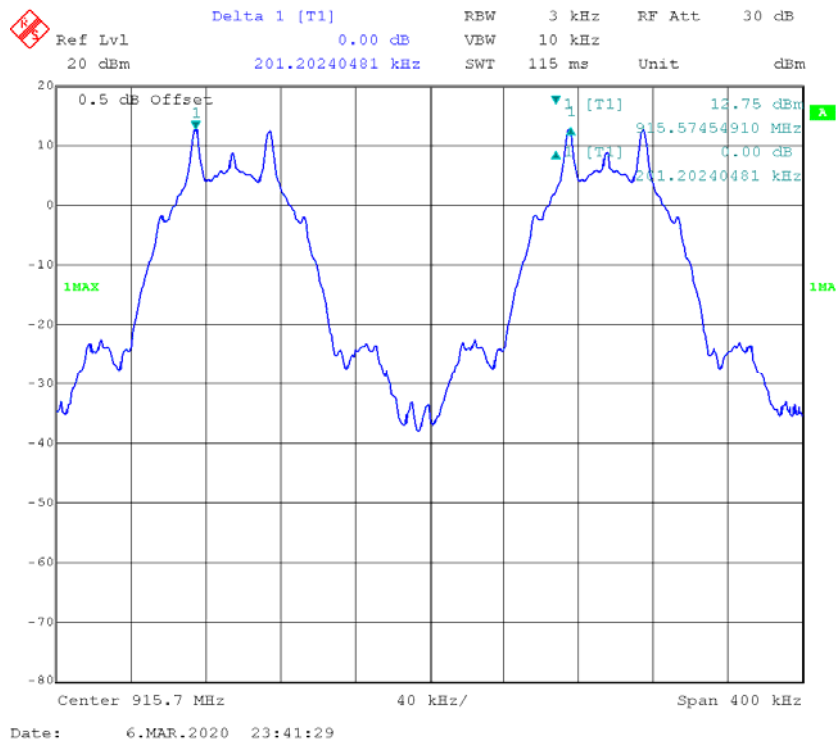
Test Result: Compliance.

Please refer to following tables and plots

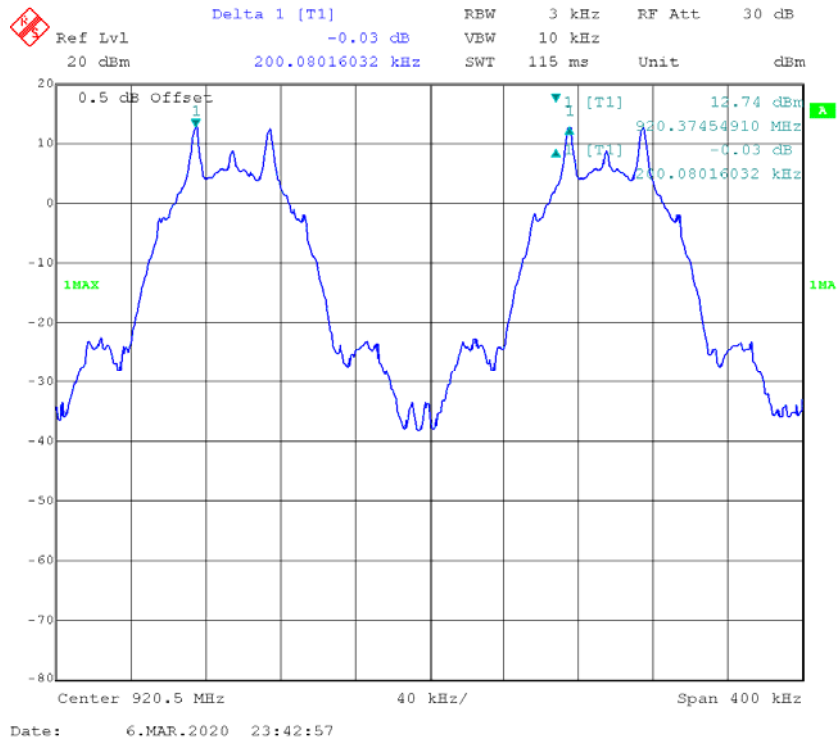
Test Mode: Transmitting

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
Low	915.6	0.201	0.085
Middle	920.4	0.200	0.085
High	925.4	0.201	0.085

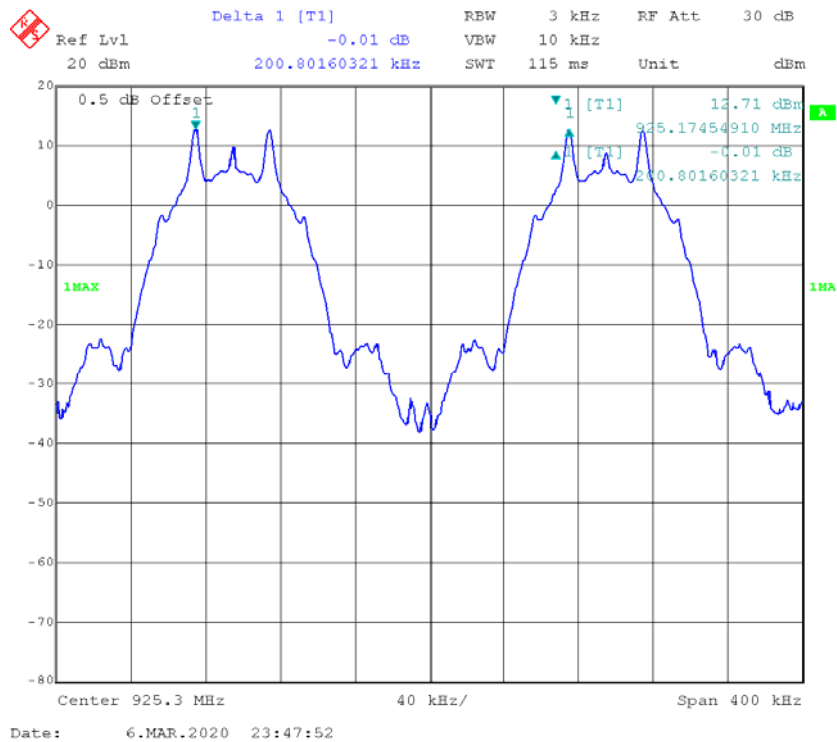
Low Channel



Middle Channel



High Channel



RSS-247 CLUASE 5.1– 20 dB BANDWIDTH TESTING

Applicable Standard

According to FCC §15.247(a) (1)

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Use Occupied bandwidth test function, measure the 99% Occupied bandwidth.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2019-08-03	2020-08-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	Each time	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:	23°C
Relative Humidity:	57%
ATM Pressure:	101.3 Pa
Tester:	Severn Zhu
Test Date:	2020-04-06

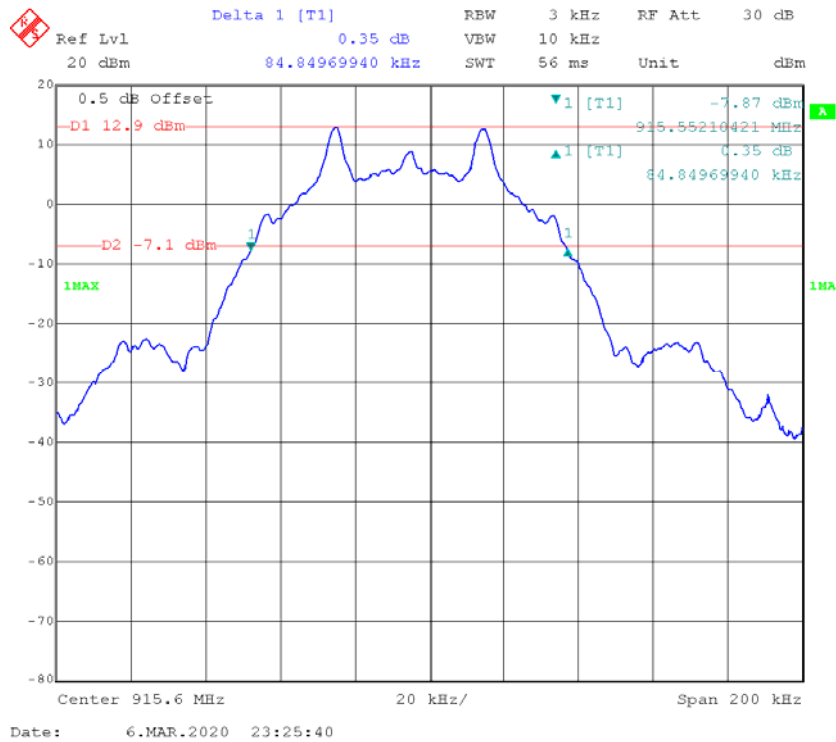
Test Result: Compliance.

Please refer to following tables and plots

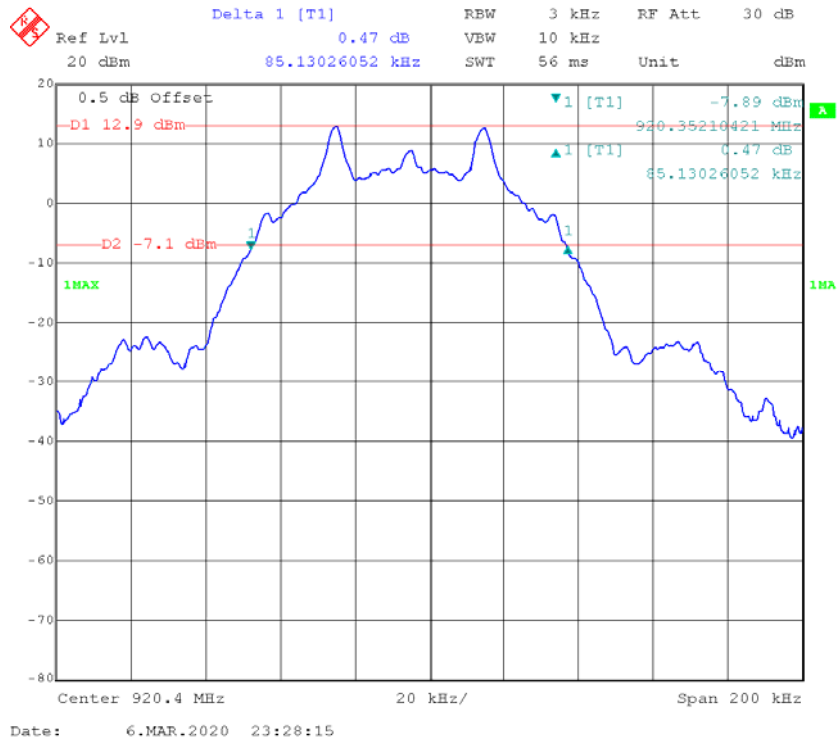
Test Mode: Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	20 dB Bandwidth Limits (MHz)
Low	915.6	0.085	≤0.25
Middle	920.4	0.085	≤0.25
High	925.4	0.085	≤0.25

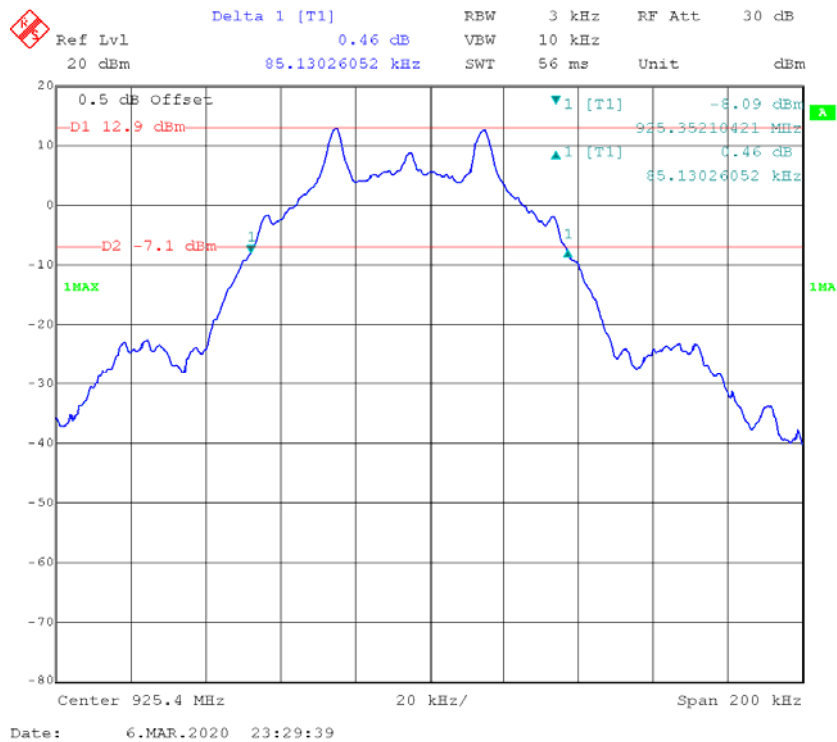
Low Channel



Middle Channel



High Channel



FCC §15.247(a) (1) (i) - QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

According to FCC §15.247(a) (1) (i)

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2019-08-03	2020-08-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	Each time	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

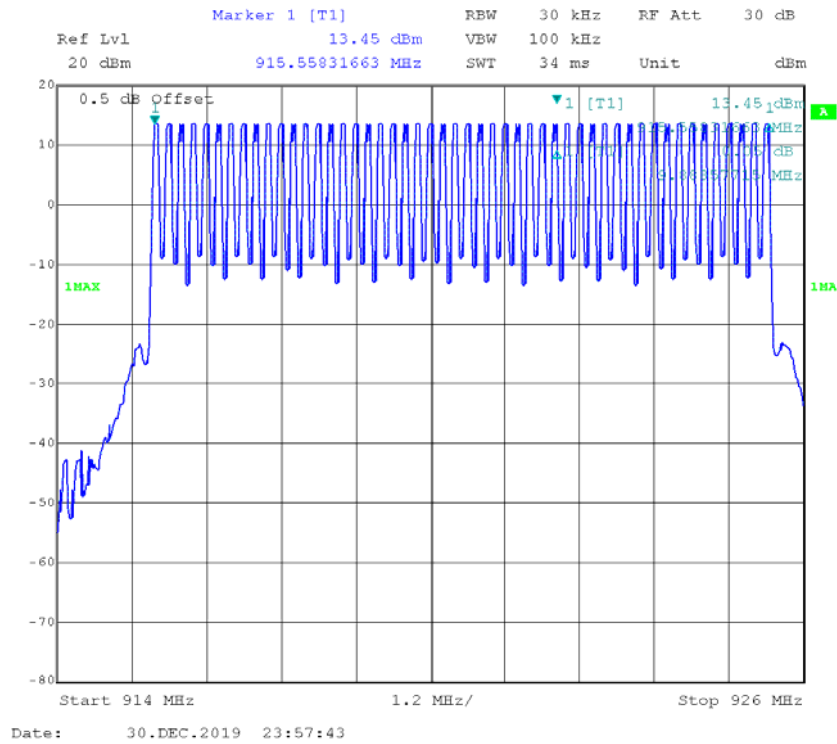
Temperature:	24.1°C
Relative Humidity:	60%
ATM Pressure:	102Pa
Tester:	Severn Zhu
Test Date:	2019-12-30

Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
902-928	50	≥50



FCC §15.247(a) (1) (i) - TIME OF OCCUPANCY (DWELL TIME)**Applicable Standard**

According to FCC §15.247(a) (1) (i)

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Procedure

The EUT was worked in channel hopping; the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2019-08-03	2020-08-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	Each time	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**

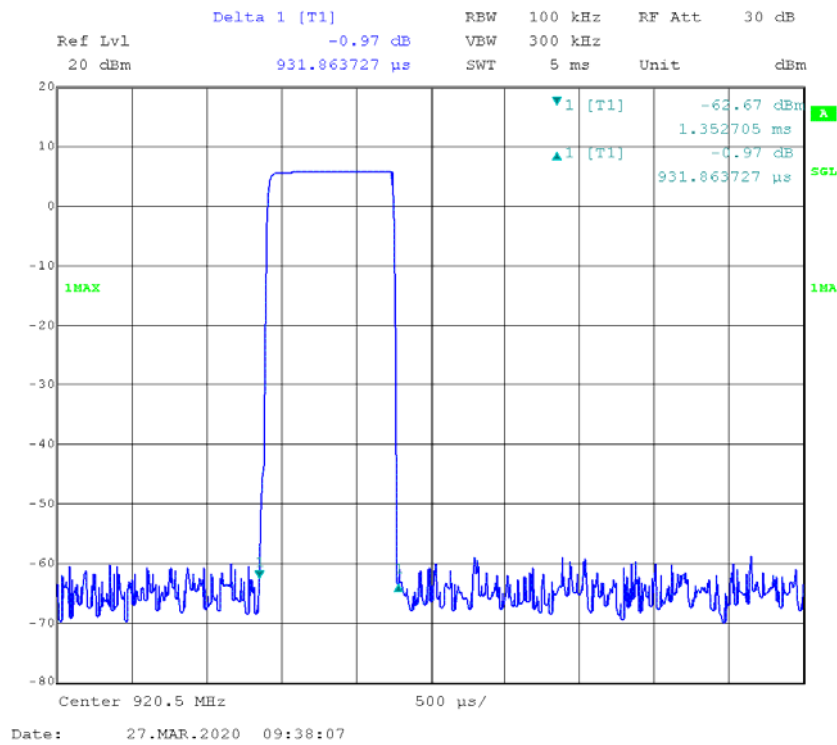
Temperature:	23.9~25°C
Relative Humidity:	52~58%
ATM Pressure:	101.1~101.8 Pa
Tester:	Severn Zhu
Test Date:	2020-4-23 & 2020-04-27

Test Mode: Transmitting

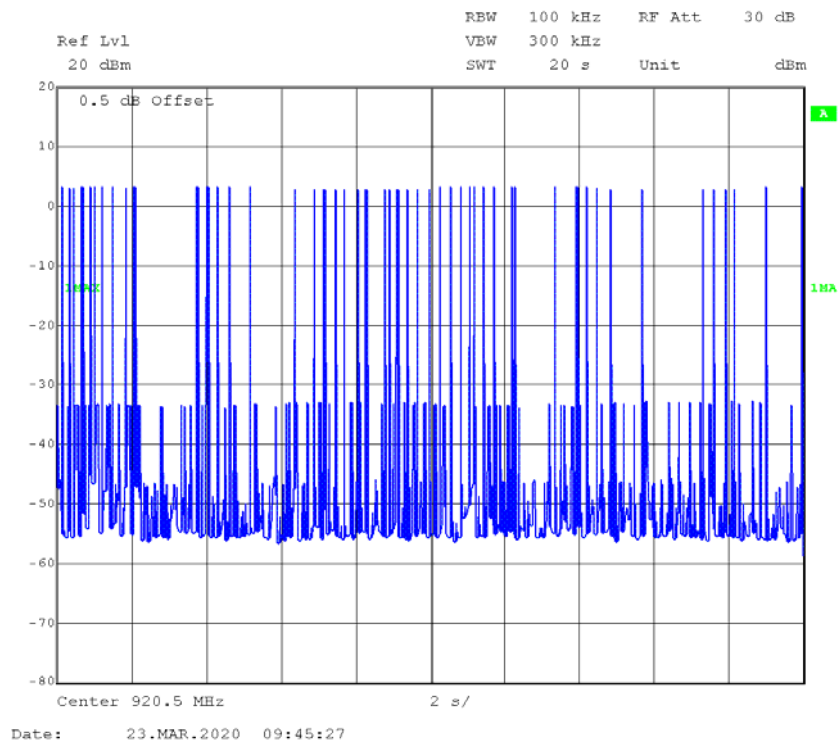
Channel	Frequency (MHz)	Pulse Width (ms)	Real Observed Period(s)	Hopping number in Observed Period	Dwell Time (s)	Limit (s)	Result
Middle	920.4	0.932	20	60	0.056	0.4	Compliance

Note:
 Dwell time=Pulse width × hopping number per channel in Observed Period
 Observed Period=20s

Pulse Width



Hopping number in Observed Period



FCC §15.247(b) (2) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to FCC §15.247(b)(2)

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A
Agilent	USB Wideband Power Sensor	U2021XA	MY54080014	2019-05-09	2020-05-09

* **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:	23°C
Relative Humidity:	57%
ATM Pressure:	101.7 Pa
Tester:	Severn Zhu
Test Date:	2020-04-07

Test Result: Compliance.

Test Mode: Transmitting

Channel	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
Low	915.6	13.61	≤ 30
Middle	920.4	13.66	
High	925.4	13.60	

Note: The data above was tested in conducted mode, the antenna gain is 6dBi.

FCC §15.247(d)- BAND EDGES TESTING

Applicable Standard

According to FCC §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW/ VBW of spectrum analyzer to 100/300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2019-08-03	2020-08-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	Each time	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

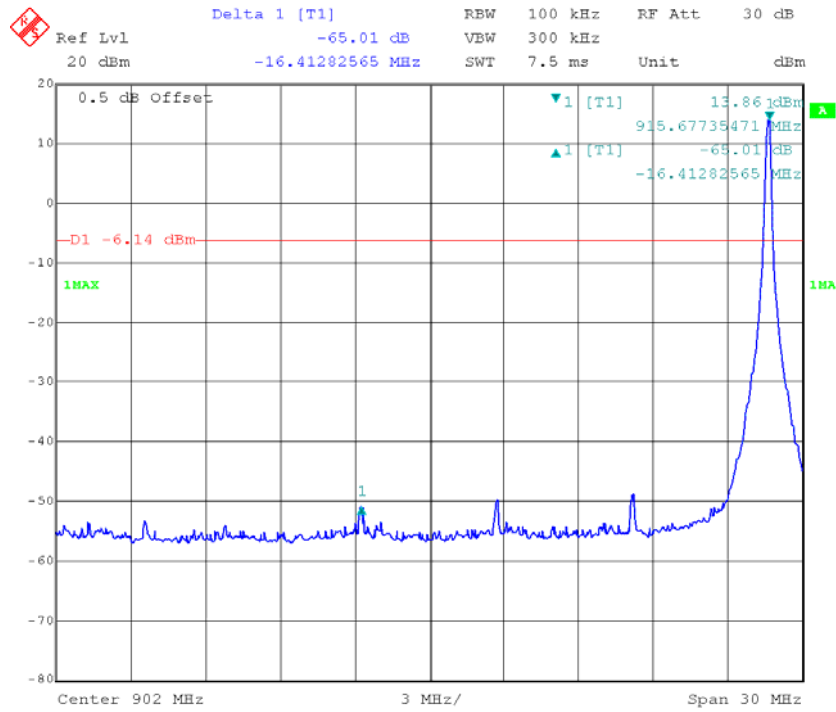
Environmental Conditions

Temperature:	23~24.1°C
Relative Humidity:	57~60%
ATM Pressure:	101.7~102 Pa
Tester:	Severn Zhu
Test Date:	2019-12-30&2020-04-07

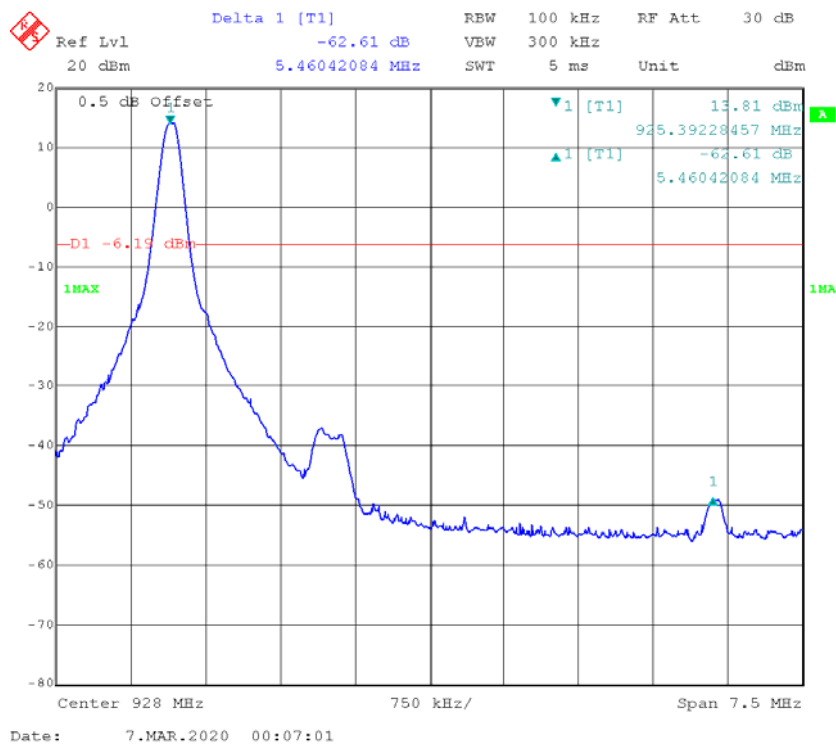
Test Result: Compliance

Single mode:

Band Edge, Left Side

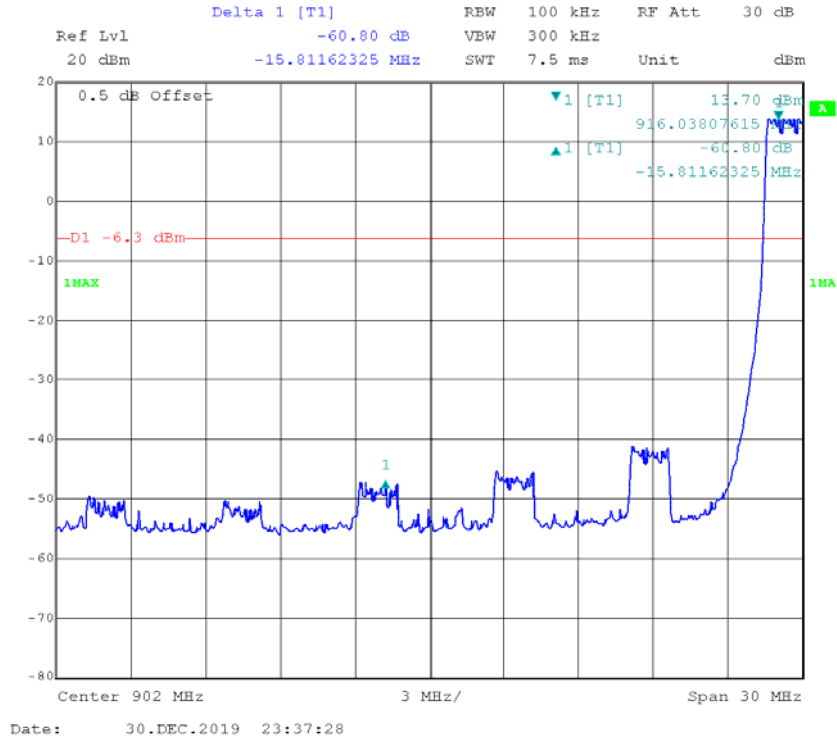


Band Edge, Right Side

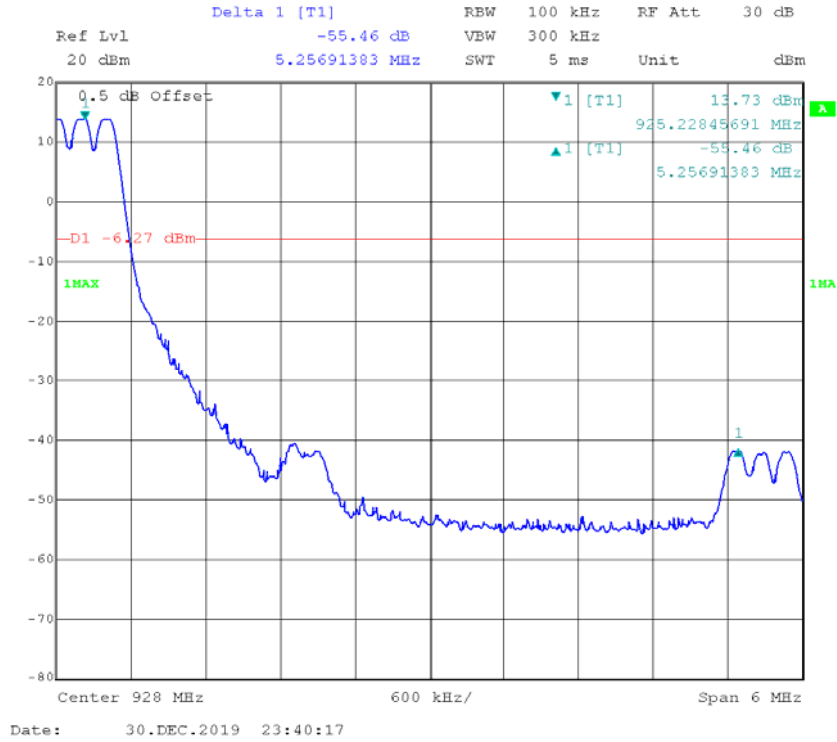


Hopping mode:

Band Edge, Left Side



Band Edge, Right Side



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