TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.247

RSS-GEN, ISSUE 5, APRIL 2018

RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Radacat Technology (Canada) Inc

15300 Croydon Dr Suite300, BC V3Z 0Z5, Canada

FCC ID:2AS98T1
IC: 23688-T1

Report Type:	**Product Name:**
Original Report	Radacat T1

Report Number:	RDG190703007-00B
Report Date:	2019-10-18
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

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Radacat T1
EUT Model:	T1
Operation Frequency:	902.5-927.5 MHz
Maximum Peak Output Power (Conducted):	28.91 dBm
Modulation Type:	GFSK
Rated Input Voltage:	DC 3.8V from battery or charged by charger
External Dimension:	42mm(L)*42mm(W)*18mm(H)
Serial Number:	190703007
EUT Received Date:	2019-07-08
EUT Received Status:	Good

Objective

This report is prepared on behalf of ***Radacat Technology (Canada) Inc*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules, RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, April 2018 of the Innovation, Science and Economic Development Canada.

The tests were performed in order to determine the compliance of the EUT with FCC Rules Part 15-Subpart C, section 15.203, 15.205, 15.209 and 15.247 rules, RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, April 2018 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AS98T1.
RSS-247 DTSs, submissions with IC: 23688-T1

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. And 558074 D01 15.247 Meas Guidance v05r02, RSS-247, Issue 2, February 2017, RSS-Gen Issue 5, April 2018 of the Innovation, Science and Economic Development Canada.

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℃
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 an asterisk '*'. 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.

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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.

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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 device was a hopping transmitter, employs 51 hopping channels:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	902.5	26	915.5
1	903	27	916
2	903.5	28	916.5
~	~	~	~
~	~	~	~
23	914	49	927
24	914.5	50	927.5
25	915	/	/

Frequency 902.5 MHz, 914.5 MHz and 927.5 MHz were selected to test.

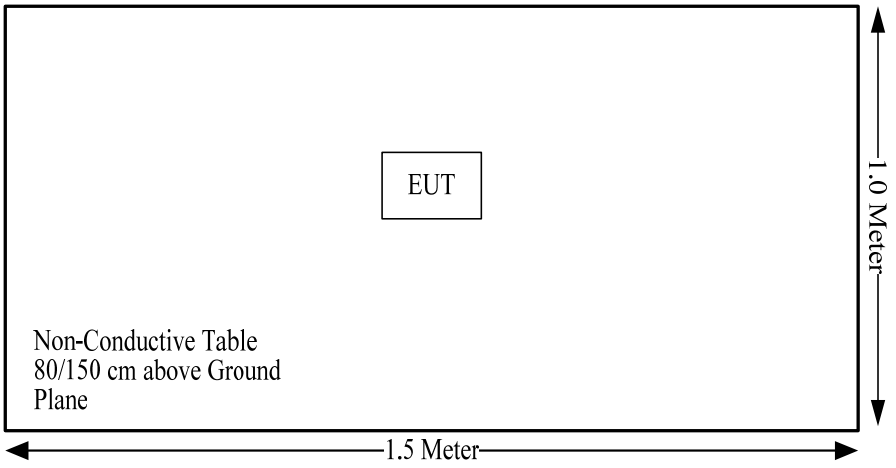
EUT Exercise Software

The software “base.apk” was used for testing, which was provided by manufacturer. The power was configured by the system default setting.

Equipment Modifications

No modification was made to the EUT.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
§15.247 (i) & §1.1310 & §2.1093 RSS-102 Clause 4	RF Exposure	Compliance
FCC §15.203, RSS-GEN Clause 6.8	Antenna Requirement	Compliance
FCC §15.207 (a); RSS-Gen Clause 8.8	AC Line Conducted Emissions	Not Applicable
FCC §15.205, §15.209, §15.247(d); RSS-247 Clause 5.5 RSS-Gen Clause 8.10	Spurious Emissions	Compliance
FCC §15.247 (a)(1) RSS-247 Clause 5.1 c) RSS-Gen Clause 6.7	Emission Bandwidth	Compliance
FCC §15.247(a)(1) RSS-247 Clause 5.1 b)	Channel Separation Test	Compliance
FCC§15.247(a)(1)(i) RSS-247 Clause 5.1 c)	Time of Occupancy (Dwell Time)	Compliance
FCC§15.247(a)(1)(i) RSS-247 Clause 5.1 c)	Quantity of hopping channel Test	Compliance
FCC§15.247(b)(2) RSS-247 Clause 5.4 a)	Peak Output Power Measurement	Compliance
FCC§15.247(d) RSS-247 Clause5.5	Band Edges	Compliance

Not Applicable: the device was powered by battery when use.

FCC §15.247 (i) & §1.1310 & §2.1093, RSS-102 CLAUSE 4- RF Exposure

Applicable Standard

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

According to RSS-102 Clause 4 Table 3, SAR limits for device used by the general public.

Body Region	Average SAR (W/Kg)	Averaging Time (minutes)	Mass Average (g)
Whole Body	0.08	6	Whole Body
Localized Head, Neck and Trunk	1.6	6	1
Localized Limbs	4	6	10

Measurement Result

Compliance, please refer to the SAR report: RDG190703007-20.

FCC §15.203, RSS-GEN CLAUSE 6.8 - ANTENNA REQUIREMENT

Applicable Standard

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 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.

According to RSS-Gen §6.8, The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.
For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).
When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.
For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:
This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has one internal antenna arrangement for Rora, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
PIFA	50	1.0 dBi/902~928 MHz

Result: Compliance.

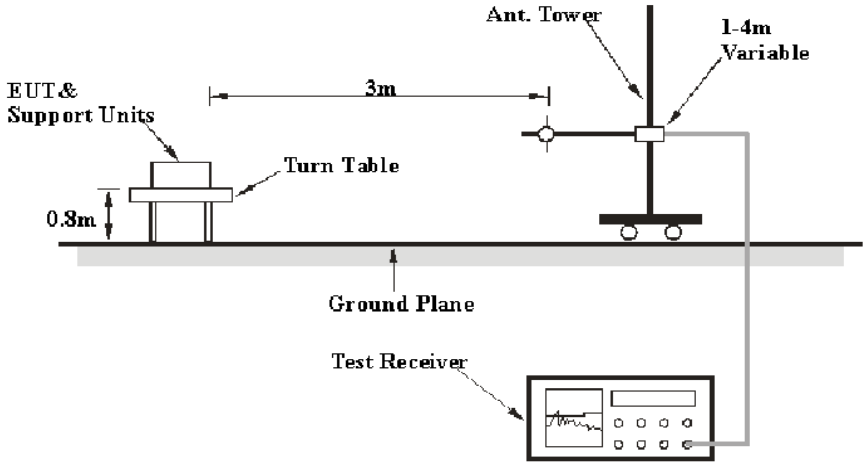
FCC §15.209, §15.205 & §15.247(d), RSS-247 CLAUSE 5.5, RSS-GEN CLAUSE 8.10 - SPURIOUS EMISSIONS

Applicable Standard

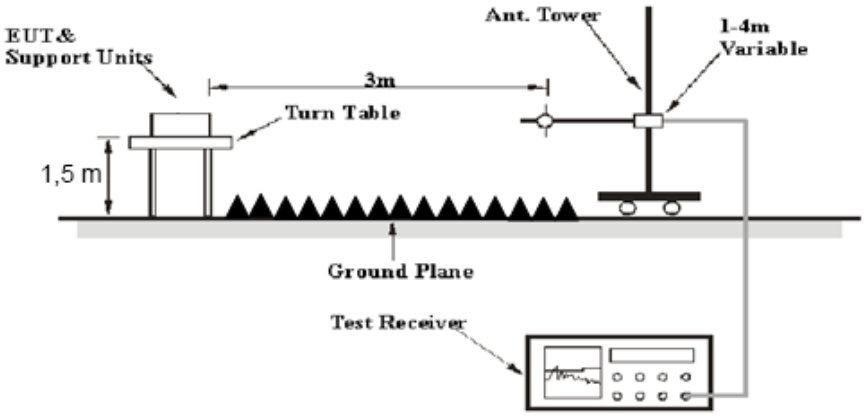
FCC §15.247 (d); §15.209; §15.205; RSS-247 §5.5, RSS-GEN §8.10.

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 A, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

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

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESR3	102453	2019-06-26	2020-06-26
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
R&S	Spectrum Analyzer	FSP 38	100478	2019-05-09	2020-05-09
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
MICRO-COAX	Coaxial Cable	UFA147-1-2362-100100	64639 231029-001	2019-02-24	2020-02-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2018-09-05	2019-09-05
E-Microwave	Band-stop Filters	OBSF-900-928	OE065488	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).

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 Data

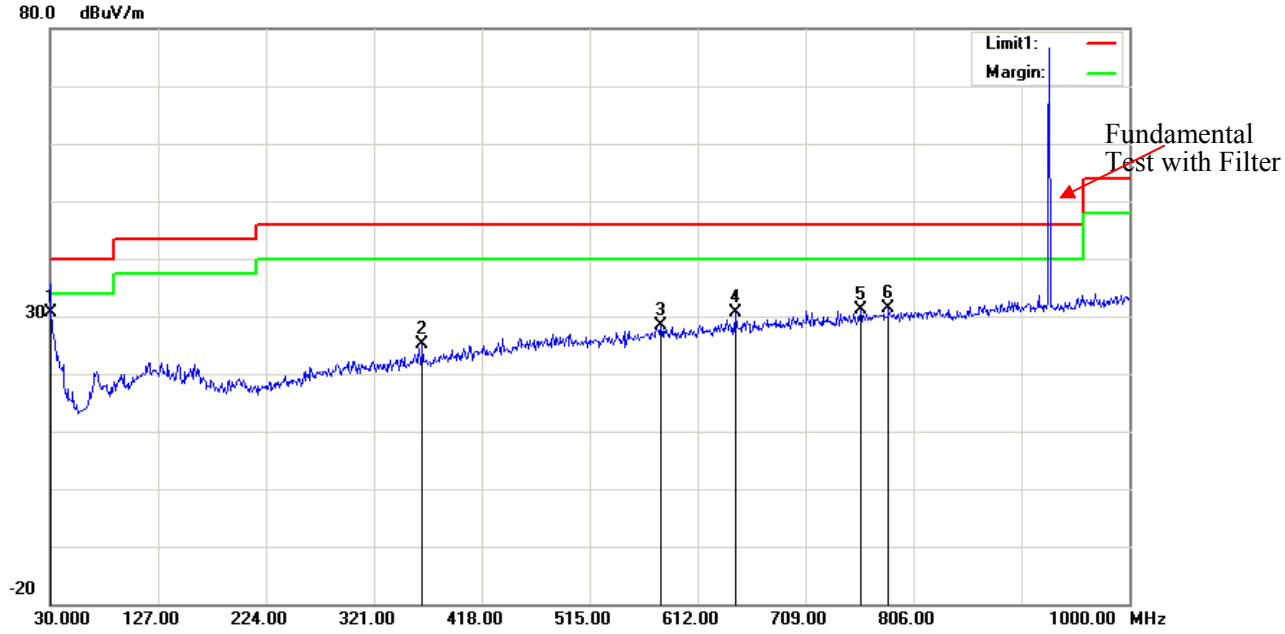
Environmental Conditions

Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	26.7 °C	26.4 °C
Relative Humidity:	41%	47%
ATM Pressure:	101.2 kPa	101.4 kPa
Tester:	Neil Liao	Vern Shen
Test Date:	2019-09-26	2019-09-25

Test Mode: Transmitting

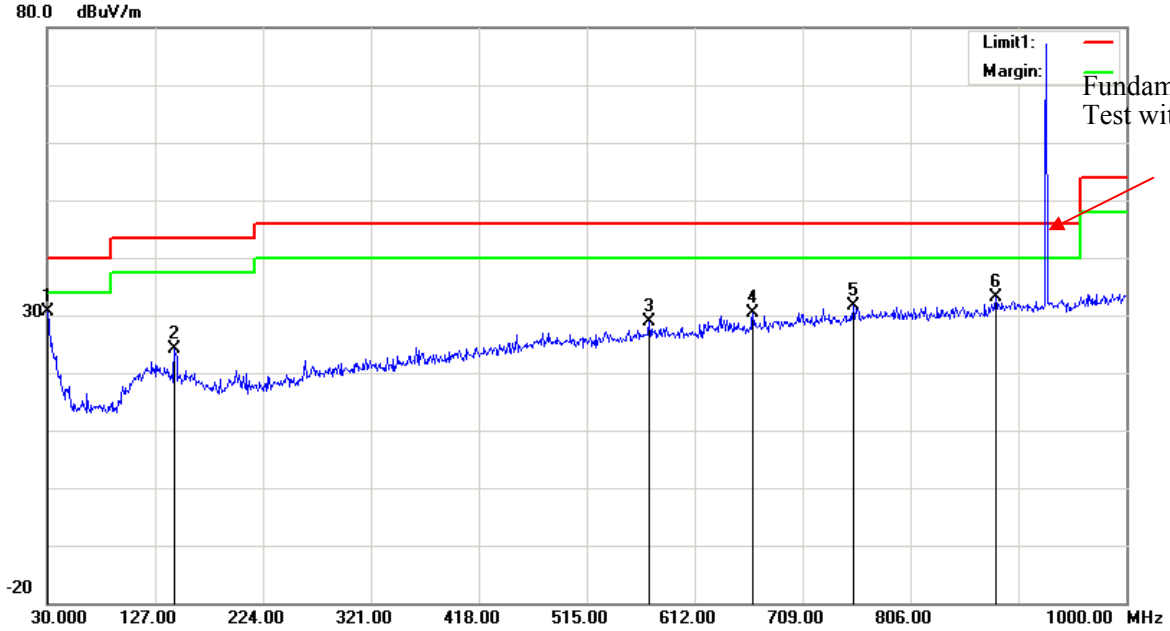
1)30MHz-1GHz(High channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.0000	28.97	QP	1.72	30.69	40.00	9.31
364.6500	27.95	peak	-2.82	25.13	46.00	20.87
579.0200	27.23	peak	1.10	28.33	46.00	17.67
645.9500	28.56	peak	2.16	30.72	46.00	15.28
758.4700	27.19	peak	3.92	31.11	46.00	14.89
783.6900	26.88	peak	4.39	31.27	46.00	14.73

Vertical:

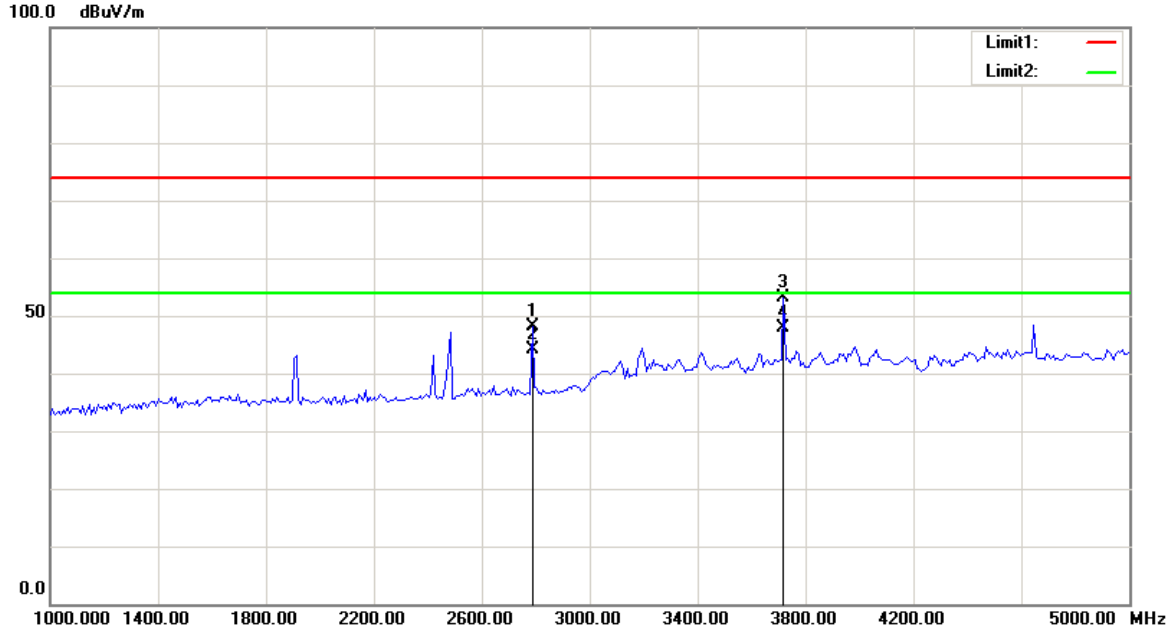


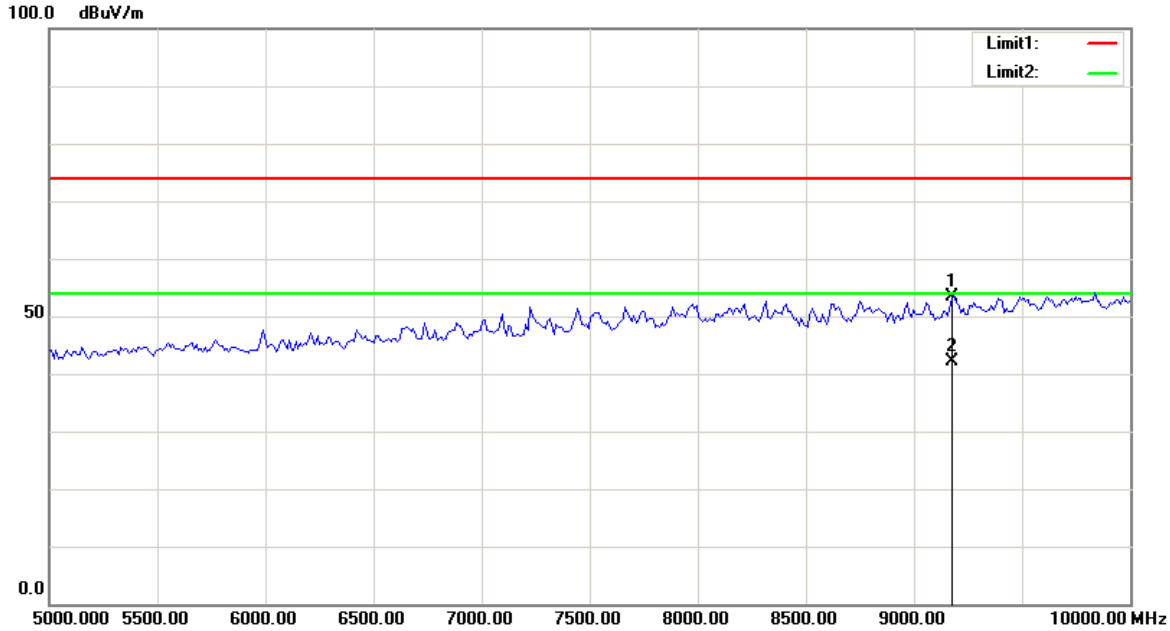
Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.9700	29.70	peak	0.91	30.61	40.00	9.39
144.4600	30.06	peak	-5.98	24.08	43.50	19.42
571.2600	27.75	peak	1.02	28.77	46.00	17.23
664.3800	28.06	peak	2.23	30.29	46.00	15.71
754.5900	27.75	peak	3.80	31.55	46.00	14.45
882.6300	33.53	peak	-0.33	33.20	46.00	12.80

2) Bandedge, and above 1GHz:

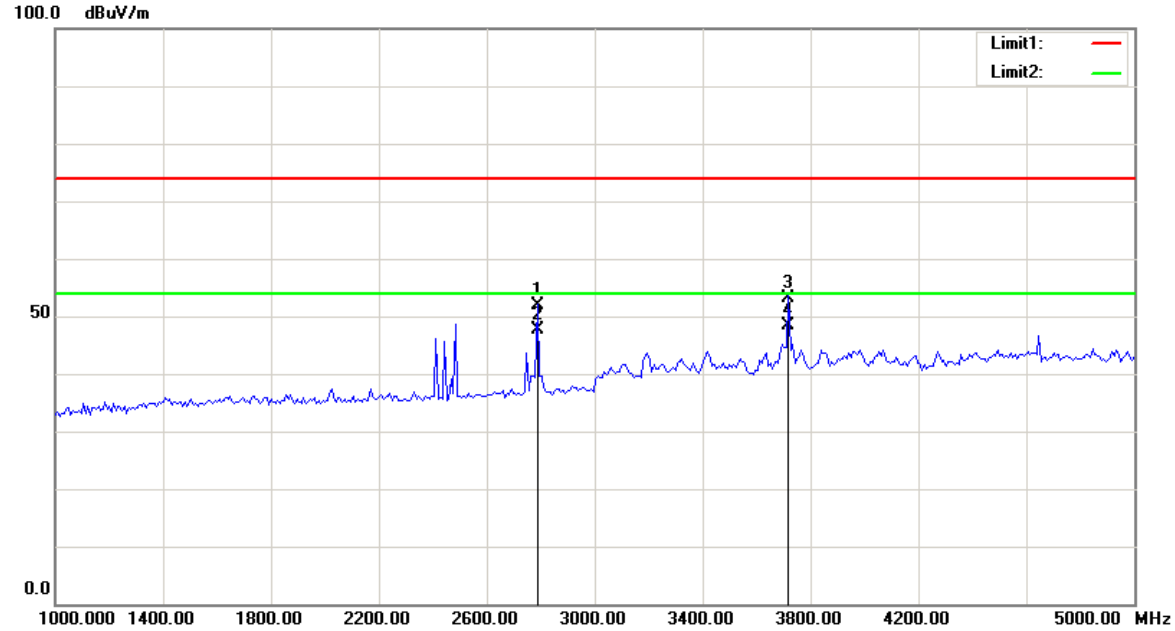
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 902.5 MHz									
902.00	8.60	QP	V	22.34	4.29	0.00	35.23	46.00	10.77
1805.00	40.22	PK	V	24.10	2.89	27.82	39.39	74.00	34.61
1805.00	25.00	AV	V	24.10	2.89	27.82	24.17	54.00	29.83
2707.50	48.58	PK	V	25.29	3.49	27.88	49.48	74.00	24.52
2707.50	45.94	AV	V	25.29	3.49	27.88	46.84	54.00	7.16
3610.00	48.04	PK	V	27.42	4.23	26.70	52.99	74.00	21.01
3610.00	43.14	AV	V	27.42	4.23	26.70	48.09	54.00	5.91
Middle Channel: 914.5 MHz									
1829.00	40.48	PK	V	24.10	2.91	27.83	39.66	74.00	34.34
1829.00	24.10	AV	V	24.10	2.91	27.83	23.28	54.00	30.72
2743.50	48.40	PK	V	25.34	3.50	27.88	49.36	74.00	24.64
2743.50	45.54	AV	V	25.34	3.50	27.88	46.50	54.00	7.50
3658.00	48.80	PK	V	27.52	4.11	26.75	53.68	74.00	20.32
3658.00	43.40	AV	V	27.52	4.11	26.75	48.28	54.00	5.72
High Channel: 927.5 MHz									
928.00	8.50	QP	V	22.56	4.34	0.00	35.40	46.00	10.60
1855.00	40.10	PK	V	24.10	2.93	27.83	39.30	74.00	34.70
1855.00	24.12	AV	V	24.10	2.93	27.83	23.32	54.00	30.68
2782.50	50.80	PK	V	25.40	3.51	27.89	51.82	74.00	22.18
2782.50	46.54	AV	V	25.40	3.51	27.89	47.56	54.00	6.44
3710.00	48.30	PK	V	27.62	4.02	26.80	53.14	74.00	20.86
3710.00	43.54	AV	V	27.62	4.02	26.80	48.38	54.00	5.62

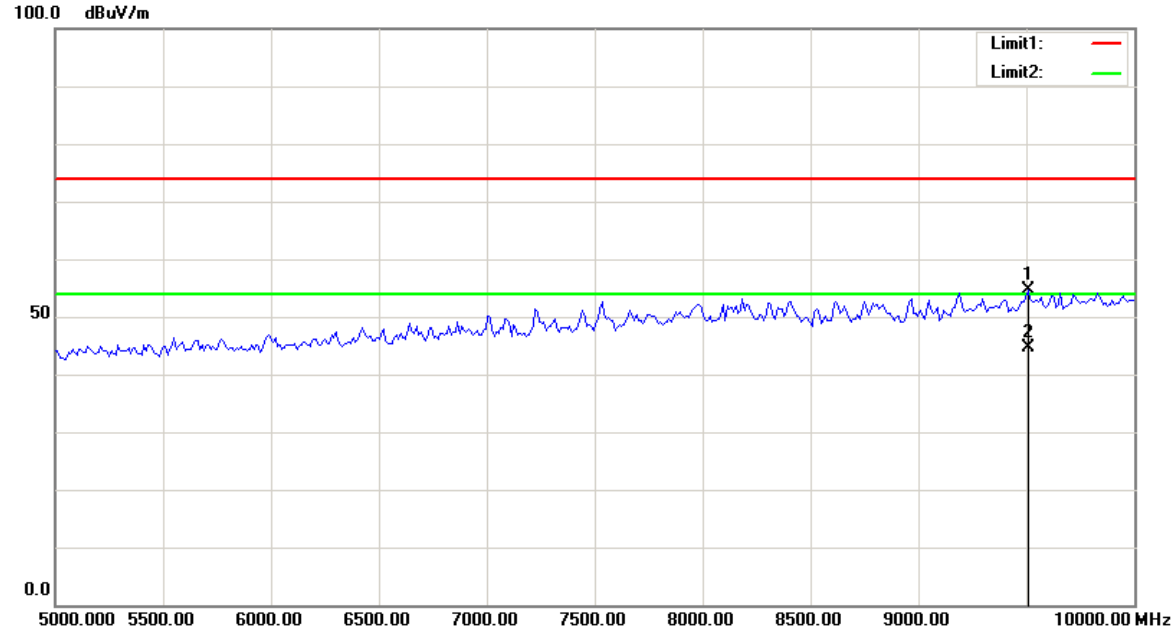
Worst plots(High channel)
Horizontal





Vertical


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
3
1000.000 1400.00 1800.00 2200.00 2600.00 3000.00 3400.00 3800.00 4200.00 5000.00 MHz


100.0 dBuV/m
Limit1:
Limit2:
50
0.0
1
2
5000.000 5500.00 6000.00 6500.00 7000.00 7500.00 8000.00 8500.00 9000.00 10000.00 MHz

FCC §15.247(a) (1), RSS-247 CLAUSE 5.1 b) - CHANNEL SEPARATION TEST

Applicable Standard

According to FCC §15.247(a) (1)

Frequency hopping systems shall have hoping 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.

RSS-247 Clause 5.1 b)

Frequency hopping systems shall have hoping 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
R&S	Spectrum Analyzer	FSV40	101474	2019-01-09	2020-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0012/04	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 RBW was set at 3 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

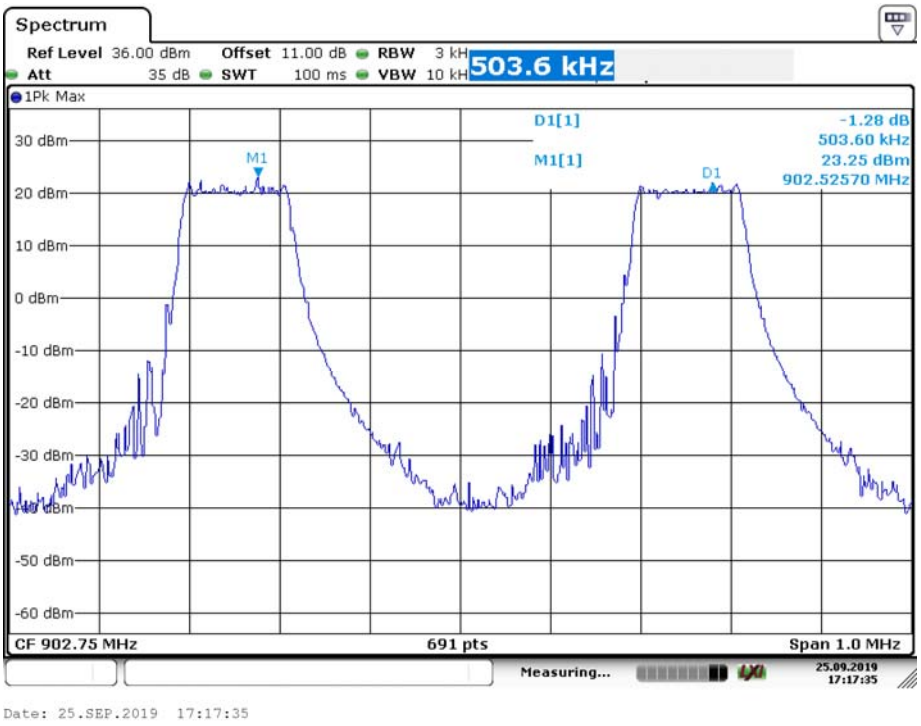
Temperature:	28 °C
Relative Humidity:	72 %
ATM Pressure:	100.4 kPa
Tester:	Blake Yang
Test Date:	2019-08-25

Test Result: Compliance.
Please refer to following tables and plots

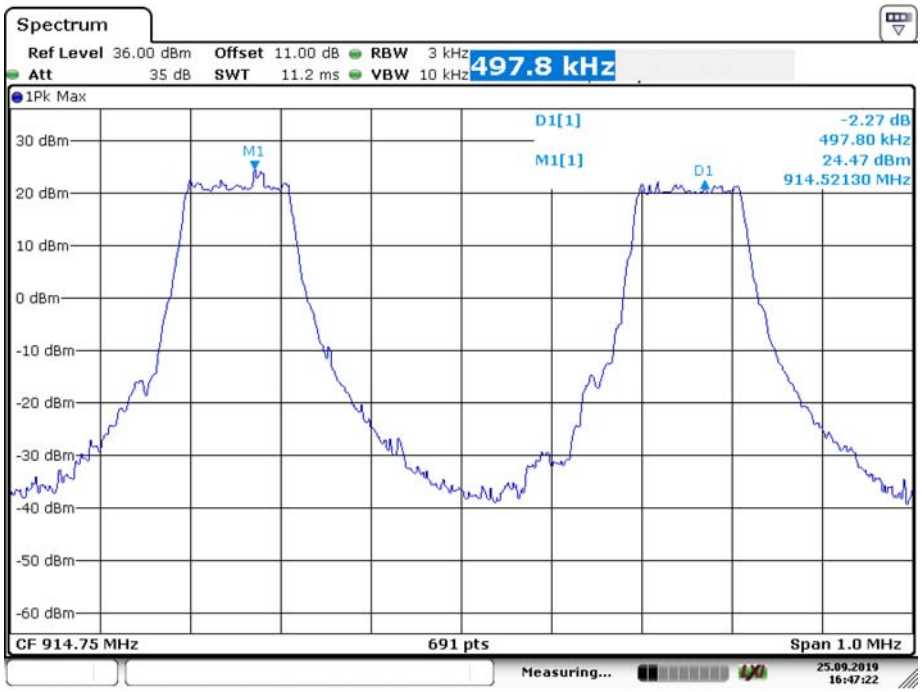
Test Mode: Transmitting

Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
Low	902.5	0.504	0.140
Middle	914.5	0.498	0.143
High	927.5	0.524	`0.140

Low Channel



Middle Channel



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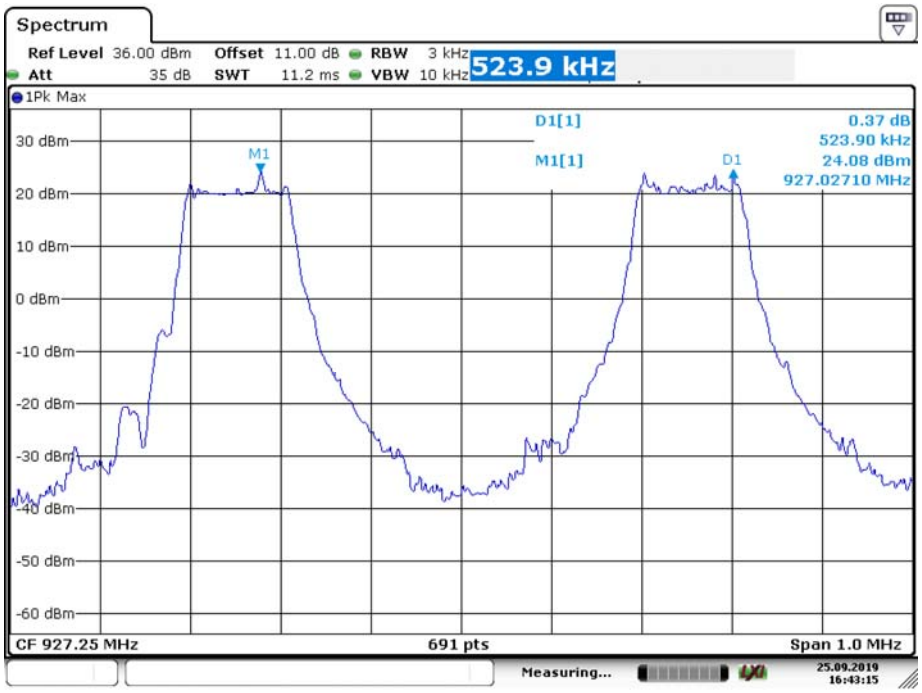
High Channel



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FCC §15.247(a) (1), RSS-247 CLUASE 5.1&RSS-GEN CLAUSE 6.7– 20 dB BANDWIDTH TESTING

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.

According to RSS-247 Clause 5.1 c):

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

According to RSS-Gen §6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

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. Repeat above procedures until all frequencies measured were complete.
5. Use Occupied bandwidth test function, measure the 99% Occupied bandwidth.
6. 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	Spectrum Analyzer	FSV40	101474	2019-01-09	2020-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0012/04	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:	28 °C
Relative Humidity:	72 %
ATM Pressure:	100.4 kPa
Tester:	Blake Yang
Test Date:	2019-08-25

Test Result: Compliance.

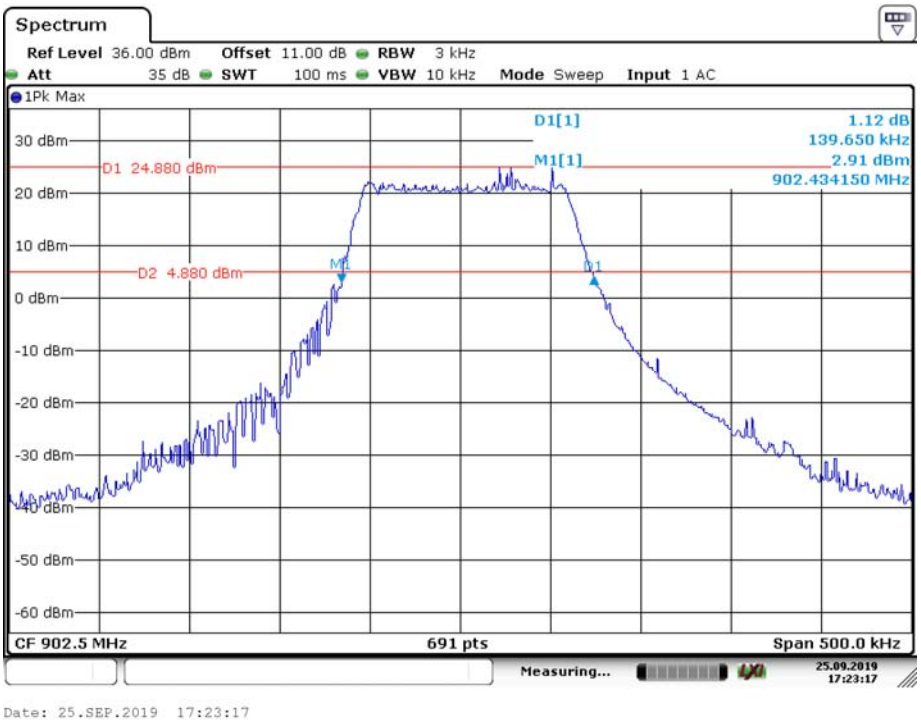
Please refer to following tables and plots

Test Mode: Transmitting

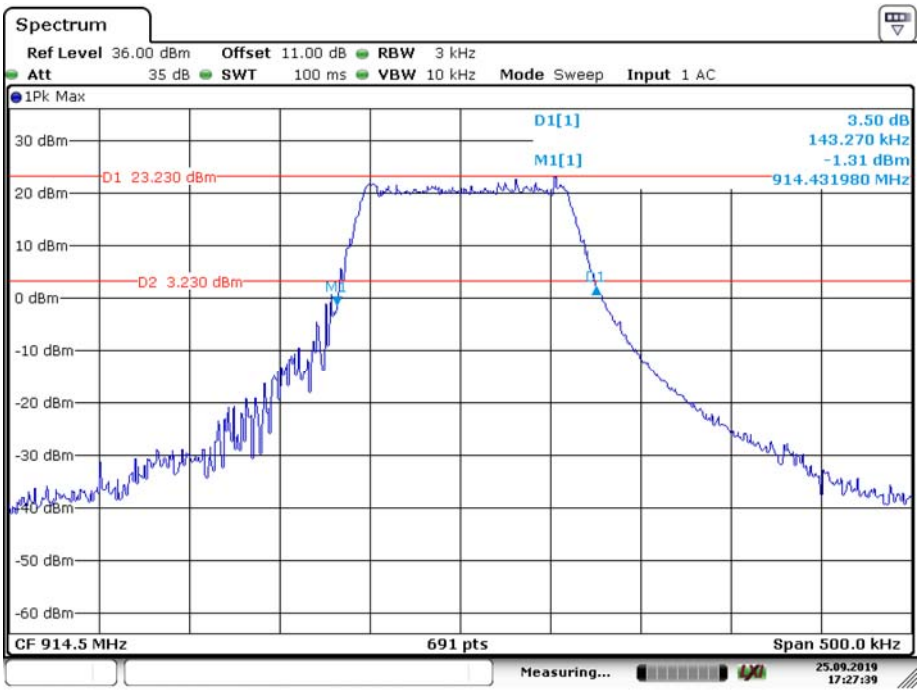
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	20 dB Bandwidth Limits (MHz)
Low	902.5	0.140	0.126	≤0.5
Middle	914.5	0.143	0.126	≤0.5
High	927.5	`0.140	0.127	≤0.5

20dB Bandwidth:

Low Channel



Middle Channel



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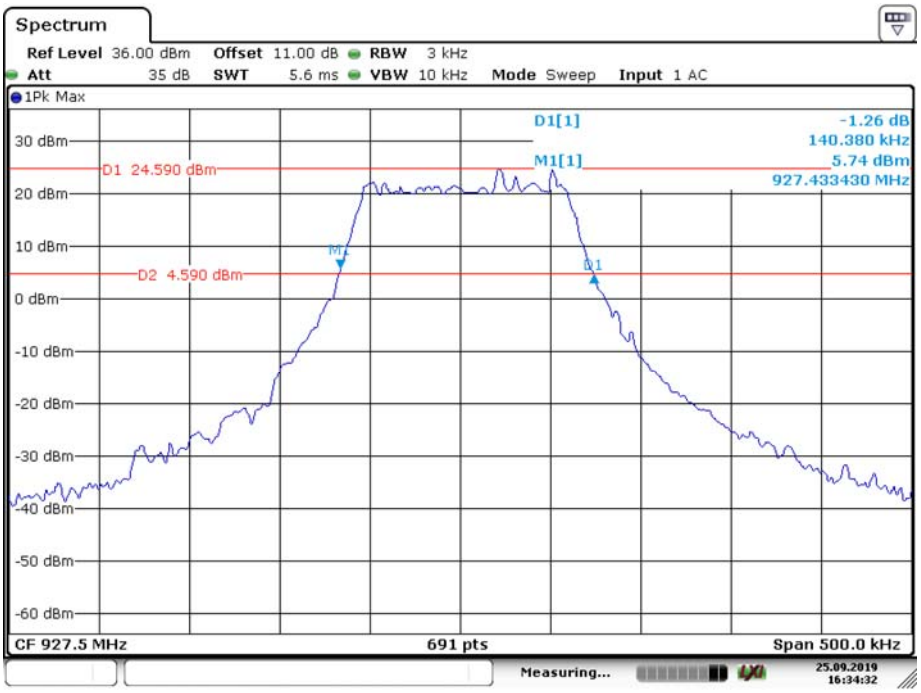
High Channel



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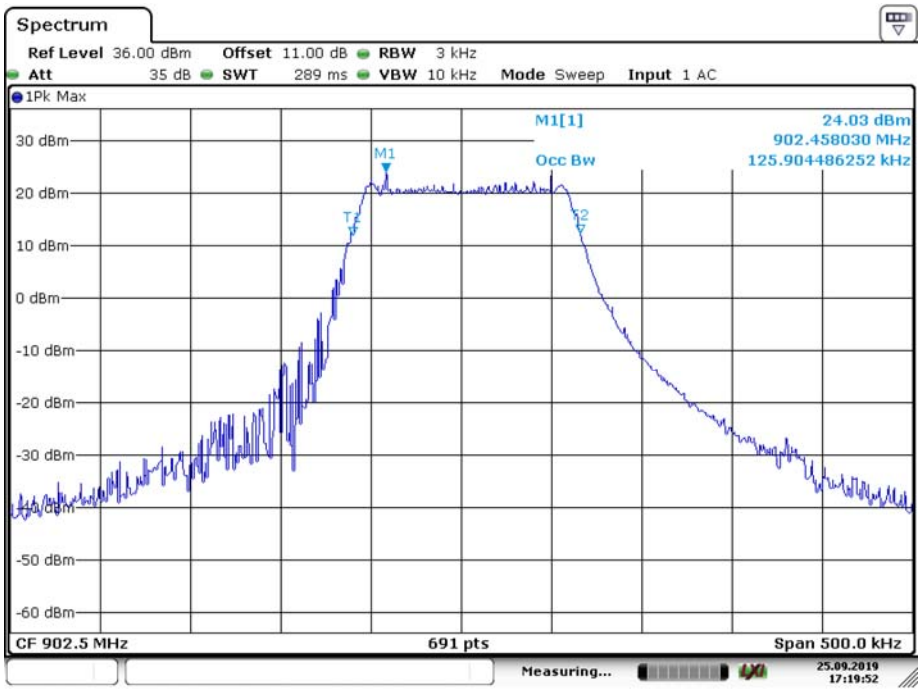
99% Occupied bandwidth:

Low Channel



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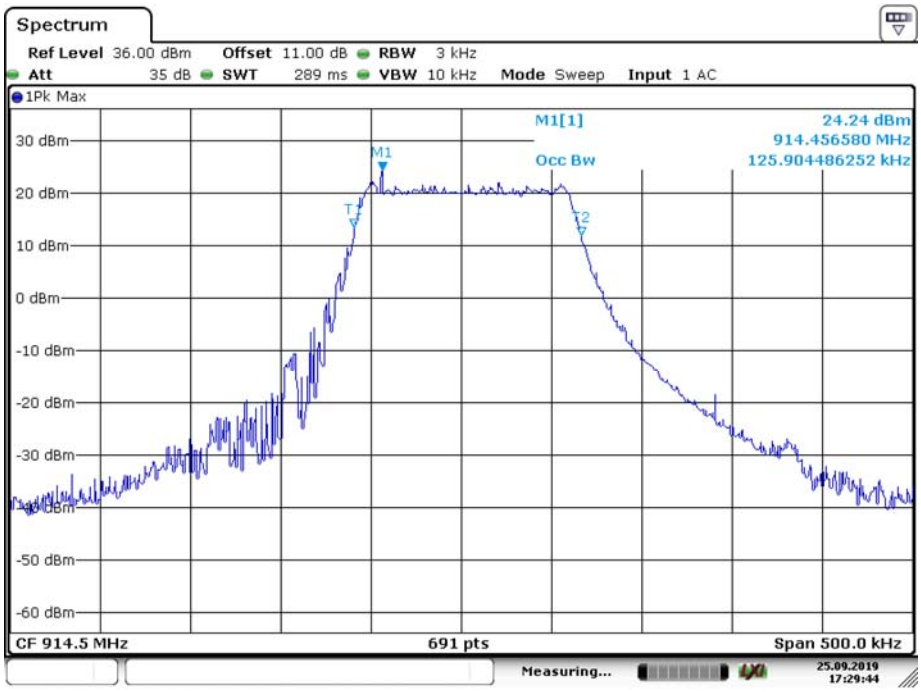
Middle Channel



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High Channel

FCC §15.247(a) (1) (i), RSS-247 CLAUSE 5.1 c) - 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.

According to RSS-247 Clause 5.1 c)

For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel 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 channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 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
R&S	EMI Test Receiver	ESPI	100120	2018-12-11	2019-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	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:	28 °C
Relative Humidity:	72 %
ATM Pressure:	100.4 kPa
Tester:	Blake Yang
Test Date:	2019-08-25

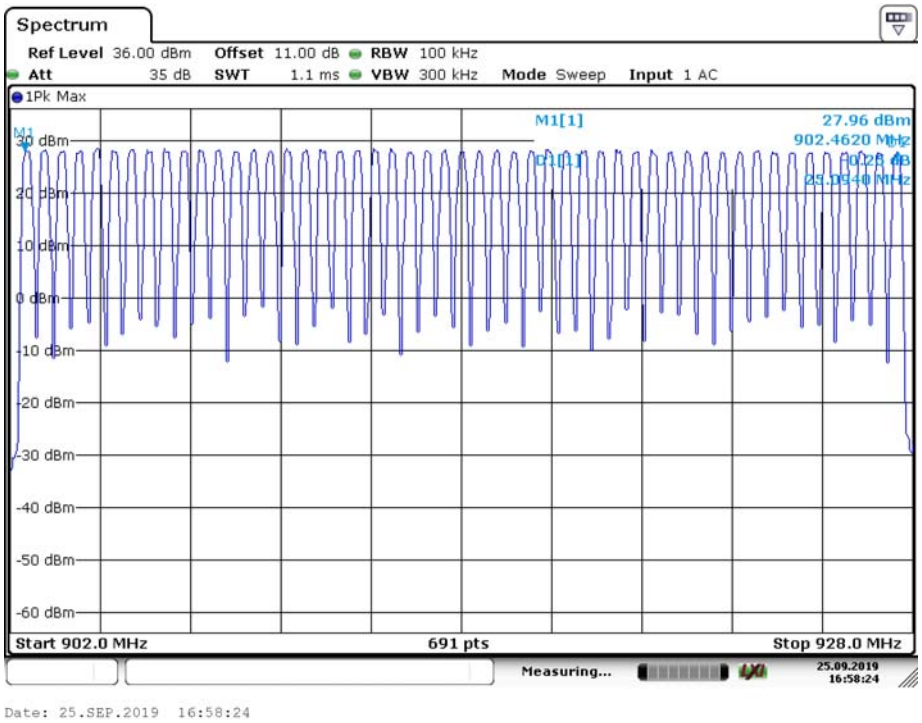
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
902-928	51	≥50

Number of Hopping Channels



FCC §15.247(a) (1) (i), RSS-247 Clause 5.1 c) - 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.

According to RSS-247 Clause 5.1 c)

For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel 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 channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 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
R&S	EMI Test Receiver	ESPI	100120	2018-12-11	2019-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	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

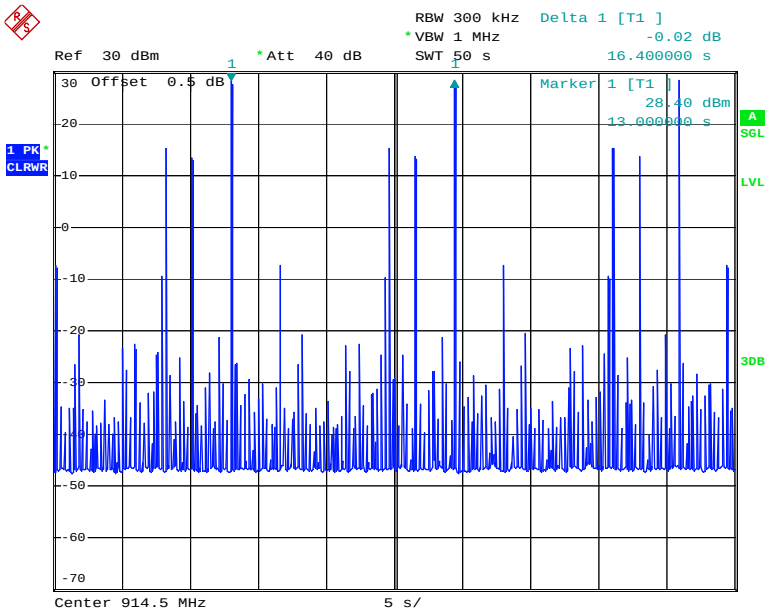
Temperature:	28 °C
Relative Humidity:	72 %
ATM Pressure:	100.4 kPa
Tester:	Blake Yang
Test Date:	2019-08-25

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	914.5	67.246	20	2	0.134	0.4	Compliance

Note:
Dwell time=Pulse width × hopping number per channel in Observed Period
Observed Period=20s
The hopping during time is 16.4s, so the maximum Hopping number in Observed Period 20s=2

Middle Channel



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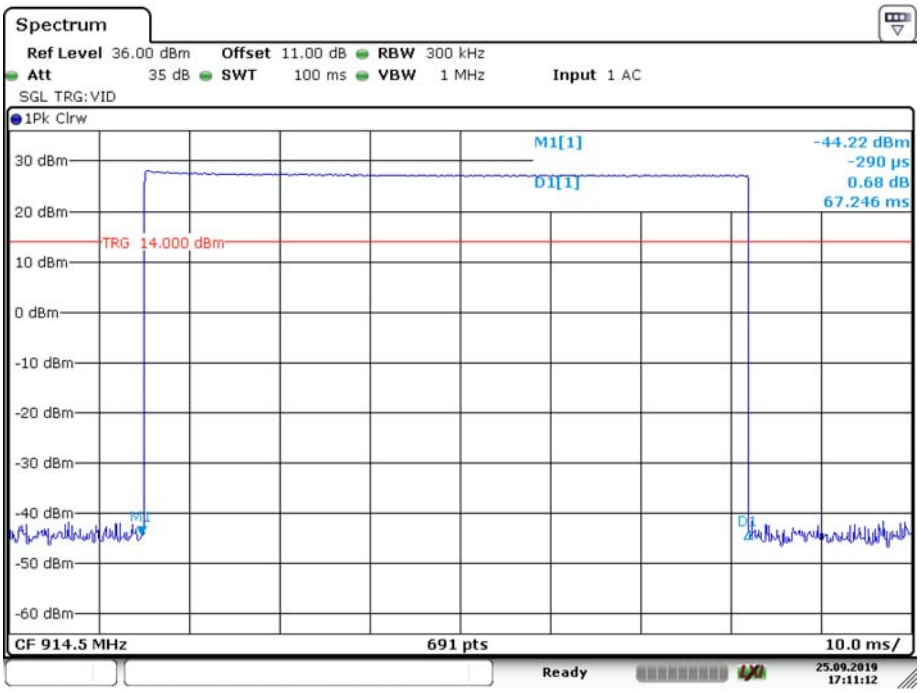

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FCC §15.247(b) (2), RSS-247 Clause 5.4 a) - PEAK OUTPUT POWER MEASUREMENT

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.

According to RSS-247 Clause 5.4 a)

a) For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

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
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2018-12-10	2019-12-10
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	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:	28 °C
Relative Humidity:	72 %
ATM Pressure:	100.4 kPa
Tester:	Blake Yang
Test Date:	2019-08-25

Test Result: Compliance.

Test Mode: Transmitting

Channel	Frequency (MHz)	Peak Conducted Output power (dBm)	Peak Conducted Output power Limit (dBm)
Low	902.5	28.91	30
Middle	914.5	28.71	30
High	927.5	28.27	30

Note: The data above was tested in conducted mode, the antenna gain is 1.0dBi, meet the EIRP limit of ISED.

FCC §15.247(d), RSS-247 Clause 5.5 - 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)).

According to RSS-247 Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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
R&S	EMI Test Receiver	ESPI	100120	2018-12-11	2019-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	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

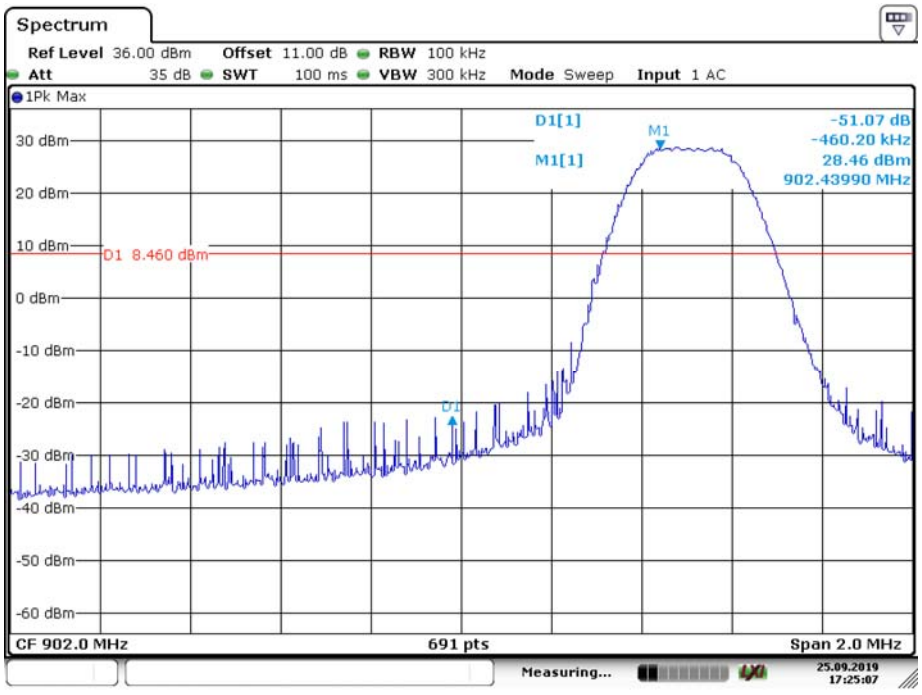
Environmental Conditions

Temperature:	28 °C
Relative Humidity:	72 %
ATM Pressure:	100.4 kPa
Tester:	Blake Yang
Test Date:	2019-08-25

Test Result: Compliance

Single mode:

Band Edge, Left Side



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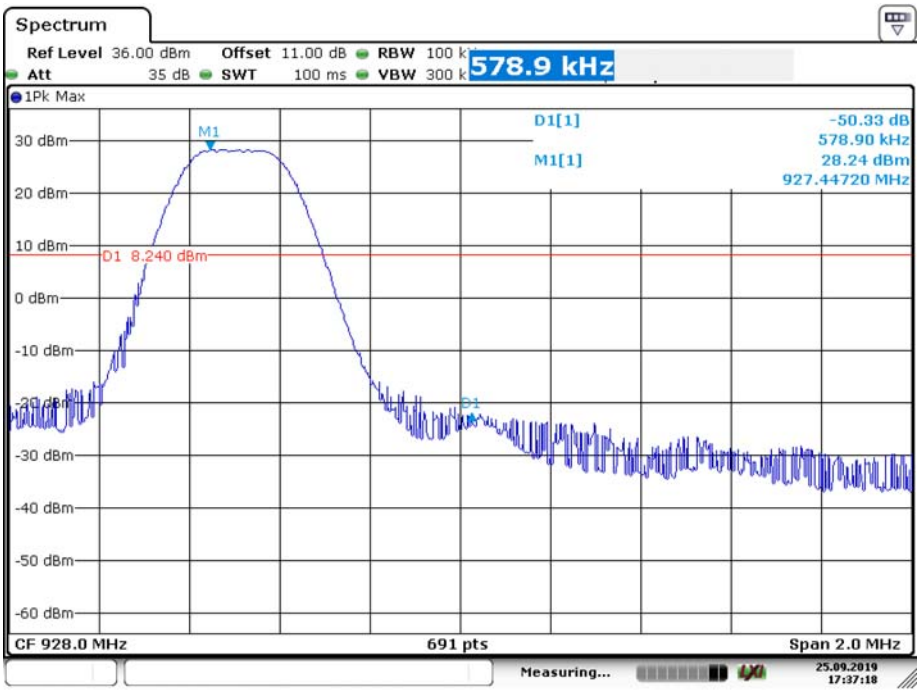
Band Edge, Right Side



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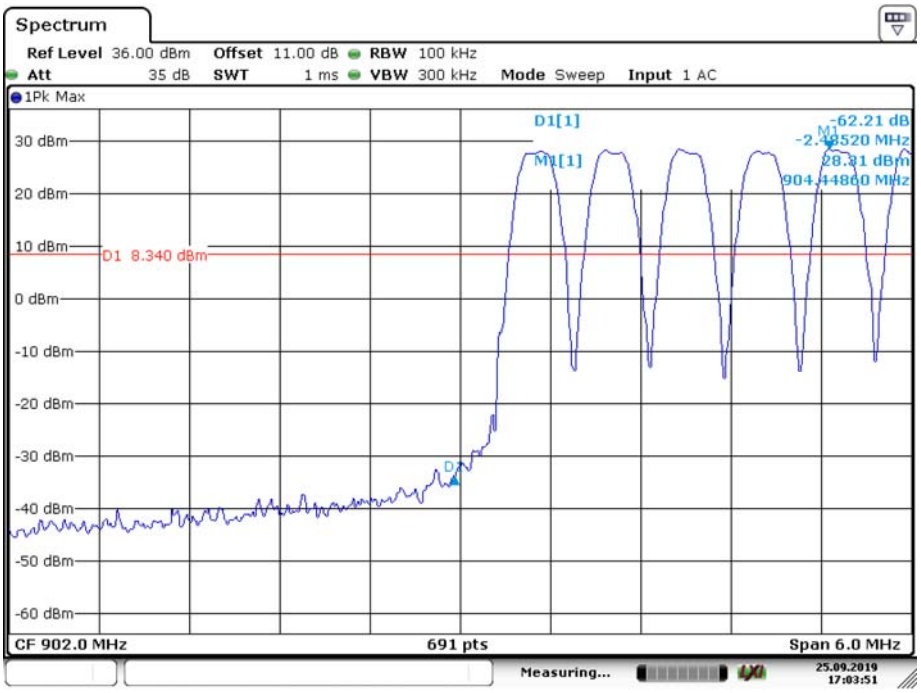
Hopping mode:

Band Edge, Left Side



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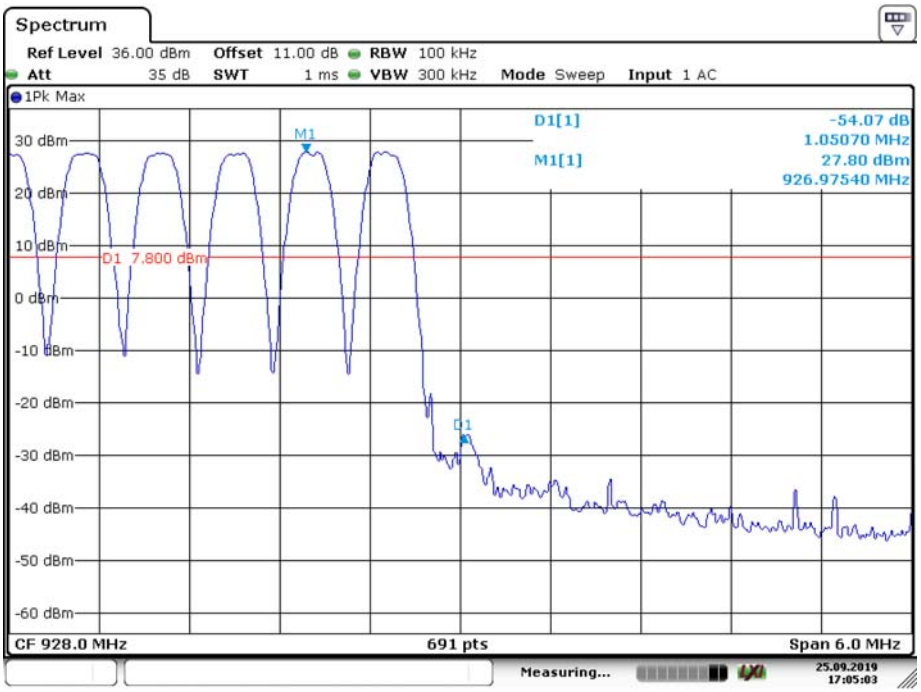
Band Edge, Right Side



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