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TEST REPORT

For

Beijing Radacat Co.,Ltd

2702 Room, 601 Building, Wangjingyuan, Fuandonglu Street, Chaoyang District Beijing, China

FCC ID: 2AOXDC1
IC: 23592-C1

Report Type: Original Report	Product Name: Radacat C1
Report Number: RDG180117002-00A	
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Jerry Zhang	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Radacat C1
EUT Model:	C1
FCC ID:	2AOXDC1
IC:	23592-C1
Rated Input Voltage:	DC 3.7V from battery
External Dimension:	11.1cm(L)*4.2cm(W)*1.6cm(H)
Serial Number:	180117002
EUT Received Date:	2018.01.17

Objective

This report is prepared on behalf of **Beijing Radacat Co.,Ltd** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

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 and RSS-247, Issue 2, February 2017, RSS-Gen Issue 4, November 2014 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC submissions with Part 15C DTS, FCC ID: 2AOXDC1.
RSS-247 DTSs submissions with IC: 23592-C1.

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 RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada, RSS-Gen Issue 4, November 2014 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
Power Spectral Density, conducted	±0.61 dB
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
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)

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 test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The device was a hopping transmitter with LoRa_125KHz, LoRa_250KHz and FSK mode.

The system was configured for testing in an engineering mode. 51 hopping channels are employed:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.487	14	908.987	28	915.487	41	922.487
2	902.987	15	909.487	29	915.987	42	922.987
3	903.487	16	909.987	30	916.487	43	923.487
4	903.987	17	910.487	31	916.987	44	923.987
5	904.487	18	910.987	32	917.487	45	924.487
6	904.987	19	911.487	33	917.987	46	924.987
7	905.487	20	911.987	34	918.487	47	925.487
8	905.987	21	912.487	35	918.987	48	925.987
9	906.487	22	912.987	36	919.487	49	926.487
10	906.987	23	913.487	37	919.987	50	926.987
11	907.487	24	913.987	38	920.487	51	927.487
12	907.987	25	914.487	39	920.987	/	/
13	908.487	26	914.987	40	921.487	/	/

Channel 1, 26, 51 were selected to test.

EUT Exercise Software

The worst condition (maximum power level) was configured by software 'blueGecko_1v4' as below:

Test Software Version	blueGecko_1v4		
Test Frequency	902.487MHz	914.987MHz	927.487MHz
FSK	6	6	6
LoRa_125KHz	1	1	1
LoRa_250KHz	1	1	1

Equipment Modifications

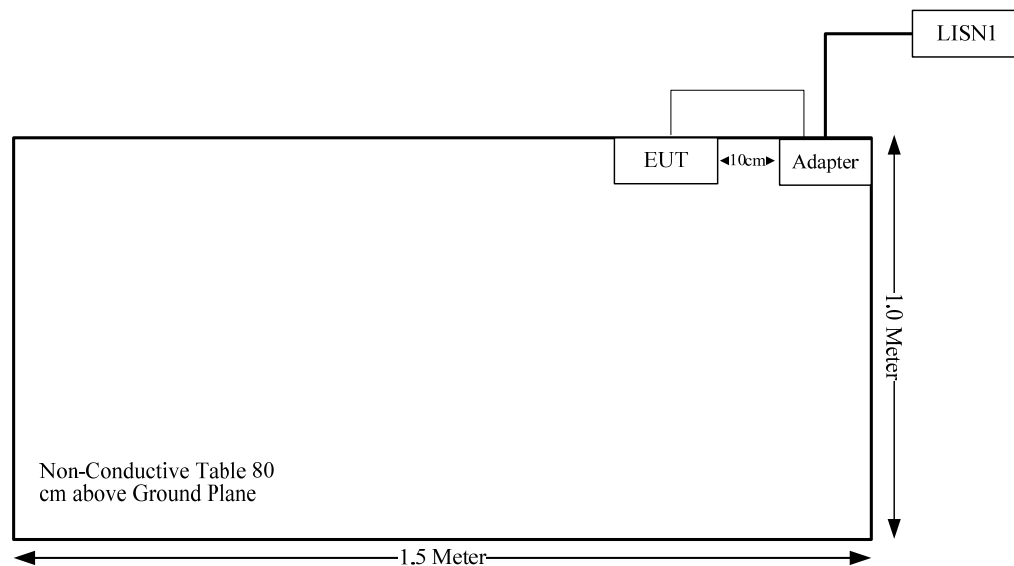
No modification was made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
CFOMAX	Adapter	ACC07C02	V043660704256144

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB	Yes	NO	0.78	EUT	Adapter

Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093 RSS-102 Clause 4	RF Exposure	Compliance
FCC§15.203 RSS-GEN Clause 8.3	Antenna Requirement	Compliance
FCC§15.207 (a) RSS-Gen Clause 8.8	Conducted Emissions	Compliance
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 b) RSS-Gen Clause 6.6	Emission Bandwidth	Compliance
FCC§15.247(a)(1) RSS-247 Clause 5.1 c)	Channel Separation Test	Compliance
FCC§15.247(a)(1)(iii) RSS-247 Clause 5.1 c)	Time of Occupancy (Dwell Time)	Compliance
FCC§15.247(a)(1)(iii) 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 Clause 5.5	Band Edges	Compliance

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

Test Result

Compliant, please refer to the SAR report: RDG180117002-20.

FCC §15.203 & RSS-GEN CLAUSE 8.3 - 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 use of a standard antenna jack or electrical connector is prohibited.

According to RSS-Gen §8.3, The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

Antenna Connector Construction

The EUT has one internal monopole antenna permanently attached to the unit, and the antenna gain is 1 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

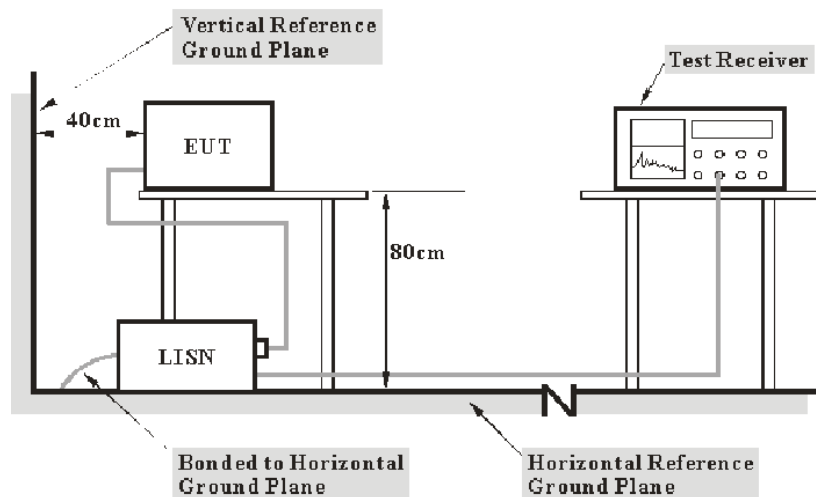
Result: Compliance.

FCC §15.207 (a) & RSS-GEN CLAUSE 8.8 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a) and RSS-GEN CLAUSE 8.8

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 and RSS-Gen 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
R&S	EMI Test Receiver	ESCS 30	830245/006	2017-12-11	2018-12-11
N/A	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2017-12-08	2018-12-08
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-25	2018-09-25

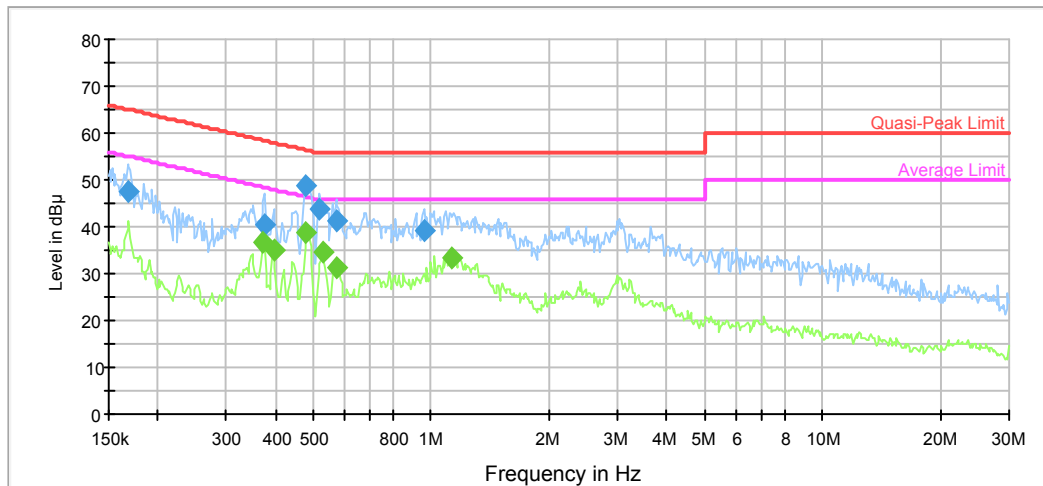
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

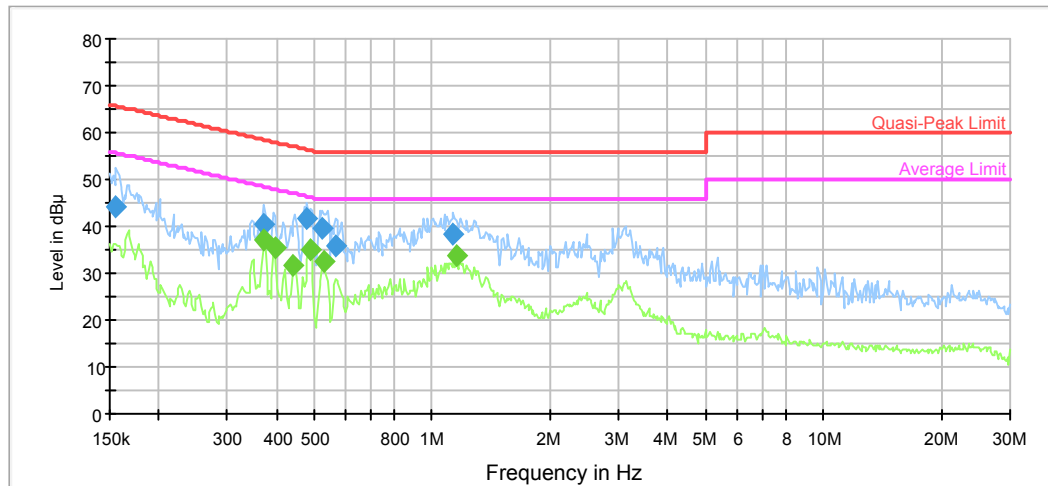
Temperature:	18.4°C
Relative Humidity:	36%
ATM Pressure:	101.5kPa

The testing was performed by Ade Xiao on 2018-01-31.

Test Mode: Transmitting**AC120V, 60 Hz, Line:**

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.167702	47.7	9.000	L1	10.9	17.4	65.1	Compliance
0.375019	40.5	9.000	L1	10.0	17.9	58.4	Compliance
0.480097	48.9	9.000	L1	9.9	7.4	56.3	Compliance
0.519918	43.7	9.000	L1	9.9	12.3	56.0	Compliance
0.572086	41.4	9.000	L1	9.8	14.6	56.0	Compliance
0.960275	39.3	9.000	L1	9.8	16.7	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.372042	36.8	9.000	L1	10.0	11.7	48.5	Compliance
0.396530	35.0	9.000	L1	10.0	12.9	47.9	Compliance
0.480097	38.8	9.000	L1	9.9	7.5	46.3	Compliance
0.528270	34.6	9.000	L1	9.9	11.4	46.0	Compliance
0.572086	31.4	9.000	L1	9.8	14.6	46.0	Compliance
1.135185	33.2	9.000	L1	9.8	12.8	46.0	Compliance

AC120V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.156097	44.3	9.000	N	11.1	21.4	65.7	Compliance
0.369089	40.6	9.000	N	10.0	17.9	58.5	Compliance
0.480097	41.5	9.000	N	9.9	14.8	56.3	Compliance
0.524077	39.4	9.000	N	9.9	16.6	56.0	Compliance
0.567545	36.0	9.000	N	9.8	20.0	56.0	Compliance
1.135185	38.5	9.000	N	9.8	17.5	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.372042	37.1	9.000	N	10.0	11.4	48.5	Compliance
0.396530	35.4	9.000	N	10.0	12.5	47.9	Compliance
0.443327	31.5	9.000	N	9.9	15.5	47.0	Compliance
0.487810	35.1	9.000	N	9.9	11.1	46.2	Compliance
0.528270	32.4	9.000	N	9.9	13.6	46.0	Compliance
1.153421	33.9	9.000	N	9.8	12.1	46.0	Compliance

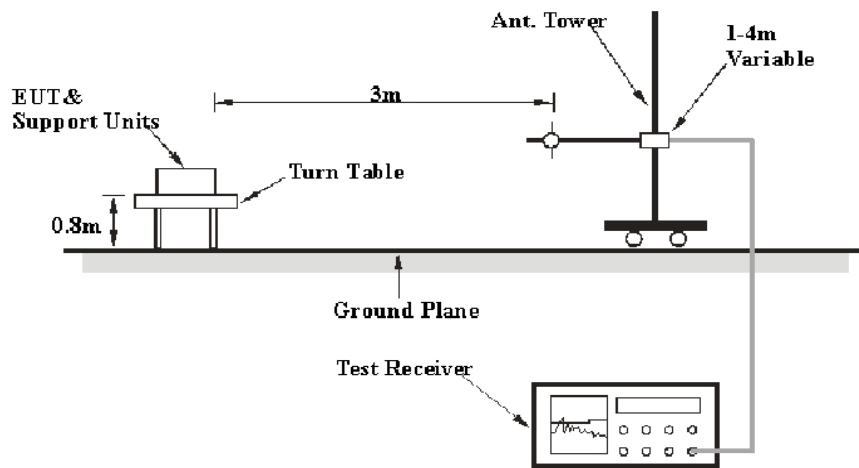
FCC §15.209, §15.205 & §15.247(d) & RSS-247 CLAUSE 5.5&RSS-GEN CLAUSE 8.10 - SPURIOUS EMISSIONS

Applicable Standard

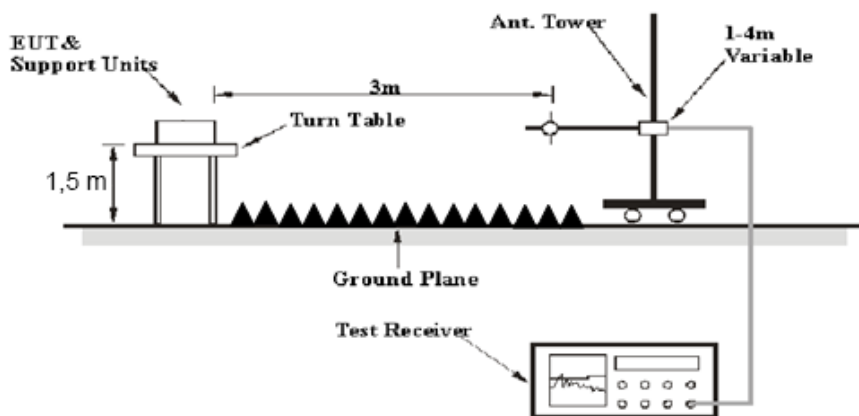
FCC §15.247 (d); §15.209; §15.205 and RSS-247 Clause 5.5, RSS-GEN Clause 8.10

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission Below 1GHz tests were performed in the 3 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits and RSS-247 Clause 5.5, RSS-GEN Clause 8.10 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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Agilent	Spectrum Analyzer	E4440A	SG43360054	2018-01-04	2019-01-04
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2017-06-27	2018-06-27
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	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).

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 Data

Environmental Conditions

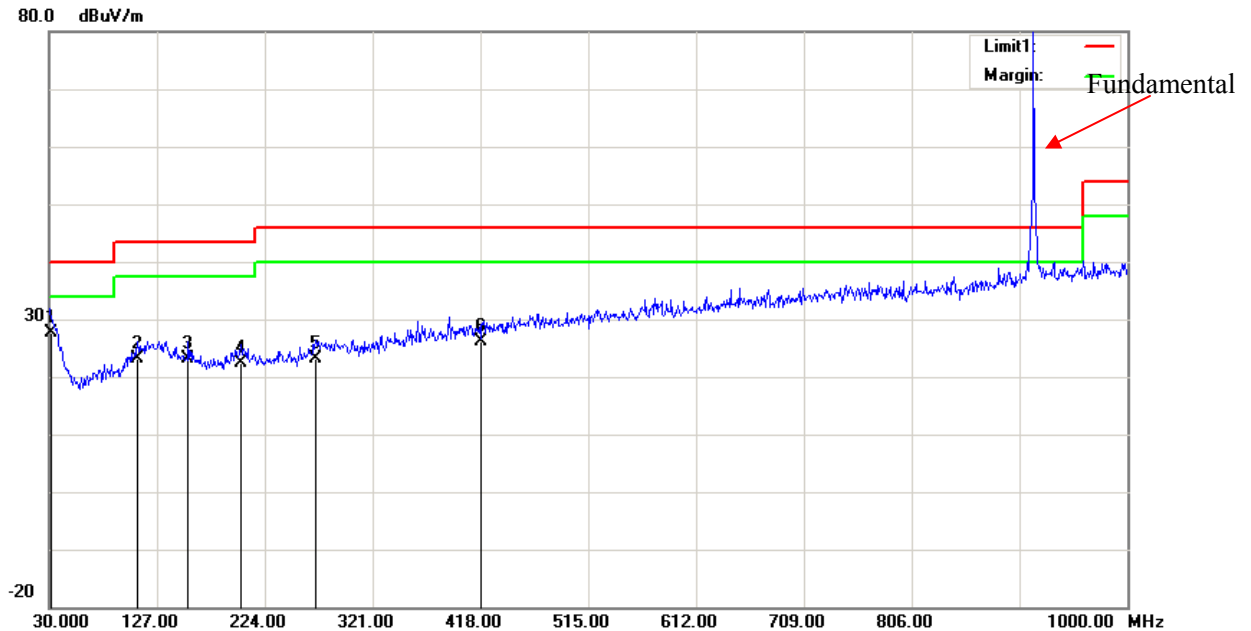
Temperature:	16.9°C
Relative Humidity:	51 %
ATM Pressure:	102 kPa

The testing was performed by Blake Yang& Sunny Cen on 2018-02-02.

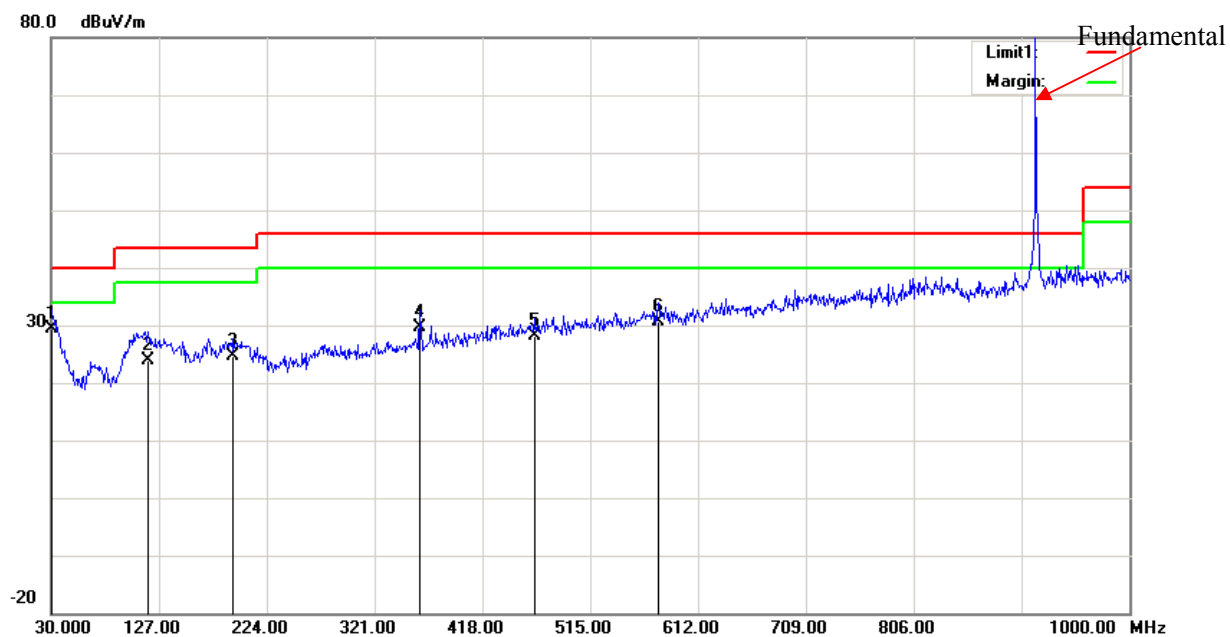
Test Mode: Transmitting

Test Mode: LoRa 125kHz

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

Horizontal:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
31.9400	1.64	QP	25.96	27.60	40.00	12.40
109.5400	3.36	QP	19.84	23.20	43.50	20.30
155.1300	3.76	QP	19.34	23.10	43.50	20.40
202.6600	3.09	QP	19.41	22.50	43.50	21.00
269.5900	1.87	QP	21.33	23.20	46.00	22.80
418.9700	1.73	QP	24.37	26.10	46.00	19.90

Vertical:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	2.83	QP	26.67	29.50	40.00	10.50
117.3000	2.89	QP	21.01	23.90	43.50	19.60
192.9600	6.20	QP	18.40	24.60	43.50	18.90
361.7400	6.65	QP	22.95	29.60	46.00	16.40
464.5600	2.26	QP	25.84	28.10	46.00	17.90
576.1100	2.90	QP	27.70	30.60	46.00	15.40

2) Fundamental, 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)					
LoRa 125kHz, Low Channel: 902.487 MHz									
902.487	93.50	QP	H	22.35	4.29	0.00	120.14	N/A	N/A
902.487	86.59	QP	V	22.35	4.29	0.00	113.23	N/A	N/A
902.00	53.50	QP	H	22.34	4.29	0.00	80.13	100.14	20.01*
1804.97	86.24	PK	H	26.48	1.66	35.90	78.48	100.14	21.74 *
2707.46	73.42	PK	H	29.05	1.88	36.47	67.88	74.00	6.12
2707.46	52.71	AV	H	29.05	1.88	36.47	47.17	54.00	6.83
2707.46	70.63	PK	V	29.05	1.88	36.47	65.09	74.00	8.91
2707.46	50.44	AV	V	29.05	1.88	36.47	44.90	54.00	9.10
3609.95	67.35	PK	H	31.54	2.41	37.11	64.19	74.00	9.81
3609.95	47.95	AV	H	31.54	2.41	37.11	44.79	54.00	9.21
3609.95	64.82	PK	V	31.54	2.41	37.11	61.66	74.00	12.34
3609.95	43.14	AV	V	31.54	2.41	37.11	39.98	54.00	14.02
LoRa 125kHz, Middle Channel: 914.987 MHz									
914.987	91.40	QP	H	22.40	4.21	0.00	118.01	N/A	N/A
914.987	84.40	QP	V	22.40	4.21	0.00	111.01	N/A	N/A
1829.97	85.16	PK	H	26.59	1.66	35.95	77.46	98.01	20.55*
2744.96	72.57	PK	H	29.18	1.91	36.51	67.15	74.00	6.85
2744.96	54.27	AV	H	29.18	1.91	36.51	48.85	54.00	5.15
2744.96	70.15	PK	V	29.18	1.91	36.51	64.73	74.00	9.27
2744.96	53.64	AV	V	29.18	1.91	36.51	48.22	54.00	5.78
3659.95	68.42	PK	H	31.65	2.50	37.06	65.51	74.00	8.49
3659.95	49.27	AV	H	31.65	2.50	37.06	46.36	54.00	7.64
3659.95	65.52	PK	V	31.65	2.50	37.06	62.61	74.00	11.39
3659.95	46.37	AV	V	31.65	2.50	37.06	43.46	54.00	10.54
LoRa 125kHz, High Channel: 927.487 MHz									
927.487	93.30	QP	H	22.55	4.35	0.00	120.20	N/A	N/A
927.487	85.96	QP	V	22.55	4.35	0.00	112.86	N/A	N/A
928.00	56.72	QP	H	22.56	4.34	0.00	83.62	100.20	16.58*
1854.97	85.94	PK	H	26.69	1.66	35.99	78.30	108.20	29.92*
2782.46	75.24	PK	H	29.32	1.94	36.55	69.95	74.00	4.05
2782.46	53.14	AV	H	29.32	1.94	36.55	47.85	54.00	6.15
2782.46	71.21	PK	V	29.32	1.94	36.55	65.92	74.00	8.08
2782.46	51.42	AV	V	29.32	1.94	36.55	46.13	54.00	7.87
3709.95	71.42	PK	H	31.76	2.57	37.02	68.73	74.00	5.27
3709.95	51.18	AV	H	31.76	2.57	37.02	48.49	54.00	5.51
3709.95	65.84	PK	V	31.76	2.57	37.02	63.15	74.00	10.85
3709.95	45.75	AV	V	31.76	2.57	37.02	43.06	54.00	10.94

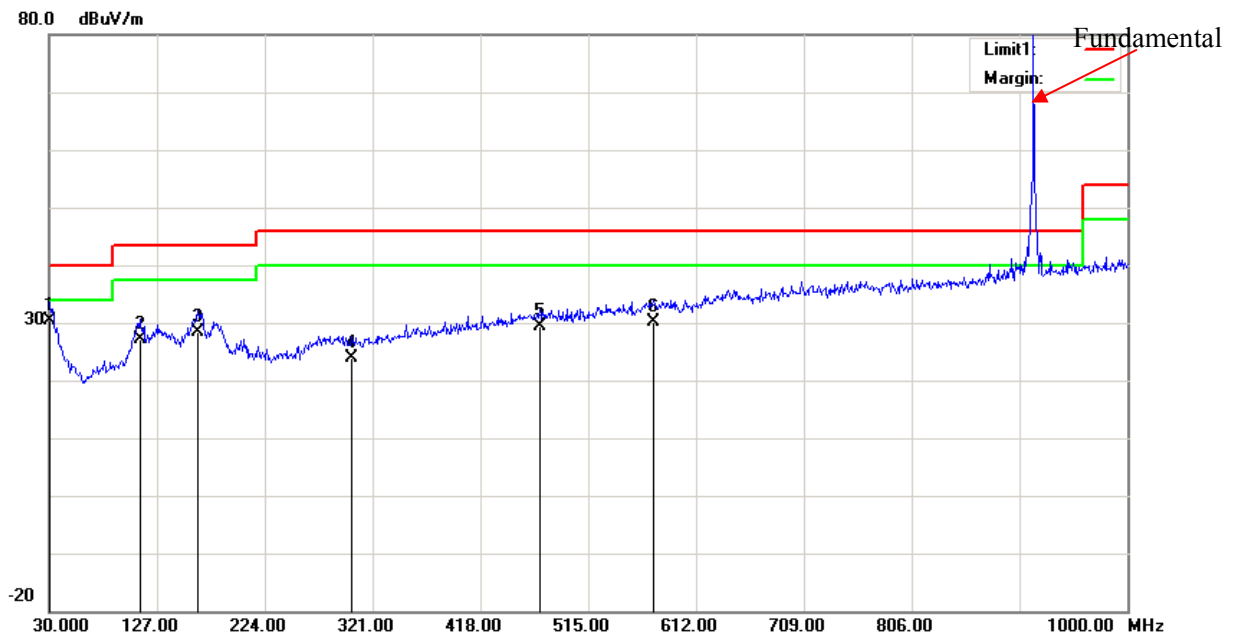
Note:

*: the emission was 20 dB below the fundanmental for the frequencies are not in the restrict band.

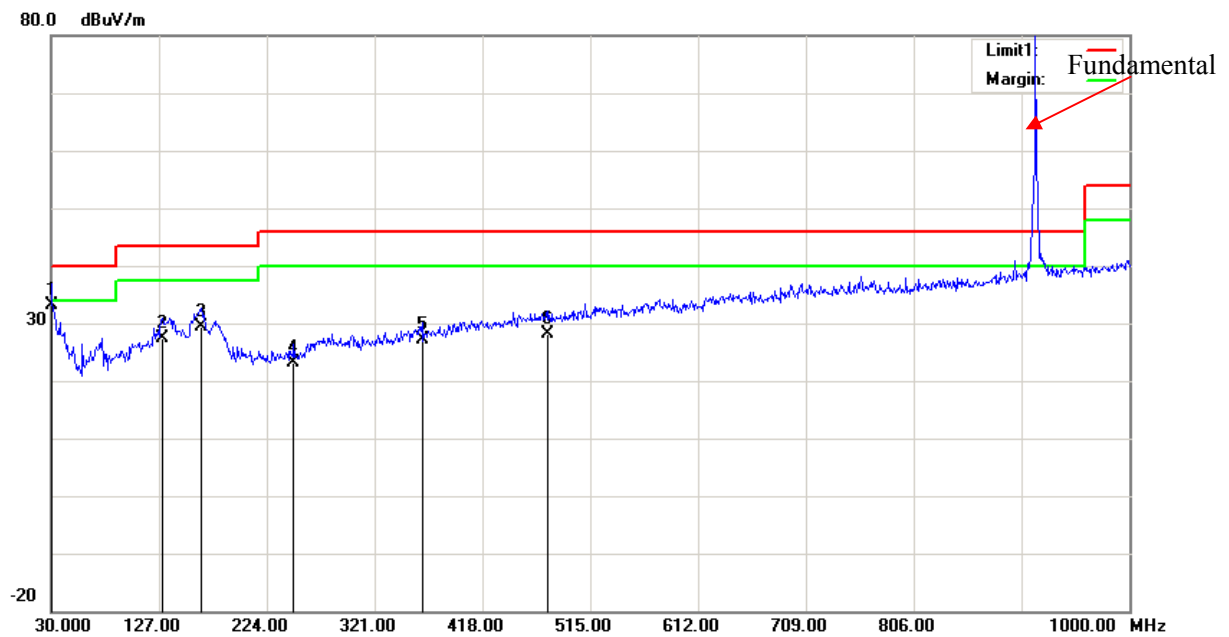
Test Mode: LoRa 250kHz

30MHz-1GHz:(Middle 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	2.90	QP	27.40	30.30	40.00	9.70
111.4800	6.94	QP	20.16	27.10	43.50	16.40
163.8600	9.34	QP	18.96	28.30	43.50	15.20
301.6000	2.85	QP	21.15	24.00	46.00	22.00
471.3500	3.42	QP	25.88	29.30	46.00	16.70
574.1700	2.46	QP	27.64	30.10	46.00	15.90

Vertical:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	5.80	QP	27.40	33.20	40.00	6.80
129.9100	6.48	QP	20.82	27.30	43.50	16.20
164.8300	10.58	QP	18.92	29.50	43.50	14.00
248.2500	3.97	QP	19.13	23.10	46.00	22.90
363.6800	4.21	QP	22.99	27.20	46.00	18.80
476.2000	2.26	QP	25.84	28.10	46.00	17.90

2) Fundamental, and above 1GHz:

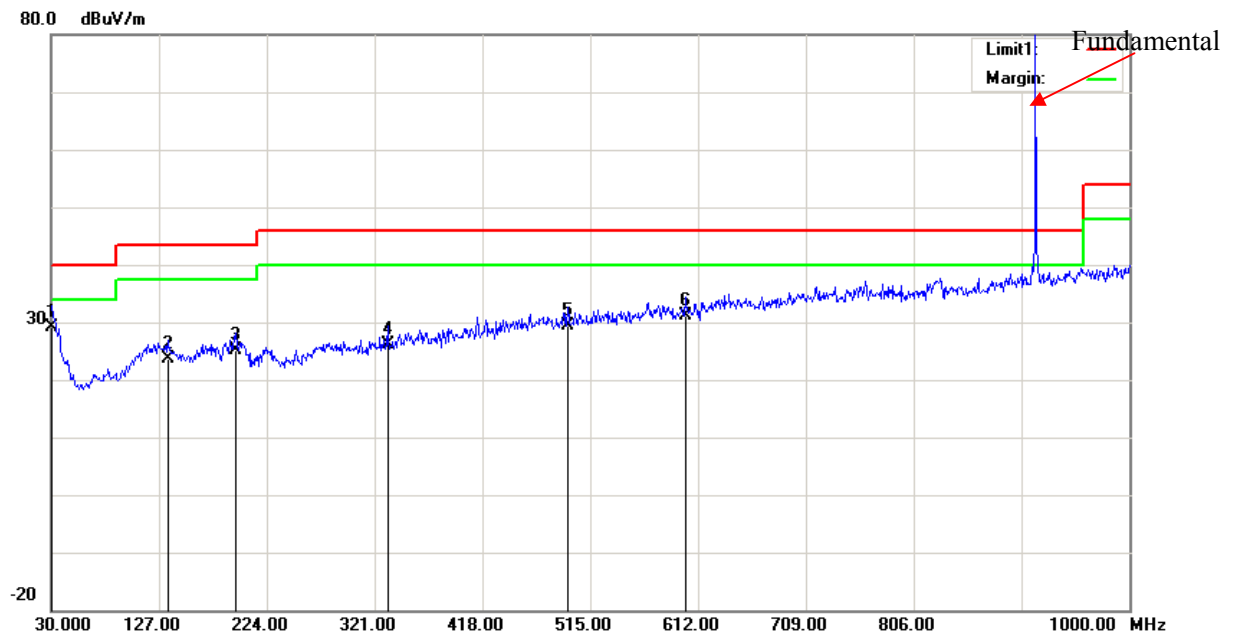
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
LoRa 250kHz, Low Channel: 902.487 MHz									
902.487	90.08	QP	H	22.35	4.29	0.00	116.72	N/A	N/A
902.487	80.29	QP	V	22.35	4.29	0.00	106.93	N/A	N/A
902.00	52.31	QP	H	22.34	4.29	0.00	78.94	96.72	17.78*
1804.97	84.17	PK	H	26.48	1.66	35.9	76.41	96.72	20.31*
2707.46	73.42	PK	H	29.05	1.88	36.47	67.88	74.00	6.12
2707.46	53.72	AV	H	29.05	1.88	36.47	48.18	54.00	5.82
2707.46	70.27	PK	V	29.05	1.88	36.47	64.73	74.00	9.27
2707.46	51.54	AV	V	29.05	1.88	36.47	46.00	54.00	8.00
3609.95	68.42	PK	H	31.54	2.41	37.11	65.26	74.00	8.74
3609.95	48.25	AV	H	31.54	2.41	37.11	45.09	54.00	8.91
3609.95	65.27	PK	V	31.54	2.41	37.11	62.11	74.00	11.89
3609.95	46.32	AV	V	31.54	2.41	37.11	43.16	54.00	10.84
LoRa 250kHz, Middle Channel: 914.987 MHz									
914.987	91.40	QP	H	22.40	4.21	0.00	118.01	N/A	N/A
914.987	84.40	QP	V	22.40	4.21	0.00	111.01	N/A	N/A
1829.97	84.81	PK	H	26.59	1.66	35.95	77.11	98.01	20.9*
2744.96	73.24	PK	H	29.18	1.91	36.51	67.82	74.00	6.18
2744.96	50.17	AV	H	29.18	1.91	36.51	44.75	54.00	9.25
2744.96	71.52	PK	V	29.18	1.91	36.51	66.10	74.00	7.90
2744.96	48.75	AV	V	29.18	1.91	36.51	43.33	54.00	10.67
3659.95	63.42	PK	H	31.65	2.50	37.06	60.51	74.00	13.49
3659.95	42.82	AV	H	31.65	2.50	37.06	39.91	54.00	14.09
3659.95	60.47	PK	V	31.65	2.50	37.06	57.56	74.00	16.44
3659.95	40.11	AV	V	31.65	2.50	37.06	37.20	54.00	16.80
LoRa 250kHz, High Channel: 927.487 MHz									
927.487	91.20	QP	H	22.55	4.35	0.00	118.10	N/A	N/A
927.487	82.67	QP	V	22.55	4.35	0.00	109.57	N/A	N/A
928.00	58.15	QP	H	22.56	4.34	0.00	85.05	98.10	13.05*
1854.97	85.73	PK	H	26.69	1.66	35.99	78.09	98.10	20.01*
2782.46	75.34	PK	H	29.32	1.94	36.55	70.05	74.00	3.95
2782.46	53.44	AV	H	29.32	1.94	36.55	48.15	54.00	5.85
2782.46	72.14	PK	V	29.32	1.94	36.55	66.85	74.00	7.15
2782.46	51.46	AV	V	29.32	1.94	36.55	46.17	54.00	7.83
3709.95	67.84	PK	H	31.76	2.57	37.02	65.15	74.00	8.85
3709.95	48.55	AV	H	31.76	2.57	37.02	45.86	54.00	8.14
3709.95	63.14	PK	V	31.76	2.57	37.02	60.45	74.00	13.55
3709.95	43.75	AV	V	31.76	2.57	37.02	41.06	54.00	12.94

Note:

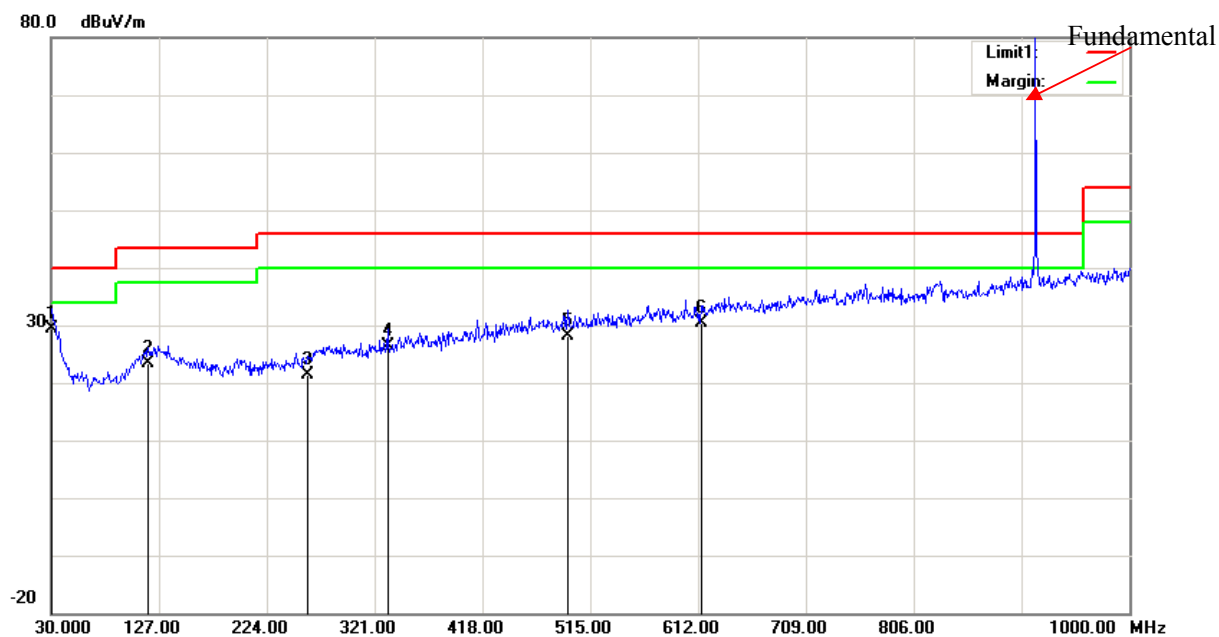
*: the emission was 20 dB below the fundanmental for the frequencies are not in the restrict band.

Test Mode: FSK

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

Horizontal:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	2.53	QP	26.67	29.20	40.00	10.80
134.7600	3.28	QP	20.42	23.70	43.50	19.80
195.8700	6.40	QP	18.80	25.20	43.50	18.30
332.6400	4.16	QP	22.04	26.20	46.00	19.80
494.6300	3.80	QP	25.70	29.50	46.00	16.50
600.3600	3.85	QP	27.25	31.10	46.00	14.90

Vertical:

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.9700	2.63	QP	26.67	29.30	40.00	10.70
117.3000	2.29	QP	21.01	23.30	43.50	20.20
260.8600	1.24	QP	20.26	21.50	46.00	24.50
332.6400	4.26	QP	22.04	26.30	46.00	19.70
494.6300	2.40	QP	25.70	28.10	46.00	17.90
614.9100	2.92	QP	27.38	30.30	46.00	15.70

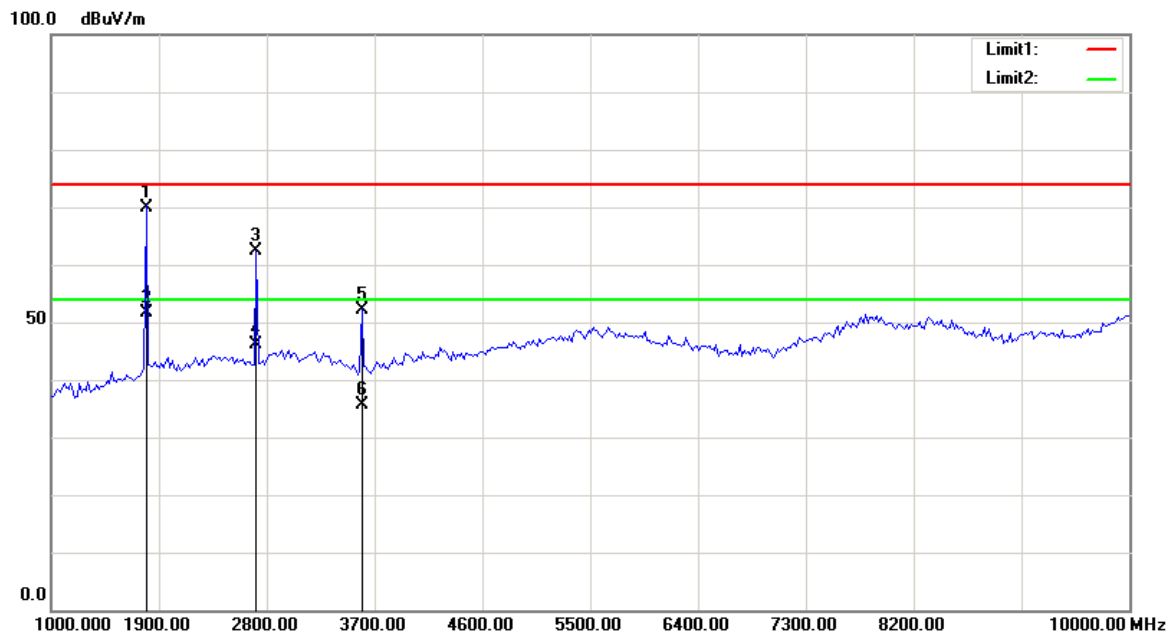
2) Fundamental, and above 1GHz:

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)					
FSK, Low Channel: 902.487 MHz									
902.487	93.40	QP	H	22.35	4.29	0.00	120.04	N/A	N/A
902.487	89.25	QP	V	22.35	4.29	0.00	115.89	N/A	N/A
902.00	52.05	QP	H	22.34	4.29	0.00	78.68	100.04	21.36*
1804.97	77.75	PK	H	26.48	1.66	35.90	69.99	74.00	4.01
1804.97	59.51	AV	H	26.48	1.66	35.90	51.75	54.00	2.25
1804.97	74.57	PK	V	26.48	1.66	35.90	66.81	74.00	7.19
1804.97	57.91	AV	V	26.48	1.66	35.90	50.15	54.00	3.85
2707.46	67.83	PK	H	29.05	1.88	36.47	62.29	74.00	11.71
2707.46	51.58	AV	H	29.05	1.88	36.47	46.04	54.00	7.96
2707.46	56.63	PK	V	29.05	1.88	36.47	51.09	74.00	22.91
2707.46	40.83	AV	V	29.05	1.88	36.47	35.29	54.00	18.71
3609.95	55.23	PK	H	31.54	2.41	37.11	52.07	74.00	21.93
3609.95	38.70	AV	H	31.54	2.41	37.11	35.54	54.00	18.46
3609.95	48.31	PK	V	31.54	2.41	37.11	45.15	74.00	28.85
3609.95	35.51	AV	V	31.54	2.41	37.11	32.35	54.00	21.65
FSK, Middle Channel: 914.987 MHz									
914.987	92.40	QP	H	22.40	4.21	0.00	119.01	N/A	N/A
914.987	90.30	QP	V	22.40	4.21	0.00	116.91	N/A	N/A
1829.97	76.81	PK	H	26.59	1.66	35.95	69.11	74.00	4.89
1829.97	58.55	AV	H	26.59	1.66	35.95	50.85	54.00	3.15
1829.97	73.46	PK	V	26.59	1.66	35.95	65.76	74.00	8.24
1829.97	57.10	AV	V	26.59	1.66	35.95	49.40	54.00	4.60
2744.96	68.01	PK	H	29.18	1.91	36.51	62.59	74.00	11.41
2744.96	51.58	AV	H	29.18	1.91	36.51	46.16	54.00	7.84
2744.96	56.69	PK	V	29.18	1.91	36.51	51.27	74.00	22.73
2744.96	40.68	AV	V	29.18	1.91	36.51	35.26	54.00	18.74
3659.95	55.25	PK	H	31.65	2.50	37.06	52.34	74.00	21.66
3659.95	38.53	AV	H	31.65	2.50	37.06	35.62	54.00	18.38
3659.95	48.32	PK	V	31.65	2.50	37.06	45.41	74.00	28.59
3659.95	35.32	AV	V	31.65	2.50	37.06	32.41	54.00	21.59
FSK, High Channel: 927.487 MHz									
927.487	94.60	QP	H	22.55	4.35	0.00	121.50	N/A	N/A
927.487	92.58	QP	V	22.55	4.35	0.00	119.48	N/A	N/A
928.00	52.02	QP	H	22.56	4.34	0.00	78.92	101.50	22.58*
1854.97	75.88	PK	H	26.69	1.66	35.99	68.24	74.00	5.76
1854.97	58.42	AV	H	26.69	1.66	35.99	50.78	54.00	3.22
1854.97	73.74	PK	V	26.69	1.66	35.99	66.10	74.00	7.90
1854.97	56.84	AV	V	26.69	1.66	35.99	49.20	54.00	4.80
2782.46	67.96	PK	H	29.32	1.94	36.55	62.67	74.00	11.33
2782.46	51.68	AV	H	29.32	1.94	36.55	46.39	54.00	7.61
2782.46	56.63	PK	V	29.32	1.94	36.55	51.34	74.00	22.66
2782.46	40.95	AV	V	29.32	1.94	36.55	35.66	54.00	18.34
3709.95	55.36	PK	H	31.76	2.57	37.02	52.67	74.00	21.33
3709.95	38.67	AV	H	31.76	2.57	37.02	35.98	54.00	18.02
3709.95	48.26	PK	V	31.76	2.57	37.02	45.57	74.00	28.43
3709.95	35.48	AV	V	31.76	2.57	37.02	32.79	54.00	21.21

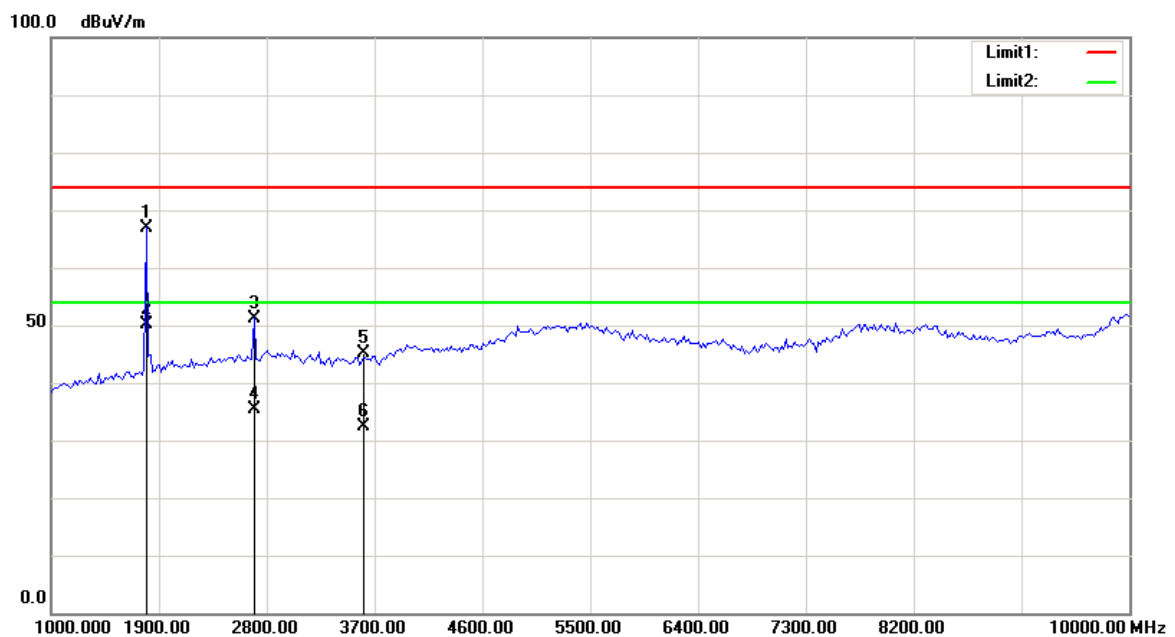
Note:

*: the emission was 20 dB below the fundamental for the frequencies are not in the restrict band.

Worst plots(FSK, Low channel) **Horizontal**



Vertical



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

Applicable Standard

According to FCC §15.247(a) (1)&RSS-247 Clause 5.1 b)

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
R&S	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/03	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 100 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:	25.8~27.1 °C
Relative Humidity:	56~60 %
ATM Pressure:	100.5~100.6 kPa

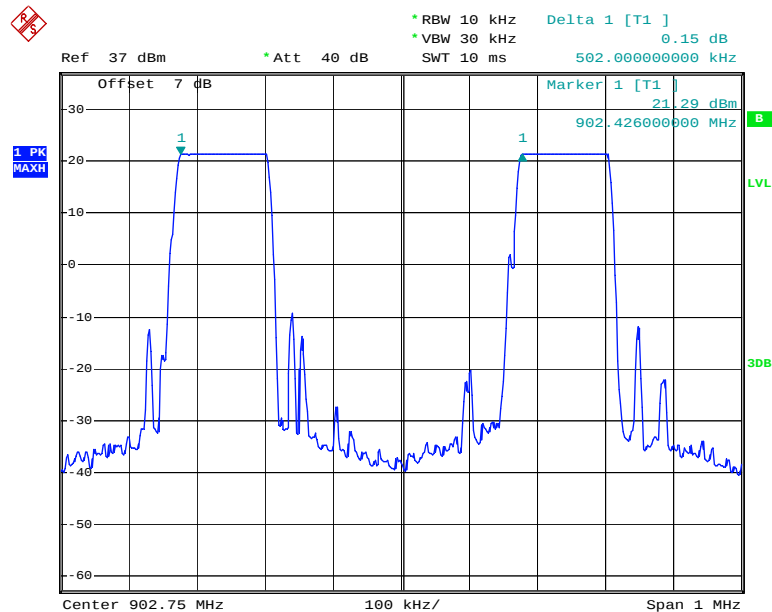
* The testing was performed by Swim Lv from 2018-04-12 to 2018-04-13.

Test Result: Compliance.

Please refer to following tables and plots

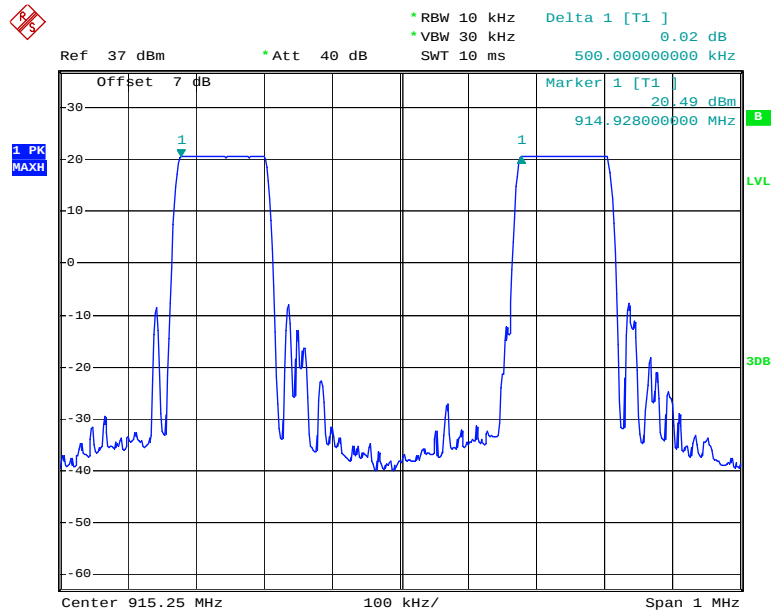
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
LoRa_125kHz	Low	902.487	0.502	0.137
	Middle	914.987	0.500	0.138
	High	927.487	0.502	0.138
LoRa_250kHz	Low	902.487	0.500	0.304
	Middle	914.987	0.500	0.304
	High	927.487	0.500	0.302
FSK	Low	902.487	0.500	0.083
	Middle	914.987	0.504	0.078
	High	927.487	0.500	0.084

LoRa_125kHz, Low Channel

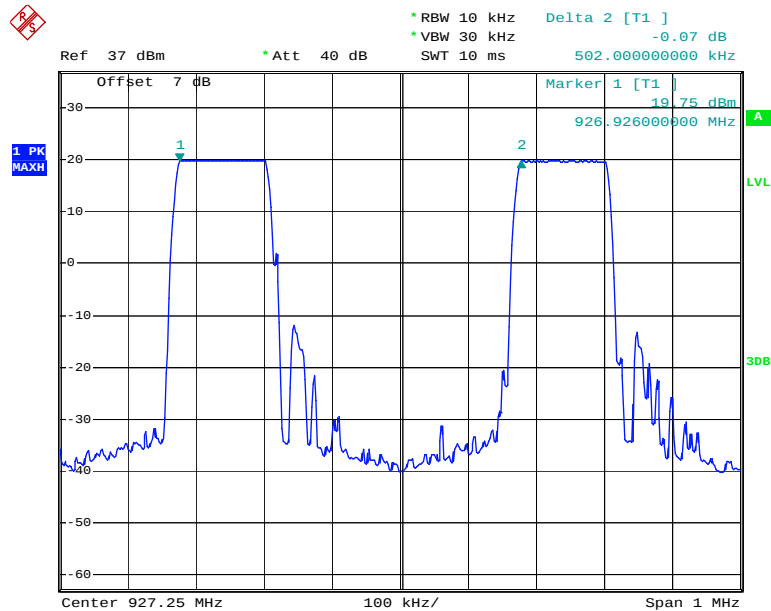
Date: 13.APR.2018 01:09:23

LoRa_125kHz, Middle Channel



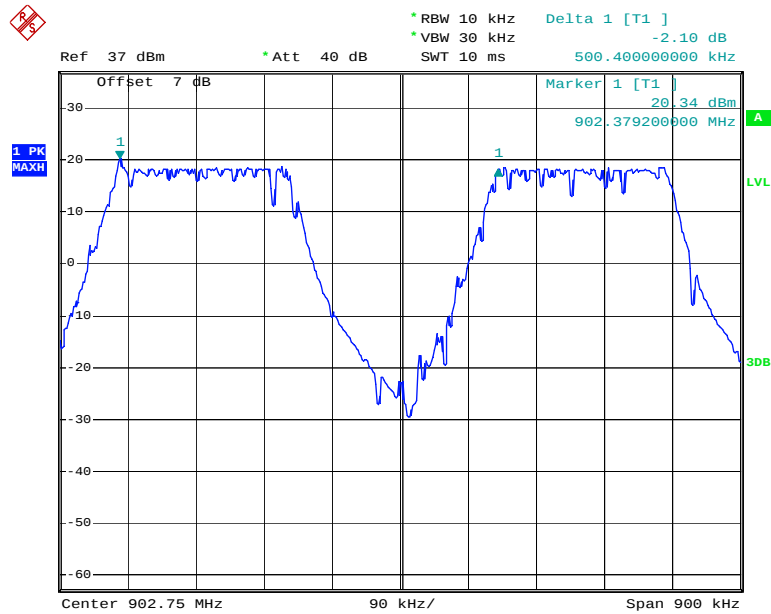
Date: 13.APR.2018 01:37:13

LoRa_125kHz, High Channel



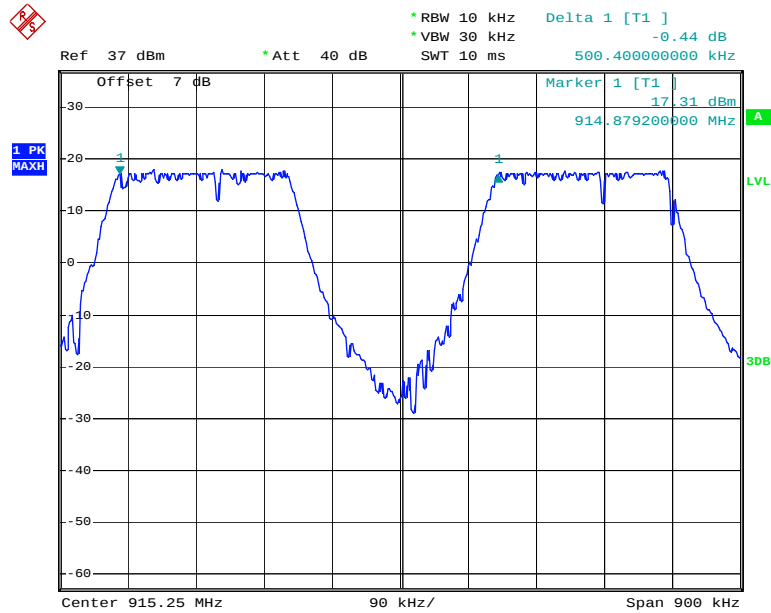
Date: 13.APR.2018 18:34:00

LoRa_250kHz, Low Channel



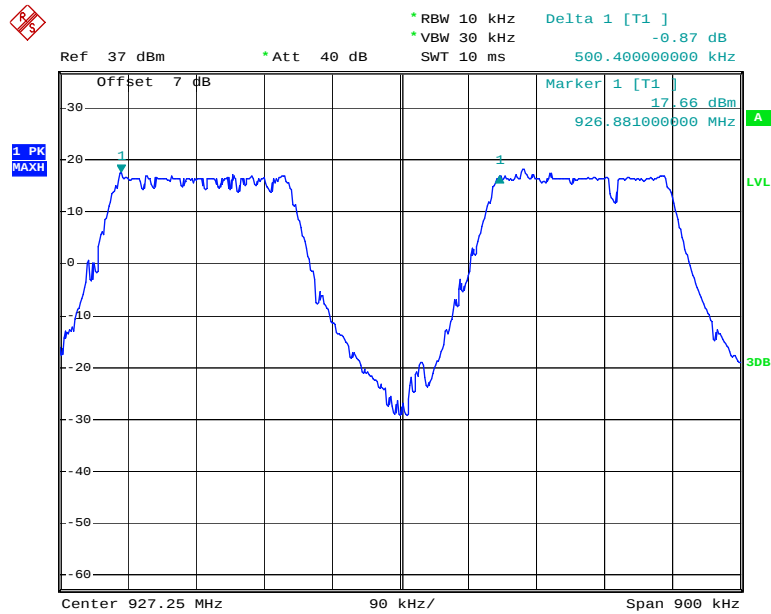
Date: 13.APR.2018 20:59:22

LoRa_250kHz, Middle Channel



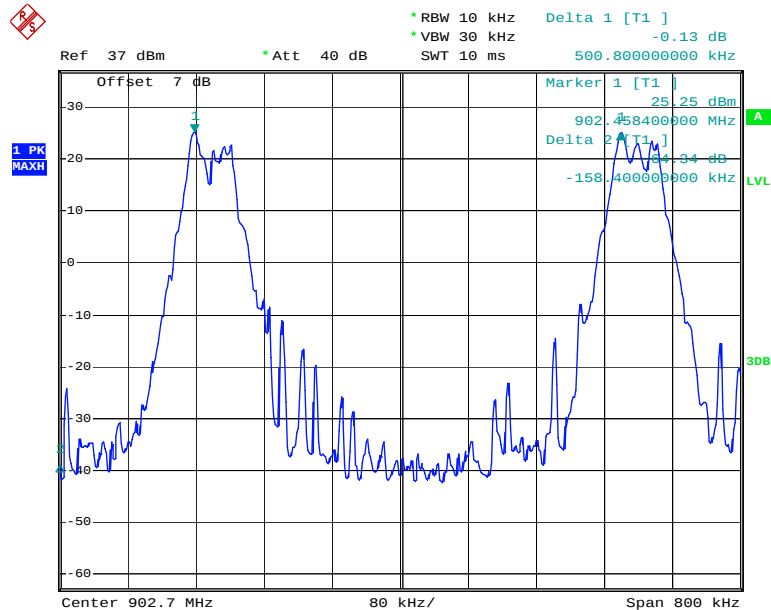
Date: 13.APR.2018 21:36:29

LoRa_250kHz, High Channel



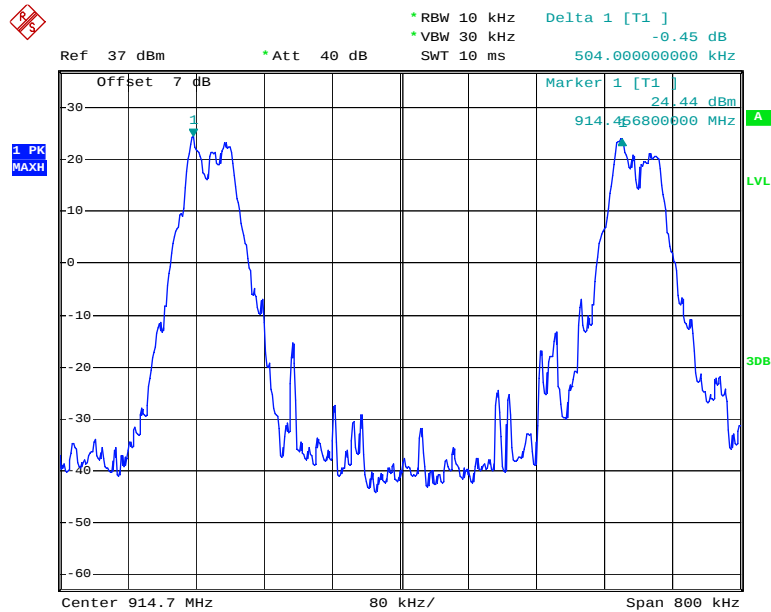
Date: 13.APR.2018 22:30:41

FSK, Low Channel



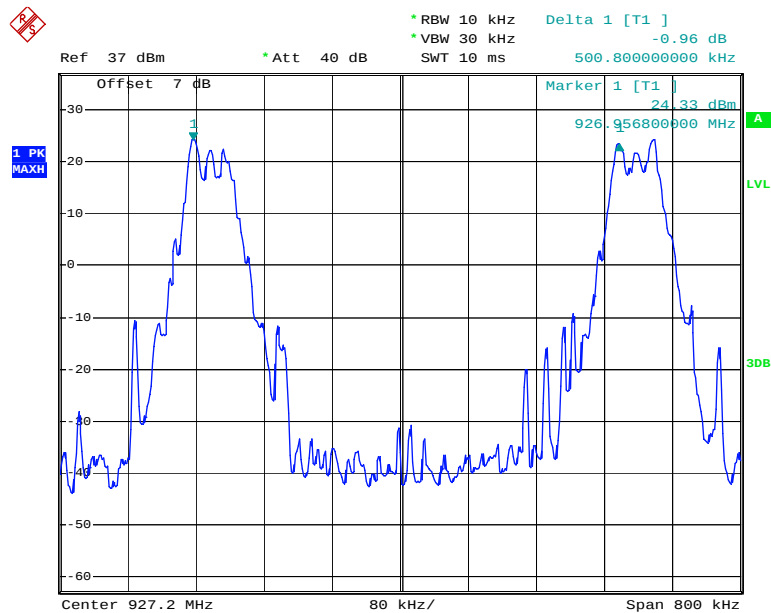
Date: 12.APR.2018 23:40:50

FSK, Middle Channel



Date: 12.APR.2018 23:44:12

FSK, High Channel



Date: 12.APR.2018 23:47:59

FCC §15.247(a) (1) & RSS-247 CLAUSE 5.1 & RSS-GEN CLAUSE 6.6 – EMISSION BANDWIDTH

Applicable Standard

According to FCC 247 §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

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
R&S	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/03	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:	20~21.3 °C
Relative Humidity:	34~36 %
ATM Pressure:	102~102.1 kPa

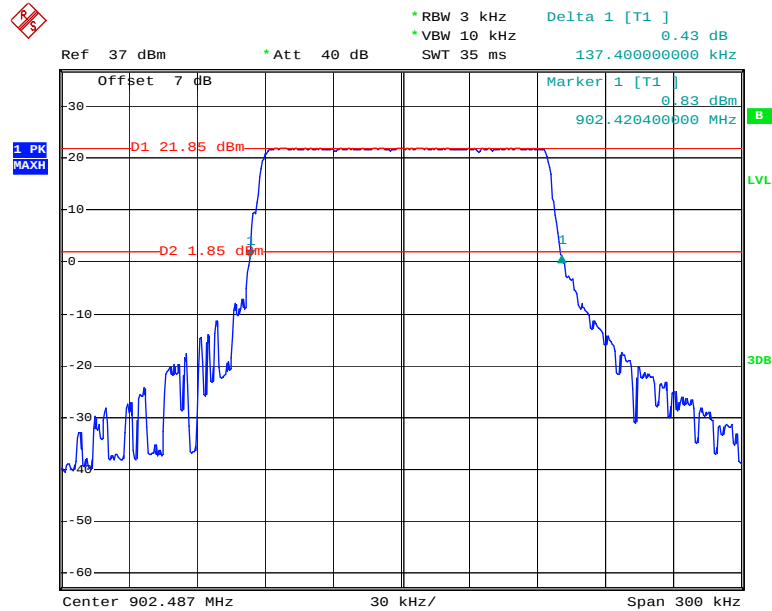
* The testing was performed by Swim Lv from 2018-02-01 to 2018-04-13.

Test Result: Compliance.

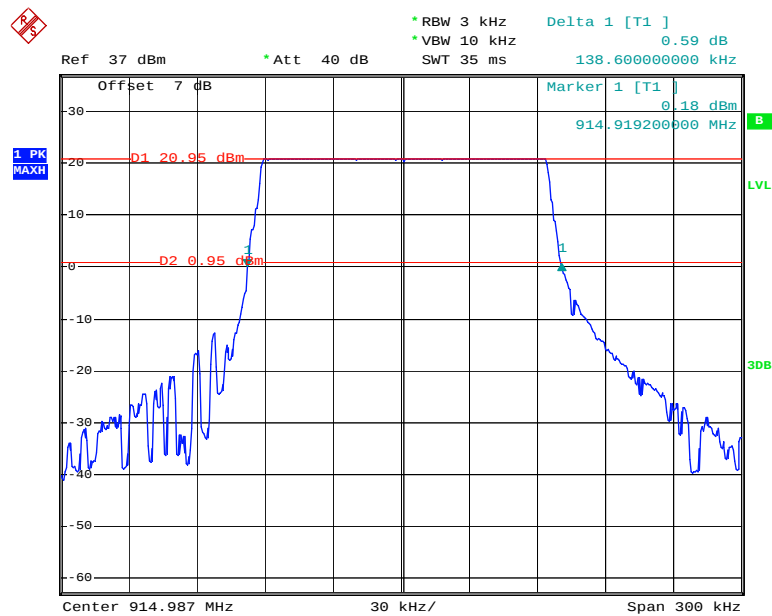
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% occupied Bandwidth (MHz)
LoRa_125kHz	Low	902.487	0.137	0.127
	Middle	914.987	0.138	0.127
	High	927.487	0.138	0.126
LoRa_250kHz	Low	902.487	0.304	0.260
	Middle	914.987	0.304	0.259
	High	927.487	0.302	0.259
FSK	Low	902.487	0.083	0.070
	Middle	914.987	0.078	0.071
	High	927.487	0.084	0.070

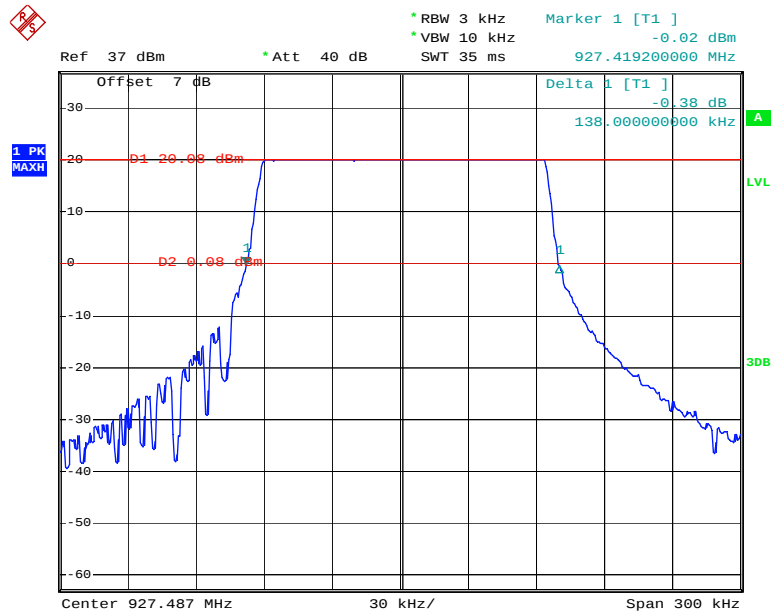
20dB Bandwidth:**LoRa_125kHz, Low Channel**

Date: 13.APR.2018 00:58:18

LoRa_125kHz, Middle Channel

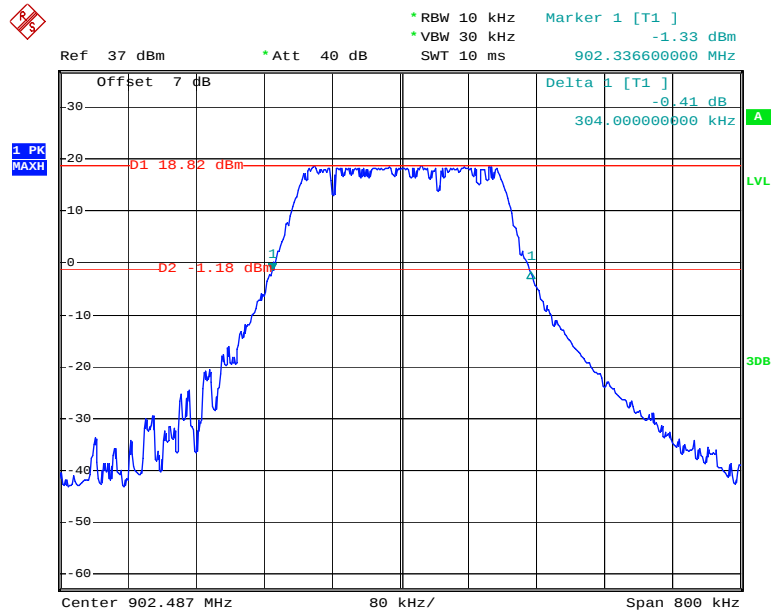
Date: 13.APR.2018 01:23:28

LoRa_125kHz, High Channel



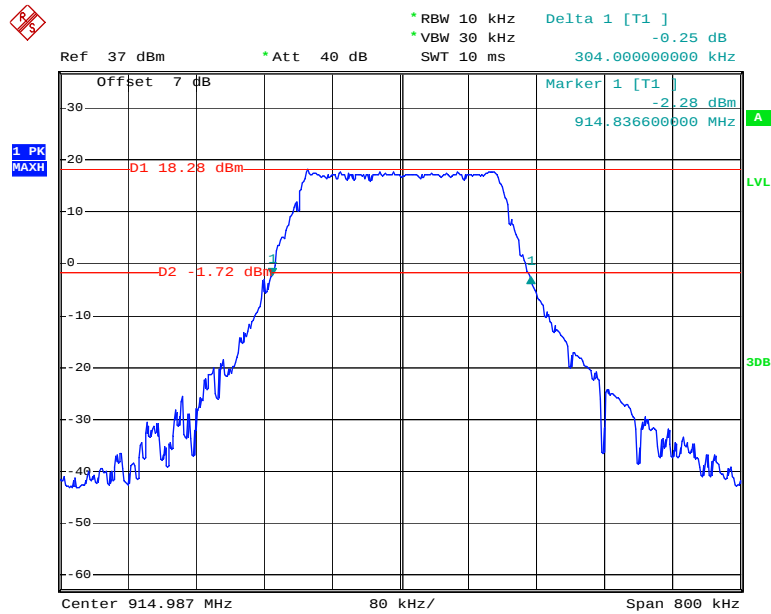
Date: 13.APR.2018 18:27:21

LoRa_250kHz, Low Channel



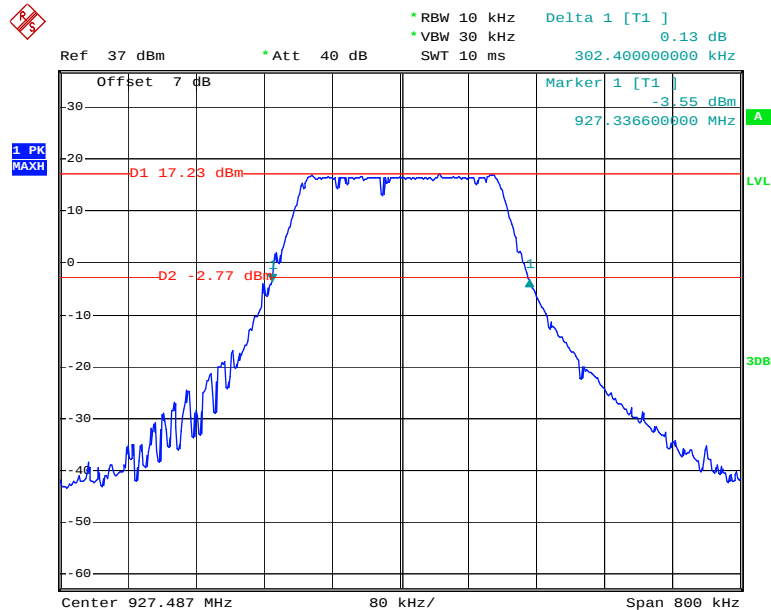
Date: 13.APR.2018 20:38:36

LoRa_250kHz, Middle Channel



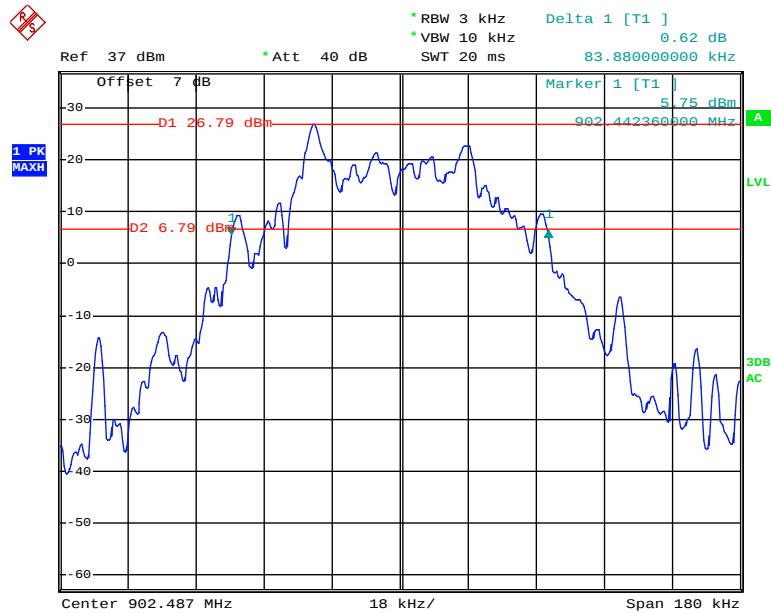
Date: 13.APR.2018 21:08:11

LoRa_250kHz, High Channel



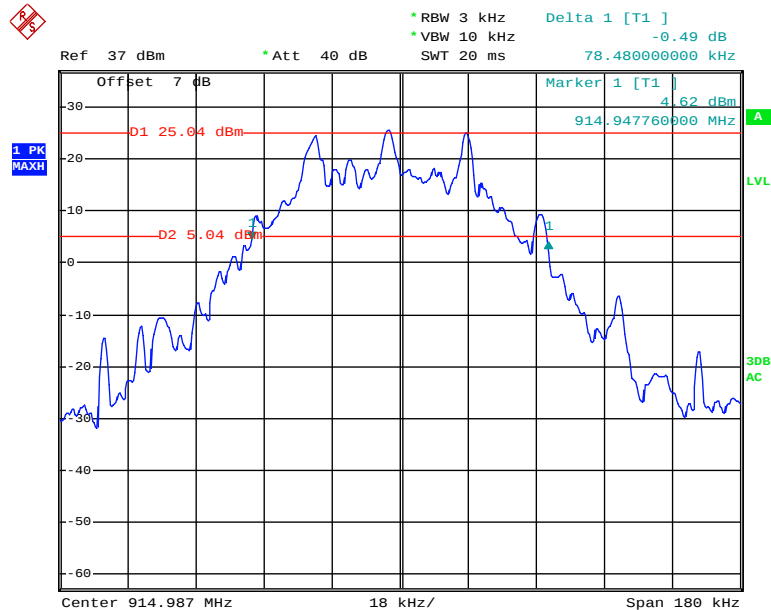
Date: 13.APR.2018 21:42:46

FSK, Low Channel



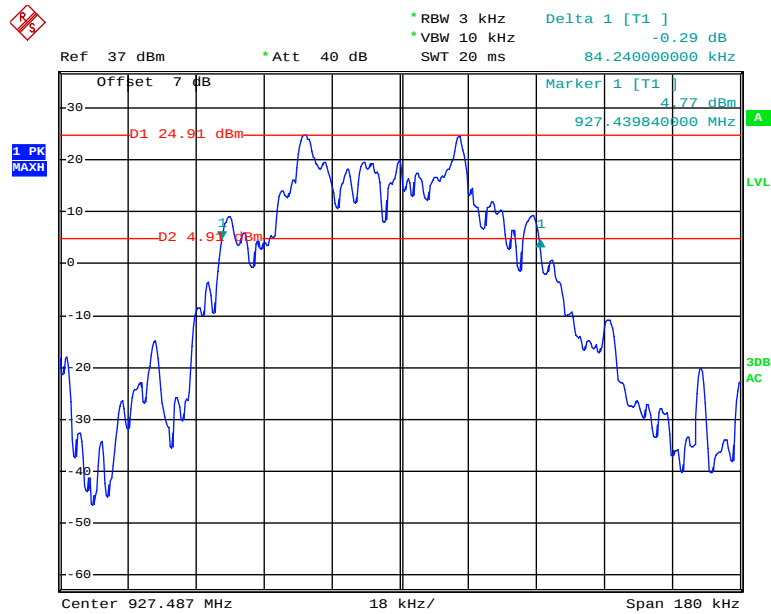
Date: 1.FEB.2018 18:45:18

FSK, Middle Channel



Date: 1.FEB.2018 19:38:59

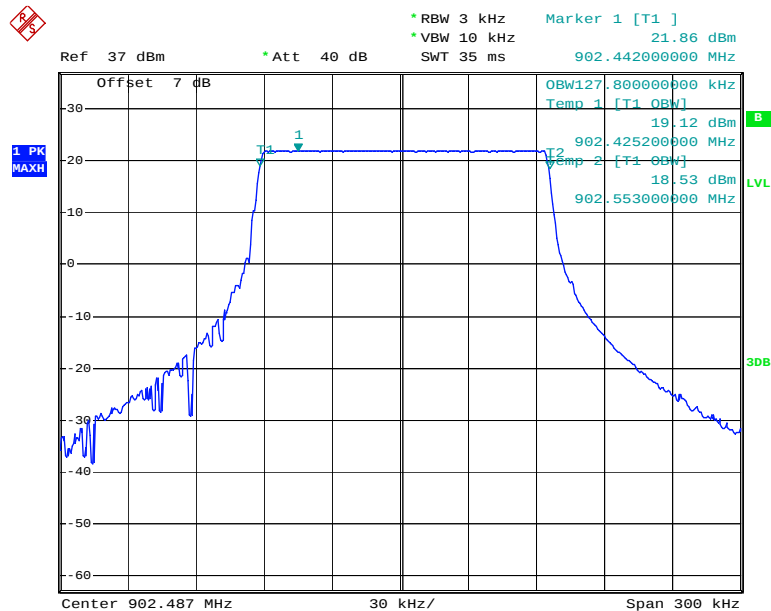
FSK, High Channel



Date: 1.FEB.2018 20:06:08

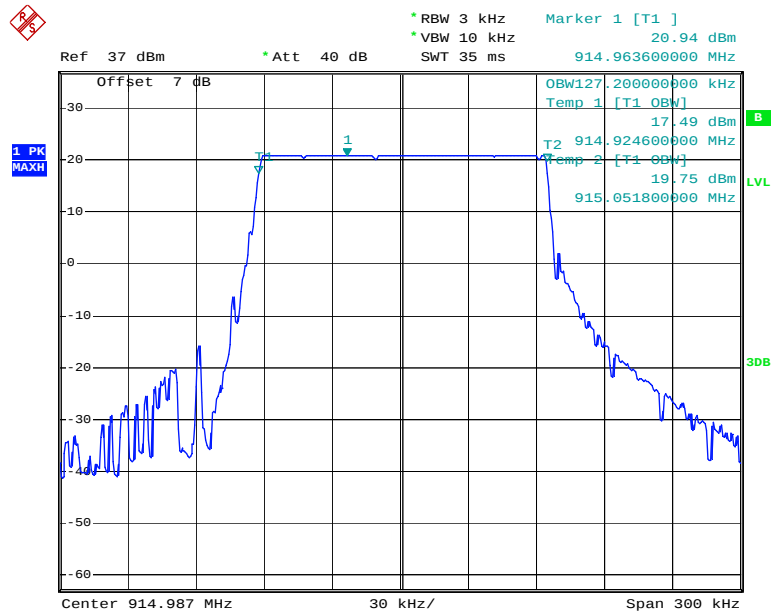
99% Occupied Bandwidth:

LoRa_125kHz, Low Channel



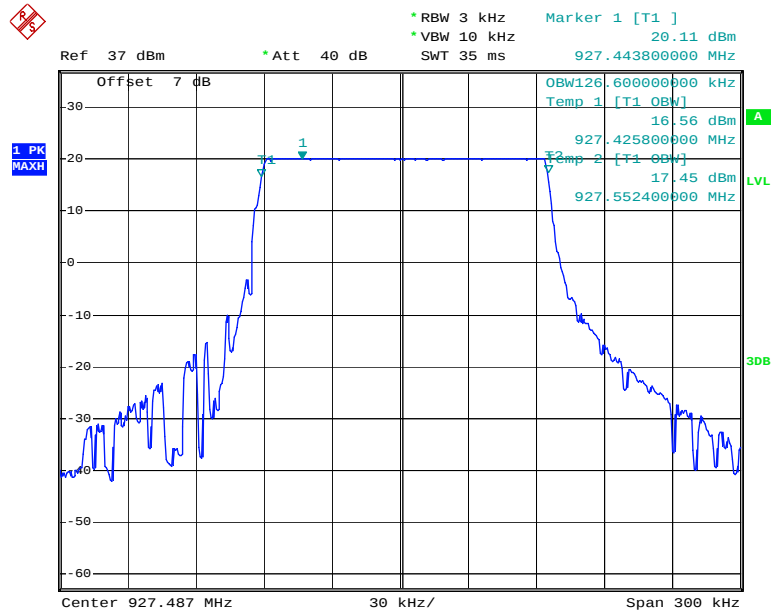
Date: 13.APR.2018 00:54:16

LoRa_125kHz, Middle Channel



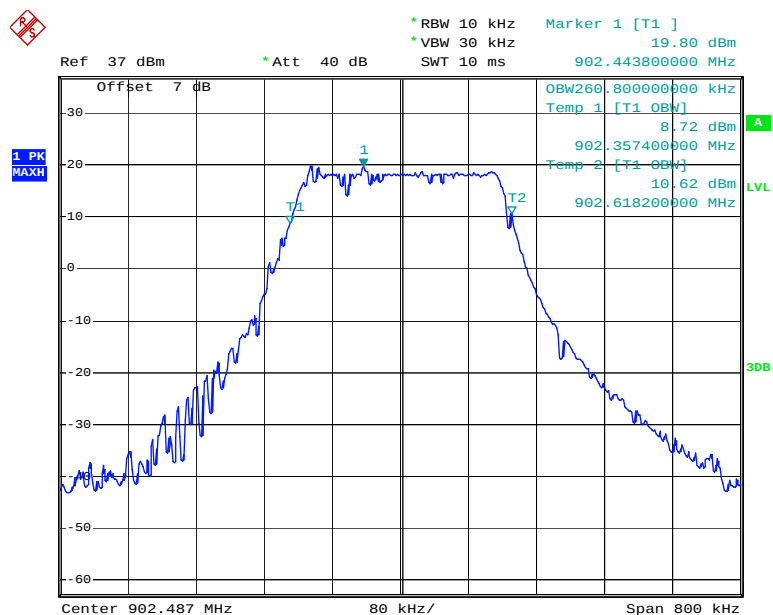
Date: 13.APR.2018 01:21:27

LoRa_125kHz, High Channel



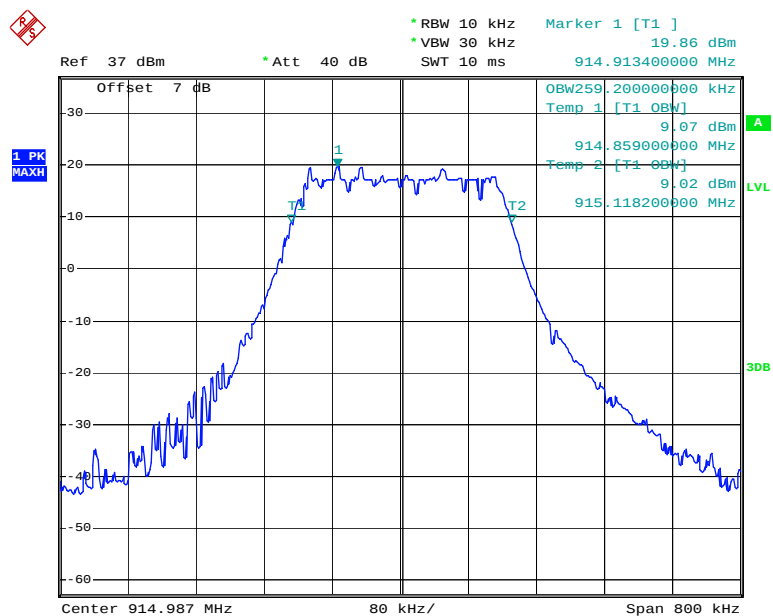
Date: 13.APR.2018 18:24:07

LoRa_250kHz, Low Channel



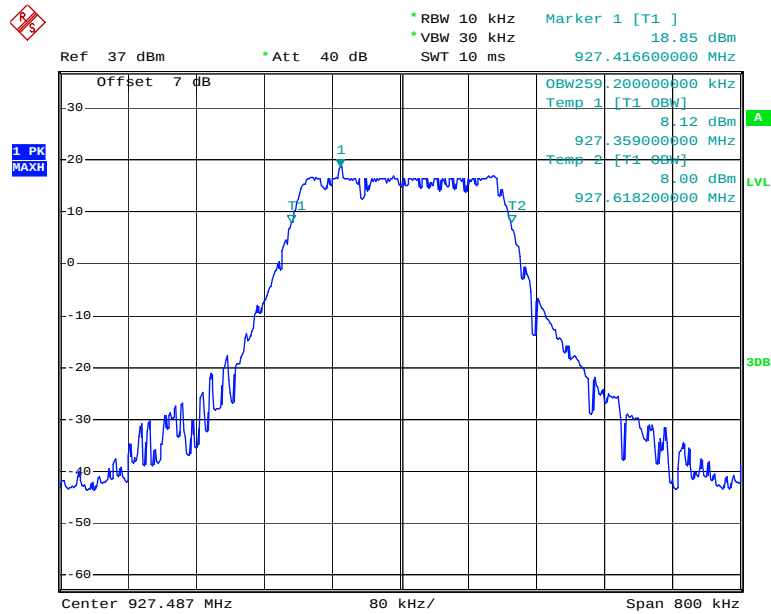
Date: 13.APR.2018 20:34:42

LoRa_250kHz, Middle Channel



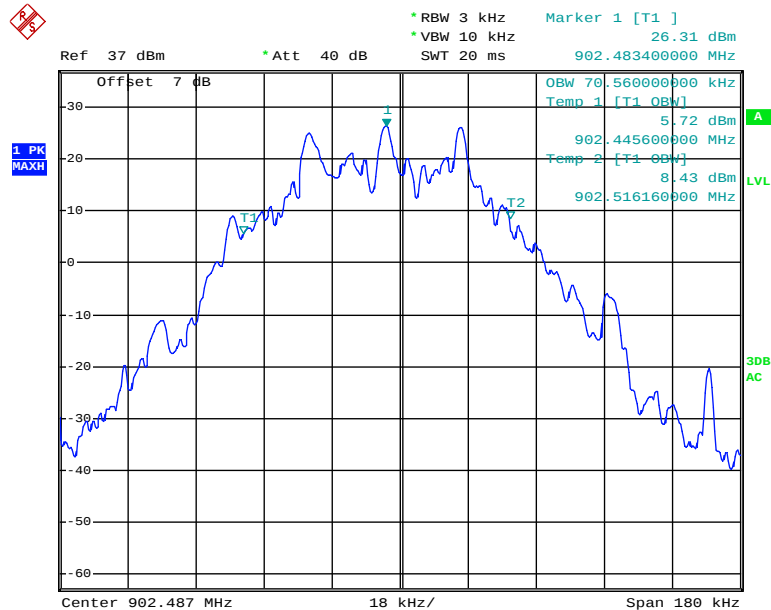
Date: 13.APR.2018 21:16:42

LoRa_250kHz, High Channel



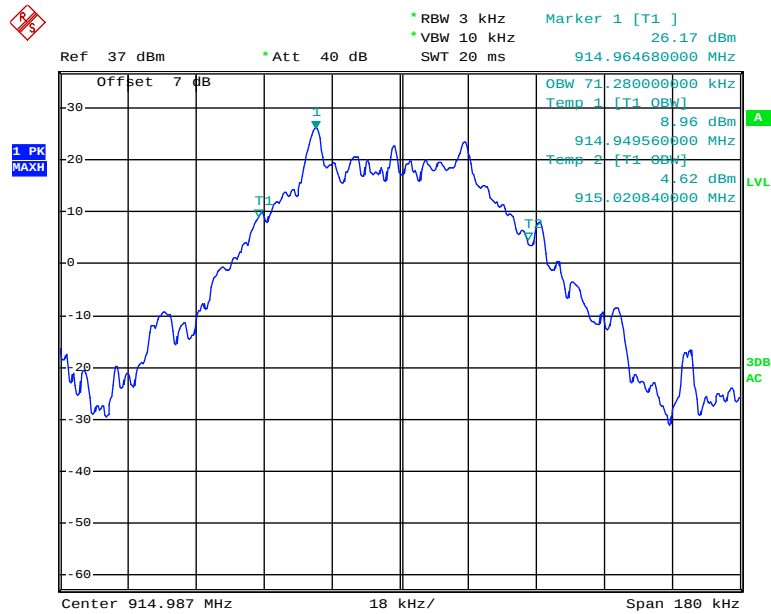
Date: 13.APR.2018 21:45:21

FSK, Low Channel



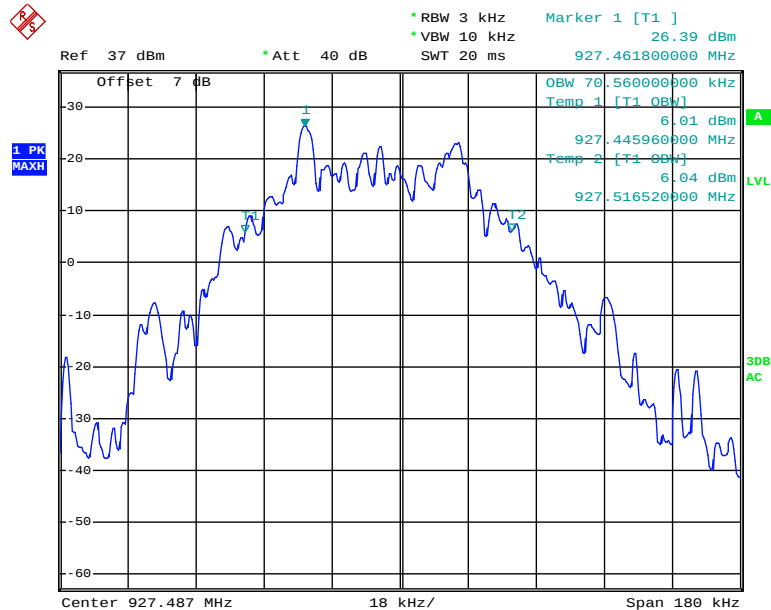
Date: 1.FEB.2018 19:54:43

FSK, Middle Channel



Date: 1.FEB.2018 19:45:28

FSK, High Channel



Date: 1.FEB.2018 19:58:15

FCC §15.247(a) (1) (i) & RSS-247 CLAUSE 5.1 c) - QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

According to FCC 247 §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

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	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.6 °C
Relative Humidity:	41 %
ATM Pressure:	101.3 kPa

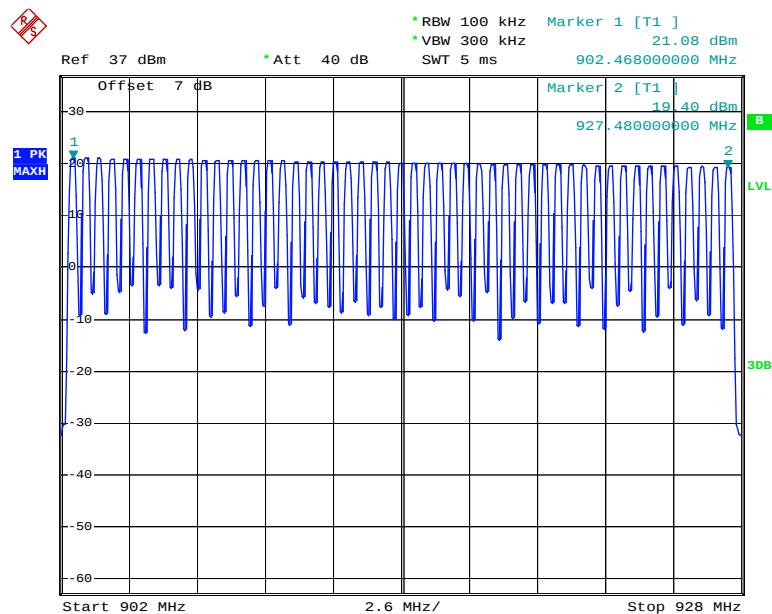
* The testing was performed by Swim Lv on 2018-04-13.

Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

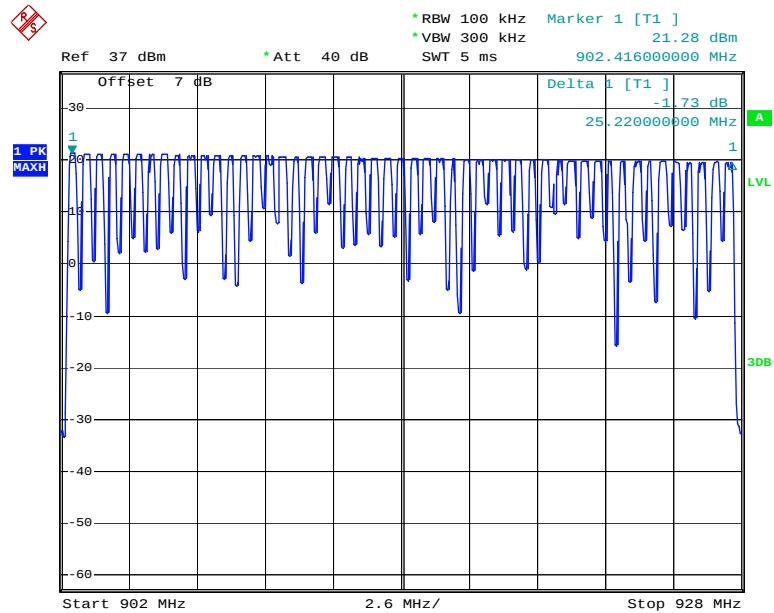
Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit
LoRa_125kHz	902-928	51	≥50

Number of Hopping Channels

Date: 13.APR.2018 01:16:44

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit
LoRa_250kHz	902-928	51	≥25

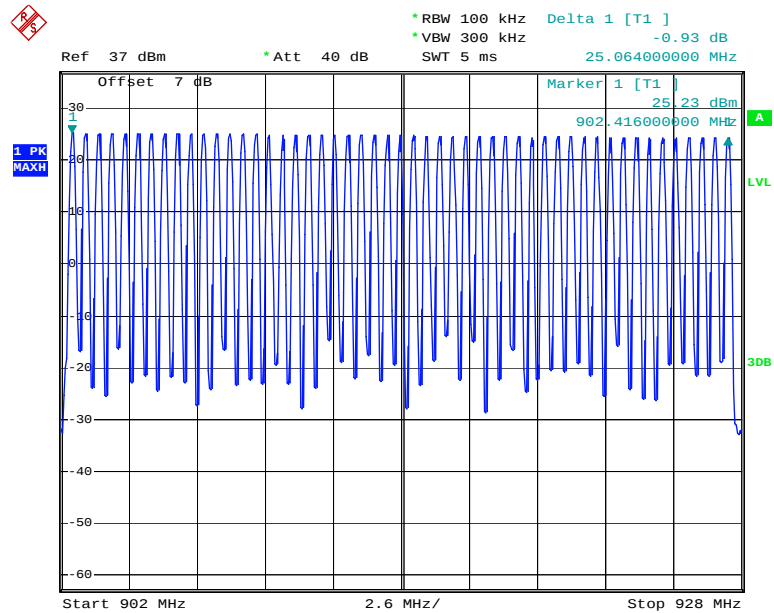
Number of Hopping Channels



Date: 13.APR.2018 19:40:46

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

Number of Hopping Channels



Date: 13.APR.2018 00:13:43

FCC §15.247(a) (1) (iii) & RSS-247 CLAUSE 5.1 c) - TIME OF OCCUPANCY (DWELL TIME)**Applicable Standard**

According to FCC 247 §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

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	ESCI	101121	2017-03-02	2018-03-02
R&S	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/03	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:	20.7~22.6 °C
Relative Humidity:	28~30 %
ATM Pressure:	101.3~102 kPa

* The testing was performed by Swim Lv from 2018-02-02 to 2018-02-11.

Test Result: Compliance.

Please refer to following tables and plots

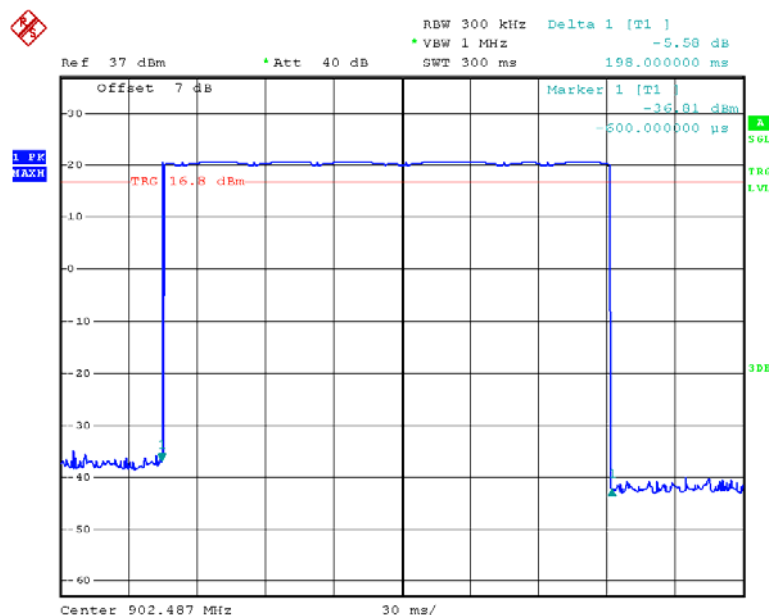
Test Mode: Transmitting

Mode	Channel	Pulse Width (ms)	Real Observed Period(s)	Hopping number in Observed Period	Dwell Time (s)	Limit (s)	Result
LoRa_125kHz	Low	198	20	2	0.396	0.4	Compliance
	Middle	198	20	2	0.396	0.4	Compliance
	High	198	20	2	0.396	0.4	Compliance

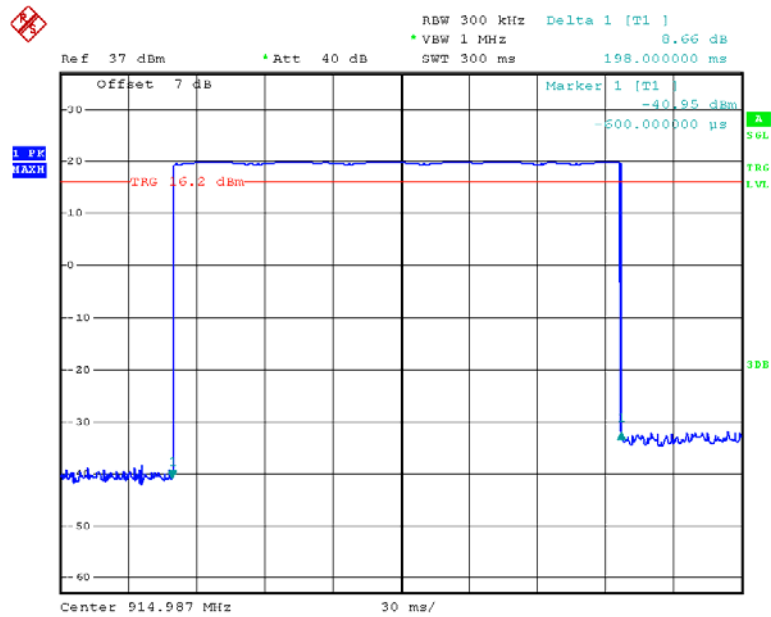
Note:

Dwell time=Pulse width (ms) × hopping number per channel in Observed Period

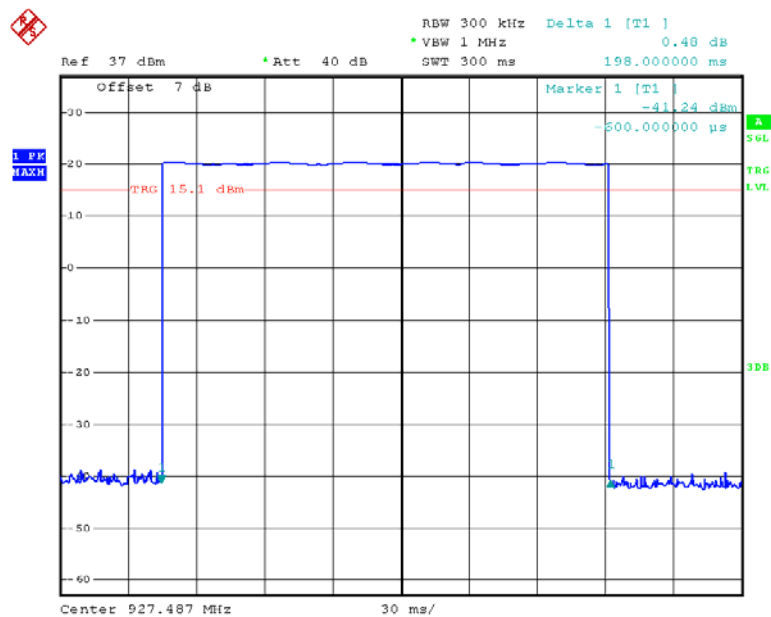
Observed Period=20s

Low Channel

Date: 8.FEB.2018 20:53:34

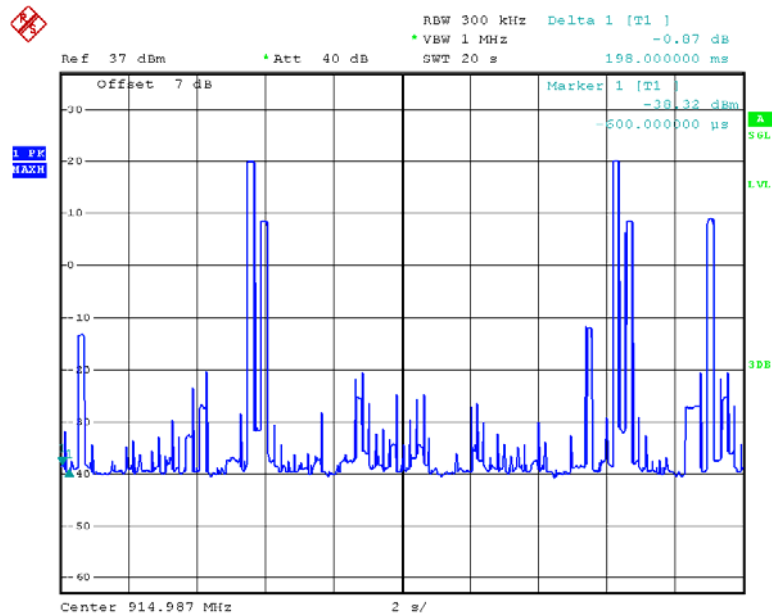
Middle Channel

Date: 8.FEB.2018 21:04:14

High Channel

Date: 8.FEB.2018 21:06:51

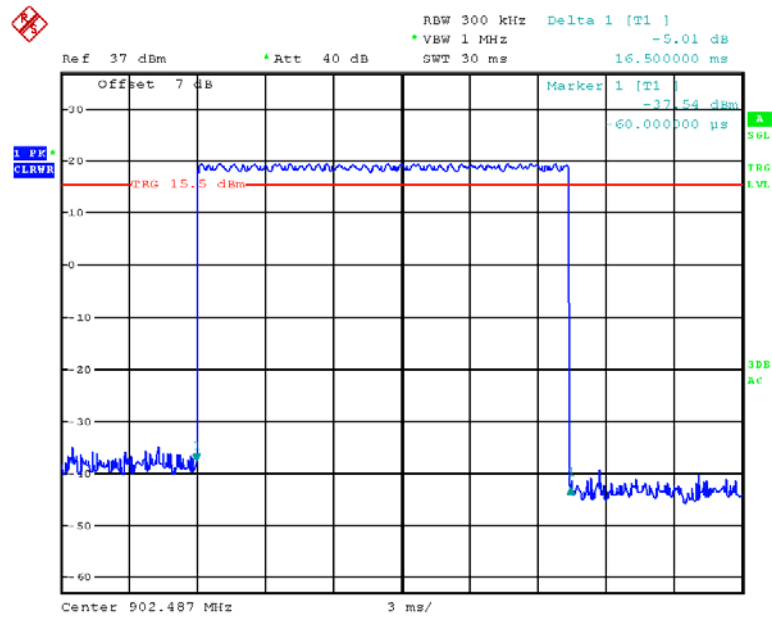
2 hopping in one channel in 20s Period



Date: 8.FEB.2018 21:04:51

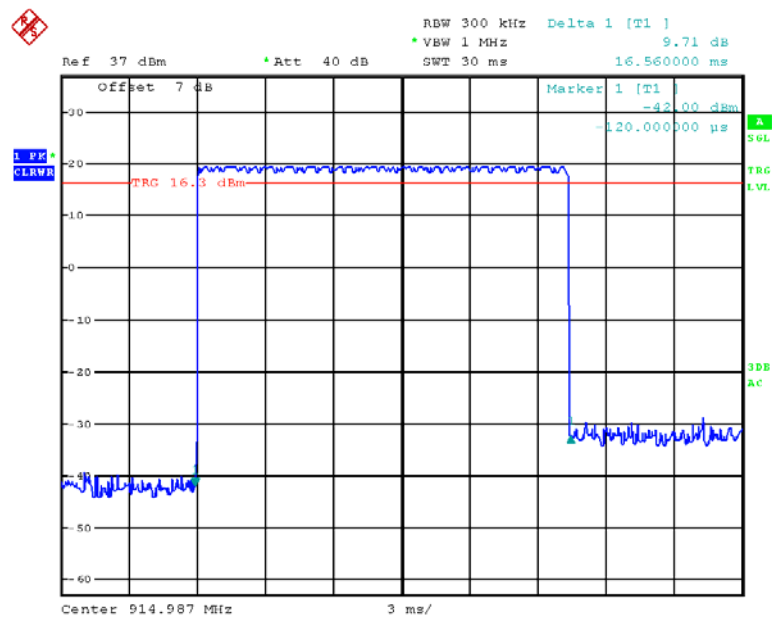
Mode	Channel	Pulse Width (ms)	Real Observed Period(s)	Hopping number in Observed Period	Dwell Time (s)	Limit (s)	Result
LoRa_250kHz	Low	16.50	10	2	0.033	0.4	Compliance
	Middle	16.56	10	2	0.033	0.4	Compliance
	High	16.50	10	2	0.033	0.4	Compliance
Note: Dwell time=Pulse width (ms) × hopping number per channel in Observed Period Observed Period=10s							

Low Channel



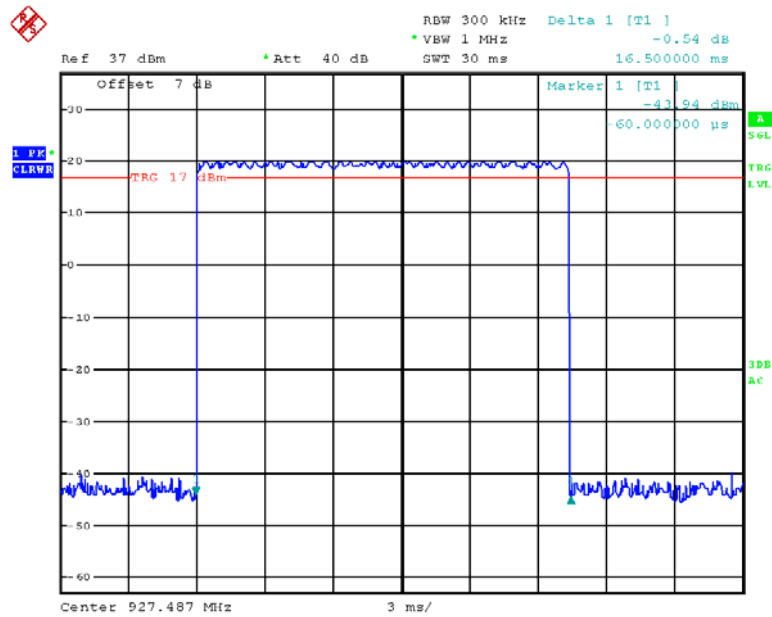
Date: 11.FEB.2018 22:24:52

Middle Channel



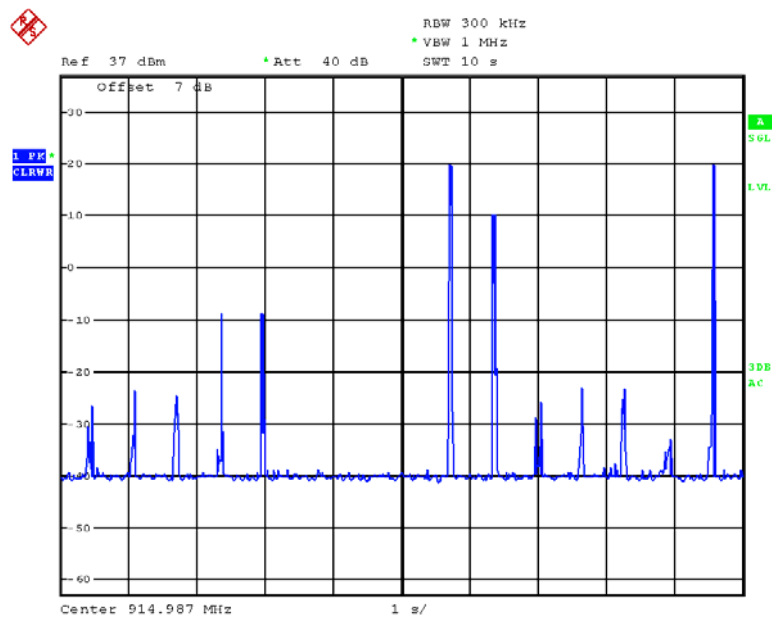
Date: 11.FEB.2018 22:25:36

High Channel



Date: 11.FEB.2018 22:27:12

2 hopping in one channel in 10s Period

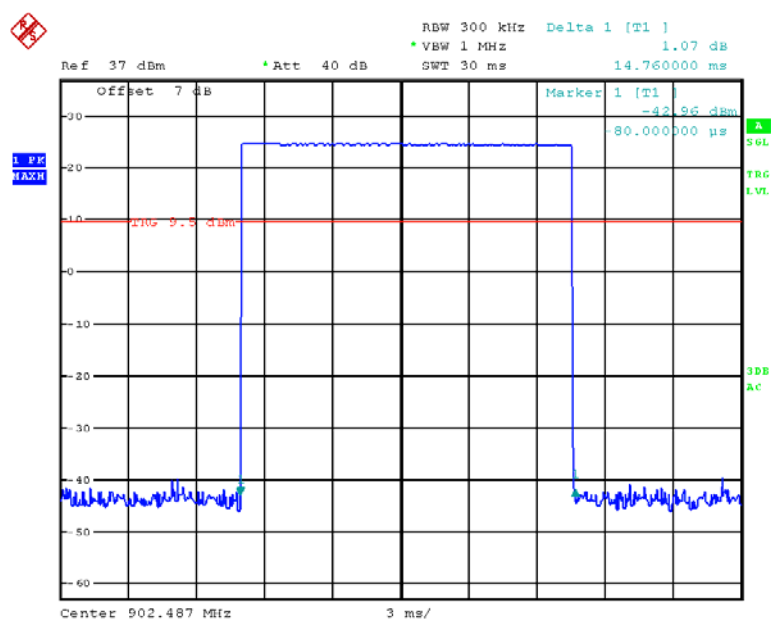


Date: 11.FEB.2018 22:26:09

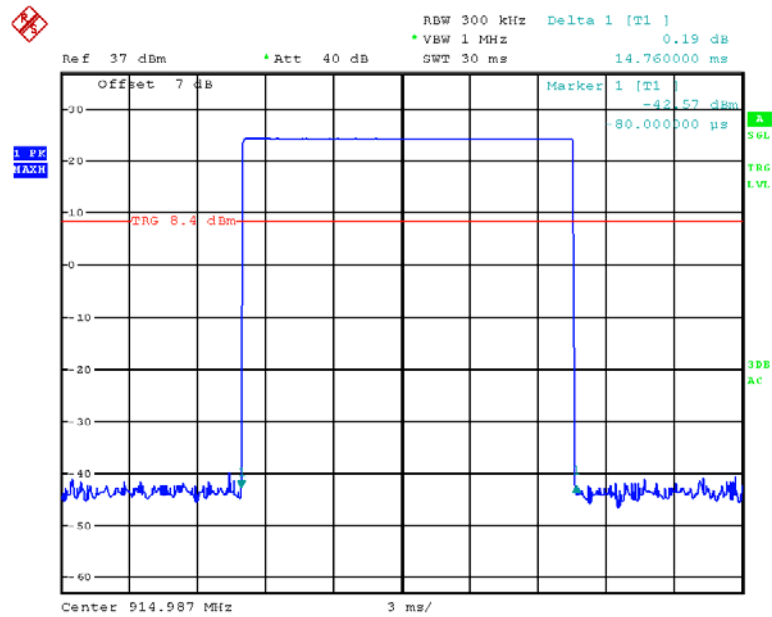
Mode	Channel	Pulse Width (ms)	Real Observed Period(s)	Hopping number in Observed Period	Dwell Time (s)	Limit (s)	Result
FSK	Low	15	20	1	0.015	0.4	Compliance
	Middle	15	20	1	0.015	0.4	Compliance
	High	15	20	1	0.015	0.4	Compliance

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

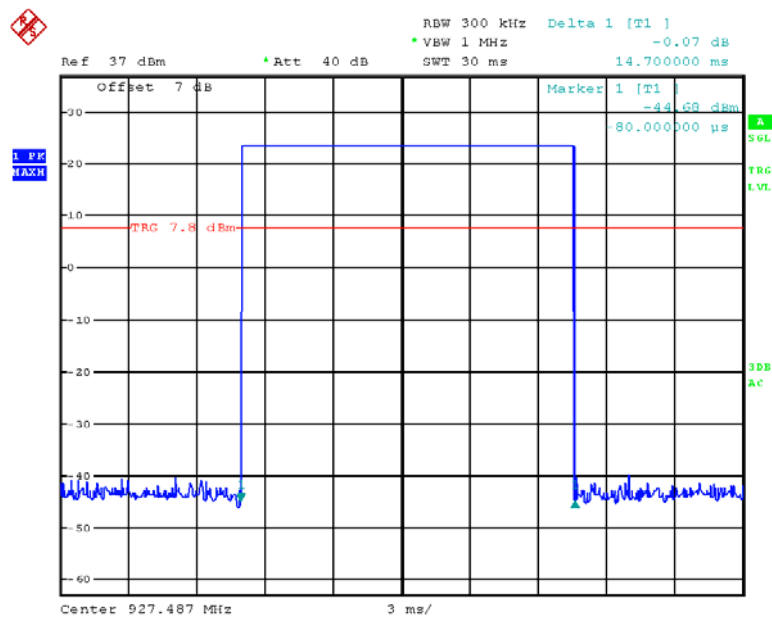
Low Channel



Date: 2.FEB.2018 23:42:56

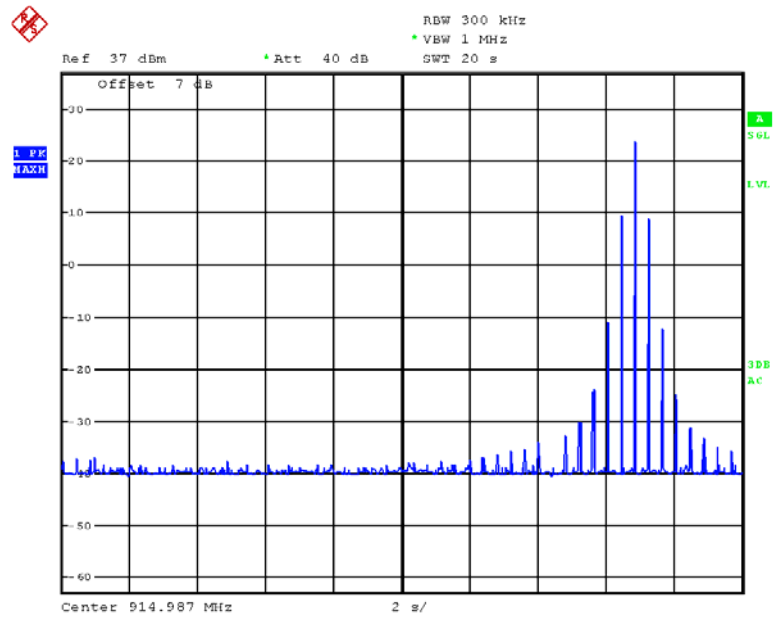
Middle Channel

Date: 2.FEB.2018 23:42:09

High Channel

Date: 2.FEB.2018 23:41:14

1 hopping in one channel in 10s Period



Date: 2.FEB.2018 23:38:32

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)

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	2017-12-11	2018-12-11
N/A	Coaxial Cable	C-SJ00-0010	C0010/03	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:	20~21.3 °C
Relative Humidity:	34~36 %
ATM Pressure:	102 kPa

* The testing was performed by Swim Lv from 2018-02-01 to 2018-02-03.

Test Result: Compliance.

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
LoRa_125kHz	Low	902.487	21.36	30
	Middle	914.987	20.44	30
	High	927.487	19.57	30
LoRa_250kHz	Low	902.487	21.24	30
	Middle	914.987	20.37	30
	High	927.487	19.58	30
FSK	Low	902.487	25.12	30
	Middle	914.987	24.61	30
	High	927.487	24.18	30

Note: The data above was tested in conducted mode, the antenna gain is 1dBi.

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	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/03	Each time	N/A

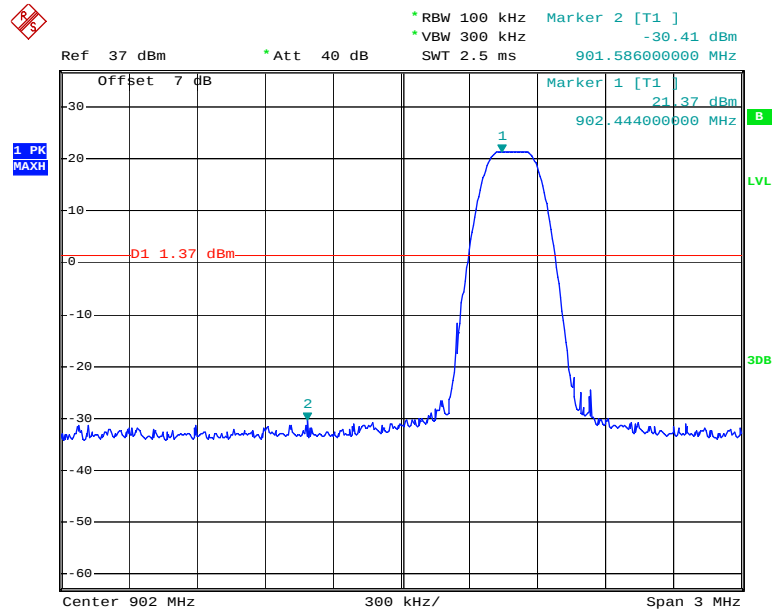
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

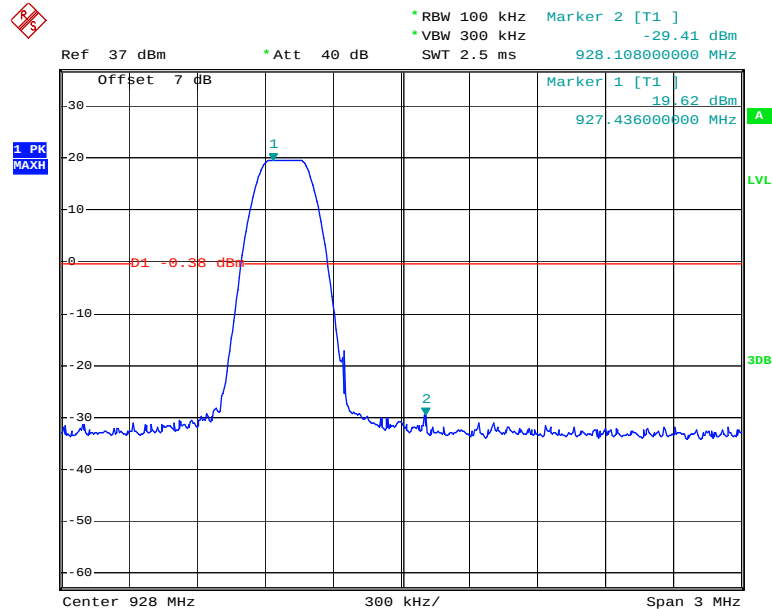
Temperature:	25.8~27.1 °C
Relative Humidity:	56~60 %
ATM Pressure:	100.5~100.6 kPa

* The testing was performed by Swim Lv from 2018-04-12 to 2018-04-13.

Test Result: Compliance

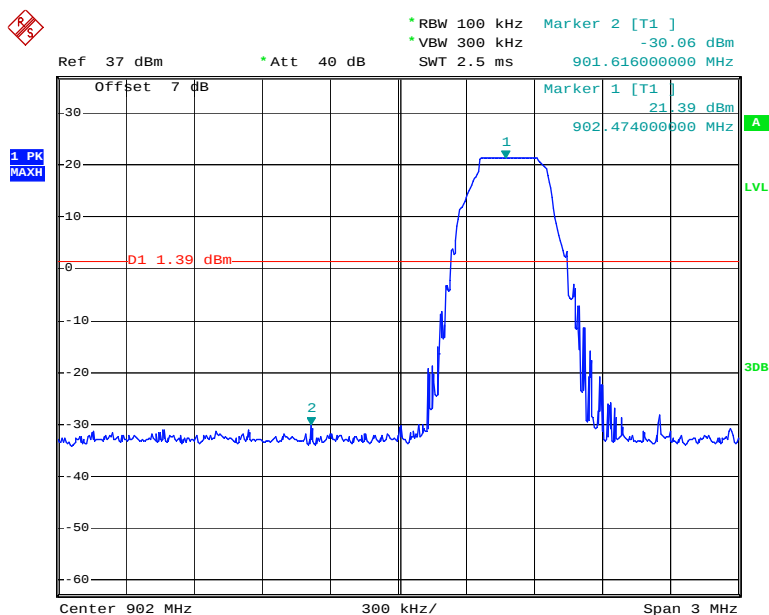
Single Channel:**LoRa_125kHz, Band Edge, Left Side**

Date: 13.APR.2018 00:59:45

LoRa_125kHz, Band Edge, Right Side

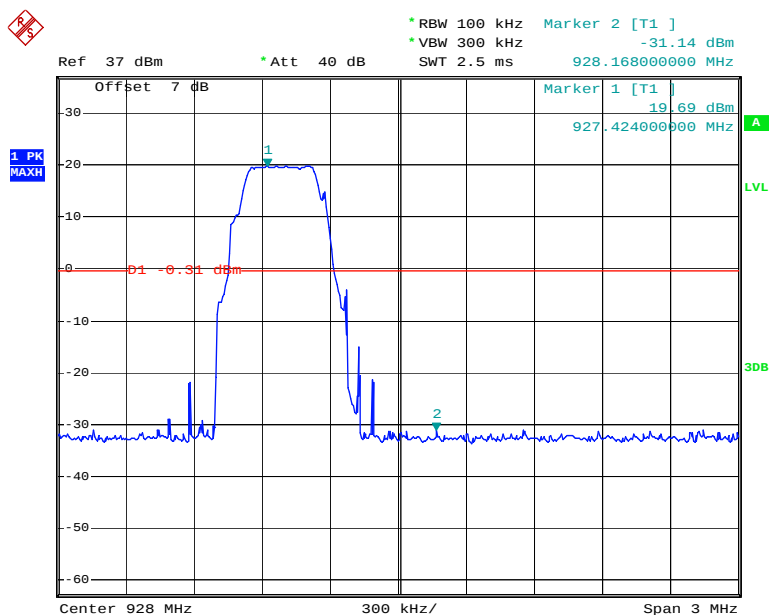
Date: 13.APR.2018 18:30:28

LoRa_250kHz, Band Edge, Left Side



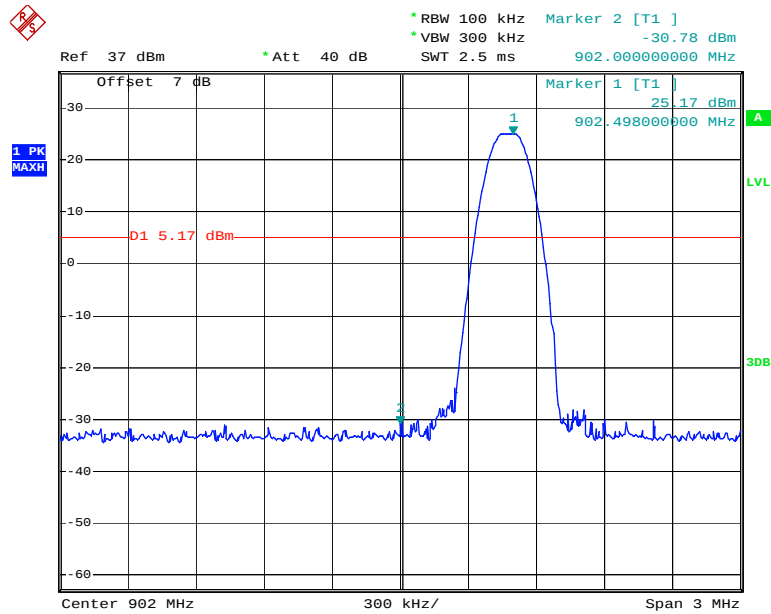
Date: 13.APR.2018 20:40:55

LoRa_250kHz, Band Edge, Right Side



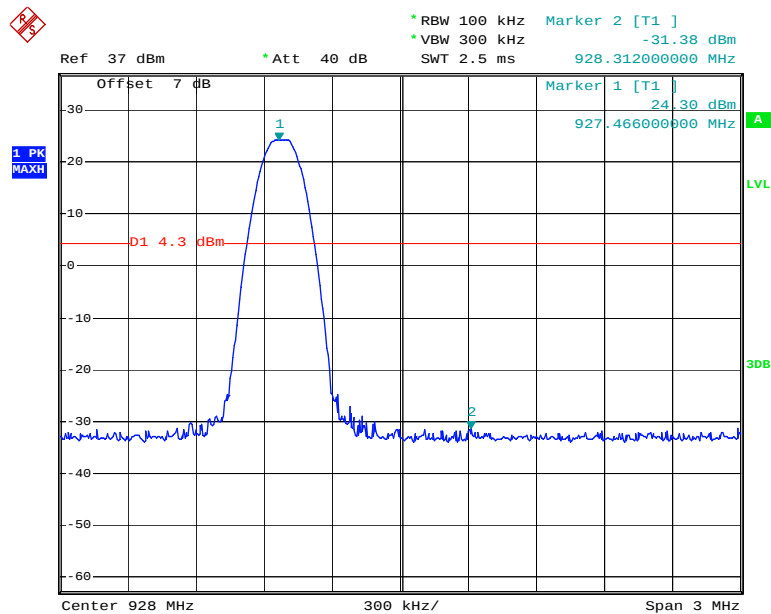
Date: 13.APR.2018 21:54:15

FSK, Band Edge, Left Side

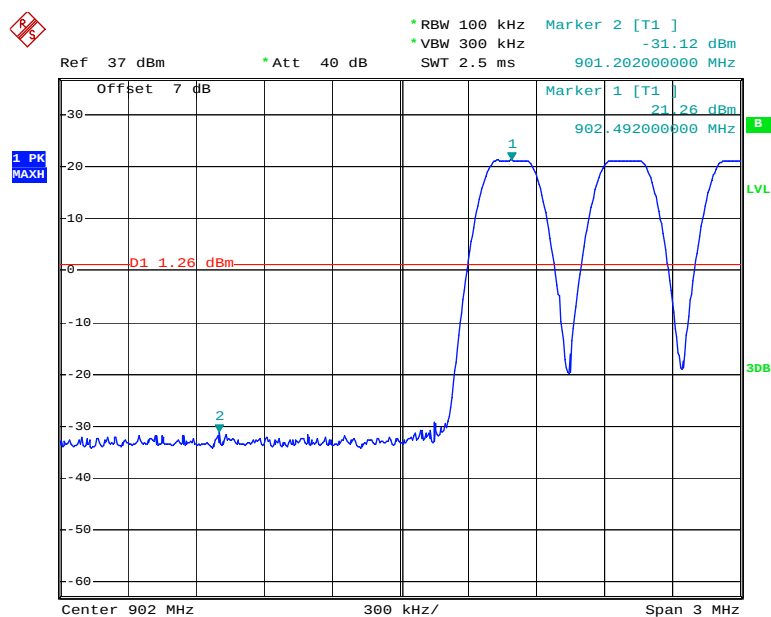


Date: 12.APR.2018 23:27:43

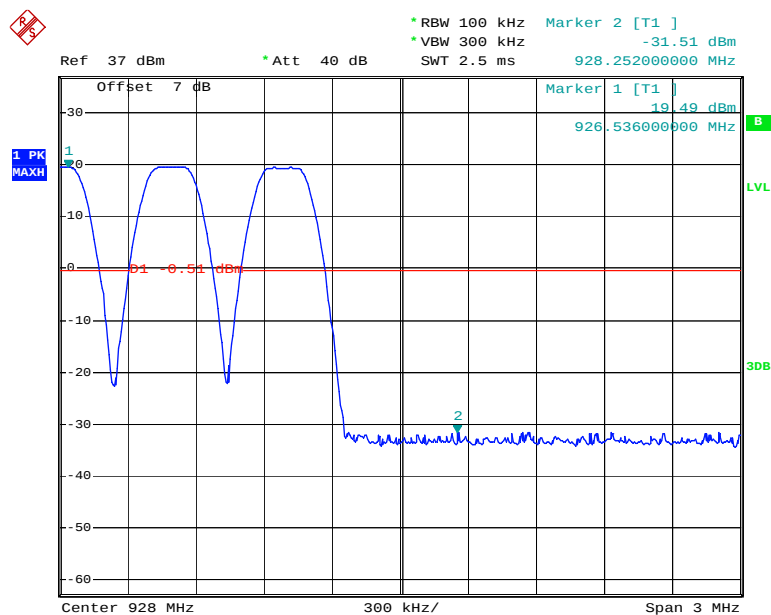
FSK, Band Edge, Right Side



Date: 12.APR.2018 23:25:38

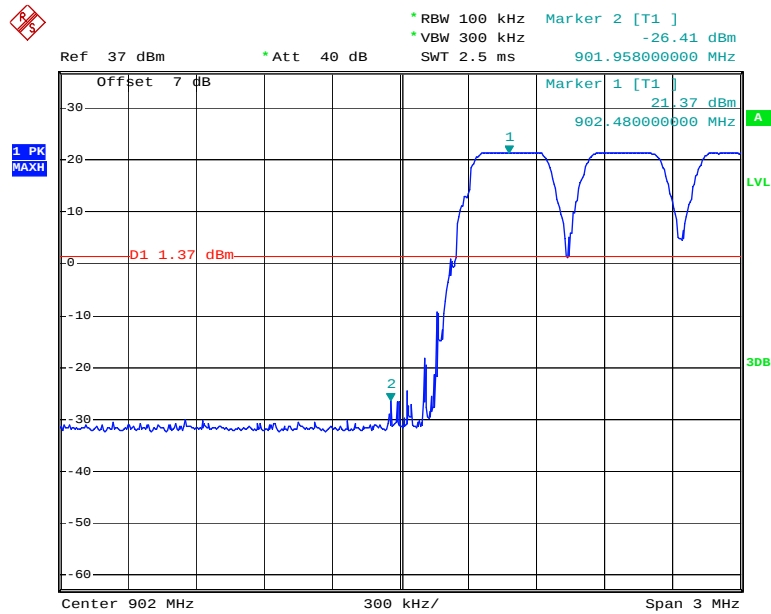
Hopping Channel:**LoRa_125kHz, Band Edge, Left Side**

Date: 13.APR.2018 01:13:51

LoRa_125kHz, Band Edge, Right Side

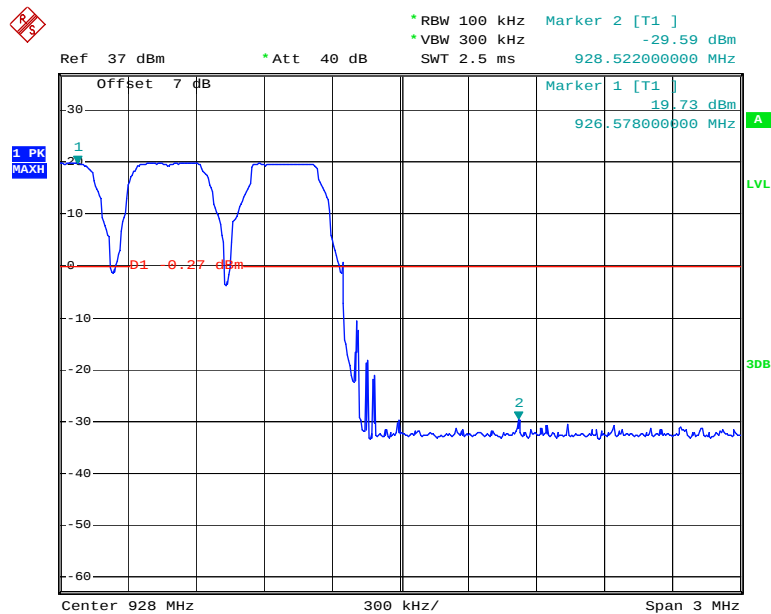
Date: 13.APR.2018 01:15:01

LoRa_250kHz, Band Edge, Left Side



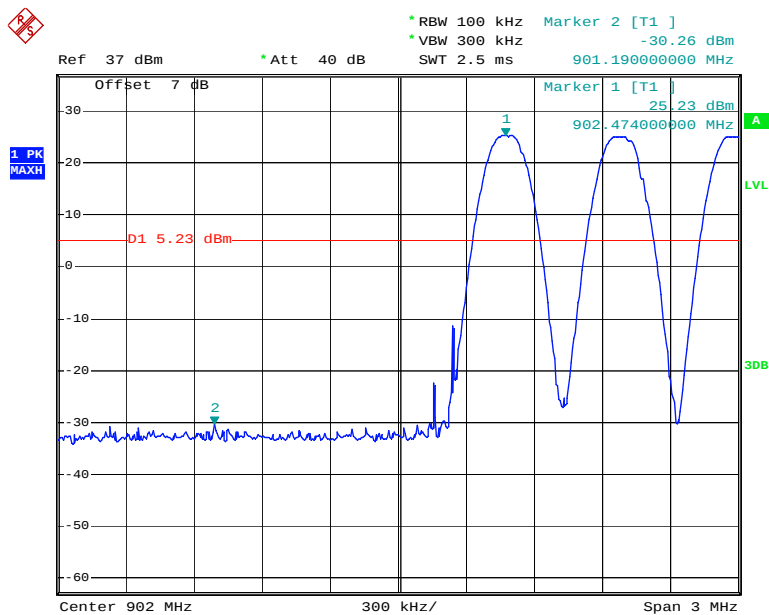
Date: 13.APR.2018 20:23:01

LoRa_250kHz, Band Edge, Right Side



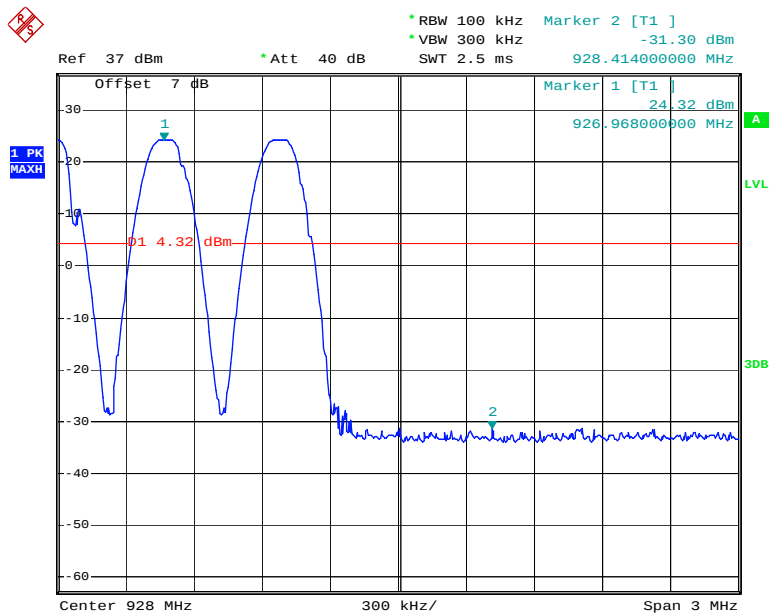
Date: 13.APR.2018 20:28:41

FSK, Band Edge, Left Side



Date: 13.APR.2018 00:10:04

FSK, Band Edge, Right Side



Date: 13.APR.2018 00:11:51

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