



FCC PART 15.247
TEST REPORT

For

The House of Marley.LLC

3000 Pontiac Trail, Commerce Township, Michigan 48390 United States

FCC ID: PVB-EMJT002

Report Type: Original Report	Product Name: Stir it Up Wireless Turntable / Simmer Down Wireless Turntable
Report Number:	RSZ190520801-00B
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Stir it Up Wireless Turntable / Simmer Down Wireless Turntable
EUT Model:	EM-JT002
Multiple Models:	EM-JT003
Operation Frequency:	2402-2480 MHz
Maximum Output Power (Conducted):	-2.59 dBm
Modulation Type:	GFSK, $\pi/4$ -DQPSK
Adapter Information	Model: BI12T-120025-I
	Input: 100-240~50/60Hz 0.5A
	Output: 12V DC
Rated Input Voltage:	12V DC
External Dimension:	420mm(L)*348mm(W)*125mm(H)
Serial Number:	190520801
EUT Received Date:	2019.5.23

Notes: Model EM-JT003 was selected for fully testing, the detailed information about the difference among EM-JT003 and model EM-JT002 can be referred to the declaration letter which was stated and guaranteed by the manufacturer.

Objective

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

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

Related Submittal(s)/Grant(s)

N/A

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".

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: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode.

EUT Exercise Software

The software: 'FCCAssist V1.6exe' was used during test, which was provided by manufacturer. The maximum power level was configured by the software as below table:

Mode	Channel	Frequency (MHz)	Power Level
GFSK	Low	2402	7
	Middle	2441	7
	High	2480	7
$\pi/4$ -DQPSK	Low	2402	7
	Middle	2441	7
	High	2480	7

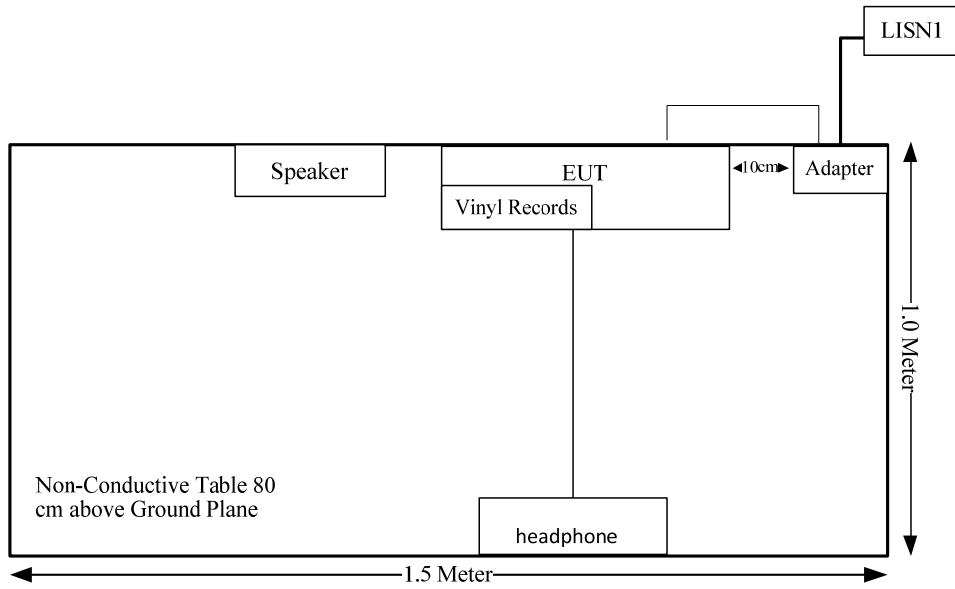
Equipment Modifications

No modification was made to the EUT.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
JBL	Speaker	TUNE2 BLM	8204186
1MORE	earphone	1m301	5521427
MNDA	Vinyl Records	N/A	45587682190

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
FCC §15.207(a)	AC line conducted emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

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

Applicable Standard

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

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

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

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

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

Calculation formula:

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

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

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

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

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

Calculated Data:

Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (mW/cm²)	MPE Limit (mW/cm²)
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	-0.58	0.87	-2	0.63	20.00	0.0001	1.0

Note: the Max. Target Power including Tolerance was declared by manufacturer.

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥20 cm.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has one internal antenna arrangement, fulfill the requirement of this section. Please refer to below information and the EUT photos:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
PCB	50	-0.58dBi/2.4~2.5GHz

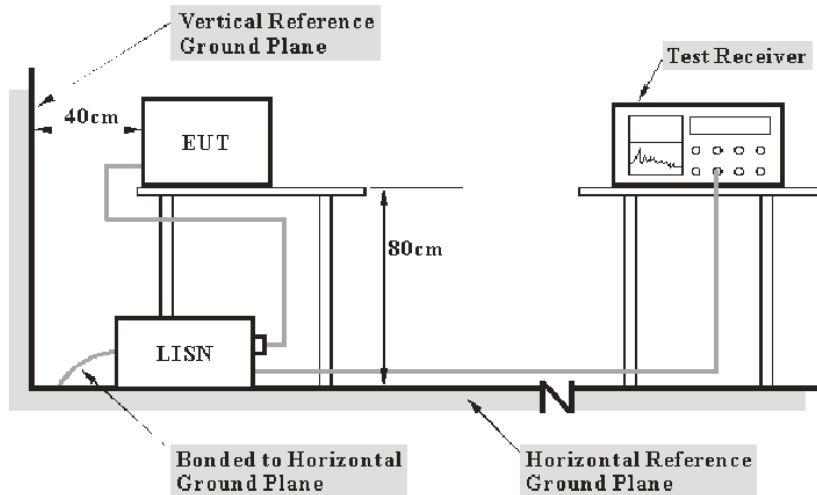
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

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

EMI Test Receiver Setup

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

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

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

Test Procedure

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

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

V_C : corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF : voltage division factor of AMN or ISN

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	101121	2019-03-23	2020-03-23
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2018-09-05	2019-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2018-12-10	2019-12-10

* **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

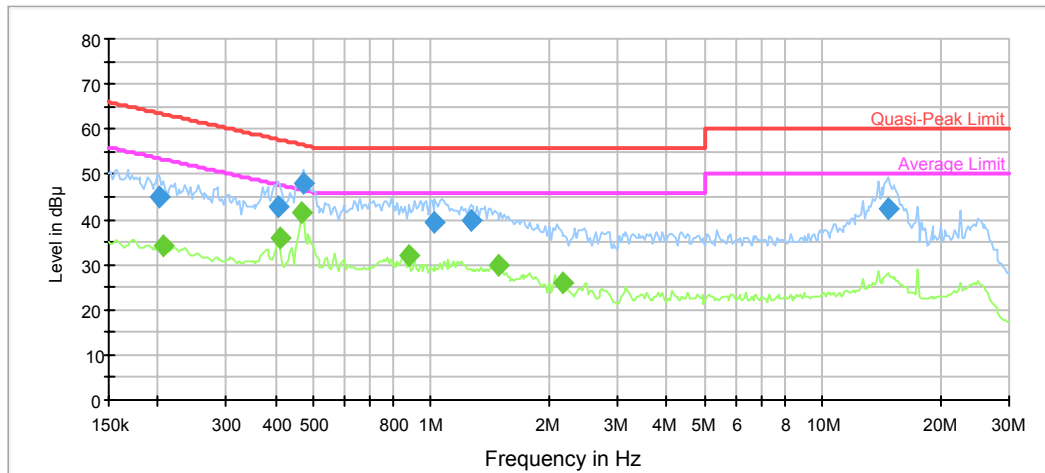
Temperature:	25.9 °C
Relative Humidity:	52 %
ATM Pressure:	101.1 kPa

The testing was performed by Lucy Lu on 2019-05-24

Test Result: Compliance

Test Mode: Transmitting

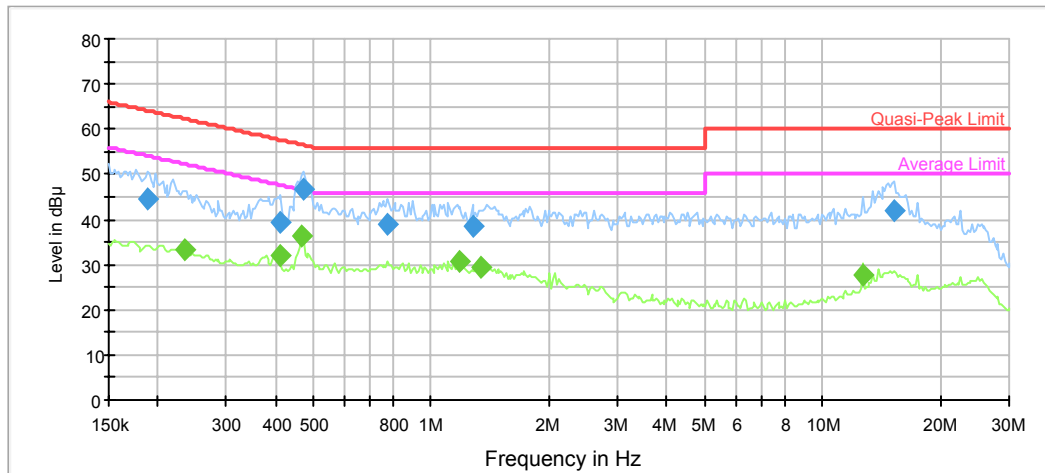
AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.202177	45.1	9.000	L1	10.6	18.4	63.5
0.405722	42.7	9.000	L1	10.0	15.0	57.7
0.471031	47.9	9.000	L1	9.9	8.6	56.5
1.023568	39.5	9.000	L1	9.8	16.5	56.0
1.261437	39.9	9.000	L1	9.8	16.1	56.0
14.731429	42.4	9.000	L1	9.9	17.6	60.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.206241	34.3	9.000	L1	10.6	19.1	53.4
0.409780	35.8	9.000	L1	10.0	11.9	47.7
0.466367	41.4	9.000	L1	9.9	5.2	46.6
0.881650	31.9	9.000	L1	9.8	14.1	46.0
1.479134	29.6	9.000	L1	9.8	16.4	46.0
2.180425	25.9	9.000	L1	9.7	20.1	46.0

AC120V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.188575	44.7	9.000	N	10.7	19.4	64.1
0.413877	39.3	9.000	N	9.9	18.3	57.6
0.471031	46.8	9.000	N	9.9	9.7	56.5
0.774673	38.9	9.000	N	9.8	17.1	56.0
1.274051	38.4	9.000	N	9.8	15.6	56.0
15.329584	42.0	9.000	N	9.9	18.0	60.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.234722	33.4	9.000	N	10.4	18.9	52.3
0.409780	32.0	9.000	N	10.0	15.7	47.7
0.466367	36.5	9.000	N	9.9	10.1	46.6
1.188331	30.9	9.000	N	9.8	15.1	46.0
1.339041	29.5	9.000	N	9.8	16.5	46.0
12.688908	27.5	9.000	N	9.9	22.5	50.0

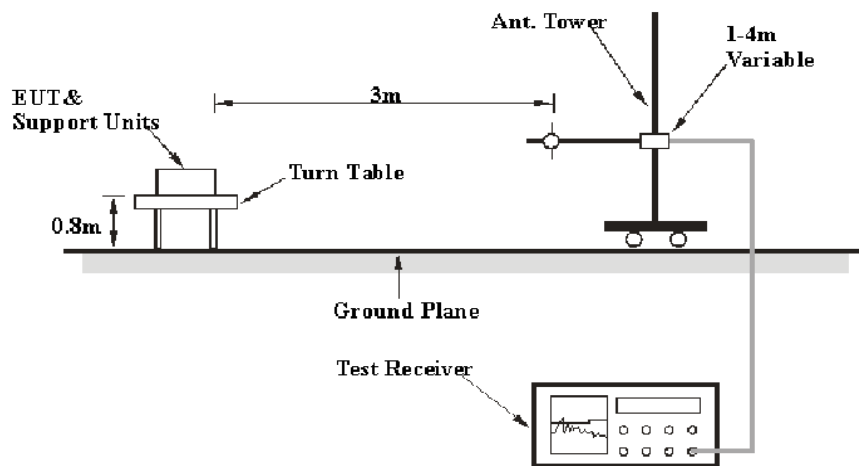
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

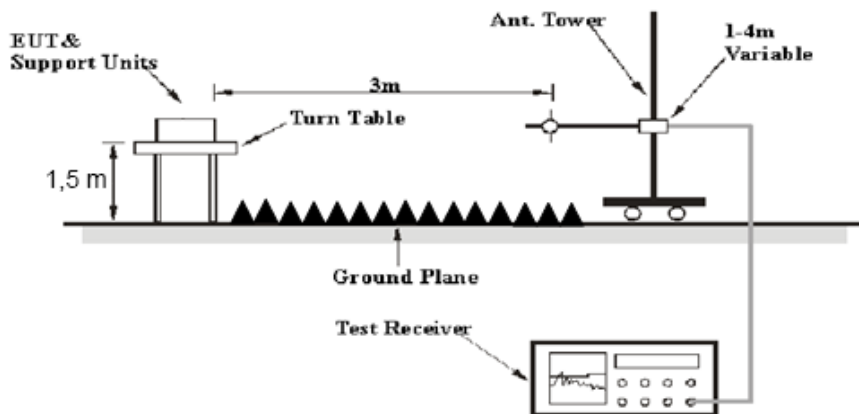
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission Below 1GHz tests were performed in the 10 meters chamber, above 1GHz tests were performed in the 3 meters chamber 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 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 25 GHz.

According to FCC public notice: DA-00-705, 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.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100035	2018-08-03	2019-08-03
Sunol Sciences	Antenna	JB3	A060611-3	2017-07-21	2020-07-21
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2018-09-24	2019-09-24
HP	Amplifier	8447F	2443A01912	2018-09-05	2019-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-01-04	2020-01-04
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2018-09-05	2019-09-05
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2018-09-05	2019-09-05
R&S	Spectrum Analyzer	FSP 38	100478	2018-12-10	2019-12-10
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
MICRO-COAX	Coaxial Cable	UFA147-1-2362-100100	64639 231029-001	2019-02-24	2020-02-24
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2018-06-27	2019-06-27
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2018-06-16	2019-06-16
Micro-tronics	High Pass Filter	HPM50111	S/N-G217	2018-06-16	2019-06-16

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

Test Data**Environmental Conditions**

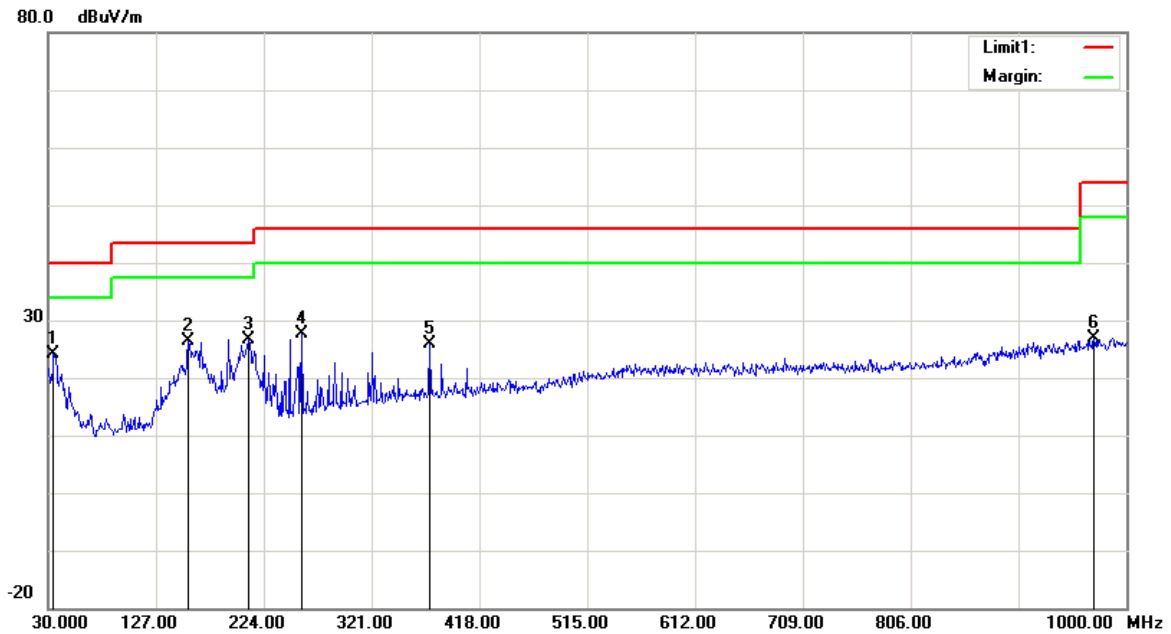
Temperature:	26.2~25.6 °C
Relative Humidity:	53~56%
ATM Pressure:	100.6~ 101.2kPa

* The testing was performed by Tyler Pan, Vito Chen on 2019-05-27 & 2019-05-29

Test Mode: Transmitting

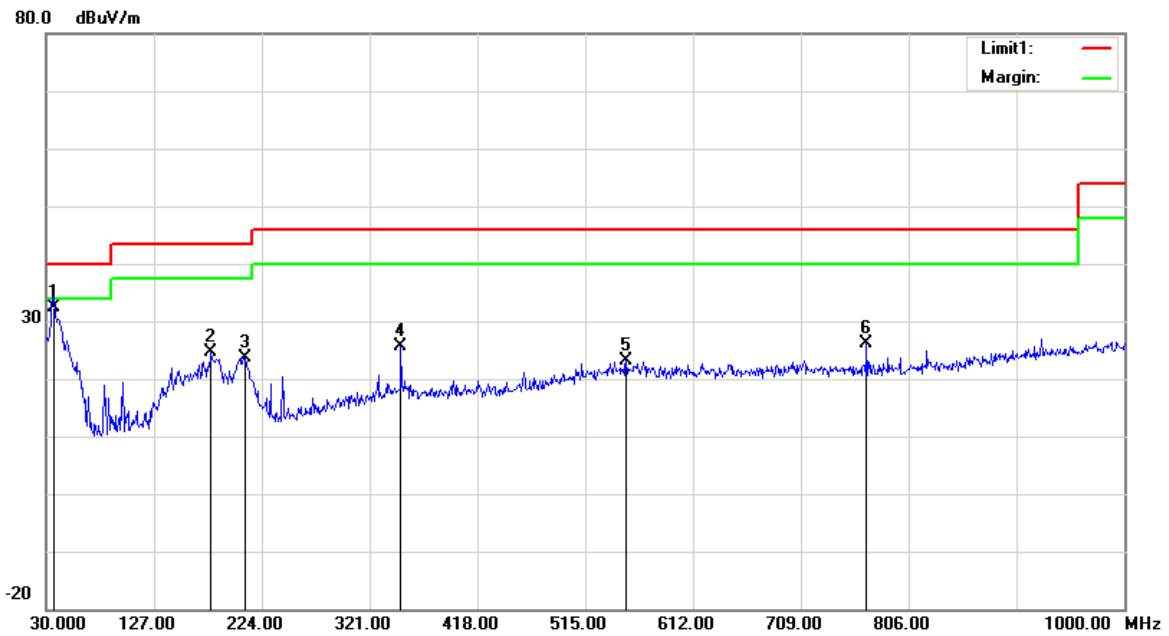
1) 30MHz-1GHz (GFSK High channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBμV)	Remark	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
34.8500	34.56	peak	-10.33	24.23	40.00	15.77
156.1000	39.24	peak	-12.79	26.45	43.50	17.05
210.4200	41.58	peak	-14.86	26.72	43.50	16.78
257.9500	40.40	peak	-12.86	27.54	46.00	18.46
373.3800	34.55	peak	-8.74	25.81	46.00	20.19
970.9000	24.83	peak	2.09	26.92	54.00	27.08

Vertical:



Frequency (MHz)	Receiver Reading (dBµV)	Remark	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
36.7900	43.59	QP	-11.29	32.30	40.00	7.70
178.4100	37.91	peak	-13.27	24.64	43.50	18.86
208.4800	38.22	peak	-14.52	23.70	43.50	19.80
349.1300	35.19	peak	-9.44	25.75	46.00	20.25
551.8600	27.15	peak	-4.10	23.05	46.00	22.95
768.1700	27.13	peak	-0.89	26.24	46.00	19.76

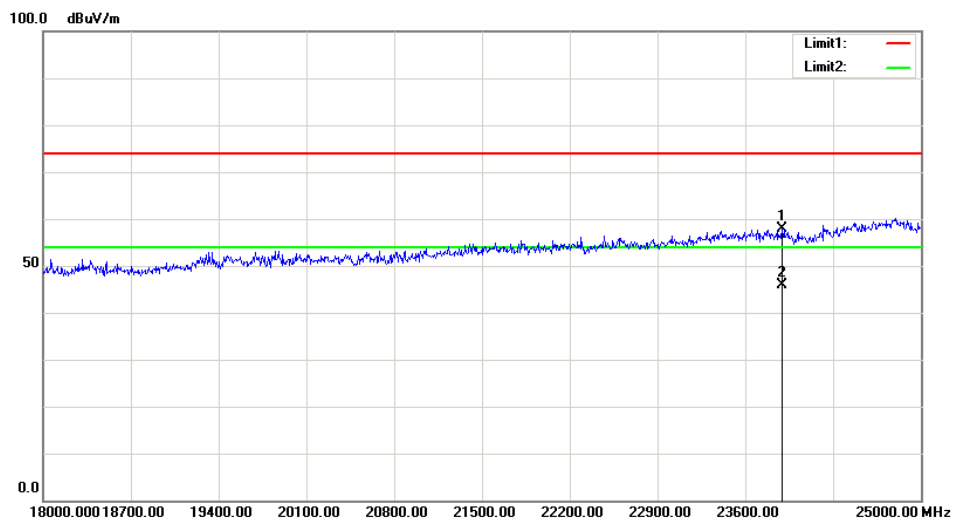
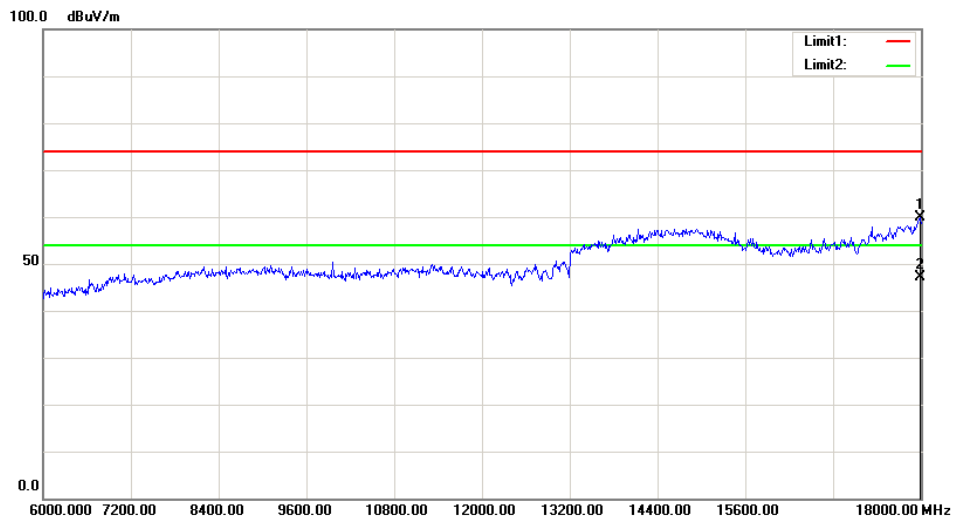
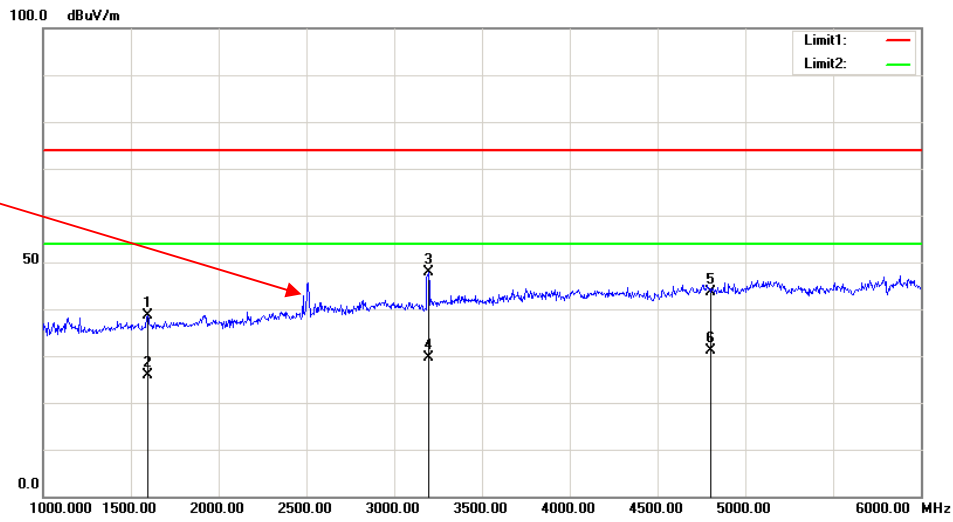
2)1GHz-25GHz:

BDR Mode (GFSK) was the worst

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Remark	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	58.22	PK	H	28.10	1.80	0.00	88.12	N/A	N/A
2402.00	48.06	AV	H	28.10	1.80	0.00	77.96	N/A	N/A
2402.00	58.02	PK	V	28.10	1.80	0.00	87.92	N/A	N/A
2402.00	48.12	AV	V	28.10	1.80	0.00	78.02	N/A	N/A
2390.00	26.81	PK	H	28.08	1.80	0.00	56.69	74.00	17.31
2390.00	12.94	AV	H	28.08	1.80	0.00	42.82	54.00	11.18
3195.00	52.15	PK	V	30.57	2.19	36.98	47.93	74.00	26.07
3195.00	34.16	AV	V	30.57	2.19	36.98	29.94	54.00	24.06
4804.00	45.12	PK	H	32.91	3.17	37.20	44.00	74.00	30.00
4804.00	32.69	AV	H	32.91	3.17	37.20	31.57	54.00	22.43
7206.00	43.70	PK	H	35.74	4.82	37.23	47.03	74.00	26.97
7206.00	31.05	AV	H	35.74	4.82	37.23	34.38	54.00	19.62
Middle Channel: 2441 MHz									
2441.00	59.62	PK	H	28.18	1.82	0.00	89.62	N/A	N/A
2441.00	49.73	AV	H	28.18	1.82	0.00	79.73	N/A	N/A
2441.00	59.39	PK	V	28.18	1.82	0.00	89.39	N/A	N/A
2441.00	49.43	AV	V	28.18	1.82	0.00	79.43	N/A	N/A
4882.00	46.59	PK	H	33.06	3.27	37.21	45.71	74.00	28.29
3195.00	52.26	PK	V	30.57	2.19	36.98	48.04	74.00	25.96
3195.00	34.28	AV	V	30.57	2.19	36.98	30.06	54.00	23.94
4882.00	32.67	AV	H	33.06	3.27	37.21	31.79	54.00	22.21
7323.00	43.94	PK	H	36.04	4.62	37.38	47.22	74.00	26.78
7323.00	31.27	AV	H	36.04	4.62	37.38	34.55	54.00	19.45
High Channel: 2480 MHz									
2480.00	61.12	PK	H	28.26	1.84	0.00	91.22	N/A	N/A
2480.00	51.23	AV	H	28.26	1.84	0.00	81.33	N/A	N/A
2480.00	60.30	PK	V	28.26	1.84	0.00	90.40	N/A	N/A
2480.00	50.44	AV	V	28.26	1.84	0.00	80.54	N/A	N/A
2483.50	27.61	PK	H	28.27	1.84	0.00	57.72	74.00	16.28
2483.50	15.06	AV	H	28.27	1.84	0.00	45.17	54.00	8.83
3195.00	52.35	PK	V	30.57	2.19	36.98	48.13	74.00	25.87
3195.00	34.52	AV	V	30.57	2.19	36.98	30.30	54.00	23.70
4960.00	46.85	PK	H	33.22	3.23	37.25	46.05	74.00	27.95
4960.00	33.94	AV	H	33.22	3.23	37.25	33.14	54.00	20.86
7440.00	44.06	PK	H	36.34	4.41	37.52	47.29	74.00	26.71
7440.00	31.49	AV	H	36.34	4.41	37.52	34.72	54.00	19.28

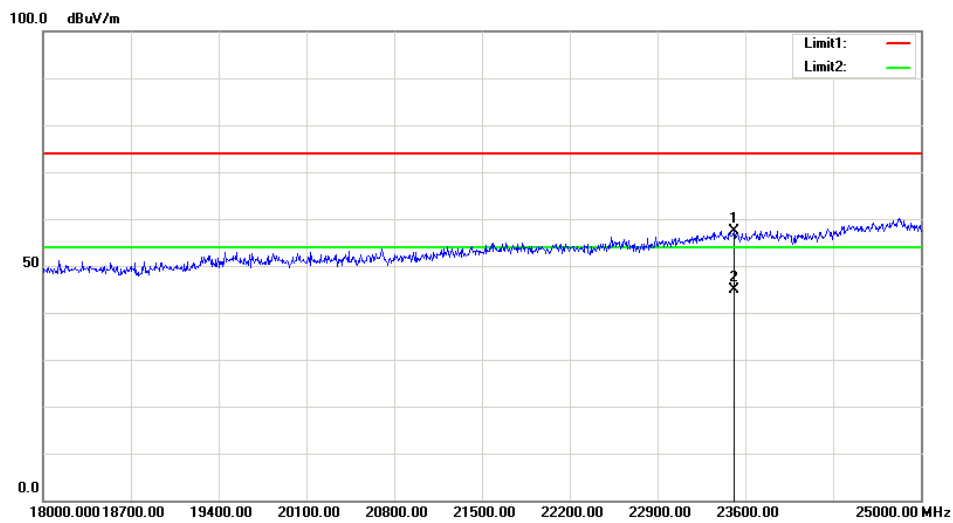
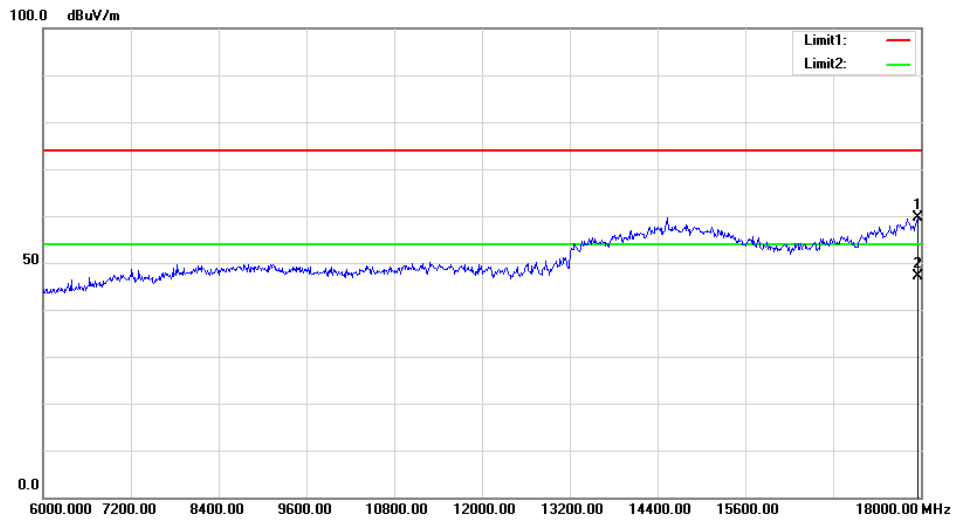
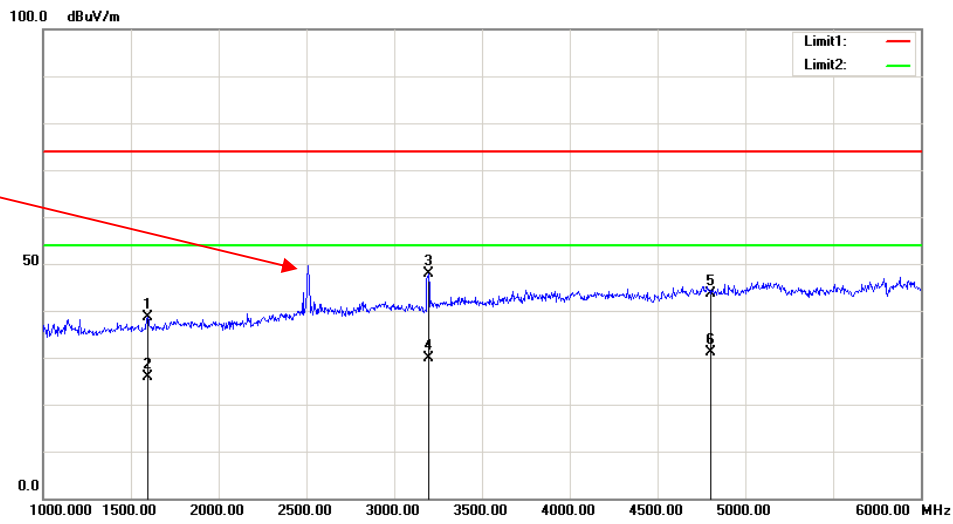
Worst plots (GFSK High channel was the worst)
Horizontal

Fundamental Test with Band Rejection Filter



Vertical

Fundamental Test with Band Rejection Filter



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

Applicable Standard

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	FSU 26	200256	2019-01-04	2020-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A

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

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	26.4 °C
Relative Humidity:	54 %
ATM Pressure:	101.1 kPa

The testing was performed by Blake Yang on 2019-05-30

Test Result: Compliance.

Please refer to following tables and plots

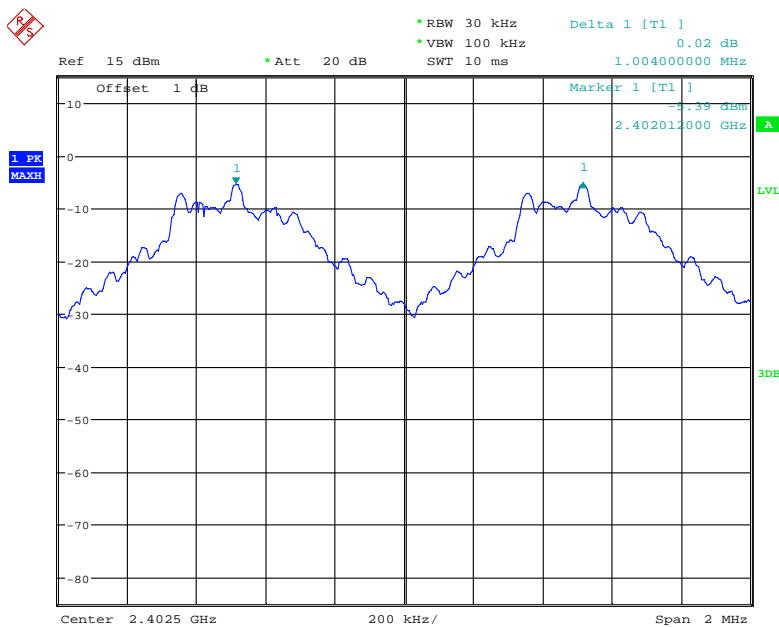
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	1.004	0.51
	Middle	2441	1.000	0.51
	High	2480	1.000	0.51
EDR ($\pi/4$ -DQPSK)	Low	2402	1.004	0.78
	Middle	2441	1.000	0.78
	High	2480	1.000	0.78

Note: Limit = $(2/3) \times 20\text{dB bandwidth}$

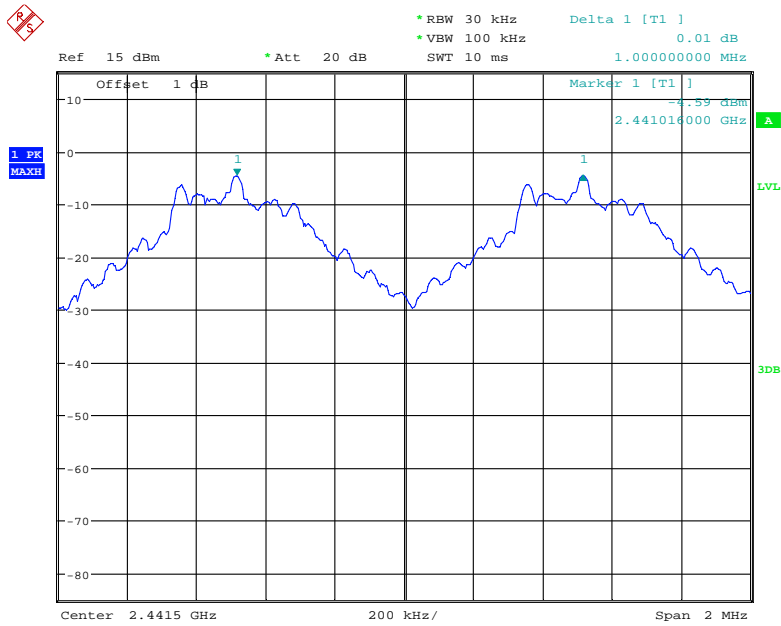
BDR Mode (GFSK):

Low Channel



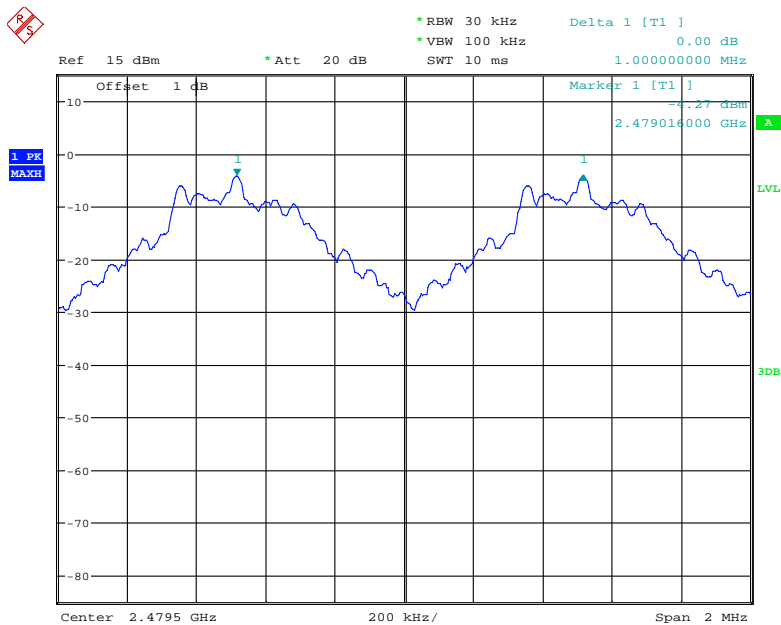
Date: 30.MAY.2019 09:33:11

Middle Channel



Date: 30.MAY.2019 09:36:51

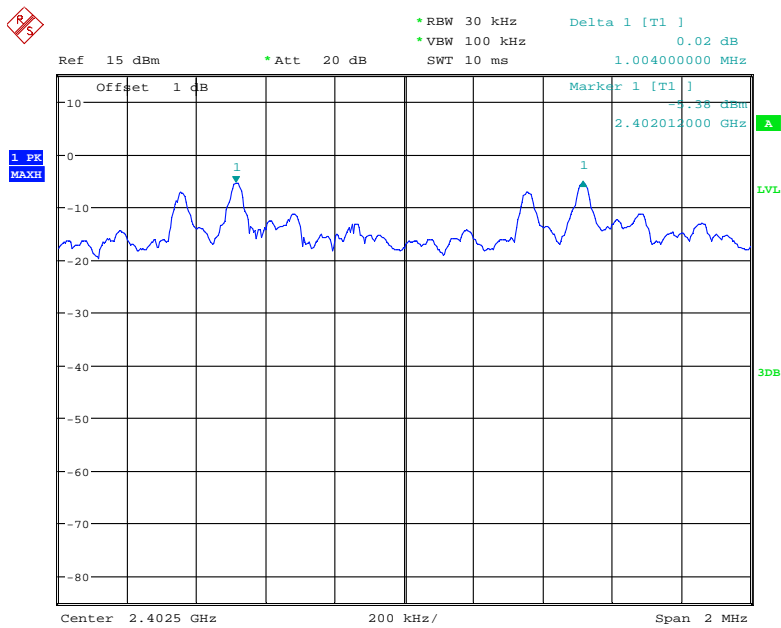
High Channel



Date: 30.MAY.2019 09:37:40

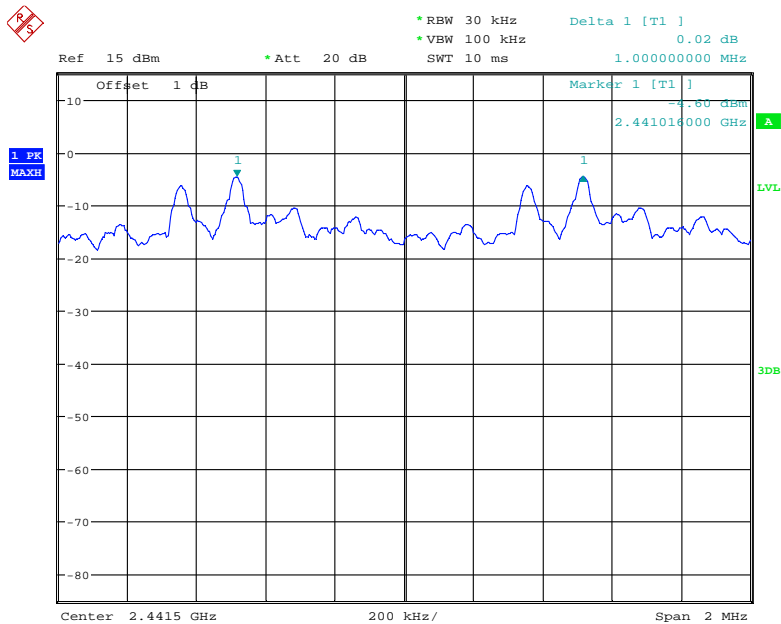
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



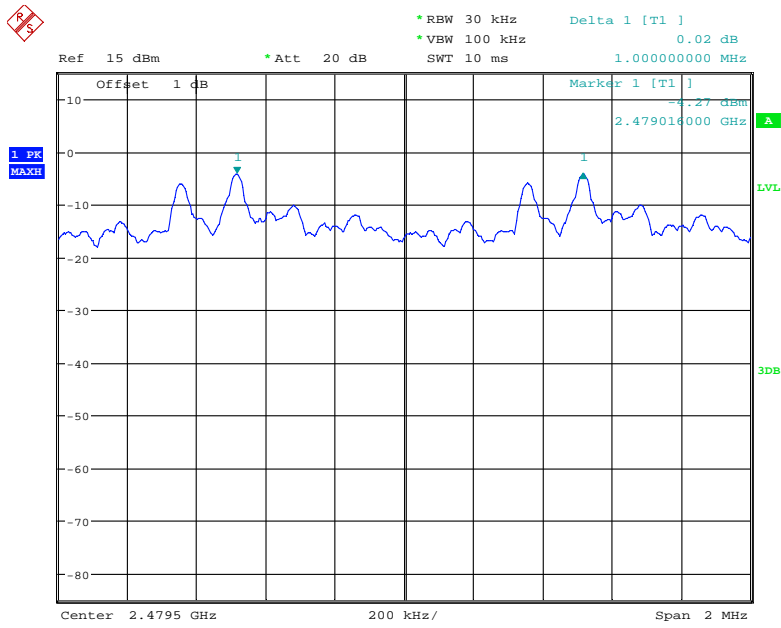
Date: 30.MAY.2019 09:30:35

Middle Channel



Date: 30.MAY.2019 09:31:35

High Channel



Date: 30.MAY.2019 09:32:16

FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING

Applicable Standard

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

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. 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	FSU 26	200256	2019-01-04	2020-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	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:	26.4 °C
Relative Humidity:	54 %
ATM Pressure:	101.1 kPa

The testing was performed by Blake Yang on 2019-05-30

Test Result: Compliance.

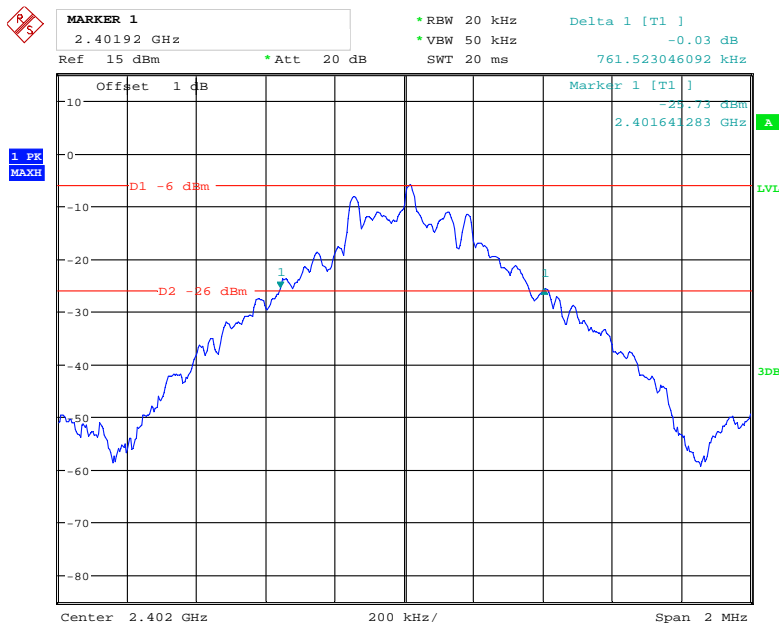
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.762
	Middle	2441	0.762
	High	2480	0.766
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.174
	Middle	2441	1.174
	High	2480	1.174

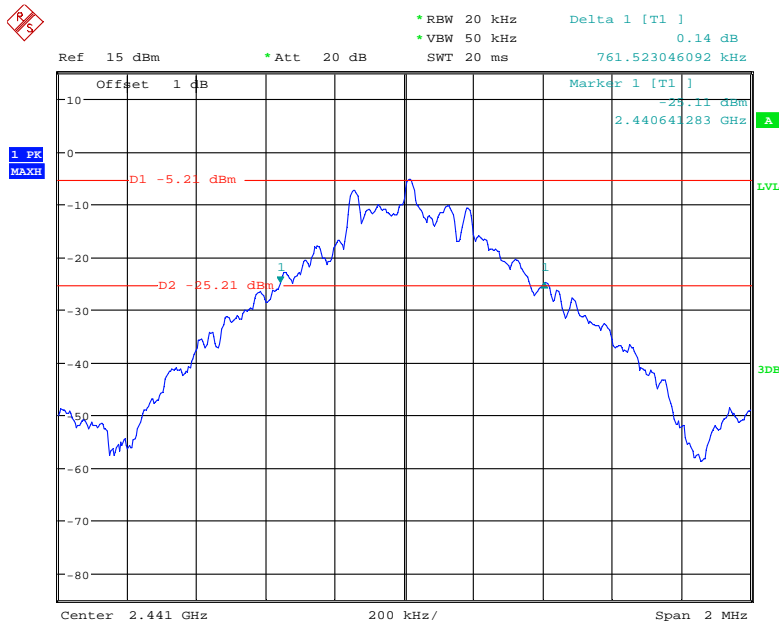
BDR Mode (GFSK):

Low Channel



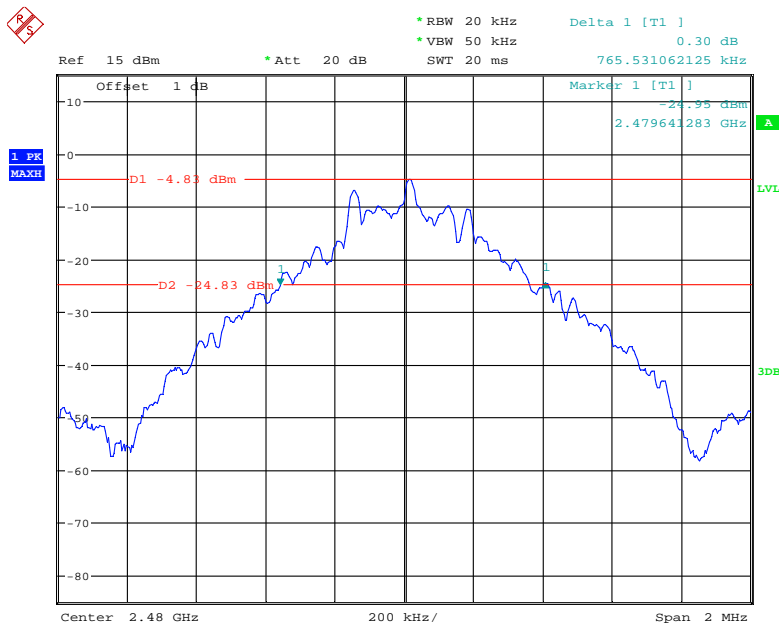
Date: 30.MAY.2019 09:21:28

Middle Channel



Date: 30.MAY.2019 09:22:53

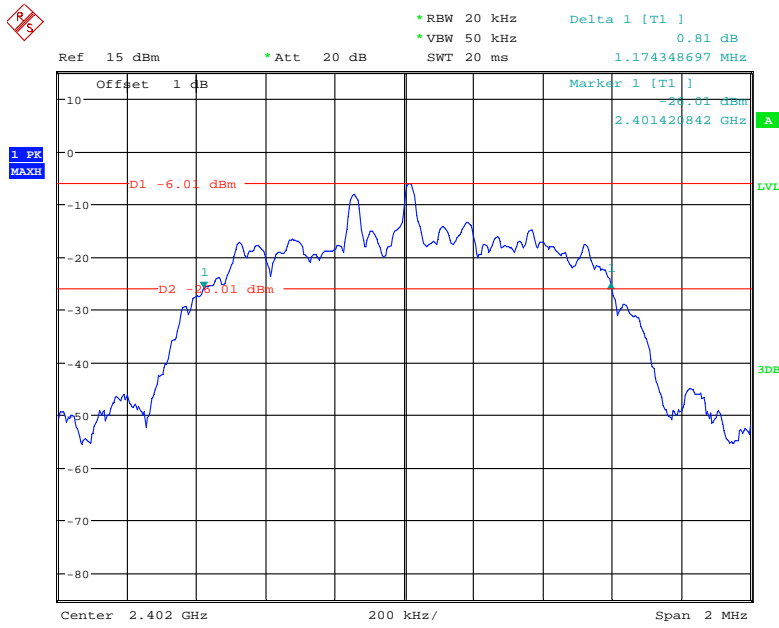
High Channel



Date: 30.MAY.2019 09:23:52

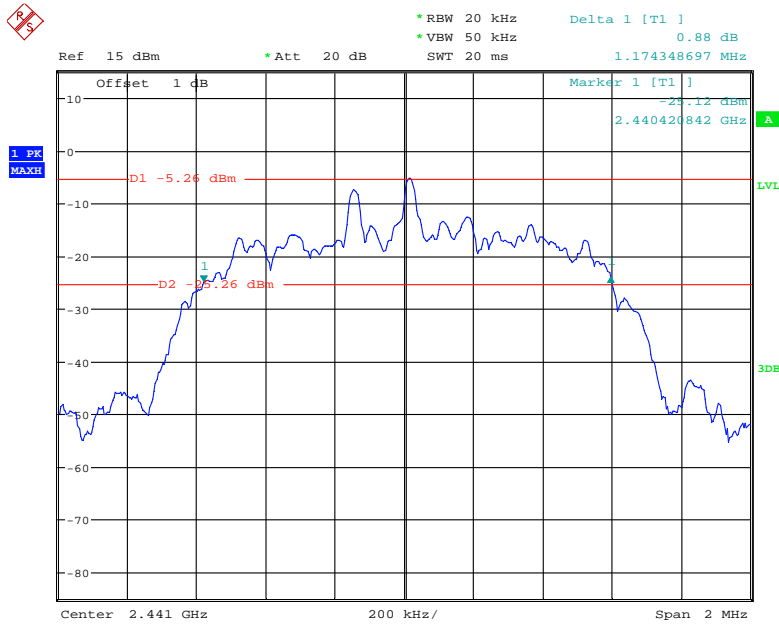
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



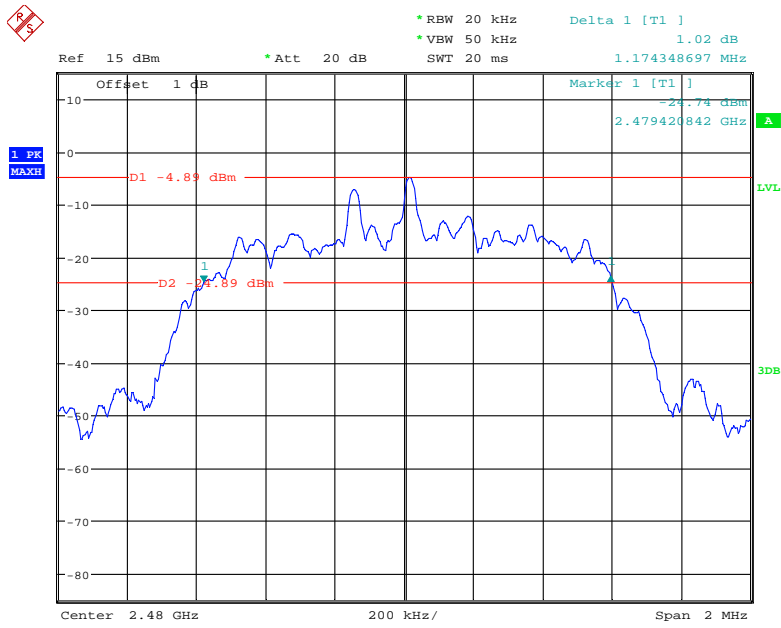
Date: 30.MAY.2019 09:27:05

Middle Channel



Date: 30.MAY.2019 09:28:39

High Channel



Date: 30.MAY.2019 09:25:17

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

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

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	FSU 26	200256	2019-01-04	2020-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	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:	26.4 °C
Relative Humidity:	54 %
ATM Pressure:	101.1 kPa

The testing was performed by Blake Yang on 2019-05-30

Test Result: Compliance.

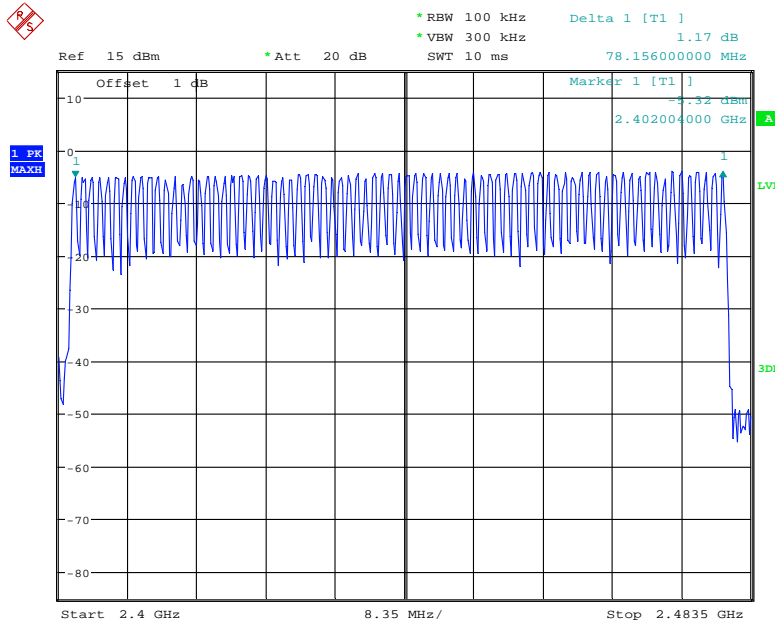
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Number of Hopping Channels

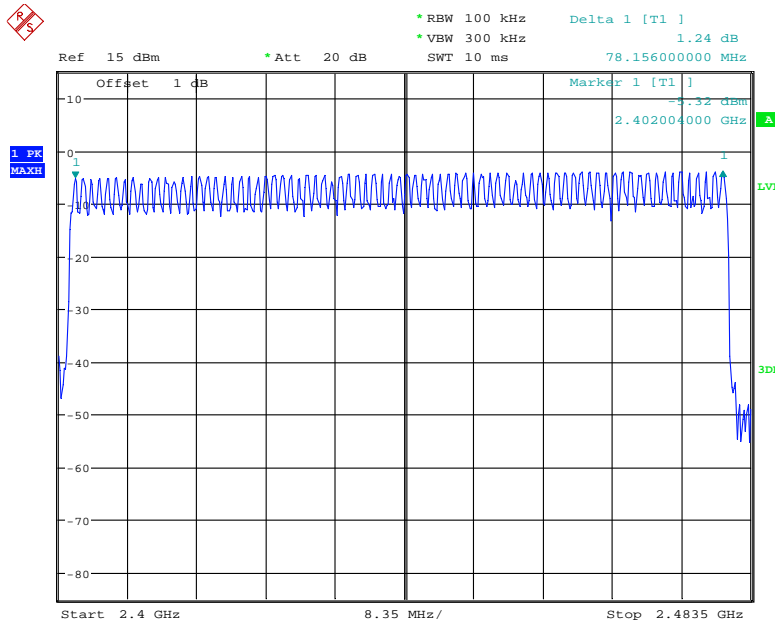


Date: 30.MAY.2019 09:39:30

EDR Mode ($\pi/4$ -DQPSK):

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥ 15

Number of Hopping Channels



Date: 30.MAY.2019 09:42:07

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

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

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	Spectrum Analyzer	FSU 26	200256	2019-01-04	2020-01-04
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:	26.4 °C
Relative Humidity:	54 %
ATM Pressure:	101.1 kPa

The testing was performed by Blake Yang on 2019-05-30

Test Result: Compliance.

Please refer to following tables and plots

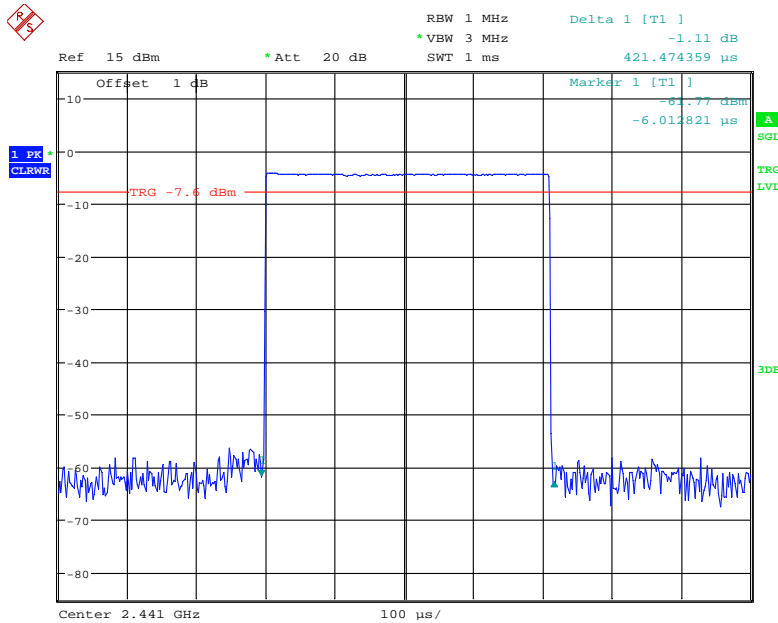
Test Mode: Transmitting

Mode	Packet type	Channel	Frequency (MHz)	Pulse width (ms)	Result (s)	Limit (s)
GFSK	DH1	Middle	2441	0.421	0.135	0.4
	DH3	Middle	2441	1.684	0.269	
	DH5	Middle	2441	2.960	0.316	
π/4-DQPSK	2DH1	Middle	2441	0.429	0.137	
	2DH3	Middle	2441	1.694	0.271	
	2DH5	Middle	2441	2.960	0.316	

Note:
 DH1/2DH1:Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s
 DH3/2DH3:Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s
 DH5/2DH5:Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s

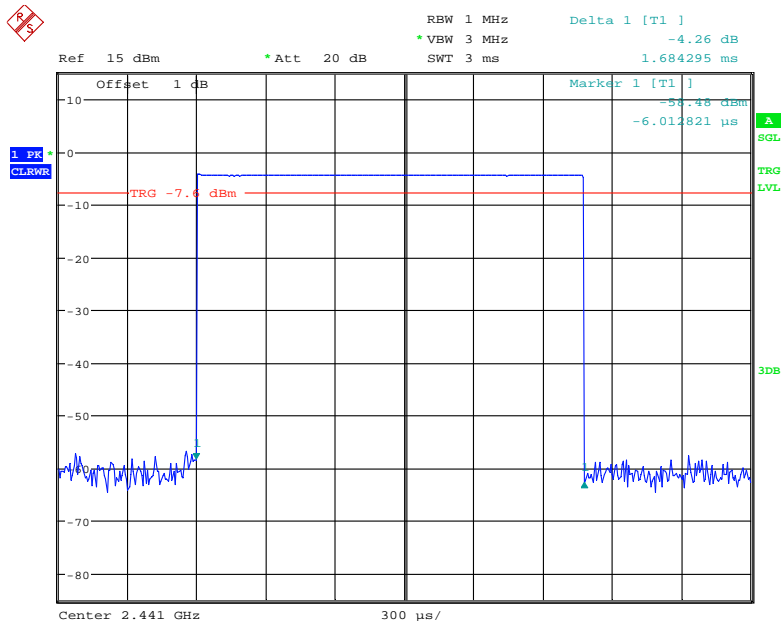
BDR Mode (GFSK):

DH1: Middle Channel



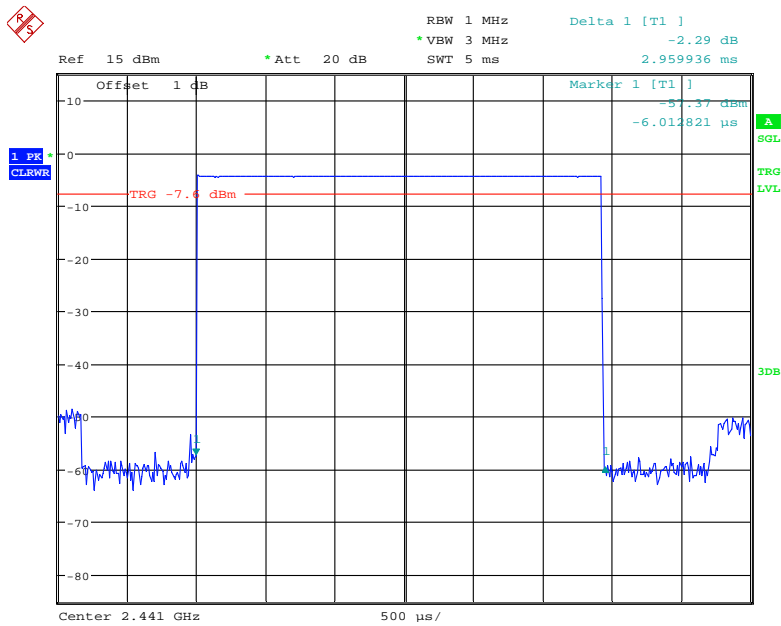
Date: 30.MAY.2019 09:52:38

DH3: Middle Channel



Date: 30.MAY.2019 09:53:41

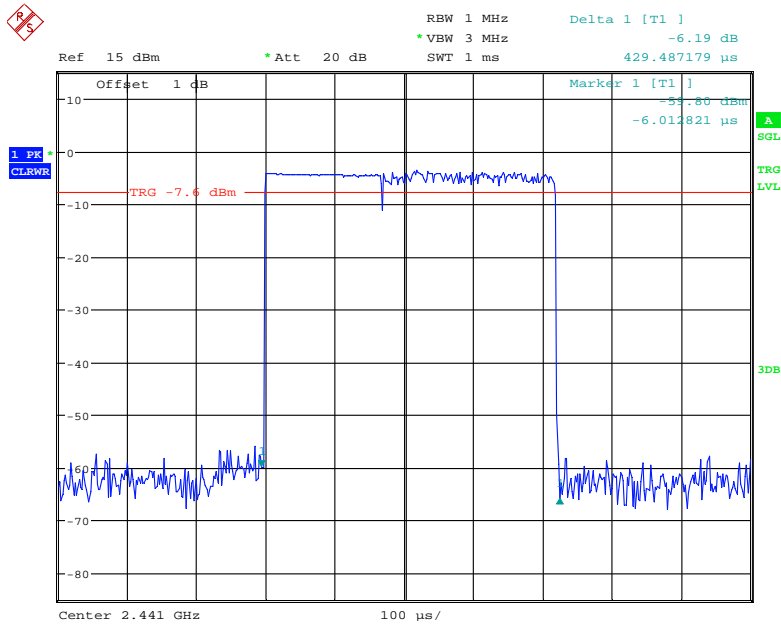
DH5: Middle Channel



Date: 30.MAY.2019 09:54:32

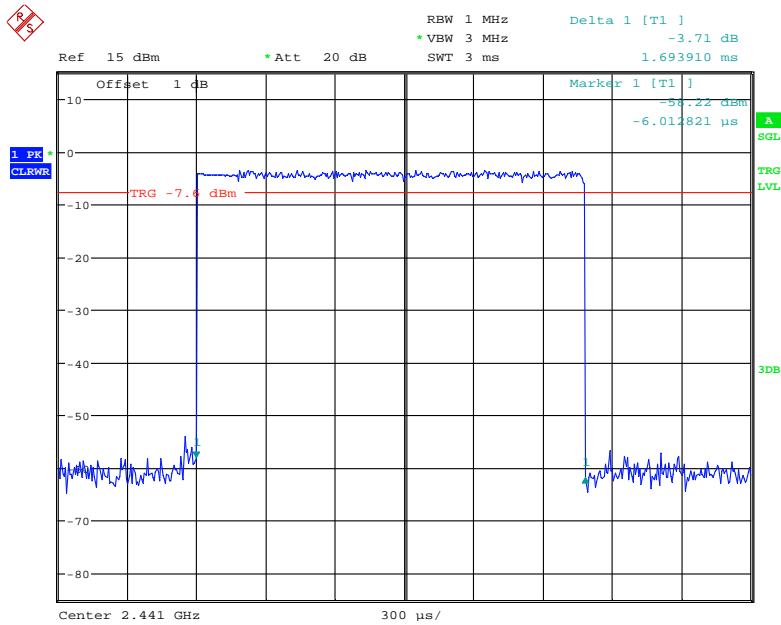
EDR Mode ($\pi/4$ -DQPSK):

2DH1: Middle Channel



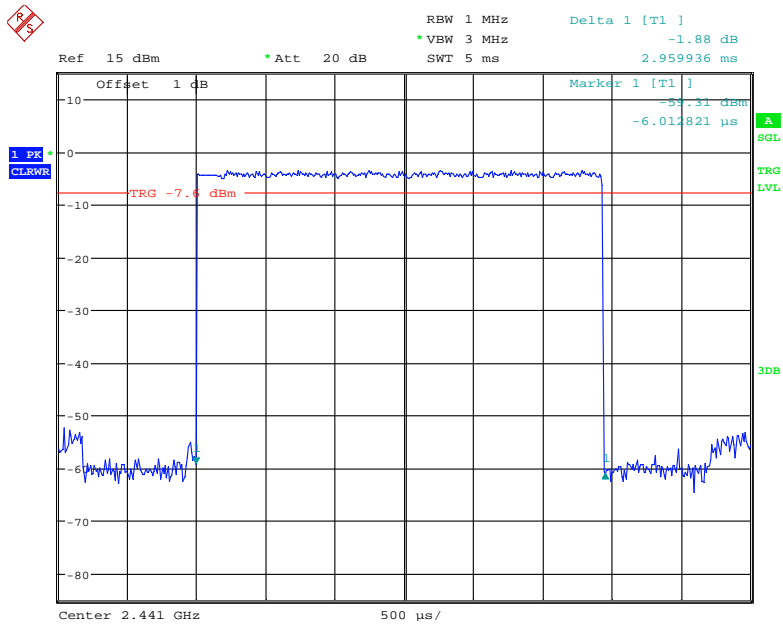
Date: 30.MAY.2019 09:53:00

2DH3: Middle Channel



Date: 30.MAY.2019 09:53:55

2DH5: Middle Channel



Date: 30.MAY.2019 09:54:45

FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts

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	C0010/01	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:	26.4 °C
Relative Humidity:	54 %
ATM Pressure:	101.1 kPa

The testing was performed by Blake Yang on 2019-05-30

Test Result: Compliance.

Test Mode: Transmitting

Mode	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	-4.91	21
	2441	-4.09	21
	2480	-3.73	21
EDR Mode ($\pi/4$ -DQPSK)	2402	-3.73	21
	2441	-2.98	21
	2480	-2.59	21

Note: The data above was tested in conducted mode.

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2019-01-04	2020-01-04
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	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:	26.4 °C
Relative Humidity:	54 %
ATM Pressure:	101.1 kPa

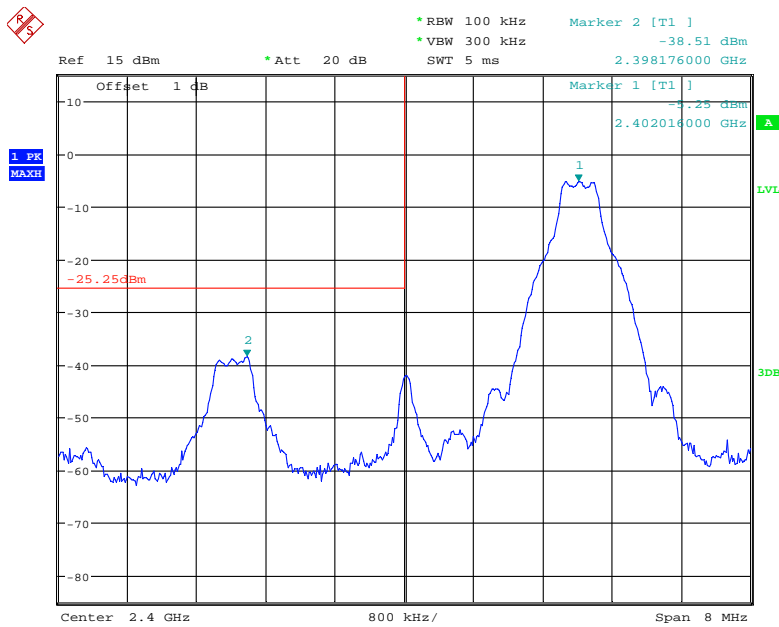
The testing was performed by Blake Yang on 2019-05-30

Test Result: Compliance

Single Channel:

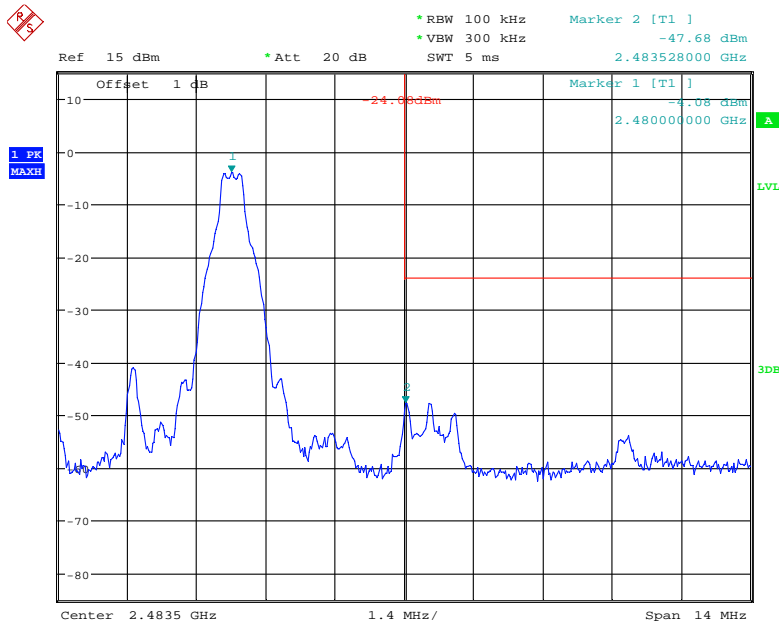
BDR Mode (GFSK):

Band Edge, Left Side



Date: 30.MAY.2019 09:22:20

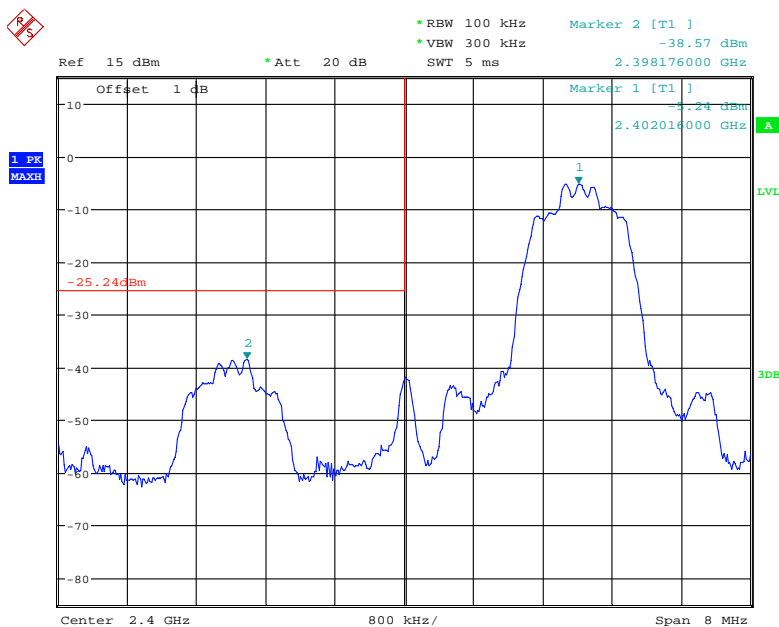
Band Edge, Right Side



Date: 30.MAY.2019 09:24:50

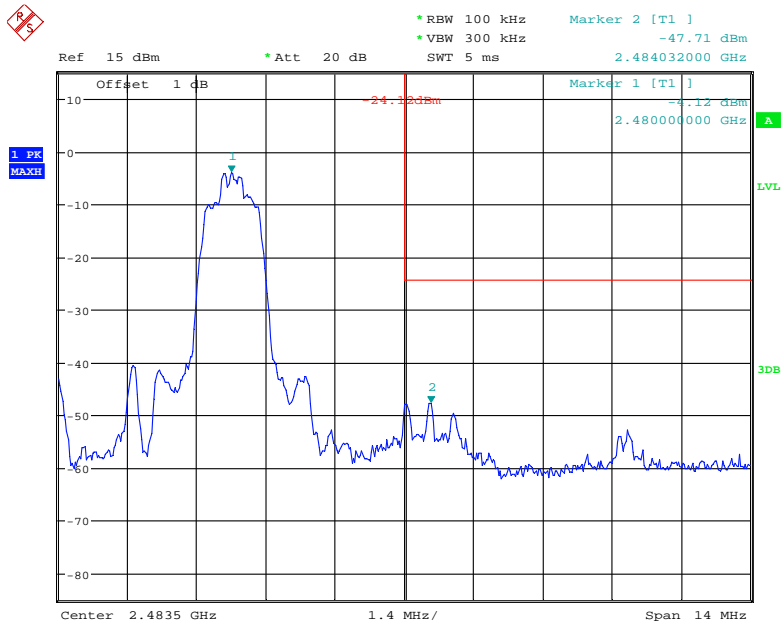
EDR Mode ($\pi/4$ -DQPSK):

Band Edge, Left Side



Date: 30.MAY.2019 09:28:10

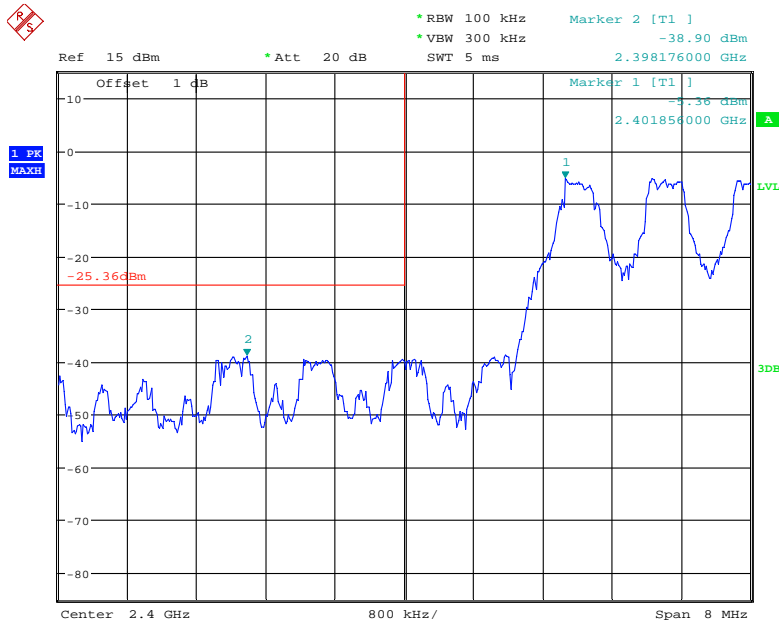
Band Edge, Right Side



Date: 30.MAY.2019 09:26:30

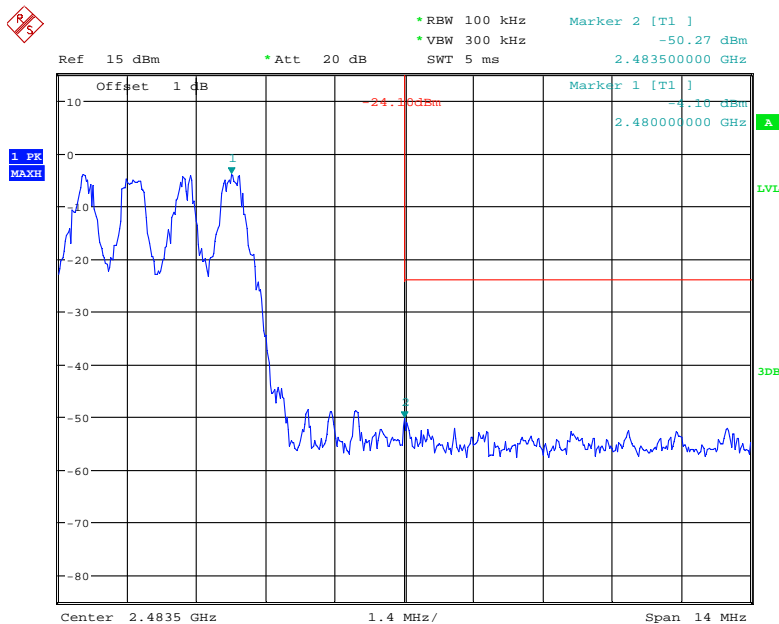
Hopping Mode,
BDR Mode (GFSK):

Band Edge, Left Side



Date: 30.MAY.2019 09:43:48

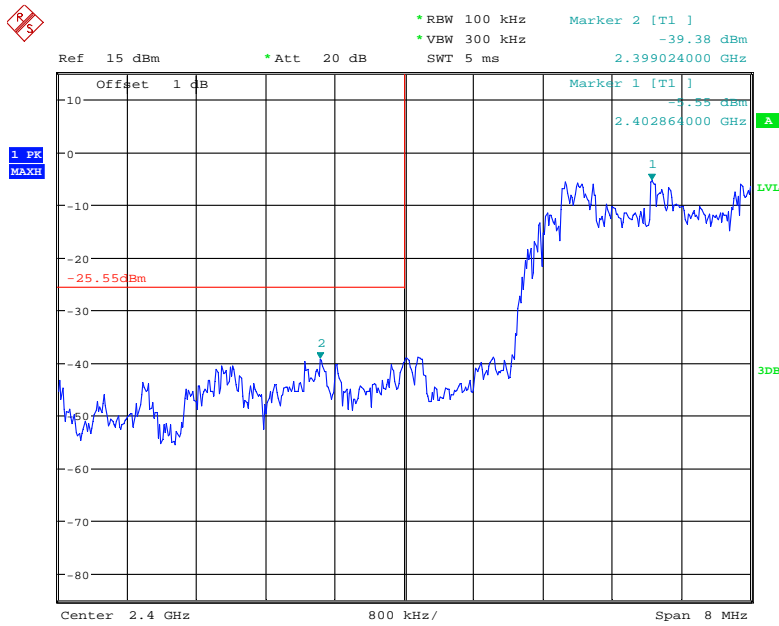
Band Edge, Right Side



Date: 30.MAY.2019 09:45:28

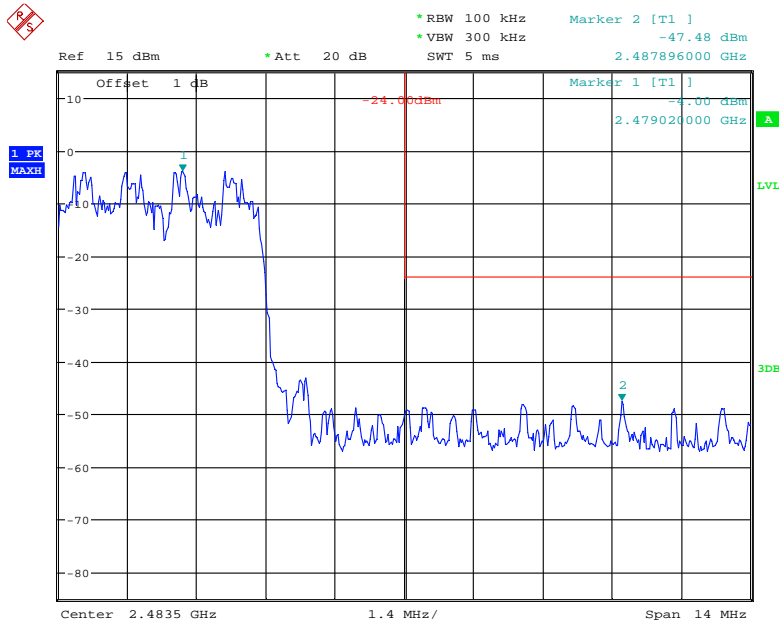
EDR Mode ($\pi/4$ -DQPSK):

Band Edge, Left Side



Date: 30.MAY.2019 14:25:52

Band Edge, Right Side



Date: 30.MAY.2019 14:27:53

**** END OF REPORT ****