



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 15.247 TEST REPORT

For

Kichler Lighting

7711 East Pleasant Valley Road, Cleveland, Ohio, United States 44131

FCC ID: YNE-49679

Report Type: Original Report	Product Name: Portable Lantern
Report Number: RDG180201050-00B	
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TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	4
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
EQUIPMENT MODIFICATIONS	6
SUPPORT CABLE LIST AND DETAILS	6
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS	7
FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE.....	8
APPLICABLE STANDARD	8
FCC §15.203 - ANTENNA REQUIREMENT.....	9
APPLICABLE STANDARD	9
ANTENNA CONNECTOR CONSTRUCTION	9
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	10
APPLICABLE STANDARD	10
EUT SETUP	10
EMI TEST RECEIVER SETUP.....	10
TEST PROCEDURE	10
CORRECTED AMPLITUDE & MARGIN CALCULATION	11
TEST EQUIPMENT LIST AND DETAILS.....	11
TEST DATA	11
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	14
APPLICABLE STANDARD	14
EUT SETUP	14
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	15
TEST PROCEDURE	15
TEST EQUIPMENT LIST AND DETAILS.....	15
CORRECTED AMPLITUDE & MARGIN CALCULATION	16
TEST DATA	16
FCC §15.247(a) (1) - CHANNEL SEPARATION TEST	24
APPLICABLE STANDARD	24
TEST EQUIPMENT LIST AND DETAILS.....	24
TEST PROCEDURE	24
TEST DATA	24
FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING.....	30
APPLICABLE STANDARD	30
TEST PROCEDURE	30
TEST EQUIPMENT LIST AND DETAILS.....	30

TEST DATA	30
FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST	36
APPLICABLE STANDARD	36
TEST PROCEDURE	36
TEST EQUIPMENT LIST AND DETAILS.....	36
TEST DATA	36
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....	40
APPLICABLE STANDARD	40
TEST PROCEDURE	40
TEST EQUIPMENT LIST AND DETAILS.....	40
TEST DATA	40
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT	56
APPLICABLE STANDARD	56
TEST PROCEDURE	56
TEST EQUIPMENT LIST AND DETAILS.....	56
TEST DATA	56
FCC §15.247(d) - BAND EDGES TESTING	58
APPLICABLE STANDARD	58
TEST PROCEDURE	58
TEST EQUIPMENT LIST AND DETAILS.....	58
TEST DATA	59

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Portable Lantern
EUT Model:		49679WHRLED(CP182083)
FCC ID:		YNE-49679
Rated Input Voltage:		DC 5V from adapter or DC3.7V form battery
Adapter Information	Model:	HB20-0503004SPA
	Input:	AC 100-240V~ 50/60Hz 0.5A
	Output:	DC 5V , 3000mA
External Dimension:		Length (50 cm)*Width (15 cm)*High (15 cm)
Serial Number:		180201050
EUT Received Date:		2018.01.22

Objective

This report is prepared on behalf of *Kichler Lighting* 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)

FCC Part 15C DTS submissions with FCC ID: YNE-49679.

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
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 system was configured for testing in engineering mode by test software: 'Bluetooth MP Tool.exe'.

EUT Exercise Software

The test software 'Bluetooth MP Tool.exe' configured the maximum power level as below setting:

Test Software Version	Bluetooth MP Tool.exe		
Test Frequency	2402MHz	2441MHz	2480MHz
GFSK	7	7	7
$\pi/4$ -DQPSK	7	7	7
8DPSK	7	7	7

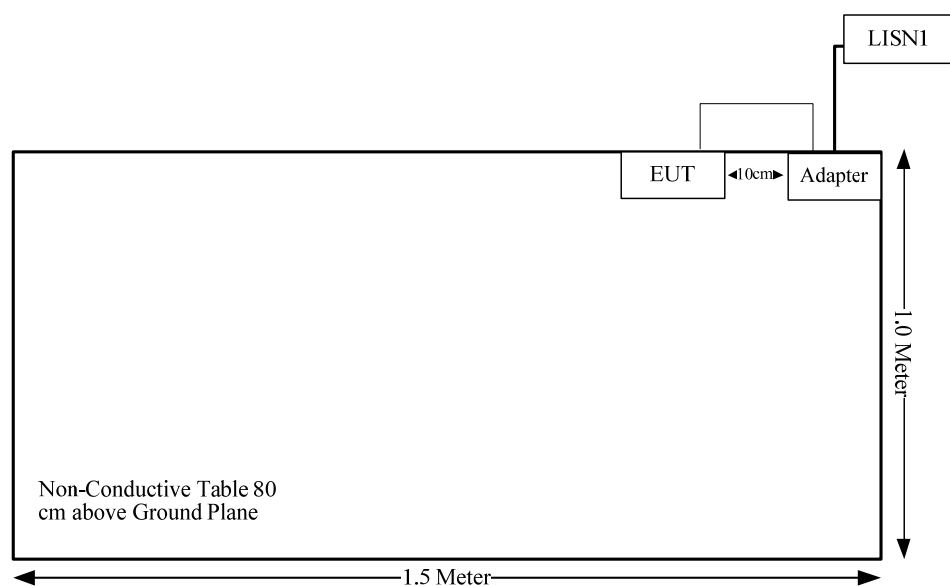
Equipment Modifications

No modification was made to the EUT.

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
DC Cable	No	No	1.6	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	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 & §2.1093- 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 KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}]$
 ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

The max conducted power including tune-up tolerance is -6 dBm (0.25 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$
 $= 0.25/5 \cdot (\sqrt{2.480}) = 0.1 < 3.0$

So the stand-alone SAR evaluation is not necessary.

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 PCB antenna arrangement for BT, and the antenna gain is 1.2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

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	ESCS 30	830245/006	2017-12-11	2018-12-11
N/A	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-9-5	2018-9-5
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2017-12-8	2018-12-8
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-09-25	2018-9-25

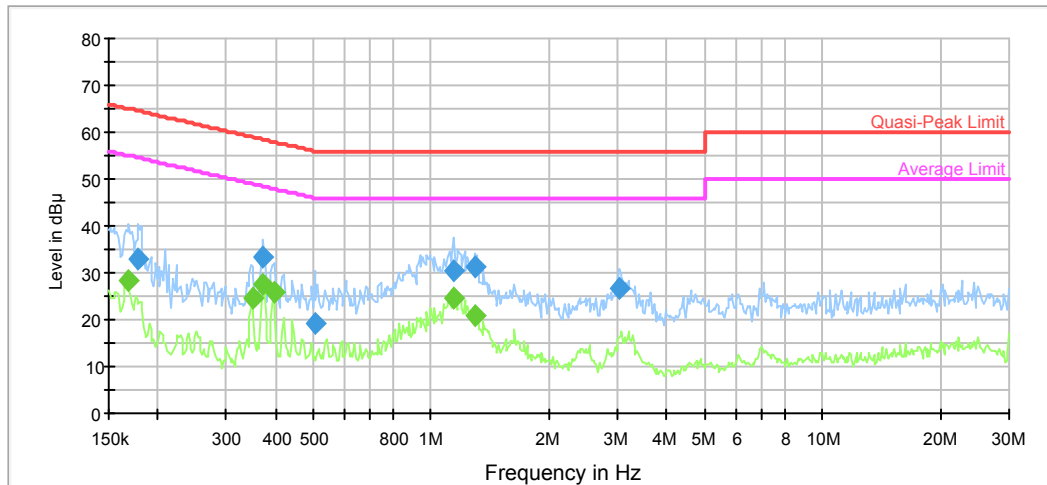
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

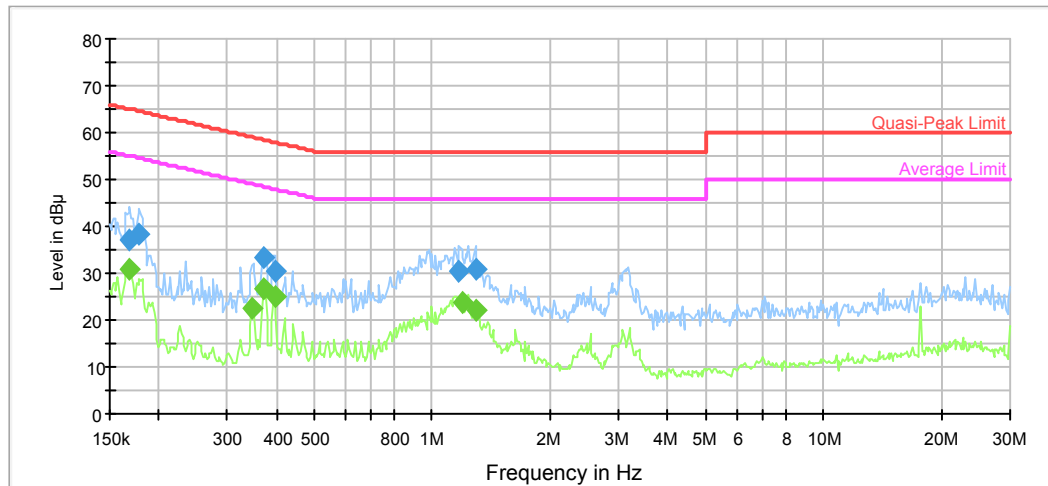
Temperature:	18.5 °C
Relative Humidity:	26 %
ATM Pressure:	101.3 kPa

The testing was performed by Jim Zhang on 2018-02-05.

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

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.178741	32.8	9.000	L1	10.8	31.7	64.5	Compliance
0.372042	33.4	9.000	L1	10.0	25.1	58.5	Compliance
0.503608	19.3	9.000	L1	9.9	36.7	56.0	Compliance
1.144267	30.6	9.000	L1	9.8	25.4	56.0	Compliance
1.289541	31.2	9.000	L1	9.8	24.8	56.0	Compliance
3.024908	26.6	9.000	L1	9.8	29.4	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.167702	28.4	9.000	L1	10.9	26.7	55.1	Compliance
0.349066	24.7	9.000	L1	10.0	24.3	49.0	Compliance
0.372042	27.4	9.000	L1	10.0	21.1	48.5	Compliance
0.396530	25.7	9.000	L1	10.0	22.2	47.9	Compliance
1.144267	24.6	9.000	L1	9.8	21.4	46.0	Compliance
1.289541	20.9	9.000	L1	9.8	25.1	46.0	Compliance

AC120V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.169044	37.1	9.000	N	10.9	27.9	65.0	Compliance
0.178741	38.5	9.000	N	10.8	26.0	64.5	Compliance
0.372042	33.2	9.000	N	10.0	25.3	58.5	Compliance
0.396530	30.4	9.000	N	10.0	27.5	57.9	Compliance
1.171949	30.3	9.000	N	9.8	25.7	56.0	Compliance
1.289541	30.9	9.000	N	9.8	25.1	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.169044	31.0	9.000	N	10.9	24.0	55.0	Compliance
0.346296	22.7	9.000	N	10.0	26.4	49.1	Compliance
0.372042	26.6	9.000	N	10.0	21.9	48.5	Compliance
0.396530	24.8	9.000	N	10.0	23.1	47.9	Compliance
1.190776	23.9	9.000	N	9.8	22.1	46.0	Compliance
1.289541	22.1	9.000	N	9.8	23.9	46.0	Compliance

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 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.

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.

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
R&S	EMI Test Receiver	ESCI	100035	2017-8-4	2018-8-4
Sunol Sciences	Antenna	JB3	A060611-3	2017-7-21	2019-7-21
HP	Amplifier	8447F	2443A01912	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-0400-02	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-0075-02	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-2200-01	2017-9-5	2018-9-5
Agilent	Spectrum Analyzer	E4440A	SG43360054	2017-12-8	2018-12-8
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-5	2019-1-4
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-5	2018-9-5
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-02 1304	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-6-27	2018-6-27
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-9-5	2018-9-5
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

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

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:

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

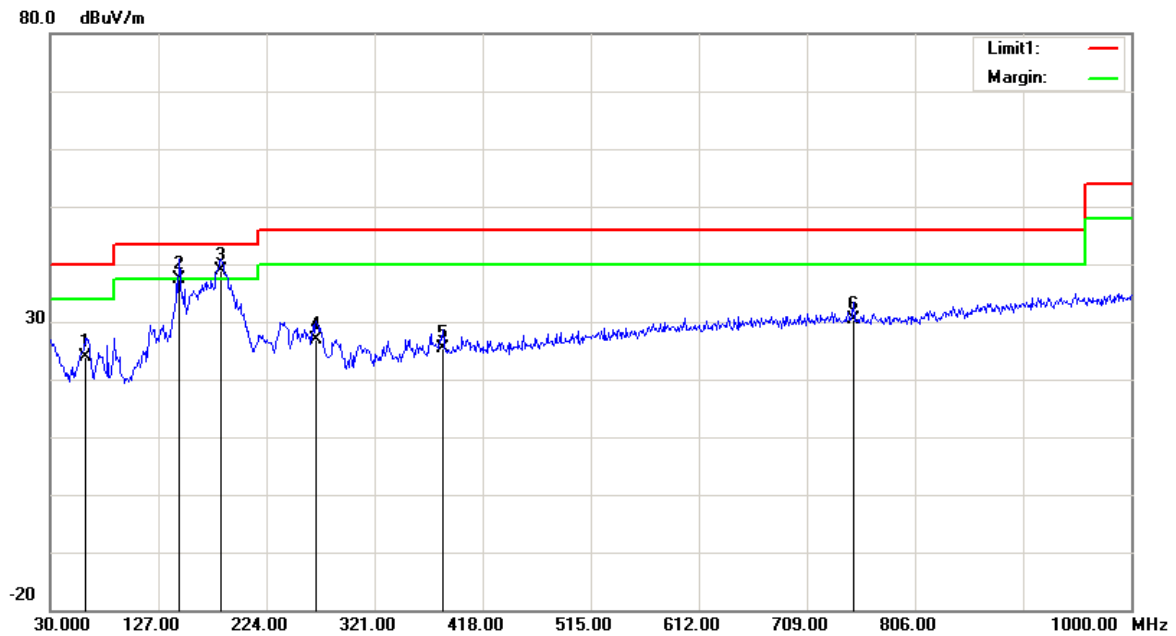
Test Data

Environmental Conditions

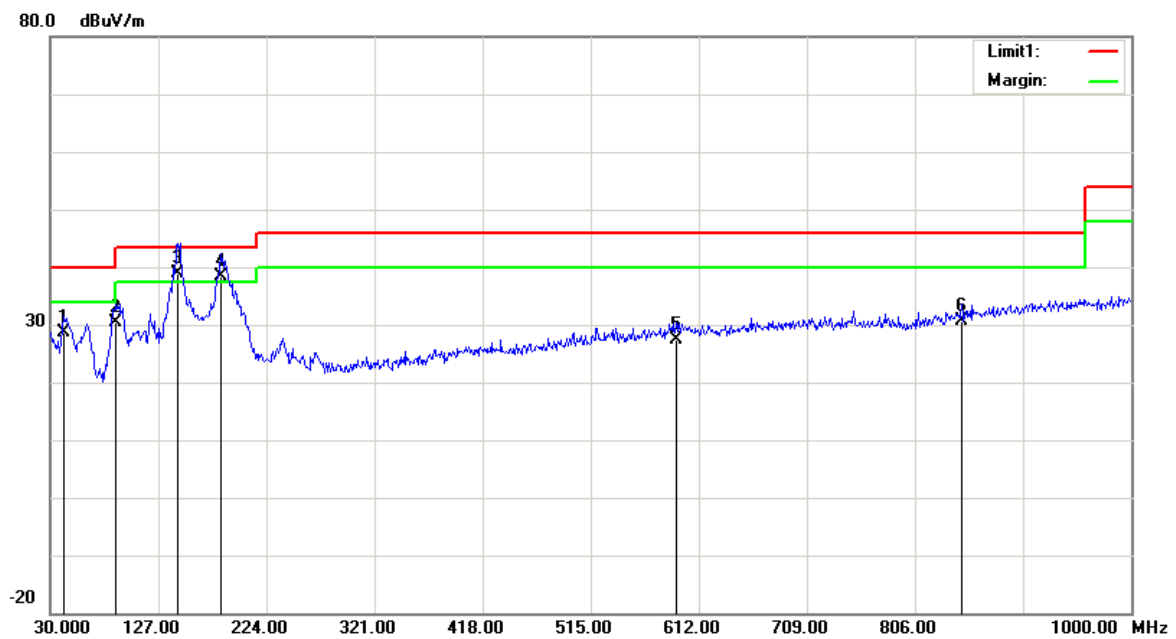
Temperature:	15.2~24.1 °C
Relative Humidity:	41~50 %
ATM Pressure:	100.8~101.3 kPa

The testing was performed by Steven Zuo & Vern Shen from 2018-01-23 to 2018-02-05

Test Mode: Transmitting

1) 30MHz-1GHz(GFSK Low channel was the worst)**Horizontal:**

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
61.0400	37.90	QP	-13.90	24.00	40.00	16.00
145.4300	44.09	QP	-6.59	37.50	43.50	6.00
183.2600	46.30	QP	-7.50	38.80	43.50	4.70
268.6200	32.97	QP	-5.97	27.00	46.00	19.00
382.1100	27.97	QP	-2.47	25.50	46.00	20.50
750.7100	24.74	QP	5.56	30.30	46.00	15.70

Vertical:

Frequency (MHz)	Receiver Reading (dB μ V)	Detector	Correction Factor (dB/m)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
42.6100	37.02	QP	-8.32	28.70	40.00	11.30
89.1700	43.02	QP	-12.52	30.50	43.50	13.00
144.4600	45.57	QP	-6.57	39.00	43.50	4.50
183.2600	45.80	QP	-7.50	38.30	43.50	5.20
591.6300	24.31	QP	2.99	27.30	46.00	18.70
847.7100	23.72	QP	6.88	30.60	46.00	15.40

2) 1GHz-25GHz:*BDR Mode (GFSK):*

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	58.16	PK	H	28.10	1.80	0.00	88.06	N/A	N/A
2402.00	56.42	AV	H	28.10	1.80	0.00	86.32	N/A	N/A
2402.00	54.69	PK	V	28.10	1.80	0.00	84.59	N/A	N/A
2402.00	52.38	AV	V	28.10	1.80	0.00	82.28	N/A	N/A
2390.00	25.84	PK	H	28.08	1.80	0.00	55.72	74.00	18.28
2390.00	13.67	AV	H	28.08	1.80	0.00	43.55	54.00	10.45
4804.00	56.28	PK	H	32.91	3.17	37.20	55.16	74.00	18.84
4804.00	51.05	AV	H	32.91	3.17	37.20	49.93	54.00	4.07
7206.00	46.63	PK	H	35.74	4.82	37.23	49.96	74.00	24.04
7206.00	35.37	AV	H	35.74	4.82	37.23	38.70	54.00	15.30
Middle Channel: 2441 MHz									
2441.00	59.48	PK	H	28.18	1.82	0.00	89.48	N/A	N/A
2441.00	57.37	AV	H	28.18	1.82	0.00	87.37	N/A	N/A
2441.00	56.05	PK	V	28.18	1.82	0.00	86.05	N/A	N/A
2441.00	54.54	AV	V	28.18	1.82	0.00	84.54	N/A	N/A
4882.00	53.79	PK	H	33.06	3.27	37.21	52.91	74.00	21.09
4882.00	49.22	AV	H	33.06	3.27	37.21	48.34	54.00	5.66
7323.00	45.42	PK	H	36.04	4.62	37.38	48.70	74.00	25.30
7323.00	35.28	AV	H	36.04	4.62	37.38	38.56	54.00	15.44
High Channel: 2480 MHz									
2480.00	57.85	PK	H	28.26	1.84	0.00	87.95	N/A	N/A
2480.00	55.46	AV	H	28.26	1.84	0.00	85.56	N/A	N/A
2480.00	54.95	PK	V	28.26	1.84	0.00	85.05	N/A	N/A
2480.00	52.48	AV	V	28.26	1.84	0.00	82.58	N/A	N/A
2483.50	26.75	PK	H	28.27	1.84	0.00	56.86	74.00	17.14
2483.50	13.56	AV	H	28.27	1.84	0.00	43.67	54.00	10.33
4960.00	50.14	PK	H	33.22	3.23	37.25	49.34	74.00	24.66
4960.00	46.58	AV	H	33.22	3.23	37.25	45.78	54.00	8.22
7440.00	46.27	PK	H	36.34	4.41	37.52	49.50	74.00	24.50
7440.00	34.86	AV	H	36.34	4.41	37.52	38.09	54.00	15.91

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

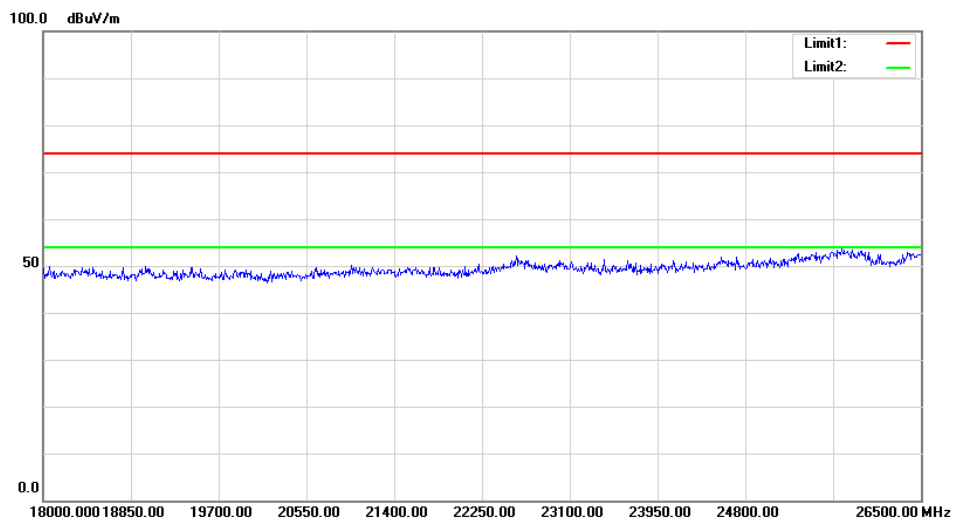
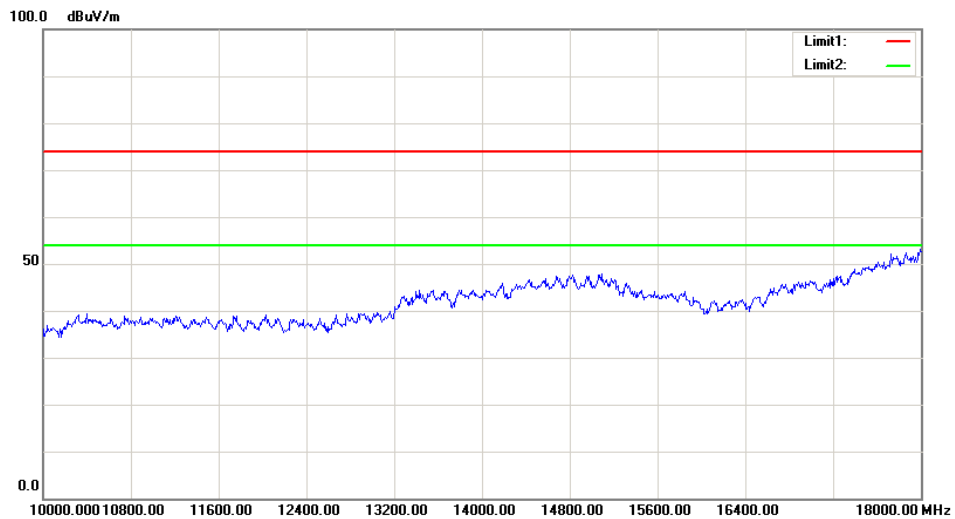
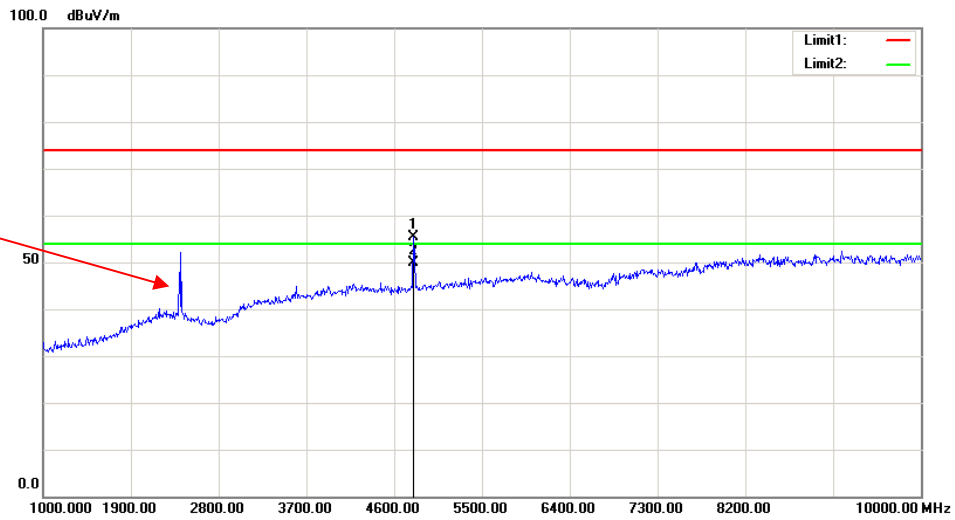
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	58.33	PK	H	28.10	1.80	0.00	88.23	N/A	N/A
2402.00	53.42	AV	H	28.10	1.80	0.00	83.32	N/A	N/A
2402.00	55.18	PK	V	28.10	1.80	0.00	85.08	N/A	N/A
2402.00	50.22	AV	V	28.10	1.80	0.00	80.12	N/A	N/A
2390.00	25.29	PK	H	28.08	1.80	0.00	55.17	74.00	18.83
2390.00	13.64	AV	H	28.08	1.80	0.00	43.52	54.00	10.48
4804.00	56.58	PK	H	32.91	3.17	37.20	55.46	74.00	18.54
4804.00	48.45	AV	H	32.91	3.17	37.20	47.33	54.00	6.67
7206.00	46.37	PK	H	35.74	4.82	37.23	49.70	74.00	24.30
7206.00	34.75	AV	H	35.74	4.82	37.23	38.08	54.00	15.92
Middle Channel: 2441 MHz									
2441.00	58.69	PK	H	28.18	1.82	0.00	88.69	N/A	N/A
2441.00	53.46	AV	H	28.18	1.82	0.00	83.46	N/A	N/A
2441.00	55.73	PK	V	28.18	1.82	0.00	85.73	N/A	N/A
2441.00	50.54	AV	V	28.18	1.82	0.00	80.54	N/A	N/A
4882.00	51.37	PK	H	33.06	3.27	37.21	50.49	74.00	23.51
4882.00	45.22	AV	H	33.06	3.27	37.21	44.34	54.00	9.66
7323.00	46.57	PK	H	36.04	4.62	37.38	49.85	74.00	24.15
7323.00	34.69	AV	H	36.04	4.62	37.38	37.97	54.00	16.03
High Channel: 2480 MHz									
2480.00	56.58	PK	H	28.26	1.84	0.00	86.68	N/A	N/A
2480.00	51.64	AV	H	28.26	1.84	0.00	81.74	N/A	N/A
2480.00	54.62	PK	V	28.26	1.84	0.00	84.72	N/A	N/A
2480.00	49.48	AV	V	28.26	1.84	0.00	79.58	N/A	N/A
2483.50	25.79	PK	H	28.27	1.84	0.00	55.90	74.00	18.10
2483.50	13.54	AV	H	28.27	1.84	0.00	43.65	54.00	10.35
4960.00	49.27	PK	H	33.22	3.23	37.25	48.47	74.00	25.53
4960.00	42.68	AV	H	33.22	3.23	37.25	41.88	54.00	12.12
7440.00	46.35	PK	H	36.34	4.41	37.52	49.58	74.00	24.42
7440.00	34.46	AV	H	36.34	4.41	37.52	37.69	54.00	16.31

EDR Mode (8-DPSK):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	58.42	PK	H	28.10	1.80	0.00	88.32	N/A	N/A
2402.00	53.58	AV	H	28.10	1.80	0.00	83.48	N/A	N/A
2402.00	55.87	PK	V	28.10	1.80	0.00	85.77	N/A	N/A
2402.00	50.66	AV	V	28.10	1.80	0.00	80.56	N/A	N/A
2390.00	24.95	PK	H	28.08	1.80	0.00	54.83	74.00	19.17
2390.00	13.54	AV	H	28.08	1.80	0.00	43.42	54.00	10.58
4804.00	57.85	PK	H	32.91	3.17	37.20	56.73	74.00	17.27
4804.00	49.16	AV	H	32.91	3.17	37.20	48.04	54.00	5.96
7206.00	46.62	PK	H	35.74	4.82	37.23	49.95	74.00	24.05
7206.00	34.58	AV	H	35.74	4.82	37.23	37.91	54.00	16.09
Middle Channel: 2441 MHz									
2441.00	59.82	PK	H	28.18	1.82	0.00	89.82	N/A	N/A
2441.00	54.57	AV	H	28.18	1.82	0.00	84.57	N/A	N/A
2441.00	56.93	PK	V	28.18	1.82	0.00	86.93	N/A	N/A
2441.00	51.72	AV	V	28.18	1.82	0.00	81.72	N/A	N/A
4882.00	50.67	PK	H	33.06	3.27	37.21	49.79	74.00	24.21
4882.00	45.15	AV	H	33.06	3.27	37.21	44.27	54.00	9.73
7323.00	46.37	PK	H	36.04	4.62	37.38	49.65	74.00	24.35
7323.00	34.48	AV	H	36.04	4.62	37.38	37.76	54.00	16.24
High Channel: 2480 MHz									
2480.00	56.58	PK	H	28.26	1.84	0.00	86.68	N/A	N/A
2480.00	51.34	AV	H	28.26	1.84	0.00	81.44	N/A	N/A
2480.00	53.46	PK	V	28.26	1.84	0.00	83.56	N/A	N/A
2480.00	49.48	AV	V	28.26	1.84	0.00	79.58	N/A	N/A
2483.50	25.76	PK	H	28.27	1.84	0.00	55.87	74.00	18.13
2483.50	13.57	AV	H	28.27	1.84	0.00	43.68	54.00	10.32
4960.00	49.63	PK	H	33.22	3.23	37.25	48.83	74.00	25.17
4960.00	44.28	AV	H	33.22	3.23	37.25	43.48	54.00	10.52
7440.00	45.78	PK	H	36.34	4.41	37.52	49.01	74.00	24.99
7440.00	34.39	AV	H	36.34	4.41	37.52	37.62	54.00	16.38

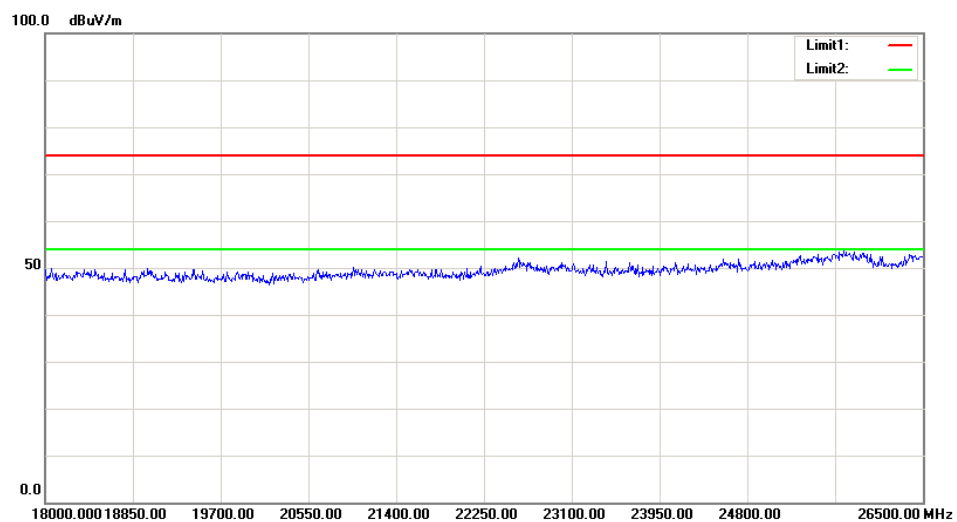
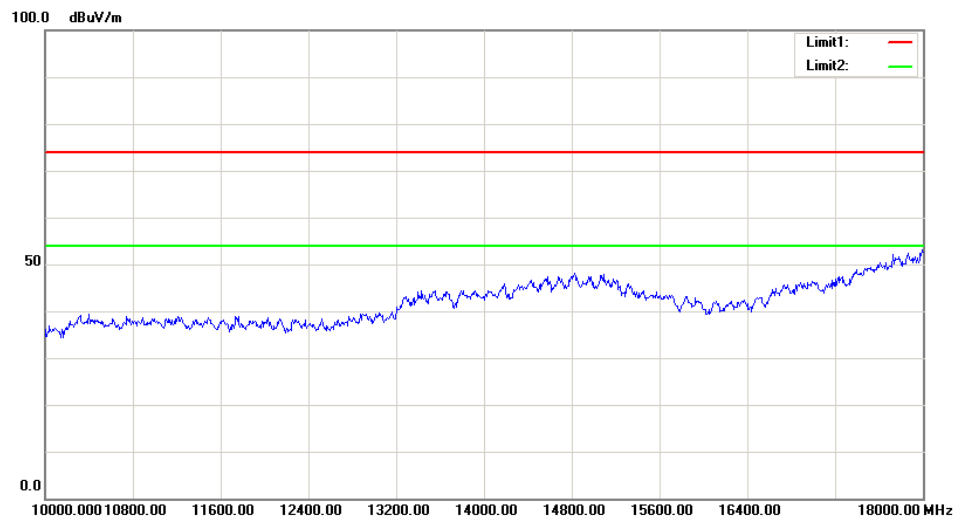
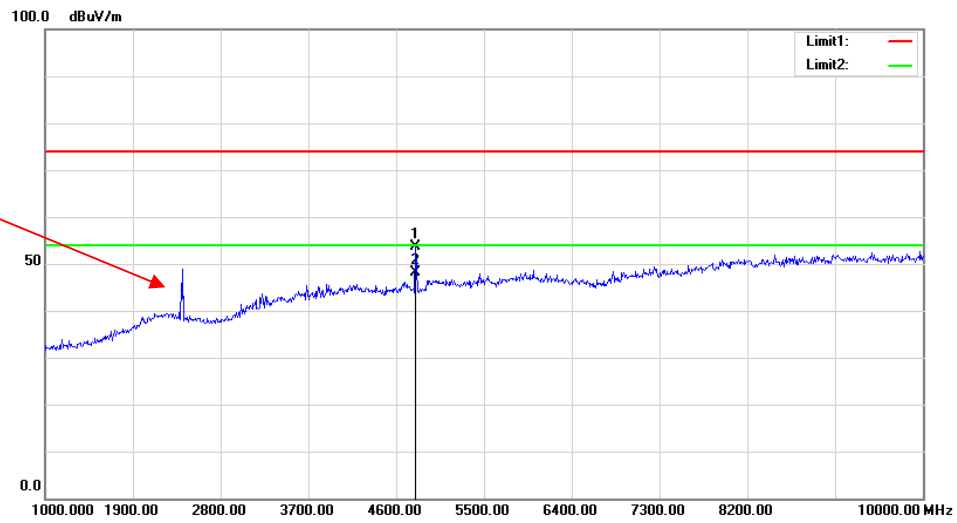
Worst plots(GFSK Low channel)
Horizontal

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
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
N/A	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 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:	24.6 °C
Relative Humidity:	46 %
ATM Pressure:	101 kPa

* The testing was performed by Kami Zhou on 2018-01-24

Test Result: Compliance.

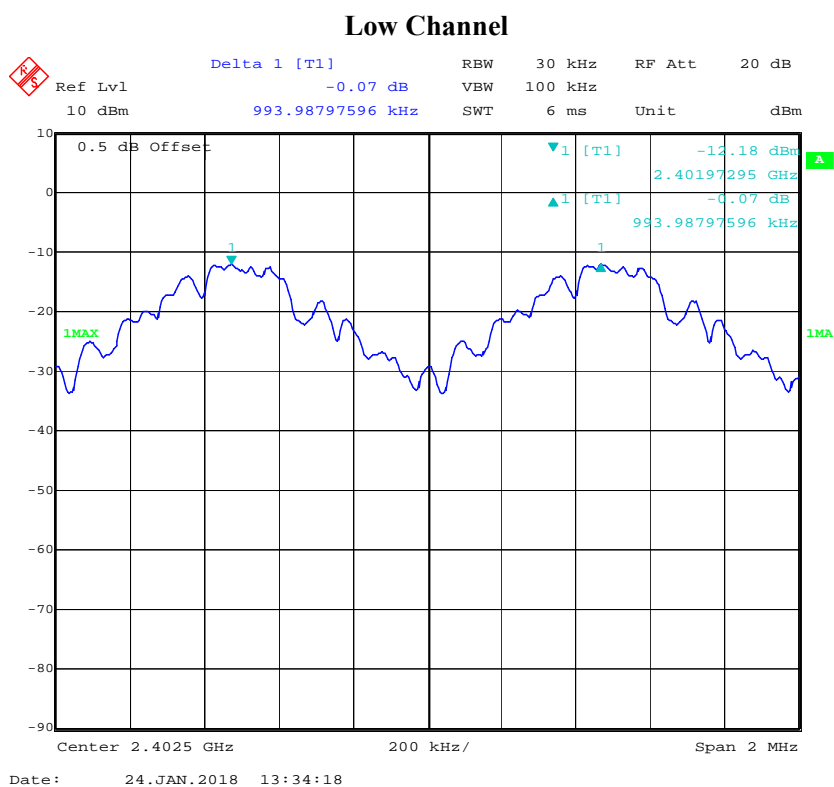
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	0.994	0.693
	Middle	2441	1.002	0.693
	High	2480	0.998	0.693
EDR ($\pi/4$ -DQPSK)	Low	2402	1.002	0.907
	Middle	2441	0.998	0.907
	High	2480	1.002	0.907
EDR (8-DPSK)	Low	2402	1.002	0.867
	Middle	2441	1.002	0.873
	High	2480	1.006	0.867

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

BDR Mode (GFSK):



Delta 1 [T1] -0.04 dB RBW 30 kHz RF Att 20 dB
 Ref Lvl 10 dBm 1.00200401 MHz VBW 100 kHz Unit dBm
 0.5 dB Offset

1 [T1] -12.27 dBm
 2.44097295 GHz
 1 [T1] -10.04 dBm
 1.00200401 MHz

1MAX

Center 2.4415 GHz 200 kHz/ Span 2 MHz

Date: 24.JAN.2018 13:35:23

Ref Lvl 10 dBm Delta 1 [T1] 0.00 dB RBW 30 kHz RF Att 20 dB
 10 dBm 997.99599199 kHz SWT 6 ms Unit dBm

0.5 dB Offset

1 [T1] -12.89 dBm
 2.47897295 GHz
 1 [T1] 0.00 dB
 997.99599199 kHz

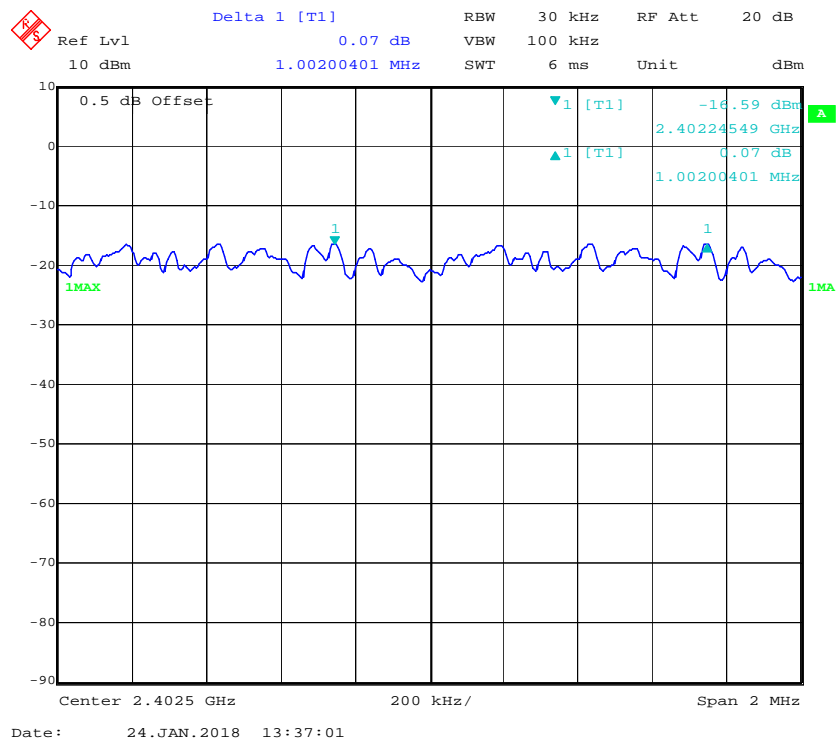
1MAX 1MA

Center 2.4795 GHz 200 kHz/ Span 2 MHz

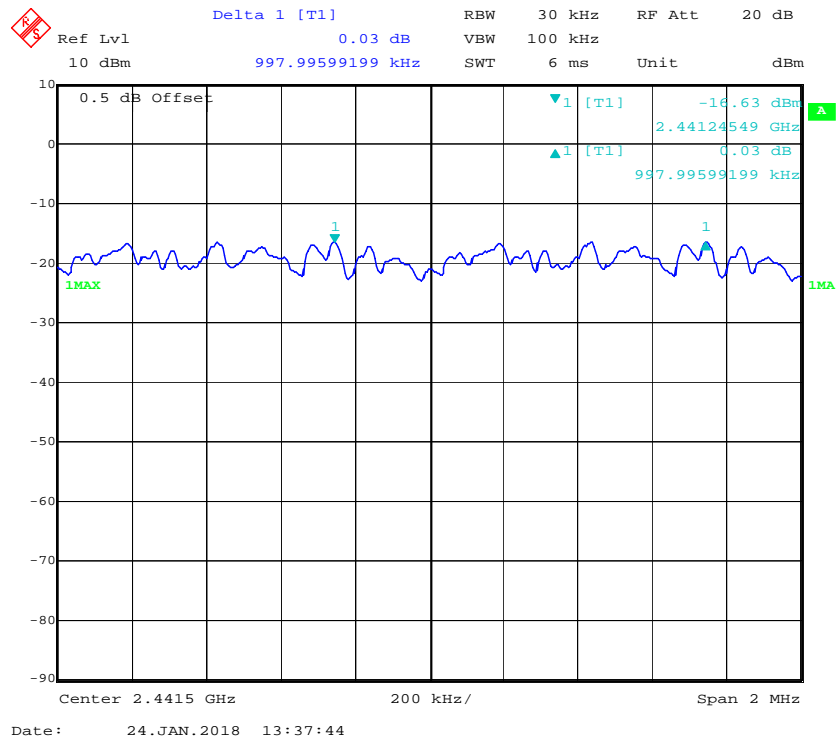
Date: 24.JAN.2018 13:36:07

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

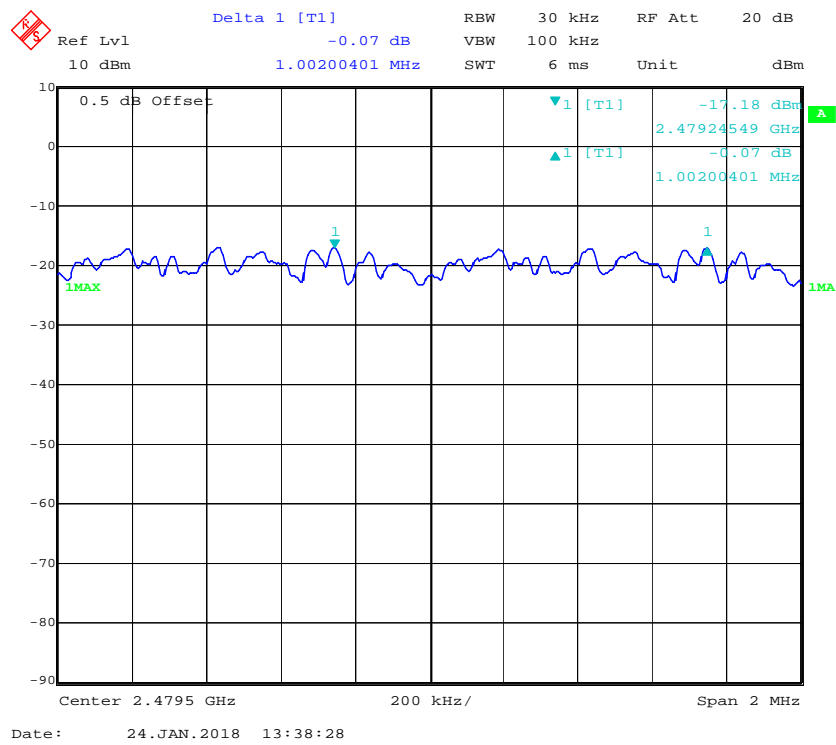
Low Channel



Middle Channel

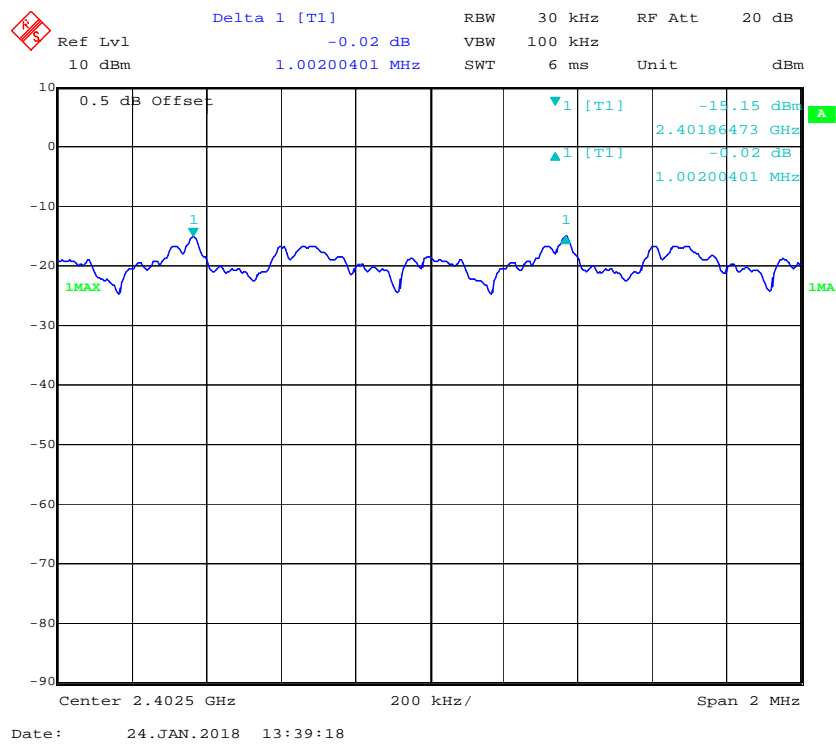


High Channel



EDR Mode (8-DPSK):

Low Channel



Delta 1 [T1]

Ref Lvl 10 dBm

RBW 30 kHz

VBW 100 kHz

SWT 6 ms

RF Att 20 dB

Unit dBm

0.5 dB Offset

1 [T1] -15.25 dBm

2.44086473 GHz

1 [T1] -0.01 dB

1.00200401 MHz

1MAX

1MA

Center 2.4415 GHz

200 kHz/

Span 2 MHz

Date: 24.JAN.2018 13:40:09

Delta 1 [T1] -0.00 dB RBW 30 kHz RF Att 20 dB
 Ref Lvl 10 dBm VBW 100 kHz SWT 6 ms Unit dBm

0.5 dB Offset

1 [T1] -15.78 dBm
 2.4788473 GHz
 -0.00 dB
 1.00601202 MHz

1MAX

Center 2.4795 GHz 200 kHz/ Span 2 MHz

Date: 24.JAN.2018 13:40:53

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
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
N/A	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:	24.6 °C
Relative Humidity:	46 %
ATM Pressure:	101 kPa

* The testing was performed by Kami Zhou on 2018-01-24

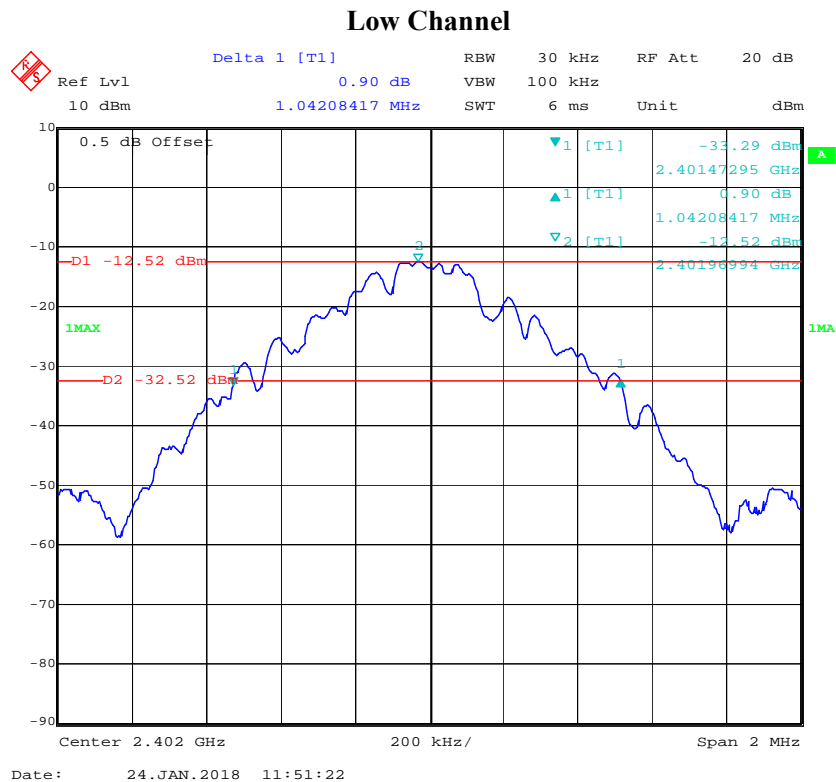
Test Result: Compliance.

Please refer to following tables and plots

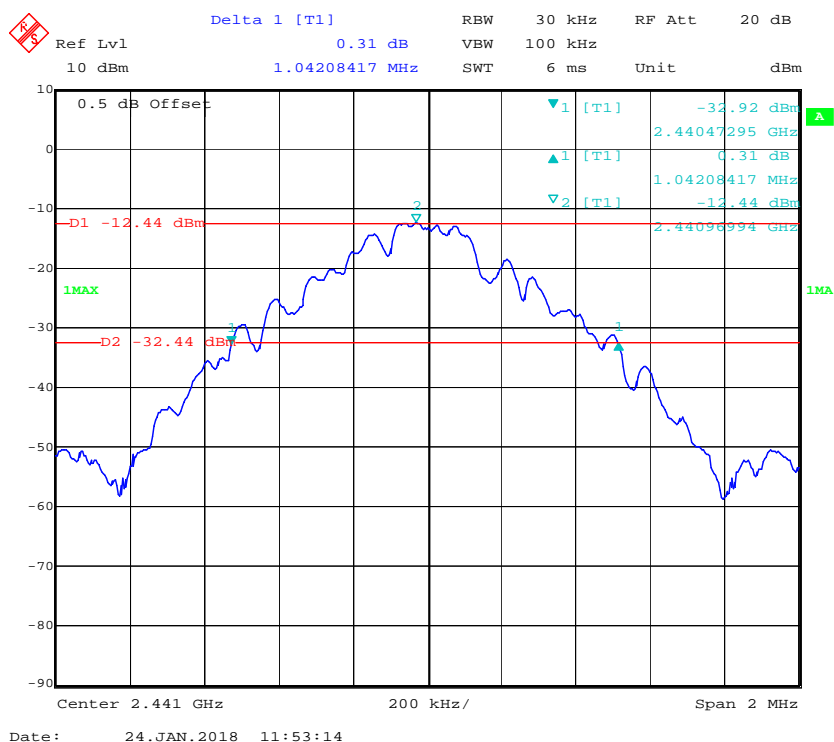
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	1.04
	Middle	2441	1.04
	High	2480	1.04
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.36
	Middle	2441	1.36
	High	2480	1.36
EDR Mode (8-DPSK)	Low	2402	1.30
	Middle	2441	1.31
	High	2480	1.30

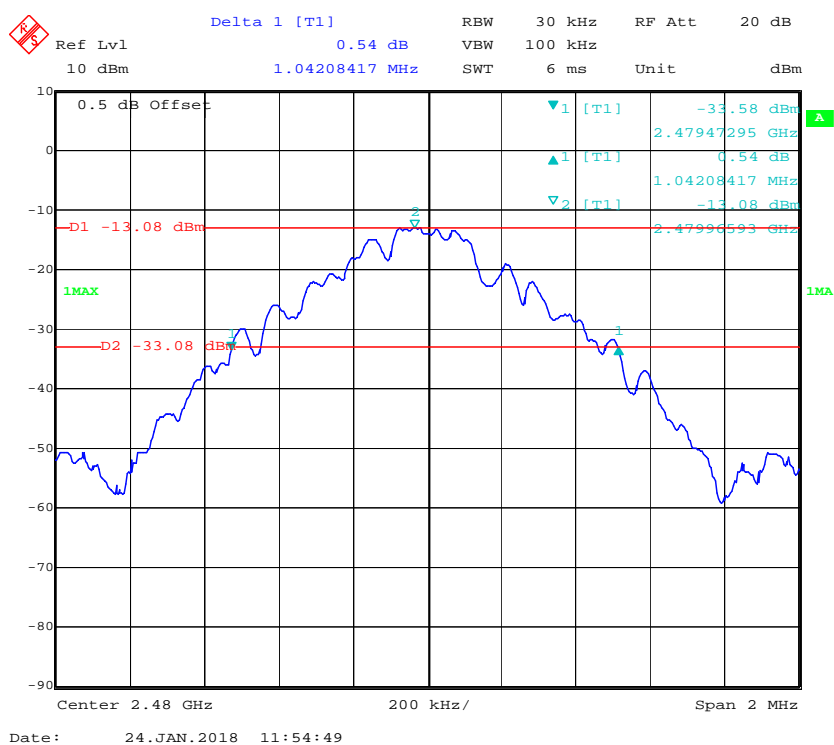
BDR Mode (GFSK):



Middle Channel

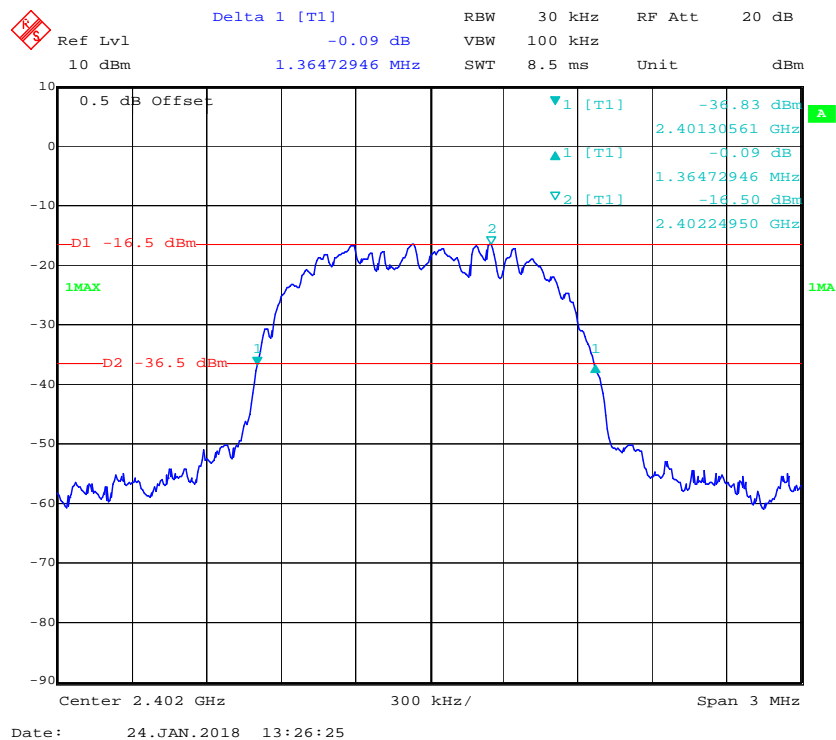


High Channel

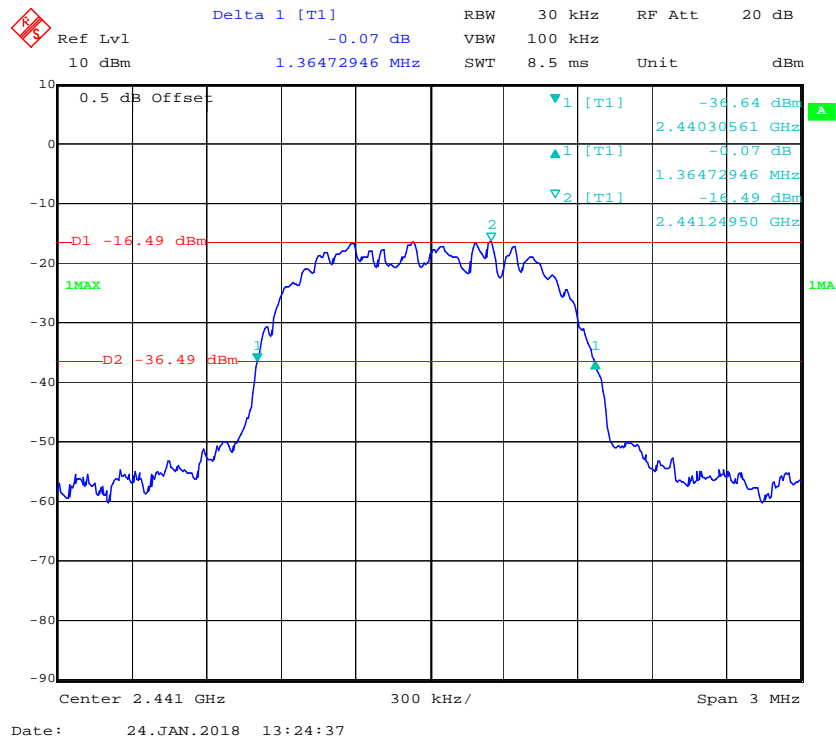


EDR Mode ($\pi/4$ -DQPSK):

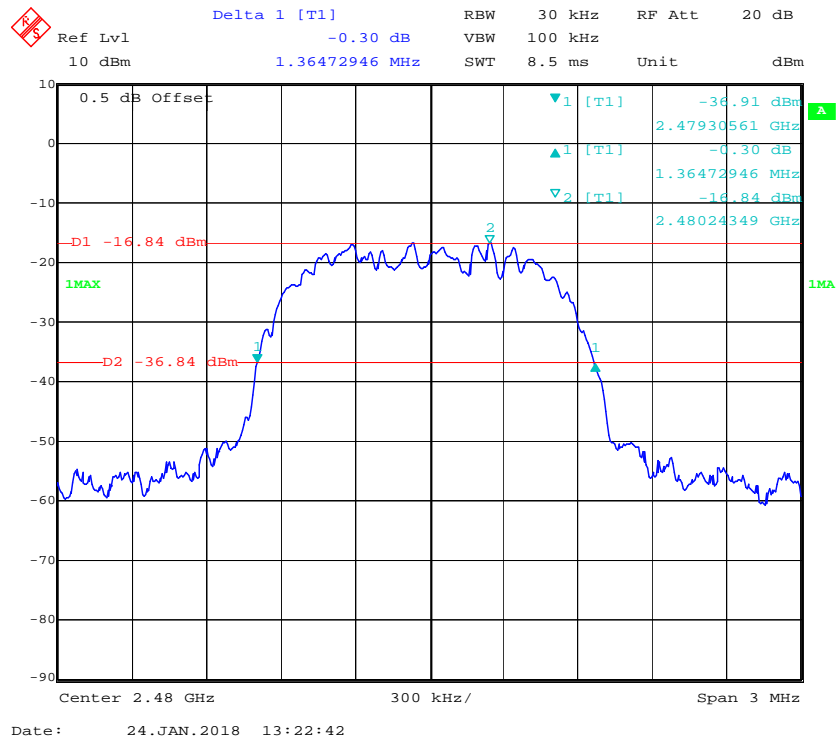
Low Channel



Middle Channel

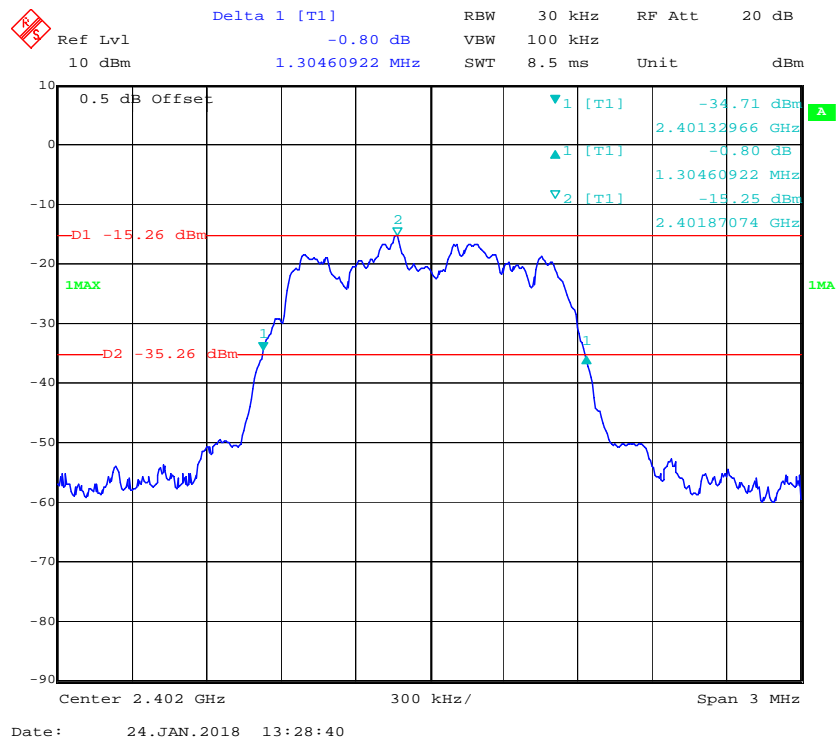


High Channel

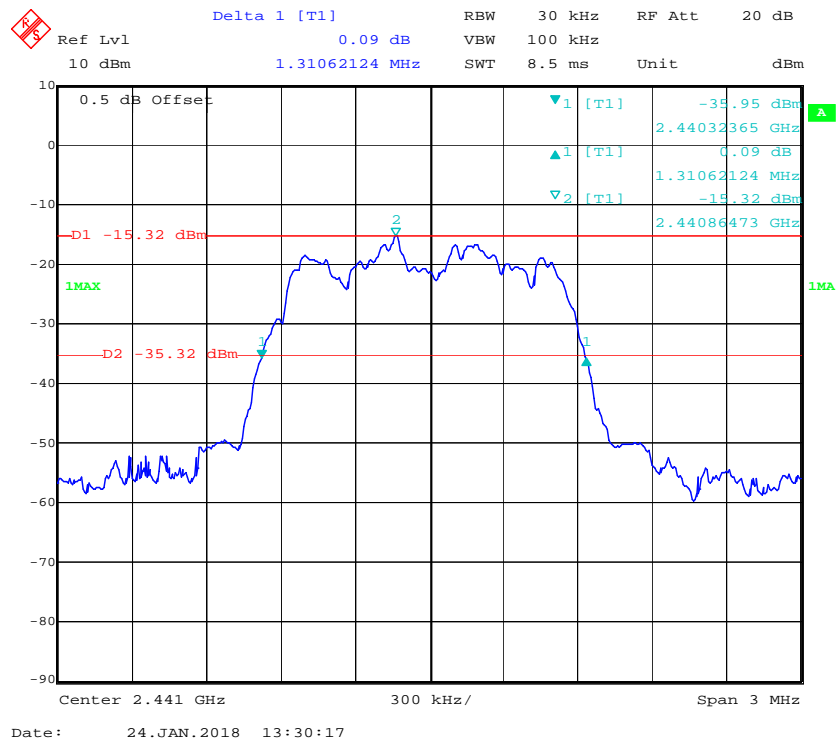


EDR Mode (8-DPSK):

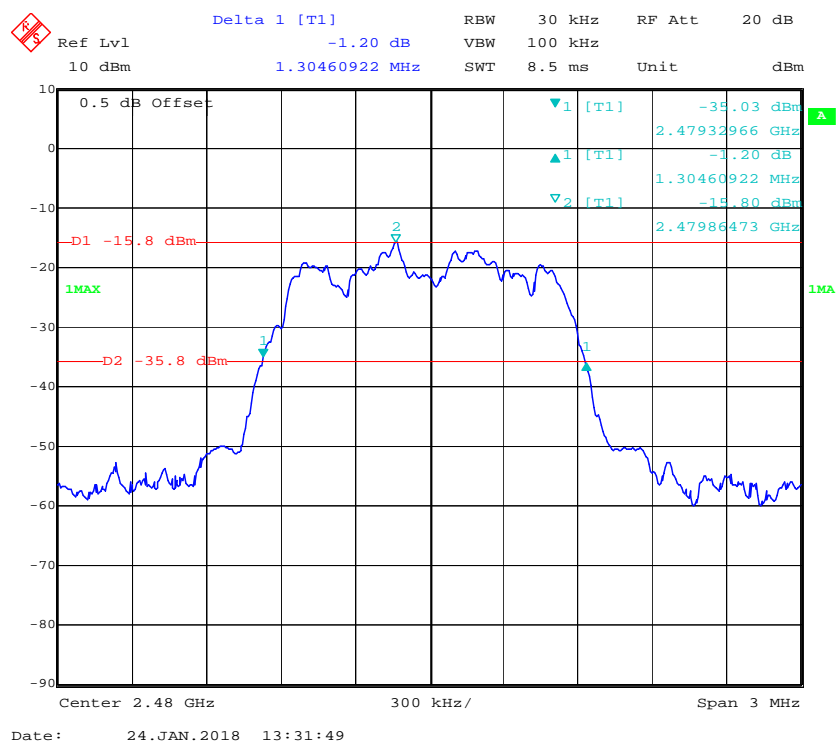
Low Channel



Middle Channel



High Channel



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
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
N/A	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:	24.6 °C
Relative Humidity:	46 %
ATM Pressure:	101 kPa

* The testing was performed by Kami Zhou on 2018-01-24

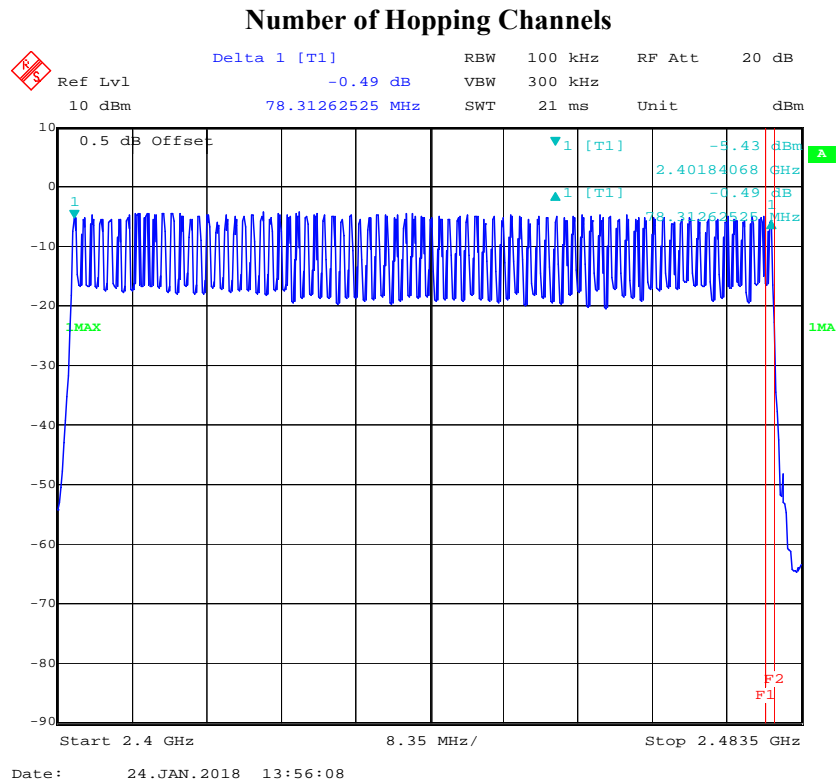
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

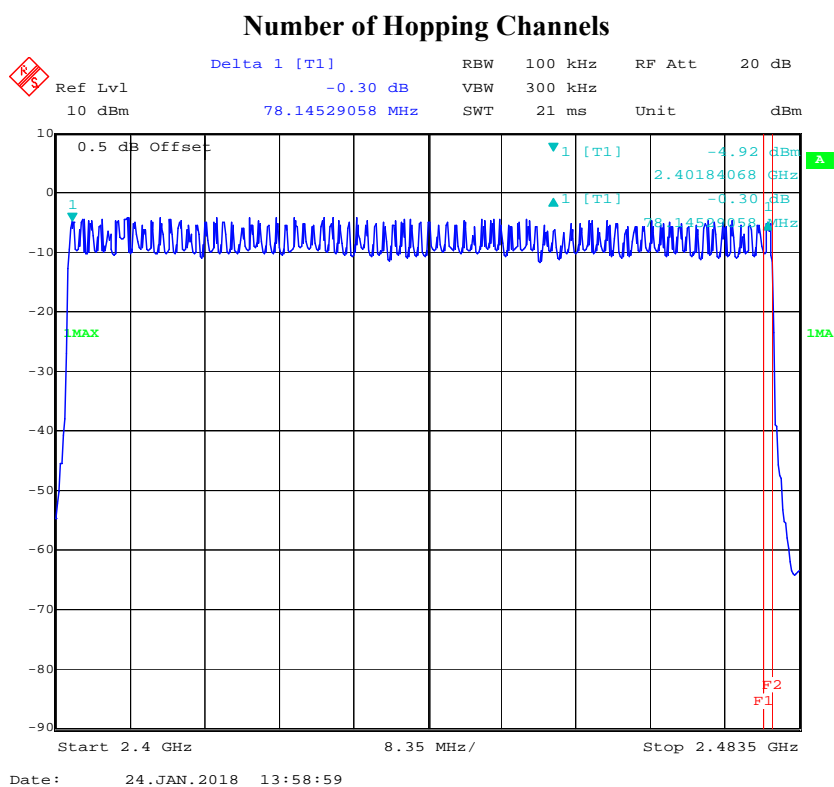
BDR Mode (GFSK):

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



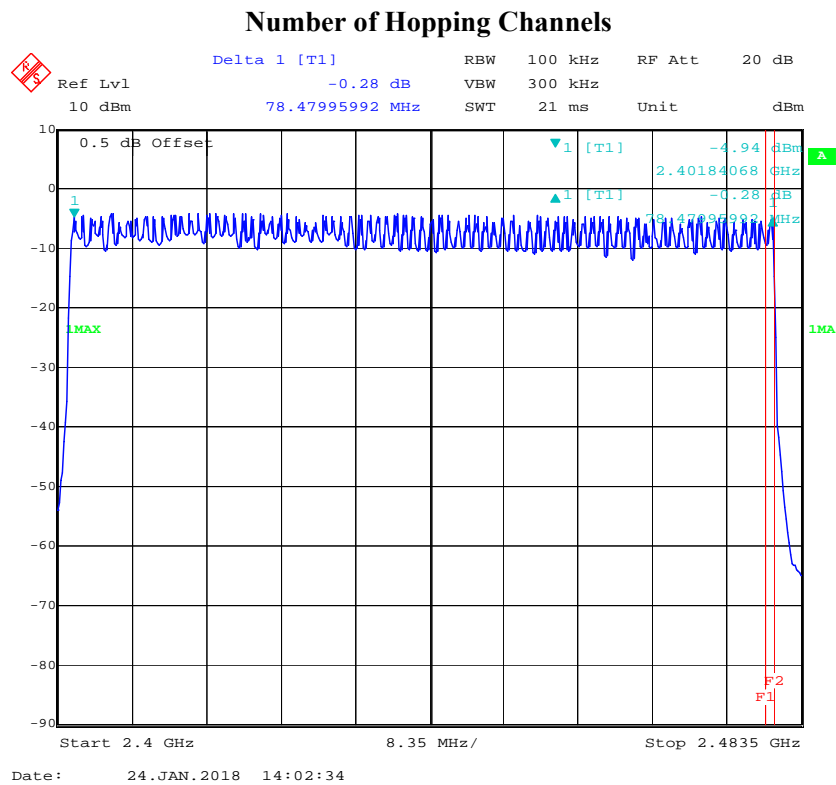
EDR Mode ($\pi/4$ -DQPSK):

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



EDR Mode (8-DPSK):

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



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
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
N/A	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:	24.6 °C
Relative Humidity:	46 %
ATM Pressure:	101 kPa

* The testing was performed by Kami Zhou on 2018-01-24

Test Result: Compliance.

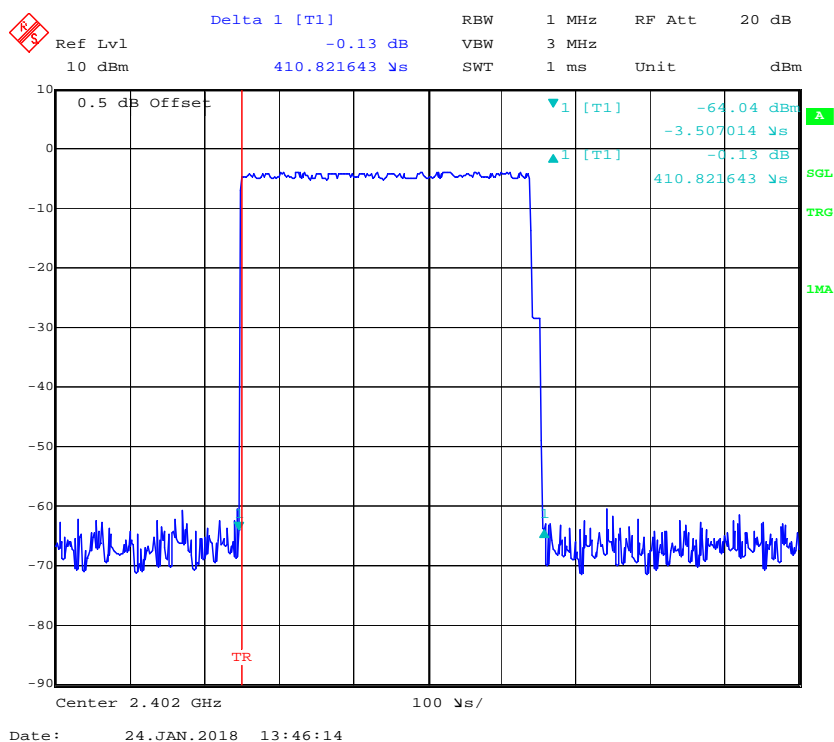
Please refer to following tables and plots

Test Mode: Transmitting

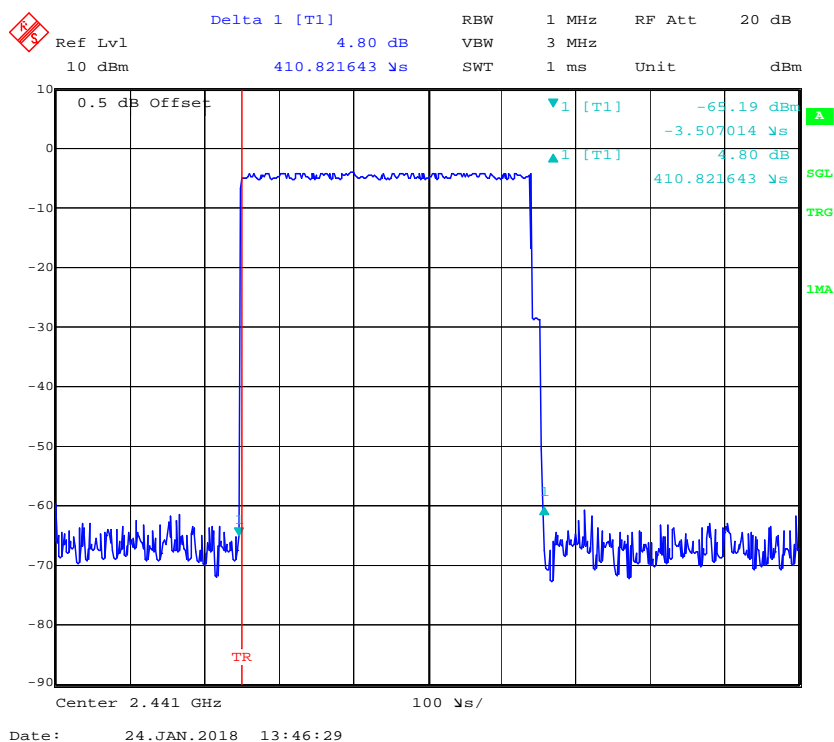
BDR Mode (GFSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.411	0.132	0.4	Compliance
	Middle	0.411	0.132	0.4	Compliance
	High	0.411	0.132	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) × 31.6 s				
DH3	Low	1.677	0.268	0.4	Compliance
	Middle	1.677	0.268	0.4	Compliance
	High	1.677	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) × 31.6 s				
DH5	Low	2.936	0.313	0.4	Compliance
	Middle	2.936	0.313	0.4	Compliance
	High	2.926	0.312	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) × 31.6 s				

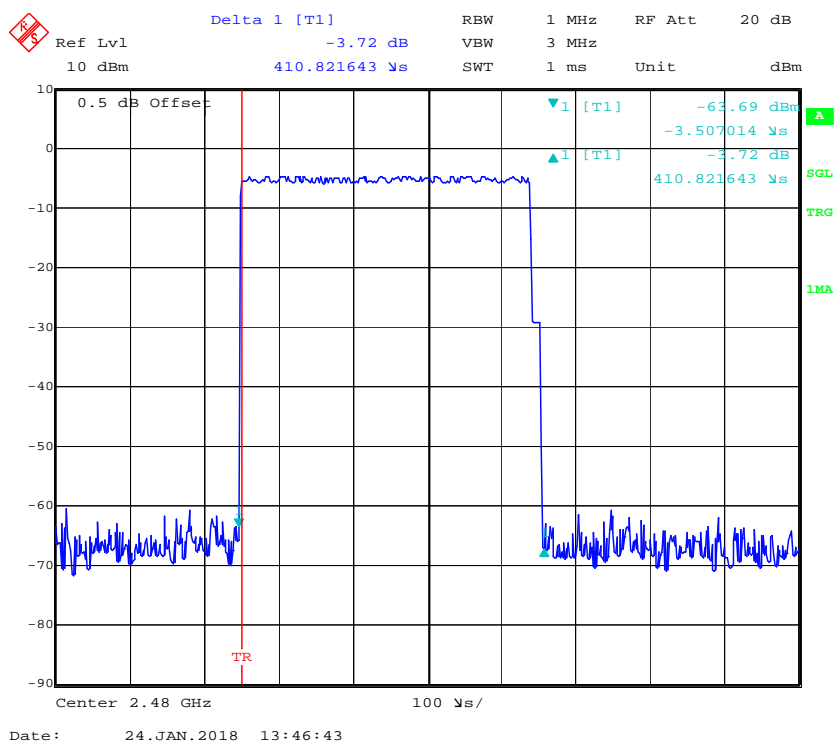
DH1: Low Channel

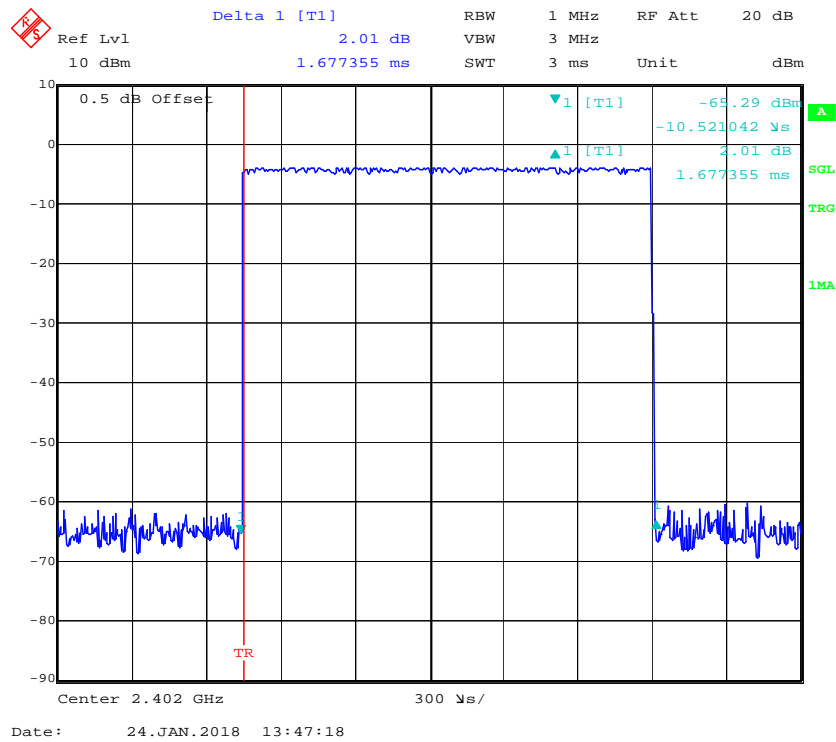
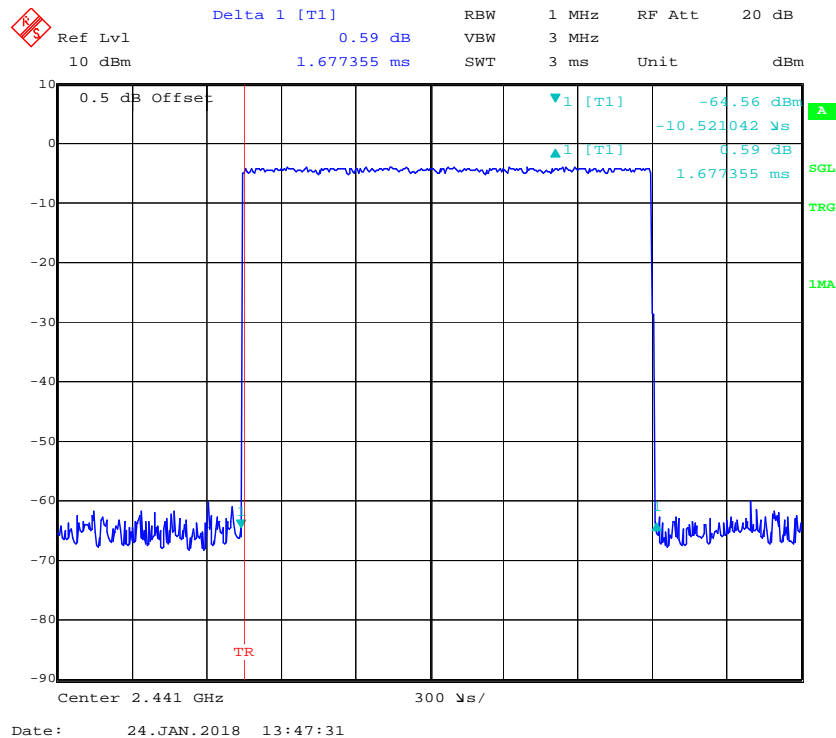


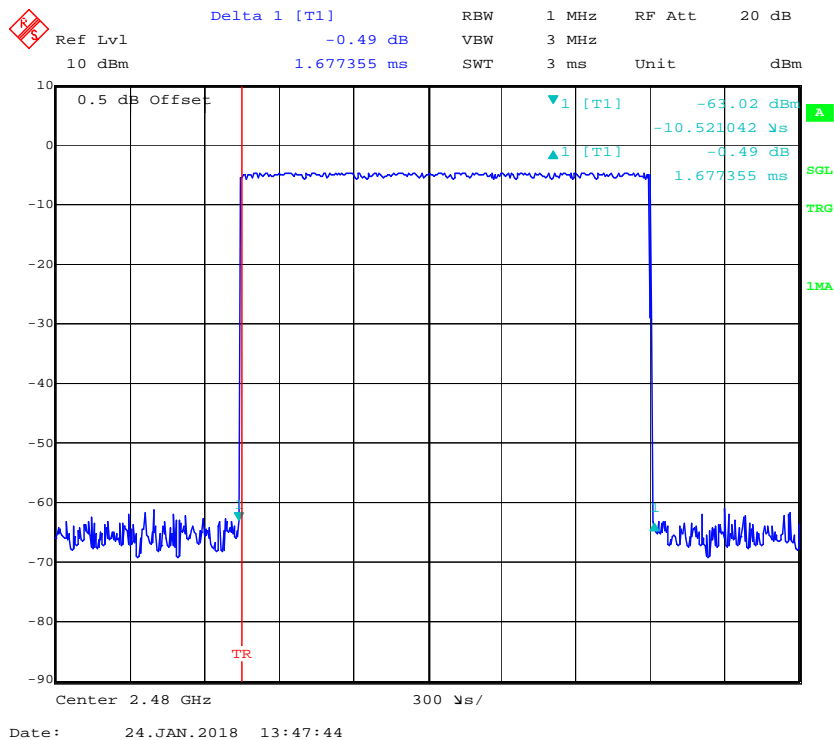
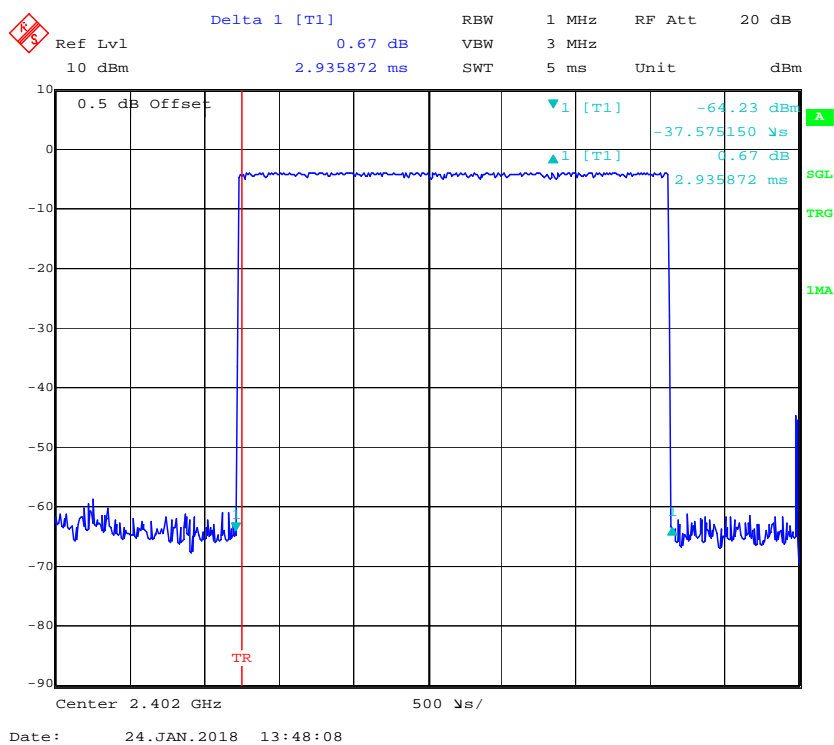
DH1: Middle Channel

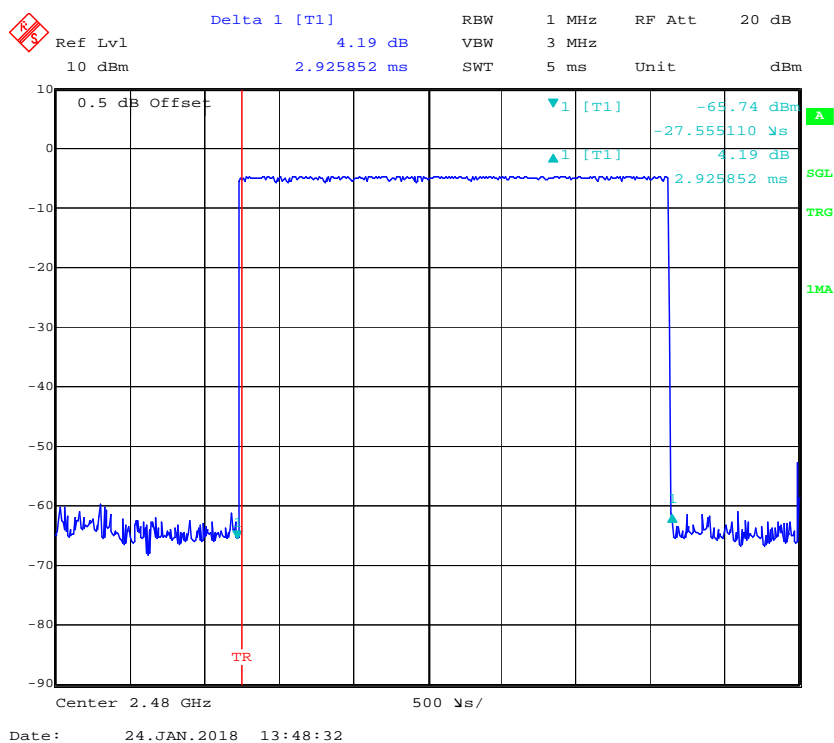
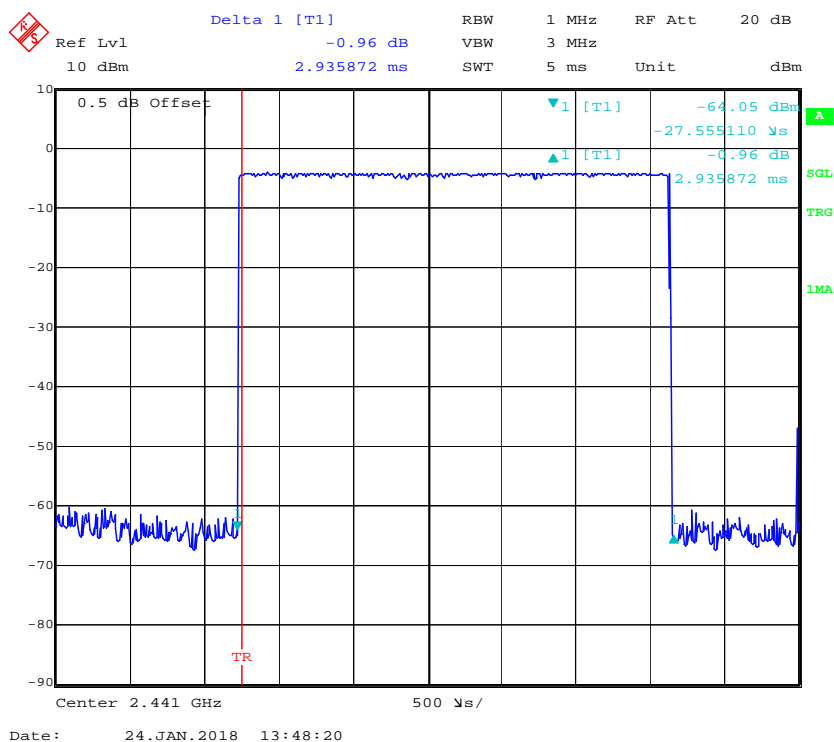


DH1: High Channel



DH3: Low Channel**DH3: Middle Channel**

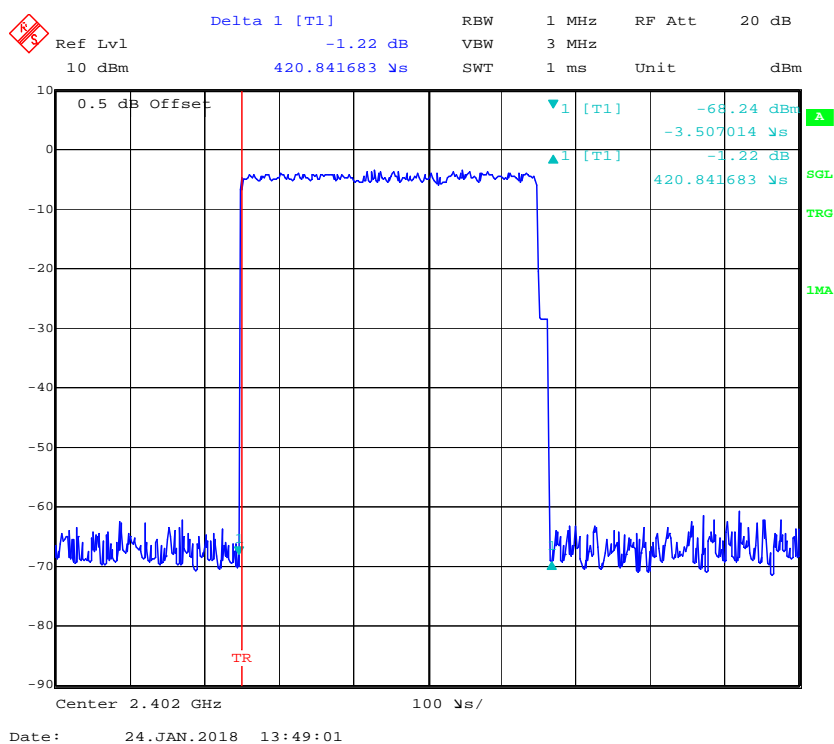
DH3: High Channel**DH5: Low Channel**

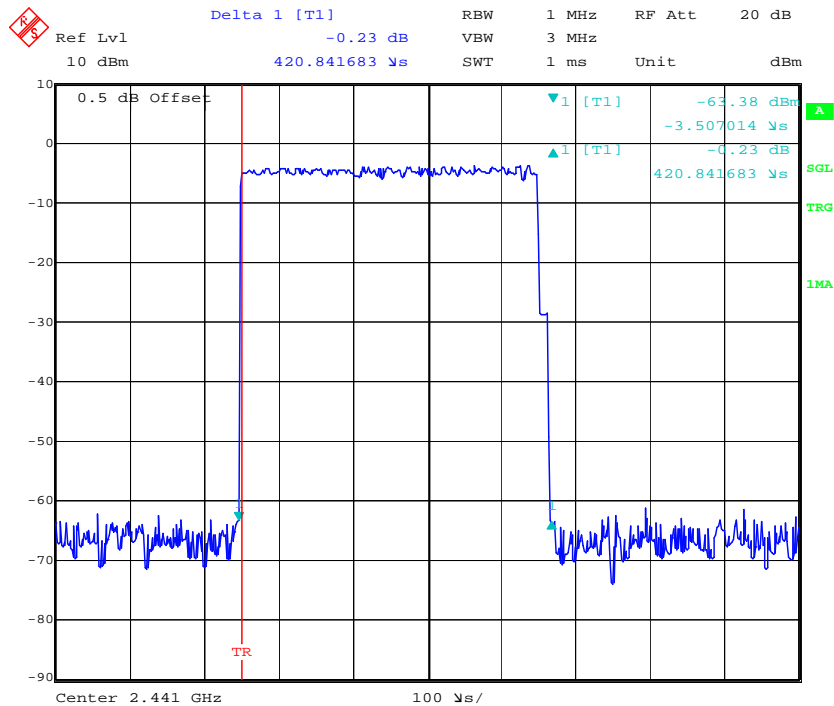
DH5: Middle Channel

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

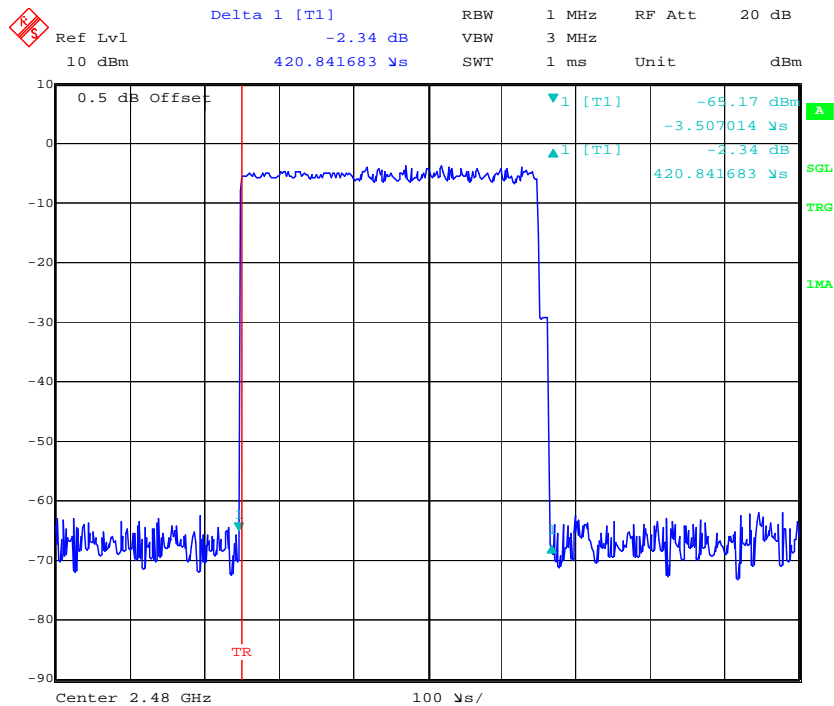
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.421	0.135	0.4	Compliance
	Middle	0.421	0.135	0.4	Compliance
	High	0.421	0.135	0.4	Compliance
	Note: Dwell time=Pulse time (ms) \times (1600/2/79) \times 31.6 s				
2DH3	Low	1.683	0.269	0.4	Compliance
	Middle	1.683	0.269	0.4	Compliance
	High	1.683	0.269	0.4	Compliance
	Note: Dwell time=Pulse time (ms) \times (1600/4/79) \times 31.6 s				
2DH5	Low	2.946	0.314	0.4	Compliance
	Middle	2.936	0.313	0.4	Compliance
	High	2.946	0.314	0.4	Compliance
	Note: Dwell time=Pulse time (ms) \times (1600/6/79) \times 31.6 s				

2DH1: Low Channel

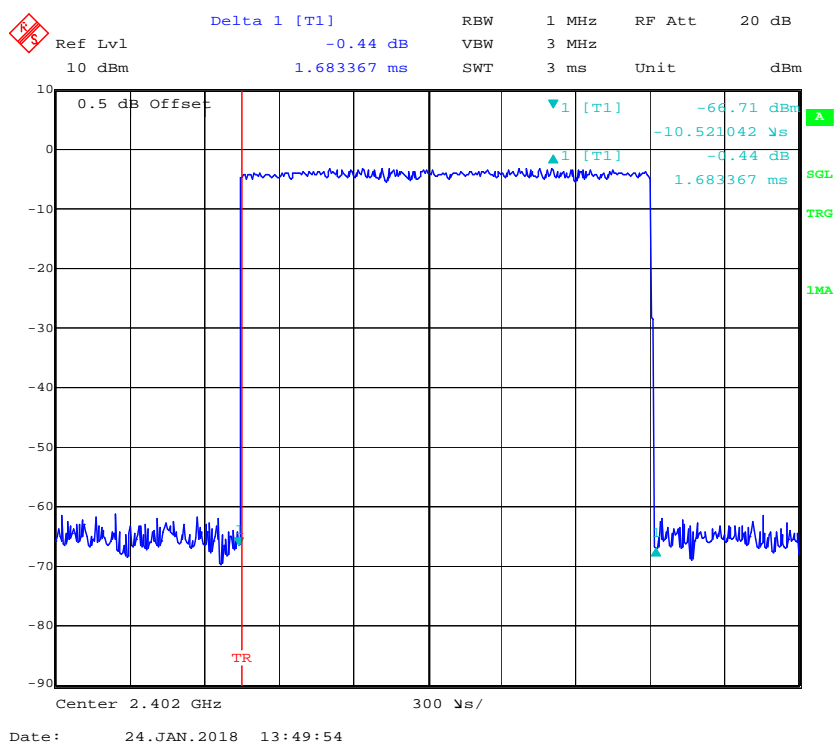
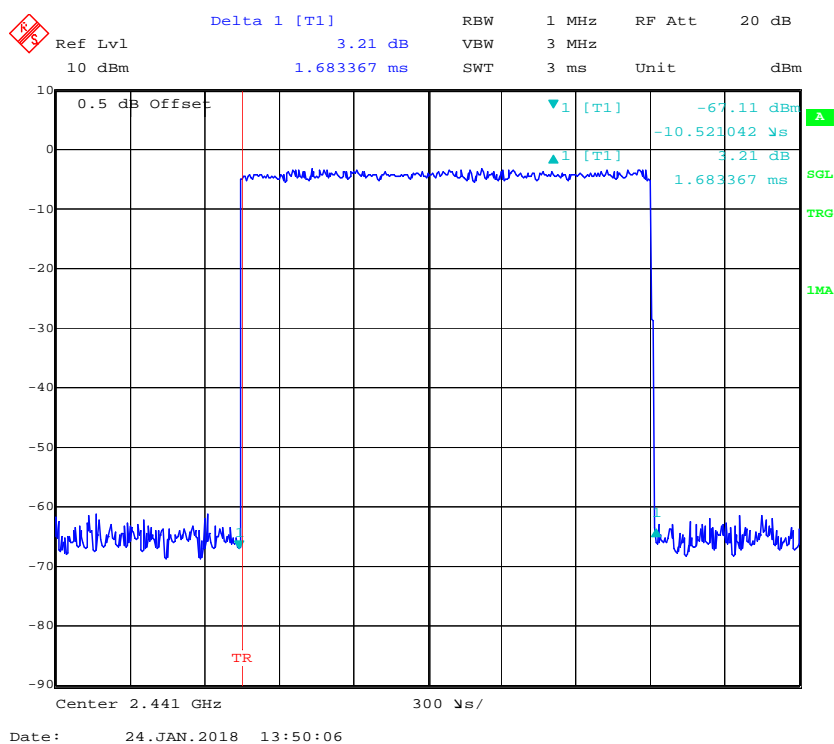


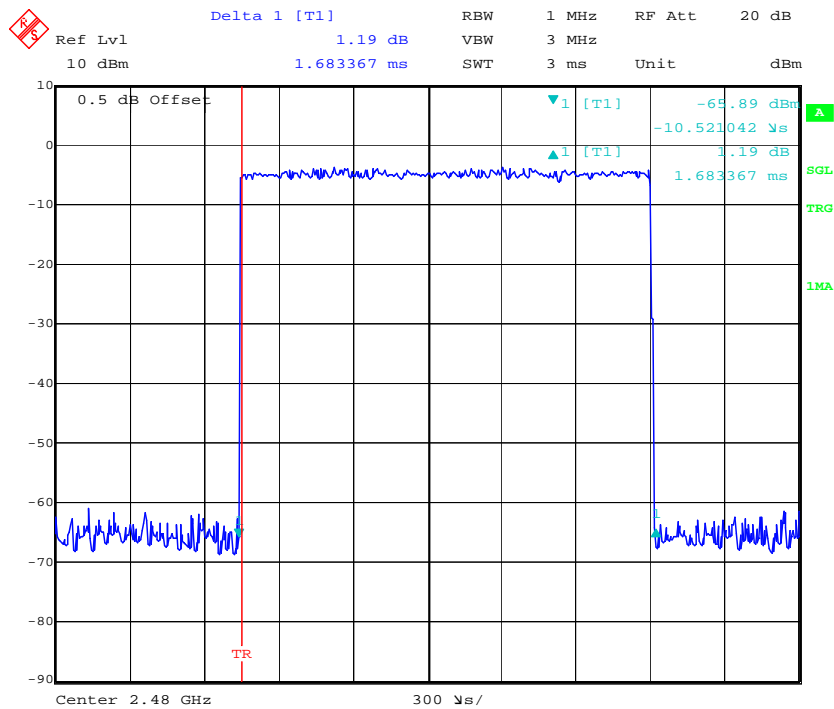
2DH1: Middle Channel

Date: 24.JAN.2018 13:49:15

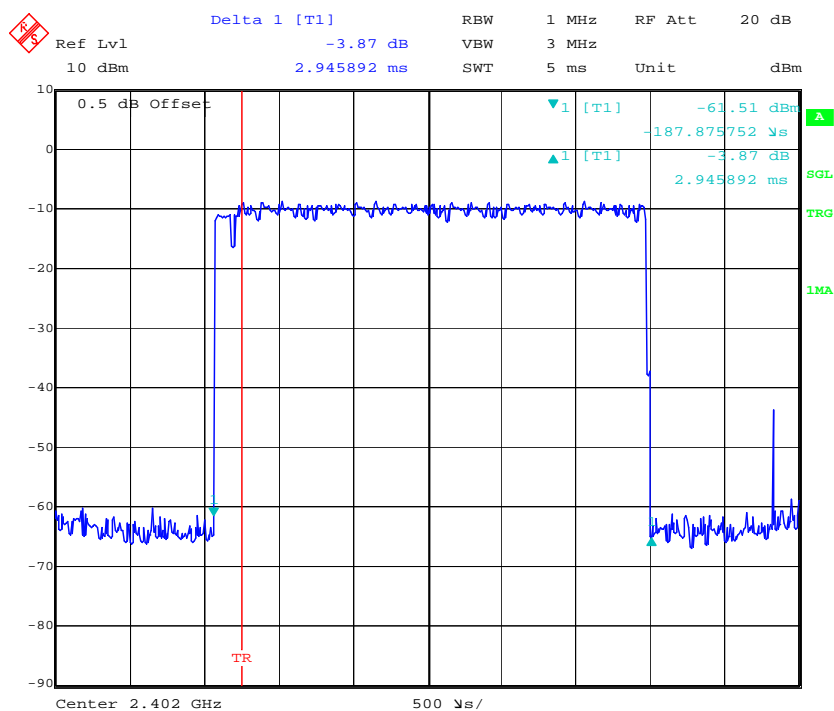
2DH1: High Channel

Date: 24.JAN.2018 13:49:29

2DH3: Low Channel**2DH3: Middle Channel**

2DH3: High Channel

Date: 24.JAN.2018 13:50:19

2DH5: Low Channel

Date: 24.JAN.2018 13:50:44

Delta 1 [T1]

Ref Lvl 10 dBm

RBW 1 MHz

VBW 3 MHz

SWT 5 ms

RF Att 20 dB

Unit dBm

0.5 dB Offset

1.05 dB

2.935872 ms

-64.65 dBm

-177.855711 μ s

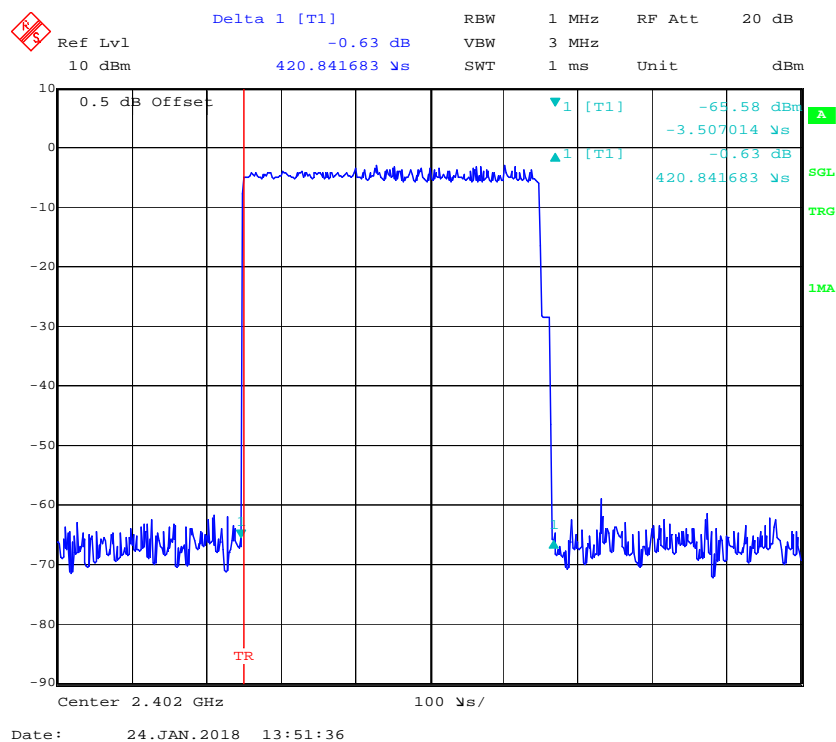
Center 2.441 GHz

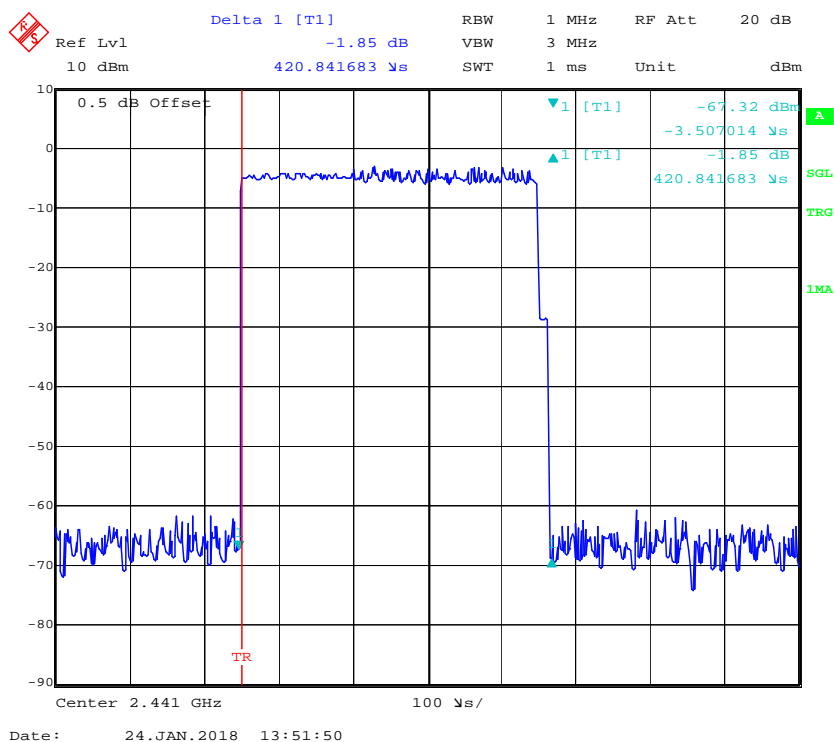
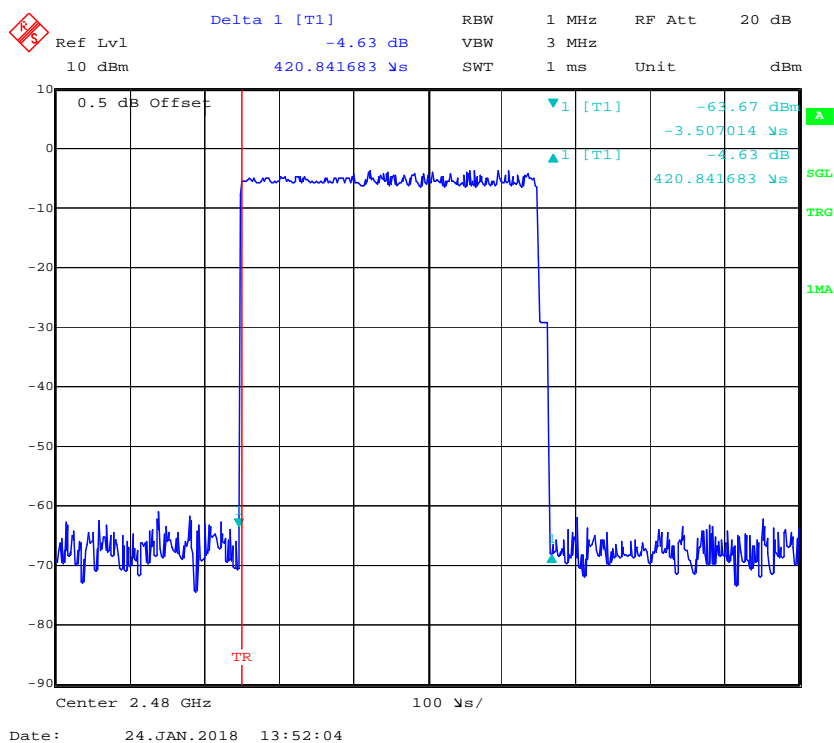
500 μ s

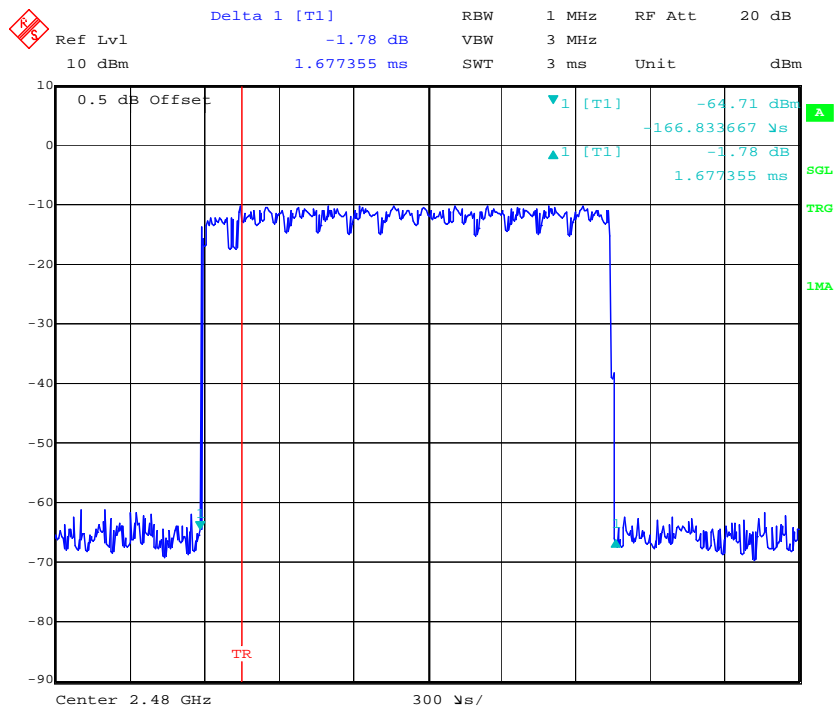
Date: 24.JAN.2018 13:50:56

EDR Mode (8-DPSK):

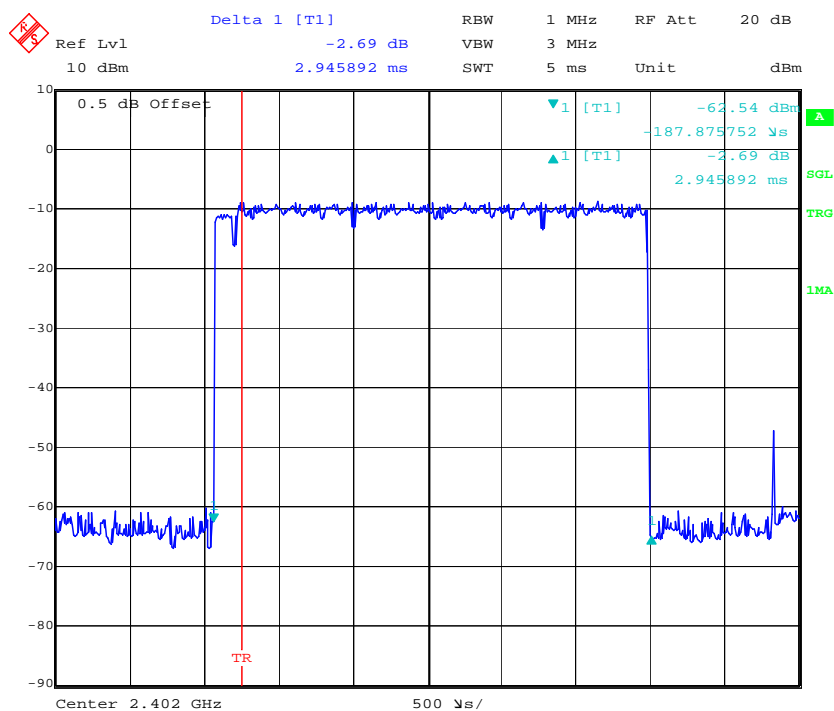
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.421	0.135	0.4	Compliance
	Middle	0.421	0.135	0.4	Compliance
	High	0.421	0.135	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) × 31.6 s				
3DH3	Low	1.683	0.269	0.4	Compliance
	Middle	1.677	0.268	0.4	Compliance
	High	1.677	0.268	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) × 31.6 s				
3DH5	Low	2.946	0.314	0.4	Compliance
	Middle	2.936	0.313	0.4	Compliance
	High	2.946	0.314	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) × 31.6 s				

3DH1: Low Channel

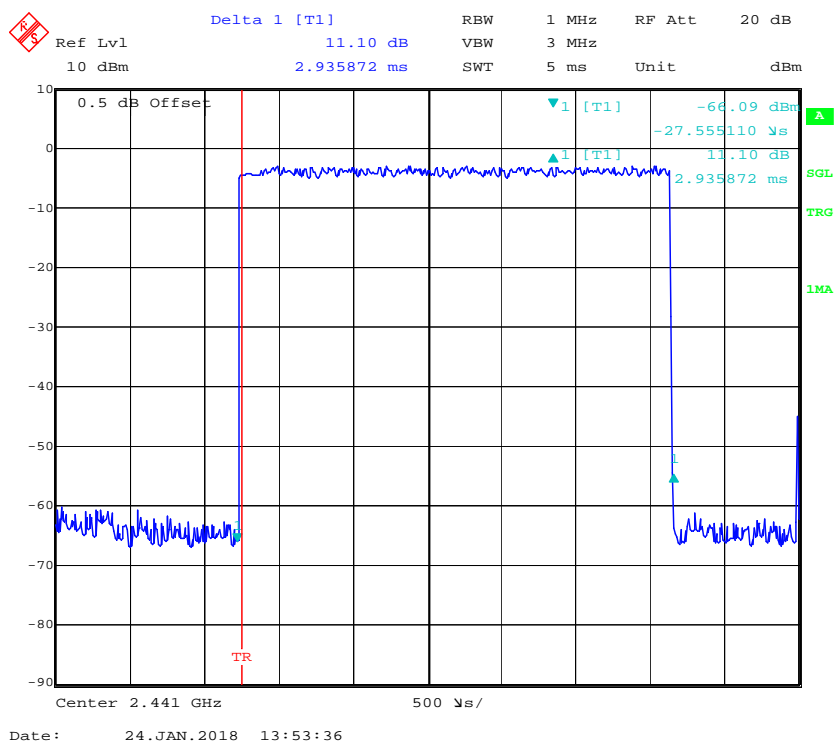
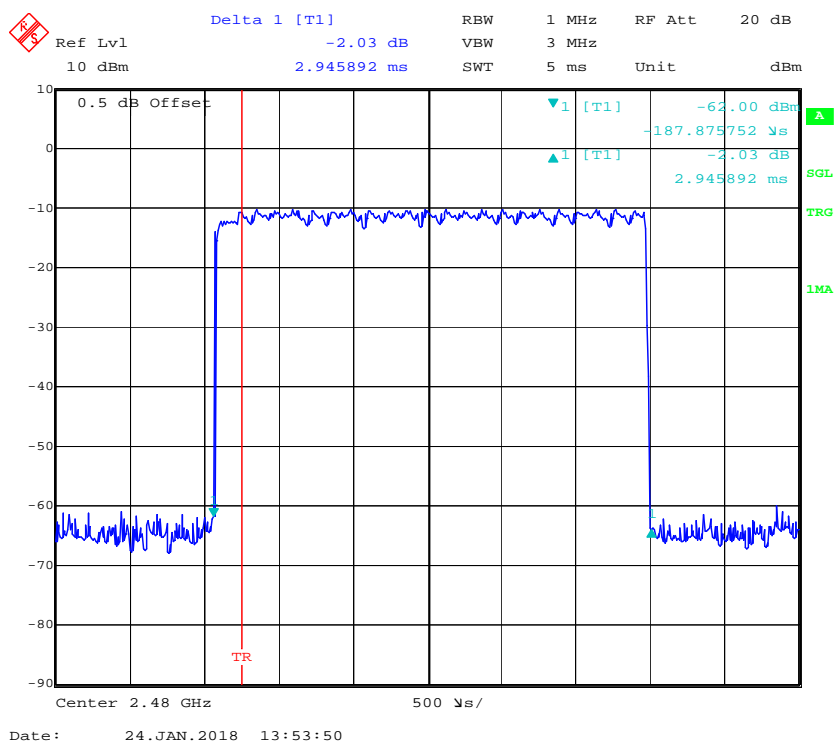
3DH1: Middle Channel**3DH1: High Channel**

3DH3: High Channel

Date: 24.JAN.2018 13:52:57

3DH5: Low Channel

Date: 24.JAN.2018 13:53:24

3DH5: Middle Channel**3DH5: High Channel**

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	Wideband Power Sensor	N1921A	MY54170013	2017-11-03	2018-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2017-11-03	2018-11-03
N/A	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:	24.6 °C
Relative Humidity:	46 %
ATM Pressure:	101 kPa

* The testing was performed by Kami Zhou on 2018-01-24

Test Result: Compliance.

Test Mode: Transmitting

Mode	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	-7.84	21
	2441	-7.84	21
	2480	-8.46	21
EDR Mode ($\pi/4$ -DQPSK)	2402	-6.29	21
	2441	-6.29	21
	2480	-6.77	21
EDR Mode (8-DPSK)	2402	-6.05	21
	2441	-6.17	21
	2480	-6.77	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
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
R&S	EMI Test Reciever	ESCI	101121	2017-03-02	2018-03-02
R&S	EMI Test Receiver	ESCI	101121	2018-03-23	2019-03-23
N/A	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**

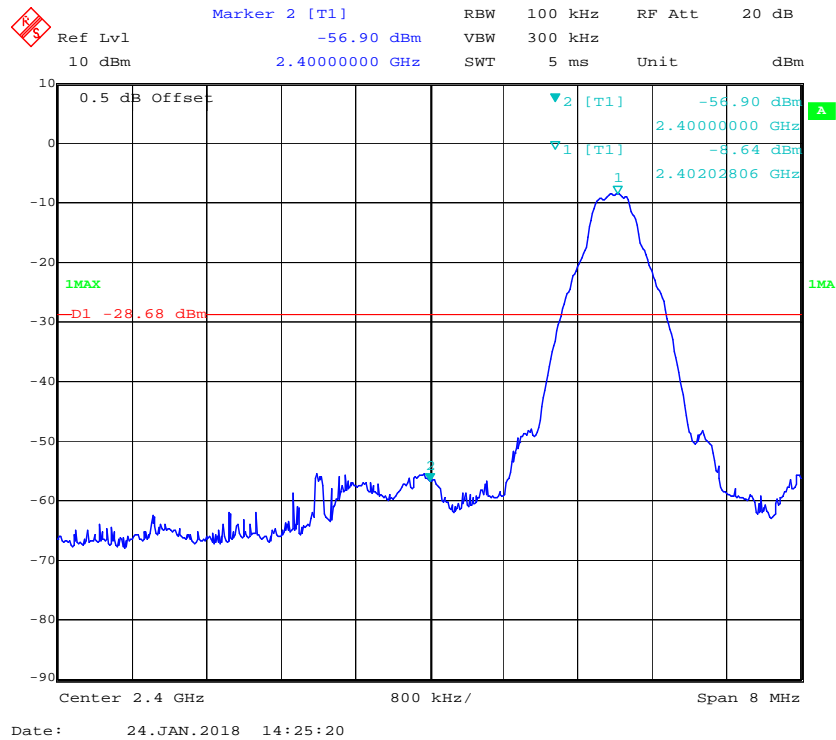
Temperature:	24.6~25.5 °C
Relative Humidity:	46~54 %
ATM Pressure:	101~101.1 kPa

** The testing was performed by Kami Zhou on 2018-01-24&2018-04-16.*

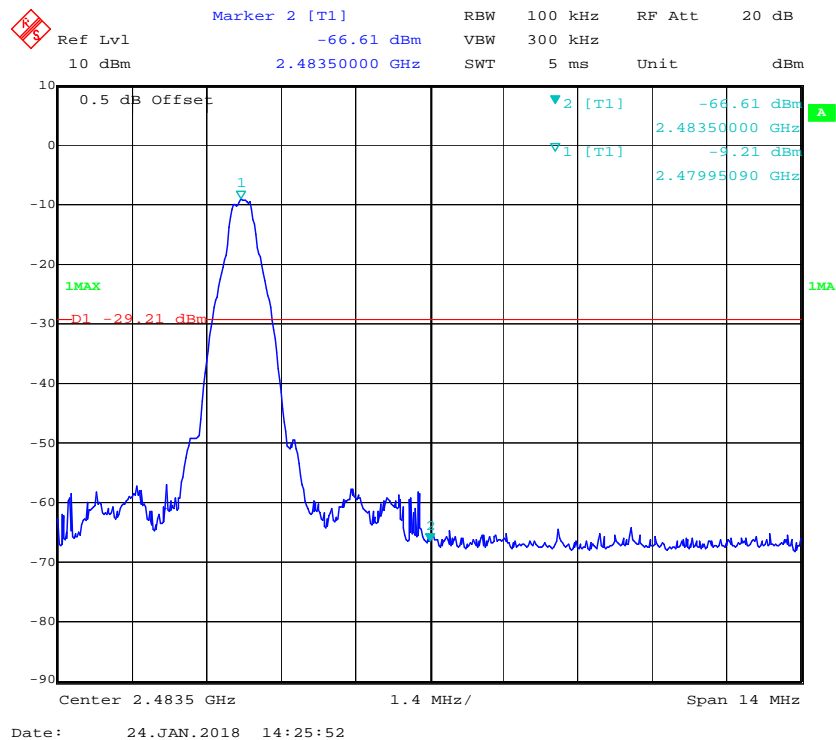
Test Result: Compliance

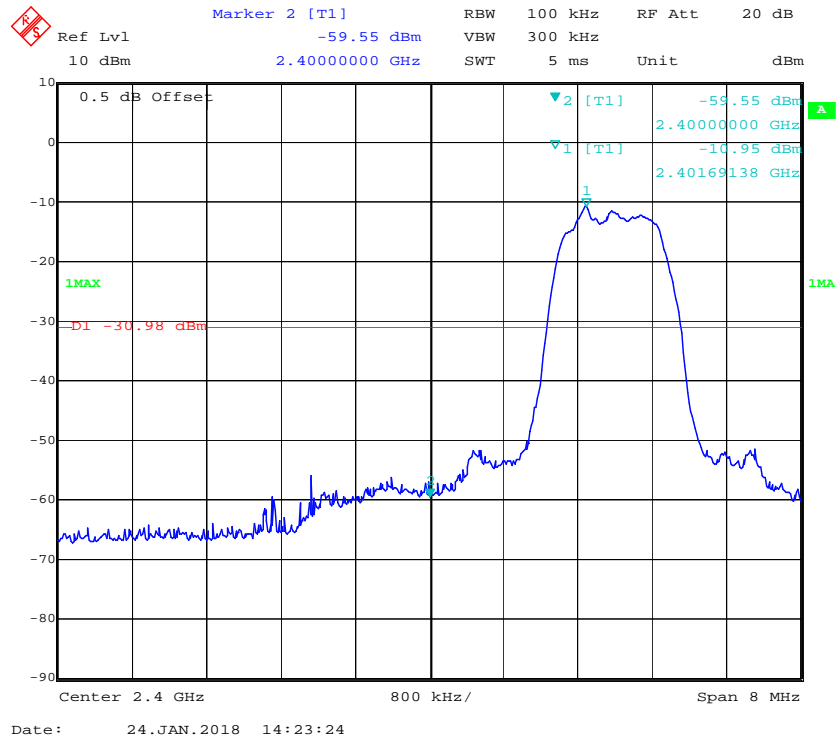
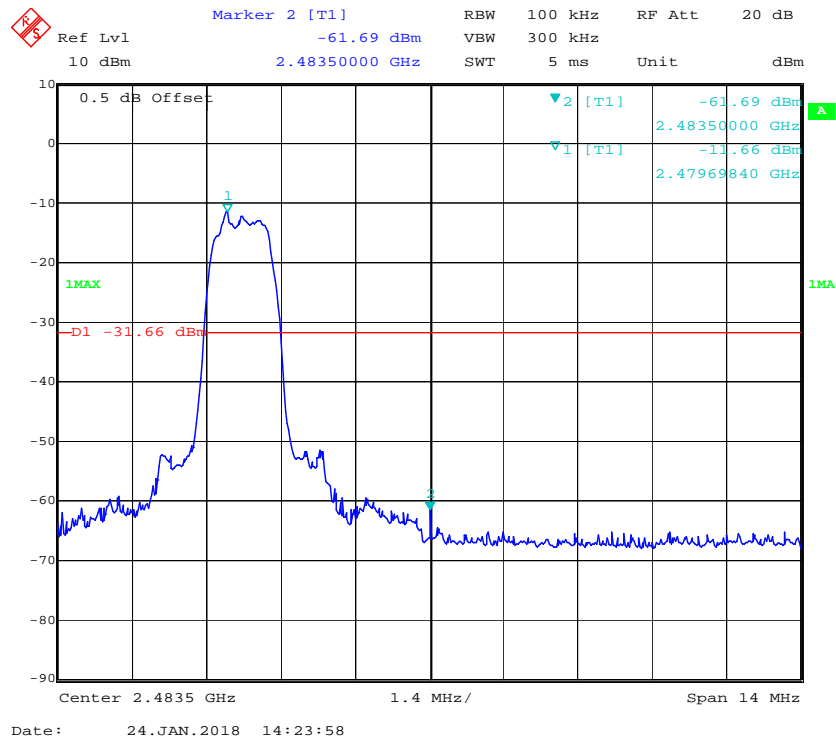
Single Channel Mode,
BDR Mode (GFSK):

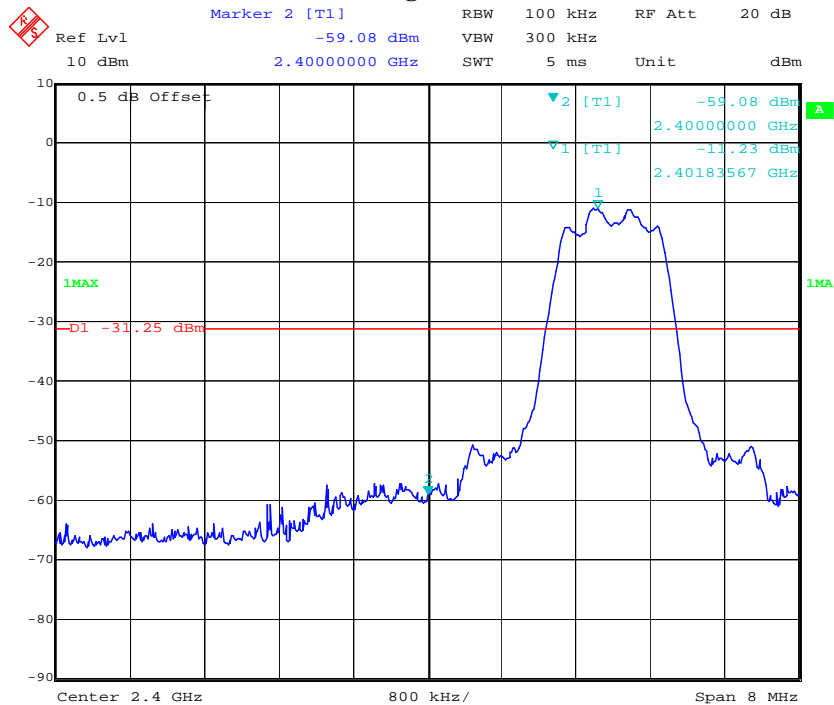
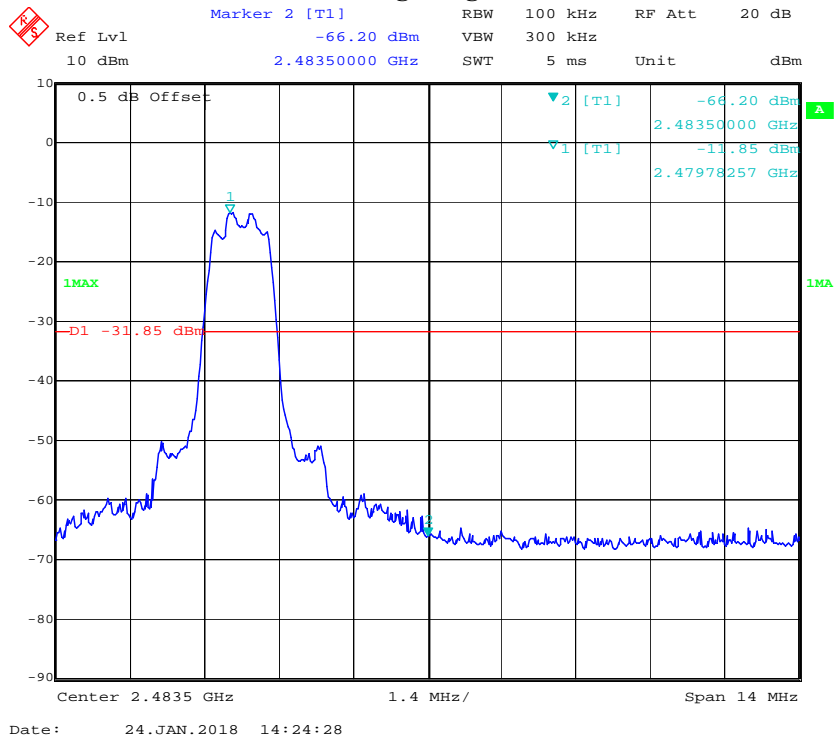
Band Edge, Left Side



Band Edge, Right Side

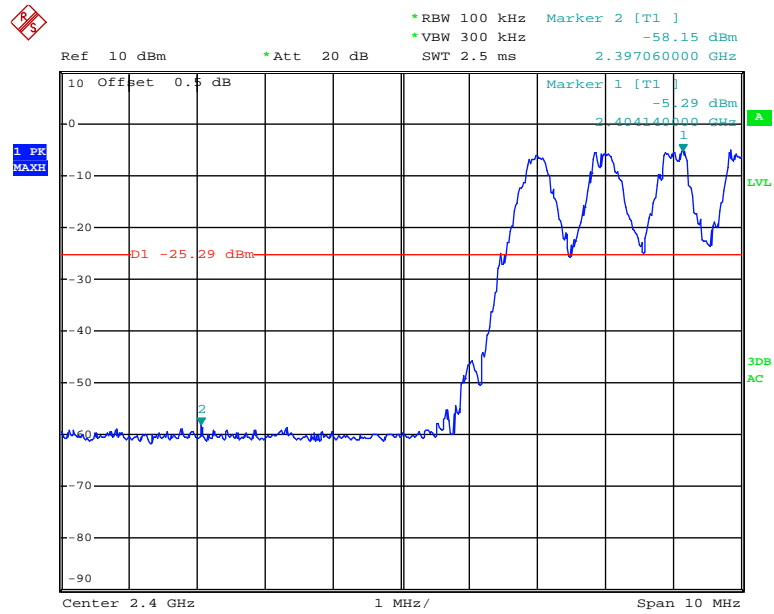


*EDR Mode ($\pi/4$ -DQPSK):***Band Edge, Left Side****Band Edge, Right Side**

*EDR Mode (8-DPSK):***Band Edge, Left Side****Band Edge, Right Side**

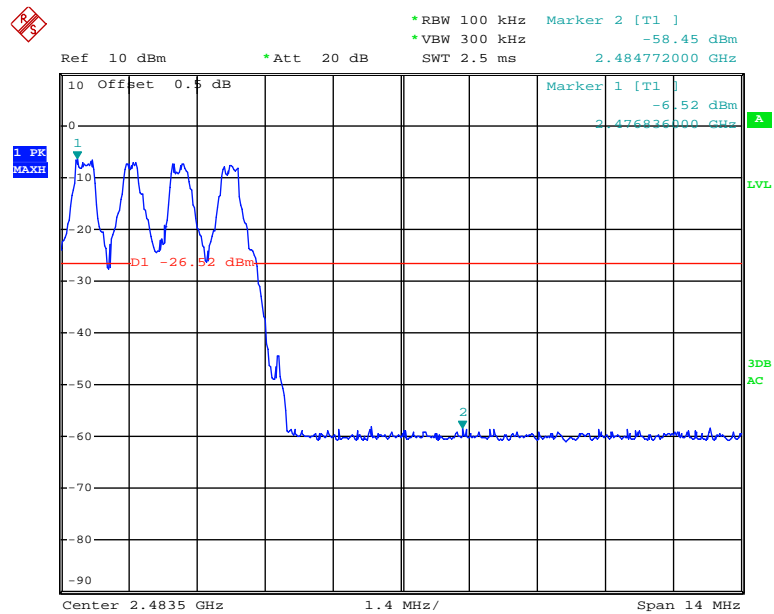
Hopping Mode,
BDR Mode (GFSK):

Band Edge, Left Side



Date: 16.APR.2018 21:03:28

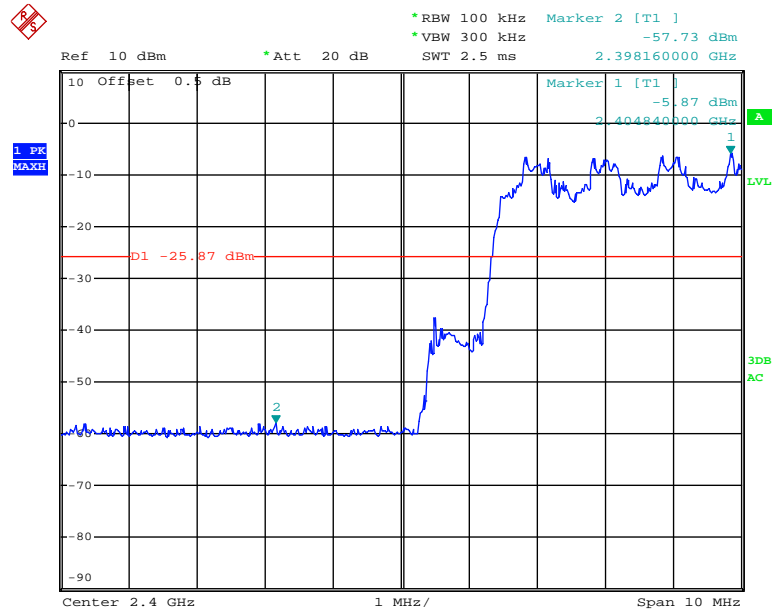
Band Edge, Right Side



Date: 16.APR.2018 21:16:59

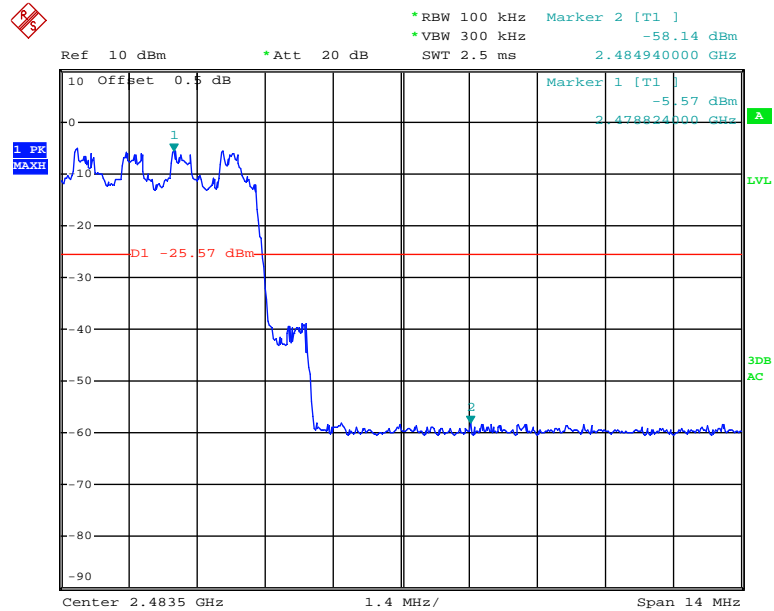
EDR Mode ($\pi/4$ -DQPSK):

Band Edge, Left Side



Date: 16.APR.2018 21:01:39

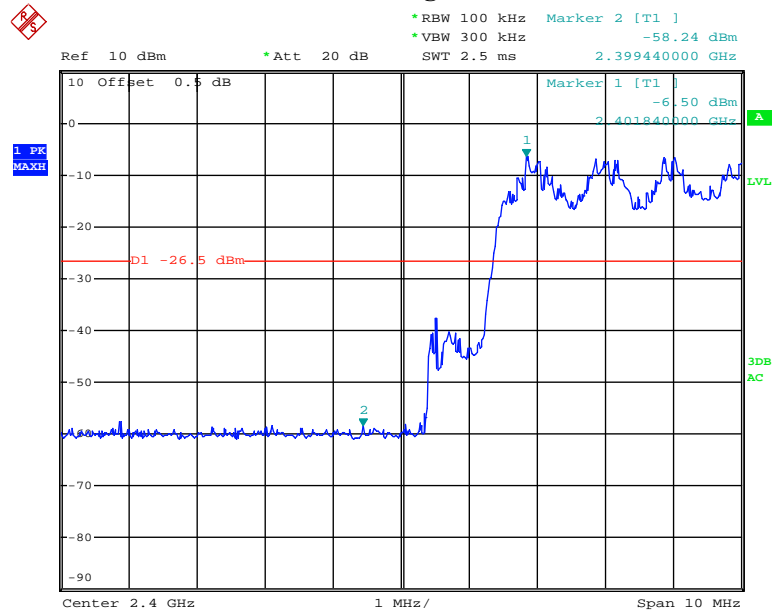
Band Edge, Right Side



Date: 16.APR.2018 21:13:26

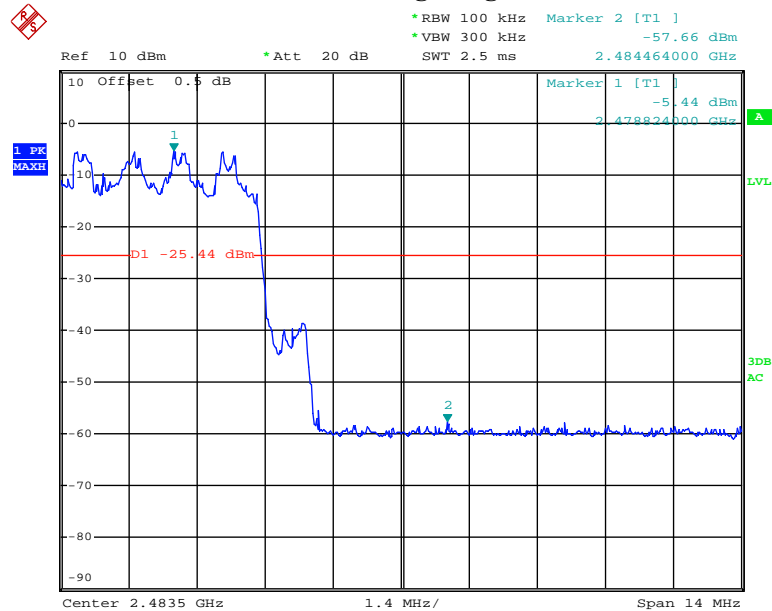
EDR Mode (8-DPSK):

Band Edge, Left Side



Date: 16.APR.2018 21:05:51

Band Edge, Right Side



Date: 16.APR.2018 21:09:28

Note: The result meets requirement which is below 20dB than Fundamental.

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