

FCC PART 15.247

TEST REPORT

For

Sounding Audio Industrial Ltd.

Unit N, 7/F, Stage 2, Wah Fung Industrial Centre, 33-39 Kwai Fung Road, Kwai Chung, Hong Kong

FCC ID: OPDP1

Report Type: Original Report	Product Name: Polk Marine Audio
Report Number: RDG170714003-00A	
Report Date: 2018-02-06	
Jerry Zhang	
EMC Manager	
Reviewed By:	<i>Jerry Zhang</i>
Test Laboratory: Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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 EQUIPMENT LIST AND DETAILS	6
SUPPORT CABLE LIST AND DETAILS	6
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS.....	8
FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE).....	9
APPLICABLE STANDARD	9
FCC §15.203 - ANTENNA REQUIREMENT.....	10
APPLICABLE STANDARD	10
ANTENNA CONNECTOR CONSTRUCTION	10
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	11
APPLICABLE STANDARD	11
EUT SETUP	11
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	12
TEST PROCEDURE	12
TEST EQUIPMENT LIST AND DETAILS.....	12
CORRECTED AMPLITUDE & MARGIN CALCULATION	13
TEST DATA	13
FCC §15.247(a) (1) - CHANNEL SEPARATION TEST	22
APPLICABLE STANDARD	22
TEST EQUIPMENT LIST AND DETAILS.....	22
TEST PROCEDURE	22
TEST DATA	22
FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING.....	28
APPLICABLE STANDARD	28
TEST PROCEDURE	28
TEST EQUIPMENT LIST AND DETAILS.....	28
TEST DATA	28
FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST	34
APPLICABLE STANDARD	34
TEST PROCEDURE	34
TEST EQUIPMENT LIST AND DETAILS.....	34
TEST DATA	34
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....	38

APPLICABLE STANDARD	38
TEST PROCEDURE	38
TEST EQUIPMENT LIST AND DETAILS.....	38
TEST DATA	38
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT	54
APPLICABLE STANDARD	54
TEST PROCEDURE	54
TEST EQUIPMENT LIST AND DETAILS.....	54
TEST DATA	54
FCC §15.247(d) - BAND EDGES TESTING	60
APPLICABLE STANDARD	60
TEST PROCEDURE	60
TEST EQUIPMENT LIST AND DETAILS.....	60
TEST DATA	61

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Sounding Audio Industrial Ltd.***'s product, model number: ***P1 (FCC ID: OPDP1)*** (the "EUT") in this report was a ***Polk Marine Audio***, which was included two parts, *Polk Marine Audio* was measured approximately: 18 cm (L) x 20.7 cm (W) x 5.2 cm (H), *Control Panel* was measured approximately: 18 cm (L) x 13.4 cm (W) x 3.7 cm (H), rated input voltage: DC12V.

**All measurement and test data in this report was gathered from production sample serial number: 170714003 (Assigned by BACL, Dongguan). The EUT was received on 2017-07-17.*

Objective

This report is prepared on behalf of ***Sounding Audio Industrial Ltd.*** 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, 15.209 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: 4.58 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~18GHz: 5.23 dB
Unwanted Emissions	±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.

EUT Exercise Software

Test software: 'BK3254 RF Test_V1.3.exe' was used in test, the system configured maximum power as below setting:

Test Software Version	BK3254 RF Test_V1.3.exe		
Test Frequency	2402MHz	2441MHz	2480MHz
GFSK	3	3	3
$\pi/4$ -DQPSK	3	3	3
8-DPSK	3	3	3

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

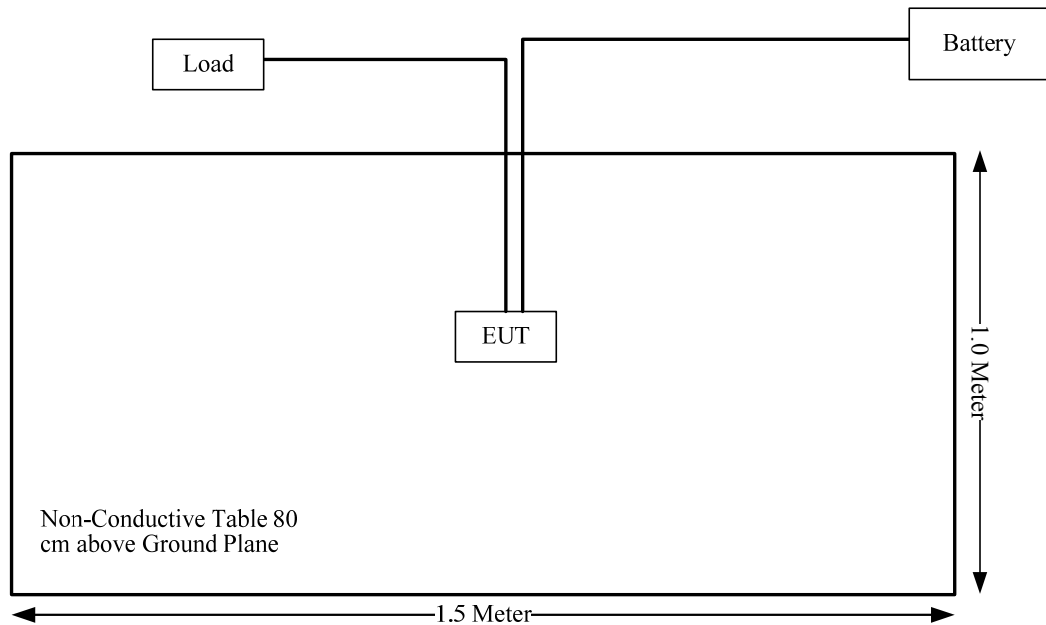
Manufacturer	Description	Model	Serial Number
Kingston	U-Disk	/	/
Desai	Battery	/	/

Support Cable List and Details

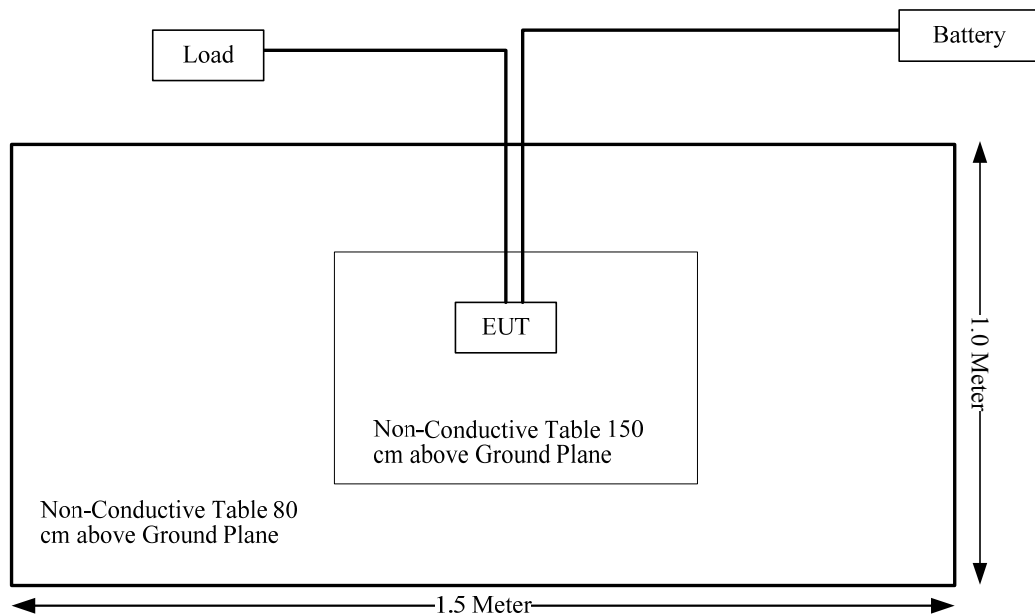
Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
AV Cable	no	no	2	AV Port of EUT	Load

Block Diagram of Test Setup

Radiation Test Below 1GHz:



Radiation Test Above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Not Applicable
§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

Note: Not Applicable: the device was powered by vehicle battery.

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/cm ²)	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.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = 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		Tune-up Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	3	2	-1	0.79	20.00	0.0003	1.0

Note: The maximum tune-up power including tolerance was declared by manufacturer.

Result: Compliance, The device meet FCC MPE at 20 cm distance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

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

Antenna Connector Construction

The EUT has one internal antenna arrangement for BT, and the antenna gain is 3 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

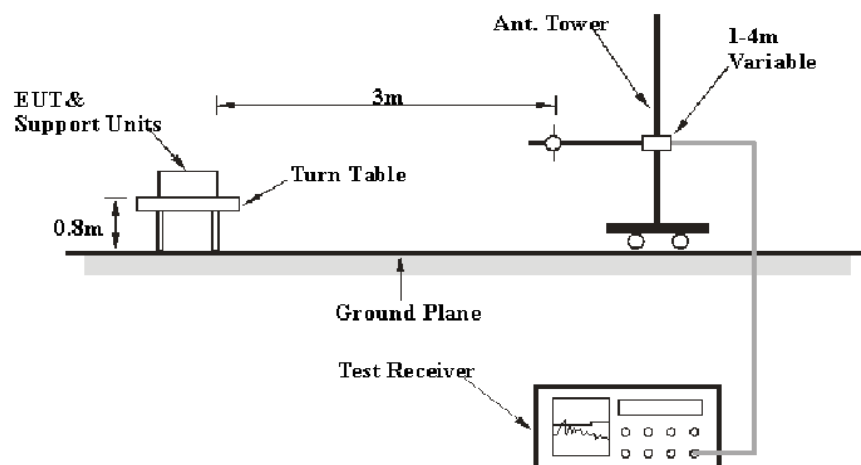
Result: Compliance.

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

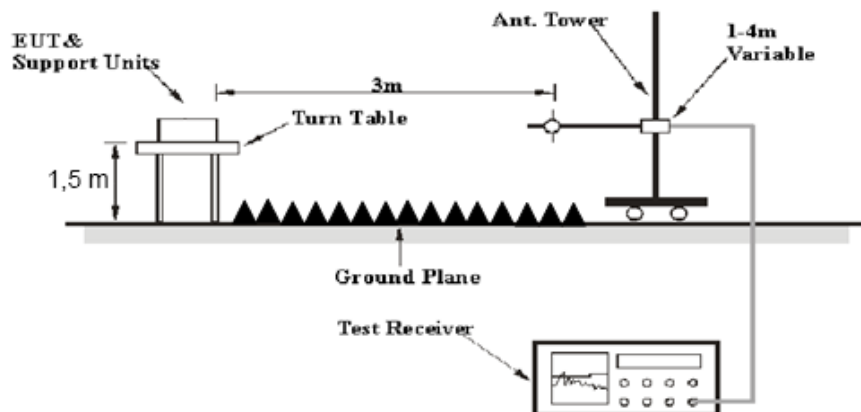
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission 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	100224	2016-09-01	2017-08-31
Sunol Sciences	Antenna	JB3	A060611-1	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2016-09-01	2017-09-01
R&S	Spectrum Analyzer	FSU 26	200256	2016-12-08	2017-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
Mini-Circuit	Amplifier	ZVA-213-S+	SN054201245	2017-02-19	2018-02-19
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2016-09-06	2017-09-06
Unknown	Coaxial Cable	Chamber A-1	4m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber B-1	0.75m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber A-2	10m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber B-2	8m	2016-09-01	2017-09-01
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	2016-09-05	2017-09-05

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

Corrected Amplitude & Margin Calculation

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

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

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

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

Test Data

Environmental Conditions

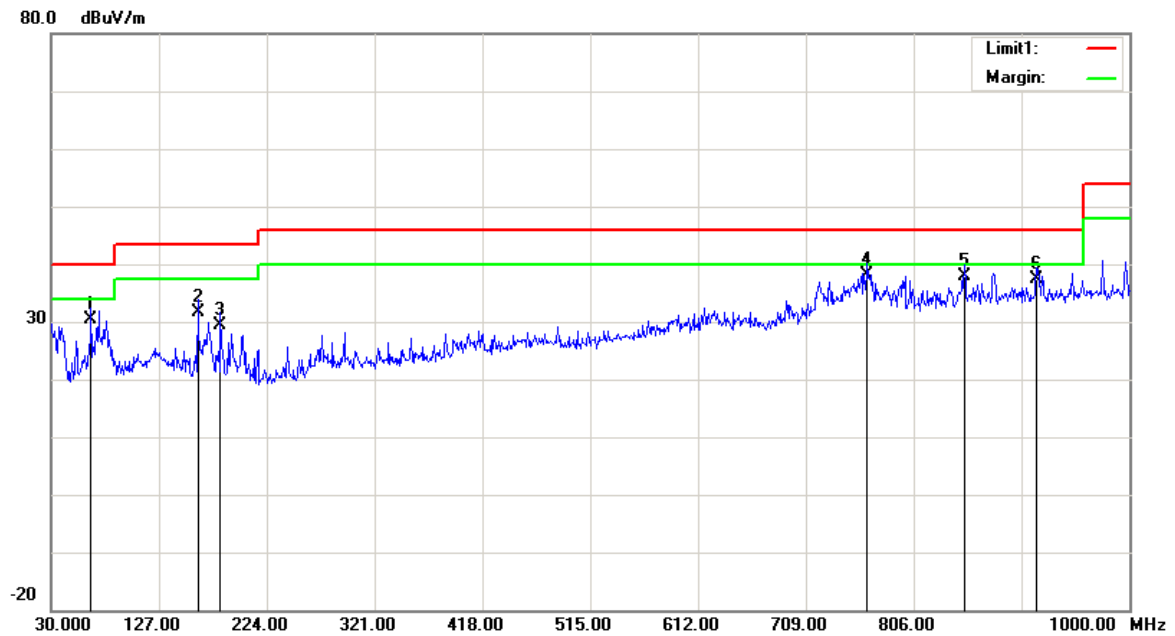
Temperature:	28.6 °C
Relative Humidity:	49 %
ATM Pressure:	100.3 kPa

** The testing was performed by George Pang on 2017-08-17.*

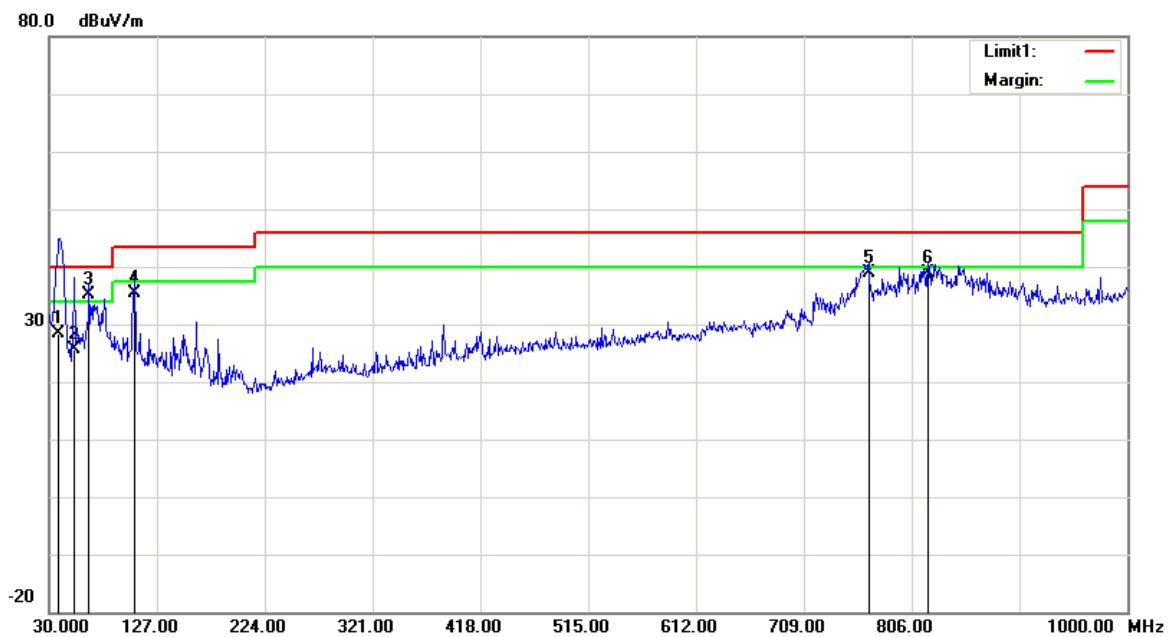
Test Mode: Transmitting

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

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Measurement	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
65.8900	42.17	QP	-11.87	30.30	40.00	9.70
161.9200	38.58	QP	-6.88	31.70	43.50	11.80
182.2900	37.37	QP	-7.87	29.50	43.50	14.00
764.2900	34.83	QP	3.37	38.20	46.00	7.80
851.5900	34.10	QP	3.80	37.90	46.00	8.10
916.5800	31.40	QP	6.00	37.40	46.00	8.60

Vertical:

Frequency (MHz)	Receiver Reading (dBuV)	Measurement	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
38.7300	33.78	QP	-5.48	28.30	40.00	11.70
52.3100	37.90	QP	-12.20	25.70	40.00	14.30
65.8900	47.07	QP	-11.87	35.20	40.00	4.80
106.6300	42.35	QP	-6.85	35.50	43.50	8.00
767.2000	35.39	QP	3.41	38.80	46.00	7.20
820.5500	35.17	QP	3.63	38.80	46.00	7.20

2) 1-25GHz:*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)	Measurement	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402	58.96	PK	H	24.82	5.32	0.00	89.10	N/A	N/A
2402	49.37	AV	H	24.82	5.32	0.00	79.51	N/A	N/A
2402	56.15	PK	V	24.82	5.32	0.00	86.29	N/A	N/A
2402	47.42	AV	V	24.82	5.32	0.00	77.56	N/A	N/A
2390	33.52	PK	H	24.80	5.30	0.00	63.62	74.00	10.38
2390	18.26	AV	H	24.80	5.30	0.00	48.36	54.00	5.64
4804	41.7	PK	H	29.71	7.33	27.36	51.38	74.00	22.62
4804	36	AV	H	29.71	7.33	27.36	45.68	54.00	8.32
7206	45.58	PK	H	33.93	8.99	27.19	61.31	74.00	12.69
7206	35.92	AV	H	33.93	8.99	27.19	51.65	54.00	2.35
2927	37.28	PK	H	25.60	5.79	27.78	40.89	74.00	33.11
2927	24.17	AV	H	25.60	5.79	27.78	27.78	54.00	26.22
Middle Channel: 2441 MHz									
2441	57.47	PK	H	24.89	5.35	0.00	87.71	N/A	N/A
2441	48.86	AV	H	24.89	5.35	0.00	79.10	N/A	N/A
2441	55.91	PK	V	24.89	5.35	0.00	86.15	N/A	N/A
2441	46.16	AV	V	24.89	5.35	0.00	76.40	N/A	N/A
4882	41.31	PK	H	29.86	7.43	27.56	51.04	74.00	22.96
4882	34.6	AV	H	29.86	7.43	27.56	44.33	54.00	9.67
7323	46.31	PK	H	34.12	9.06	27.26	62.23	74.00	11.77
7323	37.05	AV	H	34.12	9.06	27.26	52.97	54.00	1.03
1687	37.35	PK	H	24.10	4.49	27.92	38.02	74.00	35.98
1687	24.21	AV	H	24.10	4.49	27.92	24.88	54.00	29.12
2874	36.96	PK	H	25.52	5.75	27.84	40.39	74.00	33.61
2874	23.97	AV	H	25.52	5.75	27.84	27.40	54.00	26.60
High Channel: 2480 MHz									
2480	57.25	PK	H	24.96	5.39	0.00	87.60	N/A	N/A
2480	48.54	AV	H	24.96	5.39	0.00	78.89	N/A	N/A
2480	56.93	PK	V	24.96	5.39	0.00	87.28	N/A	N/A
2480	47.24	AV	V	24.96	5.39	0.00	77.59	N/A	N/A
2483.5	34.24	PK	V	24.97	5.39	0.00	64.60	74.00	9.40
2483.5	18.32	AV	H	24.97	5.39	0.00	48.68	54.00	5.32
4960	40.04	PK	H	30.02	7.54	27.37	50.23	74.00	23.77
4960	32.26	AV	H	30.02	7.54	27.37	42.45	54.00	11.55
7440	45.69	PK	H	34.30	9.14	27.22	61.91	74.00	12.09
7440	36.52	AV	H	34.30	9.14	27.22	52.74	54.00	1.26
2573	37.39	PK	H	25.10	5.48	27.89	40.08	74.00	33.92
2573	24.42	AV	H	25.10	5.48	27.89	27.11	54.00	26.89

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

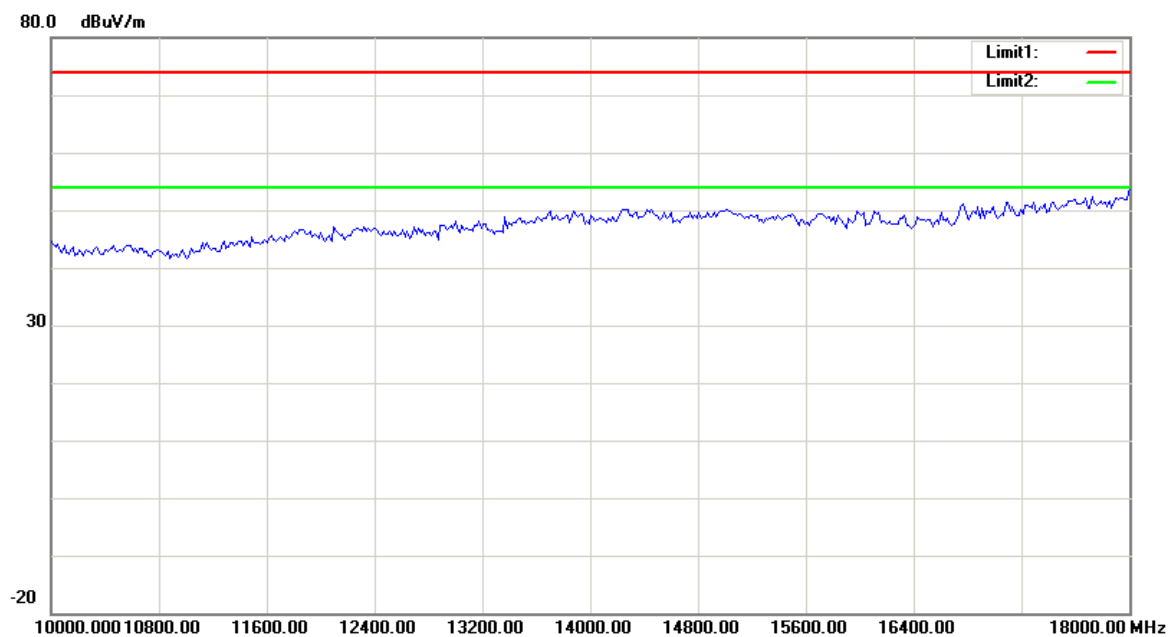
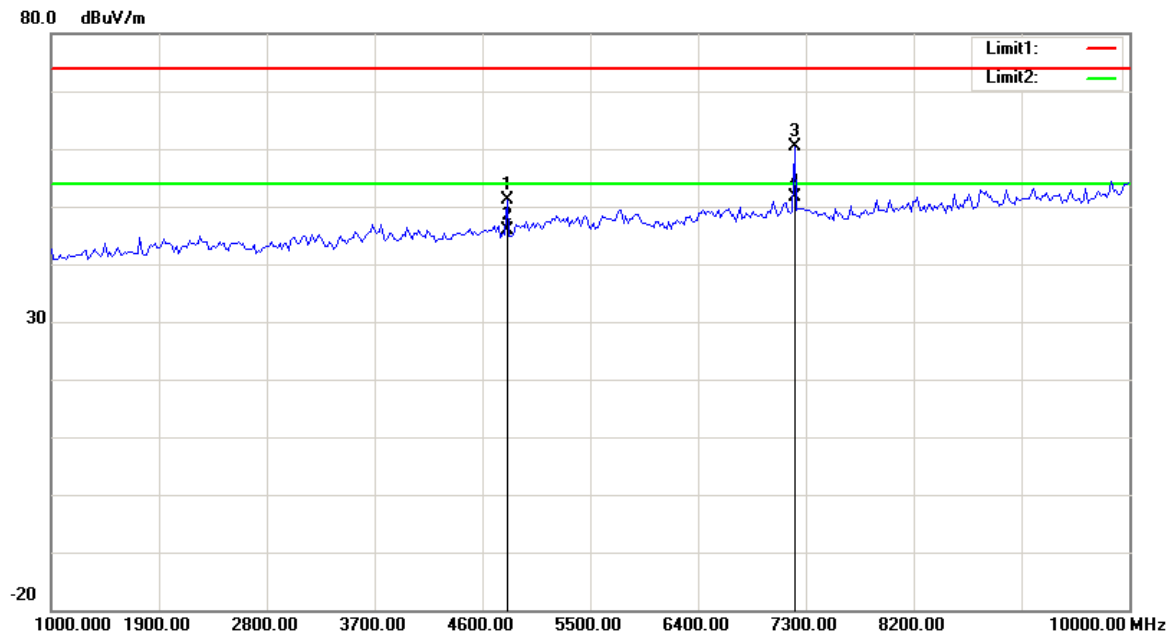
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Measurement	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402	56.53	PK	H	24.82	5.32	0.00	86.67	N/A	N/A
2402	53.06	AV	H	24.82	5.32	0.00	83.20	N/A	N/A
2402	54.12	PK	V	24.82	5.32	0.00	84.26	N/A	N/A
2402	50.54	AV	V	24.82	5.32	0.00	80.68	N/A	N/A
2390	33.13	PK	H	24.80	5.30	0.00	63.23	74.00	10.77
2390	18.25	AV	H	24.80	5.30	0.00	48.35	54.00	5.65
4804	38.52	PK	H	29.71	7.33	27.36	48.20	74.00	25.80
4804	26.01	AV	H	29.71	7.33	27.36	35.69	54.00	18.31
7206	42.53	PK	H	33.93	8.99	27.19	58.26	74.00	15.74
7206	32.76	AV	H	33.93	8.99	27.19	48.49	54.00	5.51
3215	37.32	PK	H	26.35	6.08	27.28	42.47	74.00	31.53
3215	24.28	AV	H	26.35	6.08	27.28	29.43	54.00	24.57
Middle Channel: 2441 MHz									
2441	55.51	PK	H	24.89	5.35	0.00	85.75	N/A	N/A
2441	51.83	AV	H	24.89	5.35	0.00	82.07	N/A	N/A
2441	54.07	PK	V	24.89	5.35	0.00	84.31	N/A	N/A
2441	50.4	AV	V	24.89	5.35	0.00	80.64	N/A	N/A
4882	38.42	PK	H	29.86	7.43	27.56	48.15	74.00	25.85
4882	26.63	AV	H	29.86	7.43	27.56	36.36	54.00	17.64
7323	42.27	PK	H	34.12	9.06	27.26	58.19	74.00	15.81
7323	32.51	AV	H	34.12	9.06	27.26	48.43	54.00	5.57
2719	37.21	PK	H	25.31	5.61	27.88	40.25	74.00	33.75
2719	24.29	AV	H	25.31	5.61	27.88	27.33	54.00	26.67
3126	37.08	PK	H	26.08	5.99	27.29	41.86	74.00	32.14
3126	24.12	AV	H	26.08	5.99	27.29	28.90	54.00	25.10
High Channel: 2480 MHz									
2480	55.32	PK	H	24.96	5.39	0.00	85.67	N/A	N/A
2480	51.79	AV	H	24.96	5.39	0.00	82.14	N/A	N/A
2480	55.16	PK	V	24.96	5.39	0.00	85.51	N/A	N/A
2480	51.61	AV	V	24.96	5.39	0.00	81.96	N/A	N/A
2483.5	34.38	PK	V	24.97	5.39	0.00	64.74	74.00	9.26
2483.5	18.31	AV	H	24.97	5.39	0.00	48.67	54.00	5.33
4960	38.53	PK	H	30.02	7.54	27.37	48.72	74.00	25.28
4960	26.67	AV	H	30.02	7.54	27.37	36.86	54.00	17.14
7440	41.92	PK	H	34.30	9.14	27.22	58.14	74.00	15.86
7440	32.38	AV	H	34.30	9.14	27.22	48.60	54.00	5.40
2169	37.39	PK	H	24.40	5.09	27.86	39.02	74.00	34.98
2169	24.32	AV	H	24.40	5.09	27.86	25.95	54.00	28.05

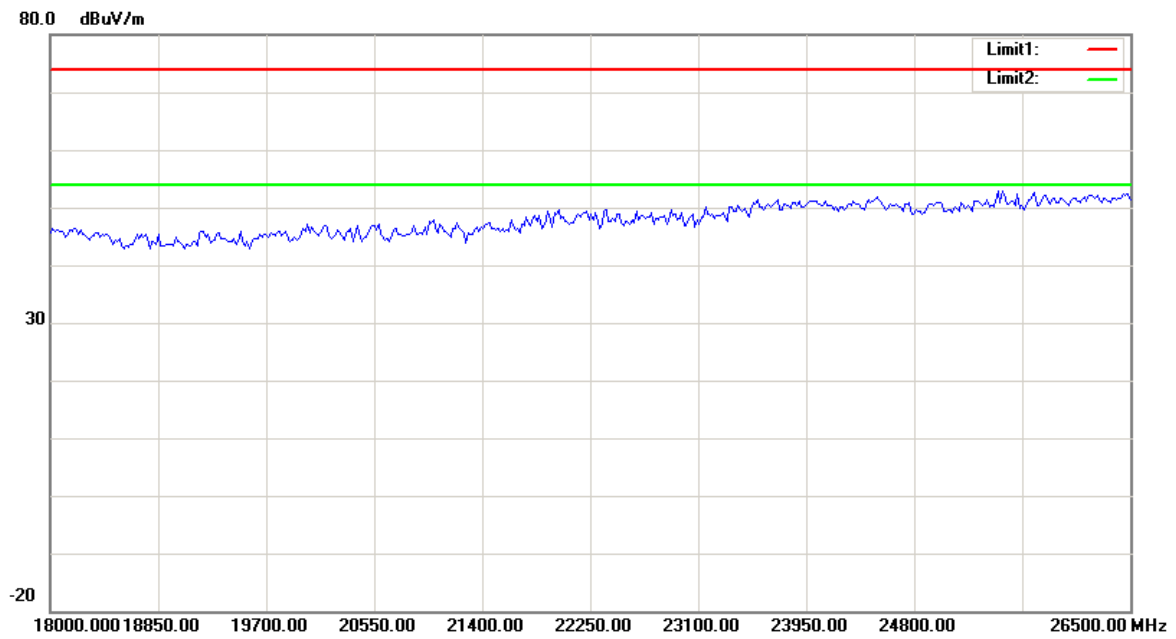
EDR Mode (8-DPSK):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Measurement	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402	56.85	PK	H	24.82	5.32	0.00	86.99	N/A	N/A
2402	53.06	AV	H	24.82	5.32	0.00	83.20	N/A	N/A
2402	54.48	PK	V	24.82	5.32	0.00	84.62	N/A	N/A
2402	50.71	AV	V	24.82	5.32	0.00	80.85	N/A	N/A
2390	34.17	PK	H	24.80	5.30	0.00	64.27	74.00	9.73
2390	18.23	AV	H	24.80	5.30	0.00	48.33	54.00	5.67
4804	38.61	PK	H	29.71	7.33	27.36	48.29	74.00	25.71
4804	26.1	AV	H	29.71	7.33	27.36	35.78	54.00	18.22
7206	42.4	PK	H	33.93	8.99	27.19	58.13	74.00	15.87
7206	32.66	AV	H	33.93	8.99	27.19	48.39	54.00	5.61
2182	37.19	PK	H	24.43	5.10	27.85	38.87	74.00	35.13
2182	24.26	AV	H	24.43	5.10	27.85	25.94	54.00	28.06
Middle Channel: 2441 MHz									
2441	55.63	PK	H	24.89	5.35	0.00	85.87	N/A	N/A
2441	51.83	AV	H	24.89	5.35	0.00	82.07	N/A	N/A
2441	54.3	PK	V	24.89	5.35	0.00	84.54	N/A	N/A
2441	50.51	AV	V	24.89	5.35	0.00	80.75	N/A	N/A
4882	38.3	PK	H	29.86	7.43	27.56	48.03	74.00	25.97
4882	26.55	AV	H	29.86	7.43	27.56	36.28	54.00	17.72
7323	42.38	PK	H	34.12	9.06	27.26	58.30	74.00	15.70
7323	32.62	AV	H	34.12	9.06	27.26	48.54	54.00	5.46
1958	37.25	PK	H	24.10	4.87	27.89	38.33	74.00	35.67
1958	24.19	AV	H	24.10	4.87	27.89	25.27	54.00	28.73
2748	37.08	PK	H	25.35	5.63	27.88	40.18	74.00	33.82
2748	24.11	AV	H	25.35	5.63	27.88	27.21	54.00	26.79
High Channel: 2480 MHz									
2480	55.72	PK	H	24.96	5.39	0.00	86.07	N/A	N/A
2480	51.74	AV	H	24.96	5.39	0.00	82.09	N/A	N/A
2480	55.27	PK	V	24.96	5.39	0.00	85.62	N/A	N/A
2480	51.48	AV	V	24.96	5.39	0.00	81.83	N/A	N/A
2483.5	37.49	PK	H	24.97	5.39	0.00	67.85	74.00	6.15
2483.5	18.47	AV	H	24.97	5.39	0.00	48.83	54.00	5.17
4960	38.68	PK	H	30.02	7.54	27.37	48.87	74.00	25.13
4960	26.81	AV	H	30.02	7.54	27.37	37.00	54.00	17.00
7440	41.85	PK	H	34.30	9.14	27.22	58.07	74.00	15.93
7440	32.3	AV	H	34.30	9.14	27.22	48.52	54.00	5.48
2315	37.31	PK	H	24.67	5.23	27.98	39.23	74.00	34.77
2315	24.26	AV	H	24.67	5.23	27.98	26.18	54.00	27.82

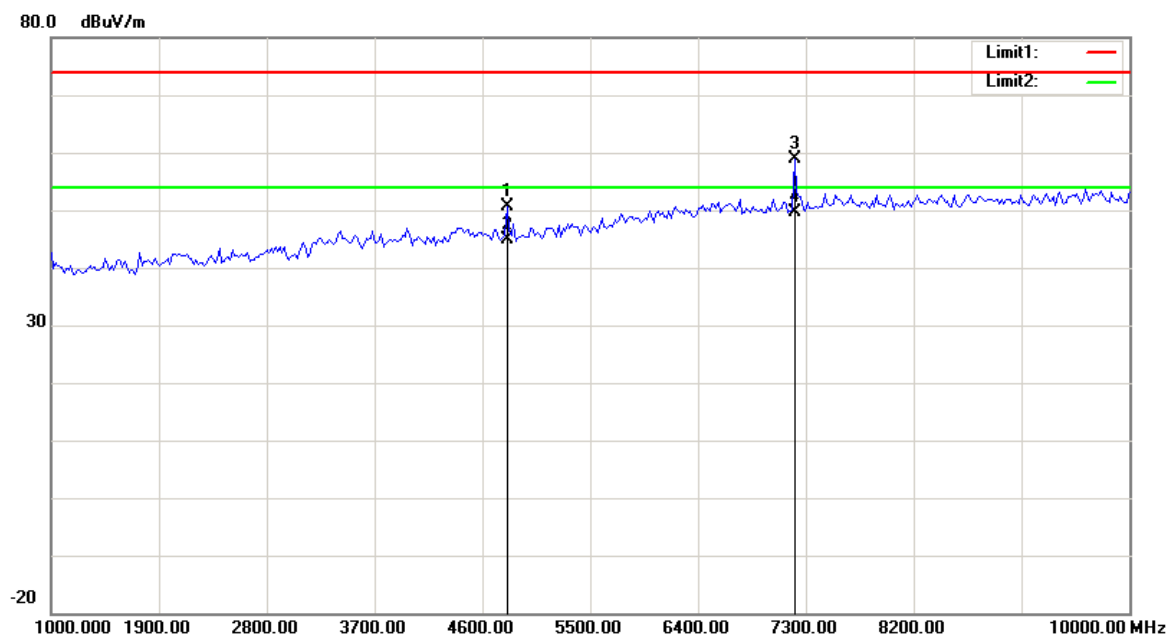
Test plos (BDR mode low channel is the worst)

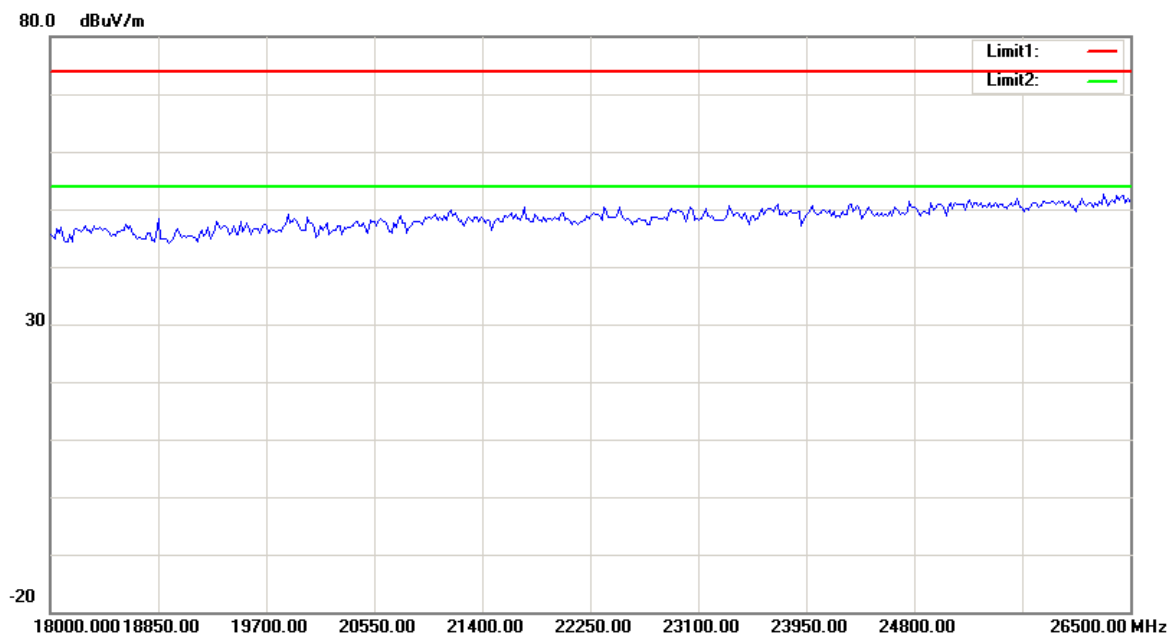
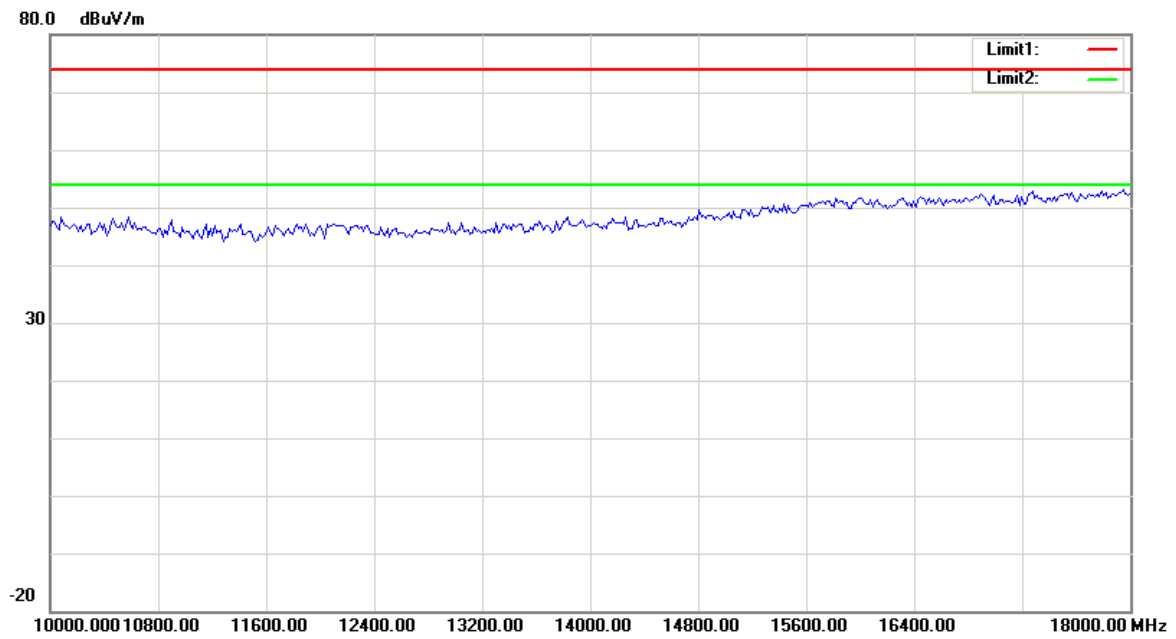
Horizontal:





Vertical:





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	FSP 38	100478	2016-12-08	2017-12-08
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **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:	25.6 °C
Relative Humidity:	47 %
ATM Pressure:	100.5 kPa

* The testing was performed by Sun Zhong on 2017-08-19.

Test Result: Compliance.

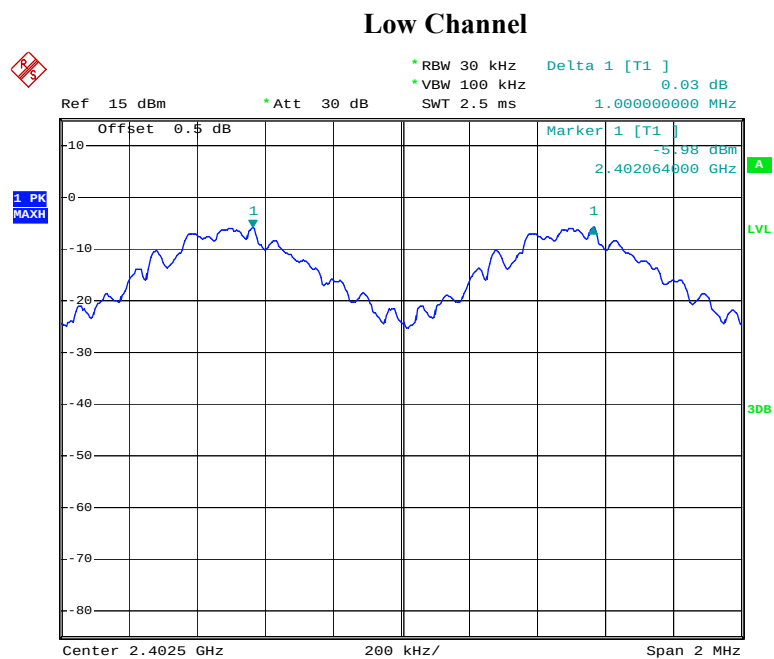
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	1.000	0.74
	Middle	2441	1.004	0.73
	High	2480	1.004	0.73
EDR ($\pi/4$ -DQPSK)	Low	2402	1.004	0.92
	Middle	2441	1.004	0.92
	High	2480	1.000	0.93
EDR (8-DPSK)	Low	2402	1.004	0.92
	Middle	2441	1.000	0.93
	High	2480	1.040	0.91

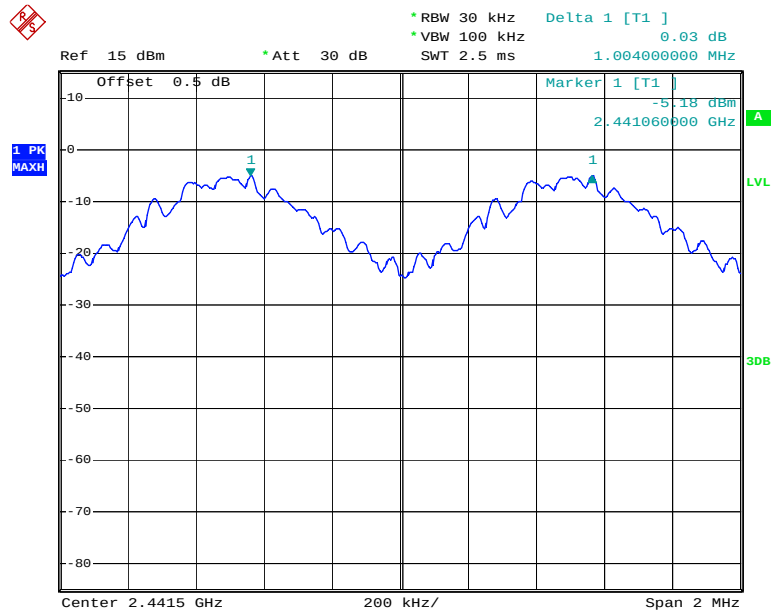
Note: Limit= $(2/3) \times 20\text{dB}$ bandwidth

BDR Mode (GFSK):



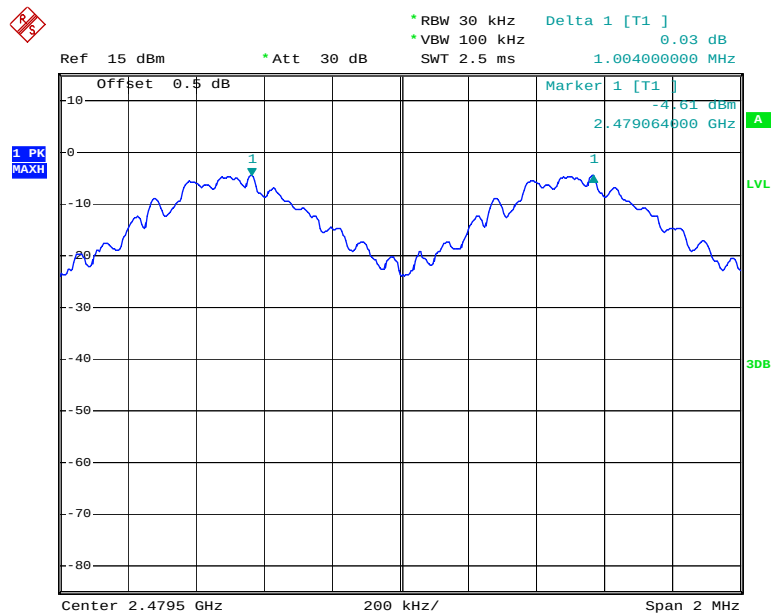
Date: 19.AUG.2017 11:41:40

Middle Channel



Date: 19.AUG.2017 11:42:17

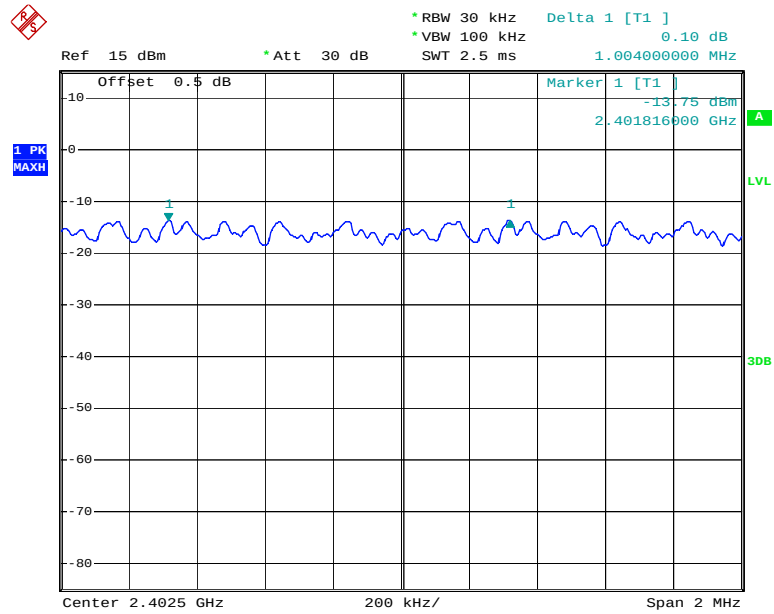
High Channel



Date: 19.AUG.2017 11:42:49

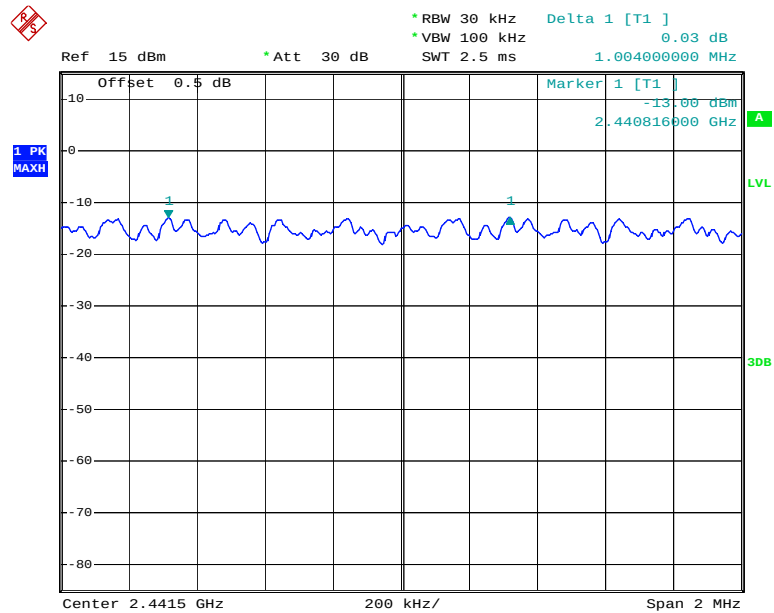
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



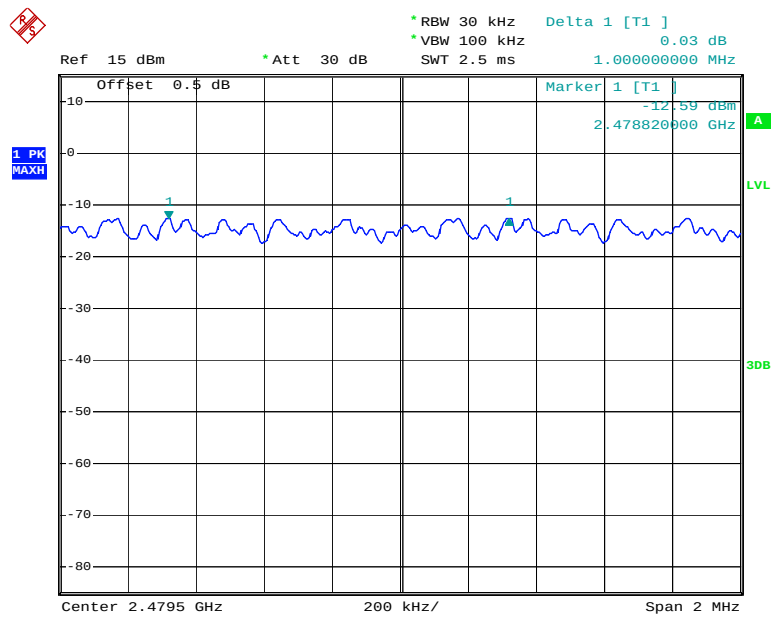
Date: 19.AUG.2017 11:45:32

Middle Channel



Date: 19.AUG.2017 11:44:35

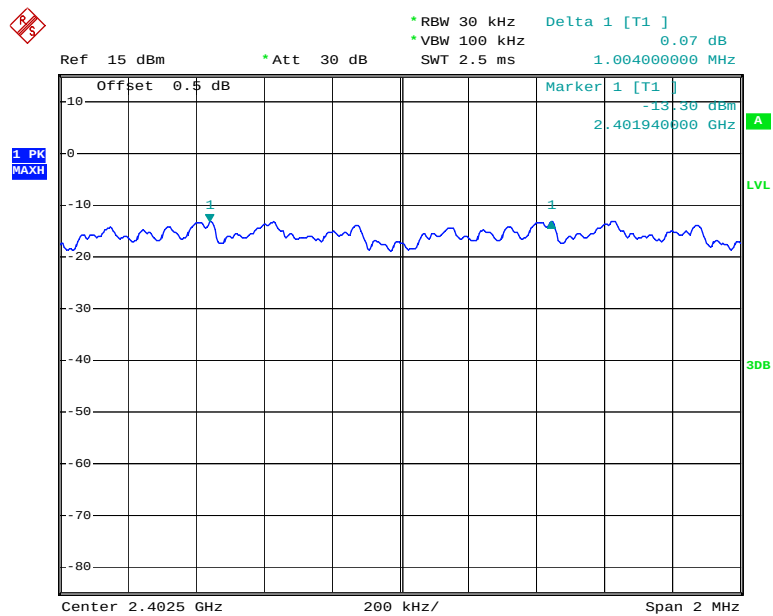
High Channel



Date: 19.AUG.2017 11:43:56

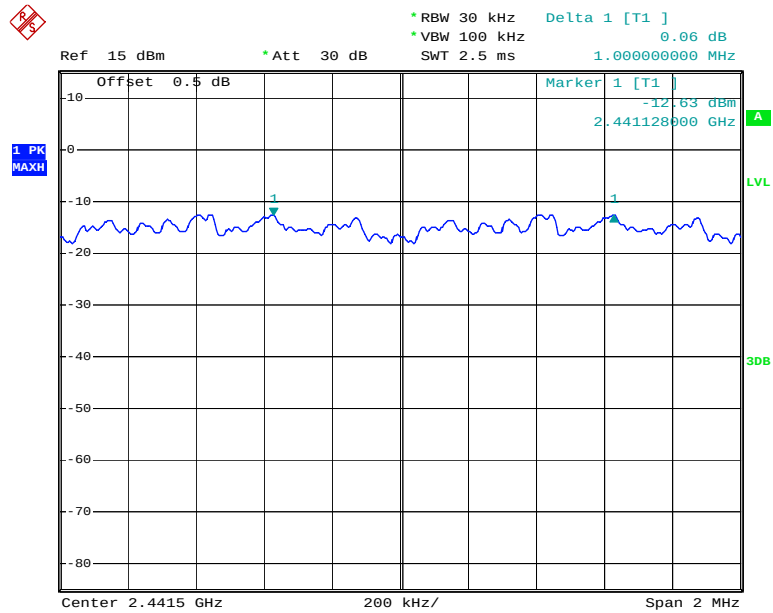
EDR Mode (8-DPSK):

Low Channel



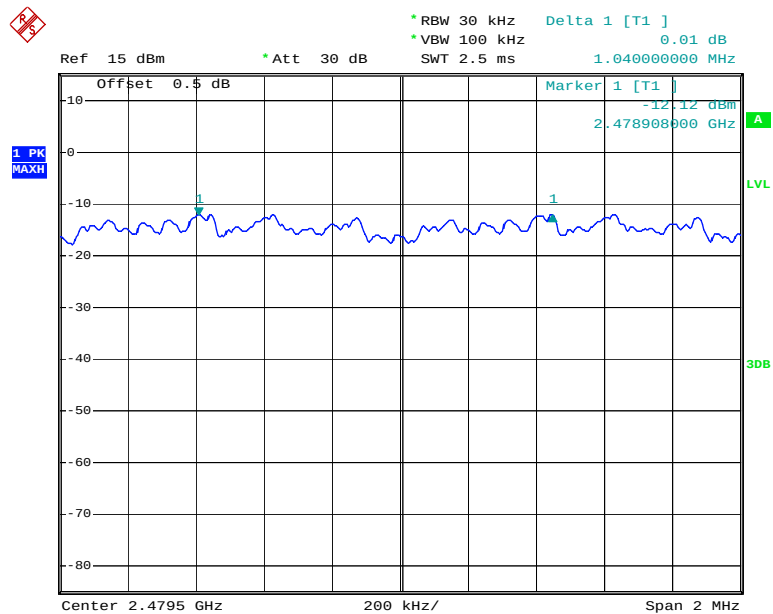
Date: 19.AUG.2017 11:46:39

Middle Channel



Date: 19.AUG.2017 11:47:42

High Channel



Date: 19.AUG.2017 11:48:29

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	FSP 38	100478	2016-12-08	2017-12-08
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **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:	25.6 °C
Relative Humidity:	47 %
ATM Pressure:	100.5 kPa

* The testing was performed by Sun Zhong on 2017-08-19.

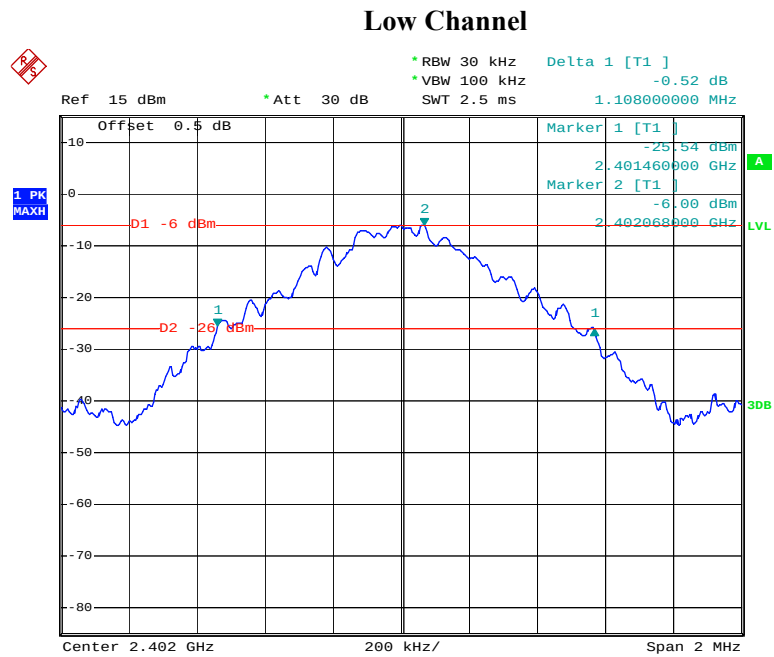
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

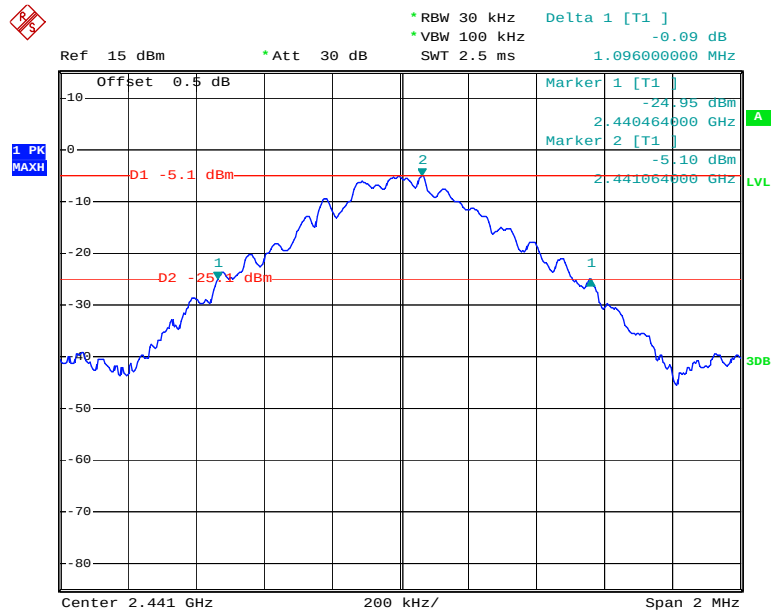
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	1.11
	Middle	2441	1.10
	High	2480	1.10
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.38
	Middle	2441	1.38
	High	2480	1.39
EDR Mode (8-DPSK)	Low	2402	1.38
	Middle	2441	1.39
	High	2480	1.37

BDR Mode (GFSK):



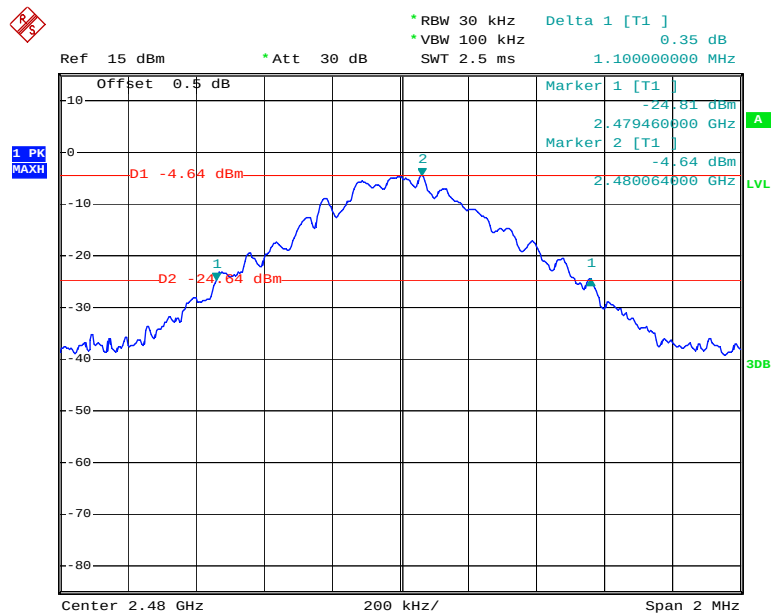
Date: 19.AUG.2017 10:40:59

Middle Channel

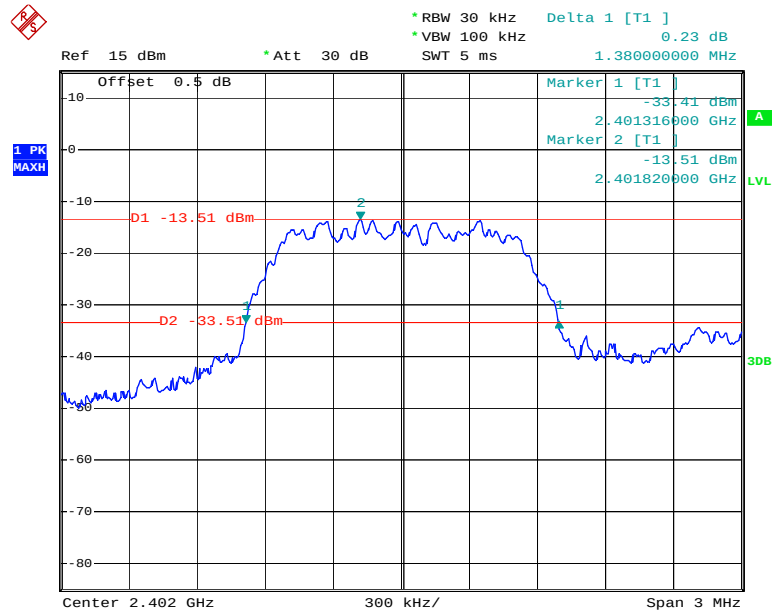


Date: 19.AUG.2017 10:39:19

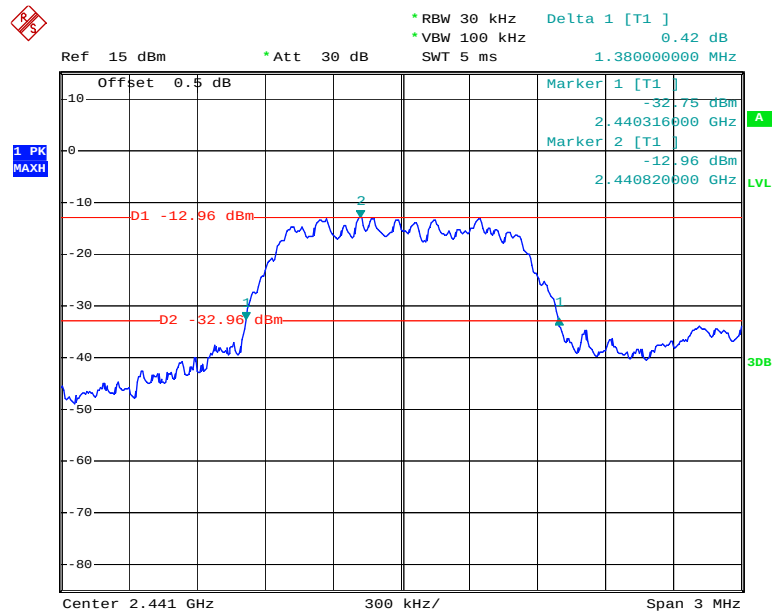
High Channel



Date: 19.AUG.2017 10:42:23

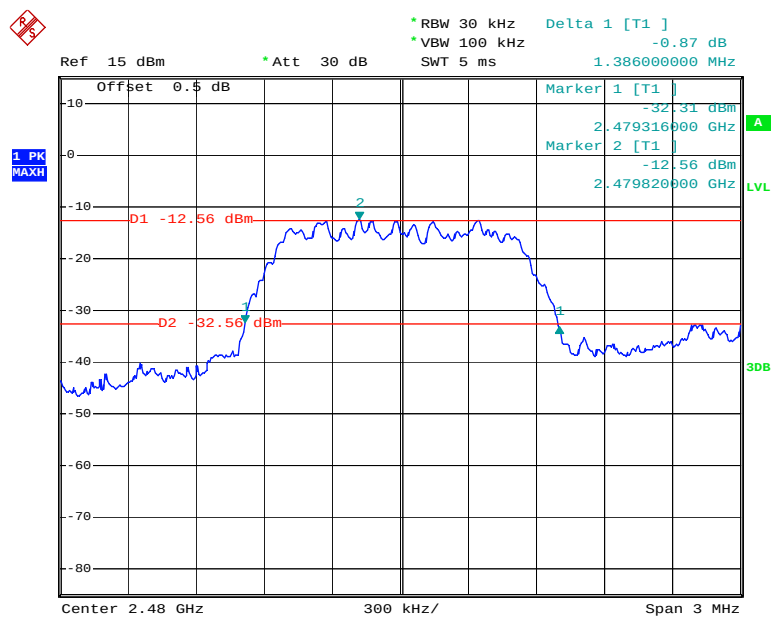
*EDR Mode ($\pi/4$ -DQPSK):***Low Channel**

Date: 19.AUG.2017 10:48:28

Middle Channel

Date: 19.AUG.2017 10:47:16

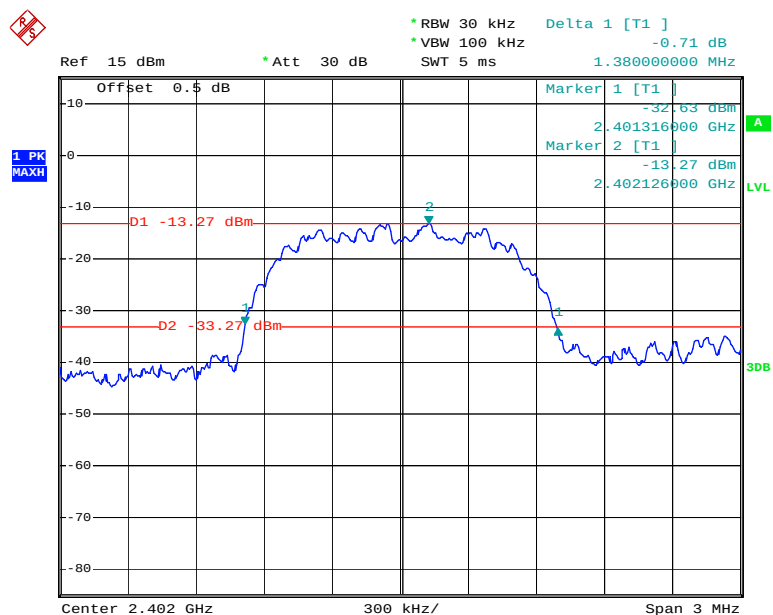
High Channel



Date: 19.AUG.2017 10:45:14

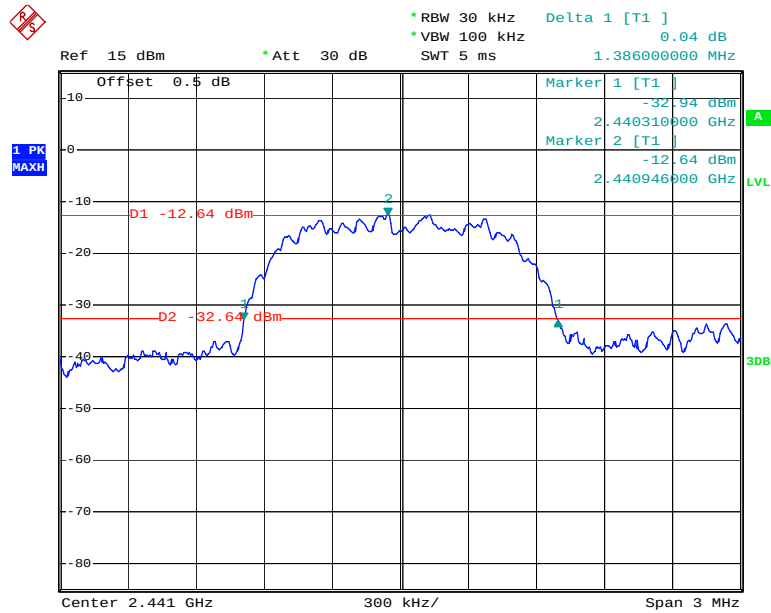
EDR Mode (8-DPSK):

Low Channel



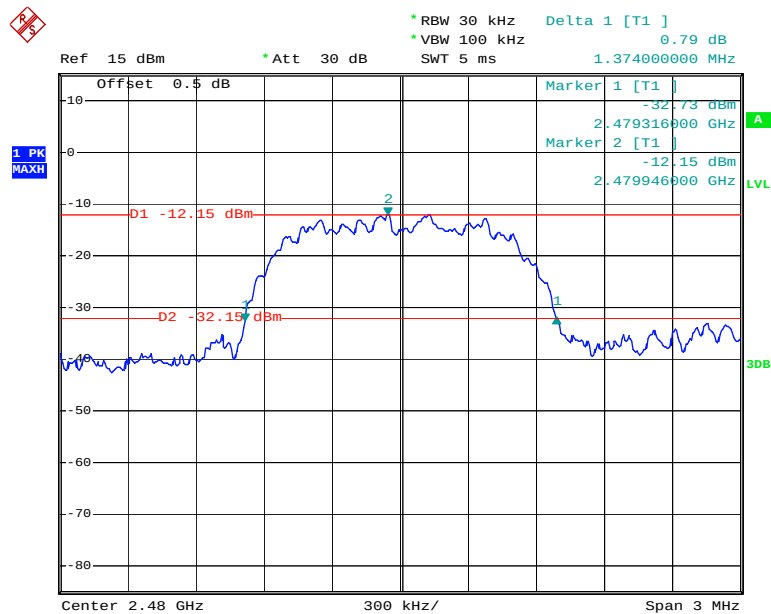
Date: 19.AUG.2017 10:51:23

Middle Channel



Date: 19.AUG.2017 10:52:58

High Channel



Date: 19.AUG.2017 10:54:01

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	FSP 38	100478	2016-12-08	2017-12-08
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **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:	25.2 °C
Relative Humidity:	46 %
ATM Pressure:	100.5 kPa

* The testing was performed by Sun Zhong on 2017-08-18.

Test Result: Compliance.

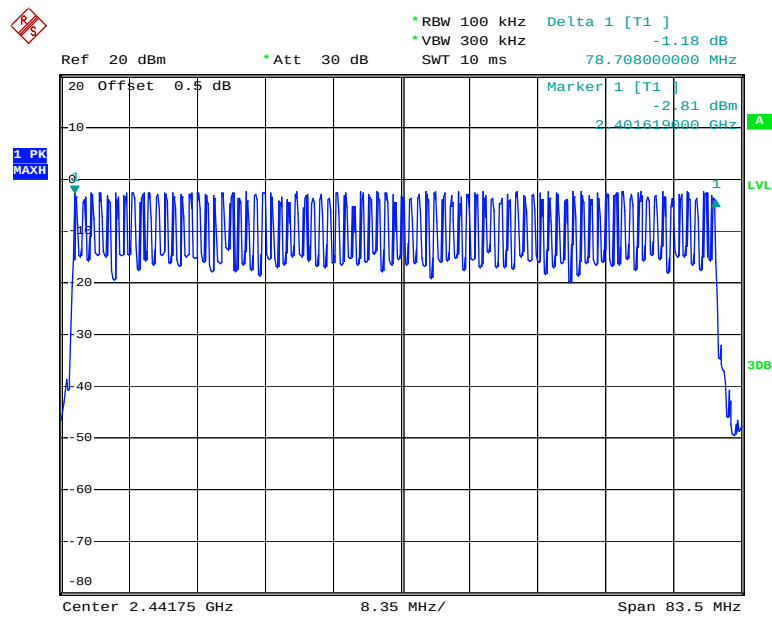
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

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

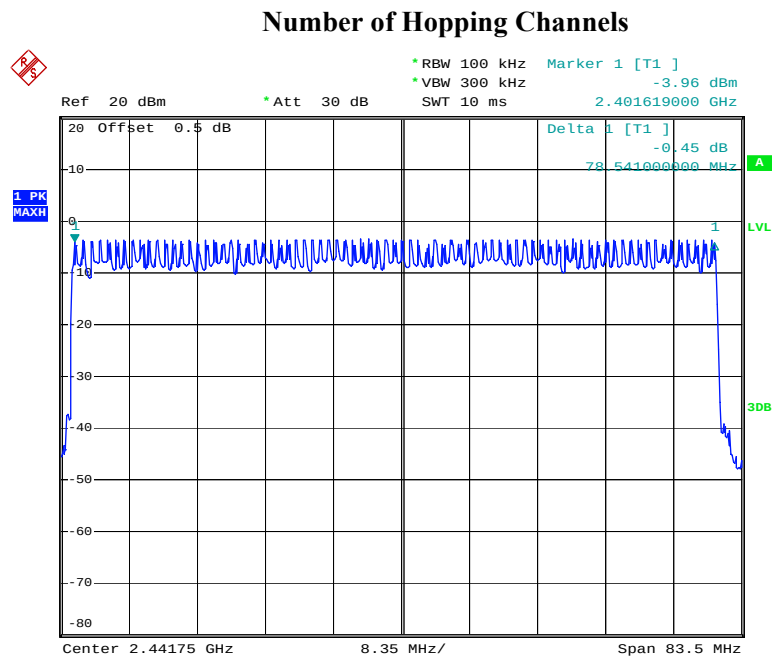
Number of Hopping Channels



Date: 18.AUG.2017 14:25:58

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

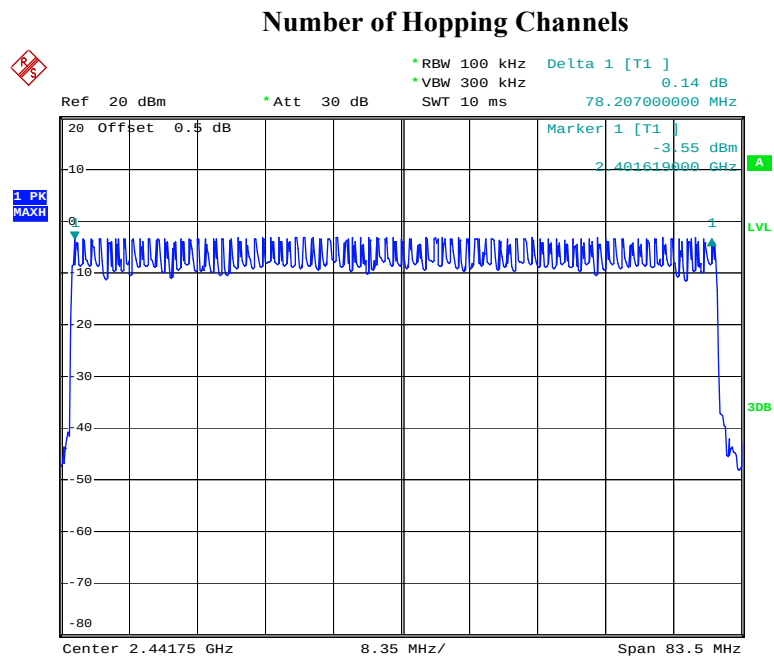
Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥ 15



Date: 18.AUG.2017 14:36:43

EDR Mode (8-DPSK):

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



Date: 18.AUG.2017 14:41:52

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	FSP 38	100478	2016-12-08	2017-12-08
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **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:	25.6 °C
Relative Humidity:	47 %
ATM Pressure:	100.5 kPa

* The testing was performed by Sun Zhong on 2017-08-19.

Test Result: Compliance.

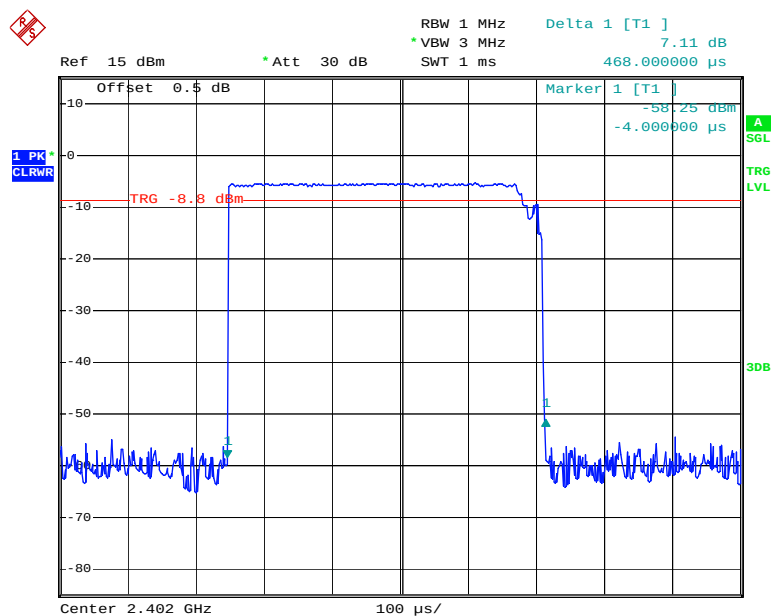
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

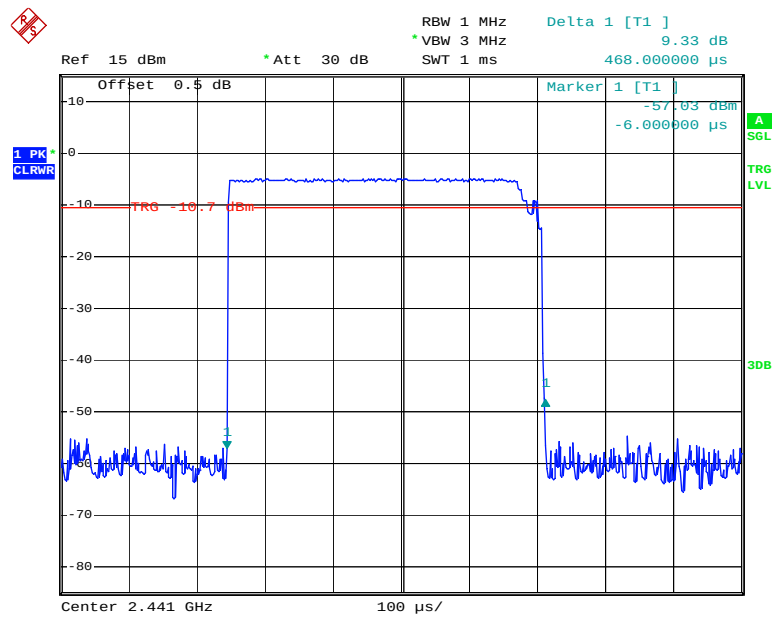
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.468	0.150	0.4	Compliance
	Middle	0.468	0.150	0.4	Compliance
	High	0.468	0.150	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
DH3	Low	1.740	0.278	0.4	Compliance
	Middle	1.740	0.278	0.4	Compliance
	High	1.740	0.278	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
DH5	Low	3.040	0.324	0.4	Compliance
	Middle	3.000	0.320	0.4	Compliance
	High	3.040	0.324	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

DH1: Low Channel



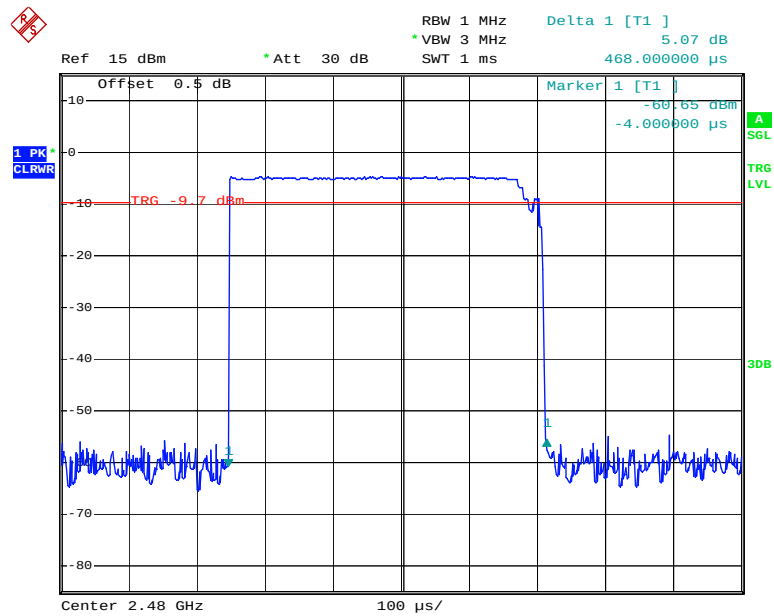
Date: 19.AUG.2017 11:32:03

DH1: Middle Channel

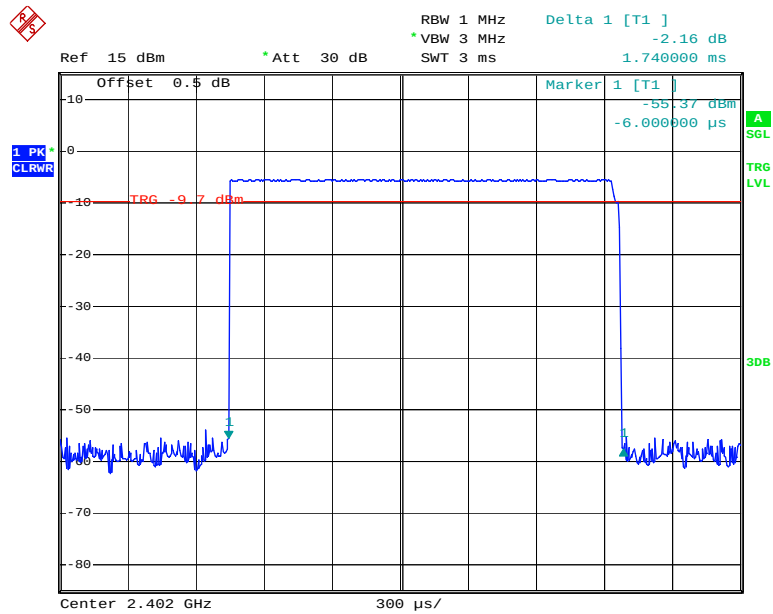


Date: 19.AUG.2017 11:32:13

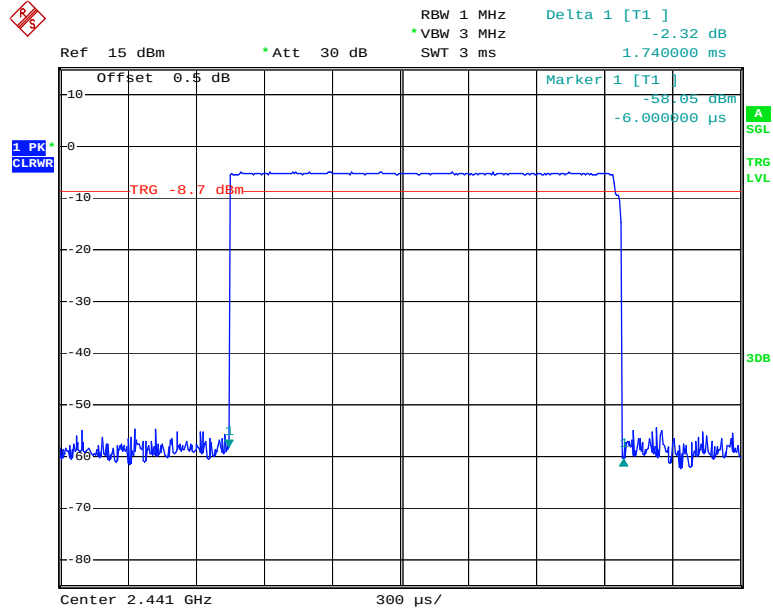
DH1: High Channel



Date: 19.AUG.2017 11:32:23

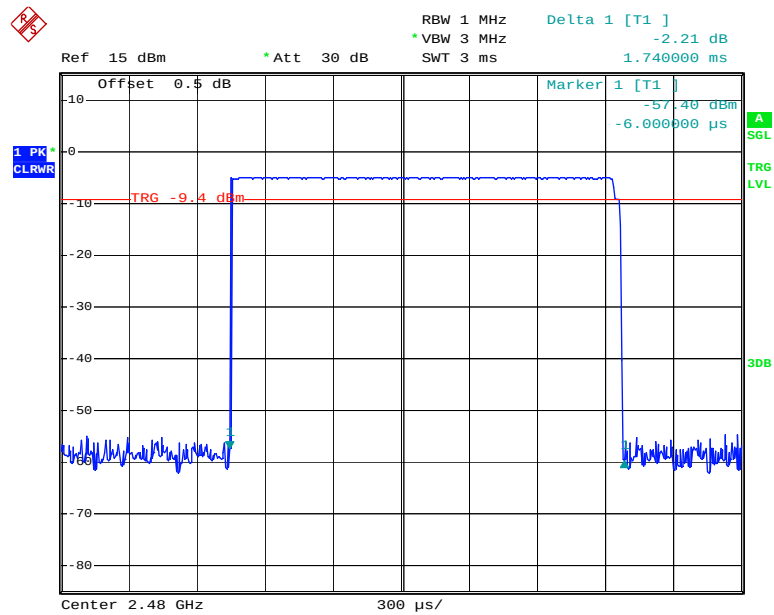
DH3: Low Channel

Date: 19.AUG.2017 11:35:22

DH3: Middle Channel

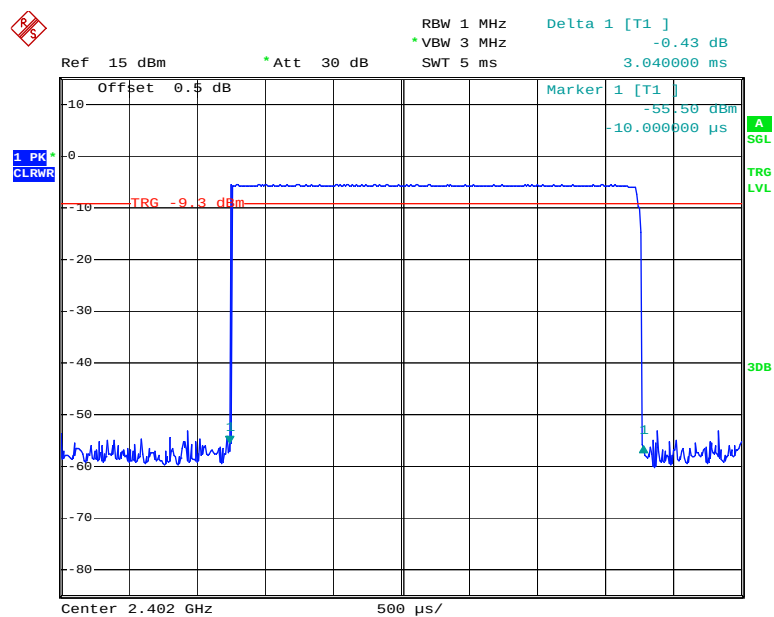
Date: 19.AUG.2017 11:35:39

DH3: High Channel



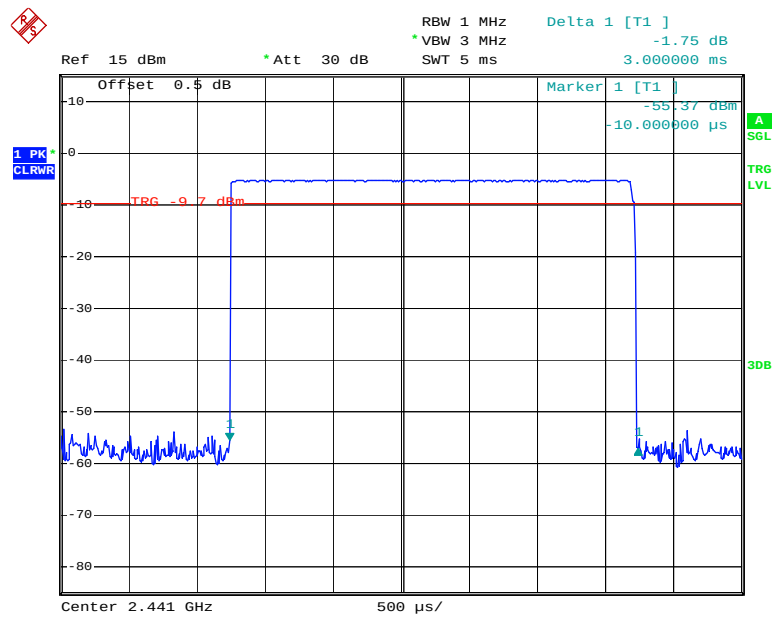
Date: 19.AUG.2017 11:35:54

DH5: Low Channel



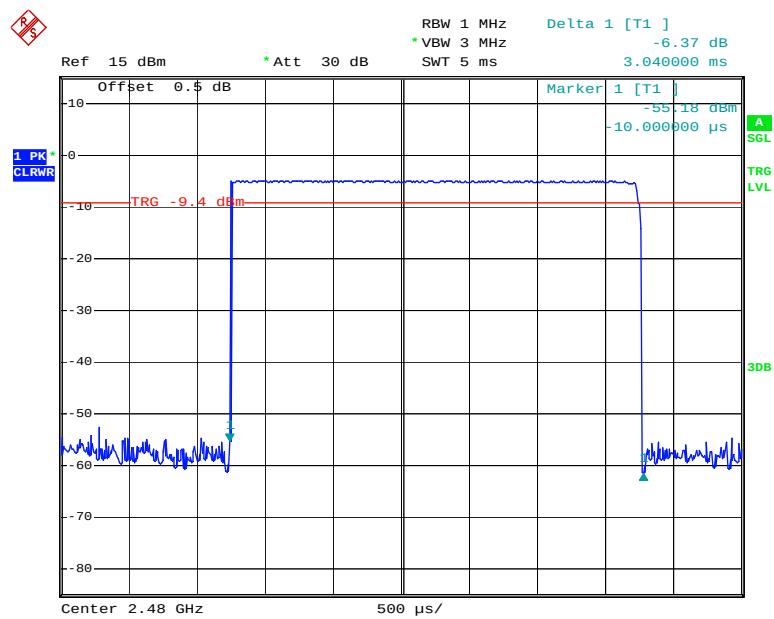
Date: 19.AUG.2017 11:37:53

DH5: Middle Channel



Date: 19.AUG.2017 11:38:19

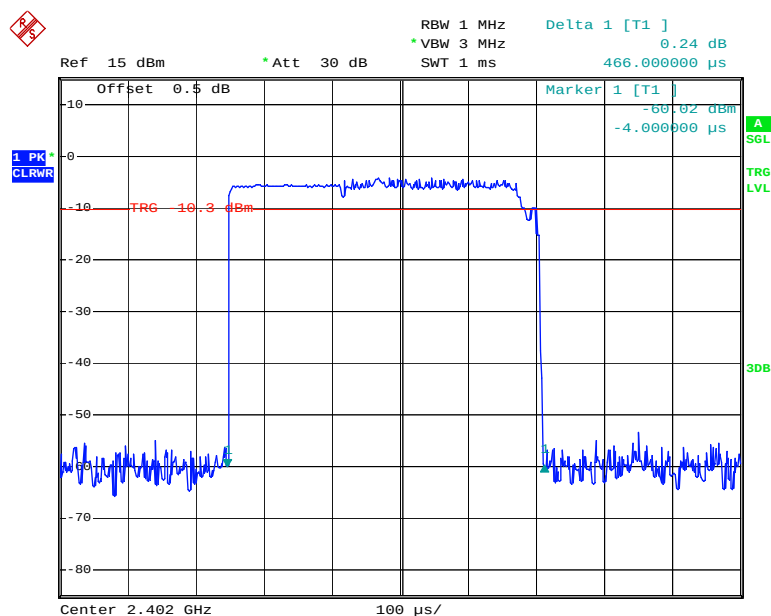
DH5: High Channel



Date: 19.AUG.2017 11:38:30

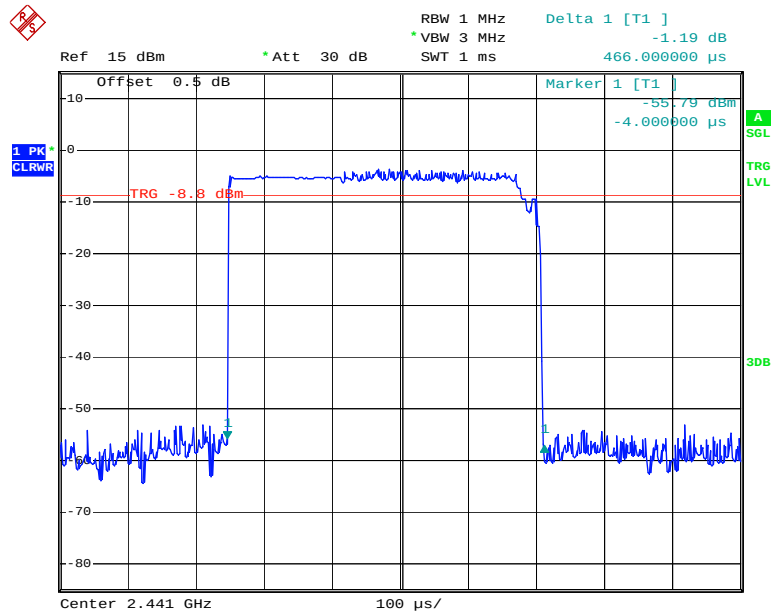
EDR Mode ($\pi/4$ -DQPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.466	0.149	0.4	Compliance
	Middle	0.466	0.149	0.4	Compliance
	High	0.466	0.149	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
2DH3	Low	1.734	0.277	0.4	Compliance
	Middle	1.734	0.277	0.4	Compliance
	High	1.734	0.277	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
2DH5	Low	2.990	0.319	0.4	Compliance
	Middle	2.990	0.319	0.4	Compliance
	High	2.990	0.319	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

2DH1: Low Channel

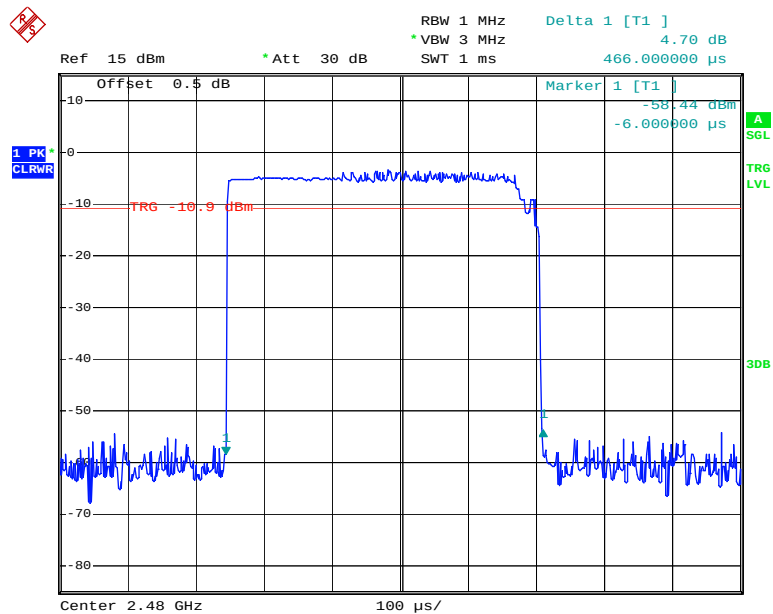
Date: 19.AUG.2017 11:30:02

2DH1: Middle Channel



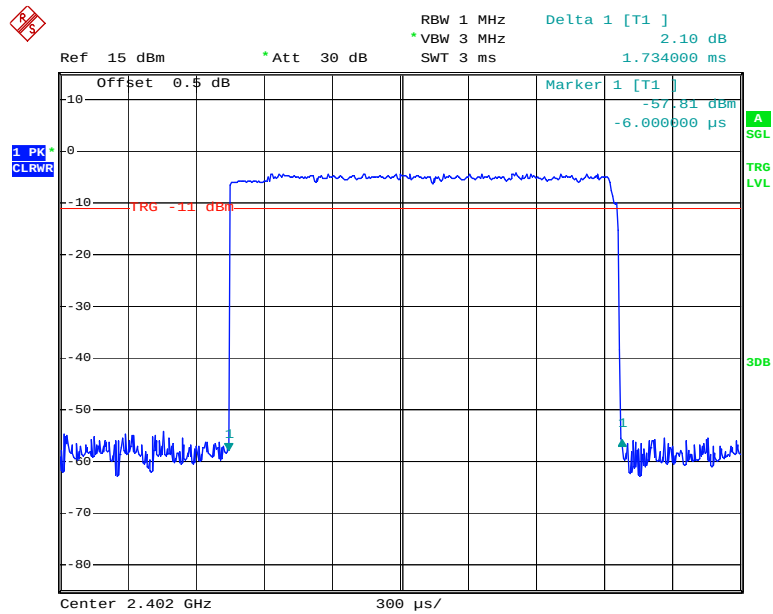
Date: 19.AUG.2017 11:30:14

2DH1: High Channel



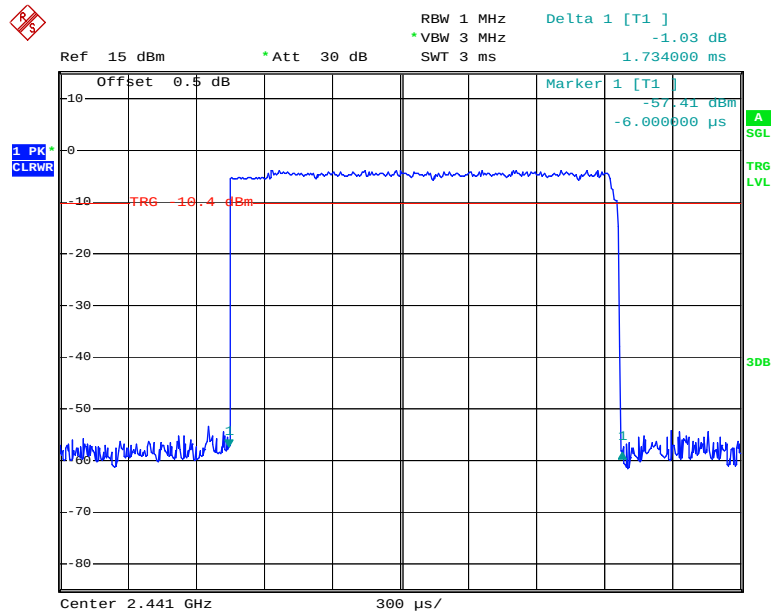
Date: 19.AUG.2017 11:30:43

2DH3: Low Channel



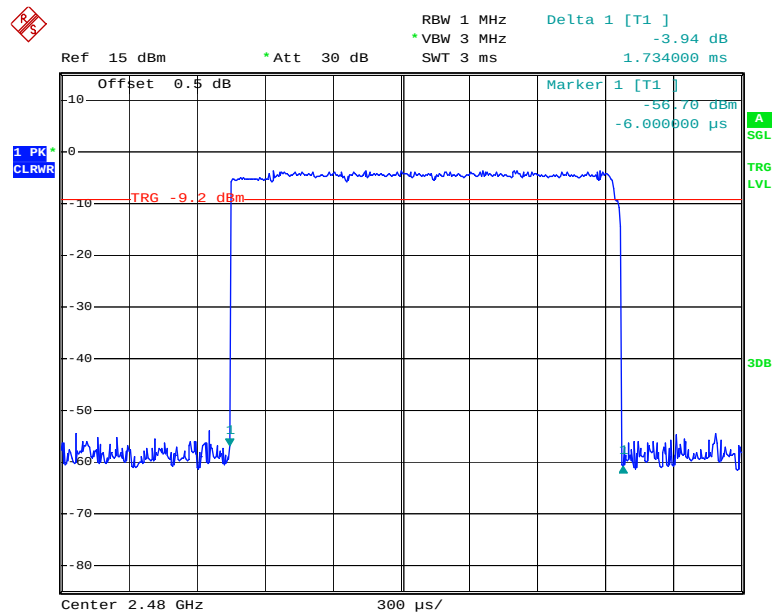
Date: 19.AUG.2017 11:28:40

2DH3: Middle Channel



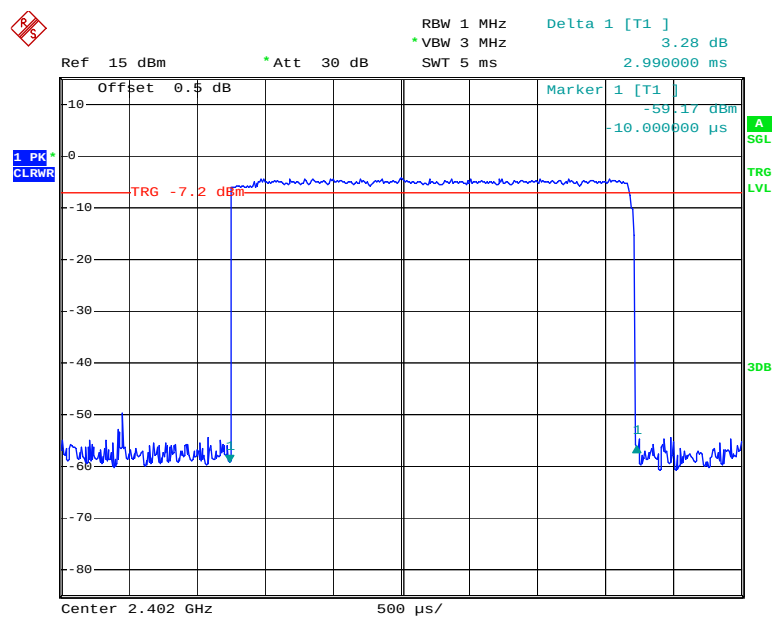
Date: 19.AUG.2017 11:29:11

2DH3: High Channel



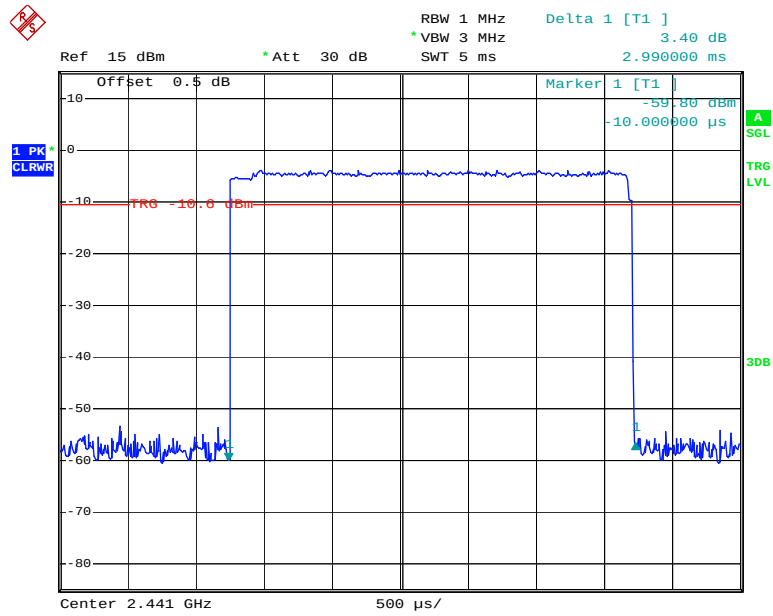
Date: 19.AUG.2017 11:29:21

2DH5: Low Channel



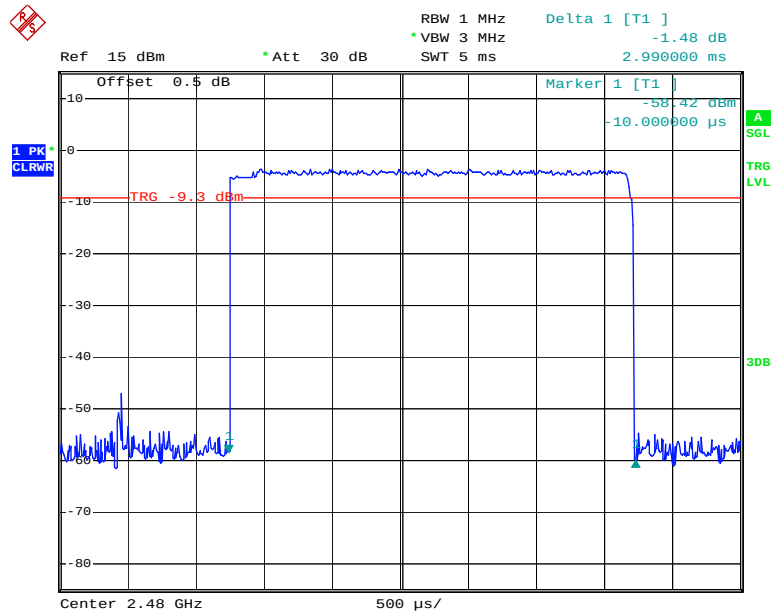
Date: 19.AUG.2017 11:25:10

2DH5: Middle Channel



Date: 19.AUG.2017 11:25:38

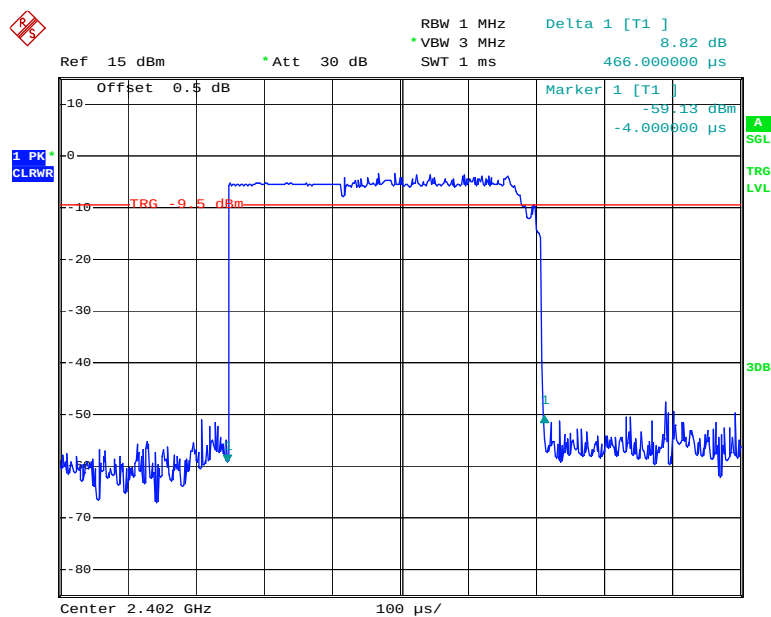
2DH5: High Channel



Date: 19.AUG.2017 11:25:57

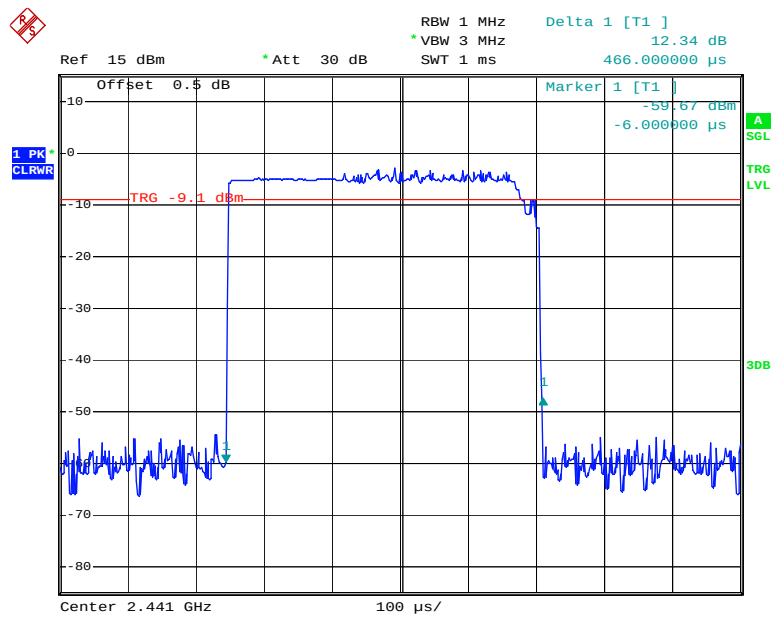
EDR Mode (8-DPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.466	0.149	0.4	Compliance
	Middle	0.466	0.149	0.4	Compliance
	High	0.464	0.148	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
3DH3	Low	1.734	0.277	0.4	Compliance
	Middle	1.728	0.276	0.4	Compliance
	High	1.728	0.276	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
3DH5	Low	2.990	0.319	0.4	Compliance
	Middle	2.990	0.319	0.4	Compliance
	High	2.990	0.319	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

3DH1: Low Channel

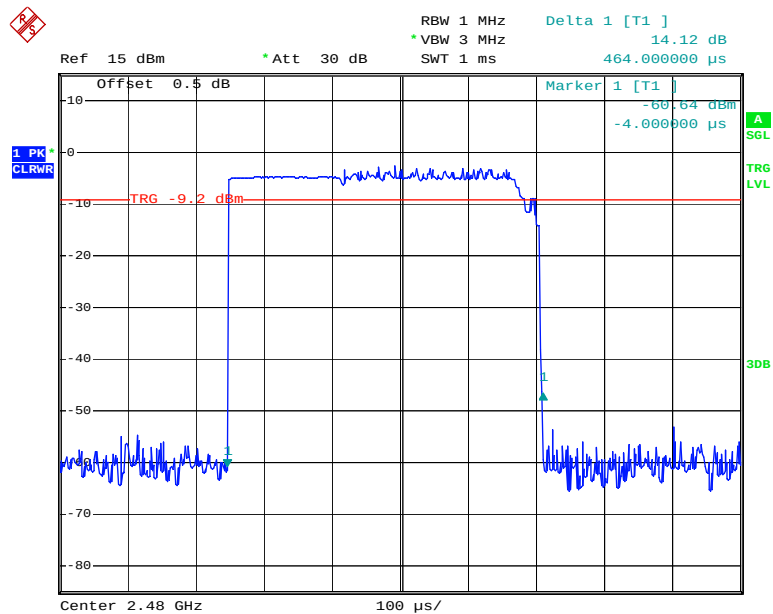
Date: 19.AUG.2017 11:11:42

3DH1: Middle Channel

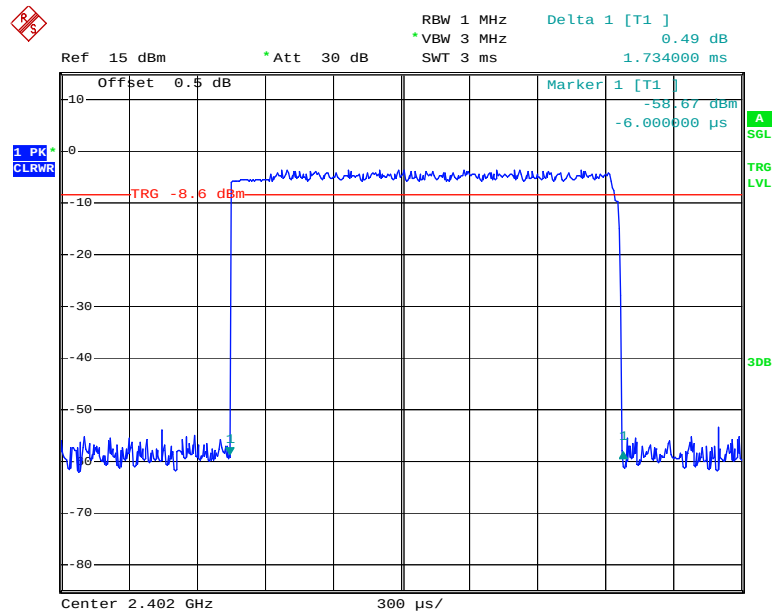


Date: 19.AUG.2017 11:11:53

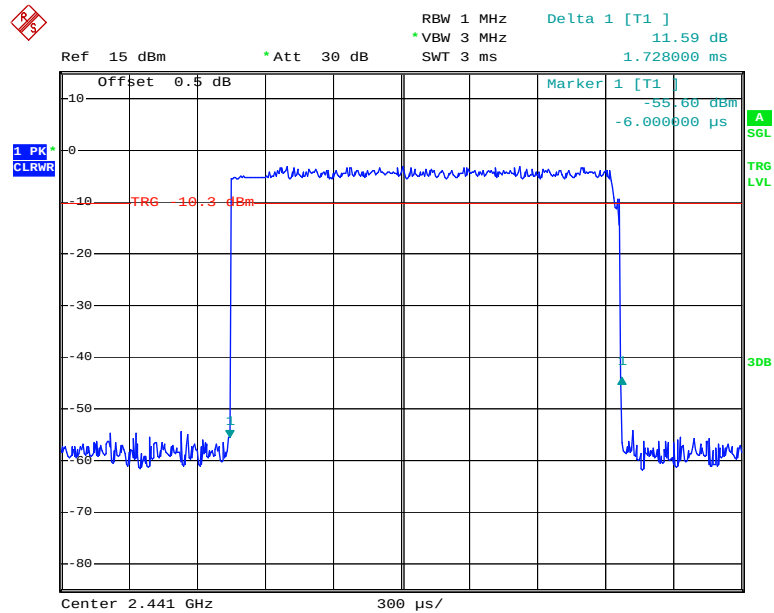
3DH1: High Channel



Date: 19.AUG.2017 11:12:03

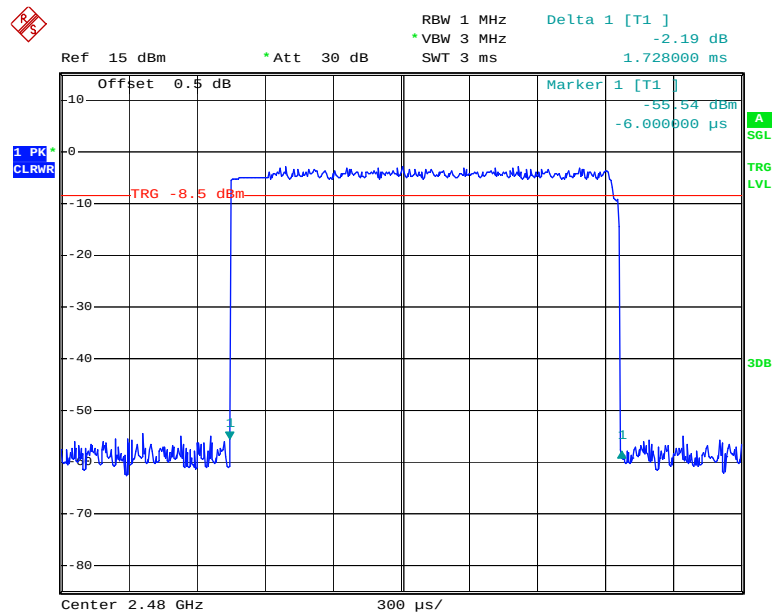
3DH3: Low Channel

Date: 19.AUG.2017 11:12:59

3DH3: Middle Channel

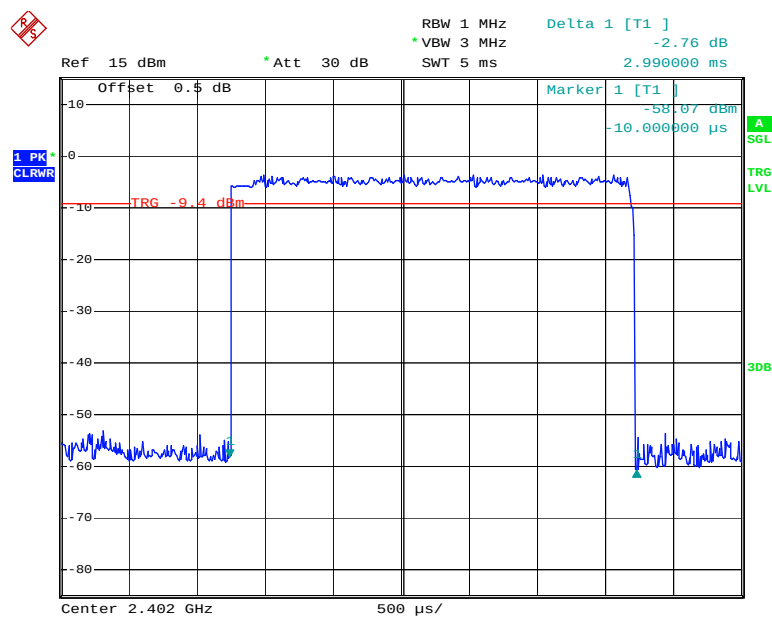
Date: 19.AUG.2017 11:13:56

3DH3: High Channel



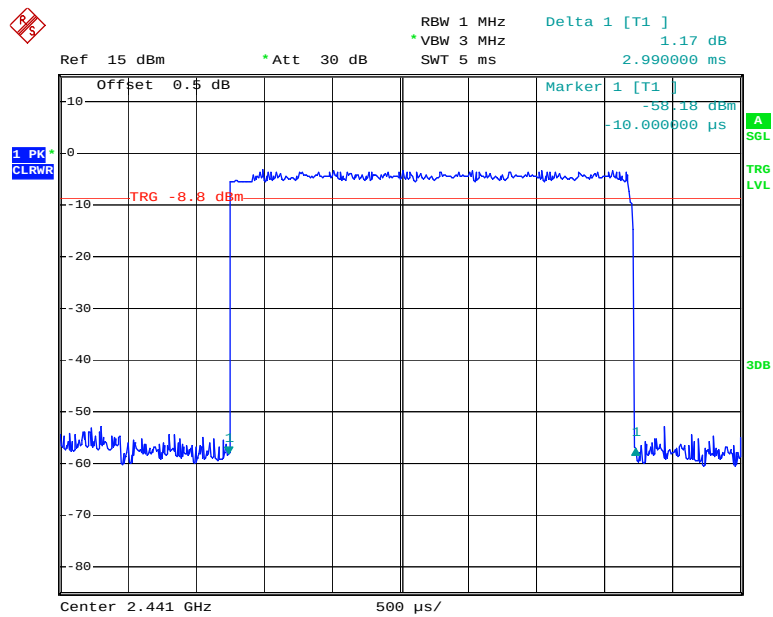
Date: 19.AUG.2017 11:14:06

3DH5: Low Channel



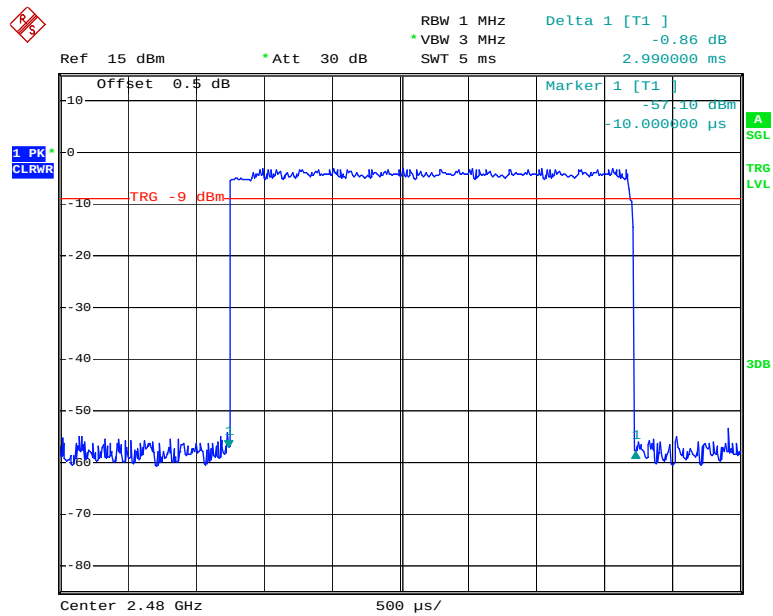
Date: 19.AUG.2017 11:23:03

3DH5: Middle Channel



Date: 19.AUG.2017 11:23:14

3DH5: High Channel



Date: 19.AUG.2017 11:23:31

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
R&S	Spectrum Analyzer	FSP 38	100478	2016-12-08	2017-12-08
Unknown	RF Cable	Unknown	C-2	Each Time	/

* **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:	25.6 °C
Relative Humidity:	47 %
ATM Pressure:	100.5 kPa

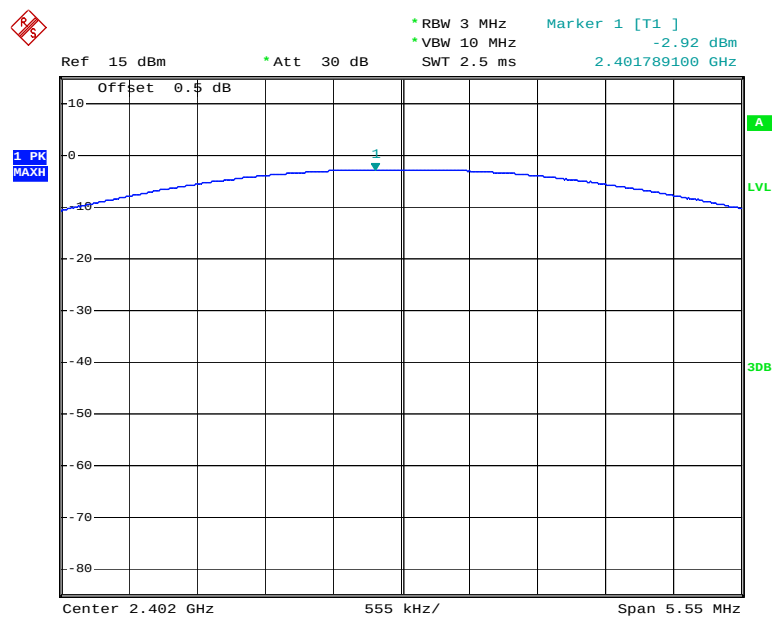
* The testing was performed by Sun Zhong on 2017-08-19.

Test Result: Compliance.

Test Mode: Transmitting

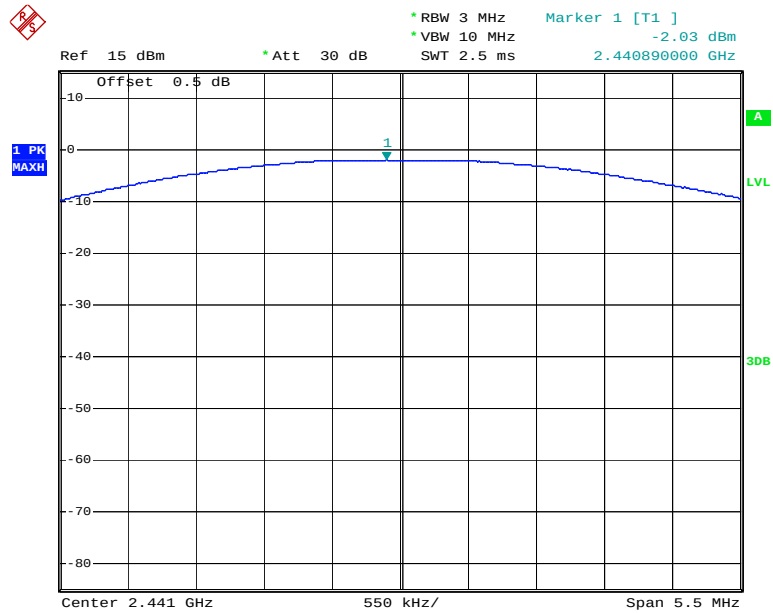
Mode	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	-2.92	30
	2441	-2.03	30
	2480	-1.48	30
EDR Mode ($\pi/4$ -DQPSK)	2402	-4.44	30
	2441	-3.77	30
	2480	-3.31	30
EDR Mode (8-DPSK)	2402	-4.01	30
	2441	-3.25	30
	2480	-2.67	30

Note: The data above was tested in conducted mode.

BDR Mode (GFSK):**Low Channel**

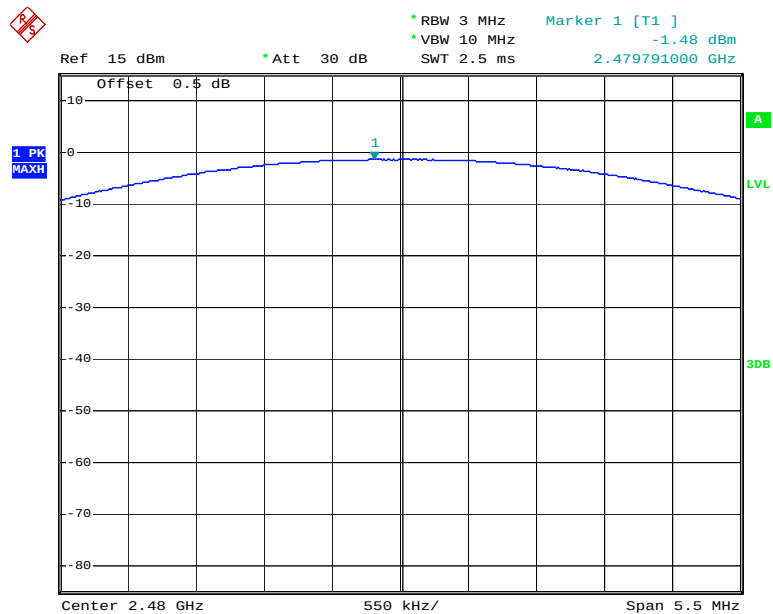
Date: 19.AUG.2017 10:41:27

Middle Channel



Date: 19.AUG.2017 10:39:47

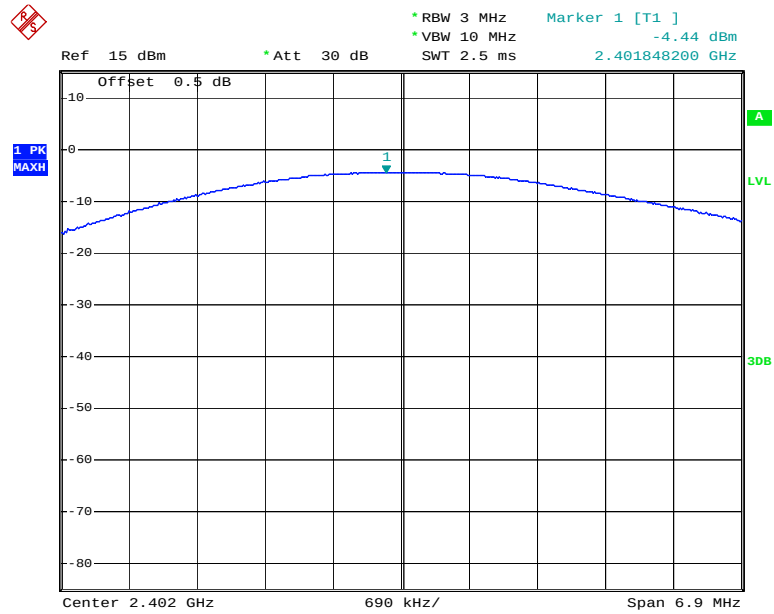
High Channel



Date: 19.AUG.2017 10:42:52

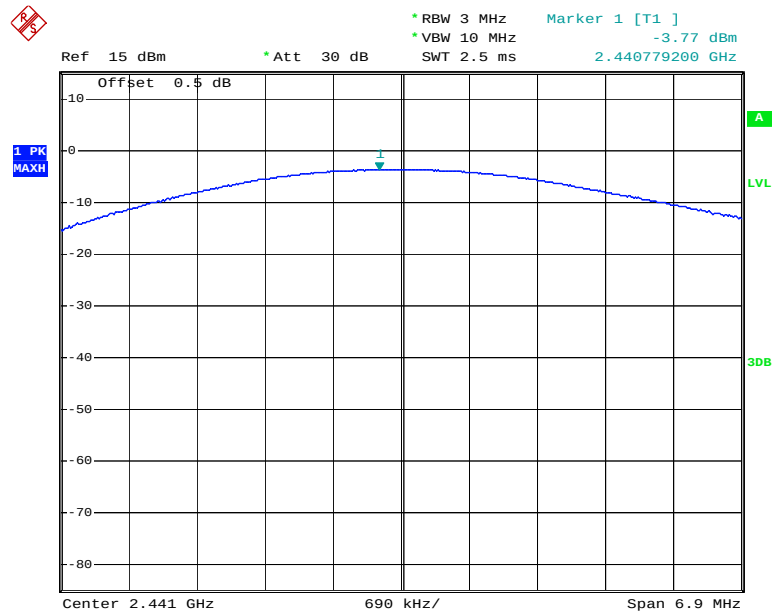
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



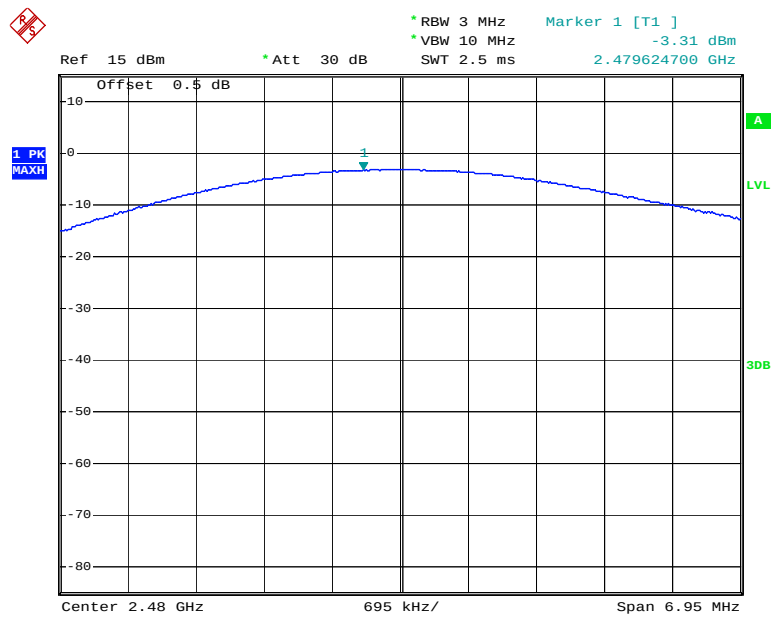
Date: 19.AUG.2017 10:48:57

Middle Channel



Date: 19.AUG.2017 10:47:45

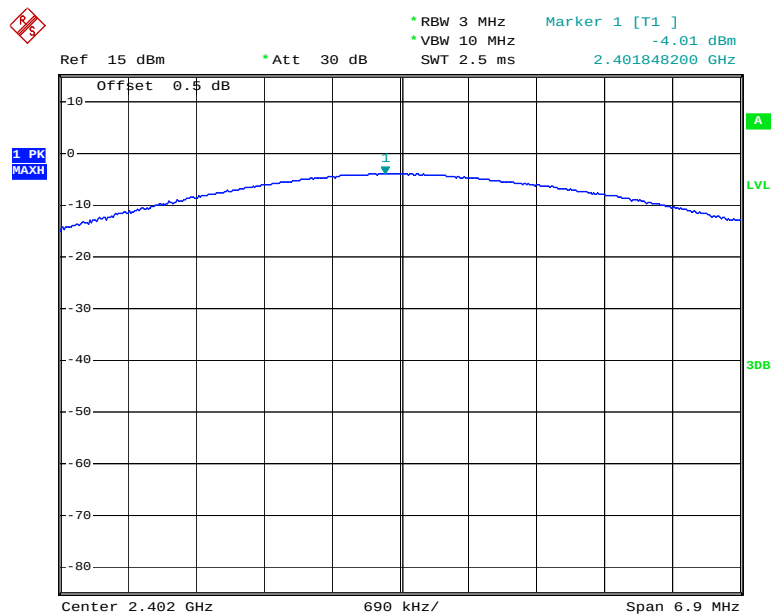
High Channel



Date: 19.AUG.2017 10:45:44

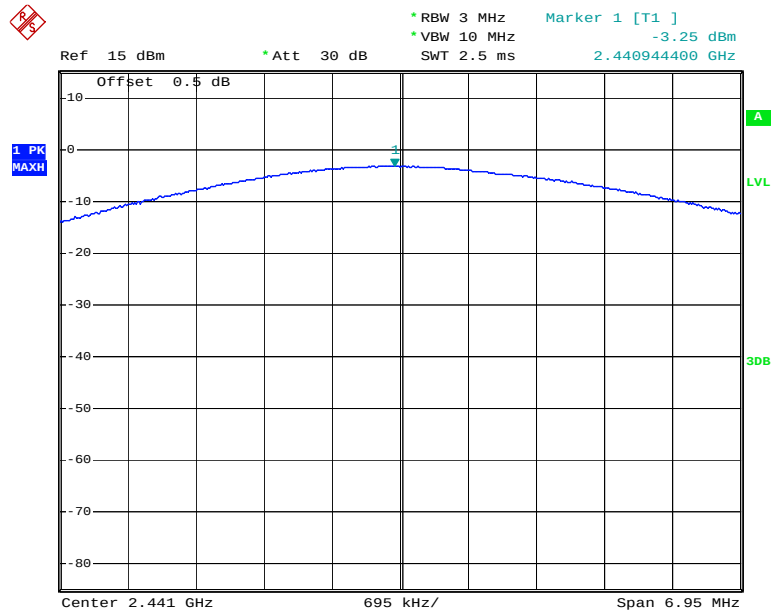
EDR Mode (8-DPSK):

Low Channel



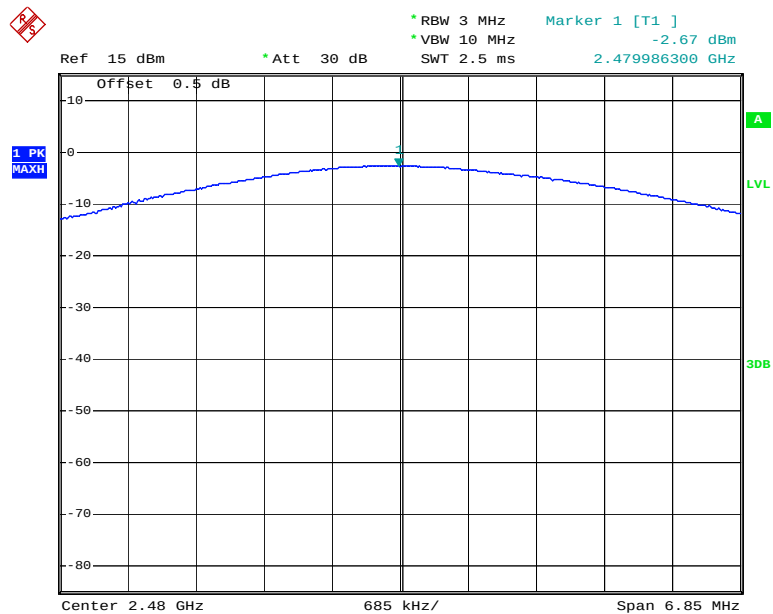
Date: 19.AUG.2017 10:51:52

Middle Channel



Date: 19.AUG.2017 10:53:27

High Channel



Date: 19.AUG.2017 10:54:31

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	FSP 38	100478	2016-12-08	2017-12-08
R&S	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
Unknown	RF Cable	Unknown	C-2	Each Time	/

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

Test Data

Environmental Conditions

Temperature:	22.5~25.6 °C
Relative Humidity:	38~47 %
ATM Pressure:	100.2~100.5 kPa

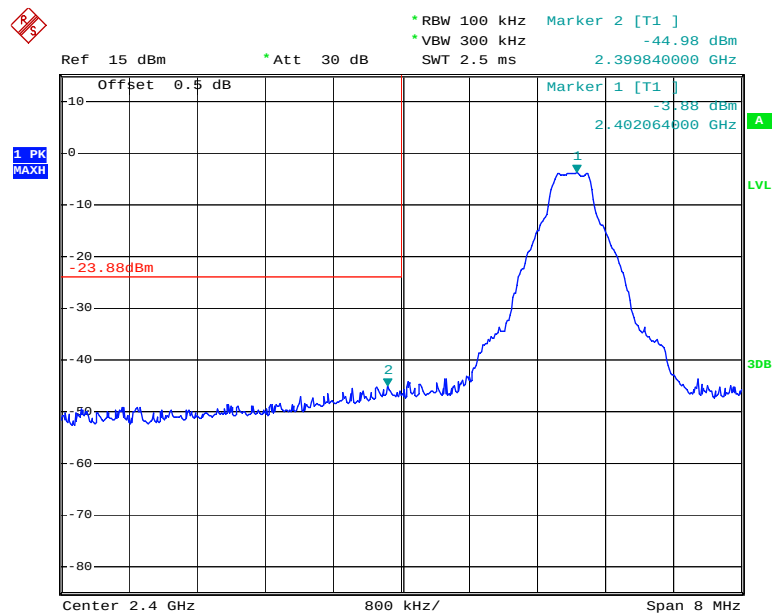
* The testing was performed by Sun Zhong on 2017-08-19&2018-02-05.

Test Result: Compliance

Single Channel mode:

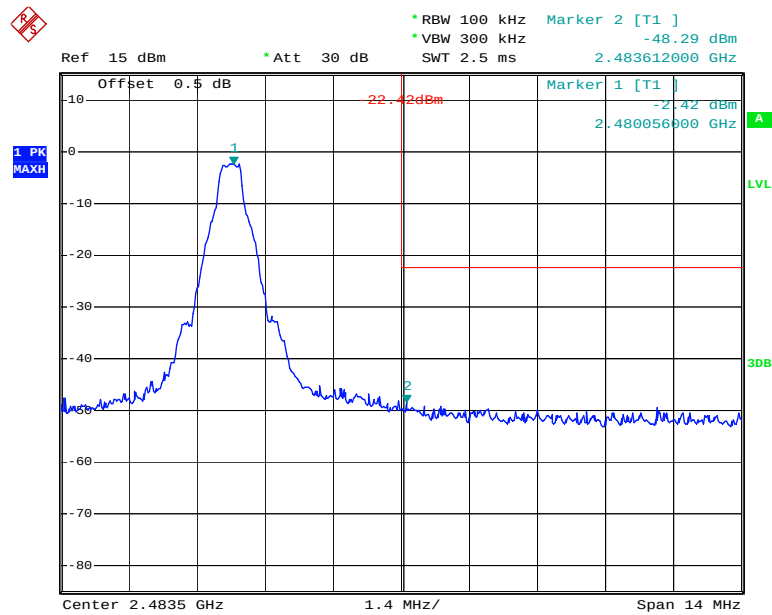
BDR Mode (GFSK)

Band Edge, Left Side



Date: 19.AUG.2017 10:41:51

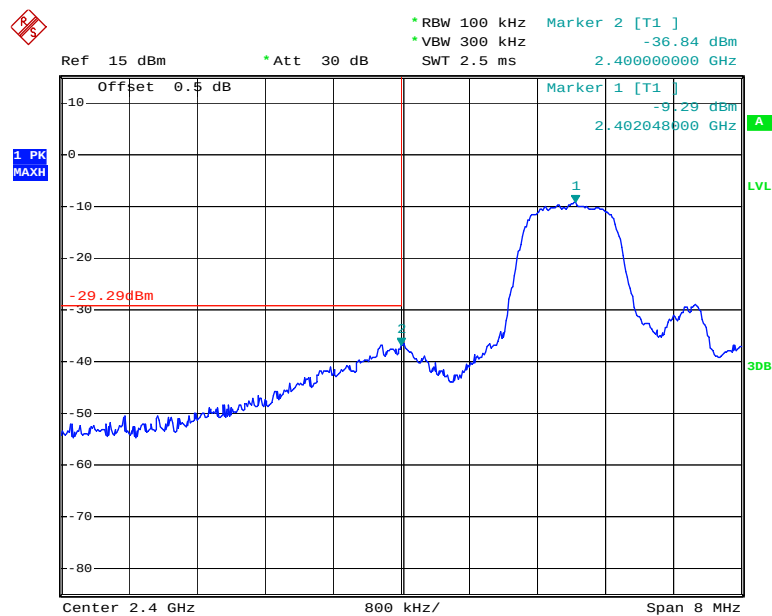
Band Edge, Right Side



Date: 19.AUG.2017 10:43:11

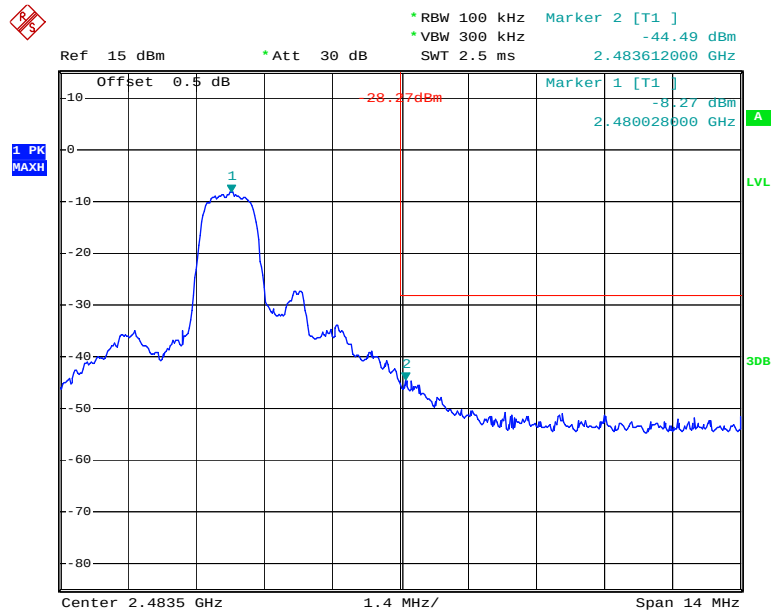
EDR Mode ($\pi/4$ -DQPSK)

Band Edge, Left Side



Date: 19.AUG.2017 10:49:16

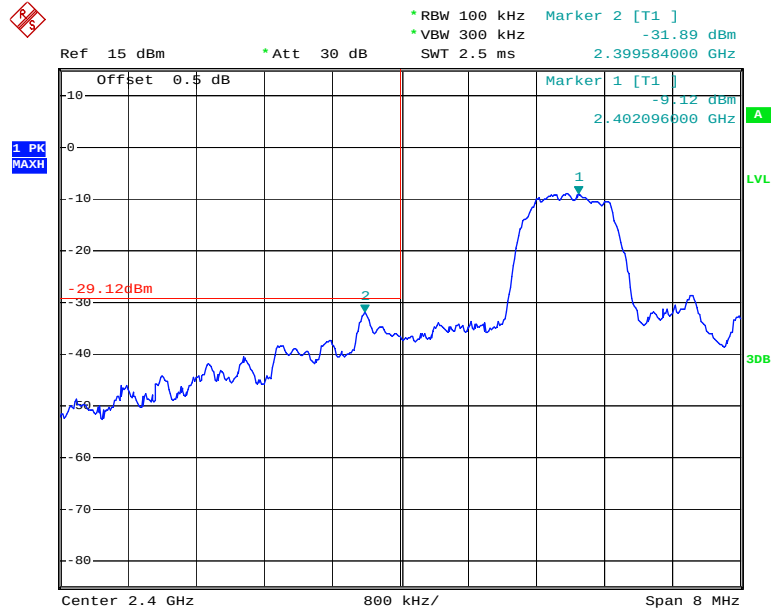
Band Edge, Right Side



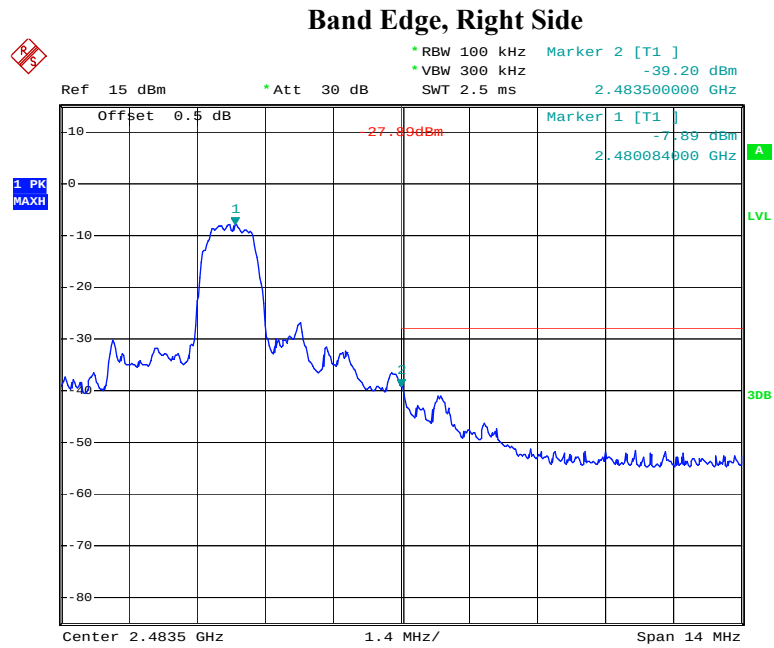
Date: 19.AUG.2017 10:46:14

EDR Mode (8-DPSK)

Band Edge, Left Side



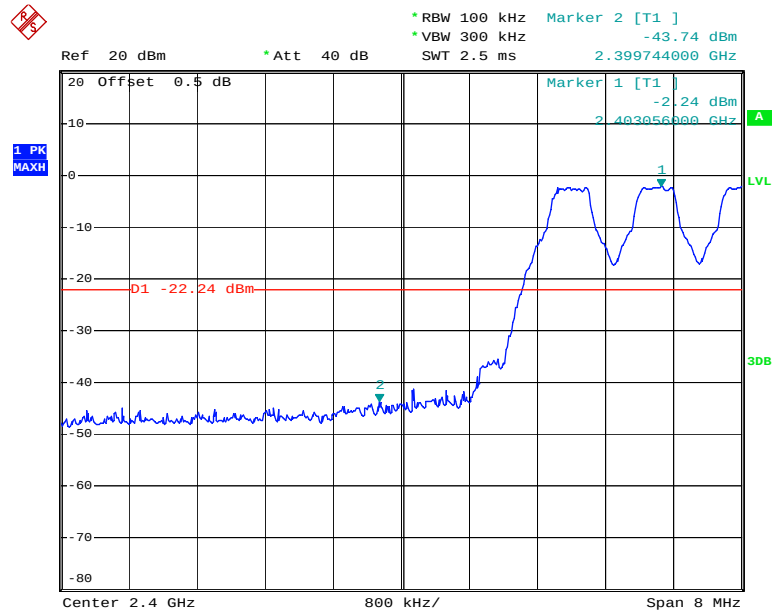
Date: 19.AUG.2017 10:52:18



Date: 19.AUG.2017 10:54:50

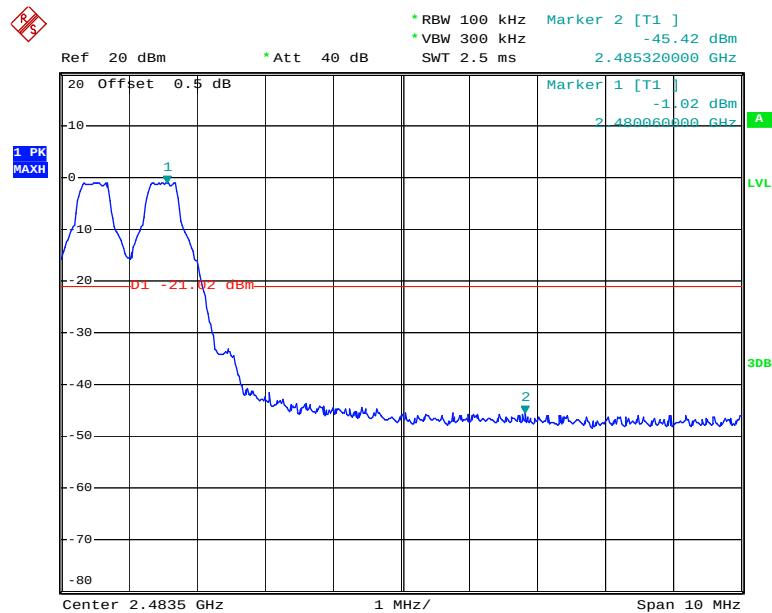
Hopping mode:
BDR Mode (GFSK)

Band Edge, Left Side



Date: 5.FEB.2018 11:20:07

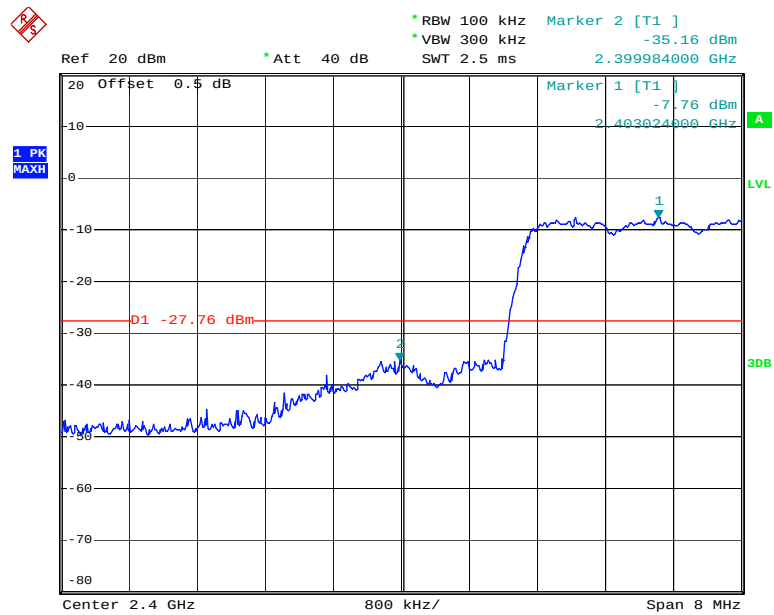
Band Edge, Right Side



Date: 5.FEB.2018 11:21:33

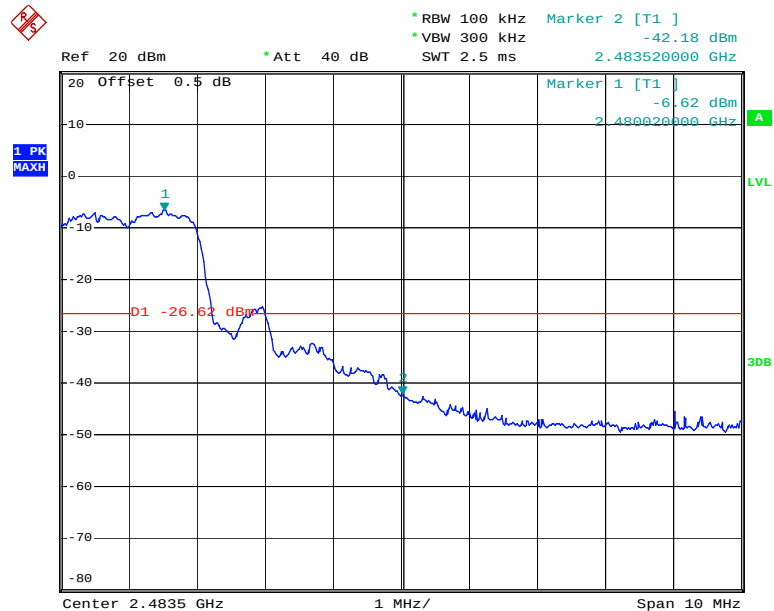
EDR Mode ($\pi/4$ -DQPSK)

Band Edge, Left Side



Date: 5.FEB.2018 11:24:22

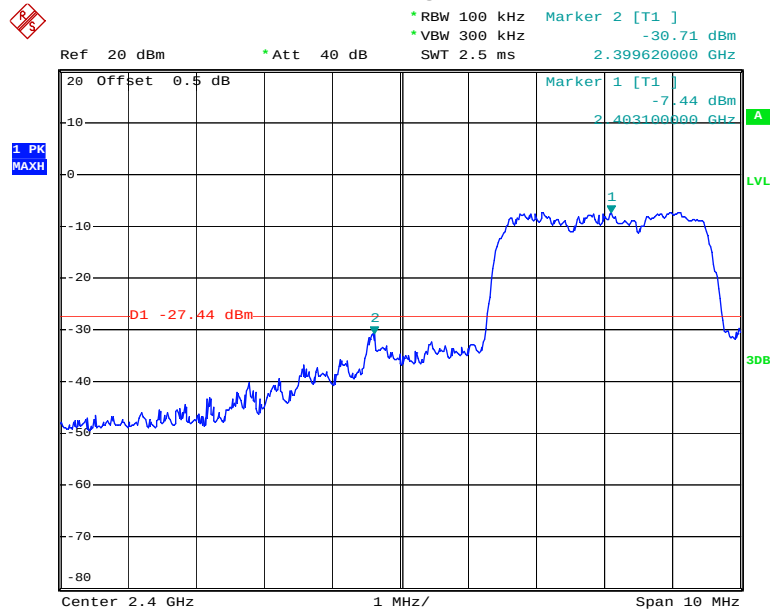
Band Edge, Right Side



Date: 5.FEB.2018 11:23:16

EDR Mode (8-DPSK)

Band Edge, Left Side



Date: 5.FEB.2018 11:25:58

Band Edge, Right Side



Date: 5.FEB.2018 11:26:59

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