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: OPDJHD916BT

Report Type:	Product Name:
Original Report	Heavy Duty Car Audio

Report Number:	RDG171106001-00B
Report Date:	2017-12-25
Reviewed By:	Jerry Zhang EMC Manager
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Heavy Duty Car Audio
EUT Model:	JHD916BT
Multiple Model:	JHD916BTBP
FCC ID:	OPDJHD916BT
Rated Input Voltage:	DC 12V
External Dimension:	Length (13.16 cm)*Width (6.12cm)*High (8.6cm)
Serial Number:	171106001
EUT Received Date:	2017.11.06

Note: The series product, models JHD916BT, JHD916BTBP are electrically identical, we selected JHD916BT for full test , and please refer to the declaration letter for details.

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, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

N/A

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.58 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℃
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

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

Test Software Version	Bluetest		
Test Frequency	2402MHz	2441MHz	2480MHz
GFSK	63	63	63
π/4-DQPSK	100	100	100
8-DPSK	100	100	100

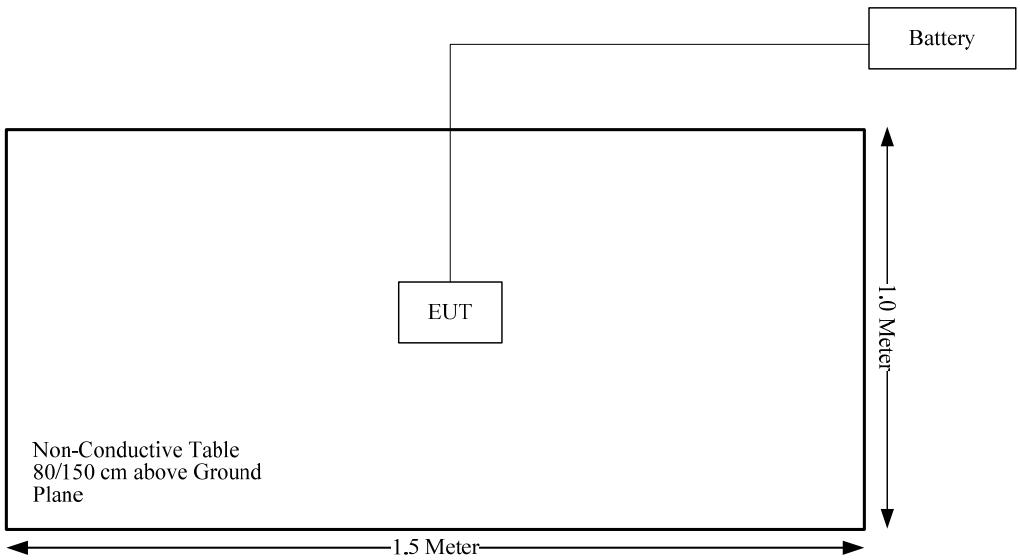
Equipment Modifications

No modification was made to the EUT.

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
DC Power Cable	no	no	2.0	Battery	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissable 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 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.

Calculation Formula:

Prediction of power density at the distance of the applicable MPE limit:
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
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	0	1.00	3	2.00	20.00	0.0004	1.0

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

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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

Antenna Connector Construction

The EUT has one internal antenna arrangement for BT, and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

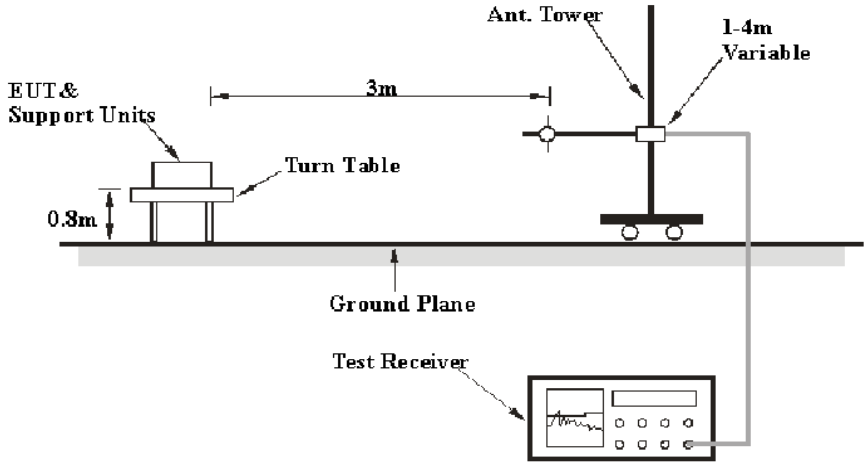
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

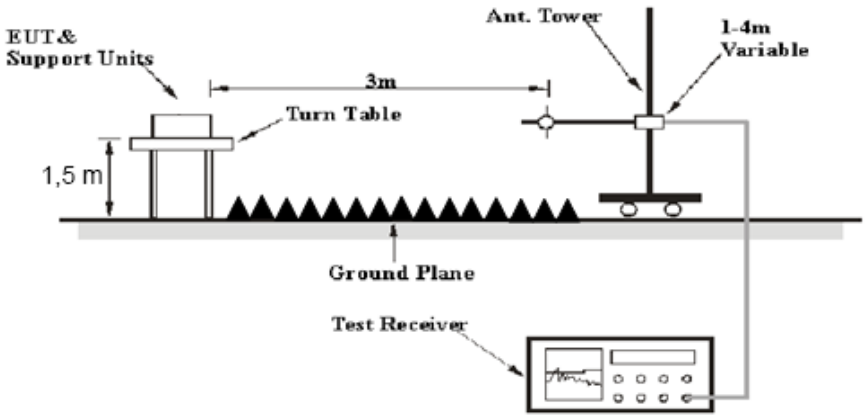
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



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

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	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
R&S	Spectrum Analyzer	E4440A	SG43360054	2017-12-08	2018-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	2017-09-05	2018-09-05

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

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

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

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

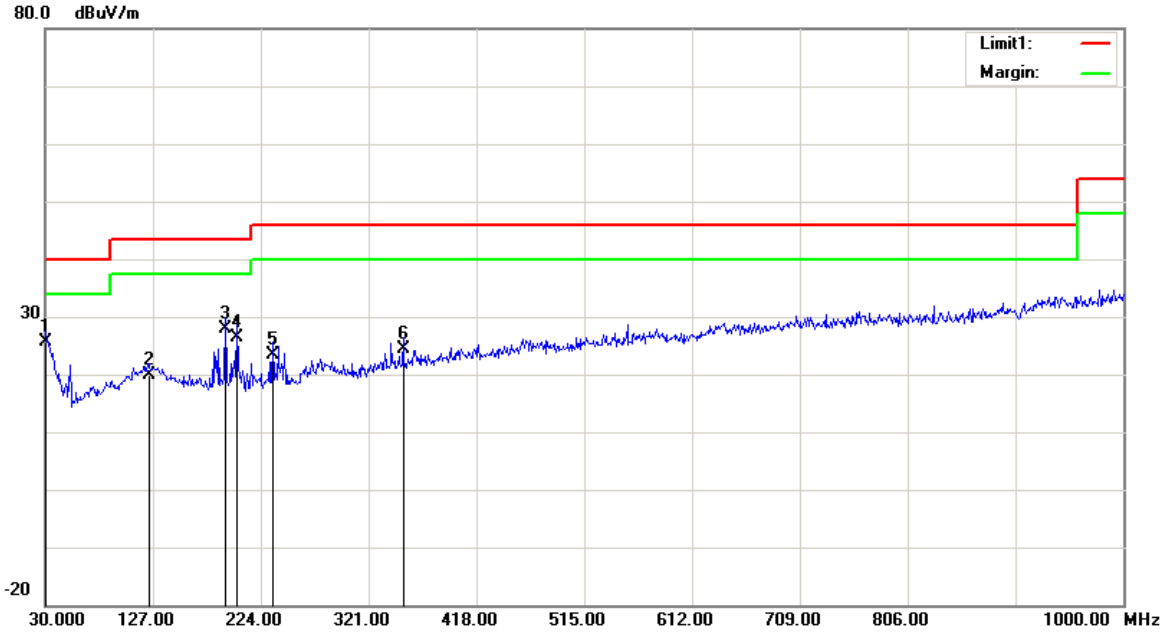
Temperature:	20.3 °C
Relative Humidity:	31 %
ATM Pressure:	102.3 kPa

** The testing was performed by Blake Yang&Steven Zuo on 2017-12-22.*

Test Mode: Transmitting

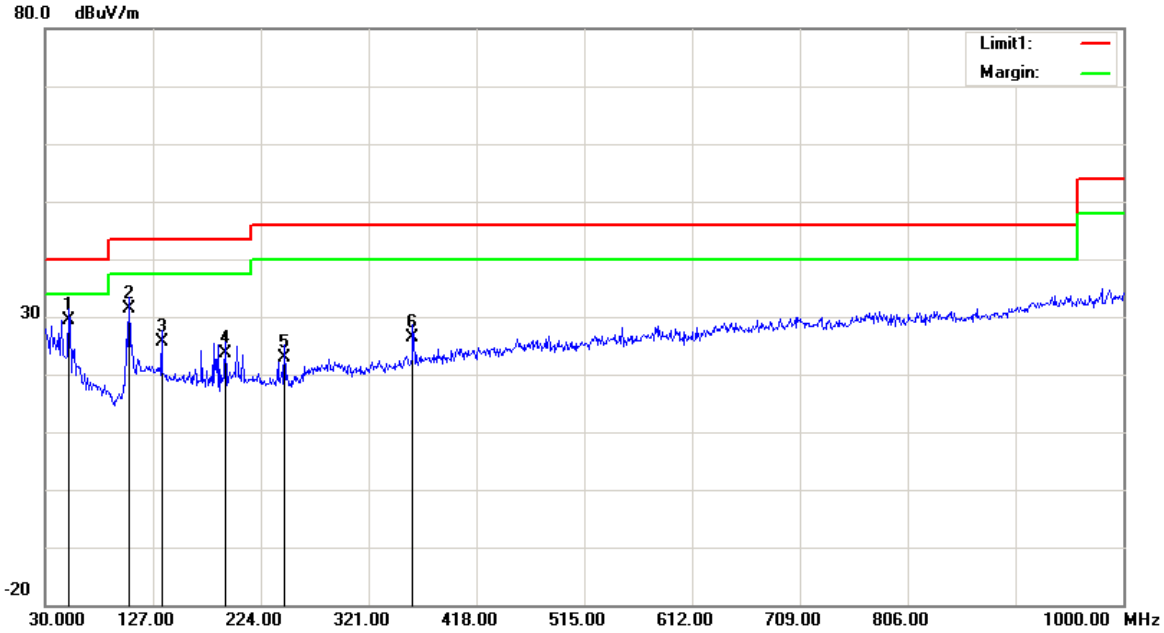
1) 30MHz-1GHz(GFSK Low channel was the worst)

Horizontal:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.9700	25.25	QP	0.35	25.60	40.00	14.40
123.1200	24.68	QP	-4.78	19.90	43.50	23.60
191.9900	35.32	QP	-7.52	27.80	43.50	15.70
202.6600	32.78	QP	-6.28	26.50	43.50	17.00
234.6700	29.99	QP	-6.49	23.50	46.00	22.50
352.0400	27.41	QP	-3.11	24.30	46.00	21.70

Vertical:



Frequency (MHz)	Receiver Reading (dBµV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
51.3400	41.19	QP	-11.89	29.30	40.00	10.70
105.6600	38.46	QP	-6.96	31.50	43.50	12.00
134.7600	31.10	QP	-5.50	25.60	43.50	17.90
191.9900	31.12	QP	-7.52	23.60	43.50	19.90
245.3400	29.31	QP	-6.31	23.00	46.00	23.00
360.7700	29.41	QP	-2.91	26.50	46.00	19.50

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	61.69	PK	H	28.10	1.80	0.00	91.59	N/A	N/A
2402.00	51.46	AV	H	28.10	1.80	0.00	81.36	N/A	N/A
2402.00	63.51	PK	V	28.10	1.80	0.00	93.41	N/A	N/A
2402.00	53.54	AV	V	28.10	1.80	0.00	83.44	N/A	N/A
2390.00	26.01	PK	V	28.08	1.80	0.00	55.89	74.00	18.11
2390.00	13.28	AV	V	28.08	1.80	0.00	43.16	54.00	10.84
4804.00	64.02	PK	V	32.91	3.17	37.20	62.90	74.00	11.10
4804.00	49.99	AV	V	32.91	3.17	37.20	48.87	54.00	5.13
7206.00	47.40	PK	V	35.74	4.82	37.23	50.73	74.00	23.27
7206.00	36.54	AV	V	35.74	4.82	37.23	39.87	54.00	14.13
5950.00	52.03	PK	V	34.28	3.81	37.28	52.84	74.00	21.16
5950.00	39.01	AV	V	34.28	3.81	37.28	39.82	54.00	14.18
Middle Channel: 2441 MHz									
2441.00	60.18	PK	H	28.18	1.82	0.00	90.18	N/A	N/A
2441.00	50.21	AV	H	28.18	1.82	0.00	80.21	N/A	N/A
2441.00	62.56	PK	V	28.18	1.82	0.00	92.56	N/A	N/A
2441.00	51.67	AV	V	28.18	1.82	0.00	81.67	N/A	N/A
4882.00	64.61	PK	V	33.06	3.27	37.21	63.73	74.00	10.27
4882.00	41.61	AV	V	33.06	3.27	37.21	40.73	54.00	13.27
7323.00	48.87	PK	V	36.04	4.62	37.38	52.15	74.00	21.85
7323.00	37.16	AV	V	36.04	4.62	37.38	40.44	54.00	13.56
4619.00	46.73	PK	V	32.54	3.09	37.12	45.24	74.00	28.76
4619.00	35.29	AV	V	32.54	3.09	37.12	33.80	54.00	20.20
High Channel: 2480 MHz									
2480.00	61.39	PK	H	28.26	1.84	0.00	91.49	N/A	N/A
2480.00	51.34	AV	H	28.26	1.84	0.00	81.44	N/A	N/A
2480.00	63.59	PK	V	28.26	1.84	0.00	93.69	N/A	N/A
2480.00	53.14	AV	V	28.26	1.84	0.00	83.24	N/A	N/A
2483.50	27.09	PK	V	28.27	1.84	0.00	57.20	74.00	16.80
2483.50	14.01	AV	V	28.27	1.84	0.00	44.12	54.00	9.88
4960.00	62.95	PK	V	33.22	3.23	37.25	62.15	74.00	11.85
4960.00	44.67	AV	V	33.22	3.23	37.25	43.87	54.00	10.13
7440.00	48.69	PK	V	36.34	4.41	37.52	51.92	74.00	22.08
7440.00	37.02	AV	V	36.34	4.41	37.52	40.25	54.00	13.75
5222.00	47.02	PK	V	33.66	3.56	37.39	46.85	74.00	27.15
5222.00	36.58	AV	V	33.66	3.56	37.39	36.41	54.00	17.59

EDR Mode (π/4-DQPSK):

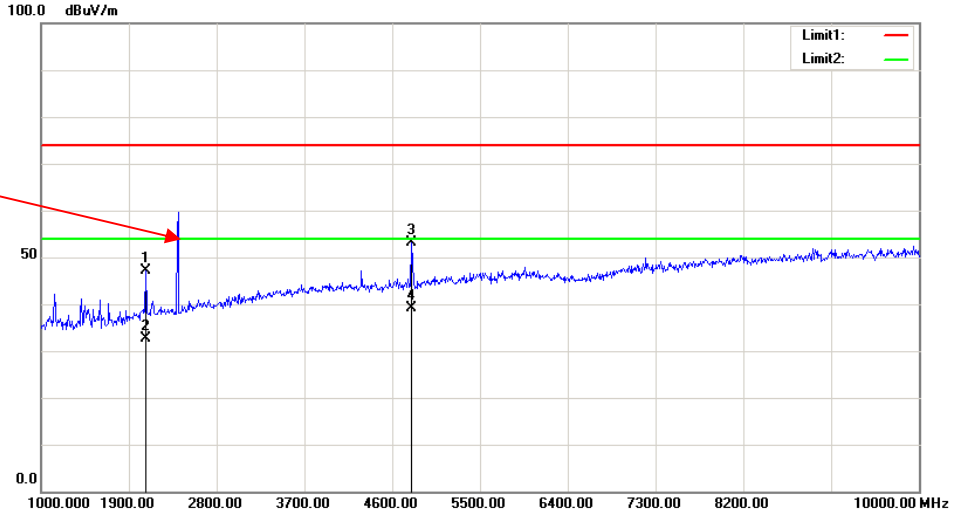
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	59.54	PK	H	28.10	1.80	0.00	89.44	N/A	N/A
2402.00	49.26	AV	H	28.10	1.80	0.00	79.16	N/A	N/A
2402.00	61.28	PK	V	28.10	1.80	0.00	91.18	N/A	N/A
2402.00	50.21	AV	V	28.10	1.80	0.00	80.11	N/A	N/A
2390.00	26.24	PK	V	28.08	1.80	0.00	56.12	74.00	17.88
2390.00	13.27	AV	V	28.08	1.80	0.00	43.15	54.00	10.85
4804.00	59.45	PK	V	32.91	3.17	37.20	58.33	74.00	15.67
4804.00	42.67	AV	V	32.91	3.17	37.20	41.55	54.00	12.45
7206.00	48.61	PK	V	35.74	4.82	37.23	51.94	74.00	22.06
7206.00	37.22	AV	V	35.74	4.82	37.23	40.55	54.00	13.45
3904.00	48.99	PK	V	32.19	2.58	36.94	46.82	74.00	27.18
3904.00	37.00	AV	V	32.19	2.58	36.94	34.83	54.00	19.17
Middle Channel: 2441 MHz									
2441.00	59.47	PK	H	28.18	1.82	0.00	89.47	N/A	N/A
2441.00	49.67	AV	H	28.18	1.82	0.00	79.67	N/A	N/A
2441.00	62.47	PK	V	28.18	1.82	0.00	92.47	N/A	N/A
2441.00	50.64	AV	V	28.18	1.82	0.00	80.64	N/A	N/A
4882.00	59.02	PK	V	33.06	3.27	37.21	58.14	74.00	15.86
4882.00	42.31	AV	V	33.06	3.27	37.21	41.43	54.00	12.57
7323.00	48.91	PK	V	36.04	4.62	37.38	52.19	74.00	21.81
7323.00	37.45	AV	V	36.04	4.62	37.38	40.73	54.00	13.27
5698.00	46.98	PK	V	34.18	3.68	37.35	47.49	74.00	26.51
5698.00	35.22	AV	V	34.18	3.68	37.35	35.73	54.00	18.27
High Channel: 2480 MHz									
2480.00	59.21	PK	H	28.26	1.84	0.00	89.31	N/A	N/A
2480.00	49.31	AV	H	28.26	1.84	0.00	79.41	N/A	N/A
2480.00	61.75	PK	V	28.26	1.84	0.00	91.85	N/A	N/A
2480.00	50.34	AV	V	28.26	1.84	0.00	80.44	N/A	N/A
2483.50	26.21	PK	V	28.27	1.84	0.00	56.32	74.00	17.68
2483.50	13.41	AV	V	28.27	1.84	0.00	43.52	54.00	10.48
4960.00	57.89	PK	V	33.22	3.23	37.25	57.09	74.00	16.91
4960.00	42.98	AV	V	33.22	3.23	37.25	42.18	54.00	11.82
7440.00	47.34	PK	V	36.34	4.41	37.52	50.57	74.00	23.43
7440.00	36.25	AV	V	36.34	4.41	37.52	39.48	54.00	14.52
4239.00	46.89	PK	V	32.35	2.77	37.04	44.97	74.00	29.03
4239.00	35.16	AV	V	32.35	2.77	37.04	33.24	54.00	20.76

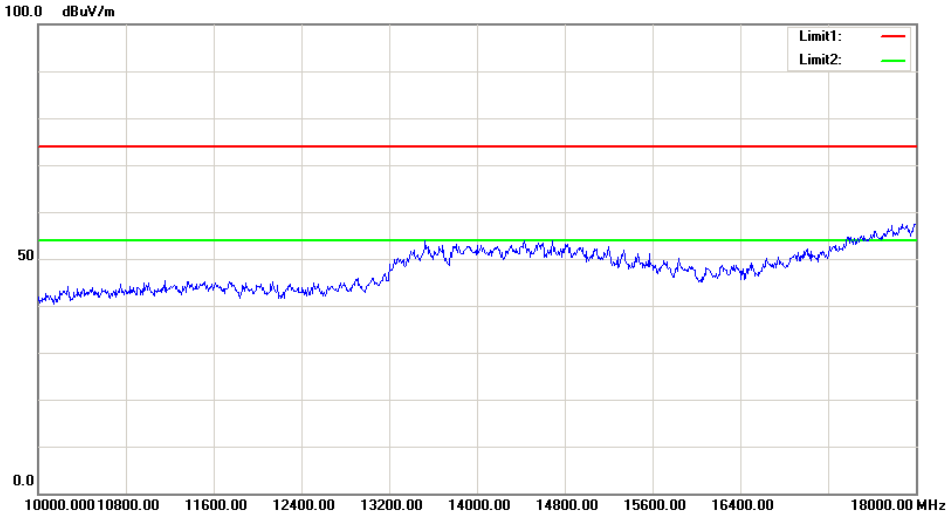
EDR Mode (8-DPSK):

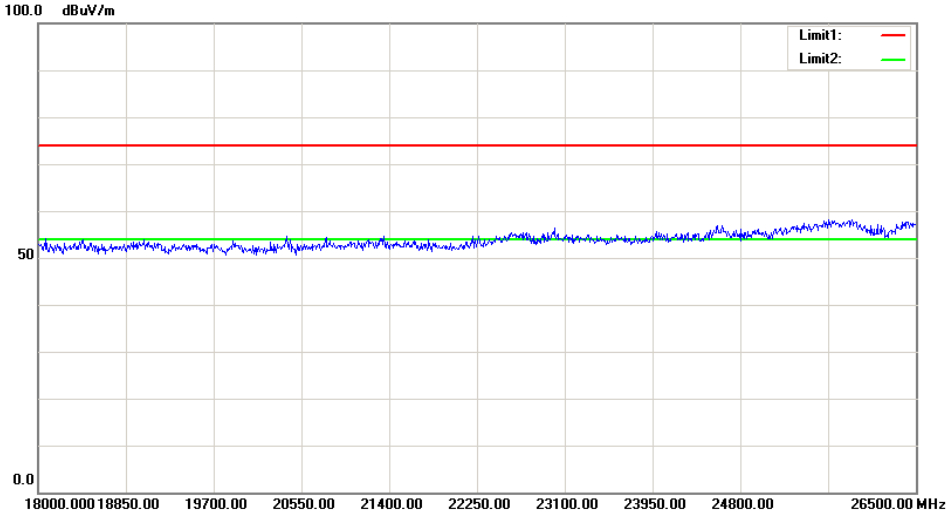
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	59.21	PK	H	28.10	1.80	0.00	89.11	N/A	N/A
2402.00	49.31	AV	H	28.10	1.80	0.00	79.21	N/A	N/A
2402.00	61.38	PK	V	28.10	1.80	0.00	91.28	N/A	N/A
2402.00	50.31	AV	V	28.10	1.80	0.00	80.21	N/A	N/A
2390.00	25.89	PK	V	28.08	1.80	0.00	55.77	74.00	18.23
2390.00	13.41	AV	V	28.08	1.80	0.00	43.29	54.00	10.71
4804.00	60.12	PK	V	32.91	3.17	37.20	59.00	74.00	15.00
4804.00	42.35	AV	V	32.91	3.17	37.20	41.23	54.00	12.77
7206.00	48.67	PK	V	35.74	4.82	37.23	52.00	74.00	22.00
7206.00	37.42	AV	V	35.74	4.82	37.23	40.75	54.00	13.25
5641.00	46.59	PK	V	34.16	3.62	37.49	46.88	74.00	27.12
5641.00	35.28	AV	V	34.16	3.62	37.49	35.57	54.00	18.43
Middle Channel: 2441 MHz									
2441.00	59.68	PK	H	28.18	1.82	0.00	89.68	N/A	N/A
2441.00	49.62	AV	H	28.18	1.82	0.00	79.62	N/A	N/A
2441.00	61.78	PK	V	28.18	1.82	0.00	91.78	N/A	N/A
2441.00	51.03	AV	V	28.18	1.82	0.00	81.03	N/A	N/A
4882.00	62.00	PK	V	33.06	3.27	37.21	61.12	74.00	12.88
4882.00	42.69	AV	V	33.06	3.27	37.21	41.81	54.00	12.19
7323.00	48.37	PK	V	36.04	4.62	37.38	51.65	74.00	22.35
7323.00	37.26	AV	V	36.04	4.62	37.38	40.54	54.00	13.46
4632.00	46.48	PK	V	32.56	3.08	37.11	45.01	74.00	28.99
4632.00	35.74	AV	V	32.56	3.08	37.11	34.27	54.00	19.73
High Channel: 2480 MHz									
2480.00	59.09	PK	H	28.26	1.84	0.00	89.19	N/A	N/A
2480.00	49.24	AV	H	28.26	1.84	0.00	79.34	N/A	N/A
2480.00	62.24	PK	V	28.26	1.84	0.00	92.34	N/A	N/A
2480.00	52.64	AV	V	28.26	1.84	0.00	82.74	N/A	N/A
2483.50	26.01	PK	V	28.27	1.84	0.00	56.12	74.00	17.88
2483.50	13.28	AV	V	28.27	1.84	0.00	43.39	54.00	10.61
4960.00	61.57	PK	V	33.22	3.23	37.25	60.77	74.00	13.23
4960.00	42.35	AV	V	33.22	3.23	37.25	41.55	54.00	12.45
7440.00	48.64	PK	V	36.34	4.41	37.52	51.87	74.00	22.13
7440.00	37.26	AV	V	36.34	4.41	37.52	40.49	54.00	13.51
5120.00	46.69	PK	V	33.49	3.54	37.35	46.37	74.00	27.63
5120.00	35.44	AV	V	33.49	3.54	37.35	35.12	54.00	18.88

Worst plots(BDR Low channel)
Horizontal

Fundamental
Test with Band
Rejection Filter

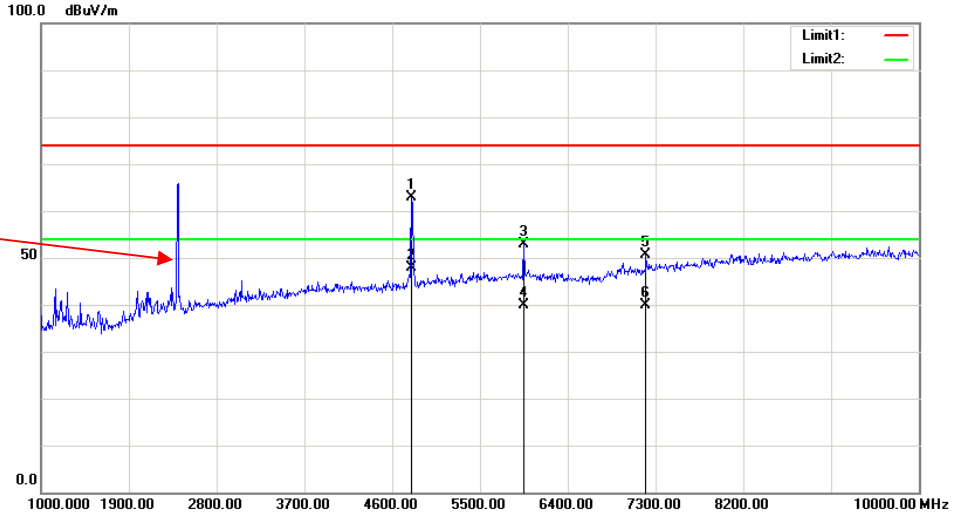


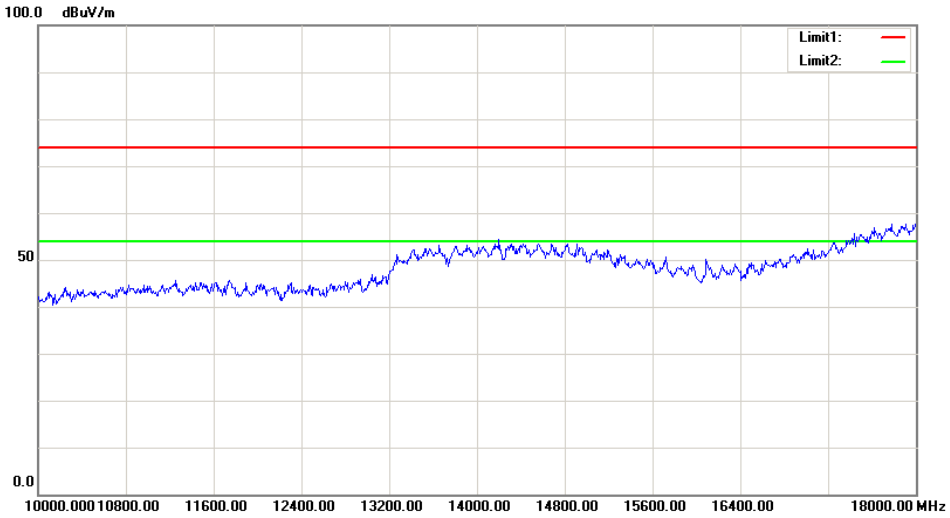


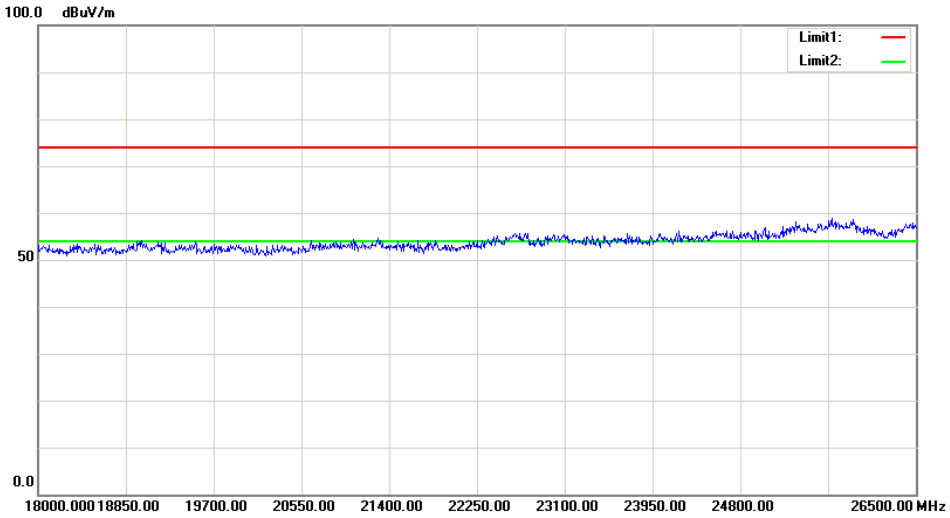


Vertical

Fundamental Test with Band Rejection Filter







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

Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.3 °C
Relative Humidity:	35 %
ATM Pressure:	102.2 kPa

** The testing was performed by George Pang on 2017-12-18.*

Test Result: Compliance.

Please refer to following tables and plots

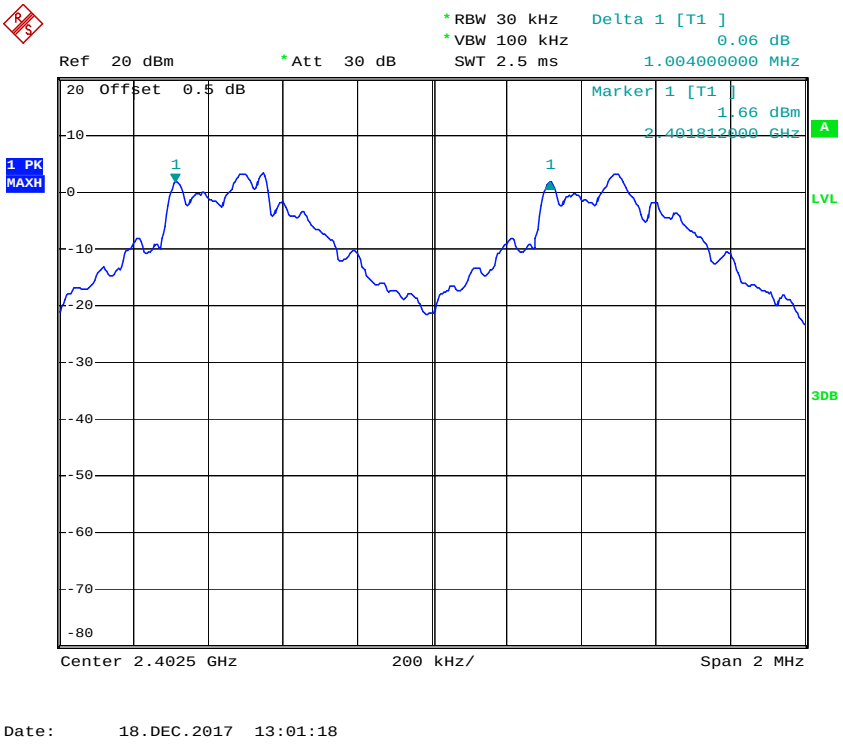
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	1.004	0.53
	Middle	2441	1.000	0.55
	High	2480	1.004	0.55
EDR (π/4-DQPSK)	Low	2402	1.000	0.8
	Middle	2441	1.004	0.81
	High	2480	1.004	0.81
EDR (8-DPSK)	Low	2402	1.000	0.8
	Middle	2441	1.000	0.8
	High	2480	1.000	0.81

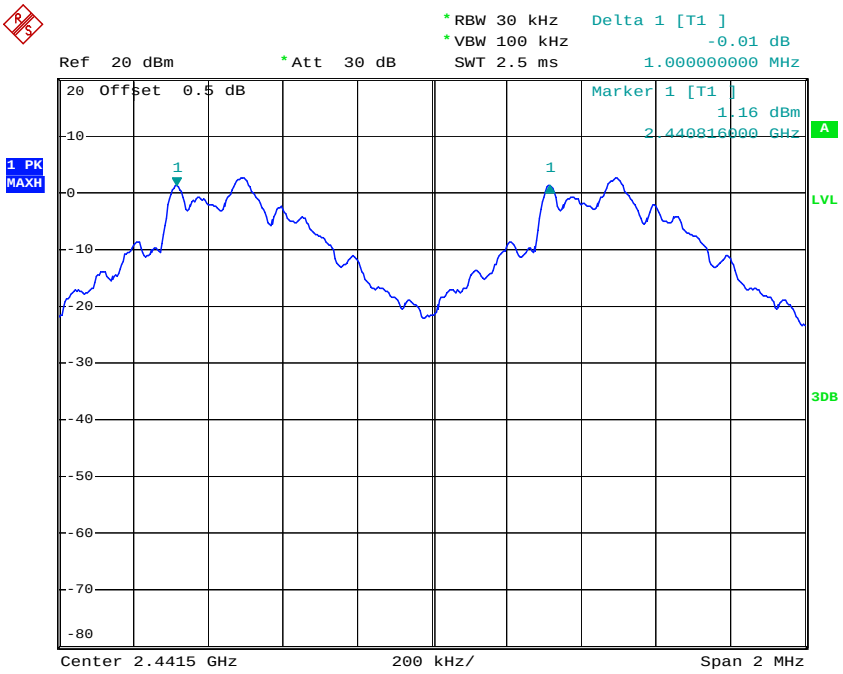
Note: Limit= (2/3) × 20dB bandwidth

BDR Mode (GFSK):

Low Channel

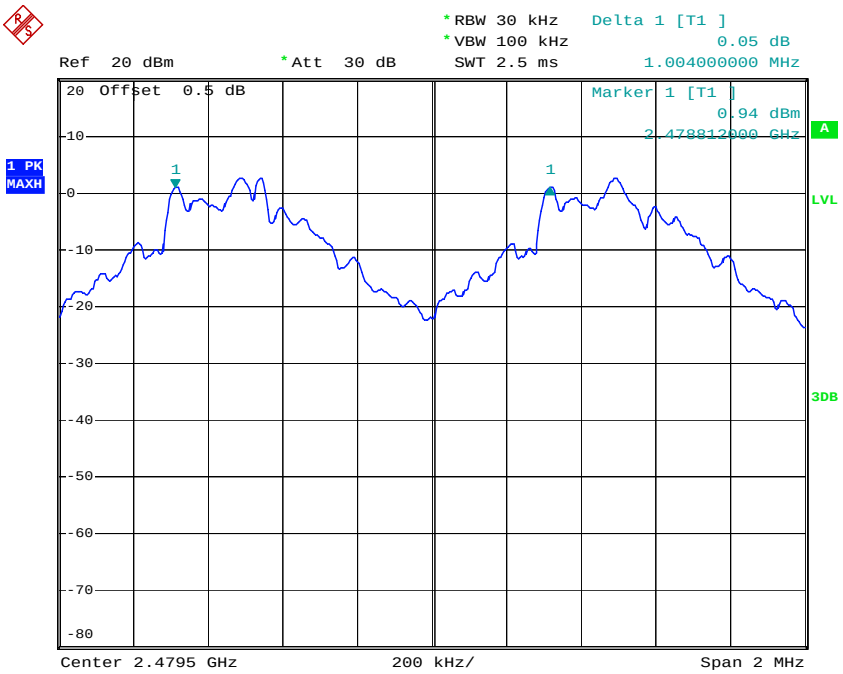


Middle Channel



Date: 18.DEC.2017 13:02:40

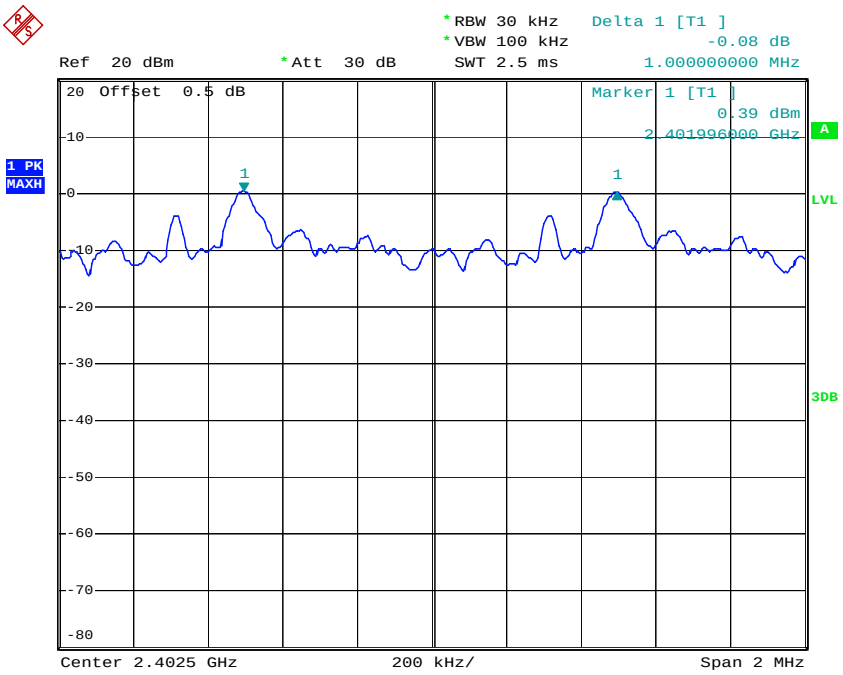
High Channel



Date: 18.DEC.2017 13:03:53

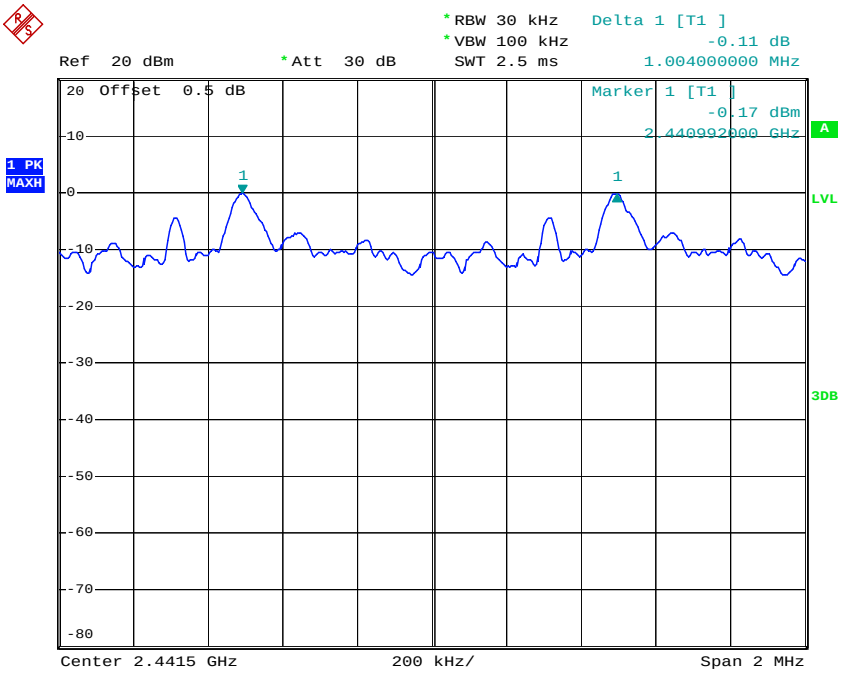
EDR Mode (π/4-DQPSK):

Low Channel



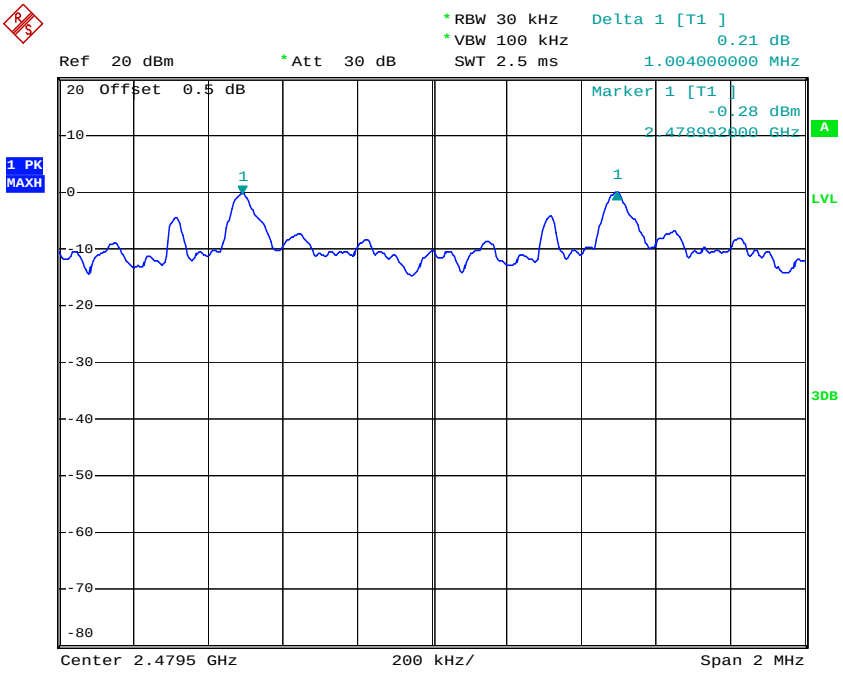
Date: 18.DEC.2017 13:09:54

Middle Channel



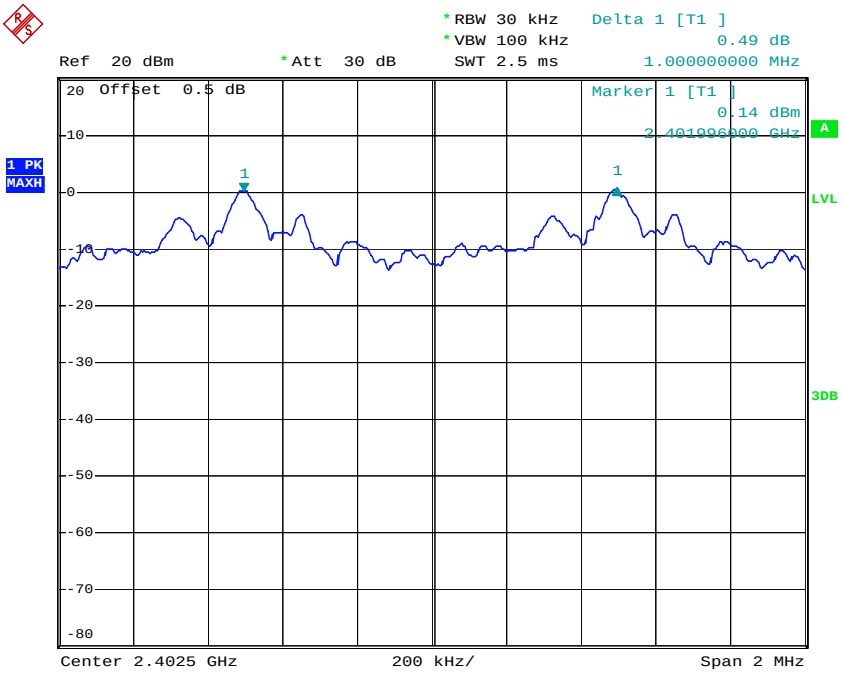
Date: 18.DEC.2017 13:06:35

High Channel

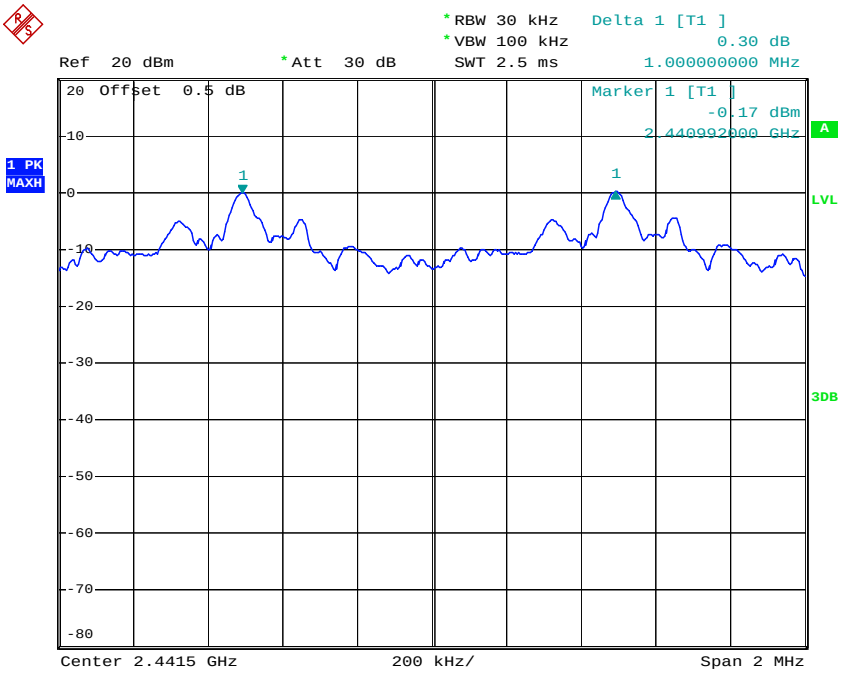


EDR Mode (8-DPSK):

Low Channel

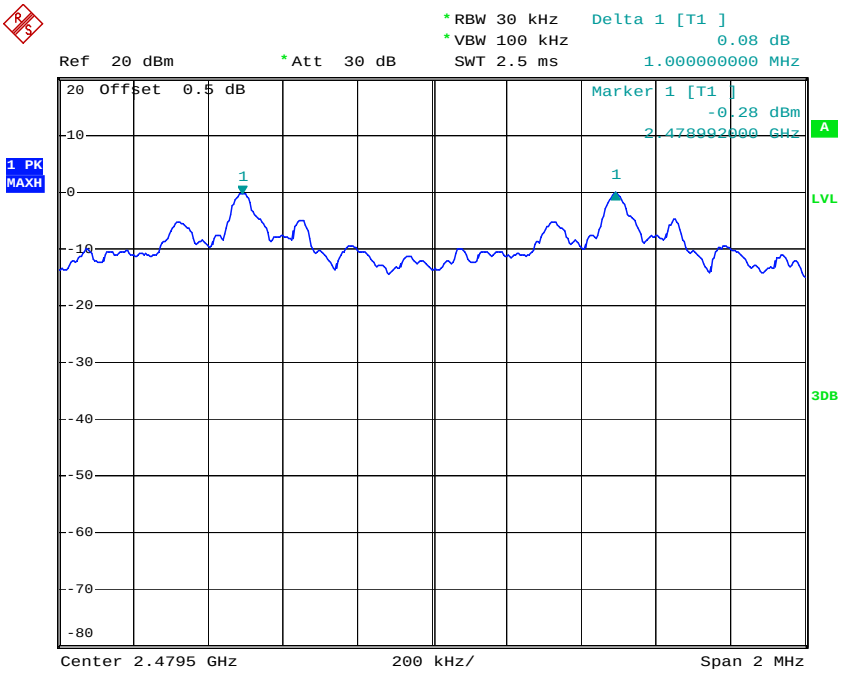


Middle Channel



Date: 18.DEC.2017 13:13:03

High Channel



Date: 18.DEC.2017 13:14:27

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	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.3 °C
Relative Humidity:	35 %
ATM Pressure:	102.2 kPa

** The testing was performed by George Pang on 2017-12-18.*

Test Result: Compliance.

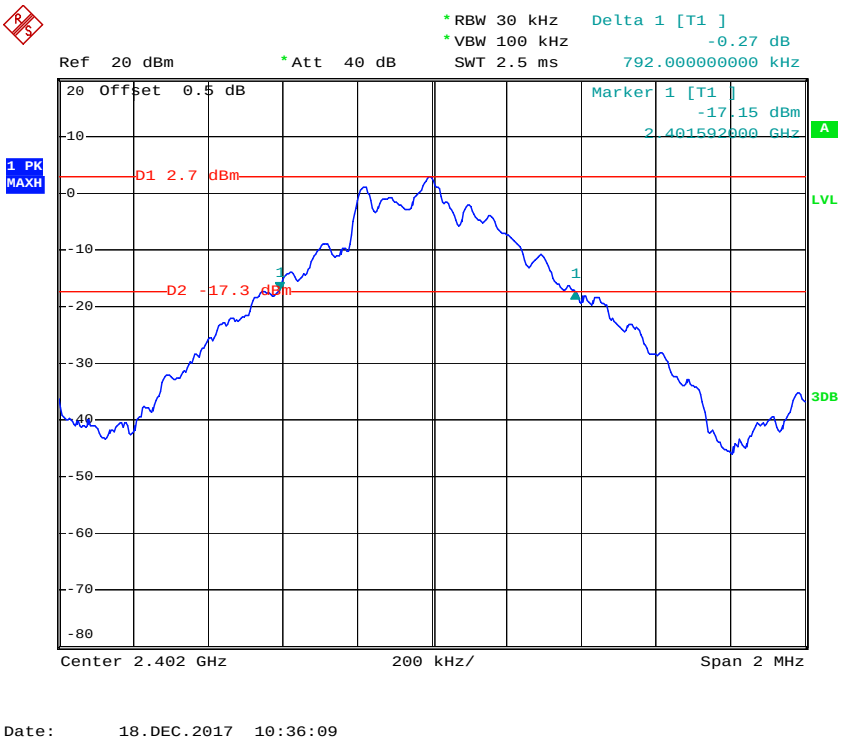
Please refer to following tables and plots

Test Mode: Transmitting

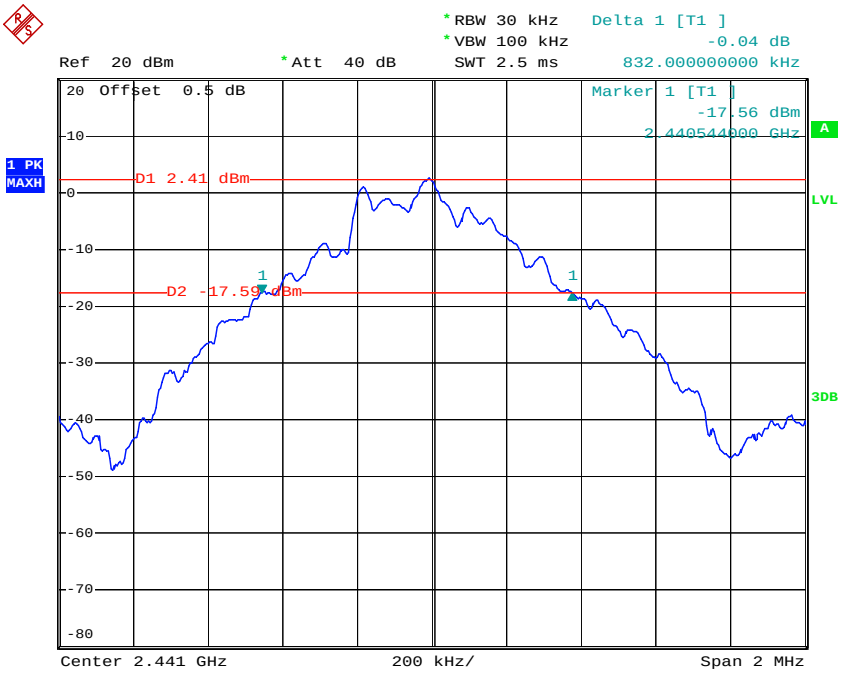
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.79
	Middle	2441	0.83
	High	2480	0.83
EDR Mode (π/4-DQPSK)	Low	2402	1.20
	Middle	2441	1.21
	High	2480	1.21
EDR Mode (8-DPSK)	Low	2402	1.22
	Middle	2441	1.20
	High	2480	1.20

BDR Mode (GFSK):

Low Channel

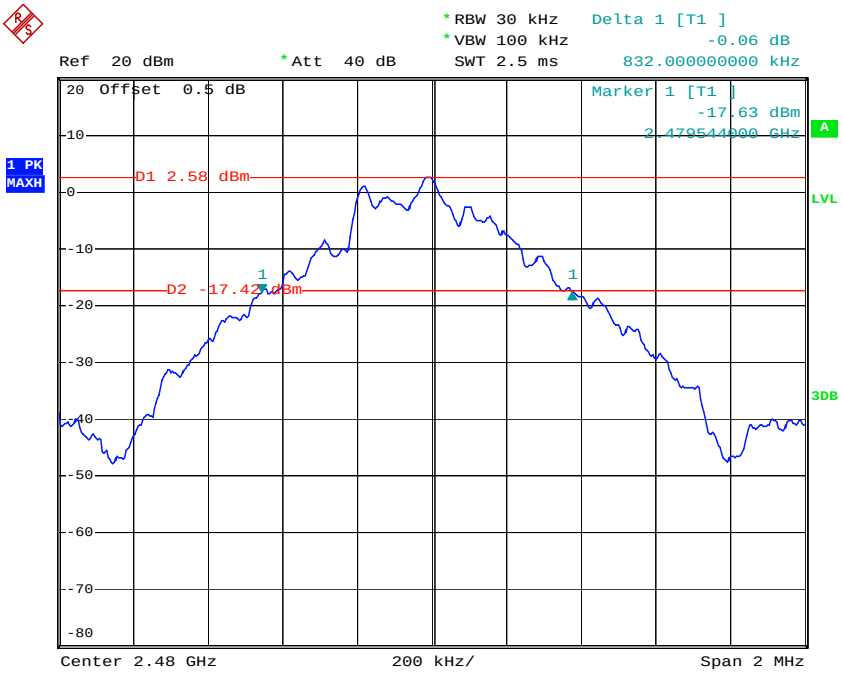


Middle Channel



Date: 18.DEC.2017 10:38:20

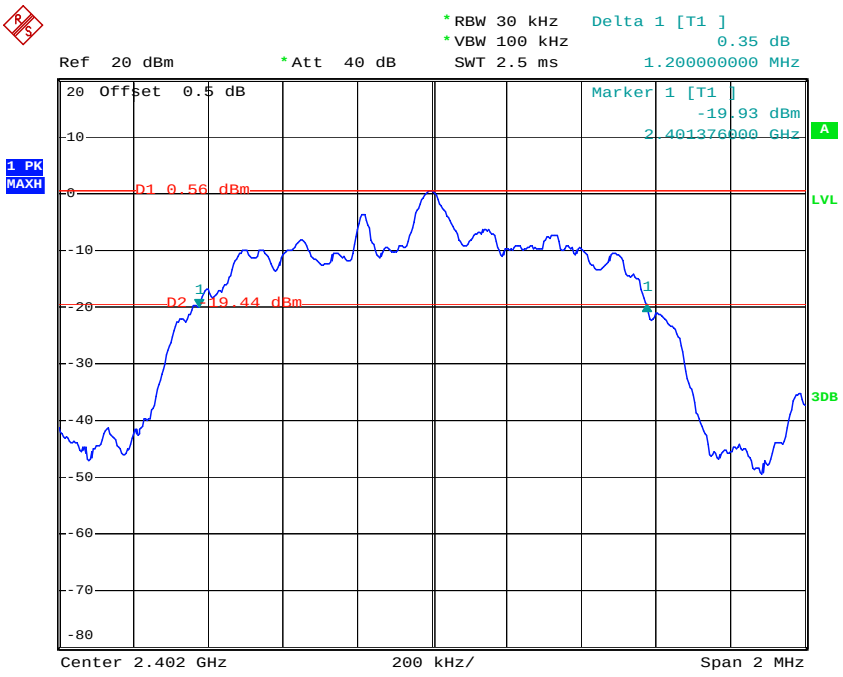
High Channel



Date: 18.DEC.2017 10:40:59

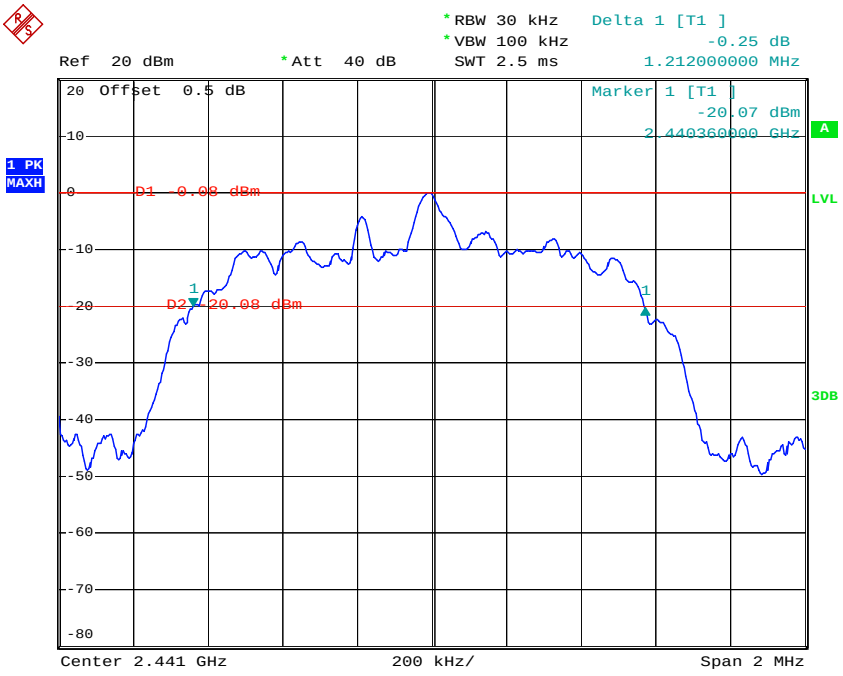
EDR Mode (π/4-DQPSK):

Low Channel



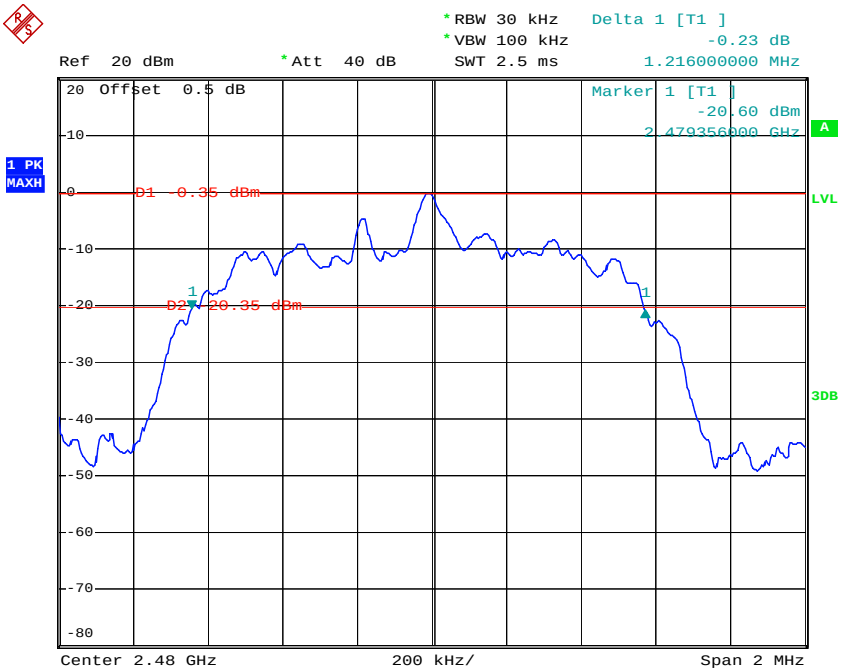
Date: 18.DEC.2017 11:37:49

Middle Channel



Date: 18.DEC.2017 11:39:42

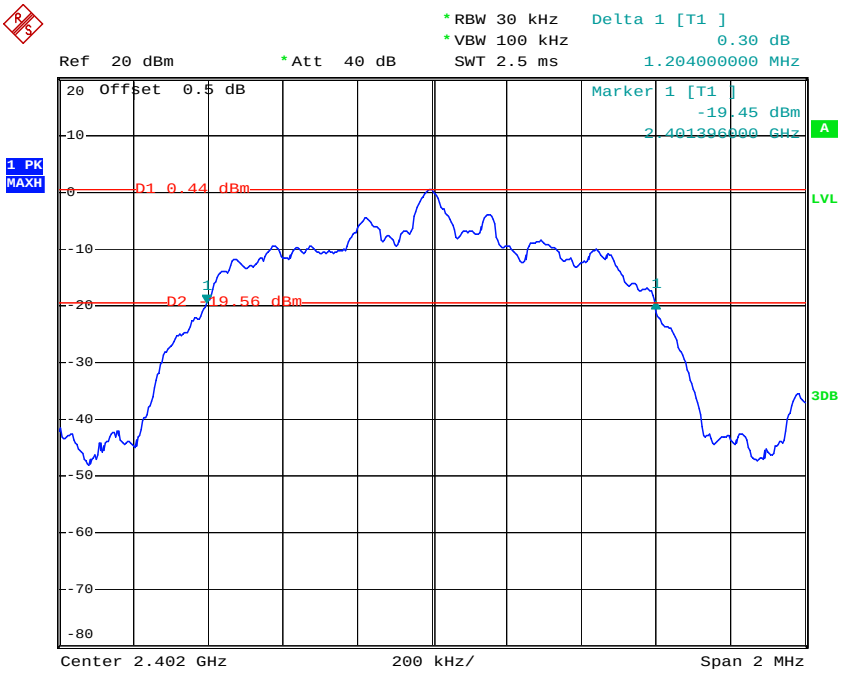
High Channel



Date: 18.DEC.2017 11:54:39

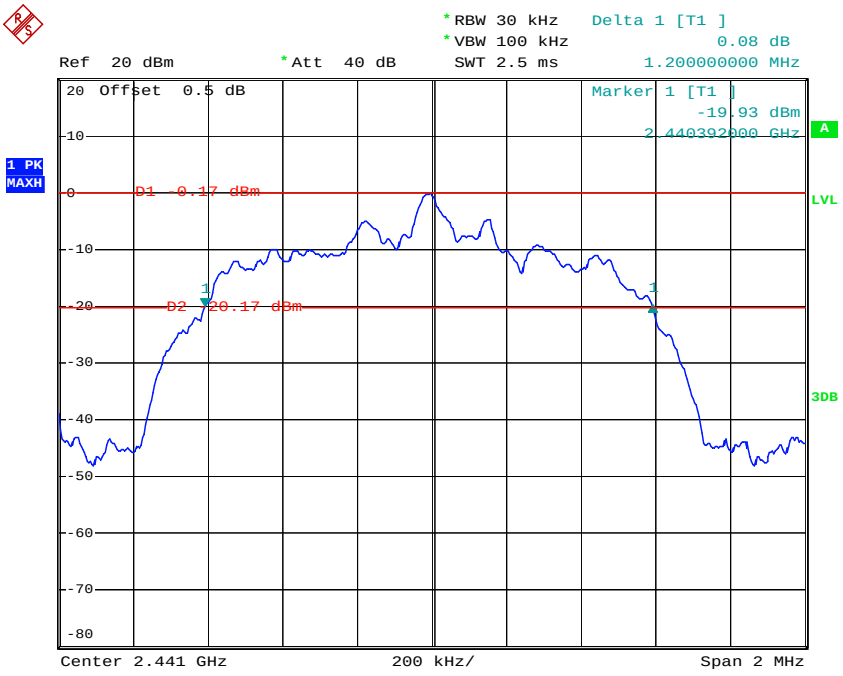
EDR Mode (8-DPSK):

Low Channel



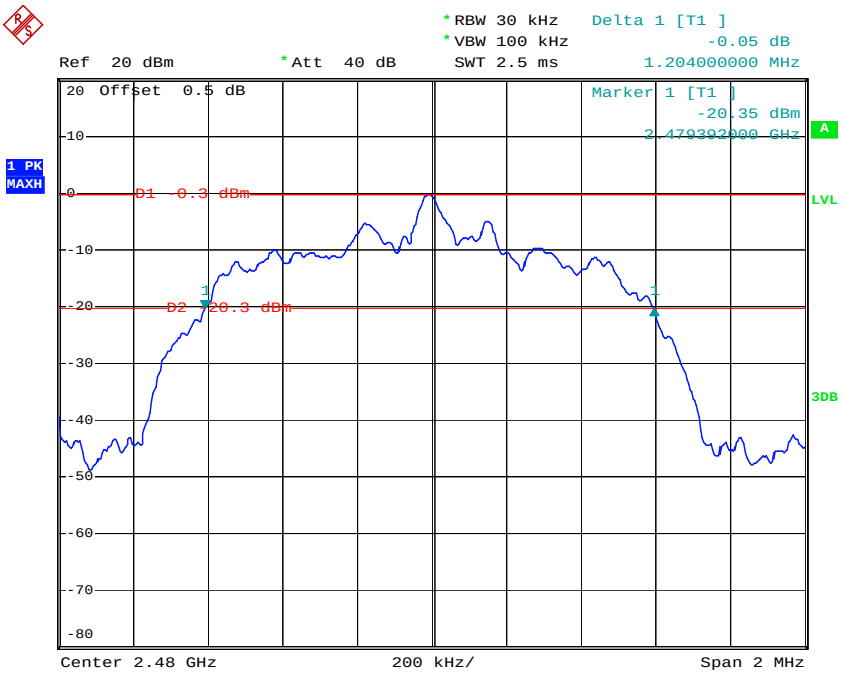
Date: 18.DEC.2017 11:48:42

Middle Channel



Date: 18.DEC.2017 11:50:27

High Channel



Date: 18.DEC.2017 11:51:52

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	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.3 °C
Relative Humidity:	35 %
ATM Pressure:	102.2 kPa

** The testing was performed by George Pang on 2017-12-18.*

Test Result: Compliance.

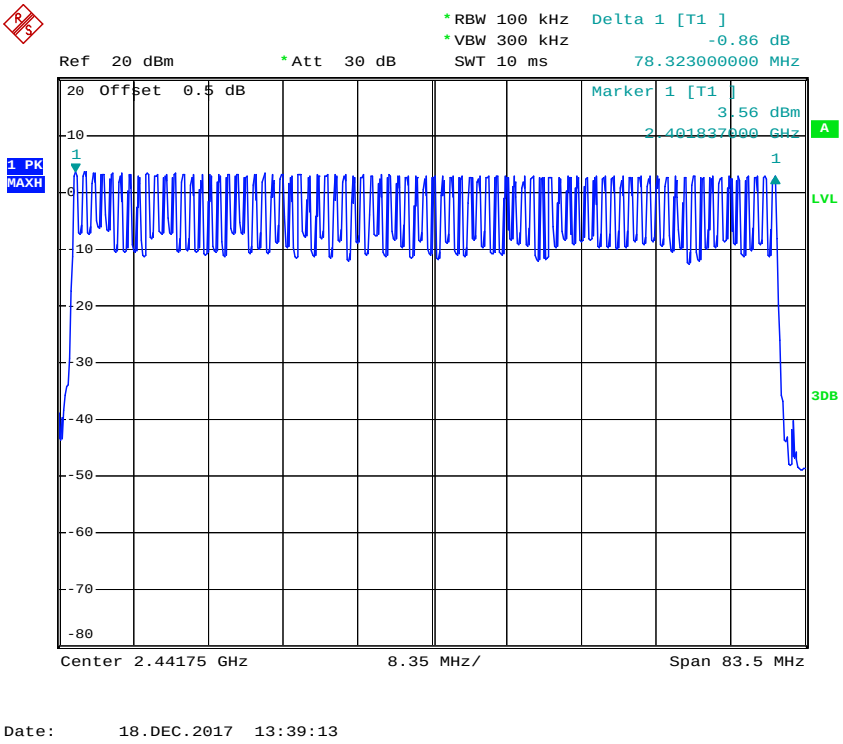
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

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

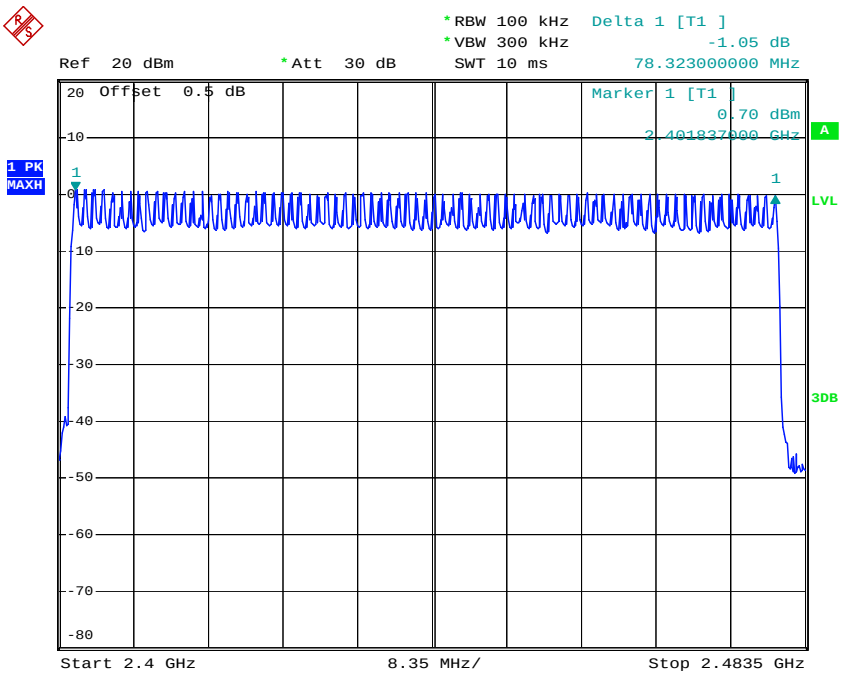
Number of Hopping Channels



EDR Mode (π/4-DQPSK):

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

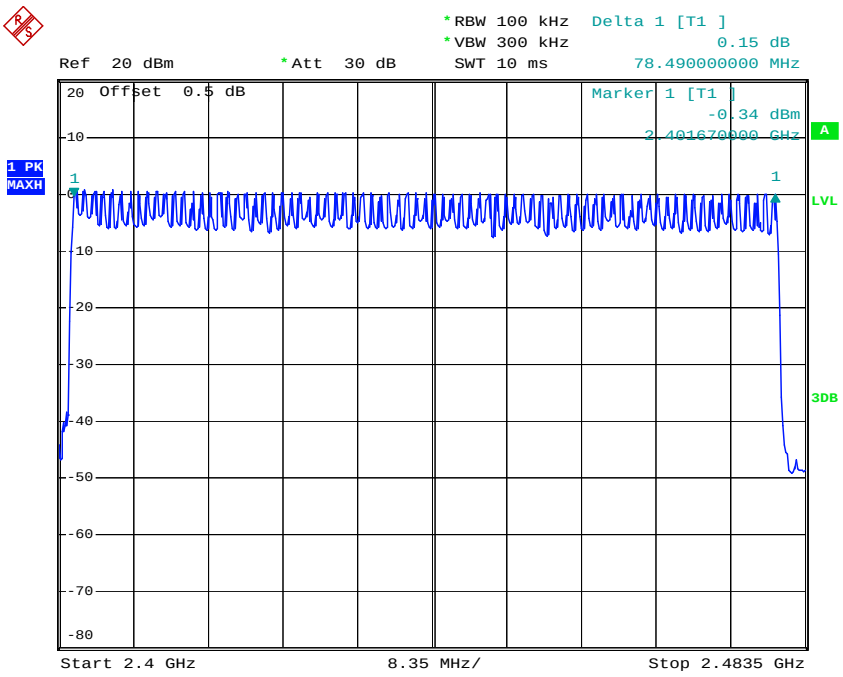
Number of Hopping Channels



EDR Mode (8-DPSK):

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

Number of Hopping Channels



Date: 18.DEC.2017 13:23:09

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	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.3 °C
Relative Humidity:	35 %
ATM Pressure:	102.2 kPa

** The testing was performed by George Pang on 2017-12-18 .*

Test Result: Compliance.

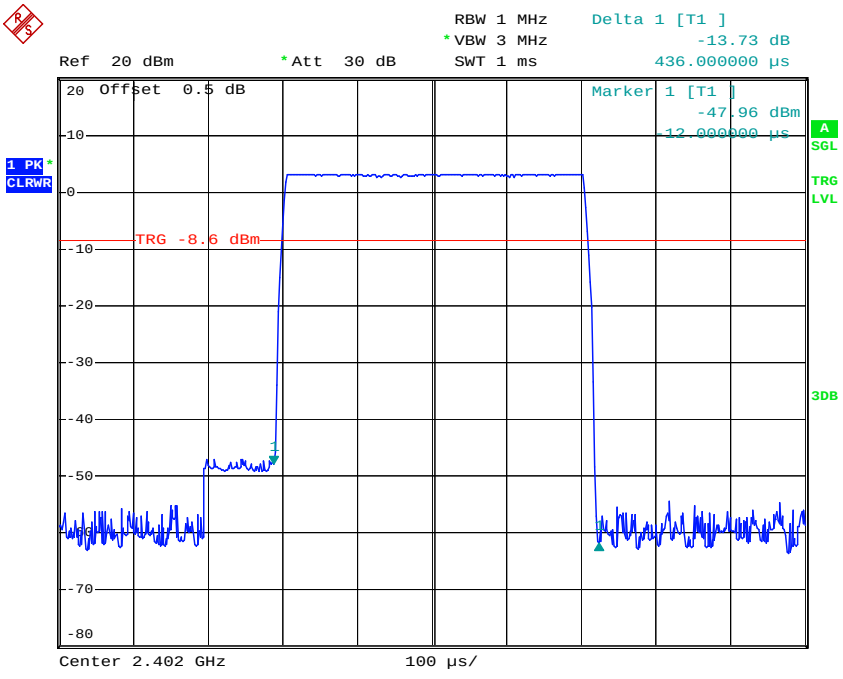
Please refer to following tables and plots

Test Mode: Transmitting

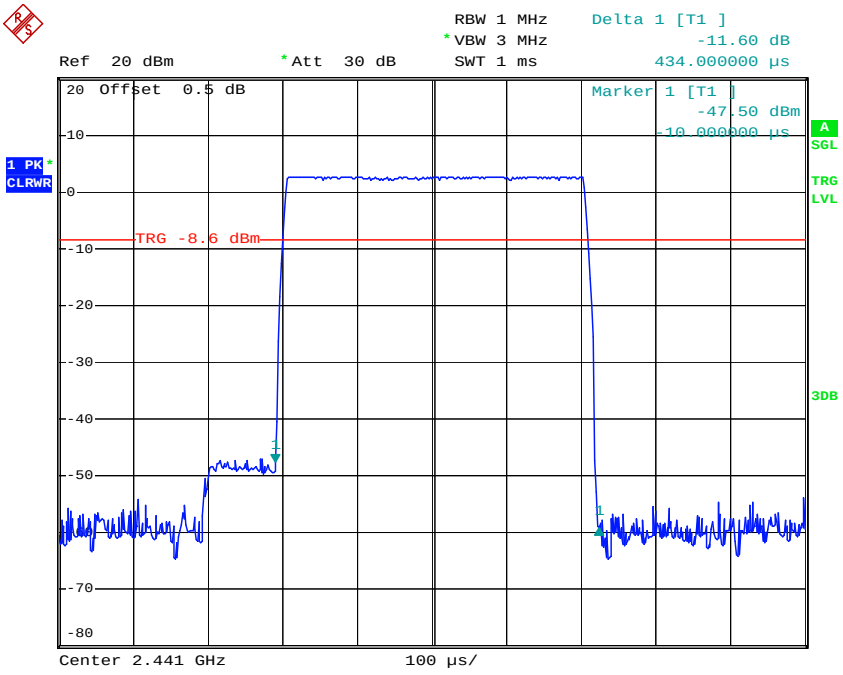
BDR Mode (GFSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.436	0.14	0.4	Compliance
	Middle	0.434	0.139	0.4	Compliance
	High	0.434	0.139	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.706	0.273	0.4	Compliance
	Middle	1.712	0.274	0.4	Compliance
	High	1.706	0.273	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.966	0.316	0.4	Compliance
	Middle	2.956	0.315	0.4	Compliance
	High	2.956	0.315	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

DH1: Low Channel

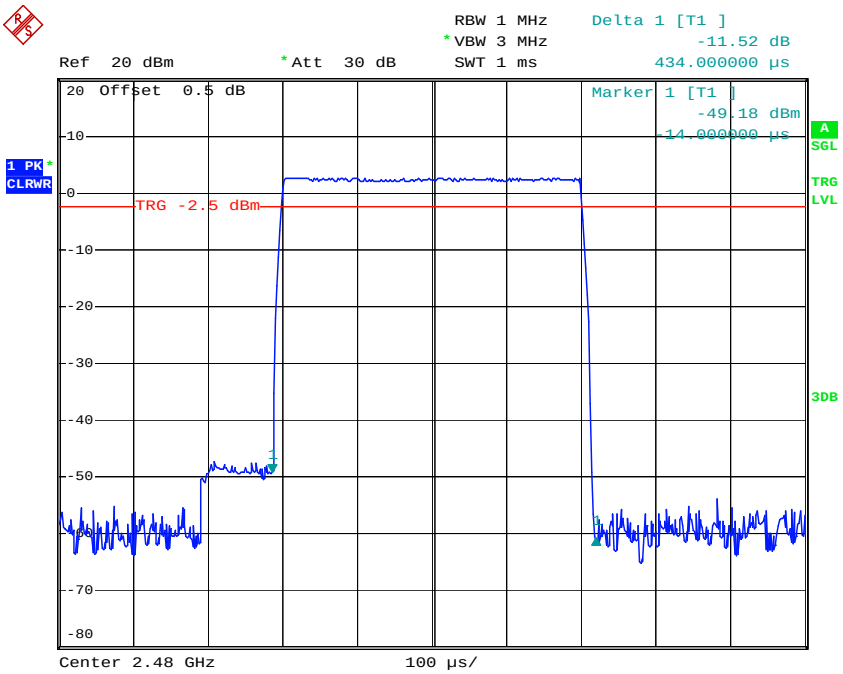


DH1: Middle Channel



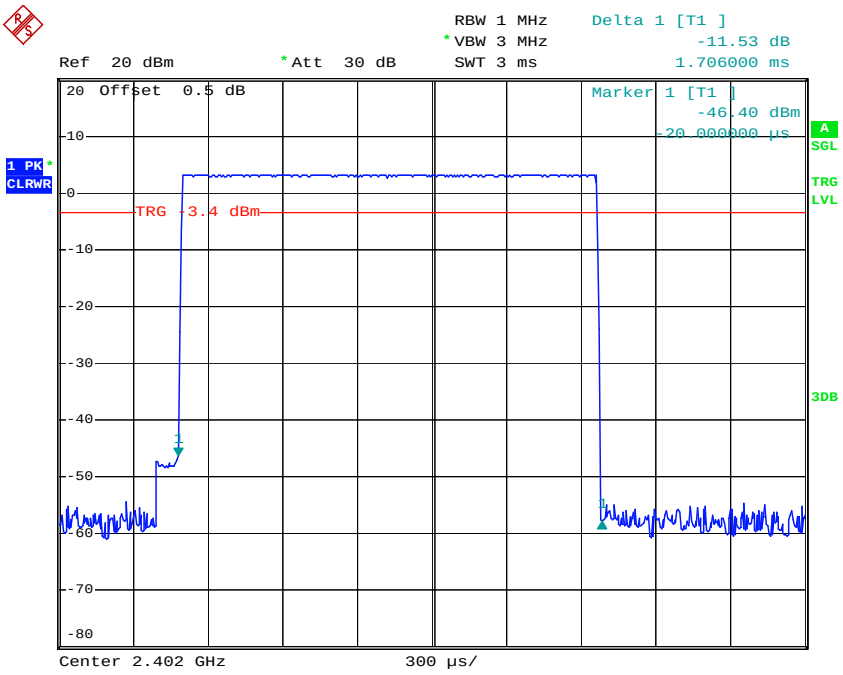
Date: 18.DEC.2017 13:42:34

DH1: High Channel



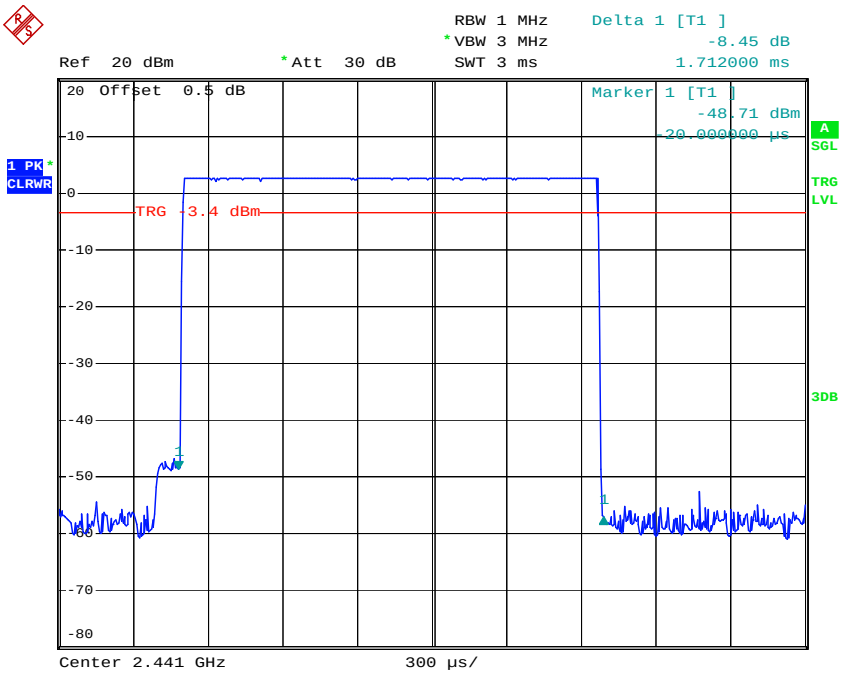
Date: 18.DEC.2017 13:43:06

DH3: Low Channel



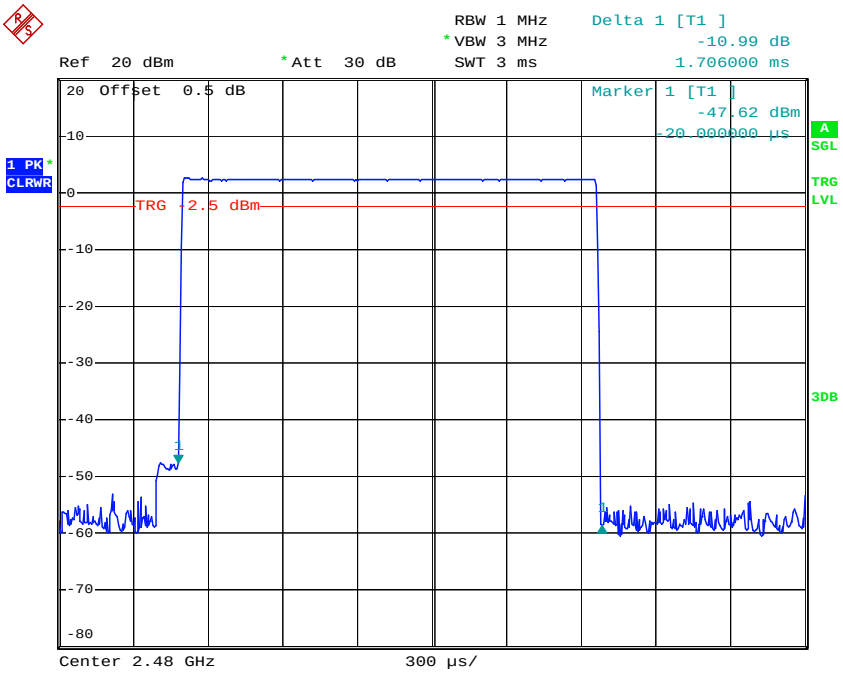
Date: 18.DEC.2017 13:45:56

DH3: Middle Channel



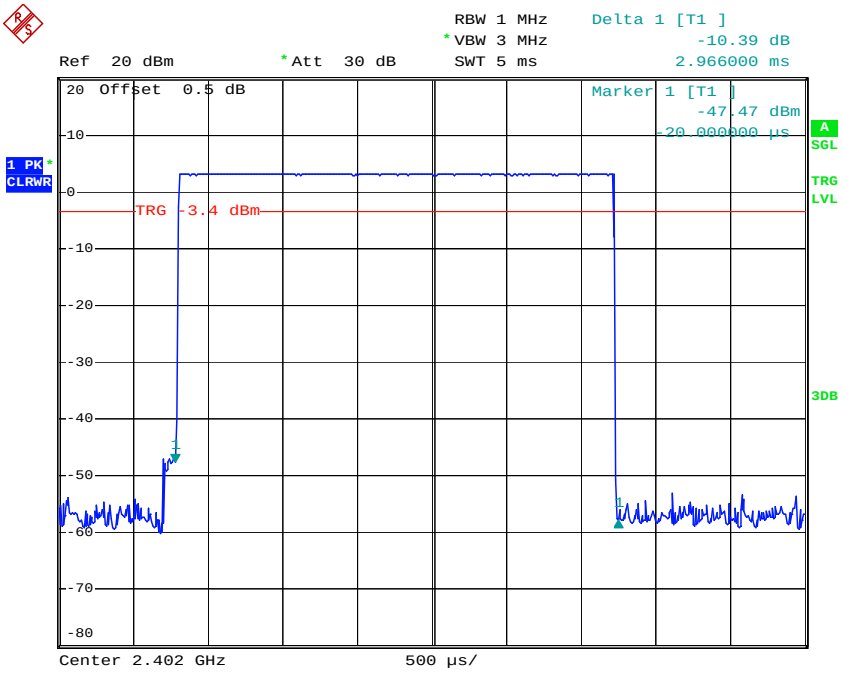
Date: 18.DEC.2017 13:45:28

DH3: High Channel



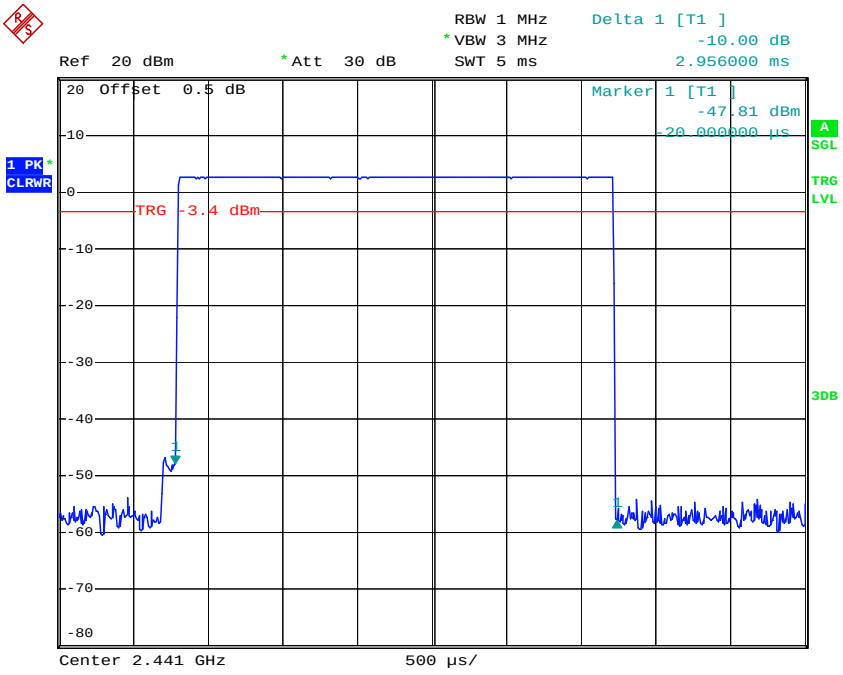
Date: 18.DEC.2017 13:44:33

DH5: Low Channel



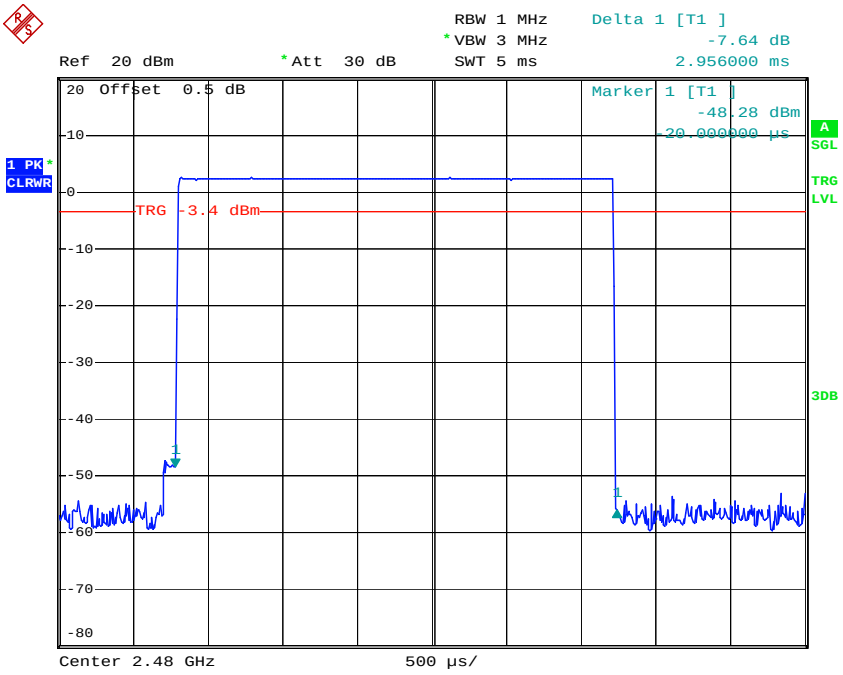
Date: 18.DEC.2017 13:46:58

DH5: Middle Channel



Date: 18.DEC.2017 13:47:23

DH5: High Channel

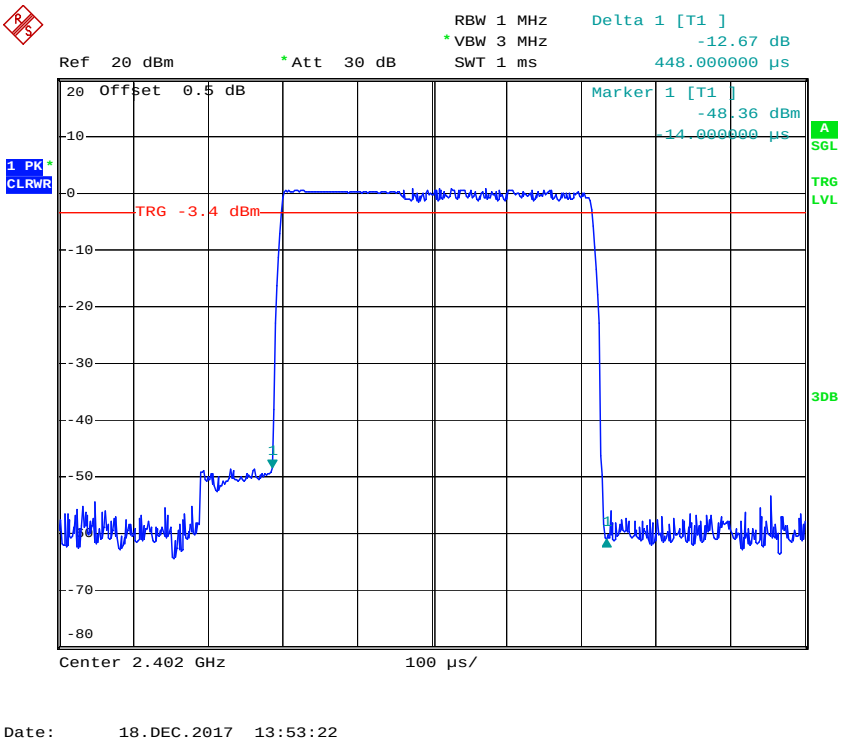


Date: 18.DEC.2017 13:47:48

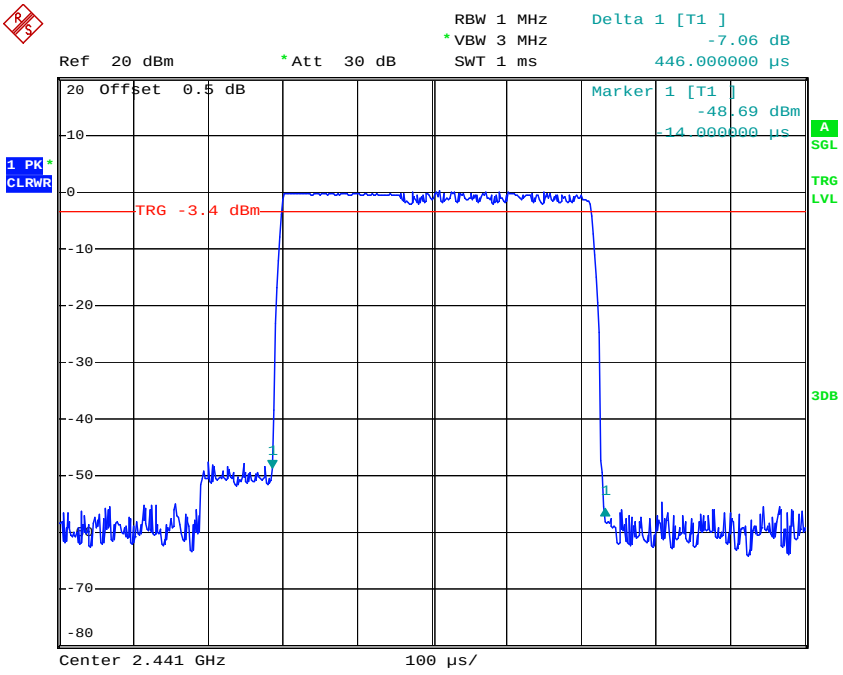
EDR Mode (π/4-DQPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.448	0.143	0.4	Compliance
	Middle	0.446	0.143	0.4	Compliance
	High	0.446	0.143	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.716	0.275	0.4	Compliance
	Middle	1.716	0.275	0.4	Compliance
	High	1.716	0.275	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.966	0.316	0.4	Compliance
	Middle	2.966	0.316	0.4	Compliance
	High	2.966	0.316	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

2DH1: Low Channel

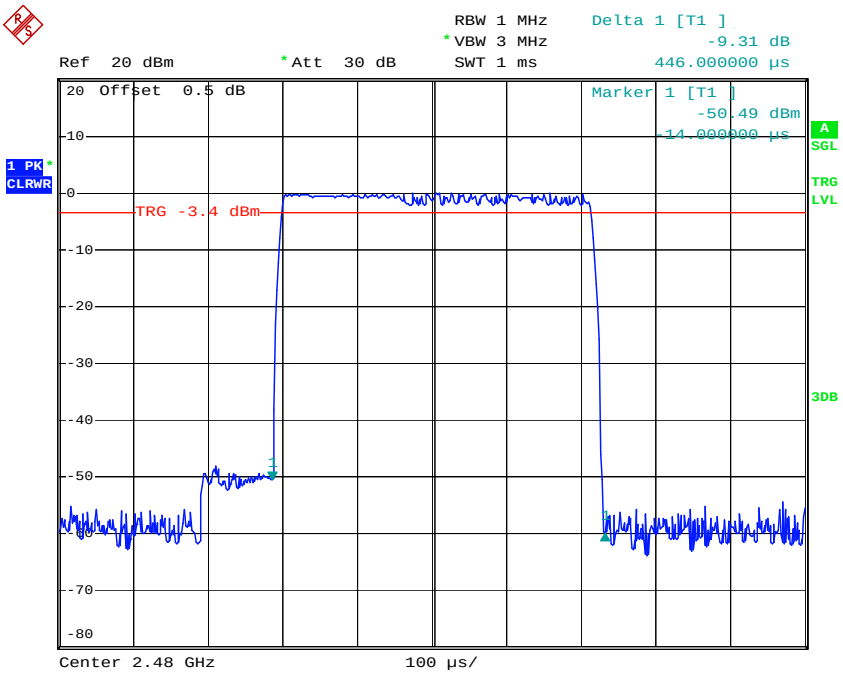


2DH1: Middle Channel



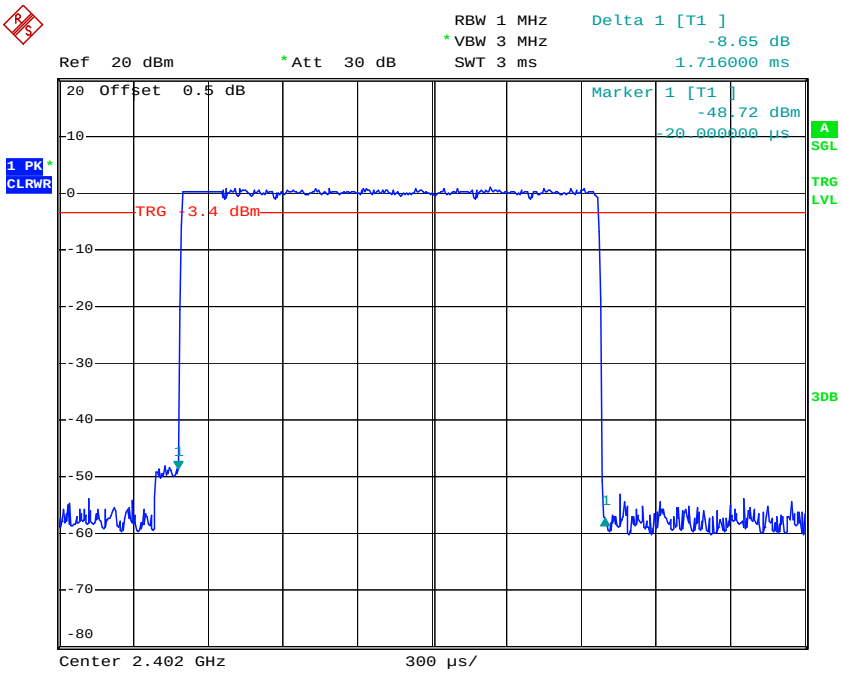
Date: 18.DEC.2017 13:52:54

2DH1: High Channel



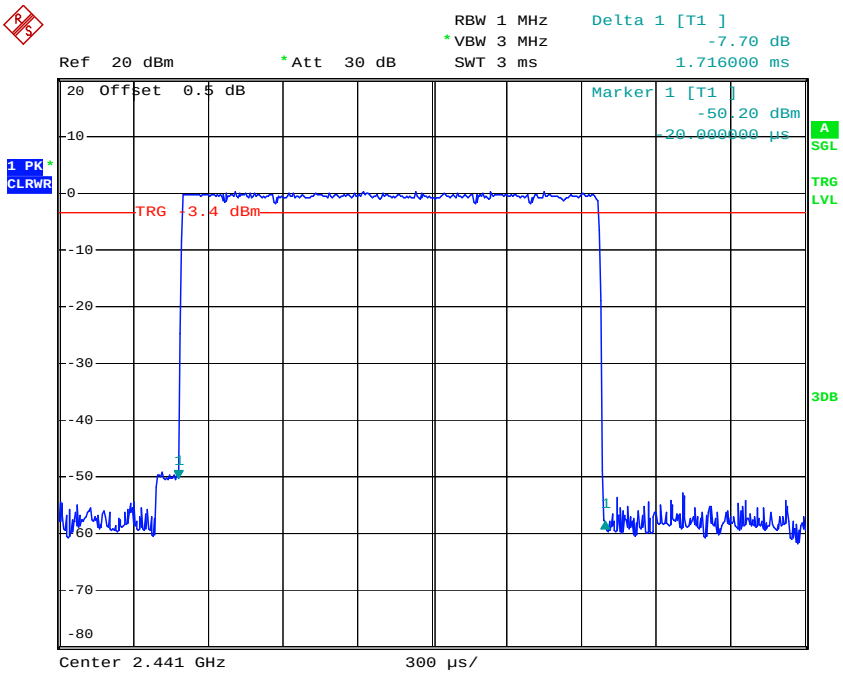
Date: 18.DEC.2017 13:52:29

2DH3: Low Channel



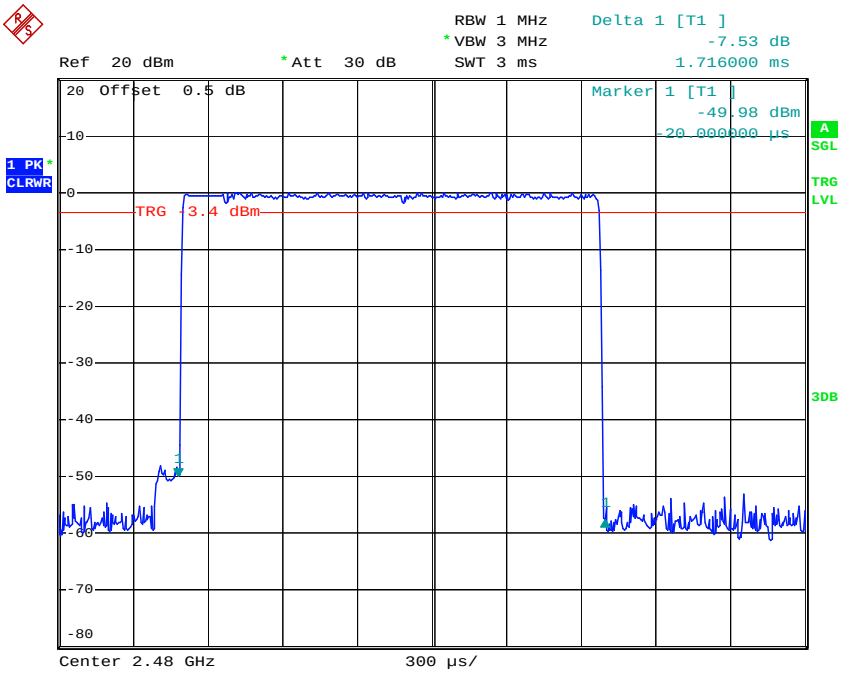
Date: 18.DEC.2017 13:50:40

2DH3: Middle Channel



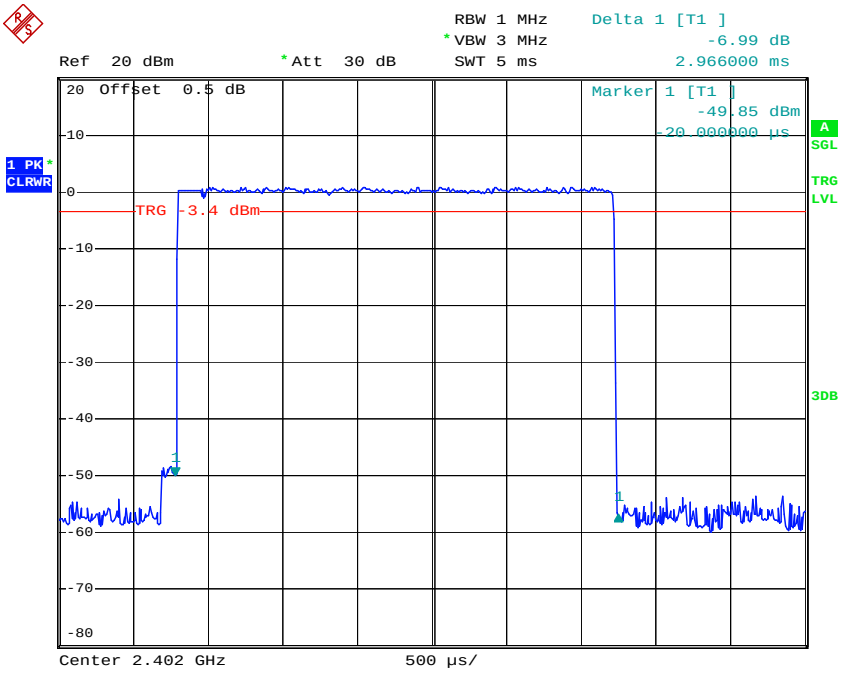
Date: 18.DEC.2017 13:51:06

2DH3: High Channel



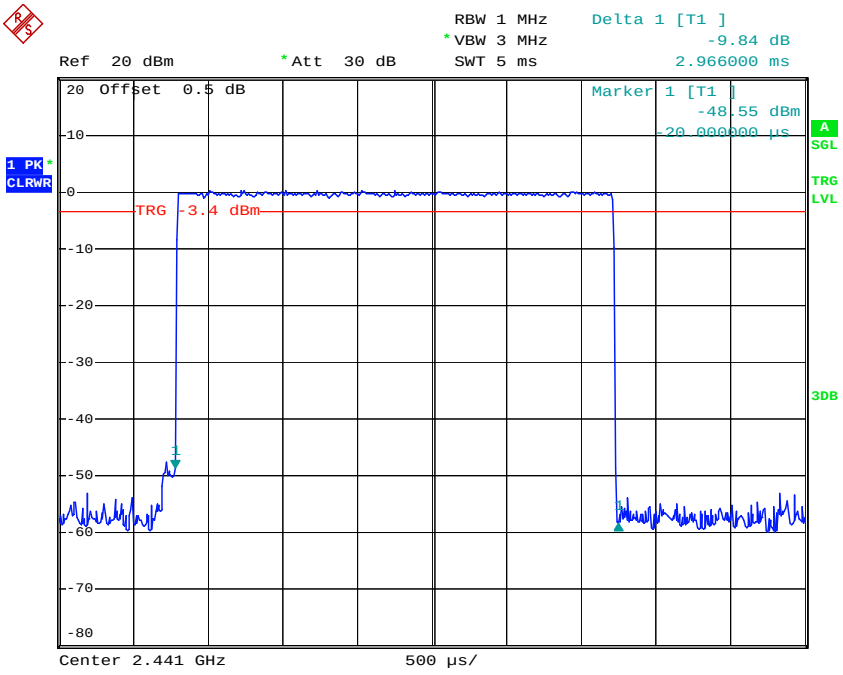
Date: 18.DEC.2017 13:51:33

2DH5: Low Channel



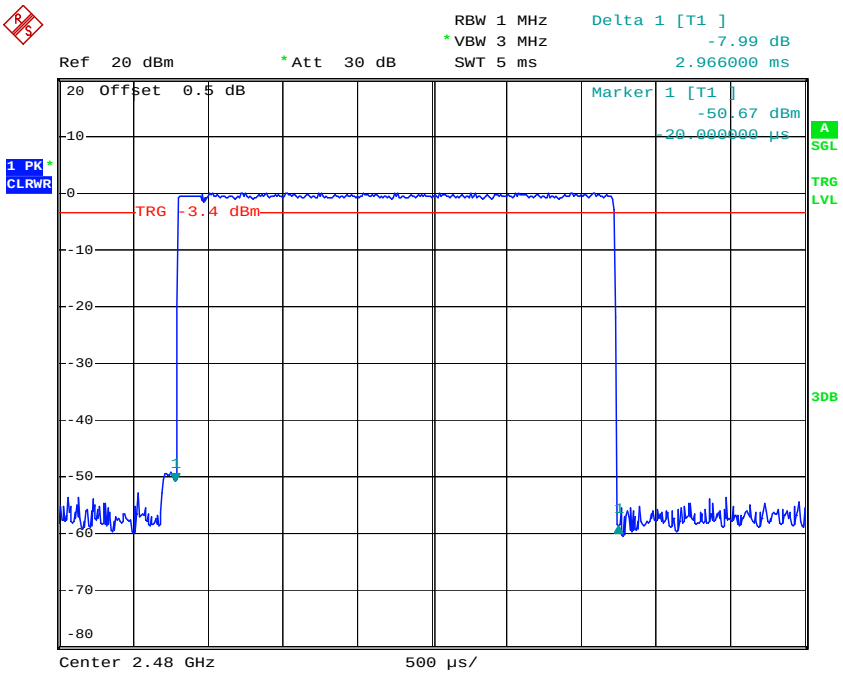
Date: 18.DEC.2017 13:49:42

2DH5: Middle Channel



Date: 18.DEC.2017 13:49:18

2DH5: High Channel

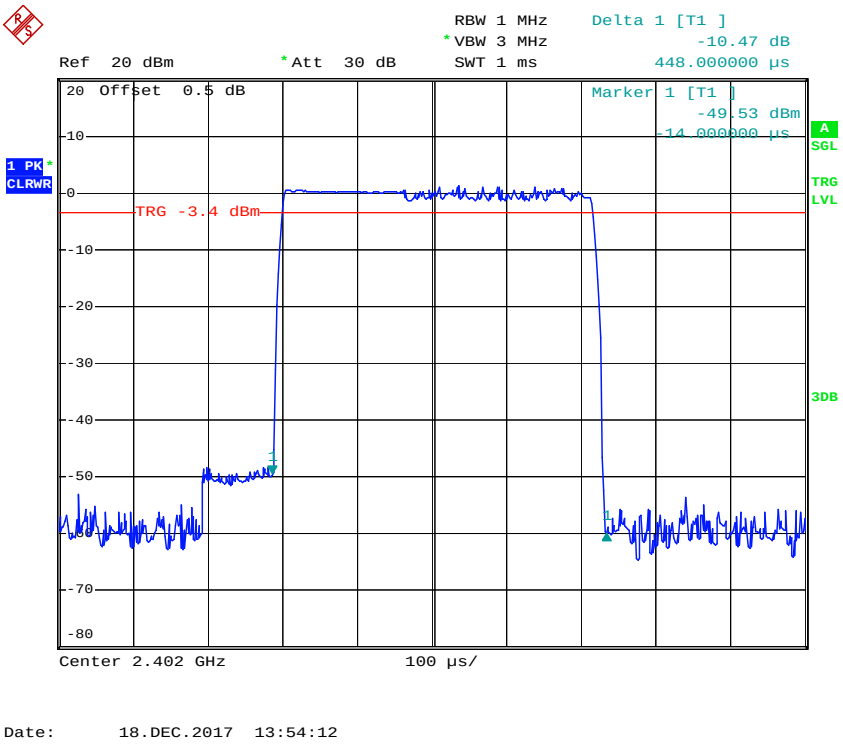


Date: 18.DEC.2017 13:48:54

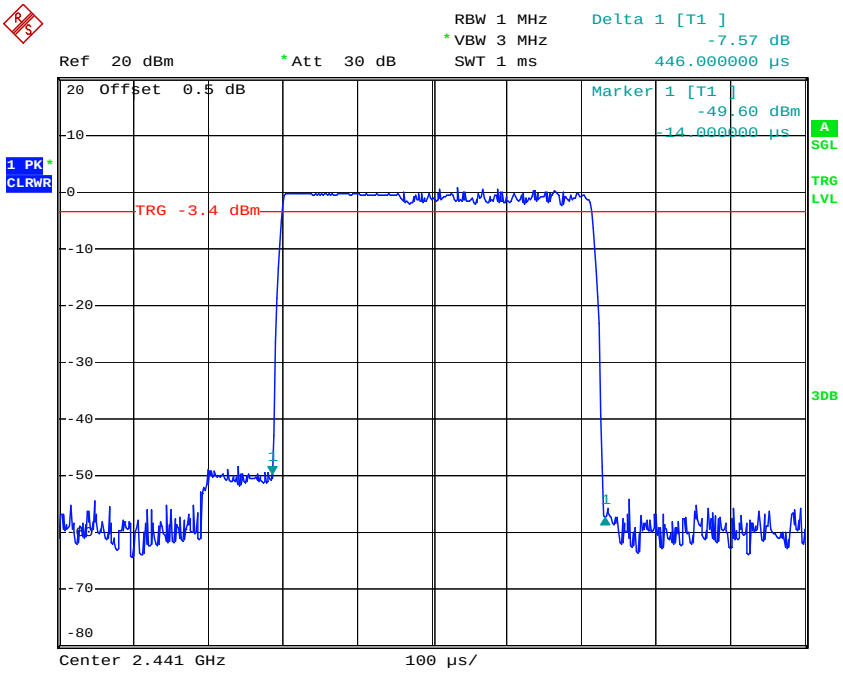
EDR Mode (8-DPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.448	0.143	0.4	Compliance
	Middle	0.446	0.143	0.4	Compliance
	High	0.448	0.143	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
3DH3	Low	1.714	0.274	0.4	Compliance
	Middle	1.708	0.273	0.4	Compliance
	High	1.708	0.273	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
3DH5	Low	2.974	0.317	0.4	Compliance
	Middle	2.974	0.317	0.4	Compliance
	High	2.974	0.317	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

3DH1: Low Channel

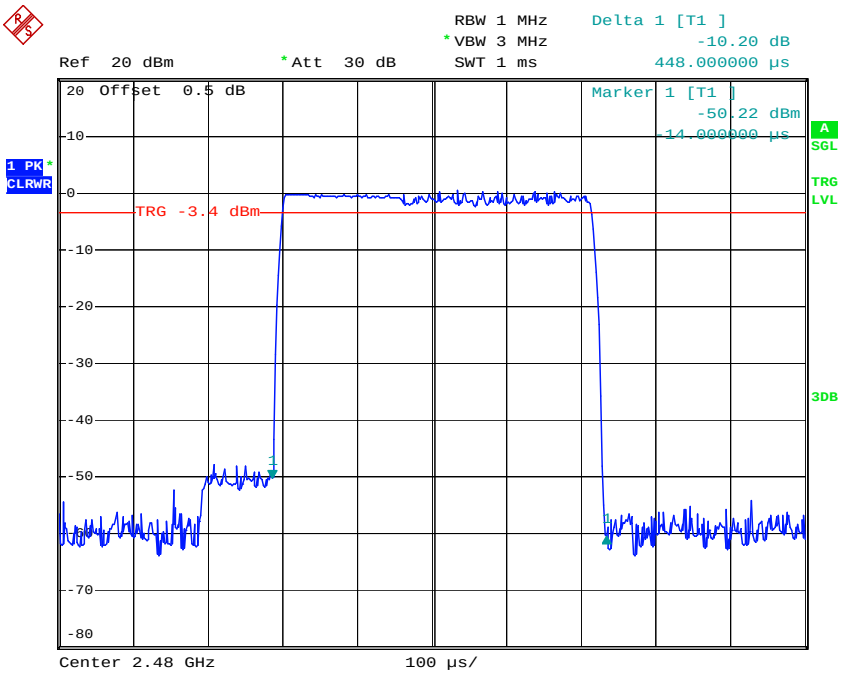


3DH1: Middle Channel



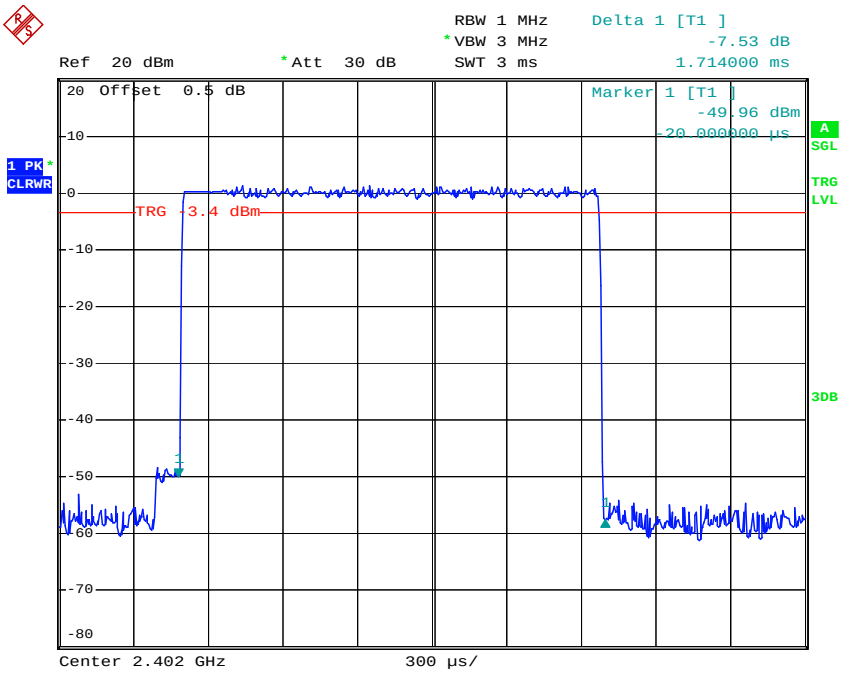
Date: 18.DEC.2017 13:54:40

3DH1: High Channel



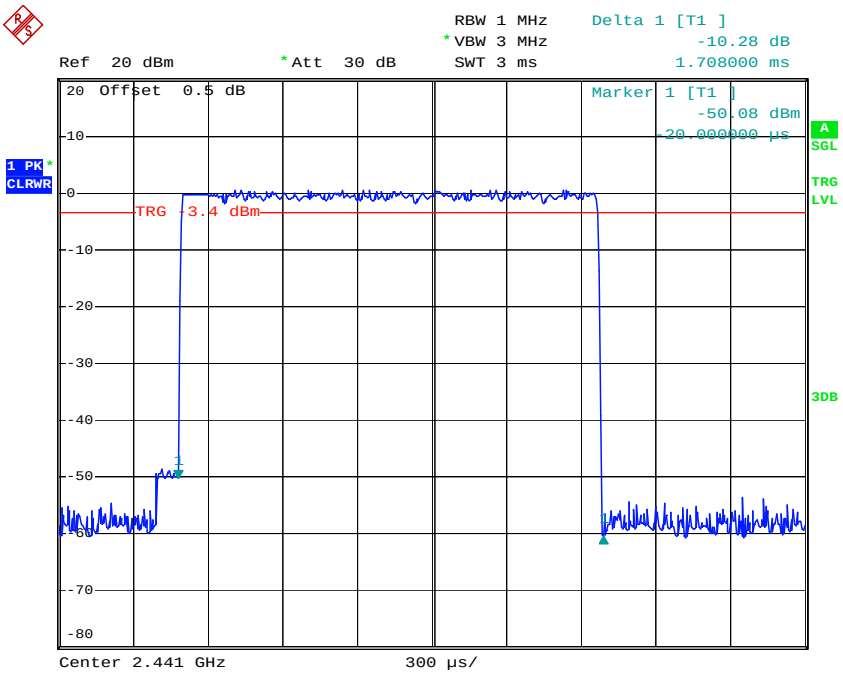
Date: 18.DEC.2017 13:55:00

3DH3: Low Channel



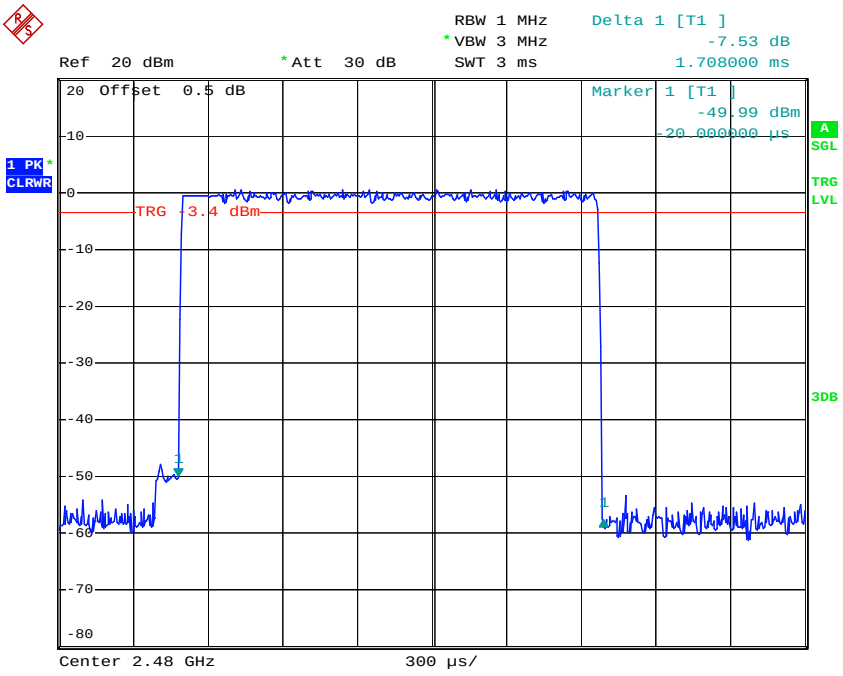
Date: 18.DEC.2017 13:56:43

3DH3: Middle Channel



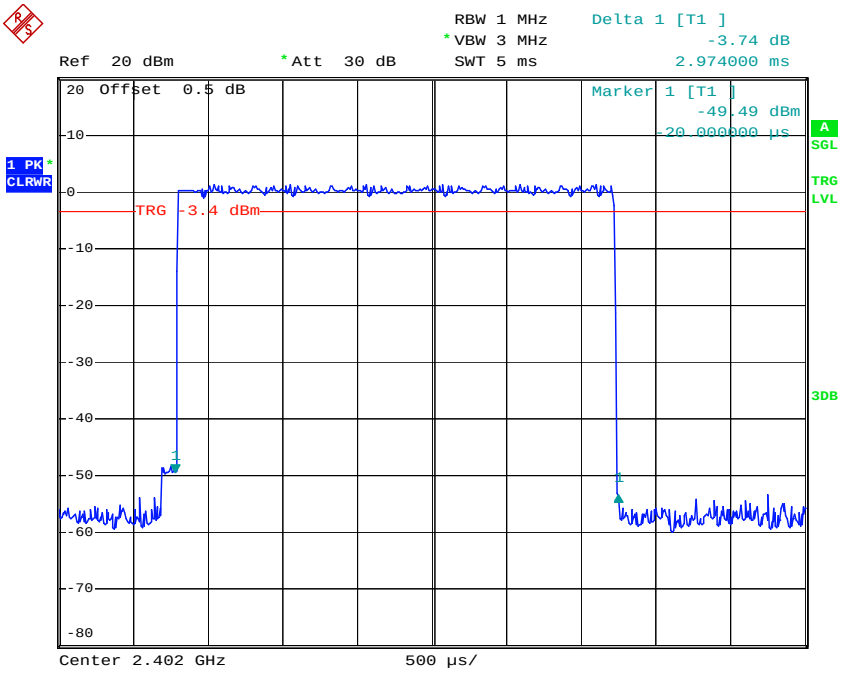
Date: 18.DEC.2017 13:56:11

3DH3: High Channel



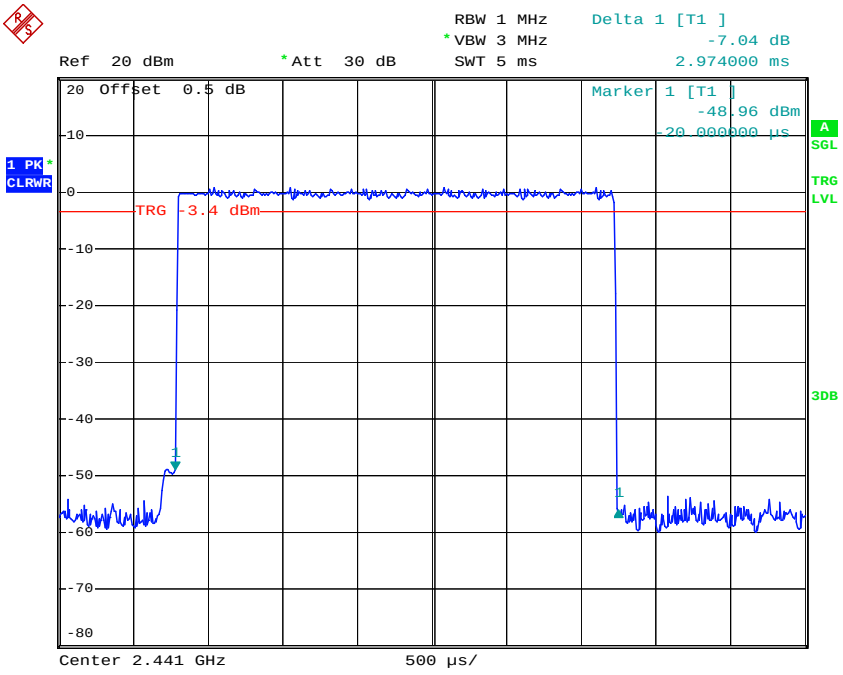
Date: 18.DEC.2017 13:55:51

3DH5: Low Channel



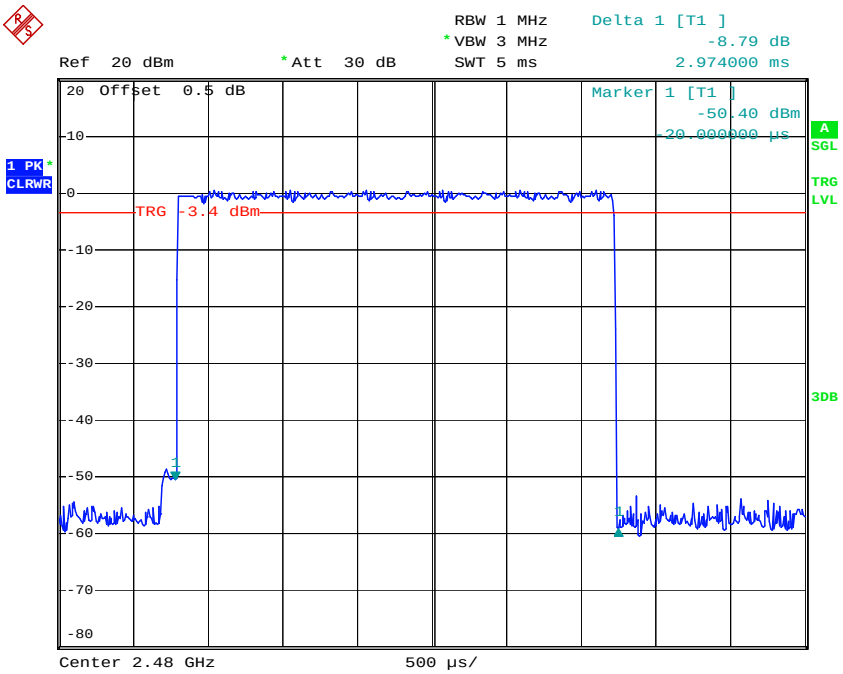
Date: 18.DEC.2017 13:57:34

3DH5: Middle Channel



Date: 18.DEC.2017 13:57:56

3DH5: High Channel



Date: 18.DEC.2017 13:58:14

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	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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:	22.3 °C
Relative Humidity:	35 %
ATM Pressure:	102.2 kPa

** The testing was performed by George Pang on 2017-12-18.*

Test Result: Compliance.

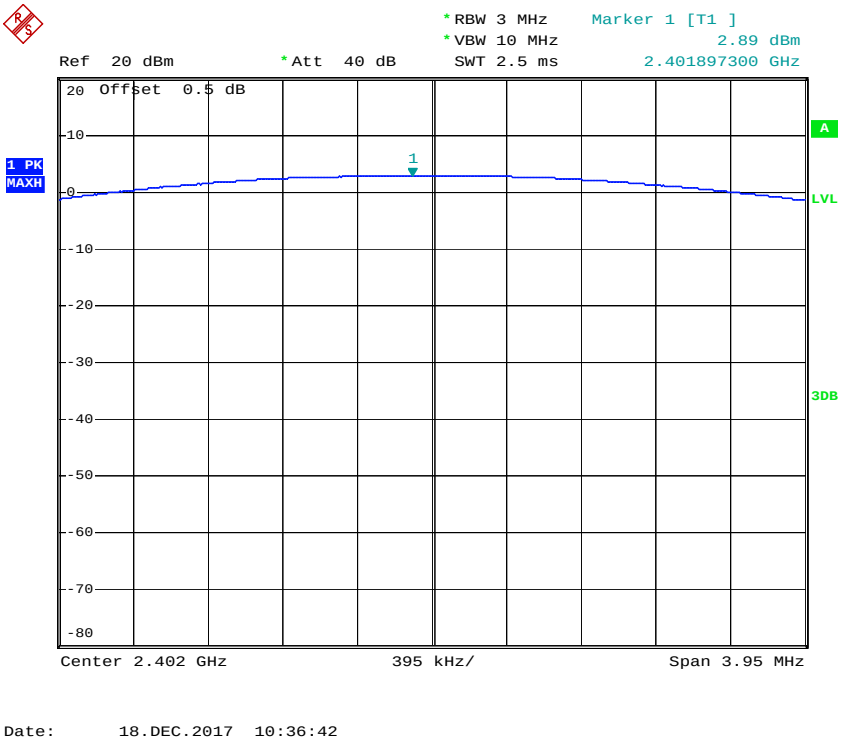
Test Mode: Transmitting

Mode	Frequency (MHz)	Peak Conducted Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	2.89	30
	2441	2.58	30
	2480	2.74	30
EDR Mode (π/4-DQPSK)	2402	1.61	30
	2441	0.81	30
	2480	0.57	30
EDR Mode (8-DPSK)	2402	2.00	30
	2441	1.18	30
	2480	0.97	30

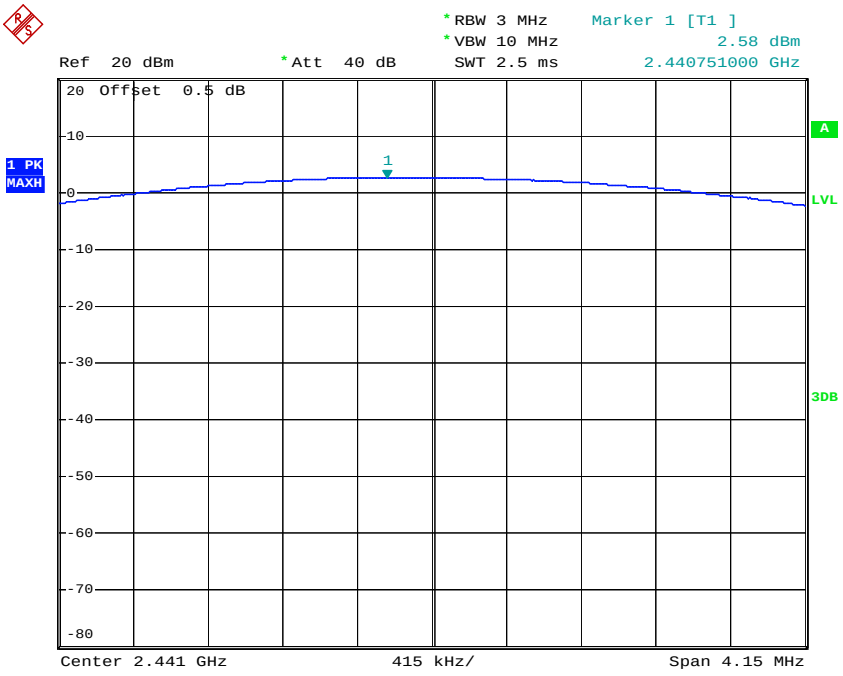
Note: The data above was tested in conducted mode.

BDR Mode (GFSK):

Low Channel

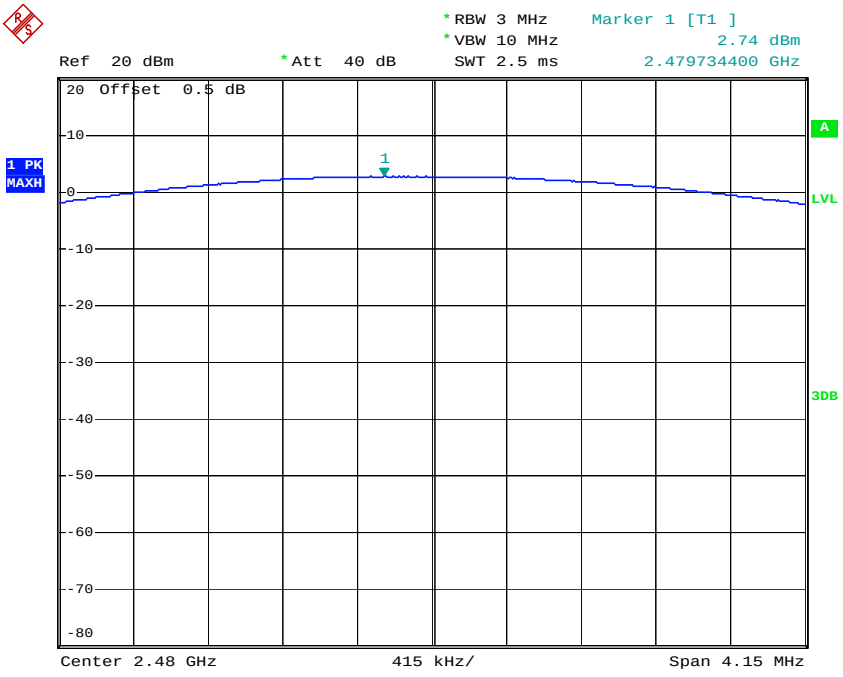


Middle Channel



Date: 18.DEC.2017 10:38:49

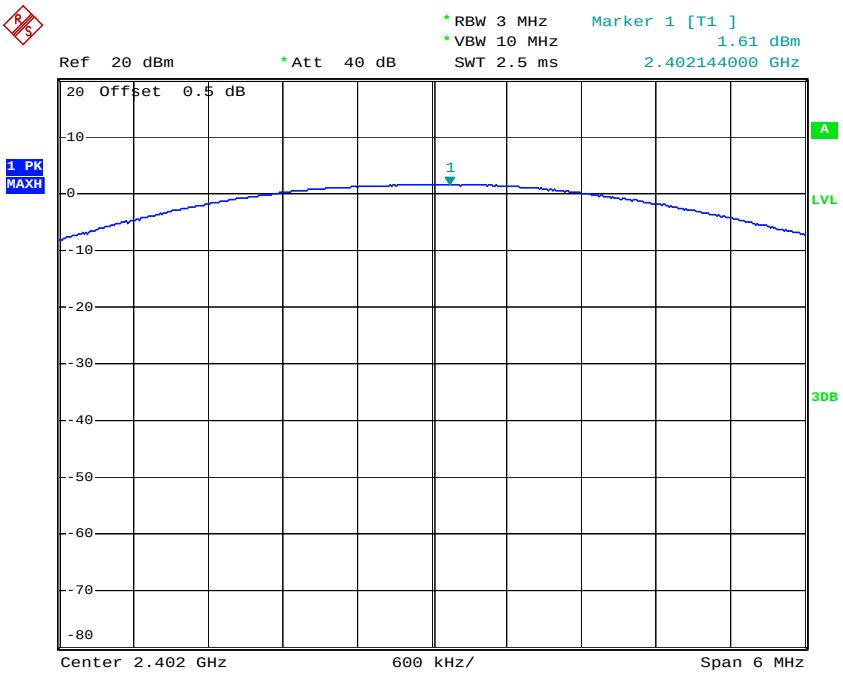
High Channel



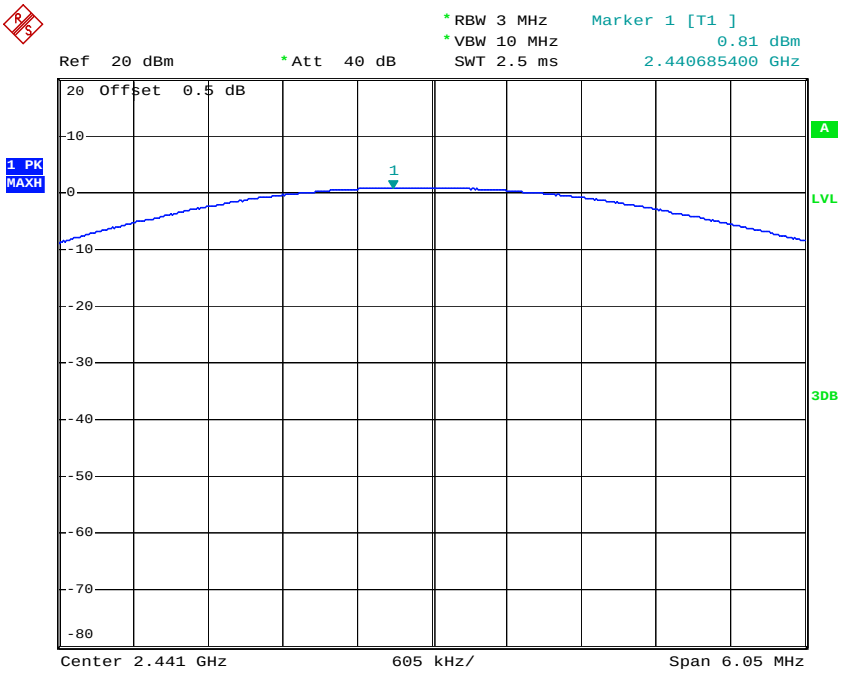
Date: 18.DEC.2017 10:40:07

EDR Mode (π/4-DQPSK):

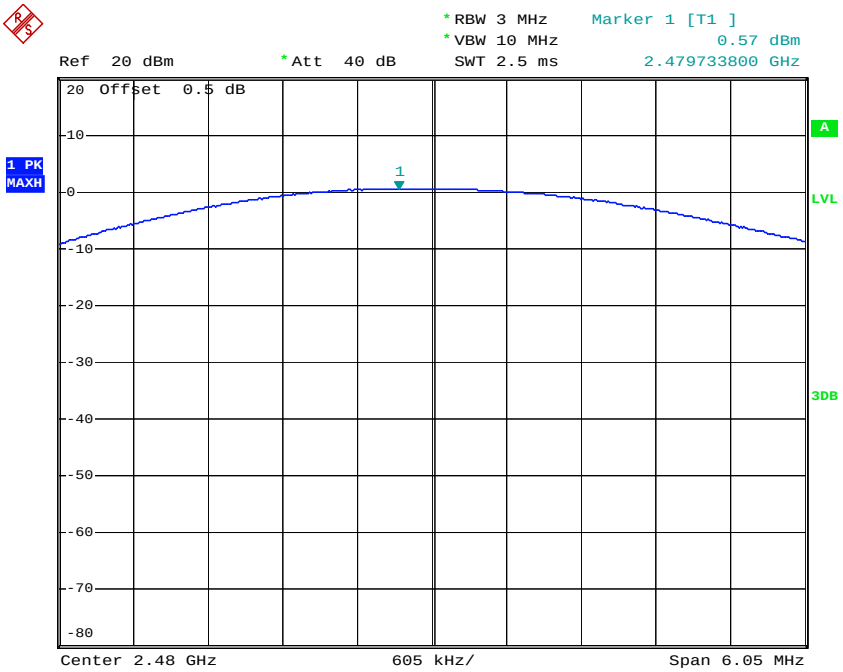
Low Channel



Middle Channel

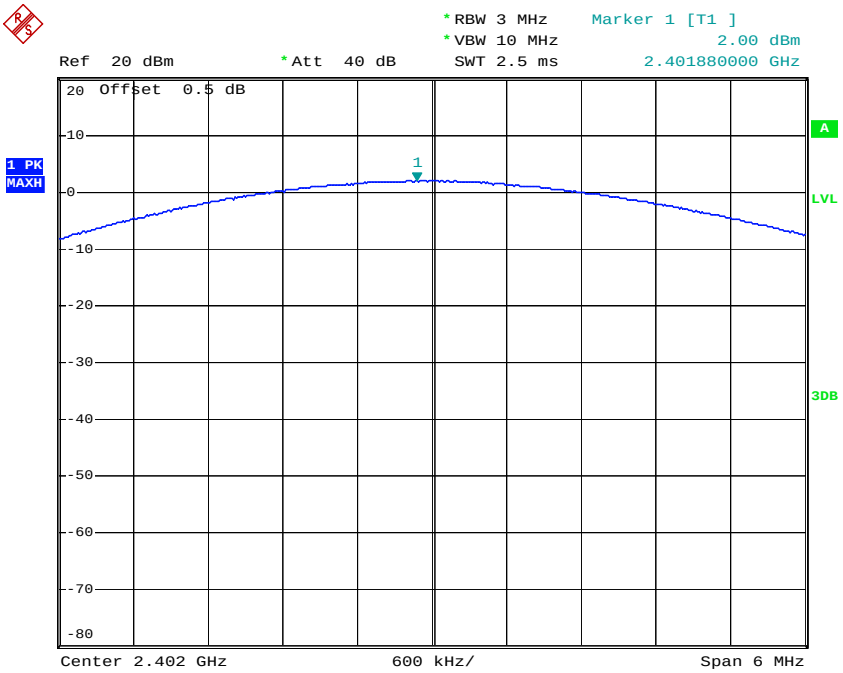


High Channel

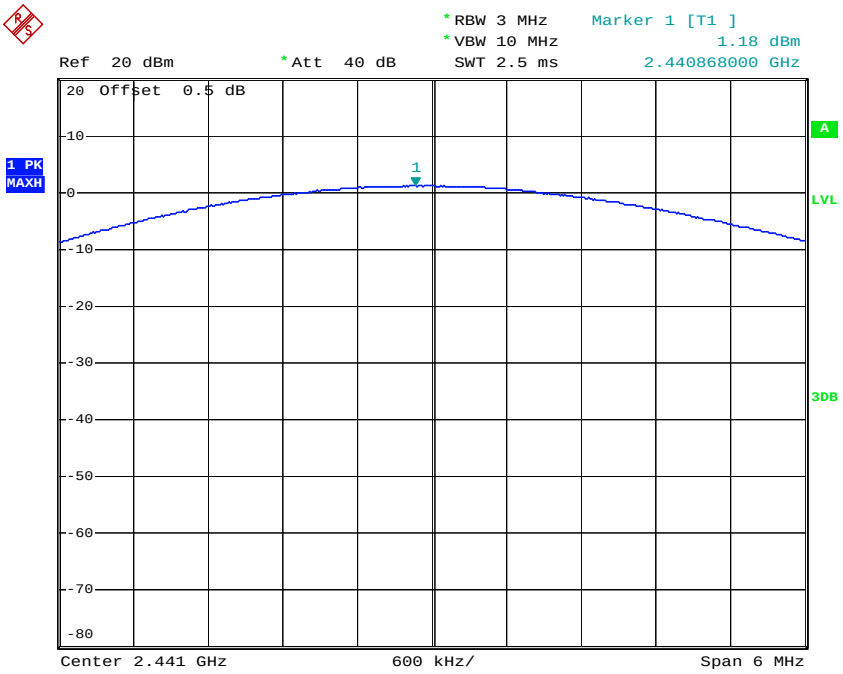


EDR Mode (8-DPSK):

Low Channel

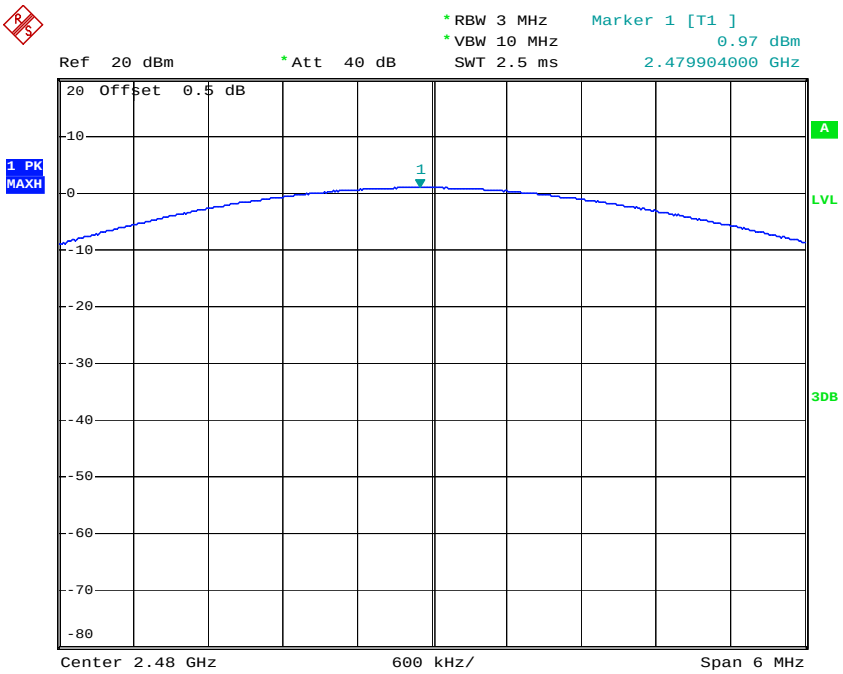


Middle Channel



Date: 18.DEC.2017 11:51:10

High Channel



Date: 18.DEC.2017 11:52:27

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	EMI Test Receiver	ESPI	100120	2017-12-11	2018-12-11
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	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

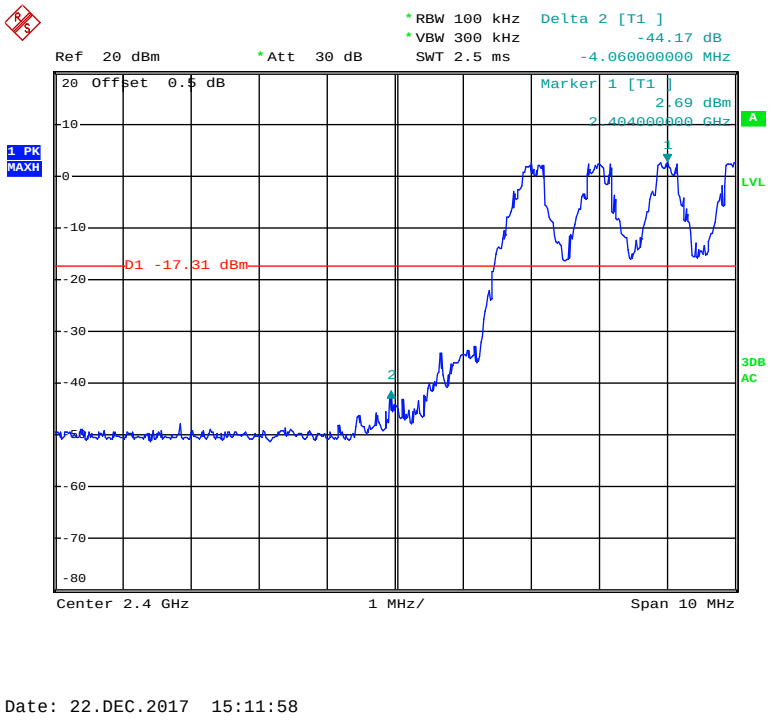
Temperature:	22.3~23.5 °C
Relative Humidity:	35~39 %
ATM Pressure:	102.2~102.3 kPa

** The testing was performed by George Pang on 2017-12-18&2017-12-22.*

Test Result: Compliance

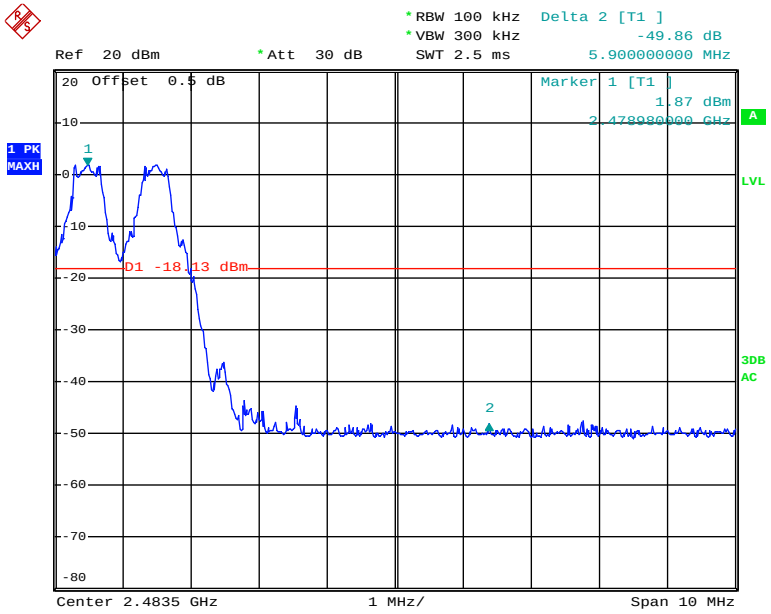
Hopping mode, BDR Mode (GFSK):

Band Edge, Left Side



Date: 22.DEC.2017 15:11:58

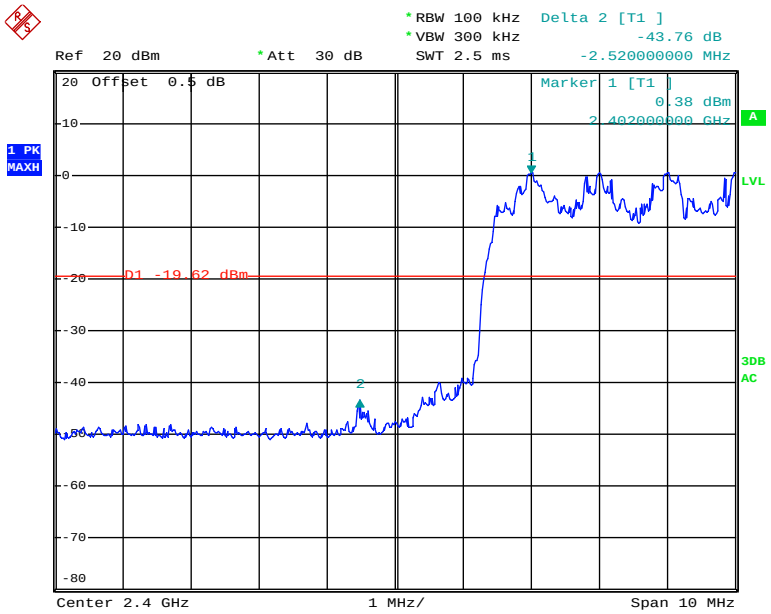
Band Edge, Right Side



Date: 22.DEC.2017 15:13:48

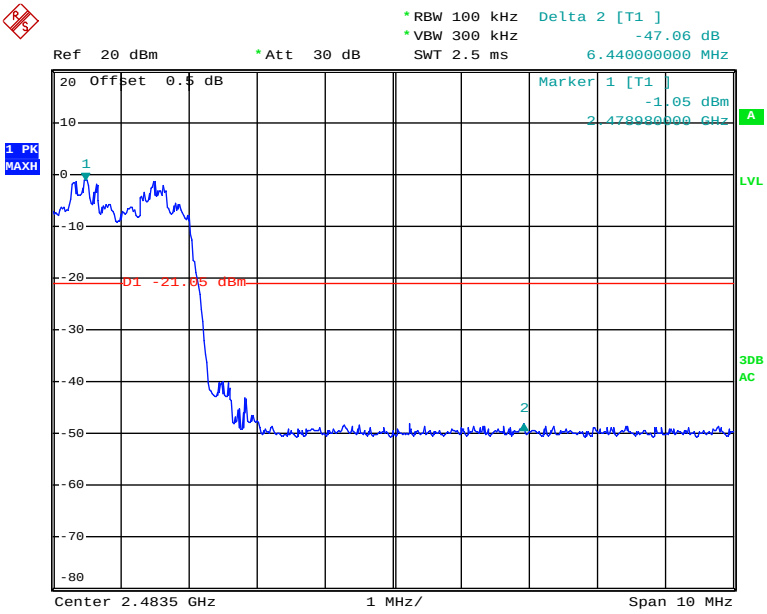
EDR Mode (π/4-DQPSK):

Band Edge, Left Side



Date: 22.DEC.2017 15:23:13

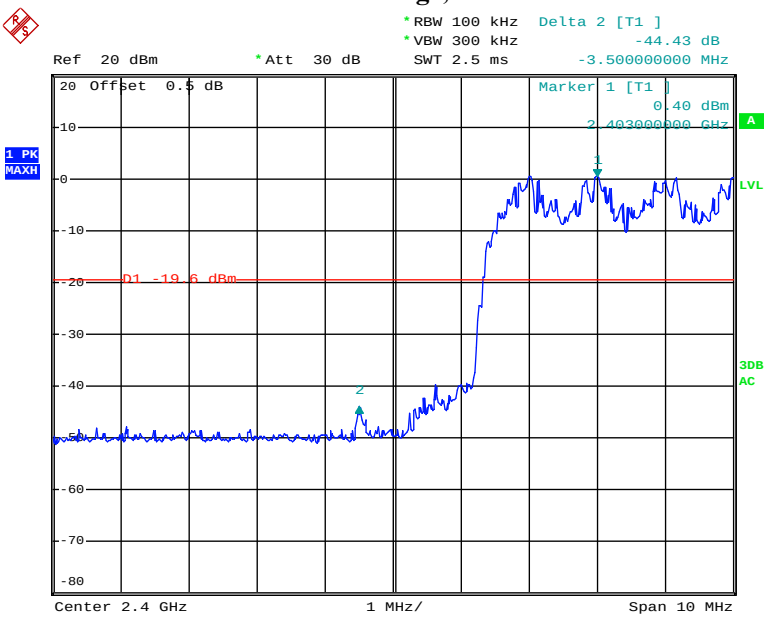
Band Edge, Right Side



Date: 22.DEC.2017 15:17:15

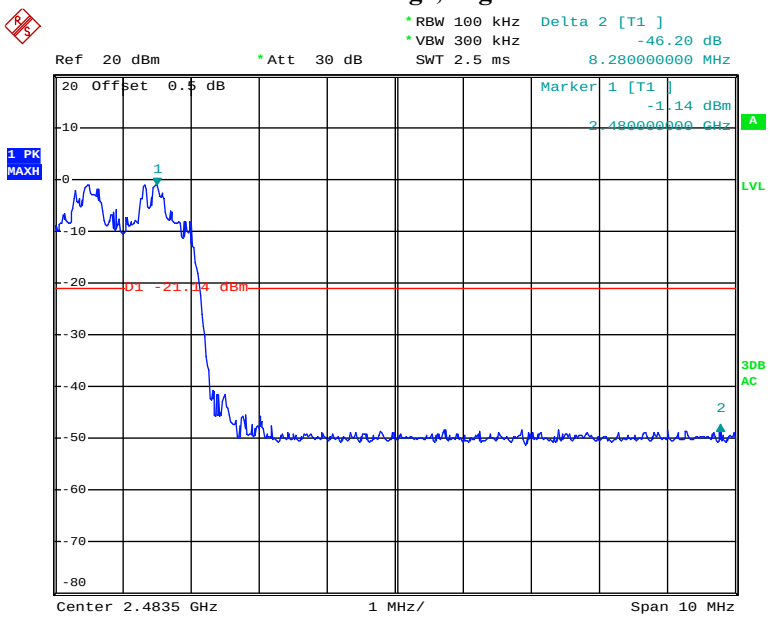
EDR Mode (8-DPSK):

Band Edge, Left Side



Date: 22.DEC.2017 15:28:50

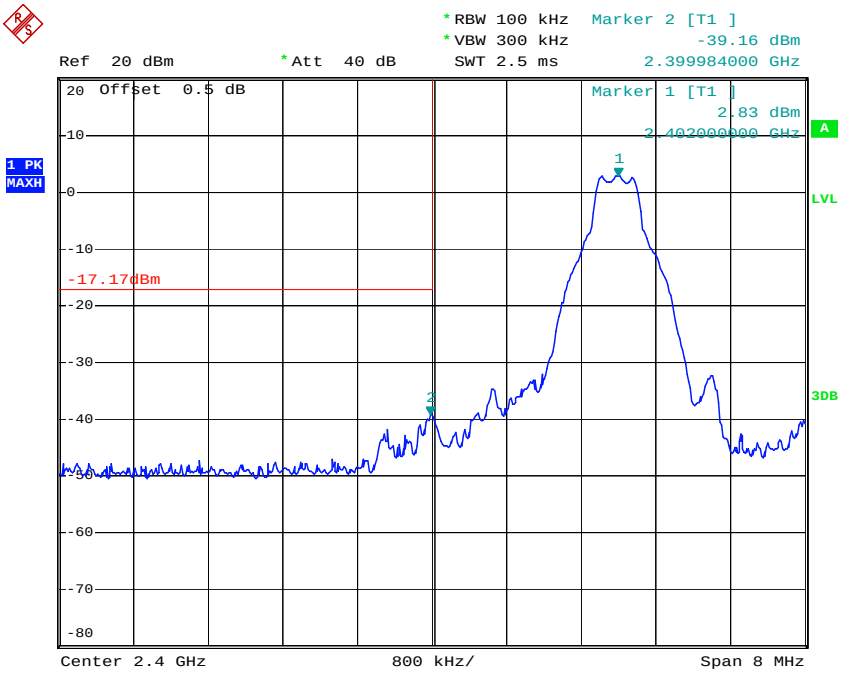
Band Edge, Right Side



Date: 22.DEC.2017 15:31:02

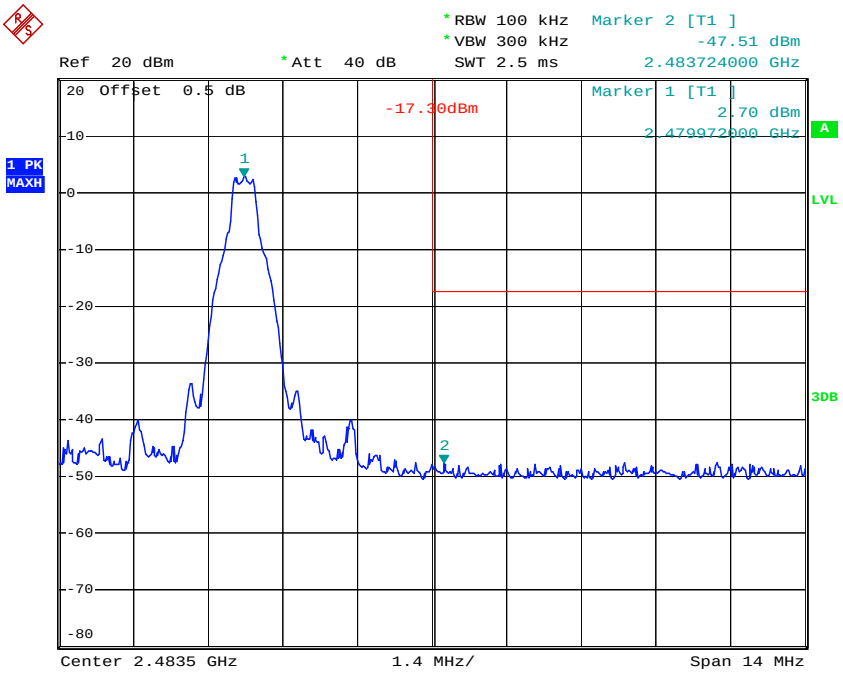
Single channel mode, BDR Mode (GFSK):

Band Edge, Left Side



Date: 18.DEC.2017 10:37:12

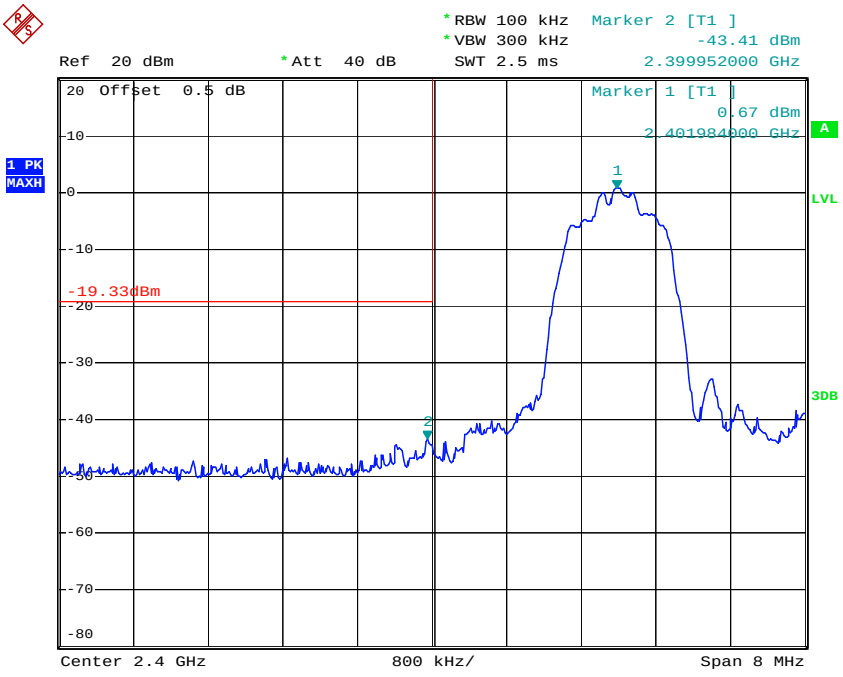
Band Edge, Right Side



Date: 18.DEC.2017 10:40:24

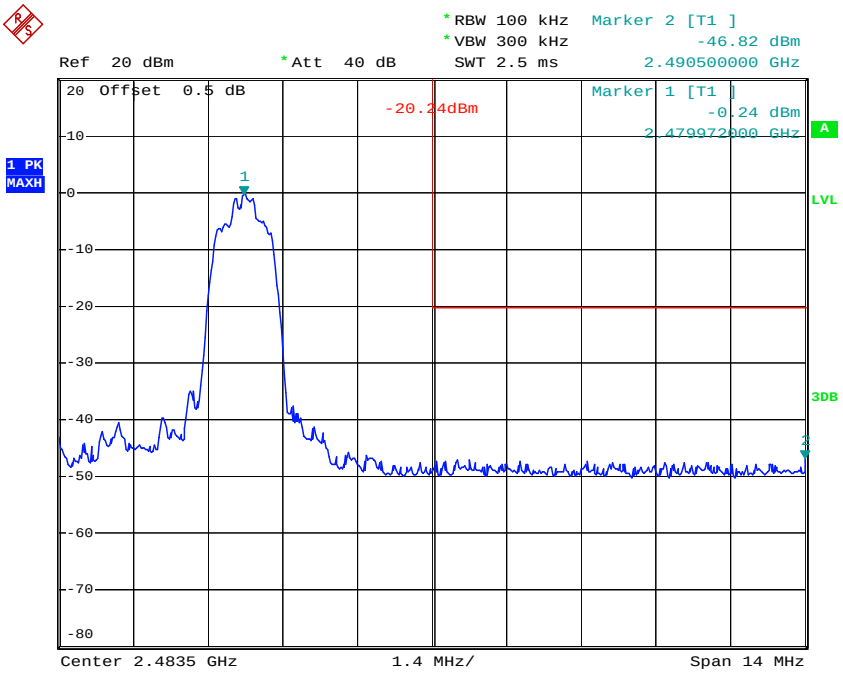
EDR Mode (π/4-DQPSK):

Band Edge, Left Side



Date: 18.DEC.2017 11:38:55

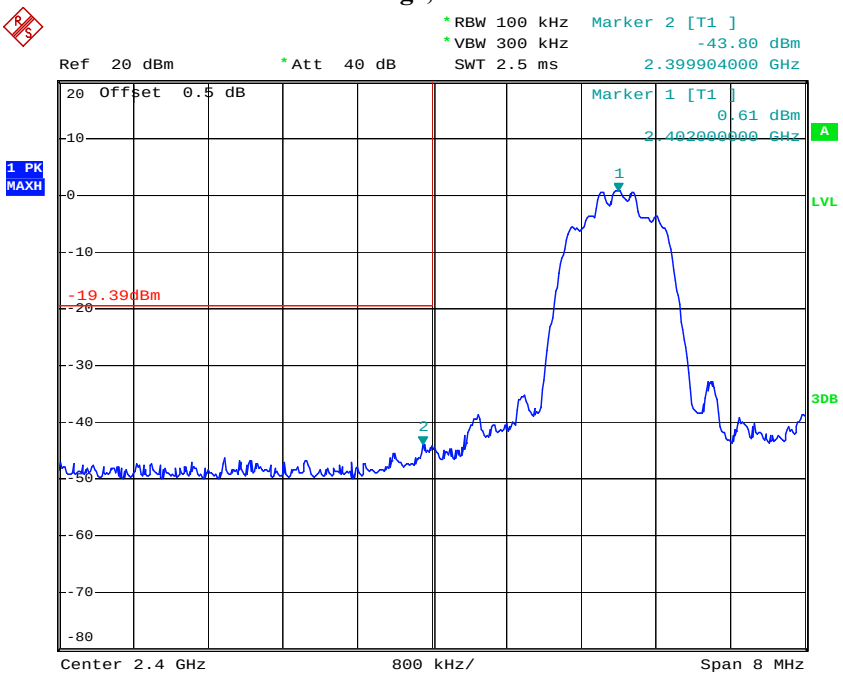
Band Edge, Right Side



Date: 18.DEC.2017 11:42:10

EDR Mode (8-DPSK):

Band Edge, Left Side



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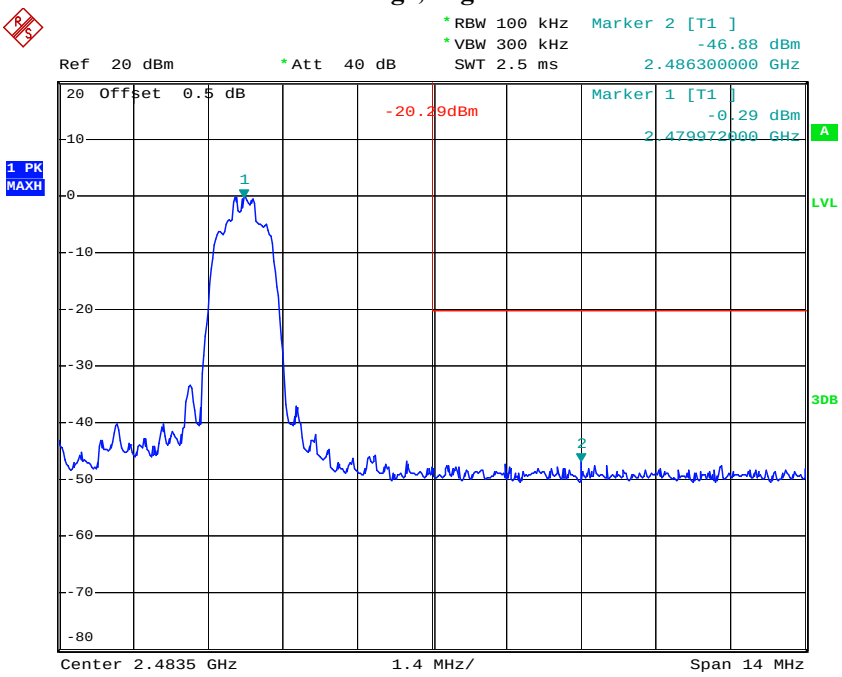
Band Edge, Right Side



Date: 18.DEC.2017 11:52:50

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