



FCC PART 15.247 TEST REPORT

For

Sounding Audio Industrial Ltd.

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

FCC ID: OPDVRCP65

Report Type: Original Report	Product Name: 2DIN Car Audio with CarPlay
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Report Number: <u>RDG170504005</u>	
Report Date: <u>2017-07-05</u>	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Sounding Audio Industrial Ltd.**'s product, model number: **VRCP-65 (FCC ID: OPDVRCP65)** (the "EUT") in this report was a **2DIN Car Audio with CarPlay**, which was measured approximately: 8.5 cm (L) x 18.8 cm (W) x 11.7 cm (H), rated input voltage: DC12V.

Note: The series product, model VRCP-65, PDCP-62 are electrically identical, the differences between them are the model name and brand, we selected VRCP-65 for fully testing, the details was explained in the attached declaration letter.

**All measurement and test data in this report was gathered from final production sample, serial number: 170504005 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-05-04, and EUT conformed to test requirement.*

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 of the measurements detailed in this Test Report were performed by Bay Area Compliance Laboratories Corp. (Chengdu).

The Bay Area Compliance Laboratories Corp. Chengdu's measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

-For all of the AC Line Conducted Emissions Tests reported herein: ± 3.17 dB.

-For of all of the Direct Antenna Conducted Emissions Tests reported herein: ± 0.56 dB.

-For of all of the direct Radiated Emissions Tests reported herein are:

30 MHz to 200 MHz: ± 4.7 dB;

200 MHz to 1 GHz: ± 6.0 dB;

1 GHz to 6 GHz: ± 5.13 dB; and,

6 GHz to 40 GHz: ± 5.47 dB.

And the uncertainty will not be taken into consideration for all test data recorded in the report.

Test Facility

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode.

EUT Exercise Software

Test software: ' HC_Data_Test.exe ' was used in test, the maximum power was configured as below setting:

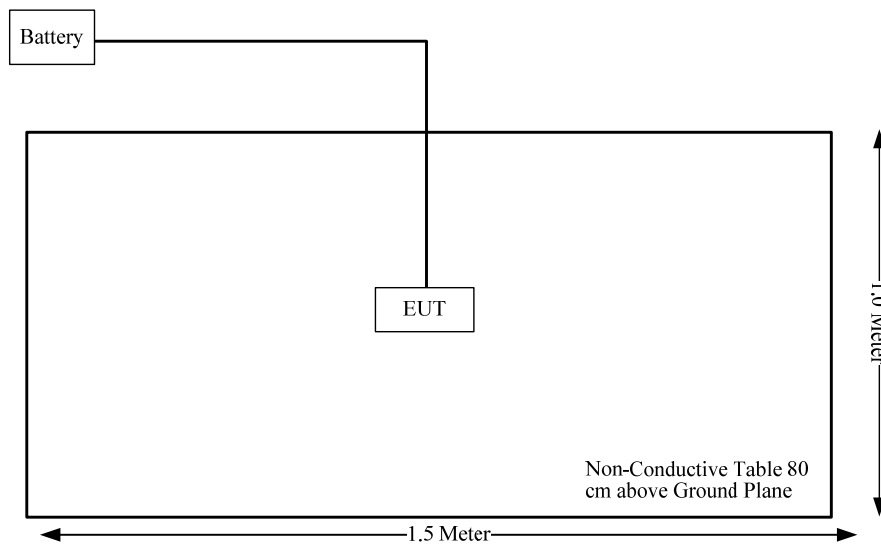
Test Software Version	HC_Data_Test.exe		
Test Frequency	2402MHz	2441MHz	2480MHz
GFSK	14	14	14
π /4-DQPSK	14	14	14
8DPSK	14	14	14

Equipment Modifications

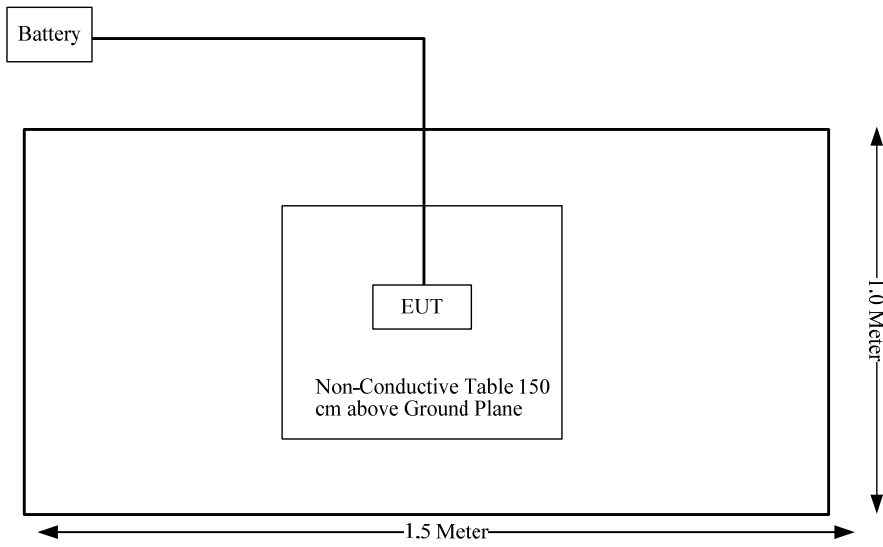
No modification was made to the EUT.

Block Diagram of Test Setup

Radiation below 1GHz



Radiation Above 1GHz



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§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/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	-1.55	0.70	4	2.51	20.00	0.0003	1.0

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

Result: The device meet FCC MPE at 20 cm distance

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, and the antenna gain is -1.55 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

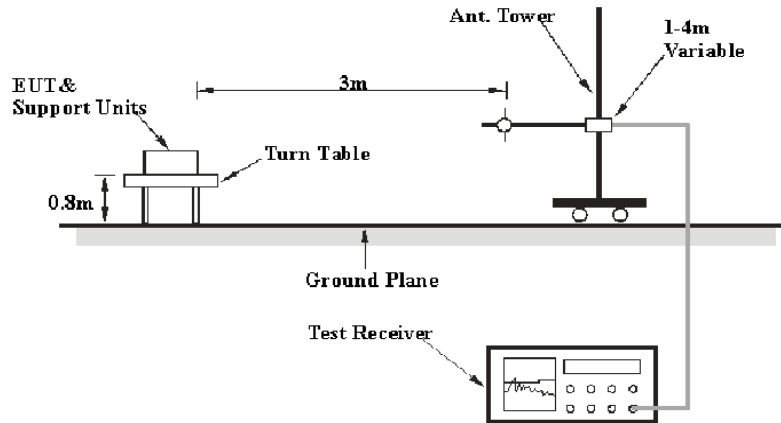
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

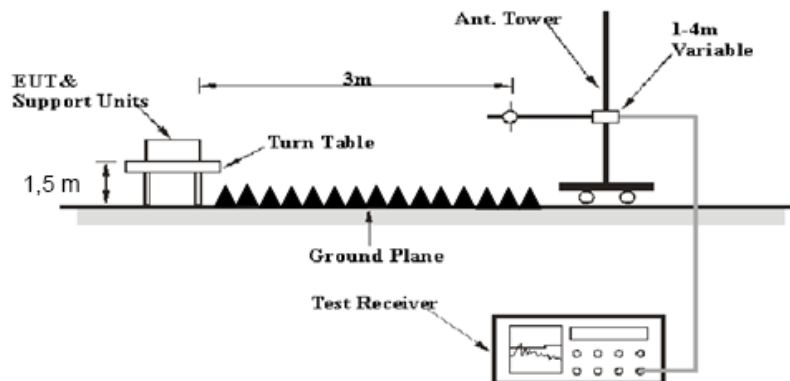
FCC §15.247 (d); §15.209; §15.205;

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	Detector
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
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A121808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2017-06-16	2020-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	966-1	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

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:	26.9 °C
Relative Humidity:	61.8 %
ATM Pressure:	100.1 kPa

* The testing was performed by Kevin Hu on 2017-06-20.

Test Mode: Transmitting

30 MHz-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)					
Low Channel: 2402 MHz									
2402	60.91	PK	H	23.53	3.00	0.00	87.44	N/A	N/A
2402	50.74	AV	H	23.53	3.00	0.00	77.27	N/A	N/A
2402	67.21	PK	V	23.53	3.00	0.00	93.74	N/A	N/A
2402	55.56	AV	V	23.53	3.00	0.00	82.09	N/A	N/A
2390	30.72	PK	V	23.57	3.00	0.00	57.29	74.00	16.71
2390	18.40	AV	V	23.57	3.00	0.00	44.97	54.00	9.03
4804	43.48	PK	V	30.77	5.12	26.87	52.50	74.00	21.50
4804	30.87	AV	V	30.77	5.12	26.87	39.89	54.00	14.11
7206	39.93	PK	V	34.71	6.16	26.35	54.45	74.00	19.55
7206	28.55	AV	V	34.71	6.16	26.35	43.07	54.00	10.93
3988	47.61	PK	V	28.95	4.90	26.55	54.91	74.00	19.09
3988	32.29	AV	V	28.95	4.90	26.55	39.59	54.00	14.41
591.63	43.27	QP	V	19.35	1.83	28.85	35.60	46.00	10.40
53.28	46.06	QP	V	8.06	0.43	28.45	26.10	40.00	13.90
Middle Channel: 2441 MHz									
2441	61.07	PK	H	23.40	3.00	0.00	87.47	N/A	N/A
2441	50.53	AV	H	23.40	3.00	0.00	76.93	N/A	N/A
2441	67.41	PK	V	23.40	3.00	0.00	93.81	N/A	N/A
2441	55.27	AV	V	23.40	3.00	0.00	81.67	N/A	N/A
4882	43.61	PK	V	31.02	5.09	26.87	52.85	74.00	21.15
4882	30.92	AV	V	31.02	5.09	26.87	40.16	54.00	13.84
7323	40.70	PK	V	34.95	6.22	26.40	55.47	74.00	18.53
7323	28.49	AV	V	34.95	6.22	26.40	43.26	54.00	10.74
5450	40.38	PK	V	32.21	5.47	26.64	51.42	74.00	22.58
5450	25.15	AV	V	32.21	5.47	26.64	36.19	54.00	17.81
3988	46.48	PK	V	28.95	4.90	26.55	53.78	74.00	20.22
3988	31.30	AV	V	28.95	4.90	26.55	38.60	54.00	15.40
591.63	42.97	QP	V	19.35	1.83	28.85	35.30	46.00	10.70
53.28	46.16	QP	V	8.06	0.43	28.45	26.20	40.00	13.80
High Channel: 2480 MHz									
2480	61.16	PK	H	23.27	2.99	0.00	87.42	N/A	N/A
2480	51.23	AV	H	23.27	2.99	0.00	77.49	N/A	N/A
2480	66.99	PK	V	23.27	2.99	0.00	93.25	N/A	N/A
2480	55.27	AV	V	23.27	2.99	0.00	81.53	N/A	N/A
2483.5	31.49	PK	V	23.26	2.99	0.00	57.74	74.00	16.26
2483.5	18.98	AV	V	23.26	2.99	0.00	45.23	54.00	8.77
4960	43.38	PK	V	31.27	5.05	26.88	52.82	74.00	21.18
4960	30.14	AV	V	31.27	5.05	26.88	39.58	54.00	14.42
7440	39.44	PK	V	35.18	6.27	26.45	54.44	74.00	19.56
7440	24.10	AV	V	35.18	6.27	26.45	39.10	54.00	14.90
3988	46.33	PK	V	28.95	4.90	26.55	53.63	74.00	20.37
3988	31.50	AV	V	28.95	4.90	26.55	38.80	54.00	15.20
591.63	42.97	QP	V	19.35	1.83	28.85	35.30	46.00	10.70
53.28	46.06	QP	V	8.06	0.43	28.45	26.10	40.00	13.90

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

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector	Polar (H/V)	Factor (dB)					
Low Channel: 2402 MHz									
2402	60.86	PK	H	23.53	3.00	0.00	87.39	N/A	N/A
2402	49.36	AV	H	23.53	3.00	0.00	75.89	N/A	N/A
2402	67.69	PK	V	23.53	3.00	0.00	94.22	N/A	N/A
2402	56.00	AV	V	23.53	3.00	0.00	82.53	N/A	N/A
2390	30.74	PK	V	23.57	3.00	0.00	57.31	74.00	16.69
2390	17.93	AV	V	23.57	3.00	0.00	44.50	54.00	9.50
4804	43.32	PK	V	30.77	5.12	26.87	52.34	74.00	21.66
4804	29.83	AV	V	30.77	5.12	26.87	38.85	54.00	15.15
7206	39.37	PK	V	34.71	6.16	26.35	53.89	74.00	20.11
7206	24.18	AV	V	34.71	6.16	26.35	38.70	54.00	15.30
3987	45.97	PK	V	28.95	4.90	26.55	53.27	74.00	20.73
3987	30.88	AV	V	28.95	4.90	26.55	38.18	54.00	15.82
591.63	42.97	QP	V	19.35	1.83	28.85	35.30	46.00	10.70
53.28	45.86	QP	V	8.06	0.43	28.45	25.90	40.00	14.10
Middle Channel: 2441 MHz									
2441	61.11	PK	H	23.40	3.00	0.00	87.51	N/A	N/A
2441	49.54	AV	H	23.40	3.00	0.00	75.94	N/A	N/A
2441	67.73	PK	V	23.40	3.00	0.00	94.13	N/A	N/A
2441	56.04	AV	V	23.40	3.00	0.00	82.44	N/A	N/A
4882	43.41	PK	V	31.02	5.09	26.87	52.65	74.00	21.35
4882	30.10	AV	V	31.02	5.09	26.87	39.34	54.00	14.66
7323	40.00	PK	V	34.95	6.22	26.40	54.77	74.00	19.23
7323	24.28	AV	V	34.95	6.22	26.40	39.05	54.00	14.95
5518	41.03	PK	V	32.32	5.54	26.61	52.28	74.00	21.72
5518	25.34	AV	V	32.32	5.54	26.61	36.59	54.00	17.41
3988	45.49	PK	V	28.95	4.90	26.55	52.79	74.00	21.21
3988	30.90	AV	V	28.95	4.90	26.55	38.20	54.00	15.80
591.63	43.07	QP	V	19.35	1.83	28.85	35.40	46.00	10.60
53.28	46.26	QP	V	8.06	0.43	28.45	26.30	40.00	13.70
High Channel: 2480 MHz									
2480	61.08	PK	H	23.27	2.99	0.00	87.34	N/A	N/A
2480	51.53	AV	H	23.27	2.99	0.00	77.79	N/A	N/A
2480	66.93	PK	V	23.27	2.99	0.00	93.19	N/A	N/A
2480	55.21	AV	V	23.27	2.99	0.00	81.47	N/A	N/A
2483.5	31.53	PK	V	23.26	2.99	0.00	57.78	74.00	16.22
2483.5	18.95	AV	V	23.26	2.99	0.00	45.20	54.00	8.80
4960	42.35	PK	V	31.27	5.05	26.88	51.79	74.00	22.21
4960	26.27	AV	V	31.27	5.05	26.88	35.71	54.00	18.29
7440	39.49	PK	V	35.18	6.27	26.45	54.49	74.00	19.51
7440	24.41	AV	V	35.18	6.27	26.45	39.41	54.00	14.59
3988	45.50	PK	V	28.95	4.90	26.55	52.80	74.00	21.20
3988	30.83	AV	V	28.95	4.90	26.55	38.13	54.00	15.87
591.63	42.97	QP	V	19.35	1.83	28.85	35.30	46.00	10.70
53.28	45.86	QP	V	8.06	0.43	28.45	25.90	40.00	14.10

EDR Mode (8DPSK):

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)					
Low Channel: 2402 MHz									
2402	61.06	PK	H	23.53	3.00	0.00	87.59	N/A	N/A
2402	48.35	AV	H	23.53	3.00	0.00	74.88	N/A	N/A
2402	67.91	PK	V	23.53	3.00	0.00	94.44	N/A	N/A
2402	56.56	AV	V	23.53	3.00	0.00	83.09	N/A	N/A
2390	30.50	PK	V	23.57	3.00	0.00	57.07	74.00	16.93
2390	17.88	AV	V	23.57	3.00	0.00	44.45	54.00	9.55
4804	43.87	PK	V	30.77	5.12	26.87	52.89	74.00	21.11
4804	31.25	AV	V	30.77	5.12	26.87	40.27	54.00	13.73
7206	37.52	PK	V	34.71	6.16	26.35	52.04	74.00	21.96
7206	23.46	AV	V	34.71	6.16	26.35	37.98	54.00	16.02
3988	46.56	PK	V	28.95	4.90	26.55	53.86	74.00	20.14
3988	31.19	AV	V	28.95	4.90	26.55	38.49	54.00	15.51
591.63	43.47	QP	V	19.35	1.83	28.85	35.80	46.00	10.20
53.28	45.86	QP	V	8.06	0.43	28.45	25.90	40.00	14.10
Middle Channel: 2441 MHz									
2441	61.03	PK	H	23.40	3.00	0.00	87.43	N/A	N/A
2441	48.80	AV	H	23.40	3.00	0.00	75.20	N/A	N/A
2441	68.03	PK	V	23.40	3.00	0.00	94.43	N/A	N/A
2441	56.64	AV	V	23.40	3.00	0.00	83.04	N/A	N/A
4882	43.92	PK	V	31.02	5.09	26.87	53.16	74.00	20.84
4882	31.05	AV	V	31.02	5.09	26.87	40.29	54.00	13.71
7323	37.60	PK	V	34.95	6.22	26.40	52.37	74.00	21.63
7323	23.41	AV	V	34.95	6.22	26.40	38.18	54.00	15.82
4550	41.71	PK	V	29.96	5.25	26.85	50.07	74.00	23.93
4550	26.60	AV	V	29.96	5.25	26.85	34.96	54.00	19.04
3987	44.11	PK	V	28.95	4.90	26.55	51.41	74.00	22.59
3987	29.90	AV	V	28.95	4.90	26.55	37.20	54.00	16.80
591.63	43.47	QP	V	19.35	1.83	28.85	35.80	46.00	10.20
53.28	46.16	QP	V	8.06	0.43	28.45	26.20	40.00	13.80
High Channel: 2480 MHz									
2480	61.15	PK	H	23.27	2.99	0.00	87.41	N/A	N/A
2480	48.89	AV	H	23.27	2.99	0.00	75.15	N/A	N/A
2480	67.77	PK	V	23.27	2.99	0.00	94.03	N/A	N/A
2480	55.22	AV	V	23.27	2.99	0.00	81.48	N/A	N/A
2483.5	31.15	PK	V	23.26	2.99	0.00	57.40	74.00	16.60
2483.5	18.95	AV	V	23.26	2.99	0.00	45.20	54.00	8.80
4960	44.09	PK	V	31.27	5.05	26.88	53.53	74.00	20.47
4960	31.35	AV	V	31.27	5.05	26.88	40.79	54.00	13.21
7440	37.82	PK	V	35.18	6.27	26.45	52.82	74.00	21.18
7440	24.33	AV	V	35.18	6.27	26.45	39.33	54.00	14.67
3989	45.10	PK	V	28.96	4.90	26.55	52.41	74.00	21.59
3989	30.46	AV	V	28.96	4.90	26.55	37.77	54.00	16.23
591.63	43.37	QP	V	19.35	1.83	28.85	35.70	46.00	10.30
53.28	45.86	QP	V	8.06	0.43	28.45	25.90	40.00	14.10

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

Applicable Standard

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-5	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

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:	28.6°C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

* The testing was performed by Kevin Hu on 2017-06-19.

Test Result: Compliance.

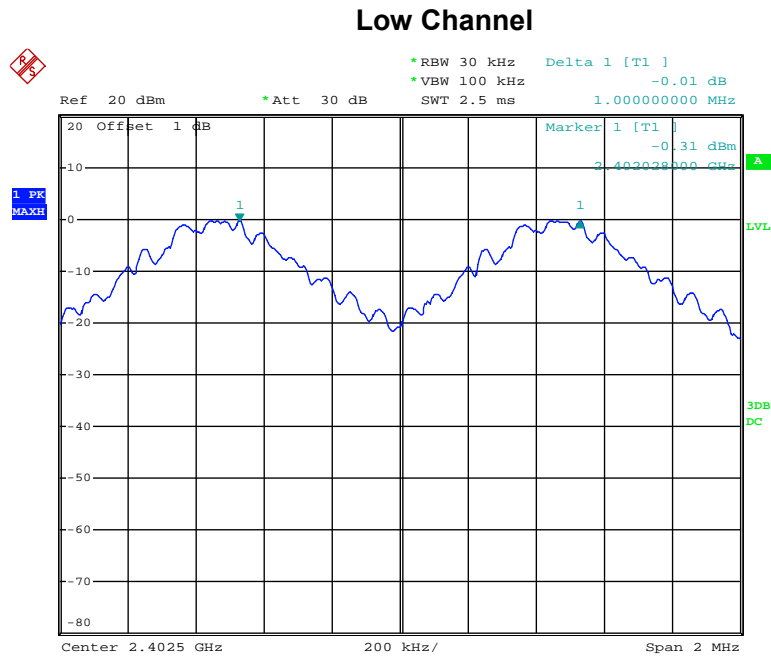
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
BDR (GFSK)	Low	2402	1.000	0.68
	Middle	2441	1.000	0.65
	High	2480	1.004	0.69
EDR (π/4-DQPSK)	Low	2402	1.000	0.91
	Middle	2441	1.000	0.92
	High	2480	1.004	0.91
EDR (8DPSK)	Low	2402	1.000	0.90
	Middle	2441	1.000	0.90
	High	2480	1.004	0.91

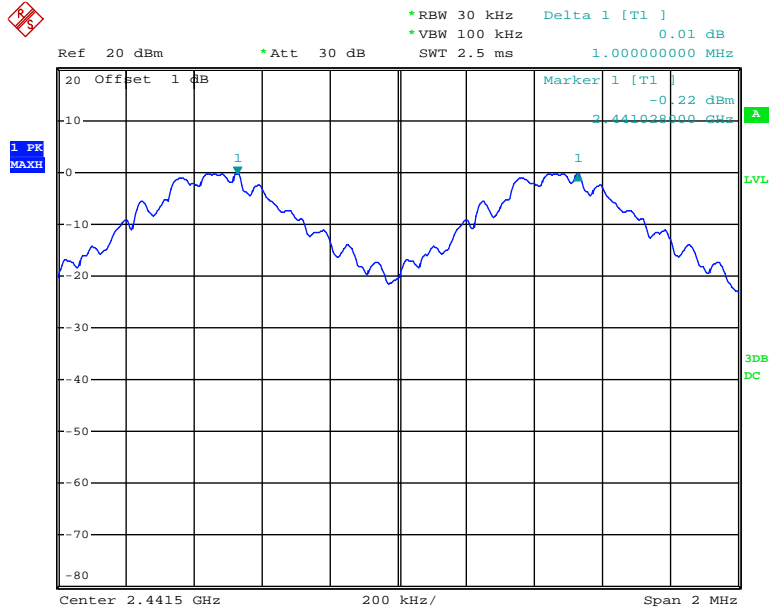
Note: Limit= (2/3) × 20dB bandwidth

BDR Mode (GFSK):



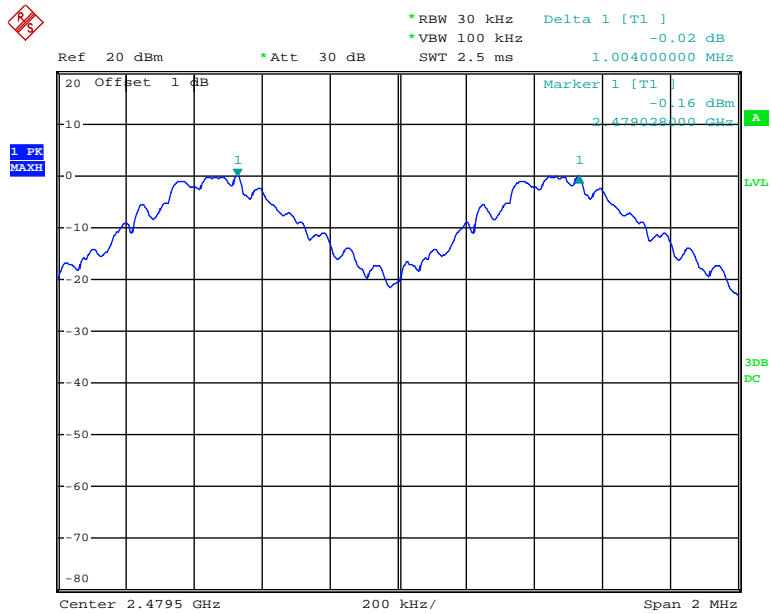
Date: 19.JUN.2017 12:13:54

Middle Channel



Date: 19.JUN.2017 12:12:20

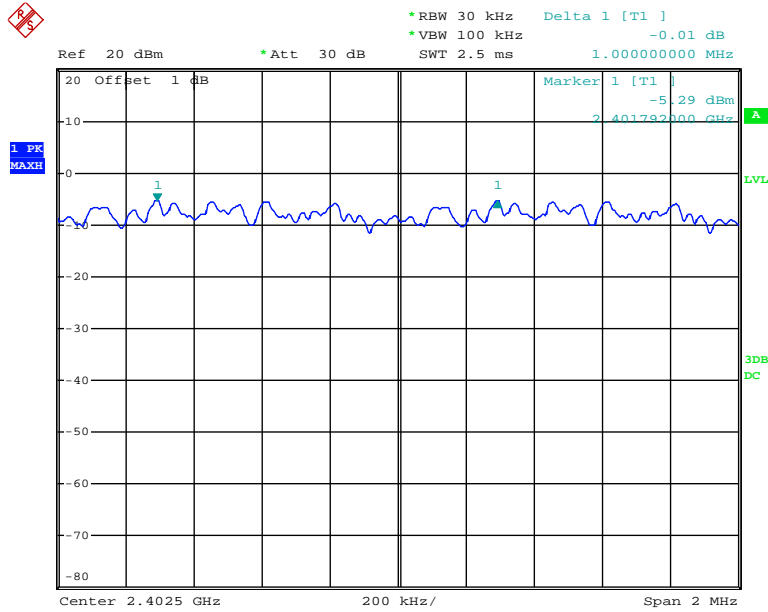
High Channel



Date: 19.JUN.2017 12:11:04

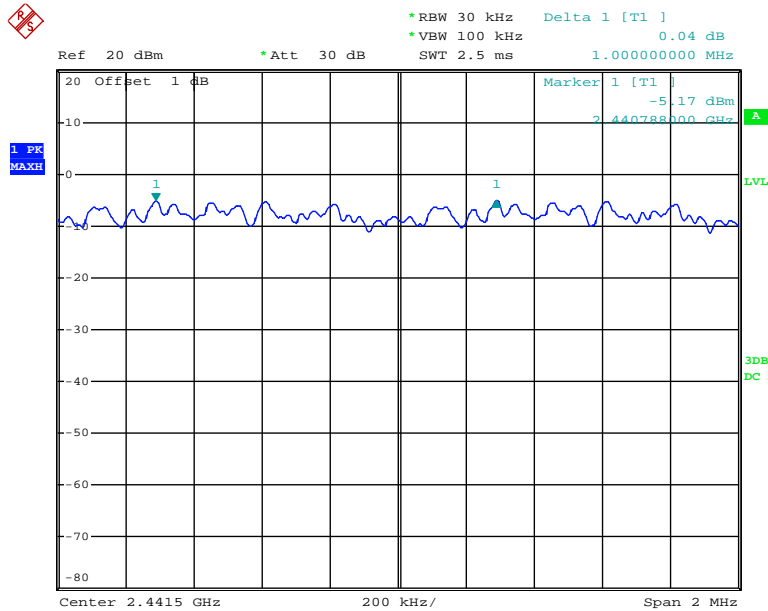
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



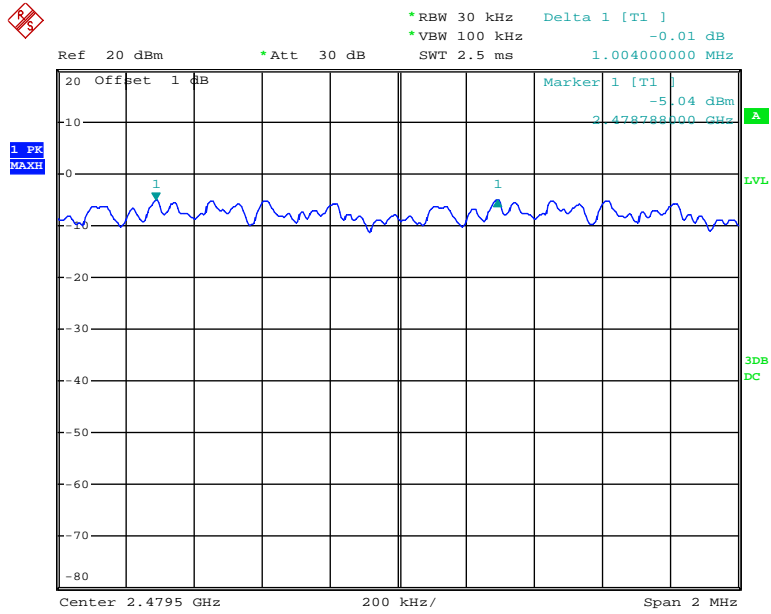
Date: 19.JUN.2017 12:07:43

Middle Channel



Date: 19.JUN.2017 12:08:39

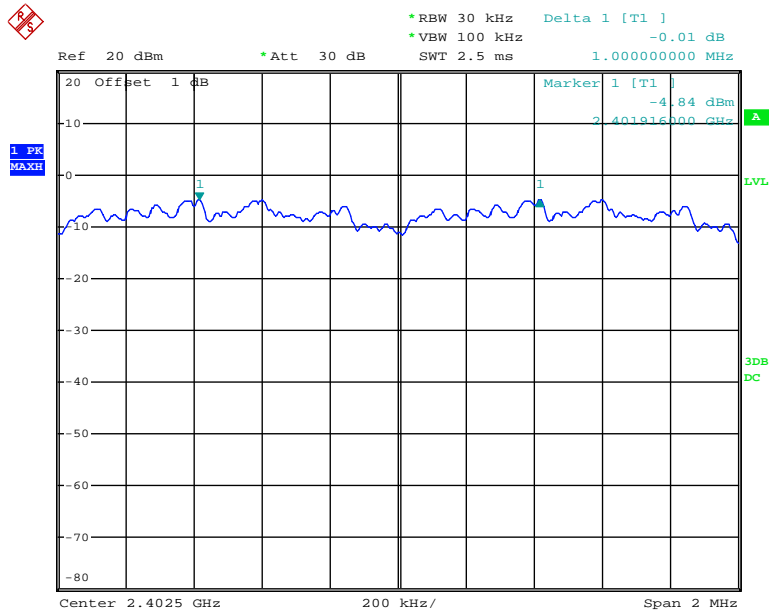
High Channel



Date: 19.JUN.2017 12:09:35

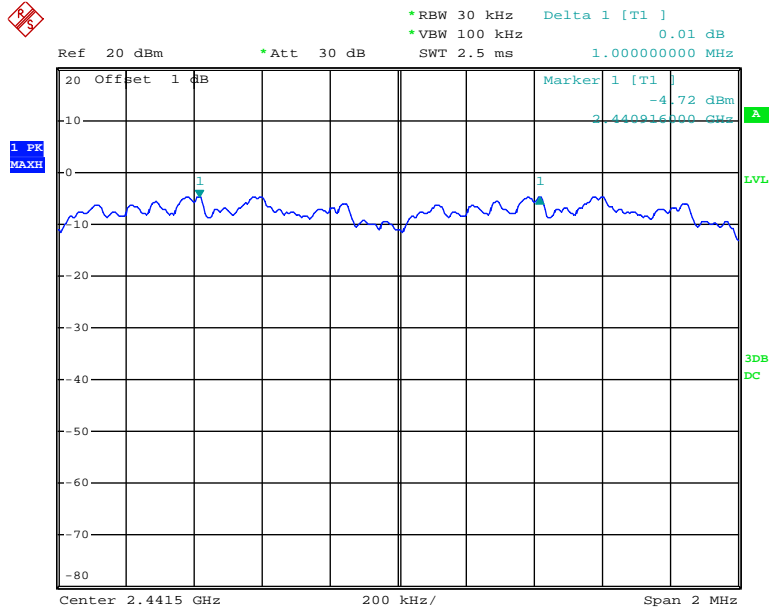
EDR Mode (8DPSK):

Low Channel



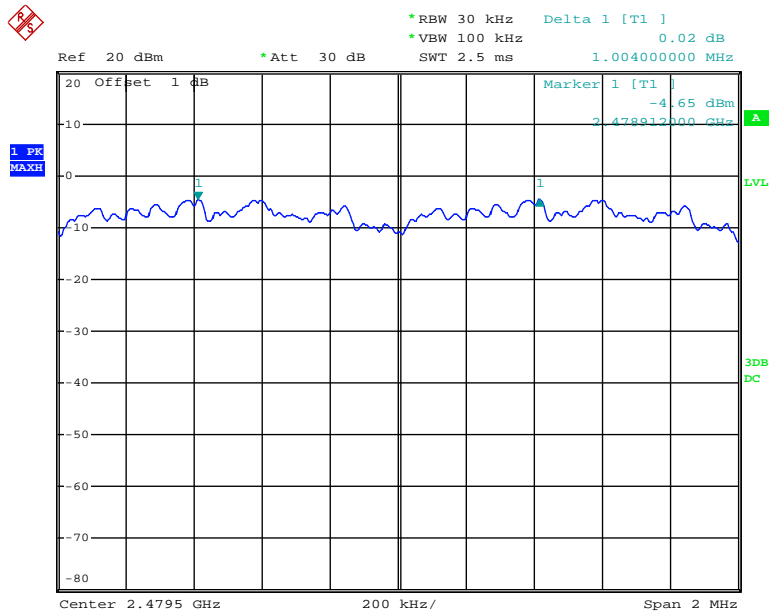
Date: 19.JUN.2017 12:05:42

Middle Channel



Date: 19.JUN.2017 12:04:20

High Channel



Date: 19.JUN.2017 12:03:03

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

Applicable Standard

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

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-5	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	28.6°C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

* *The testing was performed by Kevin Hu on 2017-06-19.*

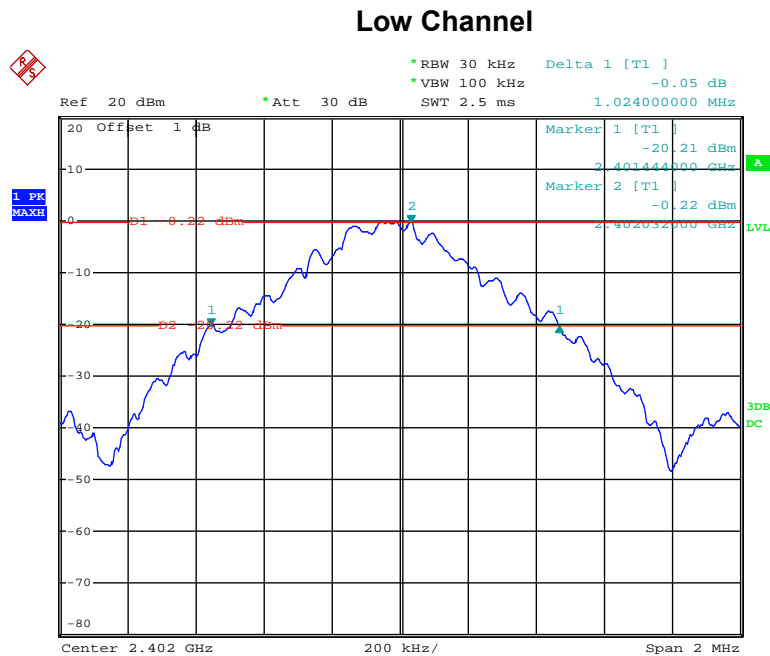
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

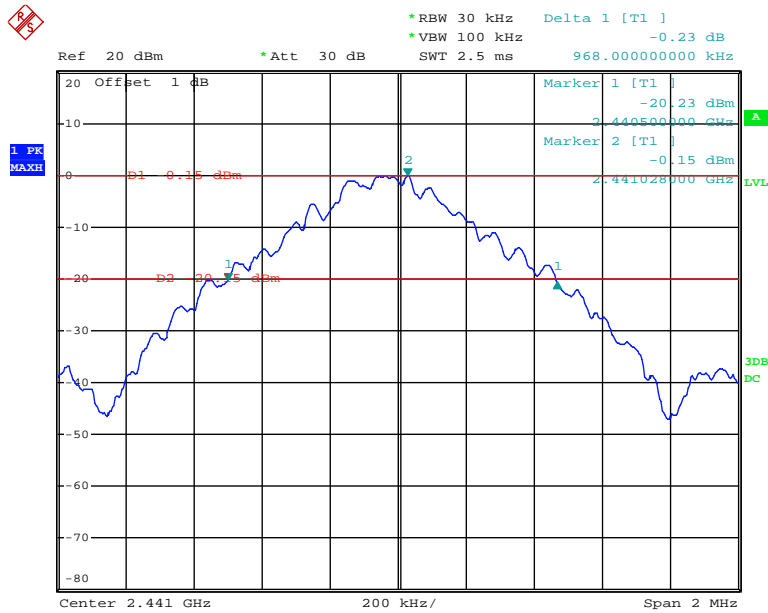
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	1.02
	Middle	2441	0.97
	High	2480	1.03
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.37
	Middle	2441	1.38
	High	2480	1.37
EDR Mode (8DPSK)	Low	2402	1.35
	Middle	2441	1.35
	High	2480	1.36

BDR Mode (GFSK):



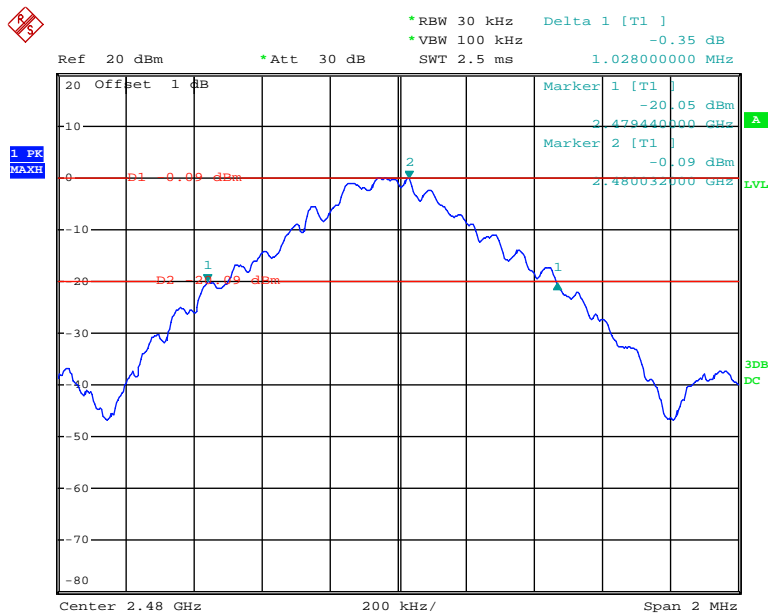
Date: 19.JUN.2017 11:48:23

Middle Channel



Date: 19.JUN.2017 11:50:36

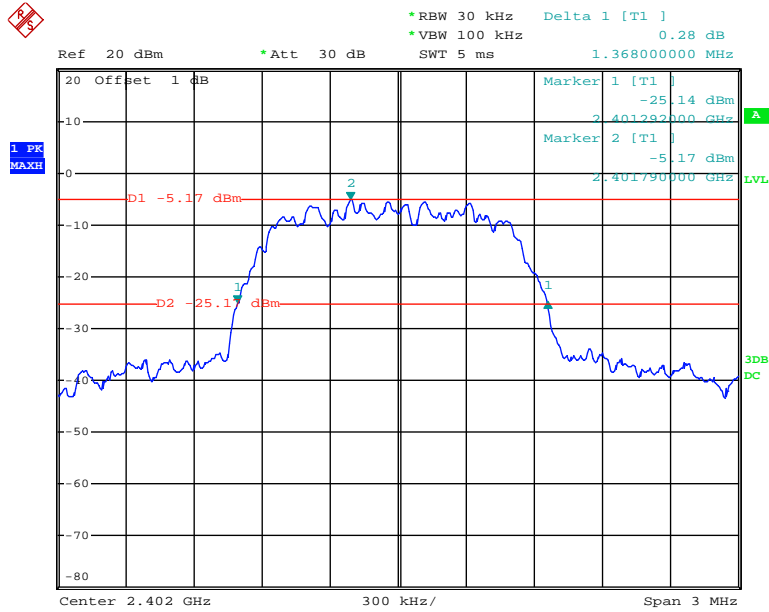
High Channel



Date: 19.JUN.2017 11:51:47

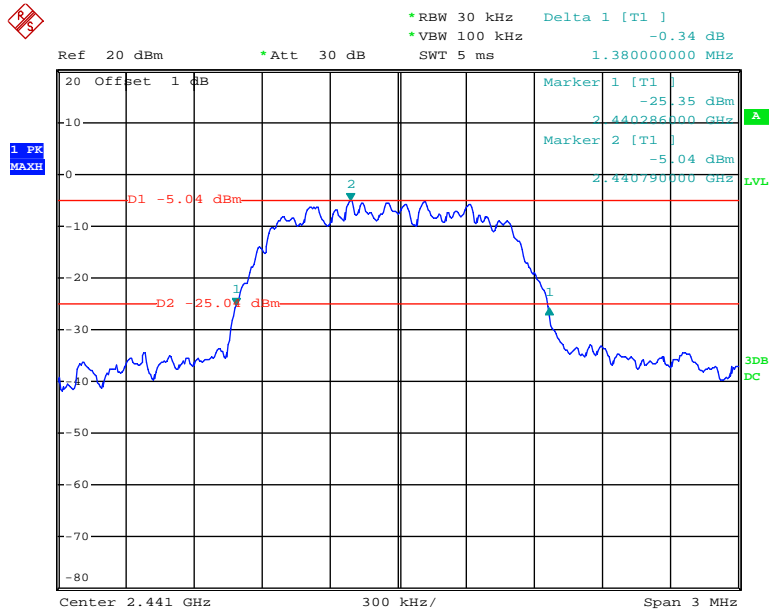
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



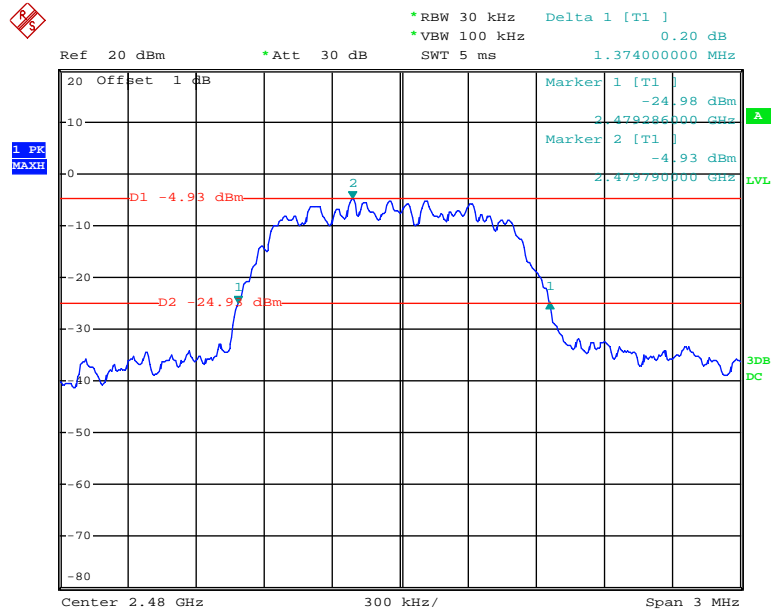
Date: 19.JUN.2017 11:56:34

Middle Channel



Date: 19.JUN.2017 11:55:29

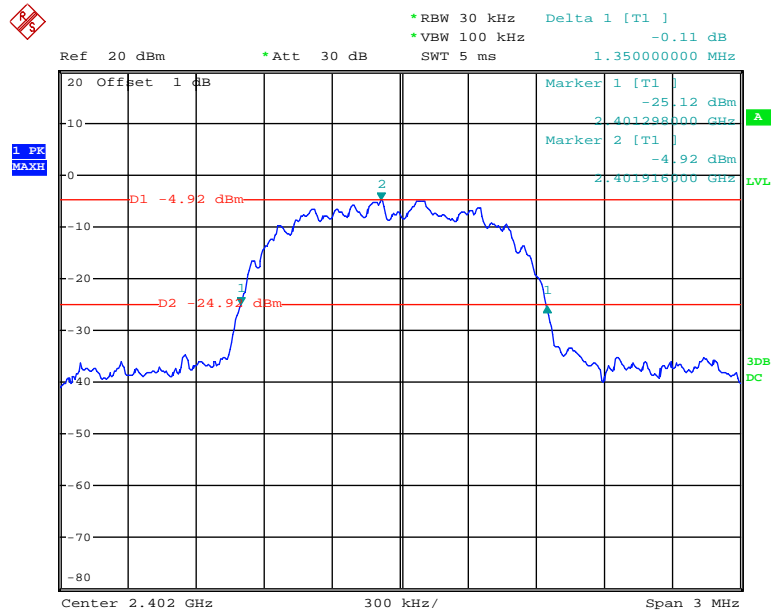
High Channel



Date: 19.JUN.2017 11:54:09

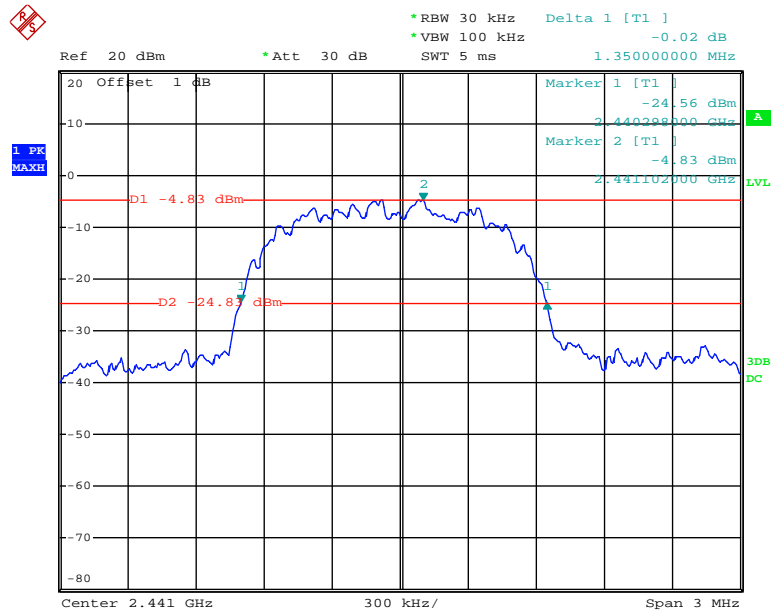
EDR Mode (8DPSK):

Low Channel



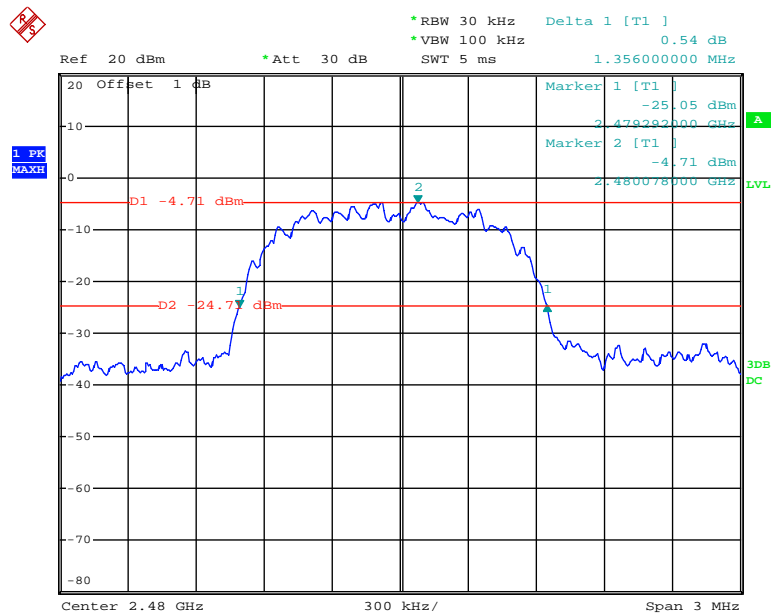
Date: 19.JUN.2017 11:58:12

Middle Channel



Date: 19.JUN.2017 11:59:46

High Channel



Date: 19.JUN.2017 12:00:51

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

Applicable Standard

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

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-5	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	28.6°C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

* *The testing was performed by Kevin Hu on 2017-06-19.*

Test Result: Compliance.

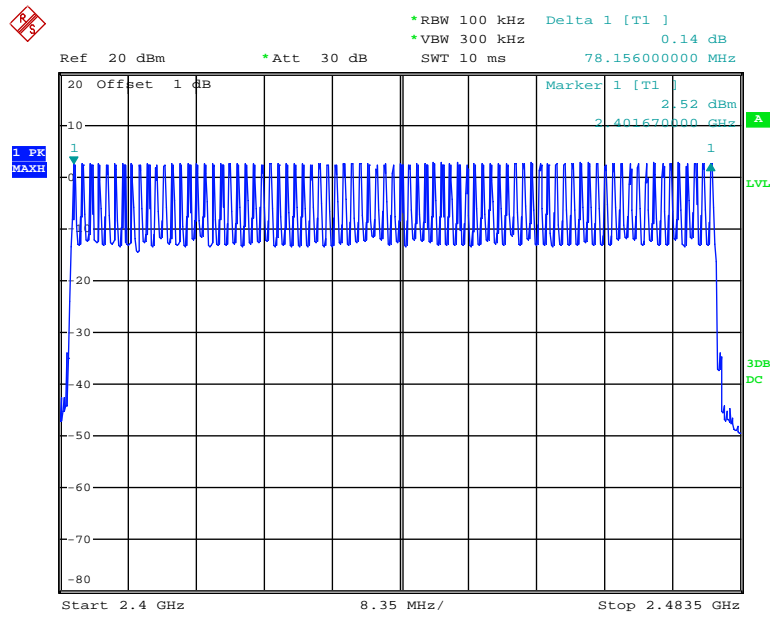
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

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

Number of Hopping Channels

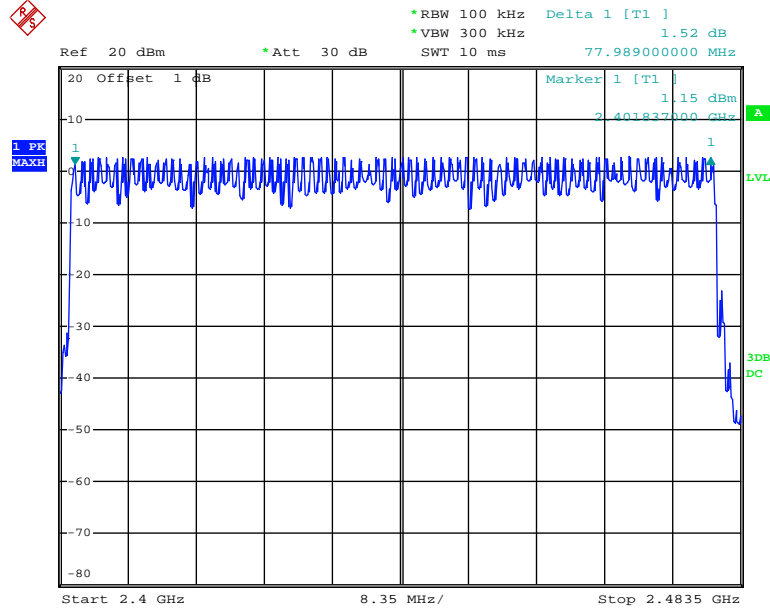


Date: 19.JUN.2017 12:49:28

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

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

Number of Hopping Channels

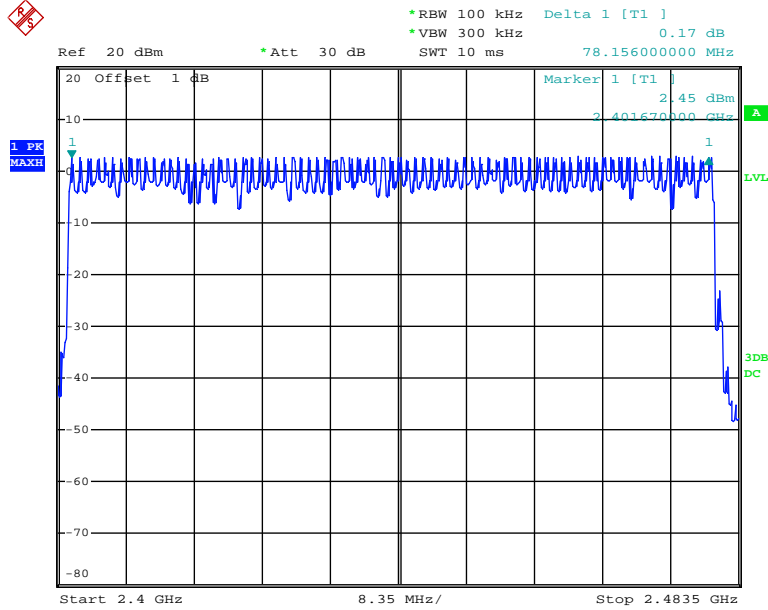


Date: 19.JUN.2017 12:46:25

EDR Mode (8DPSK):

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

Number of Hopping Channels



Date: 19.JUN.2017 12:42:32

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; Spectrum SPAN was set as 0. the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-5	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	29.3°C
Relative Humidity:	49 %
ATM Pressure:	100.1 kPa

* *The testing was performed by Kevin Hu on 2017-06-30.*

Test Result: Compliance.

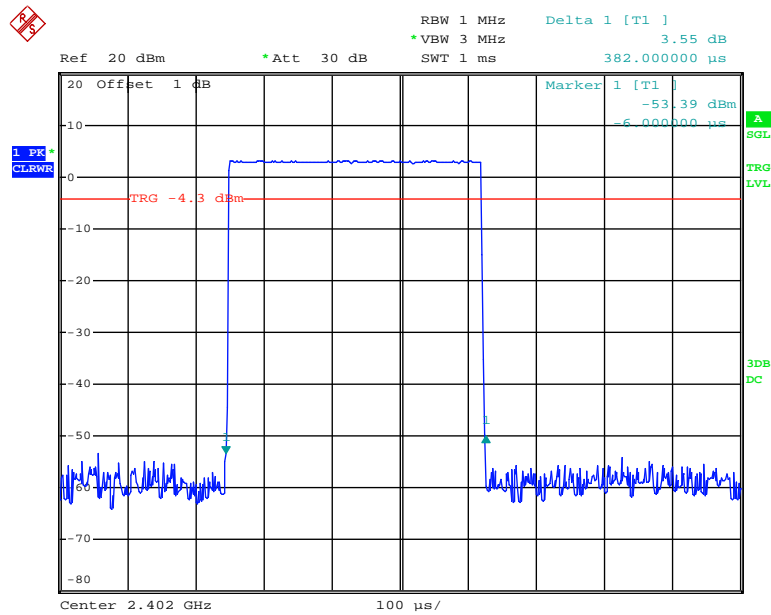
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

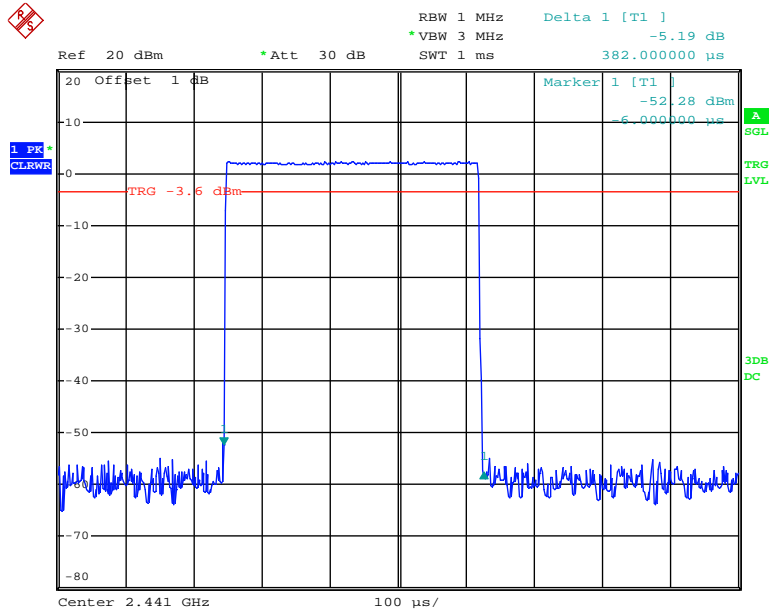
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.382	0.122	0.4	Compliance
	Middle	0.382	0.122	0.4	Compliance
	High	0.382	0.122	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.650	0.264	0.4	Compliance
	Middle	1.650	0.264	0.4	Compliance
	High	1.650	0.264	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.900	0.309	0.4	Compliance
	Middle	2.900	0.309	0.4	Compliance
	High	2.910	0.310	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

DH1: Low Channel



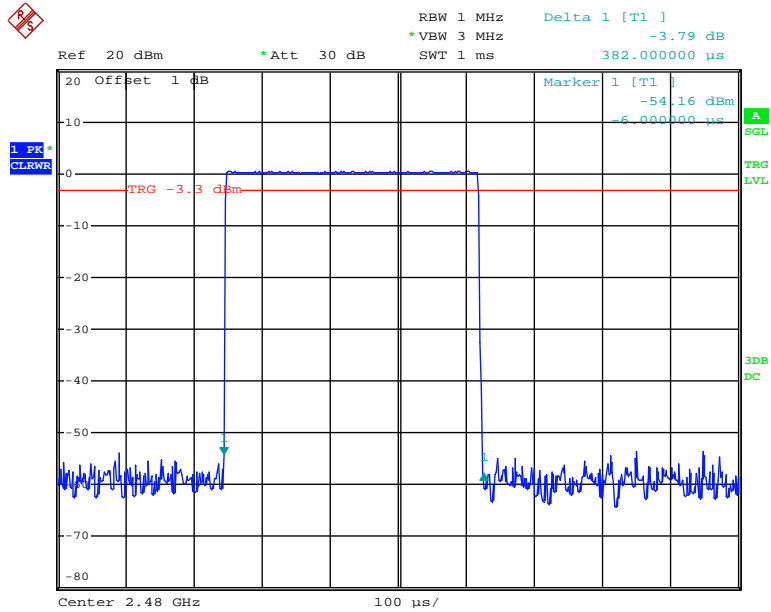
Date: 30.JUN.2017 22:05:39

DH1: Middle Channel



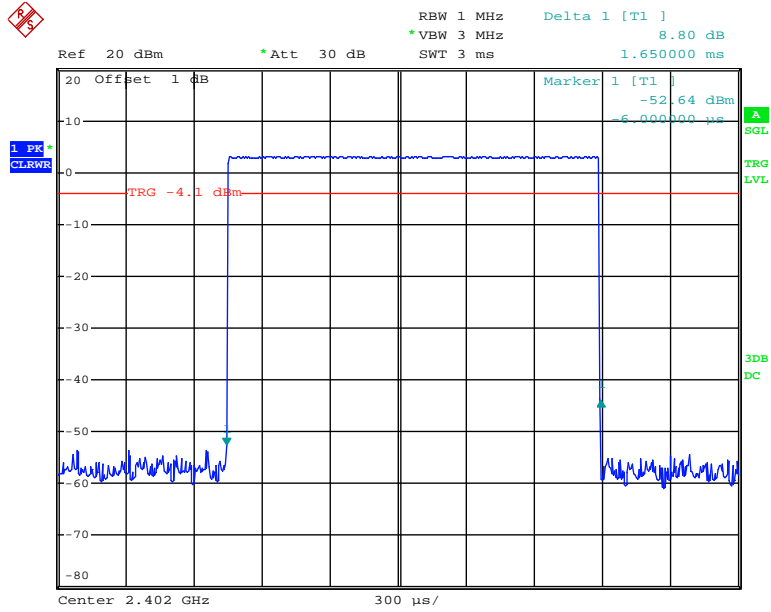
Date: 30.JUN.2017 22:05:46

DH1: High Channel



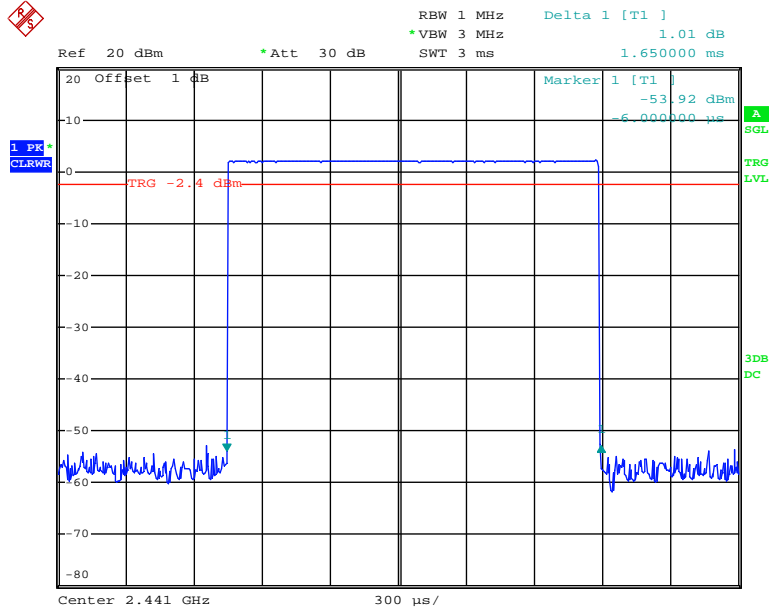
Date: 30.JUN.2017 22:05:53

DH3: Low Channel



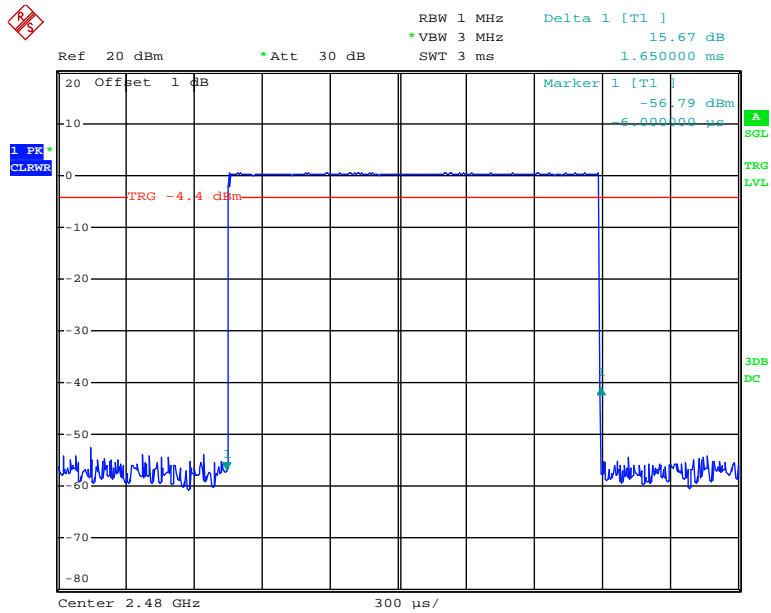
Date: 30.JUN.2017 22:07:52

DH3: Middle Channel



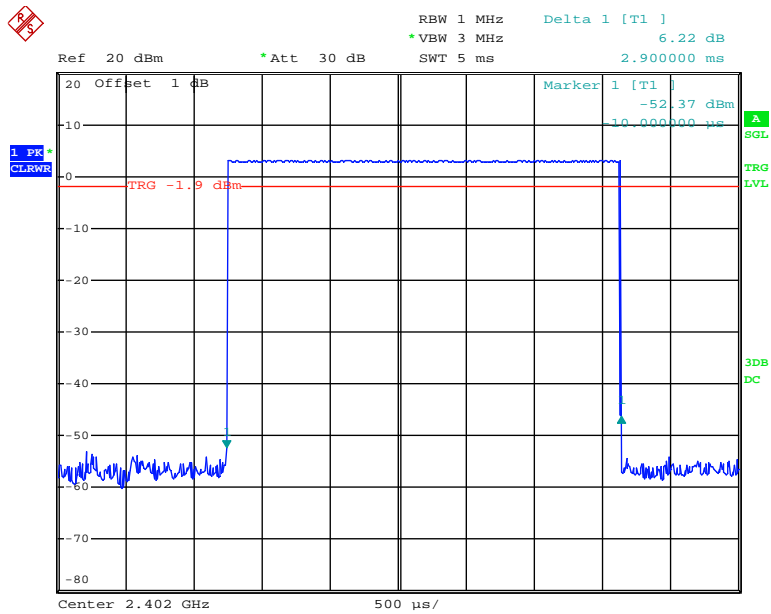
Date: 30.JUN.2017 22:07:59

DH3: High Channel



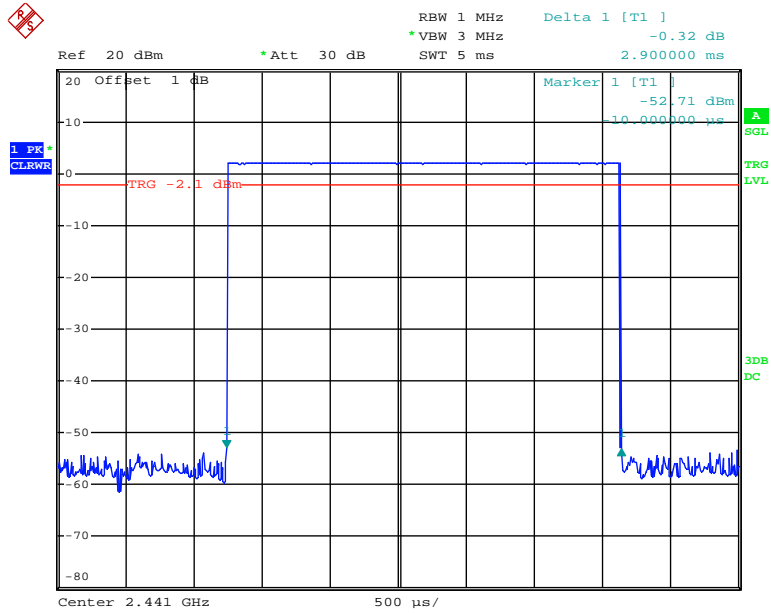
Date: 30.JUN.2017 22:08:05

DH5: Low Channel



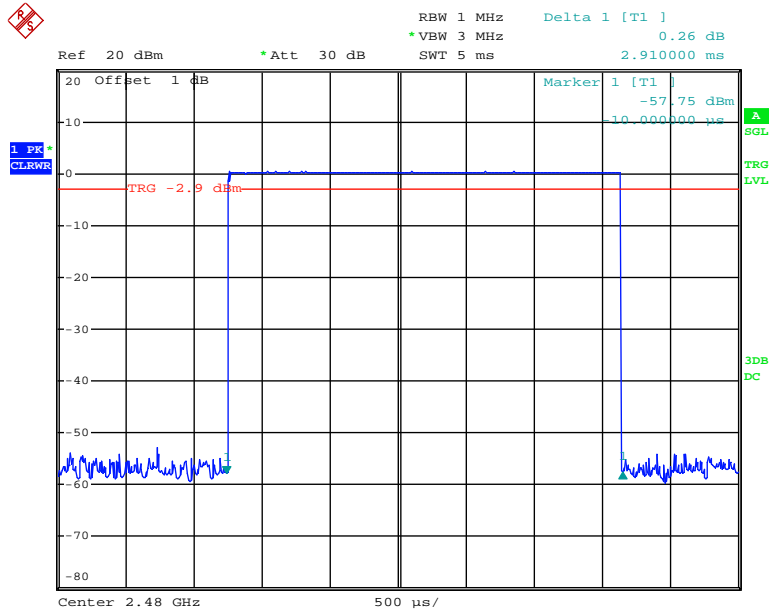
Date: 30.JUN.2017 22:08:34

DH5: Middle Channel



Date: 30.JUN.2017 22:08:40

DH5: High Channel

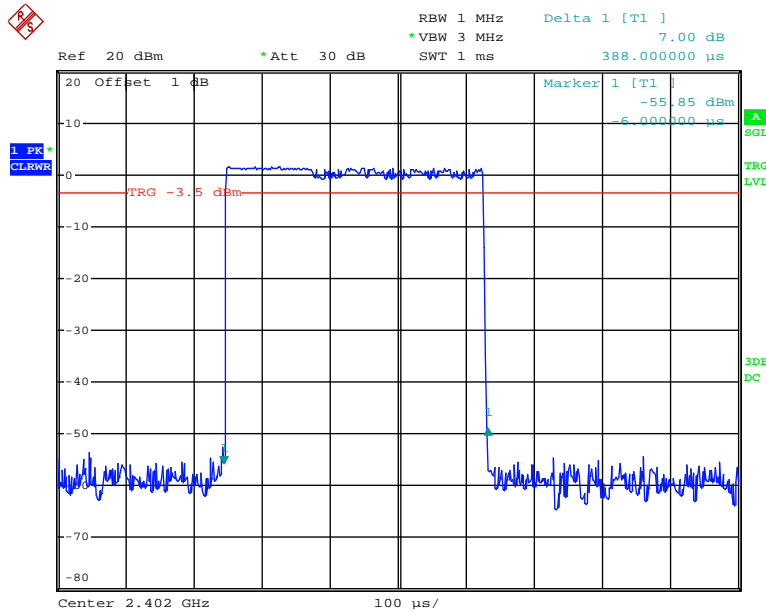


Date: 30.JUN.2017 22:08:47

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

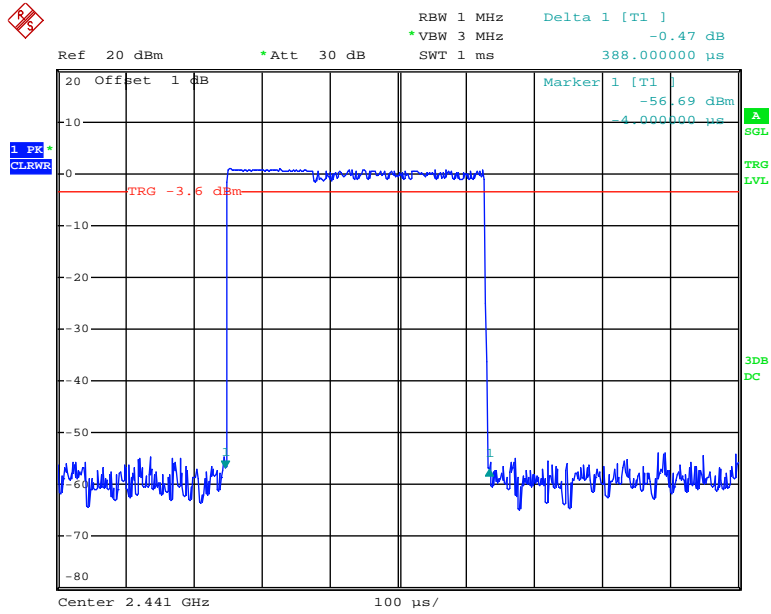
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.388	0.124	0.4	Compliance
	Middle	0.388	0.124	0.4	Compliance
	High	0.390	0.125	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
2DH3	Low	1.650	0.264	0.4	Compliance
	Middle	1.650	0.264	0.4	Compliance
	High	1.656	0.265	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
2DH5	Low	2.920	0.311	0.4	Compliance
	Middle	2.910	0.310	0.4	Compliance
	High	2.920	0.311	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

2DH1: Low Channel



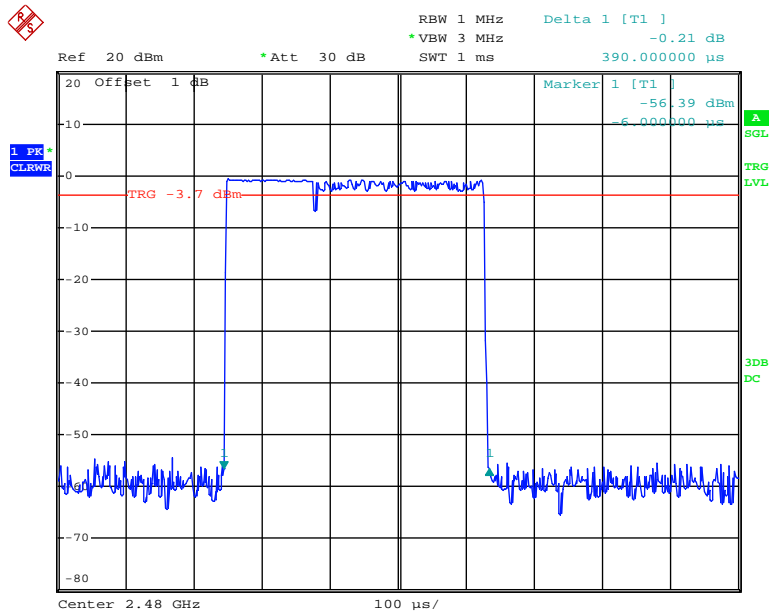
Date: 30.JUN.2017 22:09:55

2DH1: Middle Channel



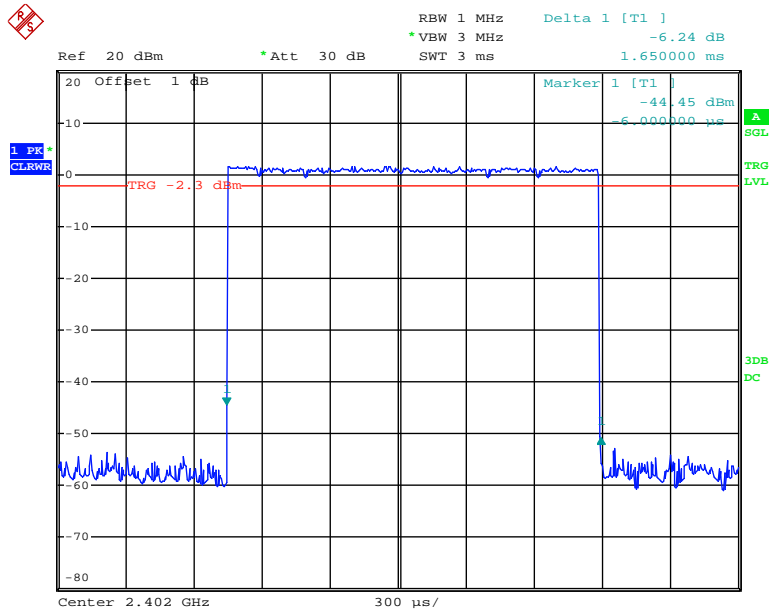
Date: 30.JUN.2017 22:10:01

2DH1: High Channel



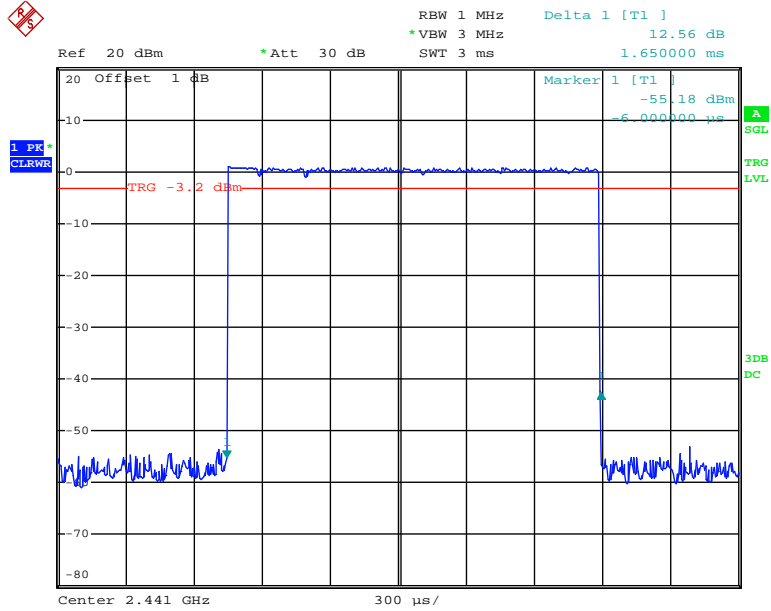
Date: 30.JUN.2017 22:10:08

2DH3: Low Channel



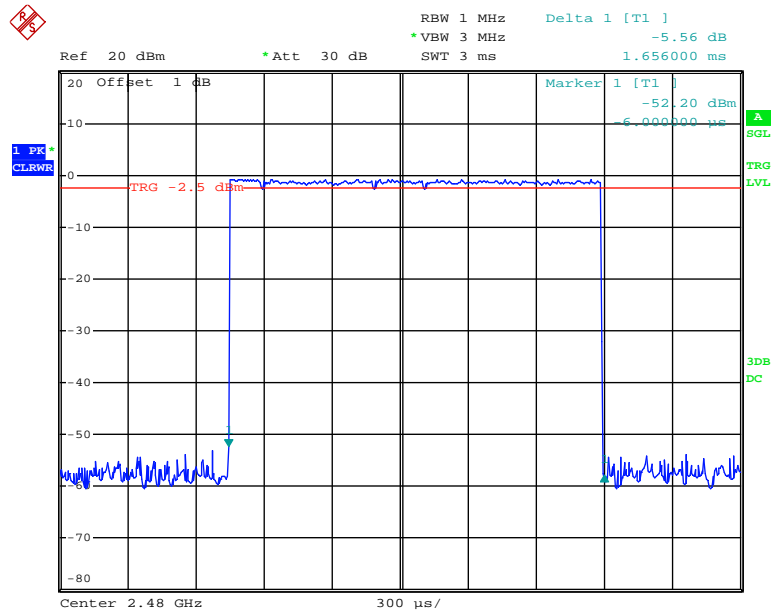
Date: 30.JUN.2017 22:11:31

2DH3: Middle Channel



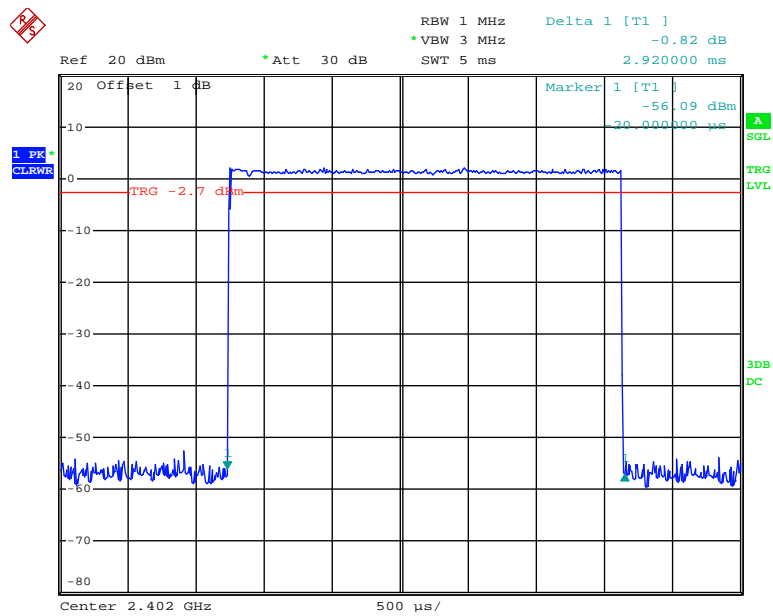
Date: 30.JUN.2017 22:11:37

2DH3: High Channel



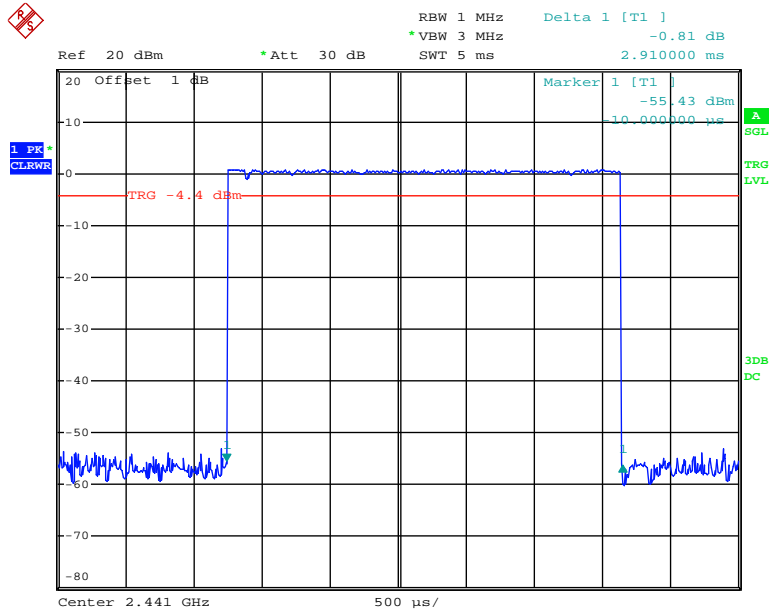
Date: 30.JUN.2017 22:11:44

2DH5: Low Channel



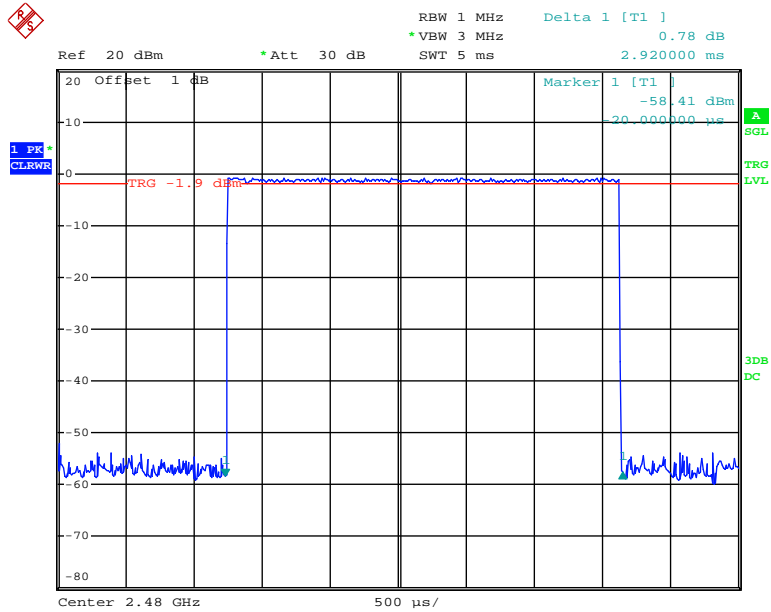
Date: 30.JUN.2017 22:12:41

2DH5: Middle Channel



Date: 30.JUN.2017 22:12:48

2DH5: High Channel

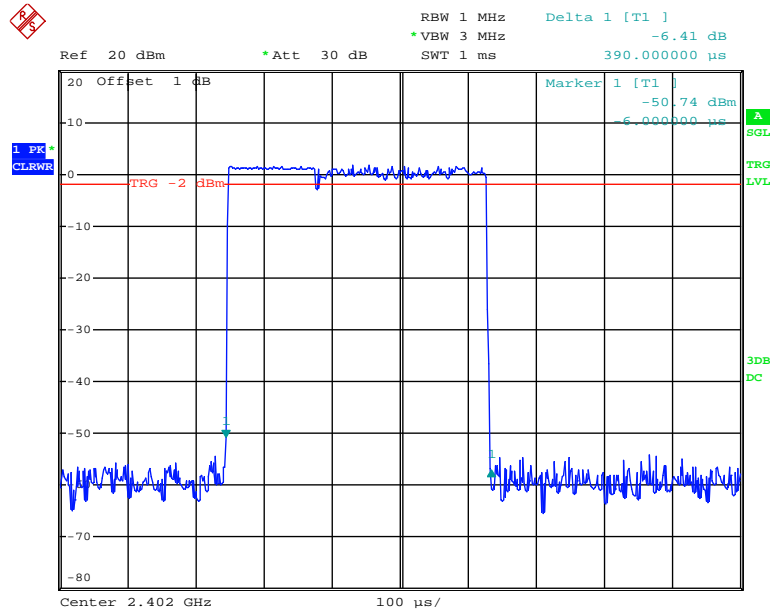


Date: 30.JUN.2017 22:12:54

EDR Mode (8DPSK):

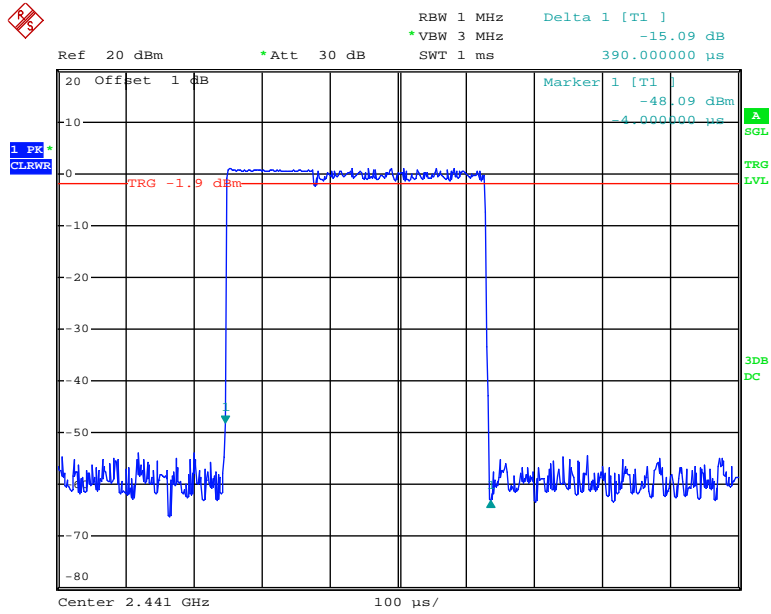
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.390	0.125	0.4	Compliance
	Middle	0.390	0.125	0.4	Compliance
	High	0.390	0.125	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
3DH3	Low	1.656	0.265	0.4	Compliance
	Middle	1.656	0.265	0.4	Compliance
	High	1.656	0.265	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
3DH5	Low	2.910	0.310	0.4	Compliance
	Middle	2.910	0.310	0.4	Compliance
	High	2.910	0.310	0.4	Compliance
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

3DH1: Low Channel



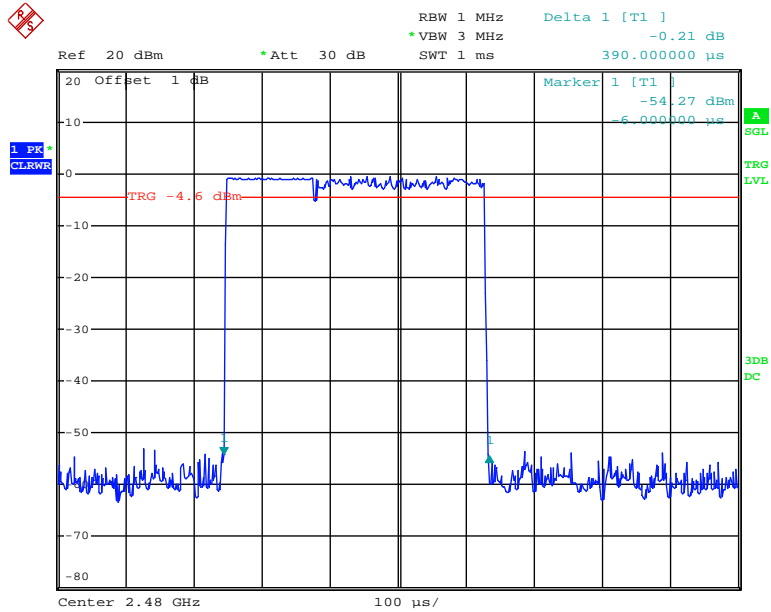
Date: 30.JUN.2017 22:13:31

3DH1: Middle Channel



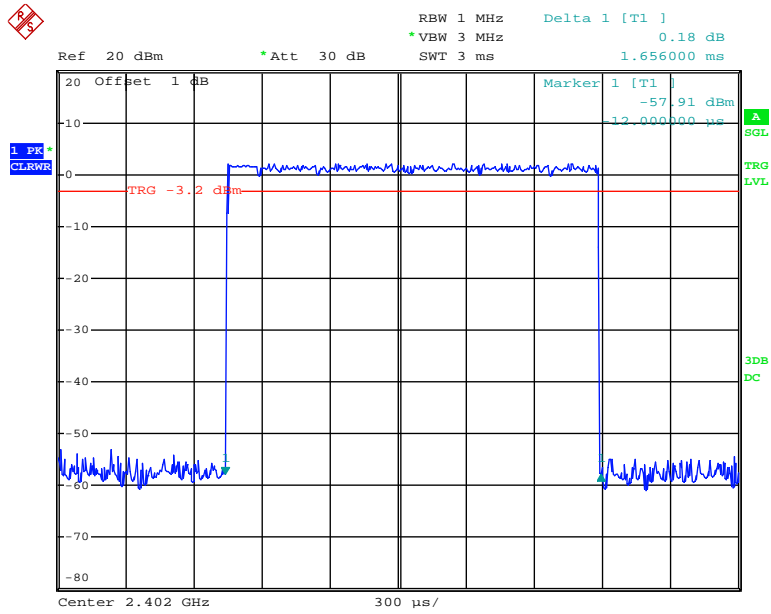
Date: 30.JUN.2017 22:13:38

3DH1: High Channel



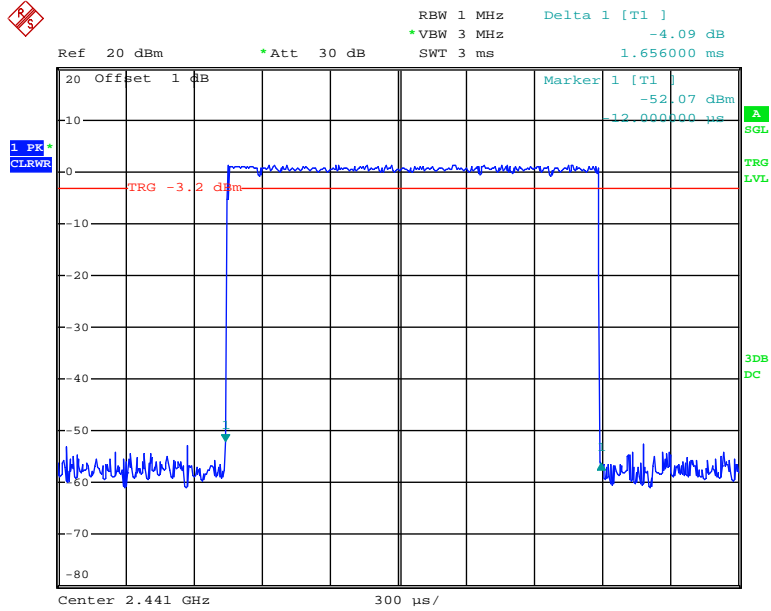
Date: 30.JUN.2017 22:13:45

3DH3: Low Channel



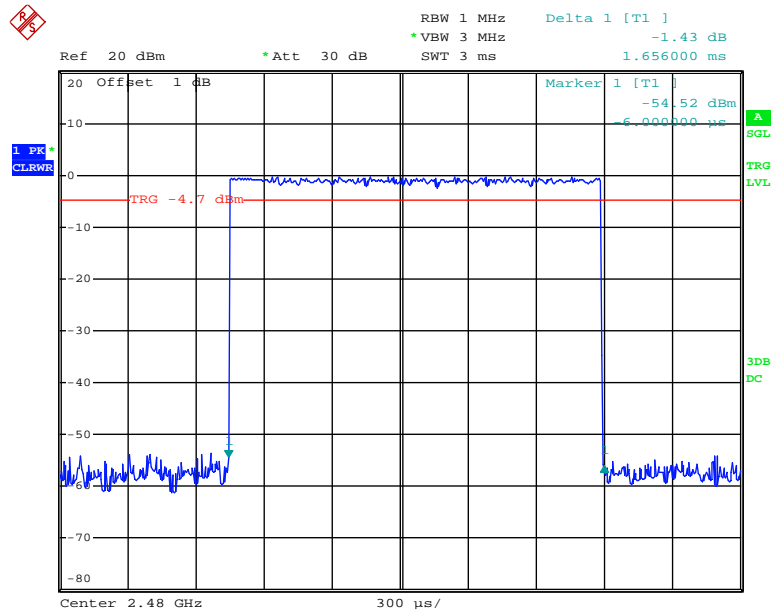
Date: 30.JUN.2017 22:14:41

3DH3: Middle Channel



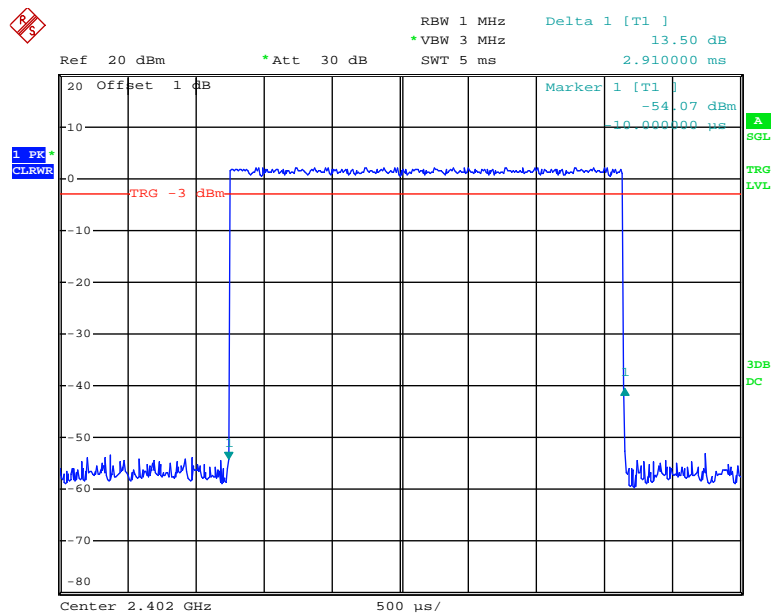
Date: 30.JUN.2017 22:14:48

3DH3: High Channel



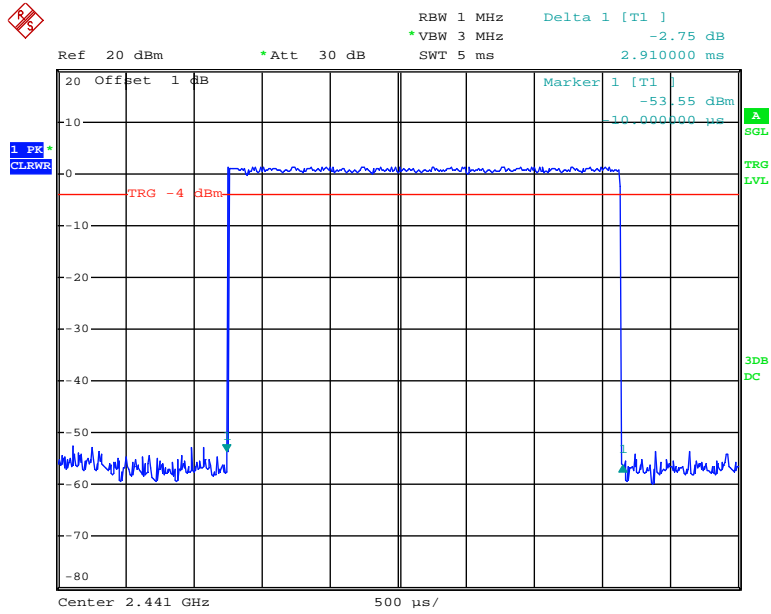
Date: 30.JUN.2017 22:14:54

3DH5: Low Channel



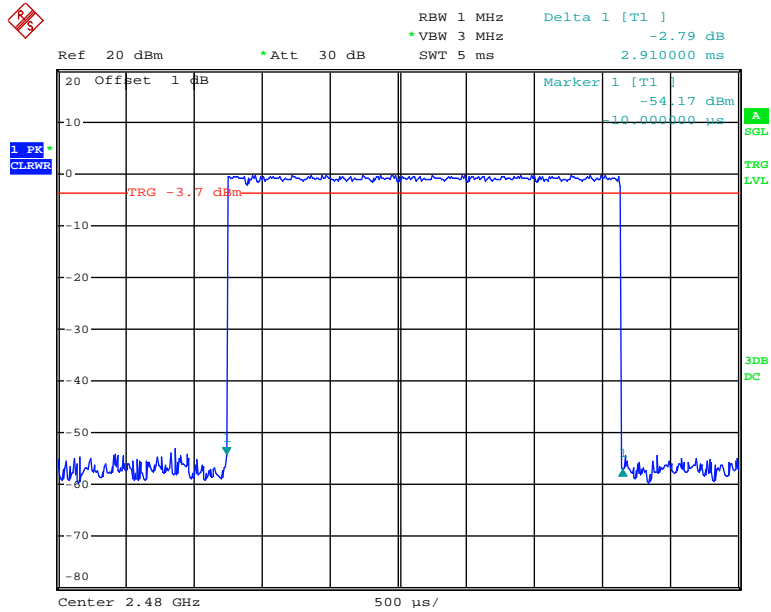
Date: 30.JUN.2017 22:15:21

3DH5: Middle Channel



Date: 30.JUN.2017 22:15:27

3DH5: High Channel



Date: 30.JUN.2017 22:15:34

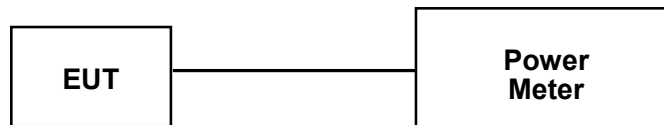
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

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 it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.
4. Set the power Meter to test Peak output power, record the result as peak power.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54170074	2017-01-03	2018-01-02
Agilent	P-Series Power Meter	N1912A	MY5000798	2017-01-03	2018-01-02
Unknown	RF Cable	Unknown	C-5	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	28.6°C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

* The testing was performed by Kevin Hu on 2017-06-19.

Test Result: Compliance.

Test Mode: Transmitting

Mode	Frequency (MHz)	Conducted Peak Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	2402	2.51	30
	2441	2.57	30
	2480	2.63	30
EDR Mode ($\pi/4$ -DQPSK)	2402	3.09	30
	2441	3.12	30
	2480	3.18	30
EDR Mode (8DPSK)	2402	3.37	30
	2441	3.37	30
	2480	3.4	30

Note: The data above was tested in conducted mode.

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	C-5	Each Time	/

* **Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

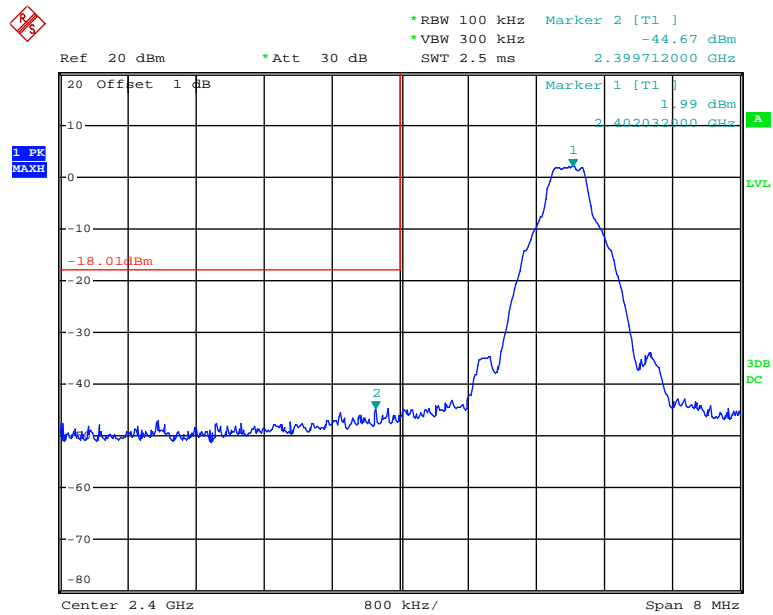
Temperature:	28.6°C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

* The testing was performed by Kevin Hu on 2017-06-19.

Test Result: Compliance

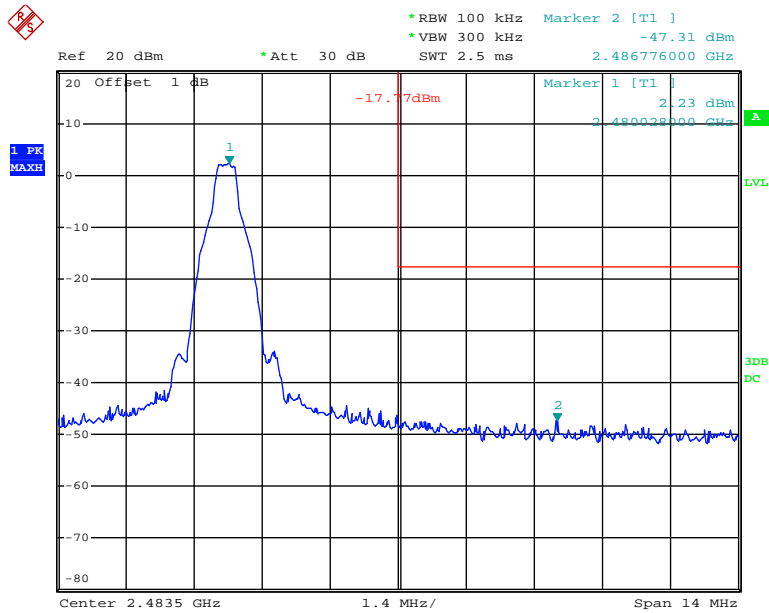
BDR Mode (GFSK):

Band Edge, Left Side



Date: 19.JUN.2017 11:48:59

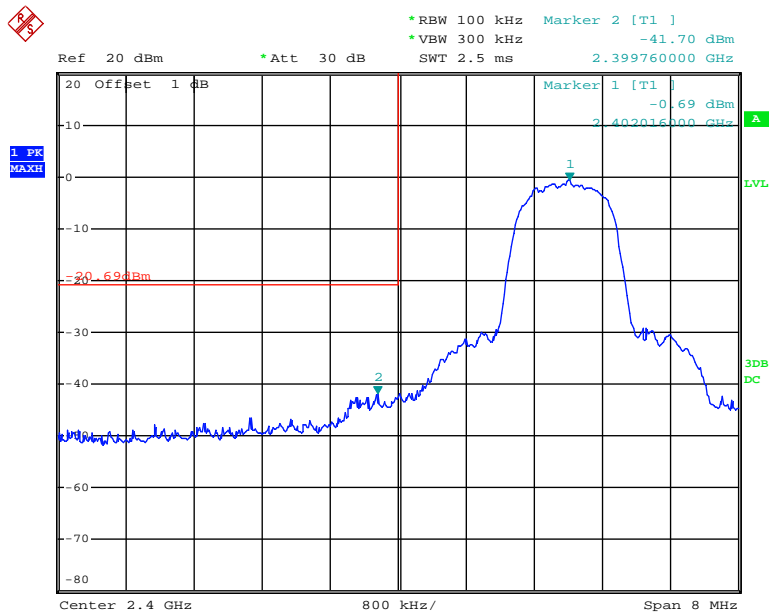
Band Edge, Right Side



Date: 19.JUN.2017 11:52:23

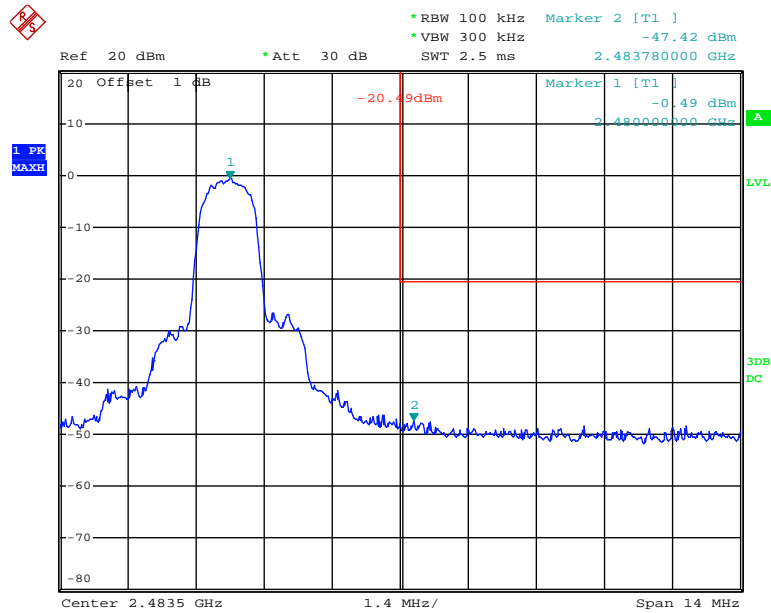
EDR Mode ($\pi/4$ -DQPSK):

Band Edge, Left Side



Date: 19.JUN.2017 11:57:09

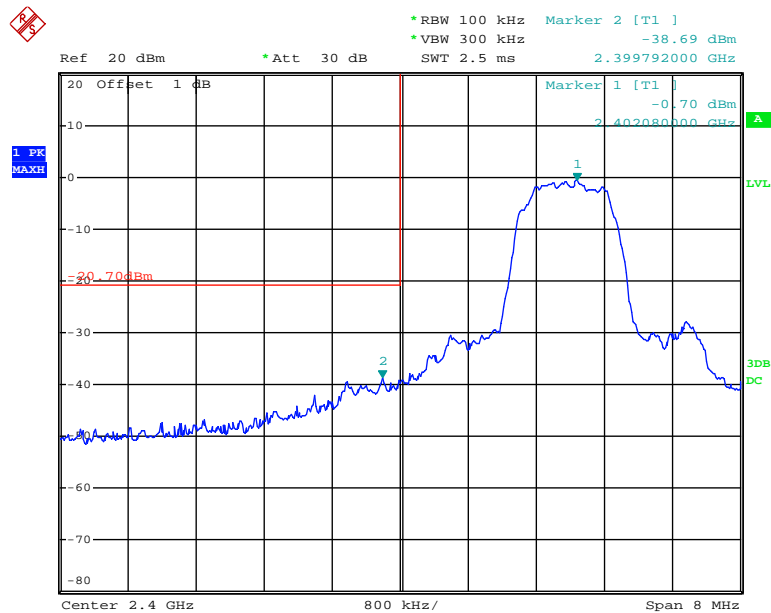
Band Edge, Right Side



Date: 19.JUN.2017 11:54:47

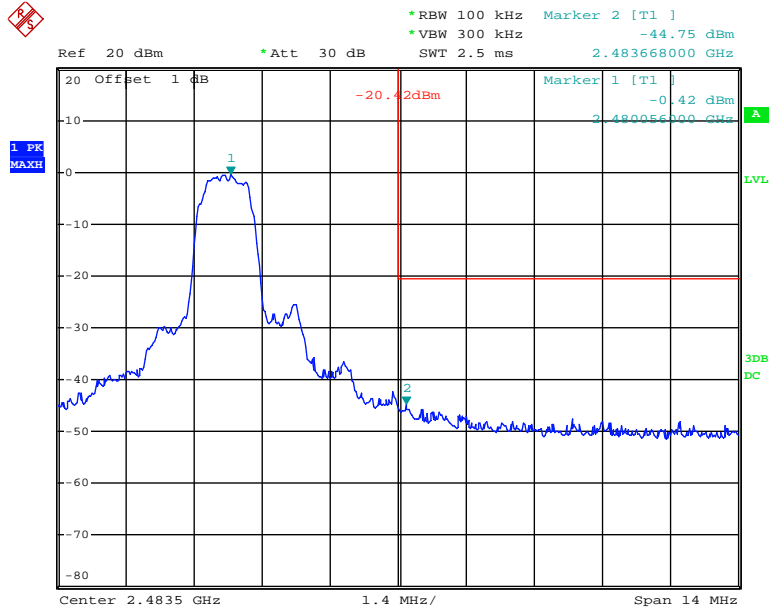
EDR Mode (8DPSK):

Band Edge, Left Side



Date: 19.JUN.2017 11:58:50

Band Edge, Right Side



Date: 19.JUN.2017 12:01:32

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