

FCC PART 15.247

TEST REPORT

For

Hytera Communications Corporation Limited

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People's Republic of China

FCC ID: YAMMT680PF4

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

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Corporation Limited*'s product, model number: *MT680 Plus F4* (FCC ID: *YAMMT680PF4*) (the "EUT") in this report was a *TETRA Mobile Terminal*, which was measured approximately: 186 mm (L)×184 mm (W)×70 mm (H), rated input voltage: DC 13.2V.

All measurement and test data in this report was gathered from production sample serial number: 160427006 (Assigned by BACL Dongguan). The EUT was received on 2016-04-27.

Objective

This report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2, Subpart J, Part 15, Subparts A, B 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 Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 90 TNB submissions with FCC ID: YAMMT680PF4.

FCC Part 15.247 DTS submissions with FCC ID: YAMMT680PF4.

Test Methodology

All measurements contained in this report were conducted 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).

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 Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications 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 February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. 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

The engineering mode configured the maximum power as default setting.

Equipment Modifications

No modification was made to the EUT.

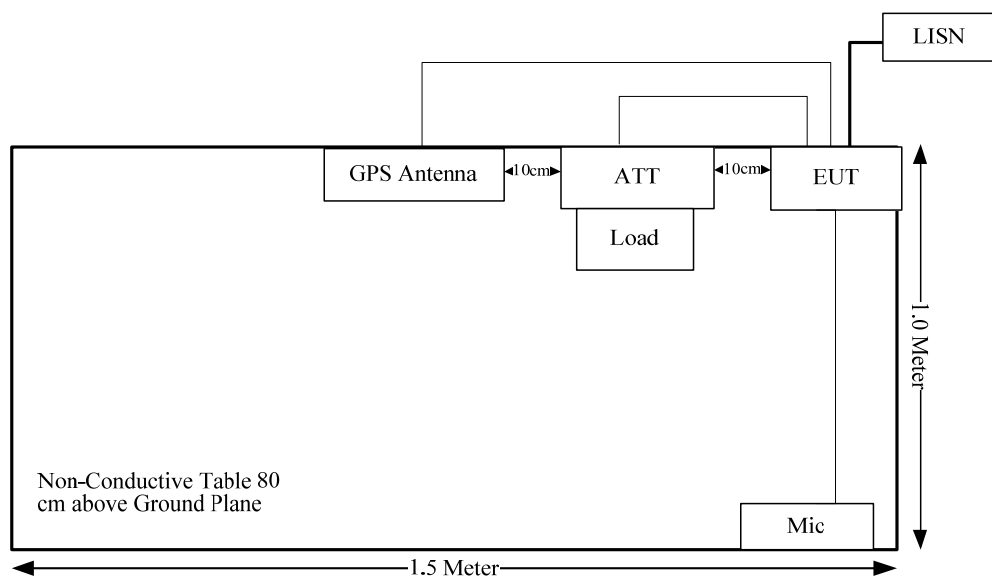
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	50 Load Terminal	2W	/
AA-MCS	Attenuator	CAT-50-40-200-Nm-Nf	0602-010

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Power Line	No	No	3	EUT	Lisn
BNC Cable	Yes	No	0.5	EUT	Load

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b)(1), §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(1)	20 dB Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band Edges	Compliance

Note: Not Applicable: It is power by DC source.

FCC§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for Maximum Permissible Exposure (MPE)

Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E , H or S (minutes)
0.3- 3.0	614	1.63	(100)*	6
3.0 - 30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6

f = frequency in MHz;

* = Plane-wave equivalent power density;

MPE Calculation

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where: S = 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

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

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

MPE Results**Tune-Up Power Including Tolerance:**

For Tetra, the highest Power is 10+/-1W .

Frequency Bands	Antenna Gain		Tune-Up Power		Output Power* 50% duty cycle (PTT)	Evaluation Distance	Power Density	S _{limit}	S _f /S _{limit}
	(dBi)	(numeric)	dBm	(mW)	(mW)	cm	(mW/cm ²)	(mW/cm ²)	
450-470MHz	5.5	3.55	\	11000	5500	35	1.26770	1.5	0.84513
2402-2480MHz	1	1.26	6.8	4.79	\	35	0.00039	5	0.00008

The Tetra module can transmit simultaneously with BT, the Ratio for Tetra, and:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$$=S_{Tetra}/S_{limit_Tetra} + S_{BT}/S_{limit_BT}$$

$$=0.84513+0.00008$$

$$=0.84521$$

$$< 1.0$$

Result: Compliance, The device meets MPE requirement for Occupational/Controlled use at 35 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 for Bluetooth and the antenna gain is 1.0 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;

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cisp} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cisp} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit.

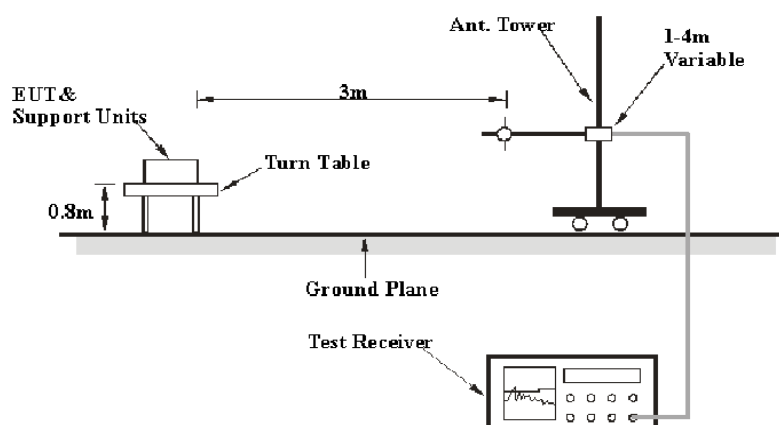
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB

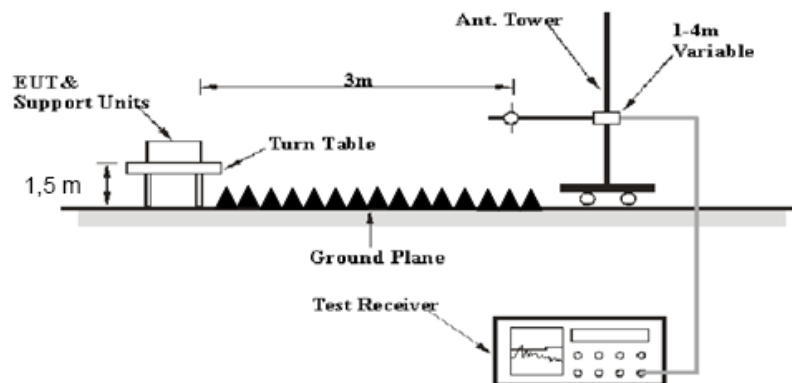
Table 1 – Values of U_{cisp}

Measurement	U_{cisp}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1GHz:



Above 1GHz:

The radiated emission tests were performed in the 3 meters 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
R&S	EMI Test Receiver	ESCI	100224	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
QuinTETRA Mobile Terminal	Amplifier	QLW-18405536-JO	15964001001	2015-09-06	2016-09-06
N/A	Coaxial Cable	14m	N/A	2015-05-06	2016-05-06
N/A	Coaxial Cable	8m	N/A	2015-05-06	2016-05-06

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

Corrected Amplitude & Margin Calculation

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

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

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

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

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, and section 15.205, 15.209 and 15.247.

Test Data**Environmental Conditions**

Temperature:	25.1°C
Relative Humidity:	61%
ATM Pressure:	100.3kPa

The testing was performed by Gavin Xu on 2016-05-06.

Test Mode: Transmitting

BDR Mode (GFSK):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	70.52	PK	H	25.65	3.66	0.00	99.83	N/A	N/A
2402	60.25	AV	H	25.65	3.66	0.00	89.56	N/A	N/A
2402	68.6	PK	V	25.65	3.66	0.00	97.91	N/A	N/A
2402	58.63	AV	V	25.65	3.66	0.00	87.94	N/A	N/A
2400	35.73	PK	H	25.64	3.65	0.00	65.02	74.00	8.98
2400	19.39	AV	H	25.64	3.65	0.00	48.68	54.00	5.32
4804	43.96	PK	H	30.59	5.06	27.41	52.20	74.00	21.80
4804	32.1	AV	H	30.59	5.06	27.41	40.34	54.00	13.66
7206	32.16	PK	H	34.09	6.61	25.91	46.95	74.00	27.05
7206	19.59	AV	H	34.09	6.61	25.91	34.38	54.00	19.62
9608	31.05	PK	H	36.74	8.53	27.55	48.77	74.00	25.23
9608	18.54	AV	H	36.74	8.53	27.55	36.26	54.00	17.74
3206	32.21	PK	H	27.86	6.11	27.36	38.82	74.00	35.18
3206	20.08	AV	H	27.86	6.11	27.36	26.69	54.00	27.31
575.76	32.9	QP	V	19.39	2.89	22.21	32.97	46.00	13.03
Middle Channel: 2441 MHz									
2441	71.46	PK	H	25.75	3.76	0.00	100.97	N/A	N/A
2441	63.39	AV	H	25.75	3.76	0.00	92.90	N/A	N/A
2441	71.11	PK	V	25.75	3.76	0.00	100.62	N/A	N/A
2441	60.73	AV	V	25.75	3.76	0.00	90.24	N/A	N/A
4882	40.68	PK	H	30.79	5.19	27.42	49.24	74.00	24.76
4882	27.81	AV	H	30.79	5.19	27.42	36.37	54.00	17.63
7323	32.38	PK	H	34.38	6.75	25.88	47.63	74.00	26.37
7323	19.84	AV	H	34.38	6.75	25.88	35.09	54.00	18.91
9764	31.37	PK	H	36.81	8.62	27.20	49.60	74.00	24.40
9764	18.8	AV	H	36.81	8.62	27.20	37.03	54.00	16.97
3056	31.17	PK	H	27.38	6.66	27.49	37.72	74.00	36.28
3056	18.65	AV	H	27.38	6.66	27.49	25.20	54.00	28.80
3206	32.33	PK	H	27.86	6.11	27.36	38.94	74.00	35.06
3206	20.22	AV	H	27.86	6.11	27.36	26.83	54.00	27.17
575.76	32.5	QP	V	19.39	2.89	22.21	32.57	46.00	13.43
High Channel: 2480 MHz									
2480	71.17	PK	H	25.85	3.68	0.00	100.70	N/A	N/A
2480	61.33	AV	H	25.85	3.68	0.00	90.86	N/A	N/A
2480	70.28	PK	V	25.85	3.68	0.00	99.81	N/A	N/A
2480	60.45	AV	V	25.85	3.68	0.00	89.98	N/A	N/A
2483.5	28.06	PK	H	25.86	3.67	0.00	57.59	74.00	16.41
2483.5	15.71	AV	H	25.86	3.67	0.00	45.24	54.00	8.76
4960	37.54	PK	H	31.00	5.34	27.43	46.45	74.00	27.55
4960	24.7	AV	H	31.00	5.34	27.43	33.61	54.00	20.39
7440	32.28	PK	H	34.66	6.89	25.97	47.86	74.00	26.14
7440	19.65	AV	H	34.66	6.89	25.97	35.23	54.00	18.77
9920	31.19	PK	H	36.87	8.71	26.66	50.11	74.00	23.89
9920	18.59	AV	H	36.87	8.71	26.66	37.51	54.00	16.49
3206	32.39	PK	H	27.86	6.11	27.36	39.00	74.00	35.00
3206	20.34	AV	H	27.86	6.11	27.36	26.95	54.00	27.05
575.76	32.6	QP	V	19.39	2.89	22.21	32.67	46.00	13.33

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

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
(MHz)	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	70.03	PK	H	25.65	3.66	0.00	99.34	N/A	N/A
2402	58.7	AV	H	25.65	3.66	0.00	88.01	N/A	N/A
2402	68.58	PK	V	25.65	3.66	0.00	97.89	N/A	N/A
2402	57.36	AV	V	25.65	3.66	0.00	86.67	N/A	N/A
2390	25.97	PK	H	25.61	3.63	0.00	55.21	74.00	18.79
2390	13.96	AV	H	25.61	3.63	0.00	43.20	54.00	10.80
4804	43.75	PK	H	30.59	5.06	27.41	51.99	74.00	22.01
4804	31.93	AV	H	30.59	5.06	27.41	40.17	54.00	13.83
7206	32.15	PK	H	34.09	6.61	25.91	46.94	74.00	27.06
7206	19.59	AV	H	34.09	6.61	25.91	34.38	54.00	19.62
9608	31.05	PK	H	36.74	8.53	27.55	48.77	74.00	25.23
9608	18.51	AV	H	36.74	8.53	27.55	36.23	54.00	17.77
3206	32.2	PK	H	27.86	6.11	27.36	38.81	74.00	35.19
3206	20.11	AV	H	27.86	6.11	27.36	26.72	54.00	27.28
575.76	32.8	QP	V	19.39	2.89	22.21	32.87	46.00	13.13
Middle Channel: 2441 MHz									
2441	71.18	PK	H	25.75	3.76	0.00	100.69	N/A	N/A
2441	59.86	AV	H	25.75	3.76	0.00	89.37	N/A	N/A
2441	70.56	PK	V	25.75	3.76	0.00	100.07	N/A	N/A
2441	58.95	AV	V	25.75	3.76	0.00	88.46	N/A	N/A
4882	40.01	PK	H	30.79	5.19	27.42	48.57	74.00	25.43
4882	27.25	AV	H	30.79	5.19	27.42	35.81	54.00	18.19
7323	31.94	PK	H	34.38	6.75	25.88	47.19	74.00	26.81
7323	19.3	AV	H	34.38	6.75	25.88	34.55	54.00	19.45
9764	30.94	PK	H	36.81	8.62	27.20	49.17	74.00	24.83
9764	18.37	AV	H	36.81	8.62	27.20	36.60	54.00	17.40
3056	30.6	PK	H	27.38	6.66	27.49	37.15	74.00	36.85
3056	18.03	AV	H	27.38	6.66	27.49	24.58	54.00	29.42
3206	32.26	PK	H	27.86	6.11	27.36	38.87	74.00	35.13
3206	20.15	AV	H	27.86	6.11	27.36	26.76	54.00	27.24
575.76	32.7	QP	V	19.39	2.89	22.21	32.77	46.00	13.23
High Channel: 2480 MHz									
2480	69.81	PK	H	25.85	3.68	0.00	99.34	N/A	N/A
2480	58.44	AV	H	25.85	3.68	0.00	87.97	N/A	N/A
2480	69.38	PK	V	25.85	3.68	0.00	98.91	N/A	N/A
2480	58.35	AV	V	25.85	3.68	0.00	87.88	N/A	N/A
2483.5	31.12	PK	H	25.86	3.67	0.00	60.65	74.00	13.35
2483.5	14.49	AV	H	25.86	3.67	0.00	44.02	54.00	9.98
4960	37.06	PK	H	31.00	5.34	27.43	45.97	74.00	28.03
4960	24.22	AV	H	31.00	5.34	27.43	33.13	54.00	20.87
7440	31.97	PK	H	34.66	6.89	25.97	47.55	74.00	26.45
7440	19.48	AV	H	34.66	6.89	25.97	35.06	54.00	18.94
9920	30.94	PK	H	36.87	8.71	26.66	49.86	74.00	24.14
9920	18.4	AV	H	36.87	8.71	26.66	37.32	54.00	16.68
3206	32.16	PK	H	27.86	6.11	27.36	38.77	74.00	35.23
3206	20.06	AV	H	27.86	6.11	27.36	26.67	54.00	27.33
575.76	32.6	OP	V	19.39	2.89	22.21	32.67	46.00	13.33

EDR Mode (8-DPSK):

Frequency	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
(MHz)	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	70.02	PK	H	25.65	3.66	0.00	99.33	N/A	N/A
2402	59.11	AV	H	25.65	3.66	0.00	88.42	N/A	N/A
2402	67.85	PK	V	25.65	3.66	0.00	97.16	N/A	N/A
2402	56.61	AV	V	25.65	3.66	0.00	85.92	N/A	N/A
2390	25.6	PK	H	25.61	3.63	0.00	54.84	74.00	19.16
2390	13.43	AV	H	25.61	3.63	0.00	42.67	54.00	11.33
4804	43.59	PK	H	30.59	5.06	27.41	51.83	74.00	22.17
4804	31.76	AV	H	30.59	5.06	27.41	40.00	54.00	14.00
7206	31.88	PK	H	34.09	6.61	25.91	46.67	74.00	27.33
7206	19.3	AV	H	34.09	6.61	25.91	34.09	54.00	19.91
9608	30.79	PK	H	36.74	8.53	27.55	48.51	74.00	25.49
9608	18.29	AV	H	36.74	8.53	27.55	36.01	54.00	17.99
3206	32.02	PK	H	27.86	6.11	27.36	38.63	74.00	35.37
3206	19.95	AV	H	27.86	6.11	27.36	26.56	54.00	27.44
575.76	32.7	QP	V	19.39	2.89	22.21	32.77	46.00	13.23
Middle Channel: 2441 MHz									
2441	71.49	PK	H	25.75	3.76	0.00	101.00	N/A	N/A
2441	60.38	AV	H	25.75	3.76	0.00	89.89	N/A	N/A
2441	70.19	PK	V	25.75	3.76	0.00	99.70	N/A	N/A
2441	59.15	AV	V	25.75	3.76	0.00	88.66	N/A	N/A
4882	40.29	PK	H	30.79	5.19	27.42	48.85	74.00	25.15
4882	27.48	AV	H	30.79	5.19	27.42	36.04	54.00	17.96
7323	32.16	PK	H	34.38	6.75	25.88	47.41	74.00	26.59
7323	19.56	AV	H	34.38	6.75	25.88	34.81	54.00	19.19
9764	31.08	PK	H	36.81	8.62	27.20	49.31	74.00	24.69
9764	18.51	AV	H	36.81	8.62	27.20	36.74	54.00	17.26
3056	30.83	PK	H	27.38	6.66	27.49	37.38	74.00	36.62
3056	18.26	AV	H	27.38	6.66	27.49	24.81	54.00	29.19
3206	32.38	PK	H	27.86	6.11	27.36	38.99	74.00	35.01
3206	20.31	AV	H	27.86	6.11	27.36	26.92	54.00	27.08
575.76	32.5	QP	V	19.39	2.89	22.21	32.57	46.00	13.43
High Channel: 2480 MHz									
2480	71.1	PK	H	25.85	3.68	0.00	100.63	N/A	N/A
2480	59.37	AV	H	25.85	3.68	0.00	88.90	N/A	N/A
2480	69.55	PK	V	25.85	3.68	0.00	99.08	N/A	N/A
2480	58.53	AV	V	25.85	3.68	0.00	88.06	N/A	N/A
2483.5	32.14	PK	H	25.86	3.67	0.00	61.67	74.00	12.33
2483.5	15.19	AV	H	25.86	3.67	0.00	44.72	54.00	9.28
4960	37.19	PK	H	31.00	5.34	27.43	46.10	74.00	27.90
4960	24.36	AV	H	31.00	5.34	27.43	33.27	54.00	20.73
7440	32.01	PK	H	34.66	6.89	25.97	47.59	74.00	26.41
7440	19.42	AV	H	34.66	6.89	25.97	35.00	54.00	19.00
9920	30.96	PK	H	36.87	8.71	26.66	49.88	74.00	24.12
9920	18.36	AV	H	36.87	8.71	26.66	37.28	54.00	16.72
3206	32.22	PK	H	27.86	6.11	27.36	38.83	74.00	35.17
3206	20.15	AV	H	27.86	6.11	27.36	26.76	54.00	27.24
575.76	32.7	OP	V	19.39	2.89	22.21	32.77	46.00	13.23

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

Applicable Standard

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **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:	29.7°C
Relative Humidity:	61%
ATM Pressure:	100.4kPa

The testing was performed by Gavin Xu on 2016-05-07.

Test Result: Compliance.

Please refer to following tables and plots

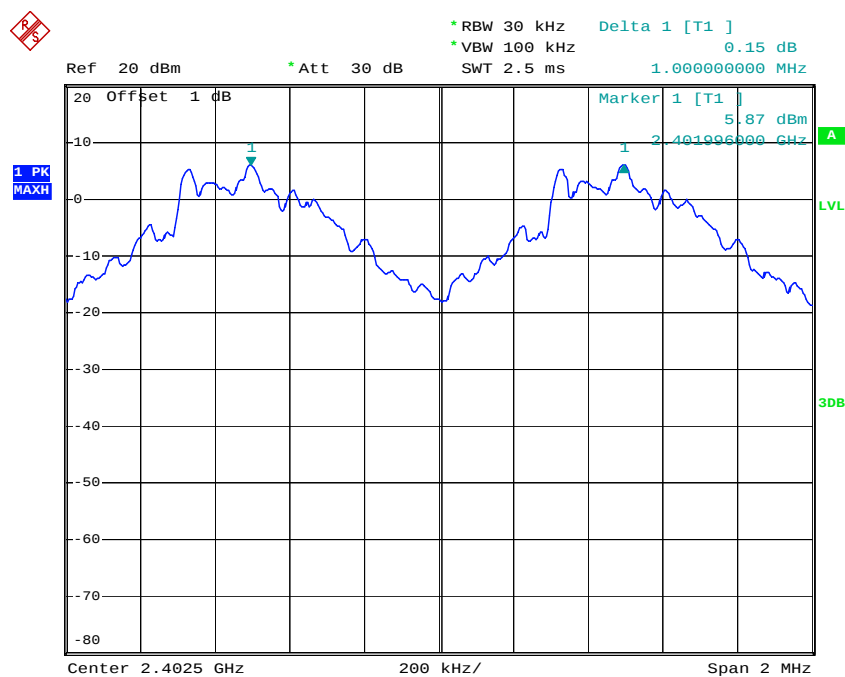
Test Mode: Transmitting

Mode	Channel	Frequency	Channel Separation	Limit	Result
		MHz	MHz	MHz	
BDR (GFSK)	Low	2402	1.000	0.56	Compliance
	Middle	2441	1.000	0.56	
	High	2480	1.000	0.56	
EDR ($\pi/4$ -DQPSK)	Low	2402	1.000	0.82	Compliance
	Middle	2441	1.000	0.81	
	High	2480	1.000	0.81	
EDR (8DPSK)	Low	2402	1.000	0.81	Compliance
	Middle	2441	1.000	0.81	
	High	2480	1.000	0.81	

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

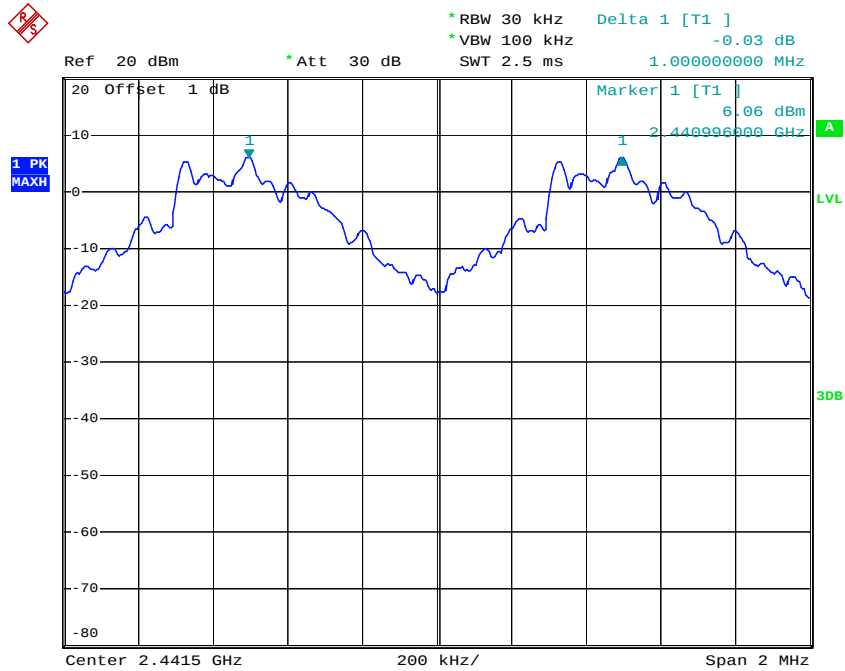
BDR Mode (GFSK):

Low Channel



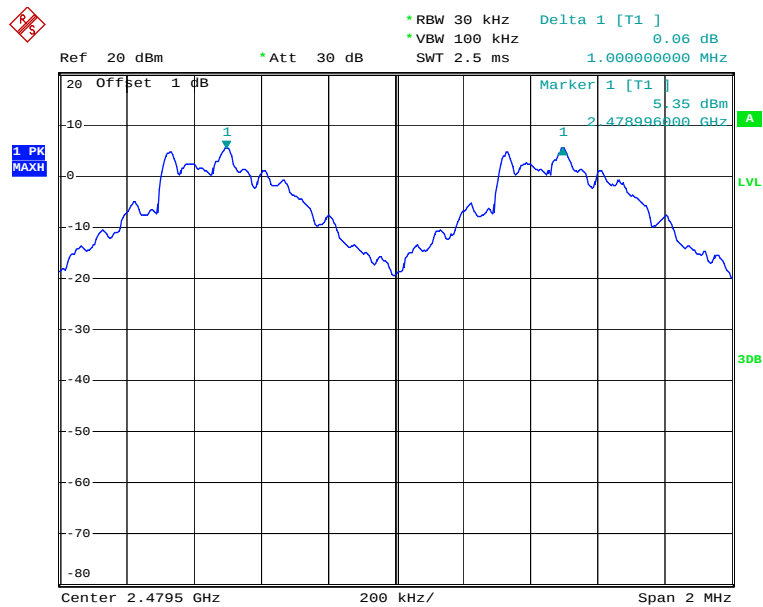
Date: 7.MAY.2016 13:25:31

Middle Channel



Date: 7.MAY.2016 13:26:23

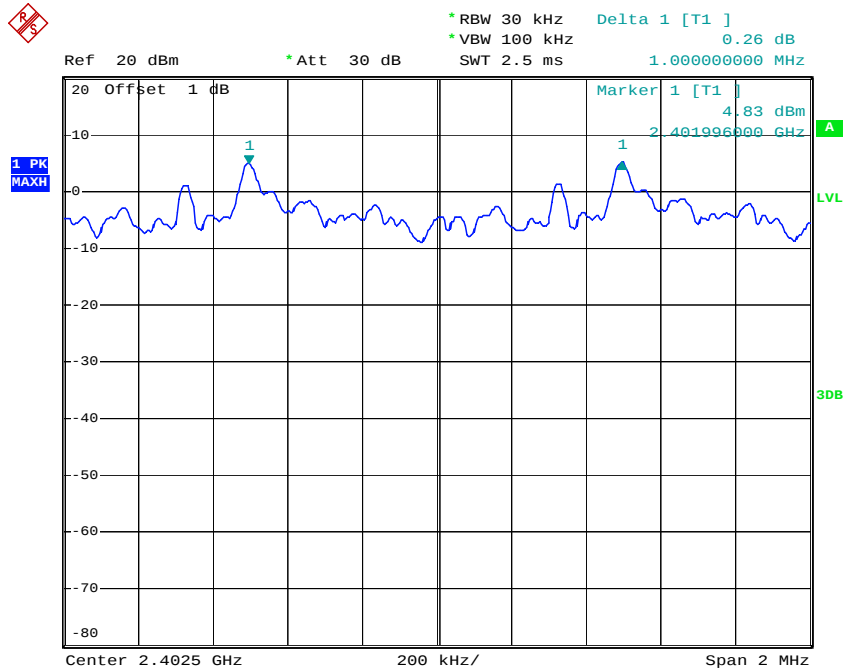
High Channel



Date: 7.MAY.2016 13:27:13

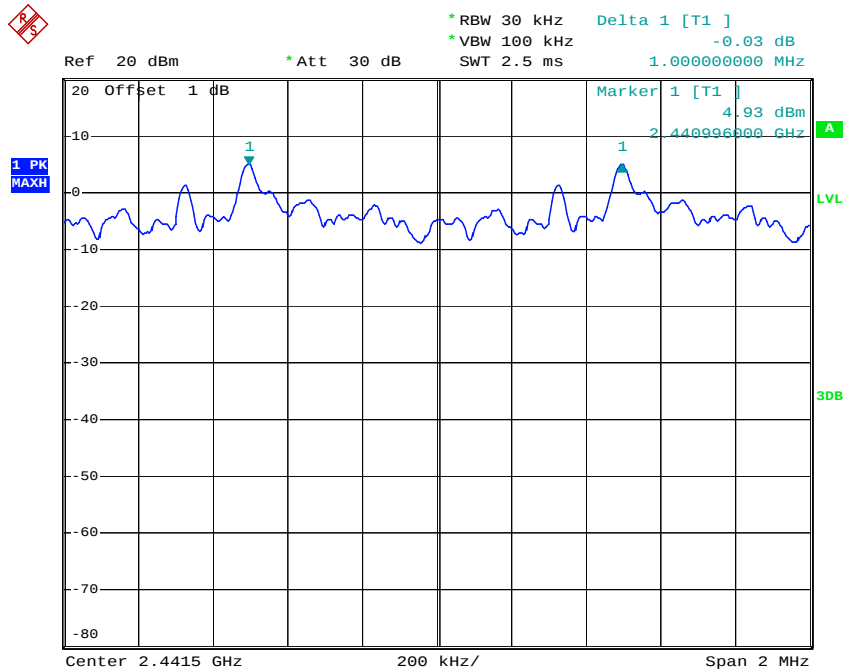
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



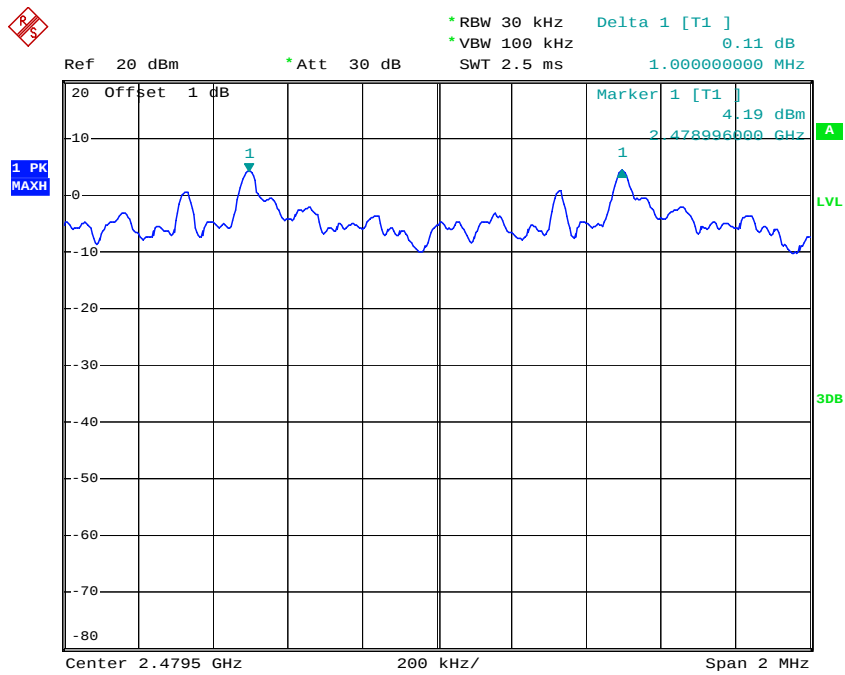
Date: 7.MAY.2016 13:30:00

Middle Channel



Date: 7.MAY.2016 13:31:36

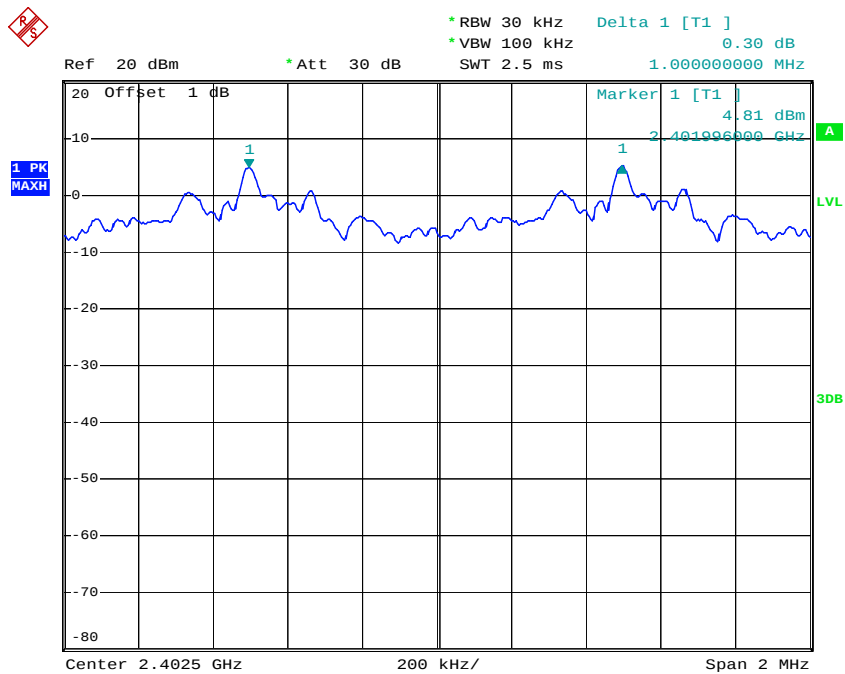
High Channel



Date: 7.MAY.2016 13:32:29

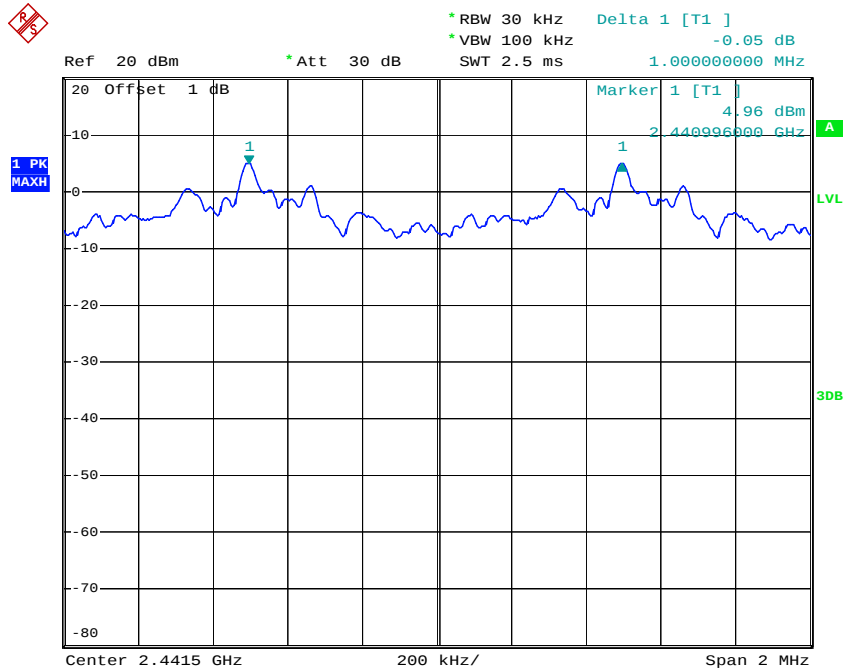
EDR Mode (8-DPSK):

Low Channel



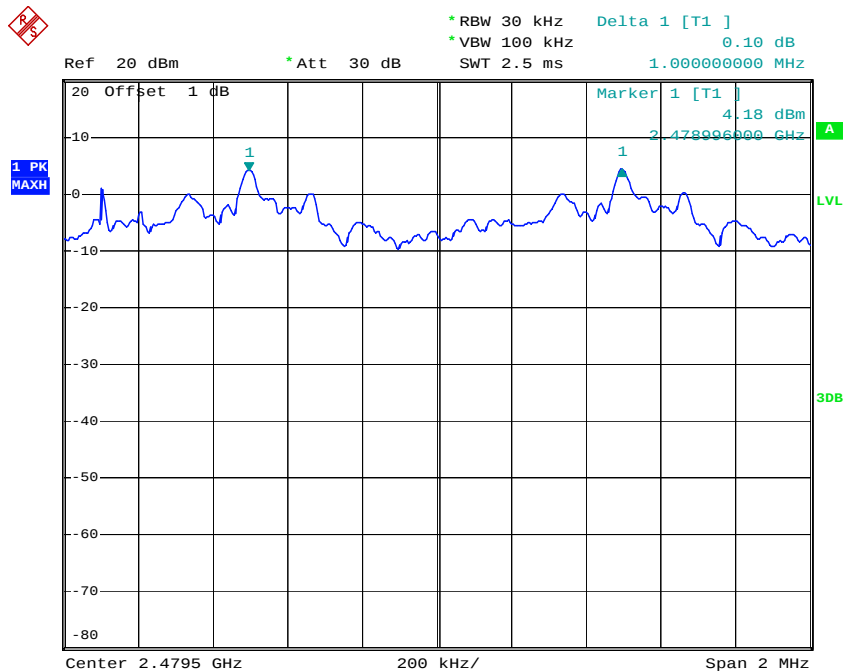
Date: 7.MAY.2016 13:47:49

Middle Channel



Date: 7.MAY.2016 13:46:49

High Channel



Date: 7.MAY.2016 13:45:58

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

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **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:	29.7°C
Relative Humidity:	61%
ATM Pressure:	100.4kPa

The testing was performed by Gavin Xu on 2016-05-07.

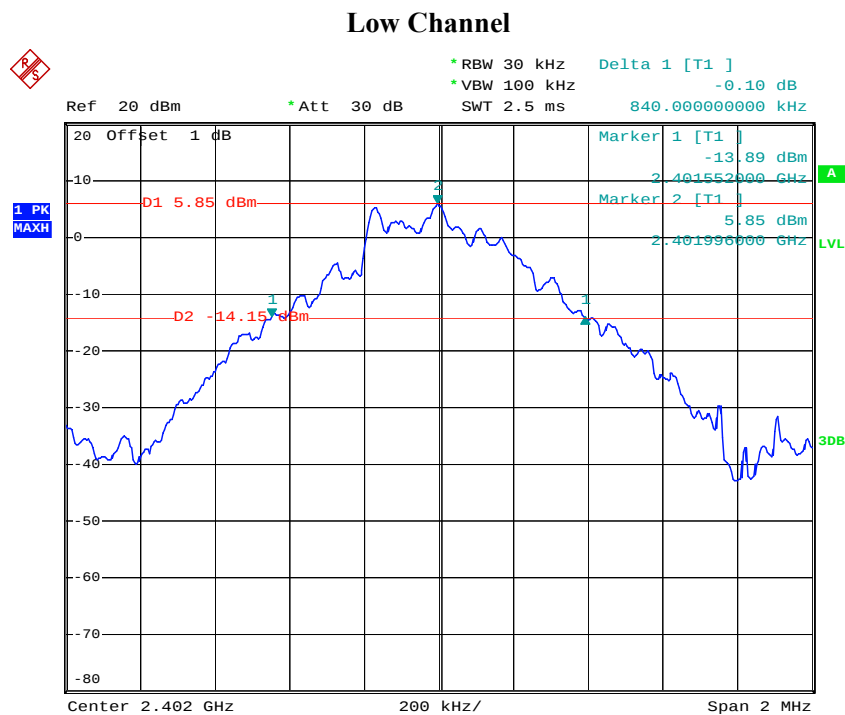
Test Result: Compliance.

Please refer to following tables and plots

Test Mode: Transmitting

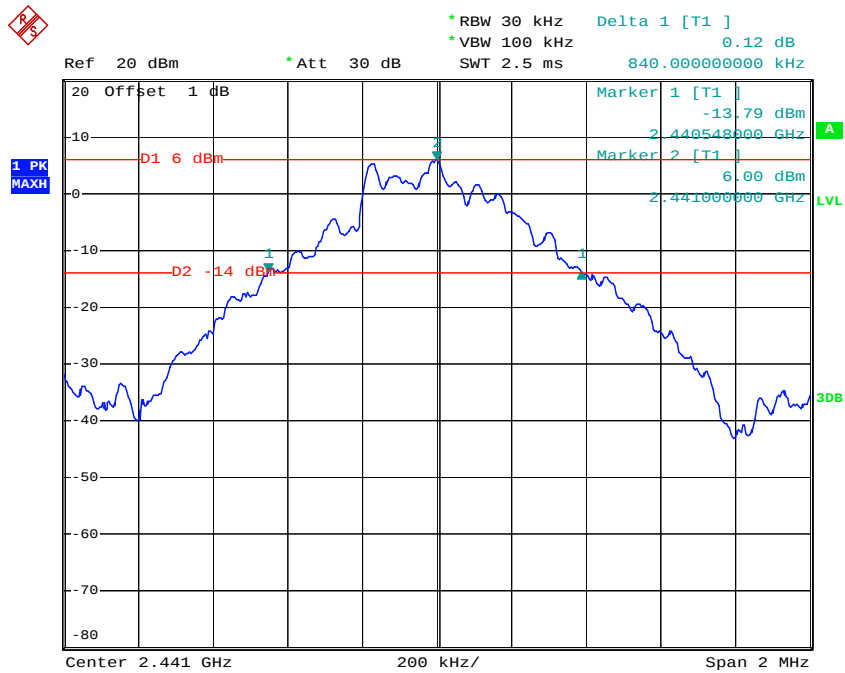
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.84
	Middle	2441	0.84
	High	2480	0.84
EDR Mode ($\pi/4$ -DQPSK):	Low	2402	1.23
	Middle	2441	1.22
	High	2480	1.22
EDR Mode (8-DPSK):	Low	2402	1.21
	Middle	2441	1.21
	High	2480	1.21

BDR Mode (GFSK):



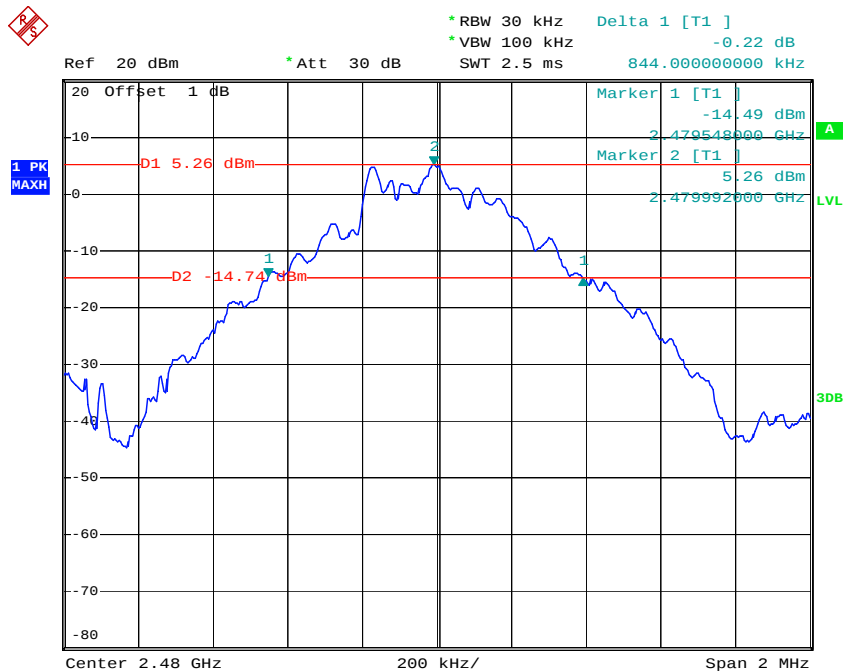
Date: 7.MAY.2016 13:20:12

Middle Channel



Date: 7.MAY.2016 13:22:05

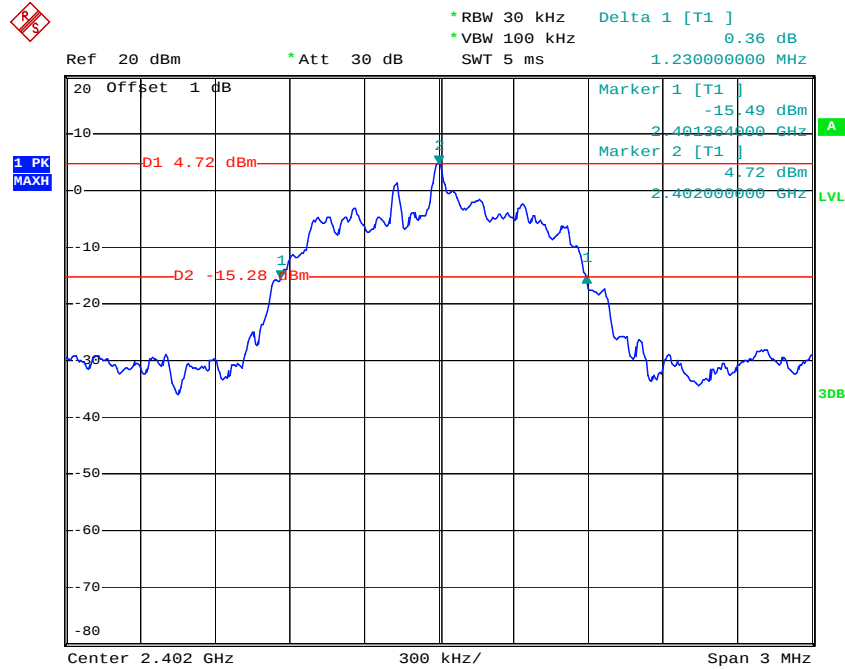
High Channel



Date: 7.MAY.2016 13:23:10

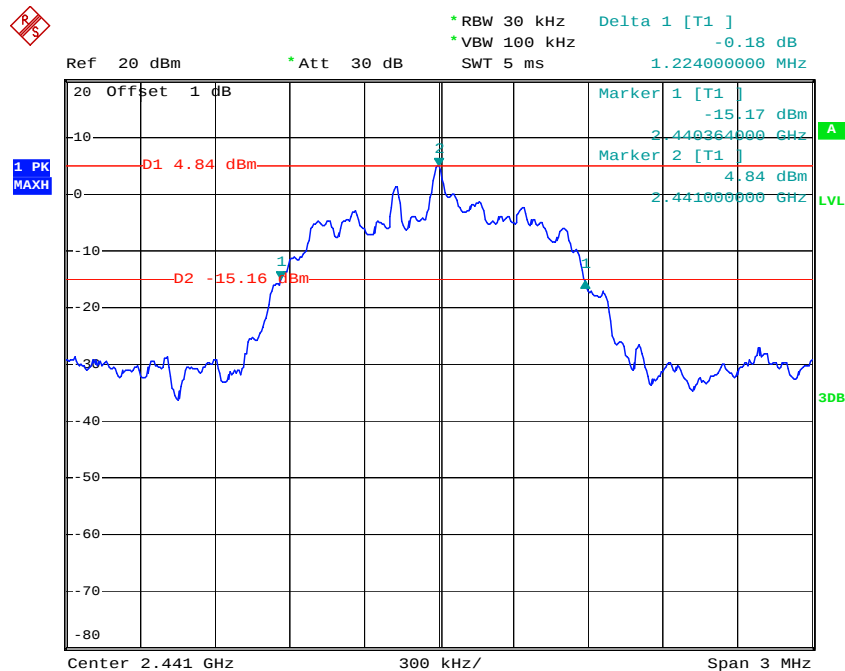
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



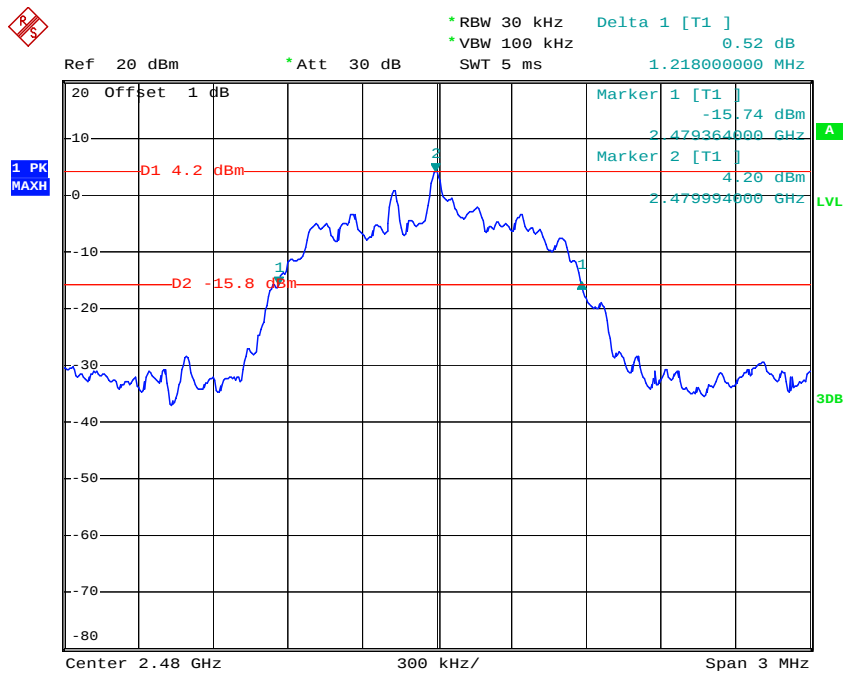
Date: 7.MAY.2016 13:37:04

Middle Channel



Date: 7.MAY.2016 13:35:27

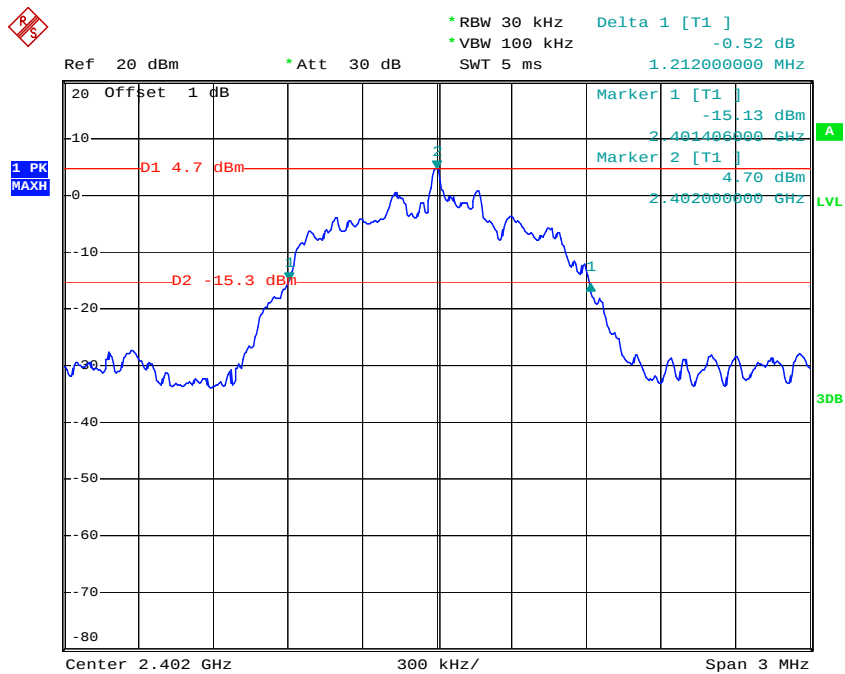
High Channel



Date: 7.MAY.2016 13:33:02

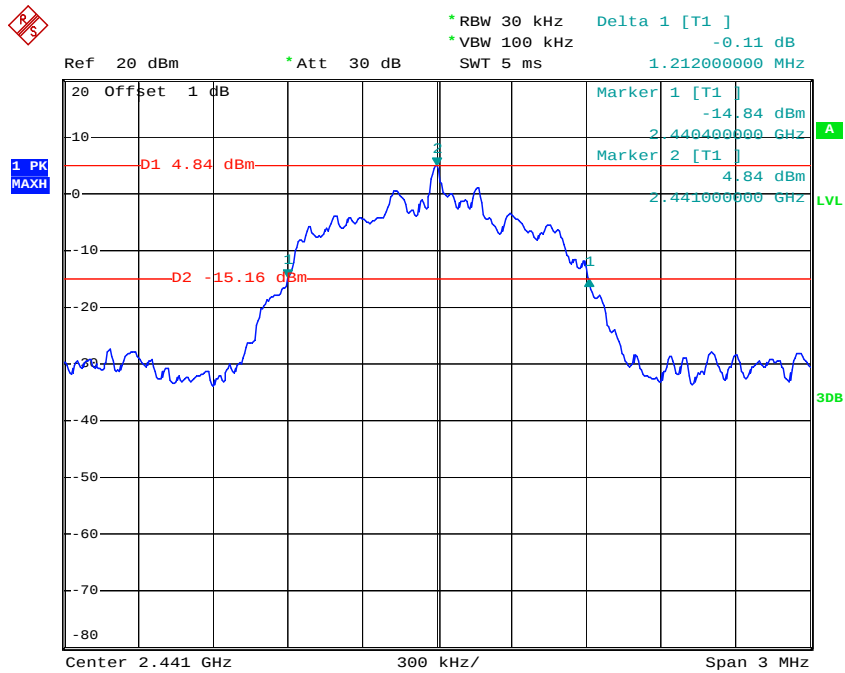
EDR Mode (8-DPSK):

Low Channel



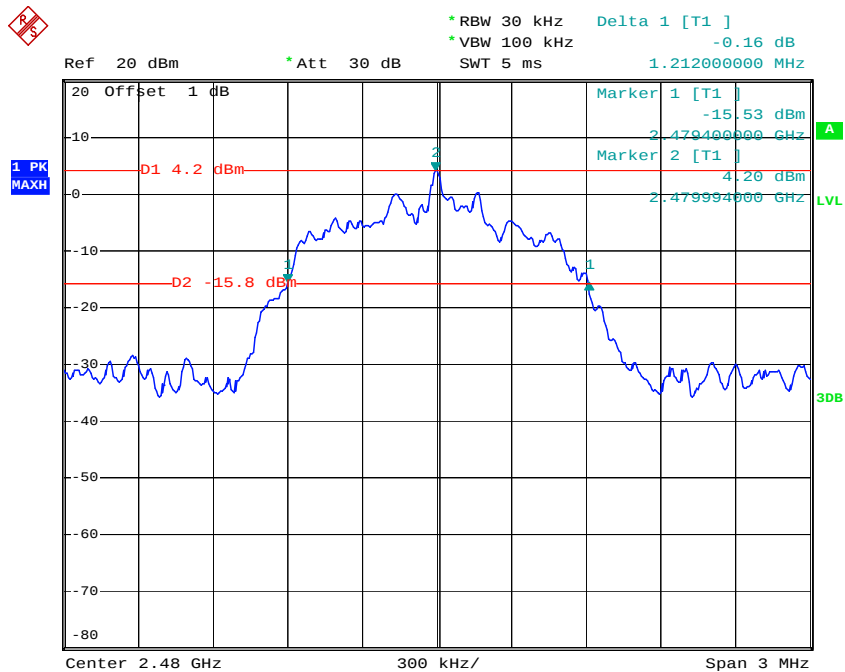
Date: 7.MAY.2016 13:41:08

Middle Channel



Date: 7.MAY.2016 13:42:40

High Channel



Date: 7.MAY.2016 13:43:53

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

Applicable Standard

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **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:	29.7°C
Relative Humidity:	61%
ATM Pressure:	100.4kPa

The testing was performed by Gavin Xu on 2016-05-07.

Test Result: Compliance.

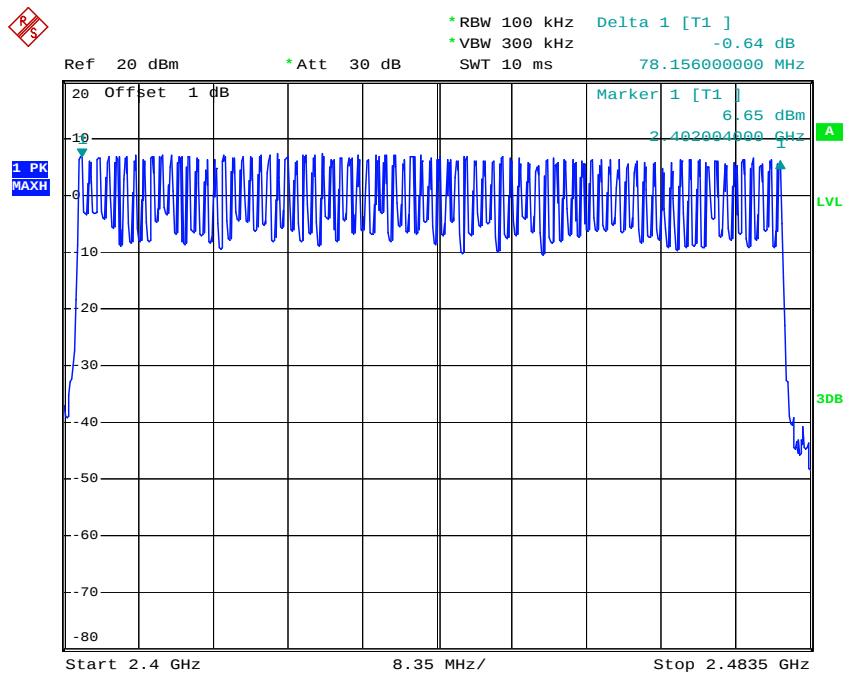
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥ 75

Number of Hopping Channels

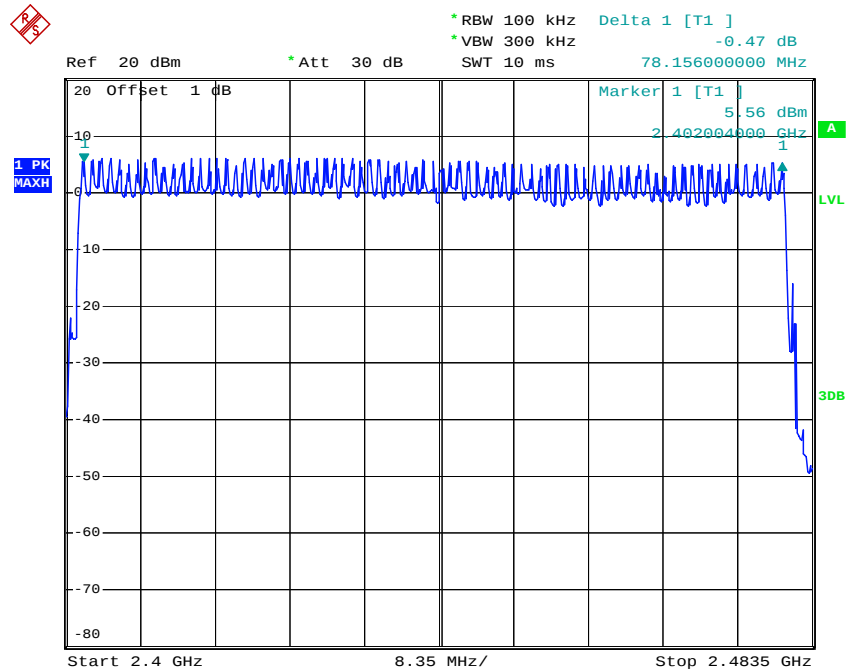


Date: 7.MAY.2016 14:01:02

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

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥ 75

Number of Hopping Channels

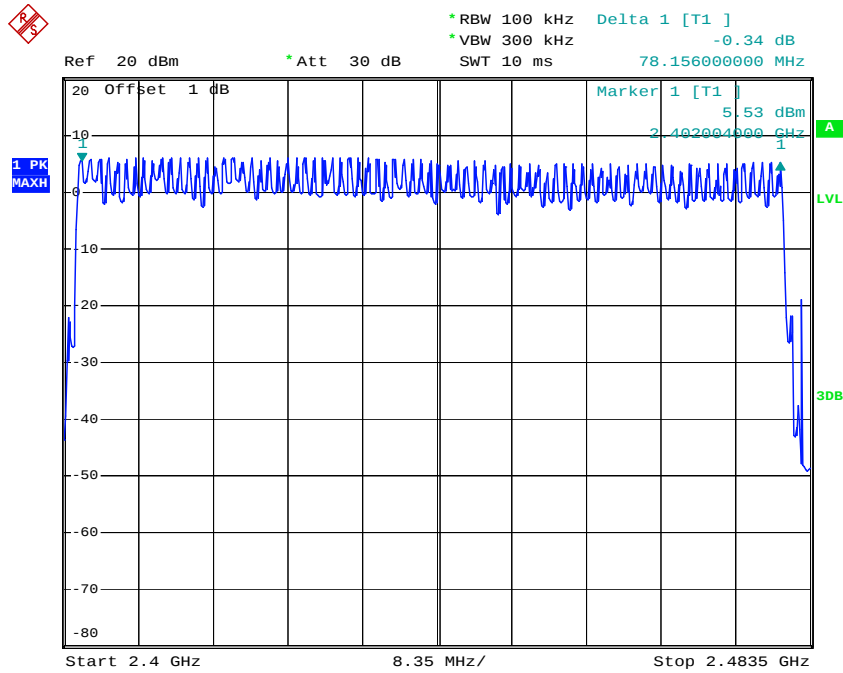


Date: 7.MAY.2016 14:05:19

EDR Mode (8-DPSK):

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥75

Number of Hopping Channels



Date: 7.MAY.2016 14:12:32

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. Sweep was set as $0.4 \times \text{channel no. (s)}$, the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell Time= time slot length * hope rate/ number of hopping channels * 31.6s
Hop rate=1600/s

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **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:	29.7°C
Relative Humidity:	61%
ATM Pressure:	100.4kPa

The testing was performed by Gavin Xu on 2016-05-07.

Test Result: Compliance.

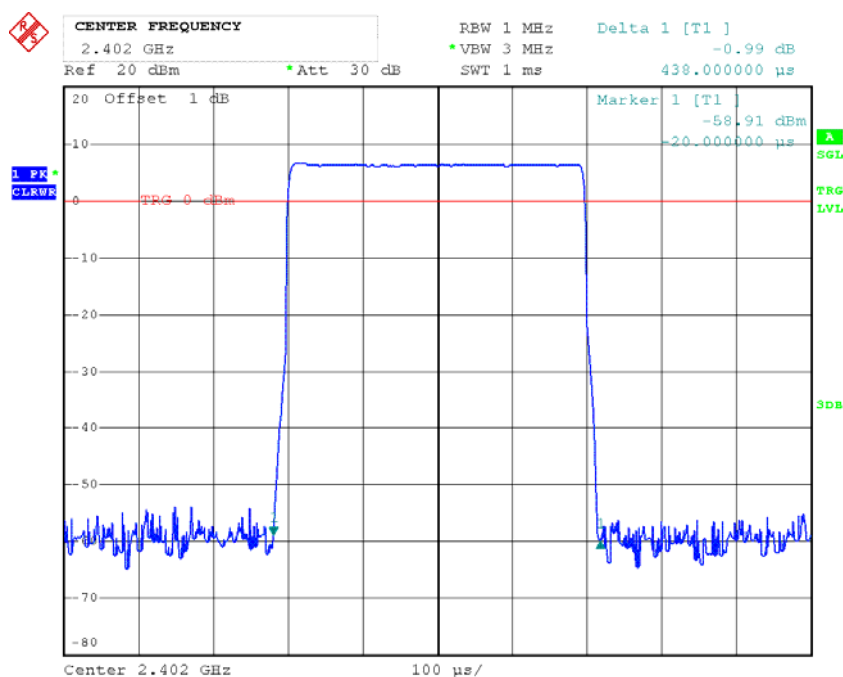
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

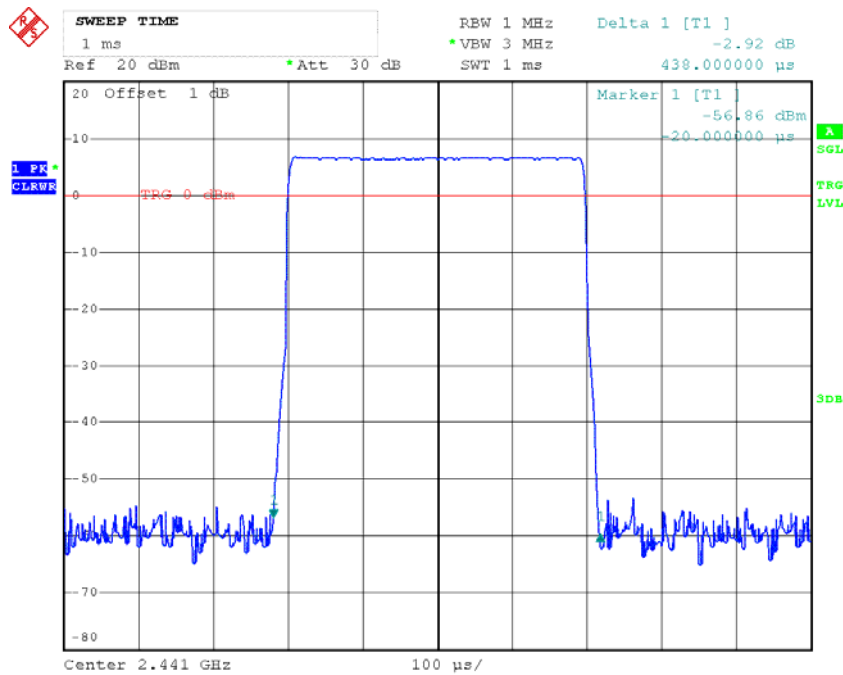
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.438	0.140	0.4	Compliance
	Middle	0.438	0.140	0.4	Compliance
	High	0.438	0.140	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
DH3	Low	1.716	0.275	0.4	Compliance
	Middle	1.716	0.275	0.4	Compliance
	High	1.716	0.275	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
DH5	Low	2.986	0.319	0.4	Compliance
	Middle	2.986	0.319	0.4	Compliance
	High	2.986	0.319	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

DH1: Low Channel



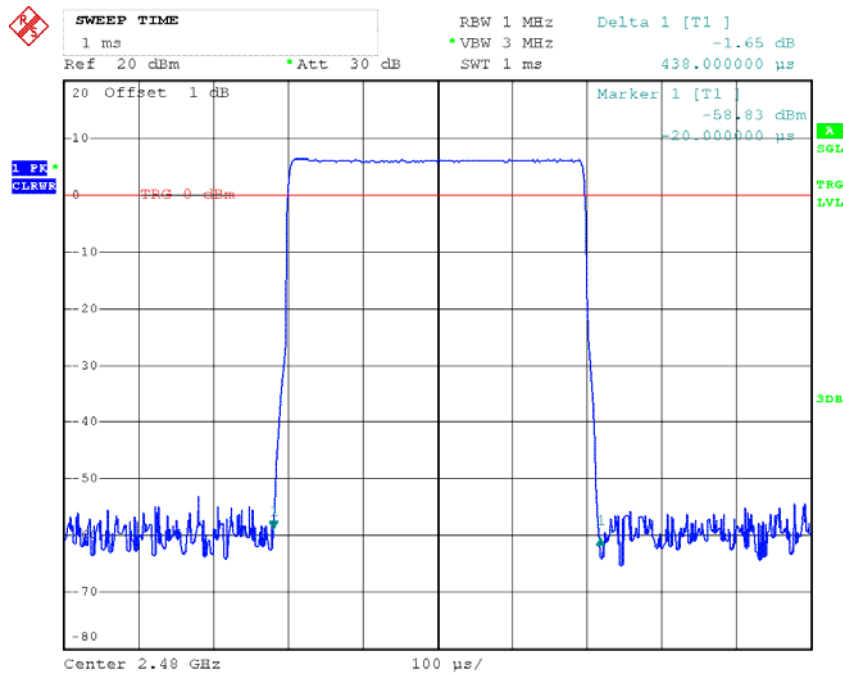
Date: 7.MAY.2016 14:16:03

DH1: Middle Channel



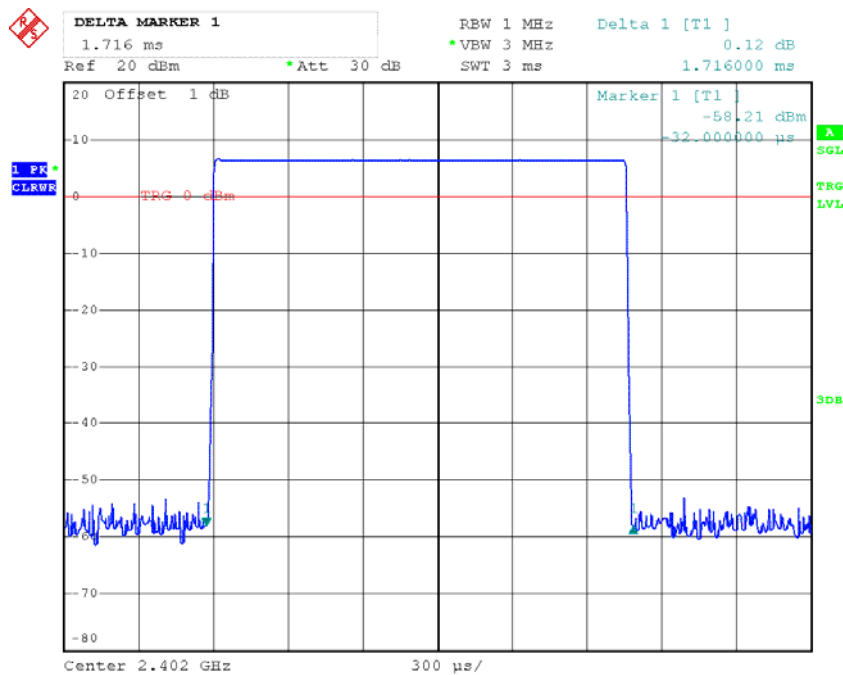
Date: 7.MAY.2016 14:16:16

DH1: High Channel



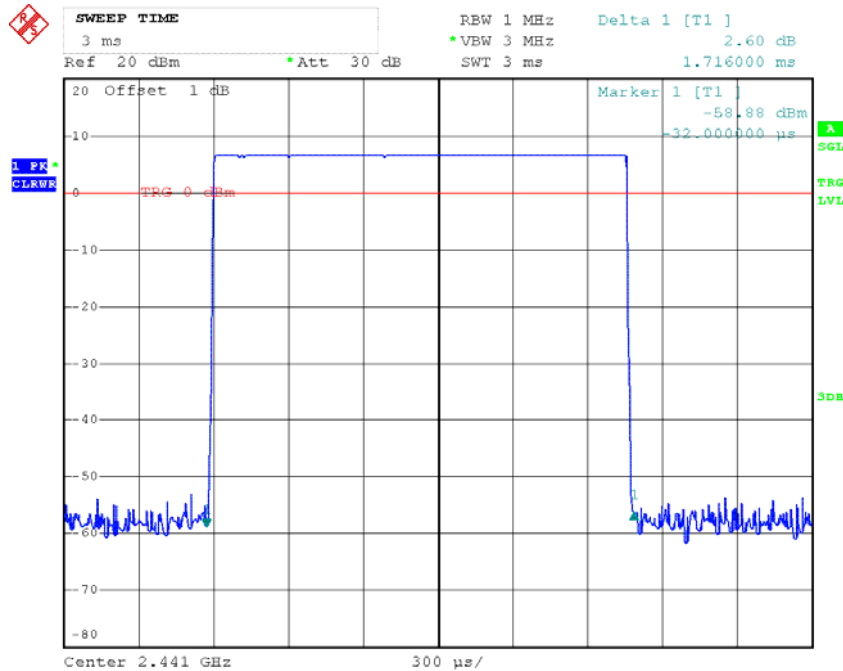
Date: 7.MAY.2016 14:16:24

DH3: Low Channel



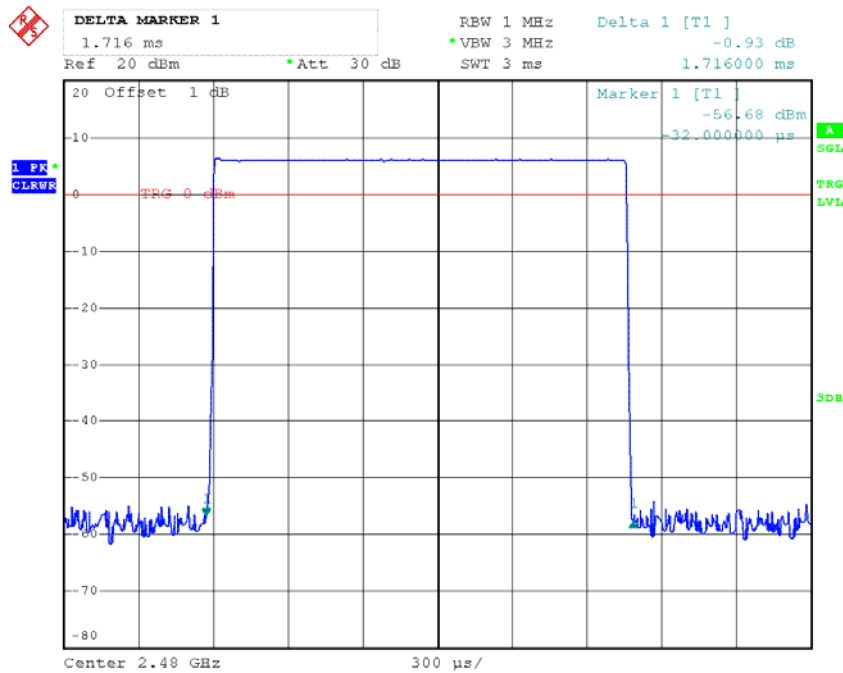
Date: 7.MAY.2016 14:18:09

DH3: Middle Channel



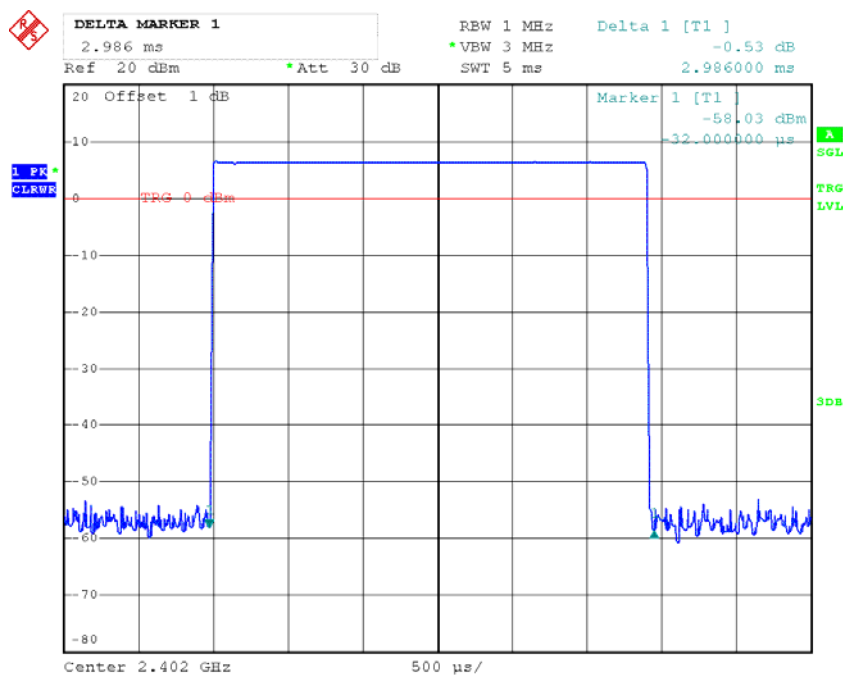
Date: 7.MAY.2016 14:17:51

DH3: High Channel



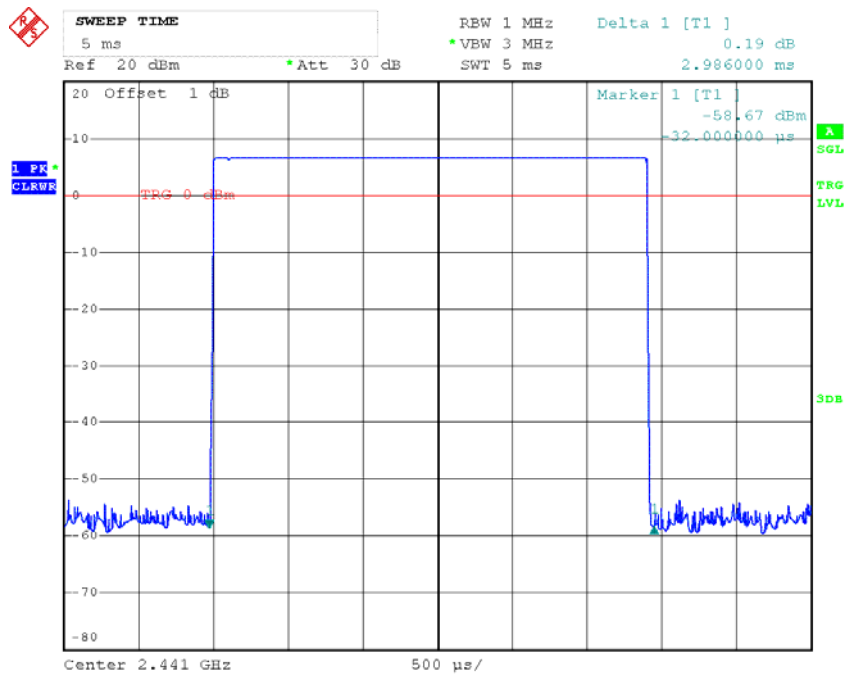
Date: 7.MAY.2016 14:17:42

DH5: Low Channel



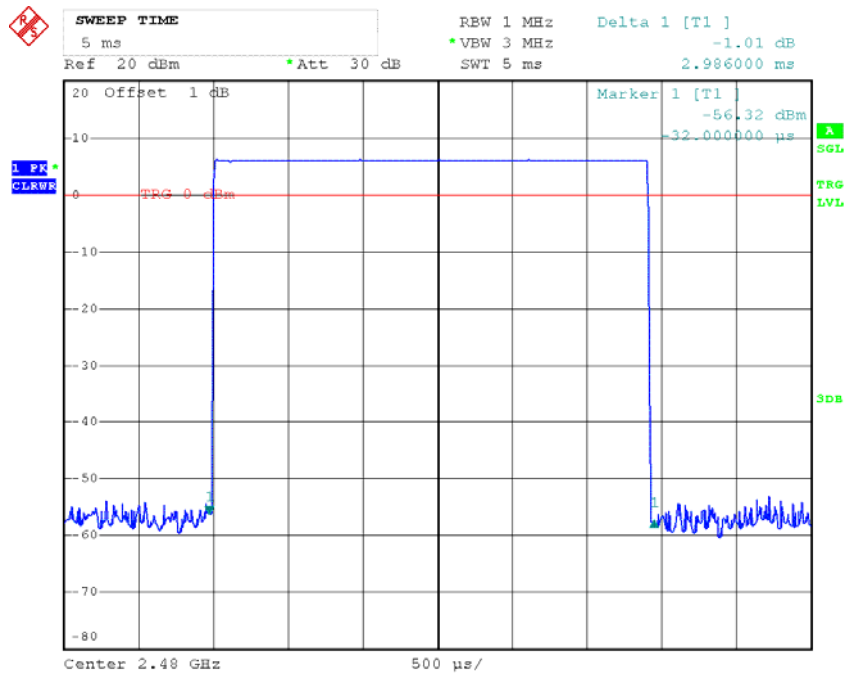
Date: 7.MAY.2016 14:19:08

DH5: Middle Channel



Date: 7.MAY.2016 14:19:18

DH5: High Channel

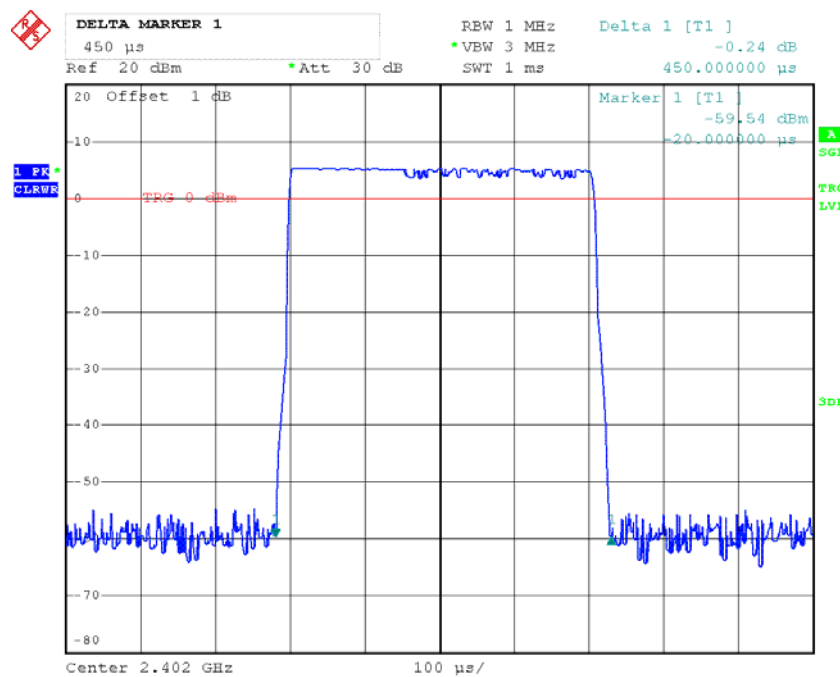


Date: 7.MAY.2016 14:19:27

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

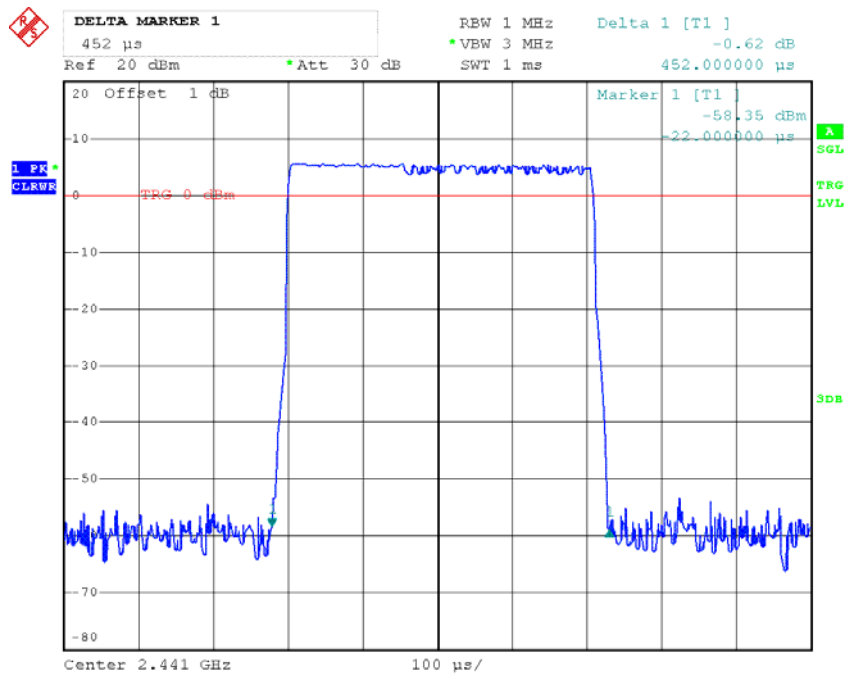
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
2DH1	Low	0.450	0.144	0.4	Compliance
	Middle	0.452	0.145	0.4	Compliance
	High	0.452	0.145	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
2DH3	Low	1.718	0.275	0.4	Compliance
	Middle	1.736	0.278	0.4	Compliance
	High	1.718	0.275	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
2DH5	Low	3.008	0.321	0.4	Compliance
	Middle	2.968	0.317	0.4	Compliance
	High	2.978	0.318	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

2DH1: Low Channel



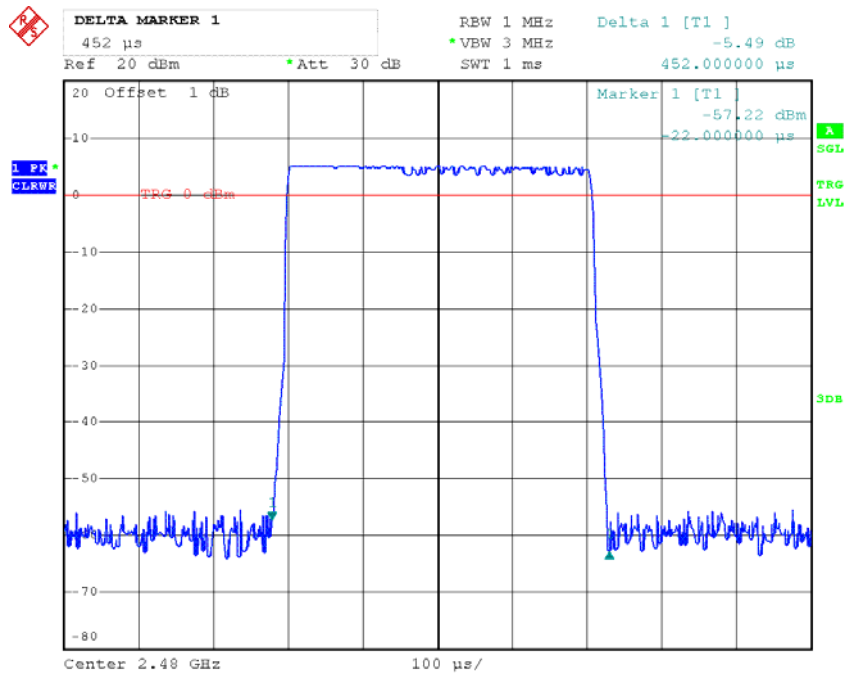
Date: 7.MAY.2016 14:25:13

2DH1: Middle Channel



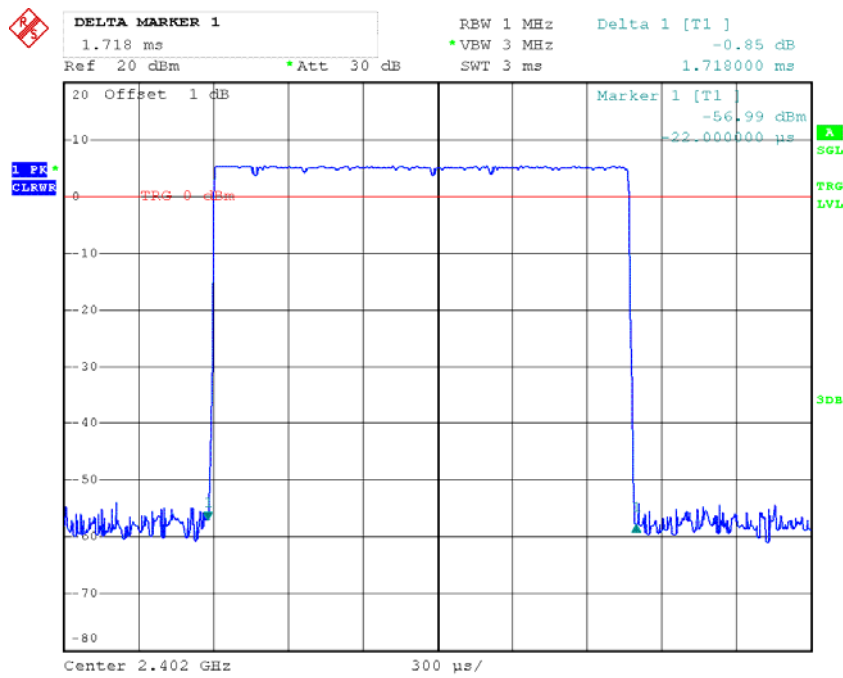
Date: 7.MAY.2016 14:25:35

2DH1: High Channel



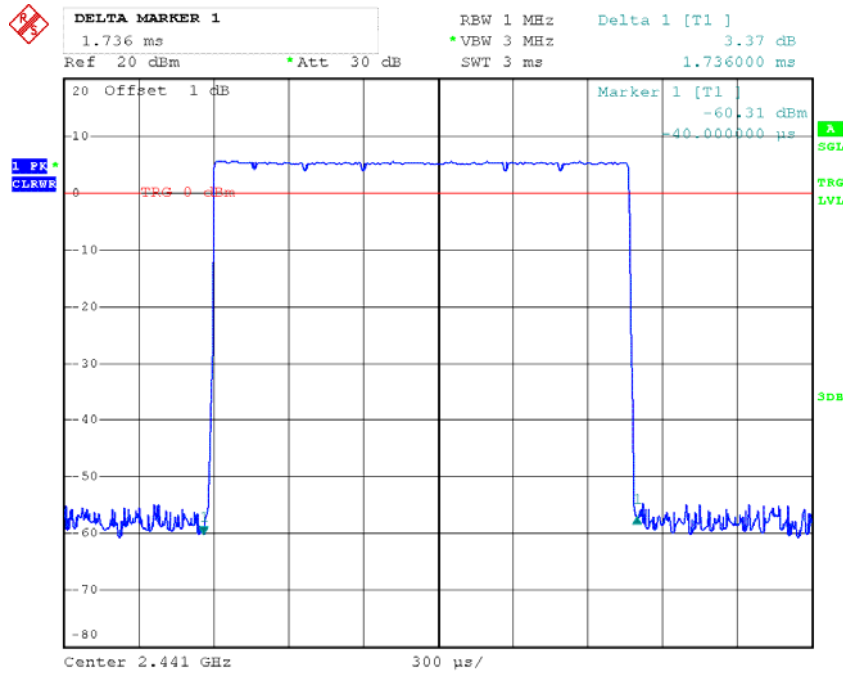
Date: 7.MAY.2016 14:26:01

2DH3: Low Channel



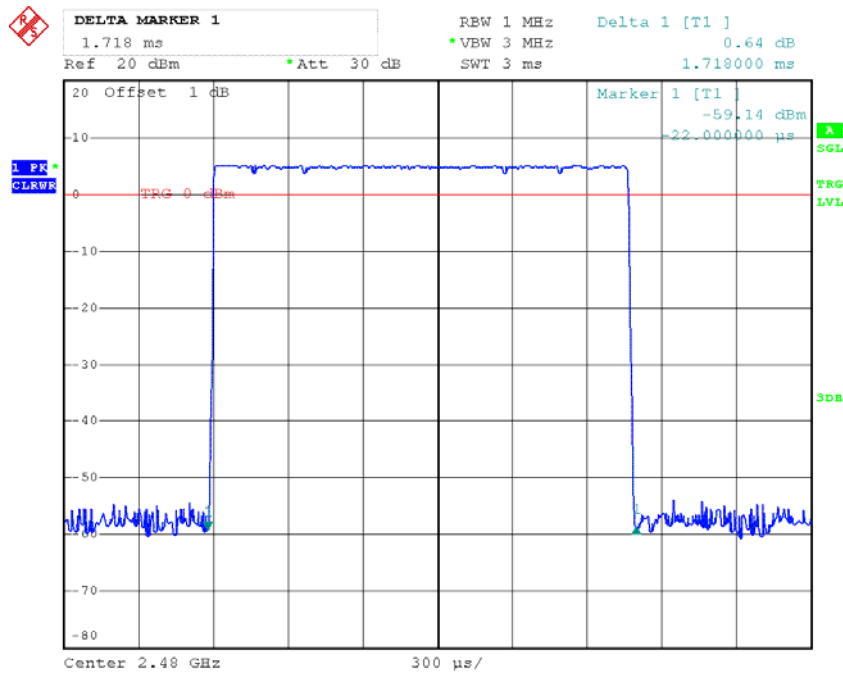
Date: 7.MAY.2016 14:27:20

2DH3: Middle Channel



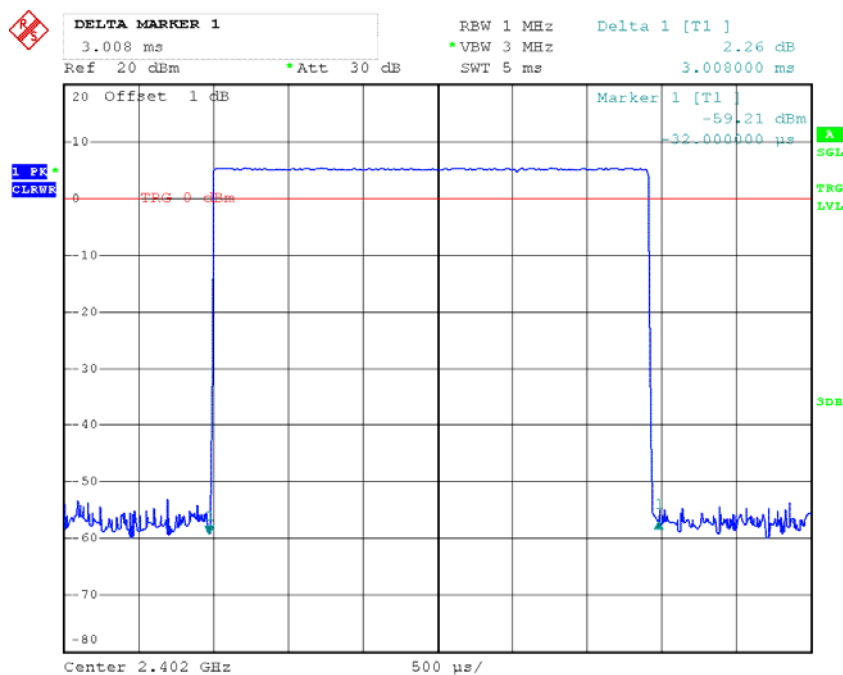
Date: 7.MAY.2016 14:27:06

2DH3: High Channel



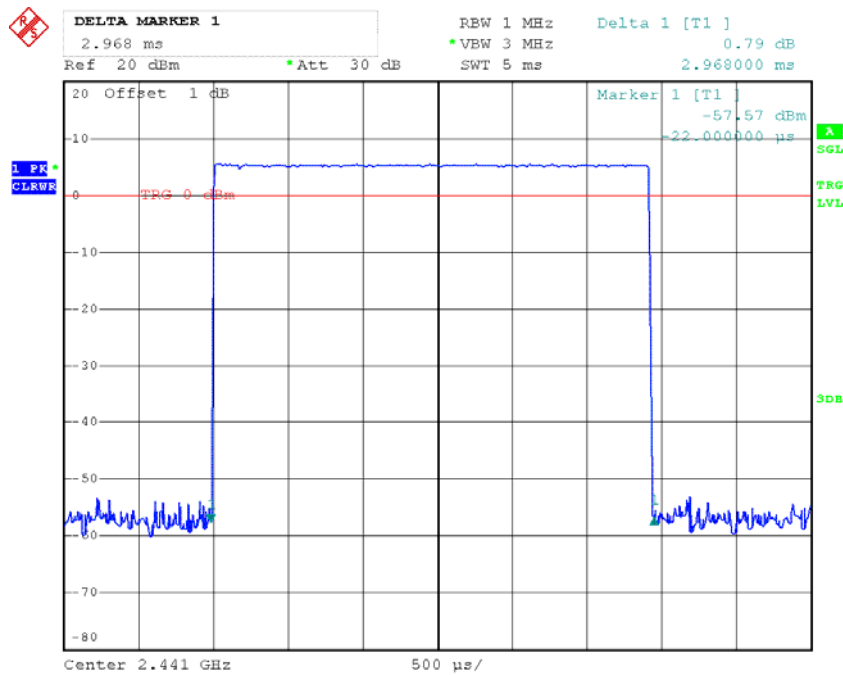
Date: 7.MAY.2016 14:26:44

2DH5: Low Channel



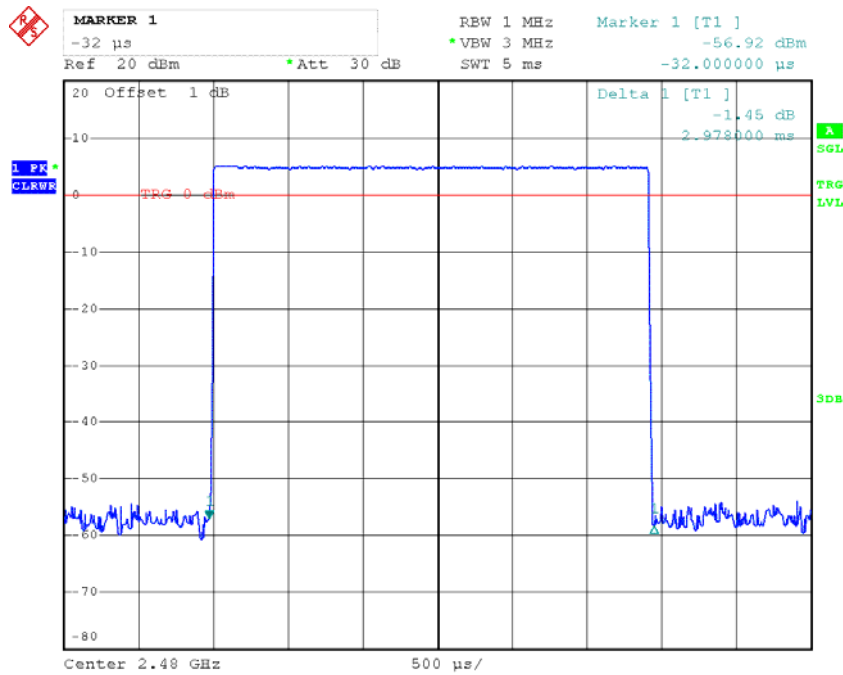
Date: 7.MAY.2016 14:28:15

2DH5: Middle Channel



Date: 7.MAY.2016 14:29:32

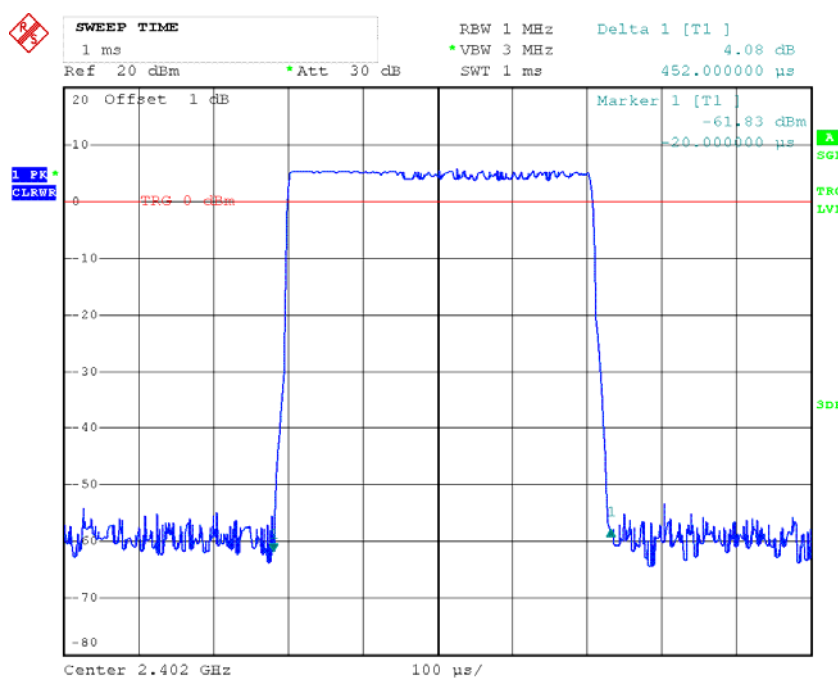
2DH5: High Channel



Date: 7.MAY.2016 14:36:45

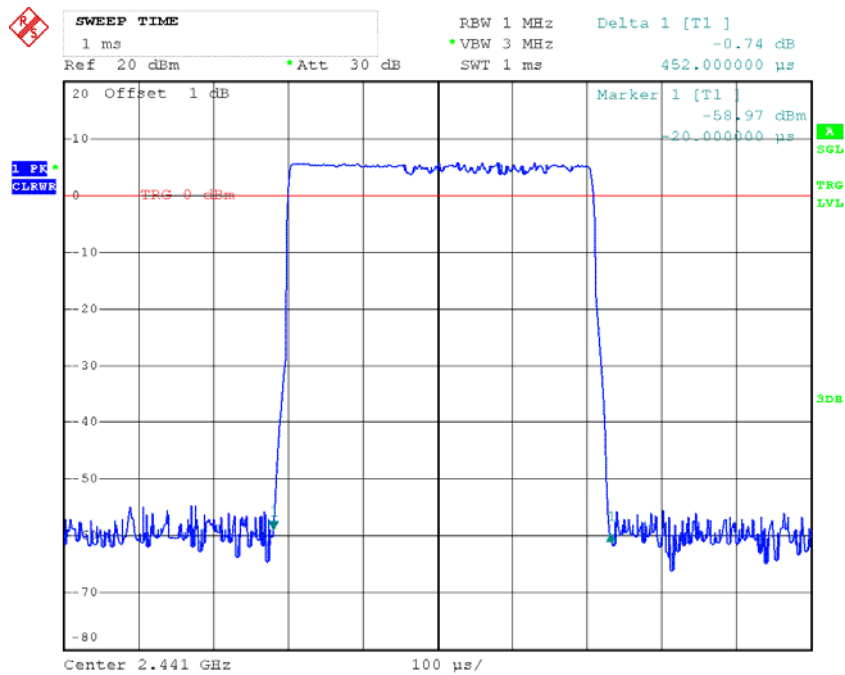
EDR Mode (8-DPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
3DH1	Low	0.452	0.145	0.4	Compliance
	Middle	0.452	0.145	0.4	Compliance
	High	0.452	0.145	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
3DH3	Low	1.730	0.277	0.4	Compliance
	Middle	1.724	0.276	0.4	Compliance
	High	1.718	0.275	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
3DH5	Low	2.998	0.320	0.4	Compliance
	Middle	2.978	0.318	0.4	Compliance
	High	2.968	0.317	0.4	Compliance
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

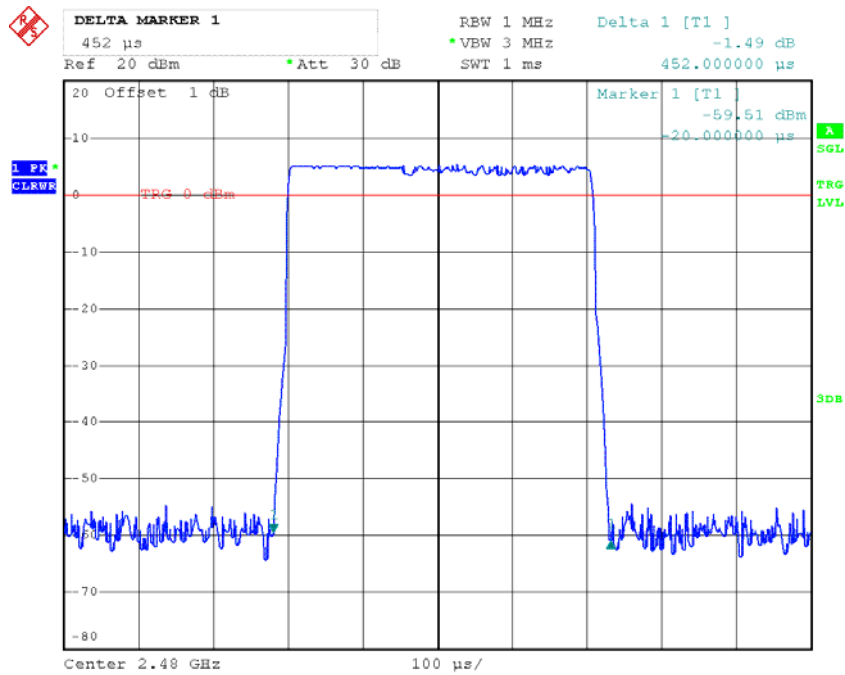
3DH1: Low Channel

Date: 7.MAY.2016 14:20:53

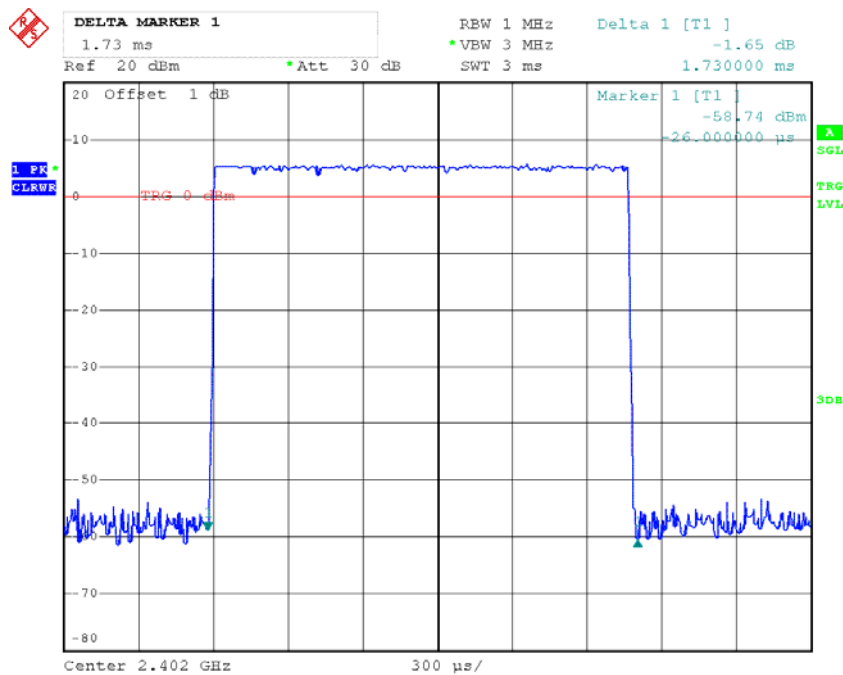
3DH1: Middle Channel



3DH1: High Channel

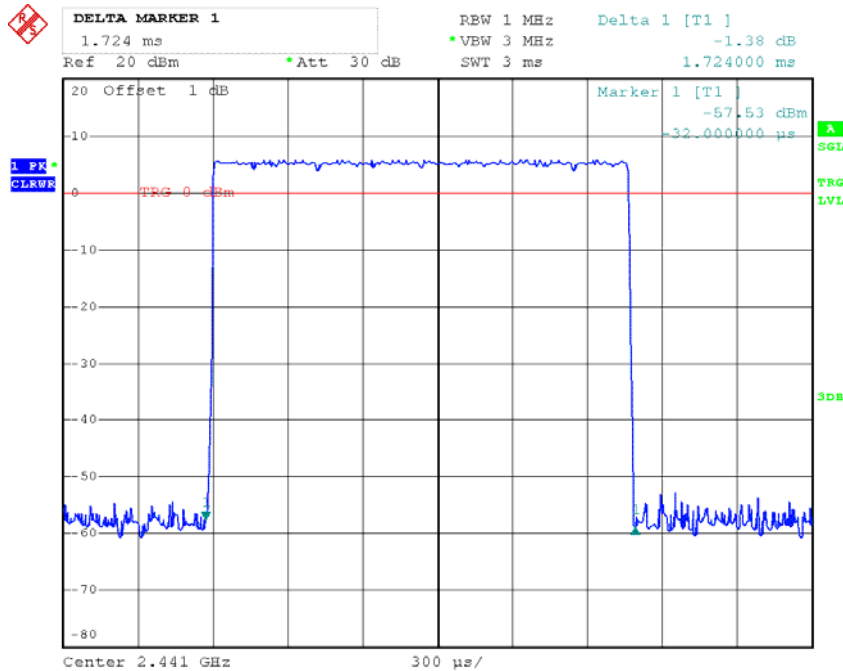


3DH3: Low Channel



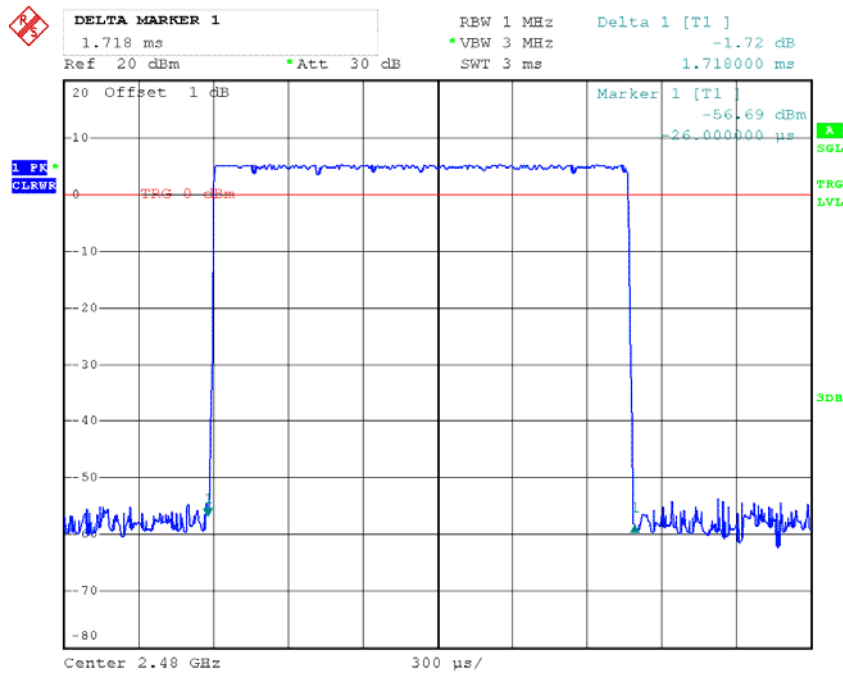
Date: 7.MAY.2016 14:21:37

3DH3: Middle Channel



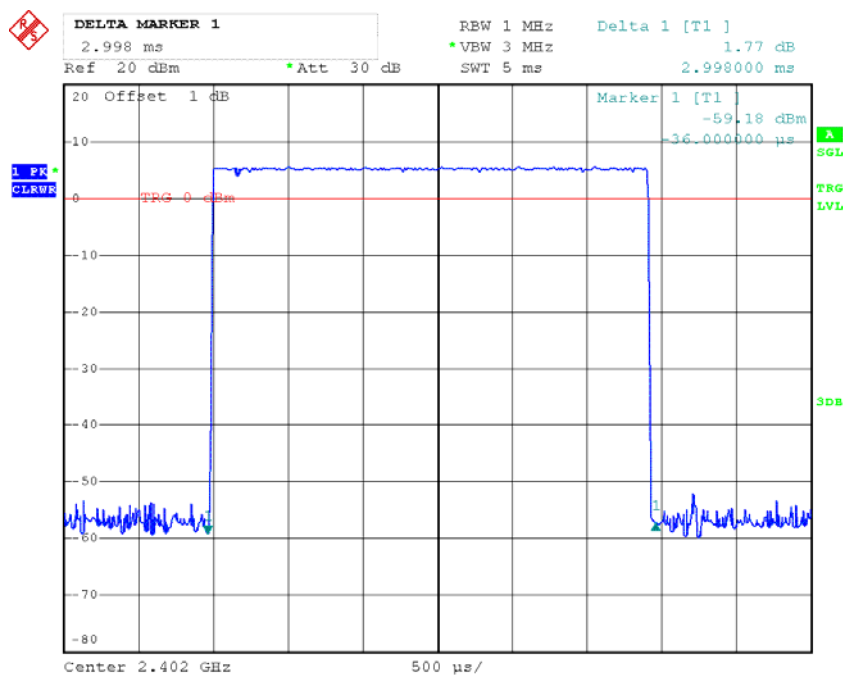
Date: 7.MAY.2016 14:22:09

3DH3: High Channel



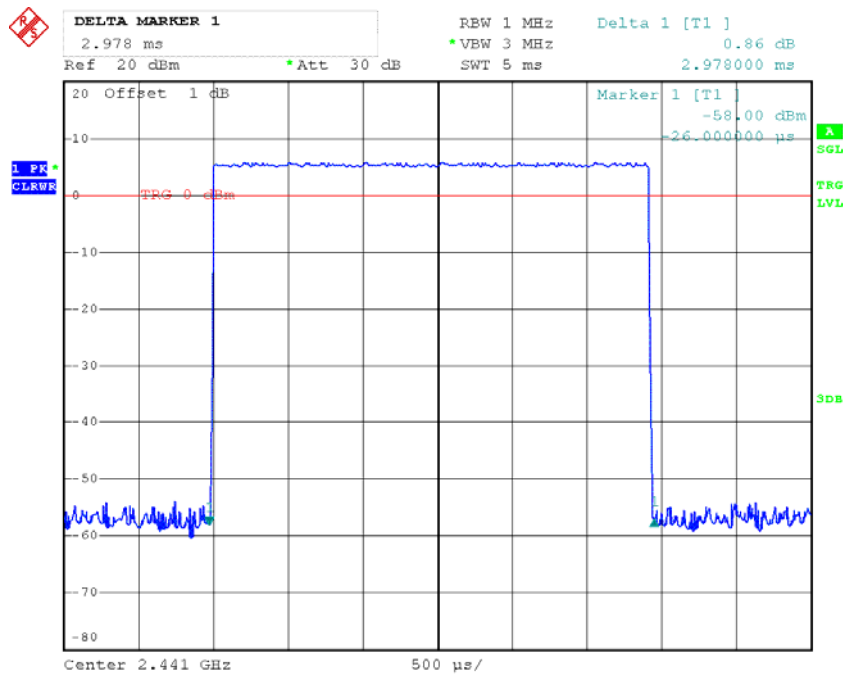
Date: 7.MAY.2016 14:22:29

3DH5: Low Channel



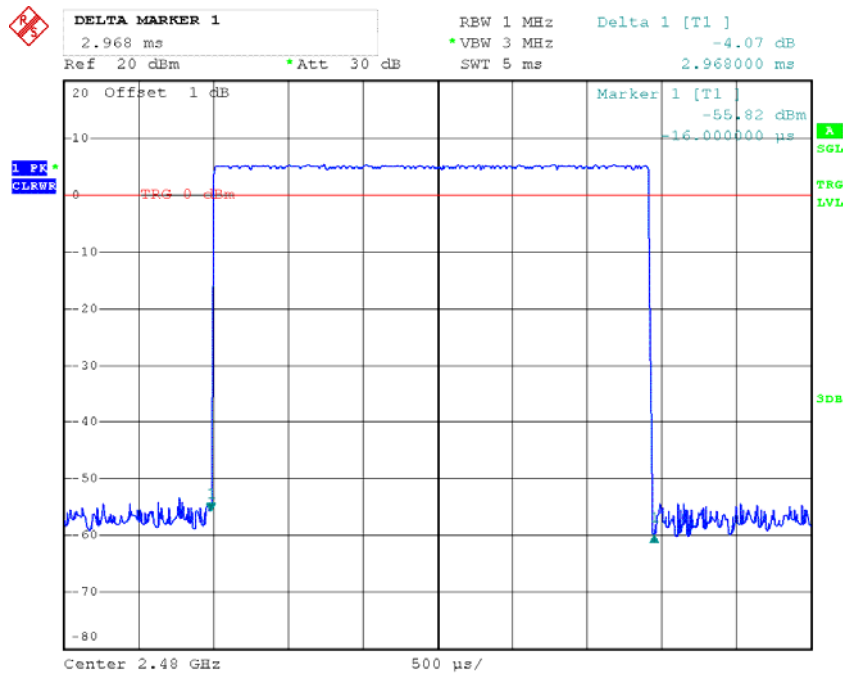
Date: 7.MAY.2016 14:24:23

3DH5: Middle Channel



Date: 7.MAY.2016 14:23:53

3DH5: High Channel



Date: 7.MAY.2016 14:23:40

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

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

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

* **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:	29.7°C
Relative Humidity:	61%
ATM Pressure:	100.4kPa

The testing was performed by Gavin Xu on 2016-05-07.

Test Result: Compliance.

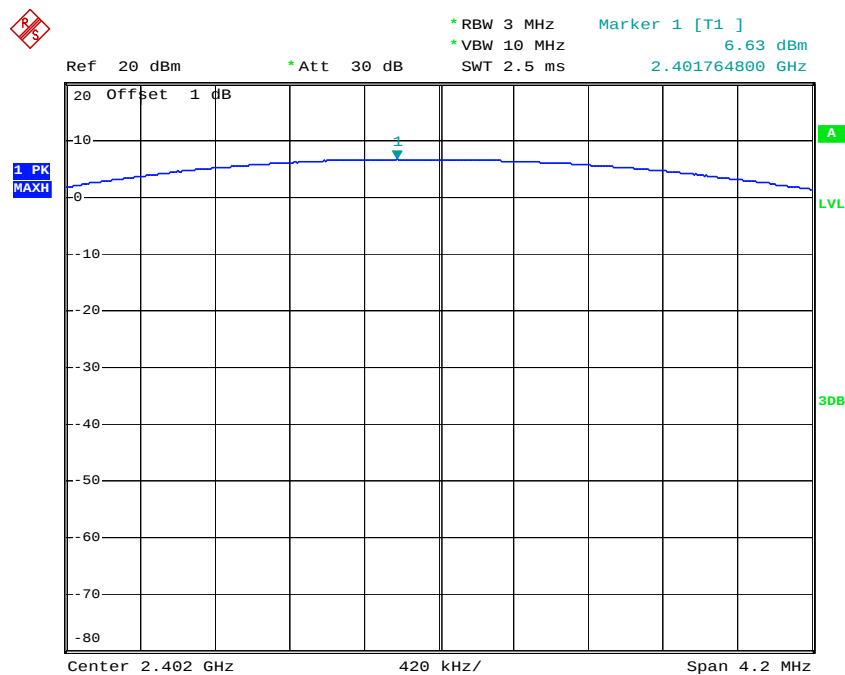
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	6.63	30
	Middle	2441	6.72	30
	High	2480	6.11	30
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	5.9	30
	Middle	2441	5.99	30
	High	2480	5.32	30
EDR Mode (8-DPSK)	Low	2402	5.99	30
	Middle	2441	6.14	30
	High	2480	5.44	30

Note: The data above was tested in conducted mode.

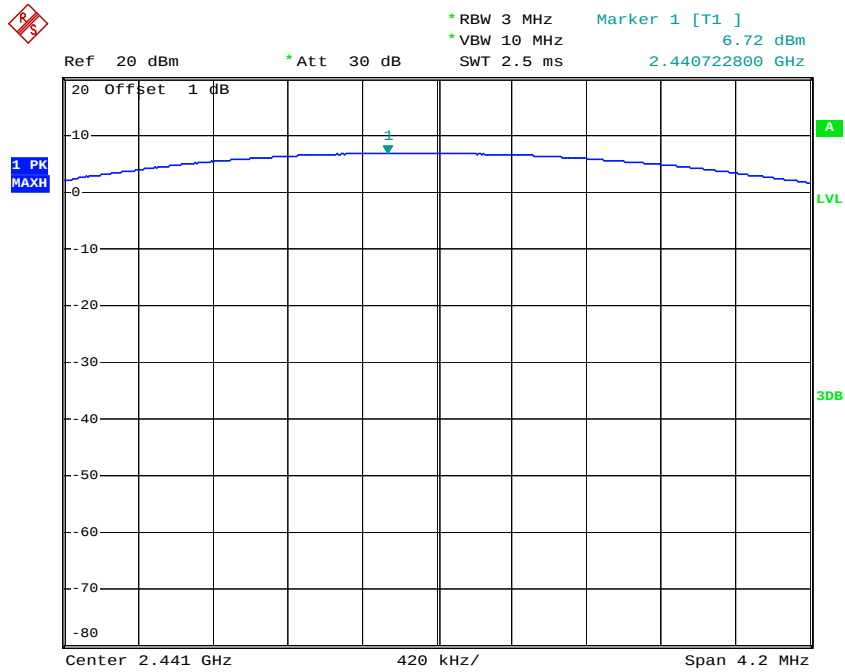
BDR Mode (GFSK):

Output Power, Low Channel



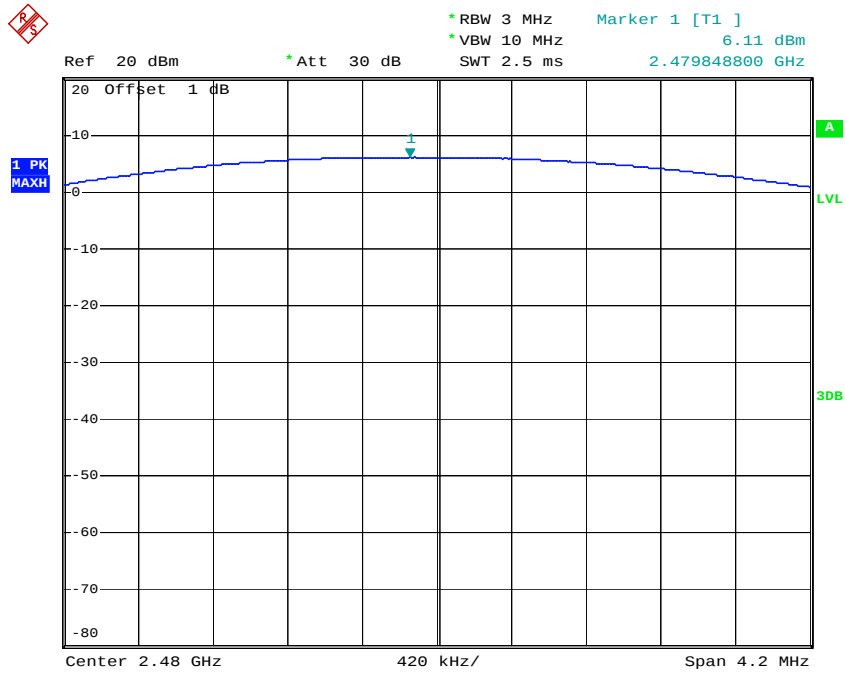
Date: 7.MAY.2016 13:20:45

Output Power, Middle Channel



Date: 7.MAY.2016 13:22:37

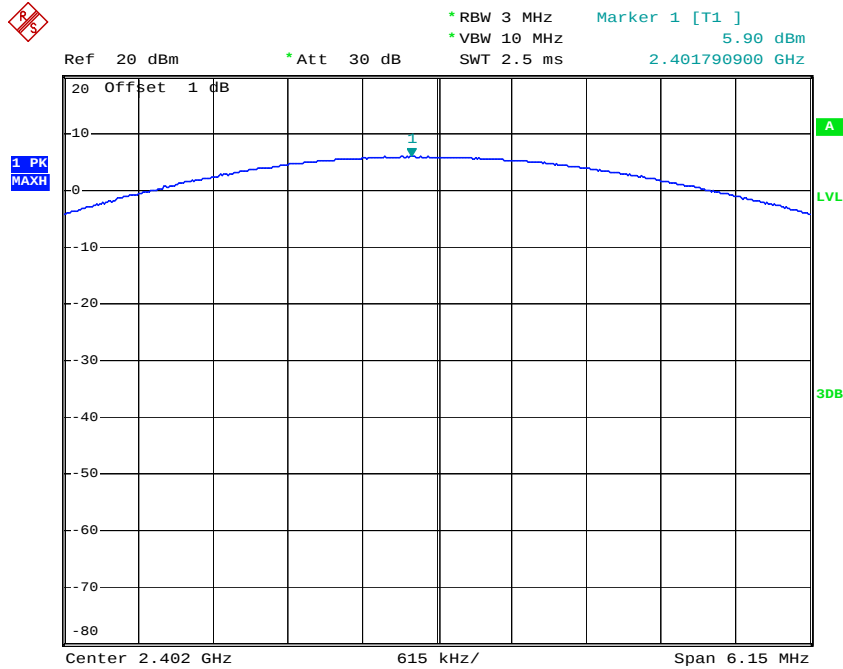
Output Power, High Channel



Date: 7.MAY.2016 13:23:43

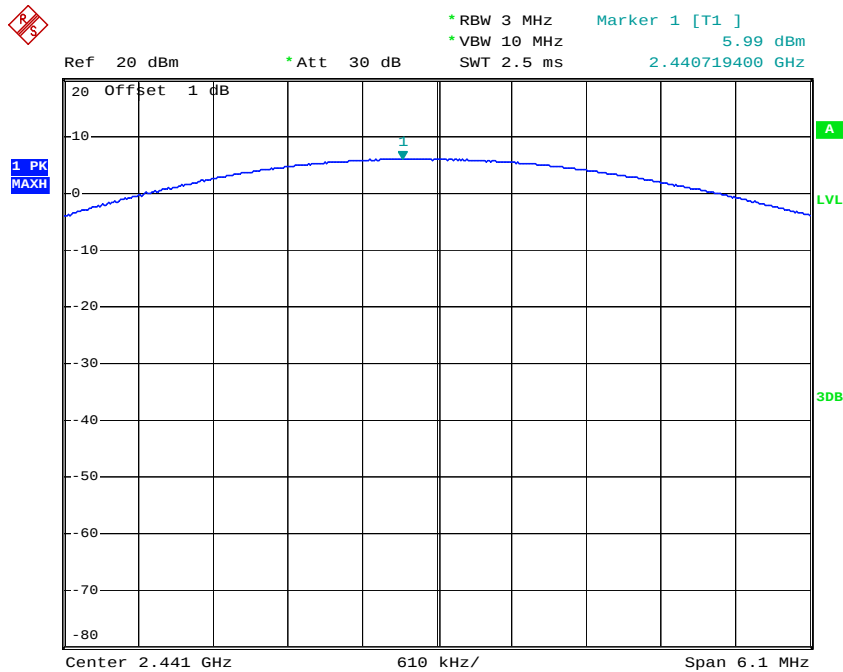
EDR Mode ($\pi/4$ -DQPSK):

Output Power, Low Channel



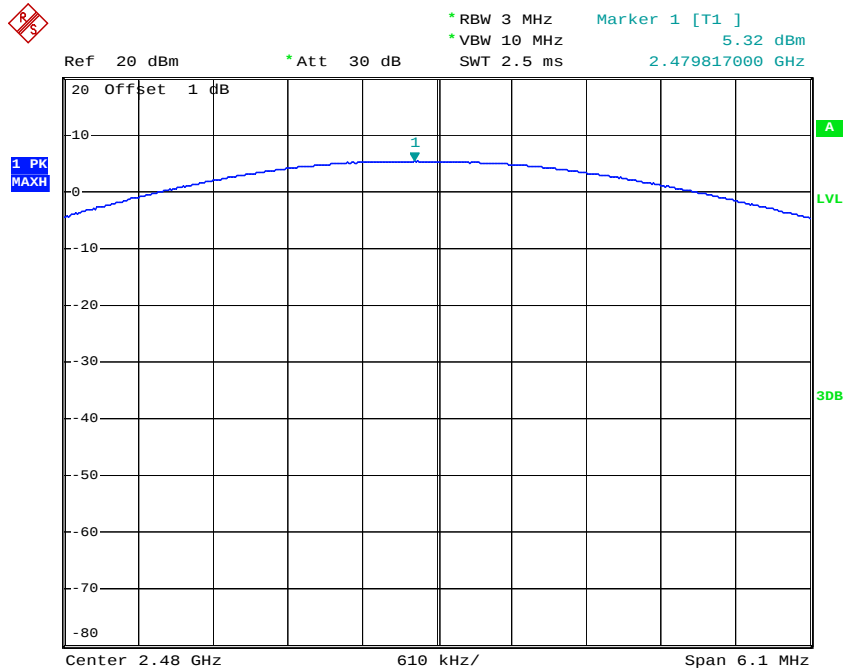
Date: 7.MAY.2016 13:37:37

Output Power, Middle Channel



Date: 7.MAY.2016 13:35:58

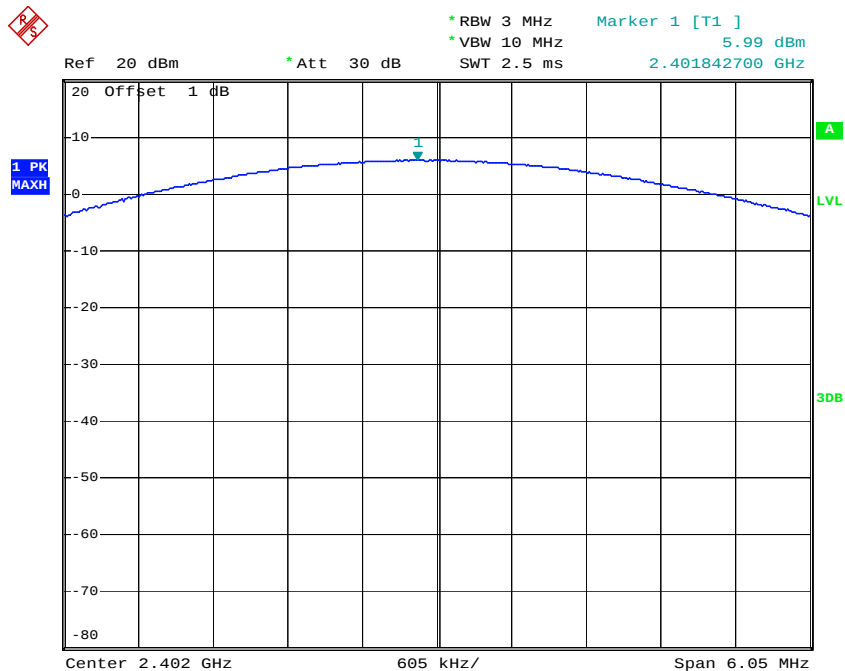
Output Power, High Channel



Date: 7.MAY.2016 13:33:34

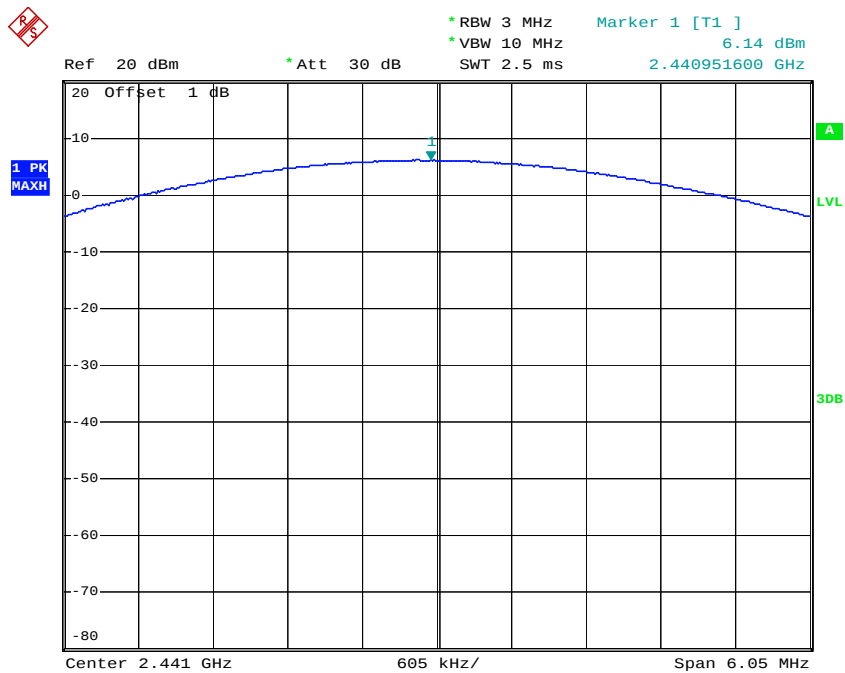
EDR Mode (8-DPSK):

Output Power, Low Channel



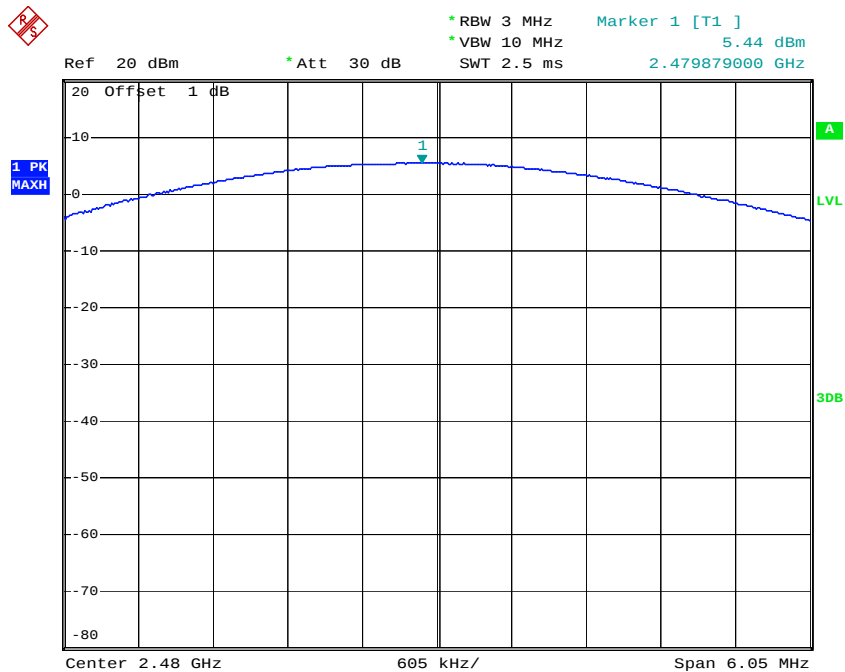
Date: 7.MAY.2016 13:41:39

Output Power, Middle Channel



Date: 7.MAY.2016 13:43:12

Output Power, High Channel



Date: 7.MAY.2016 13:44:26

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 both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06

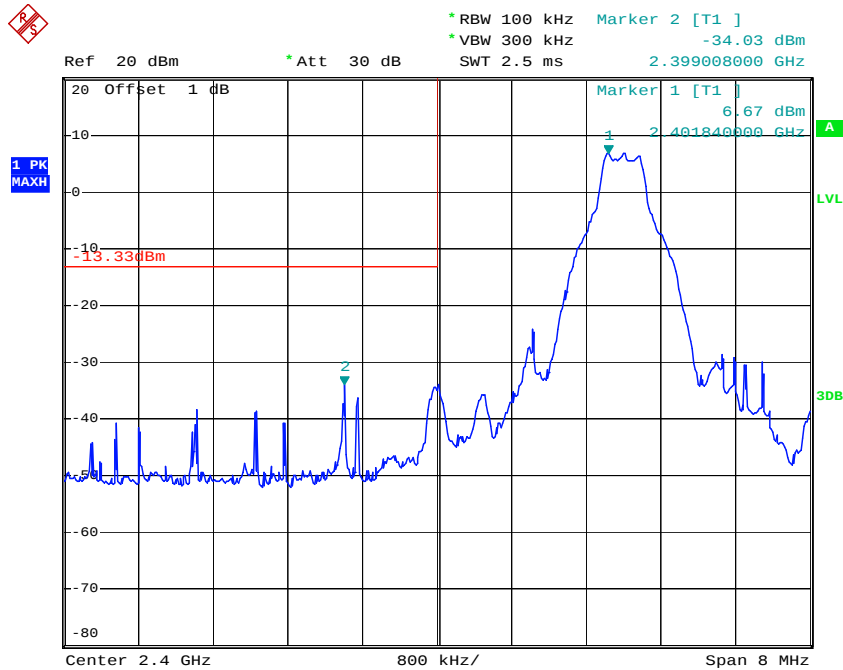
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

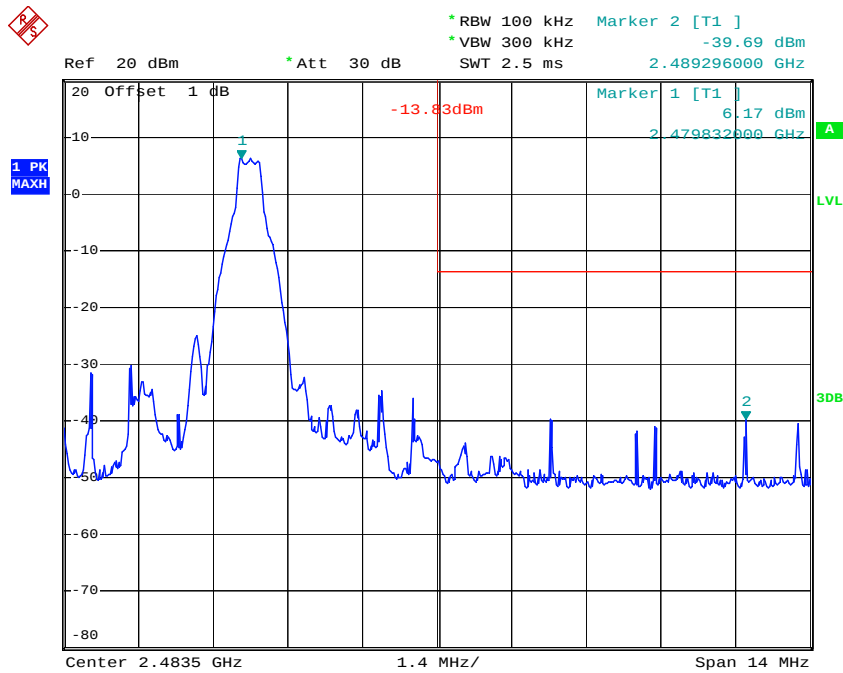
Environmental Conditions

Temperature:	29.7°C
Relative Humidity:	61%
ATM Pressure:	100.4kPa

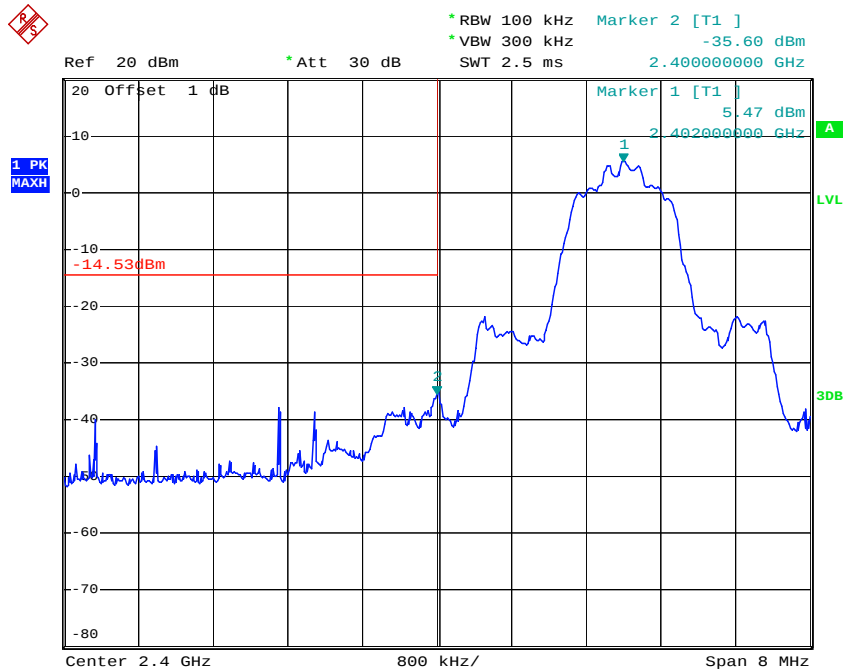
The testing was performed by Gavin Xu on 2016-05-07.

Test Result: Compliance*BDR Mode (GFSK):***Band Edge, Left Side**

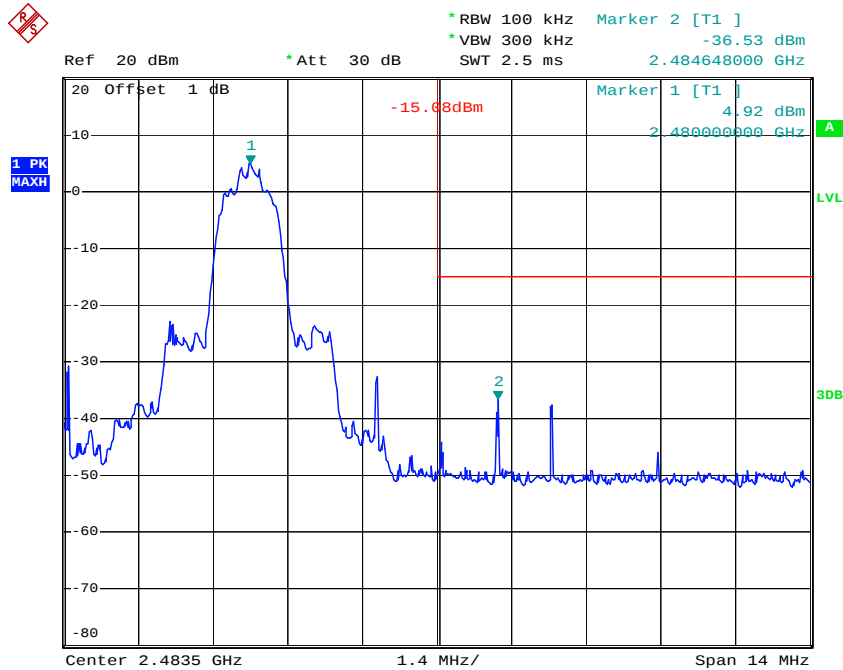
Date: 7.MAY.2016 13:21:10

Band Edge, Right Side

Date: 7.MAY.2016 13:24:04

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

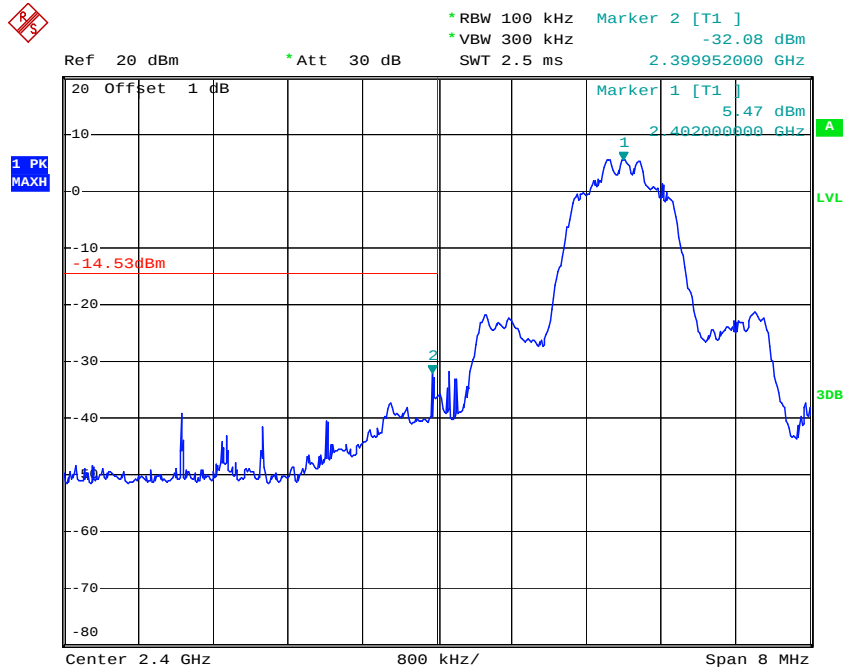
Date: 7.MAY.2016 13:38:08

Band Edge, Right Side

Date: 7.MAY.2016 13:33:53

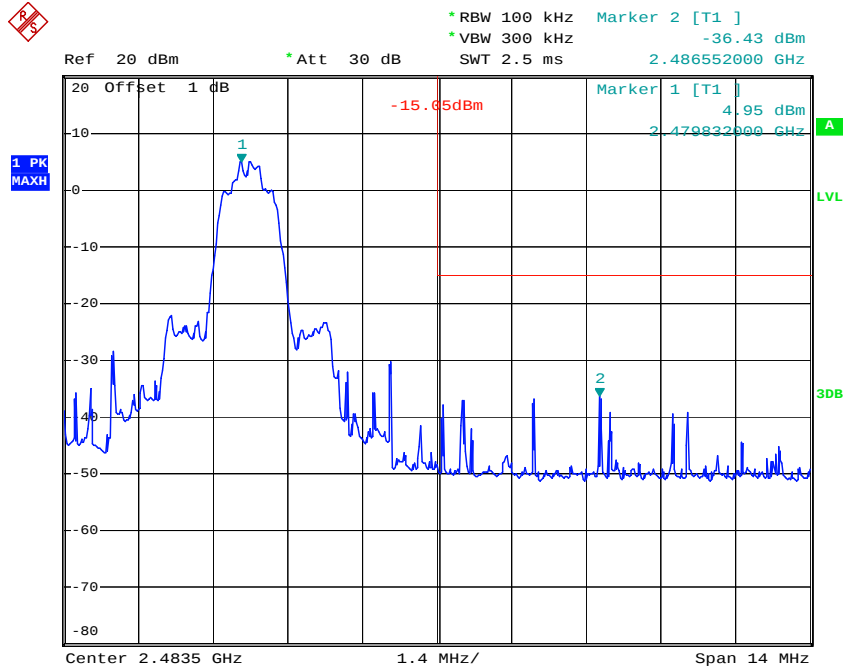
EDR Mode (8-DPSK):

Band Edge, Left Side



Date: 7.MAY.2016 13:42:04

Band Edge, Right Side



Date: 7.MAY.2016 13:45:04

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