

FCC PART 15.247

TEST REPORT

For

Zhongshan K-mate General Electronics Co.,Ltd.

NO.2, 5th Xincheng Street, Gangkou Town, Zhongshan City, Guangdong, China

FCC ID: WAD-BTC021L

Report Type: Original Report	Product Type: Bluetooth car kit
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Report Number: RDG140824001-00A	
Report Date: 2014-09-11	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The Zhongshan K-mate General Electronics Co., Ltd.'s product, model number: *BTC021L* (the "EUT") in this report is a *Bluetooth car kit*, which was measured approximately: 4.2 cm (L) x 4.2 cm (W) x 1.5 cm (H) for main Unit, 5.4 cm (L) x 2.4 cm (W) x 2.4 cm (H) for Car Charger, rated input voltage: DC 12-24 V.

All measurement and test data in this report was gathered from production sample serial number: 140824001. (Assigned by BACL, Dongguan). The EUT was received on 2014-08-25.

Objective

This report is prepared on behalf of *Zhongshan K-mate General Electronics Co., Ltd.* 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 Part15C DTS submissions with FCC ID: *WAD-BTC021L* for BLE mode.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

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 an engineering mode, which was provided by manufacturer.

EUT Exercise Software

The software “CSR Blue Suite 2.5.0” was used for testing, which was provided by manufacturer. The worst condition (maximum power) was setting by the software as following table:

Test Software Version		CSR Blue Suite 2.5.0		
Test Frequency		2402MHz	2441MHz	2480MHz
Power Level Setting	GFSK	50	50	50
	$\pi/4$ -DQPSK	50	50	50
	8DPSK	50	50	50

Equipment Modifications

No modification was made to the EUT.

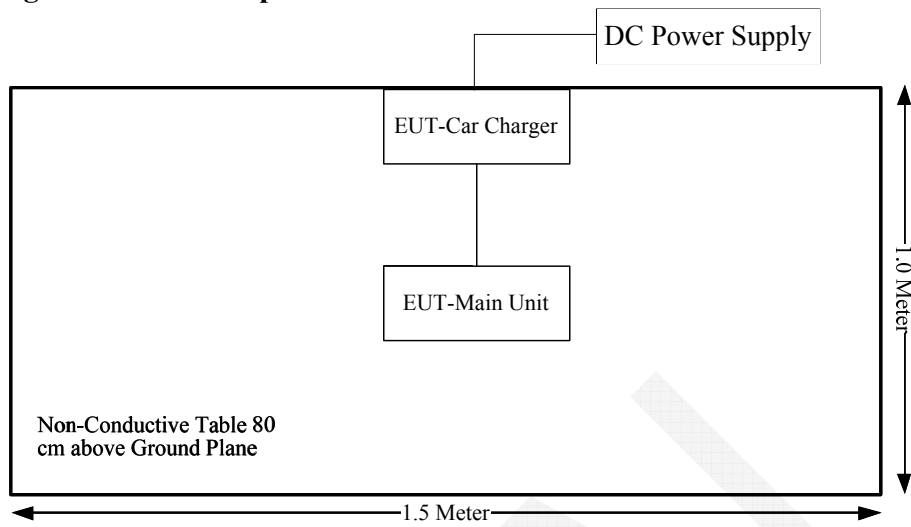
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Pro Instrument	DC power supply	Pps3300	/

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
DC Cable	no	no	1.5	Car Charger	DC power supply

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Radiated 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

Not Applicable: The EUT is for vehicular use.

FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

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

Calculated Data:

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2441	0	1.0	5.74	3.75	20	0.00075	1.0

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 integral antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

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_{cispr} 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_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, 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: 5.0 dB

200M~1GHz: 6.2 dB

1G~6GHz: 4.45 dB

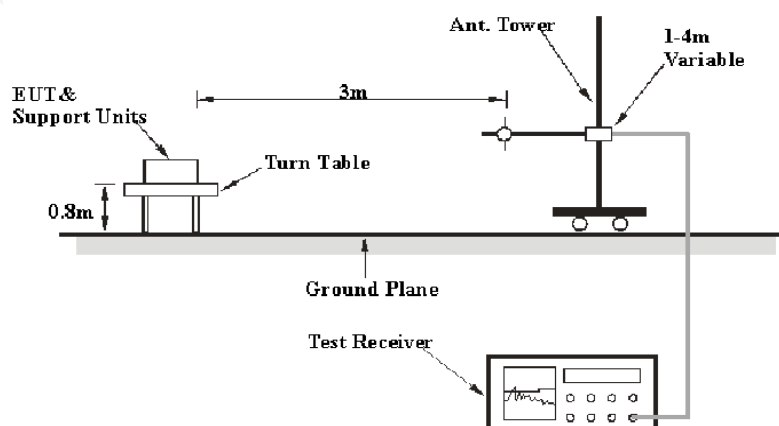
6G~18GHz: 5.23 dB

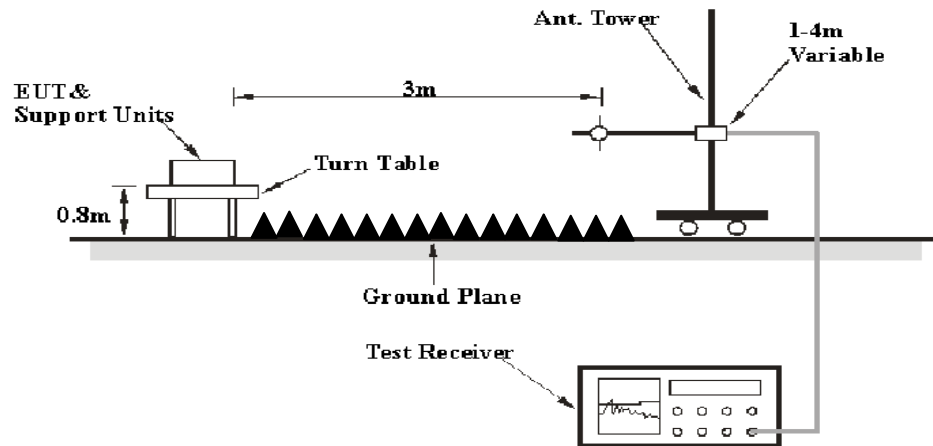
Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
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 C63.4-2003. 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	/	Ave.

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
HP	Signal Generator	8648A	3426A00831	2013-11-06	2014-11-05
Sunol Sciences	Antenna	JB3	A060611-1	2011-09-06	2014-09-05
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
HP	Amplifier	8447E	2434A02181	2013-09-06	2014-09-05
R&S	EMI Test Receiver	ESCI	100224	2014-05-09	2015-05-08
Giga	Signal Generator	1026	320408	2014-05-09	2015-05-08
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-18
TDK RF	Horn Antenna	HRN-0118	130 084	2012-09-06	2015-09-05
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-05
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-09	2015-05-08

* **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, with the worst margin reading of:

7.12 dB at 4882 MHz in the Horizontal polarization of BDR Mode (GFSK)

Test Data

Environmental Conditions

Temperature:	28.3 °C
Relative Humidity:	56%
ATM Pressure:	100.4kPa

The testing was performed by Dean Liu on 2014-09-01.

Test Mode: Transmitting

Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK mode and the worst case is GFSK mode.

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	96.85	PK	H	25.65	4.42	27.32	99.60	N/A	N/A
2402	86.83	AV	H	25.65	4.42	27.32	89.58	N/A	N/A
2402	90.23	PK	V	25.65	4.42	27.32	92.98	N/A	N/A
2402	79.81	AV	V	25.65	4.42	27.32	82.56	N/A	N/A
2390	40.43	PK	H	25.61	4.39	27.32	43.11	74.00	30.89
2390	30.03	AV	H	25.61	4.39	27.32	32.71	54.00	21.29
4804	47.00	PK	H	30.59	5.98	27.41	56.16	74.00	17.84
4804	36.44	AV	H	30.59	5.98	27.41	45.60	54.00	8.40
7206	39.72	PK	H	34.09	7.45	25.91	55.35	74.00	18.65
7206	29.38	AV	H	34.09	7.45	25.91	45.01	54.00	8.99
9608	38.43	PK	H	35.96	8.80	27.55	55.64	74.00	18.36
9608	27.81	AV	H	35.96	8.80	27.55	45.02	54.00	8.98
1950	46.4	PK	H	24.50	3.79	27.49	47.20	74.00	26.80
1950	35.73	AV	H	24.50	3.79	27.49	36.53	54.00	17.47
163.2	38.09	QP	H	12.55	1.56	21.44	30.76	43.50	12.74
Middle Channel: 2441 MHz									
2441	97.69	PK	H	25.75	4.40	27.34	100.50	N/A	N/A
2441	86.9	AV	H	25.75	4.40	27.34	89.71	N/A	N/A
2441	90.75	PK	V	25.75	4.40	27.34	93.56	N/A	N/A
2441	79.84	AV	V	25.75	4.40	27.34	82.65	N/A	N/A
4882	47.99	PK	H	30.79	6.08	27.42	57.44	74.00	16.56
4882	37.43	AV	H	30.79	6.08	27.42	46.88	54.00	7.12
7323	41.03	PK	H	34.38	7.51	25.88	57.04	74.00	16.96
7323	30.44	AV	H	34.38	7.51	25.88	46.45	54.00	7.55
9764	38.56	PK	H	36.33	8.83	27.20	56.52	74.00	17.48
9764	26.98	AV	H	36.33	8.83	27.20	44.94	54.00	9.06
7464	40.09	PK	H	34.71	7.59	26.04	56.35	74.00	17.65
7464	28.78	AV	H	34.71	7.59	26.04	45.04	54.00	8.96
1745	39.37	PK	H	24.09	3.66	27.61	39.51	74.00	34.49
1745	27.75	AV	H	24.09	3.66	27.61	27.89	54.00	26.11
163.2	38.79	QP	H	12.55	1.56	21.44	31.46	43.50	12.04
High Channel: 2480 MHz									
2480	97.50	PK	H	25.85	4.48	27.36	100.47	N/A	N/A
2480	86.69	AV	H	25.85	4.48	27.36	89.66	N/A	N/A
2480	90.13	PK	V	25.85	4.48	27.36	93.10	N/A	N/A
2480	79.72	AV	V	25.85	4.48	27.36	82.69	N/A	N/A
2483.5	46.35	PK	H	25.86	4.49	27.36	49.34	74.00	24.66
2483.5	30.93	AV	H	25.86	4.49	27.36	33.92	54.00	20.08
4960	45.85	PK	H	31.00	5.90	27.43	55.32	74.00	18.68
4960	34.46	AV	H	31.00	5.90	27.43	43.93	54.00	10.07
7440	40.39	PK	H	34.66	7.58	25.97	56.66	74.00	17.34
7440	28.93	AV	H	34.66	7.58	25.97	45.20	54.00	8.80
9920	37.57	PK	H	36.71	8.87	26.66	56.49	74.00	17.51
9920	26.71	AV	H	36.71	8.87	26.66	45.63	54.00	8.37
1742	48.09	PK	H	24.08	3.64	27.61	48.20	74.00	25.80
1742	36.44	AV	H	24.08	3.64	27.61	36.55	54.00	17.45
163.2	38.62	QP	H	12.55	1.56	21.44	31.29	43.50	12.21

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	2014-05-09	2015-05-08

* **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:	30.1 °C
Relative Humidity:	60%
ATM Pressure:	100.8 kPa

The testing was performed by Dean Liu on 2014-08-29.

Test Result: Compliance.

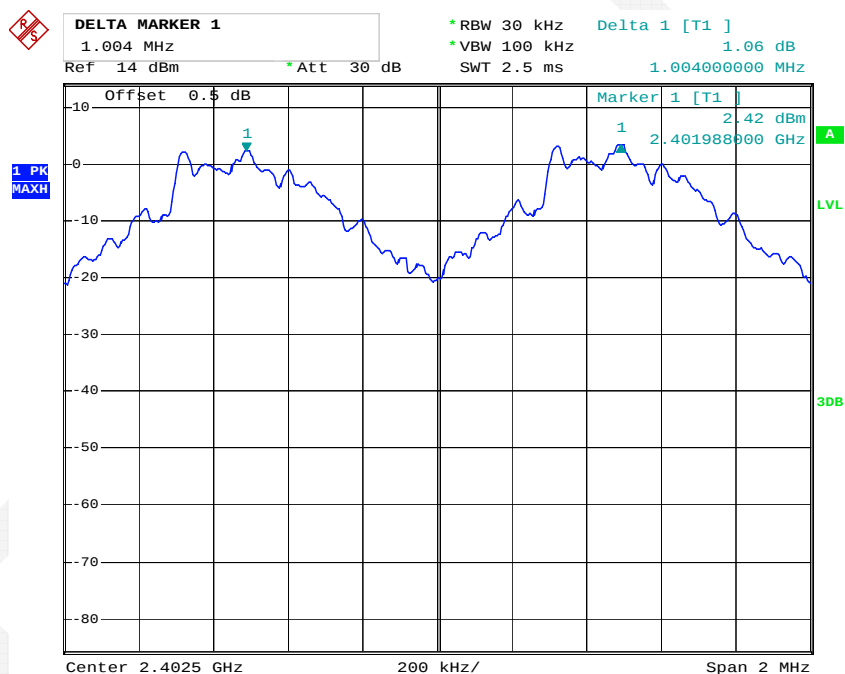
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR Mode (GFSK)	Low	2402	1.004	0.611	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.611	Pass
	Adjacent	2442			
	High	2480	1.004	0.611	Pass
	Adjacent	2479			

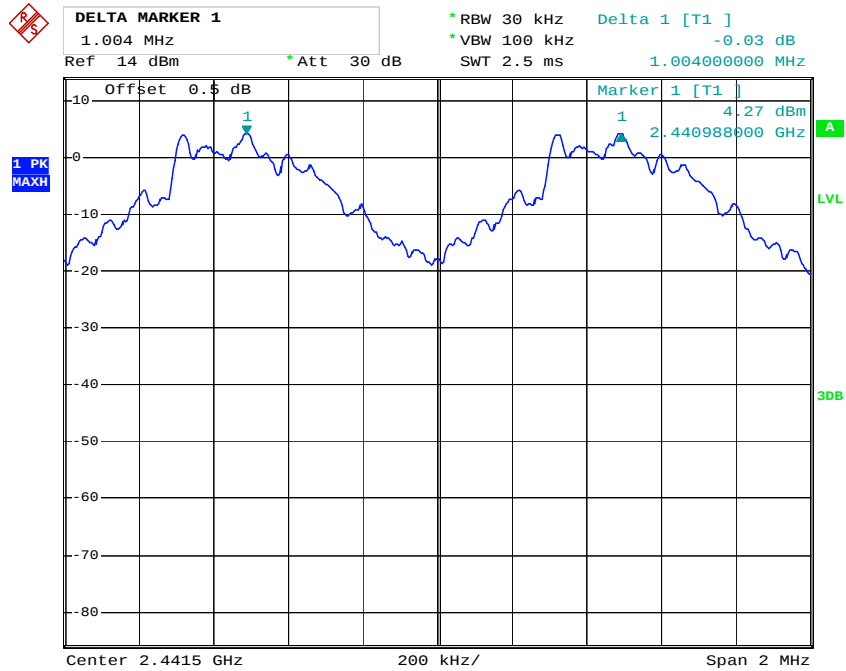
BDR Mode (GFSK):

Low Channel



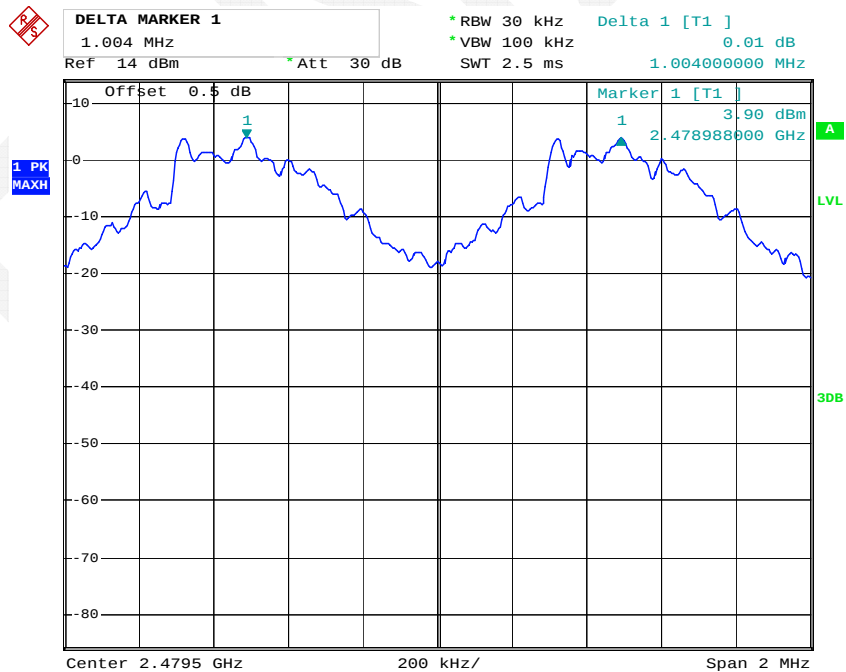
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Middle Channel



Date: 29.AUG.2014 21:47:19

High Channel

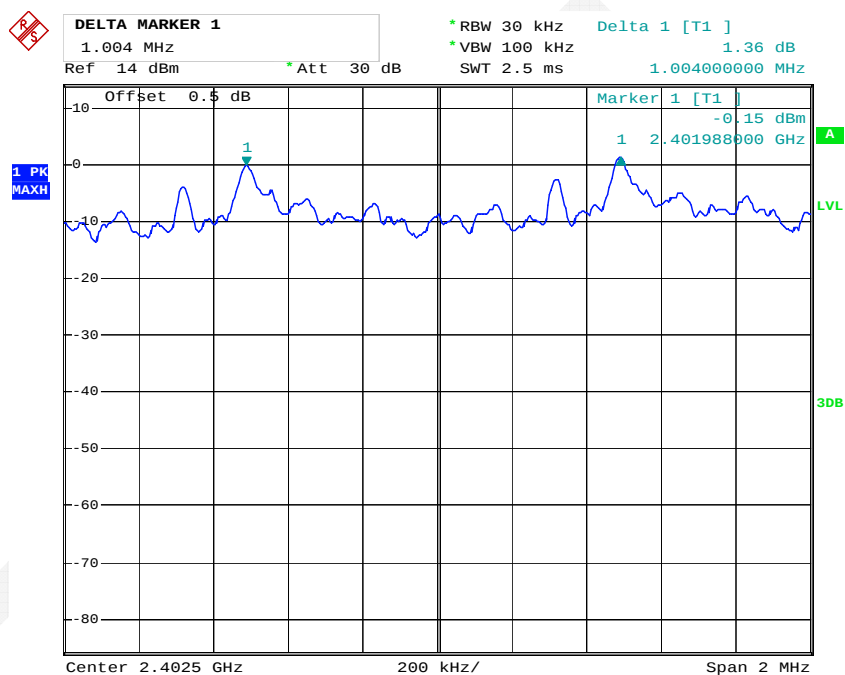


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Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
EDR ($\pi/4$ -DQPSK)	Low	2402	1.004	0.819	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.819	Pass
	Adjacent	2442			
	High	2480	1.004	0.819	Pass
	Adjacent	2479			

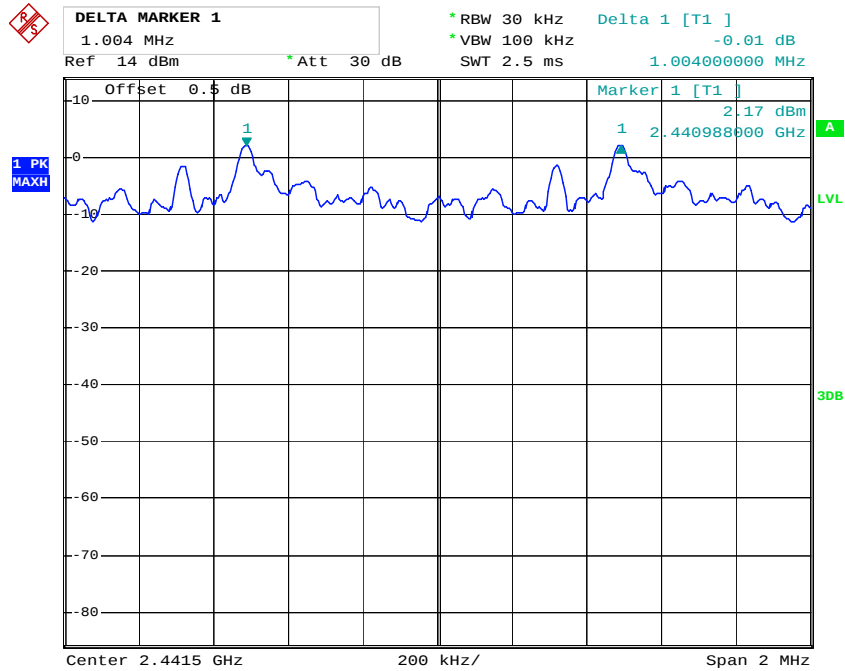
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



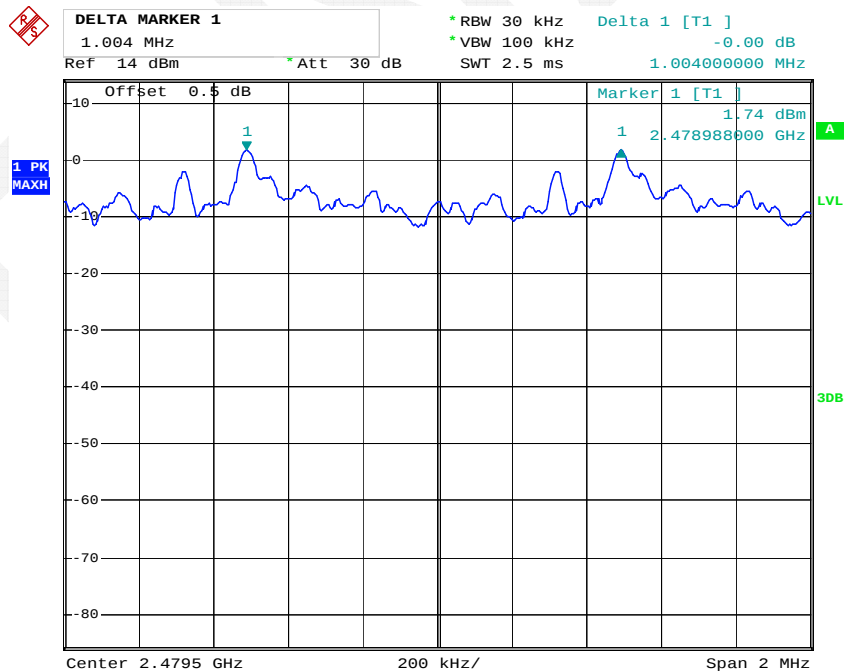
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Middle Channel



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High Channel

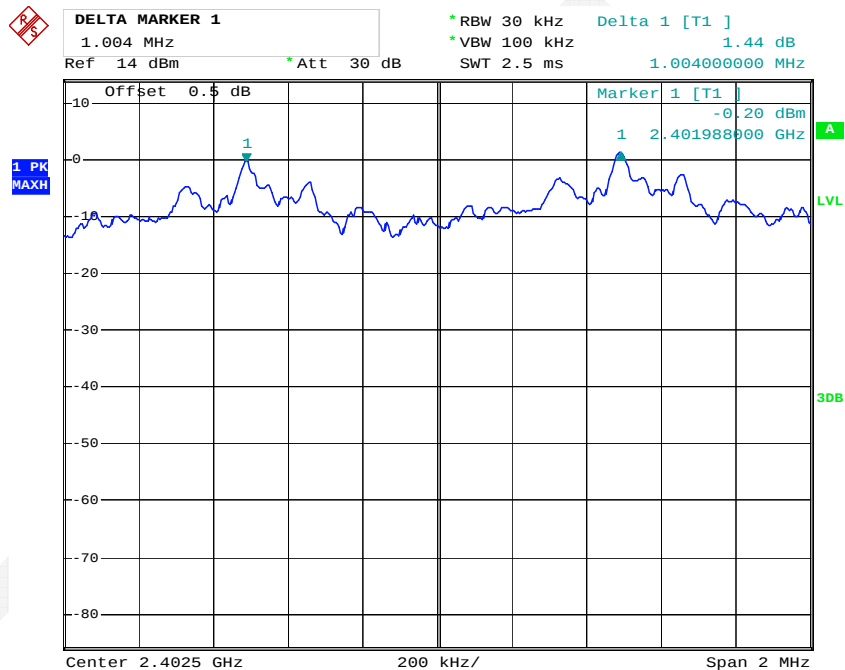


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Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
EDR (8DPSK)	Low	2402	1.004	0.808	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.808	Pass
	Adjacent	2442			
	High	2480	1.004	0.808	Pass
	Adjacent	2479			

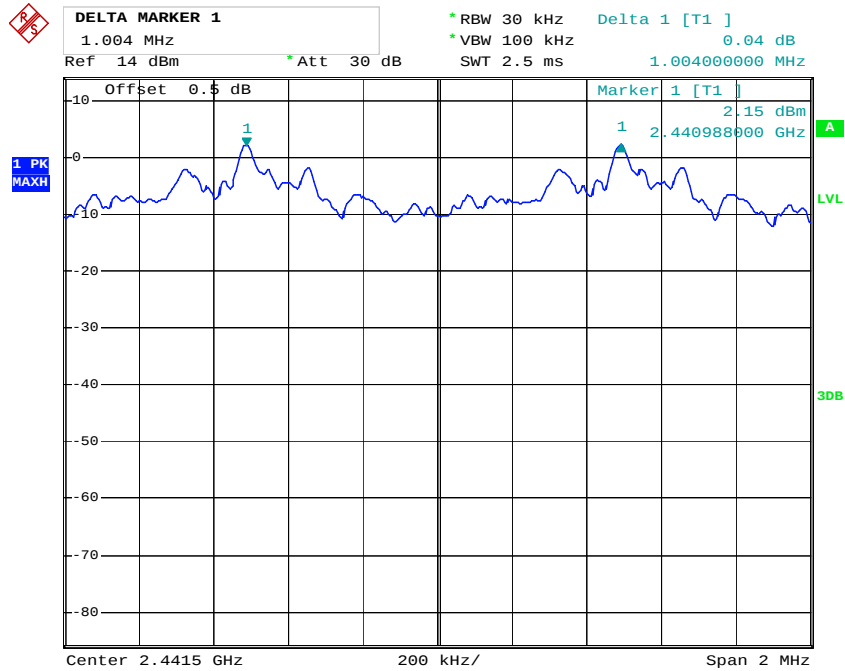
EDR Mode (8DPSK):

Low Channel



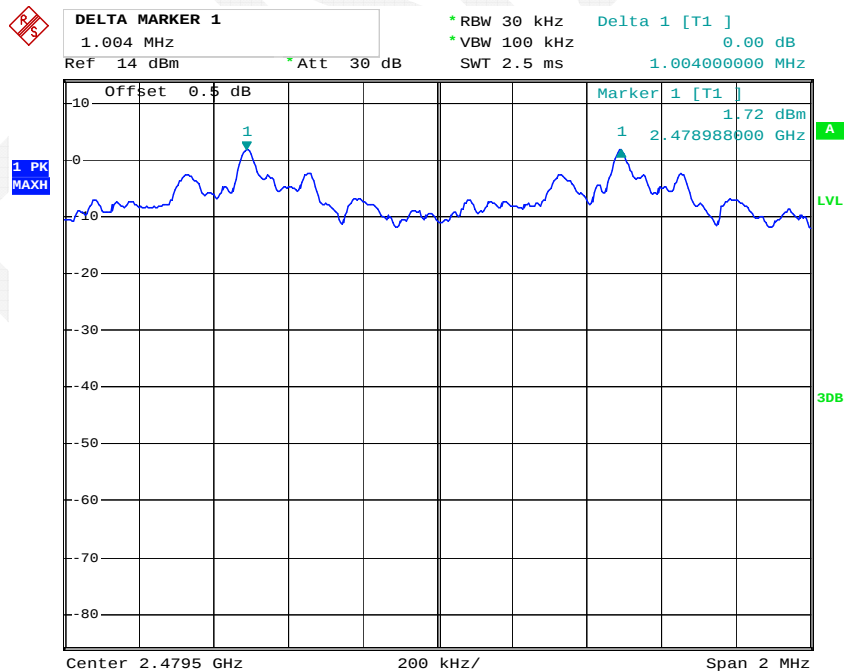
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Middle Channel



Date: 29.AUG.2014 22:09:19

High Channel



Date: 29.AUG.2014 22:11:52

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	2014-05-09	2015-05-08

* **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:	30.1 °C
Relative Humidity:	60%
ATM Pressure:	100.8 kPa

The testing was performed by Dean Liu on 2014-08-29.

Test Result: Compliance.

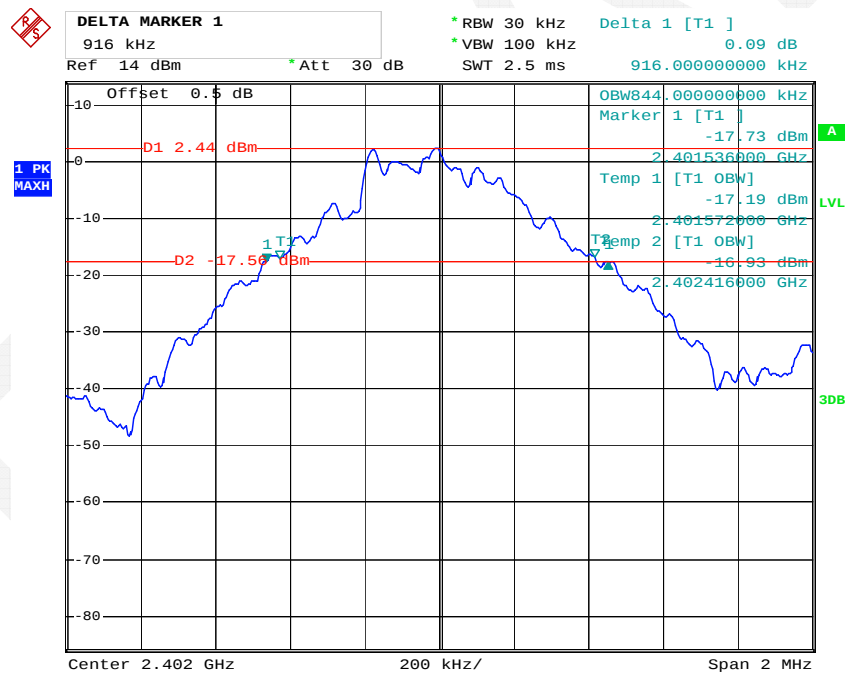
Please refer to following tables and plots

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.916
	Middle	2441	0.896
	High	2480	0.880
EDR ($\pi/4$ -DQPSK)	Low	2402	1.228
	Middle	2441	1.220
	High	2480	1.224
EDR (8DPSK)	Low	2402	1.208
	Middle	2441	1.212
	High	2480	1.212

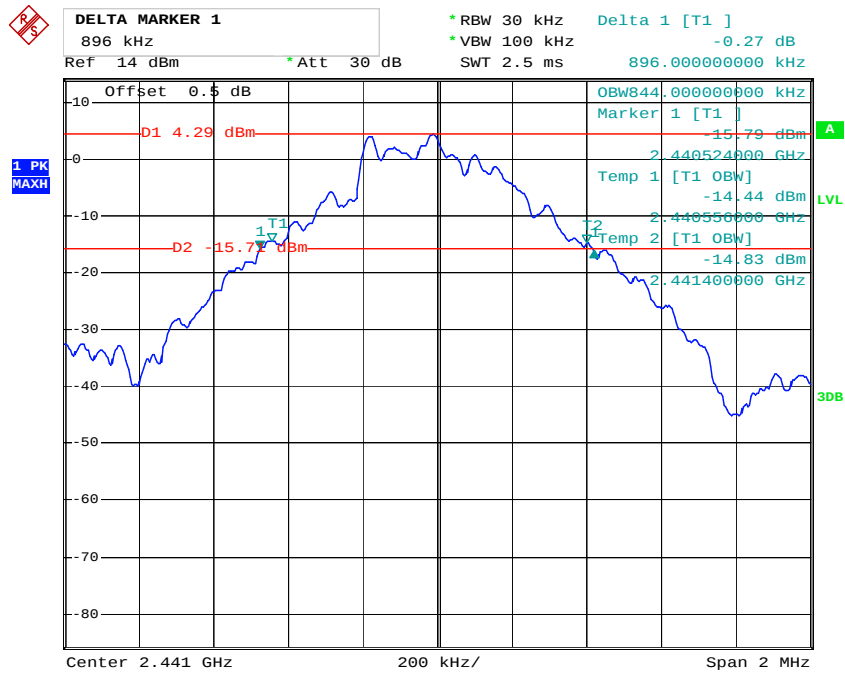
BDR Mode (GFSK):

Low Channel



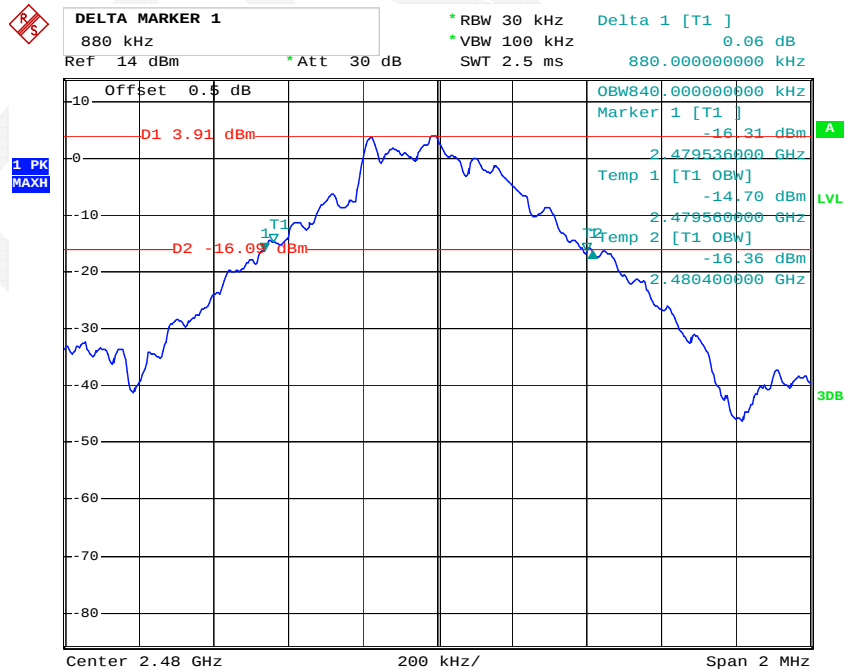
Date: 29.AUG.2014 21:42:28

Middle Channel



Date: 29.AUG.2014 21:48:29

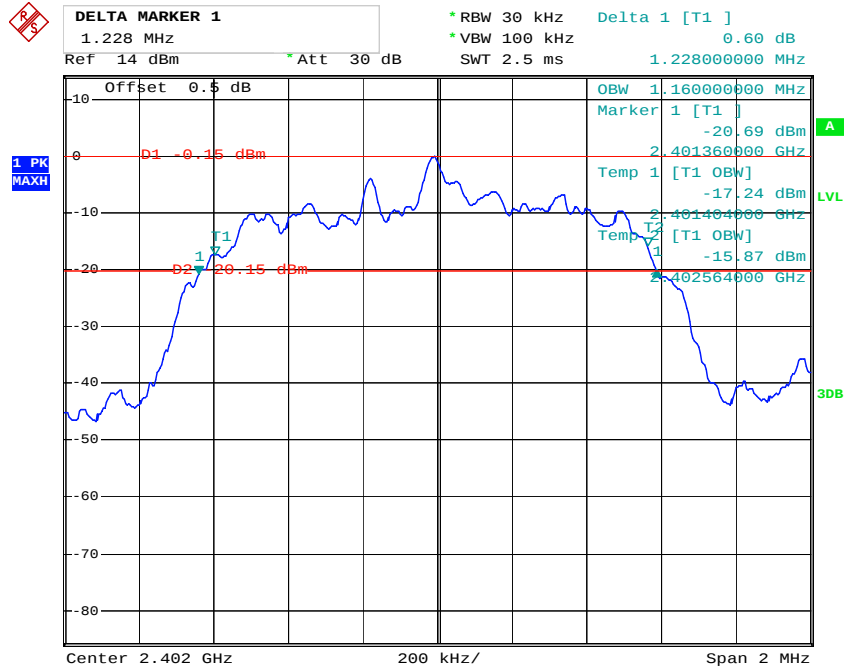
High Channel



Date: 29.AUG.2014 21:49:32

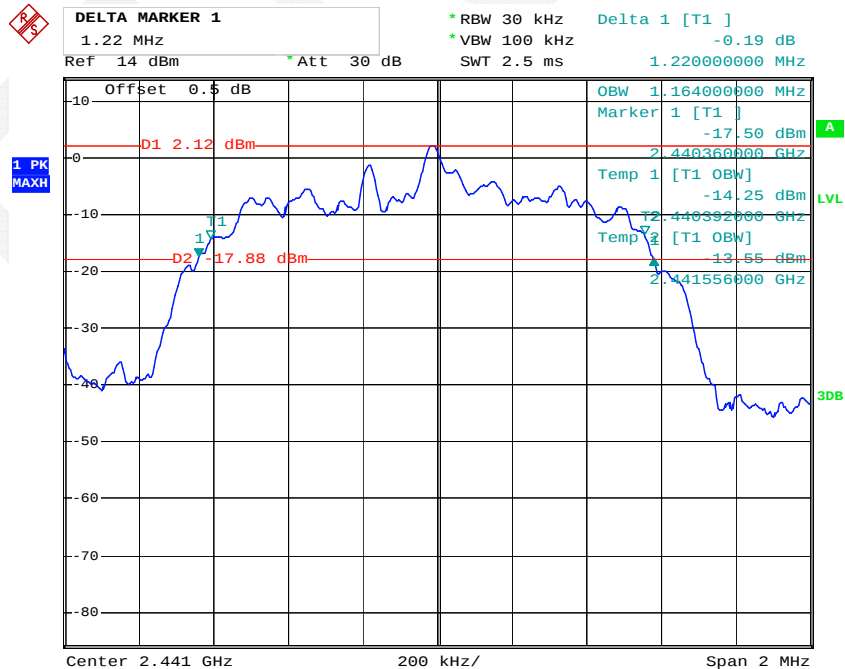
EDR Mode ($\pi/4$ -DQPSK):

Low Channel



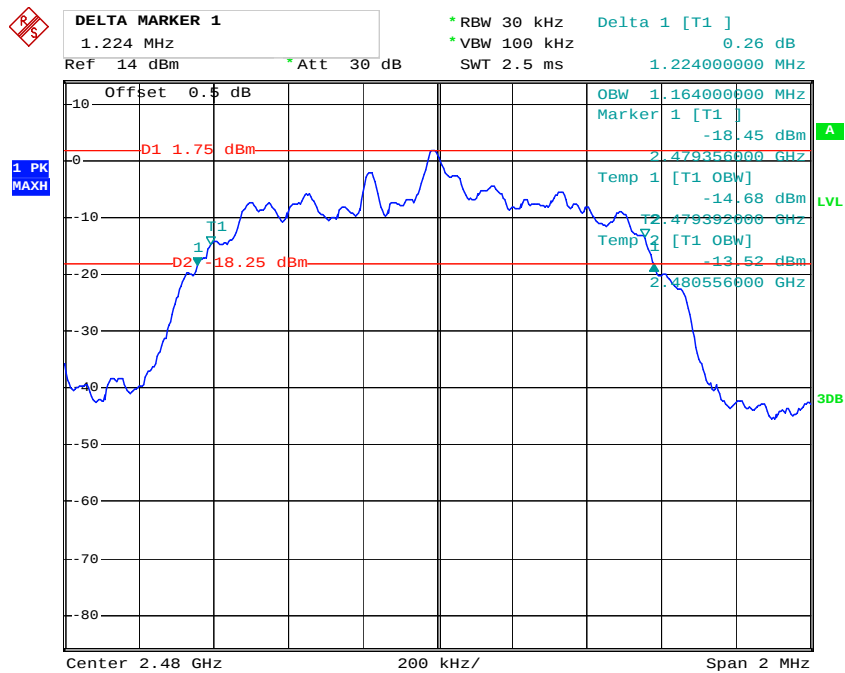
Date: 29.AUG.2014 22:02:32

Middle Channel



Date: 29.AUG.2014 21:58:32

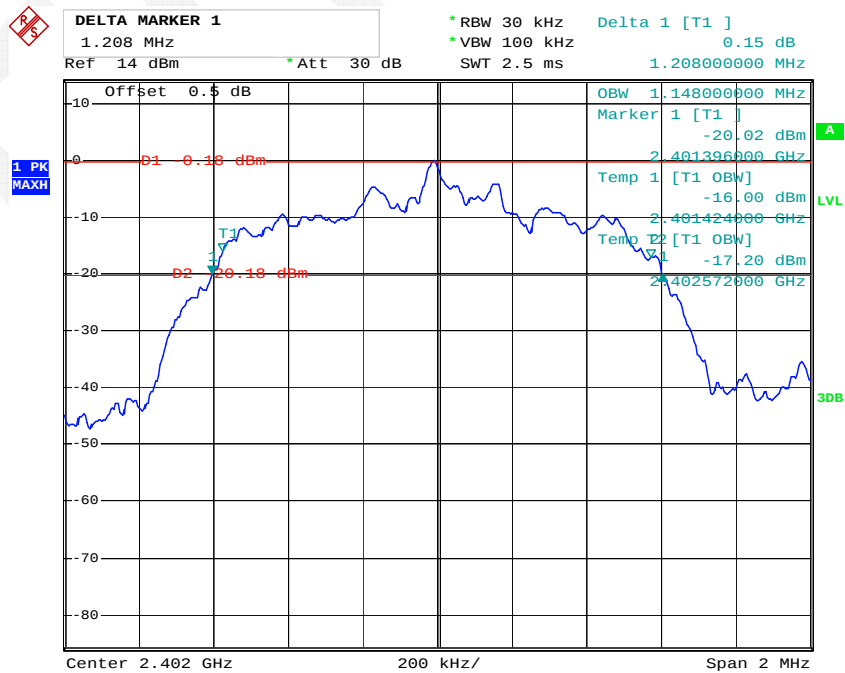
High Channel



Date: 29.AUG.2014 21:55:23

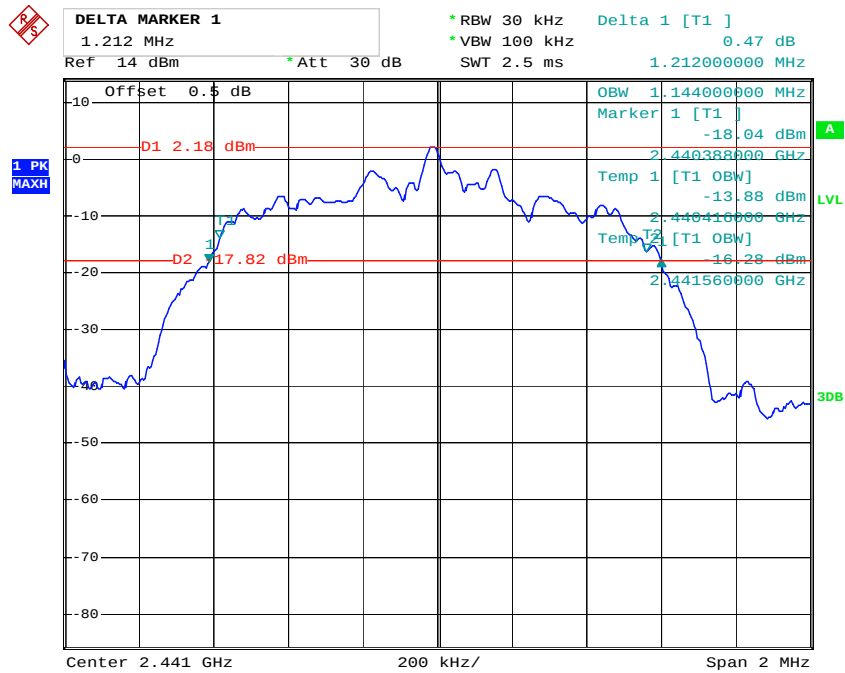
EDR Mode (8DPSK):

Low Channel



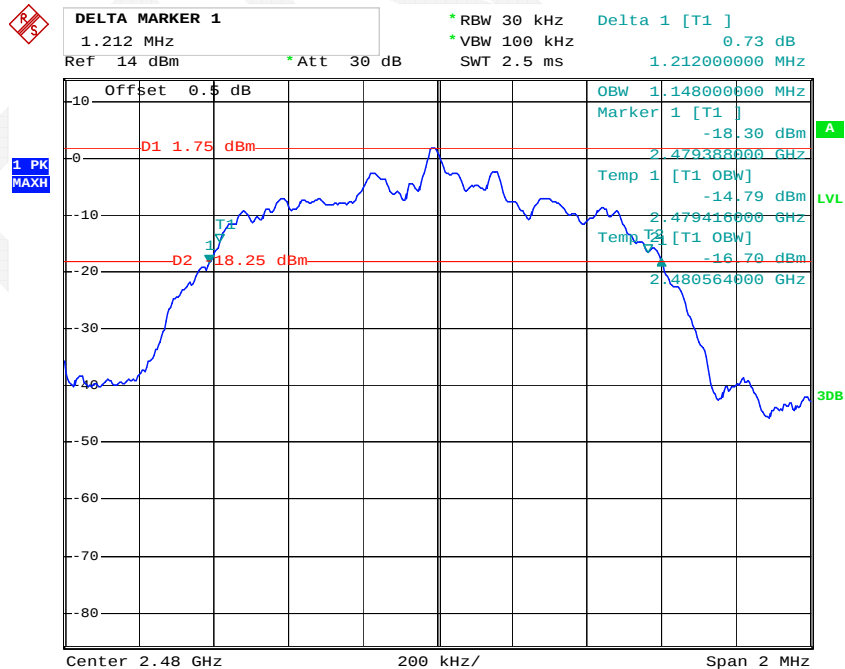
Date: 29.AUG.2014 22:06:55

Middle Channel



Date: 29.AUG.2014 22:10:07

High Channel



Date: 29.AUG.2014 22:11:09

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	2014-05-09	2015-05-08

* **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:	30.1 °C
Relative Humidity:	60%
ATM Pressure:	100.8 kPa

The testing was performed by Dean Liu on 2014-08-29.

Test Result: Compliance.

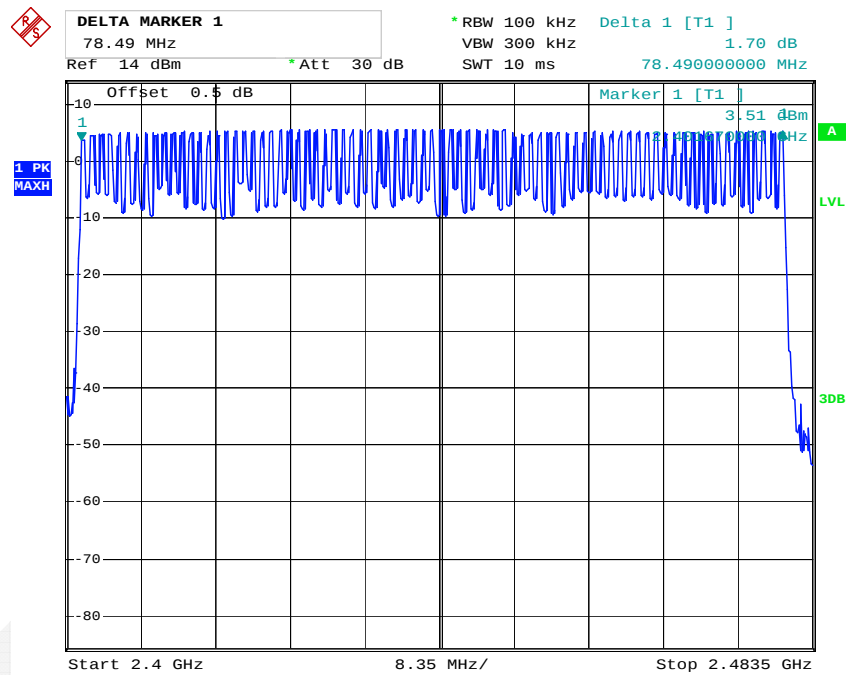
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

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

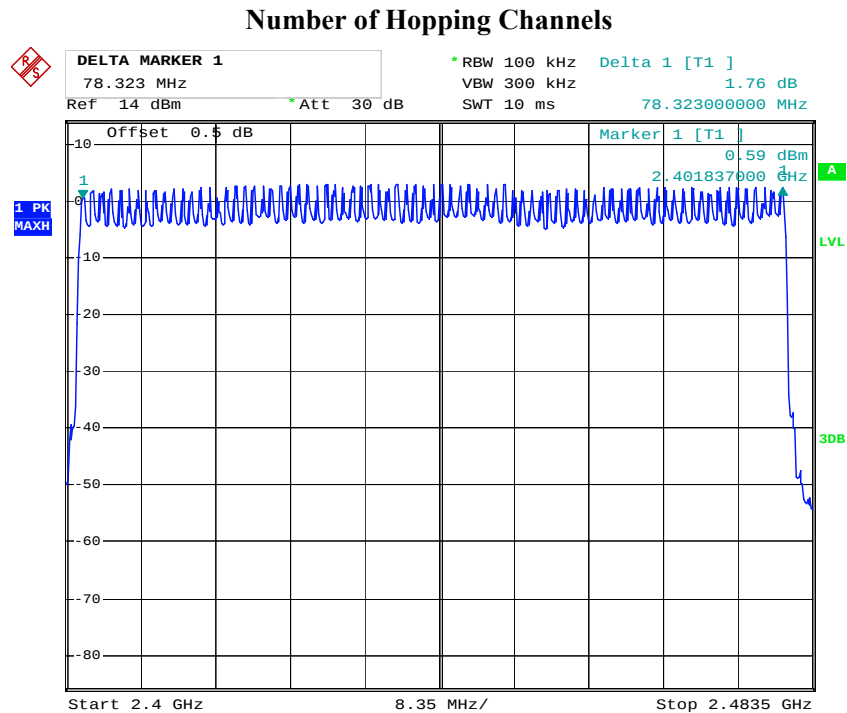
Number of Hopping Channels



Date: 29.AUG.2014 22:59:58

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

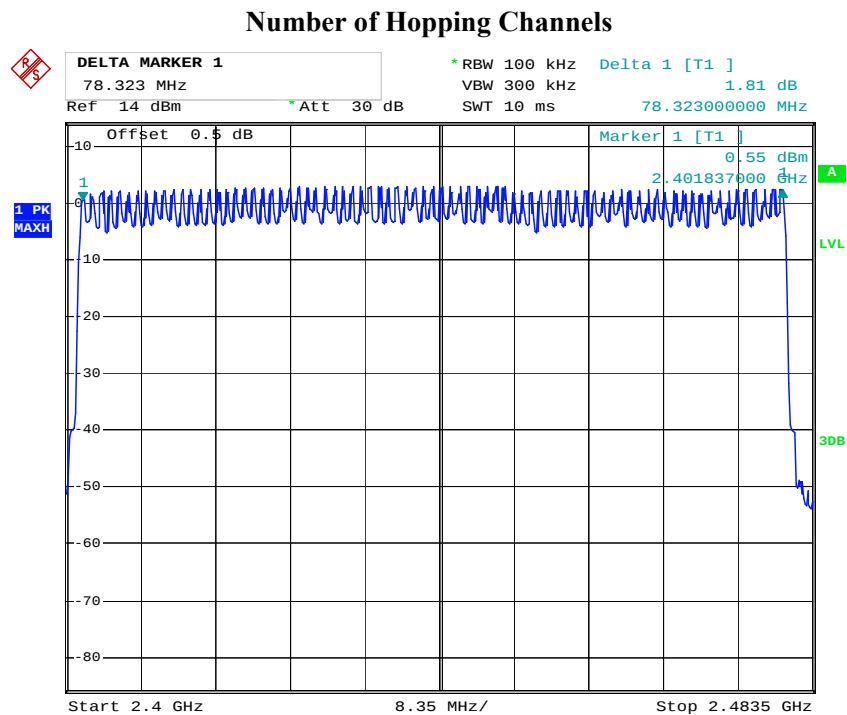
Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥ 15



Date: 29.AUG.2014 23:05:17

EDR Mode (8DPSK):

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



Date: 29.AUG.2014 23:13:42

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	2014-05-09	2015-05-08

* **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:	30.1 °C
Relative Humidity:	60%
ATM Pressure:	100.8 kPa

The testing was performed by Dean Liu on 2014-08-29.

Test Result: Compliance.

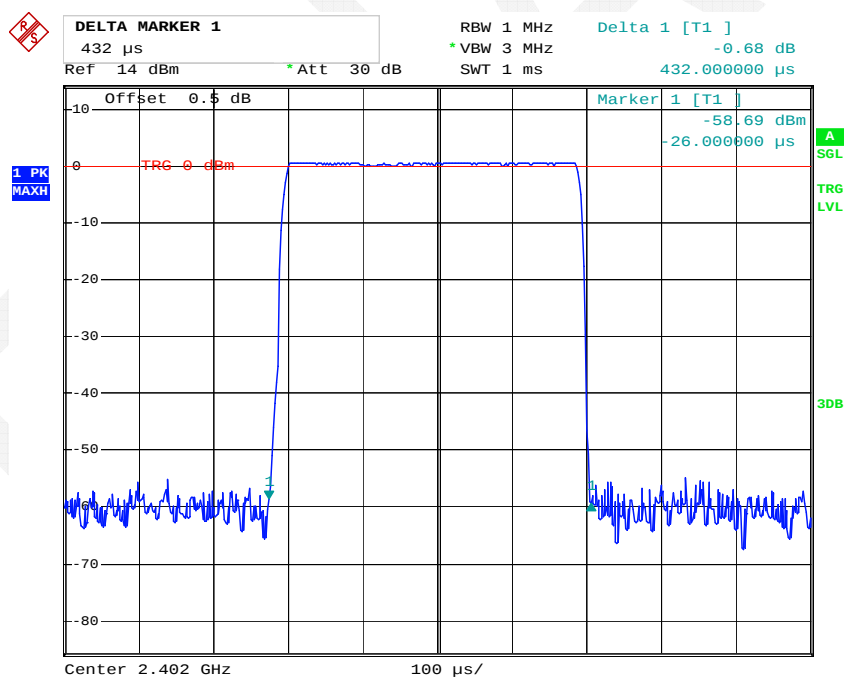
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

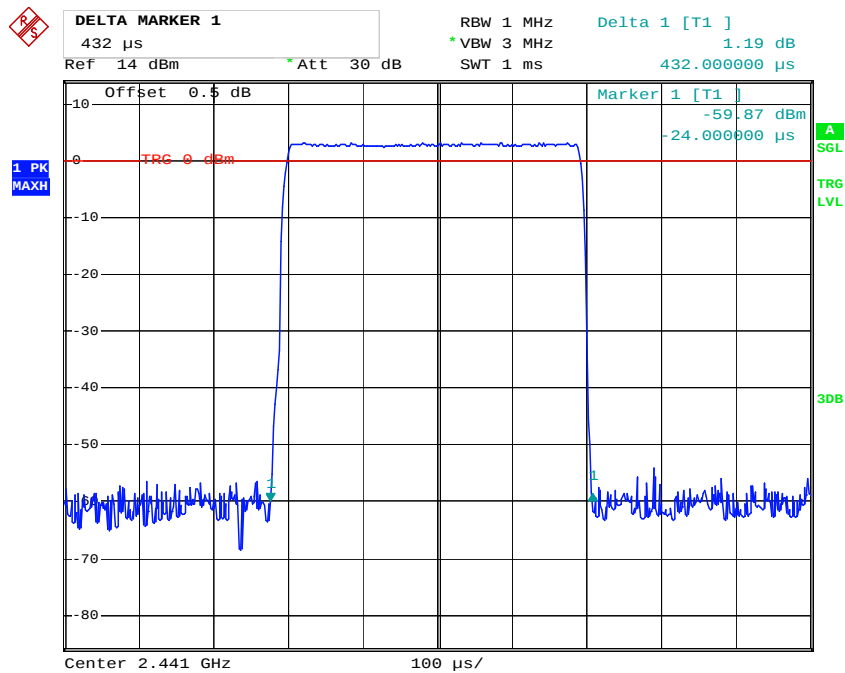
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.432	0.138	0.4	Pass
	Middle	0.432	0.138	0.4	Pass
	High	0.432	0.138	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
DH3	Low	1.704	0.273	0.4	Pass
	Middle	1.704	0.273	0.4	Pass
	High	1.704	0.273	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
DH5	Low	2.962	0.316	0.4	Pass
	Middle	2.962	0.316	0.4	Pass
	High	2.962	0.316	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

DH1: Low Channel



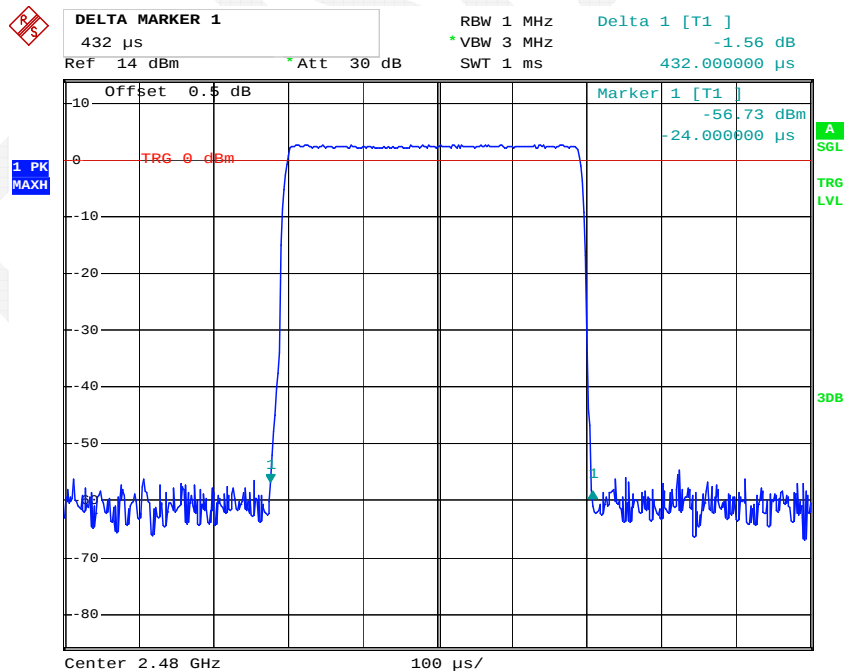
Date: 29.AUG.2014 22:28:44

DH1: Middle Channel



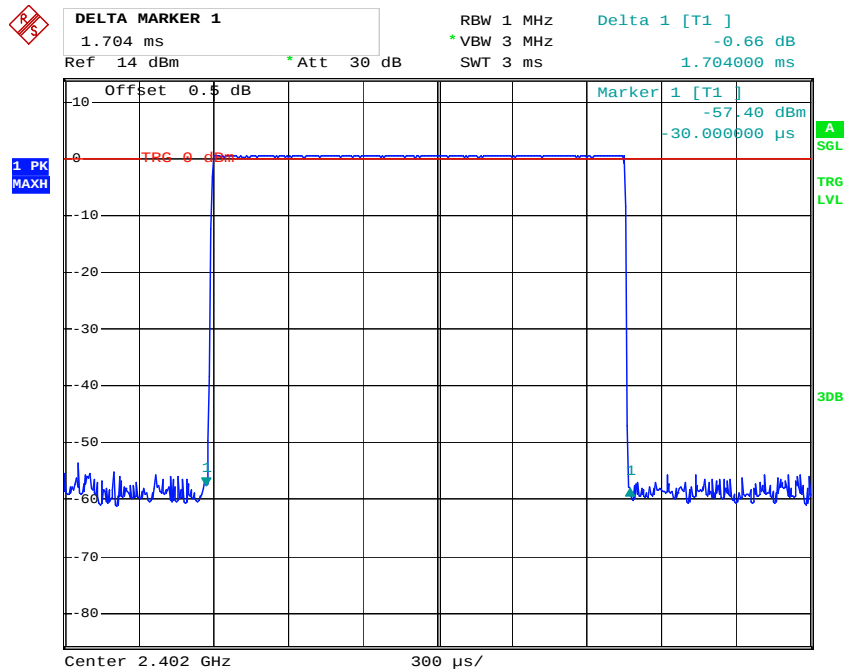
Date: 29.AUG.2014 22:28:22

DH1: High Channel



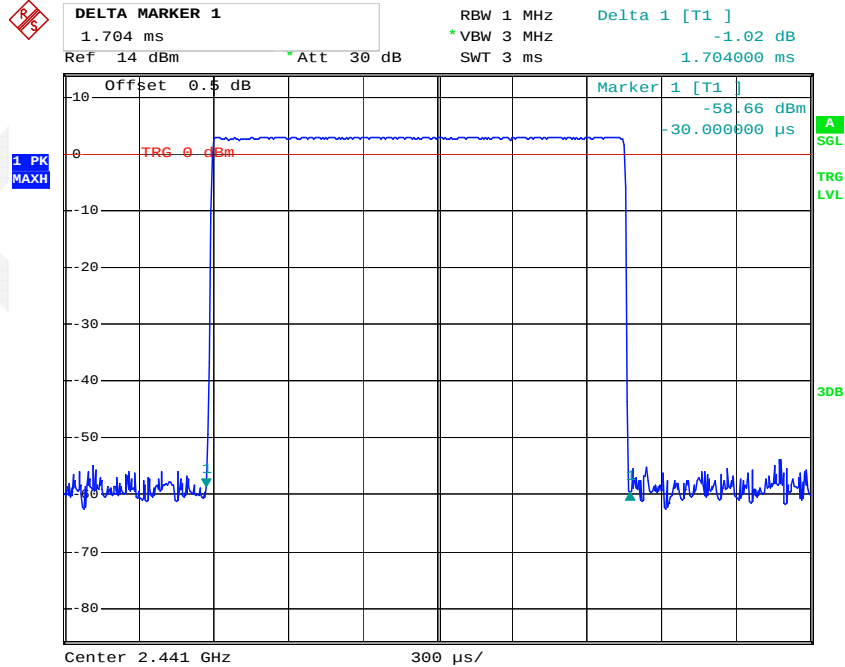
Date: 29.AUG.2014 22:29:39

DH3: Low Channel



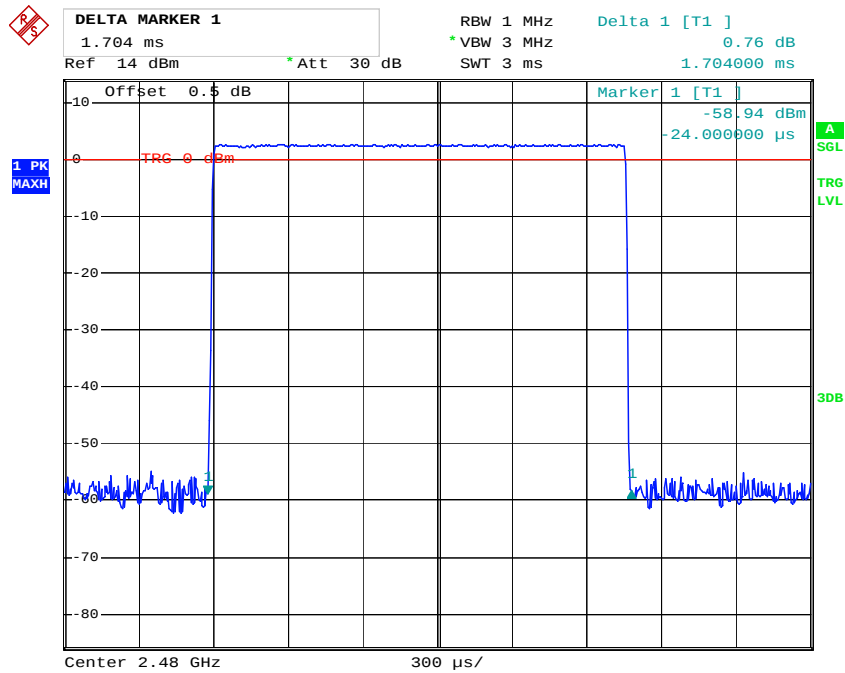
Date: 29.AUG.2014 22:32:09

DH3: Middle Channel



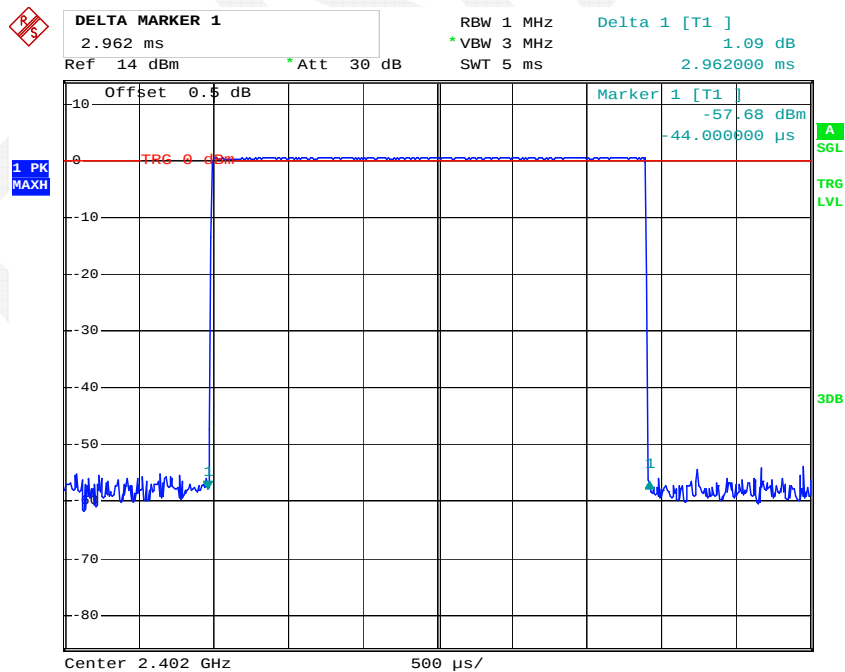
Date: 29.AUG.2014 22:32:43

DH3: High Channel



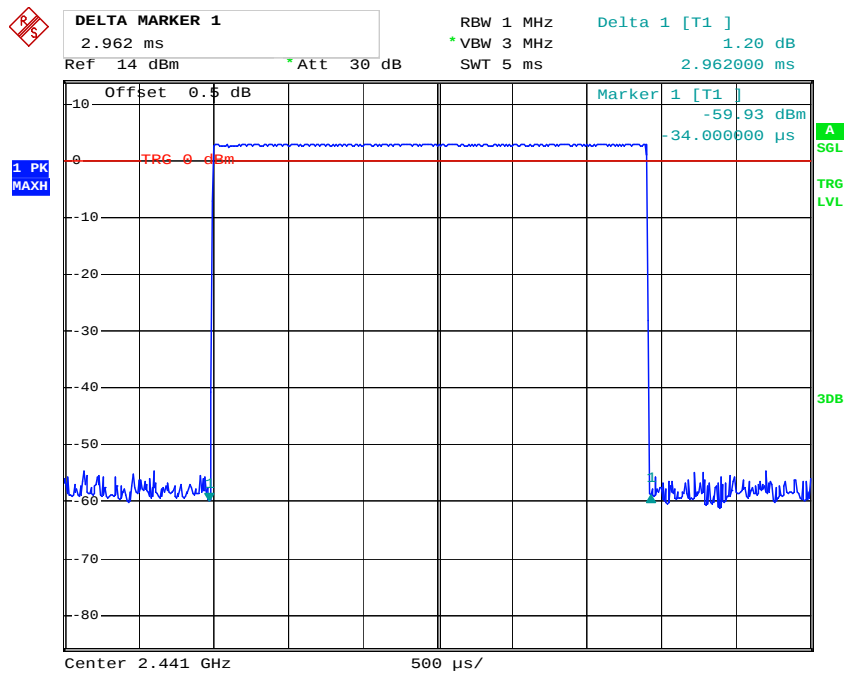
Date: 29.AUG.2014 22:30:23

DH5: Low Channel



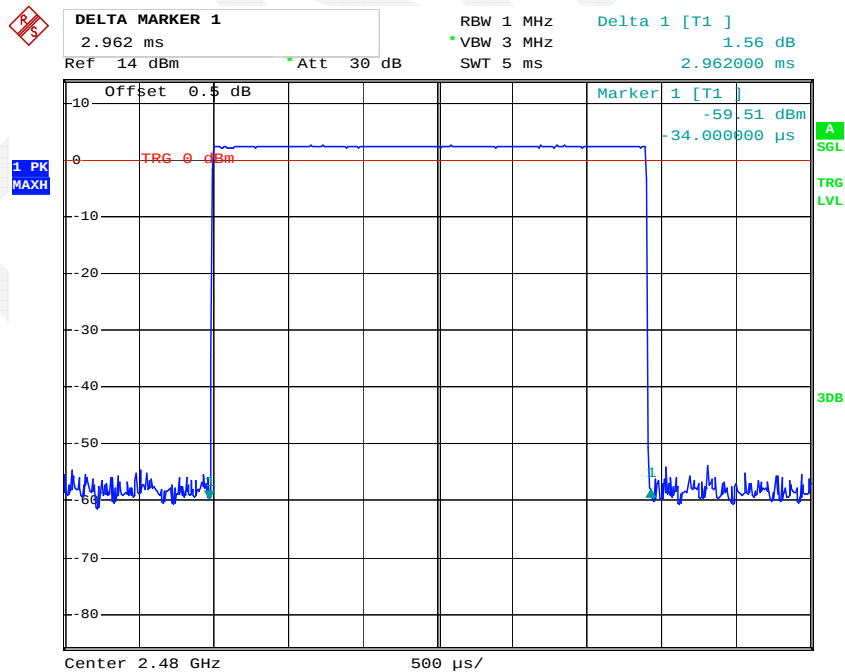
Date: 29.AUG.2014 22:45:34

DH5: Middle Channel



Date: 29.AUG.2014 22:46:07

DH5: High Channel

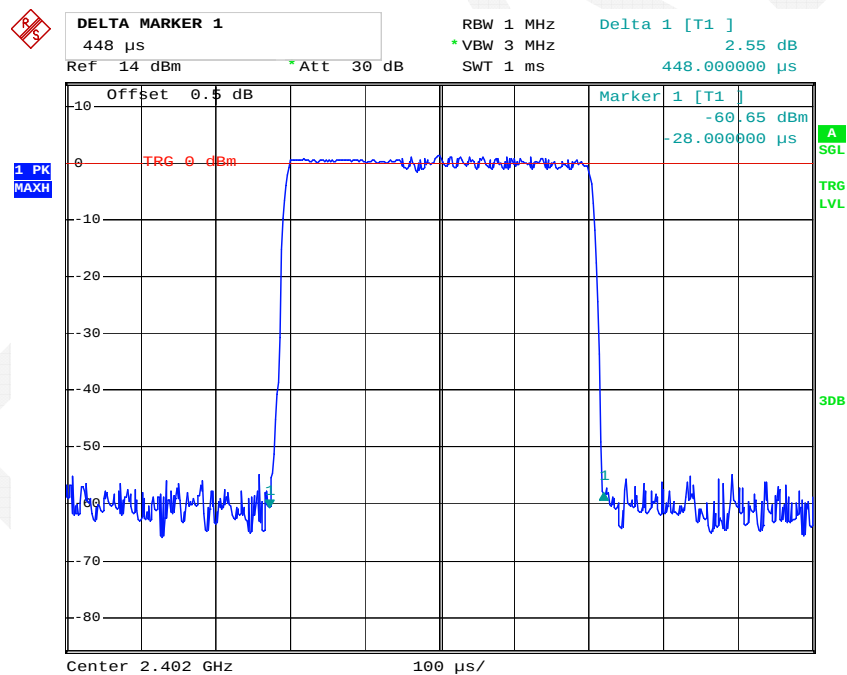


Date: 29.AUG.2014 22:44:59

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

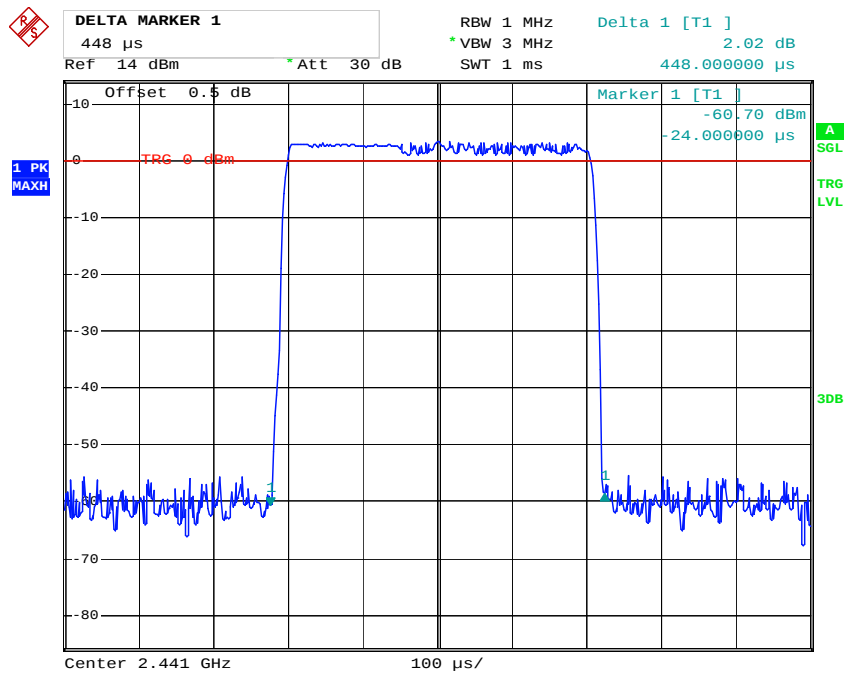
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.448	0.143	0.4	Pass
	Middle	0.448	0.143	0.4	Pass
	High	0.448	0.143	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
DH3	Low	1.710	0.274	0.4	Pass
	Middle	1.710	0.274	0.4	Pass
	High	1.710	0.274	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
DH5	Low	2.970	0.317	0.4	Pass
	Middle	2.970	0.317	0.4	Pass
	High	2.970	0.317	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

DH1: Low Channel



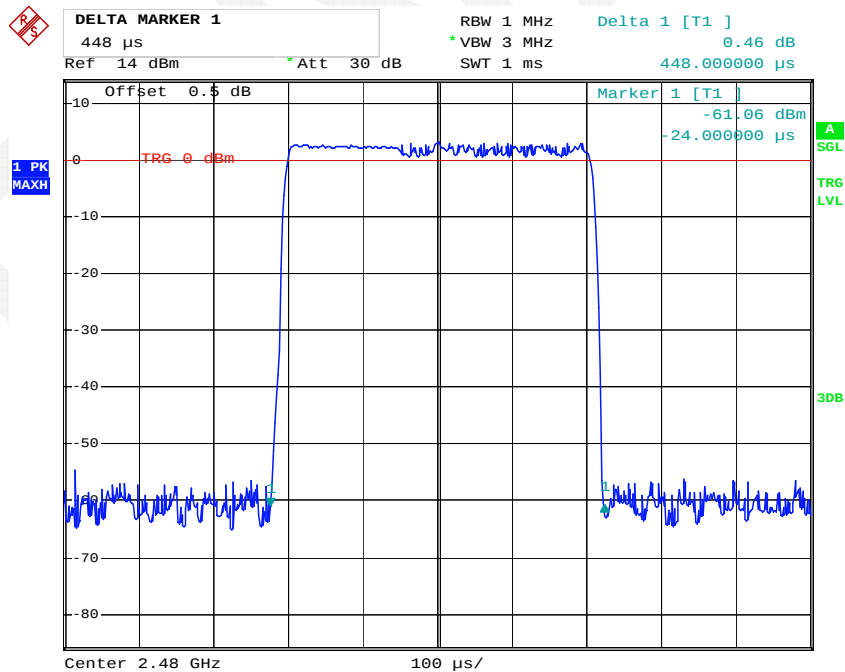
Date: 29.AUG.2014 22:27:16

DH1: Middle Channel



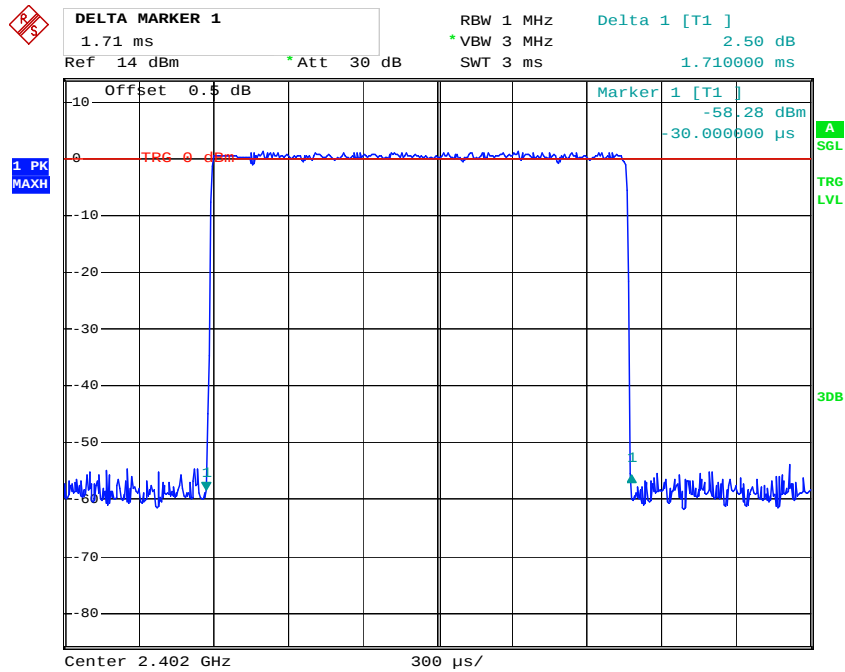
Date: 29.AUG.2014 22:27:57

DH1: High Channel



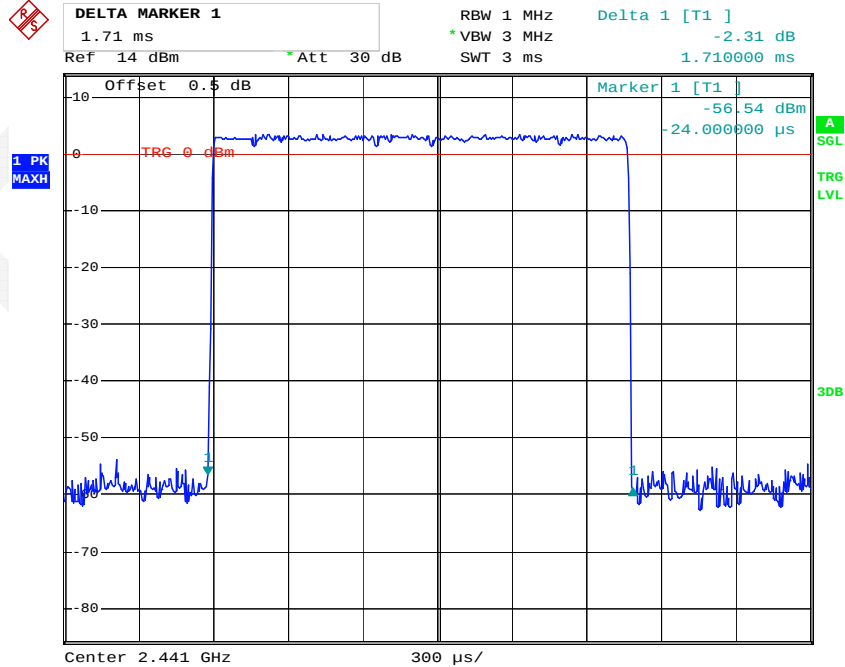
Date: 29.AUG.2014 22:26:15

DH3: Low Channel



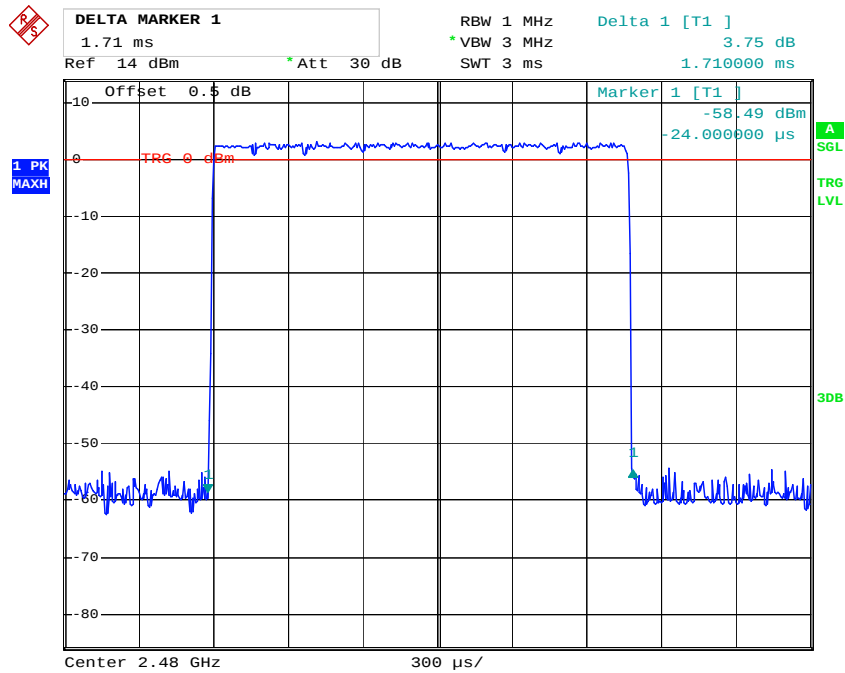
Date: 29.AUG.2014 22:33:52

DH3: Middle Channel



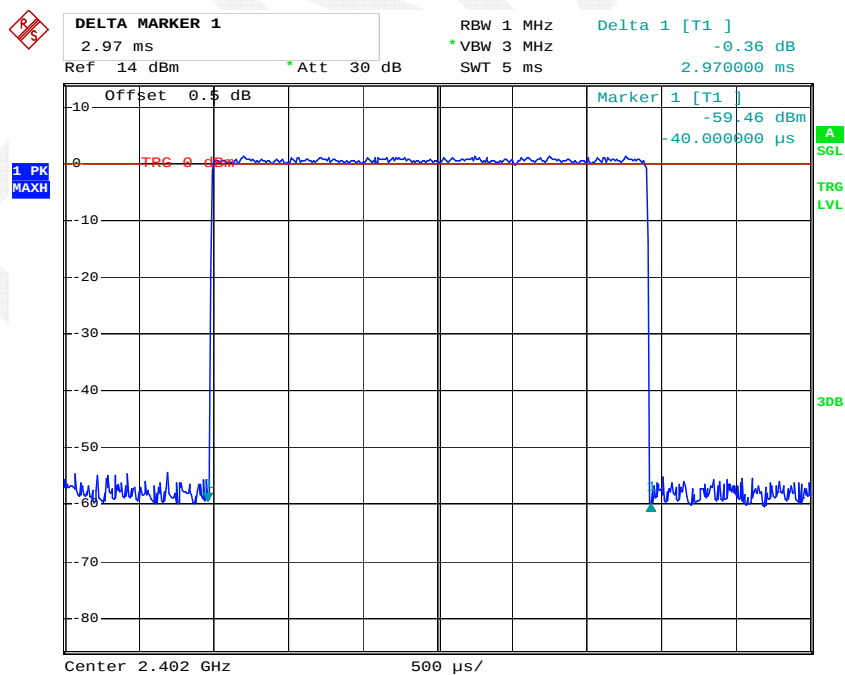
Date: 29.AUG.2014 22:34:13

DH3: High Channel



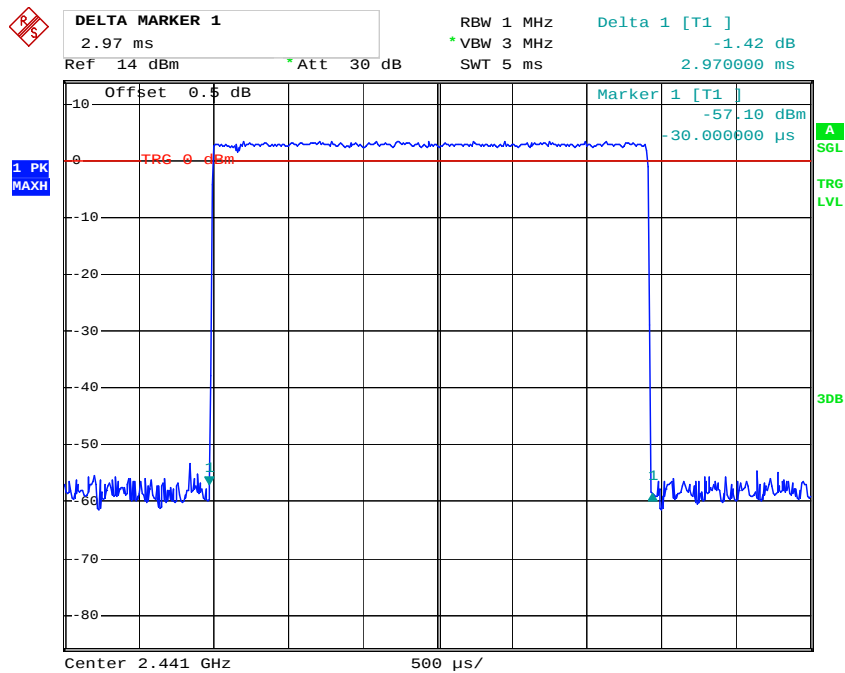
Date: 29.AUG.2014 22:34:37

DH5: Low Channel



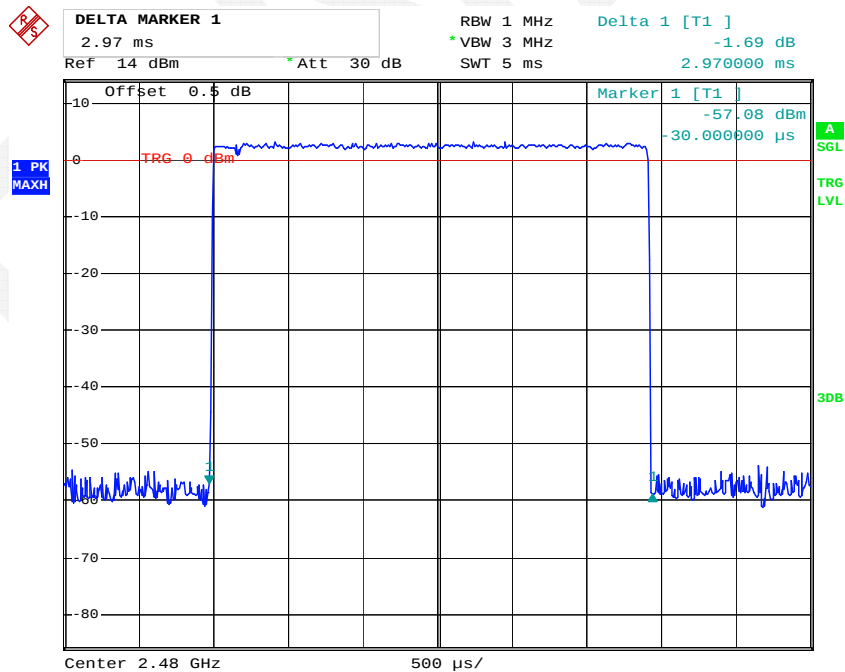
Date: 29.AUG.2014 22:38:06

DH5: Middle Channel



Date: 29.AUG.2014 22:38:43

DH5: High Channel

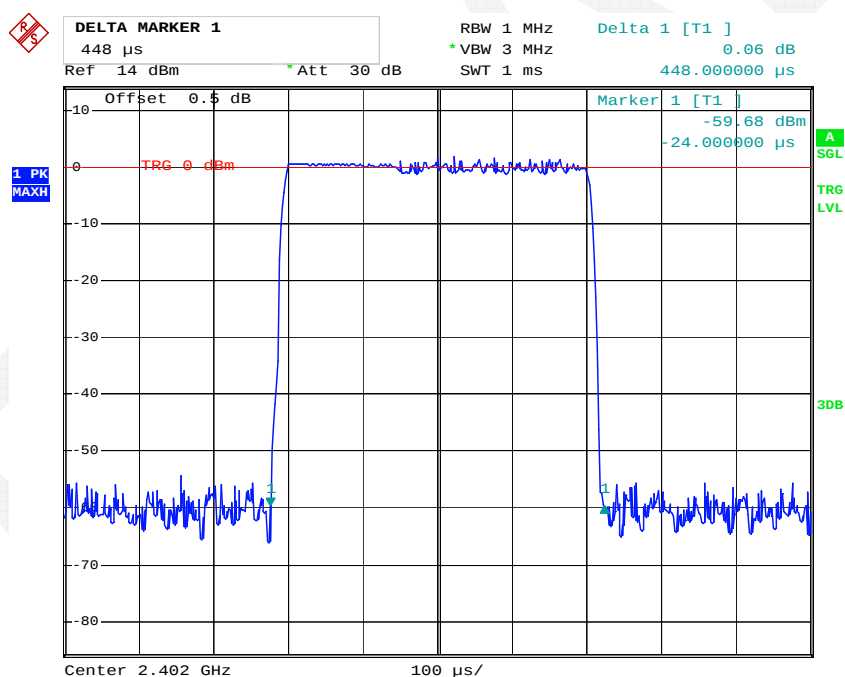


Date: 29.AUG.2014 22:39:04

EDR Mode (8DPSK):

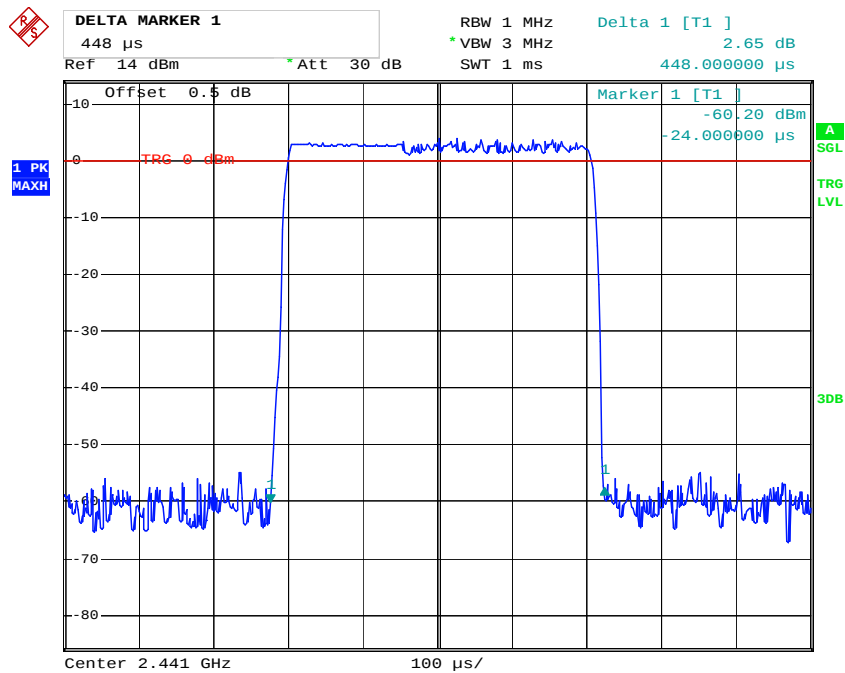
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.448	0.143	0.4	Pass
	Middle	0.448	0.143	0.4	Pass
	High	0.448	0.143	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/2/79) $\times$ 31.6 s				
DH3	Low	1.710	0.274	0.4	Pass
	Middle	1.712	0.274	0.4	Pass
	High	1.710	0.274	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/4/79) $\times$ 31.6 s				
DH5	Low	2.970	0.317	0.4	Pass
	Middle	2.970	0.317	0.4	Pass
	High	2.970	0.317	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1600/6/79) $\times$ 31.6 s				

DH1: Low Channel



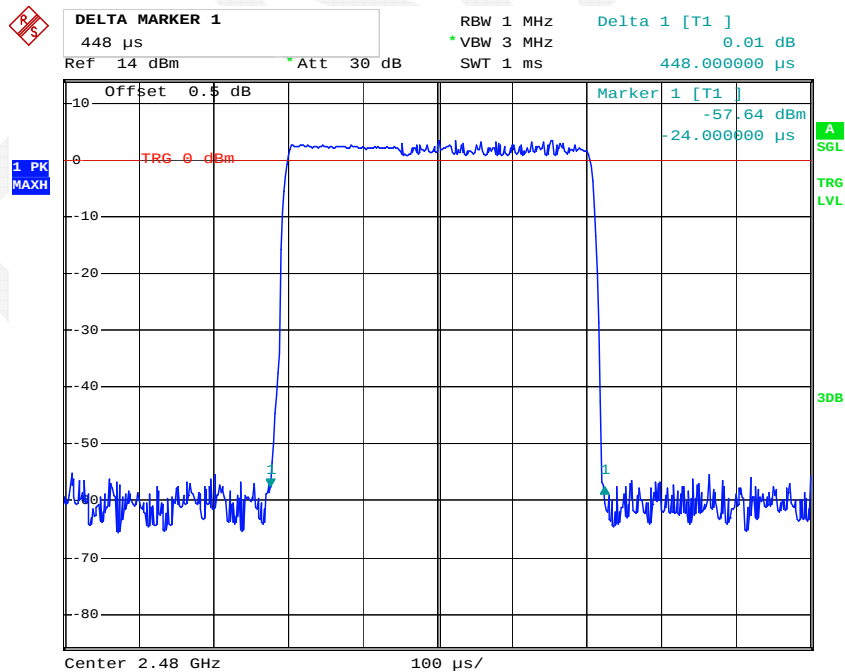
Date: 29.AUG.2014 22:25:13

DH1: Middle Channel



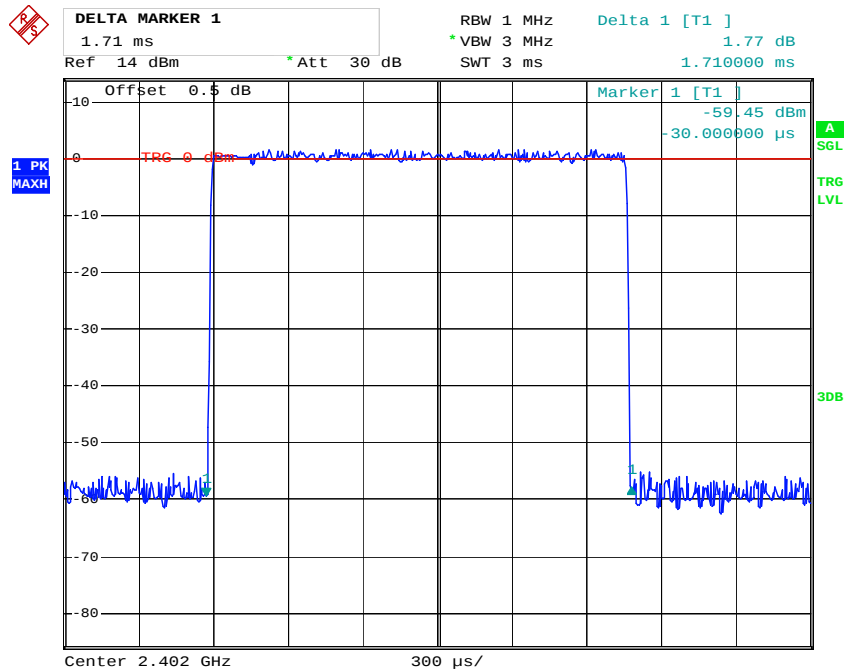
Date: 29.AUG.2014 22:24:28

DH1: High Channel



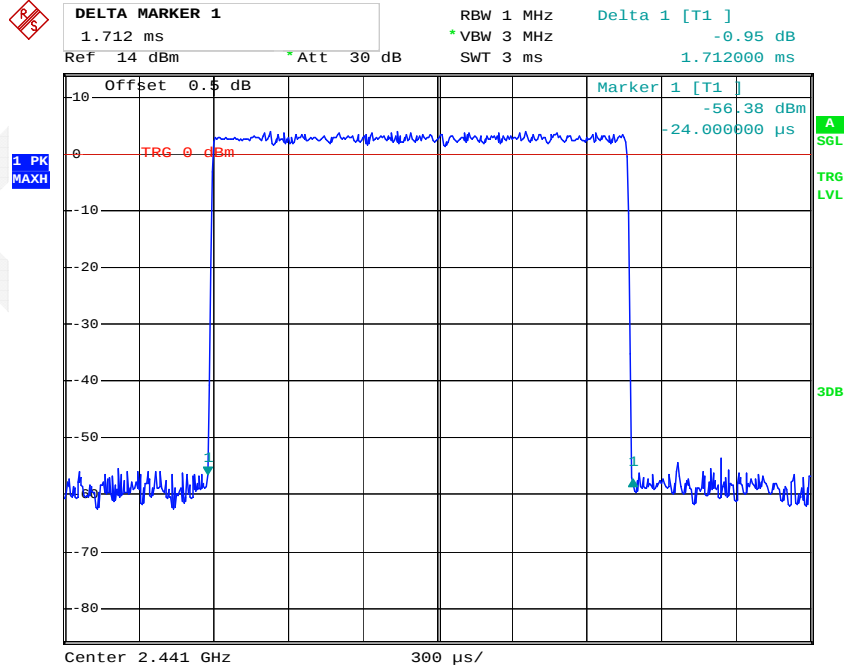
Date: 29.AUG.2014 22:25:53

DH3: Low Channel



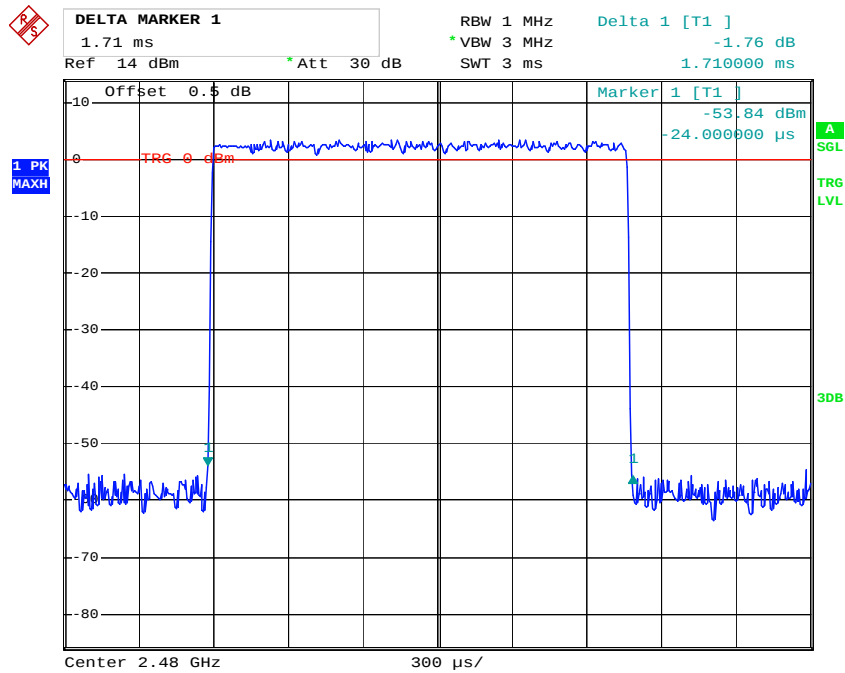
Date: 29.AUG.2014 22:35:42

DH3: Middle Channel



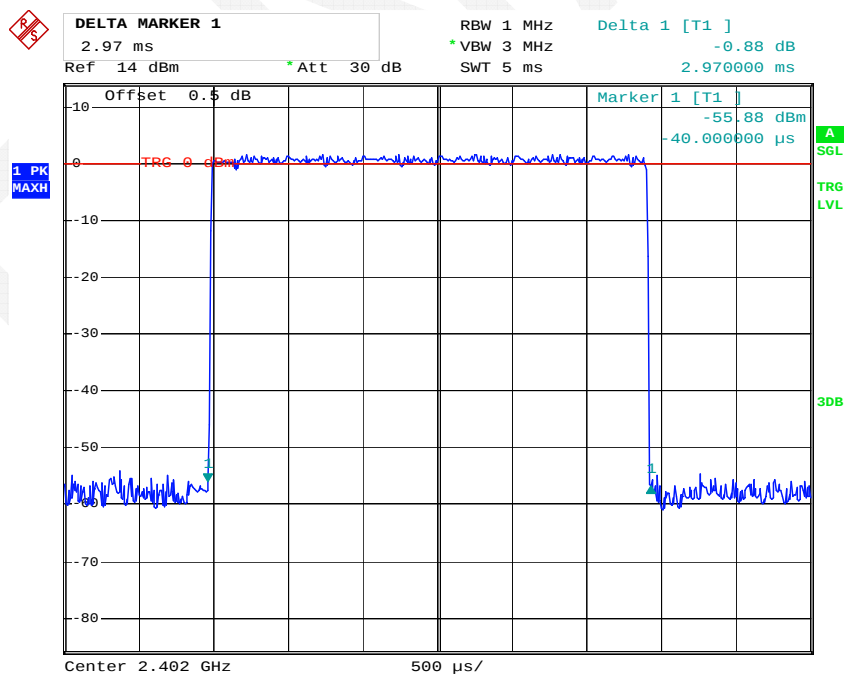
Date: 29.AUG.2014 22:42:07

DH3: High Channel



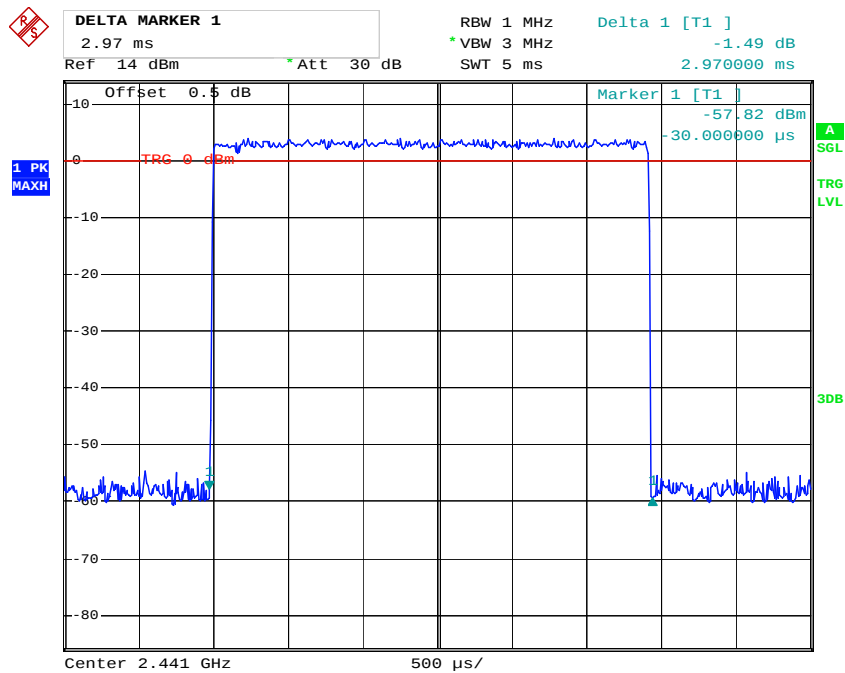
Date: 29.AUG.2014 22:35:08

DH5: Low Channel



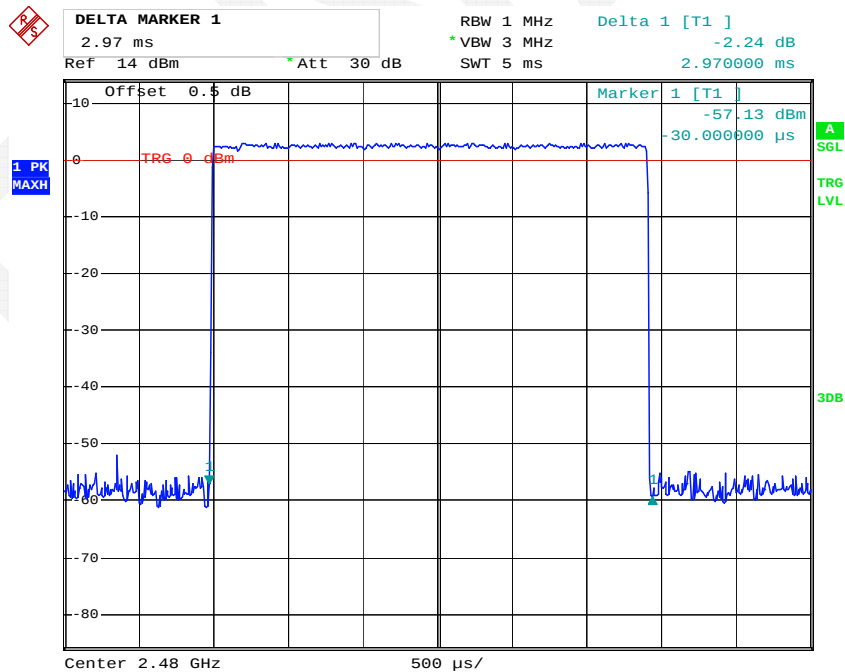
Date: 29.AUG.2014 22:36:33

DH5: Middle Channel



Date: 29.AUG.2014 22:36:50

DH5: High Channel



Date: 29.AUG.2014 22:40:03

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 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	2014-05-09	2015-05-08

* **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:	30.1 °C
Relative Humidity:	60%
ATM Pressure:	100.8 kPa

The testing was performed by Dean Liu on 2014-08-29.

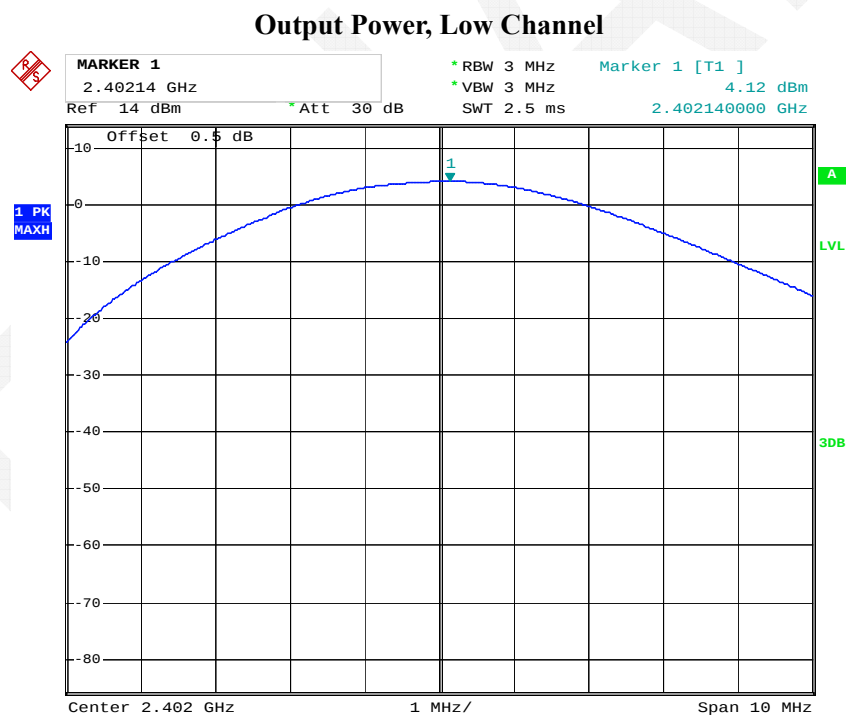
Test Result: Compliance.

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	4.12	30
	Middle	2441	5.74	30
	High	2480	5.43	30
EDR ($\pi/4$ -DQPSK)	Low	2402	2.37	30
	Middle	2441	4.07	30
	High	2480	3.67	30
EDR (8DPSK)	Low	2402	2.95	30
	Middle	2441	4.43	30
	High	2480	4.06	30

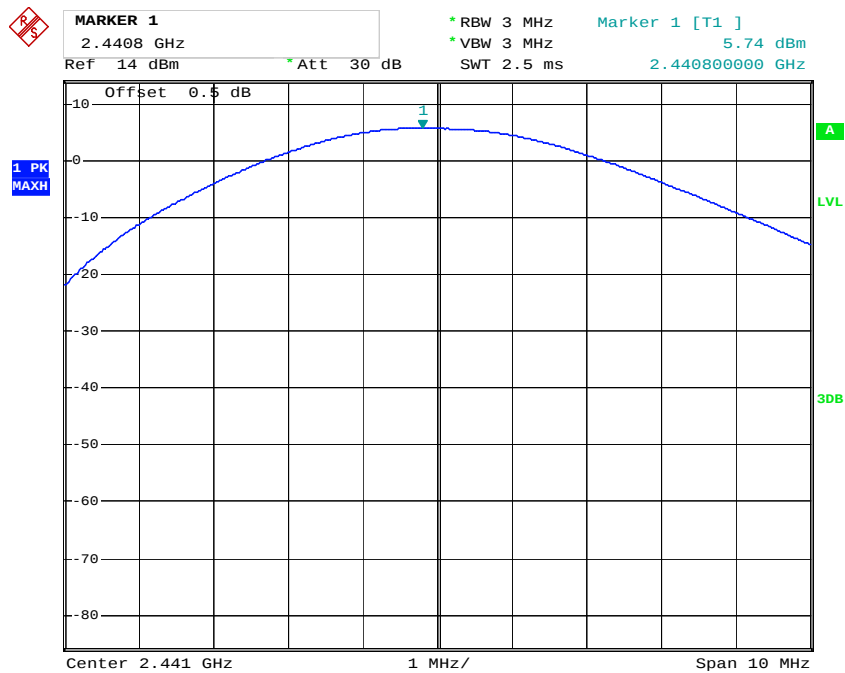
Note: The data above was tested in conducted mode.

BDR Mode (GFSK):



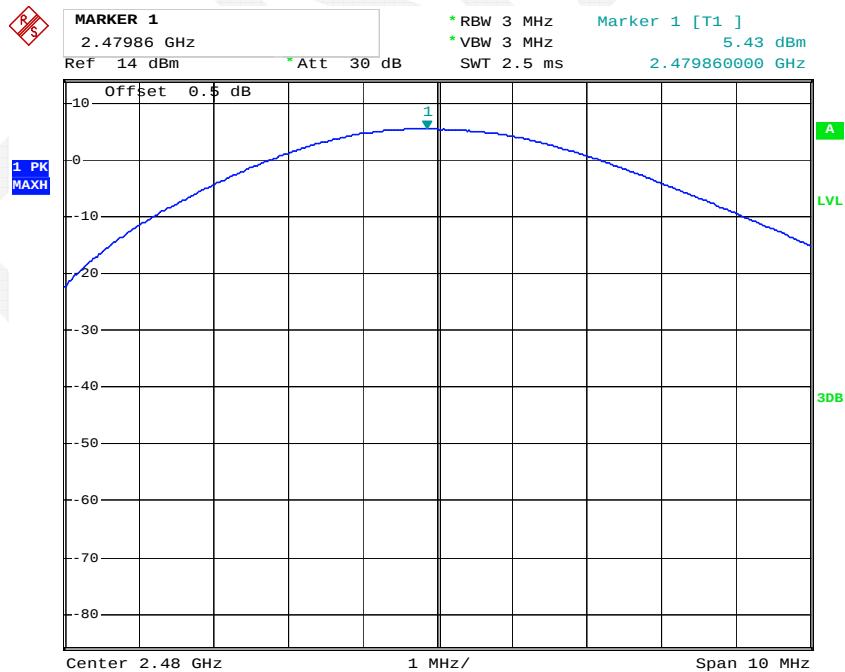
Date: 29.AUG.2014 23:18:57

Output Power, Middle Channel



Date: 29.AUG.2014 21:45:07

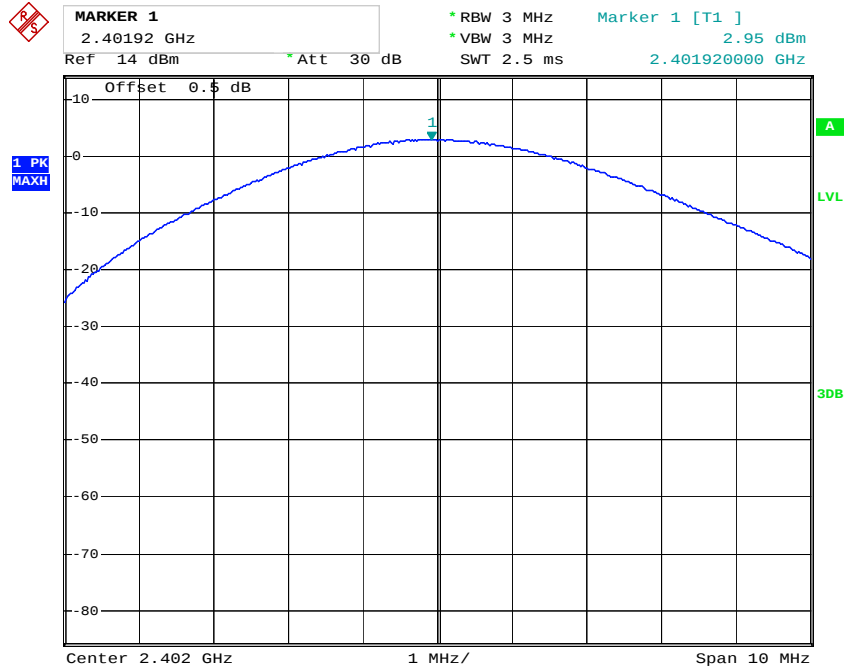
Output Power, High Channel



Date: 29.AUG.2014 21:50:38

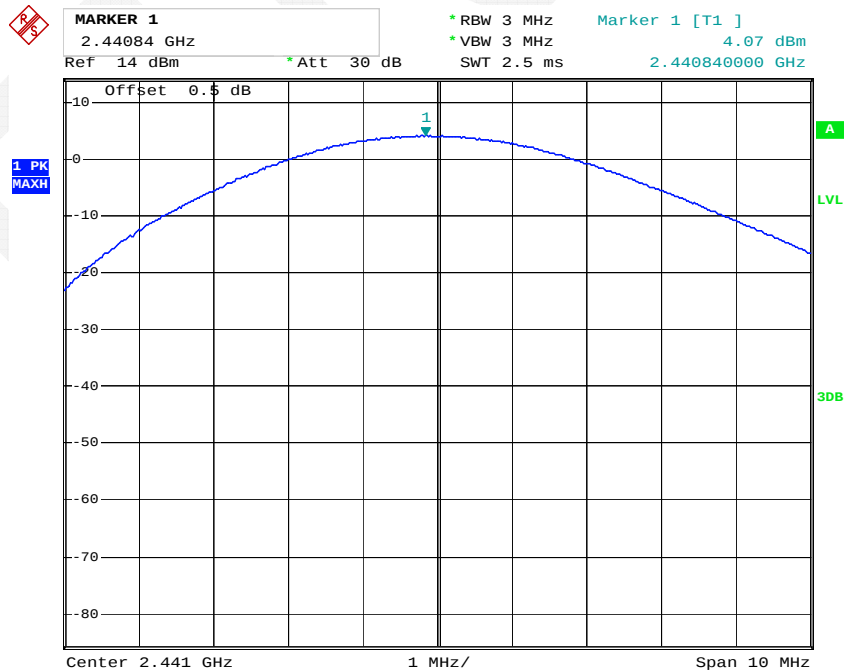
EDR Mode ($\pi/4$ -DQPSK):

Output Power, Low Channel



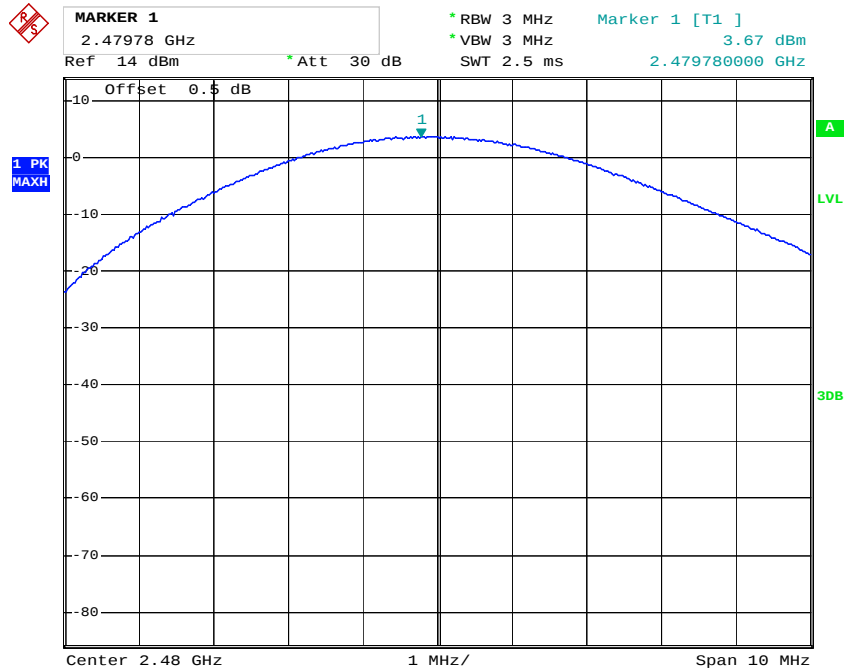
Date: 29.AUG.2014 12:50:20

Output Power, Middle Channel



Date: 29.AUG.2014 21:56:55

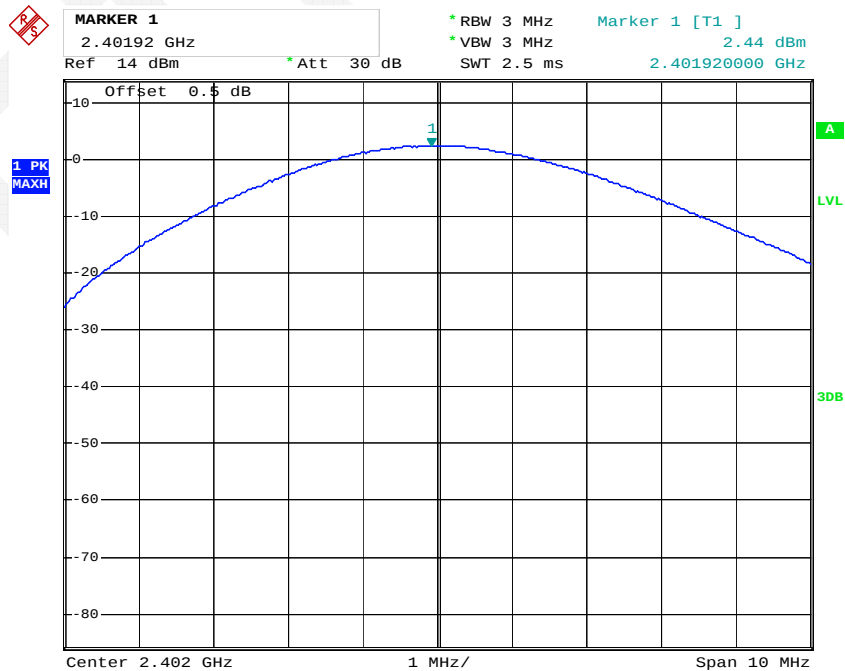
Output Power, High Channel



Date: 29.AUG.2014 21:56:28

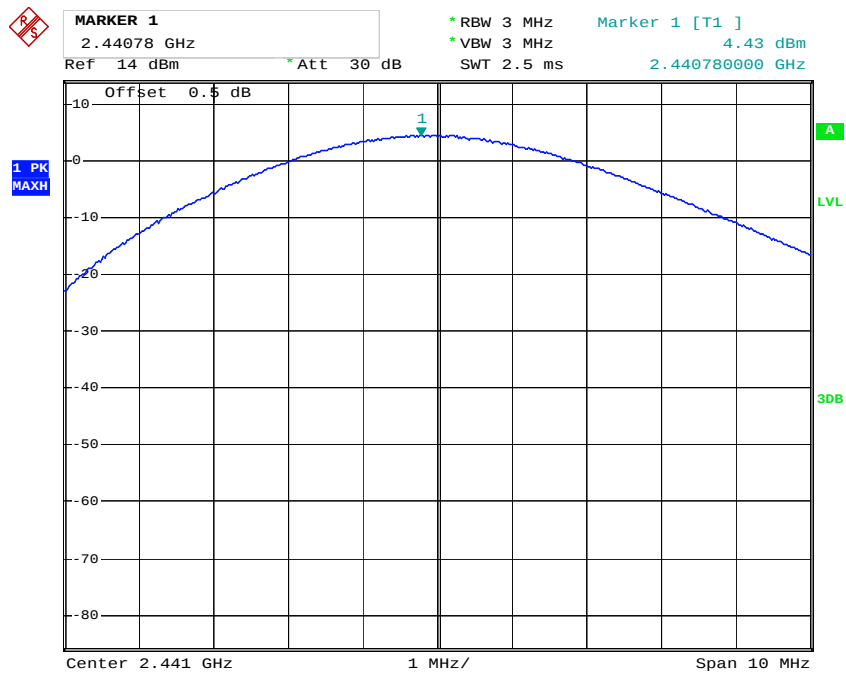
EDR Mode (8DPSK):

Output Power, Low Channel



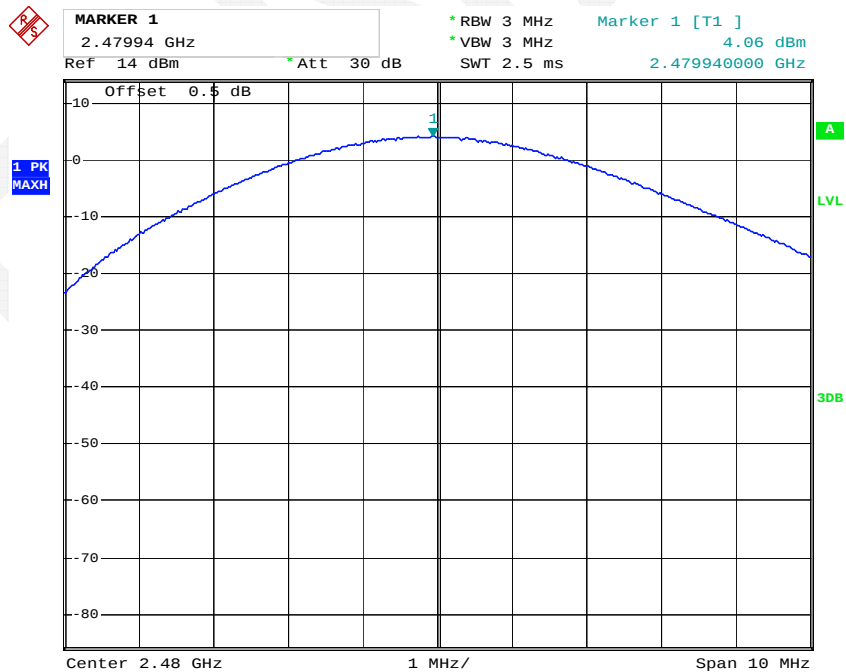
Date: 29.AUG.2014 22:08:26

Output Power, Middle Channel



Date: 29.AUG.2014 22:08:43

Output Power, High Channel



Date: 29.AUG.2014 22:12:22

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	2014-05-09	2015-05-08

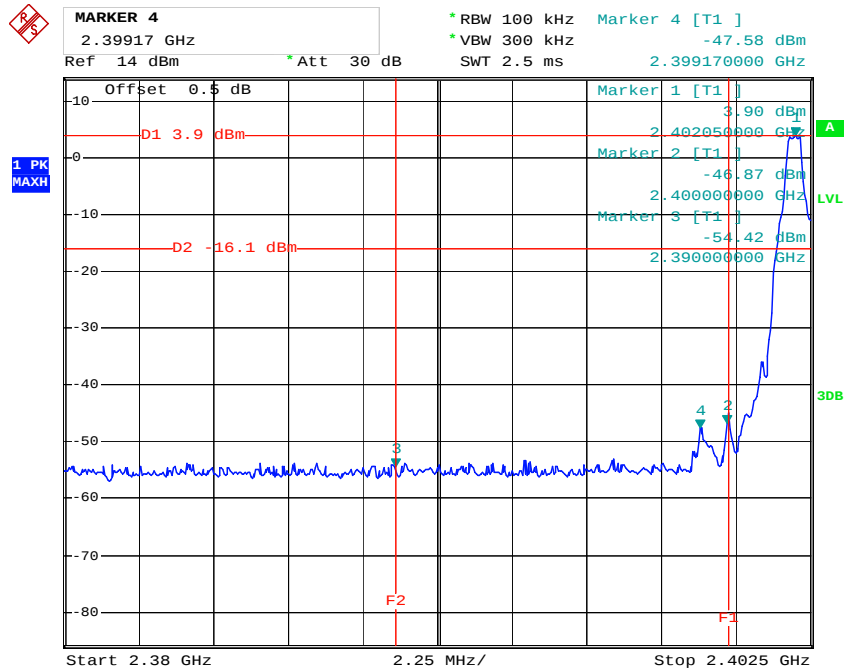
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

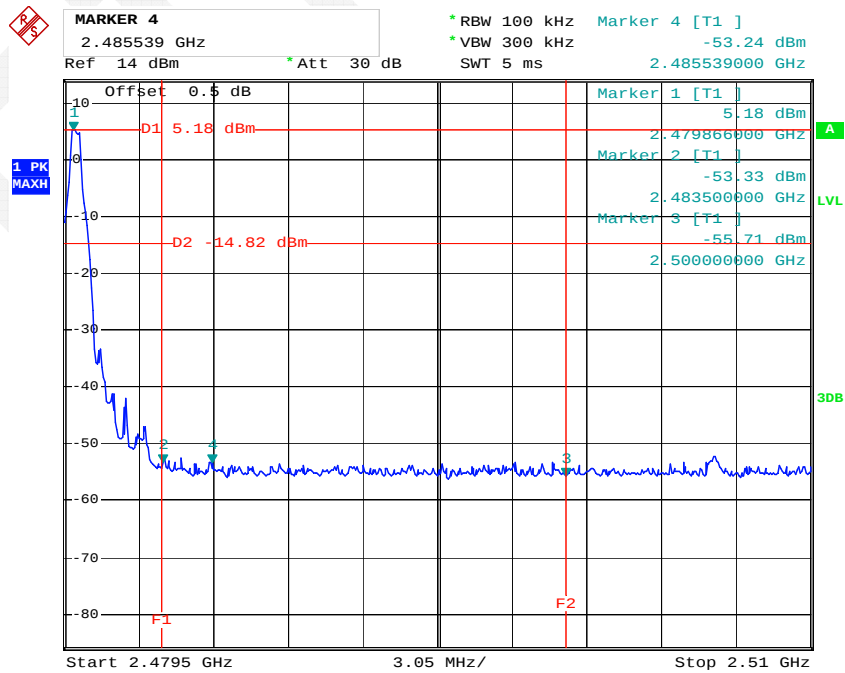
Environmental Conditions

Temperature:	30.1 °C
Relative Humidity:	60%
ATM Pressure:	100.8 kPa

The testing was performed by Dean Liu on 2014-08-29.

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

Date: 29.AUG.2014 21:44:06

Band Edge, Right Side

Date: 29.AUG.2014 21:52:12

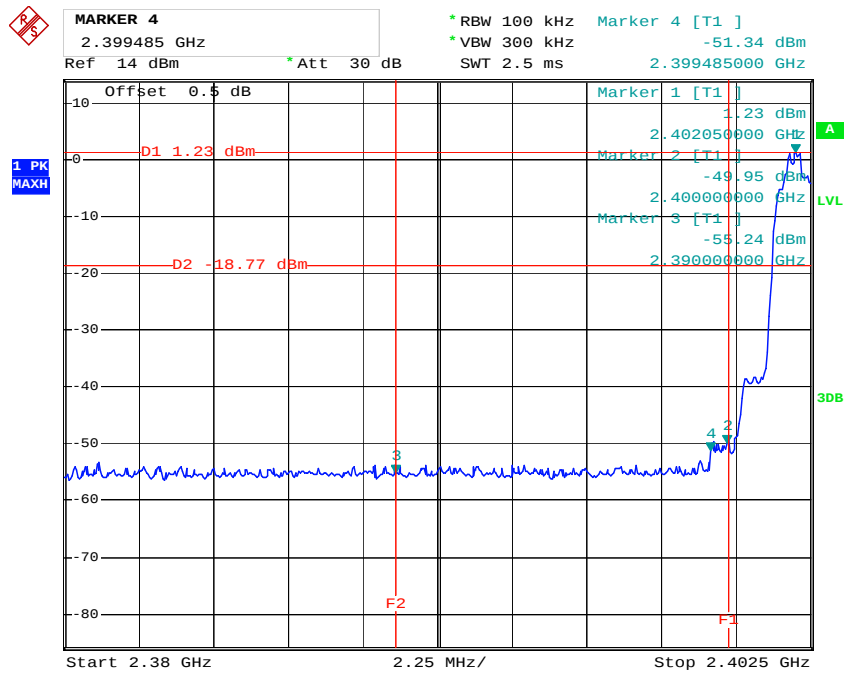
Band Edge, Left Side



Date: 29.AUG.2014 21:53:59

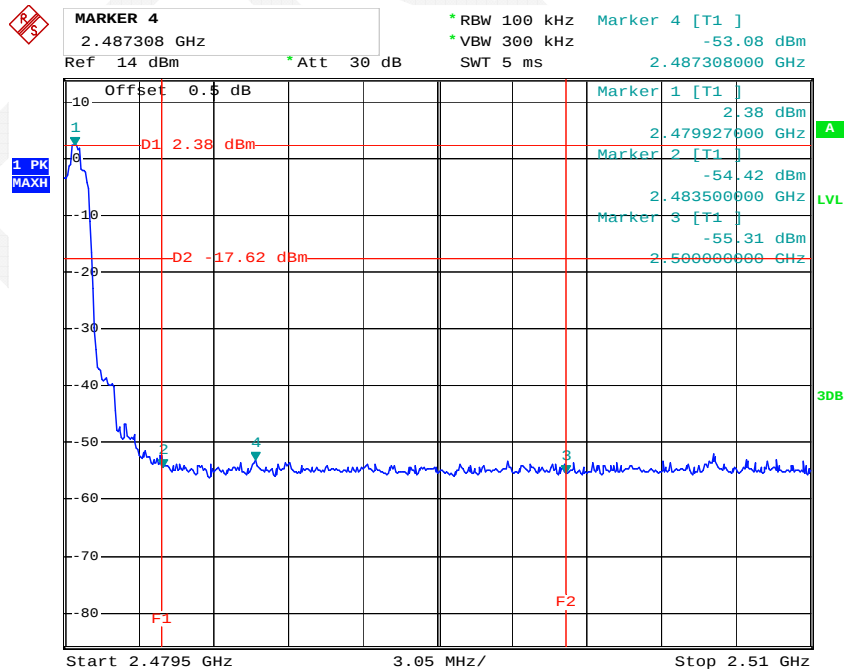
EDR Mode (8DPSK):

Band Edge, Left Side



Date: 29.AUG.2014 12:46:52

Band Edge, Right Side



Date: 29.AUG.2014 22:14:48

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