FCC PART 15.247

TEST REPORT

For

SHENZHEN TEKSUN TECHNOLOGY CO.,LTD

3F, bldg F7, F518 Idea Land, Baoyuan Road, Xixiang Avenue, Bao'an District, Shenzhen, China

FCC ID: 2ADXM53602BT

Report Type:	**Product Type:**
Original Report	Bluetooth Speaker

Test Engineer:	Allen Qiao
Report Number:	RDG150123001-00A
Report Date:	2015-02-11
Reviewed By:	Sula Huang RF Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *SHENZHEN TEKSUN TECHNOLOGY CO.,LTD*'s product, model number: *53602BT (FCC ID: 2ADXM53602BT)* (the "EUT") in this report was a *Bluetooth Speaker,* which was measured approximately:11.8 cm (L) x 7.5 cm (W) x 3.6 cm (H), rated input voltage: DC 3.7V rechargeable Li-ion battery or DC5V charging from USB port.

All measurement and test data in this report was gathered from production sample serial number: 150123001 (Assigned by BACL, Dongguan). The EUT was received on 2015-01-29.

Objective

This report is prepared on behalf of *SHENZHEN TEKSUN TECHNOLOGY 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)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, 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 06, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

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.

EUT Exercise Software

The software "FCC Assist V1.1" 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		FCC Assist V1.1		
Test Frequency		2402MHz	2441MHz	2480MHz
Power Level Setting	GFSK			
	π/4-DQPSK			
	8DPSK			

Equipment Modifications

No modification was made to the EUT.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
HP	Printer	C3941A	JPTVOB2337
DELL	Keyboard	L100	CNORH656658907BL05DC
SAST	Modem	AEM-2100	0293

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Serial Cable	Yes	No	1.2	Serial Port of Laptop	Modem
Parallel Cable	Yes	No	1.2	Parallel Port of Laptop	Printer
Keyboard Cable	Yes	No	1.8	USB Port of Laptop	Keyboard
USB Cable	No	No	0.5	USB Port of Laptop	EUT

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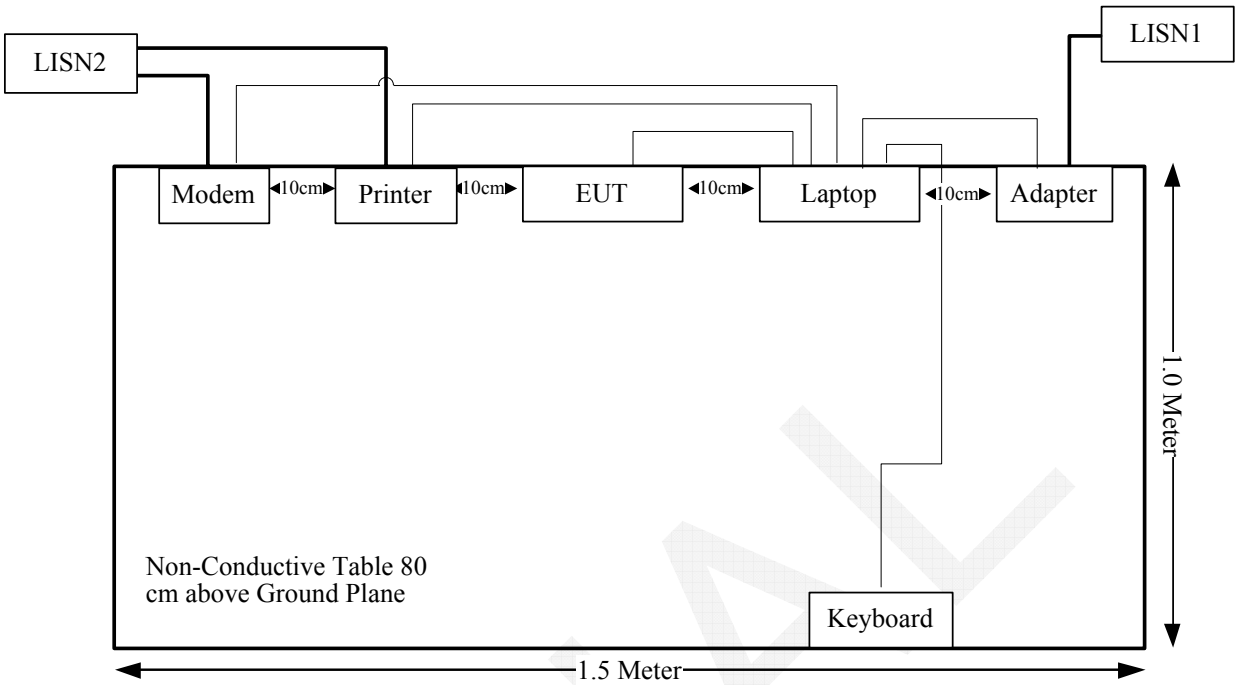
Block Diagram of Test Setup



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SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliace
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliace
§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

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FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

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

According to KDB447498 D01 General RF Exposure Guidance v05r02:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

The maximum conducted output power= -0.04 dBm (0.99 mW) at 2402 MHz
[(max. power of channel, mW)/(min. test separation distance, mm)] [√f(GHz)]
= 0.99/5*(√2.402) = 0.31 < 3.0

So the stand-alone SAR evaluation is not necessary.

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.

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FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

Measurement Uncertainty

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

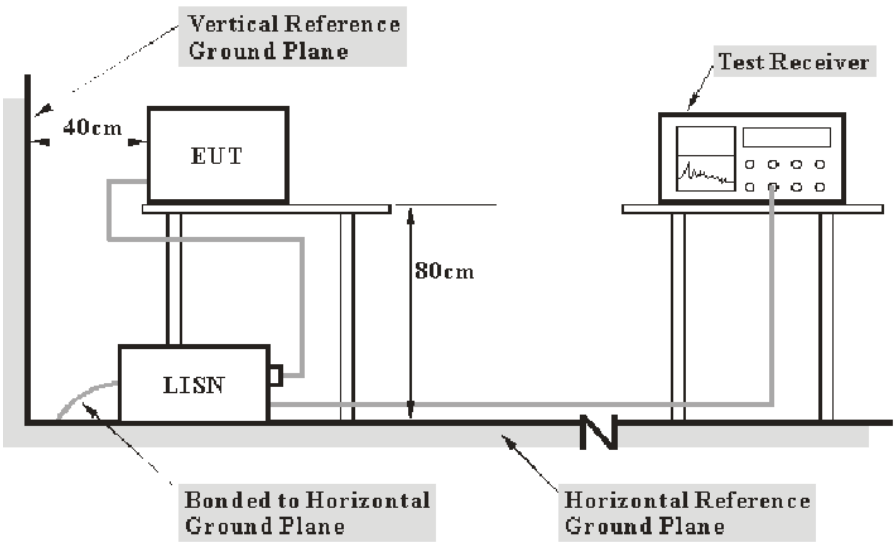
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of 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 conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$

Herein,
V_C: corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN or ISN

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

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2014-10-16	2015-10-16
R&S	L.I.S.N	ESH3-Z5	843331/015	N/A	N/A
R&S	Two-line V-network	ENV 216	3560.6550.12	2014-12-11	2015-12-11
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

*** 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 Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

5.1 dB at **1.396499 MHz** in the **Neutral** conducted mode

Test Data

Environmental Conditions

Temperature:	21°C
Relative Humidity:	39 %
ATM Pressure:	101.7 kPa

The testing was performed by Allen Qiao on 2015-02-10.

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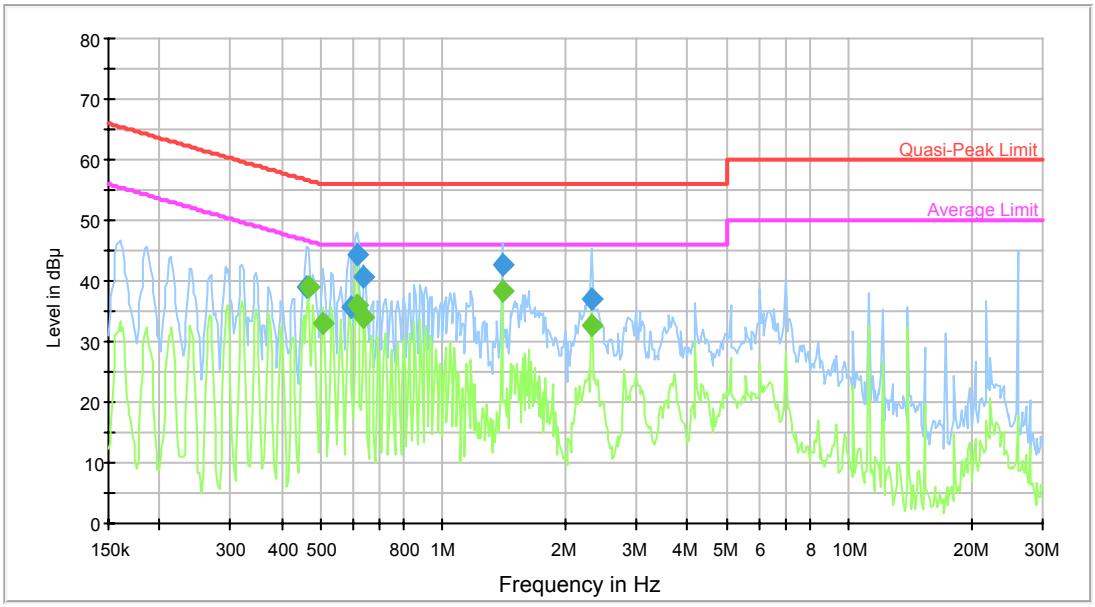
Test Mode: Charging&Transmitting

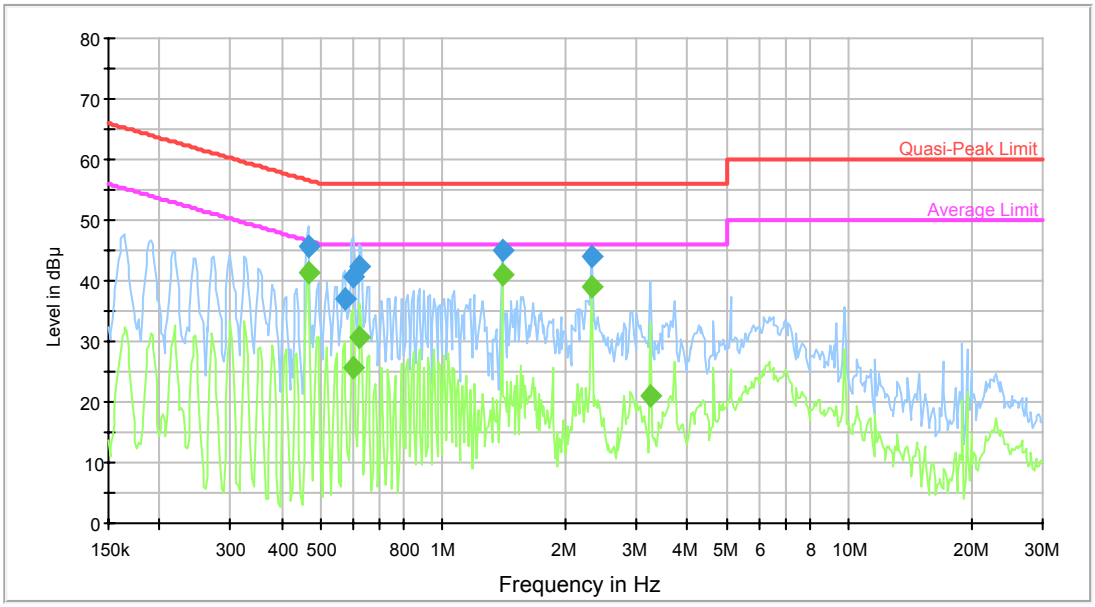
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.461346	38.9	9.000	L1	10.4	17.8	56.7	Compliance
0.590613	35.8	9.000	L1	10.4	20.2	56.0	Compliance
0.614619	44.5	9.000	L1	10.5	11.5	56.0	Compliance
0.639600	40.6	9.000	L1	10.5	15.4	56.0	Compliance
1.396499	42.7	9.000	L1	10.4	13.3	56.0	Compliance
2.325491	37.0	9.000	L1	10.5	19.0	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.465037	39.0	9.000	L1	10.4	7.6	46.6	Compliance
0.507637	32.9	9.000	L1	10.3	13.1	46.0	Compliance
0.614619	36.1	9.000	L1	10.5	9.9	46.0	Compliance
0.639600	34.1	9.000	L1	10.5	11.9	46.0	Compliance
1.396499	38.5	9.000	L1	10.4	7.5	46.0	Compliance
2.325491	32.8	9.000	L1	10.5	13.2	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.465037	45.7	9.000	N	10.5	10.9	56.6	Compliance
0.572086	36.9	9.000	N	10.4	19.1	56.0	Compliance
0.600101	40.7	9.000	N	10.5	15.3	56.0	Compliance
0.624492	42.3	9.000	N	10.5	13.7	56.0	Compliance
1.396499	45.1	9.000	N	10.5	10.9	56.0	Compliance
2.325491	44.0	9.000	N	10.5	12.0	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.465037	41.3	9.000	N	10.5	5.3	46.6	Compliance
0.600101	25.6	9.000	N	10.5	20.4	46.0	Compliance
0.624492	30.5	9.000	N	10.5	15.5	46.0	Compliance
1.396499	40.9	9.000	N	10.5	5.1	46.0	Compliance
2.325491	39.1	9.000	N	10.5	6.9	46.0	Compliance
3.249802	21.1	9.000	N	10.7	24.9	46.0	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.

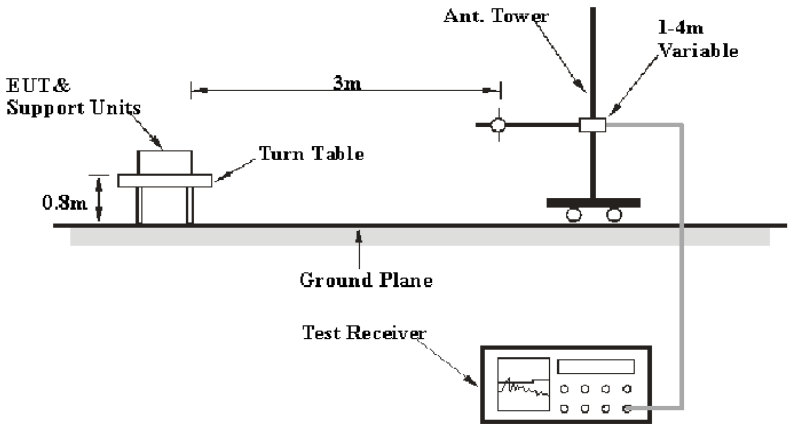
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:
30M~200MHz: 5.0 dB
200M~1GHz: 6.2 dB
1G~6GHz: 4.45 dB
6G~18GHz: 5.23 dB

Table 1 – Values of U_{cispr}

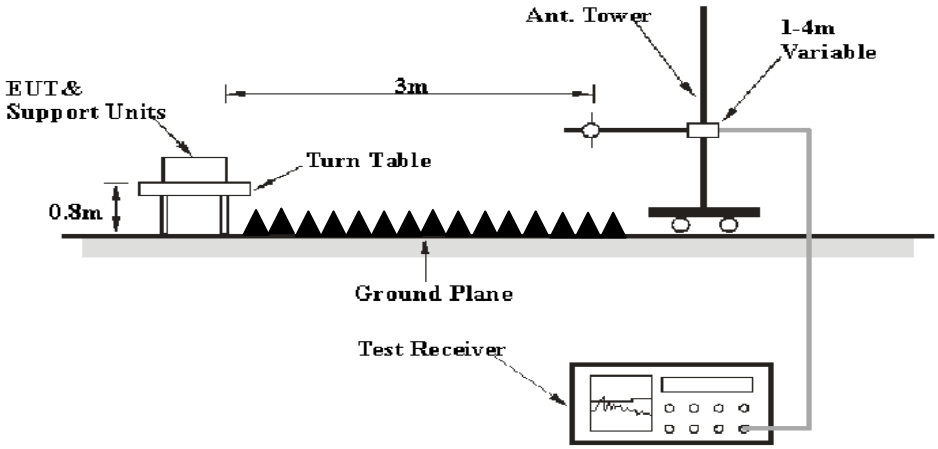
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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 C63.4-2009. 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
R&S	EMI Test Receiver	ESCI	100224	2014-05-09	2015-05-09
Sunol Sciences	Antenna	JB3	A060611-3	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2014-09-01	2015-09-01
R&S	Spectrum Analyzer	FSEM	DE31388	2014-05-09	2015-05-09
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-19
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2014-09-06	2015-09-06

*** 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:

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

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

Margin = Limit – Corrected Amplitude

Test 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:

7.90 dB at **7323 MHz** in the **Horizontal** polarization of EDR Mode (π/4-DQPSK)

Test Data

Environmental Conditions

Temperature:	23.4 °C
Relative Humidity:	64 %
ATM Pressure:	101.6 kPa

The testing was performed by Allen Qiao on 2015-02-04.

Mode: Transmitting

BDR Mode (GFSK):

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	56.36	PK	H	25.65	4.42	0.00	86.43	N/A	N/A
2402	46.49	AV	H	25.65	4.42	0.00	76.56	N/A	N/A
2402	64.15	PK	V	25.65	4.42	0.00	94.22	N/A	N/A
2402	54.24	AV	V	25.65	4.42	0.00	84.31	N/A	N/A
2390	25.81	PK	V	25.61	4.39	0.00	55.81	74.00	18.19
2390	14.67	AV	V	25.61	4.39	0.00	44.67	54.00	9.33
4804	40.13	PK	V	30.59	5.98	27.41	49.29	74.00	24.71
4804	32.06	AV	V	30.59	5.98	27.41	41.22	54.00	12.78
7206	32.25	PK	V	34.09	7.45	25.91	47.88	74.00	26.12
7206	20.29	AV	V	34.09	7.45	25.91	35.92	54.00	18.08
9608	30.15	PK	V	35.96	8.80	27.55	47.36	74.00	26.64
9608	18.39	AV	V	35.96	8.80	27.55	35.60	54.00	18.40
1894	32.26	PK	V	24.39	3.62	27.51	32.76	74.00	41.24
1894	20.84	AV	V	24.39	3.62	27.51	21.34	54.00	32.66
266.9	34.19	QP	V	13.51	2.00	21.50	28.20	46.00	17.80
Middle Channel: 2441 MHz									
2441	58.33	PK	H	25.75	4.40	0.00	88.48	N/A	N/A
2441	48.19	AV	H	25.75	4.40	0.00	78.34	N/A	N/A
2441	64.03	PK	V	25.75	4.40	0.00	94.18	N/A	N/A
2441	54.24	AV	V	25.75	4.40	0.00	84.39	N/A	N/A
4882	40.79	PK	V	30.79	6.08	27.42	50.24	74.00	23.76
4882	32.16	AV	V	30.79	6.08	27.42	41.61	54.00	12.39
7323	32.54	PK	V	34.38	7.51	25.88	48.55	74.00	25.45
7323	20.27	AV	V	34.38	7.51	25.88	36.28	54.00	17.72
9764	30.43	PK	V	36.33	8.83	27.20	48.39	74.00	25.61
9764	18.37	AV	V	36.33	8.83	27.20	36.33	54.00	17.67
1554	32.1	PK	V	23.71	3.23	27.62	31.42	74.00	42.58
1554	20.06	AV	V	23.71	3.23	27.62	19.38	54.00	34.62
266.9	34.23	QP	V	13.51	2.00	21.50	28.24	46.00	17.76
High Channel: 2480 MHz									
2480	56.76	PK	H	25.85	4.48	0.00	87.09	N/A	N/A
2480	46.65	AV	H	25.85	4.48	0.00	76.98	N/A	N/A
2480	64.51	PK	V	25.85	4.48	0.00	94.84	N/A	N/A
2480	54.26	AV	V	25.85	4.48	0.00	84.59	N/A	N/A
2483.5	26.07	PK	V	25.86	4.49	0.00	56.42	74.00	17.58
2483.5	15.12	AV	V	25.86	4.49	0.00	45.47	54.00	8.53
4960	40.81	PK	V	31.00	5.90	27.43	50.28	74.00	23.72
4960	32.54	AV	V	31.00	5.90	27.43	42.01	54.00	11.99
7440	32.66	PK	V	34.66	7.58	25.97	48.93	74.00	25.07
7440	20.19	AV	V	34.66	7.58	25.97	36.46	54.00	17.54
9920	30.47	PK	V	36.71	8.87	26.66	49.39	74.00	24.61
9920	18.7	AV	V	36.71	8.87	26.66	37.62	54.00	16.38
1891	32.14	PK	V	24.38	3.63	27.51	32.64	74.00	41.36
1891	20.28	AV	V	24.38	3.63	27.51	20.78	54.00	33.22
266.9	34.38	QP	V	13.51	2.00	21.50	28.39	46.00	17.61

EDR Mode (π/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	56.71	PK	H	25.65	4.42	0.00	86.78	N/A	N/A
2402	44.52	AV	H	25.65	4.42	0.00	74.59	N/A	N/A
2402	64.01	PK	V	25.65	4.42	0.00	94.08	N/A	N/A
2402	52.17	AV	V	25.65	4.42	0.00	82.24	N/A	N/A
2390	26.03	PK	H	25.61	4.39	0.00	56.03	74.00	17.97
2390	15.39	AV	H	25.61	4.39	0.00	45.39	54.00	8.61
4804	38.24	PK	H	30.59	5.98	27.41	47.40	74.00	26.60
4804	26.27	AV	H	30.59	5.98	27.41	35.43	54.00	18.57
7206	32.12	PK	H	34.09	7.45	25.91	47.75	74.00	26.25
7206	20.27	AV	H	34.09	7.45	25.91	35.90	54.00	18.10
9608	30.99	PK	H	35.96	8.80	27.55	48.20	74.00	25.80
9608	18.92	AV	H	35.96	8.80	27.55	36.13	54.00	17.87
1815	32.11	PK	H	24.23	3.57	27.53	32.38	74.00	41.62
1815	20.63	AV	H	24.23	3.57	27.53	20.90	54.00	33.10
266.9	34.06	QP	H	13.51	2.00	21.50	28.07	46.00	17.93
Middle Channel: 2441 MHz									
2441	58.13	PK	H	25.75	4.40	0.00	88.28	N/A	N/A
2441	46.25	AV	H	25.75	4.40	0.00	76.40	N/A	N/A
2441	64.1	PK	V	25.75	4.40	0.00	94.25	N/A	N/A
2441	52.07	AV	V	25.75	4.40	0.00	82.22	N/A	N/A
4882	38.2	PK	H	30.79	6.08	27.42	47.65	74.00	26.35
4882	26.13	AV	H	30.79	6.08	27.42	35.58	54.00	18.42
7323	32.48	PK	H	34.38	7.51	25.88	48.49	74.00	25.51
7323	30.09	AV	H	34.38	7.51	25.88	46.10	54.00	7.90
9764	30.83	PK	H	36.33	8.83	27.20	48.79	74.00	25.21
9764	18.73	AV	H	36.33	8.83	27.20	36.69	54.00	17.31
1933	32.61	PK	H	24.47	3.73	27.50	33.31	74.00	40.69
1933	20.22	AV	H	24.47	3.73	27.50	20.92	54.00	33.08
266.9	34.49	QP	H	13.51	2.00	21.50	28.50	46.00	17.50
High Channel: 2480 MHz									
2480	58.02	PK	H	25.85	4.48	0.00	88.35	N/A	N/A
2480	48.16	AV	H	25.85	4.48	0.00	78.49	N/A	N/A
2480	63.95	PK	V	25.85	4.48	0.00	94.28	N/A	N/A
2480	54.04	AV	V	25.85	4.48	0.00	84.37	N/A	N/A
2483.5	26.52	PK	H	25.86	4.49	0.00	56.87	74.00	17.13
2483.5	15.33	AV	H	25.86	4.49	0.00	45.68	54.00	8.32
4960	38.15	PK	H	31.00	5.90	27.43	47.62	74.00	26.38
4960	26.28	AV	H	31.00	5.90	27.43	35.75	54.00	18.25
7440	32.15	PK	H	34.66	7.58	25.97	48.42	74.00	25.58
7440	20.34	AV	H	34.66	7.58	25.97	36.61	54.00	17.39
9920	30.46	PK	H	36.71	8.87	26.66	49.38	74.00	24.62
9920	18.78	AV	H	36.71	8.87	26.66	37.70	54.00	16.30
1649	32.01	PK	H	23.90	3.41	27.74	31.58	74.00	42.42
1649	20.09	AV	H	23.90	3.41	27.74	19.66	54.00	34.34
266.9	34.05	QP	H	13.51	2.00	21.50	28.06	46.00	17.94

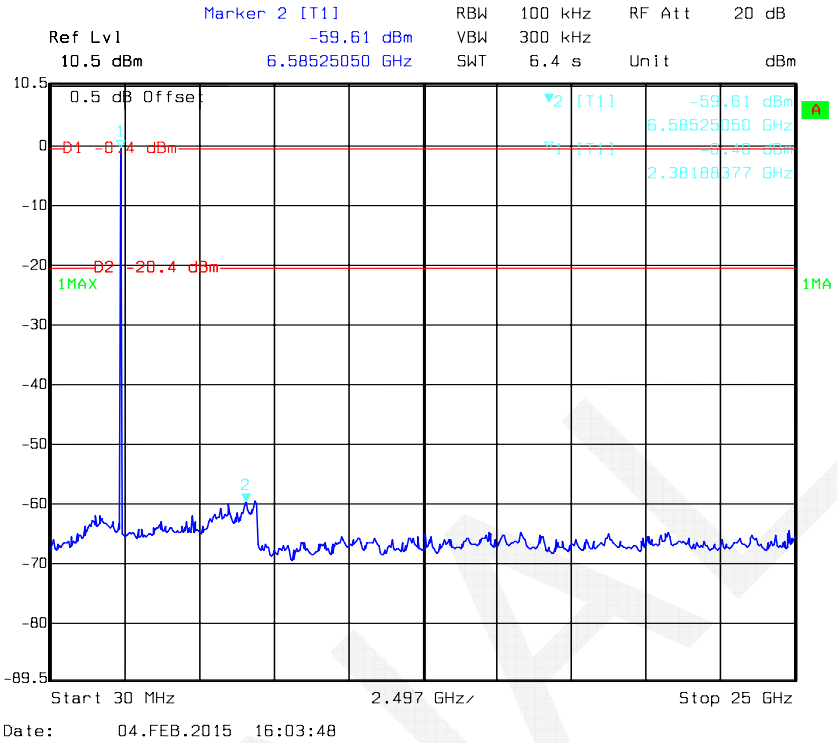
EDR Mode (8-DPSK):

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	56.16	PK	H	25.65	4.42	0.00	86.23	N/A	N/A
2402	44.23	AV	H	25.65	4.42	0.00	74.30	N/A	N/A
2402	64.13	PK	V	25.65	4.42	0.00	94.20	N/A	N/A
2402	52.07	AV	V	25.65	4.42	0.00	82.14	N/A	N/A
2390	26.07	PK	H	25.61	4.39	0.00	56.07	74.00	17.93
2390	15.11	AV	H	25.61	4.39	0.00	45.11	54.00	8.89
4804	34.16	PK	H	30.59	5.98	27.41	43.32	74.00	30.68
4804	22.08	AV	H	30.59	5.98	27.41	31.24	54.00	22.76
7206	32.93	PK	H	34.09	7.45	25.91	48.56	74.00	25.44
7206	20.16	AV	H	34.09	7.45	25.91	35.79	54.00	18.21
9608	30.19	PK	H	35.96	8.80	27.55	47.40	74.00	26.60
9608	18.51	AV	H	35.96	8.80	27.55	35.72	54.00	18.28
2916	32.54	PK	H	26.98	6.62	27.54	38.60	74.00	35.40
2916	20.49	AV	H	26.98	6.62	27.54	26.55	54.00	27.45
266.9	34.66	QP	H	13.51	2.00	21.50	28.67	46.00	17.33
Middle Channel: 2441 MHz									
2441	58.36	PK	H	25.75	4.40	0.00	88.51	N/A	N/A
2441	46.41	AV	H	25.75	4.40	0.00	76.56	N/A	N/A
2441	64.29	PK	V	25.75	4.40	0.00	94.44	N/A	N/A
2441	52.13	AV	V	25.75	4.40	0.00	82.28	N/A	N/A
4882	34.16	PK	H	30.79	6.08	27.42	43.61	74.00	30.39
4882	22.27	AV	H	30.79	6.08	27.42	31.72	54.00	22.28
7323	32.59	PK	H	34.38	7.51	25.88	48.60	74.00	25.40
7323	20.42	AV	H	34.38	7.51	25.88	36.43	54.00	17.57
9764	30.85	PK	H	36.33	8.83	27.20	48.81	74.00	25.19
9764	18.67	AV	H	36.33	8.83	27.20	36.63	54.00	17.37
2676	32.43	PK	H	26.36	4.81	27.47	36.13	74.00	37.87
2676	20.29	AV	H	26.36	4.81	27.47	23.99	54.00	30.01
266.9	34.82	QP	H	13.51	2.00	21.50	28.83	46.00	17.17
High Channel: 2480 MHz									
2480	58.73	PK	H	25.85	4.48	0.00	89.06	N/A	N/A
2480	46.25	AV	H	25.85	4.48	0.00	76.58	N/A	N/A
2480	64.08	PK	V	25.85	4.48	0.00	94.41	N/A	N/A
2480	52.1	AV	V	25.85	4.48	0.00	82.43	N/A	N/A
2483.5	27.16	PK	H	25.86	4.49	0.00	57.51	74.00	16.49
2483.5	15.35	AV	H	25.86	4.49	0.00	45.70	54.00	8.30
4960	34.09	PK	H	31.00	5.90	27.43	43.56	74.00	30.44
4960	22.17	AV	H	31.00	5.90	27.43	31.64	54.00	22.36
7440	32.15	PK	H	34.66	7.58	25.97	48.42	74.00	25.58
7440	20.26	AV	H	34.66	7.58	25.97	36.53	54.00	17.47
9920	30.44	PK	H	36.71	8.87	26.66	49.36	74.00	24.64
9920	18.17	AV	H	36.71	8.87	26.66	37.09	54.00	16.91
2793	32.35	PK	H	26.66	5.28	27.56	36.73	74.00	37.27
2793	20.46	AV	H	26.66	5.28	27.56	24.84	54.00	29.16
266.9	34.57	QP	H	13.51	2.00	21.50	28.58	46.00	17.42

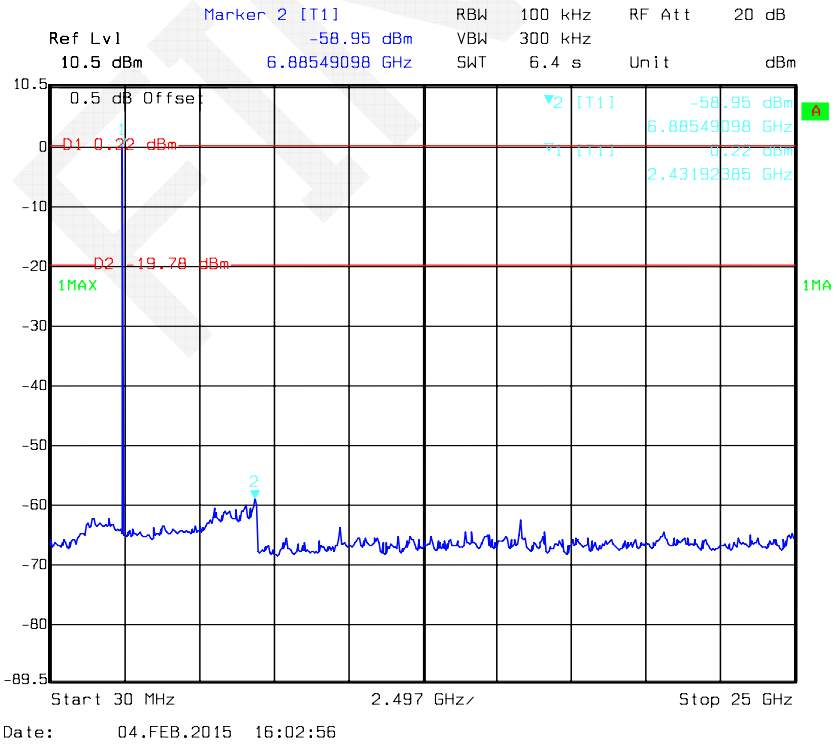
Conducted Spurious Emissions at Antenna Port

BDR Mode (GFSK):

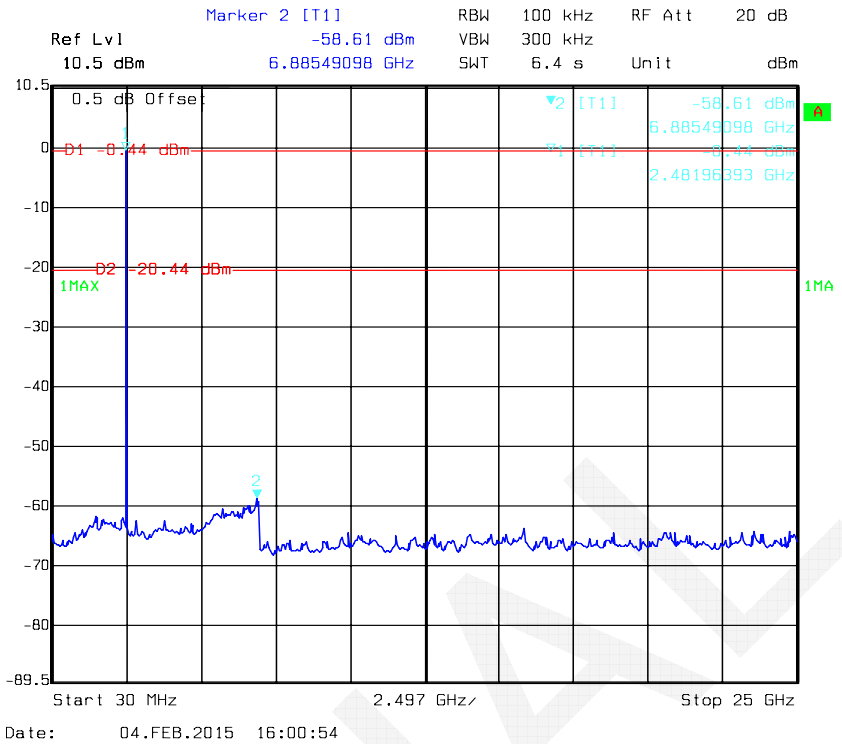
Low Channel



Middle Channel

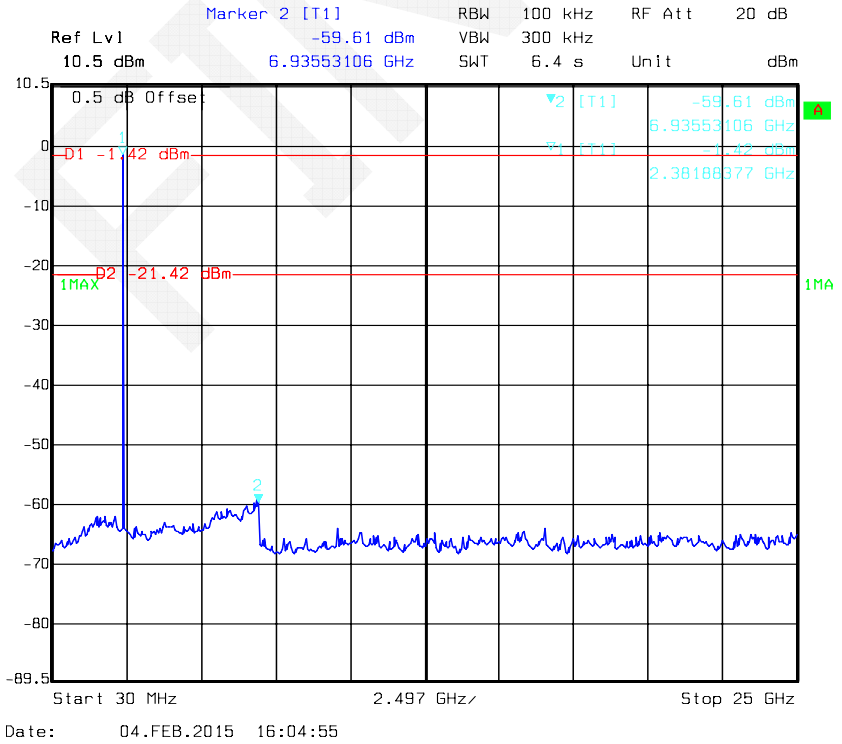


High Channel

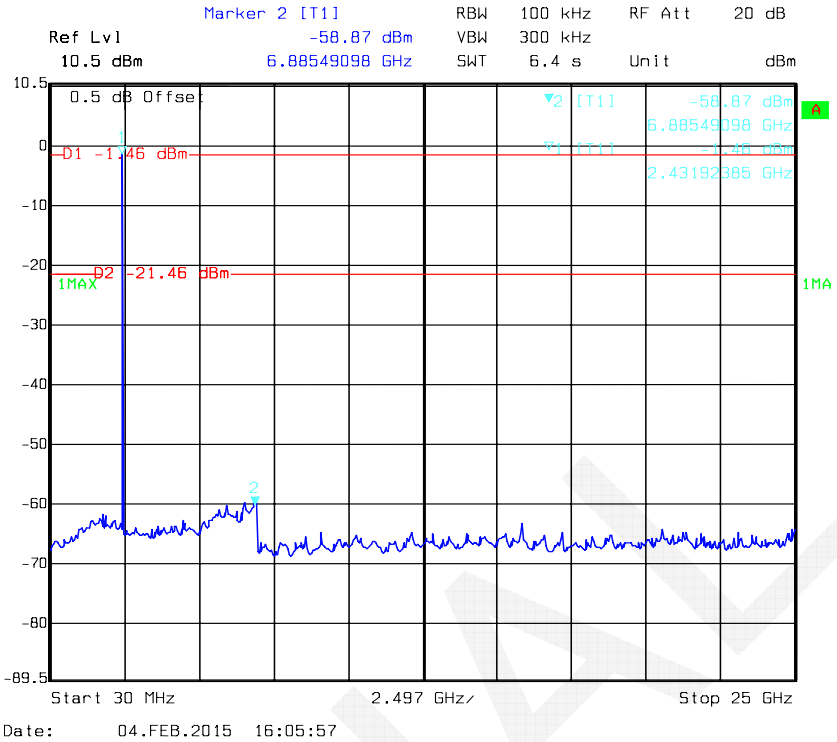


EDR Mode (π/4-DQPSK):

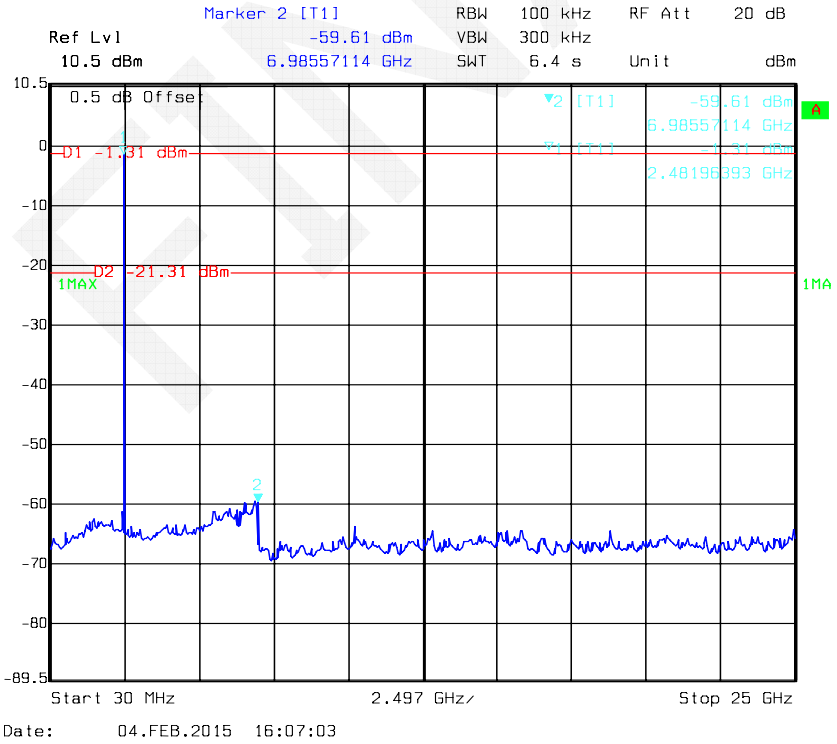
Low Channel



Middle Channel

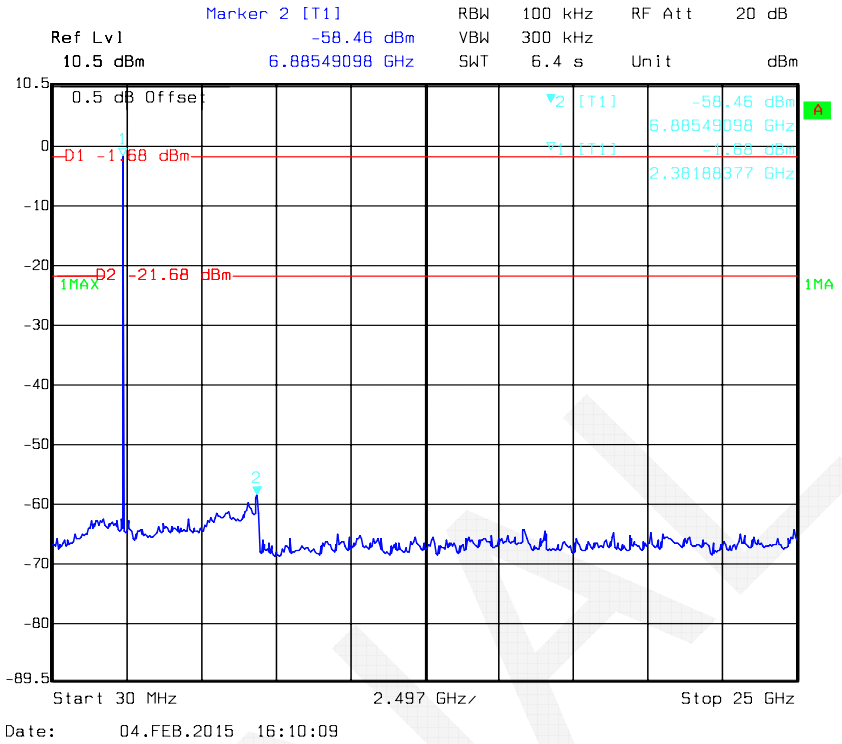


High Channel

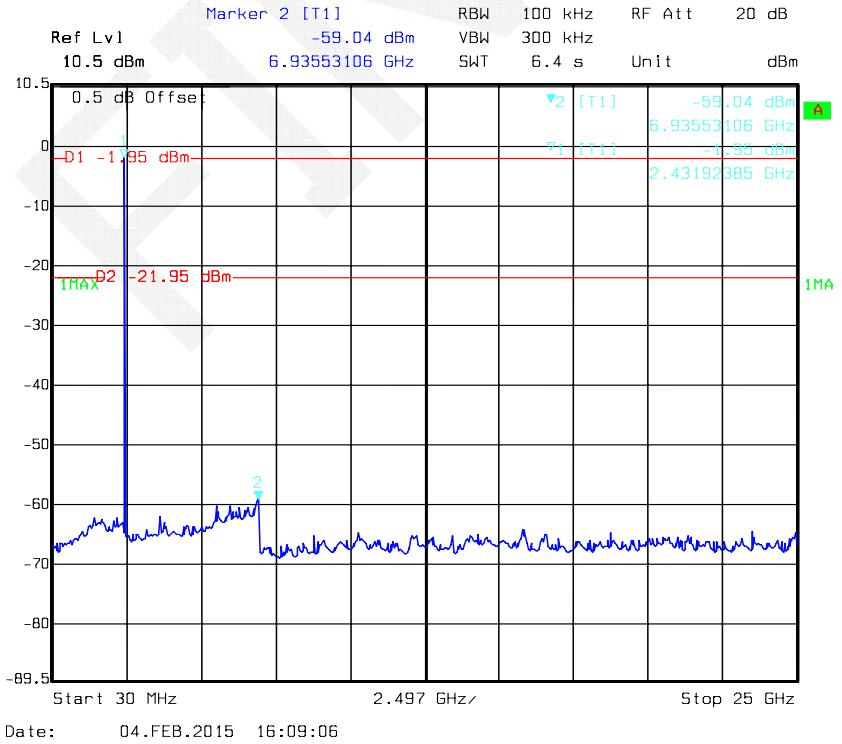


EDR Mode (8-DPSK):

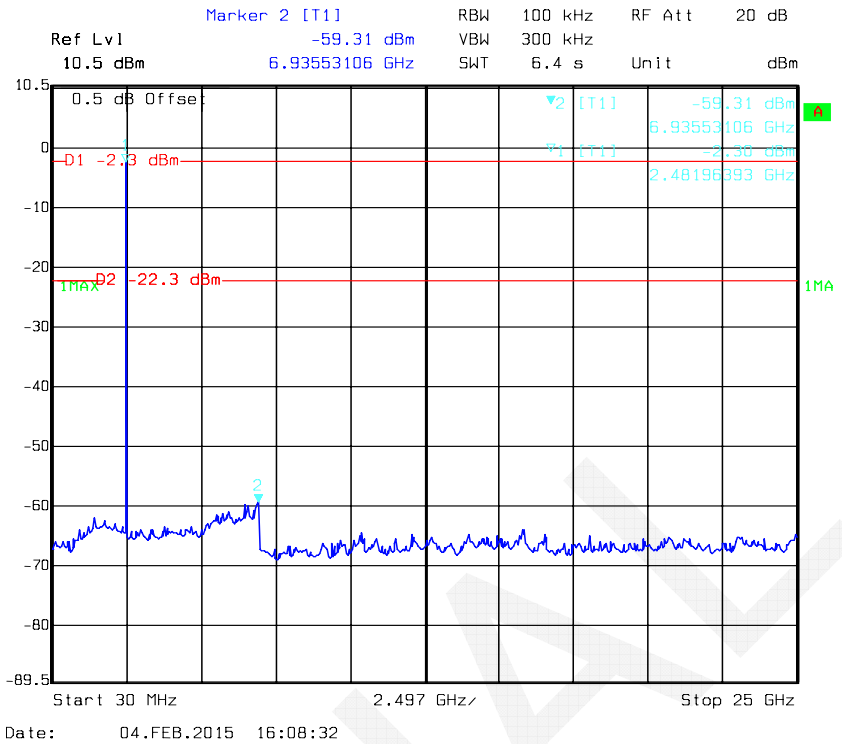
Low Channel



Middle Channel



High Channel



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

Applicable Standard

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09

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

Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	22.7°C
Relative Humidity:	42 %
ATM Pressure:	101.6 kPa

** The testing was performed by Allen Qiao on 2015-02-04.*

Test Result: Compliance.

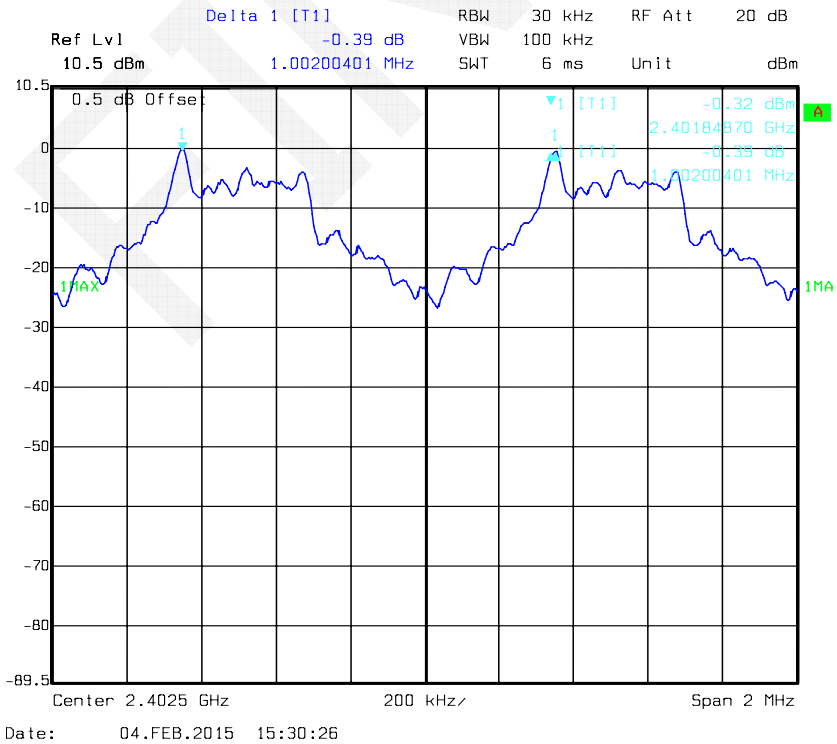
Please refer to following tables and plots

Test Mode: Transmitting

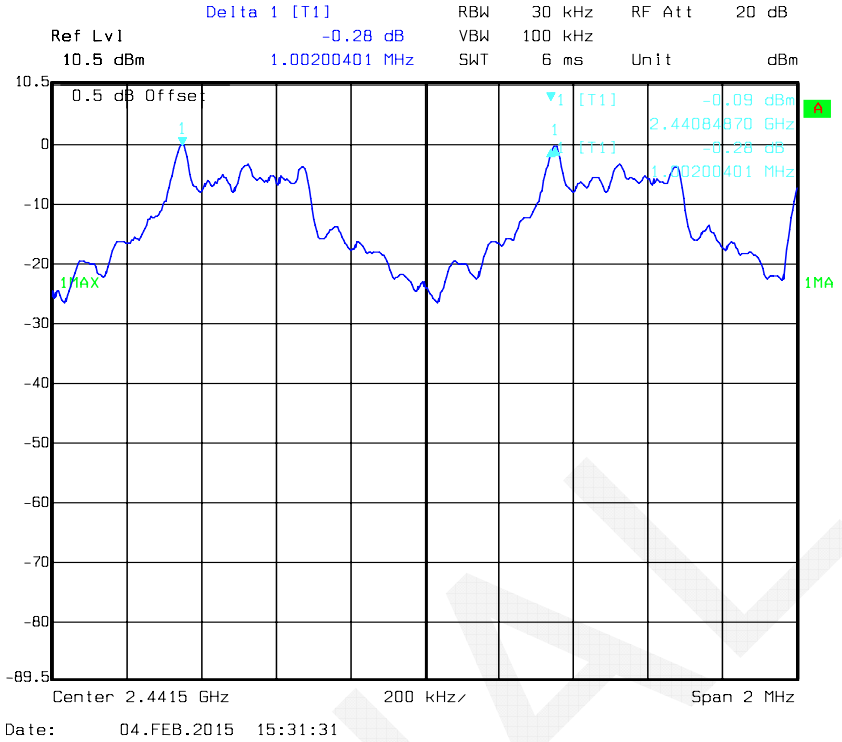
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR Mode (GFSK)	Low	2402	1.002	0.561	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.561	Pass
	Adjacent	2442			
	High	2480	1.002	0.561	Pass
	Adjacent	2479			
EDR Mode (π/4-DQPSK):	Low	2402	1.002	0.756	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.756	Pass
	Adjacent	2442			
	High	2480	1.002	0.756	Pass
	Adjacent	2479			
EDR Mode (8-DPSK):	Low	2402	1.002	0.783	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.783	Pass
	Adjacent	2442			
	High	2480	1.002	0.783	Pass
	Adjacent	2479			

BDR Mode (GFSK):

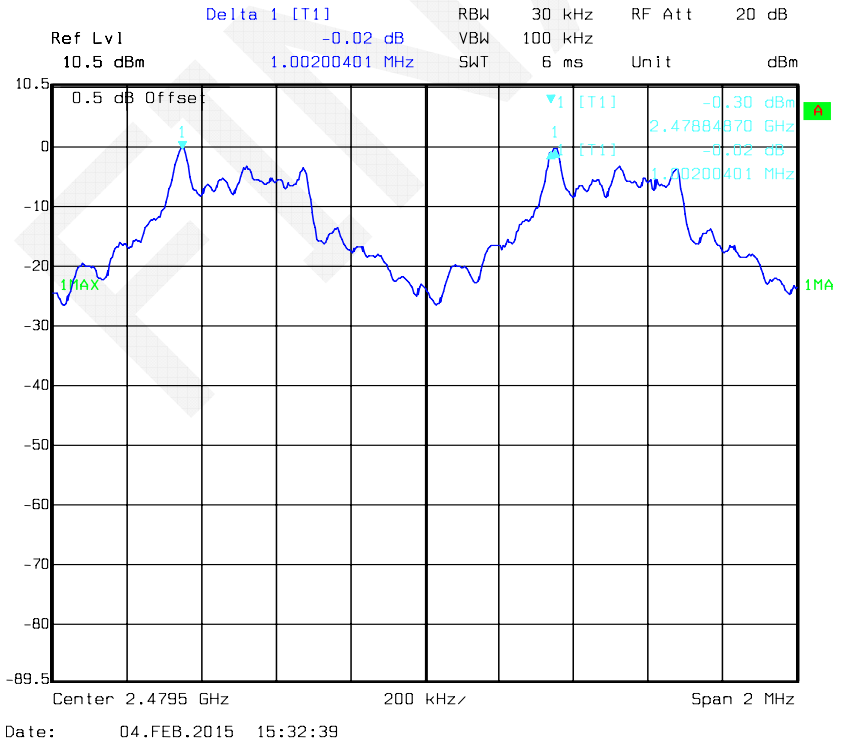
Low Channel



Middle Channel

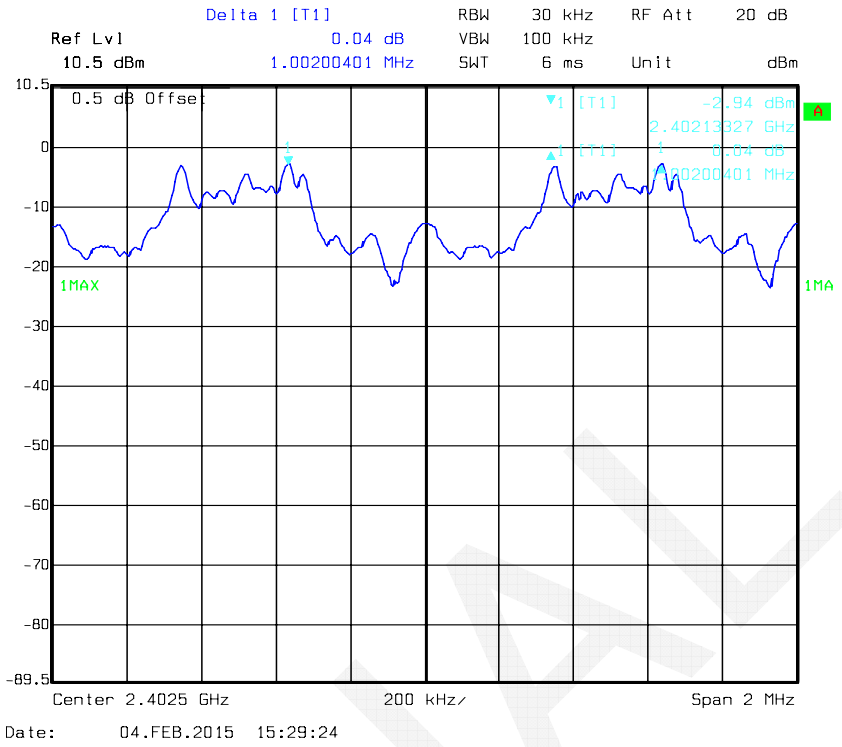


High Channel

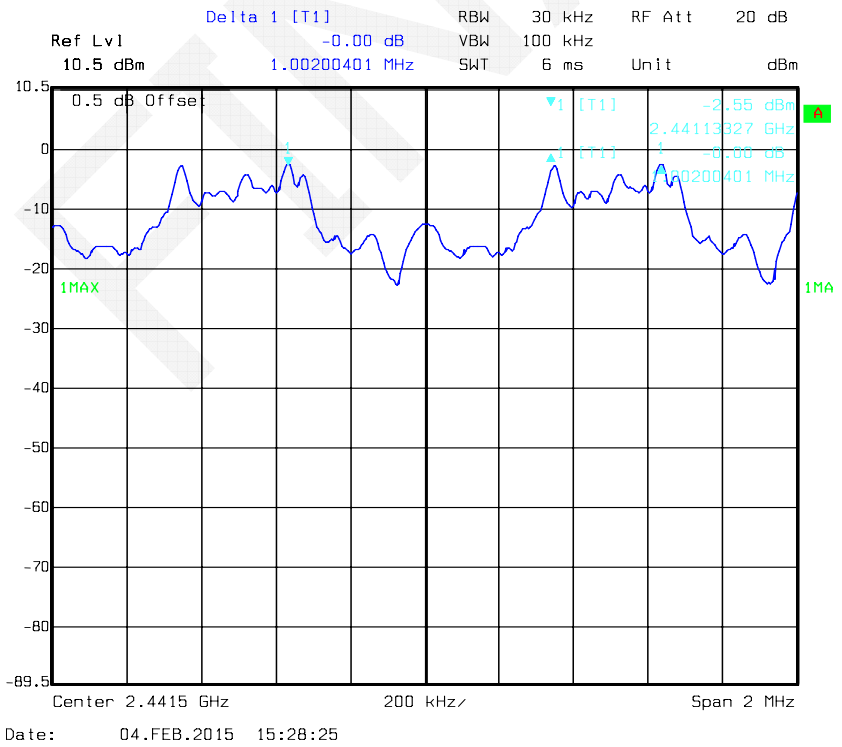


EDR Mode (π/4-DQPSK):

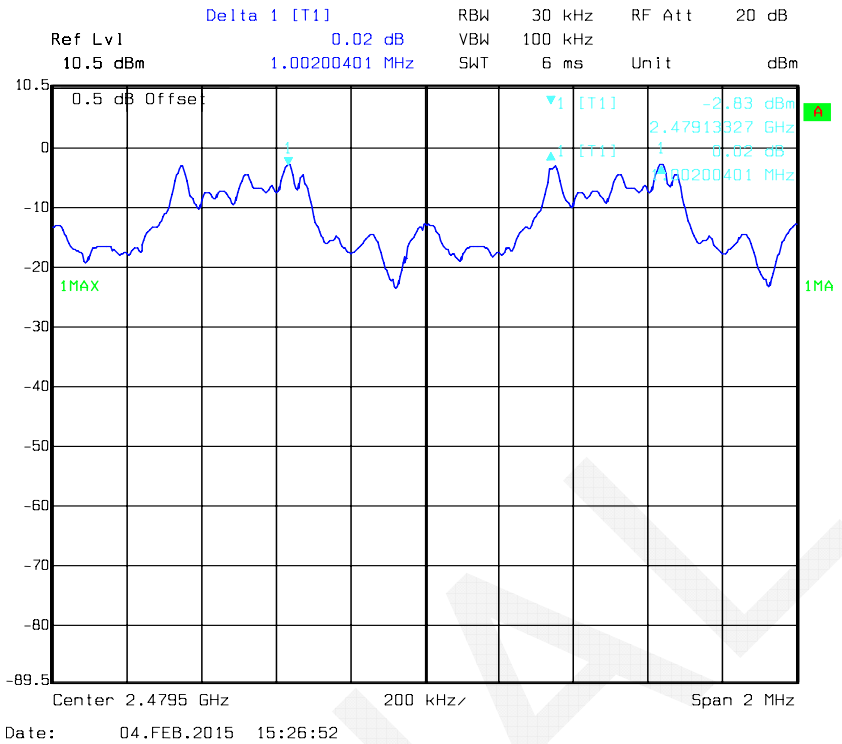
Low Channel



Middle Channel

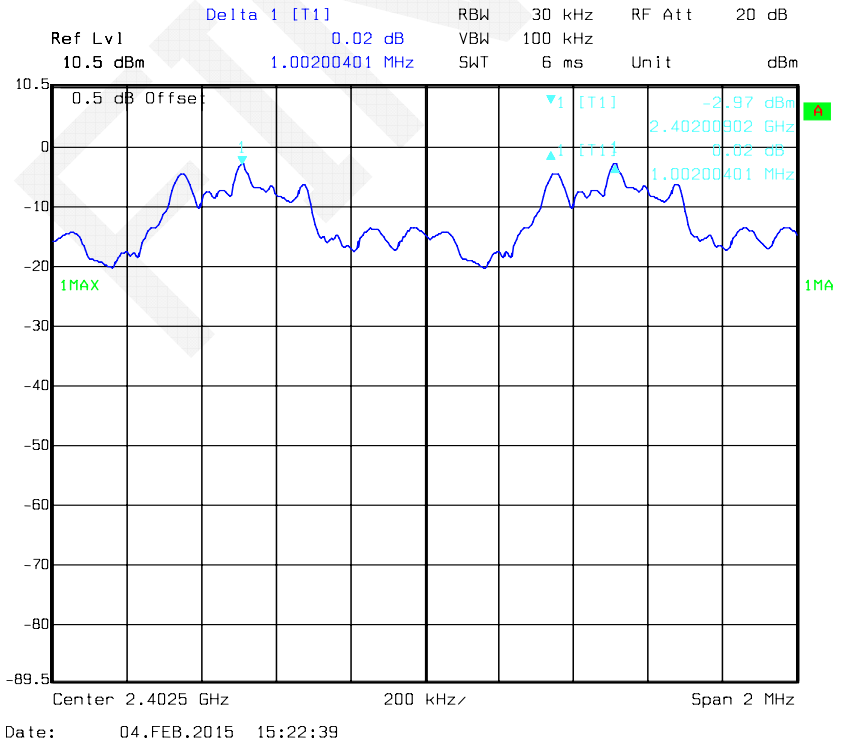


High Channel

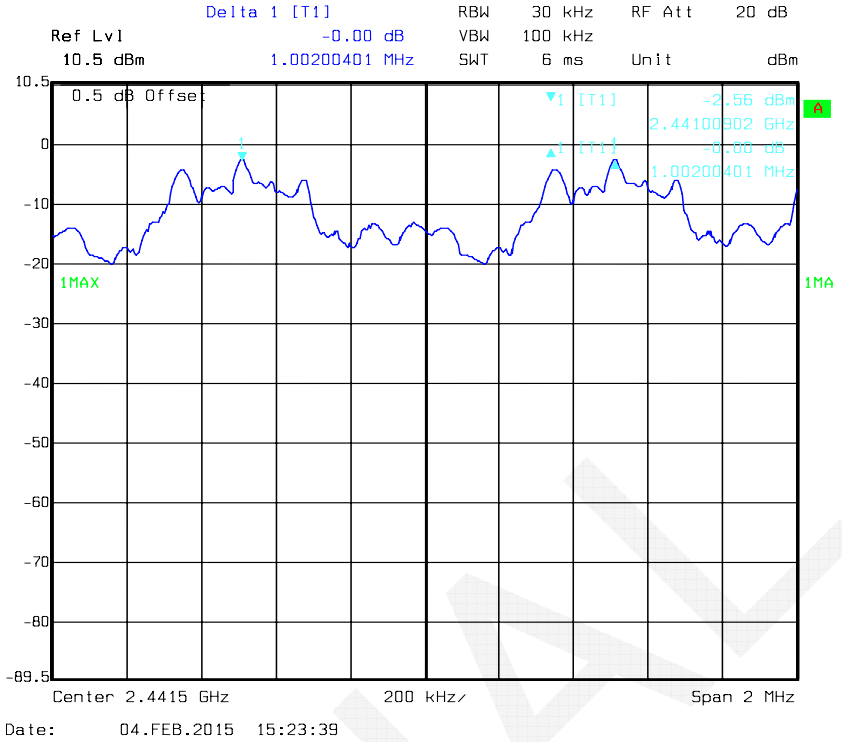


EDR Mode (8-DPSK):

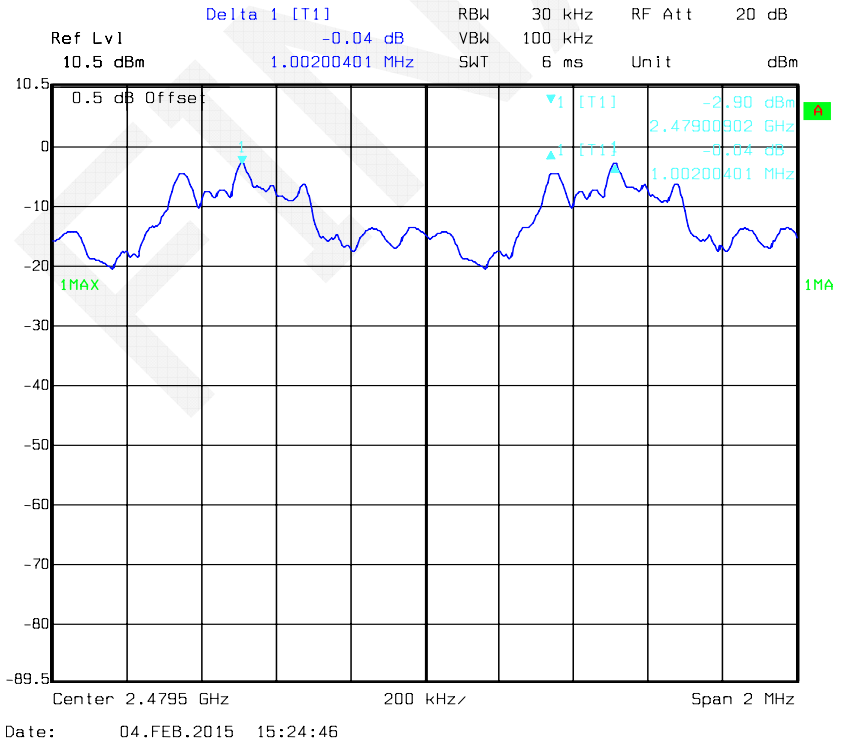
Low Channel



Middle Channel



High Channel



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	2015-05-09

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

Test Data

Environmental Conditions

Temperature:	22.7°C
Relative Humidity:	42 %
ATM Pressure:	101.6 kPa

** The testing was performed by Allen Qiao on 2015-02-04.*

Test Result: Compliance.

Please refer to following tables and plots

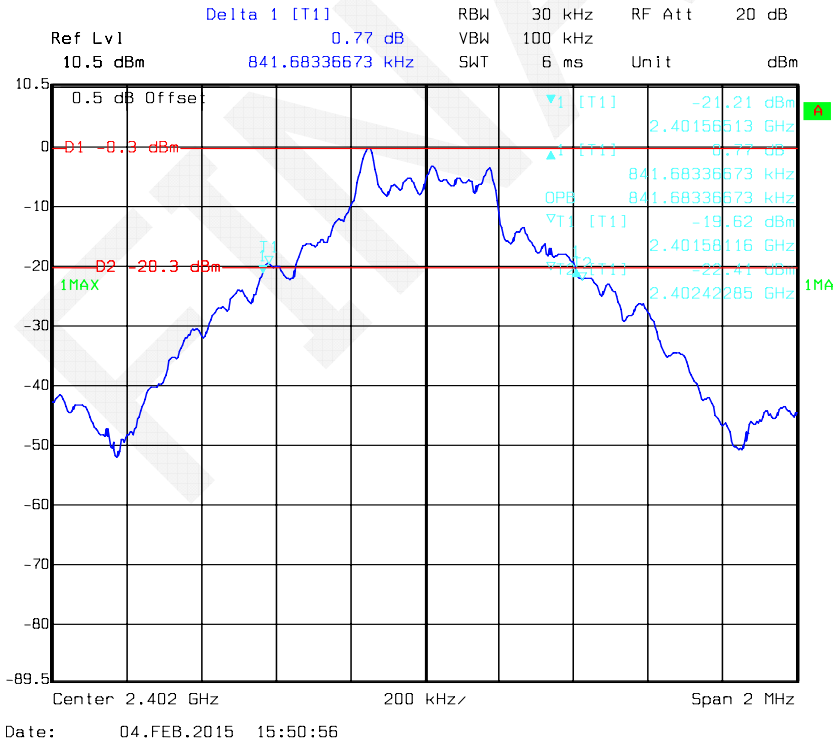
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.842
	Middle	2441	0.842
	High	2480	0.842
EDR Mode (π/4-DQPSK):	Low	2402	1.134
	Middle	2441	1.134
	High	2480	1.134
EDR Mode (8-DPSK):	Low	2402	1.170
	Middle	2441	1.170
	High	2480	1.174

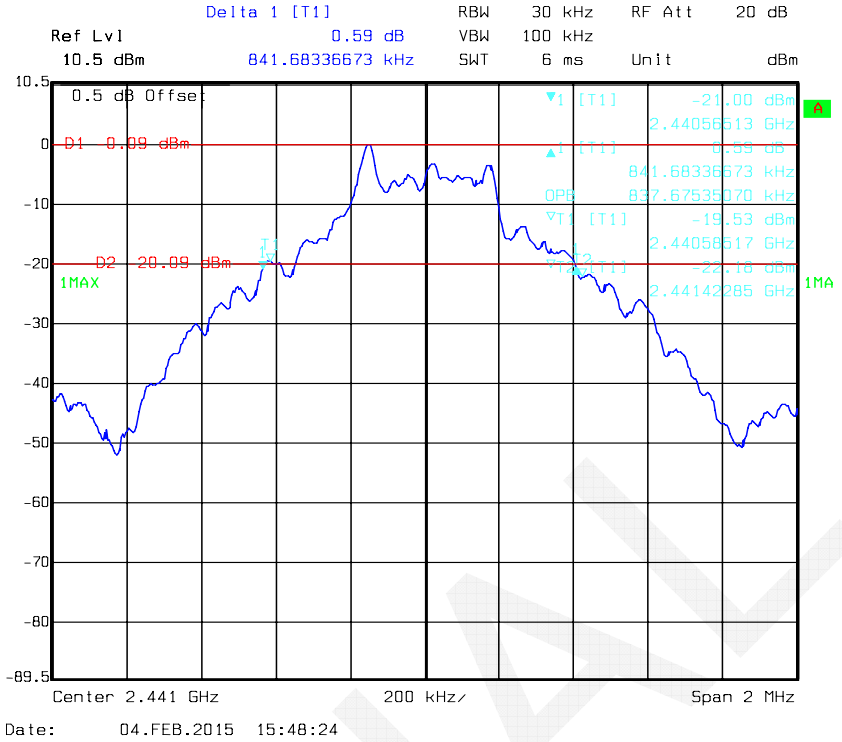
Please refer to the following plots.

BDR Mode (GFSK):

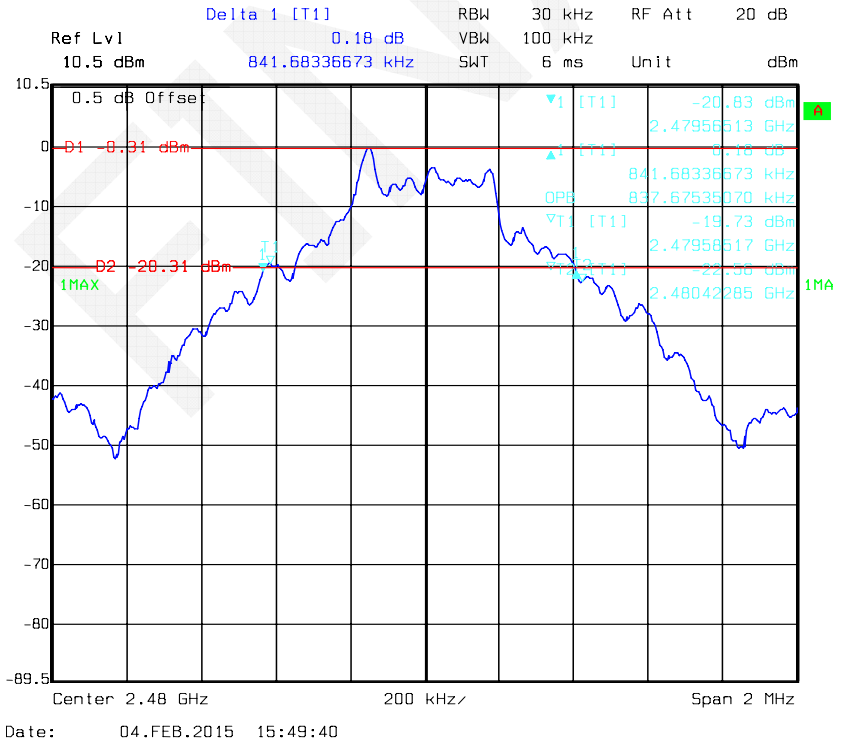
Low Channel



Middle Channel

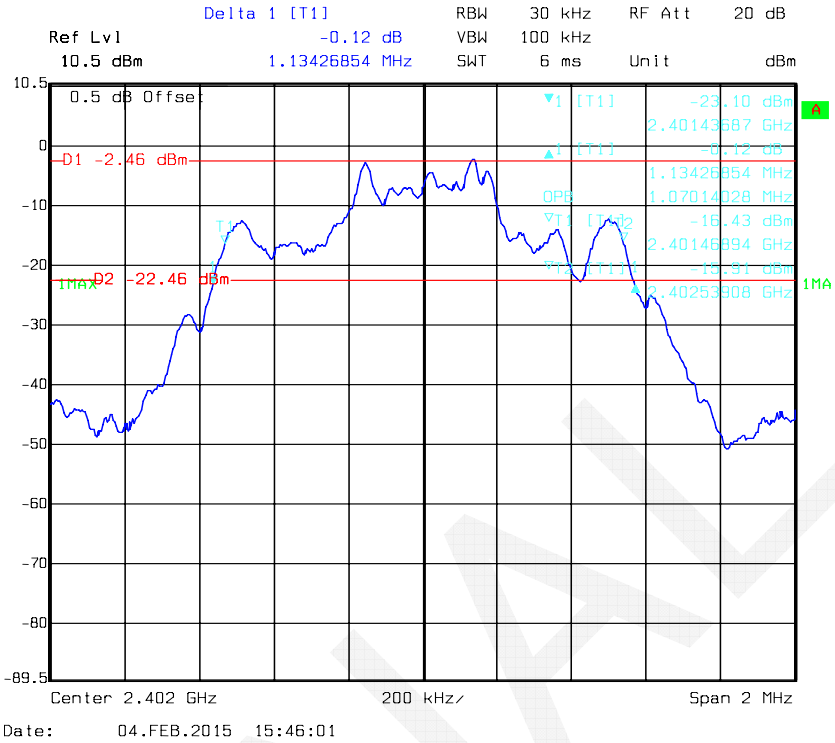


High Channel

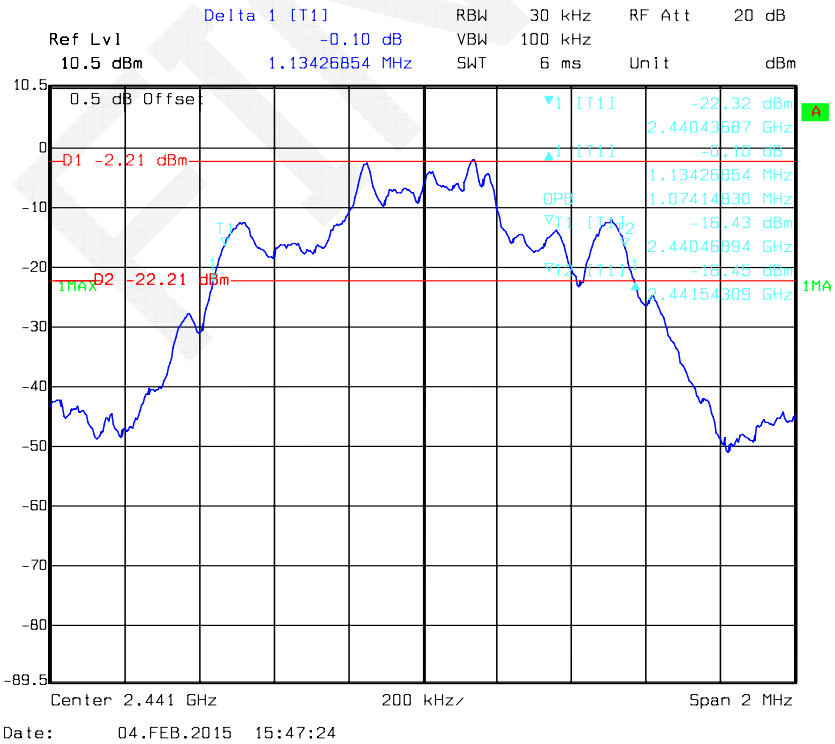


EDR Mode (π/4-DQPSK):

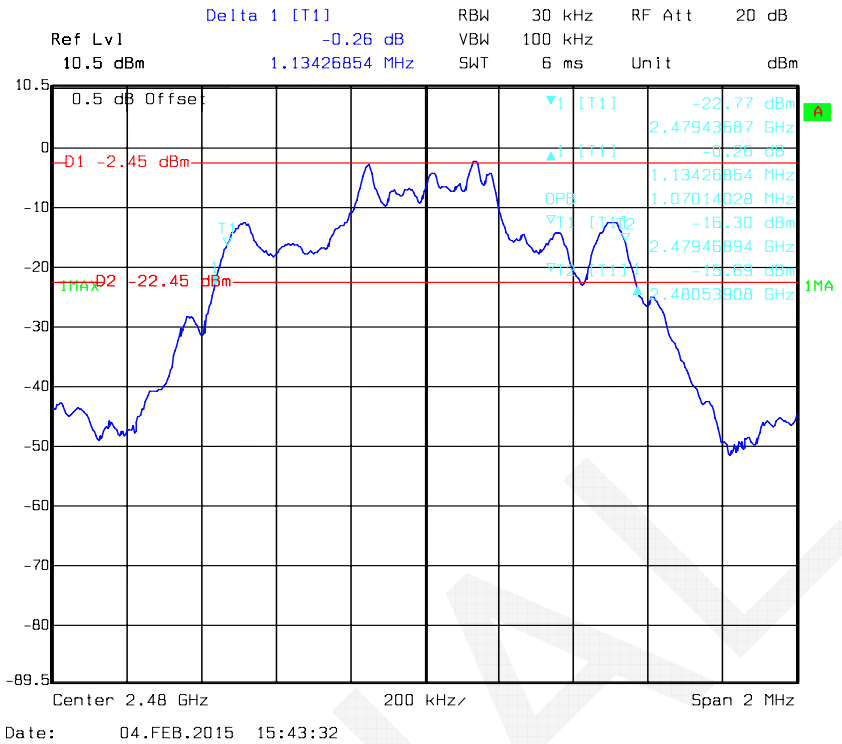
Low Channel



Middle Channel

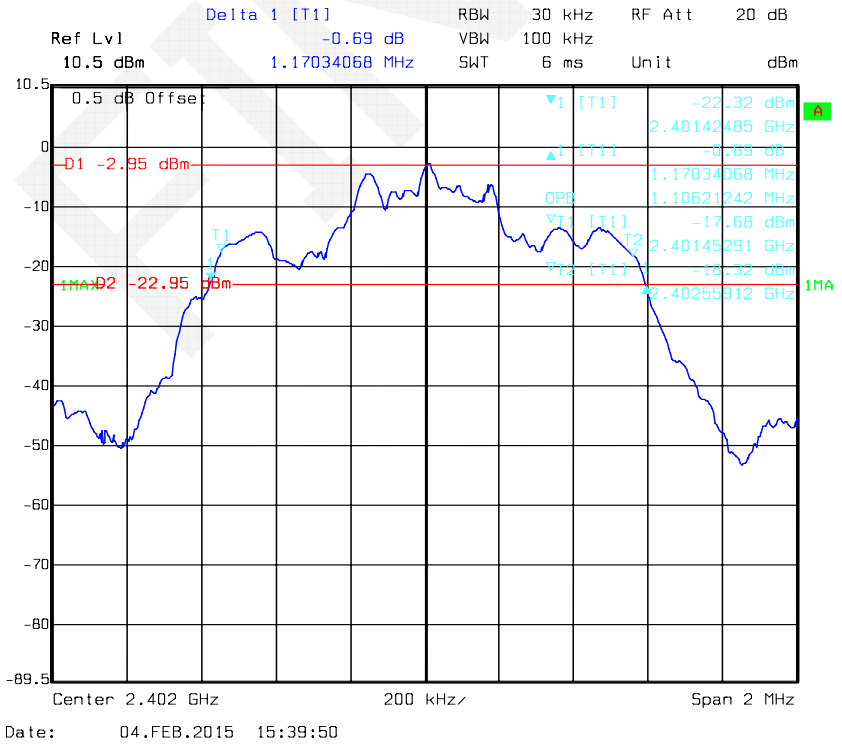


High Channel

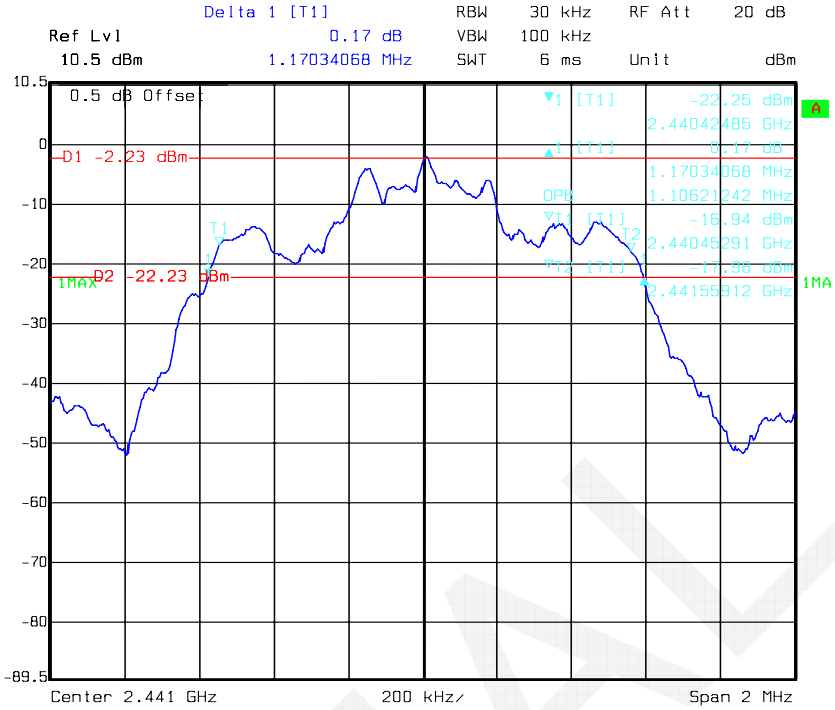


EDR Mode (8-DPSK):

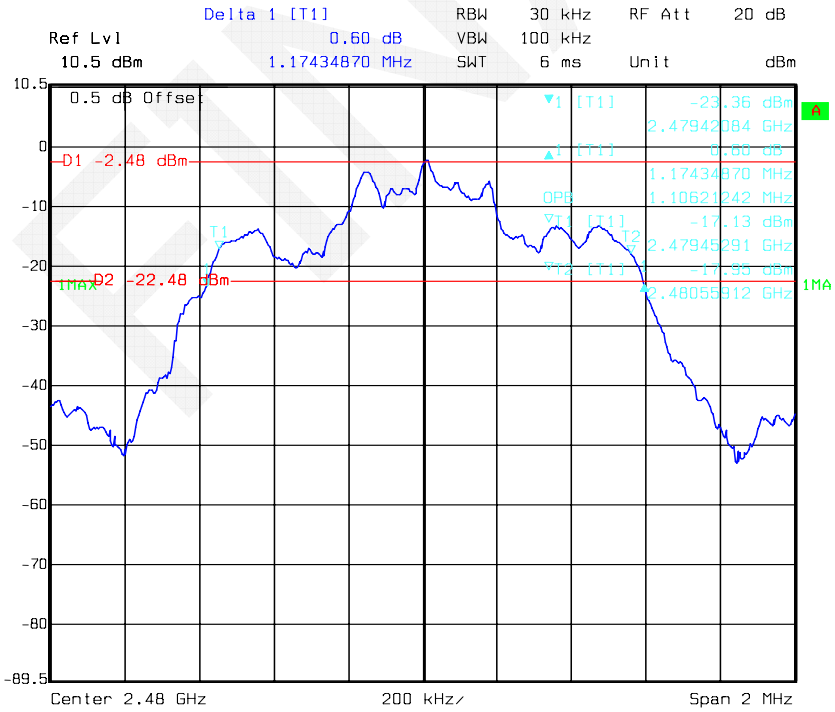
Low Channel



Middle Channel



High Channel



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	2015-05-09

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

Test Data

Environmental Conditions

Temperature:	22.7°C
Relative Humidity:	42 %
ATM Pressure:	101.6 kPa

** The testing was performed by Allen Qiao on2015-02-04.*

Test Result: Compliance.

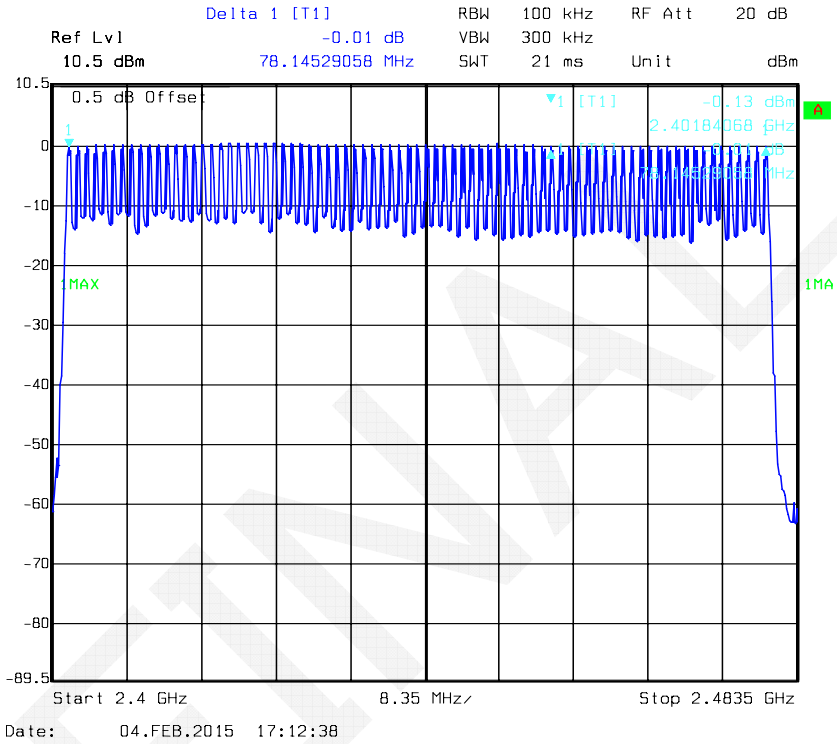
Please refer to following tables and plots

Test Mode: Transmitting

BDR Mode (GFSK):

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

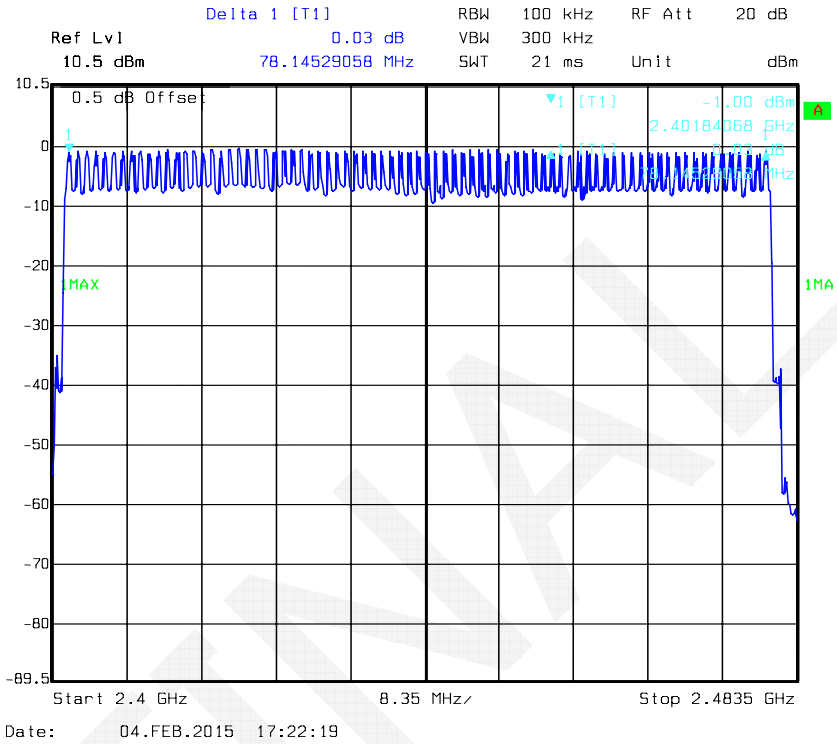
Number of Hopping Channels



EDR Mode (π/4-DQPSK):

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

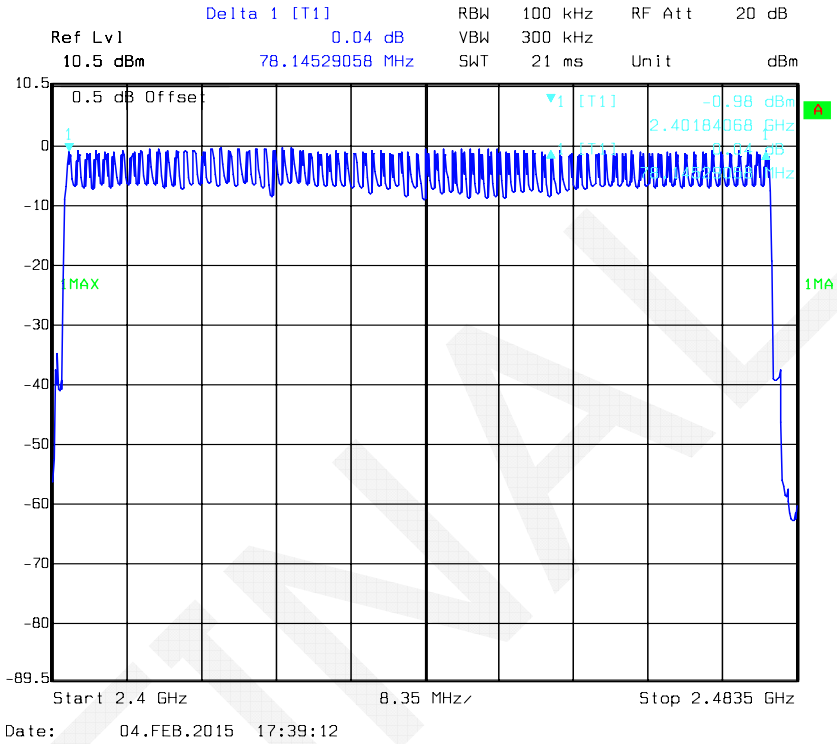
Number of Hopping Channels



EDR Mode (8-DPSK):

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

Number of Hopping Channels



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 * 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	2015-05-09

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

Test Data

Environmental Conditions

Temperature:	22.7°C
Relative Humidity:	42 %
ATM Pressure:	101.6 kPa

** The testing was performed by Allen Qiao on 2015-02-04.*

Test Result: Compliance.

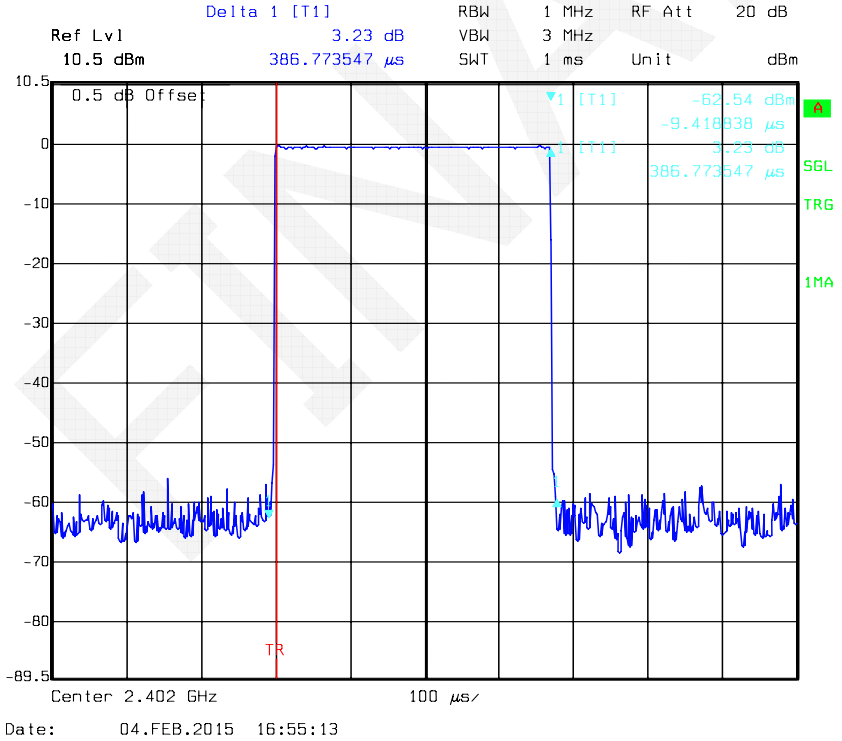
Please refer to following tables and plots

Test Mode: Transmitting

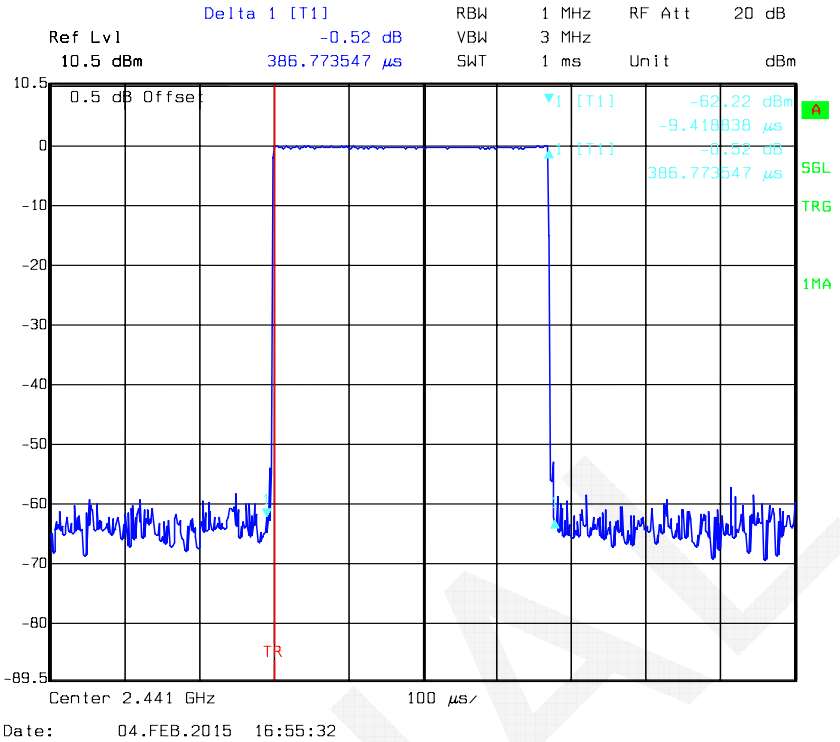
BDR Mode (GFSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.387	0.124	0.4	Pass
	Middle	0.387	0.124	0.4	Pass
	High	0.387	0.124	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.649	0.264	0.4	Pass
	Middle	1.649	0.264	0.4	Pass
	High	1.649	0.264	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.922	0.312	0.4	Pass
	Middle	2.922	0.312	0.4	Pass
	High	2.922	0.312	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

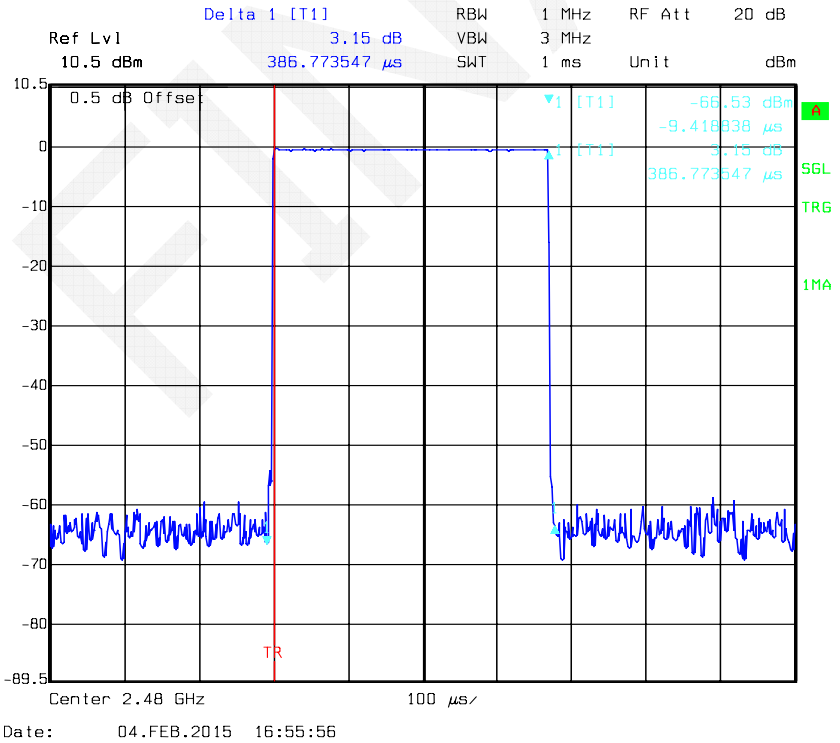
DH1: Low Channel



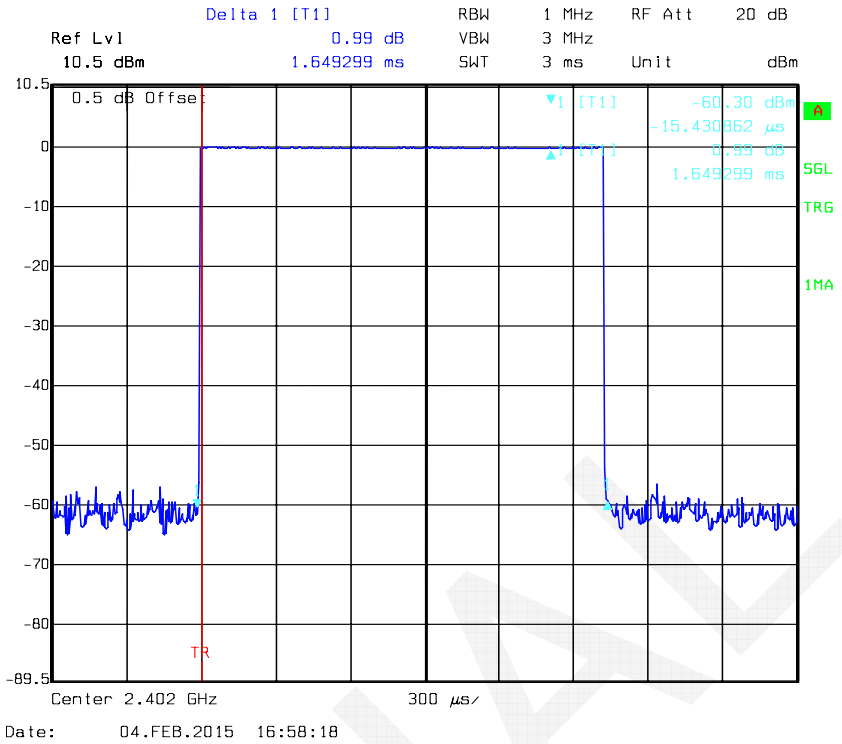
DH1: Middle Channel



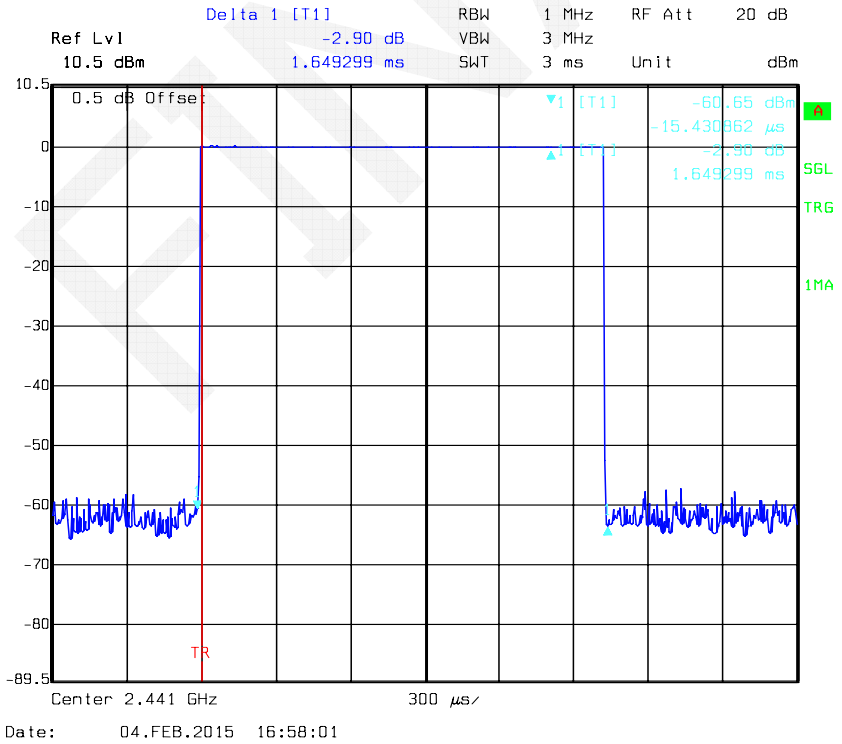
DH1: High Channel



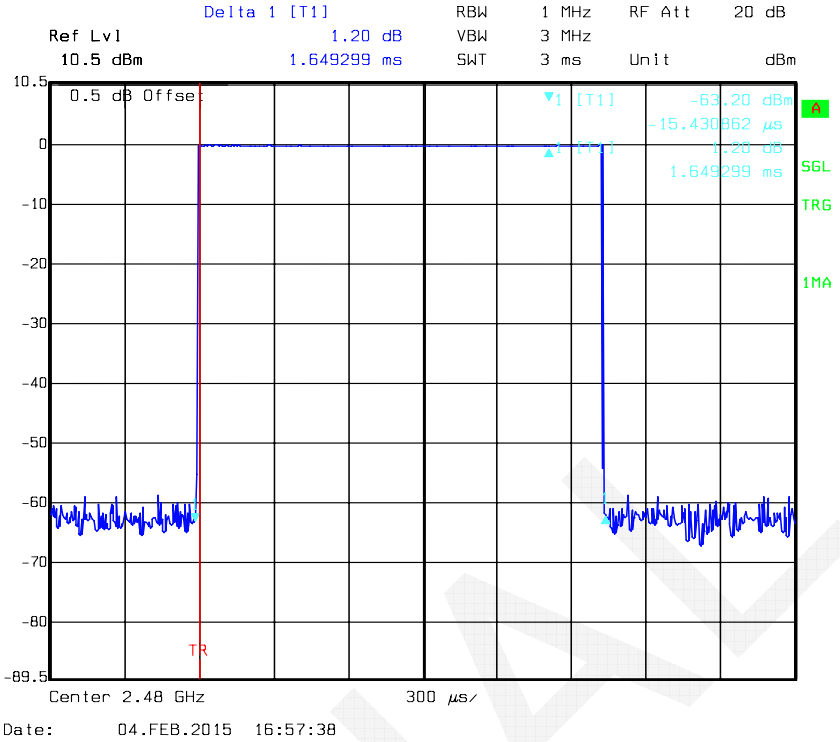
DH3: Low Channel



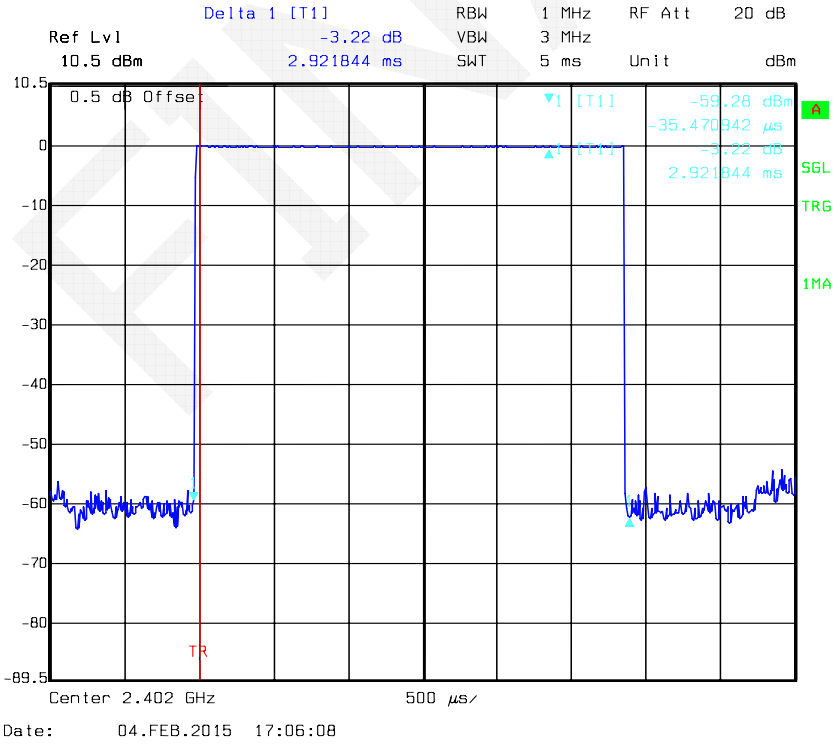
DH3: Middle Channel



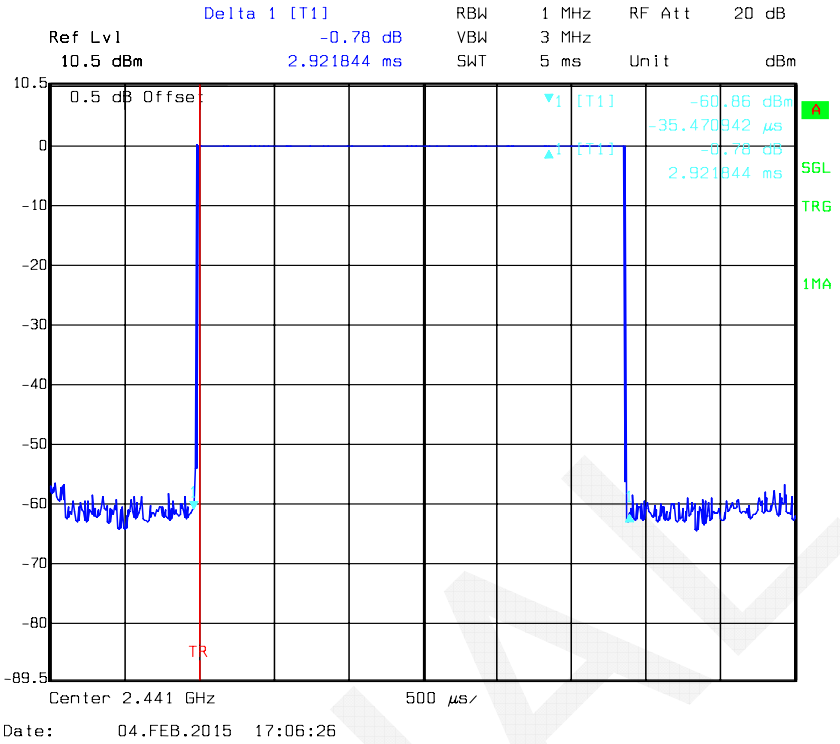
DH3: High Channel



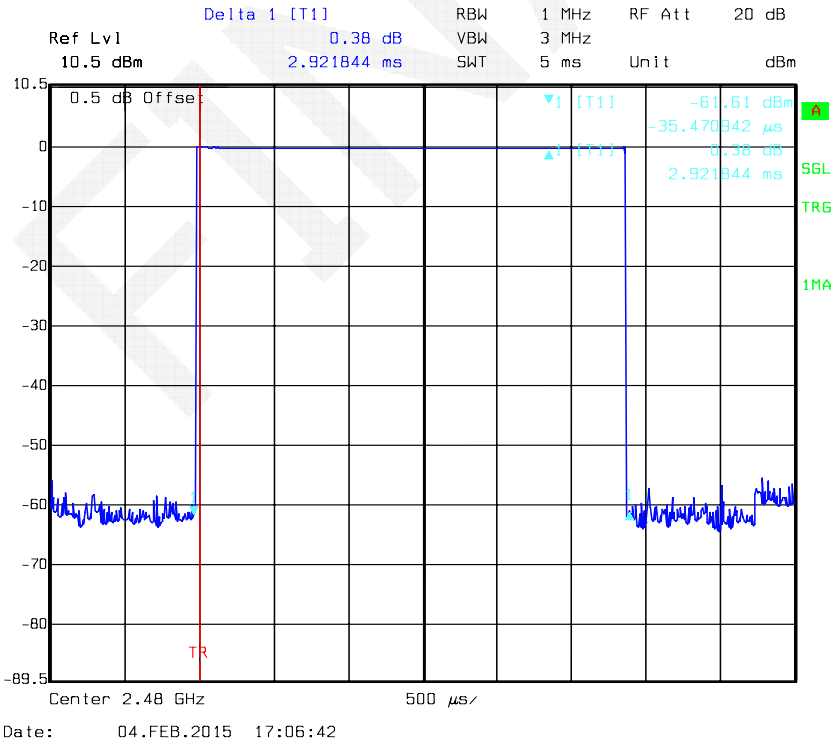
DH5: Low Channel



DH5: Middle Channel



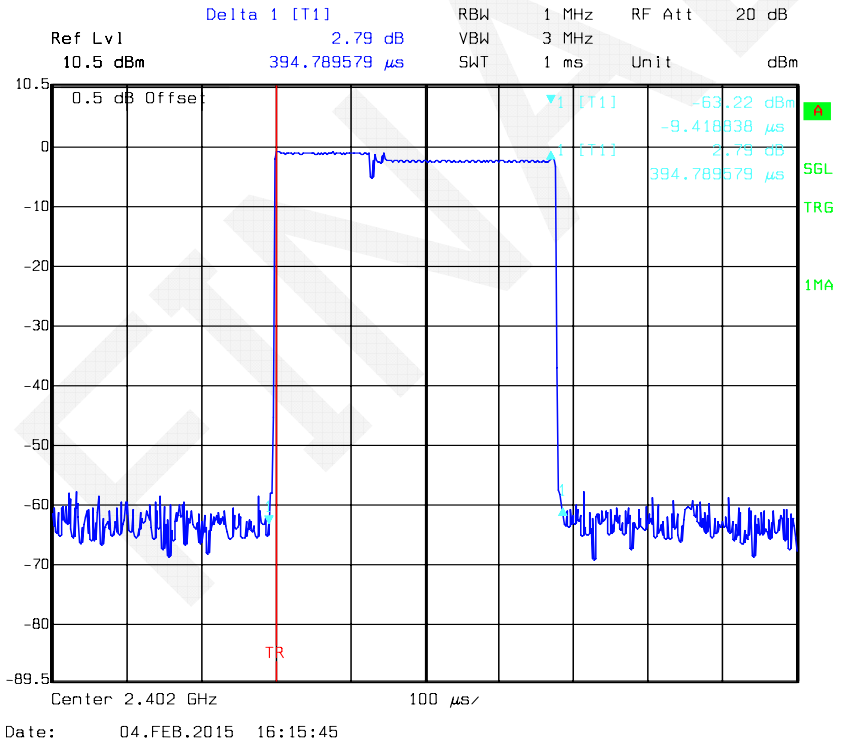
DH5: High Channel



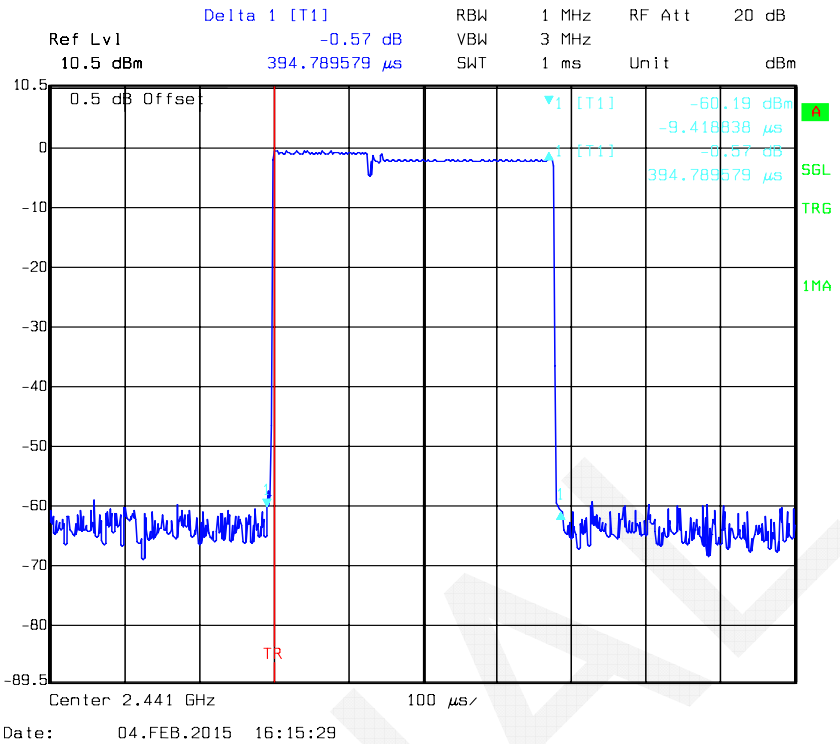
EDR Mode (π/4-DQPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.395	0.126	0.4	Pass
	Middle	0.395	0.126	0.4	Pass
	High	0.395	0.126	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.649	0.264	0.4	Pass
	Middle	1.649	0.264	0.4	Pass
	High	1.649	0.264	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.922	0.312	0.4	Pass
	Middle	2.922	0.312	0.4	Pass
	High	2.922	0.312	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

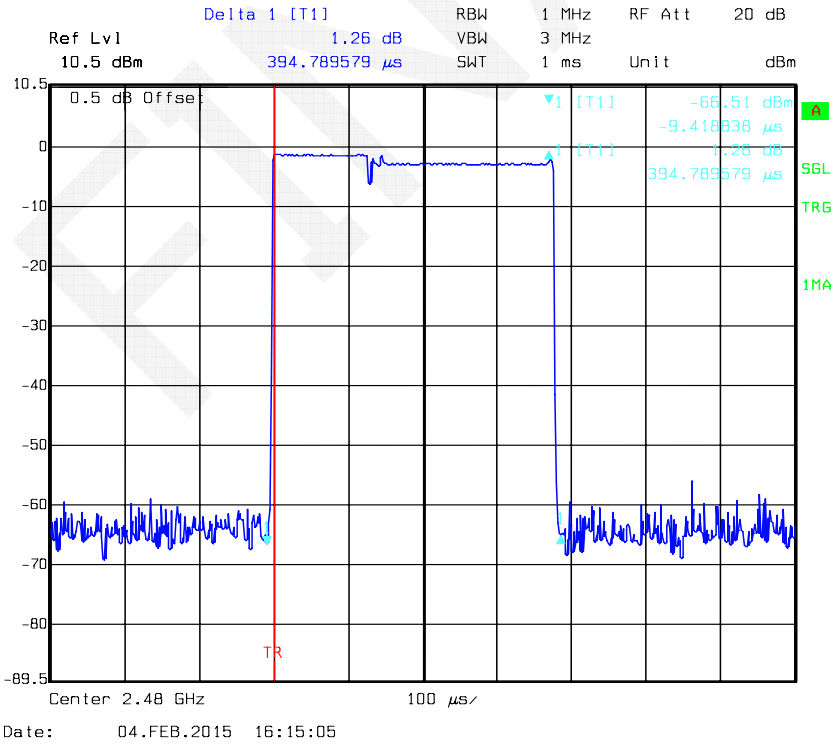
DH1: Low Channel



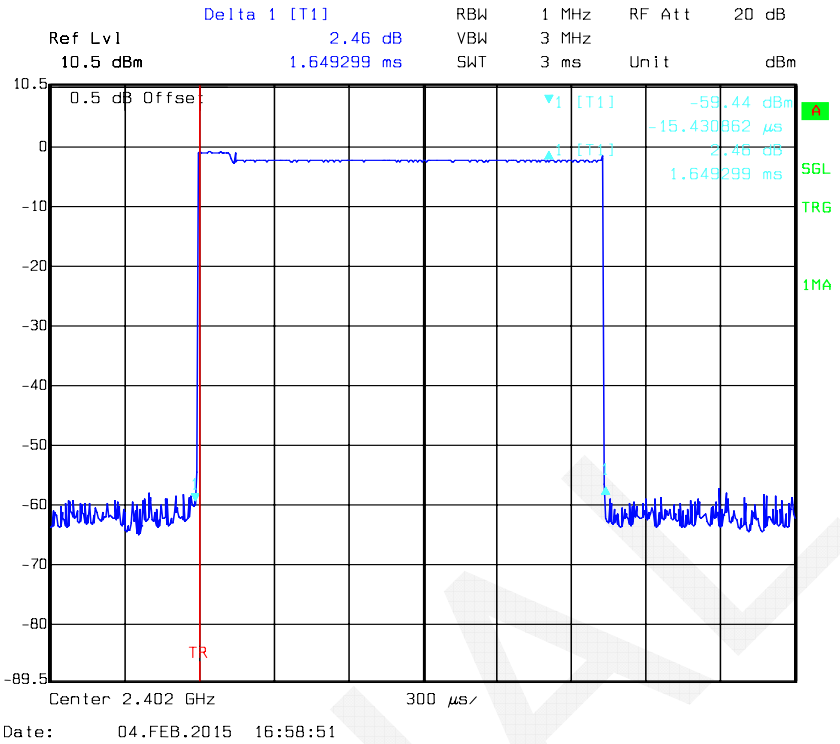
DH1: Middle Channel



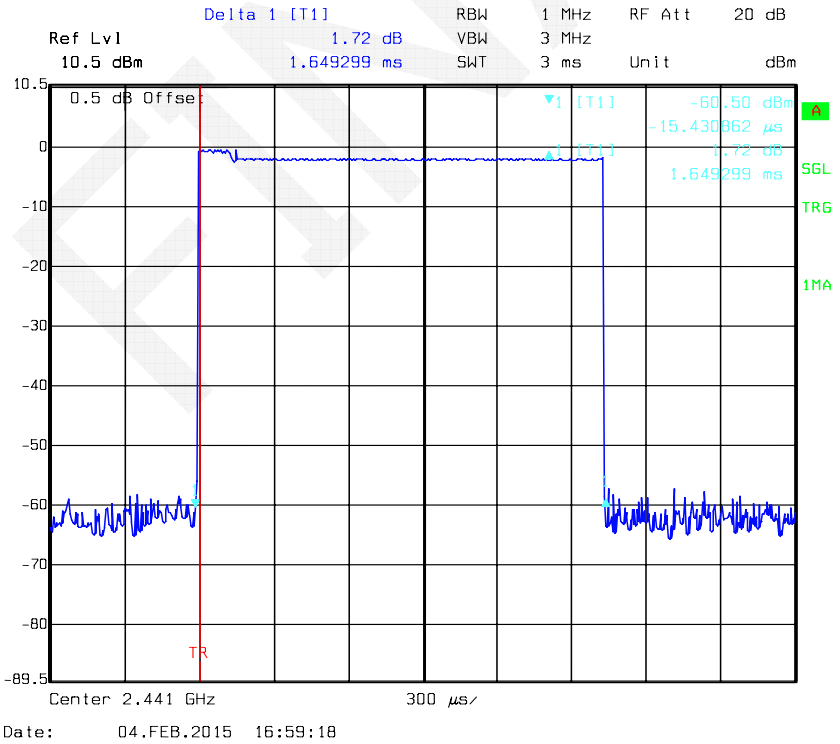
DH1: High Channel



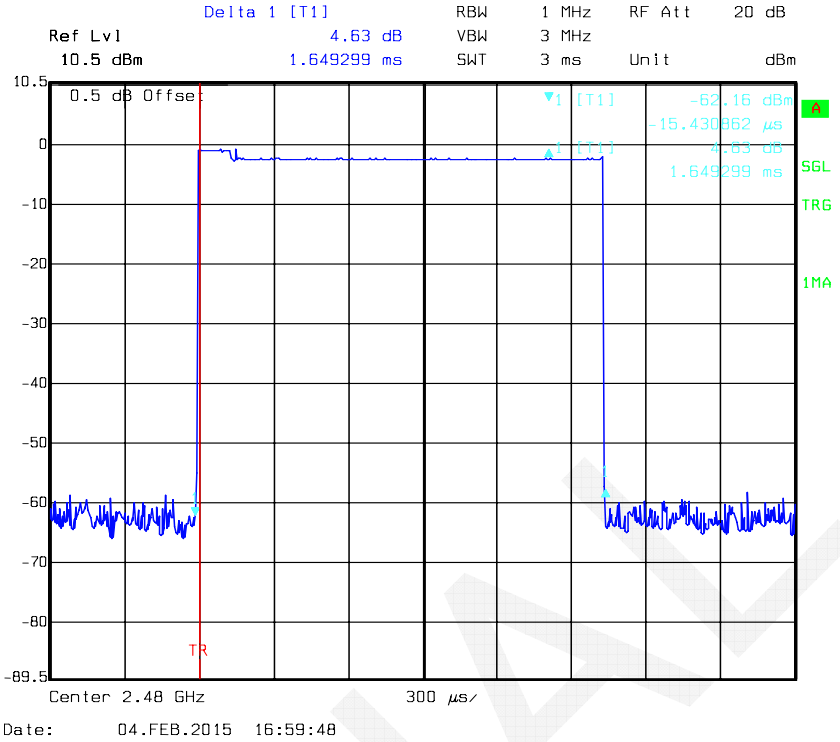
DH3: Low Channel



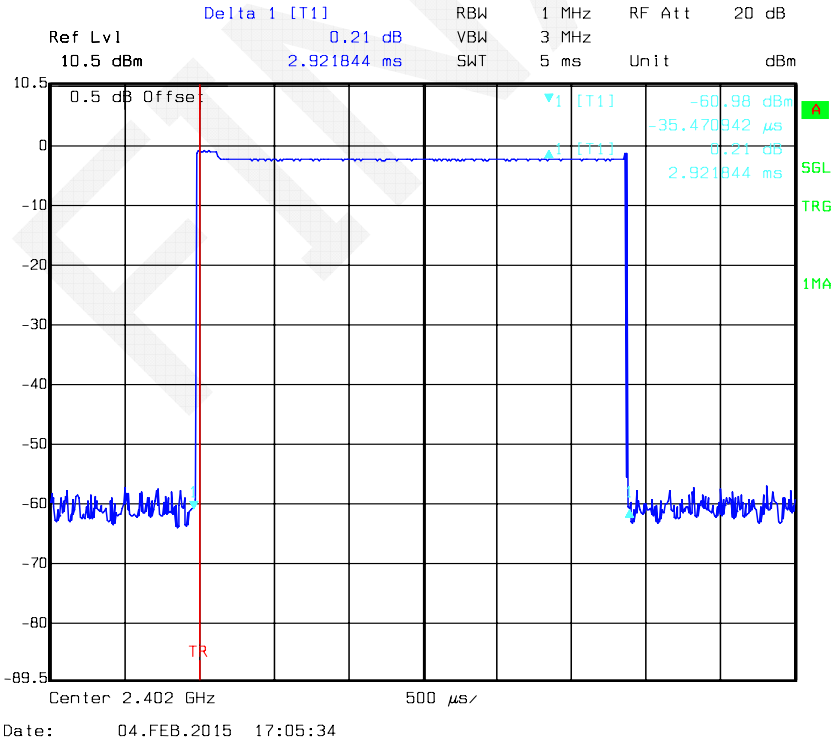
DH3: Middle Channel



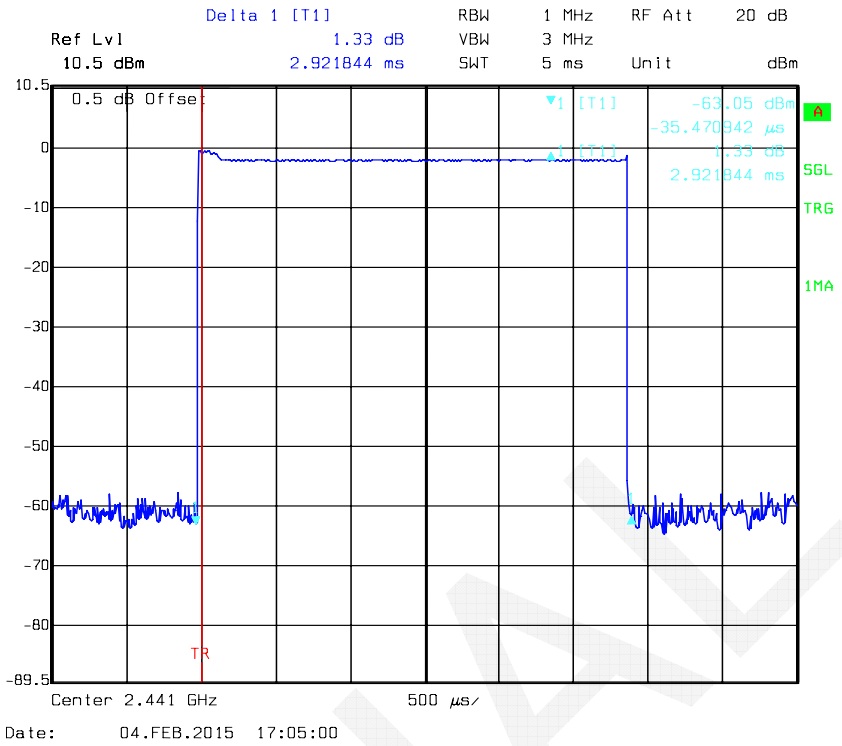
DH3: High Channel



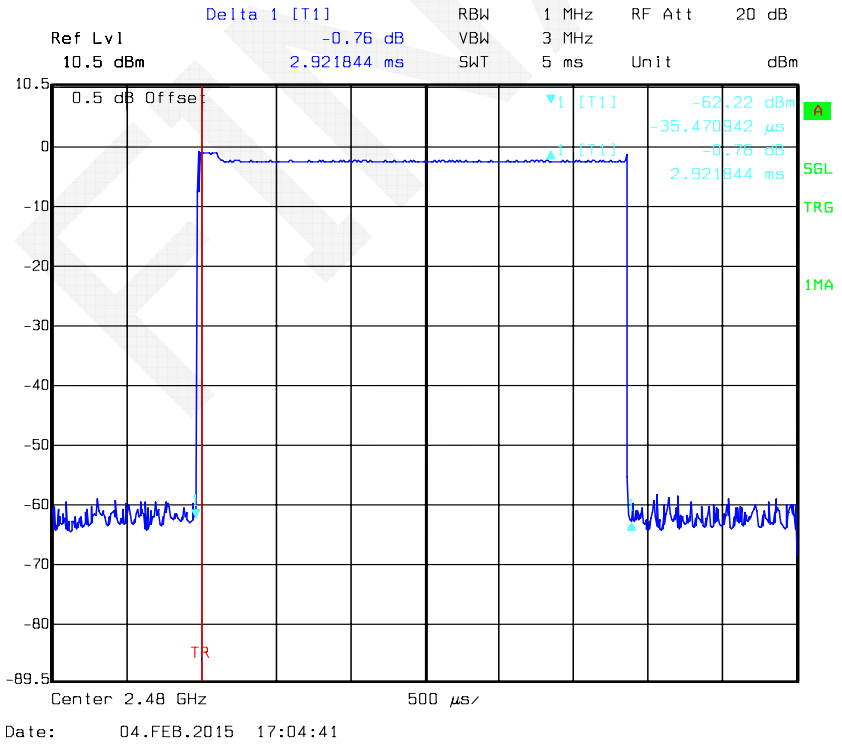
DH5: Low Channel



DH5: Middle Channel



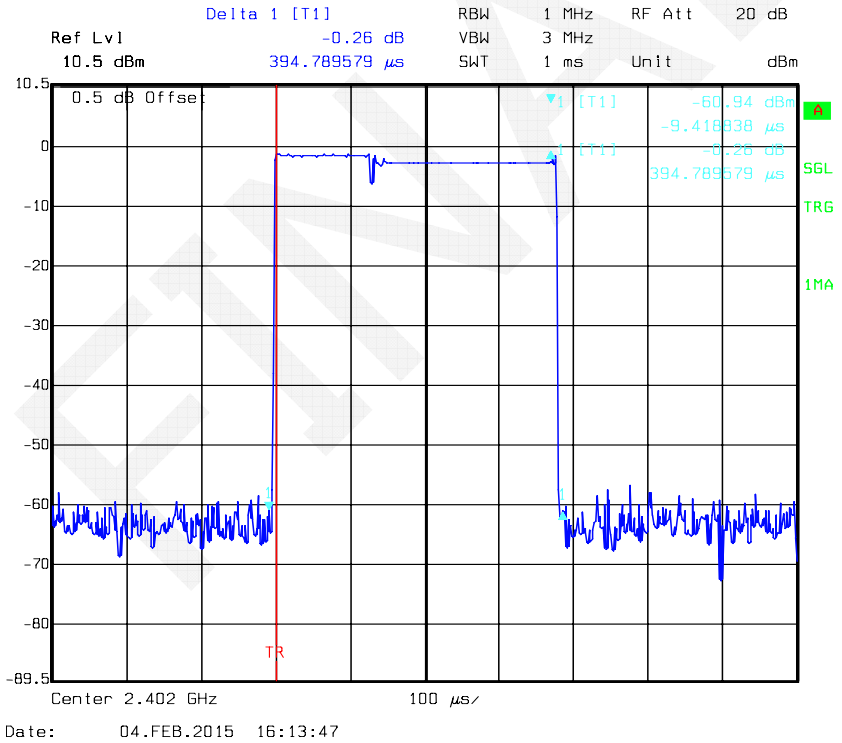
DH5: High Channel



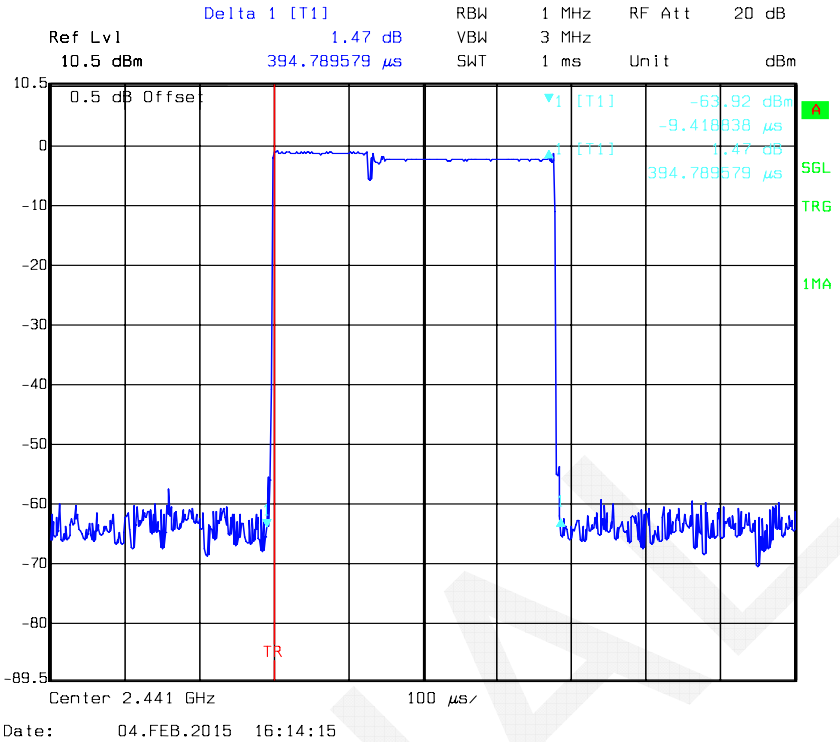
EDR Mode (8-DPSK):

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH1	Low	0.395	0.126	0.4	Pass
	Middle	0.395	0.126	0.4	Pass
	High	0.395	0.126	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/2/79) ×31.6 s				
DH3	Low	1.649	0.264	0.4	Pass
	Middle	1.649	0.264	0.4	Pass
	High	1.649	0.264	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s				
DH5	Low	2.922	0.312	0.4	Pass
	Middle	2.922	0.312	0.4	Pass
	High	2.922	0.312	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s				

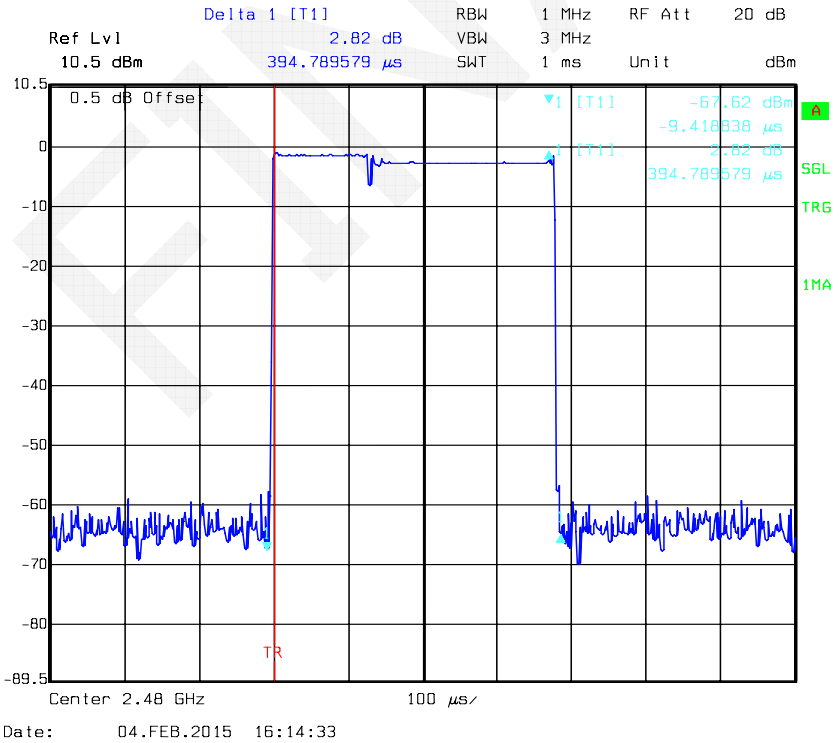
DH1: Low Channel



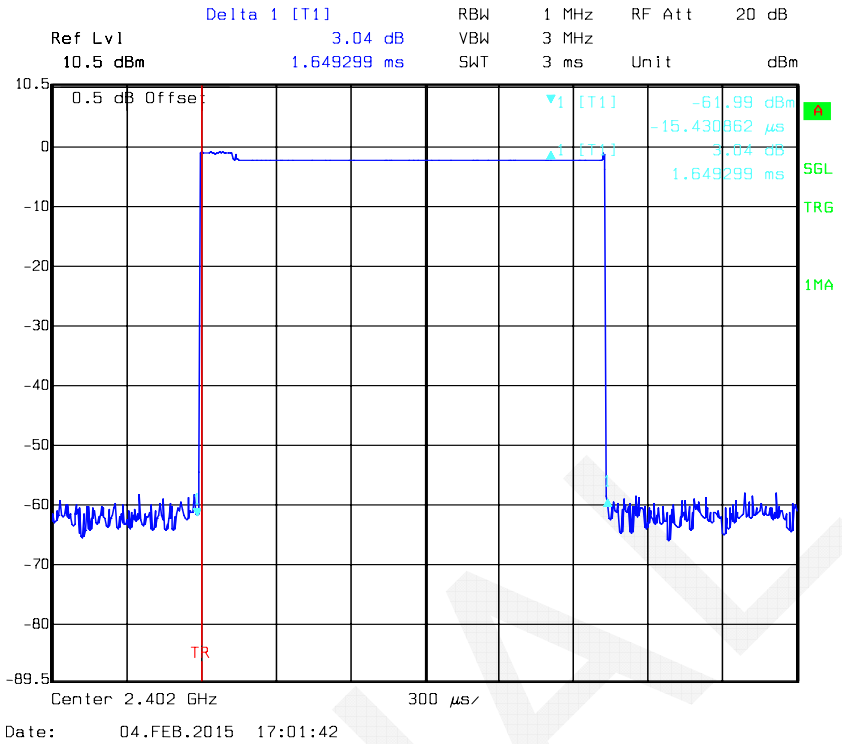
DH1: Middle Channel



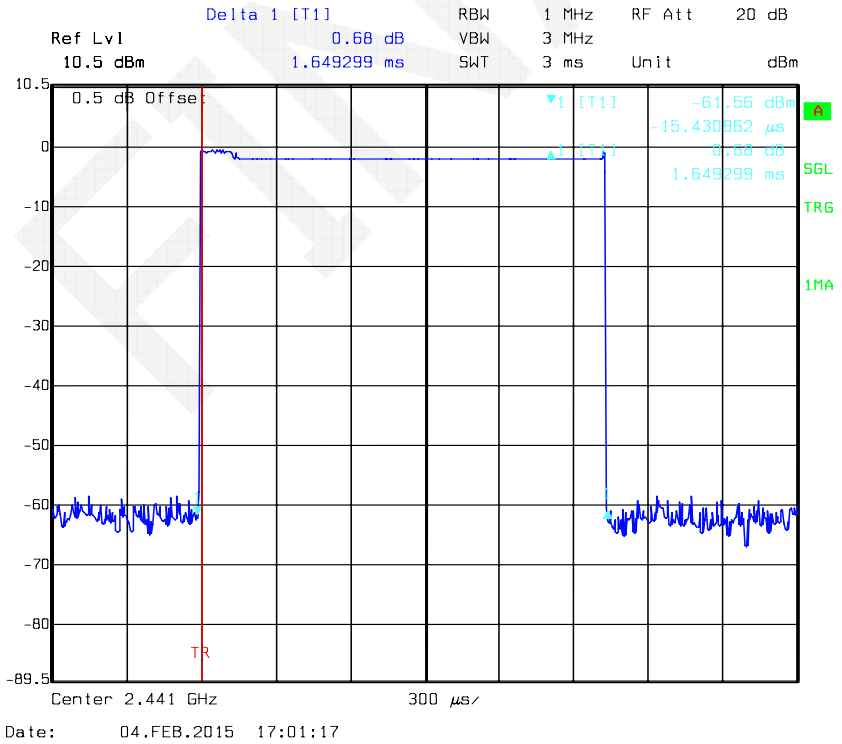
DH1: High Channel



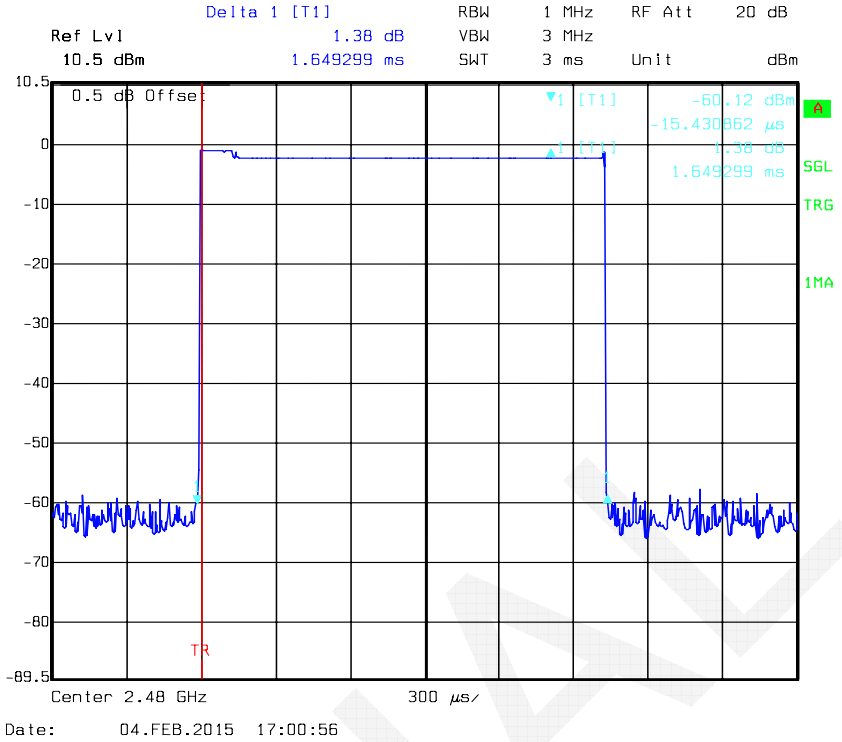
DH3: Low Channel



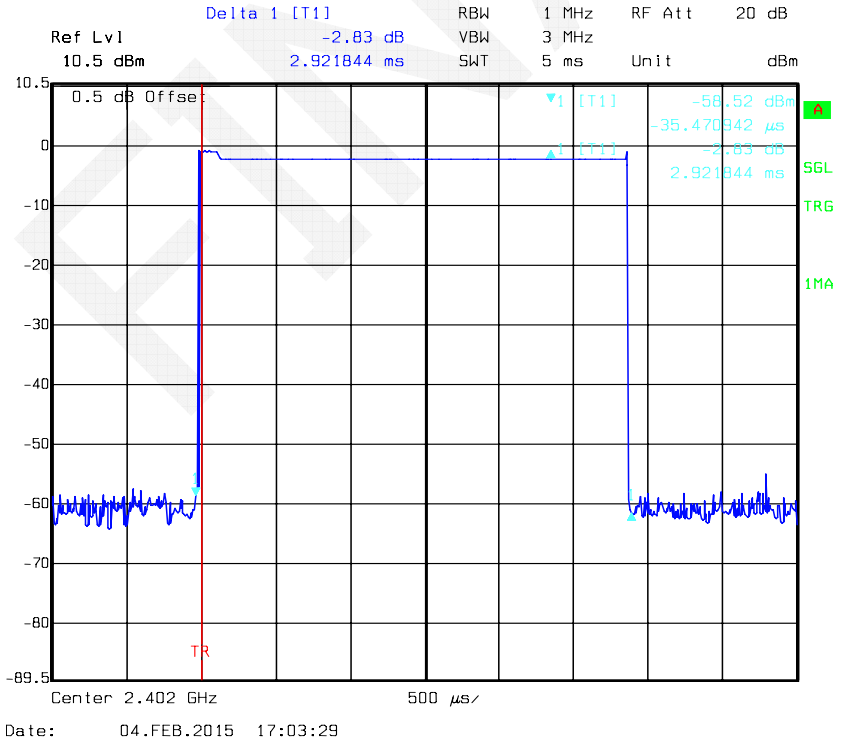
DH3: Middle Channel



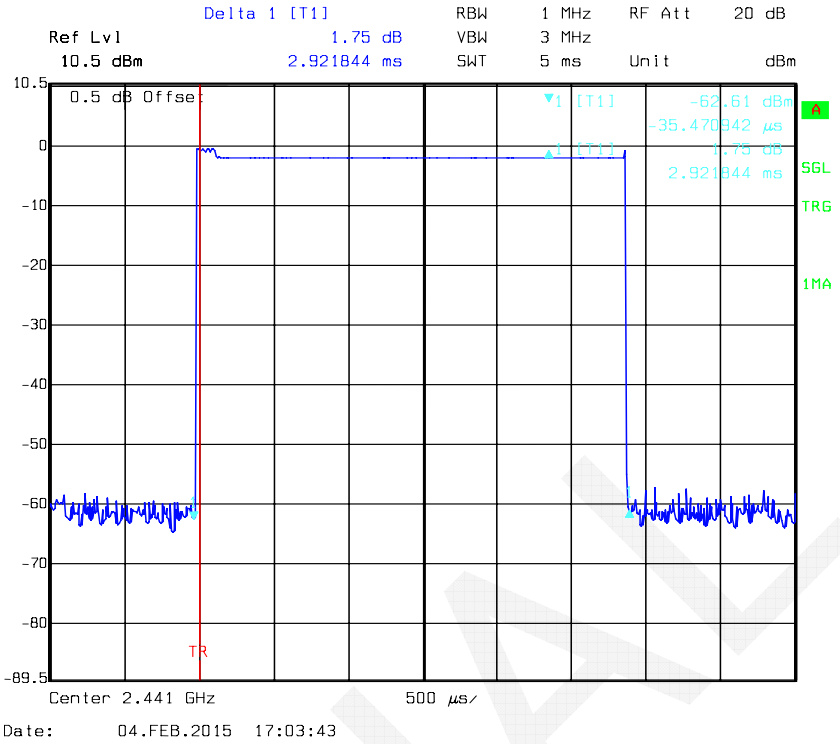
DH3: High Channel



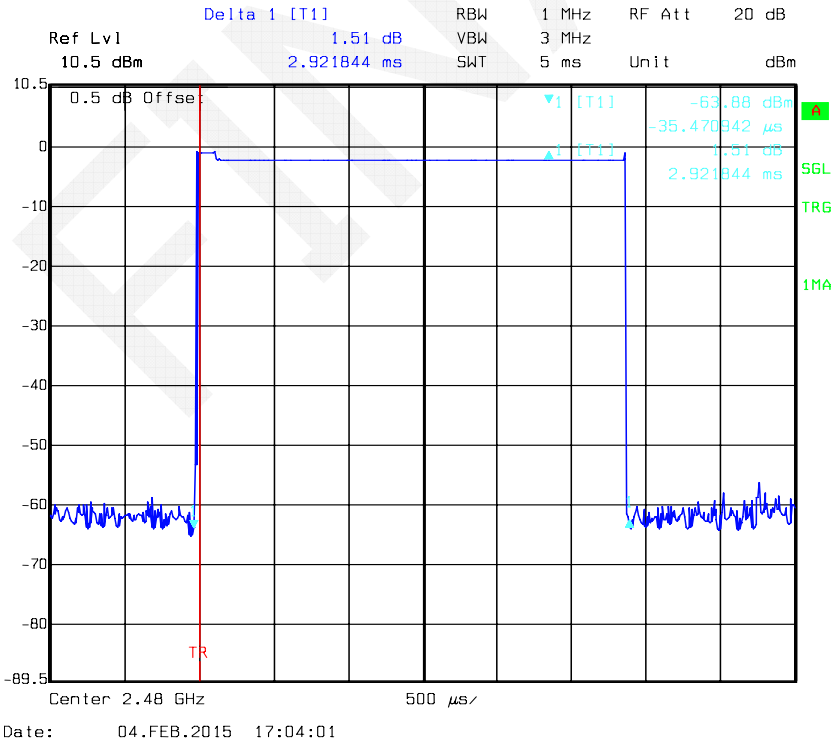
DH5: Low Channel



DH5: Middle Channel



DH5: High Channel



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 an EMI test receiver.
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	2015-05-09

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

Test Data

Environmental Conditions

Temperature:	22.7°C
Relative Humidity:	42 %
ATM Pressure:	101.6 kPa

** The testing was performed by Allen Qiao on2015-02-04.*

Test Result: Compliance.

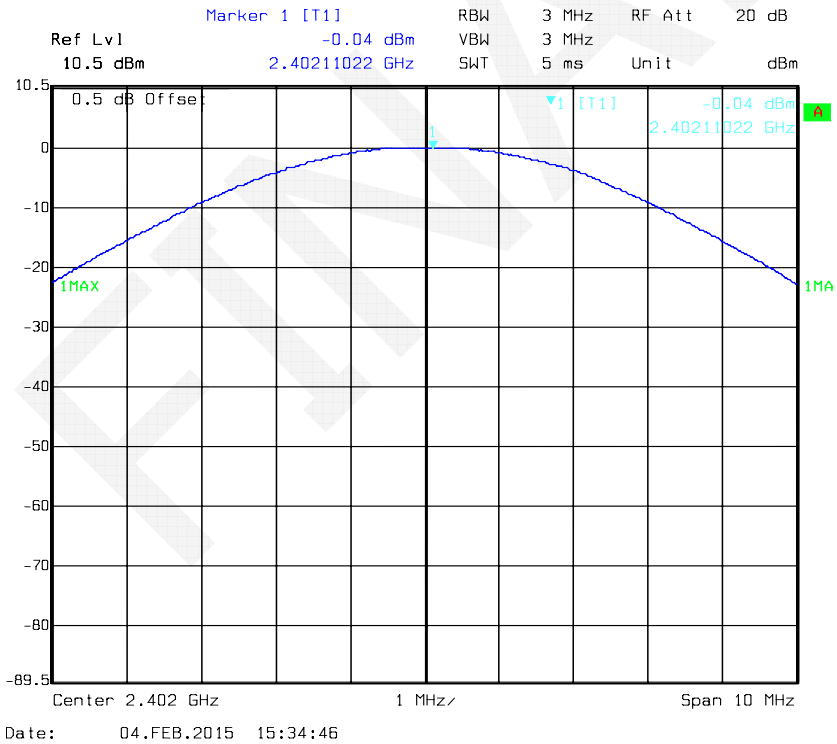
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	-0.04	30
	Middle	2441	-0.14	30
	High	2480	-0.08	30
EDR Mode (π/4-DQPSK)	Low	2402	-0.92	30
	Middle	2441	-0.56	30
	High	2480	-0.86	30
EDR Mode (8-DPSK)	Low	2402	-0.77	30
	Middle	2441	-0.48	30
	High	2480	-0.75	30

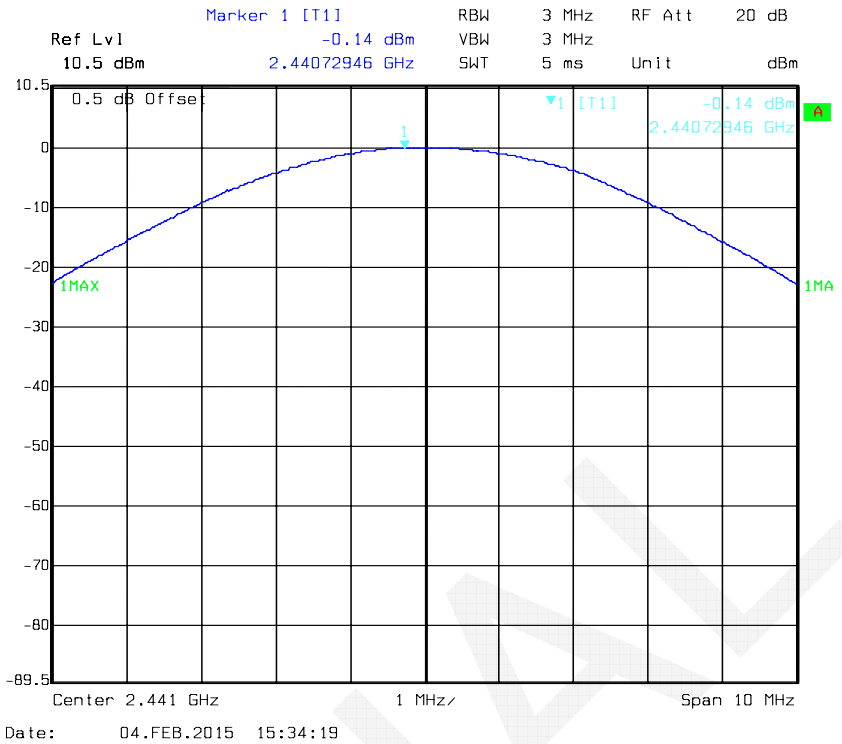
Note: The data above was tested in conducted mode.

BDR Mode (GFSK):

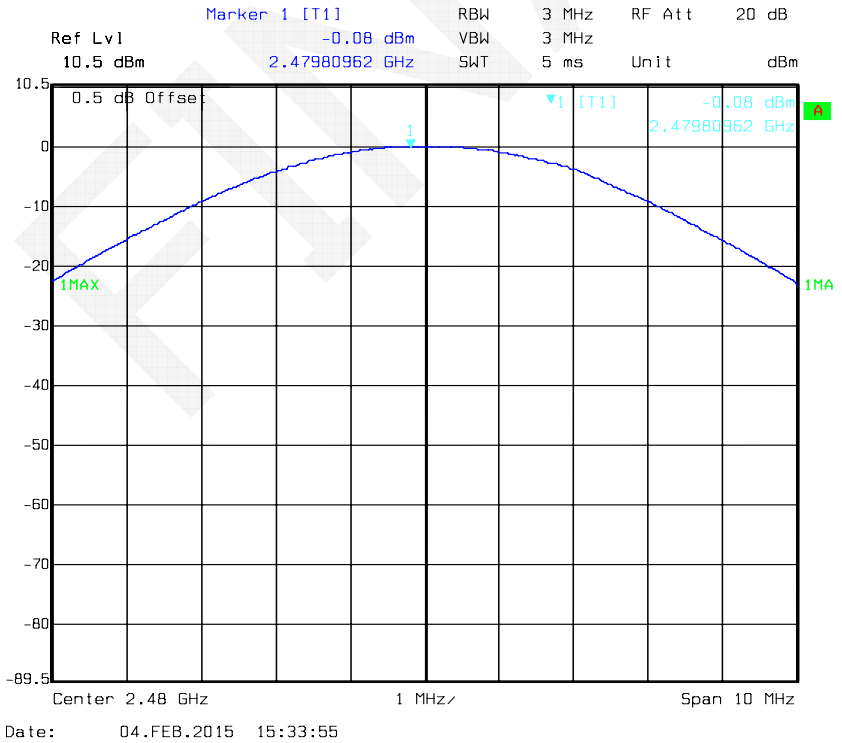
Output Power, Low Channel



Output Power, Middle Channel

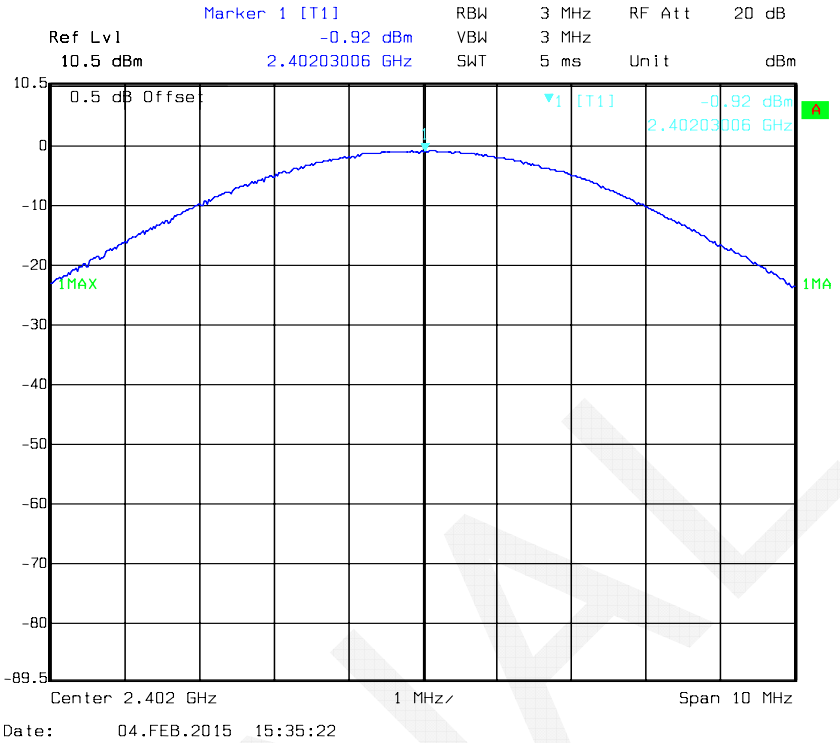


Output Power, High Channel

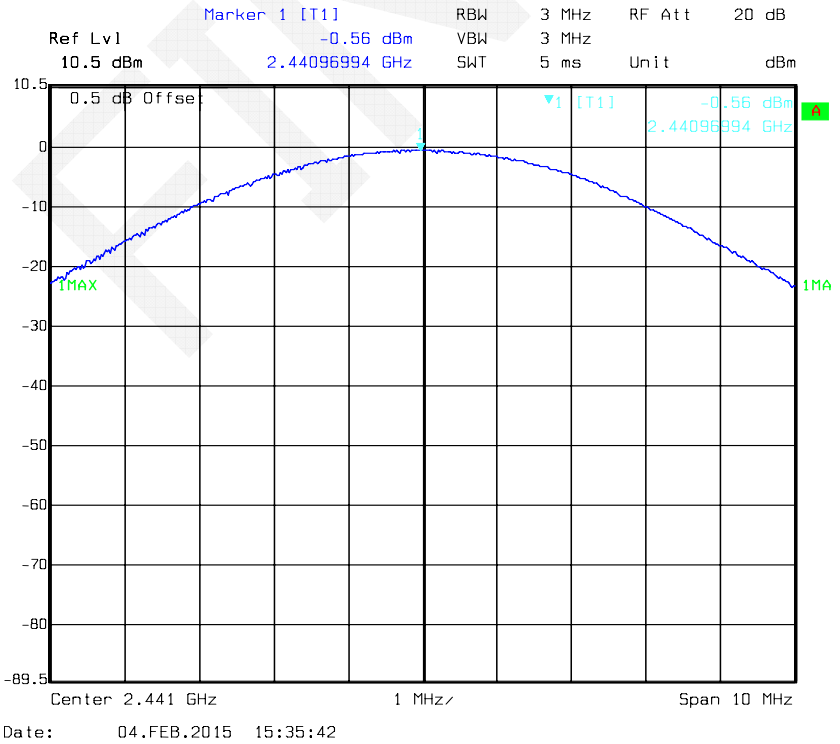


EDR Mode (π/4-DQPSK):

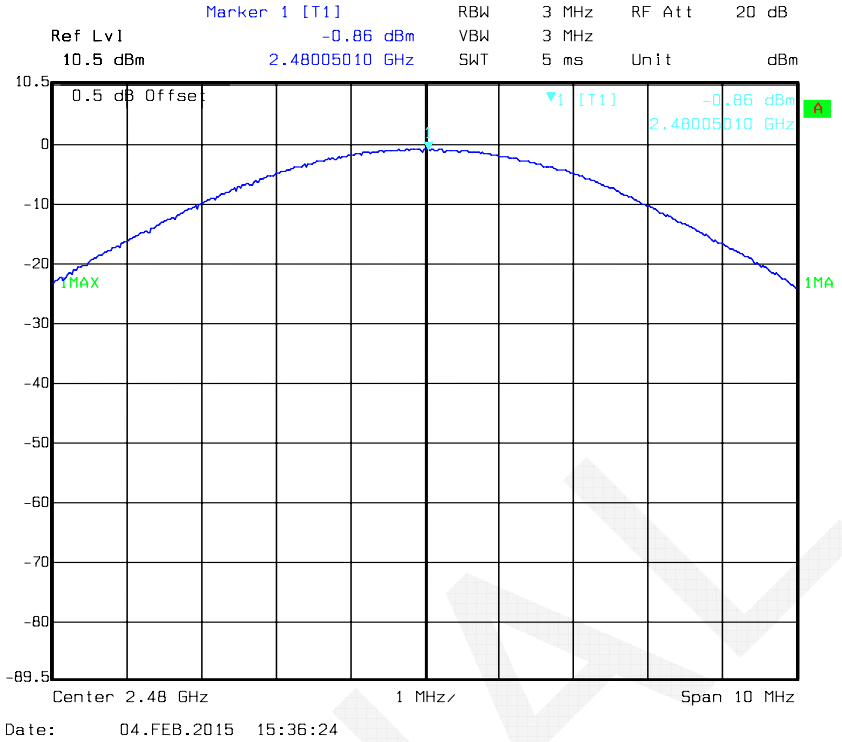
Output Power, Low Channel



Output Power, Middle Channel

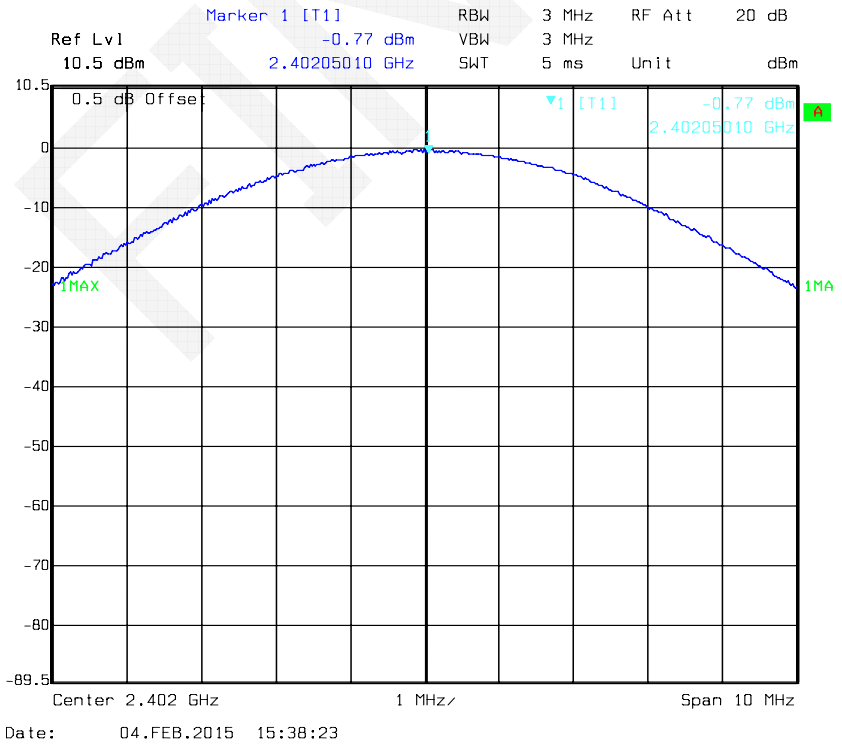


Output Power, High Channel

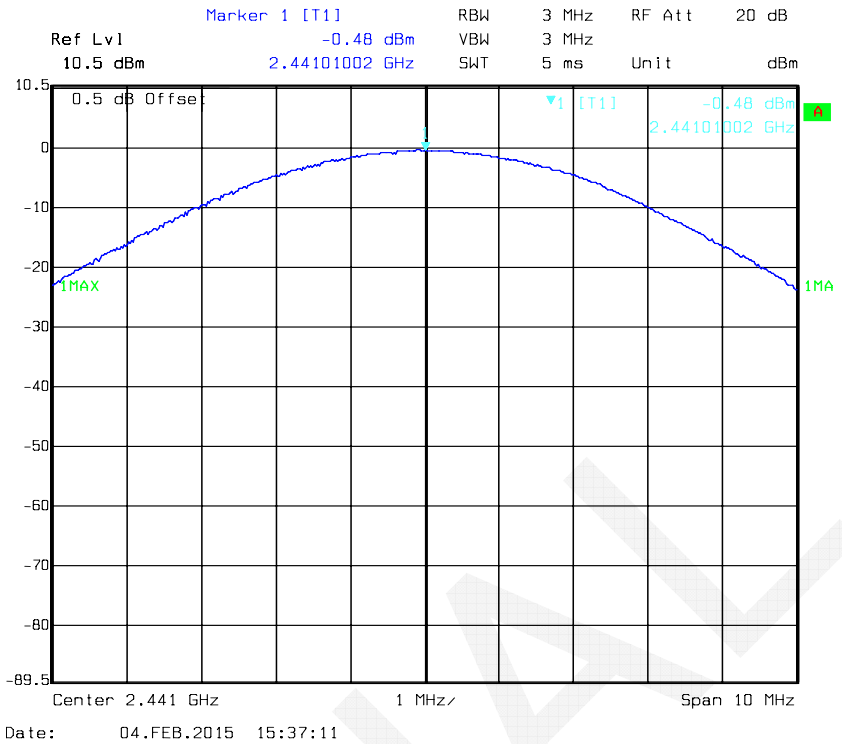


EDR Mode (8-DPSK):

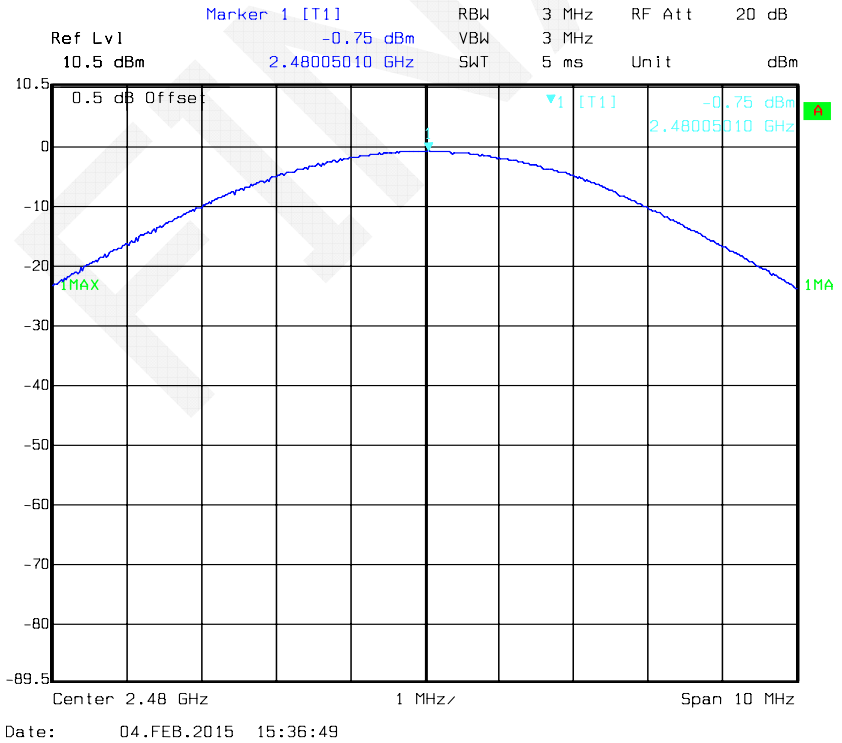
Output Power, Low Channel



Output Power, Middle Channel



Output Power, High Channel



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	2015-05-09

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

Test Data

Environmental Conditions

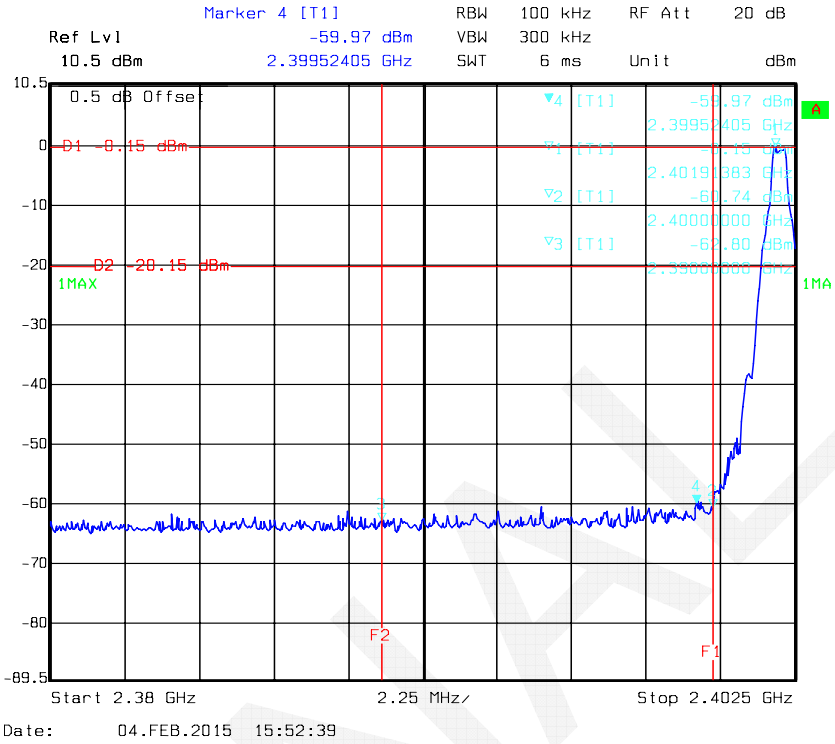
Temperature:	22.7°C
Relative Humidity:	42 %
ATM Pressure:	101.6 kPa

** The testing was performed by Allen Qiao on 2015-02-04.*

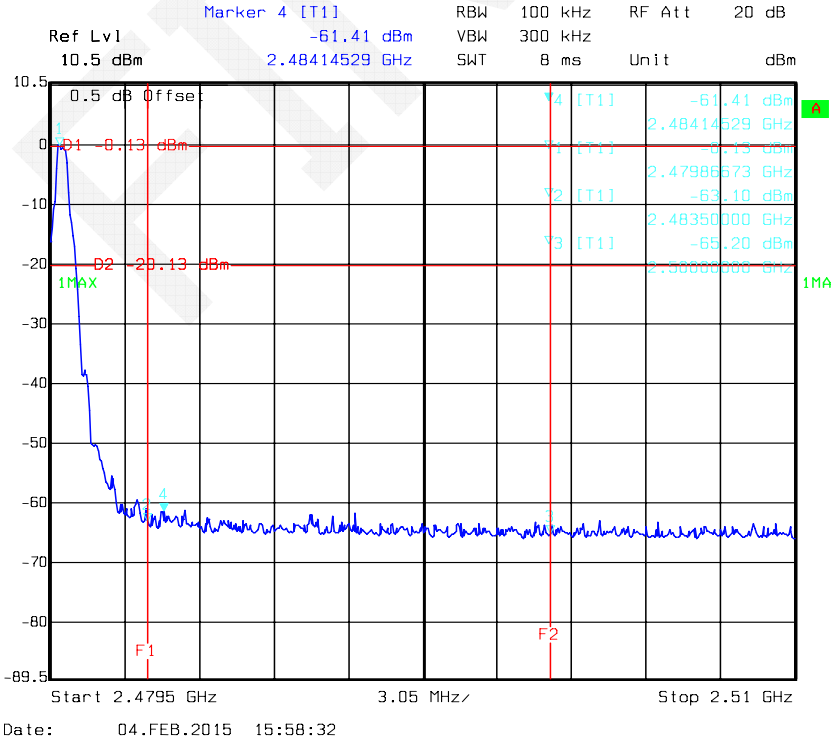
Test Result: Compliance

BDR Mode (GFSK):

Band Edge, Left Side

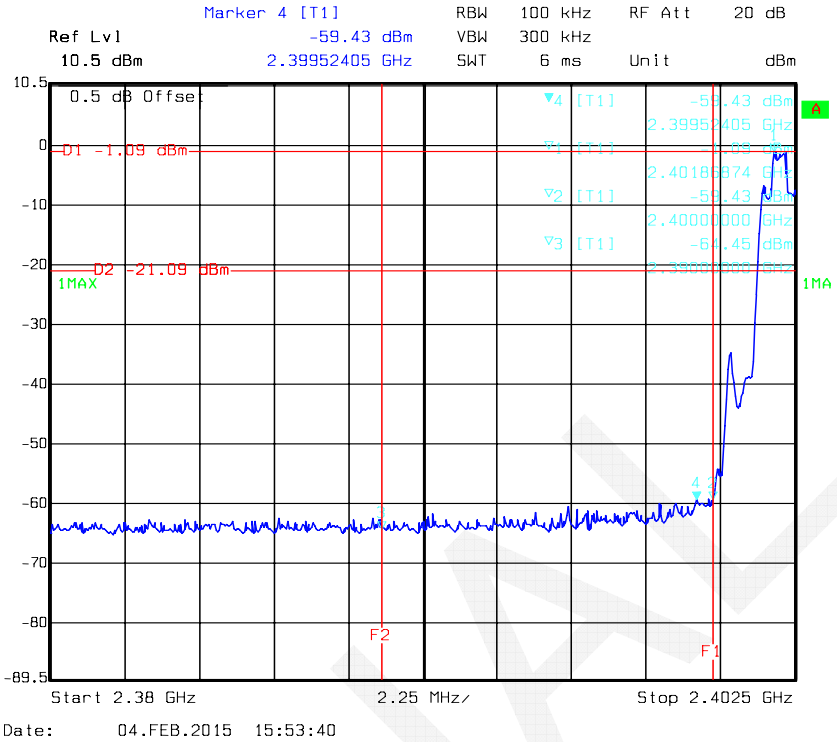


Band Edge, Right Side

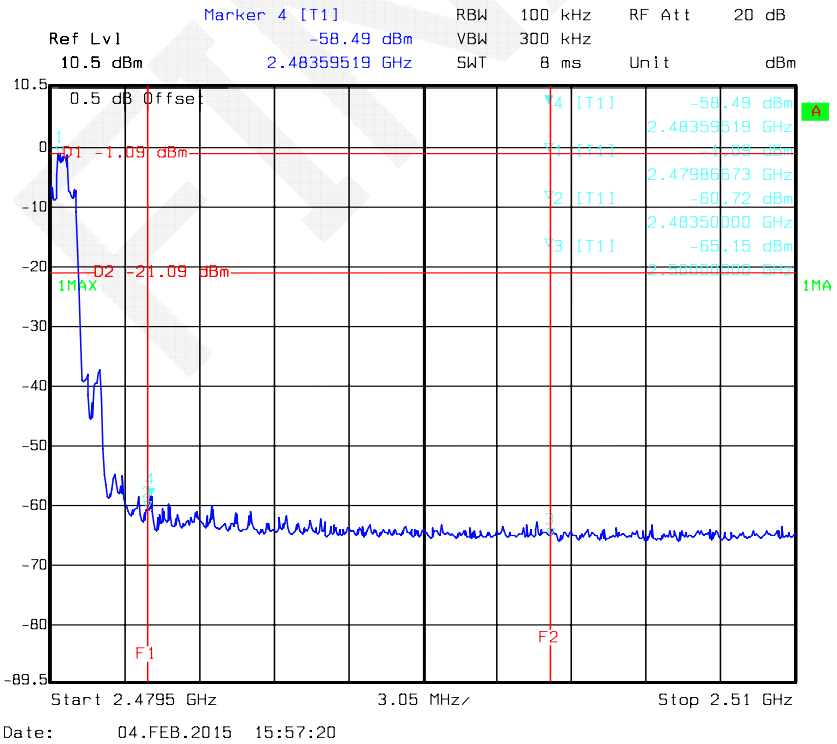


EDR Mode (π/4-DQPSK):

Band Edge, Left Side

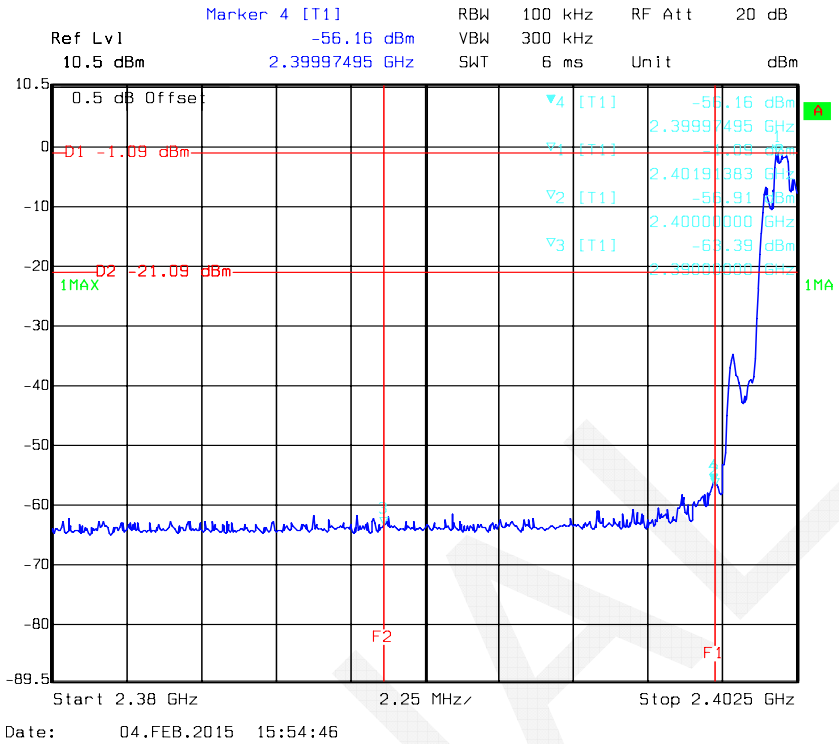


Band Edge, Right Side

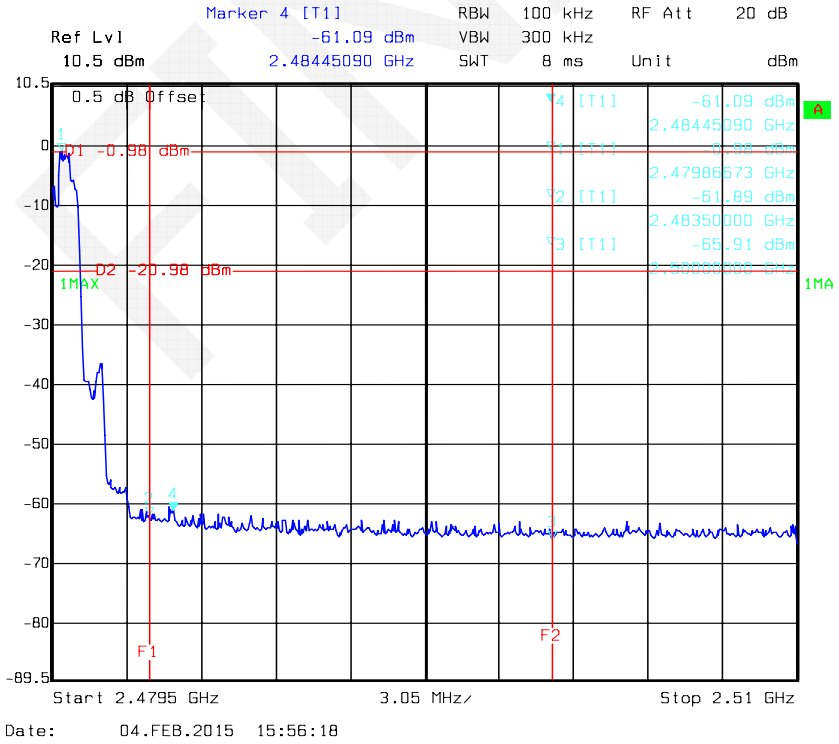


EDR Mode (8-DPSK):

Band Edge, Left Side



Band Edge, Right Side



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