

FCC PART 15.247
MEASUREMENT AND TEST REPORT

For

ZBA, Inc.

94 Old Camplain Road, Hillsborough, New Jersey 08844, USA

FCC ID: VMTBT44-291S
Model: BT44-291S

Report Type: Original Report	Product Type: HID Controller Module
Test Engineer: Jack Wu	<i>Jack . Wu</i>
Report Number: RSC120913001	
Report Date: 2012-09-24	
Reviewed By: Darren Dai	<i>Darren.dai</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Phone: +86-28-65525123 Tel: +86-28-65525125 www.baclcorp.com

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

TABLE OF CONTENTS

1 - GENERAL INFORMATION.....	4
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
1.2 MECHANICAL DESCRIPTION OF EUT.....	4
1.3 OBJECTIVE	4
1.4 RELATED SUBMITTAL(S)/GRANT(S)	4
1.5 TEST METHODOLOGY.....	4
1.6 TEST FACILITY	5
2 - SYSTEM TEST CONFIGURATION.....	6
2.1 DESCRIPTION OF TEST CONFIGURATION	6
2.2 EQUIPMENT MODIFICATIONS	6
2.3 EUT EXERCISE SOFTWARE	6
2.4 LOCAL SUPPORT EQUIPMENT LIST AND DETAILS	6
2.5 EXTERNAL I/O CABLE.....	6
2.6 CONFIGURATION OF TEST SETUP.....	7
2.7 BLOCK DIAGRAM OF TEST SETUP	8
3 - SUMMARY OF TEST RESULTS.....	10
4 - FCC §15.247 (I) & §2.1091 – RF EXPOSURE	11
4.1 APPLICABLE STANDARD.....	11
4.3 MPE PREDICTION.....	11
4.4 MPE RESULTS.....	11
5 - FCC §15.203 – ANTENNA REQUIREMENT.....	12
5.1 STANDARD APPLICABLE.....	12
5.2 ANTENNA CONNECTOR CONSTRUCTION	12
6 - FCC§ 15.207(a) - CONDUCTED EMISSIONS	13
6.1 APPLICABLE STANDARD.....	13
6.2 EUT SETUP	13
6.3 EMI TEST RECEIVER.....	14
6.4 TEST EQUIPMENT LIST AND DETAILS	14
6.5 TEST PROCEDURE.....	14
6.6 SUMMARY OF TEST RESULTS	14
6.7 CONDUCTED EMISSIONS TEST DATA & PLOTS.....	14
7 - FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS	17
7.1 APPLICABLE STANDARD.....	17
7.2 MEASUREMENT UNCERTAINTY	17
7.3 EUT SETUP	17
7.4 EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP.....	18
7.5 TEST PROCEDURE.....	18
7.6 TEST EQUIPMENT LIST AND DETAILS	18
7.7 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	18
7.8 TEST RESULTS SUMMARY	19
7.9 TEST DATA.....	19
8 - FCC §15.247(a) (1) - CHANNEL SEPARATION TEST	29
8.1 APPLICABLE STANDARD.....	29
8.2 TEST EQUIPMENT LIST AND DETAILS	29
8.3 TEST PROCEDURE.....	29

8.4 TEST DATA.....	29
9 - FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING.....	36
9.1 APPLICABLE STANDARD.....	36
9.2 TEST PROCEDURE.....	36
9.3 TEST EQUIPMENT LIST AND DETAILS.....	36
9.4 TEST DATA.....	36
10 - FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST.....	43
10.1 APPLICABLE STANDARD.....	43
10.2 TEST PROCEDURE.....	43
10.3 TEST EQUIPMENT LIST AND DETAILS.....	43
10.4 TEST DATA.....	43
11 - FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)	46
11.1 APPLICABLE STANDARD.....	46
11.2 TEST PROCEDURE.....	46
11.3 TEST EQUIPMENT LIST AND DETAILS.....	46
11.4 TEST DATA.....	46
12 - FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT.....	62
12.1 APPLICABLE STANDARD.....	62
12.2 TEST PROCEDURE.....	62
12.3 TEST EQUIPMENT LIST AND DETAILS.....	62
12.4 TEST DATA.....	62
13 - FCC §15.247(d) - BAND EDGES TESTING	69
13.1 APPLICABLE STANDARD.....	69
13.3 TEST PROCEDURE.....	69
13.3 TEST EQUIPMENT LIST AND DETAILS.....	69
13.4 TEST DATA.....	70

1 - GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The ZBA, Inc.'s product, model number: *BT44-291S (FCC ID: VMTBT44-291S)* or the "EUT" as referred to in this report is a *HID Controller Module*, rated input voltage: DC 3.3V.

1.2 Mechanical Description of EUT

The EUT is measured approximately 3 cm L x 1.5 cm W x 0.2 cm H.

All measurement and test data in this report was gathered from production sample serial number: 120911001 (Assigned by BACL, Chengdu). The EUT was received on 2012-09-11.

1.3 Objective

This Type approval report is prepared on behalf of ZBA, Inc. in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

1.4 Related Submittal(s)/Grant(s)

N/A.

1.5 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. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is ± 0.96 dB, the uncertainty of any radiation on emissions measurement is ± 4.0 dB

1.6 Test Facility

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

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on July 31, 2009. 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.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 - SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

The system was configured for testing in an engineering mode, which is provided by manufacture.

2.2 Equipment Modifications

No modification was made to the unit tested.

2.3 EUT Exercise Software

The EUT was test under 'bluetest 3', which is provided by manufacture.

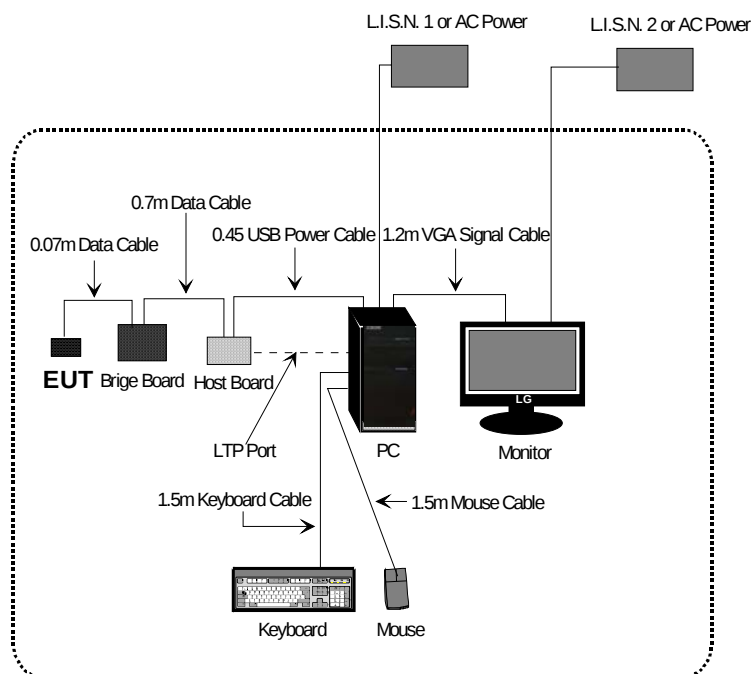
2.4 Local Support Equipment List and Details

Description	Manufacturer	Model	Serial Number
PC	IBM	8176	N/A
Monitor	LG	L15NS-7	511NTTQ25137
Mouse	IBM	M028U0	N/A
Keyboard	IBM	SK-8815	09161634
Brige Board	ZBA., Inc.	N/A	N/A

2.5 External I/O Cable

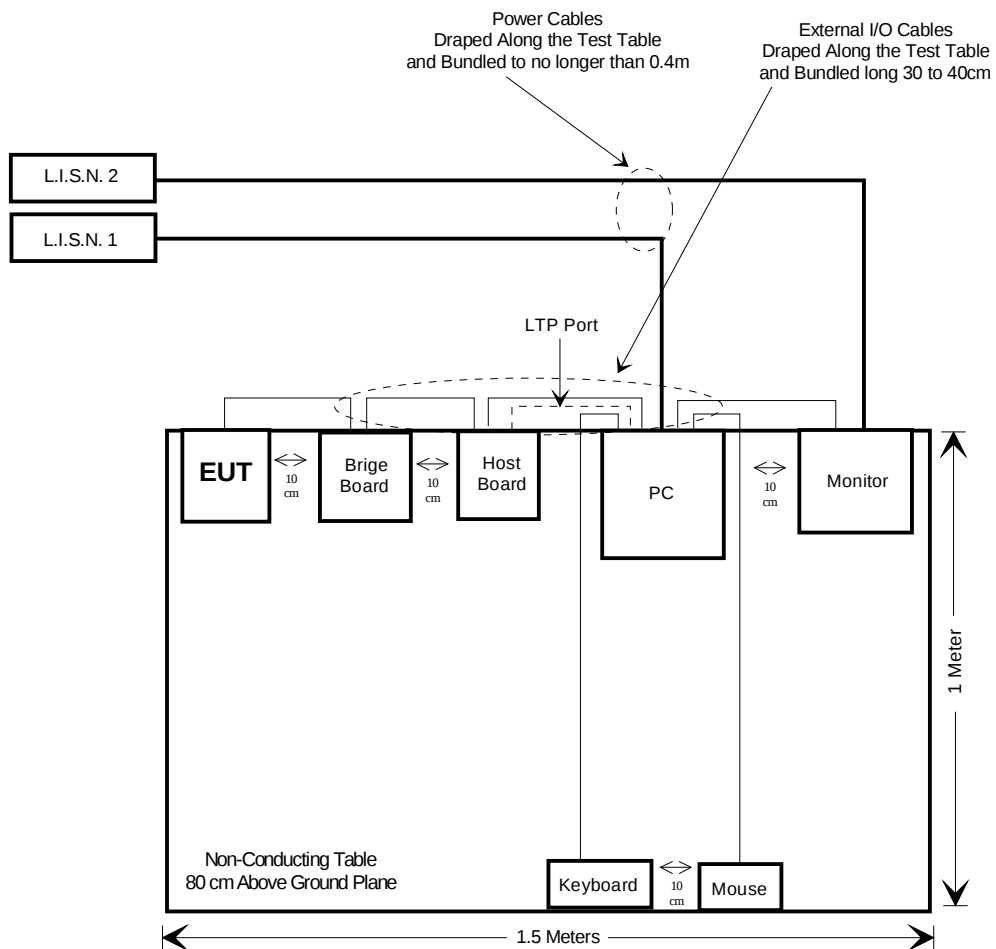
Cable Description	Length (M)	From	To
Unshielded Detachable USB Power Cable	0.45	PC	Host Board
Unshielded Detachable Data Cable	0.7	Host Board	Brige Board
Unshielded Detachable Data Cable	0.07	EUT	Brige Board
Shielded Detachable VGA Signal Cable	1.2	PC	Monitor
Shielded Detachable Mouse Cable	1.5	PC	Mouse
Shielded Detachable Keyboard Cable	1.5	PC	Keyboard

2.6 Configuration of Test Setup

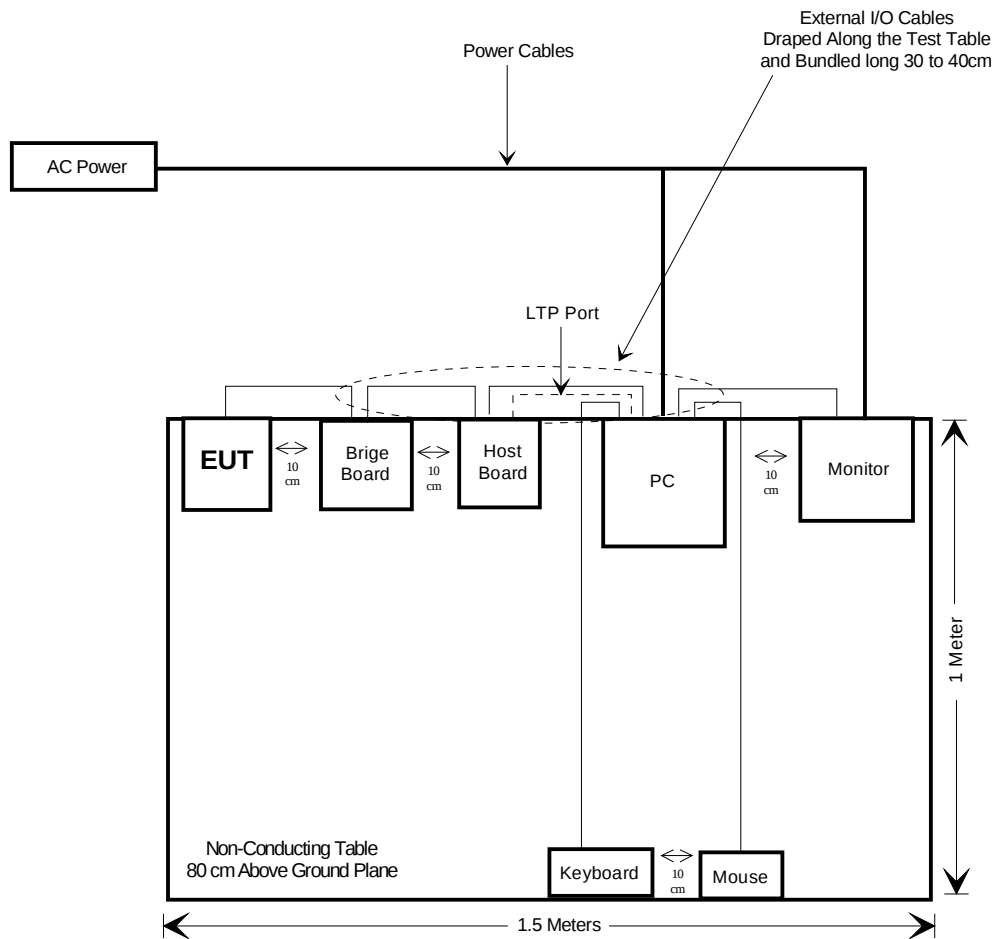


2.7 Block Diagram of Test Setup

For Conducted Emissions:



For Spurious Emissions:



3 - SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
15.247 (i) & §2.1091	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§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

4 - FCC §15.247 (I) & §2.1091 – RF EXPOSURE

4.1 Applicable Standard

According to §15.247(i) and §1.1307(b)(1), 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 KDB 447498 D01 Mobile Portable RF Exposure v04, no SAR required if power is lower than the flowing threshold:

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

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)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

4.3 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

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

Where: S = power density

P = power input to antenna

G = gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

4.4 MPE Results

Mode	Frequency (MHz)	Antenna Gain		Output Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BDR Mode (GFSK)	2402	-0.5	0.89	-2.16	0.61	20	0.00011	1.0
0EDR Mode (π/4-DQPSK)	2480	-0.5	0.89	0.81	1.21	20	0.00021	1.0
EDR Mode (8DPSK)	2480	-0.5	0.89	0.52	1.13	20	0.00020	1.0

Result: The device meets FCC MPE at 20 cm distance.

5 - FCC §15.203 – ANTENNA REQUIREMENT

5.1 Standard Applicable

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.

5.2 Antenna Connector Construction

The EUT has 50 Ohm external antenna permanently connection with the PCB, which in accordance to section 15.203, the maximum gain is -0.5 dBi which fulfills the requirements of FCC rule 15.203.

Result: Compliance.

6 - FCC§ 15.207(a) - CONDUCTED EMISSIONS

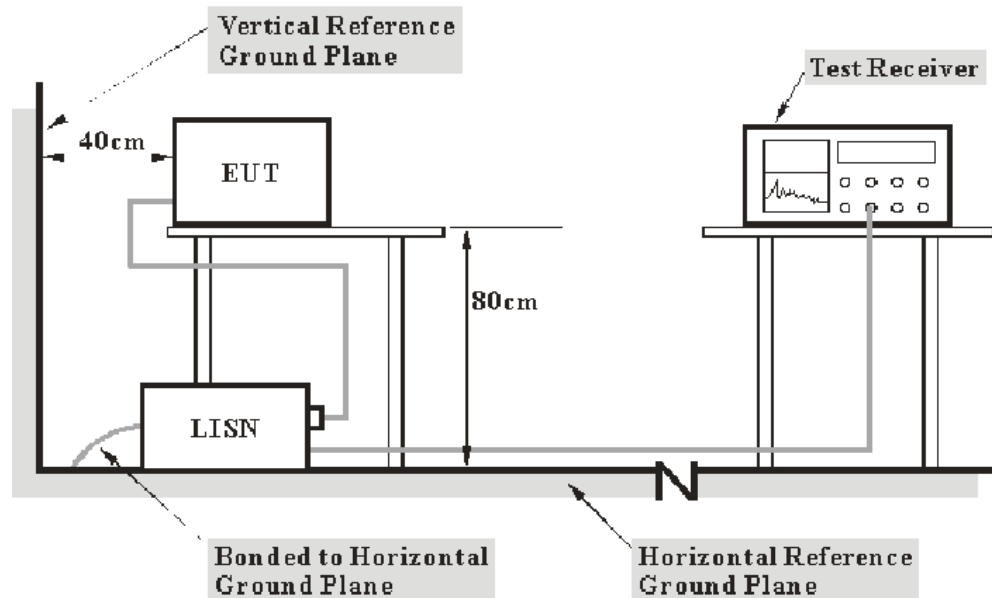
6.1 Applicable Standard

According to FCC § 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

Note: * Decreases with the logarithm of the frequency.

6.2 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 specification used was in accordance with FCC §15.207(a) limits.

6.3 EMI Test Receiver

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:

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

6.4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	10028	2012-05-24	2013-05-23
L.I.S.N.	Rohde & Schwarz	ENV216	3560.6550.06	2012-03-26	2013-03-25

6.5 Test Procedure

Maximizing procedure is performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data is recorded in the Quasi-peak mode.

Final test data for this test configuration is recorded in the section below.

6.6 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC §15.207(a), with the worst margin reading of:

14.79 dB at 24.50 MHz in the **Line** conductor mode
14.72 dB at 24.50 MHz in the **Neutral** conductor mode

6.7 Conducted Emissions Test Data & Plots

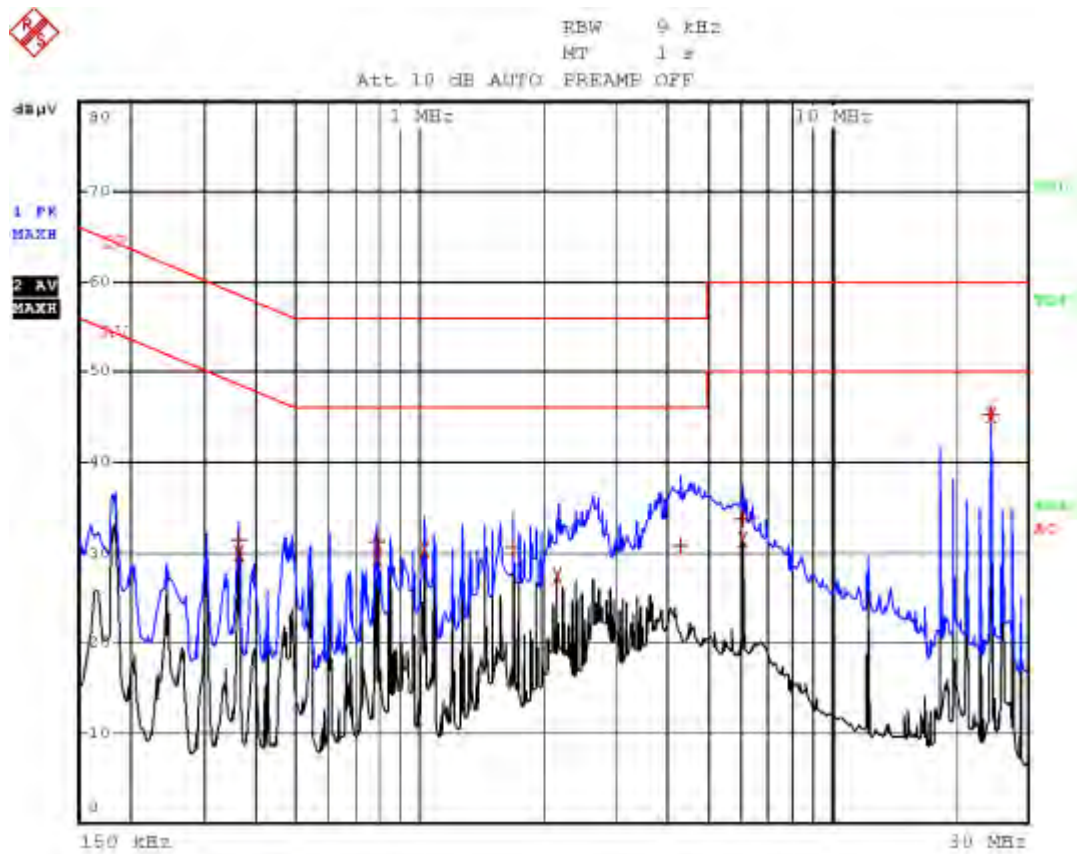
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

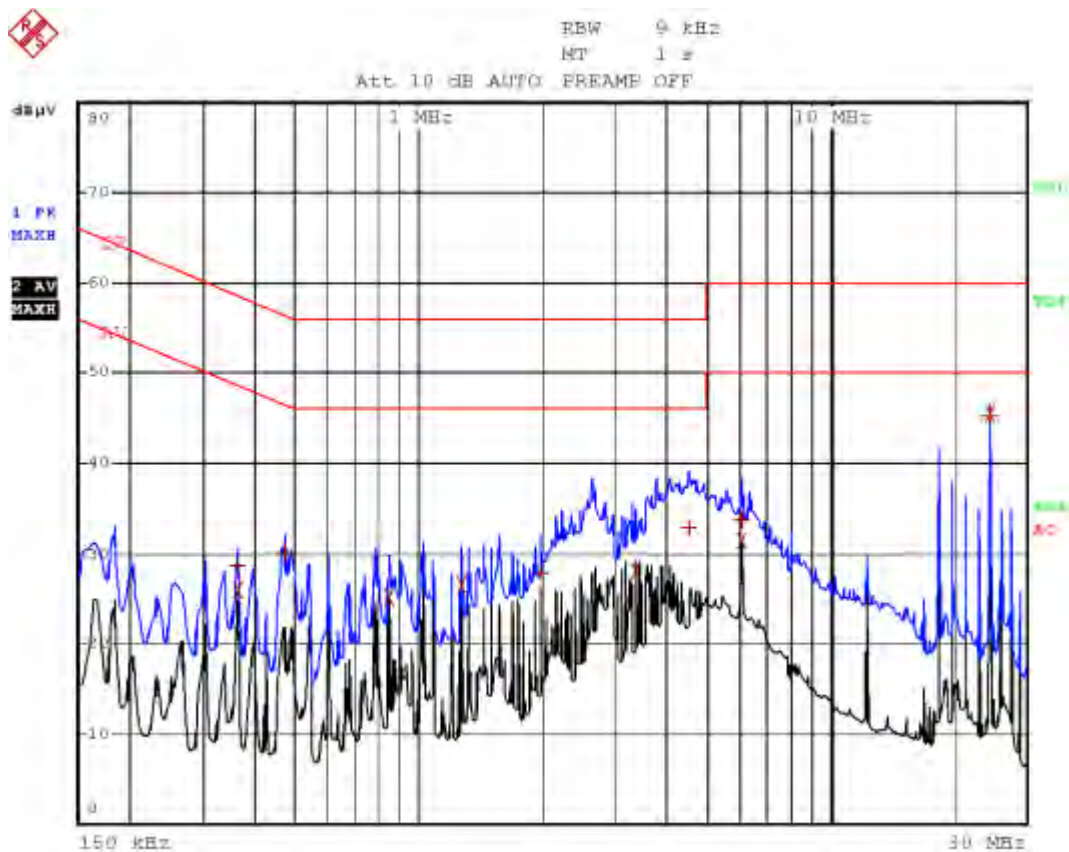
* The testing was performed by Jack Wu on 2012-09-17

Test Result: Compliance, Please refer to following tables and plots.

Line



Frequency MHz	Cord. Reading dBuV	Detector (Qp/Ave)	Phase (Line/Neutral)	FCC Part 15.207(a)	
				Limits dBμV	Margin dB
0.36	31.33	QP	Line	58.68	27.35
0.36	29.94	AV	Line	48.68	18.74
0.79	31.13	QP	Line	56.00	24.87
0.79	29.42	AV	Line	46.00	16.58
1.03	30.27	AV	Line	46.00	15.73
1.69	30.53	QP	Line	56.00	25.47
2.17	27.34	AV	Line	46.00	18.66
4.33	30.74	QP	Line	56.00	25.26
6.13	33.67	QP	Line	60.00	26.33
6.13	31.34	AV	Line	50.00	18.66
24.50	45.21	QP	Line	60.00	*14.79

Neutral

Frequency MHz	Cord. Reading dBuV	Detector (Qp/Ave)	Phase (Line/Neutral)	FCC Part 15.207(a)	
				Limits dBμV	Margin dB
0.36	28.62	QP	Neutral	58.68	30.06
0.36	25.94	AV	Neutral	48.68	22.74
0.47	30.09	QP	Neutral	56.51	26.42
0.85	25.06	AV	Neutral	46.00	20.94
1.27	26.65	AV	Neutral	46.00	19.35
1.99	27.78	QP	Neutral	56.00	28.22
3.38	27.95	AV	Neutral	46.00	18.05
4.53	32.80	QP	Neutral	56.00	23.20
6.13	33.71	QP	Neutral	60.00	26.29
6.13	31.28	AV	Neutral	50.00	18.72
24.50	45.28	QP	Neutral	60.00	*14.72

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

7.1 Applicable Standard

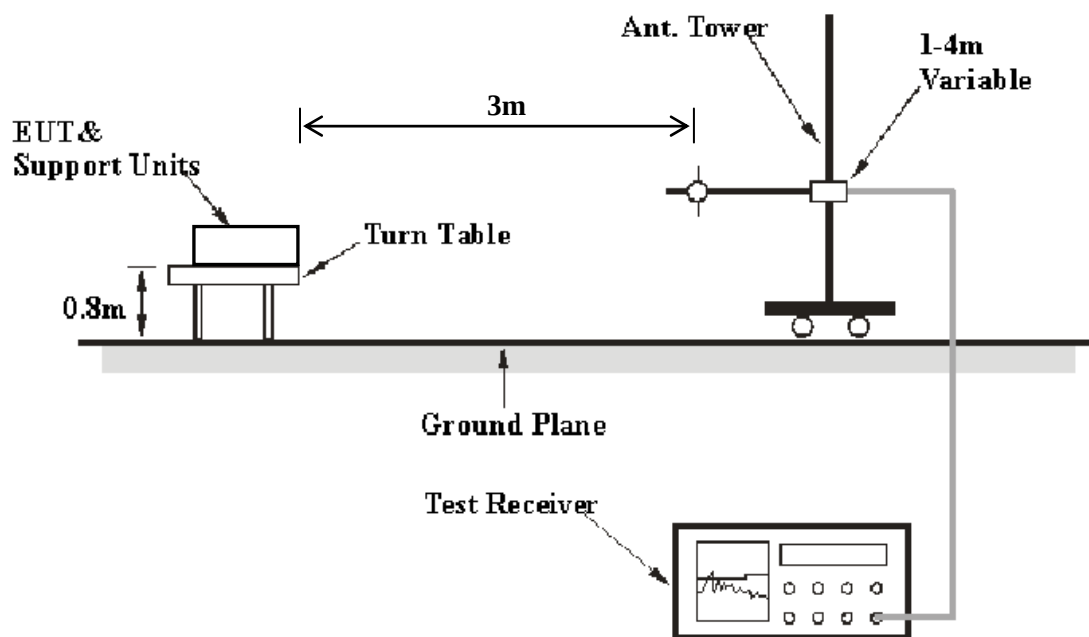
FCC §15.247 (d); §15.209; §15.205;

7.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is 4.0 dB(k=2, 95% level of confidence).

7.3 EUT Setup



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 ~40cm long in the middle.

7.4 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:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video BW</i>	<i>Detector</i>
30 MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	Ave.

7.5 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.

7.6 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Pre-Amplifier	Agilent	8447D	2944A10442	2012-05-24	2013-05-23
EMI Test Receiver	Rohde & Schwarz	ESCI	10028	2012-05-24	2013-05-23
Broadband Antenna	Sunol Sciences	JB3	A101808	2012-08-14	2013-08-13
Spectrum Analyzer	Rohde & Schwarz	FSL18	100180	2012-05-10	2013-05-09
Horn Antenna	HP	3115	9607-4897	2012-05-05	2013-05-04
Pre-Amplifier	HP	8449B	3008A00277	2012-05-24	2013-05-23
Semi-Anechoic Chamber	EMCT	966	N/A	2012-06-19	2015-06-18

7.7 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:

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

7.8 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:

EDR ($\pi/4$ -DQPSK) Mode: 1.14 dB at 1628 MHz in the **Vertical polarization at middle channel**

7.9 Test Data

Environmental Conditions

Temperature:	26 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

**The testing was performed by Jack Wu on 2012-07-05.*

Test Result: Compliance, Please refer to following tables.

BDR (GFSK) Mode:*Test Mode: Transmitting*

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2402 MHz)								
79	53.64	QP	V	-19.04	34.6	40	5.4	Spurious
79	52.54	QP	H	-19.04	33.5	40	6.5	Spurious
1602	45.35	PK	H	4.47	49.82	74	24.18	Spurious
1602	41.46	AV	H	4.47	45.93	54	8.07	Spurious
1602	49.93	PK	V	4.47	54.4	74	19.6	Spurious
1602	47.38	AV	V	4.47	51.85	54	*2.15	Spurious
2380	41.91	PK	H	7.71	49.62	74	24.38	Spurious
2380	26.82	AV	H	7.71	34.53	54	19.47	Spurious
2380	42.42	PK	V	7.71	50.13	74	23.87	Spurious
2380	26.65	AV	V	7.71	34.36	54	19.64	Spurious
4804	51.15	PK	V	17.23	68.38	74	5.62	Harmonic
4804	50.68	PK	H	17.23	67.91	74	6.09	Harmonic
4804	33.39	AV	V	17.23	50.62	54	*3.38	Harmonic
4804	33.11	AV	H	17.23	50.34	54	*3.66	Harmonic
7206	42.18	PK	V	21.03	63.21	74	10.79	Harmonic
7206	41.77	PK	H	21.03	62.8	74	11.2	Harmonic
7206	27.26	AV	V	21.03	48.29	54	5.71	Harmonic
7206	26.65	AV	H	21.03	47.68	54	6.32	Harmonic
9608	39.25	PK	H	26.49	65.74	74	8.26	Harmonic
9608	22.84	AV	H	26.49	49.33	54	4.67	Harmonic
9608	41.33	PK	V	26.49	67.82	74	6.18	Harmonic
9608	22.18	AV	V	26.49	48.67	54	5.33	Harmonic
2402	81.41	PK	V	6.76	88.17	N/A	N/A	Fund.
2402	46.65	AV	V	6.76	53.41	N/A	N/A	Fund.
2402	85.45	PK	H	6.76	92.21	N/A	N/A	Fund.
2402	46.43	AV	H	6.76	53.19	N/A	N/A	Fund.

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Middle Channel (2441MHz)								
79	52.74	QP	V	-19.04	33.7	40	6.3	Spurious
79	51.44	QP	H	-19.04	32.4	40	7.6	Spurious
1628	47.47	AV	V	4.47	51.94	54	*2.06	Spurious
1628	50.68	PK	V	4.47	55.15	74	18.85	Spurious
1628	43.95	AV	H	4.47	48.42	54	5.58	Spurious
1628	47.18	PK	H	4.47	51.65	74	22.35	Spurious
2603	19.21	AV	V	8.96	28.17	54	25.83	Spurious
2603	42.12	PK	V	8.96	51.08	74	22.92	Spurious
2603	18.87	AV	H	8.96	27.83	54	26.17	Spurious
2603	43.12	PK	H	8.96	52.08	74	21.92	Spurious
4882	52.49	PK	V	17.23	69.72	74	4.28	Harmonic
4882	49.6	PK	H	17.23	66.83	74	7.17	Harmonic
4882	33.66	AV	V	17.23	50.89	54	*3.11	Harmonic
4882	32.89	AV	H	17.23	50.12	54	*3.88	Harmonic
7323	41.21	PK	V	21.21	62.42	74	11.58	Harmonic
7323	42.13	PK	H	21.21	63.34	74	10.66	Harmonic
7323	26.52	AV	V	21.21	47.73	54	6.27	Harmonic
7323	25.12	AV	H	21.21	46.33	54	7.67	Harmonic
9764	19.03	AV	V	27.06	46.09	54	7.91	Harmonic
9764	38.72	PK	V	27.06	65.78	74	8.22	Harmonic
9764	18.65	AV	H	27.06	45.71	54	8.29	Harmonic
9764	39.11	PK	H	27.06	66.17	74	7.83	Harmonic
2441	80.06	PK	V	6.76	86.82	N/A	N/A	Fund.
2441	45.44	AV	V	6.76	52.2	N/A	N/A	Fund.
2441	82.6	PK	H	6.76	89.36	N/A	N/A	Fund.
2441	45.16	AV	H	6.76	51.92	N/A	N/A	Fund.

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2480 MHz)								
82	52.84	QP	V	-19.04	33.8	40	6.2	Spurious
82	51.24	QP	H	-19.04	32.2	40	7.8	Spurious
1654	47.51	PK	H	4.47	51.98	74	22.02	Spurious
1654	44.09	AV	H	4.47	48.56	54	5.44	Spurious
1654	51.05	PK	V	4.47	55.52	74	18.48	Spurious
1654	48.18	AV	V	4.47	52.65	54	*1.35	Spurious
1690	43.98	PK	H	4.49	48.47	74	25.53	Spurious
1690	19.22	AV	H	4.49	23.71	54	30.29	Spurious
1690	45.86	PK	V	4.49	50.35	74	23.65	Spurious
1690	20.96	AV	V	4.49	25.45	54	28.55	Spurious
4960	51.67	PK	V	17.9	69.57	74	4.43	Harmonic
4960	49.11	PK	H	17.9	67.01	74	6.99	Harmonic
4960	33.31	AV	V	17.9	51.21	54	*2.79	Harmonic
4960	32.19	AV	H	17.9	50.09	54	*3.91	Harmonic
7440	41.22	PK	V	21.43	62.65	74	11.35	Harmonic
7440	42.31	PK	H	21.43	63.74	74	10.26	Harmonic
7440	18.22	AV	V	21.43	39.65	54	14.35	Harmonic
7440	17.45	AV	H	21.43	38.88	54	15.12	Harmonic
9920	42.12	PK	H	27.29	69.41	74	4.59	Harmonic
9920	18.23	AV	H	27.29	45.52	54	8.48	Harmonic
9920	41.16	PK	V	27.29	68.45	74	5.55	Harmonic
9920	17.87	AV	V	27.29	45.16	54	8.84	Harmonic
2480	80.82	PK	V	6.76	87.58	N/A	N/A	Fund.
2480	46.14	AV	V	6.76	52.9	N/A	N/A	Fund.
2480	82.41	PK	H	6.76	89.17	N/A	N/A	Fund.
2480	45.25	AV	H	6.76	52.01	N/A	N/A	Fund.

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

Frequency (MHz)	Reading (dB μ V)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Comment
Low Channel (2402 MHz)								
79	49.44	QP	V	-19.04	30.4	40	9.6	Spurious
79	50.54	QP	H	-19.04	31.5	40	8.5	Spurious
1602	45.97	PK	H	4.47	50.44	74	23.56	Spurious
1602	42.34	AV	H	4.47	46.81	54	7.19	Spurious
1602	49.32	PK	V	4.47	53.79	74	20.21	Spurious
1602	46.66	AV	V	4.47	51.13	54	*2.87	Spurious
2380	42.53	PK	H	7.71	50.24	74	23.76	Spurious
2380	25.32	AV	H	7.71	33.03	54	20.97	Spurious
2380	41.63	PK	V	7.71	49.34	74	24.66	Spurious
2380	26.23	AV	V	7.71	33.94	54	20.06	Spurious
4804	46.51	PK	V	17.23	63.74	74	10.26	Harmonic
4804	26.47	AV	V	17.23	43.7	54	10.3	Harmonic
4804	45.18	PK	H	17.23	62.41	74	11.59	Harmonic
4804	26.23	AV	H	17.23	43.46	54	10.54	Harmonic
7206	43.38	PK	V	21.03	64.41	74	9.59	Harmonic
7206	42.55	PK	H	21.03	63.58	74	10.42	Harmonic
7206	25.13	AV	V	21.03	46.16	54	7.84	Harmonic
7206	24.54	AV	H	21.03	45.57	54	8.43	Harmonic
9608	37.26	PK	H	26.49	63.75	74	10.25	Harmonic
9608	21.76	AV	H	26.49	48.25	54	5.75	Harmonic
9608	38.34	PK	V	26.49	64.83	74	9.17	Harmonic
9608	20.15	AV	V	26.49	46.64	54	7.36	Harmonic
2402	85.97	PK	V	6.76	92.73	N/A	N/A	Fund.
2402	47.2	AV	V	6.76	53.96	N/A	N/A	Fund.
2402	88.52	PK	H	6.76	95.28	N/A	N/A	Fund.
2402	47.77	AV	H	6.76	54.53	N/A	N/A	Fund.

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Middle Channel (2441 MHz)								
79	48.74	QP	V	-19.04	29.7	40	10.3	Spurious
79	48.44	QP	H	-19.04	29.4	40	10.6	Spurious
1628	48.39	AV	V	4.47	52.86	54	*1.14	Spurious
1628	50.11	PK	V	4.47	54.58	74	19.42	Spurious
1628	47.45	AV	H	4.47	51.92	54	*2.08	Spurious
1628	49.66	PK	H	4.47	54.13	74	19.87	Spurious
2603	21.32	AV	V	8.96	30.28	54	23.72	Spurious
2603	43.41	PK	V	8.96	52.37	74	21.63	Spurious
2603	19.56	AV	H	8.96	28.52	54	25.48	Spurious
2603	42.76	PK	H	8.96	51.72	74	22.28	Spurious
4882	47.64	PK	V	17.23	64.87	74	9.13	Harmonic
4882	27.76	AV	V	17.23	44.99	54	9.01	Harmonic
4882	44.97	PK	H	17.23	62.2	74	11.8	Harmonic
4882	27.29	AV	H	17.23	44.52	54	9.48	Harmonic
7323	39.32	PK	V	21.21	60.53	74	13.47	Harmonic
7323	40.13	PK	H	21.21	61.34	74	12.66	Harmonic
7323	23.12	AV	V	21.21	44.33	54	9.67	Harmonic
7323	22.76	AV	H	21.21	43.97	54	10.03	Harmonic
9764	18.76	AV	V	27.06	45.82	54	8.18	Harmonic
9764	36.65	PK	V	27.06	63.71	74	10.29	Harmonic
9764	19.21	AV	H	27.06	46.27	54	7.73	Harmonic
9764	37.42	PK	H	27.06	64.48	74	9.52	Harmonic
2441	83.8	PK	V	6.76	90.56	N/A	N/A	Fund.
2441	47.15	AV	V	6.76	53.91	N/A	N/A	Fund.
2441	86.35	PK	H	6.76	93.11	N/A	N/A	Fund.
2441	46.7	AV	H	6.76	53.46	N/A	N/A	Fund.

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2480 MHz)								
82	50.84	QP	V	-19.04	31.8	40	8.2	Spurious
82	49.24	QP	H	-19.04	30.2	40	9.8	Spurious
1654	49.43	PK	H	4.47	53.9	74	20.1	Spurious
1654	47.26	AV	H	4.47	51.73	54	*2.27	Spurious
1654	49.98	PK	V	4.47	54.45	74	19.55	Spurious
1654	47.7	AV	V	4.47	52.17	54	*1.83	Spurious
1690	45.32	PK	H	4.49	49.81	74	24.19	Spurious
1690	23.83	AV	H	4.49	28.32	54	25.68	Spurious
1690	44.73	PK	V	4.49	49.22	74	24.78	Spurious
1690	21.72	AV	V	4.49	26.21	54	27.79	Spurious
4960	45.13	PK	V	17.9	63.03	74	10.97	Harmonic
4960	26.83	AV	V	17.9	44.73	54	9.27	Harmonic
4960	43.9	PK	H	17.9	61.8	74	12.2	Harmonic
4960	26.72	AV	H	17.9	44.62	54	9.38	Harmonic
7440	38.31	PK	V	21.43	59.74	74	14.26	Harmonic
7440	37.92	PK	H	21.43	59.35	74	14.65	Harmonic
7440	17.83	AV	V	21.43	39.26	54	14.74	Harmonic
7440	18.12	AV	H	21.43	39.55	54	14.45	Harmonic
9920	40.02	PK	H	27.29	67.31	74	6.69	Harmonic
9920	17.09	AV	H	27.29	44.38	54	9.62	Harmonic
9920	40.21	PK	V	27.29	67.5	74	6.5	Harmonic
9920	18.32	AV	V	27.29	45.61	54	8.39	Harmonic
2480	81.36	PK	V	6.76	88.12	N/A	N/A	Fund.
2480	45.76	AV	V	6.76	52.52	N/A	N/A	Fund.
2480	86.03	PK	H	6.76	92.79	N/A	N/A	Fund.
2480	46.66	AV	H	6.76	53.42	N/A	N/A	Fund.

EDR (8DPSK) Mode:*Test Mode: Transmitting*

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2402 MHz)								
79	49.64	QP	V	-19.04	30.6	40	9.4	Spurious
79	48.54	QP	H	-19.04	29.5	40	10.5	Spurious
1602	46.12	PK	H	4.47	50.59	74	23.41	Spurious
1602	42.3	AV	H	4.47	46.77	54	7.23	Spurious
1602	48.81	PK	V	4.47	53.28	74	20.72	Spurious
1602	46.5	AV	V	4.47	50.97	54	*3.03	Spurious
2380	40.13	PK	H	7.71	47.84	74	26.16	Spurious
2380	25.68	AV	H	7.71	33.39	54	20.61	Spurious
2380	41.82	PK	V	7.71	49.53	74	24.47	Spurious
2380	24.97	AV	V	7.71	32.68	54	21.32	Spurious
4804	46.24	PK	V	17.23	63.47	74	10.53	Harmonic
4804	26.41	AV	V	17.23	43.64	54	10.36	Harmonic
4804	44.3	PK	H	17.23	61.53	74	12.47	Harmonic
4804	26.17	AV	H	17.23	43.4	54	10.6	Harmonic
7206	41.03	PK	V	21.03	62.06	74	11.94	Harmonic
7206	40.24	PK	H	21.03	61.27	74	12.73	Harmonic
7206	25.12	AV	V	21.03	46.15	54	7.85	Harmonic
7206	24.32	AV	H	21.03	45.35	54	8.65	Harmonic
9608	38.61	PK	H	26.49	65.1	74	8.9	Harmonic
9608	18.25	AV	H	26.49	44.74	54	9.26	Harmonic
9608	37.12	PK	V	26.49	63.61	74	10.39	Harmonic
9608	19.32	AV	V	26.49	45.81	54	8.19	Harmonic
2402	83.87	PK	V	6.76	90.63	N/A	N/A	Fund.
2402	46.37	AV	V	6.76	53.13	N/A	N/A	Fund.
2402	87.72	PK	H	6.76	94.48	N/A	N/A	Fund.
2402	47.31	AV	H	6.76	54.07	N/A	N/A	Fund.

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Middle Channel (2441 MHz)								
79	47.64	QP	V	-19.04	28.6	40	11.4	Spurious
79	48.34	QP	H	-19.04	29.3	40	10.7	Spurious
1628	47.83	AV	V	4.47	52.3	54	*1.7	Spurious
1628	50.02	PK	V	4.47	54.49	74	19.51	Spurious
1628	46.56	AV	H	4.47	51.03	54	*2.97	Spurious
1628	48.93	PK	H	4.47	53.4	74	20.6	Spurious
2603	20.12	AV	V	8.96	29.08	54	24.92	Spurious
2603	43.12	PK	V	8.96	52.08	74	21.92	Spurious
2603	20.87	AV	H	8.96	29.83	54	24.17	Spurious
2603	44.21	PK	H	8.96	53.17	74	20.83	Spurious
4882	47.81	PK	V	17.23	65.04	74	8.96	Harmonic
4882	28.02	AV	V	17.23	45.25	54	8.75	Harmonic
4882	46.22	PK	H	17.23	63.45	74	10.55	Harmonic
4882	27.57	AV	H	17.23	44.8	54	9.2	Harmonic
7323	41.21	PK	V	21.21	62.42	74	11.58	Harmonic
7323	42.13	PK	H	21.21	63.34	74	10.66	Harmonic
7323	26.52	AV	V	21.21	47.73	54	6.27	Harmonic
7323	25.12	AV	H	21.21	46.33	54	7.67	Harmonic
9764	19.03	AV	V	27.06	46.09	54	7.91	Harmonic
9764	38.72	PK	V	27.06	65.78	74	8.22	Harmonic
9764	18.65	AV	H	27.06	45.71	54	8.29	Harmonic
9764	39.11	PK	H	27.06	66.17	74	7.83	Harmonic
2441	82.81	PK	V	6.76	89.57	N/A	N/A	Fund.
2441	46.65	AV	V	6.76	53.41	N/A	N/A	Fund.
2441	86.44	PK	H	6.76	93.2	N/A	N/A	Fund.
2441	46.46	AV	H	6.76	53.22	N/A	N/A	Fund.

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Ant. Polar (H/V)	Correction Factor (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2480 MHz)								
82	49.74	QP	V	-19.04	30.7	40	9.3	Spurious
82	50.34	QP	H	-19.04	31.3	40	8.7	Spurious
1654	48.15	PK	H	4.47	52.62	74	21.38	Spurious
1654	45.74	AV	H	4.47	50.21	54	*3.79	Spurious
1654	49.42	PK	V	4.47	53.89	74	20.11	Spurious
1654	46.47	AV	V	4.47	50.94	54	*3.06	Spurious
1690	43.42	PK	H	4.49	47.91	74	26.09	Spurious
1690	20.13	AV	H	4.49	24.62	54	29.38	Spurious
1690	44.64	PK	V	4.49	49.13	74	24.87	Spurious
1690	21.32	AV	V	4.49	25.81	54	28.19	Spurious
4960	47.06	PK	V	17.9	64.96	74	9.04	Harmonic
4960	27.93	AV	V	17.9	45.83	54	8.17	Harmonic
4960	45.04	PK	H	17.9	62.94	74	11.06	Harmonic
4960	27.08	AV	H	17.9	44.98	54	9.02	Harmonic
7440	41.22	PK	V	21.43	62.65	74	11.35	Harmonic
7440	42.31	PK	H	21.43	63.74	74	10.26	Harmonic
7440	18.22	AV	V	21.43	39.65	54	14.35	Harmonic
7440	17.45	AV	H	21.43	38.88	54	15.12	Harmonic
9920	42.12	PK	H	27.29	69.41	74	4.59	Harmonic
9920	18.23	AV	H	27.29	45.52	54	8.48	Harmonic
9920	41.16	PK	V	27.29	68.45	74	5.55	Harmonic
9920	17.87	AV	V	27.29	45.16	54	8.84	Harmonic
2480	80.7	PK	V	6.76	87.46	N/A	N/A	Fund.
2480	45.43	AV	V	6.76	52.19	N/A	N/A	Fund.
2480	85.26	PK	H	6.76	92.02	N/A	N/A	Fund.
2480	46.03	AV	H	6.76	52.79	N/A	N/A	Fund.

*Within measurement uncertainty!

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

8.1 Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB 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.

8.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSL18	100180	2012-05-10	2013-05-09

8.3 Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another true
3. Measure the channel separation.

8.4 Test Data

Environmental Conditions

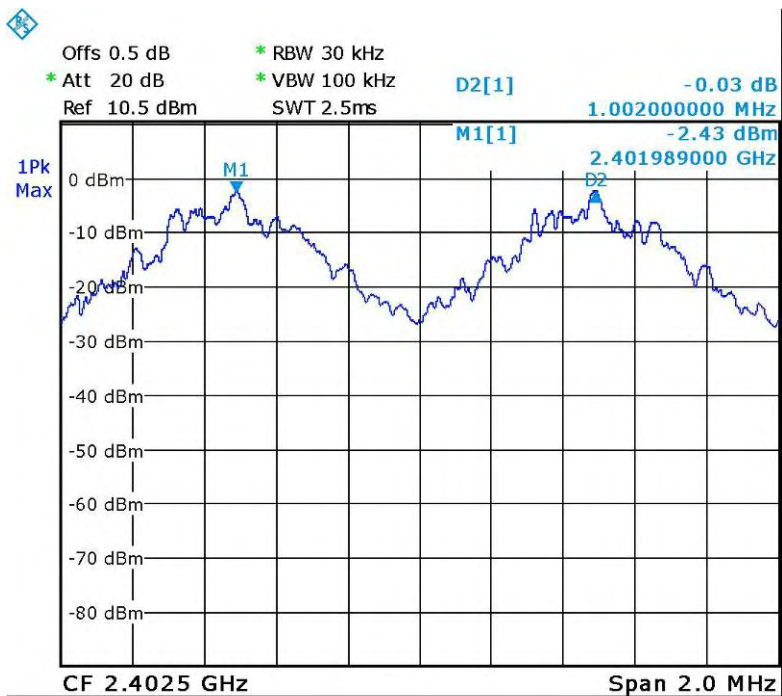
Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

**The testing was performed by Jack Wu on 2012-09-13.*

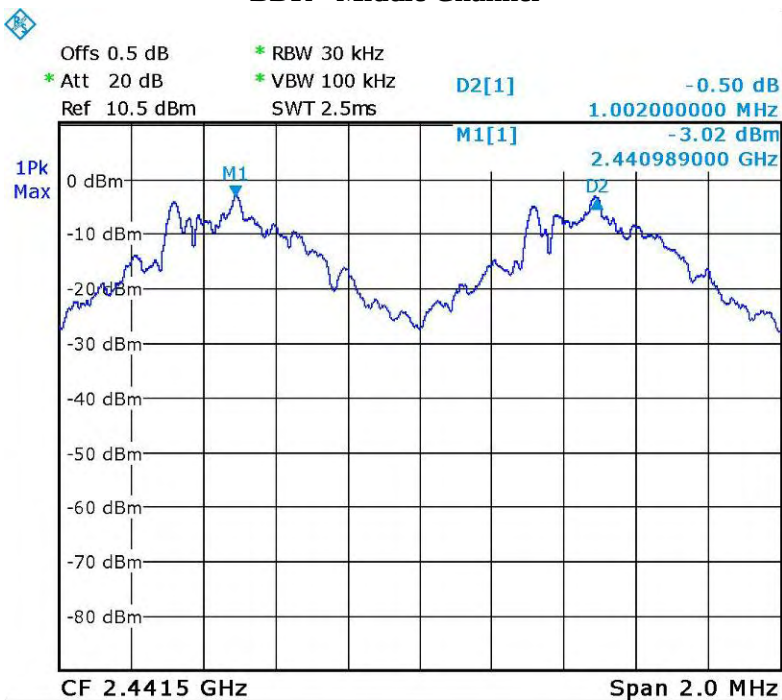
Test Result: Compliance, Please refer to following plots.

Test Mode: Transmitting

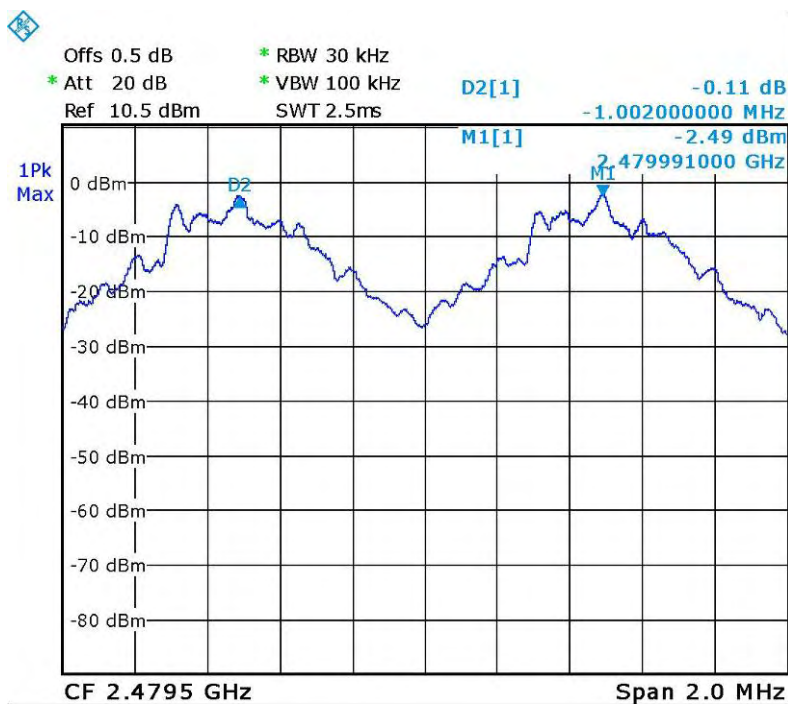
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR Mode (GFSK)	Low	2402	1.002	0.506	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.506	Pass
	Adjacent	2442			
	High	2480	1.002	0.511	Pass
	Adjacent	2479			
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.002	0.814	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.817	Pass
	Adjacent	2442			
	High	2480	1.006	0.817	Pass
	Adjacent	2479			
EDR Mode (8DPSK)	Low	2402	1.002	0.809	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.809	Pass
	Adjacent	2442			
	High	2480	1.002	0.809	Pass
	Adjacent	2479			

BDR - Low Channel

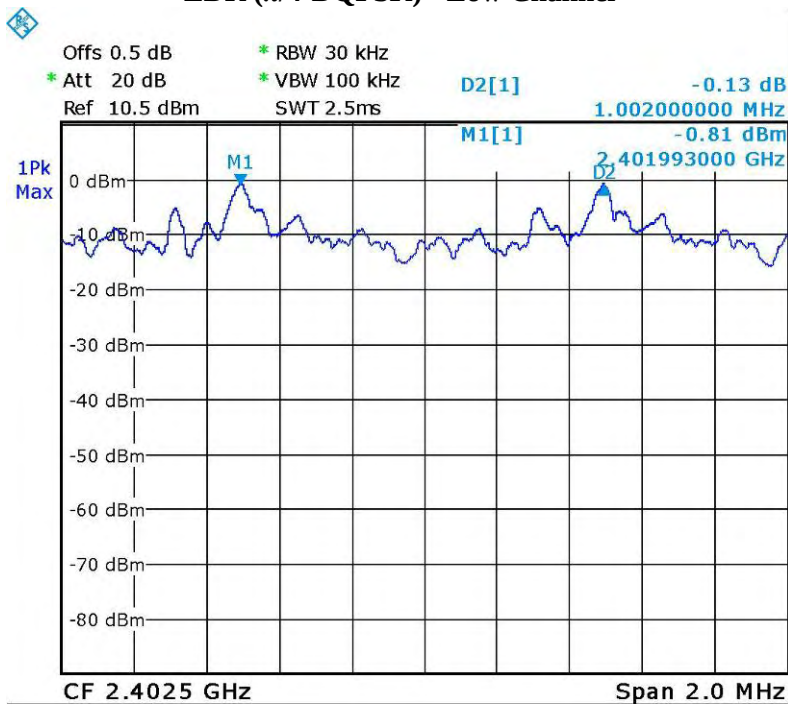
Date: 13.SEP.2012 06:22:13

BDR - Middle Channel

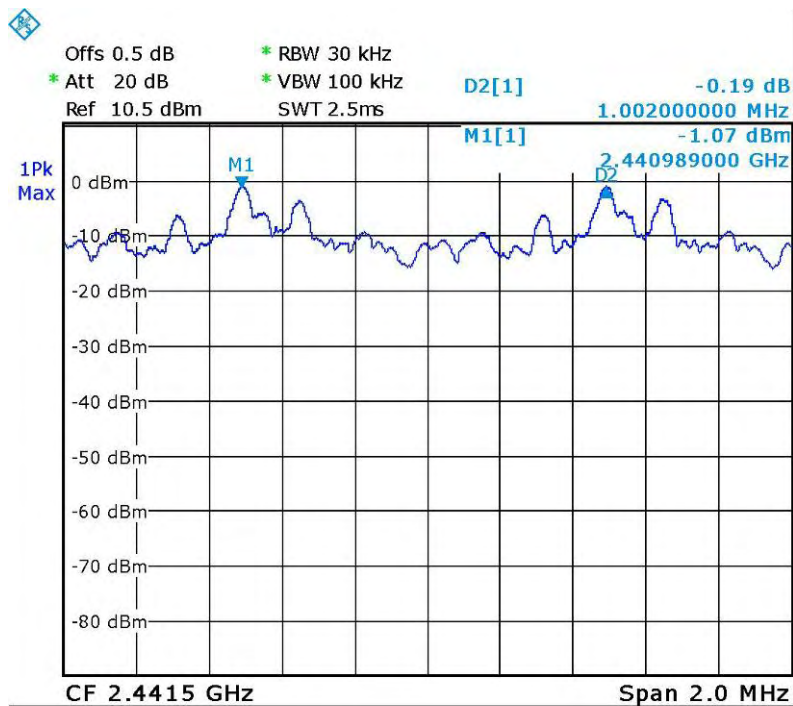
Date: 13.SEP.2012 06:20:40

BDR - High Channel

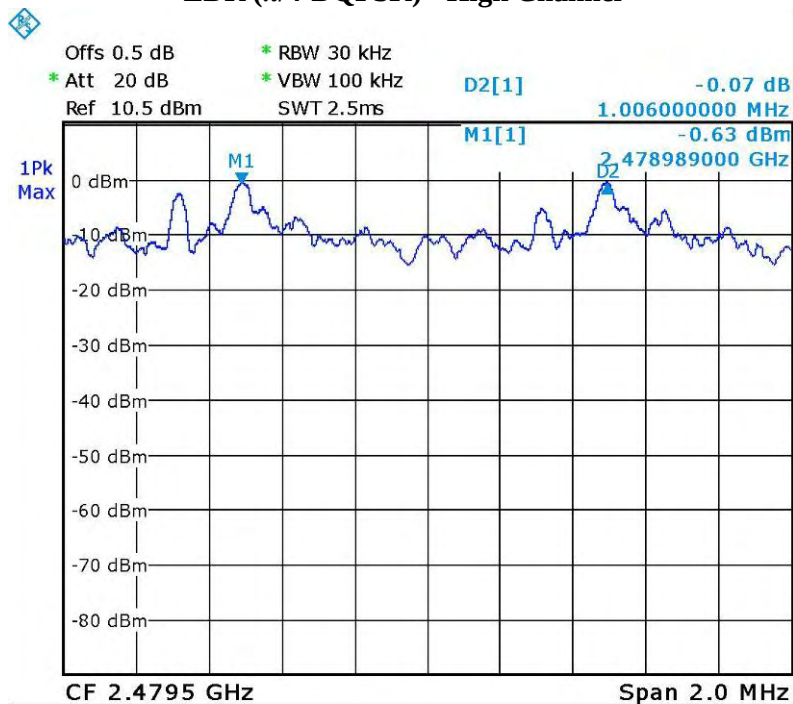
Date: 13.SEP.2012 06:27:15

EDR ($\pi/4$ -DQPSK) - Low Channel

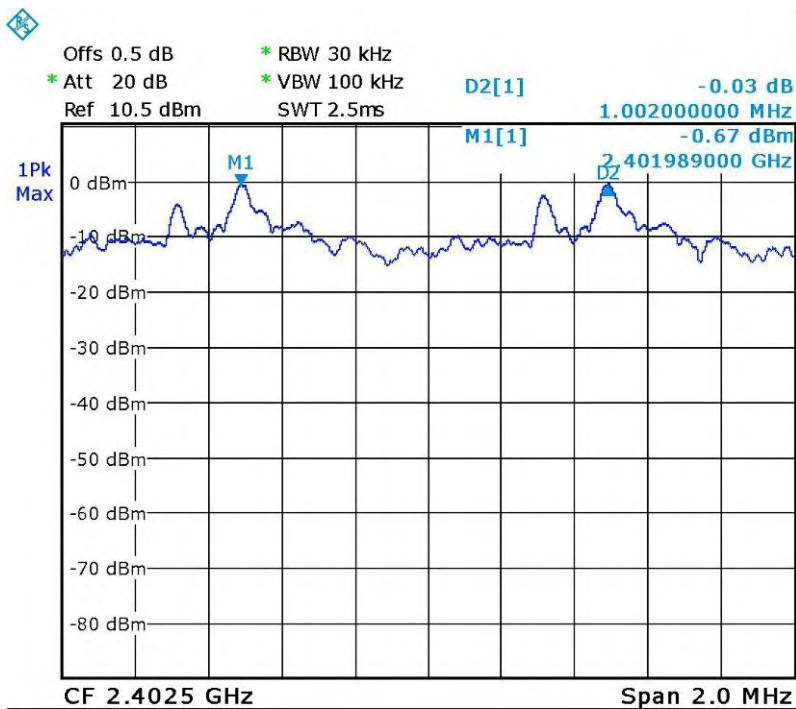
Date: 13.SEP.2012 06:05:35

EDR ($\pi/4$ -DQPSK) - Middle Channel

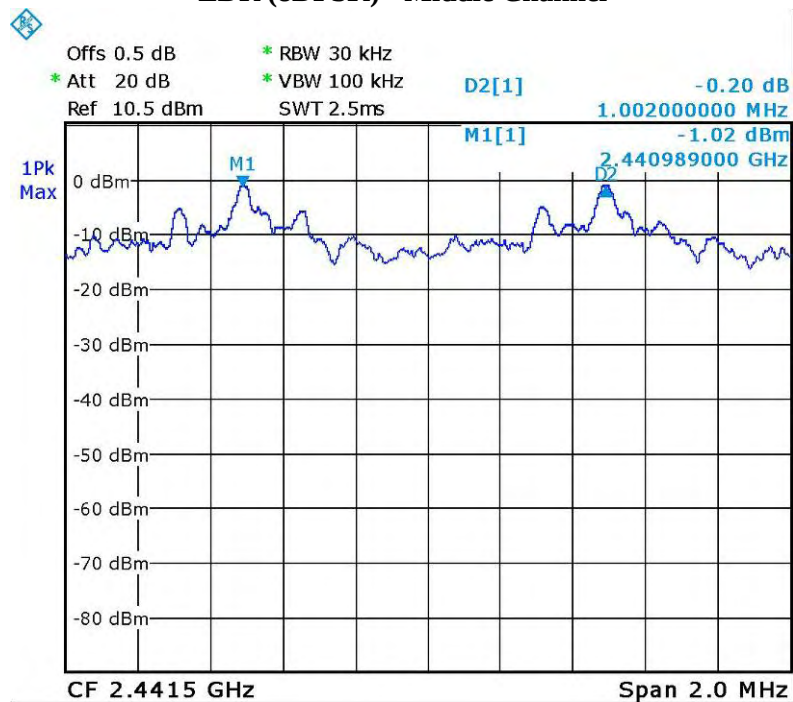
Date: 13.SEP.2012 06:10:34

EDR ($\pi/4$ -DQPSK) - High Channel

Date: 13.SEP.2012 06:13:11

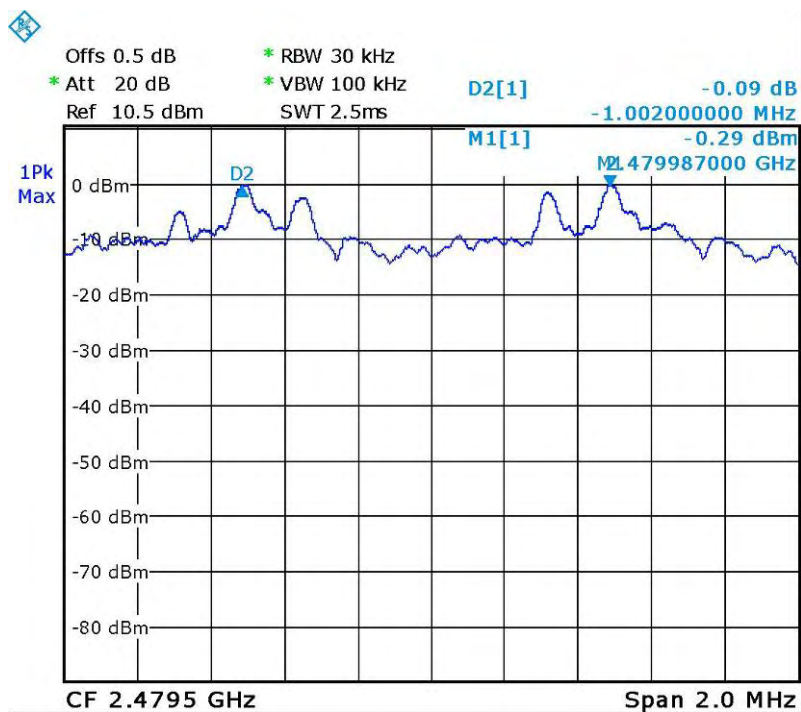
EDR (8DPSK) - Low Channel

Date: 13.SEP.2012 05:28:52

EDR (8DPSK) - Middle Channel

Date: 13.SEP.2012 06:02:37

EDR (8DPSK) - High Channel



Date: 13.SEP.2012 05:59:42

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

9.1 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.

9.2 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.

9.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSL18	100180	2012-05-10	2013-05-09

9.4 Test Data

Environmental Conditions

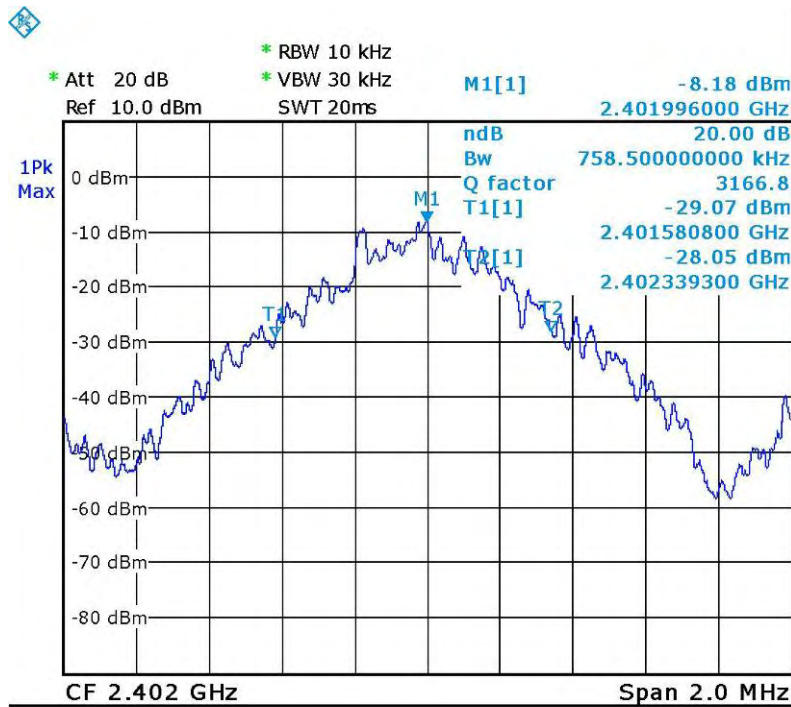
Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

**The testing was performed by Jack Wu on 2012-09-12.*

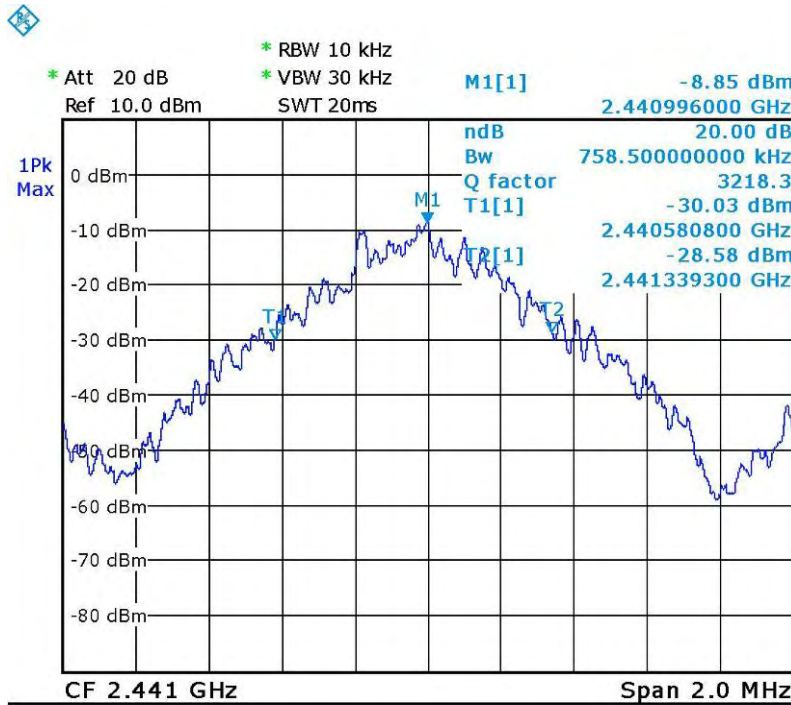
Test Result: Compliance, Please refer to following plots.

Test Mode: Transmitting

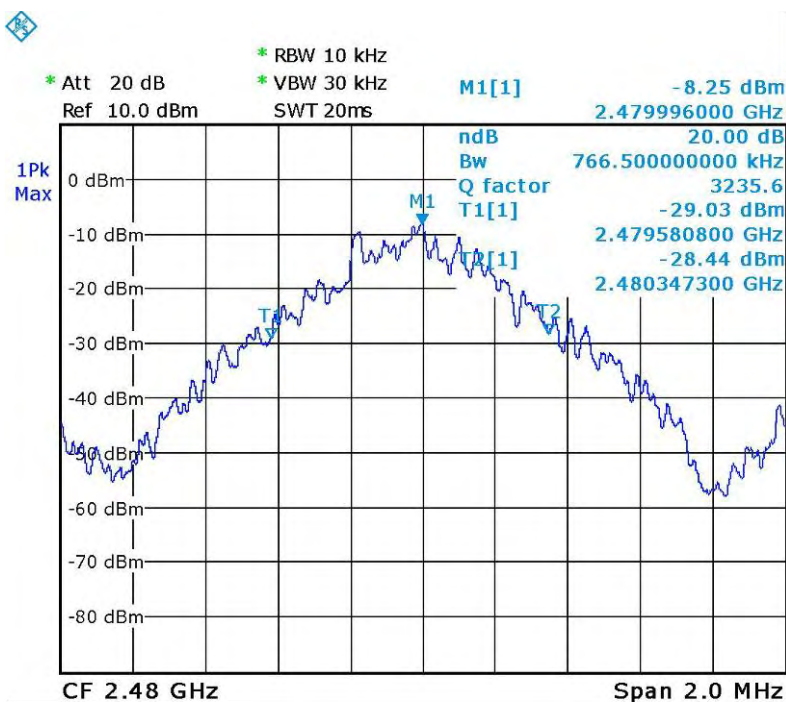
Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.7585
	Middle	2441	0.7585
	High	2480	0.7665
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.2216
	Middle	2441	1.2255
	High	2480	1.2255
EDR Mode (8DPSK)	Low	2402	1.2136
	Middle	2441	1.2136
	High	2480	1.2136

BDR - Low Channel

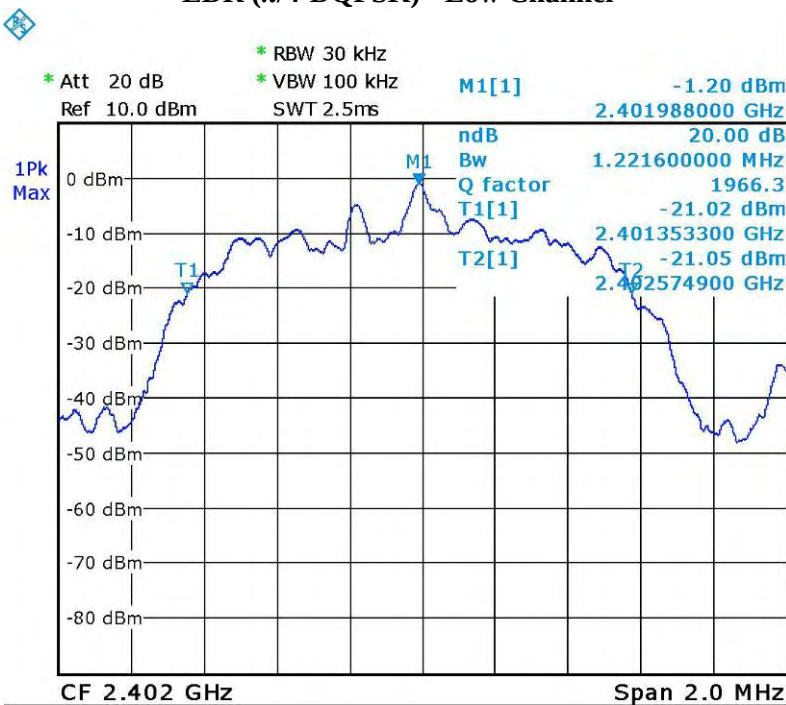
Date: 12.SEP.2012 11:09:21

BDR - Middle Channel

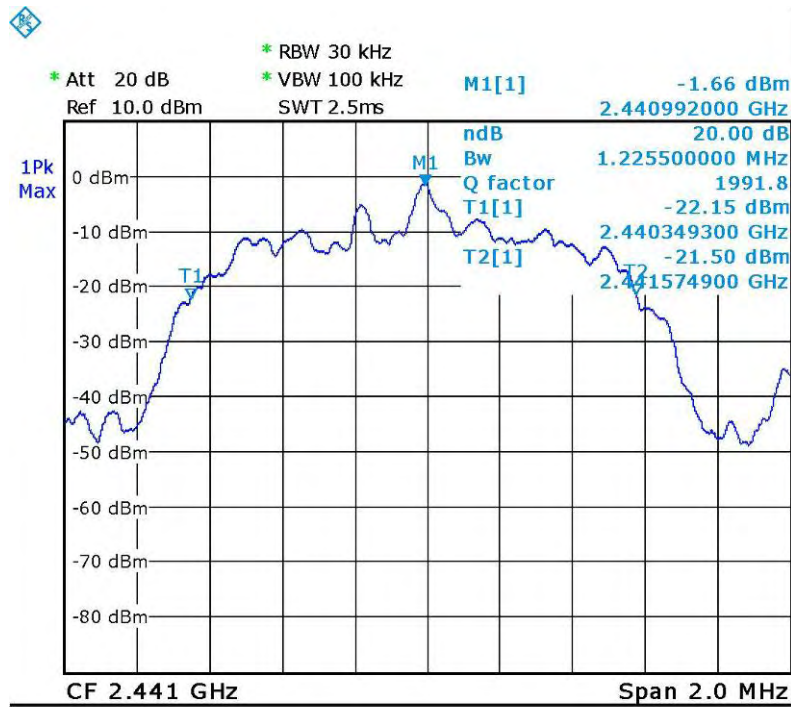
Date: 12.SEP.2012 11:04:33

BDR - High Channel

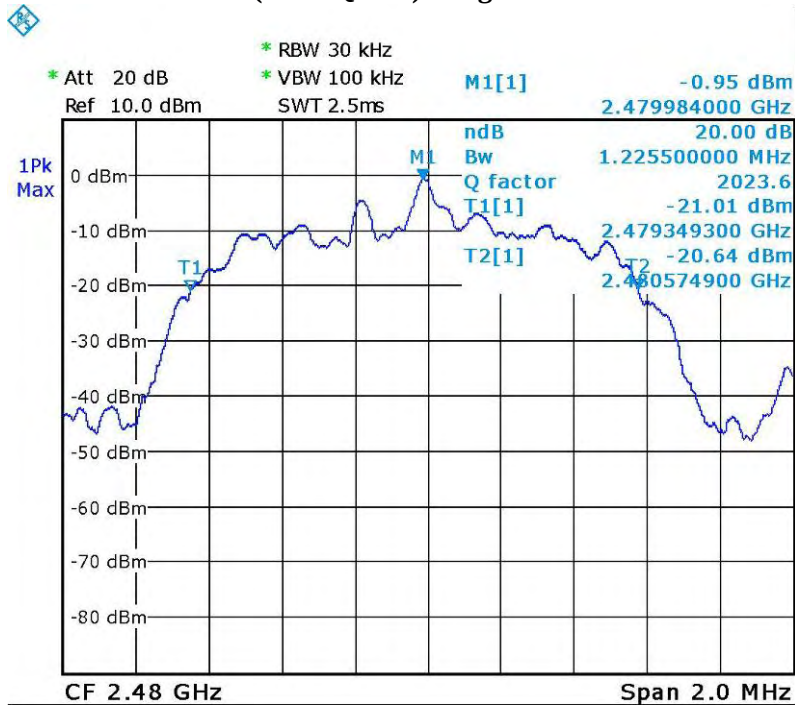
Date: 12.SEP.2012 11:07:13

EDR ($\pi/4$ -DQPSK) - Low Channel

Date: 12.SEP.2012 11:20:51

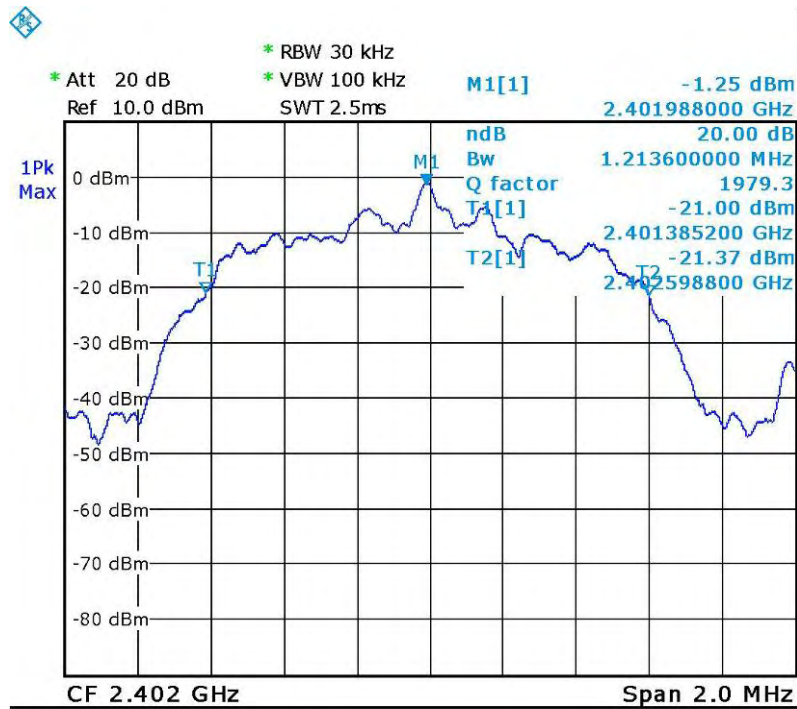
EDR ($\pi/4$ -DQPSK) - Middle Channel

Date: 12.SEP.2012 11:22:47

EDR ($\pi/4$ -DQPSK) - High Channel

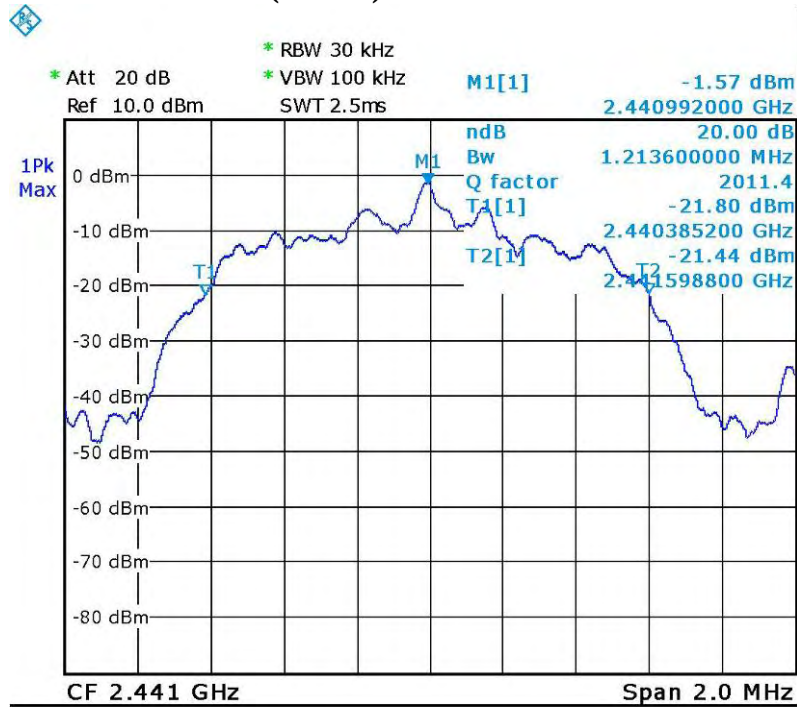
Date: 12.SEP.2012 11:24:24

EDR (8DPSK) - Low Channel



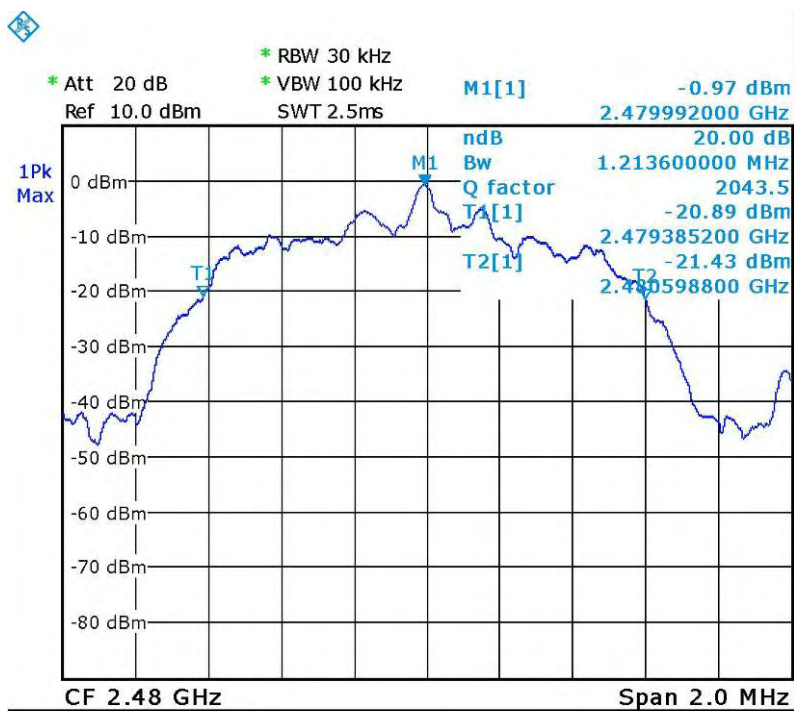
Date: 12.SEP.2012 11:27:41

EDR (8DPSK) - Middle Channel



Date: 12.SEP.2012 11:29:32

EDR (8DPSK) - High Channel



Date: 12.SEP.2012 11:31:26

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

10.1 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.

10.2 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.

10.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSL18	100180	2012-05-10	2013-05-09

10.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

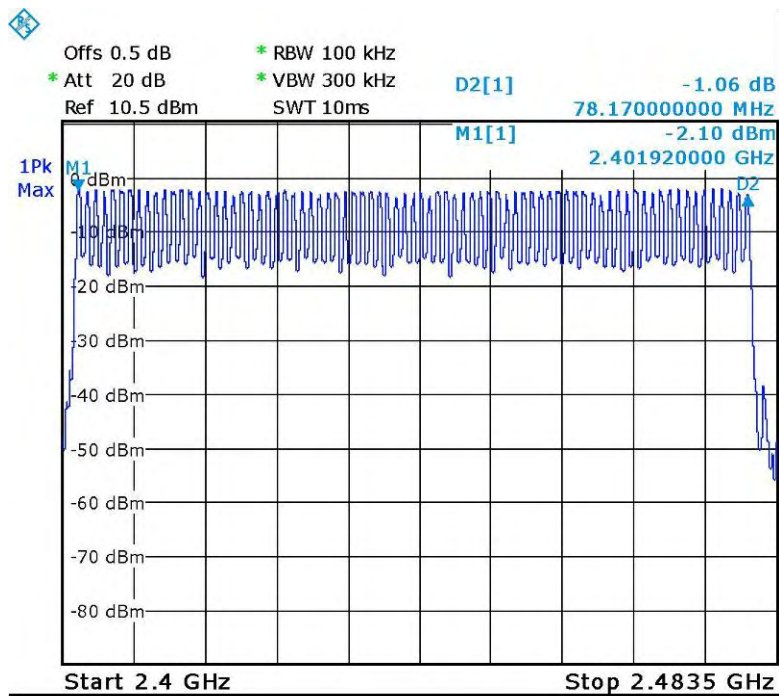
**The testing was performed by Jack Wu on 2012-09-12.*

Test Result: Compliance, Please refer to following plots.

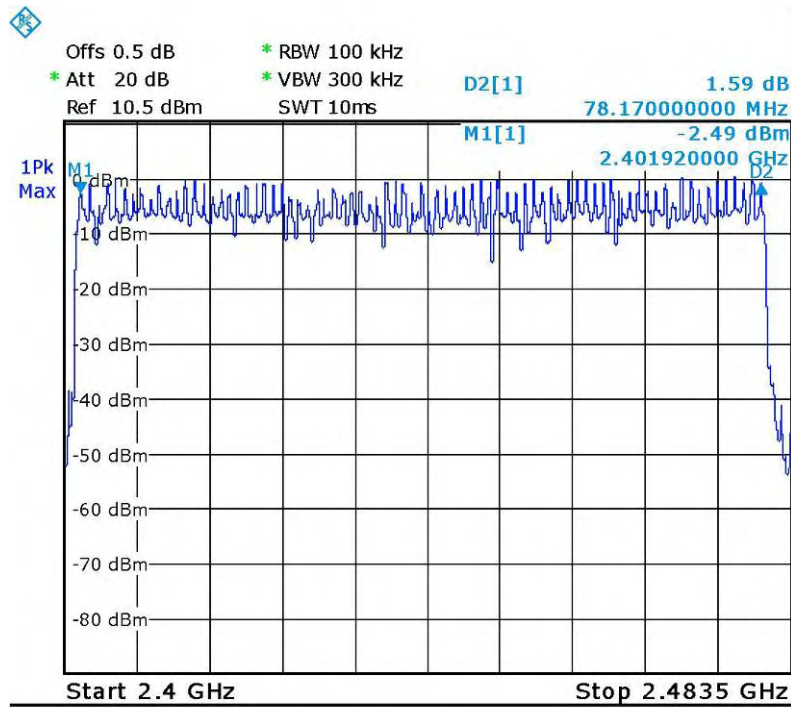
Test Mode: Transmitting (BDR & EDR)

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit
BDR	2400-2483.50	79	≥ 15
EDR ($\pi/4$ -DQPSK)	2400-2483.50	79	≥ 15
EDR (8DPSK)	2400-2483.50	79	≥ 15

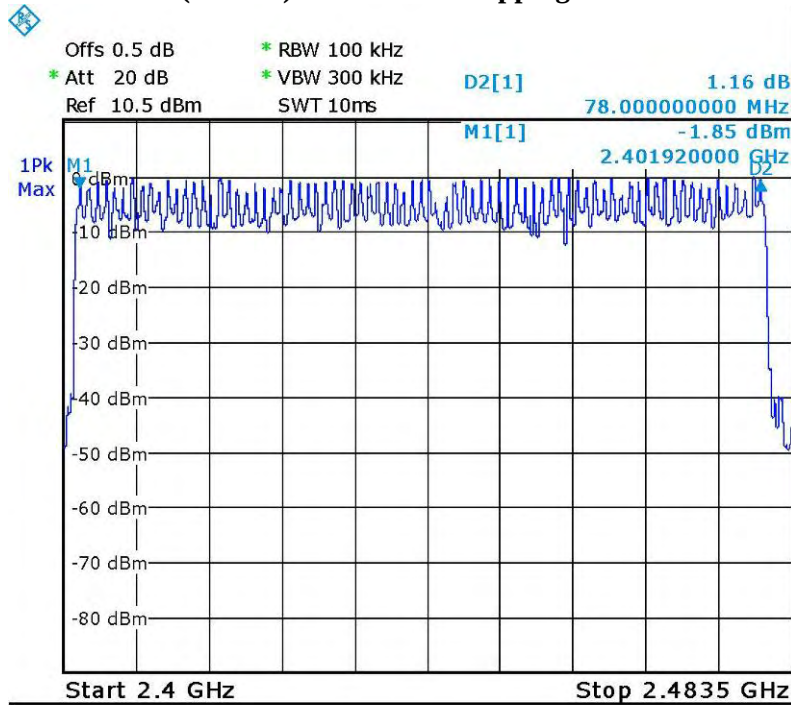
BDR - Number of Hopping Channels



Date: 12.SEP.2012 13:14:37

EDR ($\pi/4$ -DQPSK) - Number of Hopping Channels

Date: 12.SEP.2012 13:18:23

EDR (8DPSK) - Number of Hopping Channels

Date: 12.SEP.2012 13:29:18

11 - FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

11.1 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.

11.2 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

11.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSL18	100180	2012-05-10	2013-05-09

11.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

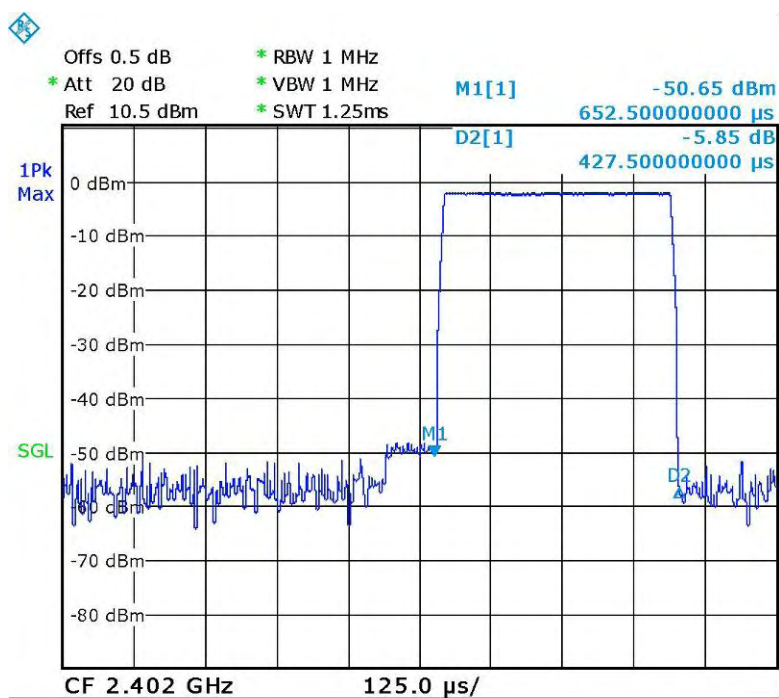
**The testing was performed by Jack Wu on 2012-09-13.*

Test Result: Compliance, Please refer to following plots.

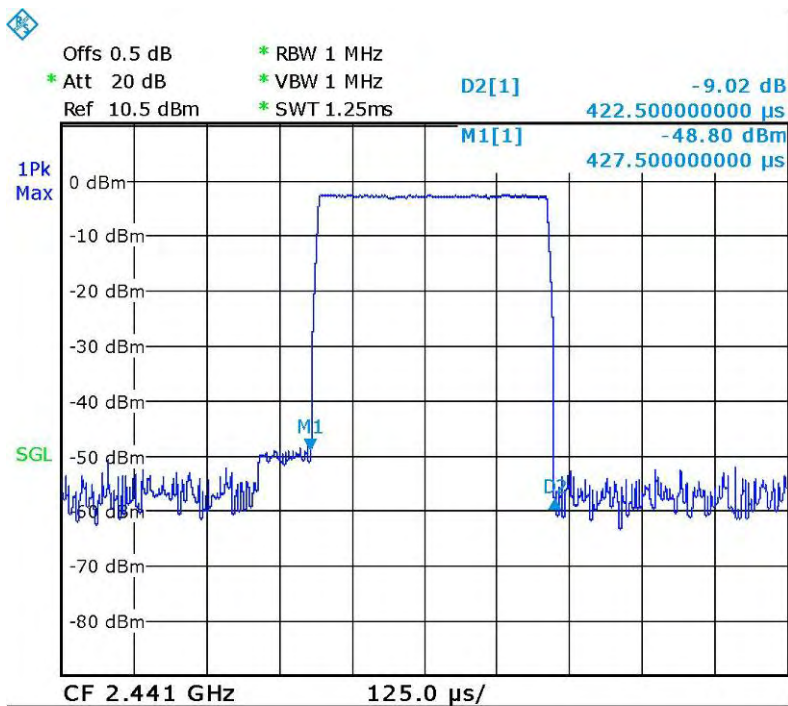
DH1:

Test Mode: Transmitting

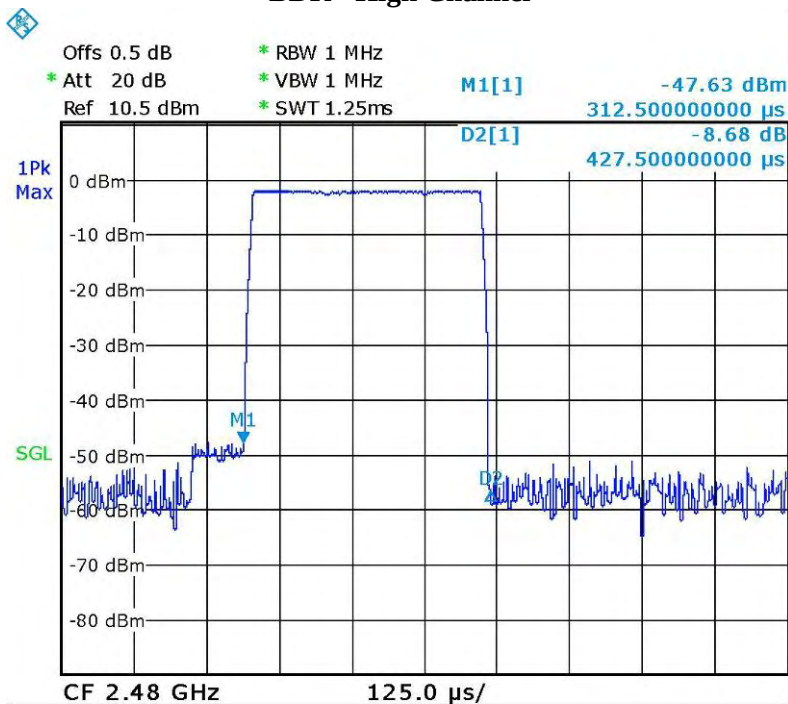
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR Mode (GFSK)	Low	0.4275	0.1368	0.4	Pass
	Middle	0.4275	0.1368	0.4	Pass
	High	0.4275	0.1368	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1.6/2/79) $\times$ 31.6 s				
EDR Mode ($\pi/4$ -DQPSK)	Low	0.4425	0.1416	0.4	Pass
	Middle	0.4425	0.1416	0.4	Pass
	High	0.4425	0.1416	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1.6/2/79) $\times$ 31.6 s				
EDR Mode (8DPSK)	Low	1.680	0.2688	0.4	Pass
	Middle	1.680	0.2688	0.4	Pass
	High	1.680	0.2688	0.4	Pass
	Note: Dwell time=Pulse time (ms) $\times$ (1.6/2/79) $\times$ 31.6 s				

BDR - Low Channel

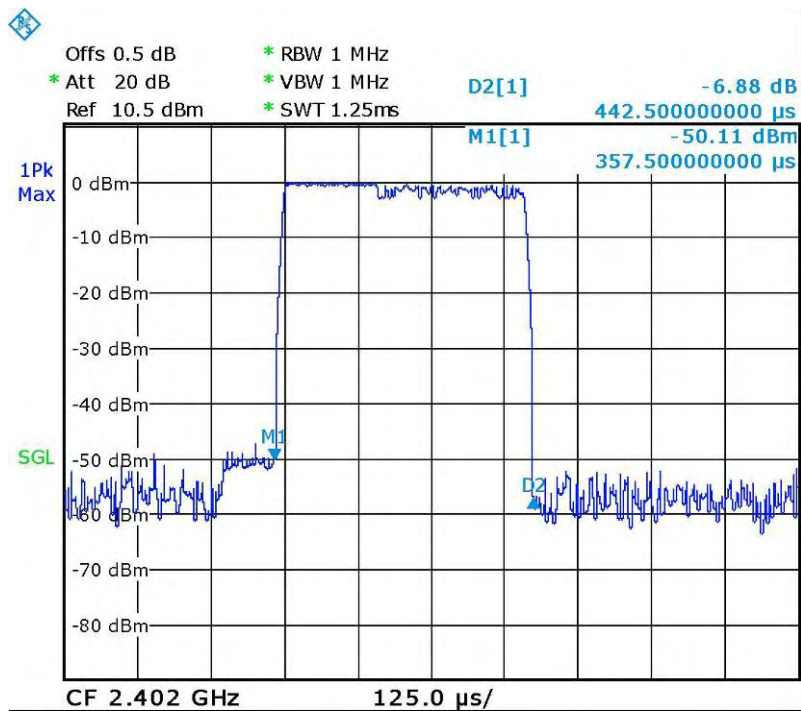
Date: 13.SEP.2012 12:21:34

BDR - Middle Channel

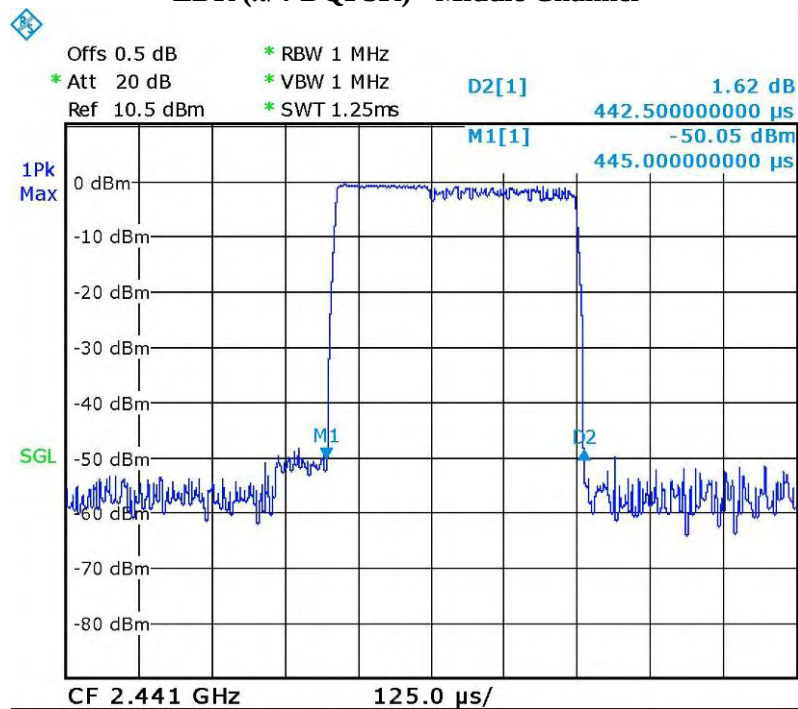
Date: 13.SEP.2012 12:23:05

BDR - High Channel

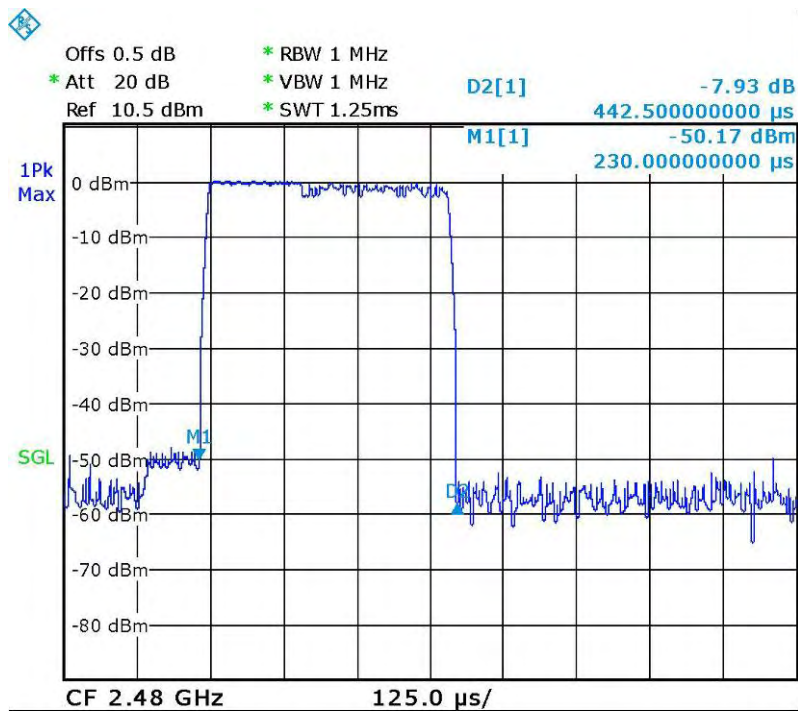
Date: 13.SEP.2012 12:58:48

EDR ($\pi/4$ -DQPSK) - Low Channel

Date: 13.SEP.2012 12:27:07

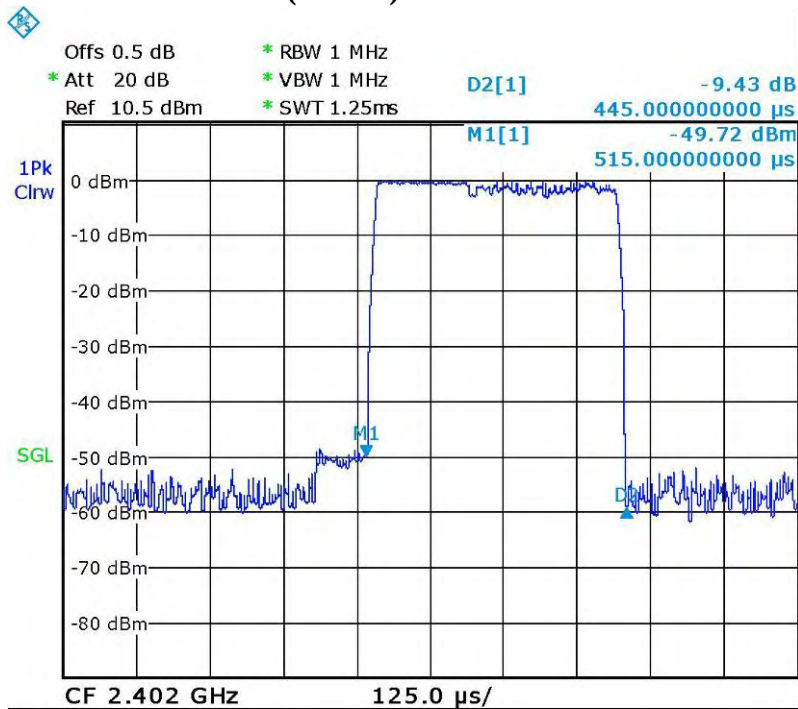
EDR ($\pi/4$ -DQPSK) - Middle Channel

Date: 13.SEP.2012 12:55:29

EDR ($\pi/4$ -DQPSK) - High Channel

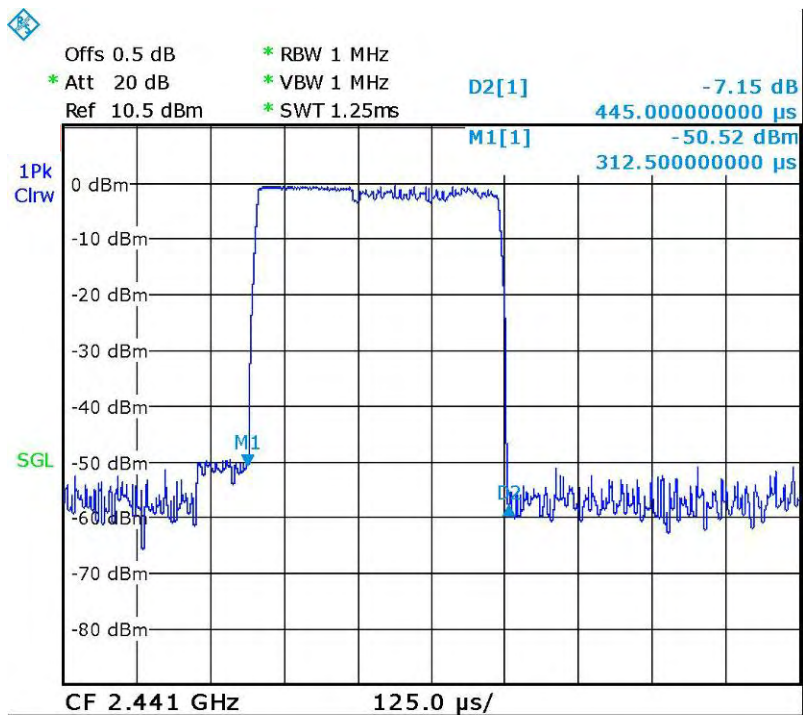
Date: 13.SEP.2012 12:57:03

EDR (8DPSK) - Low Channel



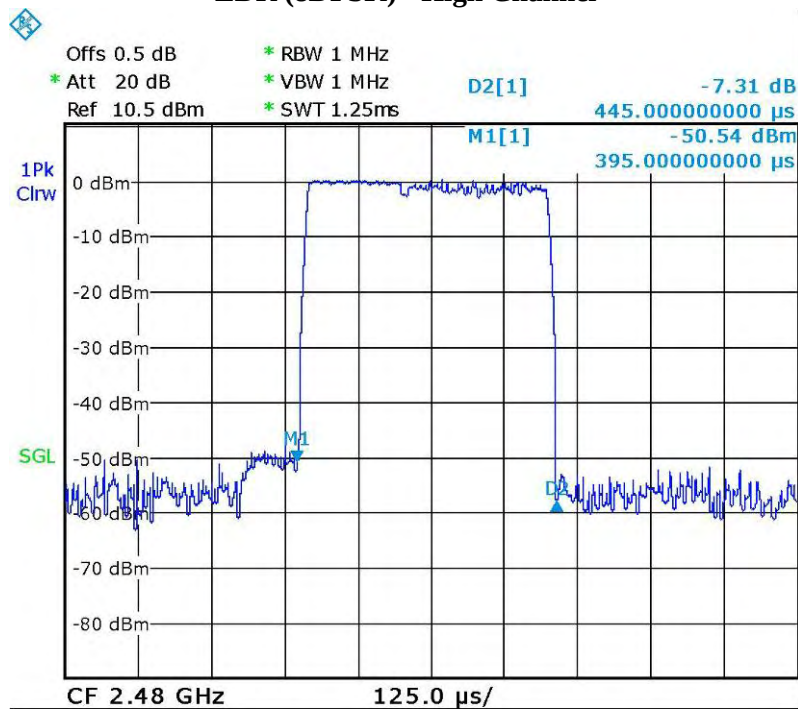
Date: 13.SEP.2012 13:03:44

EDR (8DPSK) - Middle Channel



Date: 13.SEP.2012 13:05:33

EDR (8DPSK) - High Channel

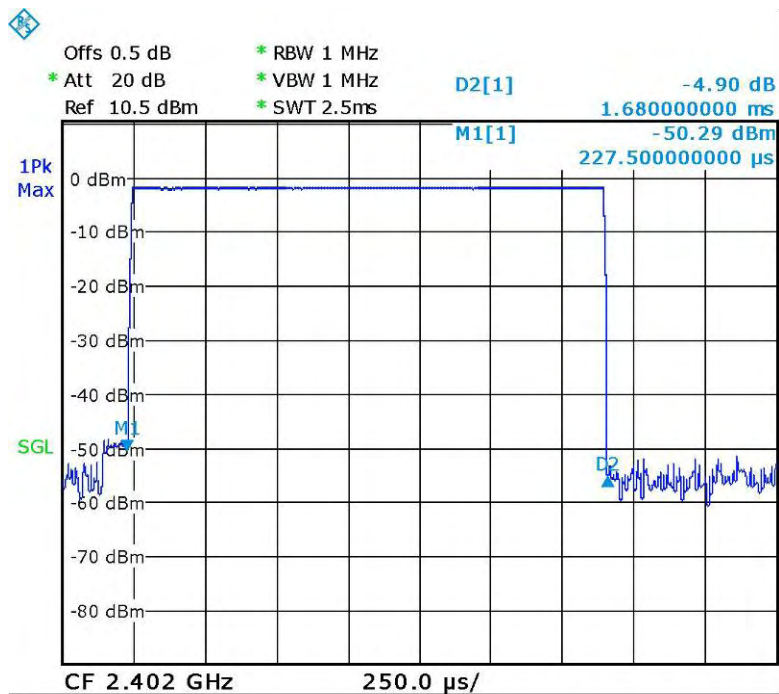


Date: 13.SEP.2012 13:00:56

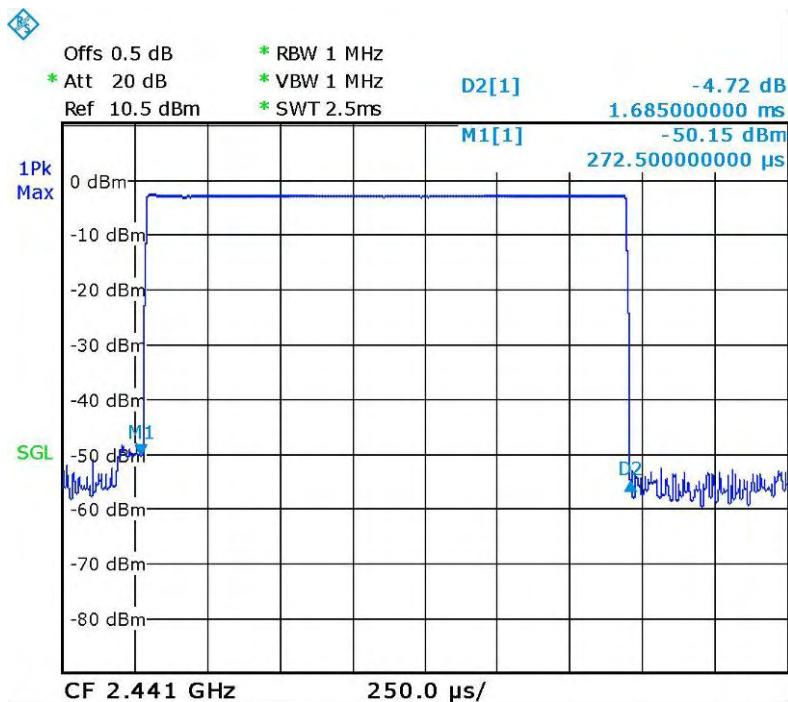
DH3:

Test Mode: Transmitting

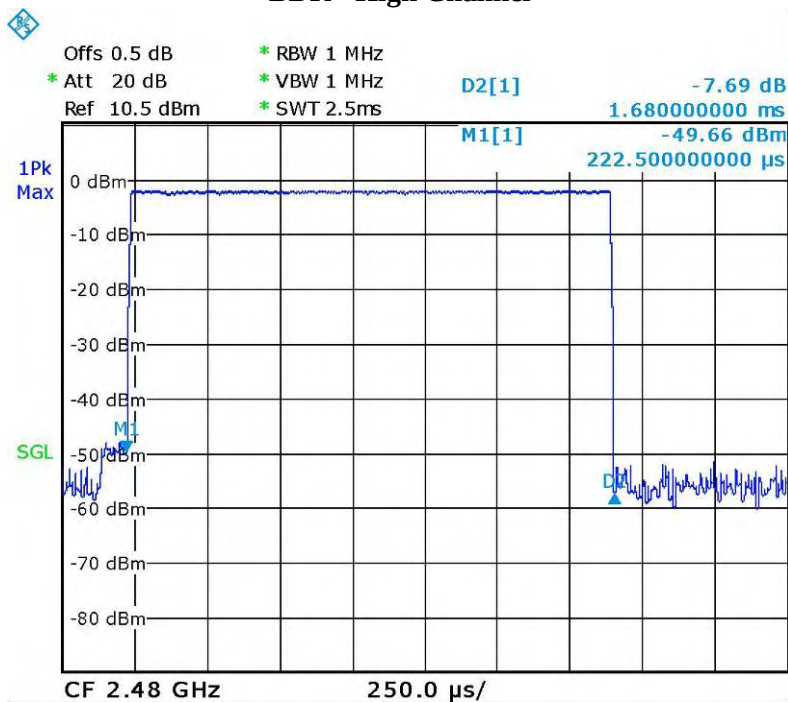
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR Mode (GFSK)	Low	1.680	0.2688	0.4	Pass
	Middle	1.680	0.2688	0.4	Pass
	High	1.680	0.2688	0.4	Pass
	Note: Dwell time = Pulse time*(1600/4/79)*31.6S				
EDR Mode ($\pi/4$ -DQPSK)	Low	1.700	0.272	0.4	Pass
	Middle	1.700	0.272	0.4	Pass
	High	1.700	0.272	0.4	Pass
	Note: Dwell time = Pulse time*(1600/4/79)*31.6S				
EDR Mode (8DPSK)	Low	1.700	0.272	0.4	Pass
	Middle	1.700	0.272	0.4	Pass
	High	1.700	0.272	0.4	Pass
	Note: Dwell time = Pulse time*(1600/4/79)*31.6S				

BDR - Low Channel

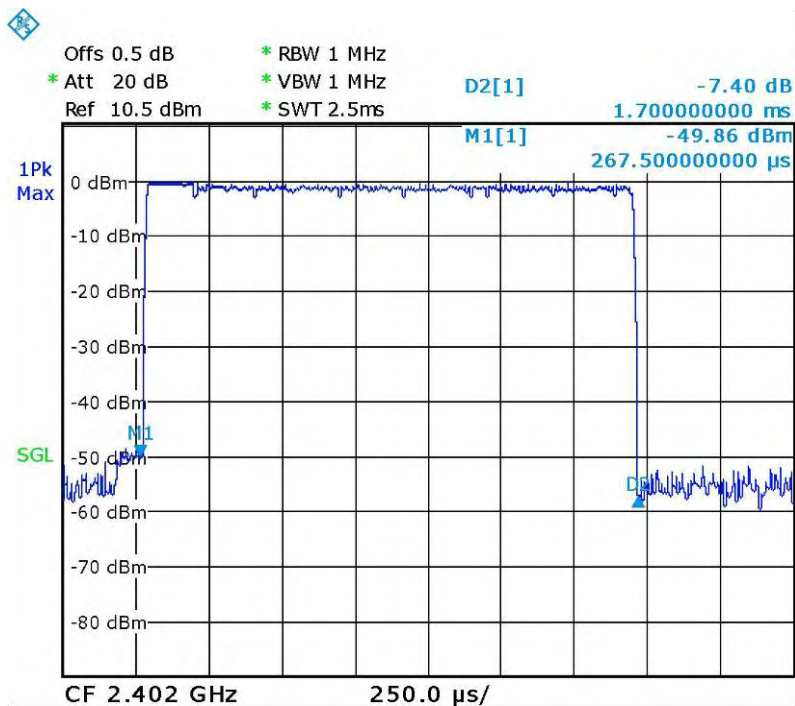
Date: 13.SEP.2012 13:14:18

BDR - Middle Channel

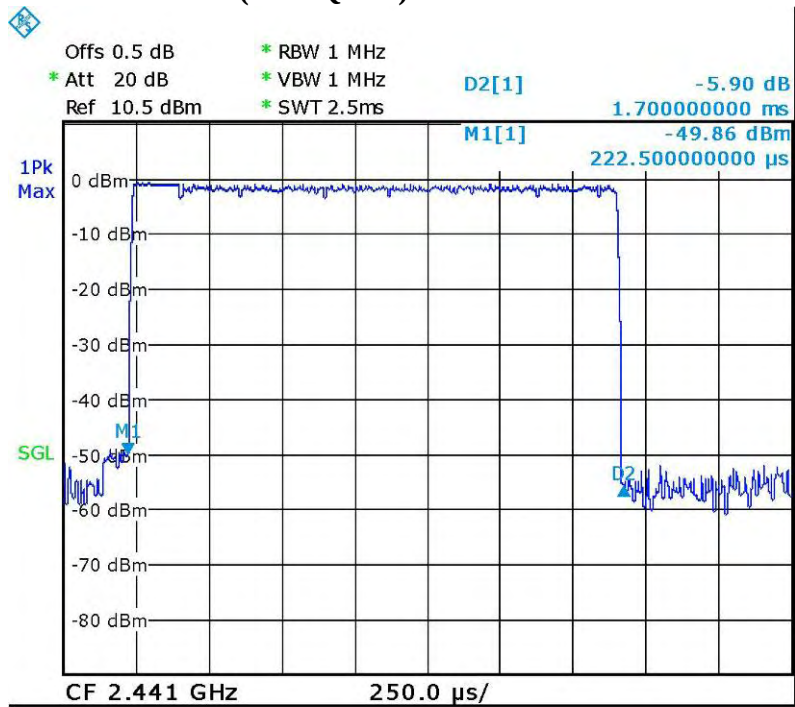
Date: 13.SEP.2012 13:15:19

BDR - High Channel

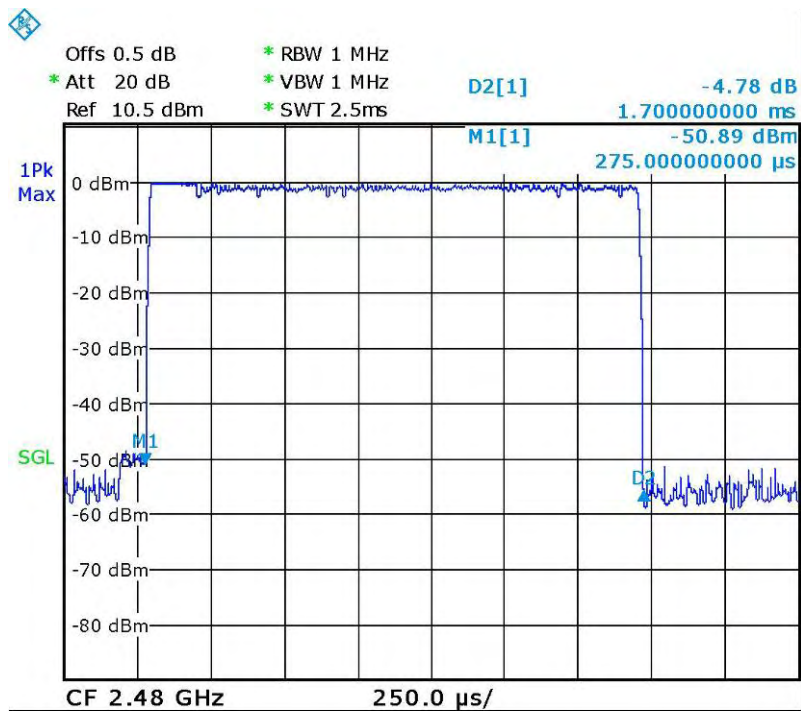
Date: 13.SEP.2012 13:16:08

EDR ($\pi/4$ -DQPSK) - Low Channel

Date: 13.SEP.2012 13:19:50

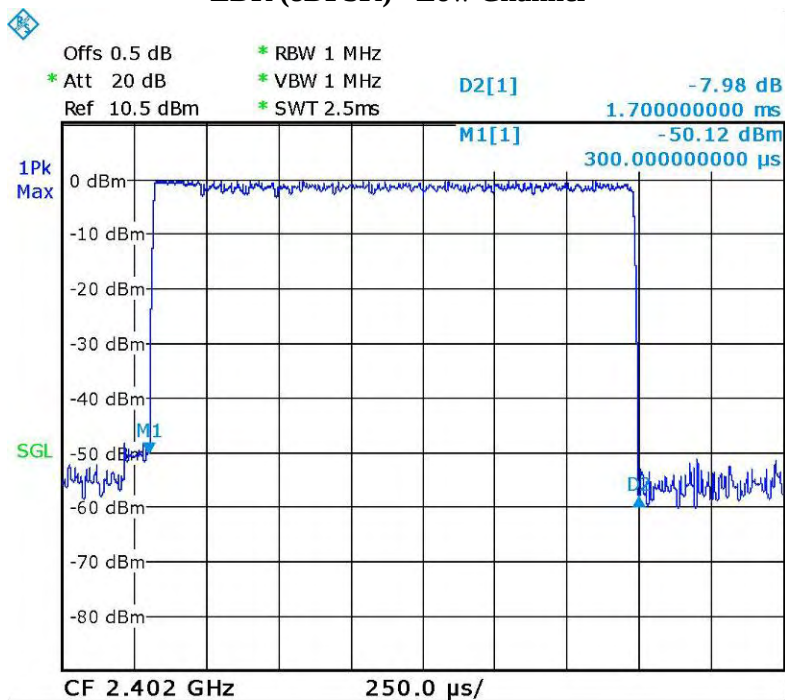
EDR ($\pi/4$ -DQPSK) - Middle Channel

Date: 13.SEP.2012 13:21:00

EDR ($\pi/4$ -DQPSK) - High Channel

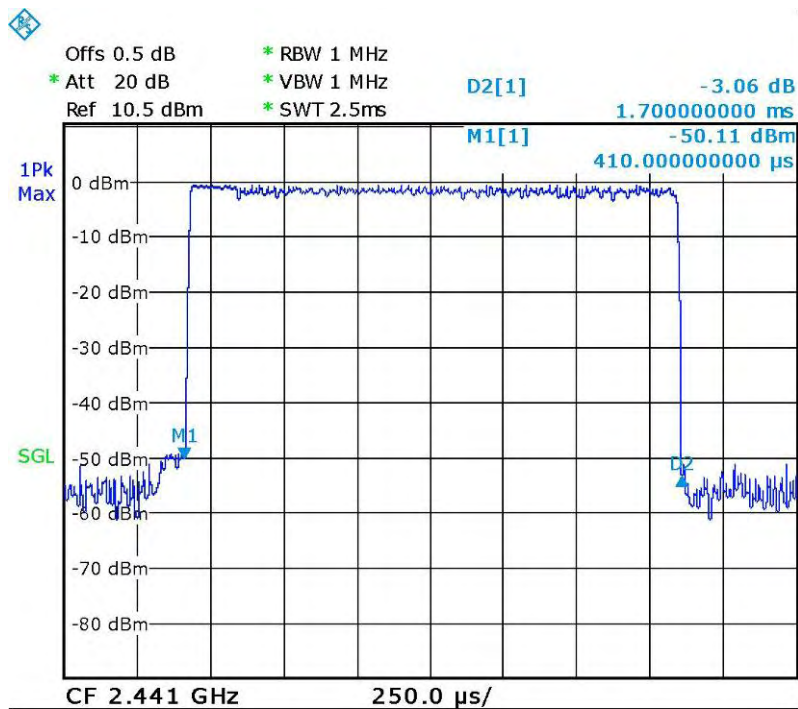
Date: 13.SEP.2012 13:22:40

EDR (8DPSK) - Low Channel



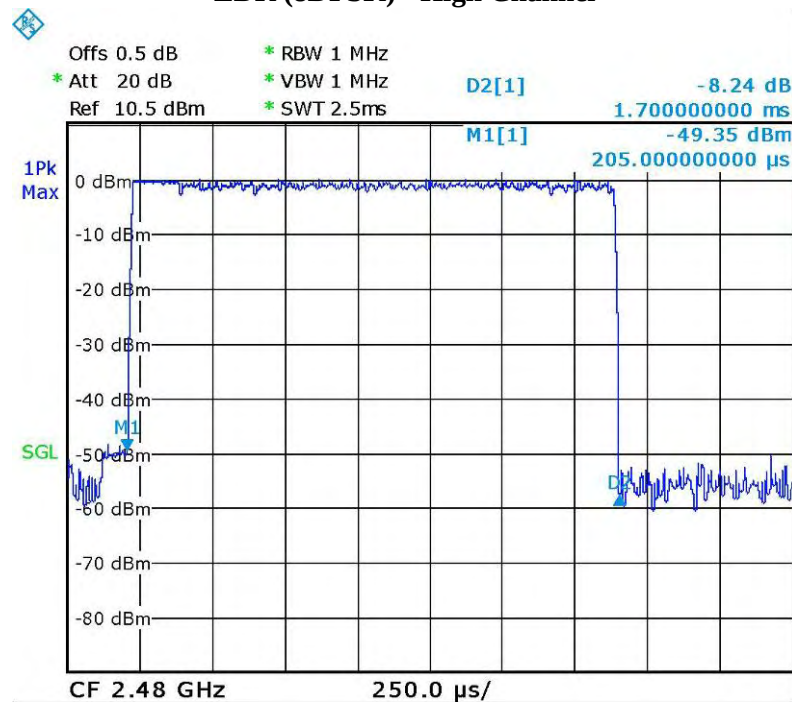
Date: 13.SEP.2012 13:24:29

EDR (8DPSK) - Middle Channel



Date: 13.SEP.2012 13:26:32

EDR (8DPSK) - High Channel

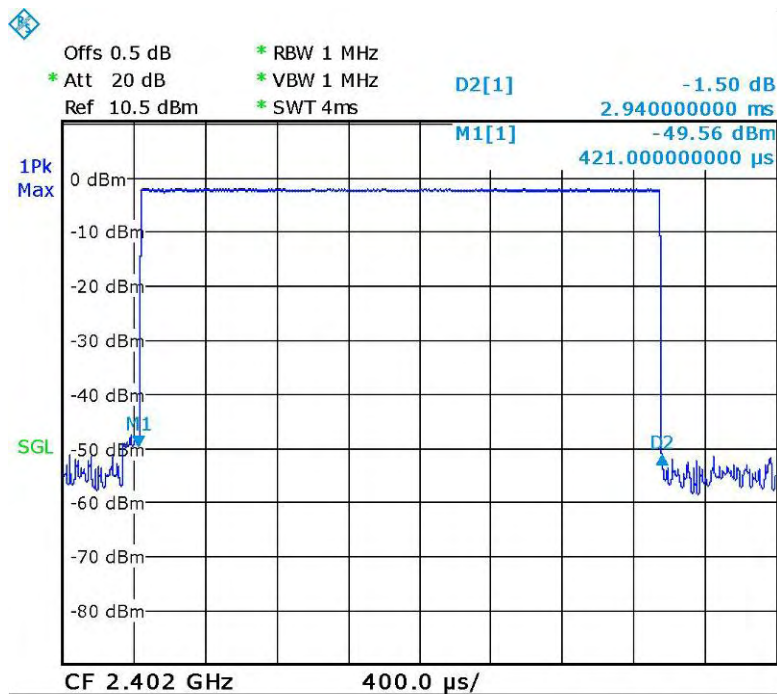


Date: 13.SEP.2012 13:27:23

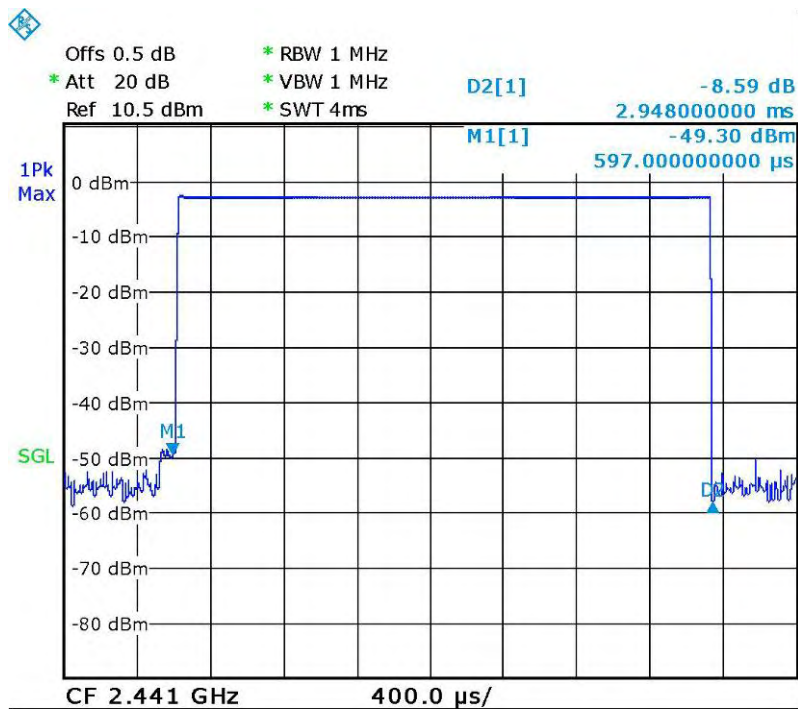
DH5:

Test Mode: Transmitting

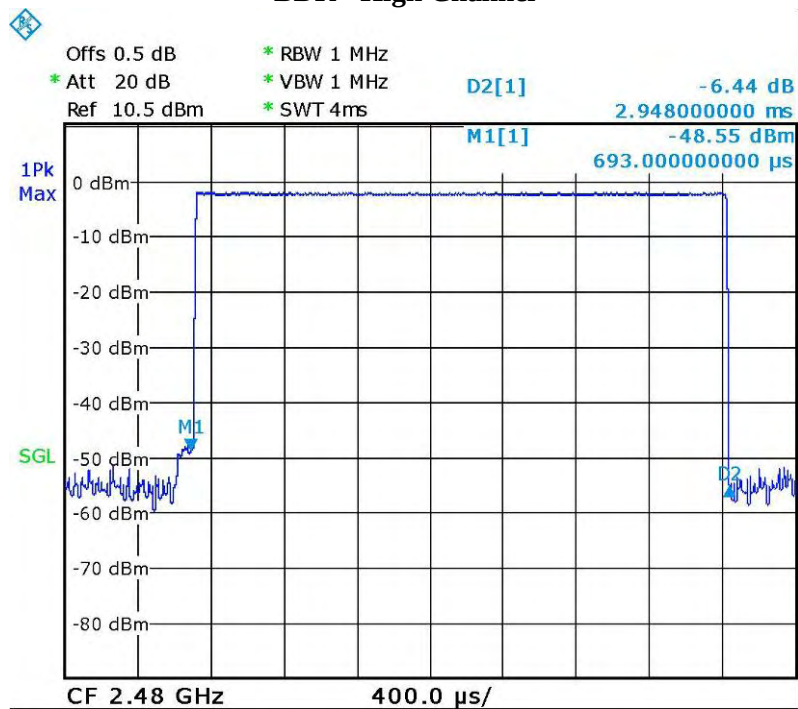
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR Mode (GFSK)	Low	2.94	0.314	0.4	Pass
	Middle	2.948	0.314	0.4	Pass
	High	2.948	0.314	0.4	Pass
	Note: Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR Mode ($\pi/4$ -DQPSK)	Low	2.956	0.315	0.4	Pass
	Middle	2.964	0.316	0.4	Pass
	High	2.956	0.315	0.4	Pass
	Note: Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR Mode (8DPSK)	Low	2.964	0.316	0.4	Pass
	Middle	2.964	0.316	0.4	Pass
	High	2.964	0.316	0.4	Pass
	Note: Dwell time = Pulse time*(1600/6/79)*31.6S				

BDR - Low Channel

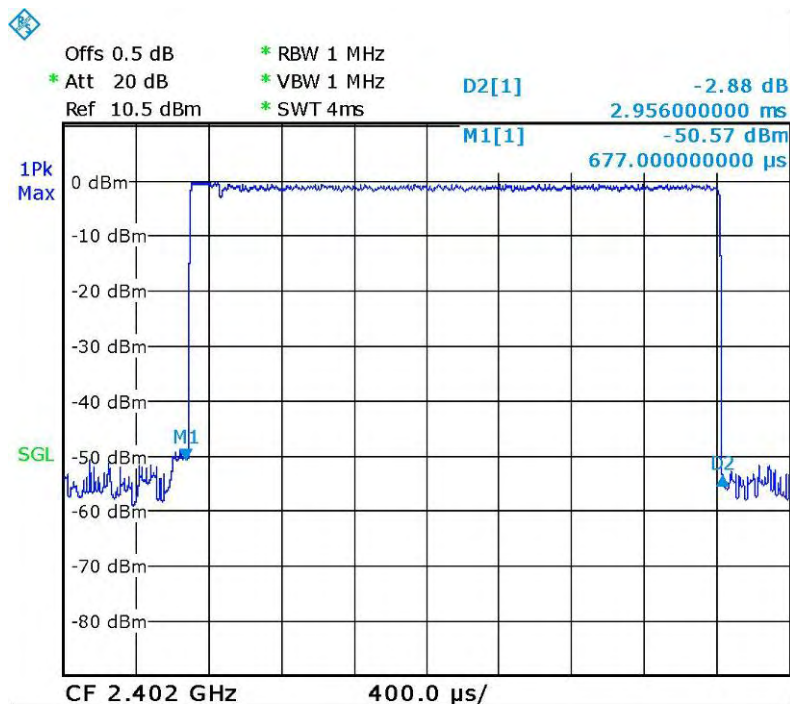
Date: 13.SEP.2012 13:30:24

BDR - Middle Channel

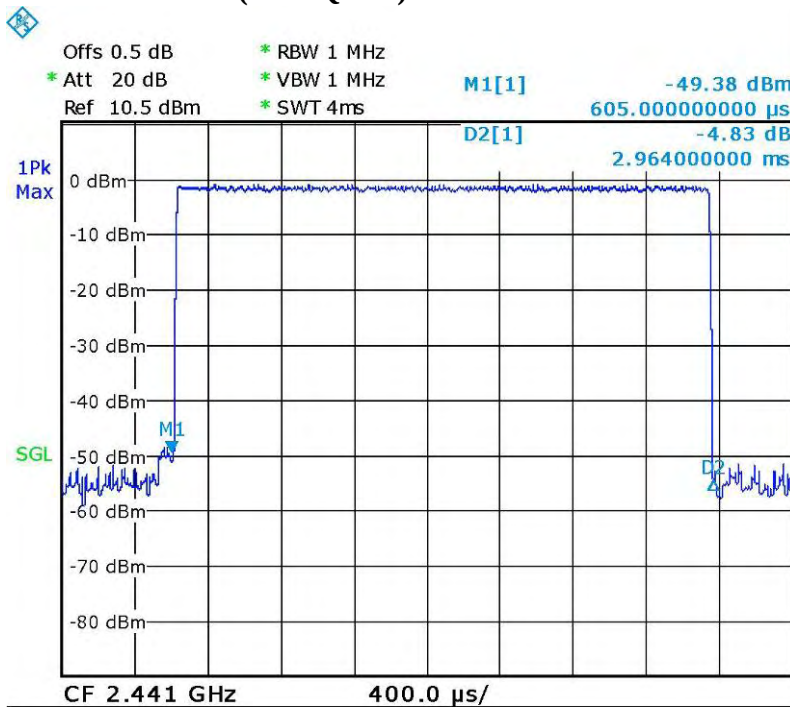
Date: 13.SEP.2012 13:31:22

BDR - High Channel

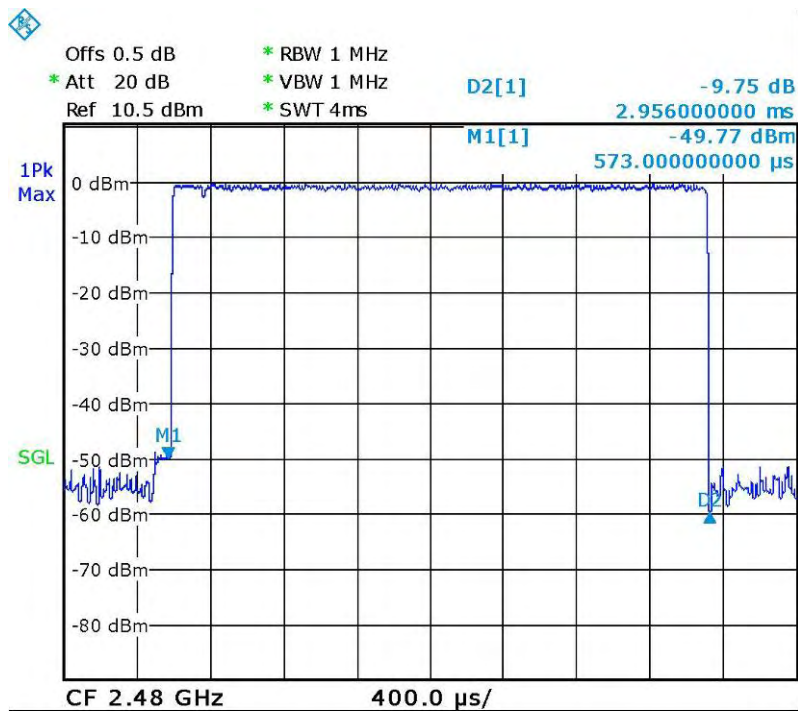
Date: 13.SEP.2012 13:32:12

EDR ($\pi/4$ -DQPSK) - Low Channel

Date: 13.SEP.2012 13:34:42

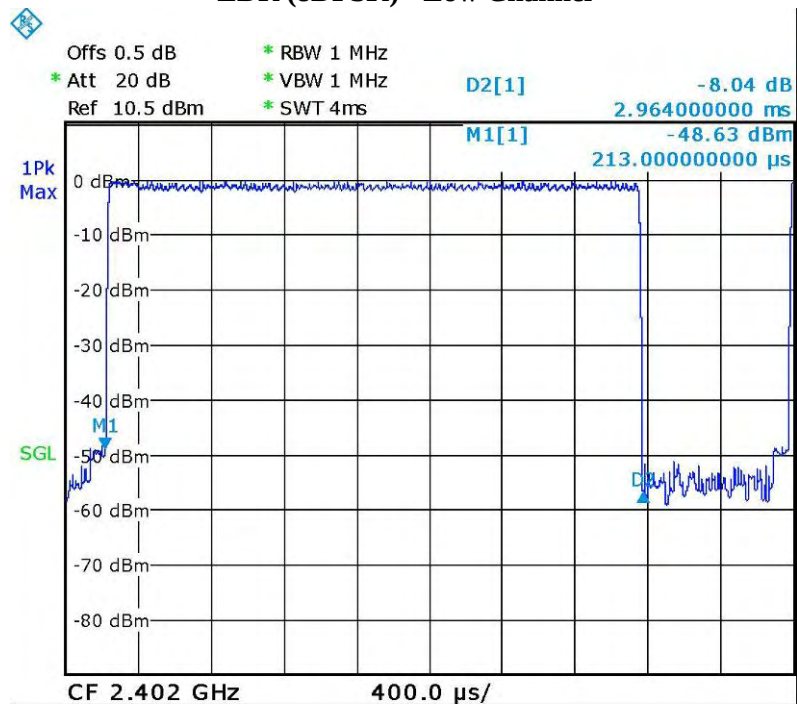
EDR ($\pi/4$ -DQPSK) - Middle Channel

Date: 13.SEP.2012 13:35:48

EDR ($\pi/4$ -DQPSK) - High Channel

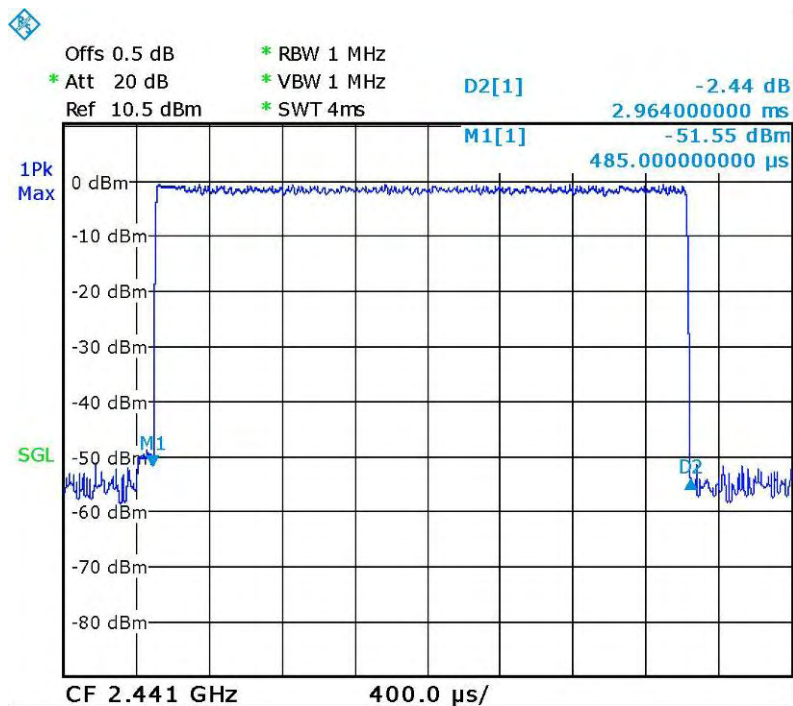
Date: 13.SEP.2012 13:36:34

EDR (8DPSK) - Low Channel



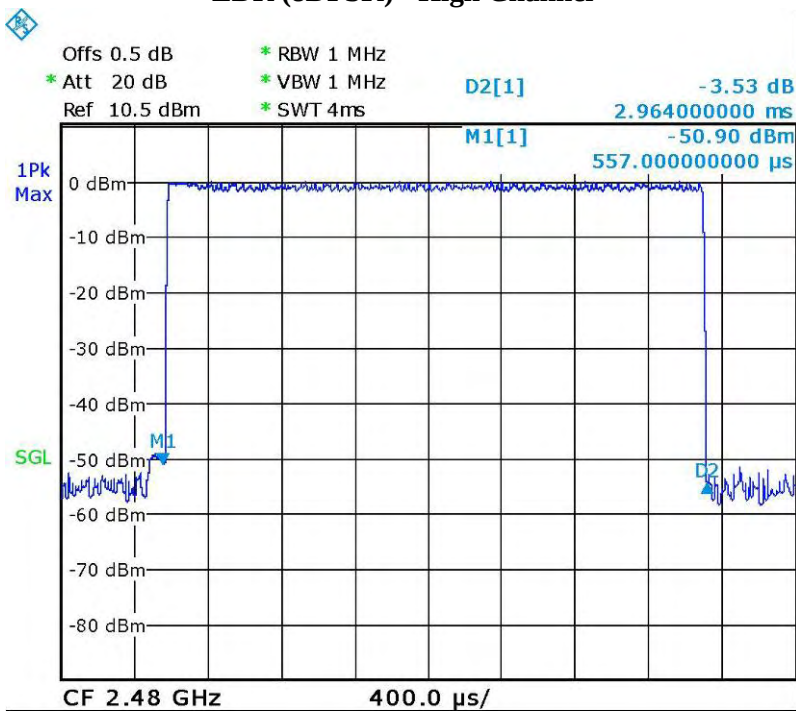
Date: 13.SEP.2012 13:38:34

EDR (8DPSK) - Middle Channel



Date: 13.SEP.2012 13:40:15

EDR (8DPSK) - High Channel



Date: 13.SEP.2012 13:42:10

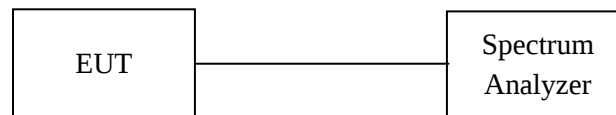
12 - FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

12.1 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.

12.2 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.



12.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSL18	100180	2012-05-10	2013-05-09

12.4 Test Data

Environmental Conditions

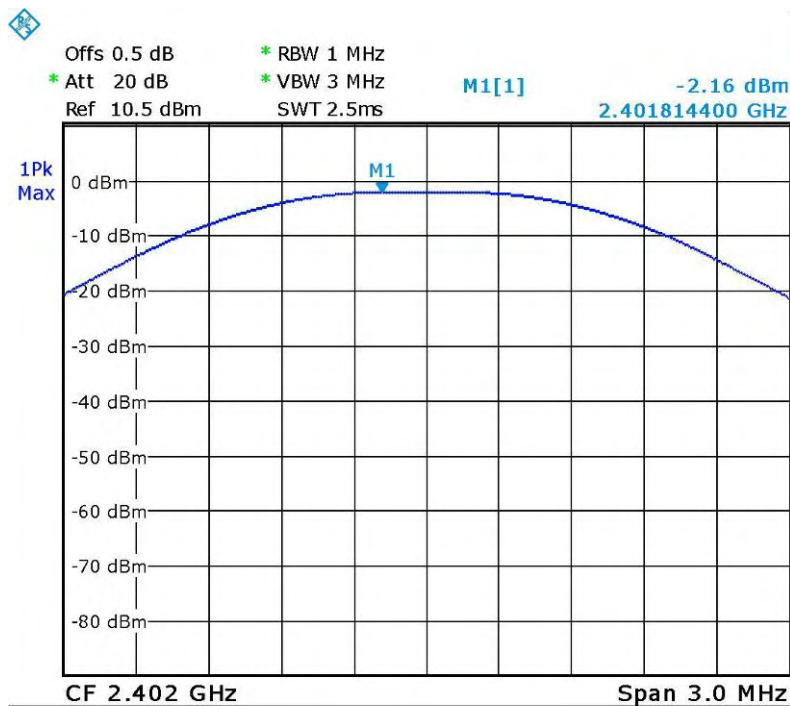
Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

**The testing was performed by Jack Wu on 2012-09-12.*

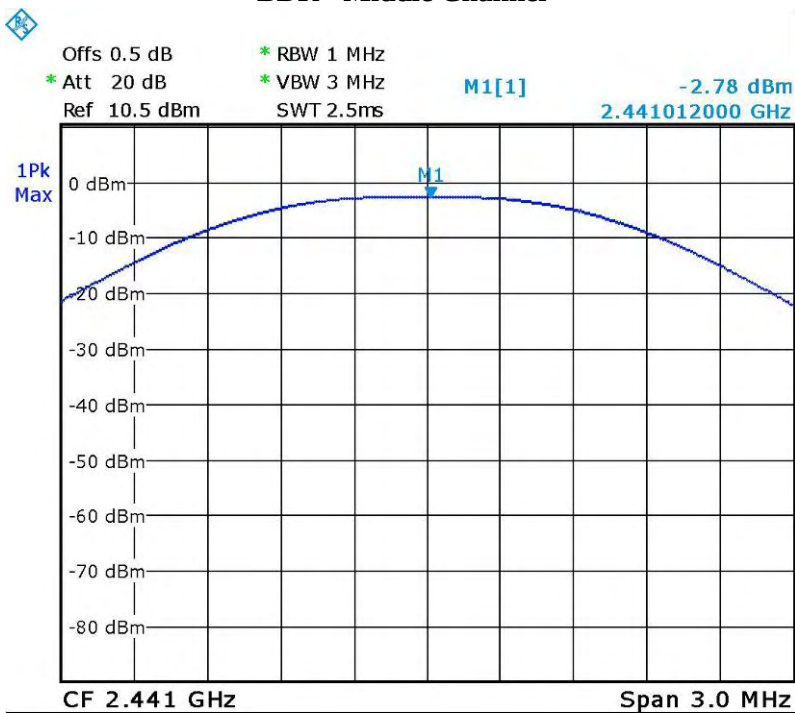
Test Result: Compliance, Please refer to following plots.

Test Mode: Transmitting

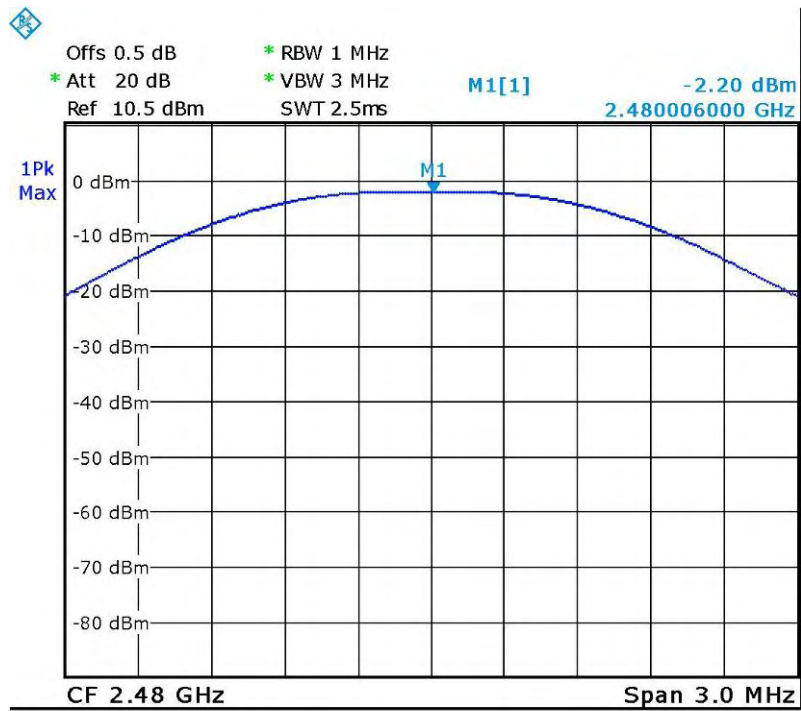
Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	-2.16	30
	Middle	2441	-2.78	30
	High	2480	-2.20	30
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	0.19	30
	Middle	2441	-0.16	30
	High	2480	0.52	30
EDR Mode (8DPSK)	Low	2402	0.47	30
	Middle	2441	0.12	30
	High	2480	0.81	30

BDR - Low Channel

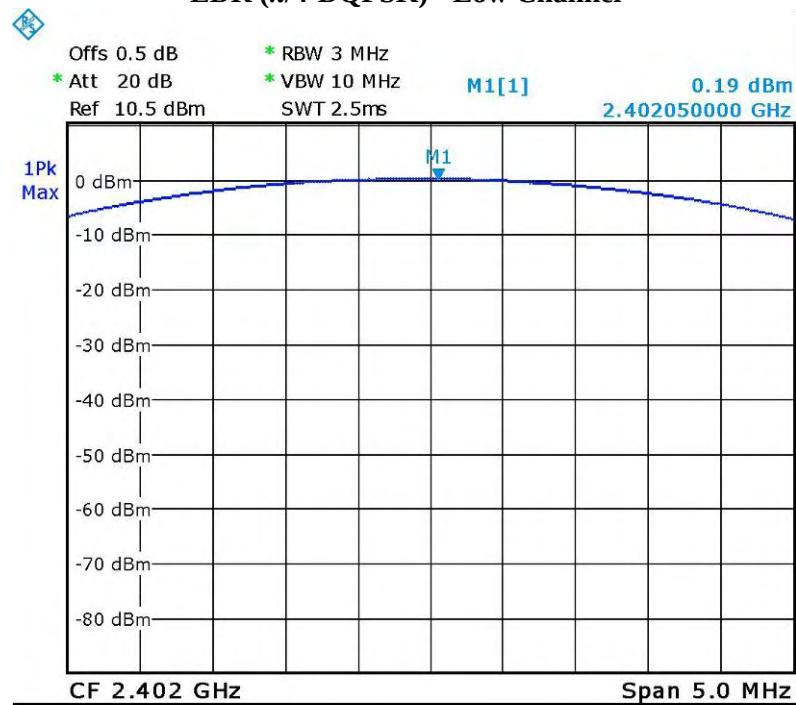
Date: 12.SEP.2012 12:09:50

BDR - Middle Channel

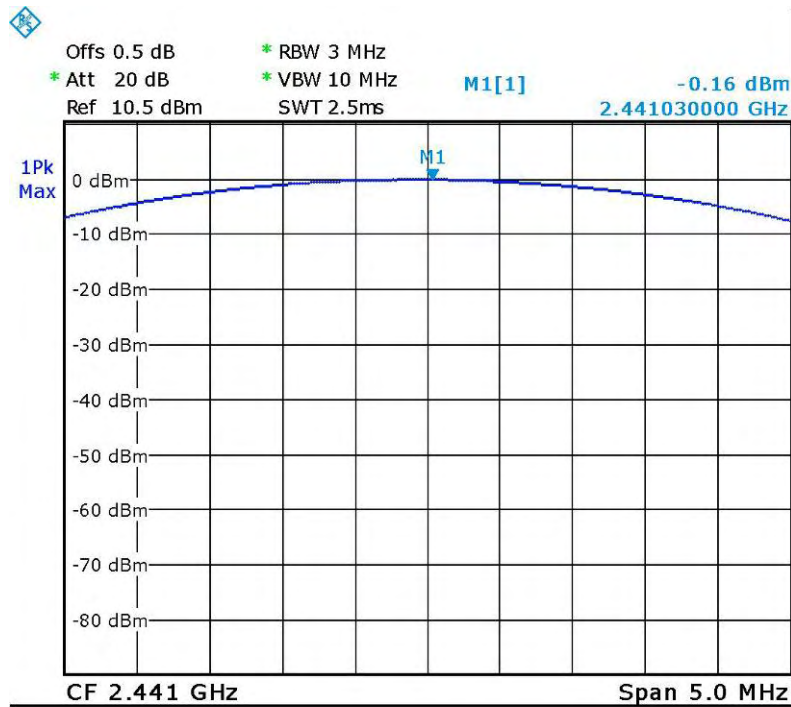
Date: 12.SEP.2012 12:12:11

BDR - High Channel

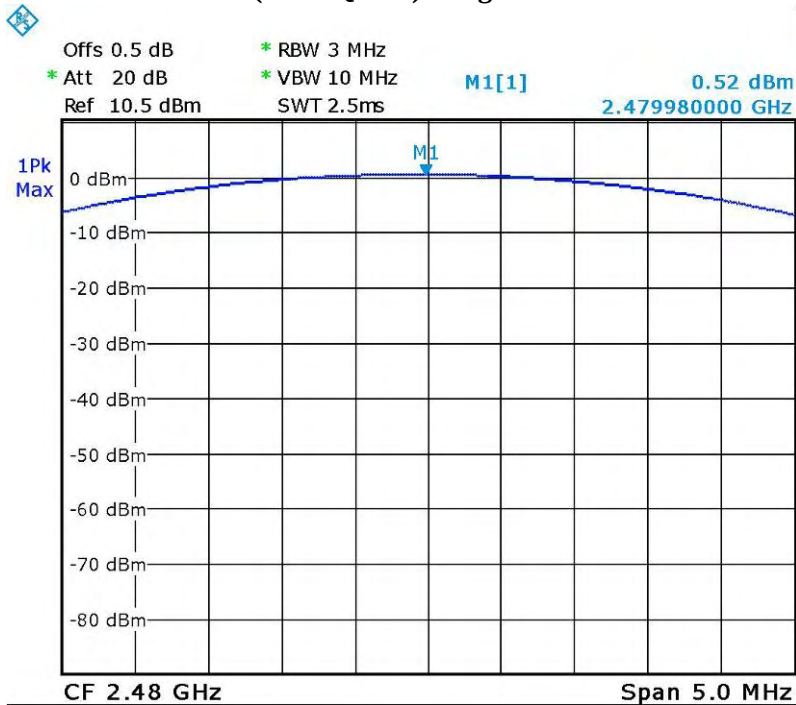
Date: 12.SEP.2012 12:11:27

EDR ($\pi/4$ -DQPSK) - Low Channel

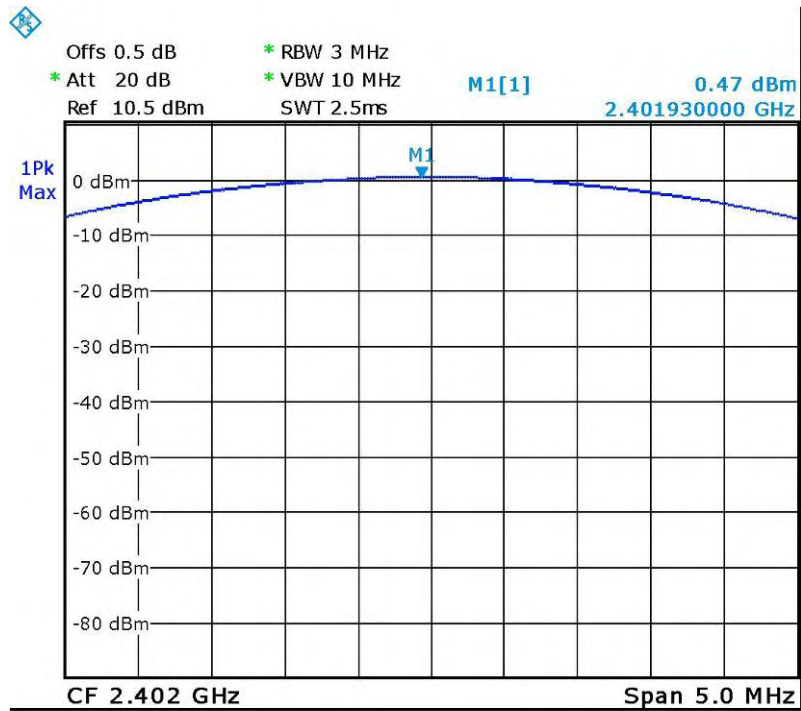
Date: 12.SEP.2012 12:21:10

EDR ($\pi/4$ -DQPSK) - Middle Channel

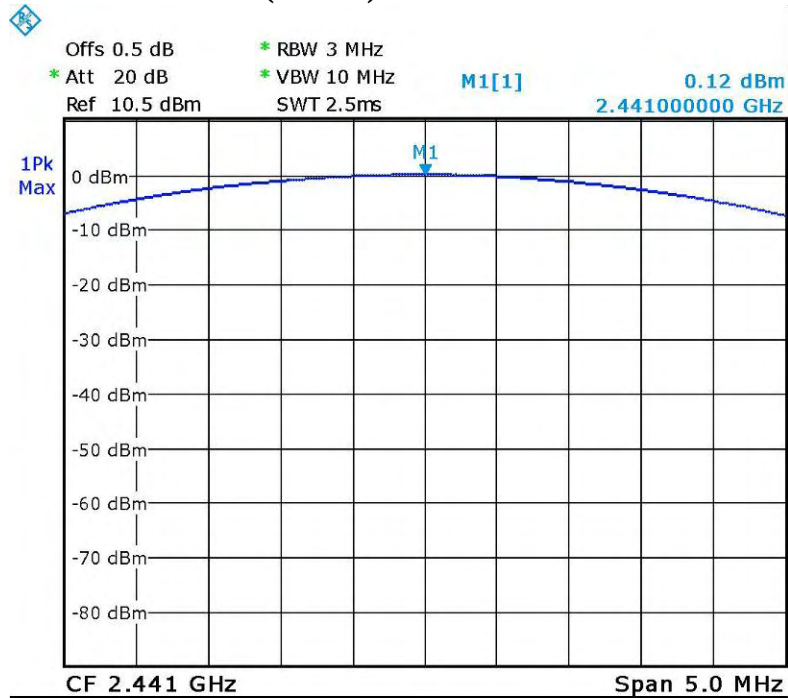
Date: 12.SEP.2012 12:20:24

EDR ($\pi/4$ -DQPSK) - High Channel

Date: 12.SEP.2012 12:21:52

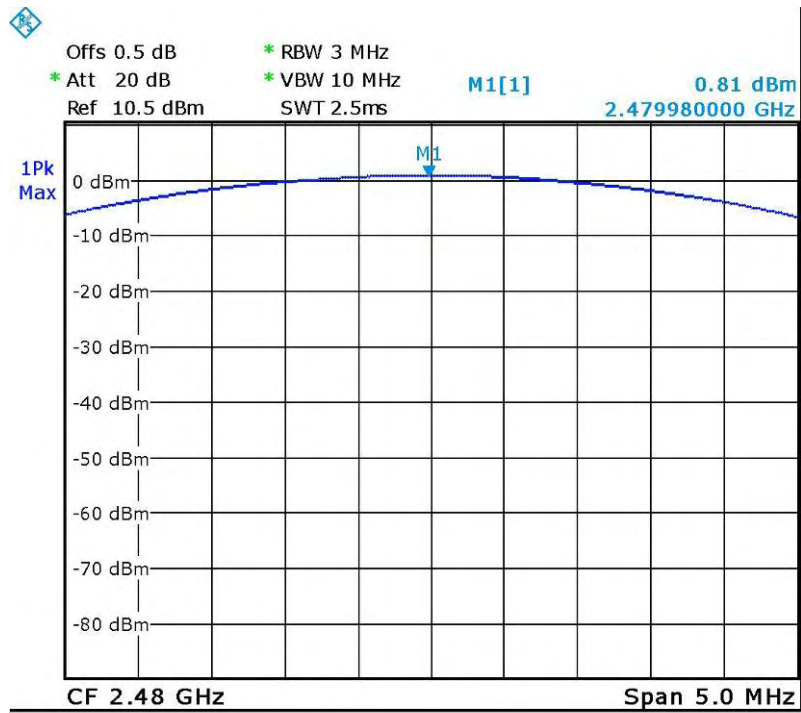
EDR (8DPSK) - Low Channel

Date: 12.SEP.2012 12:25:13

EDR (8DPSK) - Middle Channel

Date: 12.SEP.2012 12:24:31

EDR (8DPSK) - High Channel



Date: 12.SEP.2012 12:23:12

13 - FCC §15.247(d) - BAND EDGES TESTING

13.1 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)).

13.3 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.

13.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSL18	100180	2012-05-10	2013-05-09

13.4 Test Data

Environmental Conditions

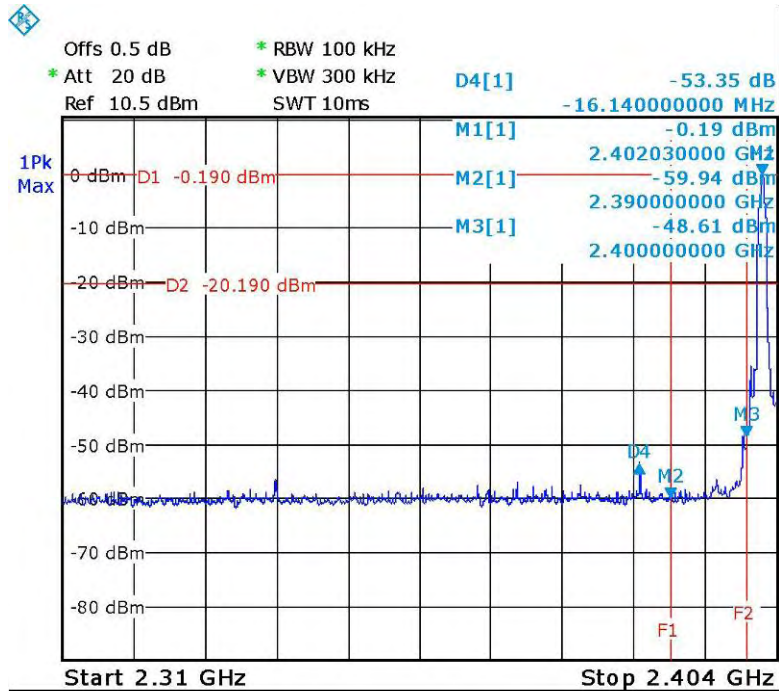
Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	95.5 kPa

**The testing was performed by Jack Wu on 2012-09-13.*

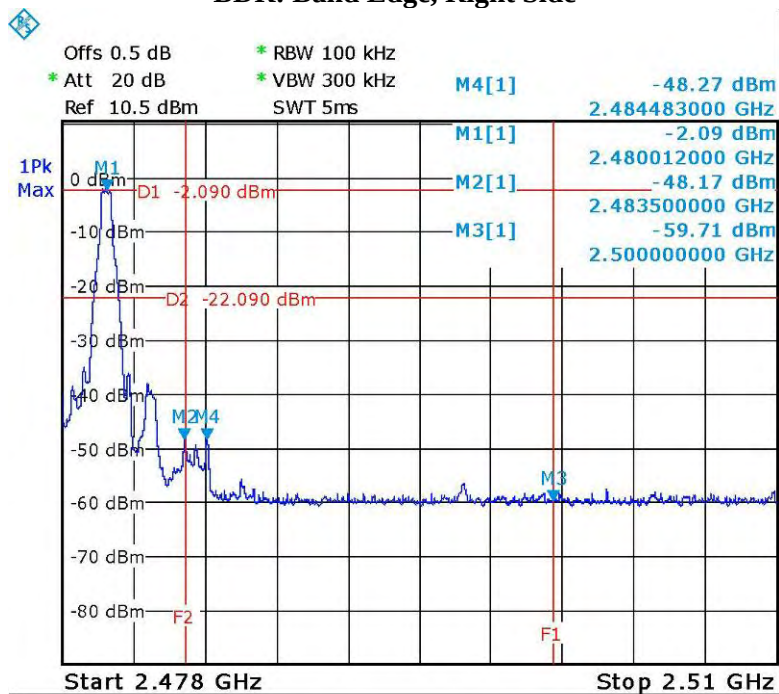
Test Result: Compliance, Please refer to following table and plots.

Test Mode: Transmitting

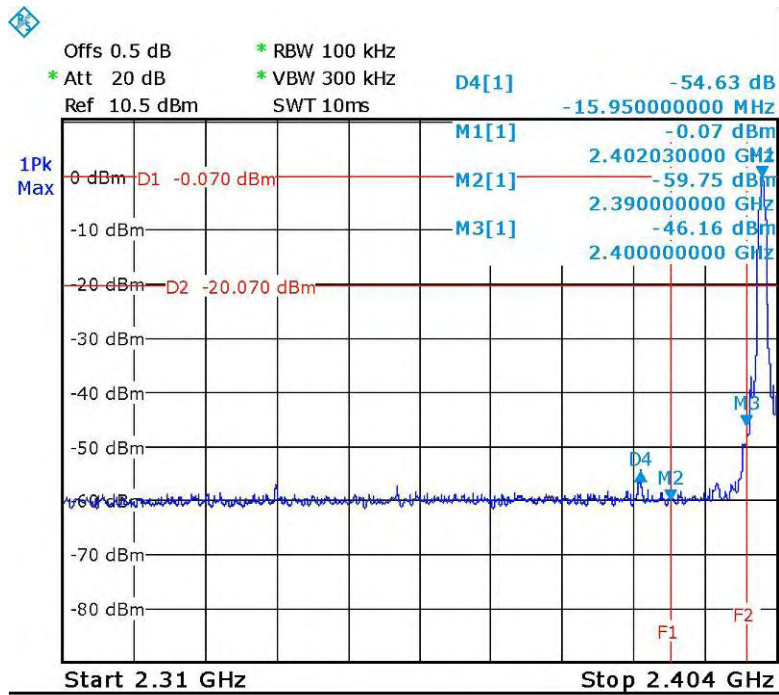
Mode	Channel	Frequency (MHz)	Band Edge (dBm)	Limit (dBm)
BDR Mode (GFSK)	Left	2402	-53.35	-20.19
	Right	2480	-48.27	-22.09
EDR Mode ($\pi/4$ -DQPSK)	Left	2402	-54.63	-20.07
	Right	2480	-49.20	-19.96
EDR Mode (8DPSK)	Left	2402	-53.35	-20.19
	Right	2480	-49.24	-20.05

BDR: Band Edge, Left Side

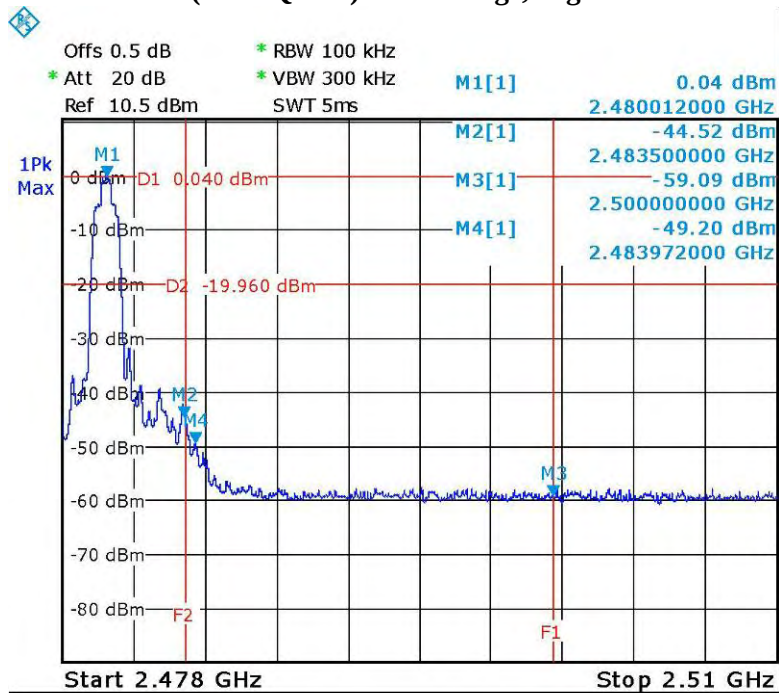
Date: 13.SEP.2012 11:24:54

BDR: Band Edge, Right Side

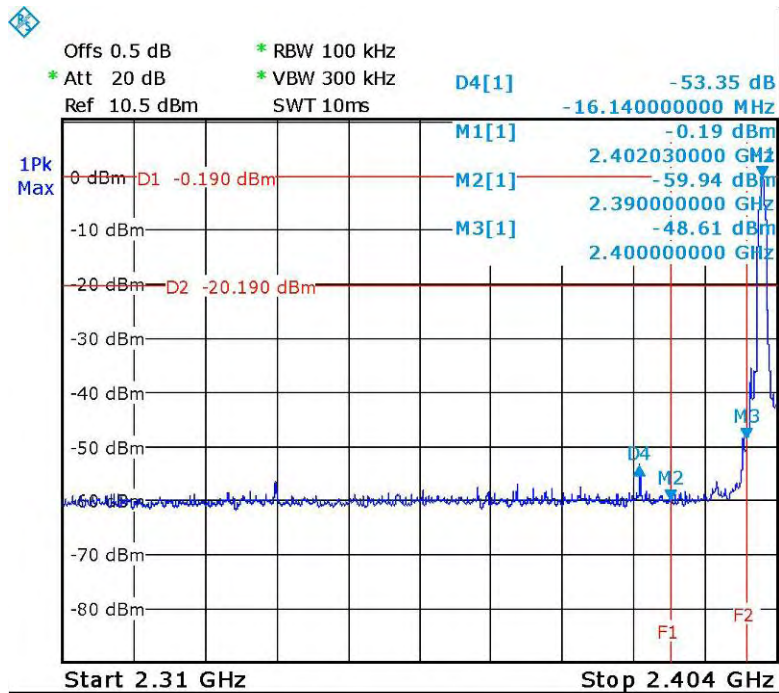
Date: 13.SEP.2012 10:03:35

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

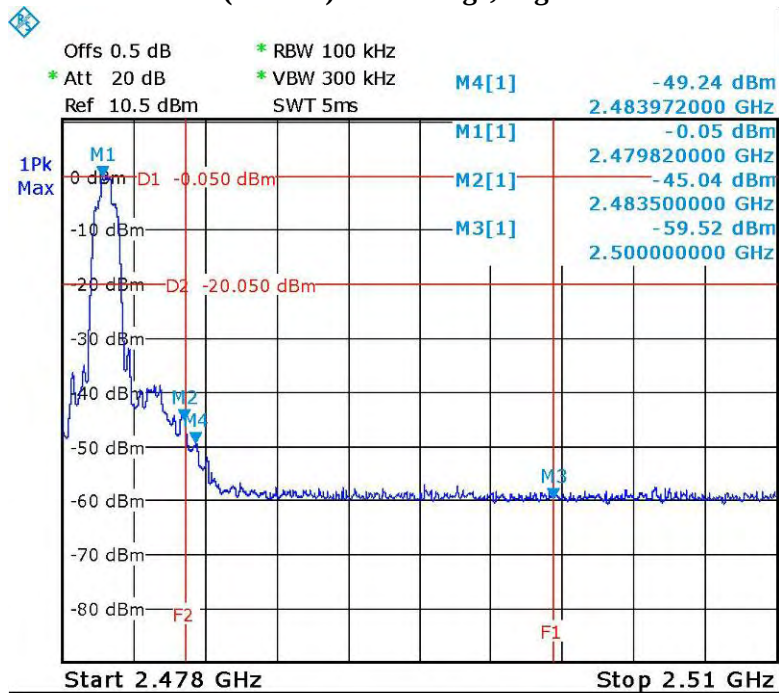
Date: 13.SEP.2012 11:22:55

EDR ($\pi/4$ -DQPSK) : Band Edge, Right Side

Date: 13.SEP.2012 09:51:08

EDR (8DPSK): Band Edge, Left Side

Date: 13.SEP.2012 11:24:54

EDR (8DPSK): Band Edge, Right Side

Date: 13.SEP.2012 09:53:04

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