FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

ZBA, Inc.

94 Old Camplain Road Hillsborough, New Jersey 08844

FCC ID: VMTBT44-111S
Model Number: BT44-111S

Report Type:	**Product Type:**
Original Report	Class 1 Bluetooth Module

Test Engnieer	Kate Yang
Report Number:	RSC120507001
Report Date:	2012-07-11
Reviewed By:	Name: Darren Dai Title: EMC Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China Phone: +86-28-65525123 Tel: +86-28-65525125 www.baclcorp.com

TABLE OF CONTENTS

1 - GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The *ZBA, Inc.'s* product, model number: *BT44-111S (FCC ID: VMTBT44-111S)* or the "EUT" as referred to in this report is a *Class 1 Bluetooth Module*, rated input voltage: DC 3.3V.

1.2 Mechanical Description of EUT

The EUT is measured approximately 2.75 cm L x 1.45 cm W x 0.2 cm H.

All measurement and test data in this report was gathered from production sample serial number: 120506 (Assigned by BACL, Chengdu). The EUT was received on 2012-05-06.

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. (Shenzhen). 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, 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.

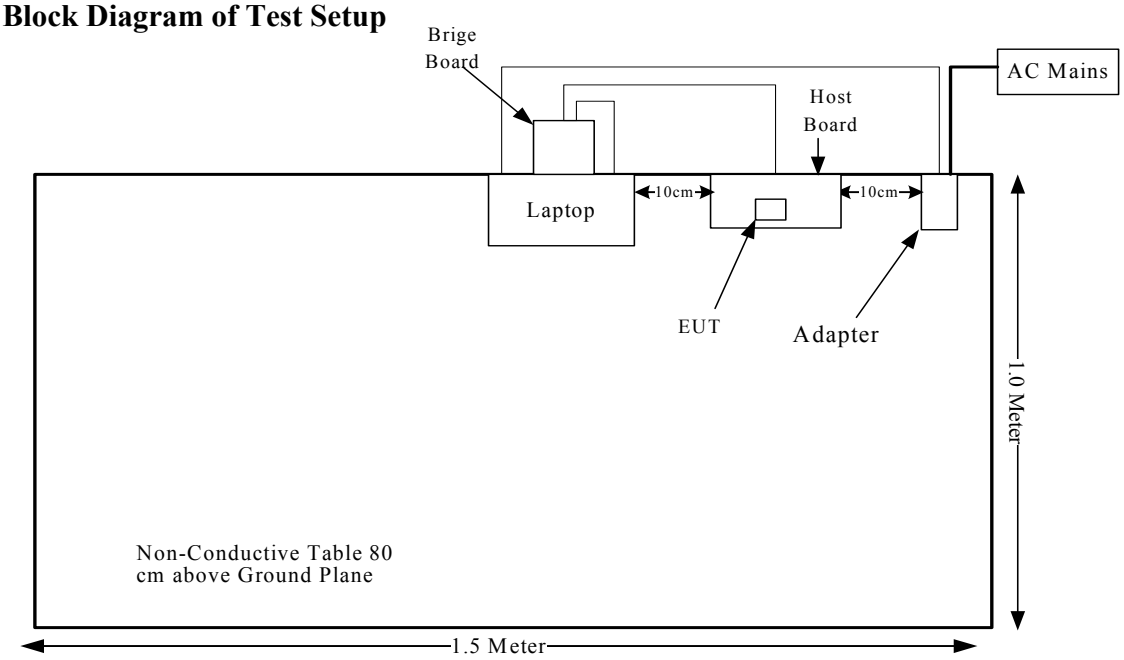
2.4 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Notebook	LATITUDE	N/A
N/A	Host Board	N/A	N/A
N/A	Brige Board	N/A	N/A

2.5 External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded DC Power Cable	1.83	AC Adapter	Notebook
Unshielded USB Power Cable	0.5	Notebook	Brige Board
Unshielded Datachable Flex Cable	0.5	Host Board	Brige Board

2.7 Block Diagram of Test Setup



3 - SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
15.247 (i), §1.1307 (b) (1) & §2.1091	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Radiated Emission	Compliant
§15.247 (a)(1)	20 dB Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

4 - FCC §15.247 (I) AND §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 v03r03, no SAR required if power is lower than the flowing threshold:

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

RF Exposure Limit

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

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 = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

MPE Results

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
2480	-2	0.63	18.8	75.86	20	0.0095	1.0

Result: The device meet 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 -2 dBi which fulfills the requirements of FCC rule 15.203.

Result: Compliant.

6 - FCC§ 15.207(a) - CONDUCTED EMISSIONS

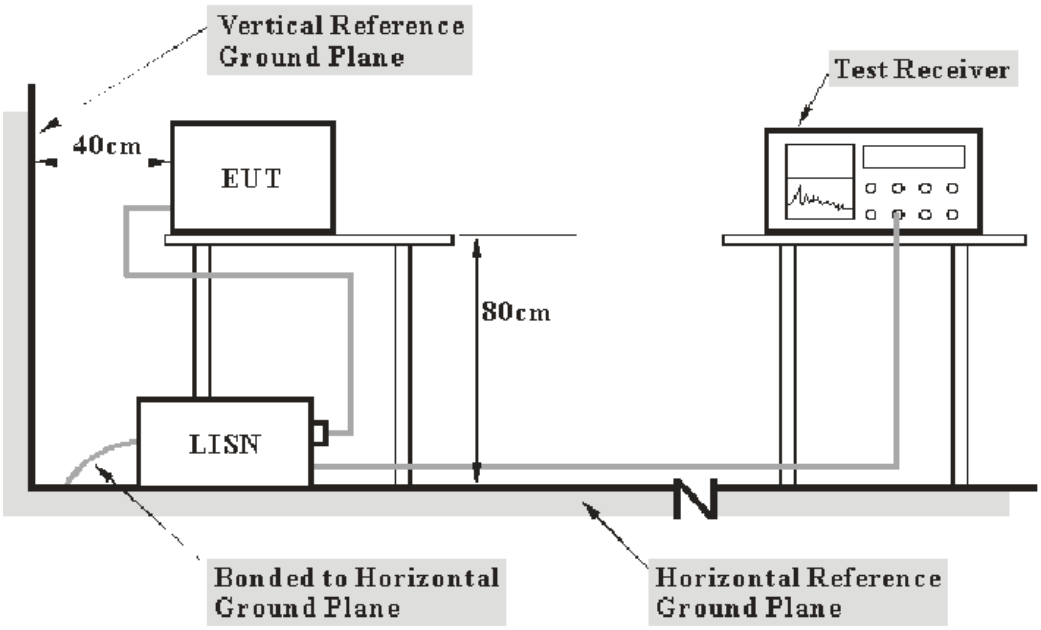
6.1 Applicable Standard

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 μH/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 (dBμV)	
	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:

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

6.4 Test Equipment List and Details

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

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:

13.17 dB at **0.48 MHz** in the **Neutral** conductor mode

6.7 Conducted Emissions Test Data & Plots

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0 KPa

** The testing was performed by Kate Yang on 2012-05-29*

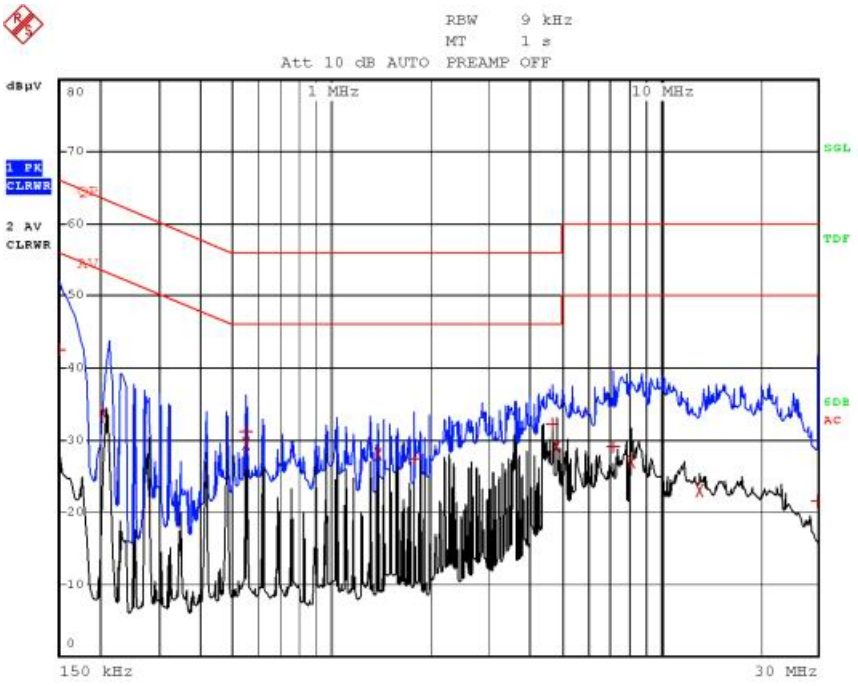
Test Result: Compliant,
Please refer to following tables and plots.

Test Data

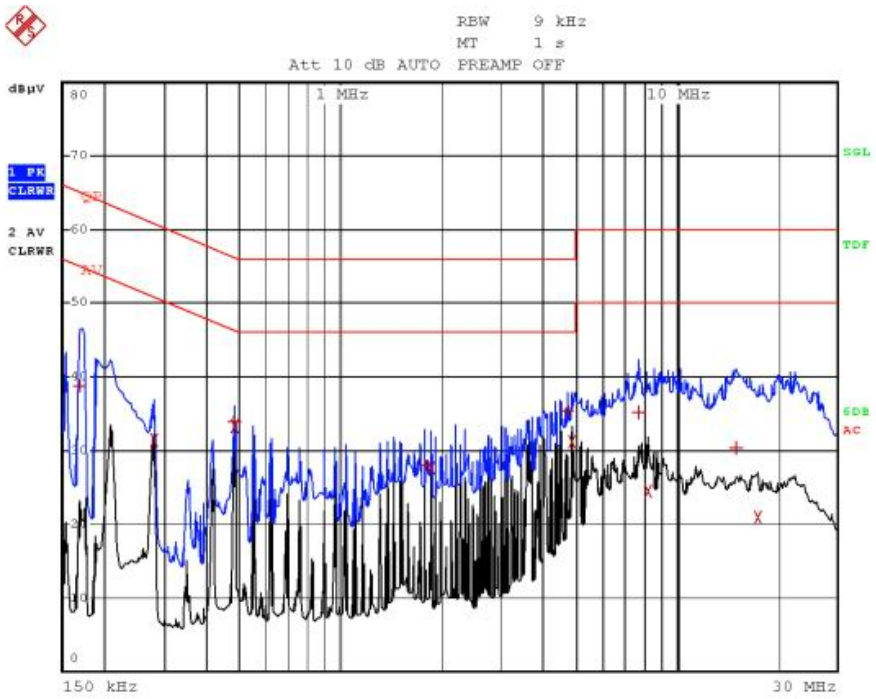
Frequency MHz	Cord. Reading dBuV	Detector (Qp/Ave)	Phase Line/Neutral	FCC Part 15.207(a)	
				Limits dBµV	Margin dB
0.48	33.13	AV	Neutral	46.30	13.17
0.48	32.72	AV	Line	46.30	13.58
4.41	31.29	AV	Line	46.00	14.71
4.89	28.72	AV	Neutral	46.00	17.28
0.97	28.62	AV	Line	46.00	17.38
1.86	27.57	AV	Neutral	46.00	18.43
0.28	31.38	AV	Neutral	50.88	19.50
0.21	33.63	AV	Line	53.37	19.74
4.76	34.68	QP	Neutral	56.00	21.32
8.14	28.53	AV	Line	50.00	21.47
0.48	33.79	QP	Neutral	56.30	22.51
4.55	32.61	QP	Line	56.00	23.39
0.17	40.28	QP	Neutral	64.96	24.68
8.21	25.25	AV	Neutral	50.00	24.75
0.55	31.00	QP	Line	56.00	25.00
0.21	38.11	QP	Line	63.21	25.10
7.72	33.79	QP	Neutral	60.00	26.21
1.45	29.28	QP	Line	56.00	26.72
1.79	28.43	QP	Neutral	56.00	27.57
13.72	22.08	AV	Line	50.00	27.92
17.53	21.58	AV	Neutral	50.00	28.42
15.07	30.91	QP	Neutral	60.00	29.09
7.93	30.81	QP	Line	60.00	29.19
15.87	28.76	QP	Line	60.00	31.24

Plot(s) of Test Data

Line



Neutral



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

7.1 Applicable Standard

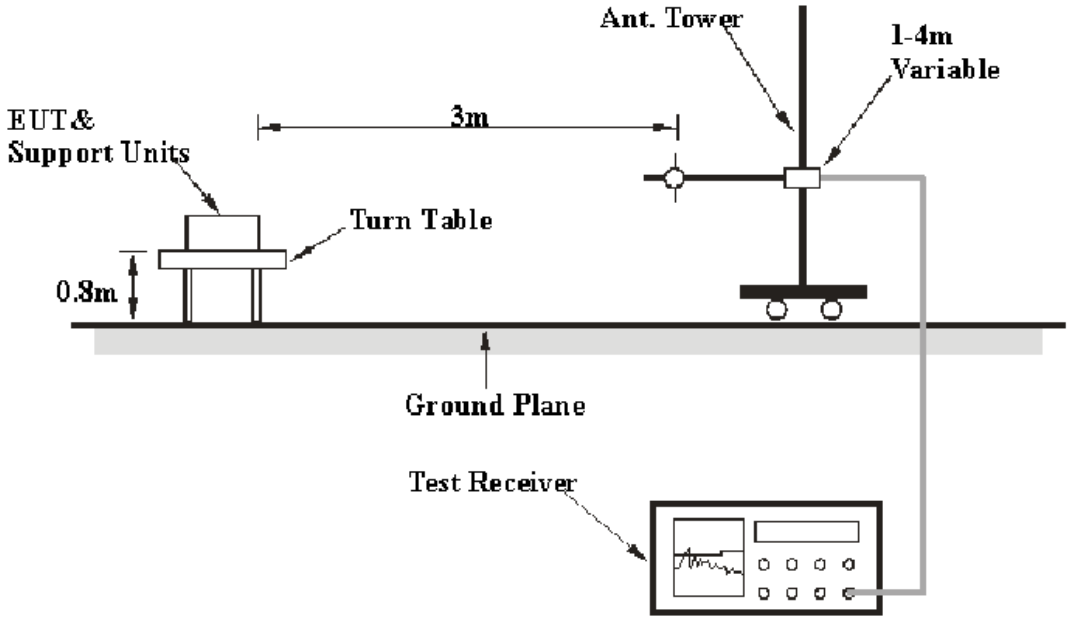
FCC §15.247 (d); §15.209; §15.205;

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 to 40 cm 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:

Frequency Range	***RBW***	***Video BW***	***Detector***
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

During the conducted emission test, the adapter was connected to the outlet of the LISN.

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-11-24	2012-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27
DUCOMMUN Technologies	Pre-amp	ALN-09173030-01	991396-01	2011-11-24	2012-12-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2012-12-01	2012-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ 26	8386001028	2011-11-24	2012-11-23

6.7 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:

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

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:

BDR Mode: 0.38 dB at **4804 MHz** in the **Vertical** polarization at low channel

7.9 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

**The testing was performed by Kate Yang on 2012-07-05.*

Test Result: Compliant,
Please refer to following tables.

BDR (GFSK) Mode:

Test Mode: Transmitting(BDR is the worse case):

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Polar (H/V)	Corrected Amplitude (dB/m)	Correction Data (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2402MHz)								
4804	43.08	Ave.	V	10.54	53.62	54	0.38*	Harmonic
2390	38.41	PK	V	34.8	73.21	74	0.79*	spurious
4804	62.18	PK	V	10.79	72.97	74	1.03*	Harmonic
2390	17.31	Ave.	V	34.8	52.11	54	1.89*	spurious
2390	36.77	PK	H	34.8	71.57	74	2.43*	spurious
2390	16.21	Ave.	H	34.8	51.01	54	2.99*	spurious
4804	40.37	Ave.	H	10.54	50.91	54	3.09*	Harmonic
7206	31.16	Ave.	V	18.63	49.79	54	4.21	Harmonic
7206	31.09	Ave.	H	18.63	49.72	54	4.28	Harmonic
7206	49.96	PK	V	18.63	68.59	74	5.41	Harmonic
4804	57.59	PK	H	10.79	68.38	74	5.62	Harmonic
7206	49.17	PK	H	18.63	67.8	74	6.2	Harmonic
9608	20.69	Ave.	V	20.88	41.57	54	12.43	Harmonic
9608	20.38	Ave.	H	20.88	41.26	54	12.74	Harmonic
613	30.21	QP	V	-0.99	29.22	46	16.78	spurious
613	29.14	QP	H	-0.99	28.15	46	17.85	spurious
9608	34.67	PK	V	20.88	55.55	74	18.45	Harmonic
9608	33.72	PK	H	20.88	54.6	74	19.4	Harmonic
2402	81.22	PK	H	34.91	116.13	N/A	N/A	Fundamental
2402	50.79	Ave.	H	34.91	85.7	N/A	N/A	Fundamental
2402	84.19	PK	V	34.91	119.1	N/A	N/A	Fundamental
2402	51.48	Ave.	V	34.91	86.39	N/A	N/A	Fundamental
Middle Channel (2441MHz)								
4882	62.37	PK	V	11.07	73.44	74	0.56*	Harmonic
4882	42.33	Ave.	V	11.07	53.4	54	0.6*	Harmonic
7323	32.31	Ave.	V	18.93	51.24	54	2.76*	Harmonic
7323	31.63	Ave.	H	18.93	50.56	54	3.44*	Harmonic
7323	51.56	PK	V	18.93	70.49	74	3.51*	Harmonic
4882	39.12	Ave.	H	11.07	50.19	54	3.81*	Harmonic
7323	50.64	PK	H	18.93	69.57	74	4.43	Harmonic
4882	56.28	PK	H	11.07	67.35	74	6.65	Harmonic
613	31.22	QP	V	-0.99	30.23	46	15.77	spurious
9764	16.52	Ave.	V	20.87	37.39	54	16.61	Harmonic
613	30.12	QP	H	-0.99	29.13	46	16.87	spurious
9764	15.89	Ave.	H	20.87	36.76	54	17.24	Harmonic
9764	33.51	PK	V	20.87	54.38	74	19.62	Harmonic
9764	32.72	PK	H	20.87	53.59	74	20.41	Harmonic
2441	80.27	PK	H	35.24	115.51	N/A	N/A	Fundamental
2441	51.24	Ave.	H	35.24	86.48	N/A	N/A	Fundamental
2441	82.43	PK	V	35.24	117.67	N/A	N/A	Fundamental
2441	51.27	Ave.	V	35.24	86.51	N/A	N/A	Fundamental

Frequency (MHz)	Reading (dBμV)	Detector (PK/QP /Ave.)	Polar (H/V)	Corrected Amplitude (dB/m)	Correction Data (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2480MHz)								
4960	62.04	PK	V	10.96	73	74	1.00*	Harmonic
4960	41.84	Ave.	V	10.96	52.8	54	1.20*	Harmonic
2483.5	36.92	PK	V	35.3	72.22	74	1.78*	spurious
2483.5	16.11	Ave.	H	35.3	51.41	54	2.59*	spurious
2483.5	16.03	Ave.	V	35.3	51.33	54	2.67*	spurious
2483.5	35.8	PK	H	35.3	71.1	74	2.9*	spurious
4960	38.89	Ave.	H	10.96	49.85	54	4.15	Harmonic
7440	30.26	Ave.	V	19.25	49.51	54	4.49	Harmonic
7440	49.95	PK	V	19.25	69.2	74	4.8	Harmonic
7440	29.93	Ave.	H	19.25	49.18	54	4.82	Harmonic
7440	49.04	PK	H	19.25	68.29	74	5.71	Harmonic
4960	56.71	PK	H	10.96	67.67	74	6.33	Harmonic
9220	20.91	Ave.	V	21.04	41.95	54	12.05	Harmonic
9220	20.59	Ave.	H	21.04	41.63	54	12.37	Harmonic
9220	38.52	PK	V	21.04	59.56	74	14.44	Harmonic
752	31.01	QP	H	0.29	31.3	46	14.7	spurious
752	30.79	QP	V	0.29	31.08	46	14.92	spurious
9220	36.44	PK	H	21.04	57.48	74	16.52	Harmonic
2480	79.8	PK	H	35.3	115.1	N/A	N/A	Fundamental
2480	50.03	Ave.	H	35.3	85.33	N/A	N/A	Fundamental
2480	80.92	PK	V	35.3	116.22	N/A	N/A	Fundamental
2480	50.11	Ave.	V	35.3	85.41	N/A	N/A	Fundamental

*Within measurement uncertainty!

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

8.1 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.

8.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

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 truce
3. Measure the channel separation.

8.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

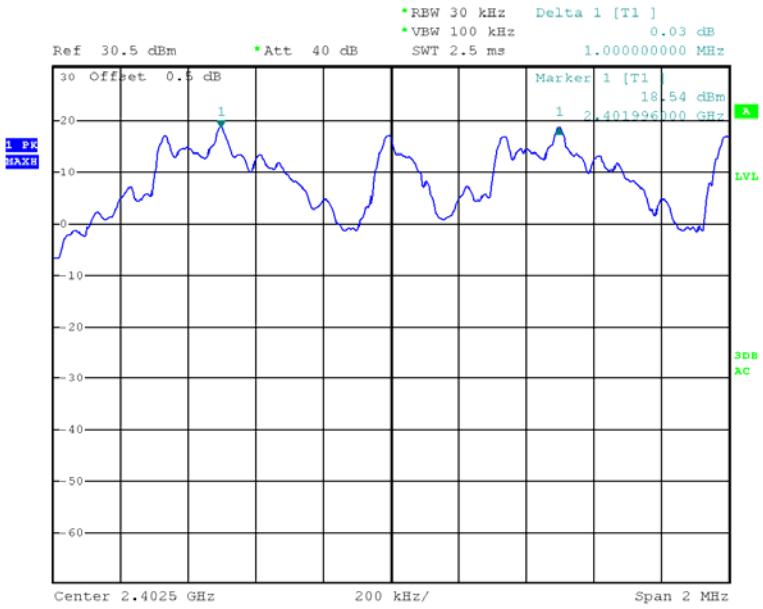
**The testing was performed by Kate Yang on 2012-07-06.*

Test Result: Compliant,
Please refer to following plots.

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR Mode (GFSK)	Low	2402	1.000	0.664	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.661	Pass
	Adjacent	2442			
	High	2480	1.000	0.643	Pass
	Adjacent	2479			
EDR Mode (π/4-DQPSK)	Low	2402	1.000	0.867	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.861	Pass
	Adjacent	2442			
	High	2480	1.004	0.851	Pass
	Adjacent	2479			
EDR Mode (8DPSK)	Low	2402	1.004	0.845	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.848	Pass
	Adjacent	2442			
	High	2480	1.000	0.829	Pass
	Adjacent	2479			

BDR - Low Channel



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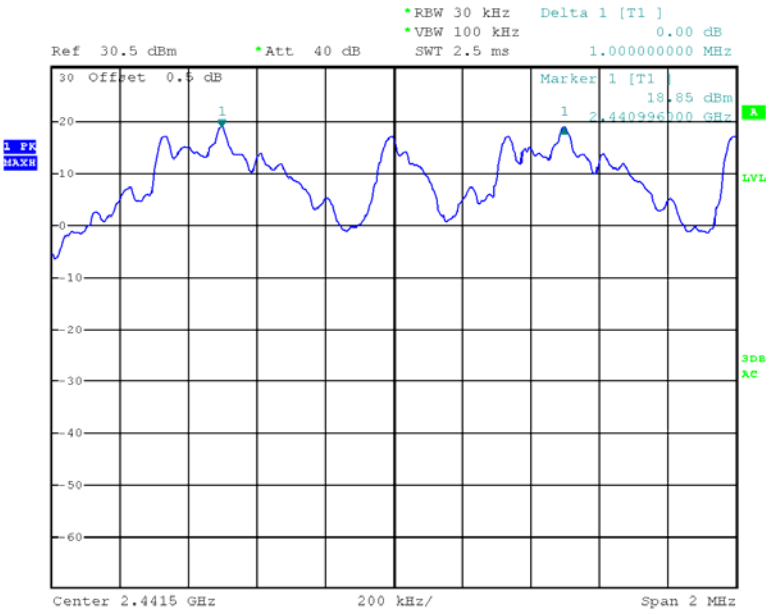
BDR - Middle Channel



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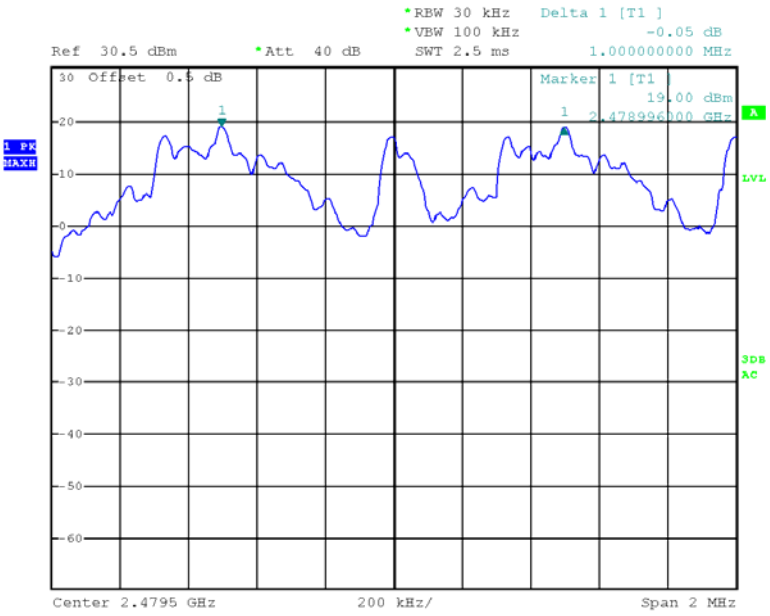
BDR - High Channel



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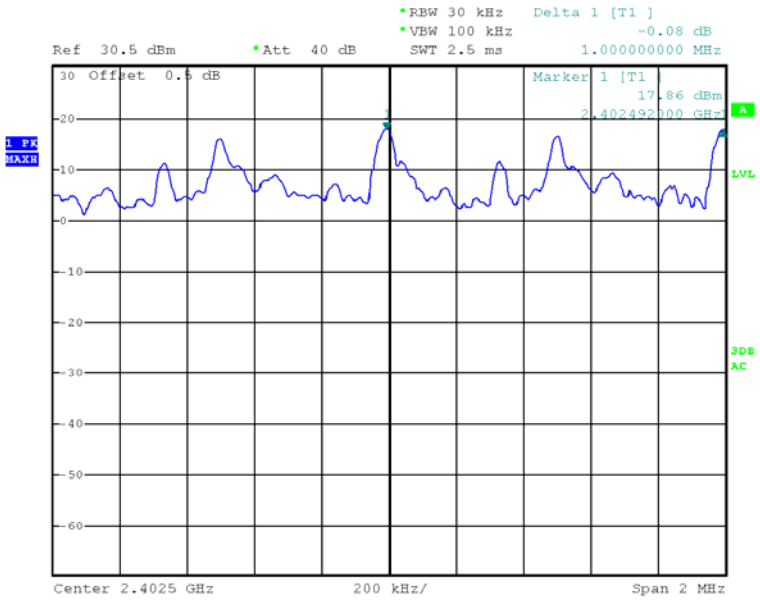
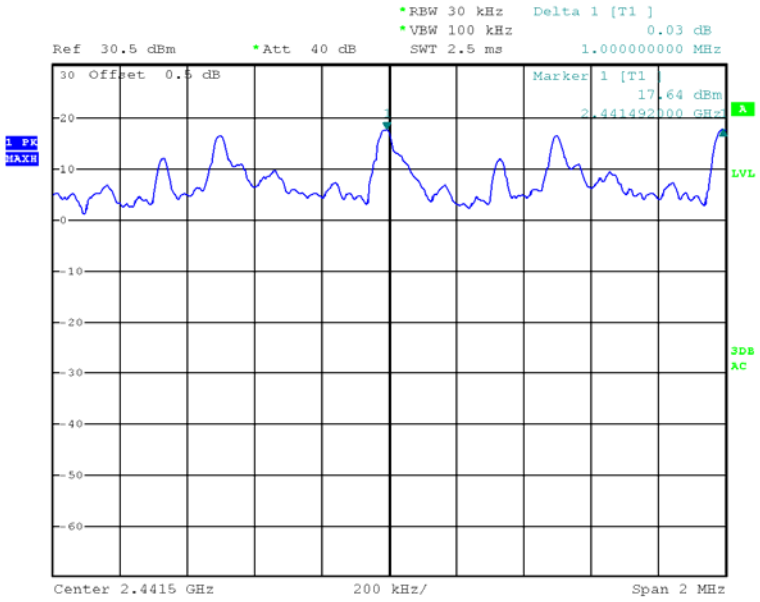
EDR (π/4-DQPSK) - Low Channel



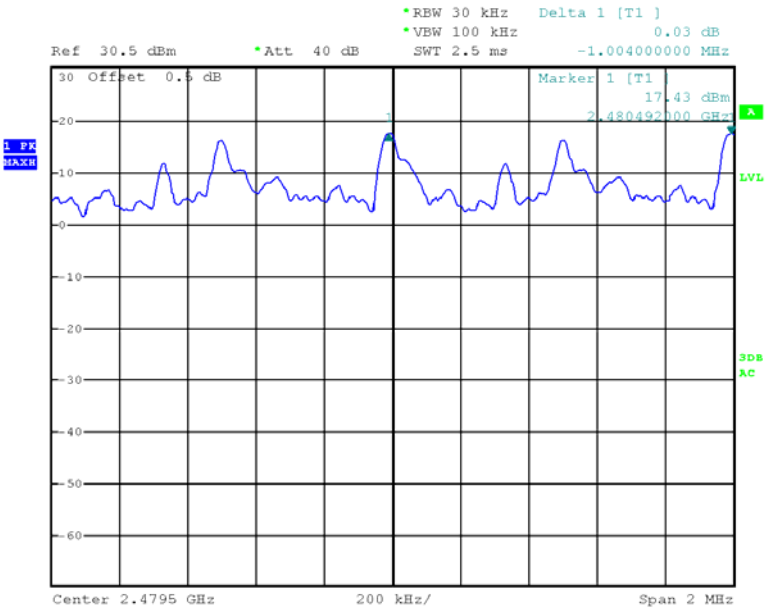
Date: 6.JUL.2012 17:52:24

EDR (π/4-DQPSK) - Middle Channel



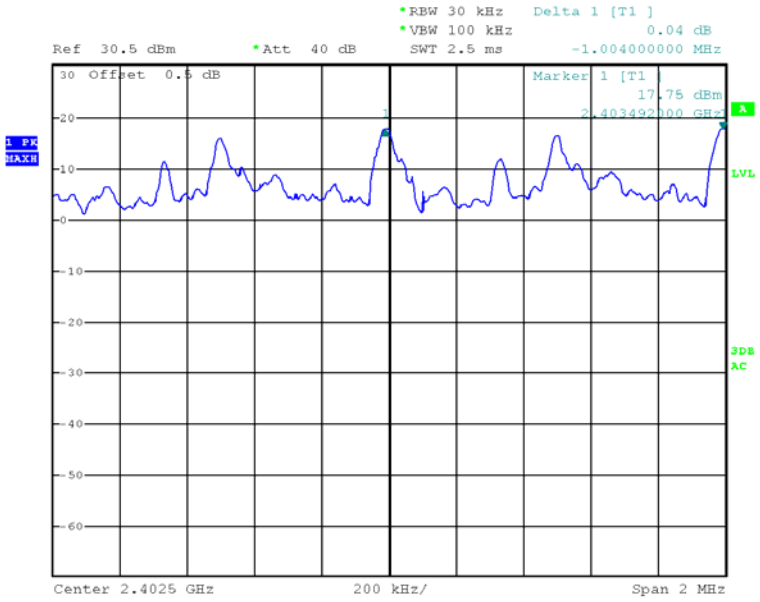
Date: 6.JUL.2012 17:51:47

EDR (π/4-DQPSK) - High Channel



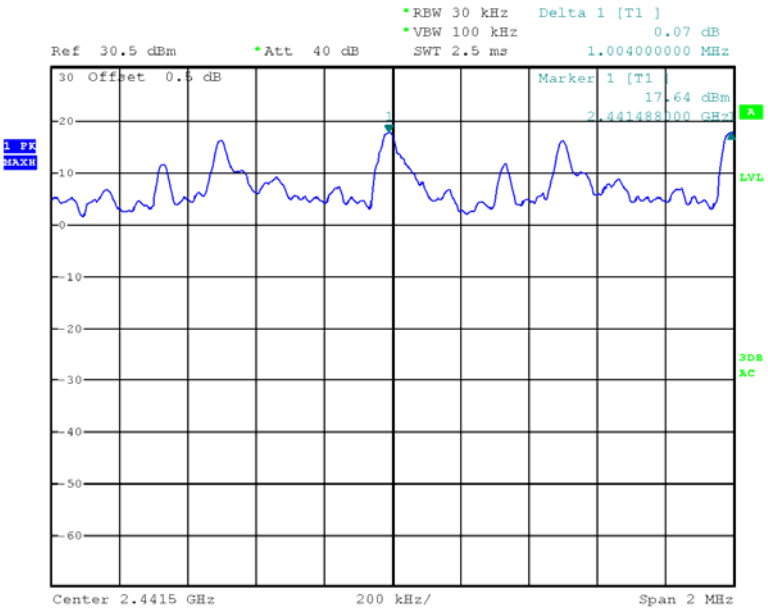
Date: 6.JUL.2012 17:51:11

EDR (8DPSK) - Low Channel



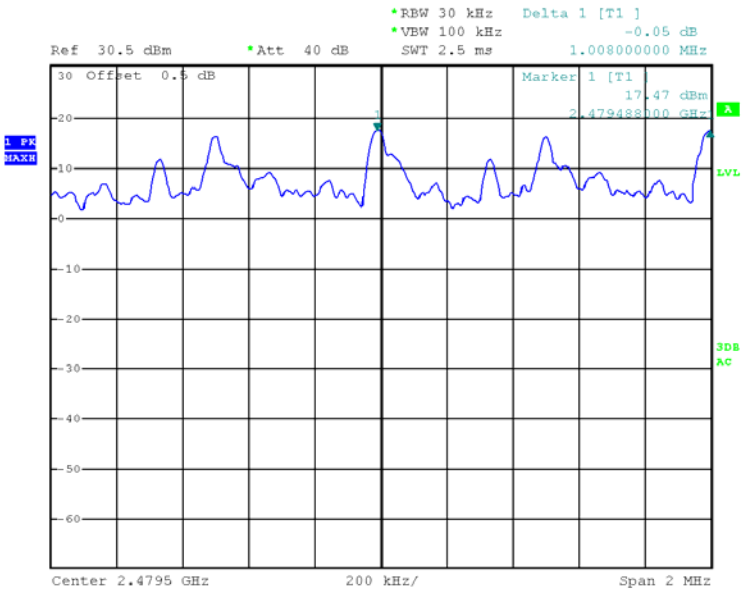
Date: 6.JUL.2012 17:53:02

EDR (8DPSK) - Middle Channel



Date: 6.JUL.2012 17:53:33

EDR (8DPSK) - High Channel



Date: 6.JUL.2012 17:54:12

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

9.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

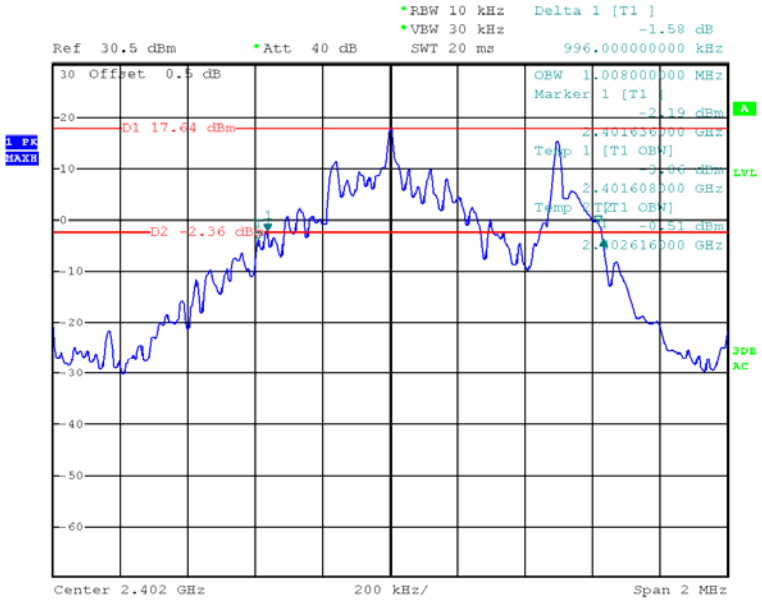
*****The testing was performed by Kate Yang on 2012-07-06.*

Test Result: Compliant,
Please refer to following plots.

Test Mode: Transmitting

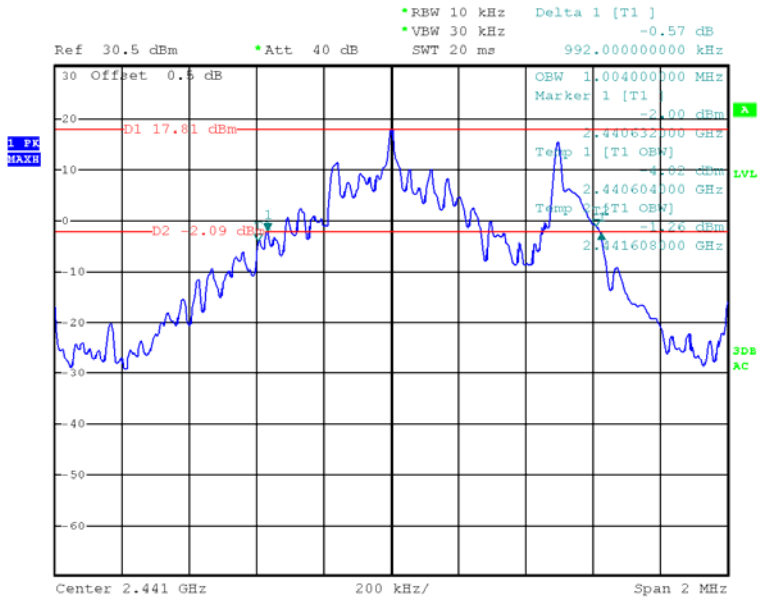
	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Low	2402	0.996
	Middle	2441	0.992
	High	2480	0.964
EDR Mode (π/4-DQPSK)	Low	2402	1.300
	Middle	2441	1.292
	High	2480	1.276
EDR Mode (8DPSK)	Low	2402	1.268
	Middle	2441	1.272
	High	2480	1.244

BDR - Low Channel



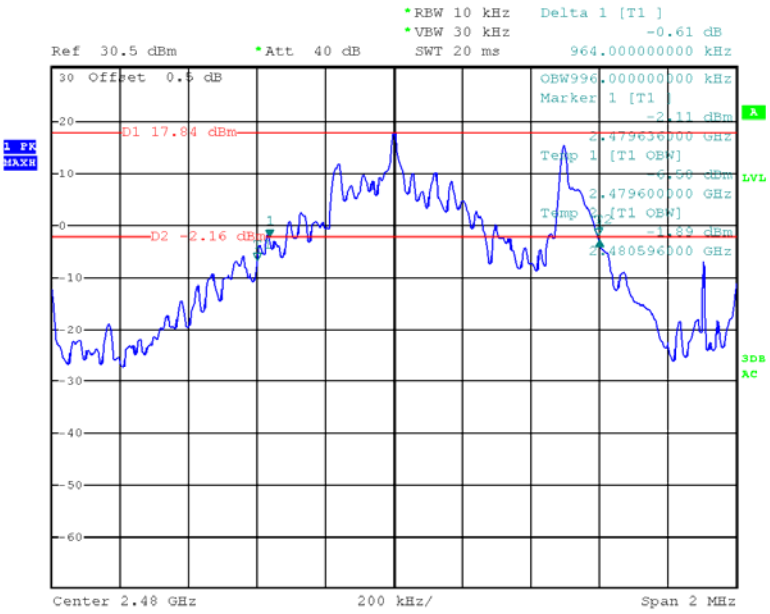
Date: 6.JUL.2012 16:44:53

BDR - Middle Channel

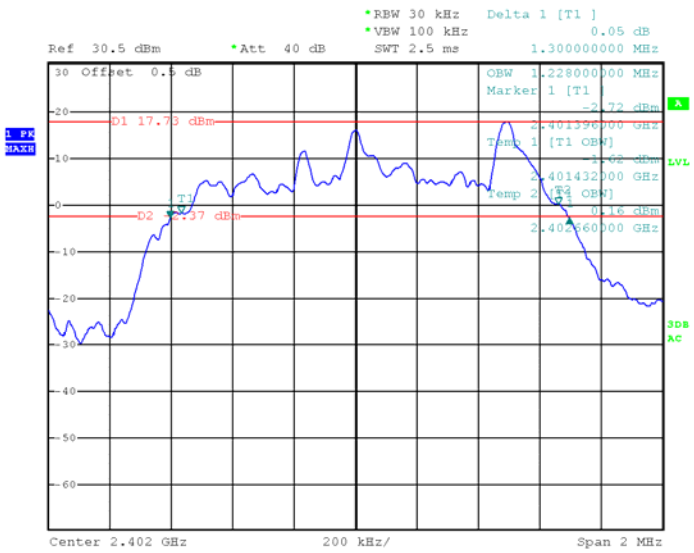


Date: 6.JUL.2012 16:45:56

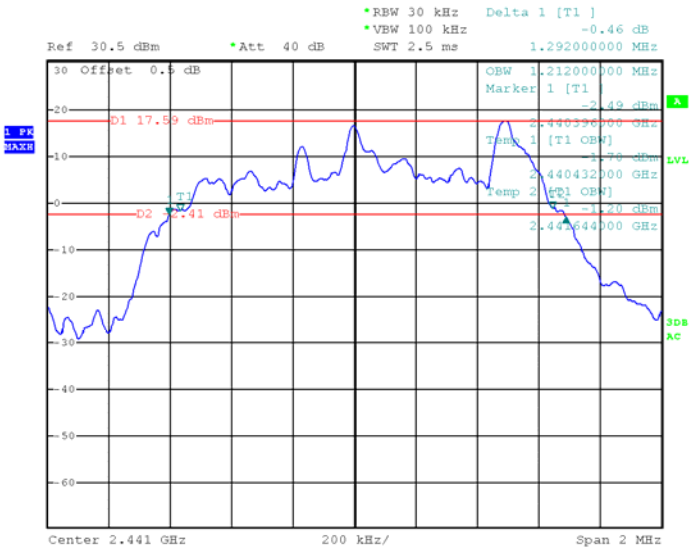
BDR - High Channel



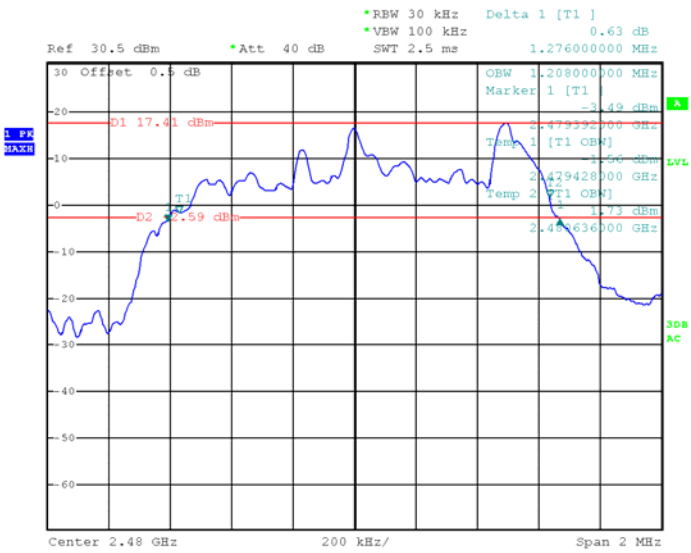
EDR (π/4-DQPSK) - Low Channel



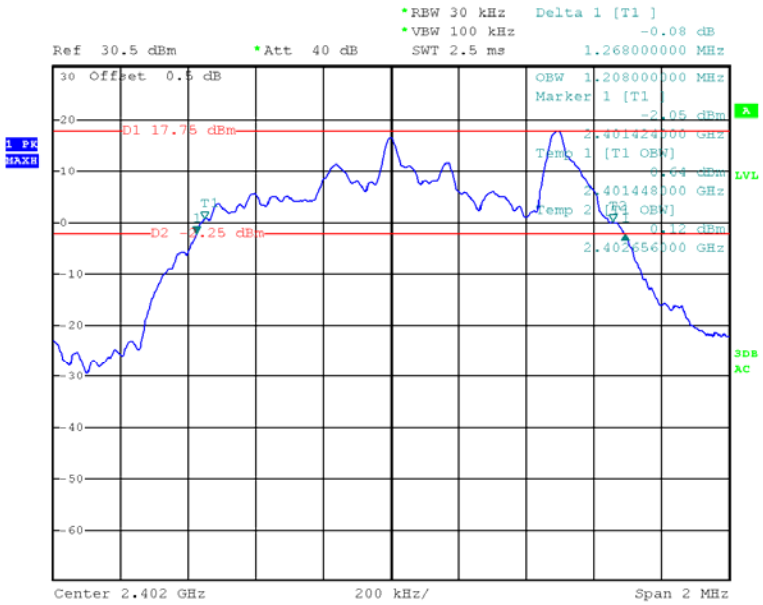
EDR (π/4-DQPSK) - Middle Channel



EDR (π/4-DQPSK) - High Channel

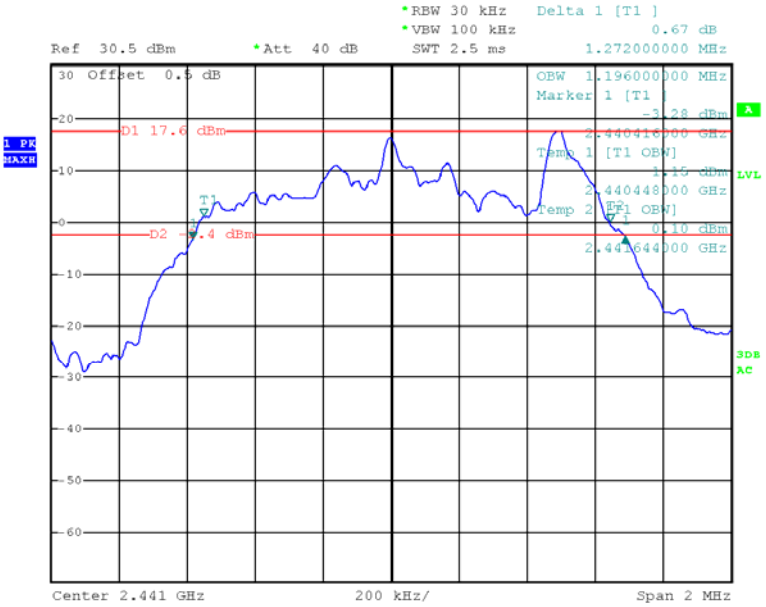


EDR (8DPSK) - Low Channel



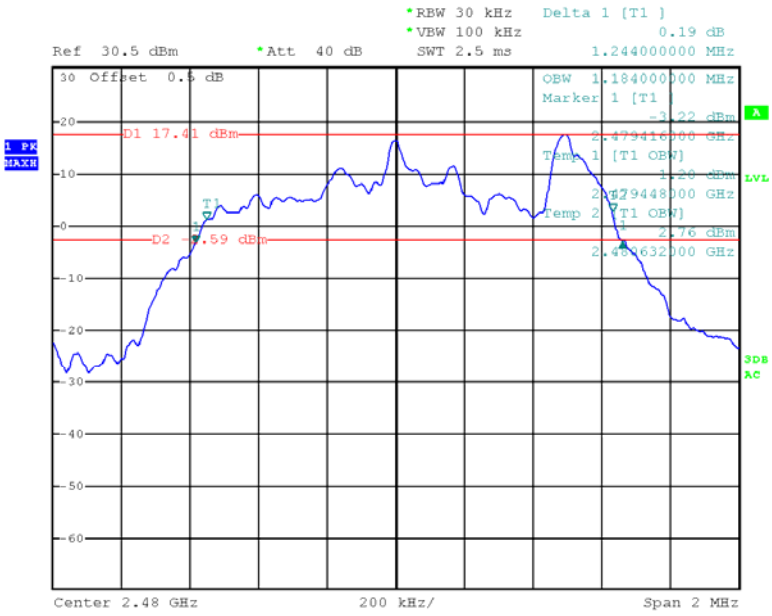
Date: 6.JUL.2012 16:59:24

EDR (8DPSK) - Middle Channel



Date: 6.JUL.2012 16:58:17

EDR (8DPSK) - High Channel



Date: 6.JUL.2012 16:56:33

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

10.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

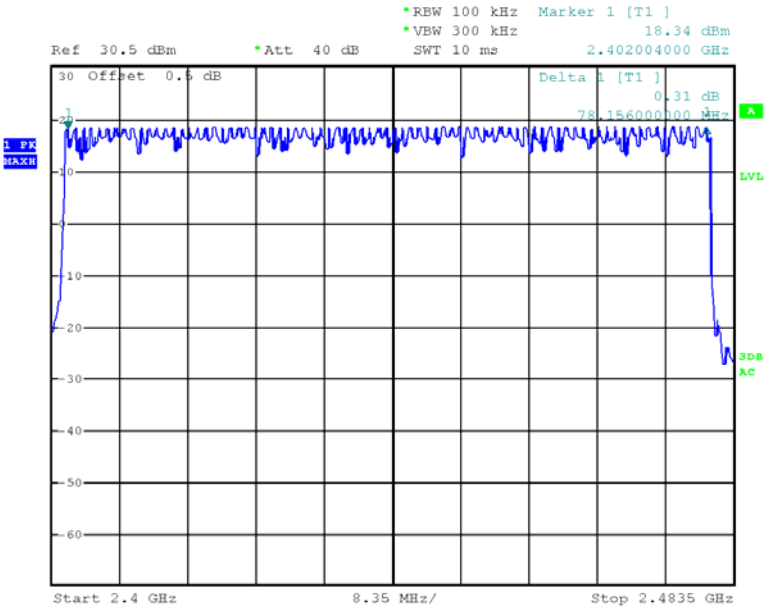
**The testing was performed by Kate Yang on 2012-07-06.*

Test Result: Compliant,
Please refer to following plots.

Test Mode: Transmitting (BDR & EDR)

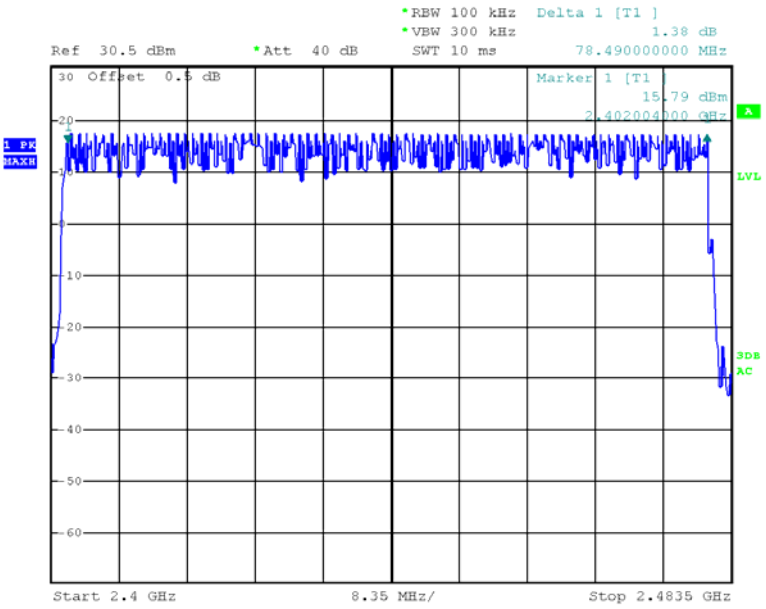
	Frequency Range (MHz)	Number of Hopping Channel	Limit
BDR	2400-2483.50	79	⩾15
EDR (π/4-DQPSK)	2400-2483.50	79	⩾15
EDR (8DPSK)	2400-2483.50	78	⩾15

BDR - Number of Hopping Channels



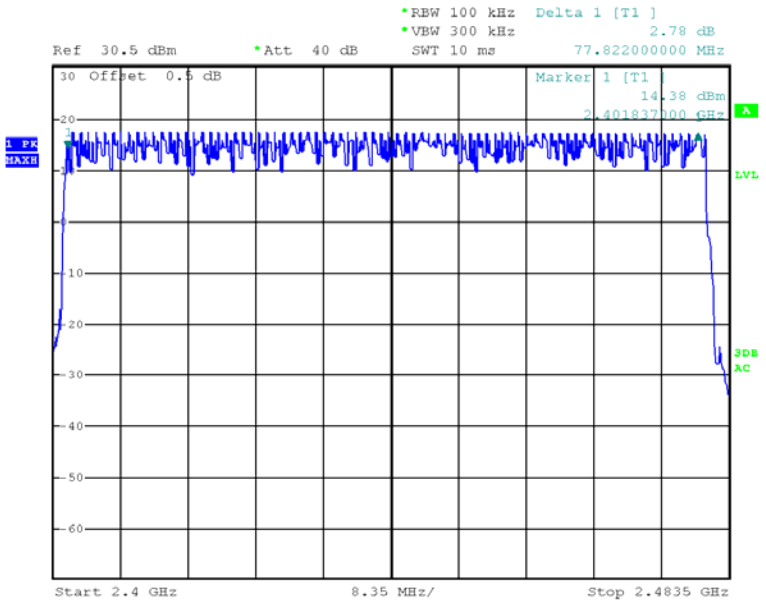
Date: 6.JUL.2012 17:58:56

EDR (π/4-DQPSK) - Number of Hopping Channels



Date: 6.JUL.2012 18:01:24

EDR (8DPSK) - Number of Hopping Channels



Date: 6.JUL.2012 18:05:09

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	8386001028	2011-11-24	2012-12-23

11.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

**The testing was performed by Kate Yang on 2012-07-07.*

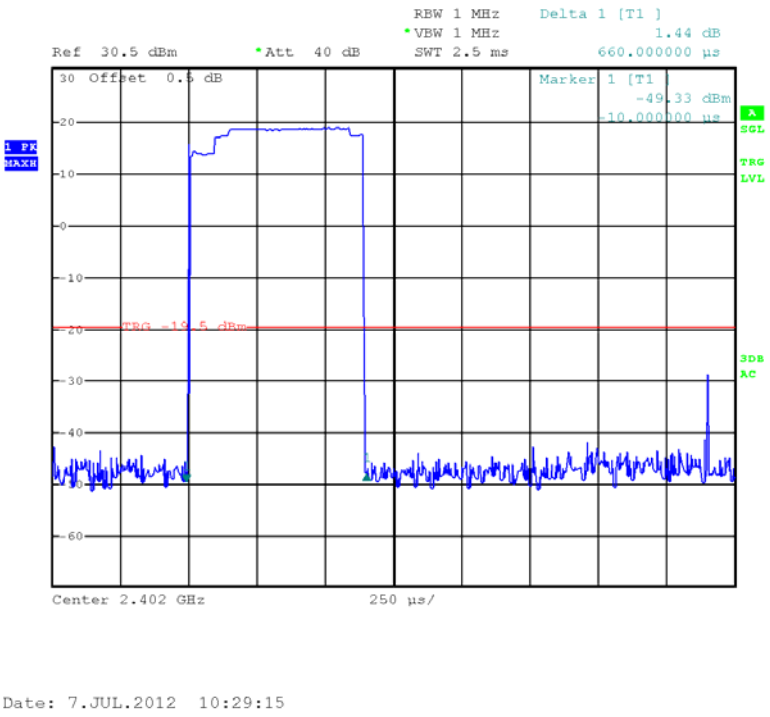
Test Result: Compliant,
Please refer to following plots.

DH1:

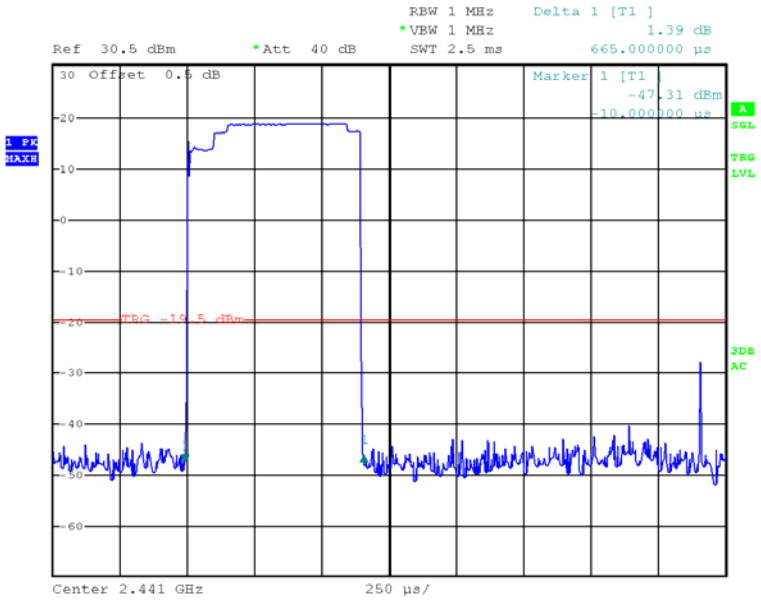
Test Mode: Transmitting

	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR Mode (GFSK)	Low	0.660	0.211	0.4	Pass
	Middle	0.665	0.213	0.4	Pass
	High	0.665	0.213	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1.6/2/79) ×31.6 s				
EDR Mode (π/4-DQPSK)	Low	0.680	0.218	0.4	Pass
	Middle	0.680	0.218	0.4	Pass
	High	0.675	0.216	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1.6/2/79) ×31.6 s				
EDR Mode (8DPSK)	Low	0.680	0.218	0.4	Pass
	Middle	0.680	0.218	0.4	Pass
	High	0.680	0.218	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1.6/2/79) ×31.6 s				

BDR - Low Channel

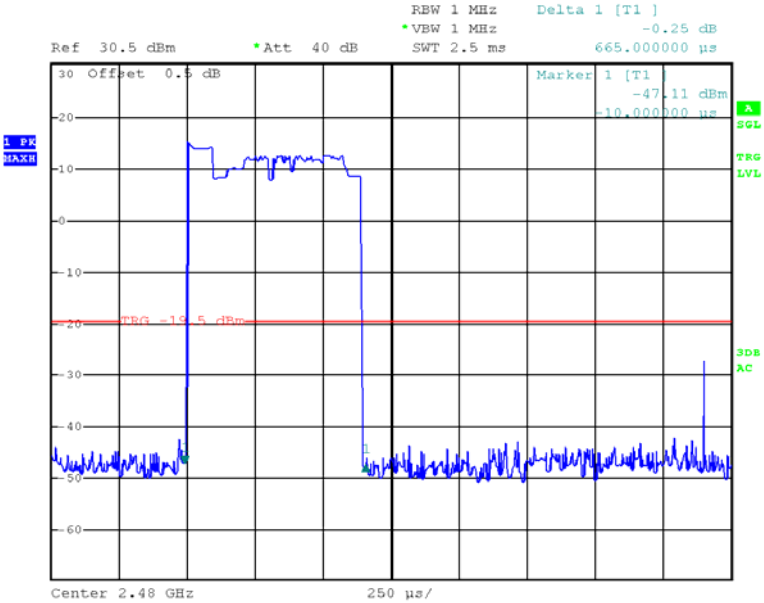


BDR - Middle Channel



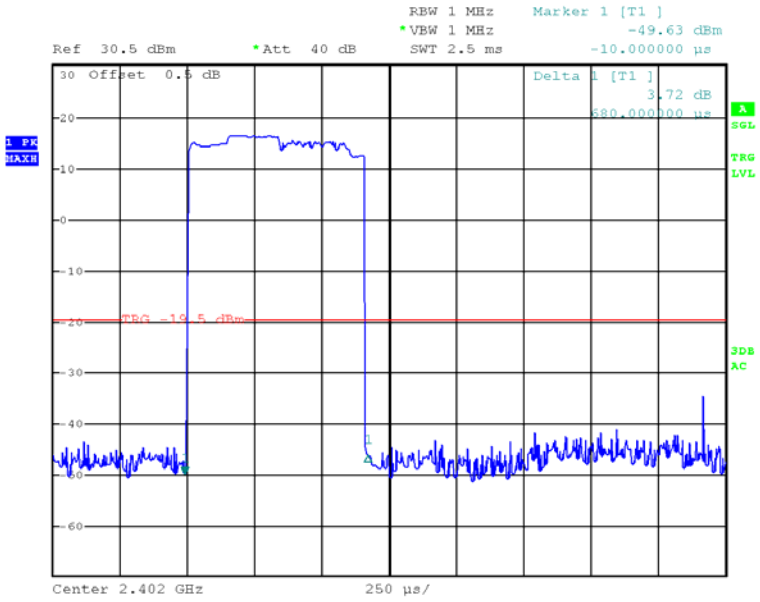
Date: 7.JUL.2012 10:29:28

BDR - High Channel



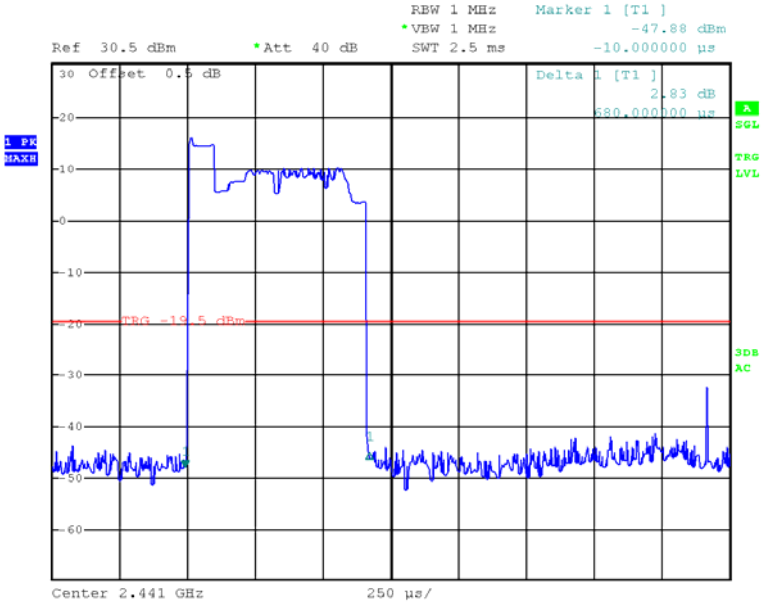
Date: 7.JUL.2012 10:29:45

EDR (π/4-DQPSK) - Low Channel



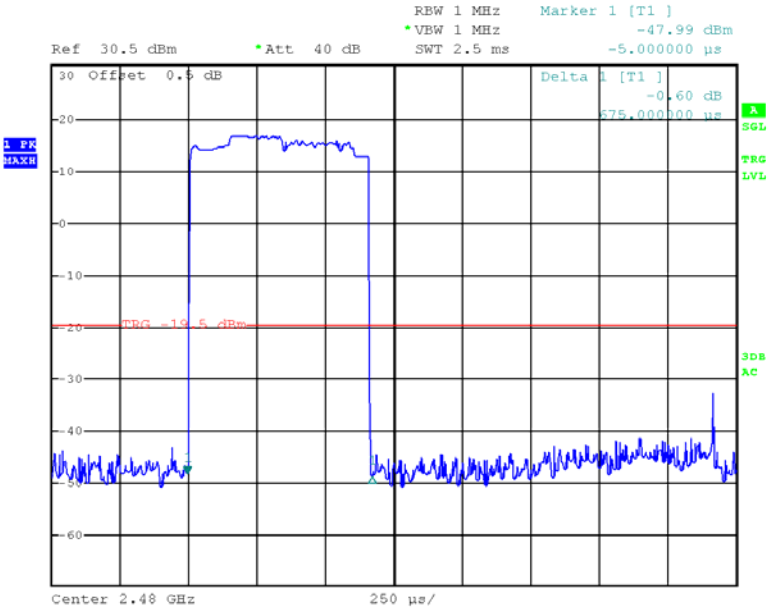
Date: 7.JUL.2012 10:32:10

EDR (π/4-DQPSK) - Middle Channel



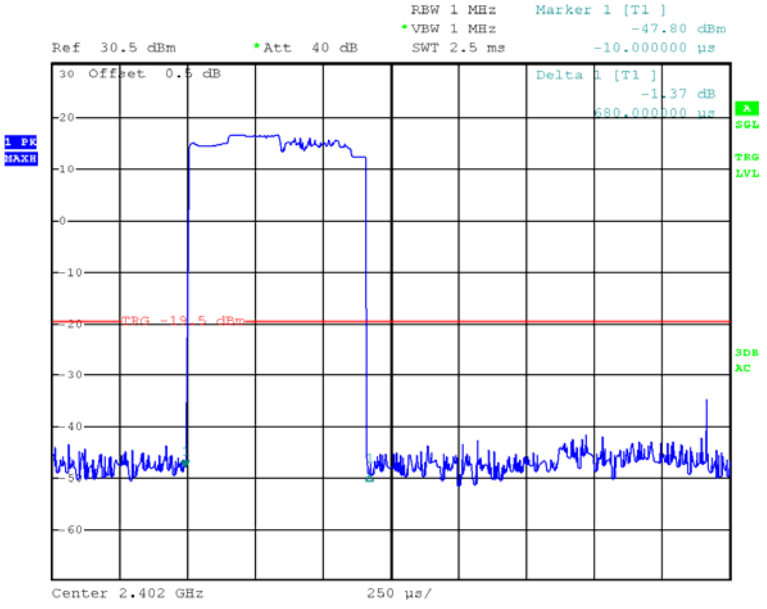
Date: 7.JUL.2012 10:31:44

EDR (π/4-DQPSK) - High Channel



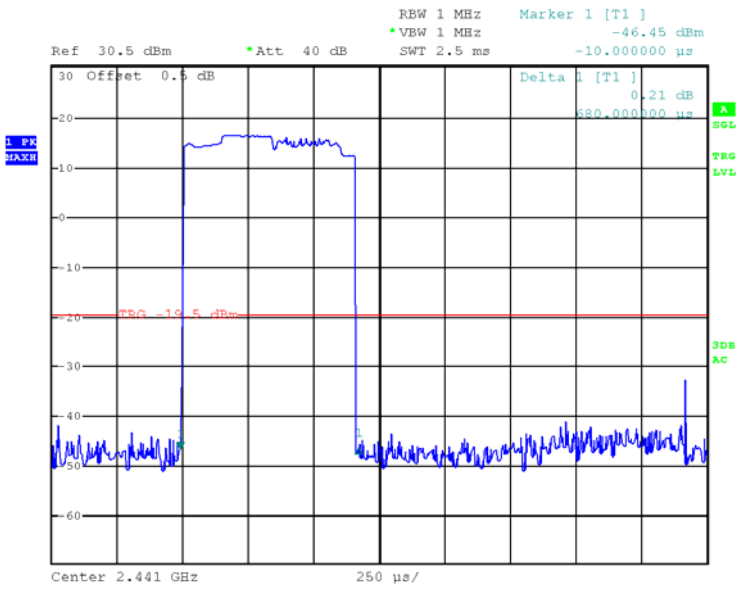
Date: 7.JUL.2012 10:30:59

EDR (8DPSK) - Low Channel



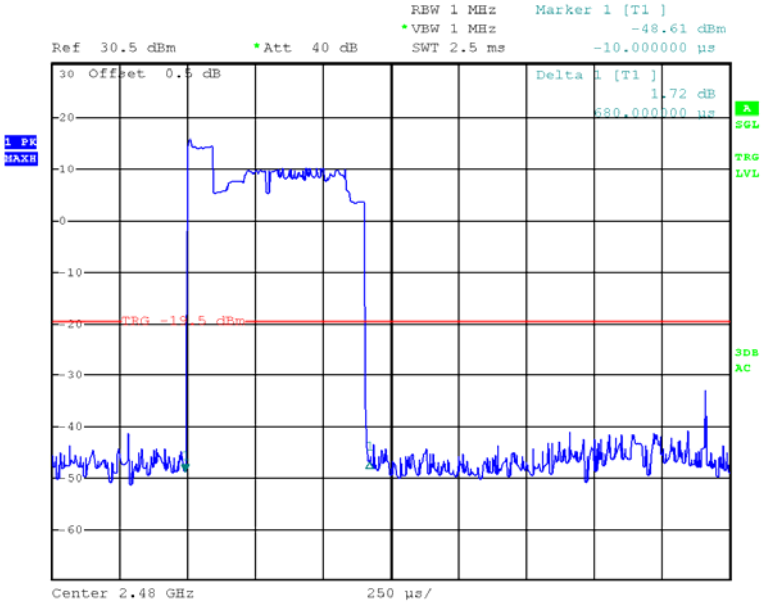
Date: 7.JUL.2012 10:32:58

EDR (8DPSK) - Middle Channel



Date: 7.JUL.2012 10:33:29

EDR (8DPSK) - High Channel



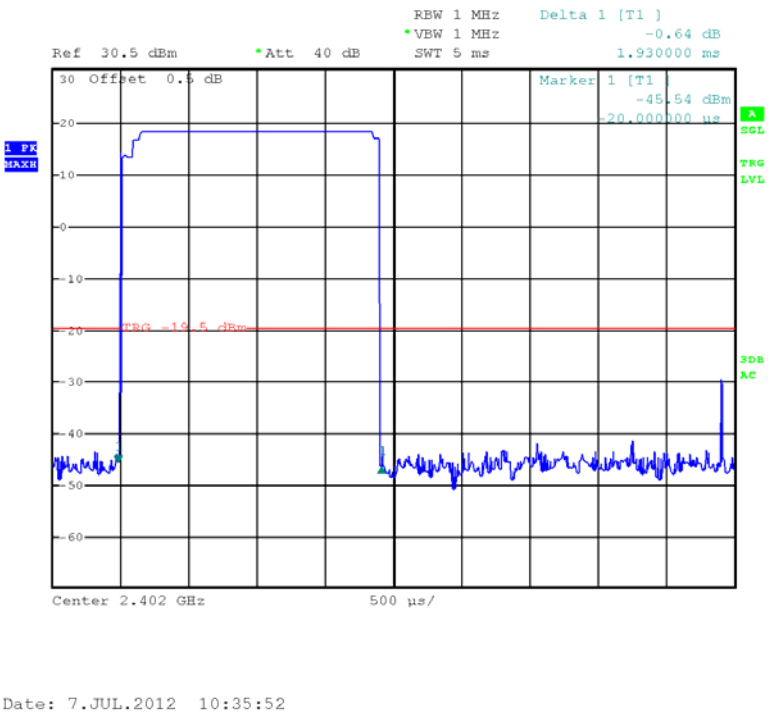
Date: 7.JUL.2012 10:33:53

DH3:

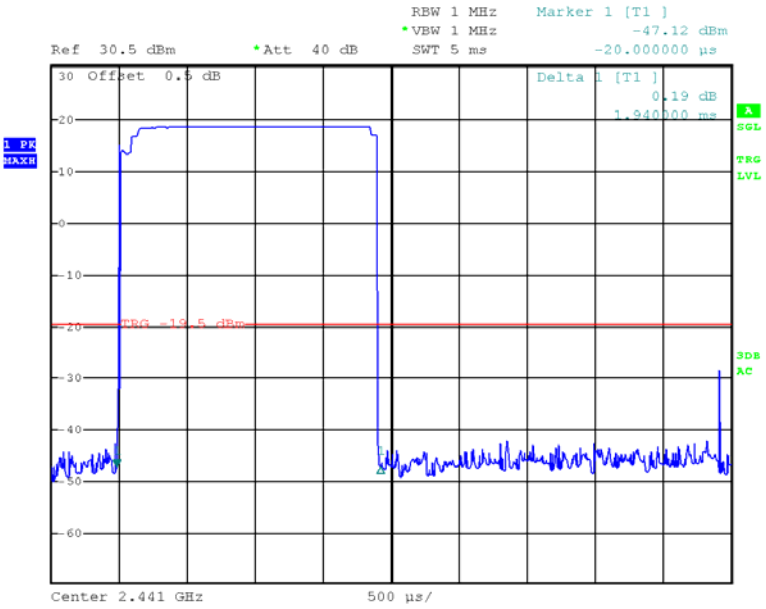
Test Mode: Transmitting

	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR Mode (GFSK)	Low	1.930	0.309	0.4	Pass
	Middle	1.940	0.310	0.4	Pass
	High	1.930	0.309	0.4	Pass
	Note: Dwell time = Pulse time(1600/4/79)*31.6S*				
EDR Mode (π/4-DQPSK)	Low	1.940	0.310	0.4	Pass
	Middle	1.940	0.310	0.4	Pass
	High	1.940	0.310	0.4	Pass
	Note: Dwell time = Pulse time(1600/4/79)*31.6S*				
EDR Mode (8DPSK)	Low	1.940	0.310	0.4	Pass
	Middle	1.940	0.310	0.4	Pass
	High	1.940	0.310	0.4	Pass
	Note: Dwell time = Pulse time(1600/4/79)*31.6S*				

BDR - Low Channel

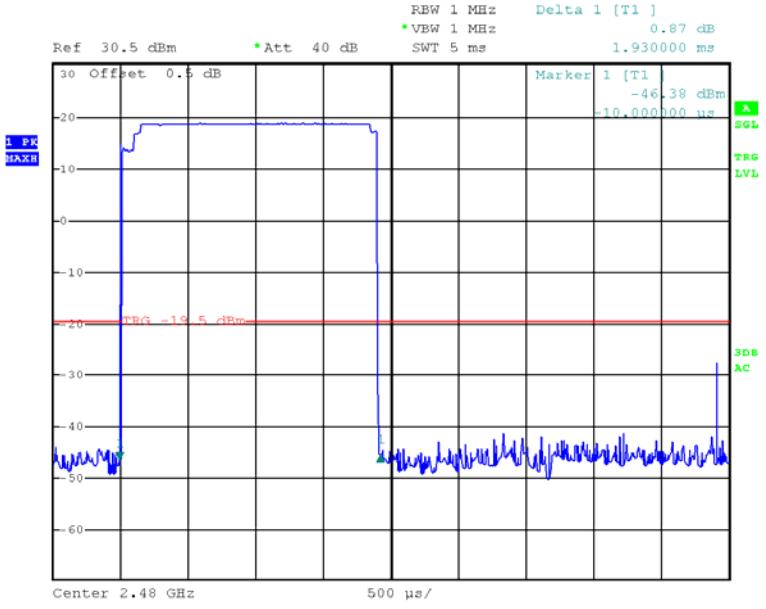


BDR - Middle Channel



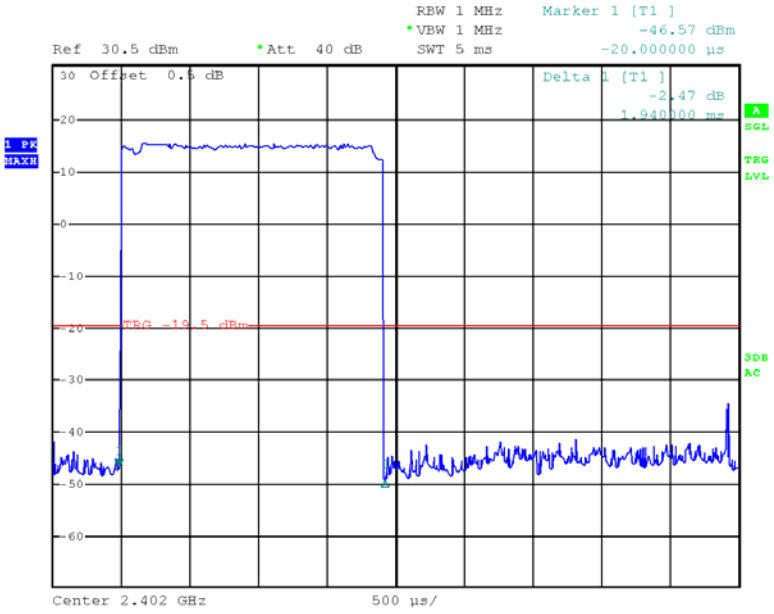
Date: 7.JUL.2012 10:35:36

BDR - High Channel



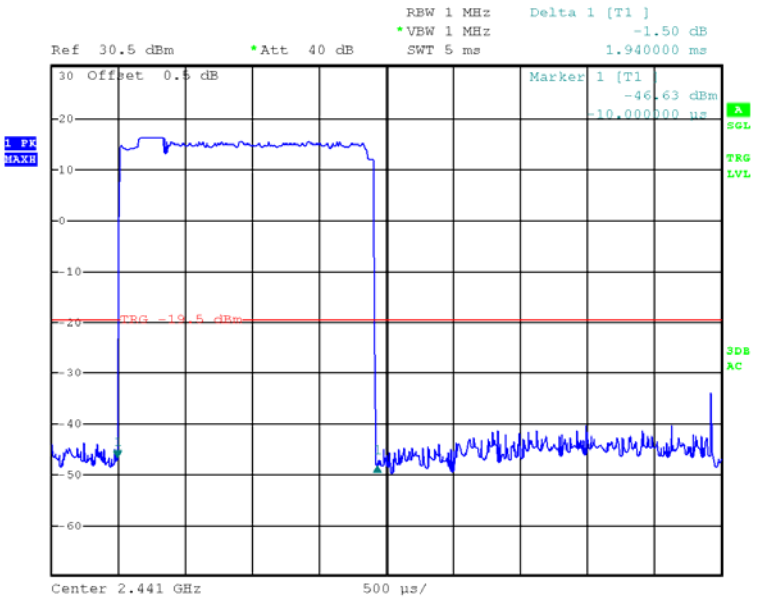
Date: 7.JUL.2012 10:35:13

EDR (π/4-DQPSK) - Low Channel



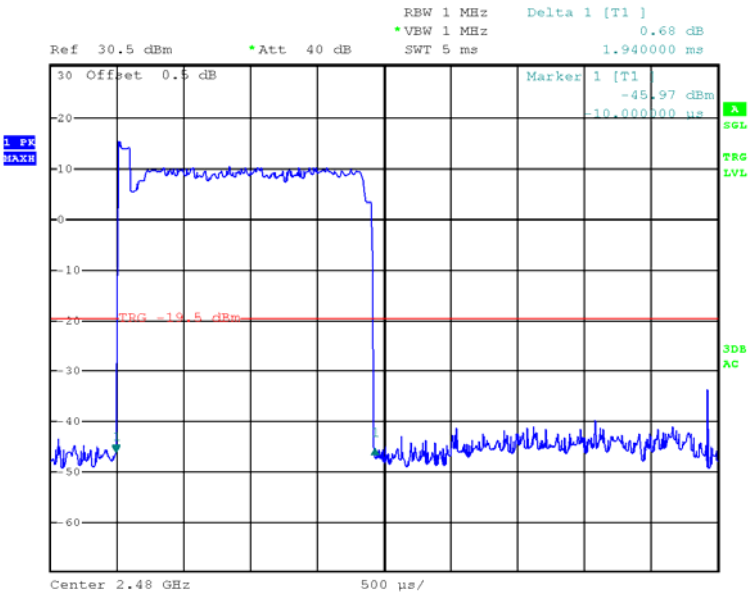
Date: 7.JUL.2012 10:36:58

EDR (π/4-DQPSK) - Middle Channel



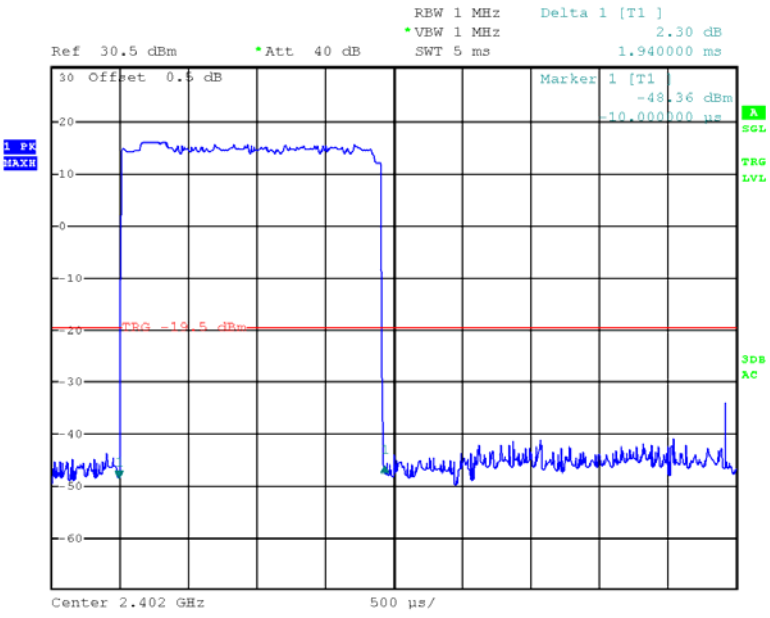
Date: 7.JUL.2012 10:37:23

EDR (π/4-DQPSK) - High Channel



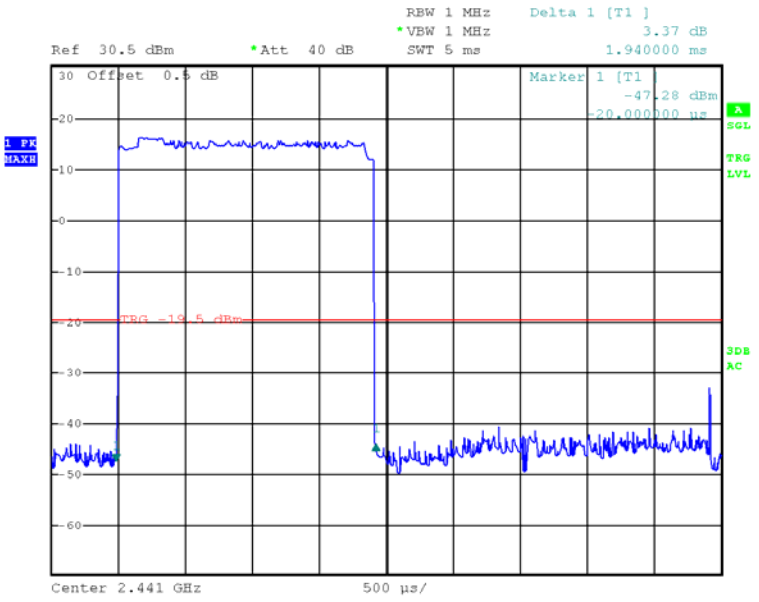
Date: 7.JUL.2012 10:38:06

EDR (8DPSK) - Low Channel



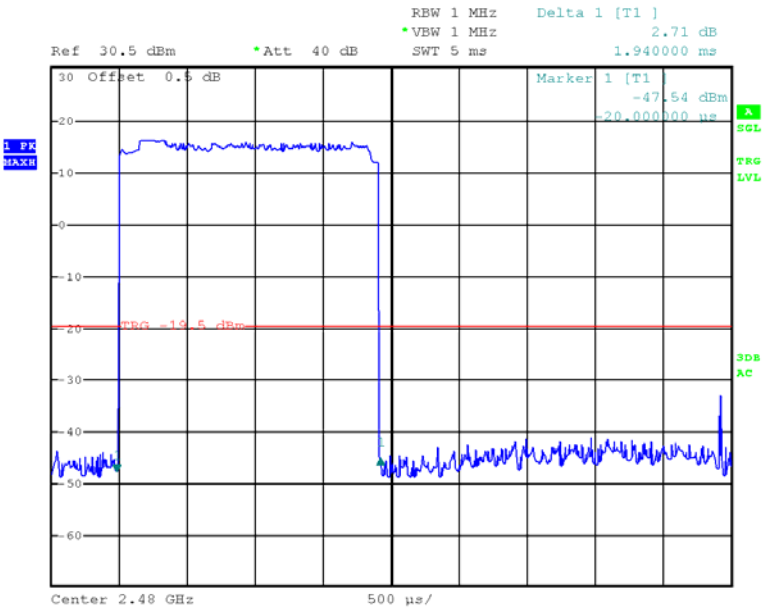
Date: 7.JUL.2012 10:40:01

EDR (8DPSK) - Middle Channel



Date: 7.JUL.2012 10:39:41

EDR (8DPSK) - High Channel



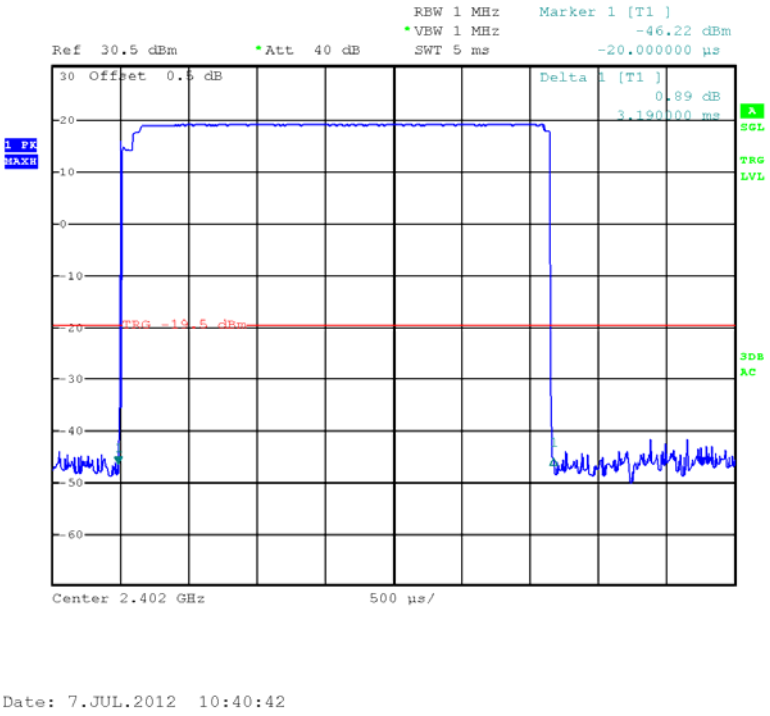
Date: 7.JUL.2012 10:39:03

DH5:

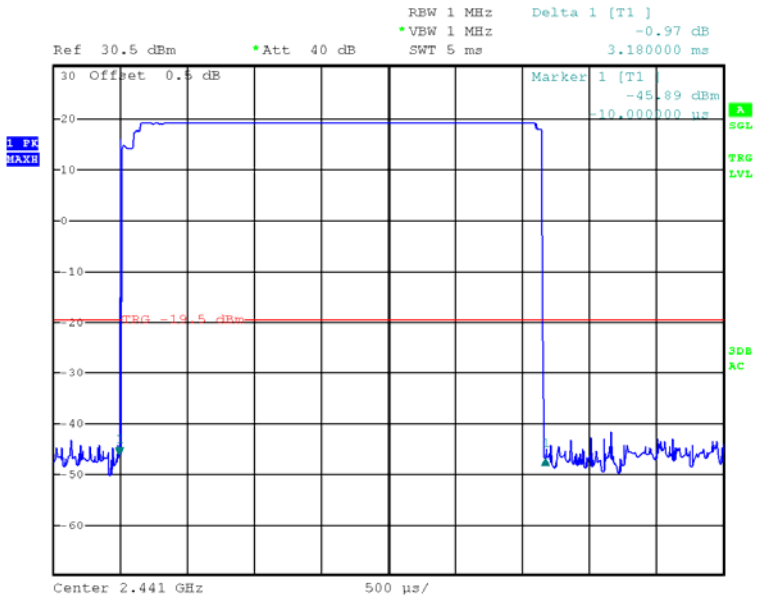
Test Mode: Transmitting

	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
BDR Mode (GFSK)	Low	3.190	0.340	0.4	Pass
	Middle	3.180	0.339	0.4	Pass
	High	3.180	0.339	0.4	Pass
	Note: Dwell time = Pulse time(1600/6/79)*31.6S*				
EDR Mode (π/4-DQPSK)	Low	3.200	0.341	0.4	Pass
	Middle	3.200	0.341	0.4	Pass
	High	3.200	0.341	0.4	Pass
	Note: Dwell time = Pulse time(1600/6/79)*31.6S*				
EDR Mode (8DPSK)	Low	3.200	0.341	0.4	Pass
	Middle	3.200	0.341	0.4	Pass
	High	3.200	0.341	0.4	Pass
	Note: Dwell time = Pulse time(1600/6/79)*31.6S*				

BDR - Low Channel

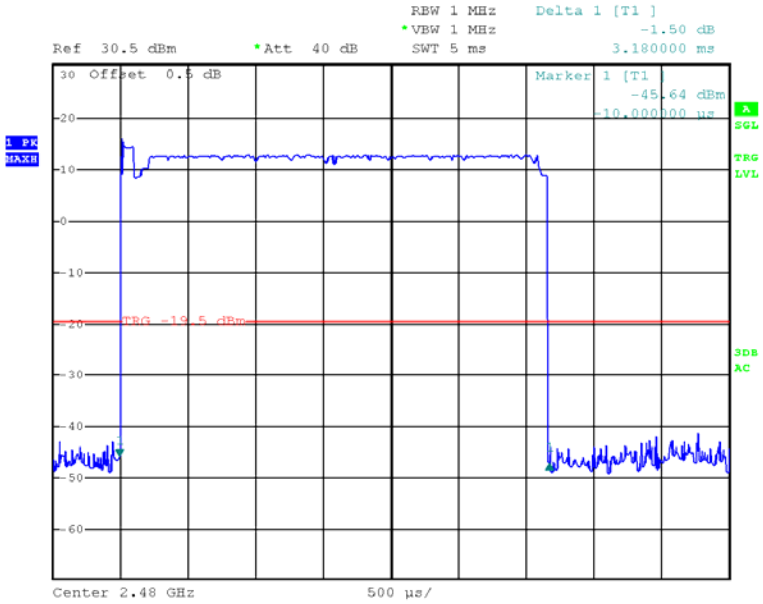


BDR - Middle Channel



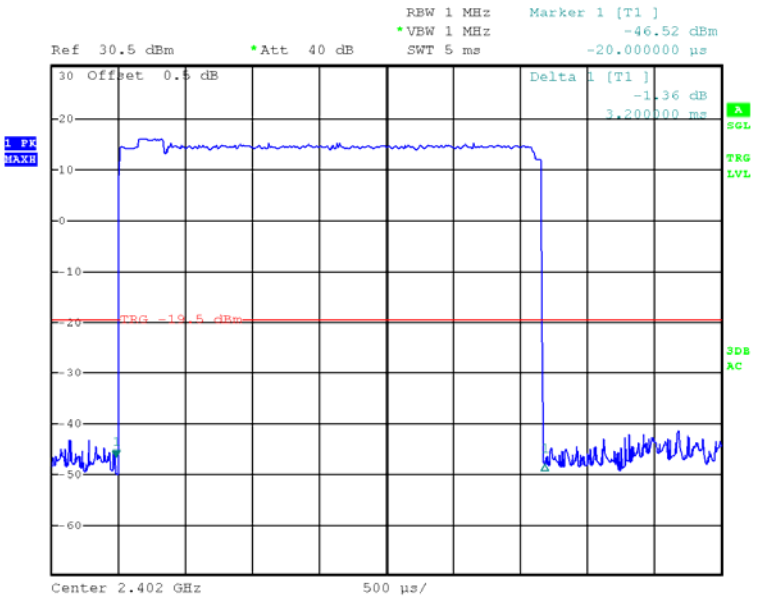
Date: 7.JUL.2012 10:41:33

BDR - High Channel



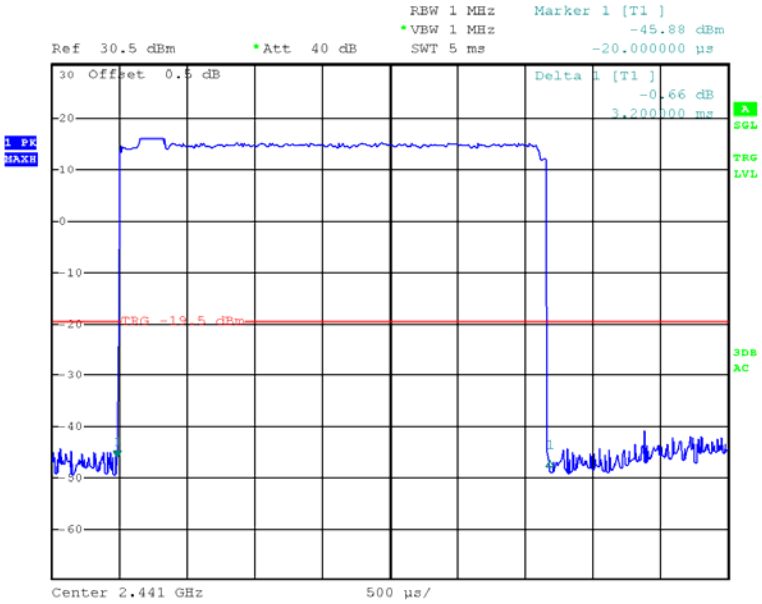
Date: 7.JUL.2012 10:42:10

EDR (π/4-DQPSK) - Low Channel



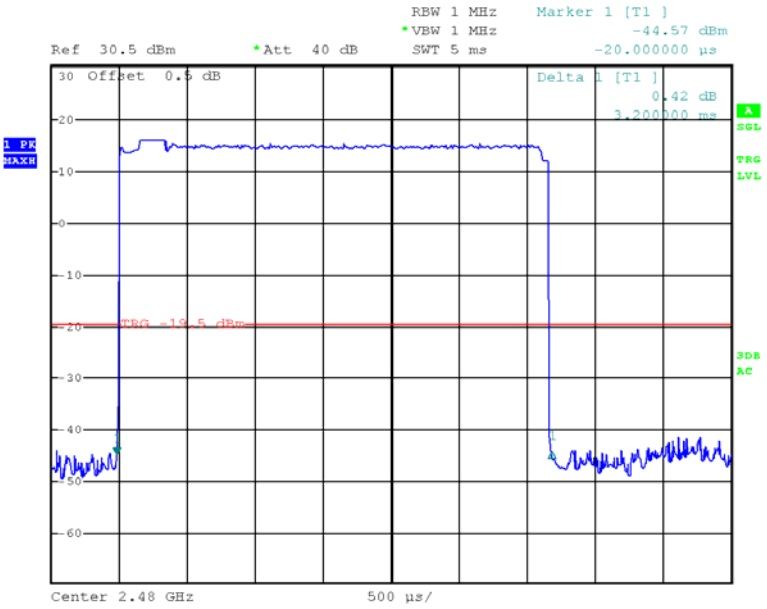
Date: 7.JUL.2012 10:43:59

EDR (π/4-DQPSK) - Middle Channel



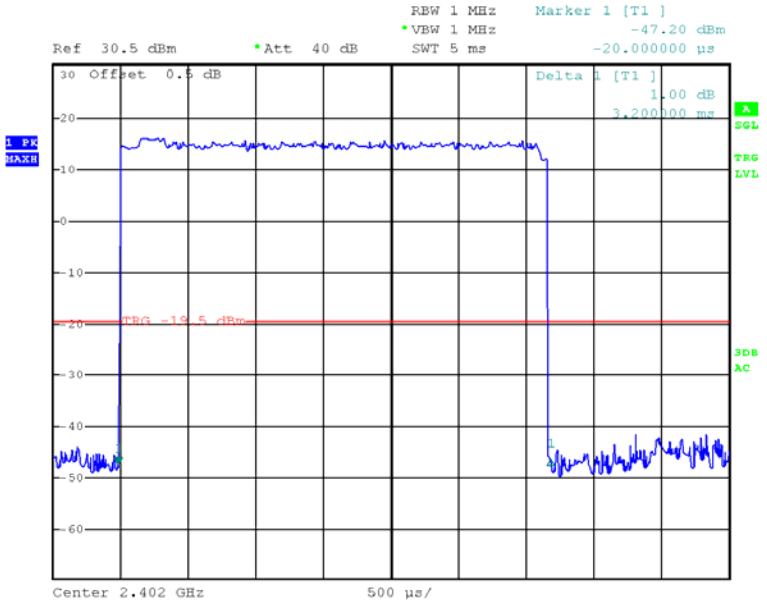
Date: 7.JUL.2012 10:43:46

EDR (π/4-DQPSK) - High Channel



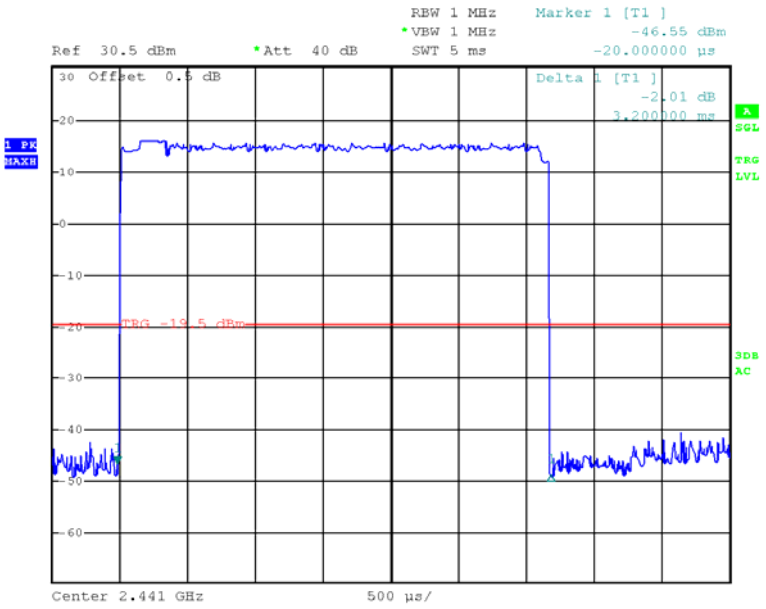
Date: 7.JUL.2012 10:42:52

EDR (8DPSK) - Low Channel



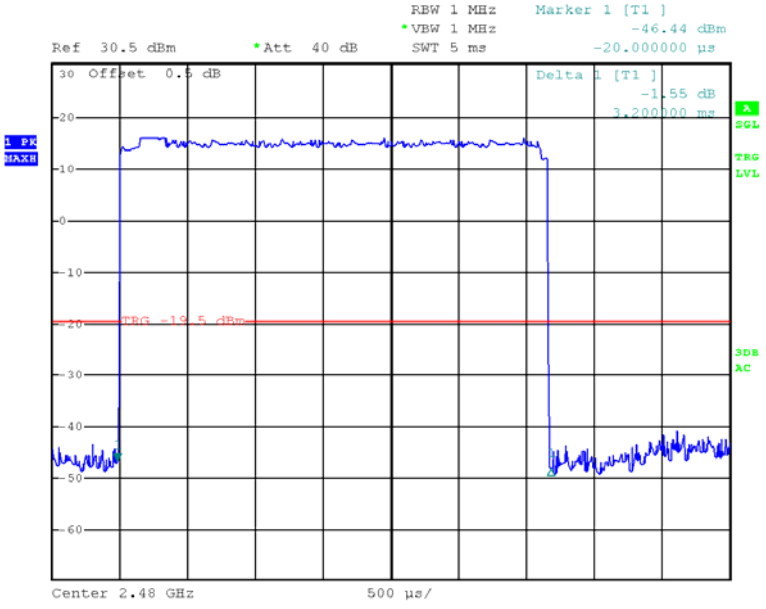
Date: 7.JUL.2012 10:44:21

EDR (8DPSK) - Middle Channel



Date: 7.JUL.2012 10:44:32

EDR (8DPSK) - High Channel



Date: 7.JUL.2012 10:44:48

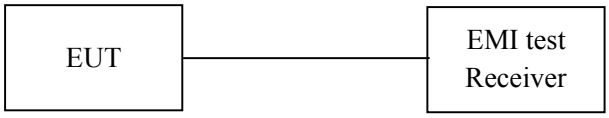
12 - FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

12.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9kPa

**The testing was performed by Kate Yang on 2012-07-06.*

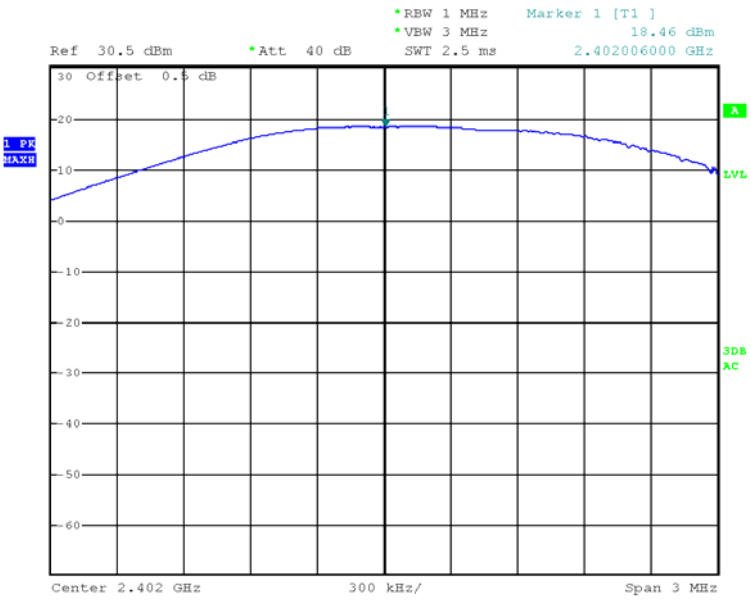
Test Result: Compliant,
Please refer to following plots.

Test Mode: Transmitting

	Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	18.46	30
	Middle	2441	18.67	30
	High	2480	18.8	30
EDR Mode (π/4-DQPSK)	Low	2402	18.29	30
	Middle	2441	18.11	30
	High	2480	17.86	30
EDR Mode (8DPSK)	Low	2402	18.29	30
	Middle	2441	18.08	30
	High	2480	17.86	30

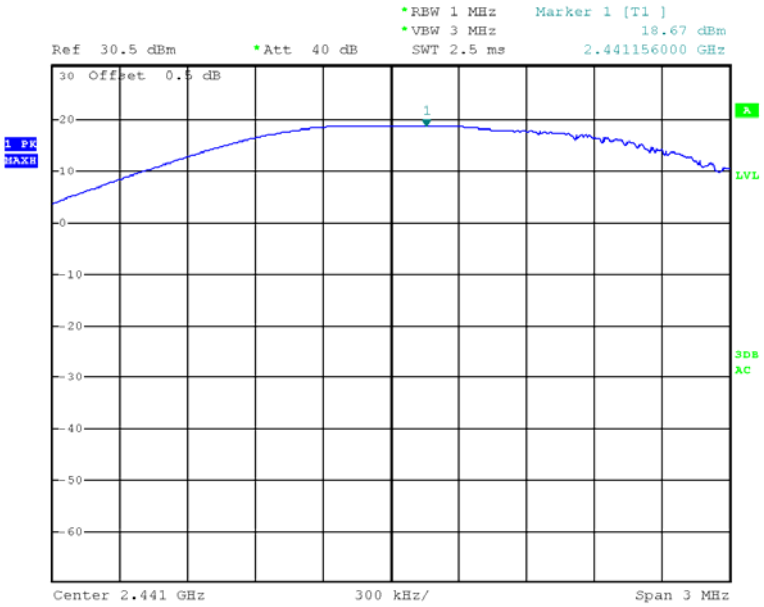
Note: The data above was tested in conducted mode.

BDR - Low Channel



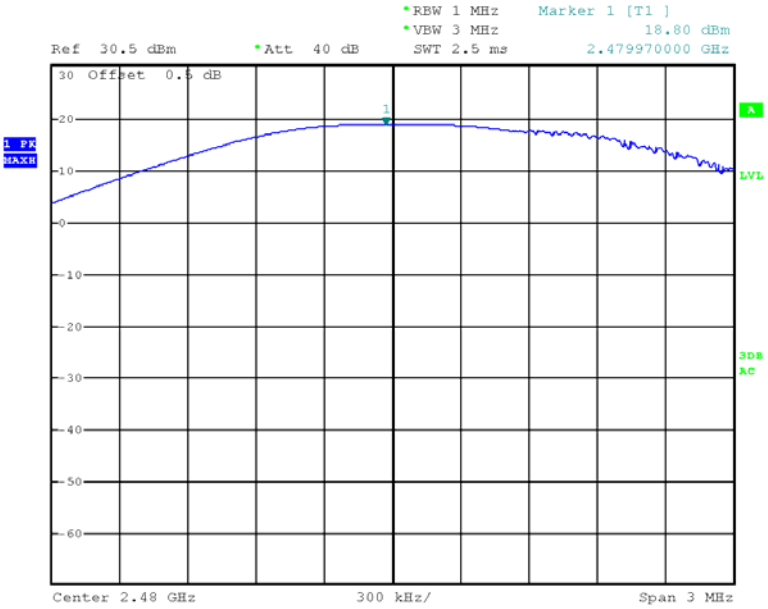
Date: 6.JUL.2012 17:01:20

BDR - Middle Channel



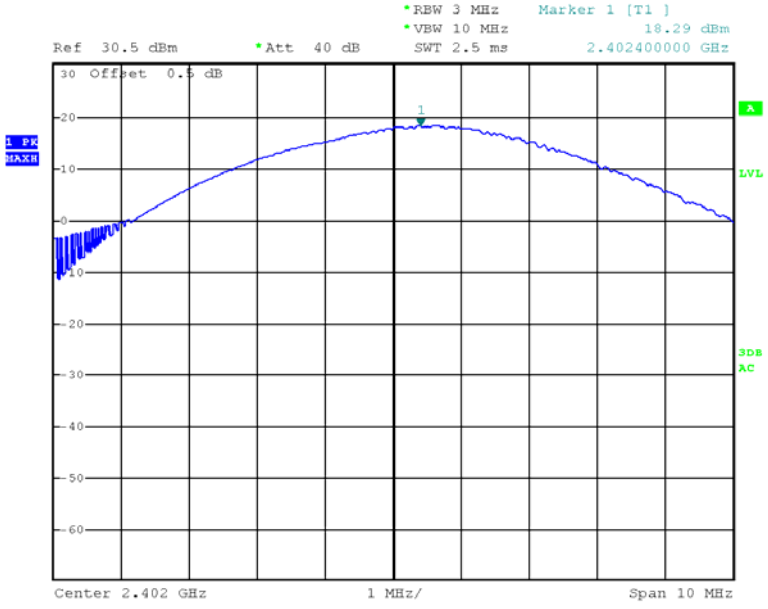
Date: 6.JUL.2012 17:01:49

BDR - High Channel



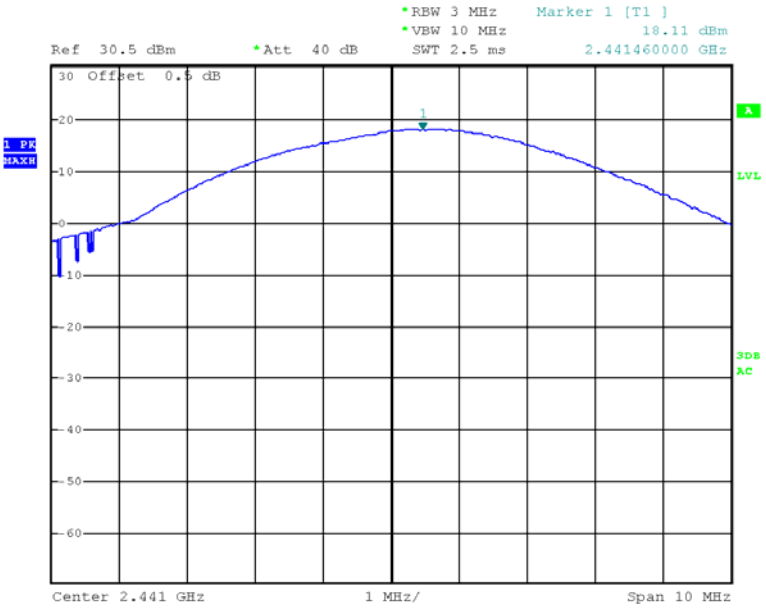
Date: 6.JUL.2012 17:02:12

EDR (π/4-DQPSK) - Low Channel



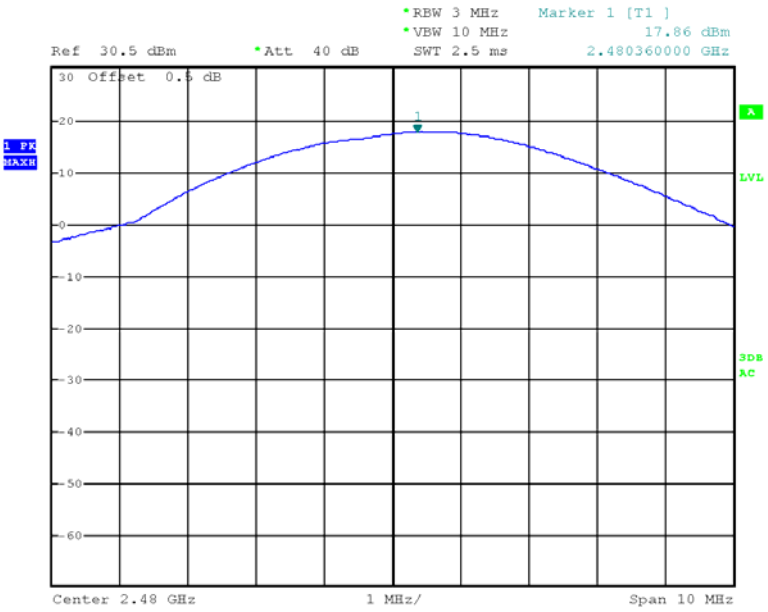
Date: 6.JUL.2012 17:05:49

EDR (π/4-DQPSK) - Middle Channel



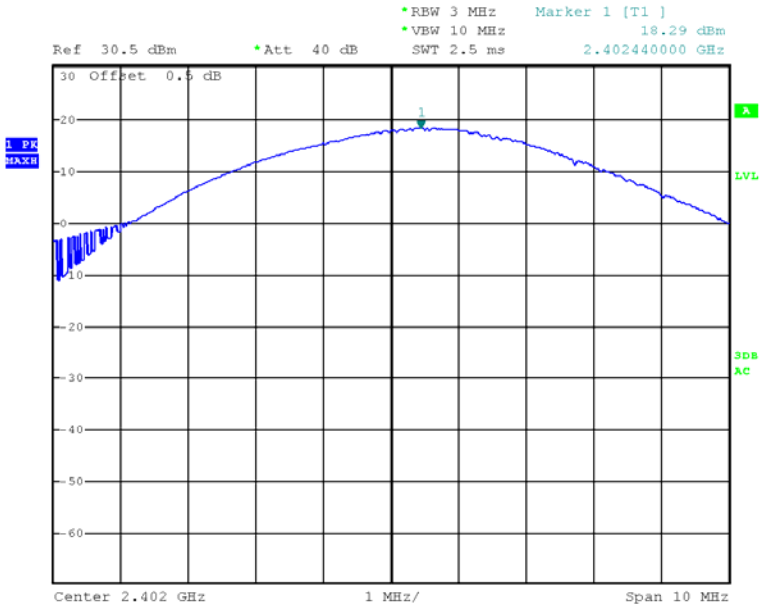
Date: 6.JUL.2012 17:03:50

EDR (π/4-DQPSK) - High Channel



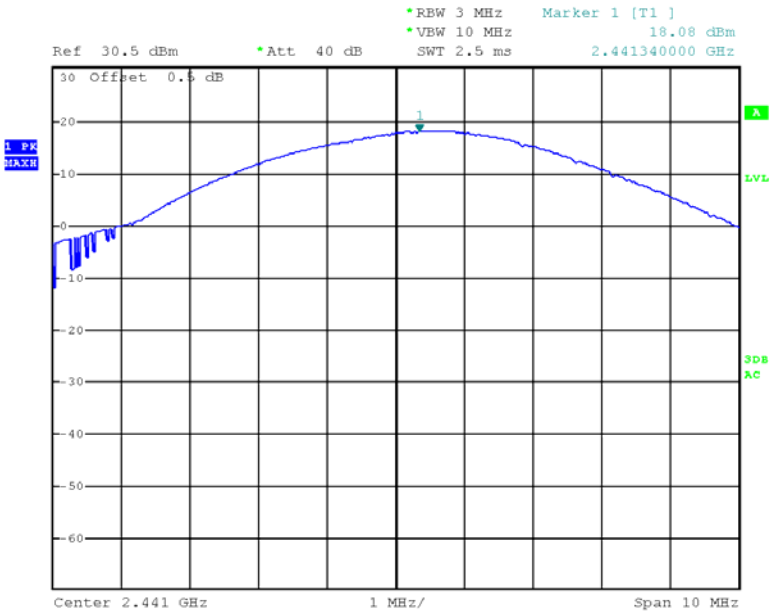
Date: 6.JUL.2012 17:03:26

EDR (8DPSK) - Low Channel



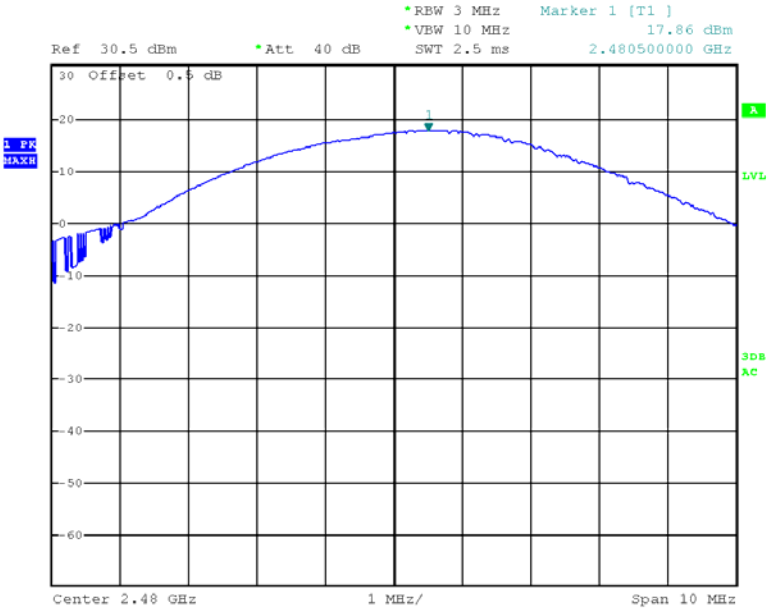
Date: 6.JUL.2012 17:06:11

EDR (8DPSK) - Middle Channel



Date: 6.JUL.2012 17:06:35

EDR (8DPSK) - High Channel



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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

13.4 Test Data

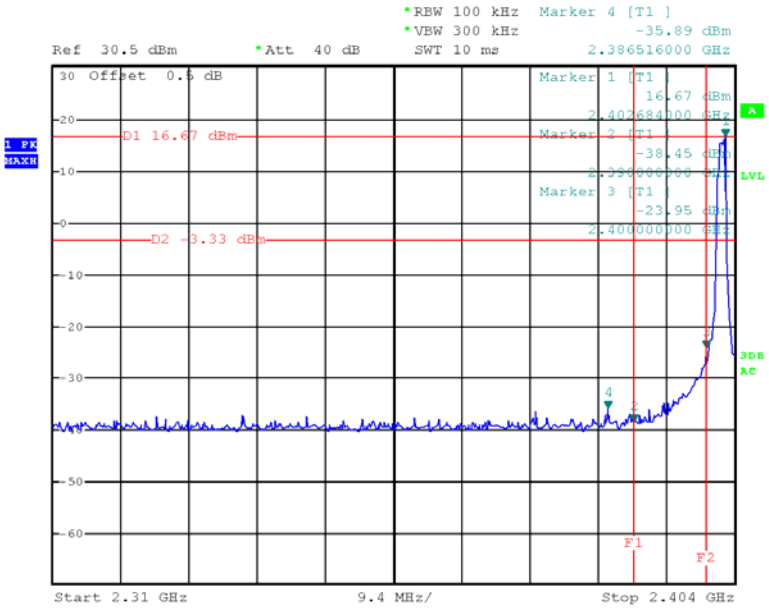
Environmental Conditions

Temperature:	26 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

**The testing was performed by Kate Yang on 2012-06-05.*

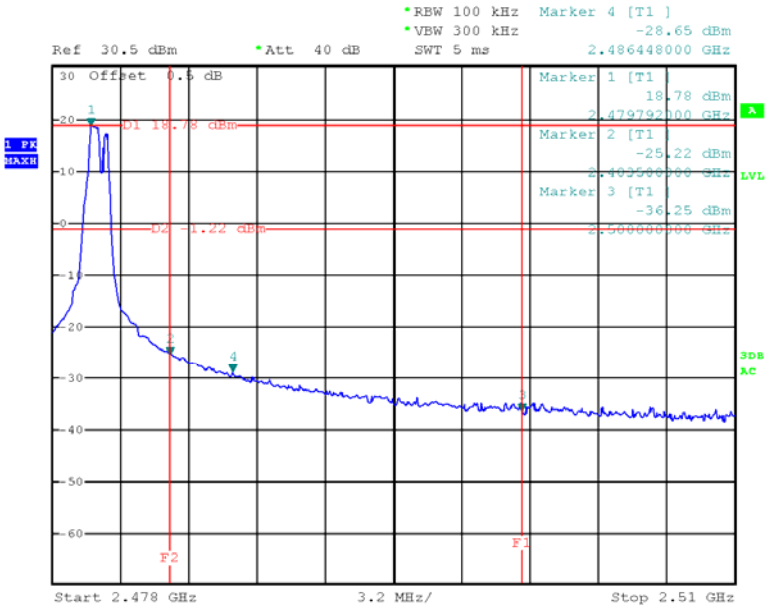
Test Result: Compliant,
Please refer to following plots.

BDR: Band Edge, Left Side



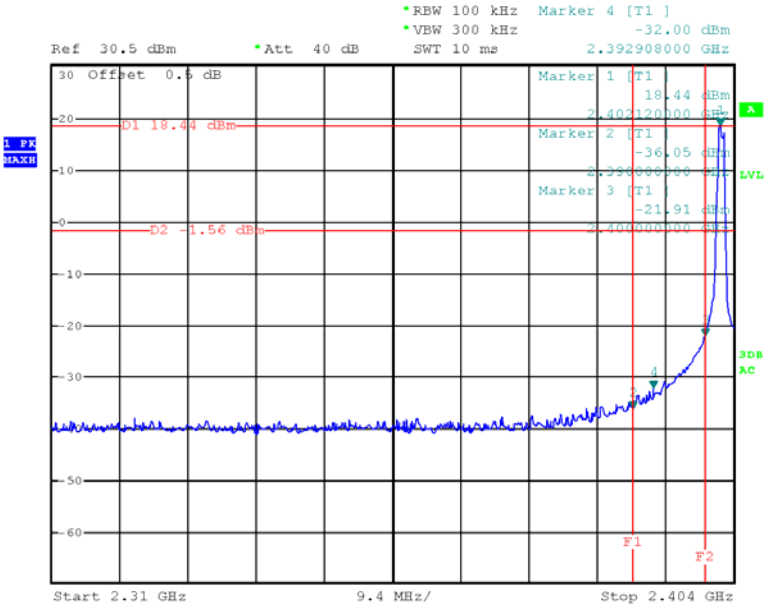
Date: 6.JUL.2012 17:42:34

BDR: Band Edge, Right Side



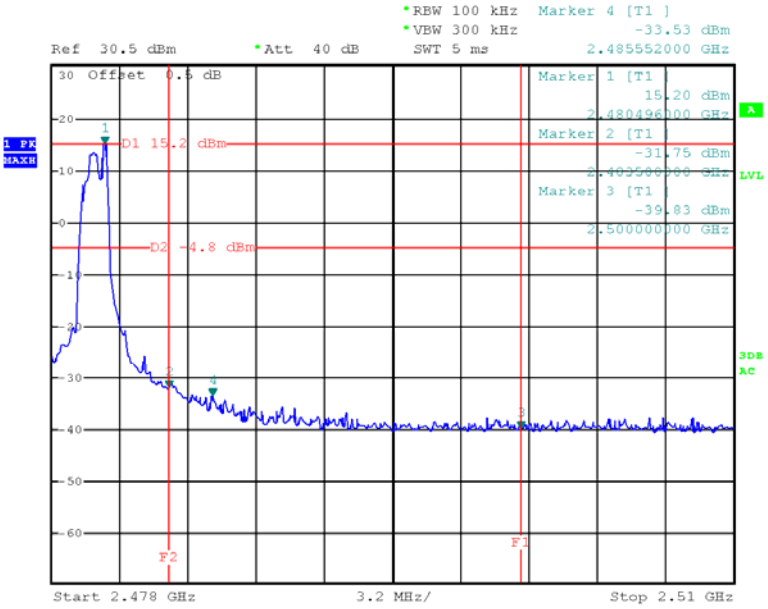
Date: 6.JUL.2012 17:19:03

EDR (π/4-DQPSK) : Band Edge, Left Side



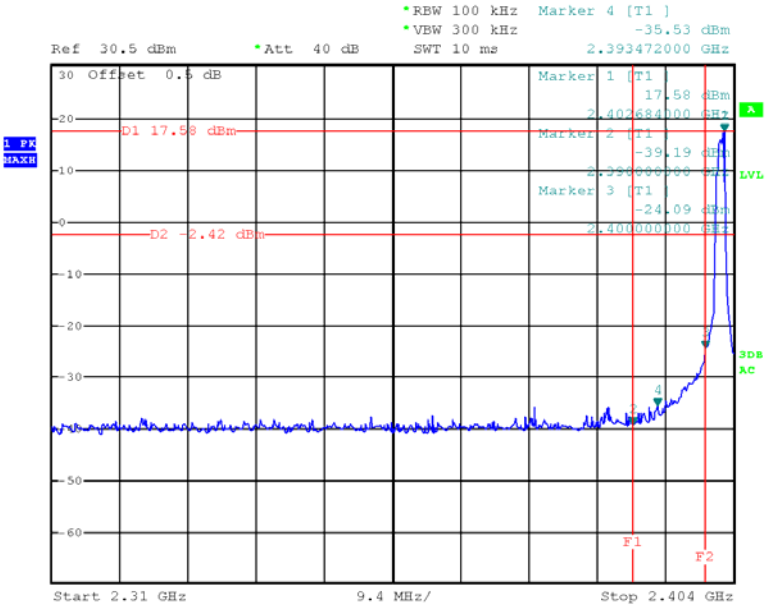
Date: 6.JUL.2012 17:43:51

EDR (π/4-DQPSK) : Band Edge, Right Side



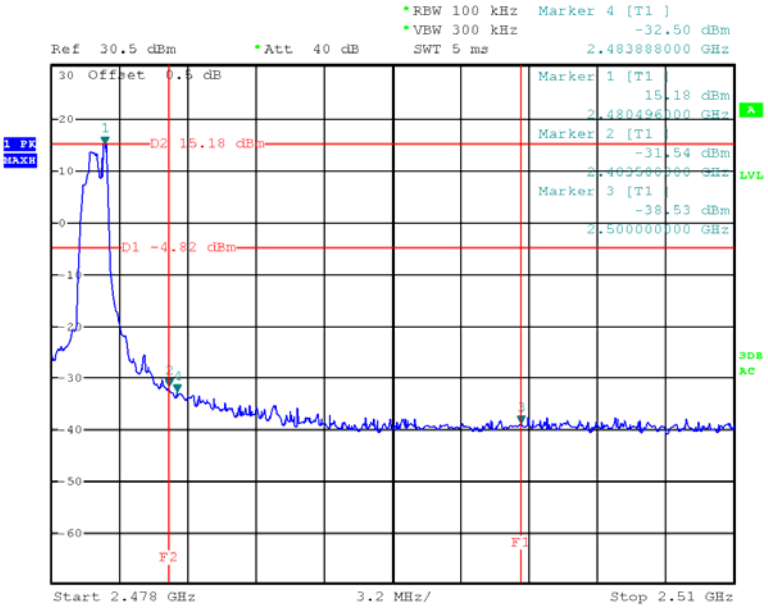
Date: 6.JUL.2012 17:39:27

EDR (8DPSK): Band Edge, Left Side



Date: 6.JUL.2012 17:45:05

EDR (8DPSK): Band Edge, Right Side



Date: 6.JUL.2012 17:40:45

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