

FCC PART 15.247 TEST REPORT

For

Hytera Communications Co., Ltd.

HYT Tower, Hi-Tech Industrial Park North, Nanshan District, Shenzhen, China

FCC ID: YAMADN01

Report Type: Original Report	Product Type: Wireless Audio Adapter
Test Engineer: <u>Gardon Zhang</u> <i>Gardon Zhang</i>	
Report Number: <u>RSZ131230002-00A</u>	
Report Date: <u>2014-01-20</u>	
Reviewed By: <u>Jimmy Xiao</u> <i>Jimmy Xiao</i>	
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

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

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	4
TEST FACILITY	4
SYSTEM TEST CONFIGURATION.....	5
DESCRIPTION OF TEST CONFIGURATION	5
EUT EXERCISE SOFTWARE	5
SPECIAL ACCESSORIES.....	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
BLOCK DIAGRAM OF TEST SETUP	5
SUMMARY OF TEST RESULTS	6
FCC §15.247 (i) & §2.1093 – RF EXPOSURE	7
APPLICABLE STANDARD	7
RESULT	7
FCC §15.203 – ANTENNA REQUIREMENT	8
APPLICABLE STANDARD	8
ANTENNA CONNECTOR CONSTRUCTION	8
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS.....	9
APPLICABLE STANDARD	9
MEASUREMENT UNCERTAINTY.....	9
EUT SETUP	9
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	10
TEST PROCEDURE	10
CORRECTED AMPLITUDE & MARGIN CALCULATION	10
TEST EQUIPMENT LIST AND DETAILS.....	10
TEST RESULTS SUMMARY	11
TEST DATA	11
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST	14
APPLICABLE STANDARD	14
TEST PROCEDURE	14
TEST EQUIPMENT LIST AND DETAILS.....	14
TEST DATA	14
FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH.....	21
APPLICABLE STANDARD	21
TEST PROCEDURE	21
TEST EQUIPMENT LIST AND DETAILS.....	21
TEST DATA	21
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST	27
APPLICABLE STANDARD	27
TEST PROCEDURE	27
TEST EQUIPMENT LIST AND DETAILS.....	27

TEST DATA	27
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME).....	30
APPLICABLE STANDARD	30
TEST PROCEDURE	30
TEST EQUIPMENT LIST AND DETAILS.....	30
TEST DATA	30
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT	46
APPLICABLE STANDARD	46
TEST PROCEDURE	46
TEST EQUIPMENT LIST AND DETAILS.....	46
TEST DATA	46
FCC §15.247(d) - BAND EDGES TESTING	52
APPLICABLE STANDARD	52
TEST PROCEDURE	52
TEST EQUIPMENT LIST AND DETAILS.....	52
TEST DATA	52

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Co., Ltd.*'s product, model number: *ADN-01 (FCC ID: YAMADN01)* or the "EUT" in this report was a *Wireless Audio Adapter*, which was measured approximately: 5.6 cm (L) x 2.1 cm (W) x 1.7 cm (H), rated with input voltage: DC 7.4 V.

**All measurement and test data in this report was gathered from production sample serial number: 1312143 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-12-30.*

Objective

This test report is prepared on behalf of *Hytera Communications Co., Ltd.* 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, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No related submittal.

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 at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.91 dB for 30MHz-1GHz, and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) 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 December 06, 2010. 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.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was controlled by the test software.

EUT Exercise Software

CSR 2.4.8

Special Accessories

No special accessory.

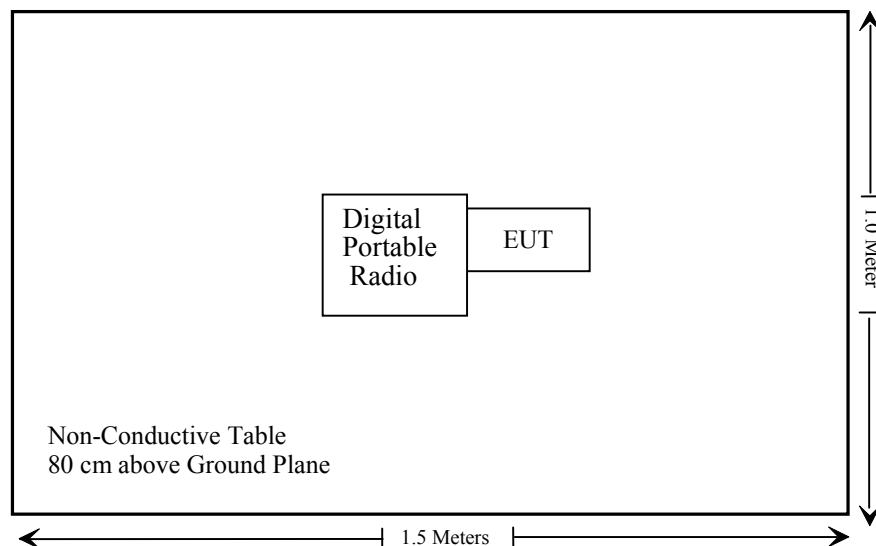
Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Hytera	Digital Portable Radio	PD780 U(1)	N/A

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	20 dB Emission 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

FCC §15.247 (i) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 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 General RF Exposure Guidance v05

Result

According to FCC KDB 447498 D01 General RF Exposure Guidance v05 generic portable criteria

The distance between antenna and test point is 5 mm
The Max output power: 3.02 dBm (2.004 mW)

According to the Appendix A of KDB 447498, the exclusion thresholds for 2450 MHz is 10 mW.

Conclusion:

The time-averaged output power is 2.004 mW < the exclusion thresholds 10 mW, so stand-alone SAR evaluation is not required.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has one integral antenna arrangement for bluetooth, which was permanently attached and the antenna gain is -1.5 dBi, fulfill the requirement of this section. Please refer to the internal photos.

Result: Compliance.

FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

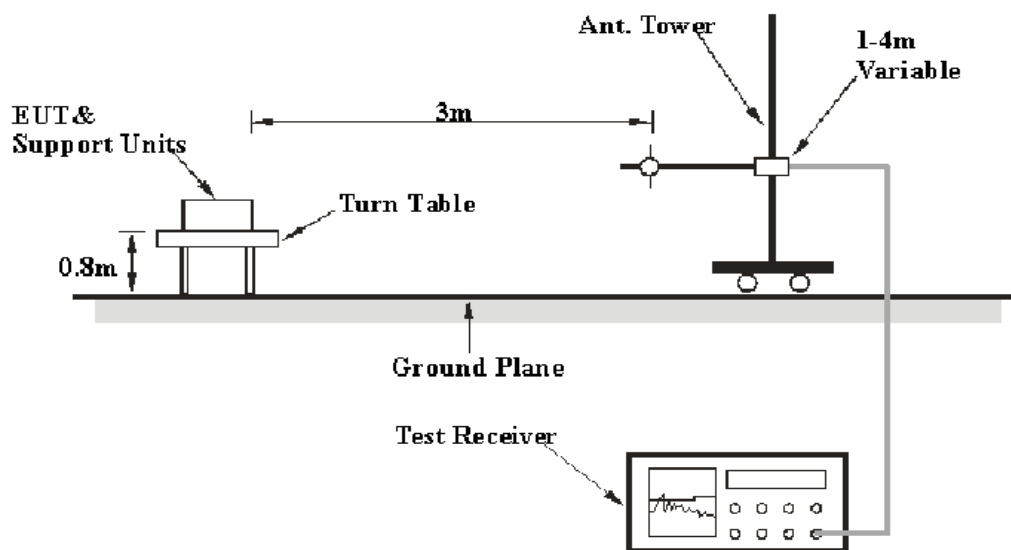
FCC §15.205; §15.209; §15.247(d)

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 CISPR 16-4-2:2011, the expanded combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.91 dB for 30MHz-1GHz, and 4.92 dB for above 1GHz. And this uncertainty will not be taken into consideration for the test data recorded in the report.

EUT Setup



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC 15.209 and FCC 15.247 limits.

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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

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

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

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2013-09-30	2014-09-30
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-17	2014-09-17
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Mini	Amplifier	ZVA-183-S+	5969001149	2013-04-03	2014-04-03
A.H. System	Horn Antenna	SAS-200/571	135	2012-02-11	2015-02-10
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2013-11-12	2014-11-12
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2013-10-14	2016-10-13
R&S	Auto test Software	EMC32	V9.10	--	--

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

Test Results Summary

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

4.42 dB at 396.7 MHz in the Horizontal polarization

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(L_m)} \leq L_{lim} + U_{cispr}$$

in BACL., $U_{(L_m)}$ is less than $+ U_{cispr}$, if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Gardon Zhang on 2014-01-16.

EUT operation mode: Transmitting

30 MHz -25 GHz: (Scan with GFSK, $\pi/4$ -DQPSK, 8-DPSK mode, the worst case is BDR Mode (GFSK))

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402 MHz)									
396.7	52.37	QP	268	1.0	H	-11.2	41.17	46	4.83
2402.0	92.67	PK	186	1.9	H	5.48	98.15	/	/
2402.0	82.59	Ave.	186	1.9	H	5.48	88.07	/	/
2402.0	95.24	PK	356	1.3	V	5.48	100.72	/	/
2402.0	85.13	Ave.	356	1.3	V	5.48	90.61	/	/
2341.8	35.02	PK	122	1.2	H	5.48	40.50	74	33.50
2341.8	20.74	Ave.	122	1.2	H	5.48	26.22	54	27.78
2375.9	41.98	PK	24	1.5	V	5.48	47.46	74	26.54
2375.9	26.54	Ave.	24	1.5	V	5.48	32.02	54	21.98
2483.9	37.89	PK	129	1.4	V	7.21	45.10	74	28.90
2483.9	25.04	Ave.	129	1.4	V	7.21	32.25	54	21.75
4804.0	41.73	PK	171	1.1	H	12.44	54.17	74	19.83
4804.0	27.59	Ave.	171	1.1	H	12.44	40.03	54	13.97
7206.0	36.18	PK	81	1.8	H	17.06	53.24	74	20.76
7206.0	23.34	Ave.	81	1.8	H	17.06	40.40	54	13.60
9608.0	35.80	PK	271	1.8	H	19.28	55.08	74	18.92
9608.0	21.09	Ave.	271	1.8	H	19.28	40.37	54	13.63
Middle Channel (2441 MHz)									
396.7	52.78	QP	264	1.0	H	-11.2	41.58	46	4.42
2441.0	90.57	PK	163	2.4	H	6.13	96.7	/	/
2441.0	78.74	Ave.	163	2.4	H	6.13	84.87	/	/
2441.0	95.32	PK	156	2.3	V	6.13	101.45	/	/
2441.0	84.65	Ave.	156	2.3	V	6.13	90.78	/	/
2375.1	37.06	PK	213	2.1	V	5.48	42.54	74	31.46
2375.1	25.09	Ave.	213	2.1	V	5.48	30.57	54	23.43
2483.9	48.09	PK	78	1.0	V	7.21	55.30	74	18.70
2483.9	34.15	Ave.	78	1.0	V	7.21	41.36	54	12.64
2492.5	37.19	PK	222	2.4	H	7.21	44.40	74	29.60
2492.5	24.61	Ave.	222	2.4	H	7.21	31.82	54	22.18
4882.0	40.69	PK	72	2.1	V	12.4	53.09	74	20.91
4882.0	27.39	Ave.	72	2.1	V	12.4	39.79	54	14.21
7323.0	36.35	PK	275	2.2	V	16.49	52.84	74	21.16
7323.0	24.75	Ave.	275	2.2	V	16.49	41.24	54	12.76
9764.0	35.29	PK	70	2.4	V	19.4	54.69	74	19.31
9764.0	20.77	Ave.	70	2.4	V	19.4	40.17	54	13.83

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2480 MHz)									
396.7	52.06	QP	272	1.0	H	-11.2	40.86	46	5.14
2480.0	89.44	PK	171	1.2	H	7.21	96.65	/	/
2480.0	78.53	Ave.	171	1.2	H	7.21	85.74	/	/
2480.0	92.92	PK	195	2.2	V	7.21	100.13	/	/
2480.0	81.89	Ave.	195	2.2	V	7.21	89.1	/	/
2365.8	35.70	PK	168	1.2	V	5.48	41.18	74	32.82
2365.8	24.36	Ave.	168	1.2	V	5.48	29.84	54	24.16
2483.5	47.74	PK	305	1.1	V	7.21	54.95	74	19.05
2483.5	32.32	Ave.	305	1.1	V	7.21	39.53	54	14.47
2492.0	37.04	PK	124	1.5	H	7.21	44.25	74	29.75
2492.0	24.38	Ave.	124	1.5	H	7.21	31.59	54	22.41
4960.0	40.57	PK	289	2.3	H	12.5	53.07	74	20.93
4960.0	27.08	Ave.	289	2.3	H	12.5	39.58	54	14.42
7440.0	36.21	PK	198	2.4	V	15.9	52.11	74	21.89
7440.0	24.35	Ave.	198	2.4	V	15.9	40.25	54	13.75
9920.0	34.51	PK	275	2.2	V	19.39	53.90	74	20.10
9920.0	20.07	Ave.	275	2.2	V	19.39	39.46	54	14.54

Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

FCC §15.247(a) (1)-CHANNEL SEPARATION TEST**Applicable Standard**

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

Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-17	2014-09-17

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

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Gardon Zhang on 2013-12-31.

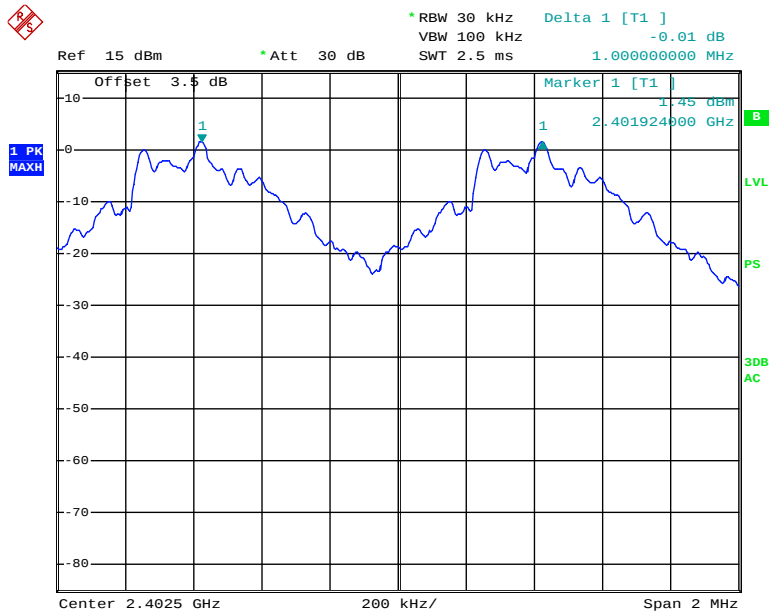
EUT operation mode: Transmitting

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

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	$\geq$ Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.000	0.616	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.616	Pass
	Adjacent	2442			
	High	2480	1.000	0.616	Pass
	Adjacent	2479			
EDR ($\pi/4$-DQPSK)	Low	2402	1.002	0.805	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.805	Pass
	Adjacent	2442			
	High	2480	1.002	0.805	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.002	0.808	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.808	Pass
	Adjacent	2442			
	High	2480	1.002	0.808	Pass
	Adjacent	2479			

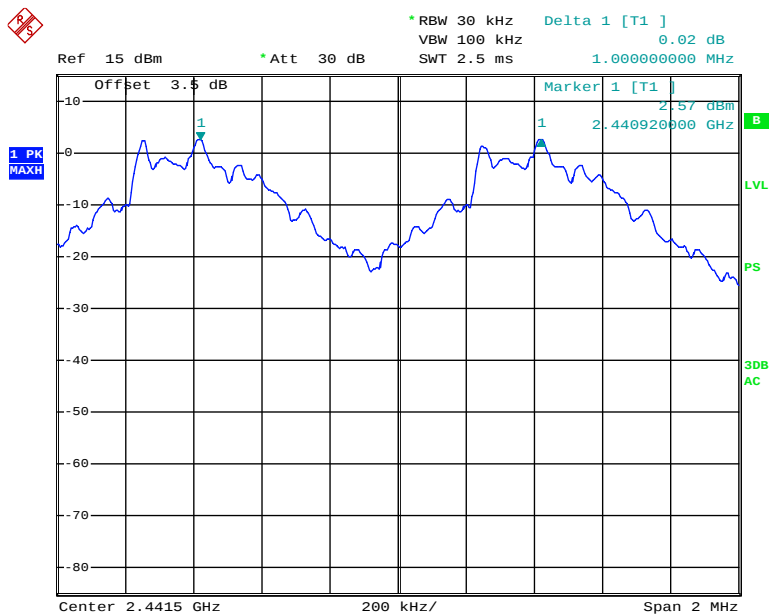
Note: Limit = 20 dB bandwidth *2/3

BDR (GFSK): Low Channel



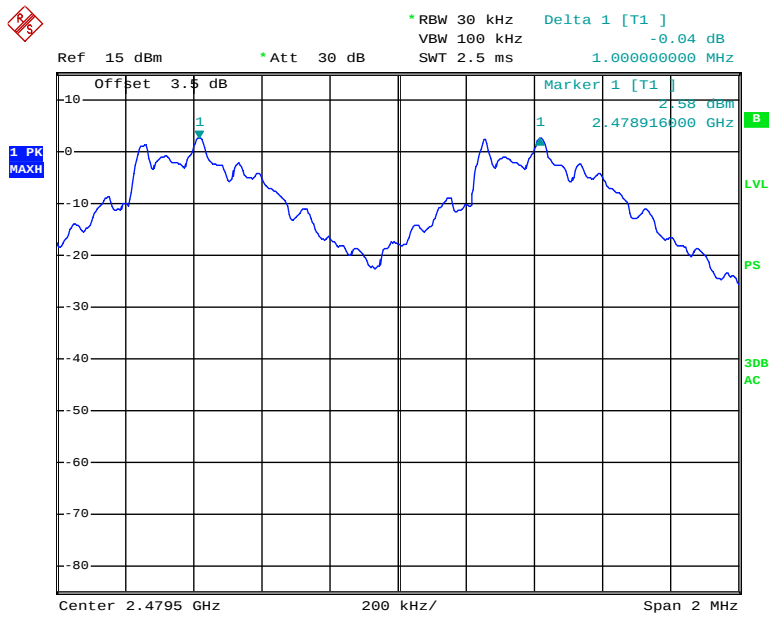
Date: 31.DEC.2013 14:39:56

BDR (GFSK): Middle Channel



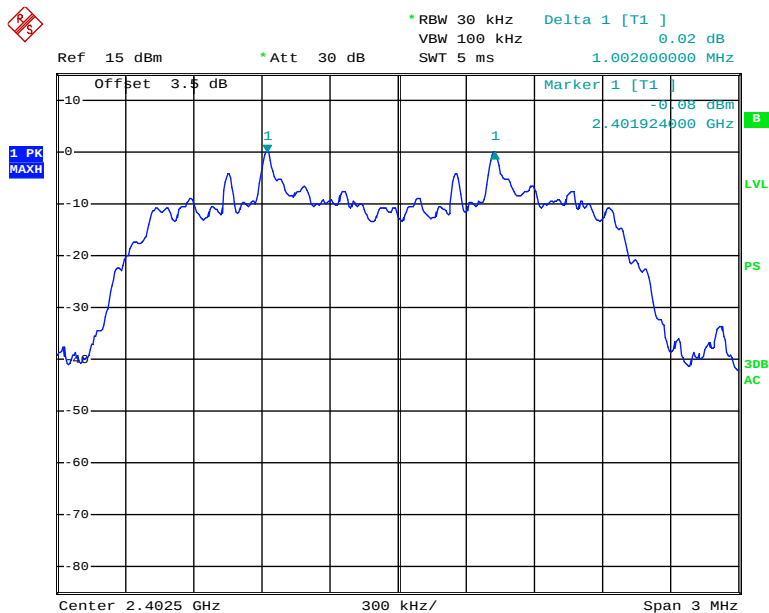
Date: 31.DEC.2013 14:41:28

BDR (GFSK): High Channel



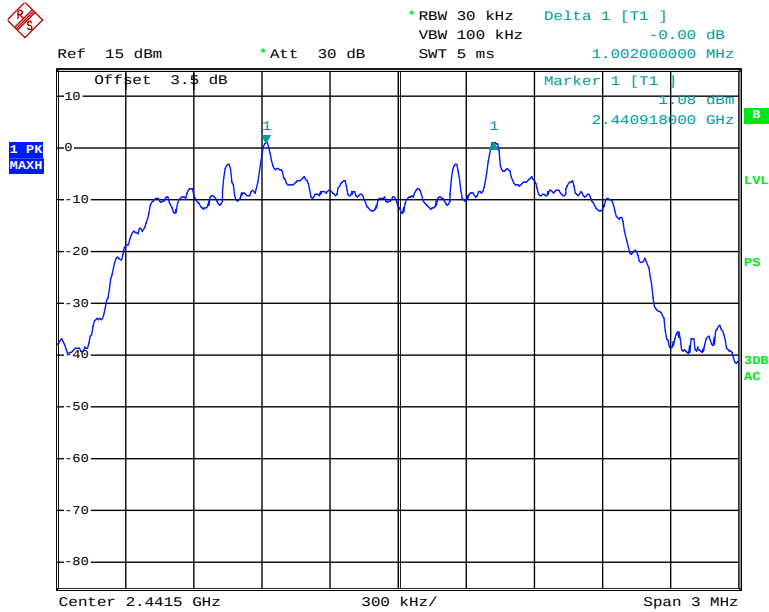
Date: 31.DEC.2013 14:44:18

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



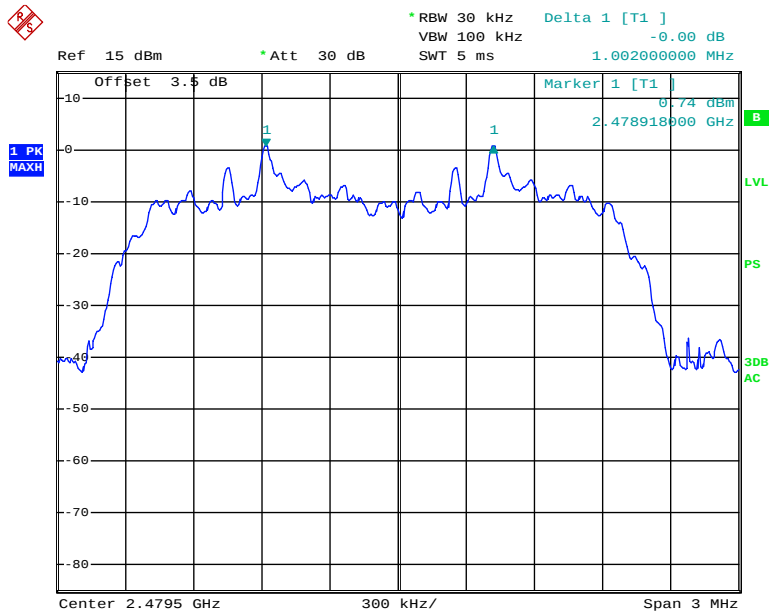
Date: 31.DEC.2013 14:48:14

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



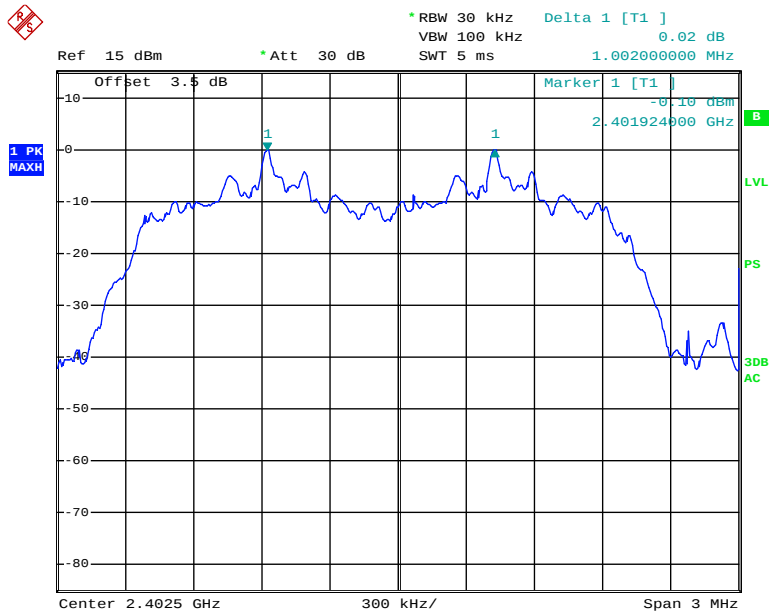
Date: 31.DEC.2013 14:50:04

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



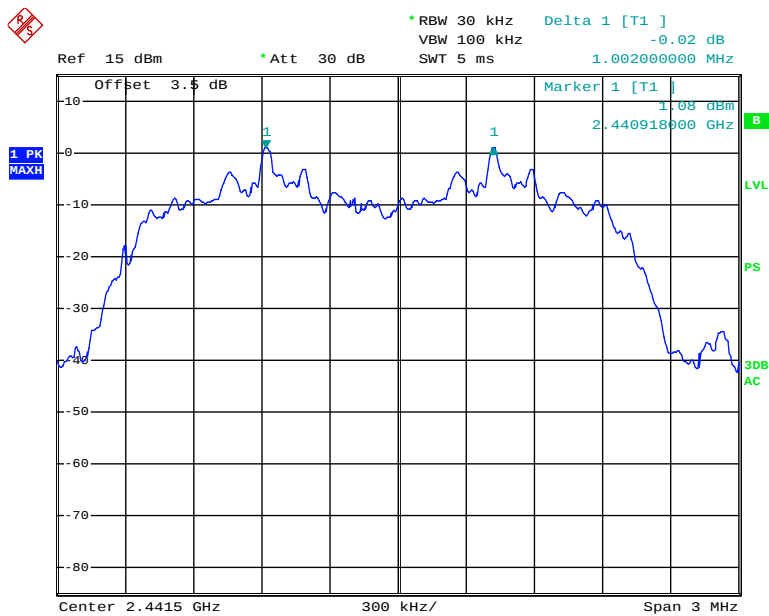
Date: 31.DEC.2013 14:51:14

EDR (8DPSK): Low Channel



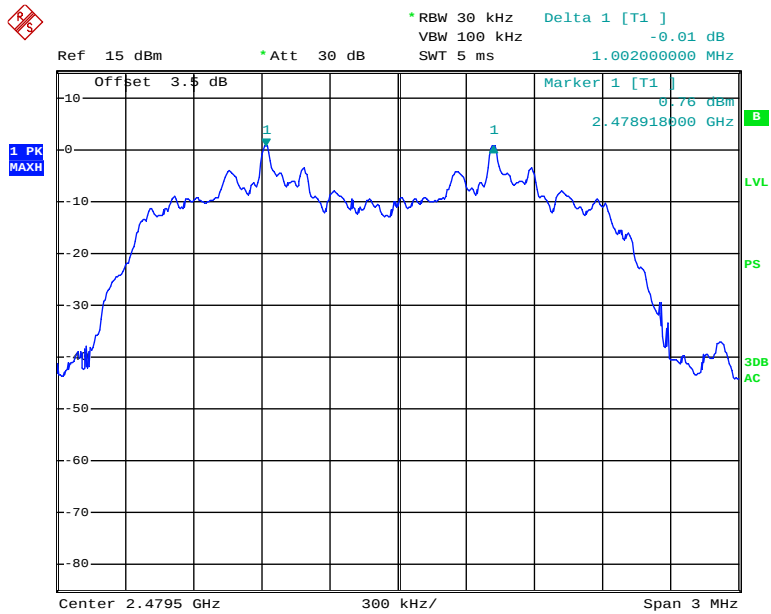
Date: 31.DEC.2013 14:52:31

EDR (8DPSK): Middle Channel



Date: 31.DEC.2013 14:54:26

EDR (8DPSK): High Channel



Date: 31.DEC.2013 14:57:57

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

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-17	2014-09-17

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

Test Data**Environmental Conditions**

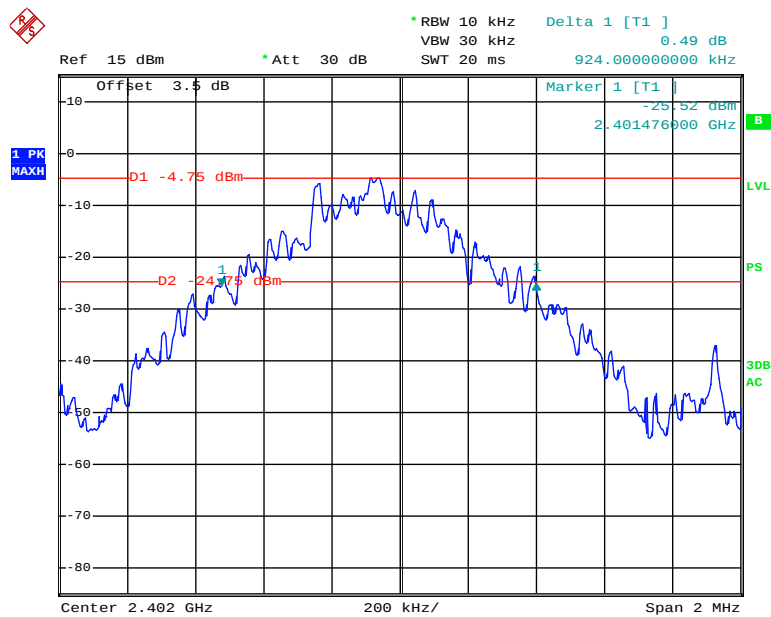
Temperature:	22 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Gardon Zhang on 2013-12-31.

EUT operation mode: Transmitting

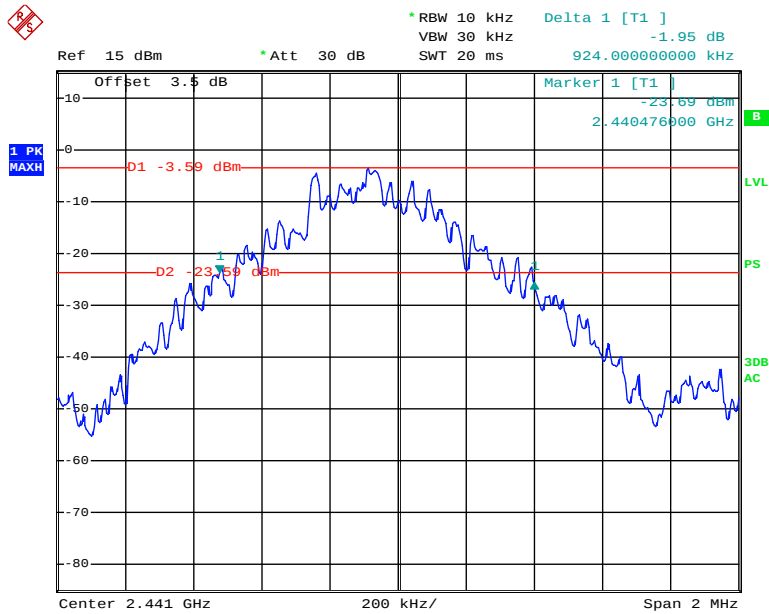
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.924
	Middle	2441	0.924
	High	2480	0.924
EDR ($\pi/4$-DQPSK)	Low	2402	1.208
	Middle	2441	1.208
	High	2480	1.208
EDR (8DPSK)	Low	2402	1.212
	Middle	2441	1.212
	High	2480	1.212

BDR (GFSK): Low Channel

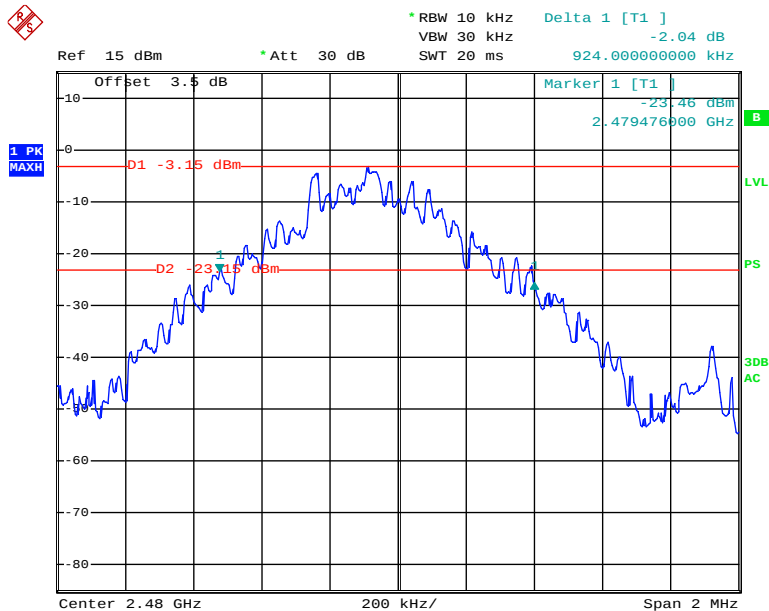
Date: 31.DEC.2013 13:47:44

BDR (GFSK): Middle Channel



Date: 31.DEC.2013 13:45:44

BDR (GFSK): High Channel



Date: 31.DEC.2013 13:51:56

Ref 15 dBm * Att 30 dB * RBW 30 kHz VBW 100 kHz SWT 2.5 ms Delta 1 [T1] -0.93 dB 1.208000000 MHz

Offset 3.5 dB Marker 1 [T1] -20.21 dBm 2.401312000 GHz

1 PK MAXH

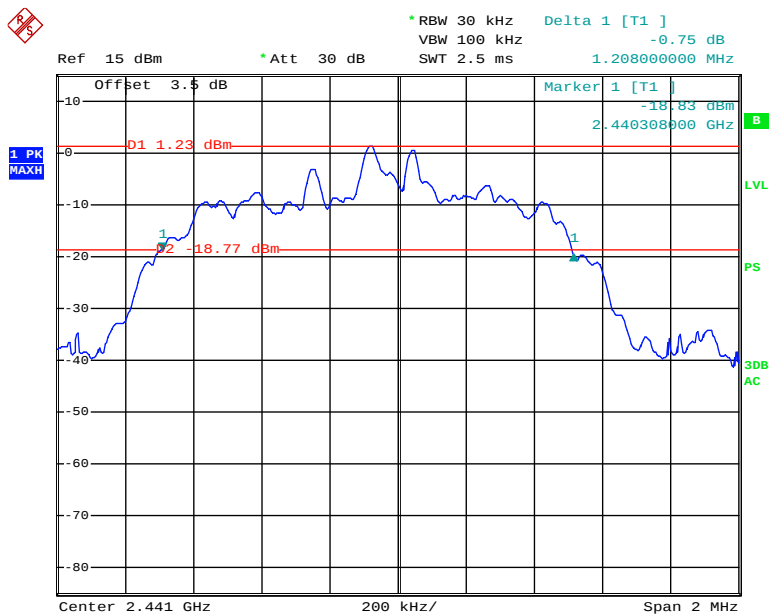
D1 -0.02 dBm D2 -19.08 dBm

1

3dB AC

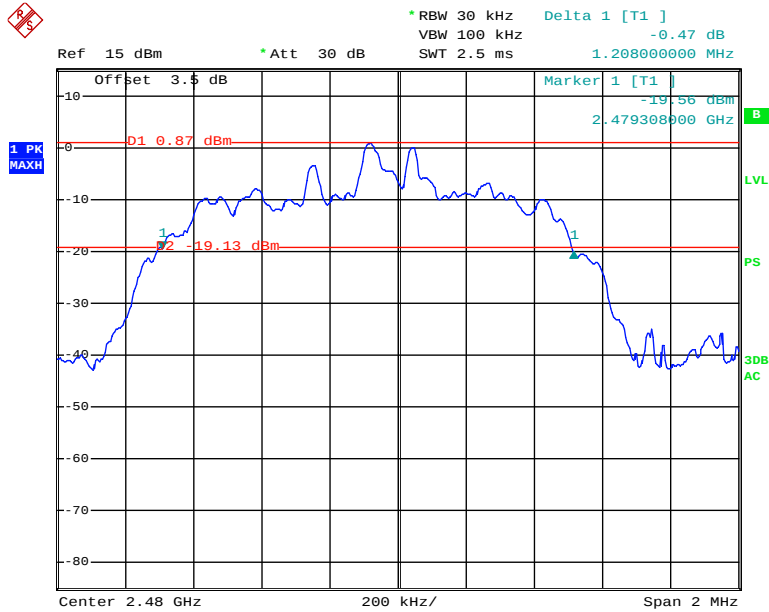
Center 2.402 GHz 200 kHz/ Span 2 MHz

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



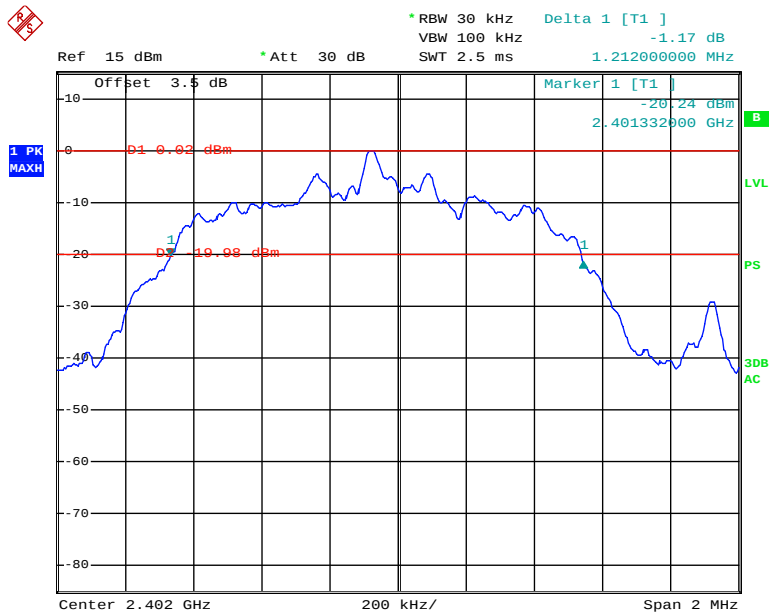
Page 24 of 56

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



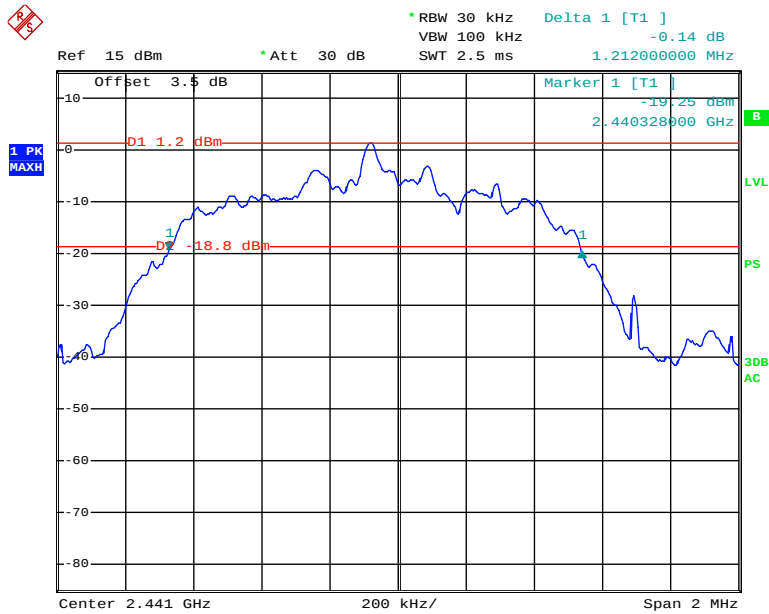
Date: 31.DEC.2013 14:02:09

EDR (8DPSK): Low Channel



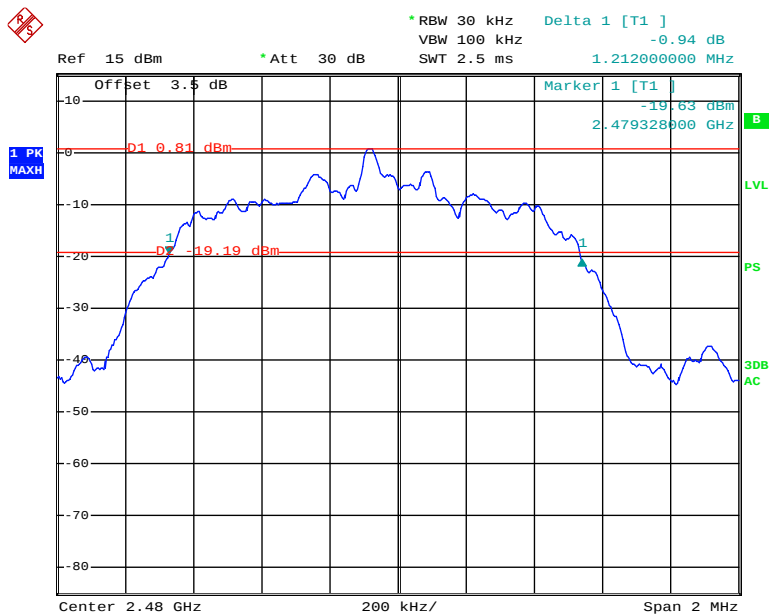
Date: 31.DEC.2013 14:10:20

EDR (8DPSK): Middle Channel



Date: 31.DEC.2013 14:12:22

EDR (8DPSK): High Channel



Date: 31.DEC.2013 14:18:52

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

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-17	2014-09-17

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

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

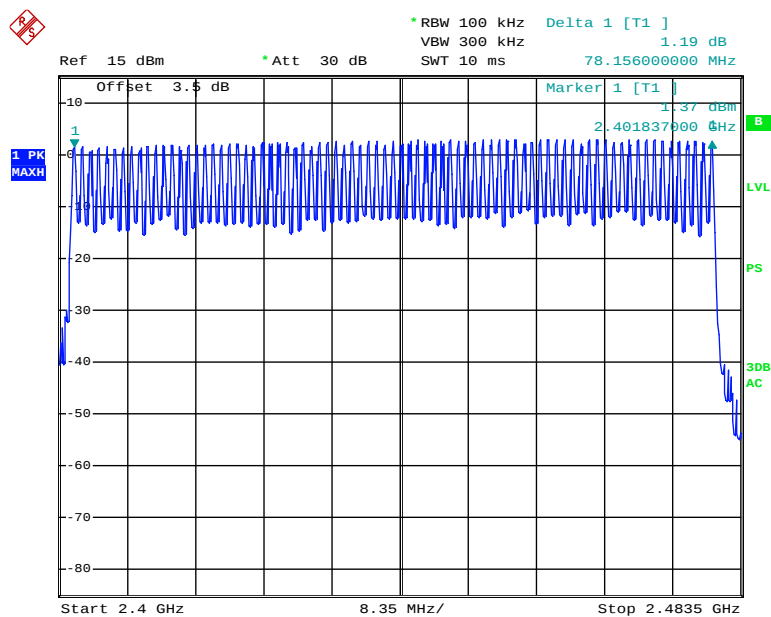
The testing was performed by Gardon Zhang on 2013-12-31.

EUT operation mode: Transmitting

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

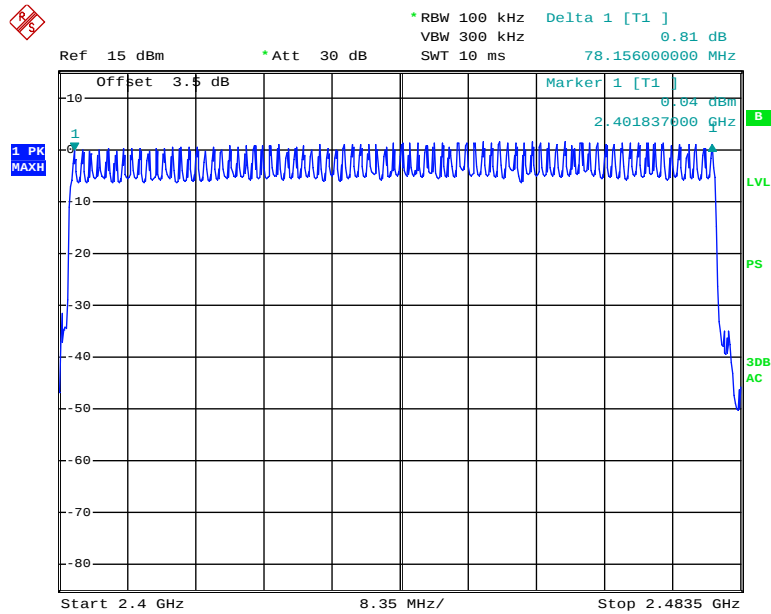
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	≥ 15
EDR ($\pi/4$ -DQPSK)	2400-2483.5	79	≥ 15
EDR (8DPSK)	2400-2483.5	79	≥ 15

BDR (GFSK): Number of Hopping Channels



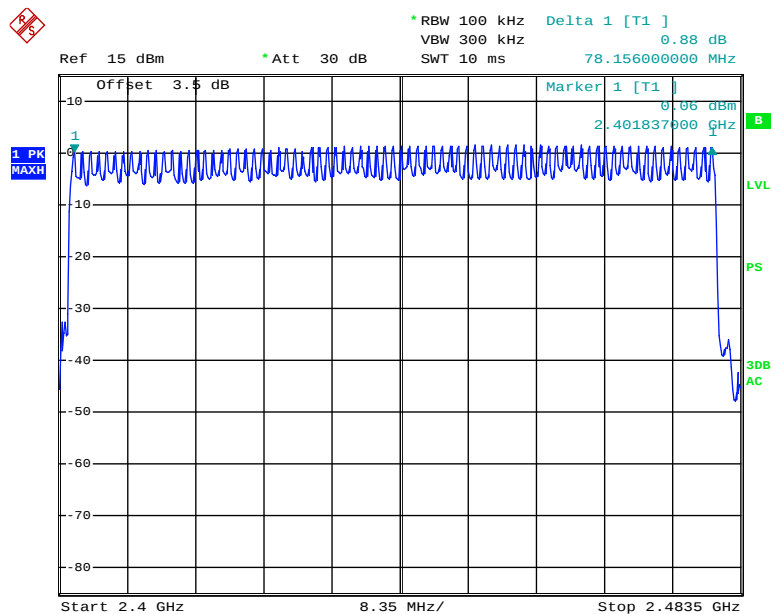
Date: 31.DEC.2013 15:37:04

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



Date: 31.DEC.2013 15:41:30

EDR (8DPSK): Number of Hopping Channels



Date: 31.DEC.2013 15:49:13

FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWEELL TIME)**Applicable Standard**

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

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-17	2014-09-17

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

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Gardon Zhang on 2013-12-31.

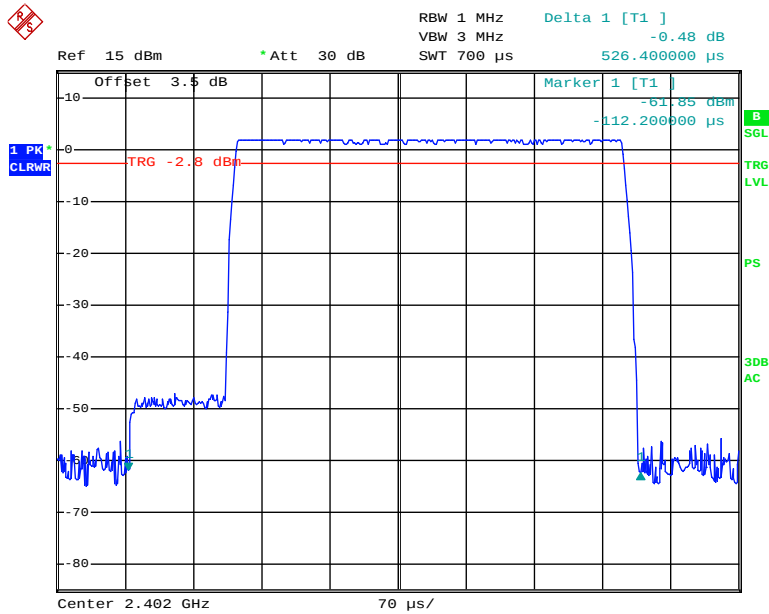
EUT operation mode: Transmitting

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

Mode		Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
BDR (GFSK)	DH 1	Low	0.5264	0.1684	0.4	Pass
		Middle	0.5264	0.1684	0.4	Pass
		High	0.5264	0.1684	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.7990	0.2878	0.4	Pass
		Middle	1.7990	0.2878	0.4	Pass
		High	1.7990	0.2878	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.0612	0.3265	0.4	Pass
		Middle	3.0612	0.3265	0.4	Pass
		High	3.0612	0.3265	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR ($\pi/4$ -DQPSK)	DH 1	Low	0.5390	0.1725	0.4	Pass
		Middle	0.5390	0.1725	0.4	Pass
		High	0.5390	0.1725	0.4	Pass
		Note: 2DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.8102	0.2896	0.4	Pass
		Middle	1.8102	0.2896	0.4	Pass
		High	1.8102	0.2896	0.4	Pass
		Note: 2DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.0612	0.3265	0.4	Pass
		Middle	3.0612	0.3265	0.4	Pass
		High	3.0612	0.3265	0.4	Pass
		Note: 2DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	DH 1	Low	0.5390	0.1725	0.4	Pass
		Middle	0.5390	0.1725	0.4	Pass
		High	0.5390	0.1725	0.4	Pass
		Note: 3DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.8102	0.2896	0.4	Pass
		Middle	1.8102	0.2896	0.4	Pass
		High	1.8102	0.2896	0.4	Pass
		Note: 3DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.0612	0.3265	0.4	Pass
		Middle	3.0612	0.3265	0.4	Pass
		High	3.0612	0.3265	0.4	Pass
		Note: 3DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

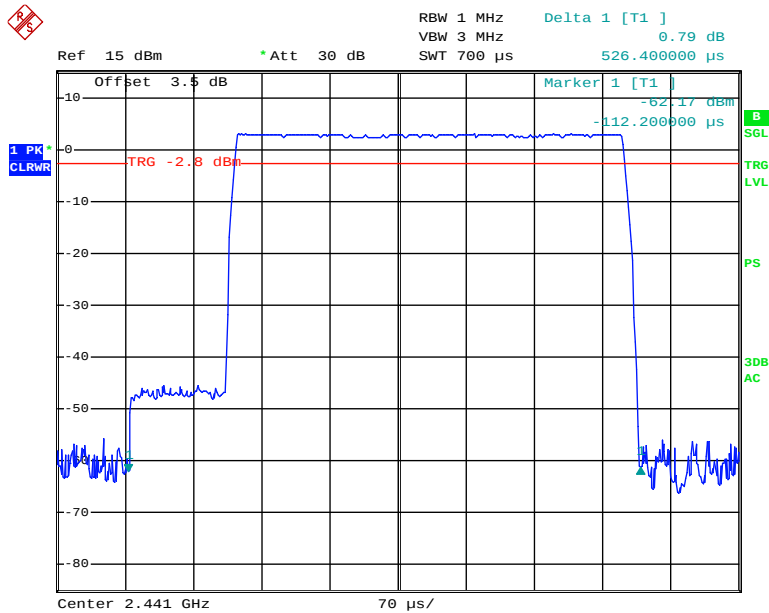
BDR (GFSK):

Pulse time, Low Channel, DH1



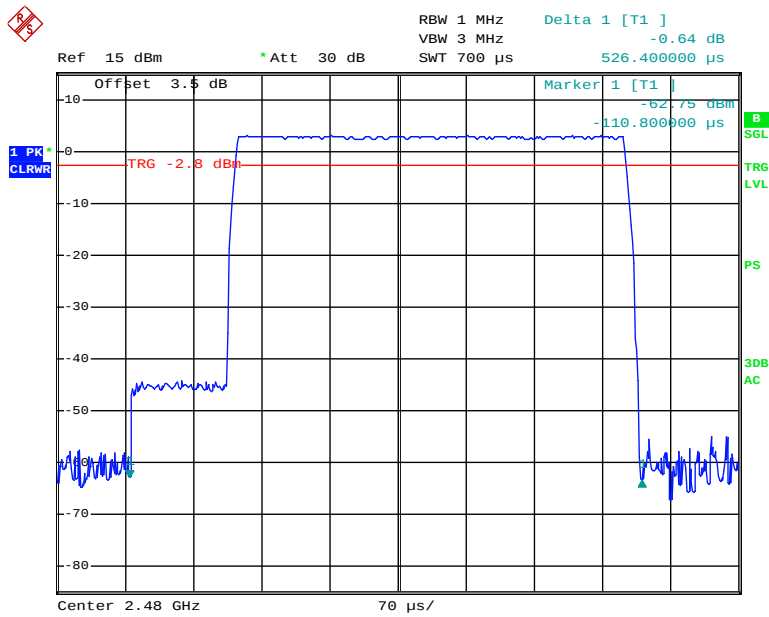
Date: 31.DEC.2013 15:10:57

Pulse time, Middle Channel, DH1



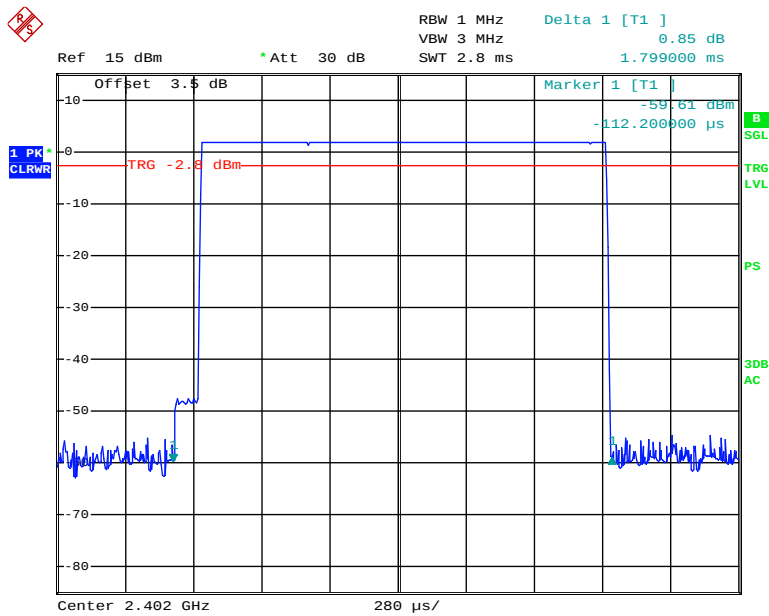
Date: 31.DEC.2013 15:12:11

Pulse time, High Channel, DH1



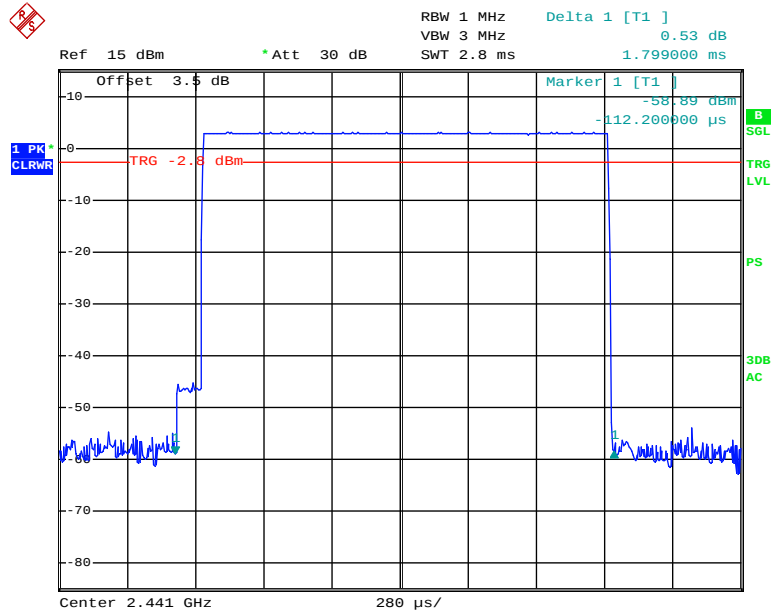
Date: 31.DEC.2013 15:13:43

Pulse time, Low Channel, DH3



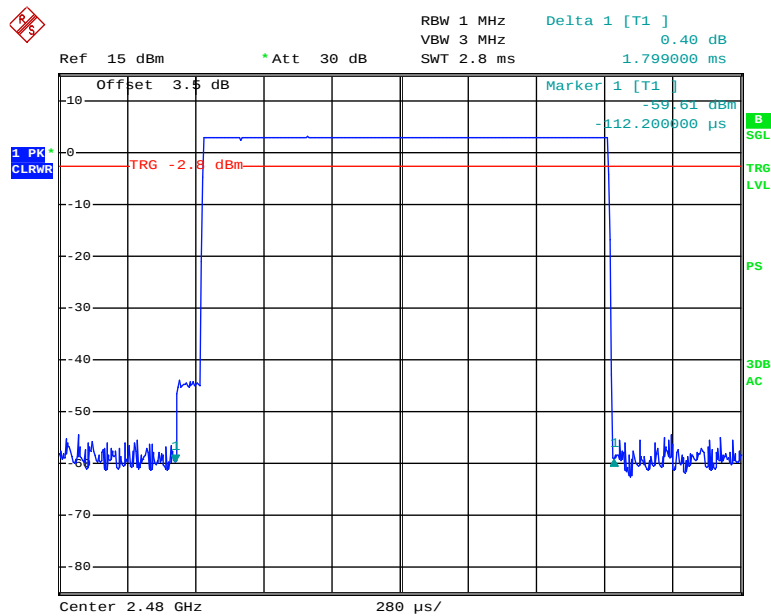
Date: 31.DEC.2013 15:20:57

Pulse time, Middle Channel, DH3



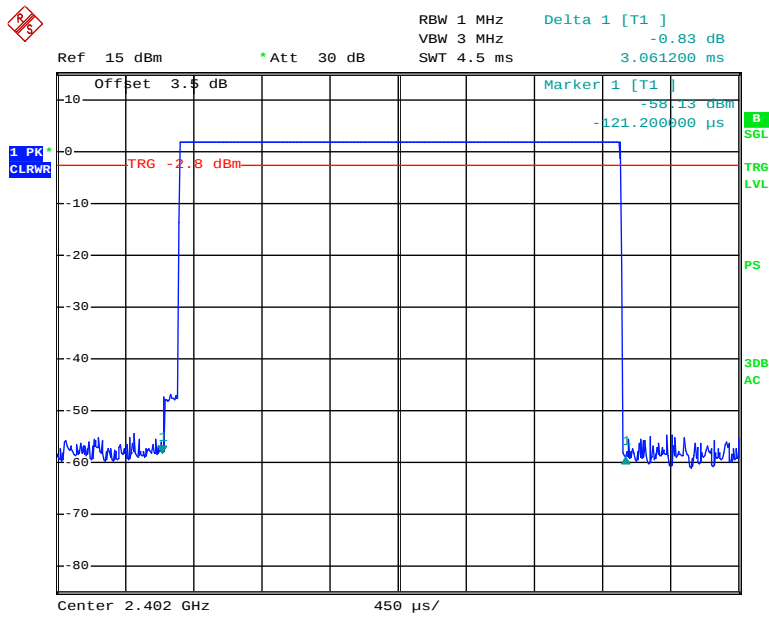
Date: 31.DEC.2013 15:20:35

Pulse time, High Channel, DH3



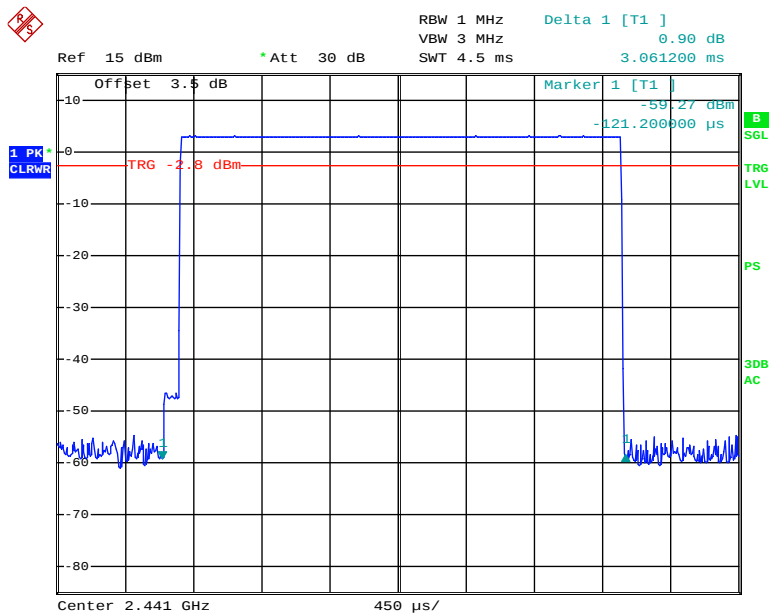
Date: 31.DEC.2013 15:20:07

Pulse time, Low Channel, DH5



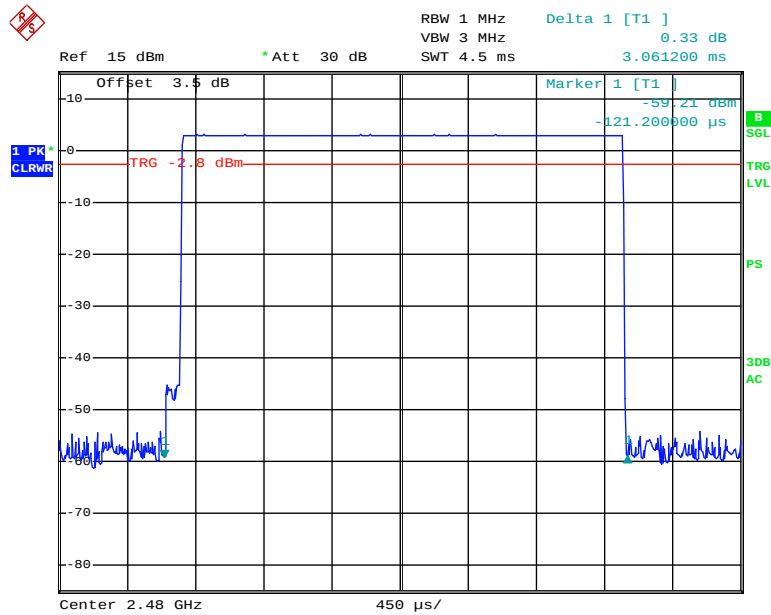
Date: 31.DEC.2013 15:28:48

Pulse time, Middle Channel, DH5



Date: 31.DEC.2013 15:27:31

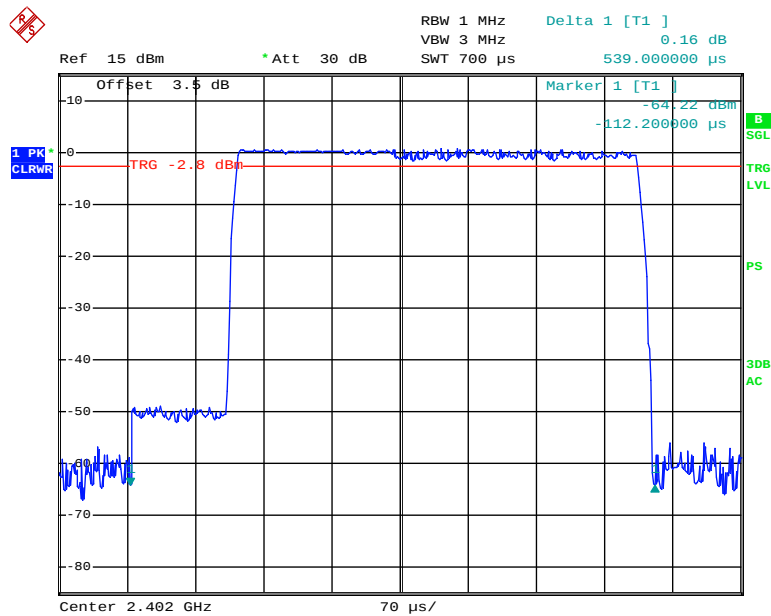
Pulse time, High Channel, DH5



Date: 31.DEC.2013 15:27:09

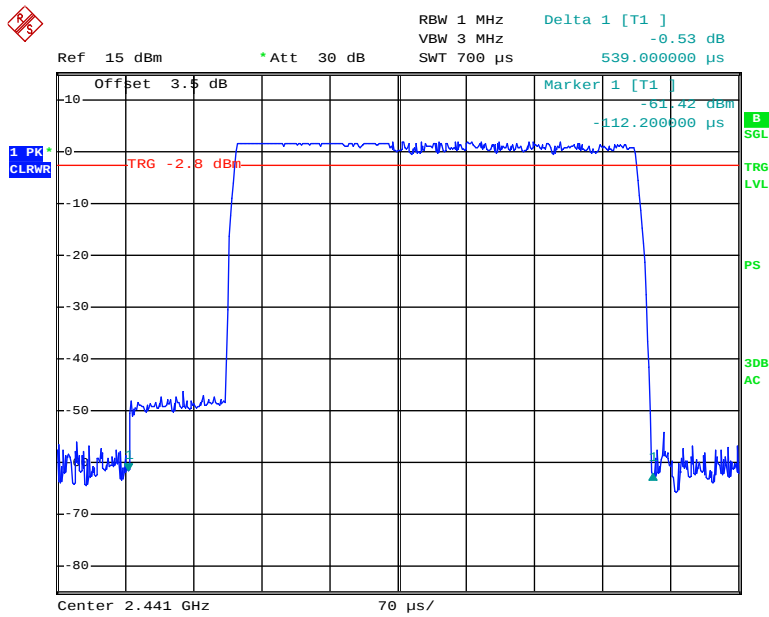
EDR ($\pi/4$ -DQPSK):

Pulse time, Low Channel, 2DH1



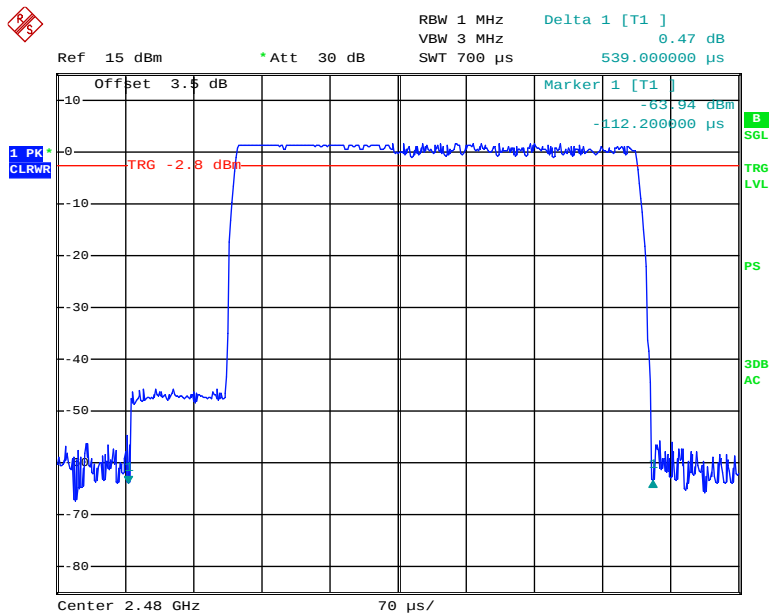
Date: 31.DEC.2013 15:15:12

Pulse time, Middle Channel, 2DH1



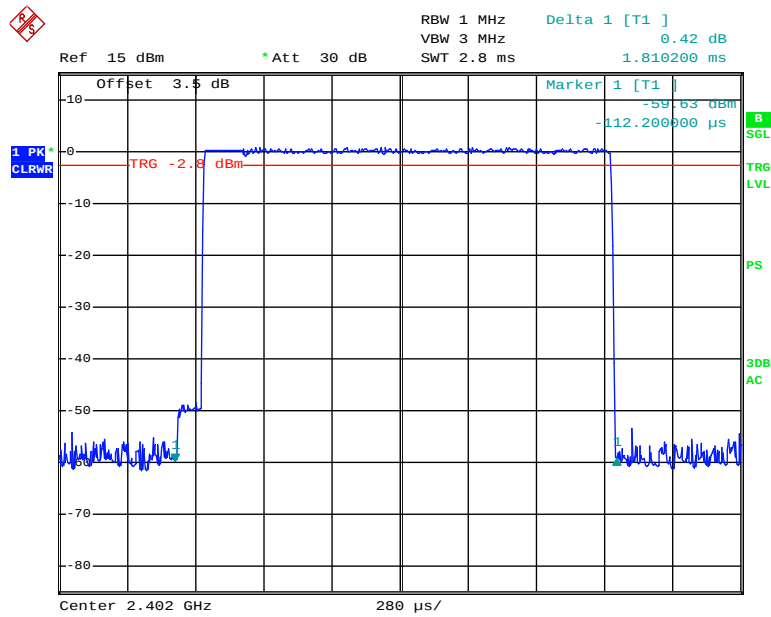
Date: 31.DEC.2013 15:15:42

Pulse time, High Channel, 2DH1



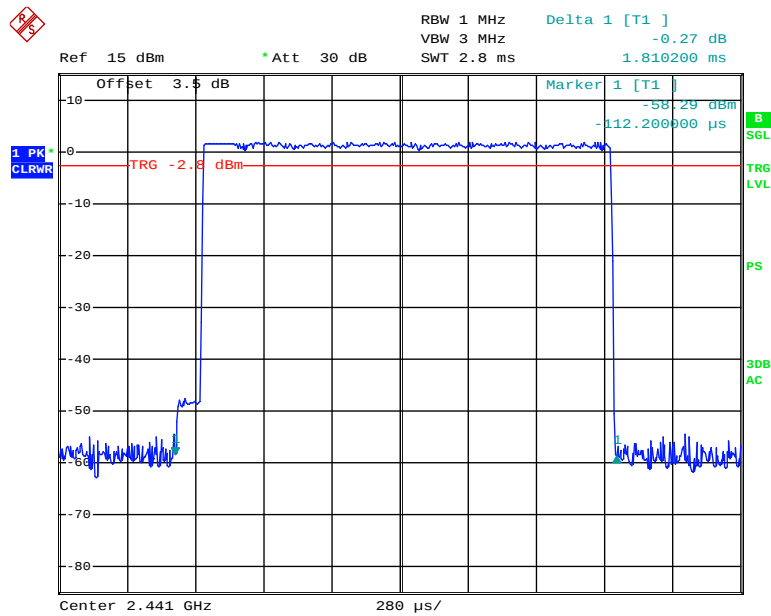
Date: 31.DEC.2013 15:16:54

Pulse time, Low Channel, 2DH3



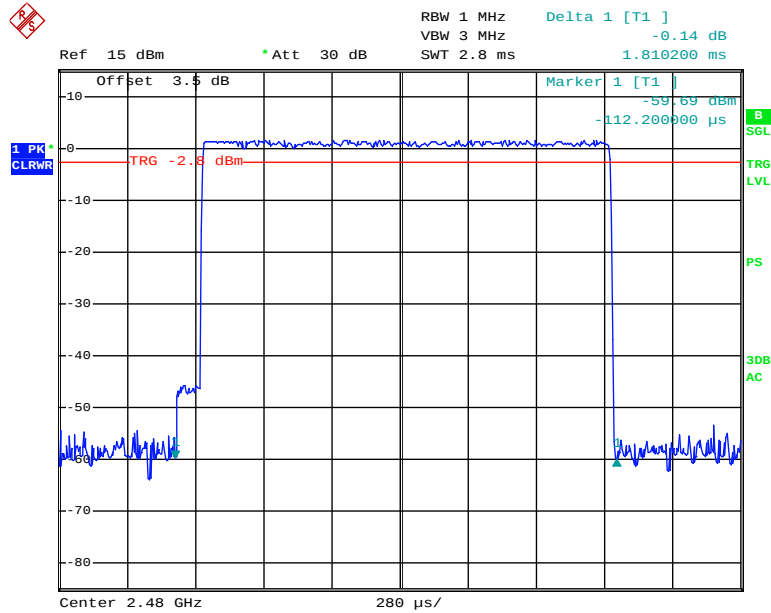
Date: 31.DEC.2013 15:22:20

Pulse time, Middle Channel, 2DH3



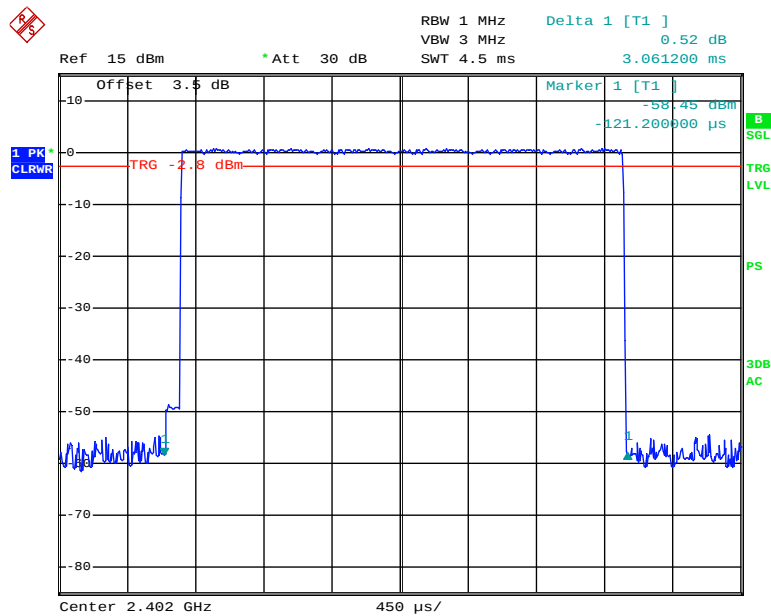
Date: 31.DEC.2013 15:23:24

Pulse time, High Channel, 2DH3



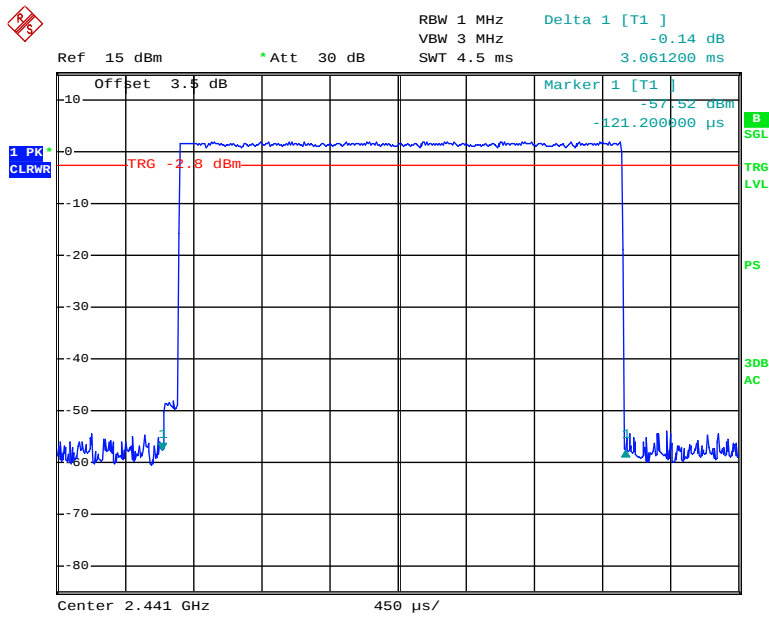
Date: 31.DEC.2013 15:23:40

Pulse time, Low Channel, 2DH5



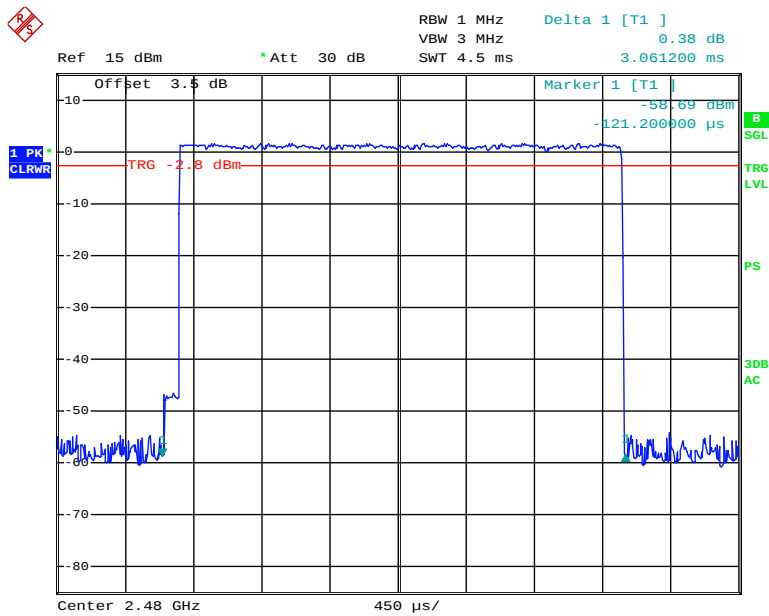
Date: 31.DEC.2013 15:29:35

Pulse time, Middle Channel, 2DH5



Date: 31.DEC.2013 15:30:04

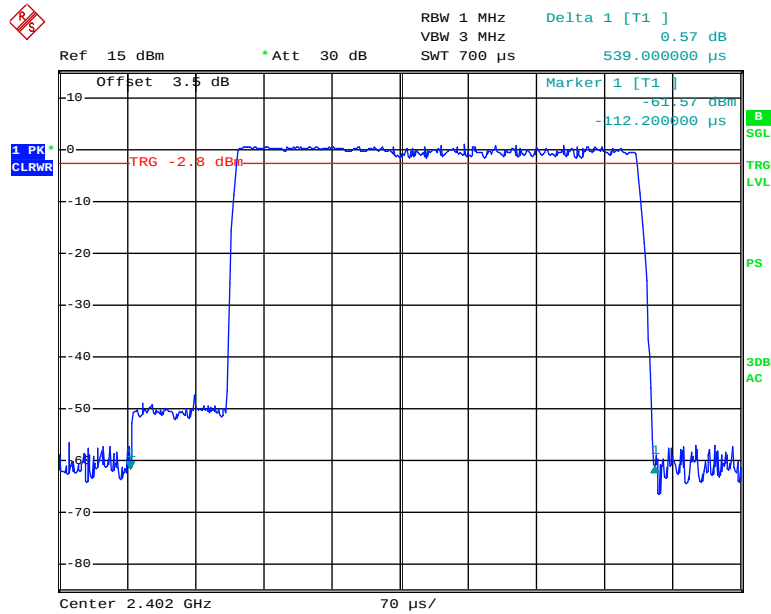
Pulse time, High Channel, 2DH5



Date: 31.DEC.2013 15:30:27

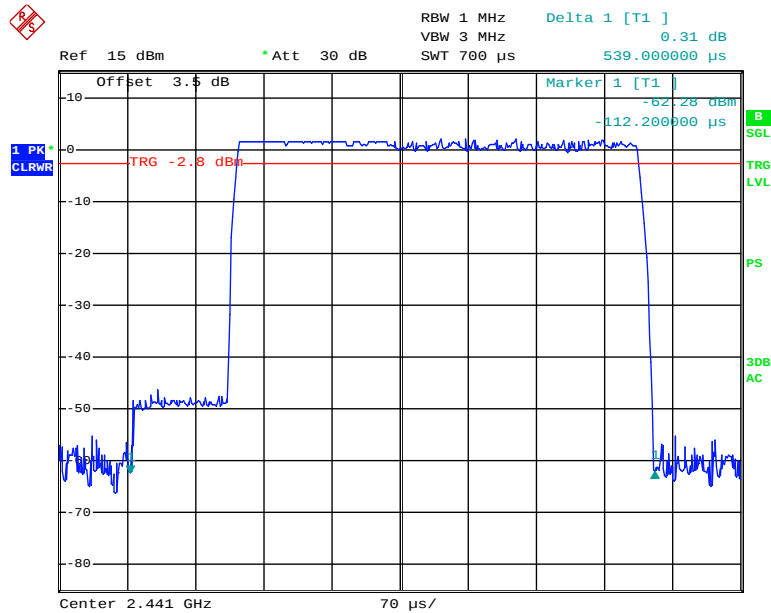
EDR (8DPSK):

Pulse time, Low Channel, 3DH1



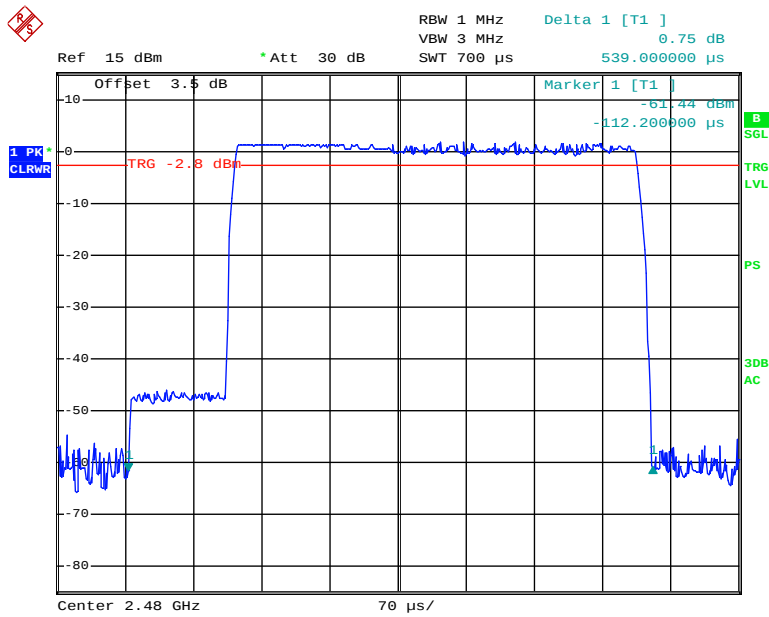
Date: 31.DEC.2013 15:17:37

Pulse time, Middle Channel, 3DH1



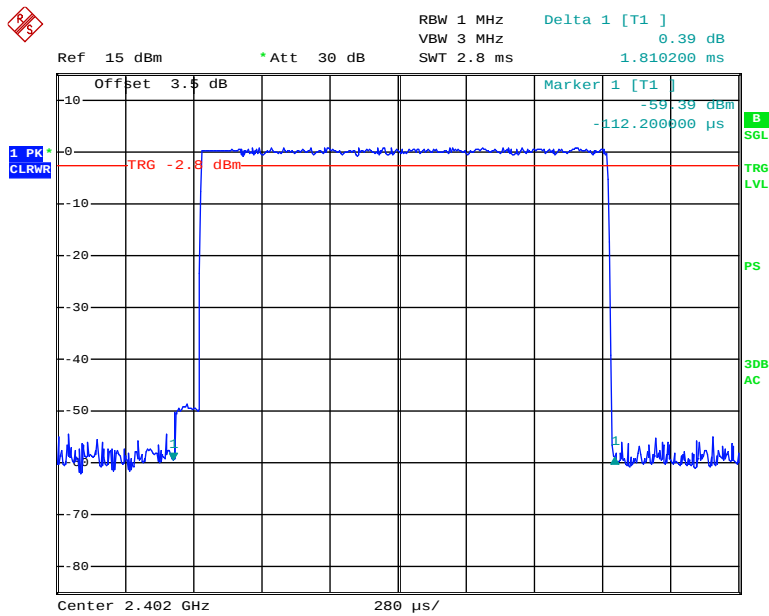
Date: 31.DEC.2013 15:18:03

Pulse time, High Channel, 3DH1



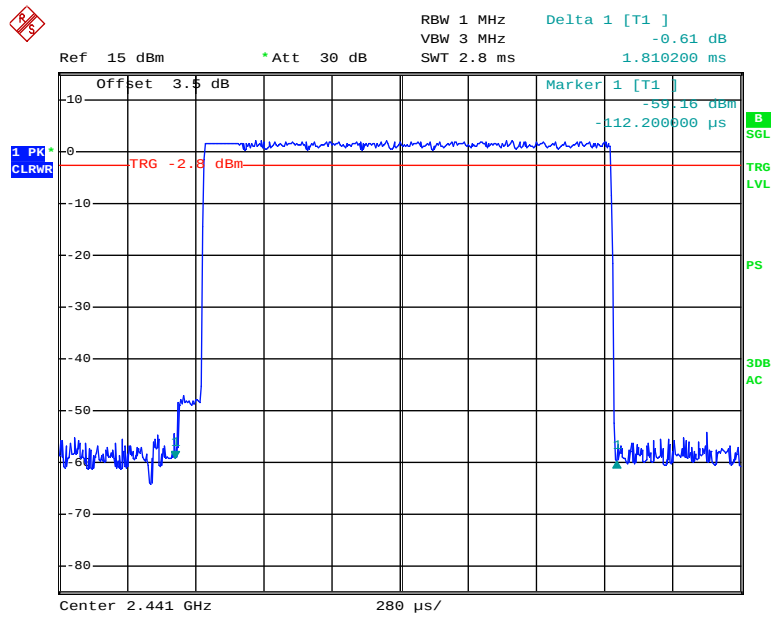
Date: 31.DEC.2013 15:18:51

Pulse time, Low Channel, 3DH3



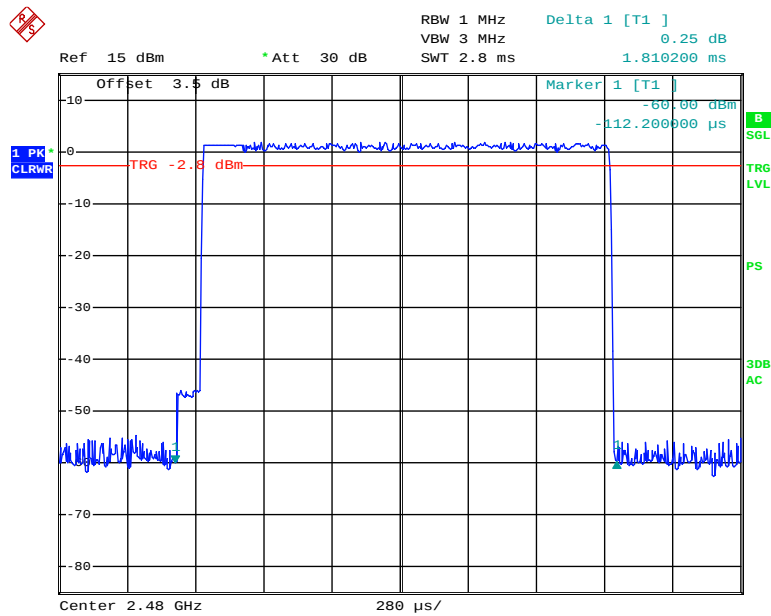
Date: 31.DEC.2013 15:24:50

Pulse time, Middle Channel, 3DH3



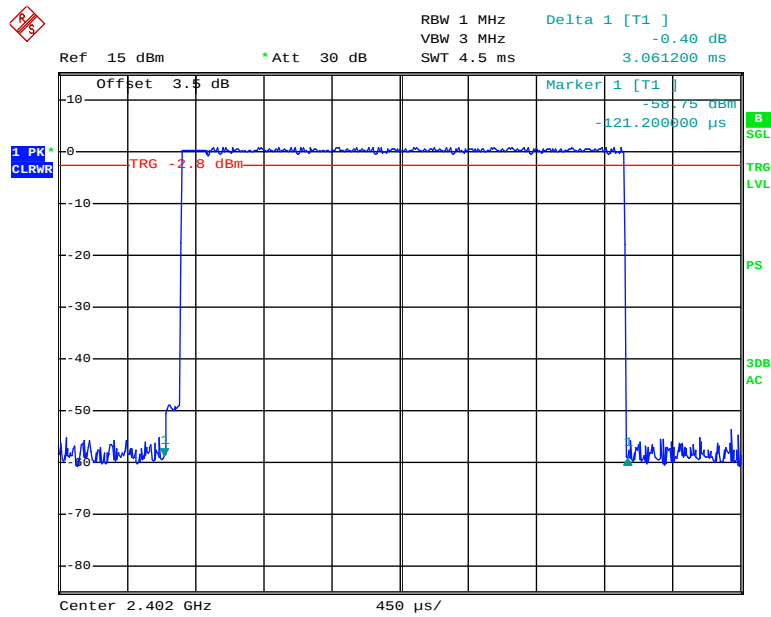
Date: 31.DEC.2013 15:25:13

Pulse time, High Channel, 3DH3



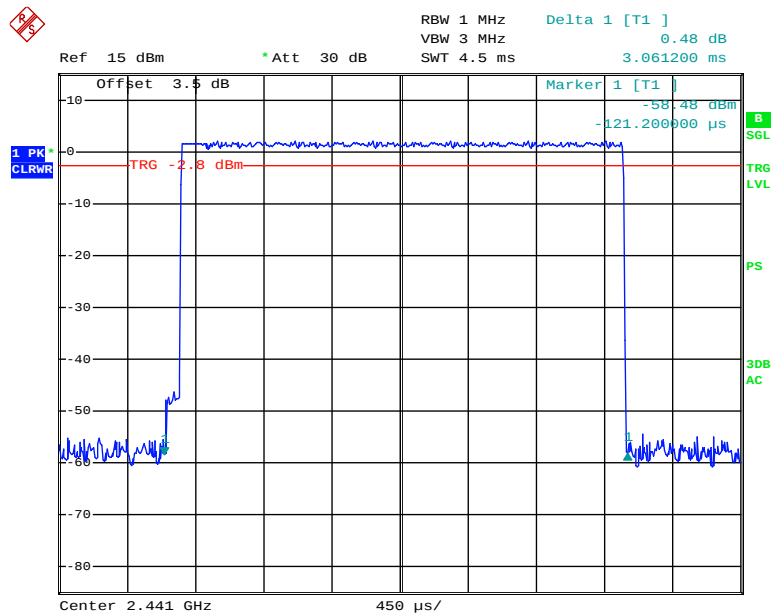
Date: 31.DEC.2013 15:25:37

Pulse time, Low Channel, 3DH5



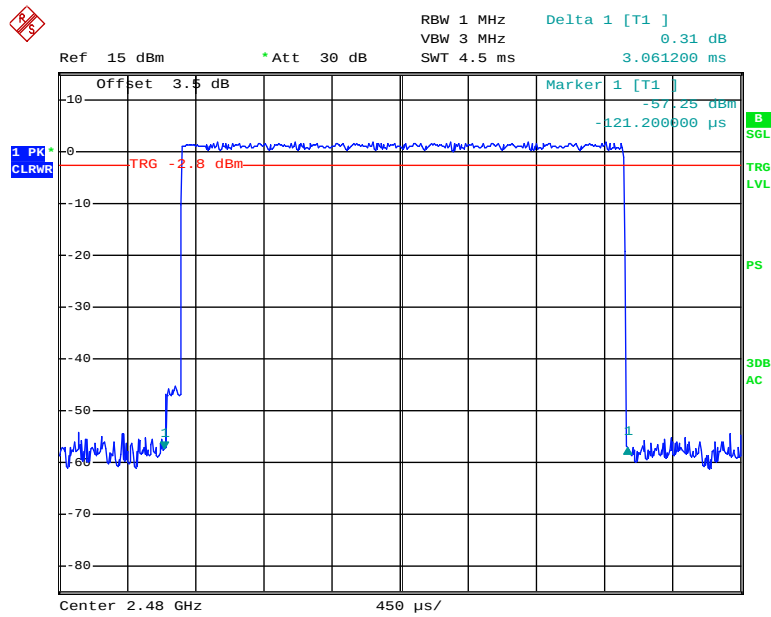
Date: 31.DEC.2013 15:31:21

Pulse time, Middle Channel, 3DH5



Date: 31.DEC.2013 15:32:23

Pulse time, High Channel, 3DH5



Date: 31.DEC.2013 15:32:44

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

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-17	2014-09-17

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

Test Data**Environmental Conditions**

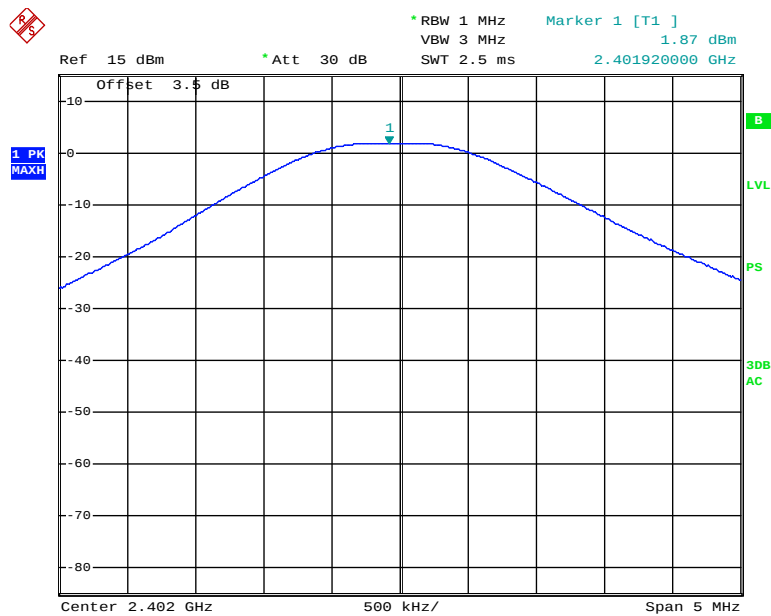
Temperature:	22 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Gardon Zhang on 2013-12-31.

EUT operation mode: Transmitting

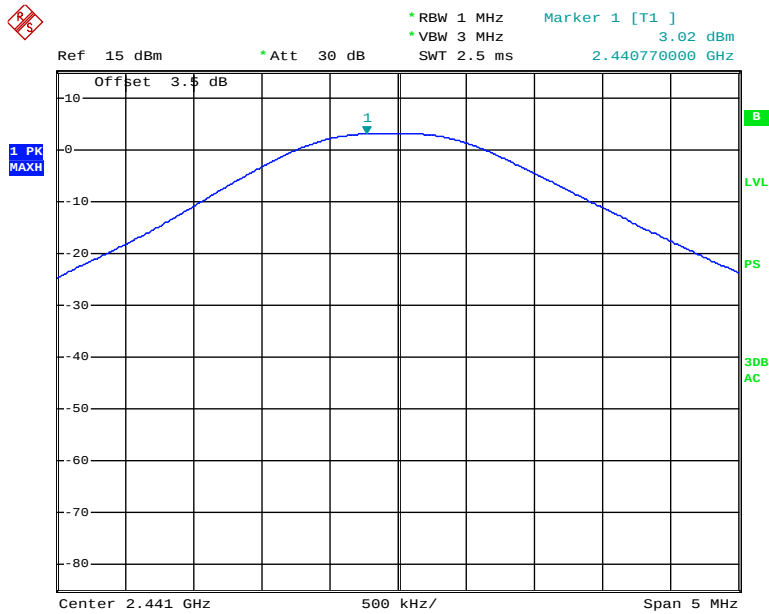
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	Conducted Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	1.87	1.538	1000
	Middle	2441	3.02	2.004	1000
	High	2480	3.01	2.000	1000
EDR ($\pi/4$-DQPSK)	Low	2402	1.01	1.262	1000
	Middle	2441	2.19	1.656	1000
	High	2480	1.97	1.574	1000
EDR (8DPSK)	Low	2402	1.17	1.309	1000
	Middle	2441	2.37	1.726	1000
	High	2480	2.25	1.679	1000

BDR (GFSK): Low Channel

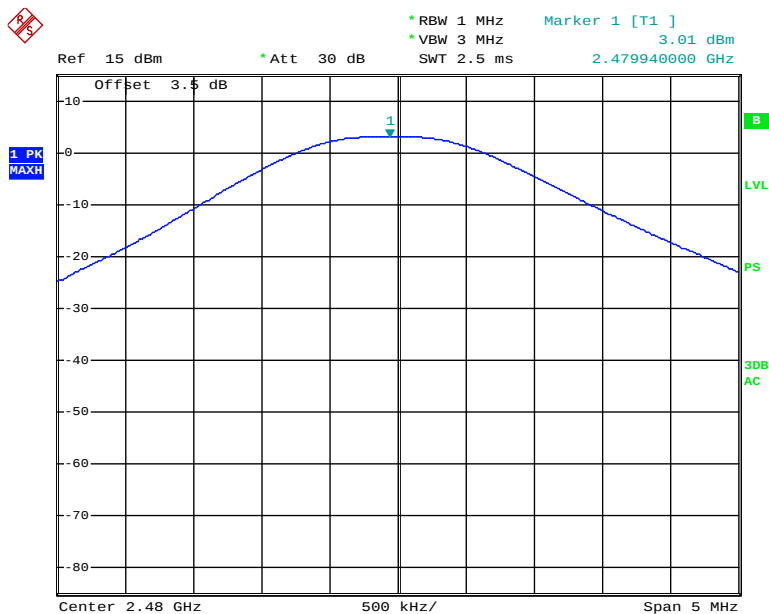
Date: 31.DEC.2013 14:20:59

BDR (GFSK): Middle Channel



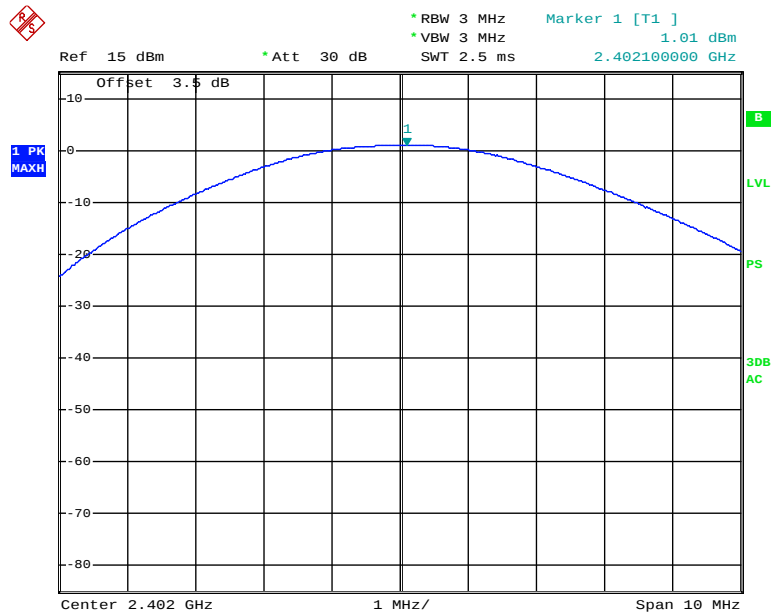
Date: 31.DEC.2013 14:23:44

BDR (GFSK): High Channel



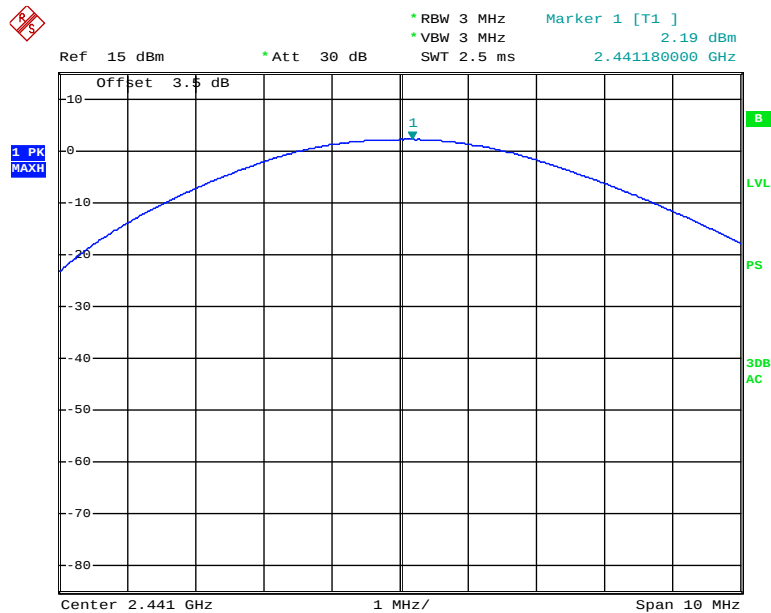
Date: 31.DEC.2013 14:24:44

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



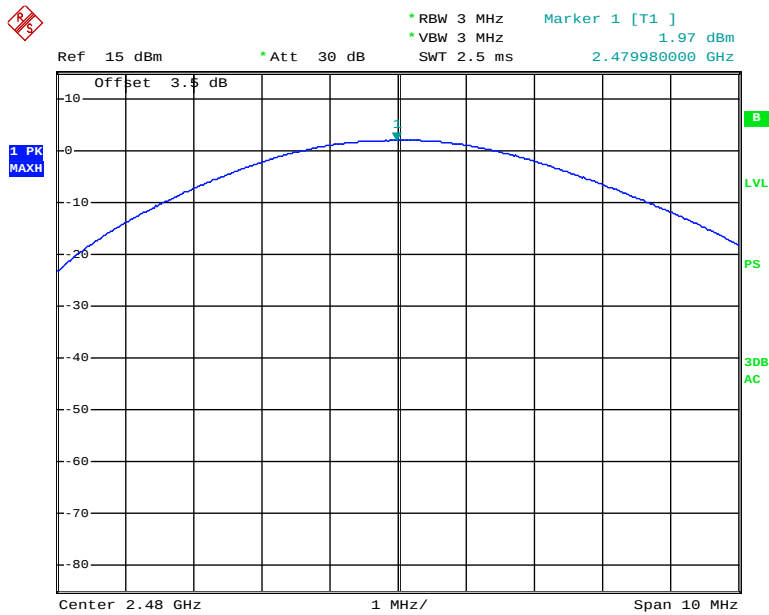
Date: 31.DEC.2013 14:28:04

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



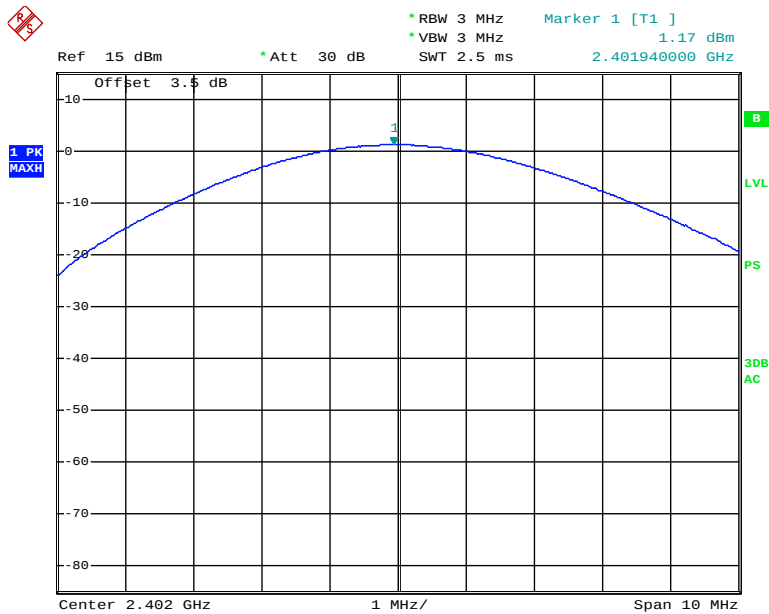
Date: 31.DEC.2013 14:29:23

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



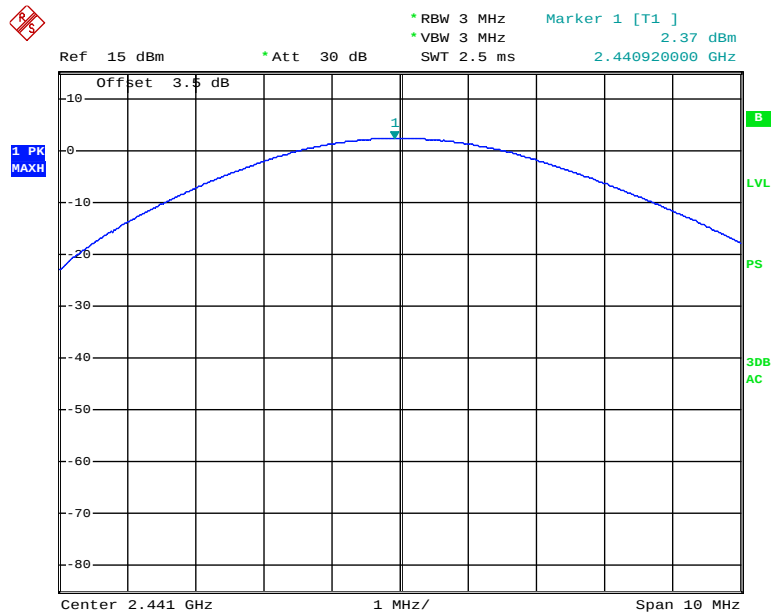
Date: 31.DEC.2013 14:31:54

EDR(8DPSK): Low Channel



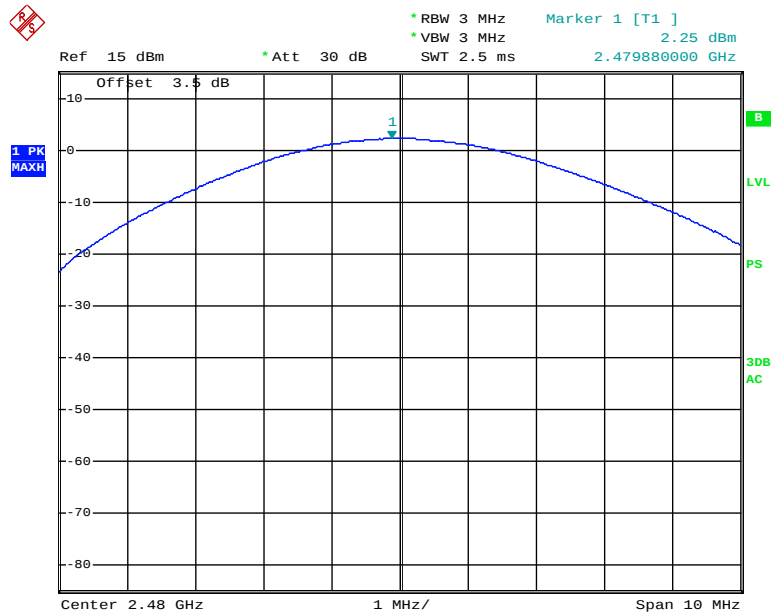
Date: 31.DEC.2013 14:33:11

EDR(8DPSK): Middle Channel



Date: 31.DEC.2013 14:36:23

EDR(8DPSK): High Channel



Date: 31.DEC.2013 14:37:21

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2013-09-17	2014-09-17

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

Test Data

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

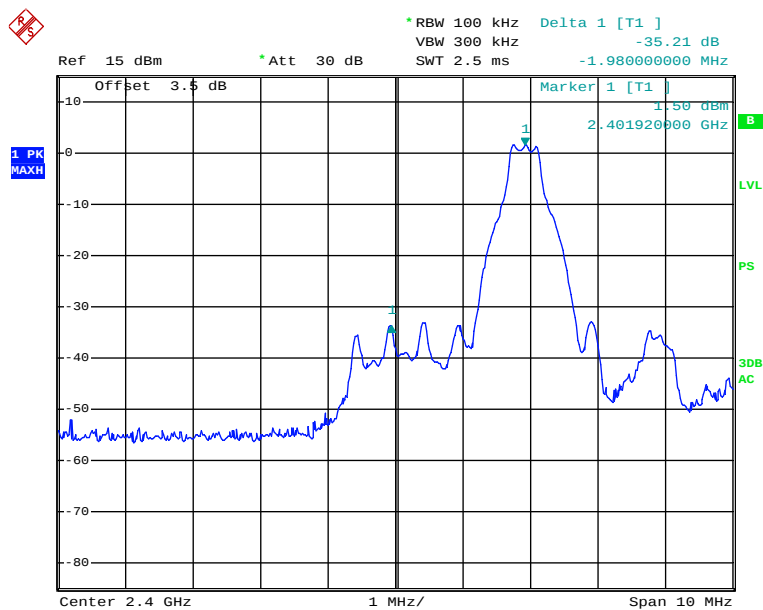
The testing was performed by Gardon Zhang on 2013-12-31.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following plots.

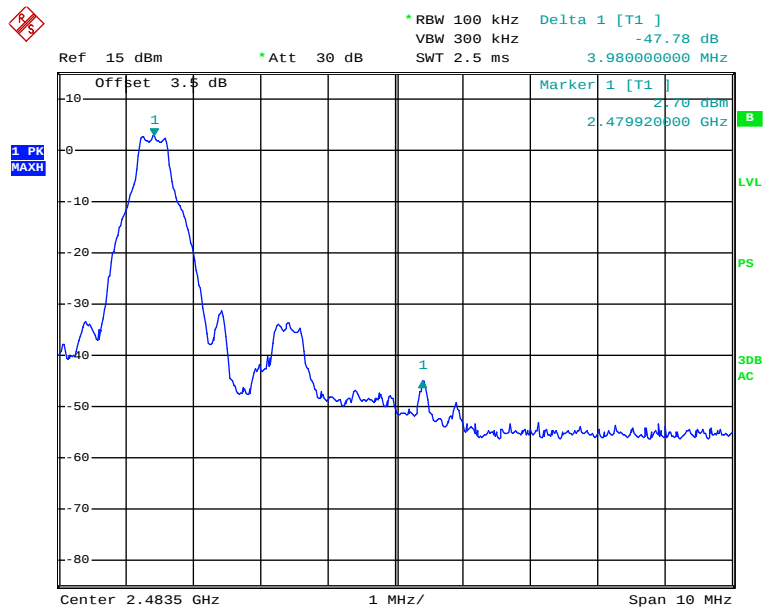
Frequency Band	Delta Peak to band emission (dBc)	≥Limit (dBc)	Result
BDR mode (GFSK)			
Left-band	35.21	20	Pass
Right-band	47.78	20	Pass
EDR Mode ($\pi/4$ -DQPSK)			
Left-band	41.14	20	Pass
Right-band	47.69	20	Pass
EDR Mode (8 DPSK)			
Left-band	41.13	20	Pass
Right-band	47.28	20	Pass

BDR (GFSK): Band Edge-Left Side



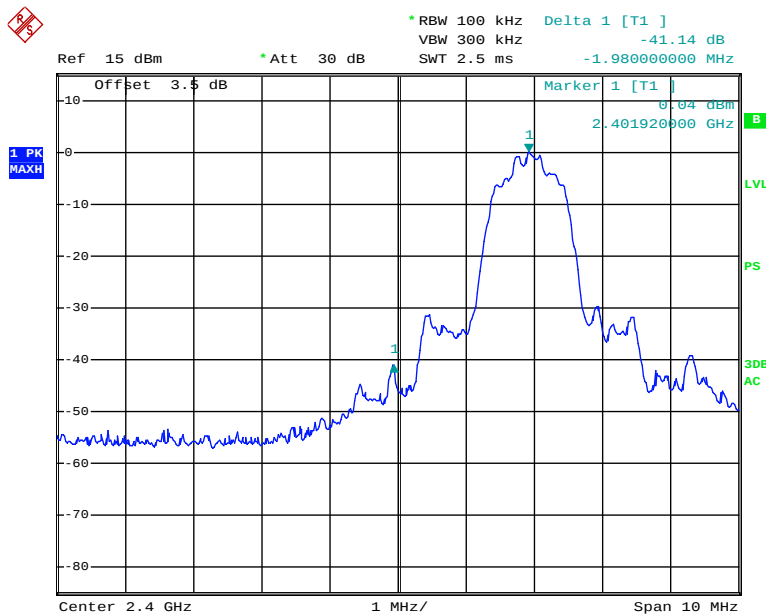
Date: 31.DEC.2013 15:00:11

BDR (GFSK): Band Edge-Right Side



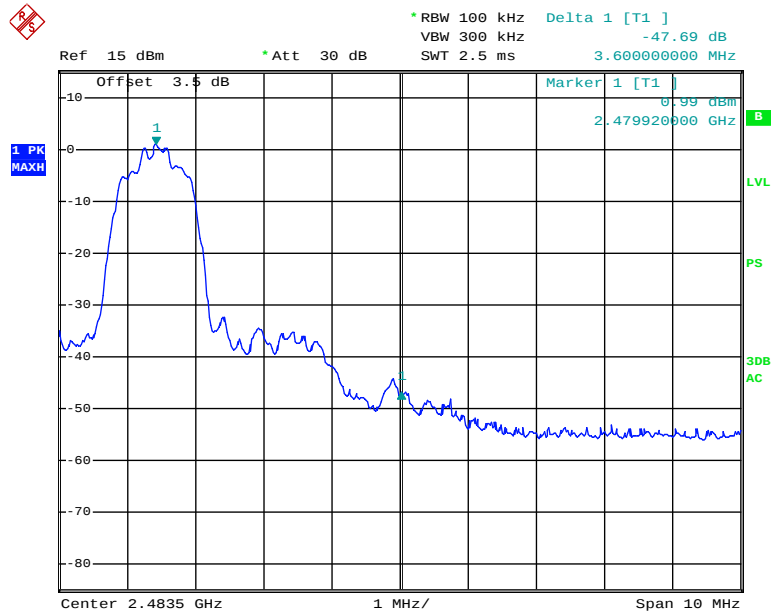
Date: 31.DEC.2013 15:01:19

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



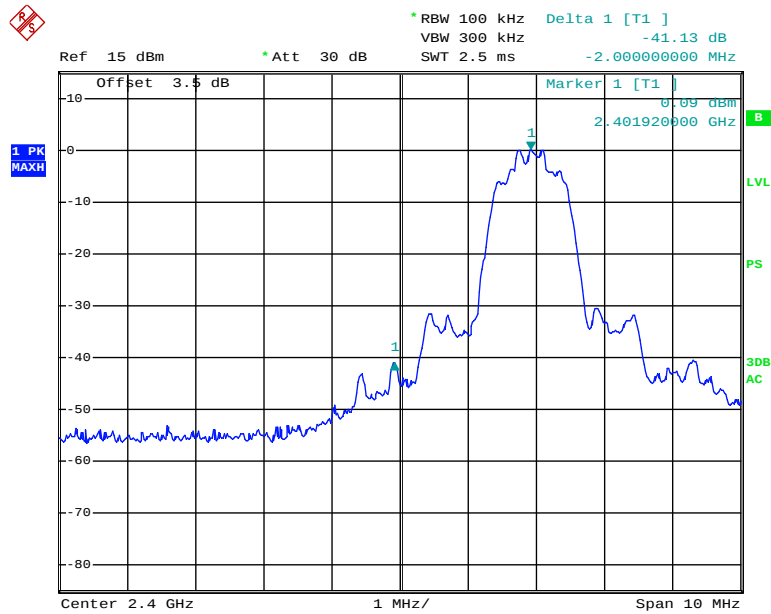
Date: 31.DEC.2013 15:02:26

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



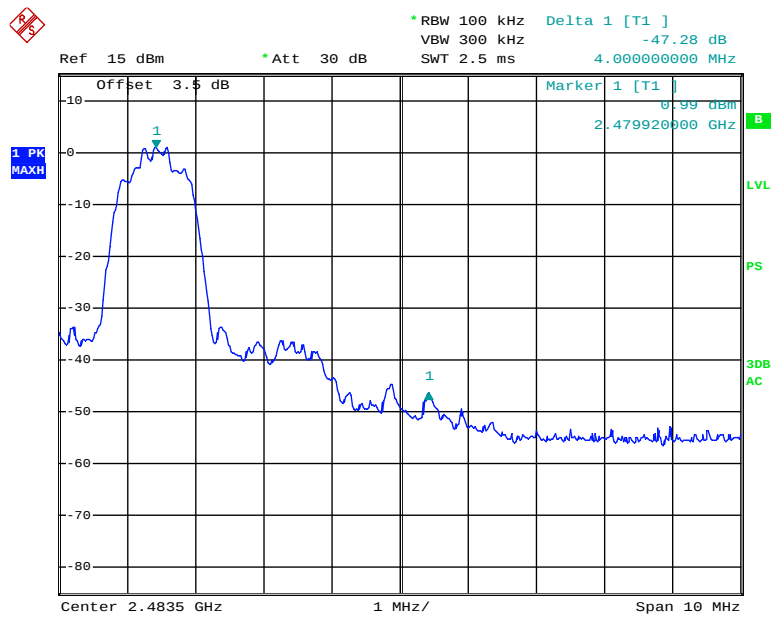
Date: 31.DEC.2013 15:03:54

EDR (8DPSK): Band Edge-Left Side



Date: 31.DEC.2013 15:05:46

BDR (8DPSK): Band Edge-Right Side



Date: 31.DEC.2013 15:07:19

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