

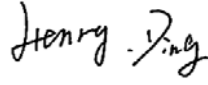

# FCC PART 15.247 TEST REPORT

For

**invoxia**

87 rue du Gouverneur General Eboue, Issy-Les-Moulineaux, France

**FCC ID: ZVS-NVX-DTP2**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Desktop phone (Bluetooth device)
<b>Test Engineer:</b> <u>Henry Ding</u> 	
<b>Report Number:</b> <u>RSZ130311002-00B</u>	
<b>Report Date:</b> <u>2013-03-25</u>	
<b>Reviewed By:</b> <u>Alvin Huang</u>  RF Leader	
<b>Prepared By:</b> 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 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**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.

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *invoxia*'s product, model number: NVX 620 (FCC ID: ZVS-NVX-DTP2) or the "EUT" in this report was a Desktop phone (Bluetooth device), named as NVX2 by applicant, which was measured approximately: 29.0 cm (L) x 14.0 cm (W) x 6.0 cm (H), rated input voltage: DC 12V from adapter.

Adapter Information:

Model: KSAP0361200300D5

Input: 100-240V~50/60Hz, 0.8A

Output: DC 12V, 3.0A

*\* All measurement and test data in this report was gathered from production sample serial number: 0231330010006DE (Assigned by the applicant). The EUT supplied by the applicant was received on 2013-03-11.*

### Objective

This test report is prepared on behalf of *invoxia* 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)

FCC 15B JBP submittal with FCC ID: ZVS-NVX-DTP2

### Test Methodology

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

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

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3<sup>rd</sup> 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 C63.4-2003.

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 configured for testing with test software.

### Equipment Modifications

No modification was made to the EUT tested.

### EUT Exercise Software

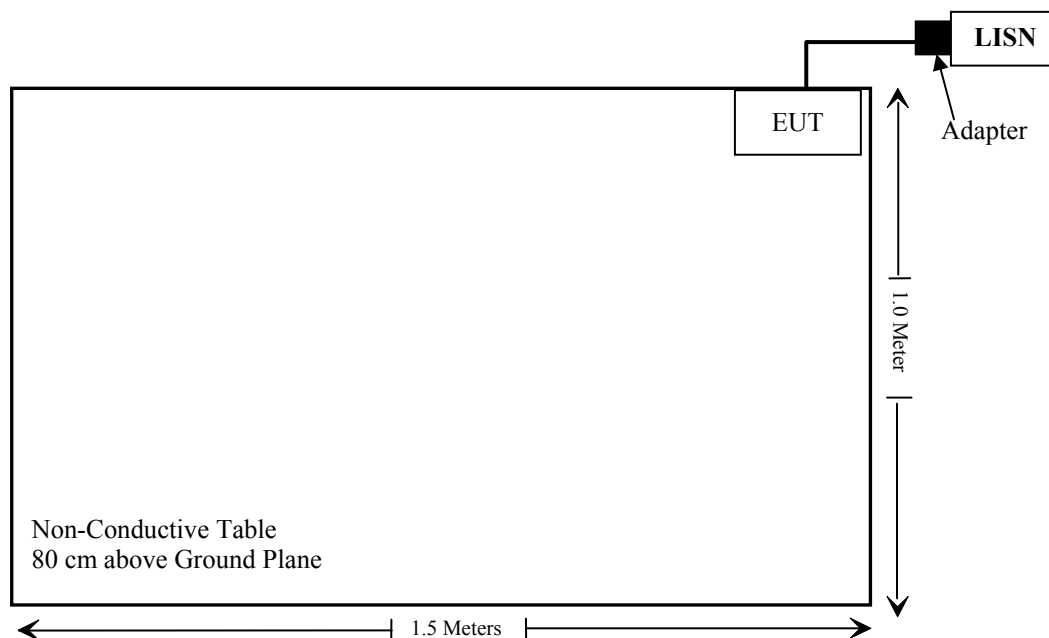
CSR Bluesuite

### External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielding Detachable Power Cable	1.5	EUT	Adapter

### Block Diagram of Test Setup

For conducted emission



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**SUMMARY OF TEST RESULTS**

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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	Compliance
§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**

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**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: 2.698 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 2.698 mW < the exclusion thresholds 10 mW, so SAR evaluation is not required.



## **FCC §15.203 – ANTENNA REQUIREMENT**

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### **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 an integral antenna arrangement for bluetooth, which was permanently attached, the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the internal photos.

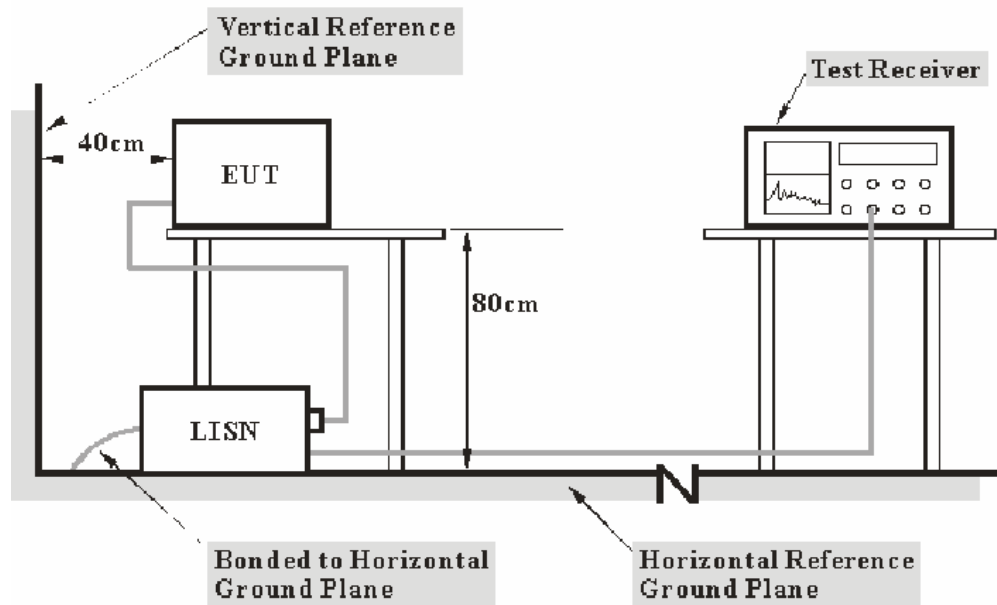
**Result:** Compliance.

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

FCC §15.207(a)

### 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 measurement procedure of EUT setup is according with ANSI C63.4-2003. The related limit was specified in FCC Part 15.207.

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

### EMI Test Receiver Setup

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

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

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

## Test Procedure

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

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

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

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2012-11-24	2013-11-23
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2012-08-22	2013-08-21
Rohde & Schwarz	Pulse limiter	ESH3Z2	DE25985	2012-07-08	2013-07-07
BACL	CE Test software	BACL-CE	V1.0	-	-

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

## Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Pulse Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Pulse Limiter Attenuation}$$

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 7 dB below the limit. The equation for margin calculation is as follows:

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

## Test Results Summary

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

**24.45 dB at 0.150 MHz** in the **Line** conducted mode

## Test Data

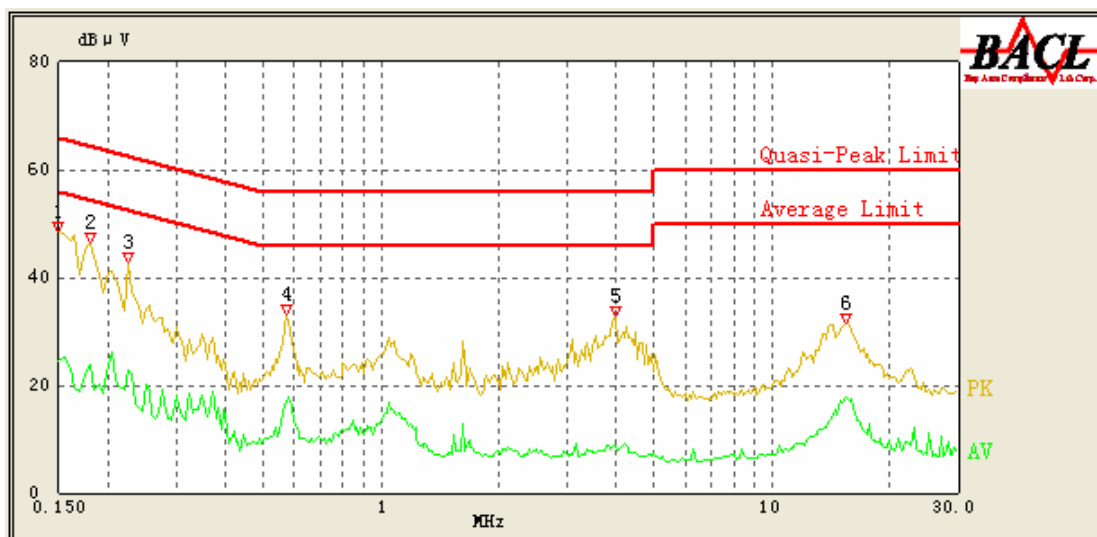
### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

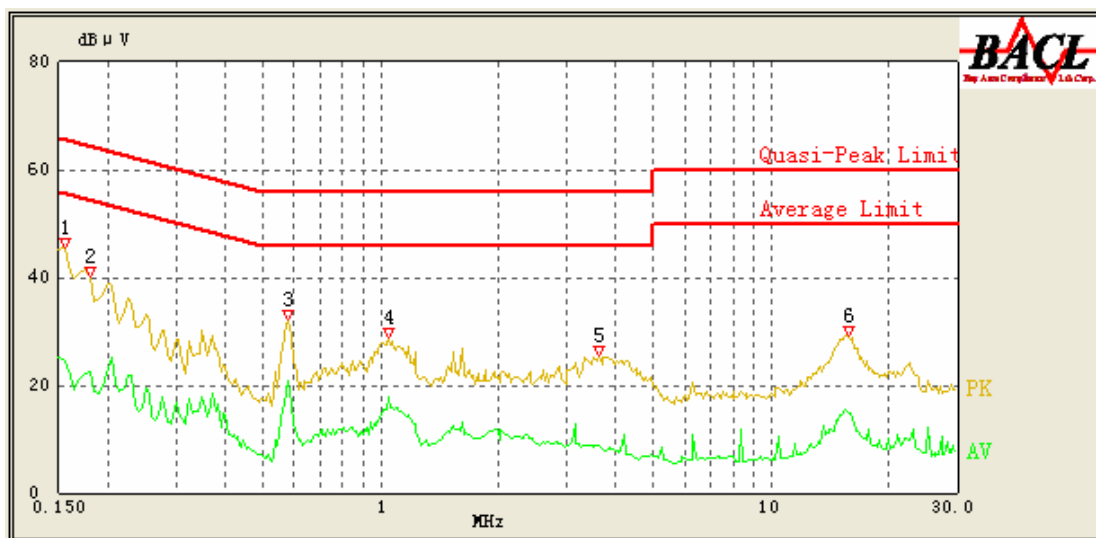
*The testing was performed by Henry Ding on 2013-03-15.*

EUT operation mode: Transmitting

AC 120 V, 60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.150	41.55	10.10	66.00	24.45	QP
0.180	36.13	10.10	65.14	29.01	QP
0.575	16.80	10.20	46.00	29.20	Ave.
0.225	22.90	10.10	53.86	30.96	Ave.
0.180	23.87	10.10	55.14	31.27	Ave.
0.575	24.72	10.20	56.00	31.28	QP
0.150	24.46	10.10	56.00	31.54	Ave.
15.505	17.79	10.61	50.00	32.21	Ave.
0.225	31.02	10.10	63.86	32.84	QP
15.505	25.73	10.61	60.00	34.27	QP
3.990	8.69	10.20	46.00	37.31	Ave.
3.980	15.76	10.20	56.00	40.24	QP

**AC 120V, 60 Hz, Neutral:**

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.580	20.98	10.20	46.00	25.02	Ave.
0.155	39.52	10.10	65.86	26.34	QP
1.050	17.82	10.20	46.00	28.18	Ave.
0.580	27.64	10.20	56.00	28.36	QP
0.180	35.63	10.10	65.14	29.51	QP
0.155	24.45	10.10	55.86	31.41	Ave.
1.050	23.65	10.20	56.00	32.35	QP
0.180	22.65	10.10	55.14	32.49	Ave.
15.875	14.87	10.62	50.00	35.13	Ave.
3.625	8.86	10.20	46.00	37.14	Ave.
15.740	21.59	10.61	60.00	38.41	QP
3.615	14.67	10.20	56.00	41.33	QP

**Note:**

- 1) Correction Factor = LISN/ISN VDF (Voltage Division Factor) + Cable Loss + Pulse Limiter Attenuation  
The corrected factor has been input into the transducer of the test software.
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

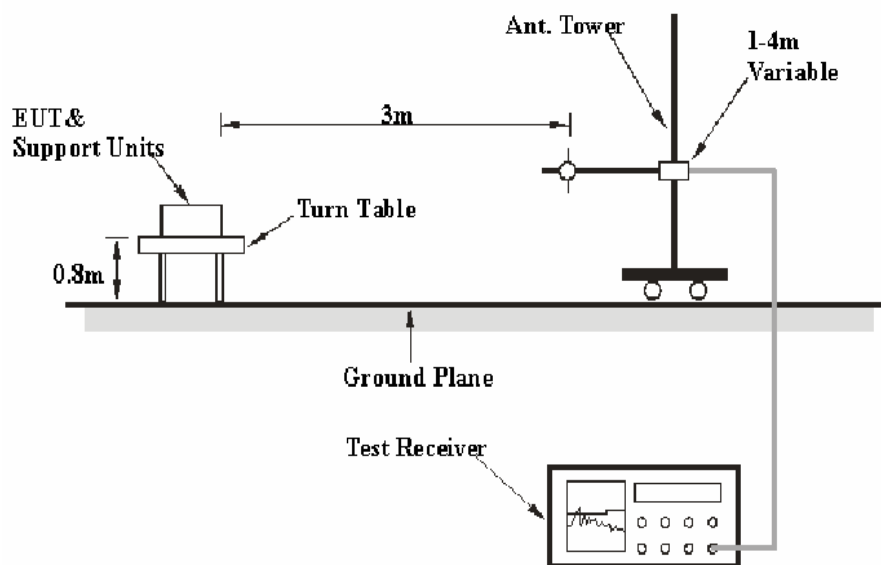
## FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

### Applicable Standard

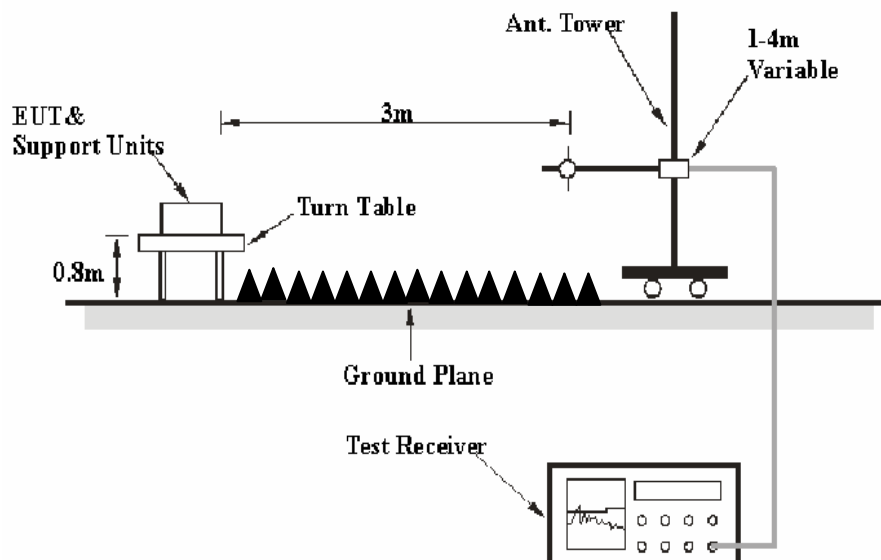
FCC §15.205; §15.209; §15.247(d)

### EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 and FCC 15.247 limits.

## 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	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

## Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz 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:

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Corrected Factor}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the maximum 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	2012-11-24	2013-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-07
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
SUPER ULTRA	Amplifier	ZVA-213+	N/A	2012-11-24	2013-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
Agilent	Spectrum Analyzer	8564E	3943A01781	2012-05-17	2013-05-16
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2010-10-14	2013-10-13

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, 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.

**2.64 dB at 720 MHz** in the **Vertical** polarization

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Henry Ding on 2013-03-15.*



EUT operation mode: Transmitting

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

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBuV/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)									
2402.0	94.38	PK	22	1.1	H	6.13	100.51	/	/
2402.0	83.12	Ave.	22	1.1	H	6.13	89.25	/	/
2402.0	97.09	PK	164	1.2	V	6.13	103.22	/	/
2402.0	84.62	Ave.	164	1.2	V	6.13	90.75	/	/
720.0	49.91	QP	62	1.0	V	-6.6	43.31	46.0	2.69
720.0	45.24	QP	102	1.0	H	-6.6	38.64	46.0	7.36
9608.0	18.63	Ave.	24	1.0	V	19.28	37.91	54	16.09
4804.0	25.32	Ave.	54	1.1	V	12.40	37.72	54	16.28
7206.0	20.54	Ave.	67	1.2	H	17.06	37.60	54	16.40
4804.0	40.60	PK	54	1.1	V	12.40	53.00	74	21.00
9608.0	32.09	PK	24	1.0	V	19.28	51.37	74	22.63
7206.0	33.71	PK	67	1.2	H	17.06	50.77	74	23.23
2486.5	21.66	Ave.	32	1.0	V	7.21	28.87	54	25.13
2388.1	22.02	Ave.	101	1.2	V	6.13	28.15	54	25.85
2348.6	21.52	Ave.	85	1.3	H	5.48	27.00	54	27.00
2486.5	35.31	PK	32	1.0	V	7.21	42.52	74	31.48
2388.1	35.13	PK	101	1.2	V	6.13	41.26	74	32.74
2348.6	34.44	PK	85	1.3	H	5.48	39.92	74	34.08
Middle Channel (2441 MHz)									
2441.0	94.01	PK	57	1.2	H	7.21	101.22	/	/
2441.0	82.90	Ave.	57	1.2	H	7.21	90.11	/	/
2441.0	96.03	PK	110	1.3	V	7.21	103.24	/	/
2441.0	84.39	Ave.	110	1.3	V	7.21	91.60	/	/
720.0	49.14	QP	136	1.0	V	-6.6	42.54	46.0	3.46
720.0	43.89	QP	47	1.0	H	-6.6	37.29	46.0	8.71
9764.0	18.77	Ave.	110	1.3	V	19.40	38.17	54	15.83
4882.0	24.33	Ave.	82	1.2	V	12.46	36.79	54	17.21
7323.0	20.10	Ave.	32	1.1	H	16.49	36.59	54	17.41
4882.0	39.57	PK	82	1.2	V	12.46	52.03	74	21.97
9764.0	31.63	PK	110	1.3	V	19.40	51.03	74	22.97
7323.0	32.87	PK	32	1.1	H	16.49	49.36	74	24.64
2489.5	21.89	Ave.	65	1.1	V	7.21	29.10	54	24.90
2338.5	21.08	Ave.	35	1.1	H	5.48	26.56	54	27.44
2364.5	20.96	Ave.	74	1.2	V	5.48	26.44	54	27.56
2489.5	35.77	PK	65	1.1	V	7.21	42.98	74	31.02
2338.5	35.22	PK	35	1.1	H	5.48	40.70	74	33.30
2364.5	34.76	PK	74	1.2	V	5.48	40.24	74	33.76

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBuV/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)									
2480.0	91.90	PK	57	1.2	H	7.21	99.11	/	/
2480.0	81.46	Ave.	57	1.2	H	7.21	88.67	/	/
2480.0	94.59	PK	113	1.0	V	7.21	101.80	/	/
2480.0	84.23	Ave.	113	1.0	V	7.21	91.44	/	/
720.0	49.96	QP	167	1.0	V	-6.6	43.36	46.0	2.64
720.0	44.14	QP	84	1.0	H	-6.6	37.54	46.0	8.46
9920.0	18.96	Ave.	75	1.0	V	19.38	38.34	54	15.66
4960.0	25.17	Ave.	54	1.1	V	12.50	37.67	54	16.33
7440.0	21.54	Ave.	61	1.2	H	15.90	37.44	54	16.56
9920.0	35.61	PK	75	1.0	V	19.38	54.99	74	19.01
4960.0	40.52	PK	54	1.1	V	12.50	53.02	74	20.98
7440.0	34.22	PK	61	1.2	H	15.90	50.12	74	23.88
2495.6	21.51	Ave.	37	1.2	V	7.21	28.72	54	25.28
2389.2	22.41	Ave.	101	1.3	H	6.13	28.54	54	25.46
2355.6	21.74	Ave.	25	1.1	H	5.48	27.22	54	26.78
2495.6	34.74	PK	37	1.2	V	7.21	41.95	74	32.05
2389.2	35.43	PK	101	1.3	H	6.13	41.56	74	32.44
2355.6	32.66	PK	25	1.1	H	5.48	38.14	74	35.86

## 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	2012-08-08	2013-08-07

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

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	100.1 kPa

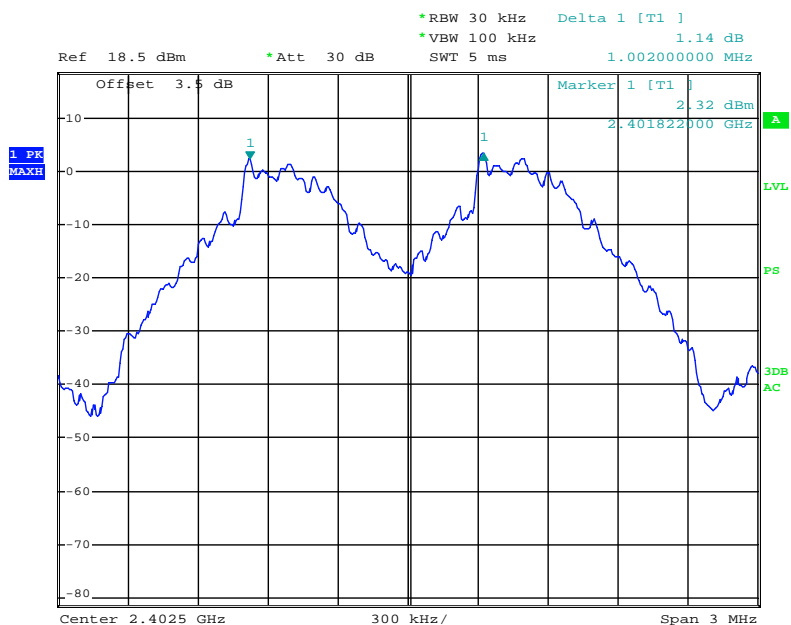
\* The testing was performed by Henry Ding on 2013-03-07.

*EUT operation mode: Transmitting*

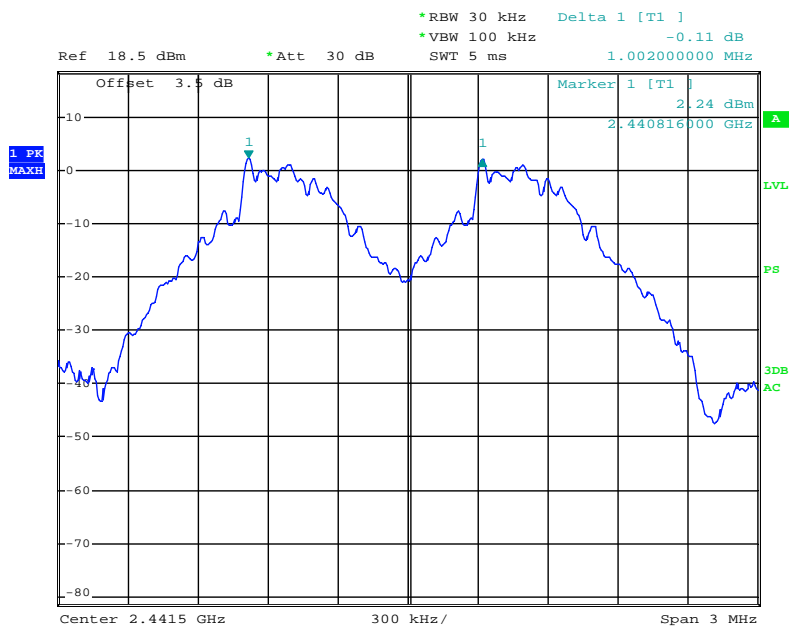
*Test Result: Compliance. Please refer to following tables and plots*

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	$\geq$ Limit (MHz)	Result
<b>BDR (GFSK)</b>	Low	2402	1.002	0.613	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.613	Pass
	Adjacent	2442			
	High	2480	1.002	0.613	Pass
	Adjacent	2479			
<b>EDR (<math>\pi/4</math>-DQPSK)</b>	Low	2402	1.002	0.812	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.812	Pass
	Adjacent	2442			
	High	2480	0.996	0.812	Pass
	Adjacent	2479			
<b>EDR (8DPSK)</b>	Low	2402	1.002	0.816	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.829	Pass
	Adjacent	2442			
	High	2480	1.002	0.835	Pass
	Adjacent	2479			

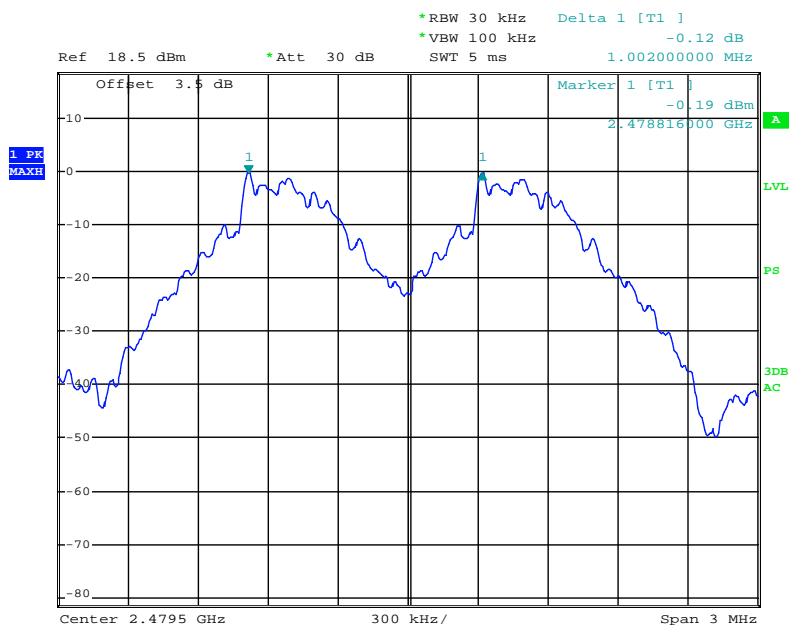
Note: Limit = 20 dB bandwidth \*2/3

**BDR (GFSK): Low Channel**

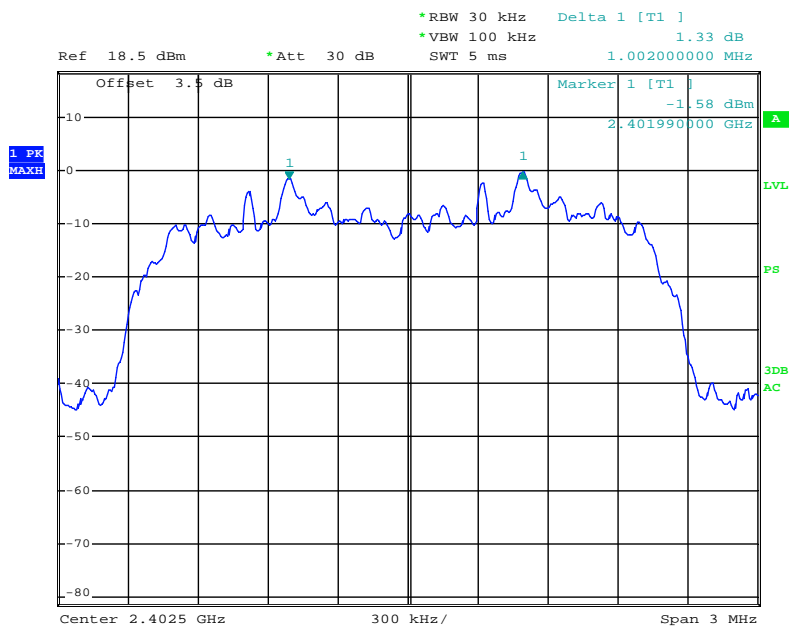
Date: 7.MAR.2013 12:00:28

**BDR (GFSK): Middle Channel**

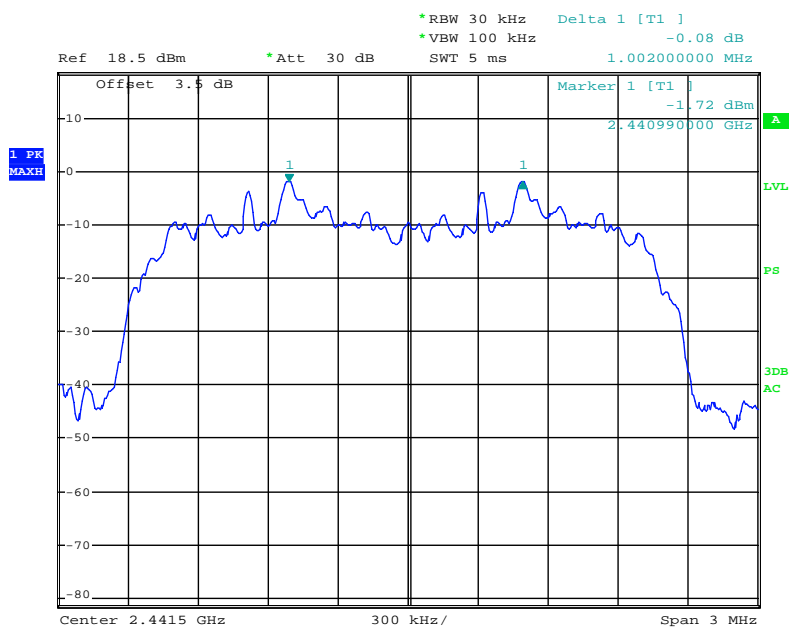
Date: 7.MAR.2013 12:01:18

**BDR (GFSK): High Channel**

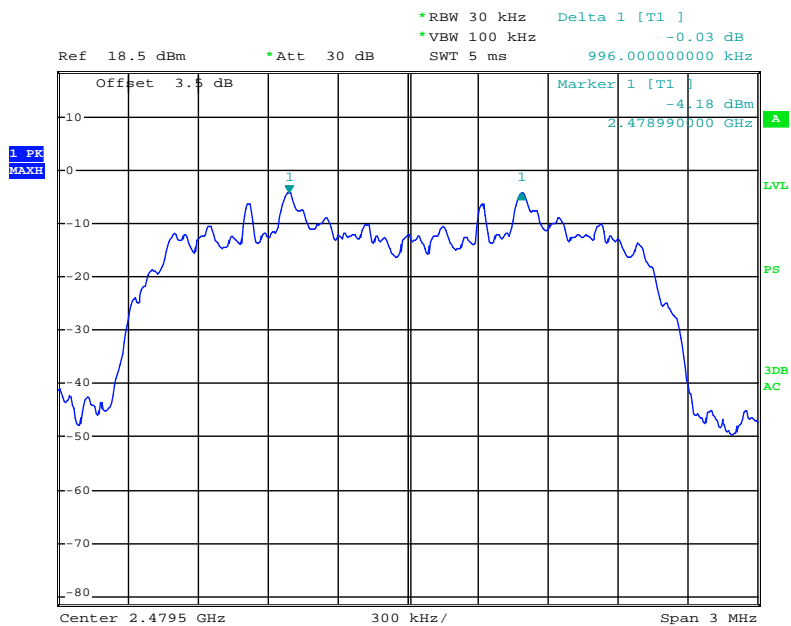
Date: 7.MAR.2013 12:02:13

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

Date: 7.MAR.2013 12:41:47

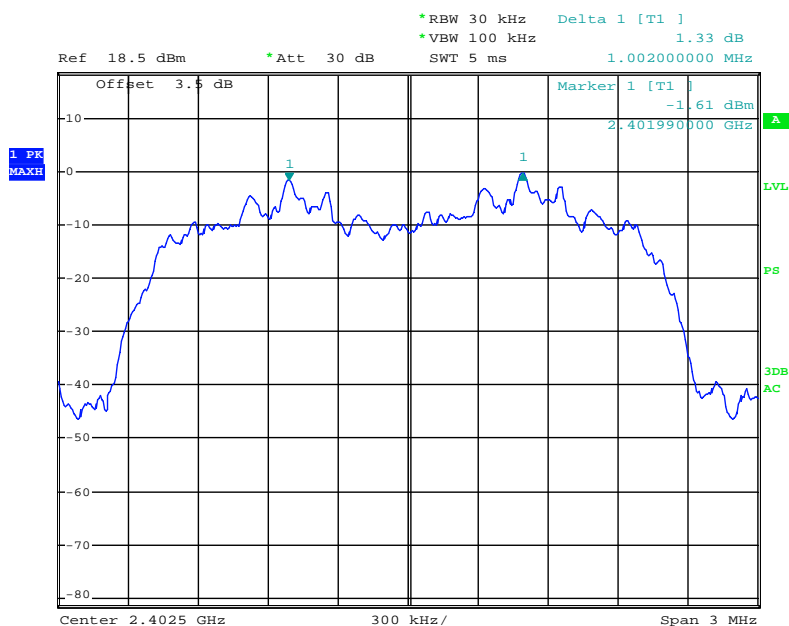
**EDR ( $\pi/4$ -DQPSK): Middle Channel**

Date: 7.MAR.2013 12:40:33

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

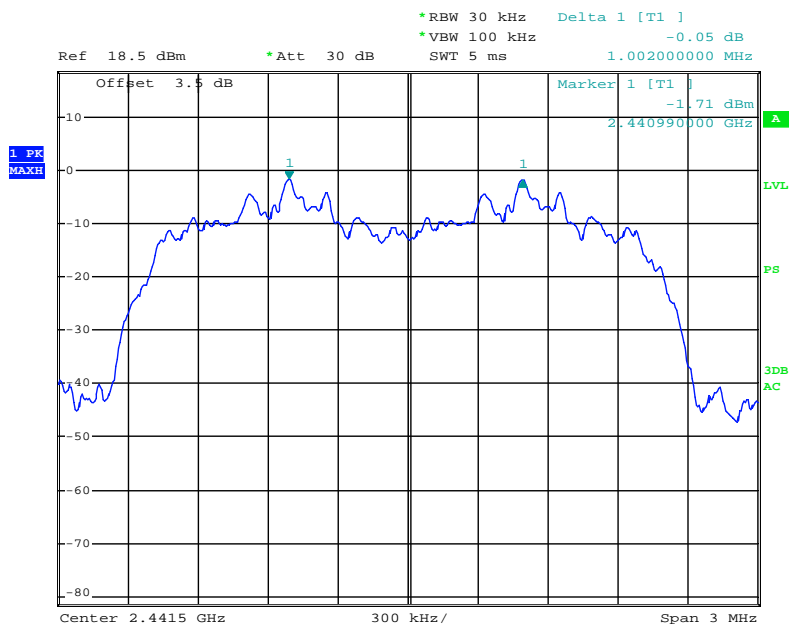
Date: 7.MAR.2013 12:39:28

### EDR (8DPSK): Low Channel



Date: 7.MAR.2013 12:56:51

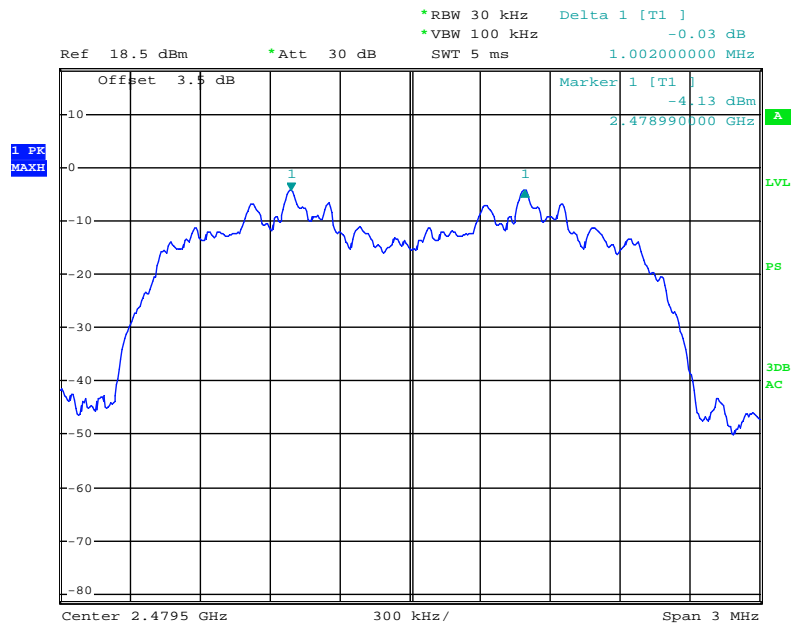
### EDR (8DPSK): Middle Channel



Date: 7.MAR.2013 12:56:01



# EDR (8DPSK): High Channel



Date: 7.MAR.2013 12:55:08

## 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	2012-08-08	2013-08-07

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

### Test Data

#### Environmental Conditions

Temperature:	24~25 °C
Relative Humidity:	50~56 %
ATM Pressure:	100.0~100.1 kPa

\* The testing was performed by Henry Ding on 2013-03-07 and 0313-03-18.

EUT operation mode: Transmitting

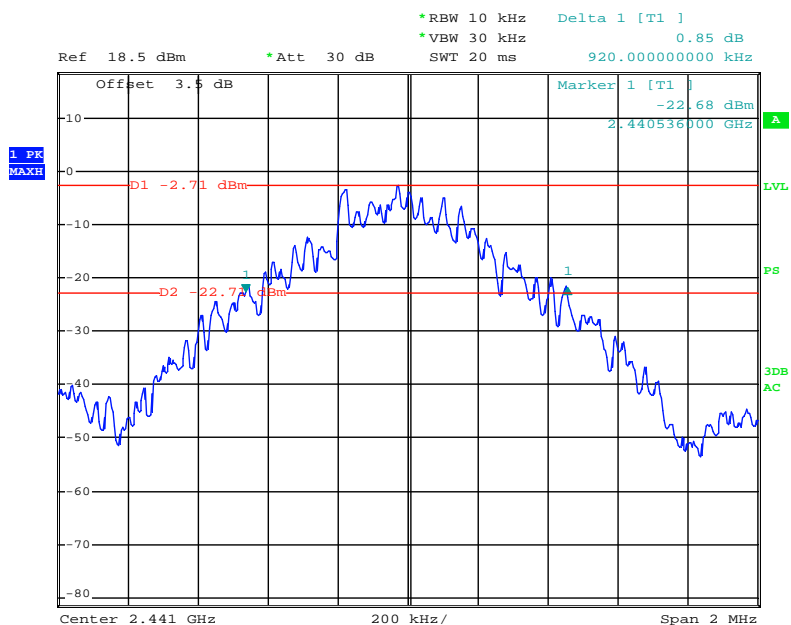
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
<b>BDR (GFSK)</b>	Low	2402	0.920
	Middle	2441	0.920
	High	2480	0.920
<b>EDR (<math>\pi/4</math>-DQPSK)</b>	Low	2402	1.218
	Middle	2441	1.218
	High	2480	1.218
<b>EDR (8DPSK)</b>	Low	2402	1.224
	Middle	2441	1.244
	High	2480	1.252

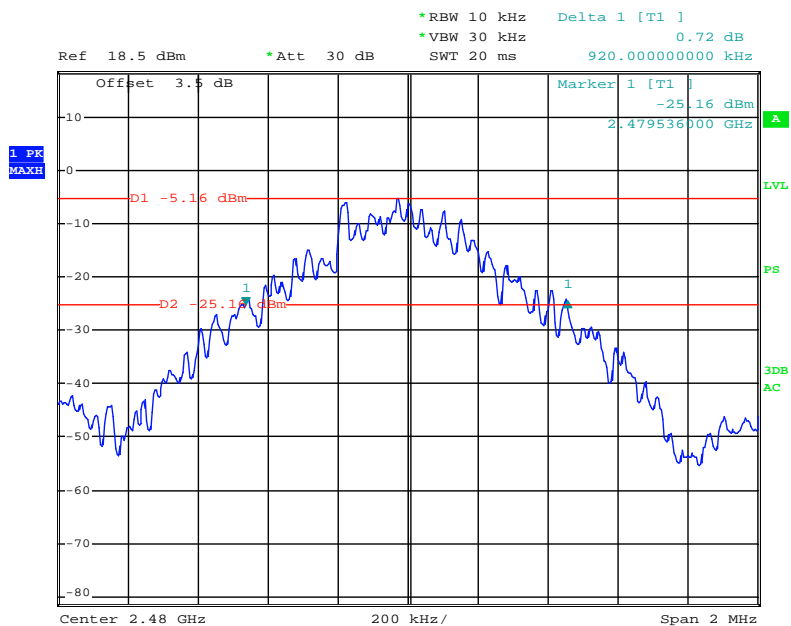
### BDR (GFSK): Low Channel



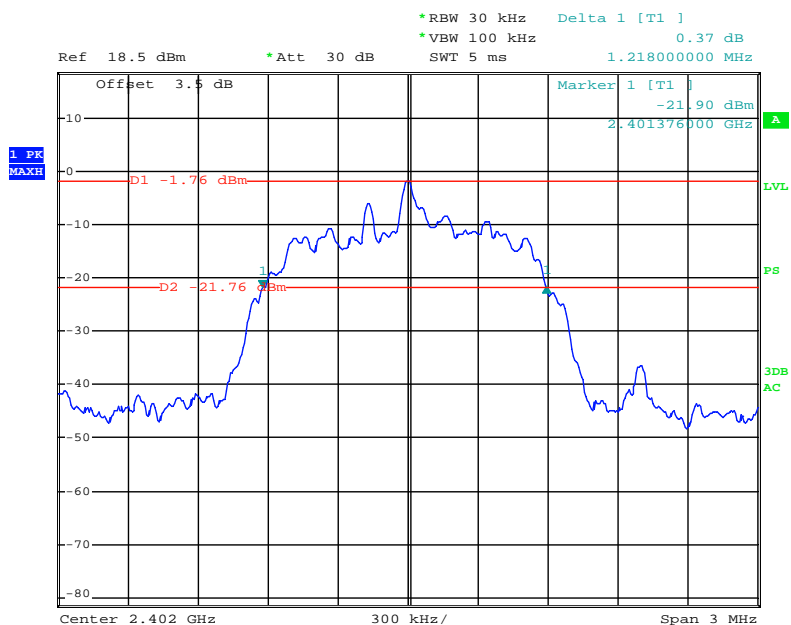
Date: 7.MAR.2013 11:54:15

**BDR (GFSK): Middle Channel**

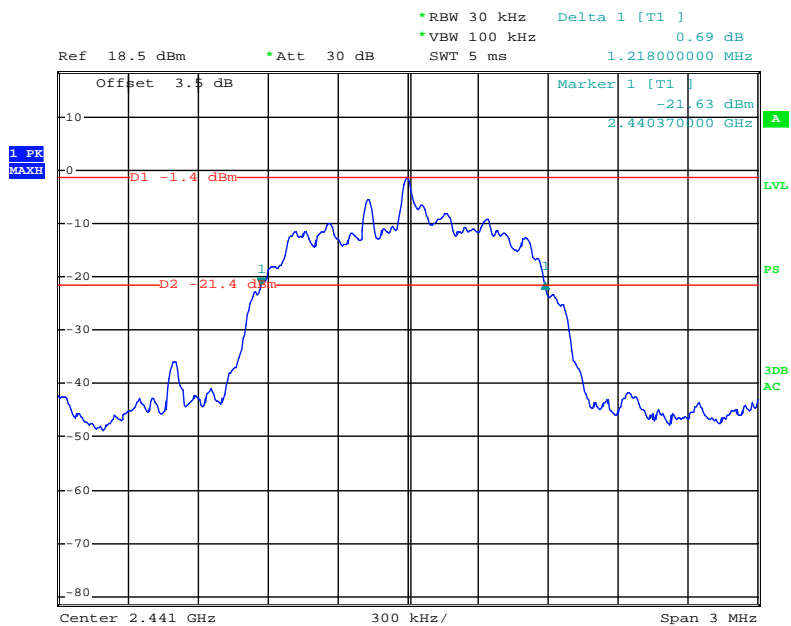
Date: 7.MAR.2013 11:56:12

**BDR (GFSK): High Channel**

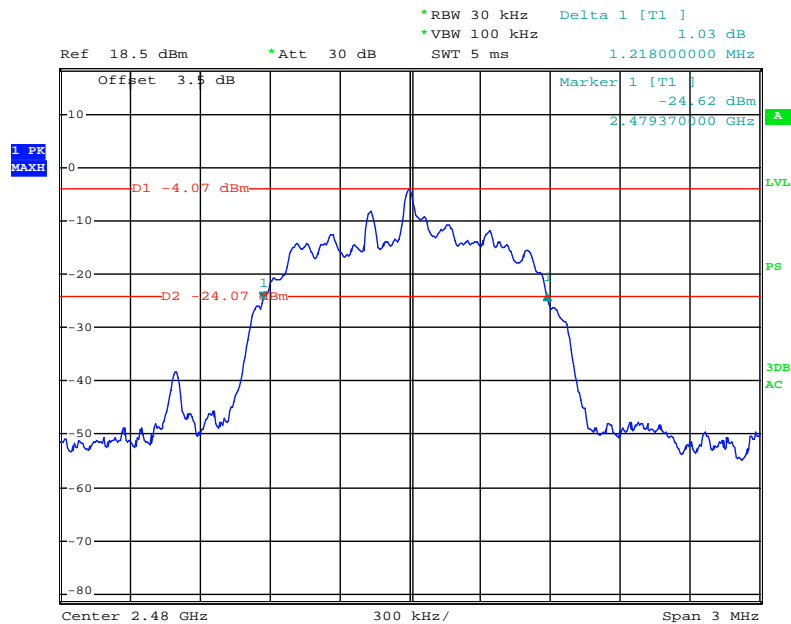
Date: 7.MAR.2013 11:57:12

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

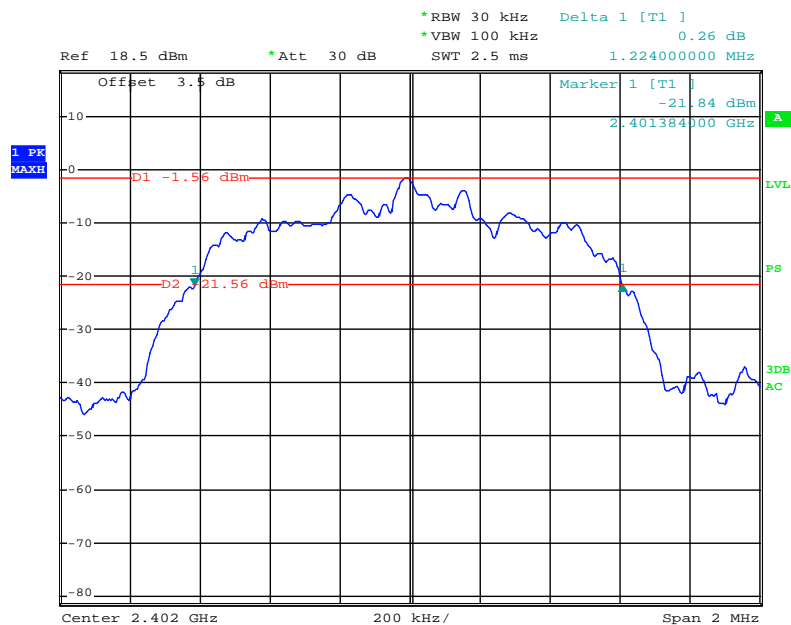
Date: 18.MAR.2013 18:20:28

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

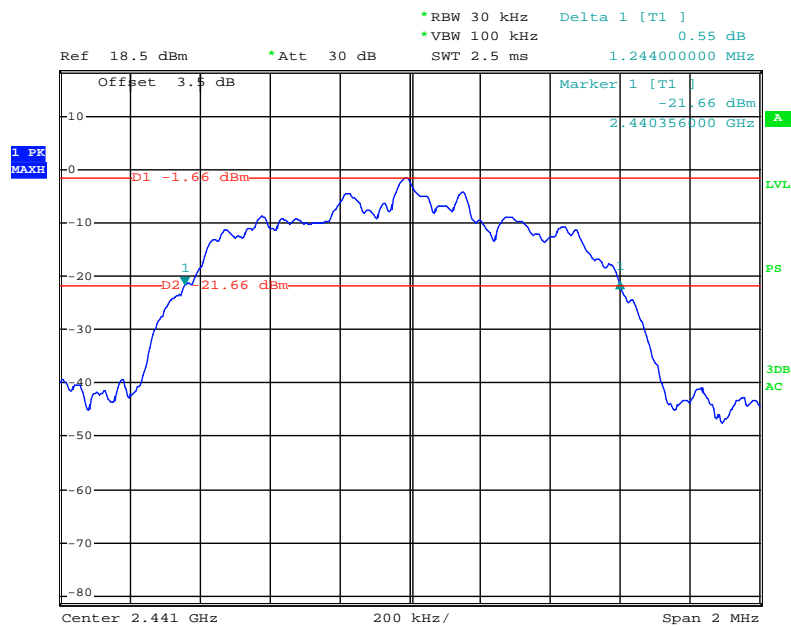
Date: 18.MAR.2013 18:21:48

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

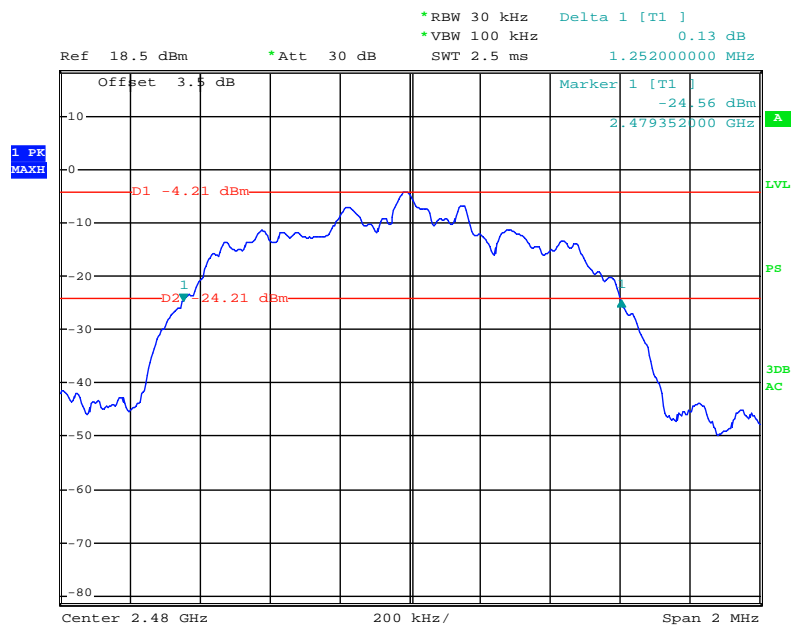
Date: 18.MAR.2013 18:24:40

**EDR (8DPSK): Low Channel**

Date: 7.MAR.2013 12:43:43

**EDR (8DPSK): Middle Channel**

Date: 7.MAR.2013 12:44:59

**EDR (8DPSK): High Channel**

Date: 7.MAR.2013 12:46:12

## 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	2012-08-08	2013-08-07

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

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	100.1 kPa

*The testing was performed by Henry Ding on 2013-03-07.*

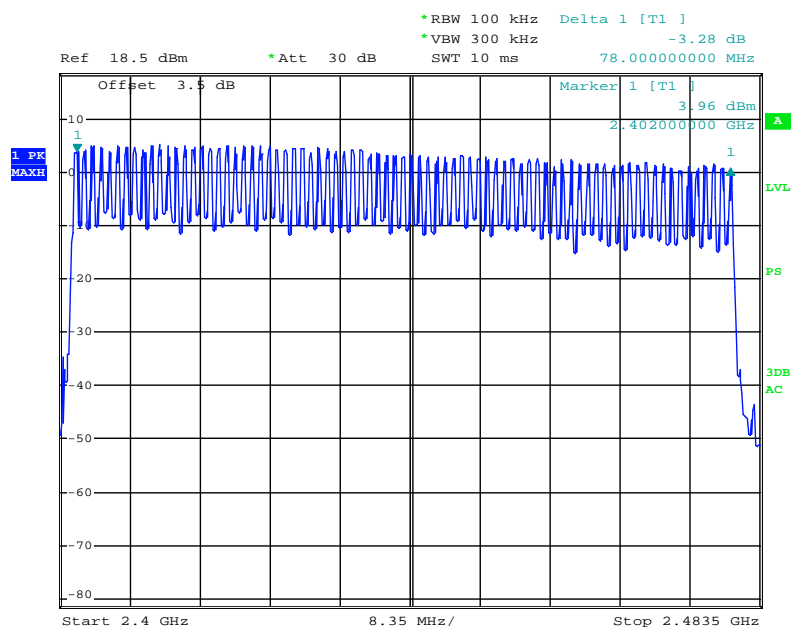
*EUT operation mode: Transmitting*

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

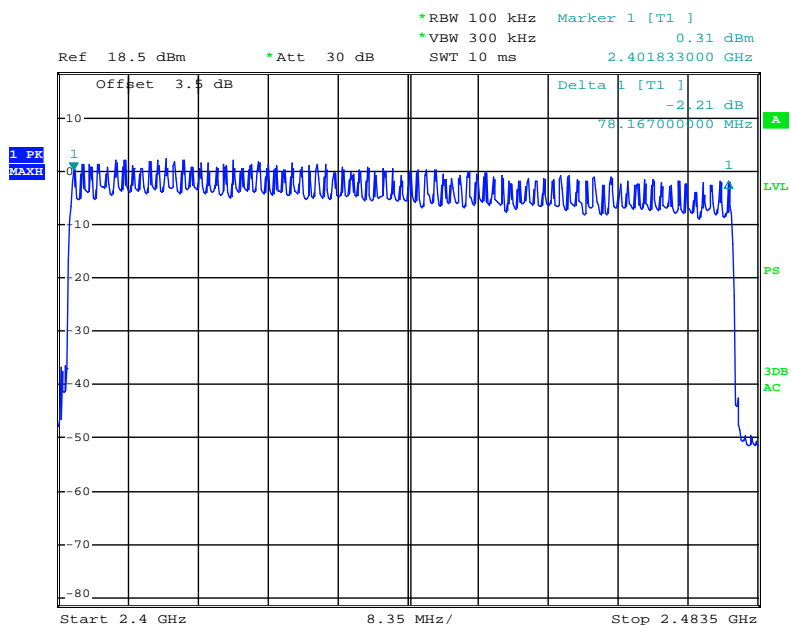


Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2400-2483.5	79	$\geq 15$
EDR ( $\pi/4$ -DQPSK)	2400-2483.5	79	$\geq 15$
EDR (8DPSK)	2400-2483.5	79	$\geq 15$

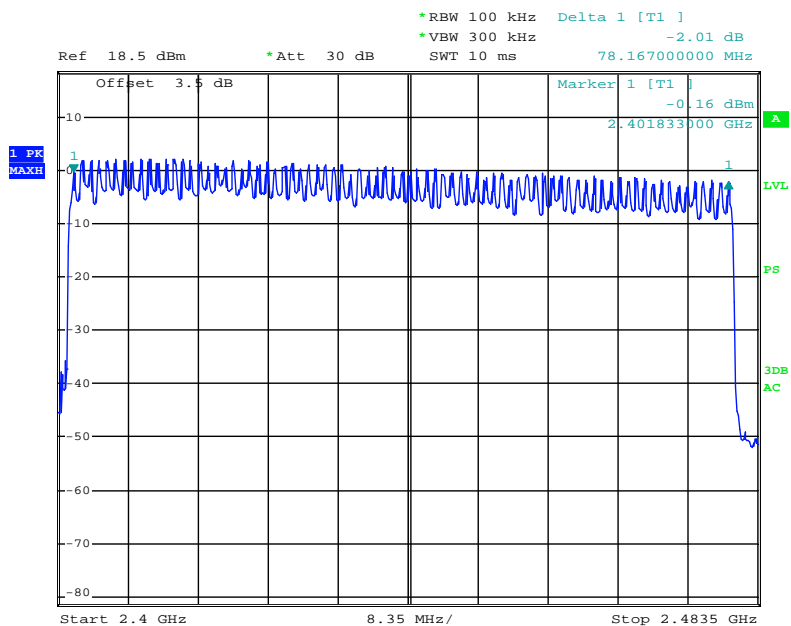
### BDR (GFSK): Number of Hopping Channels



Date: 7.MAR.2013 11:51:42

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

Date: 7.MAR.2013 12:24:52

**(8DPSK): Number of Hopping Channels**

Date: 7.MAR.2013 12:49:49

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

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

**Test Procedure**

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

Dwell time = Pulse time\*hop rate/number of hopping channels\*31.6S  
Hop rate=1600/S

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-07

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

**Test Data****Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	100.1 kPa

*The testing was performed by Henry Ding on 2013-03-07.*

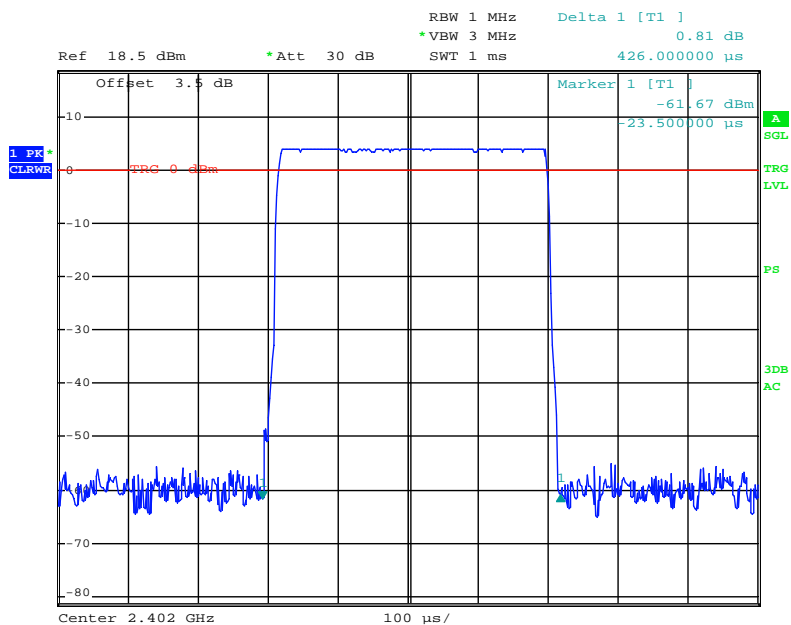
*EUT operation mode: Transmitting*

*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	0.426	0.1363	0.4	Pass
		Middle	0.426	0.1363	0.4	Pass
		High	0.426	0.1363	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.704	0.2726	0.4	Pass
		Middle	1.704	0.2726	0.4	Pass
		High	1.704	0.2726	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.954	0.3151	0.4	Pass
		Middle	2.954	0.3151	0.4	Pass
		High	2.954	0.3151	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR ( $\pi/4$ -DQPSK)	DH 1	Low	0.444	0.1421	0.4	Pass
		Middle	0.438	0.1402	0.4	Pass
		High	0.440	0.1408	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.706	0.2730	0.4	Pass
		Middle	1.700	0.2720	0.4	Pass
		High	1.712	0.2739	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.986	0.3185	0.4	Pass
		Middle	2.956	0.3153	0.4	Pass
		High	2.956	0.3153	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	DH 1	Low	0.442	0.1414	0.4	Pass
		Middle	0.442	0.1414	0.4	Pass
		High	0.442	0.1414	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.708	0.2733	0.4	Pass
		Middle	1.702	0.2723	0.4	Pass
		High	1.702	0.2723	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	2.958	0.3155	0.4	Pass
		Middle	2.958	0.3155	0.4	Pass
		High	2.958	0.3155	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

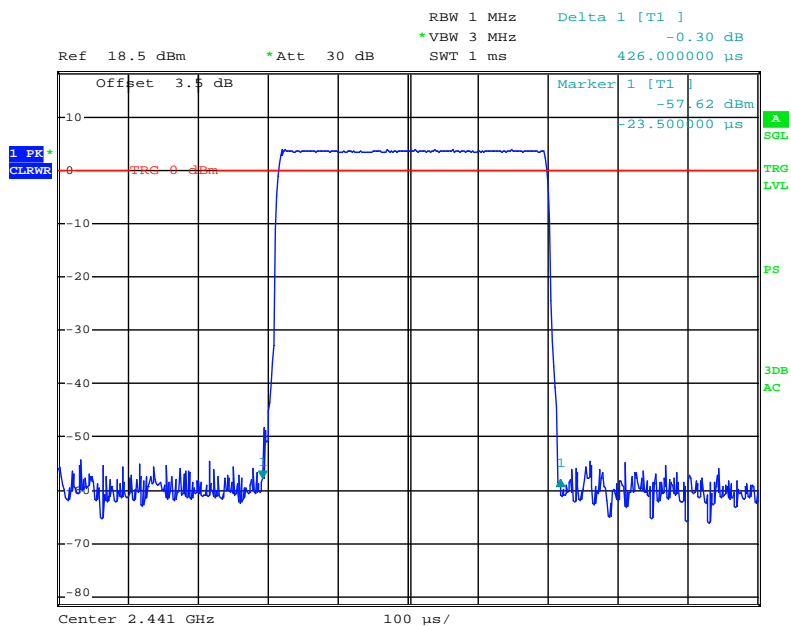
# BDR (GFSK):

## Pulse time, Low Channel, DH1

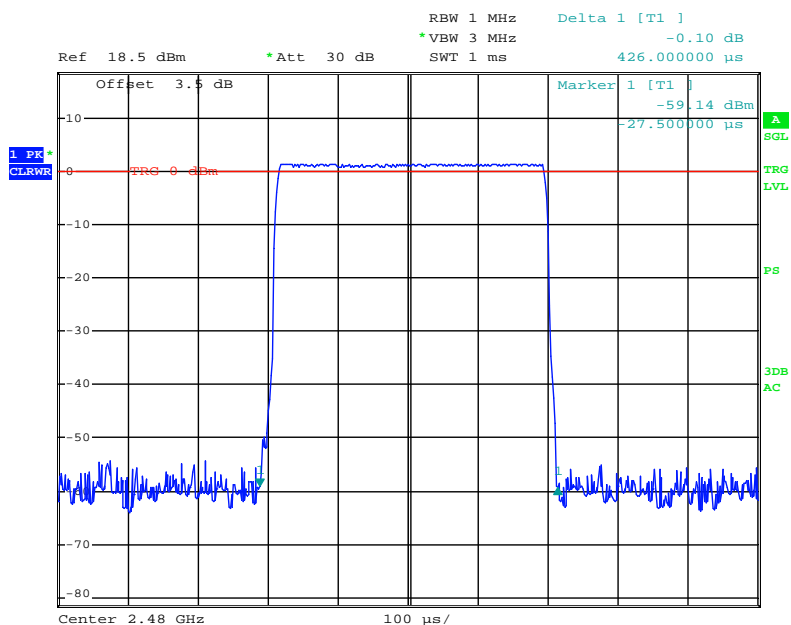


Date: 7.MAR.2013 12:08:59

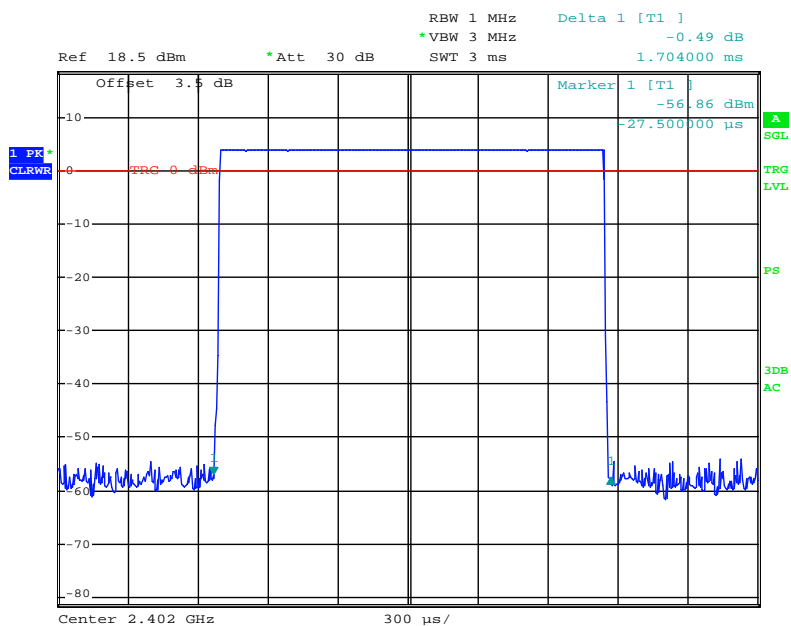
## Pulse time, Middle Channel, DH1



Date: 7.MAR.2013 12:09:32

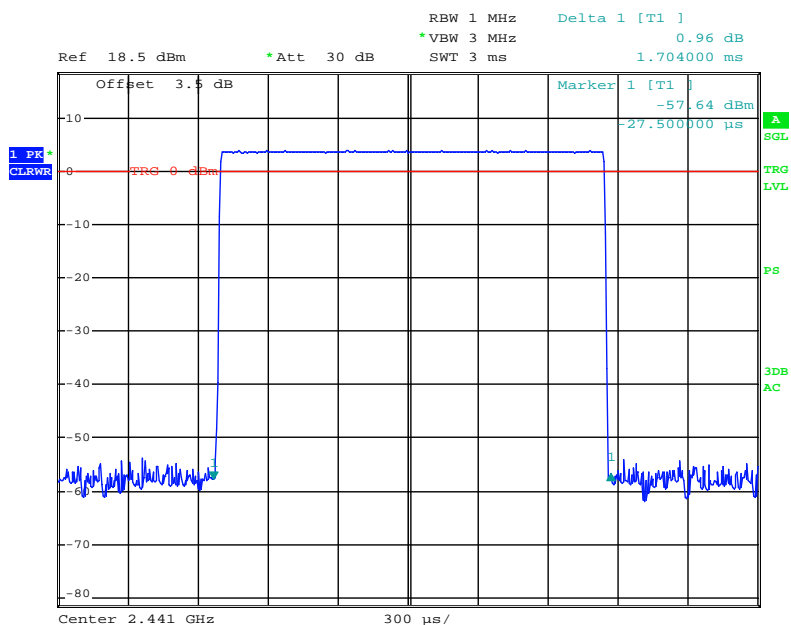
**Pulse time, High Channel, DH1**

Date: 7.MAR.2013 12:10:18

**Pulse time, Low Channel, DH3**

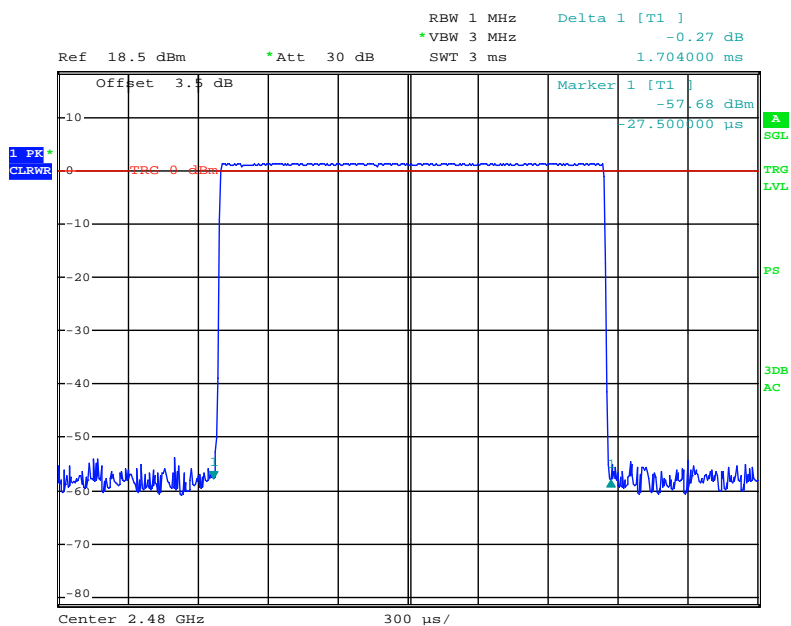
Date: 7.MAR.2013 12:12:32

### Pulse time, Middle Channel, DH3



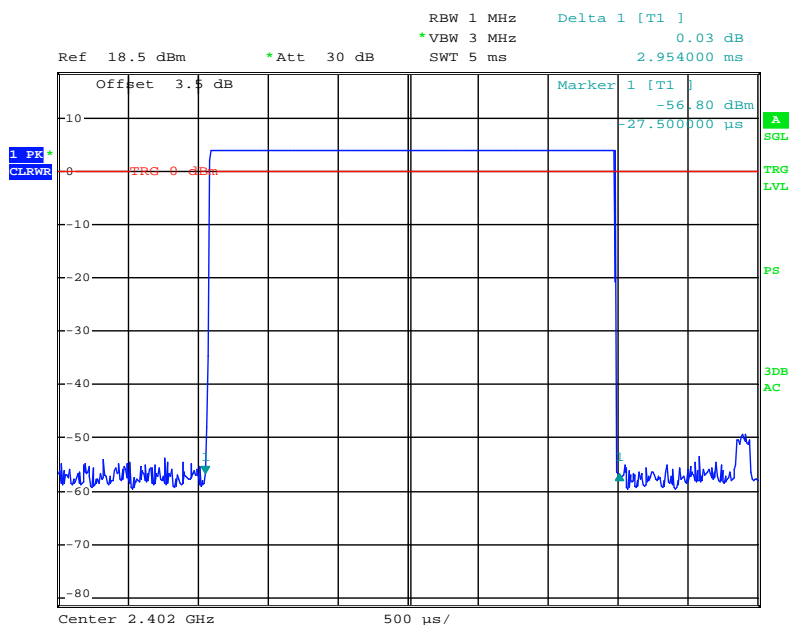
Date: 7.MAR.2013 12:12:05

### Pulse time, High Channel, DH3



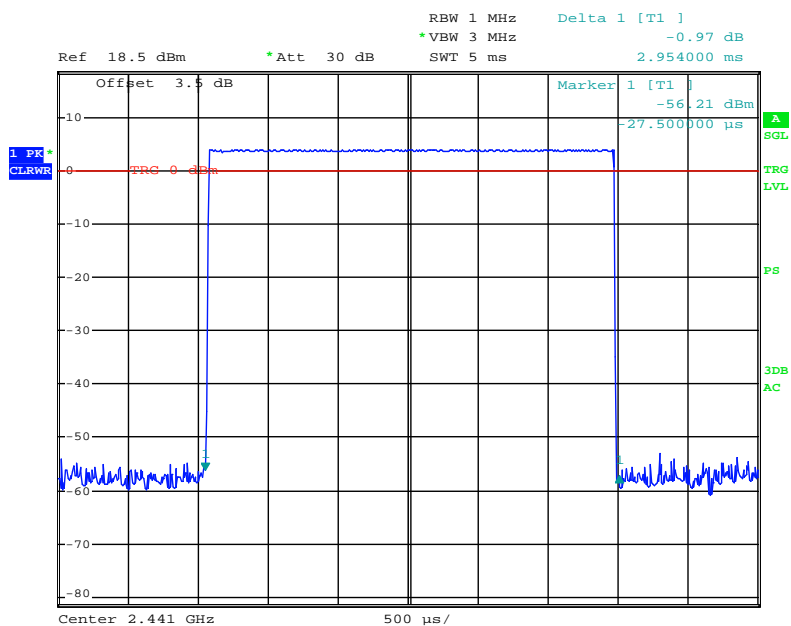
Date: 7.MAR.2013 12:11:48

### Pulse time, Low Channel, DH5



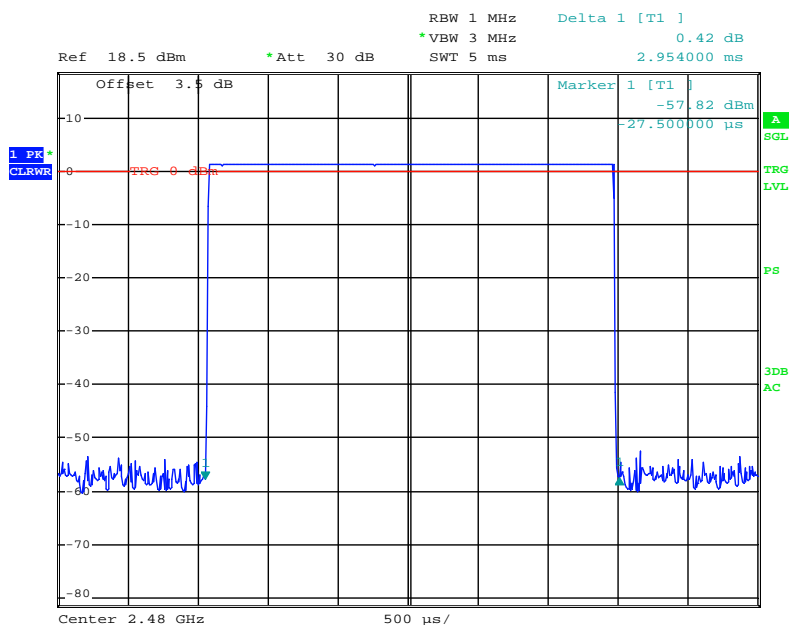
Date: 7.MAR.2013 12:13:43

### Pulse time, Middle Channel, DH5

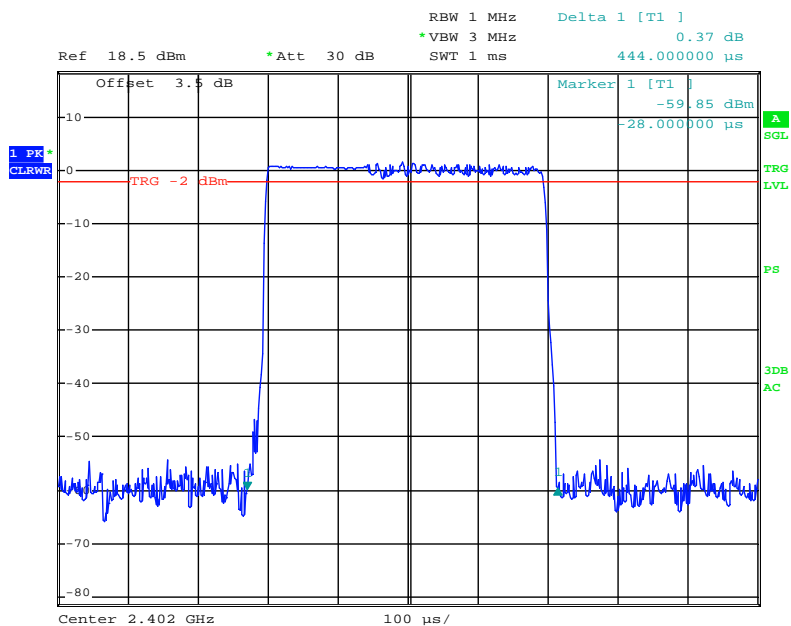


Date: 7.MAR.2013 12:14:01



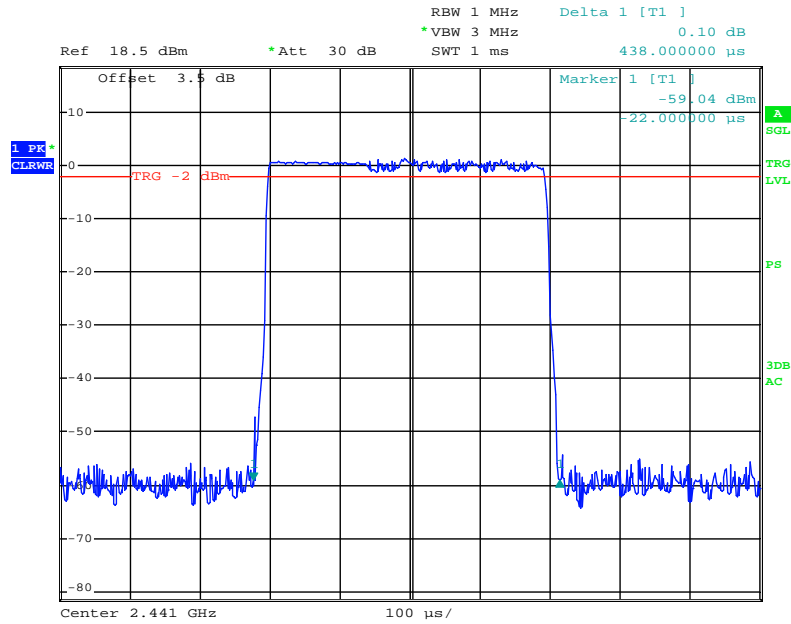
**Pulse time, High Channel, DH5**

Date: 7.MAR.2013 12:14:15

**EDR ( $\pi/4$ -DQPSK):****Pulse time, Low Channel, DH1**

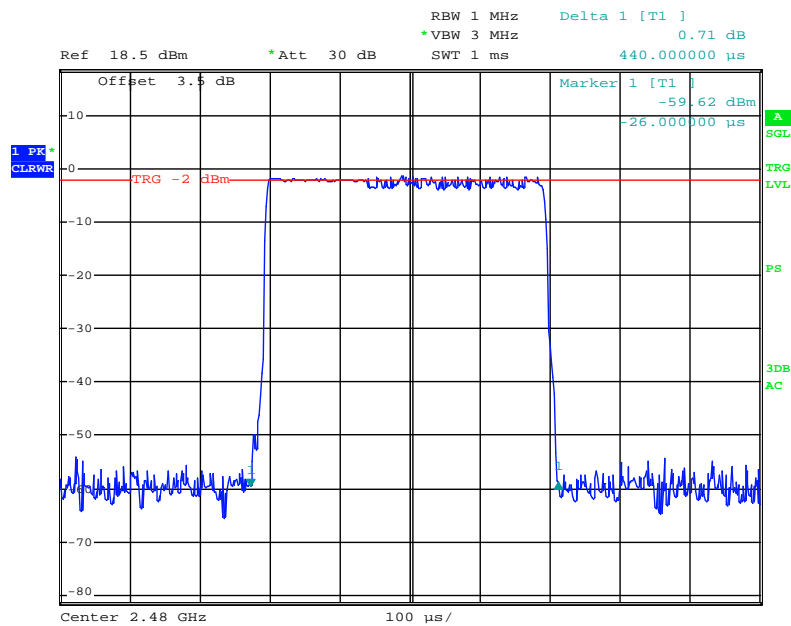
Date: 7.MAR.2013 12:27:16

### Pulse time, Middle Channel, DH1



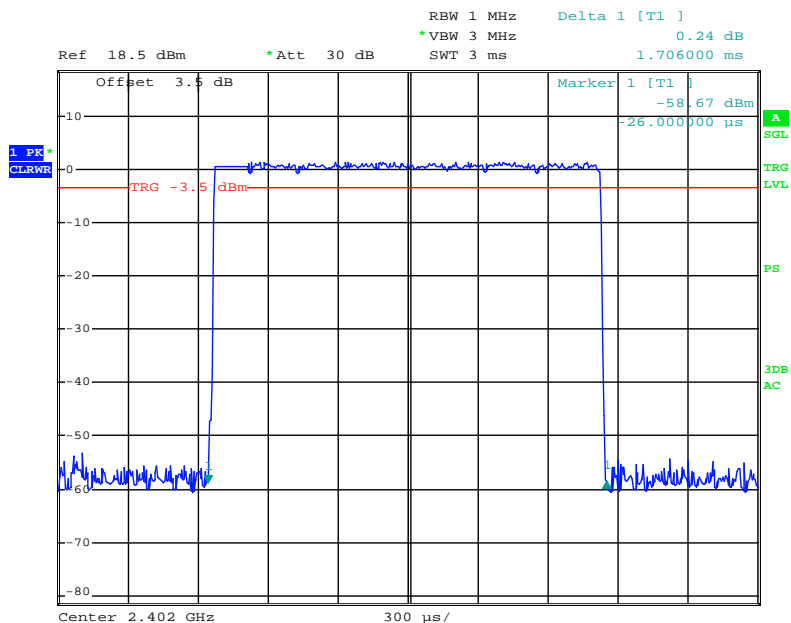
Date: 7.MAR.2013 12:28:02

### Pulse time, High Channel, DH1



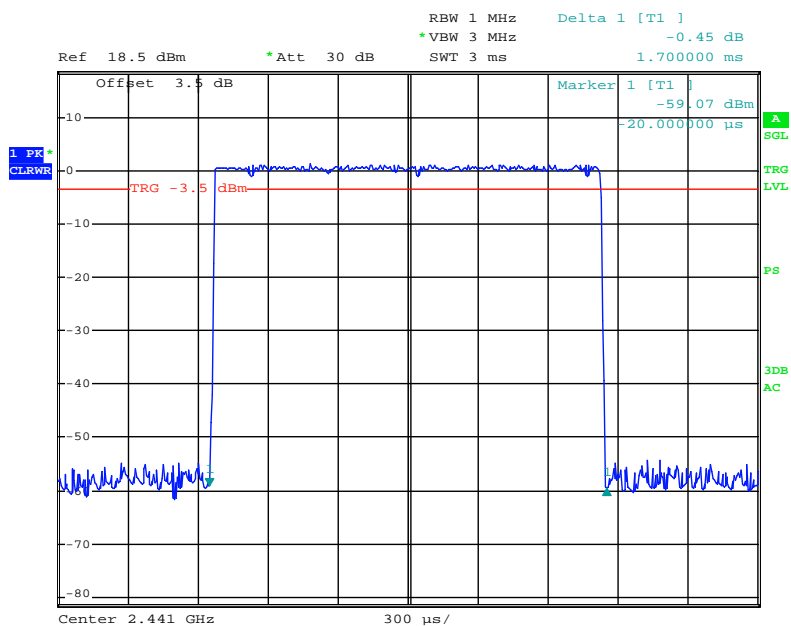
Date: 7.MAR.2013 12:28:38

### Pulse time, Low Channel, DH3

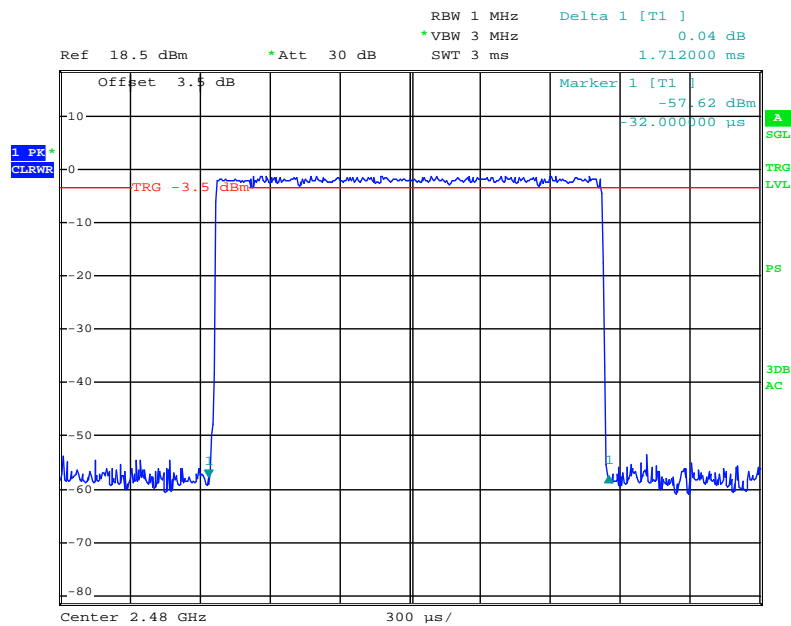


Date: 7.MAR.2013 12:30:49

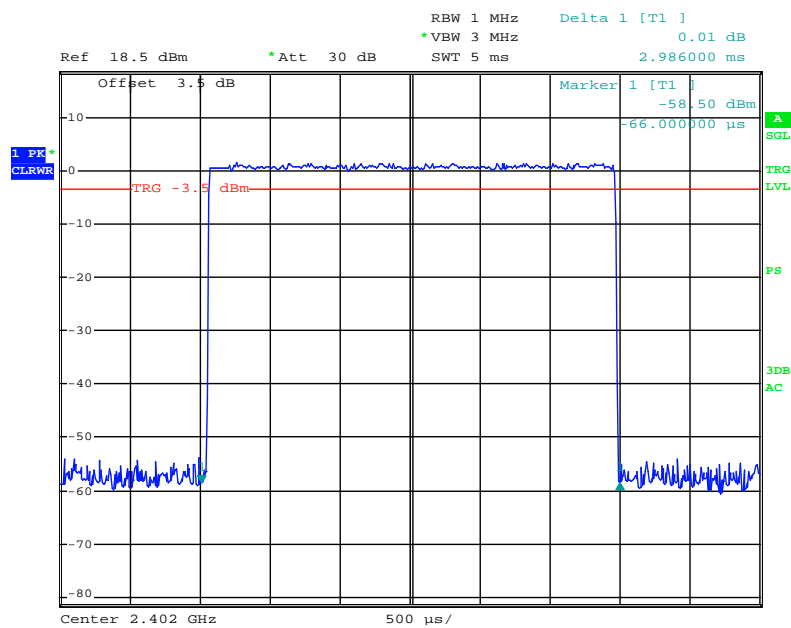
### Pulse time, Middle Channel, DH3



Date: 7.MAR.2013 12:30:13

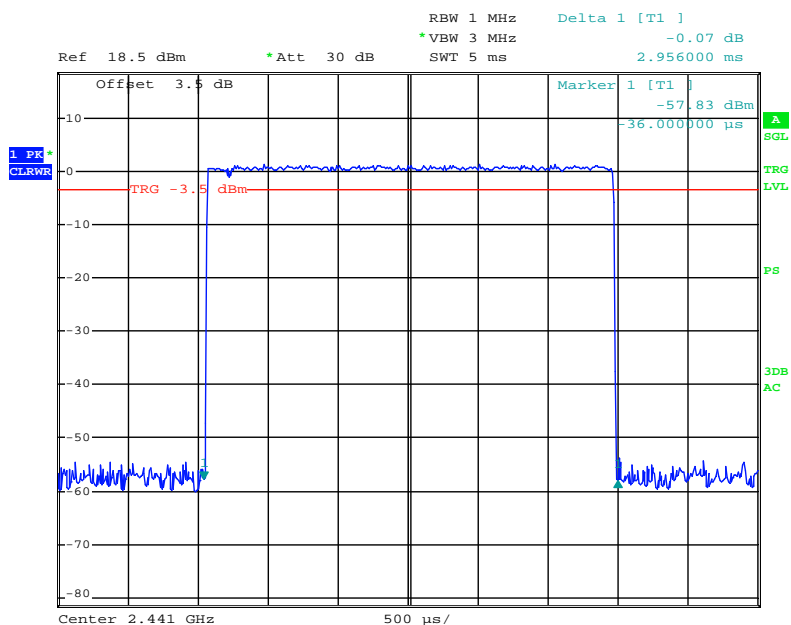
**Pulse time, High Channel, DH3**

Date: 7.MAR.2013 12:29:50

**Pulse time, Low Channel, DH5**

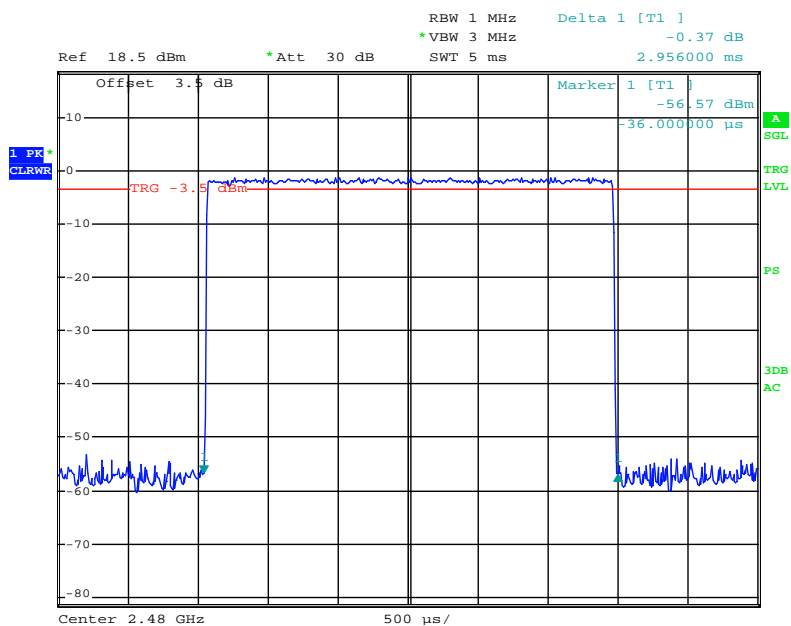
Date: 7.MAR.2013 12:31:49

## Pulse time, Middle Channel, DH5

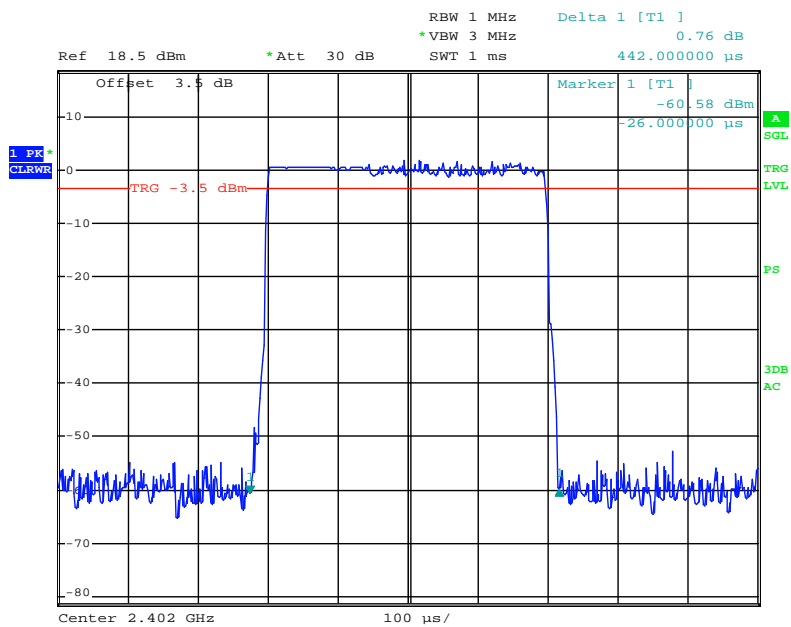


Date: 7.MAR.2013 12:32:50

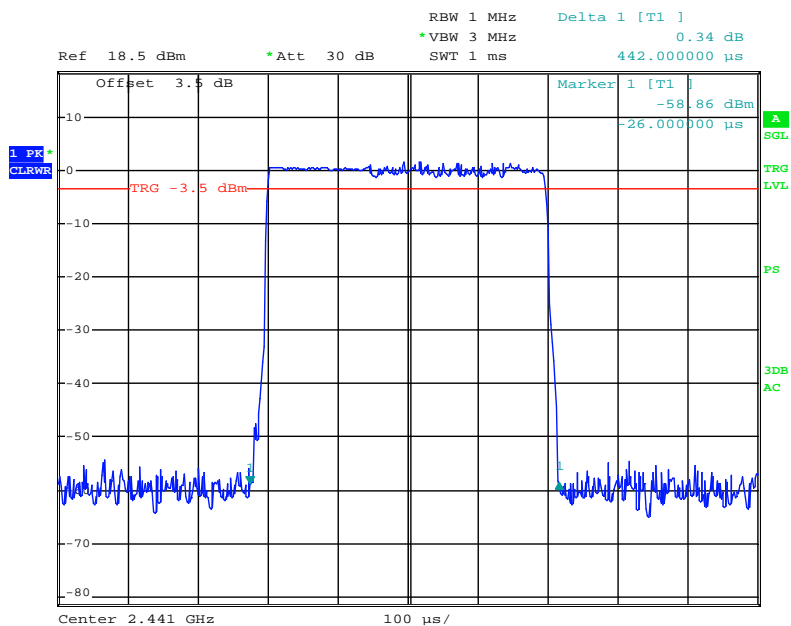
## Pulse time, High Channel, DH5



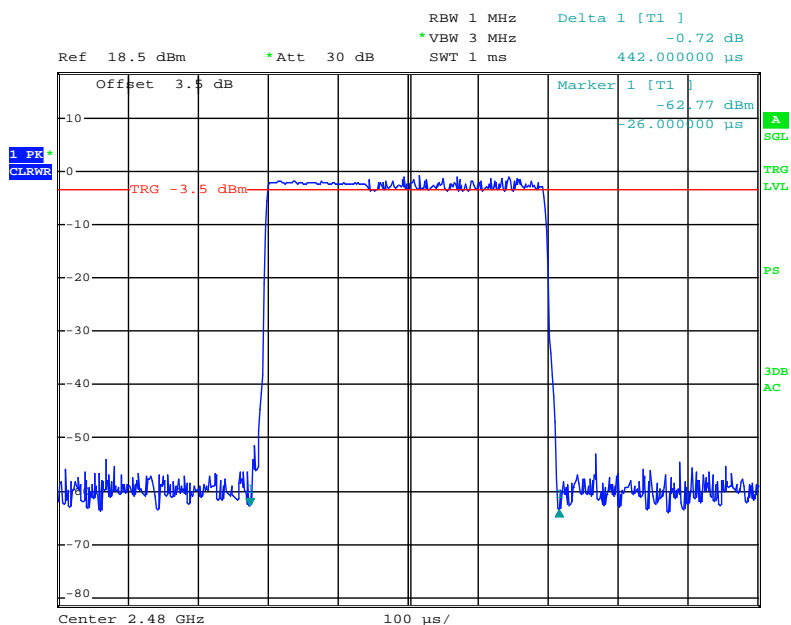
Date: 7.MAR.2013 12:33:06

**EDR (8DPSK):****Pulse time, Low Channel, DH1**

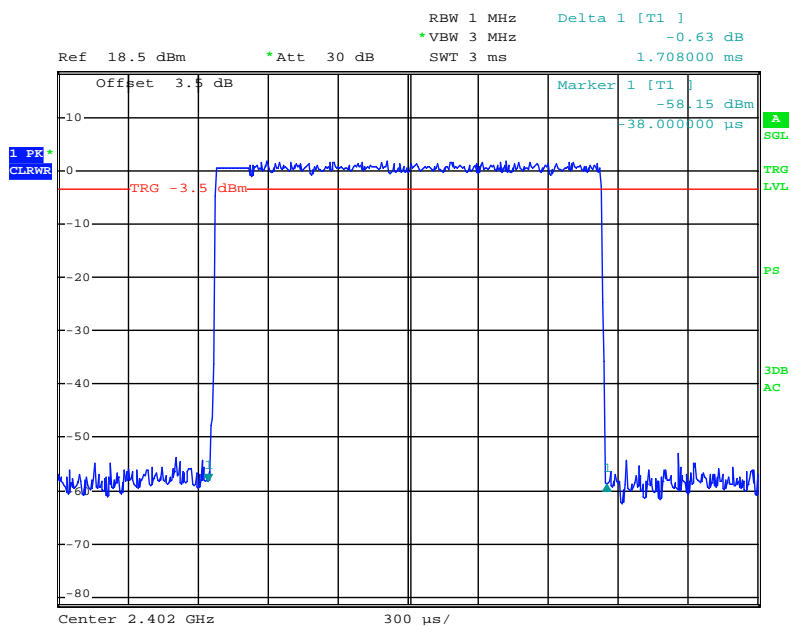
Date: 7.MAR.2013 12:58:10

**Pulse time, Middle Channel, DH1**

Date: 7.MAR.2013 12:58:40

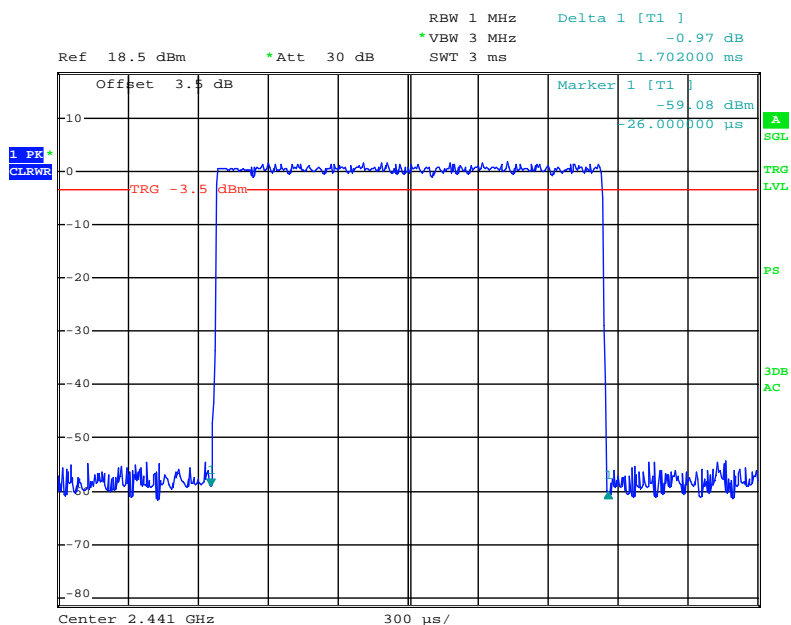
**Pulse time, High Channel, DH1**

Date: 7.MAR.2013 12:58:57

**Pulse time, Low Channel, DH3**

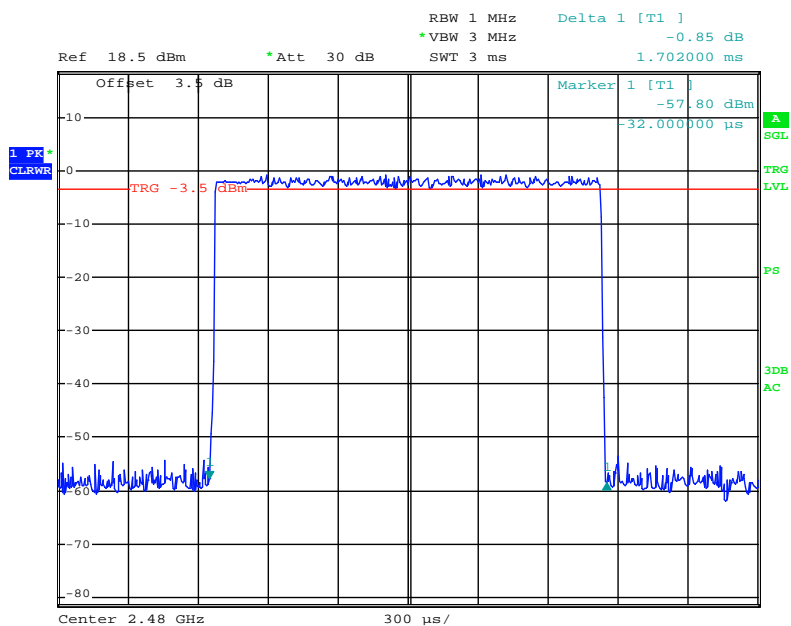
Date: 7.MAR.2013 13:01:15

### Pulse time, Middle Channel, DH3



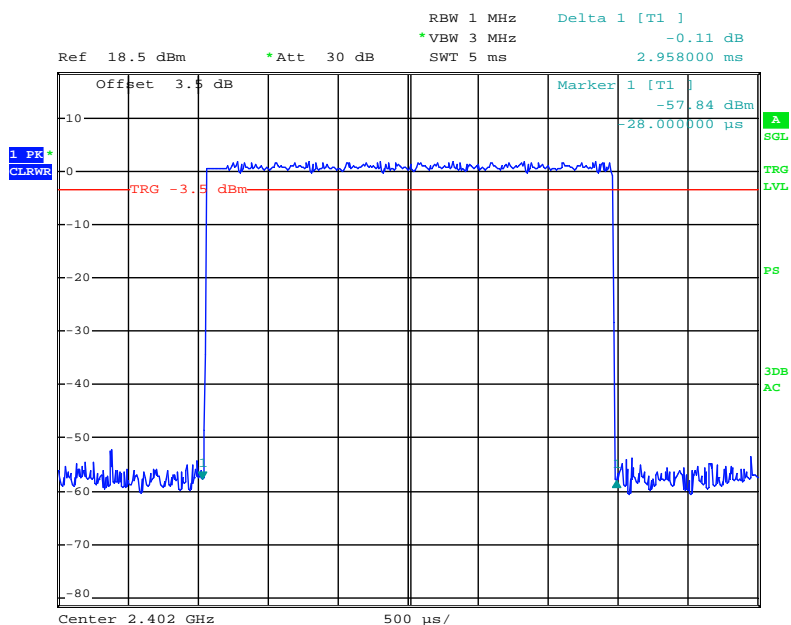
Date: 7.MAR.2013 13:00:51

### Pulse time, High Channel, DH3

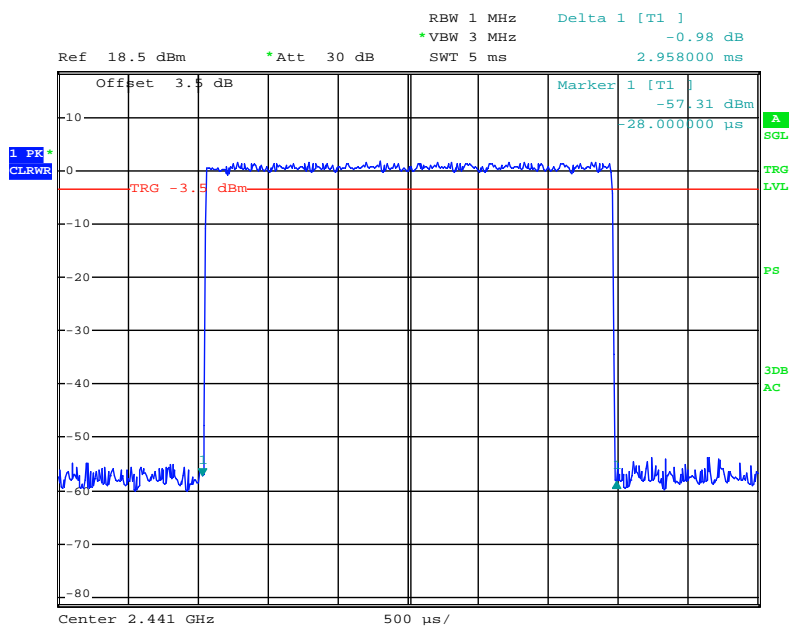


Date: 7.MAR.2013 13:00:05



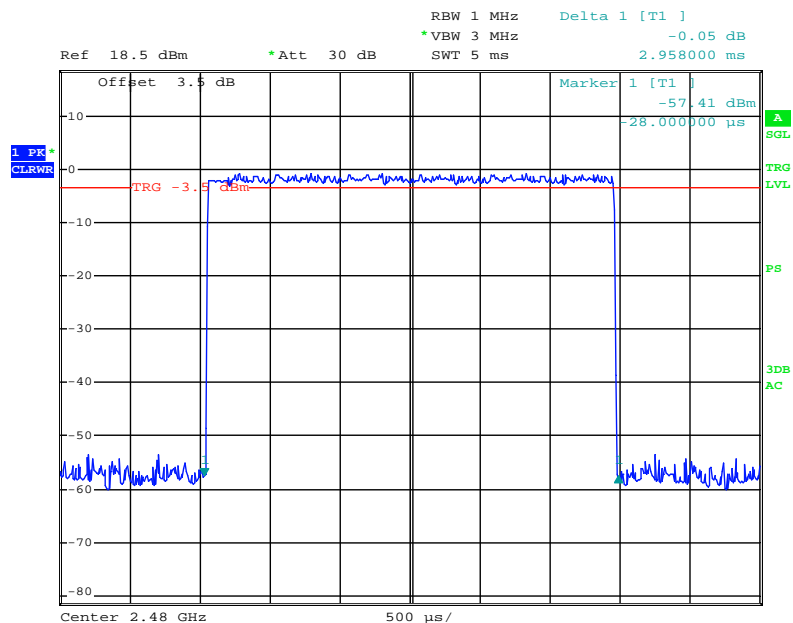
**Pulse time, Low Channel, DH5**

Date: 7.MAR.2013 13:02:19

**Pulse time, Middle Channel, DH5**

Date: 7.MAR.2013 13:02:45

Pulse time, High Channel, DH5



Date: 7.MAR.2013 13:03:02

## 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 an EMI test receiver.
3. Add a correction factor to the display.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-07

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

### Test Data

#### Environmental Conditions

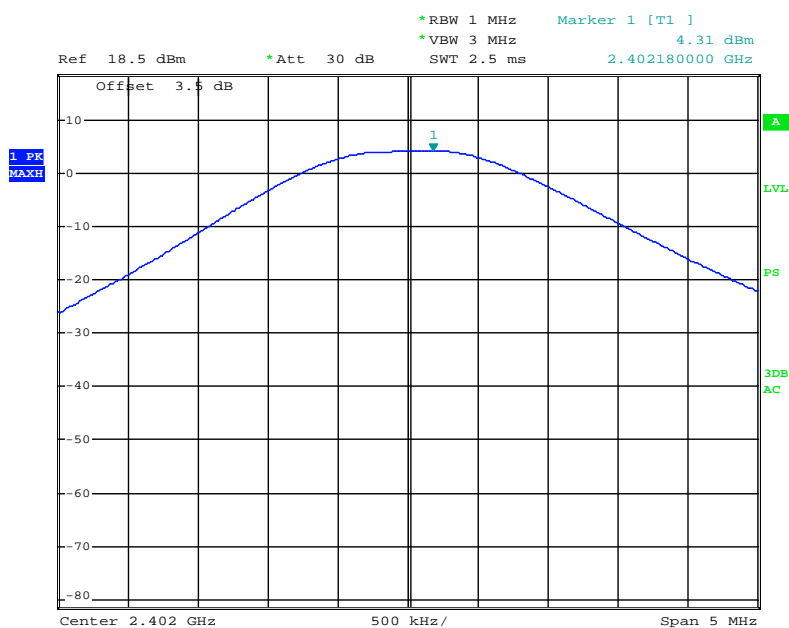
Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	100.1 kPa

*The testing was performed by Henry Ding on 2013-03-07.*

*EUT operation mode: Transmitting*

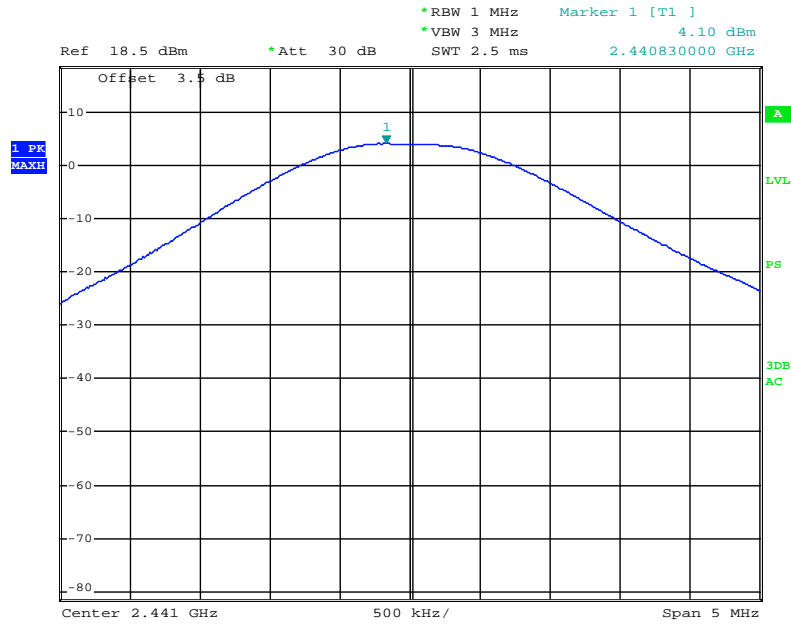
*Test Result: Compliance. Please refer to following tables and plots*

Mode	Channel	Frequency (MHz)	Conducted Output Power		Limit (mW)
			(dBm)	(mW)	
<b>BDR (GFSK)</b>	Low	2402	4.31	2.698	1000
	Middle	2441	4.10	2.570	1000
	High	2480	1.54	1.426	1000
<b>EDR (<math>\pi/4</math>-DQPSK)</b>	Low	2402	2.00	1.585	1000
	Middle	2441	1.78	1.507	1000
	High	2480	-0.79	0.834	1000
<b>EDR (8DPSK)</b>	Low	2402	2.47	1.766	1000
	Middle	2441	2.29	1.694	1000
	High	2480	-0.23	0.948	1000

**BDR (GFSK): Low Channel**

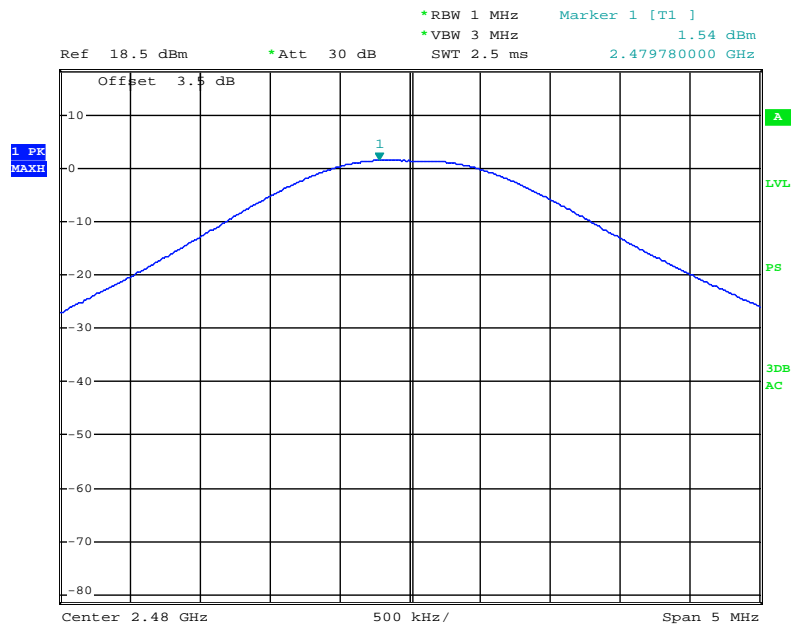
Date: 7.MAR.2013 11:59:15

### BDR (GFSK): Middle Channel

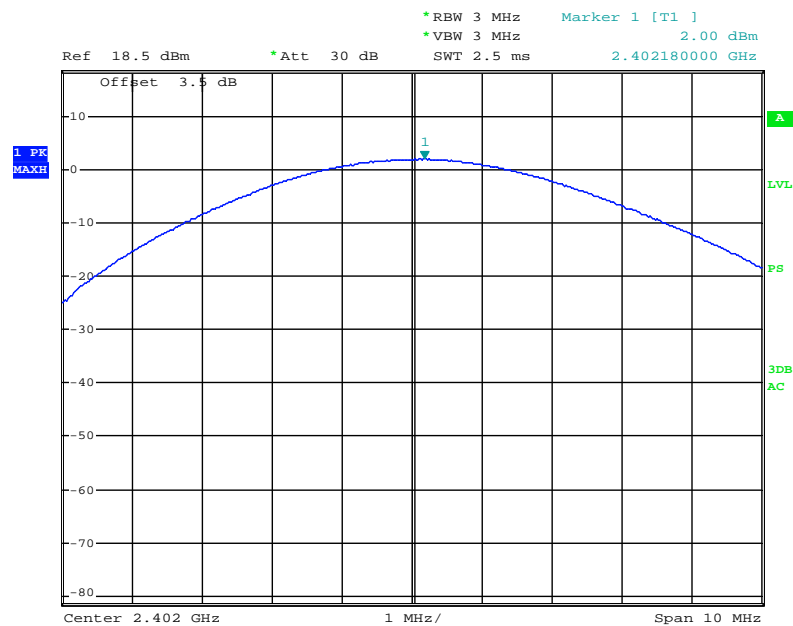


Date: 7.MAR.2013 11:58:45

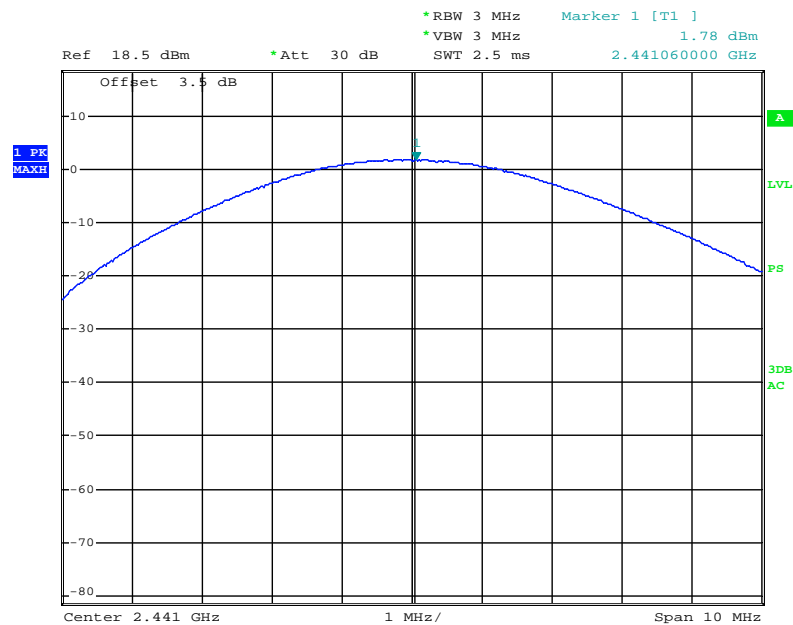
### BDR (GFSK): High Channel



Date: 7.MAR.2013 11:58:08

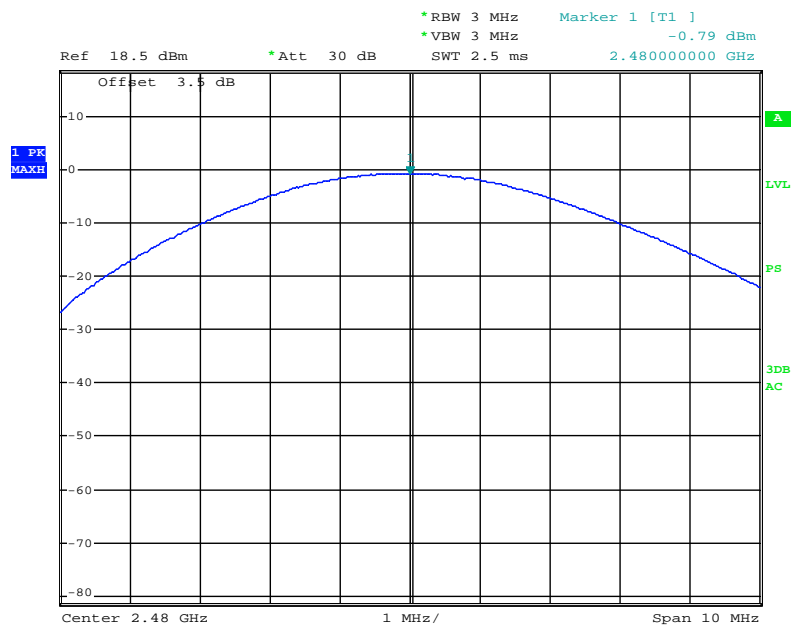
**EDR( $\pi/4$ -DQPSK): Low Channel**

Date: 7.MAR.2013 12:35:44

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

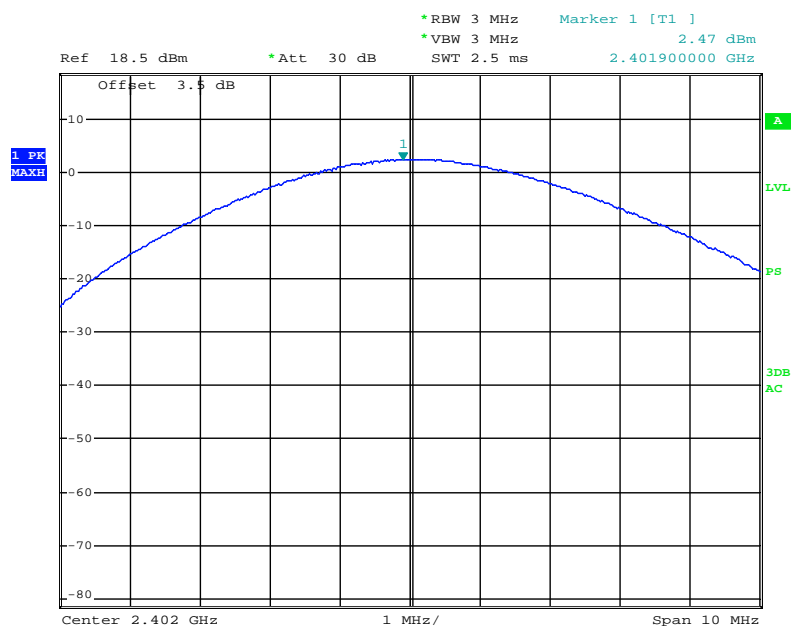
Date: 7.MAR.2013 12:35:10

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



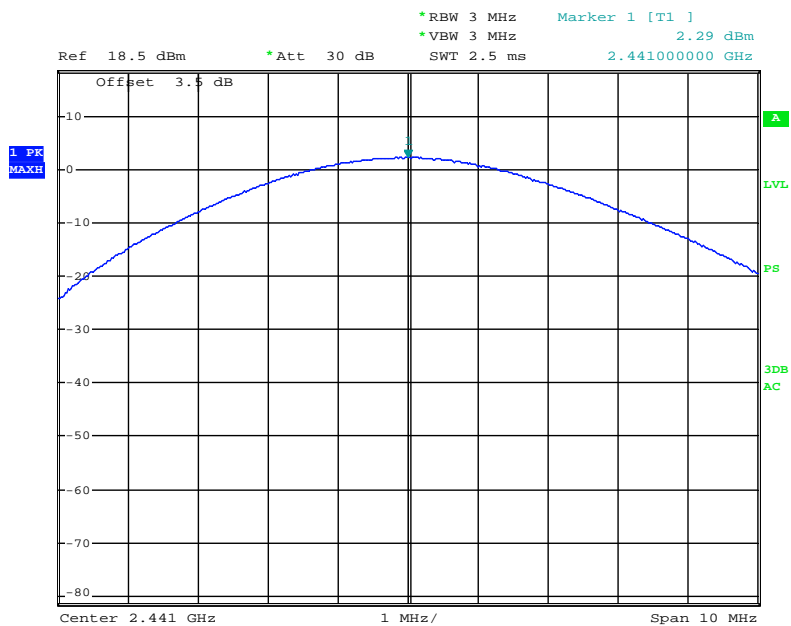
Date: 7.MAR.2013 12:34:38

### EDR(8DPSK): Low Channel



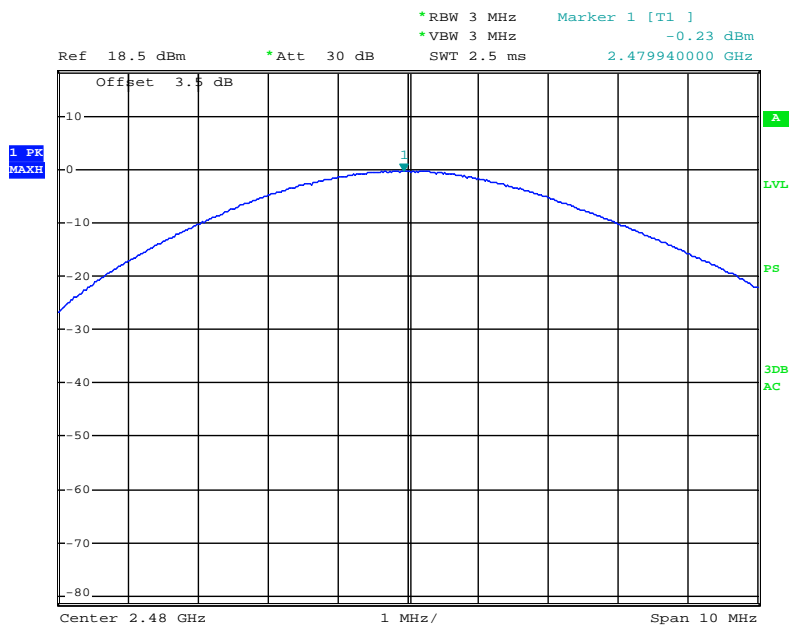
Date: 7.MAR.2013 12:51:43

### EDR(8DPSK): Middle Channel



Date: 7.MAR.2013 12:51:14

### EDR(8DPSK): High Channel



Date: 7.MAR.2013 12:50:48



## 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	2012-08-08	2013-08-07

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

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	100.1 kPa

*The testing was performed by Henry Ding on 2013-03-07.*

*EUT operation mode: Transmitting*

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

Frequency Band	Delta Peak to band emission (dBc)	$\geq$ Limit (dBc)	Result
BDR mode (GFSK)			
Left-band	45.77	20	Pass
Right-band	50.85	20	Pass
EDR Mode ( $\pi/4$ -DQPSK)			
Left-band	48.83	20	Pass
Right-band	49.13	20	Pass
EDR Mode (8 DPSK)			
Left-band	48.60	20	Pass
Right-band	49.59	20	Pass

Ref 18.5 dBm \*Att 30 dB

\*RBW 100 kHz \*VBW 300 kHz SWT 2.5 ms

Marker 1 [T1] 3.83 dBm 2.401980000 GHz

Offset 3.5 dB Delta 1 [T1] -45.77 dB -2.020000000 MHz

1 PK MAXH

D1 3.83 dBm

D2 -16.17 dBm

PS

3DB AC

Center 2.4 GHz 1 MHz/ Span 10 MHz

Date: 7.MAR.2013 12:06:56

Ref 18.5 dBm \*Att 30 dB

\*RBW 100 kHz Marker 1 [T1] 1.24 GHz  
 \*VBW 300 kHz  
 SWT 2.5 ms 2.479820000 GHz

Offset 3.5 dB

Delta 1 [T1] -50.85 dB  
 3.940000000 MHz

1 PK MAXH

D1 -1.24 dBm

D2 -18.76 dBm

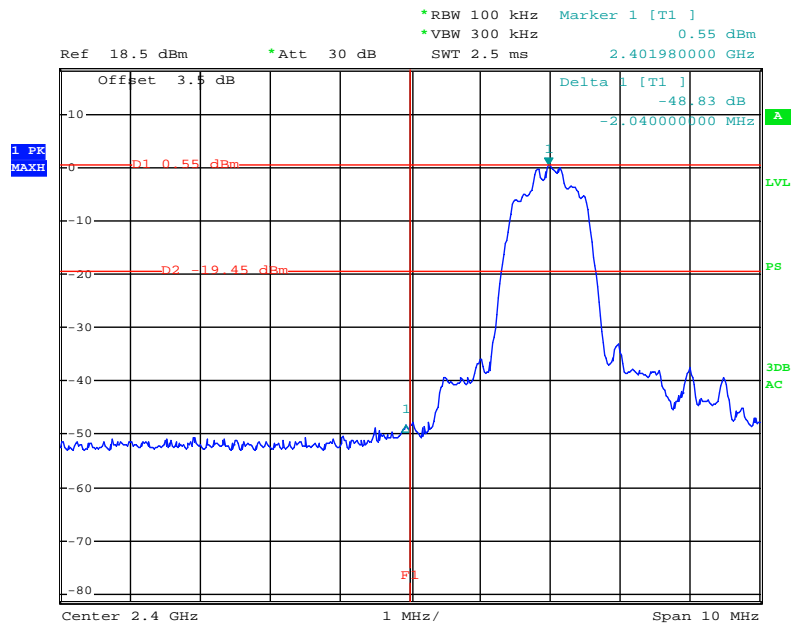
1

FL

Center 2.4835 GHz 1 MHz/ Span 10 MHz

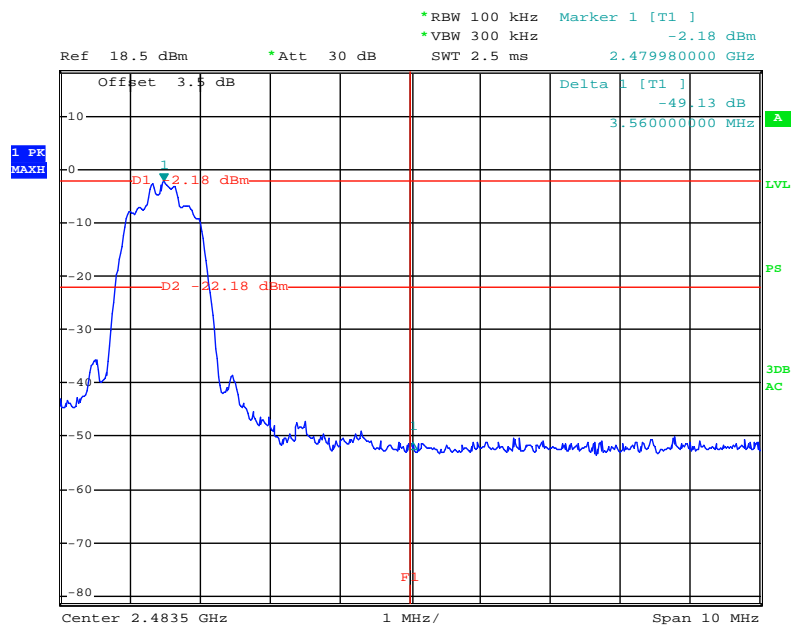
Date: 7.MAR.2013 12:05:30

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



Date: 7.MAR.2013 12:37:02

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



Date: 7.MAR.2013 12:38:08

The screenshot displays a spectrum analyzer interface with the following parameters and data:

- Parameters:**
  - Ref: 18.5 dBm
  - \*Att: 30 dB
  - \*RBW: 100 kHz
  - \*VBW: 300 kHz
  - SWT: 2.5 ms
  - Offset: 3.5 dB
  - Marker 1 [T1]: 2.402000000 GHz, -48 dBm
  - Delta 1 [T1]: -2.060000000 MHz
- Signal Data:**
  - 1 PK MAXH: -19.53 dBm (labeled D2)
  - D1: 0.47 dBm
  - D2: -19.53 dBm
  - Marker 1: -48 dBm
- Axis Labels:**
  - Center: 2.4 GHz
  - Span: 10 MHz
  - 1 MHz/ (frequency scale)
  - Offset: 3.5 dB

Date: 7.MAR.2013 12:52:44

Ref 18.5 dBm \*Att 30 dB

\*RBW 100 kHz \*VBW 300 kHz SWT 2.5 ms

Marker 1 [T1] -2.11 dBm

Delta 1 [T1] -49.59 dB

3.740000000 MHz

Offset 3.5 dB

1 PK MAXH

D1 -2.11 dBm

D2 -22.11 dBm

FL

Center 2.4835 GHz 1 MHz/ Span 10 MHz

Date: 7.MAR.2013 12:53:50

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