

FCC PART 15.247 TEST REPORT

For

Gajah International (HK) Co., Ltd.

18/F Bel Trade Commercial Building, 1-3, Burrows Street, Wan Chai, Hong Kong

FCC ID: UFKGD90BT00

Report Type: Original Report	Product Type: Speaker
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Report Number: RSZ130311003-00B	
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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

Product Description for Equipment under Test (EUT)

The *Gajah International (HK) Co., Ltd.*'s product, model number: *GD90BT (FCC ID: UFKGD90BT00)* or the "EUT" in this report was a *Speaker*, which was measured approximately: 18.5 cm (L) x 7.8 cm (W) x 10.0 cm (H), rated with input voltage: DC 3.7 V Li-ion battery or DC5V charging from USB port.

**All measurement and test data in this report was gathered from production sample serial number: 1303021 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-03-11.*

Objective

This test report is prepared on behalf of *Gajah International (HK) 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)

FCC Part 15B JBP submission with FCC ID: UFKGD90BT00.

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 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 C63.4-2003.

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 software (CSR BlueSuite 2.2) provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

CSR BlueSuite 2.2

Support Equipment List and Details

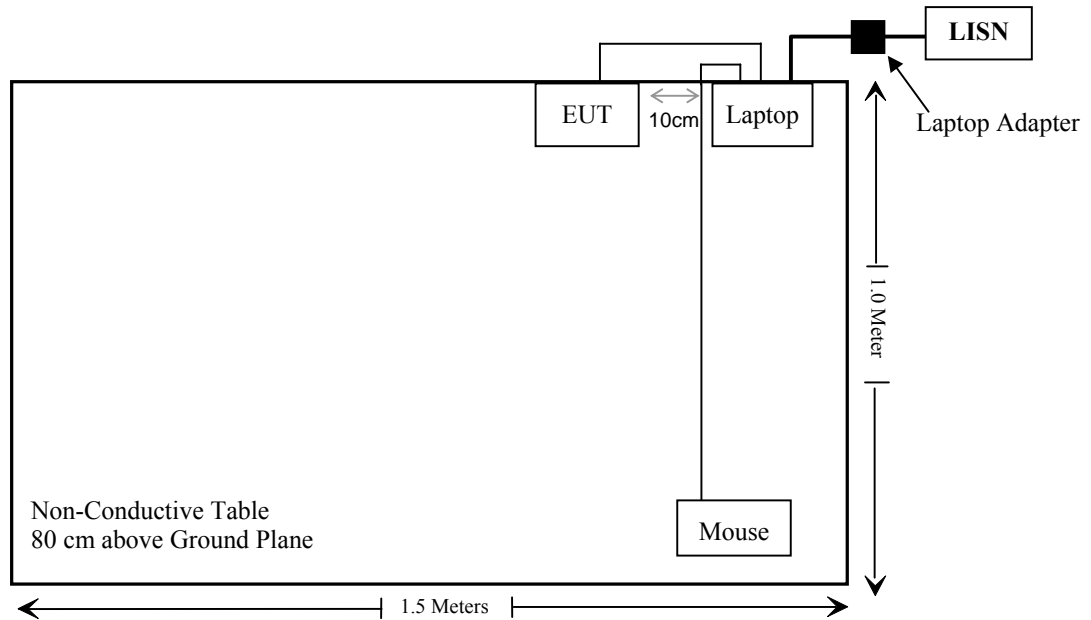
Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP05L	00045-452-921-345
DELL	Mouse	MOC5UO	G1900NKD

External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielded Detachable Mouse Cable	1.5	Mouse Port / Host	Mouse
Unshielded Detachable USB Cable	0.8	Laptop	EUT
Unshielding Detachable AC Cable	1.5	Laptop Adapter	LISN

Block Diagram of Test Setup

For conducted emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1091	Maximum Permissible Exposure (MPE)	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) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

MPE Calculation

Predication of MPE limit at a given distance

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

Where:

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally *numeric* gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BDR (GFSK)	2480	0	1.0	2.31	1.702	20	0.00034	1.0
EDR (π/4-DQPSK)	2441	0	1.0	1.49	1.409	20	0.00028	1.0
EDR (8DPSK)	2441	0	1.0	1.35	1.365	20	0.00027	1.0

Note: To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

Result: Compliance

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 an integrated antenna arrangement, which was permanently attached and the gain was 0 dBi, fulfill the requirement of this section. Please refer to the internal photos.

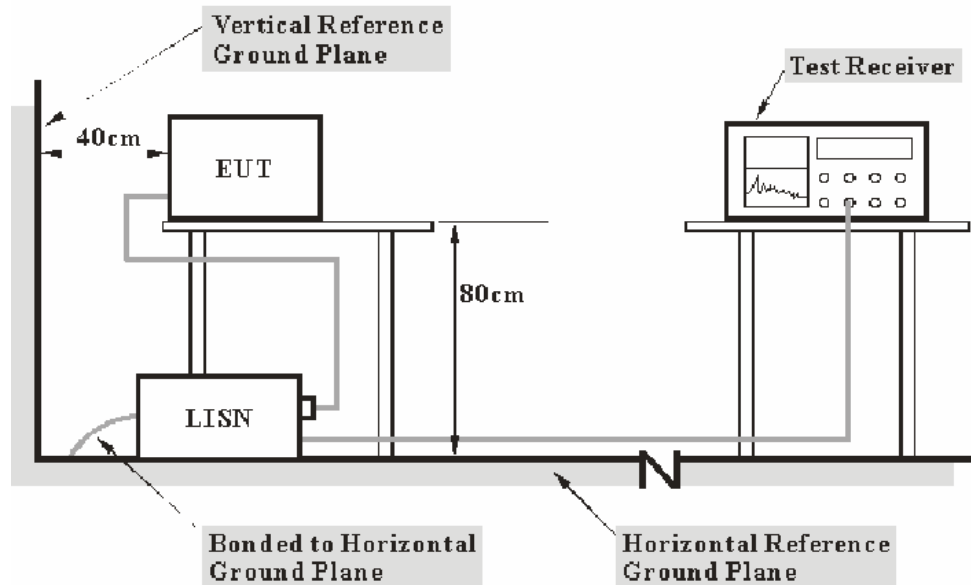
Result: Compliance.

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 laptop 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 laptop 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	2012-08-09	2013-08-08
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:

11.28 dB at 8.825 MHz in the Line conducted mode

Test Data

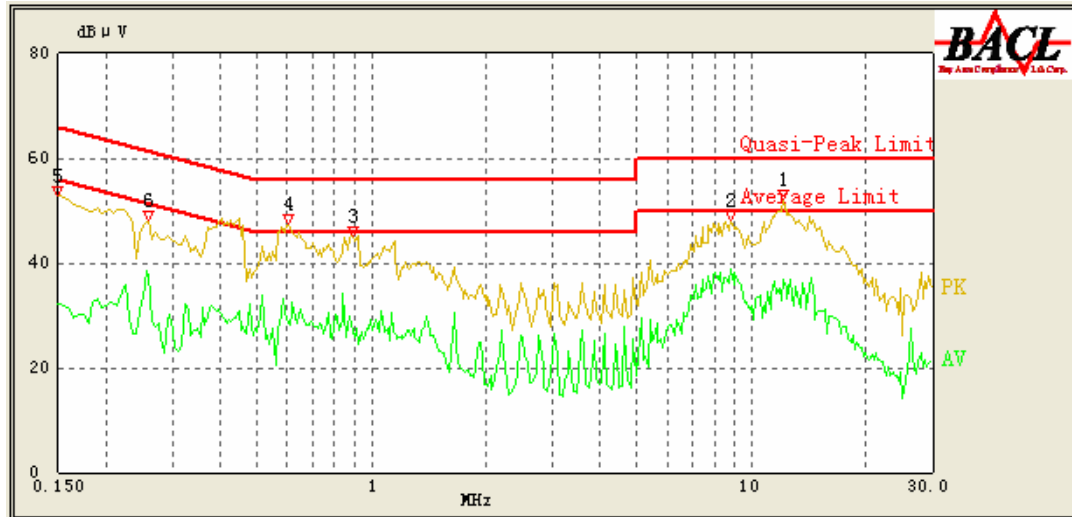
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

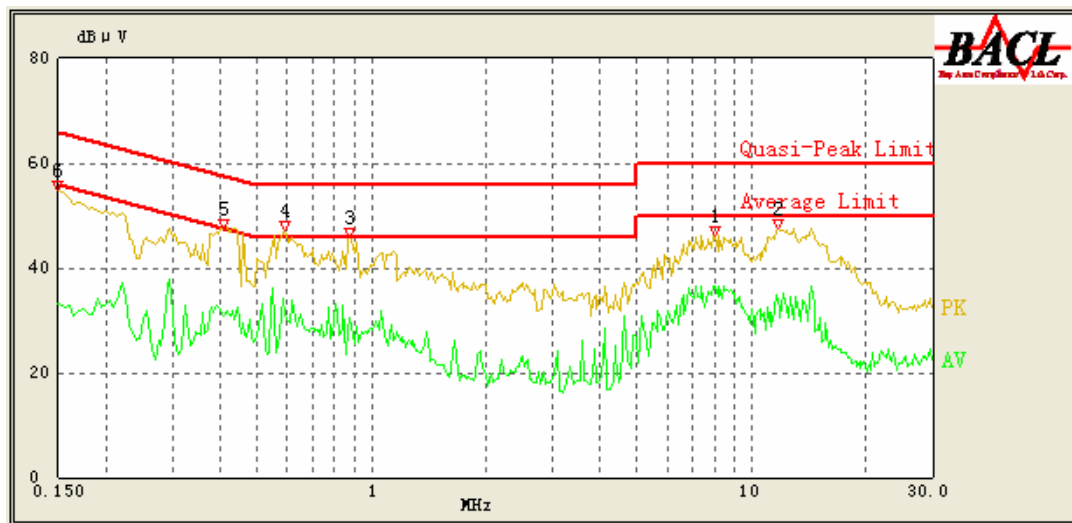
The testing was performed by Simon Wang on 2013-03-18.

EUT operation mode: Charging&Transmitting

AC 120 V, 60 Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
8.825	38.72	10.30	50.00	11.28	Ave.
12.070	36.87	10.42	50.00	13.13	Ave.
0.605	41.31	10.20	56.00	14.69	QP
0.260	38.00	10.10	52.86	14.86	Ave.
0.895	40.16	10.20	56.00	15.84	QP
0.610	28.09	10.20	46.00	17.91	Ave.
0.150	48.07	10.10	66.00	17.93	QP
0.890	27.24	10.20	46.00	18.76	Ave.
0.260	43.99	10.10	62.86	18.87	QP
12.065	40.70	10.42	60.00	19.30	QP
8.840	40.03	10.30	60.00	19.97	QP
0.150	32.13	10.10	56.00	23.87	Ave.

AC 120V, 60 Hz, Neutral:

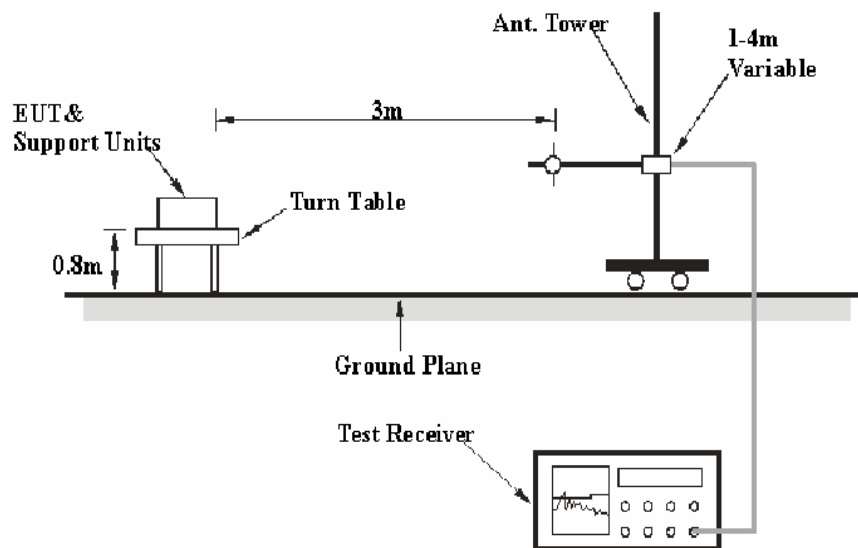
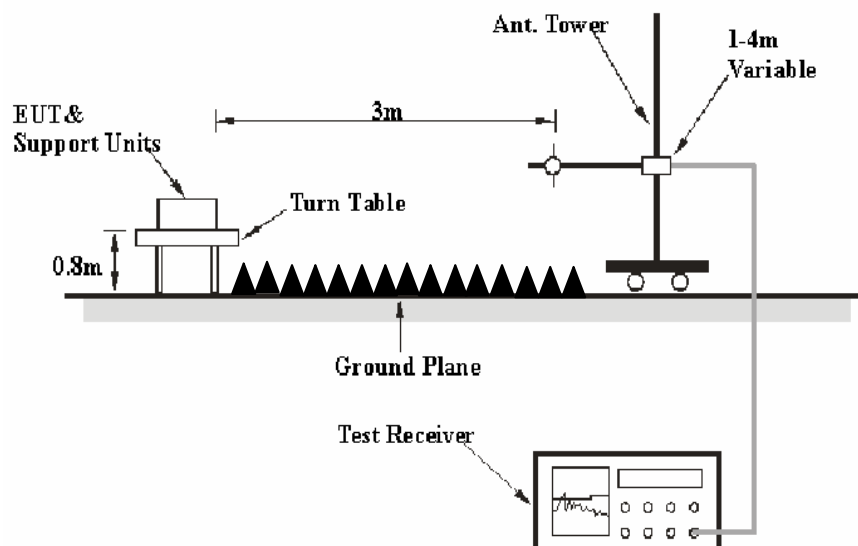
Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
7.980	36.59	10.30	50.00	13.41	Ave.
0.590	31.14	10.20	46.00	14.86	Ave.
0.590	41.06	10.20	56.00	14.94	QP
0.875	30.66	10.20	46.00	15.34	Ave.
0.150	49.84	10.10	66.00	16.16	QP
0.875	39.11	10.20	56.00	16.89	QP
0.410	41.63	10.11	58.57	16.94	QP
11.820	32.58	10.41	50.00	17.42	Ave.
0.410	30.69	10.11	48.57	17.88	Ave.
7.980	40.93	10.30	60.00	19.07	QP
0.150	33.21	10.10	56.00	22.79	Ave.
11.755	37.14	10.41	60.00	22.86	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
30MHz – 1000 MHz	100 kHz	300 kHz	120kHz	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.

5.78 dB at 4882.0 MHz in the **Horizontal** polarization

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Simon Wang on 2013-03-17.

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		Turn table 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)									
2402.0	88.57	PK	135	1.2	H	6.13	94.70	/	/
2402.0	51.34	Ave.	135	1.2	H	6.13	57.47	/	/
2402.0	92.14	PK	245	1.1	V	6.13	98.27	/	/
2402.0	52.87	Ave	245	1.1	V	6.13	59.00	/	/
4804.0	33.58	Ave	68	1.2	V	12.40	45.98	54	8.02
4804.0	51.18	PK	68	1.2	V	12.40	63.58	74	10.42
7206.0	24.56	Ave	124	1.1	V	17.06	41.62	54	12.38
176.71	46.16	QP	206	1.1	H	-16	30.16	43.5	13.34
7206.0	39.55	PK	124	1.1	V	17.06	56.61	74	17.39
2385.9	28.17	Ave	252	1.3	V	6.13	34.30	54	19.70
2499.5	25.81	Ave	183	1.2	V	7.21	33.02	54	20.98
1628.3	31.21	Ave	325	1.3	V	1.77	32.98	54	21.02
2345.4	27.32	Ave	16	1.1	V	5.48	32.80	54	21.20
1628.3	48.43	PK	325	1.3	V	1.77	50.20	74	23.80
2385.9	42.05	PK	252	1.3	V	6.13	48.18	74	25.82
2499.5	40.43	PK	183	1.2	V	7.21	47.64	74	26.36
2345.4	41.31	PK	16	1.1	V	5.48	46.79	74	27.21
Middle Channel (2441 MHz)									
2441.0	88.10	PK	237	1.2	H	7.21	95.31	/	/
2441.0	51.06	Ave.	237	1.2	H	7.21	58.27	/	/
2441.0	91.69	PK	252	1.1	V	7.21	98.90	/	/
2441.0	52.38	Ave.	252	1.1	V	7.21	59.59	/	/
4882.0	35.76	Ave.	162	1.3	H	12.46	48.22	54	5.78
4882.0	52.57	PK	162	1.3	H	12.46	65.03	74	8.97
7323.0	24.50	Ave.	15	1.1	V	16.49	40.99	54	13.01
176.71	45.76	QP	87	1.1	H	-16	29.76	43.5	13.74
7323.0	38.96	PK	15	1.1	V	16.49	55.45	74	18.55
1628.3	31.49	Ave.	28	1.2	V	1.77	33.26	54	20.74
2486.9	25.77	Ave.	138	1.1	V	7.21	32.98	54	21.02
2388.5	26.84	Ave.	245	1.2	V	6.13	32.97	54	21.03
2352.9	26.29	Ave.	164	1.2	V	5.48	31.77	54	22.23
1628.3	49.75	PK	28	1.2	V	1.77	51.52	74	22.48
2486.9	39.91	PK	138	1.1	V	7.21	47.12	74	26.88
2388.5	40.61	PK	245	1.2	V	6.13	46.74	74	27.26
2352.9	39.96	PK	164	1.2	V	5.48	45.44	74	28.56

Frequency (MHz)	Receiver		Turn table 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	86.84	PK	268	1.2	H	7.21	94.05	/	/
2480.0	50.97	Ave.	268	1.2	H	7.21	58.18	/	/
2480.0	91.08	PK	135	1.1	V	7.21	98.29	/	/
2480.0	51.53	Ave.	135	1.1	V	7.21	58.74	/	/
4960.0	33.40	Ave.	55	1.2	H	12.50	45.90	54	8.10
2483.6	38.60	Ave.	315	1.2	V	7.21	45.81	54	8.19
2494.3	35.74	Ave.	124	1.3	V	7.21	42.95	54	11.05
4960.0	48.53	PK	55	1.2	H	12.50	61.03	74	12.97
7440.0	24.90	Ave.	228	1.2	V	15.90	40.80	54	13.20
176.71	45.89	QP	37	1.2	H	-16	29.89	43.5	13.61
7440.0	39.50	PK	228	1.2	V	15.90	55.40	74	18.60
2483.6	46.37	PK	315	1.2	V	7.21	53.58	74	20.42
1628.3	31.45	Ave.	63	1.2	V	1.77	33.22	54	20.78
2357.6	25.87	Ave.	242	1.1	V	5.48	31.35	54	22.65
1628.3	49.55	PK	63	1.2	V	1.77	51.32	74	22.68
2494.3	42.60	PK	124	1.3	V	7.21	49.81	74	24.19
2357.6	40.39	PK	242	1.1	V	5.48	45.87	74	28.13

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) + cable loss – amplifier factor

Margin = Limit- Corr. 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	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:	55 %
ATM Pressure:	100.1 kPa

* The testing was performed by Simon Wang on 2013-03-17.

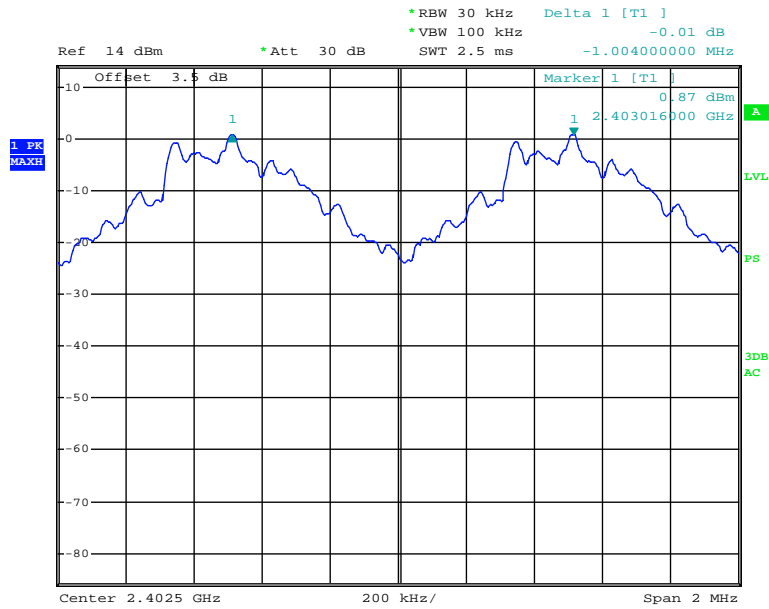
EUT operation mode: Transmitting

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	1.004	0.563	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.563	Pass
	Adjacent	2440			
	High	2480	1.000	0.563	Pass
	Adjacent	2479			
EDR ($\pi/4$-DQPSK)	Low	2402	1.004	0.816	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.820	Pass
	Adjacent	2440			
	High	2480	1.004	0.816	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.000	0.860	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.848	Pass
	Adjacent	2440			
	High	2480	1.000	0.848	Pass
	Adjacent	2479			

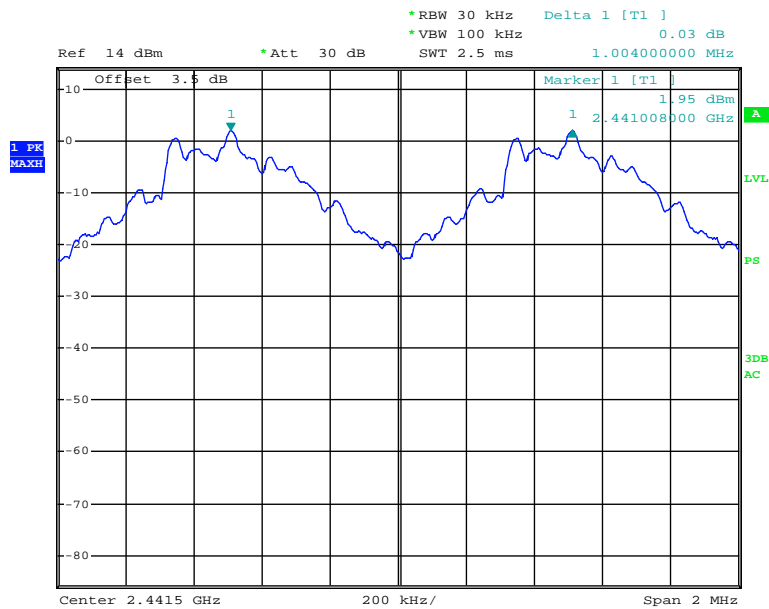
Note: Limit = 20 dB bandwidth *2/3

BDR (GFSK): Low Channel



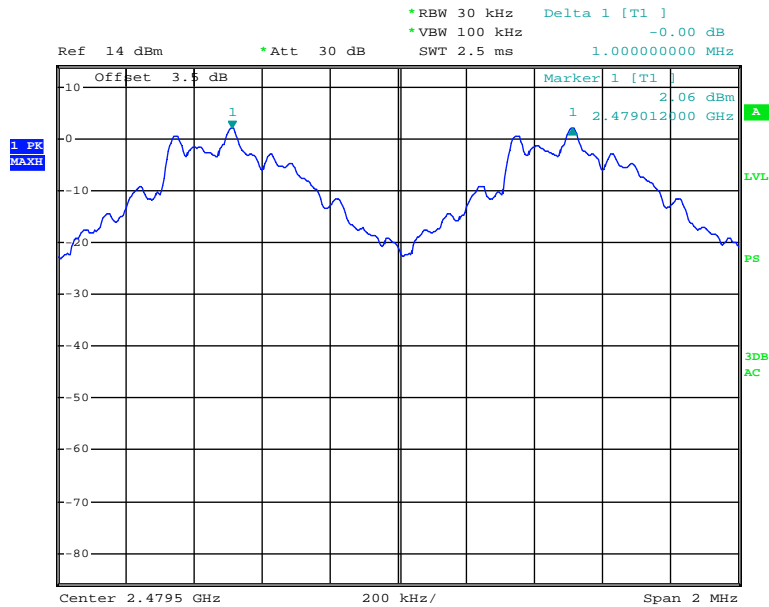
Date: 17.MAR.2013 11:40:34

BDR (GFSK): Middle Channel



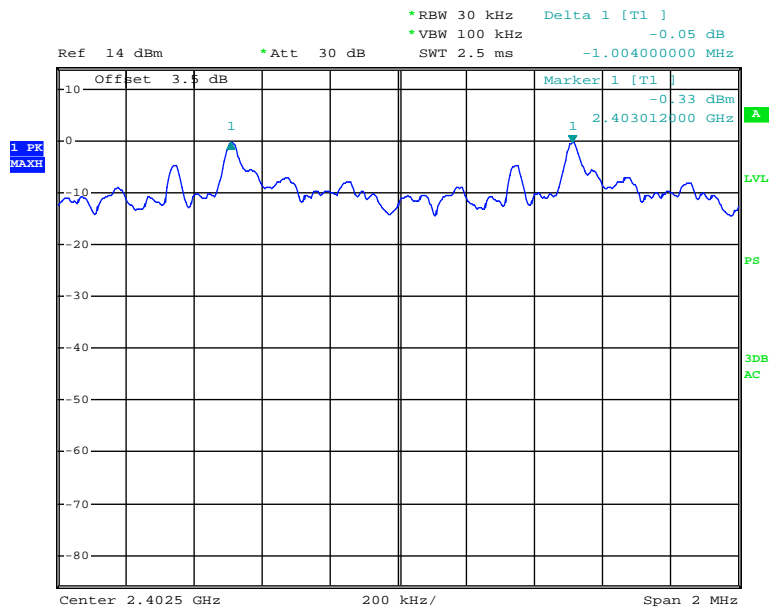
Date: 17.MAR.2013 11:41:44

BDR (GFSK): High Channel



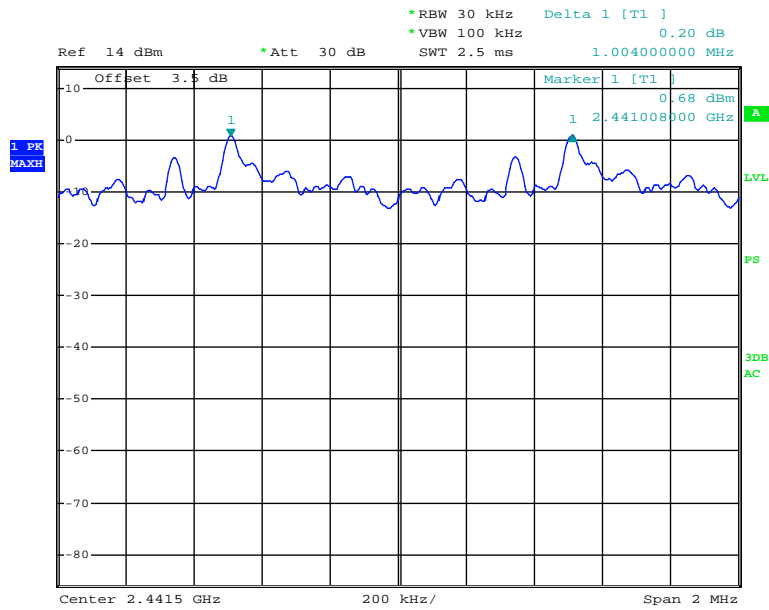
Date: 17.MAR.2013 11:44:53

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



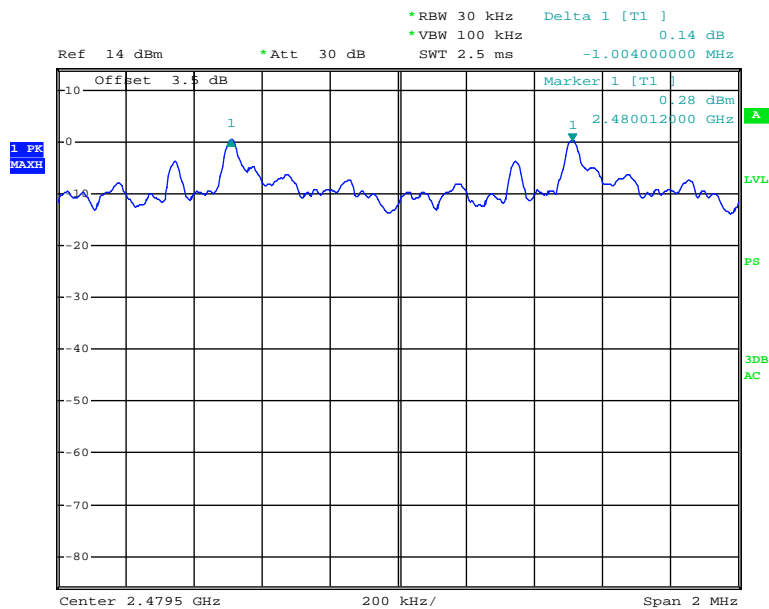
Date: 17.MAR.2013 12:45:30

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



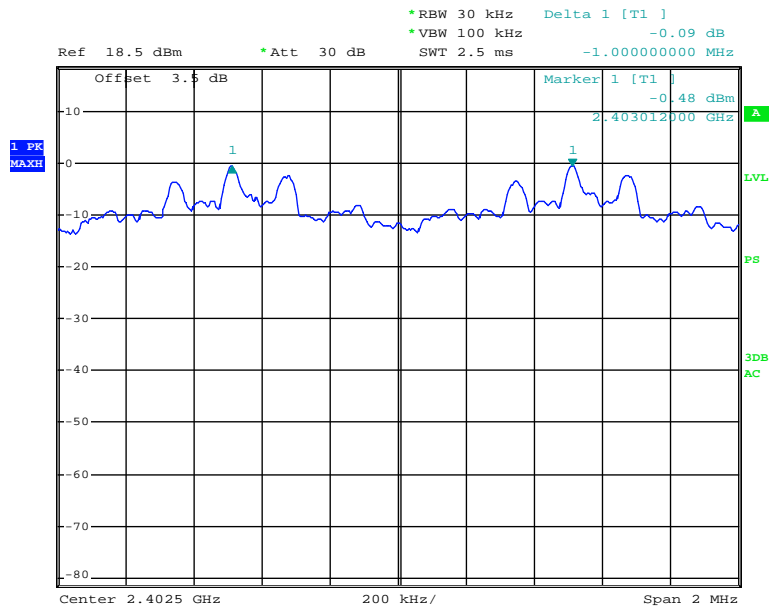
Date: 17.MAR.2013 12:46:58

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



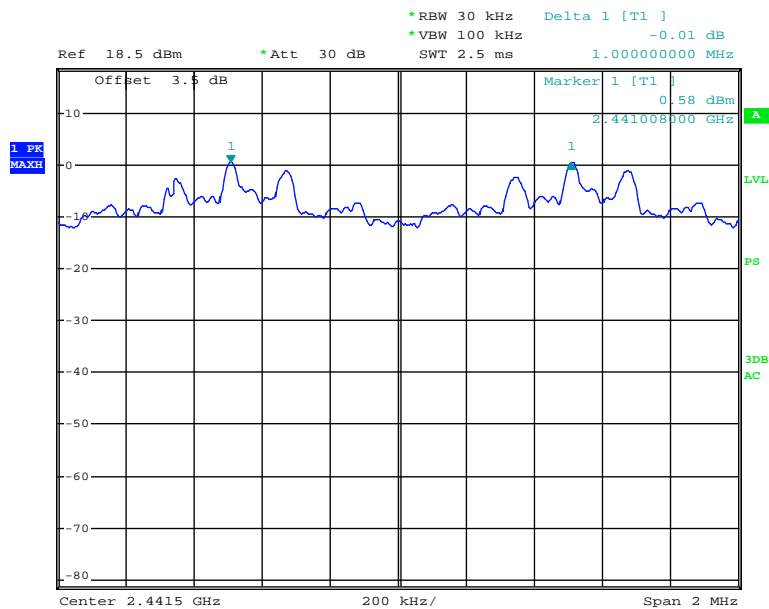
Date: 17.MAR.2013 12:47:55

EDR (8DPSK): Low Channel



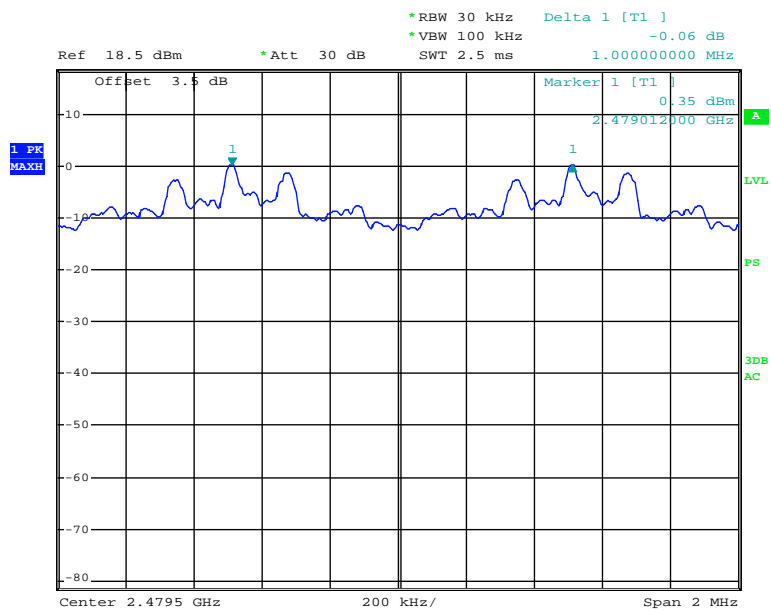
Date: 17.MAR.2013 15:01:26

EDR (8DPSK): Middle Channel



Date: 17.MAR.2013 15:05:43

EDR (8DPSK): High Channel



Date: 17.MAR.2013 15:04:05

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:	25 °C
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

* The testing was performed by Simon Wang on 2013-03-17.

EUT operation mode: Transmitting

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

Mode	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.844
	Middle	2441	0.844
	High	2480	0.844
EDR ($\pi/4$-DQPSK)	Low	2402	1.224
	Middle	2441	1.224
	High	2480	1.230
EDR (8DPSK)	Low	2402	1.290
	Middle	2441	1.272
	High	2480	1.272

Ref 14 dBm * Att 30 dB

* RBW 30 kHz Delta 1 [T1] 0.31 dB
 * VBW 100 kHz
 SWT 2.5 ms 844.000000000 kHz

Offset 3.5 dB

Marker 1 [T1] -19.37 dBm
 2.401568000 GHz

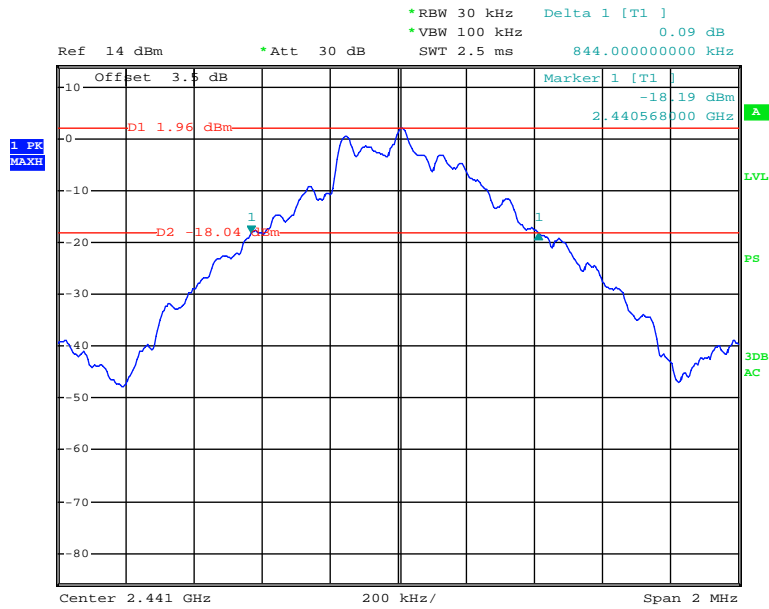
D1 0.89 dBm
 D2 -19.11 dBm

1 PK MAXH

Center 2.402 GHz 200 kHz/ Span 2 MHz

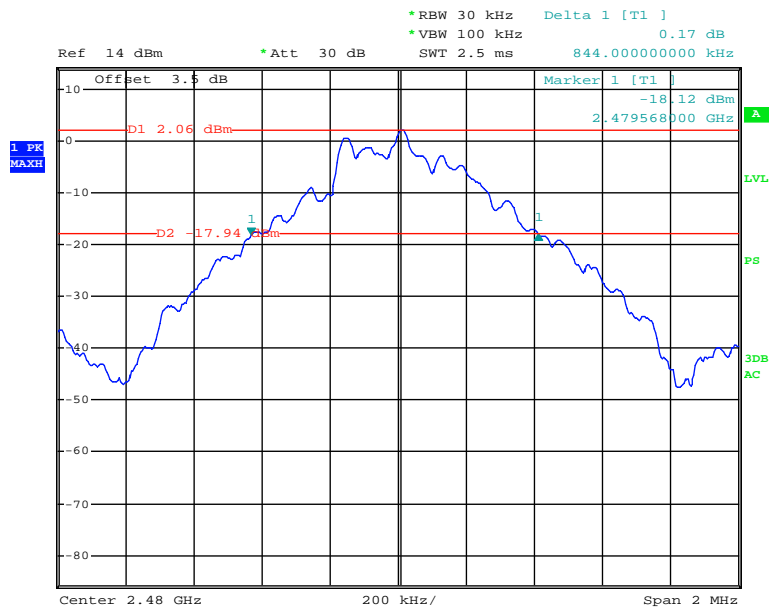
Date: 17.MAR.2013 11:22:35

BDR (GFSK): Middle Channel



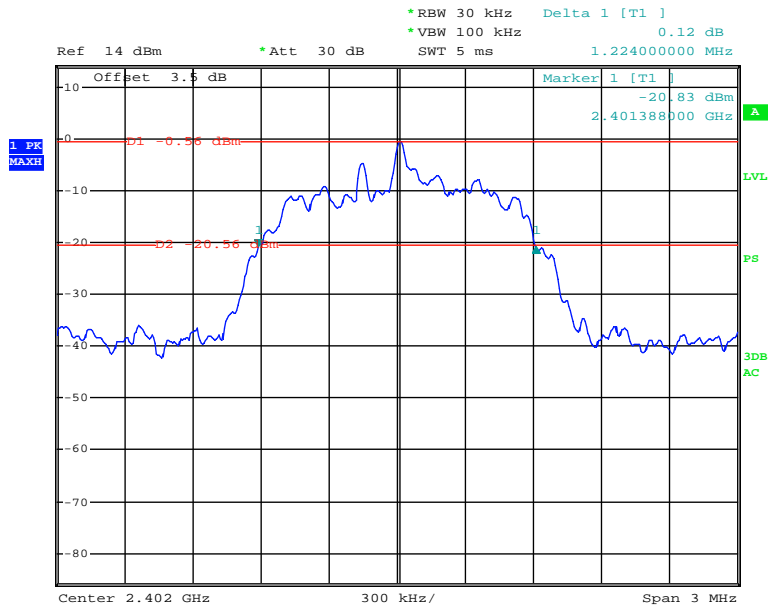
Date: 17.MAR.2013 11:28:48

BDR (GFSK): High Channel



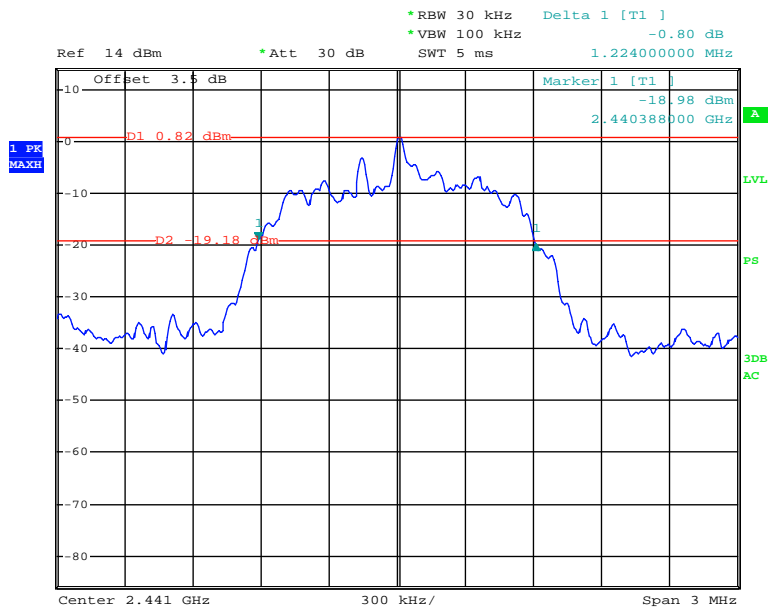
Date: 17.MAR.2013 11:30:58

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



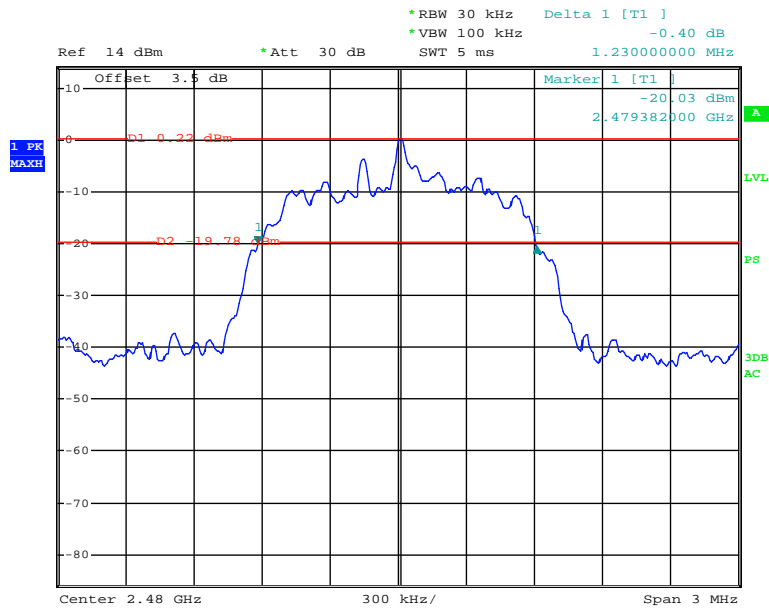
Date: 17.MAR.2013 12:35:34

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



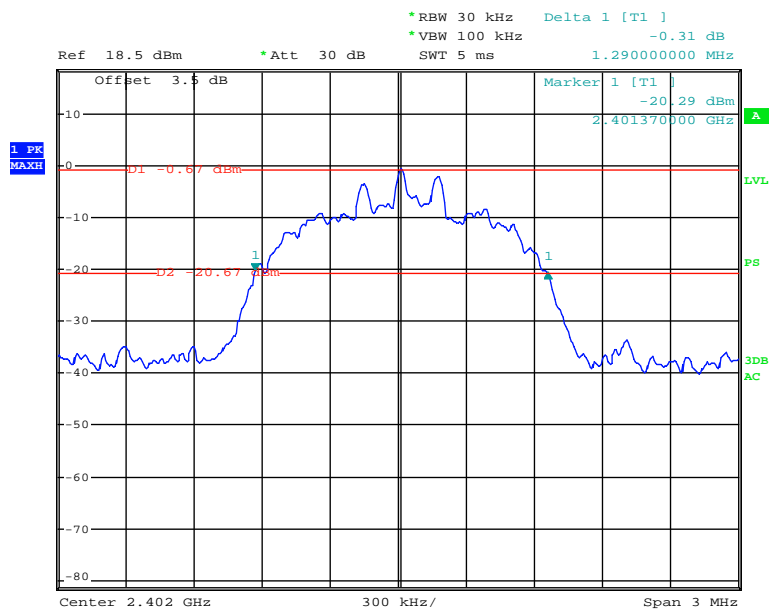
Date: 17.MAR.2013 12:37:46

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



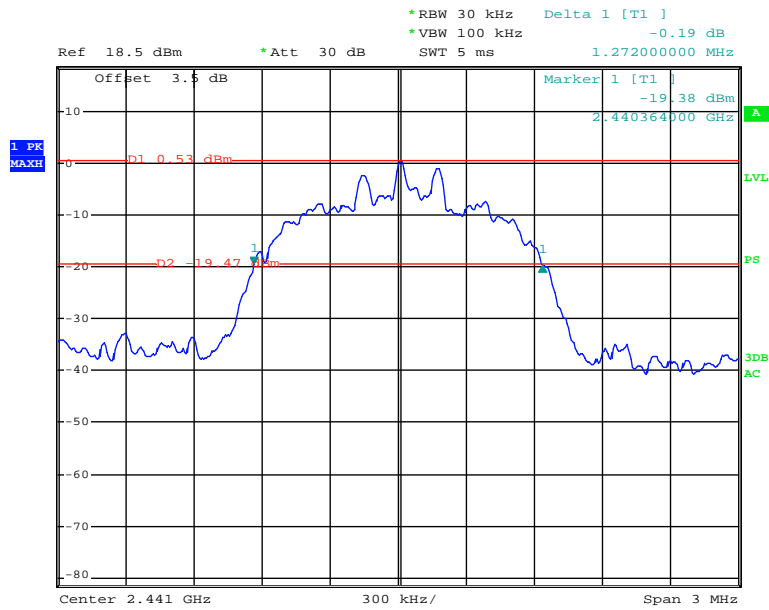
Date: 17.MAR.2013 12:33:24

EDR (8DPSK): Low Channel



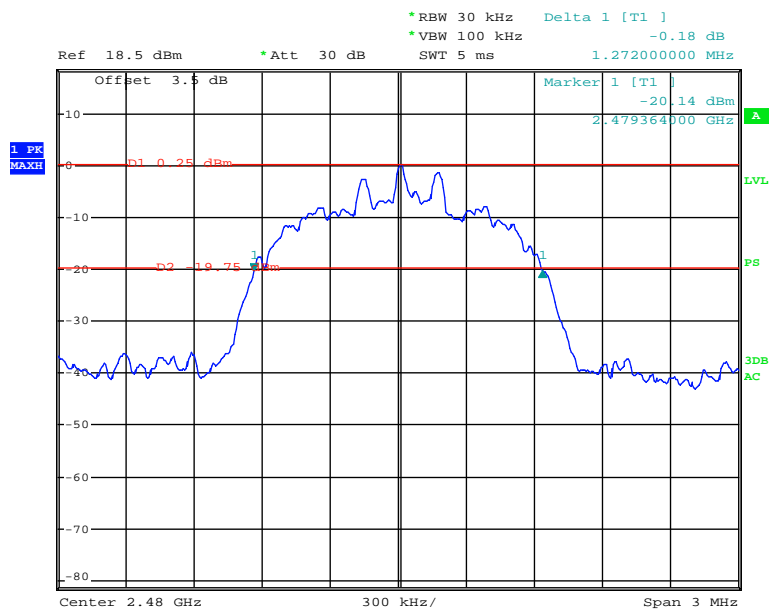
Date: 17.MAR.2013 14:50:36

EDR (8DPSK): Middle Channel



Date: 17.MAR.2013 14:53:21

EDR (8DPSK): High Channel



Date: 17.MAR.2013 14:54:32

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:	55 %
ATM Pressure:	100.1 kPa

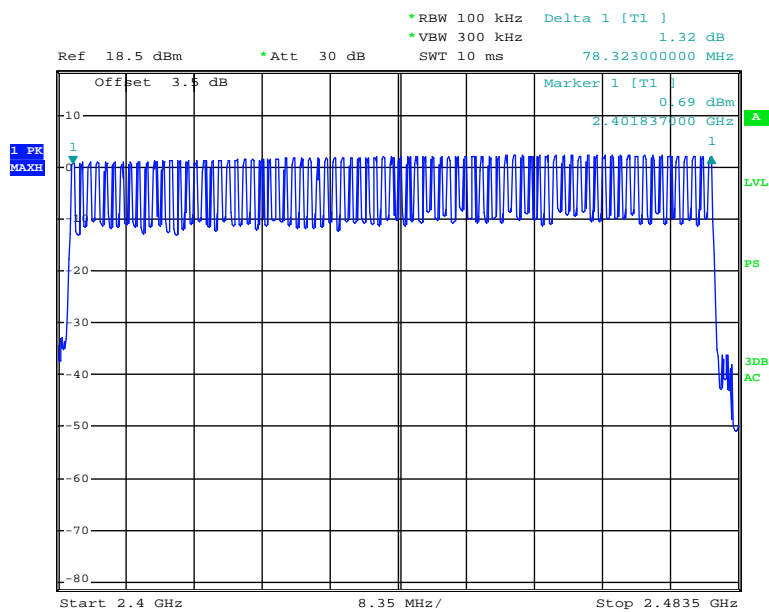
The testing was performed by Simon Wang on 2013-03-17.

EUT operation mode: Transmitting

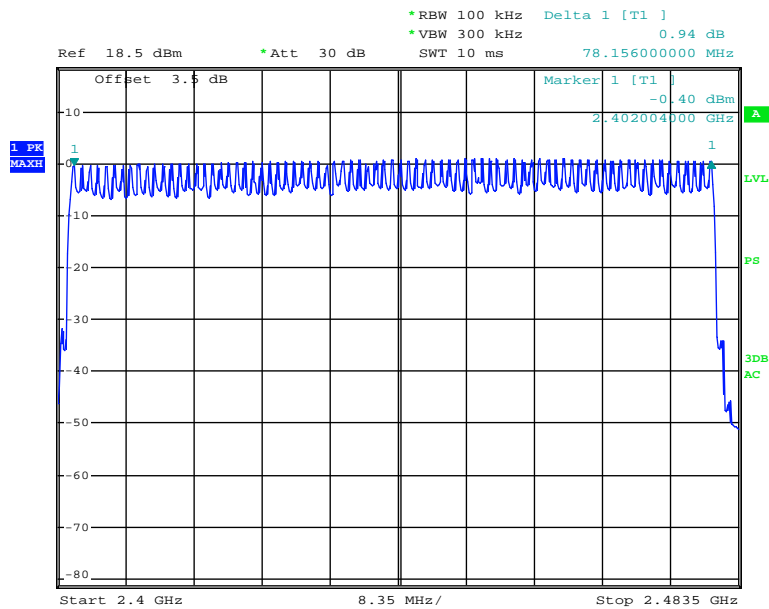
Test Result: Compliance. Please refer to following tables and plots

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

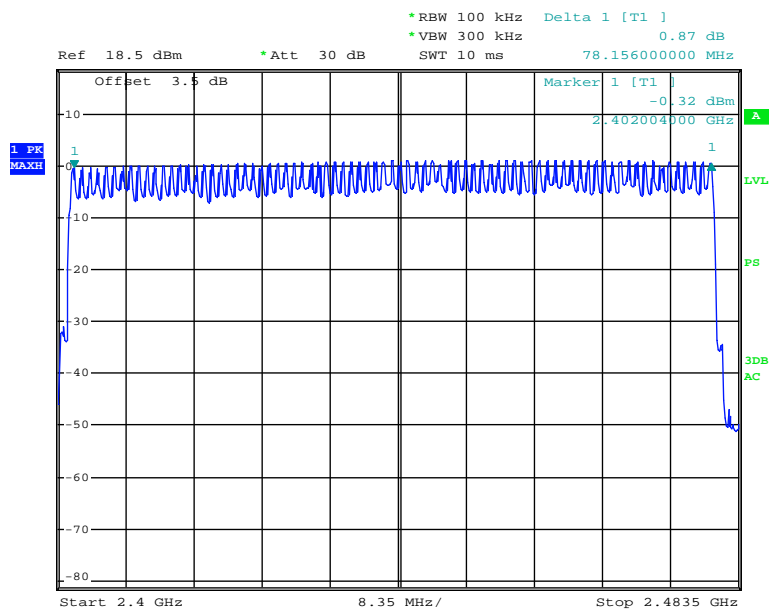
BDR (GFSK): Number of Hopping Channels



Date: 17.MAR.2013 11:16:57

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

Date: 17.MAR.2013 15:20:02

(8DPSK): Number of Hopping Channels

Date: 17.MAR.2013 15:26:33

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:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Simon Wang on 2013-03-17.

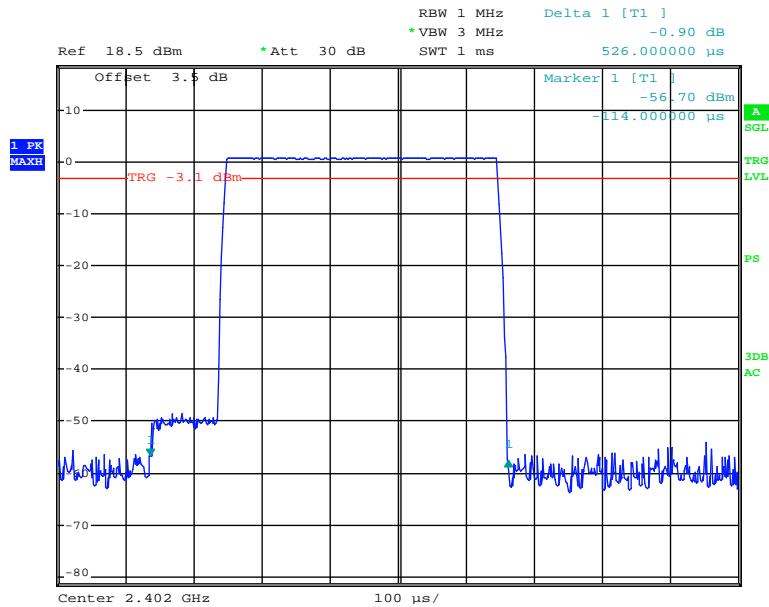
EUT operation mode: Transmitting

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	0.526	0.169	0.4	Pass
		Middle	0.528	0.169	0.4	Pass
		High	0.528	0.169	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.794	0.287	0.4	Pass
		Middle	1.800	0.288	0.4	Pass
		High	1.800	0.288	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.060	0.327	0.4	Pass
		Middle	3.060	0.327	0.4	Pass
		High	3.060	0.327	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR ($\pi/4$ -DQPSK)	DH 1	Low	0.538	0.172	0.4	Pass
		Middle	0.538	0.172	0.4	Pass
		High	0.538	0.172	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.804	0.289	0.4	Pass
		Middle	1.804	0.289	0.4	Pass
		High	1.804	0.289	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.064	0.327	0.4	Pass
		Middle	3.064	0.327	0.4	Pass
		High	3.064	0.327	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	DH 1	Low	0.538	0.172	0.4	Pass
		Middle	0.538	0.172	0.4	Pass
		High	0.540	0.173	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.806	0.289	0.4	Pass
		Middle	1.806	0.289	0.4	Pass
		High	1.806	0.289	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.060	0.327	0.4	Pass
		Middle	3.060	0.327	0.4	Pass
		High	3.060	0.327	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

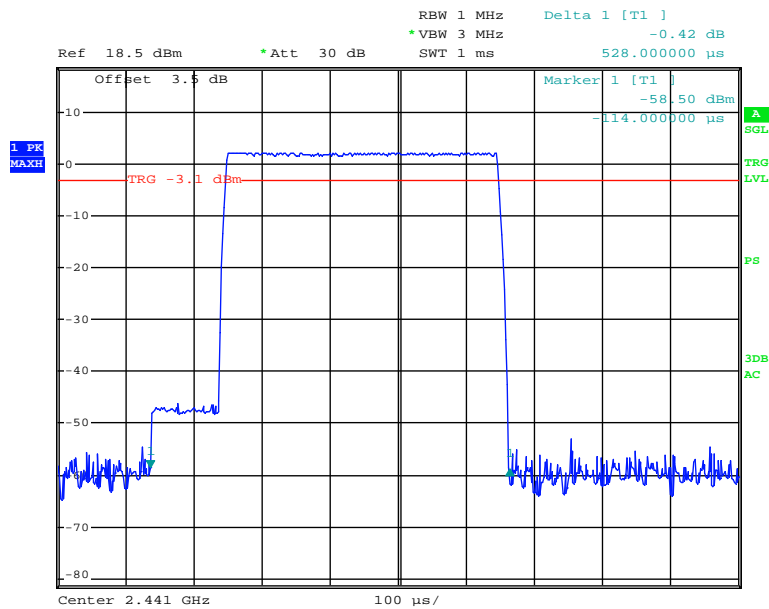
BDR (GFSK):

Pulse time, Low Channel, DH1



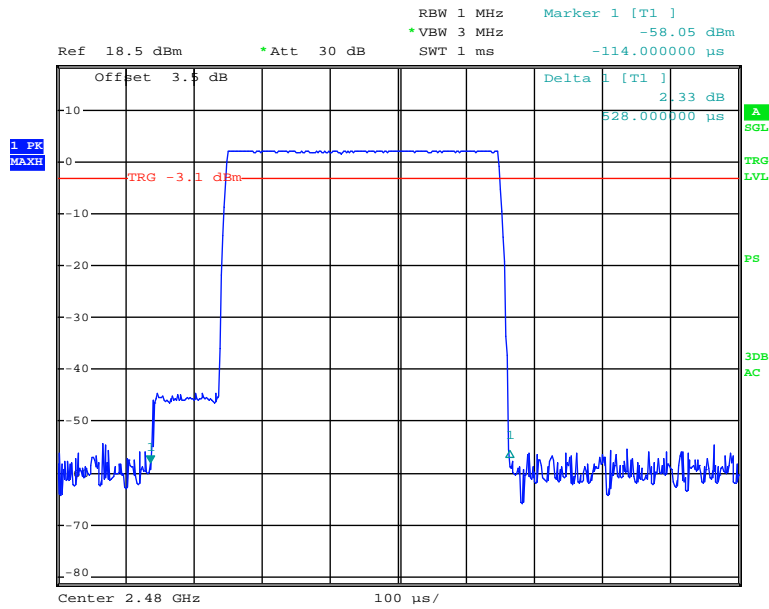
Date: 17.MAR.2013 12:04:26

Pulse time, Middle Channel, DH1



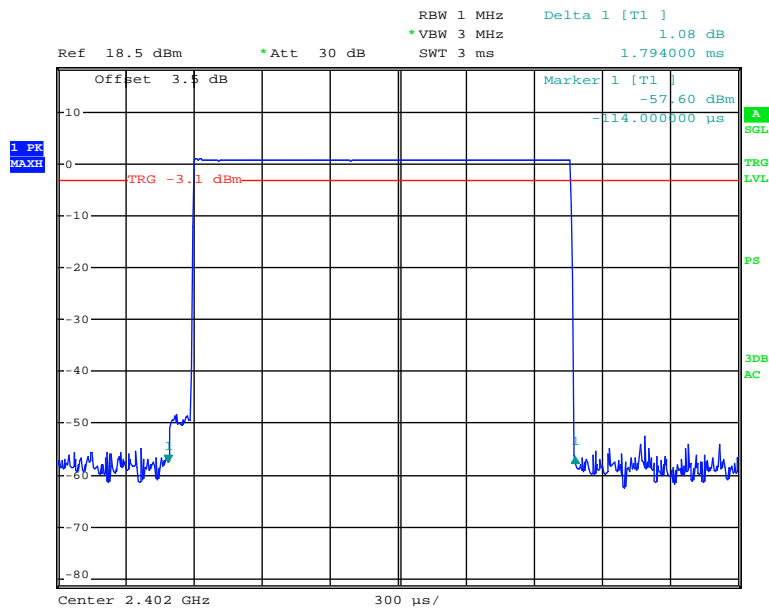
Date: 17.MAR.2013 12:05:09

Pulse time, High Channel, DH1



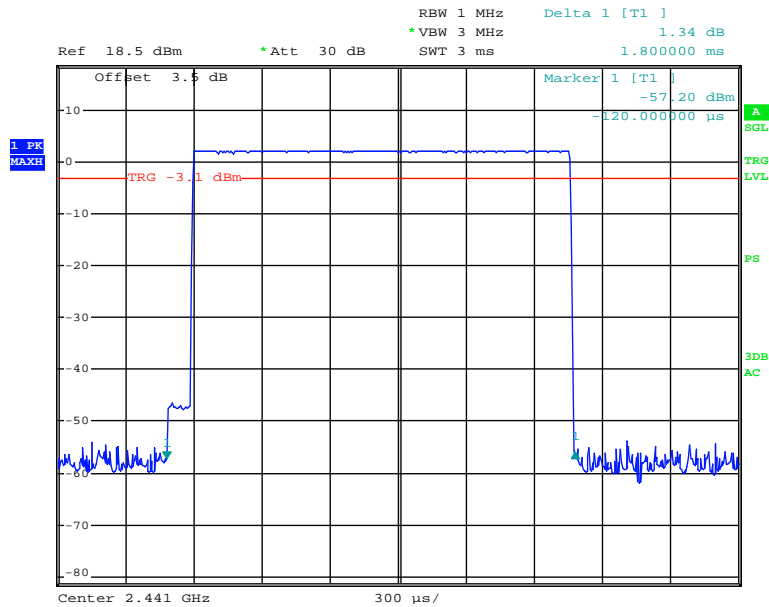
Date: 17.MAR.2013 12:05:56

Pulse time, Low Channel, DH3



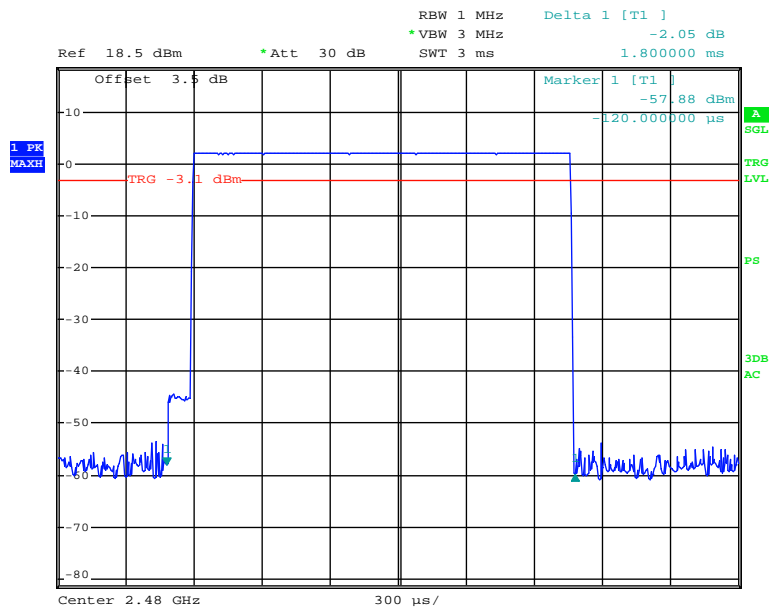
Date: 17.MAR.2013 12:08:44

Pulse time, Middle Channel, DH3



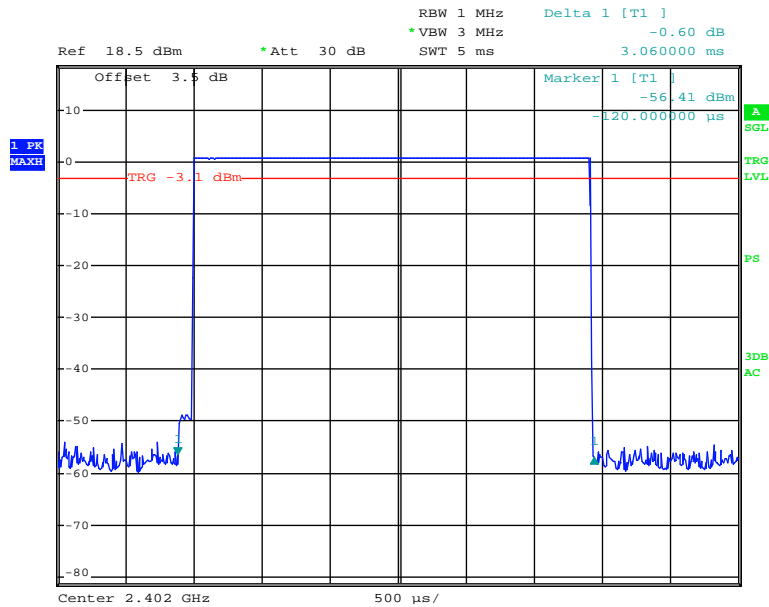
Date: 17.MAR.2013 12:09:26

Pulse time, High Channel, DH3



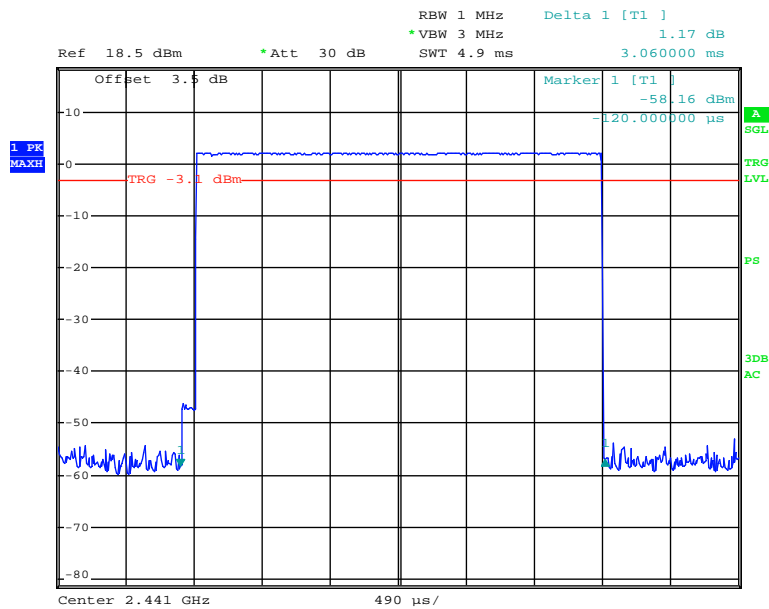
Date: 17.MAR.2013 12:09:55

Pulse time, Low Channel, DH5



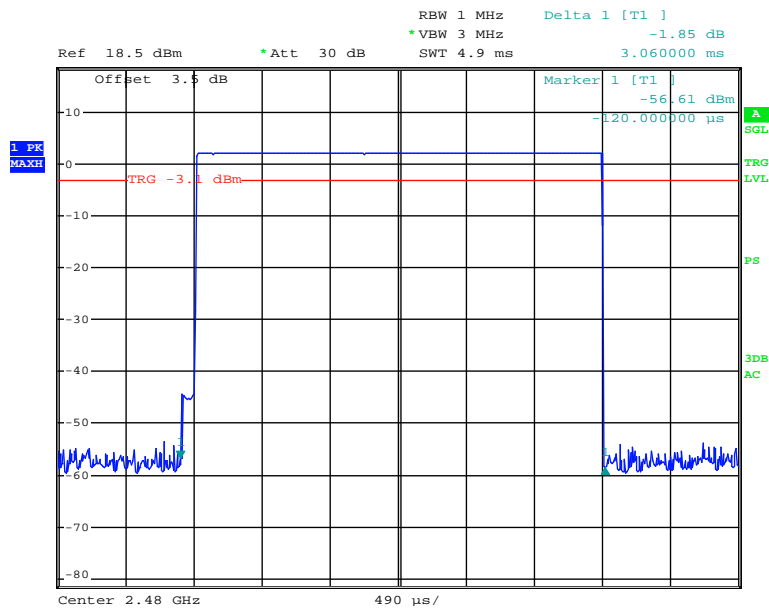
Date: 17.MAR.2013 12:11:41

Pulse time, Middle Channel, DH5



Date: 17.MAR.2013 12:12:27

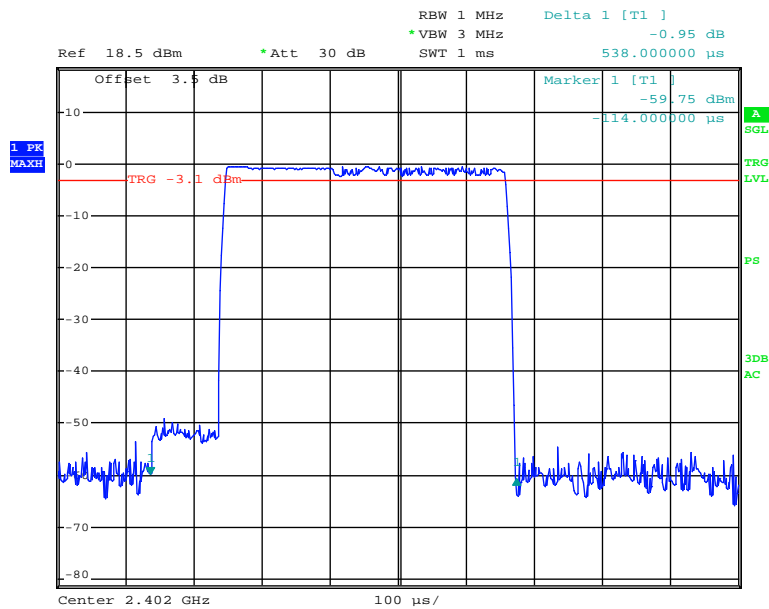
Pulse time, High Channel, DH5



Date: 17.MAR.2013 12:12:59

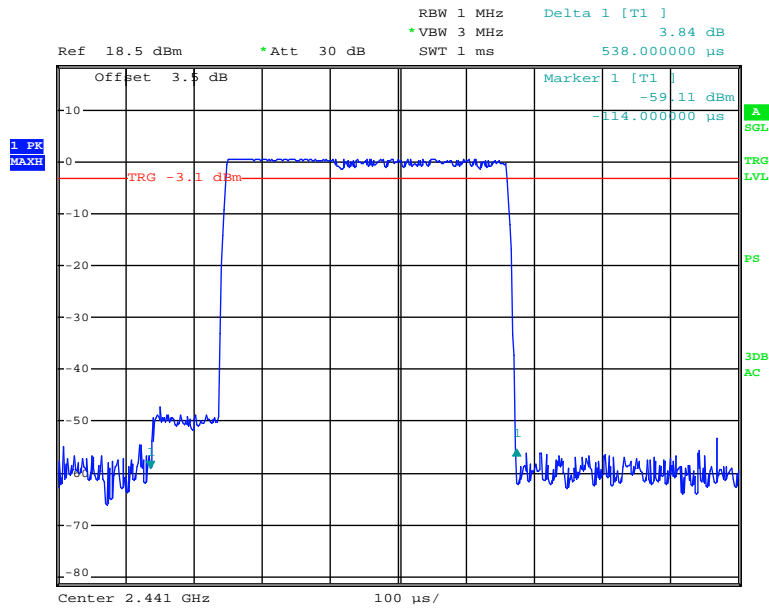
EDR ($\pi/4$ -DQPSK):

Pulse time, Low Channel, DH1



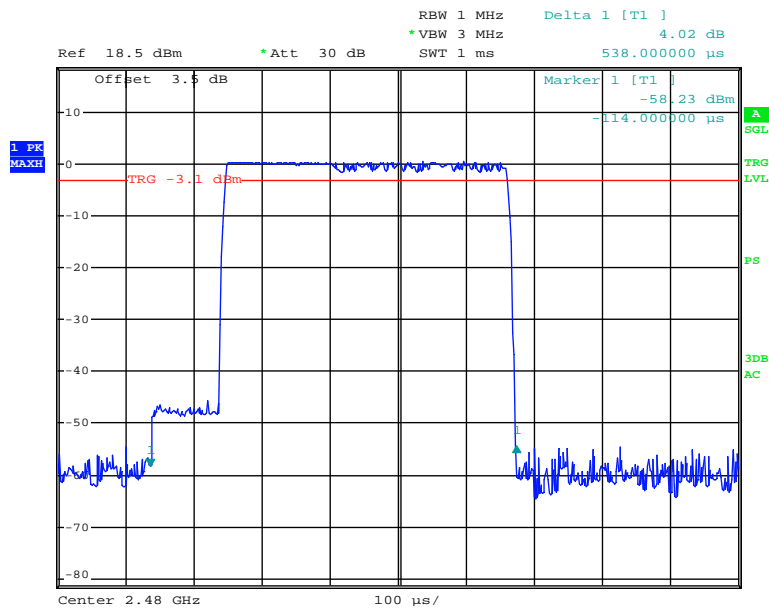
Date: 17.MAR.2013 14:08:58

Pulse time, Middle Channel, DH1



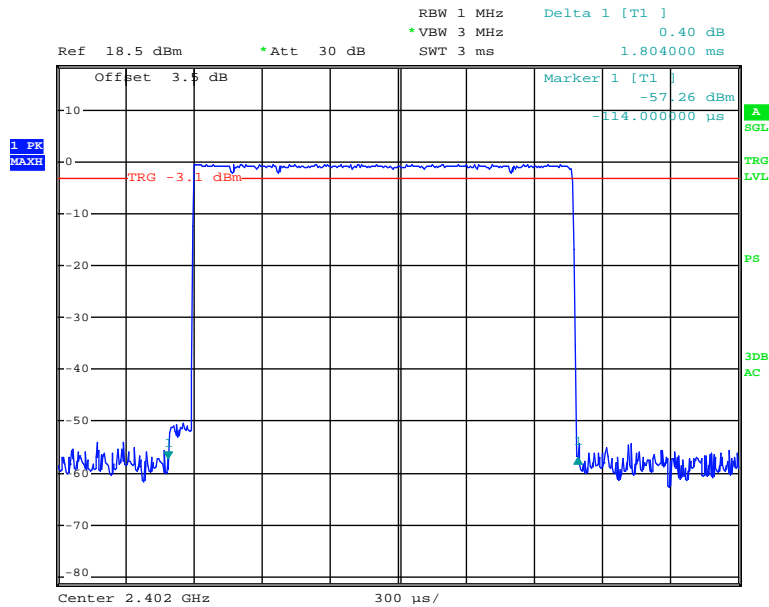
Date: 17.MAR.2013 14:09:31

Pulse time, High Channel, DH1



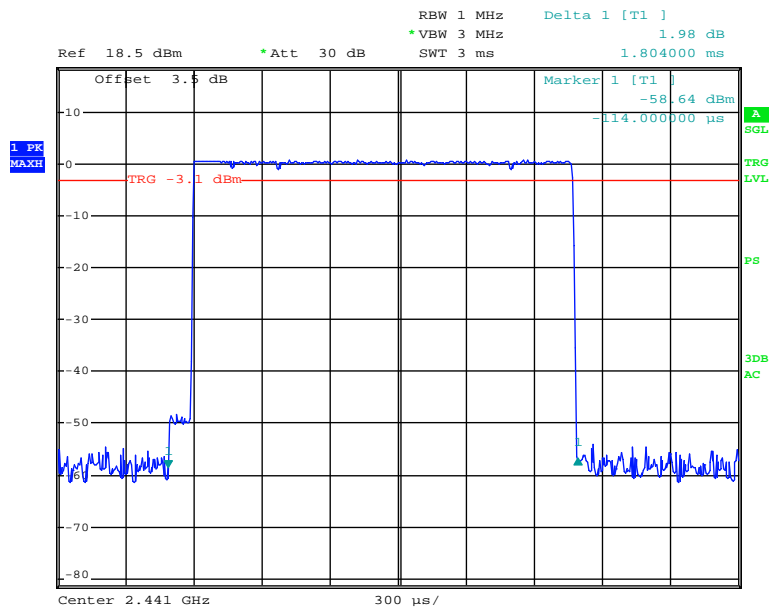
Date: 17.MAR.2013 14:11:10

Pulse time, Low Channel, DH3



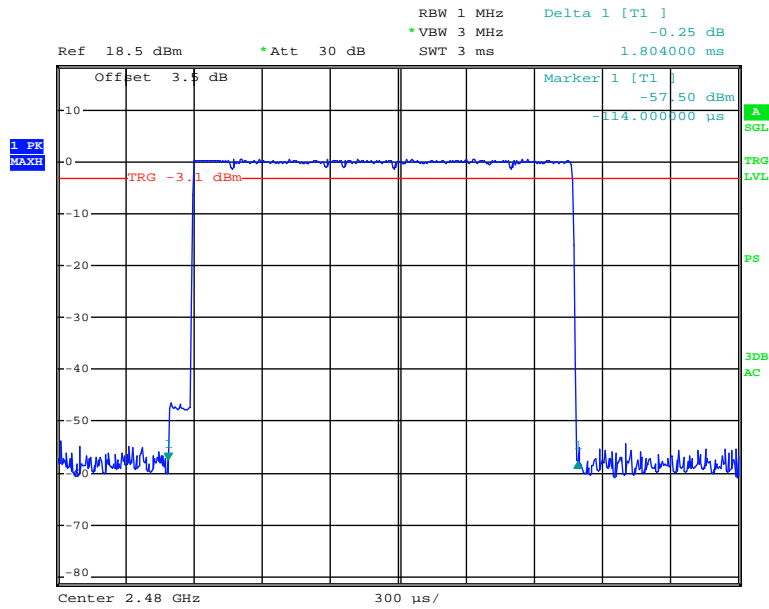
Date: 17.MAR.2013 14:12:42

Pulse time, Middle Channel, DH3



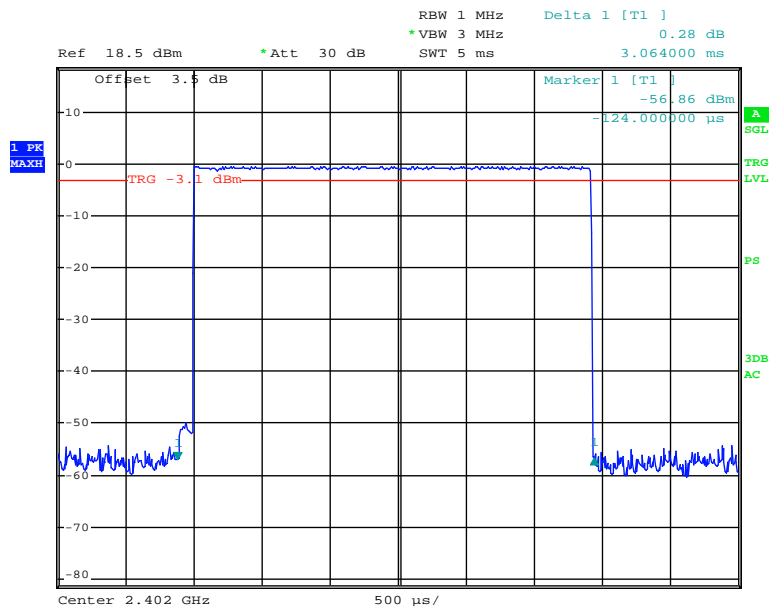
Date: 17.MAR.2013 14:13:16

Pulse time, High Channel, DH3



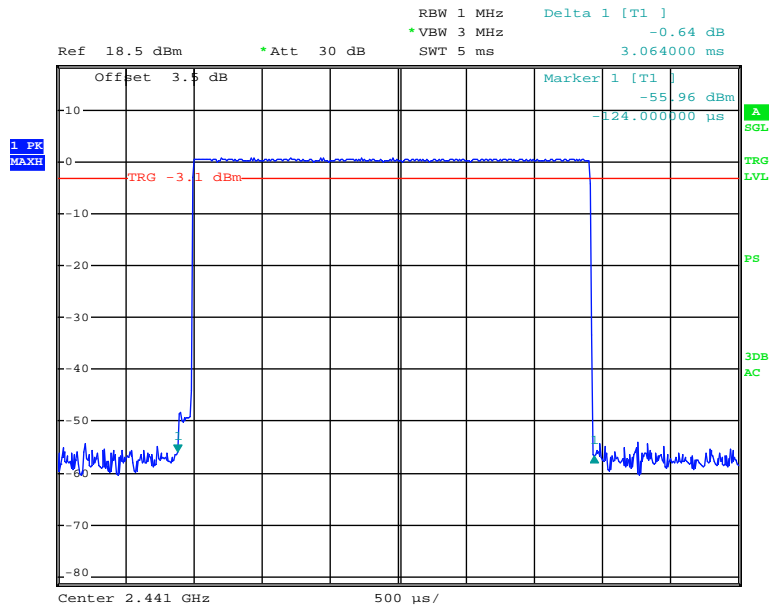
Date: 17.MAR.2013 14:13:53

Pulse time, Low Channel, DH5



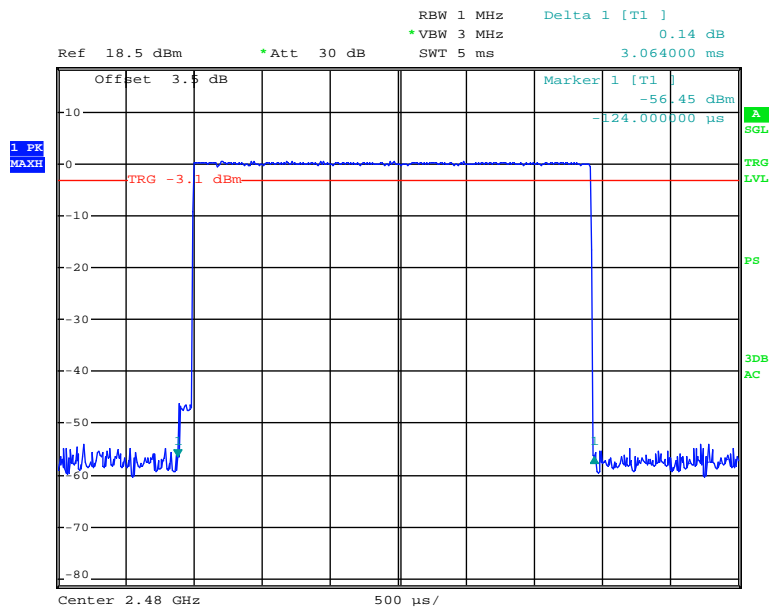
Date: 17.MAR.2013 14:16:18

Pulse time, Middle Channel, DH5



Date: 17.MAR.2013 14:16:41

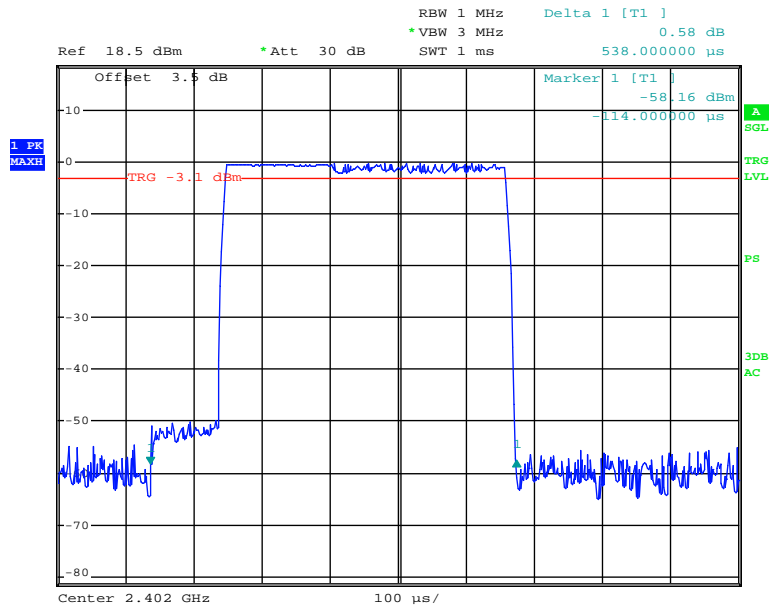
Pulse time, High Channel, DH5



Date: 17.MAR.2013 14:17:00

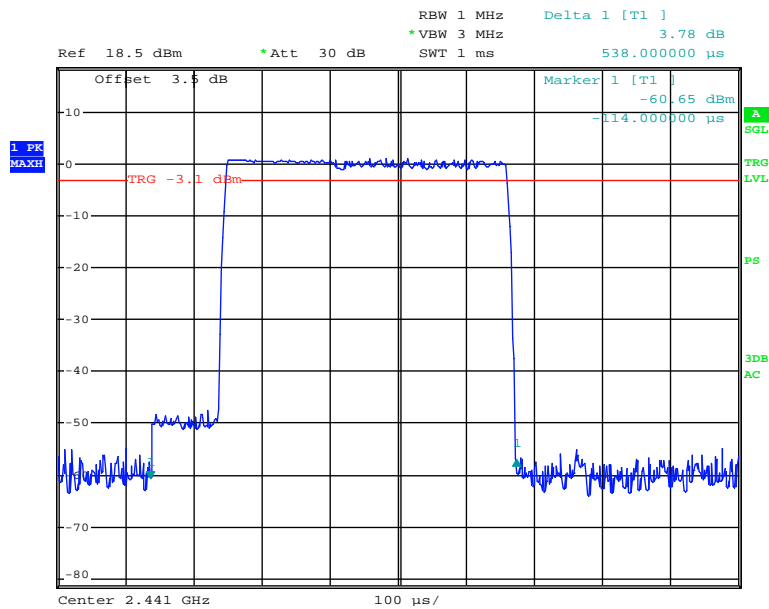
EDR (8DPSK):

Pulse time, Low Channel, DH1



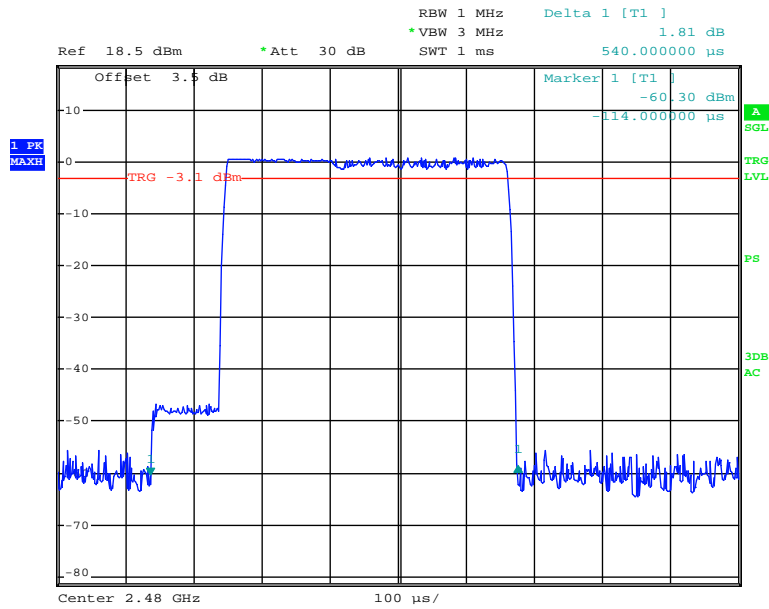
Date: 17.MAR.2013 14:40:23

Pulse time, Middle Channel, DH1



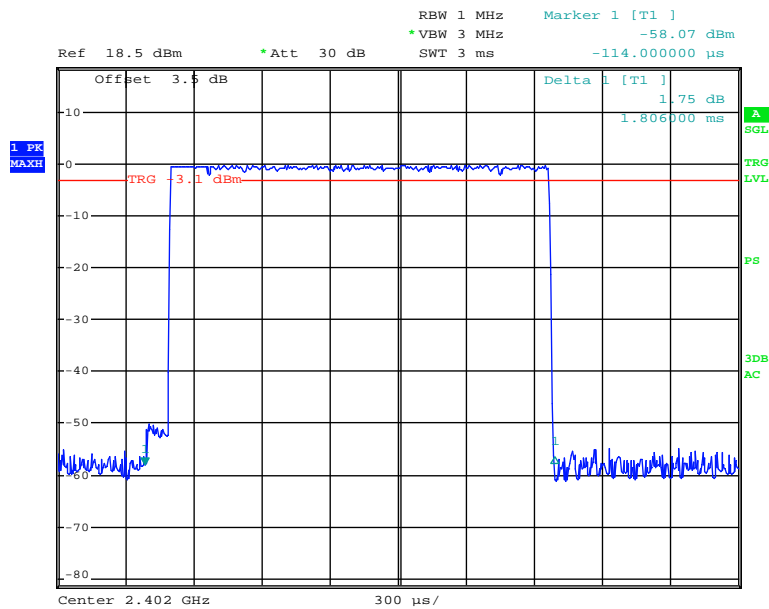
Date: 17.MAR.2013 14:41:27

Pulse time, High Channel, DH1



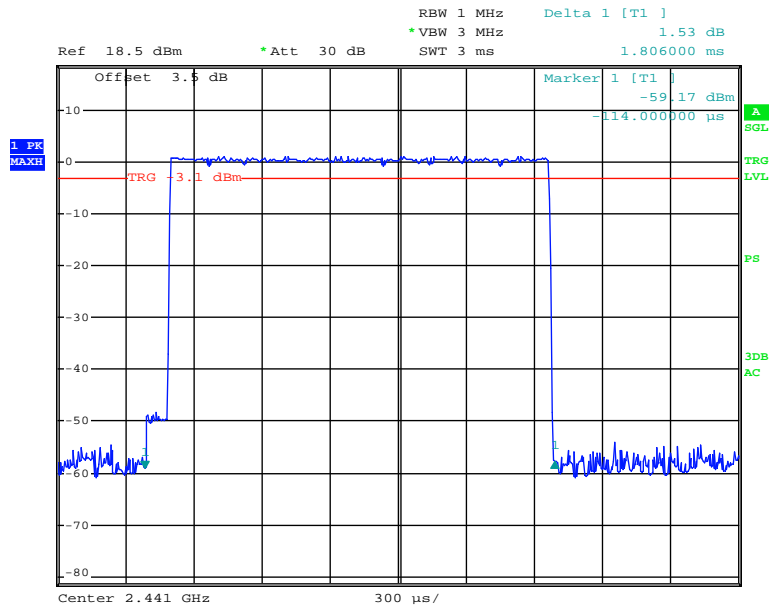
Date: 17.MAR.2013 14:42:22

Pulse time, Low Channel, DH3



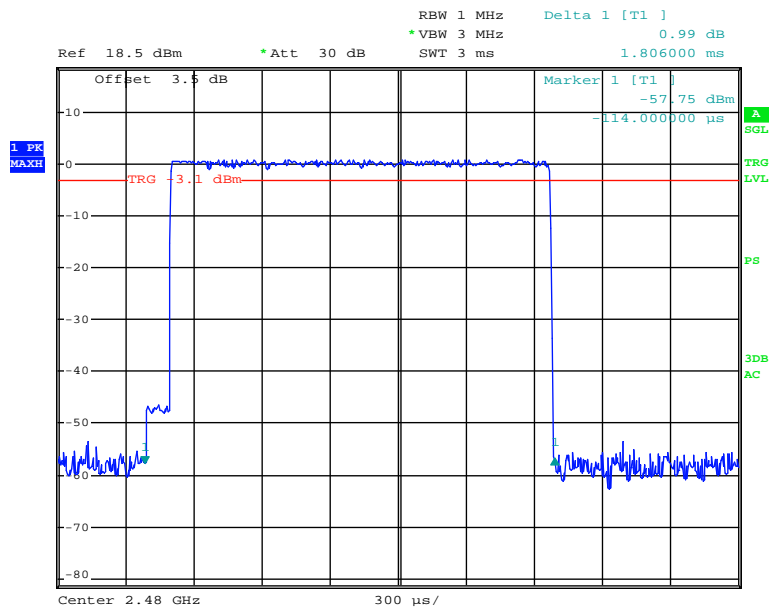
Date: 17.MAR.2013 14:43:40

Pulse time, Middle Channel, DH3



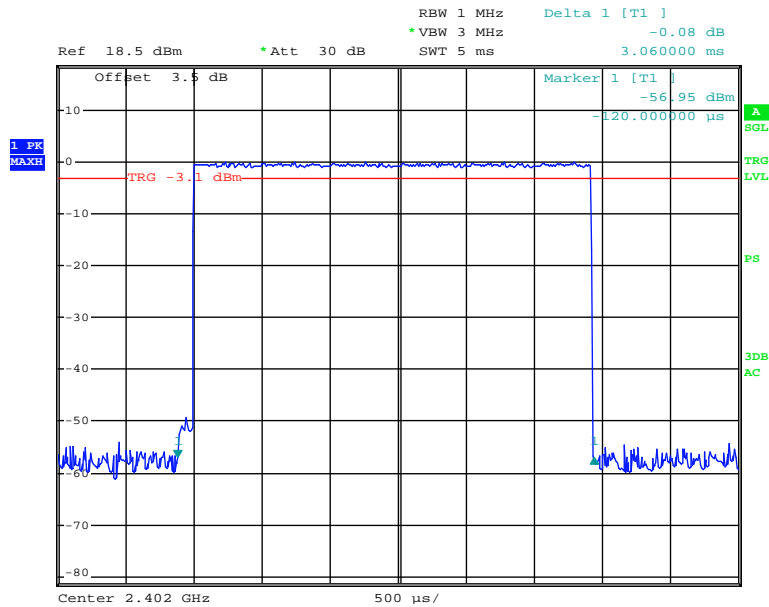
Date: 17.MAR.2013 14:44:18

Pulse time, High Channel, DH3



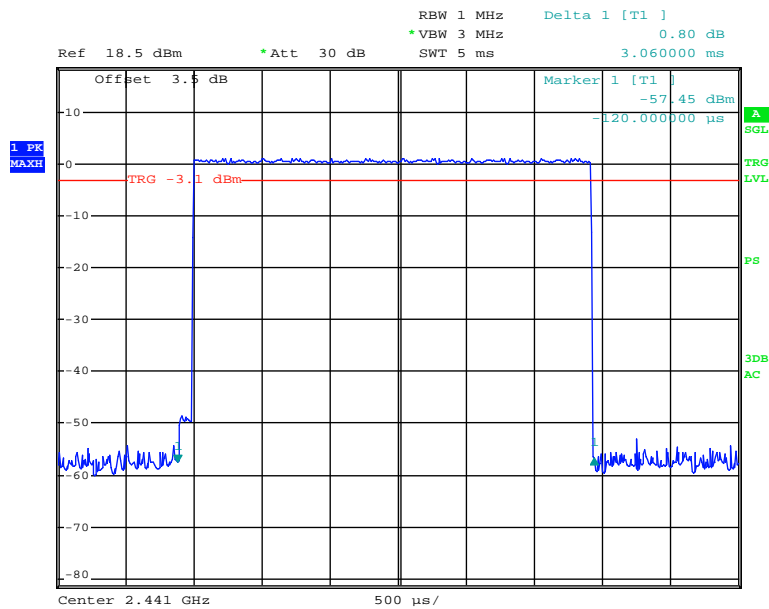
Date: 17.MAR.2013 14:44:42

Pulse time, Low Channel, DH5



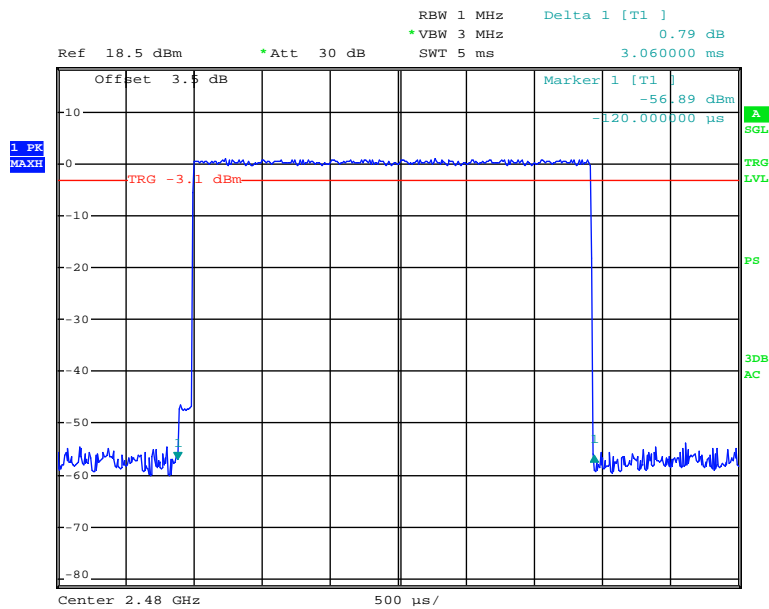
Date: 17.MAR.2013 14:46:17

Pulse time, Middle Channel, DH5



Date: 17.MAR.2013 14:46:42

Pulse time, High Channel, DH5



Date: 17.MAR.2013 14:47:16

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**

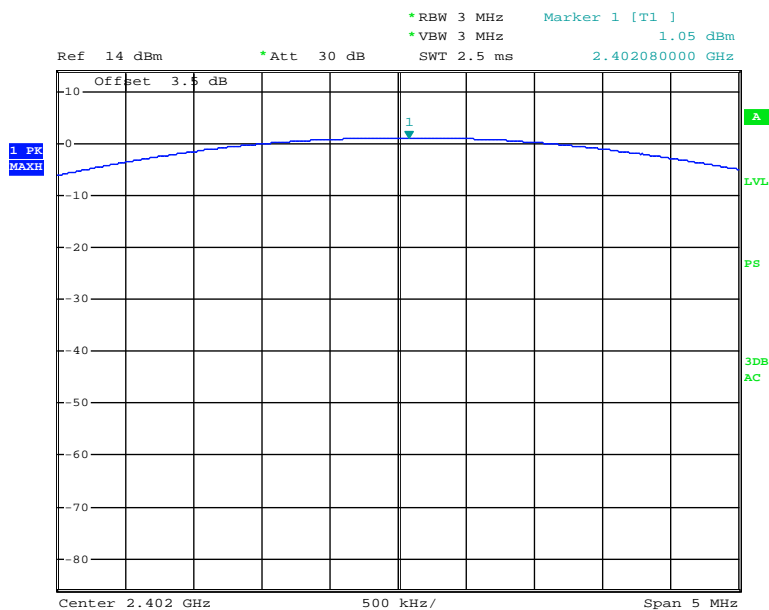
Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Simon Wang on 2013-03-17.

EUT operation mode: Transmitting

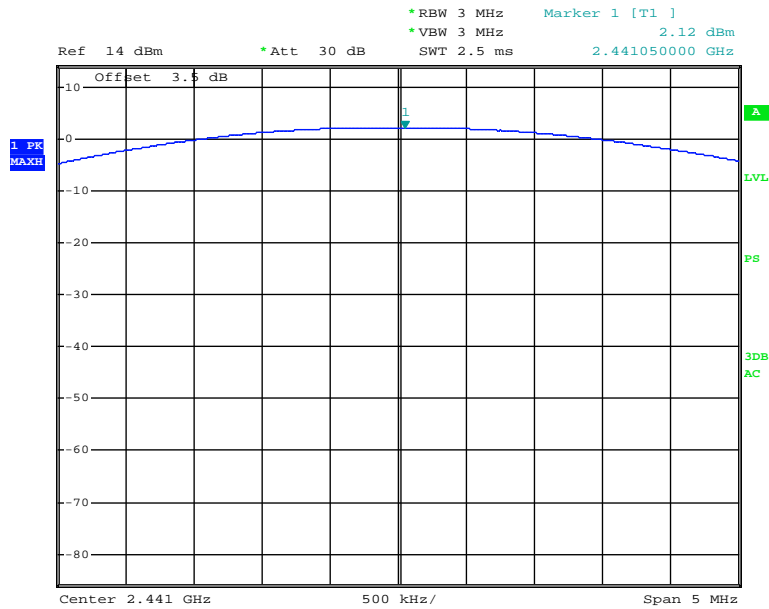
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	Conducted Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	1.05	1.274	1000
	Middle	2441	2.12	1.629	1000
	High	2480	2.31	1.702	1000
EDR ($\pi/4$-DQPSK)	Low	2402	0.29	1.069	1000
	Middle	2441	1.49	1.409	1000
	High	2480	1.23	1.327	1000
EDR (8DPSK)	Low	2402	0.96	1.247	1000
	Middle	2441	1.35	1.365	1000
	High	2480	1.23	1.327	1000

BDR (GFSK): Low Channel

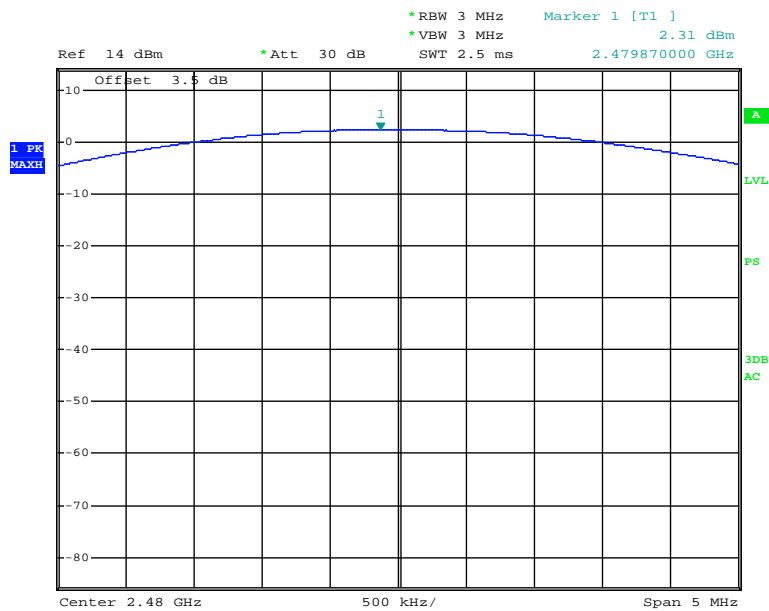
Date: 17.MAR.2013 11:34:15

BDR (GFSK): Middle Channel



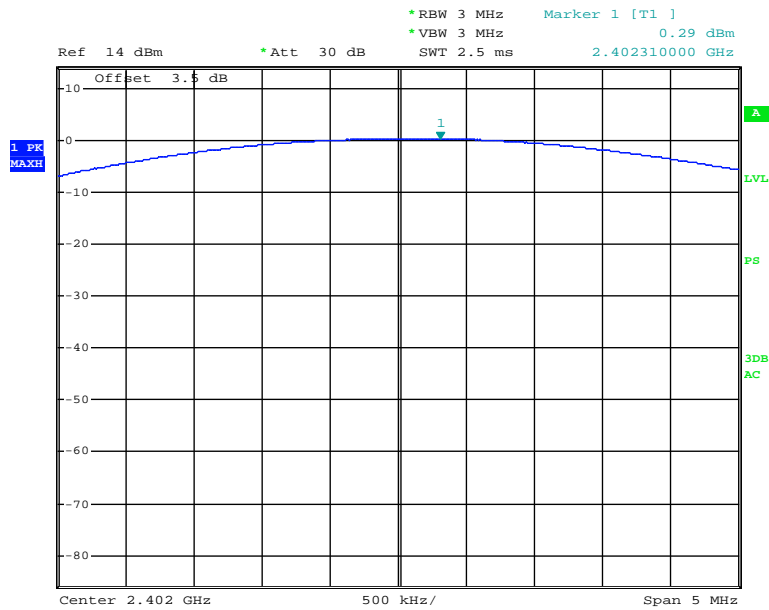
Date: 17.MAR.2013 11:36:12

BDR (GFSK): High Channel



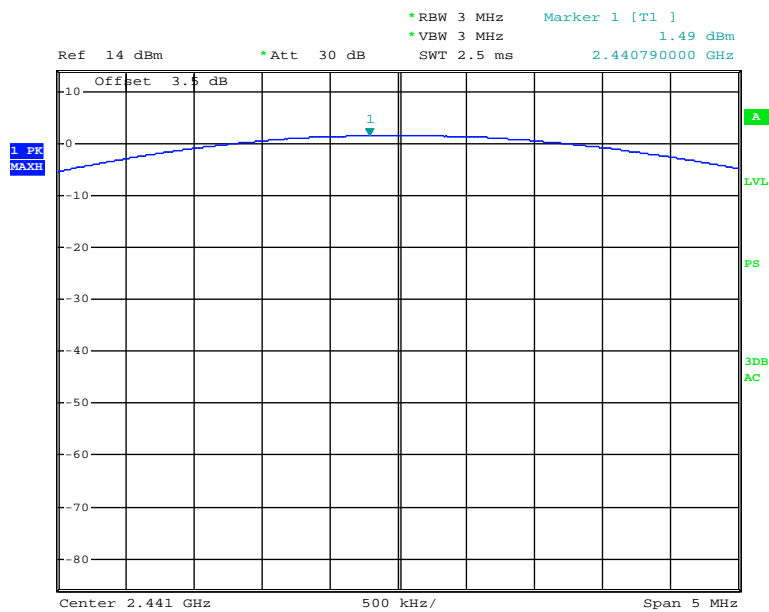
Date: 17.MAR.2013 11:32:39

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



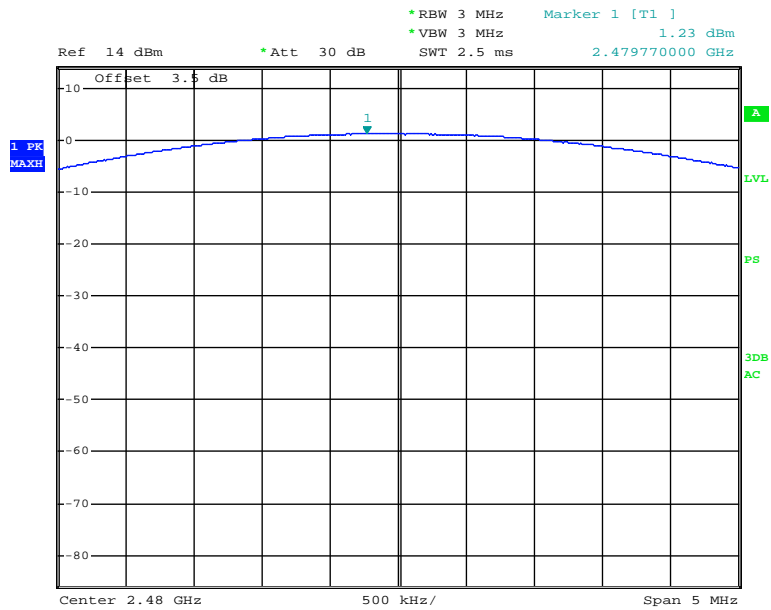
Date: 17.MAR.2013 12:41:23

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



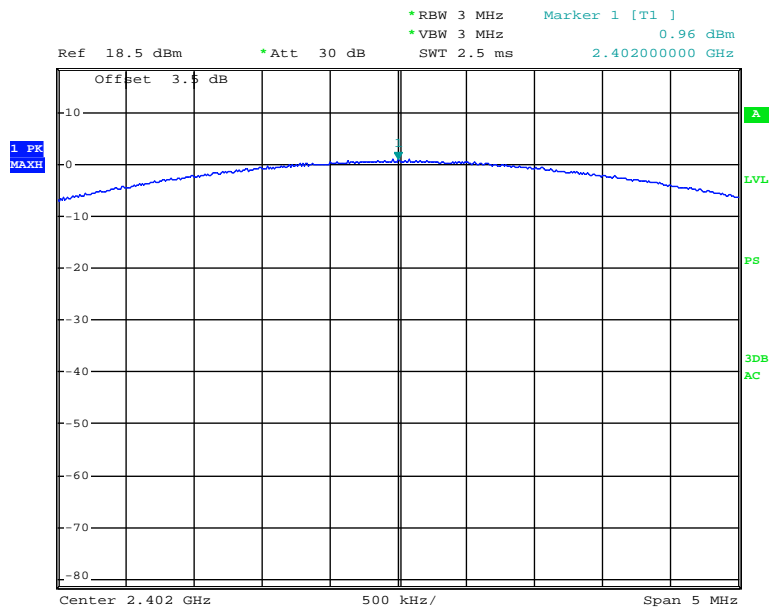
Date: 17.MAR.2013 12:39:25

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



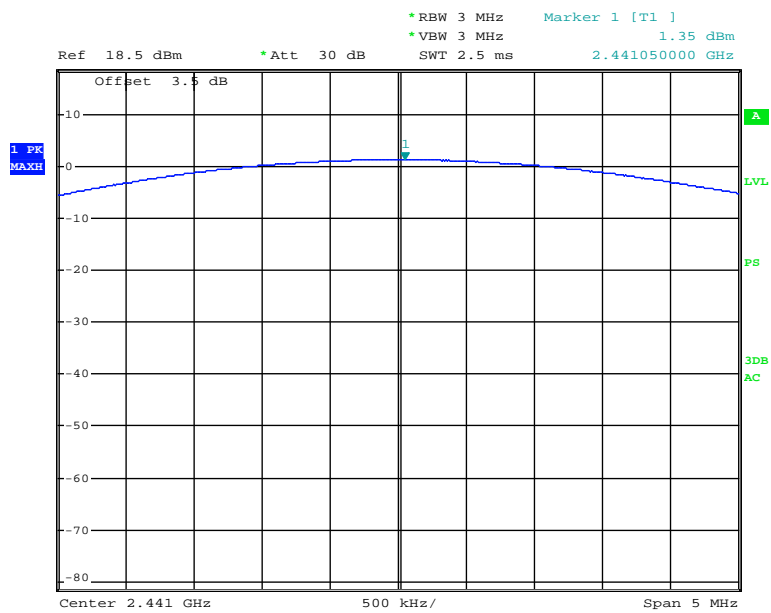
Date: 17.MAR.2013 12:42:50

EDR(8DPSK): Low Channel



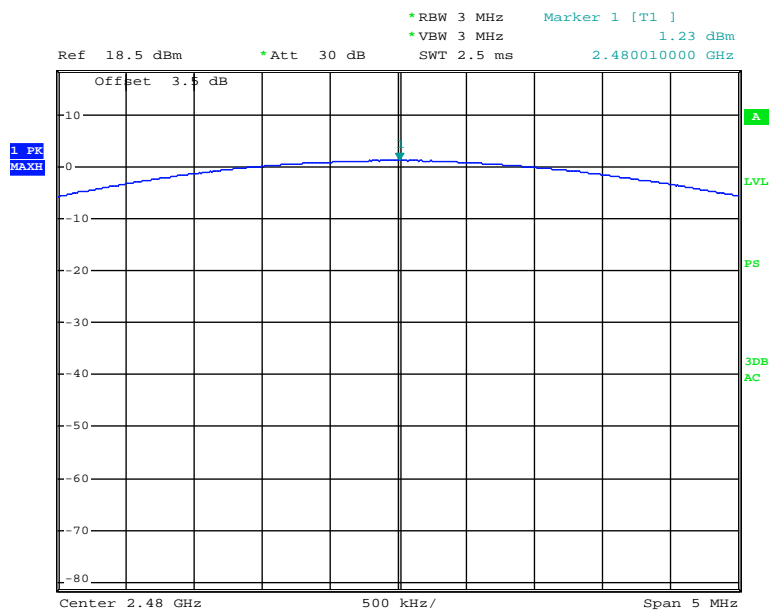
Date: 17.MAR.2013 21:04:06

EDR(8DPSK): Middle Channel



Date: 17.MAR.2013 15:07:59

EDR(8DPSK): High Channel



Date: 17.MAR.2013 15:10:02

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**

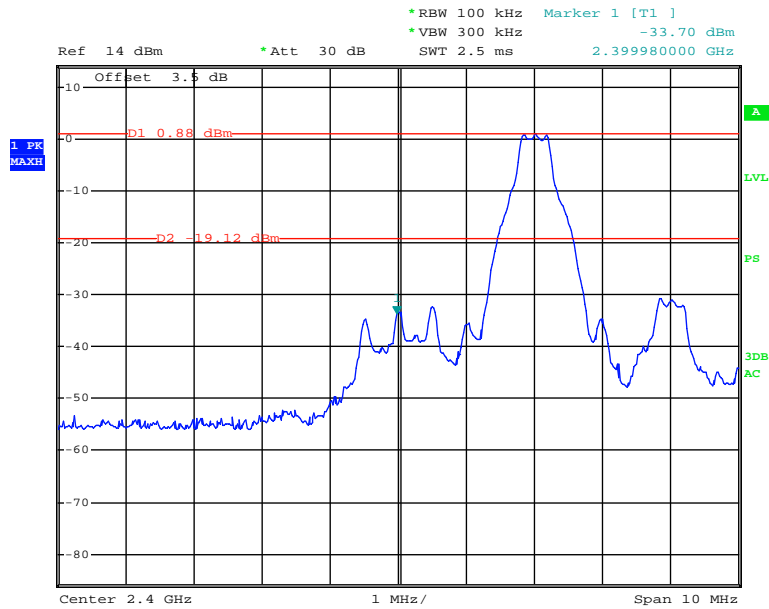
Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Simon Wang on 2013-03-17.

EUT operation mode: Transmitting

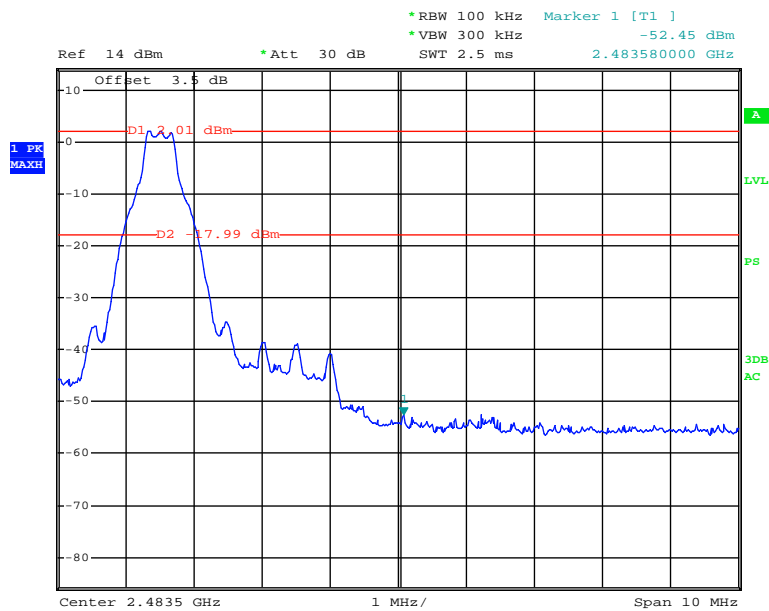
Test Result: Compliance. Please refer to following plots

BDR (GFSK): Band Edge-Left Side



Date: 17.MAR.2013 11:54:41

BDR (GFSK): Band Edge-Right Side



Date: 17.MAR.2013 11:57:49

Ref 14 dBm * Att 30 dB

* RBW 100 kHz Marker 1 [T1] -43.15 dBm
 * VBW 300 kHz
 SWT 2.5 ms 2.399980000 GHz

Offset 3.5 dB

1 PK MAXH

D1 -0.36 dBm

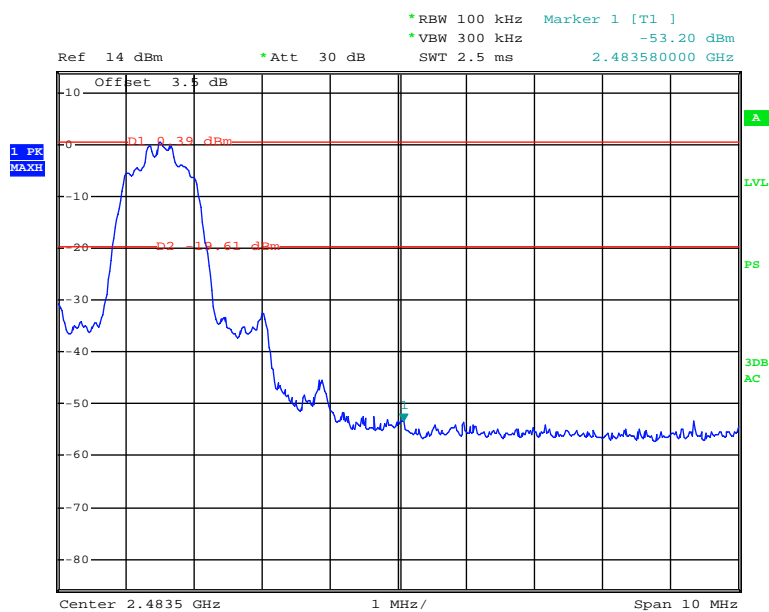
D2 -20.36 dBm

Center 2.4 GHz 1 MHz/ Span 10 MHz

10 -0 -10 -20 -30 -40 -50 -60 -70 -80

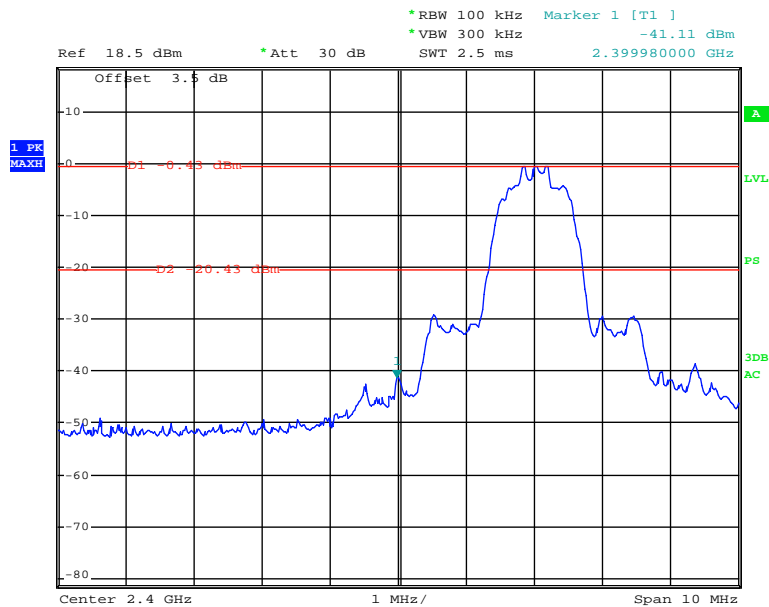
A LVL PS 3DB AC

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



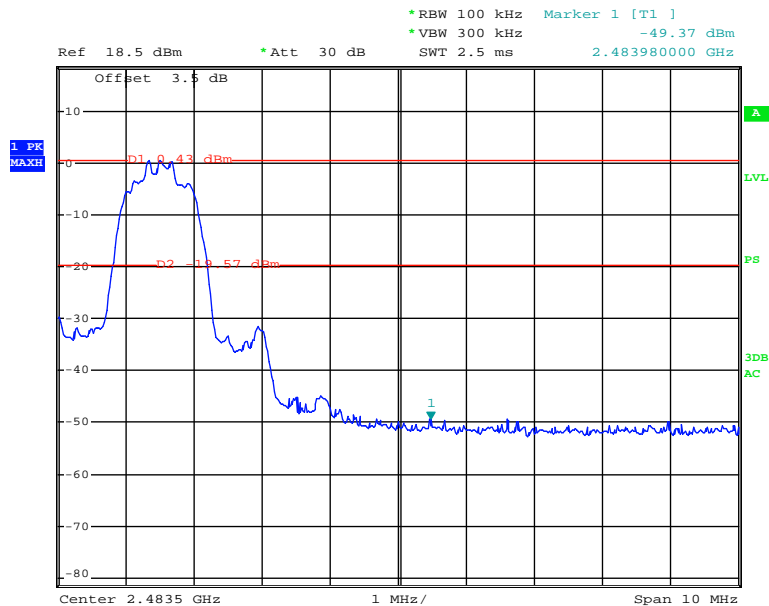
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EDR (8DPSK): Band Edge-Left Side



Date: 17.MAR.2013 14:58:53

BDR (8DPSK): Band Edge-Right Side



Date: 17.MAR.2013 14:56:55

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