

**FCC PART 15.247
TEST REPORT**

For

VTech Telecommunications Ltd

23/F, Tai Ping Industrial Centre, Block 1, 57Ting Kok Road, Tai Po, Hong Kong

FCC ID: EW7MA3222

Report Type: Original Report	Product Type: VTech Dual Mode Portable Speaker
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Report Number: R2DG130311002-00	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *VTech Telecommunications Ltd*'s product, model number: *MA3222 (FCC ID: EW7MA3222)* or the "EUT" in this report was a *VTech Dual Mode Portable Speaker*, which was measured approximately: 6.8 cm (L) x 6.8 cm (W) x 6.0 cm (H), rated with input voltage: DC3.6V AAA Ni-MH rechargeable battery pack or DC 5V charging from USB port

** All measurement and test data in this report was gathered from production sample serial number: 130311002 (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 *VTech Telecommunications 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 15D submission with FCC ID: EW7MA3222.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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

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

Test Facility

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

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

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

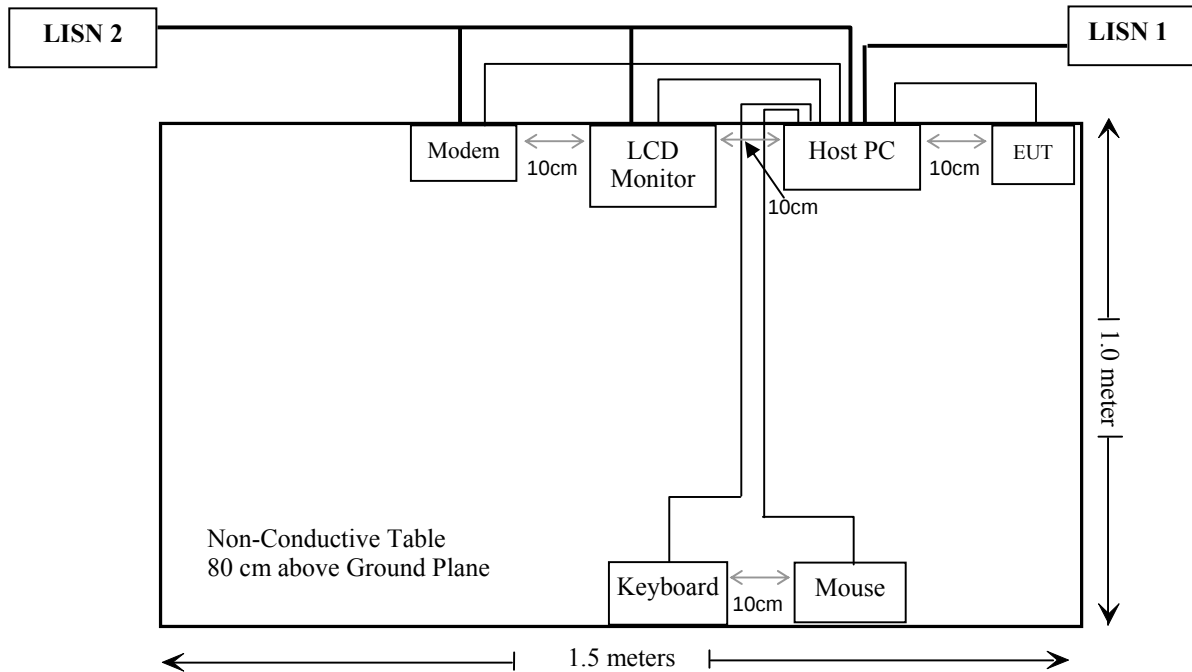
Manufacturer	Description	Model	Serial Number
DELL	PC	VOSTRO 220S	127BP2X
DELL	Keyboard	L100	CNORH656658907BL05DC
DELL	Mouse	MOC5UO	G1900NKD
DELL	LCD Monitor	E178WFPC	CN-OWY564-64180-7C4-2SQH
SAST	Modem	AEM-2100	0293

External I/O Cable

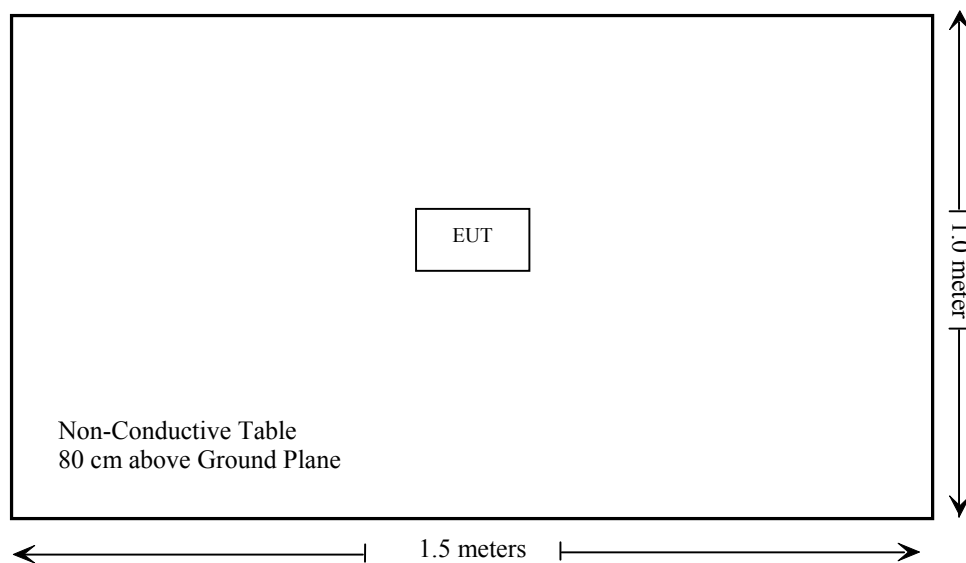
Cable Description	Length (m)	From/Port	To
Shielding Detachable USB Cable	1.5	Host PC	Mouse
Shielding Detachable Serial Cable	1.2	Host PC	Modem
Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Shielding Detachable USB Cable	1.0	USB port of EUT	Host PC

Block Diagram of Test Setup

For conducted emission



For radiated emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1) & §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	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel	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	5.87	3.864	20	0.00077	1.0
EDR (π/4-DQPSK)	2402	0	1.0	5.63	3.656	20	0.00073	1.0
EDR (8DPSK)	2402	0	1.0	5.86	3.855	20	0.00077	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 for BT, 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)

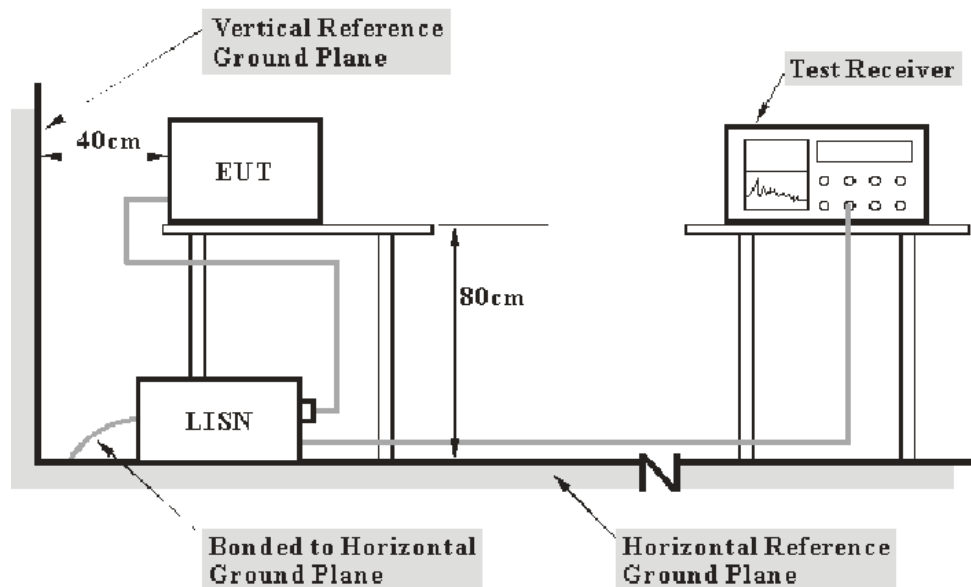
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements may be receiver reading, attenuation of the connection between AMN/ISN and receiver, AMN/ISN voltage division factor, AMN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

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 C63.4-2009. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm

The host PC 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 host PC was connected to the outlet of the first LISN, and the other relevant equipments were connected to the second 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	Transient limiter	ESH3Z2	DE25985	2012-08-09	2013-08-09
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 NVLAP requirements that 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:

9.40 dB at 8.955 MHz in the **Neutral** conducted mode

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

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

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

Test Data

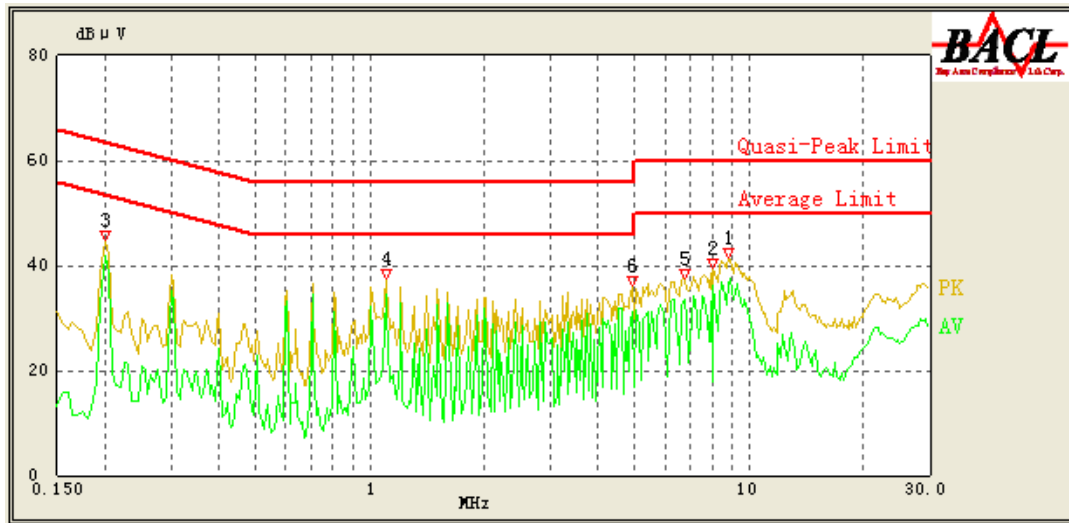
Environmental Conditions

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

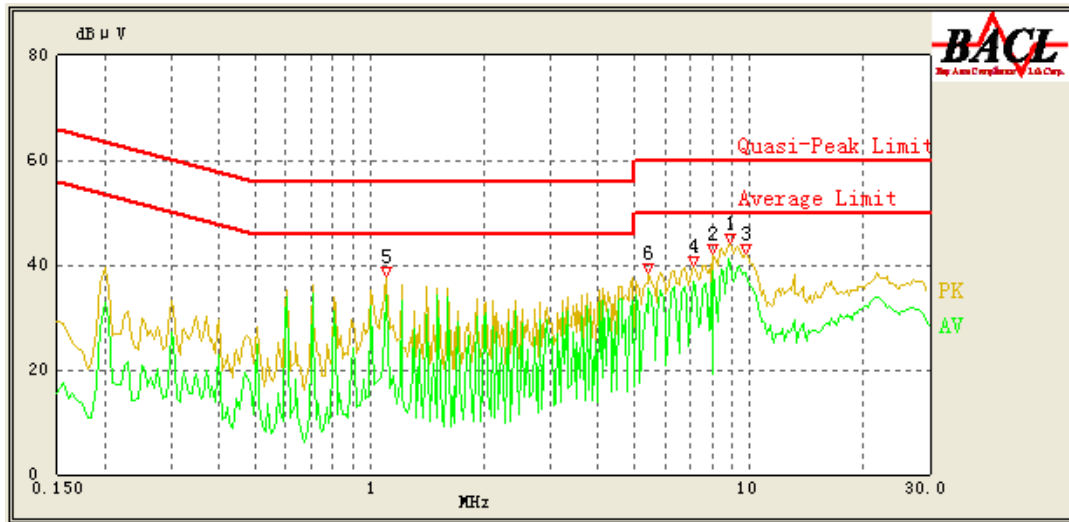
The testing was performed by Candy Li on 2013-03-31.

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)
1.105	34.63	10.20	46.00	11.37	Ave.
0.200	41.83	10.10	54.57	12.74	Ave.
8.850	36.57	10.36	50.00	13.43	Ave.
8.045	36.07	10.33	50.00	13.93	Ave.
4.925	31.05	10.20	46.00	14.95	Ave.
6.735	33.39	10.29	50.00	16.61	Ave.
1.105	35.03	10.20	56.00	20.97	QP
0.200	43.07	10.10	64.57	21.50	QP
8.845	37.98	10.36	60.00	22.02	QP
4.925	33.51	10.20	56.00	22.49	QP
8.040	36.77	10.33	60.00	23.23	QP
6.735	35.20	10.29	60.00	24.80	QP

AC 120V, 60 Hz, Neutral:

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
8.955	40.60	10.30	50.00	9.40	Ave.
8.050	38.88	10.30	50.00	11.12	Ave.
9.760	38.56	10.30	50.00	11.44	Ave.
1.105	34.15	10.20	46.00	11.85	Ave.
7.145	36.93	10.30	50.00	13.07	Ave.
5.435	35.38	10.22	50.00	14.62	Ave.
8.955	41.01	10.30	60.00	18.99	QP
8.050	39.80	10.30	60.00	20.20	QP
1.105	35.39	10.20	56.00	20.61	QP
9.760	38.95	10.30	60.00	21.05	QP
7.145	37.09	10.30	60.00	22.91	QP
5.435	36.28	10.22	60.00	23.72	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)

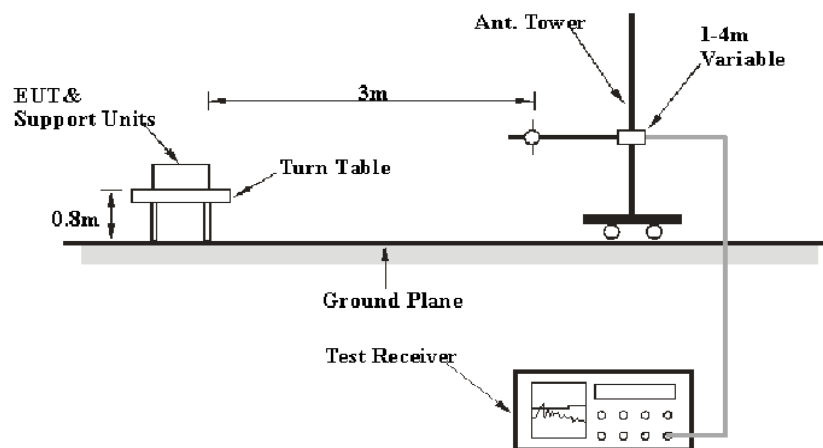
Measurement Uncertainty

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

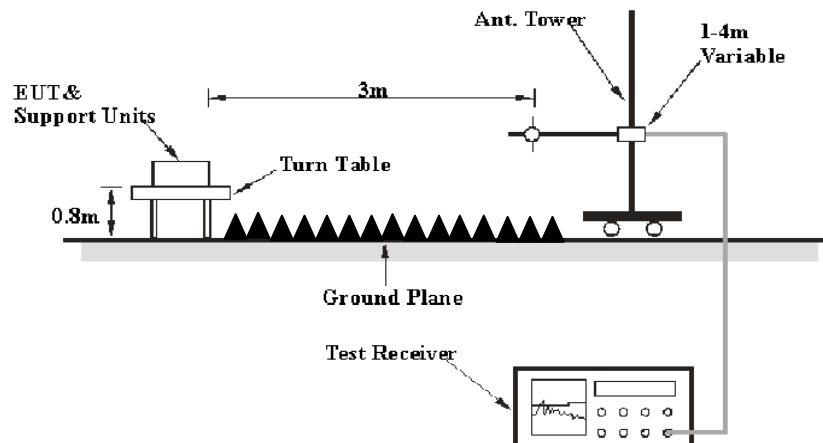
Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) will not be taken into consideration for the test data recorded in the report.

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 C63.4-2009. The specification used was the FCC 15.209 and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

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:

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

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	2011-11-24	2013-11-23
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 NVLAP requirements that traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

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

7.90 dB at 7323 MHz in the Vertical polarization

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

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

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

Test Data**Environmental Conditions**

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

The testing was performed by Candy Li on 2013-03-31.

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 (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	94.27	PK	105	1.0	H	6.13	100.40	/	/
2402	51.03	Ave.	105	1.0	H	6.13	57.16	/	/
2402	95.87	PK	358	1.1	V	6.13	102.00	/	/
2402	51.31	Ave.	358	1.1	V	6.13	57.44	/	/
9608	25.88	Ave.	94	1.1	V	19.28	45.16	54	8.84
7206	27.10	Ave.	27	1.1	V	17.06	44.16	54	9.84
4804	30.28	Ave.	71	1.2	V	12.40	42.68	54	11.32
7206	42.21	PK	27	1.1	V	17.06	59.27	74	14.73
4804	46.63	PK	71	1.2	V	12.40	59.03	74	14.97
370.63	43.44	QP	178	1.1	H	-13.1	30.34	46	15.66
9608	36.74	PK	94	1.1	V	19.28	56.02	74	17.98
2490.4	26.15	Ave.	231	1.3	V	7.21	33.36	54	20.64
2337.3	27.18	Ave.	32	1.2	H	5.48	32.66	54	21.34
2320.6	27.08	Ave.	10	1.3	H	5.48	32.56	54	21.44
2490.4	40.84	PK	231	1.3	V	7.21	48.05	74	25.95
2337.3	42.18	PK	32	1.2	H	5.48	47.66	74	26.34
2320.6	41.53	PK	10	1.3	H	5.48	47.01	74	26.99
Middle Channel (2441 MHz)									
2441	90.42	PK	128	1.2	H	7.21	97.63	/	/
2441	49.35	Ave.	128	1.2	H	7.21	56.56	/	/
2441	94.16	PK	11	1.0	V	7.21	101.37	/	/
2441	50.58	Ave.	11	1.0	V	7.21	57.79	/	/
7323	29.61	Ave.	2	1.0	V	16.49	46.10	54	7.90
9764	25.35	Ave.	184	1.3	V	19.29	44.64	54	9.36
4882	29.75	Ave.	60	1.2	V	12.46	42.21	54	11.79
7323	44.15	PK	2	1.0	V	16.49	60.64	74	13.36
4882	47.13	PK	60	1.2	V	12.46	59.59	74	14.41
9764	39.53	PK	184	1.3	V	19.29	58.82	74	15.18
370.63	43.25	QP	46	1.0	H	-13.1	30.15	46	15.85
2487.2	26.83	Ave.	258	1.2	V	7.21	34.04	54	19.96
2375.8	26.87	Ave.	105	1.2	V	6.13	33.00	54	21.00
2388.7	26.41	Ave.	139	1.1	V	6.13	32.54	54	21.46
2487.2	42.97	PK	258	1.2	V	7.21	50.18	74	23.82
2375.8	43.60	PK	105	1.2	V	6.13	49.73	74	24.27
2388.7	42.83	PK	139	1.1	V	6.13	48.96	74	25.04

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2480 MHz)									
2480	90.97	PK	43	1.2	H	7.21	98.18	/	/
2480	49.37	Ave.	43	1.2	H	7.21	56.58	/	/
2480	95.14	PK	191	1.2	V	7.21	102.35	/	/
2480	50.67	Ave.	191	1.2	V	7.21	57.88	/	/
9920	25.41	Ave.	314	1.1	V	19.38	44.79	54	9.21
7440	27.67	Ave.	91	1.1	V	15.90	43.57	54	10.43
4960	29.02	Ave.	153	1.0	V	12.50	41.52	54	12.48
9920	40.74	PK	314	1.1	V	19.38	60.12	74	13.88
2483.7	51.81	PK	206	1.2	V	7.21	59.02	74	14.98
4960	46.08	PK	153	1.0	V	12.50	58.58	74	15.42
7440	42.68	PK	91	1.1	V	15.90	58.58	74	15.42
370.63	43.65	QP	98	1.2	H	-13.1	30.55	46	15.45
2483.7	31.06	Ave.	206	1.2	V	7.21	38.27	54	15.73
2484.2	28.49	Ave.	18	1.0	V	7.21	35.70	54	18.30
2484.2	47.30	PK	18	1.0	V	7.21	54.51	74	19.49
2379.6	26.22	Ave.	348	1.0	V	6.13	32.35	54	21.65
2379.6	40.88	PK	348	1.0	V	6.13	47.01	74	26.99

Note:

1. Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor
2. Corrected Amplitude = Corrected Factor + Receiver Reading
3. Margin = Limit- Corrected Amplitude

FCC §15.247(a) (1)-CHANNEL SEPARATION**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 NVLAP requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

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

* The testing was performed by Candy Li on 2013-03-29.

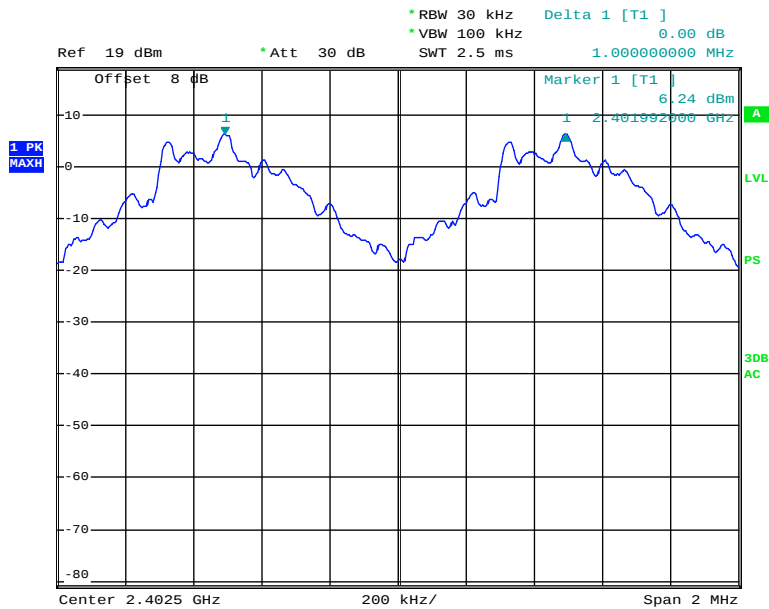
EUT operation mode: Transmitting

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

Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	$\geq$ Limit (MHz)	Result
BDR (GFSK)	Low	2402	1.000	0.613	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.613	Pass
	Adjacent	2442			
	High	2480	1.000	0.613	Pass
	Adjacent	2479			
EDR ($\pi/4$-DQPSK)	Low	2402	1.000	0.813	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.813	Pass
	Adjacent	2442			
	High	2480	1.000	0.813	Pass
	Adjacent	2479			
EDR (8DPSK)	Low	2402	1.000	0.805	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.805	Pass
	Adjacent	2442			
	High	2480	1.000	0.805	Pass
	Adjacent	2479			

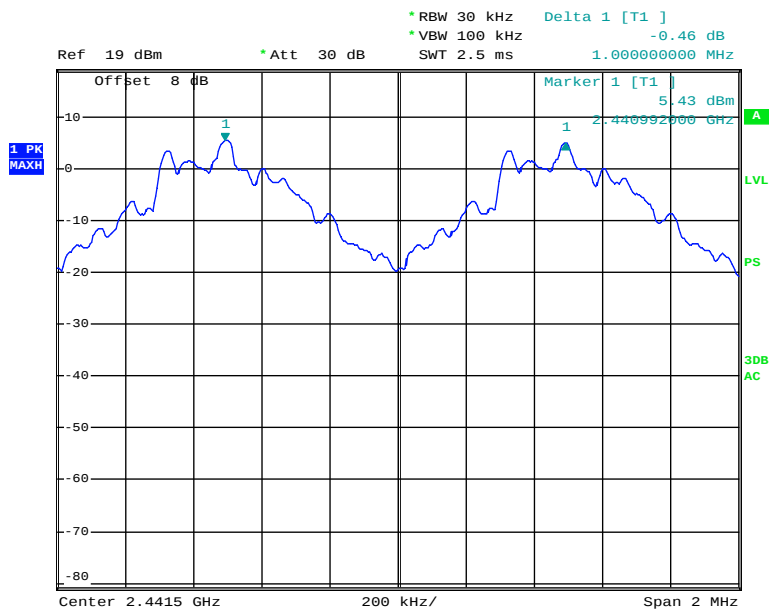
Note: Limit = 20 dB bandwidth *2/3

BDR (GFSK): Low Channel



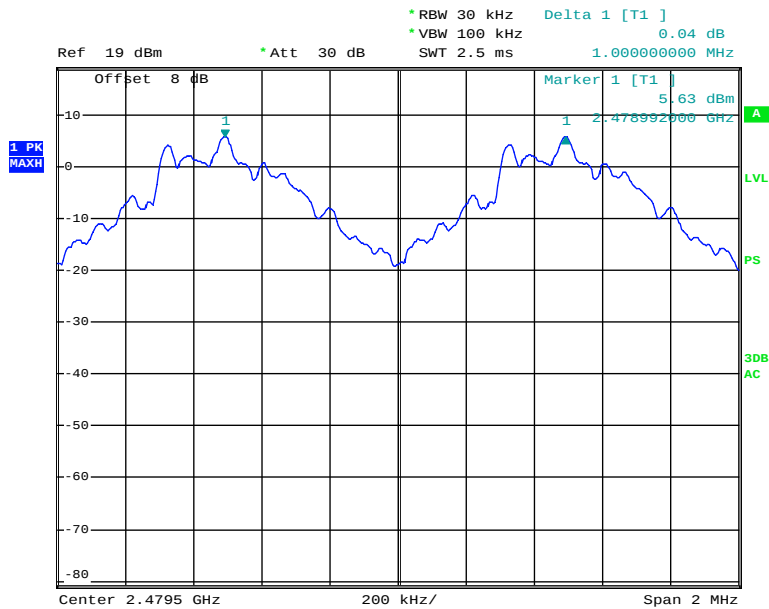
Date: 29.MAR.2013 23:27:44

BDR (GFSK): Middle Channel



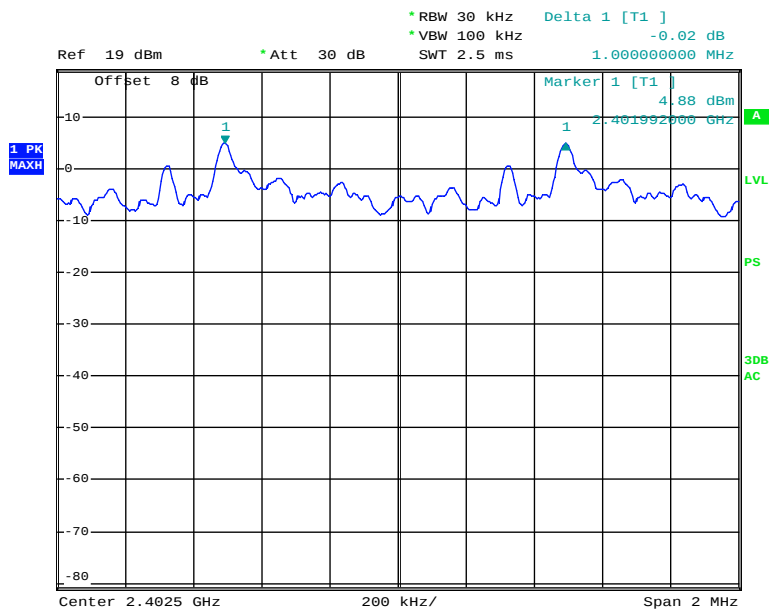
Date: 29.MAR.2013 23:29:09

BDR (GFSK): High Channel



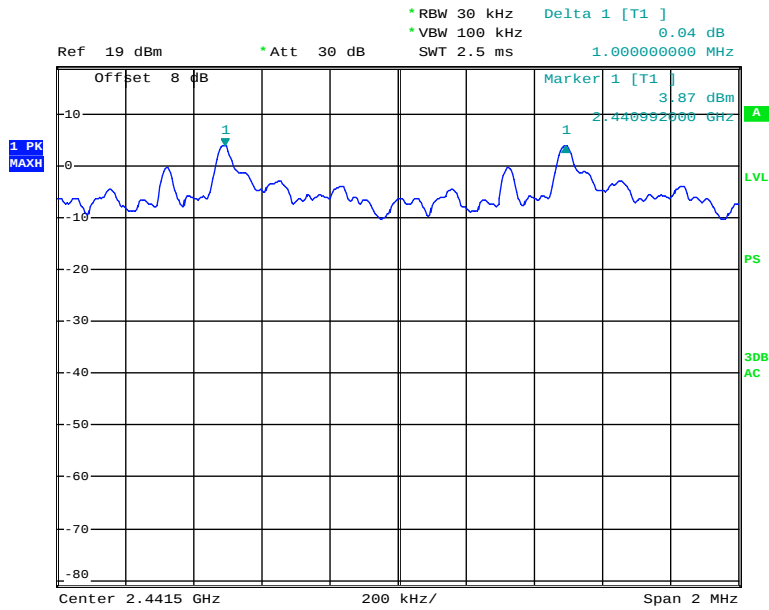
Date: 29.MAR.2013 23:31:01

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



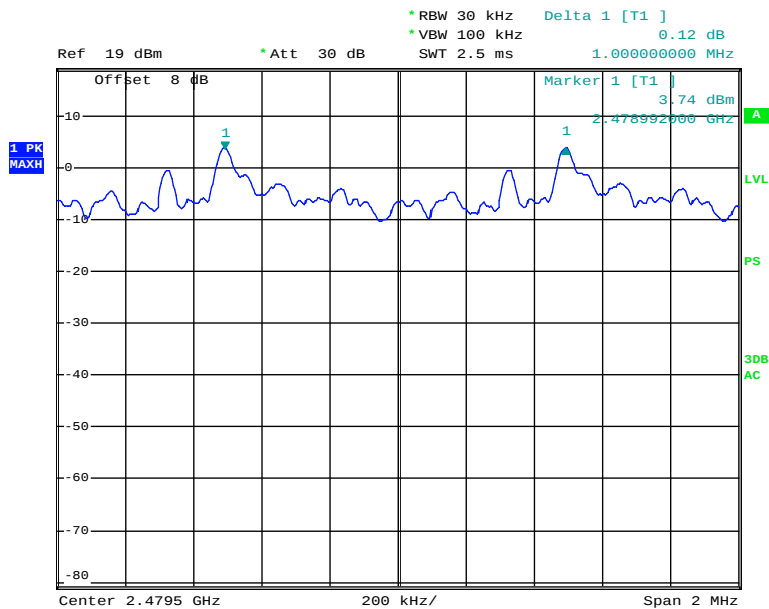
Date: 29.MAR.2013 23:36:10

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



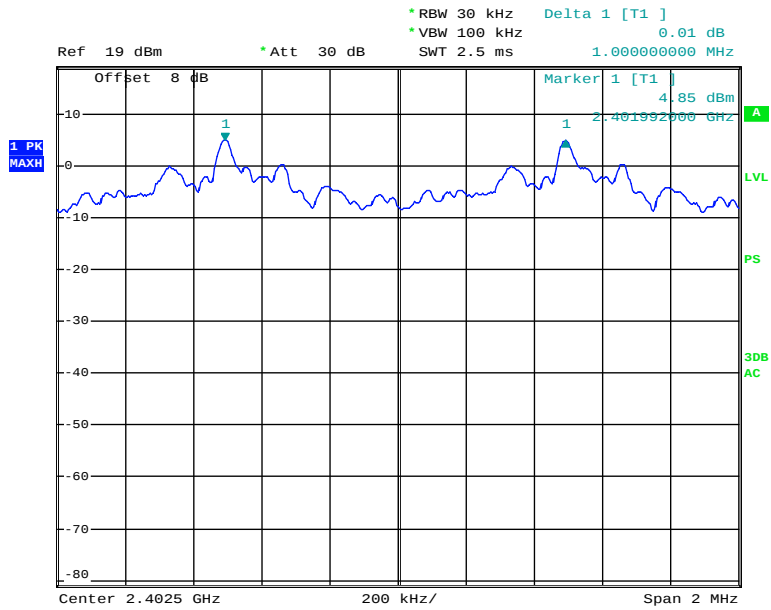
Date: 29.MAR.2013 23:34:45

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



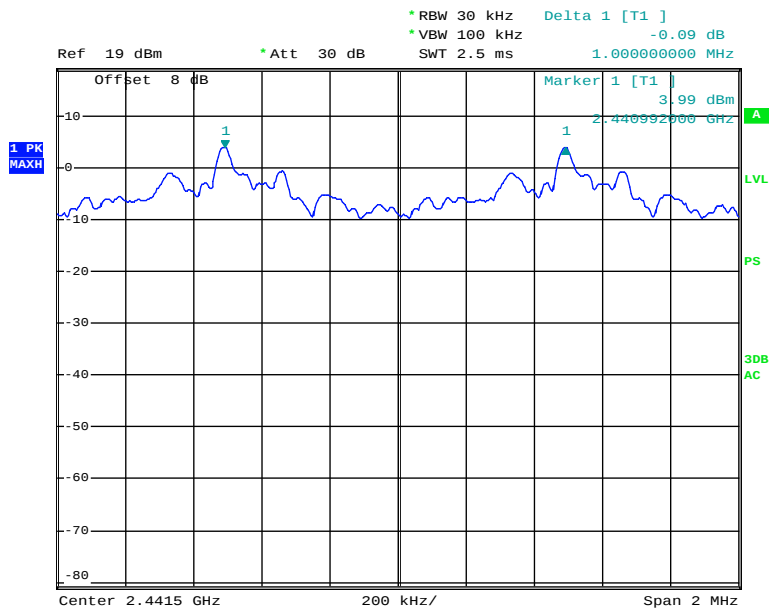
Date: 29.MAR.2013 23:33:05

EDR (8DPSK): Low Channel



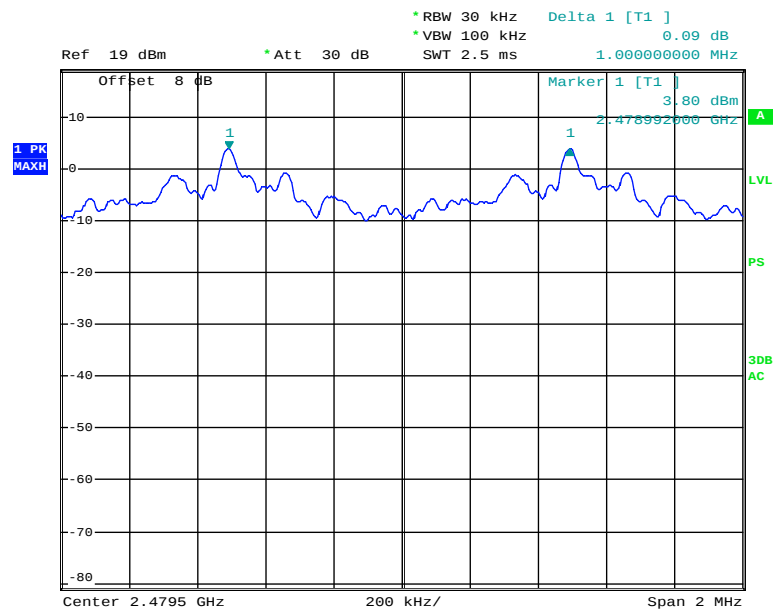
Date: 29.MAR.2013 23:37:54

EDR (8DPSK): Middle Channel



Date: 29.MAR.2013 23:39:24

EDR (8DPSK): High Channel



Date: 29.MAR.2013 23:40:46

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 NVLAP requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

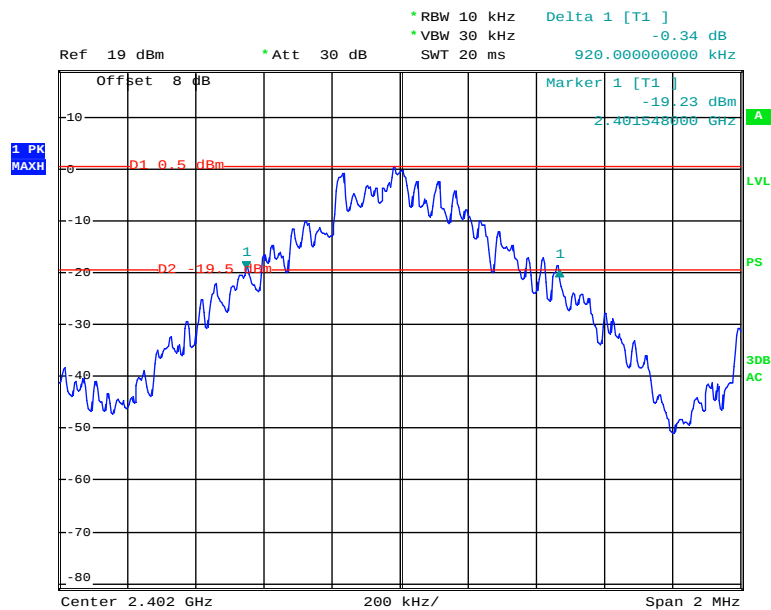
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

* The testing was performed by Candy Li on 2013-03-29.

EUT operation mode: Transmitting

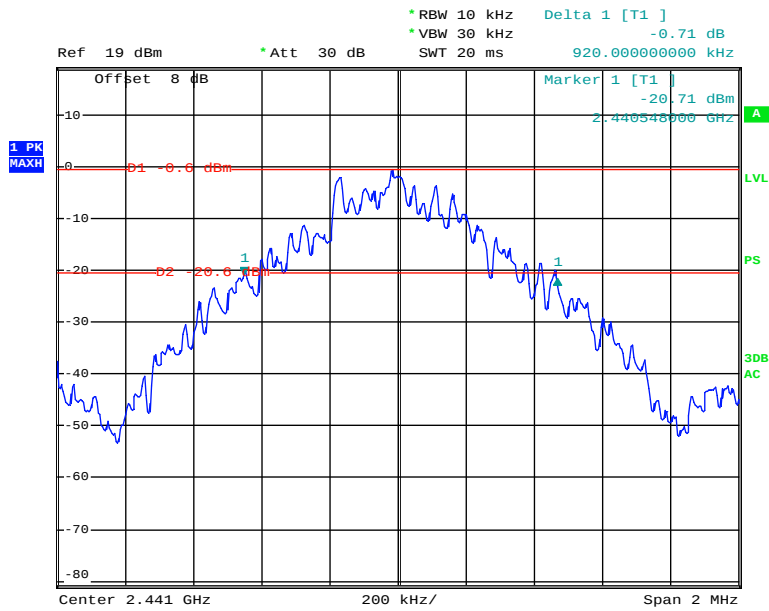
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	20 dB Emission Bandwidth (MHz)
BDR (GFSK)	Low	2402	0.920
	Middle	2441	0.920
	High	2480	0.920
EDR ($\pi/4$-DQPSK)	Low	2402	1.220
	Middle	2441	1.220
	High	2480	1.220
EDR (8DPSK)	Low	2402	1.208
	Middle	2441	1.208
	High	2480	1.208

BDR (GFSK): Low Channel

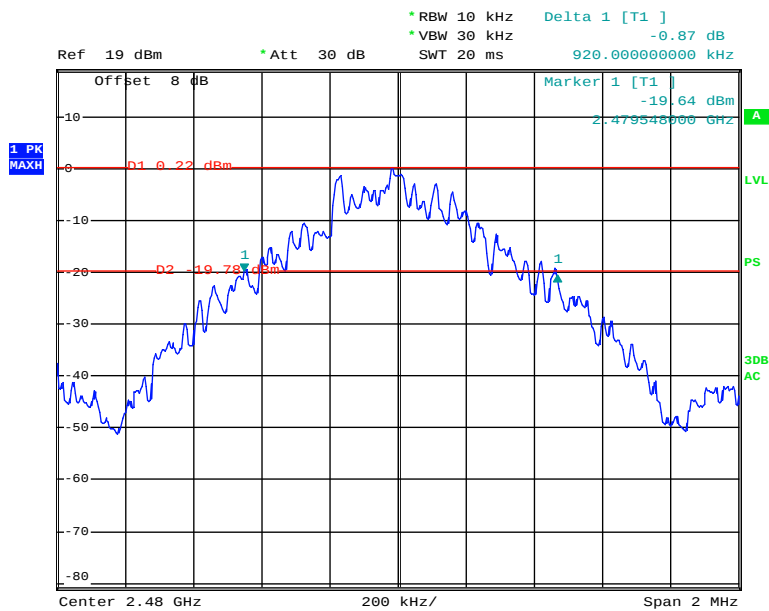
Date: 29.MAR.2013 22:57:16

BDR (GFSK): Middle Channel



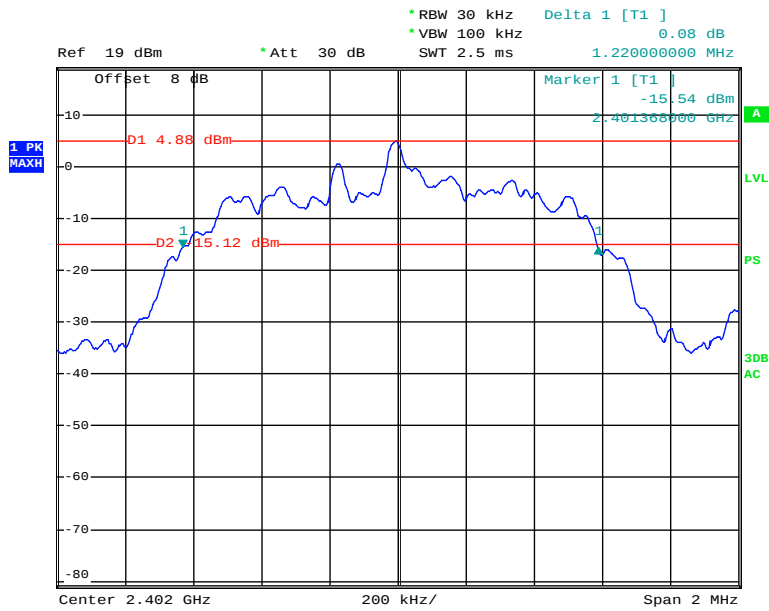
Date: 29.MAR.2013 23:00:38

BDR (GFSK): High Channel



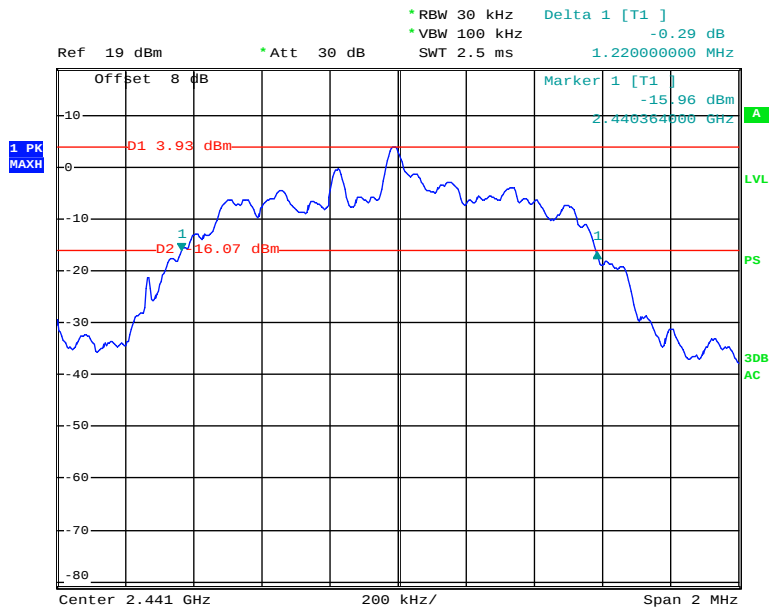
Date: 29.MAR.2013 23:02:40

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



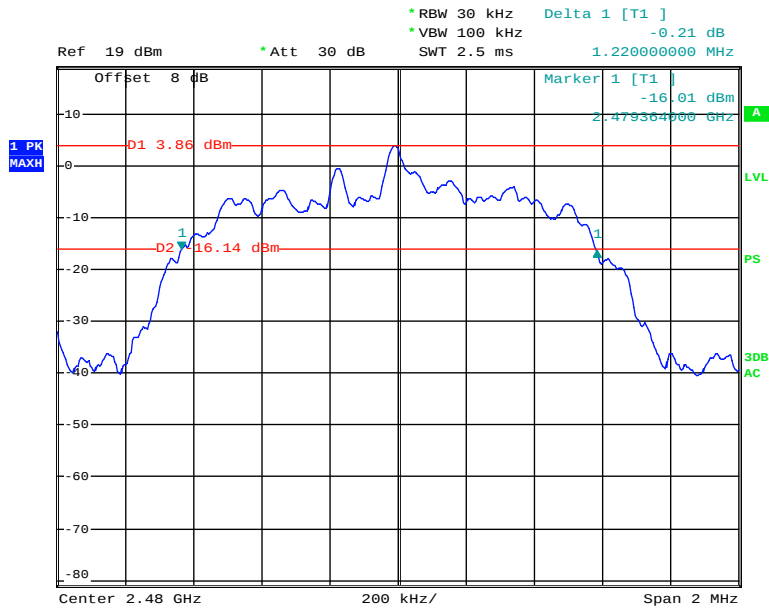
Date: 29.MAR.2013 23:13:58

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



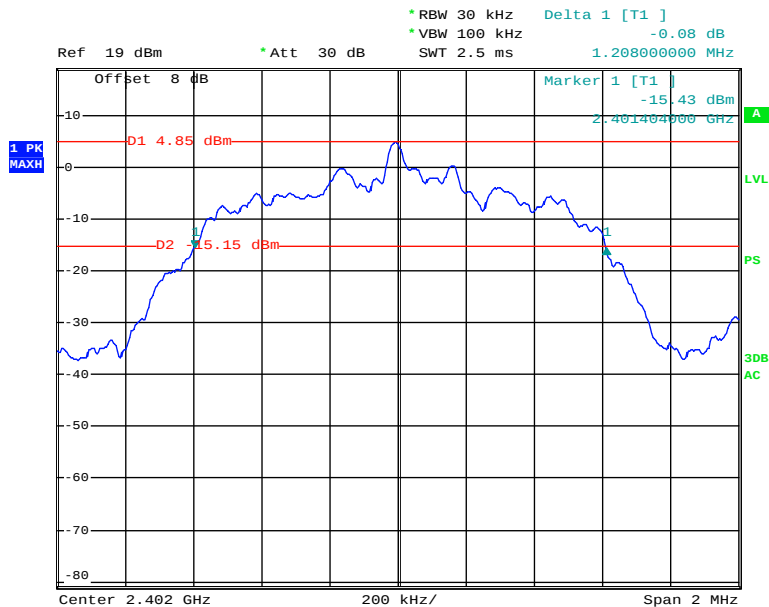
Date: 29.MAR.2013 23:10:55

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



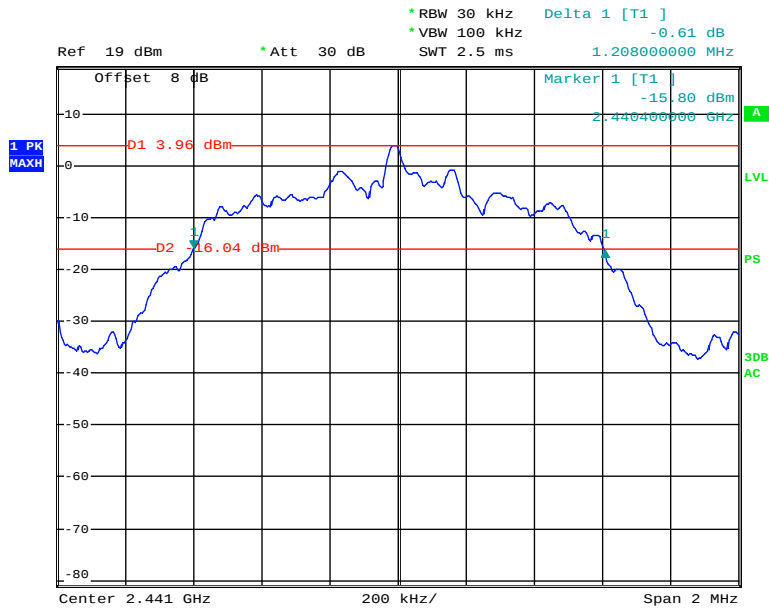
Date: 29.MAR.2013 23:07:54

EDR (8DPSK): Low Channel



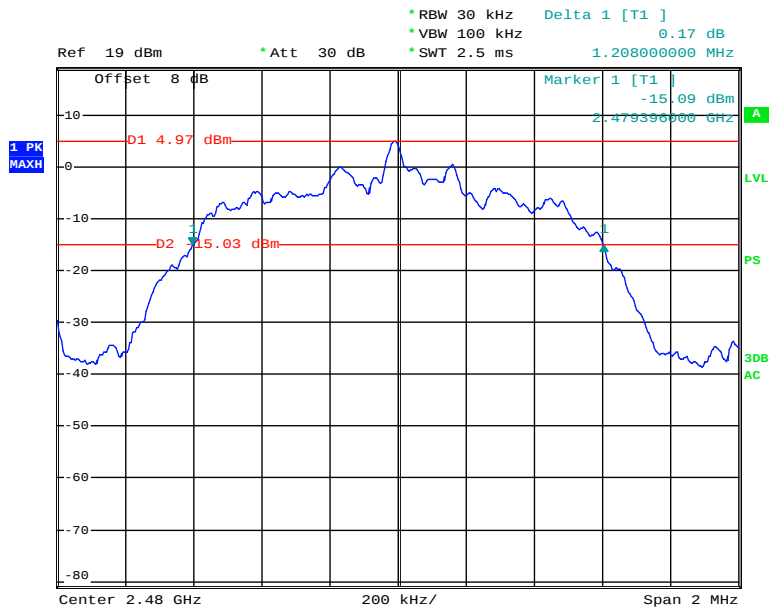
Date: 29.MAR.2013 23:16:15

EDR (8DPSK): Middle Channel



Date: 29.MAR.2013 23:19:34

EDR (8DPSK): High Channel



Date: 29.MAR.2013 23:21:27

FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL**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 NVLAP requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

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

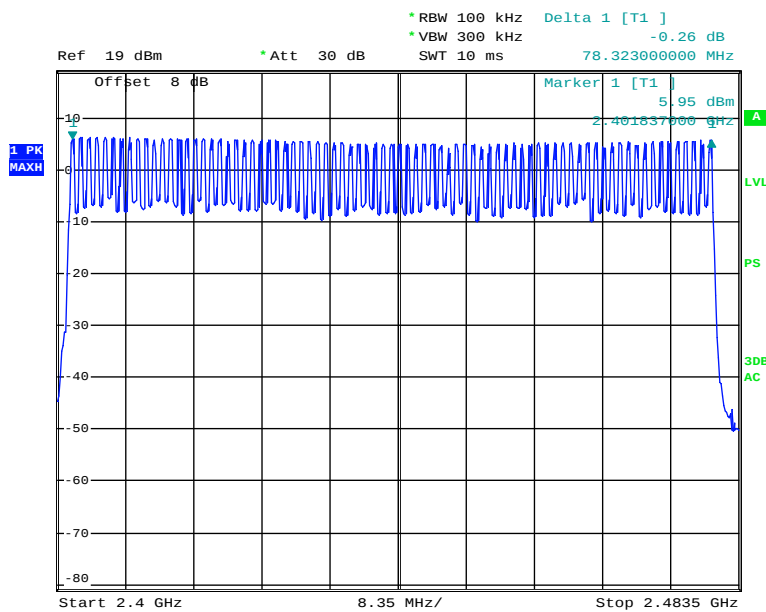
The testing was performed by Candy Li on 2013-03-29.

EUT operation mode: Transmitting

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

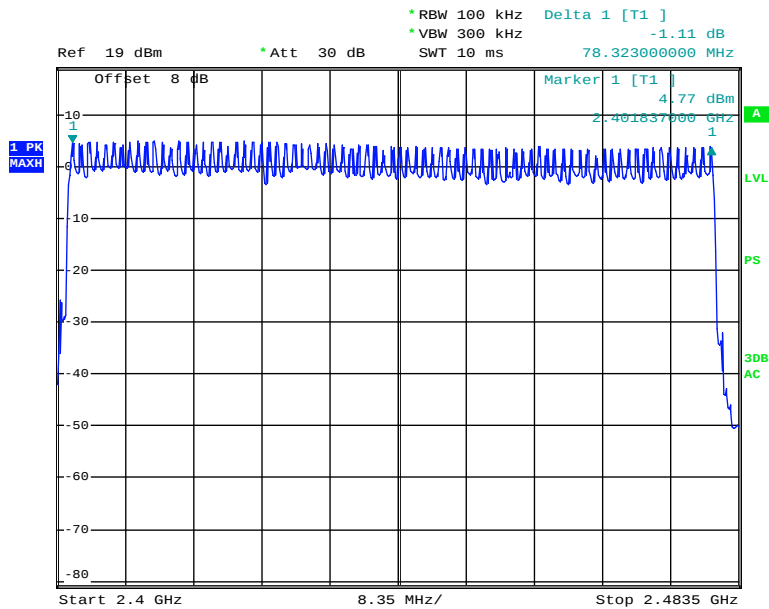
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
BDR (GFSK)	2402-2480	79	≥15
EDR (π/4-DQPSK)	2402-2480	79	≥15
EDR (8DPSK)	2402-2480	79	≥15

BDR (GFSK): Number of Hopping Channels



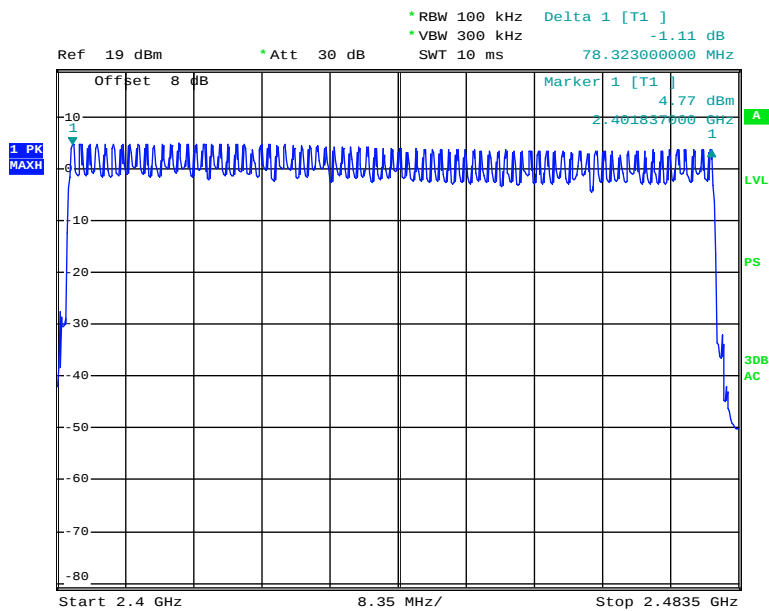
Date: 29.MAR.2013 20:51:54

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



Date: 29.MAR.2013 20:56:28

(8DPSK): Number of Hopping Channels



Date: 29.MAR.2013 21:02:13

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 NVLAP requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

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

The testing was performed by Candy Li on 2013-03-29.

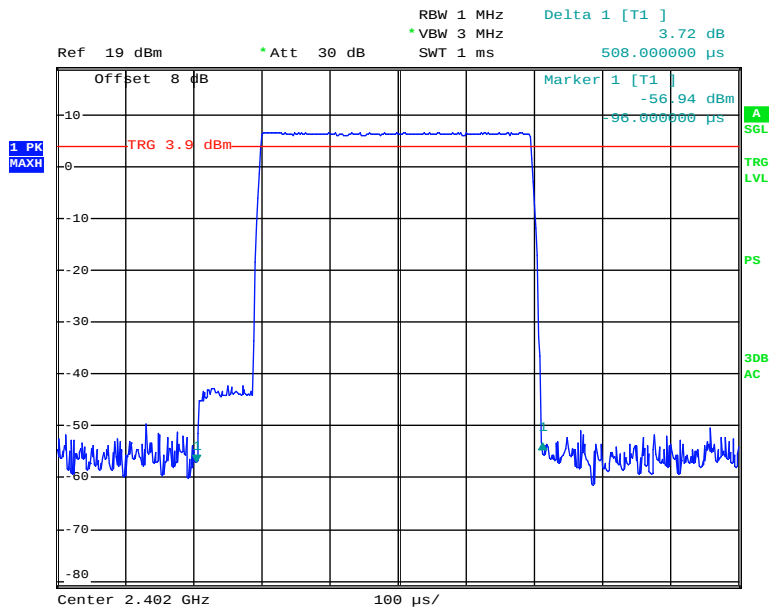
EUT operation mode: Transmitting

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	0.508	0.163	0.4	Pass
		Middle	0.508	0.163	0.4	Pass
		High	0.508	0.163	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.774	0.284	0.4	Pass
		Middle	1.774	0.284	0.4	Pass
		High	1.774	0.284	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.030	0.323	0.4	Pass
		Middle	3.030	0.323	0.4	Pass
		High	3.030	0.323	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR ($\pi/4$ -DQPSK)	DH 1	Low	0.522	0.167	0.4	Pass
		Middle	0.522	0.167	0.4	Pass
		High	0.522	0.167	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.786	0.286	0.4	Pass
		Middle	1.786	0.286	0.4	Pass
		High	1.786	0.286	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.040	0.324	0.4	Pass
		Middle	3.040	0.324	0.4	Pass
		High	3.040	0.324	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				
EDR (8DPSK)	DH 1	Low	0.520	0.166	0.4	Pass
		Middle	0.520	0.166	0.4	Pass
		High	0.520	0.166	0.4	Pass
		Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6S				
	DH 3	Low	1.780	0.285	0.4	Pass
		Middle	1.780	0.285	0.4	Pass
		High	1.780	0.285	0.4	Pass
		Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6S				
	DH 5	Low	3.040	0.324	0.4	Pass
		Middle	3.040	0.324	0.4	Pass
		High	3.040	0.324	0.4	Pass
		Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6S				

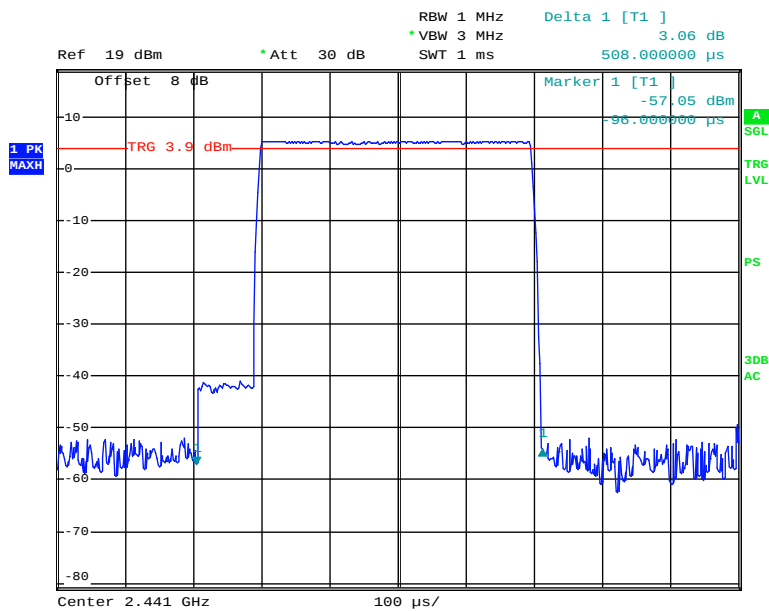
BDR (GFSK):

Pulse time, Low Channel, DH1



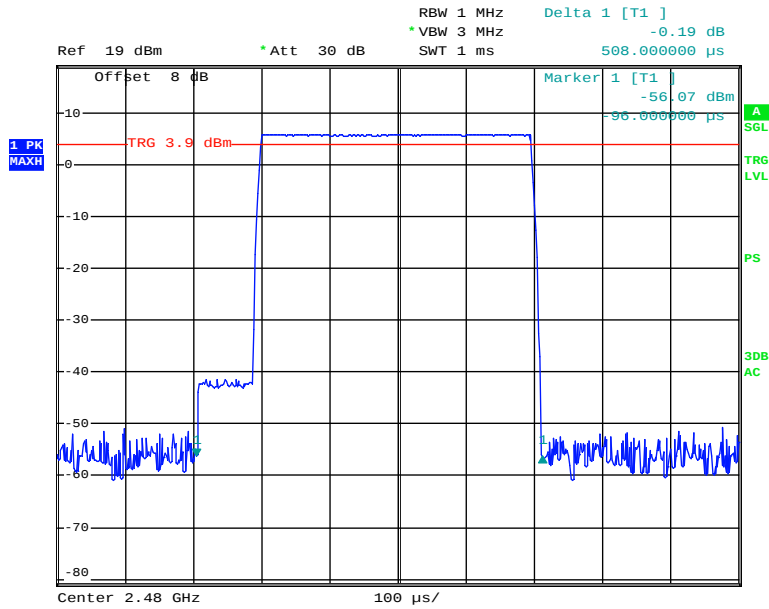
Date: 29.MAR.2013 22:01:10

Pulse time, Middle Channel, DH1



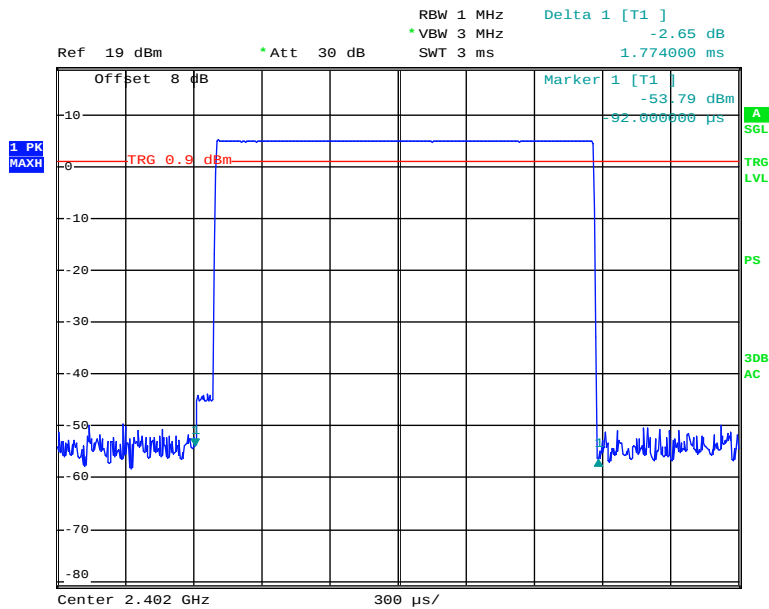
Date: 29.MAR.2013 22:00:40

Pulse time, High Channel, DH1



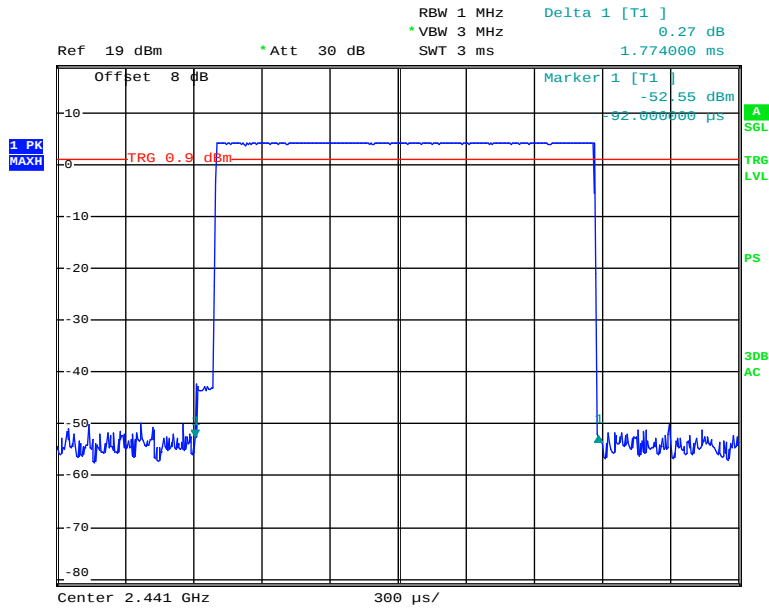
Date: 29.MAR.2013 22:01:34

Pulse time, Low Channel, DH3



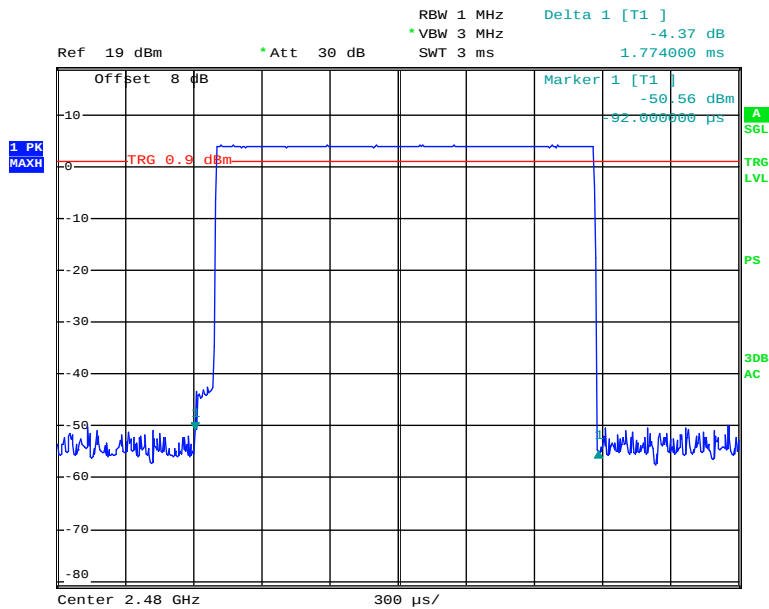
Date: 29.MAR.2013 22:12:39

Pulse time, Middle Channel, DH3



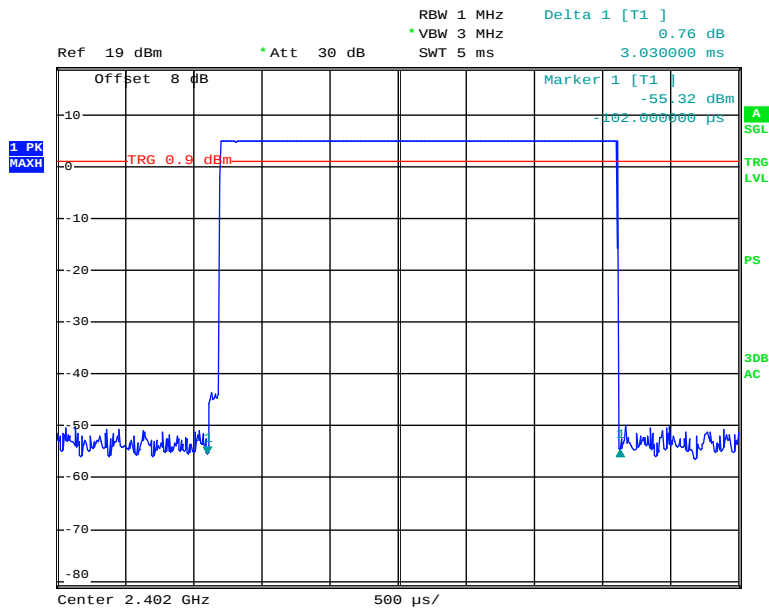
Date: 29.MAR.2013 22:11:46

Pulse time, High Channel, DH3



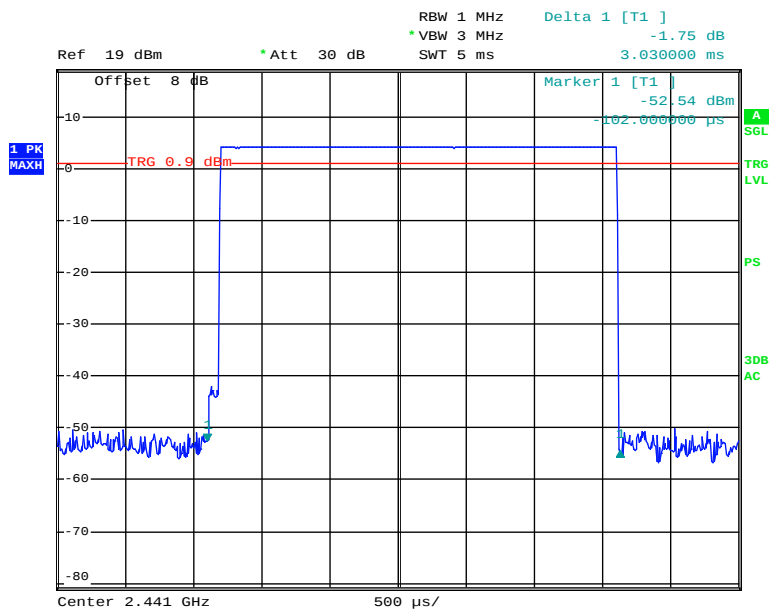
Date: 29.MAR.2013 22:12:13

Pulse time, Low Channel, DH5



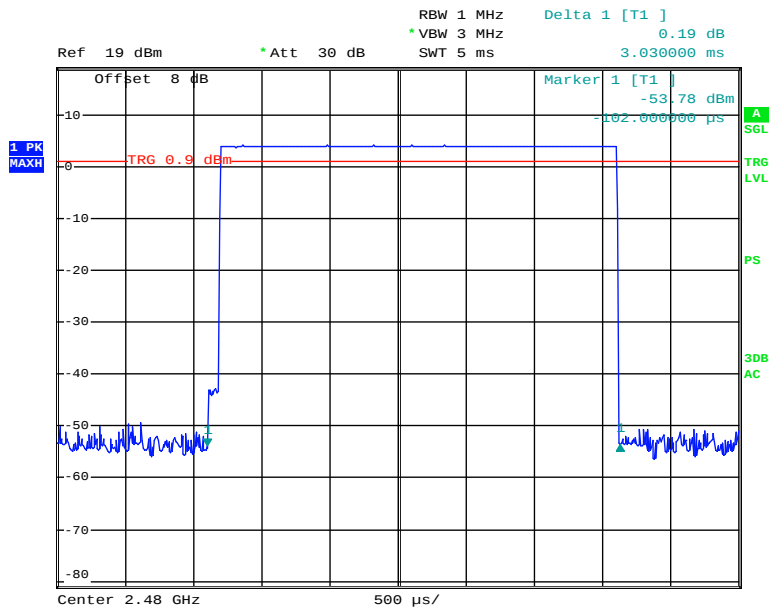
Date: 29.MAR.2013 22:19:43

Pulse time, Middle Channel, DH5



Date: 29.MAR.2013 22:20:20

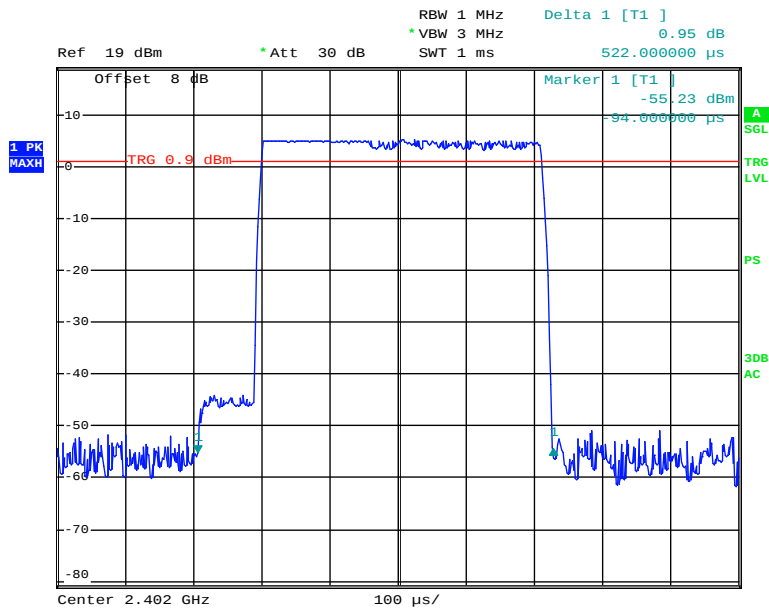
Pulse time, High Channel, DH5



Date: 29.MAR.2013 22:20:45

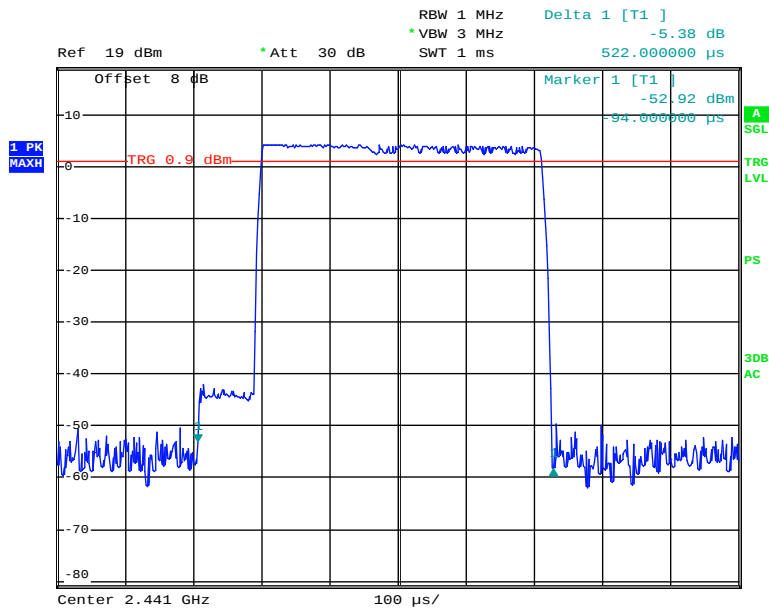
EDR ($\pi/4$ -DQPSK):

Pulse time, Low Channel, DH1



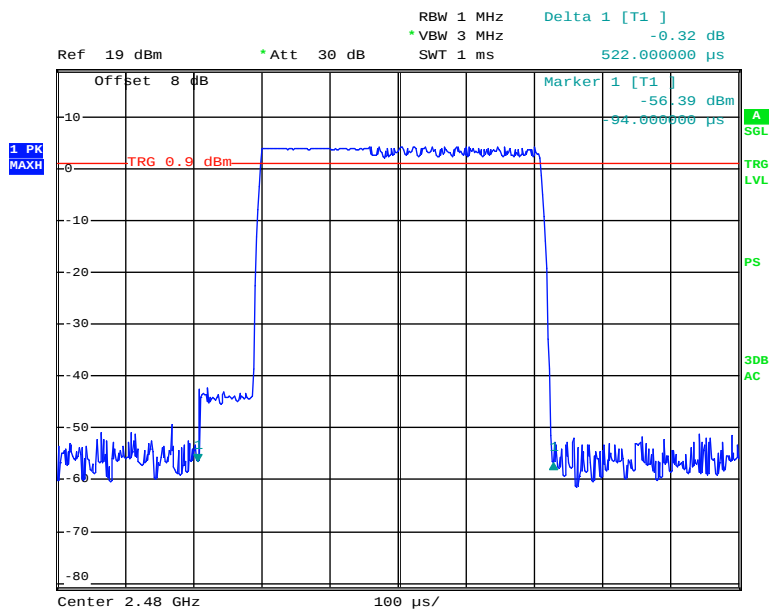
Date: 29.MAR.2013 22:04:01

Pulse time, Middle Channel, DH1



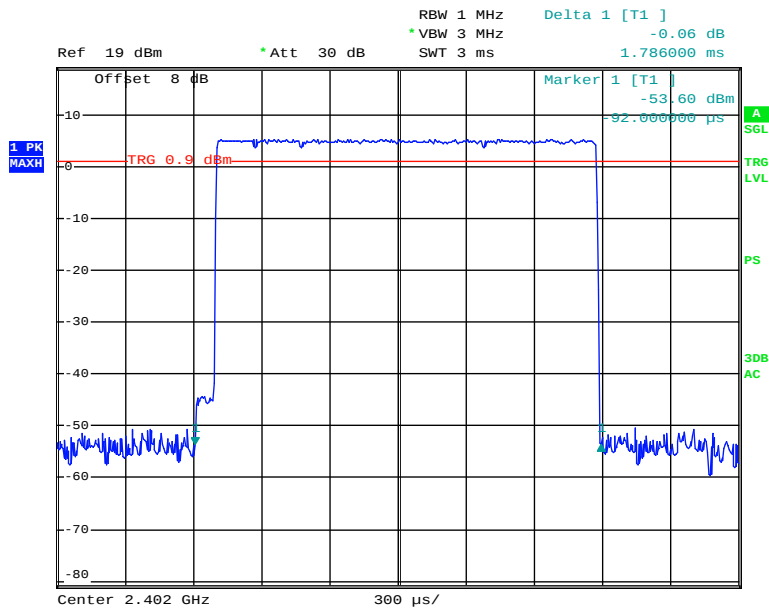
Date: 29.MAR.2013 22:03:31

Pulse time, High Channel, DH1



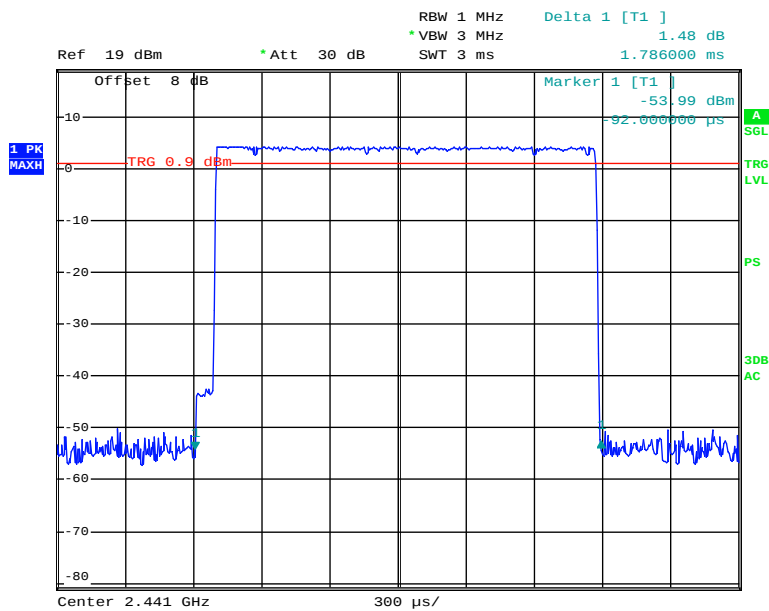
Date: 29.MAR.2013 22:03:07

Pulse time, Low Channel, DH3



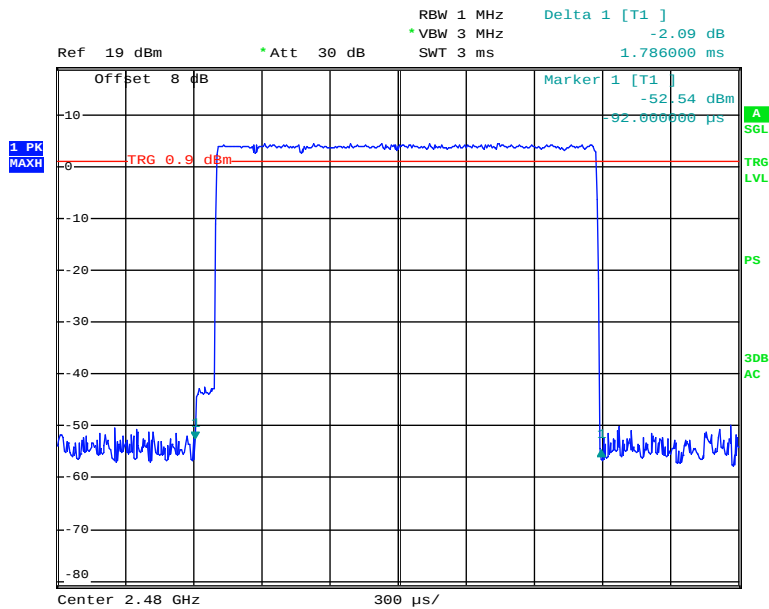
Date: 29.MAR.2013 22:14:19

Pulse time, Middle Channel, DH3



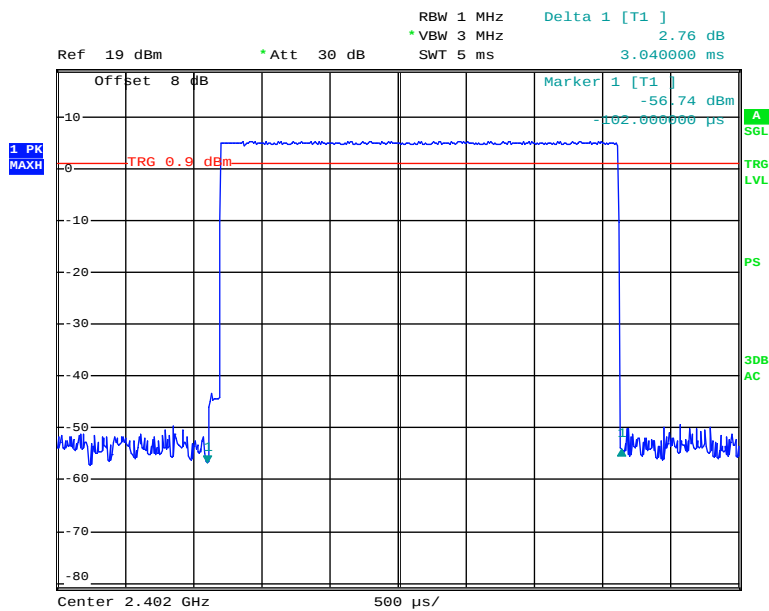
Date: 29.MAR.2013 22:14:51

Pulse time, High Channel, DH3



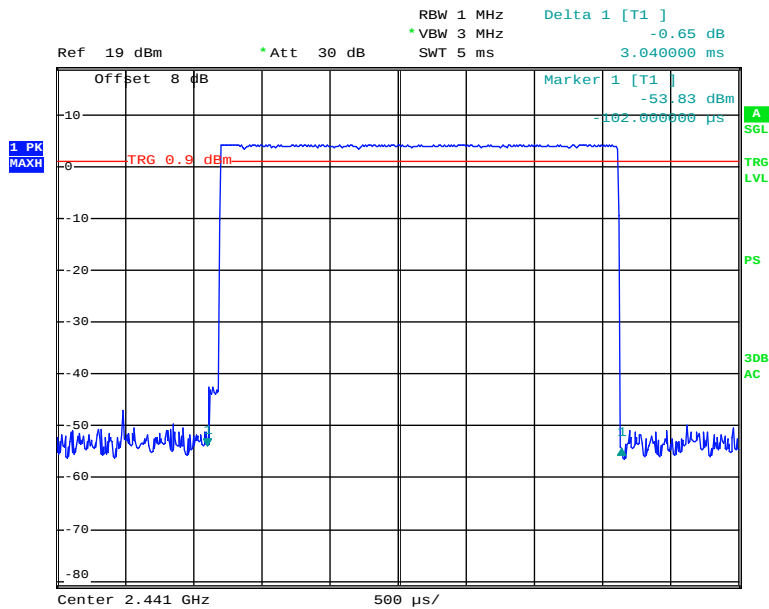
Date: 29.MAR.2013 22:15:13

Pulse time, Low Channel, DH5



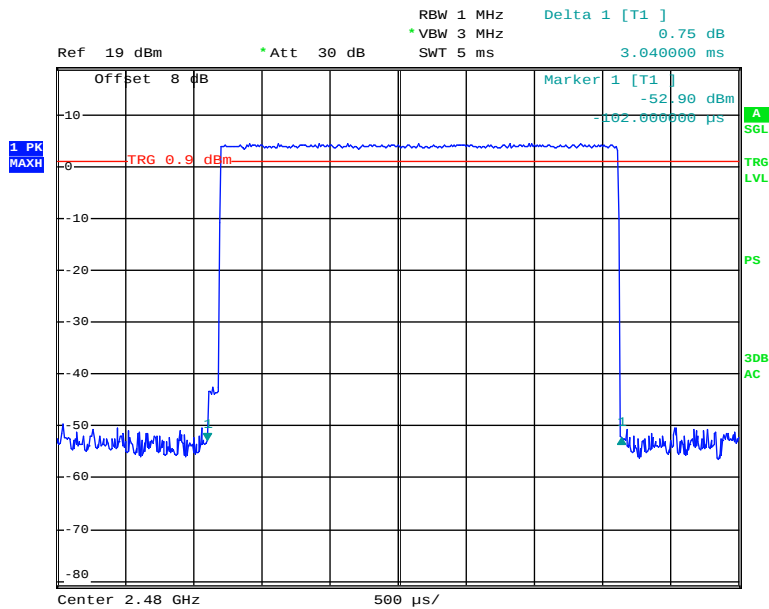
Date: 29.MAR.2013 22:23:28

Pulse time, Middle Channel, DH5



Date: 29.MAR.2013 22:23:06

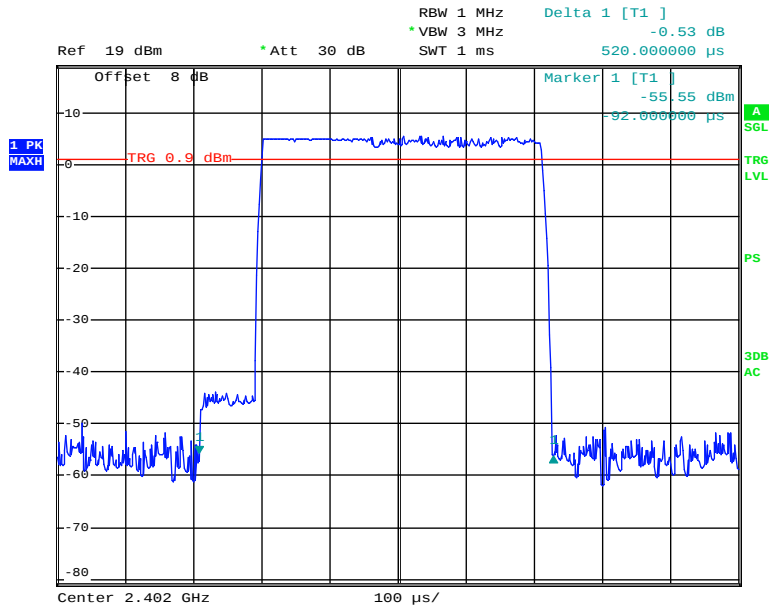
Pulse time, High Channel, DH5



Date: 29.MAR.2013 22:22:20

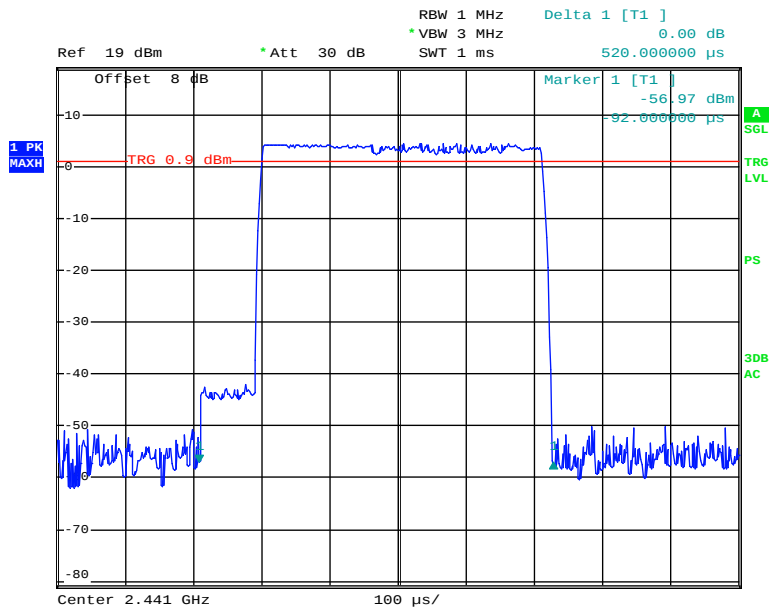
EDR (8DPSK):

Pulse time, Low Channel, DH1



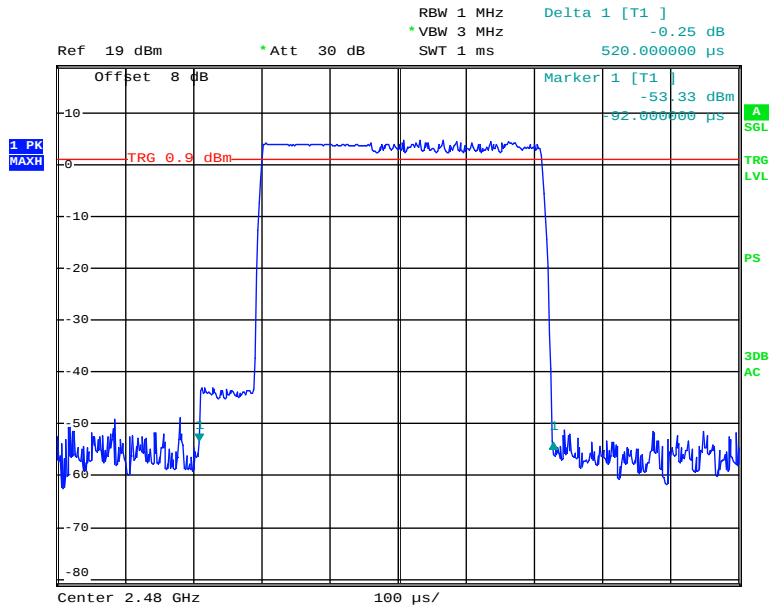
Date: 29.MAR.2013 22:05:47

Pulse time, Middle Channel, DH1



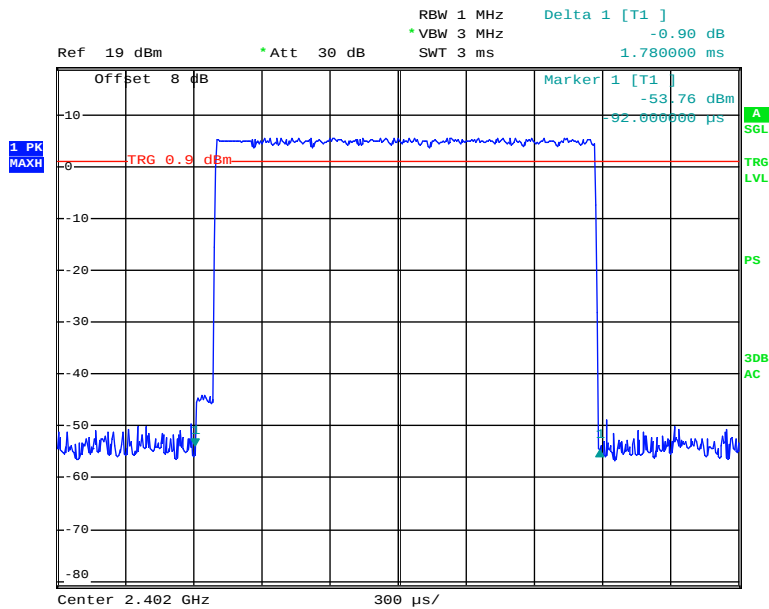
Date: 29.MAR.2013 22:06:58

Pulse time, High Channel, DH1



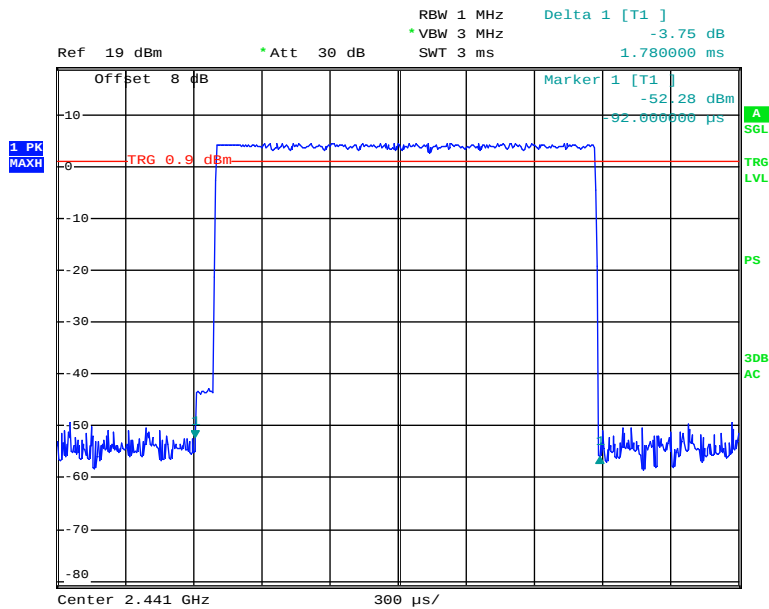
Date: 29.MAR.2013 22:07:40

Pulse time, Low Channel, DH3



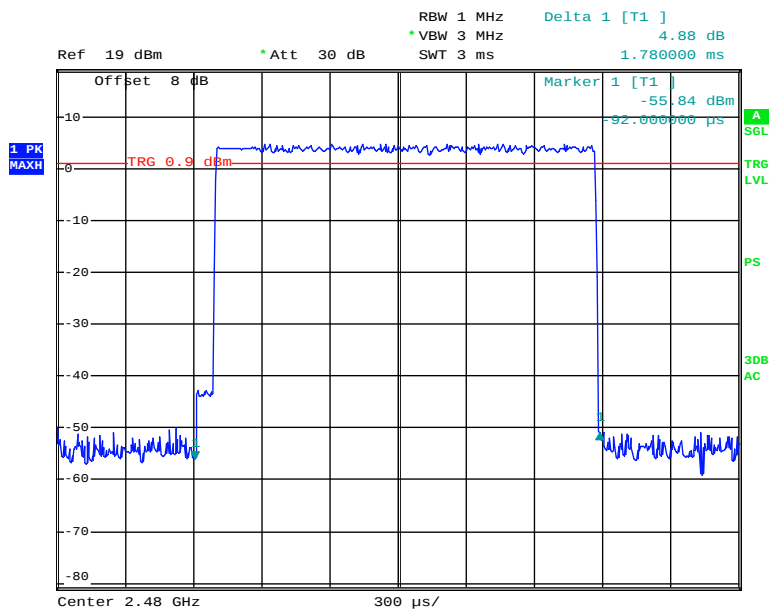
Date: 29.MAR.2013 22:17:26

Pulse time, Middle Channel, DH3



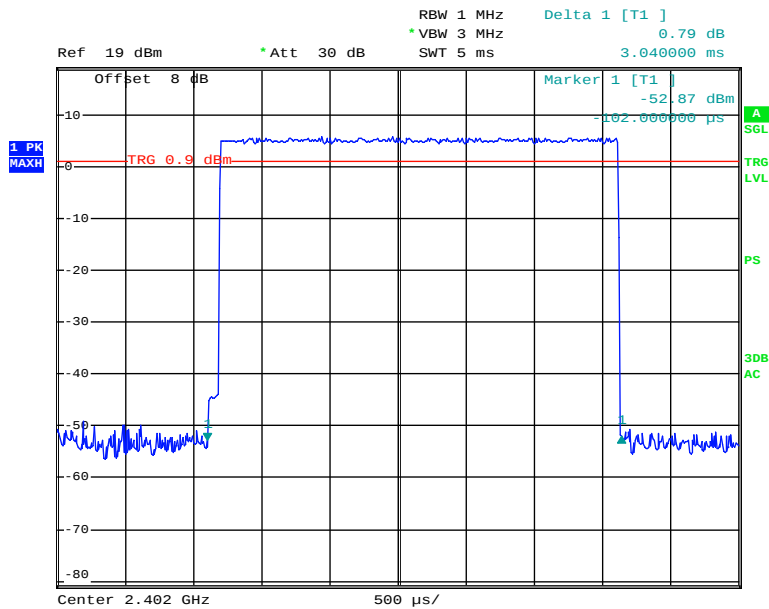
Date: 29.MAR.2013 22:17:04

Pulse time, High Channel, DH3



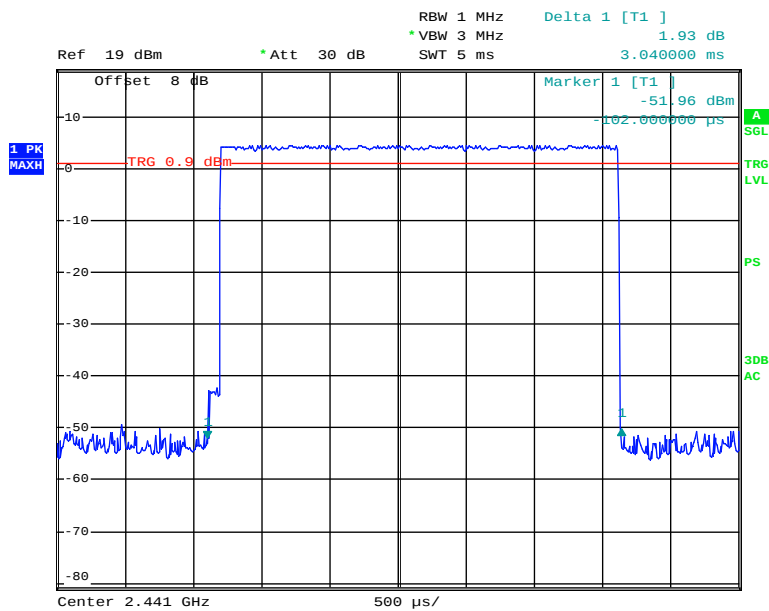
Date: 29.MAR.2013 22:16:28

Pulse time, Low Channel, DH5



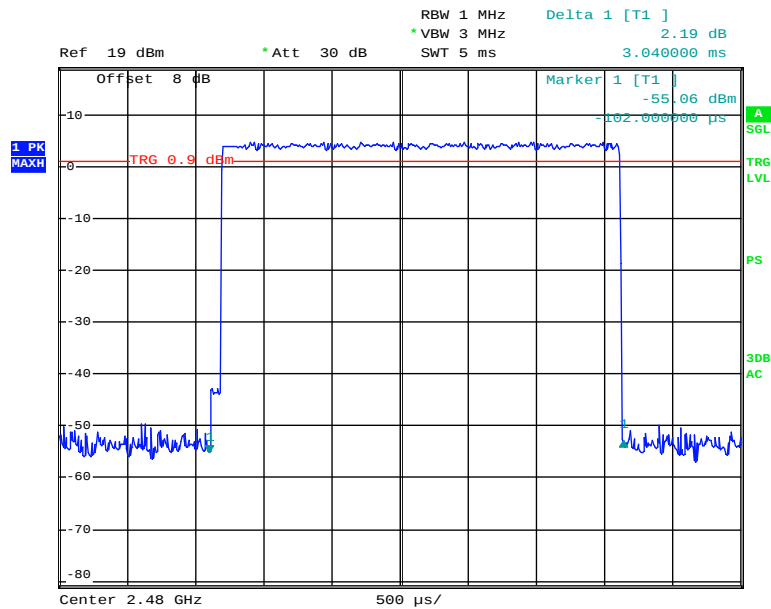
Date: 29.MAR.2013 22:24:21

Pulse time, Middle Channel, DH5



Date: 29.MAR.2013 22:25:09

Pulse time, High Channel, DH5



Date: 29.MAR.2013 22:25:42

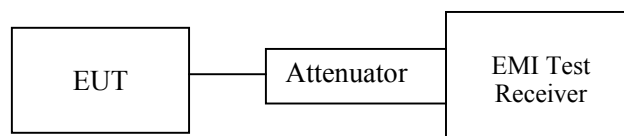
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

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 NVLAP requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

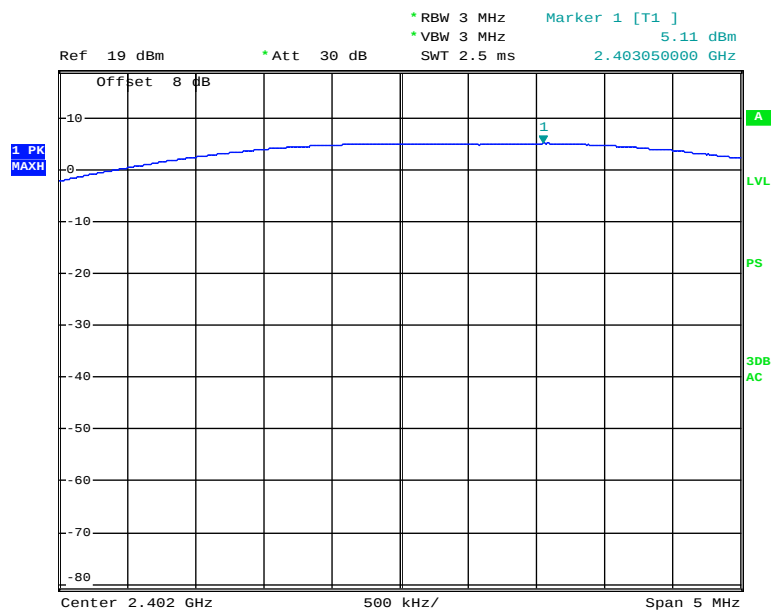
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Candy Li on 2013-03-29.

EUT operation mode: Transmitting

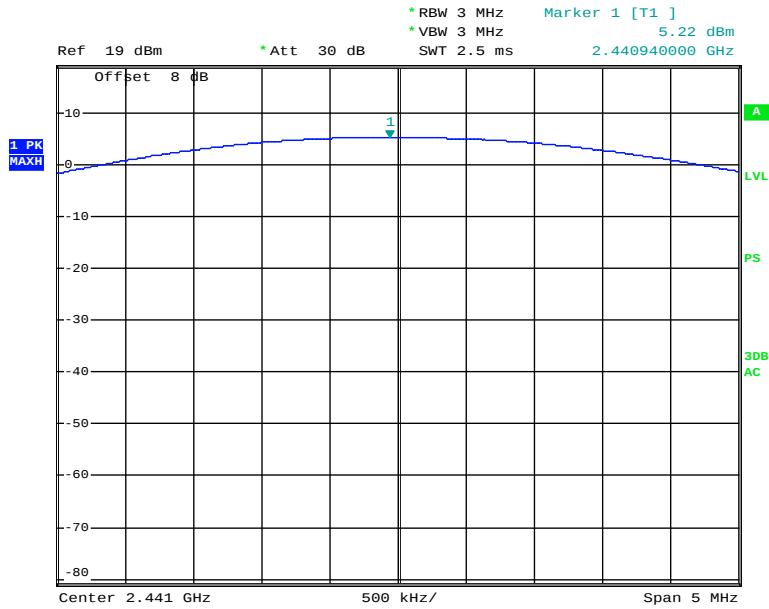
Test Result: Compliance. Please refer to following tables and plots

Mode	Channel	Frequency (MHz)	Conducted Output Power		Limit (mW)
			(dBm)	(mW)	
BDR (GFSK)	Low	2402	5.11	3.243	1000
	Middle	2441	5.22	3.327	1000
	High	2480	5.87	3.864	1000
EDR ($\pi/4$-DQPSK)	Low	2402	5.63	3.656	1000
	Middle	2441	4.57	2.864	1000
	High	2480	4.69	2.944	1000
EDR (8DPSK)	Low	2402	5.86	3.855	1000
	Middle	2441	4.72	2.965	1000
	High	2480	5.05	3.199	1000

BDR (GFSK): Low Channel

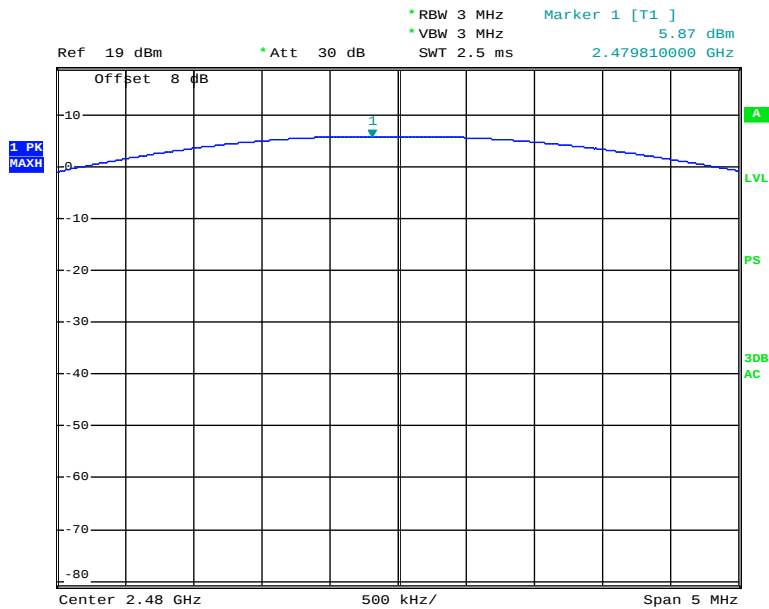
Date: 29.MAR.2013 21:06:54

BDR (GFSK): Middle Channel



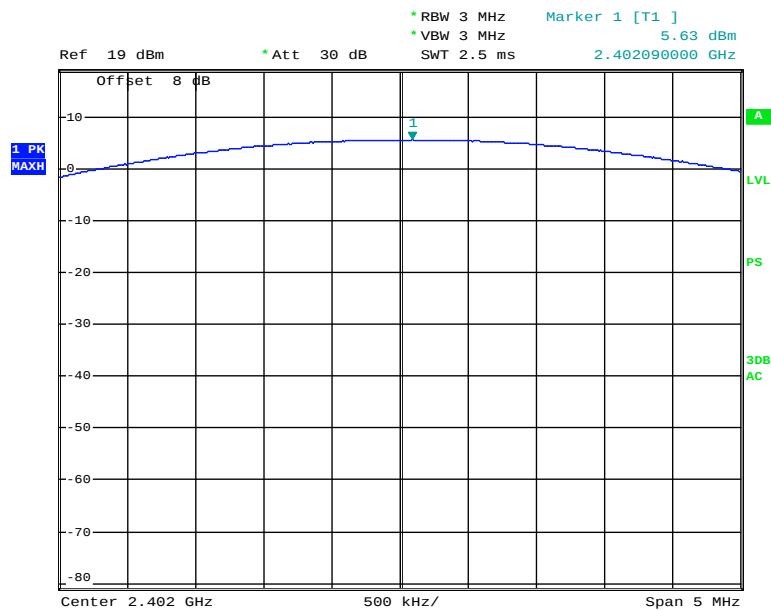
Date: 29.MAR.2013 21:08:06

BDR (GFSK): High Channel



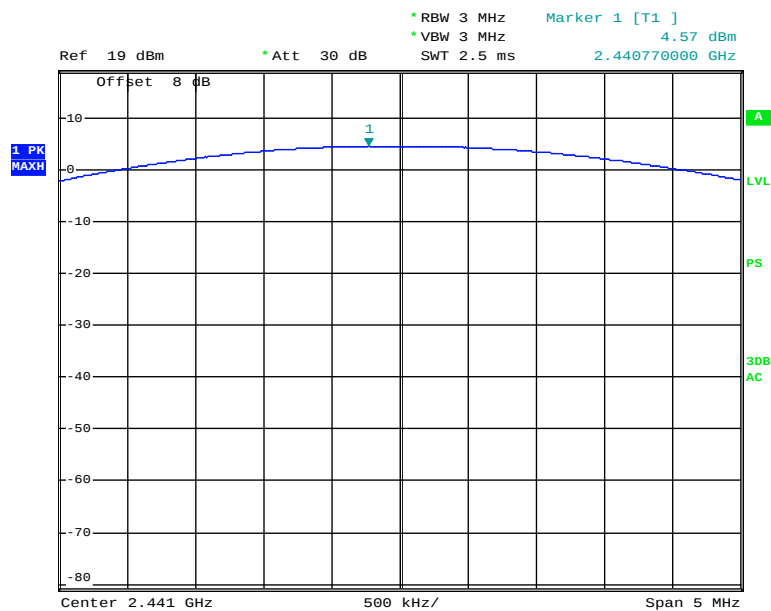
Date: 29.MAR.2013 21:09:01

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

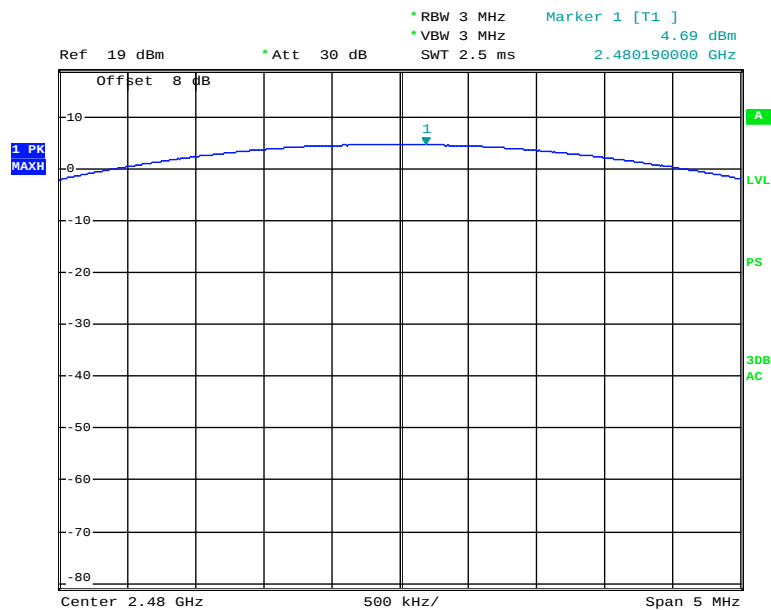


Date: 29.MAR.2013 21:15:42

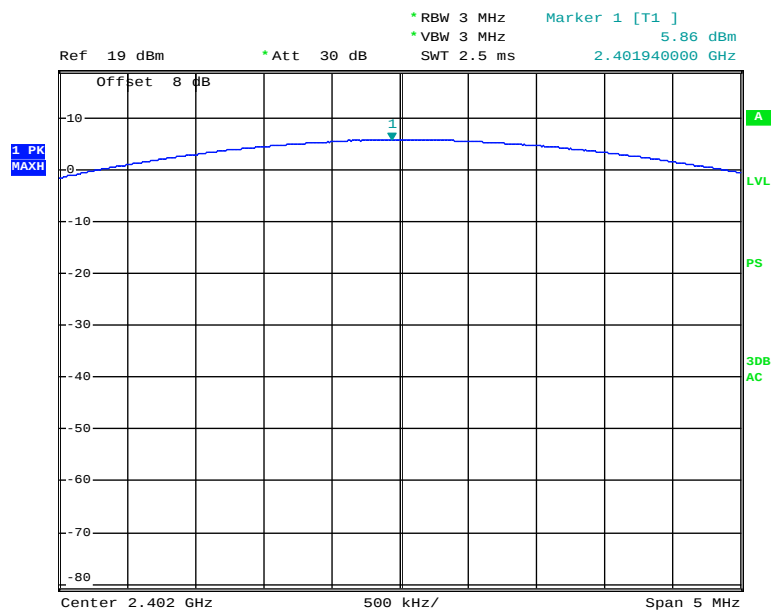
EDR($\pi/4$ -DQPSK): Middle Channel



Date: 29.MAR.2013 21:16:46

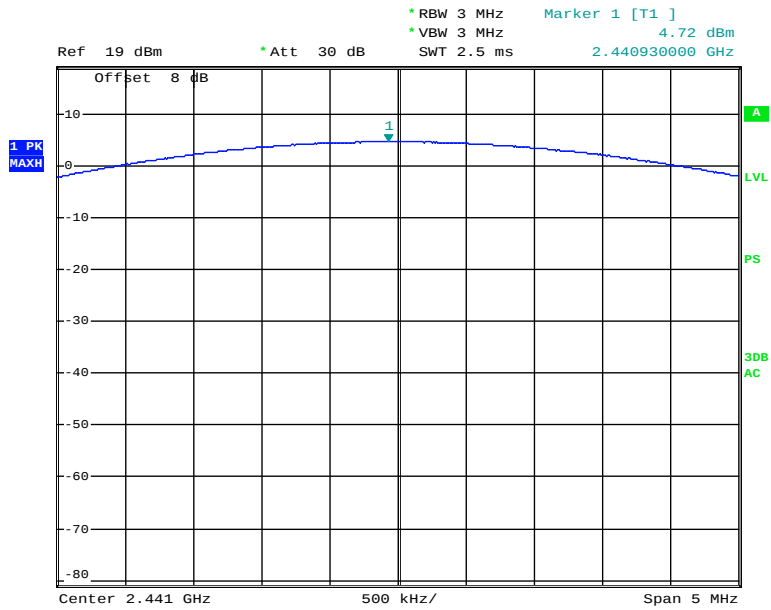
EDR($\pi/4$ -DQPSK): High Chanel

Date: 29.MAR.2013 21:17:34

EDR(8DPSK): Low Channel

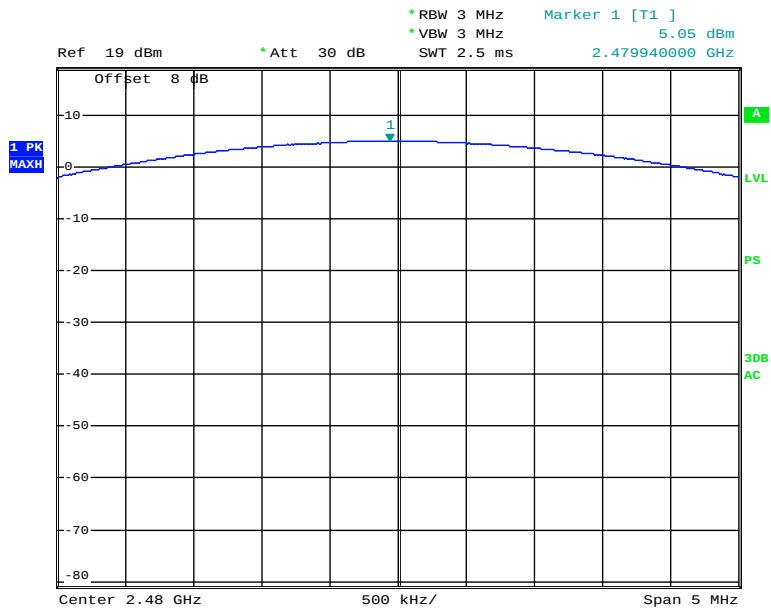
Date: 29.MAR.2013 21:21:15

EDR(8DPSK): Middle Channel



Date: 29.MAR.2013 21:20:23

EDR(8DPSK): High Chanel



Date: 29.MAR.2013 21:19:37

FCC §15.247(d) - BAND EDGES

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 NVLAP requirements that traceable to National Primary Standards and International System of Units (SI).

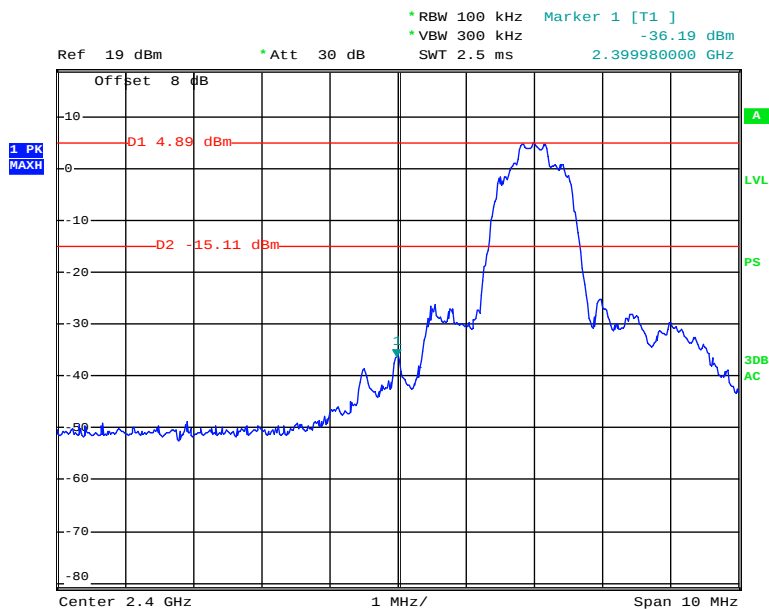
Test Data**Environmental Conditions**

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

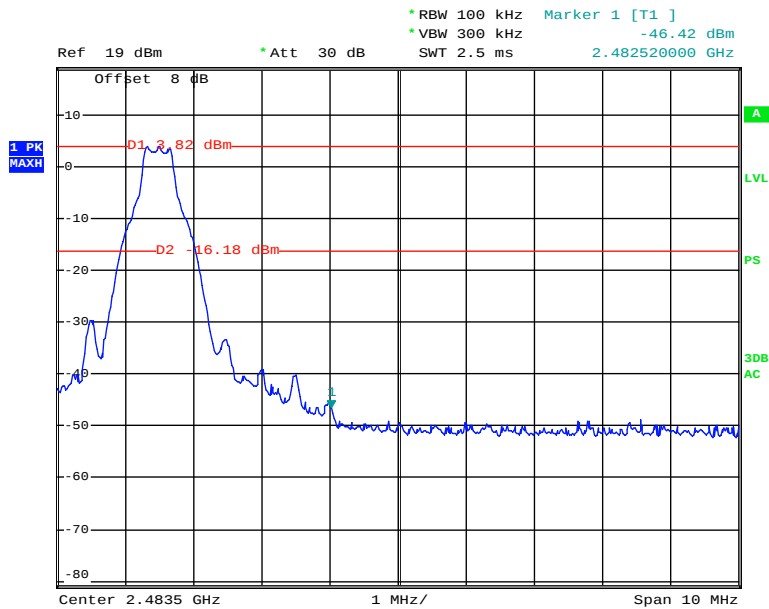
The testing was performed by Candy Li on 2013-03-29.

EUT operation mode: Transmitting

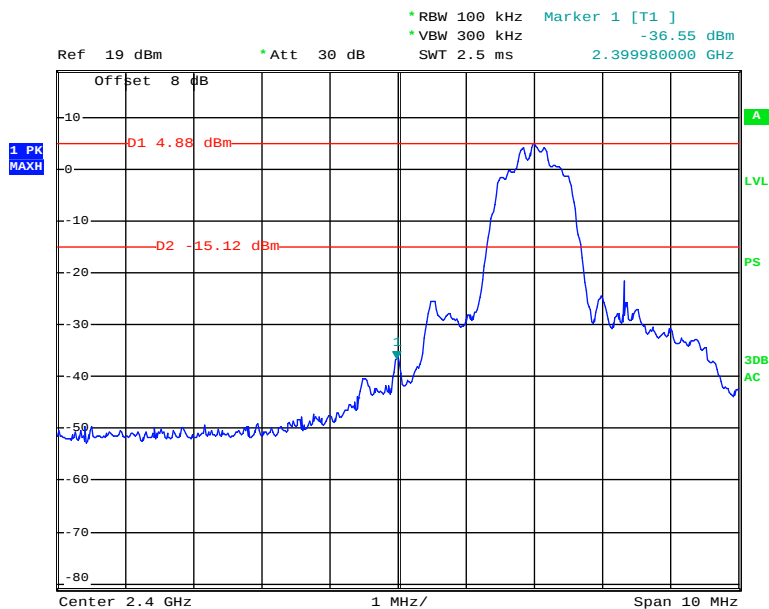
Test Result: Compliance. Please refer to following plots

BDR (GFSK): Band Edge-Left Side

Date: 29.MAR.2013 23:51:13

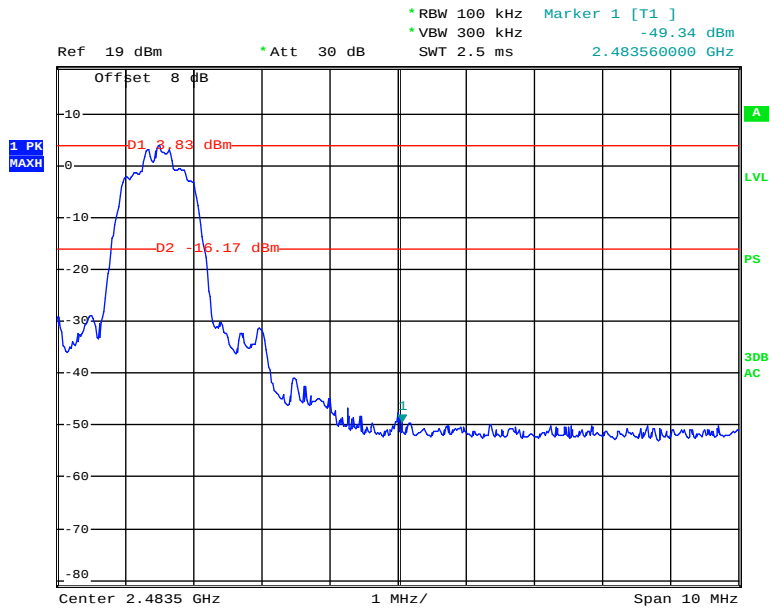
BDR (GFSK): Band Edge-Right Side

Date: 29.MAR.2013 22:49:12

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

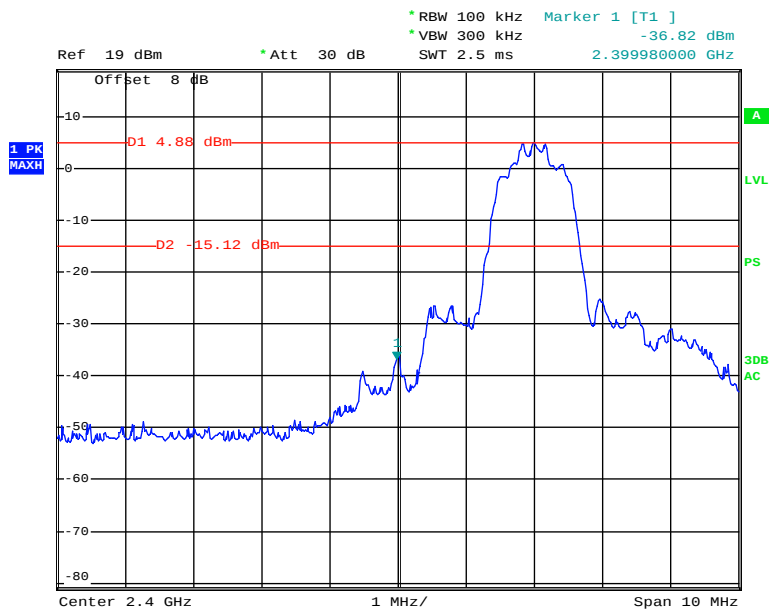
Date: 29.MAR.2013 22:44:09

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



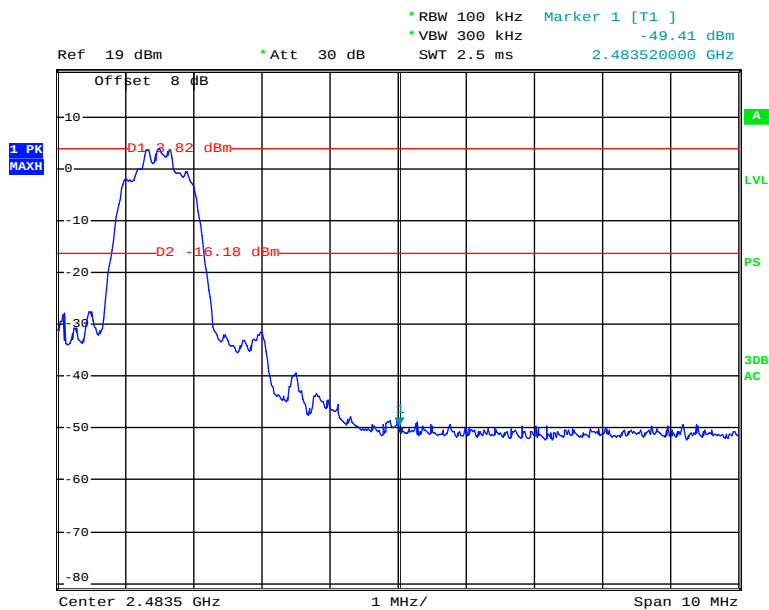
Date: 29.MAR.2013 22:46:26

EDR (8DPSK): Band Edge-Left Side



Date: 29.MAR.2013 22:41:42

BDR (8DPSK): Band Edge-Right Side



Date: 29.MAR.2013 22:47:46

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