

FCC PART 15.247
TEST REPORT

For

Swissvoice HK Ltd.

Unit 1910, 19/F, Dominion Centre, 43-59 Queen's Road East, Wan Chai, Hong Kong

FCC ID: FJO-BH01

Report Type: Original Report	Product Type: Bluetooth handset and speaker
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* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The Swissvoice HK Ltd.'s product, model number: BH01u, BH01i (FCC ID: FJO-BH01) or the "EUT" as referred to in this report is a Bluetooth handset and speaker, which measures approximately: 21.0cm (L) x 5.3 cm (W) x 5.1 cm (H), rated input voltage: DC 3.7V from lithium battery , DC 5V from PC or Charging Base.

Note: The series product, model number: BH01u, BH01i, the difference between them is the base module of BH01u, there is no docking connector, but with an extra USB port ,the details was explained in the attached declaration letter.

** All measurement and test data in this report was gathered from production serial number: A5000001 (Assigned by applicant). The EUT was received on 2012-04-09.*

Objective

This report is prepared on behalf of *Swissvoice HK 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 the compliance of EUT with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s).

Test Methodology

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

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

The uncertainty of any RF tests which use conducted method measurement is ± 0.96 dB, the uncertainty of any radiation on emissions measurement is ± 4.0 dB

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) 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 February 02, 2012. 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.: 273710. 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 system was configured for testing in a testing mode which was controlled by the PC.

EUT Exercise Software

The test was performed under “Bluetest 3”, which is provided by manufacturer.

Equipment Modifications

No modification was made to the EUT tested.

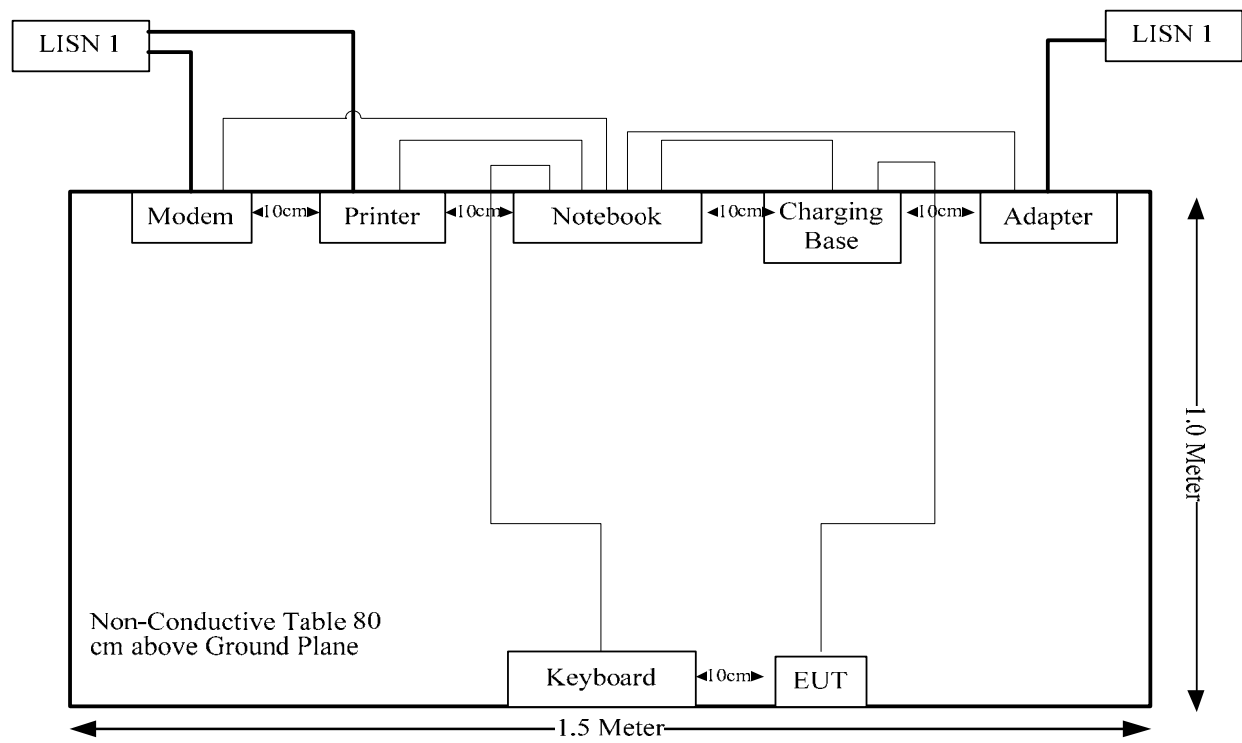
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
SAST	Modem	AEM-2100	090200213
HP	Printer	C3941A	JPTV013237
DELL	Keyboard	SK-8115	CN-0DJ313-716716-05A-0DSO
DELL	Notebook	PP11L	N/A

External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielded Detachable Keyboard Cable	1.5	Keyboard Port/Notebook	Keyboard
Shielded Detachable USB Cable	1.5	USB port / Charging Base	EUT
Shielded Detachable Serial Cable	1.2	Serial Port/ Notebook	Modem
Shielded Detachable Printer Cable	1.8	Parallel Port/ Notebook	Printer
Shielded Detachable USB Cable	0.8	USB port / Notebook	Charging Base
Shielded Detachable Power Cable	1.0	Adapter	Notebook

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 15.247 (i), § 2.1093	RF Exposure	Compliance
§ 15.203	Antenna Requirement	Compliance
§ 15.207 (a)	Conducted Emissions	Compliance
§ 15.205, § 15.209, § 15.247(d)	Radiated Emissions	Compliance
§ 15.247 (a)(1)	20 dB 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) AND §2.1093 – RF EXPOSURE

Applicable Standard

According to §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to TCB Exclusion List, no SAR required if power is lower than the flowing threshold:

In the following table, f_{GHz} is mid-band frequency in GHz, and d is the distance to a person's body, excluding hands, wrists, feet, and ankles.

Exposure category	<u>low threshold</u>	<u>high threshold</u>
general population	$(60/f_{\text{GHz}}) \text{ mW}, d < 2.5 \text{ cm}$ $(120/f_{\text{GHz}}) \text{ mW}, d \geq 2.5 \text{ cm}$	$(900/f_{\text{GHz}}) \text{ mW}, d < 20 \text{ cm}$
occupational	$(375/f_{\text{GHz}}) \text{ mW}, d < 2.5 \text{ cm}$ $(900/f_{\text{GHz}}) \text{ mW}, d \geq 2.5 \text{ cm}$	$(2250/f_{\text{GHz}}) \text{ mW}, d < 20 \text{ cm}$

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

Measurement Result:

Max peak output power:

GFSK: 3.11 dBm = 2.046 mW

$\pi/4$ -DQPSK: 1.95 dBm = 1.566 mW

8DPSK: 2.31 dBm = 1.702 mW

$60/f_{\text{GHz}} = 60/2441 = 24.58 \text{ mW}$

This is a portable device and the Max peak output power of EUT is less than 24.58 mW.

So the SAR measurement is not necessary.

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 a PIFA antenna mounted on the print circuit board, which complied with 15.203, the maximum gain is 0dBi, please refer to the internal photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

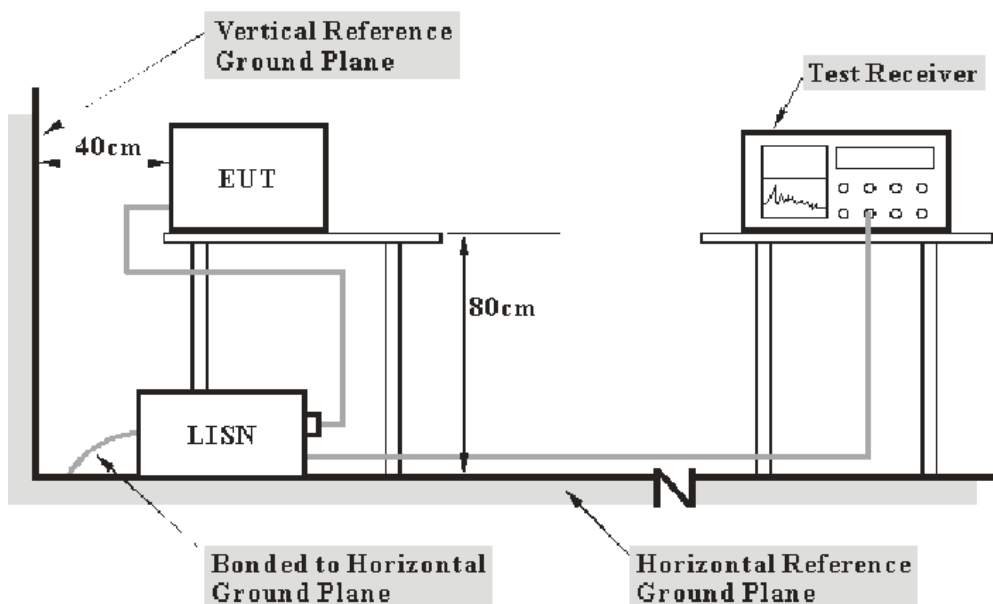
FCC §15.207

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is 2.4 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 setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.207 limits.

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

The notebook 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:

<u>Frequency Range</u>	<u>IF BW</u>
150 kHz – 30 MHz	9 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2011-11-24	2012-11-23
Rohde & Schwarz	L.I.S.N.1	ESH2-Z5	892107/021	2011-11-17	2012-11-16
Com-Power	L.I.S.N.2	LI-200	12005	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

During the conducted emission test, the notebook was connected to the outlet of the first LISN and the Printer, Modem were connected to outlet of 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 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:

12.27 dB at 0.435MHz in the **Neutral** conducted mode

Test Data

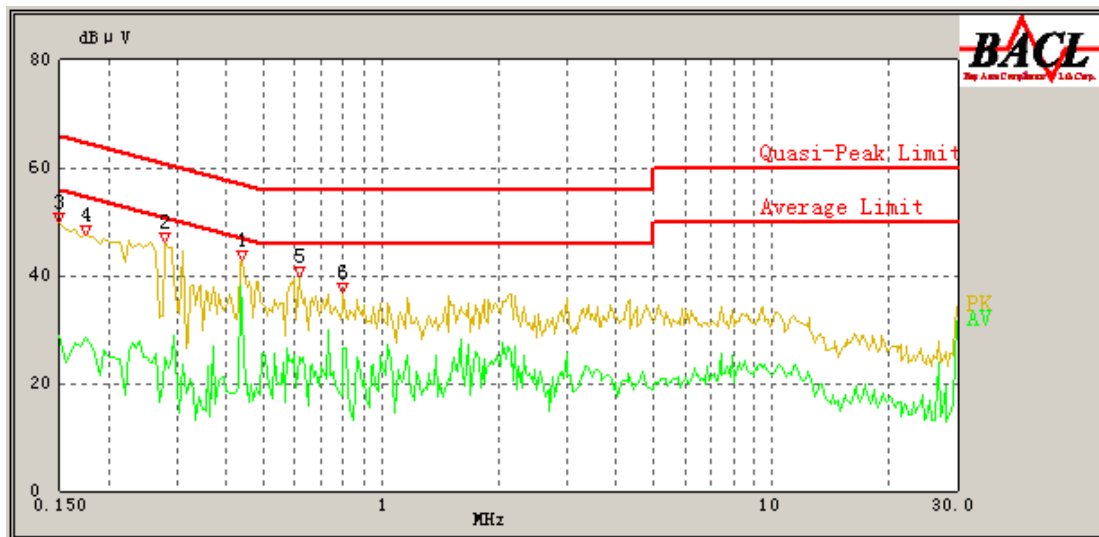
Environmental Conditions

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

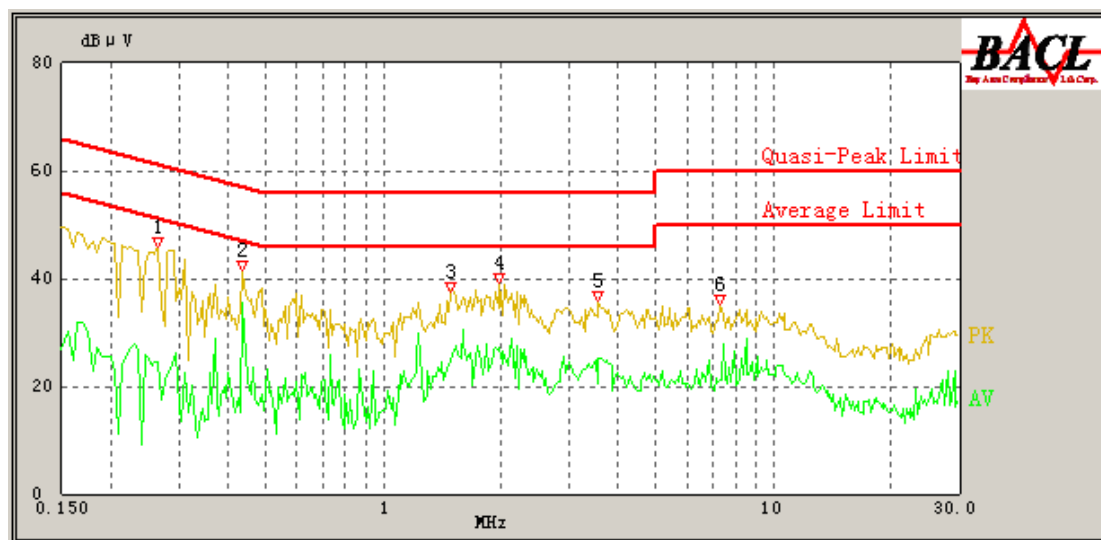
* The testing was performed by Dean Liu on 2012-04-16.

Test Mode: Transmitting

AC 120 V/60 Hz, Line



No.	Frequency (MHz)	Reading (dBμV)	Correction (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
1	0.44	34.14	0.42	47.71	13.57	Ave.
2	0.8	26.57	0.44	46	19.43	Ave.
3	0.175	44.36	0.41	65.29	20.93	QP
4	0.615	24.97	0.43	46	21.03	Ave.
5	0.28	40.51	0.42	62.29	21.78	QP
6	0.44	35.76	0.42	57.71	21.95	QP
7	0.15	43.56	0.4	66	22.44	QP
8	0.615	30.31	0.43	56	25.69	QP
9	0.8	29.81	0.44	56	26.19	QP
10	0.175	28.47	0.41	55.29	26.82	Ave.
11	0.15	28.95	0.4	56	27.05	Ave.
12	0.28	24.84	0.42	52.29	27.45	Ave.

AC 120 V/ 60 Hz, Neutral:

No.	Frequency (MHz)	Reading (dBμV)	Correction (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
1	0.435	35.59	0.42	47.86	12.27	Ave.
2	1.99	27.25	0.48	46	18.75	Ave.
3	0.435	38.33	0.42	57.86	19.53	QP
4	1.5	25.44	0.46	46	20.56	Ave.
5	3.565	25.2	0.5	46	20.8	Ave.
6	1.99	32.42	0.48	56	23.58	QP
7	0.265	38.79	0.42	62.71	23.92	QP
8	1.49	32	0.46	56	24	QP
9	3.565	28.62	0.5	56	27.38	QP
10	0.265	24.34	0.42	52.71	28.37	Ave.
11	7.335	21.09	0.55	50	28.91	Ave.
12	7.305	26.34	0.55	60	33.66	QP

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

Applicable Standard

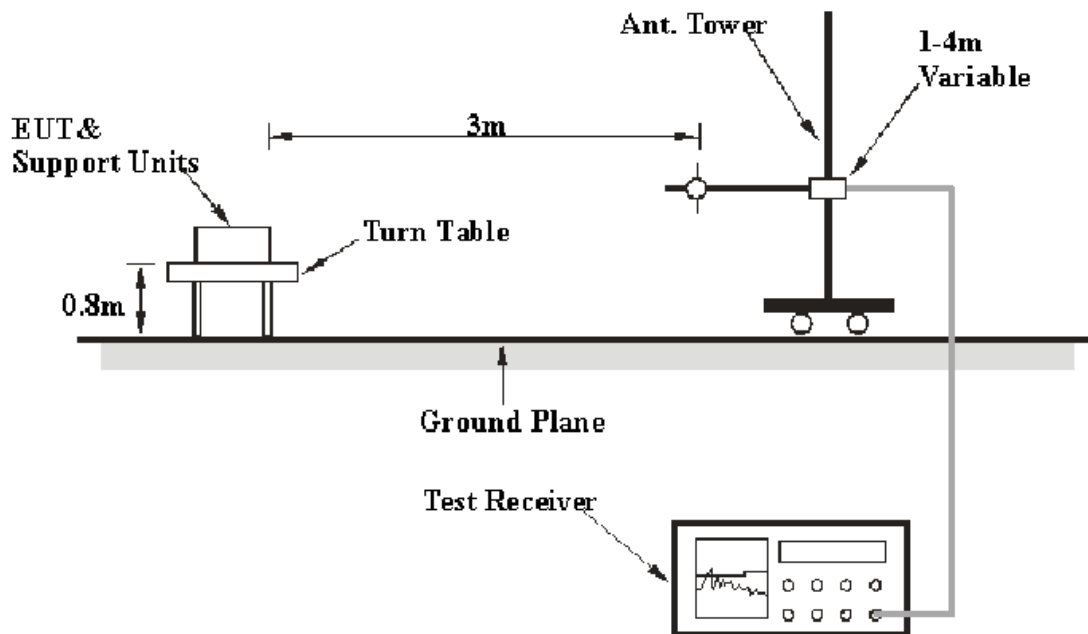
FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

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

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB(k=2, 95% level of confidence).

EUT Setup



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

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

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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

<i>Frequency Range</i>	<i>RBW</i>	<i>Video BW</i>	<i>Detector</i>
30 MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	Ave.

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, peak and Average detection modes for frequencies above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-11-24	2012-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27
DUCOMMUN Technologies	Pre-amp	ALN-09173030-01	991396-01	2011-11-24	2012-12-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2012-12-01	2012-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ 26	8386001028	2011-11-24	2012-11-23

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

Corrected Amplitude & Margin Calculation

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

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

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

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

Test Results Summary

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

Transmitting (BDR) Mode: 7.55 dB at 4960 MHz in the Vertical polarization at High channel

Test Data

Environmental Conditions

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

The testing was performed by Dean Liu on 2012-04-16.

1) 30MHz-25GHz

Test Mode: Transmitting (BDR Mode was the worst case)

Frequency (MHz)	Reading (dBuV)	Detector (PK/QP /Ave.)	Polar (H/V)	Corrected Amplitude (dB/m)	Correction Data (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
Low Channel (2402MHz)								
2390	17.01	Ave.	V	26.69	43.7	54	10.3	spurious
2390	15.52	Ave.	H	26.69	42.21	54	11.79	spurious
4804	13.5	Ave.	H	28.57	42.07	54	11.93	Harmonic
4804	13.48	Ave.	V	28.57	42.05	54	11.95	Harmonic
4804	30.54	peak	H	28.57	59.11	74	14.89	Harmonic
4804	29.36	peak	V	28.57	57.93	74	16.07	Harmonic
2390	30.33	peak	H	26.69	57.02	74	16.98	spurious
2390	30.3	peak	V	26.69	56.99	74	17.01	spurious
280.26	35.33	QP	H	-6.35	28.98	46	17.02	spurious
280.26	35.01	QP	V	-6.35	28.66	46	17.34	spurious
2402	65.36	peak	H	35.19	100.55	N/A	N/A	Fundamental
2402	64.38	peak	V	35.19	99.57	N/A	N/A	Fundamental
2402	56.61	Ave.	H	35.19	91.8	N/A	N/A	Fundamental
2402	55.45	Ave.	V	35.19	90.64	N/A	N/A	Fundamental
Middle Channel (2441MHz)								
4882	13.99	AV	V	31.57	45.56	54	8.44	Harmonic
332.64	42.83	QP	H	-5.39	37.44	46	8.56	spurious
4882	13.49	Ave.	H	31.57	45.06	54	8.94	Harmonic
4882	29.05	peak	H	31.57	60.62	74	13.38	Harmonic
4882	28.9	peak	V	31.57	60.47	74	13.53	Harmonic
332.64	36.88	QP	V	-5.39	31.49	46	14.51	spurious
2441	64.59	peak	H	35.24	99.83	N/A	N/A	Fundamental
2441	65.14	peak	V	35.24	100.38	N/A	N/A	Fundamental
2441	58.9	Ave.	H	35.24	94.14	N/A	N/A	Fundamental
2441	59.1	Ave.	V	35.24	94.34	N/A	N/A	Fundamental
High Channel (2480MHz)								
4960	14.59	Ave.	V	31.86	46.45	54	7.55	Harmonic
4960	14.25	Ave.	H	31.86	46.11	54	7.89	Harmonic
2483.5	15.44	Ave.	V	27.12	42.56	54	11.44	spurious
816.67	32.53	QP	H	1.86	34.39	46	11.61	spurious
2483.5	15.25	Ave.	H	27.12	42.37	54	11.63	spurious
816.67	32.41	QP	V	1.86	34.27	46	11.73	spurious
4960	28.76	peak	H	31.86	60.62	74	13.38	Harmonic
4960	27.01	peak	V	31.86	58.87	74	15.13	Harmonic
2483.5	28.9	peak	V	27.12	56.02	74	17.98	spurious
2483.5	28.37	peak	H	27.12	55.49	74	18.51	spurious
2480	65.51	peak	H	35.29	100.8	N/A	N/A	Fundamental
2480	66.57	peak	V	35.29	101.86	N/A	N/A	Fundamental
2480	56.23	Ave.	H	35.29	91.52	N/A	N/A	Fundamental
2480	56.97	Ave.	V	35.29	92.26	N/A	N/A	Fundamental

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 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Equipment List and Details

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

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

Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another truce
3. Measure the channel separation.

Test Data

Environmental Conditions

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

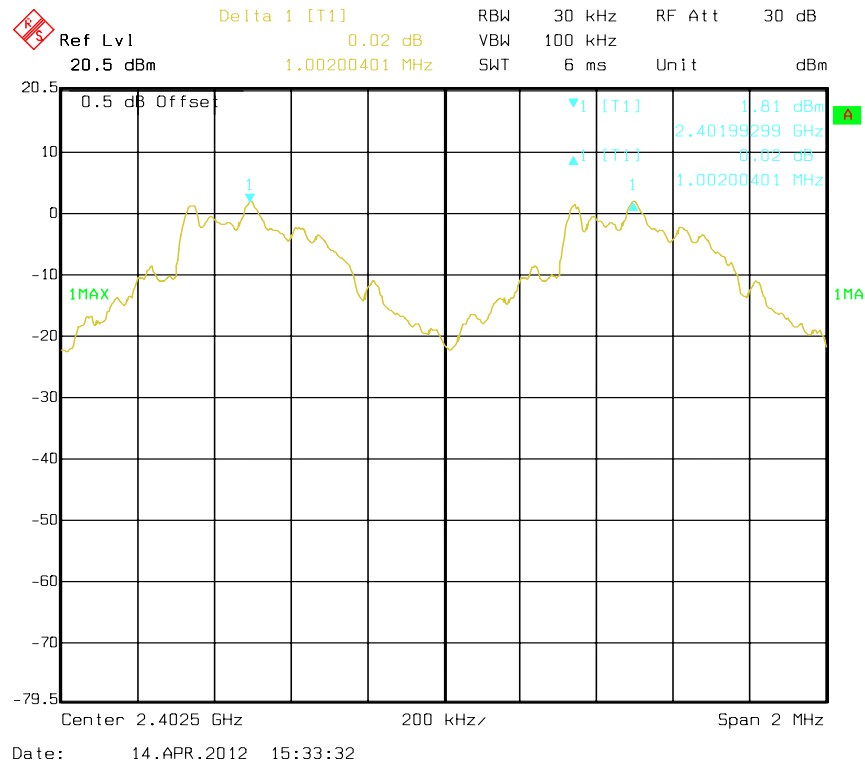
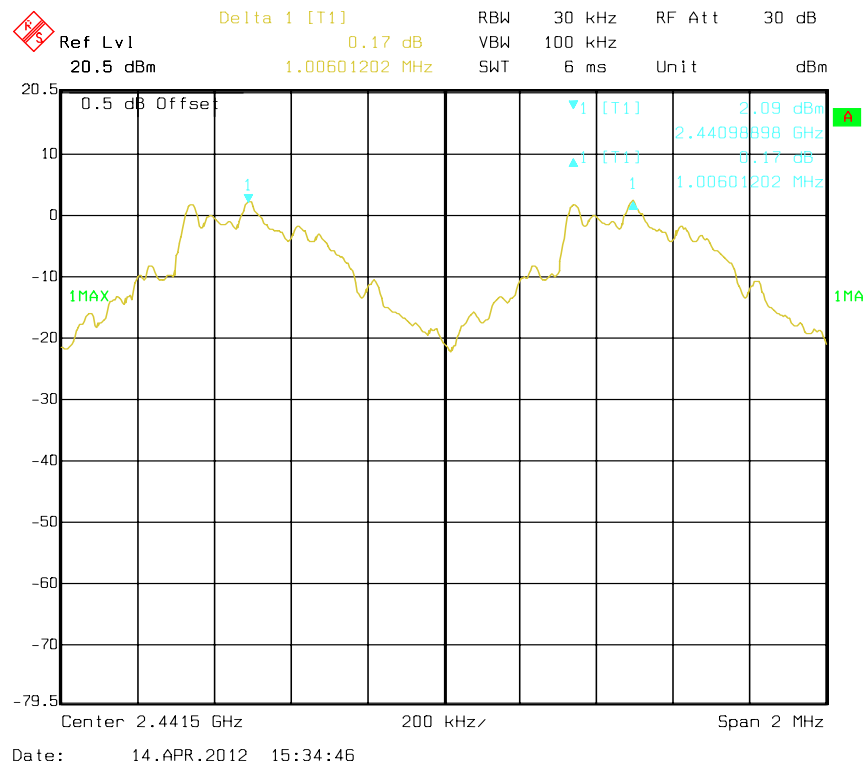
* The testing was performed by Dean Liu on 2012-04-14.

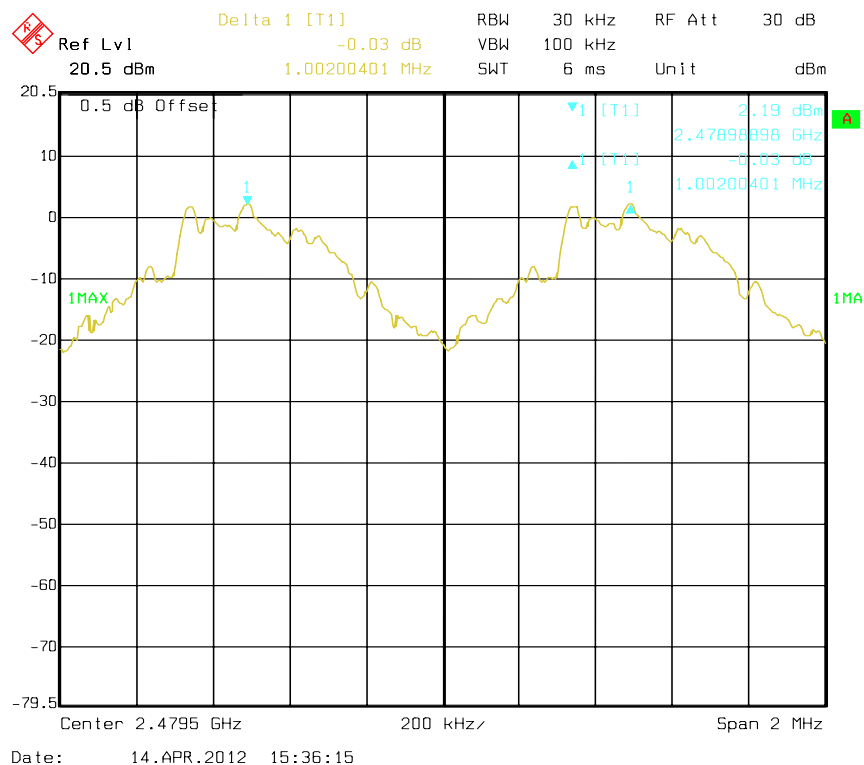
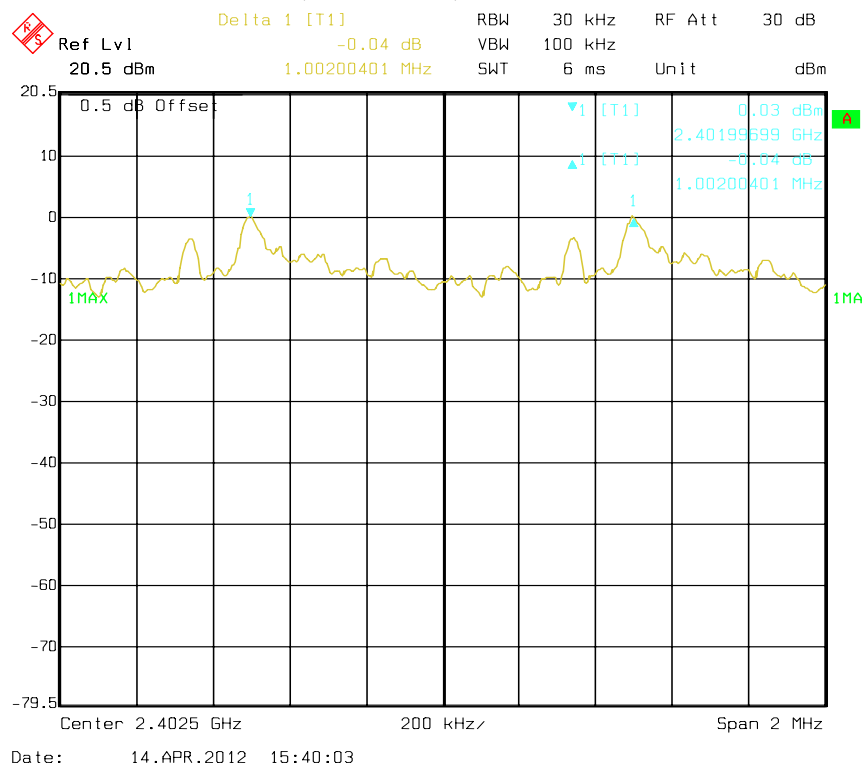
Test Result: Compliance.

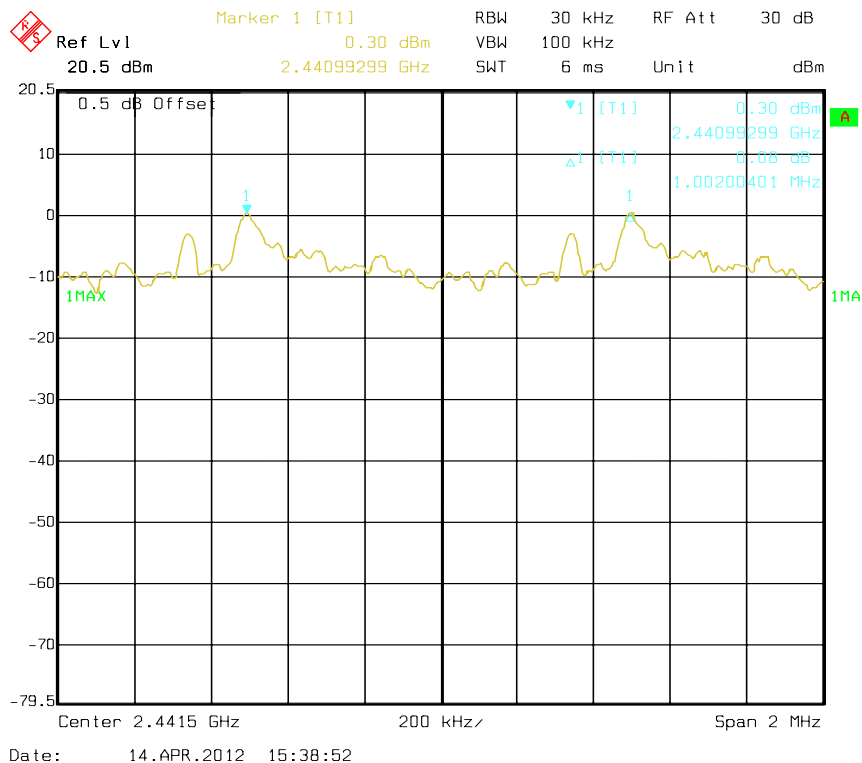
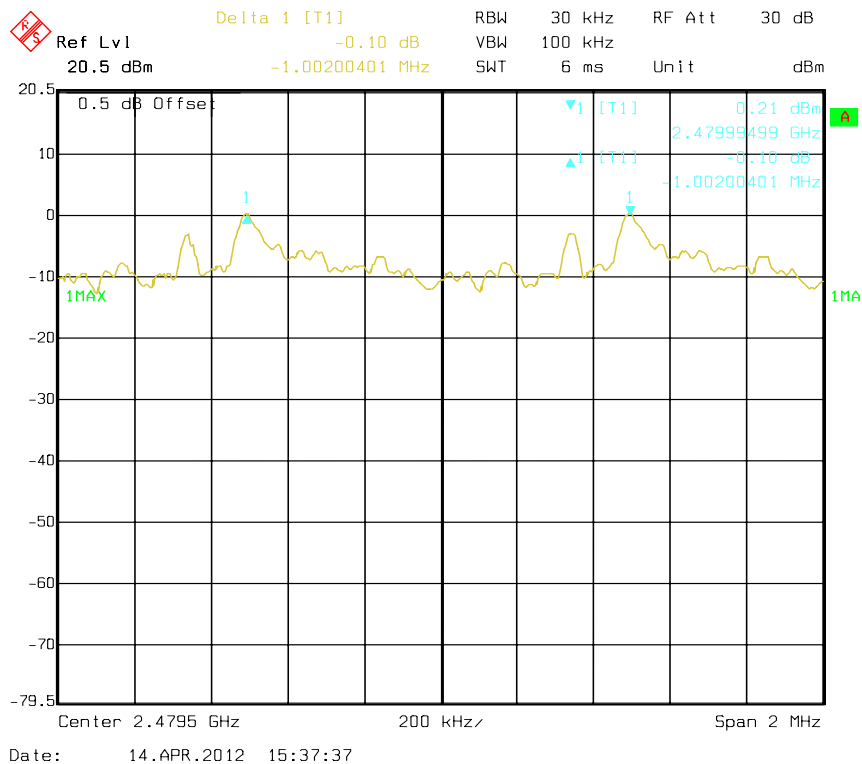
Please refer to following tables and plots

Test Mode: Transmitting

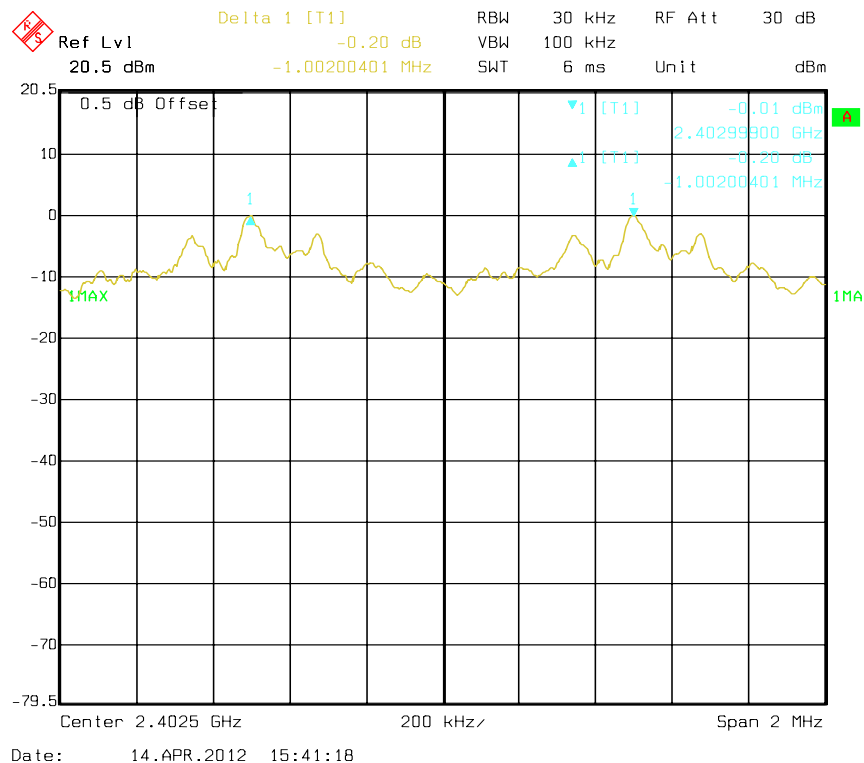
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
<i>BDR Mode (GFSK)</i>	Low	2402	1.002	0.585	Pass
	Adjacent	2403			
	Middle	2441	1.006	0.588	Pass
	Adjacent	2440			
	High	2480	1.002	0.588	Pass
	Adjacent	2479			
<i>EDR Mode ($\pi/4$-DQPSK)</i>	Low	2402	1.002	0.777	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.828	Pass
	Adjacent	2442			
	High	2480	1.002	0.820	Pass
	Adjacent	2479			
<i>EDR Mode (8DPSK)</i>	Low	2402	1.002	0.820	Pass
	Adjacent	2403			
	Middle	2441	1.002	0.820	Pass
	Adjacent	2442			
	High	2480	1.006	0.815	Pass
	Adjacent	2479			

BDR - Low Channel**BDR - Middle Channel**

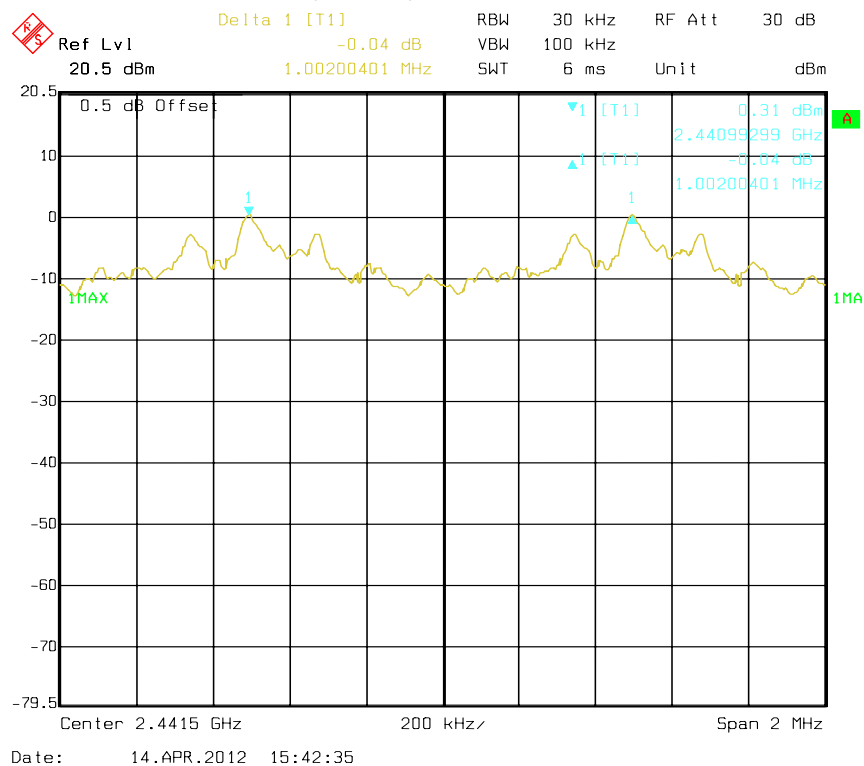
BDR - High Channel**EDR ($\pi/4$ -DQPSK) - Low Channel**

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

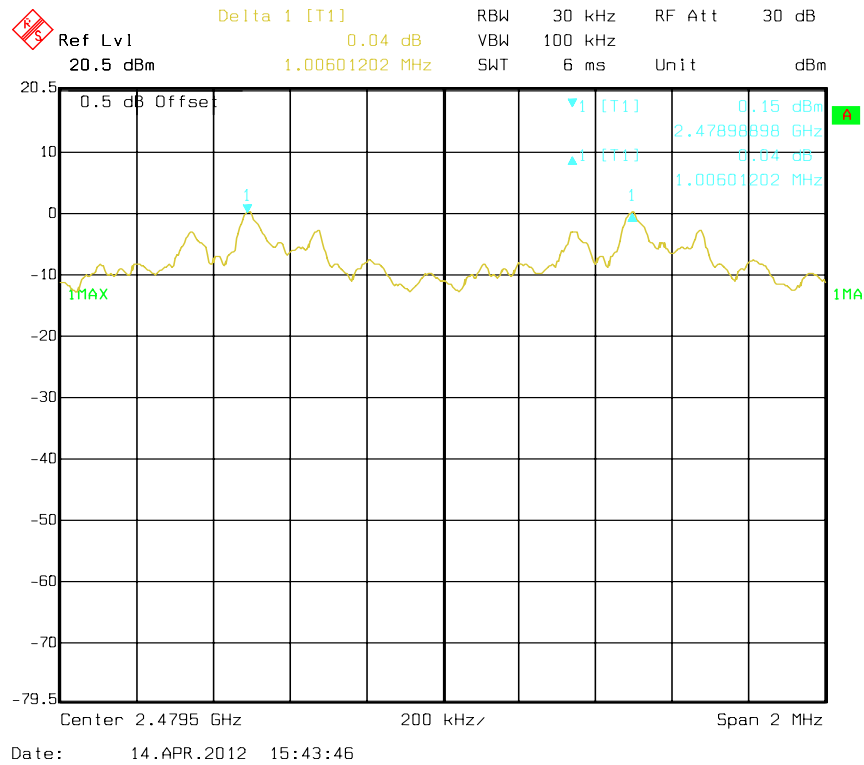
EDR (8DPSK) - Low Channel



EDR (8DPSK) - Middle Channel



EDR (8DPSK) - High Channel



FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING

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 on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

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

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

Test Data

Environmental Conditions

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

* The testing was performed by Dean Liu on 2012-04-14.

Test Result: Compliance.

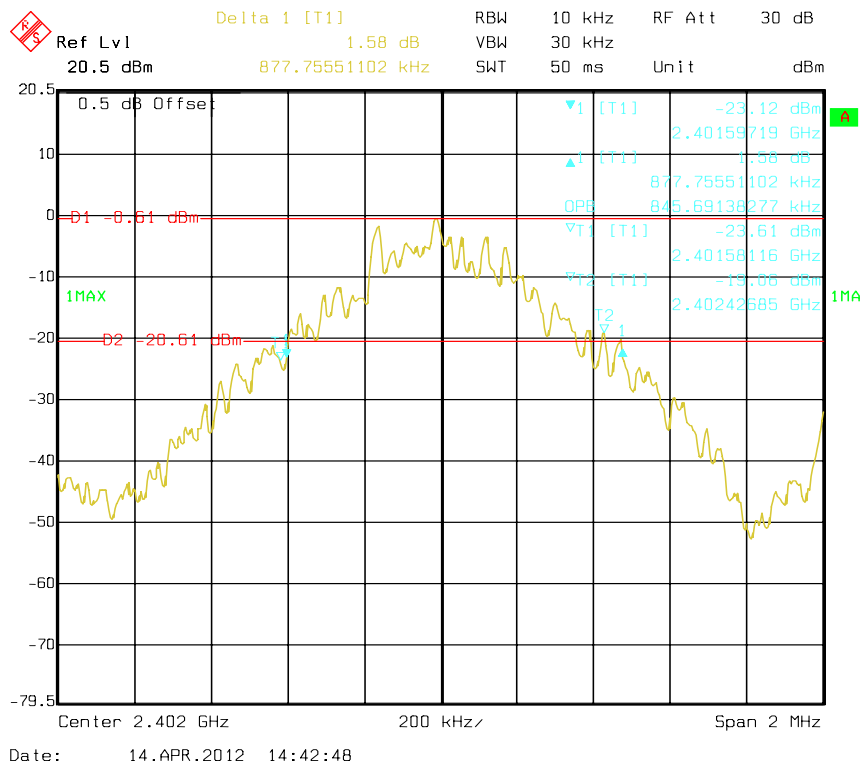
Please refer to following tables and plots

Test Mode: Transmitting

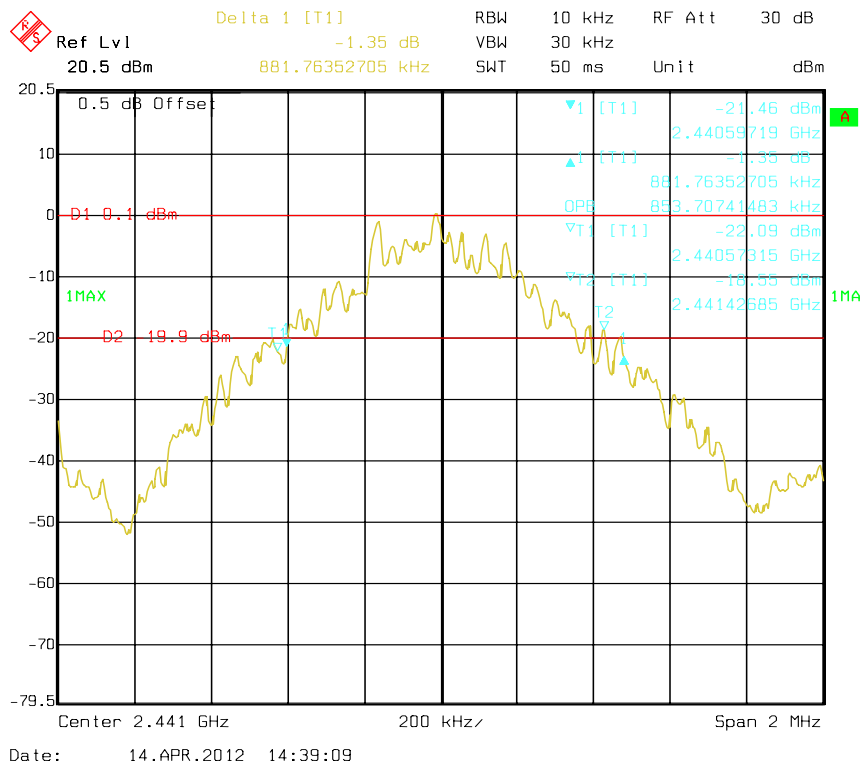
	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
<i>BDR Mode (GFSK)</i>	Low	2402	0.877
	Middle	2441	0.881
	High	2480	0.881
<i>EDR Mode ($\pi/4$-DQPSK)</i>	Low	2402	1.166
	Middle	2441	1.242
	High	2480	1.230
<i>EDR Mode (8DPSK)</i>	Low	2402	1.230
	Middle	2441	1.230
	High	2480	1.222

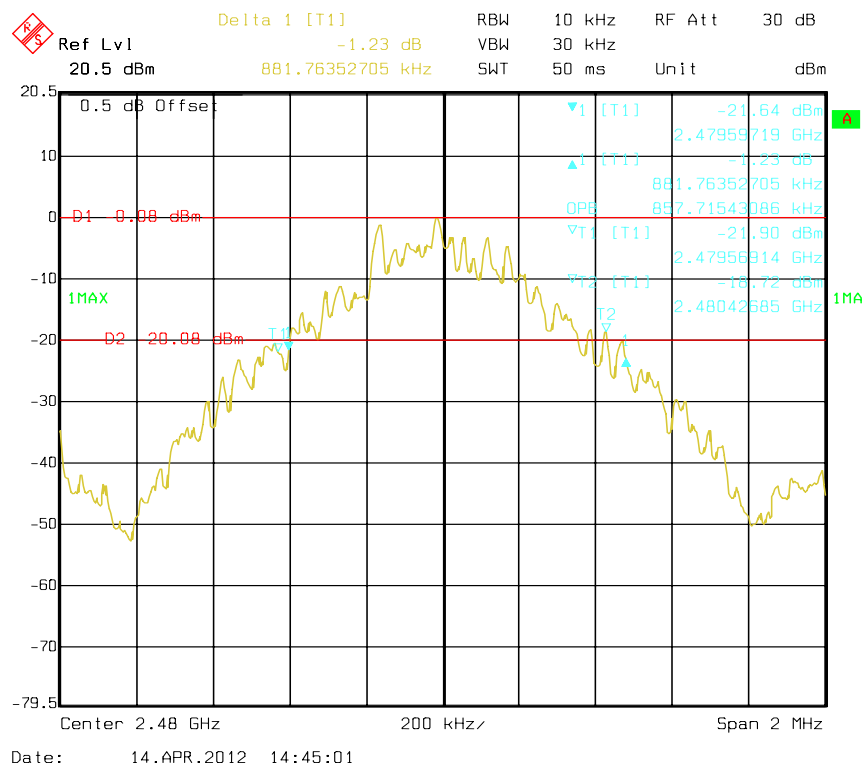
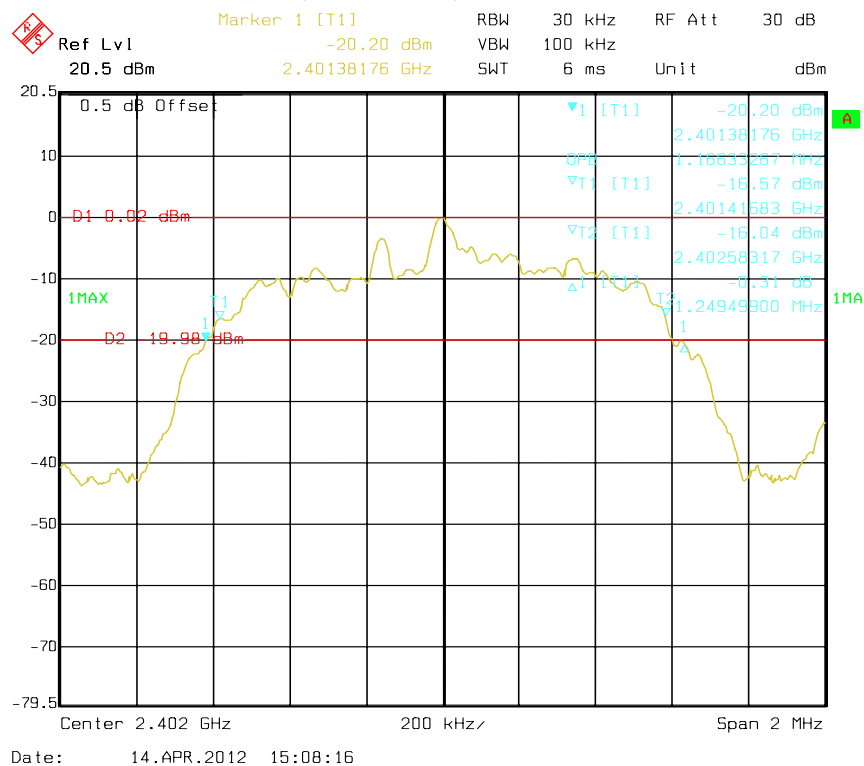
Please refer to the following plots.

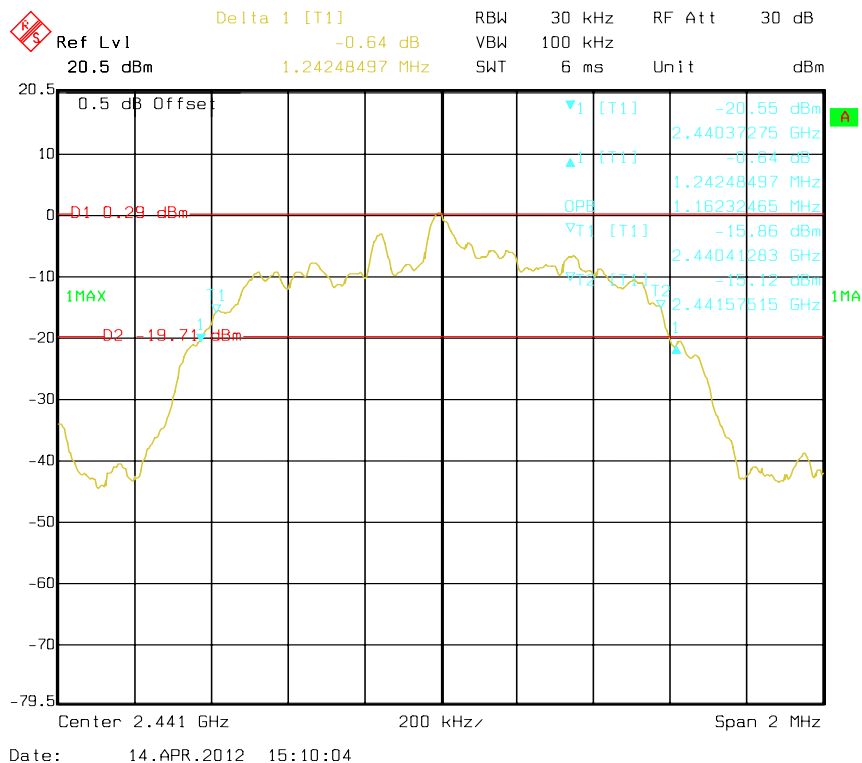
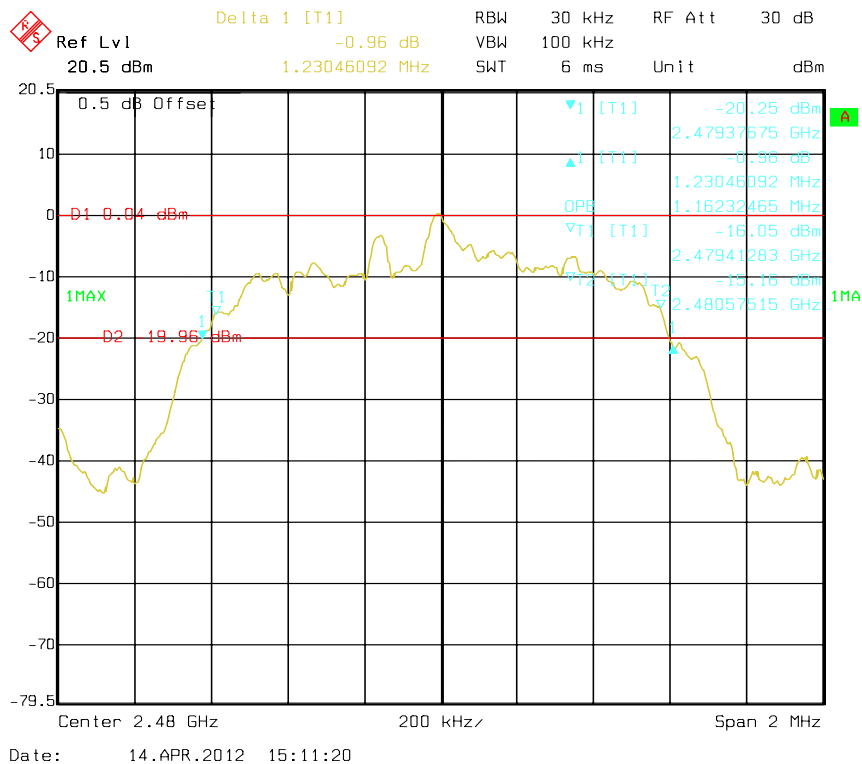
BDR - Low Channel



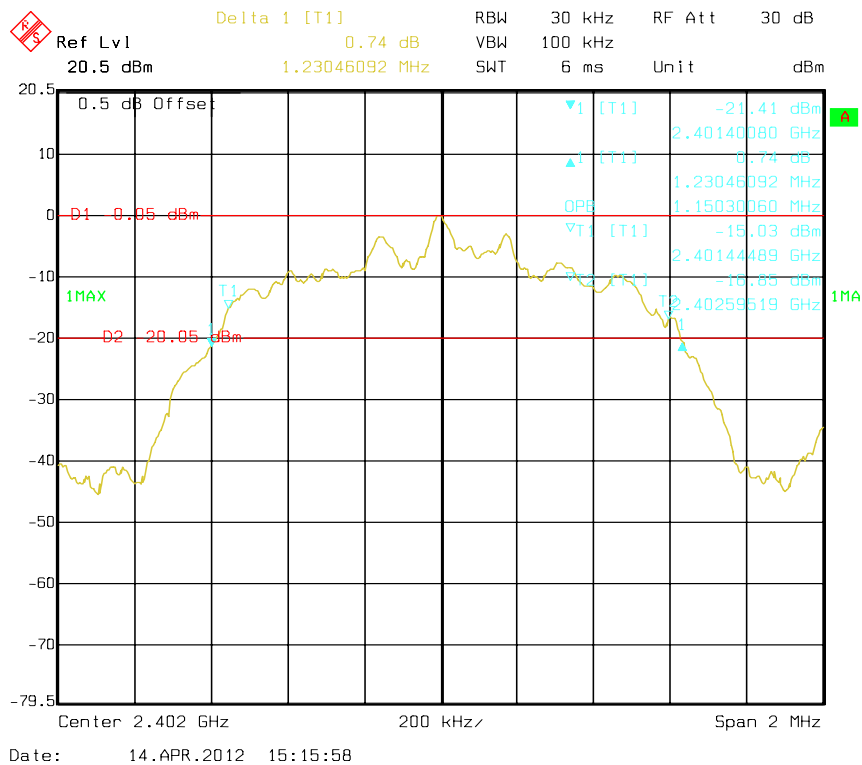
BDR - Middle Channel



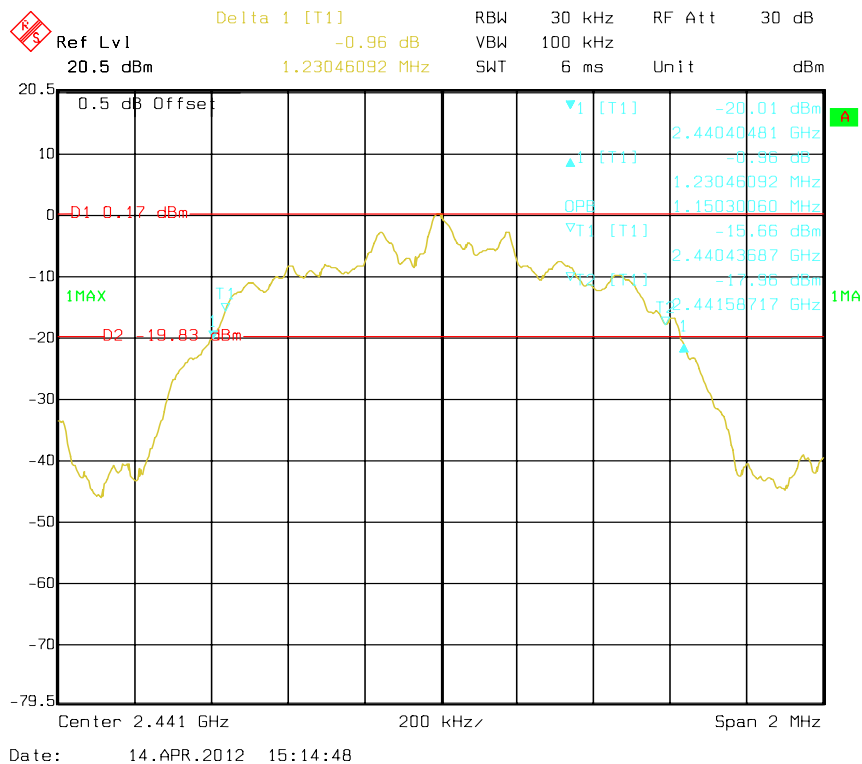
BDR - High Channel**EDR ($\pi/4$ -DQPSK) - Low Channel**

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

EDR (8DPSK) - Low Channel



EDR (8DPSK) - Middle Channel



[illegible]

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	Signal Analyzer	FSIQ 26	8386001028	2011-11-24	2012-11-23

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

Test Data**Environmental Conditions**

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

The testing was performed by Dean Liu on 2012-04-14.

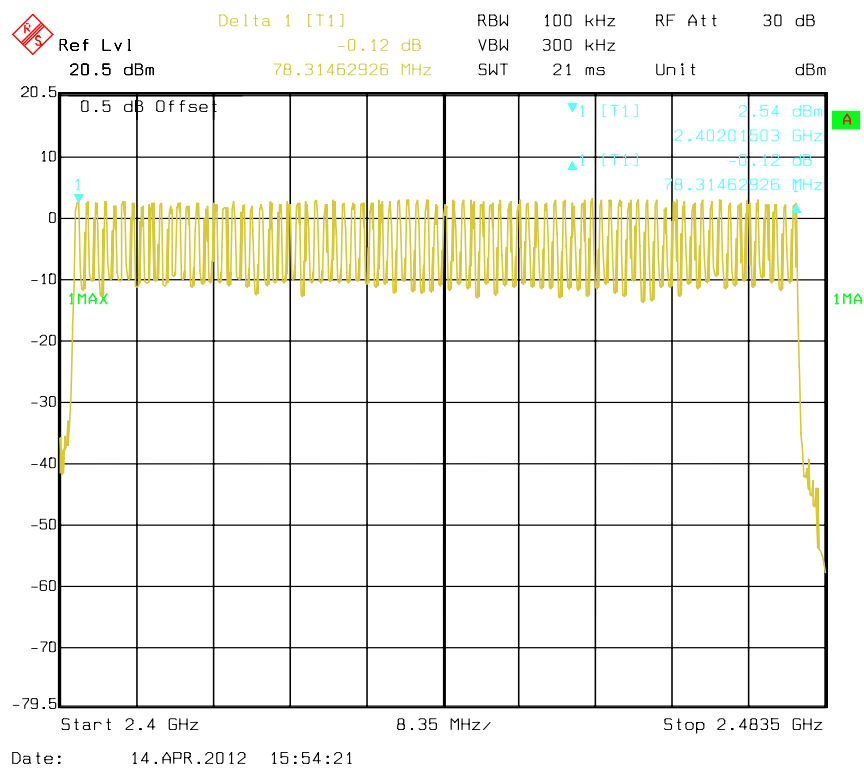
Test Result: Compliance.

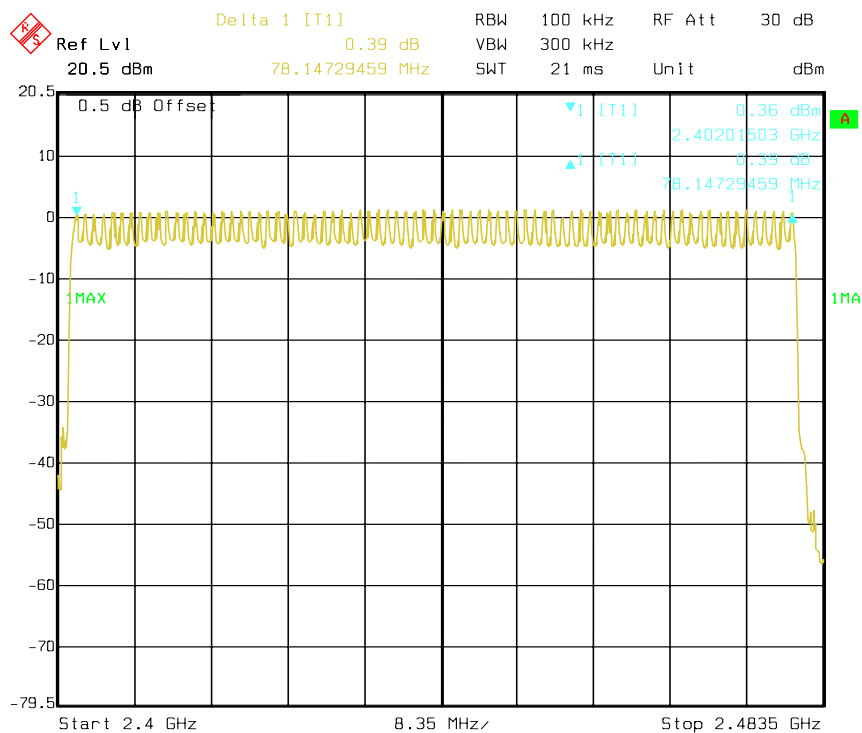
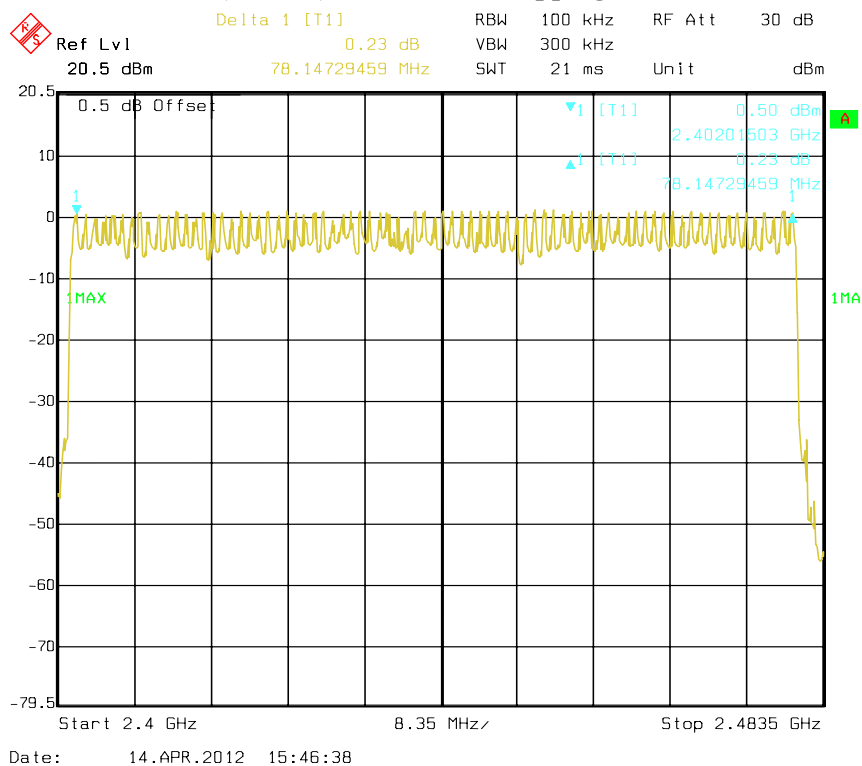
Please refer to following tables and plots

Test Mode: Transmitting (BDR & EDR)

	Frequency Range (MHz)	Number of Hopping Channel	Limit
BDR	2400-2483.50	79	≥ 15
EDR ($\pi/4$ -DQPSK)	2400-2483.50	79	≥ 15
EDR (8DPSK)	2400-2483.50	79	≥ 15

BDR - Number of Hopping Channels



EDR ($\pi/4$ -DQPSK) - Number of Hopping Channels**EDR (8DPSK) - Number of Hopping Channels**

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

Applicable Standard

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

Test Procedure

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

Dwell Time= time slot length * hope rate/ number of hopping channels * 31.6s
Hop rate=1600/s

Test Equipment List and Details

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

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

Test Data

Environmental Conditions

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

* The testing was performed by Dean Liu on 2012-04-14.

Test Result: Compliance.

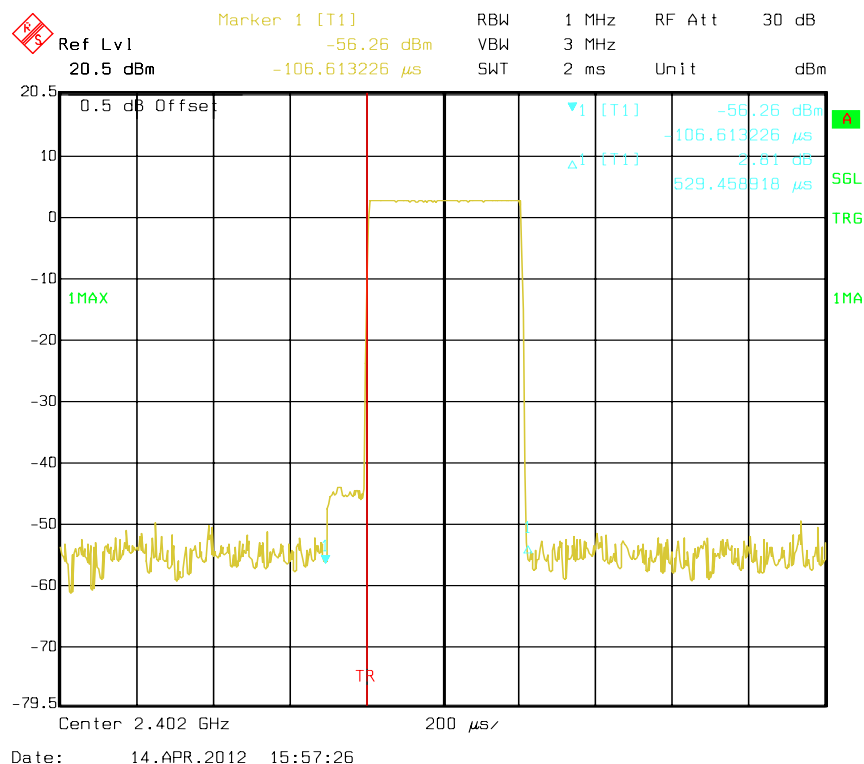
Please refer to following tables and plots

BDR (GFSK):

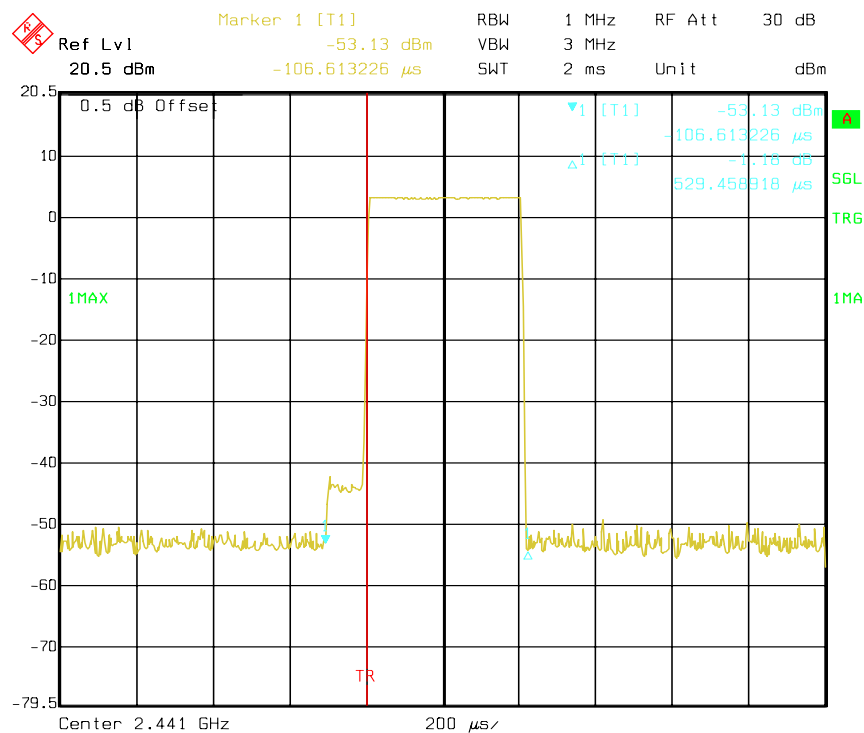
Test Mode: Transmitting

	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH 1	Low	0.529	0.169	0.4	Pass
	Middle	0.529	0.169	0.4	Pass
	High	0.529	0.169	0.4	Pass
	Note: 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	1.794	0.287	0.4	Pass
	Note: Dwell time = Pulse time*(1600/2/79)*31.6S				
DH 5	Low	3.056	0.326	0.4	Pass
	Middle	3.056	0.326	0.4	Pass
	High	3.057	0.326	0.4	Pass
	Note: Dwell time = Pulse time*(1600/2/79)*31.6S				

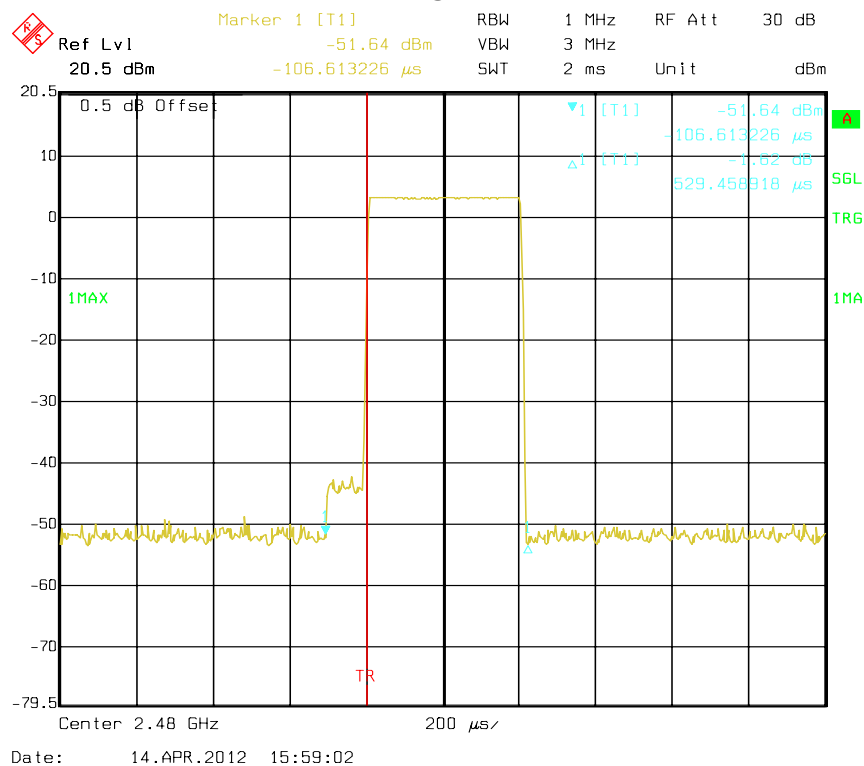
DH 1 - Low Channel



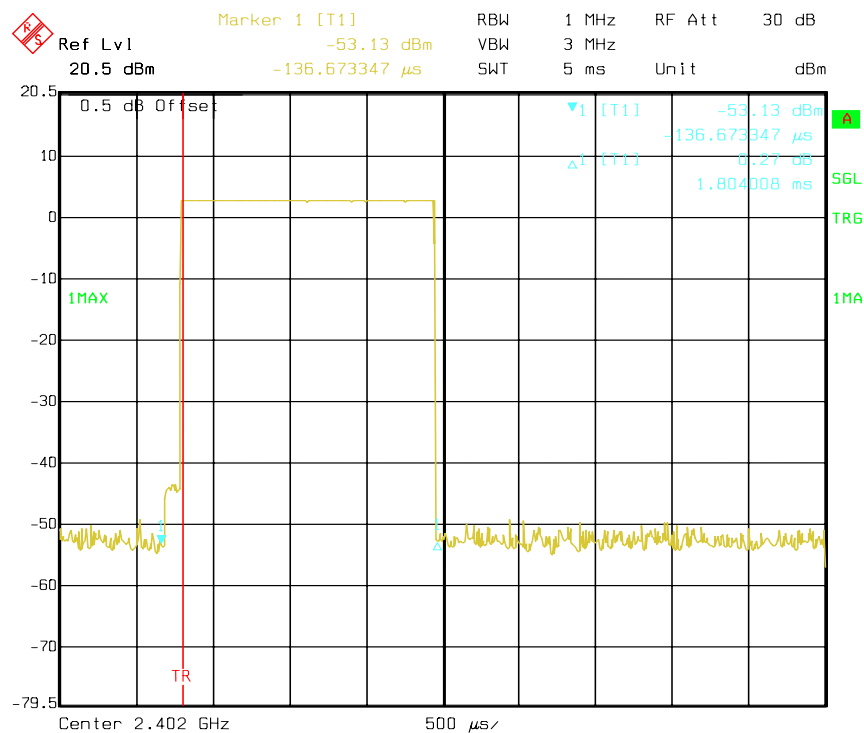
DH 1 - Middle Channel



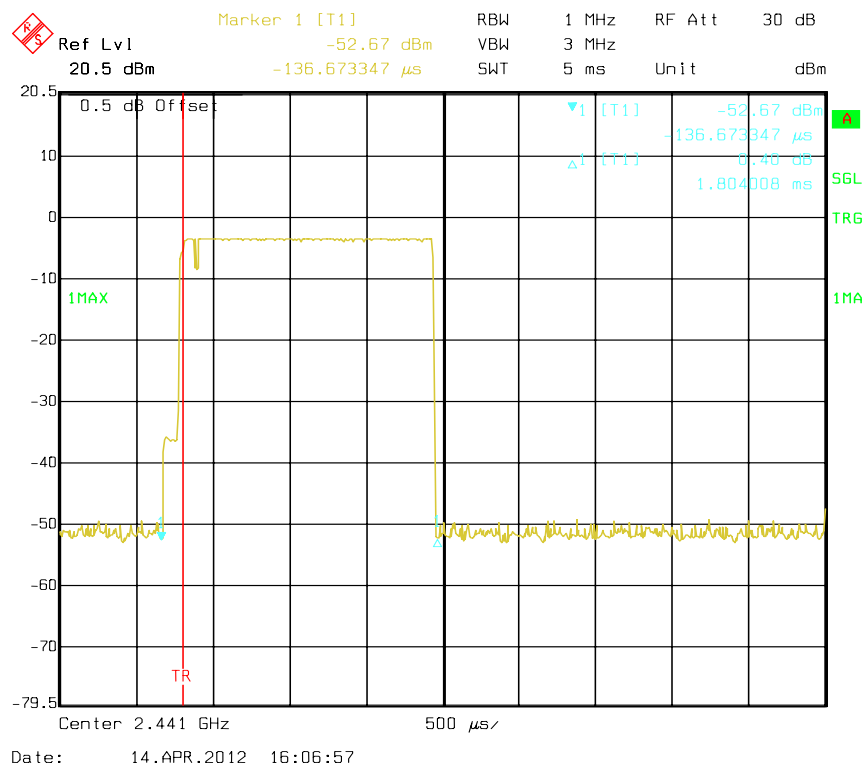
DH 1 - High Channel



DH 3 - Low Channel



DH 3 - Middle Channel



[illegible]

Date: 14.APR.2012 16:06:17

Ref Lvl 20.5 dBm

Delta 1 [T1] 0.07 dB

RBW 1 MHz

VBW 3 MHz

SWT 5 ms

RF Att 30 dB

Unit dBm

0.5 dB Offset

1MAX

TR

▼1 [T1] -52.13 dBm

▲1 [T1] -136.673347 μs

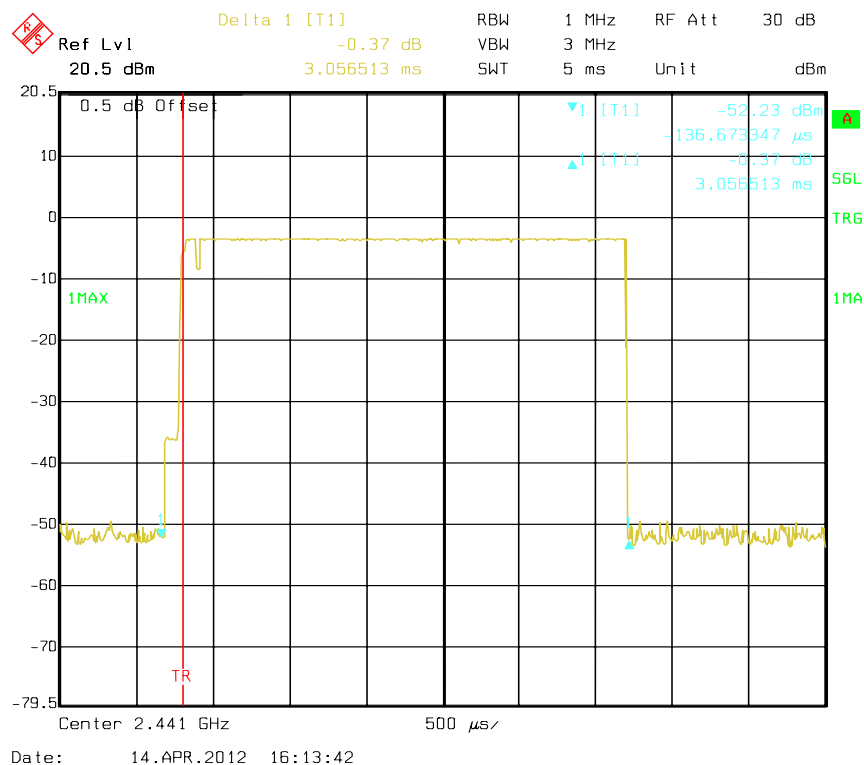
3.056513 ms

Center 2.402 GHz

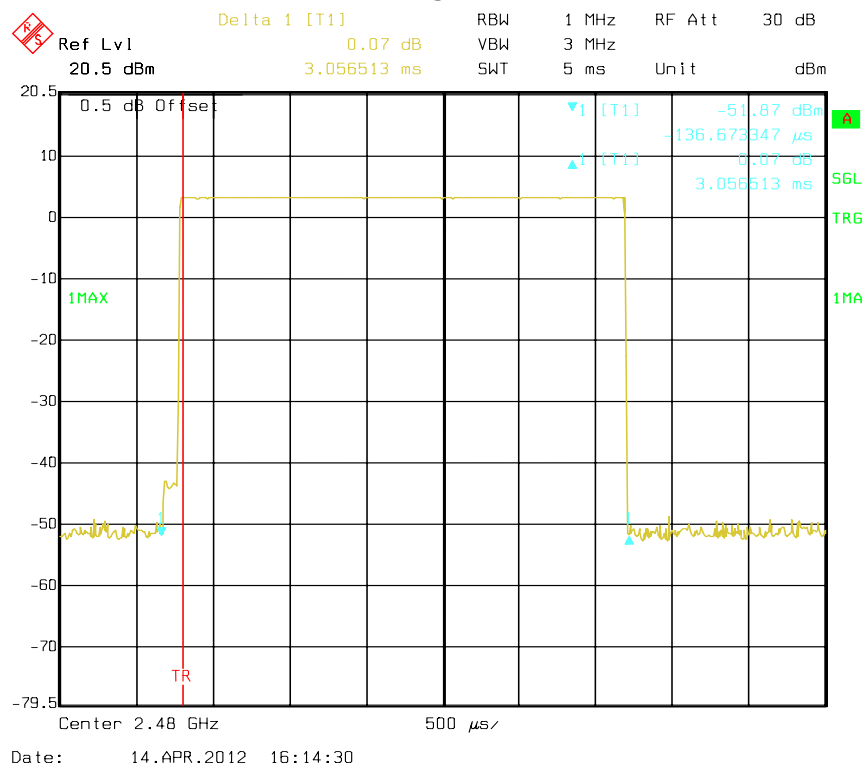
500 μs

Date: 14.APR.2012 16:12:53

DH 5 - Middle Channel



DH 5 - High Channel

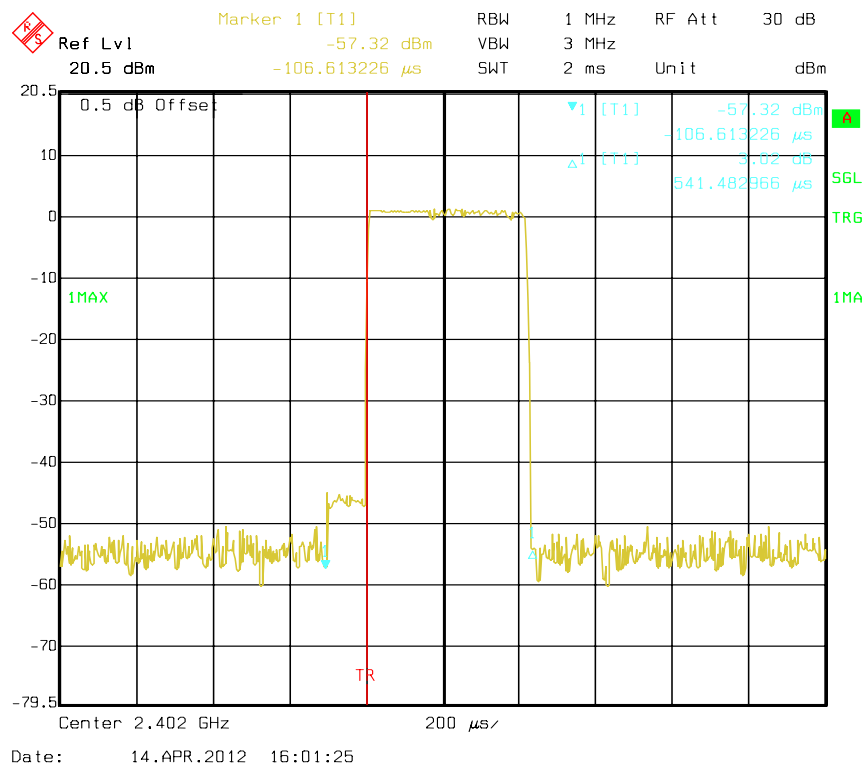


EDR Mode ($\pi/4$ -DQPSK):

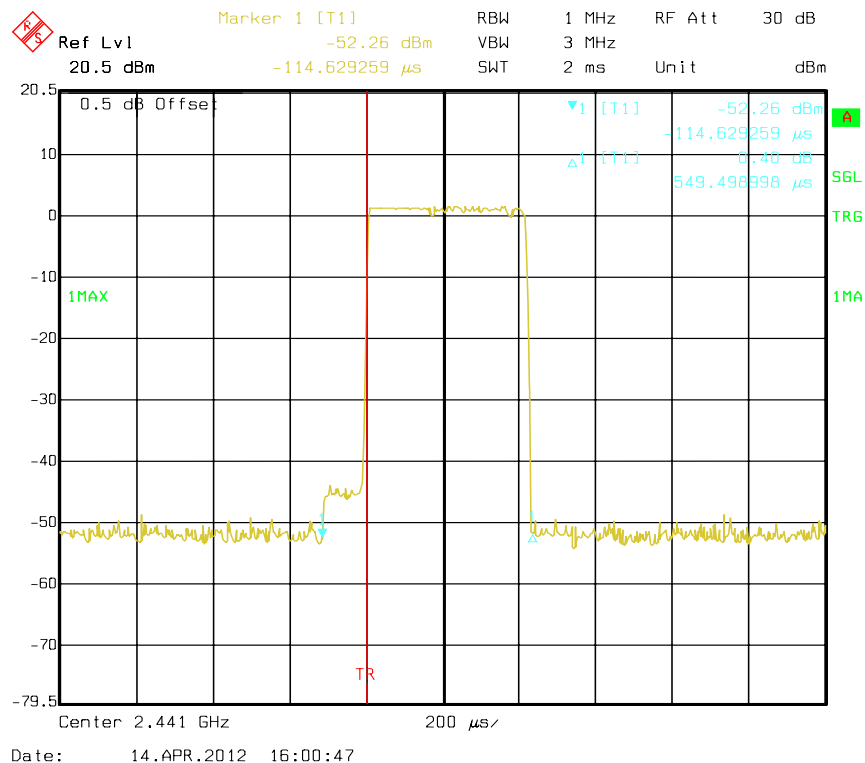
Test Mode: Transmitting

	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH 1	Low	0.541	0.173	0.4	Pass
	Middle	0.549	0.176	0.4	Pass
	High	0.533	0.171	0.4	Pass
	Note: Dwell time = Pulse time*(1600/4/79)*31.6S				
DH 3	Low	1.814	0.290	0.4	Pass
	Middle	1.814	0.290	0.4	Pass
	High	1.814	0.290	0.4	Pass
	Note: Dwell time = Pulse time*(1600/4/79)*31.6S				
DH 5	Low	3.067	0.327	0.4	Pass
	Middle	3.067	0.327	0.4	Pass
	High	3.057	0.326	0.4	Pass
	Note: Dwell time = Pulse time*(1600/4/79)*31.6S				

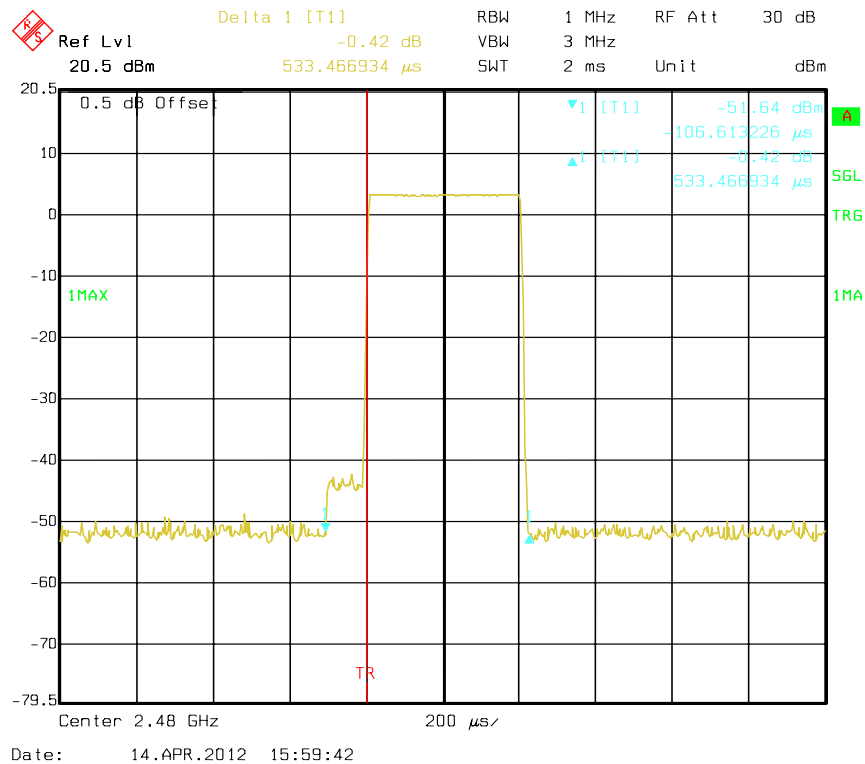
DH 1 - Low Channel



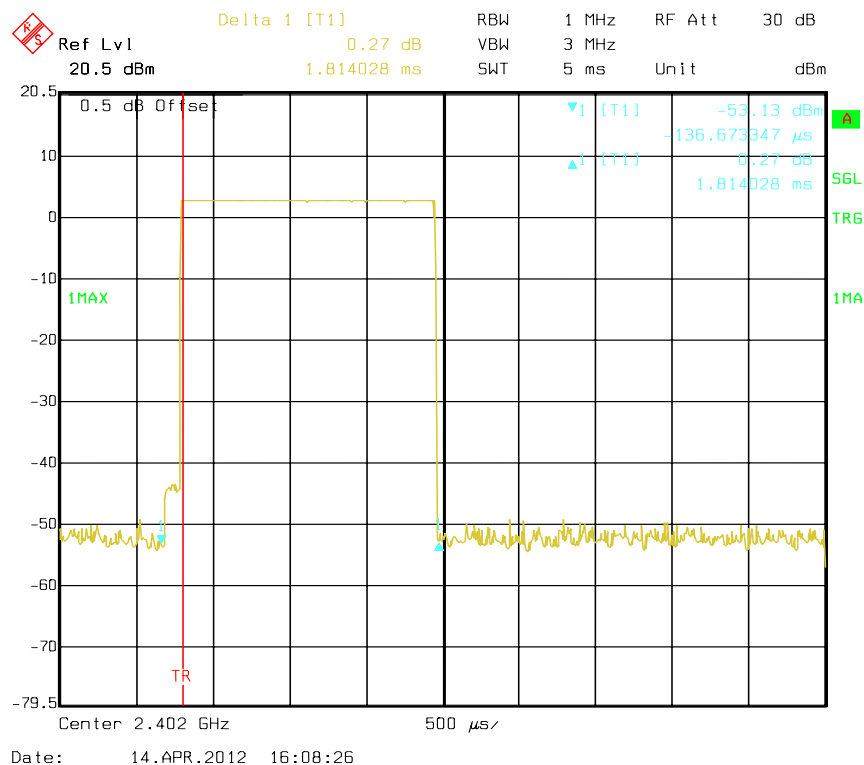
DH 1 - Middle Channel



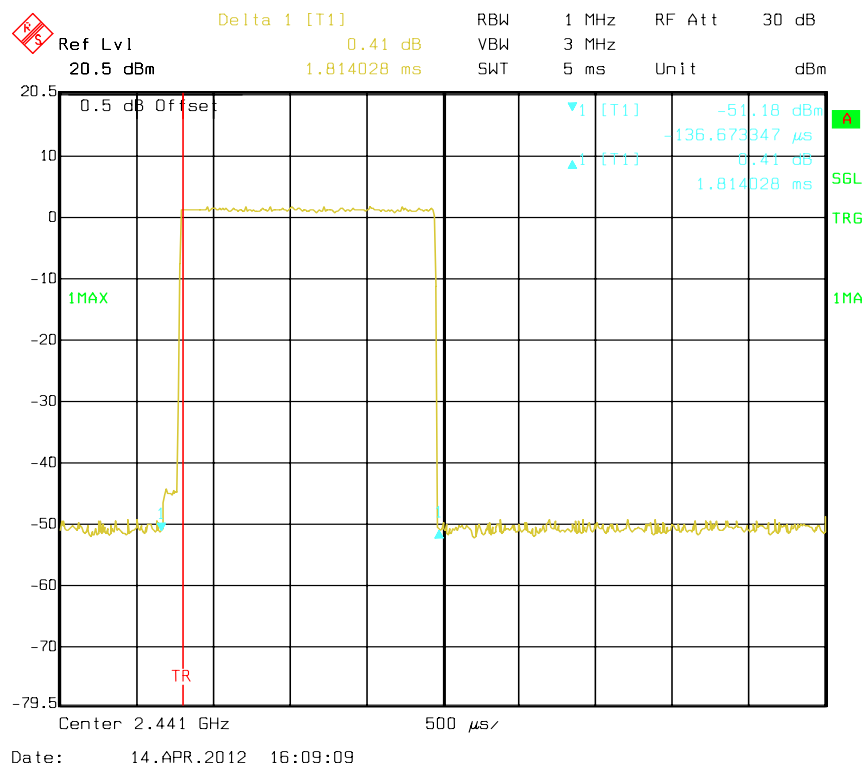
DH 1 - High Channel



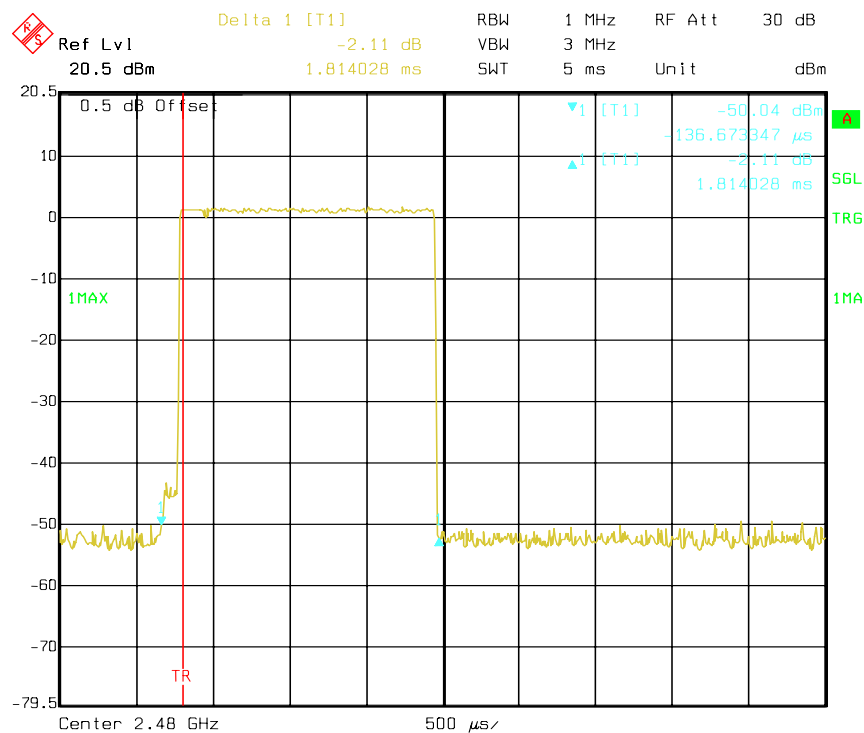
DH 3 - Low Channel



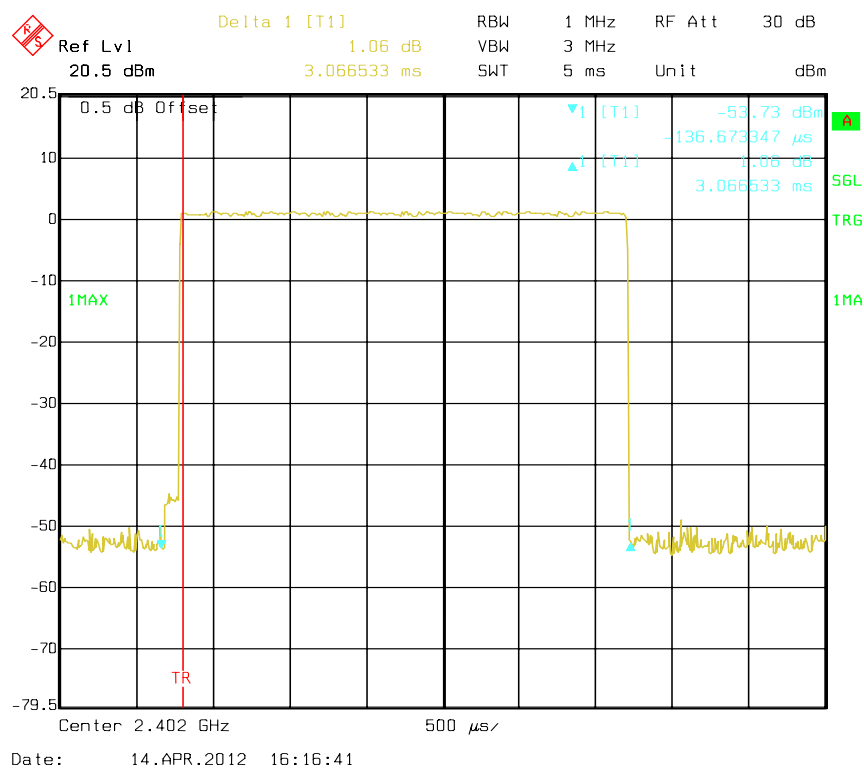
DH 3 - Middle Channel



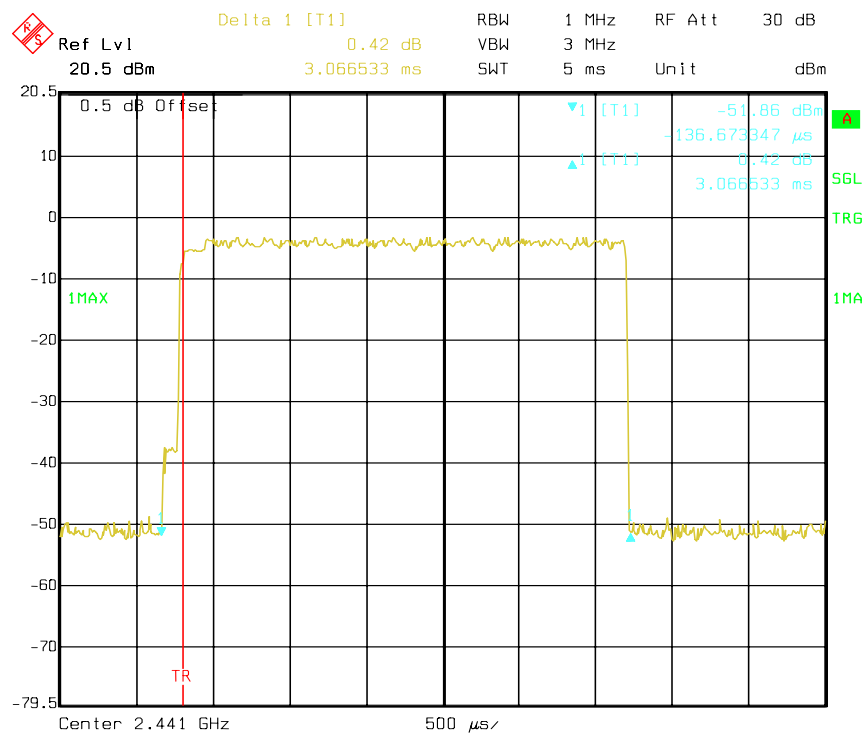
DH 3 - High Channel



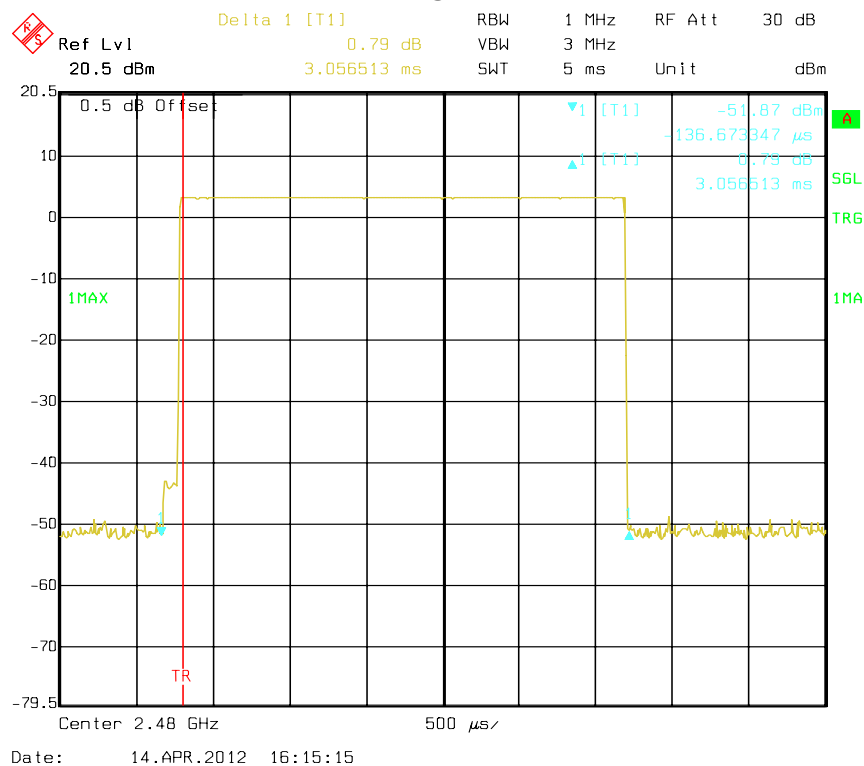
DH 5 - Low Channel



DH 5 - Middle Channel



DH 5 - High Channel

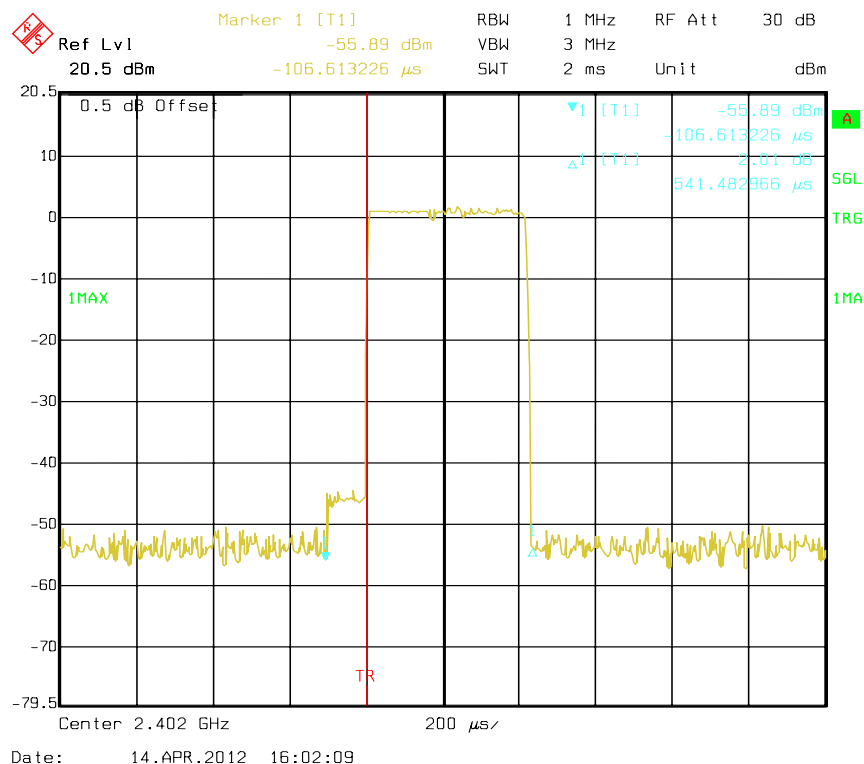


EDR Mode (8DPSK):

Test Mode: Transmitting

	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH 1	Low	0.541	0.173	0.4	Pass
	Middle	0.541	0.173	0.4	Pass
	High	0.541	0.173	0.4	Pass
	Note: Dwell time = Pulse time*(1600/6/79)*31.6S				
DH 3	Low	1.814	0.290	0.4	Pass
	Middle	1.814	0.290	0.4	Pass
	High	1.814	0.290	0.4	Pass
	Note: Dwell time = Pulse time*(1600/6/79)*31.6S				
DH 5	Low	3.067	0.327	0.4	Pass
	Middle	3.067	0.327	0.4	Pass
	High	3.067	0.327	0.4	Pass
	Note: Dwell time = Pulse time*(1600/6/79)*31.6S				

DH 1 - Low Channel



Ref Lvl 20.5 dBm

Marker 1 [T1] -52.28 dBm

RBW 1 MHz RF Att 30 dB

VBW 3 MHz

SWT 2 ms Unit dBm

0.5 dB Offset

1MAX

1MA

TR

TRG

SGL

SGLG

Center 2.441 GHz

200 μs

Date: 14.APR.2012 16:02:44

Ref Lvl 20.5 dBm

Marker 1 [T1] -53.34 dBm

RBW 1 MHz RF Att 30 dB

VBW 3 MHz

SWT 2 ms Unit dBm

0.5 dB Offset

1MAX

1MIN

TR

Center 2.48 GHz

200 μs

▼1 [T1] -53.34 dBm

Δ1 [T1] -106.613226 μs

541.482966 μs

14.APR.2012 16:04:03

[illegible]

Date: 14.APR.2012 16:11:59

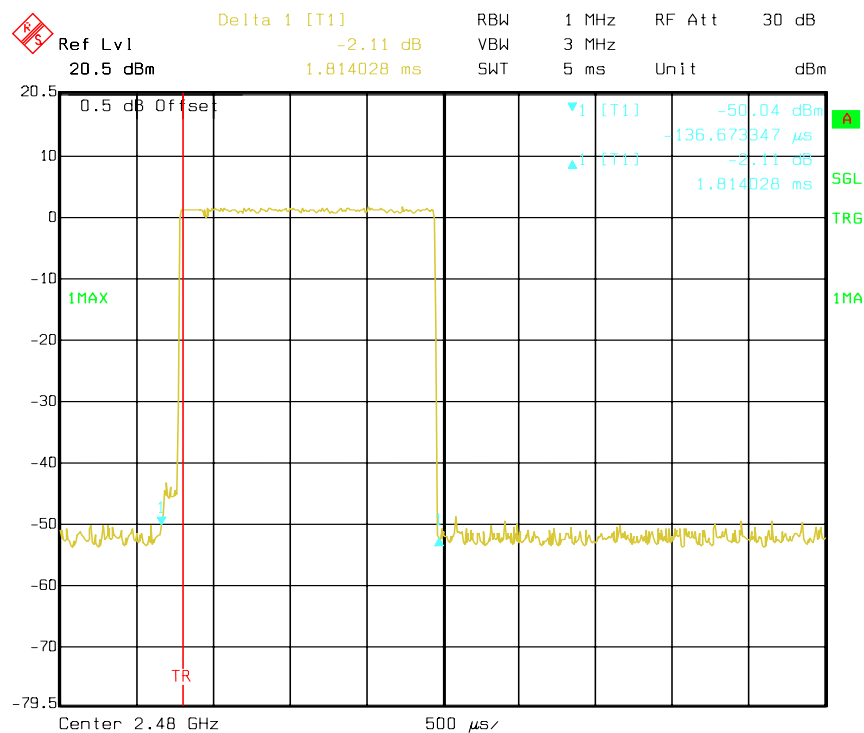
Ref Lvl 20.5 dBm
 Delta 1 [T1] 0.46 dB
 RBW 1 MHz
 VBW 3 MHz
 SWT 5 ms
 RF Att 30 dB
 Unit dBm

0.5 dB Offset
 1MAX
 TR
 -50.83 dBm
 -136.673347 μs
 0.46 dB
 1.814028 ms

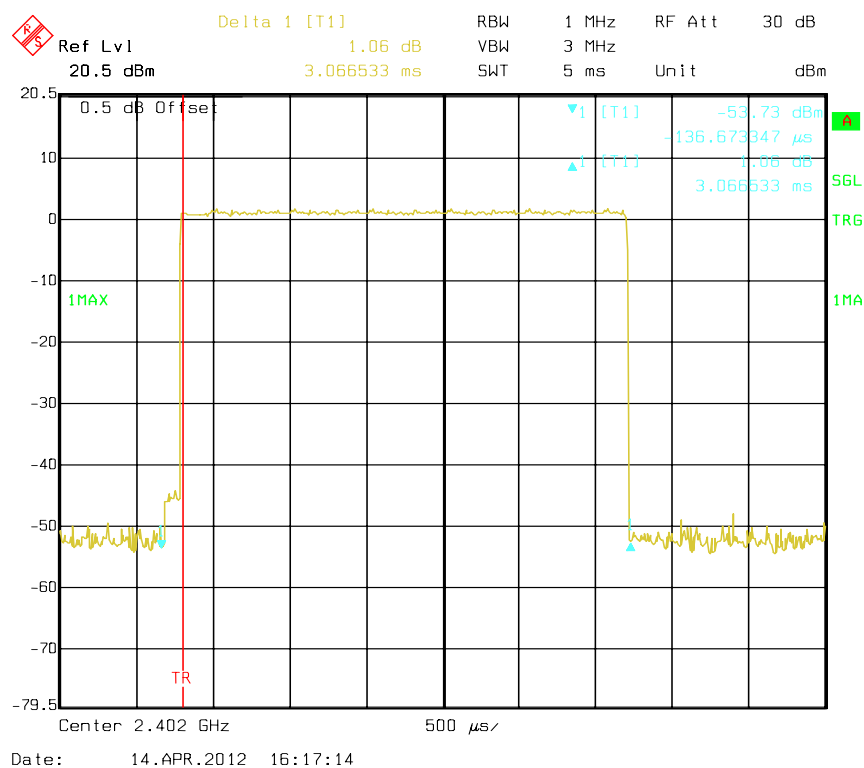
Center 2.441 GHz
 500 μs

Date: 14.APR.2012 16:11:24

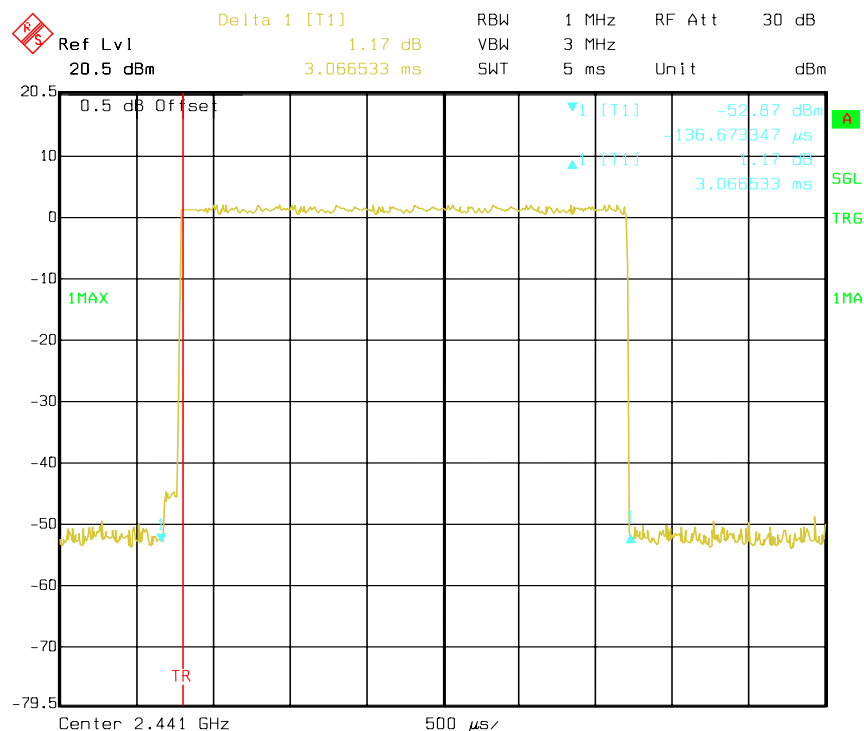
DH 3 - High Channel



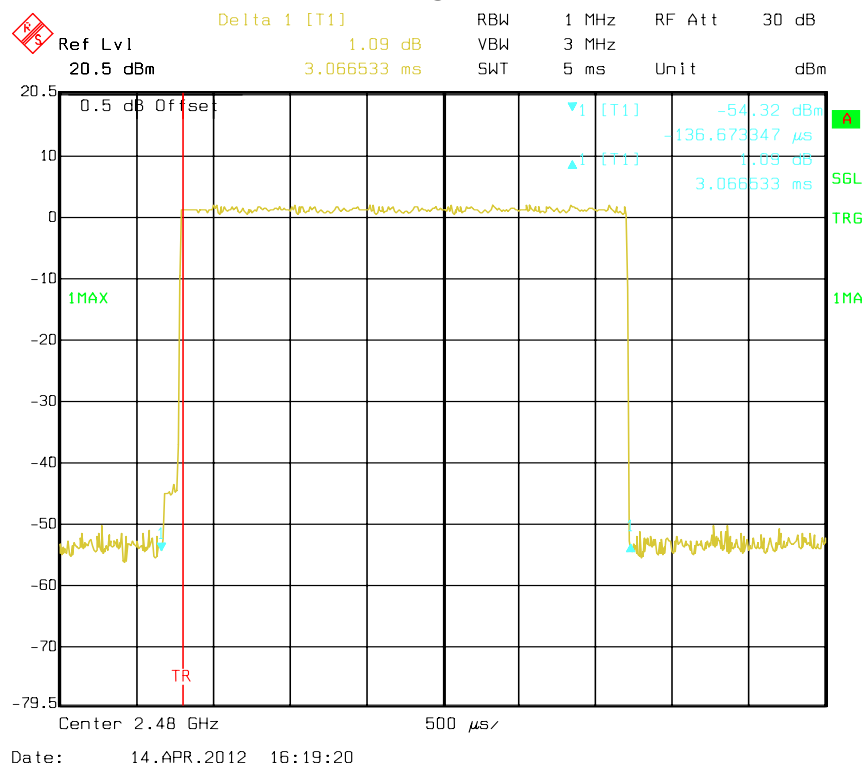
DH 5 - Low Channel



DH 5 - Middle Channel



DH 5 - High Channel



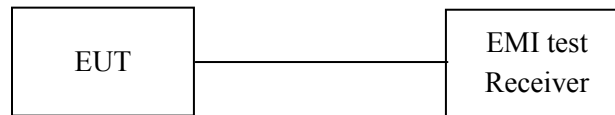
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

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. 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	Signal Analyzer	FSIQ 26	8386001028	2011-11-24	2012-11-23

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

Test Data

Environmental Conditions

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

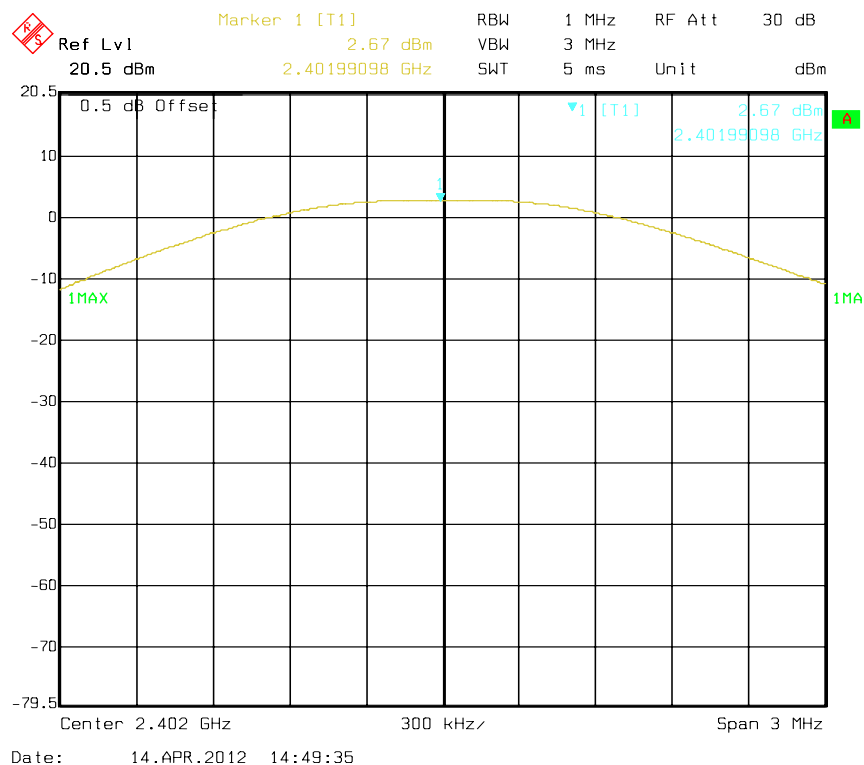
* The testing was performed by Dean Liu on 2012-04-14.

Test Result: Compliance.

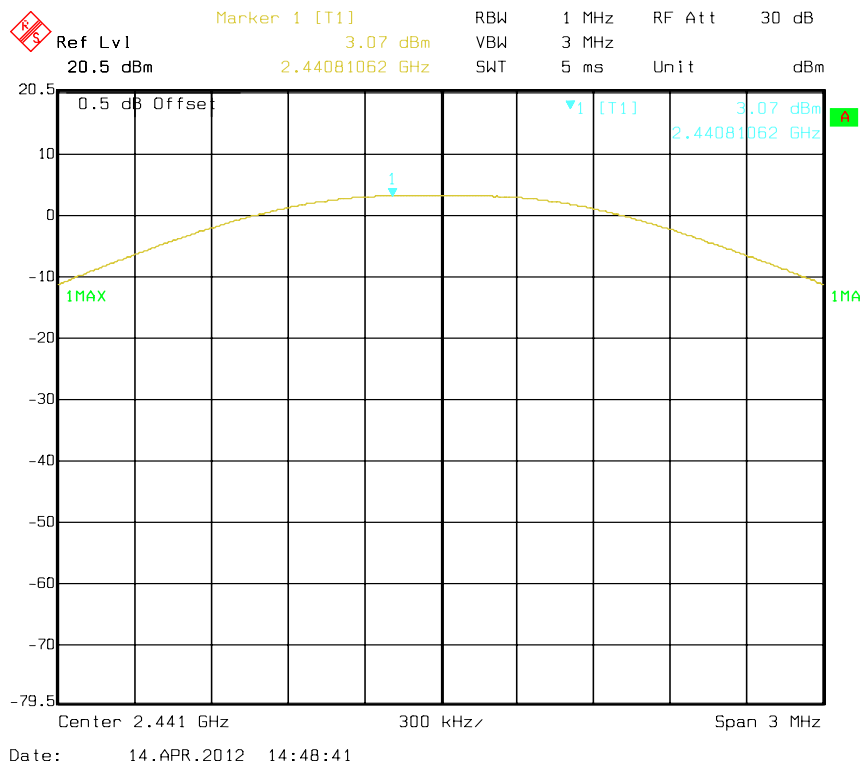
Test Mode: Transmitting

	Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
BDR Mode (GFSK)	Low	2402	2.67	30
	Middle	2441	3.07	30
	High	2480	3.11	30
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.46	30
	Middle	2441	1.95	30
	High	2480	1.95	30
EDR Mode (8DPSK)	Low	2402	1.82	30
	Middle	2441	2.31	30
	High	2480	2.19	30

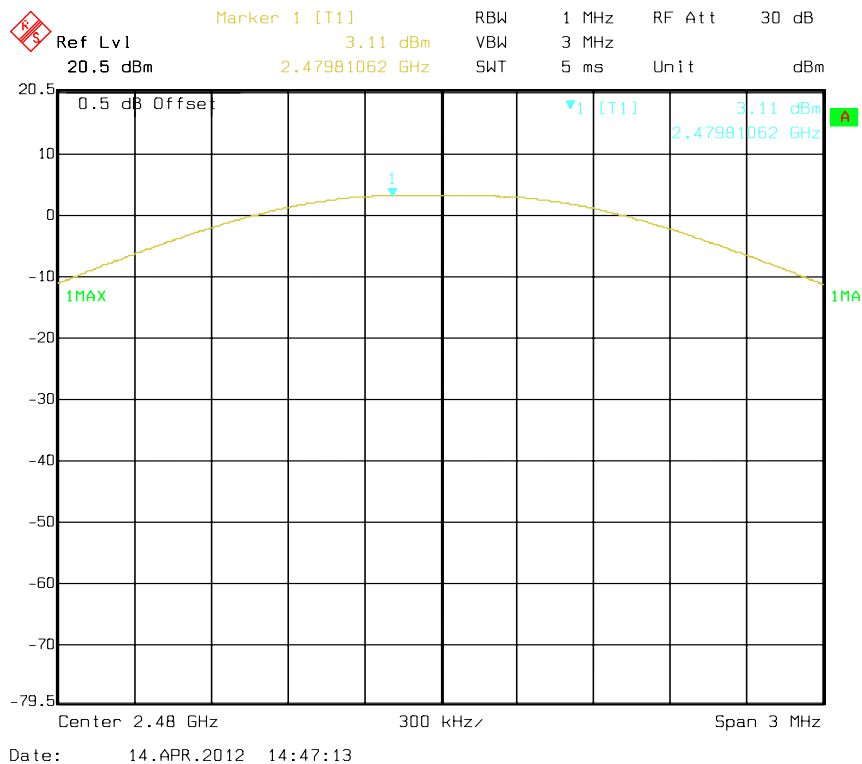
Note: The data above was tested in conducted mode.

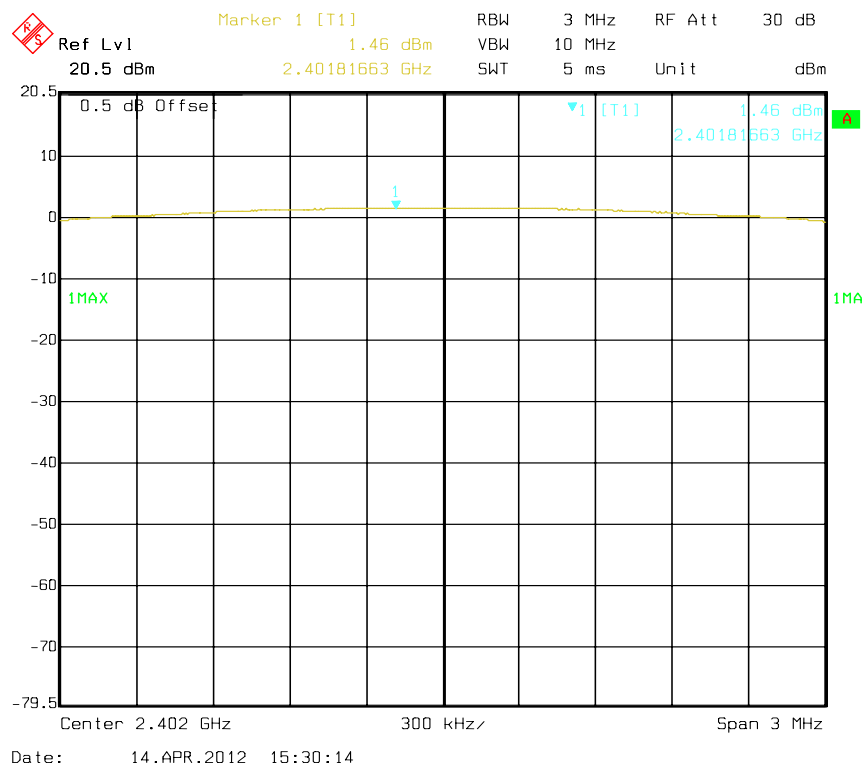
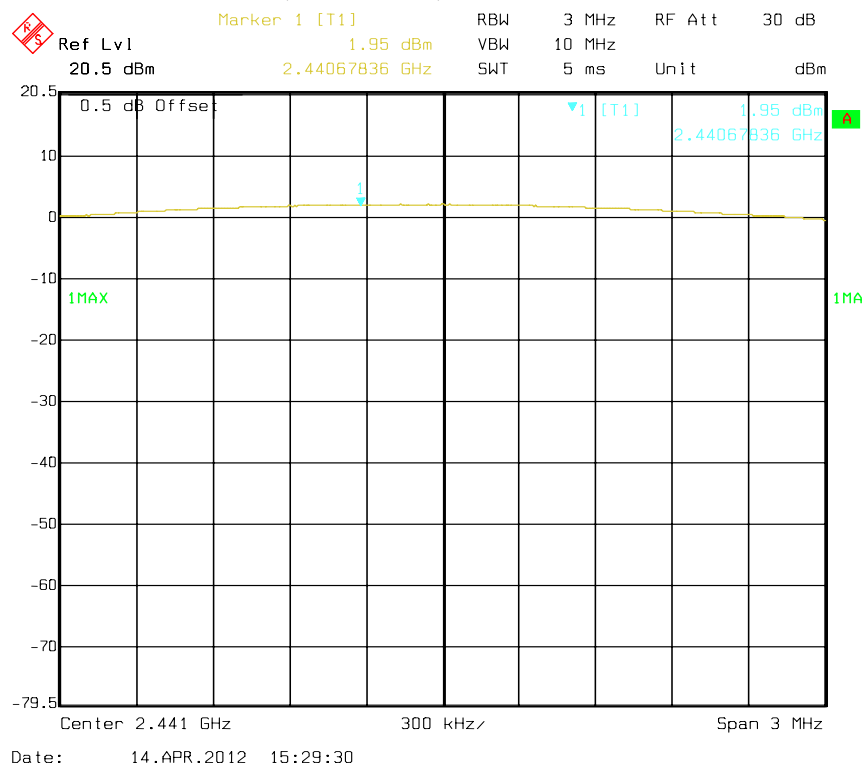
BDR - Low Channel

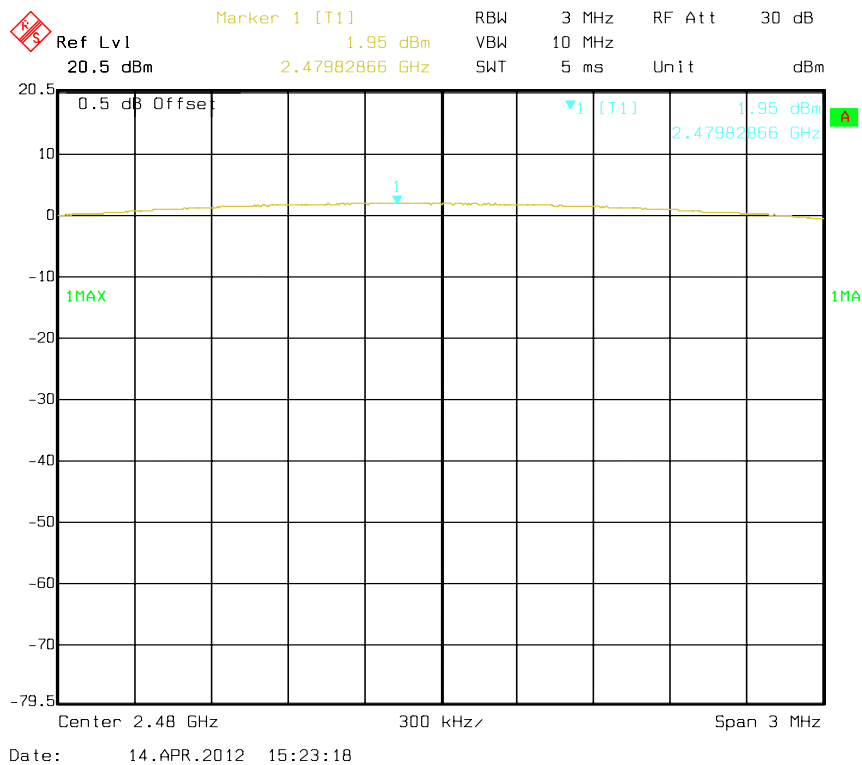
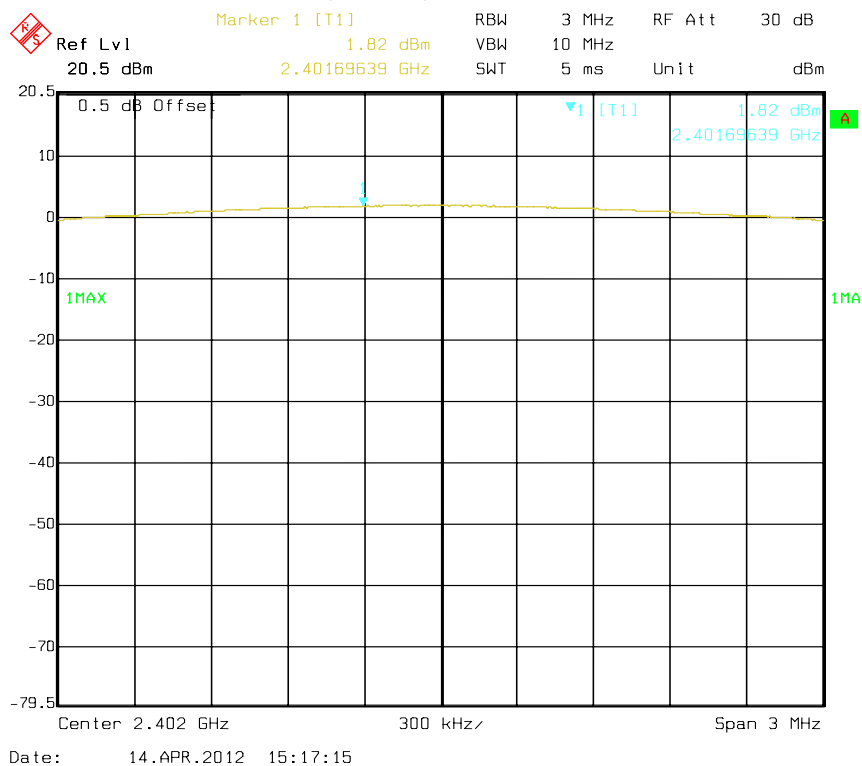
BDR - Middle Channel



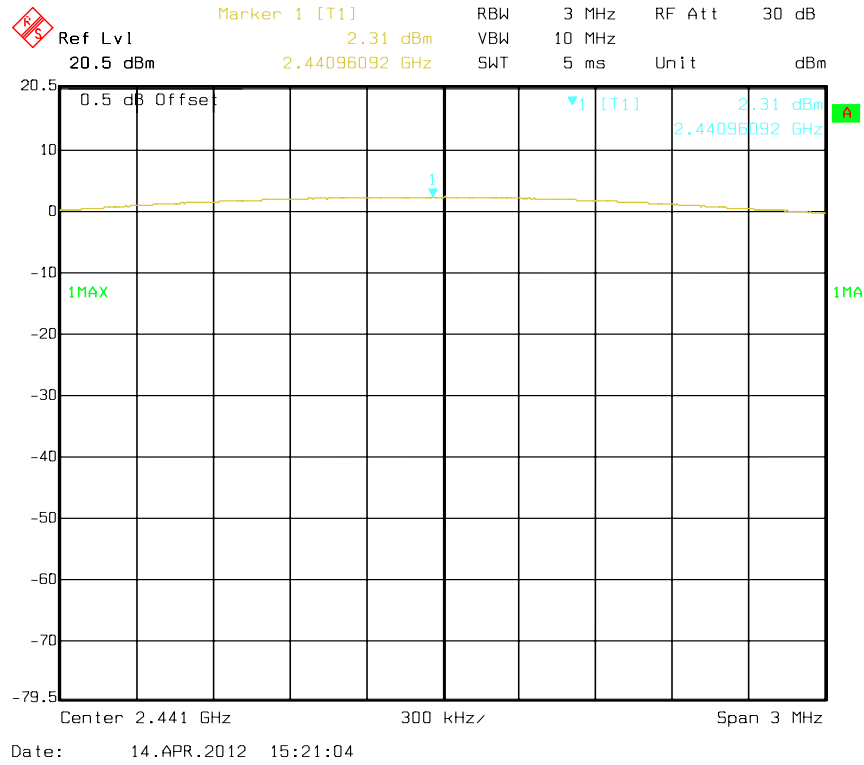
BDR - High Channel



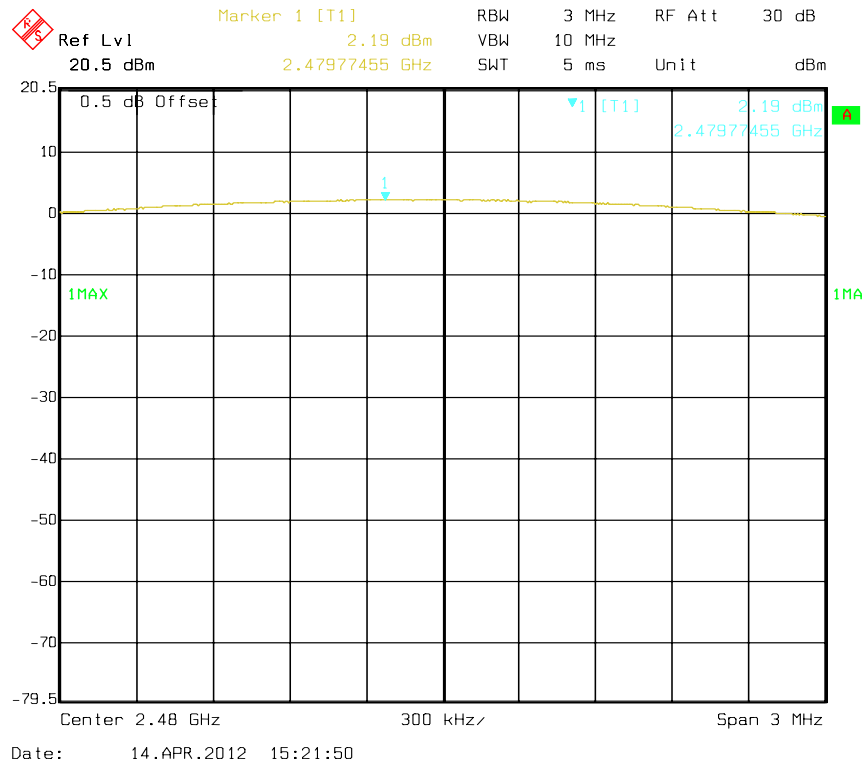
EDR ($\pi/4$ -DQPSK) - Low Channel**EDR ($\pi/4$ -DQPSK) - Middle Channel**

EDR ($\pi/4$ -DQPSK) - High Channel**EDR (8DPSK) - Low Channel**

EDR (8DPSK) - Middle Channel



EDR (8DPSK) - High Channel



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 both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

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

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

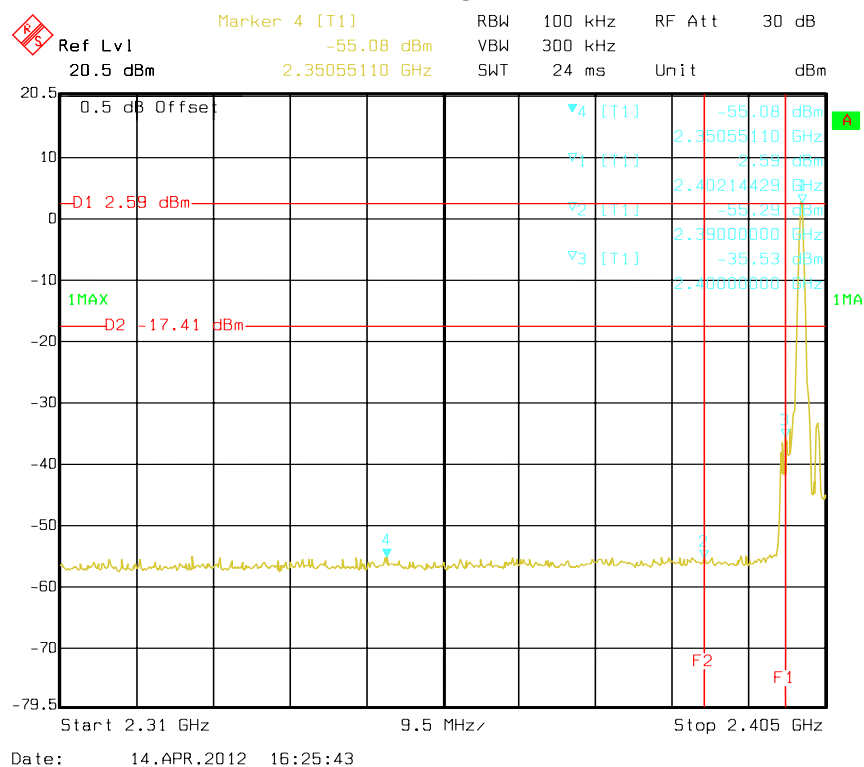
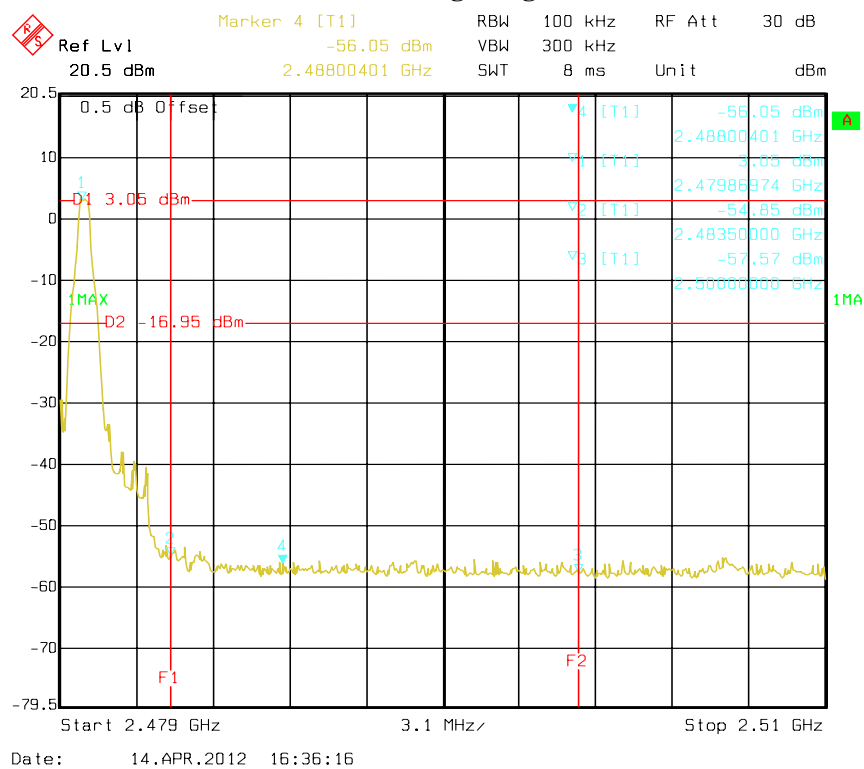
Test Data

Environmental Conditions

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

*The testing was performed by Dean Liu on 2012-04-14.

Test Result: Compliance

BDR: Band Edge, Left Side**BDR: Band Edge, Right Side**

Ref Lvl 0.74 dBm RBW 100 kHz RF Att 30 dB
 20.5 dBm 2.40214429 GHz VBW 300 kHz Unit dBm
 0.5 dB Offset

▼1 [T1] 0.74 dBm
 2.40214429 GHz
 ▼2 [T1] -55.94 dBm
 2.39000000 GHz
 ▼3 [T1] -42.34 dBm
 2.40000000 GHz
 ▼4 [T1] -55.67 dBm
 2.36191335 GHz

D1 0.74 dBm
 D2 -19.26 dBm

1MAX

Start 2.31 GHz 9.5 MHz/ Stop 2.405 GHz

Date: 14.APR.2012 16:27:57

Ref Lvl 0.5 dB Offset: -55.91 dBm RBW 100 kHz RF Att 30 dB
 20.5 dBm 2.48868737 GHz VBW 300 kHz Unit dBm
 0.5 dB Offset: -55.91 dBm 2.48868737 GHz
 1MAX 1.07 dBm 2.47999999 GHz
 D1 1.07 dBm 2.48350000 GHz
 D2 -18.93 dBm 2.50000000 GHz
 F1 F2
 Start 2.479 GHz 3.1 MHz/ Stop 2.51 GHz
 Date: 14.APR.2012 16:34:48

RBW 100 kHz RF Att 30 dB
 VBW 300 kHz
 SWT 24 ms Unit dBm

Ref Lvl 20.5 dBm
 Marker 4 [T1] -55.30 dBm
 2.35873747 GHz

0.5 dB Offset
 D1 0.73 dBm
 D2 -19.27 dBm
 1MAX

4 [T1] -55.30 dBm
 2.35873747 GHz
 1 [T1] -58.73 dBm
 2.40214429 GHz
 2 [T1] -58.84 dBm
 2.39000000 GHz
 3 [T1] -42.10 dBm
 2.40000000 GHz

F2
 F1

Start 2.31 GHz 9.5 MHz/ Stop 2.405 GHz

Date: 14.APR.2012 16:29:25

RBW 100 kHz RF Att 30 dB
 VBW 300 kHz
 SWT 8 ms Unit dBm
 Marker 4 [T1] -54.50 dBm 2.48427655 GHz
 Ref Lvl 20.5 dBm 0.5 dB Offset
 D1 1.04 dBm
 D2 -18.96 dBm
 F1 F2
 Start 2.479 GHz 3.1 MHz/ Stop 2.51 GHz
 Date: 14.APR.2012 16:33:13

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