



FCC PART 15.247

TEST REPORT

For

Rambo Industrial Limited

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FCC ID: AJE-BTR006

Report Type: Original Report	Product Type: Bluetooth Receiver
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Report Number: R1DG111227001-00	
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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 *Rambo Industrial Limited*'s product, model number: *BTR006 (FCC ID: AJE-BTR006)* (the "EUT") in this report is a *Bluetooth Receiver*, which was measured approximately: 4.5 cm (L) x 3.3 cm (W) x 0.8 cm (H), rated input voltage: DC 3.7 V built-in rechargeable battery.

** All measurement and test data in this report was gathered from production sample serial number: 1106039 (Assigned by BACL, Shenzhen). The EUT was received on 2011-12-27.*

Objective

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

Related Submittal(s)/Grant(s)

No related submittal(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.

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 system was configured for testing in an engineering mode which was controlled by the bluetooth tester.

EUT Exercise Software

Exercise Software “Bluetest 3”

Equipment Modifications

No modification was made to the EUT tested.

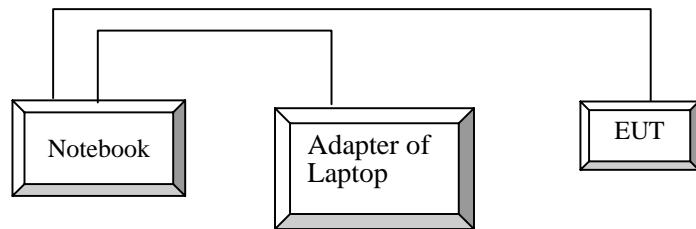
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Notebook	PP05L	N/A
TESCOM	Bluetooth Tester	TC-3000B	3000B650083

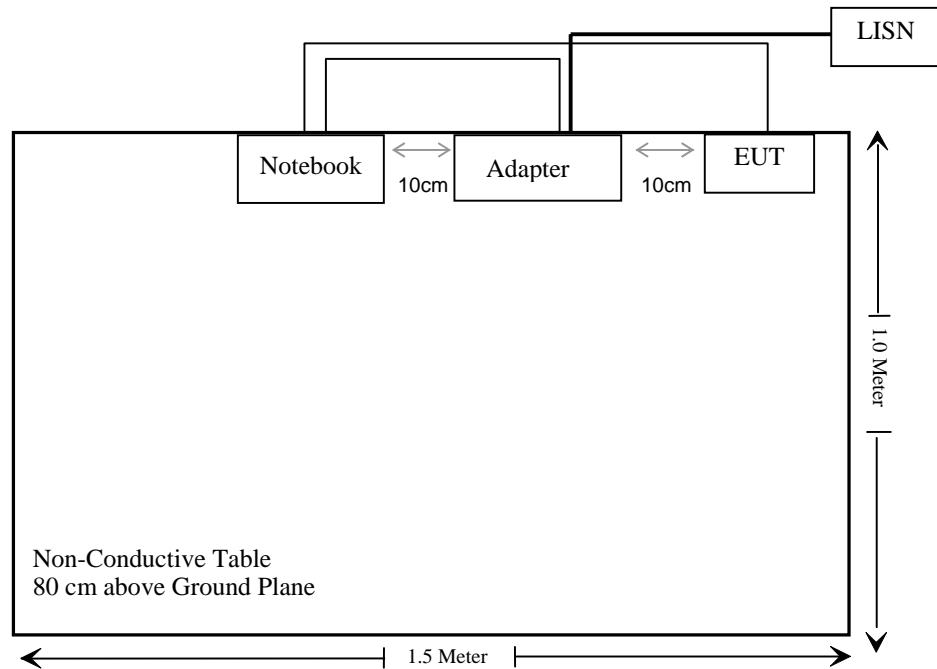
External I/O Cable

Cable Description	Length (m)	From Port	To
USB Charging Cable	1.0	EUT	Notebook

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247(i), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	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	$(60/f_{GHz})$ mW, $d < 2.5$ cm $(120/f_{GHz})$ mW, $d \geq 2.5$ cm	$(900/f_{GHz})$ mW, $d < 20$ cm
occupational	$(375/f_{GHz})$ mW, $d < 2.5$ cm $(900/f_{GHz})$ mW, $d \geq 2.5$ cm	$(2250/f_{GHz})$ mW, $d < 20$ 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:

Maximum antenna gain:0dBi

Maximum output power:

GFSK: 1.75 dBm= 1.50mW

$\pi/4$ -DQPSK: 1.14dBm=1.30mW

8DPSK: 1.23dBm= 1.33mW

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

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

So the SAR measurement is not necessary.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to CFR47 § 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 printed antenna on PCB, which in accordance to section 15.203; the antenna gain is 0 dBi, please refer to the internal photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

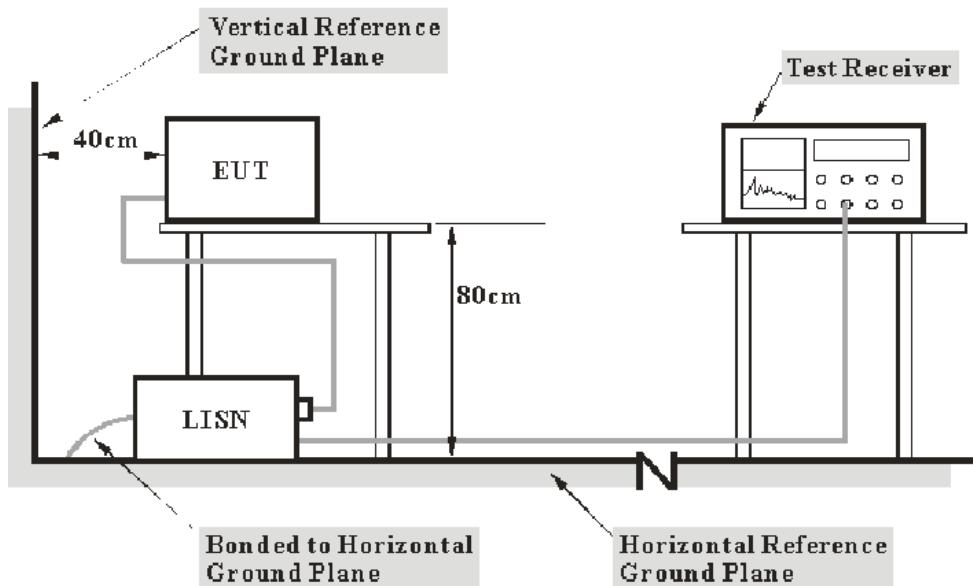
FCC §15.207

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 CISPR 16-4-4, 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 spacing between the peripherals was 10 cm.

The adapter of 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:

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

Test Procedure

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

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2011-03-03	2012-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-03-09	2012-03-08

* **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 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:

10.31 dB at 1.605 MHz in the Neutral conducted mode

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	48 %
ATM Pressure:	100.0kPa

* The testing was performed by Ivan Cao on 2011-12-30.

Test Mode: Charging&Transmitting

AC 120V/60 Hz, Line



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Corrected Result (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Remark (PK/ QP/Ave.)
1.520	44.93	10.10	56.00	11.07	QP
1.520	34.07	10.10	46.00	11.93	Ave.
22.600	38.07	10.10	50.00	11.93	Ave.
0.200	40.70	10.10	54.57	13.87	Ave.
1.720	31.03	10.10	46.00	14.97	Ave.
1.725	40.96	10.10	56.00	15.04	QP
22.605	40.55	10.10	60.00	19.45	QP
0.200	44.87	10.10	64.57	19.70	QP
8.040	29.09	10.10	50.00	20.91	Ave.
8.025	35.17	10.10	60.00	24.83	QP
0.325	28.11	10.10	61.00	32.89	QP
0.325	17.55	10.10	51.00	33.45	Ave.

AC 120V/60 Hz, Neutral



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Corrected Result (dB μ V)	Correction Factor (dB)	Limit (dB μ V)	Margin (dB)	Remark (PK/ QP/Ave.)
1.605	35.69	10.10	46.00	10.31	Ave.
22.545	39.60	10.10	50.00	10.40	Ave.
1.590	45.54	10.10	56.00	10.46	QP
1.725	42.86	10.10	56.00	13.14	QP
8.015	35.61	10.10	50.00	14.39	Ave.
1.725	31.46	10.10	46.00	14.54	Ave.
0.195	38.14	10.10	54.71	16.57	Ave.
22.545	39.63	10.10	60.00	20.37	QP
8.015	38.25	10.10	60.00	21.75	QP
0.195	42.74	10.10	64.71	21.97	QP
0.340	28.47	10.10	60.57	32.10	QP
0.340	17.75	10.10	50.57	32.82	Ave.

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

Applicable Standard

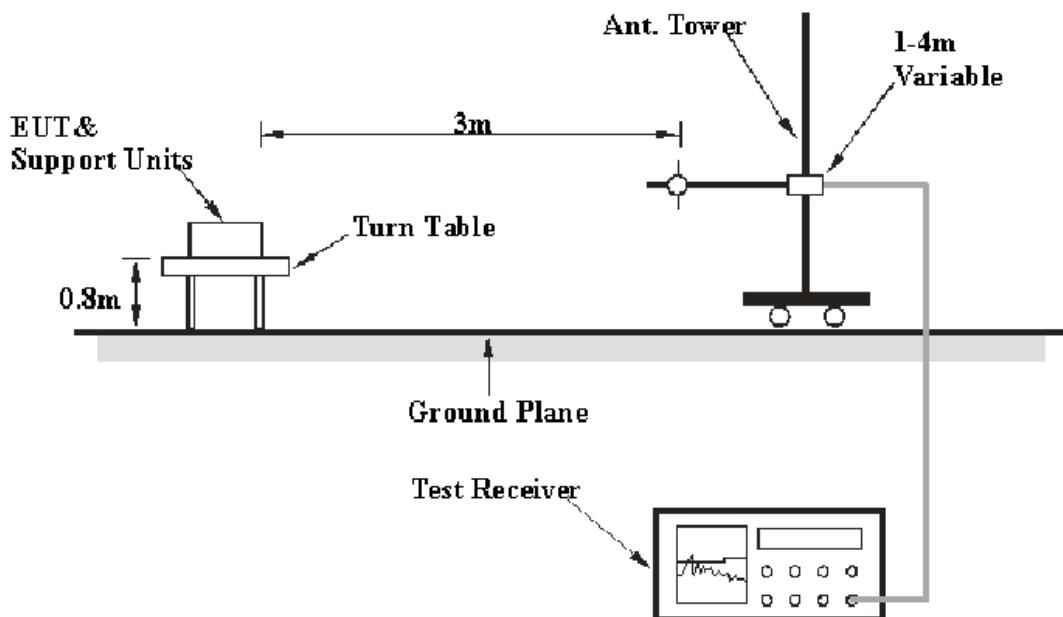
FCC §15.247 (d); §15.209; §15.205;

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 CISPR 16-4-4, 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 chamber B 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 spacing between the peripherals was 10 cm.

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	Detector
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

For the radiated emissions test, the adapter of notebook was connected to the outlet of the LISN

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.

Corrected Amplitude & Margin Calculation

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

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

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-08-02	2012-08-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-07-05	2012-07-04
Mini-Circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-04	2012-05-03
Electro-Mechanics	Horn Antenna	3116	9510-2270	2011-10-11	2012-10-10
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

*** 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 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:

1.27 dB at 4959.98 MHz in the **Horizontal** polarization

Test Data

Environmental Conditions

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

The testing was performed by Ivan Cao on 2011-12-28.

1) 30 MHz-25 GHz (BDR Mode was the worst case)

Comment	Frequency (MHz)	Reading (dB μ V/m)	Detector (PK/QP/Ave)	Polar (H / V)	Corrected Amplitude (dB)	Correction Data (dB μ V/m)	FCC Part 15.247/15.209/15.205	
							Limit (dB μ V/m)	Margin (dB)
Low Channel (2402 MHz)								
Fundamental	2402	61.46	PK	H	31.75	93.21	/	/
Fundamental	2402	46.4	Ave.	H	31.75	78.15	/	/
Fundamental	2402	55.73	PK	V	31.75	87.48	/	/
Fundamental	2402	42.83	Ave.	V	31.75	74.58	/	/
spurious	400.99	44.19	QP	H	-9.9	34.29	46	7.9
spurious	400.99	48	QP	V	-9.9	38.1	46	7.9
spurious	1602.04	41.94	Ave.	H	2.81	44.75	54	9.25
harmonic	4803.93	29.14	Ave.	H	11.55	40.69	54	13.31
spurious	1602.02	36.68	Ave.	V	3.11	39.79	54	14.21
harmonic	4804.05	27.68	Ave.	V	11.35	39.03	54	14.97
harmonic	4803.93	44.2	PK	H	11.55	55.75	74	18.25
harmonic	4804.05	42.1	PK	V	11.35	53.45	74	20.55
spurious	1602.04	44.82	PK	H	2.81	47.63	74	26.37
spurious	1602.02	41.2	PK	V	3.11	44.31	74	29.69
Middle Channel (2441 MHz)								
Fundamental	2441	62.11	PK	H	32.01	94.12	/	/
Fundamental	2441	47.18	Ave.	H	32.01	79.19	/	/
Fundamental	2441	56.74	PK	V	32.01	88.75	/	/
Fundamental	2441	43.88	Ave.	V	32.01	75.89	/	/
spurious	400.99	44.05	QP	H	-9.9	34.15	46	7.9
spurious	400.99	47.78	QP	V	-9.9	37.88	46	7.9
harmonic	4881.98	34.32	Ave.	H	11.61	45.93	54	8.07
spurious	1626.43	39.23	Ave.	H	2.81	42.04	54	11.96
harmonic	4881.96	29.79	Ave.	V	11.41	41.2	54	12.8
spurious	1626.59	37.54	Ave.	V	3.11	40.65	54	13.35
harmonic	4881.98	47.46	PK	H	11.61	59.07	74	14.93
harmonic	4881.96	42.58	PK	V	11.41	53.99	74	20.01
spurious	1626.43	43.12	PK	H	2.81	45.93	74	28.07
spurious	1626.59	41.8	PK	V	3.11	44.91	74	29.09
High Channel (2480 MHz)								
Fundamental	2480	60.17	PK	H	32.27	92.44	/	/
Fundamental	2480	44.31	Ave.	H	32.27	76.58	/	/
Fundamental	2480	54.71	PK	V	32.27	86.98	/	/
Fundamental	2480	39.84	Ave.	V	32.27	72.11	/	/
harmonic	4959.98	41.08	Ave.	H	11.65	52.73	54	1.27*
harmonic	4.959.83	36.25	Ave.	V	11.45	47.7	54	6.3
spurious	1652.67	43.47	Ave.	H	2.81	46.28	54	7.72
spurious	400.99	43.79	QP	H	-9.9	33.89	46	7.9
spurious	400.99	47.04	QP	V	-9.9	37.14	46	7.9
spurious	1652.73	39.6	Ave.	V	3.11	42.71	54	11.29
harmonic	4959.98	43.13	PK	H	11.65	54.78	74	19.22
harmonic	4.959.83	40.32	PK	V	11.45	51.77	74	22.23
spurious	1652.67	46.45	PK	H	2.81	49.26	74	24.74
spurious	1652.73	42.81	PK	V	3.11	45.92	74	28.08

The data which below the limit 20 dB was not recorded; *within measurement uncertainty;

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 2400-2483.5 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	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10

* **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 trace
3. Measure the channel separation.

Test Data**Environmental Conditions**

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

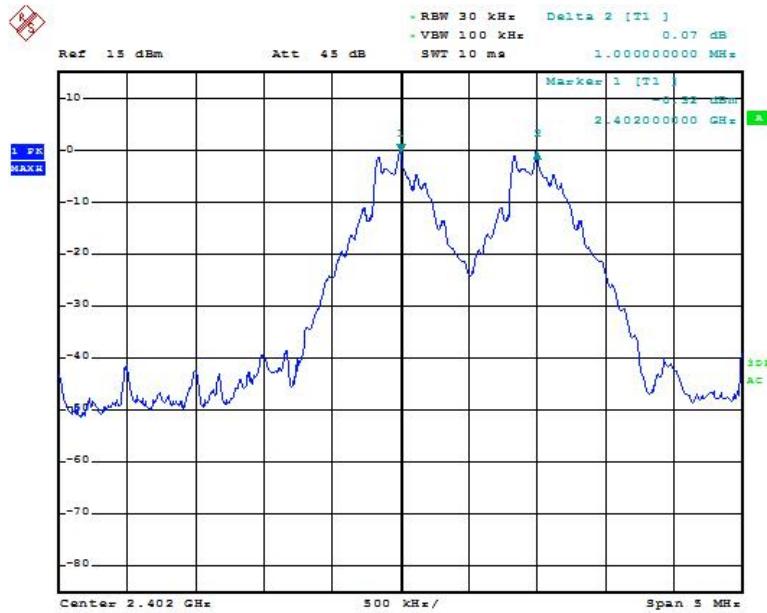
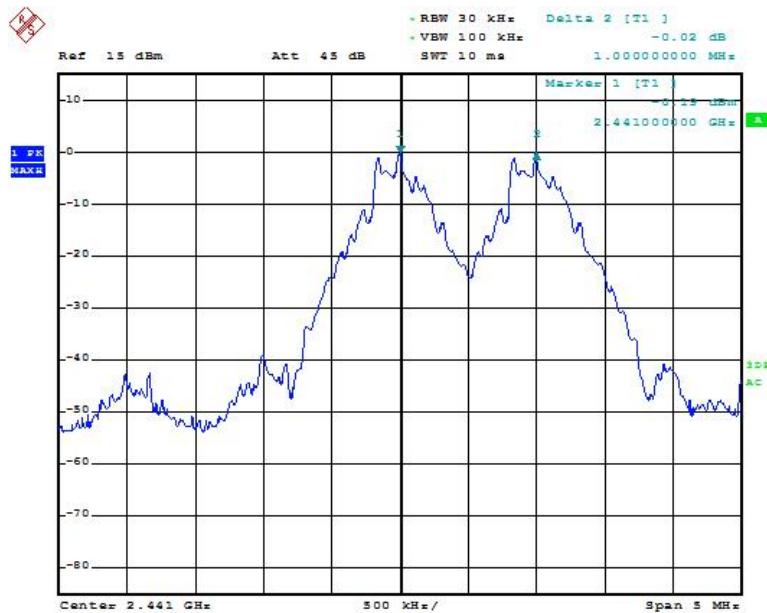
* The testing was performed by Ivan Cao on 2011-12-30.

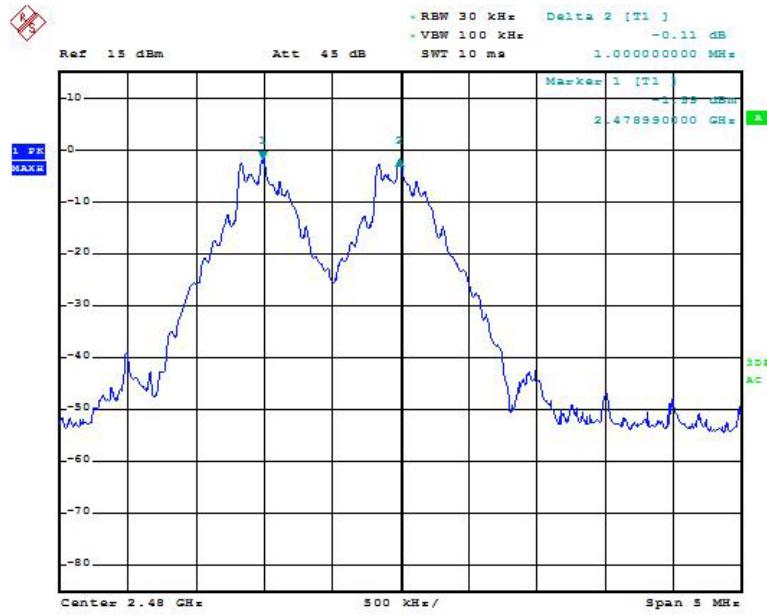
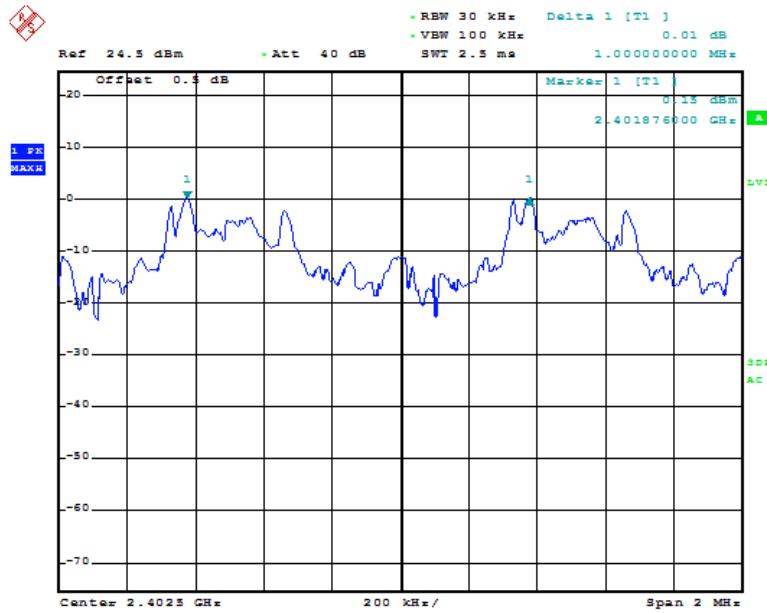
Test Result: Compliance, please refer to following tables and plots

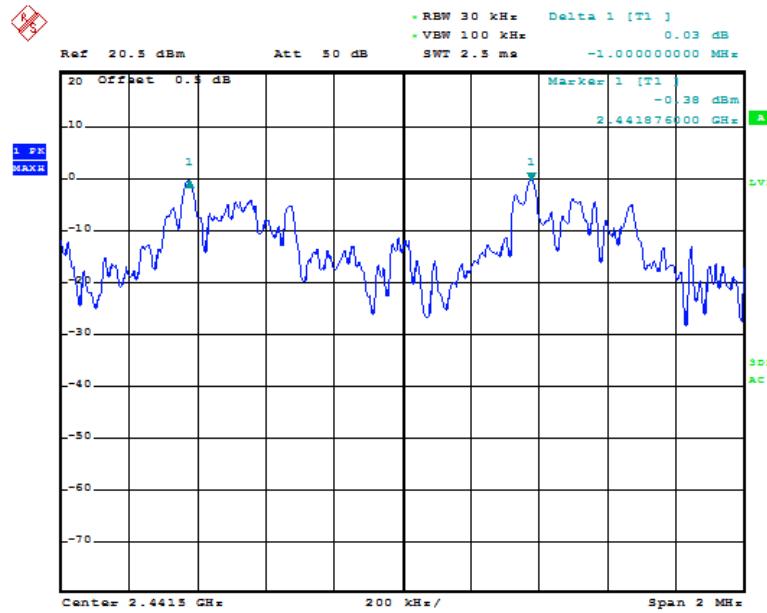
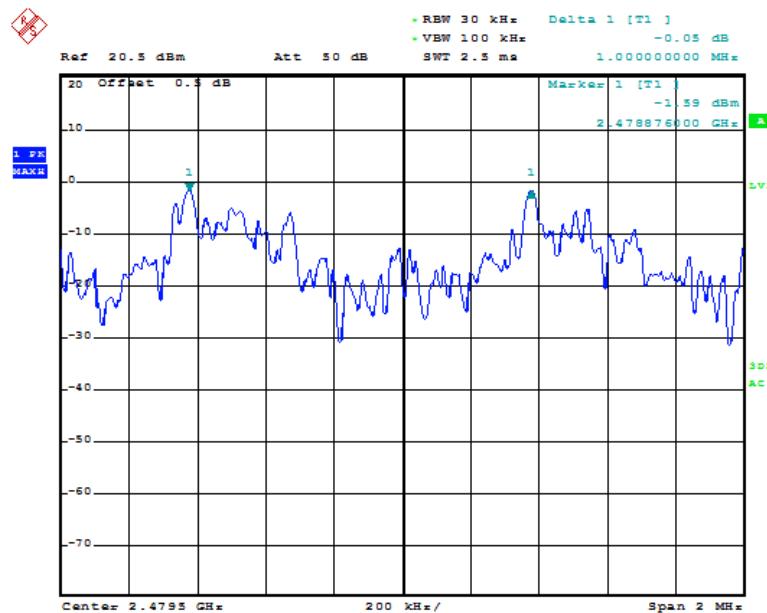
Test Mode: Transmitting

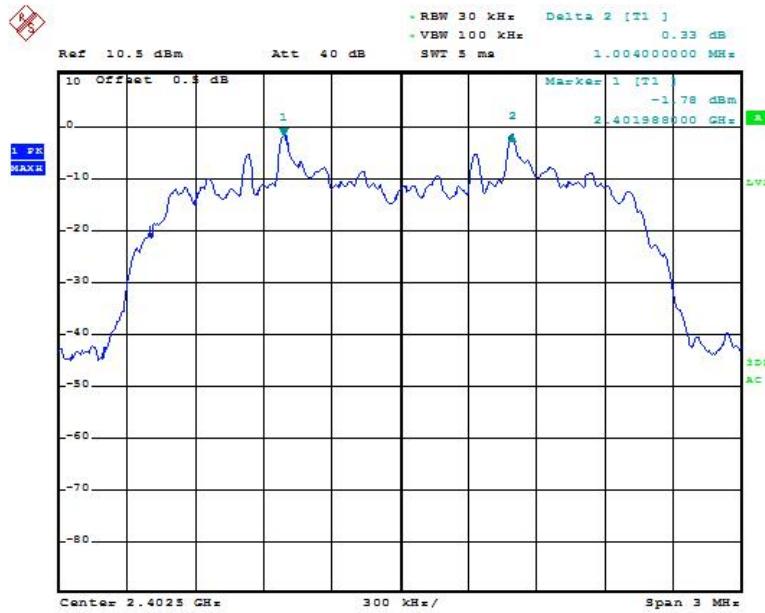
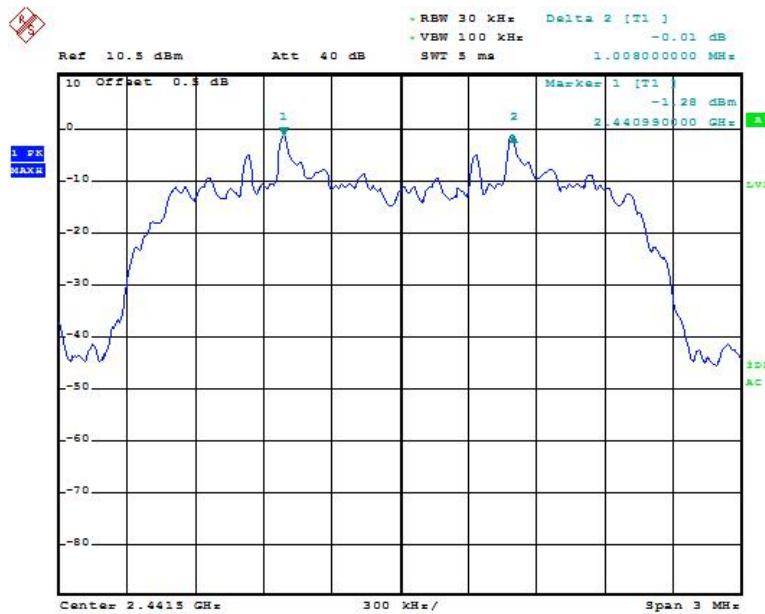
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
BDR	Low	2402	1.000	0.540	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.567	Pass
	Adjacent	2442			
	High	2480	1.000	0.564	Pass
	Adjacent	2479			
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.000	0.75	Pass
	Adjacent	2403			
	Middle	2441	1.000	0.75	Pass
	Adjacent	2442			
	High	2480	1.000	0.75	Pass
	Adjacent	2479			
EDR Mode (8DPSK)	Low	2402	1.004	0.812	Pass
	Adjacent	2403			
	Middle	2441	1.004	0.816	Pass
	Adjacent	2442			
	High	2480	1.008	0.816	Pass
	Adjacent	2479			

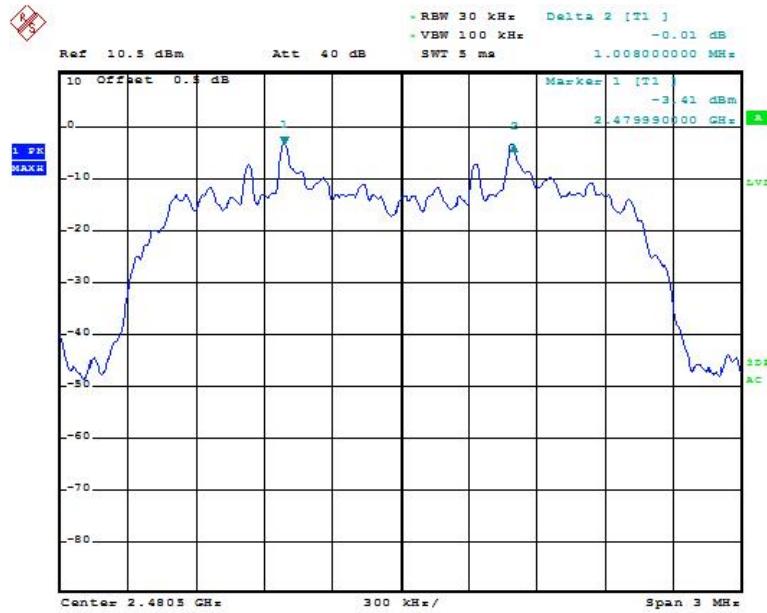
Please refer to the following plots.

BDR:**Low Channel****Middle Channel**

High Channel**EDR Mode (π/4-DQPSK)****Low Channel**

Middle Channel**High Channel**

EDR Mode (8DPSK)**Low Channel****Middle Channel**

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10

* **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. 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 Data

Environmental Conditions

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

* The testing was performed by Ivan Cao from 2011-12-30 to 2012-01-15.

Test Result: Compliance, please refer to following tables and plots

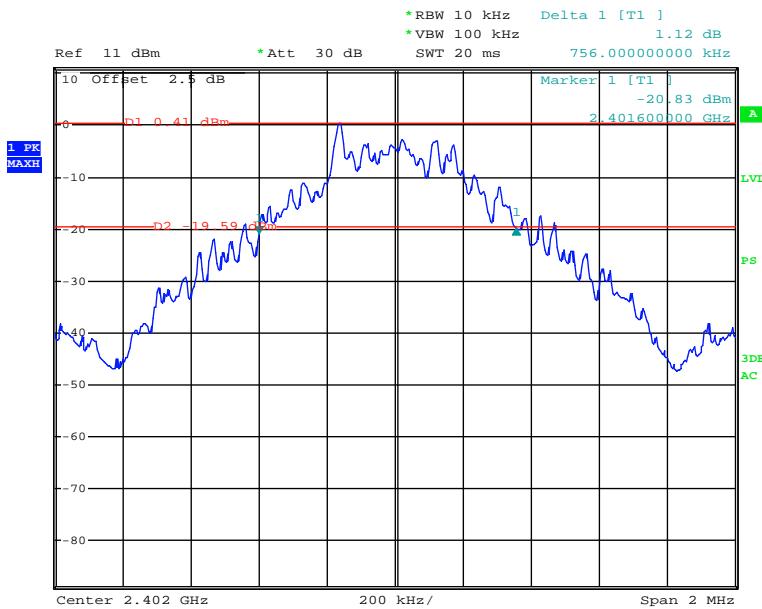
Test Mode: Transmitting

	Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
BDR	Low	2402	0.756
	Middle	2441	0.756
	High	2480	0.756
EDR Mode ($\pi/4$ -DQPSK)	Low	2402	1.12
	Middle	2441	1.124
	High	2480	1.12
EDR Mode (8DPSK)	Low	2402	1.218
	Middle	2441	1.224
	High	2480	1.224

Please refer to the following plots.

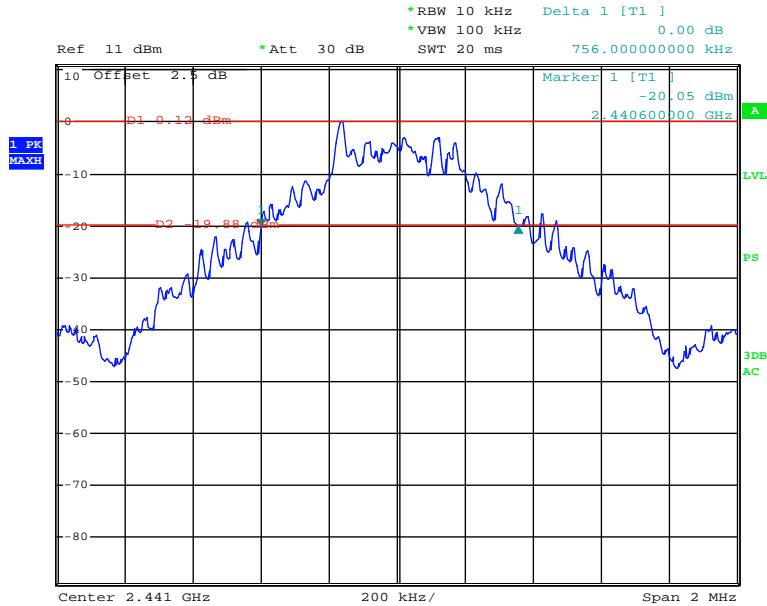
BDR:

Low Channel



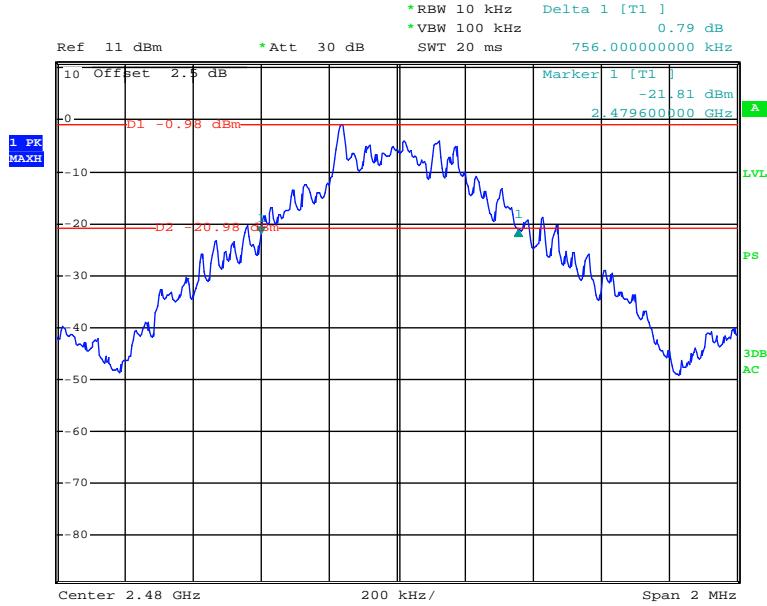
Date: 15.JAN.2012 18:36:27

Middle Channel

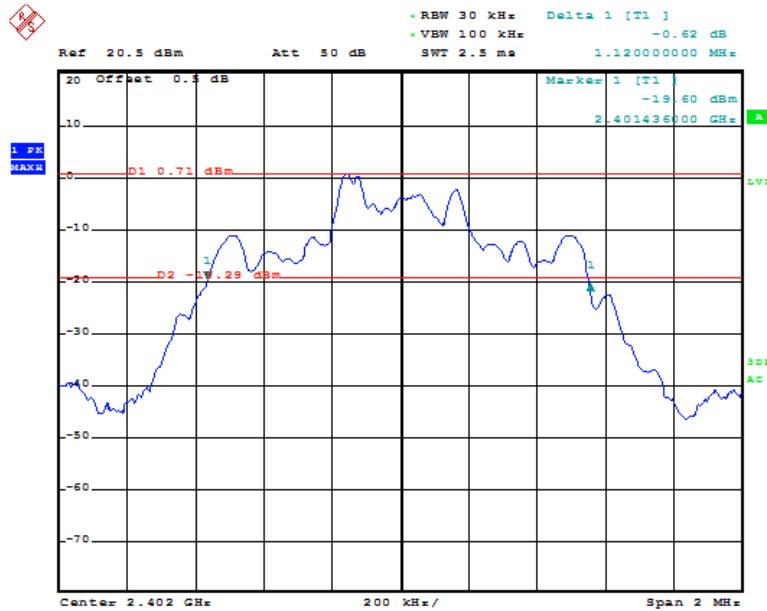
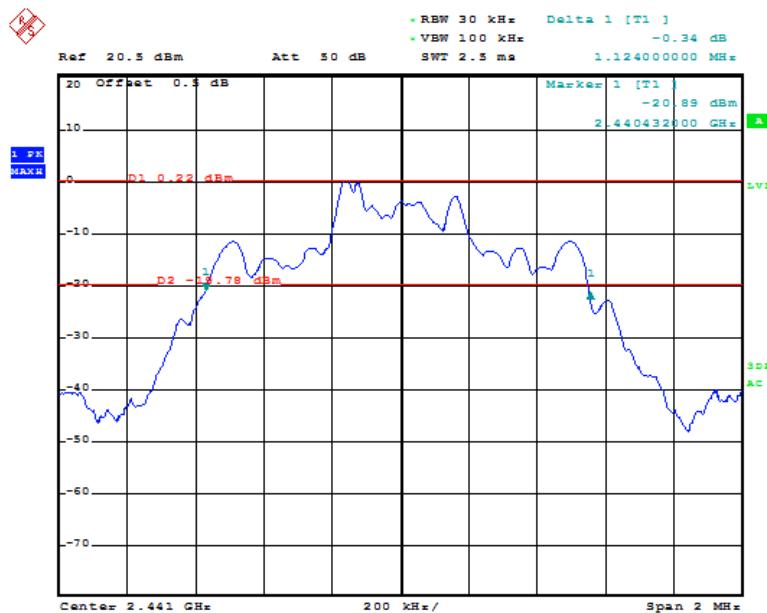


Date: 15.JAN.2012 18:34:32

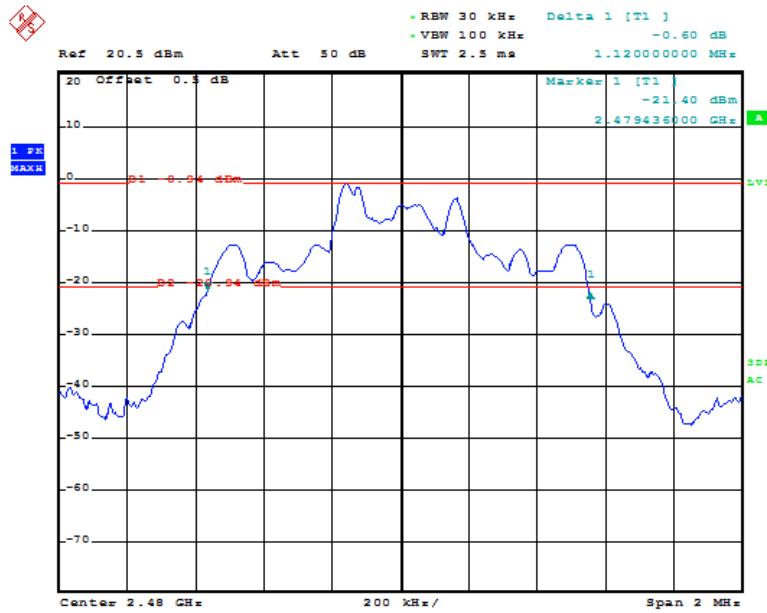
High Channel



Date: 15.JAN.2012 18:37:50

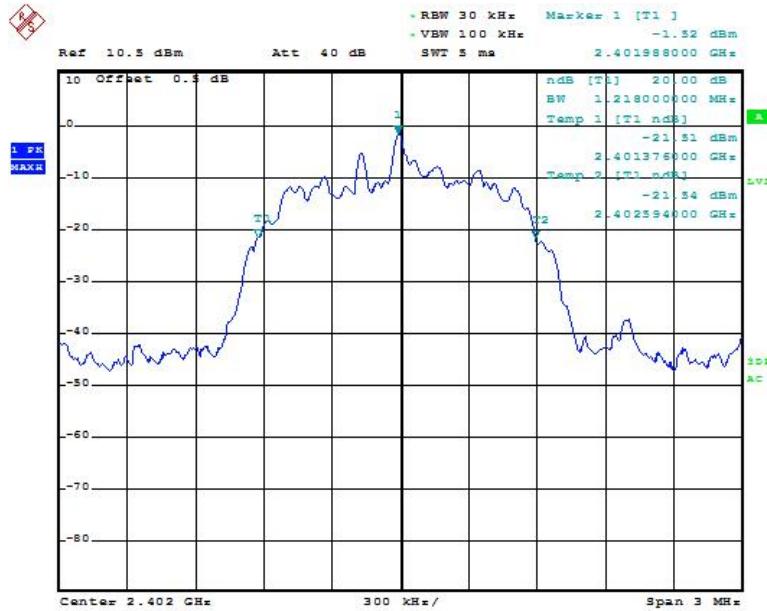
EDR Mode($\pi/4$ -DQPSK):**Low Channel****Middle Channel**

High Channel

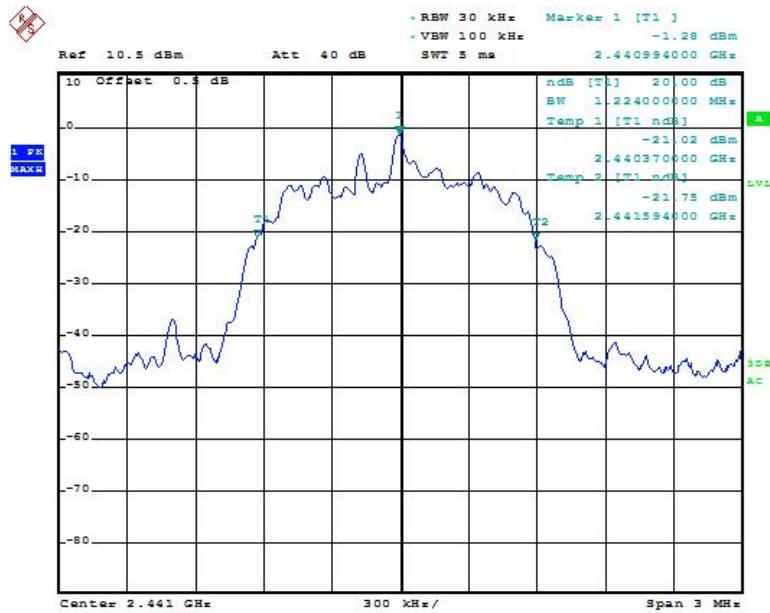


EDR Mode (8DPSK)

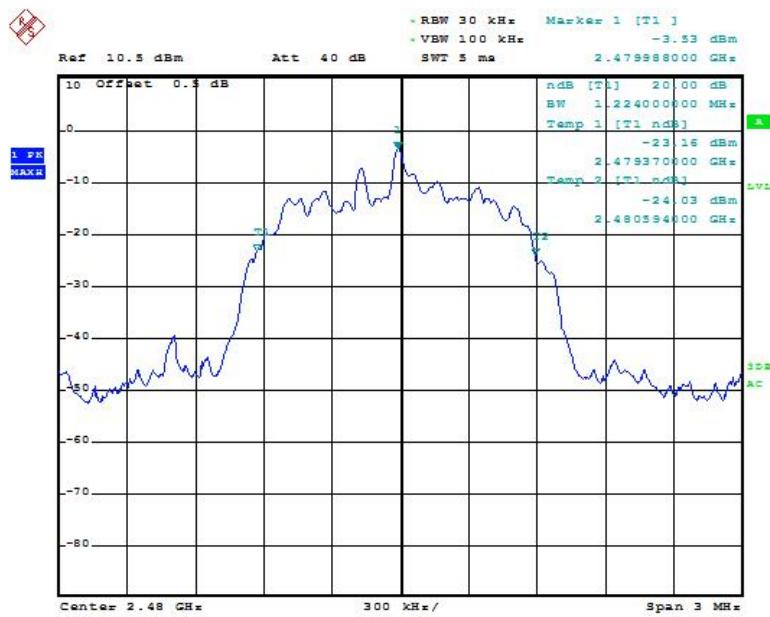
Low Channel



Middle Channel



High Channel



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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10

* **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. 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 Data

Environmental Conditions

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

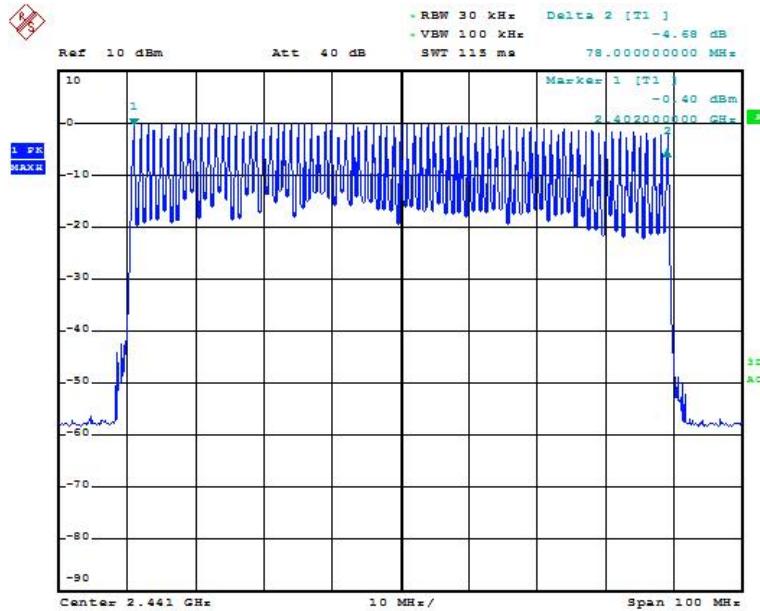
The testing was performed by Ivan Cao from 2011-12-30 to 2012-01-15.

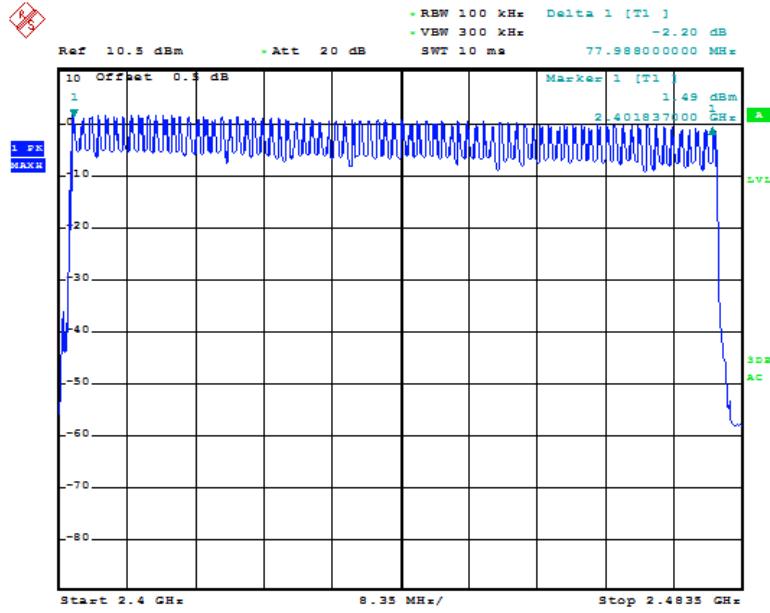
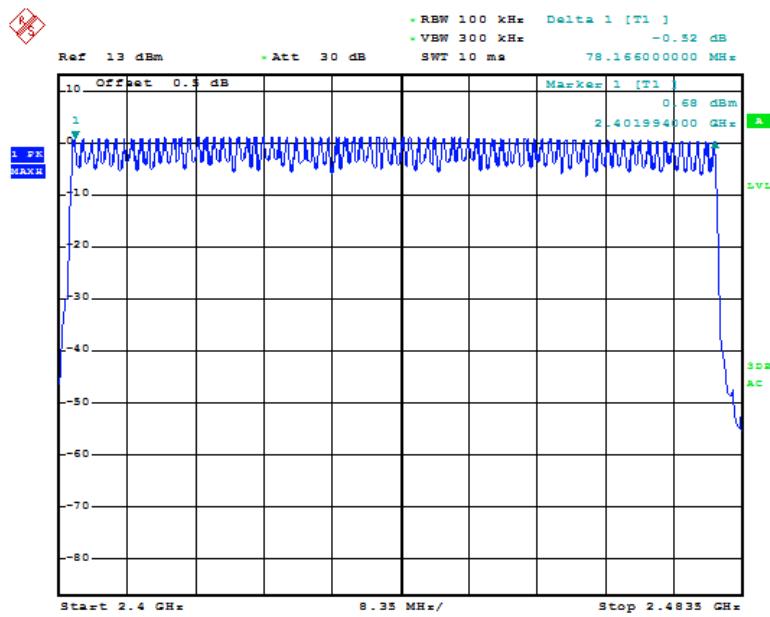
Test Result: Compliance, please refer to following tables and plots

Test Mode: Transmitting

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

Number of Hopping Channels-BDR Mode



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

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10

* **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

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * 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 Data**Environmental Conditions**

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

* The testing was performed by Ivan Cao from 2011-12-30 to 2012-01-15.

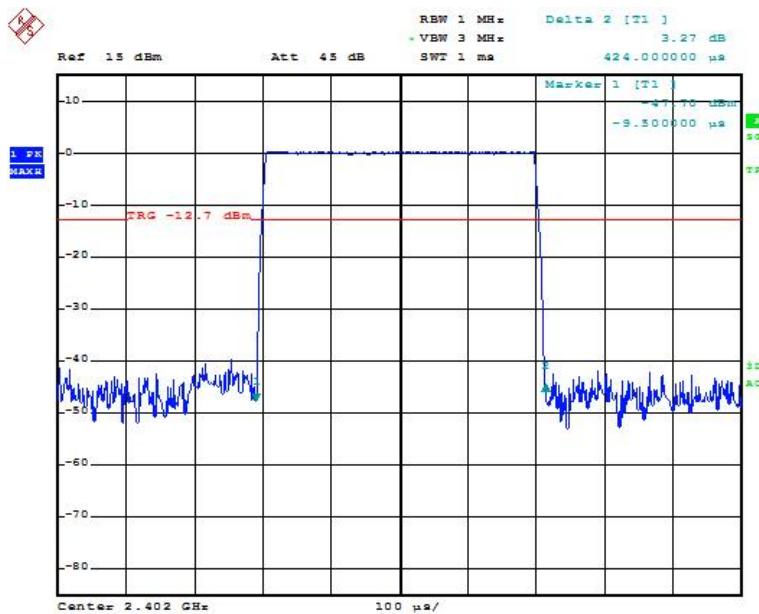
Test Result: Compliance, please refer to following tables and plots

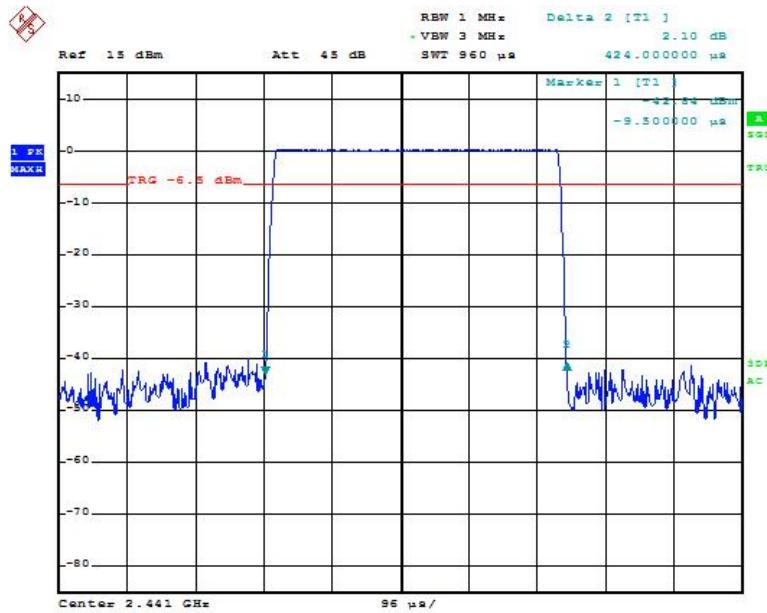
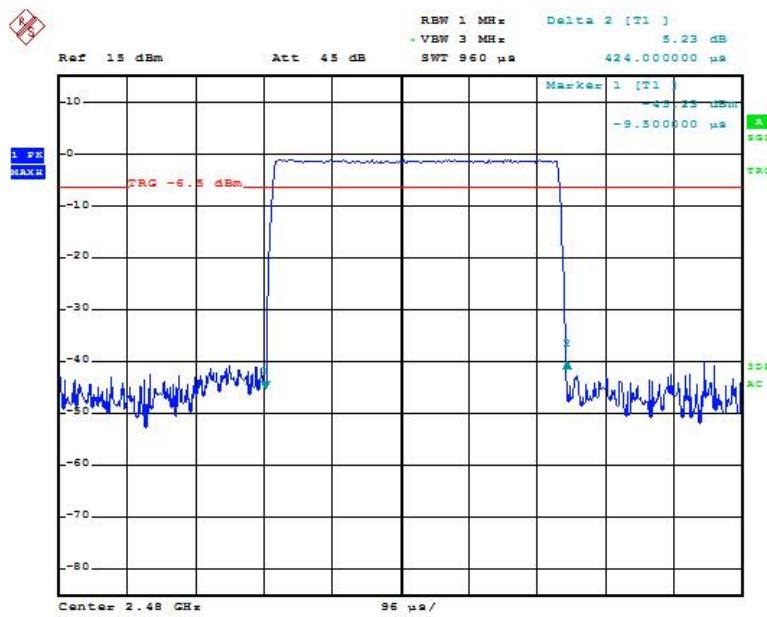
Test Mode: Transmitting (BDR)

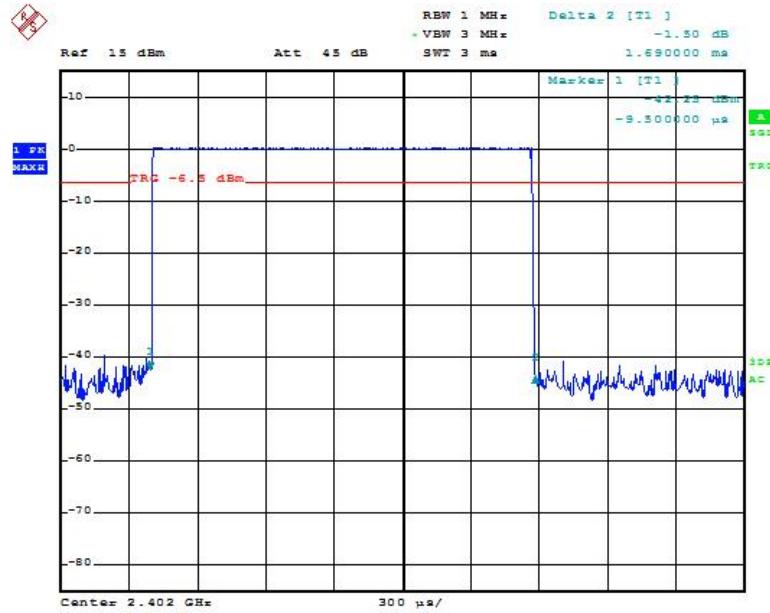
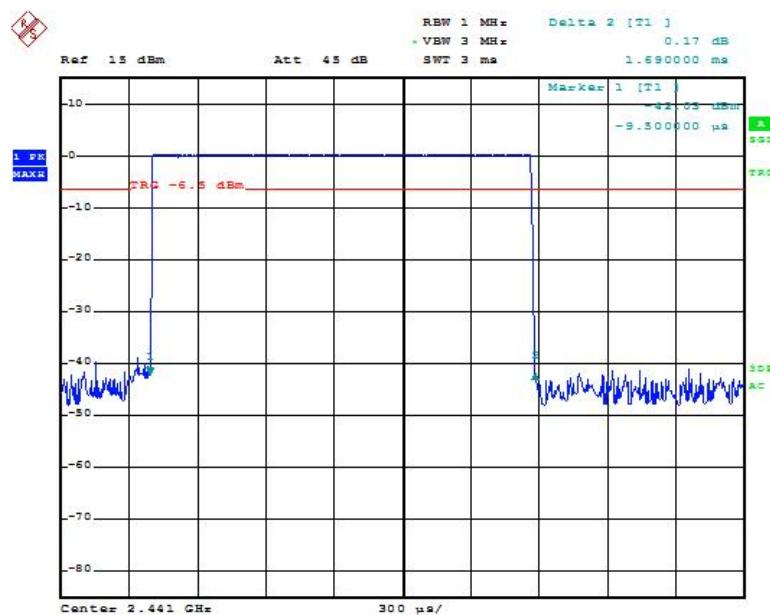
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH 1	Low	0.424	0.136	0.4	Pass
	Middle	0.424	0.136	0.4	Pass
	High	0.424	0.136	0.4	Pass
Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6s					
DH 3	Low	1.69	0.271	0.4	Pass
	Middle	1.69	0.271	0.4	Pass
	High	1.69	0.271	0.4	Pass
Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6s					
DH 5	Low	2.95	0.315	0.4	Pass
	Middle	2.95	0.315	0.4	Pass
	High	2.95	0.315	0.4	Pass
Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6s					

Please refer to the following plots.

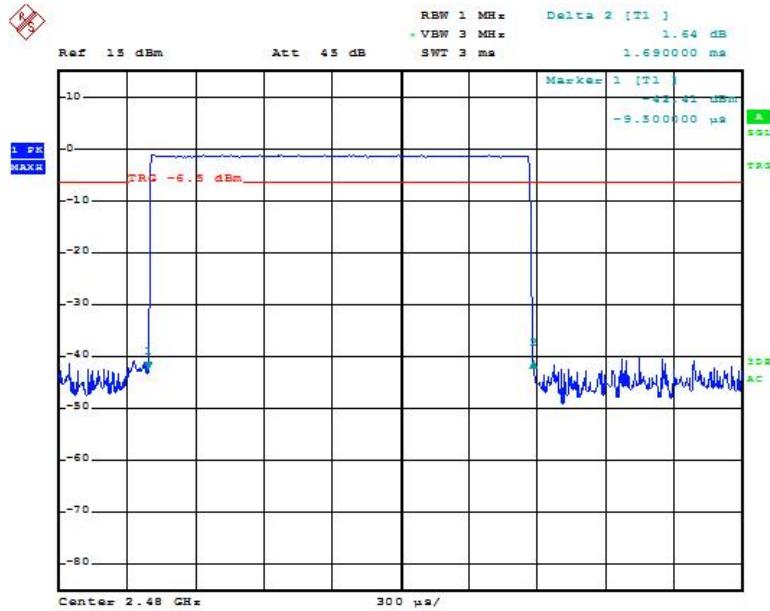
Low Channel for DH1



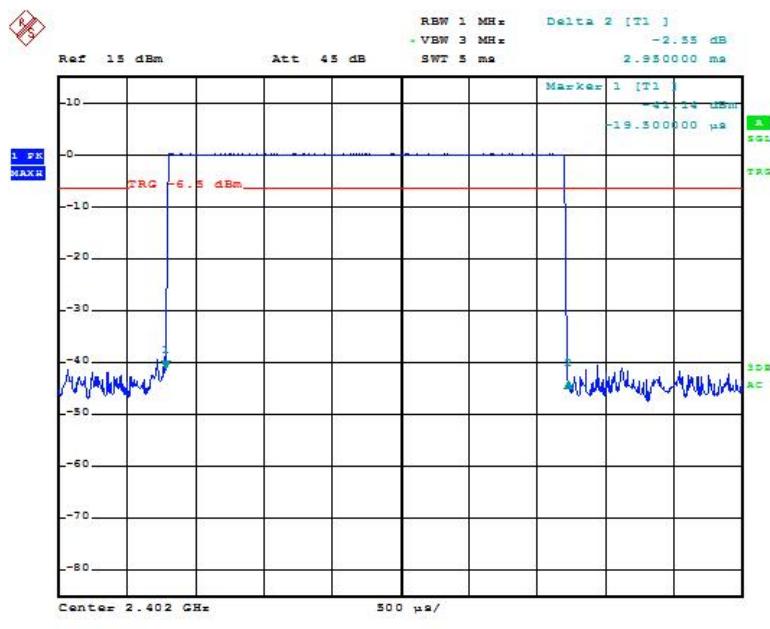
Middle Channel for DH1**High Channel for DH1**

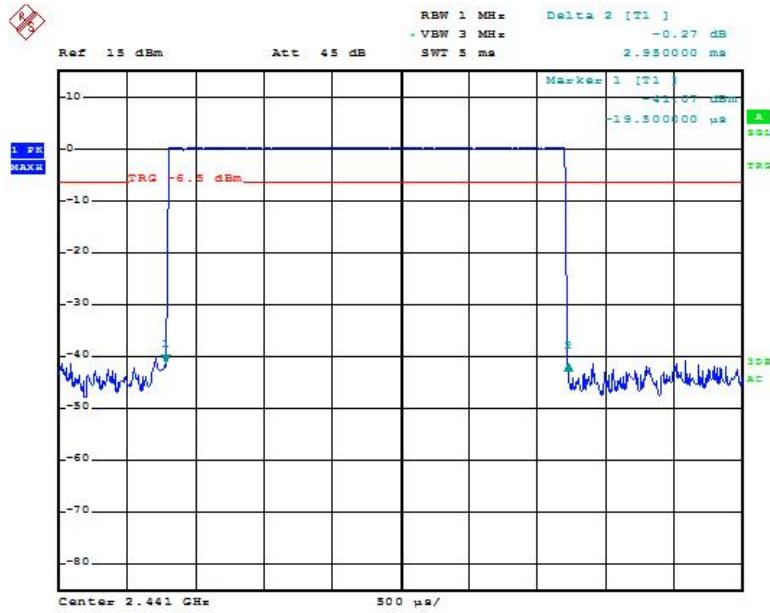
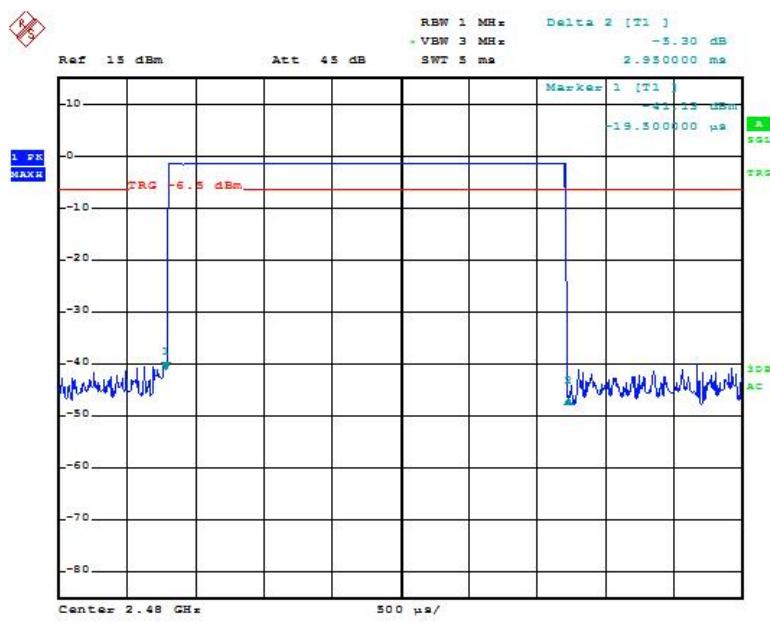
Low Channel for DH3**Middle Channel for DH3**

High Channel for DH3



Low Channel for DH5



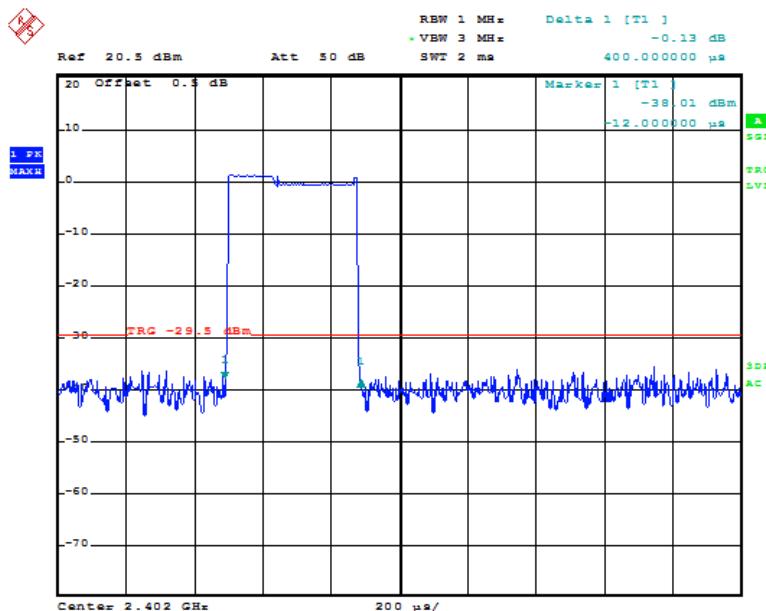
Middle Channel for DH5**High Channel for DH5**

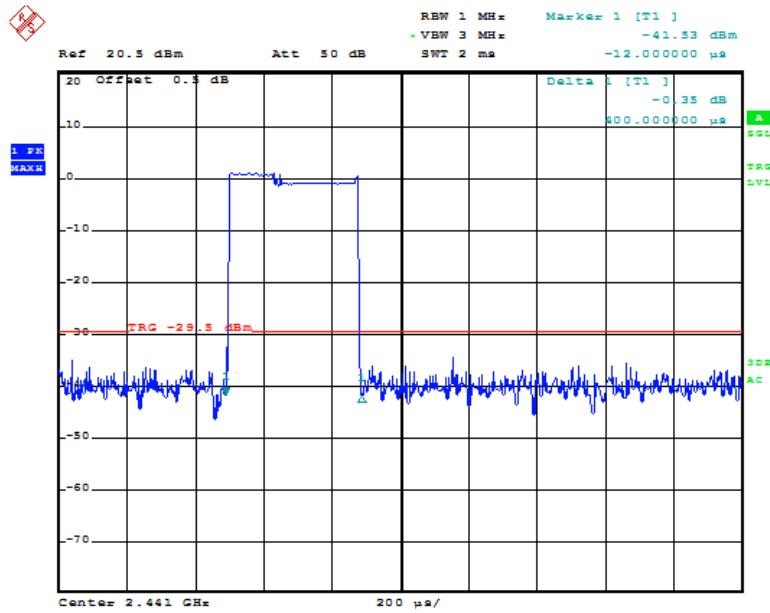
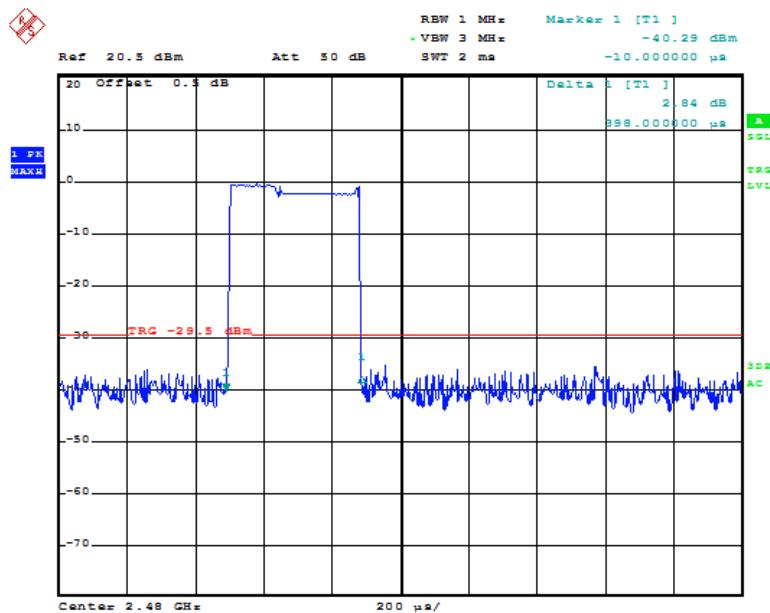
EDR Mode ($\pi/4$ -DQPSK)

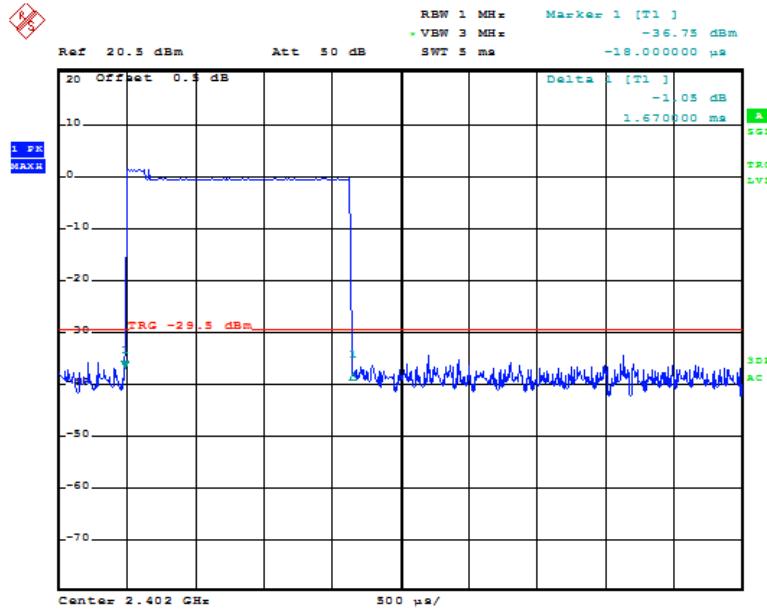
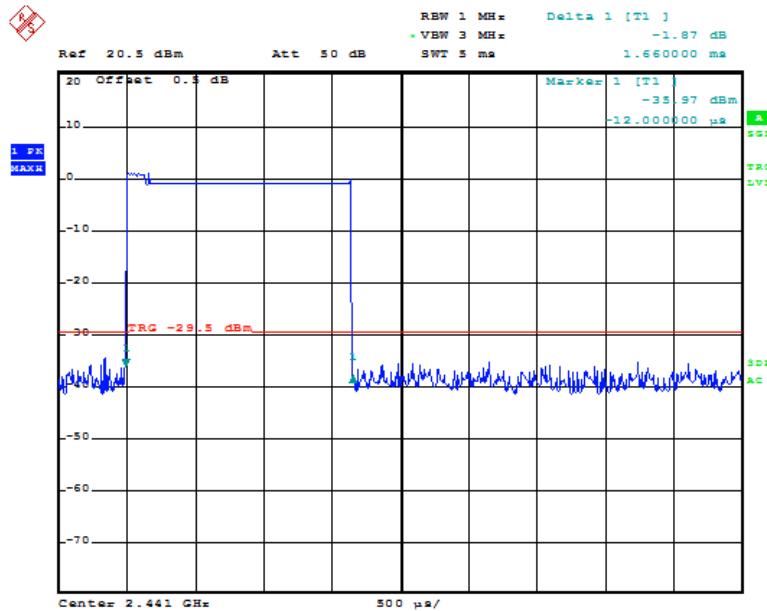
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH 1	Low	0.4	0.128	0.4	Pass
	Middle	0.4	0.128	0.4	Pass
	High	0.398	0.127	0.4	Pass
Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6s					
DH 3	Low	1.67	0.266	0.4	Pass
	Middle	1.66	0.266	0.4	Pass
	High	1.658	0.264	0.4	Pass
Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6s					
DH 5	Low	2.924	0.312	0.4	Pass
	Middle	2.934	0.313	0.4	Pass
	High	2.954	0.315	0.4	Pass
Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6s					

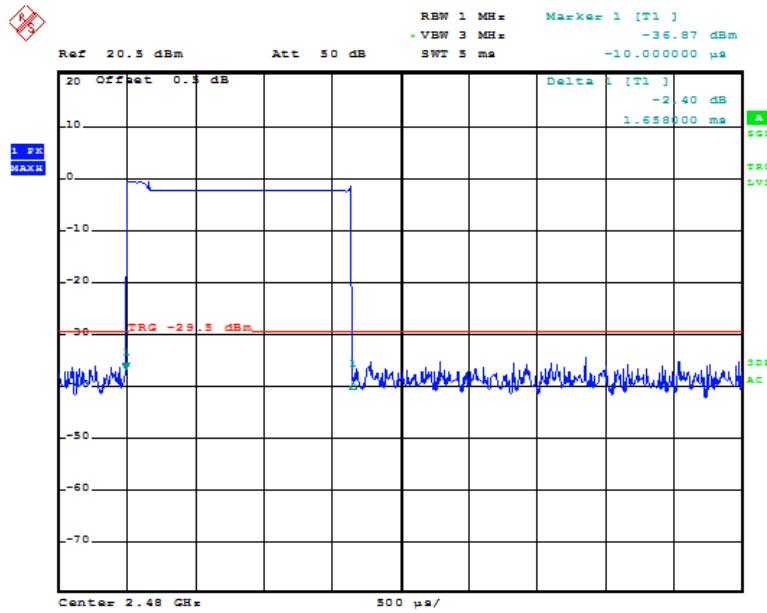
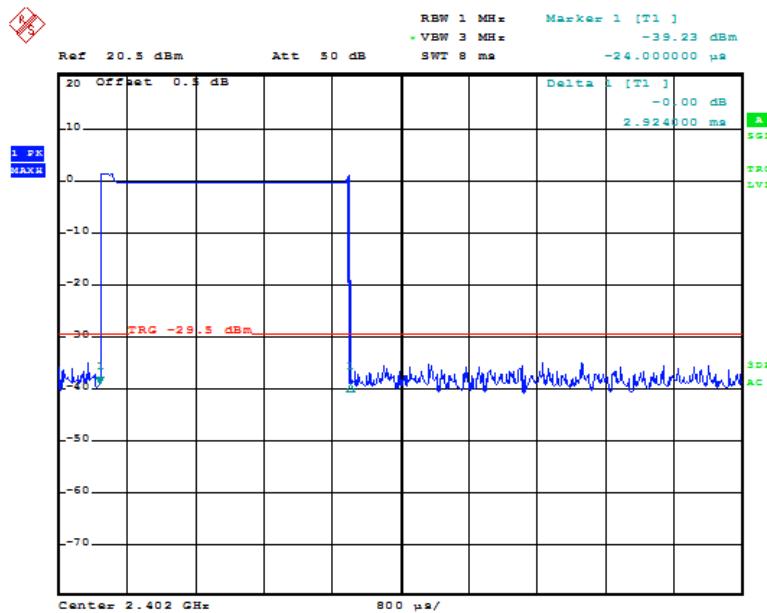
Please refer to the following plots.

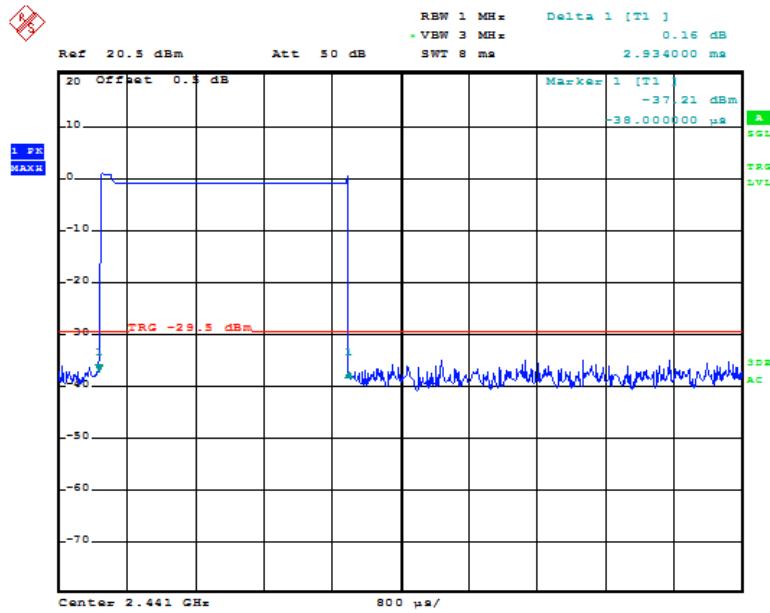
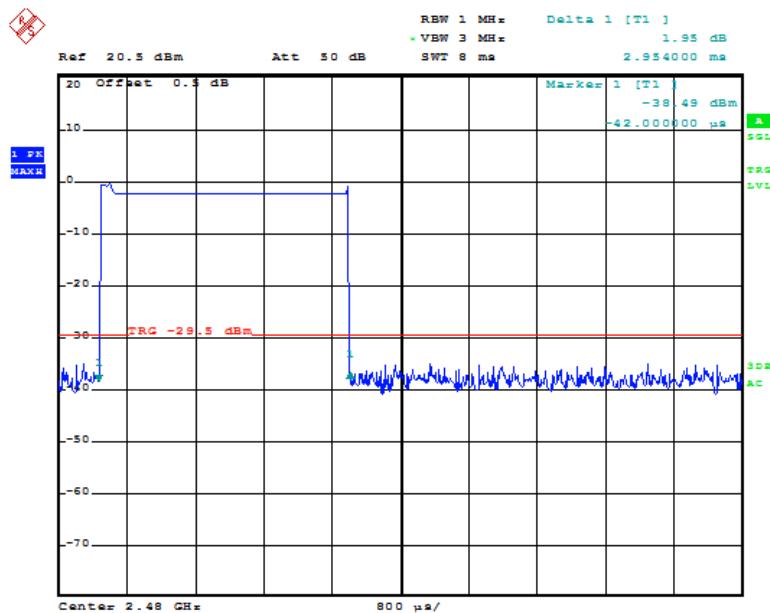
Low Channel for DH1



Middle Channel for DH1**High Channel for DH1**

Low Channel for DH3**Middle Channel for DH3**

High Channel for DH3**Low Channel for DH5**

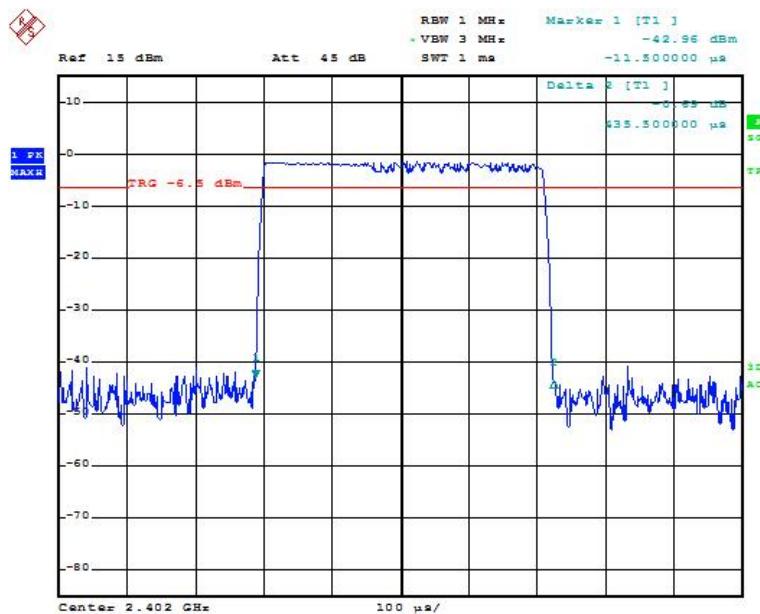
Middle Channel for DH5**High Channel for DH5**

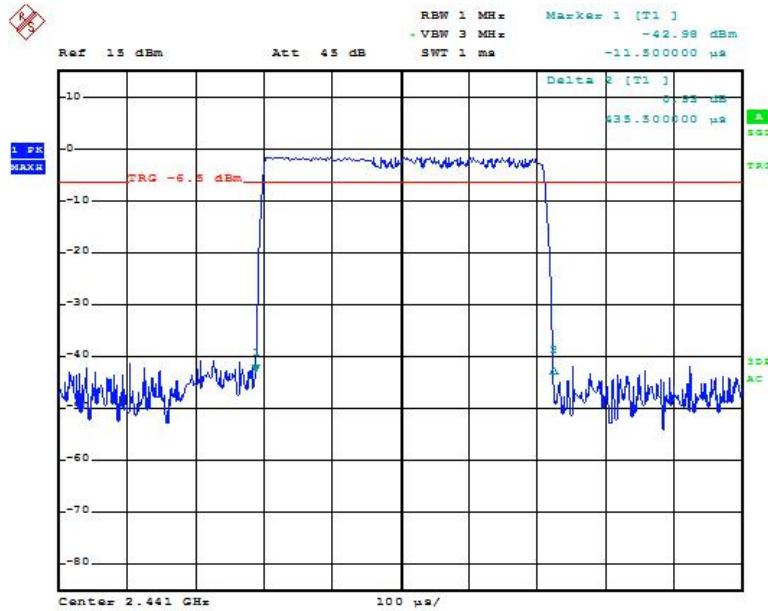
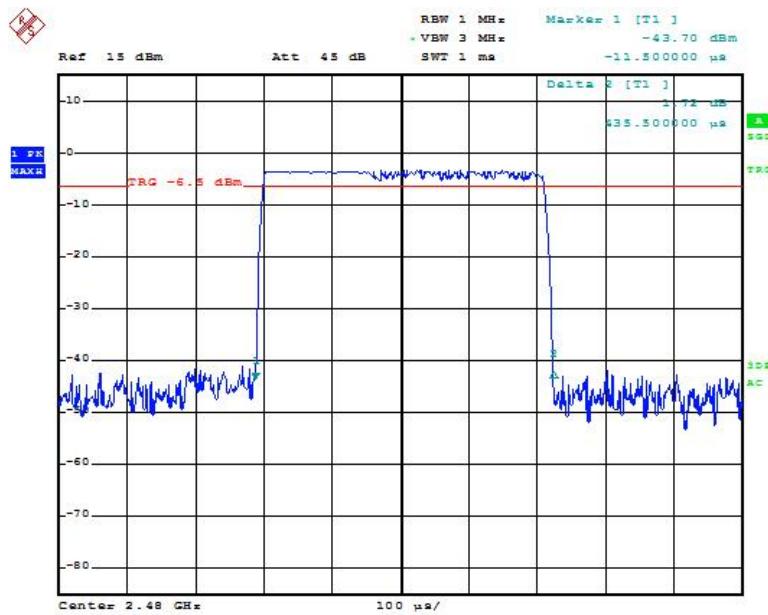
Test Mode: Transmitting- EDR Mode(8DPSK)

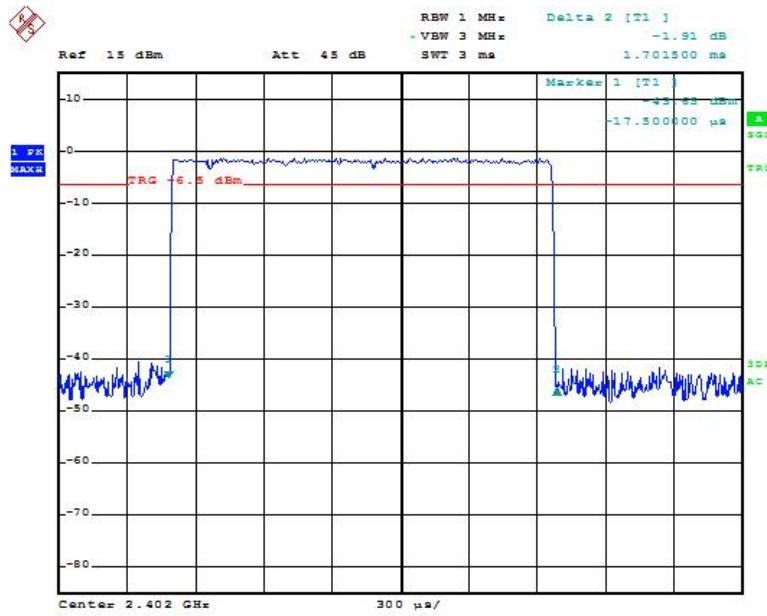
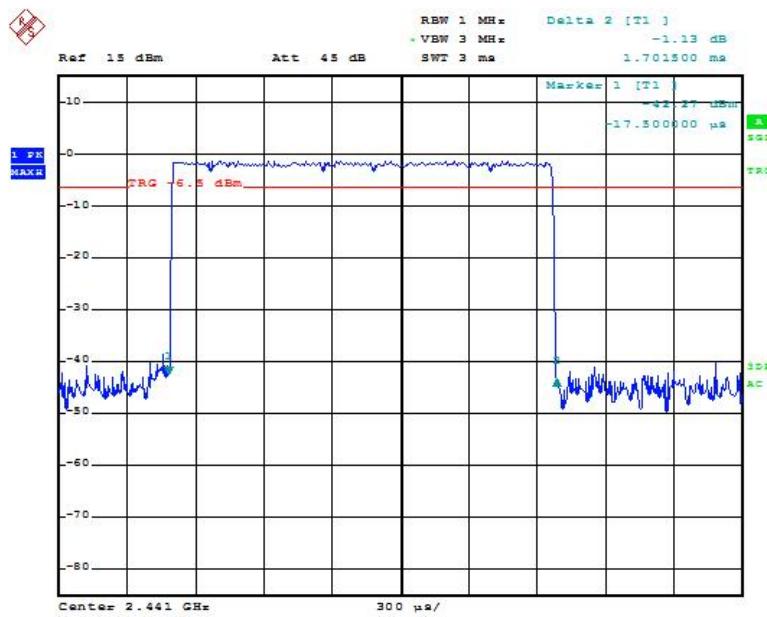
Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH 1	Low	0.436	0.140	0.4	Pass
	Middle	0.436	0.140	0.4	Pass
	High	0.436	0.140	0.4	Pass
Note: DH1:Dwell time = Pulse time*(1600/2/79)*31.6s					
DH 3	Low	1.70	0.272	0.4	Pass
	Middle	1.70	0.272	0.4	Pass
	High	1.70	0.272	0.4	Pass
Note: DH3:Dwell time = Pulse time*(1600/4/79)*31.6s					
DH 5	Low	2.96	0.316	0.4	Pass
	Middle	2.96	0.316	0.4	Pass
	High	2.96	0.316	0.4	Pass
Note: DH5:Dwell time = Pulse time*(1600/6/79)*31.6s					

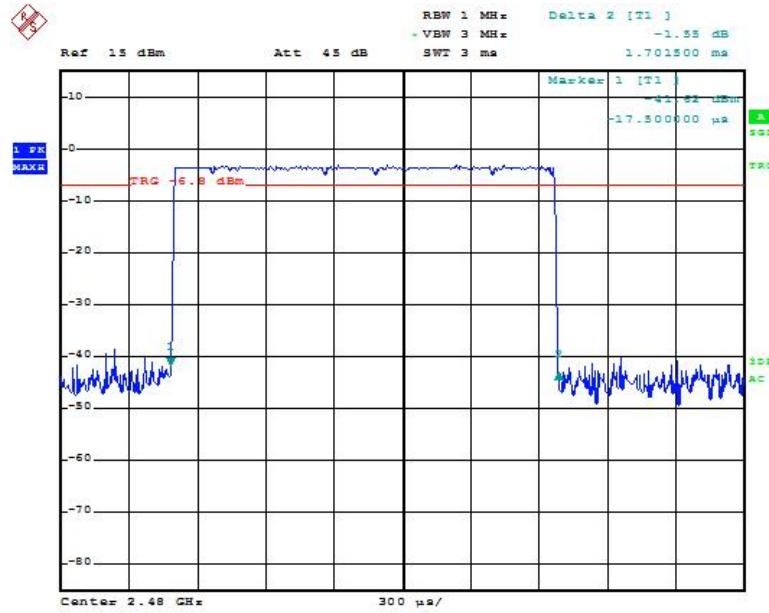
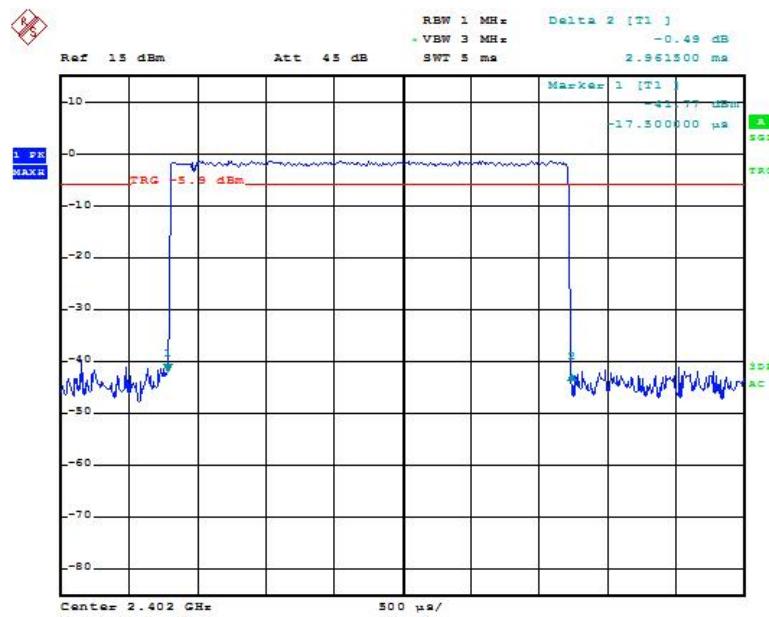
Please refer to the following plots.

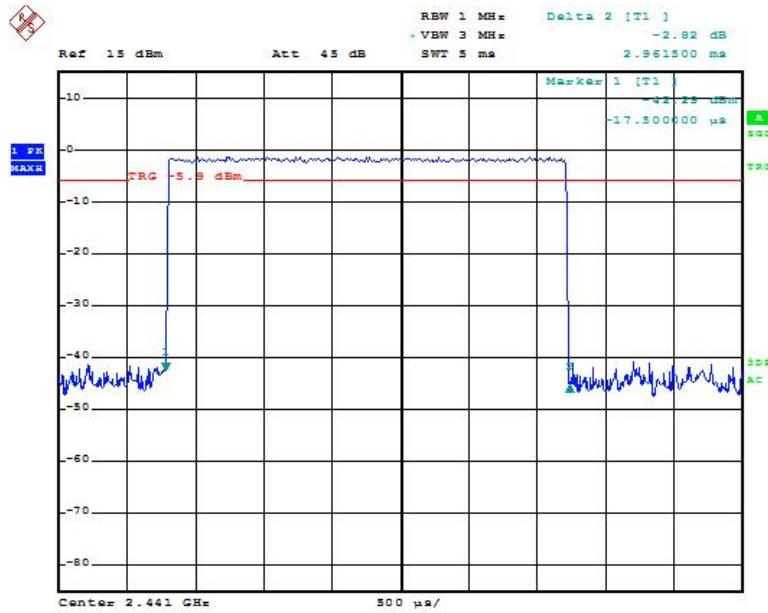
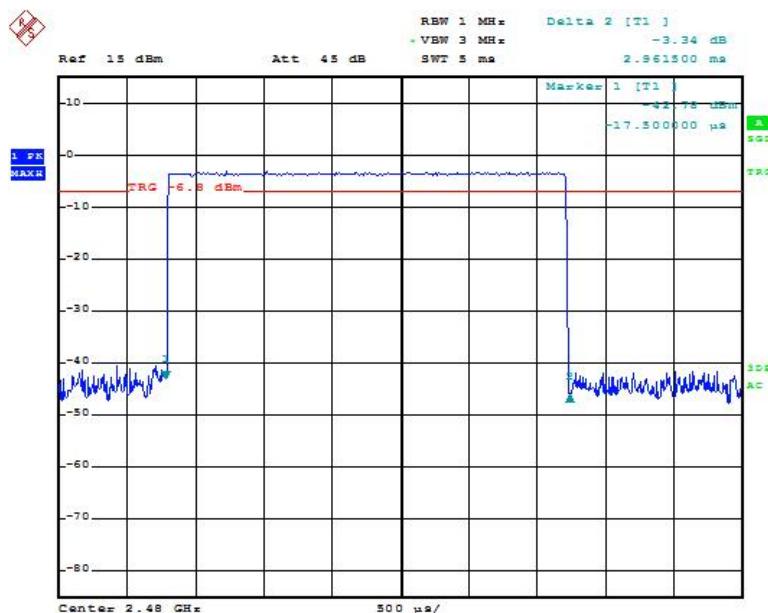
Low Channel for DH1



Middle Channel for DH1**High Channel for DH1**

Low Channel for DH3**Middle Channel for DH3**

High Channel for DH3**Low Channel for DH5**

Middle Channel for DH5**High Channel for DH5**

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.

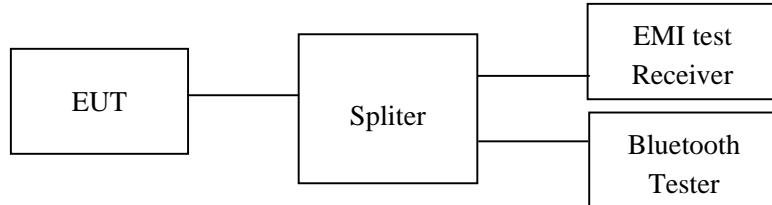
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10

* **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. 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 Data

Environmental Conditions

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

* The testing was performed by Ivan Cao from 2011-12-31 to 2012-01-15.

Test Result: Compliance.

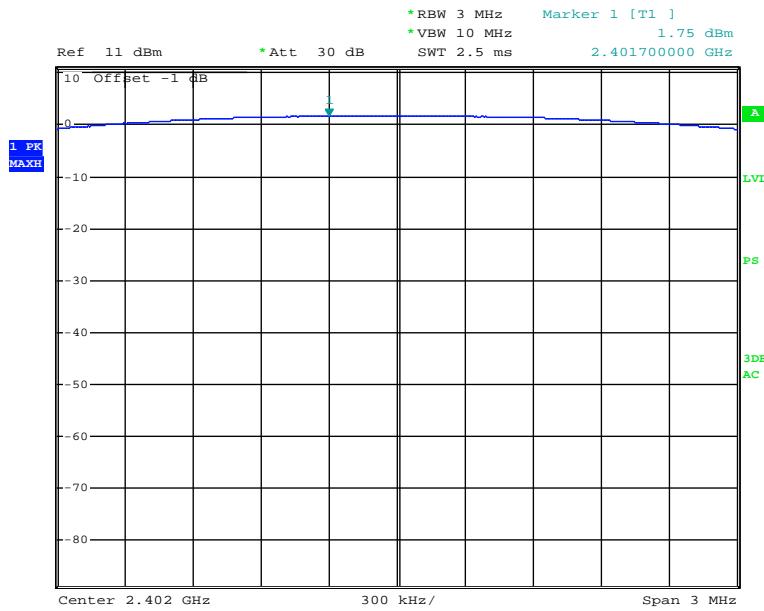
Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)
BDR	Low channel	2402	1.75	30
	Middle channel	2441	1.45	30
	High channel	2480	1.11	30
EDR Mode ($\pi/4$ -DQPSK)	Low channel	2402	1.14	30
	Middle channel	2441	1.04	30
	High channel	2480	-0.21	30
EDR Mode (8DPSK)	Low channel	2402	1.21	30
	Middle channel	2441	1.23	30
	High channel	2480	-0.20	30

Please refer to the following plots

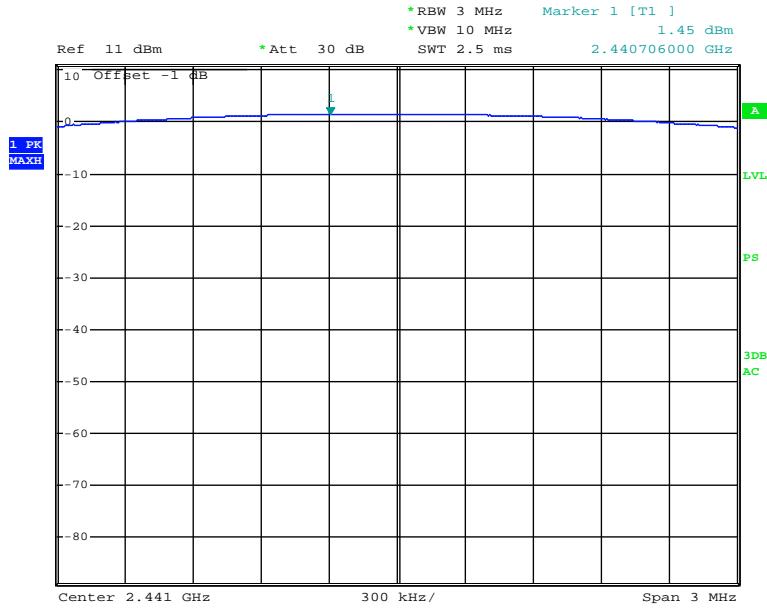
BDR:

Low Channel



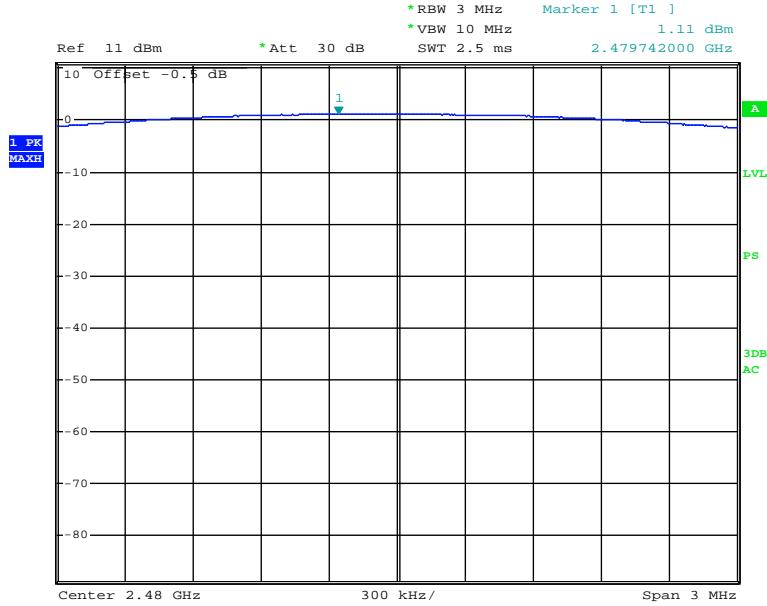
Date: 15.JAN.2012 18:42:50

Middle Channel

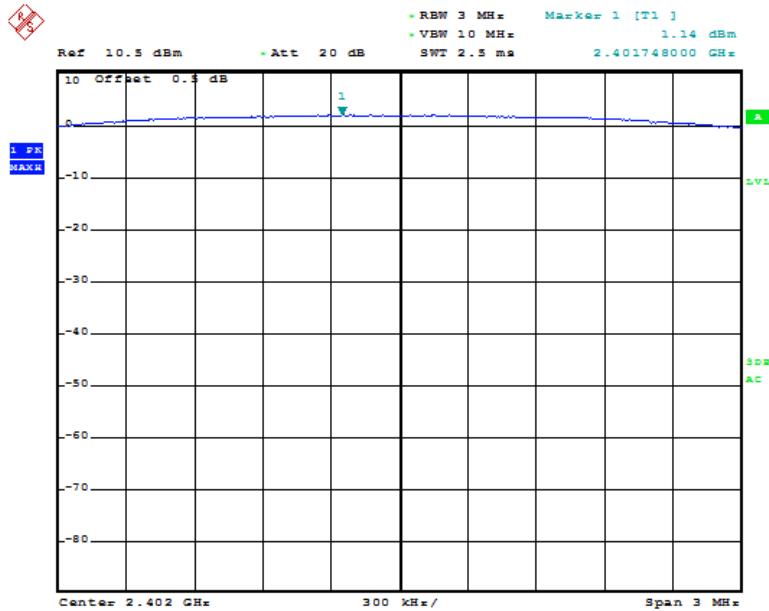
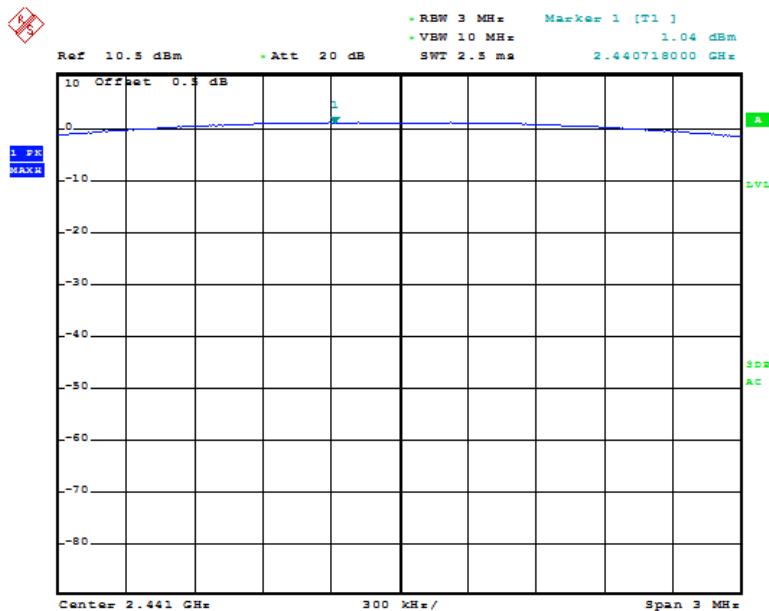


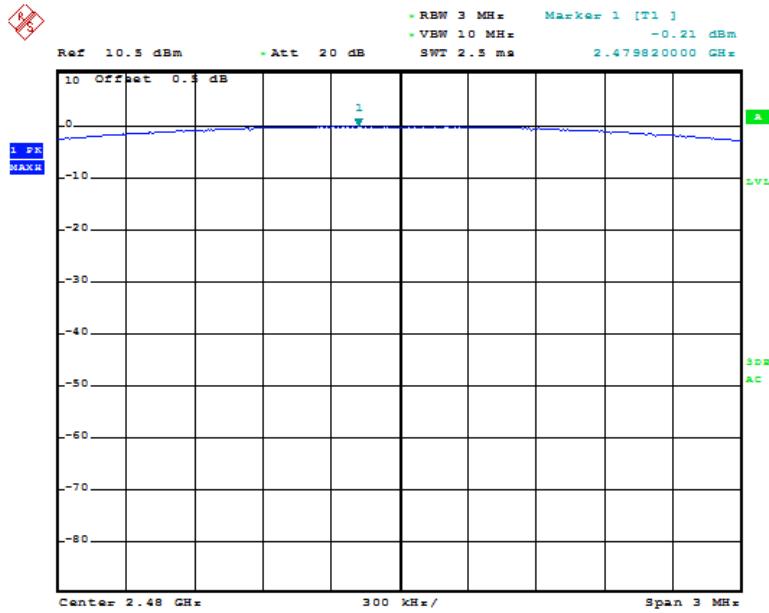
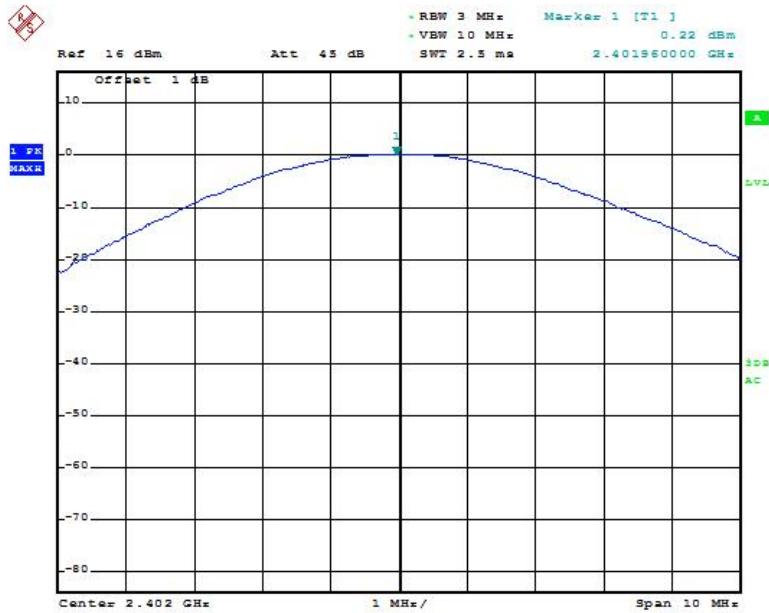
Date: 15.JAN.2012 18:42:10

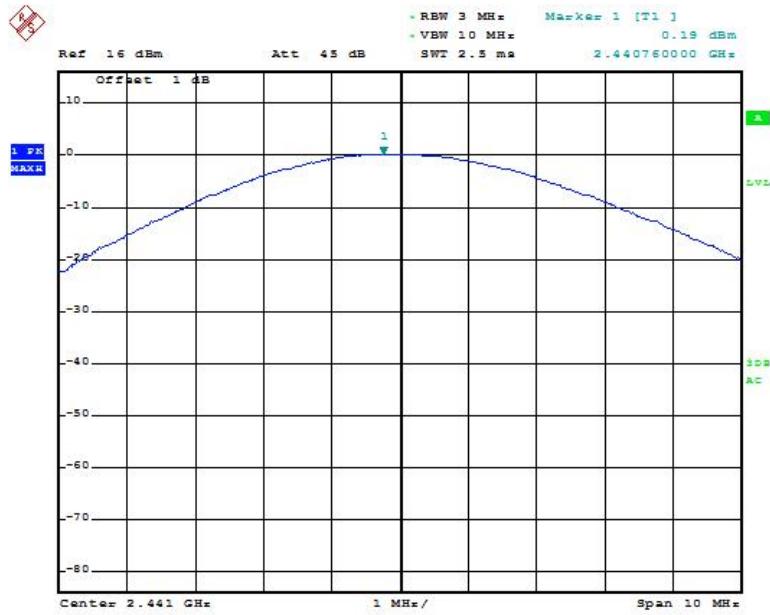
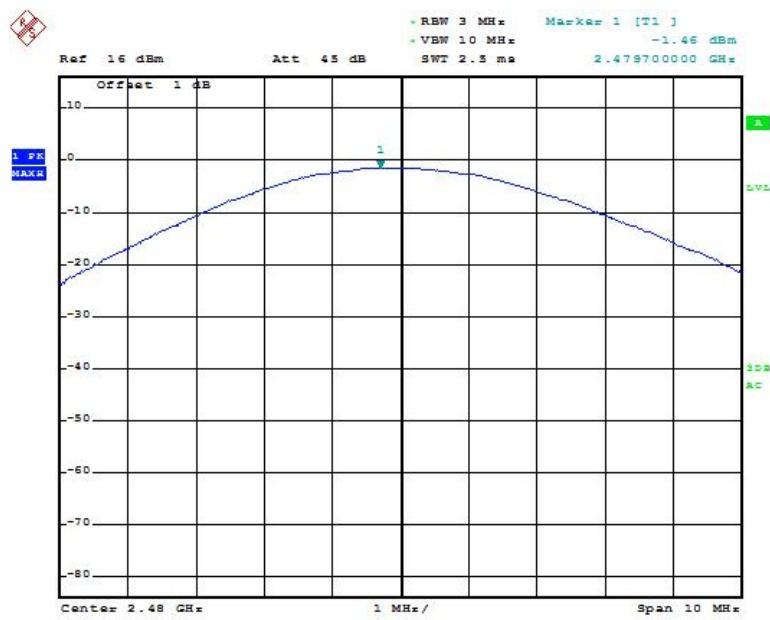
High Channel



Date: 15.JAN.2012 18:40:30

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

High Channel**EDR Mode (8DPSK)****Low Channel**

Middle Channel**High Chanel**

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10
SUNOL SCIENCES	Horn antenna	DRH-118	A052604	2011-05-05	2012-05-05

*** 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. 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 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
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 Data**Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

*The testing was performed by Ivan Cao from 2011-12-31 to 2012-01-15.

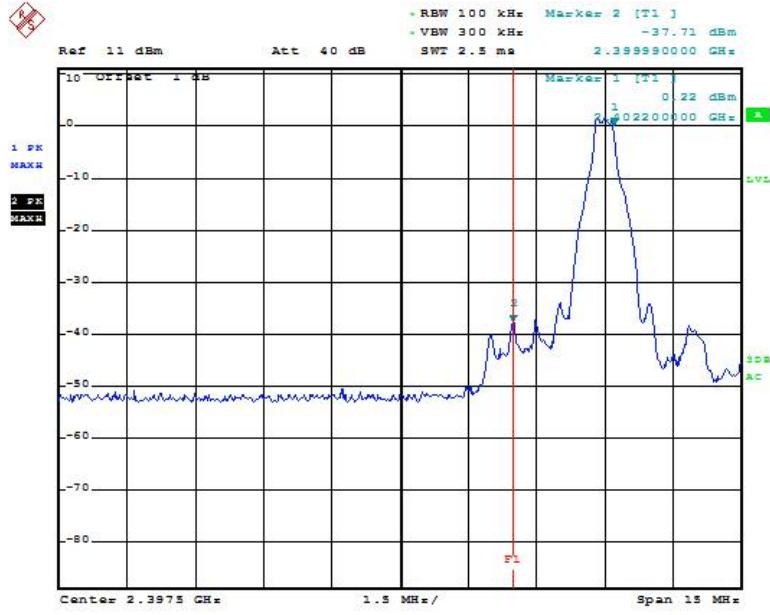
Test Result: Compliant, please refer to the following table and plots.

Test Mode: Transmitting

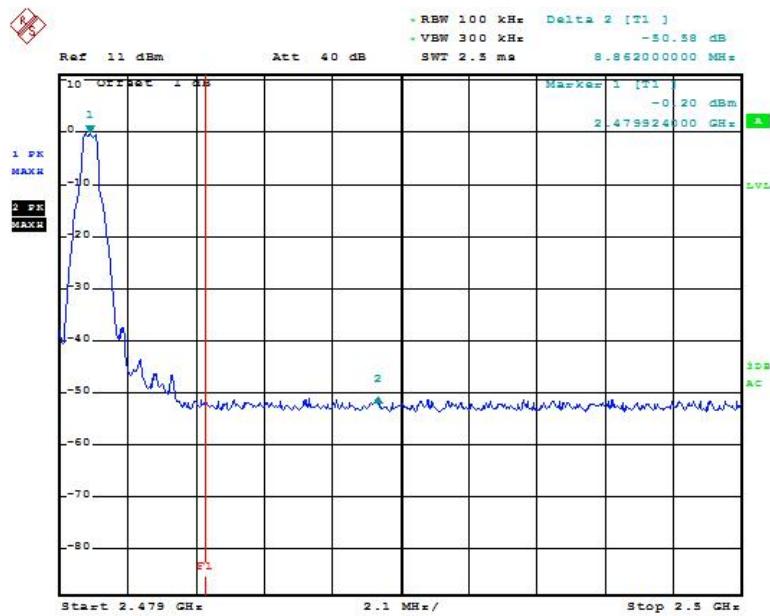
	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)
BDR	2399.99	37.93	20
	2488.786	50.58	20
EDR Mode ($\pi/4$ -DQPSK)	2399.99	47.50	20
	2488.156	53.09	20
EDR Mode (8DPSK)	2399.99	37.93	20
	2488.786	50.58	20

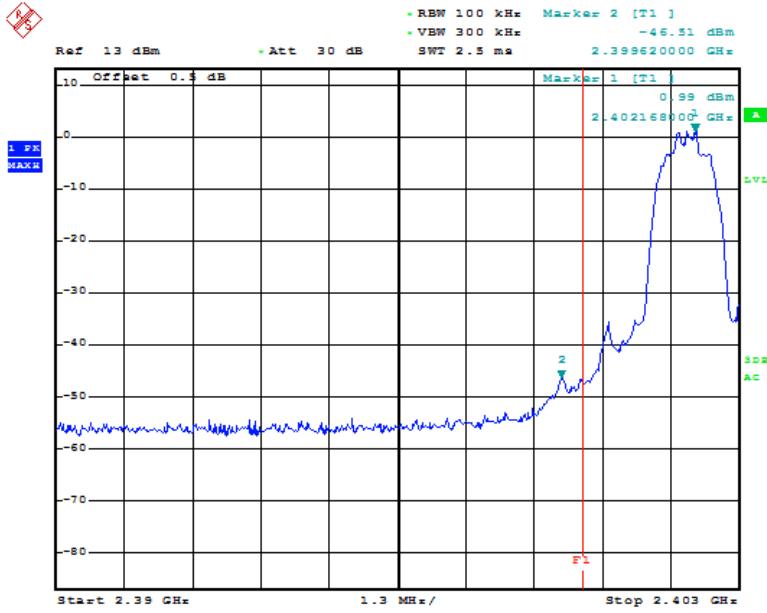
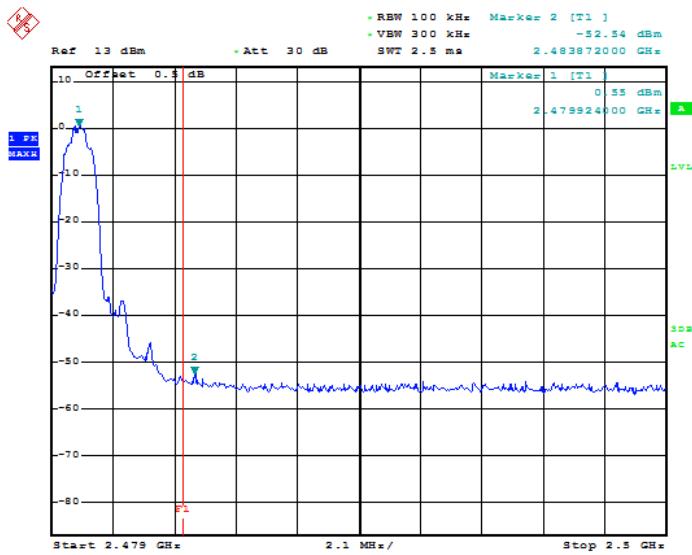
BDR:

Band Edge: Left Side



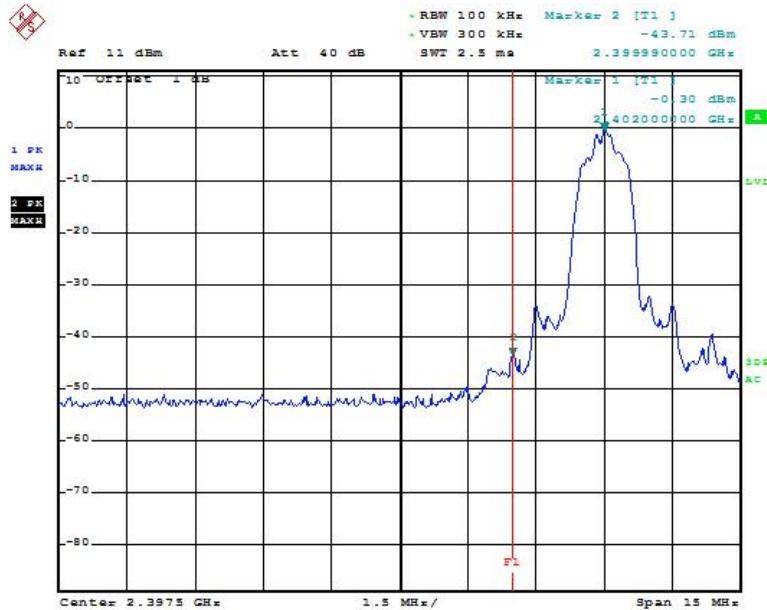
Band Edge: Right Side



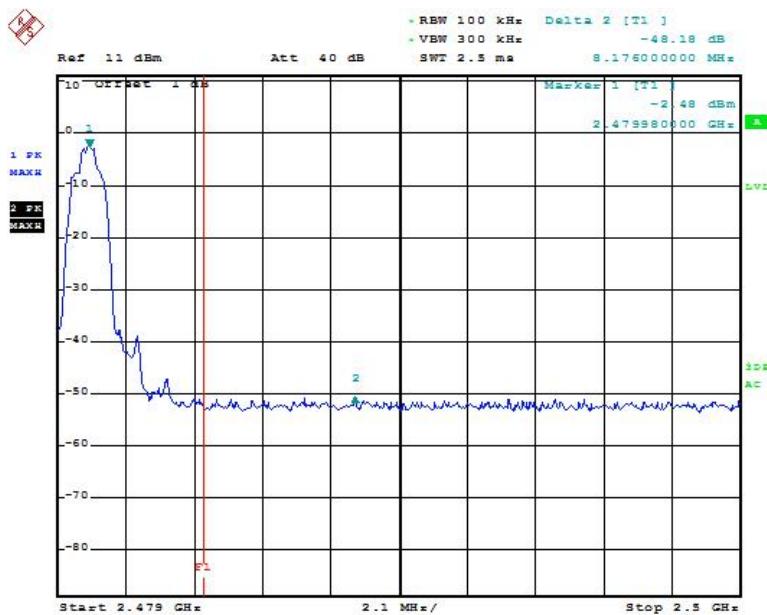
EDR Mode ($\pi/4$ -DQPSK)**Band Edge: Left Side****Band Edge: Right Side**

EDR Mode (8DPSK)

Band Edge: Left Side



Band Edge: Right Side



END OF REPORT *****