NVLAP LAB CODE 200707-0

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

ZBA, Inc.

94 Old Camplain Road Hillsborough,

New Jersey 08844, USA

FCC ID: VMTBTMS-X
Model: BTMS-X

Report Type:	**Product Type:**
Original Report	Bluetooth Media System

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Report Number:	RSC100408002
Report Date:	2010-05-28
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Reviewed By:	EMC Engineer
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *ZBA, Inc.'s* product, model number: *BTMS-X (FCC ID: VMTBTMS-X)* or the "EUT" as referred to in this report is a *Bluetooth Media System*, rated input voltage: DC 12V.

Adapter:
Manufacture: SINGOF
Model: GFP051U-1205
Input: 100-240V ~ 50/60Hz
Output: 12V⎓0.5A

All measurement and test data in this report was gathered from production sample serial number: 1004081 (Assigned by BACL, Shenzhen). The EUT was received on 2010-04-08.

Objective

This Type approval report is prepared on behalf of *ZBA, Inc.* 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, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

N/A.

Test Methodology

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

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

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located in 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 November 21, 2007. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

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

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).

NVLAP 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 typical fashion (as normally used by a typical user).

Equipment Modifications

No modification was made to the unit tested.

EUT Exercise Software

BlueSuite 2.0

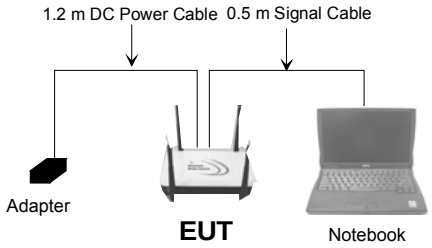
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
DELL	Notebook	PP01L	01014	DOC

External I/O Cable

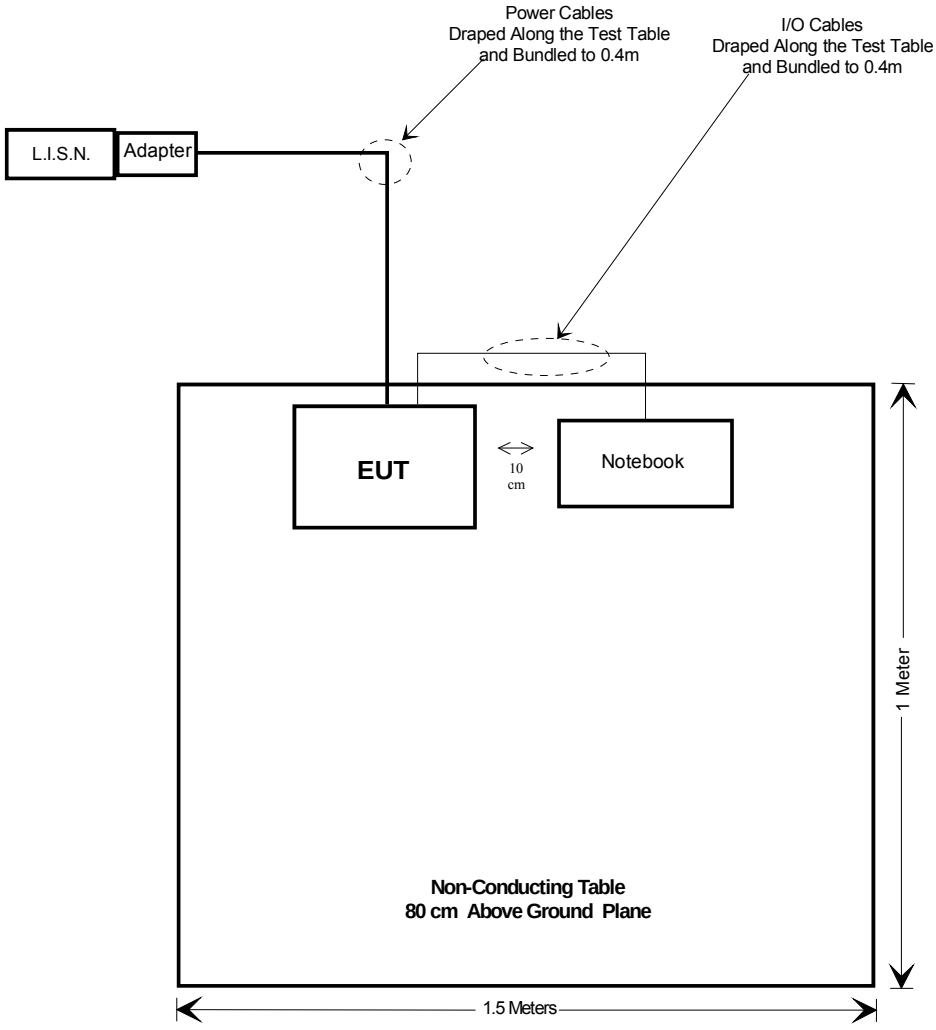
Cable Description	Length (m)	From/Port	To
DC Power Cable	1.2	Adapter	EUT
Signal Cable	0.5	EUT	Notebook

Configuration of Test Setup

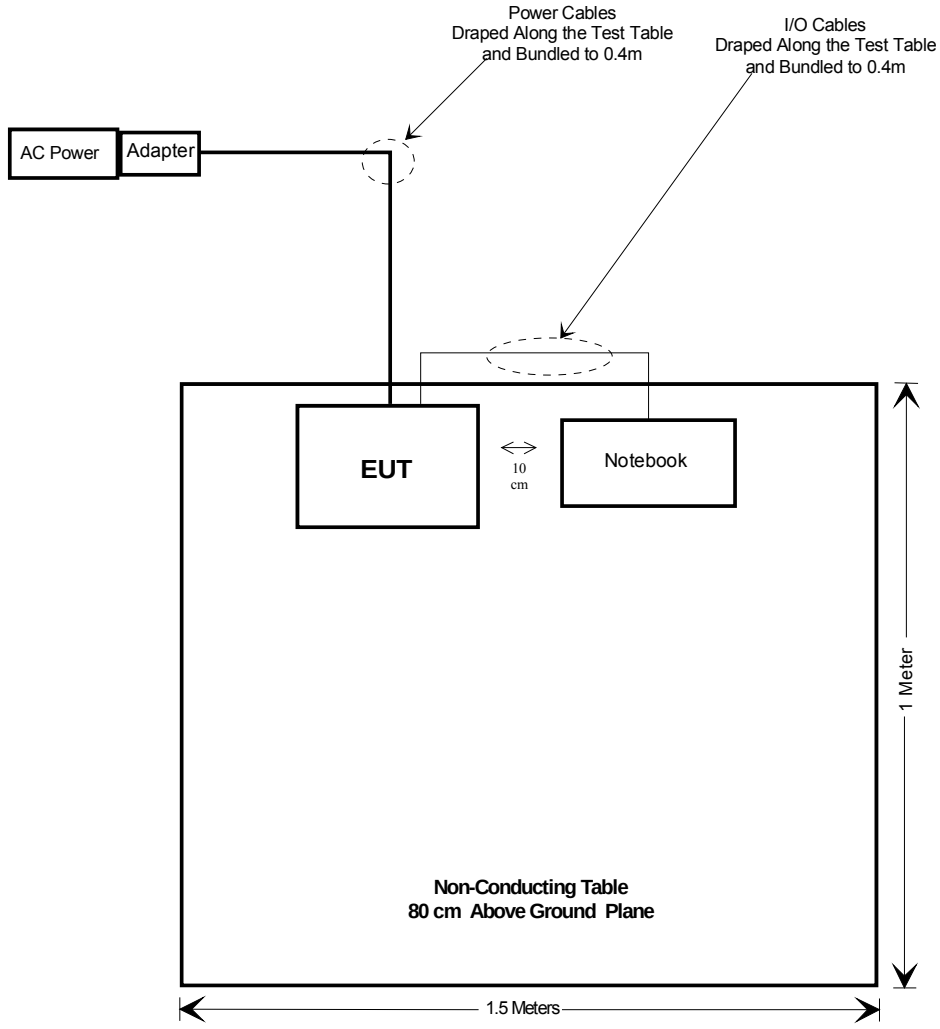


Block Diagram of Test Setup

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	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Radiated Emission	Compliant*
§15.247 (a)(1)	20 dB Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

Note: *With measurement uncertainty.

FCC §15.247 (i), §1.1307 (b) (1) & §2.1091 - RF EXPOSURE

Applicable Standards

According to FCC §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 FCC §1.1310 and §2.1091 RF exposure is calculated.

RF Exposure Limit

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)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

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

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

MPE Results

Frequency Band	MPE Distance (cm)	Output Power (dBm)	Atenna Gain (dBi)	Power Density (mw/cm^2)	Result
2.4 GHz	20	18.32	2.7	0.025	Compliance

The predicted power density level at 20 cm is 0.025 mw/cm^2 which is below the uncontrolled exposure limit of 1.0 mW/cm^2. The EUT is used at least 20 cm away from user's body. It is determined as mobile equipment and complies with the MPE limit.

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 four 50 Ohm SMA Male Reverse Omni-directional TX antennas, which in accordance to section 15.203, the maximum gain is 2.7 dBi which fulfills the requirements of FCC rule 15.203. Please refer to the antenna photo.

Result: Compliant.

FCC§ 15.207(a) - CONDUCTED EMISSIONS

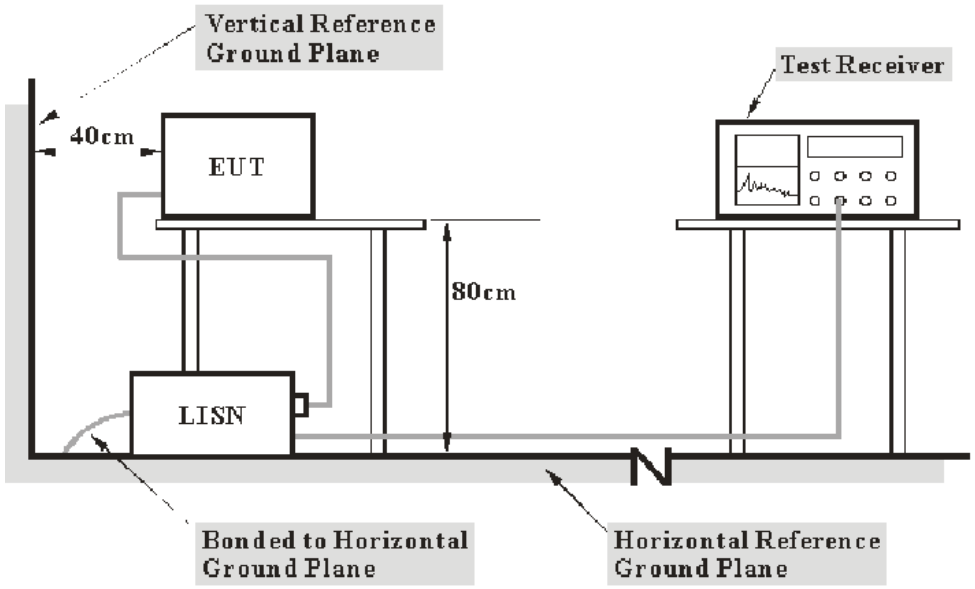
Applicable Standard

According to FCC §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dBμV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

Note: * Decreases with the logarithm of the frequency.

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 specification used was in accordance with FCC §15.207(a) limits.

EMI Test Receiver

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 Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Cal. Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	1200028	2010-09-27
Com-Power	L.I.S.N.	LI-200	12008	2010-12-20
Com-Power	L.I.S.N.	LI-200	12005	2010-12-20
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2010-11-12
Rohde & Schwarz	Pulse Limiter	ESH3Z2	DE25985	2010-10-12
BACL	Data Entry Software	DES1	0001	2010-12-20

*** 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

Maximizing procedure is performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data is recorded in the Quasi-peak mode.

Final test data for this test configuration is recorded in the section below.

Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC §15.207(a), with the worst margin reading of:

-5.4 dB at **0.34 MHz** in the **Line** conductor mode

Conducted Emissions Test Data & Plots

Environmental Conditions

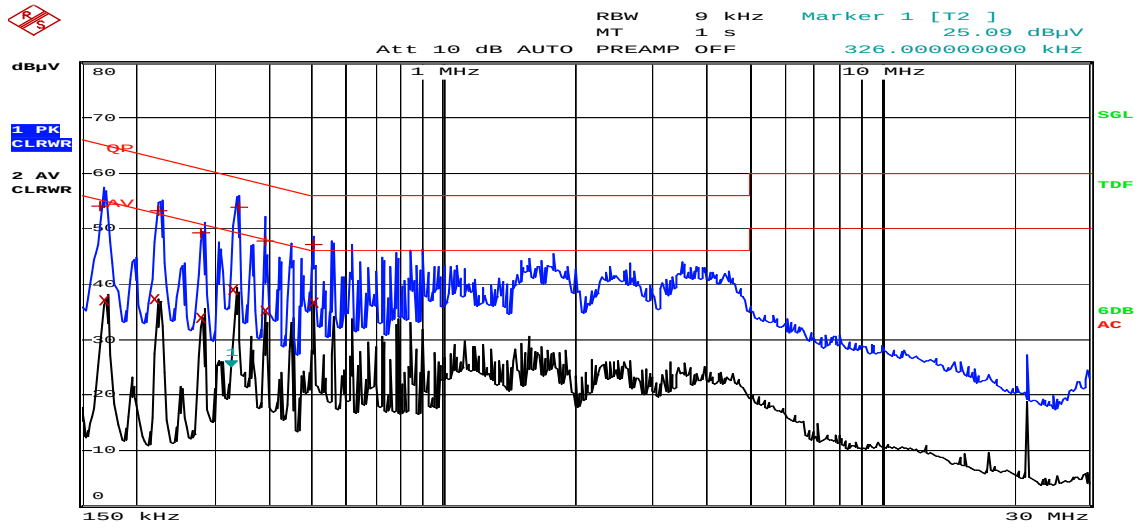
Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0 KPa

The testing was performed by Marshal Yu on 2010-04-13.

Test Result: Compliant, Please see the following tables and plots.

Frequency (MHz)	Cord. Reading (dBuV)	Detector (QP/Ave)	Conductor (Line/Neutral)	FCC Part 15.207(a)	
				Limits (dBµV)	Margin (dB)
0.34	53.8	QP	Line	59.2	-5.4
0.50	37.1	AV	Neutral	46	-8.9
0.34	50.3	QP	Neutral	59.2	-9.0
0.50	47.0	QP	Line	56	-9.0
0.23	53.2	QP	Line	62.45	-9.3
0.50	36.6	AV	Line	46	-9.4
0.17	54.7	QP	Neutral	64.96	-10.3
0.39	47.7	PK	Line	58.06	-10.4
0.33	39.0	AV	Line	49.45	-10.5
0.34	38.5	AV	Neutral	49.2	-10.7
0.17	54.1	PK	Line	65.16	-11.1
0.446	45.79	PK	Neutral	56.95	-11.2
0.39	46.55	PK	Neutral	58.06	-11.5
0.28	49.13	PK	Line	60.76	-11.6
0.28	48.9	PK	Neutral	60.82	-11.9
0.39	36.1	AV	Neutral	48.06	-12.0
0.39	35.2	AV	Line	48.06	-12.8
0.23	37.3	AV	Line	52.45	-15.1
0.29	35.2	AV	Neutral	50.52	-15.4
0.23	37.1	AV	Neutral	52.45	-15.4
0.28	33.9	AV	Line	50.82	-16.9
0.17	37.2	AV	Neutral	54.96	-17.8
0.17	37.15	AV	Line	54.96	-17.8
0.22	37.2	QP	Neutral	62.74	-25.6

Line



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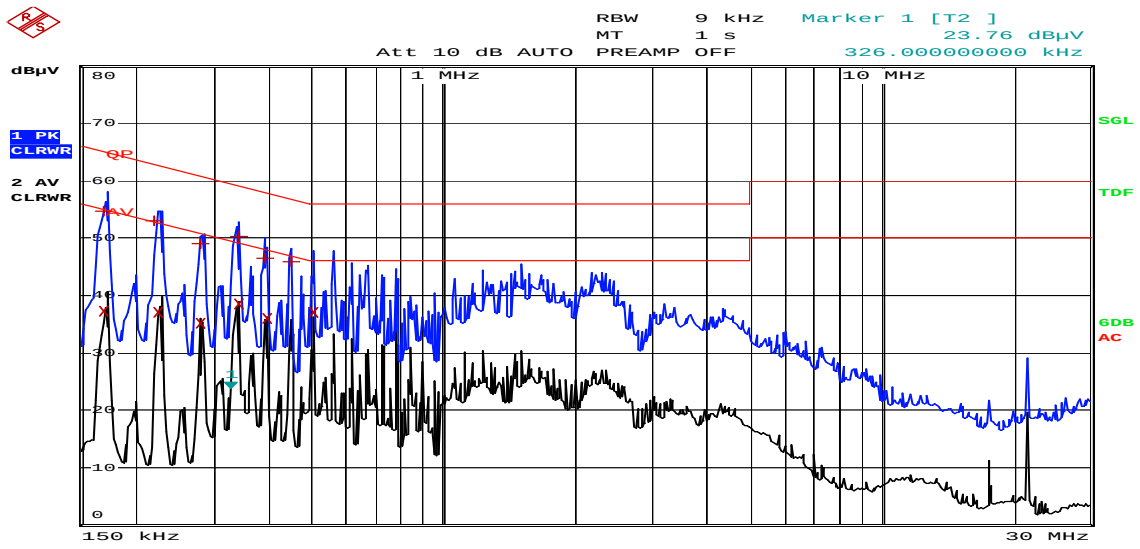
Neutral



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

Applicable Standard

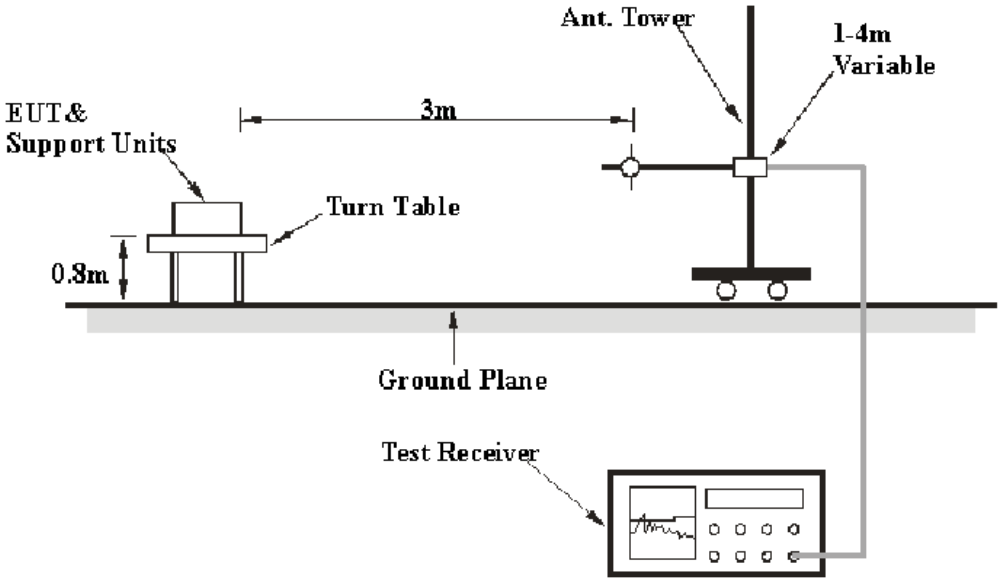
FCC §15.205; §15.209; §15.247(d)

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 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.

EUT Setup



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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	***RBW***	***Video B/W***	***Detector***
30MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	AV

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Pre-Amplifier	8447E	1937A01046	2009-11-15	2010-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2009-10-16	2010-10-16
Sunol Sciences	Broadband Antenna	JB3	A040904-2	2009-08-14	2010-08-14
Beijin microwave	Horn Antenna	OMCDH10180	10279001A	2009-08-14	2010-08-14
HP	Pre-Amplifier	8449B	3008A00277	2009-08-14	2010-08-14
HP	Spectrum Analyzer	8562A	3204A07083	2009-08-14	2010-08-14

*** 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

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

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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss- 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 maximum limit. The equation for margin calculation is as follows:

Margin = Limit - Corrected Amplitude

Test Results Summary

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

Below 1000 MHz:

Test Mode: BDR Mode

4.2 dB at 199.952 MHz in the Horizontal polarization

Test Mode: EDR Mode

0.2 dB at 200.00749 MHz in the Horizontal polarization

Above 1000 MHz:

Test Mode: BDR Transmitting

Low Channel: 2.6 dB at 72.6 MHz in the Vertical polarization
Middle Channel: 0.8 dB at 7323 MHz in the Vertical polarization
High Channel: 1.1 dB at 4960 MHz in the Vertical polarization

Test Mode: EDR Transmitting

Low Channel: 0.9 dB at 4804 MHz in the Vertical polarization
Middle Channel: 0.2 dB at 4882 MHz in the Vertical polarization
High Channel: 2.5 dB at 7440 MHz in the Vertical polarization

Test Data

Environmental Conditions

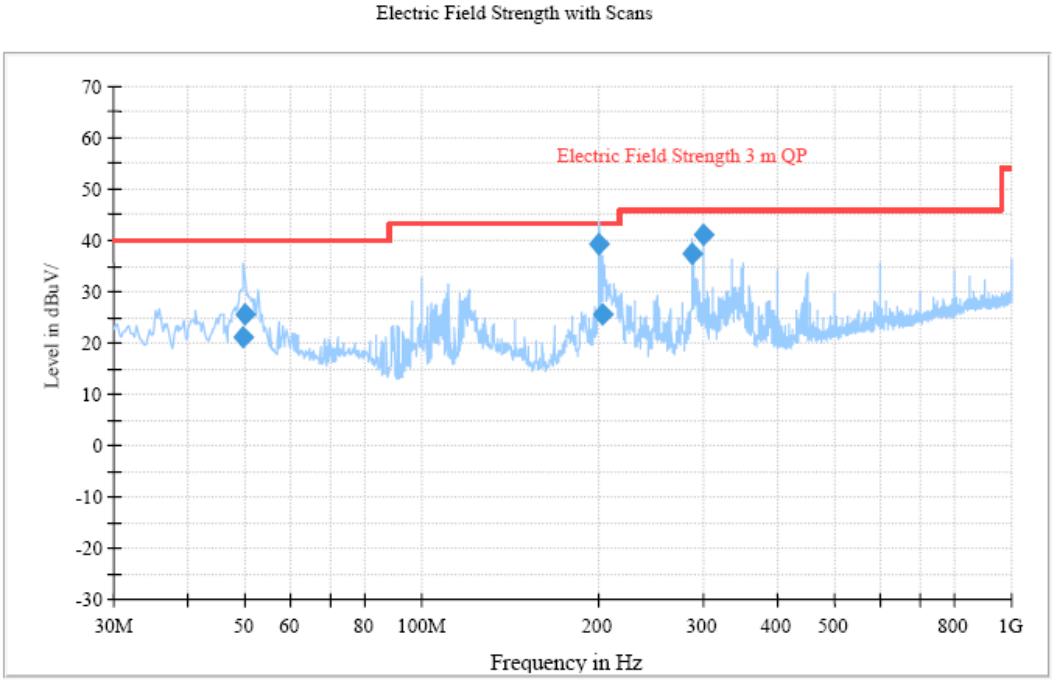
Temperature:	26 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 KPa

** The testing was performed by Marshal Yu on 2010-05-25*

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

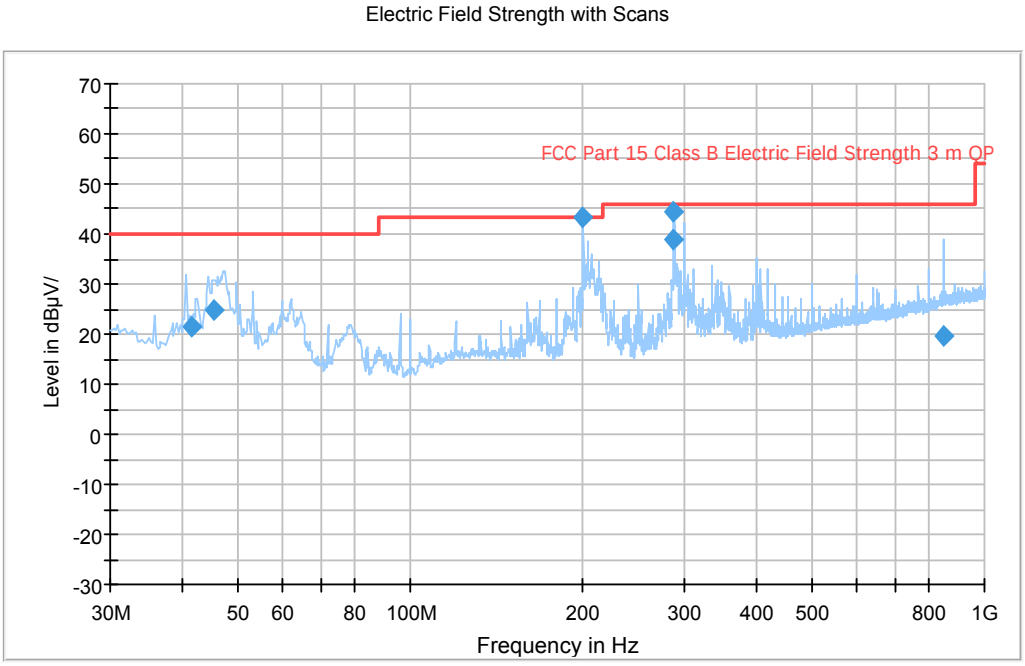
Below 1000 MHz:

BDR Mode:



Frequency (MHz)	Cord. Quasi-Peak (dBµV/m)	Measurement Bandwidth (kHz)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
199.952000	39.3	120.000	150.0	H	253.0	-13.0	4.20	43.50
300.066690	41.0	120.000	122.0	H	344.0	-10.8	5.00	46.00
288.007030	37.4	120.000	150.0	H	299.0	-10.8	8.60	46.00
50.005508	25.5	120.000	150.0	V	0.0	-19.1	14.50	40.00
203.195150	25.6	120.000	250.0	H	261.0	-13.5	17.90	43.50
49.800881	21.1	120.000	140.0	V	45.0	-19.0	18.90	40.00

EDR Mode:



Frequency (MHz)	Cord. Quasi-Peak (dBµV/m)	Measurement Bandwidth (kHz)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
200.00749	43.3	120.000	122.0	H	0.0	-13.0	0.20	43.50
288.00559	44.3	120.000	100.0	H	111.0	-10.8	1.70	46.00
288.01146	38.8	120.000	100.0	H	38.0	-10.8	7.20	46.00
45.631128	24.7	120.000	140.0	V	0.0	-17.1	15.30	40.00
41.528137	21.6	120.000	250.0	V	322.0	-14.8	18.40	40.00
848.41346	19.5	120.000	150.0	V	69.0	-0.8	26.50	46.00

Above 1000 MHz:

Test Mode: BDR Transmitting

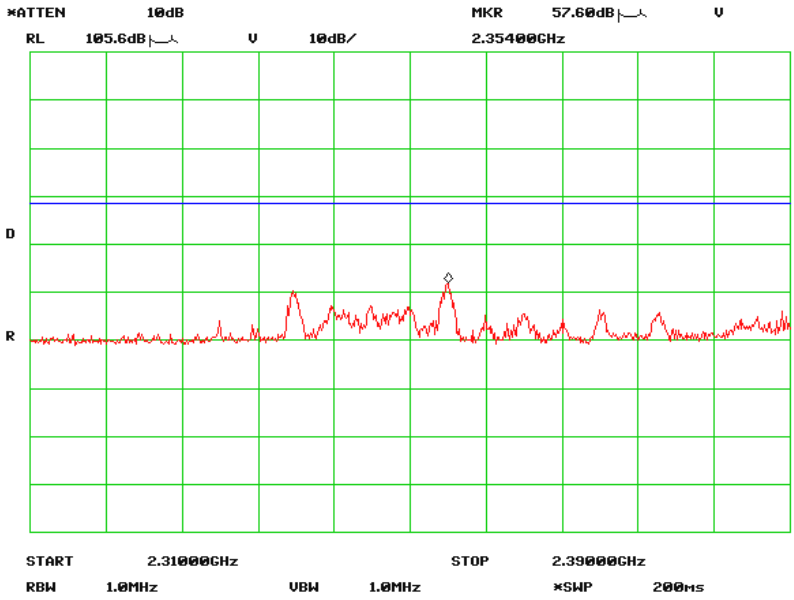
Frequency (MHz)	S.A. Reading (dBuV)	Direction Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBuV/m)	Part 15.247/209		Detector (PK/QP/AV)
			Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel (f=2402 MHz)											
7206.00	63.1	335	1.2	V3	36.6	5.3	33.6	71.4	74	2.6	PK
4804.00	66.7	10	1.3	V3	31.5	4.3	33.7	68.8	74	5.3	PK
7206.00	38.5	30	1.5	V3	36.6	5.3	33.6	46.8	54	7.2	AV
4804.00	38.8	360	1.2	V3	31.5	4.3	33.7	40.9	54	13.2	AV
7206.00	50.1	25	1.6	H3	36.6	5.3	33.6	58.4	74	15.6	PK
1637.00	65.0	100	1.5	V3	25.0	2.3	35.0	57.3	74	16.7	PK
4804.00	52.5	350	1	H3	31.5	4.3	33.7	54.6	74	19.5	PK
1637.00	36.8	40	1.4	V3	25.0	2.3	35.0	29.1	54	24.9	AV
1637.00	51.8	15	1.7	H3	25.0	2.3	35.0	44.1	74	29.9	PK
Middle Channel (f=2441 MHz)											
7323.00	64.8	38	1.3	V3	36.6	5.4	33.6	73.2	74	0.8	PK
4882.00	70.9	45	1.2	V3	31.5	4.3	33.7	73.0	74	1.1	PK
7323.00	38.7	42	1.5	V3	36.6	5.4	33.6	47.1	54	6.9	AV
4882.00	43.0	350	1.1	V3	31.5	4.3	33.7	45.1	54	9.0	AV
7323.00	54.7	20	1.6	H3	36.6	5.4	33.6	63.1	74	10.9	PK
7323.00	33.9	15	1.3	H3	36.6	5.4	33.6	42.3	54	11.7	AV
4882.00	38.8	0	1.7	H3	31.5	4.3	33.7	40.9	54	13.2	AV
4882.00	56.8	28	1.7	H3	31.5	4.3	33.7	58.9	74	15.2	PK
1618.00	53.2	15	1.4	V3	25.0	2.3	35.0	45.5	74	28.5	PK
High Channel (f=2480 MHz)											
4960.00	70.8	15	1.4	V3	31.5	4.3	33.7	72.9	74	1.1	PK
7440.00	64.3	34	1.2	V3	36.6	5.4	33.6	72.7	74	1.3	PK
7440.00	40.7	27	1.4	V3	36.6	5.4	33.6	49.1	54	4.9	AV
4960.00	45.7	352	1.2	V3	31.5	4.3	33.7	47.8	54	6.2	AV
7440.00	38.2	40	1.1	H3	36.6	5.4	33.6	46.6	54	7.4	AV
4960.00	40.1	30	1.2	H3	31.5	4.3	33.7	42.2	54	11.8	AV
7440.00	50.8	11	1.7	H3	36.6	5.4	33.6	59.2	74	14.8	PK
4960.00	51.0	47	1.3	H3	31.5	4.3	33.7	53.1	74	20.9	PK

Test Mode: EDR Transmitting

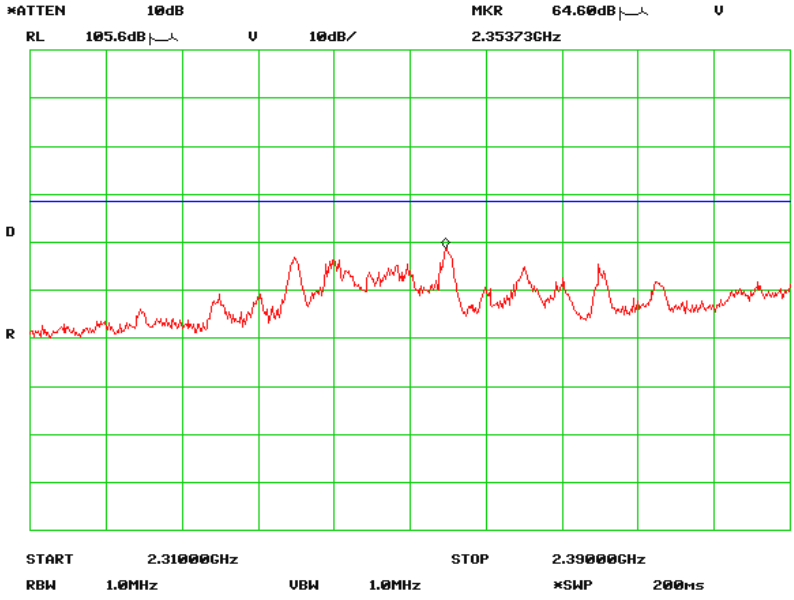
Frequency (MHz)	S.A. Reading (dBuV)	Direction Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Amp. (dBuV/m)	Part 15.247/209		Detector (PK/QP/AV)
			Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel (f=2402 MHz)											
4804.00	71.0	0	1.2	V3	31.5	4.3	33.7	73.1	74	0.9	PK
7206.00	61.8	30	1.5	V3	36.6	5.3	33.6	70.1	74	3.9	PK
7206.00	38.6	15	1.6	V3	36.6	5.3	33.6	46.9	54	7.1	AV
1637.00	71.0	150	1.3	V3	25.0	2.3	35.0	63.3	74	10.7	PK
7206.00	54.2	25	1.2	H3	36.6	5.3	33.6	62.5	74	11.5	PK
4804.00	39.5	360	1	V3	31.5	4.3	33.7	41.6	54	12.5	AV
4804.00	53.1	130	1.5	H3	31.5	4.3	33.7	55.2	74	18.9	PK
1637.00	40.5	40	1.3	V3	25.0	2.3	35.0	32.8	54	21.2	AV
1637.00	55.4	0	1.1	H3	25.0	2.3	35.0	47.7	74	26.3	PK
Middle Channel (f=2441 MHz)											
4882.00	71.7	20	1.2	V3	31.5	4.3	33.7	73.8	74	0.2	PK
7323.00	64.7	90	1.1	V3	36.6	5.4	33.6	73.1	74	0.9	PK
7323.00	44.5	24	1.5	V3	36.6	5.4	33.6	52.9	54	1.1	AV
4882.00	46.6	30	1.3	V3	31.5	4.3	33.7	48.7	54	5.4	AV
7323.00	39.7	0	1.6	H3	36.6	5.4	33.6	48.1	54	5.9	AV
4882.00	40.1	51	1.5	H3	31.5	4.3	33.7	42.2	54	11.9	AV
7323.00	48.5	15	1	H3	36.6	5.4	33.6	56.9	74	17.1	PK
4882.00	49.8	330	1.7	H3	31.5	4.3	33.7	51.9	74	22.2	PK
1618.00	57.5	35	1.4	V3	25.0	2.3	35.0	49.8	74	24.2	PK
High Channel (f=2480 MHz)											
7440.00	63.1	23	1.7	V3	36.6	5.4	33.6	71.5	74	2.5	PK
4960.00	68.9	10	1.2	V3	31.5	4.3	33.7	71.0	74	3.0	PK
7440.00	37.3	40	1.1	V3	36.6	5.4	33.6	45.7	54	8.3	AV
4960.00	43.2	0	1.5	V3	31.5	4.3	33.7	45.3	54	8.7	AV
7440.00	33.5	15	1.3	H3	36.6	5.4	33.6	41.9	54	12.1	AV
7440.00	50.0	15	1.1	H3	36.6	5.4	33.6	58.4	74	15.6	PK
4960.00	35.6	342	1	H3	31.5	4.3	33.7	37.7	54	16.3	AV
4960.00	54.2	50	1.4	H3	31.5	4.3	33.7	56.3	74	17.7	PK

Spurious Emissions in the Restricted Band

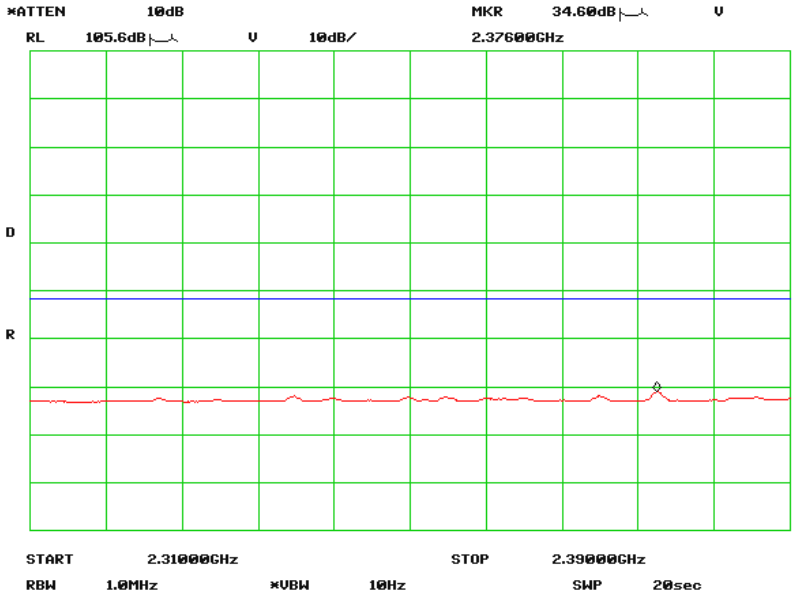
BDR Lowest Channel at Horizontal: Peak



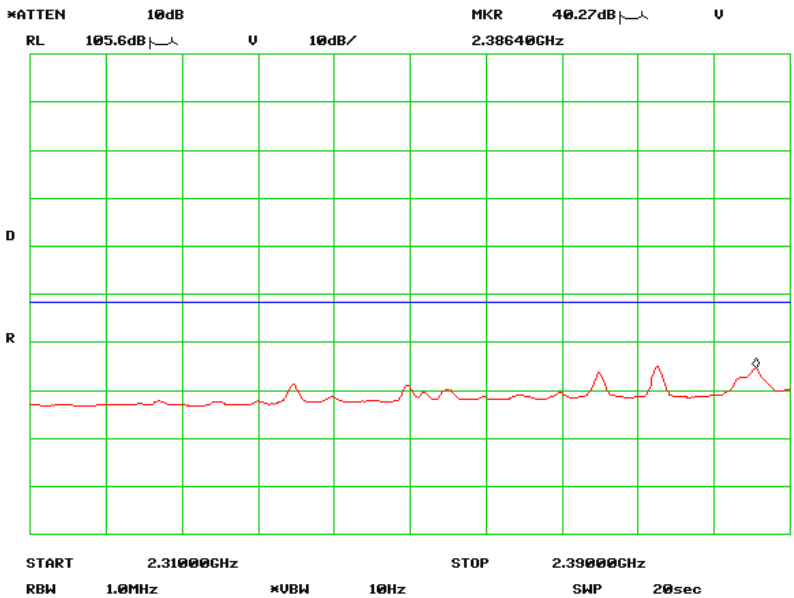
BDR Lowest Channel at Vertical: Peak



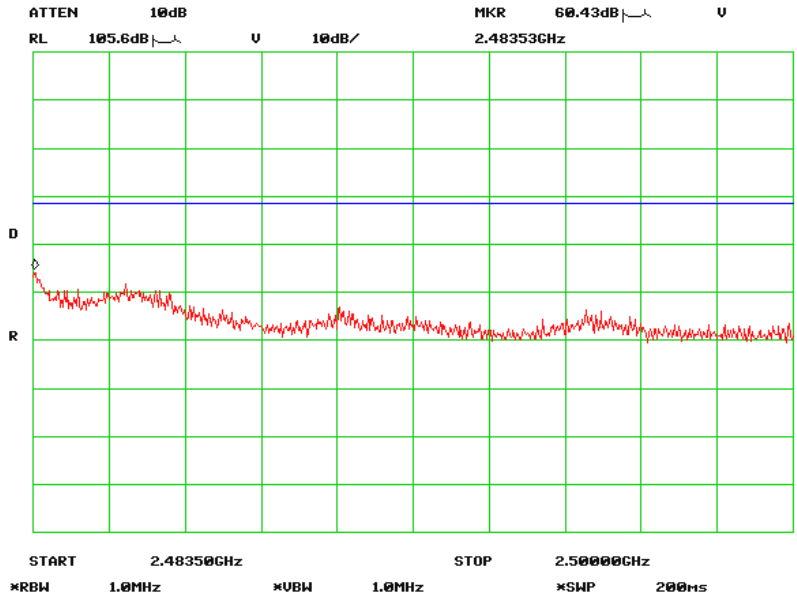
BDR Lowest Channel at Horizontal: Average



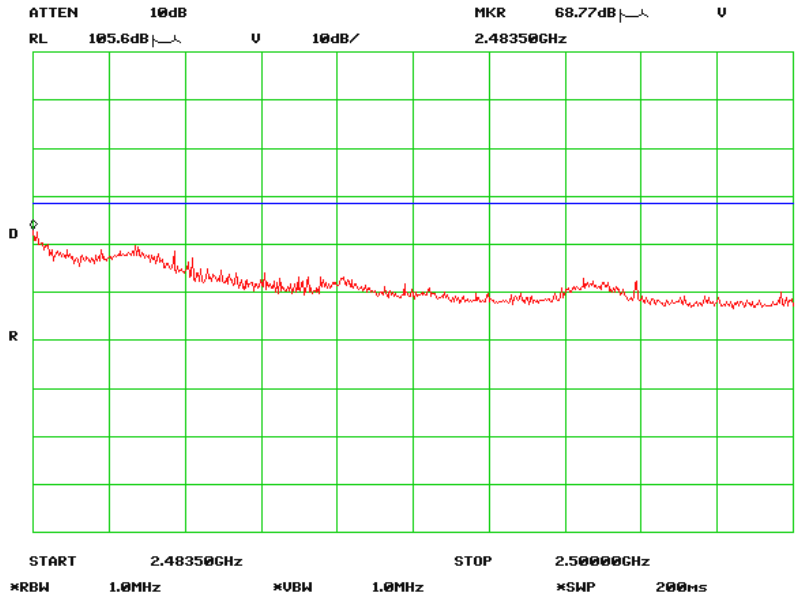
BDR Lowest Channel at Vertical: Average



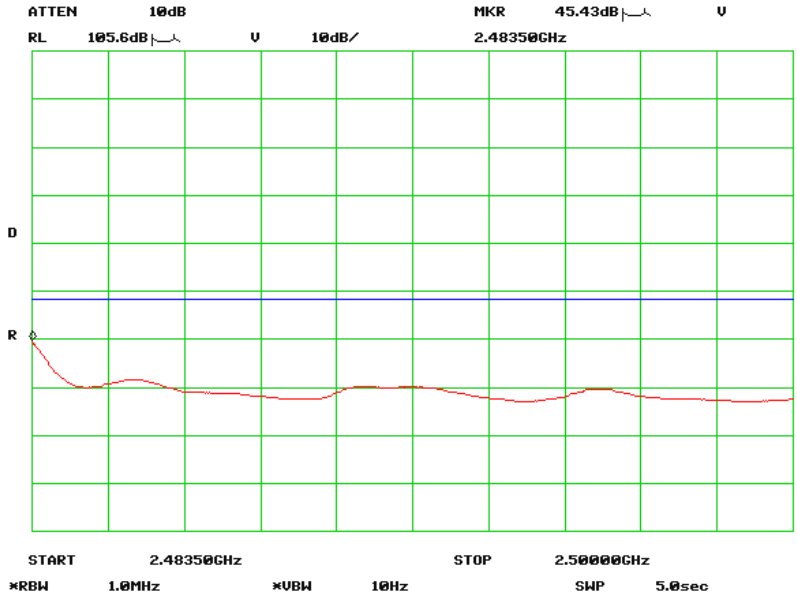
BDR Highest Channel at Horizontal: Peak



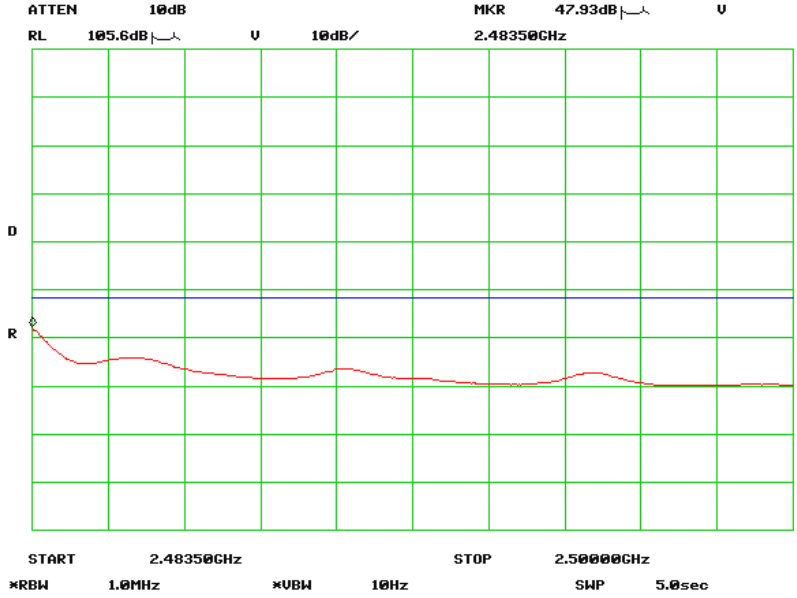
BDR Highest Channel at Vertical: Peak



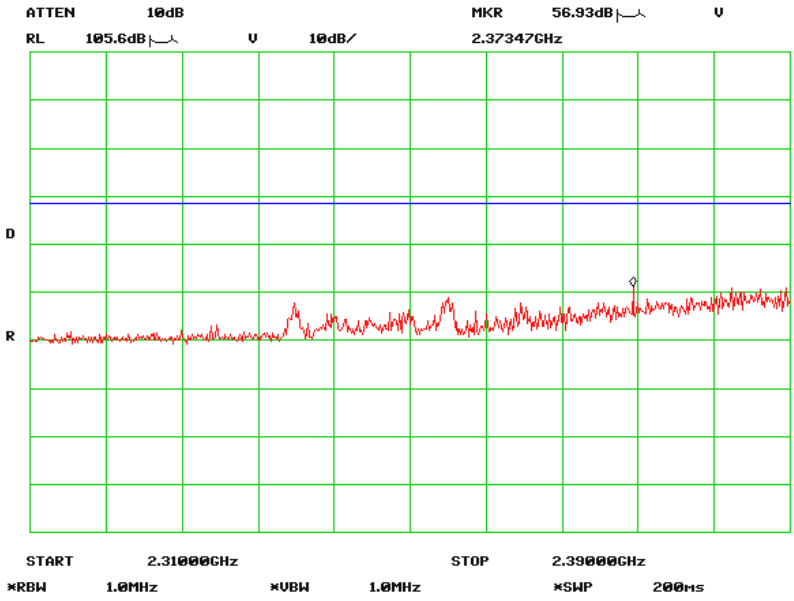
BDR Highest Channel at Horizontal: Average



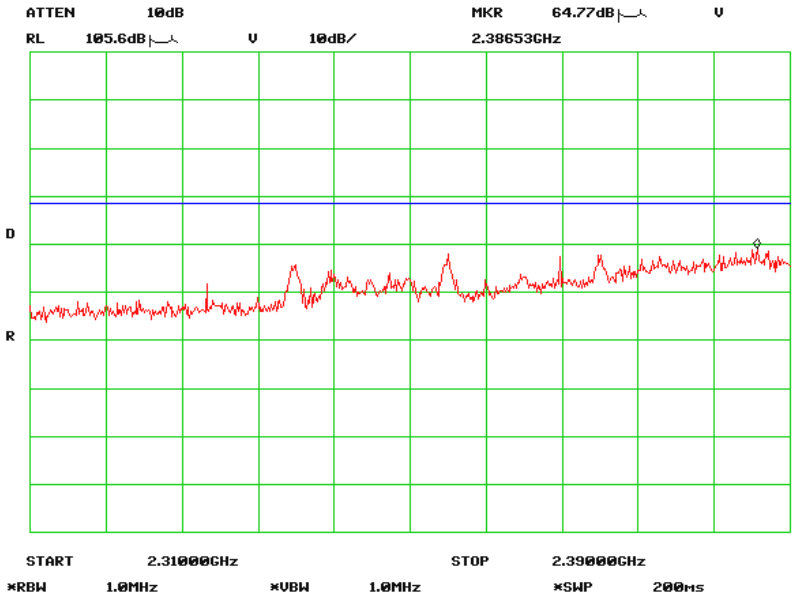
BDR Highest Channel at Vertical: Average



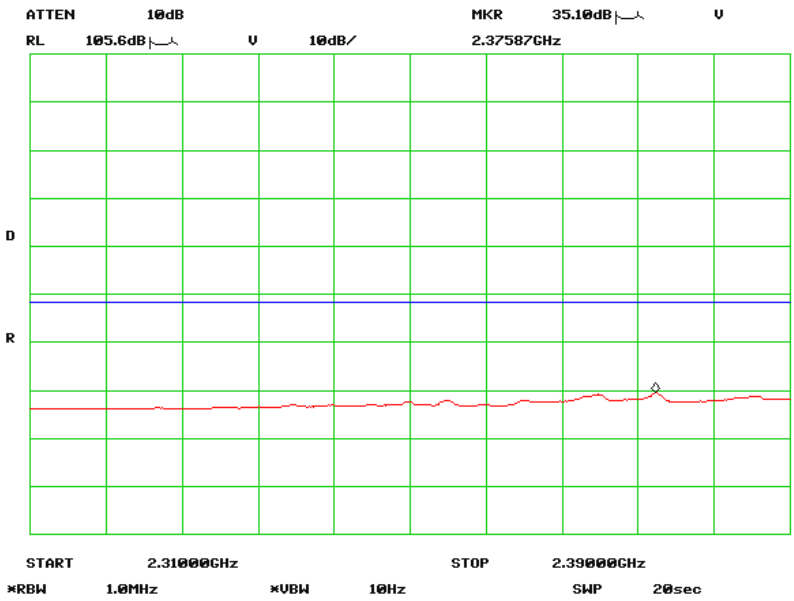
EDR Lowest Channel at Horizontal: Peak



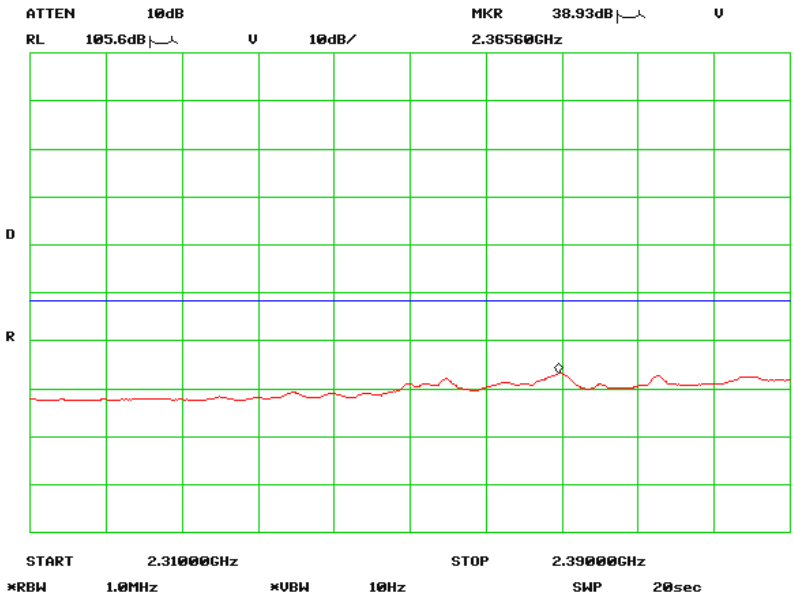
EDR Lowest Channel at Vertical: Peak



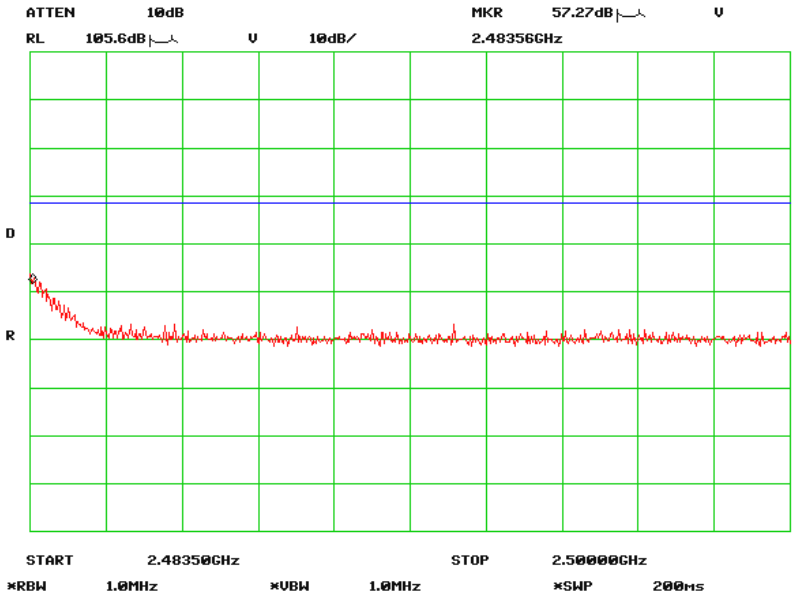
EDR Lowest Channel at Horizontal: Average



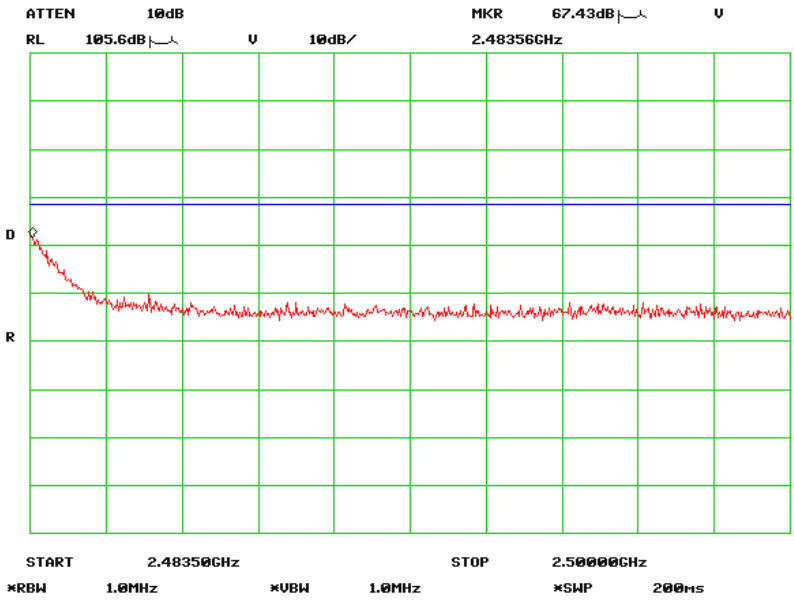
EDR Lowest Channel at Vertical: Average



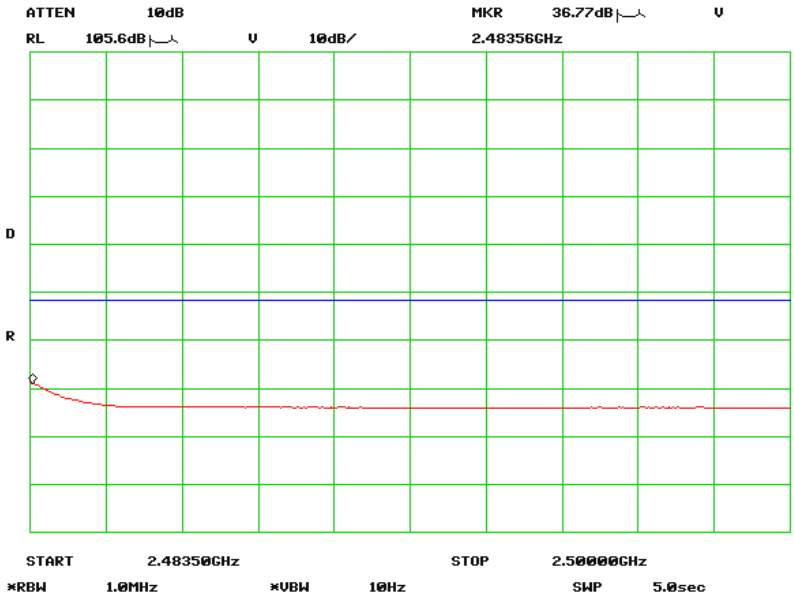
EDR Highest Channel at Horizontal: Peak



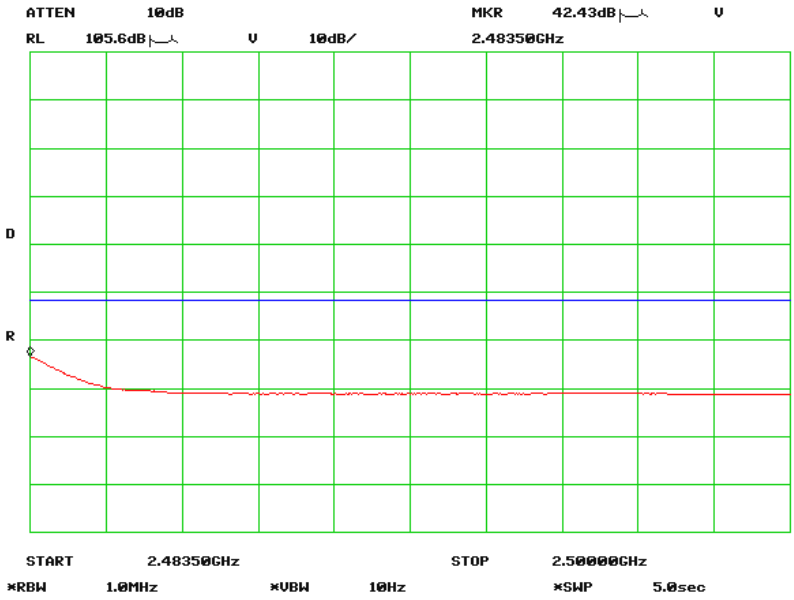
EDR Highest Channel at Vertical: Peak



EDR Highest Channel at Horizontal: Average



EDR Highest Channel at Vertical: Average



FCC §15.247(a) (1) - CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hoping 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 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	100224	2009-10-16	2010-10-16

*** 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:	52 %
ATM Pressure:	100.9 kPa

** The testing was performed by Peter Zhang & Marshal Yu on 2010-05-17.*

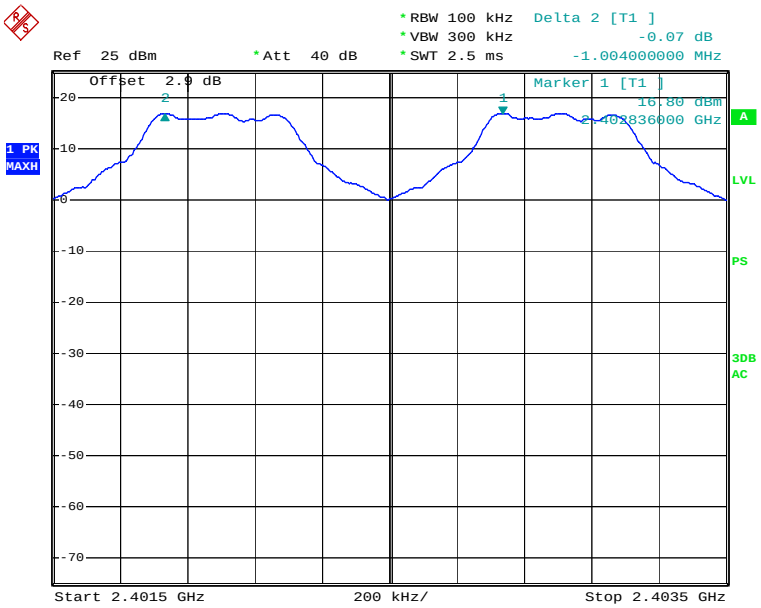
Test Result: Compliant, Please refer to following tables and plots.

Test Mode: BDR Transmitting

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.004	0.565	Pass
Adjacent Channel	2403			
Mid Channel	2441	1.004	0.576	Pass
Adjacent Channel	2442			
High Channel	2480	1.00	0.56	Pass
Adjacent Channel	2479			

Please refer to the following plots.

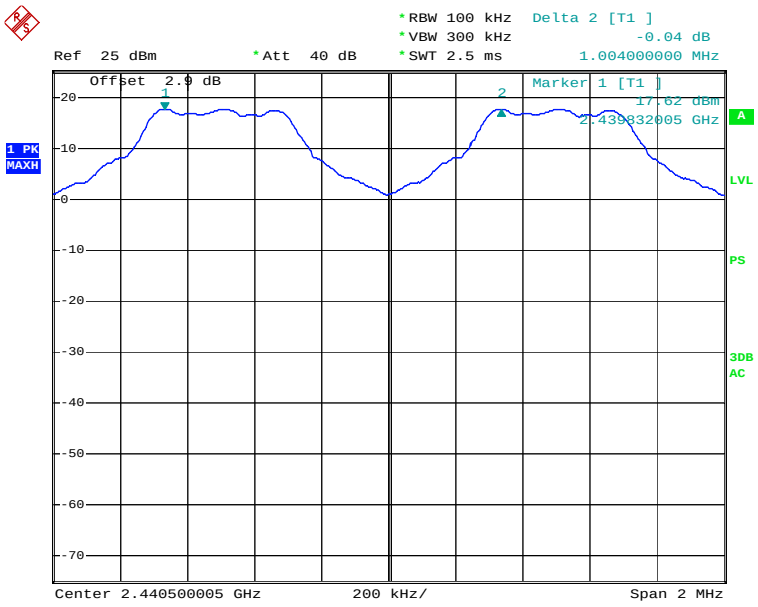
Low Channel



CS-LOW-BDR

Date: 17.MAY.2010 15:53:14

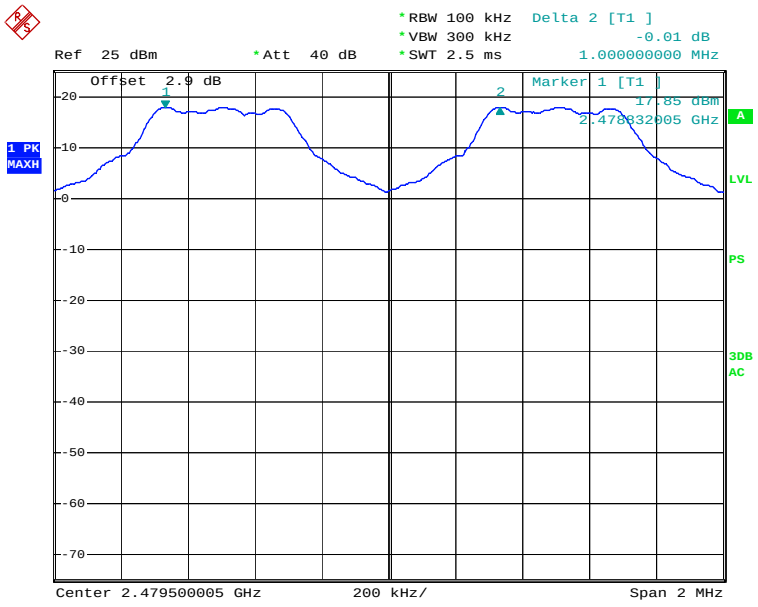
Middle Channel



CS-MIDDLE-BDR

Date: 17.MAY.2010 15:58:14

High Channel



CS-HIGH-BDR

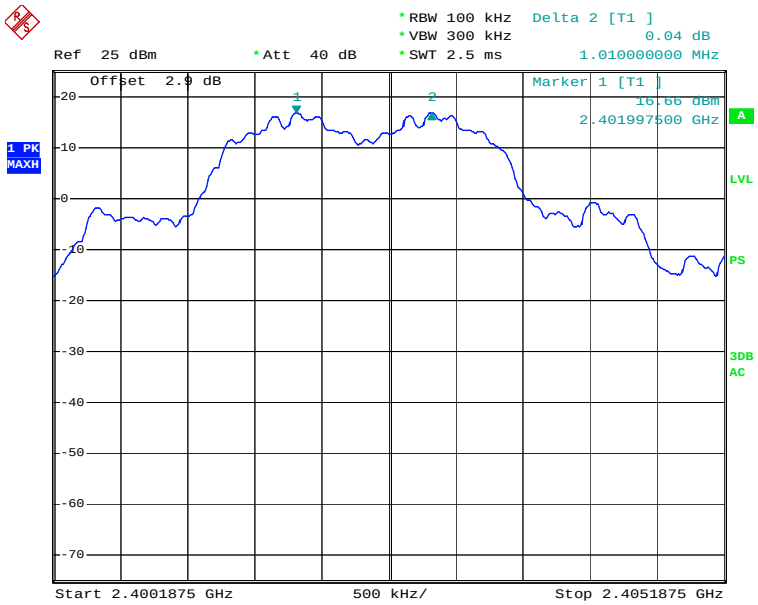
Date: 17.MAY.2010 16:05:08

Test Mode: EDR Transmitting

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.01	0.912	Pass
Adjacent Channel	2403			
Mid Channel	2441	1.00	0.891	Pass
Adjacent Channel	2442			
High Channel	2480	1.00	0.912	Pass
Adjacent Channel	2479			

Please refer to the following plots.

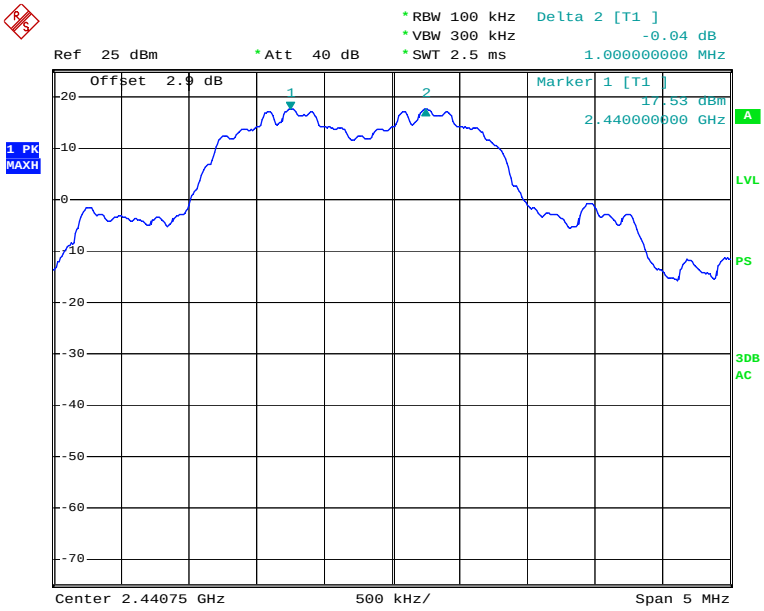
Low Channel



CS-LOW-EDR

Date: 17.MAY.2010 16:25:20

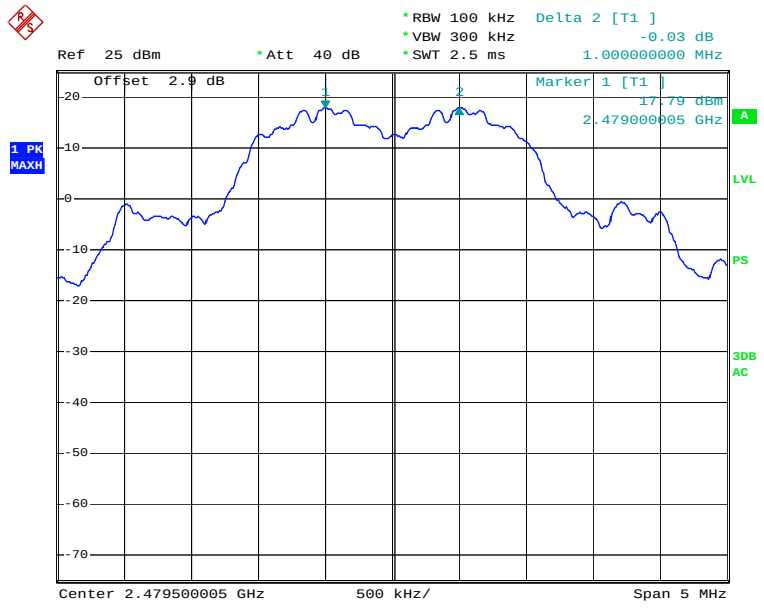
Middle Channel



CS-MIDDLE-EDR

Date: 17.MAY.2010 16:19:58

High Channel



CS-HIGH-EDR

Date: 17.MAY.2010 16:12:33

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 125mW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2009-10-16	2010-10-16

*** 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 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 Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

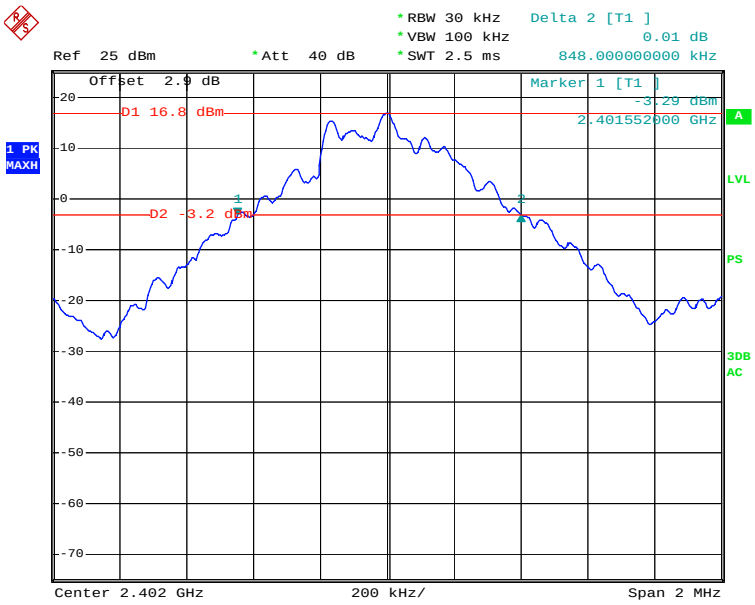
** The testing was performed by Peter Zhang & Marshal Yu on 2010-05-17 & 2010-05-26.*

Test Result: Compliant, Please refer to following tables and plots.

Test Mode: BDR Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.848	0.916
Middle	2441	0.864	0.904
High	2480	0.840	0.904

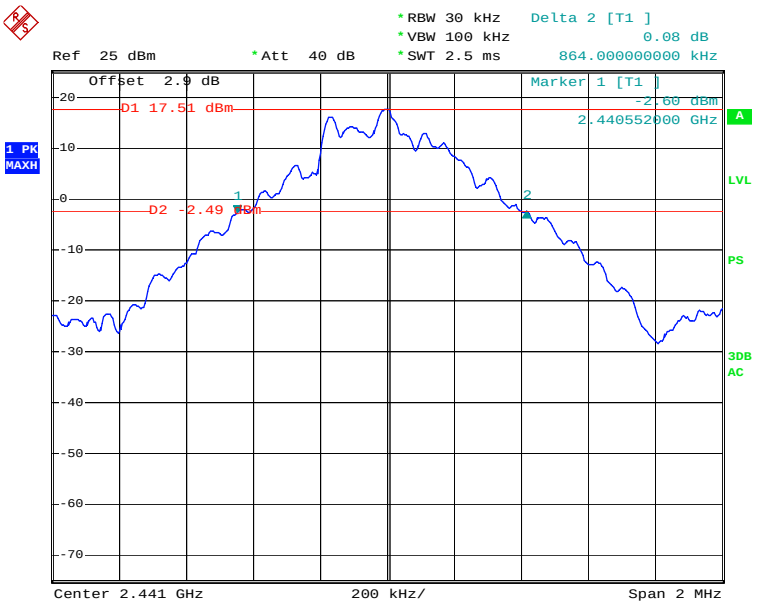
Low Channel for 20 dB Bandwidth



20DB-LOW-BDR

Date: 17.MAY.2010 16:49:17

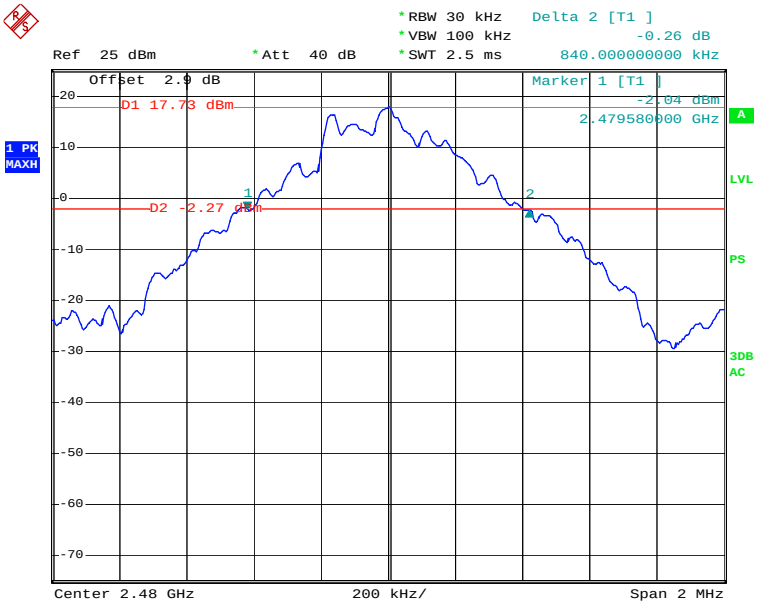
Middle Channel for 20 dB Bandwidth



20DB-MIDDLE-BDR

Date: 17.MAY.2010 16:54:47

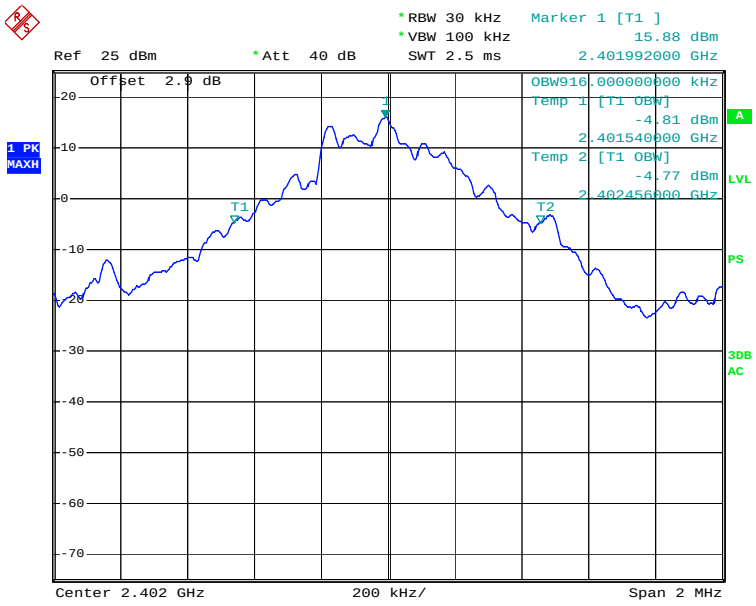
High Channel for 20 dB Bandwidth



20DB-HIGH-BDR

Date: 17.MAY.2010 16:58:28

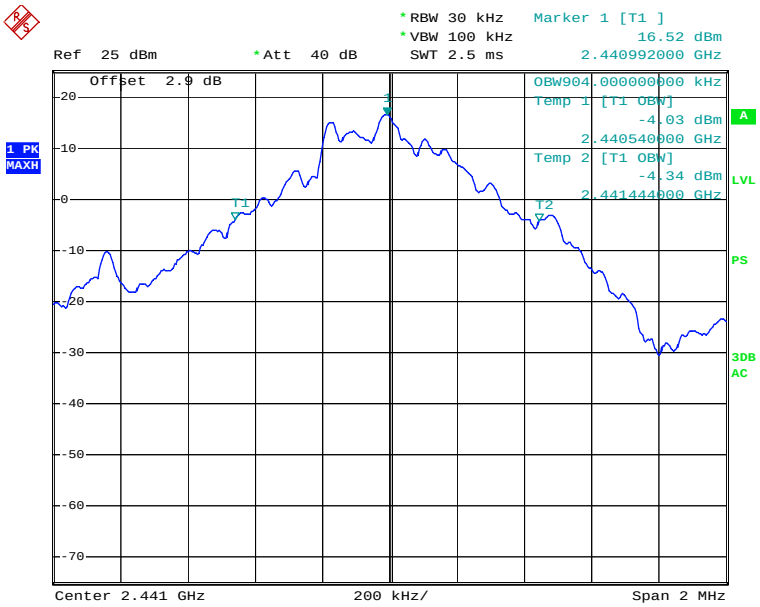
Low Channel for 99% Bandwidth



99BANDWIDTH-LOW-BDR

Date: 26.MAY.2010 10:48:49

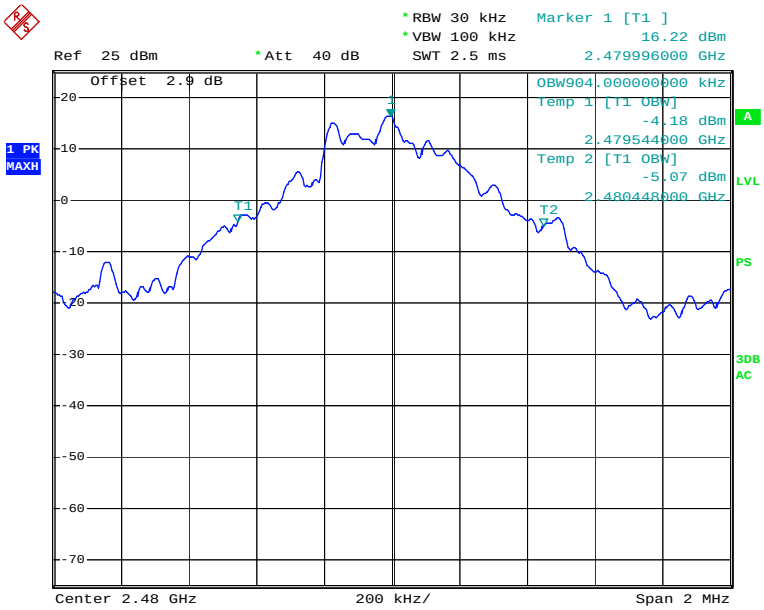
Middle Channel 99% Bandwidth



99BANDWIDTH-MIDDLE-BDR

Date: 26.MAY.2010 10:51:12

High Channel for 99% Bandwidth



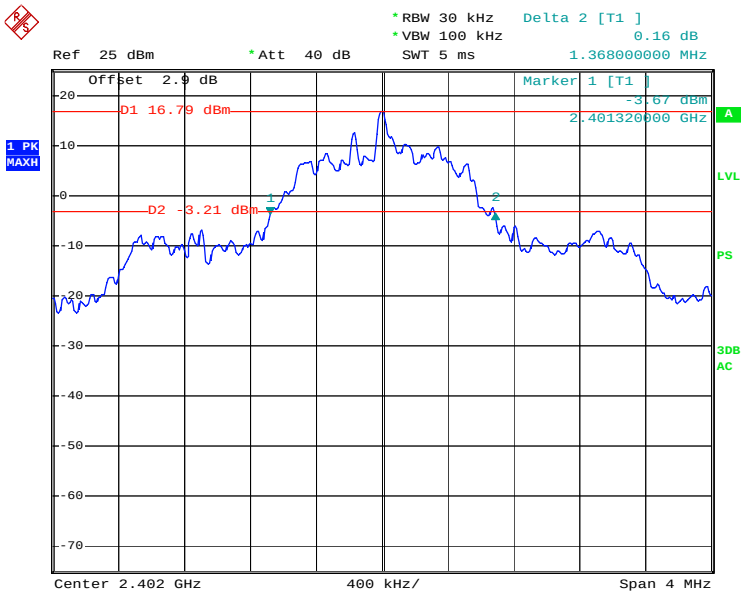
99BANDWIDTH-HIGH-BDR

Date: 26.MAY.2010 10:53:26

Test Mode: EDR Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.368	2.28
Middle	2441	1.336	1.744
High	2480	1.368	1.912

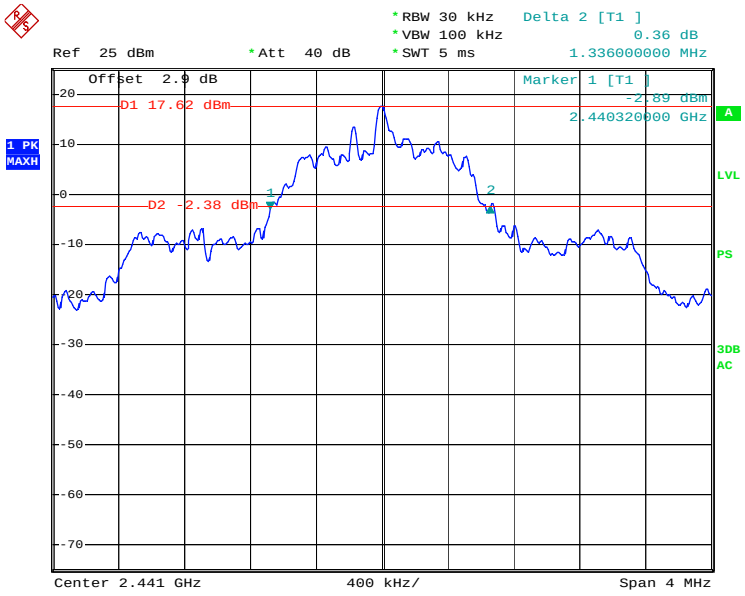
Low Channel for 20 dB Bandwidth



20DB-LOW-EDR

Date: 17.MAY.2010 17:21:00

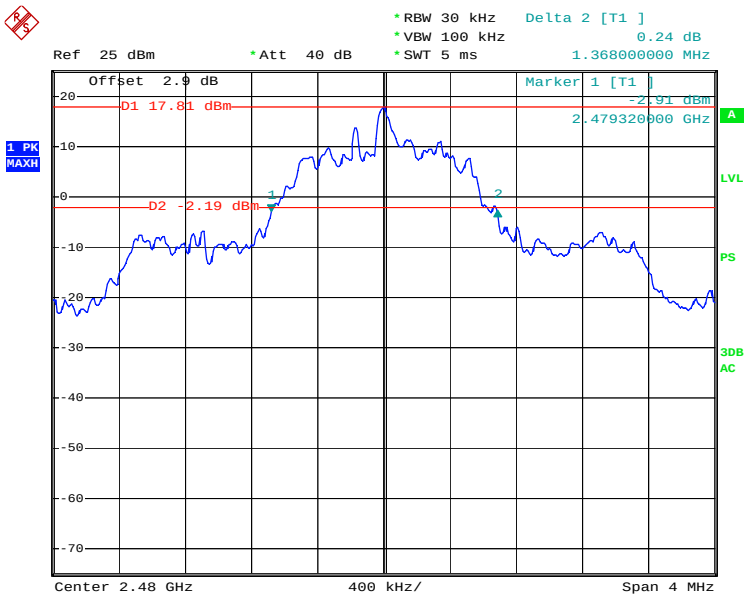
Middle Channel for 20 dB Bandwidth



20DB-MIDDLE-EDR

Date: 17.MAY.2010 17:14:01

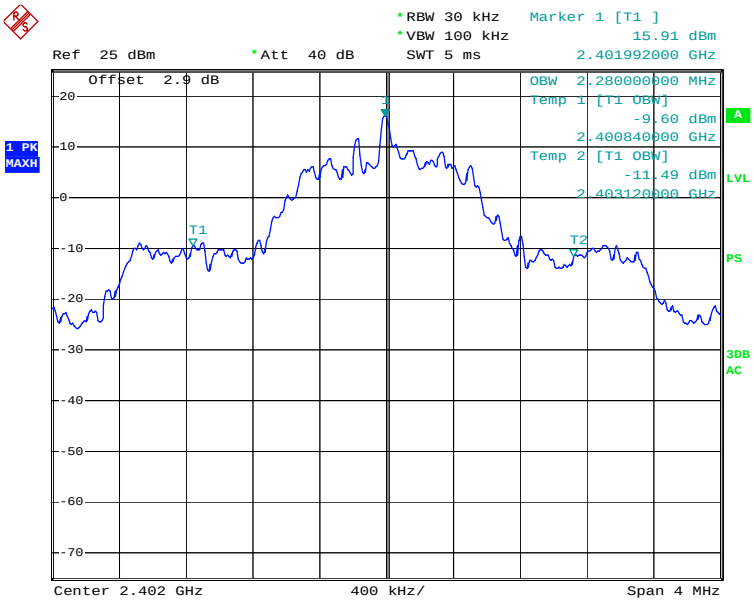
High Channel for 20 dB Bandwidth



20DB-HIGH-EDR

Date: 17.MAY.2010 17:04:54

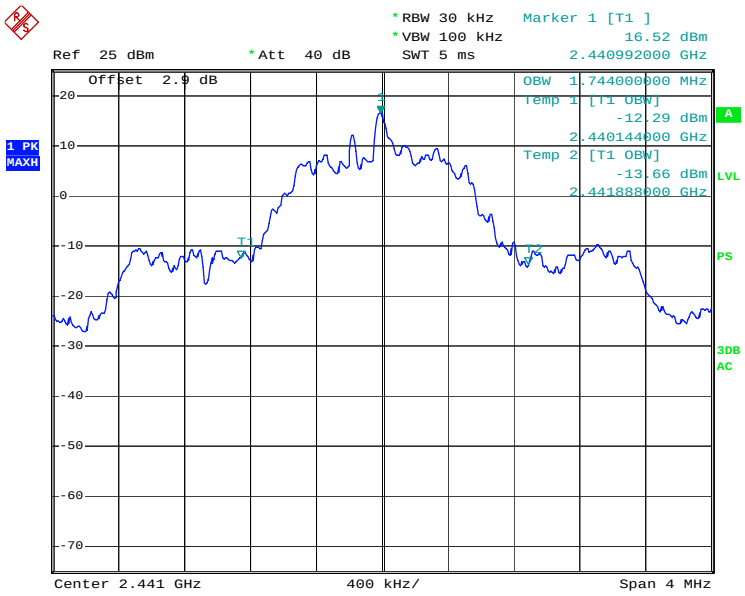
Low Channel for 99% Bandwidth



99BANDWIDTH-HIGH-EDR

Date: 26.MAY.2010 11:01:08

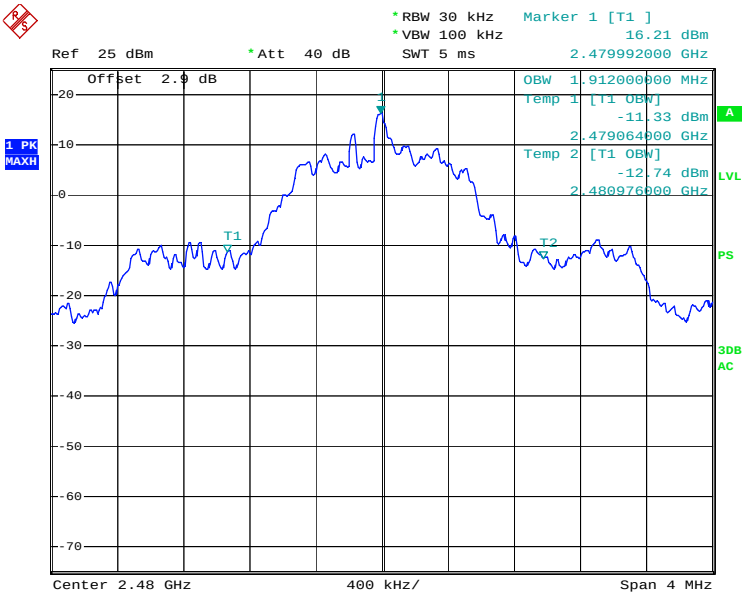
Middle Channel for 99% Bandwidth



99BANDWIDTH-MIDDLE-EDR

Date: 26.MAY.2010 10:59:04

High Channel for 99% Bandwidth



99BANDWIDTH-HIGH-EDR

Date: 26.MAY.2010 10:56:30

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	100224	2009-10-16	2010-10-16

*** 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:	52 %
ATM Pressure:	100.9 kPa

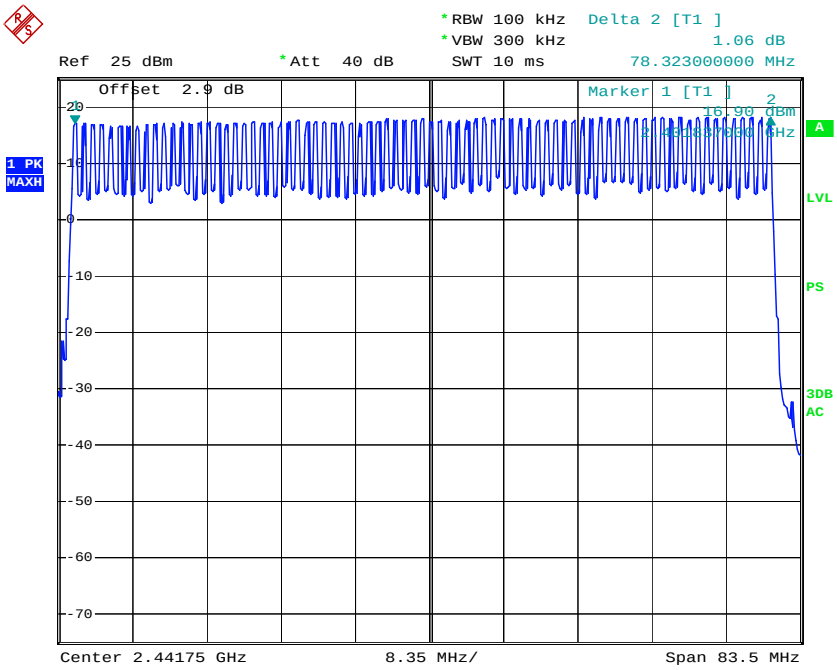
The testing was performed by Peter Zhang & Marshal Yu on 2010-05-17.

Test Result: Compliant, Please refer to following tables and plots.

Test Mode: BDR Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥ 15

Number of Hopping Channels



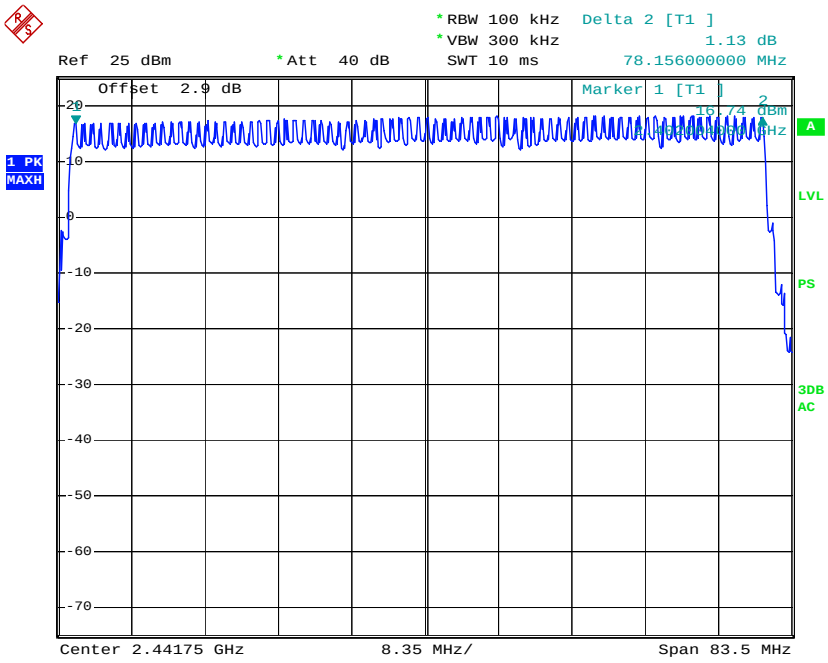
HS-BDR

Date: 17.MAY.2010 17:56:41

Test Mode: EDR Transmitting

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥ 15

Number of Hopping Channels



HS-EDR

Date: 17.MAY.2010 18:13:57

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	100224	2009-10-16	2010-10-16

*** 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 X 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 Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

** The testing was performed by Peter Zhang & Marshal Yu on 2010-05-18.*

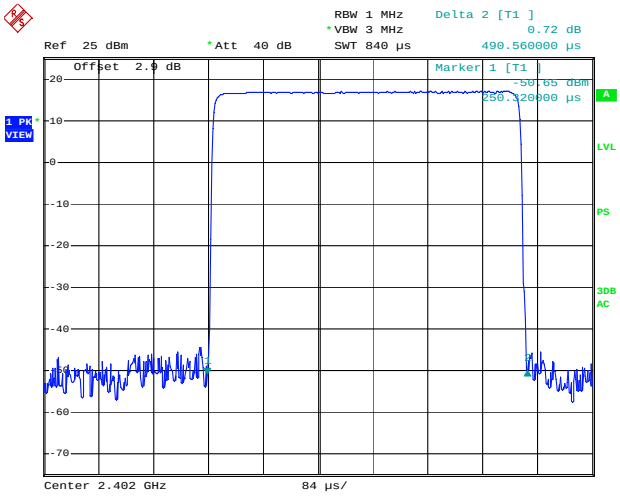
Test Result: Compliant, Please refer to following tables and plots.

Dwell Time

Test Mode: BDR Transmitting

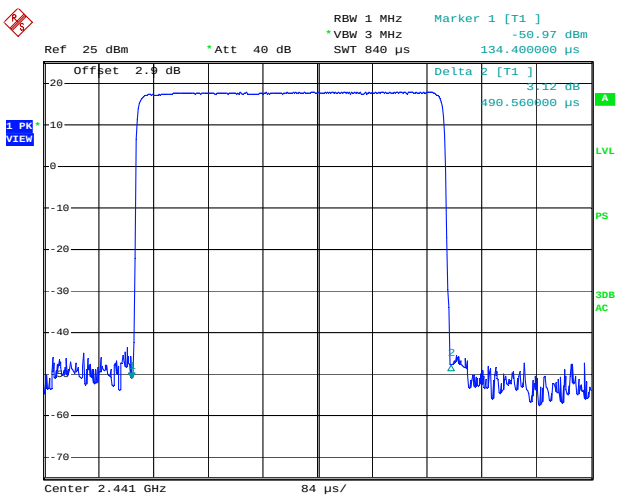
Mode	Channel	Pulse Width (ms)	Dwell Time (Sec)	Limit (Sec)	Result
DH 1	Low	0.491	0.157	0.4	Pass
	Middle	0.491	0.157	0.4	Pass
	High	0.494	0.158	0.4	Pass
	Note: Dwell time=Pulse width (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH 3	Low	1.765	0.282	0.4	Pass
	Middle	1.77	0.283	0.4	Pass
	High	1.76	0.282	0.4	Pass
	Note: Dwell time=Pulse width (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH 5	Low	3.06	0.326	0.4	Pass
	Middle	3.041	0.324	0.4	Pass
	High	3.02	0.322	0.4	Pass
	Note: Dwell time=Pulse width (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

Low Channel for DH1



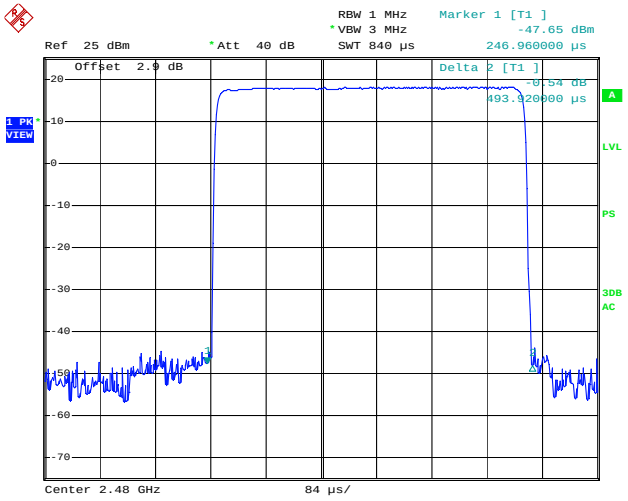
DH1-LOW-BDR
Date: 18.MAY.2010 10:03:58

Middle Channel for DH1



DH1-MIDDLE-BDR
Date: 18.MAY.2010 10:07:24

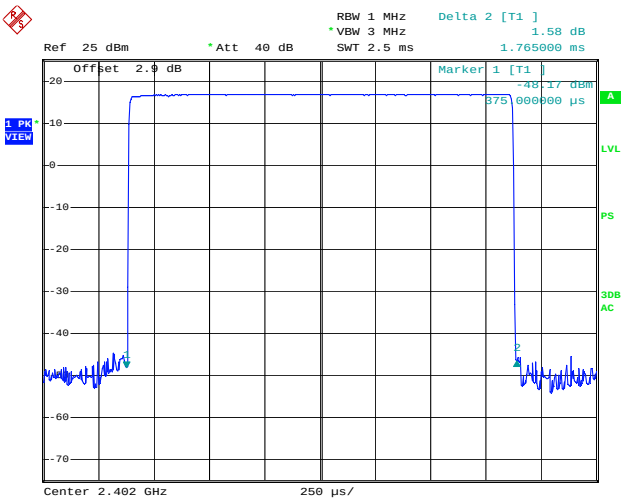
High Channel for DH1



DH1-HIGH-BDR

Date: 18.MAY.2010 10:10:20

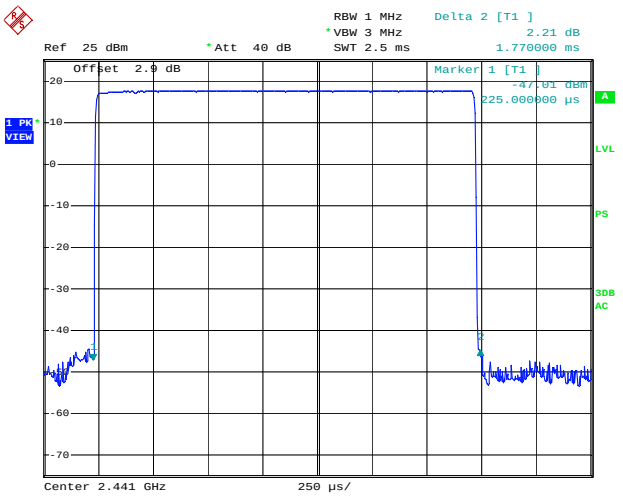
Low Channel for DH3



DH3-LOW-BDR

Date: 18.MAY.2010 10:21:10

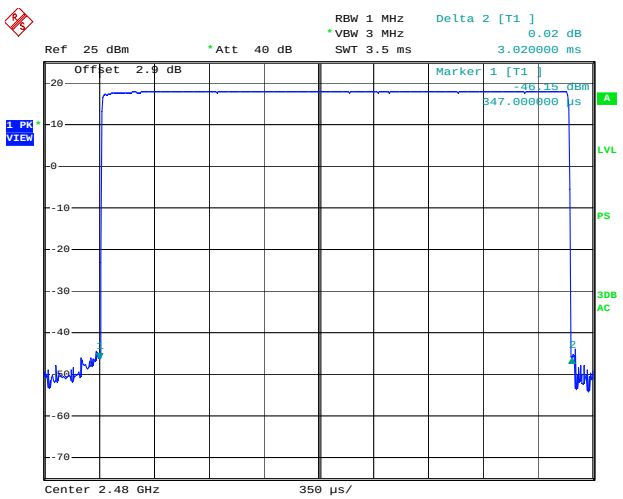
Middle Channel for DH3



DH3-MIDDLE-BDR

Date: 18.MAY.2010 10:19:14

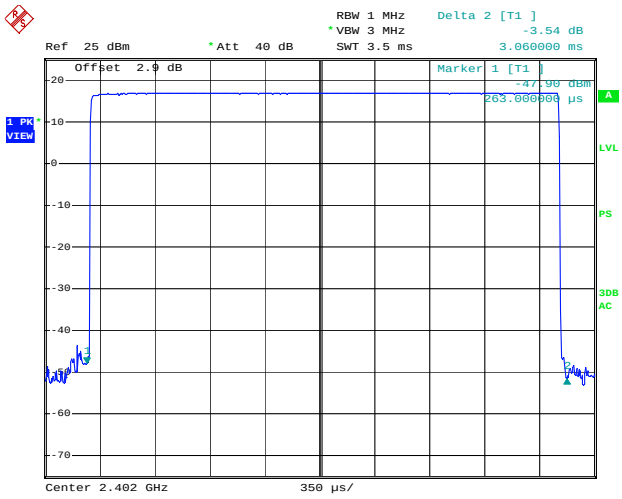
High Channel for DH3



DH5-HIGH-BDR

Date: 18.MAY.2010 10:37:44

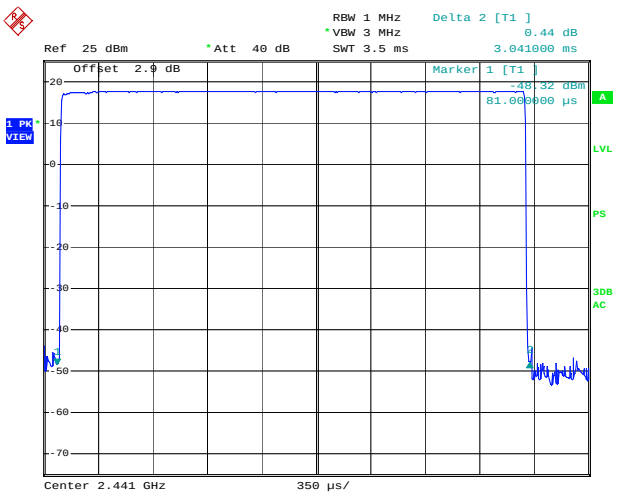
Low Channel for DH5



DH5-LOW-BDR

Date: 18.MAY.2010 10:30:12

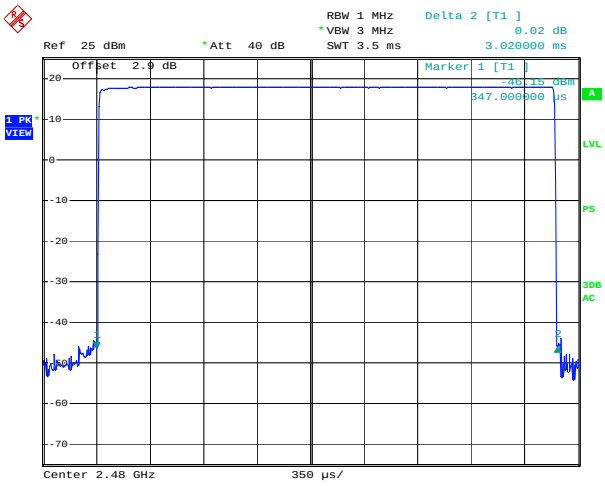
Middle Channel for DH5



DH5-MIDDLE-BDR

Date: 18.MAY.2010 10:34:29

High Channel for DH5



DH5-HIGH-BDR

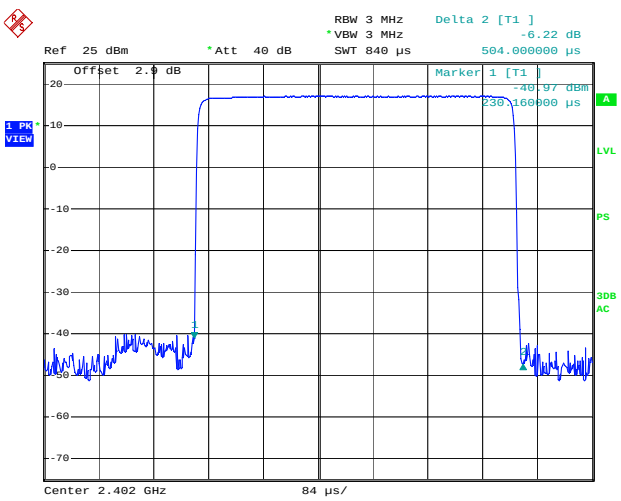
Date: 18.MAY.2010 10:37:44

Dwell Time

Test Mode: EDR Transmitting

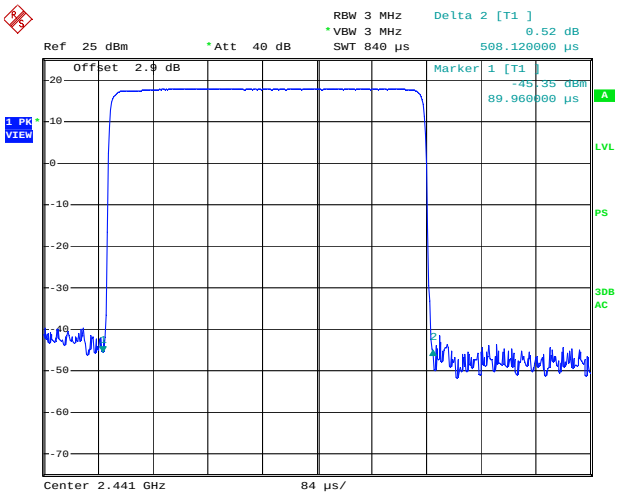
Mode	Channel	Pulse Width (ms)	Dwell Time (Sec)	Limit (Sec)	Result
DH1	Low	0.504	0.161	0.4	Pass
	Middle	0.509	0.153	0.4	Pass
	High	0.503	0.161	0.4	Pass
	Note: Dwell time=Pulse width (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH3	Low	1.776	0.284	0.4	Pass
	Middle	1.78	0.285	0.4	Pass
	High	1.772	0.284	0.4	Pass
	Note: Dwell time=Pulse width (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH5	Low	3.024	0.323	0.4	Pass
	Middle	3.031	0.323	0.4	Pass
	High	3.038	0.324	0.4	Pass
	Note: Dwell time=Pulse width (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

Low Channel for DH1



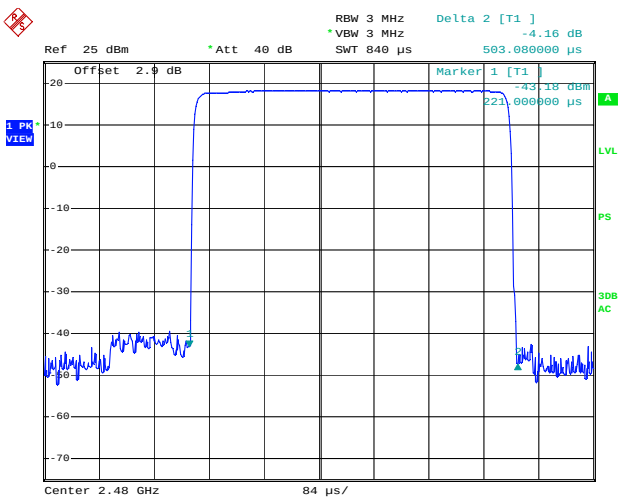
DH1-LOW-EDR
Date: 18.MAY.2010 10:54:46

Middle Channel for DH1



DH1-MIDDLE-EDR
Date: 18.MAY.2010 10:52:17

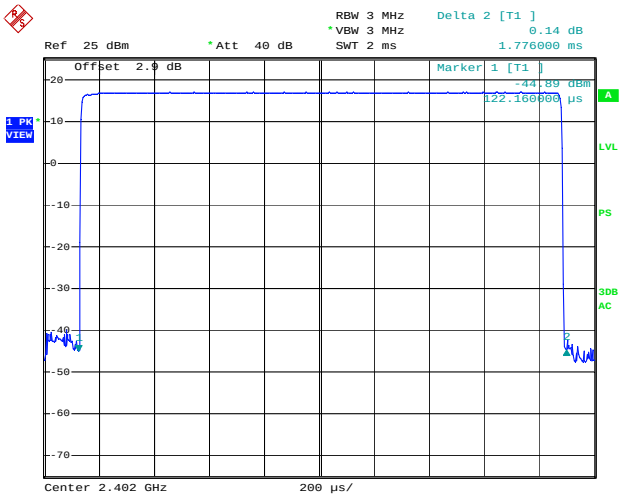
High Channel for DH1



DH1-HIGH-EDR

Date: 18.MAY.2010 10:45:49

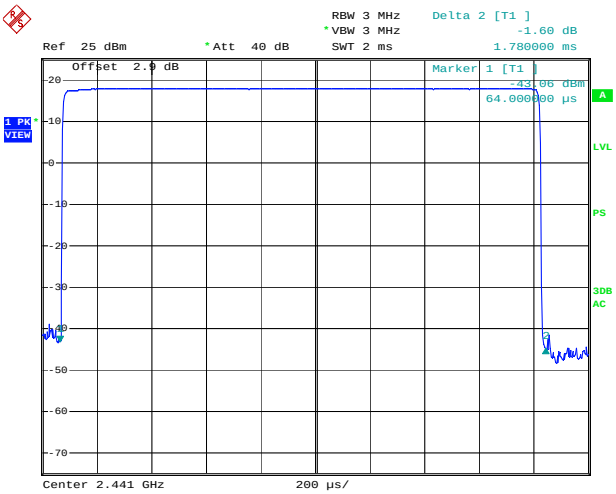
Low Channel for DH3



DH3-LOW-EDR

Date: 18.MAY.2010 11:01:27

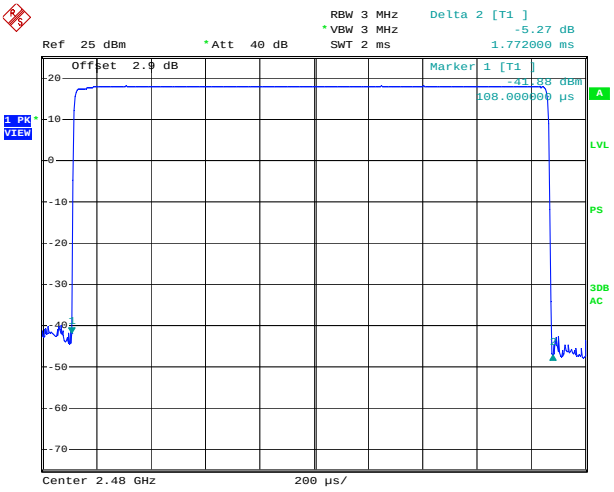
Middle Channel for DH3



DH3-MIDDLE-EDR

Date: 18.MAY.2010 11:14:58

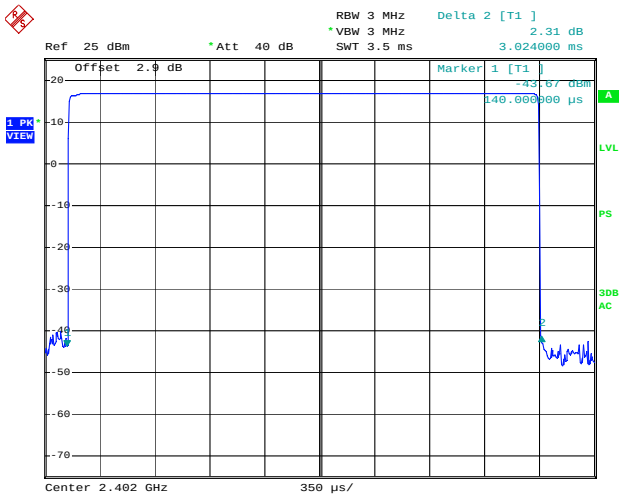
High Channel for DH3



DH3-HIGH-EDR

Date: 18.MAY.2010 11:17:44

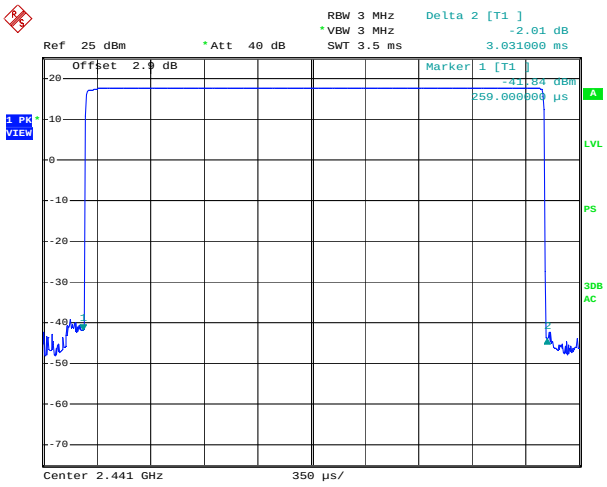
Low Channel for DH5



DH5-LOW-EDR

Date: 18.MAY.2010 11:38:44

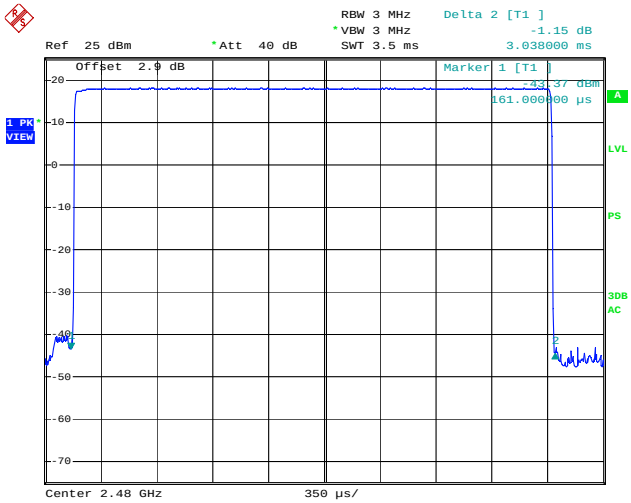
Middle Channel for DH5



DH5-MIDDLE-EDR

Date: 18.MAY.2010 11:35:52

High Channel for DH5



DH5-HIGH-EDR

Date: 18.MAY.2010 11:28:10

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.

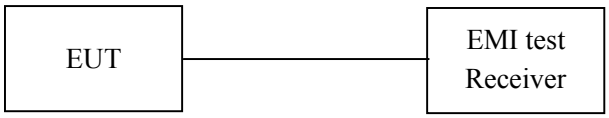
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2009-10-16	2010-10-16

*** 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:	52 %
ATM Pressure:	100.9 kPa

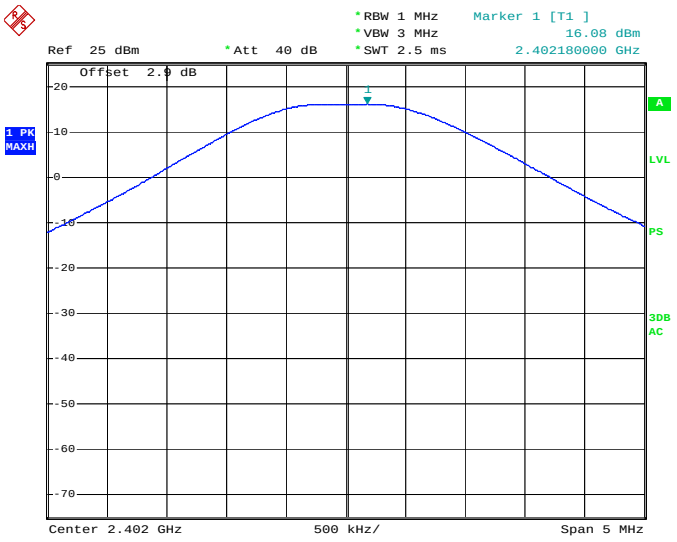
** The testing was performed by Peter Zhang & Marshal Yu on 2010-05-18 & 2010-05-20.*

Test Result: Compliant, Please refer to following tables and plots.

Test Mode: BDR Transmitting

Frequency (MHz)	Conducted Output Power (dBm)				Max.Output Power (dBm)	Limit (mW)	Results
	Ant. 0	Ant.1	Ant. 2	Ant. 3			
2402	16.08	16.80	16.06	16.69	16.80	125	Pass
2440	16.70	17.54	16.92	17.53	17.54	125	Pass
2480	16.46	17.78	17.05	17.59	17.78	125	Pass

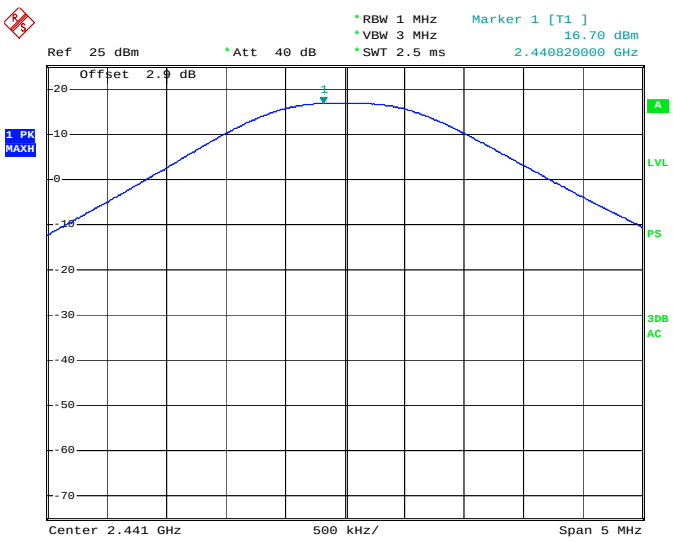
Low Channel for Antenna 0



CS0-LOW-BDR

Date: 18.MAY.2010 15:42:37

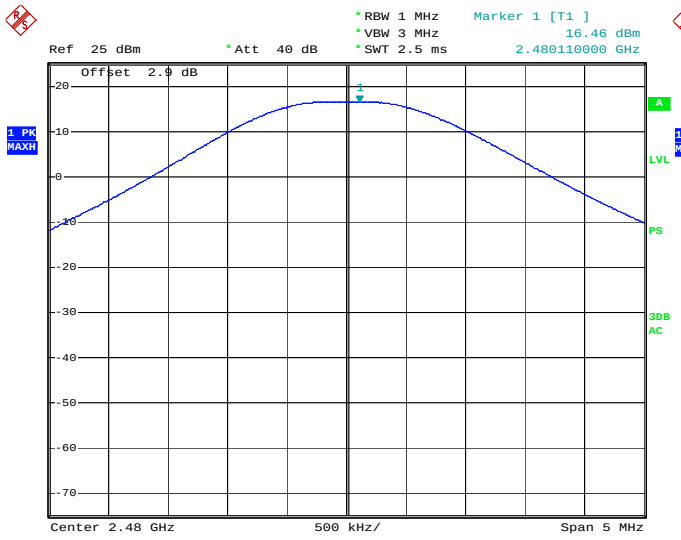
Middle Channel for Antenna 0



CS0-MIDDLE-BDR

Date: 18.MAY.2010 15:51:58

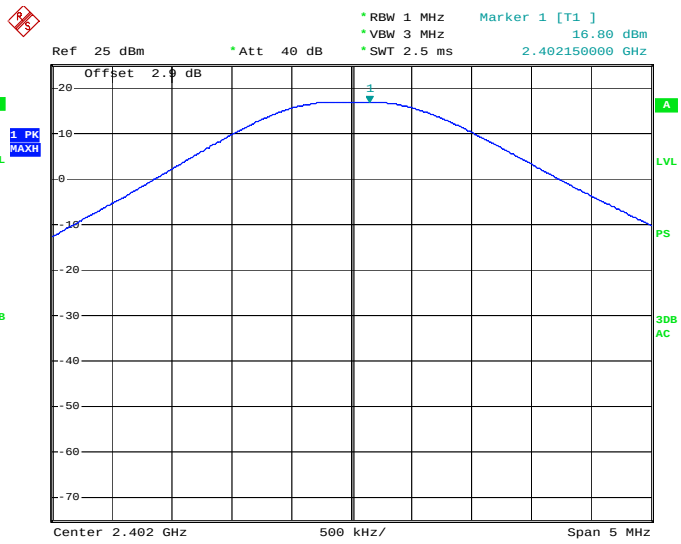
High Chanel for Antenna 0



CS0-HIGH-BDR

Date: 18.MAY.2010 15:55:43

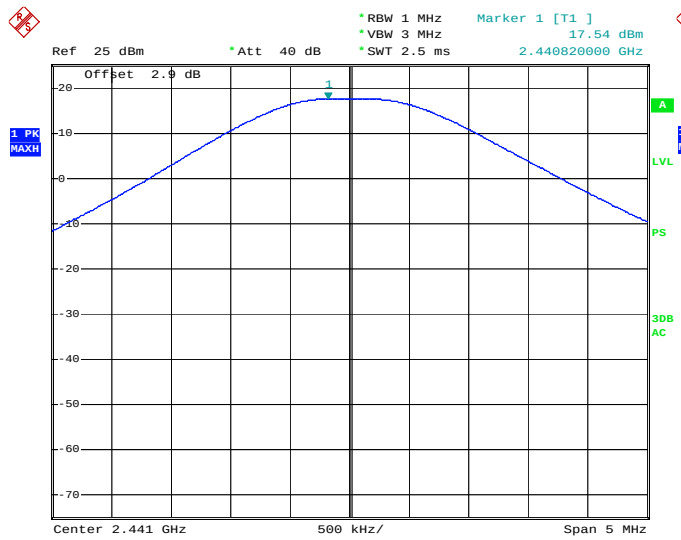
Low Channel for Antenna 1



CS1-LOW-BDR

Date: 18.MAY.2010 16:25:46

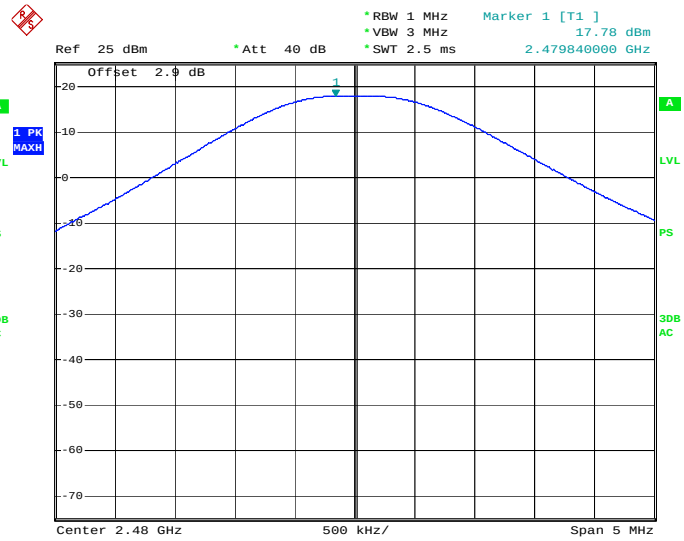
Middle Channel for Antenna 1



CS1-MIDDLE-BDR

Date: 18.MAY.2010 16:34:00

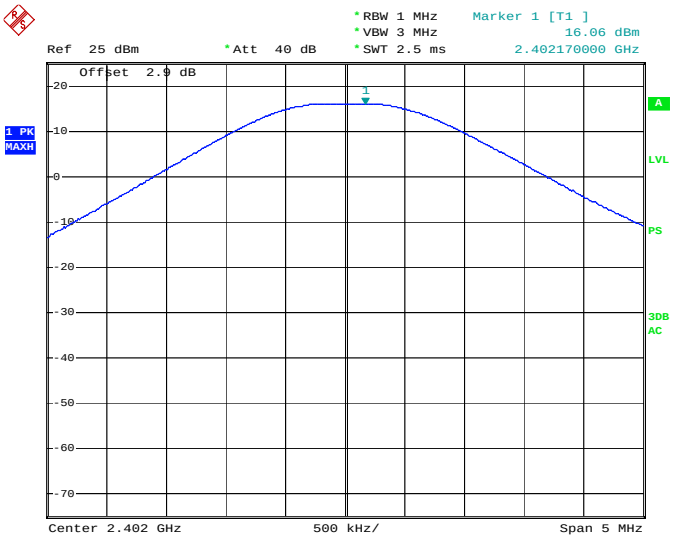
High Chanel for Antenna 1



CS1-HIGH-BDR

Date: 18.MAY.2010 16:36:18

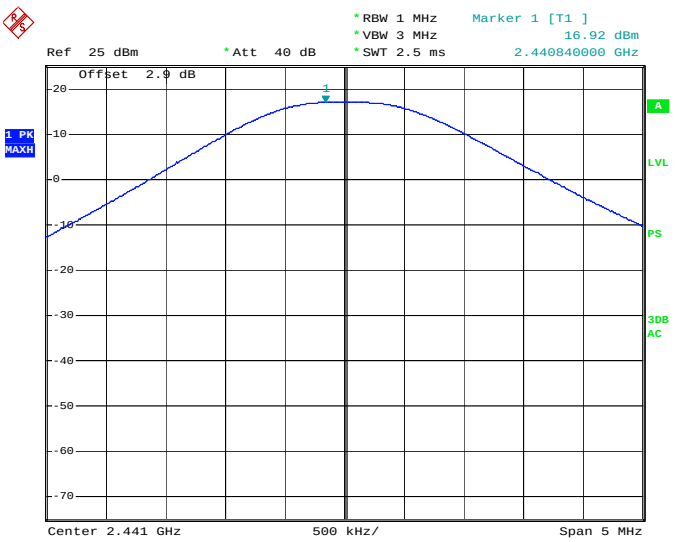
Low Channel for Antenna 2



CS2-LOW-BDR

Date: 18.MAY.2010 16:55:42

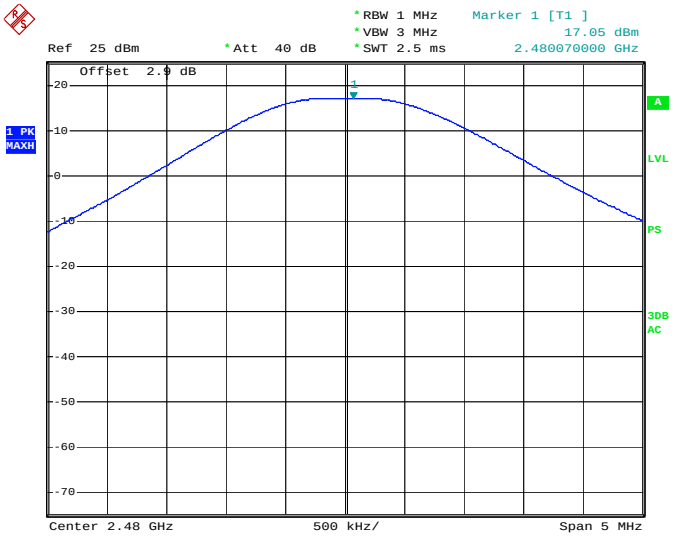
Middle Channel for Antenna 2



CS2-MIDDLE-BDR

Date: 18.MAY.2010 17:00:21

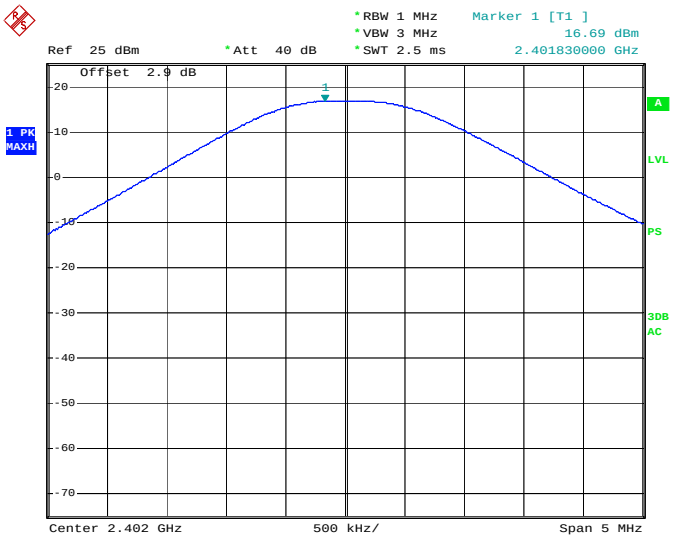
High Chanel for Antenna 2



CS2-HIGH-BDR

Date: 18.MAY.2010 17:04:02

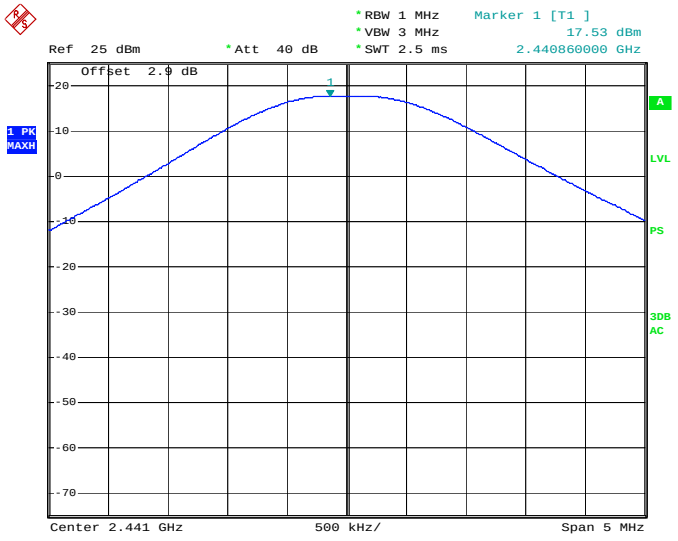
Low Channel for Antenna 3



CS3-LOW-BDR

Date: 18.MAY.2010 17:25:04

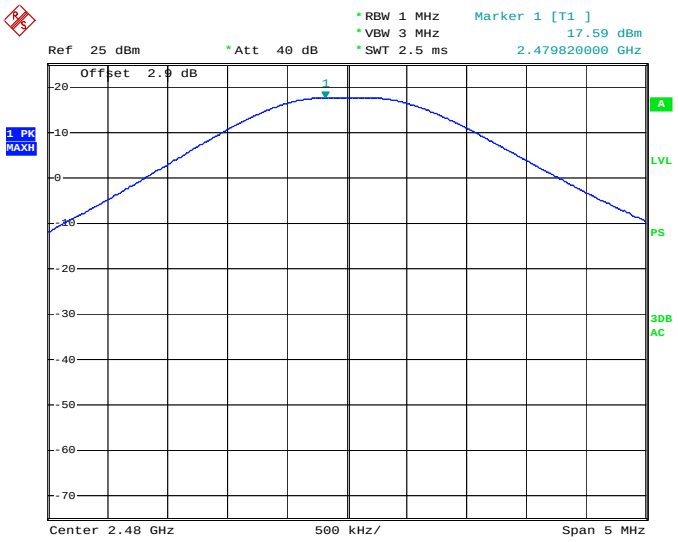
Middle Channel for Antenna 3



CS3-MIDDLE-BDR

Date: 18.MAY.2010 17:36:01

High Chanel for Antenna 3



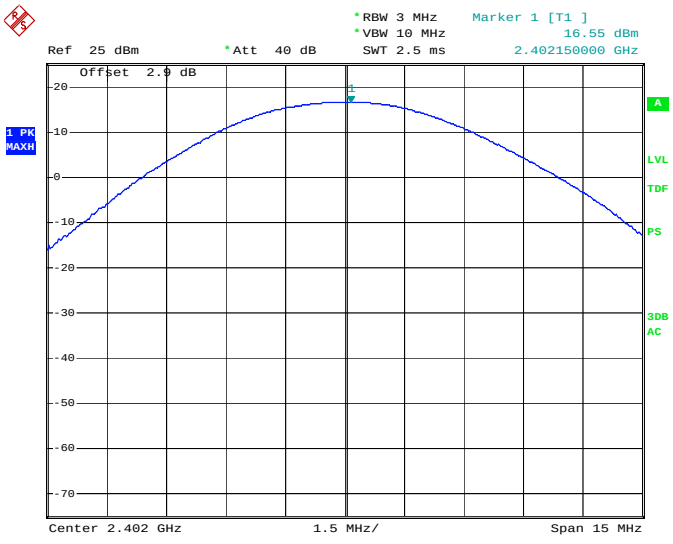
CS3-HIGH-BDR

Date: 18.MAY.2010 17:32:51

Test Mode: EDR Transmitting

Frequency (MHz)	Conducted Output Power (dBm)				Max.Output Power (dBm)	Limit (mW)	Results
	Ant. 0	Ant.1	Ant. 2	Ant. 3			
2402	16.55	17.16	15.97	16.94	17.16	125	Pass
2440	17.25	17.95	17.00	17.74	17.95	125	Pass
2480	17.16	18.32	17.55	17.86	18.32	125	Pass

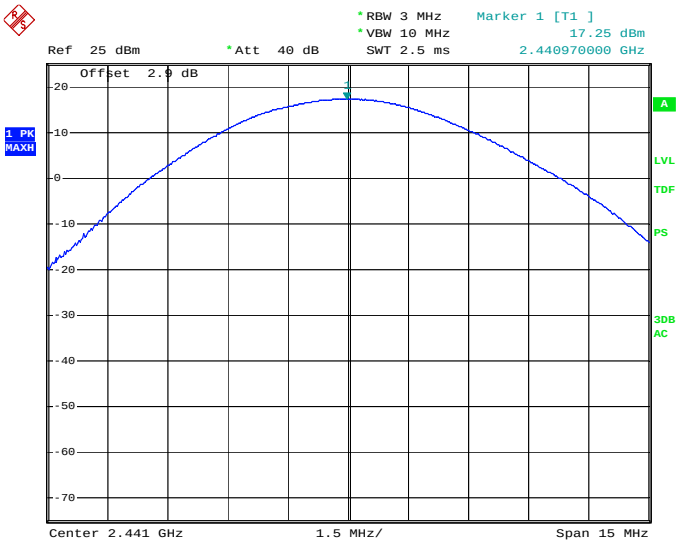
Low Channel for Antenna 0



CS0-LOW-EDR

Date: 20.MAY.2010 13:21:00

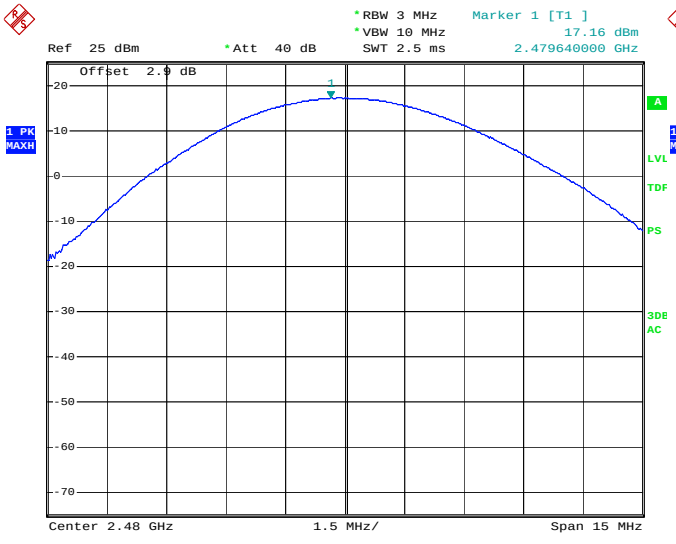
Middle Channel for Antenna 0



CS0-MIDDLE-EDR

Date: 20.MAY.2010 13:23:20

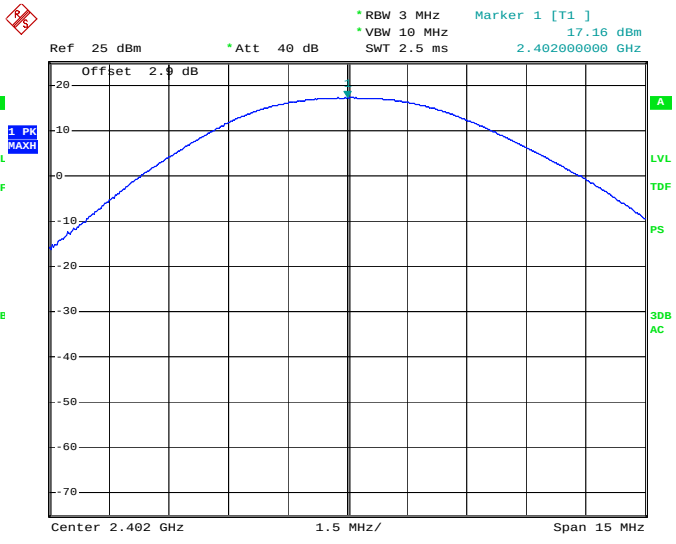
High Chanel for Antenna 0



CS0-HIGH-EDR

Date: 20.MAY.2010 13:25:27

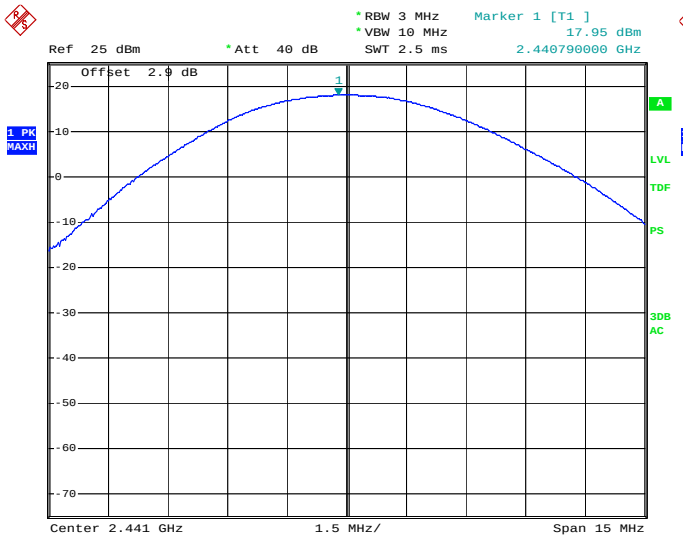
Low Channel for Antenna 1



CS1-LOW-EDR

Date: 20.MAY.2010 13:37:51

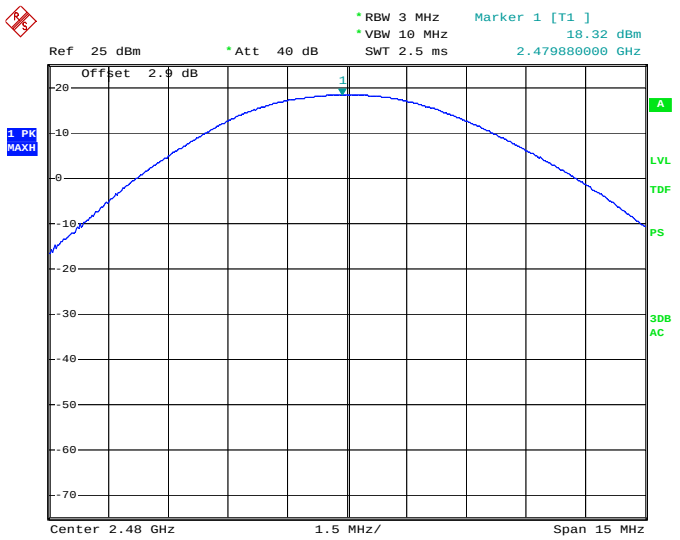
Middle Channel for Antenna 1



CS1-MIDDLE-EDR

Date: 20.MAY.2010 13:34:01

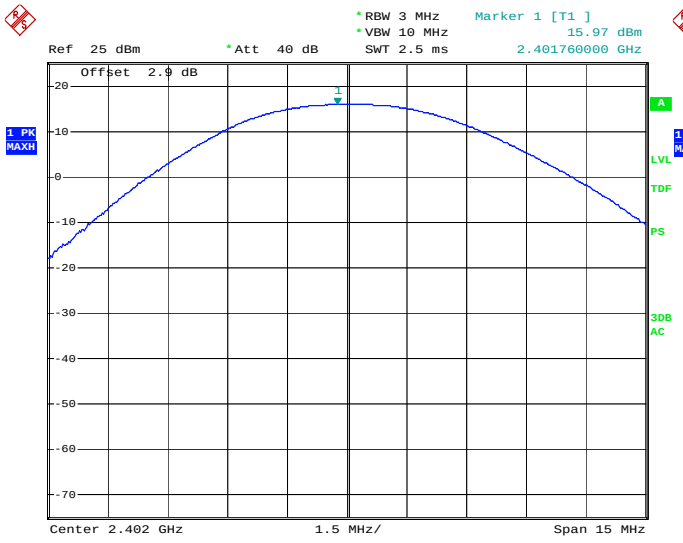
High Chanel for Antenna 1



CS1-HIGH-EDR

Date: 20.MAY.2010 13:28:45

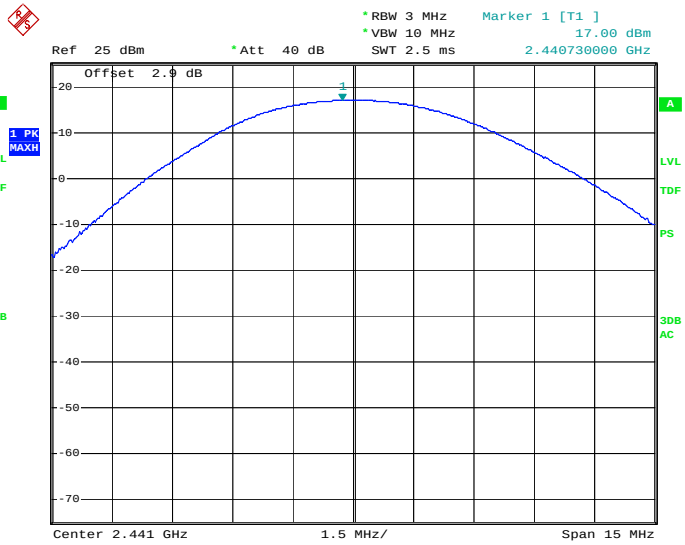
Low Channel for Antenna 2



CS2-LOW-EDR

Date: 20.MAY.2010 13:41:18

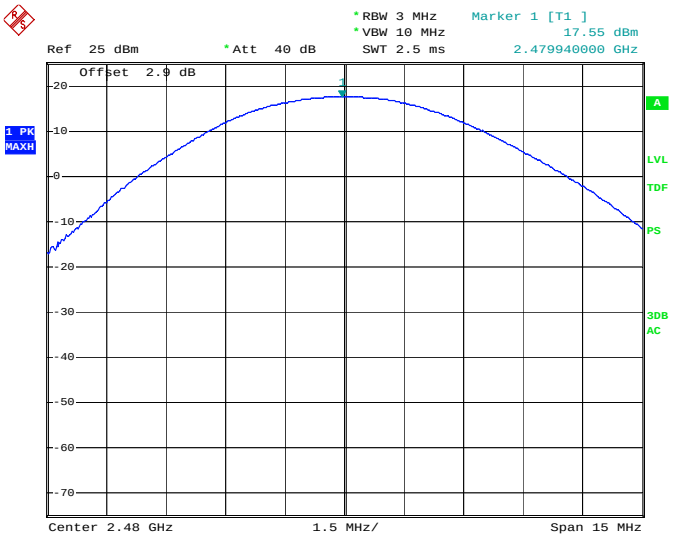
Middle Channel for Antenna 2



CS2-MIDDLE-EDR

Date: 20.MAY.2010 13:43:07

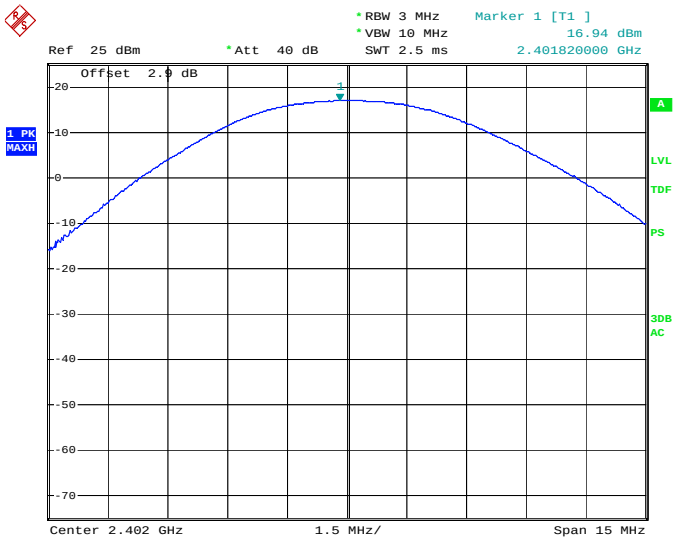
High Chanel for Antenna 2



CS2-HIGH-EDR

Date: 20.MAY.2010 13:45:25

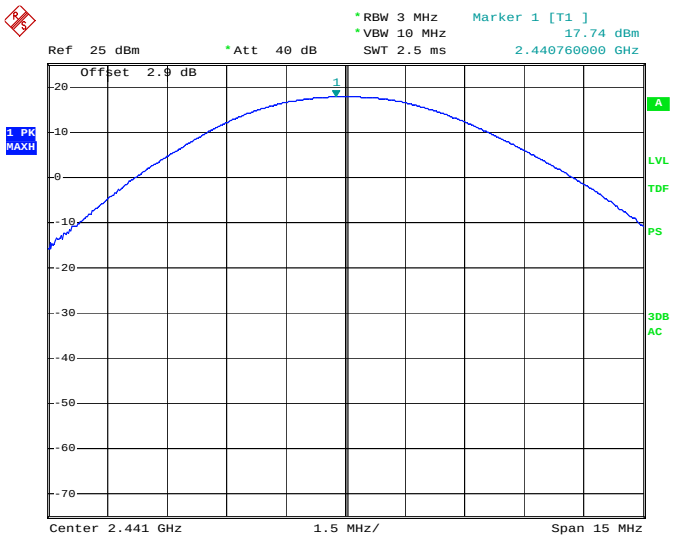
Low Channel for Antenna 3



CS3-LOW-EDR

Date: 20.MAY.2010 13:49:49

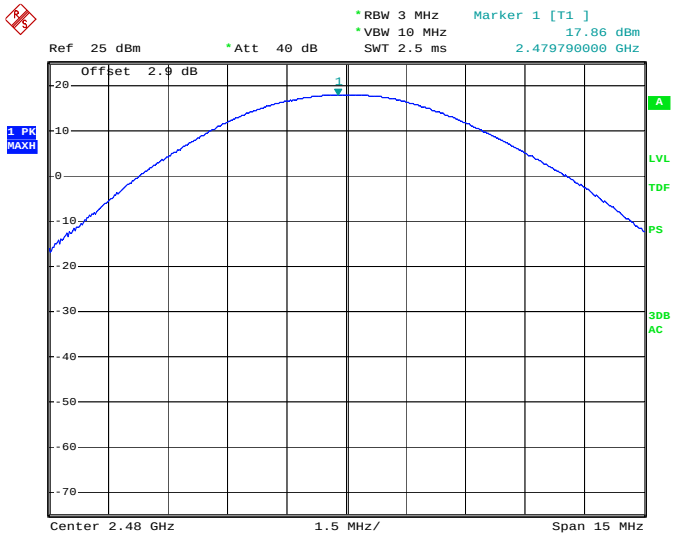
Middle Channel for Antenna 3



CS3-MIDDLE-EDR

Date: 20.MAY.2010 13:52:34

High Chanel for Antenna 3



CS3-HIGH-EDR

Date: 20.MAY.2010 13:54:20

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	100224	2009-10-16	2010-10-16

*** 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:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

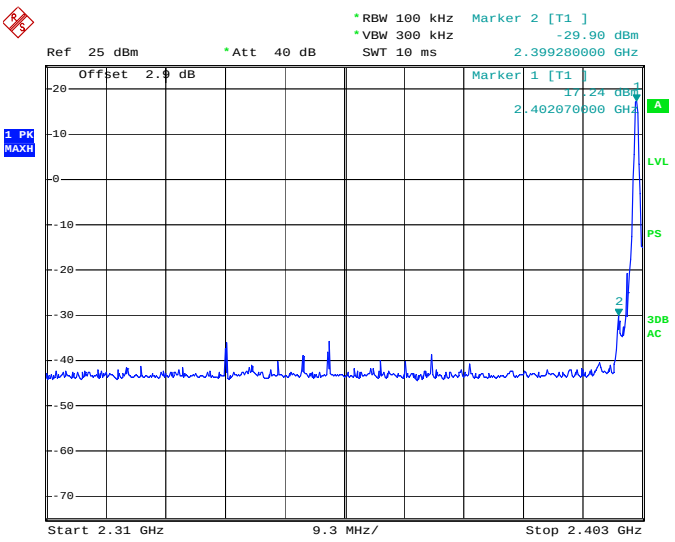
**The testing was performed by Peter Zhang & Marshal Yu on 2010-05-18.*

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

Test Mode: BDR Transmitting

Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)
2399.28	47.14	20
2485.72	58.1	20

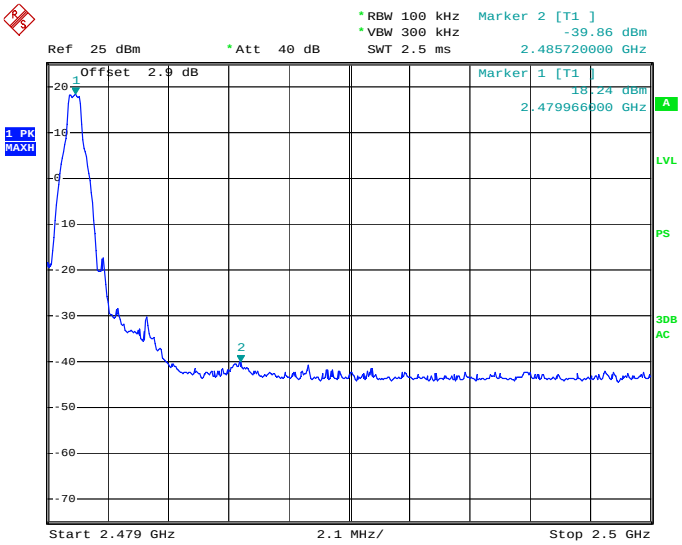
Band Edge: Left Side



BE-LOW-BDR

Date: 18.MAY.2010 09:35:23

Band Edge: Right Side



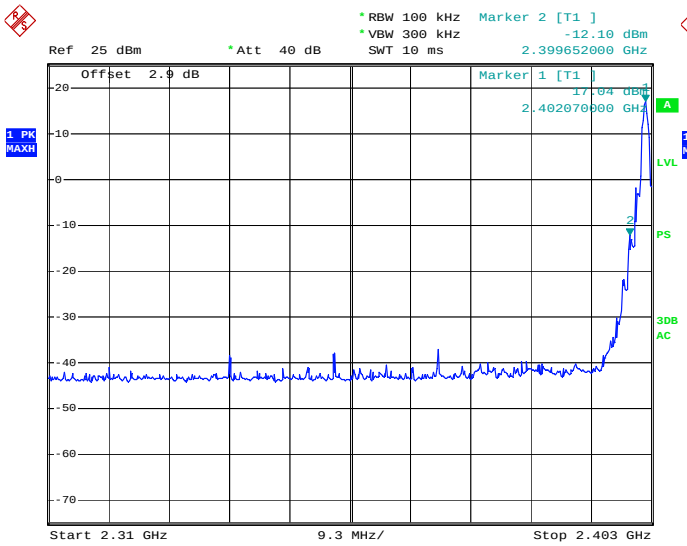
BE-HIGH-BDR

Date: 18.MAY.2010 09:41:35

Test Mode: EDR Transmitting

Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)
2399.28	29.14	20
2485.72	44.33	20

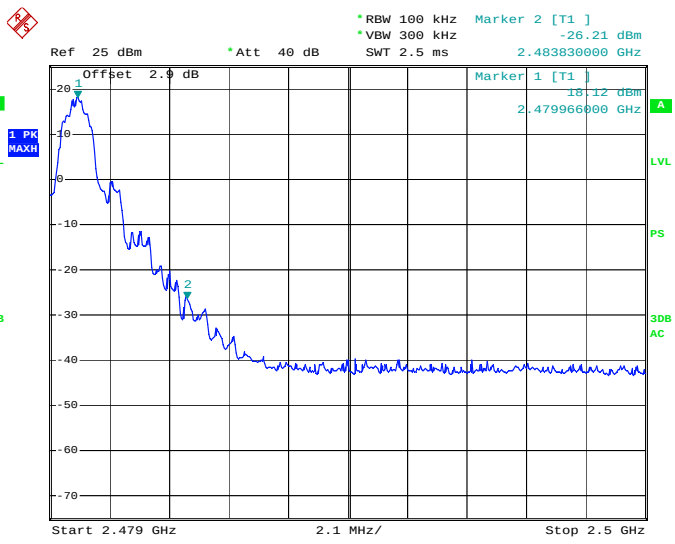
Band Edge: Left Side



BE-LOW-EDR

Date: 18.MAY.2010 09:50:55

Band Edge: Right Side



BE-HIGH-EDR

Date: 18.MAY.2010 09:45:42

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