

FCC PART 15.247
MEASUREMENT AND TEST REPORT

For

Weifang Goertek Electronics Co., Ltd.

Dongfang North Road, Hi-Tech Industry Development District,
Weifang, Shandong, China

FCC ID: SZG-GBH86X

Report Type: Original Report	Product Type: Bluetooth Headset
Test Engineer: Phoenix Liu	<i>Phoenix Liu</i>
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Reviewed By: EMC Engineer	<i>Ray chen</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008

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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" see 2

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Weifang Goertek Electronics Co.,Ltd.*'s product, model number: *GBH861* or the "EUT" as referred to in this report is a *Bluetooth headset*, which measures approximately: 5.19 cm L x 1.8 cm W x 2.83 cm H, input voltage: 3.7V battery.

Adapter Information:

Model: 7501SD-5018A-UL;

Input: 100-240V~ 50Hz/60Hz 50mA;

Output: 5.0V --- 180mA

** All measurement and test data in this report was gathered from production sample serial number: 0809019 (Assigned by BAACL, Shenzhen). The EUT was received on 2008-09-08.*

Objective

This Type approval report is prepared on behalf of *Weifang Goertek Electronics Co.,Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, 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 04, 2004. 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.

Local Support Equipment List and Details

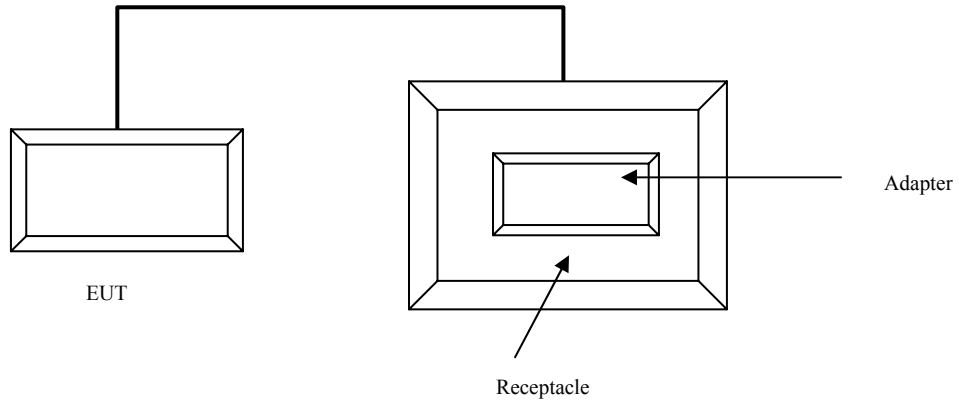
Manufacturer	Description	Model	Serial Number	FCC ID
Dell	Notebook	D610	N/A	DoC

External I/O Cable

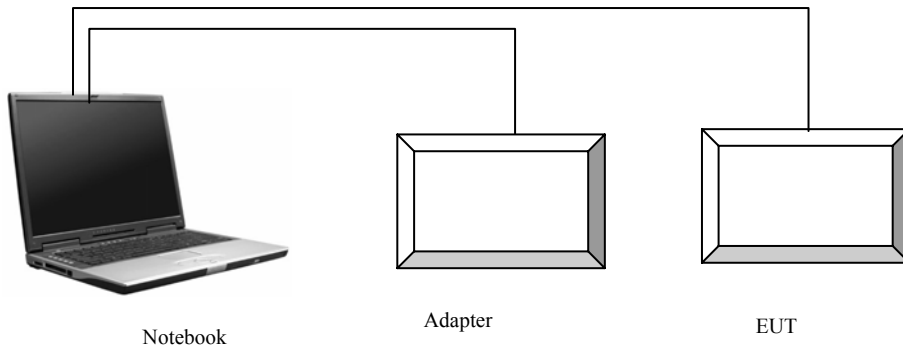
Cable Description	Length (m)	From Port	To
Unshielded Detachable DC Cable	1.0	EUT	Adapter

Configuration of Test Setup

Charging Mode:

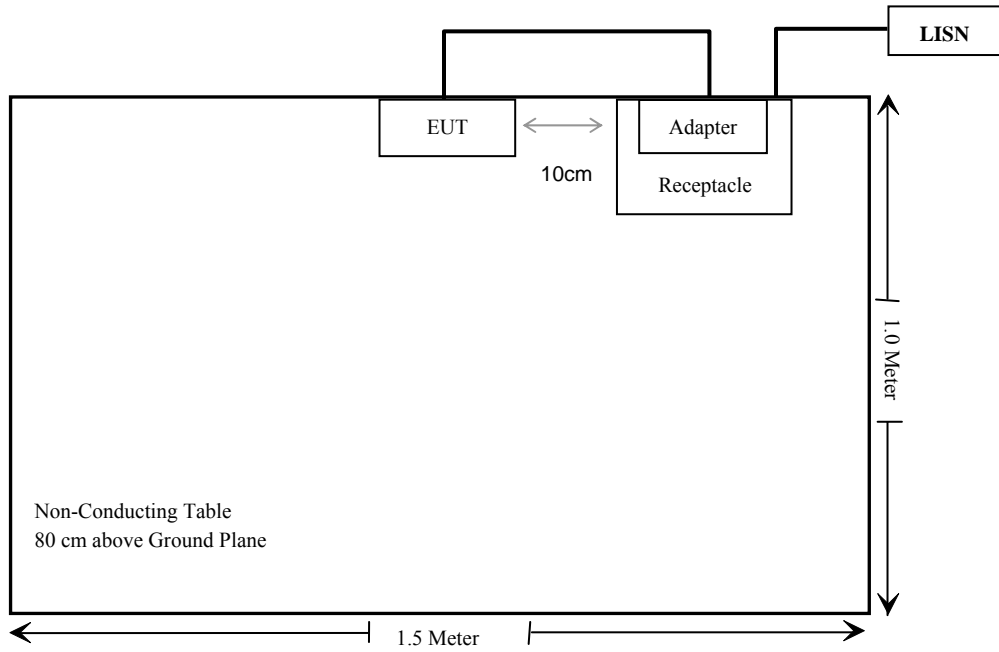


Transmitting Mode:

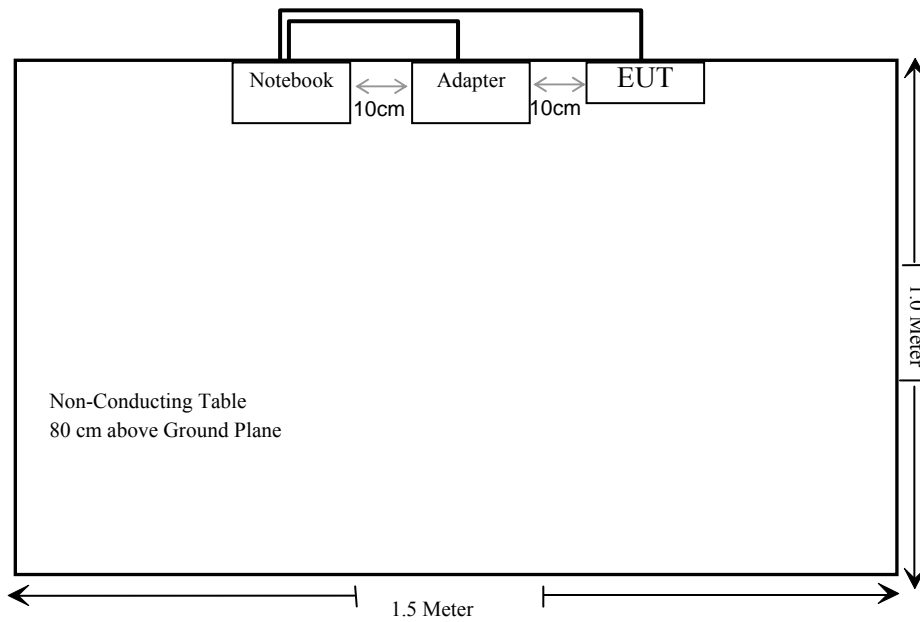


Block Diagram of Test Setup

Charging Mode:



Transmitting Mode:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i) & §2.1093	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

CFR47 §15.247 (i) & §2.1093 - RF EXPOSURE

Standard Applicable

According to § 1.1310, 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 Exclusion list, 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	low threshold	high threshold
general population	$(60/f_{\text{GHz}})$ mW, $d < 2.5$ cm	$(900/f_{\text{GHz}})$ mW, $d < 20$ cm
	$(120/f_{\text{GHz}})$ mW, $d \geq 2.5$ cm	
occupational	$(375/f_{\text{GHz}})$ mW, $d < 2.5$ cm	$(2250/f_{\text{GHz}})$ mW, $d < 20$ cm
	$(900/f_{\text{GHz}})$ mW, $d \geq 2.5$ 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:

This is a portable device and the Max peak conducted output power is 2.084 mW (3.19 dBm), the typical gain of antenna is 2 dBi, the EIRP of EUT is 5.19 dBm, i.e. $3.30 \text{ mw} < 24.58 \text{ mw} = (60/2.441\text{GHz}) \text{ mw}$

The SAR measurement is exempt.

CFR47 §15.203 - ANTENNA REQUIREMENT

Standard Applicable

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 component antenna on PCB. The maximum gain is 2 dBi; please refer to the internal photos.

Result: Compliant.

CFR47 §15.207 (a) - CONDUCTED EMISSIONS

Applicable Standard

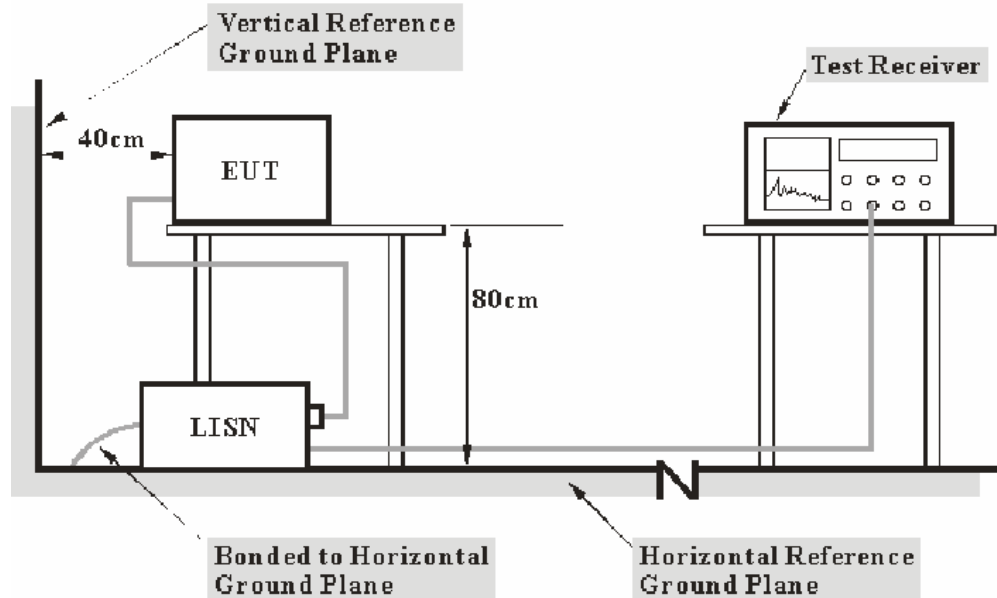
CFR47 §15.207

Measurement Uncertainty

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

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is ± 2.4 dB.

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 C63.4-2003 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 EUT 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:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Com-Power	L.I.S.N.	LI-200	12005	N/A	N/A
Com-Power	L.I.S.N.	LI-200	12208	N/A	N/A
Rohde & Schwarz	EMI Test Receiver	ESCS30	DE25330	2008-03-25	2009-03-25
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2008-03-25	2009-03-25

* Com-Power's LISN were used as the supporting equipment.

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

Test Procedure

During the conducted emission test, the 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 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:

4.8 dB at 0.555 MHz in the **Neutral** conductor mode

Test Data**Environmental Conditions**

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

* The testing was performed by Phoenix Liu on 2008-09-11.

Test Mode: Charging

Line Conducted Emissions				FCC Part 15.207	
Frequency (MHz)	Amplitude (dB μ V)	Detector (QP/AV)	Conductor (Line/Neutral)	Limit (dB μ V)	Margin (dB)
0.555	51.20	QP	Neutral	56.00	4.80
0.740	51.10	QP	Neutral	56.00	4.90
0.555	40.50	AV	Neutral	46.00	5.50
0.740	40.20	AV	Neutral	46.00	5.80
0.555	39.90	AV	Line	46.00	6.10
0.930	48.00	QP	Line	56.00	8.00
0.370	40.20	AV	Neutral	48.50	8.30
0.370	50.10	QP	Neutral	58.50	8.40
0.370	40.10	AV	Line	48.50	8.40
0.930	36.80	AV	Line	46.00	9.20
0.555	46.50	QP	Line	56.00	9.50
0.370	46.00	QP	Line	58.50	12.50
0.185	35.90	AV	Neutral	54.26	18.36
0.185	44.70	QP	Neutral	64.26	19.56
0.185	44.30	QP	Line	64.26	19.96
0.185	34.20	AV	Line	54.26	20.06
26.635	37.80	QP	Neutral	60.00	22.20
26.635	36.70	QP	Line	60.00	23.30
13.775	33.90	QP	Neutral	60.00	26.10
13.775	32.80	QP	Line	60.00	27.20
13.775	3.50	AV	Neutral	50.00	46.50
13.775	3.20	AV	Line	50.00	46.80
26.635	0.70	AV	Neutral	50.00	49.30
26.635	0.60	AV	Line	50.00	49.40

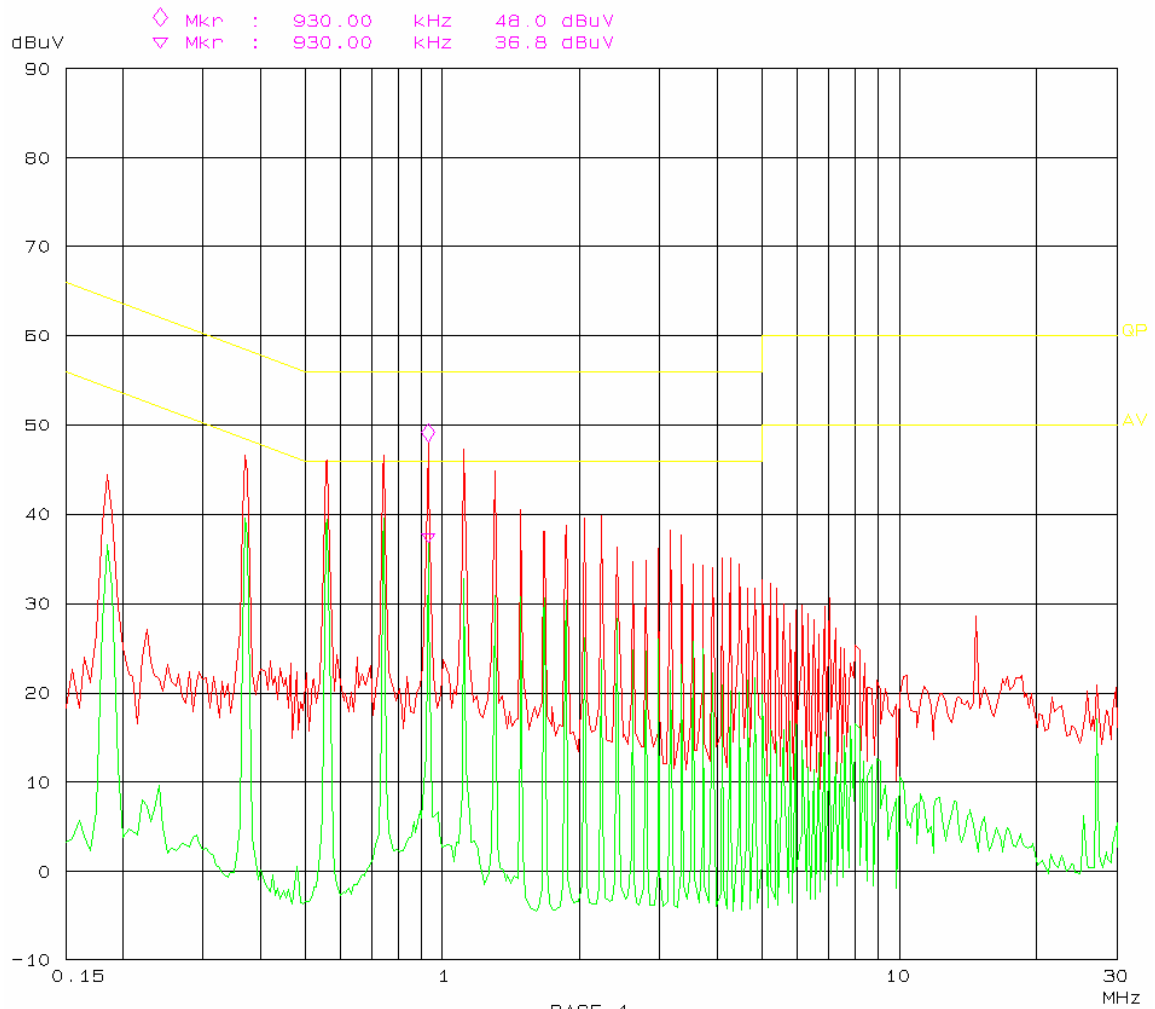
Plot(s) of Test Data

Plot(s) of Test Data is presented hereinafter as reference.

conducted emission
FCC part 15

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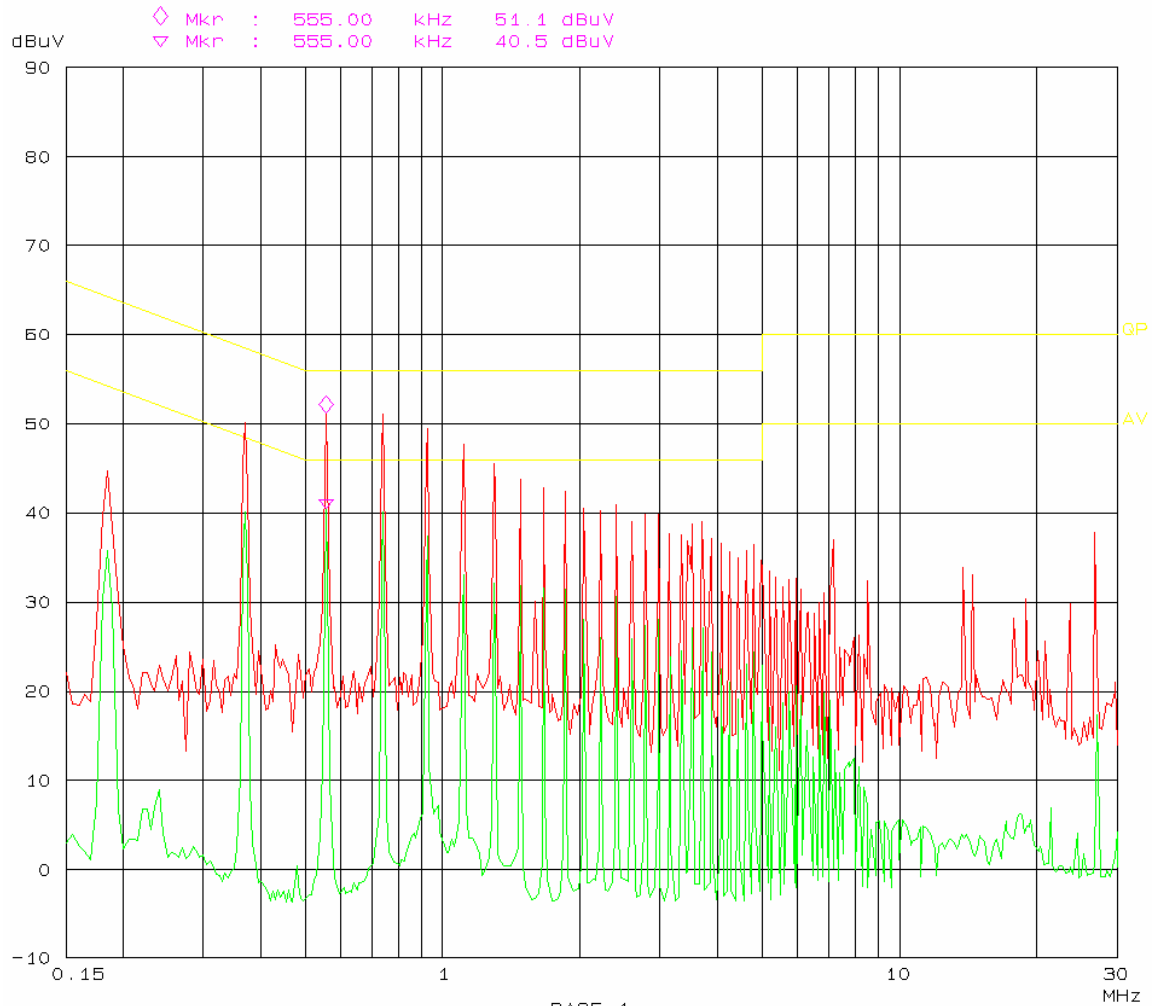
EUT: BLUETOOTH HEADSET M/N:GBH861
Manuf: Goertek
Op Cond: Charging
Operator: Phoenix
Test Spec: AC120V 60Hz Neutral
Comment: Temp: 25 Hum: 56%
Line



conducted emission
FCC part 15

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EUT: BLUETOOTH HEADSET M/N:GBH861
Manuf: Goertek
Op Cond: Charging
Operator: Phoenix
Test Spec: AC120V 60Hz Neutral
Comment: Temp: 25 Hum: 56%



CFR47 §15.205, §15.209, §15.247 - RADIATED EMISSIONS

Applicable Standard

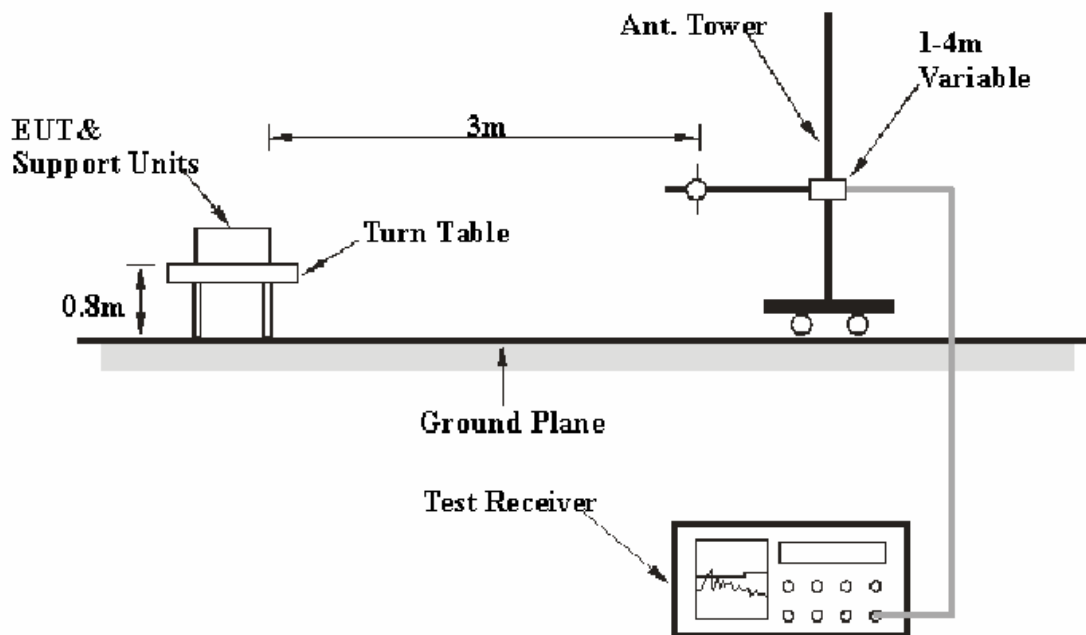
CFR47 §15.205; §15.209; §15.247 (d).

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.

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

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>
30MHz – 1000 MHz	100 kHz	300 kHz
1000 MHz – 25 GHz	1 MHz	3 MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2007-11-15	2008-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2008-03-11	2009-03-11
HP	Amplifier	8449B	3008A00277	2007-09-29	2008-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2007-09-25	2008-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-05-09	2009-05-09

* **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

For the radiated emissions test, the adapter was connected to the AC floor outlet.

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:

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

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 maximum limit. The equation for margin calculation is as follows:

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

Test Results Summary

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

Charging mode (30 – 1000 MHz):

10.7 dB at **243.319650 MHz** in the **Horizontal** polarization

Transmitting EDR mode (30 – 1000 MHz):

2.7 dB at **199.983500 MHz** in the **Horizontal** polarization

Transmitting EDR mode (Above 1 GHz):

17.54 dB at **4804 MHz** in the **Vertical** polarization (**Low Channel**)
18.63 dB at **1594 MHz** in the **Vertical** polarization (**Middle Channel**)
17.20 dB at **4960 MHz** in the **Horizontal** polarization (**High Channel**)

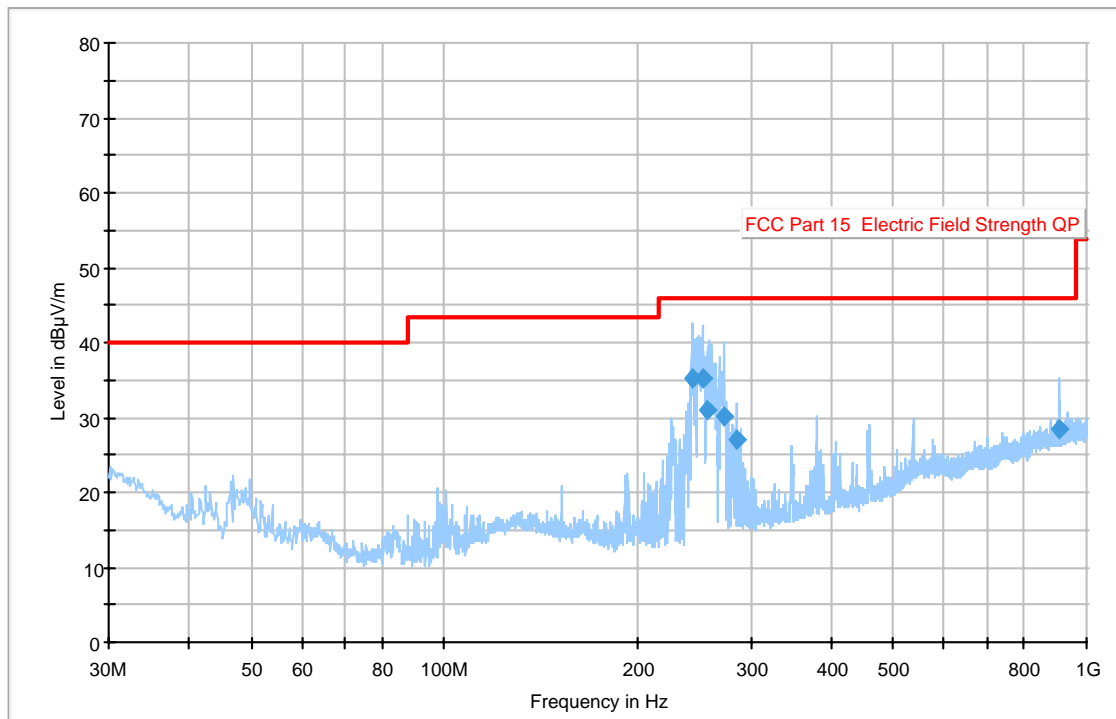
Test Data

Environmental Conditions

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

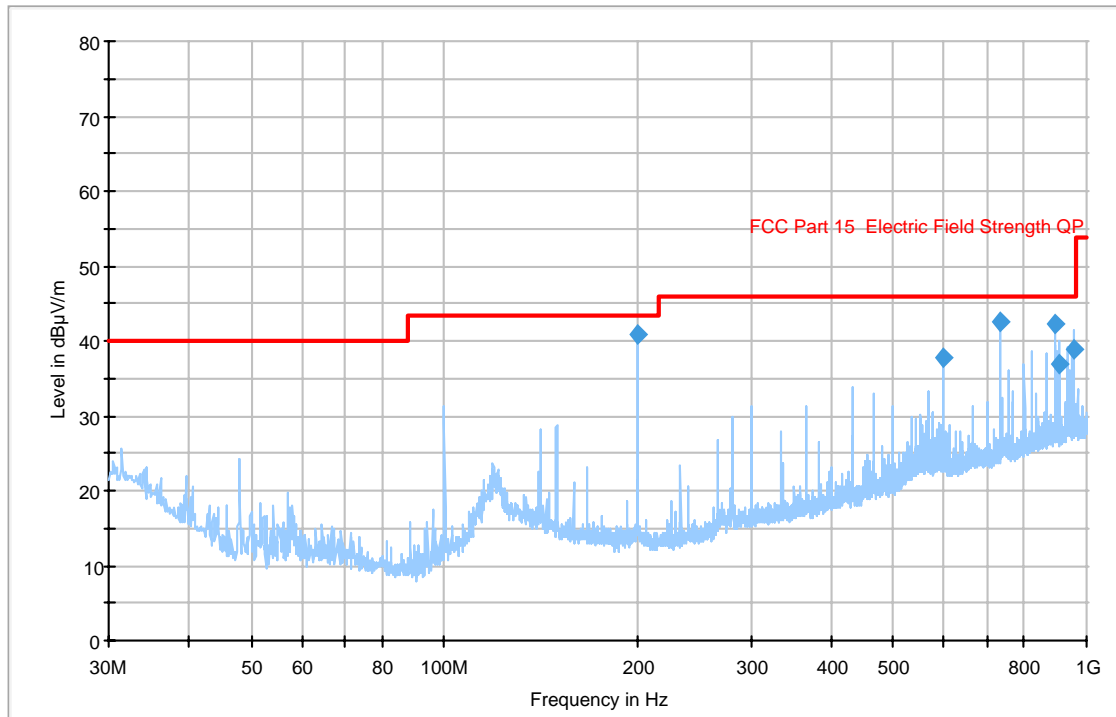
** The testing was performed by Phoenix Liu on 2008-09-11*

Test Mode: Charging (30 – 1000 MHz)



Frequency (MHz)	Corrected Amp. (dBµV/m)	Antenna Height (cm)	Ant. Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
243.319650	35.3	154.0	H	130.0	-11.8	46.0	10.7
251.838375	35.1	140.0	H	159.0	-11.7	46.0	10.9
257.431150	31.0	170.0	H	168.0	-11.5	46.0	15.0
271.988850	30.1	163.0	H	188.0	-9.5	46.0	15.9
284.590000	27.1	128.0	H	155.0	-9.9	46.0	18.9
905.444150	28.5	337.0	V	302.0	1.2	46.0	22.8

Test Mode: Transmitting (EDR) (30 – 1000 MHz)



Frequency (MHz)	Corrected Amp. (dBµV/m)	Antenna Height (cm)	Ant. Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
199.983500	40.8	156.0	H	102.0	-11.7	43.5	2.7*
733.367950	42.5	131.0	H	210.0	-1.2	46.0	3.5*
894.221100	42.3	156.0	H	34.0	1.1	46.0	3.7*
956.653150	38.8	105.0	H	10.0	1.9	46.0	7.2
600.005100	37.8	105.0	V	3.0	-3.7	46.0	8.2
905.467950	37.0	258.0	H	283.0	1.2	46.0	9.0

Test Mode: Transmitting (EDR) (Above 1GHz)

Freq. (MHz)	S.A. Reading (dBμV)	Detector PK/QP/AV	Direction Degree	Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Corr. Amp. (dBμV/m)	FCC Part 15.247/209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Remarks
Low Channel (2402 MHz)												
4804	33.42	AV	90	1	V	31.8	4.64	33.4	36.46	54	17.54	Harmonic
4804	32.76	AV	90	1	H	31.8	4.64	33.4	35.80	54	18.20	Harmonic
1064	40.17	AV	180	1.2	H	24.4	3.18	35.0	32.75	54	21.25	Spurious
4804	48.56	PK	180	1.2	H	31.8	4.64	33.4	51.60	74	22.40	Harmonic
1064	32.98	AV	180	1.2	V	24.4	3.18	35.0	25.56	54	28.44	Spurious
4804	42.18	PK	180	1.2	V	31.8	4.64	33.4	45.22	74	28.78	Harmonic
1064	51.40	PK	45	1.2	V	24.4	3.18	35.0	43.98	74	30.02	Spurious
1064	51.30	PK	45	1.2	H	24.4	3.18	35.0	43.88	74	30.12	Spurious
Middle Channel (2441 MHz)												
1594	41.30	AV	85	1.5	V	26.3	2.77	35.0	35.37	54	18.63	Spurious
4882	31.61	AV	243	1.4	V	31.8	4.64	33.4	34.65	54	19.35	Harmonic
1594	40.20	AV	135	1.3	H	26.3	2.77	35.0	34.27	54	19.73	Spurious
4882	30.53	AV	142	1.6	H	31.8	4.64	33.4	33.57	54	20.43	Harmonic
4882	45.30	PK	153	1.5	V	31.8	4.64	33.4	48.34	74	25.66	Harmonic
4882	44.40	PK	234	1.8	H	31.8	4.64	33.4	47.44	74	26.56	Harmonic
1594	52.45	PK	265	1.4	V	26.3	2.77	35.0	46.52	74	27.48	Spurious
1594	50.21	PK	156	1.4	H	26.3	2.77	35.0	44.28	74	29.72	Spurious
High Channel (2480 MHz)												
4960	33.85	AV	256	1.8	H	31.8	4.55	33.4	36.80	54	17.20	Harmonic
4960	33.79	AV	142	1.5	V	31.8	4.55	33.4	36.74	54	17.26	Harmonic
4960	48.08	PK	145	1.4	H	31.8	4.55	33.4	51.03	74	22.97	Harmonic
4960	47.46	PK	142	1.4	V	31.8	4.55	33.4	50.41	74	23.59	Harmonic
1064	37.04	AV	156	1.2	H	24.4	3.18	35.0	29.62	54	24.38	Spurious
1064	35.40	AV	210	1.2	V	24.4	3.18	35.0	27.98	54	26.02	Spurious
1064	50.94	PK	128	1.5	H	24.4	3.18	35.0	43.52	74	30.48	Spurious
1064	48.90	PK	240	1.4	V	24.4	3.18	35.0	41.48	74	32.52	Spurious

Note: Above is EDR mode test data, because the power of EDR mode is higher than BDR mode.

Spurious emission in restricted band:

Freq. (MHz)	S.A. Reading (dB μ V)	Detector PK/QP/AV	Direction Degree	Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Corr. Amp. (dB μ V/m)	FCC Part 15.247/209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dB μ V/m)	Margin (dB)	Remarks
Test mode : BDR												
2487.988	49.10	PK	45	1.4	H	27.5	7.90	33.90	50.6	74	23.4	Spurious
2487.988	34.12	AV	180	1.2	H	27.5	7.90	33.90	35.62	54	18.38	Spurious
2487.988	52.70	PK	45	1.5	V	27.5	7.90	33.90	54.2	74	19.8	Spurious
2487.988	36.15	AV	180	1.2	V	27.5	7.90	33.90	37.65	54	16.35	Spurious
Test mode : EDR												
2497.186	48.52	PK	40	1.4	H	27.5	7.90	33.90	50.02	74	23.98	Spurious
2497.186	33.85	AV	150	1.2	H	27.5	7.90	33.90	35.35	54	18.65	Spurious
2497.186	51.60	PK	40	1.5	V	27.5	7.90	33.90	53.1	74	20.9	Spurious
2497.186	35.46	AV	120	1.2	V	27.5	7.90	33.90	36.96	54	17.04	Spurious

CFR47 §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	2007-10-16	2008-10-16

* **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:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

* *The testing was performed by Phoenix Liu on 2008-08-11.*

Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting (BDR)

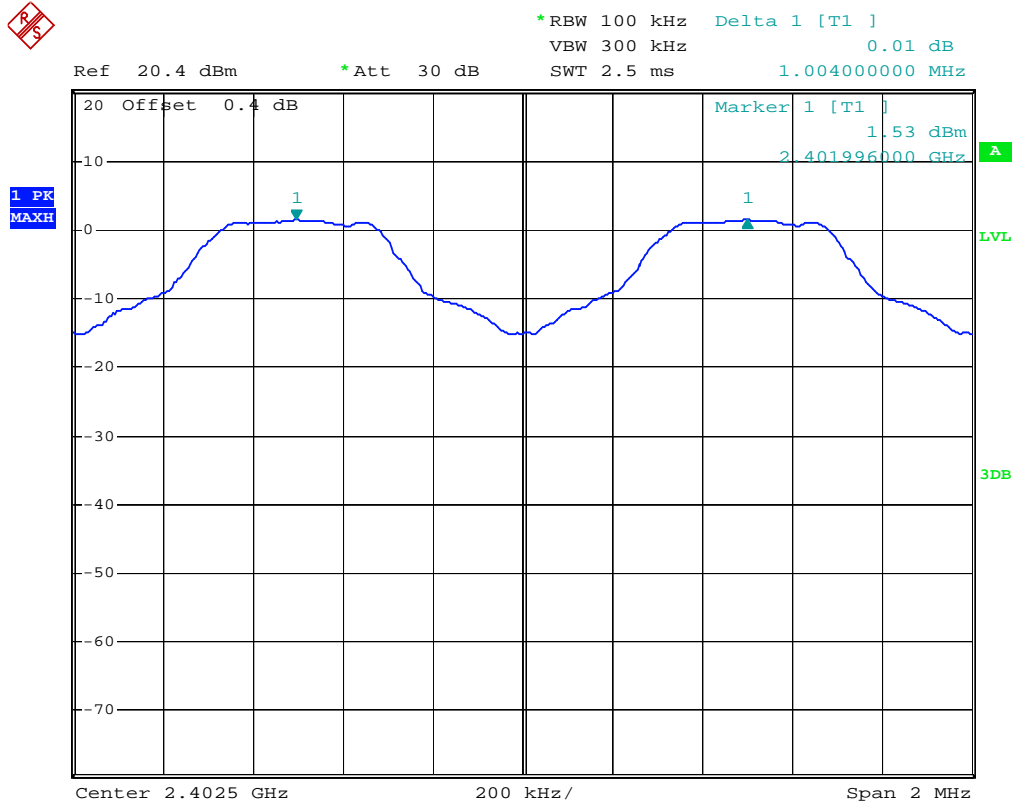
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.004	0.632	Pass
Adjacent Channel	2403			
Mid Channel	2441	1.004	0.632	Pass
Adjacent Channel	2442			
High Channel	2480	1.004	0.595	Pass
Adjacent Channel	2479			

Test Mode: Transmitting (EDR)

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.008	0.781	Pass
Adjacent Channel	2403			
Mid Channel	2441	1.008	0.779	Pass
Adjacent Channel	2442			
High Channel	2480	1.008	0.779	Pass
Adjacent Channel	2479			

Test Mode: Transmitting (BDR)

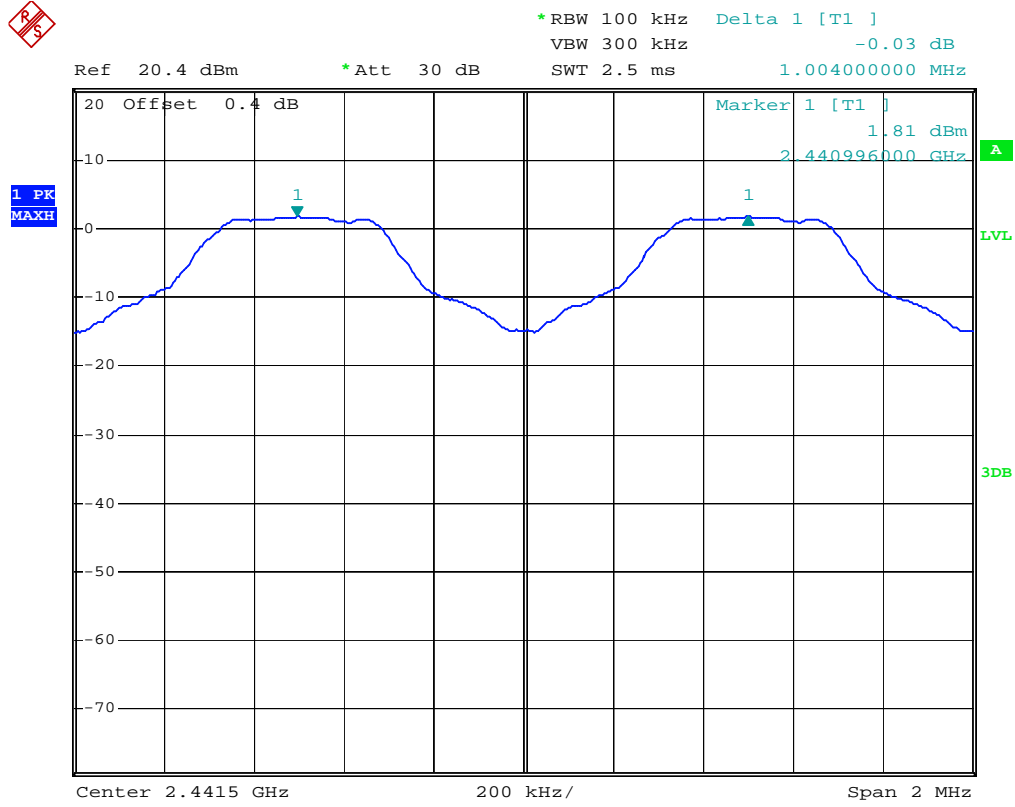
Low Channel



Channel separation (low)

Date: 11.AUG.2008 10:44:53

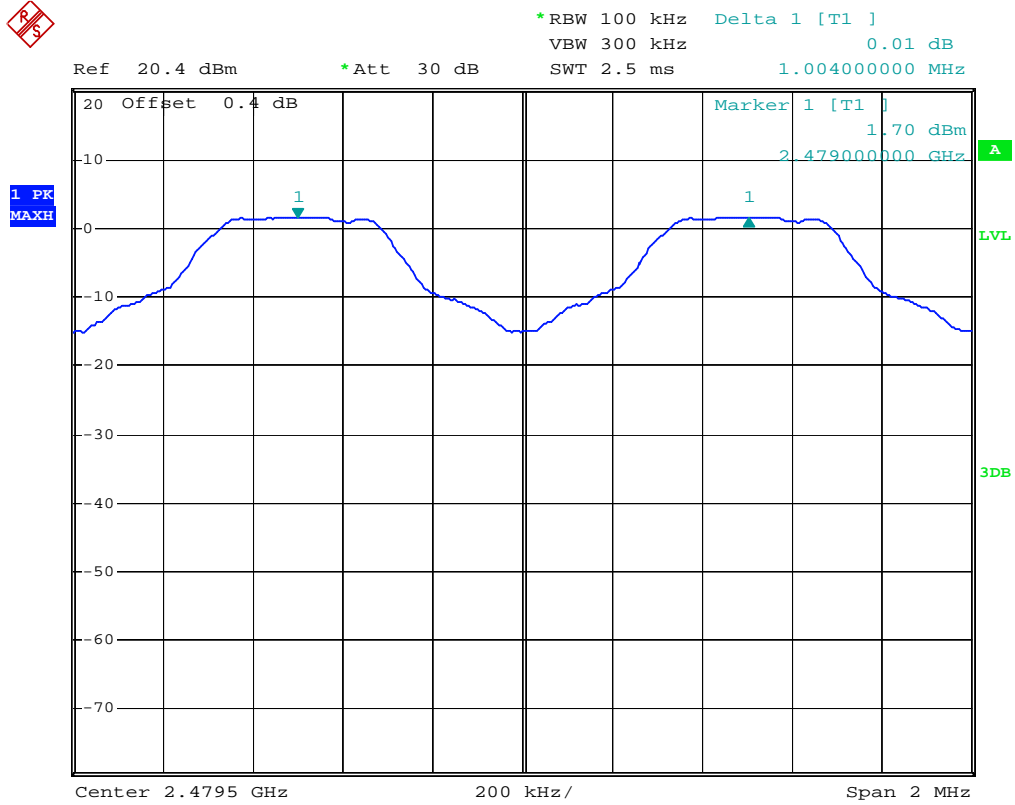
Middle Channel



Channel separation (middle)

Date: 11.AUG.2008 10:46:30

High Channel

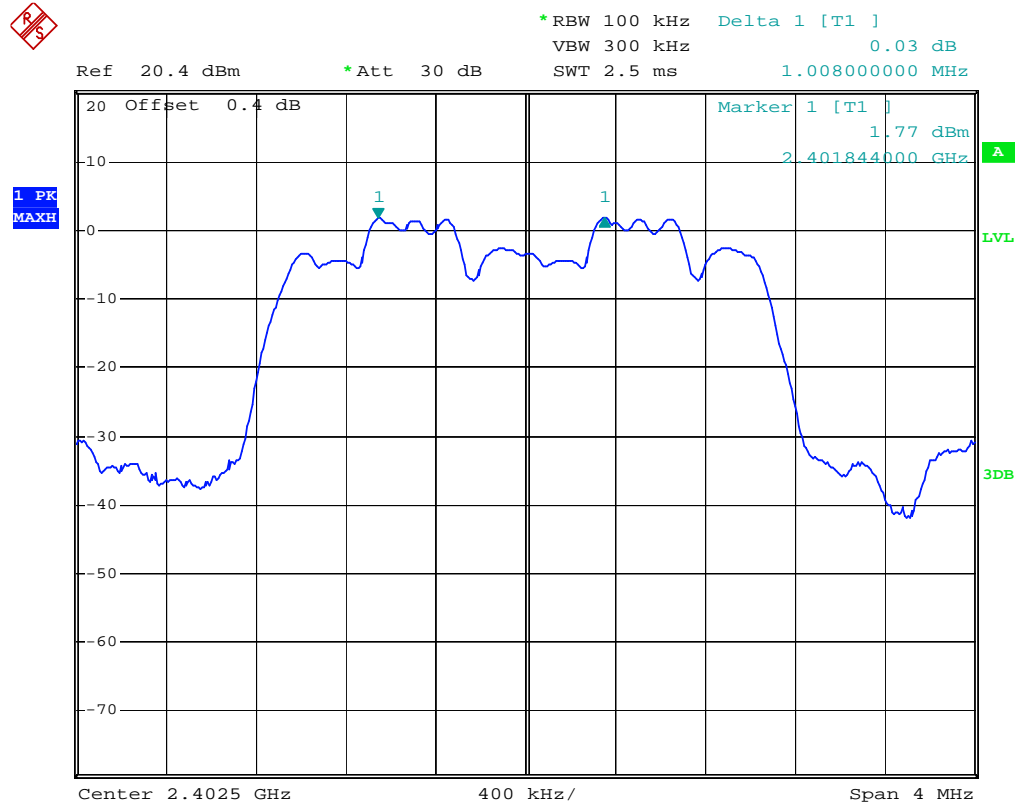


Channel separation (high)

Date: 11.AUG.2008 10:47:39

Test Mode: Transmitting (EDR)

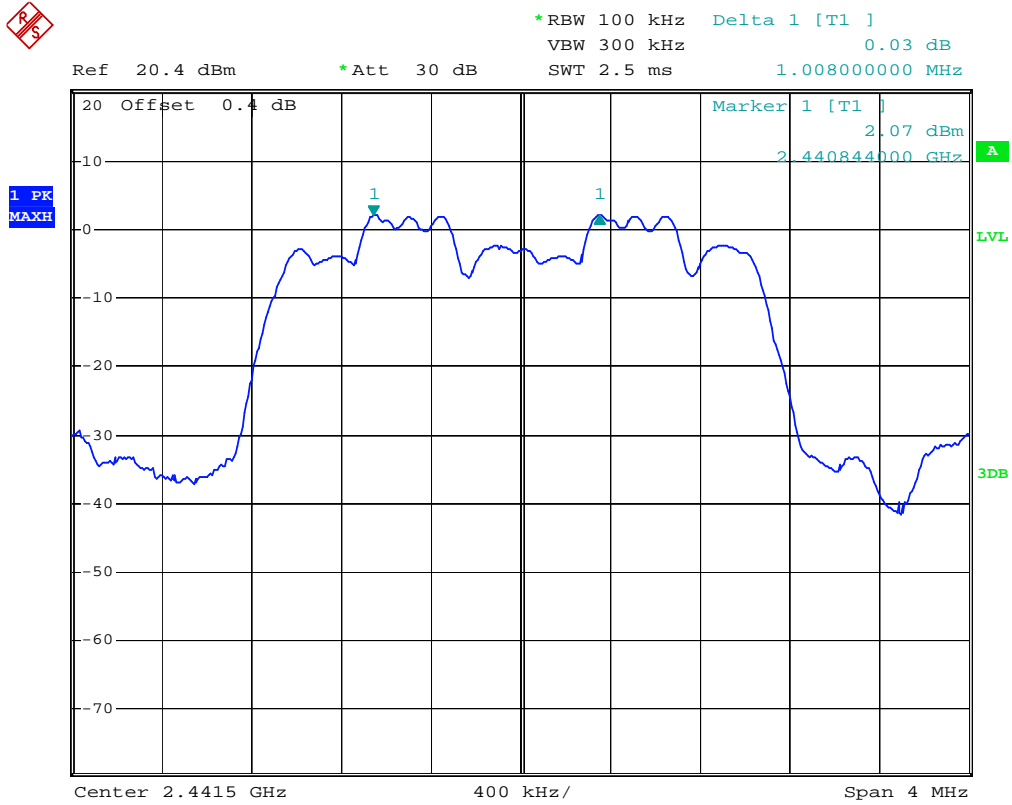
Low Channel



channel separation low channel EDR

Date: 11.AUG.2008 13:29:00

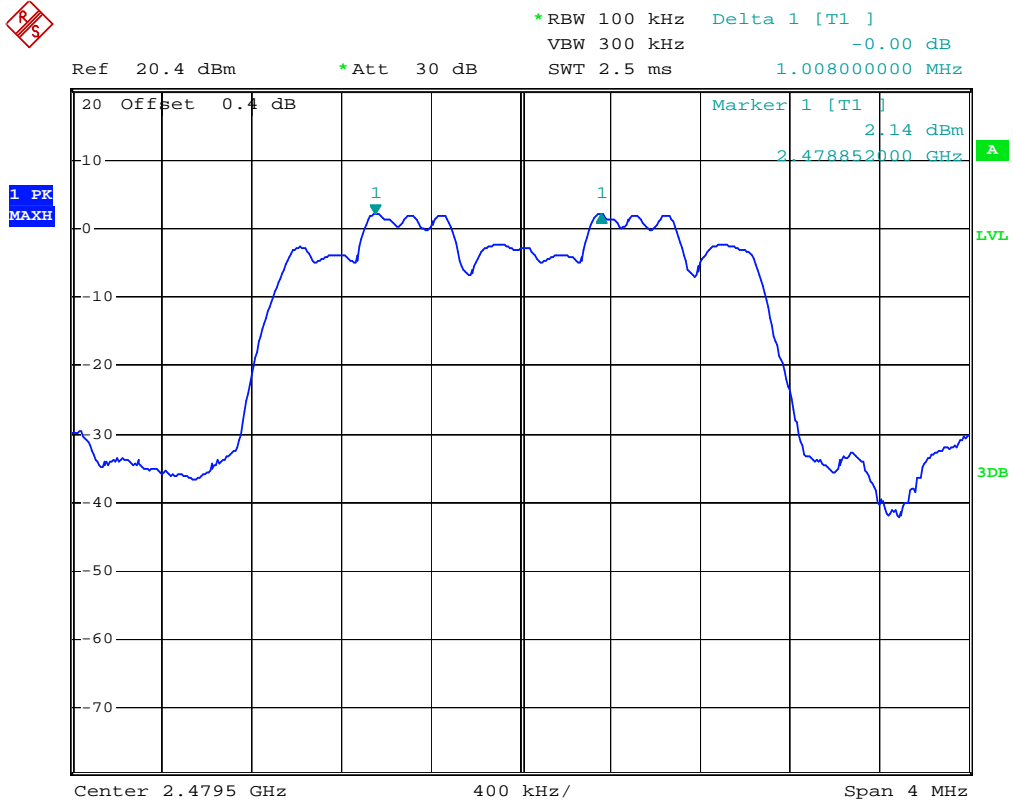
Middle Channel



channel separation middle channel EDR

Date: 11.AUG.2008 13:26:49

High Channel



channel separation high channel EDR

Date: 11.AUG.2008 13:24:50

CFR47 §15.247(a) (1) – 20dB 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	100035	2007-10-16	2008-10-16

* **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:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

* *The testing was performed by Phoenix Liu on 2008-08-11.*

Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting (BDR)

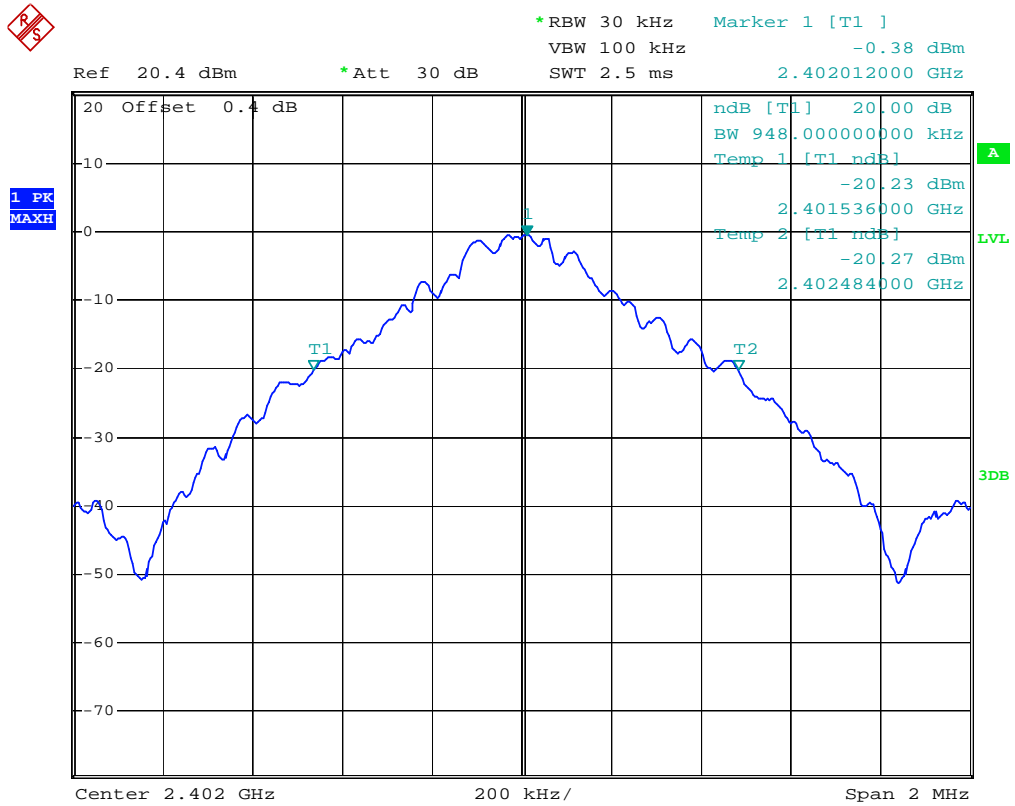
Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	0.948
Middle	2441	0.948
High	2480	0.892

Test Mode: Transmitting (EDR)

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	1.172
Middle	2441	1.168
High	2480	1.168

Test Mode: Transmitting (BDR)

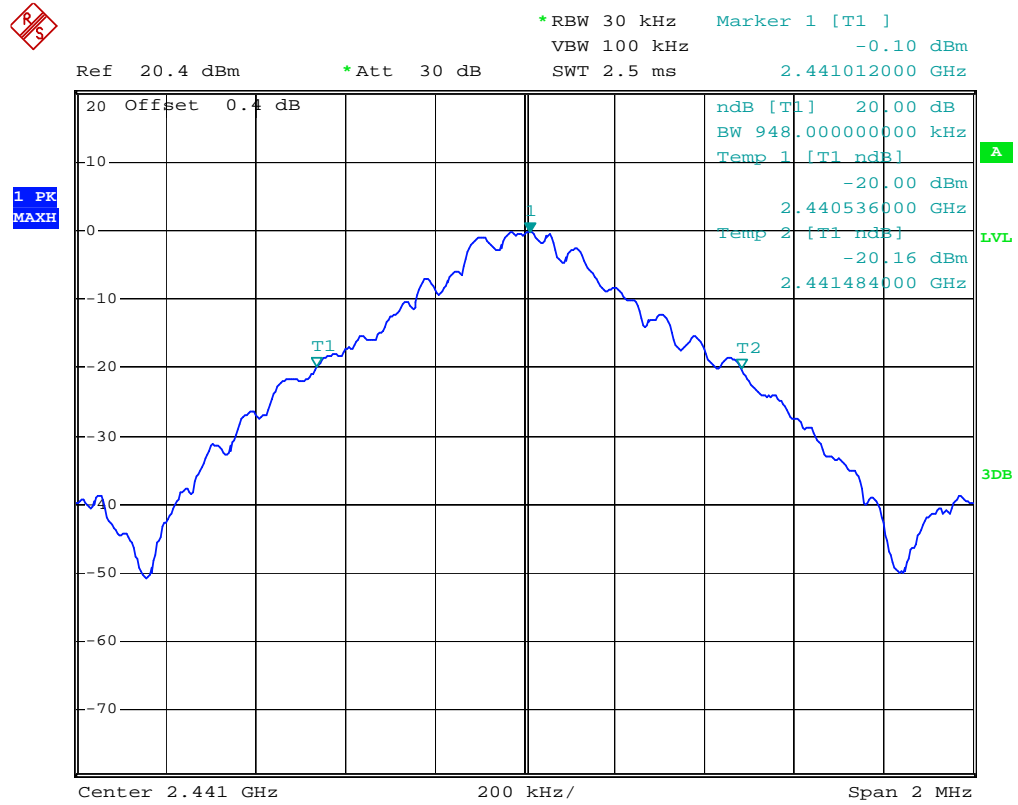
Low Channel



20dB Bandwidth (low)

Date: 11.AUG.2008 10:42:16

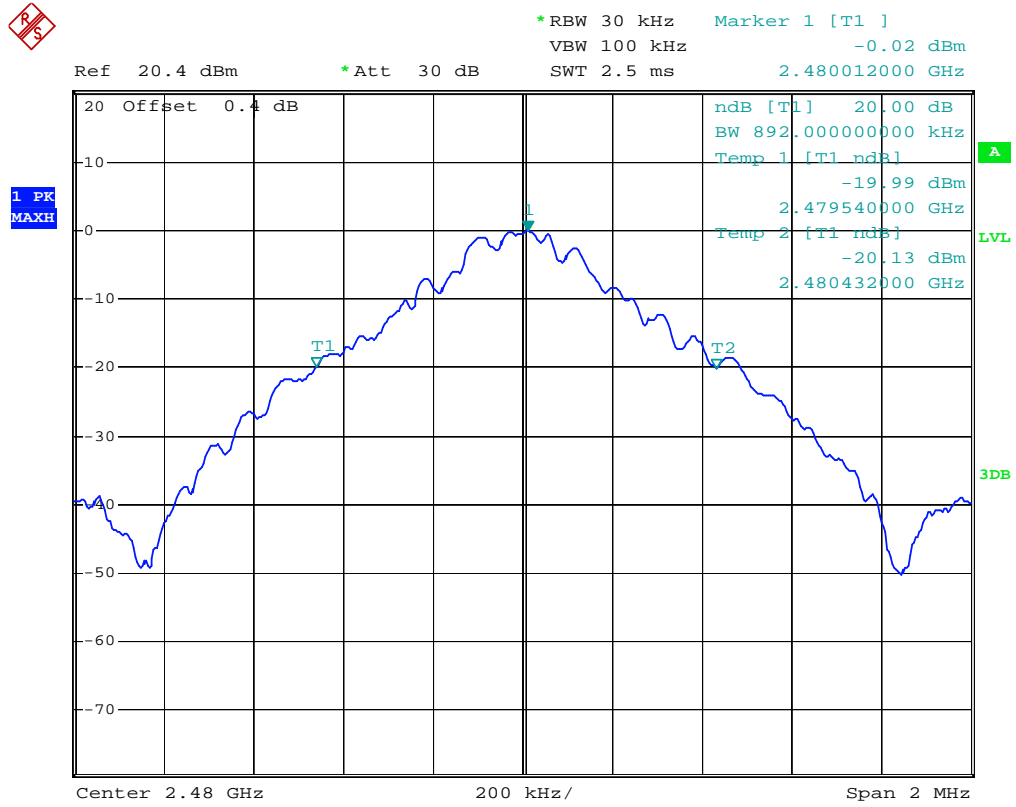
Middle Channel



20dB Bandwidth (middle)

Date: 11.AUG.2008 10:41:21

High Channel

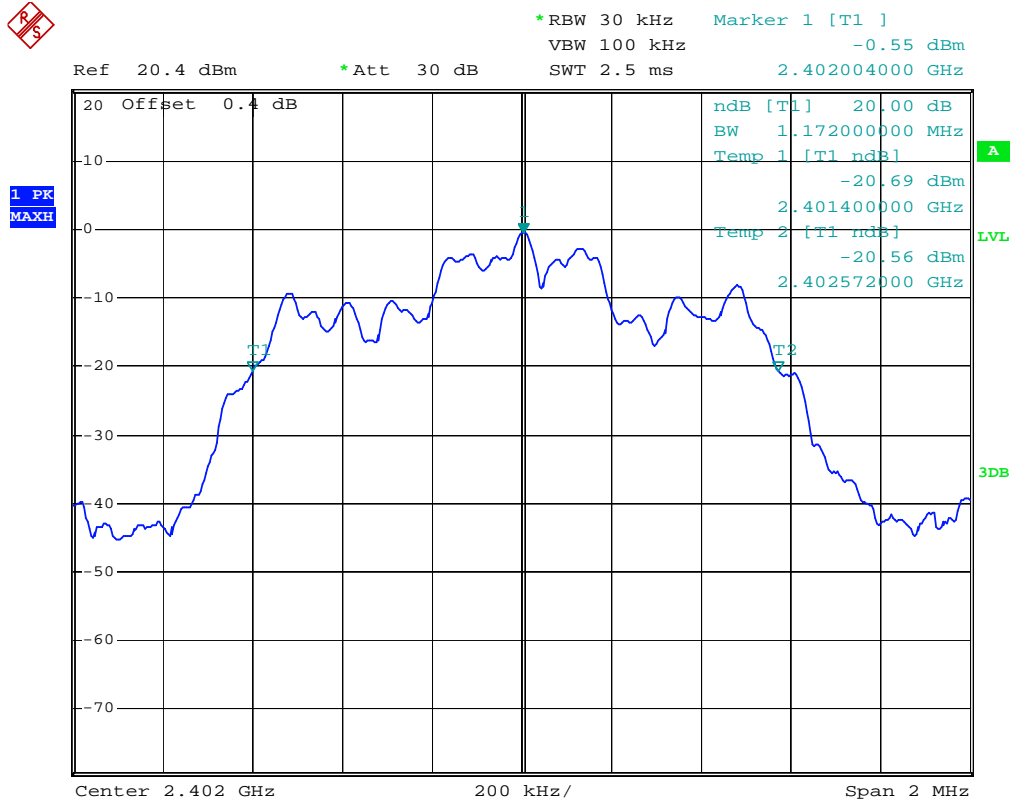


20dB Bandwidth (high)

Date: 11.AUG.2008 10:40:17

Test Mode: Transmitting (EDR)

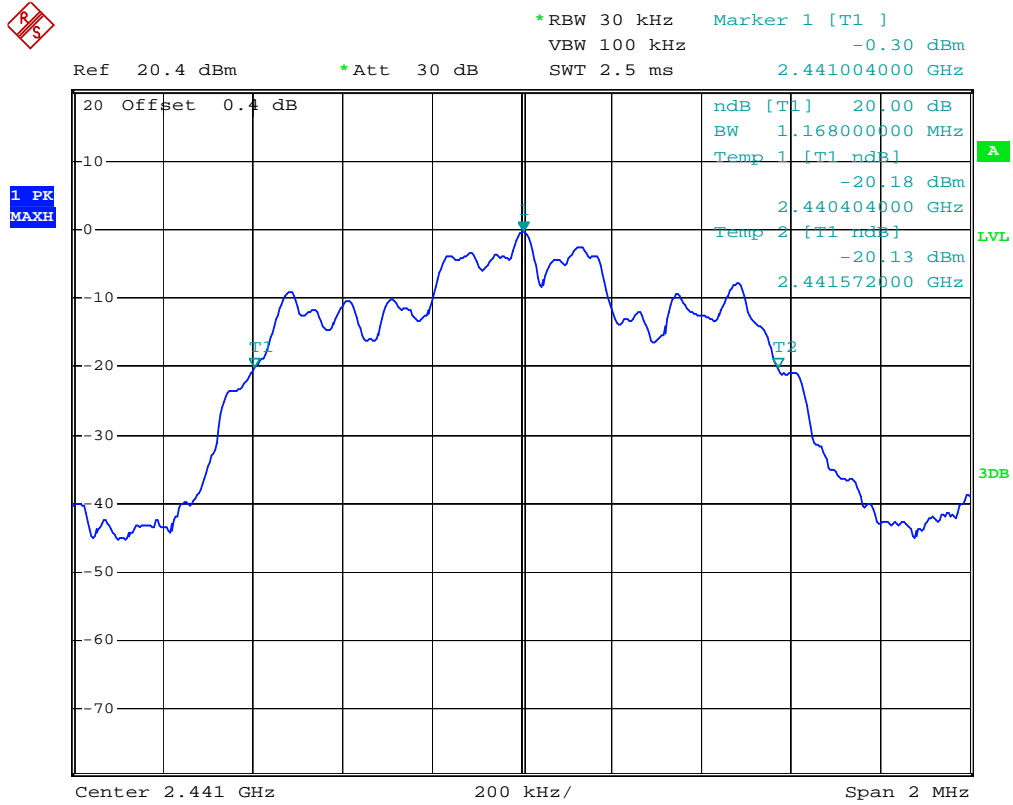
Low Channel



20dB Bandwidth low channel EDR

Date: 11.AUG.2008 13:18:54

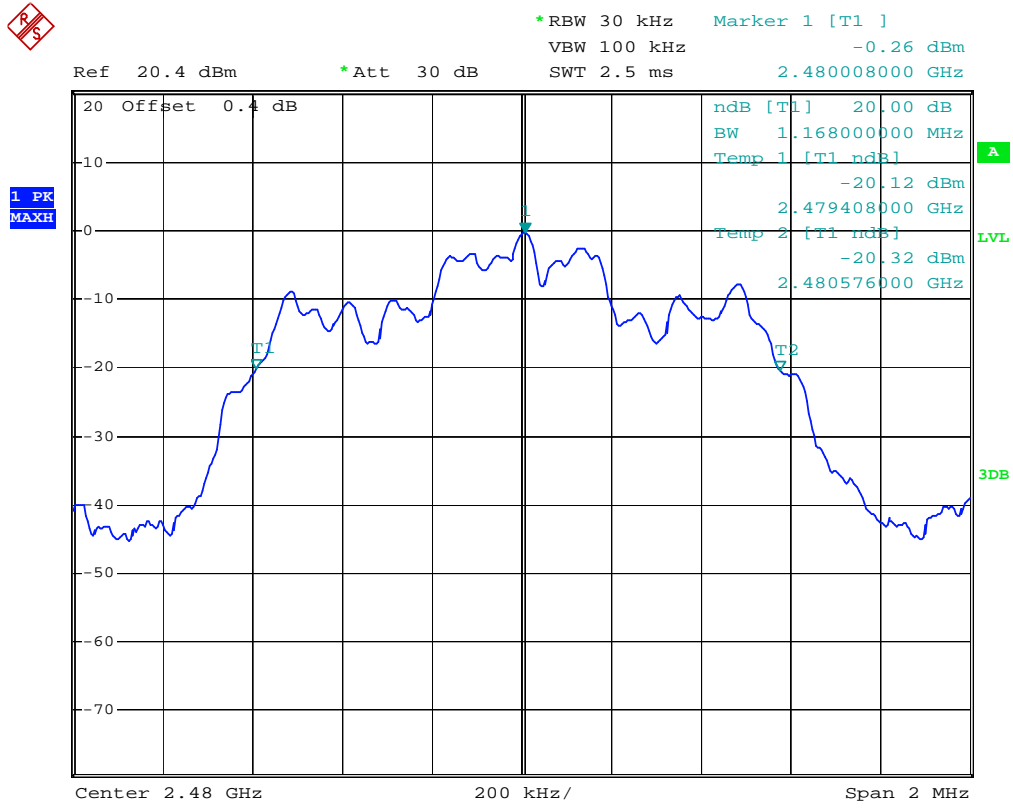
Middle Channel



20dB Bandwidth middle channel EDR

Date: 11.AUG.2008 13:19:55

High Channel



20dB Bandwidth high channel EDR

Date: 11.AUG.2008 13:20:48

CFR47 §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	2007-10-16	2008-10-16

* **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 transmitting mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Phoenix Liu on 2008-08-11.

Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting (BDR)

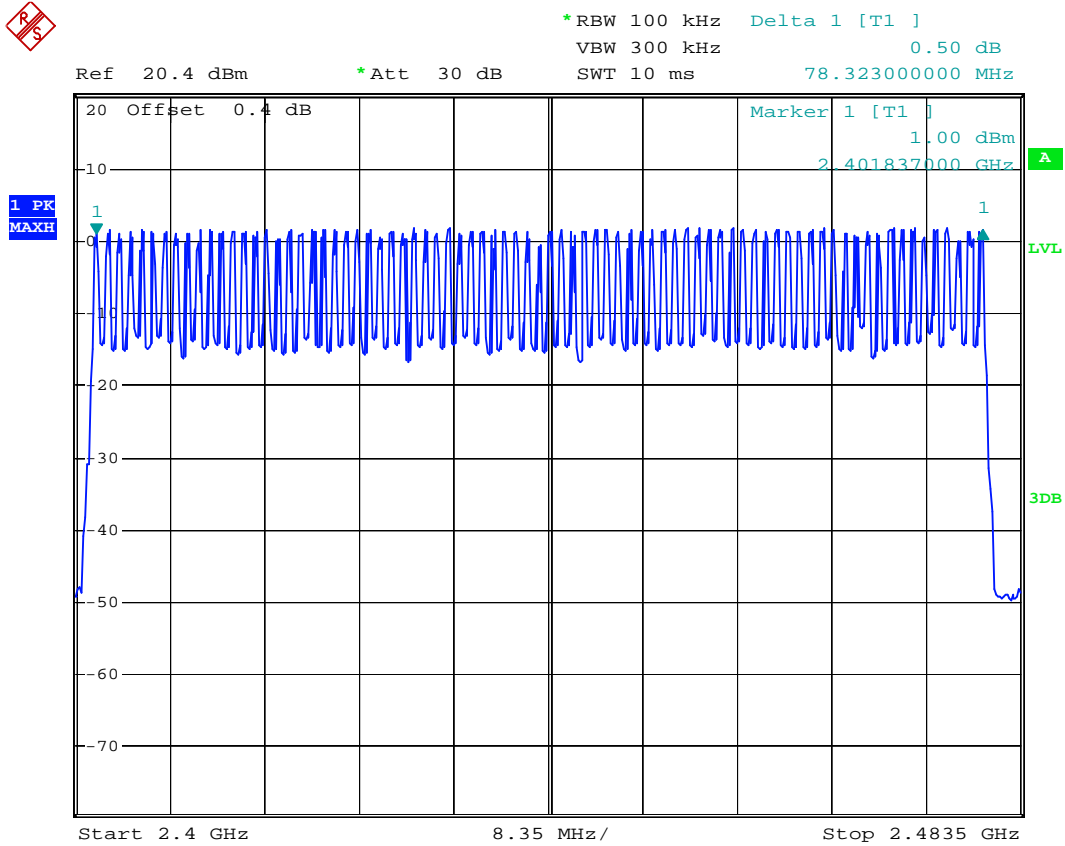
Frequency Range (MHz)	Number of Hopping Channel	Limit
2402-2480	79	≥ 15

Test Mode: Transmitting (EDR)

Frequency Range (MHz)	Number of Hopping Channel	Limit
2402-2480	79	≥ 15

Test Mode: Transmitting (BDR)

Number of Hopping Channels

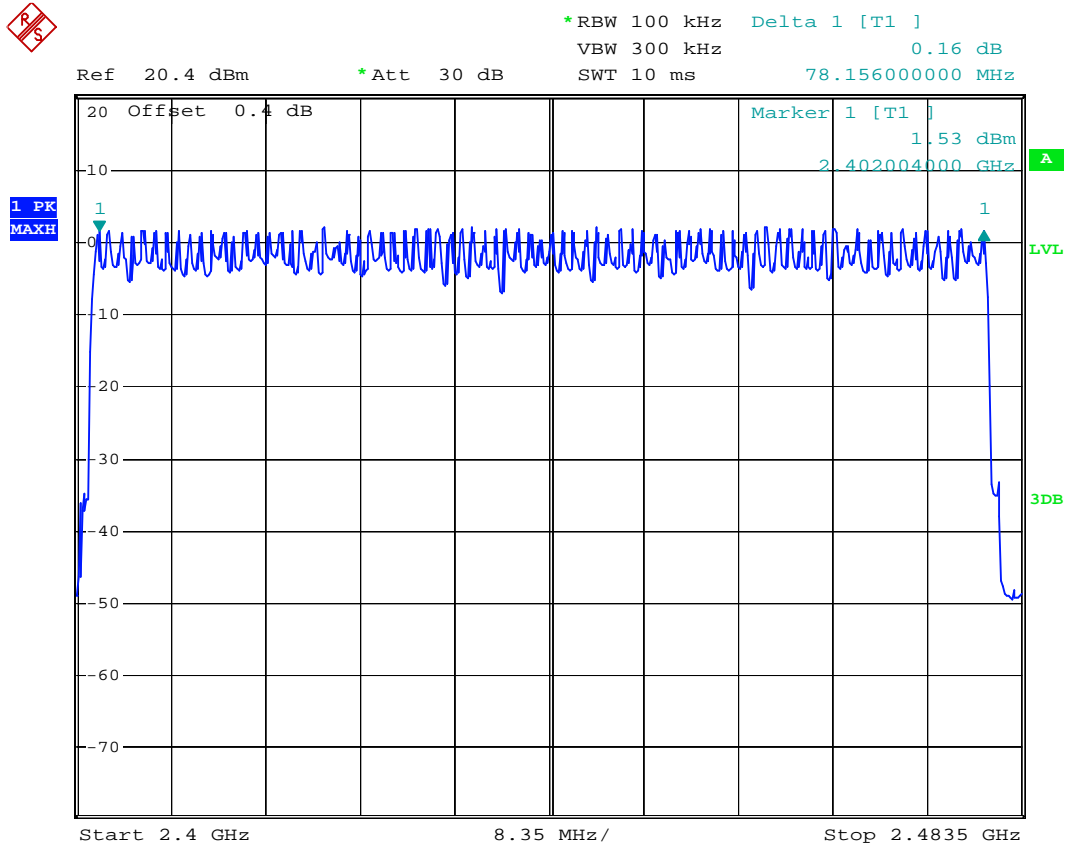


hopping channels

Date: 11.AUG.2008 10:54:21

Test Mode: Transmitting (EDR)

Number of Hopping Channels



hopping channels EDR

Date: 11.AUG.2008 11:44:22

CFR47 §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	2007-10-16	2008-10-16

* **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:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

* The testing was performed by Phoenix Liu on 2008-08-11.

Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting (BDR)

DH 1

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low	0.490	0.157	0.4	Pass
Middle	0.490	0.157	0.4	Pass
High	0.490	0.157	0.4	Pass

NOTE: Dwell time=Pulse width (ms) × (1600 ÷ 2 ÷ 79) × 31.6 Second

DH 3

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low	1.770	0.283	0.4	Pass
Middle	1.750	0.280	0.4	Pass
High	1.730	0.277	0.4	Pass

NOTE: Dwell time=Pulse width (ms) × (1600 ÷ 4 ÷ 79) × 31.6 Second

DH 5

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low	3.020	0.322	0.4	Pass
Middle	3.040	0.324	0.4	Pass
High	3.040	0.324	0.4	Pass

NOTE: Dwell time=Pulse width (ms) × (1600 ÷ 6 ÷ 79) × 31.6 Second

Test Mode: Transmitting (EDR)

DH 1

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low	0.390	0.125	0.4	Pass
Middle	0.395	0.126	0.4	Pass
High	0.385	0.123	0.4	Pass

NOTE: Dwell time=Pulse width (ms) \times (1600 \div 2 \div 79) \times 31.6 Second

DH 3

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low	0.740	0.118	0.4	Pass
Middle	0.760	0.122	0.4	Pass
High	0.770	0.123	0.4	Pass

NOTE: Dwell time=Pulse width (ms) \times (1600 \div 4 \div 79) \times 31.6 Second

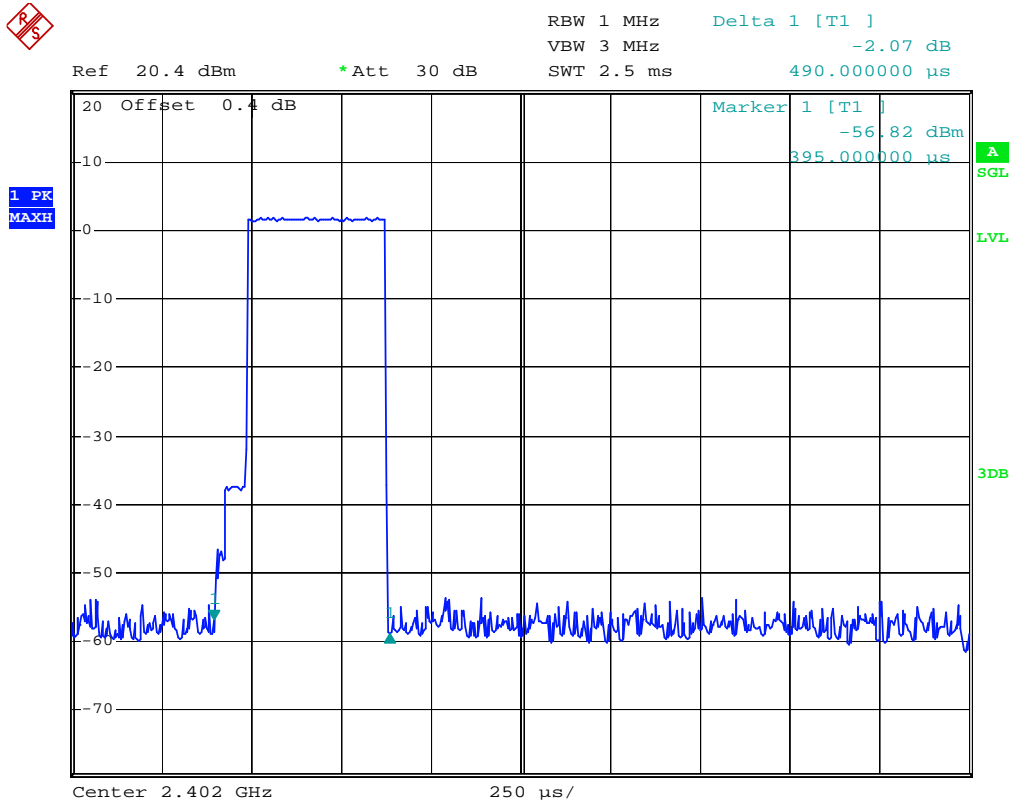
DH 5

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low	1.220	0.130	0.4	Pass
Middle	1.200	0.128	0.4	Pass
High	1.200	0.128	0.4	Pass

NOTE: Dwell time=Pulse width (ms) \times (1600 \div 6 \div 79) \times 31.6 Second

Test Mode: Transmitting (BDR)

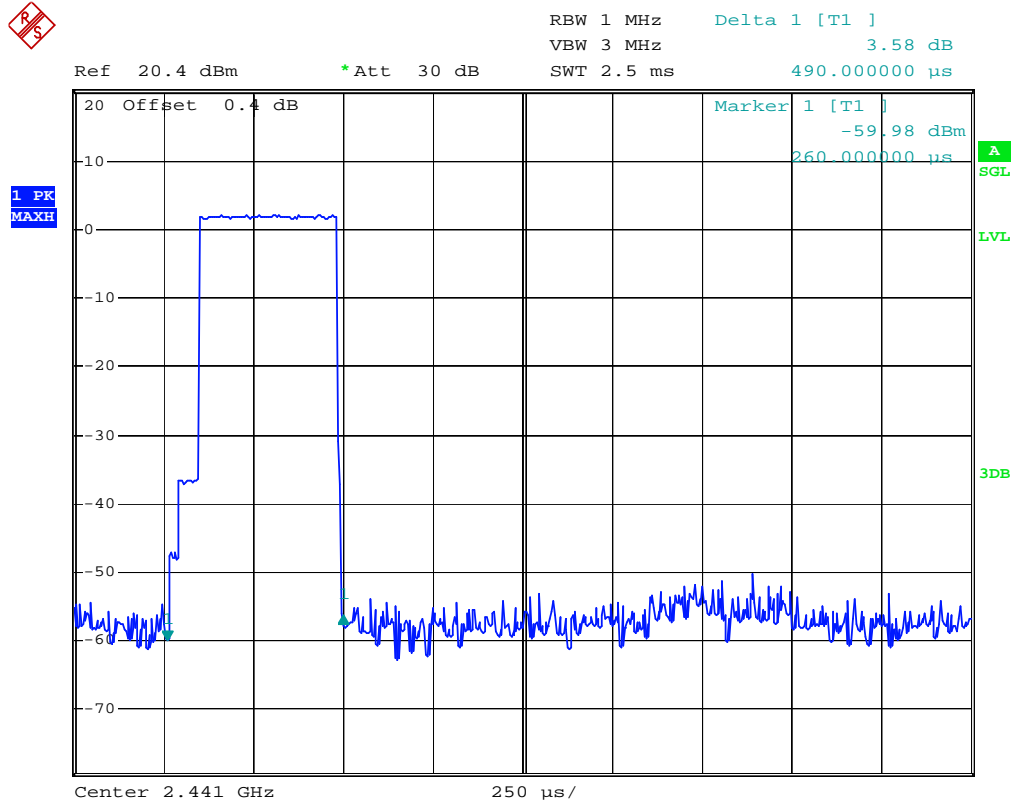
Low Channel for DH1



Dwell time low channel (DH1 BDR)

Date: 11.AUG.2008 11:06:18

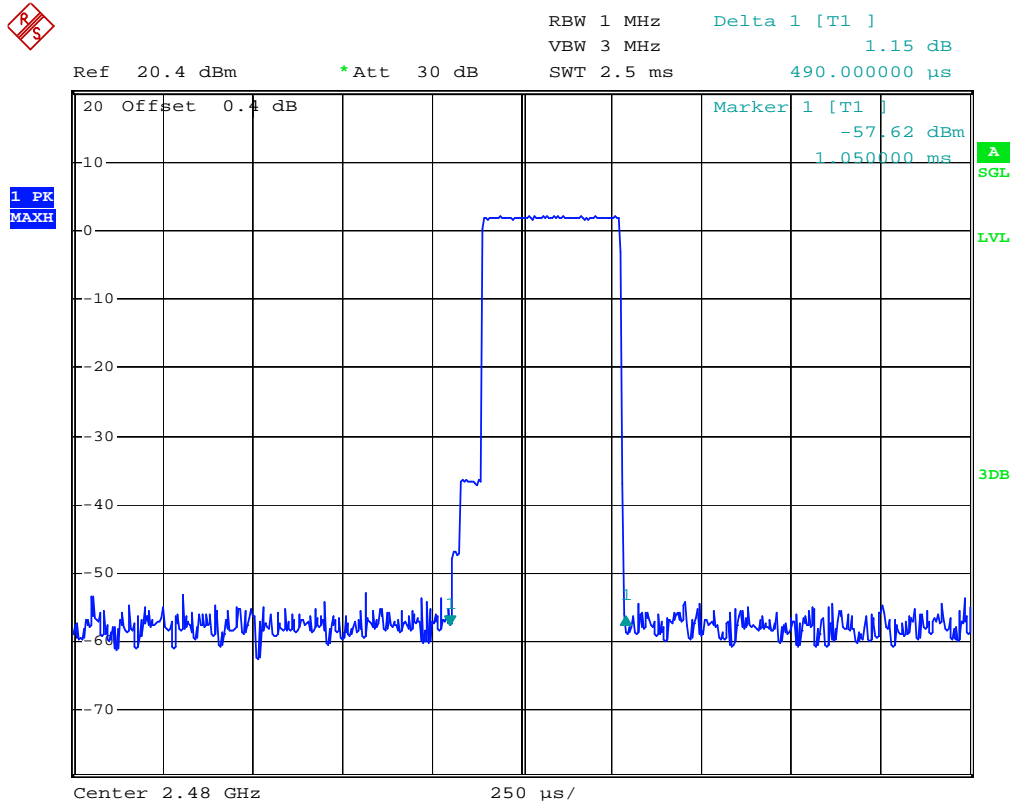
Middle Channel for DH1



Dwell time middle channel (DH1 BDR)

Date: 11.AUG.2008 11:07:43

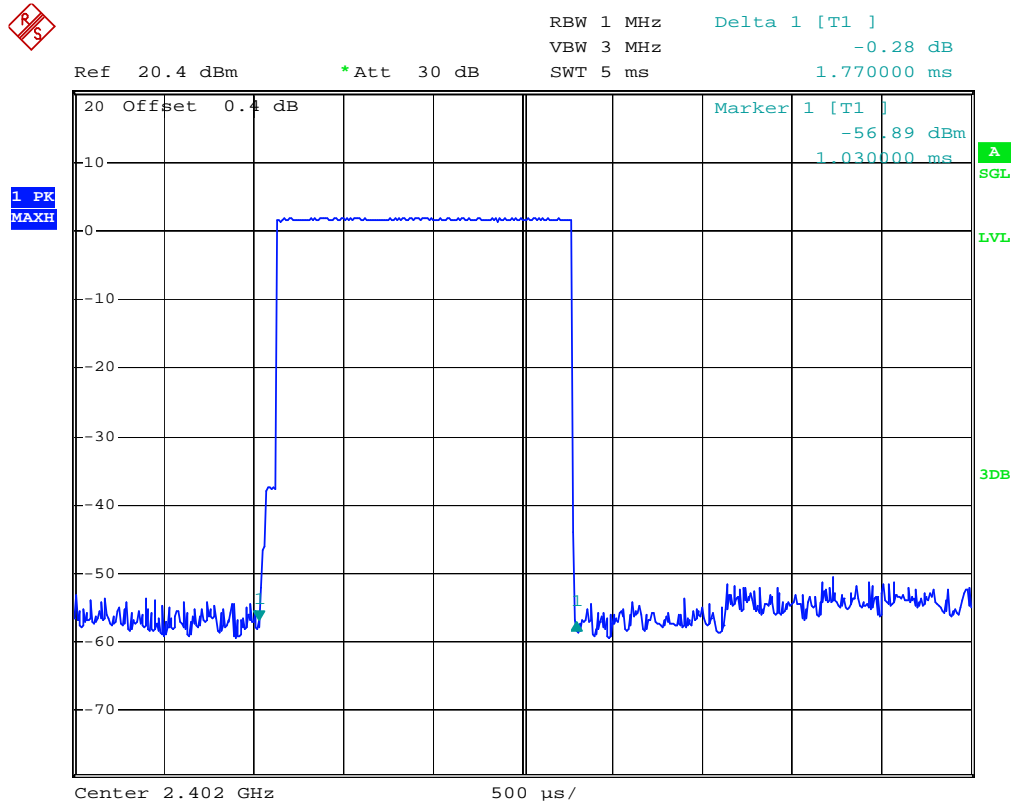
High Channel for DH1



Dwell time high channel (DH1 BDR)

Date: 11.AUG.2008 11:08:46

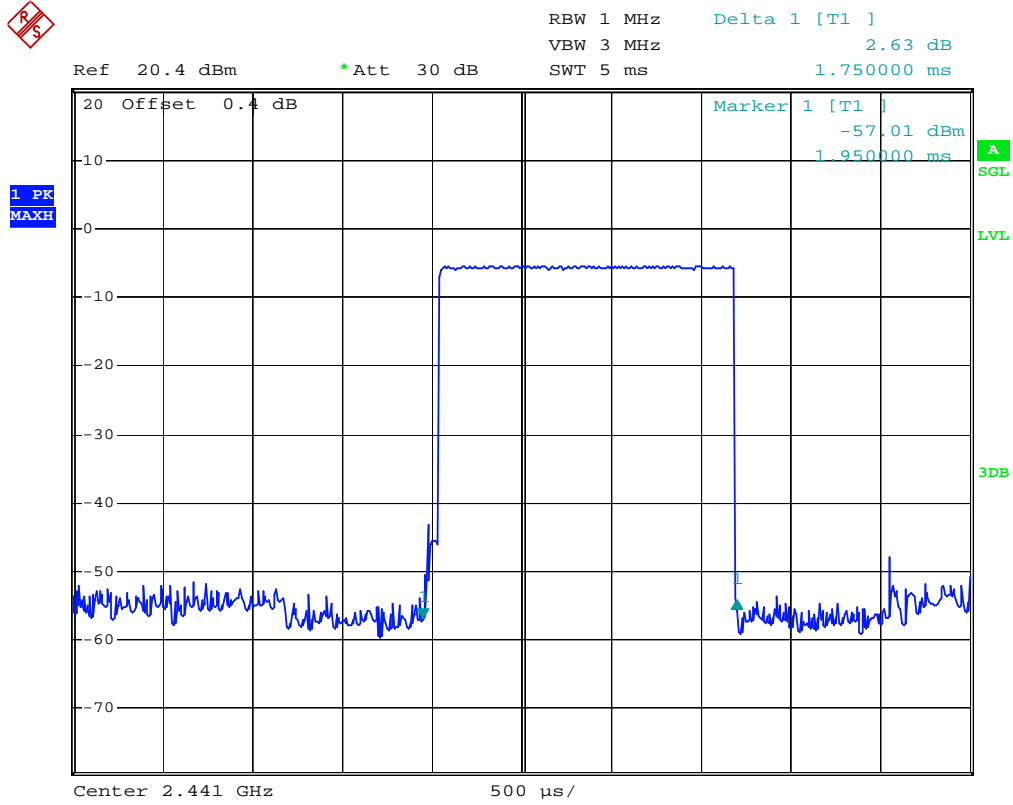
Low Channel for DH3



Dwell time low channel (DH3 BDR)

Date: 11.AUG.2008 11:16:15

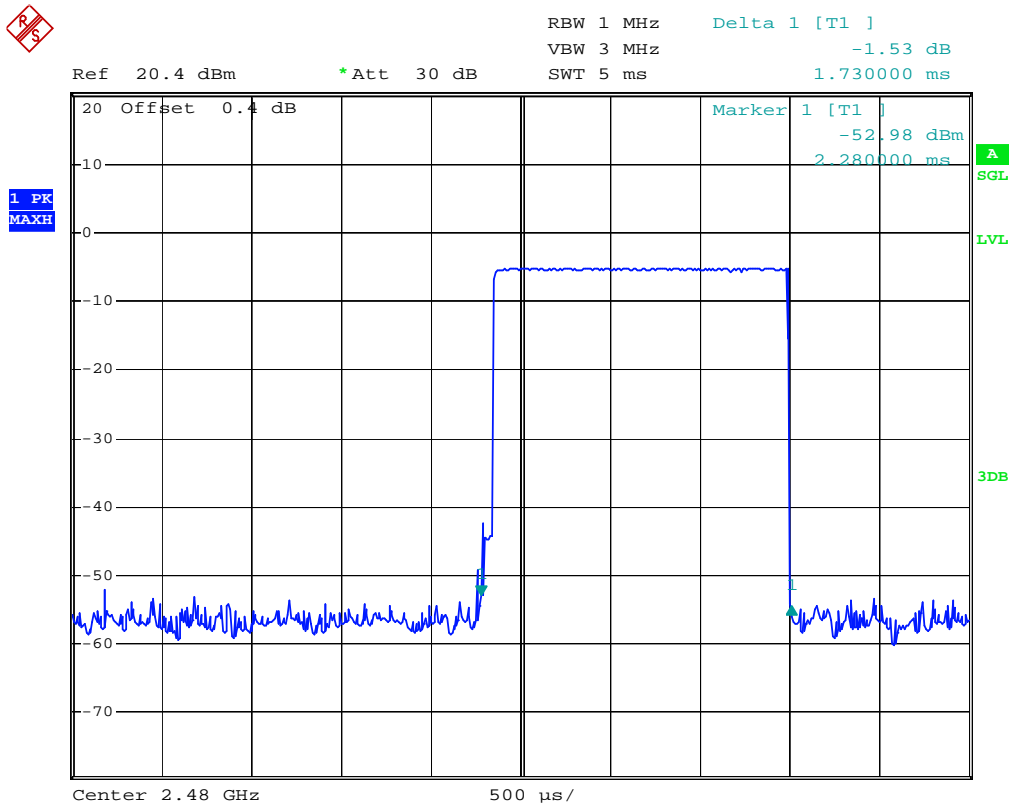
Middle Channel for DH3



Dwell time middle channel (DH3 BDR)

Date: 11.AUG.2008 11:14:23

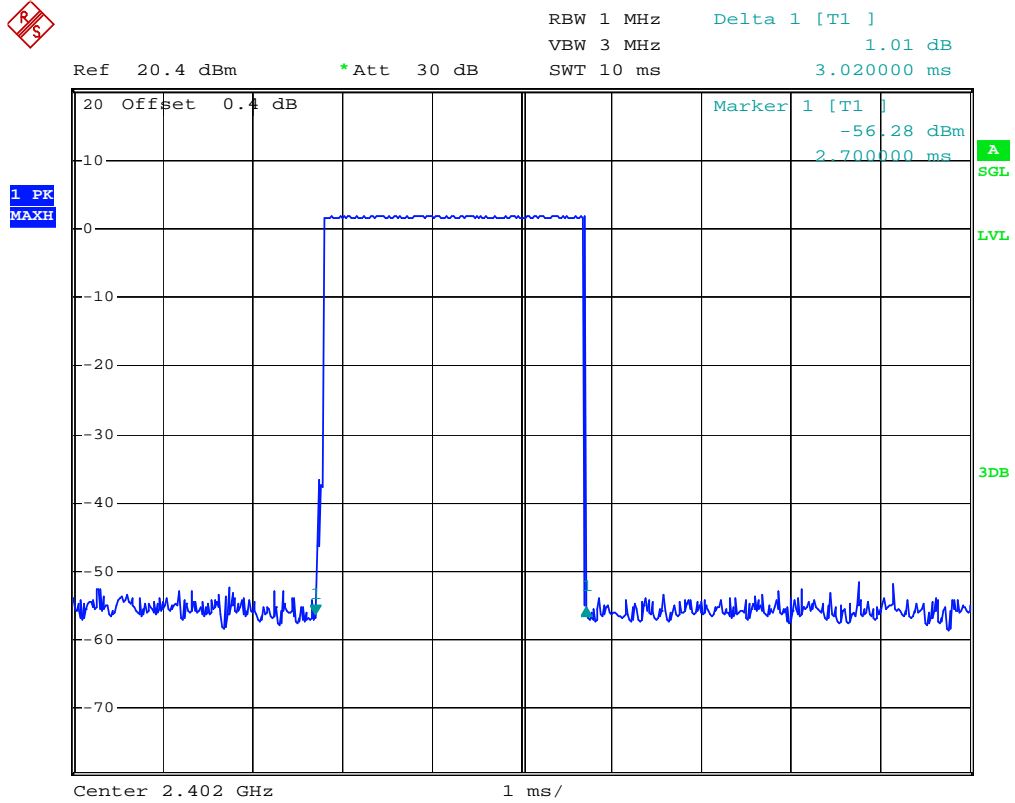
High Channel for DH3



Dwell time high channel (DH3 BDR)

Date: 11.AUG.2008 11:11:26

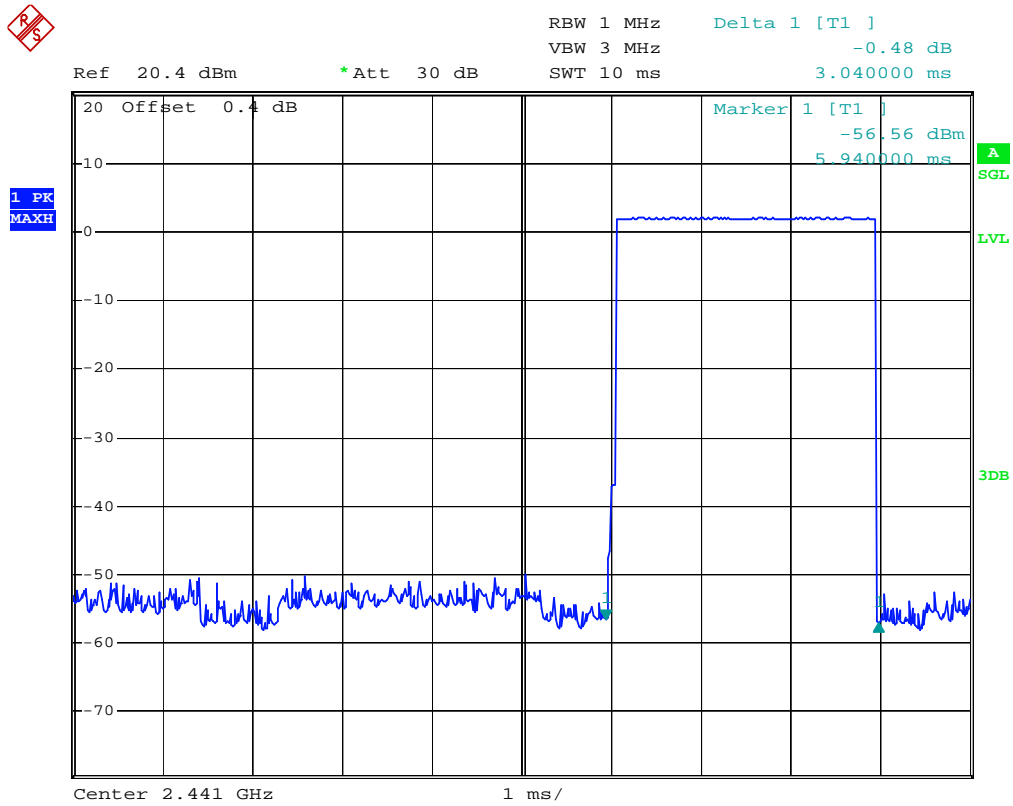
Low Channel for DH5



Dwell time low channel (DH5 BDR)

Date: 11.AUG.2008 11:17:45

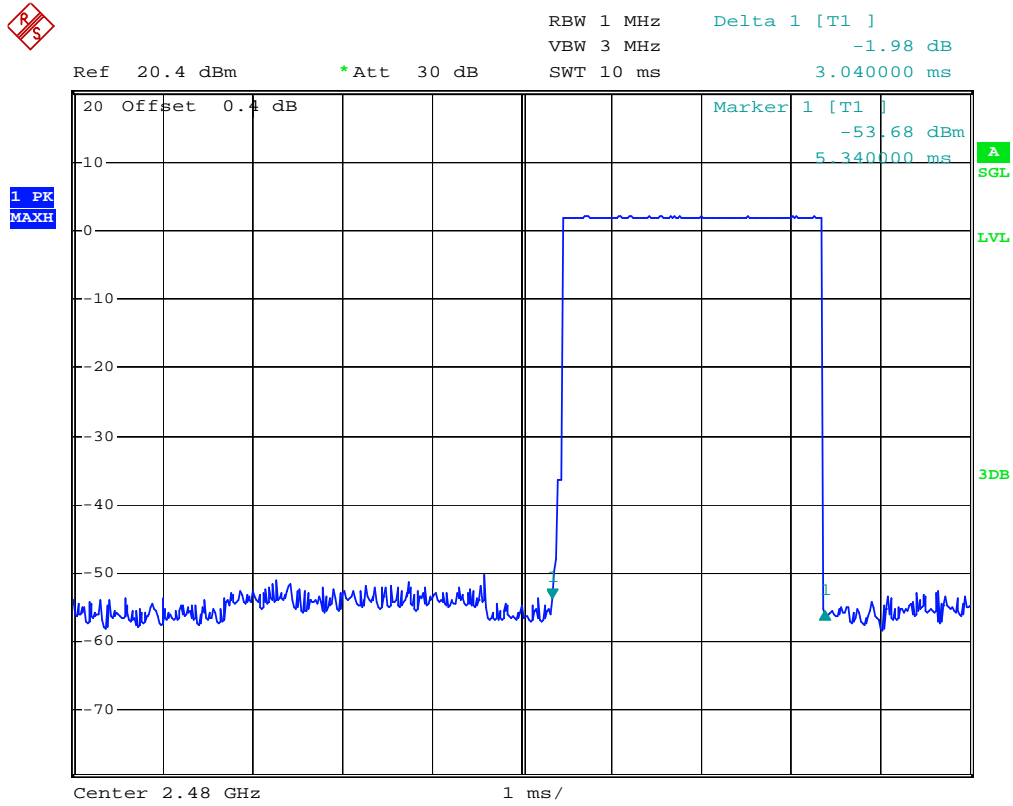
Middle Channel for DH5



Dwell time middle channel (DH5 BDR)

Date: 11.AUG.2008 11:18:52

High Channel for DH5

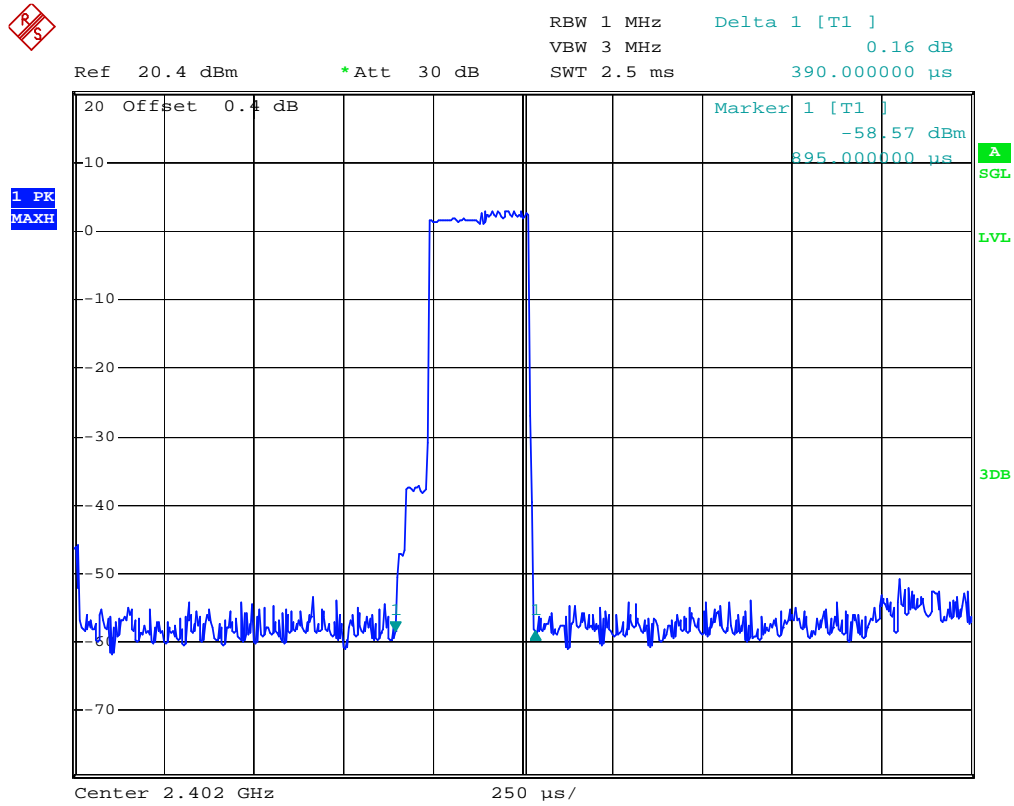


Dwell time high channel (DH5 BDR)

Date: 11.AUG.2008 11:19:38

Test Mode: Transmitting (EDR)

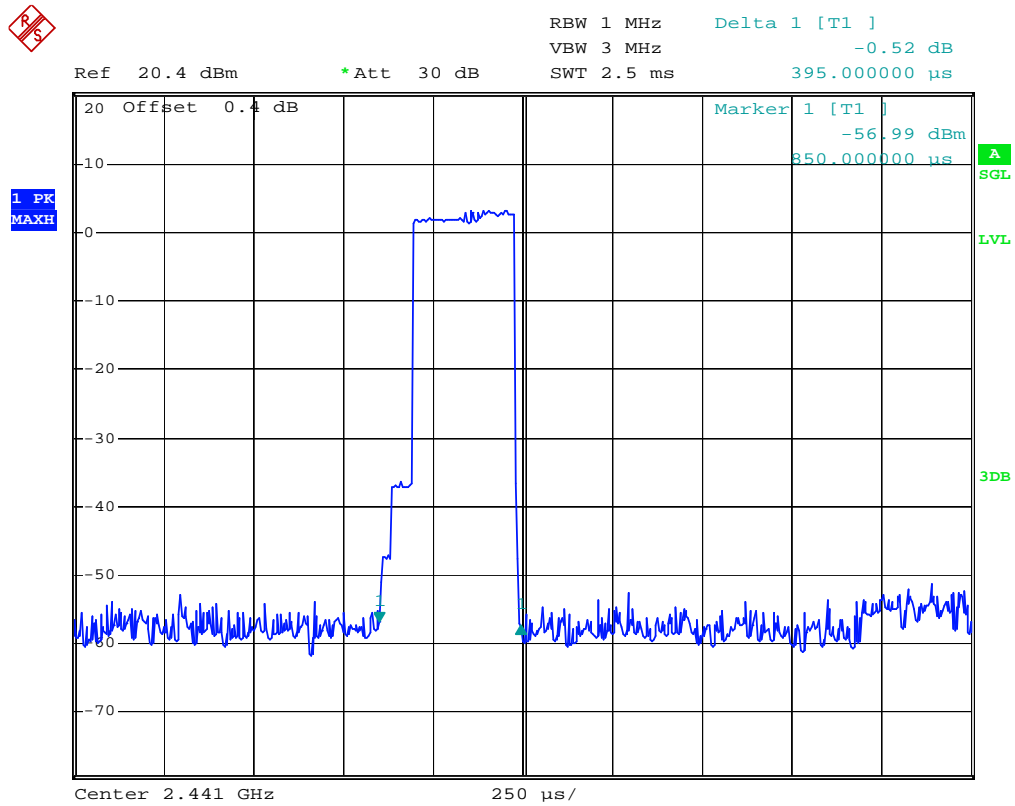
Low Channel for DH1



Dwell time low channel (DH1 EDR)

Date: 11.AUG.2008 11:33:58

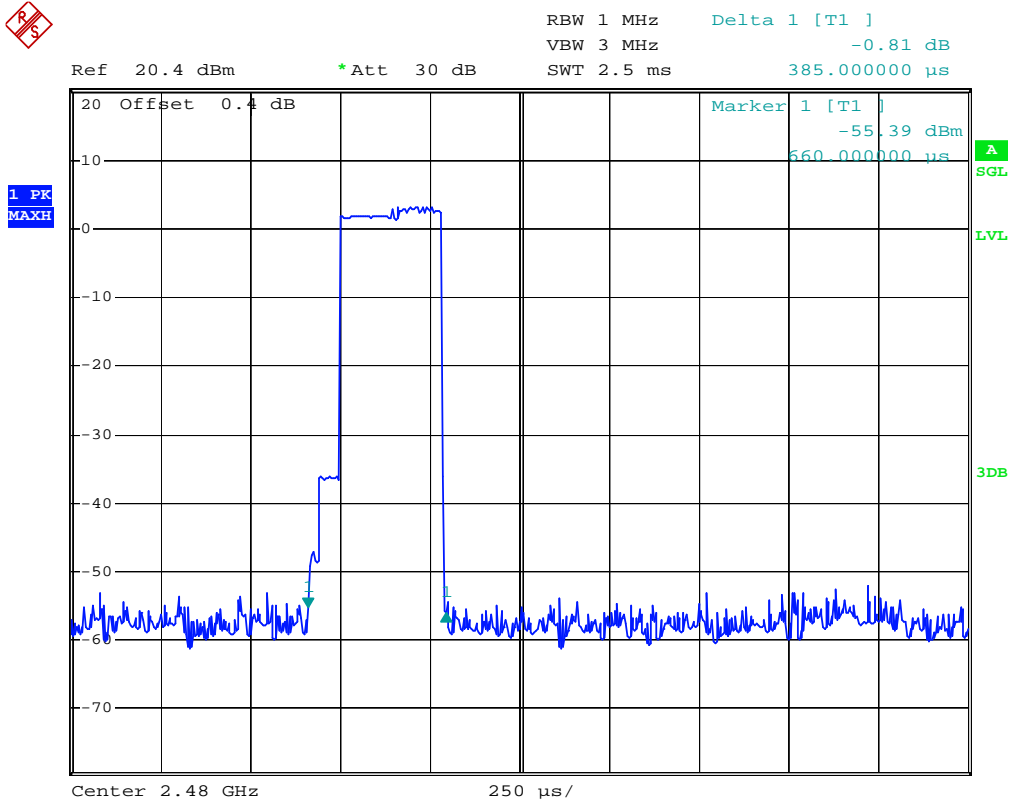
Middle Channel for DH1



Dwell time middle channel (DH1 EDR)

Date: 11.AUG.2008 11:31:55

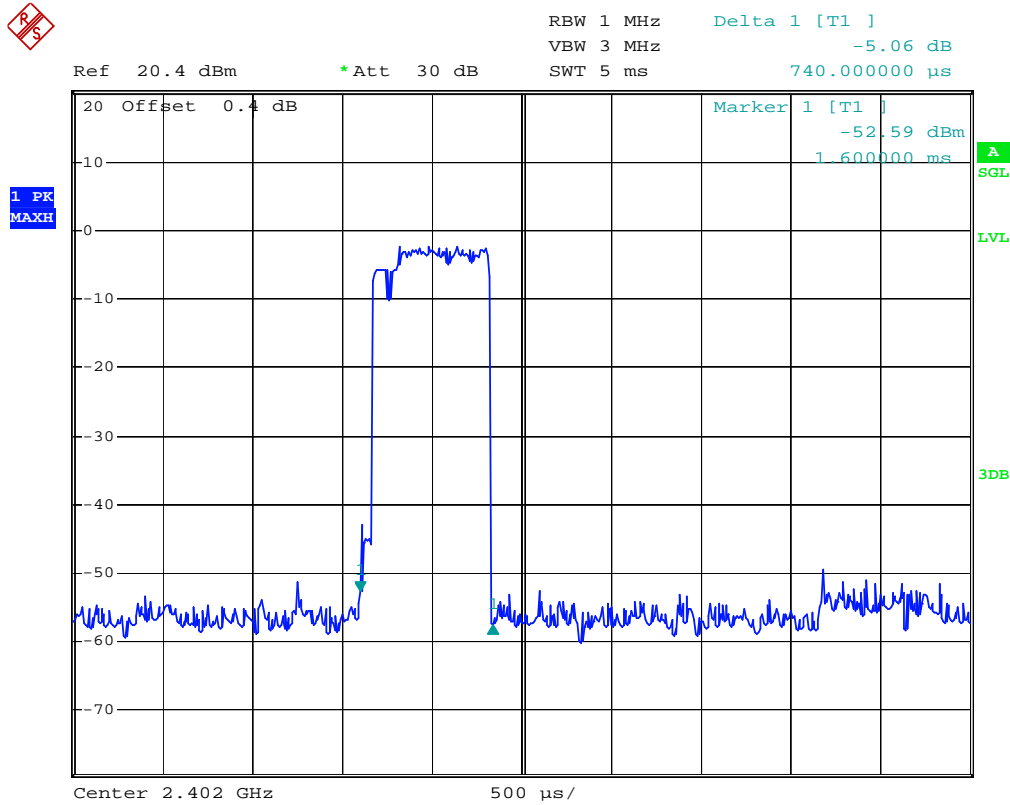
High Channel for DH1



Dwell time high channel (DH1 EDR)

Date: 11.AUG.2008 11:30:46

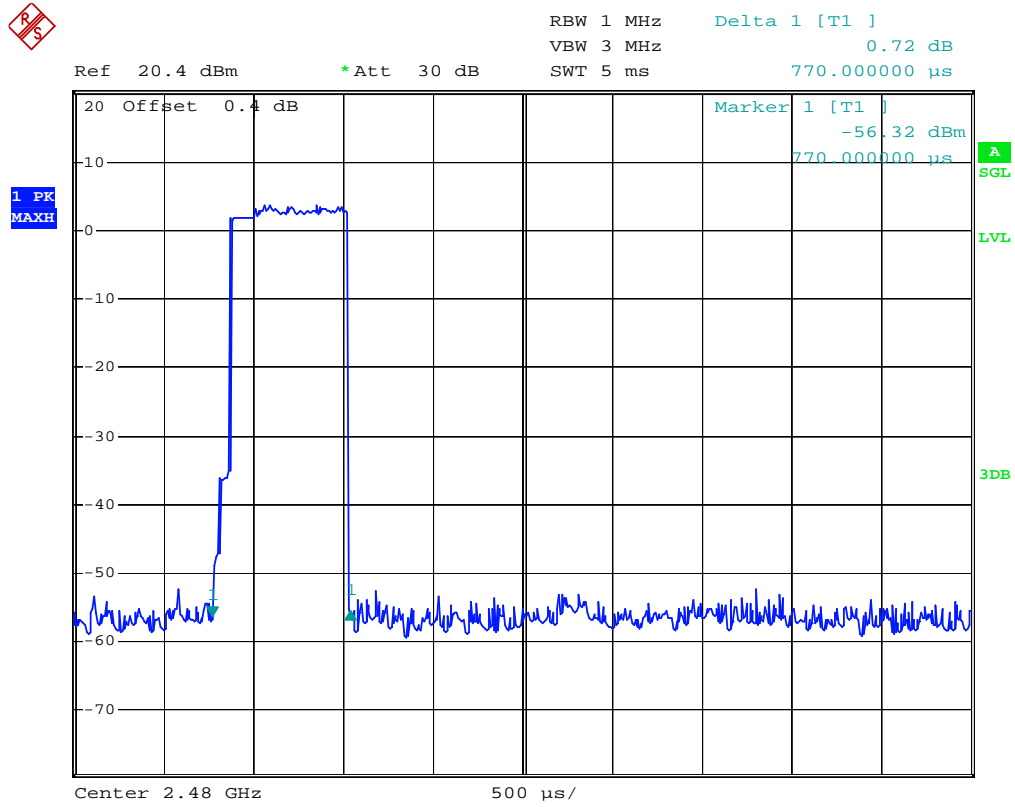
Low Channel for DH3



Dwell time low channel (DH3 EDR)

Date: 11.AUG.2008 11:25:34

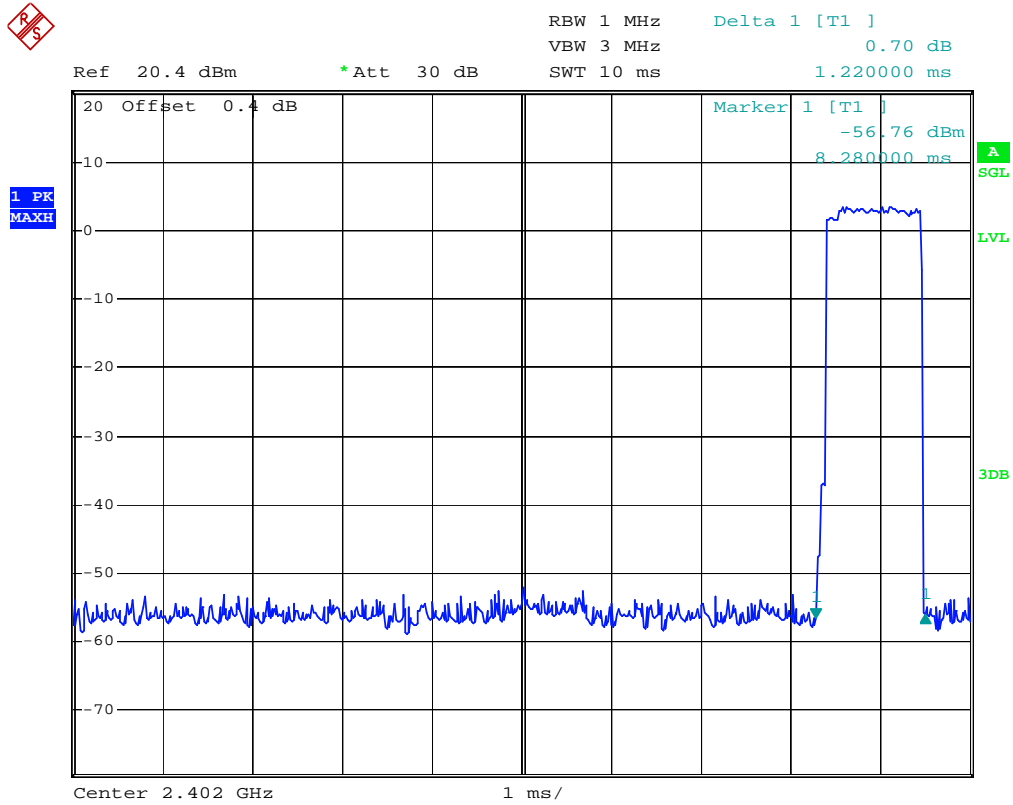
High Channel for DH3



Dwell time high channel (DH3 EDR)

Date: 11.AUG.2008 11:29:03

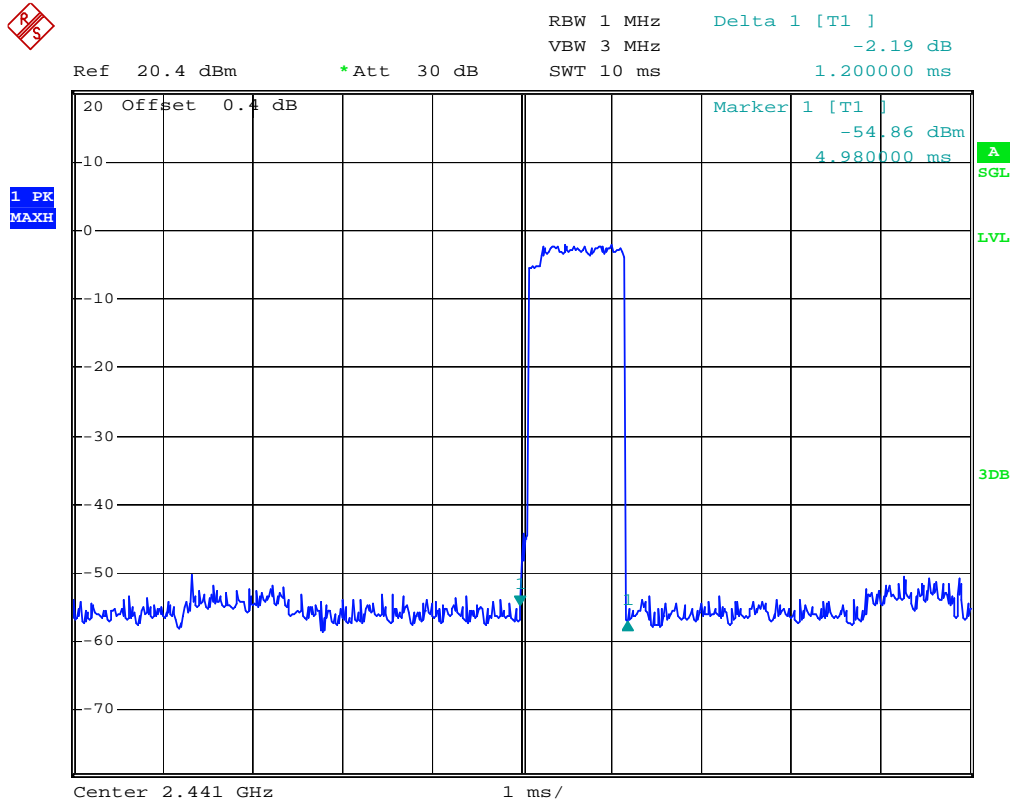
Low Channel for DH5



Dwell time low channel (DH5 EDR)

Date: 11.AUG.2008 11:23:36

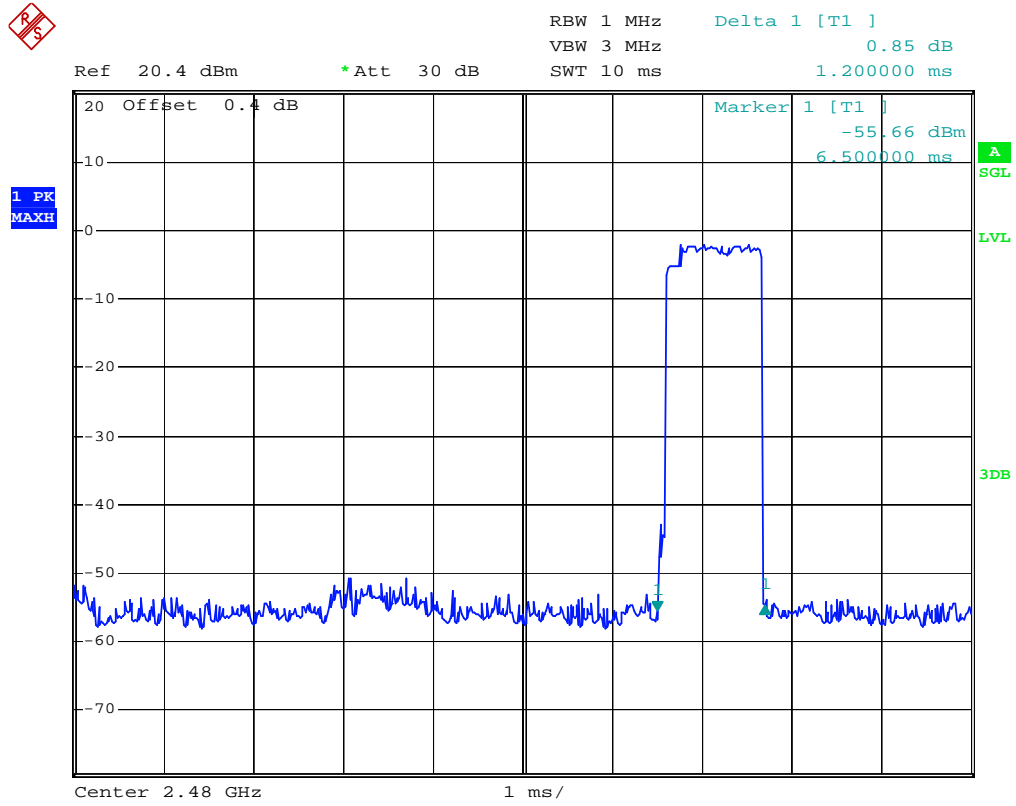
Middle Channel for DH5



Dwell time middle channel (DH5 EDR)

Date: 11.AUG.2008 11:22:34

High Channel for DH5



Dwell time high channel (DH5 EDR)

Date: 11.AUG.2008 11:21:19

CFR47 §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.

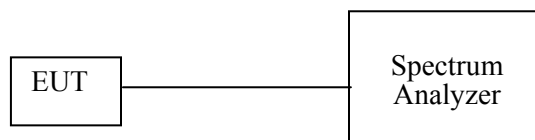
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16

* **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 it 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:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

* The testing was performed by Phoenix Liu on 2008-08-11.

Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting (BDR)

Channel	Channel Frequency (MHz)	Reading Power (dBm)	Power Output (mw)	Limit (mw)
Low	2402	2.08	1.614	125
Mid	2441	2.27	1.687	125
High	2480	2.18	1.652	125

Note: Typical Antenna Gain =2dBi

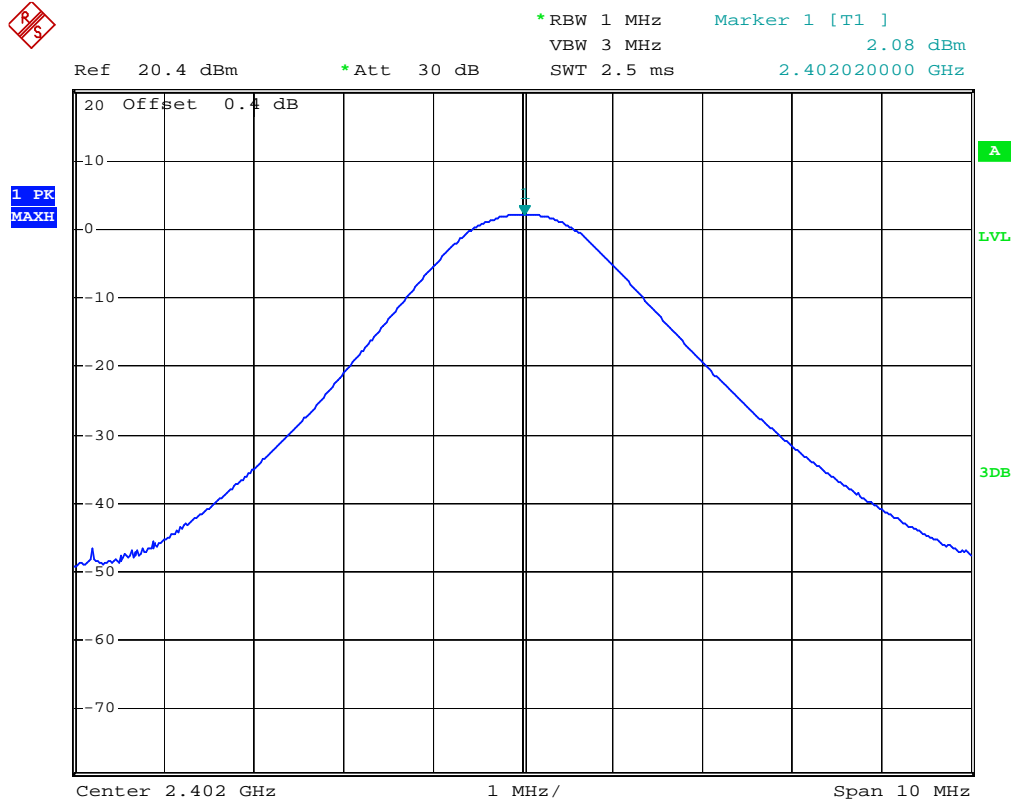
Test Mode: Transmitting (EDR)

Channel	Channel Frequency (MHz)	Reading Power (dBm)	Power Output (mw)	Limit (mw)
Low	2402	2.81	1.910	125
Mid	2441	3.08	2.032	125
High	2480	3.19	2.084	125

Note: Typical Antenna Gain =2dBi

Test Mode: Transmitting (BDR)

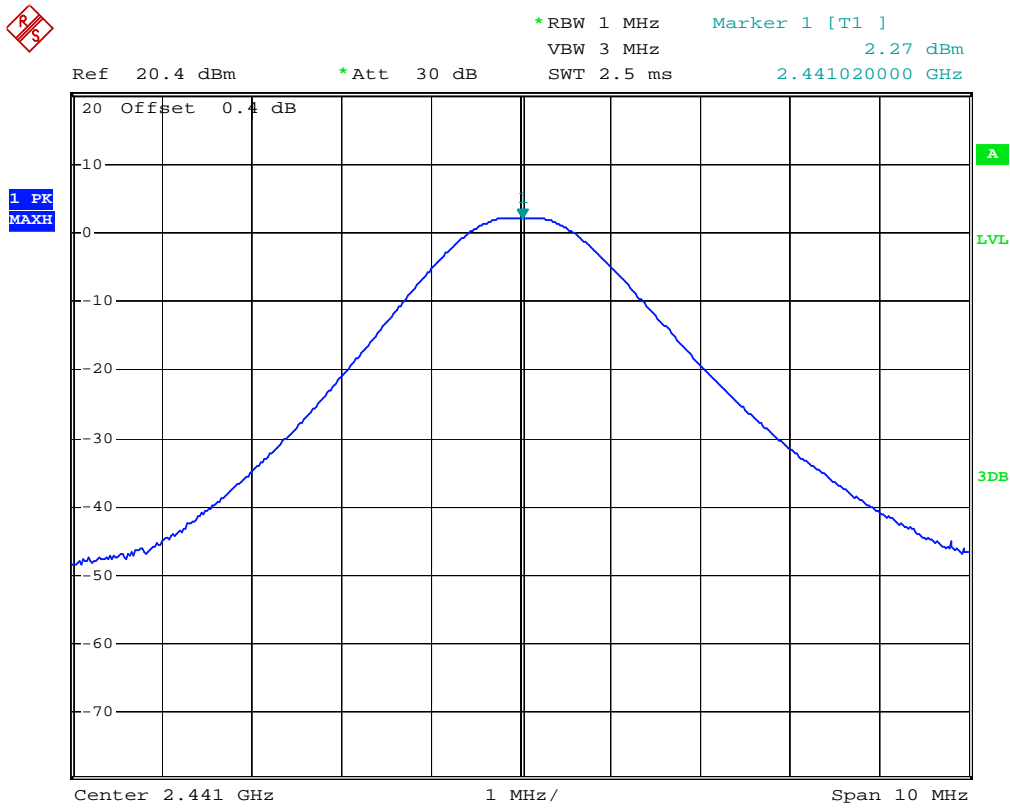
Low Channel



Peak of output power (low channel)

Date: 11.AUG.2008 10:32:36

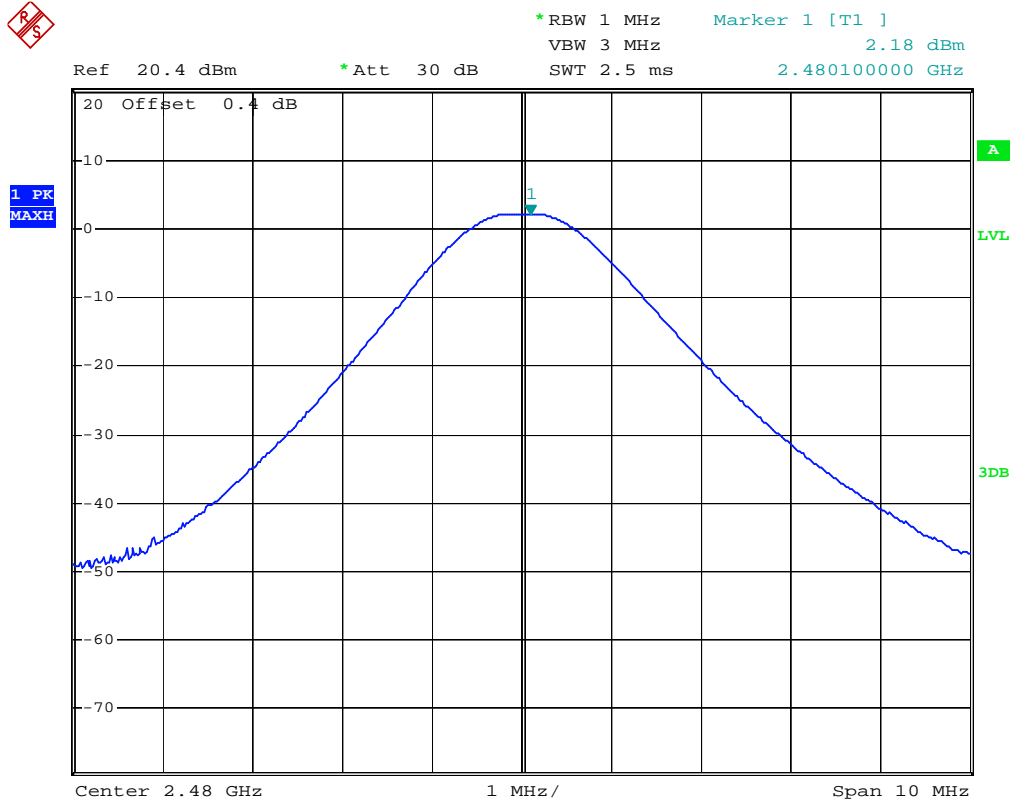
Middle Channel



Peak of output power (middle channel)

Date: 11.AUG.2008 10:37:57

High Channel

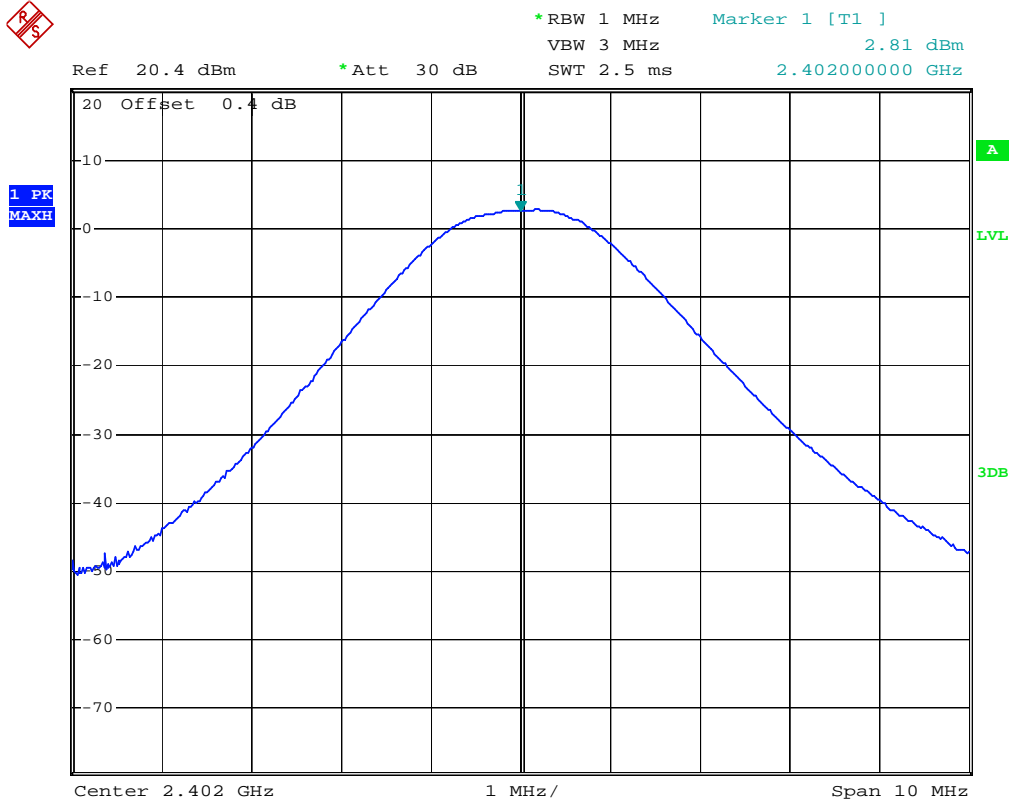


Peak of output power (high channel)

Date: 11.AUG.2008 10:38:48

Test Mode: Transmitting (EDR)

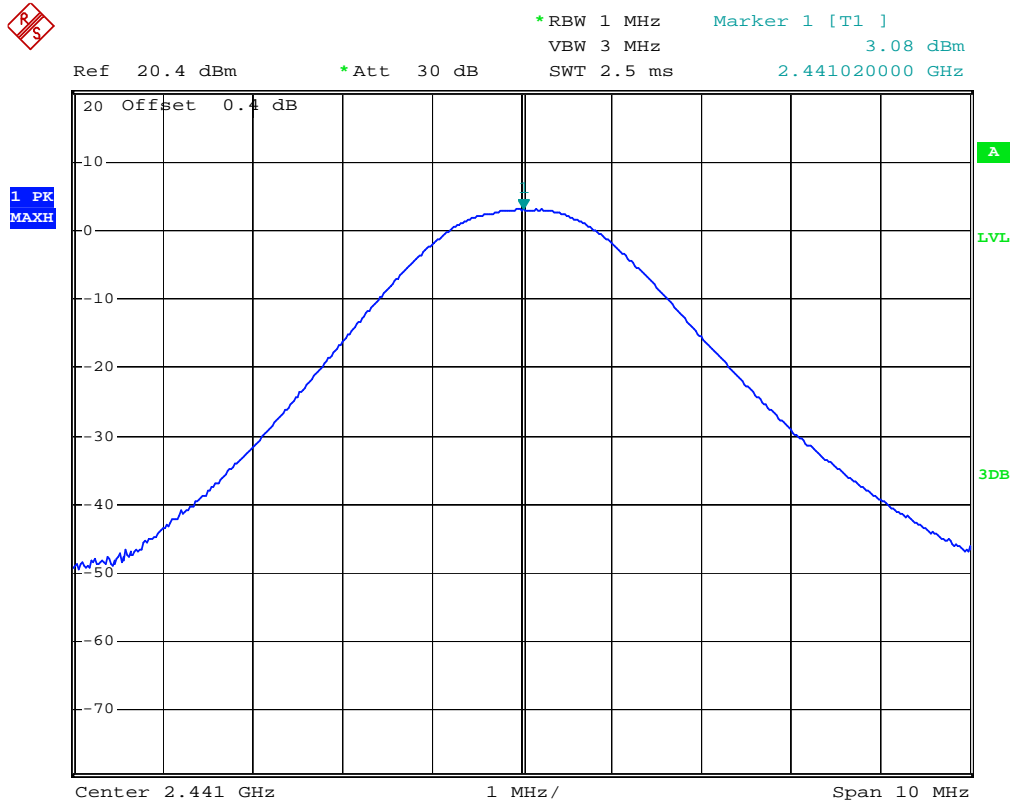
Low Channel



Peak of output power low EDR

Date: 11.AUG.2008 13:31:51

Middle Channel



Peak of output power middle EDR

Date: 11.AUG.2008 13:32:56

CFR47 §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	2007-10-16	2008-10-16

* **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. Put it on the Rotated table and 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:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

**The testing was performed by Phoenix Liu on 2008-09-26.*

Test Result: Compliant

Please refer to the following table and plots.

Test Mode: Transmitting (BDR)

Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)
2399.900	56.20	20
2483.600	54.87	20

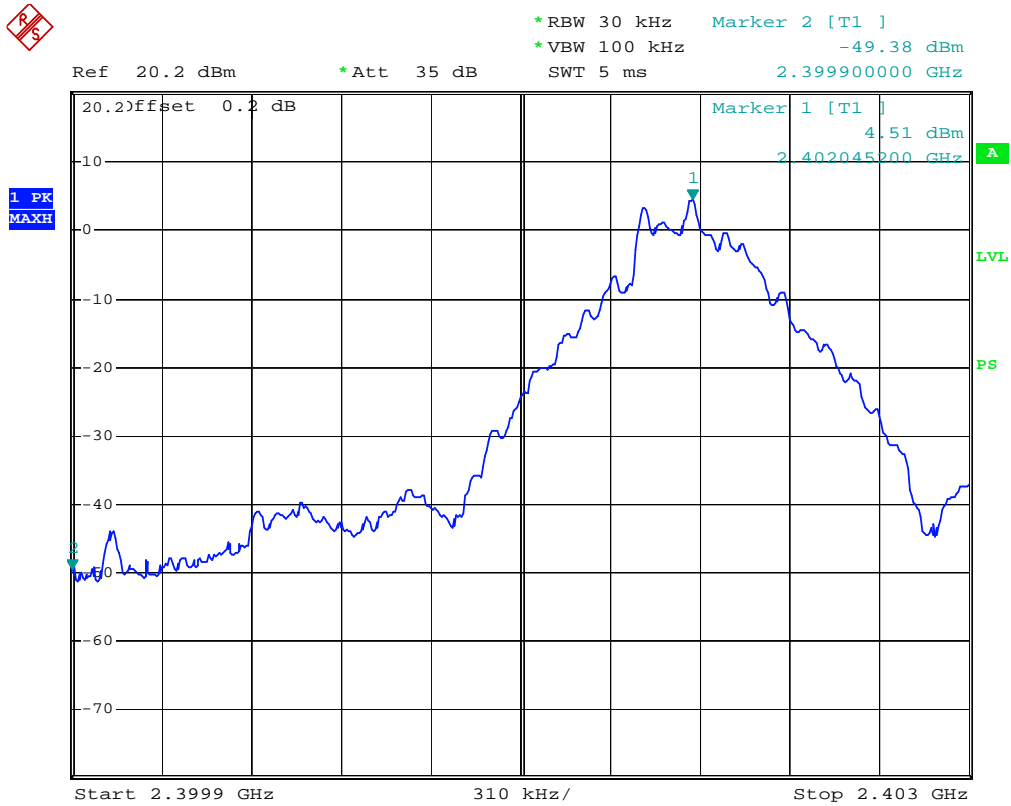
Test Mode: Transmitting (EDR)

Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)
2399.900	53.89	20
2483.600	55.93	20

Note: The frequencies fall into the stricted band was tested in FCC 15.209

Test Mode: Transmitting (EDR)

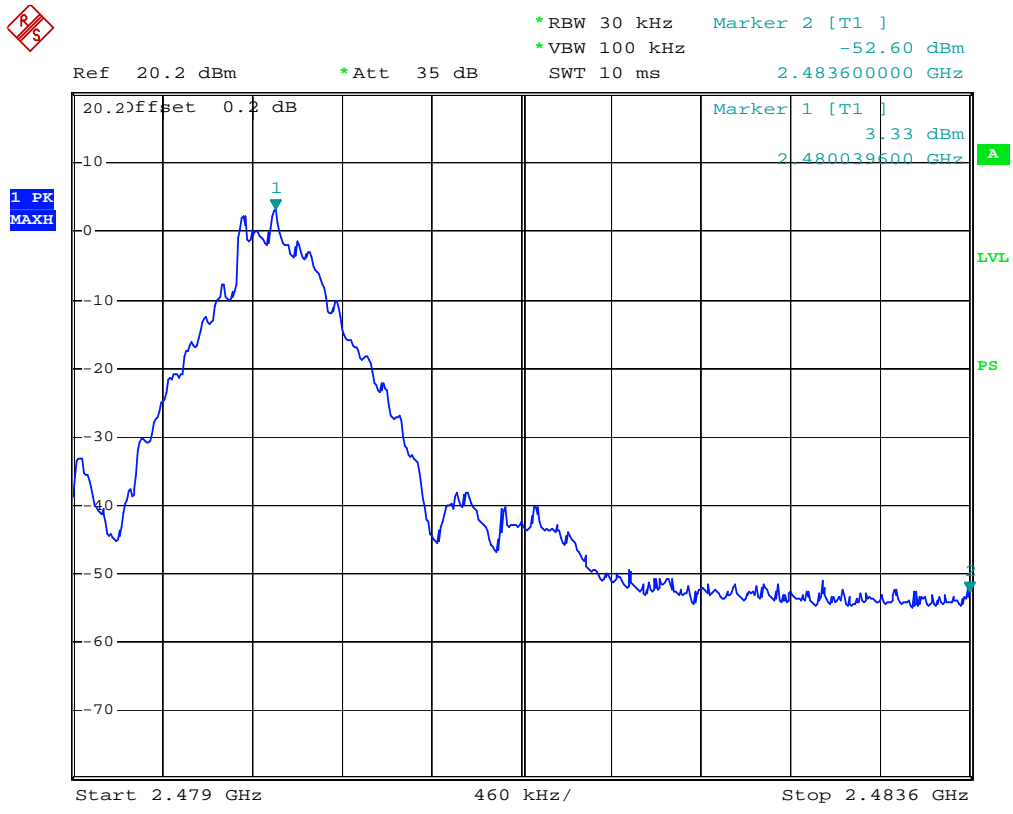
Band Edge Left Side



out of bandedge left

Date: 26.SEP.2008 13:53:11

Band Edge Right Side



out of bandedge right

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