



NVLAP LAB CODE 200707-0



FCC PART 15.247

## MEASUREMENT AND TEST REPORT

For

**Tobii Technology AB**

Karlsrovägen 2D, 18256 Danderyd, Sweden

**FCC ID: W5MTOBIIC12**

<b>Report Type:</b> Original Report	<b>Product Type:</b> A Laptop Computer with Bluetooth, Wi-Fi and GSM Modules
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<b>Report Number:</b> <u>RSZ09042306-Wi-Fi</u>	
<b>Report Date:</b> <u>2009-07-23</u>	
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\* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "\*" (Rev.2)

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *Tobii Technology AB's* product, model number: *T-C12-R1.0A-V0 (FCC ID: W5MTOBIIC12)* or the "EUT" as referred to in this report is a *Tobii C12(A Laptop Computer with Bluetooth, WiFi and GSM Modules)*, which measures approximately: 31.1 cm L x 25.9 cm W x 4.5 cm H, input voltage: DC 24V Adapter or DC 14.8V battery.

Adapter Information: powerbox AC power adapter

Part number: EXM80 5121

Input: 100-240V 50/60Hz Max.1.7 A

Output: 24V 2.9A

Frequency Bands: PCS 1900: 1850-1910 MHz (TX), 1930-1990 MHz (RX)

Bluetooth: 2402-2480 MHz (TX/RX)

Wi-Fi: 2412-2462 MHz (TX/RX)

*\* All measurement and test data in this report was gathered from production sample serial number: 0904059 (Assigned by BACL, Shenzhen). The EUT was received on 2009-04-23.*

### Objective

This Type approval report is prepared on behalf of *Tobii Technology AB* 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)

FCC Part 24E and Part 15 B submission with FCC ID: W5MTOBIIC12.

### 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).



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

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

For 802.11b and 802.11g mode, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

EUT was tested with Channel 1, 6 and 11.

The worst case data rate is determined with the data rate with highest output power. For 802.11b mode, 1 Mbps data rate was chosen for full testing. For 802.11g mode, 6 Mbps data rate was chosen for full testing.

### EUT Exercise Software

QAU2571W provided by the manufacturer.

### Equipment Modifications

No modification was made to the unit tested.

### Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
DELL	Motherboard	OWC297	CN-OWC297-70821-566-02BR	DoC
DELL	Power	NPS-250KB D	CN-0H2678-17972-56E8NBM	DoC
Seagate	Hard Disk	ST340014A	5JXK3NAD	DoC
DELL	3.5' Floppy	N/A	CN-0N8893-69802-54Q-02OZ	DoC
Lite-ON	CD-ROM	LTN-489S	N/A	DoC
Intel	CPU	Celeron D-2533	N/A	N/A
ProMOS	Memory	V826632K24SATG-C0	0525-K1933700	N/A
Intel	Ethernet	PRO 10/100 VE	N/A	DoC

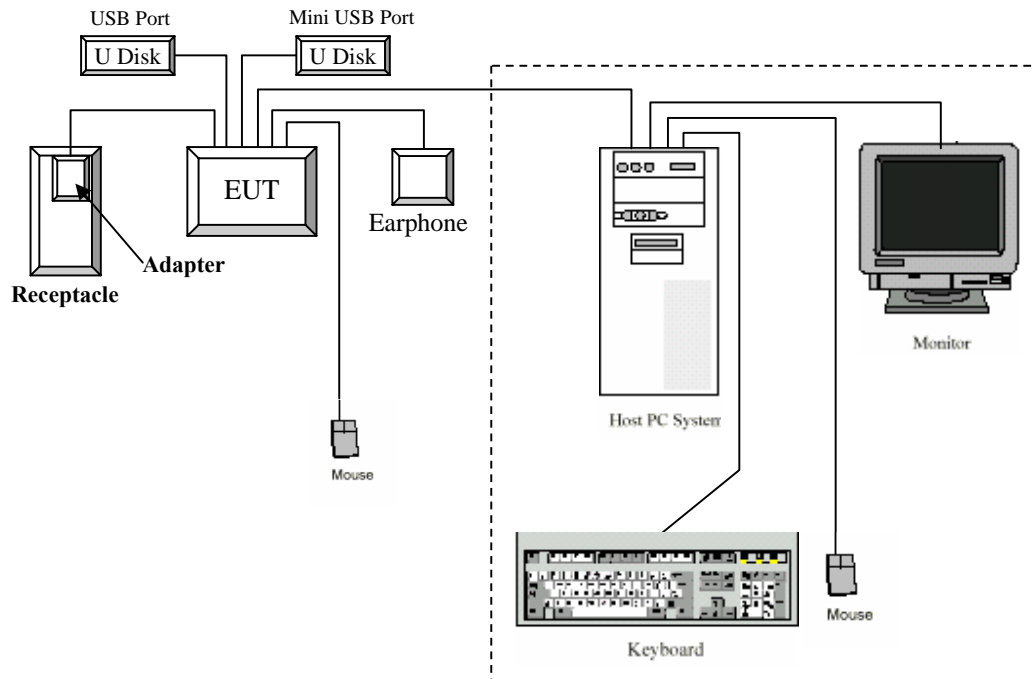
**Local Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number	FCC ID
DELL	PC	DELL 170L	CN-0TC670-70821-560-F4WQ	DoC
DELL	Keyboard	SK-8110	CN07N244-71616-56I-1I0O	DoC
DELL	Mouse	M071KC	519046820	DoC
DELL	Mouse	MUC5UO	N/A	DoC
DELL	LCD Monitor	1505FP	Y4287-7168-574-GBSH	DoC
SOMIC	Earphone	ST-818	N/A	DoC
Apacer	U disk 1	AH321	N/A	DoC
HuaPu	U disk 2	DPF-802	08-2995	DoC

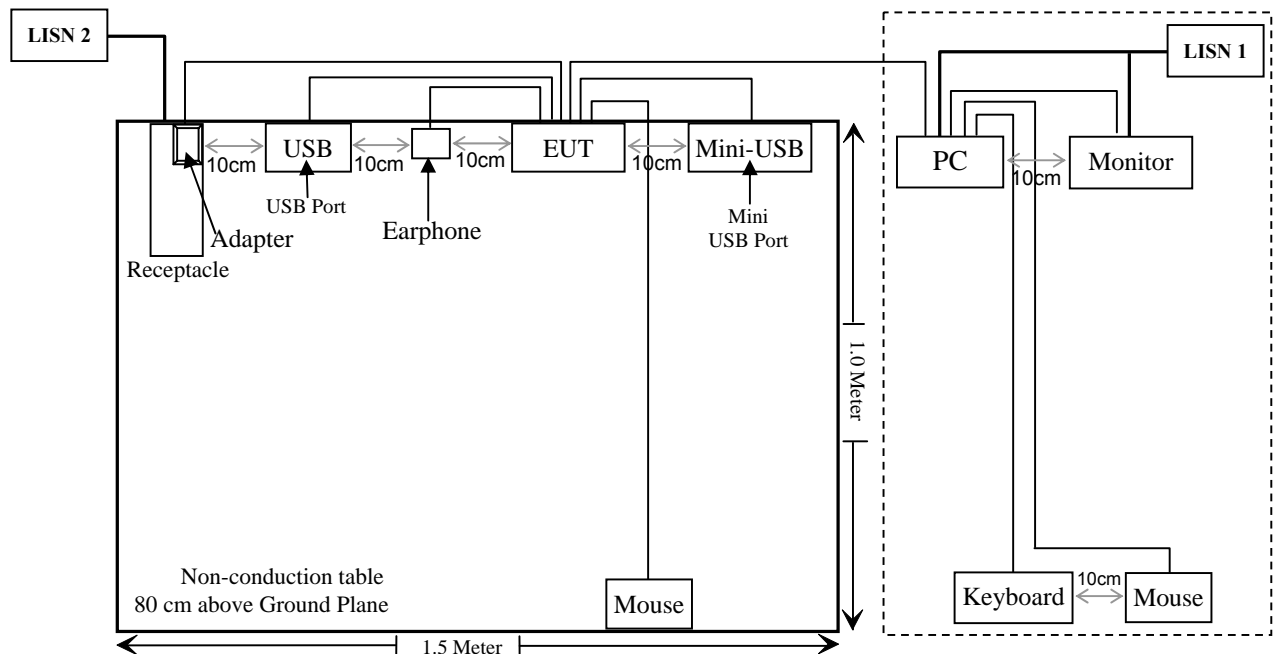
**External I/O Cable**

Cable Description	Length (m)	From/Port	To
Shielded Detachable K/B Cable	1.5	K/B Port	K/B
Shielded Detachable Mouse Cable	1.5	Mouse Port	Mouse
Shielded Detachable VGA Cable	1.5	VGA Port	Monitor
Shielded Detachable Power Line	1.9	Adapter	EUT
Shielded Detachable USB Cable	1.4	EUT-USB Port	U-Disk
Shielded Detachable USB Cable	0.21	EUT-Mini USB Port	U-Disk

## Configuration of Test Setup



## Block Diagram of Test Setup





**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.247 (i) , §1.1307 (b) (1), §2.1093	RF Exposure	Compliance *
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.209, §15.205, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Note: \* Please refer to SAR test report released by BACL, report number: R09042916-FCC-SAR.

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## **§15.247 (i) and §1.1307 (b) (1), §2.1093 – RF EXPOSURE**

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### **Standard Applicable**

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

### **Result: Compliance.**

Please refer to the SAR report, report No.: R0942916-FCC-SAR.

## **§15.203 - ANTENNA REQUIREMENT**

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### **Standard Applicable**

According to § 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Result: Compliance.**

The EUT has 3 antennae, one is for Bluetooth, the gain is -4.67 dBi; one is for WiFi, the gain is -1.02 dBi; other is for PCS, the gain is -6.53 dBi. All antennae are printed on PCB.

## §15.207 (a) - CONDUCTED EMISSIONS

### Applicable Standard

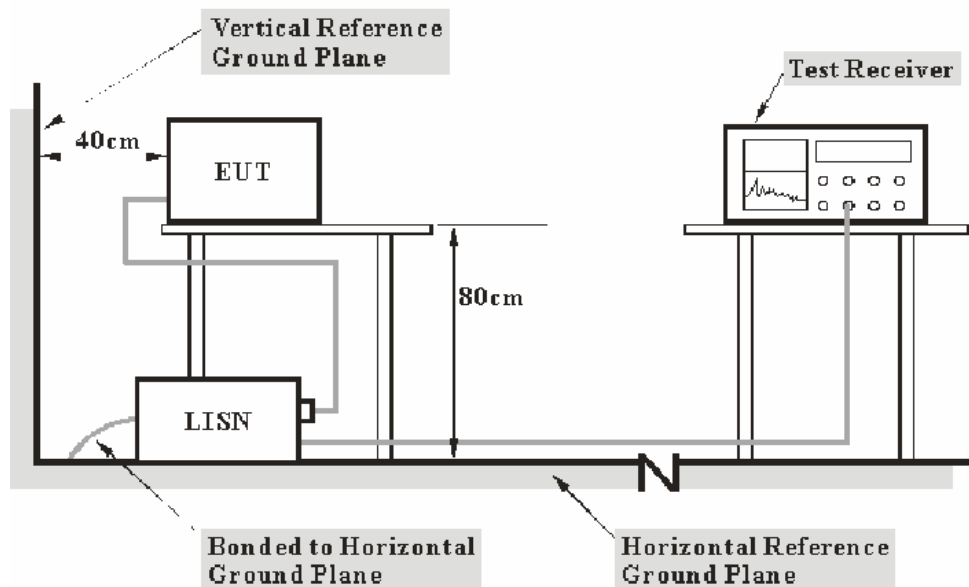
CFR47 §15.207

### 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  $\pm 2.4$  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 spacing between the peripherals was 10 cm.

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

## Test Equipment List and Details

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2009-04-28	2010-04-27
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2009-04-28	2010-04-27

\* **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 LISN 1, the host PC and the monitor was connected to the LISN 2.

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:

*802.11b*: **7.90 dB** at **7.2900 MHz** in the **Line** conductor mode

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0 kPa

The testing was performed by Bruce Zhang on 2009-06-03.

Test Mode: Transmitting (wifi worse case mode)

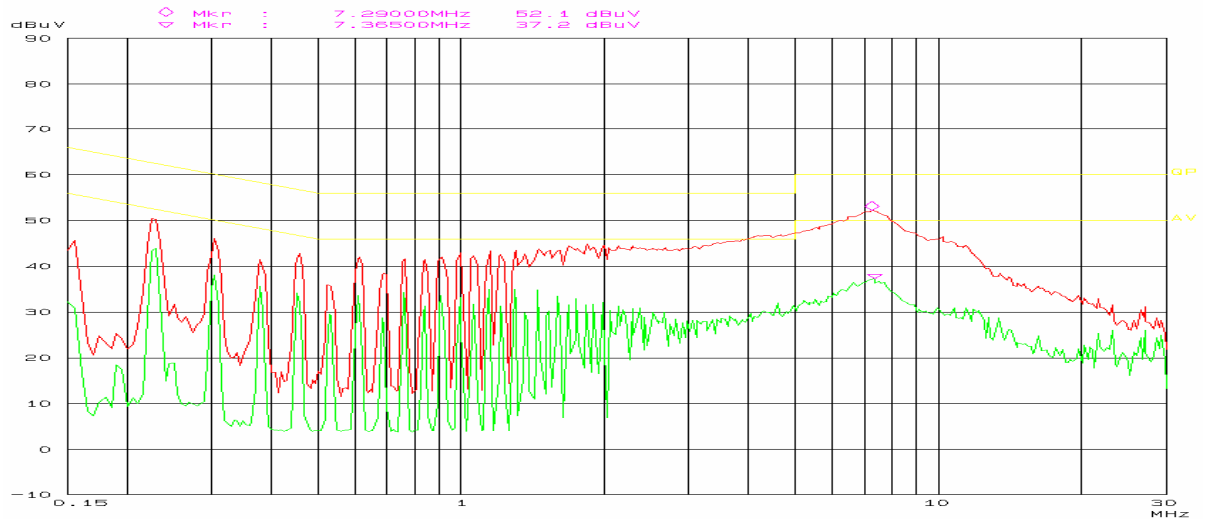
Line Conducted Emissions				FCC Part 15.207	
Frequency (MHz)	Amplitude (dBμV)	Detector (QP/AV)	Conductor (Line/Neutral)	Limit (dBμV)	Margin (dB)
7.2900	52.10	QP	Line	60.00	7.90
0.6150	37.70	AV	Neutral	46.00	8.30
0.2300	44.00	AV	Line	52.45	8.45
0.3800	39.80	AV	Neutral	48.28	8.48
0.4550	37.70	AV	Neutral	46.78	9.08
7.2700	50.50	QP	Neutral	60.00	9.50
0.3050	40.30	AV	Neutral	50.11	9.81
0.4600	45.90	QP	Neutral	56.69	10.79
0.3050	49.30	QP	Neutral	60.11	10.81
0.3800	47.20	QP	Neutral	58.28	11.08
1.1450	34.90	AV	Line	46.00	11.10
1.4450	34.80	AV	Line	46.00	11.20
0.2250	51.20	QP	Neutral	62.63	11.43
0.2250	41.10	AV	Neutral	52.63	11.53
0.3050	38.10	AV	Line	50.11	12.01
0.2300	50.30	QP	Line	62.45	12.15
1.4550	43.80	QP	Line	56.00	12.20
0.6150	33.70	AV	Line	46.00	12.30
0.6150	43.40	QP	Neutral	56.00	12.60
1.1500	43.20	QP	Line	56.00	12.80
7.3650	37.20	AV	Line	50.00	12.80
7.2050	36.60	AV	Neutral	50.00	13.40
0.6150	42.00	QP	Line	56.00	14.00
0.3050	46.10	QP	Line	60.11	14.01

### Plot(s) of Test Data

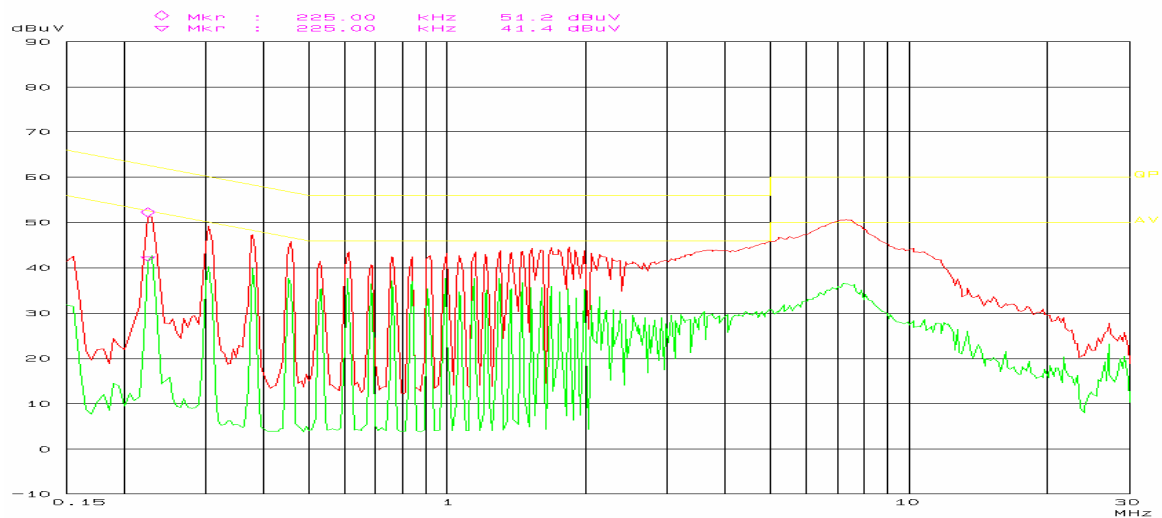
Plot(s) of Test Data is presented hereinafter as reference.

Conducted Emission  
FCC Part 15

EUT: Tobii C12 M/N: T-C12-R1.0A-V0  
Manuf: Tobii  
Op Cond: Operating  
Operator: Bruce  
Test Spec: AC 120V/50Hz L  
Comment: Temp: 25Hum: 56%  
BACL

Conducted Emission  
FCC Part 15

EUT: Tobii C12 M/N: T-C12-R1.0A-V0  
Manuf: Tobii  
Op Cond: Operating  
Operator: Bruce  
Test Spec: AC 120V/60Hz N  
Comment: Temp: 25Hum: 56%  
BACL



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

### Applicable Standard

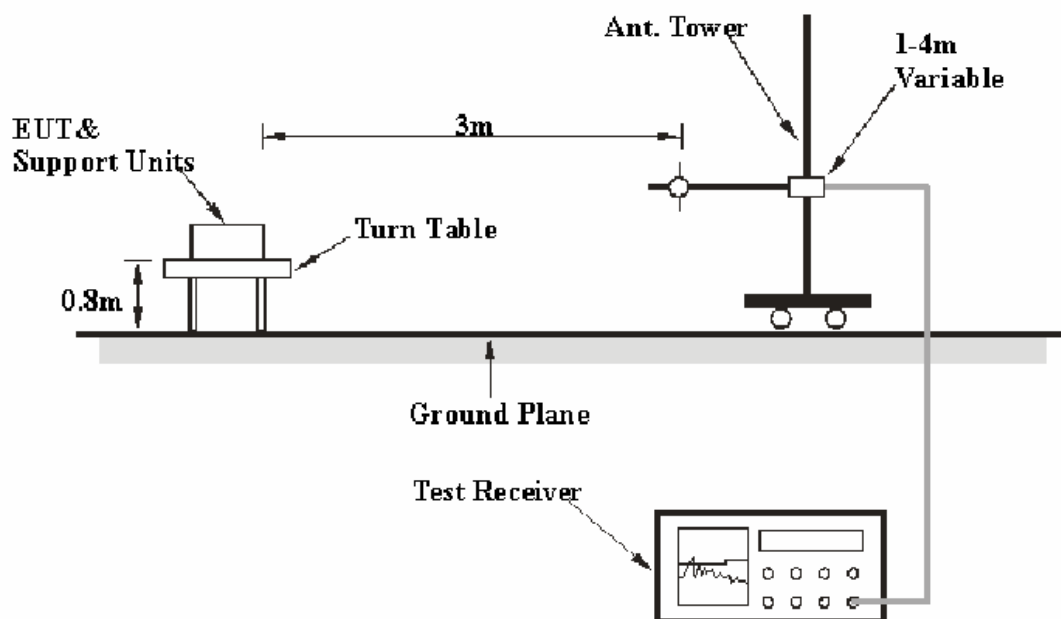
FCC §15.247 (d); §15.209; §15.205;

### Measurement Uncertainty

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

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is  $\pm 4.0$  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 Part 15.209 15.205 and 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 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	8447E	1937A01046	2008-11-15	2009-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2008-11-07	2009-11-06
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-03-11	2010-03-11
HP	Amplifier	8449B	3008A00277	2008-09-29	2009-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2008-09-25	2009-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-08-28	2009-08-27

\* **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, the host PC and monitor were 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 limit for Class B. 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 15.209, 15.205, and 15.247, with the worst margin reading of:

### 30 -1000 MHz:

**802.11b: 10.7 dB at 600.078200 MHz in the Vertical polarization**

**802.11g: 10.8 dB at 600.092375 MHz in the Vertical polarization**

### Above 1 GHz:

**3.79 dB at 1608 MHz in the Horizontal polarization, 802.11b Low Channel**

**3.38 dB at 1624 MHz in the Horizontal polarization, 802.11b Middle Channel**

**3.44 dB at 1641MHz in the Horizontal polarization, 802.11b High Channel**

**3.41 dB at 6432 MHz in the Vertical polarization, 802.11g Low Channel**

**3.93 dB at 6498 MHz in the Vertical polarization, 802.11g Middle Channel**

**13.18 dB at 1641 MHz in the Horizontal polarization, 802.11g High Channel**

## Test Data

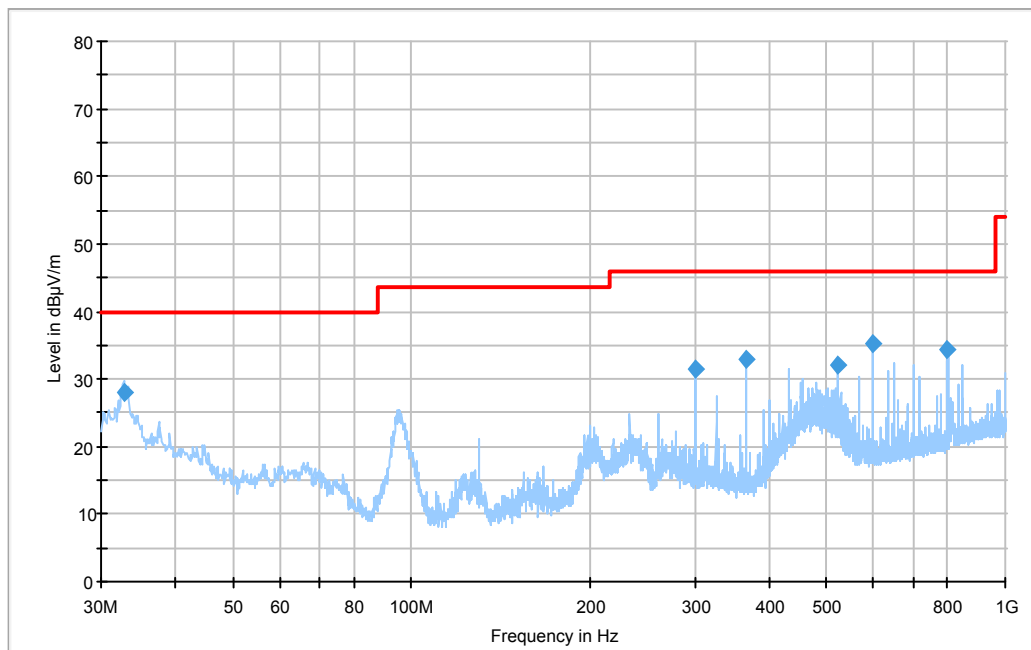
### Environmental Conditions

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0kPa

The testing was performed by Bruce Zhang on 2009-05-24 to 2009-07-22.

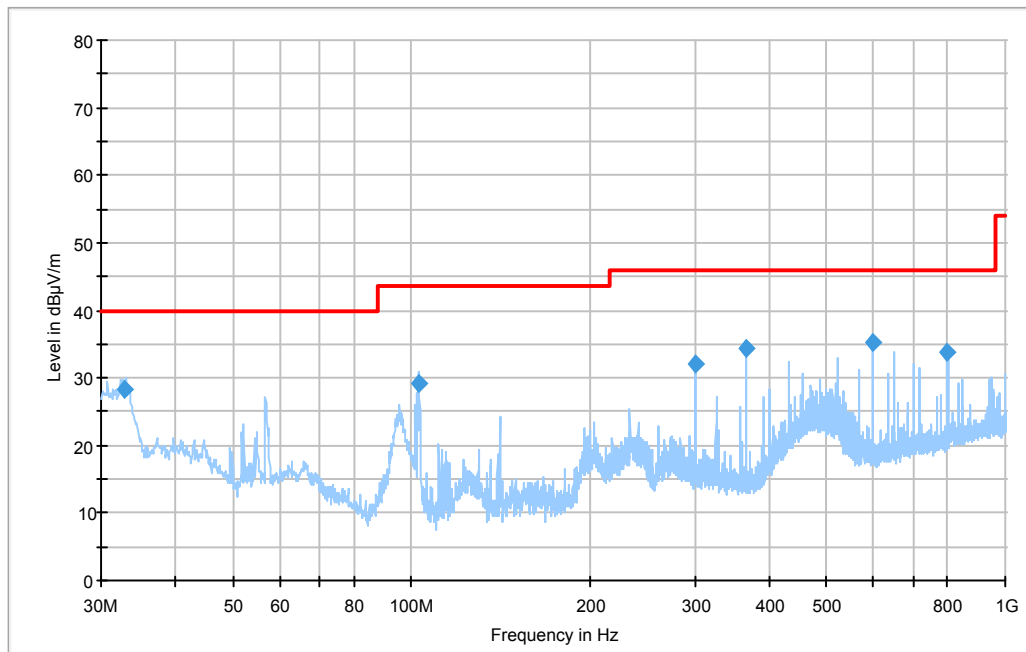
### 30-1000 MHz:

Test Mode: Transmitting (802.11b)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
600.078200	35.3	104.0	V	3.0	-8.7	46.0	10.7
800.140775	34.5	129.0	V	196.0	-5.4	46.0	11.5
32.893900	28.1	107.0	V	198.0	-10.5	40.0	11.9
366.718675	33.0	174.0	V	0.0	-12.9	46.0	13.0
521.176850	32.2	132.0	V	334.0	-10.2	46.0	13.8
300.023750	31.5	249.0	H	218.0	-3.6	46.0	14.5

Test Mode: Transmitting (802.11g)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
600.092375	35.2	105.0	V	3.0	-8.7	46.0	10.8
366.714625	34.4	171.0	V	0.0	-12.9	46.0	11.6
32.817875	28.3	334.0	H	284.0	-10.5	40.0	11.7
800.124350	33.7	129.0	V	179.0	-5.4	46.0	12.4
300.023750	32.0	110.0	H	334.0	-3.5	46.0	14.0
102.871250	29.1	142.0	H	0.0	-3.9	43.5	14.4

**Above 1 GHz:**

Test mode: Transmitting (802.11b):

Indicated		Detector (PK/AV)	Table Angle Degree	Test Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC Part 15.247/15.209		
Freq. (MHz)	S.A. Reading (dBμV/m)			Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
1608	54.25	AV	245	1.60	H	25.3	5.06	34.4	50.21	54	3.79	spurious
6432	38.29	AV	187	1.42	V	36.5	8.92	33.6	50.11	54	3.89	spurious
1608	52.10	AV	315	1.22	V	25.5	5.06	34.4	48.26	54	5.74	spurious
6432	36.47	AV	290	1.46	H	36.0	8.92	33.6	47.79	54	6.21	spurious
6432	47.54	PK	187	1.42	V	36.5	8.92	33.6	60.36	74	13.64	spurious
4824	31.65	AV	150	2.0	H	33.8	8.45	33.7	40.2	54	13.8	harmonic
4824	30.74	AV	158	1.67	V	33.5	8.45	33.4	39.29	54	14.71	harmonic
6432	45.10	PK	290	1.46	H	36.0	8.92	33.6	56.42	74	17.58	spurious
4824	46.46	PK	150	2.0	H	33.8	8.45	33.7	55.01	74	18.99	harmonic
2341.6	32.82	AV	240	1.70	V	29.1	7.01	34	34.93	54	19.07	spurious
2336.3	32.83	AV	55	1.97	H	28.9	7.01	34	34.74	54	19.26	spurious
1608	58.12	PK	245	1.60	H	25.3	5.06	34.4	54.08	74	19.92	spurious
4824	45.40	PK	158	1.67	V	33.5	8.45	33.4	53.95	74	20.05	harmonic
1608	55.76	PK	315	1.22	V	25.5	5.06	34.4	51.92	74	22.08	spurious
2341.6	47.59	PK	240	1.70	V	29.1	7.01	34	49.7	74	24.3	spurious
2336.3	47.05	PK	55	1.97	H	28.9	7.01	34	48.96	74	25.04	spurious
Middle Channel (2437 MHz)												
1624	54.66	AV	255	1.60	H	25.3	5.06	34.4	50.62	54	3.38	spurious
6496	38.71	AV	307	1.30	V	36.5	8.92	33.6	50.53	54	3.47	spurious
1624	52.73	AV	175	1.77	V	25.5	5.06	34.4	48.89	54	5.11	spurious
6496	35.82	AV	17	1.50	H	36.0	8.92	33.6	47.14	54	6.86	spurious
6496	47.65	PK	307	1.30	V	36.5	8.92	33.6	60.47	74	13.53	spurious
4874	31.82	AV	228	1.89	H	33.8	8.45	33.7	40.37	54	13.63	harmonic
4874	31.69	AV	60	1.74	V	33.5	8.45	33.4	40.24	54	13.76	harmonic
6496	45.96	PK	17	1.50	H	36.0	8.92	33.6	57.28	74	16.72	spurious
1624	59.27	PK	255	1.60	H	25.3	5.06	34.4	55.23	74	18.77	spurious
4874	45.64	PK	100	2.0	H	33.8	8.45	33.7	54.19	74	19.81	harmonic
4874	45.54	PK	60	1.74	V	33.5	8.45	33.4	54.09	74	19.91	harmonic
1624	56.90	PK	175	1.77	V	25.5	5.06	34.4	53.06	74	20.94	spurious

Indicated		Detector (PK/AV)	Table Angle Degree	Test Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC Part 15.247/15.209		
Freq. (MHz)	S.A. Reading (dBμV/m)			Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2462 MHz)												
1641	54.60	AV	285	1.66	H	25.3	5.06	34.4	50.56	54	3.44	spurious
1641	51.06	AV	240	1.66	V	25.5	5.06	34.4	47.22	54	6.78	spurious
4924	31.92	AV	158	1.91	H	33.8	8.45	33.7	40.47	54	13.53	harmonic
4924	31.87	AV	50	1.56	V	33.5	8.45	33.4	40.42	54	13.58	harmonic
1641	58.92	PK	285	1.66	H	25.3	5.06	34.4	54.88	74	19.12	spurious
4924	46.28	PK	158	1.91	H	33.8	8.45	33.7	54.83	74	19.17	harmonic
4924	45.88	PK	50	1.56	V	33.5	8.45	33.4	54.43	74	19.57	harmonic
2488	31.00	AV	240	1.58	V	29.1	7.01	34	33.11	54	20.89	spurious
2488	30.81	AV	120	1.66	H	28.9	7.01	34	32.72	54	21.28	spurious
1641	54.69	PK	310	1.20	V	25.5	5.06	34.4	50.85	74	23.15	spurious
2488	44.51	PK	240	1.58	V	29.1	7.01	34	46.62	74	27.38	spurious
2488	44.35	PK	150	1.93	H	28.9	7.01	34	46.26	74	27.74	spurious

Test mode: Transmitting (802.11g):

Indicated		Detector (PK/AV)	Table Angle Degree	Test Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC Part 15.247/15.209		
Freq. (MHz)	S.A. Reading (dBμV/m)			Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
6432	38.77	AV	185	1.02	V	36.5	8.92	33.6	52.59	54	3.41	spurious
6432	34.84	AV	18	1.28	H	36.0	8.92	33.6	46.16	54	7.84	spurious
4824	31.72	AV	276	2.0	H	33.8	8.45	33.7	40.27	54	13.73	harmonic
6432	47.29	PK	185	1.02	V	36.5	8.92	33.6	60.11	74	13.89	spurious
4824	29.74	AV	350	1.5	V	33.5	8.45	33.4	38.29	54	15.71	harmonic
1608	42.16	AV	267	1.60	H	25.3	5.06	34.4	38.12	54	15.88	spurious
6432	44.47	PK	18	1.28	H	36.0	8.92	33.6	55.79	74	18.21	spurious
1608	38.69	AV	315	1.22	V	25.5	5.06	34.4	34.85	54	19.15	spurious
4824	46.08	PK	276	2.0	H	33.8	8.45	33.7	54.63	74	19.37	harmonic
2335	31.48	AV	168	1.1	V	29.1	7.01	34	33.59	54	20.41	spurious
2330	31.61	AV	152	1.02	H	28.9	7.01	34	33.52	54	20.48	spurious
1608	57.17	PK	267	1.60	H	25.3	5.06	34.4	53.13	74	20.87	spurious
4824	44.50	PK	350	1.5	V	33.5	8.45	33.4	53.05	74	20.95	harmonic
1608	53.27	PK	315	1.22	V	25.5	5.06	34.4	49.43	74	24.57	spurious
2330	46.16	PK	152	1.02	H	28.9	7.01	34	48.07	74	25.93	spurious
2335	45.92	PK	168	1.1	V	29.1	7.01	34	48.03	74	25.97	spurious
Middle Channel (2437 MHz)												
6498	38.25	AV	197	1.38	V	36.5	8.92	33.6	50.07	54	3.93	spurious
6498	35.49	AV	H	H	H	36.0	8.92	33.6	46.81	54	7.19	spurious
4874	33.64	AV	134	1.83	H	33.8	8.45	33.4	42.49	54	11.51	harmonic
4874	33.44	AV	63	1.8	V	33.5	8.45	33.4	41.99	54	12.01	harmonic
1624	45.52	AV	60	1.60	H	25.3	5.06	34.4	41.48	54	12.52	spurious
6498	47.77	PK	197	1.38	V	36.5	8.92	33.6	60.59	74	13.41	spurious
6498	46.11	PK	240	1.50	H	36.0	8.92	33.6	57.43	74	16.57	spurious
4874	48.21	PK	134	1.83	H	33.8	8.45	33.4	57.06	74	16.94	harmonic
1624	40.54	AV	350	1.75	V	25.5	5.06	34.4	36.7	54	17.3	spurious
4874	46.48	PK	63	1.8	V	33.5	8.45	33.4	55.03	74	18.97	harmonic
1624	58.90	PK	60	1.60	H	25.3	5.06	34.4	54.86	74	19.14	spurious
1624	54.81	PK	350	1.75	V	25.5	5.06	34.4	50.97	74	23.03	spurious

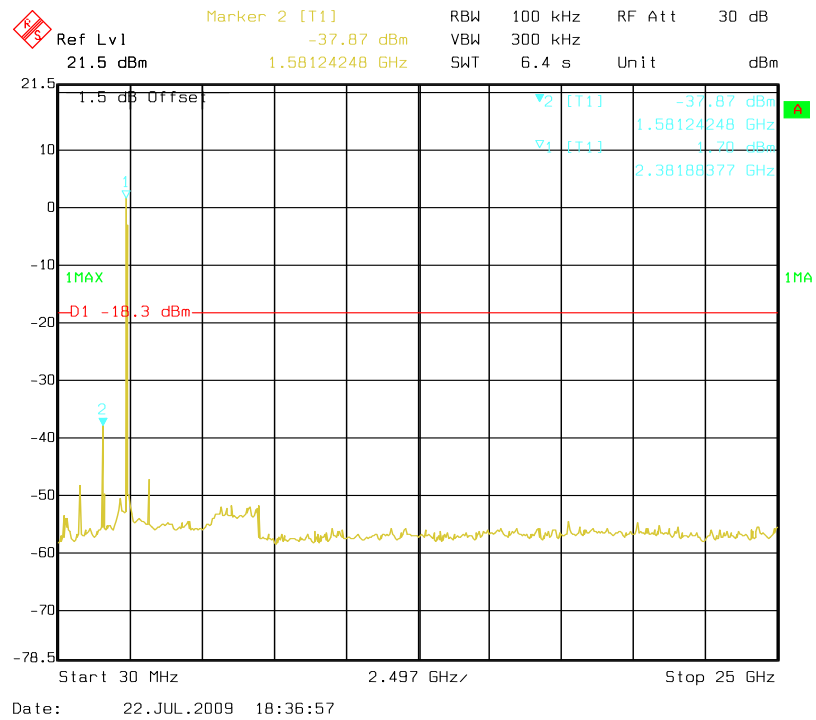
Indicated		Detector (PK/AV)	Table Angle Degree	Test Antenna			Cable Loss (dB)	Pre- Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC Part 15.247/15.209		
Freq. (MHz)	S.A. Reading (dBμV/m)			Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	Comment
High Channel (2462 MHz)												
4924	31.24	AV	157	1.69	H	33.8	8.45	33.4	40.09	54	13.91	harmonic
4924	31.52	AV	110	1.87	V	33.5	8.45	33.4	40.07	54	13.93	harmonic
1641	38.73	AV	351	1.78	V	25.5	5.06	34.4	34.89	54	19.11	spurious
4924	45.82	PK	157	1.69	H	33.8	8.45	33.4	54.67	74	19.33	harmonic
1641	58.42	PK	252	1.60	H	25.3	5.06	34.4	54.38	74	19.62	spurious
4924	45.74	PK	110	1.87	V	33.5	8.45	33.4	54.29	74	19.71	harmonic
2483.5	31.05	AV	234	1.71	H	28.9	7.01	34	32.96	54	21.04	spurious
2483.5	30.83	AV	223	2.0	V	29.1	7.01	34	32.94	54	21.06	spurious
1641	53.45	PK	351	1.78	V	25.5	5.06	34.4	49.61	74	24.39	spurious
2483.5	45.33	PK	223	2.0	V	29.1	7.01	34	47.44	74	26.56	spurious
2483.5	45.31	PK	234	1.71	H	28.9	7.01	34	47.22	74	26.78	spurious

#### Antenna Port Conducted Spurious Emissions

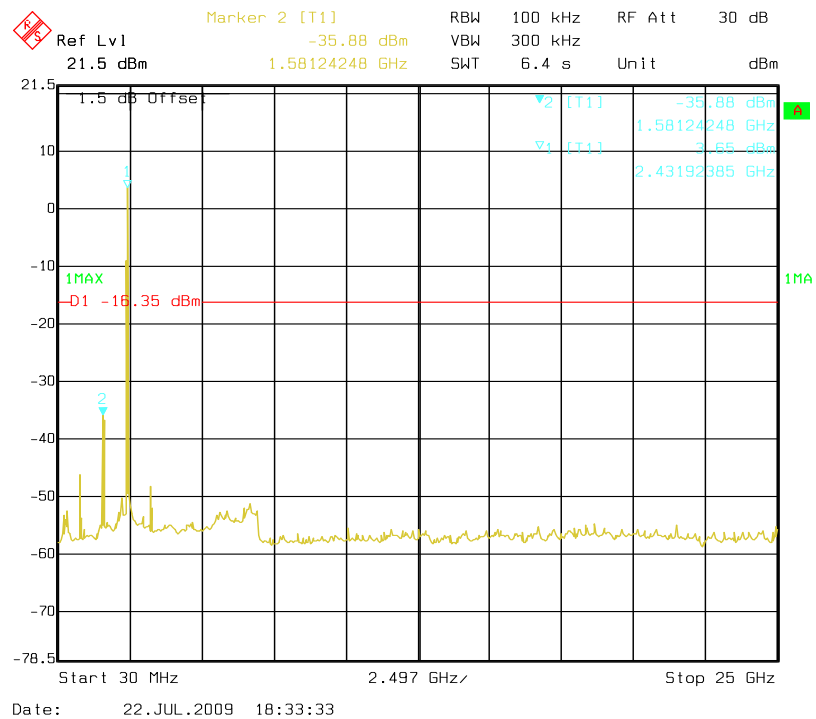
Channel Frequency (MHz)	Data Rate (Mbps)	Delta Value (dBc)	Limit (dBc)	Ref Plot	Result
802.11b Mode					
2412	1	*	20	Plot 1	Pass
2437	1	*	20	Plot 2	Pass
2462	1	*	20	Plot 3	Pass
802.11g Mode					
2412	6	*	20	Plot 4	Pass
2437	6	*	20	Plot 5	Pass
2462	6	*	20	Plot 6	Pass

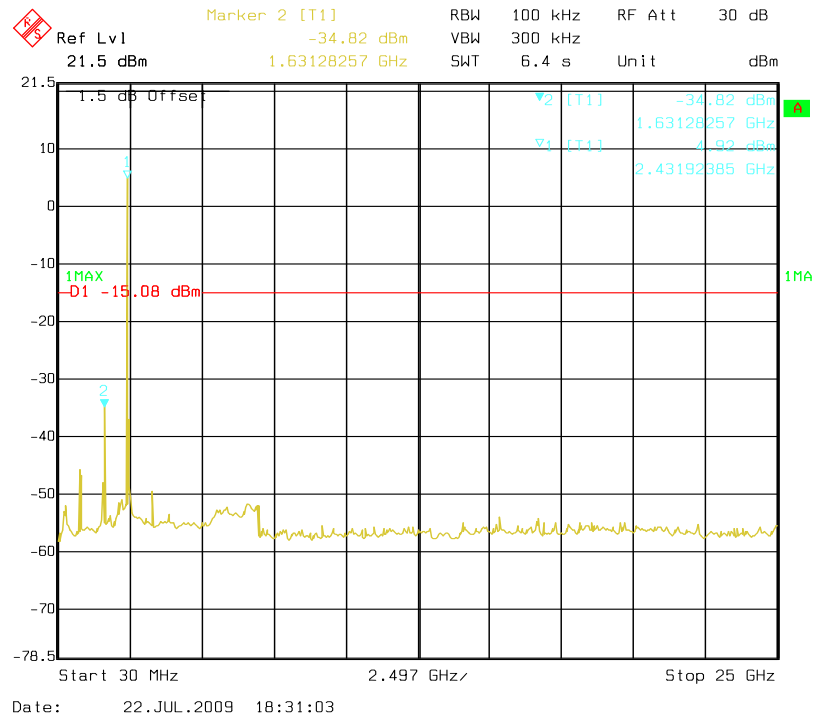
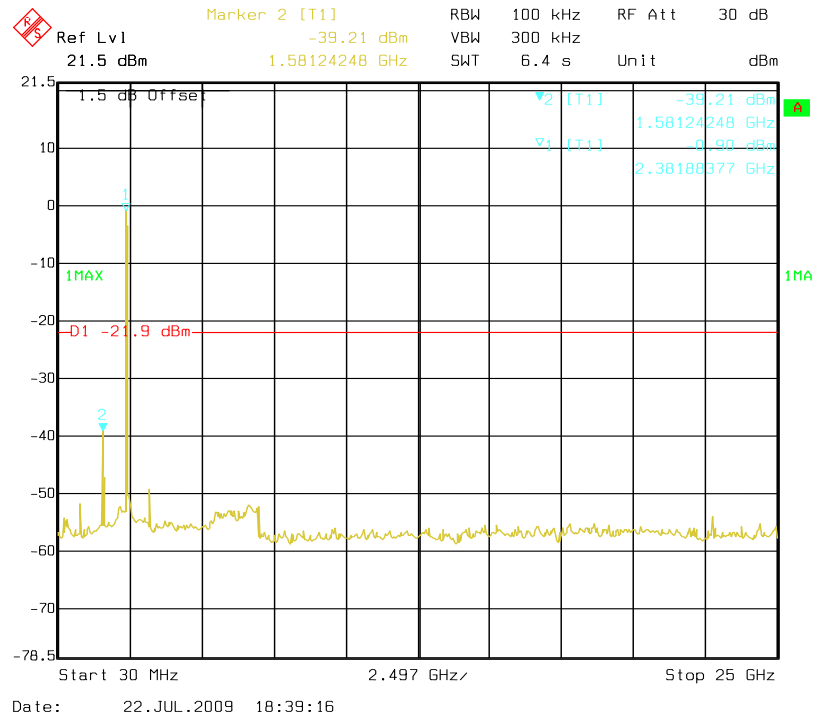


Plot 1: 802.11b Low Channel

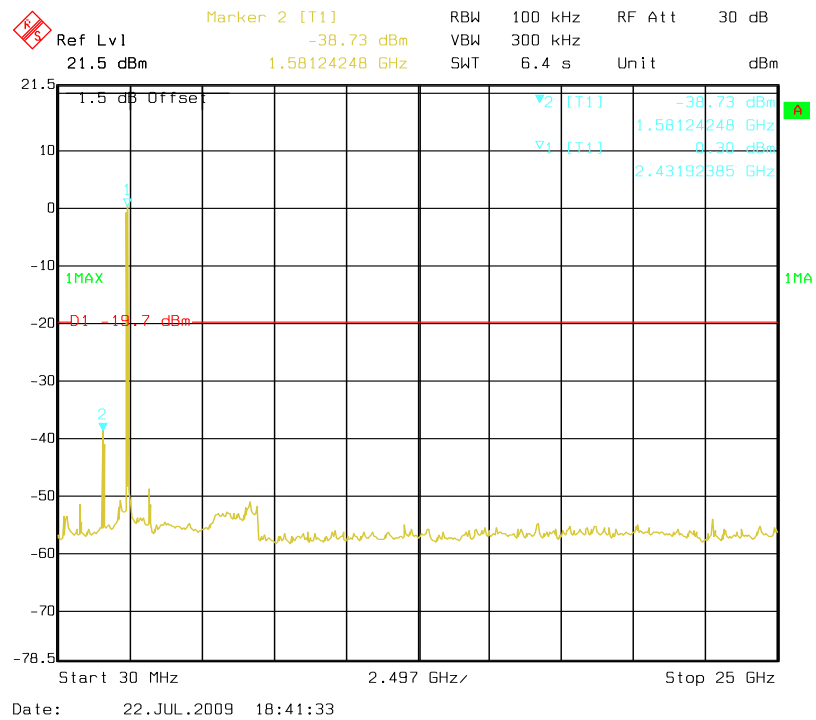


Plot 2: 802.11b Middle Channel

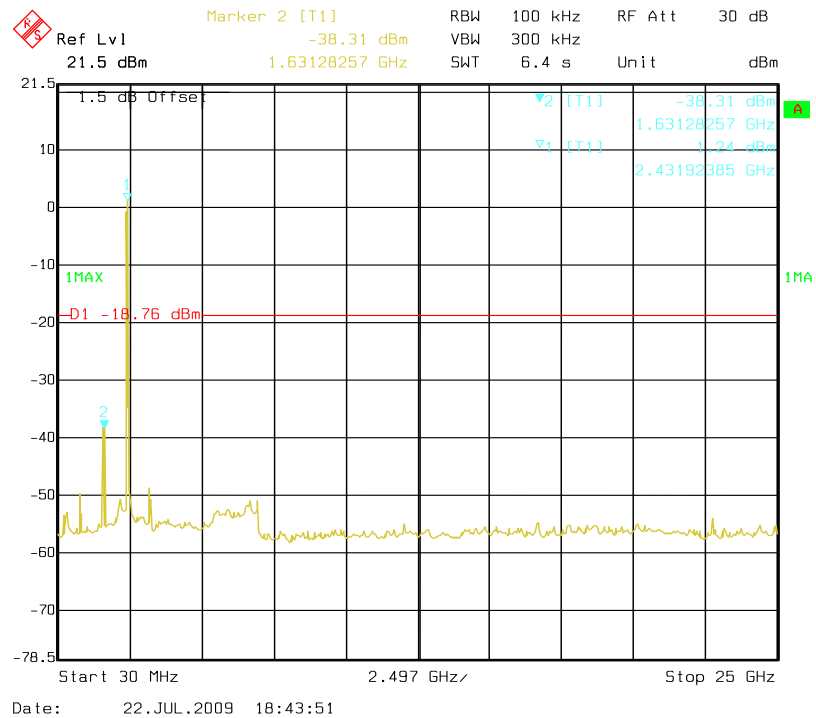


**Plot 3: 802.11b High Channel****Plot 4: 802.11g Low Channel**

Plot 5: 802.11g Middle Channel



Plot 6: 802.11g High Channel



## §15.247(a) (2) – 6 dB BANDWIDTH TESTING

### Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2008-11-07	2009-11-06

\* **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 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Test Data

#### Environmental Conditions

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

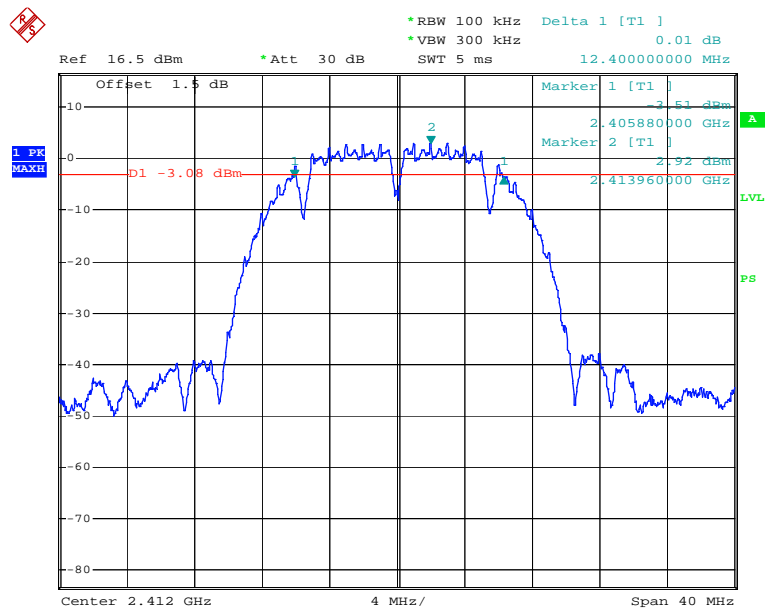
*The testing was performed by Bruce Zhang on 2009-07-22*

**Test Result:** Pass.

Please refer to the following tables and plots.

Channel	Frequency (MHz)	Data Rate (Mbps)	6 dB Occupied Bandwidth (MHz)	FCC Limit (kHz)
802.11b mode				
Low Channel	2412	11	12.40	> 500
Middle Channel	2437	11	12.40	> 500
High Channel	2462	11	12.40	> 500
802.11g mode				
Low Channel	2412	54	16.56	> 500
Middle Channel	2437	54	16.56	> 500
High Channel	2462	54	16.56	> 500

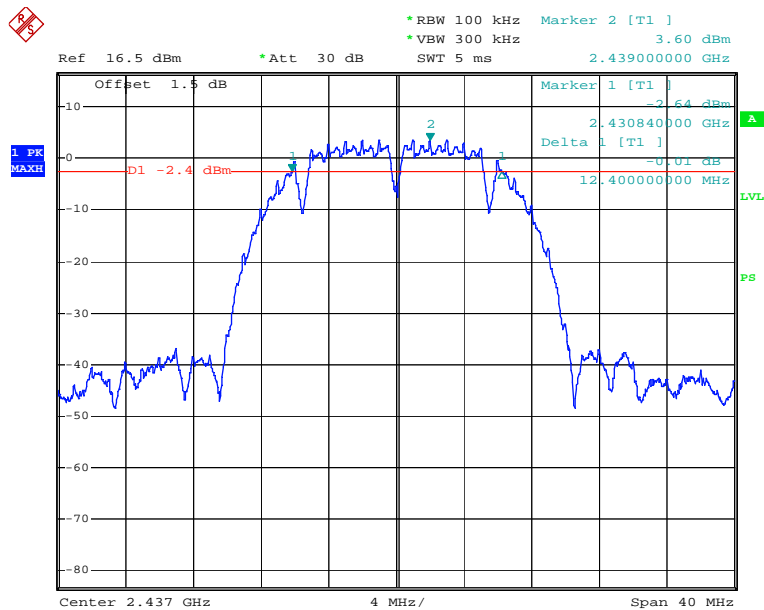
### 802.11b Low Channel



]

Date: 22.JUL.2009 18:03:00

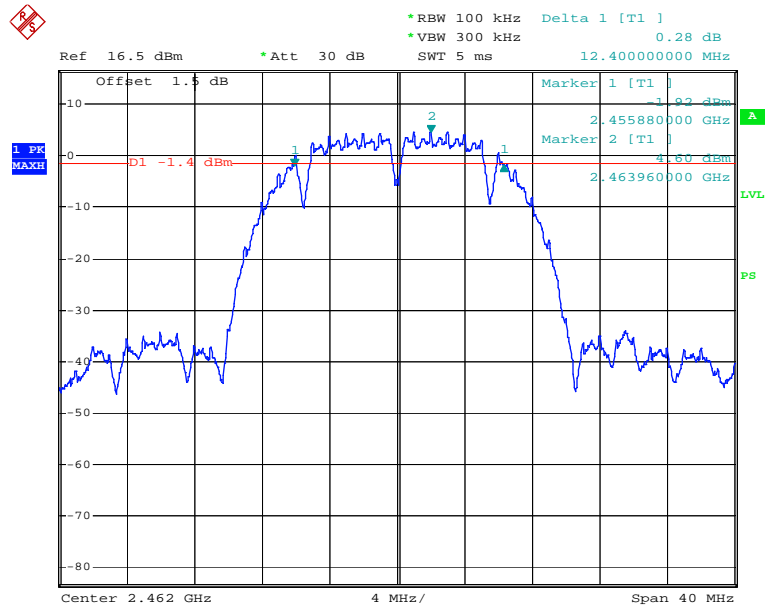
## 802.11b Middle Channel



}

Date: 22.JUL.2009 18:00:17

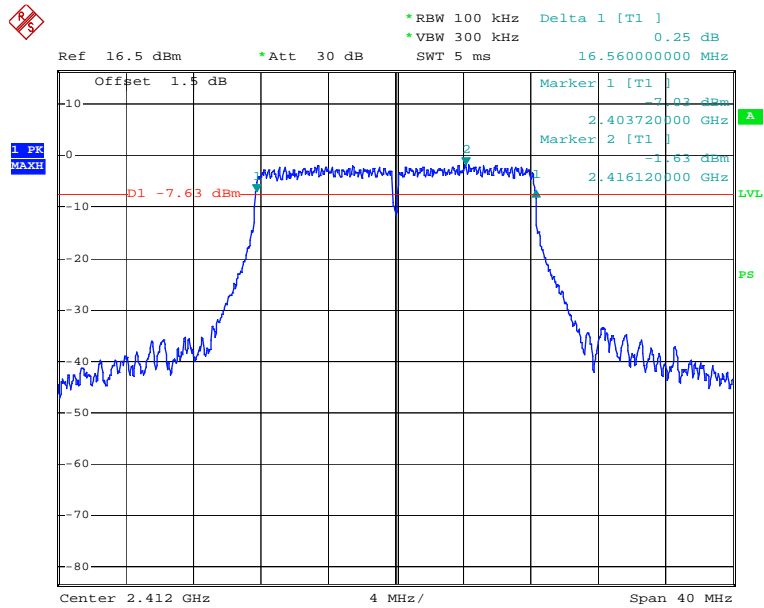
## 802.11b High Channel



}

Date: 22.JUL.2009 17:56:16

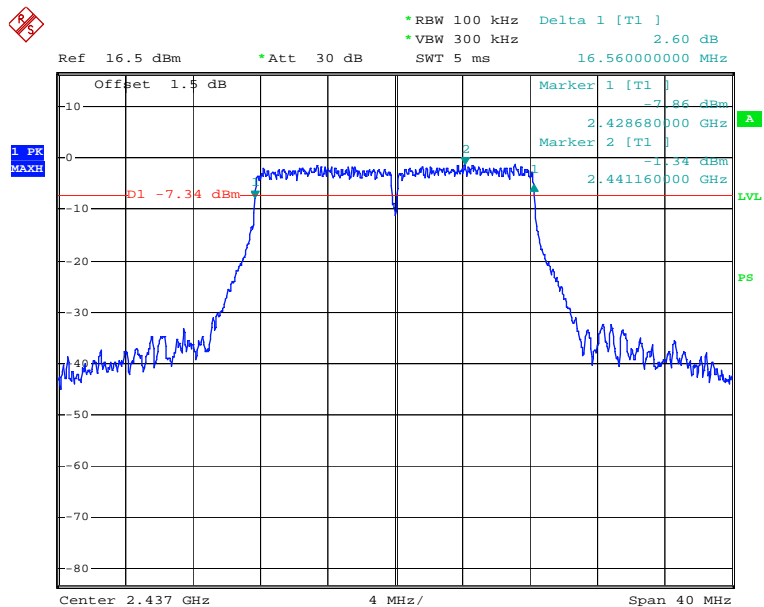
## 802.11g Low Channel



]

Date: 22.JUL.2009 18:07:27

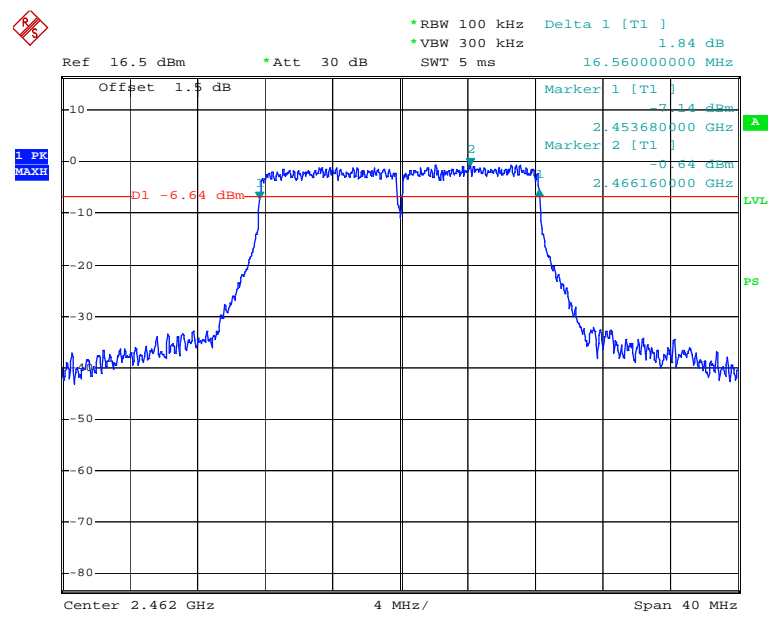
## 802.11g Middle Channel



]

Date: 22.JUL.2009 18:08:46

802.11g High Channel



] Date: 22.JUL.2009 18:11:37



## §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

### Applicable Standard

According to §15.247(b) (3), for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

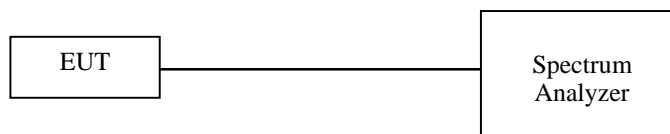
### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2008-11-07	2009-11-06

\* **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**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0kPa

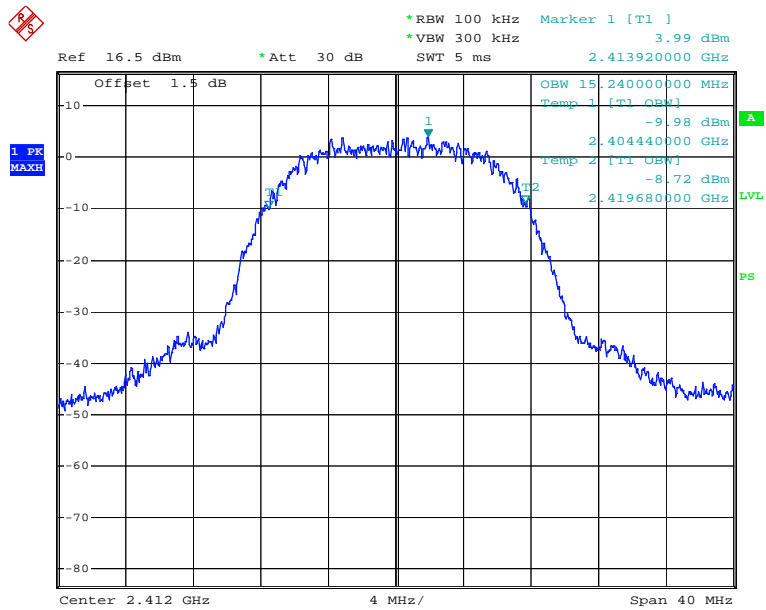
*The testing was performed by Bruce Zhang on 2009-07-22.*

*Test Mode: Transmitting*

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Data Rate (Mbps)</b>	<b>Output Power (dBm)</b>	<b>Limit (dBm)</b>
802.11b Mode				
Low	2412	1	17.16	30
Middle	2437	1	17.53	30
High	2462	1	18.16	30
802.11g Mode				
Low	2412	6	15.26	30
Middle	2437	6	15.80	30
High	2462	6	16.50	30

Please refer to the following plots.

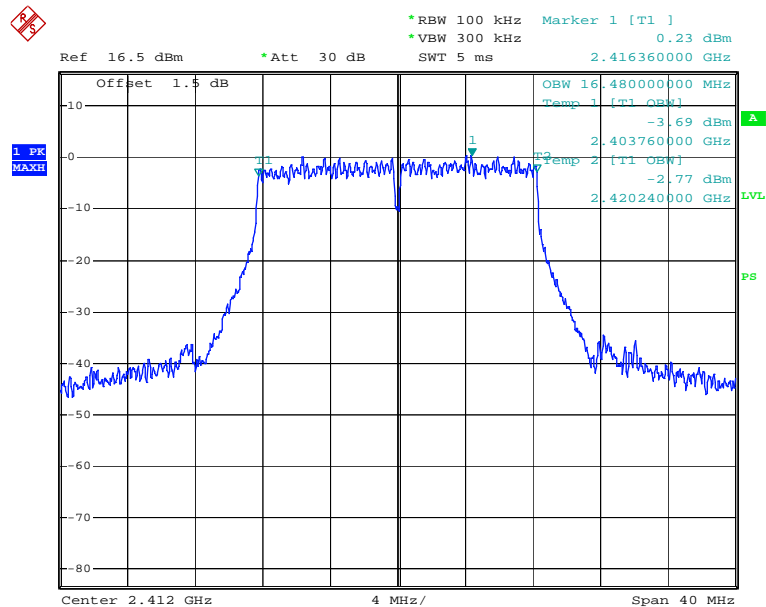
## 802.11b: 99% Occupied Bandwidth



]

Date: 22.JUL.2009 17:22:05

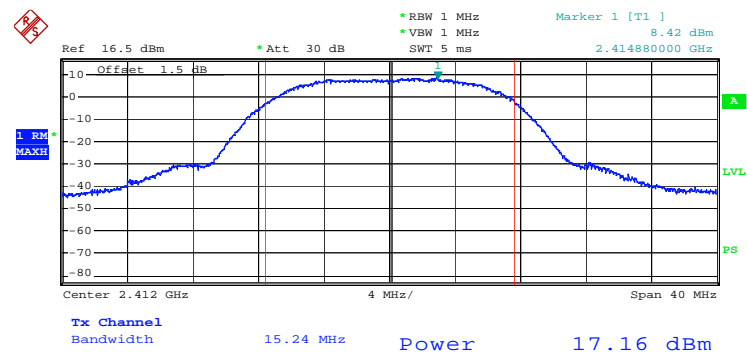
## 802.11g: 99% Occupied Bandwidth



]

Date: 22.JUL.2009 17:22:44

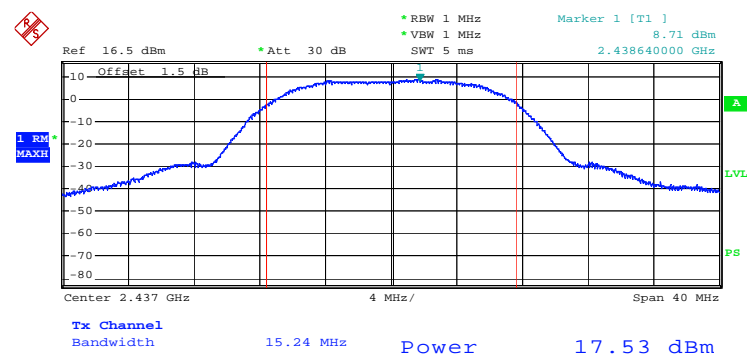
802.11b Low Channel



]

Date: 22.JUL.2009 17:25:20

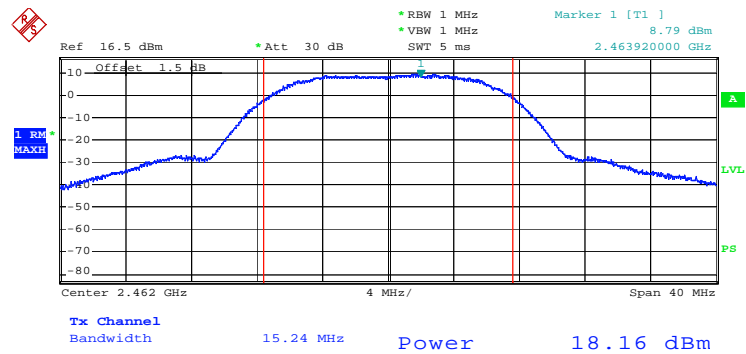
802.11b Middle Channel



]

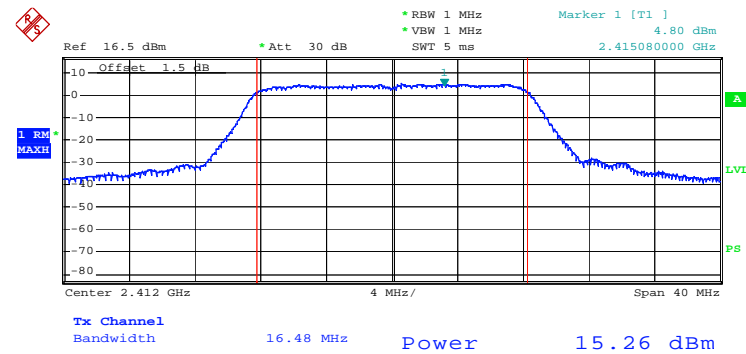
Date: 22.JUL.2009 17:40:51

802.11b High Channel



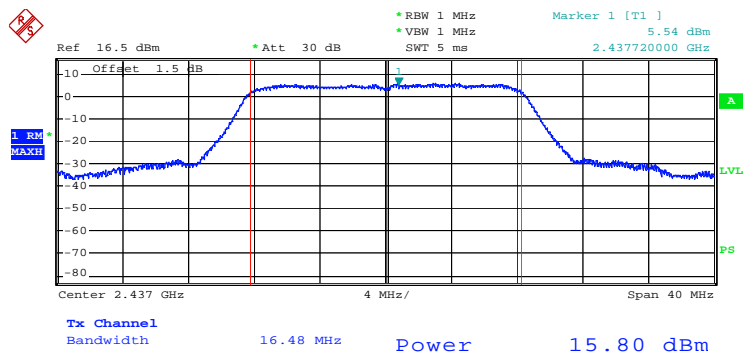
] Date: 22.JUL.2009 17:45:44

802.11g Low Channel



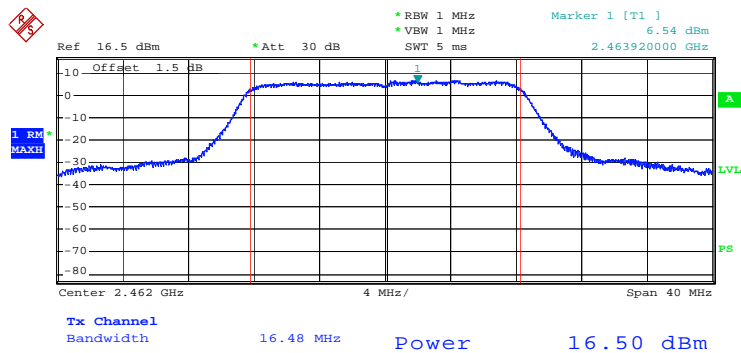
] Date: 22.JUL.2009 17:24:18

802.11g Middle Channel



] Date: 22.JUL.2009 17:42:35

802.11g High Channel



] Date: 22.JUL.2009 17:43:30

**§15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE****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	2008-11-07	2009-11-06

\* **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 its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 1 MHz and VBW of spectrum analyzer to 1 MHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0kPa

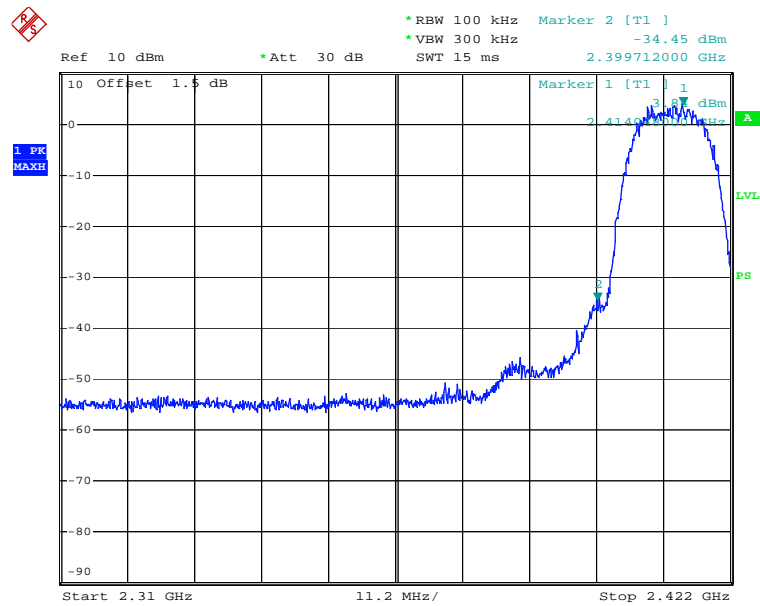
*The testing was performed by Bruce Zhang on 2009-07-22.*

**Test Result:** *Compliant.*

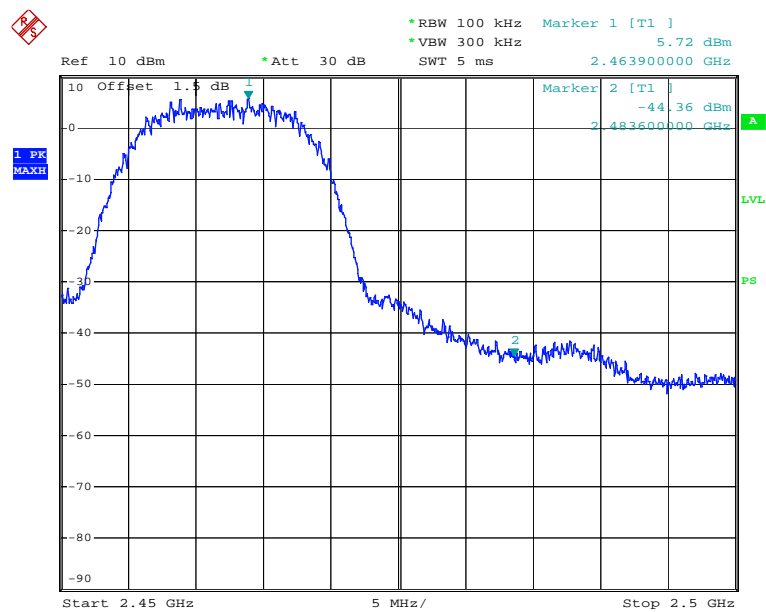
<b>Frequency (MHz)</b>	<b>Delta Peak to band emission (dBc)</b>	<b>Limit (dBc)</b>
802.11b Mode		
2399.712	38.29	20
2483.600	50.08	20
802.11g Mode		
2399.824	36.75	20
2483.600	42.49	20

Please refer to following plots.



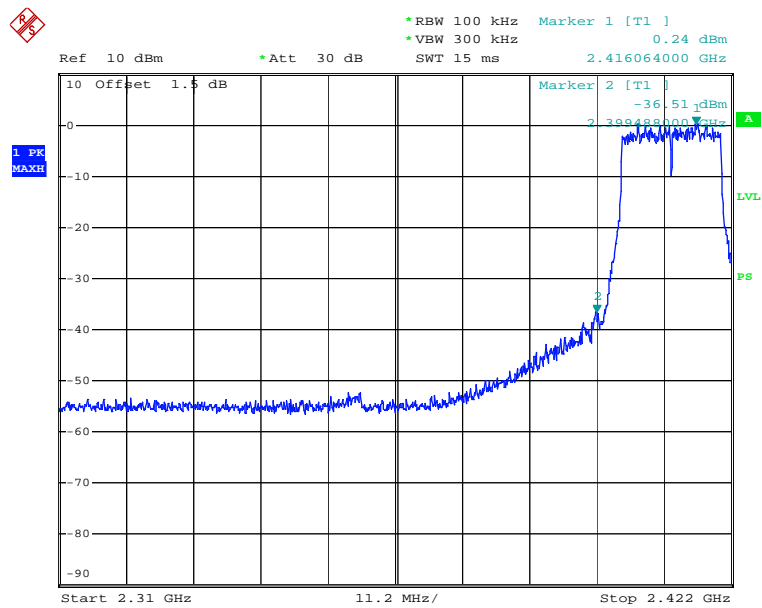
**802.11b: Band Edge, Lowest CH**

] Date: 22.JUL.2009 20:26:58

**802.11b: Band Edge, Highest CH**

] Date: 22.JUL.2009 20:28:34

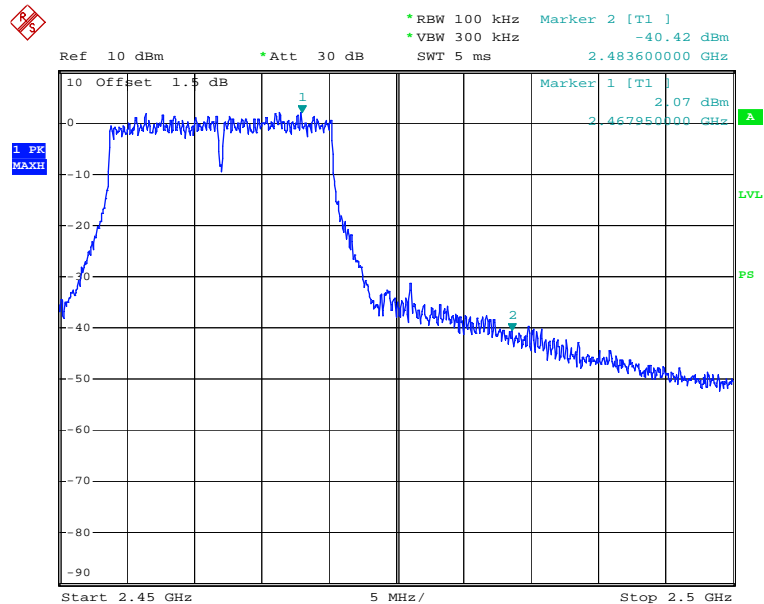
## 802.11g: Band Edge, Lowest CH



]

Date: 22.JUL.2009 20:19:24

## 802.11g: Band Edge, Highest CH



]

Date: 22.JUL.2009 20:27:50

## §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2008-11-07	2009-11-06

\* **Statement of Traceability:** Bay Area Compliance Lab 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 was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (DTS)
4. Repeat above procedures until all frequencies measured were complete.

### Test Data

#### Environmental Conditions

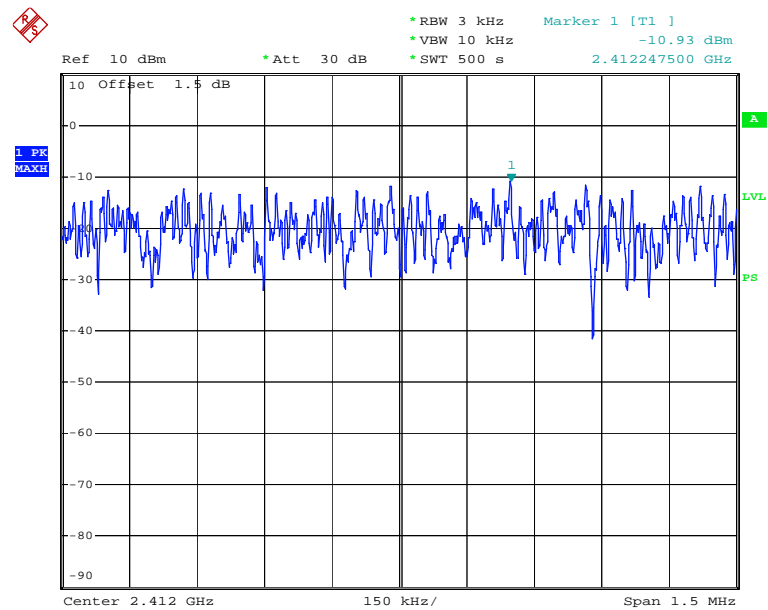
<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0kPa

*The testing was performed by Bruce Zhang on 2009-07-22.*

*Test Mode: Transmitting*

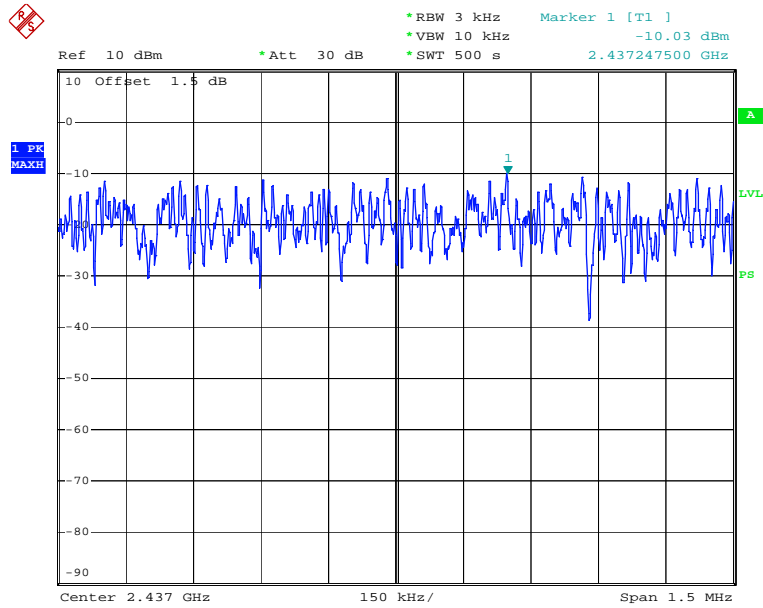
Channel	Frequency (MHz)	Data Rate (Mbps)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11b Mode					
Low	2412	1	-10.93	8	Pass
Middle	2437	1	-10.03	8	Pass
High	2462	1	-9.59	8	Pass
802.11g Mode					
Low	2412	6	-13.99	8	Pass
Middle	2437	6	-12.82	8	Pass
High	2462	6	-12.62	8	Pass

802.11b Low Channel



1  
Date: 22.JUL.2009 18:35:42

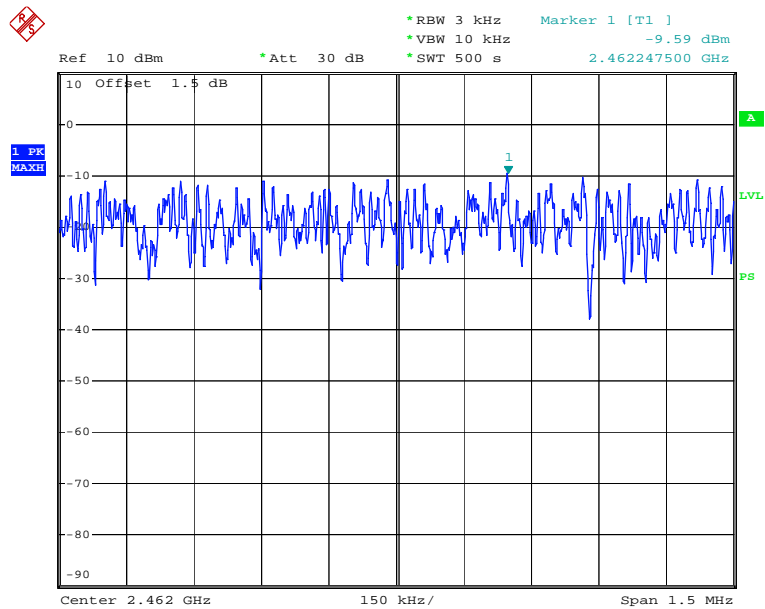
## 802.11b Middle Channel



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Date: 22.JUL.2009 18:57:19

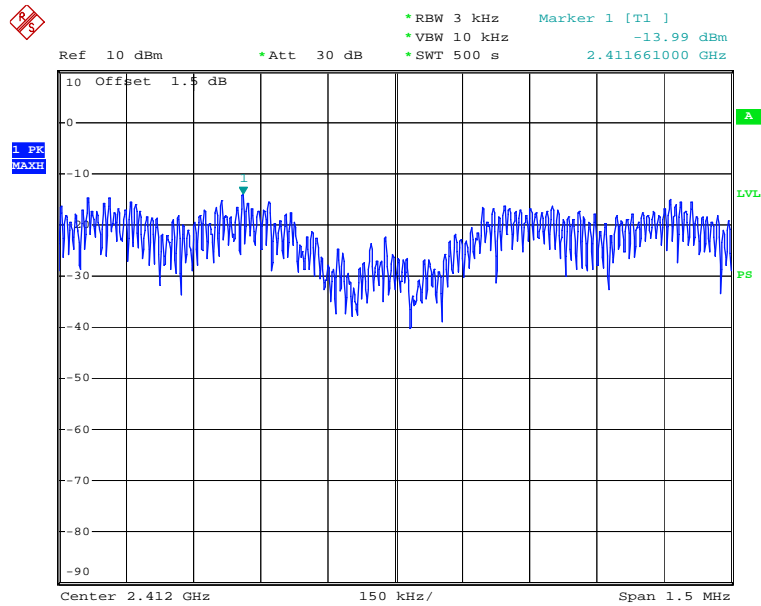
## 802.11b High Channel



]

Date: 22.JUL.2009 19:15:05

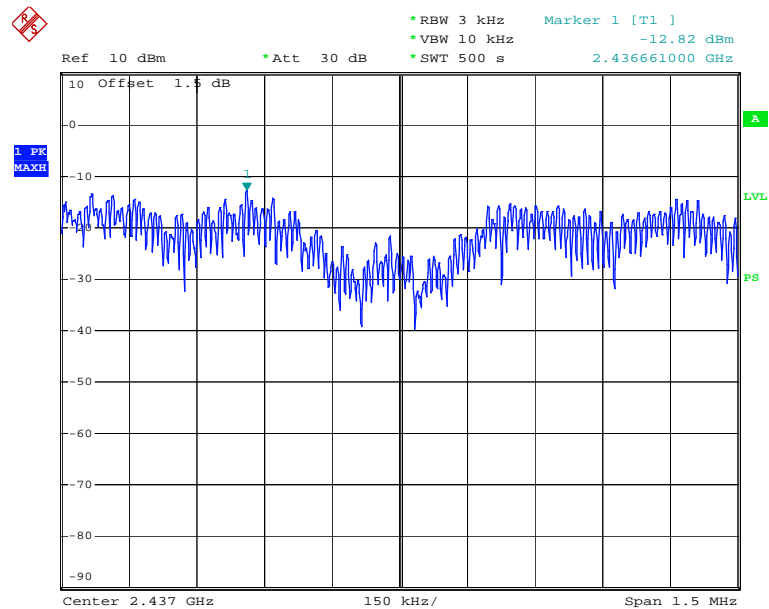
## 802.11g Low Channel



]

Date: 22.JUL.2009 20:17:28

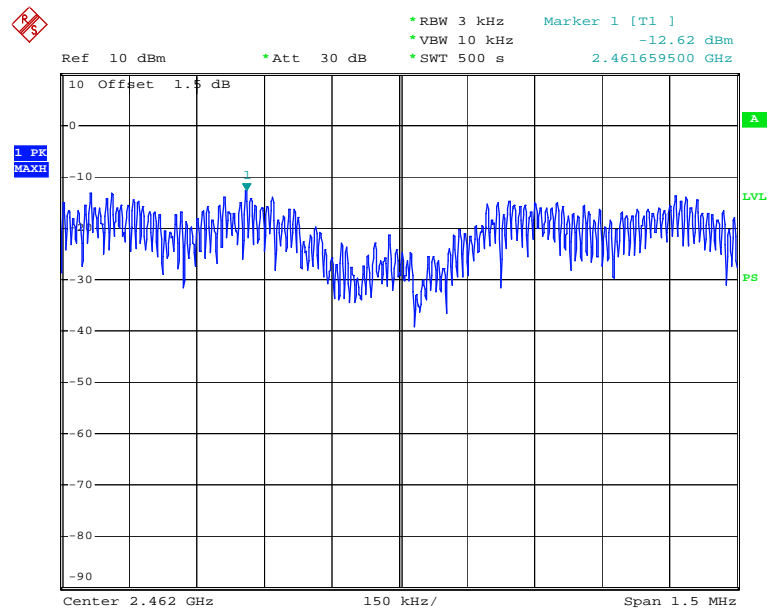
## 802.11g Middle Channel



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Date: 22.JUL.2009 19:59:06

802.11g High Channel



]
Date: 22.JUL.2009 19:37:40

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