Lab Code: 200707-0

Bay Area Compliance Labs.Corp.

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

Advanced Card Systems Ltd.

Units 2010-2013, 20/F, Chevalier Commercial Centre, Kowloon, Hong Kong

FCC ID: V5MACR320

Report Type: Original Report	**Product Type:** Ticket Validator
Test Engineer:	Eric Lee Eric Lee
Report Number:	RSZ120528001-00B
Report Date:	2012-07-03
Reviewed By:	Alvin Huang RF Leader
Test Laboratory:	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 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Advanced Card Systems Ltd. 's* product, model number: *ACR320 (FCC ID: V5MACR320)* or the "EUT" as referred to in this report is a *Ticket Validator*, which measures approximately: 28.0 cm (L) x 16.5 cm (W) x 5.0 cm (H). Rated input voltage: DC 10 ~36 V from vehicular.

** All measurement and test data in this report was gathered from production sample serial number: 1205074 (Assigned by BACL, Shenzhen). The EUT was received on 2012-05-28.*

Objective

This Type approval report is prepared on behalf of *Advanced Card Systems 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)

FCC Part 15.225 DXX, Part 22H&24E PCB and Part 15B JBP submissions with FCC ID: V5MACR320.

Test Methodology

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

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

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located 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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

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

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is 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 for 802.11b, 802.11g modes were tested with Channel 1, 6 and 11.

EUT Exercise Software

Test software supplied by client

Equipment Modifications

No modification was made to the unit tested.

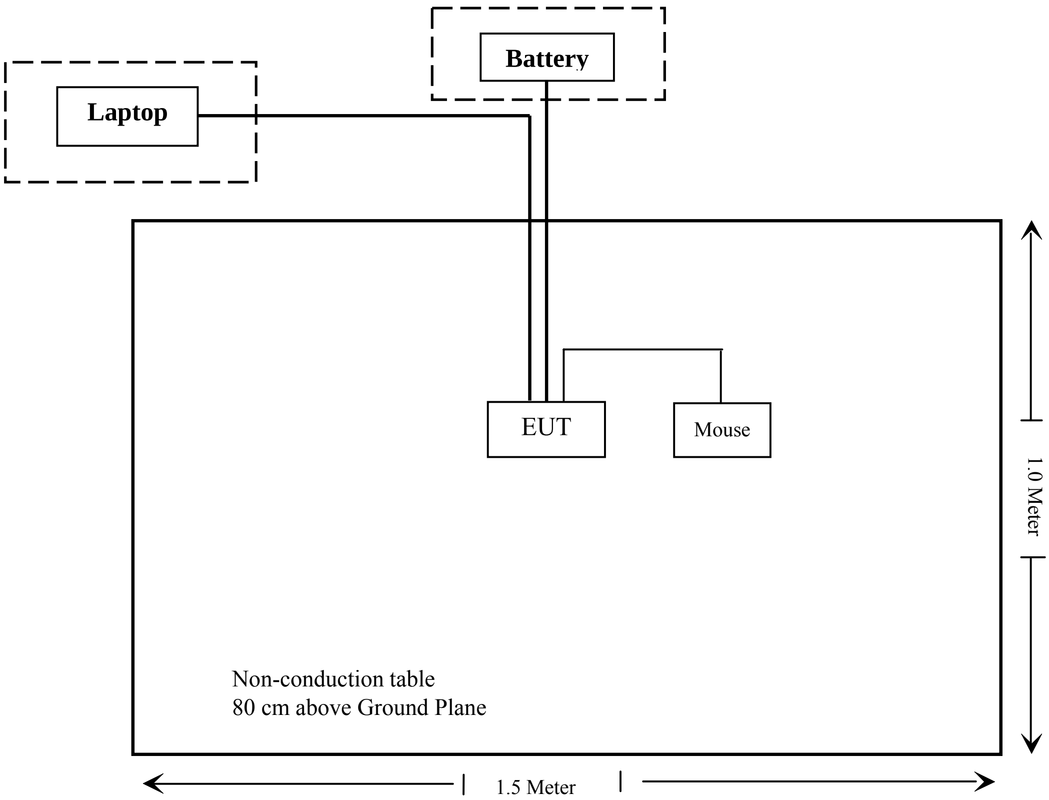
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	D260	N/A
DELL	Mouse	MOC5UO	G1900NKD

External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable DC Power Cable	3.0	EUT	Battery
Unshielded Detachable RJ45 Cable	1.8	EUT	Laptop

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b)(1), §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a),	Conducted Emissions	N/A*
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §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)	100kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Note: EUT is powered by vehicular power only.

FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

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

Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Mode	**Frequency (MHz)**	**Antenna Gain**		**Conducted Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
		(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
802.11b	2437	2.0	1.58	12.44	17.54	20	0.0055	1
802.11g	2412	2.0	1.58	14.93	31.12	20	0.0098	1

Result: Compliance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Antenna Connector Construction

The EUT used one fixed antennas, which in accordance to section 15.203, the maximum gain is 2 dBi; please refer to the internal photos.

Result: Compliant.

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

Applicable Standard

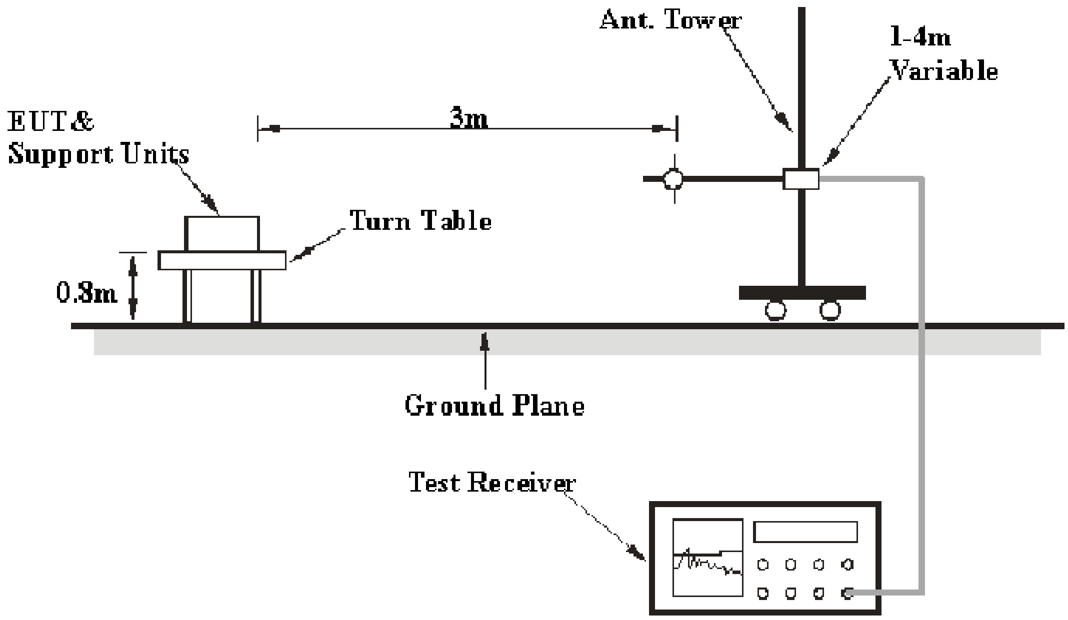
FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

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

Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB(k=2, 95% level of confidence) .

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	***RBW***	***Video B/W***	***Detector***
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	Ave

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-11-24	2012-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2012-03-17	2013-03-16
Mini-Circuits	Amplifier	ZVA-213+	T-E27H	2012-03-08	2013-03-08
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2012-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23
Agilent	Spectrum Analyzer	8564E	3943A01781	2012-04-12	2013-04-11
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2011-10-14	2012-10-13
R&S	Auto Test Software	EMC32	V6.30	-	-

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

Corrected Amplitude & Margin Calculation

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

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 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 Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, with the worst margin reading of:

4.40 dB at **2483.5 MHz** in the **Horizontal** polarization for mode 802.11g

Test Data

Environmental Conditions

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

The testing was performed by Eric Lee on 2012-06-28.

Test Mode: Transmitting

30 MHz-25 GHz:

802.11b mode:

Indicated		Detector (PK/QP/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC Part 15.247/15.205/15.209			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
2412.0	91.57	PK	35	1.3	H	29.60	3.03	26.50	97.70	N/A	N/A	Fund.
2412.0	86.24	Ave.	35	1.3	H	29.60	3.03	26.50	92.37	N/A	N/A	Fund.
2412.0	89.30	PK	125	1.0	V	29.60	3.03	26.50	95.43	N/A	N/A	Fund.
2412.0	82.14	Ave.	125	1.0	V	29.60	3.03	26.50	88.27	N/A	N/A	Fund.
298.3	52.82	QP	0	1.2	H	11.70	1.49	25.11	40.90	46.00	5.10	Spurious
1013.9	42.17	Ave.	20	1.3	H	23.40	1.90	26.50	40.97	54.00	13.03	Spurious
7236.0	18.97	Ave.	6	1.3	H	37.90	5.09	26.50	35.46	54.00	18.54	Harmonic
2389.6	28.33	Ave.	35	1.3	V	29.60	3.03	26.50	34.46	54.00	19.54	Spurious
2463.9	26.63	Ave.	65	1.2	V	30.20	3.11	26.50	33.44	54.00	20.56	Spurious
2369.4	27.19	Ave.	138	1.2	H	29.00	2.98	26.50	32.67	54.00	21.33	Spurious
9648	36.98	PK	176	1.5	H	39.80	5.98	26.50	56.26	74.00	17.74	Harmonic
9648	18.63	Ave.	176	1.5	H	39.80	5.98	26.50	37.91	54.00	16.09	Harmonic
4824.0	20.17	Ave.	114	1.1	V	34.60	4.30	26.50	32.57	54.00	21.43	Harmonic
7236.0	35.55	PK	6	1.3	H	37.90	5.09	26.50	52.04	74.00	21.96	Harmonic
2389.6	45.43	PK	35	1.3	V	29.60	3.03	26.50	51.56	74.00	22.44	Spurious
2369.4	43.67	PK	138	1.2	H	29.00	2.98	26.50	49.15	74.00	24.85	Spurious
2493.6	42.16	PK	65	1.2	V	30.20	3.11	26.50	48.97	74.00	25.03	Spurious
4824.0	35.66	PK	114	1.1	V	34.60	4.30	26.50	48.06	74.00	25.94	Harmonic
1013.9	48.92	PK	20	1.3	H	23.40	1.90	26.50	47.72	74.00	26.28	Spurious
Middle Channel (2437 MHz)												
2437.0	90.94	PK	38	1.2	H	29.60	3.03	26.50	97.07	N/A	N/A	Fund.
2437.0	84.96	Ave.	38	1.2	H	29.60	3.03	26.50	91.09	N/A	N/A	Fund.
2437.0	87.65	PK	96	1.1	V	29.60	3.03	26.50	93.78	N/A	N/A	Fund.
2437.0	82.34	Ave.	96	1.1	V	29.60	3.03	26.50	88.47	N/A	N/A	Fund.
311.9	52.56	QP	25	1.0	H	12.10	1.51	25.07	41.10	46.00	4.90	Spurious
1013.9	41.22	Ave.	138	1.1	H	23.40	1.90	26.50	40.02	54.00	13.98	Spurious
7311.0	18.02	Ave.	325	1.1	H	37.90	5.09	26.50	34.51	54.00	19.49	Harmonic
9748	37.11	PK	155	1.2	H	39.80	6.10	26.50	56.51	74.00	17.49	Harmonic
9748	18.86	Ave.	155	1.2	H	39.80	6.10	26.50	38.26	54.00	15.74	Harmonic
2489.6	27.11	Ave.	13	1.1	H	30.60	3.11	26.50	34.32	54.00	19.68	Spurious
2370.9	27.95	Ave.	255	1.2	H	29.00	2.98	26.50	33.43	54.00	20.57	Spurious
2376.3	27.36	Ave.	5	1.2	V	29.00	2.98	26.50	32.84	54.00	21.16	Spurious
4874.0	20.16	Ave.	112	1.3	V	34.60	4.36	26.50	32.62	54.00	21.38	Harmonic
7311.0	34.96	PK	325	1.1	H	37.90	5.09	26.50	51.45	74.00	22.55	Harmonic
2489.6	43.69	PK	13	1.1	H	30.60	3.11	26.50	50.90	74.00	23.10	Spurious
2370.9	44.59	PK	255	1.2	H	29.00	2.98	26.50	50.07	74.00	23.93	Spurious
2376.3	44.53	PK	5	1.2	V	29.00	2.98	26.50	50.01	74.00	23.99	Spurious
4874.0	35.19	PK	112	1.3	V	34.60	4.36	26.50	47.65	74.00	26.35	Harmonic
1013.9	47.96	PK	138	1.1	H	23.40	1.90	26.50	46.76	74.00	27.24	Spurious
High Channel (2462 MHz)												
2462.0	91.83	PK	38	1.1	H	30.60	3.11	26.50	99.04	N/A	N/A	Fund.
2462.0	86.39	Ave.	38	1.1	H	30.60	3.11	26.50	93.60	N/A	N/A	Fund.
2462.0	88.12	PK	215	1.1	V	30.60	3.11	26.50	95.33	N/A	N/A	Fund.
2462.0	84.20	Ave.	215	1.1	V	30.60	3.11	26.50	91.41	N/A	N/A	Fund.

420.4	49.46	QP	123	1.1	H	14.50	1.72	25.88	39.80	46.00	6.20	Spurious
1013.9	42.08	Ave.	225	1.2	H	23.40	1.90	26.50	40.88	54.00	13.12	Spurious
2487.3	29.53	Ave.	26	1.1	H	30.60	3.11	26.50	36.74	54.00	17.26	Spurious
2489.9	29.67	Ave.	163	1.1	V	30.20	3.11	26.50	36.48	54.00	17.52	Spurious
7386.0	19.31	Ave.	111	1.2	V	37.20	5.21	26.50	35.22	54.00	18.78	Harmonic
4924.0	21.74	Ave.	55	1.2	V	34.60	4.40	26.50	34.24	54.00	19.76	Harmonic
2386.7	27.89	Ave.	238	1.3	H	29.60	3.03	26.50	34.02	54.00	19.98	Spurious
2487.3	46.35	PK	26	1.1	H	30.60	3.11	26.50	53.56	74.00	20.44	Spurious
9848	37.32	PK	86	1.2	H	39.80	6.09	26.50	56.71	74.00	17.29	Harmonic
9848	18.88	Ave.	86	1.2	H	39.80	6.09	26.50	38.27	54.00	15.73	Harmonic
2483.9	46.54	PK	163	1.1	V	30.20	3.11	26.50	53.35	74.00	20.65	Spurious
7386.0	36.37	PK	111	1.2	V	37.20	5.21	26.50	52.28	74.00	21.72	Harmonic
2386.7	44.15	PK	238	1.3	H	29.60	3.03	26.50	50.28	74.00	23.72	Spurious
4924.0	37.25	PK	55	1.2	V	34.60	4.40	26.50	49.75	74.00	24.25	Harmonic
1013.9	47.93	PK	225	1.2	H	23.40	1.90	26.50	46.73	74.00	27.27	Spurious

802.11g mode:

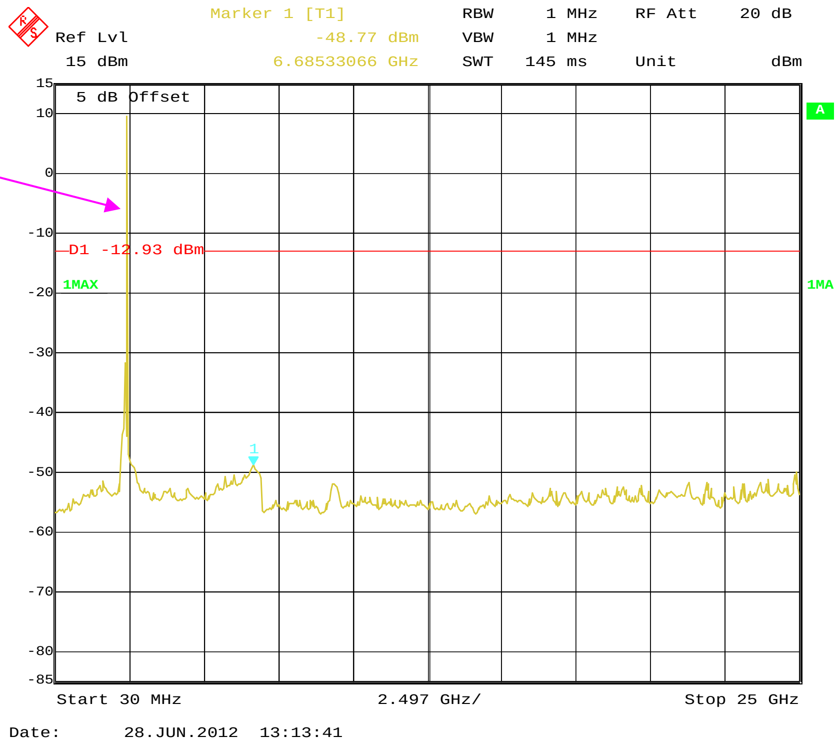
Indicated		Detector	Table	Antenna		Correction Factor			FCC Part 15.247/15.205/15.209			
Frequency (MHz)	S.A. Reading (dBµV)	(PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)												
2412.0	94.06	PK	24	1.2	H	29.60	3.03	26.50	100.19	N/A	N/A	Fund.
2412.0	82.55	Ave.	24	1.2	H	29.60	3.03	26.50	88.68	N/A	N/A	Fund.
2412.0	91.37	PK	100	1.2	V	29.60	3.03	26.50	97.50	N/A	N/A	Fund.
2412.0	80.34	Ave.	100	1.2	V	29.60	3.03	26.50	86.47	N/A	N/A	Fund.
598.0	46.27	QP	282	1.0	V	17.10	3.50	26.37	40.50	46.00	5.50	Spurious
2389.9	40.74	Ave.	67	1.1	H	29.60	3.03	26.50	46.87	54.00	7.13	Spurious
2389.2	40.39	Ave.	355	1.2	V	29.60	3.03	26.50	46.52	54.00	7.48	Spurious
2389.9	58.89	PK	67	1.1	H	29.60	3.03	26.50	65.02	74.00	8.98	Spurious
2389.2	58.61	PK	355	1.2	V	29.60	3.03	26.50	64.74	74.00	9.26	Spurious
1013.9	42.29	Ave.	133	1.2	H	23.40	1.90	26.50	41.09	54.00	12.91	Spurious
7236.0	18.63	Ave.	24	1.3	V	37.90	5.22	26.50	35.25	54.00	18.75	Harmonic
2486.7	27.36	Ave.	58	1.2	H	30.60	3.11	26.50	34.57	54.00	19.43	Spurious
4824.0	20.86	Ave.	22	1.2	V	34.60	4.30	26.50	33.26	54.00	20.74	Harmonic
2486.7	44.23	PK	58	1.2	H	30.60	3.11	26.50	51.44	74.00	22.56	Spurious
9648	36.27	PK	254	1.3	H	39.80	5.98	26.50	55.55	74.00	18.45	Harmonic
9648	18.54	Ave.	254	1.3	H	39.80	5.98	26.50	37.82	54.00	16.18	Harmonic
7236.0	34.66	PK	24	1.3	V	37.90	5.22	26.50	51.28	74.00	22.72	Harmonic
4824.0	36.27	PK	22	1.2	V	34.60	4.30	26.50	48.67	74.00	25.33	Harmonic
1013.9	48.43	PK	133	1.2	H	23.40	1.90	26.50	47.23	74.00	26.77	Spurious
Middle Channel (2437 MHz)												
2437.0	92.67	PK	114	1.2	H	29.60	3.03	26.50	98.80	N/A	N/A	Fund.
2437.0	86.83	Ave.	114	1.2	H	29.60	3.03	26.50	92.96	N/A	N/A	Fund.
2437.0	92.10	PK	72	1.2	V	29.60	3.03	26.50	98.23	N/A	N/A	Fund.
2437.0	84.27	Ave.	72	1.2	V	29.60	3.03	26.50	90.40	N/A	N/A	Fund.
754.0	43.73	QP	148	1.0	H	19.00	3.71	26.04	40.40	46.00	5.60	Spurious
1013.9	42.19	Ave.	16	1.1	H	23.40	1.90	26.50	40.99	54.00	13.01	Spurious
7311.0	19.34	Ave.	8	1.1	V	37.90	5.09	26.50	35.83	54.00	18.17	Harmonic
2489.2	28.16	Ave.	77	1.1	H	30.60	3.11	26.50	35.37	54.00	18.63	Spurious
4874.0	21.25	Ave.	358	1.2	V	34.60	4.36	26.50	33.71	54.00	20.29	Harmonic
9748	36.98	PK	100	1.2	H	39.80	6.10	26.50	56.38	74.00	17.62	Harmonic
9748	18.75	Ave.	100	1.2	H	39.80	6.10	26.50	38.15	54.00	15.85	Harmonic
2365.6	27.63	Ave.	65	1.1	H	29.00	2.98	26.50	33.11	54.00	20.89	Spurious
2337.8	27.36	Ave.	23	1.3	V	29.00	2.98	26.50	32.84	54.00	21.16	Spurious
2489.2	45.37	PK	77	1.1	H	30.60	3.11	26.50	52.58	74.00	21.42	Spurious
7311.0	35.97	PK	8	1.1	V	37.90	5.09	26.50	52.46	74.00	21.54	Harmonic
2337.8	44.73	PK	23	1.3	V	29.00	2.98	26.50	50.21	74.00	23.79	Spurious
2365.6	43.75	PK	65	1.1	H	29.00	2.98	26.50	49.23	74.00	24.77	Spurious
4874.0	36.61	PK	358	1.2	V	34.60	4.36	26.50	49.07	74.00	24.93	Harmonic
1013.9	48.67	PK	16	1.1	H	23.40	1.90	26.50	47.47	74.00	26.53	Spurious
High Channel (2462 MHz)												
2462.0	94.81	PK	38	1.2	H	30.60	3.11	26.50	102.02	N/A	N/A	Fund.
2462.0	87.69	Ave.	38	1.2	H	30.60	3.11	26.50	94.90	N/A	N/A	Fund.
2462.0	92.15	PK	245	1.0	V	30.60	3.11	26.50	99.36	N/A	N/A	Fund.
2462.0	85.14	Ave.	245	1.0	V	30.60	3.11	26.50	92.35	N/A	N/A	Fund.

2483.5	42.39	Ave.	81	1.2	H	30.60	3.11	26.50	49.60	54.00	4.40	Spurious
650.0	45.53	QP	234	1.0	H	17.90	3.56	26.49	40.50	46.00	5.50	Spurious
2483.5	60.92	PK	81	1.2	H	30.60	3.11	26.50	68.13	74.00	5.87	Spurious
2483.8	40.33	Ave.	58	1.3	V	30.20	3.11	26.50	47.14	54.00	6.86	Spurious
2483.8	58.45	PK	58	1.3	V	30.20	3.11	26.50	65.26	74.00	8.74	Spurious
1013.9	41.33	Ave.	38	1.3	H	23.40	1.90	26.50	40.13	54.00	13.87	Spurious
7386.0	19.67	Ave.	338	1.2	V	37.20	5.21	26.50	35.58	54.00	18.42	Harmonic
4924.0	21.08	Ave.	43	1.2	V	34.60	4.40	26.50	33.58	54.00	20.42	Harmonic
9848	37.11	PK	105	1.2	H	39.80	6.09	26.50	56.50	74.00	17.50	Harmonic
9848	18.73	Ave.	105	1.2	H	39.80	6.09	26.50	38.12	54.00	15.88	Harmonic
2387.6	27.13	Ave.	56	1.3	H	29.60	3.03	26.50	33.26	54.00	20.74	Spurious
7386.0	35.27	PK	338	1.2	V	37.20	5.21	26.50	51.18	74.00	22.82	Harmonic
2387.6	43.18	PK	56	1.3	H	29.60	3.03	26.50	49.31	74.00	24.69	Spurious
4924.0	36.37	PK	43	1.2	V	34.60	4.40	26.50	48.87	74.00	25.13	Harmonic
1013.9	47.98	PK	38	1.3	H	23.40	1.90	26.50	46.78	74.00	27.22	Spurious

Antenna Port Conducted Spurious Emissions:

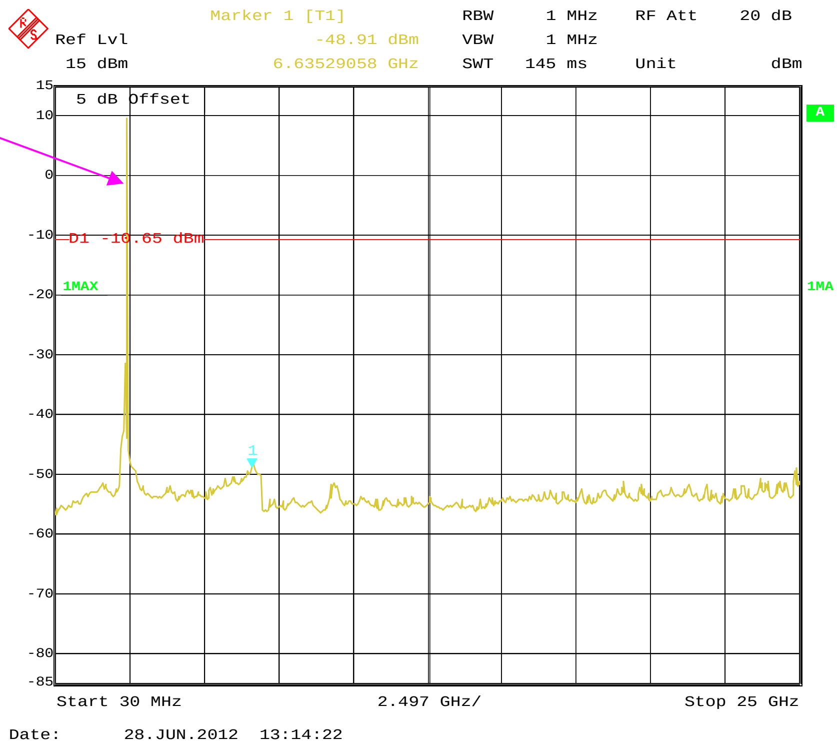
802.11b Low Channel

Fundamental



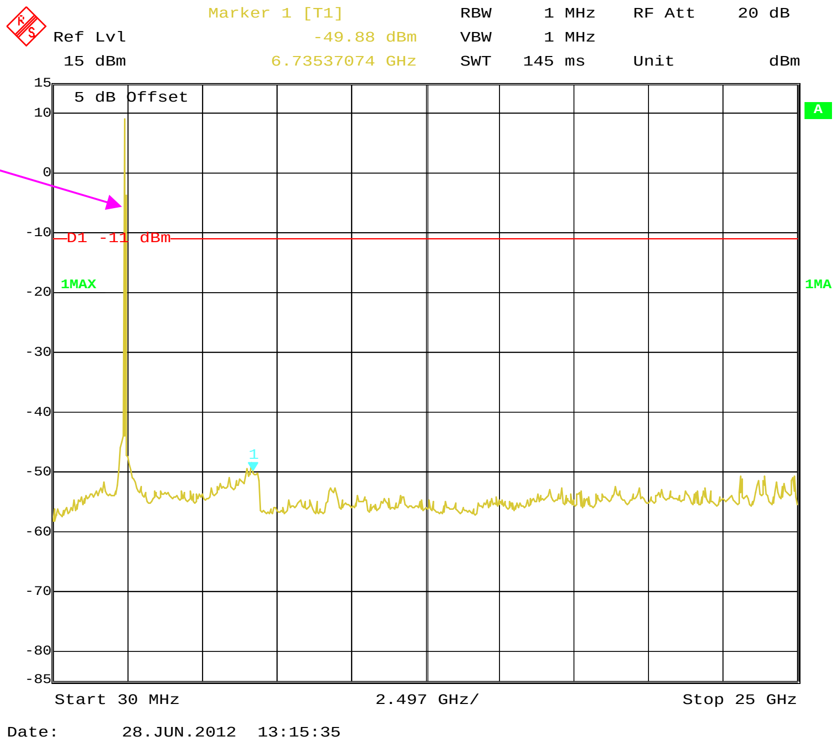
802.11b Middle Channel

Fundamental



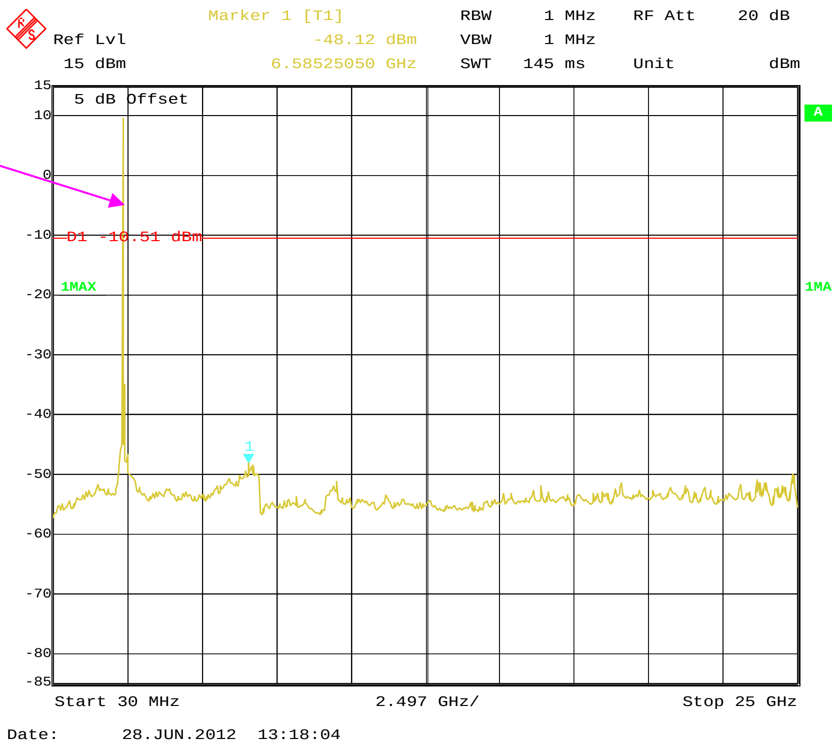
802.11b High Channel

Fundamental

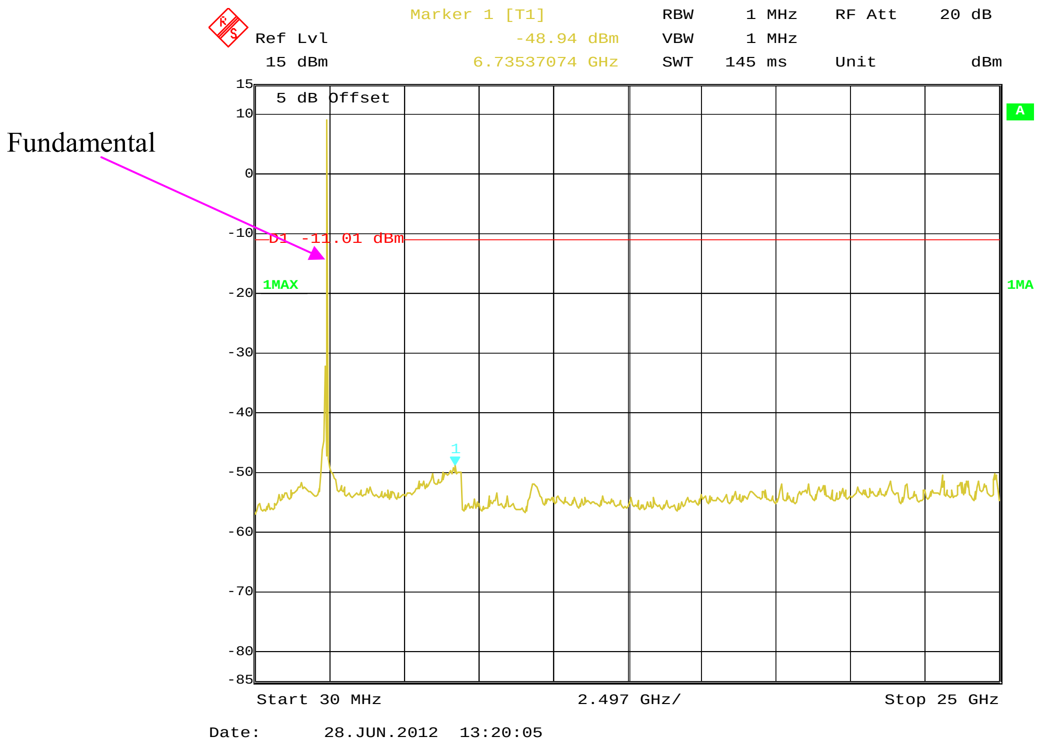


802.11g Low Channel

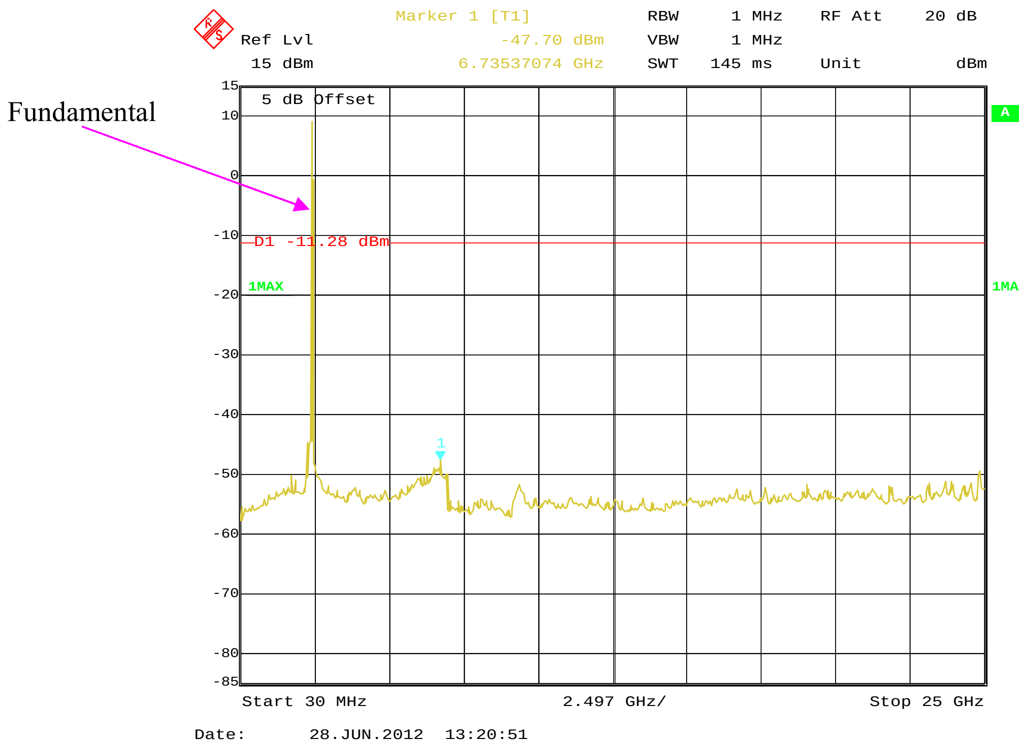
Fundamental



802.11g Middle Channel



802.11g High Channel



FCC §15.247(a) (2) – 6dB 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.

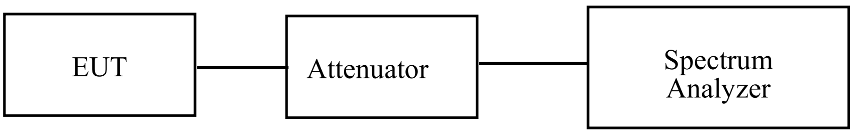
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

*** 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 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 Eric Lee on 2012-06-28.

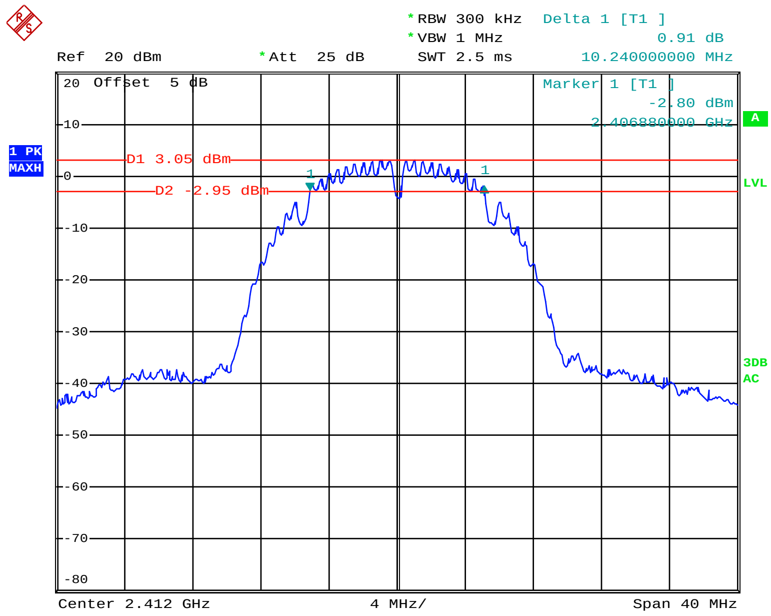
Test Mode: Transmitting

Test Result: Pass.

Please refer to the following tables and plots.

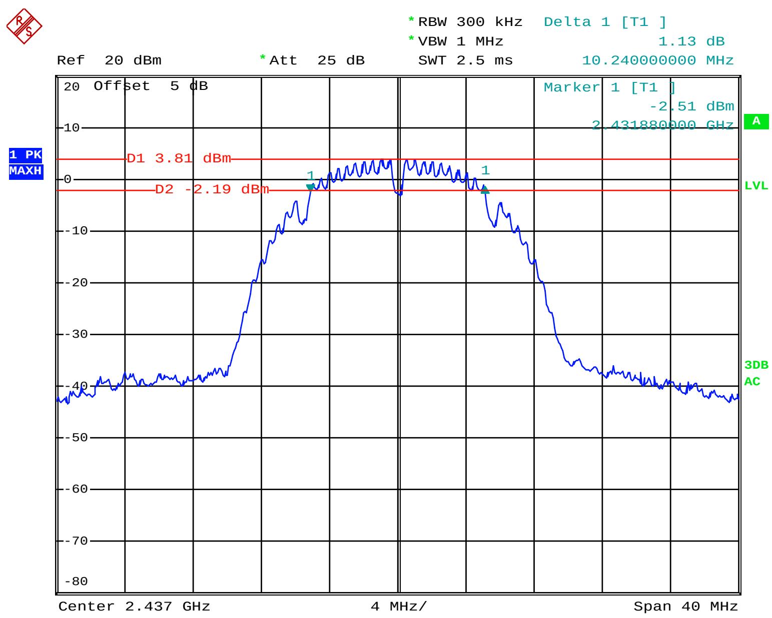
Channel	Frequency (MHz)	Data Rate (Mbps)	6dB bandwidth (MHz)	Limit (kHz)	Result
802.11b mode					
Low	2412	1	10.24	>500	Pass
Middle	2437	1	10.24	>500	Pass
High	2462	1	10.24	>500	Pass
802.11g mode					
Low	2412	6	16.48	>500	Pass
Middle	2437	6	16.48	>500	Pass
High	2462	6	16.48	>500	Pass

802.11b Low Channel



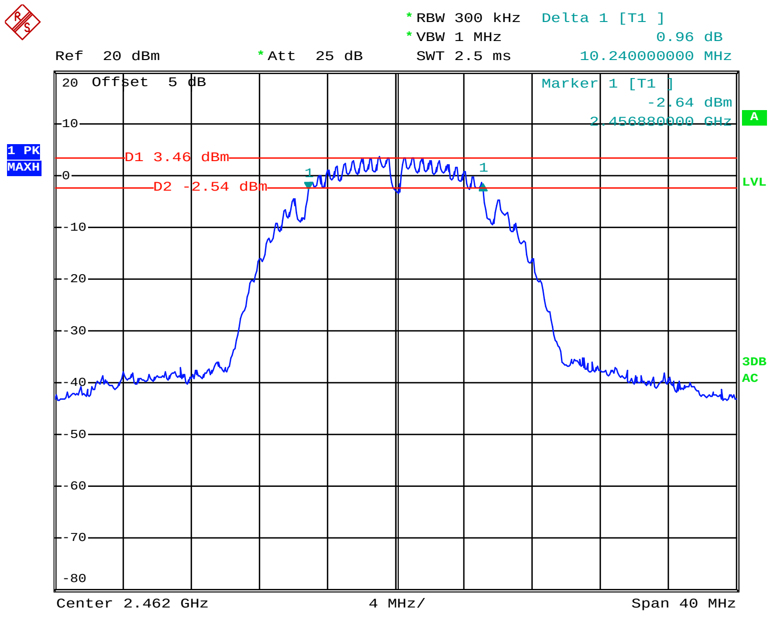
Date: 28.JUN.2012 05:05:40

802.11b Middle Channel



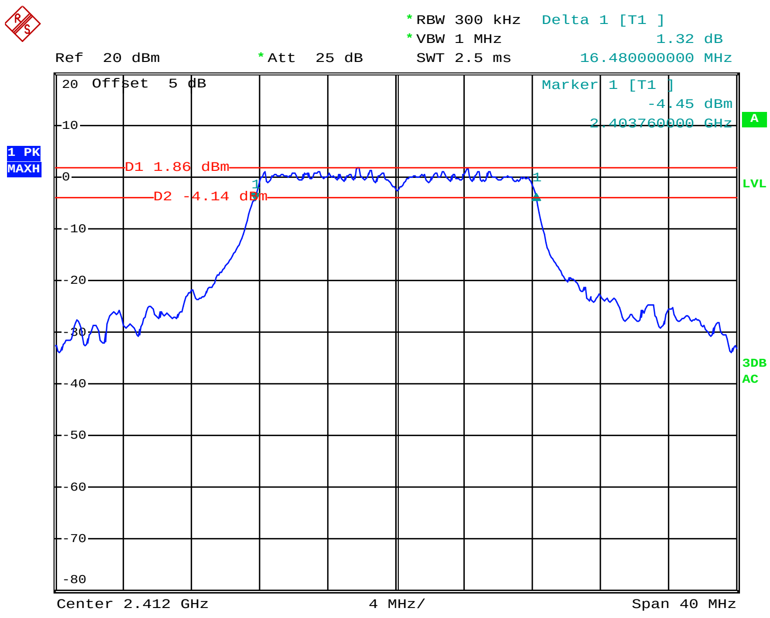
Date: 28.JUN.2012 05:03:19

802.11b High Channel



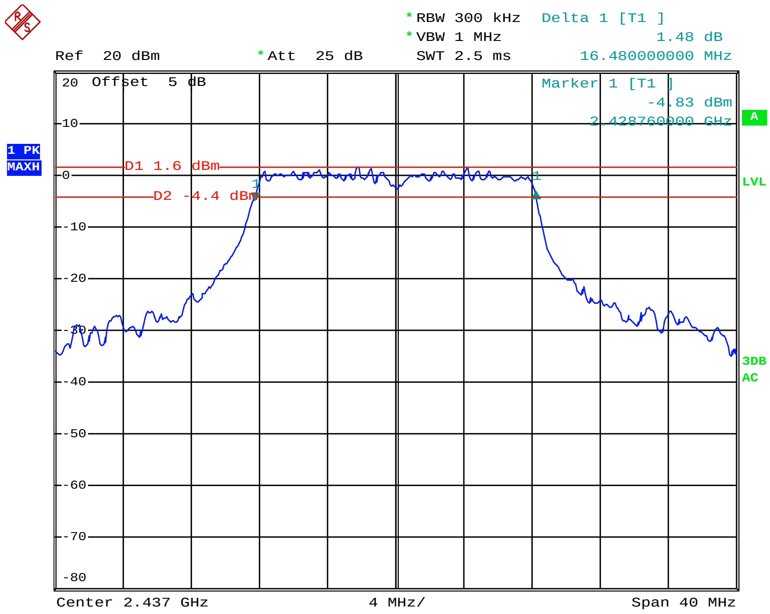
Date: 28.JUN.2012 05:07:56

802.11g Low Channel



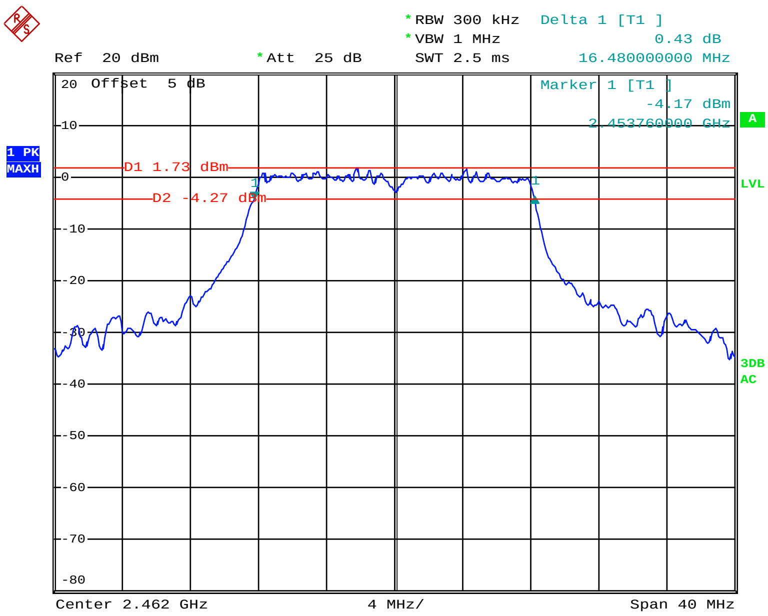
Date: 28.JUN.2012 05:11:05

802.11g Middle Channel



Date: 28.JUN.2012 05:15:11

802.11g High Channel



Date: 28.JUN.2012 05:16:56

FCC §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.

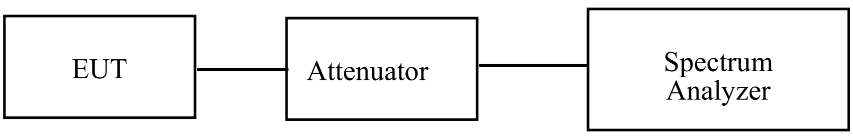
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

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

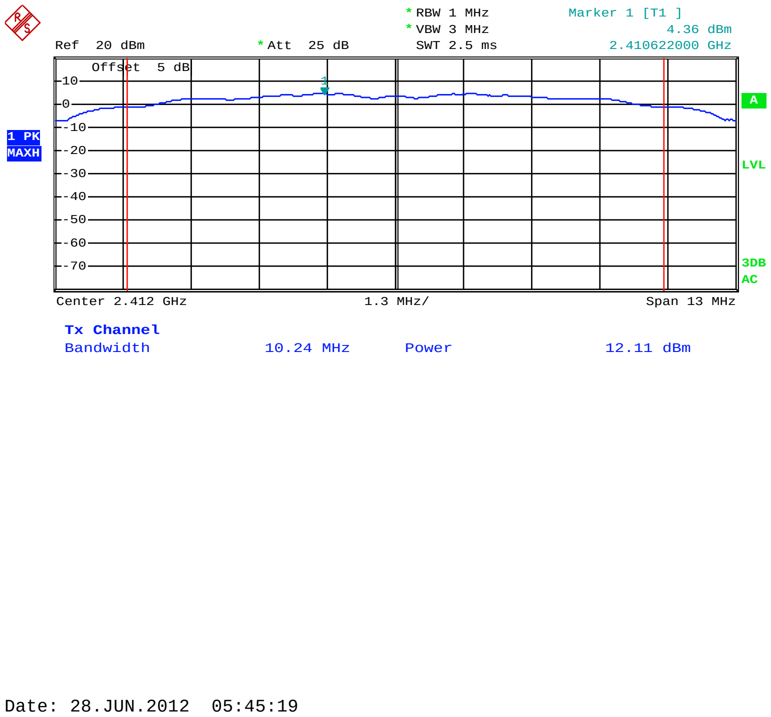
The testing was performed by Eric Lee on 2012-06-28.

Test Mode: Transmitting

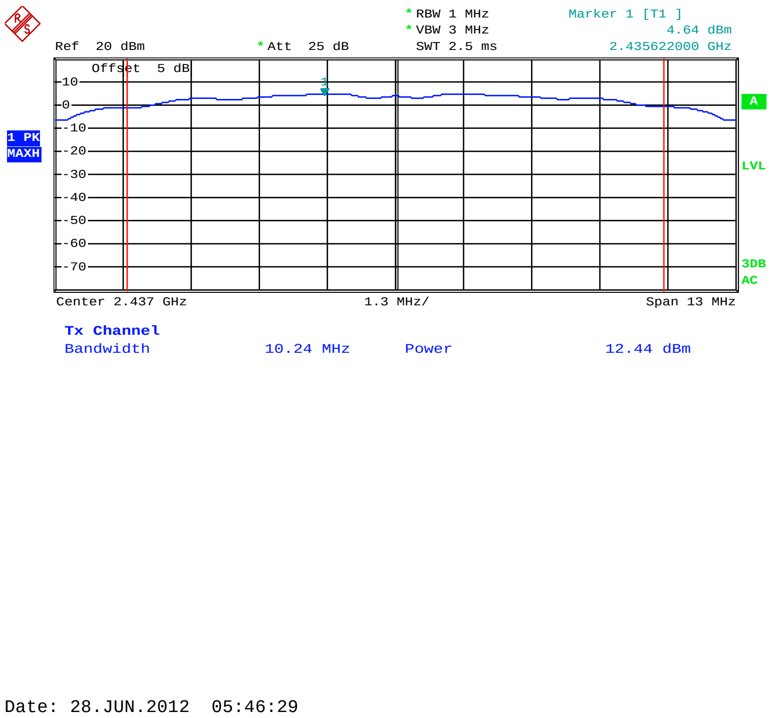
Test Result: *Compliance.*

Channel	Frequency (MHz)	Data Rate (Mbps)	Output Power (dBm)	Limit (dBm)	Result
802.11b mode					
Low	2412	1	12.11	30	Pass
Middle	2437	1	12.44	30	Pass
High	2462	1	12.04	30	Pass
802.11g mode					
Low	2412	6	14.93	30	Pass
Middle	2437	6	14.72	30	Pass
High	2462	6	14.80	30	Pass

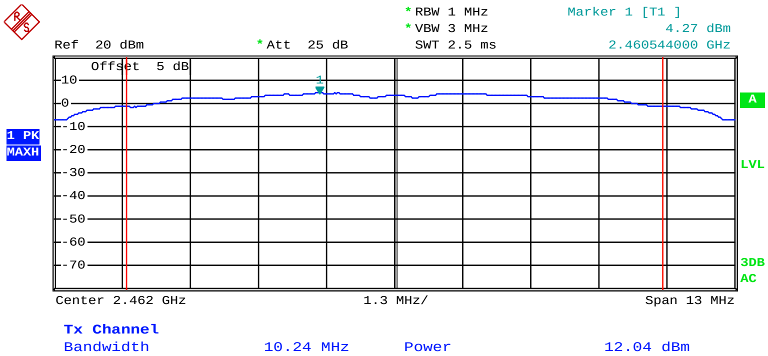
802.11b RF Output Power, Low Channel



802.11b RF Output Power, Middle Channel

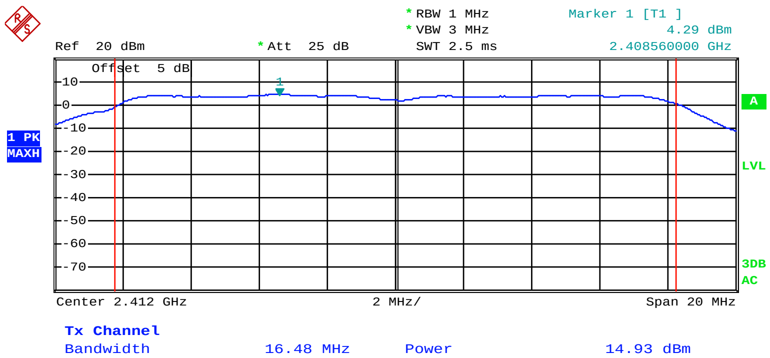


802.11b RF Output Power, High Channel



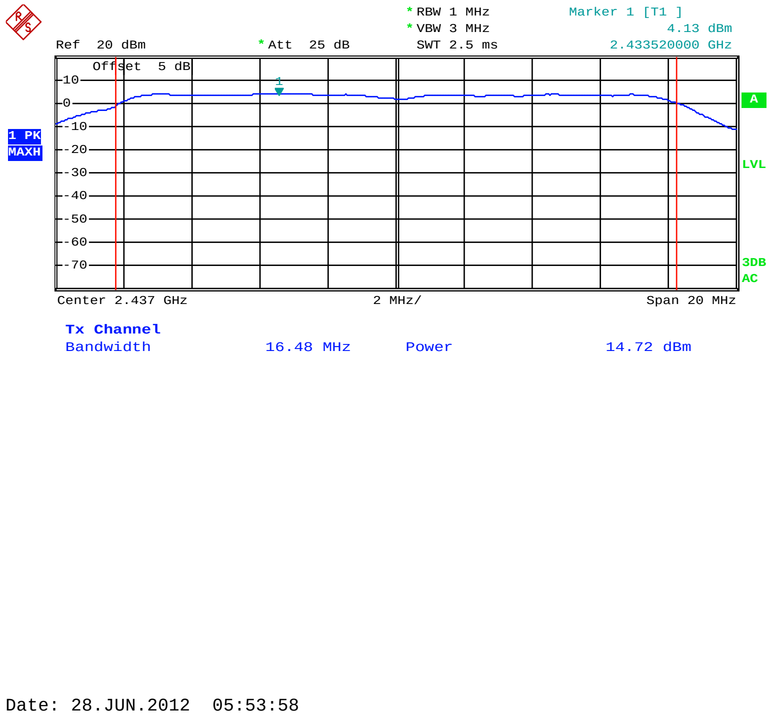
Date: 28.JUN.2012 05:47:09

802.11g RF Output Power, Low Channel

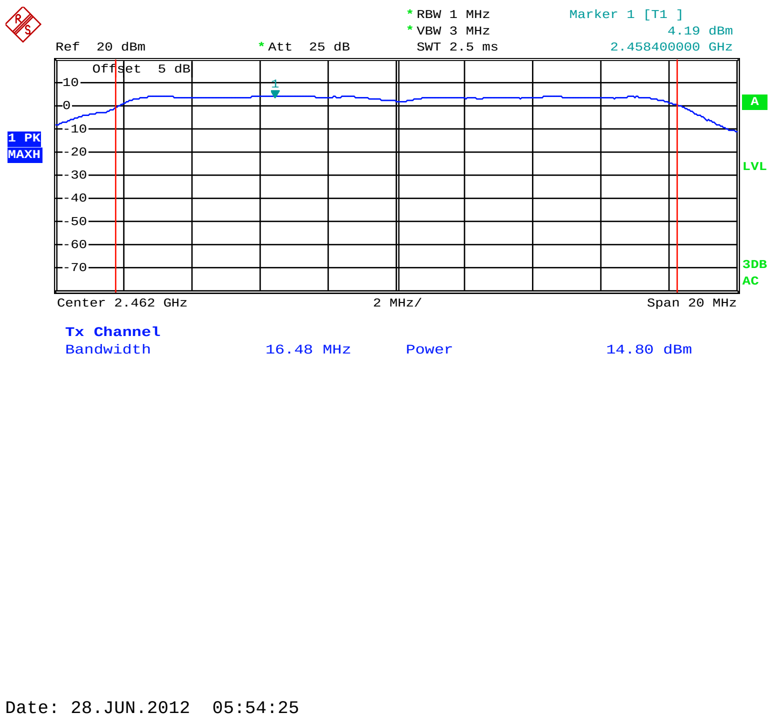


Date: 28.JUN.2012 05:53:12

802.11g RF Output Power, Middle Channel



802.11g RF Output Power, High Channel



FCC §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)).

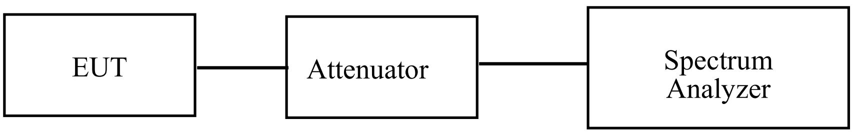
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

*** 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 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 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

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

The testing was performed by Eric Lee on 2012-06-28.

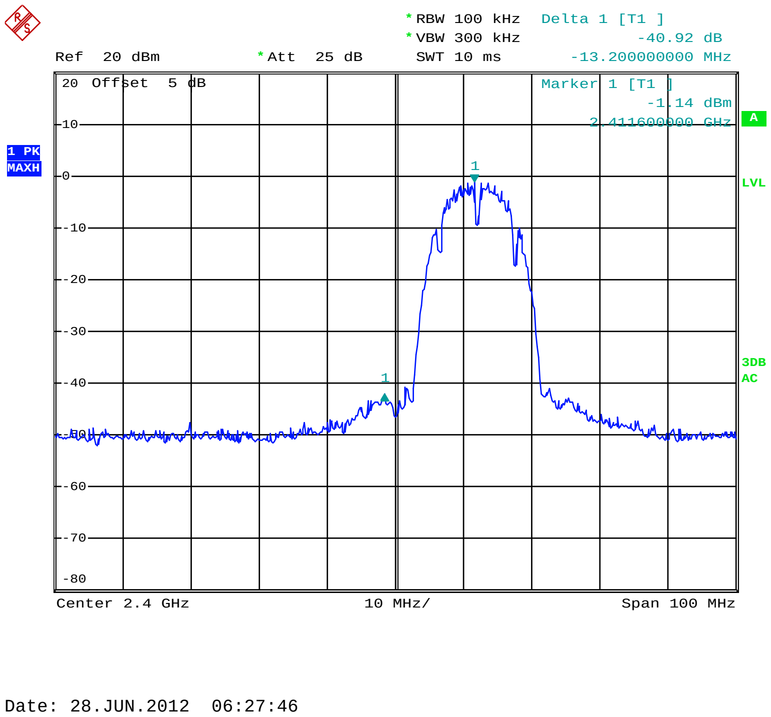
Test Mode: Transmitting

Test Result: *Compliance.*

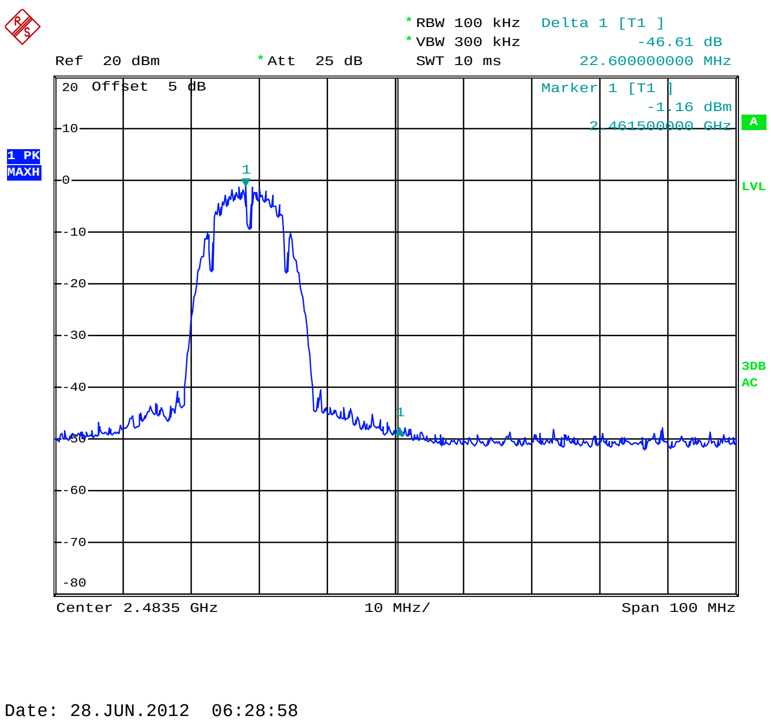
Channel	Frequency Band	Delta Peak to band emission (dBc)	Limit (dBc)	Result
802.11b mode				
Low	Left-band	40.92	20	Pass
High	Right-band	46.61	20	Pass
802.11g mode				
Low	Left-band	30.23	20	Pass
High	Right-band	40.55	20	Pass

Please refer to following plots.

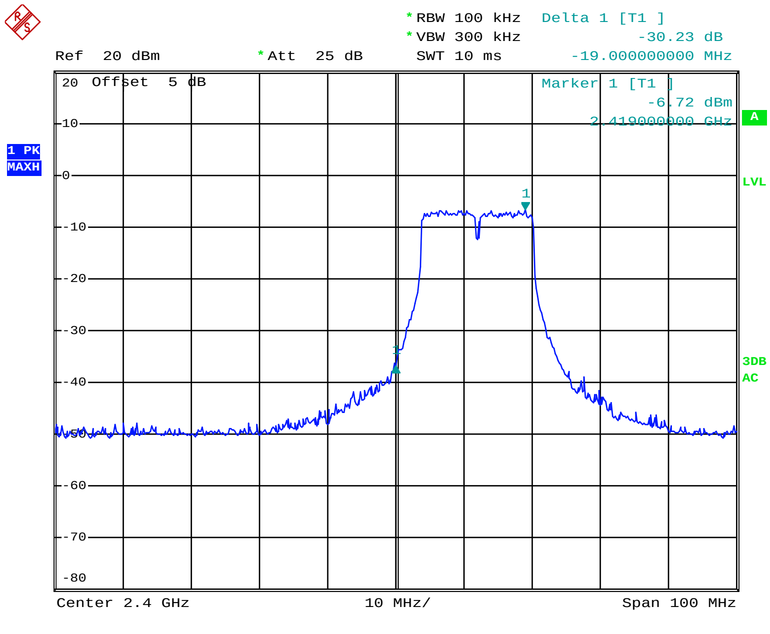
802.11b Band Edge, Left Side



802.11b Band Edge, Right Side



802.11g Band Edge, Left Side



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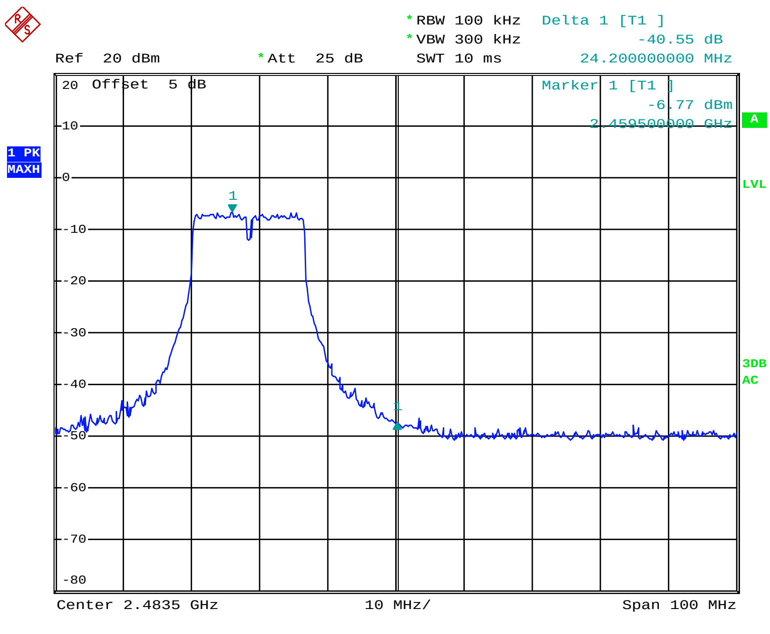
802.11g Band Edge, Right Side



Date: 28.JUN.2012 06:24:25

FCC §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.

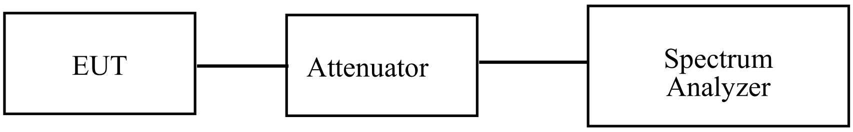
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16

*** 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. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.



Test Data

Environmental Conditions

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

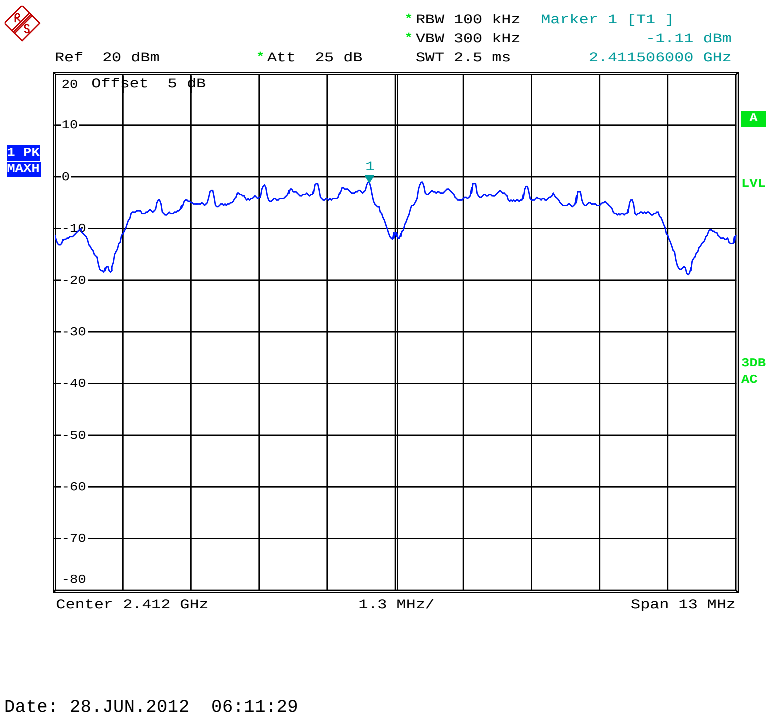
The testing was performed by Eric Lee on 2012-06-28.

Test Mode: Transmitting

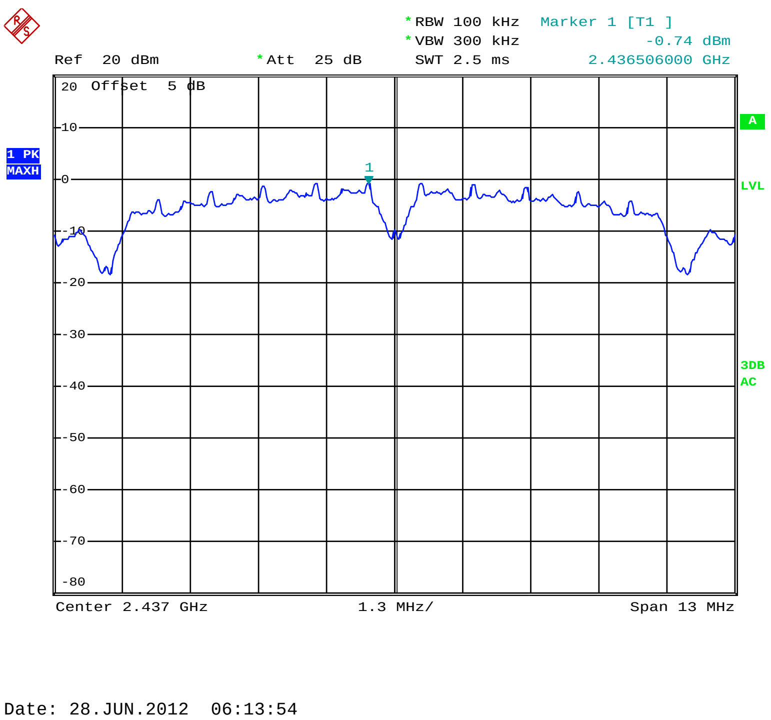
Test Result: Pass

Channel	Frequency (MHz)	Data Rate (Mbps)	Power spectral density (dBm/100kHz)	BWCF (dB)	Power spectral density (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode						
Low	2412	1	-1.11	-15.2	-16.31	8
Middle	2437	1	-0.74	-15.2	-15.94	8
High	2462	1	-1.15	-15.2	-16.35	8
802.11g mode						
Low	2412	6	-6.78	-15.2	-21.98	8
Middle	2437	6	-6.98	-15.2	-22.18	8
High	2462	6	-6.88	-15.2	-22.08	8

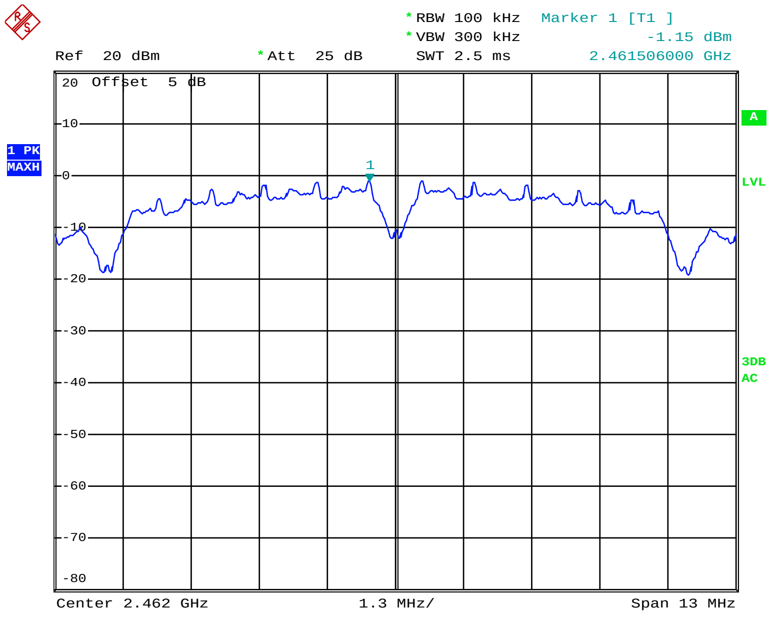
Power Spectral Density, 802.11b Low Channel



Power Spectral Density, 802.11b Middle Channel



Power Spectral Density, 802.11b High Channel



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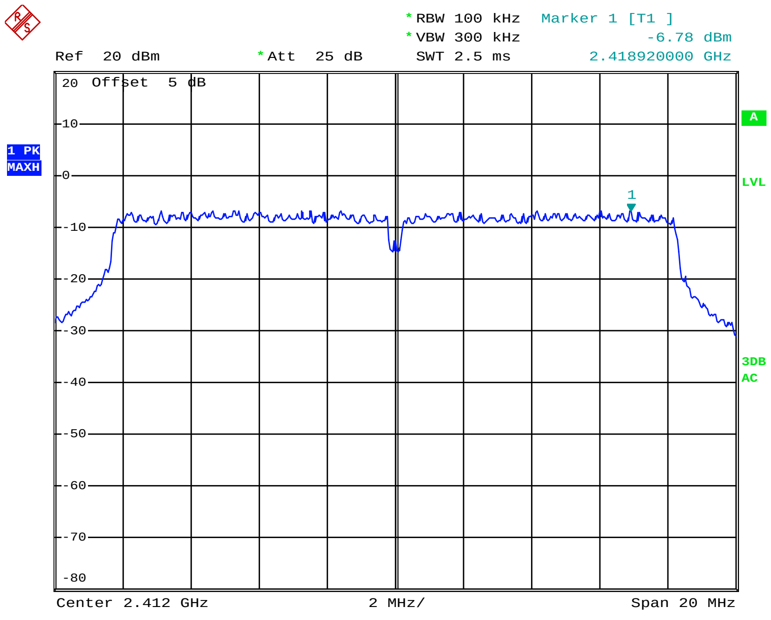
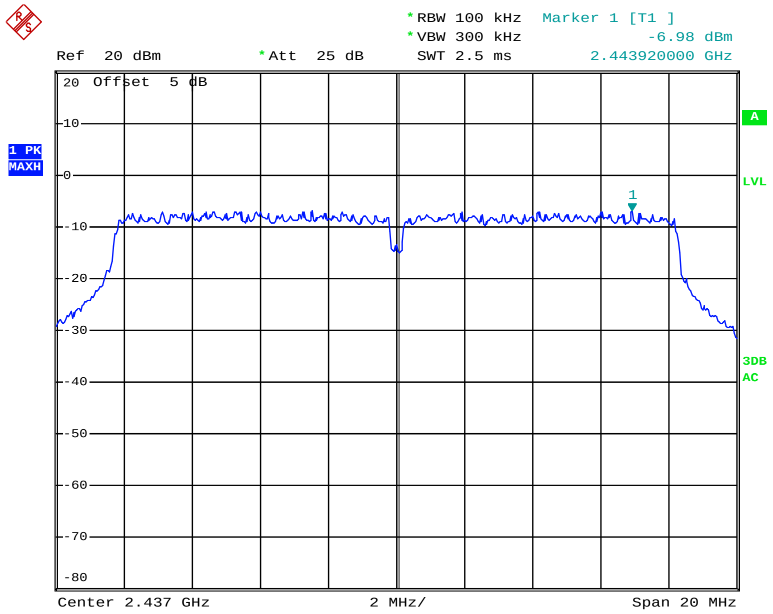
Power Spectral Density, 802.11g Low Channel



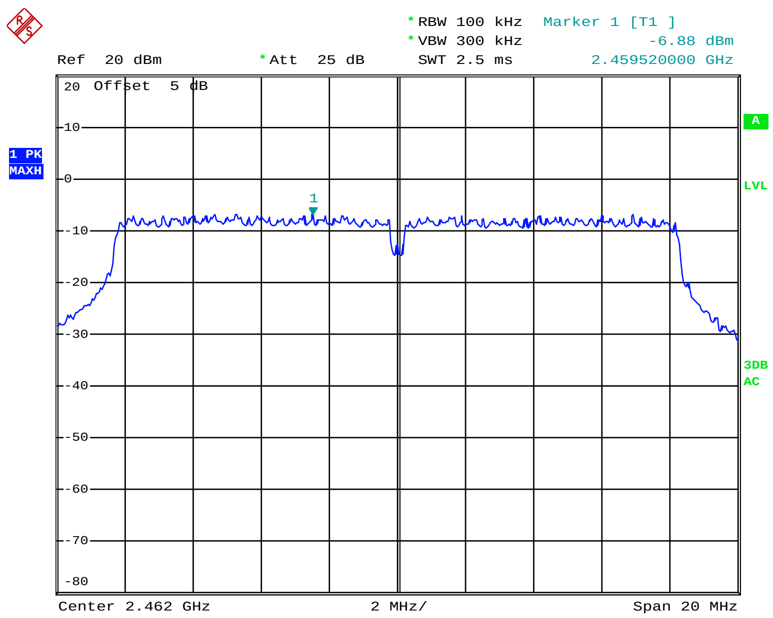
Date: 28.JUN.2012 06:16:26

Power Spectral Density, 802.11g Middle Channel



Date: 28.JUN.2012 06:17:27

Power Spectral Density, 802.11g High Channel



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