

FCC PART 15.247
MEASUREMENT AND TEST REPORT

For

Suga Electronics Limited

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FCC ID: VZFSWP23MA

Report Type: Original Report	Product Type: 802.11b/g/n (2T2R) WLAN AP/Router Module
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* This report may contain data that are not covered by the NVLAP accreditation and shall be marked with an asterisk "★".

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Suga Electronics Limited's* product, model number: *SWP23MA-0 (FCC ID: VZFSWP23MA)* or the "EUT" as referred to in this report was *802.11b/g/n (2T2R) WLAN AP/Router Module*, which was measured approximately: 50mm(L)x 51 mm (W) x 22 mm (H)(Excluded RJ45 and components), rated input voltage: 3.3VDC (Typical).

Adapter Information: I.T.E.POWER SUPPLY
P/N: EPS050250UPS-P5P-KH
MODEL: HK-C113-A05
PRI: 100-240V~50/60Hz 0.35A;
SEC: 5V DC 0-2.5A (SET AT 2.5A).

Note: The series product, model SWP23MA-0 and SWP23MA-1 are electrically identical, we select SWP23MA-0 for fully testing, and the detailed difference between the two models was explained in the attached declaration letter.

** All measurement and test data in this report was gathered from production sample serial number: 0A250001521 (Assigned by Applicant). The EUT supplied by the applicant was received on 2012-08-06.*

Objective

This report is prepared on behalf of *Suga Electronics Limited* in accordance with Part 2-Subpart J, Part 15- Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine 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 C63.4-2009, 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, 802.11g and 802.11n-HT20 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 and 802.11n-HT20 modes were tested with Channel 1, 6 and 11.

For 802.11n40 mode, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2422	6	2447
2	2427	7	2452
3	2432	/	/
4	2437	/	/
5	2442	/	/

EUT was tested with Channel 1, 4 and 7.

EUT Exercise Software

Test software: RT3352QA (provided by the Applicant)

The test was performed under:

802.11b: Data rate: 1 Mbps.

802.11g: Data rate: 6 Mbps.

802.11n-HT20: Data rate: MCS7.

802.11n-HT40: Data rate: MCS7.

Equipment Modifications

No modification was made to the EUT tested.

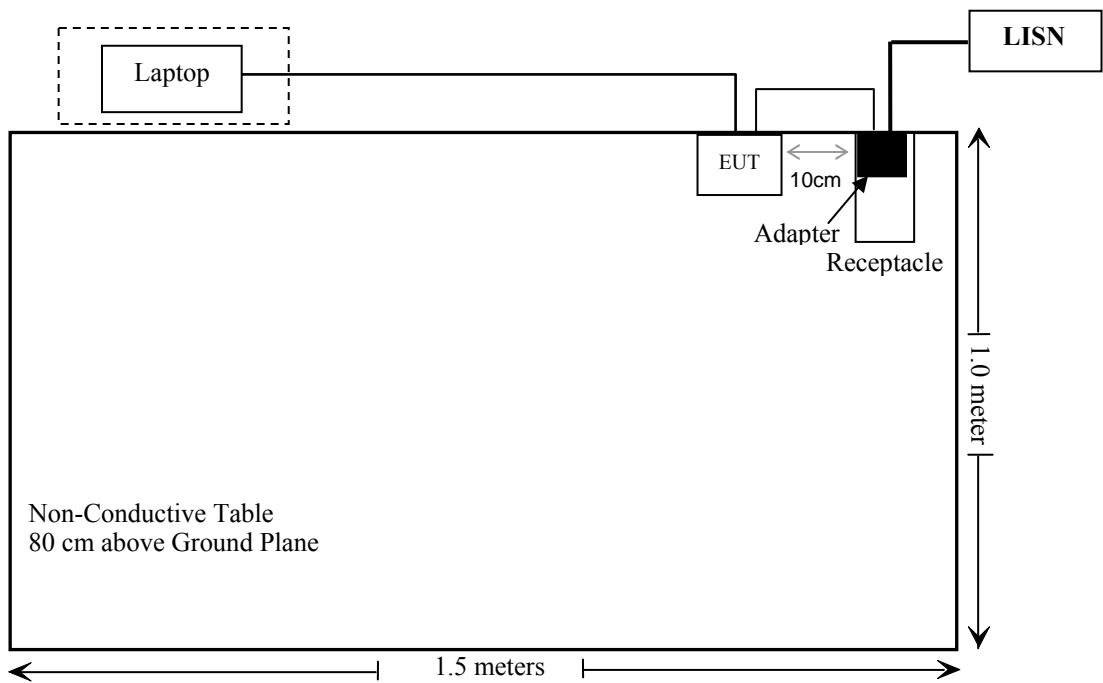
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
IBM	Laptop	2371	N/A

External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable RJ45 Cable	10	EUT	Laptop
Unshielded Detachable DC Power Cable	2.0	Adapter	EUT

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	Compliance
§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

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/cm²);

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	2412	2.0	1.58	16.98	49.89	20	0.0157	1
802.11g	2412	2.0	1.58	15.80	38.02	20	0.0120	1
802.11n-HT20	2462	2.0	1.58	18.61	72.61	20	0.0228	1
802.11n-HT40	2422	2.0	1.58	18.75	74.99	20	0.0236	1

Result: The EUT meets FCC MPE limit at 20 cm distance.

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

This product used two 2.4 GHz TX/RX antennas which were connected to the mainboard with I-PEX socket, and the maximum gain is 2.0 dBi, which fulfill the requirement of this section, and please refer to the EUT photos.

Result: Compliant.

FCC §15.207 (a) - CONDUCTED EMISSIONS

Applicable Standard

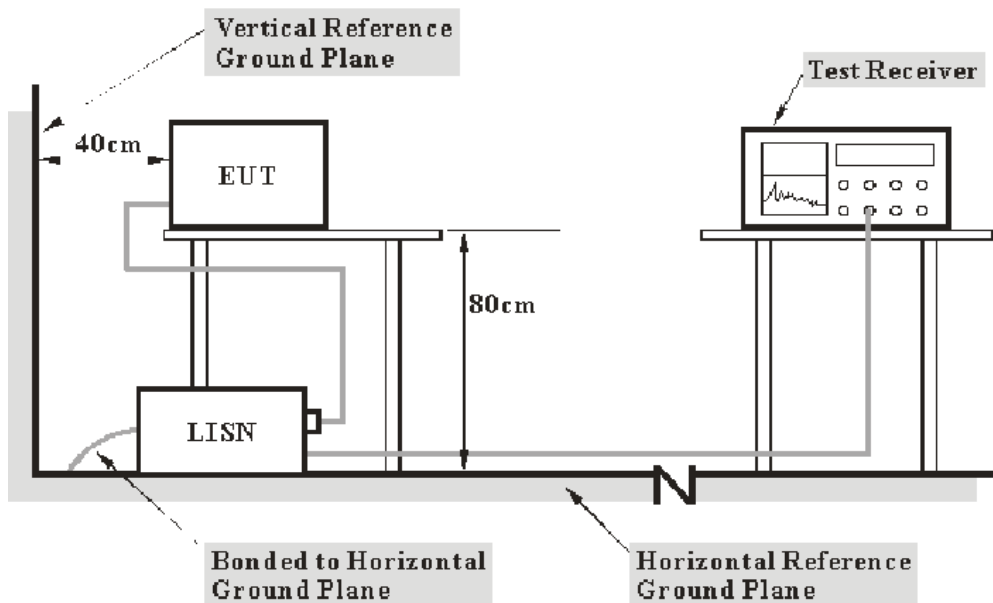
FCC§15.207

Measurement Uncertainty

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

Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is 2.4 dB ($k=2$, 95% level of confidence), and the uncertainty will not be taken into consideration for all the test data recorded in the report.

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 measurement procedure of EUT setup is according with per ANSI C63.4-2009. The related limit was specified in FCC Part 15.207.

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>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
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2011-11-24	2012-11-23
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-11-17	2012-11-16
Rohde & Schwarz	Pulse limiter	ESH3Z2	DE25985	2012-07-08	2013-07-07
BACL	CE Test software	BACL-CE	V1.0	-	-

*** 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 receptacle was connected to 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:

11.34 dB at 0.155 MHz in the **Line** conducted mode

Test Data

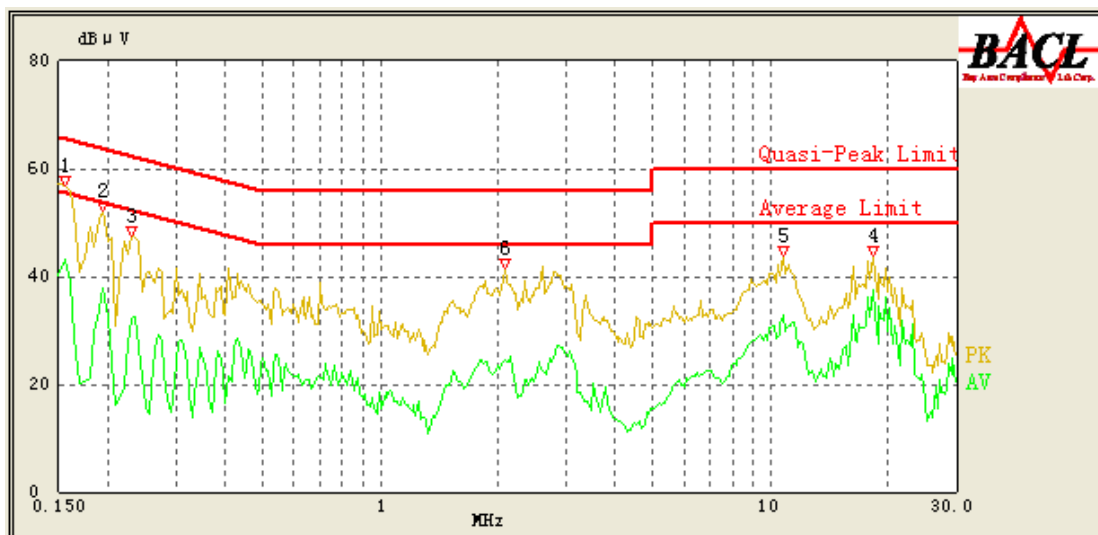
Environmental Conditions

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

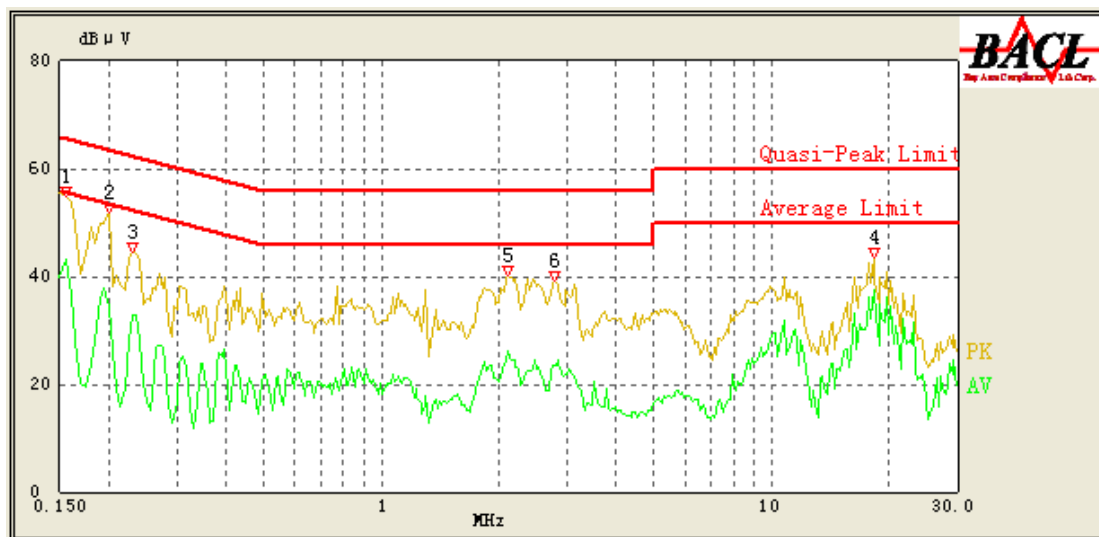
The testing was performed by Brown Lu on 2012-08-09.

Test Mode: Transmitting

AC 120V / 60Hz, Line



Frequency (MHz)	Corrected Result (dBμV)	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK /QP/Ave.)
0.155	54.52	10.27	65.86	11.34	QP
18.245	37.50	12.27	50.00	12.50	Ave.
0.155	43.12	10.27	55.86	12.74	Ave.
0.195	49.20	10.27	64.71	15.51	QP
0.195	37.72	10.27	54.71	16.99	Ave.
10.795	33.00	10.62	50.00	17.00	Ave.
18.245	41.25	12.27	60.00	18.75	QP
0.230	44.51	10.26	63.71	19.20	QP
2.080	35.02	10.21	56.00	20.98	QP
2.085	24.64	10.21	46.00	21.36	Ave.
0.230	32.03	10.26	53.71	21.68	Ave.
10.795	38.24	10.62	60.00	21.76	QP

AC 120V / 60Hz, Neutral:

Frequency (MHz)	Corrected Result (dBμV)	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/QP/Ave.)
18.245	37.56	12.10	50.00	12.44	Ave.
0.155	43.09	10.24	55.86	12.77	Ave.
0.155	52.74	10.24	65.86	13.12	QP
0.200	46.16	10.24	64.57	18.41	QP
18.245	41.49	12.10	60.00	18.51	QP
2.115	36.10	10.20	56.00	19.90	QP
2.120	26.03	10.20	46.00	19.97	Ave.
0.200	34.51	10.24	54.57	20.06	Ave.
2.775	35.73	10.22	56.00	20.27	QP
0.230	32.81	10.25	53.71	20.90	Ave.
0.230	42.19	10.25	63.71	21.52	QP
2.800	23.60	10.22	46.00	22.40	Ave.

Note:

- 1) Corrected Amplitude = Reading + Correction Factor
- 2) Correction Factor = LISN/ISN VDF (Voltage Division Factor) + Cable Loss + Pulse Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
- 3) Margin = Limit – Corrected Amplitude

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

Applicable Standard

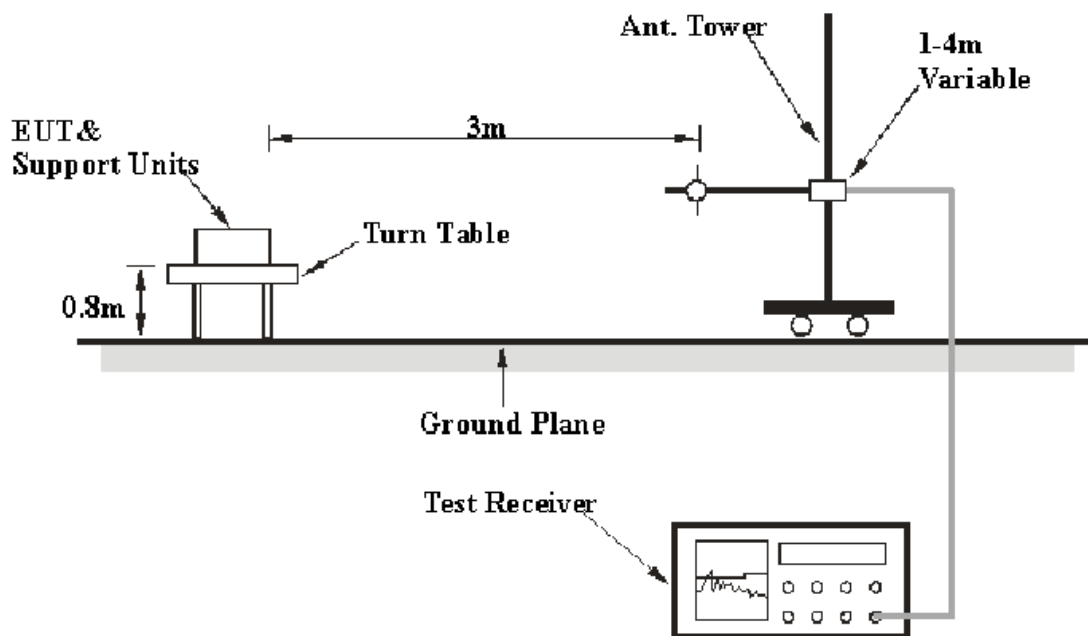
FCC §15.247 (d); §15.209; §15.205;

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), and the uncertainty will not be taken into consideration for all the test data recorded in the report.

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.

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>	<i>Detector</i>
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 and other relevant equipments 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 1 GHz.

Corrected Amplitude & Margin Calculation

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

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

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

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

Test 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:

2.28 dB at 2388.4 MHz in the **Horizontal** polarization for 802.11n-HT40 mode

Test Data

Environmental Conditions

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

The testing was performed by Brown Lu on 2012-08-10.

Test Mode: Transmitting

30 MHz-25 GHz**802.11b mode:**

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
2412.0	81.35	PK	78	1.1	H	32.63	113.98	/	/
2412.0	75.34	Ave.	78	1.1	H	32.63	107.97	/	/
2412.0	72.62	PK	61	1.3	V	32.63	105.25	/	/
2412.0	66.42	Ave.	61	1.3	V	32.63	99.05	/	/
2386.8	16.23	Ave.	274	1.2	V	32.63	48.86	54	5.14
2485.6	15.13	Ave.	127	1.3	H	33.71	48.84	54	5.16
2316.5	15.12	Ave.	115	1.1	H	31.98	47.10	54	6.90
2386.8	31.38	PK	274	1.2	V	32.63	64.01	74	9.99
2485.6	29.53	PK	127	1.3	H	33.71	63.24	74	10.76
2316.5	29.46	PK	115	1.1	H	31.98	61.44	74	12.56
4824.0	19.49	Ave.	93	1.4	H	12.40	31.89	54	22.11
4824.0	34.79	PK	93	1.4	H	12.40	47.19	74	26.81
9648.0	32.04	PK	221	1.5	V	19.29	51.33	93.98	42.65
374.9	55.58	QP	264	1.2	H	-11.58	44.0	87.97	43.97
7236.0	32.31	PK	68	1.2	V	16.62	48.93	93.98	45.05
9648.0	16.96	Ave.	221	1.5	V	19.29	36.25	87.97	51.72
7236.0	17.98	Ave.	68	1.2	V	16.62	34.60	87.97	53.37
Middle Channel (2437 MHz)									
2437.0	81.11	PK	83	1.1	H	33.71	114.82	/	/
2437.0	74.08	Ave.	83	1.1	H	33.71	107.79	/	/
2437.0	71.21	PK	176	1.3	V	33.31	104.52	/	/
2437.0	63.27	Ave.	176	1.3	V	33.31	96.58	/	/
2492.6	17.55	Ave.	168	1.5	H	33.71	51.26	54	2.74*
2388.6	16.53	Ave.	224	1.2	V	32.63	49.16	54	4.84
2312.3	16.89	Ave.	46	1.1	V	31.98	48.87	54	5.13
2492.6	33.24	PK	168	1.5	H	33.71	66.95	74	7.05
2312.3	31.12	PK	46	1.1	V	31.98	63.10	74	10.90
2388.6	30.16	PK	224	1.2	V	32.63	62.79	74	11.21
4874.0	26.43	Ave.	39	1.2	V	12.46	38.89	54	15.11
7311.0	18.11	Ave.	153	1.6	V	16.49	34.60	54	19.40
7311.0	33.45	PK	153	1.6	V	16.49	49.94	74	24.06
4874.0	35.12	PK	39	1.2	V	12.46	47.58	74	26.42
375.0	55.78	QP	98	1.2	H	-11.58	44.2	87.79	43.59
9748.0	31.32	PK	164	1.1	V	19.40	50.72	94.82	44.1
9748.0	17.02	Ave.	164	1.1	V	19.40	36.42	87.79	51.37

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H /V)			Limit (dBμV/m)	Margin (dB)
High Channel (2462 MHz)									
2462.0	80.56	PK	77	1.1	H	33.71	114.27	/	/
2462.0	74.47	Ave.	77	1.1	H	33.71	108.18	/	/
2462.0	71.26	PK	35	1.3	V	33.31	104.57	/	/
2462.0	63.83	Ave.	35	1.3	V	33.31	97.14	/	/
2487.3	16.97	Ave.	136	1.3	H	33.71	50.68	54	3.32 *
2495.6	17.02	Ave.	154	1.2	V	33.31	50.33	54	3.67 *
2317.6	16.58	Ave.	115	1.1	H	31.98	48.56	54	5.44
2495.6	33.16	PK	154	1.2	V	33.31	66.47	74	7.53
2487.3	32.07	PK	136	1.3	H	33.71	65.78	74	8.22
2317.6	31.66	PK	115	1.1	H	31.98	63.64	74	10.36
4924.0	25.71	Ave.	113	1.1	V	12.50	38.21	54	15.79
7386.0	18.17	Ave.	126	1.3	V	15.91	34.08	54	19.92
4924.0	36.52	PK	113	1.1	V	12.50	49.02	74	24.98
7386.0	31.83	PK	126	1.3	V	15.91	47.74	74	26.26
9848.0	31.26	PK	108	1.2	V	19.39	50.65	94.27	43.62
374.8	55.38	QP	196	1.2	H	-11.58	43.8	88.18	44.38
9848.0	17.03	Ave.	108	1.2	V	19.39	36.42	88.18	51.76

802.11g mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H /V)			Limit (dBμV/m)	Margin (dB)
Low Channel(2412 MHz)									
2412.0	79.09	PK	36	1.1	H	32.63	111.72	/	/
2412.0	67.18	Ave.	36	1.1	H	32.63	99.81	/	/
2412.0	68.77	PK	45	1.6	V	32.63	101.4	/	/
2412.0	53.51	Ave.	45	1.6	V	32.63	86.14	/	/
2486.5	17.12	Ave.	224	1.3	H	33.71	50.83	54	3.17*
2376.5	16.94	Ave.	136	1.1	V	32.63	49.57	54	4.43
2315.4	17.03	Ave.	115	1.2	H	31.98	49.01	54	4.99
2486.5	32.56	PK	224	1.3	H	33.71	66.27	74	7.73
2315.4	33.12	PK	115	1.2	H	31.98	65.1	74	8.9
2376.5	30.06	PK	136	1.1	V	32.63	62.69	74	11.31
4824.0	22.78	Ave.	168	1.4	V	12.4	35.18	54	18.82
4824.0	42.35	PK	168	1.4	V	12.4	54.75	74	19.25
375.1	55.78	QP	88	1.2	H	-11.58	44.2	79.81	35.61
9648.0	31.08	PK	225	1.1	H	19.29	50.37	91.72	41.35
9648.0	17.54	Ave.	225	1.1	H	19.29	36.83	79.81	42.98
7236.0	31.17	PK	138	1.2	V	16.62	47.79	91.72	43.93
7236.0	18.22	Ave.	138	1.2	V	16.62	34.84	79.81	44.97
Middle Channel (2437 MHz)									
2437.0	78.95	PK	65	1.1	H	33.71	112.66	/	/
2437.0	67.24	Ave.	65	1.1	H	33.71	100.95	/	/
2437.0	68.57	PK	115	1.2	V	33.31	101.88	/	/
2437.0	53.77	Ave.	115	1.2	V	33.31	87.08	/	/
2383.5	17.37	Ave.	48	1.3	H	32.63	50	54	4.00*
2489.6	16.02	Ave.	76	1.2	V	33.31	49.33	54	4.67
2360.3	17.02	Ave.	39	1.1	H	31.98	49	54	5.00
2383.5	31.06	PK	48	1.3	H	32.63	63.69	74	10.31
2489.6	30.21	PK	76	1.2	V	33.31	63.52	74	10.48
2360.3	30.86	PK	39	1.1	H	31.98	62.84	74	11.16
7311.0	18.14	Ave.	416	1.2	V	16.49	34.63	54	19.37
4874.0	20.76	Ave.	358	1.1	V	12.46	33.22	54	20.78
4874.0	40.71	PK	358	1.1	V	12.46	53.17	74	20.83
7311.0	32.82	PK	416	1.2	V	16.49	49.31	74	24.69
375.1	55.88	QP	125	1.2	H	-11.58	44.3	80.95	36.65
9748.0	31.73	PK	332	1	H	19.4	51.13	92.66	41.53
9748.0	18.63	Ave.	332	1.0	H	19.40	38.03	80.95	42.92

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H /V)			Limit (dBμV/m)	Margin (dB)
High Channel(2462 MHz)									
2462.0	76.99	PK	31	1.1	H	33.71	110.7	/	/
2462.0	64.13	Ave.	31	1.1	H	33.71	97.84	/	/
2462.0	67.32	PK	135	1.2	V	33.31	100.63	/	/
2462.0	52.89	Ave.	135	1.2	V	33.31	86.2	/	/
2487.1	17.12	Ave.	68	1.2	V	33.31	50.43	54	3.57*
2495.6	17.33	Ave.	154	1.1	H	33.71	51.04	54	2.96*
2315.4	15.42	Ave.	224	1.3	V	31.98	47.4	54	6.6
2495.6	31.22	PK	154	1.1	H	33.71	64.93	74	9.07
2487.1	30.06	PK	68	1.2	V	33.31	63.37	74	10.63
2315.4	29.81	PK	224	1.3	V	31.98	61.79	74	12.21
4924.0	21.58	Ave.	223	1.5	V	12.5	34.08	54	19.92
4924.0	41.02	PK	223	1.5	V	12.5	53.52	74	20.48
7386.0	17.37	Ave.	315	1.1	V	15.91	33.28	54	20.72
7386.0	32.09	PK	315	1.1	V	15.91	48	74	26
375.1	56.18	QP	104	1.2	H	-11.58	44.6	77.84	33.24
9848.0	31.22	PK	124	1.3	V	19.39	50.61	90.7	40.09
9848.0	17.06	Ave.	124	1.3	V	19.39	36.45	77.84	41.39

802.11n-HT20 mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel(2412 MHz)									
2412.0	78.52	PK	88	1.2	H	32.63	111.15	/	/
2412.0	64.32	Ave.	88	1.2	H	32.63	96.95	/	/
2412.0	69.68	PK	13	1.3	V	32.63	102.31	/	/
2412.0	54.93	Ave.	13	1.3	V	32.63	87.56	/	/
2491.2	17.12	Ave.	236	1.1	V	33.31	50.43	54	3.57*
2389.5	16.93	Ave.	117	1.2	H	32.63	49.56	54	4.44
2316.4	16.07	Ave.	58	1.5	H	31.98	48.05	54	5.95
2389.5	32.18	PK	117	1.2	H	32.63	64.81	74	9.19
2491.2	31.22	PK	236	1.1	V	33.31	64.53	74	9.47
2316.4	30.12	PK	58	1.5	H	31.98	62.1	74	11.9
4824.0	22.41	Ave.	74	1	V	12.4	34.81	54	19.19
4824.0	41.33	PK	74	1	V	12.4	53.73	74	20.27
375.1	55.48	QP	302	1.2	H	-11.58	43.9	76.95	33.05
9648.0	18.44	Ave.	225	1.3	H	19.29	37.73	76.95	39.22
9648.0	31.58	PK	225	1.3	H	19.29	50.87	91.15	40.28
7236.0	20.03	Ave.	136	1.1	V	16.62	36.65	76.95	40.3
7236.0	31.56	PK	136	1.1	V	16.62	48.18	91.15	42.97
Middle Channel (2437 MHz)									
2437.0	78.27	PK	38	1.3	H	33.71	111.98	/	/
2437.0	64.32	Ave.	38	1.3	H	33.71	98.03	/	/
2437.0	68.15	PK	223	1.2	V	33.31	101.46	/	/
2437.0	53.58	Ave.	223	1.2	V	33.31	86.89	/	/
2492.6	17.12	Ave.	224	1.5	H	33.71	50.83	54	3.17*
2386.7	16.12	Ave.	58	1.2	V	32.63	48.75	54	5.25
2331.5	16.53	Ave.	31	1.1	H	31.98	48.51	54	5.49
2492.6	31.71	PK	224	1.5	H	33.71	65.42	74	8.58
2386.7	30.59	PK	58	1.2	V	32.63	63.22	74	10.78
2331.5	31.12	PK	31	1.1	H	31.98	63.1	74	10.9
7311.0	17.96	Ave.	168	1.2	V	16.49	34.45	54	19.55
4874.0	39.87	PK	132	1.3	V	12.46	52.33	74	21.67
4874.0	19.58	Ave.	132	1.3	V	12.46	32.04	54	21.96
7311.0	31.69	PK	168	1.2	V	16.49	48.18	74	25.82
375.1	55.28	QP	36	1.2	H	-11.58	43.7	78.03	34.33
9748.0	19.06	Ave.	31	1.1	H	19.4	38.46	78.03	39.57
9748.0	32.44	PK	31	1.1	H	19.4	51.84	91.98	40.14

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H /V)			Limit (dBμV/m)	Margin (dB)
High Channel(2462 MHz)									
2462	76.72	PK	35	1.3	H	33.71	110.43	/	/
2462	64.51	Ave.	35	1.3	H	33.71	98.22	/	/
2462	66.86	PK	112	1.2	V	33.31	100.17	/	/
2462	52.44	Ave.	112	1.2	V	33.31	85.75	/	/
2493.7	17.03	Ave.	36	1.2	H	33.71	50.74	54	3.26*
2485.4	16.11	Ave.	47	1.3	H	33.71	49.82	54	4.18
2317.5	16.57	Ave.	35	1.1	V	31.98	48.55	54	5.45
2493.7	32.22	PK	36	1.2	H	33.71	65.93	74	8.07
2485.4	31.56	PK	47	1.3	H	33.71	65.27	74	8.73
2317.5	31.25	PK	35	1.1	V	31.98	63.23	74	10.77
7386	19.23	Ave.	235	1.3	V	15.91	35.14	54	18.86
4924	22.31	Ave.	115	1.1	V	12.5	34.81	54	19.19
4924	40.69	PK	115	1.1	V	12.5	53.19	74	20.81
7386	31.73	PK	235	1.3	V	15.91	47.64	74	26.36
375.1	55.68	QP	187	1.2	H	-11.58	44.1	78.22	34.12
9848	32.47	PK	168	1.2	V	19.39	51.86	90.43	38.57
9848	19.58	Ave.	168	1.2	V	19.39	38.97	78.22	39.25

802.11n-HT40 mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel(2422 MHz)									
2422.0	74.83	PK	35	1.2	H	32.63	107.46	/	/
2422.0	58.27	Ave.	35	1.2	H	32.63	90.9	/	/
2422.0	66.38	PK	115	1.3	V	32.63	99.01	/	/
2422.0	48.87	Ave.	115	1.3	V	32.63	81.5	/	/
2388.4	39.09	PK	57	1.5	H	32.63	71.72	74	2.28*
2388.4	18.92	Ave.	57	1.5	H	32.63	51.55	54	2.45*
2491.2	16.88	Ave.	89	1.3	H	33.71	50.59	54	3.41*
2316.3	17.03	Ave.	136	1.1	H	31.98	49.01	54	4.99
2491.2	31.58	PK	89	1.3	H	33.71	65.29	74	8.71
2316.3	30.01	PK	136	1.1	H	31.98	61.99	74	12.01
7266.0	21.24	Ave.	314	1.1	V	16.62	37.86	54	16.14
7266.0	36.33	PK	314	1.1	V	16.62	52.95	74	21.05
4844.0	20.13	Ave.	335	1.2	V	12.4	32.53	54	21.47
4844.0	36.58	PK	335	1.2	V	12.4	48.98	74	25.02
375.1	55.98	QP	156	1.2	H	-11.58	44.4	70.9	26.5
9688.0	19.32	Ave.	227	1.5	H	19.29	38.61	70.9	32.29
9688.0	32.48	PK	227	1.5	H	19.29	51.77	87.46	35.69
Middle Channel(2437 MHz)									
2437	75.42	PK	56	1.3	H	33.71	109.13	/	/
2437	57.32	Ave.	56	1.3	H	33.71	91.03	/	/
2437	65.97	PK	134	1.2	V	33.31	99.28	/	/
2437	47.12	Ave.	134	1.2	V	33.31	80.43	/	/
2493.5	17.32	Ave.	118	1.1	H	33.71	51.03	54	2.97*
2319.3	17.21	Ave.	116	1.1	H	31.98	49.19	54	4.81
2493.5	35.44	PK	118	1.1	H	33.71	69.15	74	4.85
2384.1	15.63	Ave.	56	1.5	H	32.63	48.26	54	5.74
2319.3	31.11	PK	116	1.1	H	31.98	63.09	74	10.91
2384.1	30.13	PK	56	1.5	H	32.63	62.76	74	11.24
7311	19.86	Ave.	53	1.3	V	16.49	36.35	54	17.65
4874	22.36	Ave.	97	1.2	V	12.46	34.82	54	19.18
7311	35.44	PK	53	1.3	V	16.49	51.93	74	22.07
4874	38.49	PK	97	1.2	V	12.46	50.95	74	23.05
375.1	55.68	QP	214	1.2	H	-11.58	44.1	71.03	26.93
9748	21.36	Ave.	226	1.1	H	19.4	40.76	71.03	30.27
9748	36.85	PK	226	1.1	H	19.4	56.25	89.13	32.88

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/15.205/15.209	
	Reading (dBμV/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H /V)			Limit (dBμV/m)	Margin (dB)
High Channel(2452 MHz)									
2452	73.73	PK	56	1.3	H	33.71	107.44	/	/
2452	55.8	Ave.	56	1.3	H	33.71	89.51	/	/
2452	64.08	PK	225	1.5	V	33.31	97.39	/	/
2452	46.47	Ave.	225	1.5	V	33.31	79.78	/	/
2388.1	18.69	Ave.	231	1.1	H	32.63	51.32	54	2.68*
2491.3	17.11	Ave.	147	1.1	H	33.71	50.82	54	3.18*
2322.2	16.89	Ave.	136	1.2	H	31.98	48.87	54	5.13
2491.3	34.25	PK	147	1.1	H	33.71	67.96	74	6.04
2388.1	31.58	PK	231	1.1	H	32.63	64.21	74	9.79
2322.2	30.56	PK	136	1.2	H	31.98	62.54	74	11.46
7356	23.56	Ave.	69	1.2	H	15.91	39.47	54	14.53
4904	24.13	Ave.	32	1.3	V	12.46	36.59	54	17.41
7356	40.03	PK	69	1.2	H	15.91	55.94	74	18.06
4904	40.12	PK	32	1.3	V	12.46	52.58	74	21.42
375.1	55.58	QP	28	1.2	H	-11.58	44	69.51	29.51
9808	37.69	PK	79	1.1	H	19.29	56.98	87.44	30.46
9808	18.37	Ave.	79	1.1	H	19.29	37.66	69.51	31.85

Note: Corrected Amplitude = Receiver Reading + Cable loss + Antenna Factor – Amplifier Gain

Margin = Limit- Corrected Amplitude

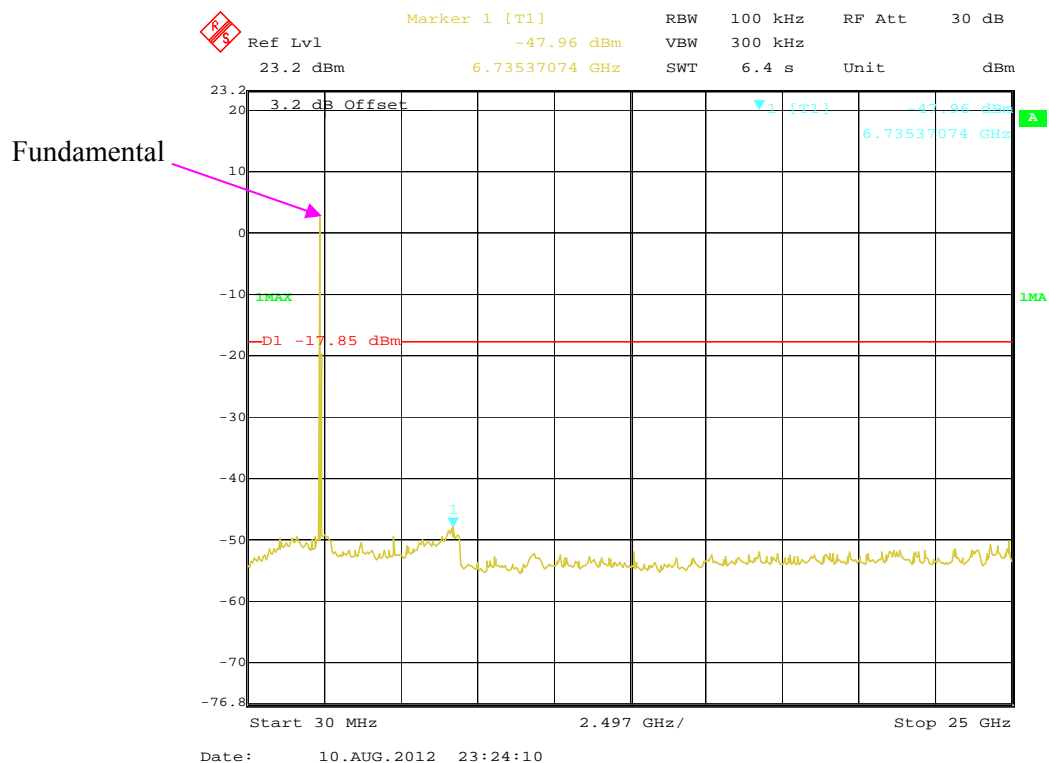
*Within measurement uncertainty.

Antenna Port Conducted Spurious Emissions:

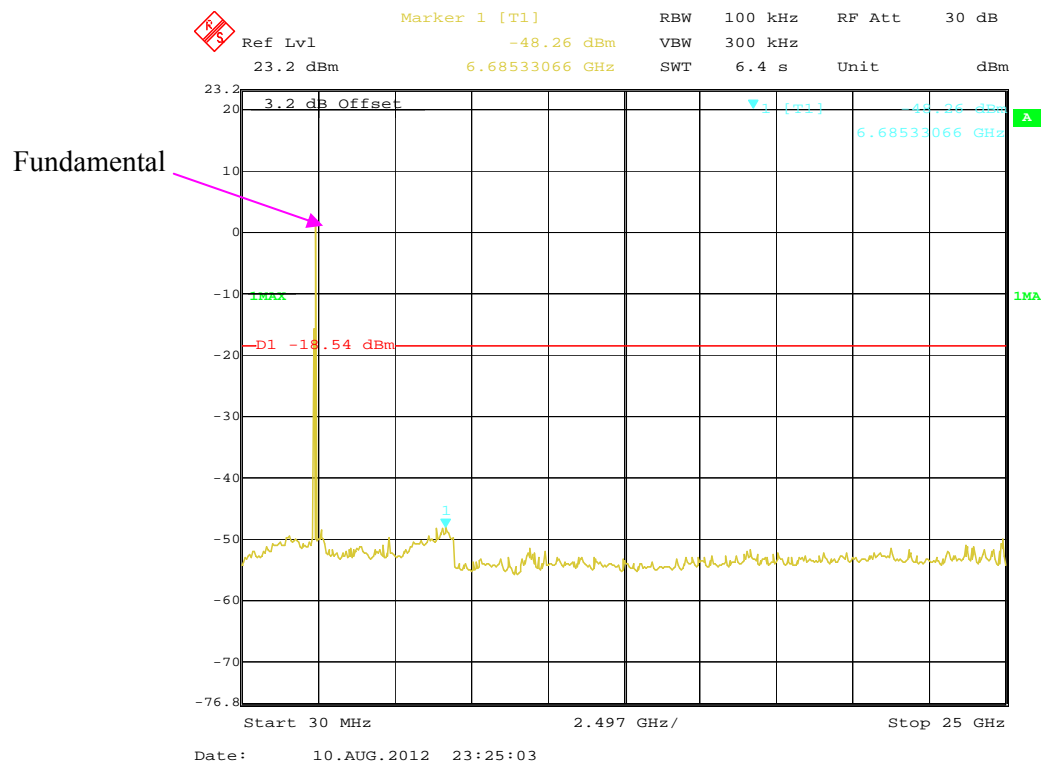
Channel	Power spectral density (dBm/100kHz)	Antenna port	Spurious Emission (Max) (dBm)	Delta Value (dBc)	Delta Limit (dBc)	Result
802.11b mode						
Low	3.01	0	-47.96	50.11	20	Pass
Low	3.28	1	-47.13	50.04	20	Pass
Middle	3.15	0	-48.26	49.72	20	Pass
Middle	3.83	1	-47.23	50.85	20	Pass
High	3.05	0	-47.93	49.85	20	Pass
High	3.02	1	-47.23	50.05	20	Pass
802.11g mode						
Low	-3.73	0	-48.66	44.18	20	Pass
Low	-4.29	1	-48.00	43.00	20	Pass
Middle	-4.23	0	-47.61	43.37	20	Pass
Middle	-4.11	1	-46.88	42.77	20	Pass
High	-4.13	0	-48.08	43.81	20	Pass
High	-4.26	1	-47.06	42.66	20	Pass
802.11n-HT20 mode						
Low	-2.36	0	-48.25	52.51	20	Pass
Low	-3.78	1	-46.69	56.47	20	Pass
Middle	-3.69	0	-47.93	53.71	20	Pass
Middle	-4.42	1	-47.44	56.56	20	Pass
High	-4.13	0	-48.60	53.46	20	Pass
High	-4.65	1	-47.77	56.41	20	Pass
802.11n-HT40 mode						
Low	-6.01	0	-47.93	41.77	20	Pass
Low	-5.13	1	-47.88	41.46	20	Pass
Middle	-7.47	0	-47.74	40.92	20	Pass
Middle	-5.28	1	-47.64	41.31	20	Pass
High	-6.66	0	-48.19	41.64	20	Pass
High	-5.80	1	-47.44	40.55	20	Pass

Channel	Power spectral density (dBm/100kHz)	Spurious Emission Max(sum) (dBm)	Delta Value (dBc)	Delta Limit (dBc)	Result
802.11n-HT20 mode(ANT1+ANT2)(with measure and sum the spectra technique)					
Low	-2.36	-44.54	42.18	20	Pass
Middle	-3.69	-44.67	40.98	20	Pass
High	-4.13	-45.16	41.03	20	Pass
802.11n-HT40 mode(ANT1+ANT2) (with measure and sum the spectra technique)					
Low	-5.13	-44.90	39.77	20	Pass
Middle	-5.28	-44.66	39.38	20	Pass
High	-5.80	-44.79	38.99	20	Pass

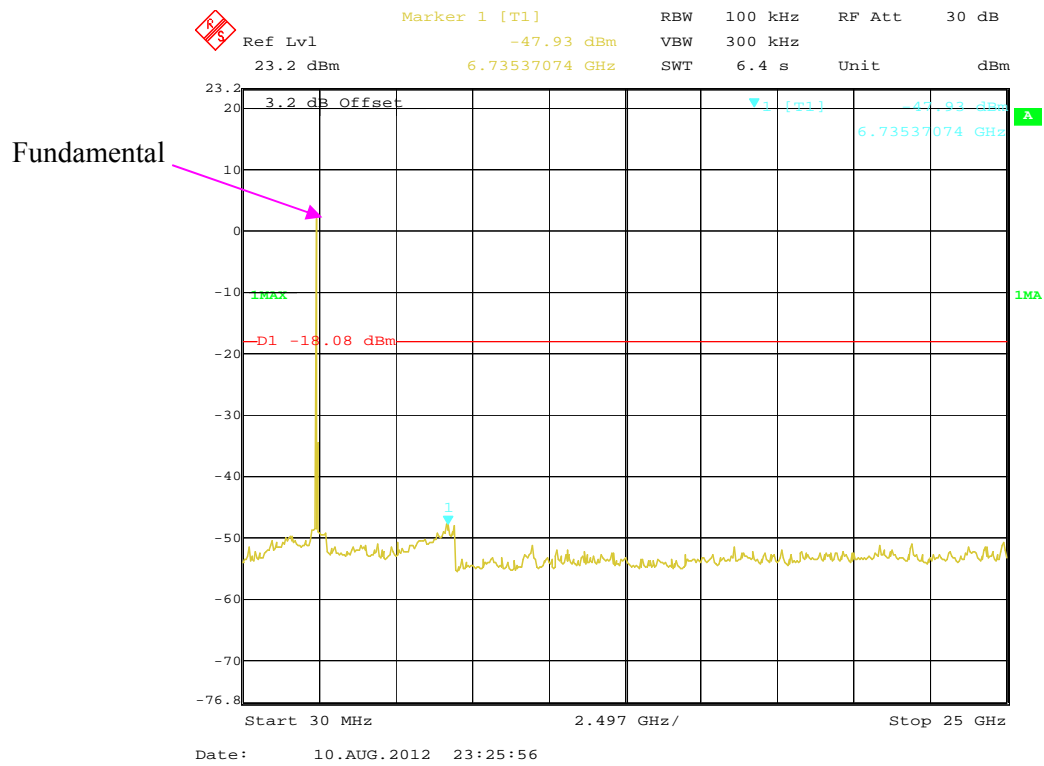
802.11b Low Channel, Antenna 0



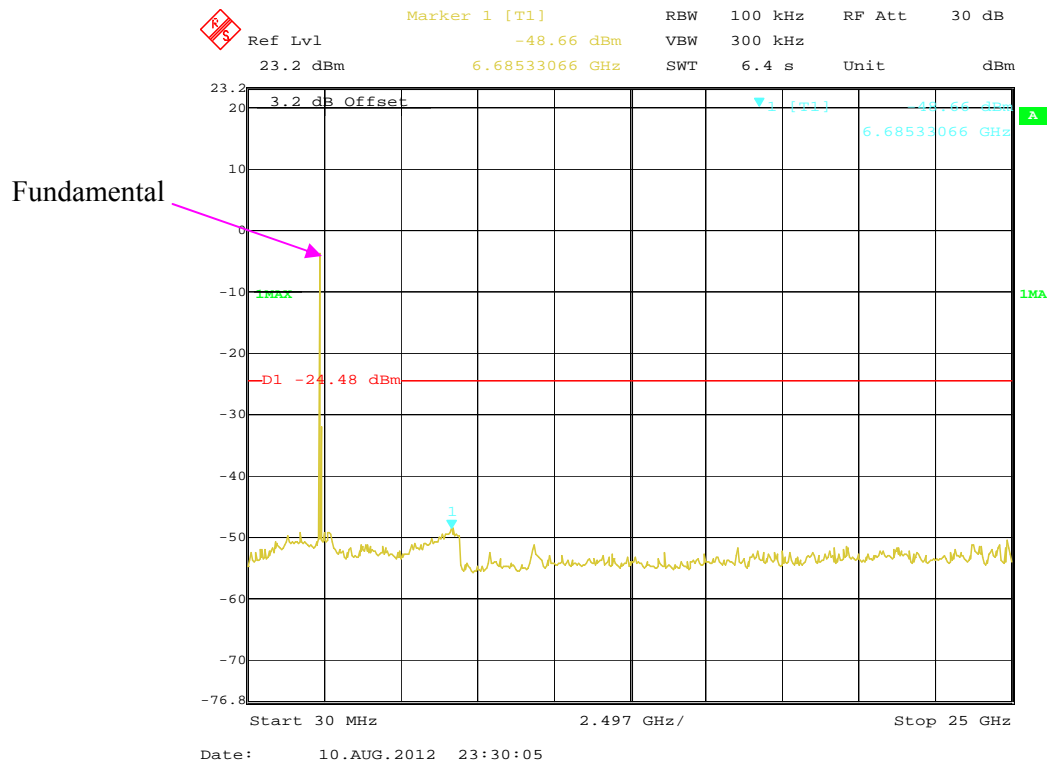
802.11b Middle Channel, Antenna 0



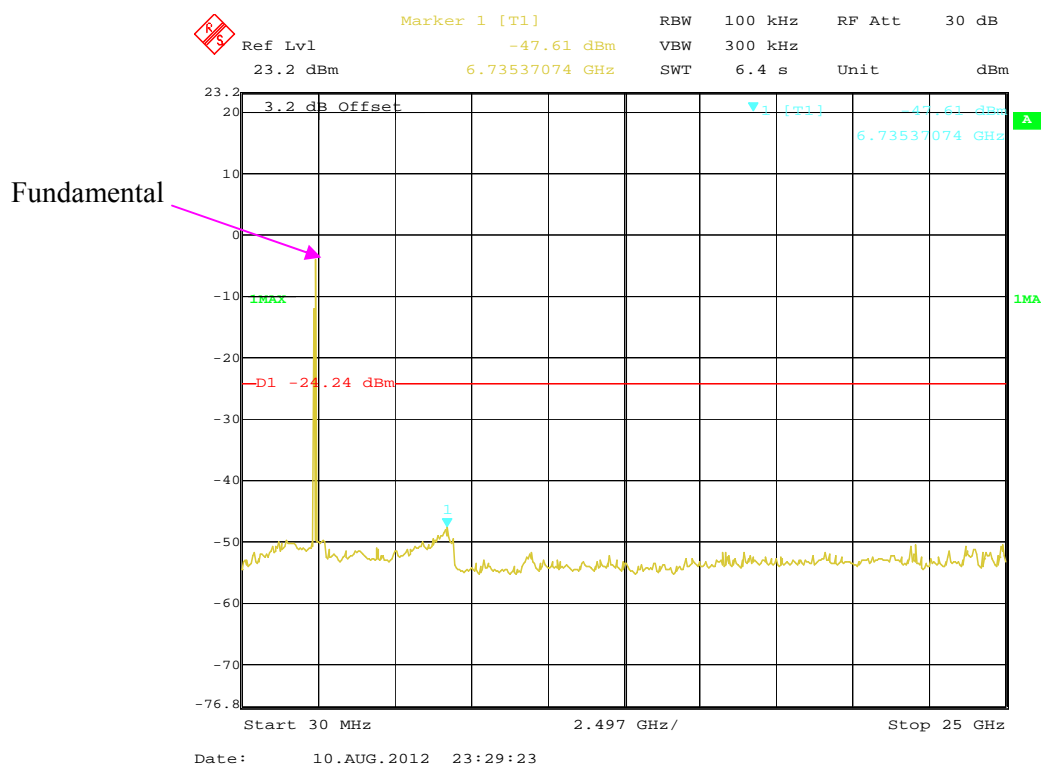
802.11b High Channel, Antenna 0



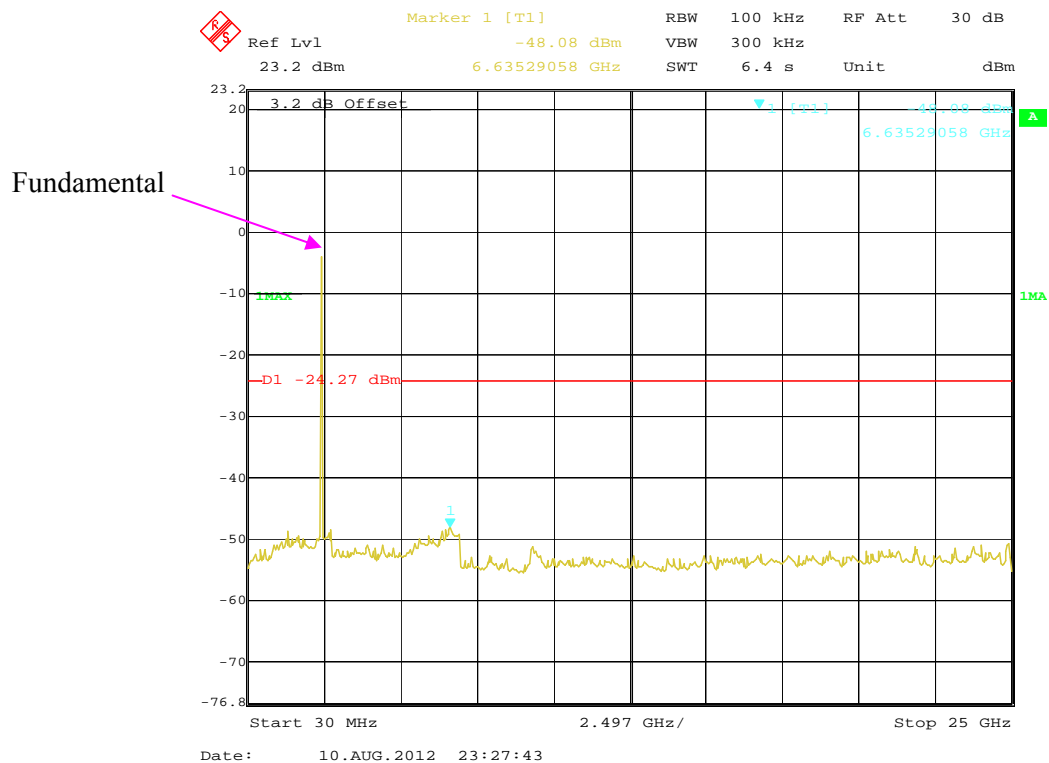
802.11g Low Channel, Antenna 0



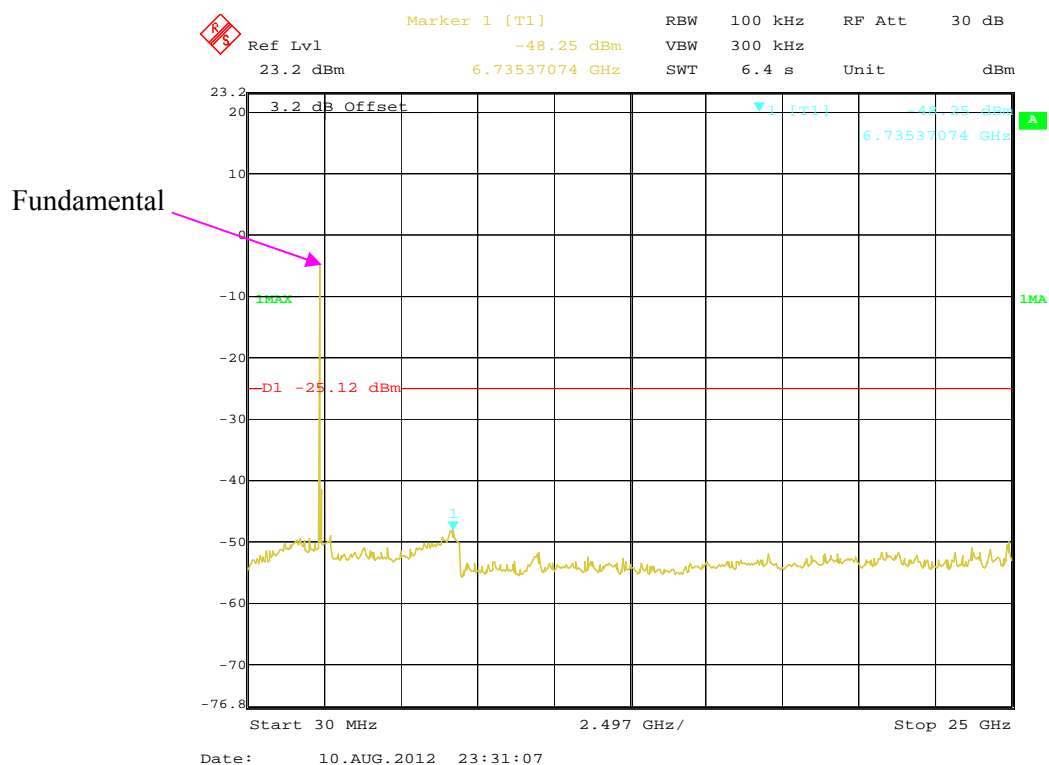
802.11g Middle Channel, Antenna 0



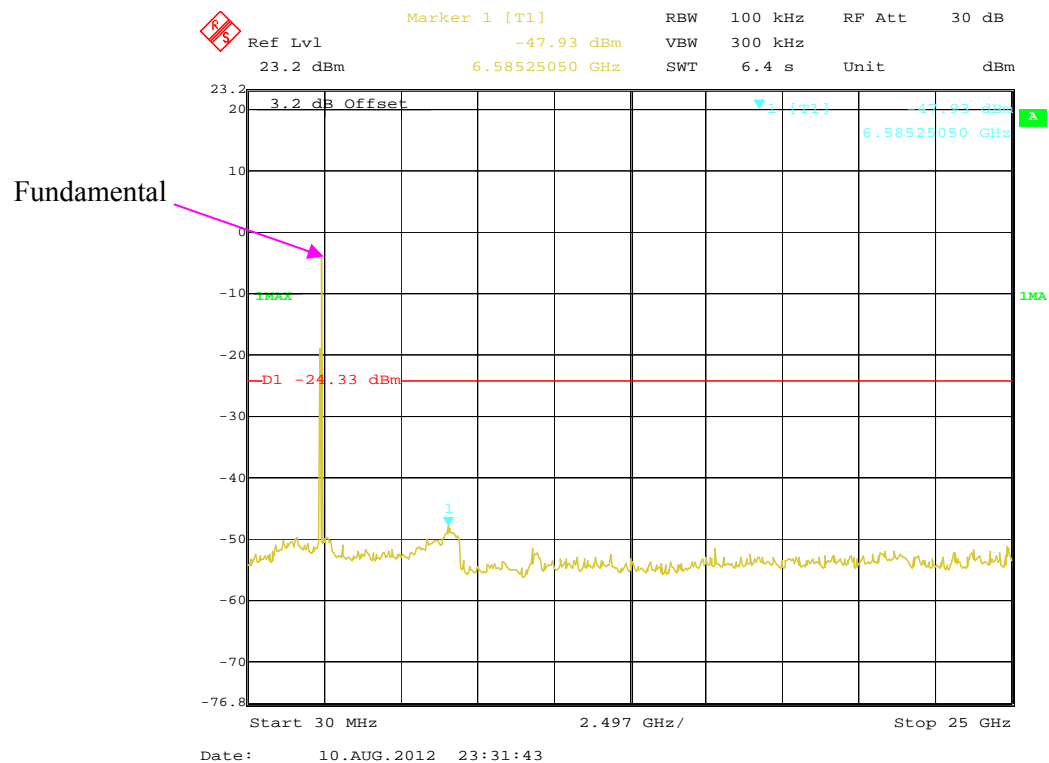
802.11g High Channel, Antenna 0



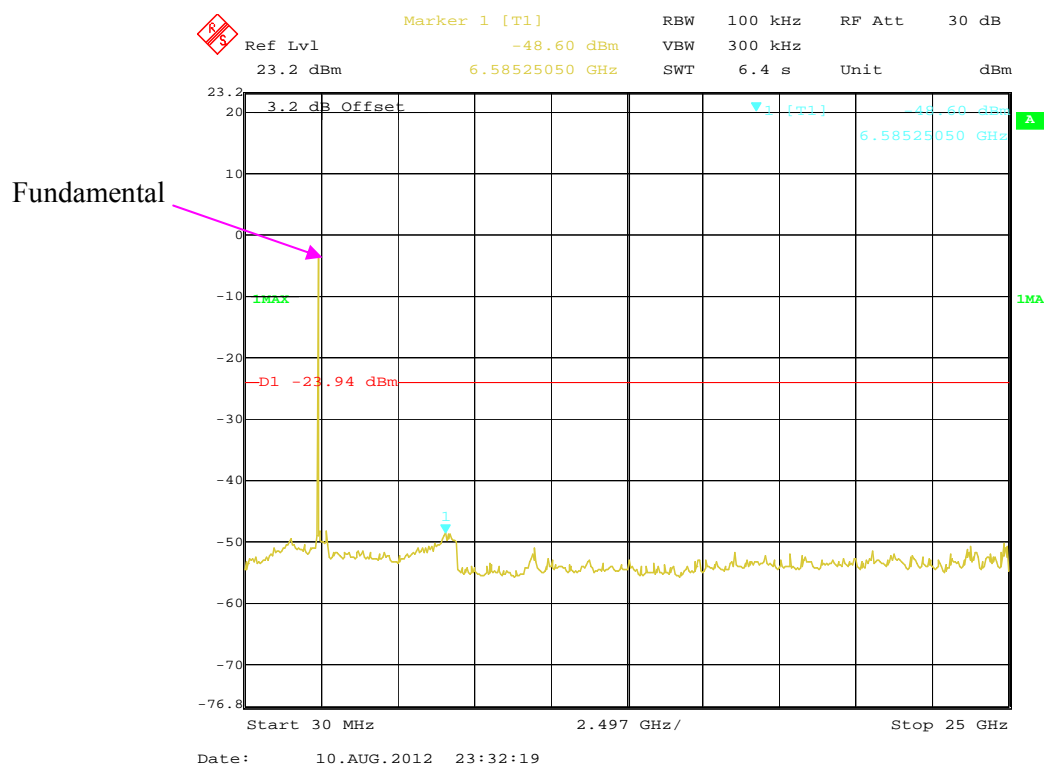
802.11n-HT20 Low Channel, Antenna 0



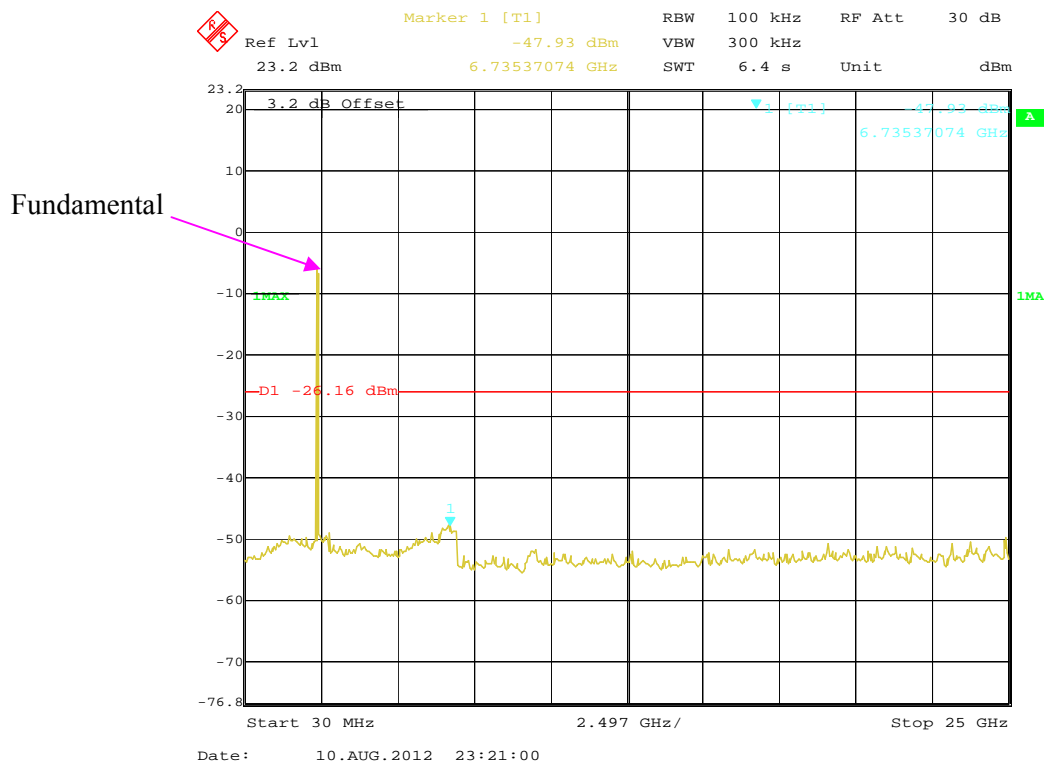
802.11n-HT20 Middle Channel, Antenna 0



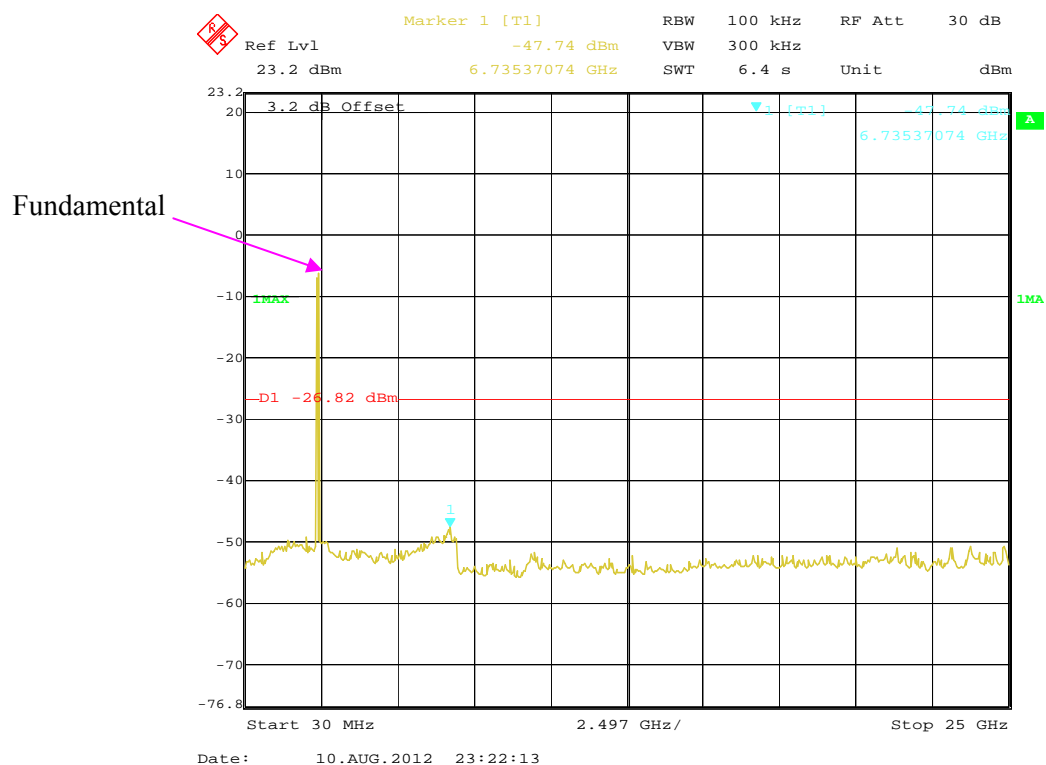
802.11n-HT20 High Channel, Antenna 0



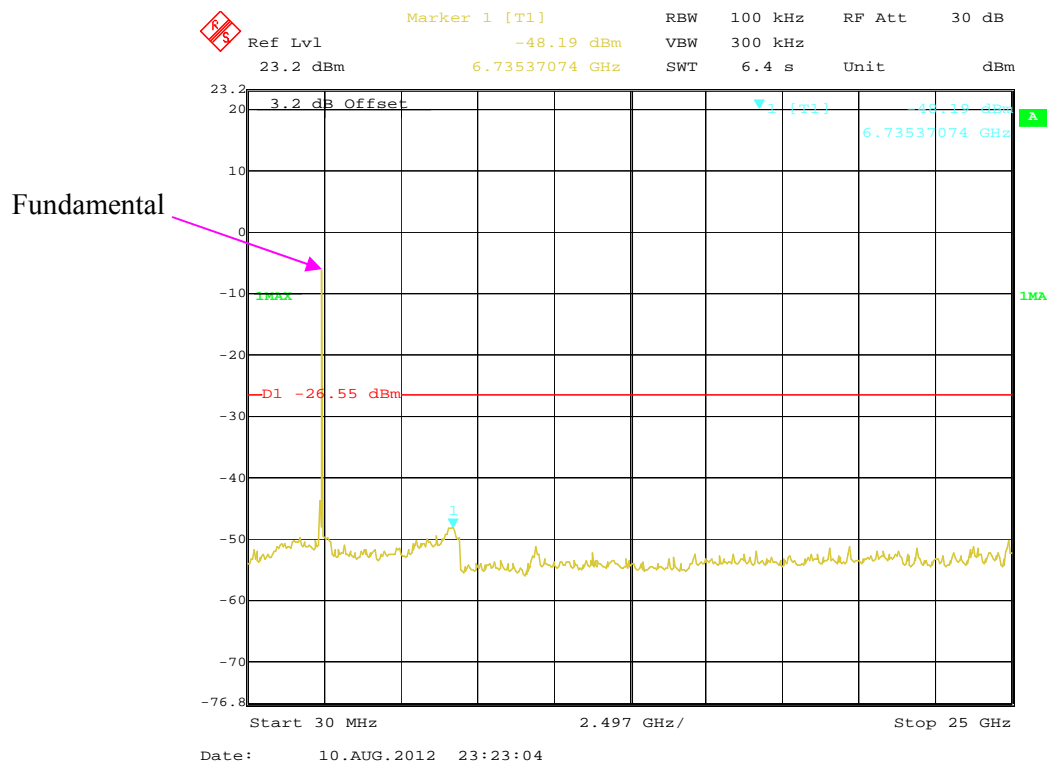
802.11n-HT40 Low Channel, Antenna 0



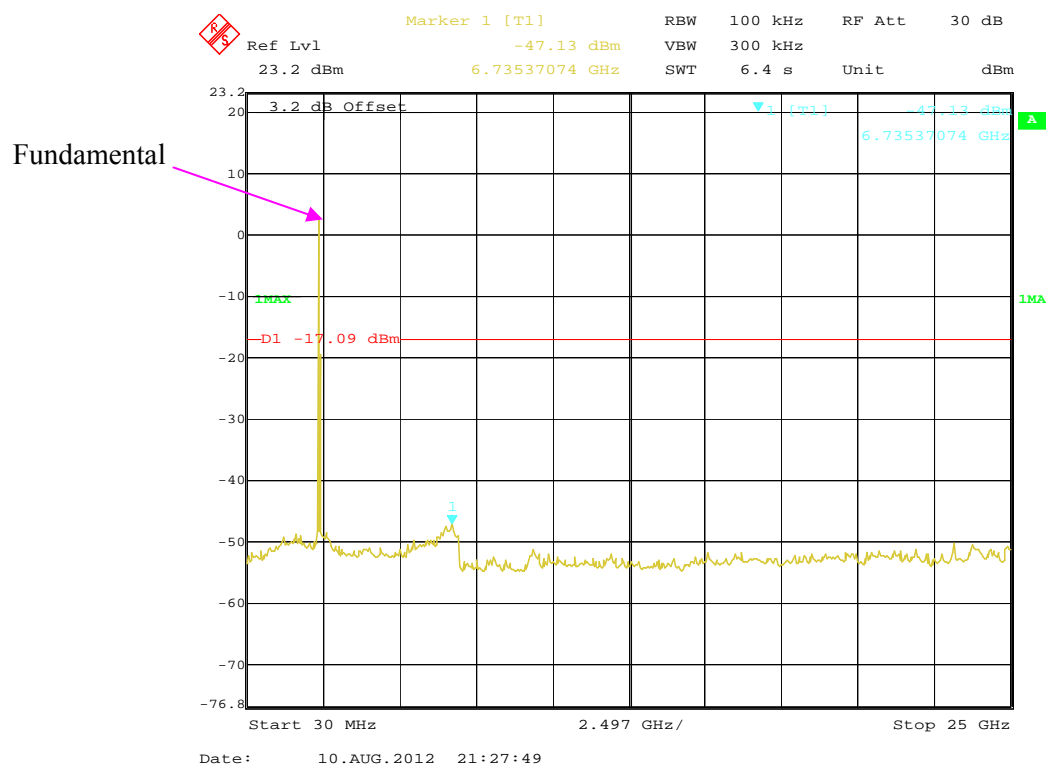
802.11n-HT40 Middle Channel, Antenna 0



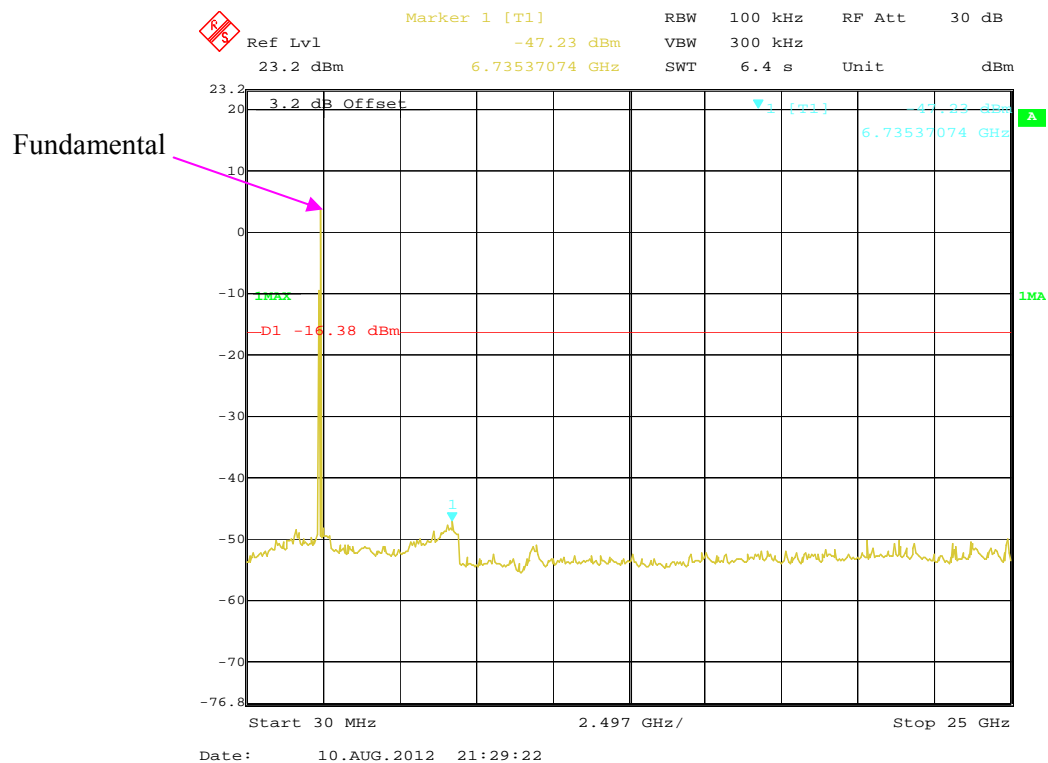
802.11n-HT40 High Channel, Antenna 0



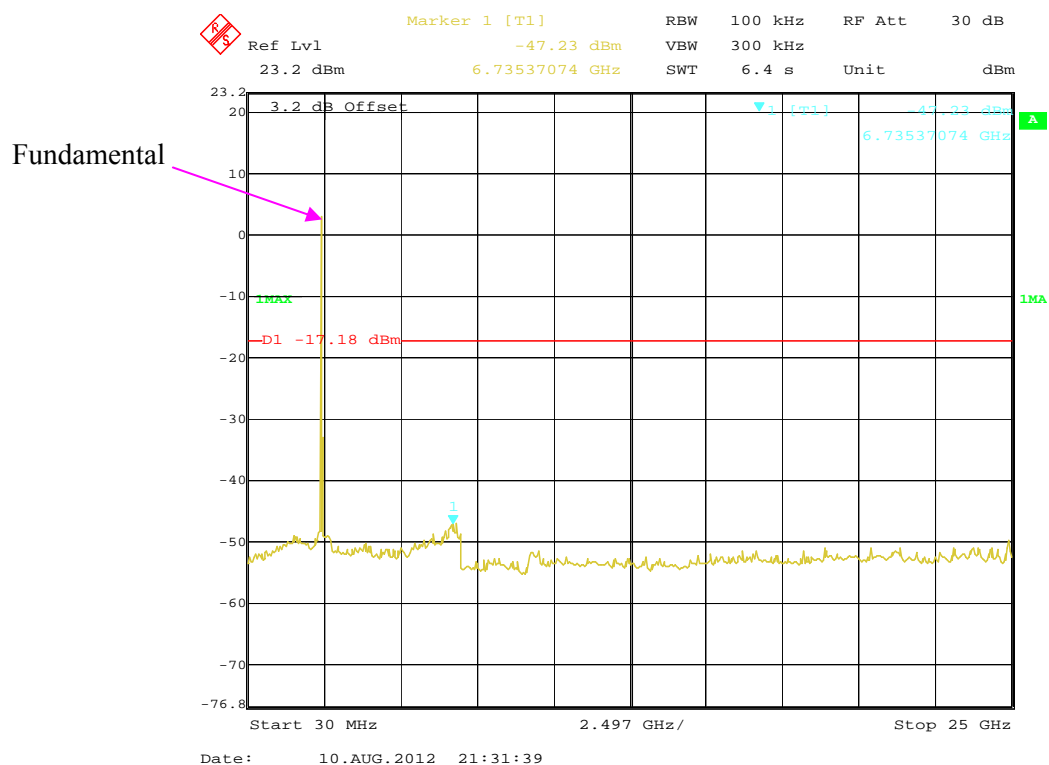
802.11b Low Channel, Antenna 1



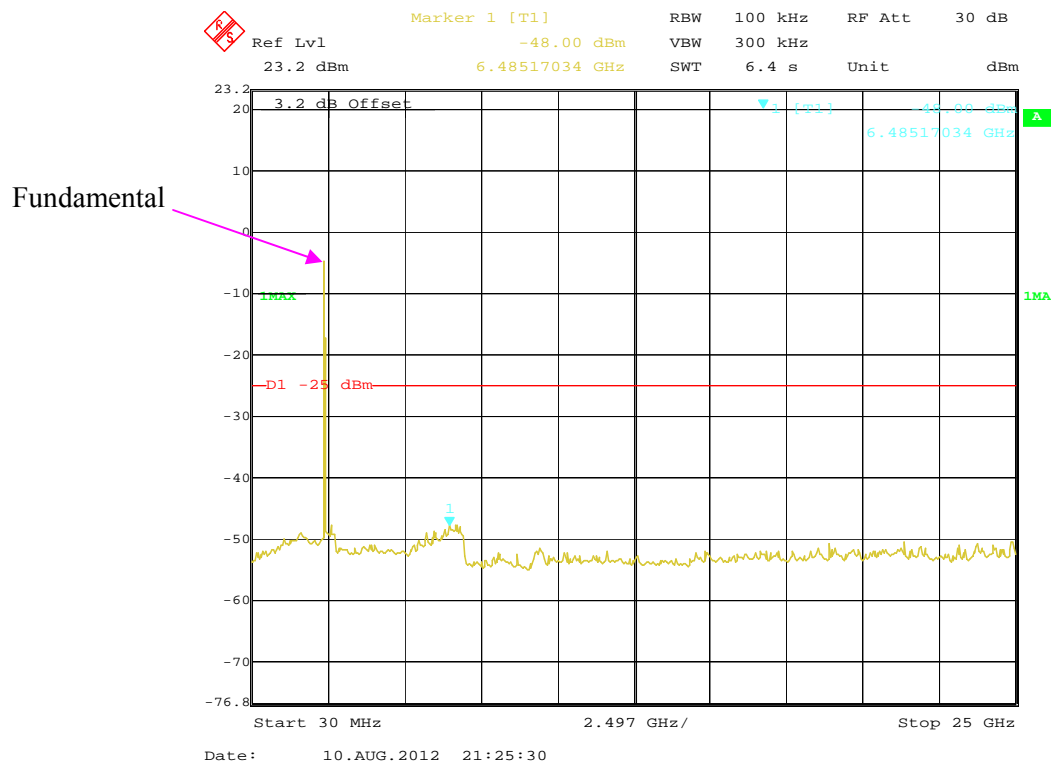
802.11b Middle Channel, Antenna 1

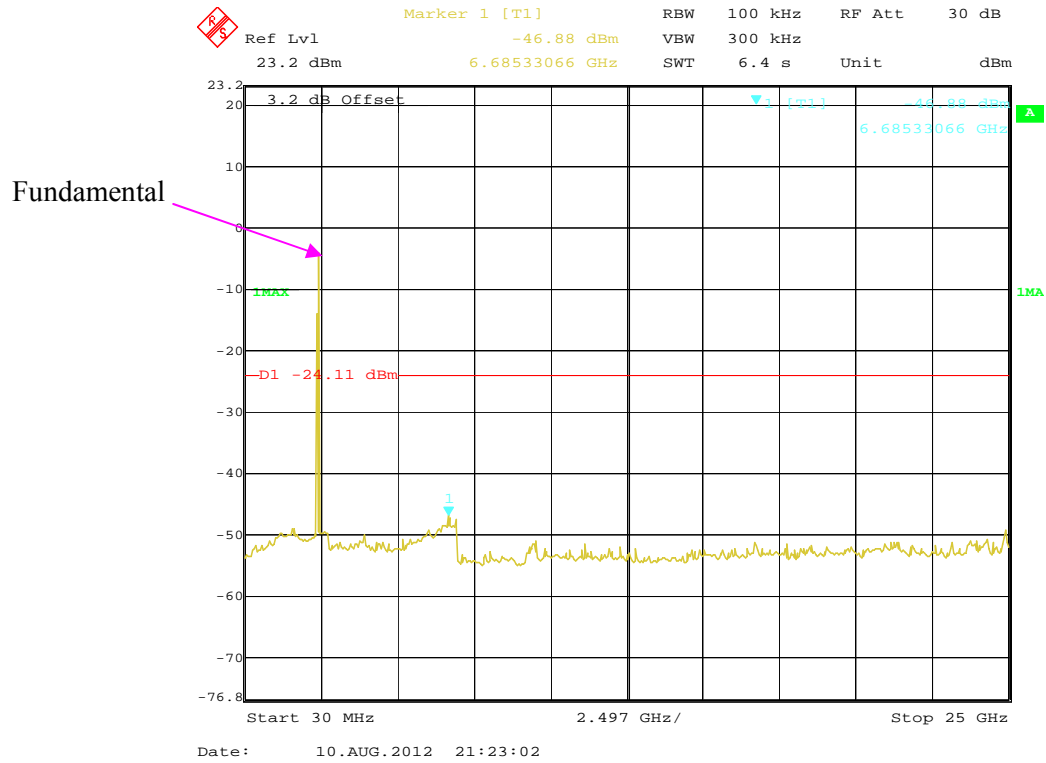
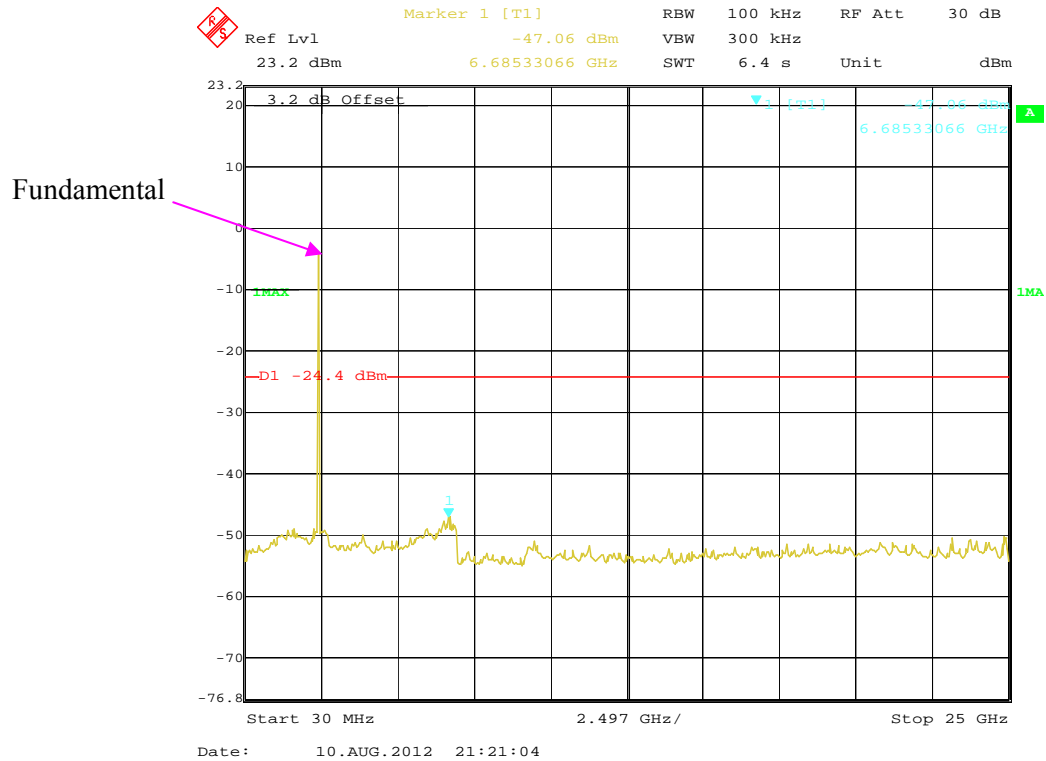


802.11b High Channel, Antenna 1

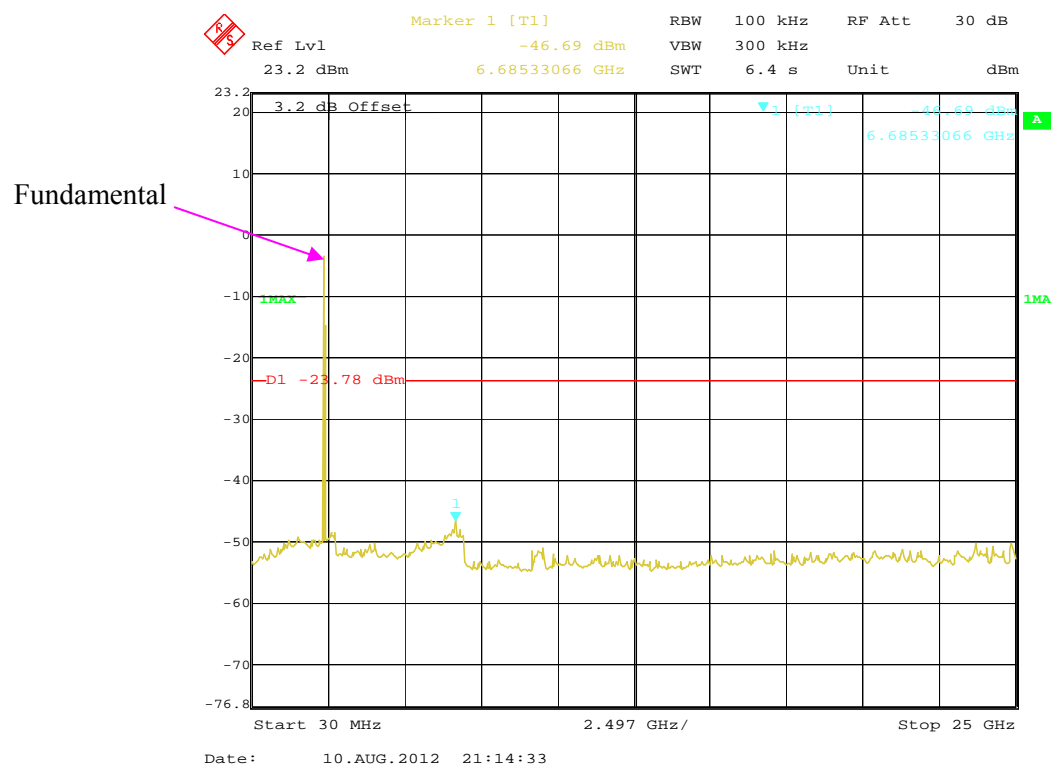


802.11g Low Channel, Antenna 1

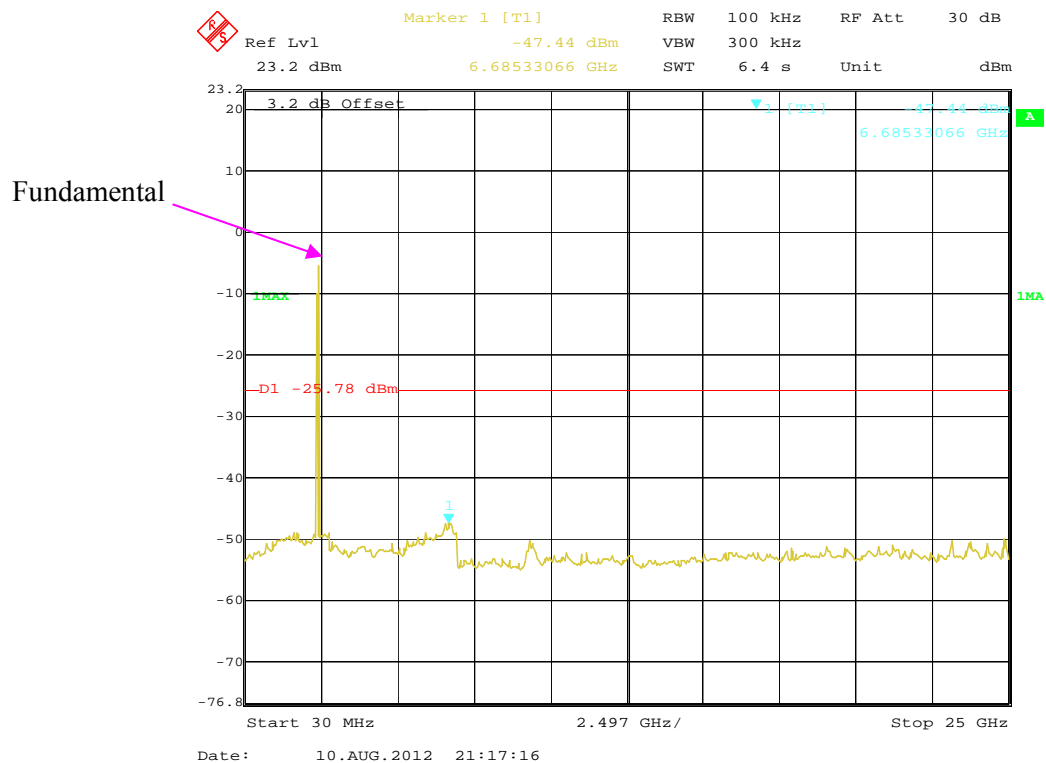


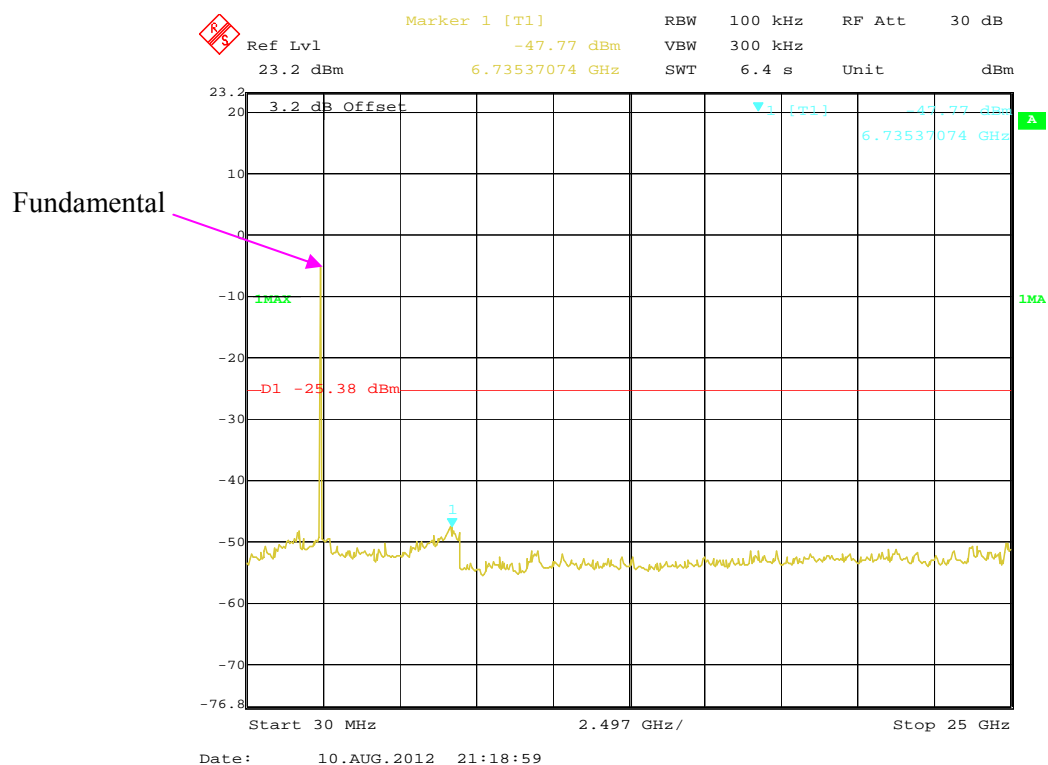
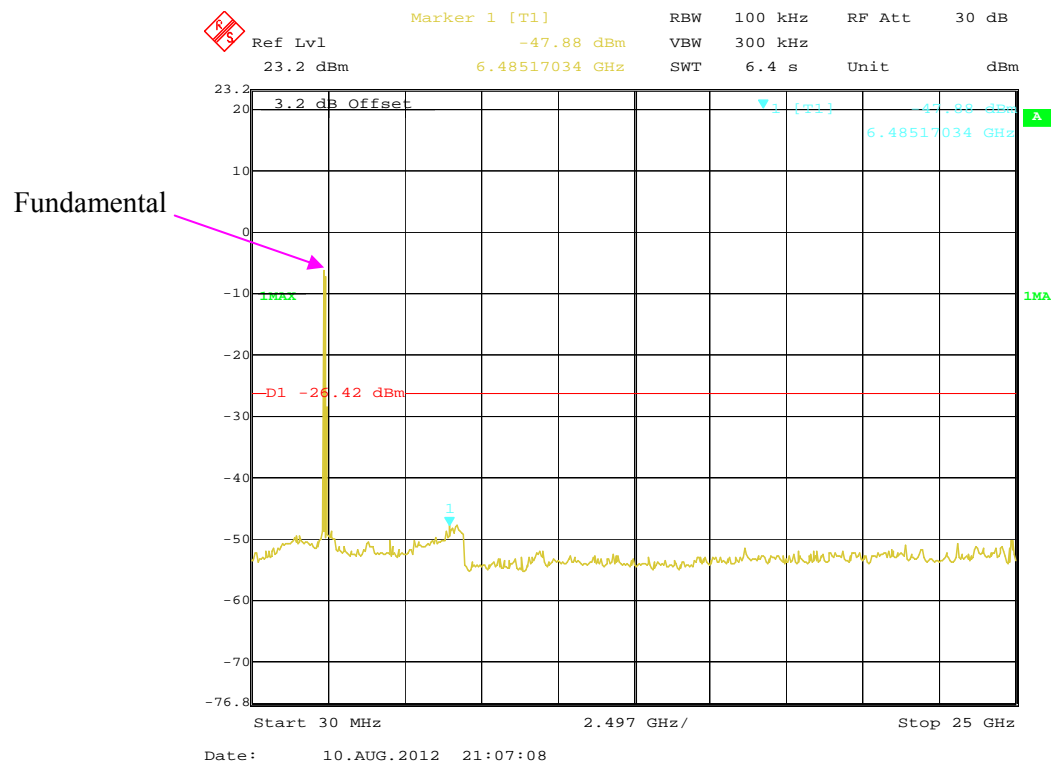
802.11g Middle Channel, Antenna 1**802.11g High Channel, Antenna 1**

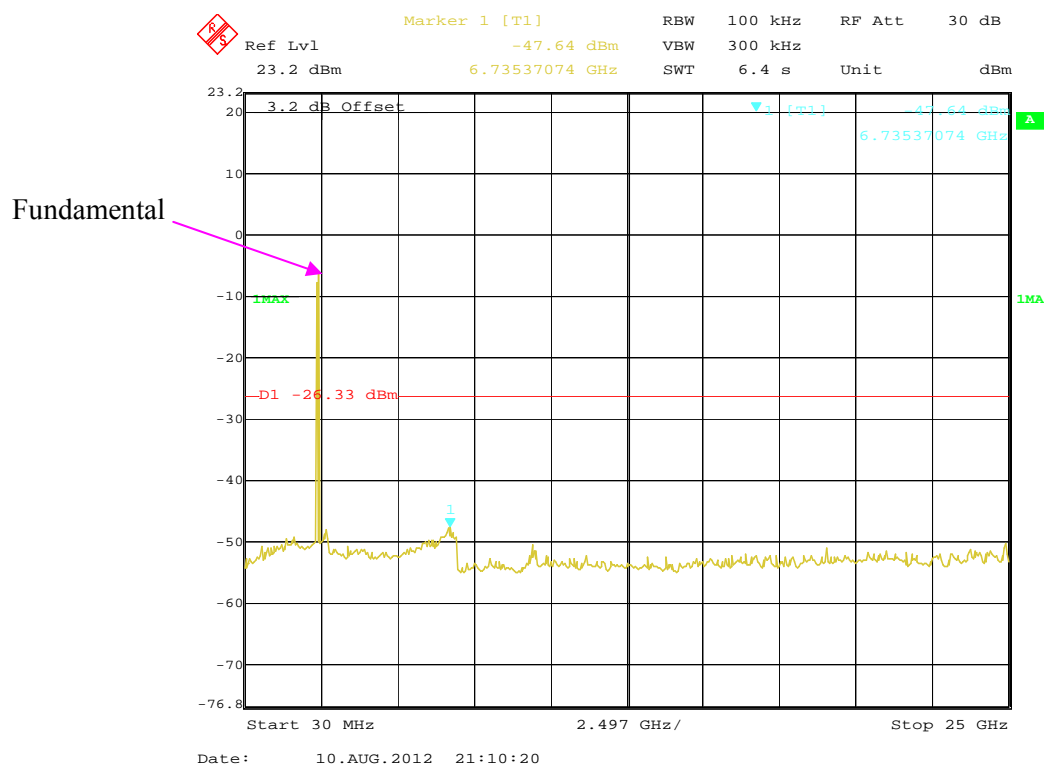
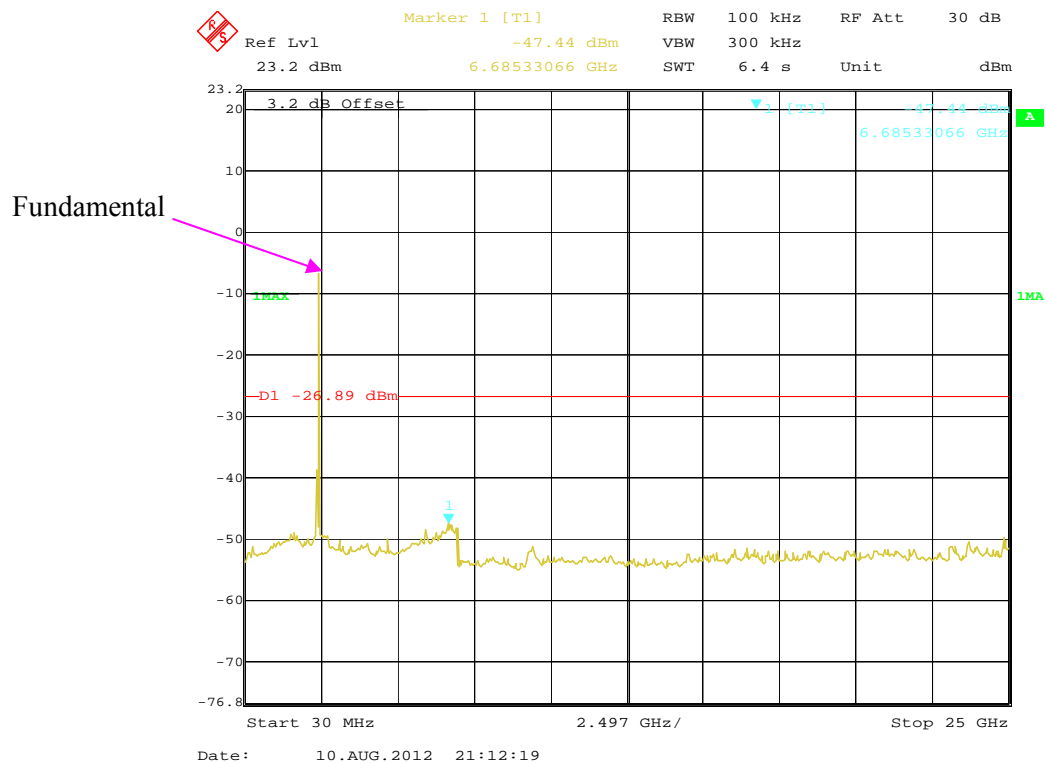
802.11n-HT20 Low Channel, Antenna 1



802.11n-HT20 Middle Channel, Antenna 1



802.11n-HT20 High Channel, Antenna 1**802.11n-HT40 Low Channel, Antenna 1**

802.11n-HT40 Middle Channel, Antenna 1**802.11n-HT40 High Channel, Antenna 1**

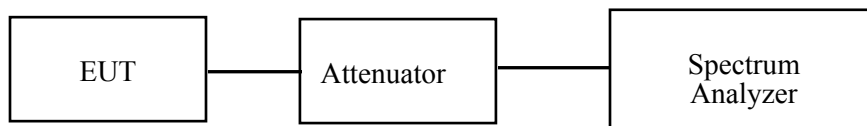
FCC §15.247(a) (2) – 6 dB BANDWIDTH TESTING

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 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23

* **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 Data

Environmental Conditions

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

The testing was performed by Brown Lu on 2012-08-10 and 2012-08-12.

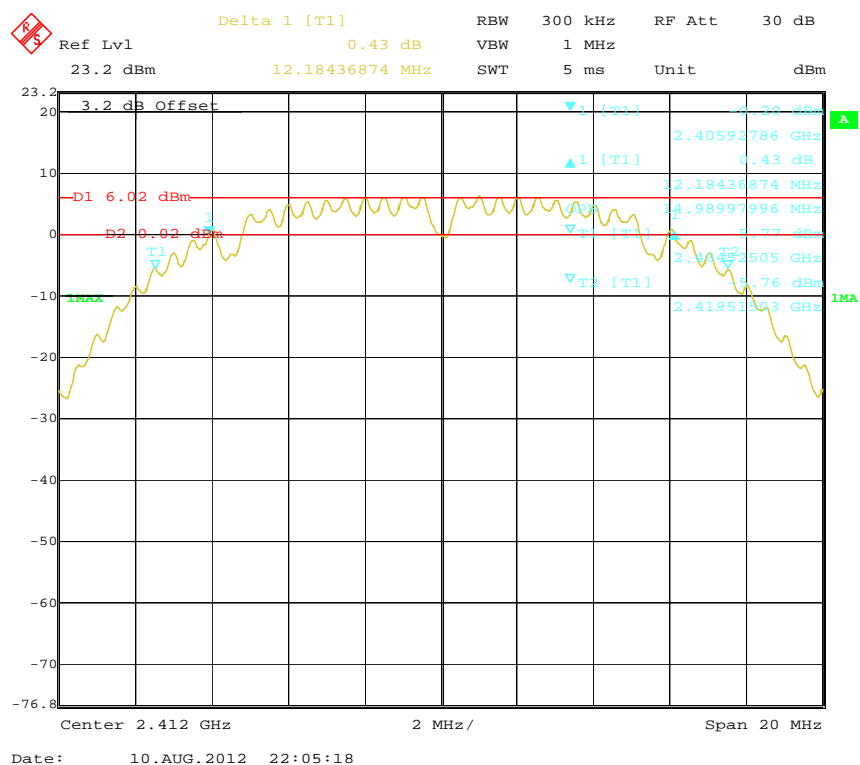
Test Mode: Transmitting

Test Result: Pass.

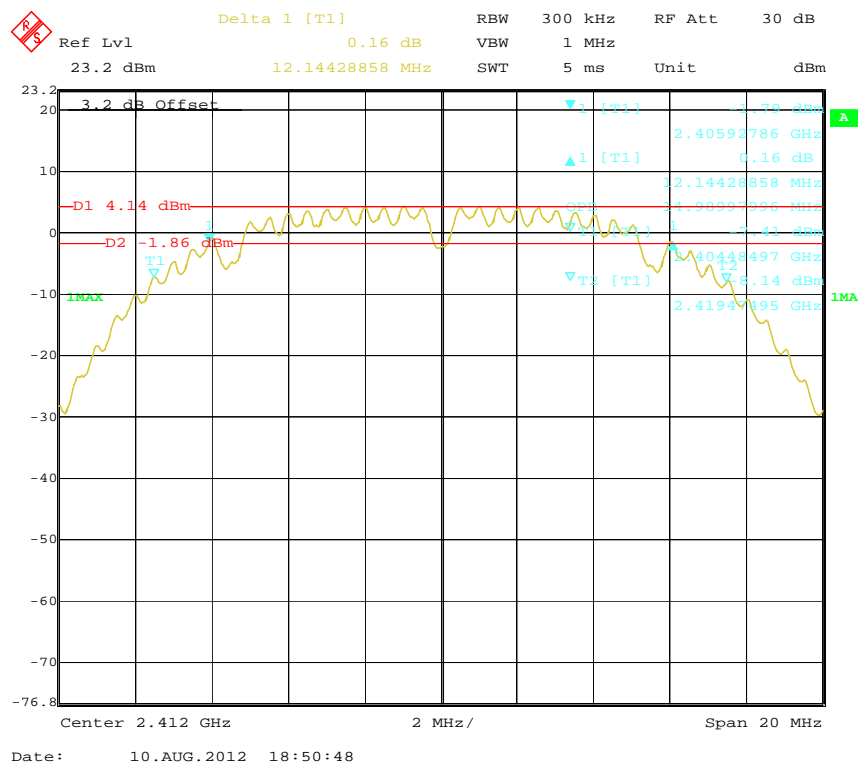
Please refer to the following tables and plots.

Channel	Frequency (MHz)	6dB bandwidth (MHz)		Limit (kHz)	Result
		Antenna port 0	Antenna port 1		
802.11b mode					
Low	2412	12.19	12.15	≥500	Pass
Middle	2437	12.19	12.15	≥500	Pass
High	2462	12.19	12.15	≥500	Pass
802.11g mode					
Low	2412	16.28	16.28	≥500	Pass
Middle	2437	16.28	16.28	≥500	Pass
High	2462	16.28	16.28	≥500	Pass
802.11n-HT20 mode					
Low	2412	16.95	16.84	≥500	Pass
Middle	2437	16.95	16.84	≥500	Pass
High	2462	16.95	16.84	≥500	Pass
802.11n-HT40 mode					
Low	2422	35.27	35.35	≥500	Pass
Middle	2437	35.27	35.35	≥500	Pass
High	2452	35.27	35.35	≥500	Pass

802.11b Low Channel, Antenna 0



802.11b Low Channel, Antenna 1



Delta 1 [T1] 0.05 dB

Ref Lvl 23.2 dBm

RBW 300 kHz

VBW 1 MHz

RF Att 30 dB

12.18436874 MHz

SWT 5 ms

Unit dBm

3.2 dB Offset

D1 6.05 dBm

D2 0.05 dBm

T1 [T1]

T2 [T1]

1MAX

1MA

Center 2.437 GHz

2 MHz/

Span 20 MHz

Date: 10.AUG.2012 22:06:19

Ref Lvl 23.2 dBm Delta 1 [T1] -0.04 dB RBW 300 kHz RF Att 30 dB

23.2 dBm 12.14428858 MHz SWT 5 ms Unit dBm

3.2 dB Offset

D1 3.93 dBm D2 -2.07 dBm

1MAX

1 [T1] 2.43092786 GHz -0.04 dB

2.14428858 MHz 1.93997786 MHz

2.44444495 GHz 2.44444495 GHz

Center 2.437 GHz 2 MHz/ Span 20 MHz

Date: 10.AUG.2012 18:49:09

Delta 1 [T1] -0.12 dB

RBW 300 kHz RF Att 30 dB

Ref Lvl 23.2 dBm

12.18436874 MHz

SWT 5 ms Unit dBm

3.2 dB Offset

D1 6.18 dBm

D2 0.18 dBm

T1 [T1] 2.45592786 GHz

T2 [T1] 2.4606012 MHz

T3 [T1] 2.46458497 GHz

T4 [T1] 2.46951323 GHz

Center 2.462 GHz

2 MHz/

Span 20 MHz

Date: 10.AUG.2012 22:07:23

Delta 1 [T1] 0.14 dB RBW 300 kHz RF Att 30 dB

Ref Lvl 23.2 dBm VBW 1 MHz Unit dBm

23.2

20

10

0

-10

-20

-30

-40

-50

-60

-70

-76.8

3.2 dB Offset

D1 3.88 dBm

D2 -2.12 dBm

T1

T2

2.45592786 GHz

2.14428858 MHz

2.45440497 GHz

2.46940495 GHz

2.462 GHz

2 MHz/

Span 20 MHz

Date: 10.AUG.2012 18:52:29

Delta 1 [T1] 0.52 dB
 Ref Lvl 23.2 dBm
 RBW 300 kHz
 VBW 1 MHz
 RF Att 30 dB
 Unit dBm
 SWT 5 ms
 Center 2.412 GHz
 Span 20 MHz
 Date: 10.AUG.2012 22:14:12

Delta 1 [T1] -0.46 dB

Ref Lvl 23.2 dBm

RBW 300 kHz RF Att 30 dB

VBW 1 MHz

SWT 5 ms Unit dBm

3.2 dB Offset

D1 -0.19 dBm

D2 -6.19 dBm

1MAX

1MAX

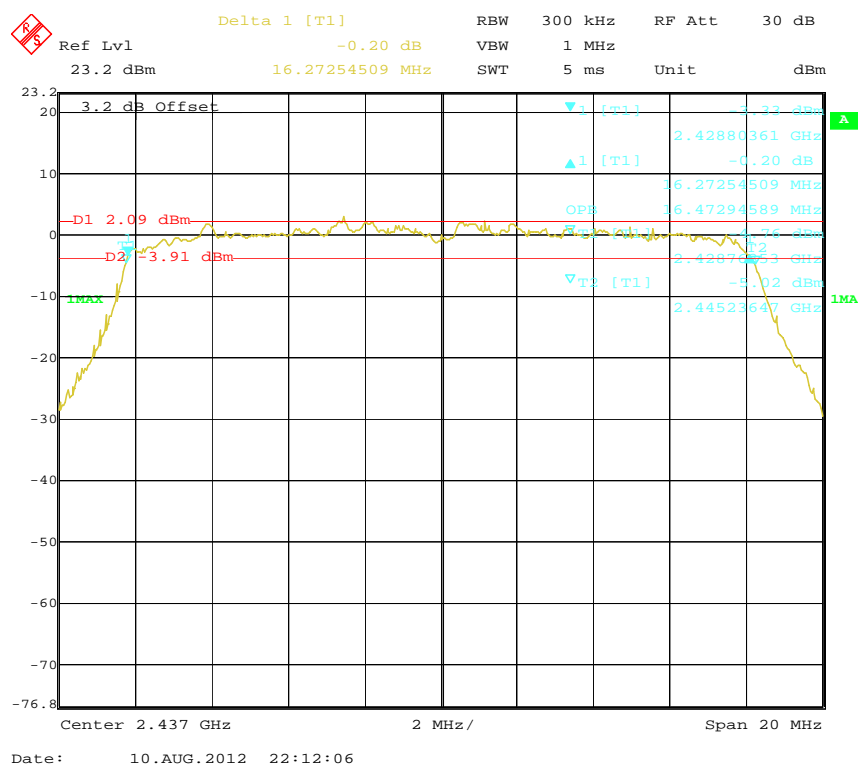
Center 2.412 GHz

2 MHz/

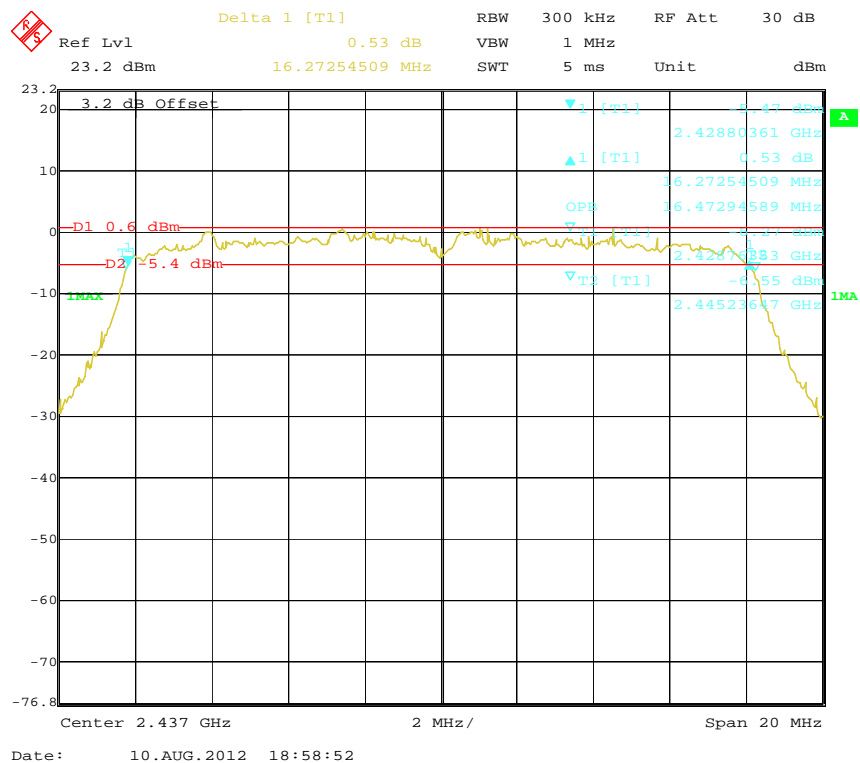
Span 20 MHz

Date: 10.AUG.2012 19:00:54

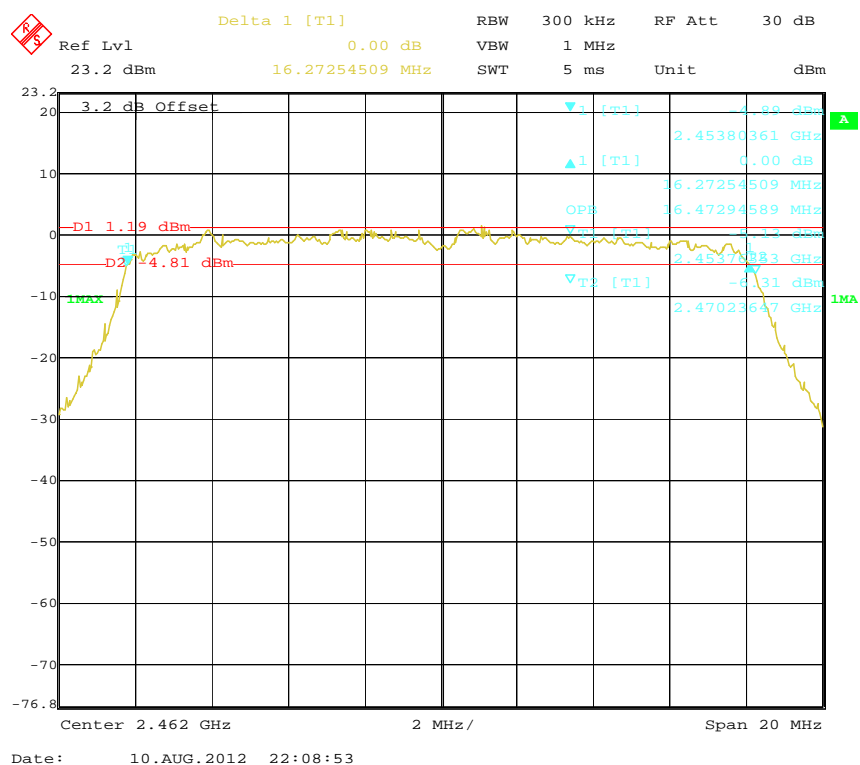
802.11g Middle Channel, Antenna 0



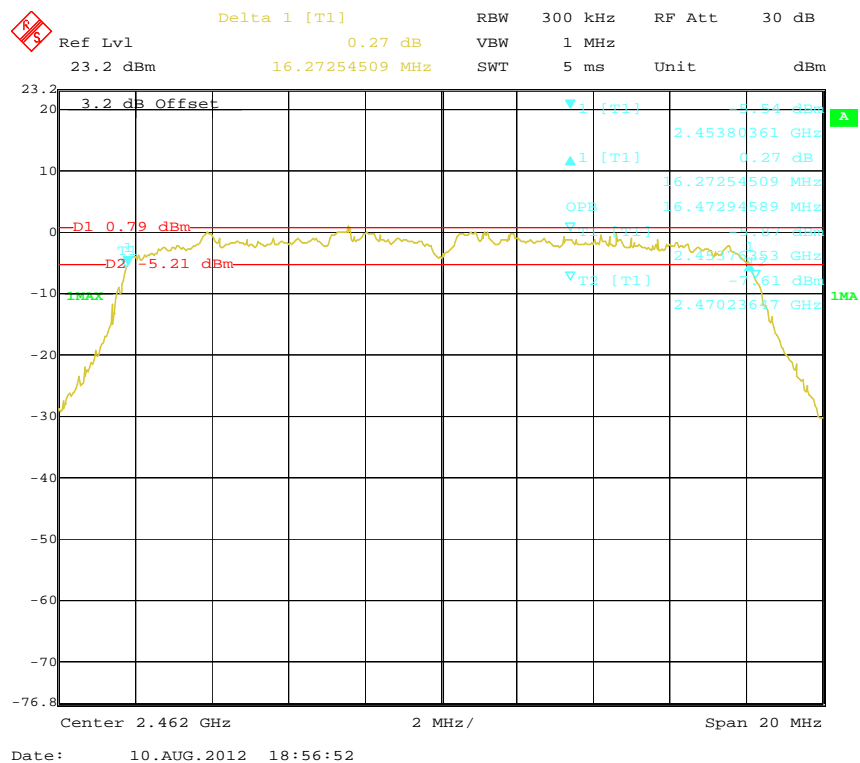
802.11g Middle Channel, Antenna 1



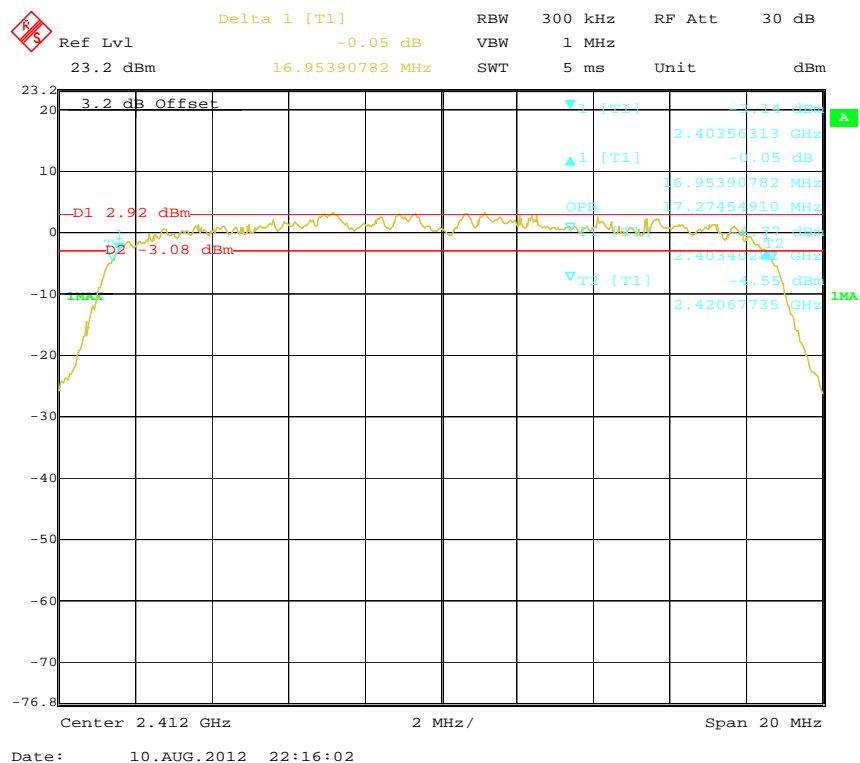
802.11g High Channel, Antenna 0



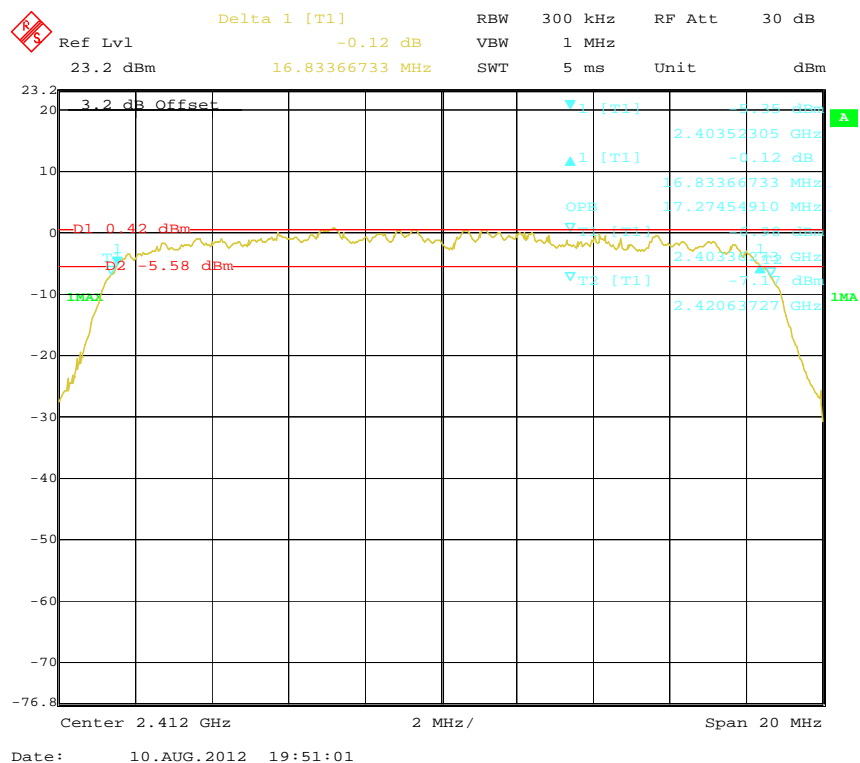
802.11g High Channel, Antenna 1

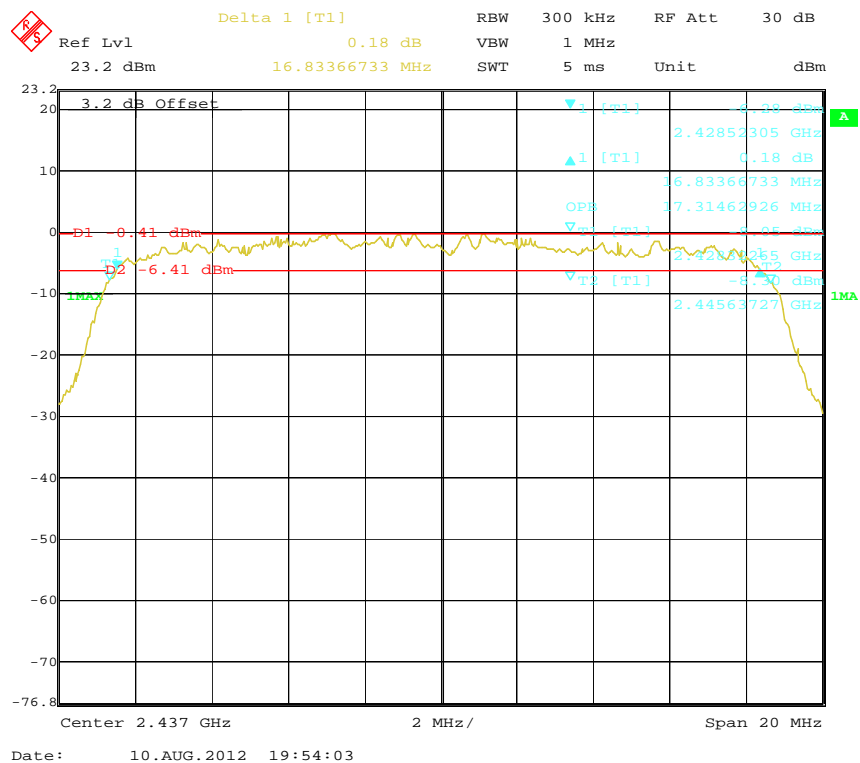
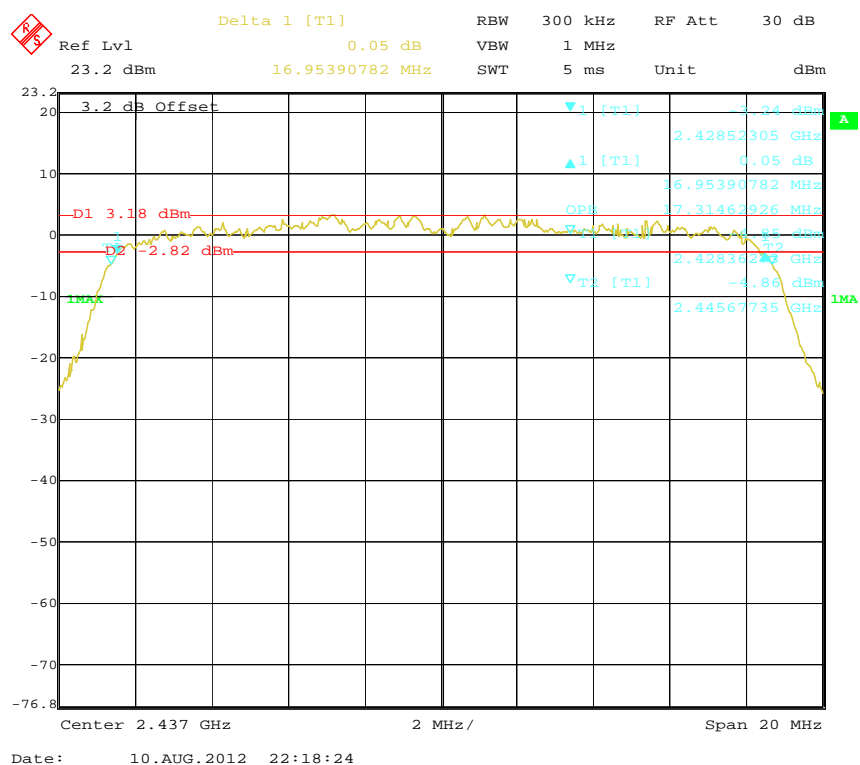


802.11n-HT20 Low Channel, Antenna 0

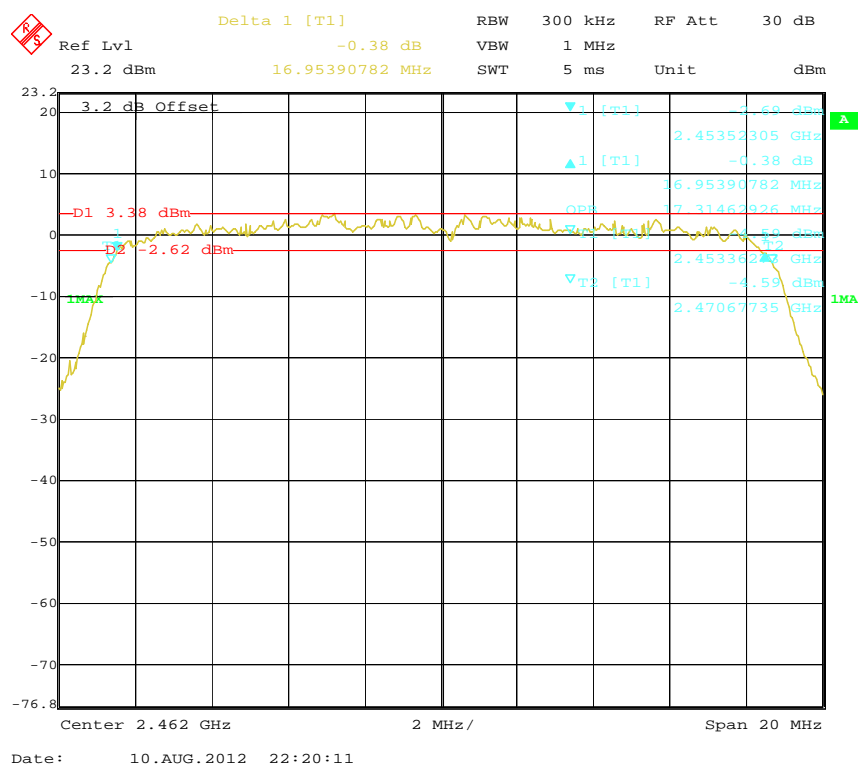


802.11n-HT20 Low Channel, Antenna 1

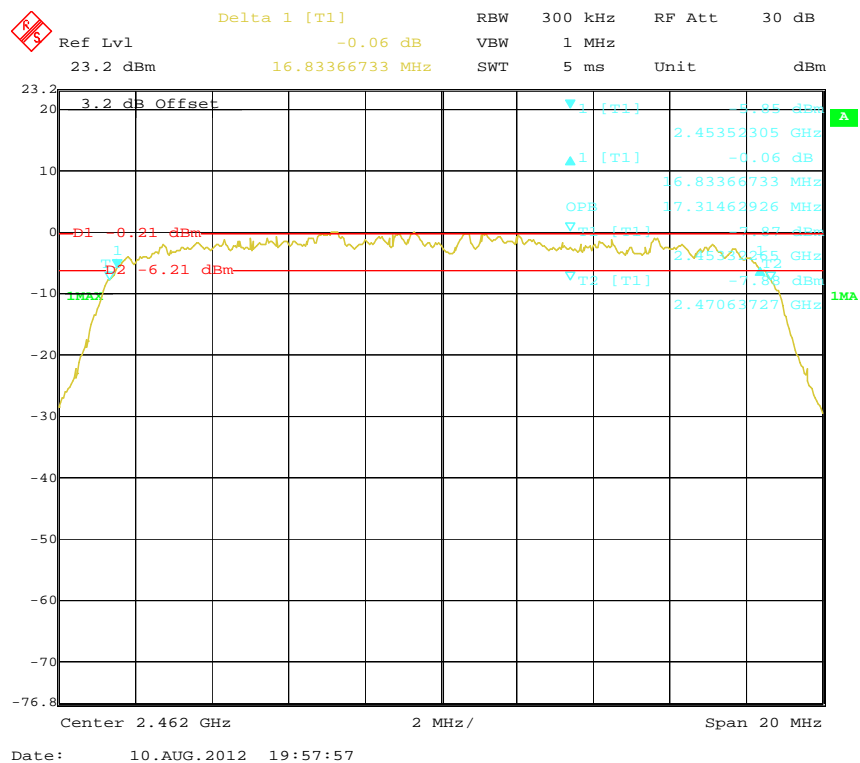




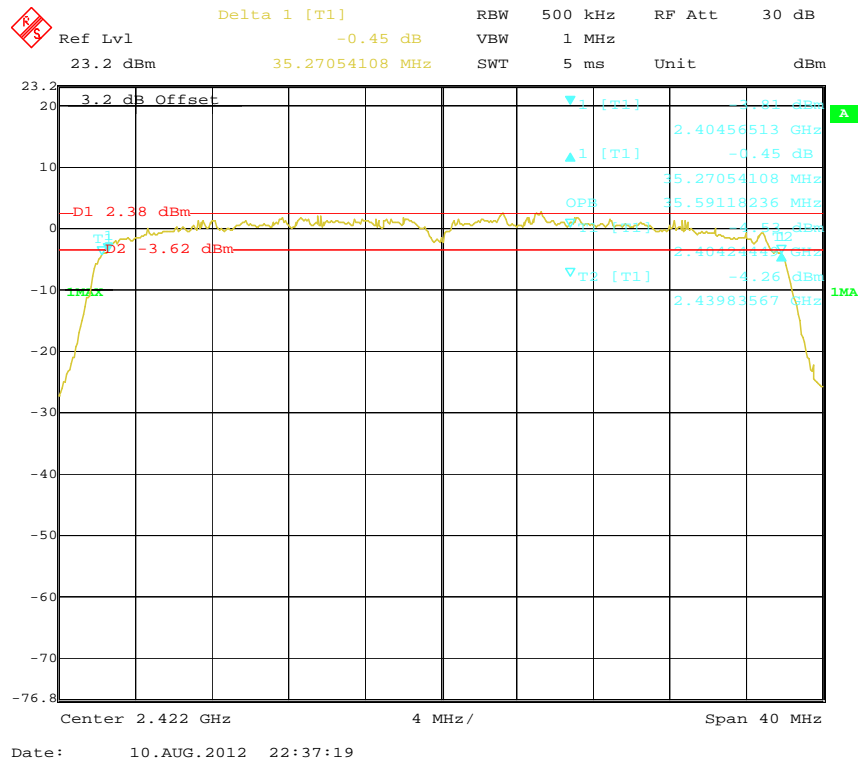
802.11n-HT20 High Channel, Antenna 0



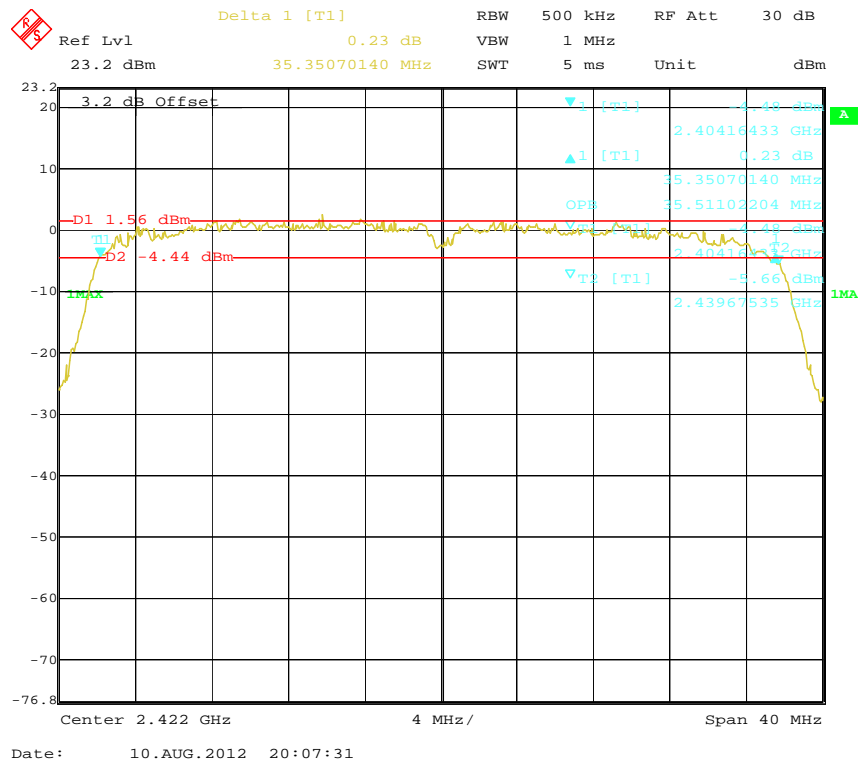
802.11n-HT20 High Channel, Antenna 1



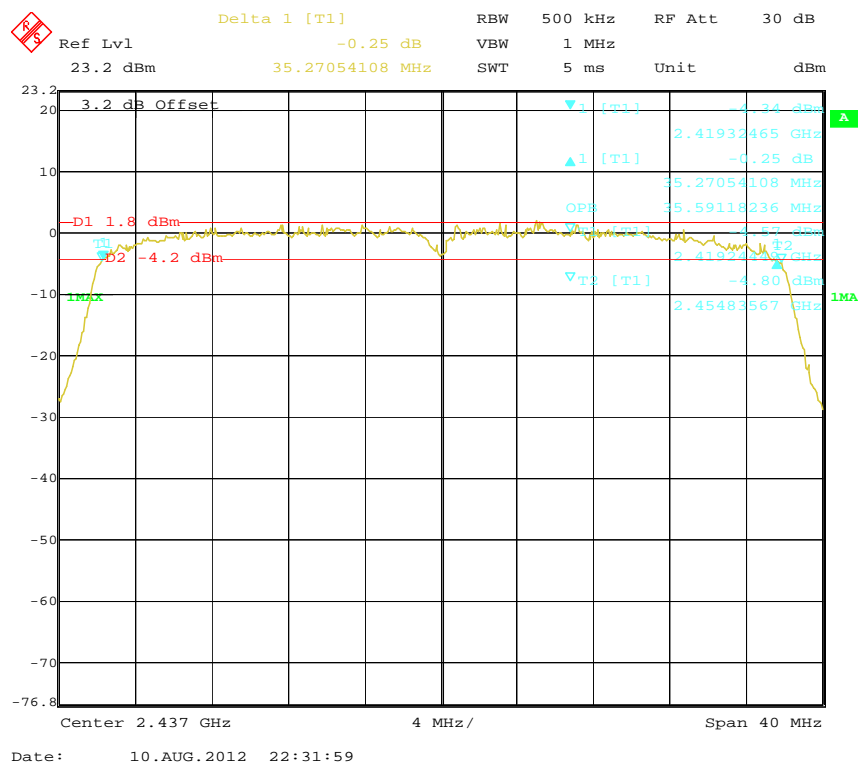
802.11n-HT40 Low Channel, Antenna 0



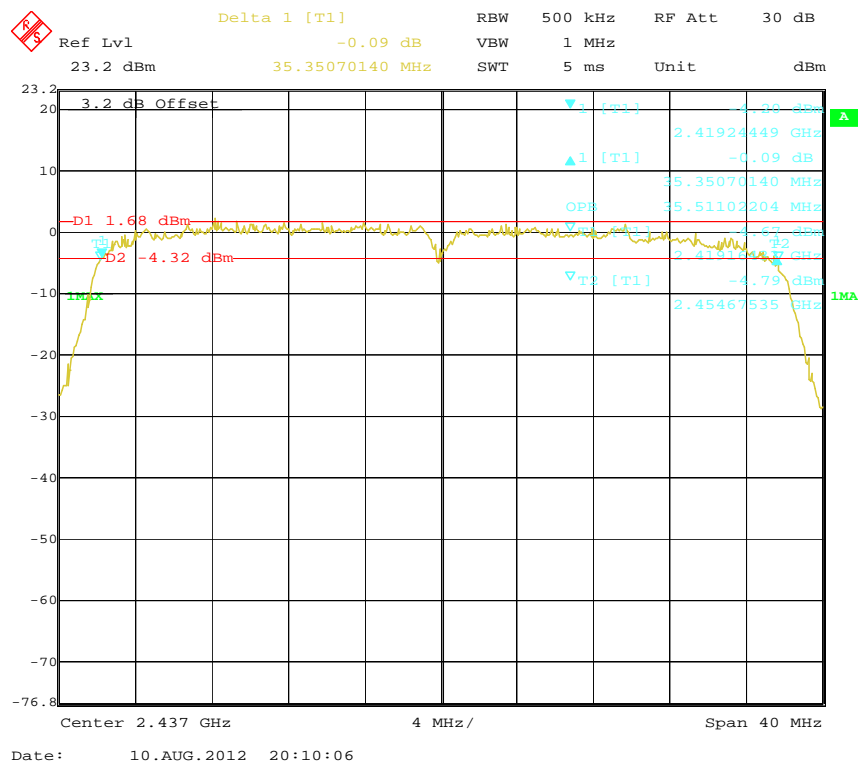
802.11n-HT40 Low Channel, Antenna 1



802.11n-HT40 Middle Channel, Antenna 0



802.11n-HT40 Middle Channel, Antenna 1



Delta 1 [T1]

RBW 500 kHz RF Att 30 dB

Ref Lvl -0.38 dB VBW 1 MHz

23.2 dBm 35.27054108 MHz SWT 5 ms Unit dBm

3.2 dB Offset

23.2

20

10

0

-10

-20

-30

-40

-50

-60

-70

-76.8

Center 2.452 GHz 4 MHz/ Span 40 MHz

Date: 12.AUG.2012 23:10:41

Ref Lvl 23.2 dBm Delta 1 [T1] -0.10 dB RBW 500 kHz RF Att 30 dB

23.2 3.2 dB Offset 20 2.43424449 GHz 2.46967535 GHz

10 35.35070140 MHz 35.51102204 MHz

0 D1 1.96 dBm D2 -4.04 dBm OPB 35.51102204 MHz

-10 T1 [T1] -0.10 dB T2 [T1] -5.96 dBm

-20 2.46967535 GHz

-30

-40

-50

-60

-70

-76.8

Center 2.452 GHz 4 MHz/ Span 40 MHz

Date: 10.AUG.2012 20:14:37

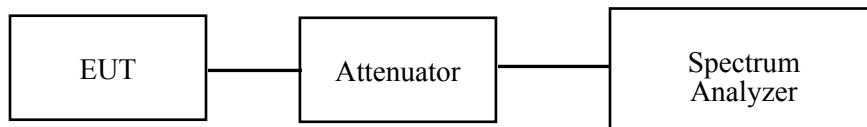
FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

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 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23

* **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 Data

Environmental Conditions

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

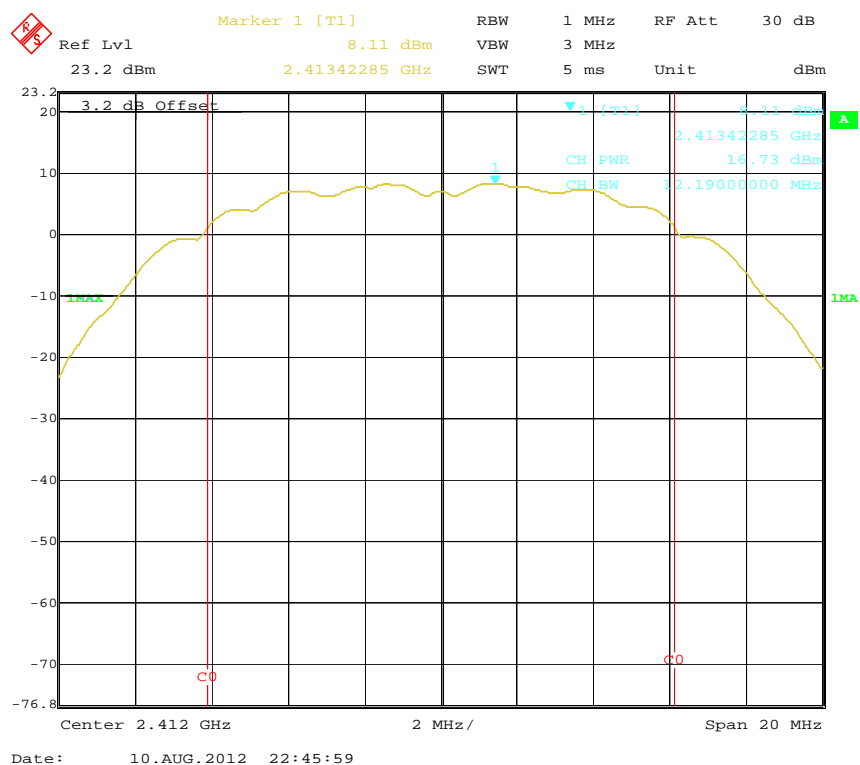
The testing was performed by Brown Lu on 2012-08-10.

Test Mode: Transmitting

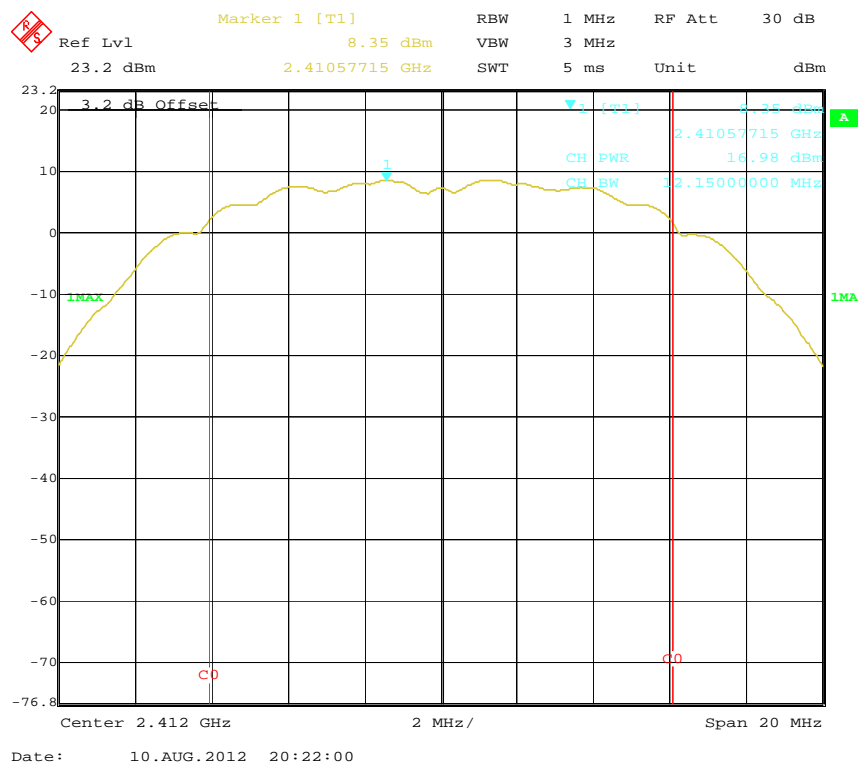
Test Result: Compliance. Please refer to the following table and plots:

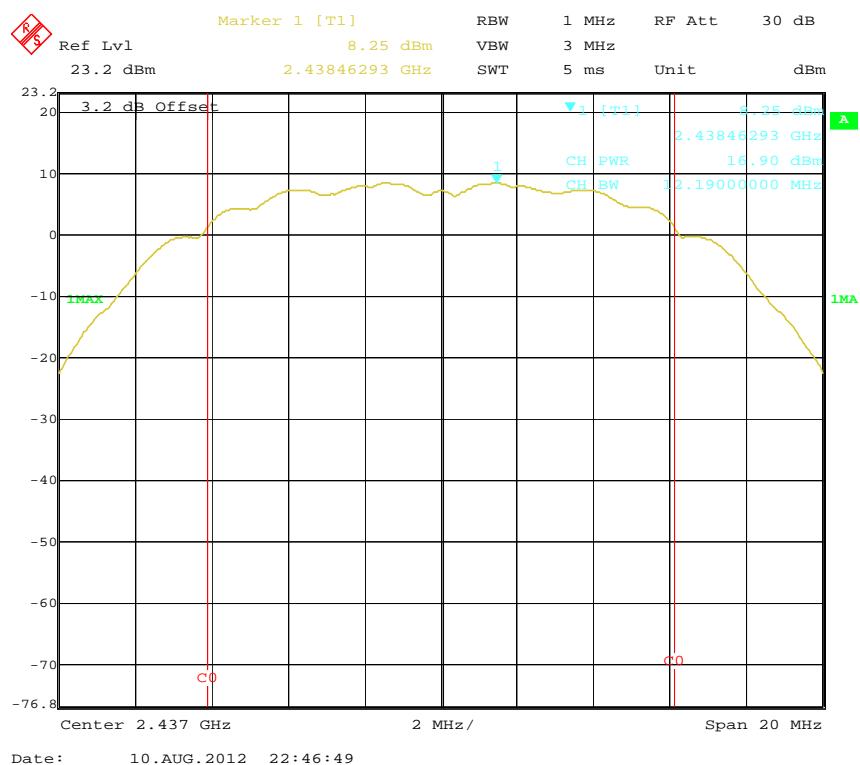
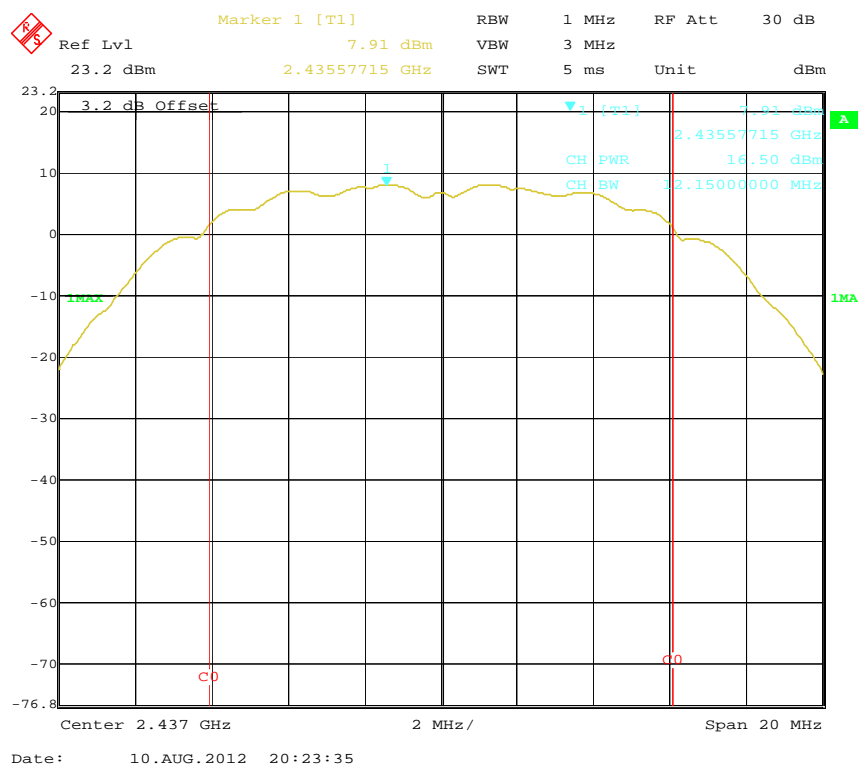
Channel	Frequency (MHz)	Antenna Port	Output Power (dBm)	Limit (dBm)	
802.11b mode					
Low	2412	0	16.73	30	
		1	16.98		
Middle	2437	0	16.90	30	
		1	16.50		
High	2462	0	16.37	30	
		1	16.27		
802.11g mode					
Low	2412	0	15.80	30	
		1	15.62		
Middle	2437	0	15.50	30	
		1	15.70		
High	2462	0	15.47	30	
		1	15.54		
802.11n-HT20 mode					
Low	2412	0	15.58	18.53	30
		1	15.46		
Middle	2437	0	15.52	18.29	30
		1	15.03		
High	2462	0	15.80	18.61	30
		1	15.40		
802.11n-HT40 mode					
Low	2422	0	15.63	18.75	30
		1	15.84		
Middle	2437	0	15.20	18.62	30
		1	15.99		
High	2452	0	15.29	18.52	30
		1	15.71		

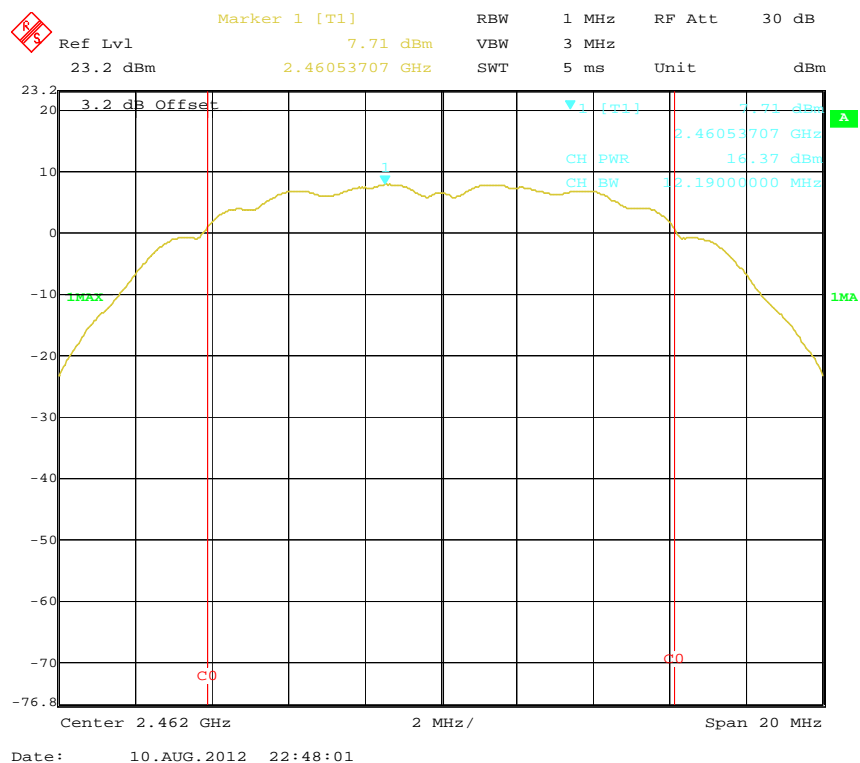
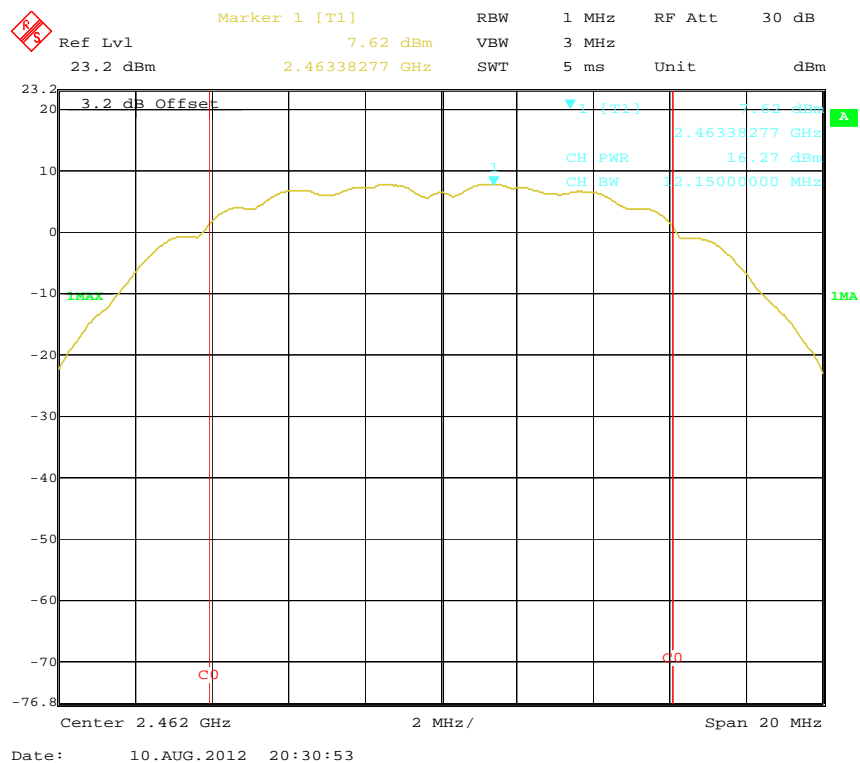
802.11b RF Output Power, Low Channel, Antenna 0



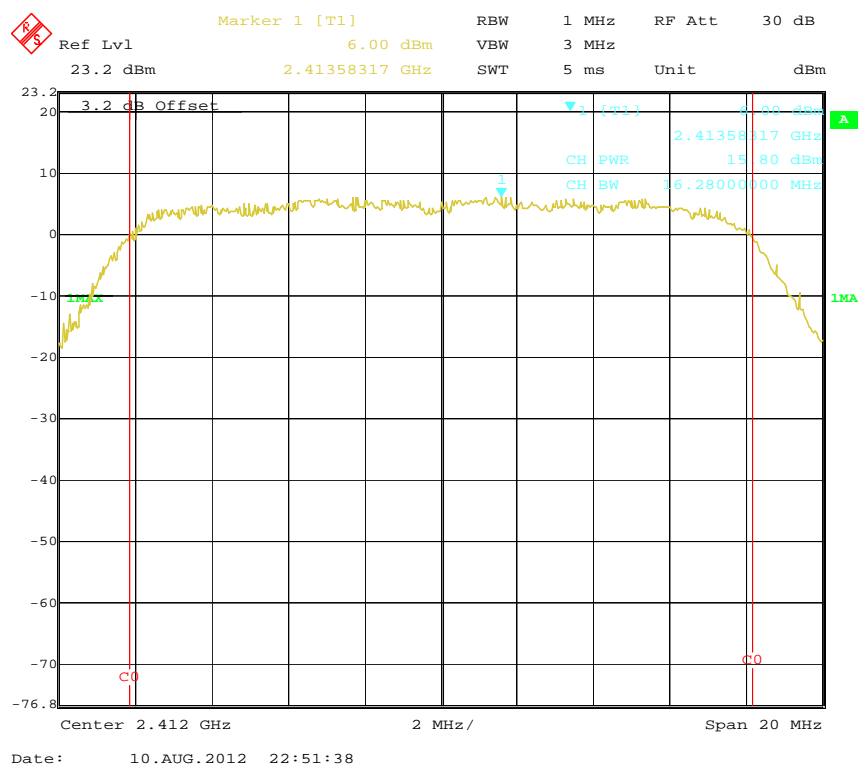
802.11b RF Output Power, Low Channel, Antenna 1



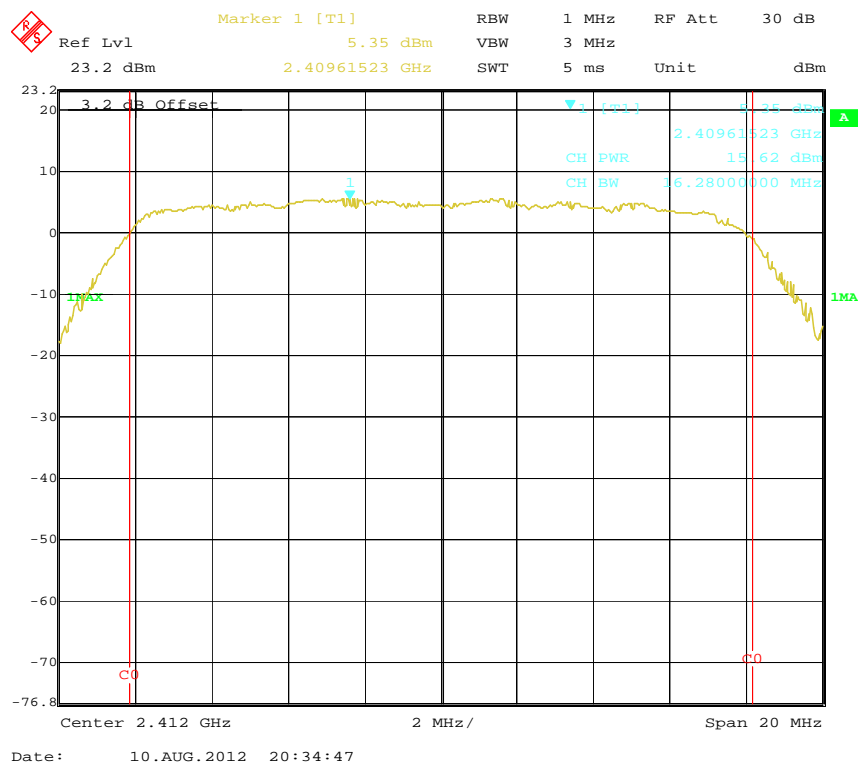
802.11b RF Output Power, Middle Channel, Antenna 0**802.11b RF Output Power, Middle Channel, Antenna 1**

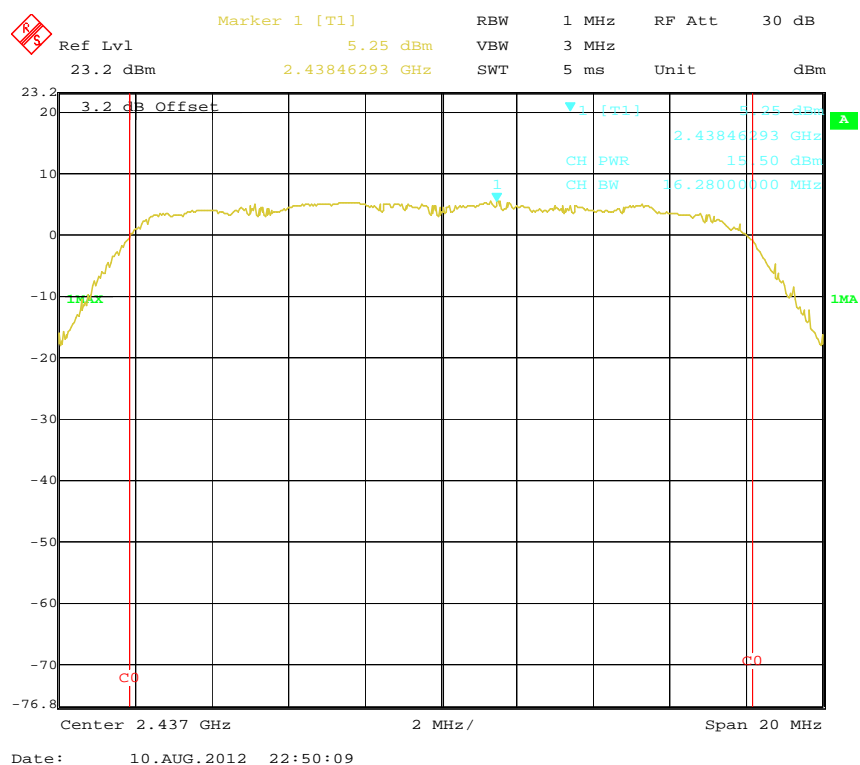
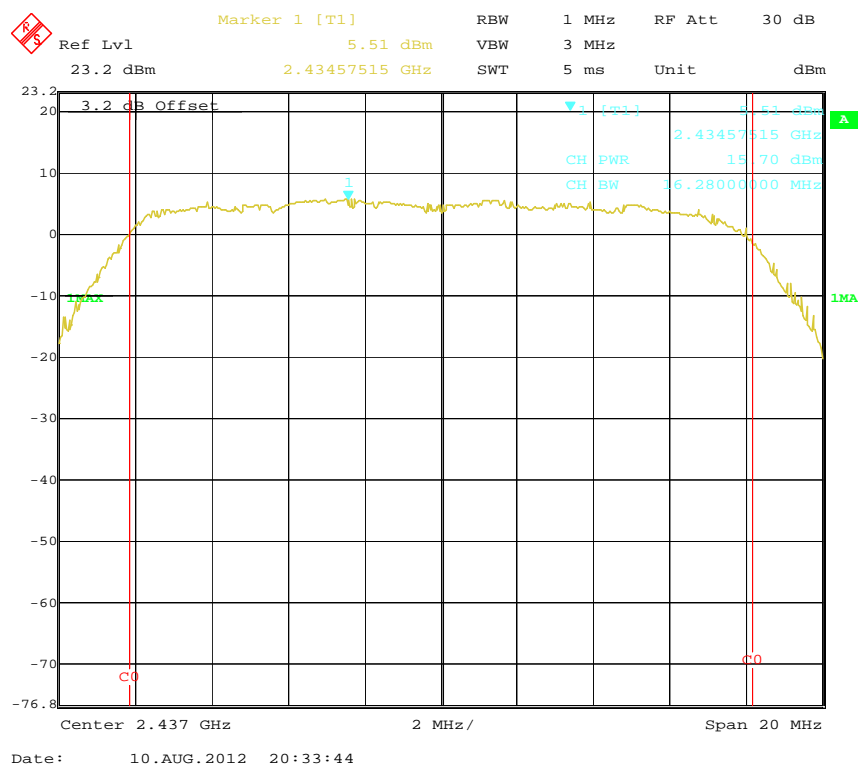
802.11b RF Output Power, High Channel, Antenna 0**802.11b RF Output Power, High Channel, Antenna 1**

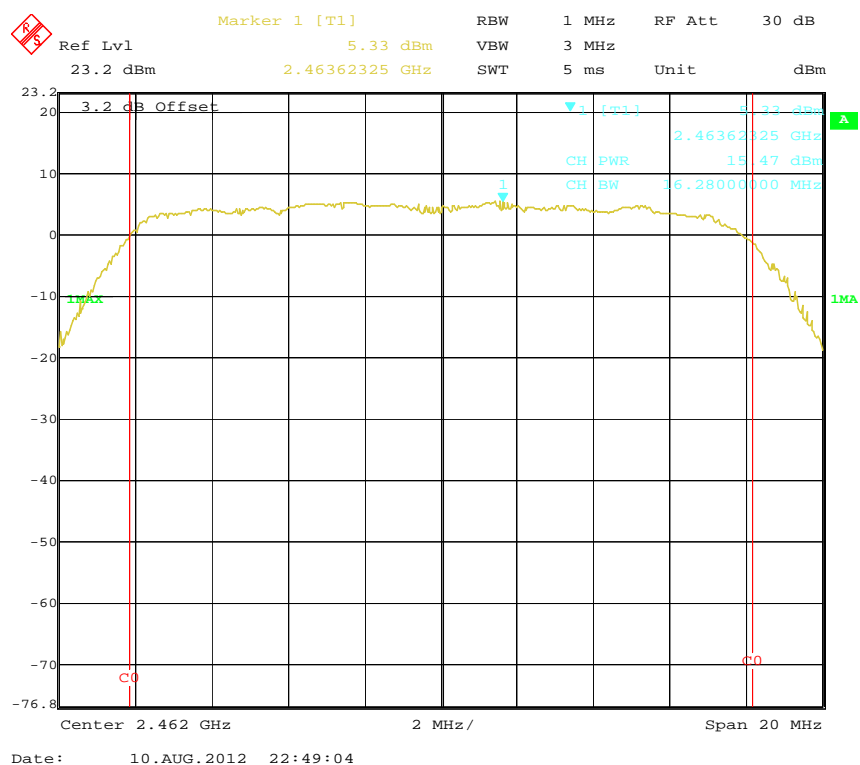
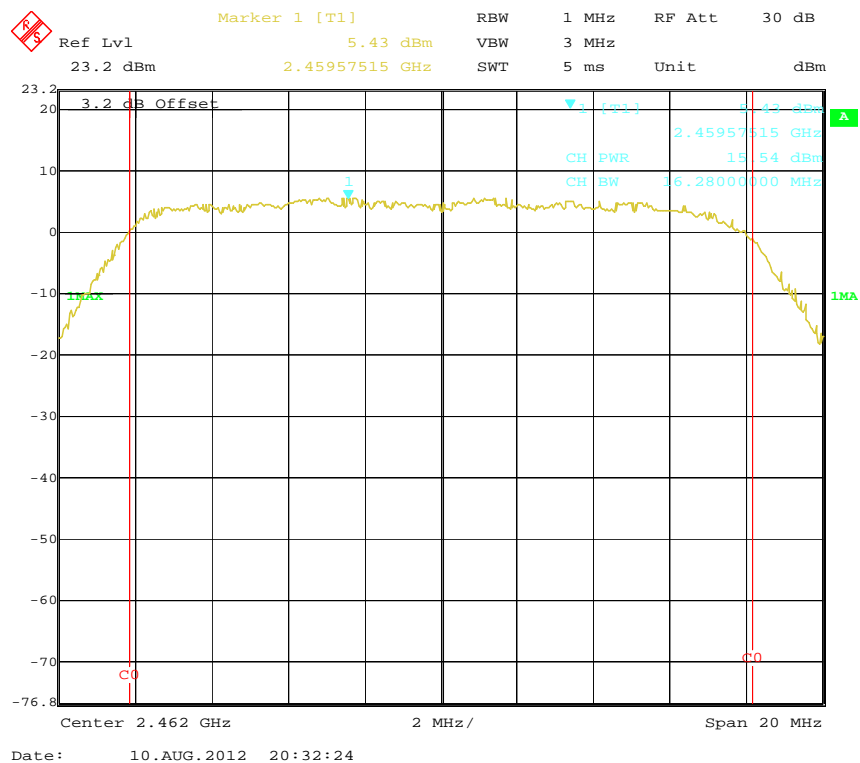
802.11g RF Output Power, Low Channel, Antenna 0



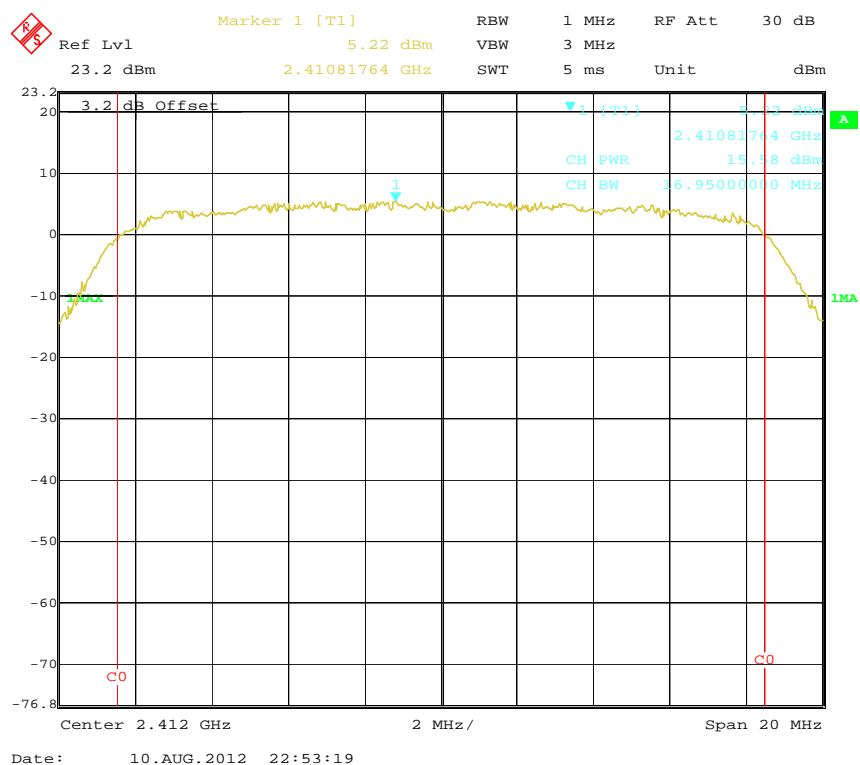
802.11g RF Output Power, Low Channel, Antenna 1



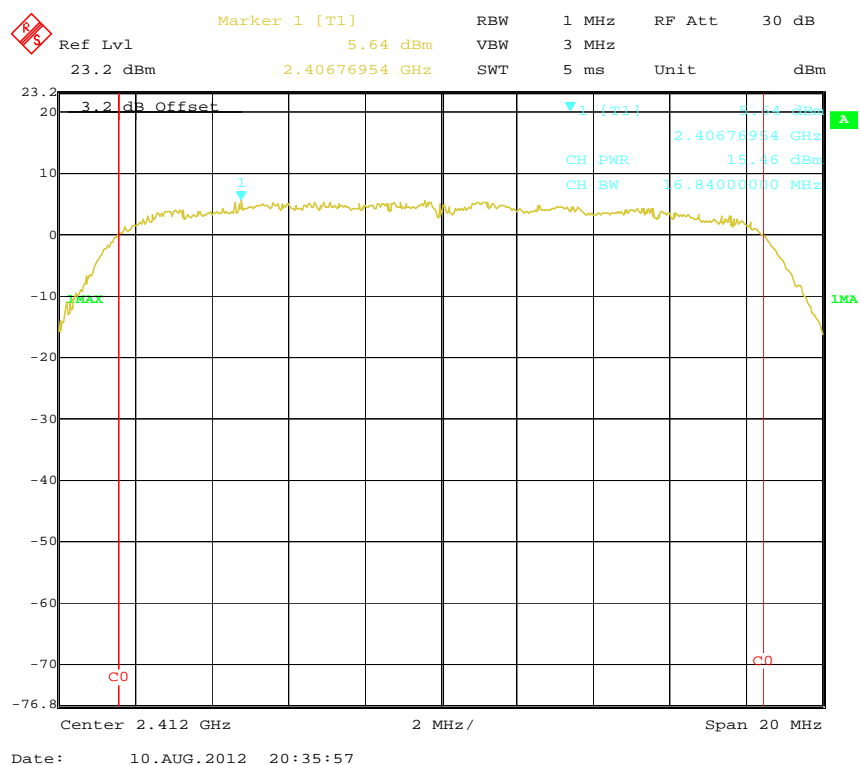
802.11g RF Output Power, Middle Channel, Antenna 0**802.11g RF Output Power, Middle Channel, Antenna 1**

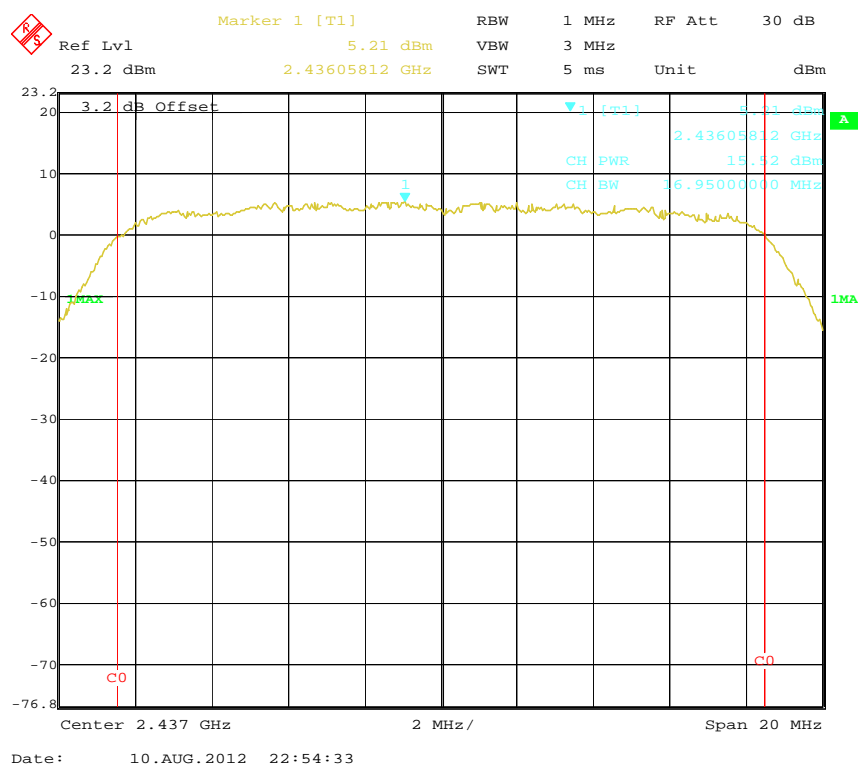
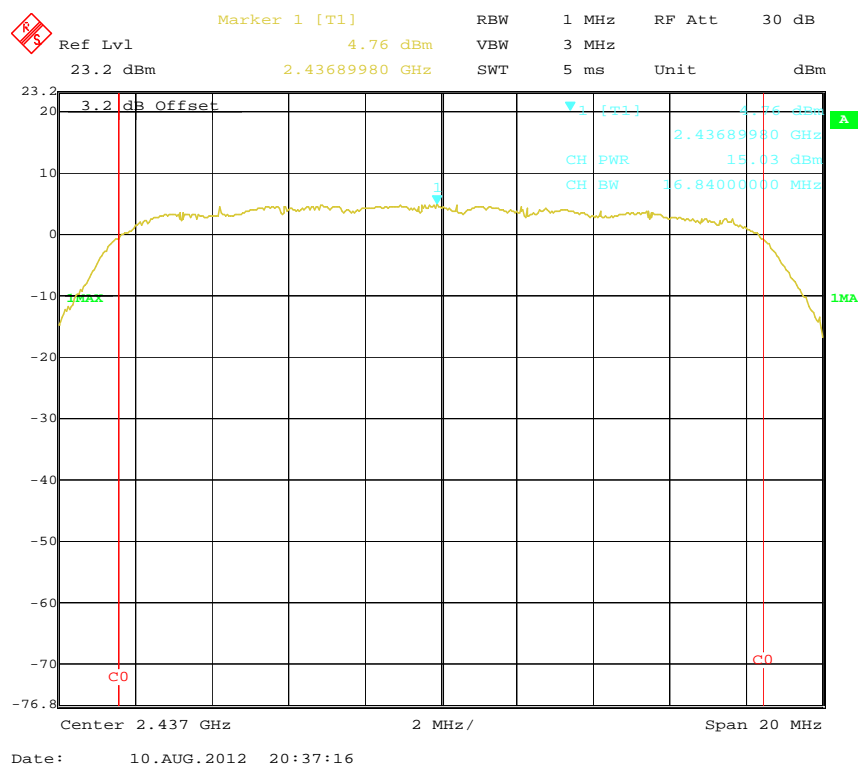
802.11g RF Output Power, High Channel, Antenna 0**802.11g RF Output Power, High Channel, Antenna 1**

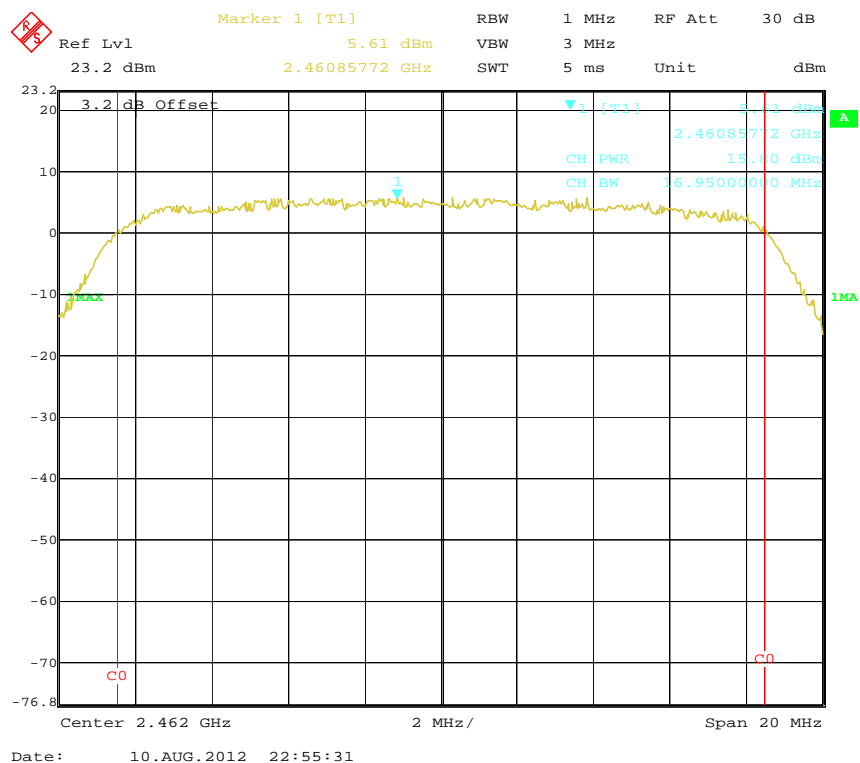
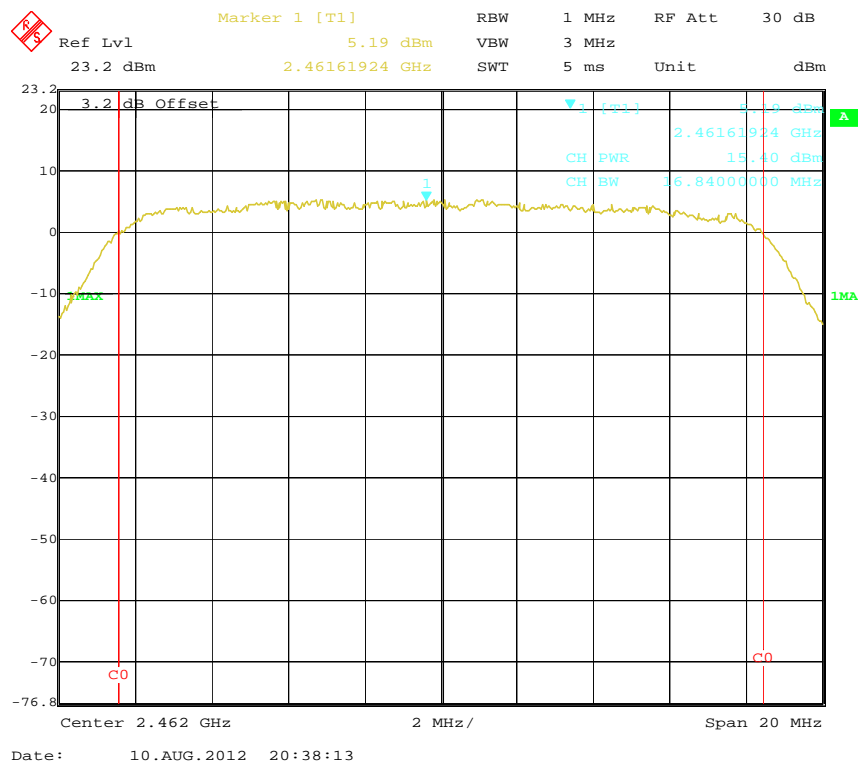
802.11n-HT20 RF Output Power, Low Channel, Antenna 0

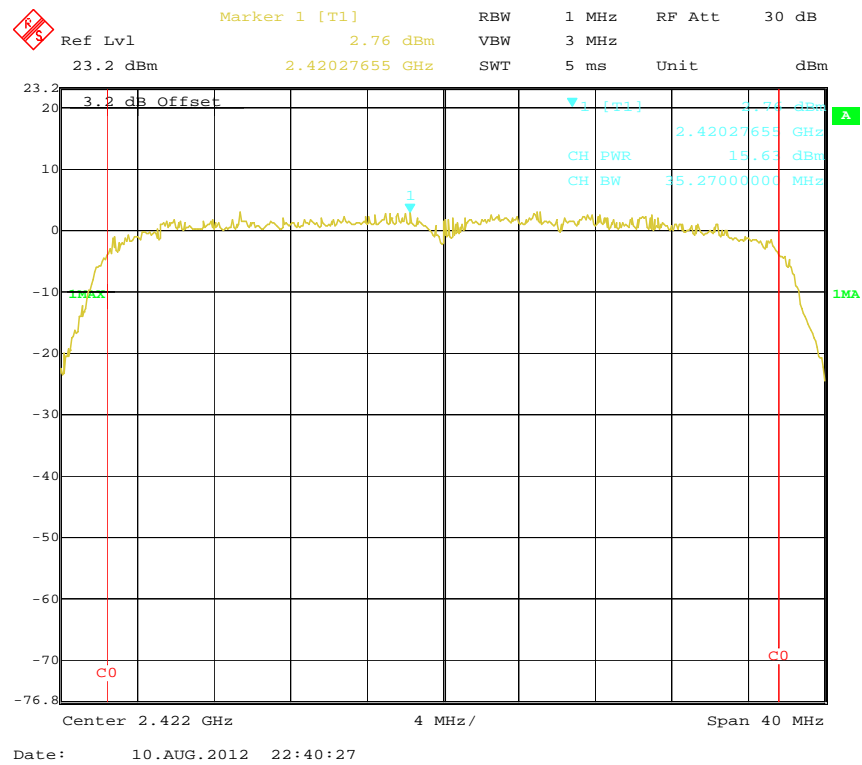
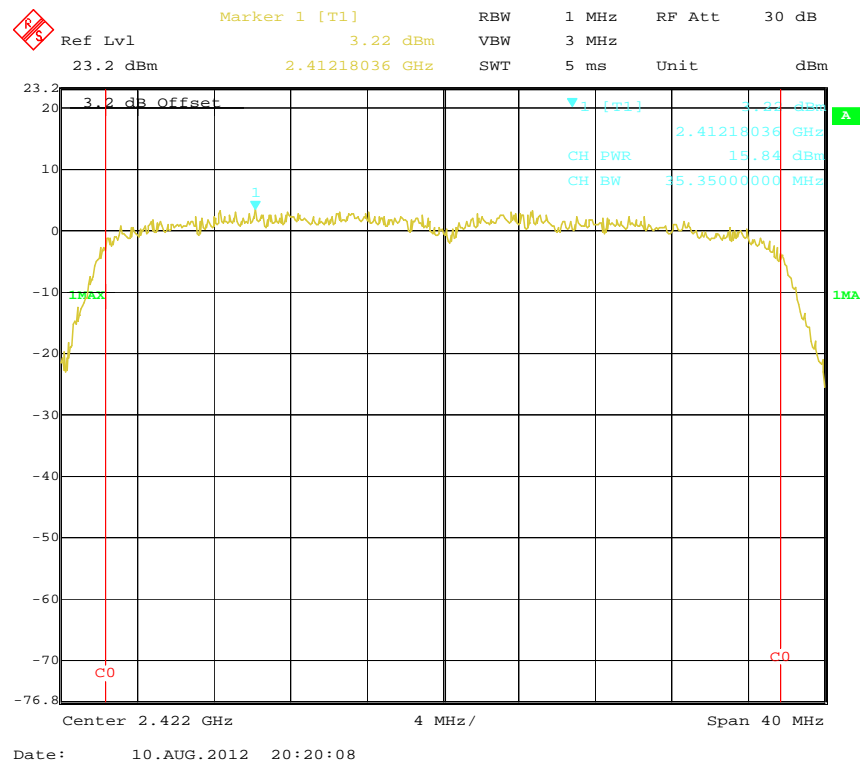


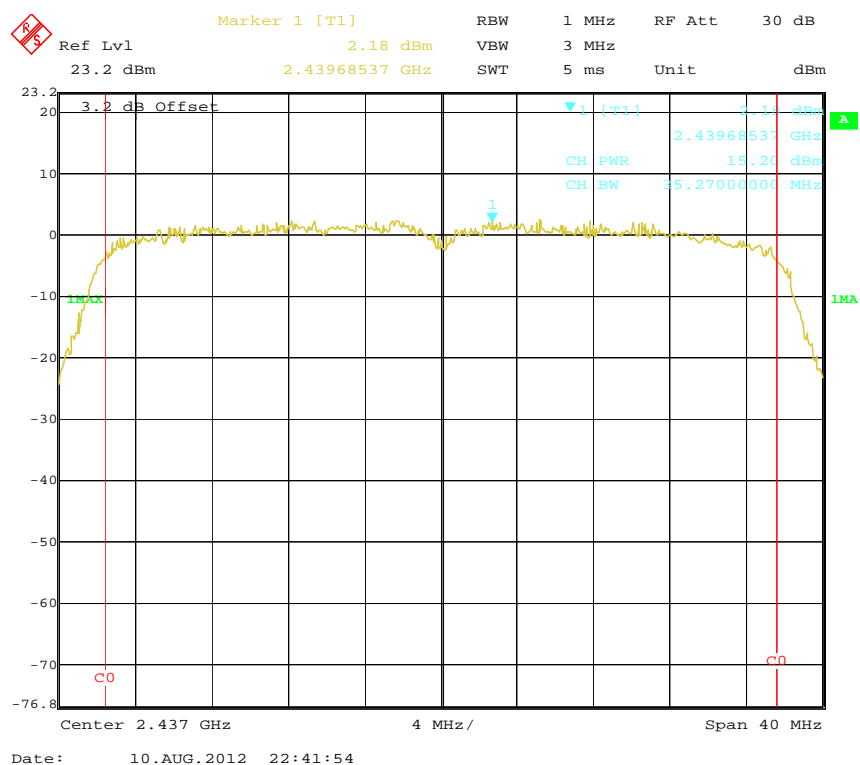
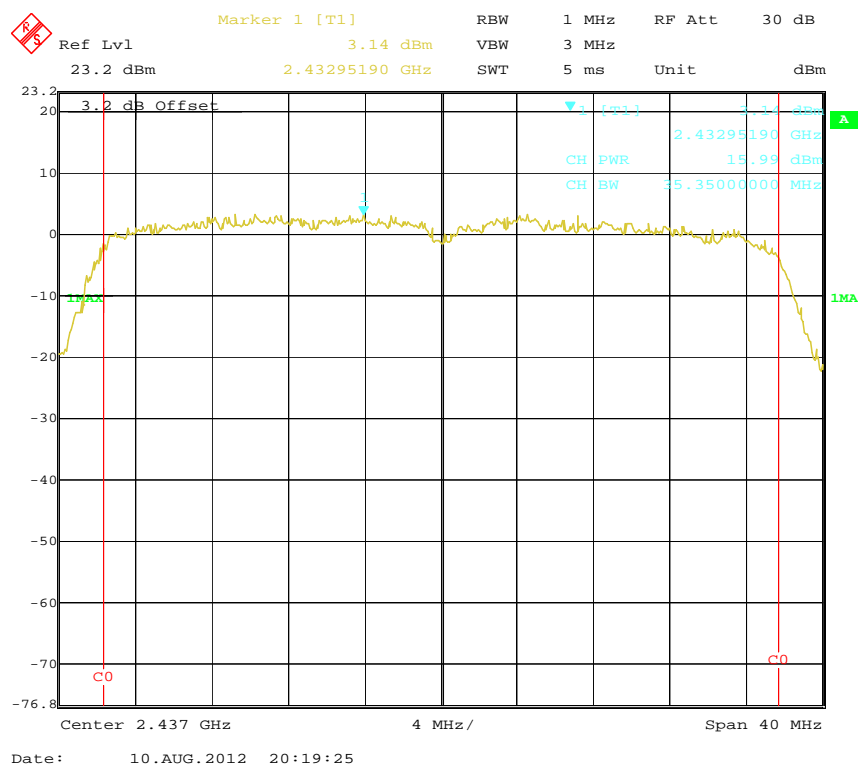
802.11n-HT20 RF Output Power, Low Channel, Antenna 1

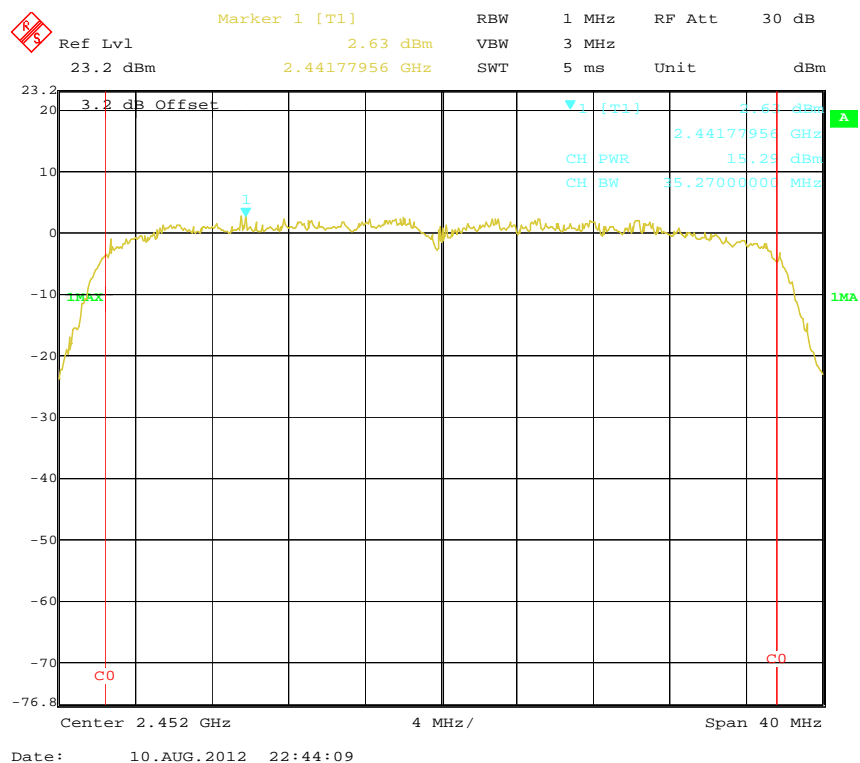
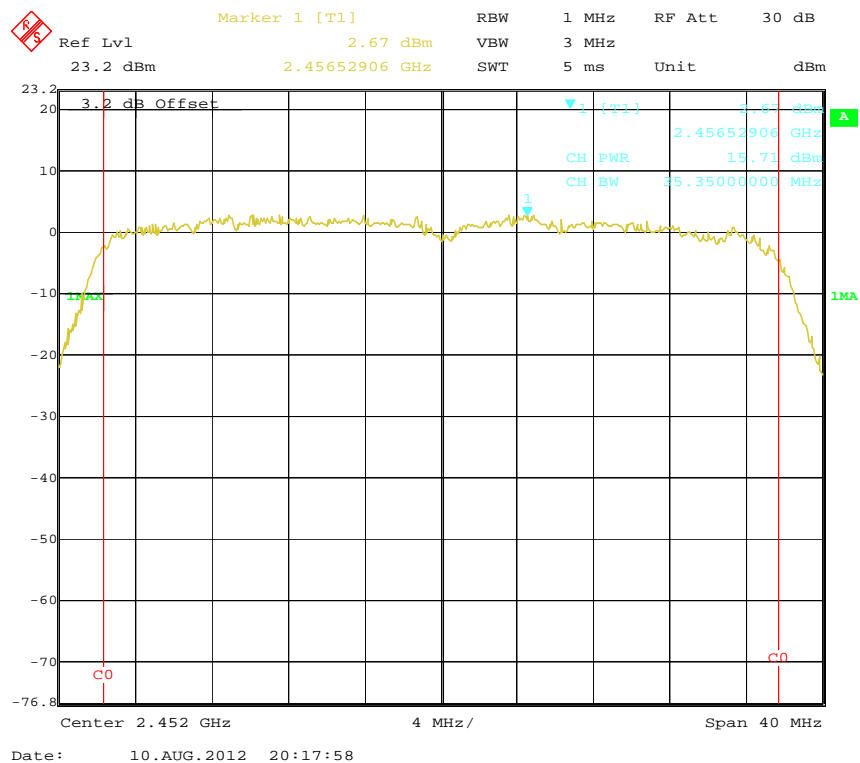


802.11n-HT20 RF Output Power, Middle Channel, Antenna 0**802.11n-HT20 RF Output Power, Middle Channel, Antenna 1**

802.11n-HT20 RF Output Power, High Channel, Antenna 0**802.11n-HT20 RF Output Power, High Channel, Antenna 1**

802.11n-HT40 RF Output Power, Low Channel, Antenna 0**802.11n-HT40 RF Output Power, Low Channel, Antenna 1**

802.11n-HT40 RF Output Power, Middle Channel, Antenna 0**802.11n-HT40 RF Output Power, Middle Channel, Antenna 1**

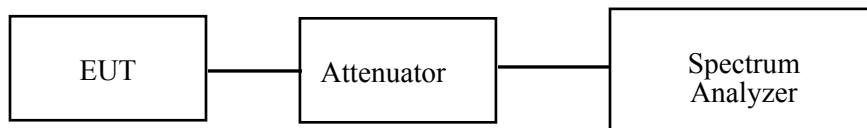
802.11n-HT40 RF Output Power, High Channel, Antenna 0**802.11n-HT40 RF Output Power, High Channel, Antenna 1**

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 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 Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23

* **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 Data**Environmental Conditions**

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

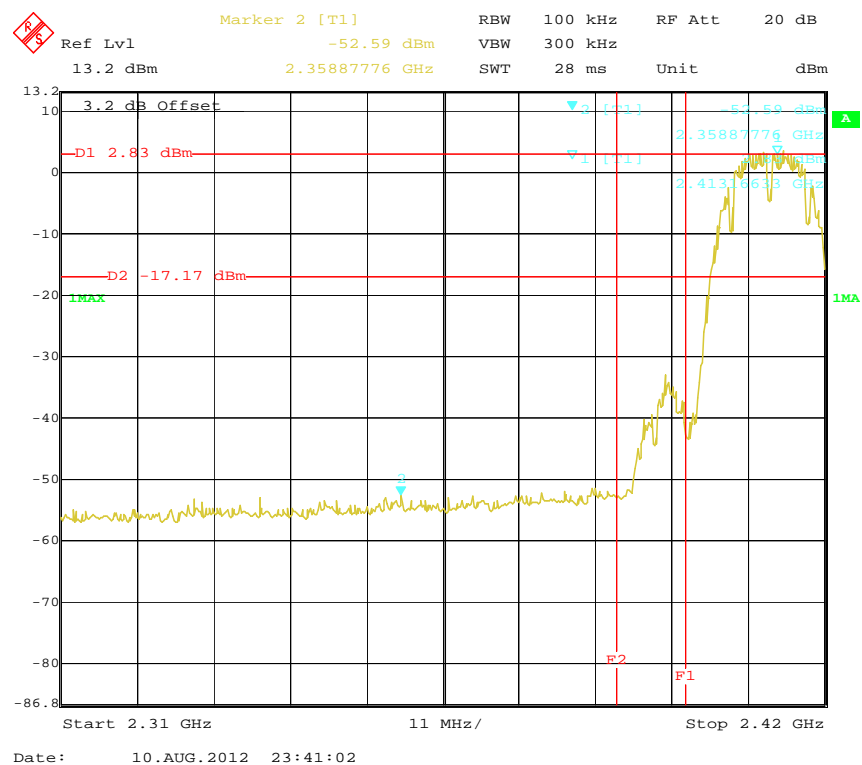
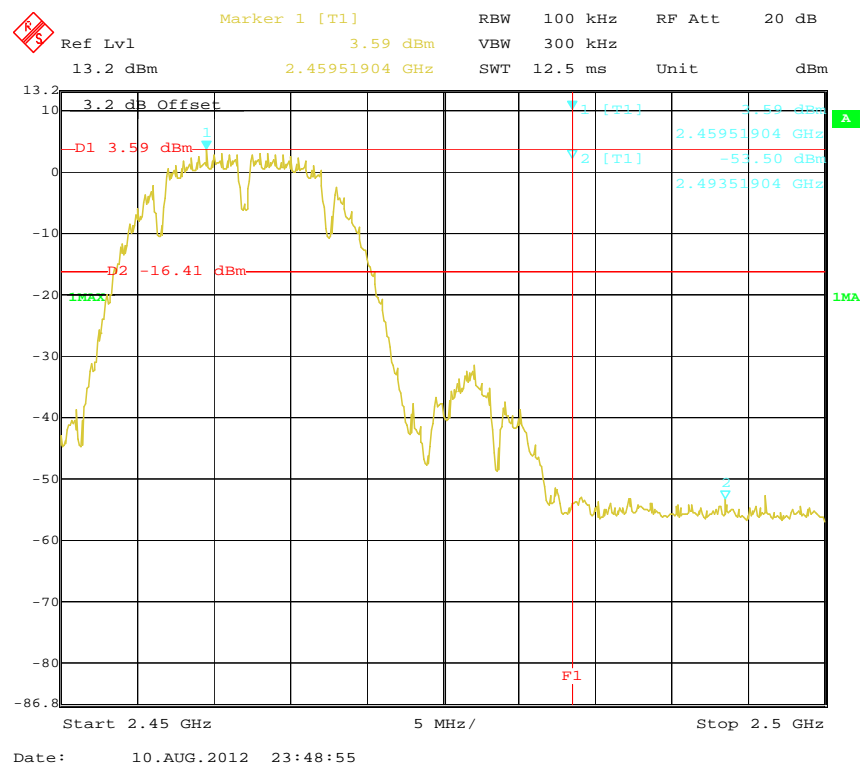
The testing was performed by Brown Lu on 2012-08-10.

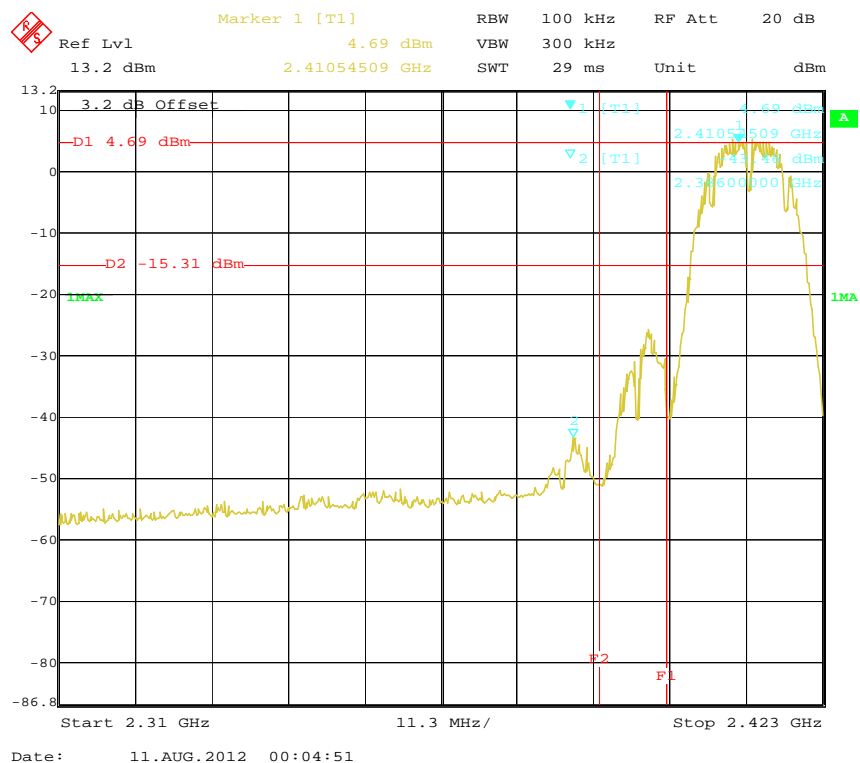
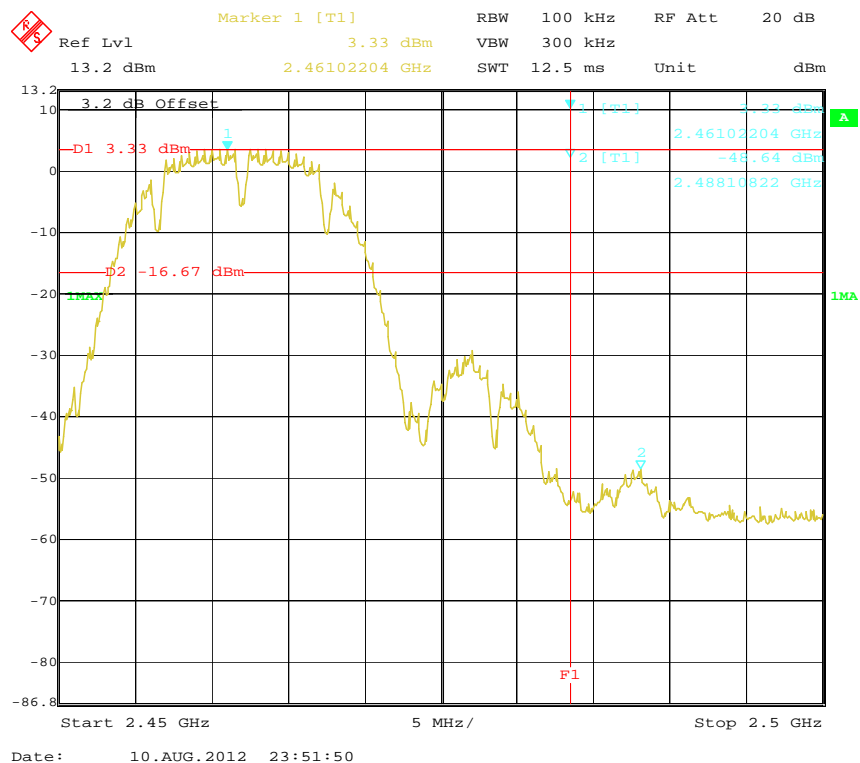
Test mode: Transmitting

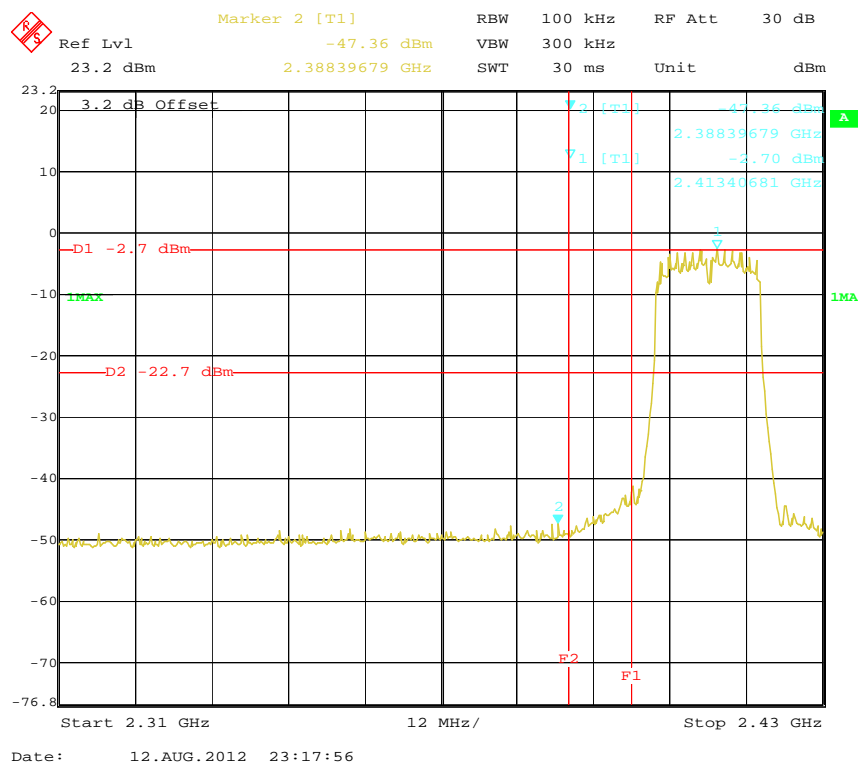
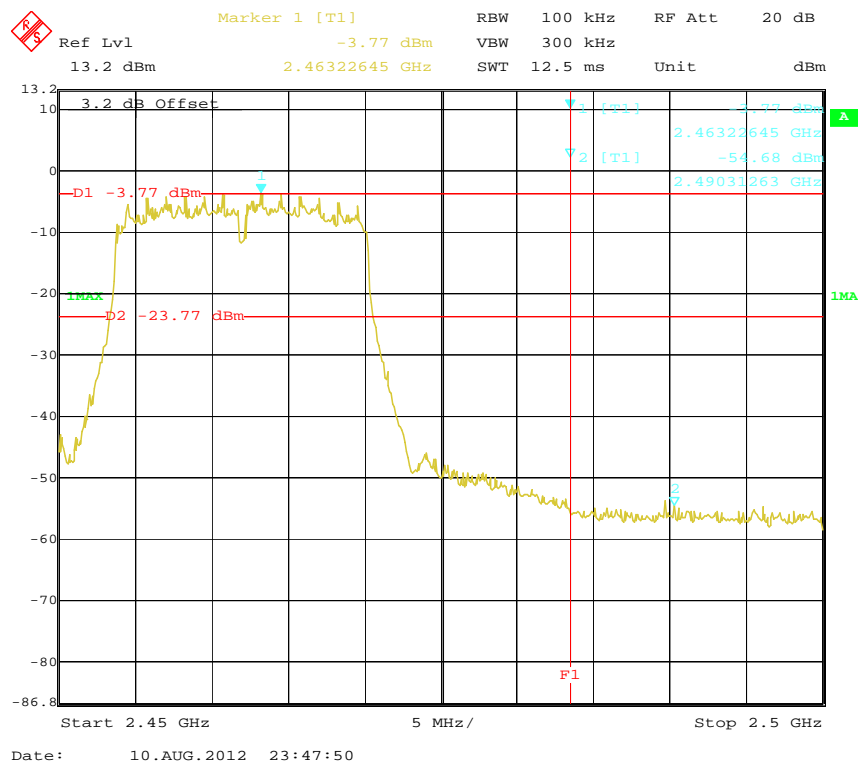
Test Result: Compliance. Please refer to the following table and plots:

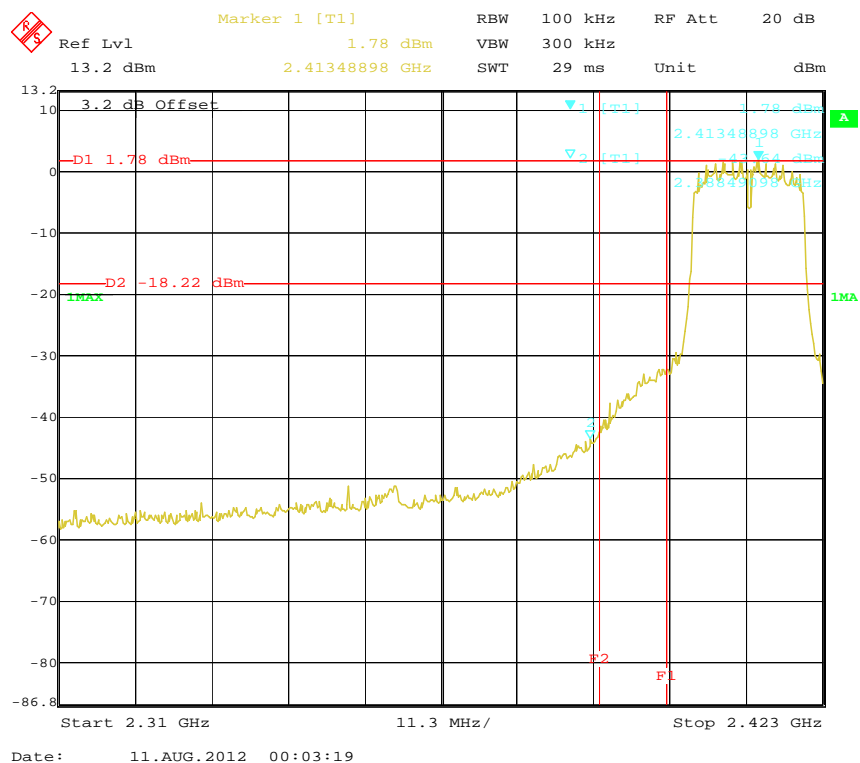
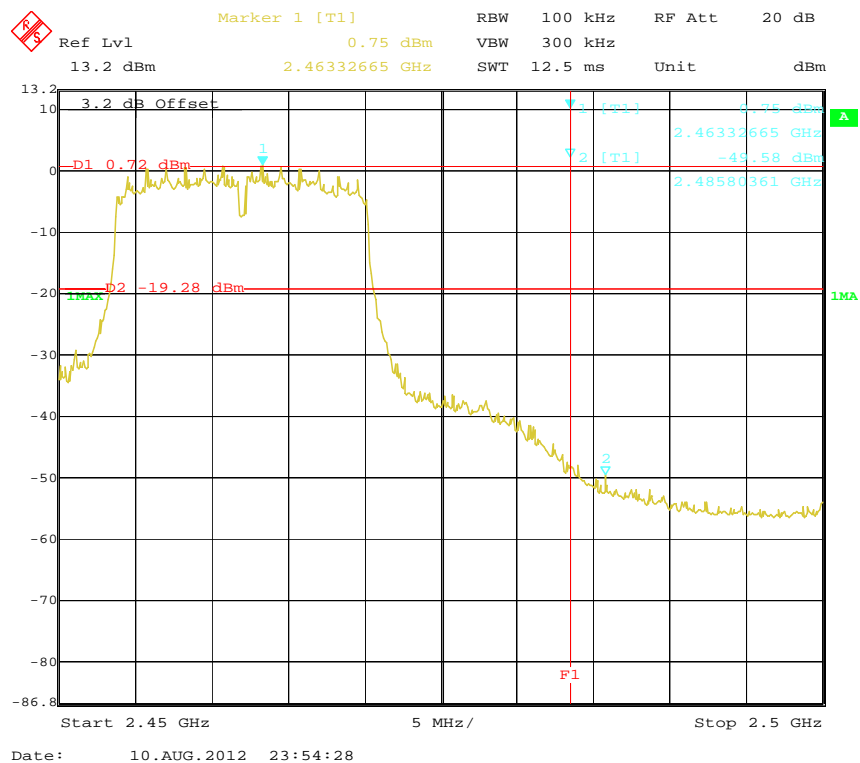
Band edge	Antenna Port	Delta Peak to Band Emission (dBc)	Delta Limit (dBc)	Result
802.11b mode				
Left side	0	36.03	20	Pass
Right side	0	57.00		
Left side	1	30.99	20	Pass
Right side	1	51.97		
802.11g mode				
Left side	0	42.10	20	Pass
Right side	0	50.91		
Left side	1	34.58	20	Pass
Right side	1	50.30		
802.11n-HT20 mode				
Left side	0	43.99	20	Pass
Right side	0	50.03		
Left side	1	30.00	20	Pass
Right side	1	46.57		
802.11n-HT40 mode				
Left side	0	37.24	20	Pass
Right side	0	40.97		
Left side	1	29.92	20	Pass
Right side	1	39.13		

Band edge	Antenna Port	Spurious Emission Max (dBm)	Spurious Emission (Sum) (dBm)	PSD (dBm/100kHz)	Delta Value (dBc)	Delta Limit (dBc)
802.11n-HT20 mode(with measure and sum the spectra technique)						
Left side	0	-47.31	-28.25	-2.36	25.89	20
Left side	1	-28.30				
Right side	0	-52.93	-44.93	-4.13	40.80	20
Right side	1	-45.69				
802.11n-HT40 mode(with measure and sum the spectra technique)						
Left side	0	-43.12	-29.72	-5.13	24.59	20
Left side	1	-29.92				
Right side	0	-47.35	-39.78	-5.80	33.98	20
Right side	1	-40.62				

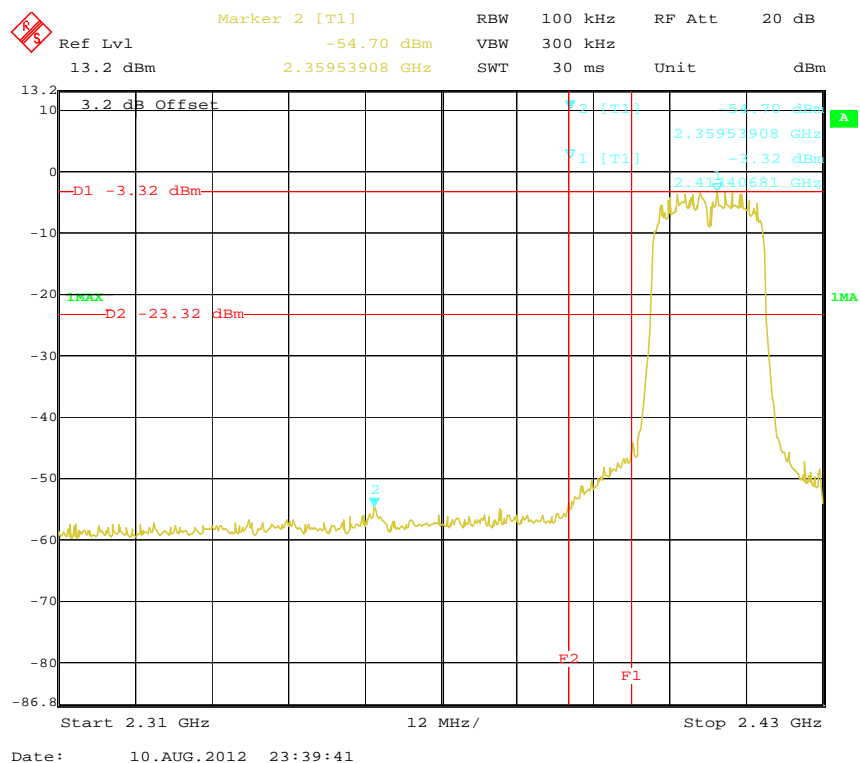
802.11b Band Edge, Left Side, Antenna 0**802.11b Band Edge, Right Side, Antenna 0**

802.11b Band Edge, Left Side, Antenna 1**802.11b Band Edge, Right Side, Antenna 1**

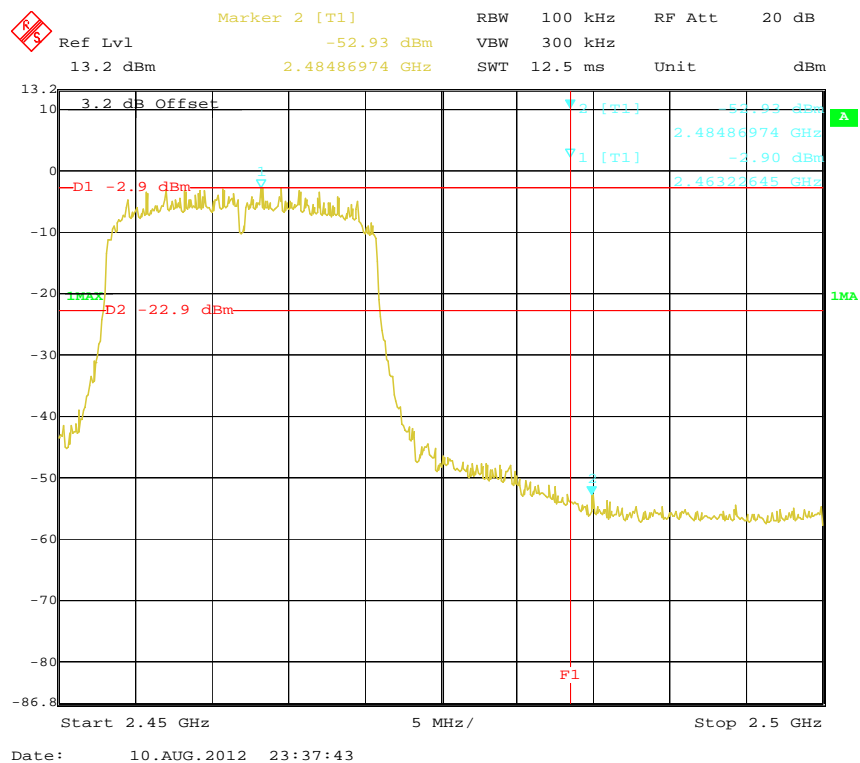
802.11g Band Edge, Left Side, Antenna 0**802.11g Band Edge, Right Side, Antenna 0**

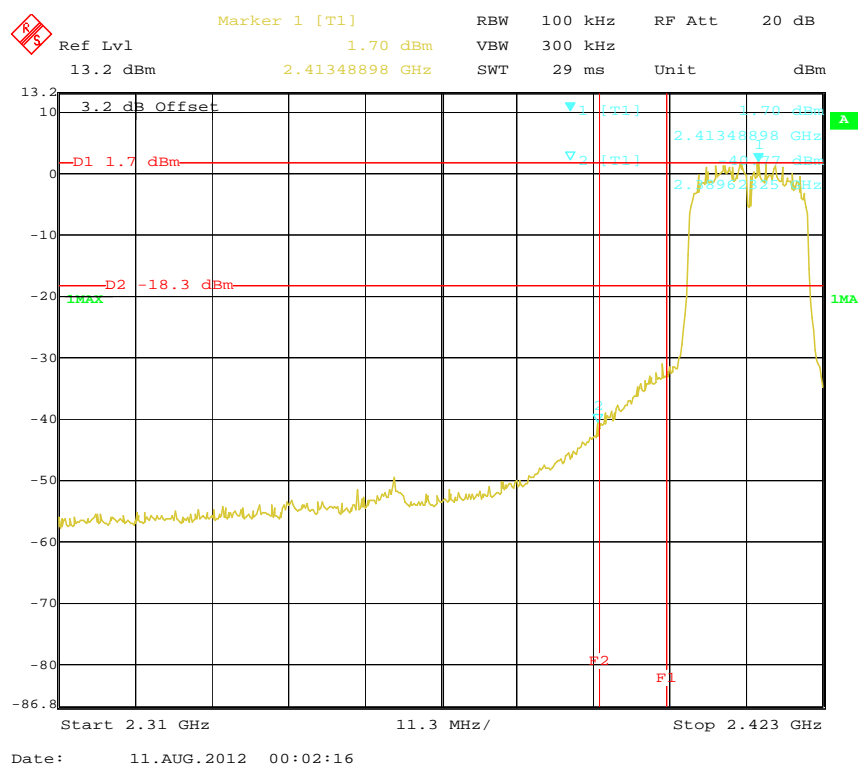
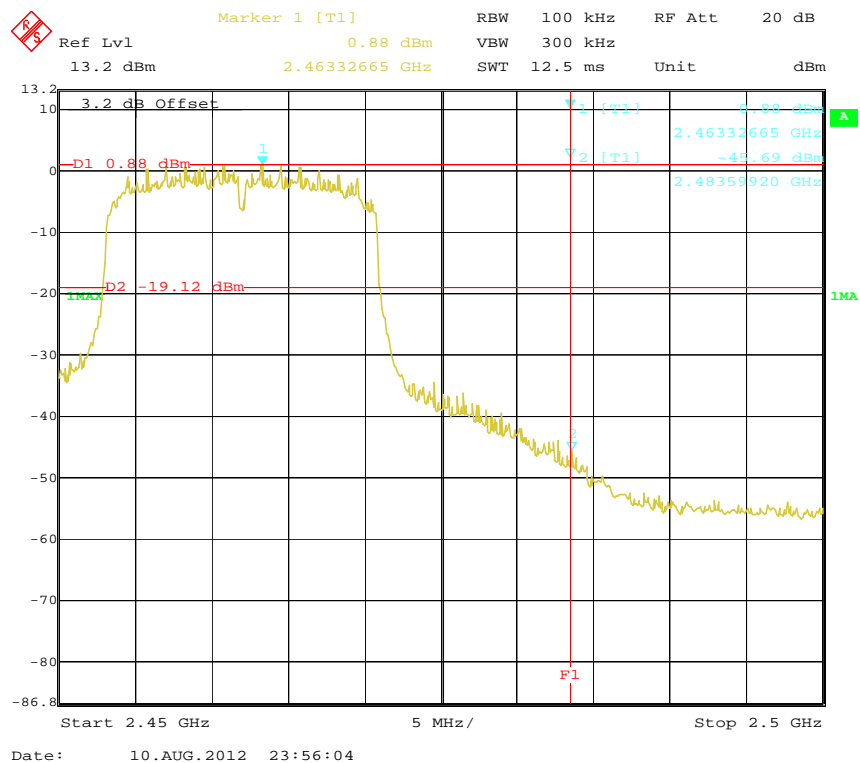
802.11g Band Edge, Left Side, Antenna 1**802.11g Band Edge, Right Side, Antenna 1**

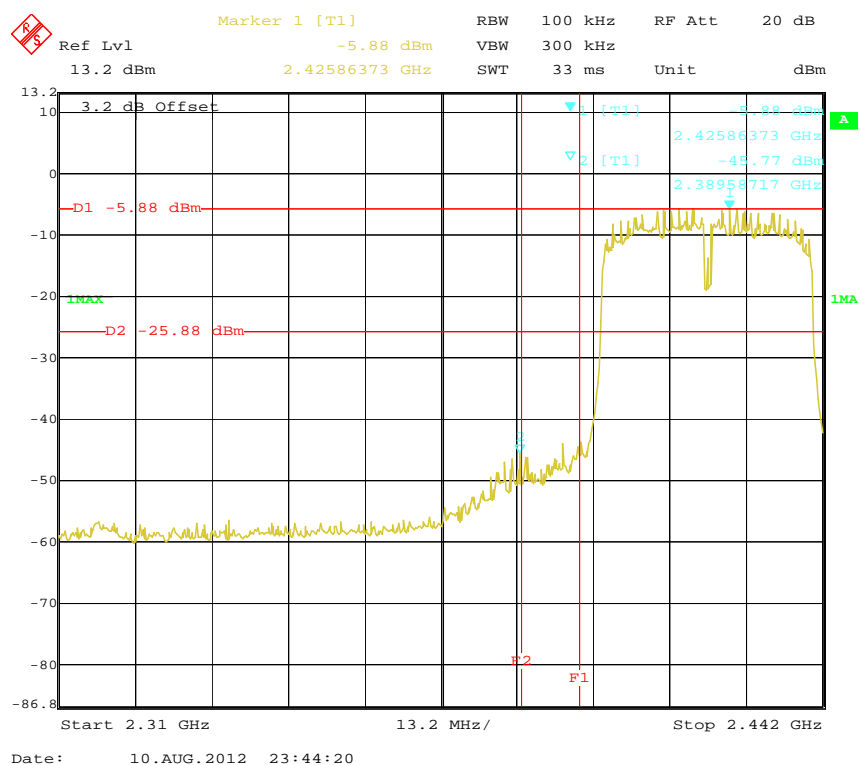
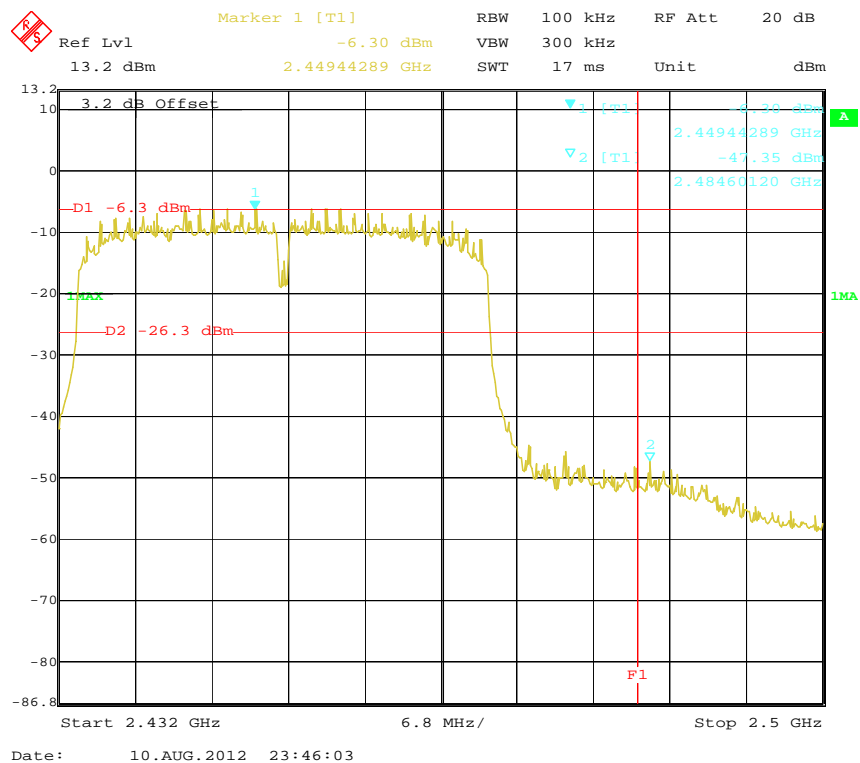
802.11n-HT20 Band Edge, Left Side, Antenna 0

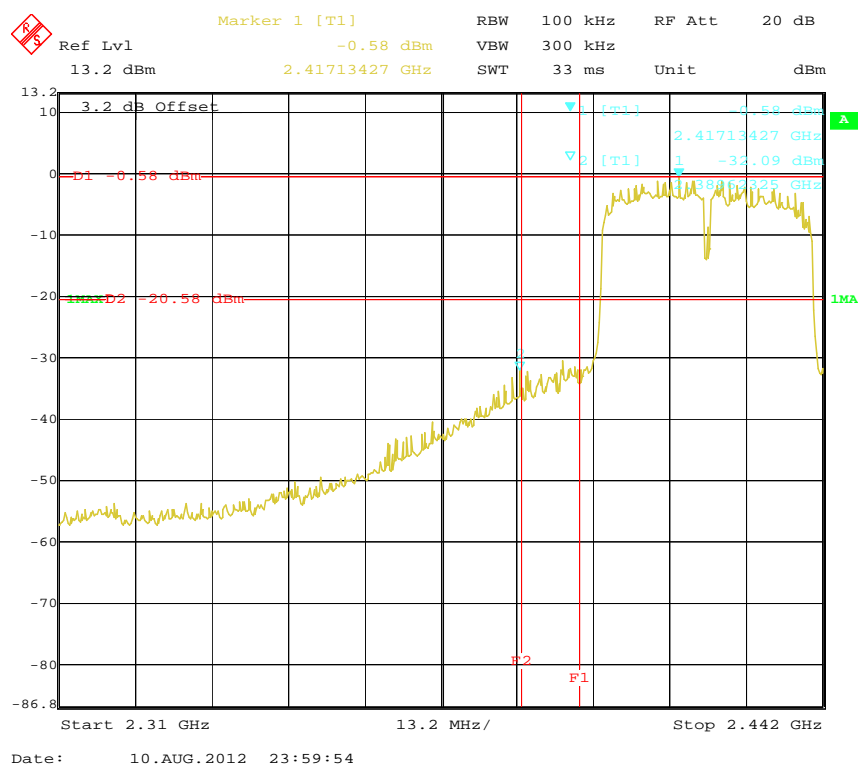
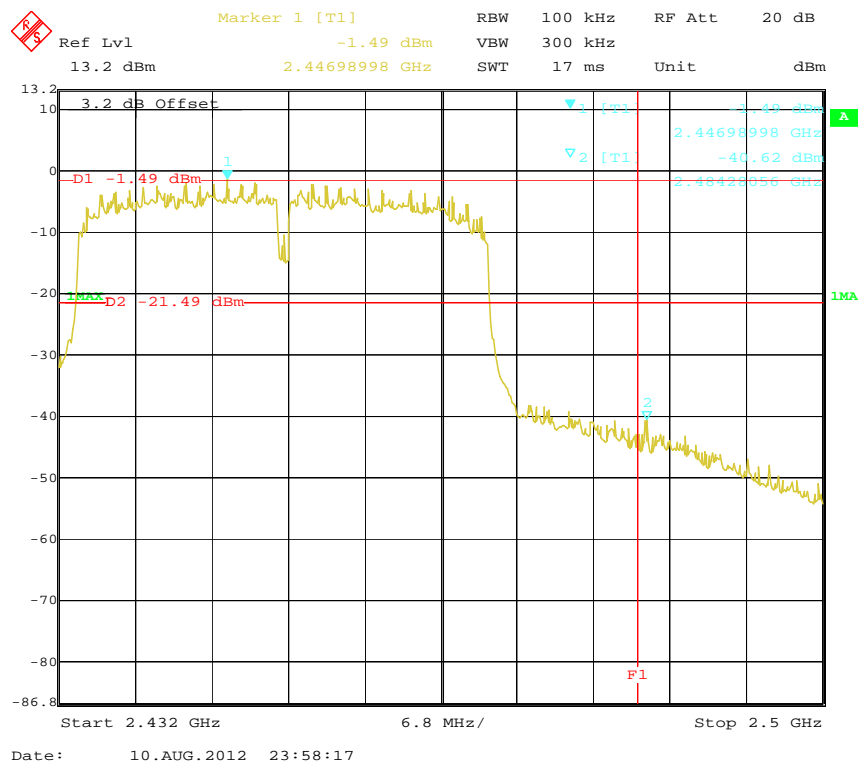


802.11n-HT20 Band Edge, Right Side, Antenna 0



802.11n-HT20 Band Edge, Left Side, Antenna 1**802.11n-HT20 Band Edge, Right Side, Antenna 1**

802.11n-HT40 Band Edge, Left Side, Antenna 0**802.11n-HT40 Band Edge, Right Side, Antenna 0**

802.11n-HT40 Band Edge, Left Side, Antenna 1**802.11n-HT40 Band Edge, Right Side, Antenna 1**

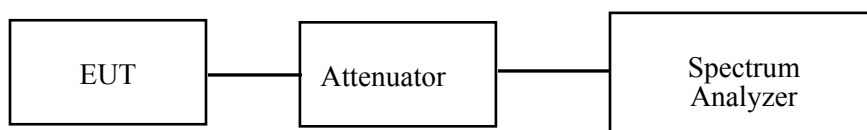
FCC §15.247(e) - POWER SPECTRAL DENSITY

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 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 \geq 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 $BWCF = 10\log(3\text{ kHz}/100\text{ kHz} = -15.2\text{ dB})$.
11. The resulting peak PSD level must be $\leq 8\text{ dBm}$.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23

* **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 Data

Environmental Conditions

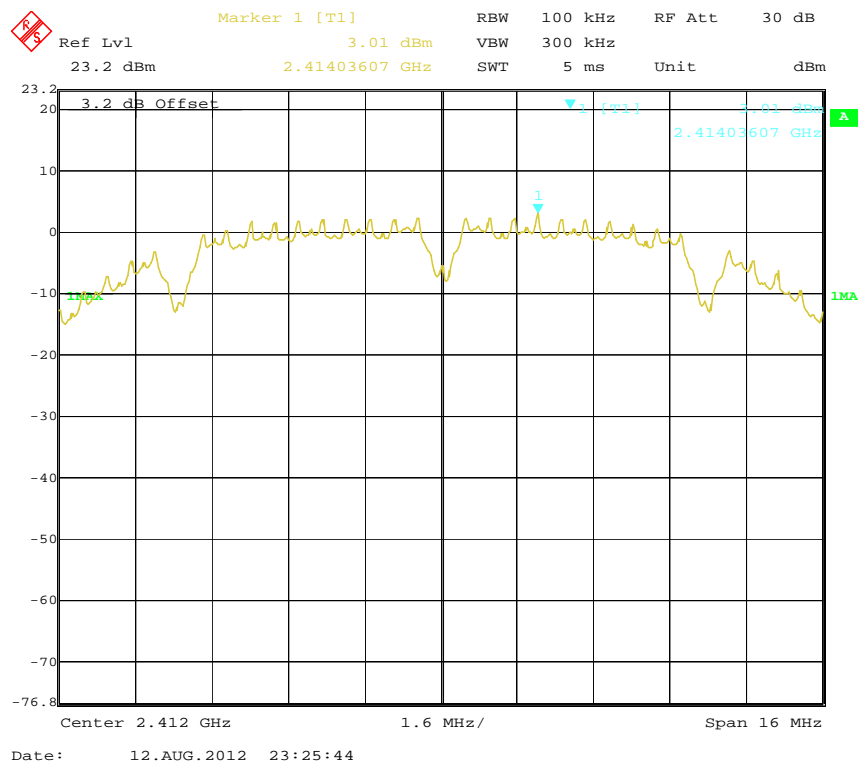
Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Brown Lu on 2012-08-10.

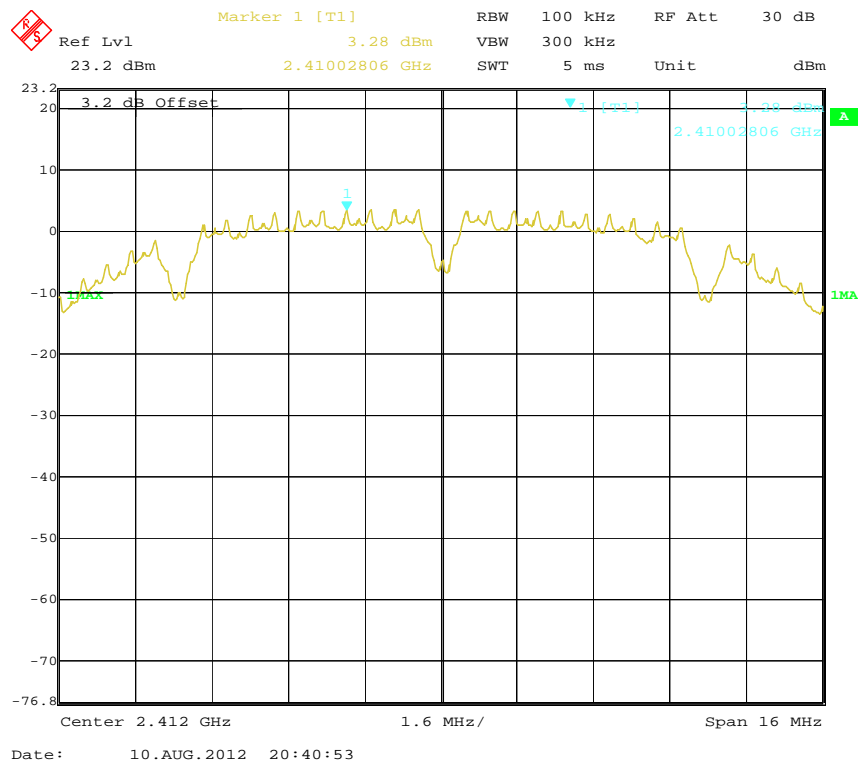
*Test Mode: Transmitting***Test Result:** Pass

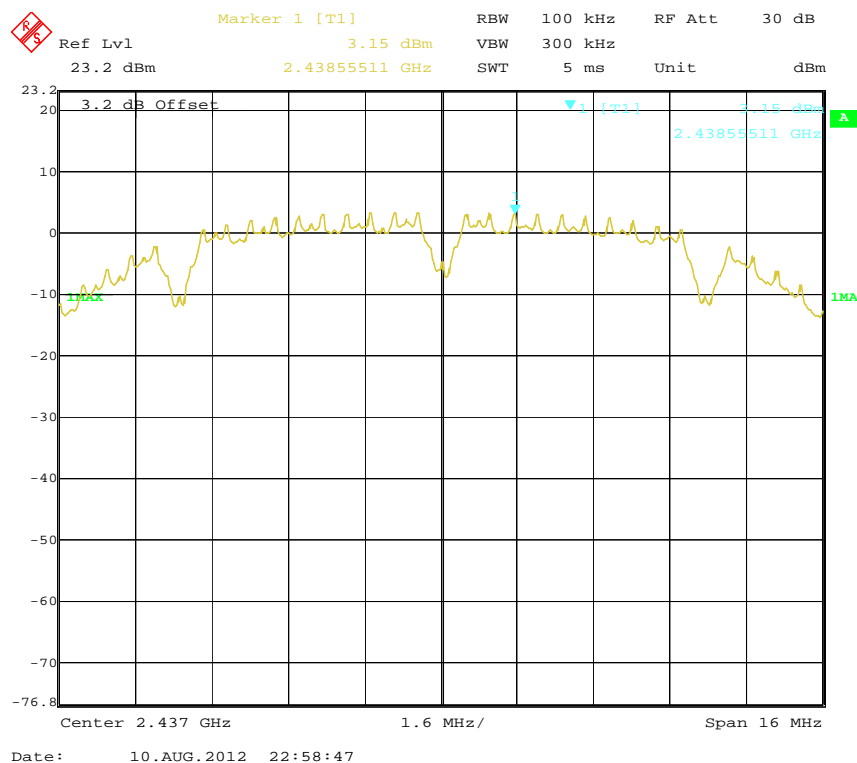
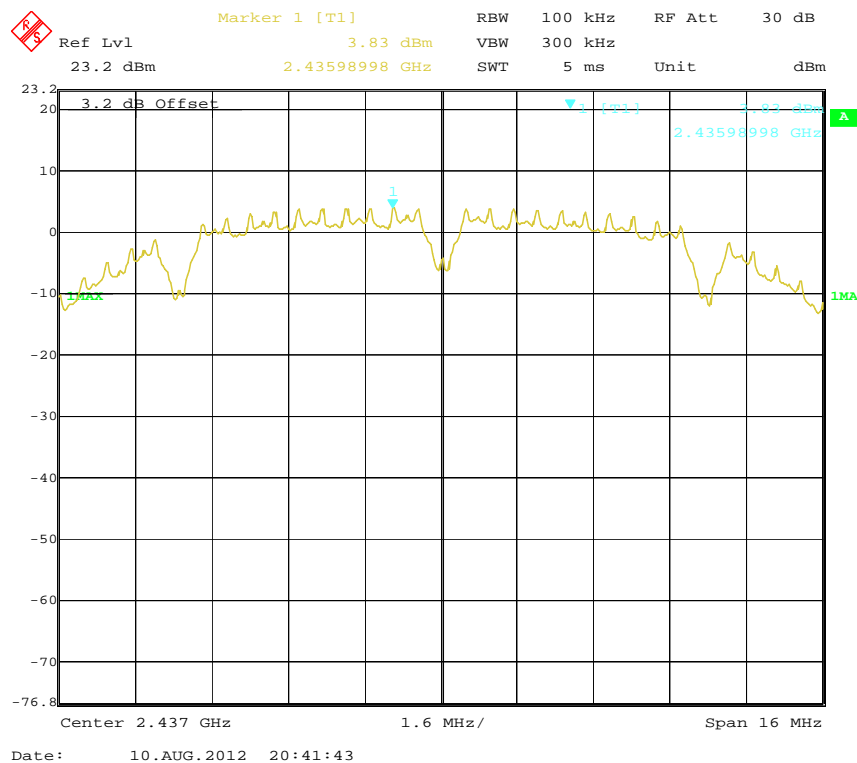
Channel	Frequency (MHz)	Antenna Port	Power spectral density (dBm/100kHz)	BWCF (dB)	Power spectral density (dBm/3kHz)	Limit (dBm/3kHz)	
802.11b mode							
Low	2412	0	3.01	-15.2	-12.19	≤8	
		1	3.28	-15.2	-11.92		
Middle	2437	0	3.15	-15.2	-12.05	≤8	
		1	3.83	-15.2	-11.37		
High	2462	0	3.05	-15.2	-12.15	≤8	
		1	3.02	-15.2	-12.18		
802.11g mode							
Low	2412	0	-3.73	-15.2	-18.93	≤8	
		1	-4.29	-15.2	-19.49		
Middle	2437	0	-4.23	-15.2	-19.43	≤8	
		1	-4.11	-15.2	-19.31		
High	2462	0	-4.13	-15.2	-19.33	≤8	
		1	-4.26	-15.2	-19.46		
802.11n-HT20 mode							
Low	2412	0	-2.36	-15.2	-17.56	-15.20	≤8
		1	-3.78	-15.2	-18.98		
Middle	2437	0	-3.69	-15.2	-18.89	-16.23	≤8
		1	-4.42	-15.2	-19.62		
High	2462	0	-4.13	-15.2	-19.33	-16.57	≤8
		1	-4.65	-15.2	-19.85		
802.11n-HT40 mode							
Low	2422	0	-6.01	-15.2	-21.21	-17.74	≤8
		1	-5.13	-15.2	-20.33		
Middle	2437	0	-7.47	-15.2	-22.67	-18.43	≤8
		1	-5.28	-15.2	-20.48		
High	2452	0	-6.66	-15.2	-21.86	-18.40	≤8
		1	-5.80	-15.2	-21.00		

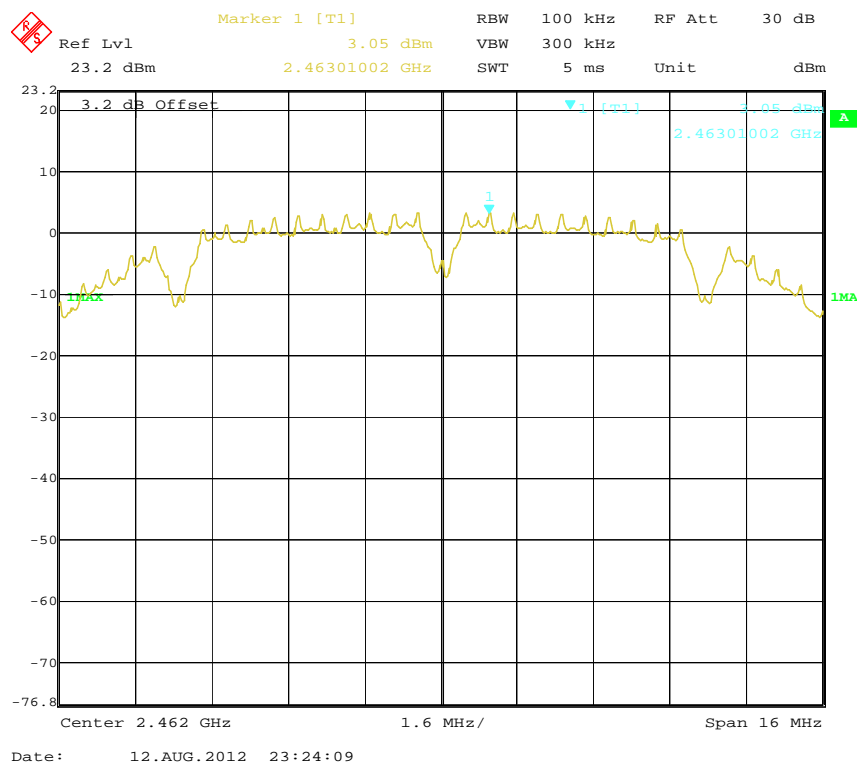
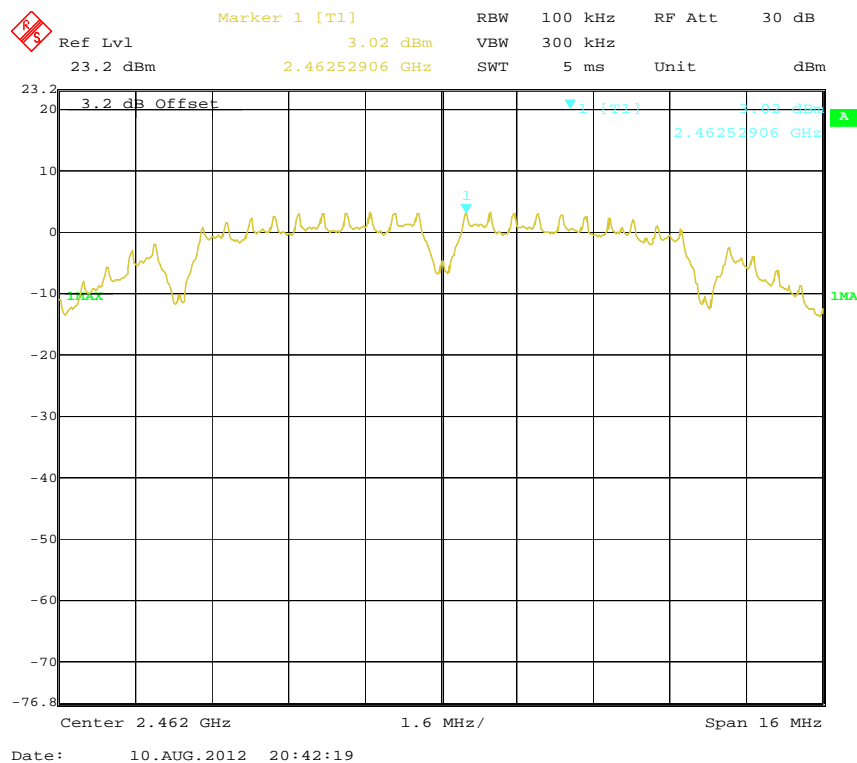
Power Spectral Density, 802.11b Low Channel, Antenna 0



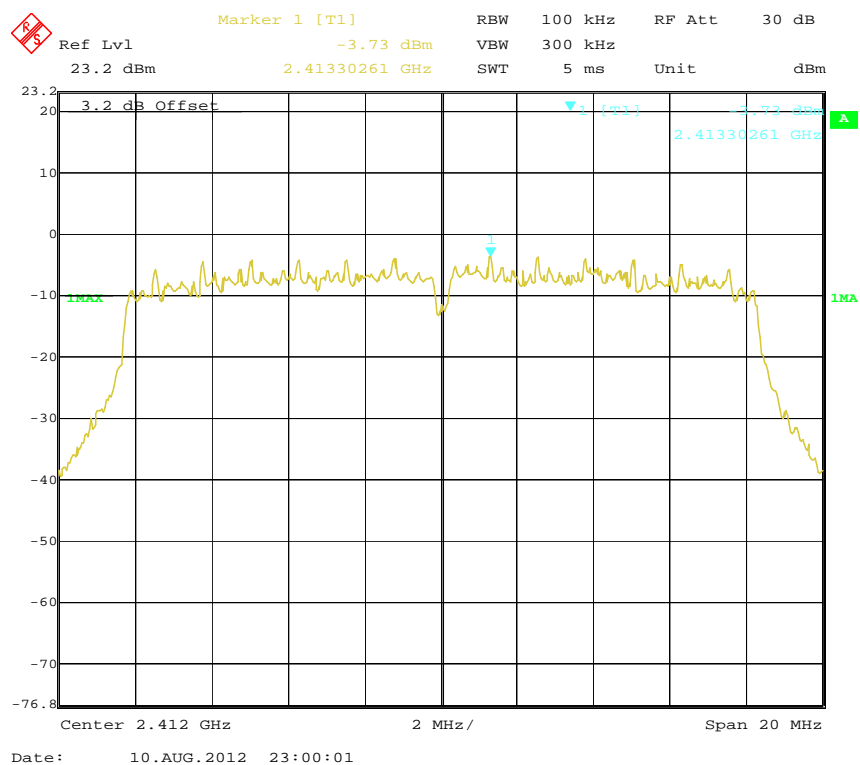
Power Spectral Density, 802.11b Low Channel, Antenna 1



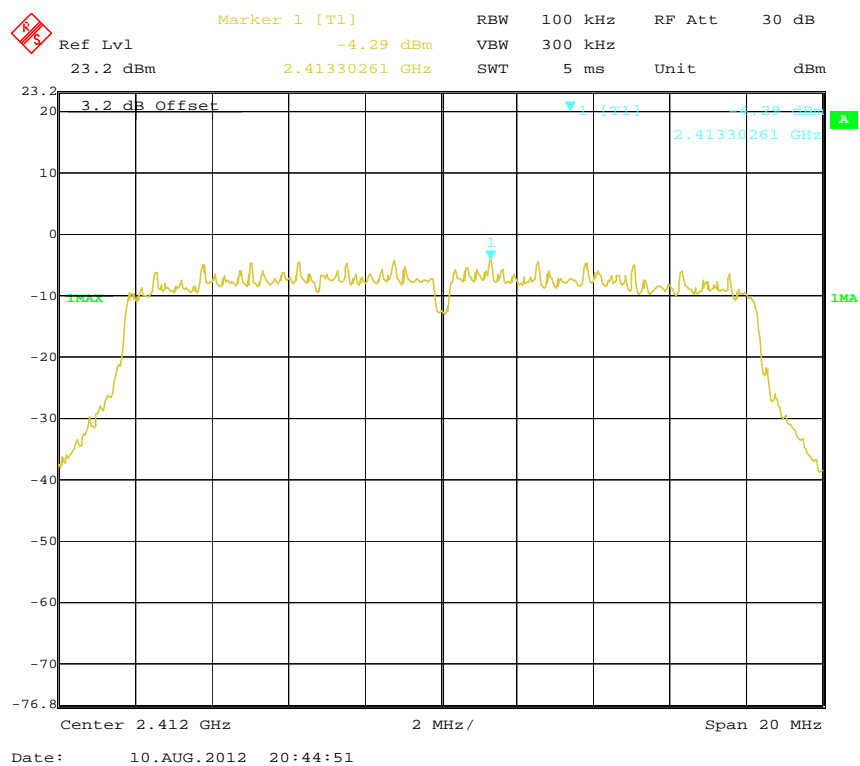
Power Spectral Density, 802.11b Middle Channel, Antenna 0**Power Spectral Density, 802.11b Middle Channel, Antenna 1**

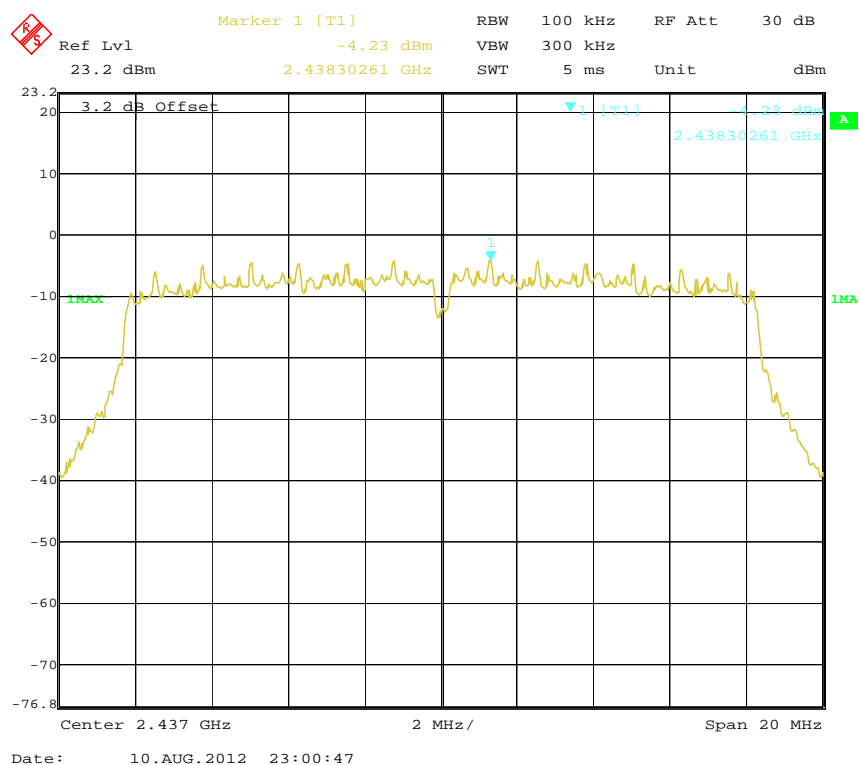
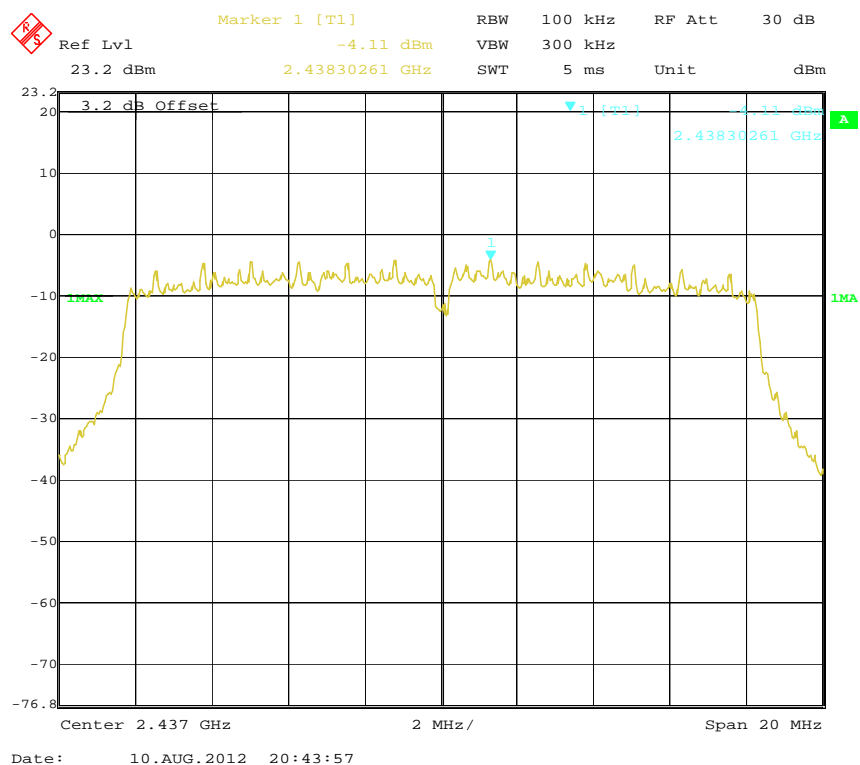
Power Spectral Density, 802.11b High Channel, Antenna 0**Power Spectral Density, 802.11b High Channel, Antenna 1**

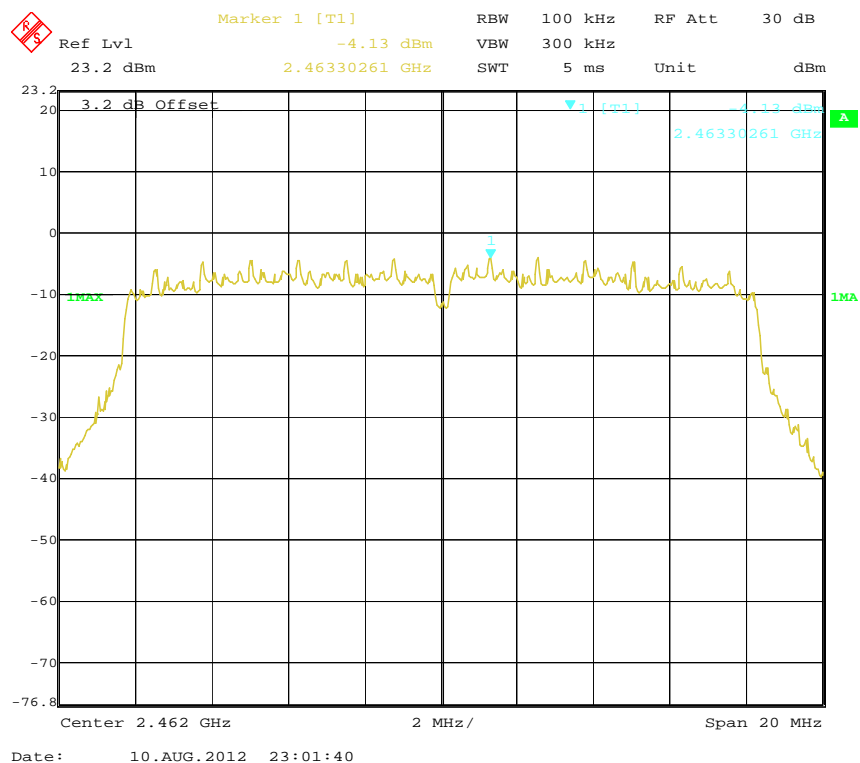
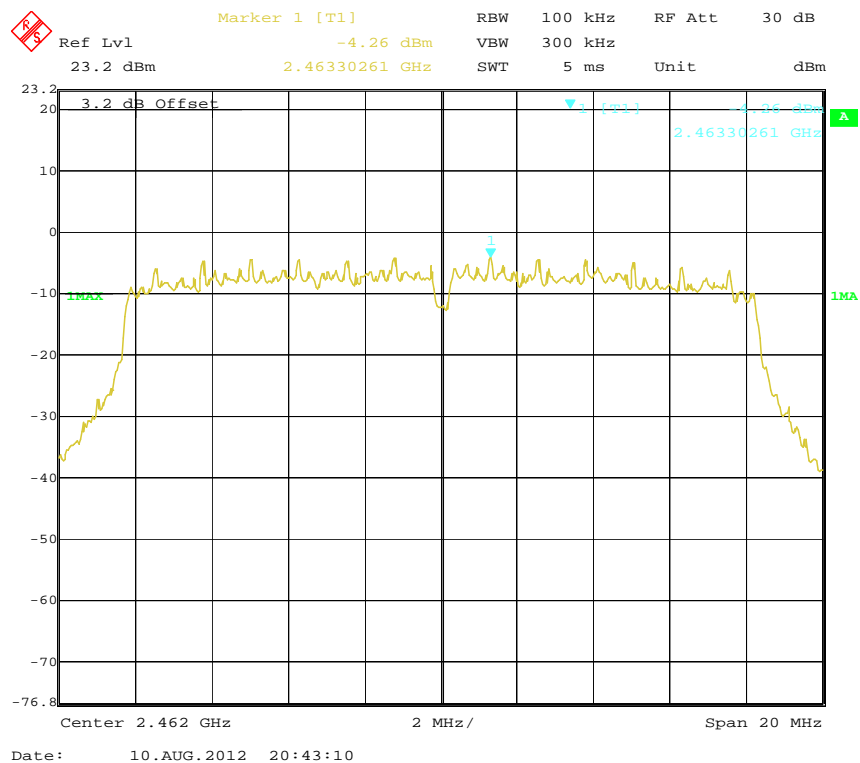
Power Spectral Density, 802.11g Low Channel, Antenna 0

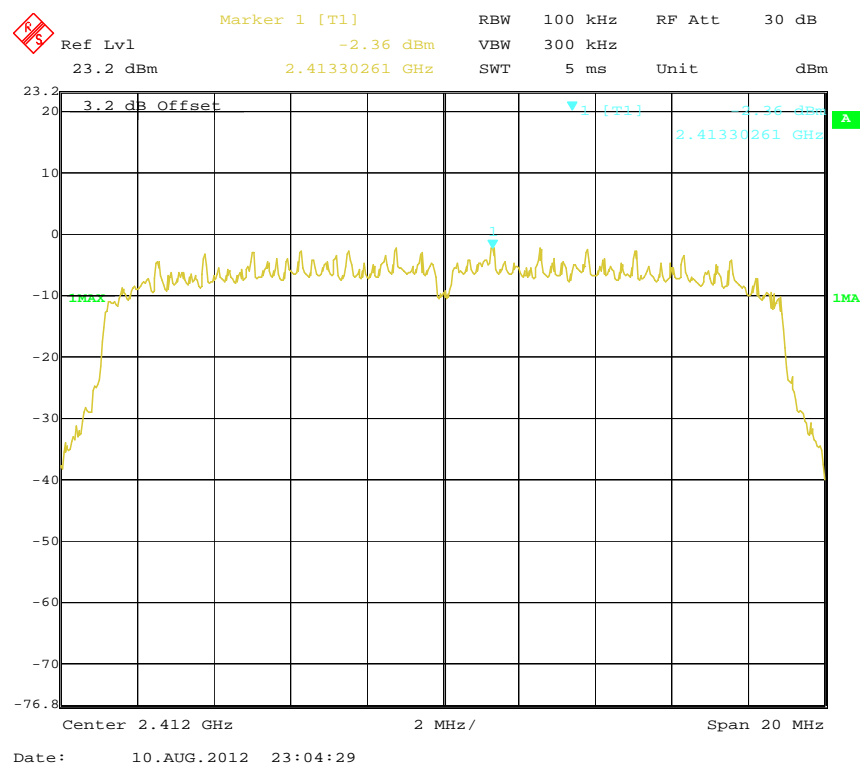
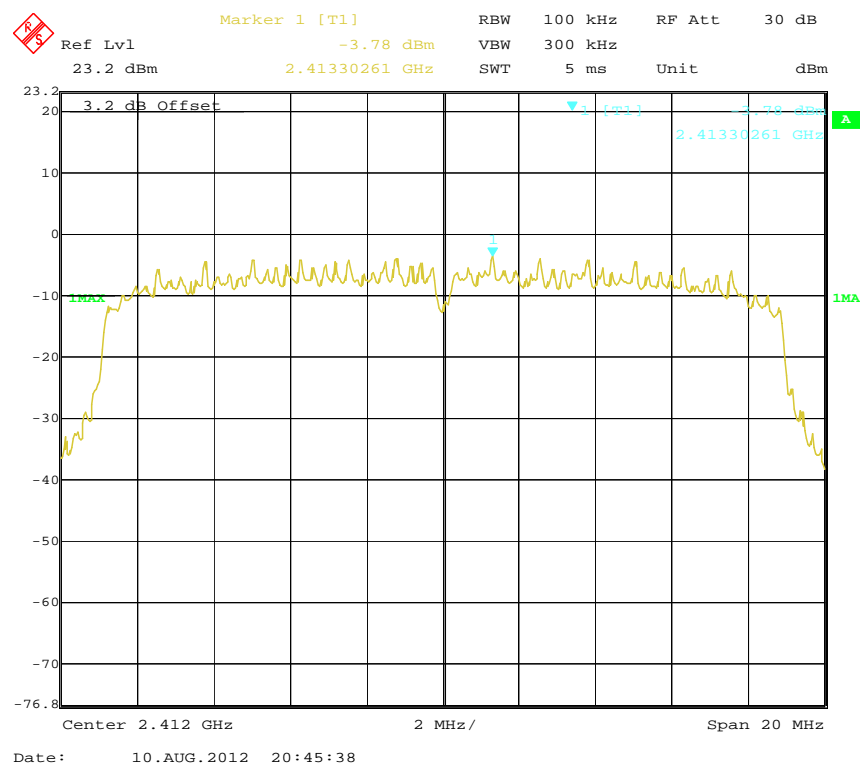


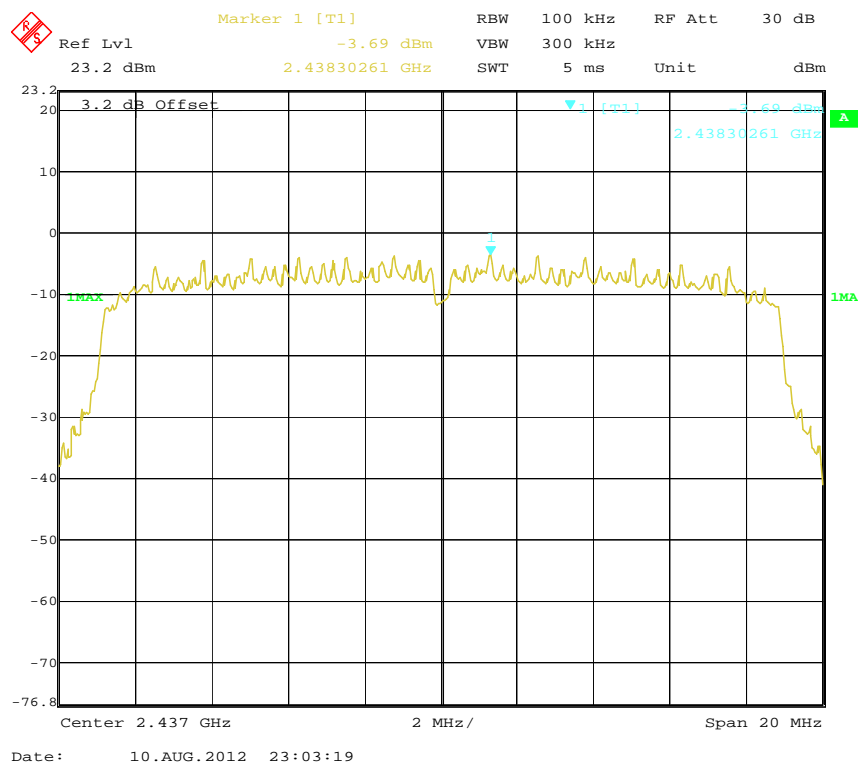
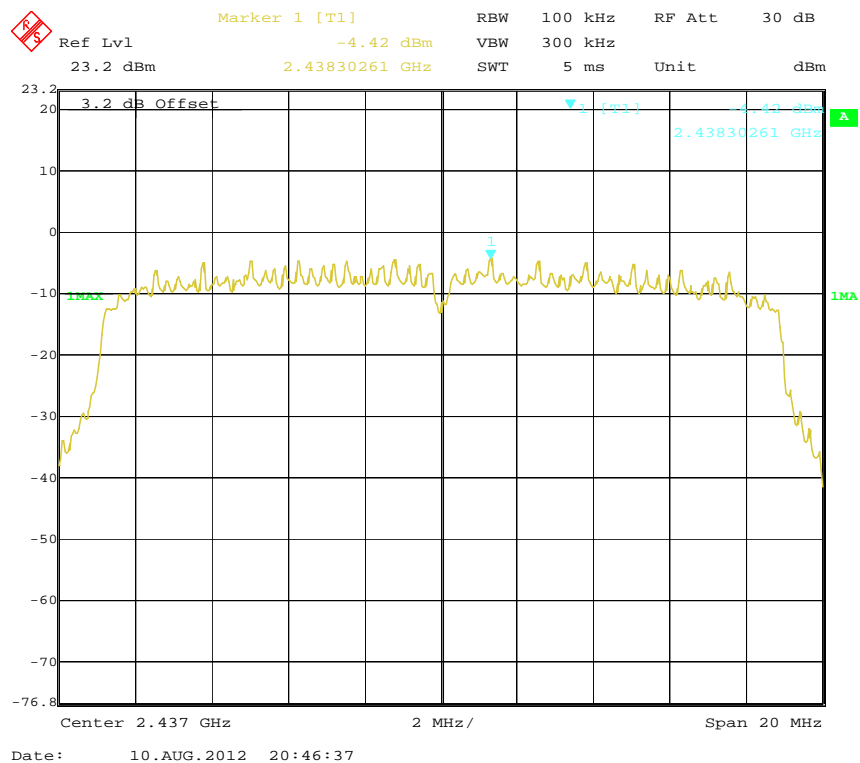
Power Spectral Density, 802.11g Low Channel, Antenna 1

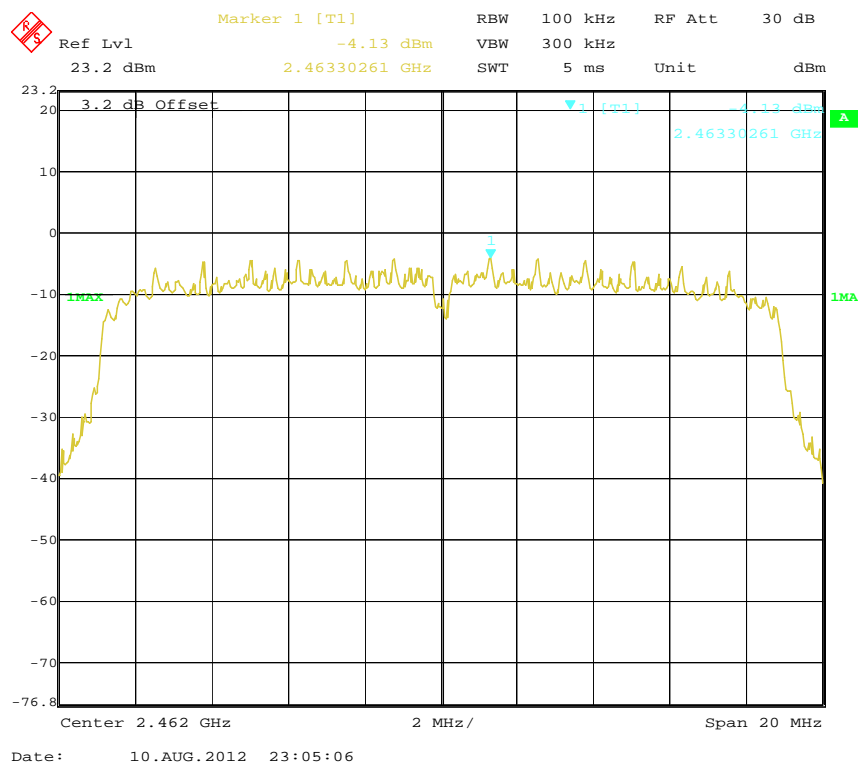
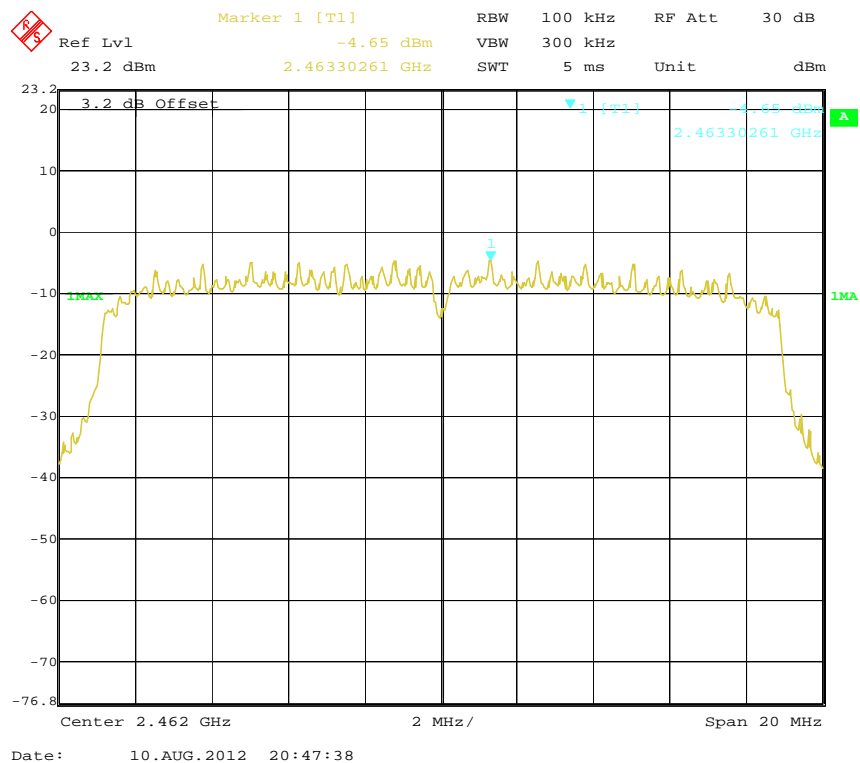


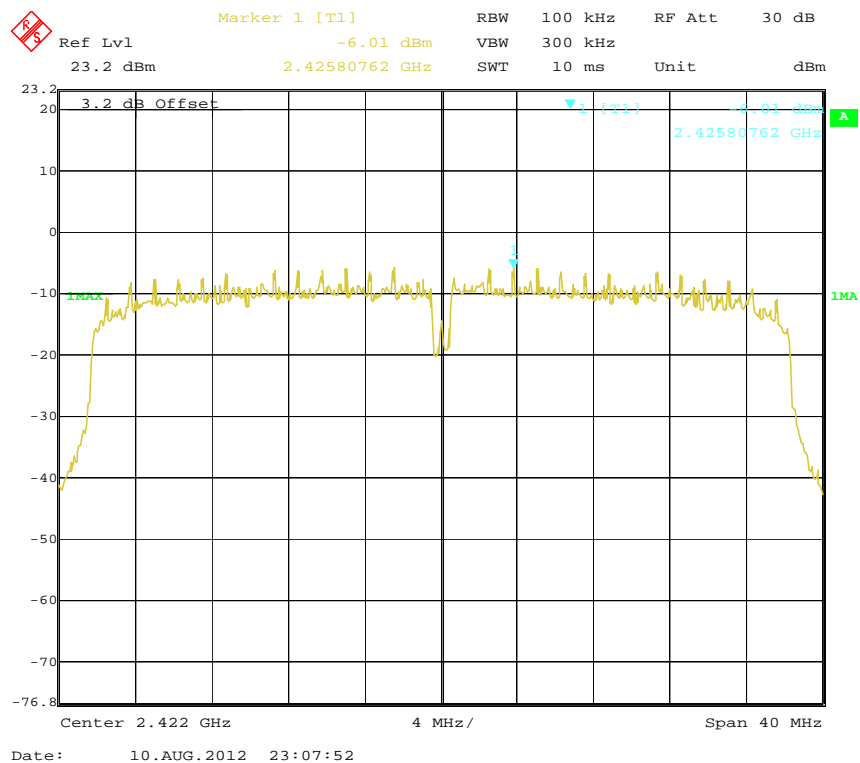
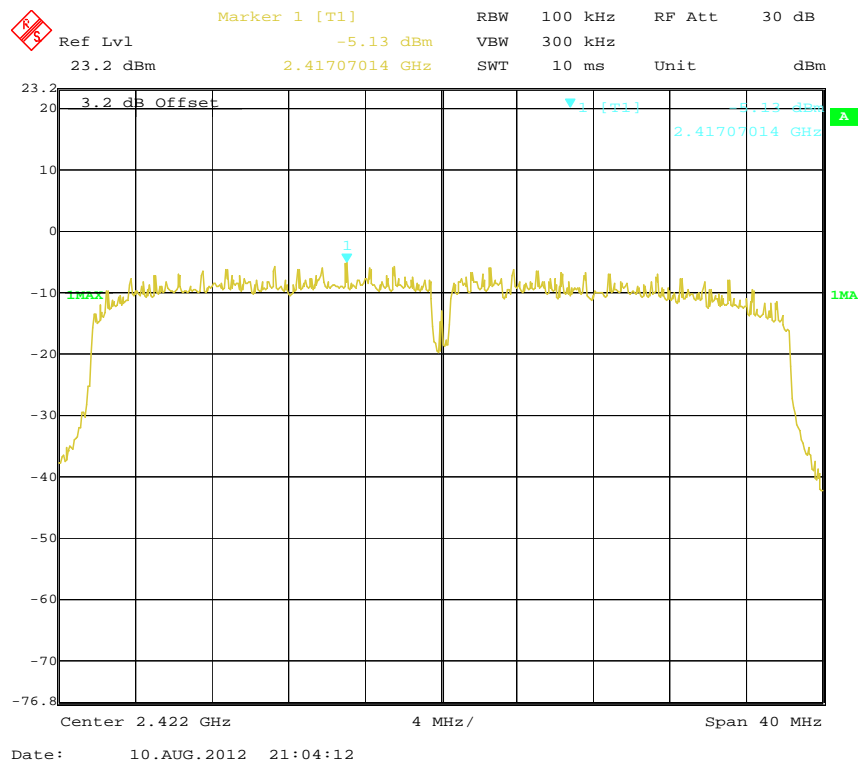
Power Spectral Density, 802.11g Middle Channel, Antenna 0**Power Spectral Density, 802.11g Middle Channel, Antenna 1**

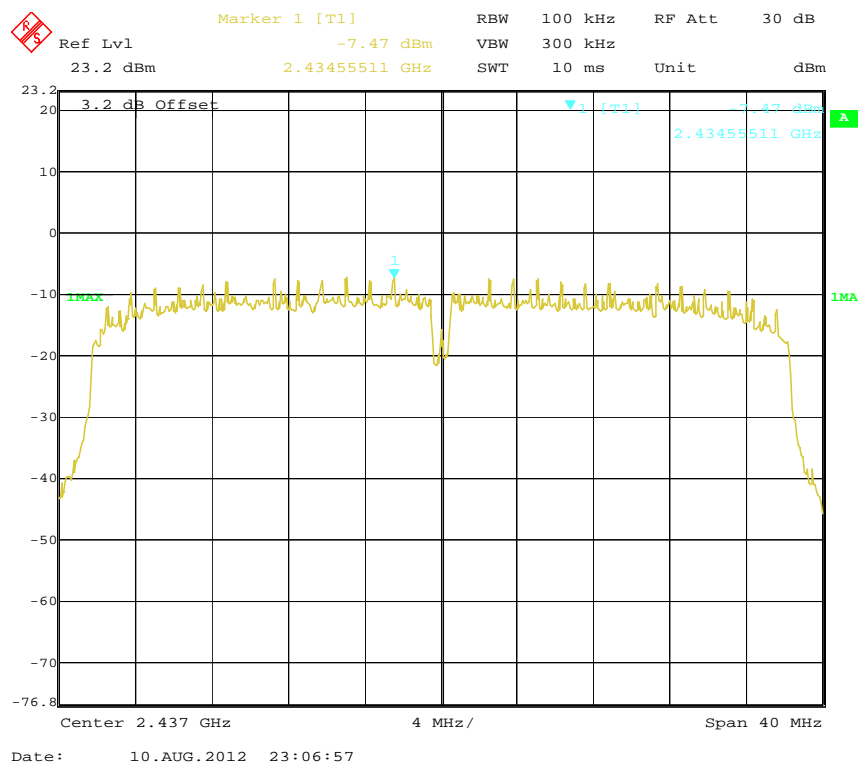
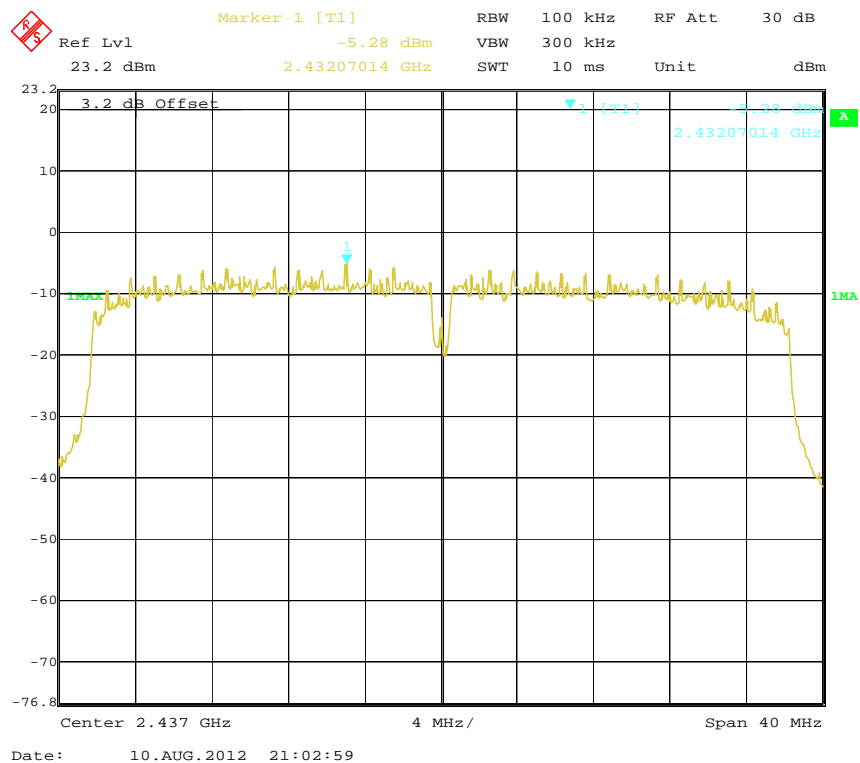
Power Spectral Density, 802.11g High Channel, Antenna 0**Power Spectral Density, 802.11g High Channel, Antenna 1**

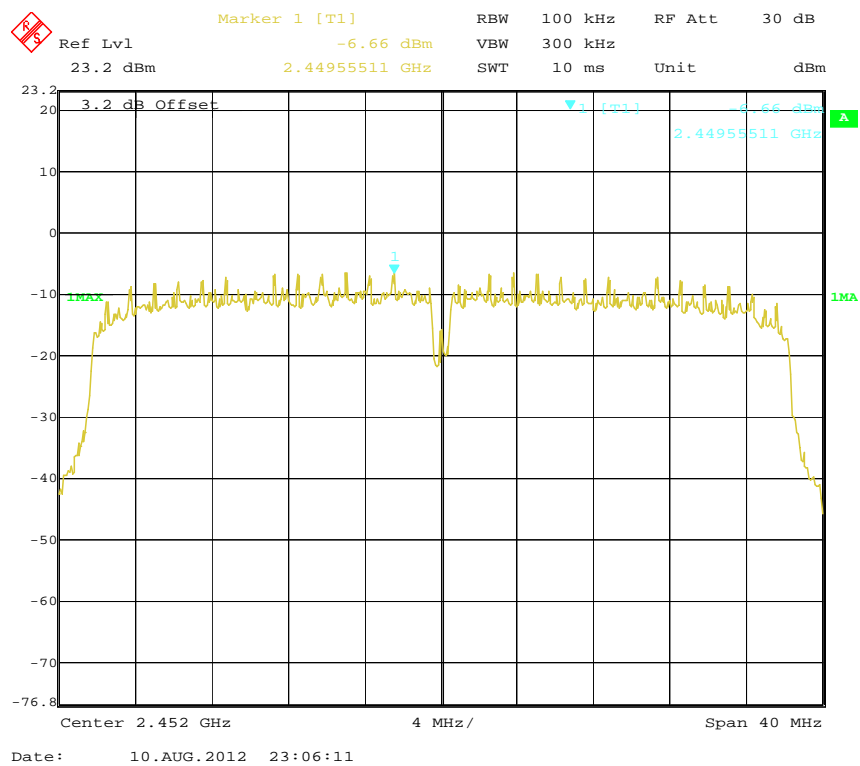
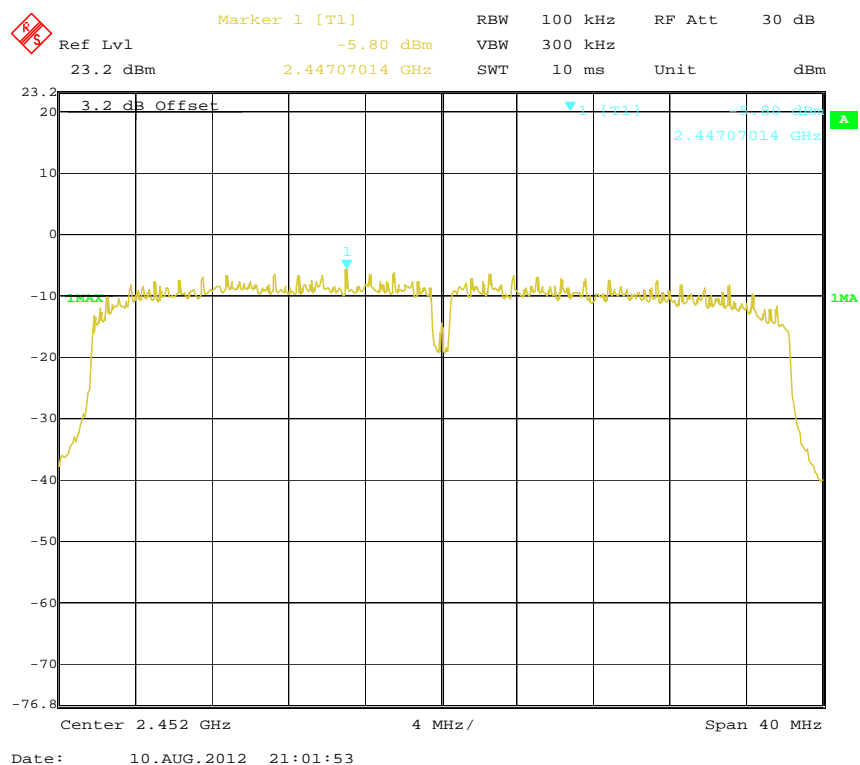
Power Spectral Density, 802.11n-HT20 Low Channel, Antenna 0**Power Spectral Density, 802.11n-HT20 Low Channel, Antenna 1**

Power Spectral Density, 802.11n-HT20 Middle Channel, Antenna 0**Power Spectral Density, 802.11n-HT20 Middle Channel, Antenna 1**

Power Spectral Density, 802.11n-HT20 High Channel, Antenna 0**Power Spectral Density, 802.11n-HT20 High Channel, Antenna 1**

Power Spectral Density, 802.11n-HT40 Low Channel1, Antenna 0**Power Spectral Density, 802.11n-HT40 Low Channel, Antenna 1**

Power Spectral Density, 802.11n-HT40 Middle Channel, Antenna 0**Power Spectral Density, 802.11n-HT40 Middle Channel, Antenna 1**

Power Spectral Density, 802.11n-HT40 High Channel, Antenna 0**Power Spectral Density, 802.11n-HT40 High Channel, Antenna 1**

PRODUCT SIMILARITY DECLARATION LETTER



Suga Electronics Limited

22/F., Tower B, Billion Centre, 1 Wang Kwong Road, Kowloon Bay, Kowloon, Hong Kong
Tel: (852) 2953 0383 Fax: (852) 2953 0393

Date: Sept 4th, 2012

Product Similarity Declaration Letter

To Whom It May Concern,

We, Suga Electronics Limited, hereby declare that our product 802.11b/g/n (2T2R) WLAN AP/Router Module of model numbers SWP23MA-0 and SWP23MA-1 are electrically identical. They have the same PCB layout and schematic. The only difference is that they are using memory chip of different capacity for the purpose of storing firmware of different user interface. The model SWP23MA-0 was tested by BACL.

Please contact me if you have any question.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Tony Tsang", written over a horizontal line.

Tony Tsang

Asst. Electronic Engineering Manager

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