

Emissions Test Report

EUT Name: Wireless Remote Access Point

Model No.: RAP-3WN and RAP-3WNP

CFR 47 Part 15.247:2010 and RSS 210:2010

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Statement of Compliance

Manufacturer: Aruba Networks
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Requester / Applicant: Ivaylo Tankov
Name of Equipment: Wireless Remote Access Point
Model No. RAP-3WN and RAP-3WNP
Type of Equipment: Intentional Radiator
Application of Regulations: CFR 47 Part 15.247:2010 and RSS 210:2010
Test Dates: February 20, 2012 to March 9, 2012

Guidance Documents:

Emissions: ANSI C63.10: 2009

Test Methods:

Emissions: ANSI C63.10: 2009

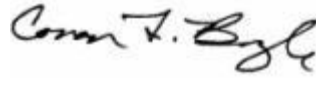
The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

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Jeremy Luong March 27, 2012

Test Engineer Date



Conan Boyle March 27, 2012

NVLAP Signatory Date



NVLAPCODE 500011-0



US5254

Industry Canada

2932M-1

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1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.247:2010 and RSS 210:2010 based on the results of testing performed on February 20, 2012 through March 9, 2012 on the Wireless Remote Access Point Model RAP-3WN and RAP-3WNP manufactured by Aruba Networks. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.4	Test Parameters (from Standard)	Result
Spurious Emission in Received Mode	CFR47 15.109, RSS-GEN Sect.7.2.3	Class B	Complied
Spurious Emission in Transmitted Mode	CFR47 15.209, RSS-GEN Sect.7.2.3	Class B	Complied
Restricted Bands of Operation	CFR47 15.205, RSS 210 Sect.2.6	Class B	Complied
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.7.2.2	Class B	Complied
Occupied Bandwidth	CFR47 15.247 (a2), RSS GEN Sect.4.4.1	500 kHz Minimum	Complied
Maximum Transmitted Power	CFR47 15.247 (b3), RSS 210 Sect. A.8.4	30 dBm w/ 6 dBi antenna	Complied
Peak Power Spectral Density	CFR47 15.247 (e), RSS 210 Sect. A.8.2	8 dBm/ 3 kHz.	Complied
Band Edge Measurement	CFR47 15.247 (d), RSS 210 Sect. A.8.5	30 dB	Complied
RF Exposure	CFR47 15.247 (i), 2.1091	General Population	Complied

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission



TUV Rheinland of North America at 1279 Quarry Lane, Ste. A., Pleasanton, CA 94566, is accredited by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (FRN # US5254). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP



TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2005 and ISO 9002 (Lab Code 500011-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

Industry Canada

TUV Rheinland of North America at the 1279 Quarry Ln, Pleasanton, CA 94566 address is accredited by Industry Canada for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by Industry Canada (File Number 2932M-1). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). The accreditation is updated every 3 years.

2.1.4 Japan – VCCI



The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at 1279 Quarry Lane, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration Nos. R3701, G447, C-4144, T-1176, C-4145, T-1177).

2.1.5 Acceptance by Mutual Recognition Arrangement



The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Lane, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Ste. A, Pleasanton, California 94566, USA. The 2305 Mission College, Santa Clara, 95054, USA location is considered a Pleasanton annex.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at test distances of 3 and 5 meters. The site is listed with the FCC and accredited by NVLAP (Lab Code 500011-0). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at test distances of 3 meters and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 4.8 m x 3.175 mm thick aluminum floor connected to PE ground.

For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470-k Ω resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470-k Ω resistors.

For EFT, Surge, PQF, the HCP and VCP are removed.

RF Field Immunity testing is performed in a 7.3m x 4.3m x 4.1m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.8m x 3.7m x 3.175mm thick aluminum ground plane.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

The *Expanded Uncertainty* defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m}}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

$$25 \text{ dBuV/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dBuV/m}$$

2.3.2 Measurement Uncertainties

Table 2: Summary of Uncertainties

	U_{lab}	U_{cispr}
Radiated Disturbance		
30 MHz – 25,000 MHz	3.2 dB	5.2 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.4 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.5 dB

Note: U_{lab} is the calculated Combined Standard Uncertainty
 U_{cispr} is the measurement uncertainty requirement per CISPR 16.

Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is $\pm 4.1\%$.
The estimated combined standard uncertainty for radiated immunity measurements is $\pm 2.7\text{dB}$.
The estimated combined standard uncertainty for conducted immunity measurements is $\pm 1.4\text{dB}$.
The estimated combined standard uncertainty for damped oscillatory wave immunity measurements is $\pm 8.8\%$.
The estimated combined standard uncertainty for harmonic current and flicker measurements is $\pm 0.45\%$.

Measurement Uncertainty – Radio Testing

The estimated combined standard uncertainty for frequency error measurements is $\pm 3.88\text{ Hz}$
The estimated combined standard uncertainty for carrier power measurements is $\pm 1.59\text{ dB}$.
The estimated combined standard uncertainty for adjacent channel power measurements is $\pm 1.47\text{ dB}$.
The estimated combined standard uncertainty for modulation frequency response measurements is $\pm 0.46\text{ dB}$.
The estimated combined standard uncertainty for transmitter conducted emission measurements is $\pm 4.01\text{ dB}$

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 17025:2005.

3 Product Information

3.1 Product Description

RAP-3WN/ RAP-3WNP are ideal for home teleworkers and small branches. The single-radio 802.11 b/g/n RAP-3WN Remote Access Point offers wired and wireless network access, zero-touch provisioning, identity-based access control, policy-based forwarding, air monitoring and wireless intrusion protection across the 2.4-GHz band.

RAP-3WN/ RAP-3WNP devices features three 10/100BASE-T ports that can each be configured with a unique set of policies, and a USB port for backup WAN connectivity across 3G/4G networks. RAP-3WNP provides an 802.3af PoE power source (PSE) on the E2 Ethernet interface to power up VOIP phones and other personal devices

3.2 Equipment Configuration

A description of the equipment configuration is given in Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

RAP-3WNP is powered by 48V DC adapter, with the PoE function. RAP-3WN powered by 12V DC adapter is depopulated version of the RAP-3WNP which offers no PoE function. The RAP-3WNP was selected to produce the worst case radiation for emission testing.

3.3 Operating Mode

A description of the operation mode is given in Test Plan Section. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.4 Unique Antenna Connector

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 Results

The RAP-3WN and RAP-3WNP are equipped with two antennas inside the device.

- Manufacturer is LYNwave. Part No. ALA100-051022
- Omni-directional antenna
- Connector type is UFL.
- Antenna gain is 3.0 dBi

Since RAP-3WN and RAP-3WNP has beam forming option, the total antenna gain is calculated per KDB662911.

Directional Gain = $G_{ant} + 10\log(N)$; where G_{ant} is antenna gain and N is # of output chain.

Directional Gain = $3\text{dBi} + 10\log(2) = 6.0\text{dBi}$

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247:2010 and RSS 210 Annex 8:2010. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in ANSI C63.10: 2009 were used.

4.1 Output Power Requirements

The maximum peak output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.

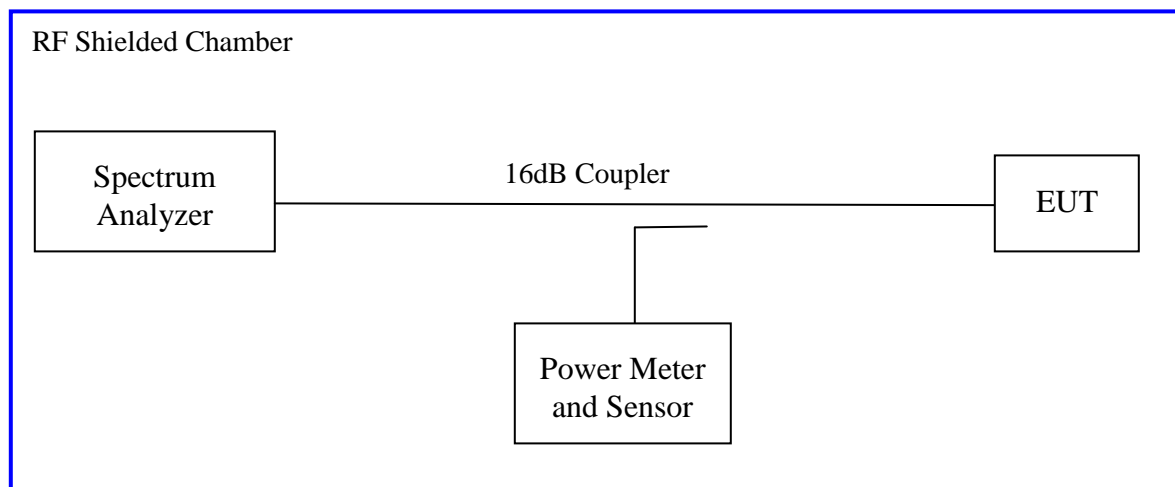
The maximum output power and harmonics shall not exceed CFR47 Part 15.247 (b3):2010 and RSS 210 A.8.4: 2010

The maximum transmitted power is +30 dBm or 1 Watt.

4.1.1 Test Method

The conducted method was used to measure the channel power output according to ANSI C63.10:2009 Section 6.10.3.1. The measurement was performed with modulation per CFR47 Part15.247 (b3):2010 and RSS 210 A.8.4: 2010. This test was conducted on 3 channels of Sample, S/N BF0000400. The worst mode result indicated below.

Test Setup:



Measurement Procedure AVG2 of KDB 558074 was applied with the device transmitted at 100% duty cycle. Since the RAP-3WN and RAP-3WNP is a 2x2 MIMO with beam forming option, the KDB 662911 procedure was used to combine the multi-chain outputs.

4.1.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 3: RF Output Power at the Antenna Port – Test Results

Test Conditions: Conducted Measurement, Normal Temperature					
Antenna Type: Omni-directional			Power Setting: See test plan		
Antenna Gain: +3.0 dBi			Directional Gain: +6.0 dBi		
Signal State: Modulated			Duty Cycle: 100%		
Ambient Temp.: 23 °C			Relative Humidity: 35%		
802.11b Mode (1x2)					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Max. Power [dBm]	Margin [dB]
2412 MHz	+30.00	13.815	13.885	13.885	-16.12
2437 MHz	+30.00	12.869	12.233	12.869	-17.13
2462 MHz	+30.00	13.990	14.196	14.196	-15.80
Note: The highest output power was observed at 1Mbps. Only one chain would be active in this mode.					
802.11b Mode (2x2)					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Total Power [dBm]	Margin [dB]
2412 MHz	+30.00	12.257	13.359	15.853	-14.15
2437 MHz	+30.00	13.568	12.916	16.265	-13.74
2462 MHz	+30.00	13.475	13.163	16.332	-13.67
Note: The highest output power was observed at 1Mbps.					
802.11g Mode (1x2)					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Max. Power [dBm]	Margin [dB]
2412 MHz	+30.00	8.370	8.207	8.370	-21.63
2437 MHz	+30.00	14.005	12.845	14.005	-16.00
2462 MHz	+30.00	8.978	8.272	8.978	-21.02

Note: The highest output power was observed at 6 Mbps. Only one chains would be active in this mode.					
802.11g Mode (2x2)					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Total Power [dBm]	Margin [dB]
2412 MHz	+30.00	7.932	8.505	11.238	-18.76
2437 MHz	+30.00	13.932	13.360	16.666	-13.33
2462 MHz	+30.00	7.891	7.175	10.558	-19.44
Note: The highest output power was observed at 6 Mbps.					
802.11n (HT20) Mode, 1x2					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Max. Power [dBm]	Margin [dB]
2412 MHz	+30.00	6.653	7.078	7.078	-22.92
2437 MHz	+30.00	14.895	14.549	14.895	-15.10
2462 MHz	+30.00	7.940	7.213	7.940	-22.06
Note: The highest output power was observed at HT20 6.5 Mbps, 1 Data Stream.					
802.11n (HT20) Mode, 2x2					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Total Power [dBm]	Margin [dB]
2412 MHz	+30.00	6.218	6.593	9.420	-20.58
2437 MHz	+30.00	14.723	14.610	17.677	-12.32
2462 MHz	+30.00	7.225	6.522	9.898	-20.10
Note: The highest output power was observed at HT20 13 Mbps, 2 Data Stream.					
802.11n (HT40) Mode, 1x2					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Max. Power [dBm]	Margin [dB]
2422 MHz	+30.00	4.705	5.094	5.094	-24.91
2437 MHz	+30.00	8.389	8.427	8.427	-21.57
2452 MHz	+30.00	6.780	6.325	6.780	-23.22
Note: The highest output power was observed at HT40 13.5 Mbps, 1 Data Stream.					
802.11n (HT40) Mode, 2x2					
Frequency	Limit [dBm]	Chain 0 [dBm]	Chain 1 [dBm]	Total Power [dBm]	Margin [dB]
2422 MHz	+30.00	3.465	5.138	7.392	-22.61

2437 MHz	+30.00	7.896	7.970	10.943	-19.06
2452 MHz	+30.00	6.311	5.776	9.062	-20.94
Note: The highest output power was observed at HT40 27 Mbps, 2 Data Stream.					

- Note:**
1. The highest power output in each mode are high-lighted.
 2. The highest channel power plots for each mode are displayed below. Additional plots are available upon requested.
 3. The beam forming in 2 space streams would have 6 dBi directional antenna gain. No antenna power adjustment is needed.

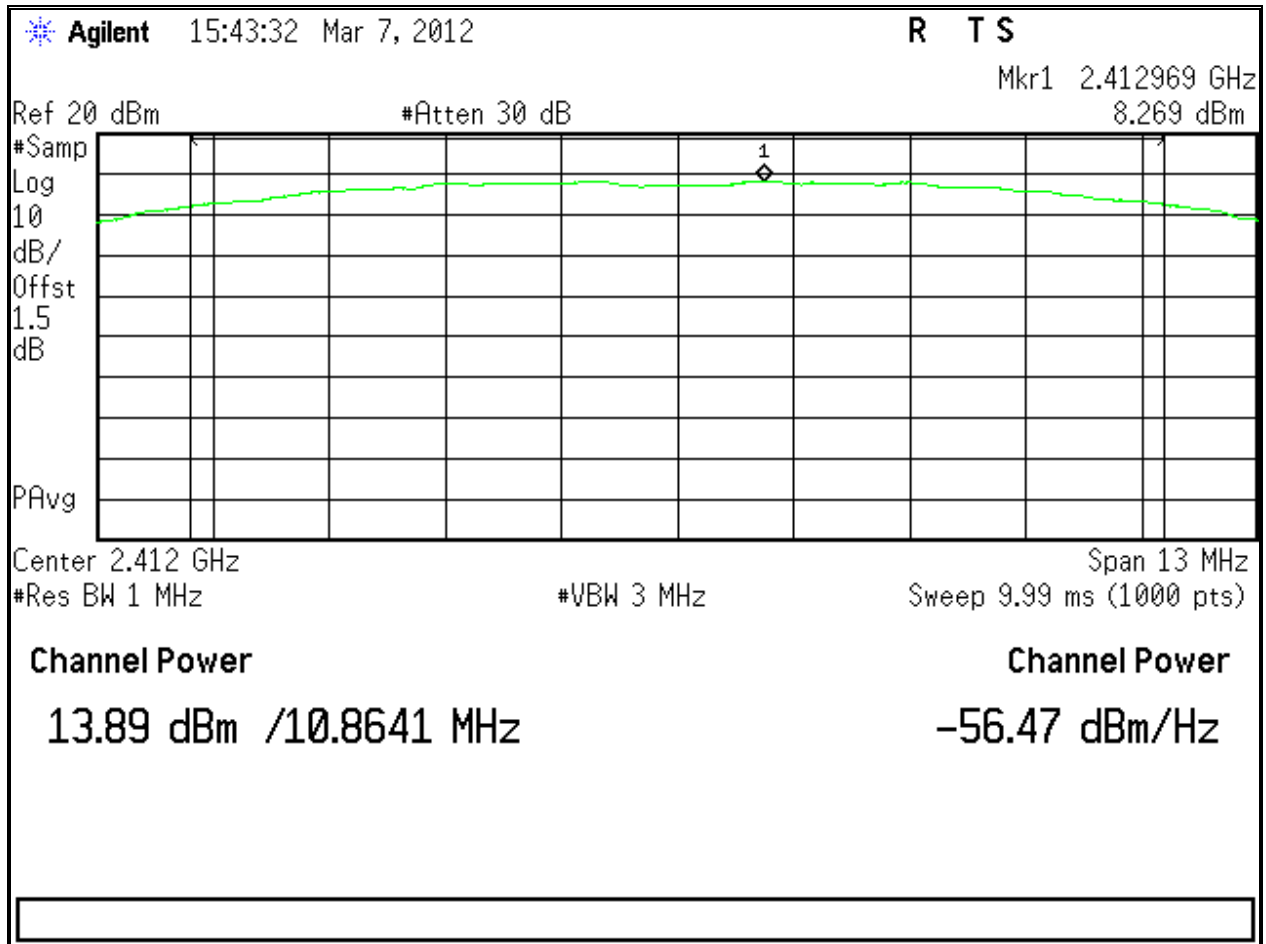


Figure 1: Maximum Transmitted Power at Chain 1, 2412 MHz of 802.11b 1Mbps (1x2)

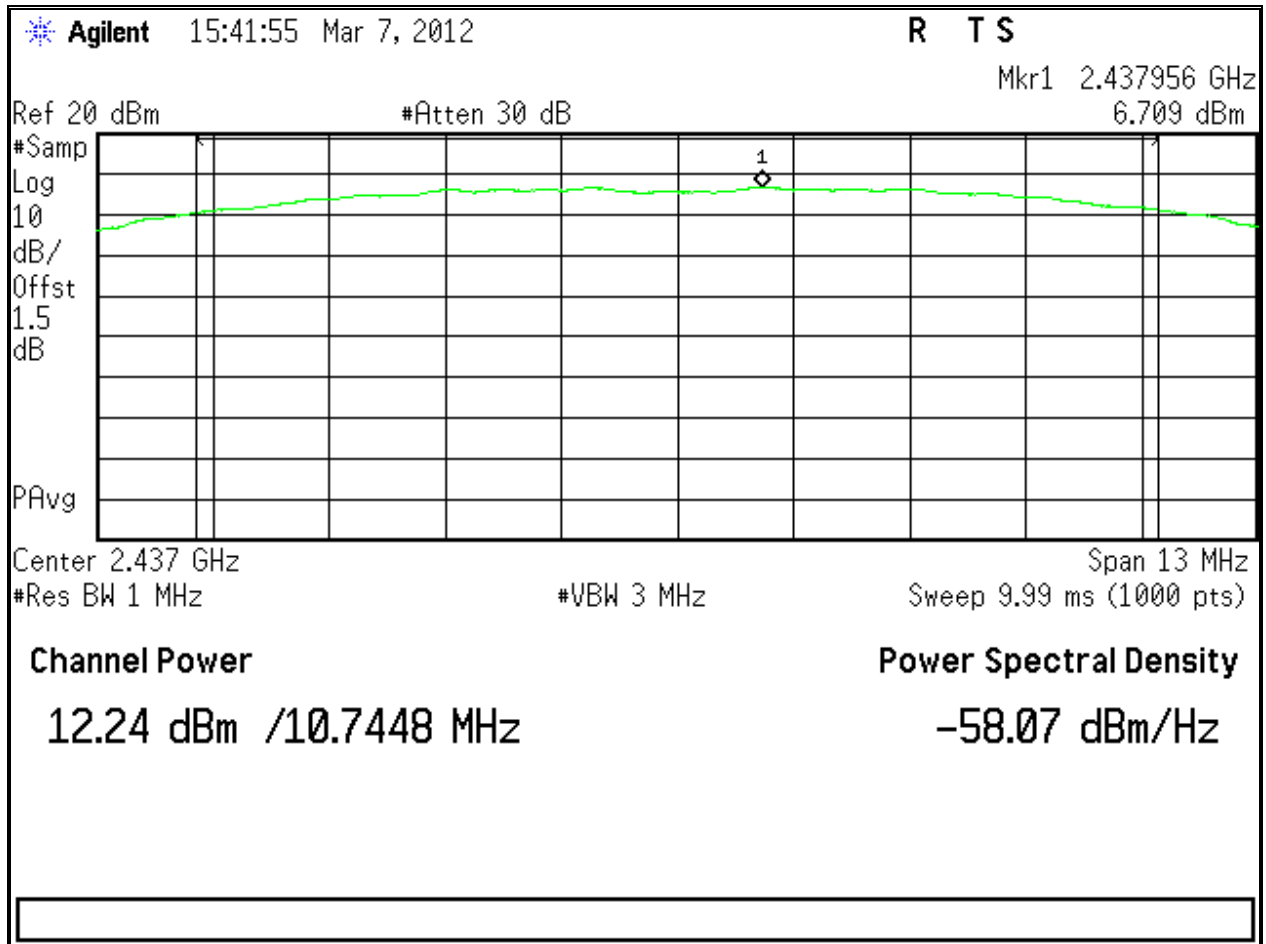


Figure 2: Maximum Transmitted Power at Chain 1, 2437 MHz of 802.11b 1Mbps (1x2)

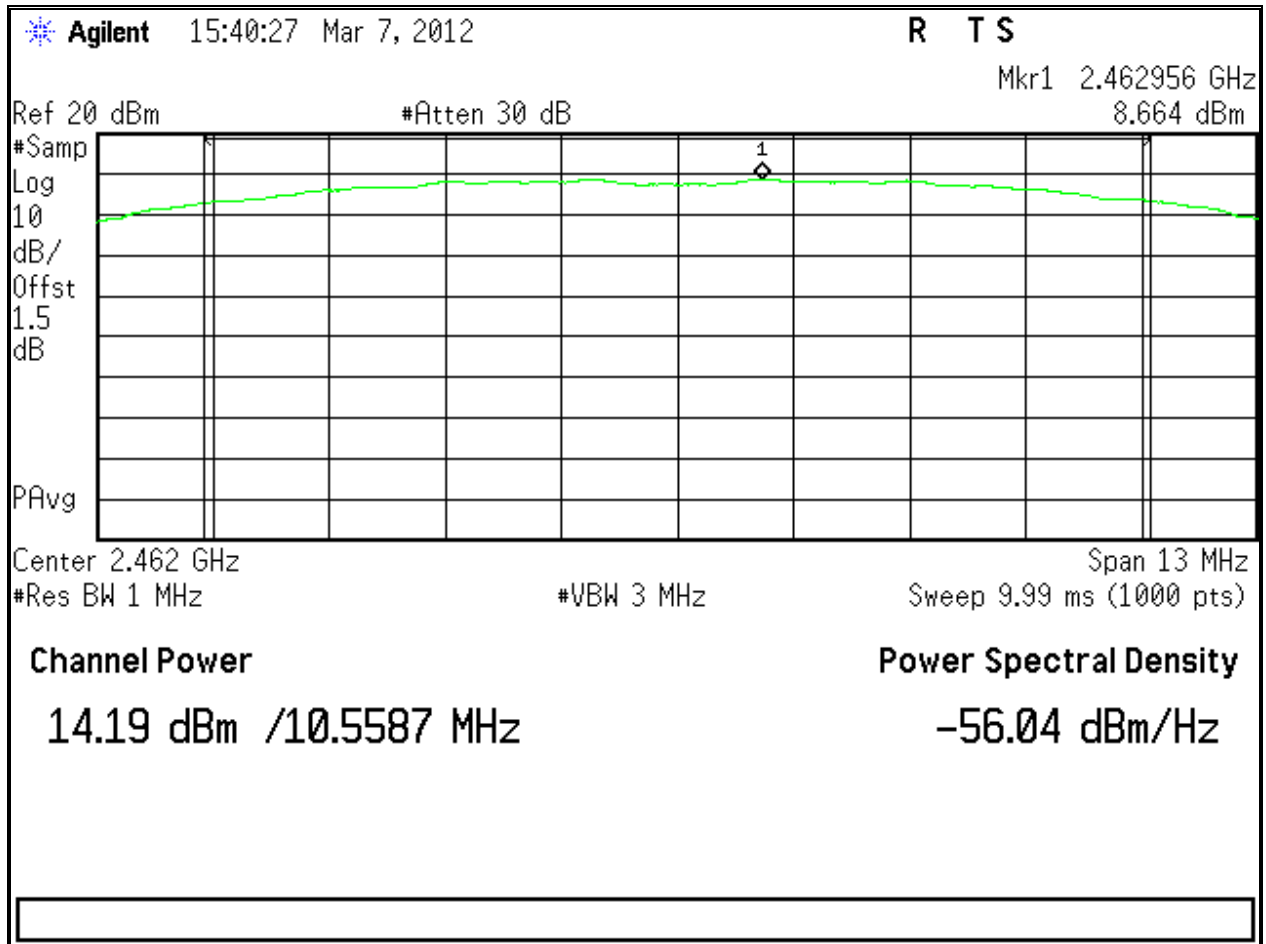


Figure 3: Maximum Transmitted Power at Chain 1, 2462 MHz of 802.11b 1Mbps (1x2)

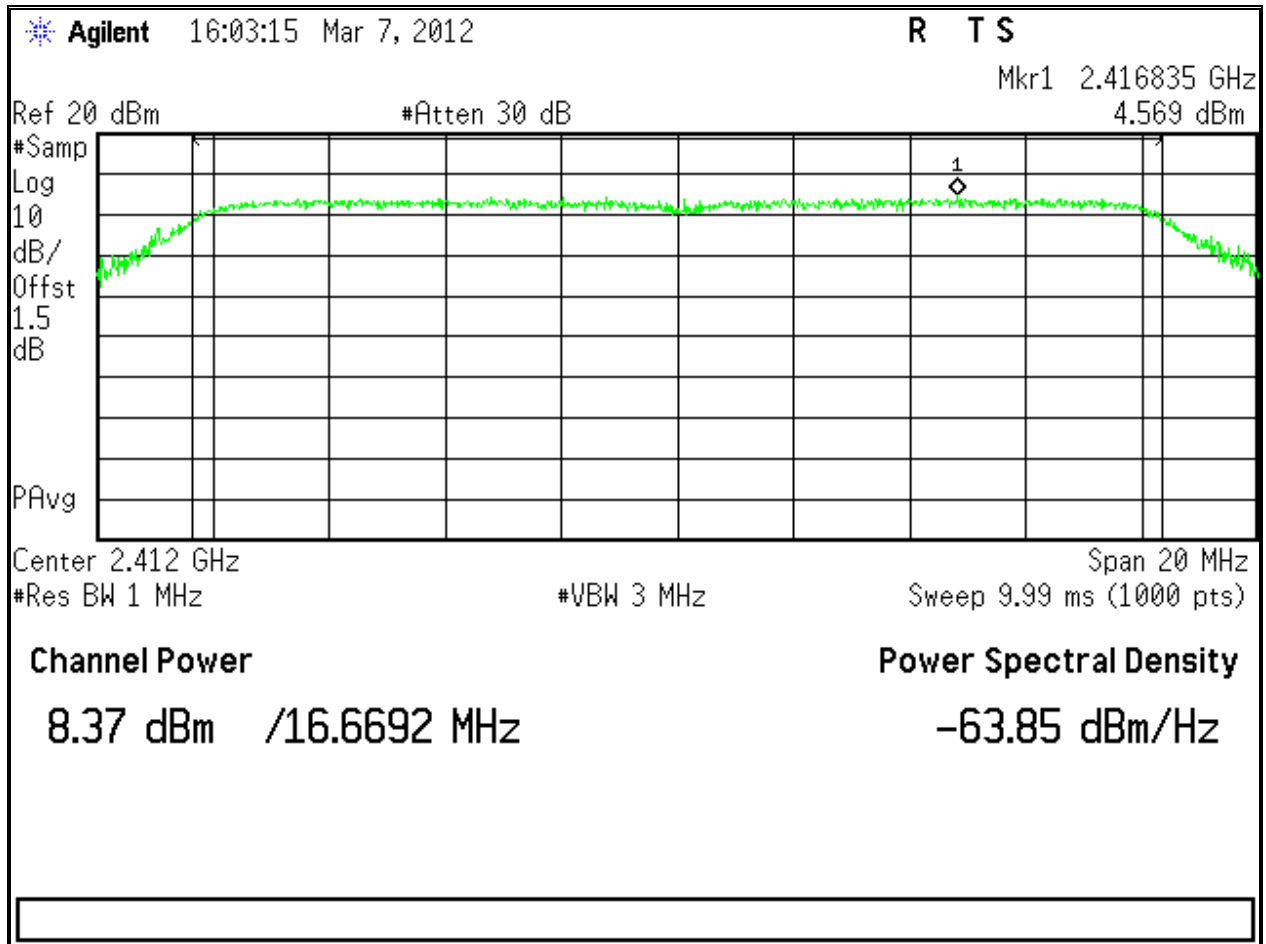


Figure 4: Maximum Transmitted Power at Chain 0, 2412 MHz of 802.11g 6Mbps (1x2)

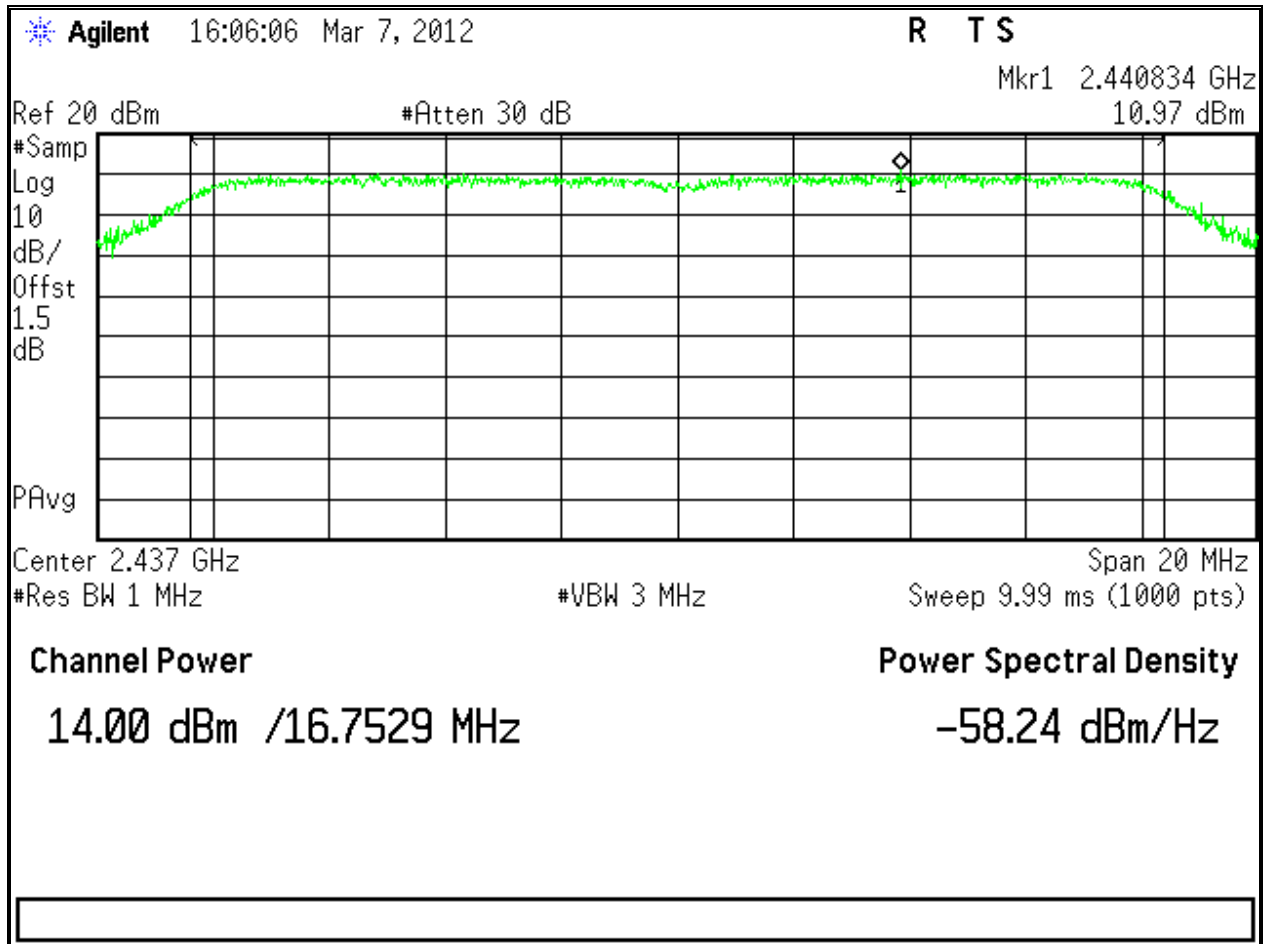


Figure 5: Maximum Transmitted Power at Chain 0, 2437 MHz of 802.11g 6Mbps (1x2)

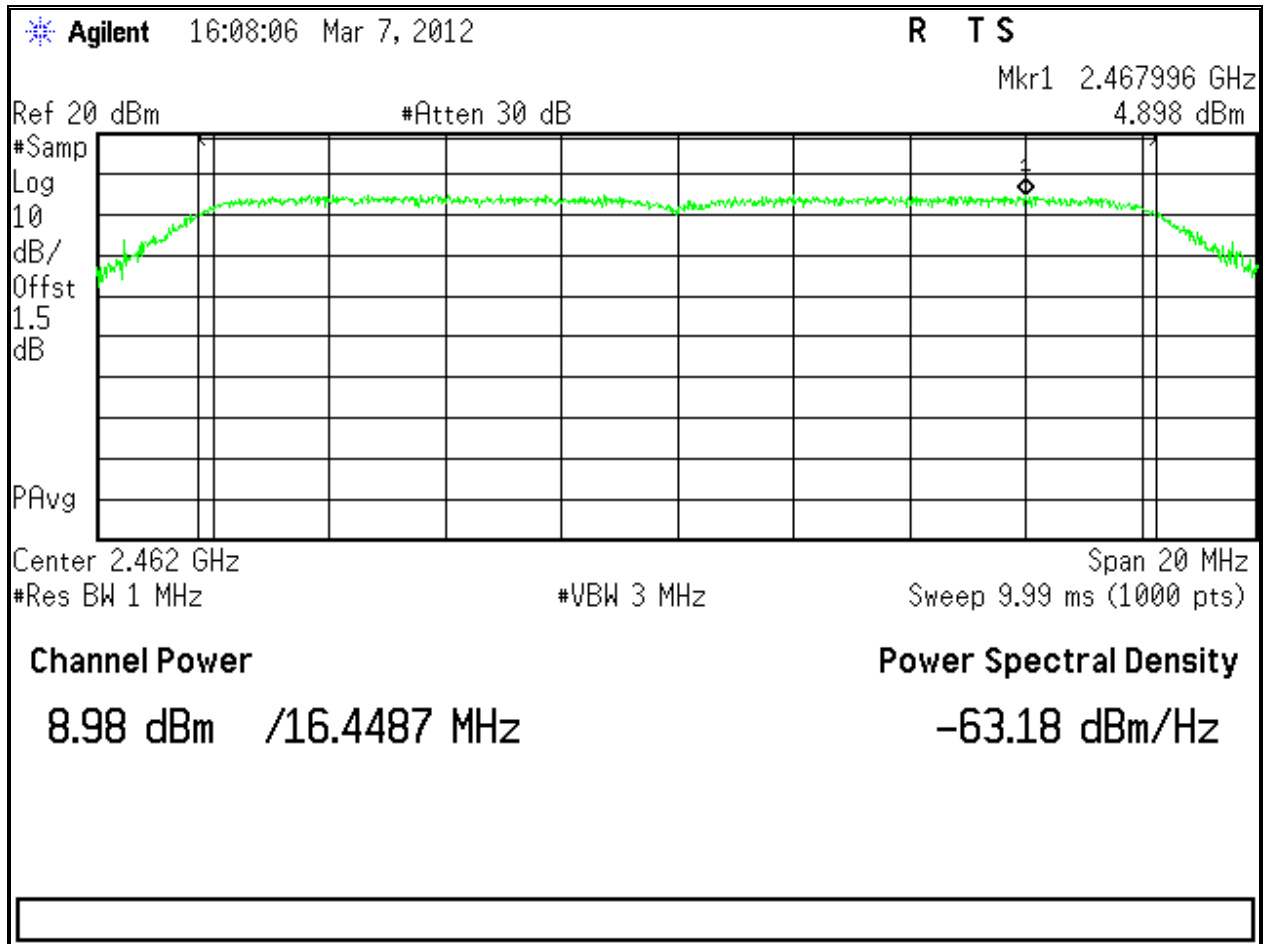


Figure 6: Maximum Transmitted Power at Chain 0, 2462 MHz of 802.11g 6Mbps (1x2)

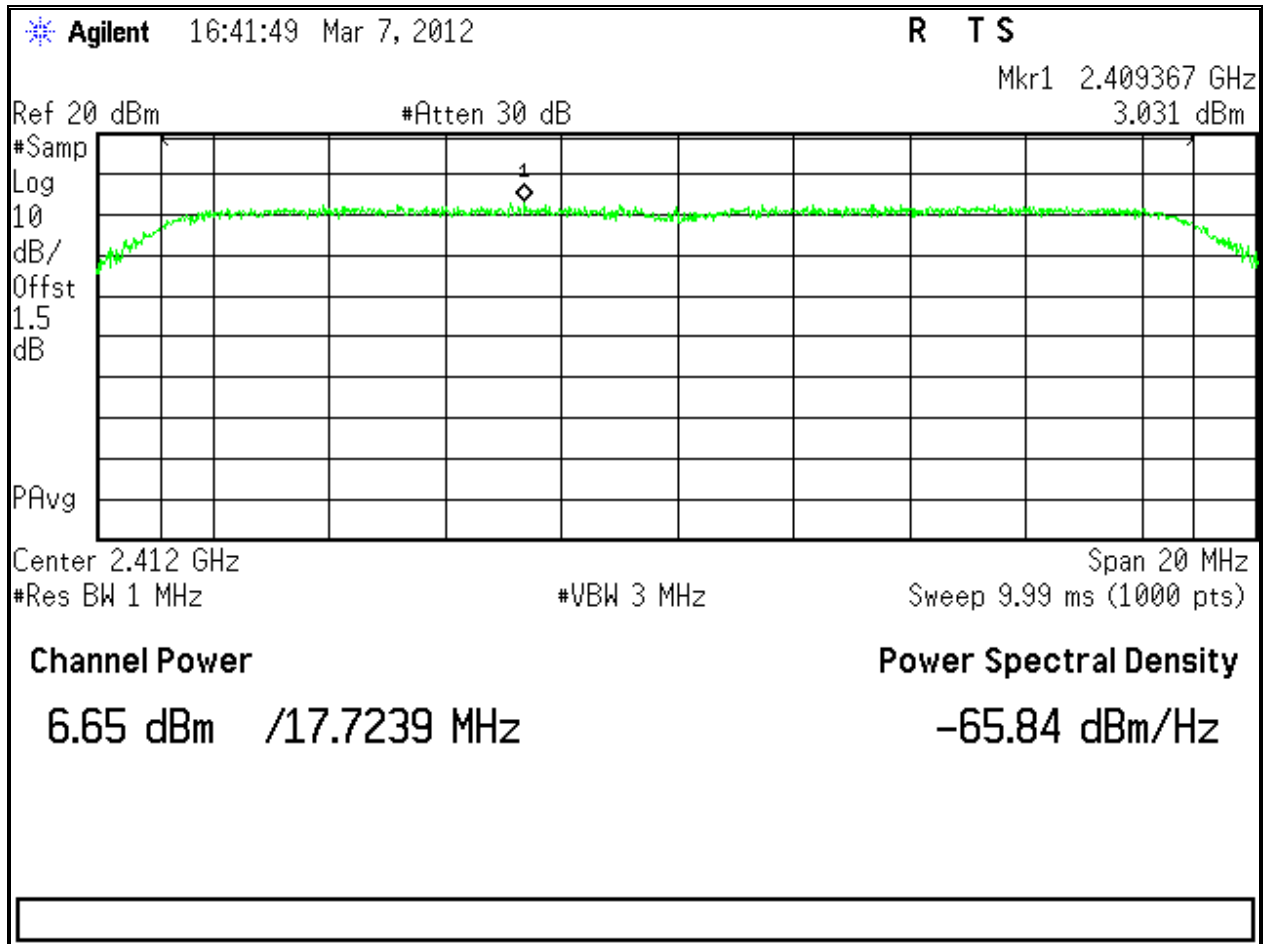


Figure 7: Maximum Transmitted Power at Chain 0, 2412 MHz HT20 6.5Mbps (1x2)

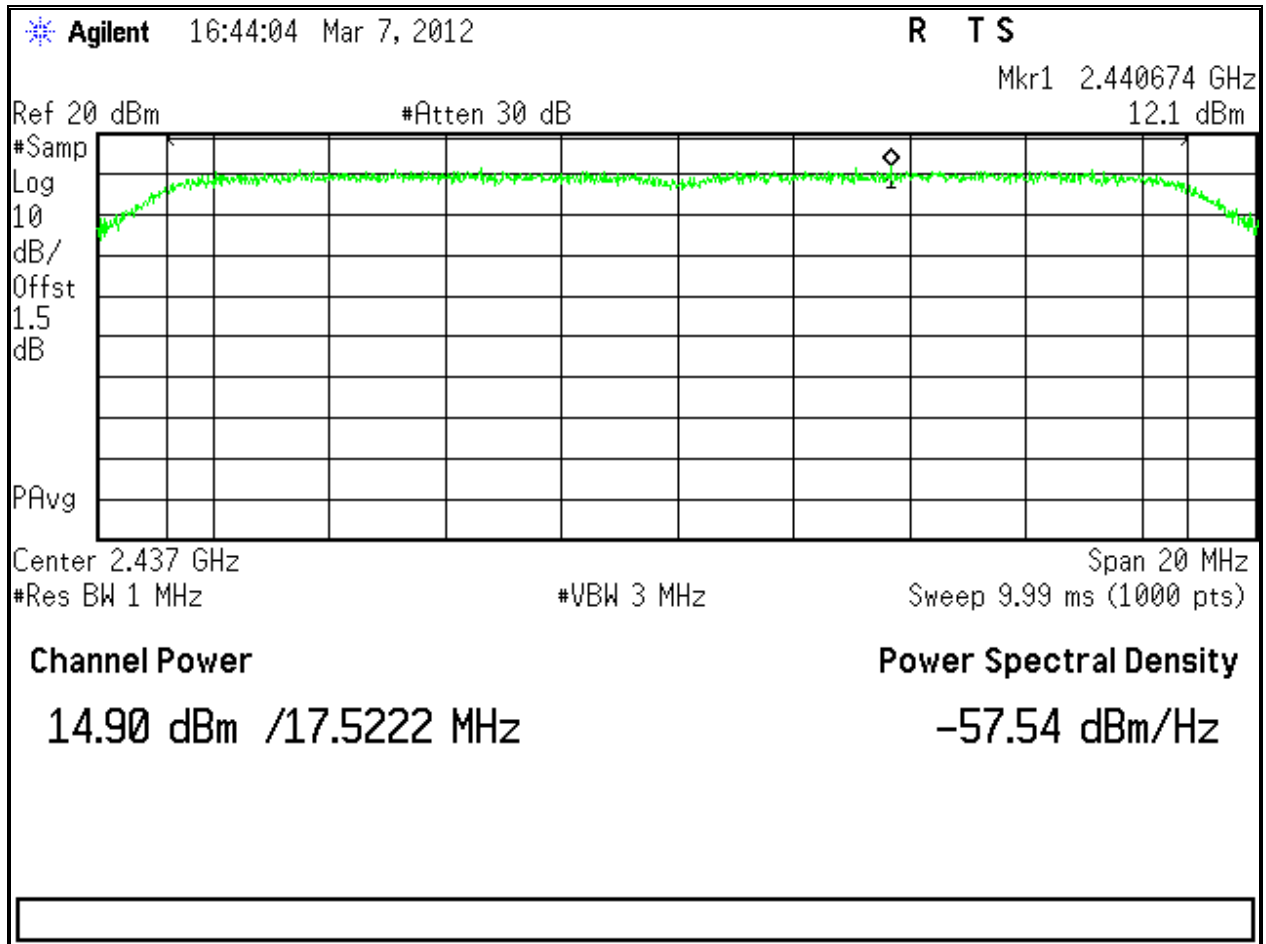


Figure 8: Maximum Transmitted Power at Chain 0, 2437 MHz HT20 6.5Mbps (1x2)

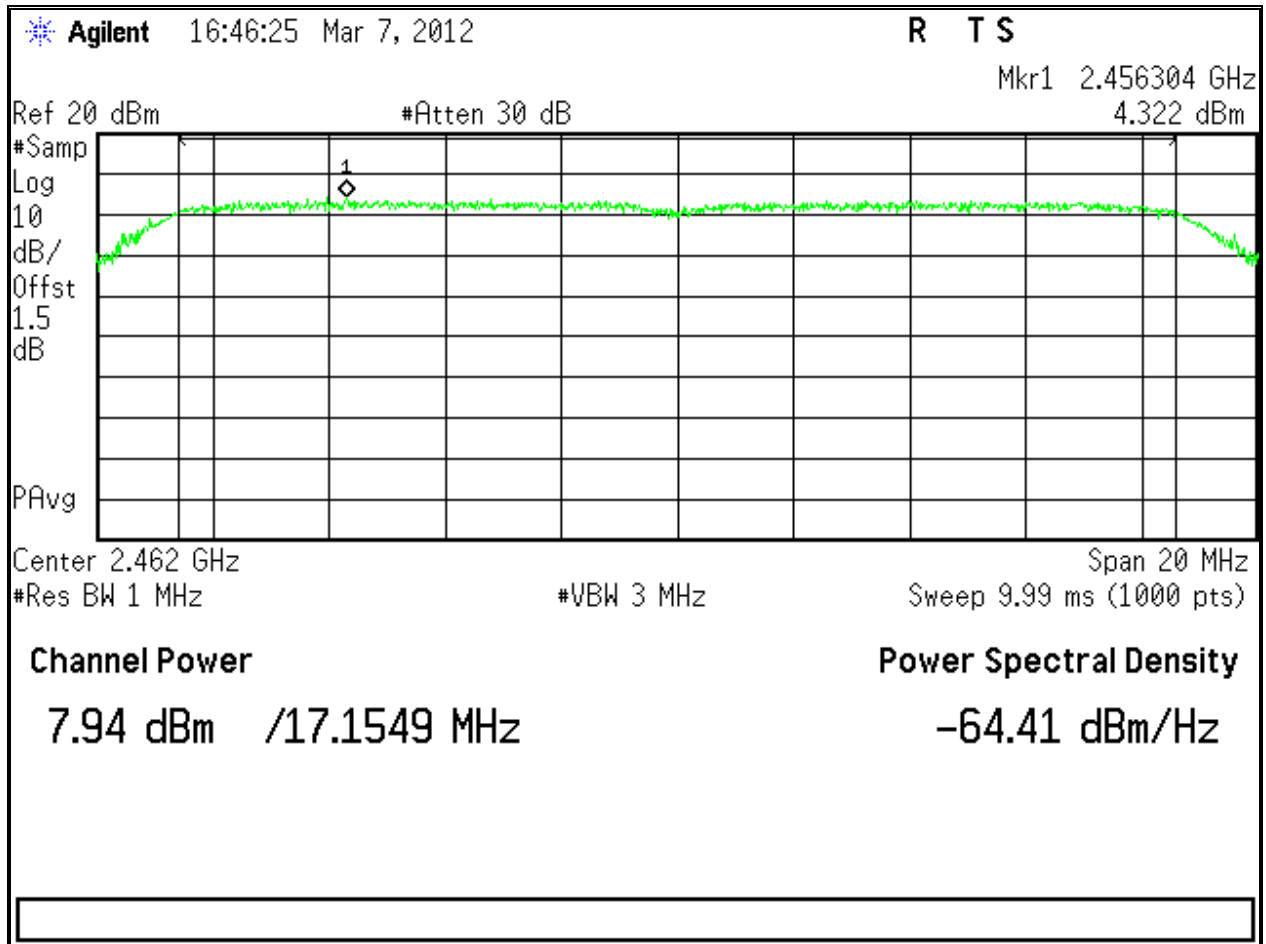


Figure 9: Maximum Transmitted Power at Chain 0, 2462 MHz HT20 6.5Mbps (1x2)

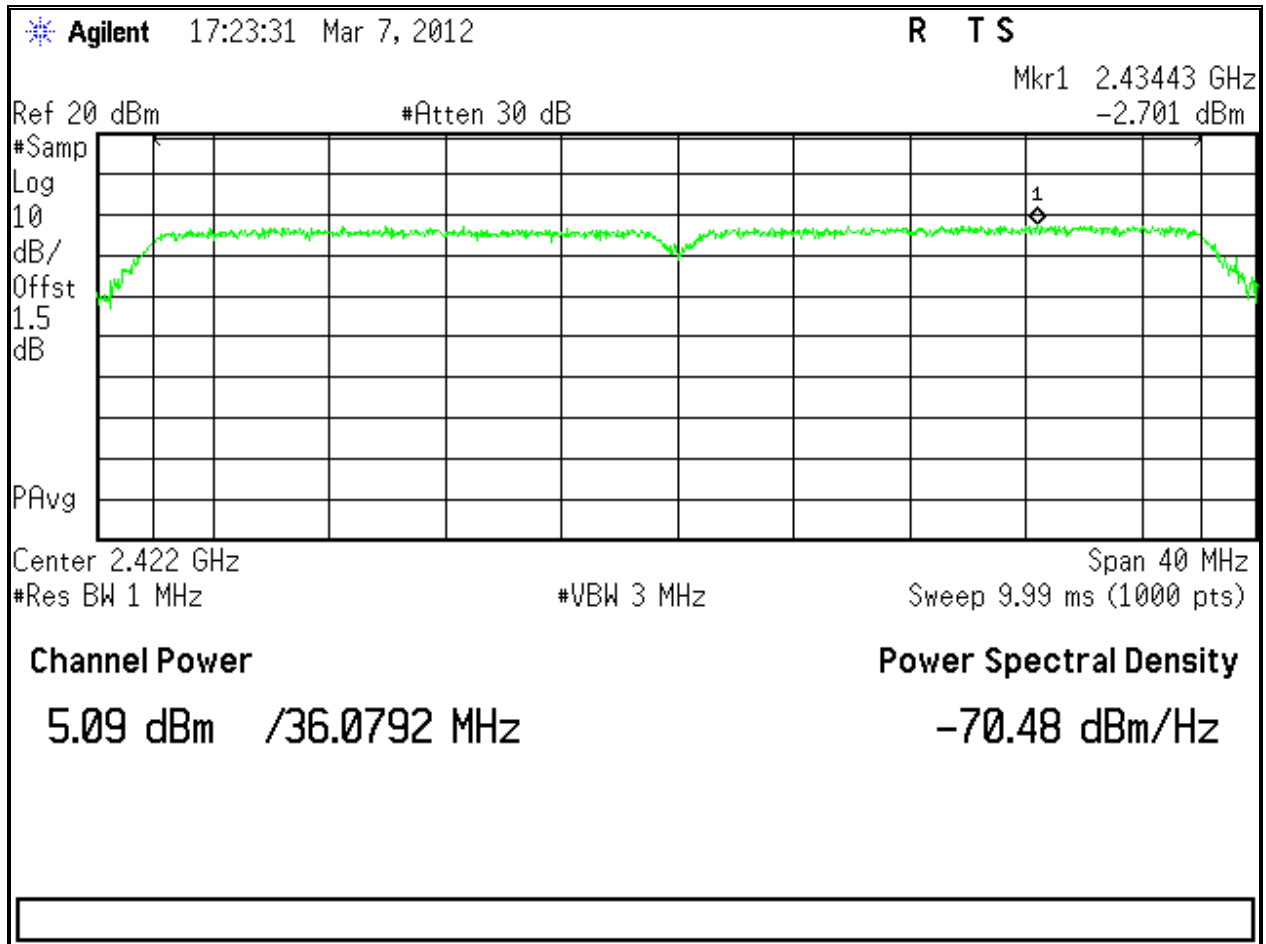


Figure 10: Maximum Transmitted Power at Chain 1, 2422 MHz at HT40 13.5Mbps (1x2)

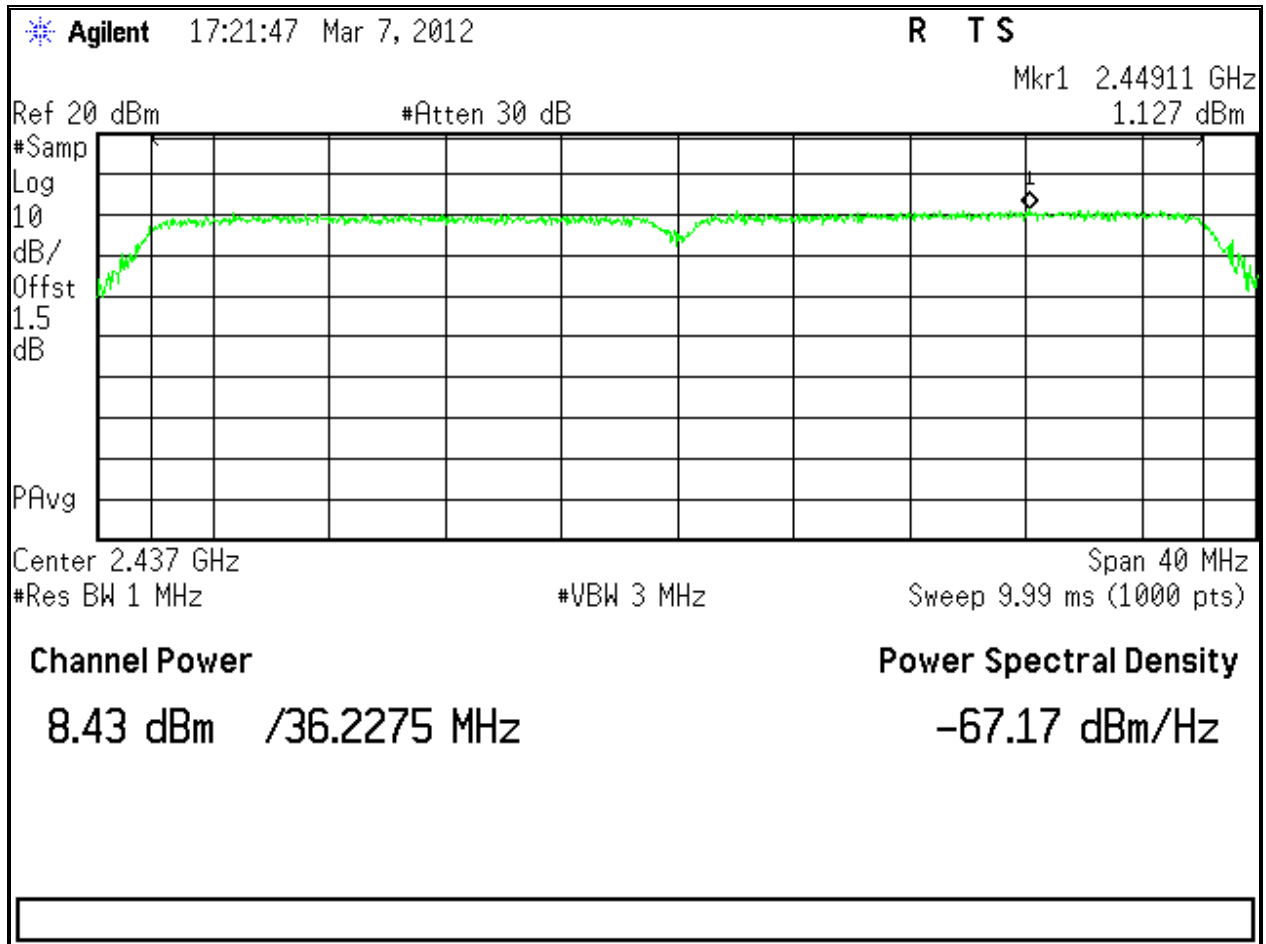


Figure 11: Maximum Transmitted Power at Chain 1, 2437 MHz at HT40 13.5Mbps (1x2)

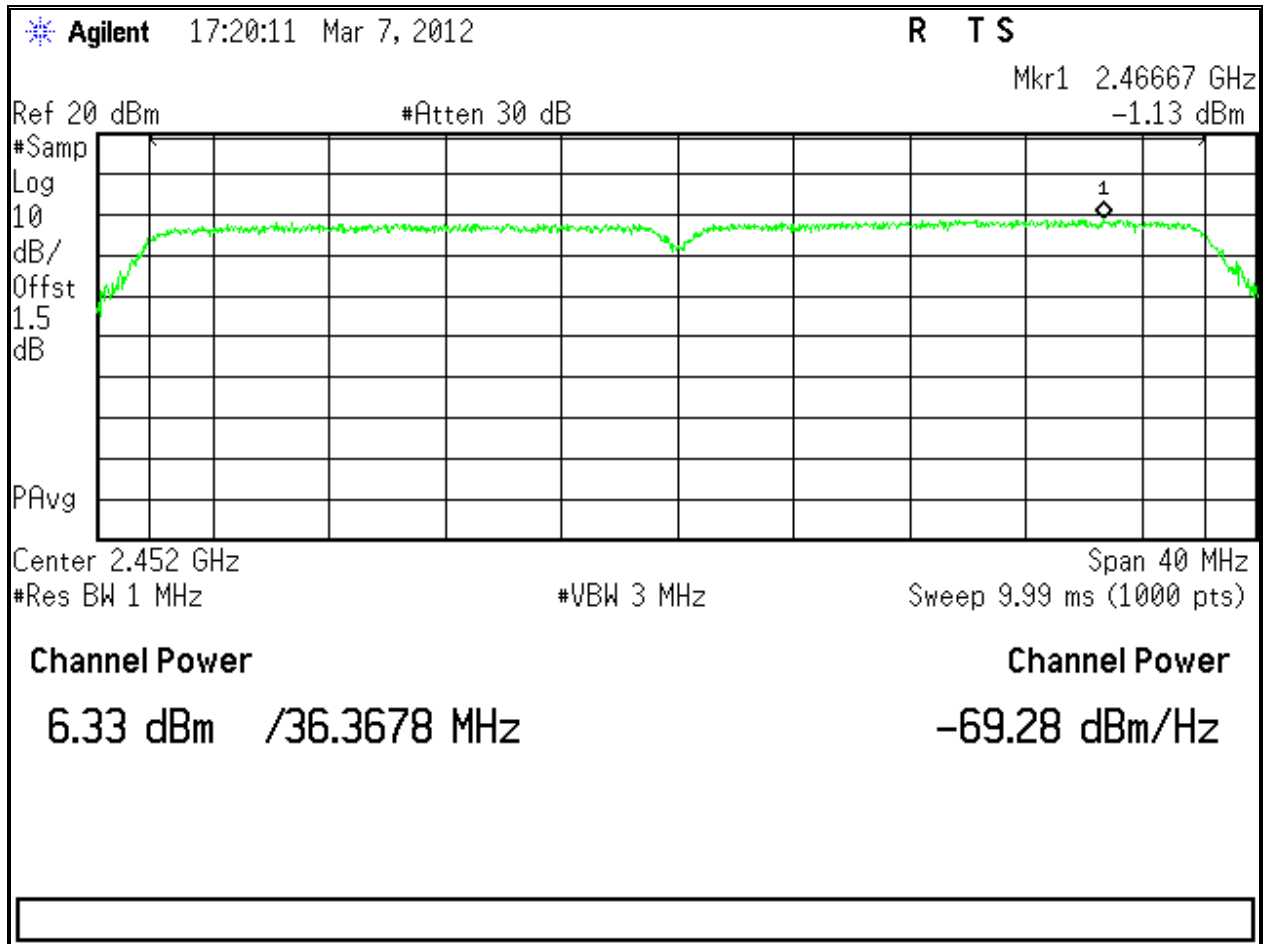


Figure 12: Maximum Transmitted Power at Chain 1, 2452 MHz at HT40 13.5Mbps (1x2)

4.2 Occupied Bandwidth

The occupied bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency.

The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

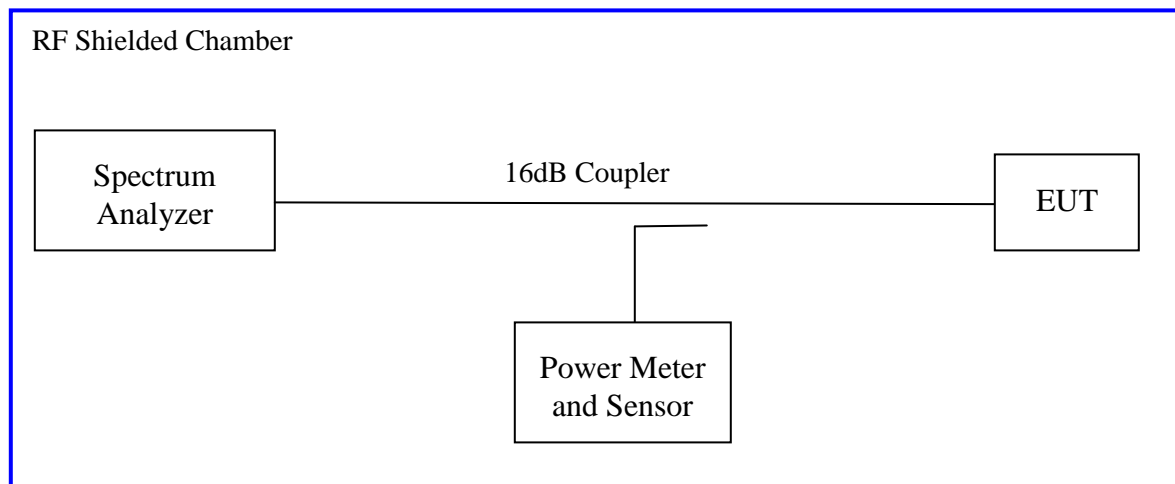
The 6dB bandwidth is defined the bandwidth of 6dB from highest transmitted level of the fundamental frequency.

The bandwidth shall be at least 500 kHz per Section CFR47 15.247(a2) 2010 and RSS Gen Sect. 4.4.1: 2010.

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth according to ANSI C63.10:2009 Section 6.9.1. The measurement was performed with modulation per CFR47 15.247(a2) 2010 and RSS Gen Sect. 4.4.1:2010. This test was conducted on 3 channels of Sample S/N BF0000400. The worst sample result indicated below.

Test Setup:



Measurement Procedure in KDB558074 was applied for occupied bandwidth.

4.2.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 4: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only				
Antenna Type: Omni-directional		Power Setting: See test plan		
Antenna Gain: +3.0 dBi		Directional Gain: +6.0 dBi		
Signal State: Modulated		Duty Cycle: 100%		
Ambient Temp.: 21 °C		Relative Humidity: 35%		
Bandwidth (MHz) for 802.11b				
Frequency (MHz)	Limit (kHz)	Ch 0 99% BW	Ch 0 6 dB BW	Results
2412	500	14.175	10.248	Pass
2437	500	14.261	10.253	Pass
2462	500	14.859	10.267	Pass
Note: The bandwidth was measured at 1Mbps for 802.11b mode.				
Bandwidth (MHz) for 802.11g				
Frequency (MHz)	Limit (kHz)	Ch 0 99% BW	Ch 0 6 dB BW	Results
2412	500	17.336	16.546	Pass
2437	500	20.055	16.557	Pass
2462	500	17.383	16.515	Pass
Note: The bandwidth was measured at 6Mbps for 802.11g mode.				
Bandwidth (MHz) for 802.11n HT20				
Frequency (MHz)	Limit (kHz)	Ch 0 99% BW	Ch 0 6 dB BW	Results
2412	500	18.189	17.727	Pass
2437	500	21.436	17.749	Pass
2462	500	18.210	17.741	Pass

Note: The bandwidth was measured at 6.5Mbps at 1 data stream				
Bandwidth (MHz) for 802.11n HT40				
Frequency (MHz)	Limit (kHz)	Ch 0 99% BW	Ch 0 6 dB BW	Results
2422	500	38.170	36.882	Pass
2437	500	38.124	37.024	Pass
2452	500	38.012	36.886	Pass
Note: The bandwidth was observed at 13.5Mbps at 1 data stream				

Note: The narrowest bandwidth plot for each mode is displayed below. Additional plots are available upon requested.

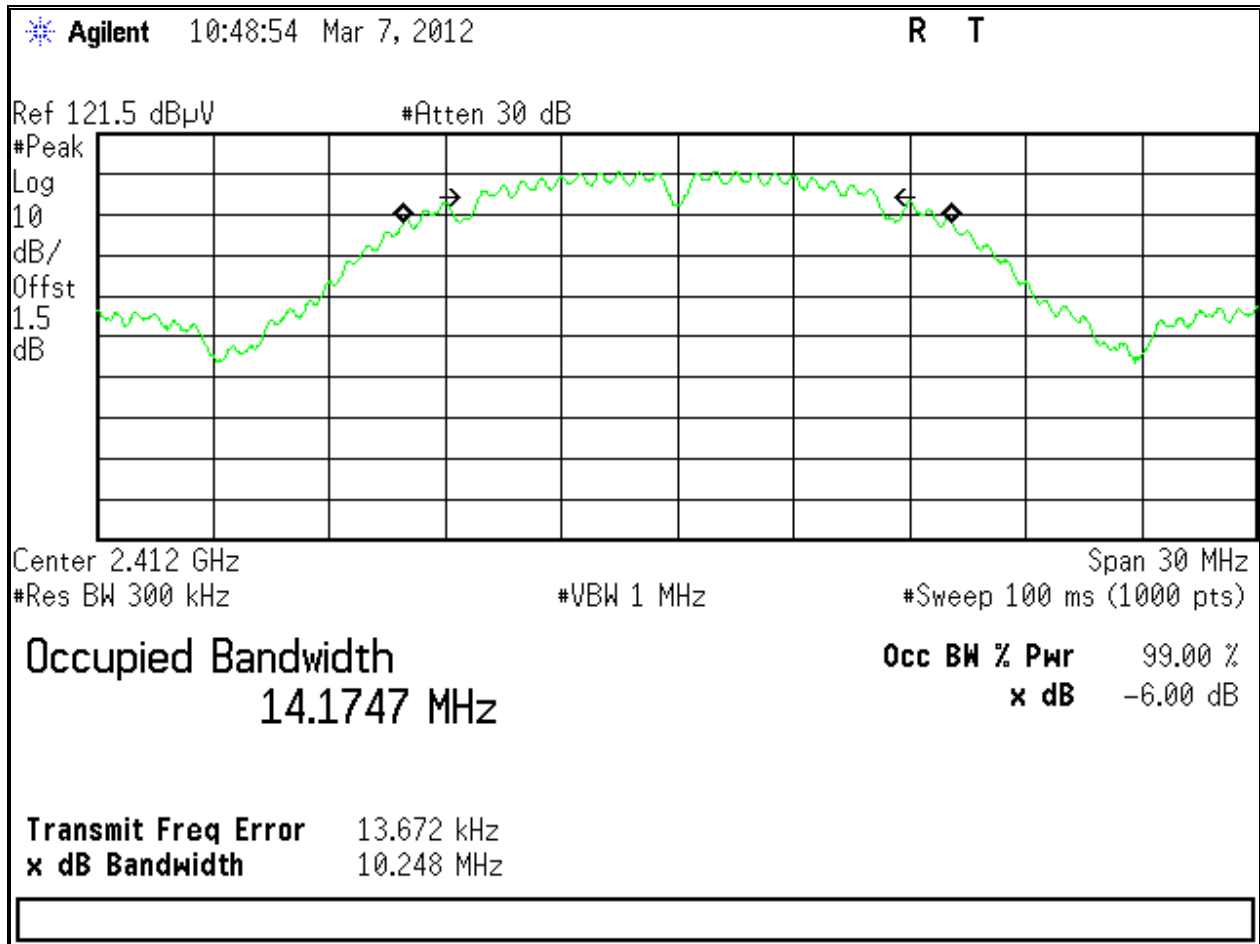


Figure 13: Occupied Bandwidth, 2412 MHz at 802.11b, 1x2 ch0, 1Mbps

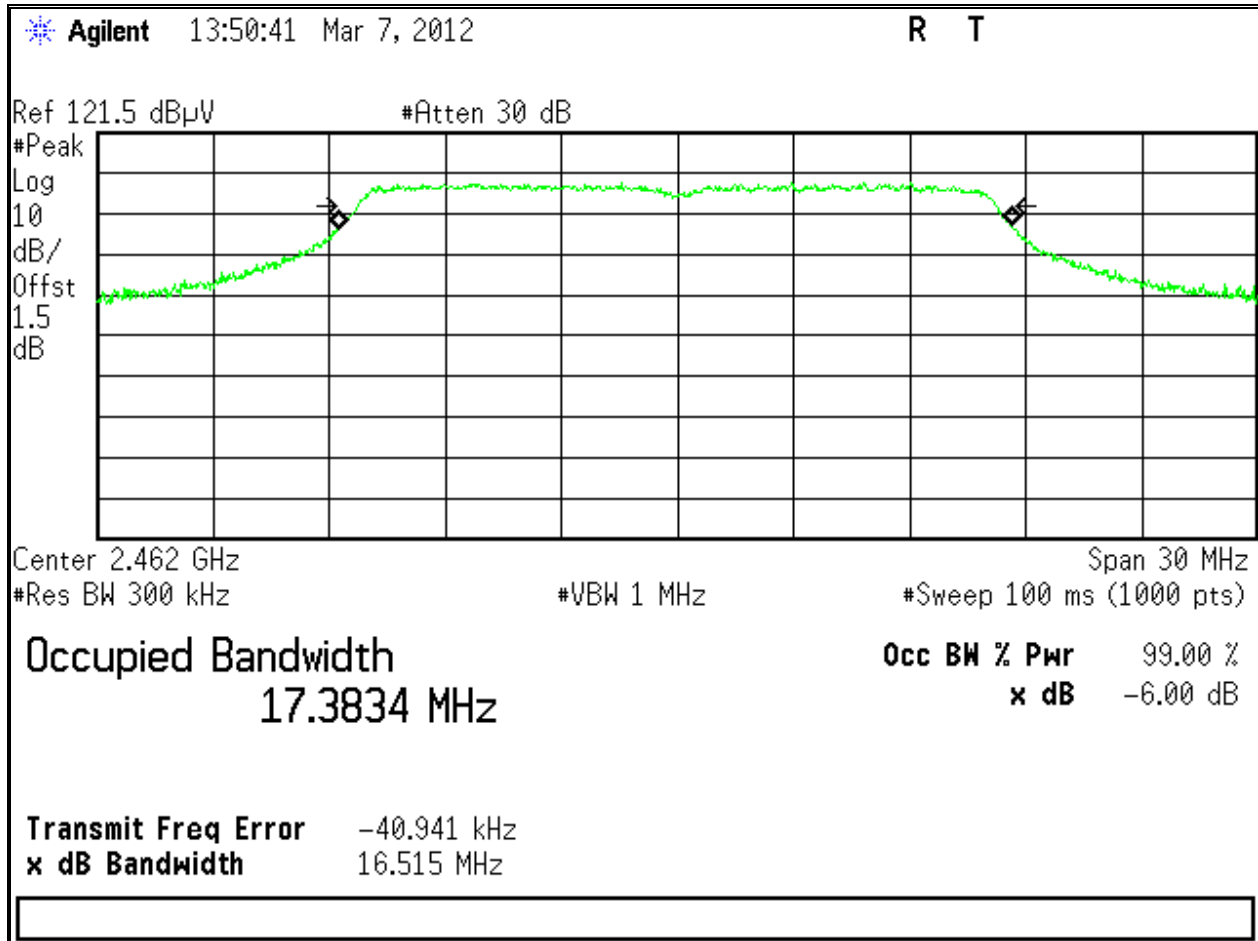


Figure 14: Occupied Bandwidth, 2462 MHz at 802.11g, 1x2 ch0, 6Mbps

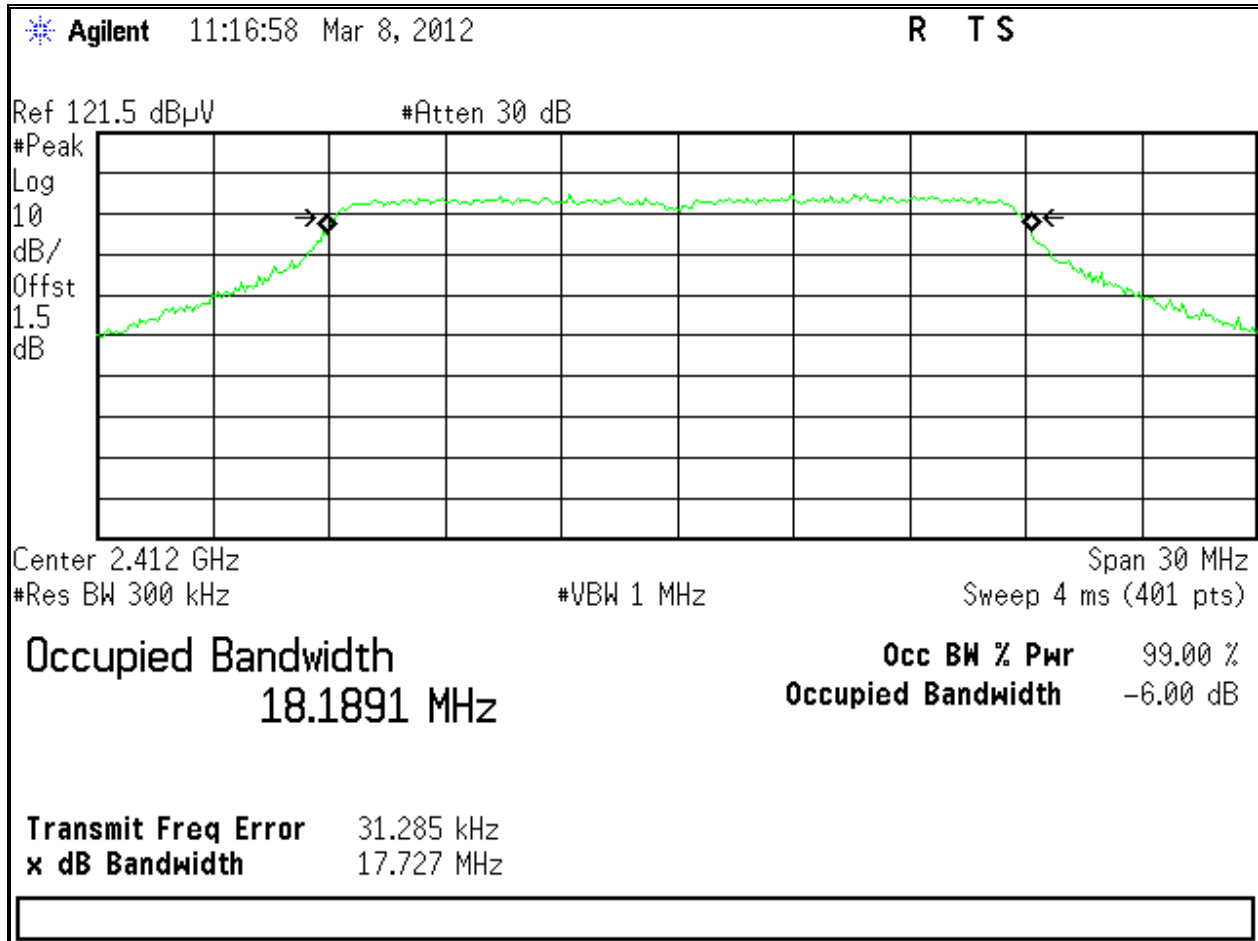


Figure 15: Occupied Bandwidth, 2412 MHz at HT20, 1x2 ch0, 6.5Mbps

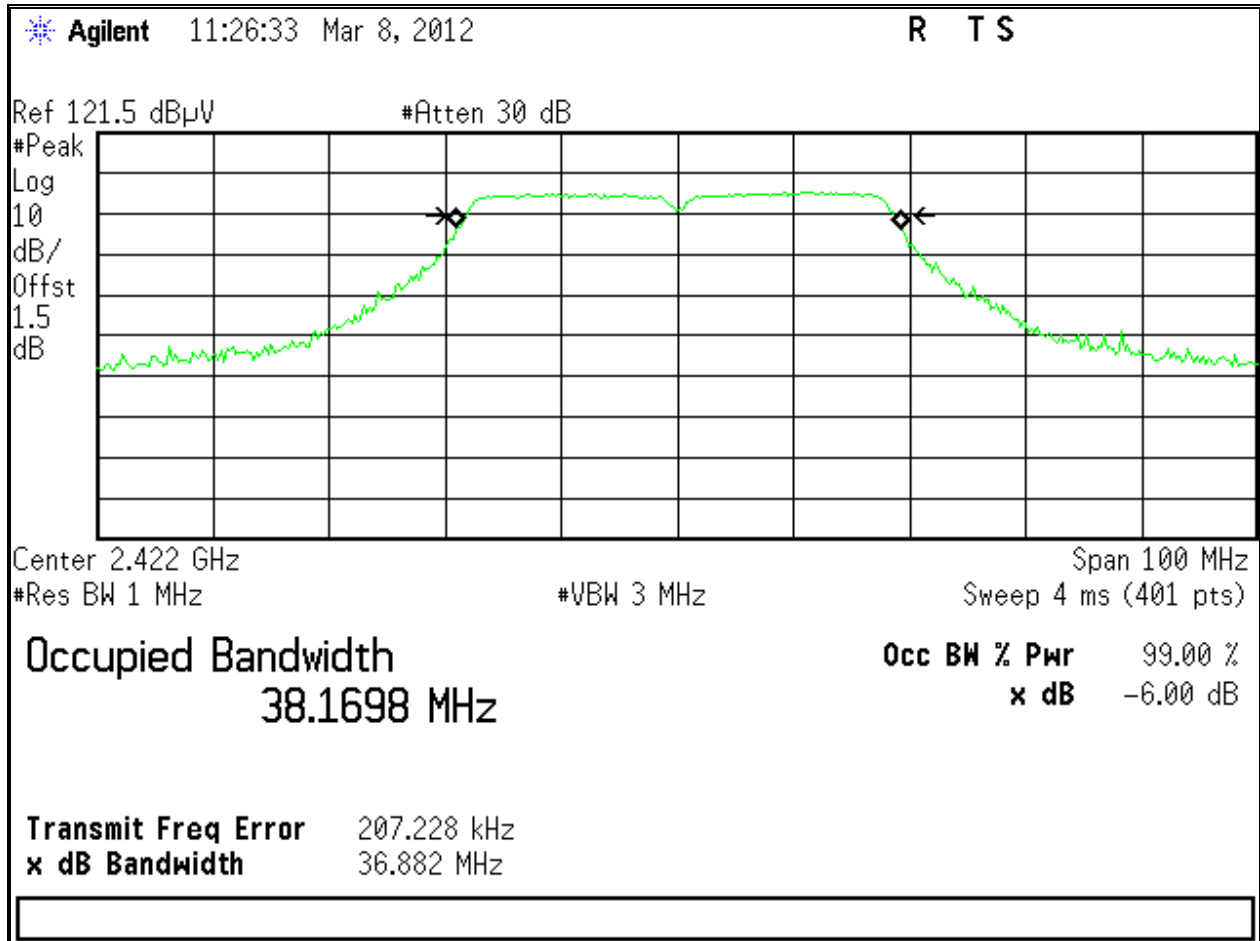


Figure 16: Occupied Bandwidth, 2422 MHz at HT40, 1x2 ch0, 13.5Mbps

4.3 Unwanted Emissions into Non-Restricted Frequency Bands

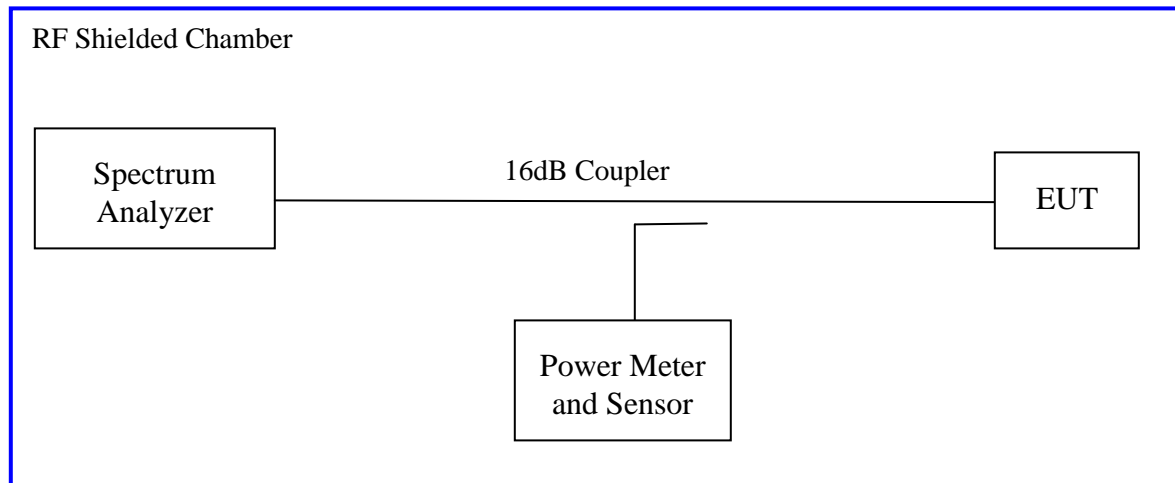
The setup was identical to RF output power measurement. Intentional radiators operating under the alternative provisions to the general emission limits, must be designed to ensure that the 20 dB or 30 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If the frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Since the transmitter complies with the conducted power limits base on the use of RMS averaging per CFR47 Part 15.247(b)(3), any frequency outside the band of 2400 MHz to 2483.5 MHz, the power output level must be below 30db from the in-band transmitting signal; CFR 47 Part 15.215, 15.247(d) and RSS 210 A8.5

4.3.1 Test Method

The conducted method was used to measure the out-of-band emission requirement. The measurement was performed with modulation per CFR47 15.247(4)(d) 2010 and RSS 210 A8.5: 2010. This test was conducted on 3 channels of Sample, S/N BF0000400. The worst sample result indicated below.

Test Setup:



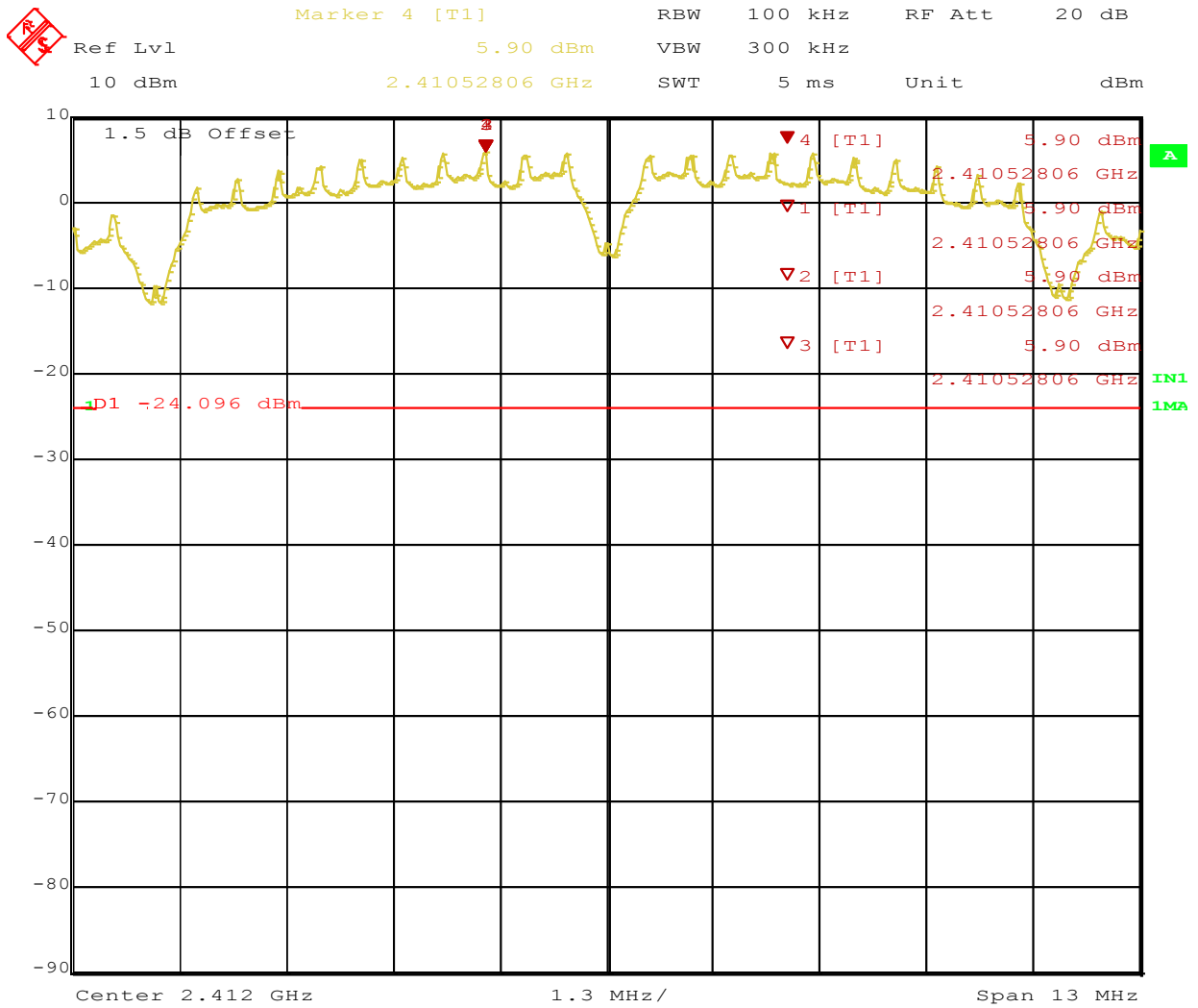
Measurement Procedure AVG2 of KDB 558074

4.3.2 Test Result

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

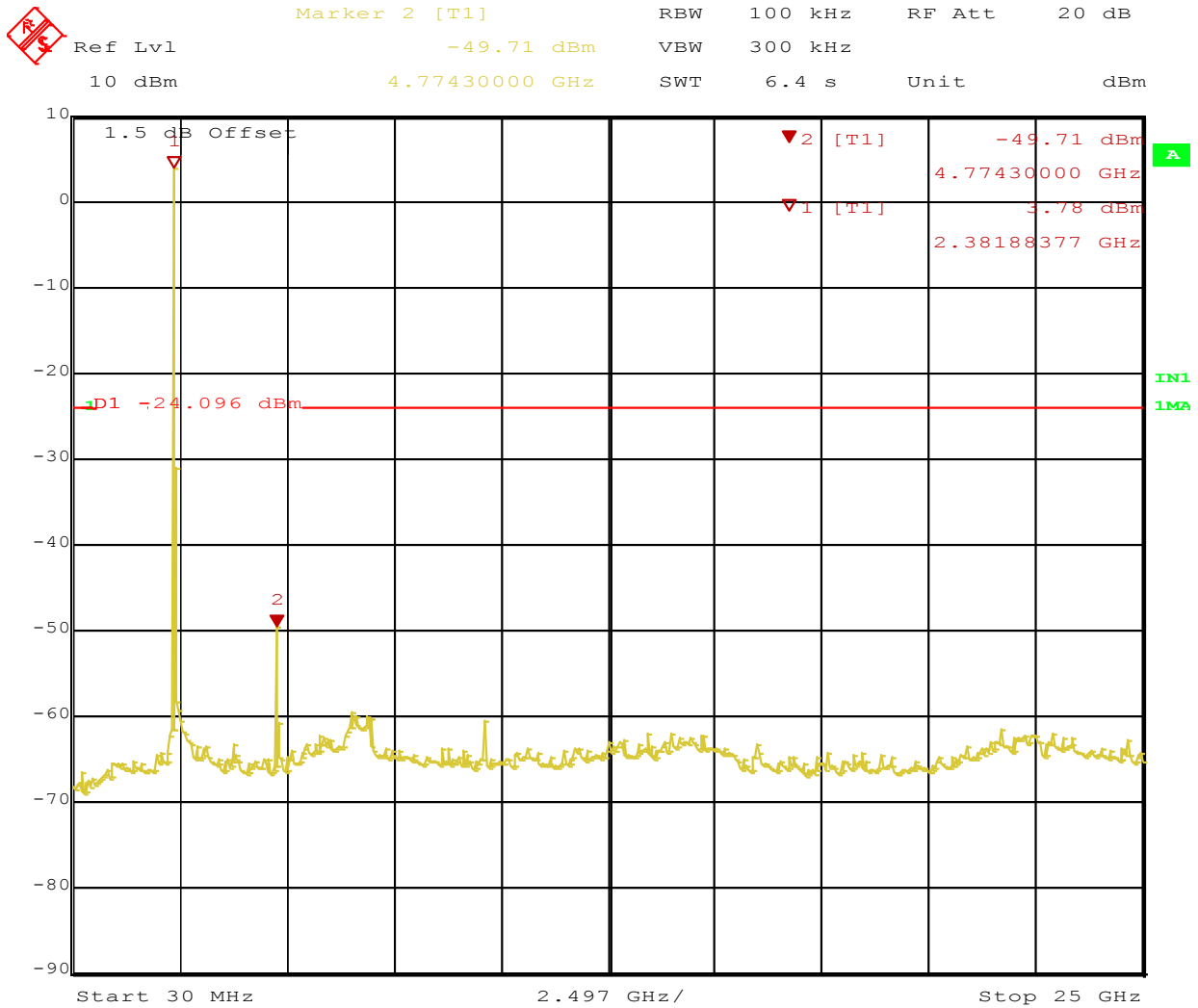
Table 5: Emissions at the Band-Edge – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only				
Antenna Type: Integrated		Power Setting: See test plan		
Max. Antenna Gain: +3.0 dBi		Signal State: Modulated		
Ambient Temp.: 23 °C		Relative Humidity: 34%		
Non-Restricted Frequency Band Emission				
Operating Channel	Mode	Ref. Level (dBm)	Plots	Results
2412 MHz	1Mbps	-24.10	Figure 18	Pass
2437 MHz	1Mbps	-25.61	Figure 20	Pass
2462 MHz	1Mbps	-24.60	Figure 22	Pass
2412 MHz	6 Mbps	-34.01	Figure 24	Pass
2437 MHz	6 Mbps	-27.91	Figure 26	Pass
2462 MHz	6 Mbps	-32.77	Figure 28	Pass
2412 MHz	6.5 Mbps	-35.83	Figure 30	Pass
2437 MHz	6.5 Mbps	-27.26	Figure 32	Pass
2462 MHz	6.5 Mbps	-34.84	Figure 34	Pass
2422 MHz	13.5 Mbps	-41.13	Figure 36	Pass
2437 MHz	13.5 Mbps	-37.04	Figure 38	Pass
2452 MHz	13.5 Mbps	-38.38	Figure 40	Pass
<p>Note: All out of band emissions are lower than the 30dBr level. The maximum out of band emission on each individual output put is at least 30 dB below the maximum in-band PSD on that output per KDB 662911.</p>				



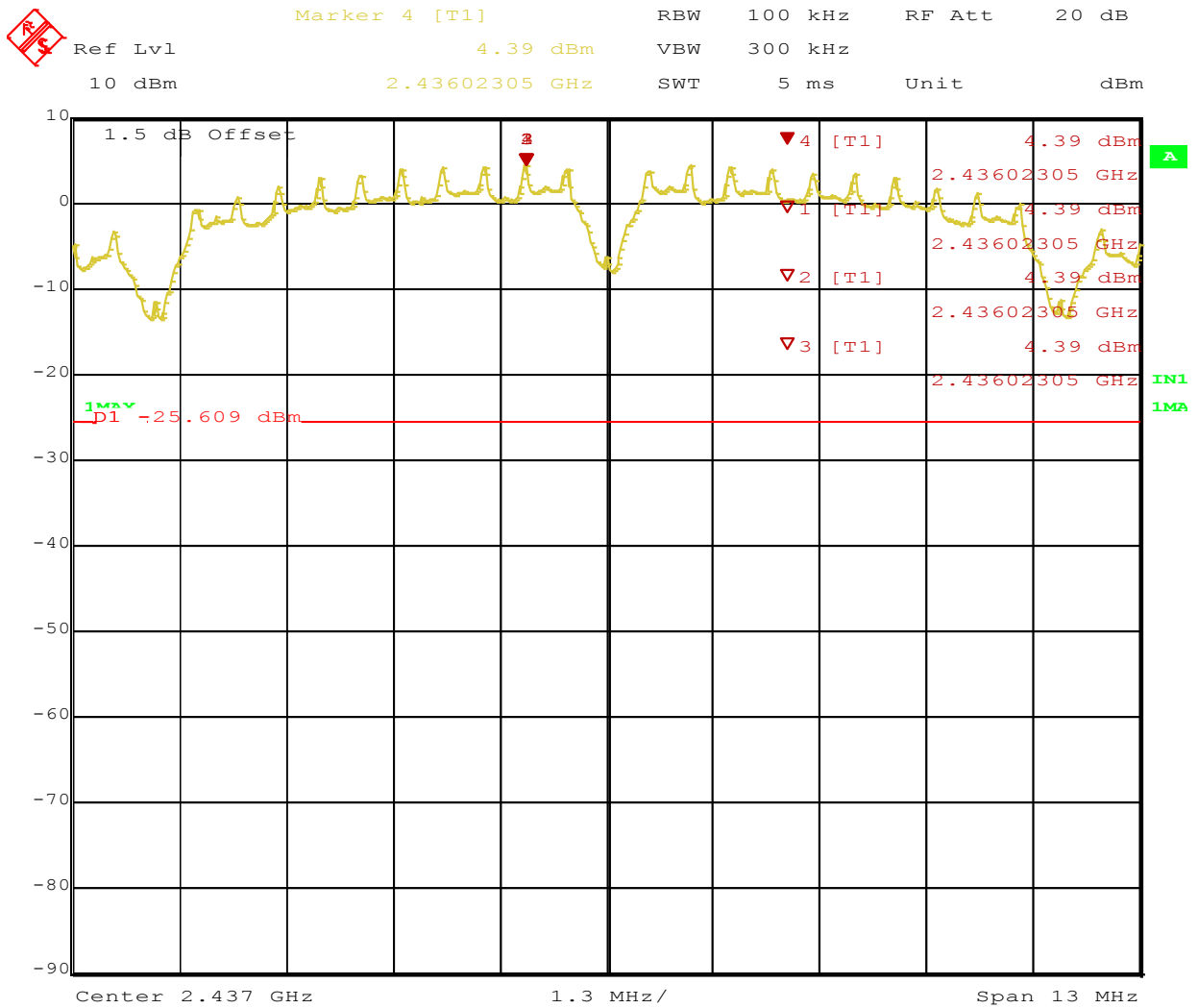
Date: 8.MAR.2012 18:04:32

Figure 17: Reference Level for 802.11b 1Mbps - 2412 MHz



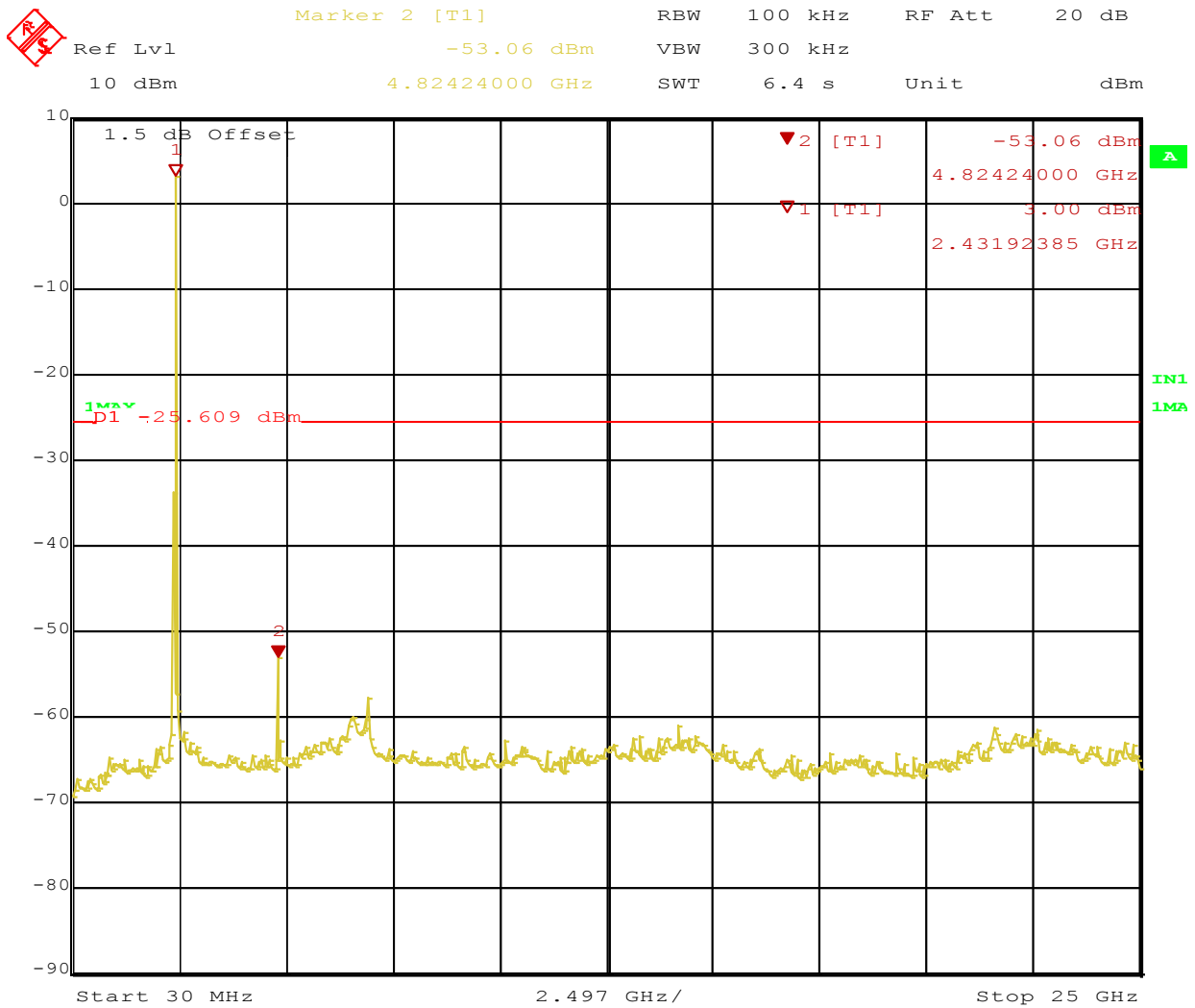
Date: 8.MAR.2012 18:04:47

Figure 18: Out of Band Emissions for 802.11b 1Mbps - 2412 MHz



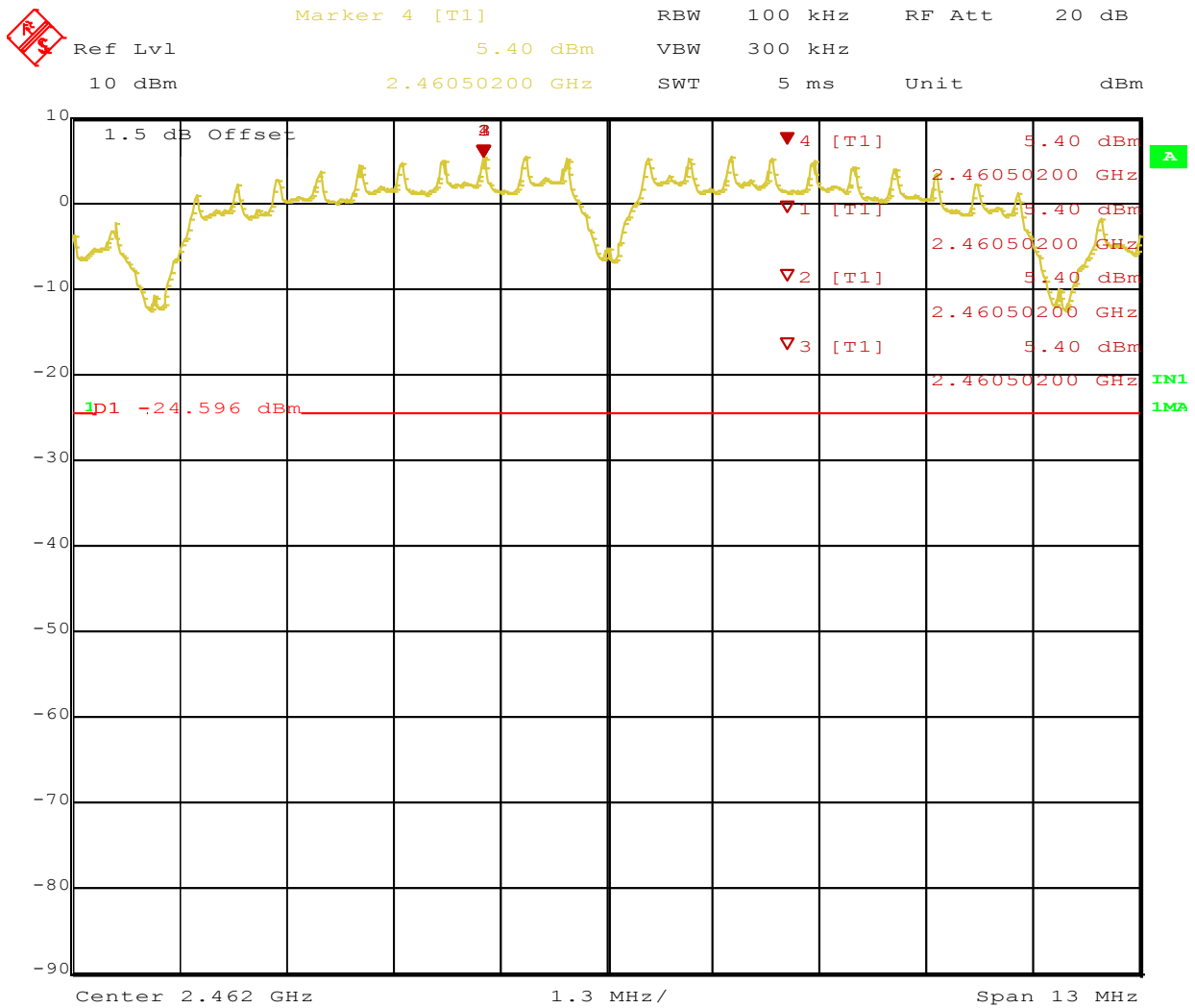
Date: 8.MAR.2012 18:07:07

Figure 19: Reference Level for 802.11b 1Mbps - 2437 MHz



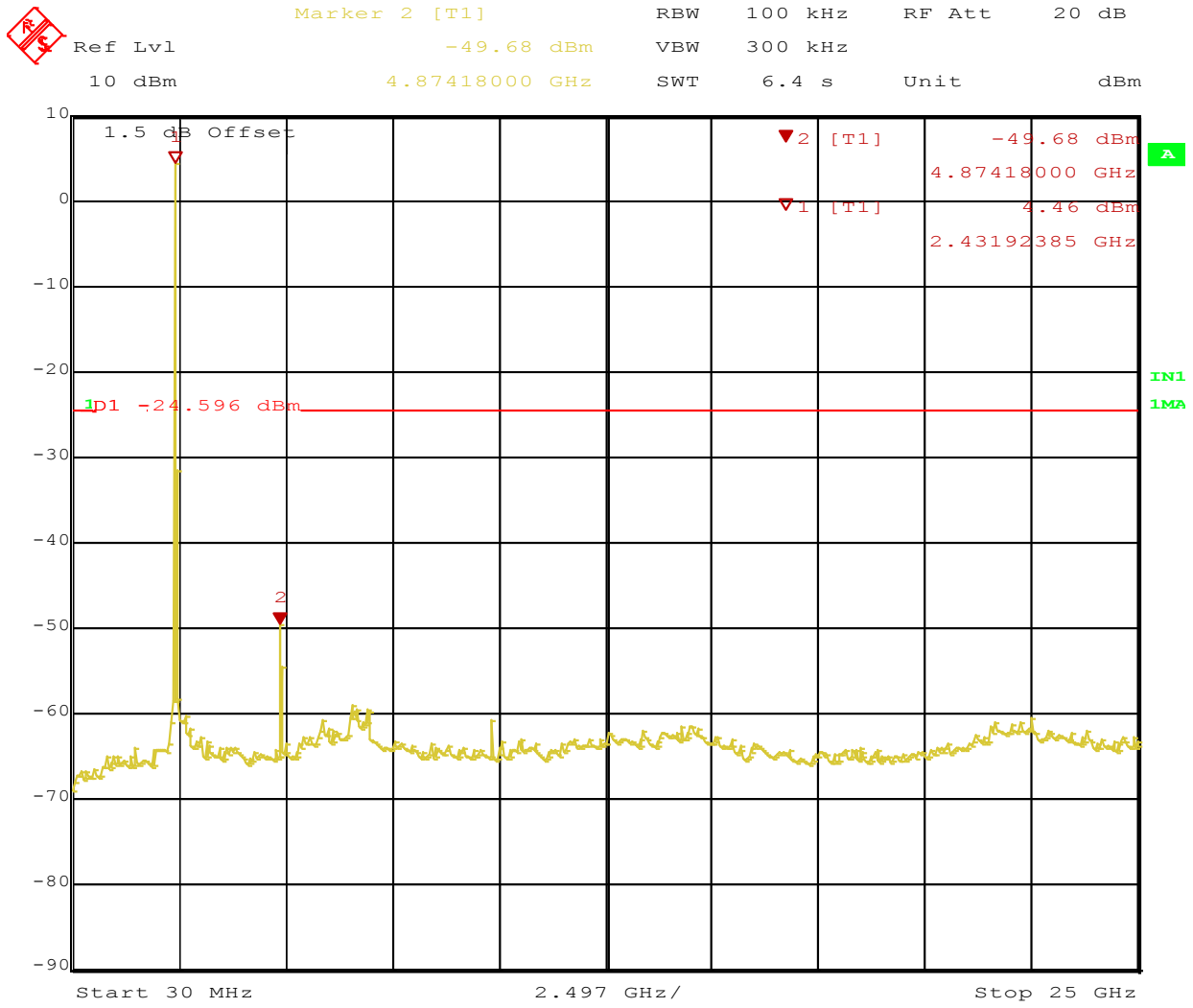
Date: 8.MAR.2012 18:07:23

Figure 20: Out of Band Emissions for 802.11b 1Mbps - 2437 MHz



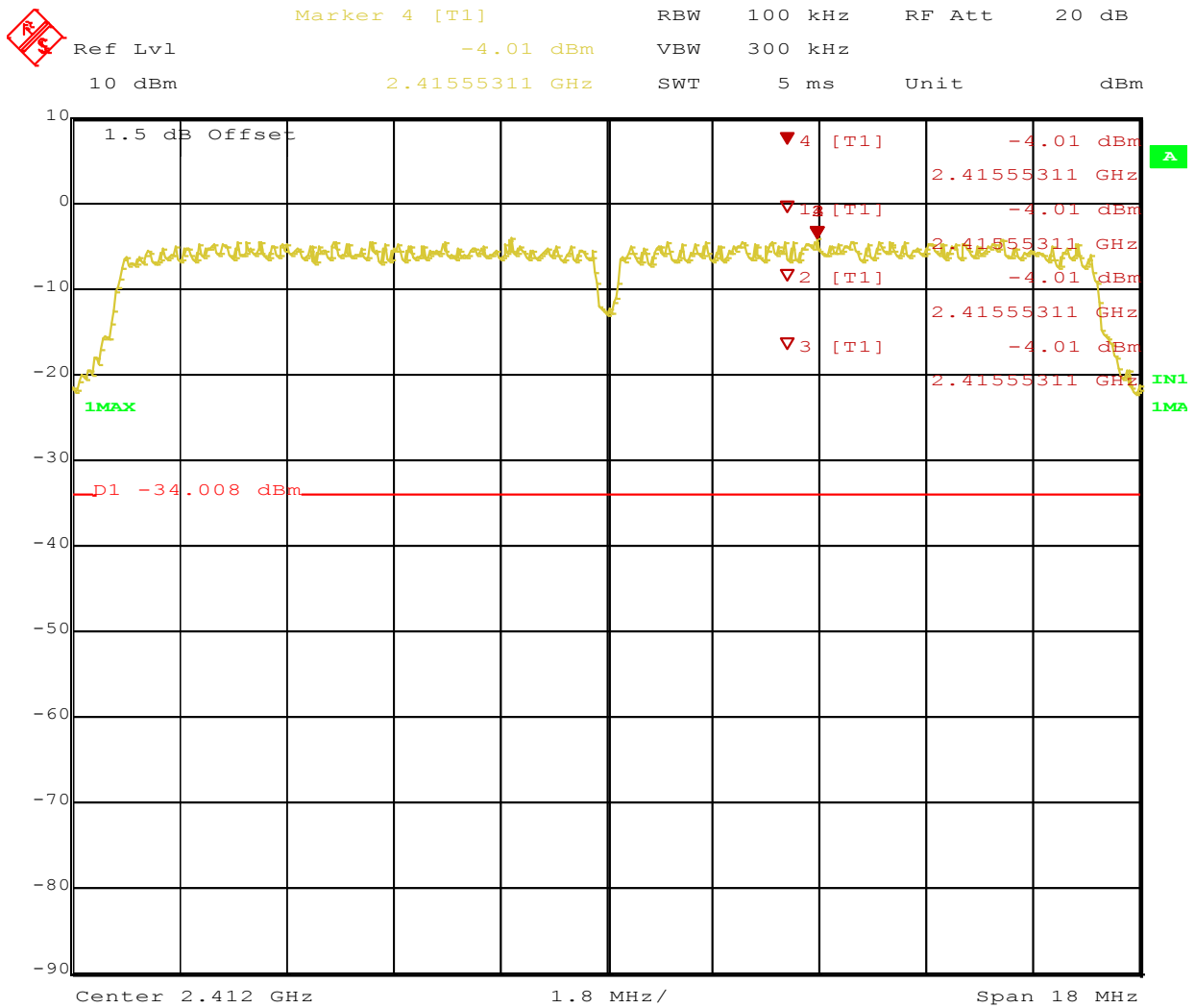
Date: 8.MAR.2012 18:10:05

Figure 21: Reference Level for 802.11b 1Mbps - 2462 MHz



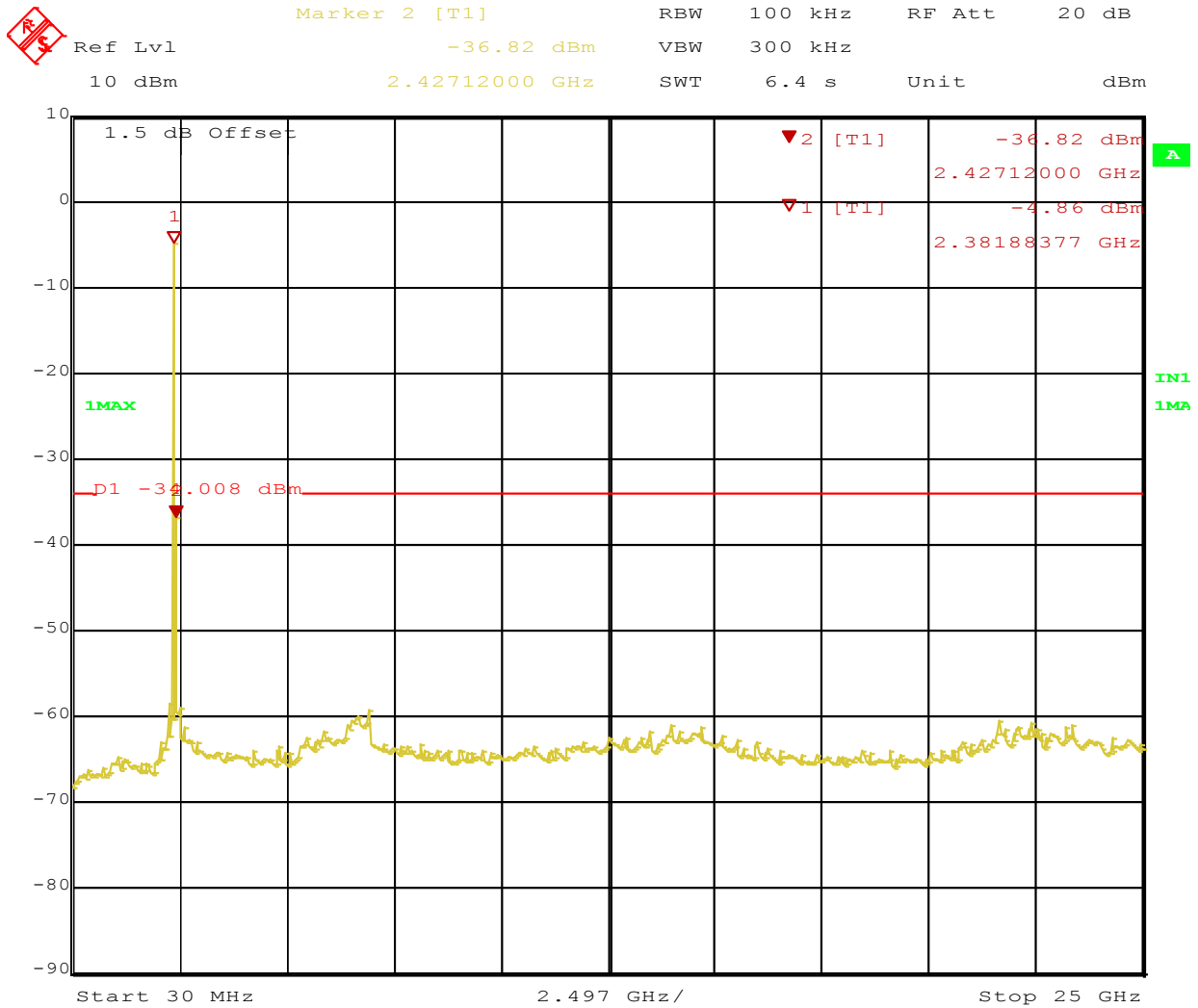
Date: 8.MAR.2012 18:11:01

Figure 22: Out of Band Emissions for 802.11b 1Mbps - 2462 MHz



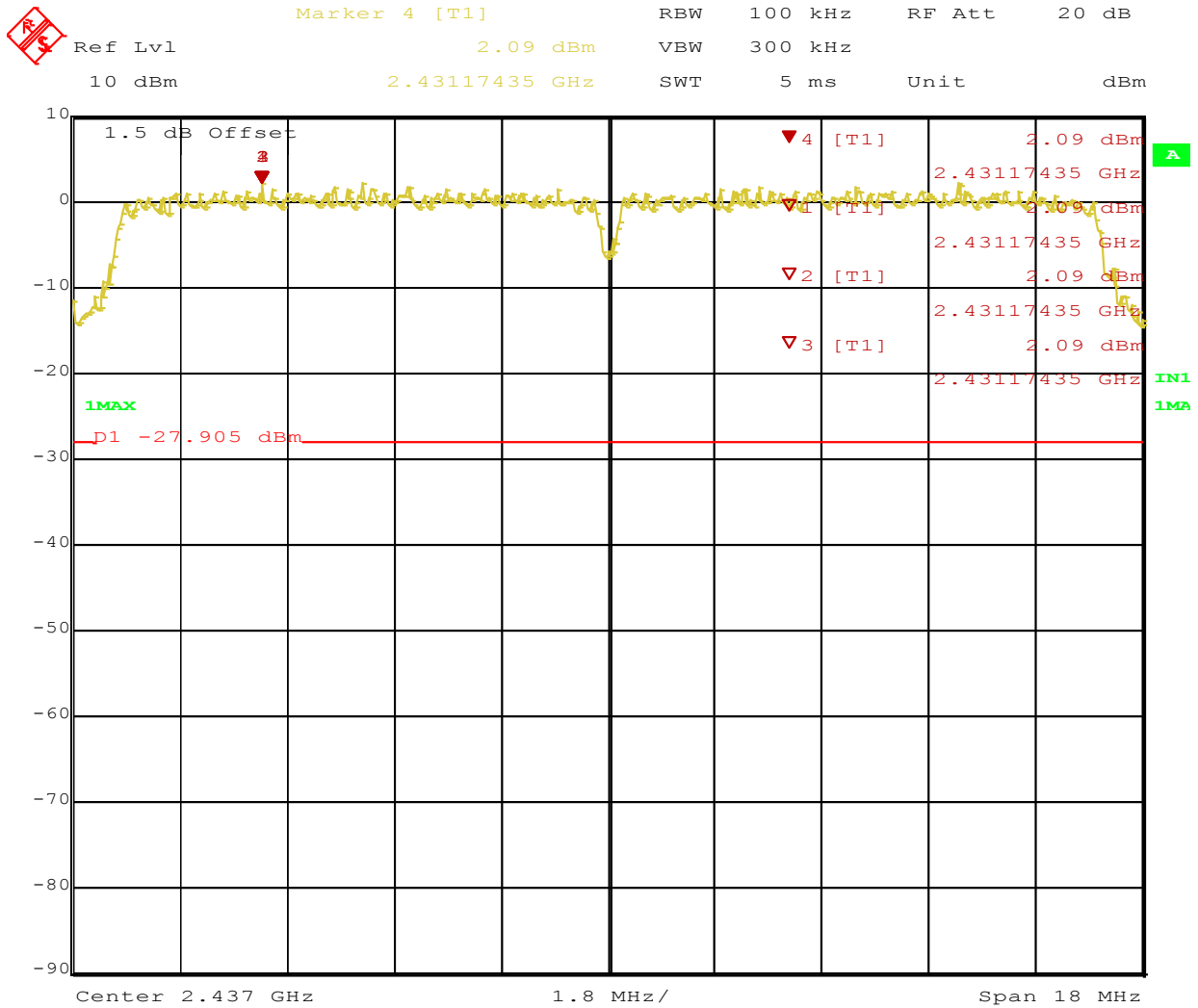
Date: 8.MAR.2012 18:13:29

Figure 23: Reference Level for 802.11g 6Mbps - 2412 MHz



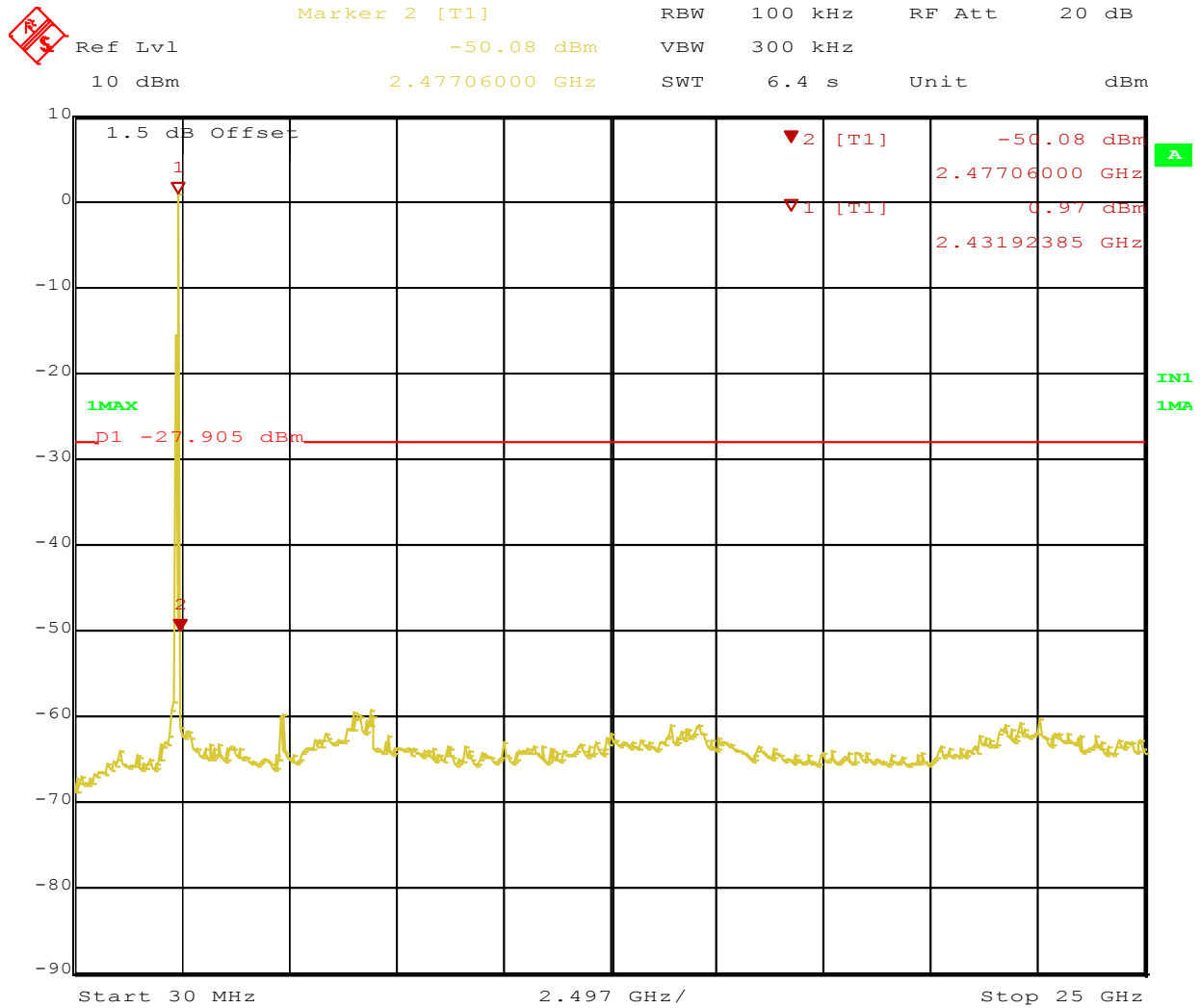
Date: 8.MAR.2012 18:14:24

Figure 24: Out of Band Emissions for 802.11g 6Mbps - 2412 MHz



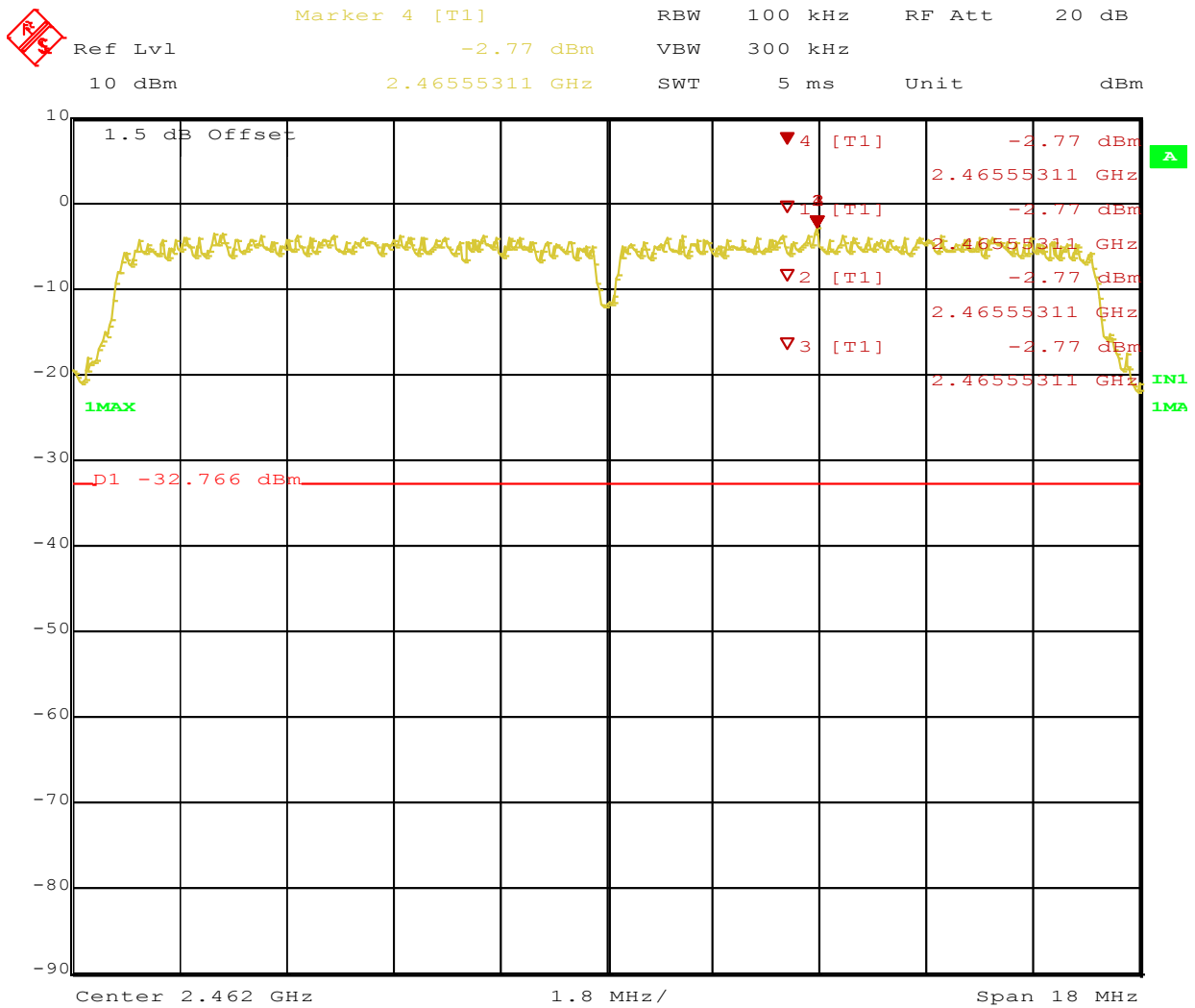
Date: 8.MAR.2012 18:15:59

Figure 25: Reference Level for 802.11g 6Mbps - 2437 MHz



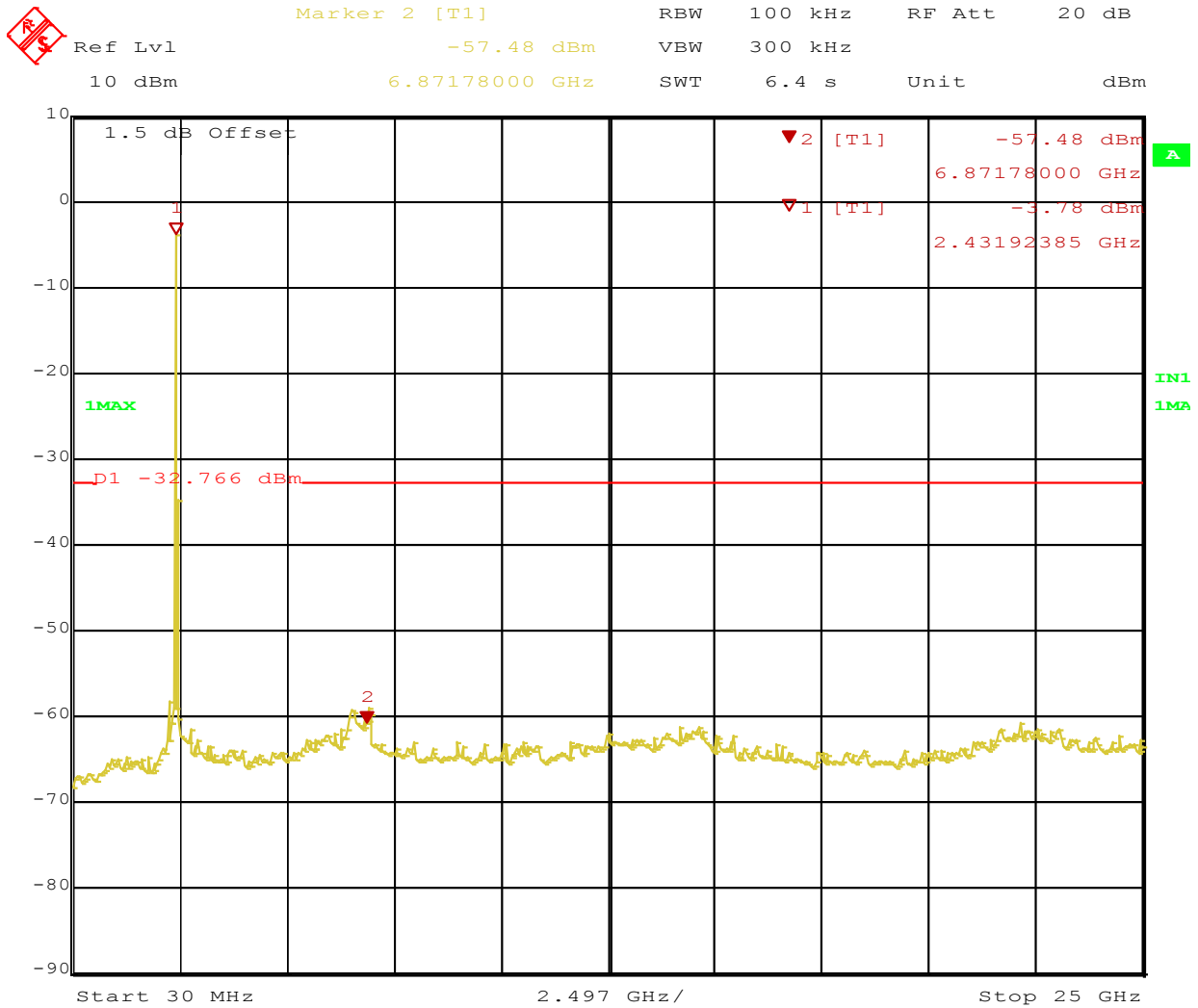
Date: 8.MAR.2012 18:16:54

Figure 26: Out of Band Emissions for 802.11g 6Mbps - 2437 MHz



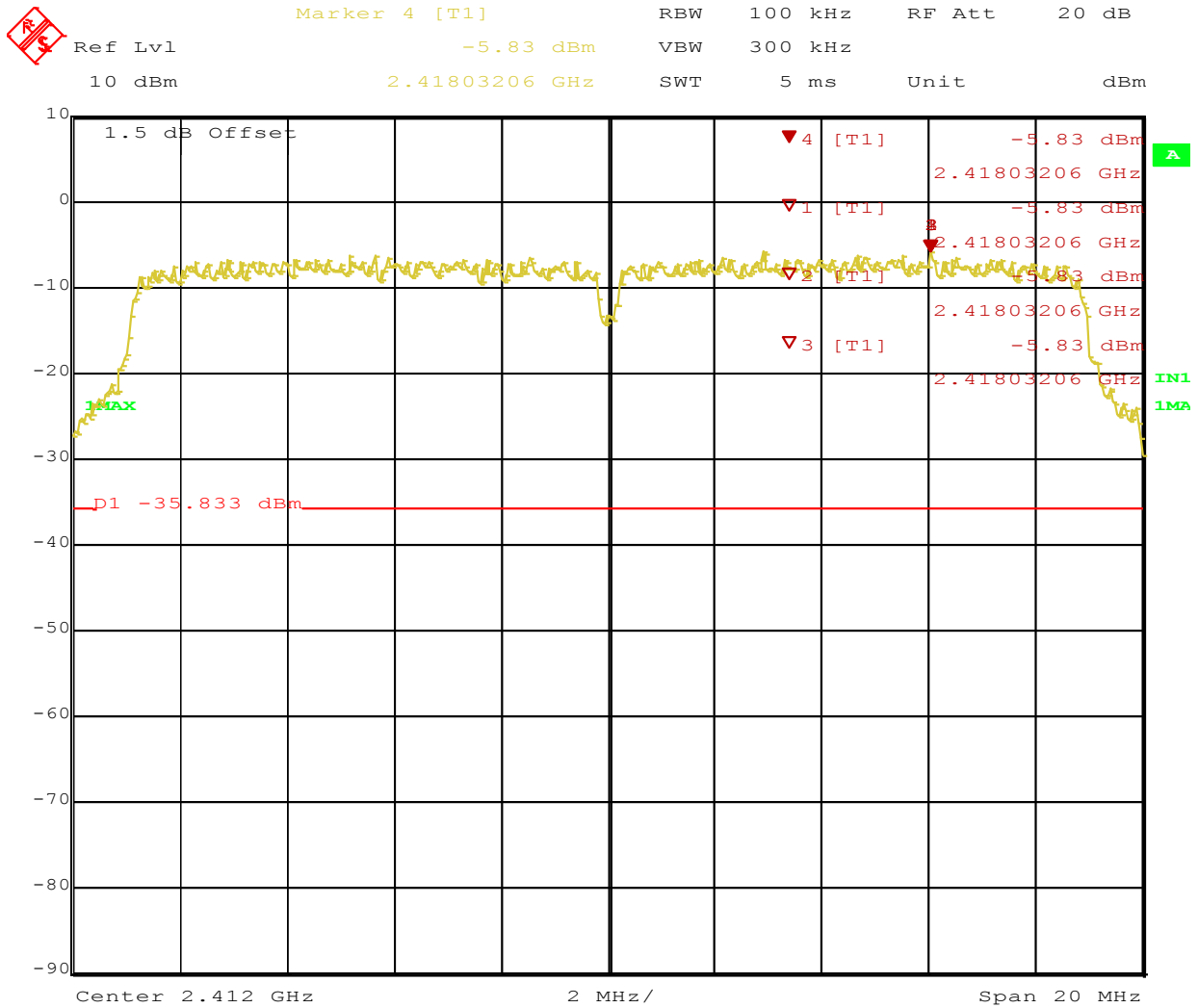
Date: 8.MAR.2012 18:17:47

Figure 27: Reference Level for 802.11g 6Mbps - 2462 MHz



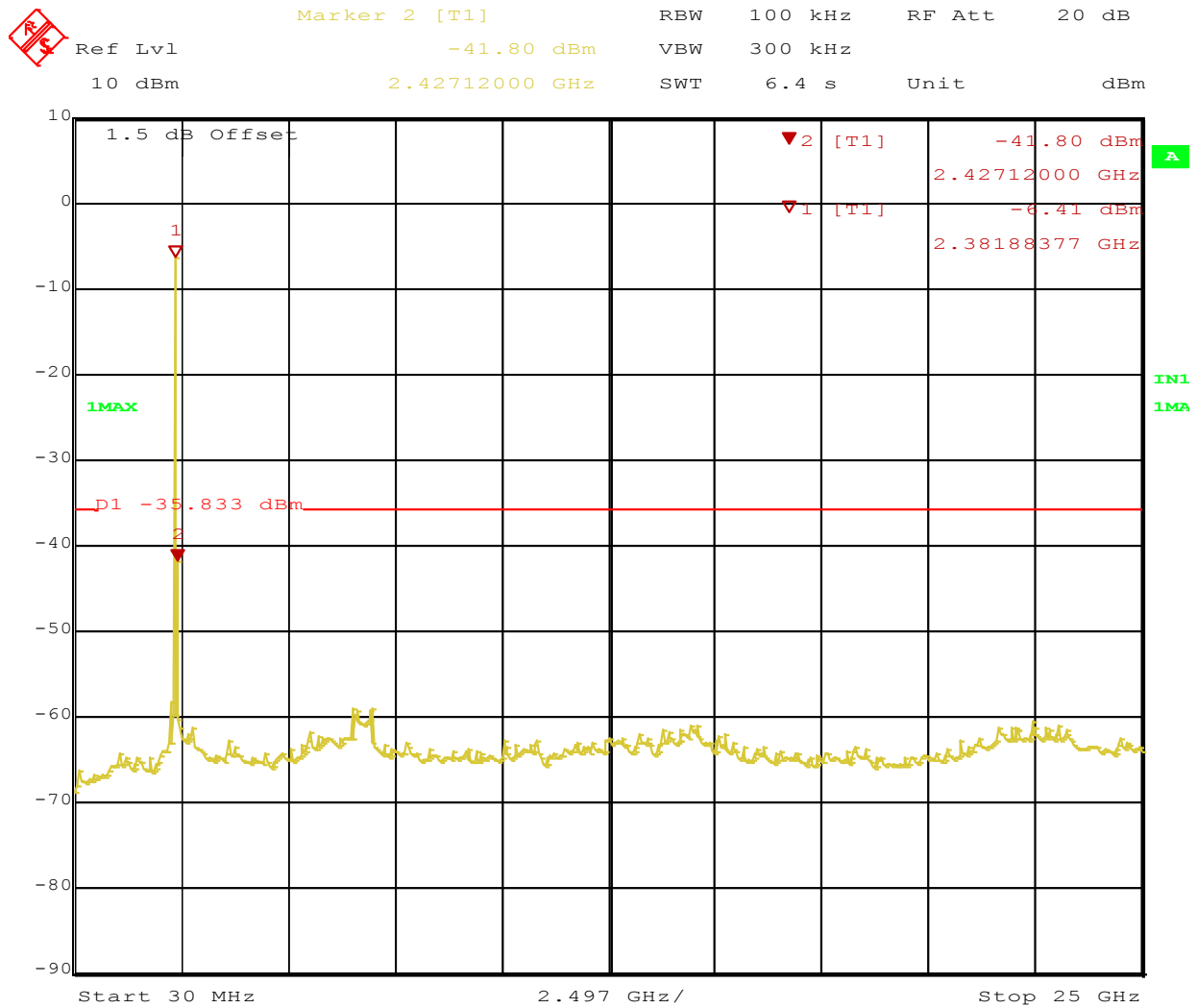
Date: 8.MAR.2012 18:18:42

Figure 28: Out of Band Emissions for 802.11g 6Mbps - 2462 MHz



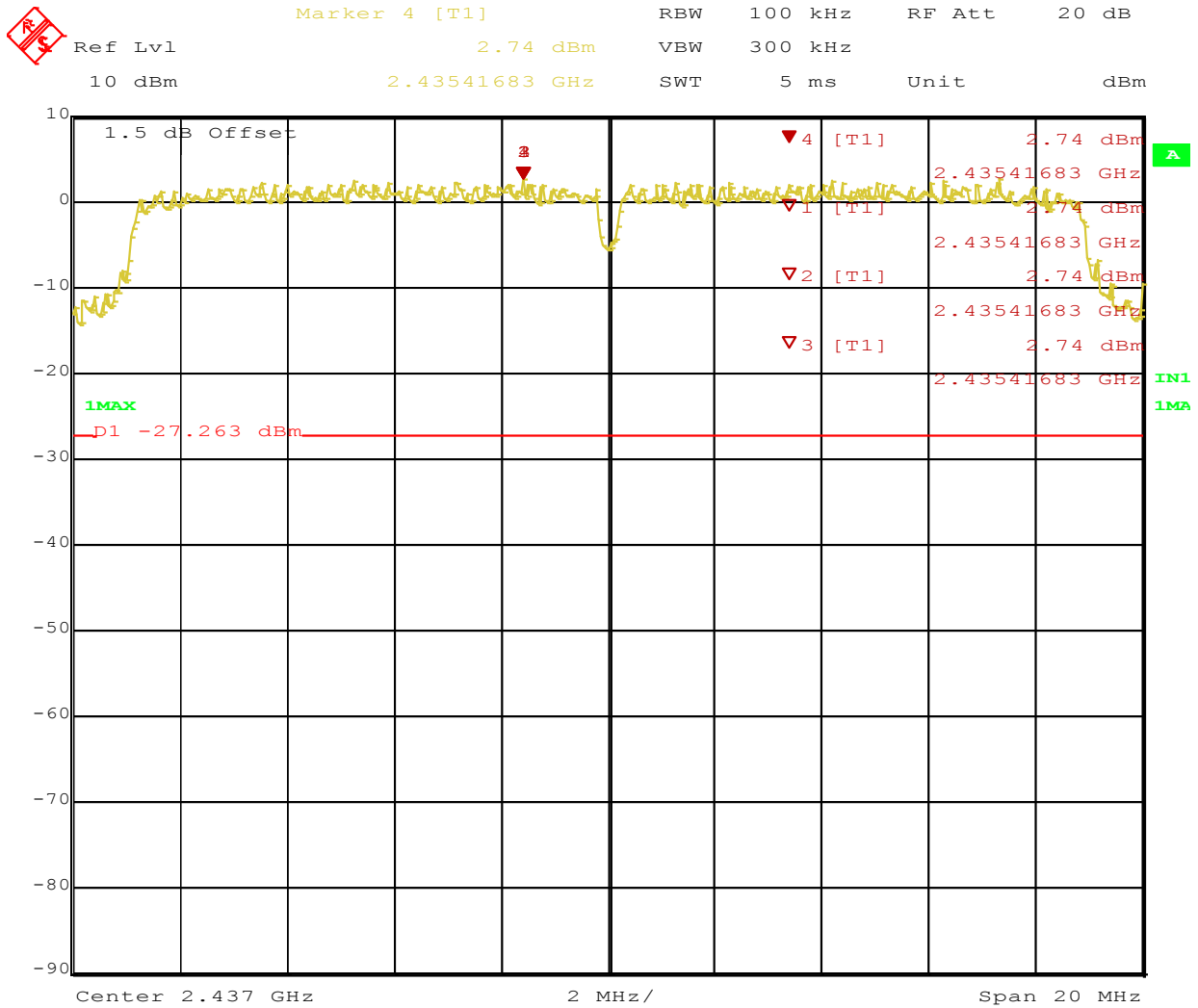
Date: 8.MAR.2012 18:23:38

Figure 29: Reference Level for 802.11n HT20 6.5Mbps - 2412 MHz



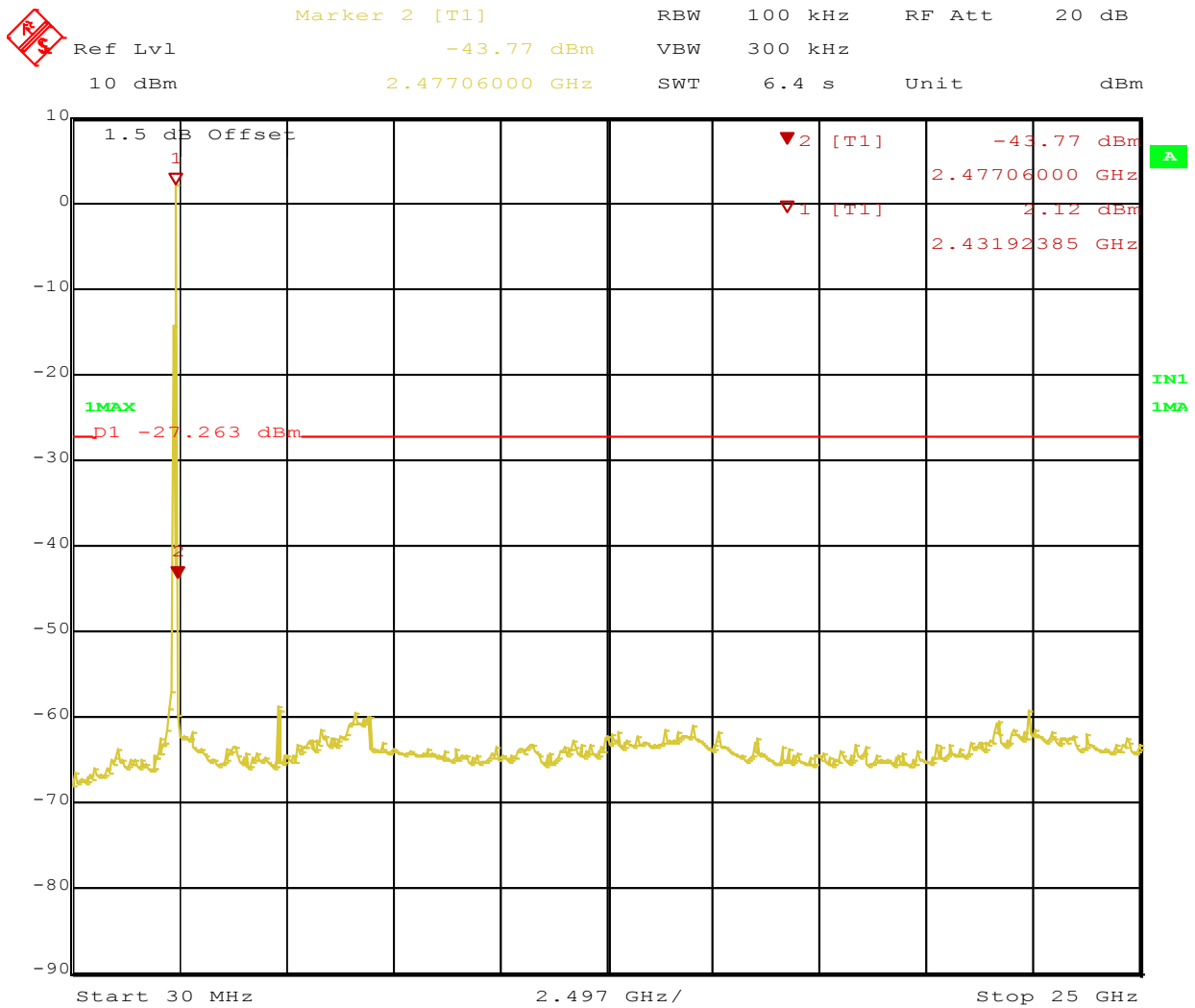
Date: 8.MAR.2012 18:24:33

Figure 30: Out of Band Emissions for 802.11n HT20 6.5Mbps - 2412 MHz



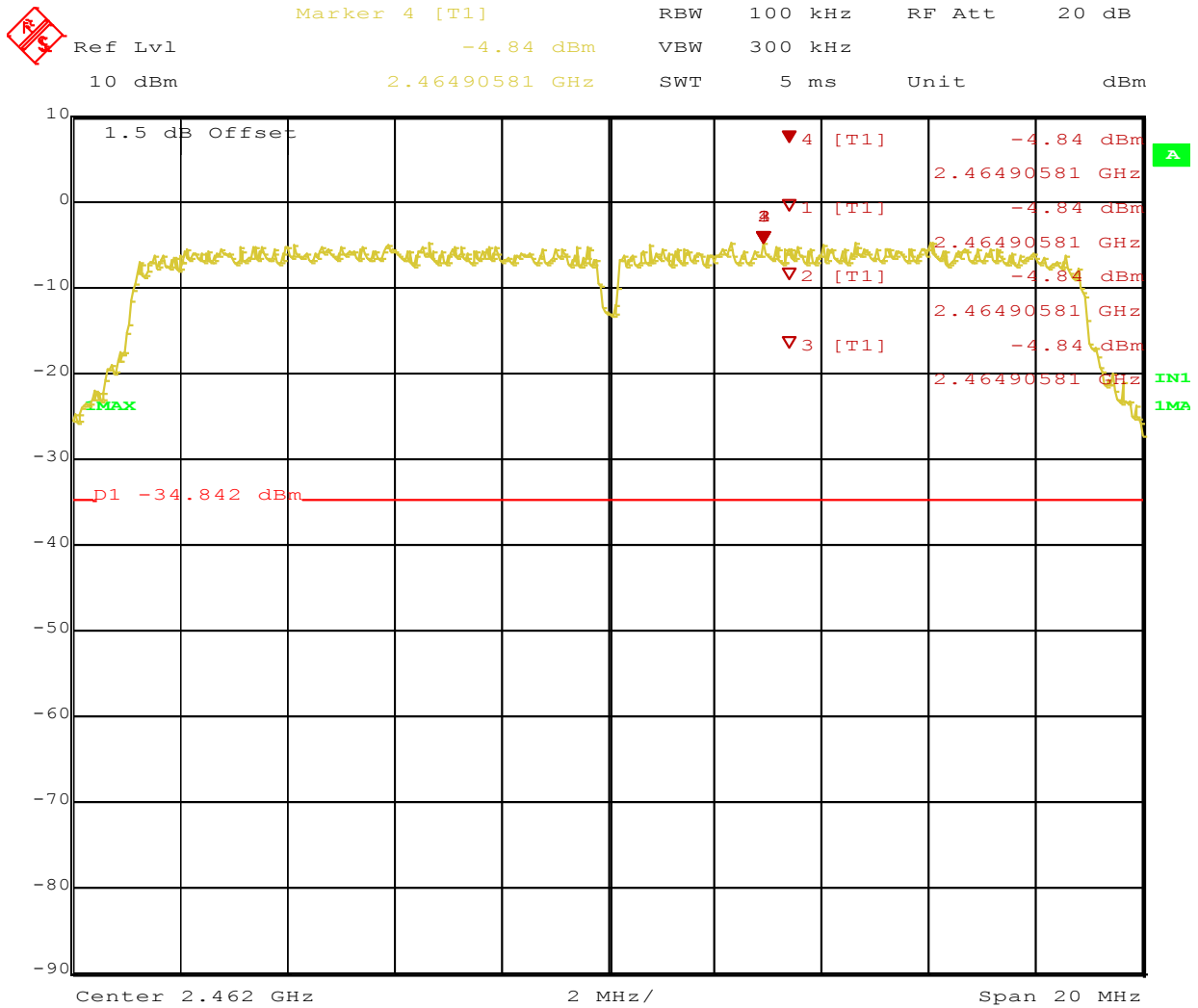
Date: 8.MAR.2012 18:29:28

Figure 31: Reference Level for 802.11n HT20 6.5Mbps - 2437 MHz



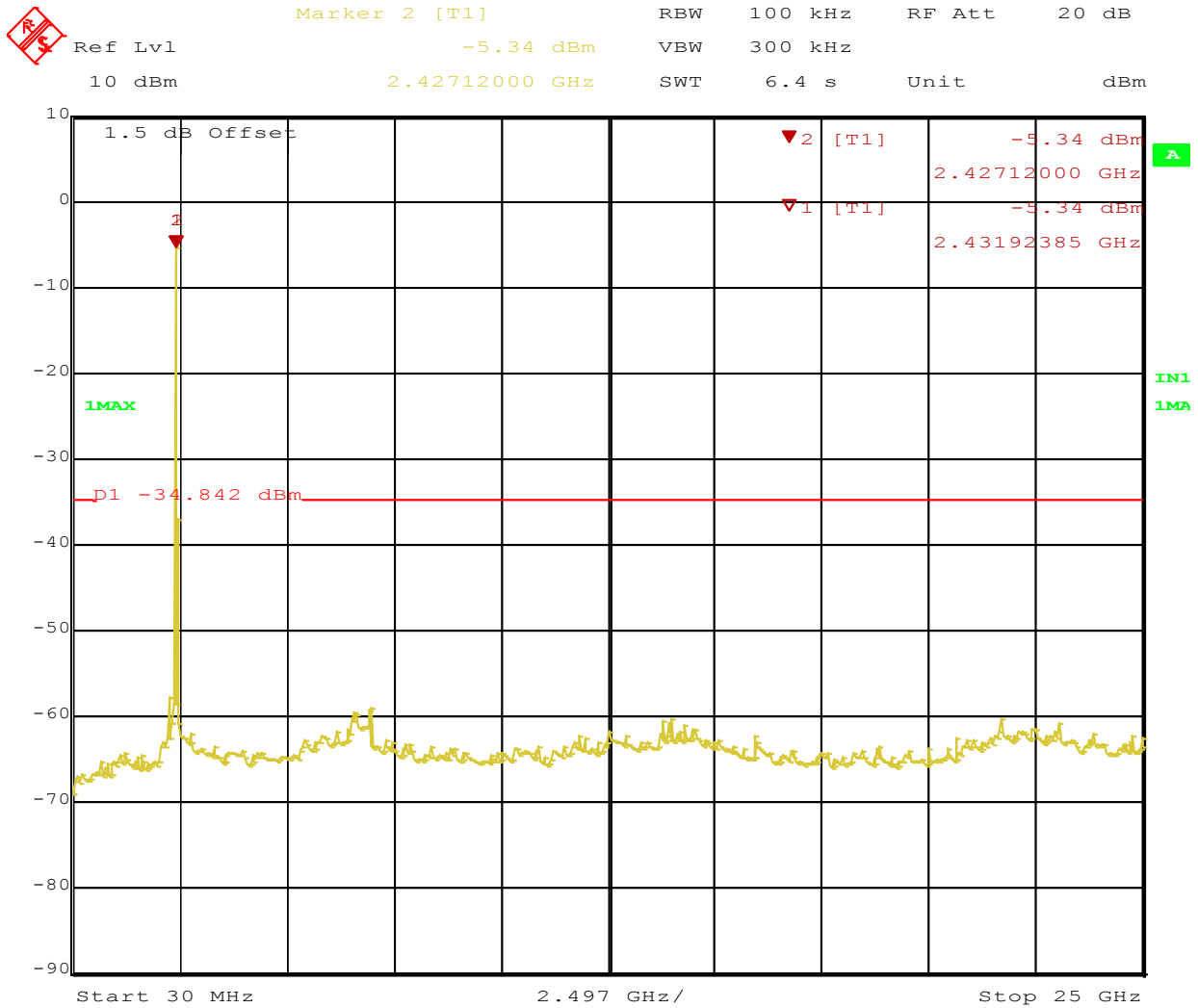
Date: 8.MAR.2012 18:30:23

Figure 32: Out of Band Emissions for 802.11n HT20 6.5Mbps - 2437 MHz



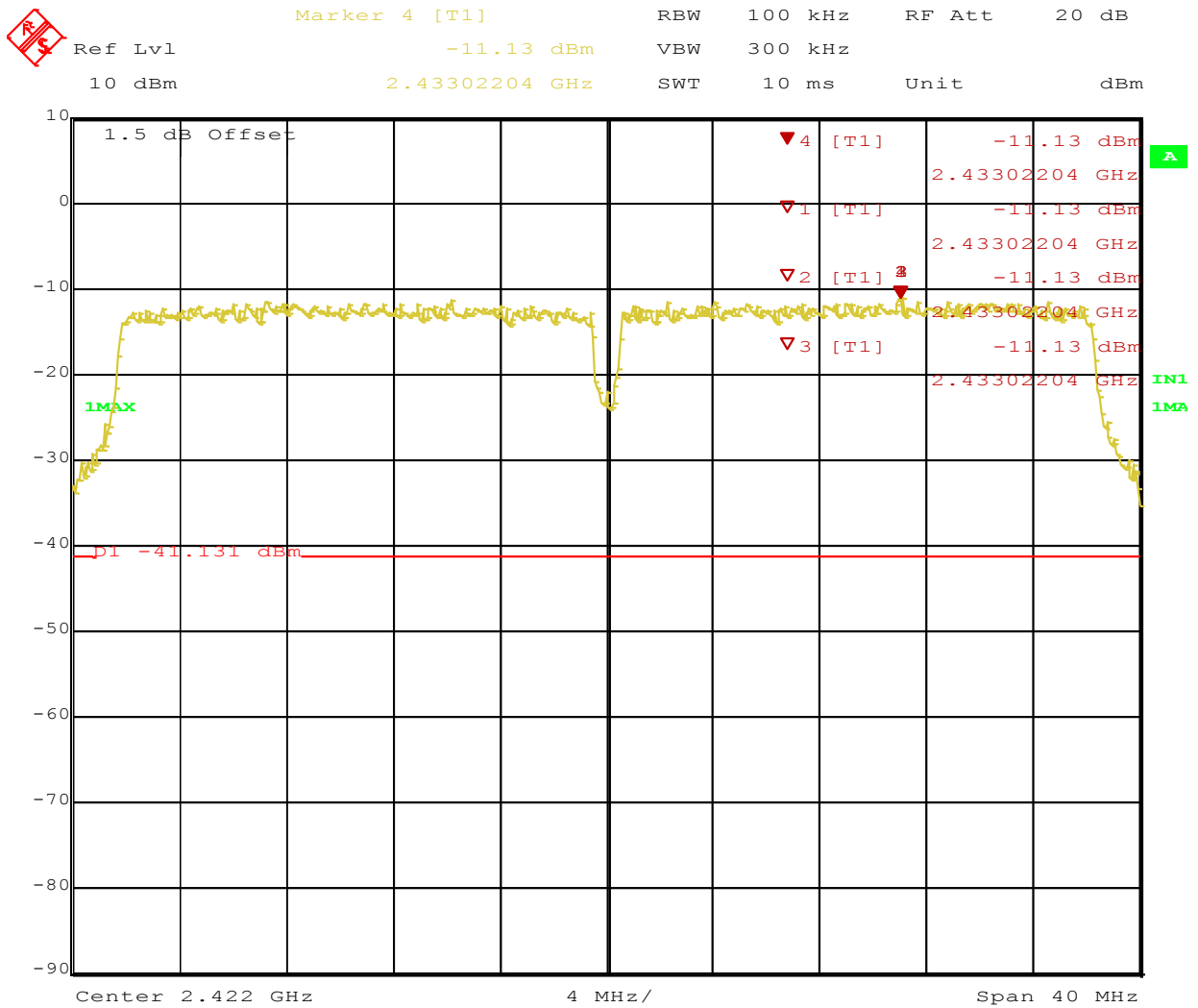
Date: 8.MAR.2012 18:34:33

Figure 33: Reference Level for 802.11n HT20 6.5Mbps - 2462 MHz



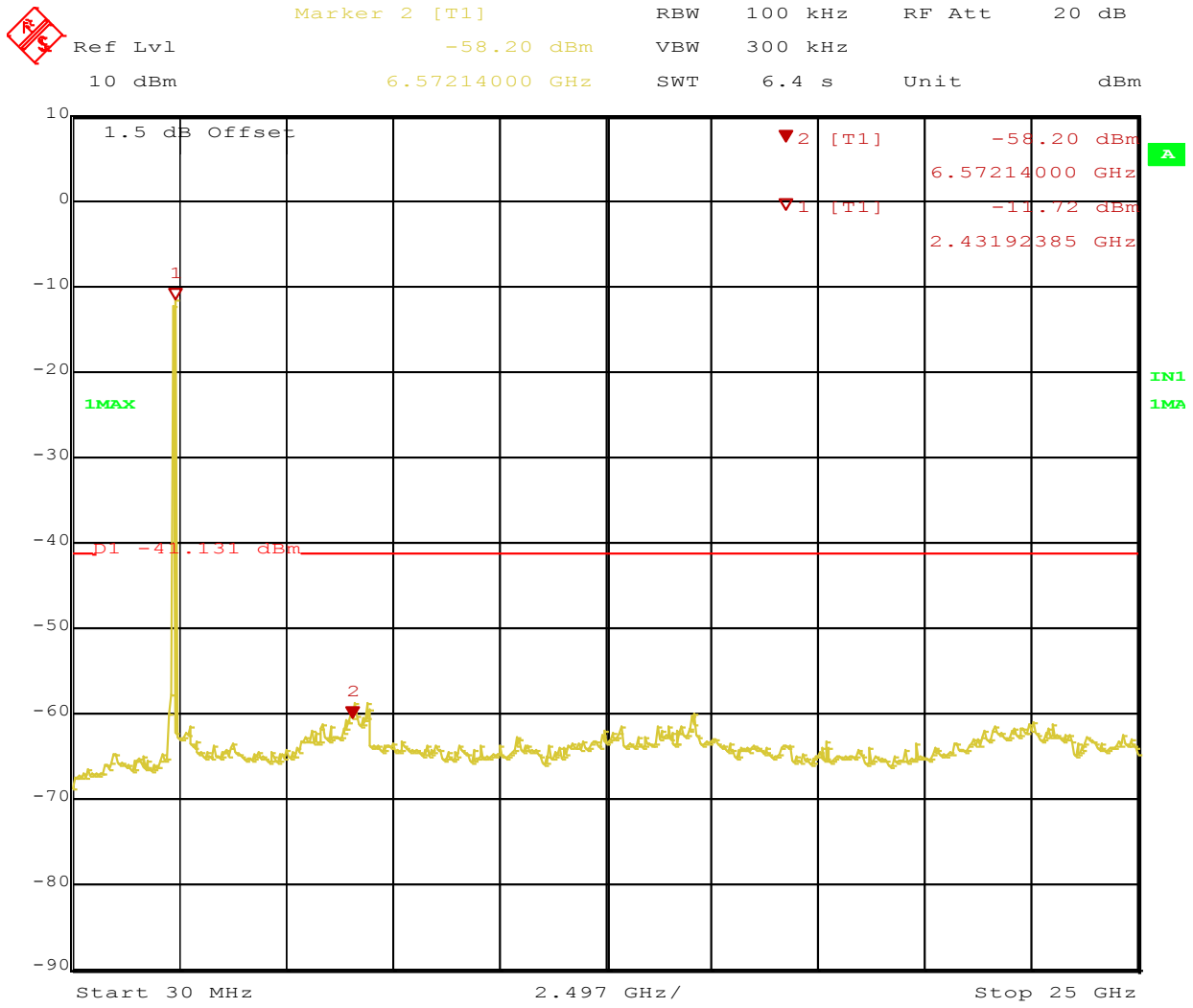
Date: 8.MAR.2012 18:35:29

Figure 34: Out of Band Emissions for 802.11n HT20 6.5Mbps - 2462 MHz



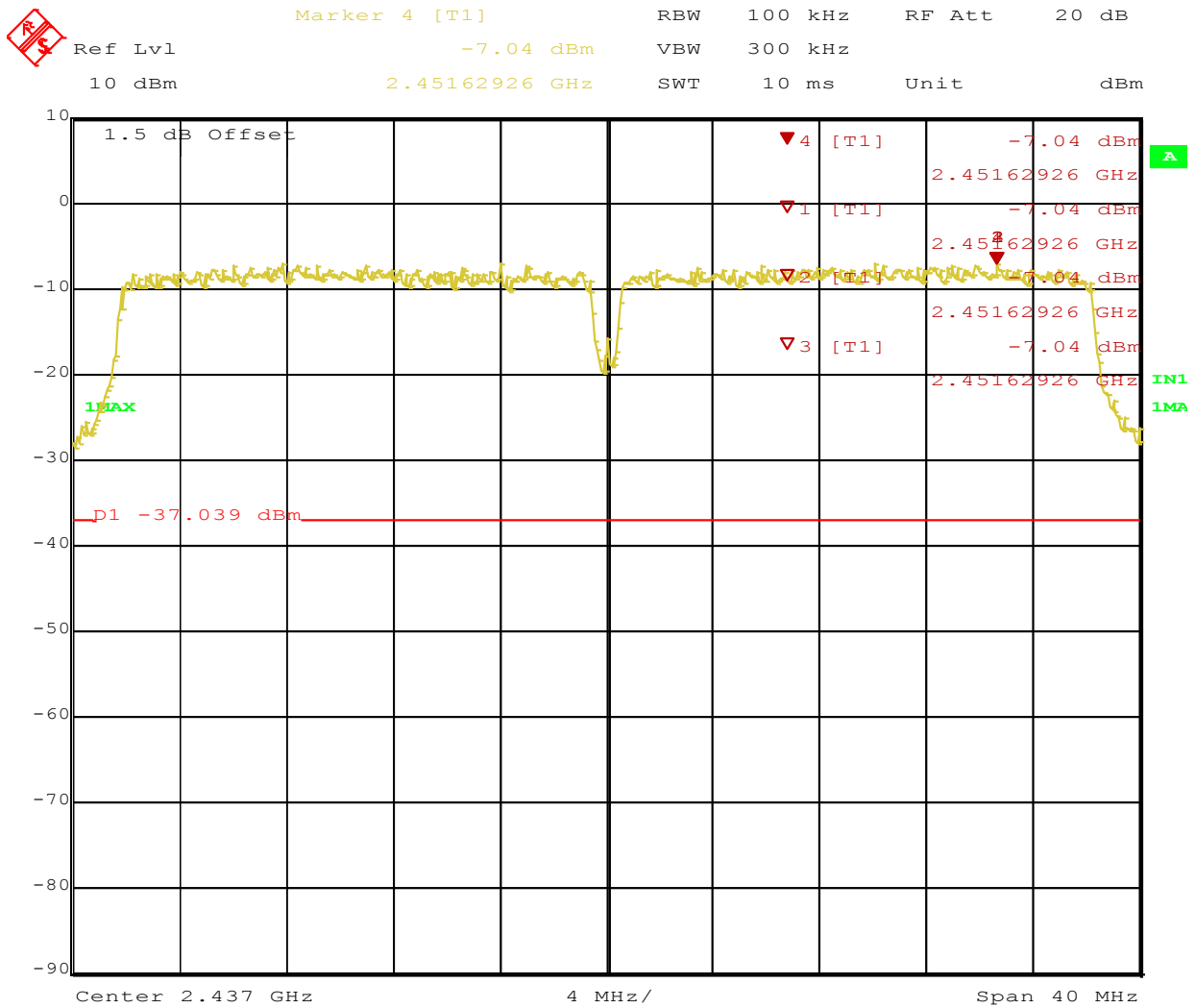
Date: 8.MAR.2012 18:40:23

Figure 35: Reference Level for 802.11n HT40 13.5Mbps - 2422 MHz



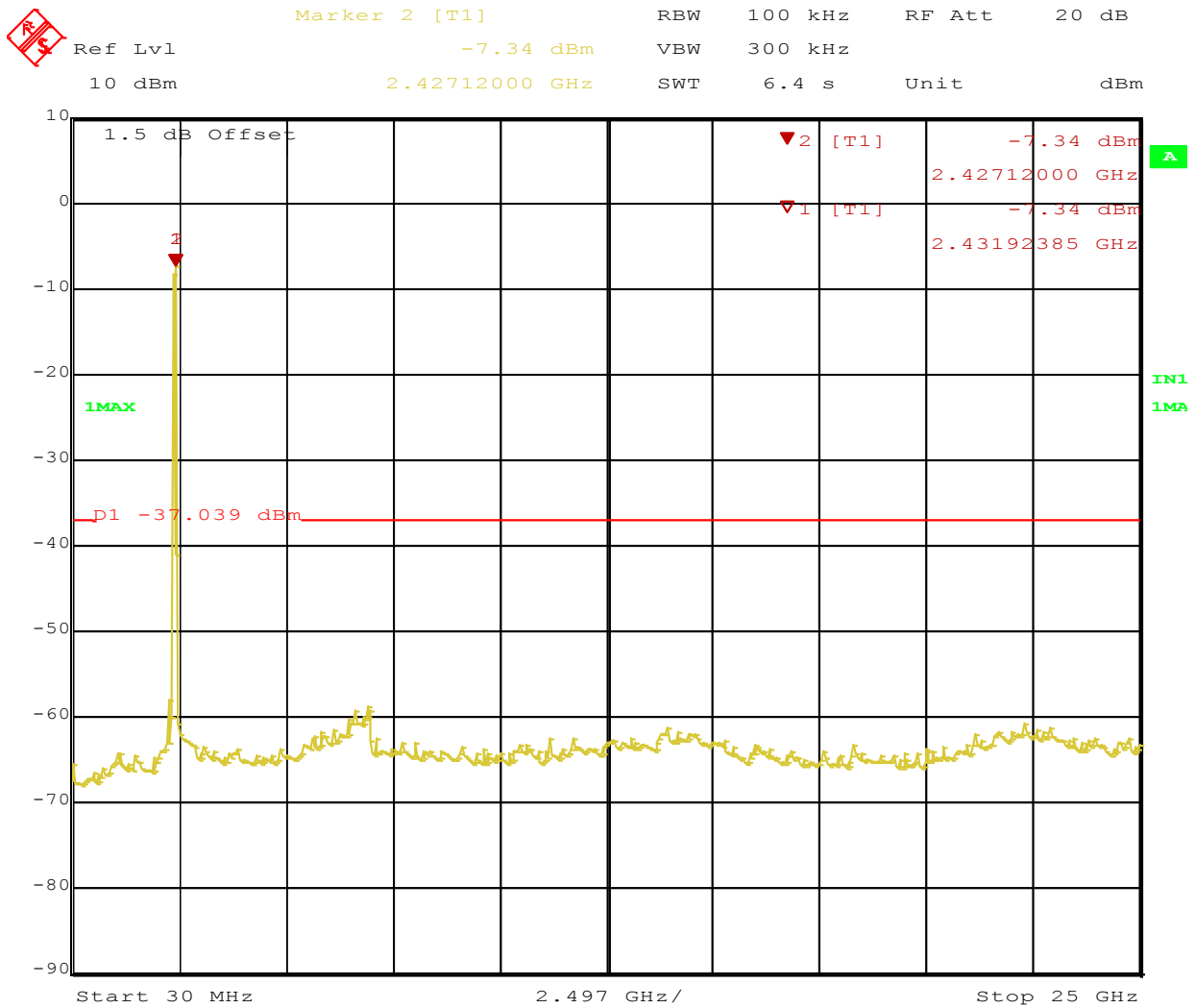
Date: 8.MAR.2012 18:41:18

Figure 36: Out of Band Emissions for 802.11n HT40 13.5Mbps - 2422 MHz



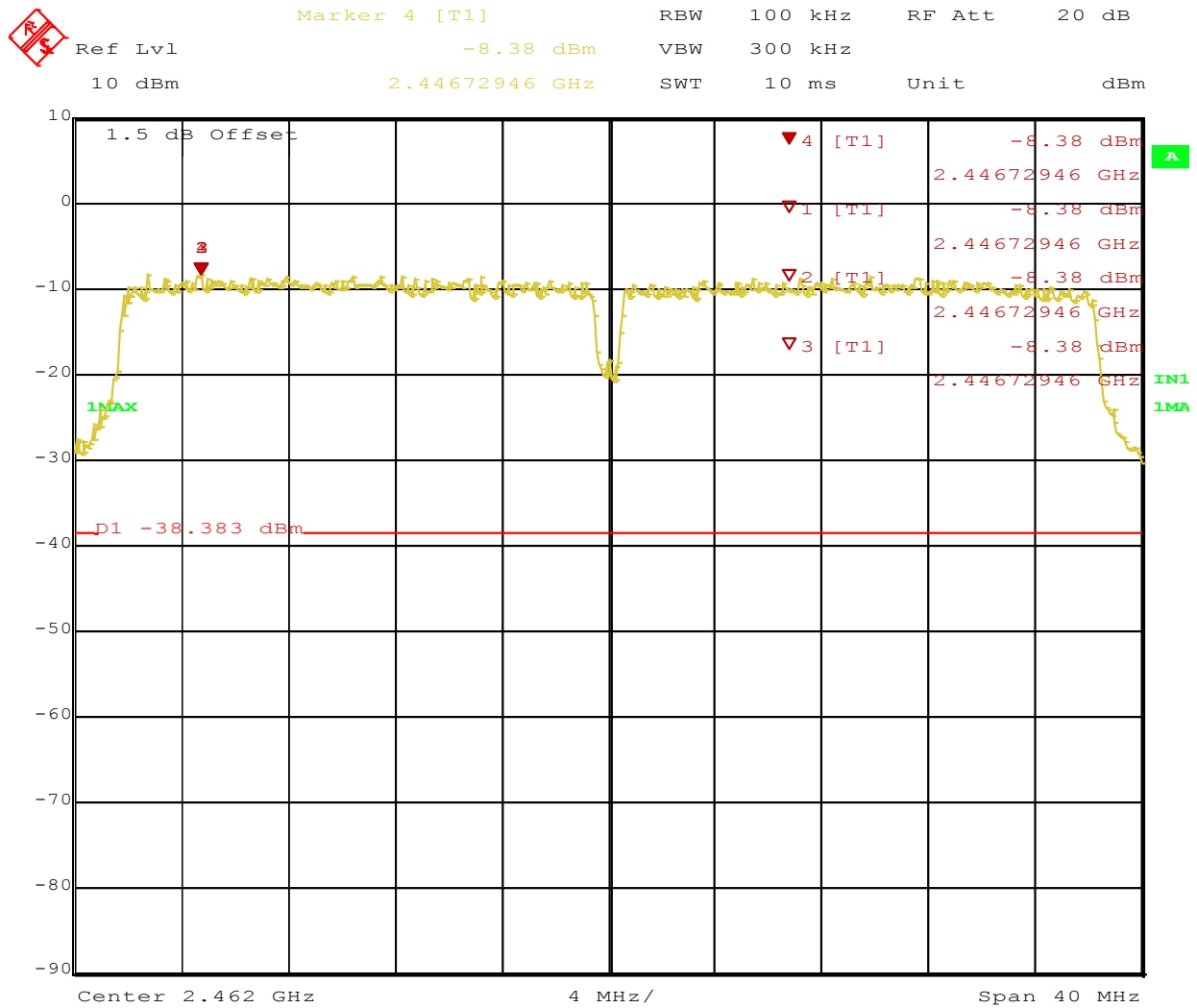
Date: 8.MAR.2012 18:42:57

Figure 37: Reference Level for 802.11n HT40 13.5Mbps - 2437 MHz



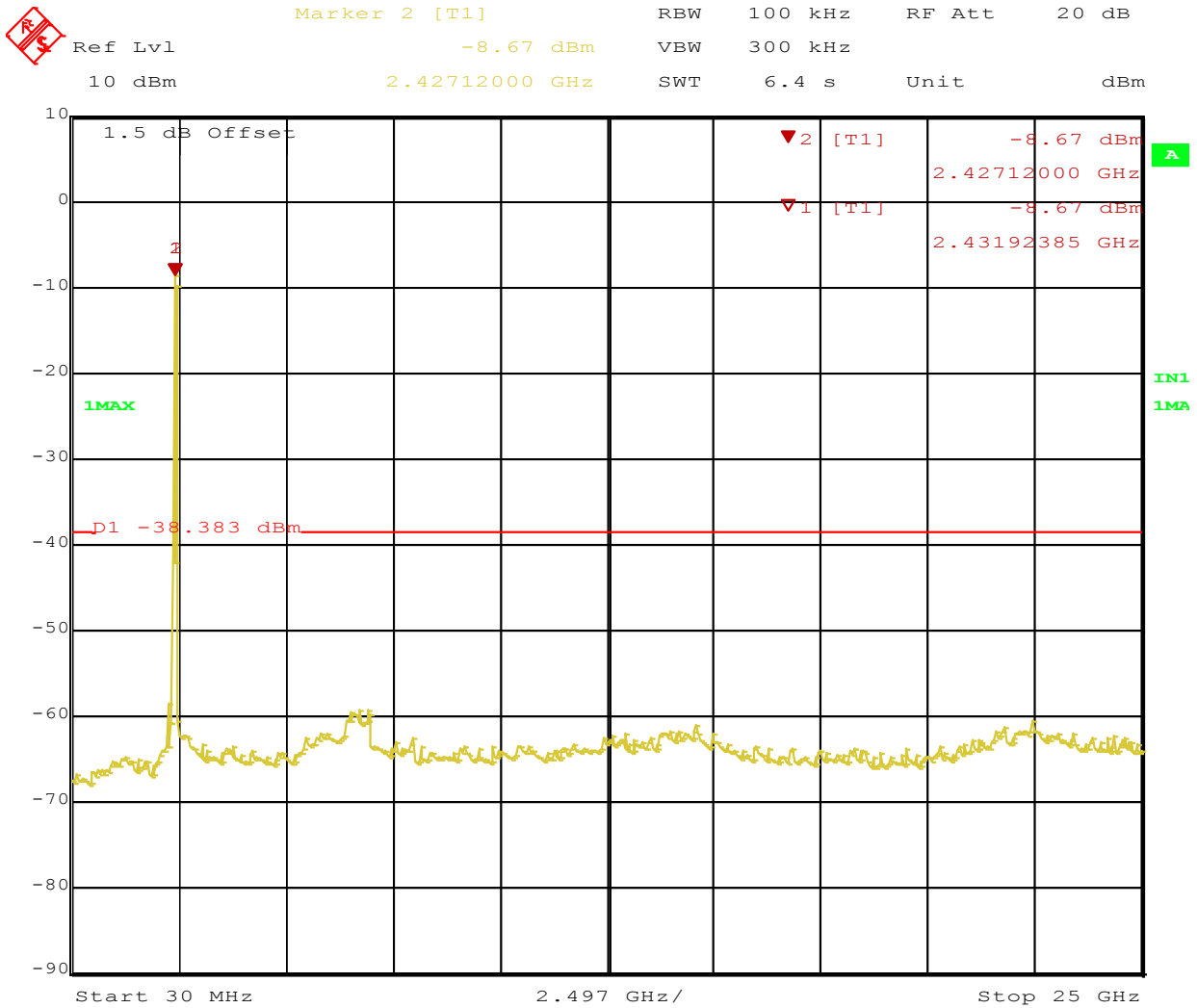
Date: 8.MAR.2012 18:43:52

Figure 38: Out of Band Emissions for 802.11n HT40 13.5Mbps - 2437 MHz



Date: 8.MAR.2012 18:45:24

Figure 39: Reference Level for 802.11n HT40 13.5Mbps - 2452 MHz



Date: 8.MAR.2012 18:46:19

Figure 40: Out of Band Emissions for 802.11n HT40 13.5Mbps - 2452 MHz

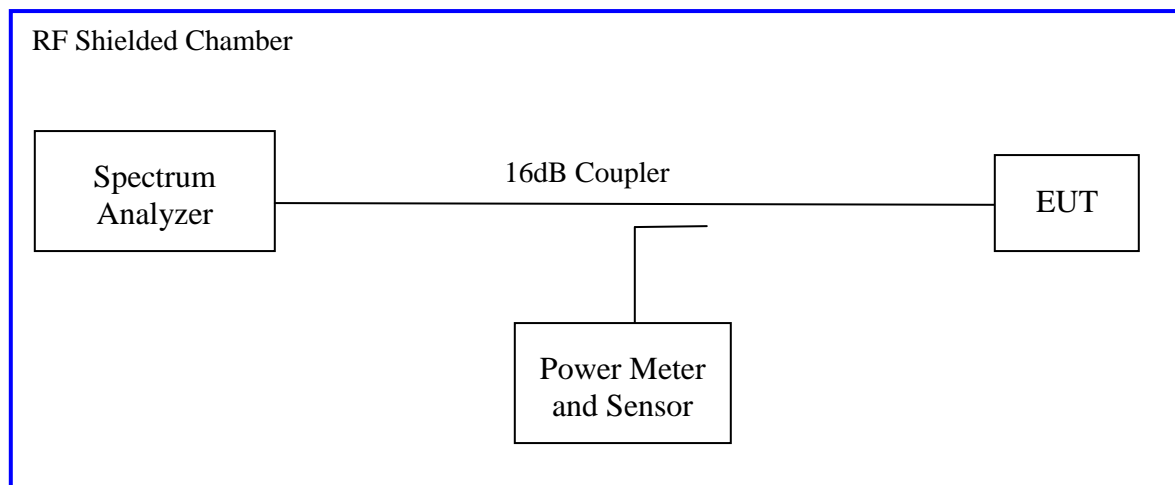
4.4 Peak Power Spectral Density

According to the CFR47 Part 15.247 (e) and RSS 210 (A8.2), the spectral power density output of the antenna port shall be less than 8dBm in any 3kHz band during any time interval of continuous transmission.

4.4.1 Test Method

The conducted method was used to measure the channel power output per ANSI C63.10:2009 Section 6.11.2. The measurement was performed with modulation per CFR47 Part 15.247 (e) and RSS 210 (A8.2). This test was conducted on 3 channels of Sample SN S/N BF0000400. The worst sample result indicated below.

Test Setup:



Measurement procedure AVGPSD in Section 5.3.2 of KDB 558074 was applied.

4.4.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 6: Peak Power Spectral Density – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only							
Antenna Type: Omni-directional				Power Setting: See test plan			
Antenna Gain: +3.0 dBi				Directional Gain: +6.0 dBi			
Signal State: Modulated				Duty Cycle: 100%			
Ambient Temp.: 23 °C				Relative Humidity: 34%			
Peak Power Spectral Density							
Freq. (MHz)	Mode	Chain 0 [dBm]	Chain 1 [dBm]	CF [dB]	Max. PPSD [dBm]	Limit [dBm]	Margin [dB]
802.11b (1x2), One Data Stream							
2412	1Mbps	-2.19	-2.34	-15.2	-17.39	8.00	-25.39
2437	1Mbps	-2.74	-2.80	-15.2	-17.94	8.00	-25.94
2462	1Mbps	-1.95	-2.12	-15.2	-17.15	8.00	-25.15
802.11b (2x2), Two Data Streams							
2412	1Mbps	-3.72	-3.28	-12.2	-15.48	8.00	-23.48
2437	1Mbps	-1.79	-1.90	-12.2	-13.99	8.00	-21.99
2462	1Mbps	-2.27	-2.69	-12.2	-14.47	8.00	-22.47
802.11g (1x2), One Data Stream							
2412	6 Mbps	-9.69	-9.91	-15.2	-24.89	8.00	-32.89

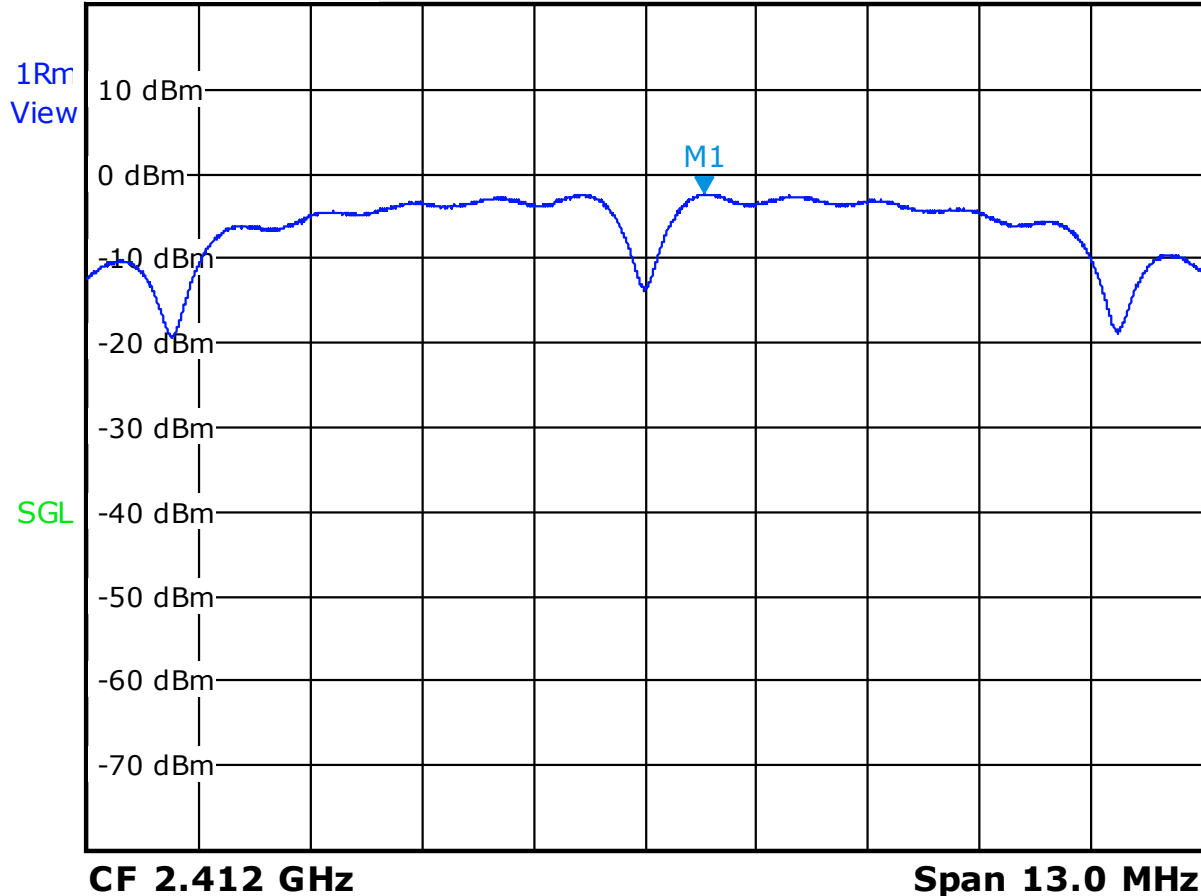
2437	6 Mbps	-3.96	-3.87	-15.2	-19.07	8.00	-27.07
2462	6 Mbps	-9.40	-9.89	-15.2	-24.60	8.00	-32.60
802.11b (2x2), Two Data Streams							
2412	6 Mbps	-9.85	-10.00	-12.2	-22.05	8.00	-30.05
2437	6 Mbps	-4.16	-3.61	-12.2	-15.81	8.00	-23.81
2462	6 Mbps	-10.61	-11.01	-12.2	-22.81	8.00	-30.81
802.11n HT20 (1x2), One Data Stream							
2412	HT20 6.5 Mbps	-11.05	-11.57	-15.2	-26.25	8.00	-34.25
2437	HT20 6.5 Mbps	-3.39	-2.86	-15.2	-18.06	8.00	-26.06
2462	HT20 6.5 Mbps	-10.62	-10.71	-15.2	-25.82	8.00	-33.82
802.11n HT20 (2x2), Two Data Streams							
2412	HT20 13 Mbps	-12.22	-11.64	-12.2	-23.84	8.00	-31.84
2437	HT20 13 Mbps	-3.38	-2.73	-12.2	-14.93	8.00	-22.93
2462	HT20 13 Mbps	-11.34	-11.92	-12.2	-23.54	8.00	-31.54
802.11n HT40 (1x2), One Data Stream							
2422	HT40 13.5 Mbps	-16.16	-15.10	-15.2	-30.30	8.00	-38.30
2437	HT40 13.5 Mbps	-12.85	-11.69	-15.2	-26.89	8.00	-34.89
2452	HT40 13.5 Mbps	-14.12	-14.73	-15.2	-29.32	8.00	-37.32
802.11n HT40 (2x2), Two Data Streams							
2422	HT40 27 Mbps	-16.96	-15.07	-12.2	-27.27	8.00	-35.27

2437	HT40 27 Mbps	-13.46	-12.23	-12.2	-24.43	8.00	-32.43
2452	HT40 27 Mbps	-14.30	-15.26	-12.2	-23.54	8.00	-31.54
<p>Note: CF was accounted for the number of data streams and test instrument bandwidth. Data stream CF is $10 \cdot \log(N)$ per KDB 662911; where N is number of outputs. It is 3.01 dB for 2 streams. Instrument Bandwidth is 100 kHz. Per KDB 558074, factor is $10 \cdot \log(3/100 \text{ kHz})$. It is -15.2 dB.</p>							

Sample Plots of the highest power spectral density are below. Additional plots are available on the files.

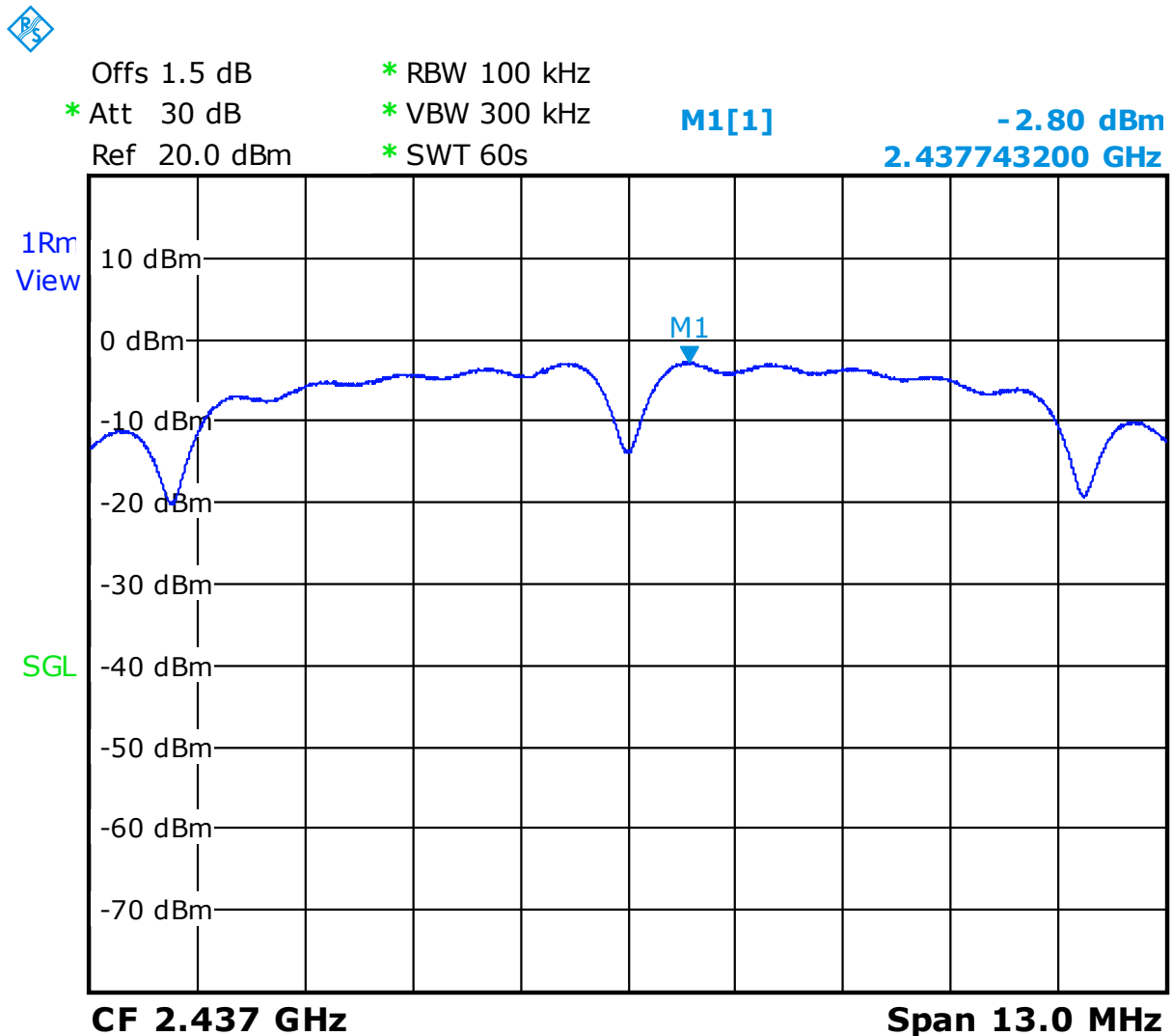


Offs 1.5 dB * RBW 100 kHz
* Att 30 dB * VBW 300 kHz **M1[1]** **-2.34 dBm**
Ref 20.0 dBm * SWT 60s **2.412686800 GHz**



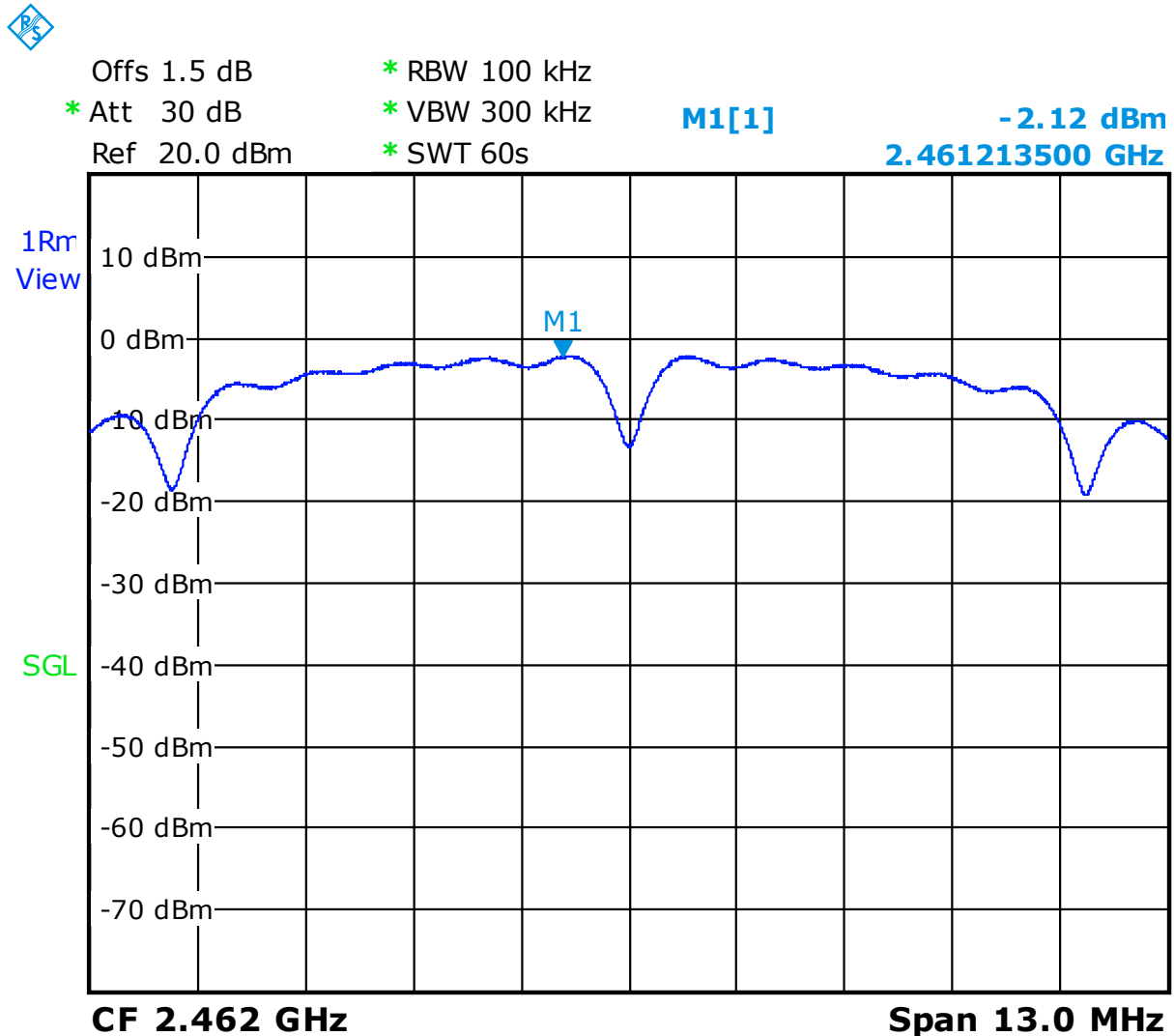
Date: 8.MAR.2012 13:44:20

Figure 41: Peak Power Spectral Density at Chain 1 - 2412 MHz 1Mbps (1x2)



Date: 8.MAR.2012 13:47:17

Figure 42: Peak Power Spectral Density at Chain 1 - 2437 MHz 1Mbps (1x2)

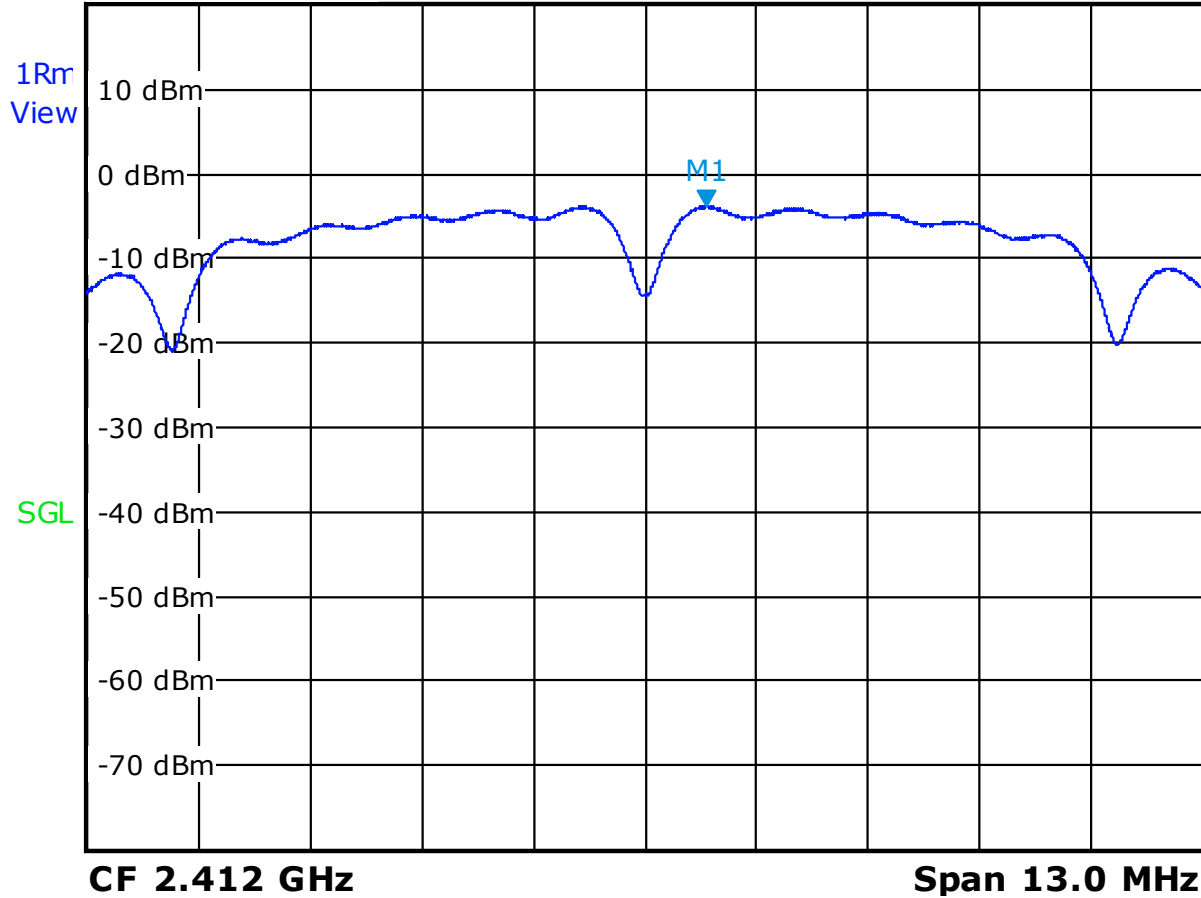


Date: 8.MAR.2012 13:50:14

Figure 43: Peak Power Spectral Density at Chain 1 - 2462 MHz 1Mbps (1x2)



Offs 1.5 dB * RBW 100 kHz
* Att 30 dB * VBW 300 kHz **M1[1]** **-3.72 dBm**
Ref 20.0 dBm * SWT 60s **2.412704200 GHz**

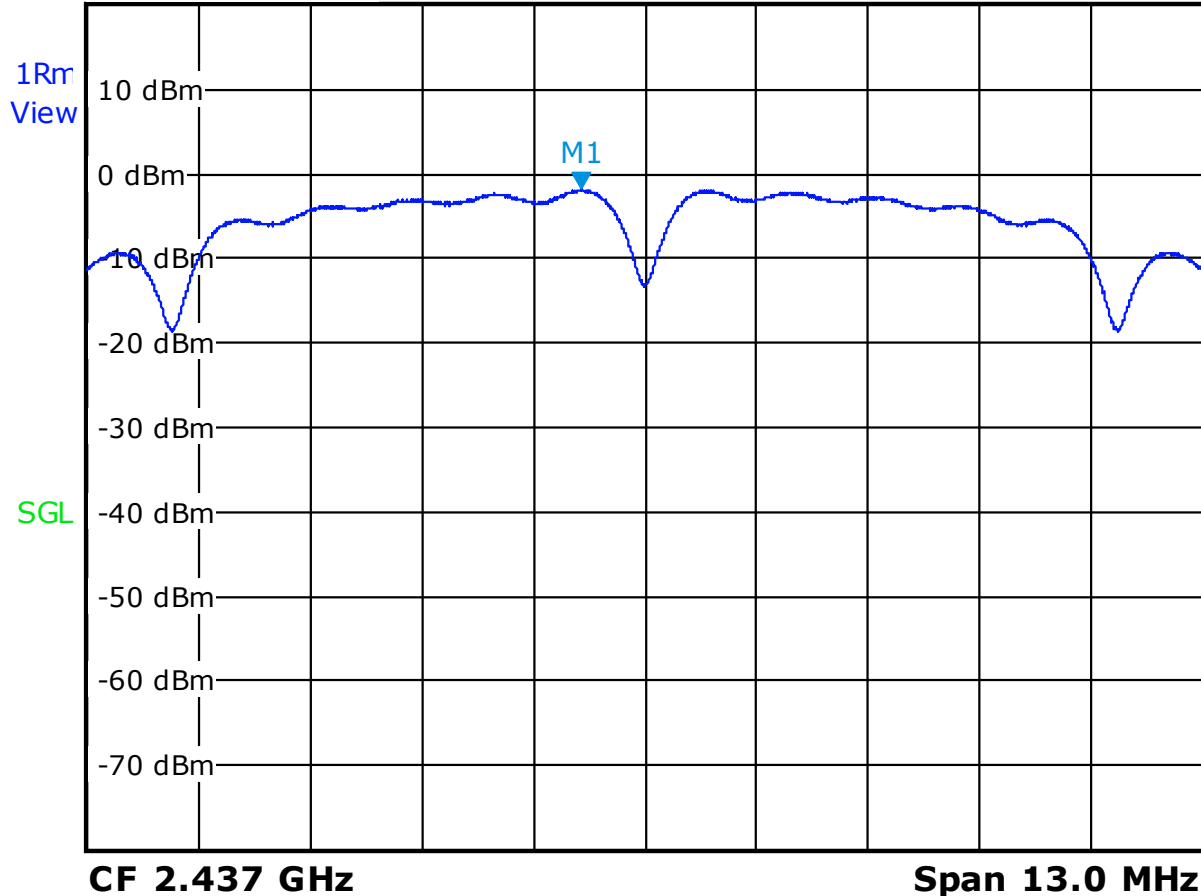


Date: 8.MAR.2012 14:06:43

Figure 44: Peak Power Spectral Density at Chain 0 - 2412 MHz 1Mbps (2x2)

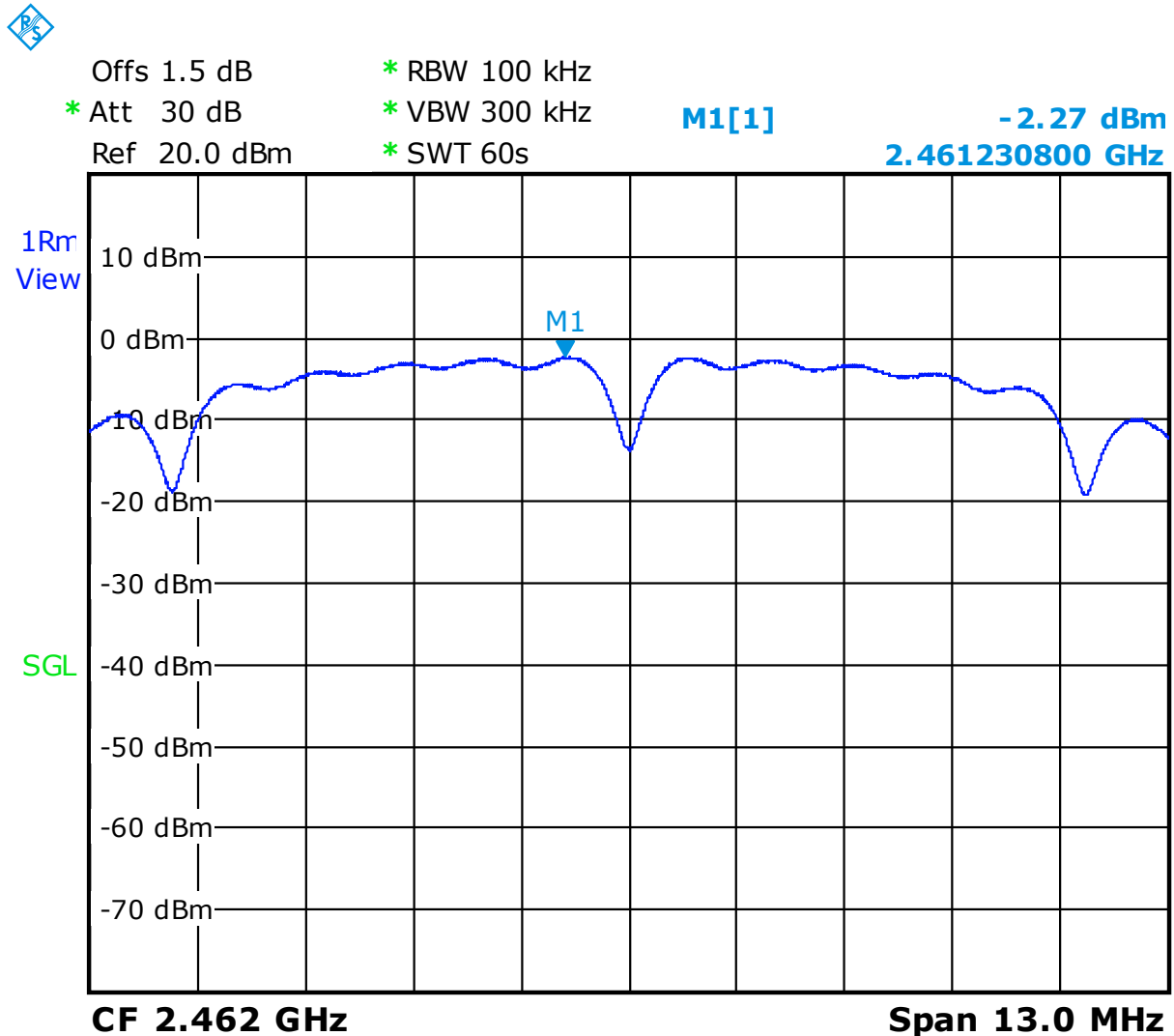


Offs 1.5 dB * RBW 100 kHz
* Att 30 dB * VBW 300 kHz **M1[1]** **-1.79 dBm**
Ref 20.0 dBm * SWT 60s **2.436252500 GHz**



Date: 8.MAR.2012 14:11:09

Figure 45: Peak Power Spectral Density at Chain 0 - 2437 MHz 1Mbps (2x2)



Date: 8.MAR.2012 14:15:33

Figure 46: Peak Power Spectral Density at Chain 0 - 2462 MHz 1Mbps (2x2)

4.5 Maximum Permissible Exposure

4.5.1 Test Methodology

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this calculation is declared by the manufacturer, and the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

4.5.2 RF Exposure Limit

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	...	...	1.0	6
300 - 1500	...	...	f/300	6
1500 - 100,000	...	...	5	6
(B)Limits For General Population / Uncontrolled Exposure				
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	0.037	0.2	30
300 - 1500	...	...	f/1500	30
1500 - 100,000	...	...	1.0	30

F = Frequency in MHz

* = Plane-wave equivalent power density

4.5.3 EUT Operating Condition

The software provided by Manufacturer enabled the EUT to transmit data at lowest, middle and highest channel individually.

4.5.4 Classification

The antenna of the product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance with the antenna should be included in user's manual. So, this device is classified as a **Mobile Device**.

4.5.5 Test Results

4.5.5.1 Antenna Gain

The transmitting antenna was integrated. The directional antenna gain was +6.01 dBi or 3.99 (numeric).

4.5.5.2 Output Power into Antenna & RF Exposure value at distance 20cm:

Calculations for this report are based on highest power measurement.

Limit for MPE (from FCC part 1.1310 table1) is 1.0 mW/cm²

The highest measured power is +17.677 dBm or 58.573mW

Using the Friss transmission formula, the EIRP is Pout*G, and R is 20cm.

$Pd = (58.573 * 3.99) / (1600\pi) = 0.0465 \text{ mW/cm}^2$, which is 0.9534 mW/cm² below to the limit.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.5.6 Sample Calculation

The Friss transmission formula: $Pd = (Pout * G) / (4 * \pi * R^2)$

Where;

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

$\pi \approx 3.1416$

R = distance between observation point and center of the radiator in cm

Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition, Page 640, Eq. (11-133).

4.6 Unwanted Emission into Restricted Bands

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS 210 Sect. A.8.5

4.6.1 Test Methodology

4.6.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

4.6.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

The 30 MHz to 1 GHz final scans performed on the worst axis, Y-Axis, at 802.11b, 1 Mbit/s, 2437 MHz.

The final scans performed on the worst axis, Y-Axis, at three operating channels for above 1 GHz; Ch0 is worst case for 1 data stream.

2412 MHz, 2437 MHz, and 2462 MHz at 1Mbit/s 802.11b mode for 1 chain and 2 chain outputs

2412 MHz, 2437 MHz, and 2462 MHz at 6Mbit/s 802.11g mode for 1 chain and 2 chain outputs

2412 MHz, 2437 MHz, and 2462 MHz at 6.5Mbit/s 802.11n HT20 mode for 1 chain output

2412 MHz, 2437 MHz, and 2462 MHz at 13Mbit/s 802.11n HT20 mode for 2 chain outputs
 2422 MHz, 2437 MHz, and 2452 MHz at 13.5Mbit/s 802.11n HT40 mode for 1 chain output
 2422 MHz, 2437 MHz, and 2452 MHz at 27 Mbit/s 802.11n HT40 mode for 2 chain outputs

4.6.1.3 Deviations

None.

4.6.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2009 and RSS 210 A1.1.2 2007.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F (kHz)	300
0.490-1.705.....	24000/F (kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

All harmonics and spurious emission which are outside of the restricted band shall be 20dB below the in-band emission.

4.6.3 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and Test Plan.

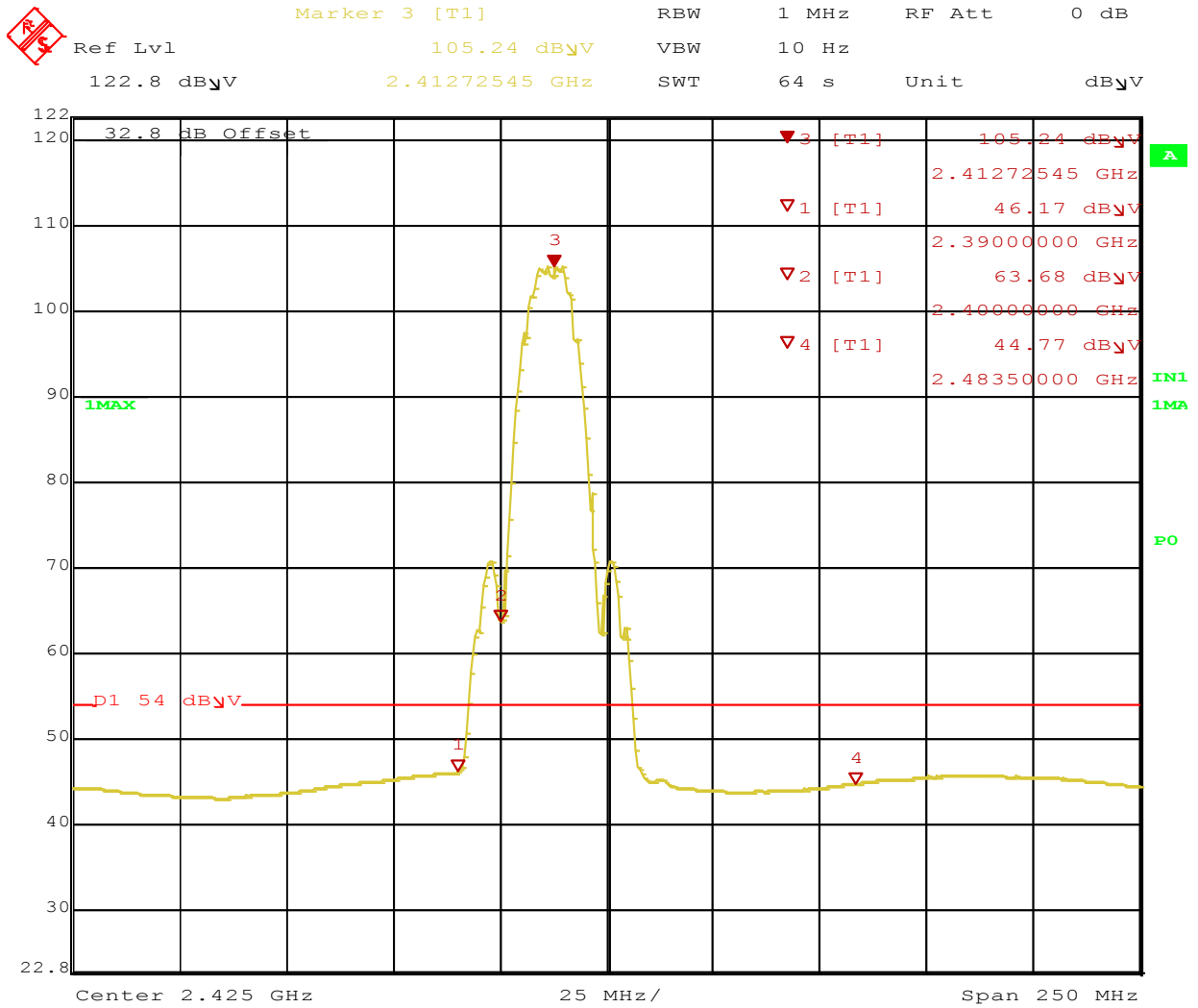
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 7: Transmit Spurious Emission at Band-Edge Requirements

Test Conditions: Radiated Measurement, Normal Temperature and Voltage only								
Antenna Type: Integrated					Power Setting: See Test Plan			
Max. Antenna Gain: + 3.0 dBi					Signal State: Modulated			
Ambient Temp.: 22 °C					Relative Humidity:34%			
Band-Edge Results								
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	Det. Pk/Ave	Level (dBuV/m)	Limit (dBuV/m)	Spec Margin (dB)	Mode
Transmitted Data in 802.11b Mode								
2390	H	270	145	Pk	59.95	74.00	-14.05	2412 MHz, 1Mbps, Ch0
2390	H	270	145	Avg	46.17	54.00	-7.83	2412 MHz, 1Mbps, Ch0
2390	V	77	290	Pk	58.93	74.00	-15.07	2412 MHz, 1Mbps, Ch0
2390	V	77	290	Avg	45.30	54.00	-8.70	2412 MHz, 1Mbps, Ch0
2390	H	238	182	Pk	58.25	74.00	-15.75	2437 MHz, 1Mbps, Ch0
2390	H	238	182	Avg	45.45	54.00	-8.55	2437 MHz, 1Mbps, Ch0
2390	V	-10	183	Pk	58.47	74.00	-15.53	2437 MHz, 1Mbps, Ch0
2390	V	-10	183	Avg	45.28	54.00	-8.72	2437 MHz, 1Mbps, Ch0
2483.5	H	270	138	Pk	58.82	74.00	-15.18	2462 MHz, 1Mbps, Ch0
2483.5	H	270	138	Avg	45.04	54.00	-8.96	2462 MHz, 1Mbps, Ch0
2483.5	V	1	269	Pk	57.75	74.00	-16.25	2462 MHz, 1Mbps, Ch0
2483.5	V	1	269	Avg	44.60	54.00	-9.40	2462 MHz, 1Mbps, Ch0
2390	H	247	136	Pk	57.84	74.00	-16.16	2412 MHz, 1Mbps, Ch0+Ch1
2390	H	247	136	Avg	47.19	54.00	-6.81	2412 MHz, 1Mbps, Ch0+Ch1
2390	V	288	173	Pk	58.18	74.00	-15.82	2412 MHz, 1Mbps, Ch0+Ch1
2390	V	288	173	Avg	47.88	54.00	-6.12	2412 MHz, 1Mbps, Ch0+Ch1
2390	H	262	174	Pk	58.86	74.00	-15.14	2437 MHz, 1Mbps, Ch0+Ch1
2390	H	262	174	Avg	47.30	54.00	-6.70	2437 MHz, 1Mbps, Ch0+Ch1
2390	V	266	164	Pk	58.27	74.00	-15.73	2437 MHz, 1Mbps, Ch0+Ch1
2390	V	266	164	Avg	47.23	54.00	-6.77	2437 MHz, 1Mbps, Ch0+Ch1
2483.5	H	244	210	Pk	59.85	74.00	-14.15	2462 MHz, 1Mbps, Ch0+Ch1
2483.5	H	244	210	Avg	51.27	54.00	-2.73	2462 MHz, 1Mbps, Ch0+Ch1
2483.5	V	274	207	Pk	59.00	74.00	-15.00	2462 MHz, 1Mbps, Ch0+Ch1
2483.5	V	274	207	Avg	49.25	54.00	-4.75	2462 MHz, 1Mbps, Ch0+Ch1
Transmitted Data in 802.11g Mode								
2390	H	303	273	Pk	67.81	74.00	-6.19	2412 MHz, 6Mbps, Ch0
2390	H	303	273	Avg	51.93	54.00	-2.07	2412 MHz, 6Mbps, Ch0
2390	V	190	269	Pk	59.97	74.00	-14.03	2412 MHz, 6Mbps, Ch0
2390	V	190	269	Avg	47.64	54.00	-6.36	2412 MHz, 6Mbps, Ch0
2390	H	284	180	Pk	68.39	74.00	-5.61	2437 MHz, 6Mbps, Ch0
2390	H	284	180	Avg	51.08	54.00	-2.92	2437 MHz, 6Mbps, Ch0
2390	V	56	232	Pk	62.81	74.00	-11.19	2437 MHz, 6Mbps, Ch0
2390	V	56	232	Avg	48.11	54.00	-5.89	2437 MHz, 6Mbps, Ch0
2483.5	H	245	171	Pk	68.46	74.00	-5.54	2462 MHz, 6Mbps, Ch0

2483.5	H	245	171	Avg	52.34	54.00	-1.66	2462 MHz, 6Mbps, Ch0
2483.5	V	57	274	Pk	68.88	74.00	-5.12	2462 MHz, 6Mbps, Ch0
2483.5	V	57	274	Avg	53.75	54.00	-0.25	2462 MHz, 6Mbps, Ch0
2390	H	290	181	Pk	71.74	74.00	-2.26	2412 MHz, 6Mbps, Ch0+Ch1
2390	H	290	181	Avg	52.30	54.00	-1.70	2412 MHz, 6Mbps, Ch0+Ch1
2390	V	273	99	Pk	68.65	74.00	-5.35	2412 MHz, 6Mbps, Ch0+Ch1
2390	V	273	99	Avg	52.76	54.00	-1.24	2412 MHz, 6Mbps, Ch0+Ch1
2390	H	244	173	Pk	71.99	74.00	-2.01	2437 MHz, 6Mbps, Ch0+Ch1
2390	H	244	173	Avg	52.94	54.00	-1.06	2437 MHz, 6Mbps, Ch0+Ch1
2390	V	289	133	Pk	70.43	74.00	-3.57	2437 MHz, 6Mbps, Ch0+Ch1
2390	V	289	133	Avg	51.53	54.00	-2.47	2437 MHz, 6Mbps, Ch0+Ch1
2483.5	H	272	103	Pk	64.87	74.00	-9.13	2462 MHz, 6Mbps, Ch0+Ch1
2483.5	H	272	103	Avg	50.55	54.00	-3.45	2462 MHz, 6Mbps, Ch0+Ch1
2483.5	V	284	169	Pk	64.23	74.00	-9.77	2462 MHz, 6Mbps, Ch0+Ch1
2483.5	V	284	169	Avg	49.93	54.00	-4.07	2462 MHz, 6Mbps, Ch0+Ch1
Transmitted Data in 802.11n HT20 Mode								
2390	H	267	172	Pk	71.69	74.00	-2.31	2412 MHz, 6.5Mbps, Ch0
2390	H	267	172	Avg	52.88	54.00	-1.12	2412 MHz, 6.5Mbps, Ch0
2390	V	202	318	Pk	59.69	74.00	-14.31	2412 MHz, 6.5Mbps, Ch0
2390	V	202	318	Avg	49.19	54.00	-4.81	2412 MHz, 6.5Mbps, Ch0
2390	H	256	175	Pk	71.29	74.00	-2.71	2437 MHz, 6.5Mbps, Ch0
2390	H	256	175	Avg	51.58	54.00	-2.42	2437 MHz, 6.5Mbps, Ch0
2390	V	0	338	Pk	66.18	74.00	-7.82	2437 MHz, 6.5Mbps, Ch0
2390	V	0	338	Avg	49.26	54.00	-4.74	2437 MHz, 6.5Mbps, Ch0
2483.5	H	235	101	Pk	72.24	74.00	-1.76	2462 MHz, 6.5Mbps, Ch0
2483.5	H	235	101	Avg	52.96	54.00	-1.04	2462 MHz, 6.5Mbps, Ch0
2483.5	V	173	312	Pk	61.98	74.00	-12.02	2462 MHz, 6.5Mbps, Ch0
2483.5	V	173	312	Avg	49.62	54.00	-4.38	2462 MHz, 6.5Mbps, Ch0
2390	H	259	327	Pk	64.44	74.00	-9.56	2412 MHz, 13Mbps, Ch0+Ch1
2390	H	264	106	Avg	50.80	54.00	-3.20	2412 MHz, 13Mbps, Ch0+Ch1
2390	V	267	99	Pk	67.68	74.00	-6.32	2412 MHz, 13Mbps, Ch0+Ch1
2390	V	267	99	Avg	52.58	54.00	-1.42	2412 MHz, 13Mbps, Ch0+Ch1
2390	H	272	323	Pk	65.15	74.00	-8.85	2437 MHz, 13Mbps, Ch0+Ch1
2390	H	272	323	Avg	50.43	54.00	-3.57	2437 MHz, 13Mbps, Ch0+Ch1
2390	V	265	163	Pk	68.84	74.00	-5.16	2437 MHz, 13Mbps, Ch0+Ch1
2390	V	265	163	Avg	51.35	54.00	-2.65	2437 MHz, 13Mbps, Ch0+Ch1
2483.5	H	283	312	Pk	66.65	74.00	-7.35	2462 MHz, 13Mbps, Ch0+Ch1
2483.5	H	283	312	Avg	51.94	54.00	-2.06	2462 MHz, 13Mbps, Ch0+Ch1
2483.5	V	303	253	Pk	65.09	74.00	-8.91	2462 MHz, 13Mbps, Ch0+Ch1
2483.5	V	303	253	Avg	51.96	54.00	-2.04	2462 MHz, 13Mbps, Ch0+Ch1
Transmitted Data in 802.11n HT40 Mode								
2390	H	277	327	Pk	69.11	74.00	-4.89	2422 MHz, 13.5Mbps, Ch0
2390	H	277	327	Avg	52.87	54.00	-1.13	2422 MHz, 13.5Mbps, Ch0
2390	V	345	338	Pk	60.33	74.00	-13.67	2422 MHz, 13.5Mbps, Ch0
2390	V	345	338	Avg	50.05	54.00	-3.95	2422 MHz, 13.5Mbps, Ch0
2483.5	H	278	140	Pk	69.80	74.00	-4.20	2437 MHz, 13.5Mbps, Ch0
2390	H	278	140	Avg	52.68	54.00	-1.32	2437 MHz, 13.5Mbps, Ch0
2483.5	V	1	338	Pk	67.01	74.00	-6.99	2437 MHz, 13.5Mbps, Ch0
2483.5	V	1	338	Avg	52.90	54.00	-1.10	2437 MHz, 13.5Mbps, Ch0
2483.5	H	273	104	Pk	64.08	74.00	-9.92	2452 MHz, 13.5Mbps, Ch0

2483.5	H	273	104	Avg	51.98	54.00	-2.02	2452 MHz, 13.5Mbps, Ch0
2483.5	V	67	329	Pk	61.06	74.00	-12.94	2452 MHz, 13.5Mbps, Ch0
2483.5	V	67	329	Avg	50.72	54.00	-3.28	2452 MHz, 13.5Mbps, Ch0
2390	H	276	264	Pk	63.15	74.00	-10.85	2422 MHz, 27Mbps, Ch0+Ch1
2390	H	276	264	Avg	51.53	54.00	-2.47	2422 MHz, 27Mbps, Ch0+Ch1
2390	V	344	332	Pk	68.61	74.00	-5.39	2422 MHz, 27Mbps, Ch0+Ch1
2390	V	344	332	Avg	52.58	54.00	-1.42	2422 MHz, 27Mbps, Ch0+Ch1
2390	H	240	143	Pk	64.19	74.00	-9.81	2437 MHz, 27Mbps, Ch0+Ch1
2390	H	240	143	Avg	51.75	54.00	-2.25	2437 MHz, 27Mbps, Ch0+Ch1
2483.5	V	266	258	Pk	64.99	74.00	-9.01	2437 MHz, 27Mbps, Ch0+Ch1
2483.5	V	266	258	Avg	52.13	54.00	-1.87	2437 MHz, 27Mbps, Ch0+Ch1
2483.5	H	248	100	Pk	65.24	74.00	-8.76	2452 MHz, 27Mbps, Ch0+Ch1
2483.5	H	248	100	Avg	52.12	54.00	-1.88	2452 MHz, 27Mbps, Ch0+Ch1
2483.5	V	283	129	Pk	64.48	74.00	-9.52	2452 MHz, 27Mbps, Ch0+Ch1
2483.5	V	283	129	Avg	51.87	54.00	-2.13	2452 MHz, 27Mbps, Ch0+Ch1
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty								
Total CF= Amp Gain + Cable Loss + ANT Factor								
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence								
Notes: Worst case was observed on Y-axis. High-lighted measurements are showed on the below plots. Additional plots are available on file.								



Date: 27.FEB.2012 15:43:16

Figure 47: Radiated Emission at the Edge for 2412 MHz, 1Mbps, Ch0 – Horizontal (Ave)

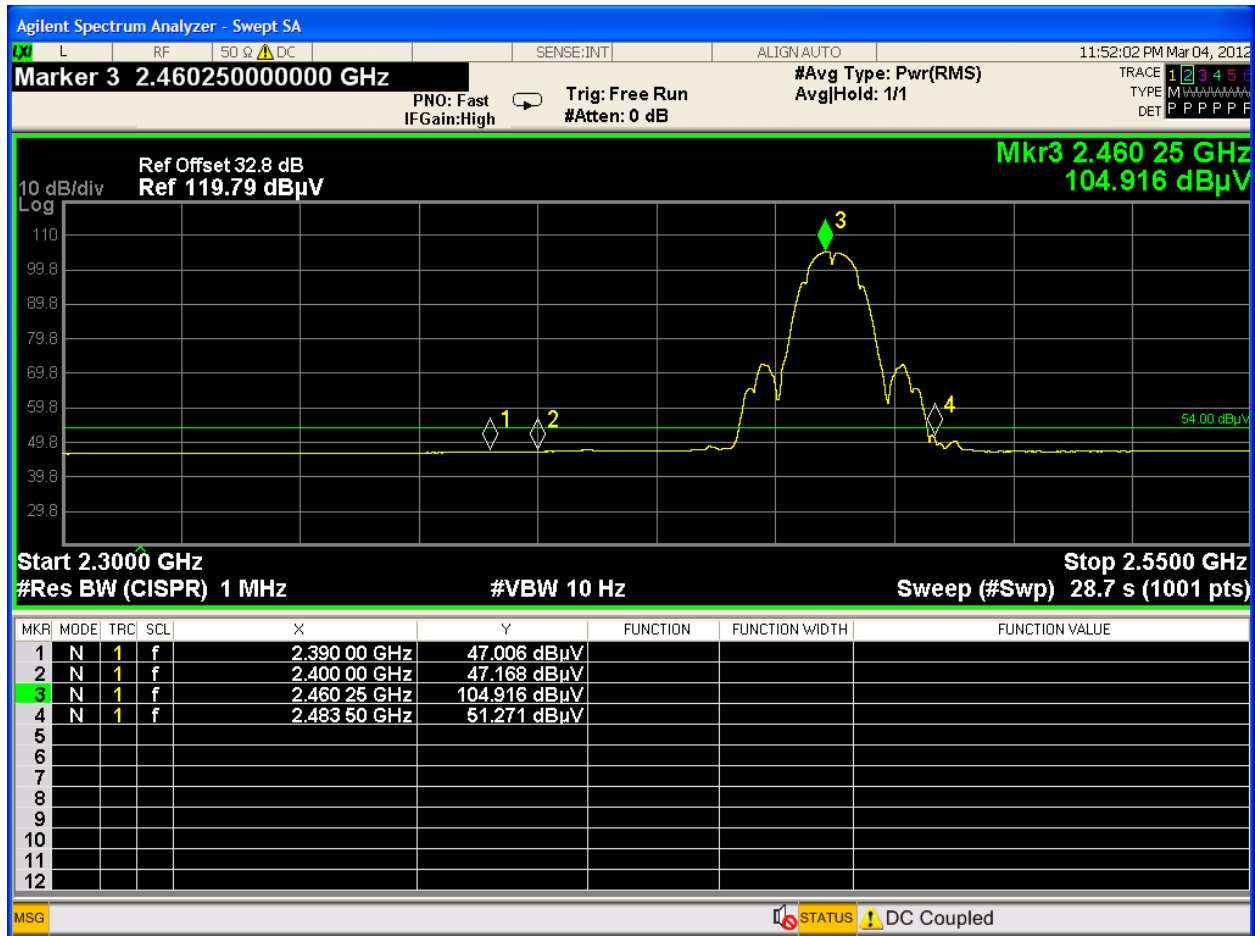


Figure 48: Radiated Emission at the Edge 2462 MHz, 1Mbps, Ch0+Ch1 – Horizontal (Ave)

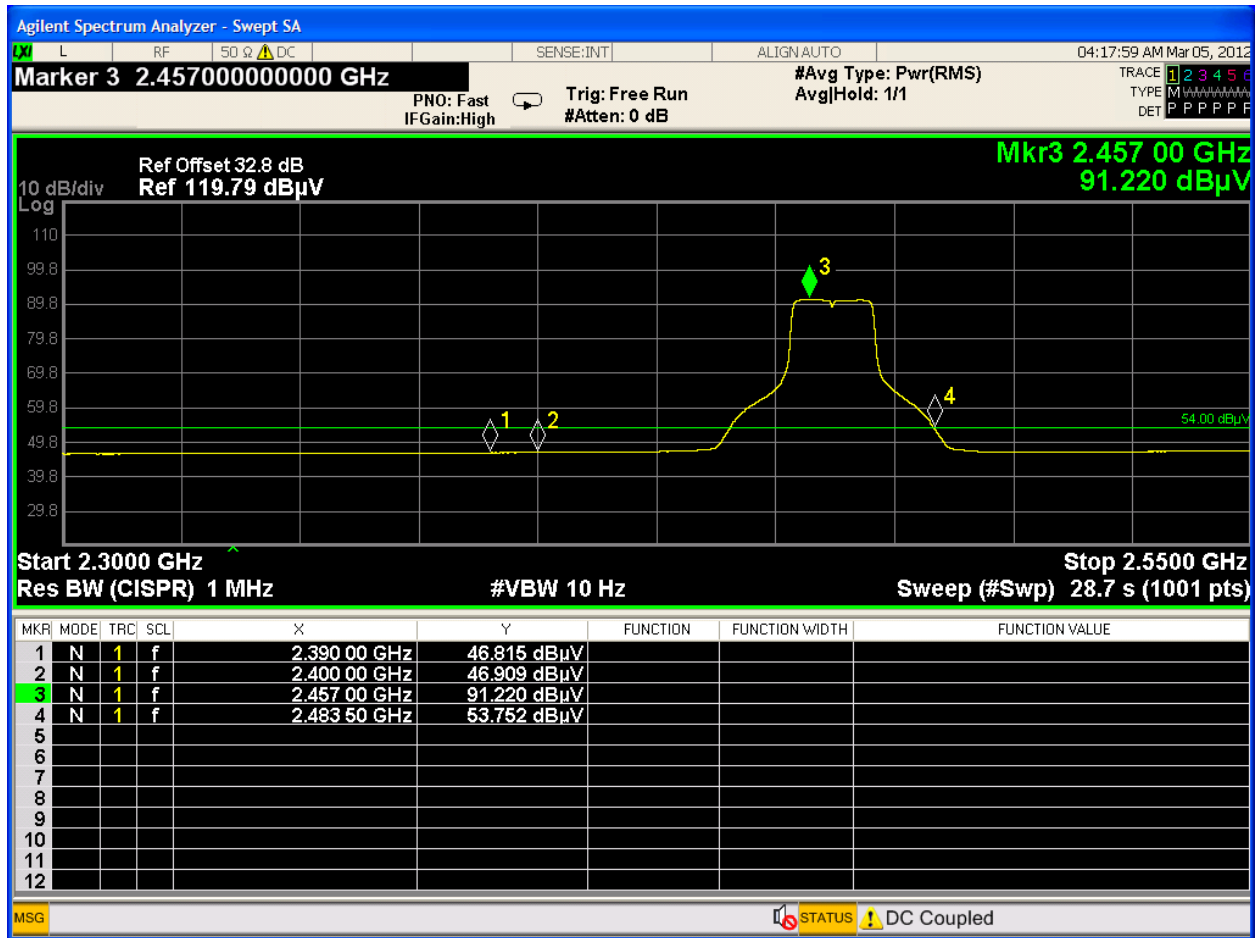


Figure 49: Radiated Emission at the Edge for 2462 MHz, 6Mbps, Ch0 – Vertical (Ave)

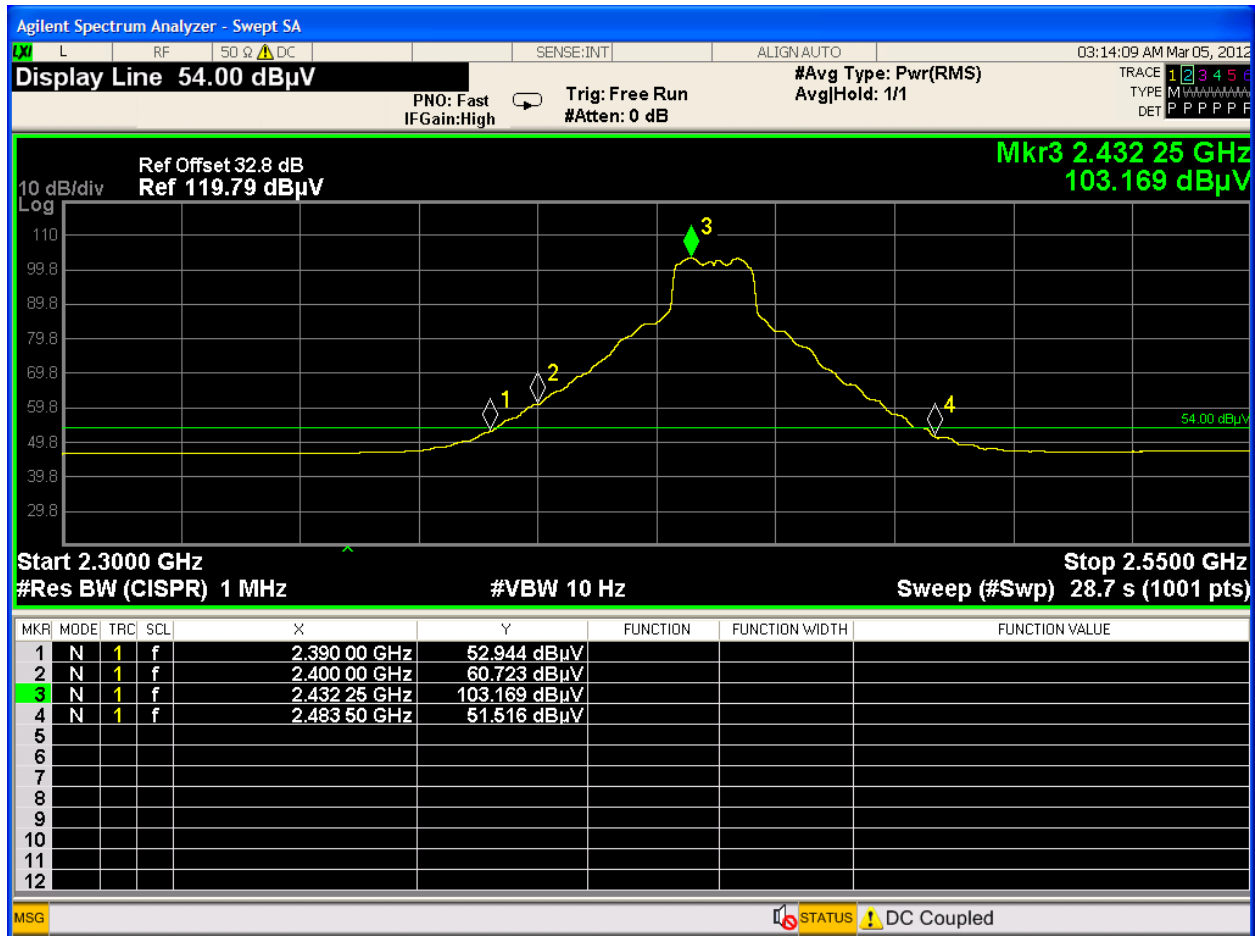


Figure 50: Radiated Emission at the Edge for 2437 MHz, 6Mbps, Ch0+Ch1 – Vertical (Ave)

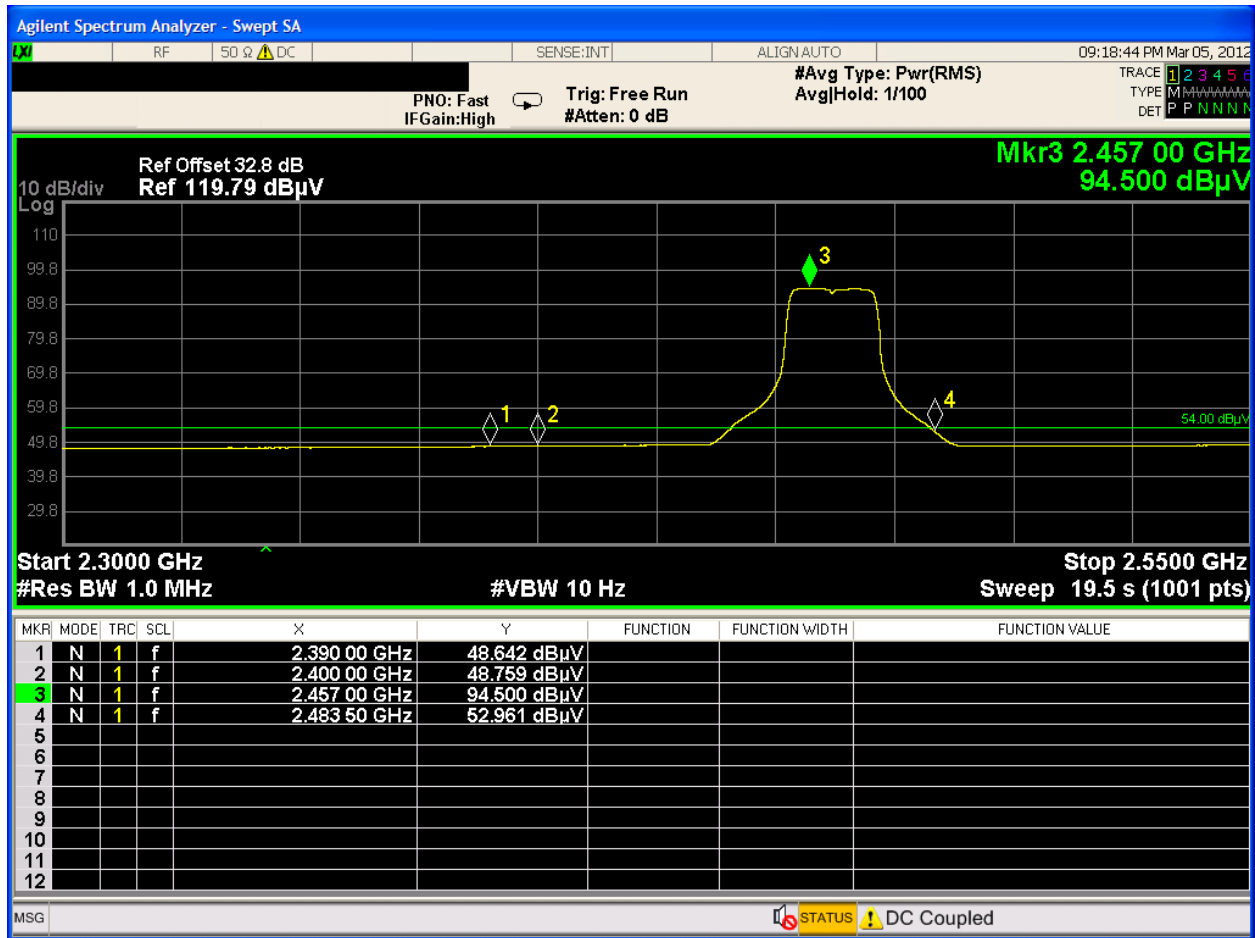


Figure 51: Radiated Emission at the Edge for 2462 MHz, 6.5Mbps, Ch0 –Horizontal (Ave)

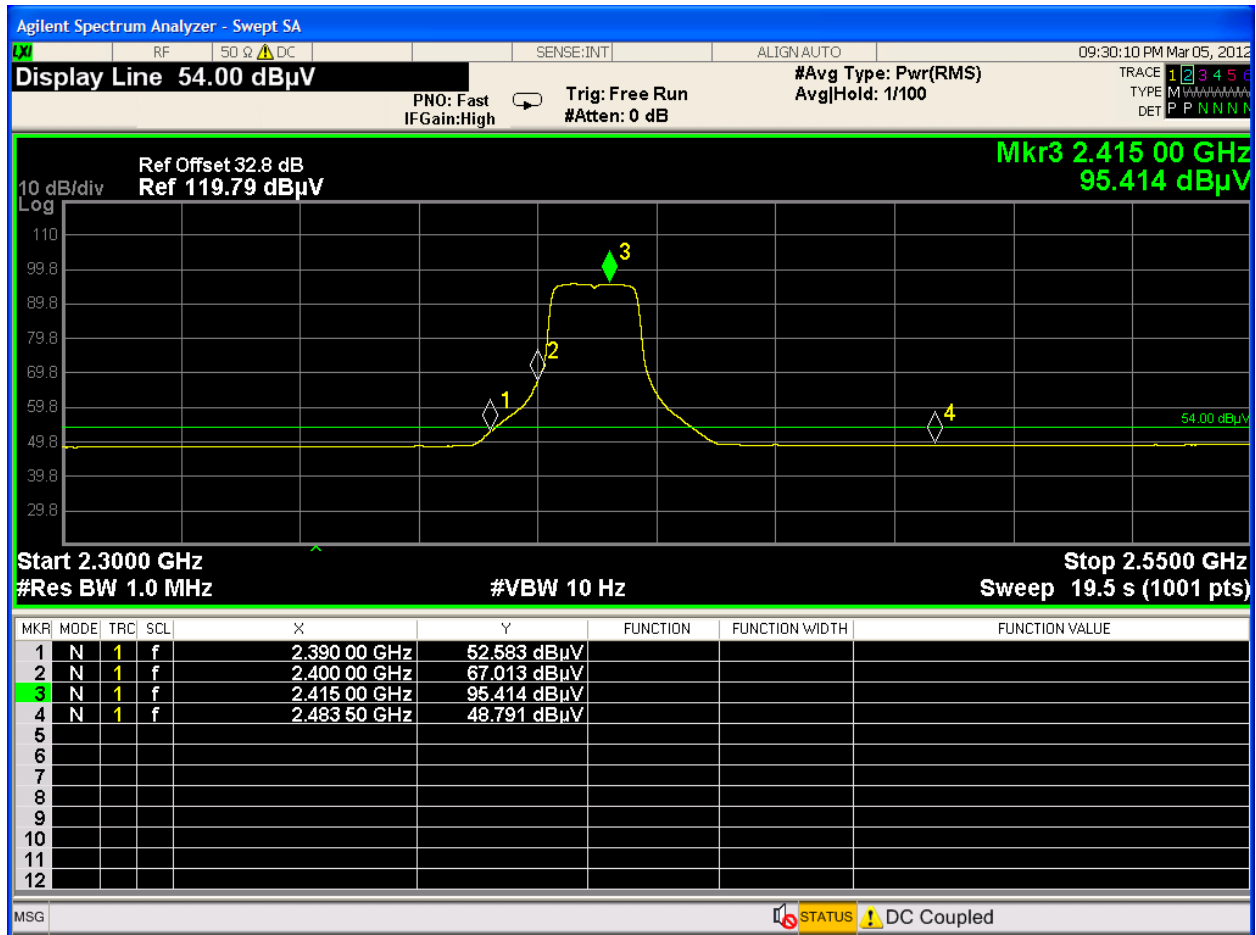


Figure 52: Radiated Emission at the Edge for 2412 MHz, 13Mbps, Ch0+Ch1 –Vertical (Ave)

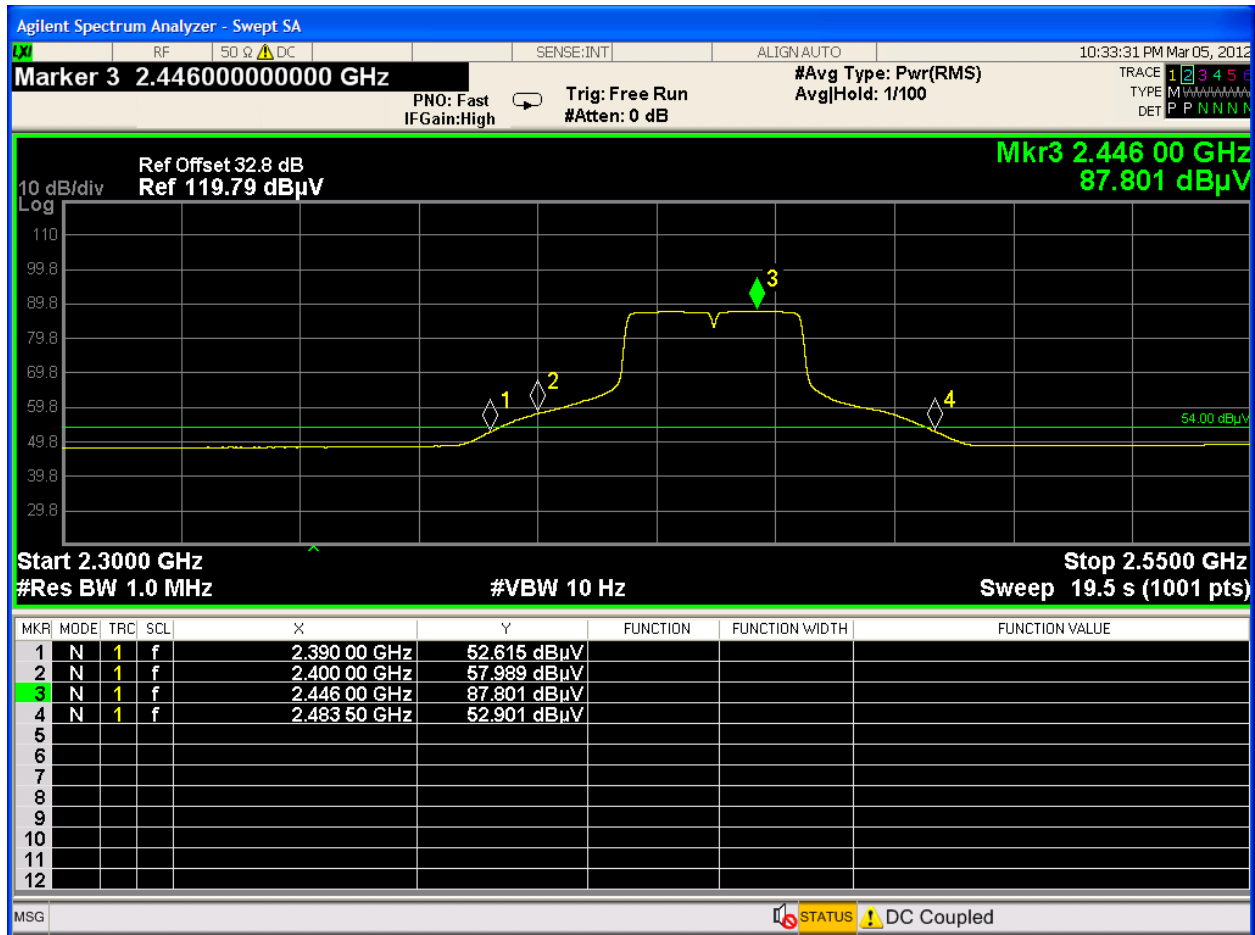


Figure 53: Radiated Emission at the Edge for 2437 MHz, 13.5Mbps, Ch0 – Vertical (Ave)

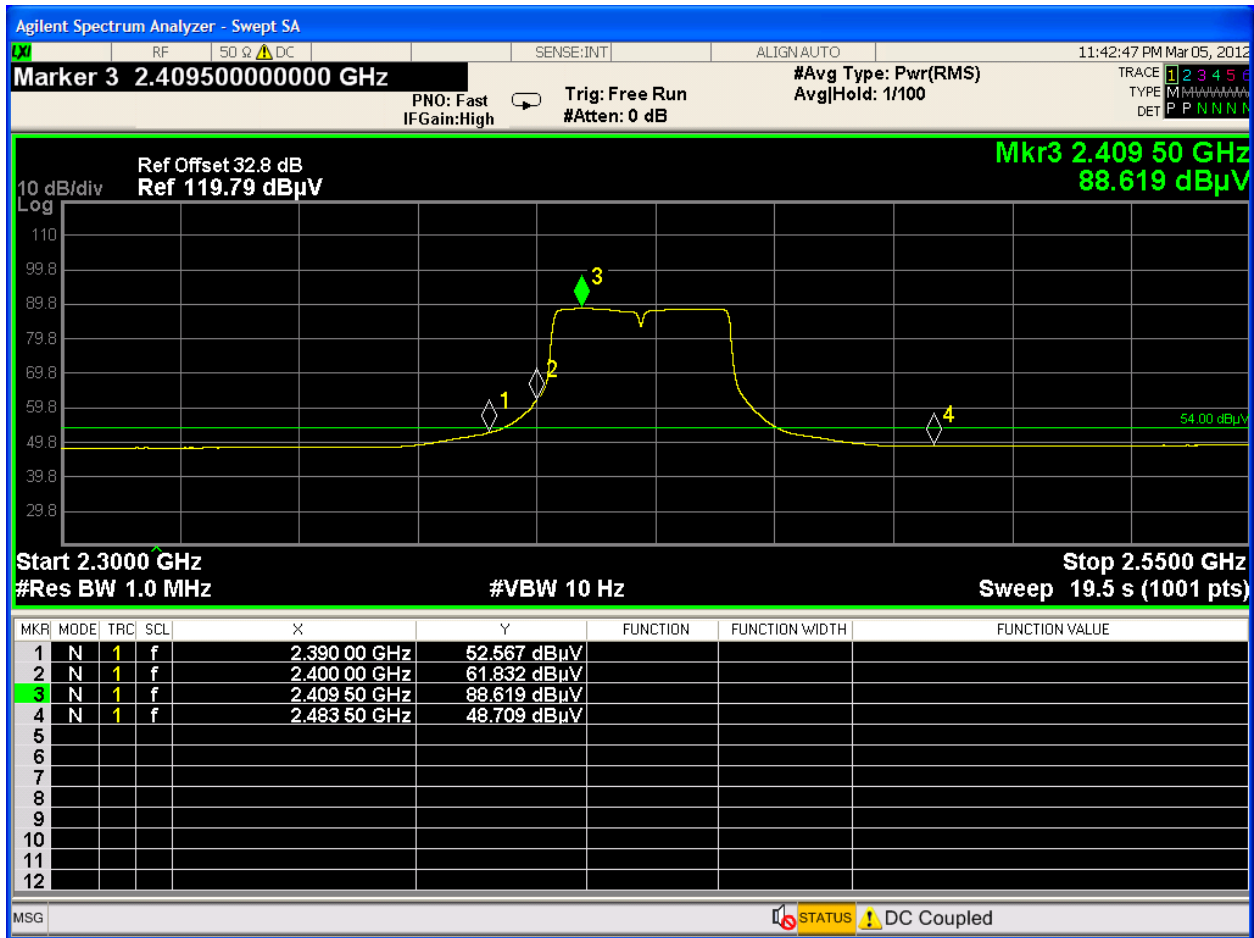


Figure 54: Radiated Emission at the Edge for 2422 MHz, 27Mbps, Ch0+Ch1 –Vertical (Ave)

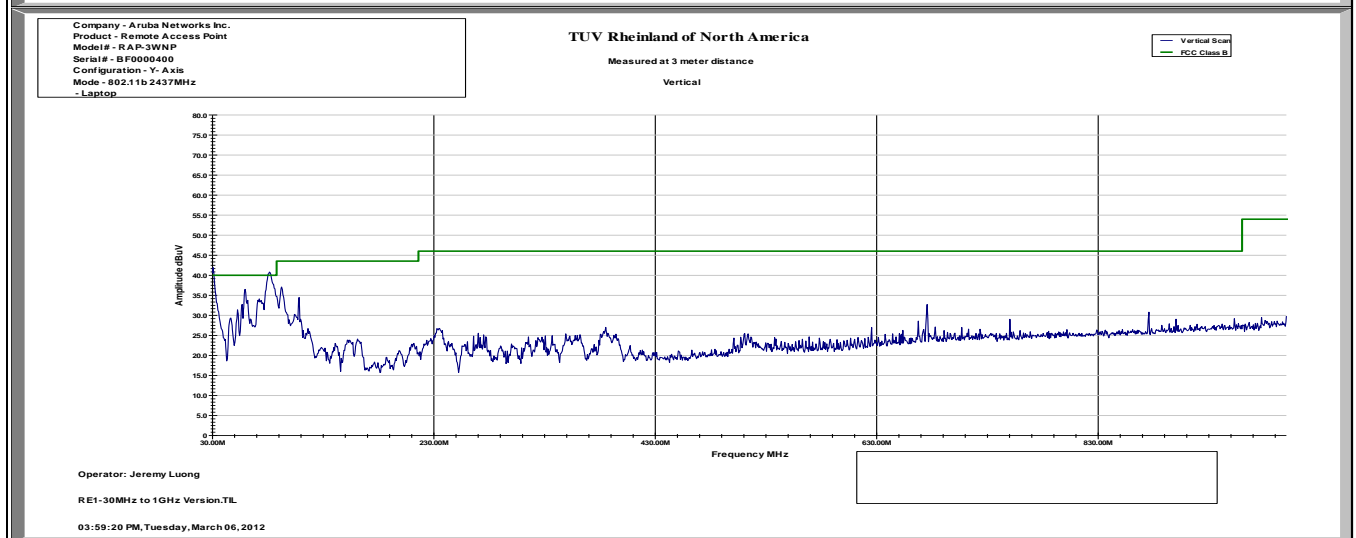
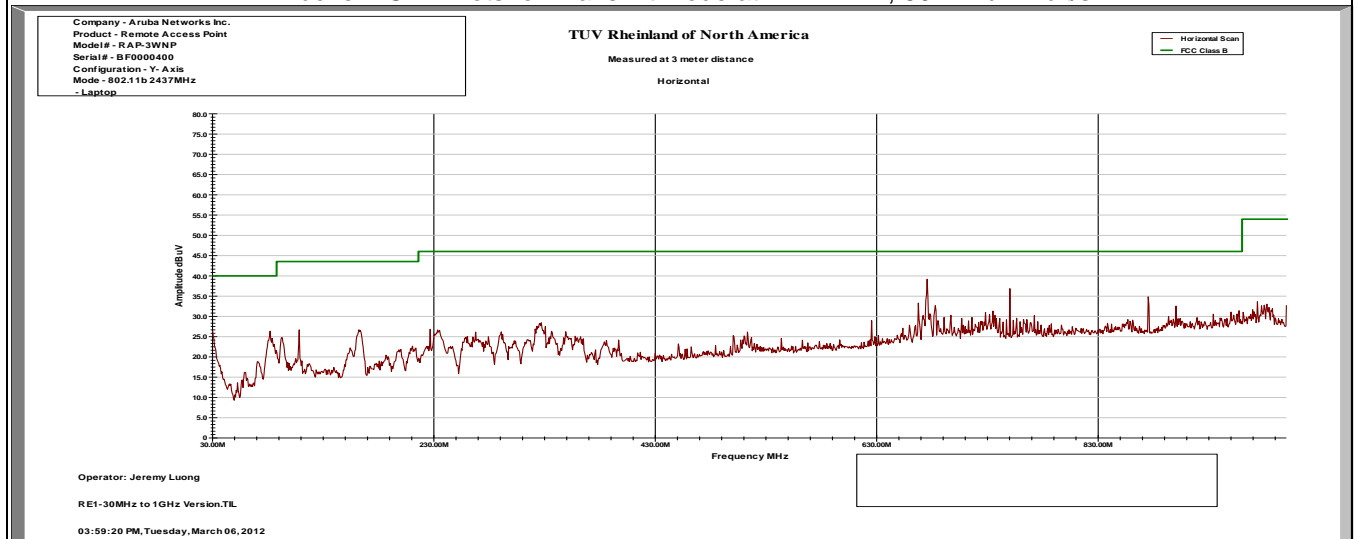
SOP 1 Radiated Emissions						Tracking # 31250477.001 Page 1 of 34					
EUT Name	Wireless Remote Access Point					Date	March 6th, 2012				
EUT Model	RAP-3WN and RAP-3WNP					Temp / Hum in	22°C / 35%rh				
EUT Serial	BF0000400					Temp / Hum out	N/A				
EUT Config.	Y-Axis, 802.11b at 1Mbps					Line AC / Freq	120 Vac/60 Hz				
Standard	CFR47 Part 15 Subpart C					RBW / VBW	1 MHz/ 3 MHz				
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C					Performed by	Jeremy Luong				
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM QP (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type	
Transmitted Data at 2437 MHz											
30.55	V	106	211	45.60	43.79	-4.63	39.16	40.00	-0.84	Spurious	
58.73	V	112	42	51.60	50.12	-16.15	33.97	40.00	-6.03	Spurious	
79.97	V	141	214	55.95	55.21	-16.68	38.53	40.00	-1.47	Spurious	
91.55	V	131	221	51.78	49.51	-15.35	34.16	43.52	-9.36	Spurious	
91.50	H	322	76	40.91	38.20	-16.01	22.19	43.52	-21.33	Spurious	
674.98	H	120	161	41.98	41.79	-2.09	39.70	46.02	-6.32	Spurious	
750.00	H	107	108	37.65	36.65	-0.63	36.02	46.02	-10.00	Spurious	
875.04	H	103	261	35.04	32.95	0.74	33.69	46.02	-12.33	Spurious	
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty											
Total CF= Amp Gain + Cable Loss + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence											
Notes: Worst case was observed on Y-axis, 1Mbps. Both Ch0 and Ch1 were active.											

SOP 1 Radiated Emissions

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EUT Name	Wireless Remote Access Point	Date	March 6th, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	22°C / 35%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 802.11b, 1Mbps on Ch0 and Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz, 802.11b 1Mbit/s



Notes: None.

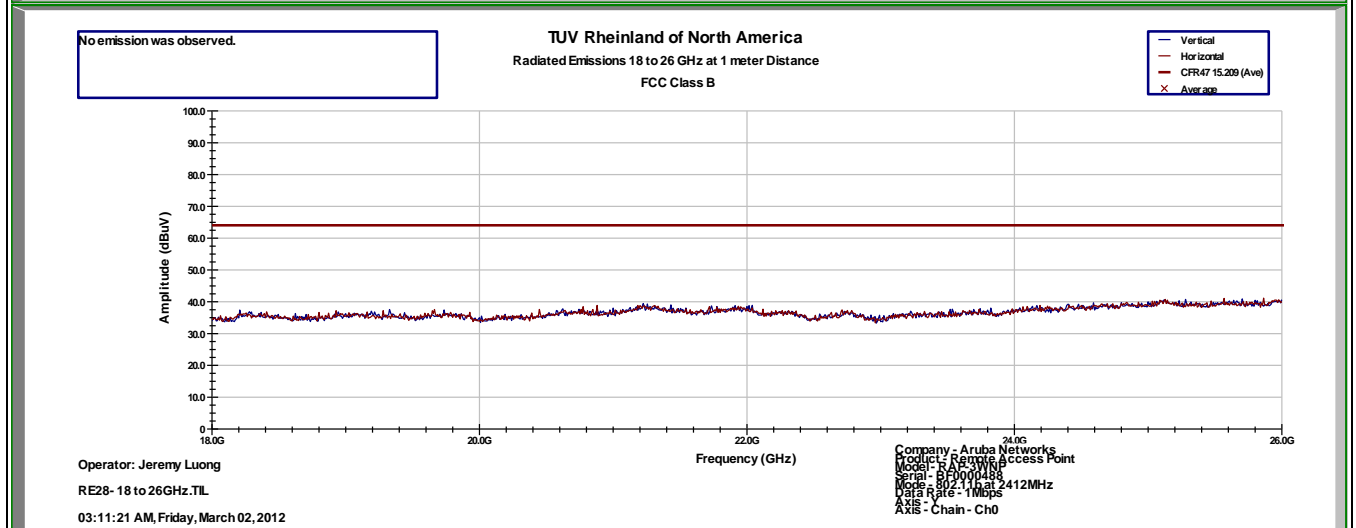
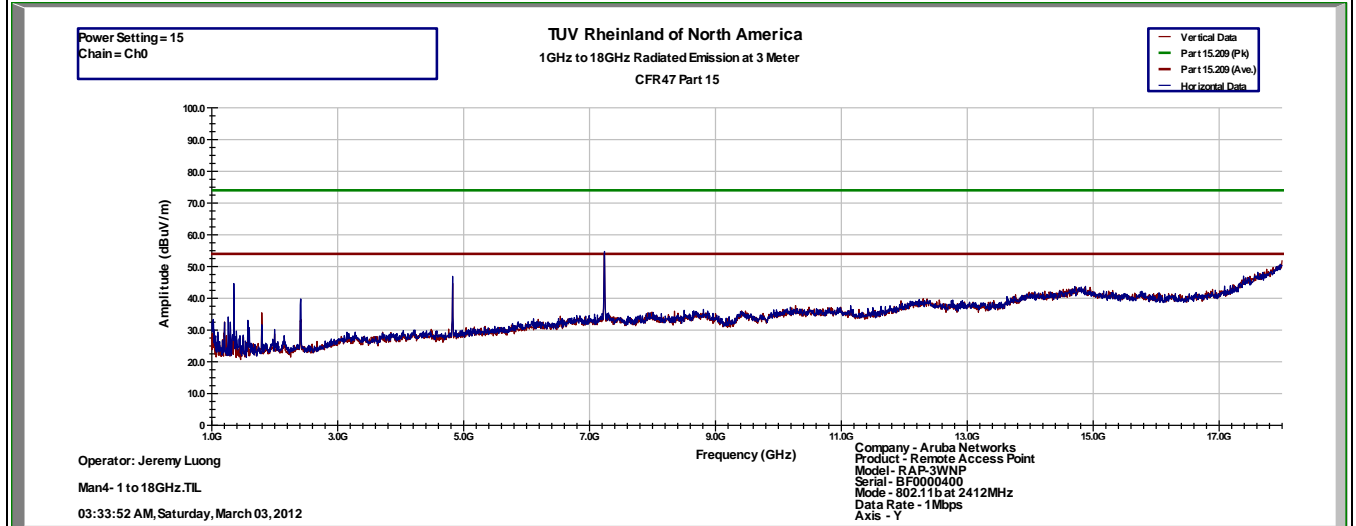
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 3 of 34				
EUT Name	Wireless Remote Access Point						Date	March 3 rd , 2012			
EUT Model	RAP-3WN and RAP-3WNP						Temp / Hum in	23°C / 32%rh			
EUT Serial	BF0000400						Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11b at 1Mbps						Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C						RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C						Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type	
Transmitted Data at 2412 MHz at 15.5 dBm											
4824	H	166	111	48.24	47.41	2.42	49.83	53.98	-4.15	Harmonic	
4824	V	311	137	45.92	44.45	2.42	46.87	53.98	-7.11	Harmonic	
7235.17	V	179	76	40.85	39.94	8.02	47.96	53.98	-6.02	Harmonic	
7236.85	H	176	224	46.93	43.93	8.02	51.95	53.98	-2.03	Harmonic	
Transmitted Data at 2437 MHz at 14 dBm											
4873.99	V	310	143	44.12	42.21	2.52	44.73	53.98	-9.25	Harmonic	
4874	H	203	94	42.12	39.87	2.52	42.39	53.98	-11.59	Harmonic	
7310.16	V	148	64	41.86	38.22	8.29	46.51	53.98	-7.47	Harmonic	
7311.88	H	148	222	47.1	44.4	8.29	52.69	53.98	-1.29	Harmonic	
Transmitted Data at 2462 MHz at 15.0 dBm											
4924	V	307	147	42.84	40.78	2.6	43.38	53.98	-10.6	Harmonic	
4924	V	307	147	42.84	40.78	2.6	43.38	53.98	-10.6	Harmonic	
7385.16	V	128	283	46.16	43.73	8.24	51.96	53.98	-2.02	Harmonic	
7386.88	H	157	227	46.1	43.49	8.23	51.72	53.98	-2.26	Harmonic	
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty											
Total CF= Amp Gain + Cable Loss + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence											
Notes: The final measurement was observed on Y-axis, 1Mbps at Ch0; worst case.											

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EUT Name	Wireless Remote Access Point	Date	Feb. 27, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 32%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 15.5dBm, 1Mbps on Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz, 802.11b 1Mbit/s



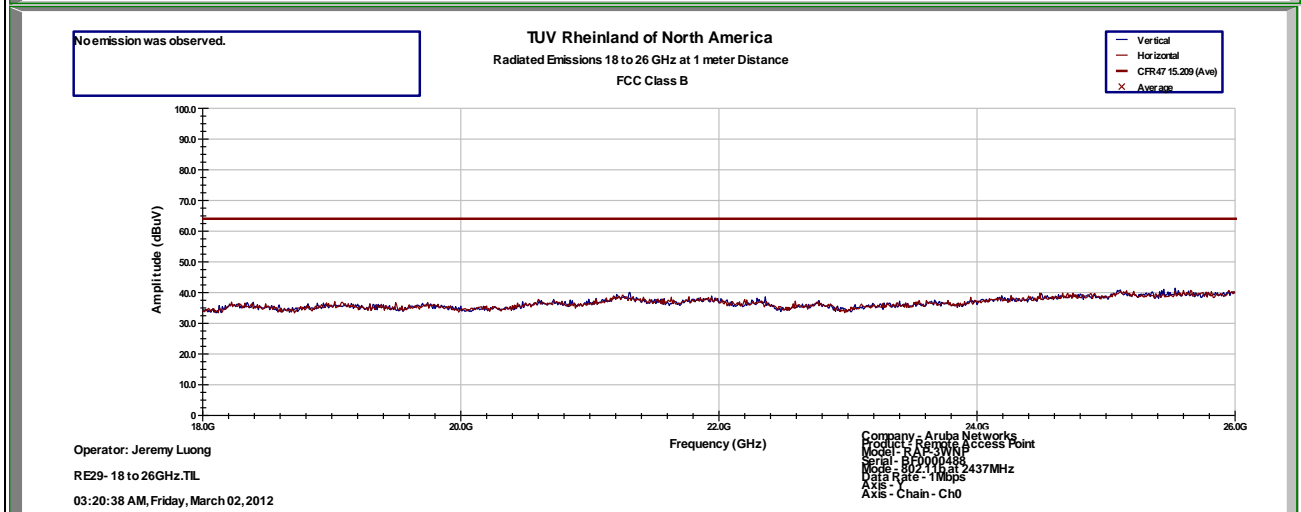
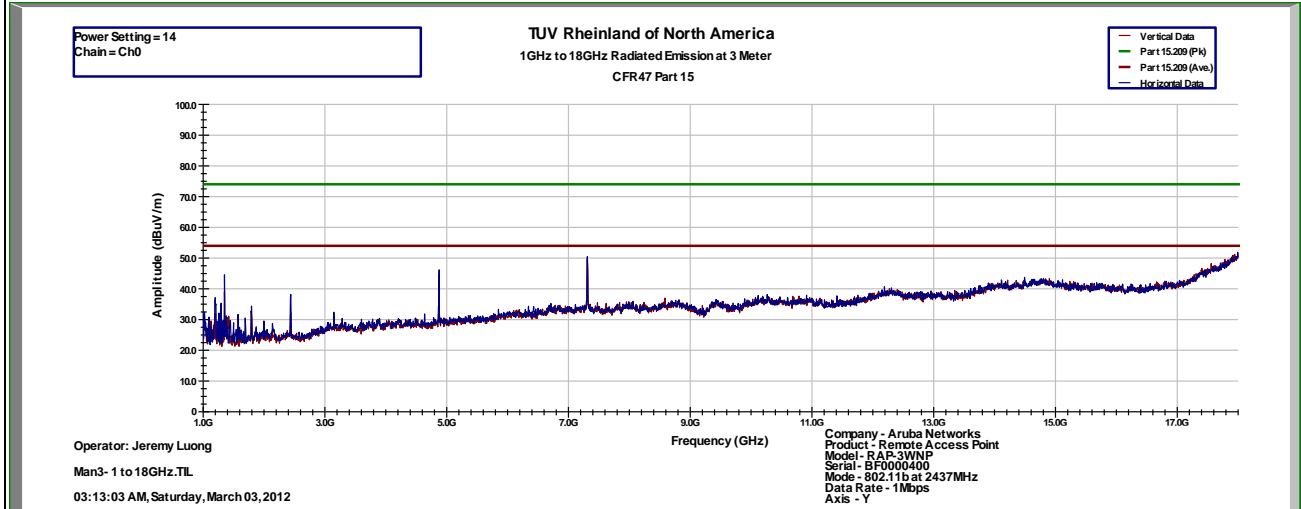
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned to determine the emission. Final measurements are tabulated above.

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EUT Name	Wireless Remote Access Point	Date	Feb. 27, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 32%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 14dBm, 1Mbps on Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz, 802.11b 1Mbit/s



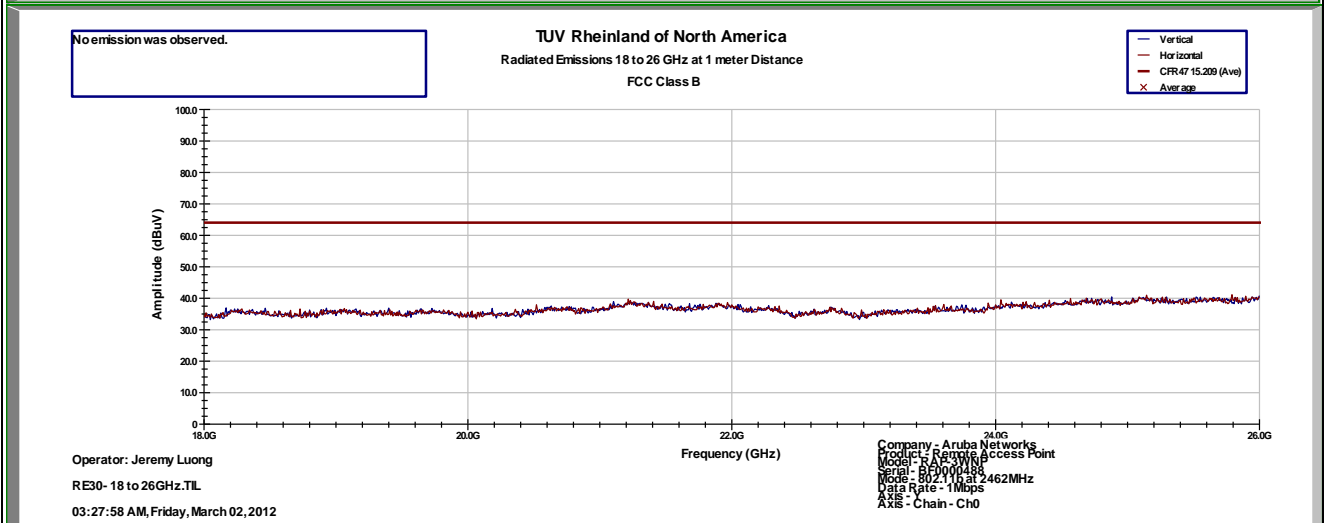
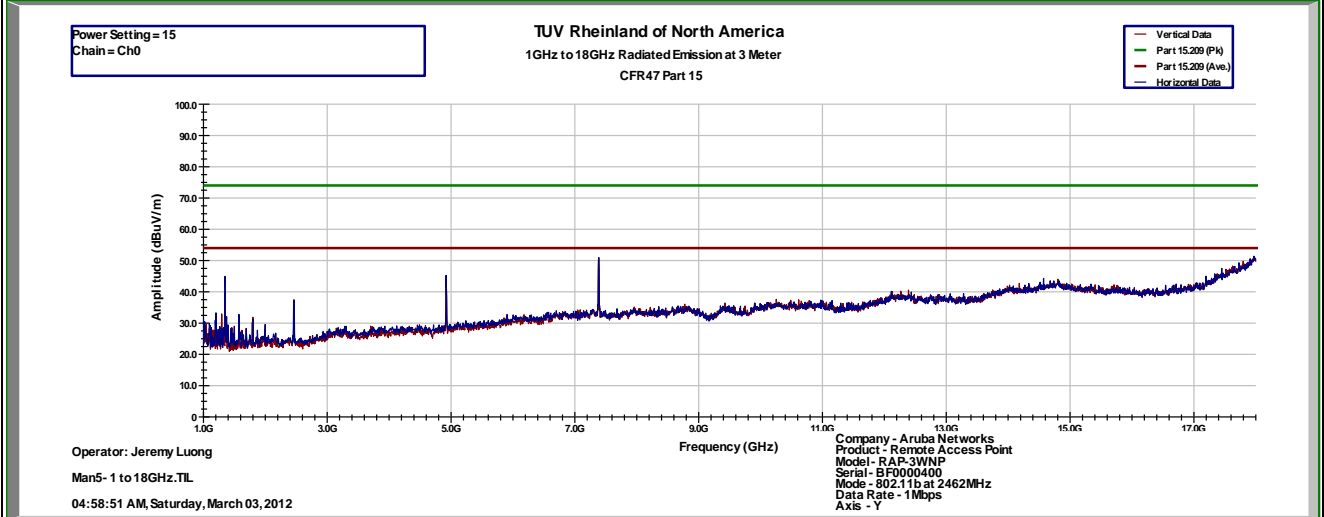
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned to determine the emission. Final measurements are tabulated above.

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EUT Name	Wireless Remote Access Point	Date	Feb. 27, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 32%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 15dBm, 1Mbps on Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz, 802.11b 1Mbit/s



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned to determine the emission. Final measurements are tabulated above.

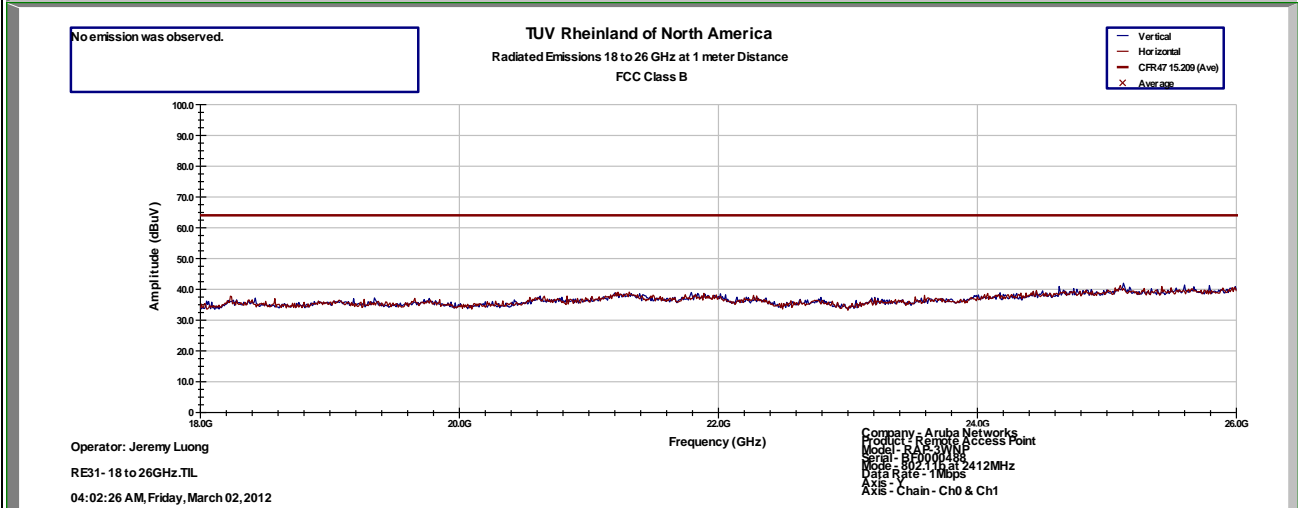
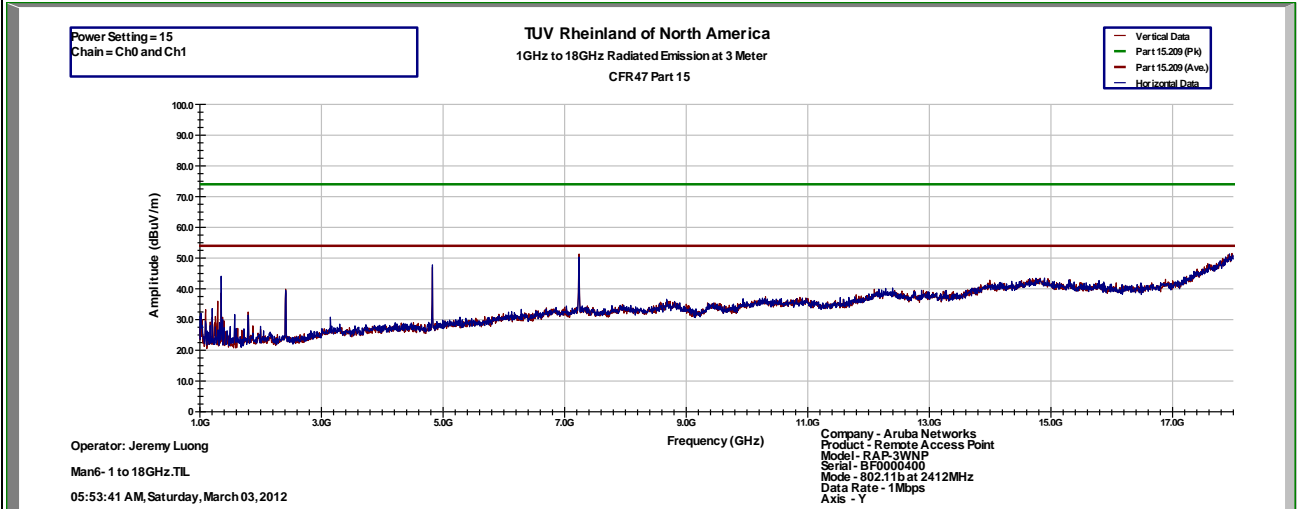
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 7 of 34				
EUT Name	Wireless Remote Access Point						Date	Feb. 27, 2012			
EUT Model	RAP-3WN and RAP-3WNP						Temp / Hum in	23°C / 32%rh			
EUT Serial	BF0000400						Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11b at 1Mbps on Ch0 and Ch1						Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C						RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C						Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type	
Transmitted Data at 2412 MHz at 15 dBm											
4824	H	149	-39	47.5	46.29	2.42	48.71	53.98	-5.27	Harmonic	
4824.03	V	313	147	47.71	46.78	2.42	49.2	53.98	-4.78	Harmonic	
7236.91	V	162	215	45.93	44.17	8.02	52.19	53.98	-1.79	Harmonic	
7236.91	V	162	215	45.43	42.53	8.02	50.55	53.98	-3.43	Harmonic	
Transmitted Data at 2437 MHz at 15.5 dBm											
4874	V	306	137	48.37	46.89	2.52	49.41	53.98	-4.57	Harmonic	
4874.01	H	179	112	46.7	45.35	2.52	47.87	53.98	-6.11	Harmonic	
7310.16	V	300	226	46.52	44.53	8.29	52.82	53.98	-1.16	Harmonic	
7310.16	H	124	221	45.32	43.45	8.29	51.74	53.98	-2.24	Harmonic	
Transmitted Data at 2462 MHz at 15 dBm											
4924.01	V	95	123	46.35	45.17	2.6	47.77	53.98	-6.21	Harmonic	
4924.01	H	98	347	46.02	45.09	2.6	47.69	53.98	-6.29	Harmonic	
7385.13	V	341	247	46.28	43.85	8.24	52.08	53.98	-1.9	Harmonic	
7386.9	H	218	159	41.74	38.17	8.23	46.4	53.98	-7.58	Harmonic	
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty											
Total CF= Amp Gain + Cable Loss + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence											
Notes: Worst case was observed on Y-axis, 1Mbps. EUT was output at Ch0 and Ch1											

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EUT Name	Wireless Remote Access Point	Date	Feb. 27, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 32%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 802.11b 1Mbps on Ch0 and Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz



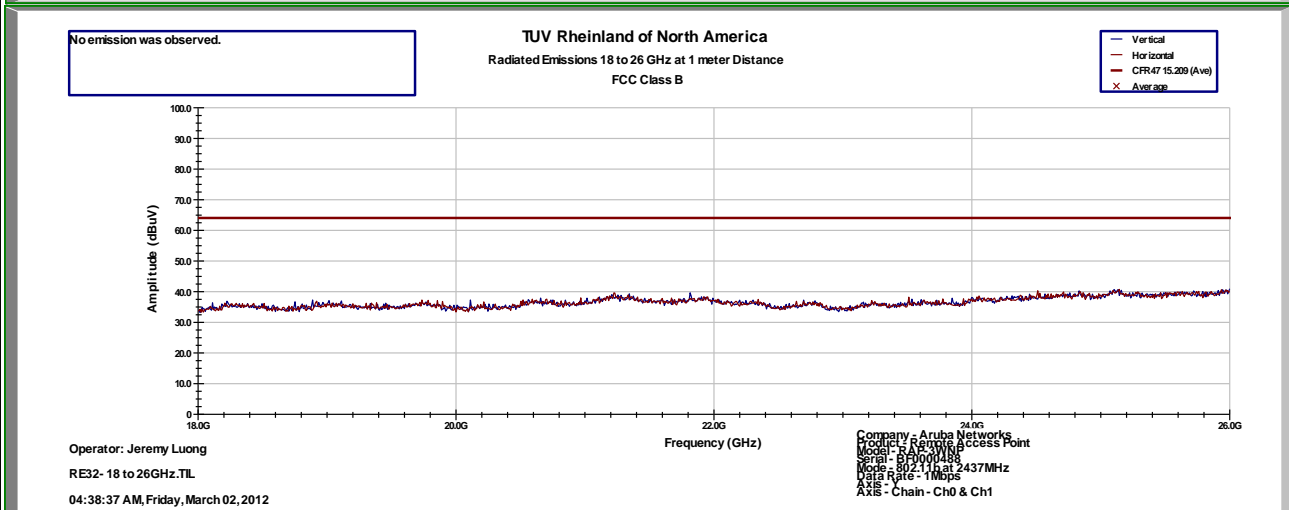
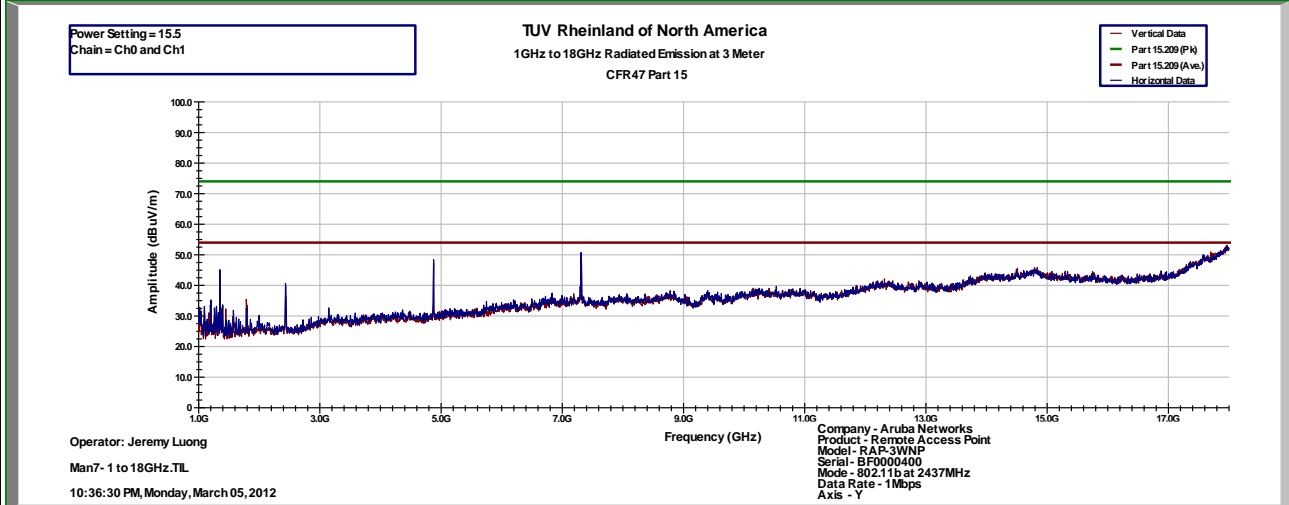
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned to determine the emission. Final measurements are tabulated above.

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EUT Name	Wireless Remote Access Point	Date	Feb. 27, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 32%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 15.5dBm, 802.11b 1Mbps on Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz



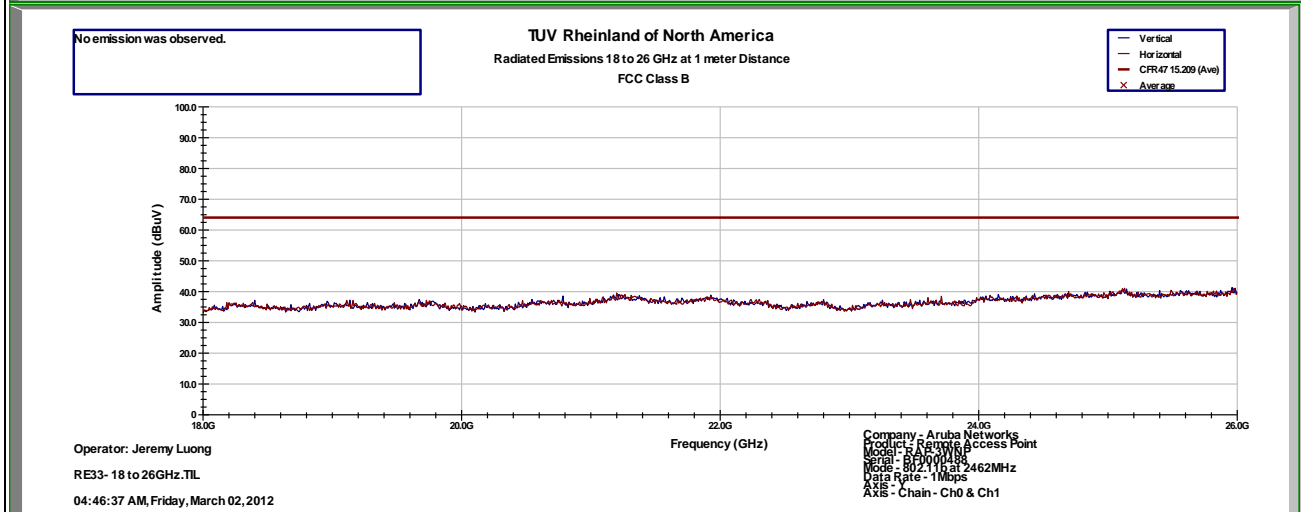
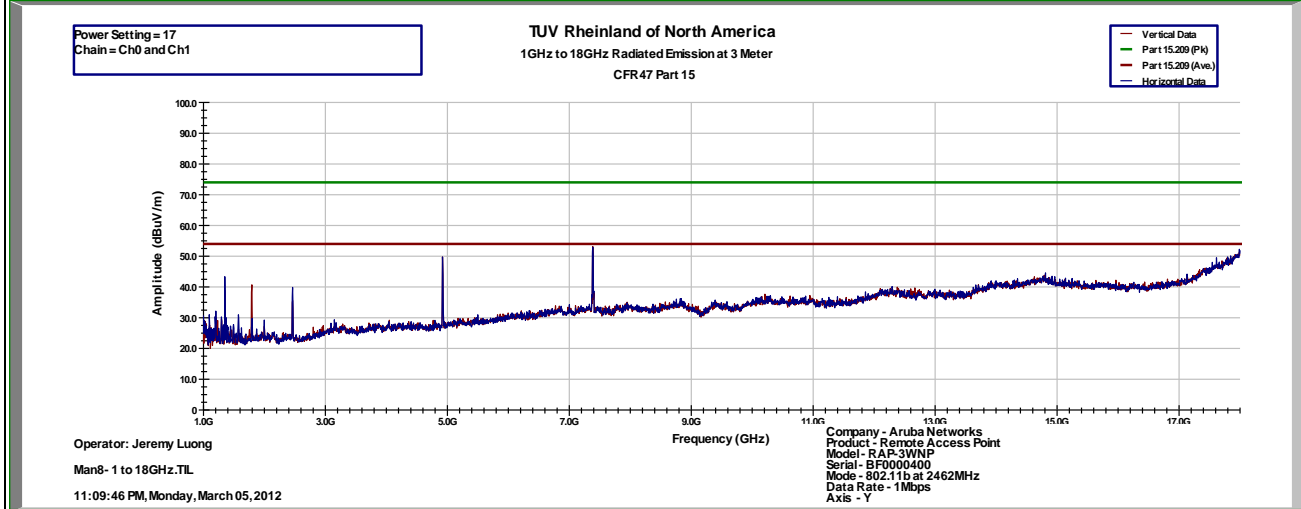
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned to determine the emission. Final measurements are tabulated above.

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EUT Name	Wireless Remote Access Point	Date	Feb. 27, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 32%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 15dBm, 802.11b 1Mbps on Ch0 and Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned to determine the emission. Final measurements are tabulated above.

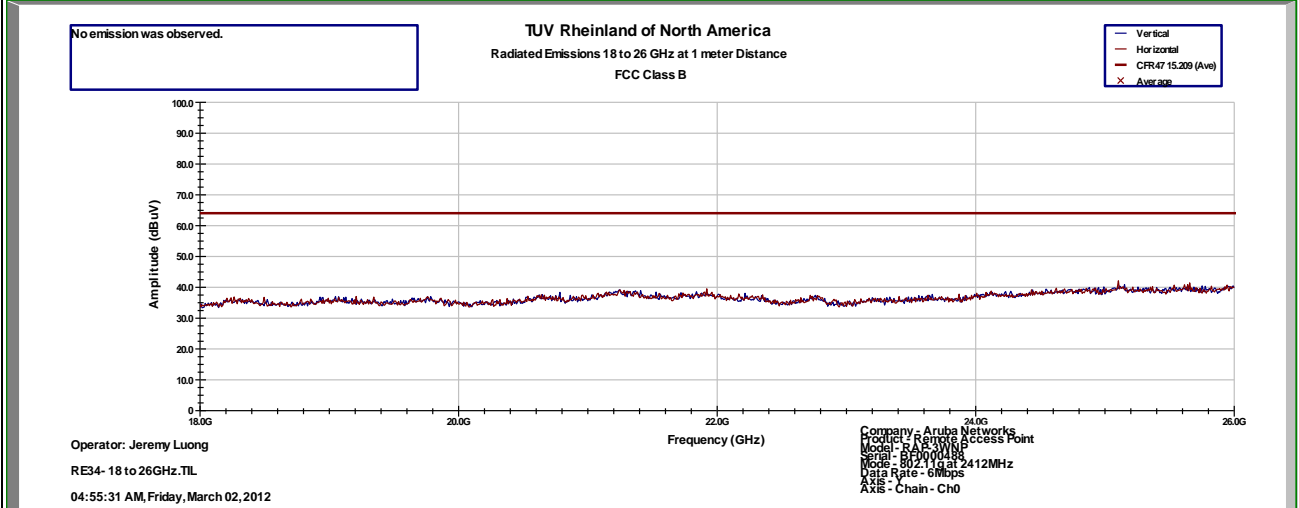
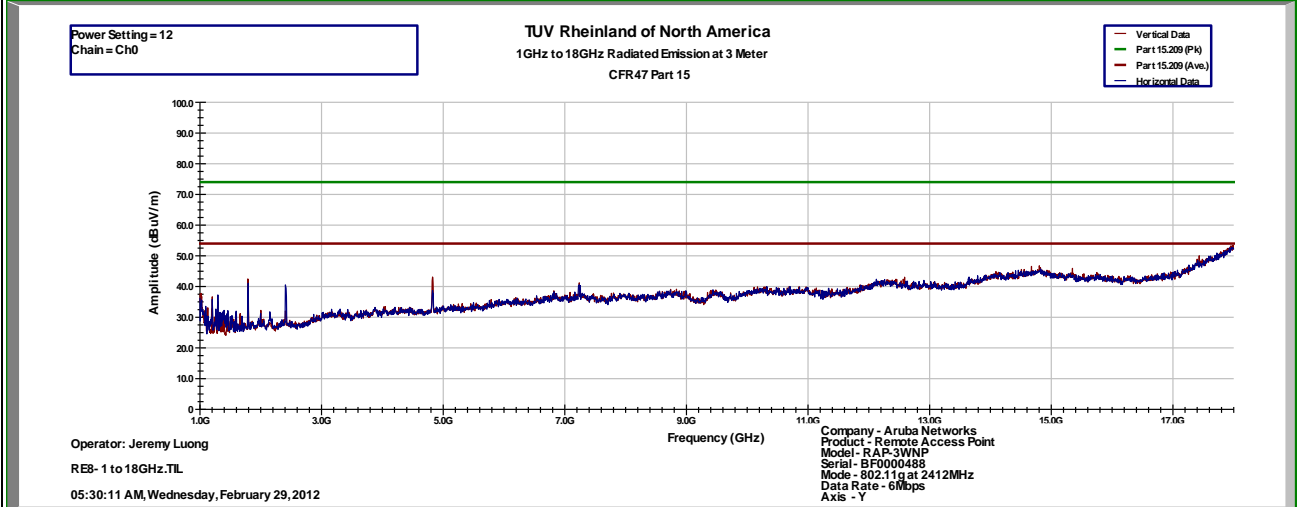
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 11 of 34			
EUT Name	Wireless Remote Access Point					Date	Feb. 29 th 2012			
EUT Model	RAP-3WN and RAP-3WNP					Temp / Hum in	23°C / 31%rh			
EUT Serial	BF0000488					Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11g 6Mbps on Ch0					Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C					RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C					Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type
Transmitted Data at 2412 MHz with 12 dBm										
4824.72	V	209	471	46.98	37.43	2.42	39.85	53.98	-14.13	Harmonic
4825.21	H	282	161	43.76	31.46	2.42	33.88	53.98	-20.1	Harmonic
7235.69	V	132	153	41.36	26.74	8.02	34.76	53.98	-19.22	Harmonic
7236.53	H	281	57	31.94	26.73	8.02	34.75	53.98	-19.23	Harmonic
Transmitted Data at 2437 MHz with 15 dBm										
7311.21	V	120	302	56.33	45.29	8.29	53.58	53.98	-0.4	Harmonic
7312.48	H	189	223	56.28	45.09	8.29	53.38	53.98	-0.6	Harmonic
4874.87	H	164	230	43.53	32.1	2.52	34.62	53.98	-19.36	Harmonic
4870.27	V	161	77	38.39	27.02	2.53	29.54	53.98	-24.44	Harmonic
Transmitted Data at 2462 MHz with 11 dBm										
1794.19	V	227	75	53.42	34.07	-4.96	29.11	53.98	-24.87	Spurious
4922.22	H	221	13	34.46	22.37	2.59	24.96	53.98	-29.02	Harmonic
4924.85	V	123	-56	32.33	21.9	2.6	24.51	53.98	-29.47	Harmonic
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty										
Total CF= Amp Gain + Cable Loss + ANT Factor										
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence										
Notes: Worst case was observed on Y-axis, 6Mbps. RF power transmitted at Ch0 of the radio. The above power levels were reduced for band-edge emission. See the final power setting level Section 6 of this report.										

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EUT Name	Wireless Remote Access Point	Date	Feb. 29th 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 31%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 12dBm, 802.11g 6Mbps on Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz



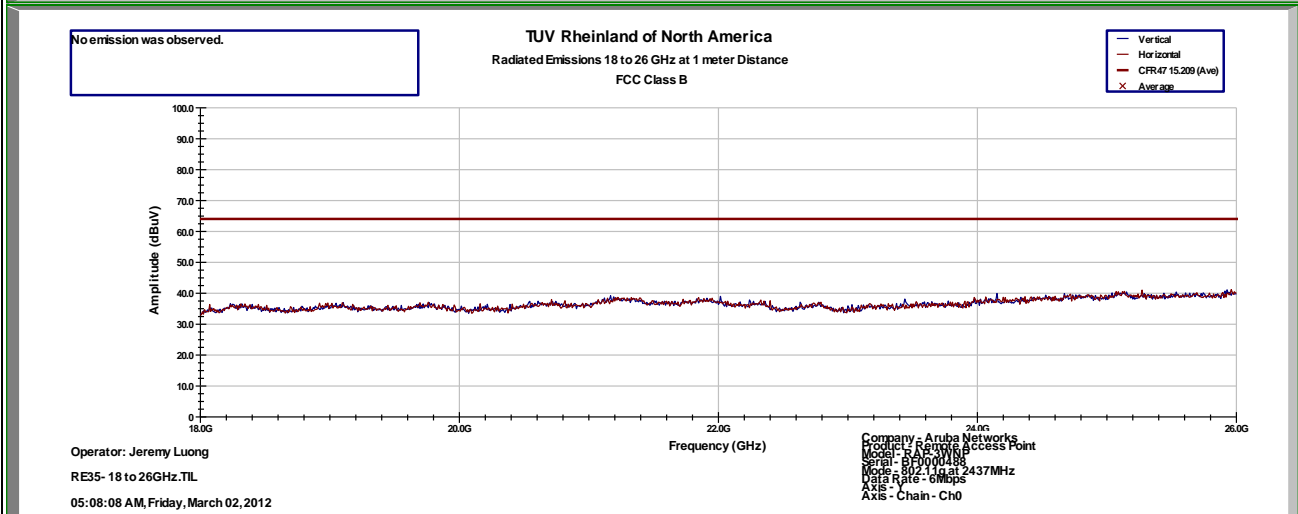
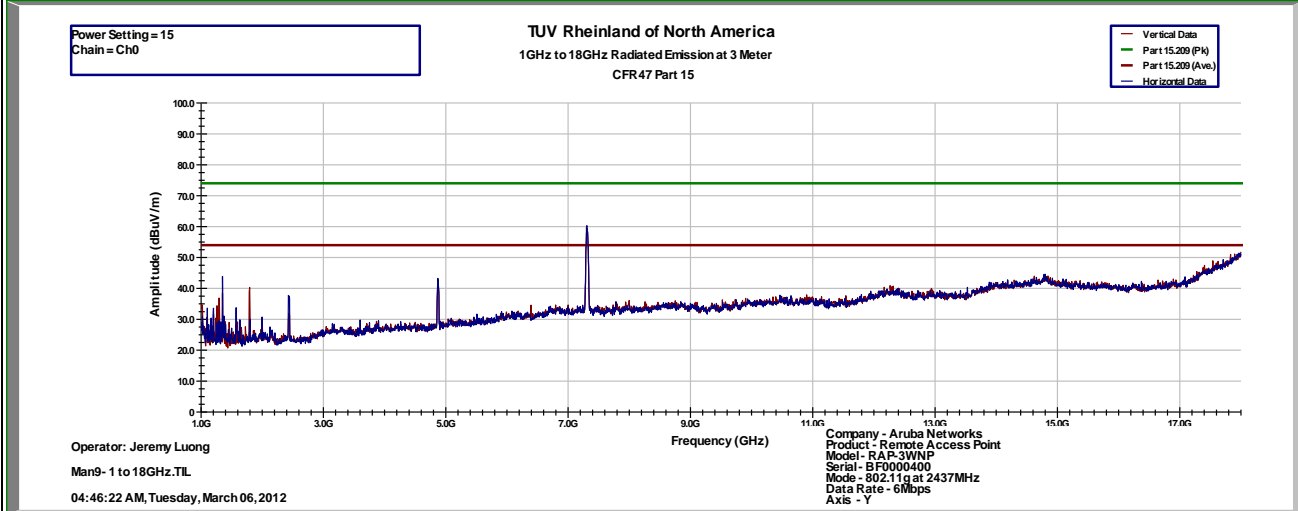
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	Feb. 29th 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 31%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 17dBm, 802.11g 6Mbps on Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz



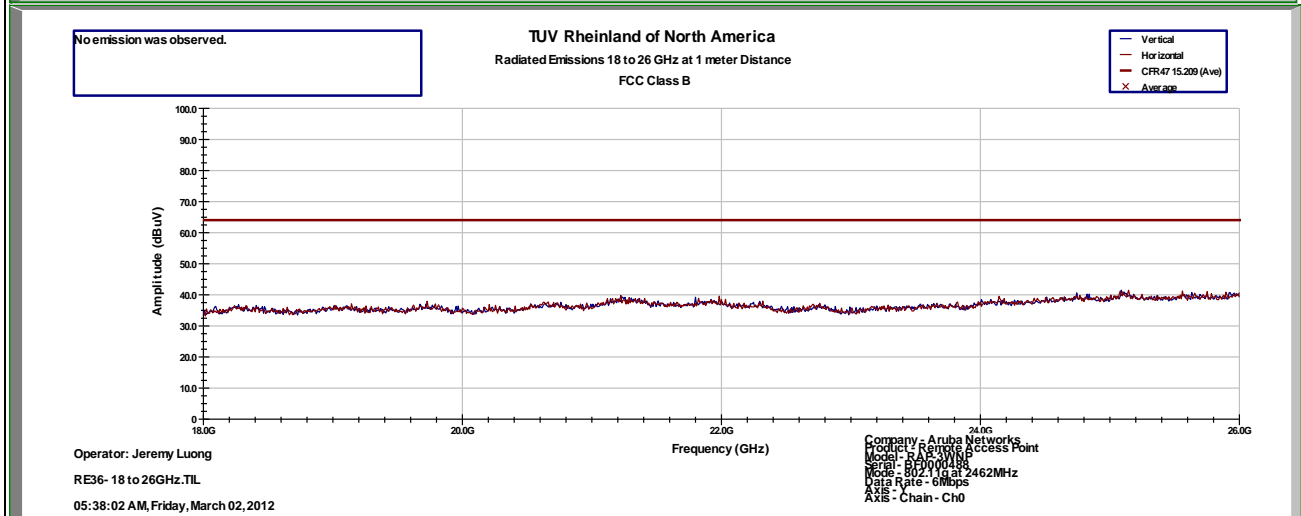
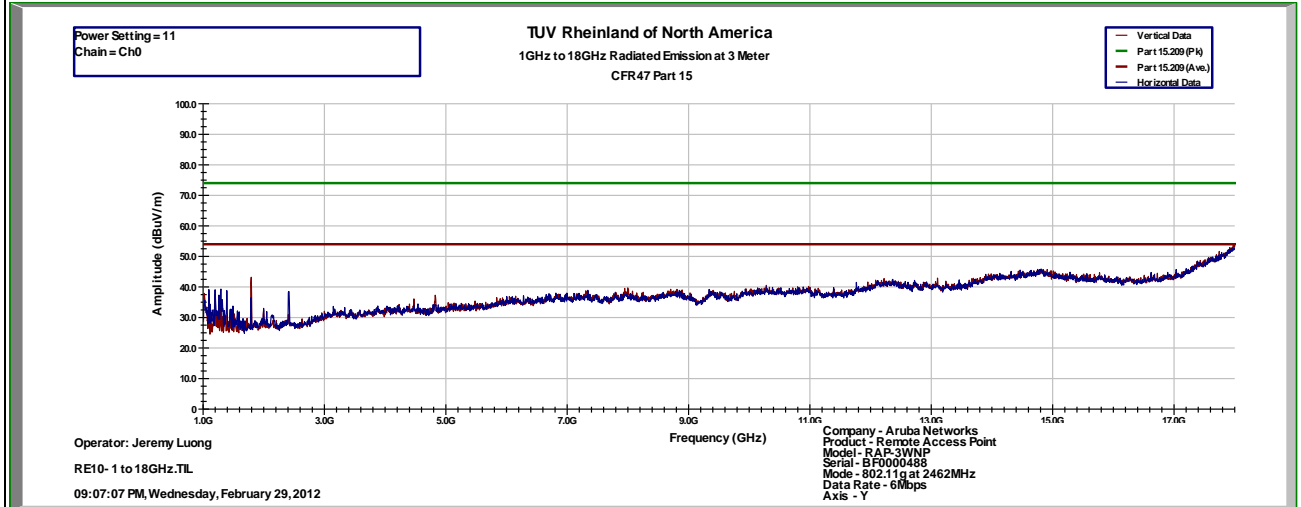
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	Feb. 29th 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 31%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 11dBm, 802.11g 6Mbps on Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

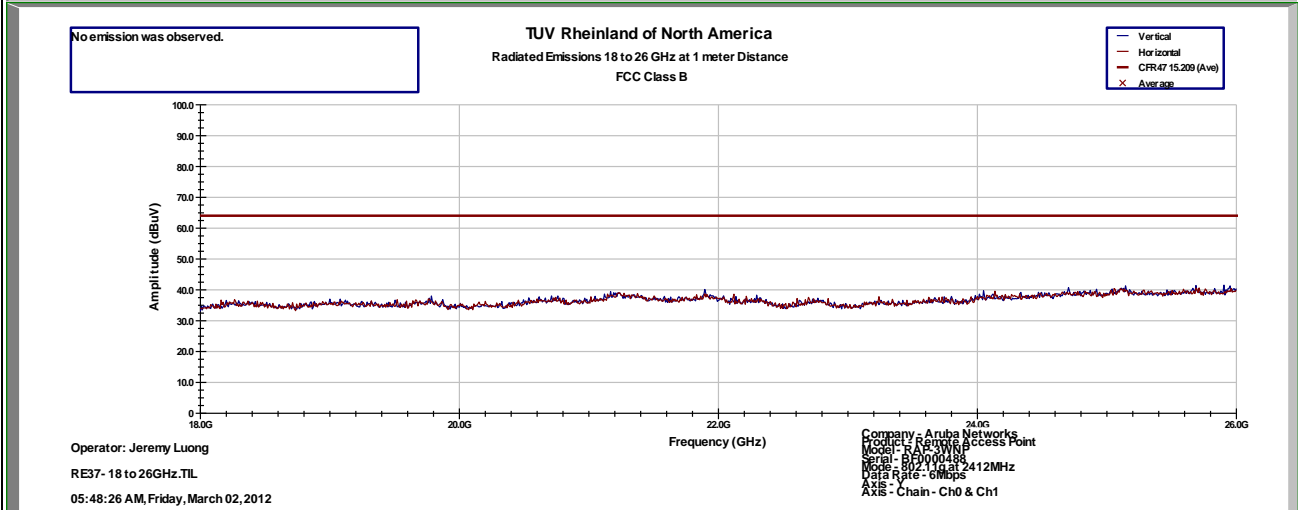
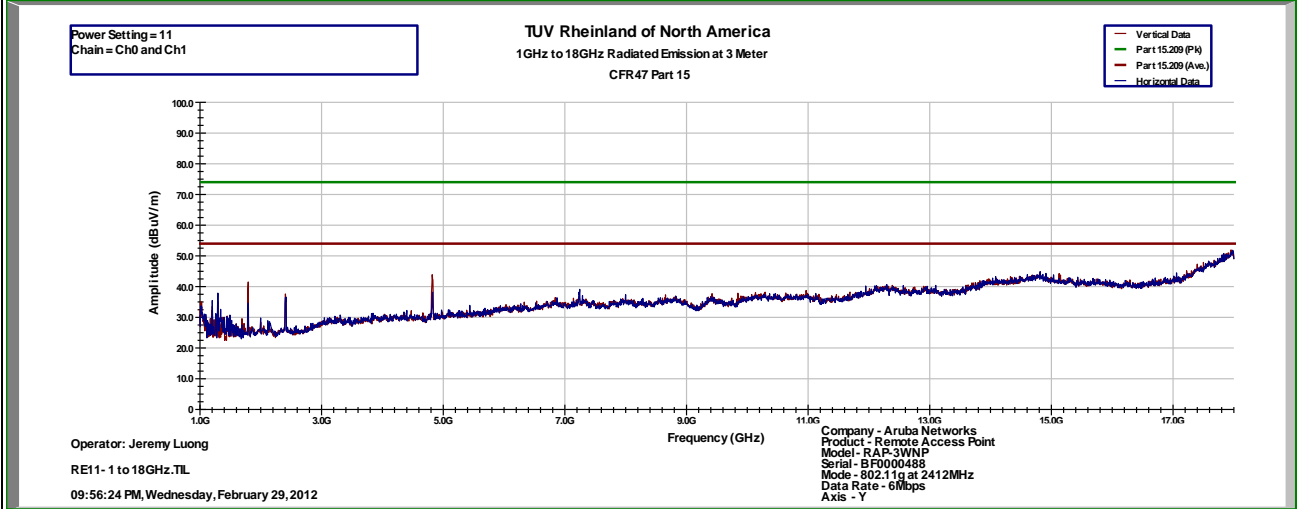
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 15 of 34				
EUT Name	Wireless Remote Access Point						Date	Feb. 29th 2012			
EUT Model	RAP-3WN and RAP-3WNP						Temp / Hum in	23°C / 31%rh			
EUT Serial	BF0000488						Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11g 6Mbps on Ch0 & Ch1						Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C						RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C						Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type	
Transmitted Data at 2412 MHz with 11 dBm											
4823.96	H	165	165	44.48	32.34	2.42	34.76	53.98	-19.22	Harmonic	
4824.23	V	209	471	48.89	37.88	2.42	40.3	53.98	-13.68	Harmonic	
7234.38	H	153	164	37.41	23.8	8.02	31.82	53.98	-22.16	Harmonic	
7237.35	V	289	15	37.76	25.13	8.02	33.15	53.98	-20.83	Harmonic	
Transmitted Data at 2437 MHz with 16 dBm											
4873.68	V	173	158	46.07	34.07	2.52	36.59	53.98	-17.39	Harmonic	
4873.83	H	177	123	45.27	34.64	2.52	37.16	53.98	-16.82	Harmonic	
7307.16	V	132	298	56.98	43.17	8.28	51.45	53.98	-2.53	Harmonic	
7307.36	H	137	225	56.32	43.68	8.28	51.96	53.98	-2.02	Harmonic	
Transmitted Data at 2462 MHz with 10 dBm											
4921.18	H	136	76	44.3	30.33	2.58	32.91	53.98	-21.07	Harmonic	
4921.3	V	143	434	52.72	39.06	2.58	41.65	53.98	-12.33	Harmonic	
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty											
Total CF= Amp Gain + Cable Loss + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence											
Notes: Worst case was observed on Y-axis, 6Mbps. RF power transmitted at Ch0 and Ch1. The above power levels were reduced for band-edge emission. See the final power setting level Section 6 of this report.											

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EUT Name	Wireless Remote Access Point	Date	Feb. 29th 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 31%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 11dBm, 802.11g 6Mbps on Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz



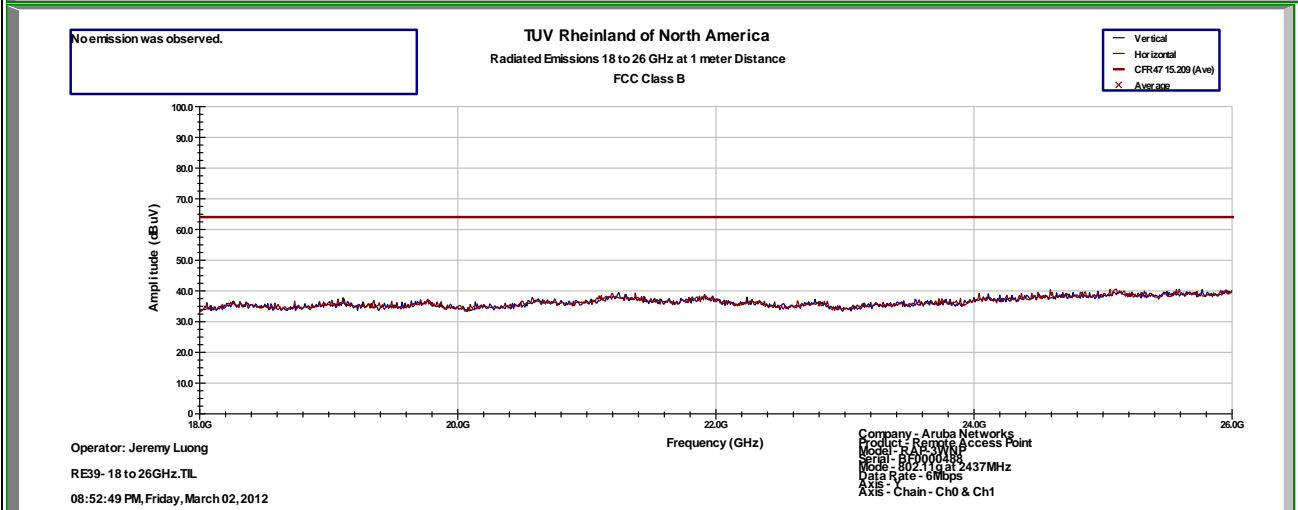
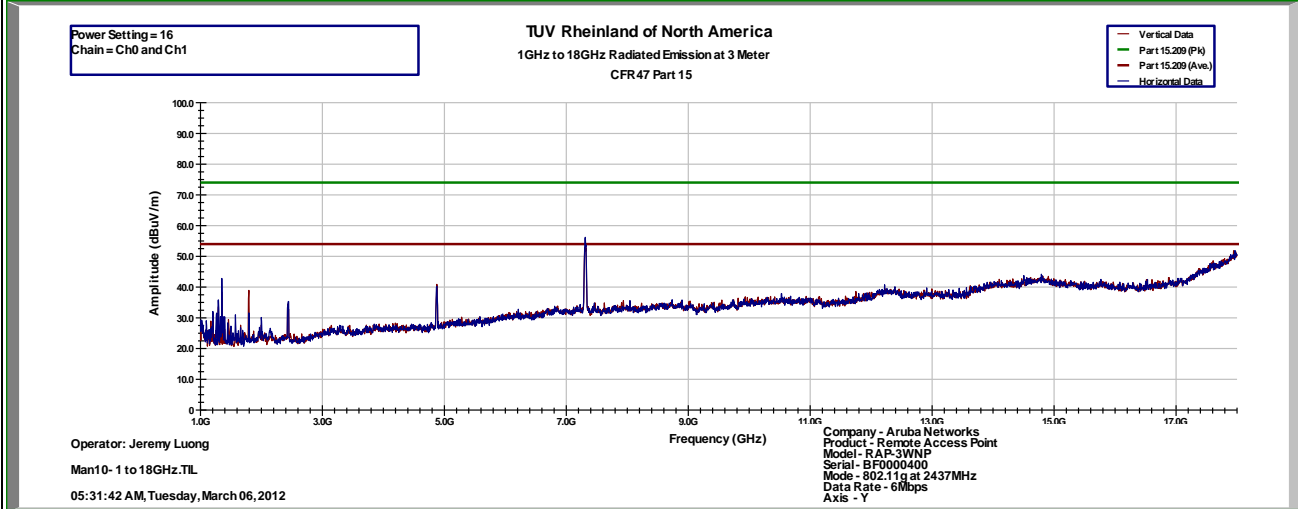
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	Feb. 29th 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 31%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 16dBm, 802.11g 6Mbps on Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz



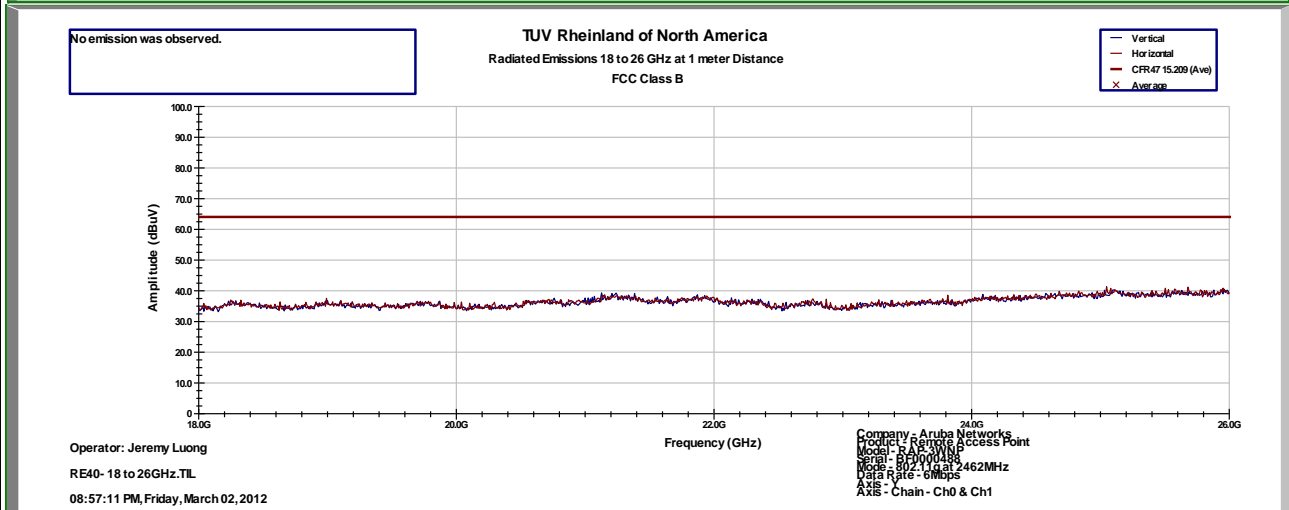
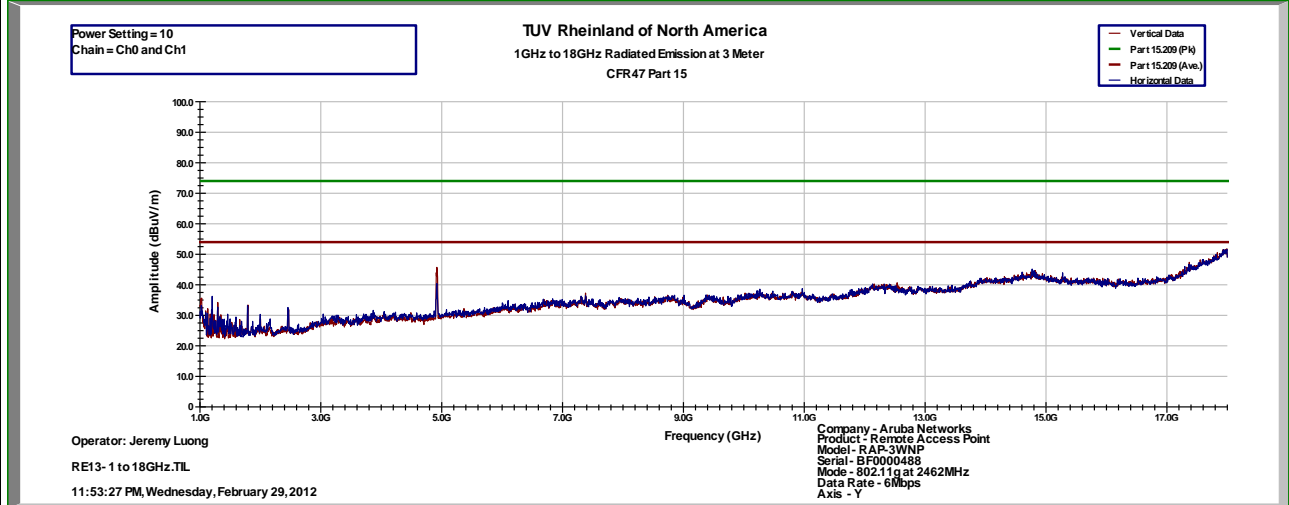
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	Feb. 29th 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 31%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 10dBm, 802.11g 6Mbps on Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

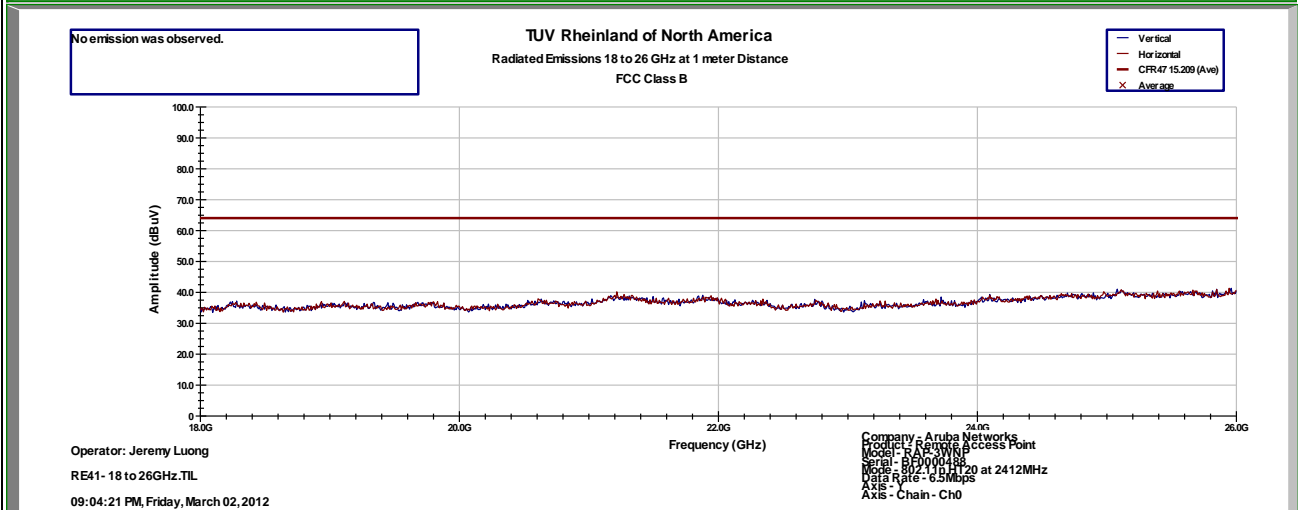
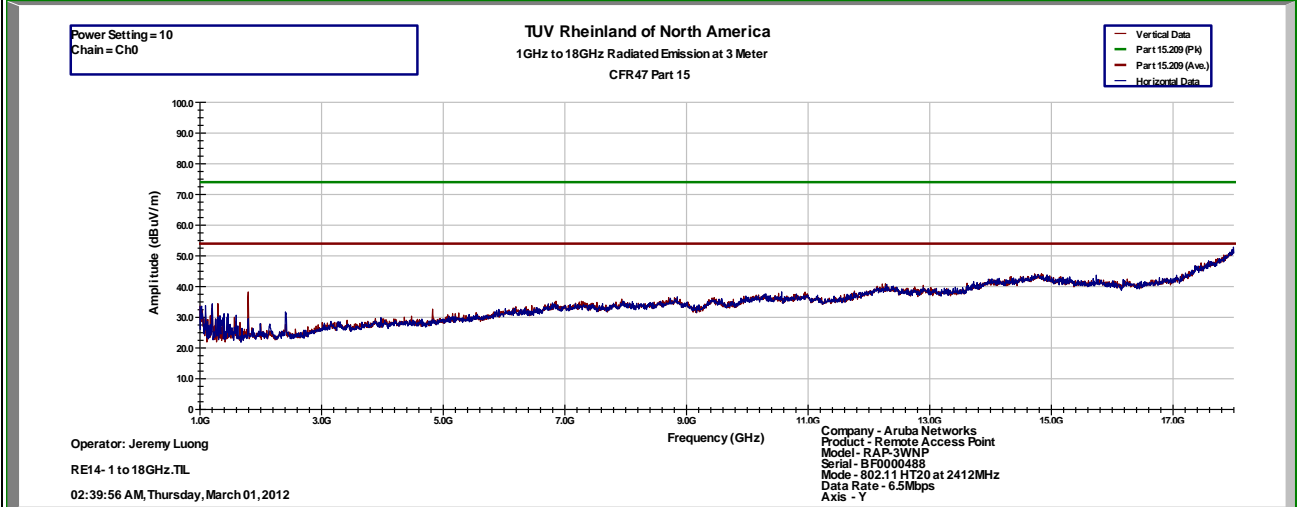
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 19 of 34				
EUT Name	Wireless Remote Access Point						Date	March 1 st , 2012			
EUT Model	RAP-3WN and RAP-3WNP						Temp / Hum in	23°C / 40%rh			
EUT Serial	BF0000488						Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11n HT20 6.5Mbps at Ch0						Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C						RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C						Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type	
Transmitted Data at 2412 MHz with 10 dBm											
4824.25	H	318	50	32.92	25.61	2.42	28.03	53.98	-25.95	Harmonic	
4825.15	V	208	468	37.64	27.6	2.42	30.02	53.98	-23.96	Harmonic	
Transmitted Data at 2437 MHz with 17 dBm											
4874.44	H	132	-19	46.1	33.9	2.52	36.42	53.98	-17.56	Harmonic	
4875.13	V	131	230	47.32	34.25	2.52	36.77	53.98	-17.21	Harmonic	
7311.7	H	135	220	58.11	45.41	8.29	53.5	53.98	-0.48	Harmonic	
7313.2	V	182	-61	57.41	43.88	8.29	52.17	53.98	-1.81	Harmonic	
Transmitted Data at 2462 MHz with 9 dBm											
4924.26	V	141	415	49.23	37.11	2.6	39.71	53.98	-14.27	Harmonic	
4924.41	H	366	172	46.84	35.71	2.6	38.31	53.98	-15.67	Harmonic	
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty											
Total CF= Amp Gain + Cable Loss + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence											
Notes: Worst case was observed on Y-axis, 6.5Mbps. RF power transmitted at Chains 0 The above power levels were reduced for band-edge emission. See the final power setting level Section 6 of this report.											

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 10dBm, 802.11n HT20 6.5Mbps at Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz



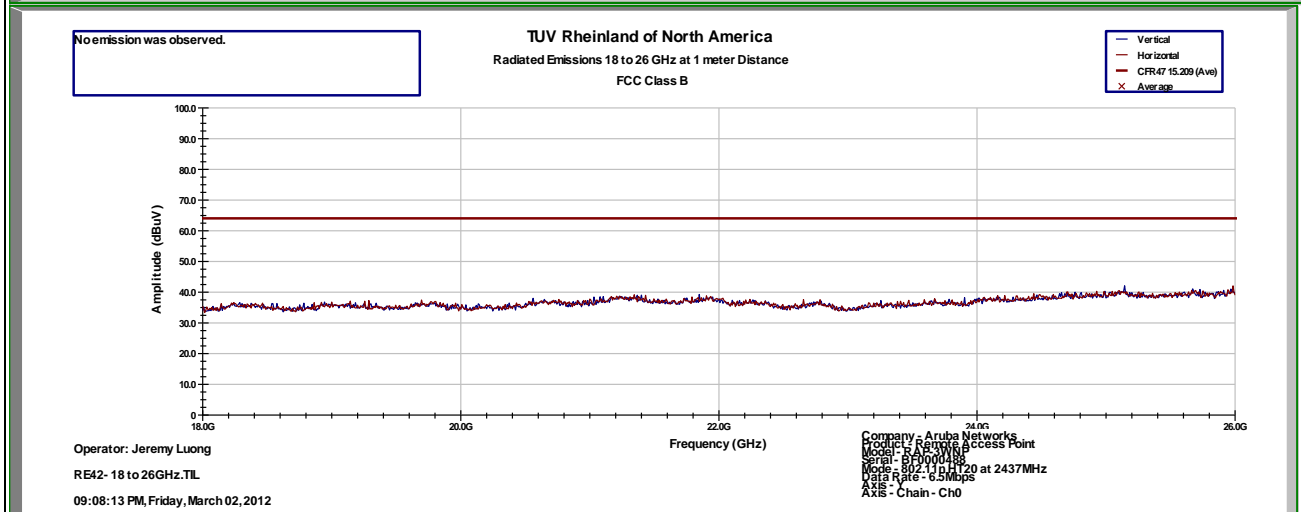
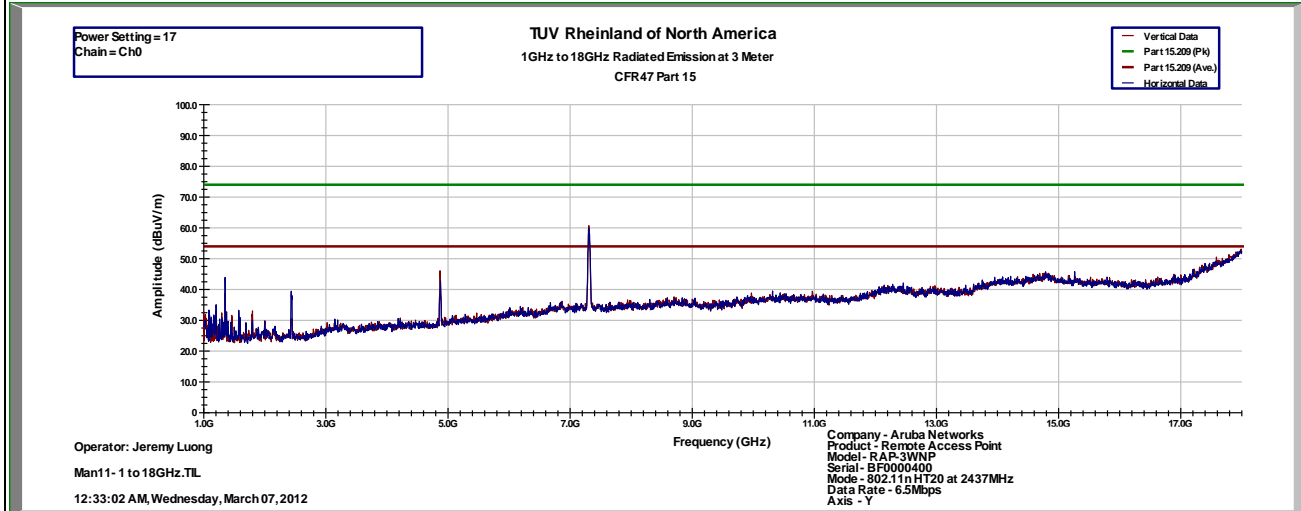
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 17dBm, 802.11n HT20 6.5Mbps at Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz



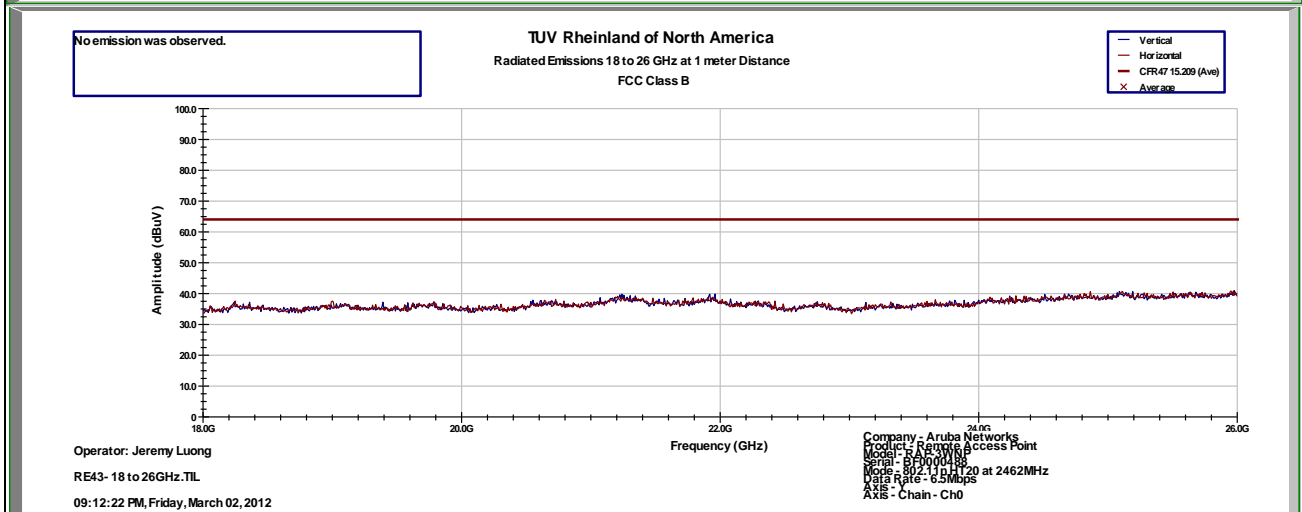
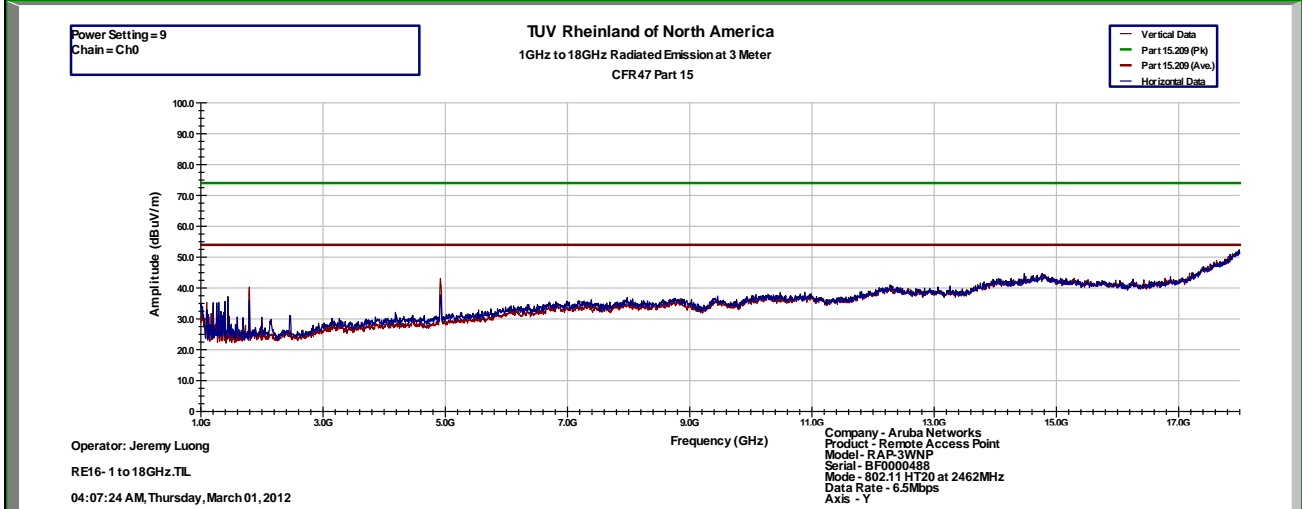
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 9dBm, 802.11n HT20 6.5Mbps at Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

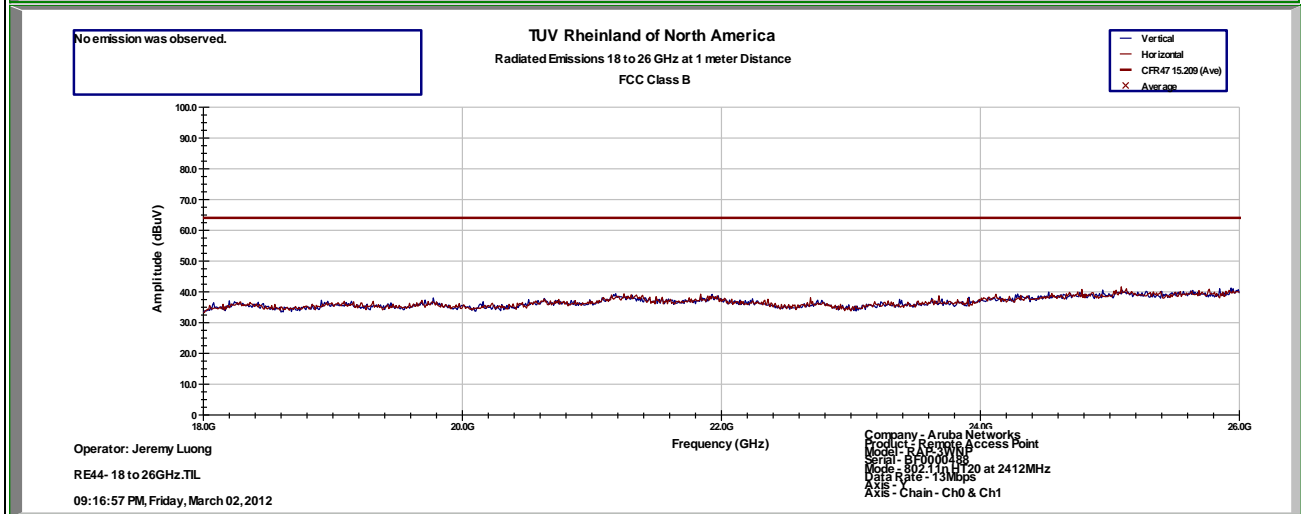
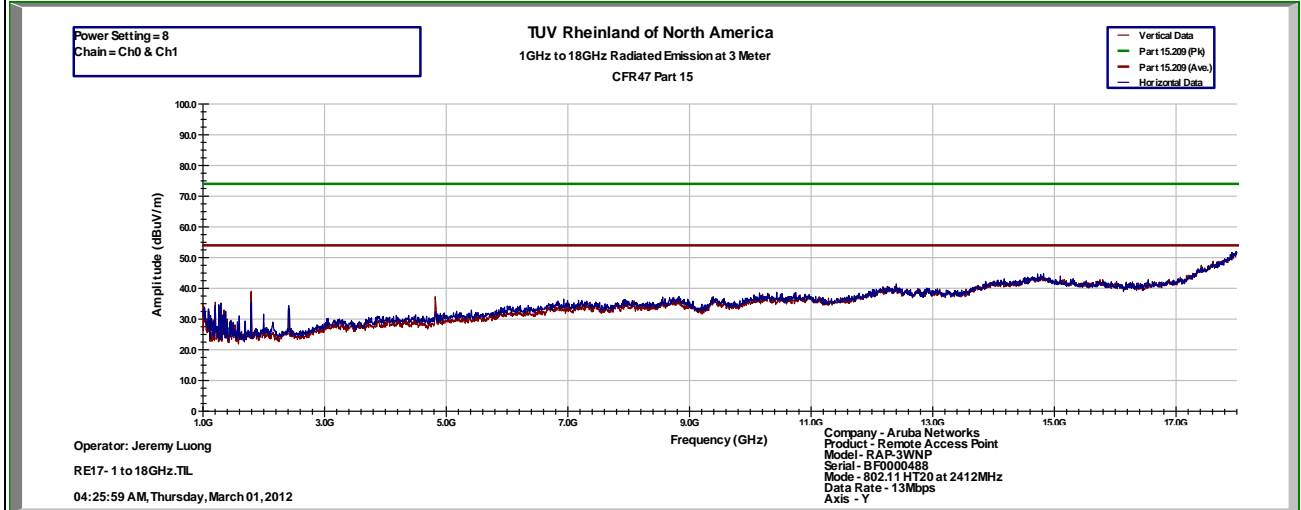
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 23 of 34				
EUT Name	Wireless Remote Access Point						Date	March 1st , 2012			
EUT Model	RAP-3WN and RAP-3WNP						Temp / Hum in	23°C / 40%rh			
EUT Serial	BF0000488						Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11n HT20 13Mbps at Ch0 & Ch1						Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C						RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C						Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type	
Transmitted Data at 2412 MHz with 8 dBm											
4823.13	V	210	467	41.99	31.62	2.41	34.03	53.98	-19.95	Harmonic	
4824.15	H	209	179	38.97	27.93	2.42	30.35	53.98	-23.63	Harmonic	
Transmitted Data at 2437 MHz with 18 dBm											
4873.13	V	117	-23	42.03	31.41	2.52	33.93	53.98	-20.05	Harmonic	
4874.15	H	101	123	42.95	33.48	2.52	36	53.98	-17.98	Harmonic	
7310.8	V	132	-52	45.72	43.98	8.29	52.27	53.98	-1.71	Harmonic	
7310.83	H	137	223	54.71	44.64	8.29	52.93	53.98	-1.05	Harmonic	
Transmitted Data at 2462 MHz with 8 dBm											
4924.14	V	204	475	51.25	38.46	2.6	41.06	53.98	-12.92	Harmonic	
4924.74	H	199	149	40.42	30.39	2.6	32.99	53.98	-20.99	Harmonic	
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty											
Total CF= Amp Gain + Cable Loss + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence											
Notes: Worst case was observed on Y-axis, 13Mbps. RF power transmitted at Chains 0 and Chain 1. See the final power setting in Section 6 of this report.											

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 8dBm, 802.11n HT20 13Mbps at Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz



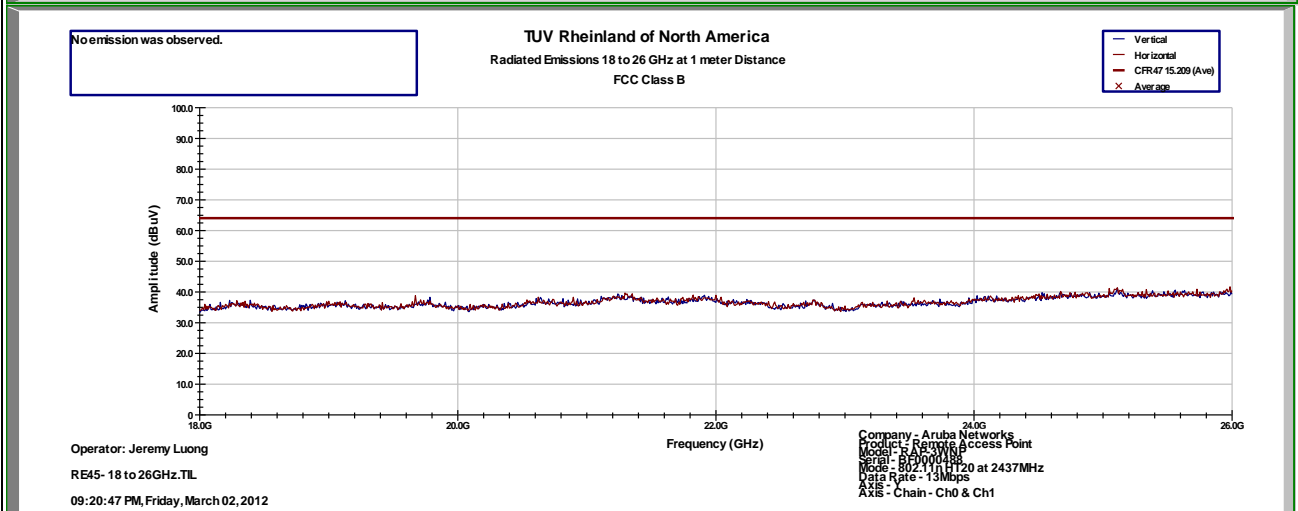
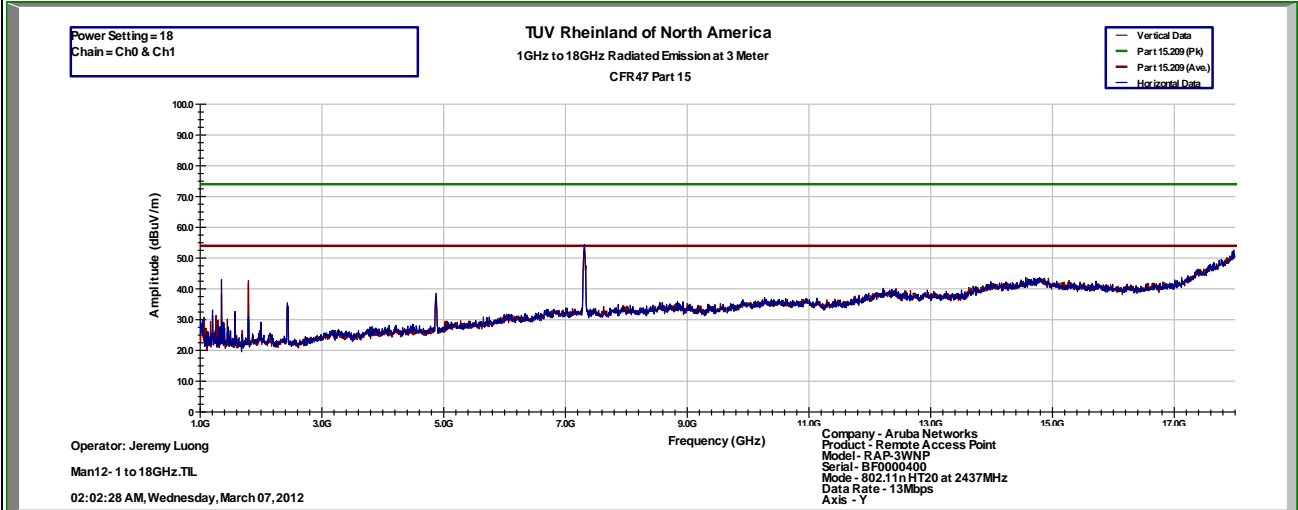
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Y-Axis, 18dBm, 802.11n HT20 13Mbps at Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz



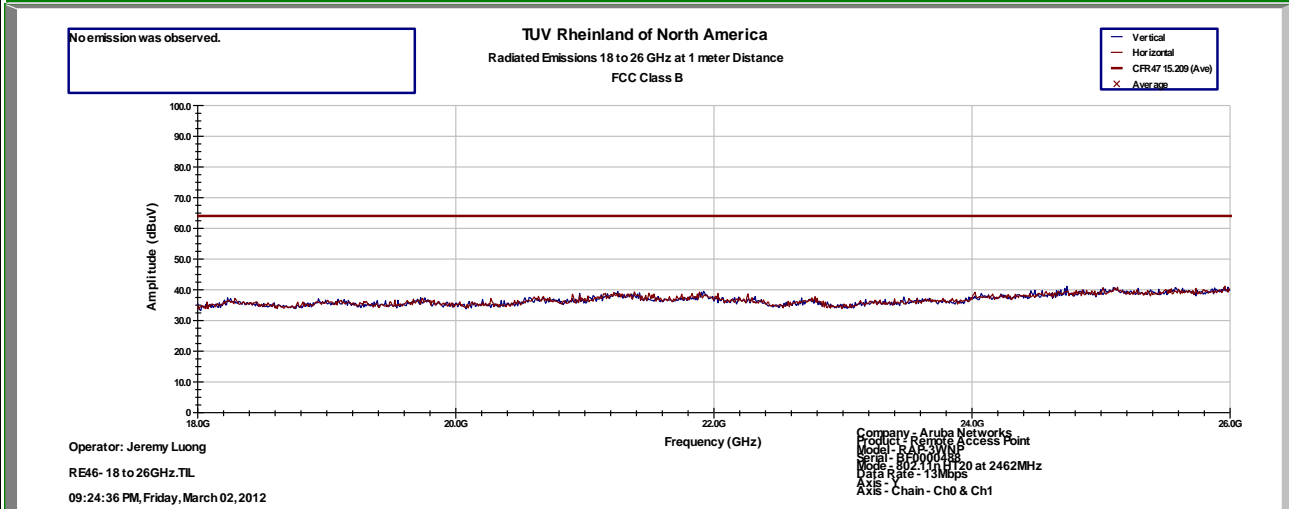
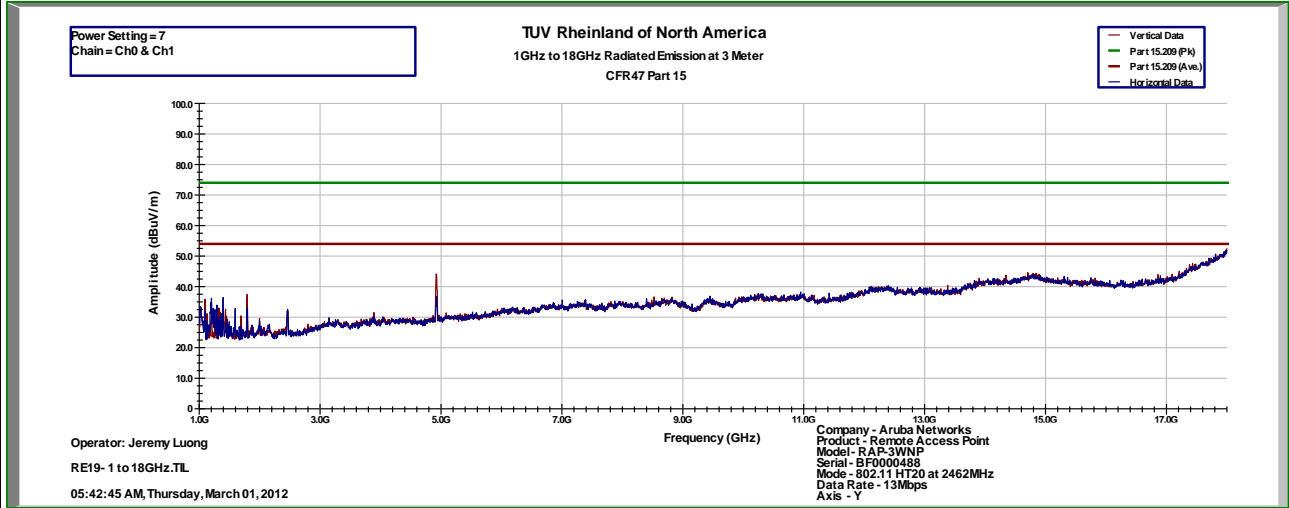
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 8dBm, 802.11n HT20 13Mbps at Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above pre-scan plots were used to determine the emission. Final measurements were tabulated above.

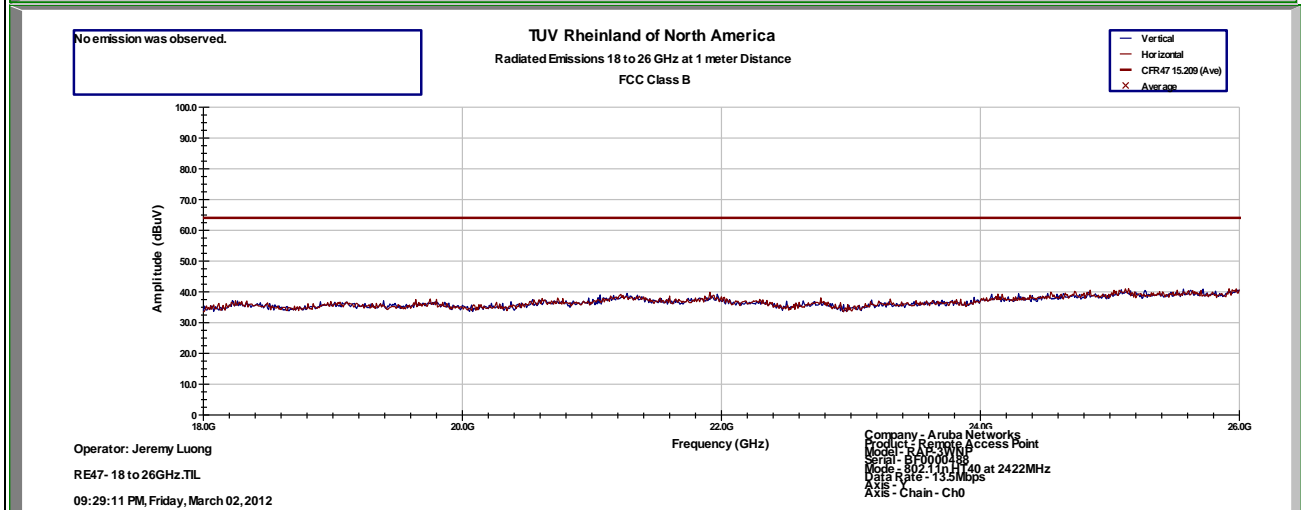
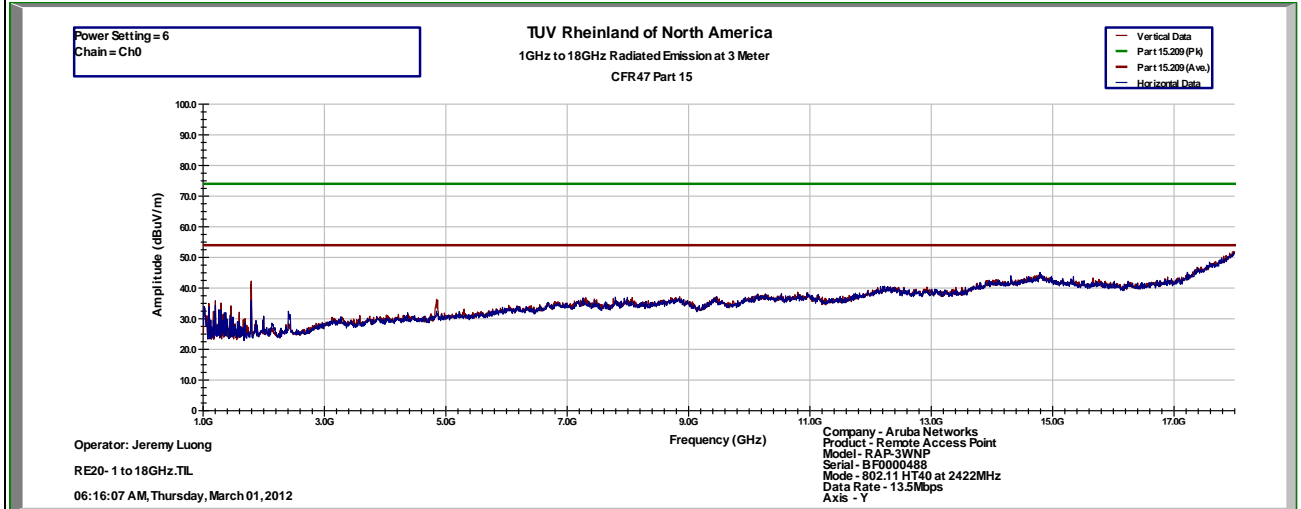
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 27 of 34				
EUT Name	Wireless Remote Access Point						Date	March 1st , 2012			
EUT Model	RAP-3WN and RAP-3WNP						Temp / Hum in	23°C / 40%rh			
EUT Serial	BF0000488						Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11n HT40 13.5Mbps at Ch0						Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C						RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C						Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type	
Transmitted Data at 2422 MHz with 6 dBm											
4850.39	H	187	170	38.32	28.08	2.55	30.63	53.98	-23.35	Harmonic	
4851.48	V	207	109	42.49	31.66	2.55	34.22	53.98	-19.76	Harmonic	
Transmitted Data at 2437 MHz with 10 dBm											
4874.81	V	162	465	49.17	38.63	2.52	41.15	53.98	-12.83	Harmonic	
4884.2	H	167	145	42.92	32.19	2.5	34.69	53.98	-19.29	Harmonic	
Transmitted Data at 2452 MHz with 7 dBm											
4901.51	H	182	166	38.85	29.36	2.48	31.84	53.98	-22.14	Harmonic	
4904.9	V	179	45	39.92	32.02	2.5	34.52	53.98	-19.46	Harmonic	
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty											
Total CF= Amp Gain + Cable Loss + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence											
Notes: Worst case was observed on Y-axis, 13.5Mbps. RF power transmitted at Chains 0. The above power levels were reduced for band-edge emission. See the final power setting level Section 6 of this report.											

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 6dBm, 802.11n HT40 13.5Mbps at Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2422 MHz



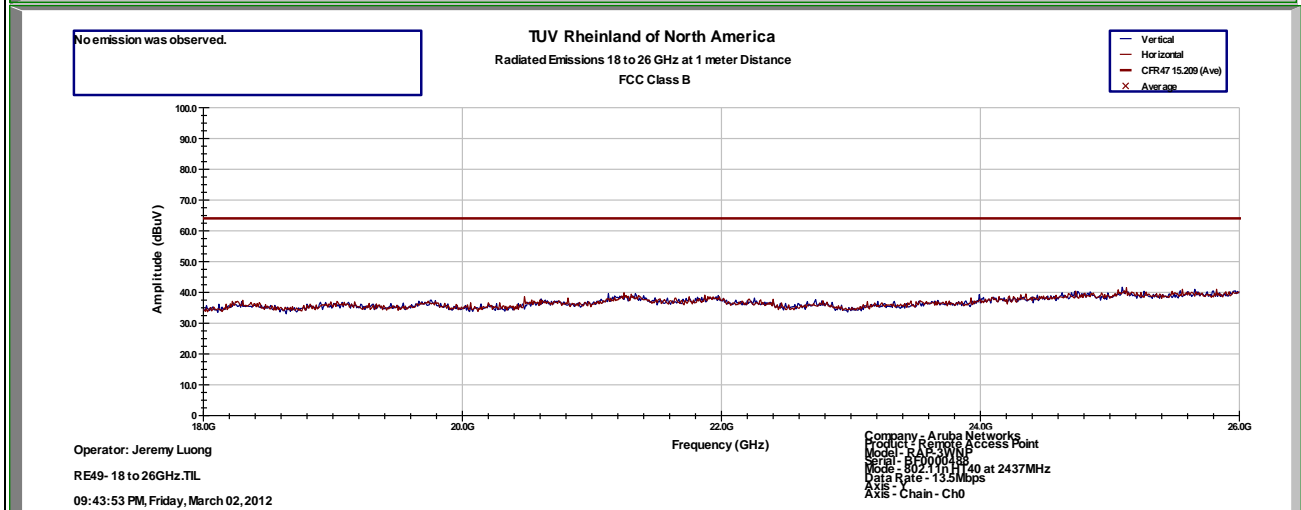
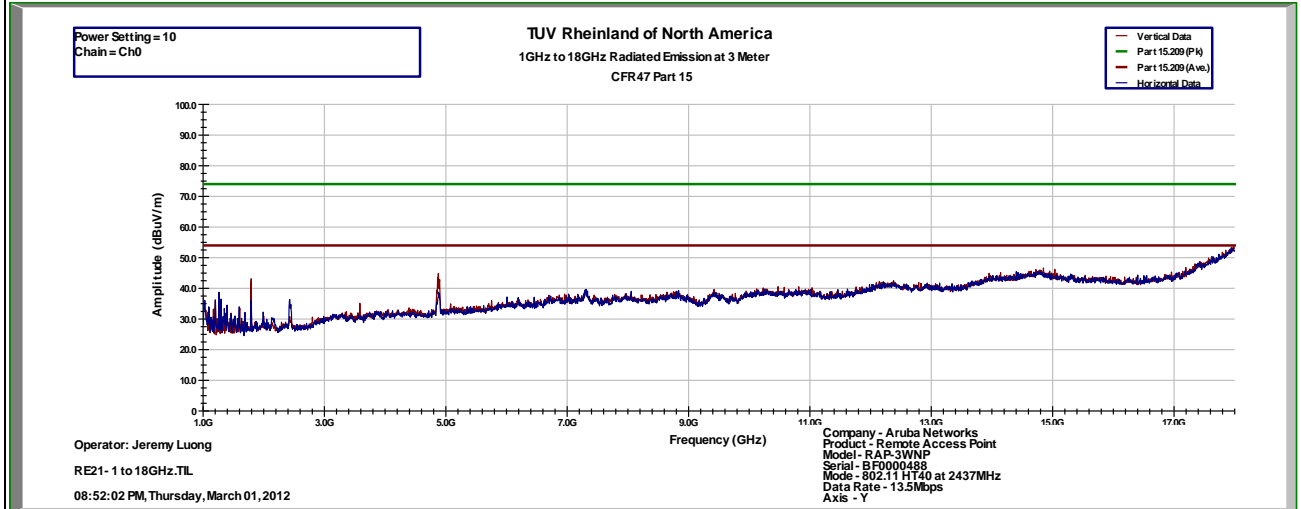
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 10dBm, 802.11n HT40 13.5Mbps at Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz



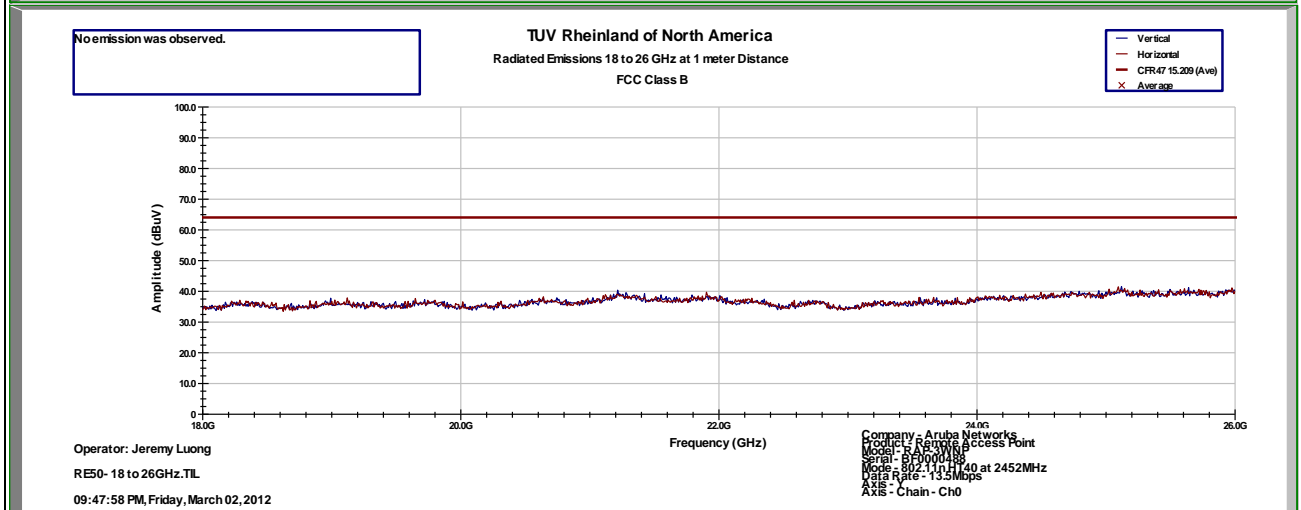
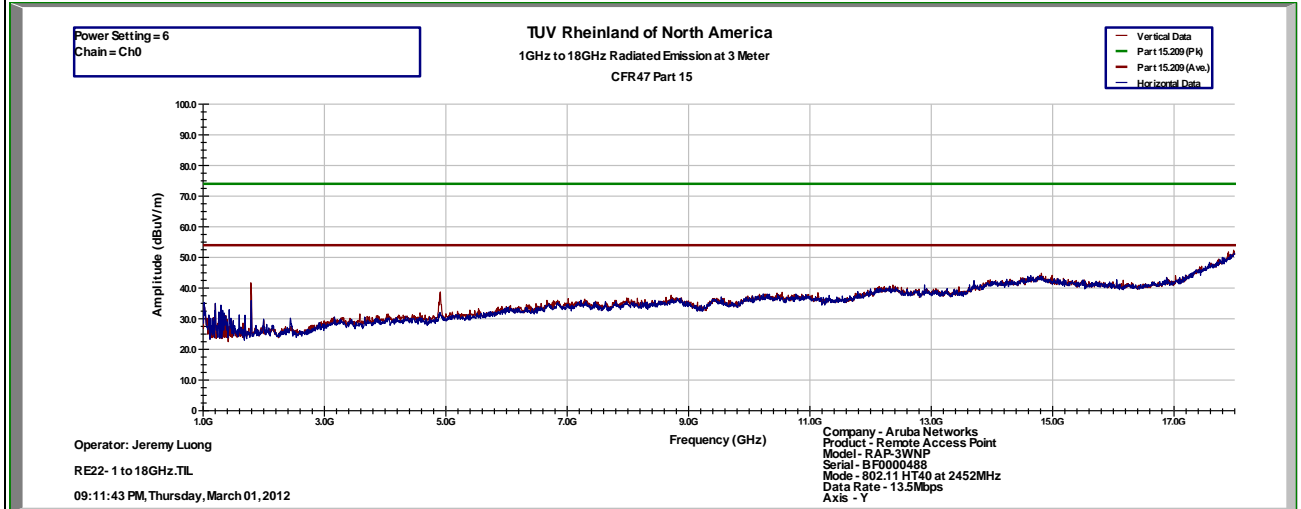
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned. The final measurements were tabulated above.

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 6dBm, 802.11n HT40 13.5Mbps at Ch0	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2452 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz

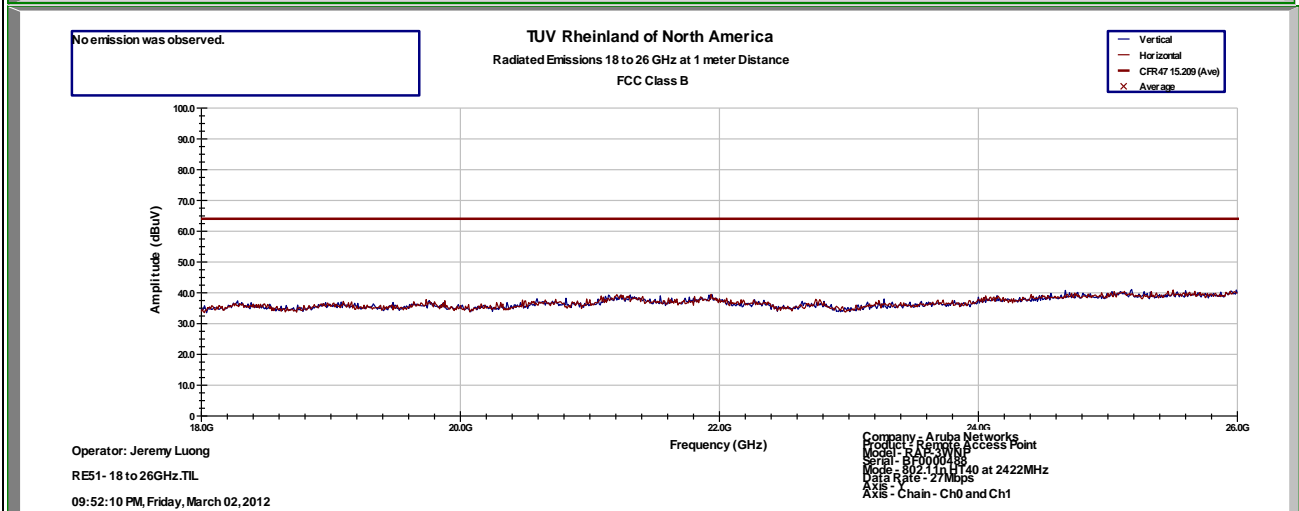
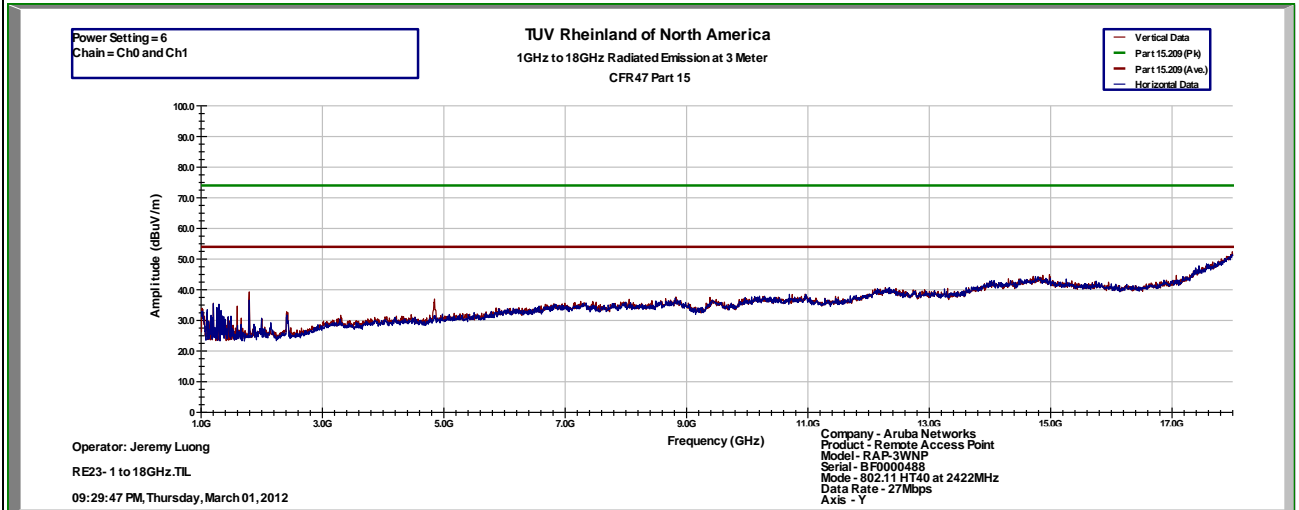
SOP 1 Radiated Emissions							Tracking # 31250477.001 Page 31 of 34			
EUT Name	Wireless Remote Access Point					Date	March 1st , 2012			
EUT Model	RAP-3WN and RAP-3WNP					Temp / Hum in	23°C / 40%rh			
EUT Serial	BF0000488					Temp / Hum out	N/A			
EUT Config.	Y-Axis, 802.11n HT40 27Mbps at Ch0 & Ch1					Line AC / Freq	120 Vac/60 Hz			
Standard	CFR47 Part 15 Subpart C					RBW / VBW	1 MHz/ 3 MHz			
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C					Performed by	Jeremy Luong			
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type
Transmitted Data at 2422 MHz with 6 dBm										
4842.28	H	165	156	36.33	27.35	2.51	29.86	53.98	-24.12	Harmonic
4843.42	V	148	119	38.3	32.29	2.52	34.81	53.98	-19.17	Harmonic
Transmitted Data at 2437 MHz with 9 dBm										
1792.47	V	135	132	53.72	45.13	-4.98	40.14	53.98	-13.84	Spurious
4874.34	H	184	171	39.26	30.01	2.52	32.53	53.98	-21.45	Harmonic
4874.76	V	183	108	42.12	36.85	2.52	39.37	53.98	-14.61	Harmonic
Transmitted Data at 2452 MHz with 7 dBm										
1792.47	V	126	122	51.9	44.11	-4.98	39.13	53.98	-14.85	Spurious
4897.02	H	204	161	38.85	29.15	2.48	31.63	53.98	-22.35	Harmonic
4905.83	V	161	111	44.4	36.13	2.5	38.63	53.98	-15.35	Harmonic
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty										
Total CF= Amp Gain + Cable Loss + ANT Factor										
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence										
Notes: Worst case was observed on Y-axis, 27Mbps. RF power transmitted at Chains 0, 1.										

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 6dBm, 802.11n HT40 27Mbps at Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2422 MHz



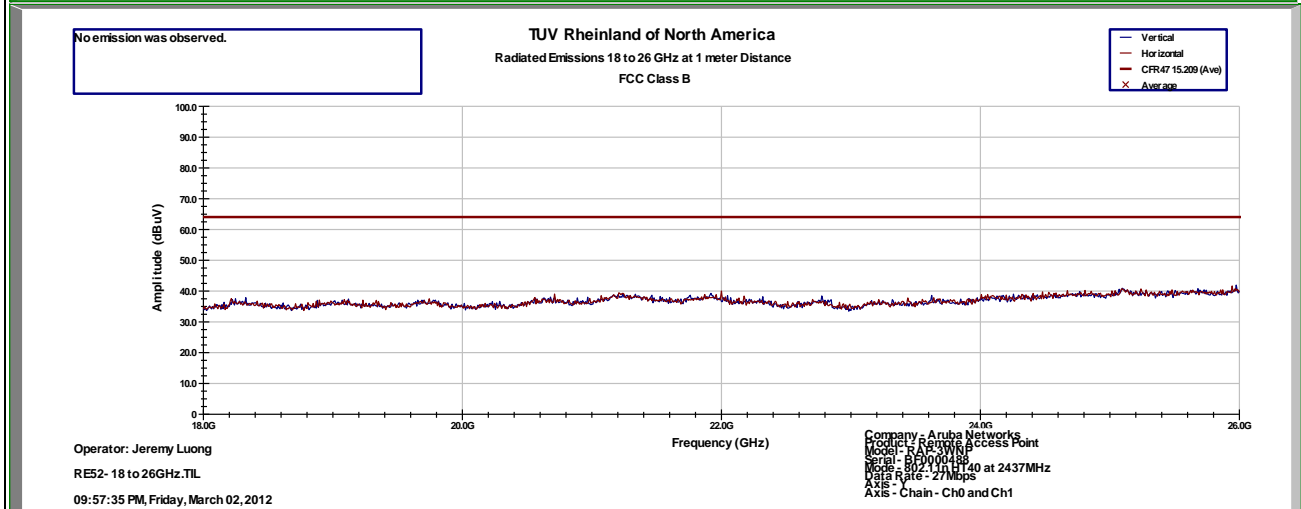
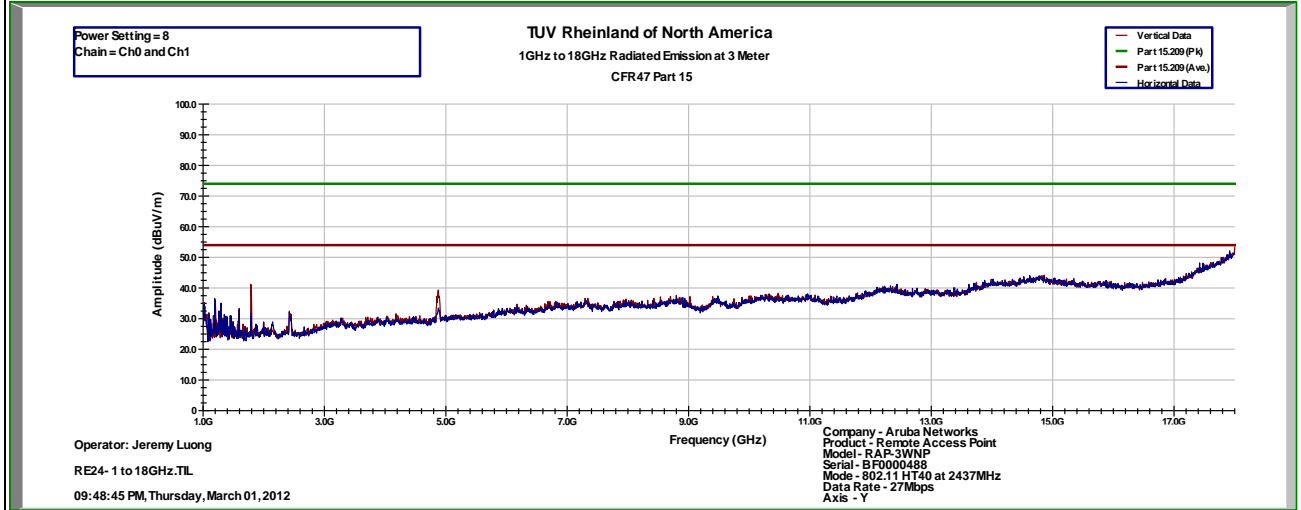
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned for emissions. The final measurements are tabulated above.

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 8dBm, 802.11n HT40 27Mbps at Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz



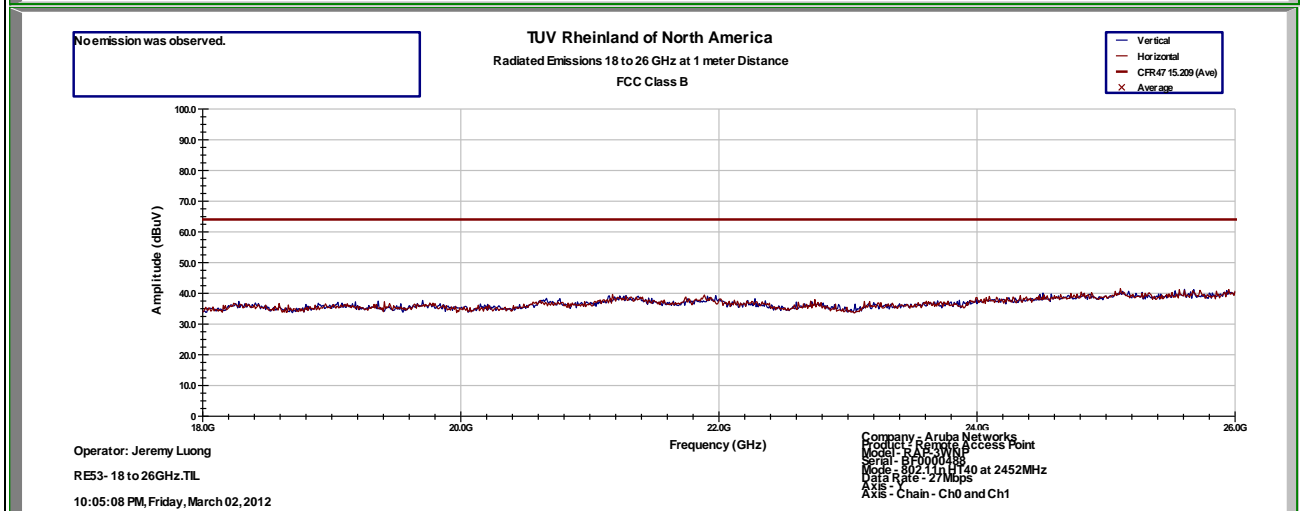
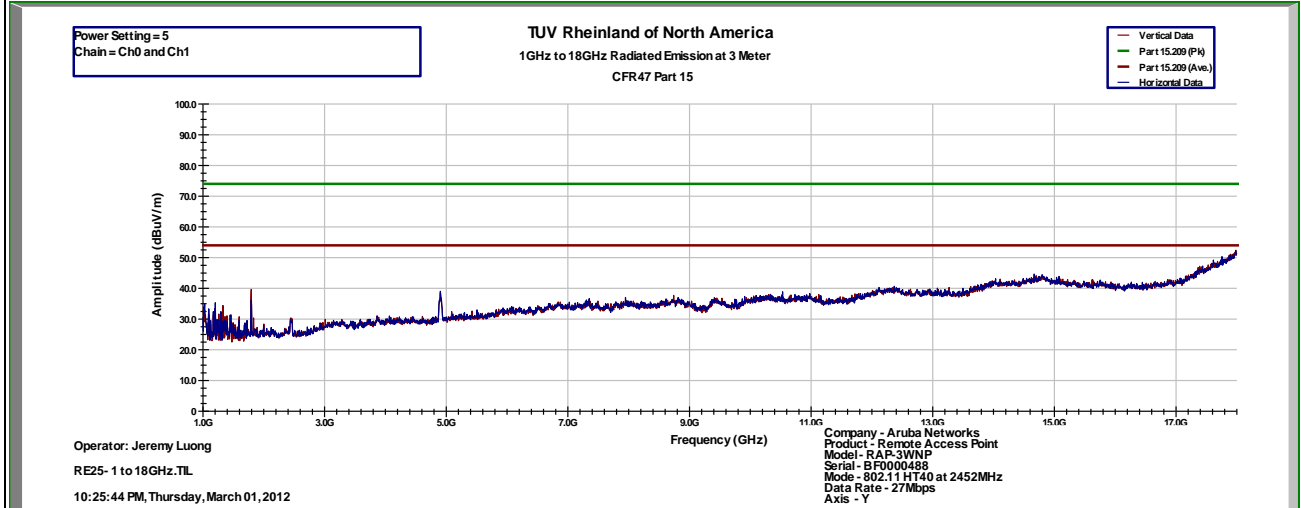
Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned for emissions. The final measurements are tabulated above.

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EUT Name	Wireless Remote Access Point	Date	March 1st , 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23°C / 40%rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	Y-Axis, 5dBm, 802.11n HT40 27Mbps at Ch0 & Ch1	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	Performed by	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2452 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 25 GHz range.
 1 GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3 MHz
 The above plots were pre-scanned for emissions. The final measurements are tabulated above.

4.6.4 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{FIM} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: FIM = Field Intensity Meter (dB μ V)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m}}{20}}$$

4.7 Receiver Spurious Emissions

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

The spurious emissions of the receiver shall not exceed the values in CFR47 Part 15.109 and RSS 210 Sect 2.7.

4.7.1 Test Methodology

4.7.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the semi anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

Preliminary scans performed with EUT positioned horizontal and vertically. Vertical position was worse.

4.7.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

The final scans performed with EUT positioned vertically in;

20 MHz received bandwidth at 2437 MHz.

40 MHz received bandwidth at 2437 MHz

4.7.1.3 Deviations

None.

4.7.2 Receiver Spurious Emission Limit

The spurious emissions of the receiver shall not exceed the values in CFR47 Part 15.205, 15.209: 2010 and RSS 210 A1.1.2 2010.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F (kHz)	300
0.490-1.705.....	24000/F (kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

4.7.3 Test Results

The final measurement data indicates the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.7.3.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and without any modifications or special accessories implemented as the manufacturer intends.

SOP 1 Radiated Emissions											Tracking # 31250477.001 Page 1 of 8	
EUT Name	Wireless Remote Access Point					Date	March 6, 2012					
EUT Model	RAP-3WN and RAP-3WNP					Temp / Hum in	23° C / 34% rh					
EUT Serial	BF0000400					Temp / Hum out	N/A					
EUT Config.	20 MHz BW, RX on Y-Axis					Line AC / Freq	120 Vac 60 Hz					
Standard	CFR47 Part 15 Subpart C					RBW / VBW	120 kHz / 300 kHz					
Dist/Ant Used	3m / JB3					Performed by	Jeremy Luong					
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (Deg)	FIM (Pk) (dBuV/m)	FIM QP (dBuV/m)	Total CF (dBuV)	E-Field QP (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type		
Receive Mode at 2437 MHz												
81.25	H	251	87	40.73	38.73	-16.26	22.47	40.00	-17.53	Spurious		
106.91	H	313	258	37.73	35.90	-11.89	24.01	43.52	-19.51	Spurious		
750.00	H	104	247	34.05	32.74	-0.63	32.11	46.02	-13.91	Spurious		
875.04	H	106	255	34.59	32.03	0.74	32.77	46.02	-13.25	Spurious		
30.62	V	122	126	43.42	41.56	-4.70	36.86	40.00	-3.14	Spurious		
58.69	V	156	25	51.80	49.25	-16.17	33.08	40.00	-6.92	Spurious		
60.80	V	108	301	47.89	45.74	-16.31	29.43	40.00	-10.57	Spurious		
80.63	V	136	245	55.44	52.84	-16.67	36.17	40.00	-3.83	Spurious		
81.17	V	114	198	56.59	53.40	-16.65	36.75	40.00	-3.25	Spurious		
91.57	V	119	214	49.78	47.21	-15.35	31.86	43.52	-11.66	Spurious		
106.90	V	106	179	46.15	44.91	-12.28	32.63	43.52	-10.89	Spurious		
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty												
Total CF= Amp Gain + Cable Loss + ANT Factor												
Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence												
Notes: 20 MHz BW RX mode at 2437 MHz												

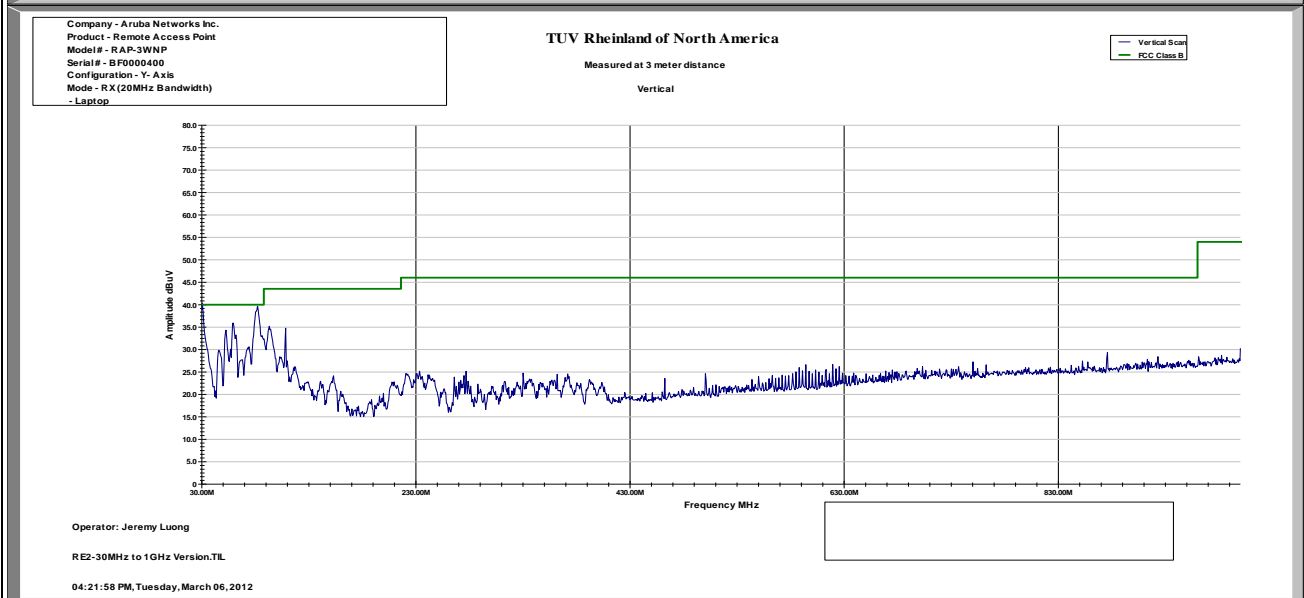
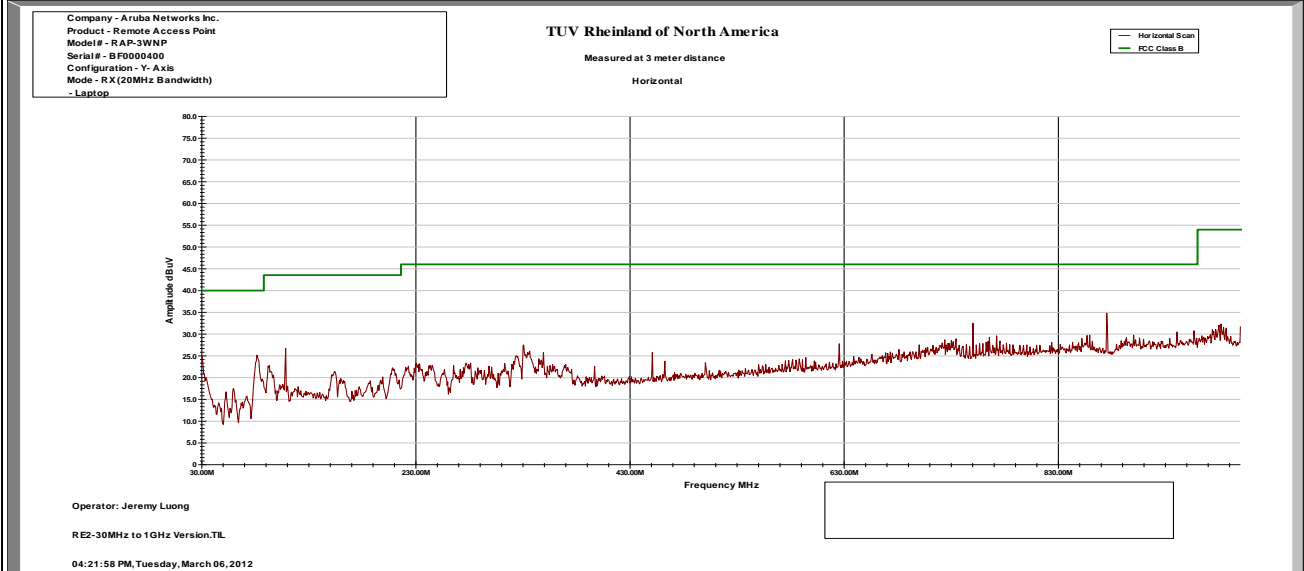
SOP 1 Radiated Emissions											Tracking # 31250477.001 Page 2 of 8	
EUT Name	Wireless Remote Access Point						Date	March 01, 2012				
EUT Model	RAP-3WN and RAP-3WNP						Temp / Hum in	22° C / 34% rh				
EUT Serial	BF0000488						Temp / Hum out	N/A				
EUT Config.	20 MHz BW RX on Y-Axis						Line AC / Freq	120 Vac/60 Hz				
Standard	CFR47 Part 15 Subpart C						RBW / VBW	1 MHz / 3 MHz				
Dist/Ant Used	3m / EMCO3115						Performed by	Jeremy Luong				
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (Deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type		
Transmitted Data at 2437 MHz												
1000.02	H	94	297	45.8	35.35	-9.25	26.1	53.98	-27.88	Spurious		
1019.64	H	94	290	48.59	41.68	-9.16	32.52	53.98	-21.46	Spurious		
1350.03	H	110	404	43.17	38.91	-7.61	31.3	53.98	-22.68	Spurious		
1375.04	H	110	314	43.25	36.86	-7.54	29.32	53.98	-24.66	Spurious		
Spec Margin = E-Field Ave - Limit, E-Field Ave = FIM Ave+ Total CF ± Uncertainty												
Total CF= Amp Gain + Cable Loss + ANT Factor												
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence												
Notes RX mode at 2437 MHz												

SOP 1 Radiated Emissions

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EUT Name	Wireless Remote Access Point	Date	March 6, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23° C / 34% rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	20 MHz BW RX on Y-Axis	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	120 kHz / 300 kHz
Dist/Ant Used	3m / JB3	Performed by	Jeremy Luong

30 MHz to 1000 MHz Plot for Receive Mode at 2437 MHz



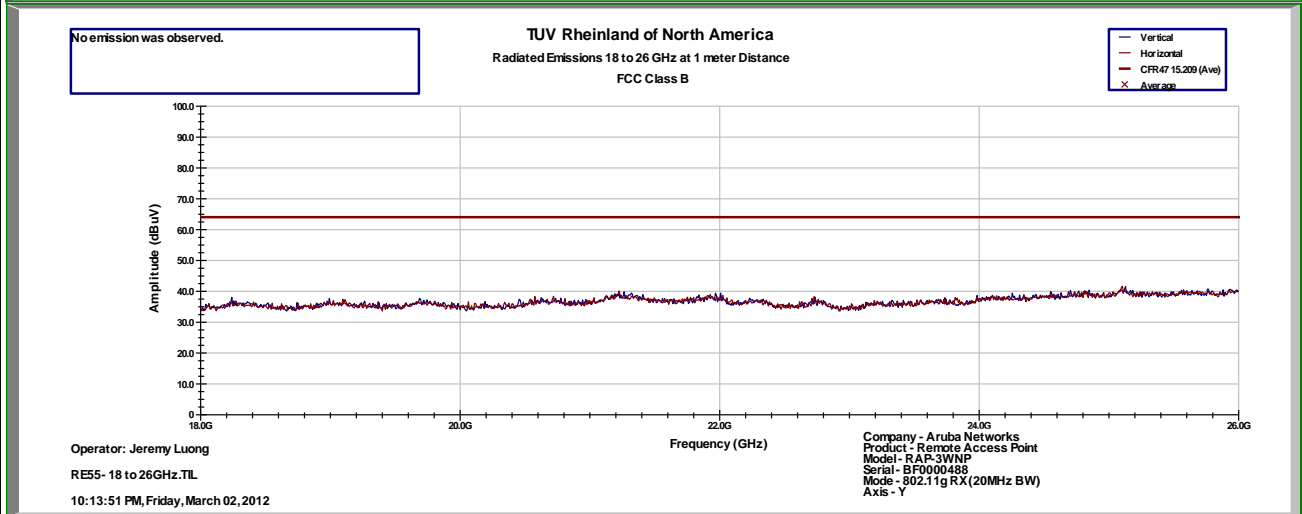
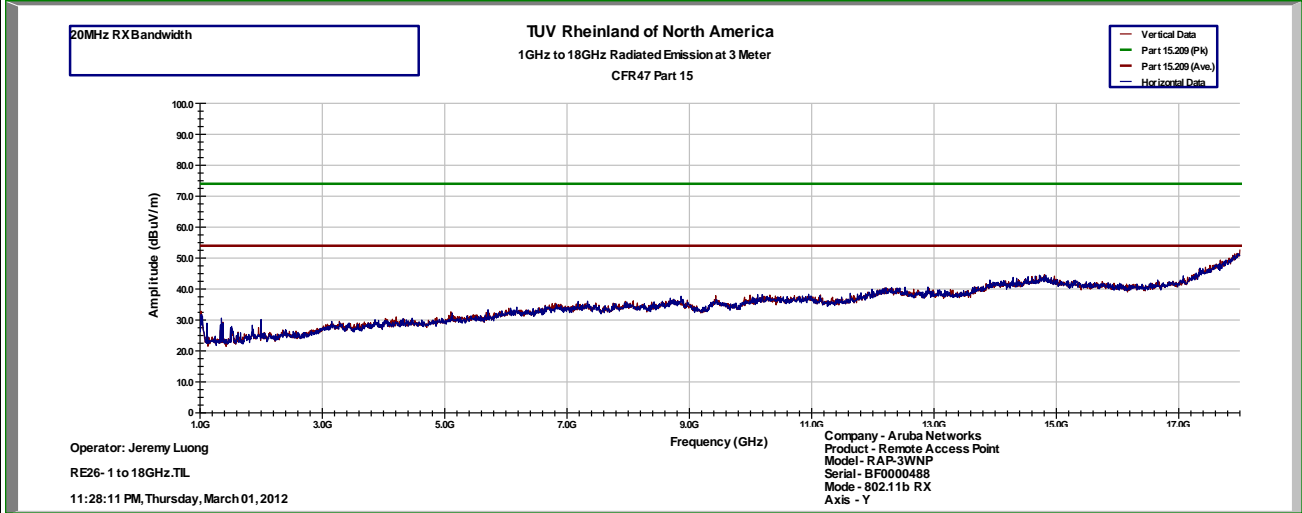
Notes: None.

SOP 1 Radiated Emissions

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EUT Name	Wireless Remote Access Point	Date	March 1, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23° C / 34% rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	20 MHz BW RX on Y-Axis	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO3115	Performed by	Jeremy Luong

1 GHz to 25 GHz Plot for Receive Mode at 2437 MHz



Notes: None

SOP 1 Radiated Emissions											Tracking # 31250477.001 Page 5 of 8	
EUT Name	Wireless Remote Access Point					Date	March 6, 2012					
EUT Model	RAP-3WN and RAP-3WNP					Temp / Hum in	23° C / 34% rh					
EUT Serial	BF0000400					Temp / Hum out	N/A					
EUT Config.	40 MHz BW, RX on Y-Axis					Line AC / Freq	120 Vac 60 Hz					
Standard	CFR47 Part 15 Subpart C					RBW / VBW	120 kHz / 300 kHz					
Dist/Ant Used	3m / JB3					Performed by	Jeremy Luong					
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (Deg)	FIM (Pk) (dBuV/m)	FIM QP (dBuV/m)	Total CF (dBuV)	E-Field QP (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type		
Receive Mode at 2437 MHz												
30.56	H	251	87	40.73	38.73	-16.26	22.47	40.00	-17.53	Spurious		
58.52	H	313	258	37.73	35.90	-11.89	24.01	43.52	-19.51	Spurious		
60.80	H	104	247	34.05	32.74	-0.63	32.11	46.02	-13.91	Spurious		
80.61	H	106	255	34.59	32.03	0.74	32.77	46.02	-13.25	Spurious		
81.19	V	122	126	43.42	41.56	-4.70	36.86	40.00	-3.14	Spurious		
91.53	V	156	25	51.80	49.25	-16.17	33.08	40.00	-6.92	Spurious		
106.90	V	108	301	47.89	45.74	-16.31	29.43	40.00	-10.57	Spurious		
81.20	V	136	245	55.44	52.84	-16.67	36.17	40.00	-3.83	Spurious		
106.90	V	114	198	56.59	53.40	-16.65	36.75	40.00	-3.25	Spurious		
749.99	V	119	214	49.78	47.21	-15.35	31.86	43.52	-11.66	Spurious		
875.03	V	106	179	46.15	44.91	-12.28	32.63	43.52	-10.89	Spurious		
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty												
Total CF= Amp Gain + Cable Loss + ANT Factor												
Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence												
Notes: 40 MHz BW RX mode at 2437 MHz												

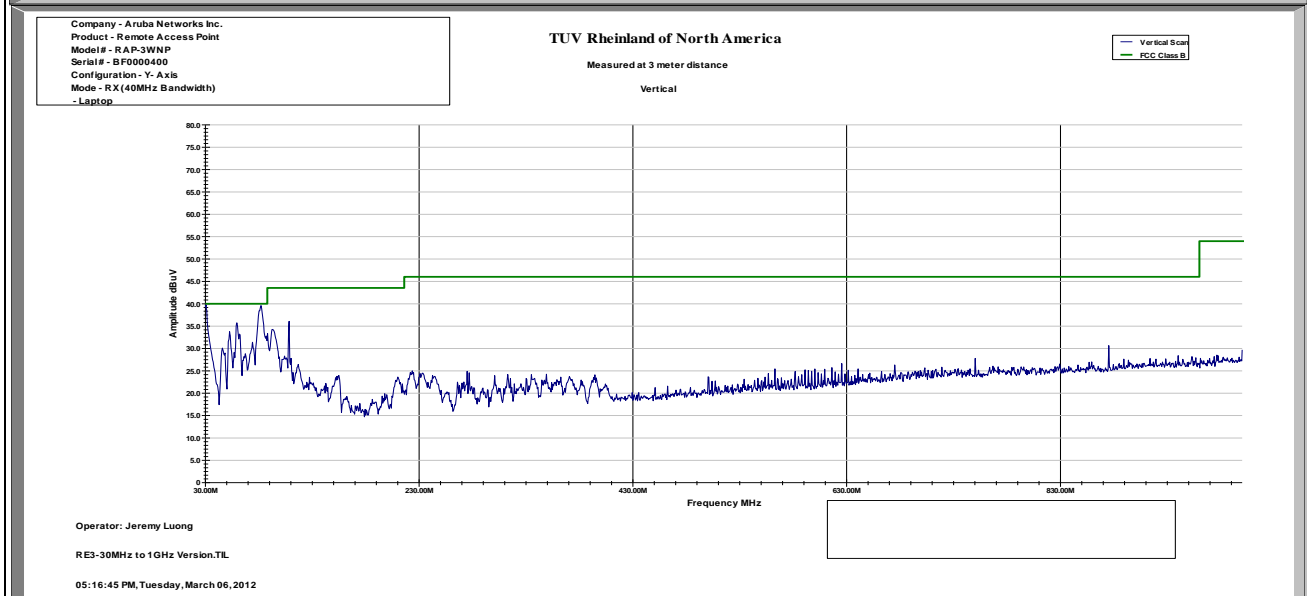
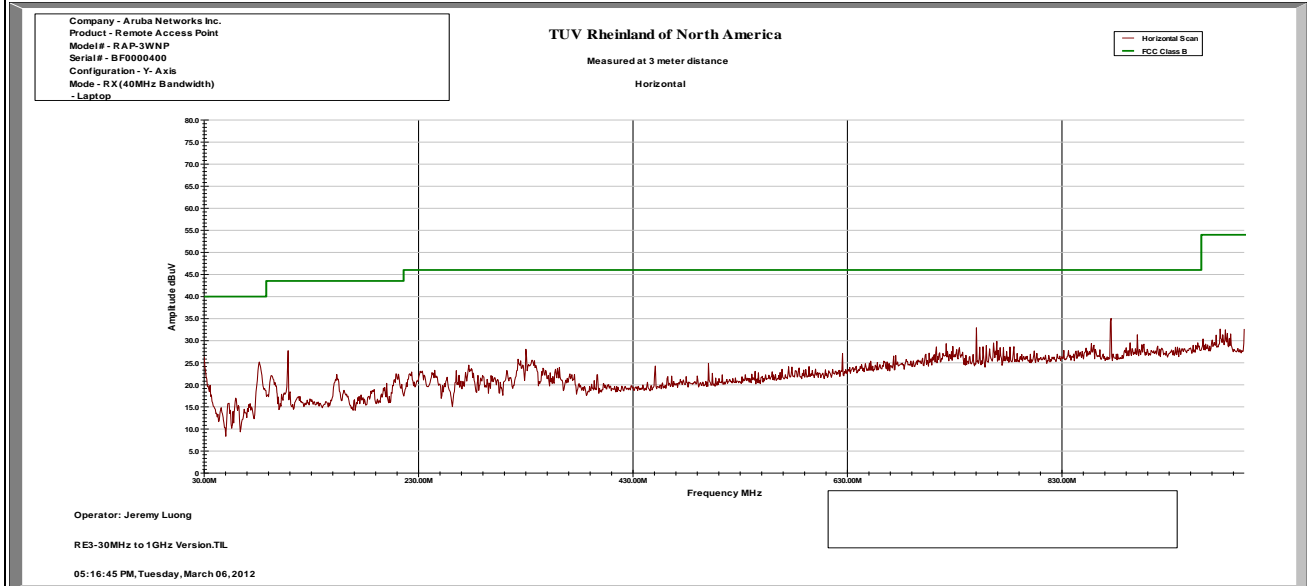
SOP 1 Radiated Emissions				Tracking # 31250477.001 Page 6 of 8						
EUT Name	Wireless Remote Access Point			Date	March 01, 2012					
EUT Model	RAP-3WN and RAP-3WNP			Temp / Hum in	22° C / 34% rh					
EUT Serial	BF0000488			Temp / Hum out	N/A					
EUT Config.	40 MHz BW RX on Y-Axis			Line AC / Freq	120 Vac/60 Hz					
Standard	CFR47 Part 15 Subpart C			RBW / VBW	1 MHz / 3 MHz					
Dist/Ant Used	3m / EMCO3115			Performed by	Jeremy Luong					
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (cm)	Table Pos (Deg)	FIM (Pk) (dBuV/m)	FIM Ave (dBuV/m)	Total CF (dBuV)	E-Field Ave (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)	Type
Transmitted Data at 2437 MHz										
1000.01	H	86	83	45.8	42.23	-9.25	32.98	53.98	-21.00	Spurious
1017.32	H	84	80	49.2	42.27	-9.18	33.09	53.98	-20.89	Spurious
1350.01	H	113	93	41.79	36.97	-7.61	29.36	53.98	-24.62	Spurious
1375.03	H	108	312	42.65	36.85	-7.54	29.31	53.98	-24.67	Spurious
2000	H	97	234	38.7	32.88	-4.74	28.14	53.98	-25.84	Spurious
Spec Margin = E-Field Ave - Limit, E-Field Ave = FIM Ave+ Total CF ± Uncertainty										
Total CF= Amp Gain + Cable Loss + ANT Factor										
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence										
Notes RX mode at 2437 MHz										

SOP 1 Radiated Emissions

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EUT Name	Wireless Remote Access Point	Date	March 6, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23° C / 34% rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	40 MHz BW RX on Y-Axis	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	120 kHz / 300 kHz
Dist/Ant Used	3m / JB3	Performed by	Jeremy Luong

30 MHz to 1000 MHz Plot for Receive Mode at 2437 MHz



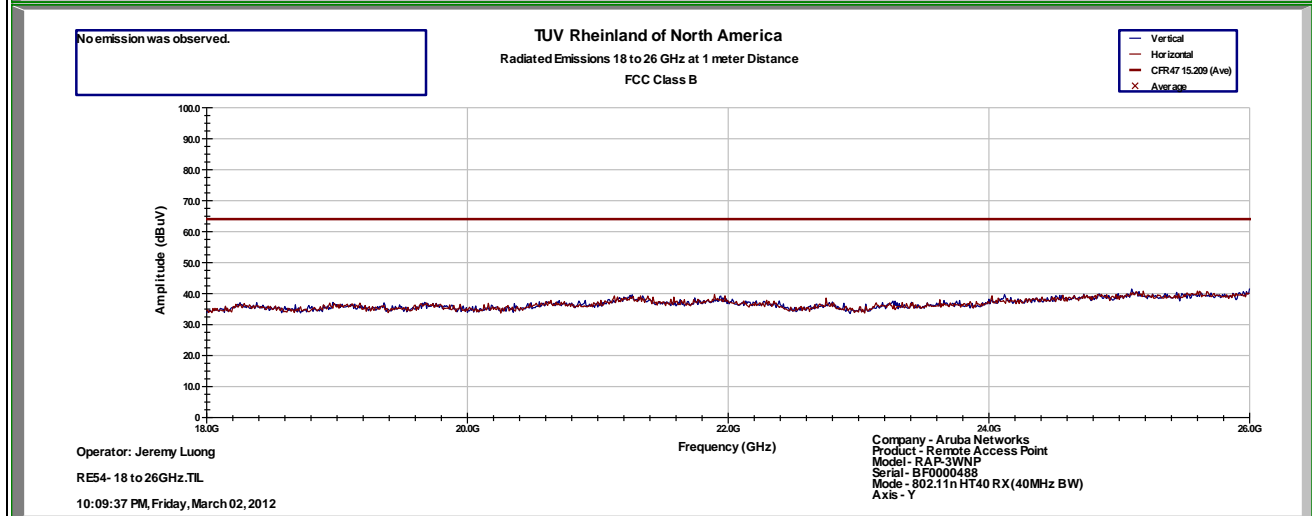
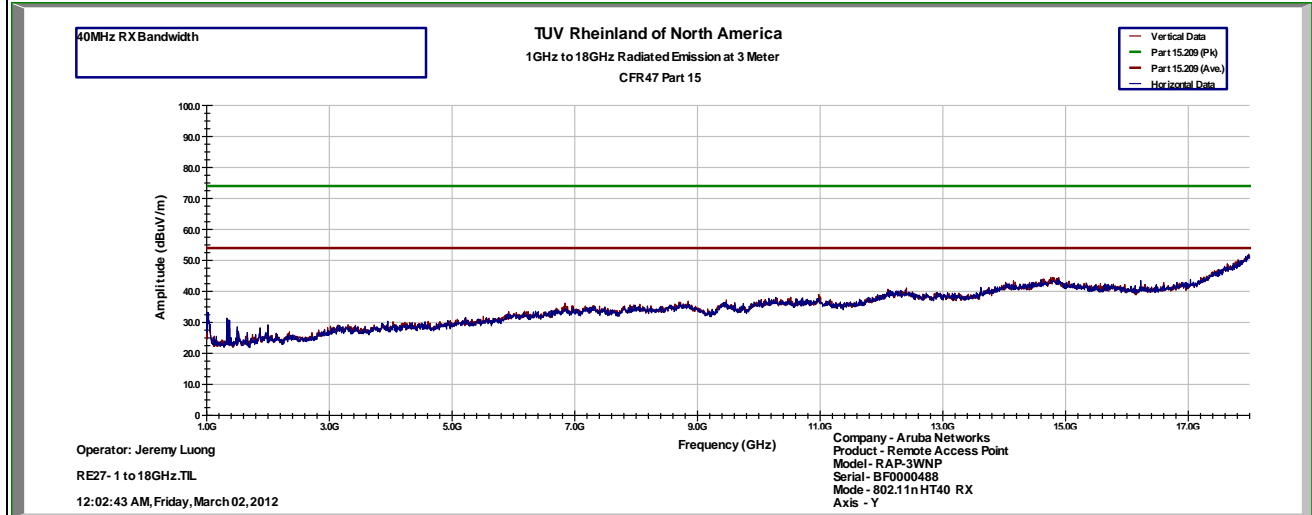
Notes: None.

SOP 1 Radiated Emissions

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EUT Name	Wireless Remote Access Point	Date	March 1, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	23° C / 34% rh
EUT Serial	BF0000488	Temp / Hum out	N/A
EUT Config.	40 MHz BW RX on Y-Axis	Line AC	120 Vac 60 Hz
Standard	CFR47 Part 15 Subpart C	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO3115	Performed by	Jeremy Luong

1 GHz to 25 GHz Plot for Receive Mode at 2437 MHz



Notes: None

4.8 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2003. These test methods are listed under the laboratory's NVLAP Scope of Accreditation.

This test measures the levels emanating from the EUT's AC input port, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

The AC conducted emissions of equipment under test shall not exceed the values in CFR47 Part 15.207: 2010 and RSS 210: 2010.

4.8.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50 μ H / 50 Ω LISNs.

Testing is either performed in Lab 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the semi-anechoic chamber is a 2m x 2m solid aluminum frame and panel, and it is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

4.8.1.1 Deviations

There were no deviations from this test methodology.

4.8.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 8: AC Conducted Emissions – Test Results

Test Conditions: Conducted Measurement at Normal Conditions only		
Antenna Type: Attached	Power Level: +16dBm at 2437 MHz	
AC Power: 120 Vac/60 Hz	Configuration: Tabletop	
Ambient Temperature: 22° C	Relative Humidity: 36% RH	
Configuration	Frequency Range	Test Result
Line 1 (Hot)	0.15 to 30 MHz	Pass
Line 2 (Neutral)	0.15 to 30 MHz	Pass

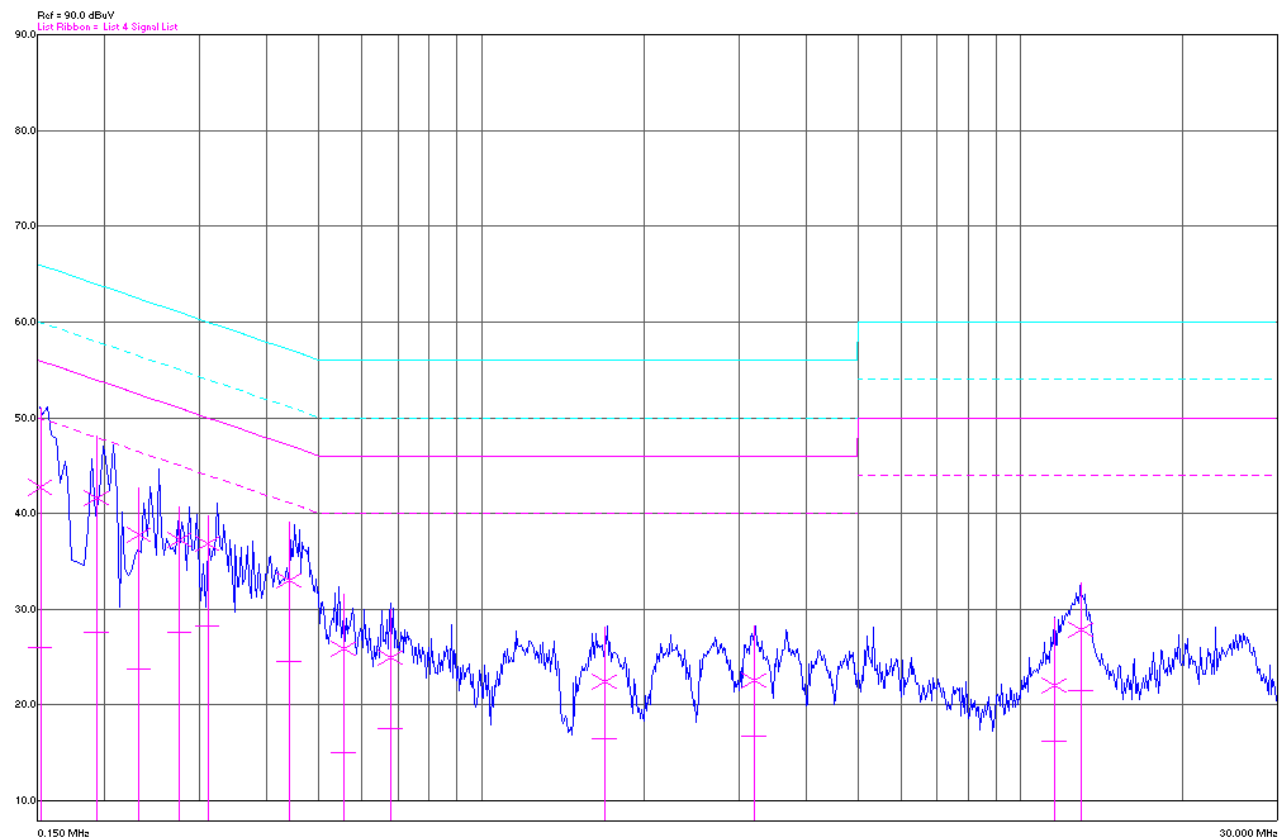
SOP 2 Conducted Emissions				Tracking # 31250477.001 Page 1 of 8		
EUT Name	Wireless Remote Access Point			Date	March 9, 2012	
EUT Model	RAP-3WN and RAP-3WNP			Temp / Hum in	22° C / 38% rh	
EUT Serial	BF0000400			Temp / Hum out	N/A	
EUT Config.	Attached Antenna			Line AC / Freq	120 Vac/60 Hz	
Standard	CFR47 Part 15.207			RBW / VBW	9kHz / 30 kHz	
Lab/LISN	Lab #2 /LI215, Line 1			Performed by	Jeremy Luong	
Frequency MHz	Quasi-Peak dBuV	QP Limit dBuV	QP Margin dB	Average dBuV	Ave Limit dBuV	Ave Margin dB
0.152136	42.73	65.90	-23.17	26.05	55.90	-29.85
0.193558	41.61	63.90	-22.29	27.61	53.90	-26.29
0.231763	37.74	62.43	-24.70	23.70	52.43	-28.73
0.275582	37.30	61.01	-23.72	27.56	51.01	-23.45
0.310708	36.83	59.96	-23.13	28.19	49.96	-21.77
0.440294	33.05	57.12	-24.06	24.50	47.12	-22.62
0.555345	25.83	56.00	-30.17	15.03	46.00	-30.97
0.678973	24.97	56.00	-31.03	17.49	46.00	-28.51
1.694882	22.47	56.00	-33.53	16.52	46.00	-29.48
3.209304	22.52	56.00	-33.48	16.78	46.00	-29.22
11.585907	22.09	60.00	-37.91	16.25	50.00	-33.75
12.968739	27.89	60.00	-32.11	21.55	50.00	-28.45
Spec Margin = QP./Ave. - Limit, ± Uncertainty						
Combined Standard Uncertainty $u_c(y) = \pm 2.4$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence						
Notes: RAP-3WNP Model was tested with 48VDC power adapter.						

SOP 2 Conducted Emissions

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EUT Name	Wireless Remote Access Point	Date	March 9, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	22° C / 38% rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Attached Antenna	Line AC	120 Vac/60 Hz
Standard	CFR47 Part 15.207	RBW / VBW	9kHz / 30 kHz
Lab/LISN	Lab #2 / LI215, Line 1	Performed by	Jeremy Luong

150 kHz to 30 MHz Plot for Line 1 (Hot)



Notes: Meet FCC Class B limit.

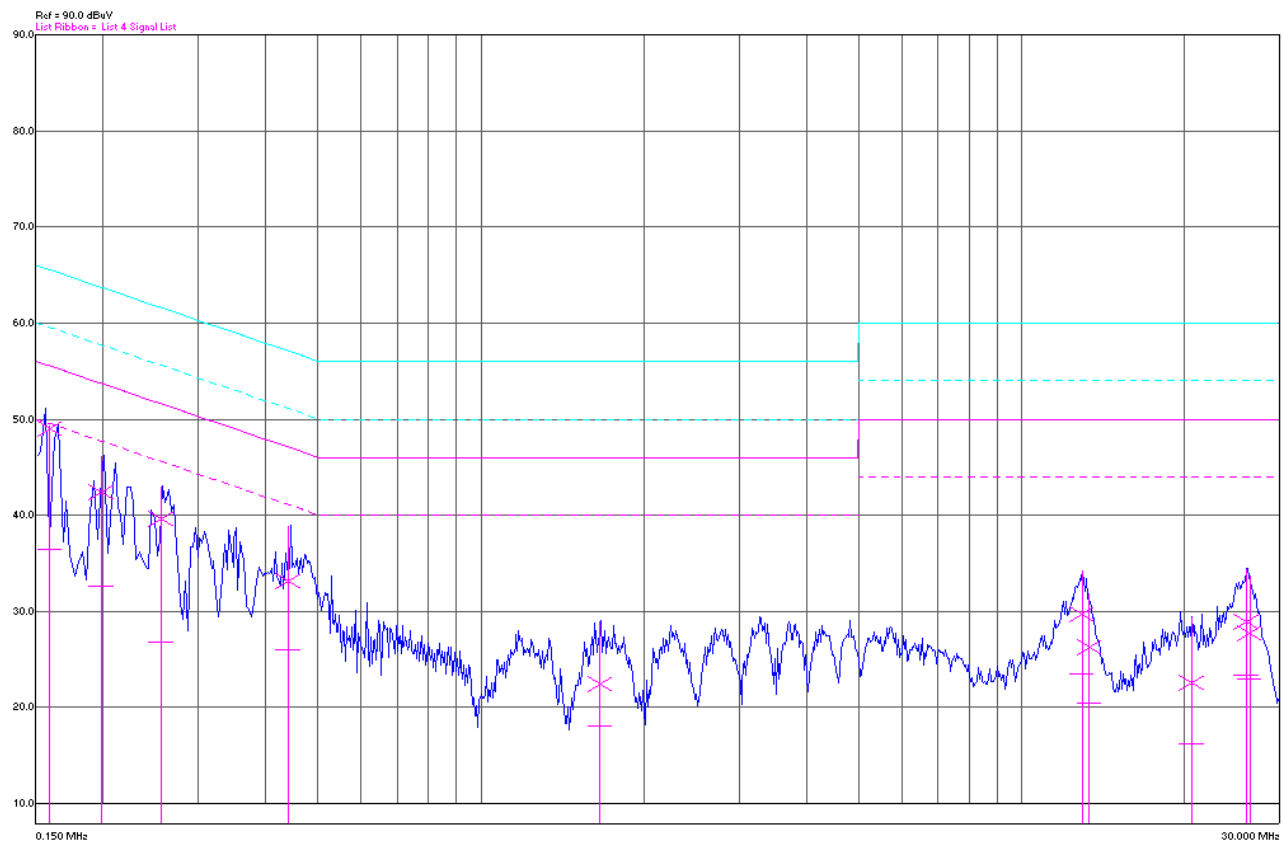
SOP 2 Conducted Emissions				Tracking # 31250477.001 Page 3 of 8		
EUT Name	Wireless Remote Access Point			Date	March 9, 2012	
EUT Model	RAP-3WN and RAP-3WNP			Temp / Hum in	22° C / 38% rh	
EUT Serial	BF0000400			Temp / Hum out	N/A	
EUT Config.	Attached Antenna			Line AC / Freq	120 Vac/60 Hz	
Standard	CFR47 Part 15.207			RBW / VBW	9kHz / 30 kHz	
Lab/LISN	Lab #2 / LI215, Line 2			Performed by	Jeremy Luong	
Frequency	Quasi-Peak	QP Limit	QP Margin	Average	Ave Limit	Ave Margin
MHz	dBuV	dBuV	dB	dBuV	dBuV	dB
0.159458	49.00	65.54	-16.54	36.42	55.54	-19.12
0.198784	42.35	63.70	-21.35	32.67	53.70	-21.04
0.256071	39.61	61.60	-21.99	26.76	51.60	-24.85
0.440964	33.16	57.10	-23.94	25.99	47.10	-21.11
1.662371	22.42	56.00	-33.58	18.00	46.00	-28.00
12.945699	29.73	60.00	-30.27	23.53	50.00	-26.47
13.353057	26.27	60.00	-33.73	20.49	50.00	-29.51
20.620011	22.58	60.00	-37.42	16.19	50.00	-33.81
26.055414	28.88	60.00	-31.12	23.33	50.00	-26.67
26.428511	27.74	60.00	-32.26	22.91	50.00	-27.09
Spec Margin = QP./Ave. - Limit, ± Uncertainty						
Combined Standard Uncertainty $u_c(y) = \pm 2.4$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence						
Notes: RAP-3WNP Model was tested with 48VDC power adapter.						

SOP 2 Conducted Emissions

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EUT Name	Wireless Remote Access Point	Date	March 9, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	22° C / 38% rh
EUT Serial	BF0000400	Temp / Hum out	N/A
EUT Config.	Attached Antenna	Line AC	120 Vac/60 Hz
Standard	CFR47 Part 15.207	RBW / VBW	9kHz / 30 kHz
Lab/LISN	Lab #2/ LI215, Line 2	Performed by	Jeremy Luong

150 kHz to 30 MHz Plot for Line 2 (Neutral)



Note: Meet FCC Class B Limit.

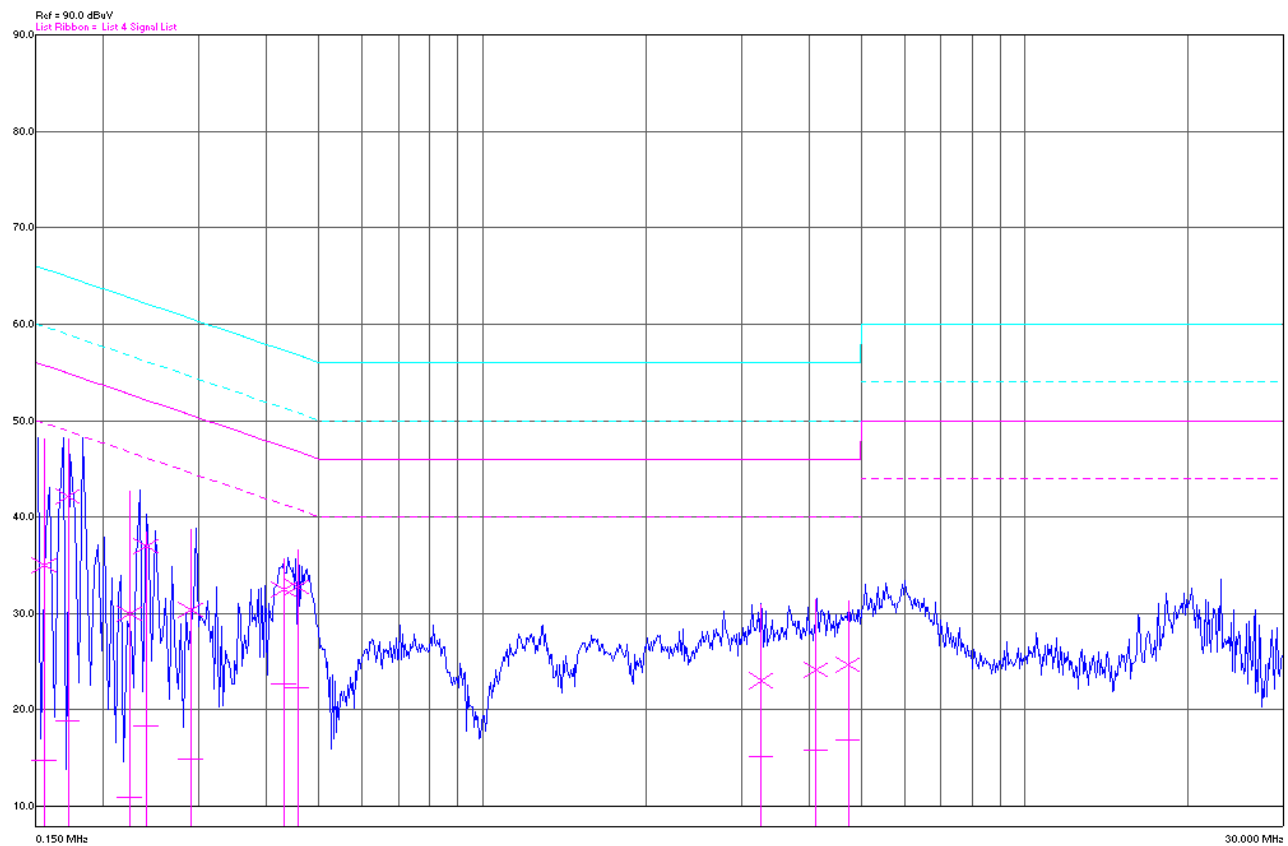
SOP 2 Conducted Emissions				Tracking # 31250477.001 Page 5 of 8		
EUT Name	Wireless Remote Access Point			Date	March 9, 2012	
EUT Model	RAP-3WN and RAP-3WNP			Temp / Hum in	22° C / 38% rh	
EUT Serial	BF0000368			Temp / Hum out	N/A	
EUT Config.	Attached Antenna			Line AC / Freq	120 Vac/60 Hz	
Standard	CFR47 Part 15.207			RBW / VBW	9kHz / 30 kHz	
Lab/LISN	Lab #2 /L215, Line 1			Performed by	Jeremy Luong	
Frequency	Quasi-Peak	QP Limit	QP Margin	Average	Ave Limit	Ave Margin
MHz	dBuV	dBuV	dB	dBuV	dBuV	dB
0.155874	35.04	65.71	-30.67	14.79	55.71	-40.93
0.172301	42.13	64.91	-22.78	18.82	54.91	-36.09
0.224081	29.93	62.73	-32.80	10.99	52.73	-41.74
0.240283	37.00	62.10	-25.10	18.29	52.10	-33.82
0.290563	30.33	60.56	-30.23	14.85	50.56	-35.71
0.431122	32.52	57.29	-24.77	22.64	47.29	-24.64
0.456224	32.79	56.82	-24.03	22.28	46.82	-24.54
3.267977	23.02	56.00	-32.98	15.13	46.00	-30.87
4.123235	24.12	56.00	-31.88	15.76	46.00	-30.24
4.726856	24.72	56.00	-31.28	16.86	46.00	-29.14
Spec Margin = QP./Ave. - Limit, ± Uncertainty						
Combined Standard Uncertainty $u_c(y) = \pm 2.4$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence						
Notes: RAP-3WN Model was tested with 12VDC power adapter.						

SOP 2 Conducted Emissions

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EUT Name	Wireless Remote Access Point	Date	March 9, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	22° C / 38% rh
EUT Serial	BF0000368	Temp / Hum out	N/A
EUT Config.	Attached Antenna	Line AC	120 Vac/60 Hz
Standard	CFR47 Part 15.207	RBW / VBW	9kHz / 30 kHz
Lab/LISN	Lab #2 / LI215, Line 1	Performed by	Jeremy Luong

150 kHz to 30 MHz Plot for Line 1 (Hot)



Notes: Meet FCC Class B limit.

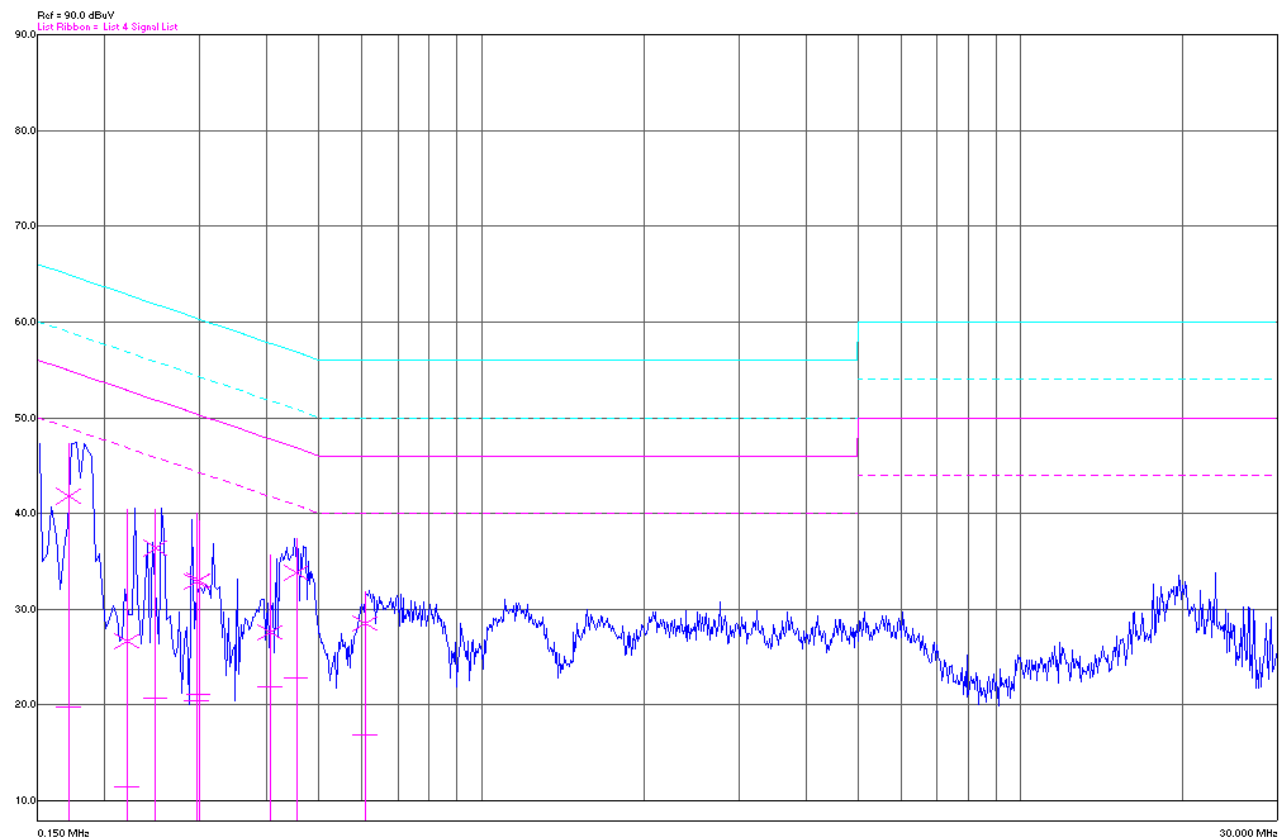
SOP 2 Conducted Emissions				Tracking # 31250477.001 Page 7 of 8		
EUT Name	Wireless Remote Access Point			Date	March 9, 2012	
EUT Model	RAP-3WN and RAP-3WNP			Temp / Hum in	22° C / 38% rh	
EUT Serial	BF0000368			Temp / Hum out	N/A	
EUT Config.	Attached Antenna			Line AC / Freq	120 Vac/60 Hz	
Standard	CFR47 Part 15.207			RBW / VBW	9kHz / 30 kHz	
Lab/LISN	Lab #2 / LI215, Line 2			Performed by	Jeremy Luong	
Frequency	Quasi-Peak	QP Limit	QP Margin	Average	Ave Limit	Ave Margin
MHz	dBuV	dBuV	dB	dBuV	dBuV	dB
0.171512	41.80	64.95	-23.15	19.77	54.95	-35.18
0.220084	26.65	62.88	-36.23	11.41	52.88	-41.47
0.248583	36.38	61.83	-25.45	20.67	51.83	-31.16
0.296610	32.90	60.38	-27.47	20.49	50.38	-29.89
0.299297	33.01	60.29	-27.29	21.12	50.29	-29.17
0.406234	27.61	57.75	-30.14	21.91	47.75	-25.84
0.454035	33.82	56.86	-23.04	22.78	46.86	-24.08
0.609027	28.49	56.00	-27.51	16.90	46.00	-29.10
Spec Margin = QP./Ave. - Limit, ± Uncertainty						
Combined Standard Uncertainty $u_c(y) = \pm 2.4$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence						
Notes: RAP-3WN Model was tested with 12VDC power adapter.						

SOP 2 Conducted Emissions

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EUT Name	Wireless Remote Access Point	Date	March 9, 2012
EUT Model	RAP-3WN and RAP-3WNP	Temp / Hum in	22° C / 38% rh
EUT Serial	BF0000368	Temp / Hum out	N/A
EUT Config.	Attached Antenna	Line AC	120 Vac/60 Hz
Standard	CFR47 Part 15.207	RBW / VBW	9kHz / 30 kHz
Lab/LISN	Lab #2/ LI215, Line 2	Performed by	Jeremy Luong

150 kHz to 30 MHz Plot for Line 2 (Neutral)



Note: Meet FCC Class B Limit.

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
Bilog Antenna	Sunol Science	JB3	A061907	5/14/2010	5/14/2012
Horn Antenna	Sunol Sciences	DRH-118	A040806	9/29/2010	9/29/2012
Horn Antenna	EMCO	3115	9602-4676	8/10/2011	8/10/2012
EMI Receiver	Hewlett Packard	8546A	3807A00445	1/17/2012	1/17/2013
Preselector	Hewlett Packard	85460A	3704A00407	1/17/2012	1/17/2013
Amplifier	Hewlett Packard	8447D	2944A07996	1/16/2012	1/16/2013
Spectrum Analyzer	Rhode & Schwarz	ESIB	832427/002	1/17/2012	1/17/2013
1-18 GHz Amplifier	Rhode & Schwarz	TS-PR18	3545.7008.03	9/29/2010	9/29/2012
18- 26 GHz Pre-amp	Rhode & Schwarz	TS-PR26	100011	11/14/2011	11/14/2012
Signal Generator	Anritsu	MG3694A	42803	1/17/2012	1/17/2013
Notch Filter	Micro-Tronics	BRM50702	37	1/16/2012	1/16/2013
High Pass Filter (3.5 GHz)	Hewlett Packard	84300-80038	820004	1/16/2012	1/16/2013
High Pass Filter (8.5 GHz)	Micro-Tronics	HPM50107	4	1/16/2012	1/16/2013
Power Supplier	Kikusui	PCR8000W	CM000912	1/17/2012	1/17/2013
Digital Multimeter	Fluke	177	92780314	1/16/2012	1/16/2013
Power Meter	Agilent	E4418B	MY45103902	1/19/2012	1/19/2013
Power Sensor	Hewlett Packard	8482A	55-5131	1/19/2012	1/19/2013
EMI Receiver	Agilent	N9038A	MY512101195	2/6/2012	2/6/2013
LISN	Compower	LI215	12111	1/19/2012	1/19/2013

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

6 EMC Test Plan

6.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

6.2 Customer

Table 9: Customer Information

Company Name	Aruba Networks
Address	1344 Crossman Avenue
City, State, Zip	Sunnyvale, CA 94089
Country	USA
Phone	(408) 227 4500
Fax	(408) 227 4550

Table 10: Technical Contact Information

Name	Ivaylo Tankov
E-mail	itankov@arubanetworks.com
Phone	(408) 227 4500
Fax	(408) 227 4550

6.3 Equipment Under Test (EUT)

Table 11: EUT Specifications

EUT Specification	
Dimensions	129mm x 109mm x 64mm (12.9" x 10.9" x 6.4")
RAP-3WN AC Adapter (M/N: SYS1357-1812) (S/N: G110306097951)	Input Voltage: 100 – 240 Vac, 50 - 60 Hz Input Current: 1.0 A Max Output Voltage: 12 Vdc Output Current: 1.5 A
RAP-3WNP AC Adapter (M/N: LTE36E-5S-1) (S/N: 120200074)	Input Voltage: 100 – 240 Vac, 47 - 63 Hz Input Current: 0.75 A Max Output Voltage: 48 Vdc Output Current: 0.75 A
Environment	Indoor
Operating Temperature Range:	0 to 40 degrees C
Multiple Feeds:	<input type="checkbox"/> Yes and how many <input checked="" type="checkbox"/> No
Hardware Version	Rev. 1.03 N01
Part Number	NI2077041000E
RF Software Version	N.A
Operating Mode	802.11b, g, HT20, and HT40
Transmitter Frequency Band	2.412 GHz to 2.462 GHz (DSSS)
Max. Rated Power Output	See Channel Power Table.
Power Setting @ Operating Channel	See Channel Power Table.
Antenna Type	Attached Omni-directional antenna; LYNwave P/N: ALA100-051022.
Modulation Type	<input type="checkbox"/> AM <input type="checkbox"/> FM <input checked="" type="checkbox"/> DSSS <input checked="" type="checkbox"/> OFDM <input type="checkbox"/> Other describe:
Data Rate	802.11b: 1, 2, 5.5, 11 Mbps at 1 Spatial Stream 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps at 1 Spatial Stream 802.11n HT20: 1 Spatial Stream: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps 2 Spatial Streams: 13, 26, 39, 58, 78, 104, 117, 130 Mbps 802.11n HT40: 1 Spatial Stream: 13.5, 27, 40.5, 54, 81, 108, 121.5, 135 Mbps 2 Spatial Streams: 27, 54, 81, 108, 162, 216, 243, 270 Mbps
TX/RX Chain (s)	MIMO (2x2)

Directional Gain Type	<input checked="" type="checkbox"/> Correlated <input checked="" type="checkbox"/> Beam-Forming <input type="checkbox"/> Other describe:
Type of Equipment	<input checked="" type="checkbox"/> Table Top <input type="checkbox"/> Wall-mount <input type="checkbox"/> Floor standing cabinet <input type="checkbox"/> Other <i>describe</i>

Table 12: Final Channel Power Specifications

No.	Freq (MHz)	Target Power Value (dBm)							
		802.11b		802.11g		802.11n HT20		802.11n HT40	
		1 Stream	2 Stream	1 Stream	2 Stream	1 Stream	2 Stream	1 Stream	2 Stream
1	2412	15.5	15.0	9.5	10.0	8.0	8.0	6.0	6.0
6	2437	14.0	15.5	15.0	16.0	17.0	18.0	9.0	9.0
11	2462	15.0	15.0	9.0	8.5	8.0	8.0	7.0	7.0

Note: The above power level are setting inside the ArtGUI Program.

Table 13: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
Ethernet	Terminated	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Metric: 30m	<input checked="" type="checkbox"/> M
Ethernet (x2)	Unterminated	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Metric: 30m	<input checked="" type="checkbox"/> M
USB	Unterminated	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Metric: 2.8 m	<input checked="" type="checkbox"/> M

Table 14: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	IBM Computer	Type 2647	78-G2YT3	Set test mode

Table 15: Description of Sample used for Testing

Device	Serial Number	Configuration	Used For
RAP-3WN and RAP-3WNP	BF0000400, BF0000488, BF0000368	Radiated Sample	Radiated Emission. AC Conducted Emission
RAP-3WN and RAP-3WNP	BF0000400	Conducted Sample	Output Power, Occupied Bandwidth, Conducted Spurious Emission, Peak Power Spectral Density

Note: None

Table 16: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Description
RAP-3WN and RAP-3WNP	Attached	Transmit & Receive	Tabletop. RAP-3WN and RAP-3WNP positioned horizontally.
RAP-3WN and RAP-3WNP	Attached	Transmit & Receive	Tabletop. RAP-3WN and RAP-3WNP positioned vertically.

Note: Test configuration was used in the preliminary testing for determining the worst orientation and data rates in each mode.

Table 17: Final Test Mode for 2400 MHz to 2483.5 MHz Band

Test	802.11b	802.11g	802.11n HT20	802.11n HT40
Occupied Bandwidth	2412, 2437, 2462 MHz @ 1Mbps	2412, 2437, 2462 MHz @ 6Mbps	2412, 2437, 2462 MHz @ 1 Stream – 6.5Mbps	2422, 2437, 2452 MHz @ 1 Stream – 13.5Mbps
Output Power	2412, 2437, 2462 MHz @ 1Mbps	2412, 2437, 2462 MHz @ 6Mbps	2412, 2437, 2462 MHz @ 1 Stream – 6.5Mbps 2 Streams – 13Mbps	2422, 2437, 2452 MHz @ 1 Stream – 13.5Mbps 2 Streams – 27Mbps
Peak Power Spectral Density	2412, 2437, 2462 MHz @ 1Mbps	2412, 2437, 2462 MHz @ 6Mbps	2412, 2437, 2462 MHz @ 1 Stream – 6.5Mbps 2 Streams – 13Mbps	2422, 2437, 2452 MHz @ 1 Stream – 13.5Mbps 2 Streams – 27Mbps
Out-of-Band (-30 dBr)	2412, 2437, 2462 MHz @ 1Mbps	2412, 2437, 2462 MHz @ 6Mbps	2412, 2437, 2462 MHz @ 1 Stream – 6.5Mbps	2422, 2437, 2452 MHz @ 1 Stream – 13.5Mbps
Band-Edge (Radiated)	2412, 2417, 2437, 2457, 2462 MHz @ 1Mbps	2412, 2417, 2437, 2457, 2462 MHz @ 6Mbps	2412, 2417, 2437, 2457, 2462 MHz @ 1 Stream – 6.5Mbps 2412, 2437, 2462 MHz @ 2 Streams – 13Mbps	2422, 2437, 2452 MHz @ 1 Stream – 13.5Mbps 2 Streams – 27Mbps
Transmitted Spurious Emission	2412, 2437, 2462 MHz @ 1Mbps	2412, 2437, 2462 MHz @ 6Mbps	2412, 2437, 2462 MHz @ 1 Stream – 6.5Mbps	2437 MHz @ 2 Stream – 27Mbps
Received Spurious Emission	2437 MHz in 802.11b and 802.11n HT40			
AC Conducted Emission	2437 MHz @ 1Mbps			
Note:	1. All tests were pre-scanned for worst case before final testing. 2. All radiated emission performed on Y-Axis (Vertical Position) 3. Receive Mode was tested with the transmitter stopped.			

6.4 Test Specifications

Testing requirements

Table 18: Test Specifications

Emissions and Immunity	
Standard	Requirement
CFR 47 Part 15.247: 2010	All
RSS 210 Iss. 8 2010	All

END OF REPORT