Emissions
Test Report

EUT Name: WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module

Model No.: EW5270UM

CFR 47 Part 15.247: 2015 and RSS 210: 2010

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	05/21/2015	Original Document	N/A

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	Varian Medical System, Inc. 1678 Pioneer Road Salt Lake City, UT 84104 (801) 978-5759
Requester / Applicant:	Maryann Mitchell
Name of Equipment:	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module
Model No.	EW5270UM
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247: 2015 and RSS 210: 2010
Test Dates:	30 Mar 2015 to 04 May 2015

Guidance Documents:

Emissions: ANSI C63.10-2009, KDB 558074 D01 DTS Measurement Guidance v03r02, KDB 662911 D01 Multiple Transmitter Output v02r01

Test Methods:

Emissions: ANSI C63.10-2009, KDB 558074 D01 DTS Measurement Guidance v03r02, KDB 662911 D01 Multiple Transmitter Output v02r01

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.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Kerwinn Corpuz		David Spencer	
Test Engineer	Date May 21, 2015	A2LA Signatory	Date May 21, 2015

Testing Cert #3331.02 **US5254** **2932M-1**

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: 2015 and RSS 210: 2010 based on the results of testing performed on 30 Mar 2015 to 04 May 2015 on the WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module Model EW5270UM manufactured by Varian Medical System, Inc. 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. The 2412 MHz to 2462 MHz frequency band is covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.4	Test Parameters (Measured)	Result
Spurious Emission in Transmitted Mode	CFR47 15.209, RSS-GEN Sect.8.9	Class B	**Complied**
Restricted Bands of Operation	CFR47 15.205, RSS 210 Sect.8.10	Class B	**Complied**
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	Class B	**Complied**
Occupied Bandwidth	CFR47 15.247 (a1), RSS GEN Sect.6.6	See plots	**Complied**
Maximum Output Power	CFR47 15.247 (b), RSS 210 Sect. A.8.1	20.41 dBm (802.11b) 14.91 dBm (802.11g) 17.72 dBm (HT 20) 17.67 dBm (HT 40)	**Complied**
Peak Power Spectral Density	CFR47 15.247 (e), RSS 210 Sect. A.8.2	< 8 dBm/3kHz	**Complied**
Out of Band Emission	CFR47 15.247 (d), RSS 210 Sect.A8.5	30 MHz - 40 GHz < 30 dBm/MHz	**Complied**
RF Exposure	CFR47 15.247 (i), 2.1093	General Population	**Complied**

Note: This test report covers 2400 MHz to 2483.5 MHz band.

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 Ln, Pleasanton, CA 94566 is recognized 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 (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 / A2LA

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 17025:1999 and ISO 9002 (Lab Code Testing Cert #3331.02). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 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). 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 Ln, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0031

VCCI Registration No. for Santa Clara: A-0032

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 Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, 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 C63.4-2009, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). 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 C63.4-2009, at a test distance of 3 meter 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-kΩ 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-kΩ 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.

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:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

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

Sample radiated emissions calculation @ 30 MHz

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

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB

Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is ± 5.0%.	Per CISPR 16-4-2 Methods

1.1.1 Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is ± 8.2%.	Per IEC 61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated combined standard uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity is ± 2.9%.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for surge immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 1.74%.

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 Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Model EW5270UM, WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module, a radio module that can be installed into Digital Image Receptor, Model 4336Wv4. This Wi-Fi radio module is a USB type accessory designed to be installed into Digital Image Receptor.

3.2 Equipment Configuration

A description of the equipment configuration is given in the 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.

3.3 Operating Mode

A description of the operation mode is given in the 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 WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module has two U.FL antenna connectors that will be connected to Patch antennas. The Patch antenna maximum directional gain is – 6 dBi (2.4 GHz). The maximum beam forming gain is – 3 dBi (2.4 GHz). There is no additional antenna available.

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2015 and RSS 210 Annex 8: 2010. These test methods are listed under the laboratory's A2LA 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 section 8 of the standard were used.

4.1 Output Power Requirements

The maximum 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 (b):2015 and RSS 210 A8.4: 2010.

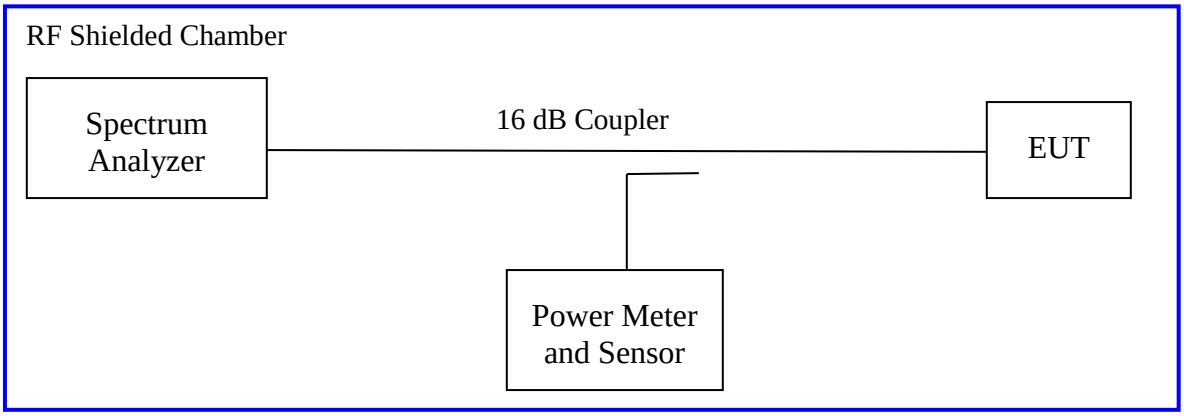
The maximum transmitted powers are

Band 2400-2483.5 MHz: 1 W

4.1.1 Test Method

The ANSI C63.10-2009 Section 6.10.3.1. conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate/ chain to determine the highest power output for each mode. The worst findings were conducted on 3 channels in each operating range per CFR47 Part 15.247(b): 2015 and RSS 210 A.8.4; 2400 MHz to 2483.5 MHz. The worst mode results indicated below.

Test Setup:



Method AVGSA-1 of "KDB 558074 – DTS Measurement Guidance v03r02" applies since the EUT continuously transmits with duty cycle greater than 98%. Sample detector was used.

Each chain was measured individually and applied the measure-and-sum approach per KDB662911.

4.1.2 Results

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

Table 2: RF Output Power at the Antenna Port – Test Results

Test Conditions: Conducted Measurement, Normal Temperature					
Antenna Type: Patch			**Power Setting:** See test plan		
Max. Directional Gain: - 6 dBi (2.4 GHz)					
Beam Forming Gain: - 3 dBi (2.4 GHz)					
Signal State: Modulated at 100%.					
Ambient Temp.: 24° C			**Relative Humidity:**39%		
802.11b					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max Power [dBm]**	**Margin [dB]**
2412.00	30.00	20.11	20.41	20.41	-9.59
2437.00	30.00	20.23	20.06	20.23	-9.77
2462.00	30.00	19.96	19.67	19.96	-10.04
Note: 1.The highest output power was observed at 802.11b mode, 1.0 Mbps, 1 Data Streams. 2. Plots for all the measurements stated above were taken, to reduce complexity and bulkiness of the report Highlighted Plots are placed in the report.					
802.11g					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max Power [dBm]**	**Margin [dB]**
2412.00	30.00	14.87	14.82	14.87	-15.13
2437.00	30.00	14.91	14.81	14.91	-15.09
2462.00	30.00	14.84	14.48	14.84	-15.16
Note: 1.The highest output power was observed at 802.11g mode, 6.0 Mbps, 1 Data Streams. 2. Plots for all the measurements stated above were taken, to reduce complexity and bulkiness of the report Highlighted Plots are placed in the report.					

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

Test Conditions: Conducted Measurement, Normal Temperature					
Antenna Type: Patch			**Power Setting:** See test plan		
Max. Directional Gain: - 6 dBi (2.4 GHz)					
Beam Forming Gain: - 3 dBi (2.4 GHz)					
Signal State: Modulated at 100%.					
Ambient Temp.: 24° C			**Relative Humidity:**39%		
802.11n Mode					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max Power [dBm]**	**Margin [dB]**
2412.00	30.00	15.38	15.18	15.38	-14.62
2437.00	30.00	15.02	14.61	15.02	-14.98
2462.00	30.00	14.66	14.27	14.66	-15.34
Note: The highest output power was observed at HT20 MCS0, 1 Data Streams.					
802.11n 2x2 Mode					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
2412.00	30.00	14.42	14.98	17.72	-12.28
2437.00	30.00	14.31	14.25	17.29	-12.71
2462.00	30.00	14.2	14.3	17.26	-12.74
Note: 1. The highest output power was observed at HT20 MCS8, 2 Data Streams. 2. Beam forming antenna gain is less than 6 dBi, therefore no adjustment to power limit. 3. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911.					

Table 4: RF Output Power at the Antenna Port – Test Results

Test Conditions: Conducted Measurement, Normal Temperature					
Antenna Type: Patch			**Power Setting:** See test plan		
Max. Directional Gain: - 6 dBi (2.4 GHz)					
Beam Forming Gain: - 3 dBi (2.4 GHz)					
Signal State: Modulated at 100%.					
Ambient Temp.: 24° C			**Relative Humidity:**39%		
802.11n Mode					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max Power [dBm]**	**Margin [dB]**
2422.00	30.00	14.61	14.09	14.61	-15.39
2432.00	30.00	14.38	14.12	14.38	-15.62
2452.00	30.00	14.03	13.89	14.03	-15.97
Note: The highest output power was observed at HT40 MCS0, 1 Data Streams.					
802.11n 2x2 Mode					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
2422.00	30.00	13.67	14.31	17.01	-12.99
2432.00	30.00	14.85	14.47	17.67	-12.33
2452.00	30.00	13.74	14.45	17.12	-12.88
Note: 1. The highest output power was observed at HT40 MCS8, 2 Data Streams. 2. Beam forming antenna gain is less than 6 dBi, therefore no adjustment to power limit. 3. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911.					

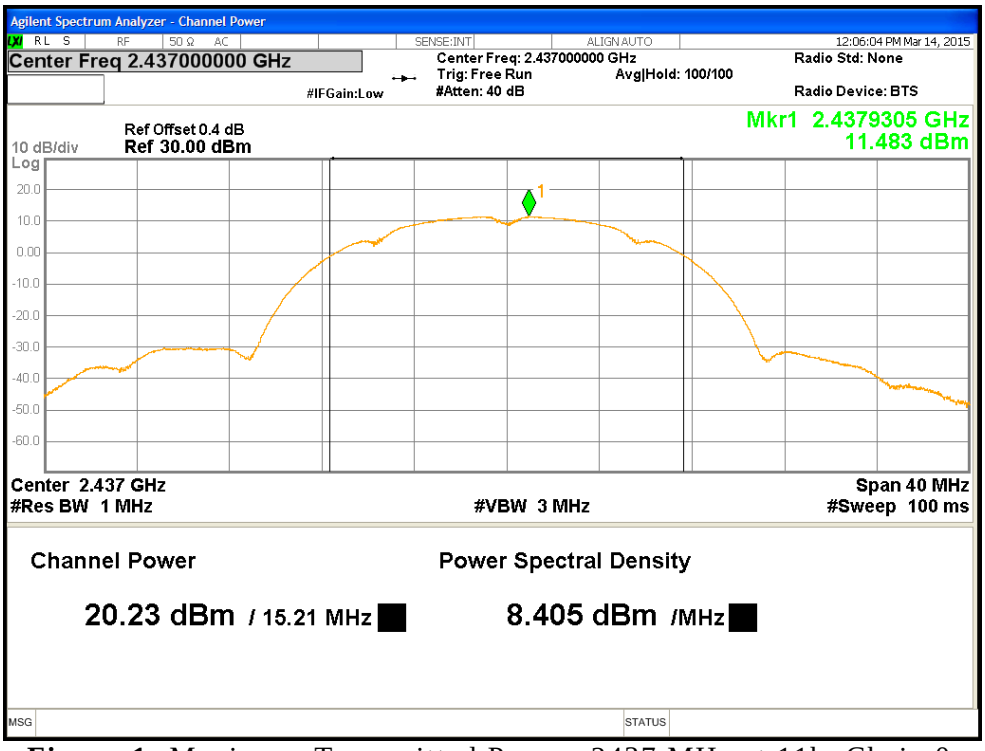


Figure 1: Maximum Transmitted Power, 2437 MHz at 11b, Chain 0

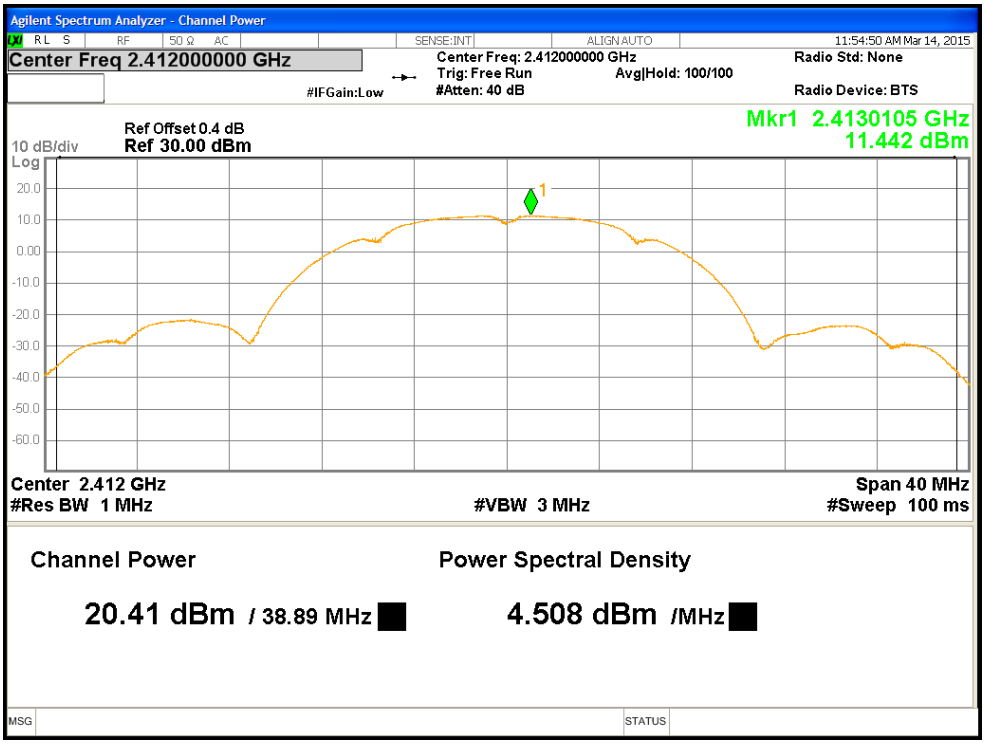


Figure 2: Maximum Transmitted Power, 2412 MHz at 11b, Chain 1

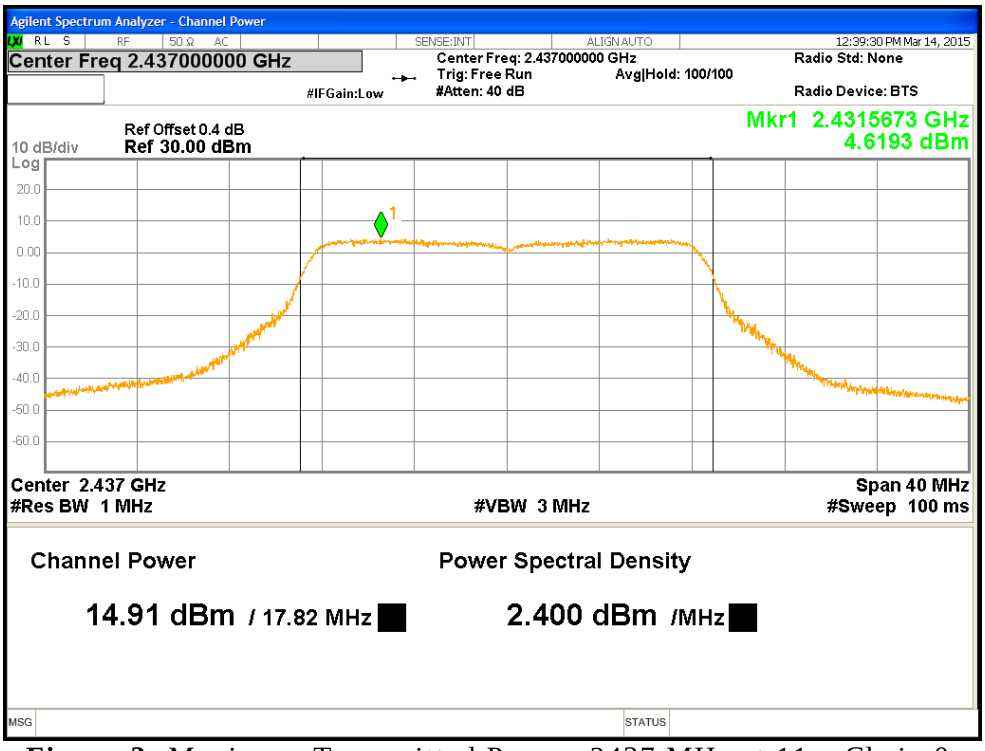


Figure 3: Maximum Transmitted Power, 2437 MHz at 11g, Chain 0

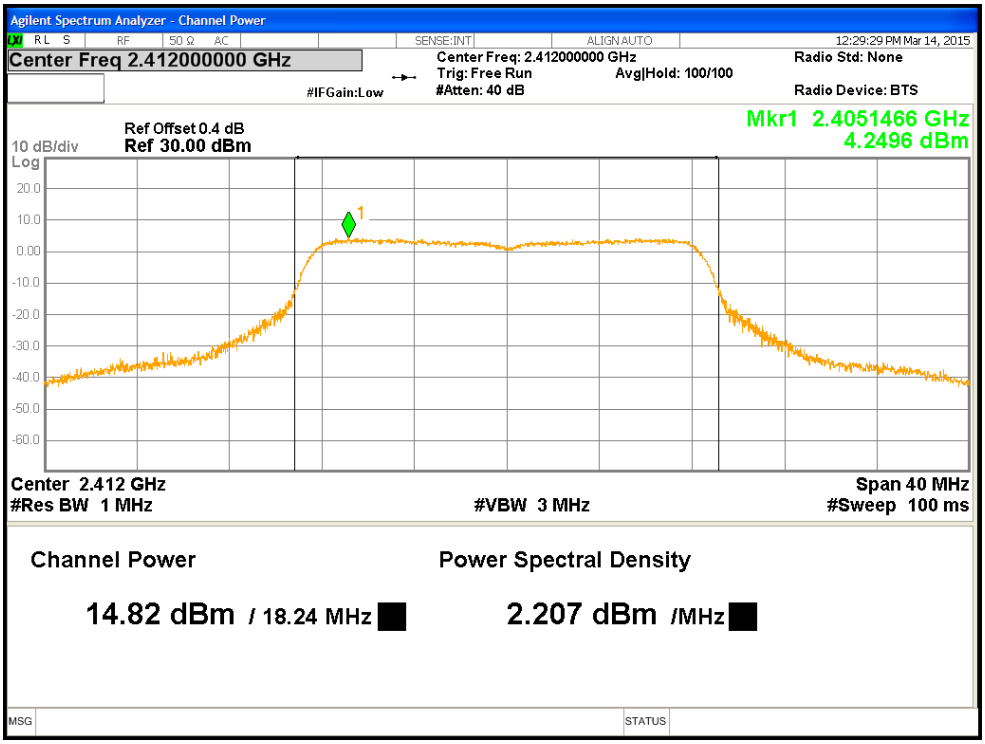


Figure 4: Maximum Transmitted Power, 2412 MHz at 11g, Chain 1

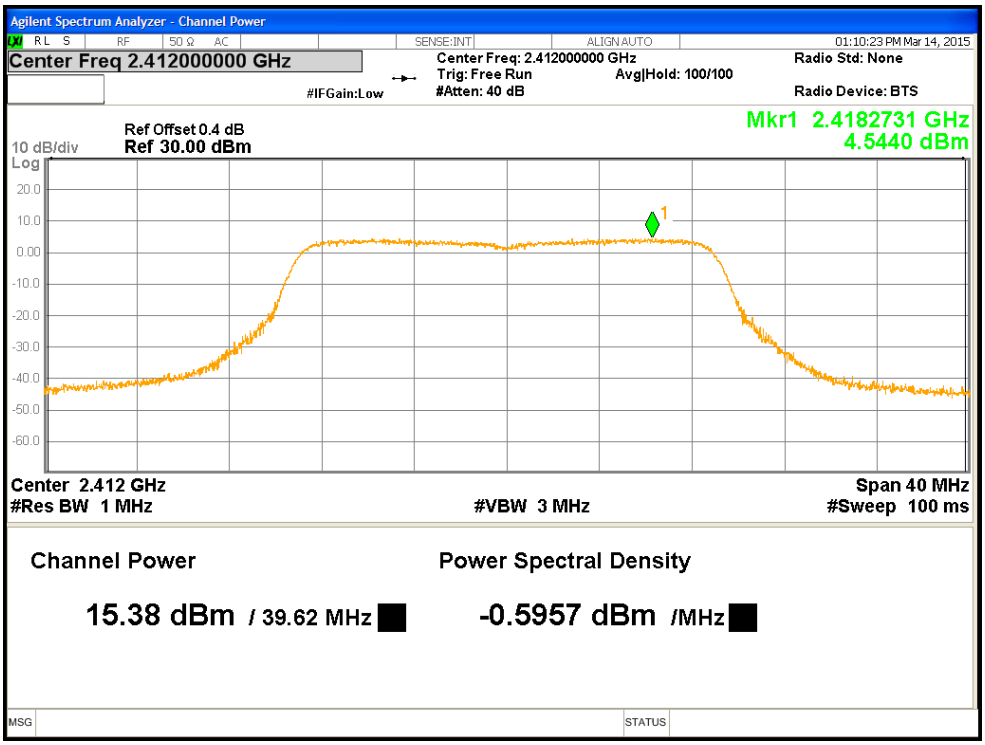


Figure 5: Maximum Transmitted Power, 2412 MHz at HT20 MCS0, Chain 0

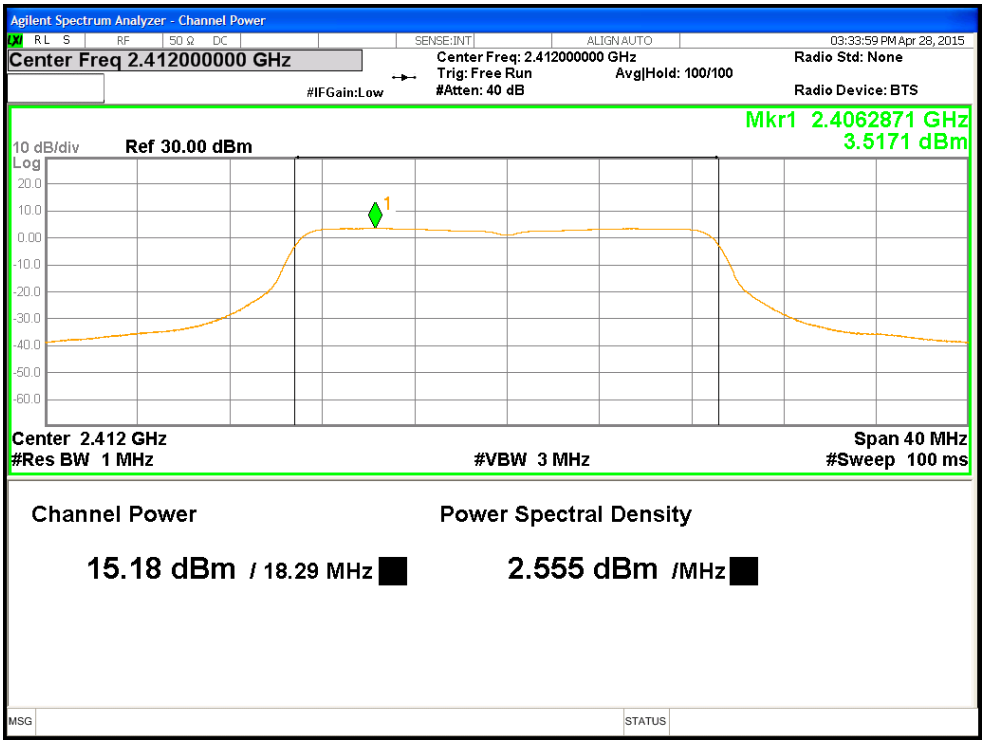


Figure 6: Maximum Transmitted Power, 2412 MHz at HT20 MCS0, Chain 1

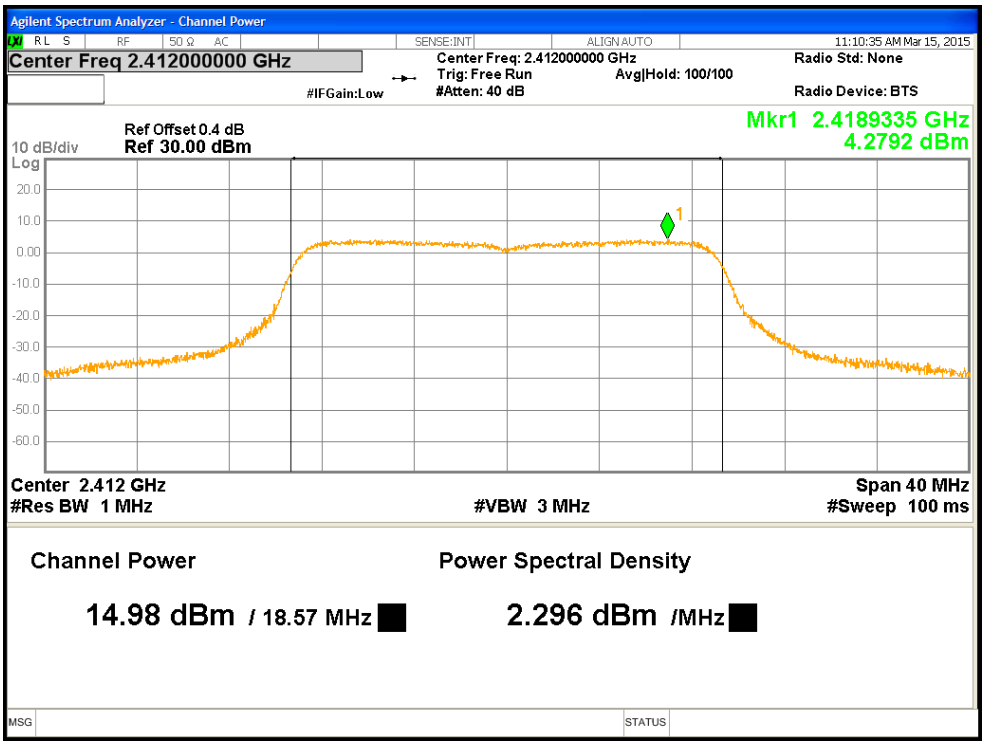


Figure 7: Maximum Transmitted Power, 2412 MHz at HT20 MCS8, Chain 0

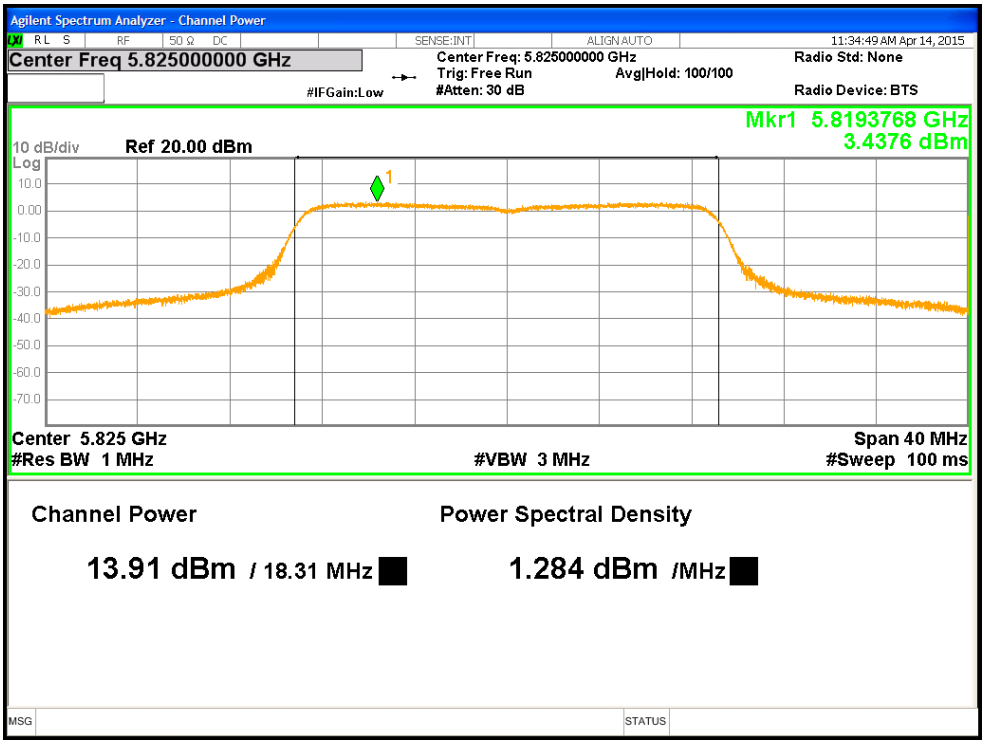


Figure 8: Maximum Transmitted Power, 5825 MHz at HT20 MCS8, Chain 0

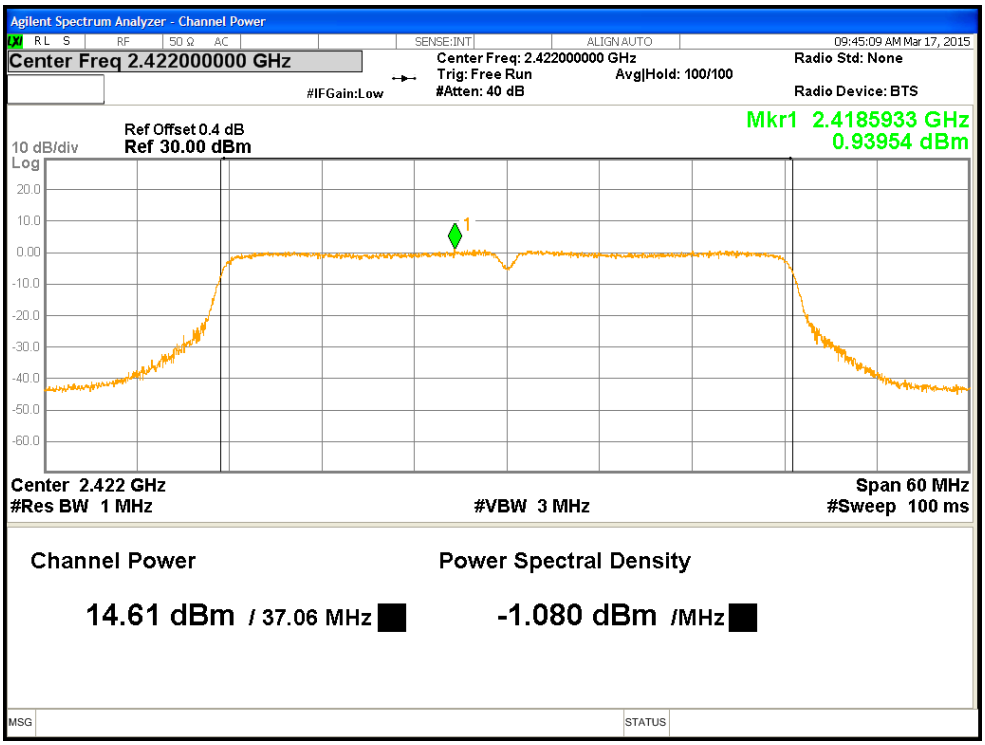


Figure 9: Maximum Transmitted Power, 2422 MHz at HT40 MCS0, Chain 0

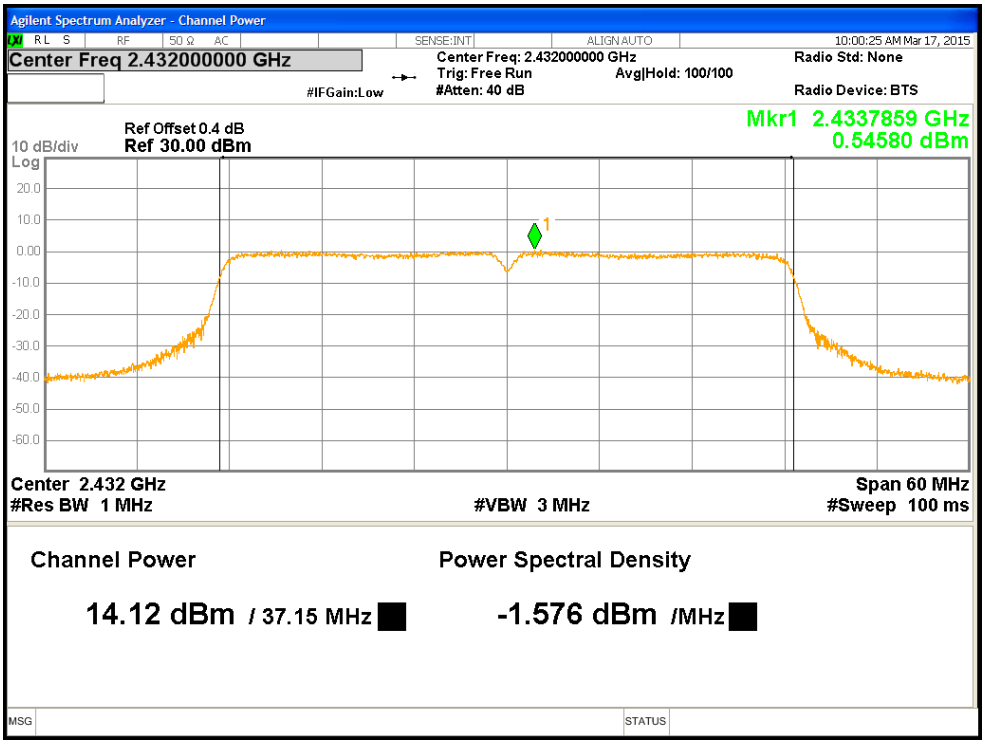


Figure 10: Maximum Transmitted Power, 2432 MHz at HT40 MCS0, Chain 1

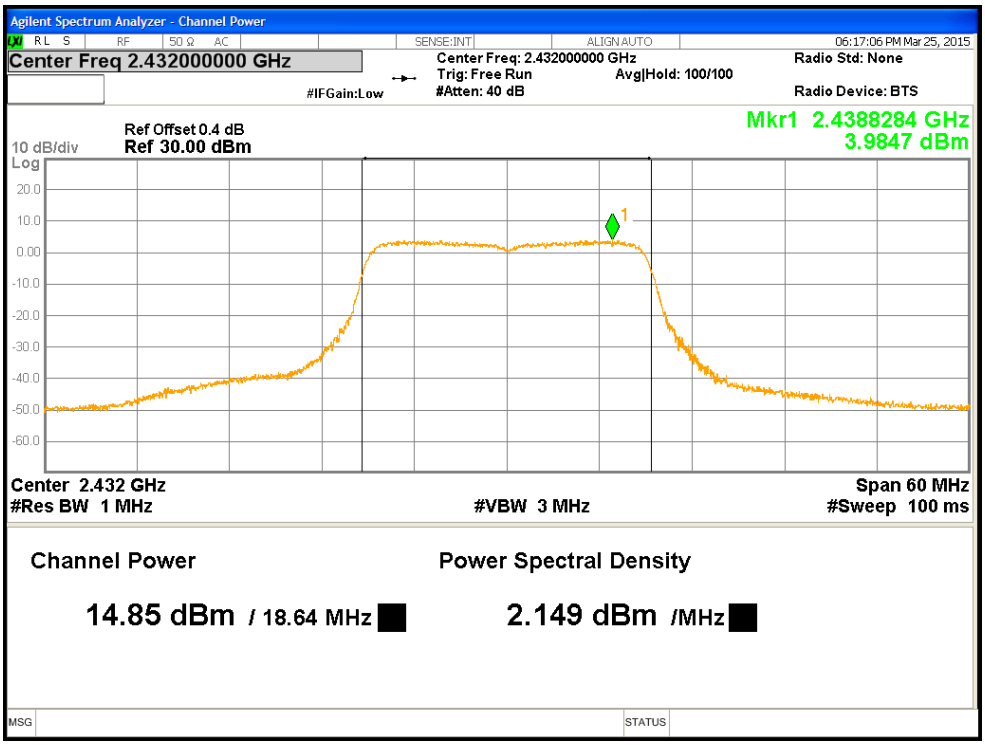


Figure 11: Maximum Transmitted Power, 2432 MHz at HT40 MCS8, Chain 0

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.

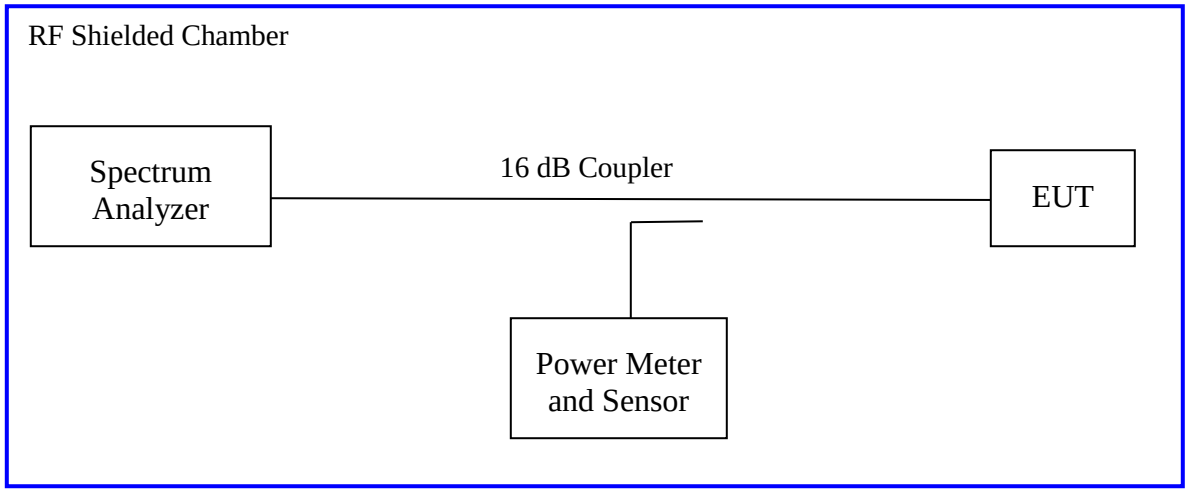
The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

The minimum 6 dB bandwidth shall be at least 500 kHz.

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth according to ANSI C63.10:2009 Section 6.9. The measurement was performed with modulation per CFR47 15.247(a) (2) 2015 and RSS Gen Sect. 6.6 2014. The preliminary investigation was performed to find the narrowest 26 dB bandwidth for each operational mode at different data rates. This worst finding was performed on 3 channels in each operating frequency range; 2400 MHz to 2483.5 MHz band, a 6 dB bandwidth was used. The worst results indicated below.

Test Setup:



4.2.2 Results

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

Table 5: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only				
Antenna Type: Patch			**Power Setting:** See test plan	
Max. Directional Gain: - 6 dBi (2.4 GHz)				
Beam Forming Gain: - 3 dBi (2.4 GHz)				
Signal State: Modulated at 100%.				
Ambient Temp.: 24° C			**Relative Humidity:**39%	
Bandwidth (MHz) for 802.11b				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2412	10.10	10.12	15.12	15.38
2437	10.12	10.12	15.12	15.45
2462	10.12	10.12	15.12	15.46
Note: The bandwidth was measured at 1.0 Mbps				
Bandwidth (MHz) for 802.11g				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2412	16.54	16.57	16.78	16.94
2437	16.54	16.57	16.78	16.96
2462	16.55	16.57	16.79	16.96
Note: The bandwidth was measured at 6.0 Mbps				

Table 6: Occupied Bandwidth – Test Results continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only				
Antenna Type: Patch			**Power Setting:** See test plan	
Max. Directional Gain: - 6 dBi (2.4 GHz)				
Beam Forming Gain: - 3 dBi (2.4 GHz)				
Signal State: Modulated at 100%.				
Ambient Temp.: 24° C			**Relative Humidity:**39%	
Bandwidth (MHz) for 802.11n				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2412	17.75	17.75	17.83	18.01
2437	17.68	17.77	17.83	18.02
2462	17.66	17.75	17.83	18.03
Note: The bandwidth was measured at HT20 MCS0, 1 Data Streams				
Bandwidth (MHz) for 802.11n 2x2				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2412	17.74	17.72	17.86	17.77
2437	17.78	17.69	17.86	17.77
2462	17.74	17.69	17.86	17.78
Note: The bandwidth was measured at HT20 MCS8, 2 Data Streams				

Table 7: Occupied Bandwidth – Test Results continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only				
Antenna Type: Patch			**Power Setting:** See test plan	
Max. Directional Gain: - 6 dBi (2.4 GHz)				
Beam Forming Gain: - 3 dBi (2.4 GHz)				
Signal State: Modulated at 100%.				
Ambient Temp.: 24° C			**Relative Humidity:**39%	
Bandwidth (MHz) for 802.11n				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2422	36.44	36.47	36.89	36.96
2432	36.47	36.47	36.87	36.97
2452	36.44	36.47	36.89	36.97
Note: The bandwidth was measured at HT40 MCS0, 1 Data Streams				
Bandwidth (MHz) for 802.11n 2x2				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2422	36.53	36.36	36.18	36.20
2432	36.52	36.37	36.18	36.20
2452	36.51	36.10	36.18	36.18
Note: The bandwidth was measured at HT40 MCS8, 2 Data Streams				

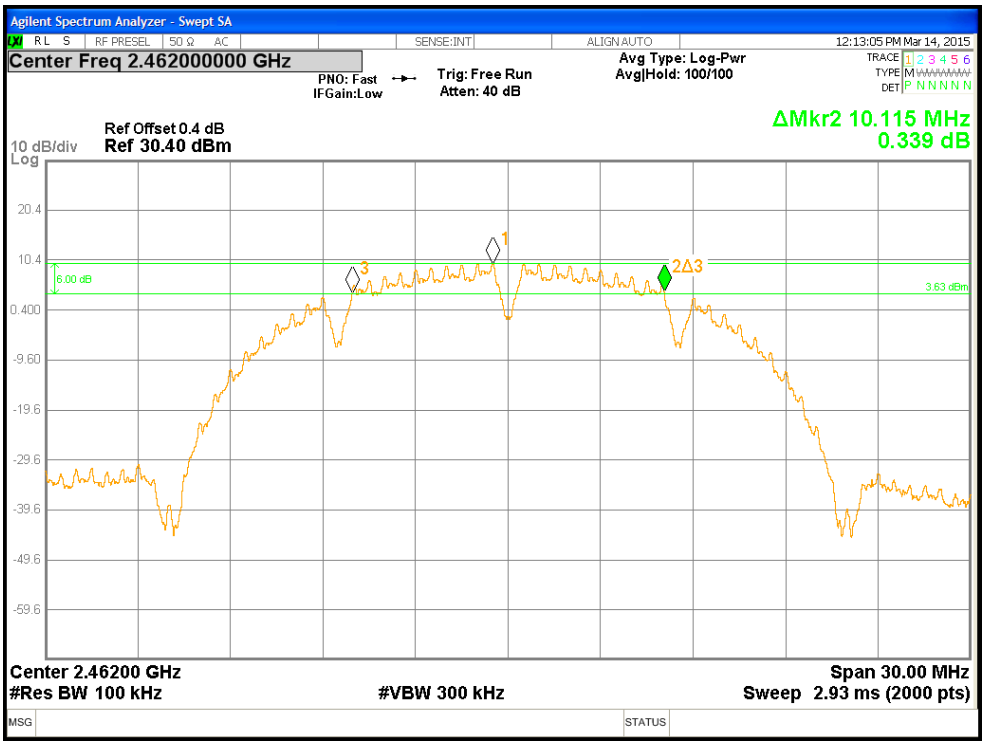


Figure 12: 6dB Occupied Bandwidth, 2462 MHz at 802.11b, Chain 0

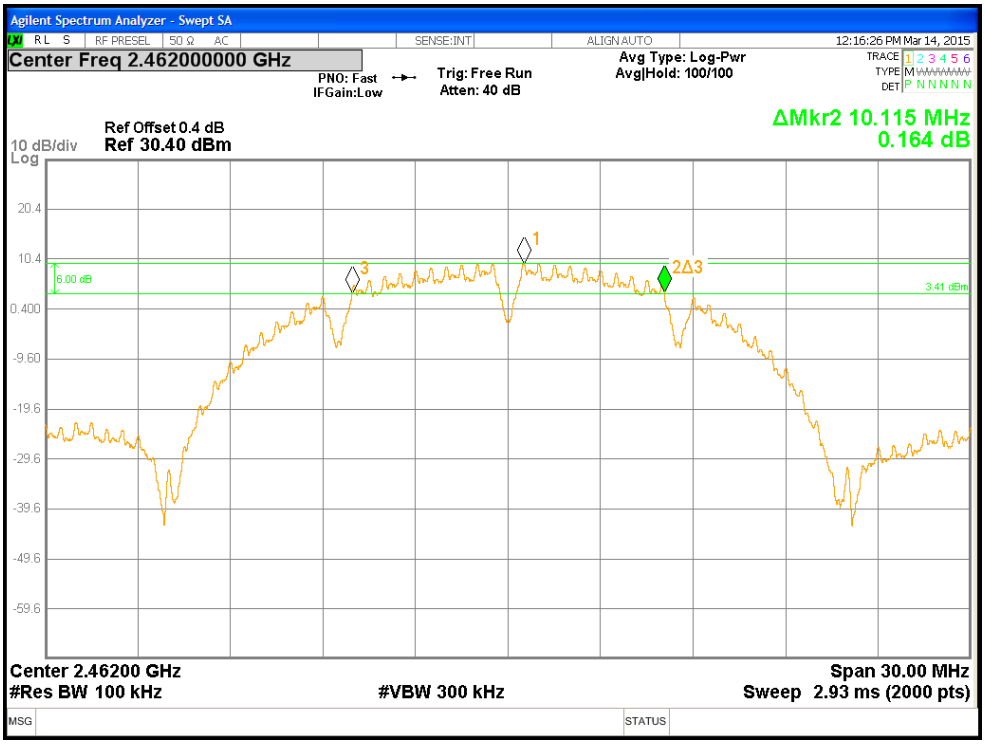


Figure 13: 6dB Occupied Bandwidth, 2462 MHz at 802.11b, Chain 1

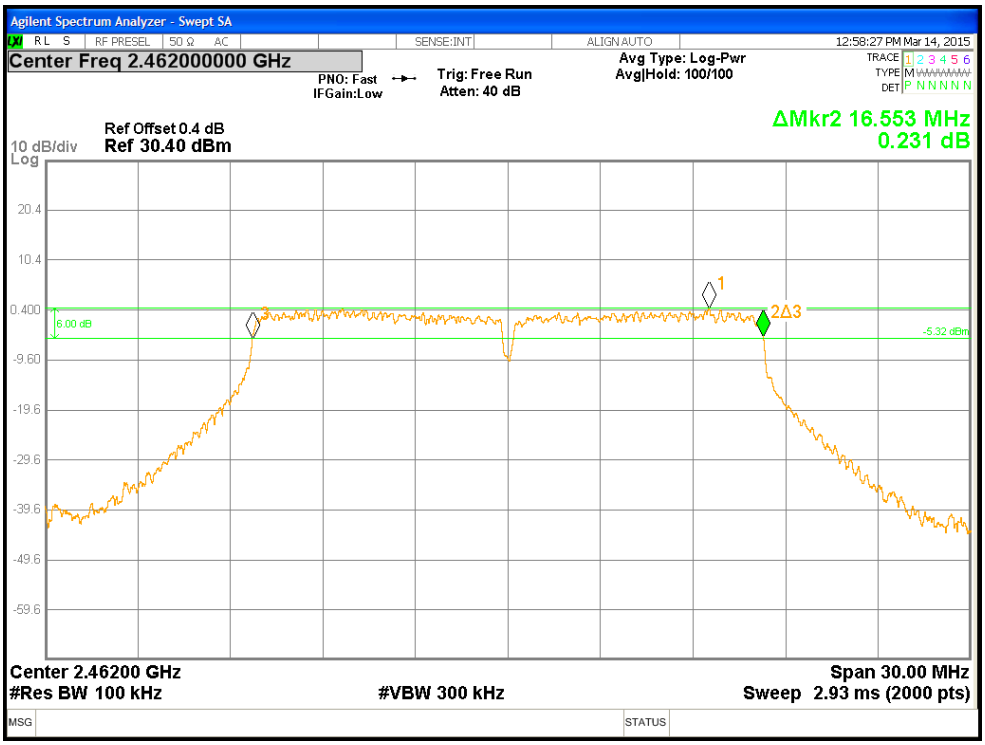


Figure 14: 6dB Occupied Bandwidth, 2462 MHz at 802.11g, Chain 0

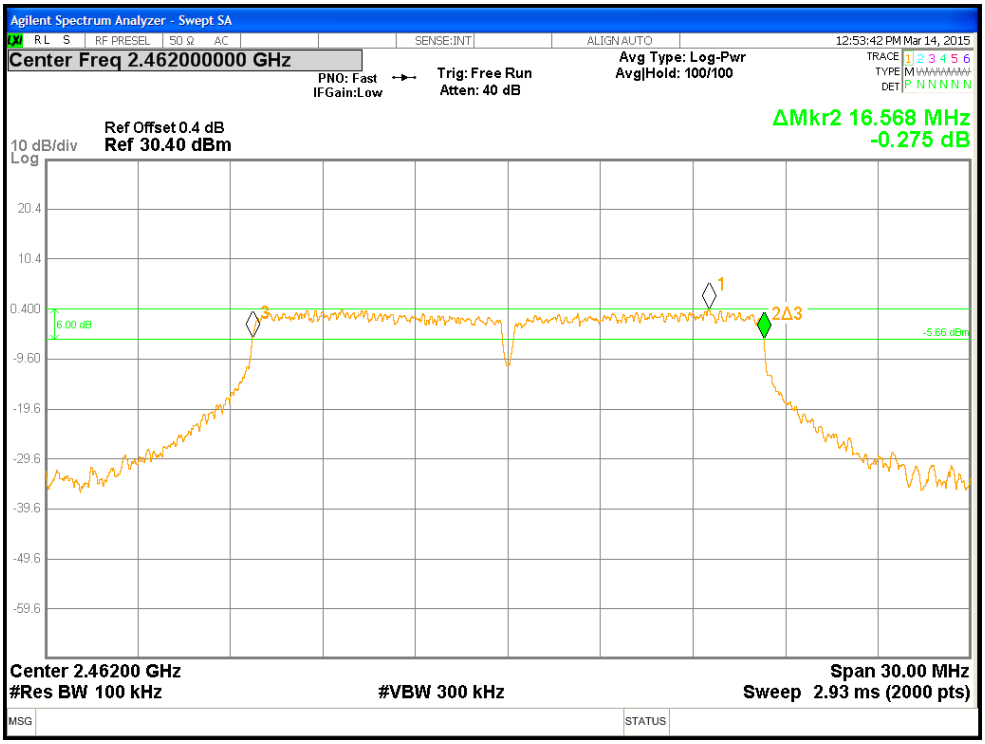


Figure 15: 6dB Occupied Bandwidth, 2462 MHz at 802.11g, Chain 1

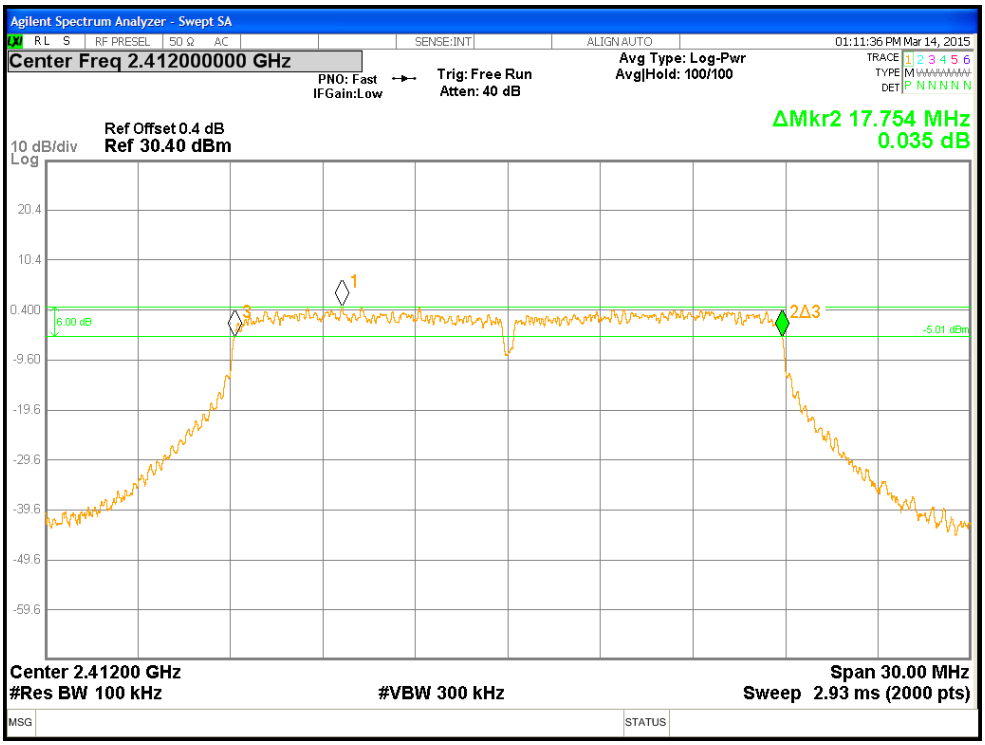


Figure 16: 6dB Occupied Bandwidth, 2412 MHz at HT20 MCS0, Chain 0

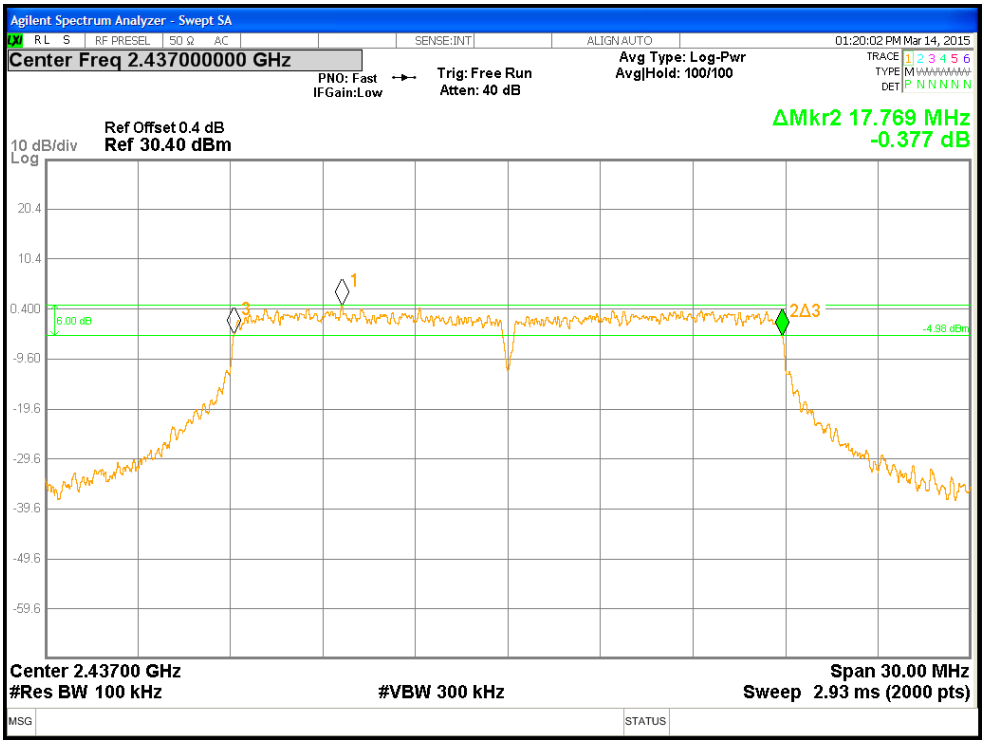


Figure 17: 6dB Occupied Bandwidth, 2437 MHz at HT20 MCS0, Chain 1

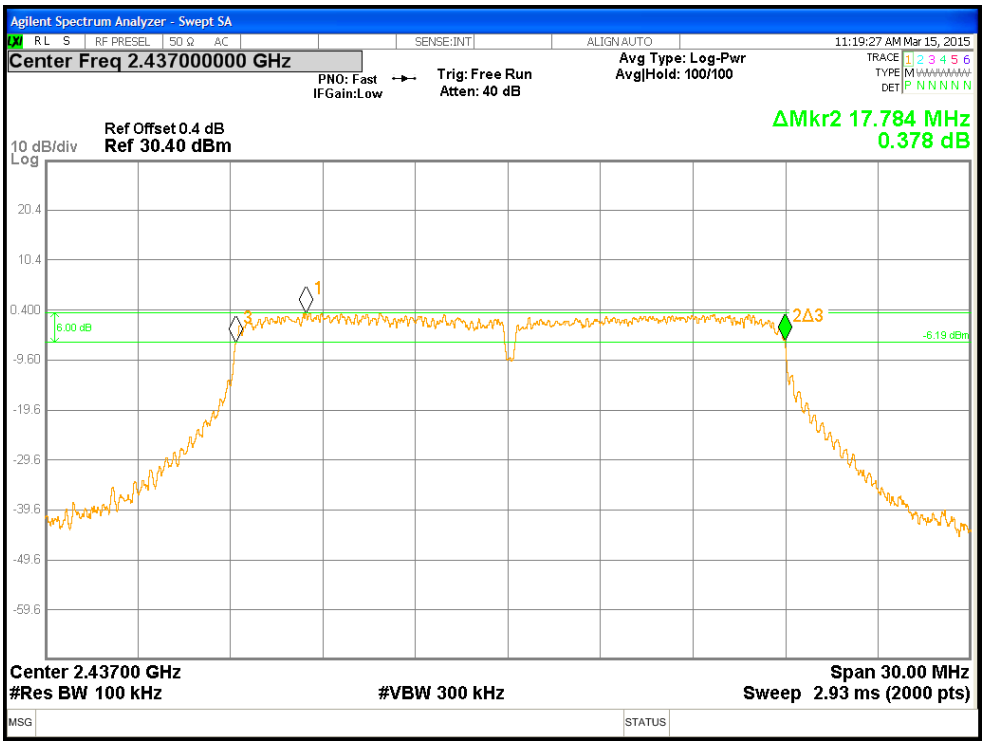


Figure 18: 6dB Occupied Bandwidth, 2437 MHz at HT20 MCS8, Chain 0

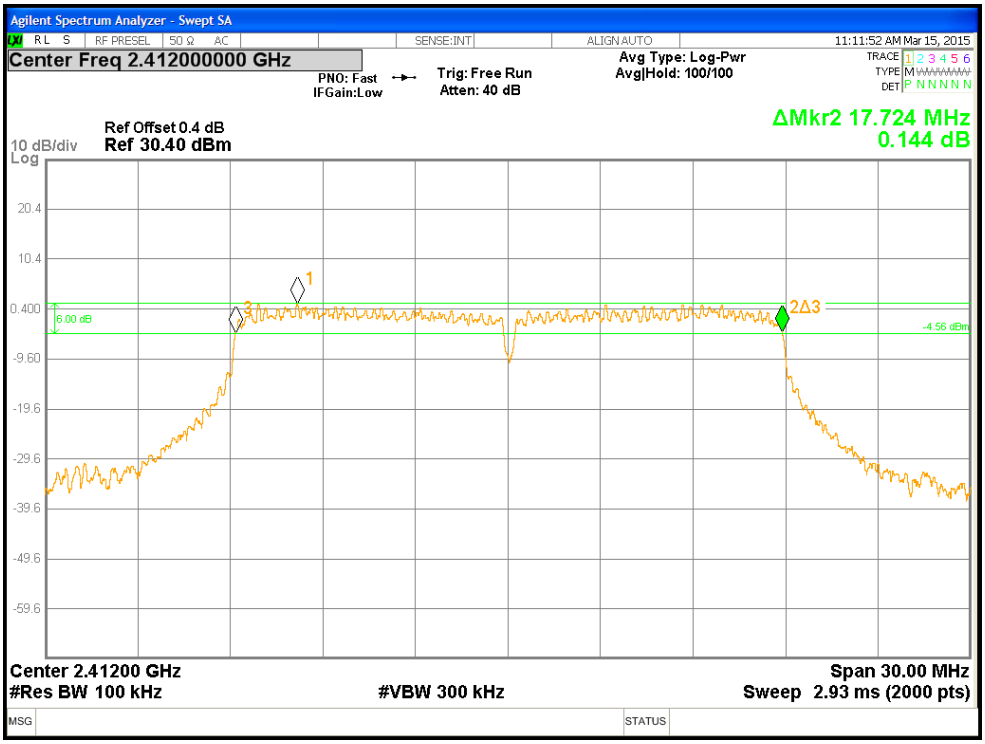


Figure 19: 6dB Occupied Bandwidth, 2412 MHz at HT20 MCS8, Chain 1

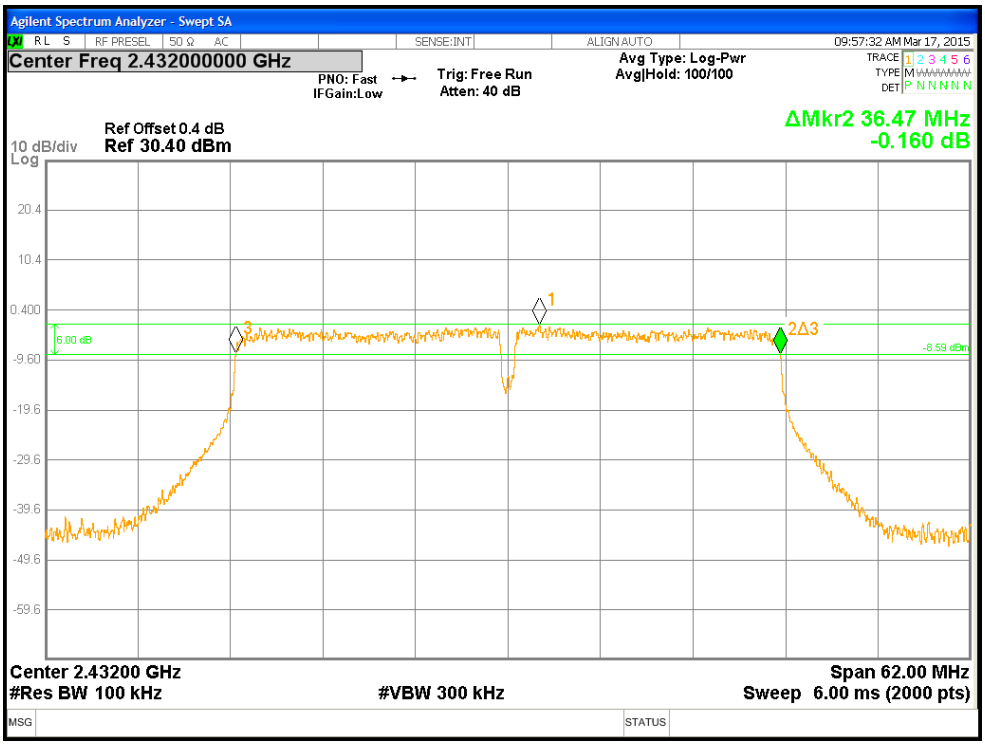


Figure 20: 6dB Occupied Bandwidth, 2432 MHz at HT40 MCS0, Chain 0

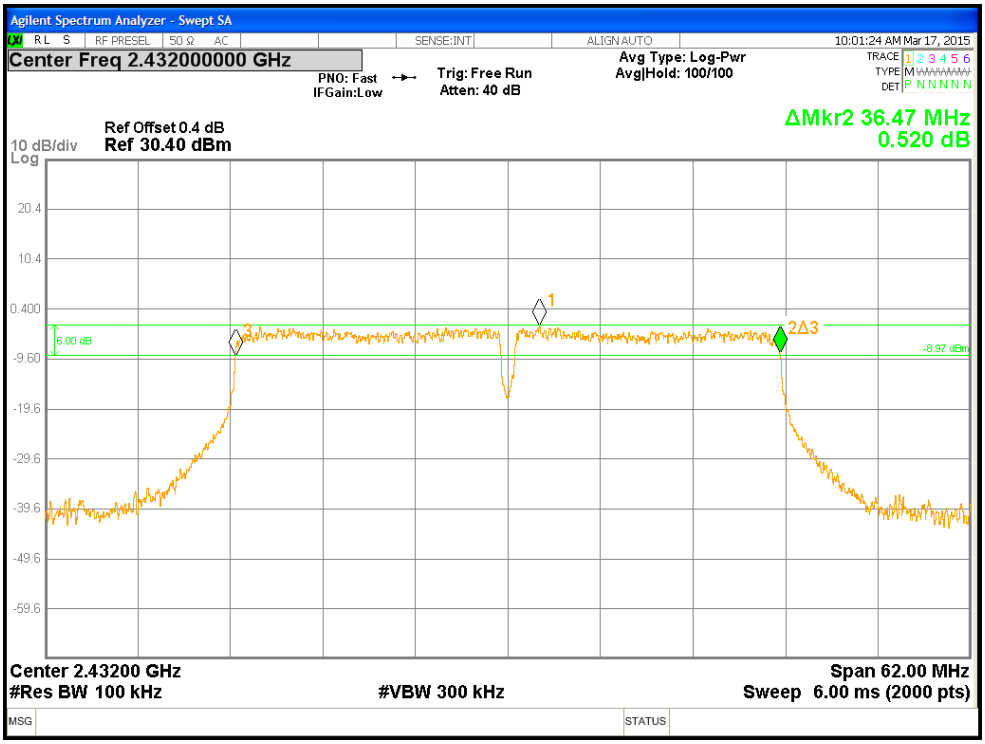


Figure 21: 6dB Occupied Bandwidth, 2432 MHz at HT40 MCS0, Chain 1

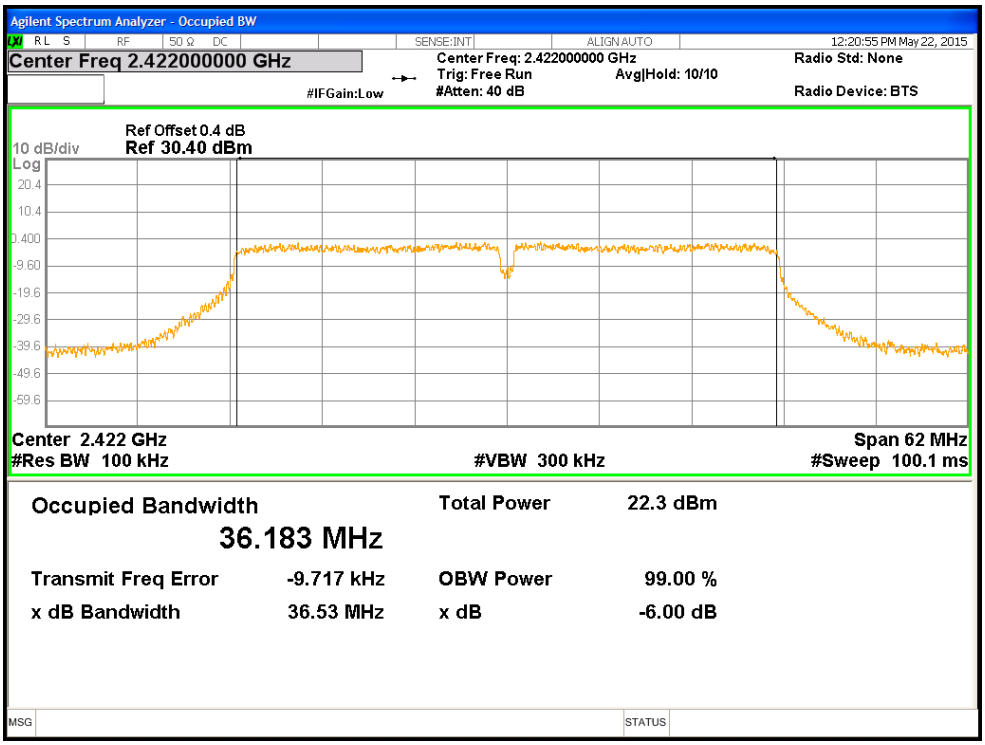


Figure 22: 6dB & 99% Occupied Bandwidth, 2422 MHz at HT40 MCS8, Chain 0

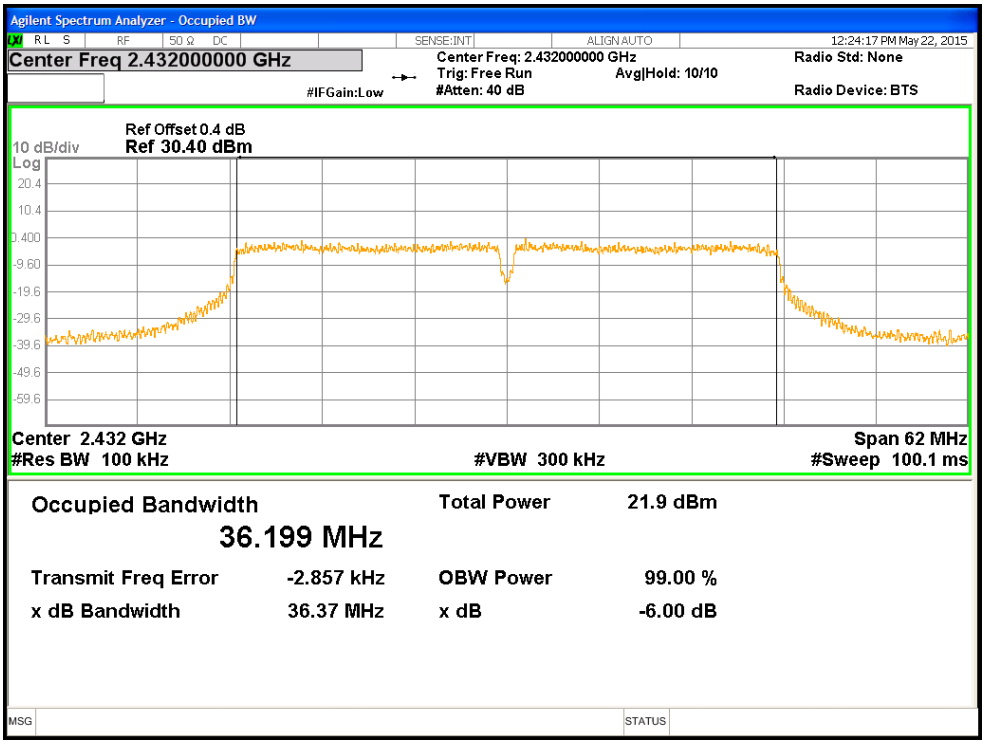


Figure 23: 6dB & 99% Occupied Bandwidth, 2432 MHz at HT40 MCS8, Chain 1

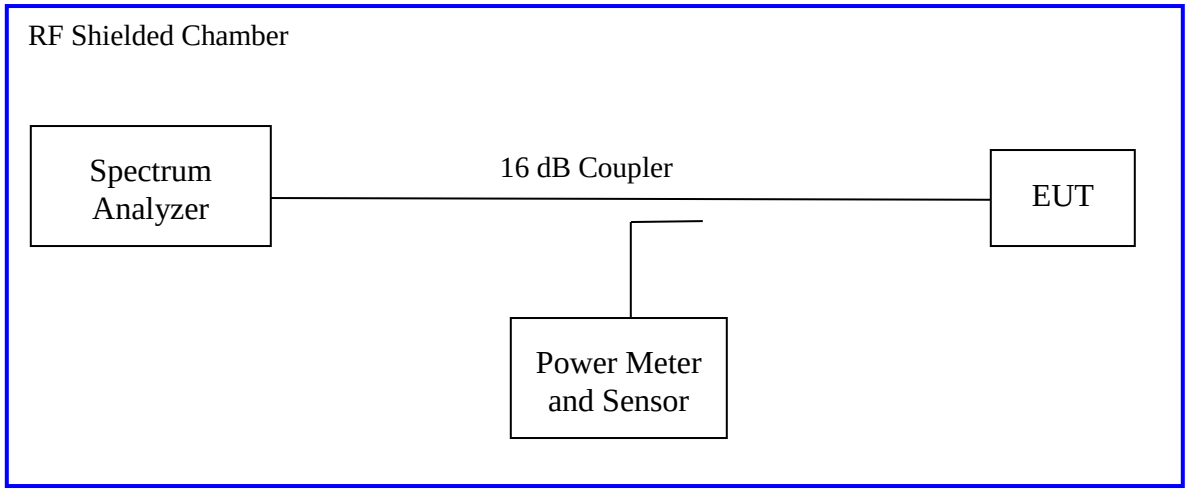
4.3 Peak Power Spectral Density

According to the CFR47 Part 15.247 (e) and RSS 210 (A8.2), the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.1 Test Method

The conducted method was used to measure the channel power output per ANSI C63.10-2009 Section 6.11.2.2. The measurement was performed with modulation per CFR47 Part 15.247 (e) and RSS 210 (A8.2). The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in each operating frequency range of 2400 MHz to 2483.5 MHz. The worst sample result indicated below.

Test Setup:



4.3.2 Results

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

Table 8: Peak Power Spectral Density – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only							
Antenna Type: Patch				**Power Setting:** See test plan			
Max. Directional Gain: - 6 dBi (2.4 GHz)							
Beam Forming Gain: - 3 dBi (2.4 GHz)							
Signal State: Modulated at 100%.							
Ambient Temp.: 23° C				**Relative Humidity:**35%			
Peak Power Spectral Density							
802.11b Mode							
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**CF [dB]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2412	2.57	2.58	2.58	-15.23	-12.65	8.00	-20.65
2437	2.49	2.36	2.49	-15.23	-12.74	8.00	-20.74
2462	2.15	2.03	2.15	-15.23	-13.08	8.00	-21.08
Note: 1. The highest peak output power was observed at **11b 1Mbps** per data stream. 2. Correction Factor (CF) for bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB. 3. Total PSD is the combined worst case PSD. Limited number of plots are placed in the report.							
802.11g Mode							
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**CF [dB]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2412	-5.07	-4.84	-4.84	-15.23	-20.07	8.00	-28.07
2437	-4.94	-5.07	-4.94	-15.23	-20.17	8.00	-28.17
2462	-5.04	-5.54	-5.04	-15.23	-20.27	8.00	-28.27
Note: 1. The highest peak output power was observed at **11g 6Mbps** per data stream. 2. Correction Factor (CF) for bandwidth ratio is 10*log (3kHz/100kHz) or -15.23dB. 3. Total PSD is the combined worst case PSD. Limited number of plots are placed in the report.							

Table 9: Peak Power Spectral Density – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only							
Antenna Type: Patch				**Power Setting:** See test plan			
Max. Directional Gain: - 6 dBi (2.4 GHz)							
Beam Forming Gain: - 3 dBi (2.4 GHz)							
Signal State: Modulated at 100%.							
Ambient Temp.: 23° C				**Relative Humidity:**35%			
Peak Power Spectral Density							
802.11n Mode							
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**CF [dB]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2412	-5.46	-5.28	-5.28	-15.23	-20.51	8.00	-28.51
2437	-5.42	-5.65	-5.42	-15.23	-20.65	8.00	-28.65
2462	-5.43	-5.94	-5.43	-15.23	-20.66	8.00	-28.66
Note: 1. The highest peak output power was observed at **HT20 MCS0** per data stream. 2. Correction Factor (CF) for bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB. 3. Total PSD is the combined worst case PSD. Limited number of plots are placed in the report.							
Peak Power Spectral Density							
802.11n 2x2 Mode							
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**CF [dB]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2412	-5.98	-5.34	-5.34	-12.22	-17.56	8.00	-25.56
2437	-6.32	-6.02	-6.02	-12.22	-18.24	8.00	-26.24
2462	-6.37	-6.29	-6.29	-12.22	-18.51	8.00	-26.51
Note: 1. The highest peak output power was observed at **HT20 MCS8** per data stream. 2. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911. 3. Correction Factor (CF) for number of output chains. Where CF = 10 log(2) = 3.01 dB. 4. Correction Factor (CF) for bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB. 5. The beam forming antenna gain is less than 6 dBi, therefore no CF applied. 6. Total PSD is the combined worst case PSD. Limited number of plots are placed in the report.							

Table 10: Peak Power Spectral Density – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only							
Antenna Type: Patch				**Power Setting:** See test plan			
Max. Directional Gain: - 6 dBi (2.4 GHz)							
Beam Forming Gain: - 3 dBi (2.4 GHz)							
Signal State: Modulated at 100%.							
Ambient Temp.: 23° C				**Relative Humidity:**35%			
Peak Power Spectral Density							
802.11n Mode							
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**CF [dB]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2422	-8.72	-9.25	-8.72	-15.23	-23.95	8.00	-31.95
2432	-8.62	-8.83	-8.62	-15.23	-23.85	8.00	-31.85
2452	-9.33	-9.10	-9.10	-15.23	-24.33	8.00	-32.33
Note: 1. The highest peak output power was observed at **HT40 MCS0** per data stream. 2. Correction Factor (CF) for bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB. 3. Total PSD is the combined worst case PSD. Limited number of plots are placed in the report.							
Peak Power Spectral Density							
802.11n 2x2 Mode							
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**CF [dB]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2422	-9.39	-8.65	-8.65	-12.22	-20.87	8.00	-28.87
2432	-8.39	-7.33	-7.33	-12.22	-19.55	8.00	-27.55
2452	-7.97	-7.63	-7.63	-12.22	-19.85	8.00	-27.85
Note: 1. The highest peak output power was observed at **HT40 MCS8** per data stream. 2. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911. 3. Correction Factor (CF) for number of output chains. Where CF = 10 log(2) = 3.01 dB. 4. Correction Factor (CF) for bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB. 5. The beam forming antenna gain is less than 6 dBi, therefore no CF applied. 6. Total PSD is the combined worst case PSD. Limited number of plots are placed in the report.							

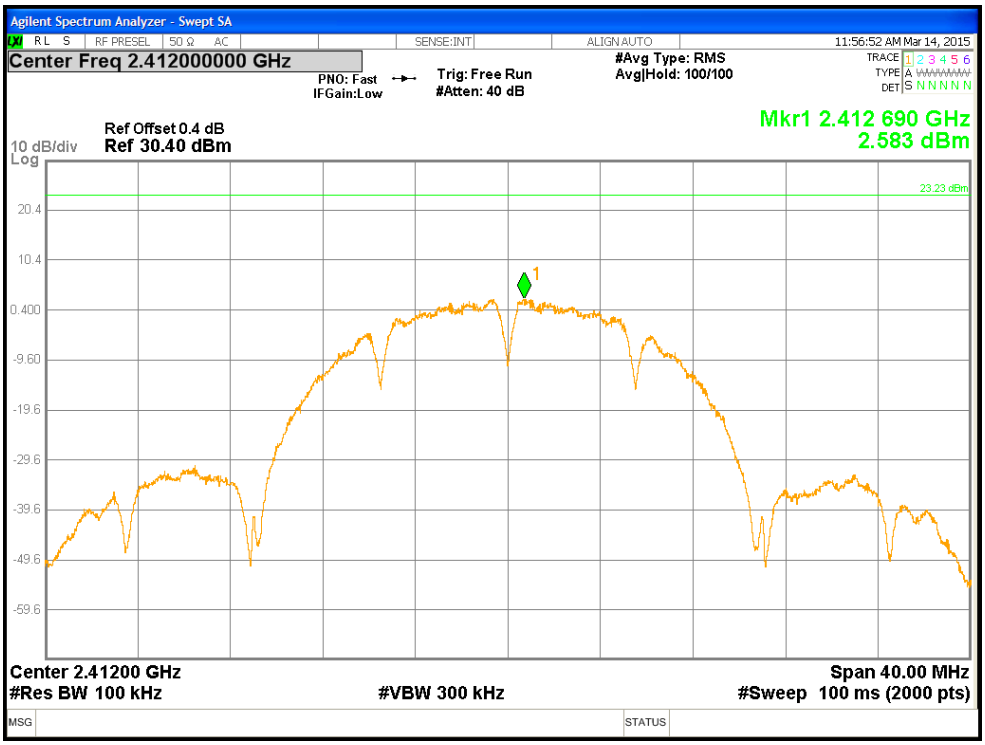


Figure 24: Power Spectral Density, 2412 MHz at 802.11b 1Mbps, Chain 1

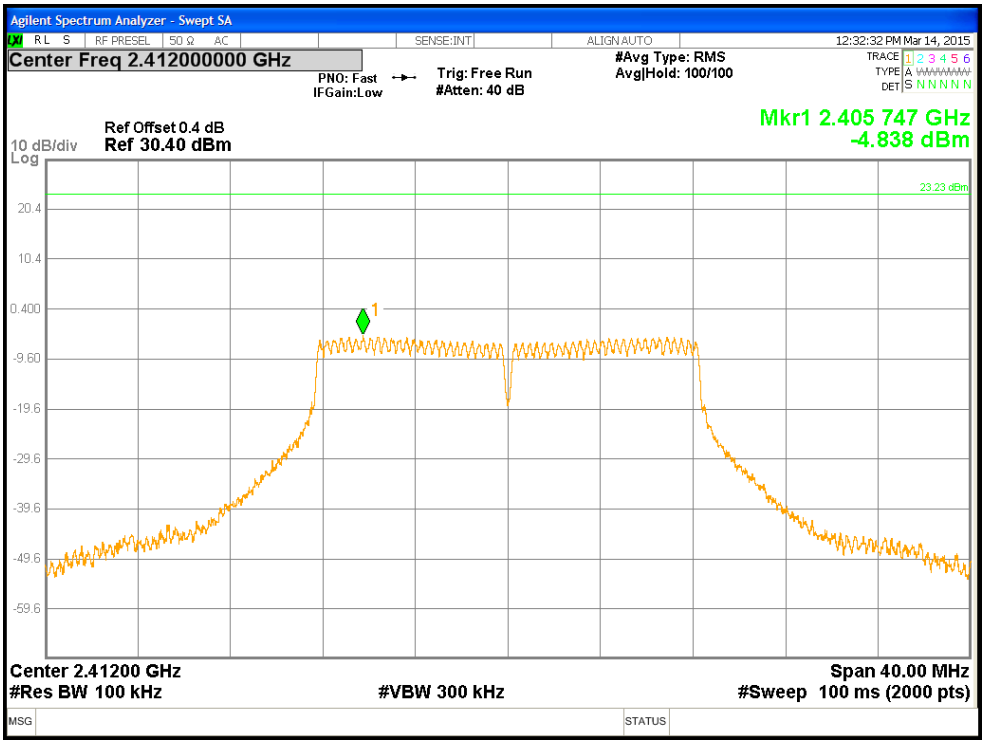


Figure 25: Power Spectral Density, 2412 MHz at 802.11g 6Mbps, Chain 1

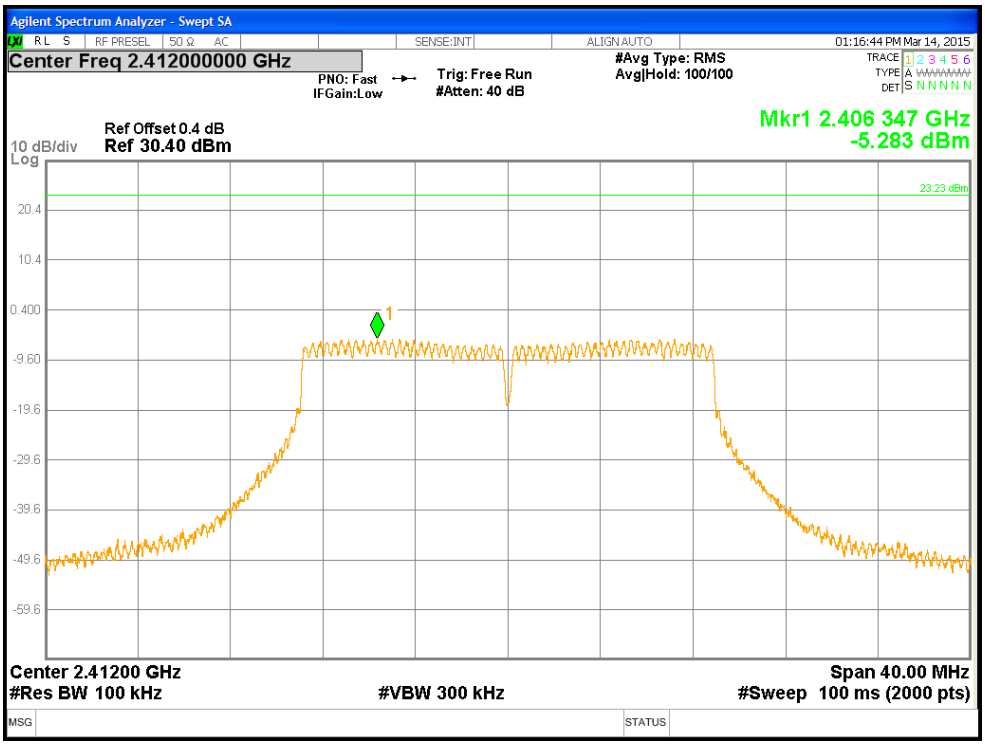


Figure 26: Power Spectral Density, 2412 MHz at HT20 MCS0, Chain 1

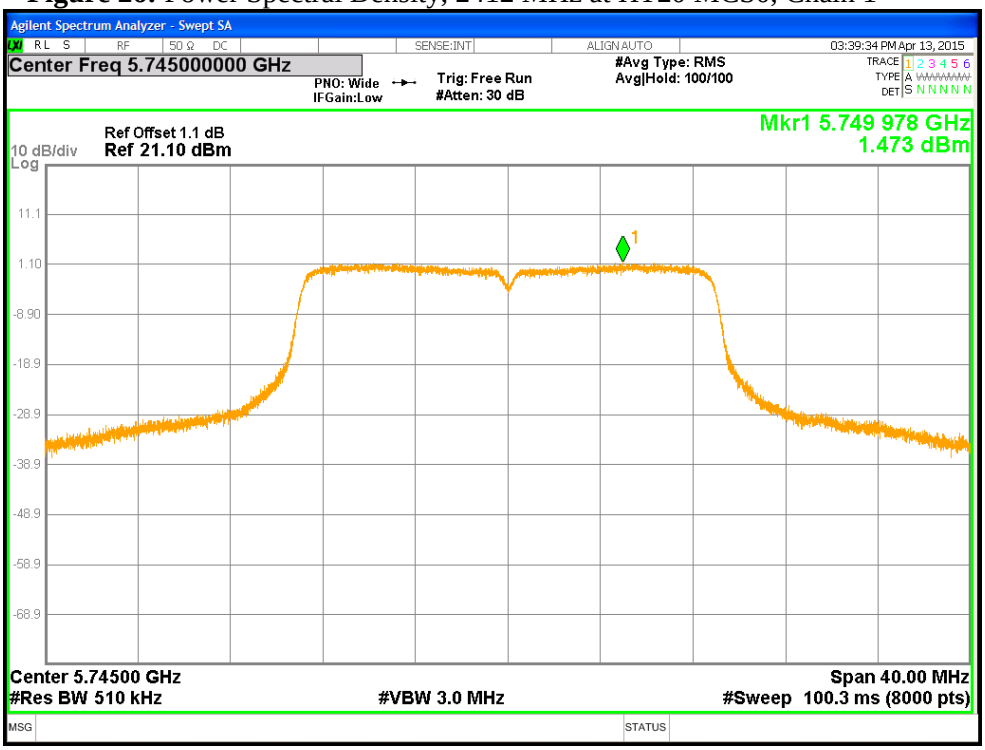


Figure 27: Power Spectral Density, 5745 MHz at HT20 MCS0, Chain 0

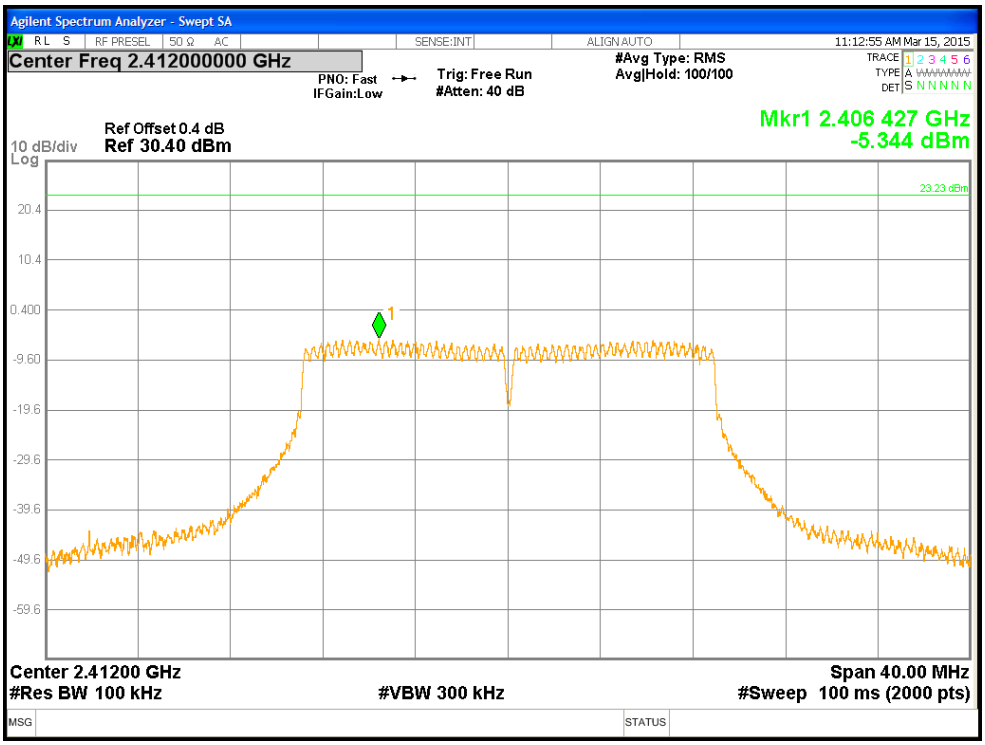


Figure 28: Power Spectral Density, 2412 MHz at HT20 MCS8, Chain 1

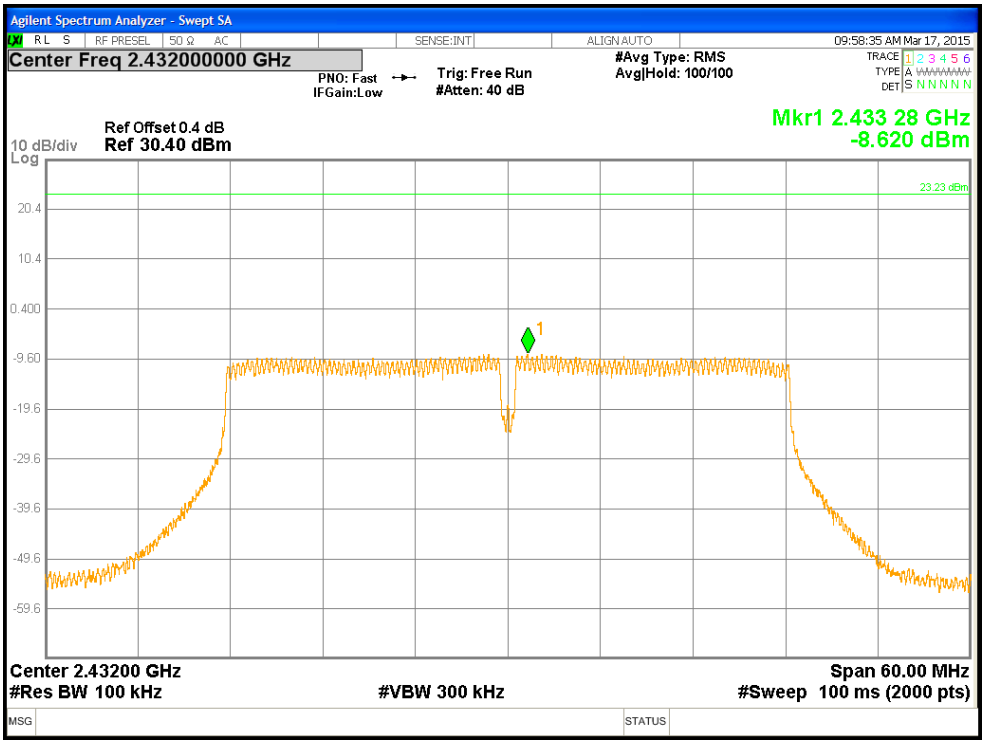


Figure 29: Power Spectral Density, 2432 MHz at HT40 MCS0, Chain 0

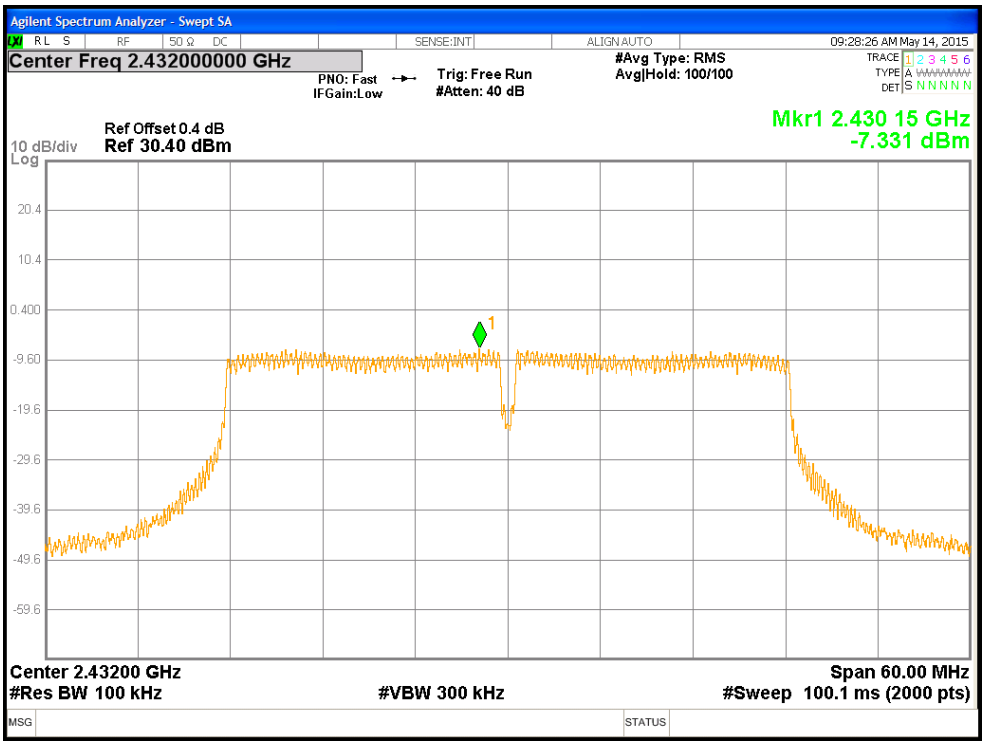


Figure 30: Power Spectral Density, 2432 MHz at HT40 MCS8, Chain 0

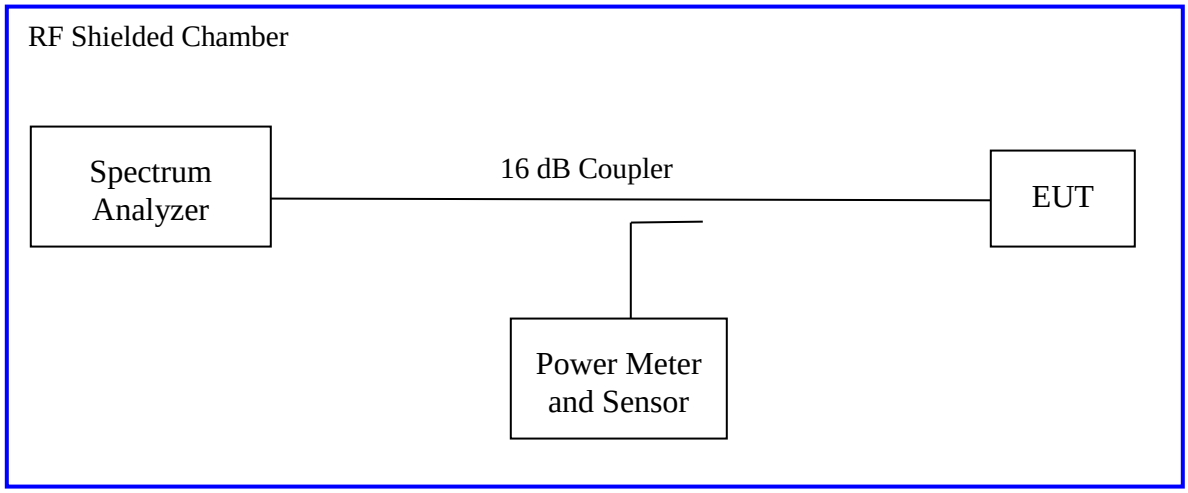
4.4 Out of Band Emissions

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

4.4.1 Test Method

The conducted method was used to measure the undesirable emission requirement. The measurement was performed with modulation. This test was conducted on 3 channels of Sample in each mode on Sample. The worst sample result indicated below.

Test Setup:



Measurement Procedure AVG2 of KDB 662911

4.4.2 Results

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

Table 11: Emissions at the Band-Edge – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only						
Antenna Type: Patch			**Power Setting:** See test plan			
Max. Directional Gain: - 6 dBi (2.4 GHz)						
Beam Forming Gain: - 3 dBi (2.4 GHz)						
Signal State: Modulated at 100%.						
Ambient Temp.: 24° C			**Relative Humidity:**38%			
Non-Restricted Frequency Band Emissions						
Freq. (MHz)	**Mode**	**Chain**	**Measured (dBm)**	**Limit (dBm)**	**Plots**	**Results**
2400	1Mbps	0	-31.64	-20.25	Fig. 79, 80	Pass
2400	1Mbps	1	-25.44	-20.02	Fig. 81, 82	Pass
2400	6Mbps	0	-33.97	-29.06	Fig. 83, 84	Pass
2400	6Mbps	1	-29.78	-29.24	Fig. 85, 86	Pass
2400	HT20-MCS0	0	-32.96	-29.07	Fig. 87, 88	Pass
2400	HT20-MCS0	1	-30.35	-29.02	Fig. 89, 90	Pass
2400	HT20-MCS8	0	-34.48	-29.72	Fig. 91, 92	Pass
2400	HT20-MCS8	1	-29.96	-28.63	Fig. 93, 94	Pass
2400	HT40-MCS0	0	-32.95	-32.87	Fig. 95, 96	Pass
2400	HT40-MCS0	1	-33.60	-33.17	Fig. 97, 98	Pass
2400	HT40-MCS8	0	-33.61	-33.41	Fig. 99, 100	Pass
2400	HT40-MCS8	1	-31.60	-31.00	Fig. 101, 102	Pass
Note: The stated limits for 30 dBr are relative to each individual output per KDB 662911 Method. The worst case of each data rate is recorded.						

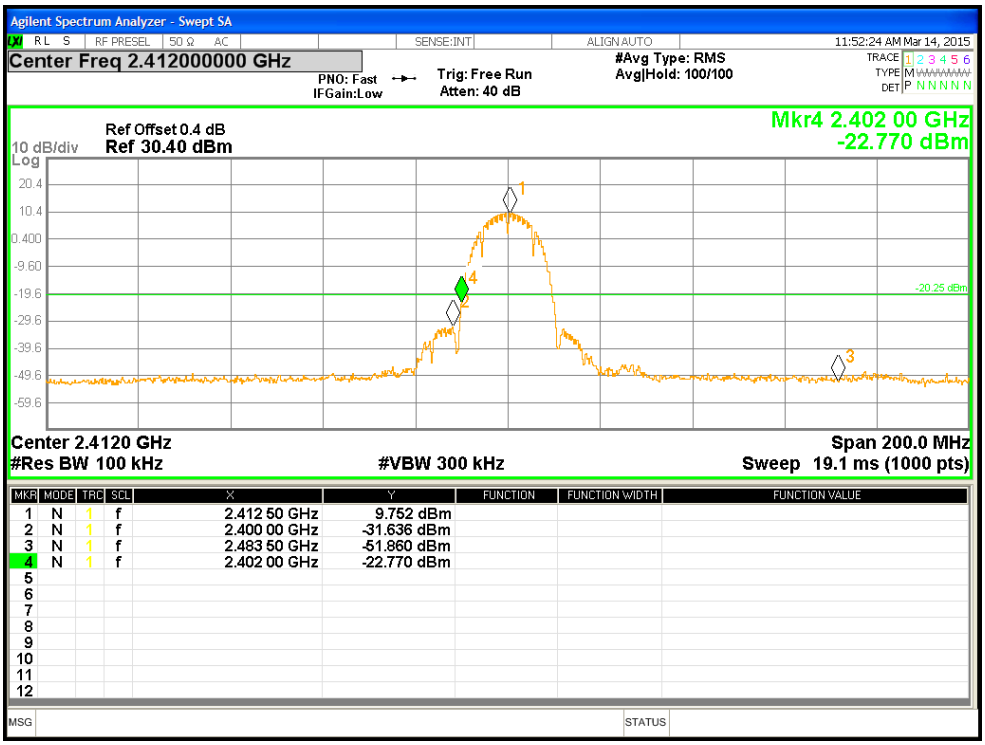


Figure 31: Measured Bandedge for 802.11b-1Mbps at 2412 MHz, Chain 0

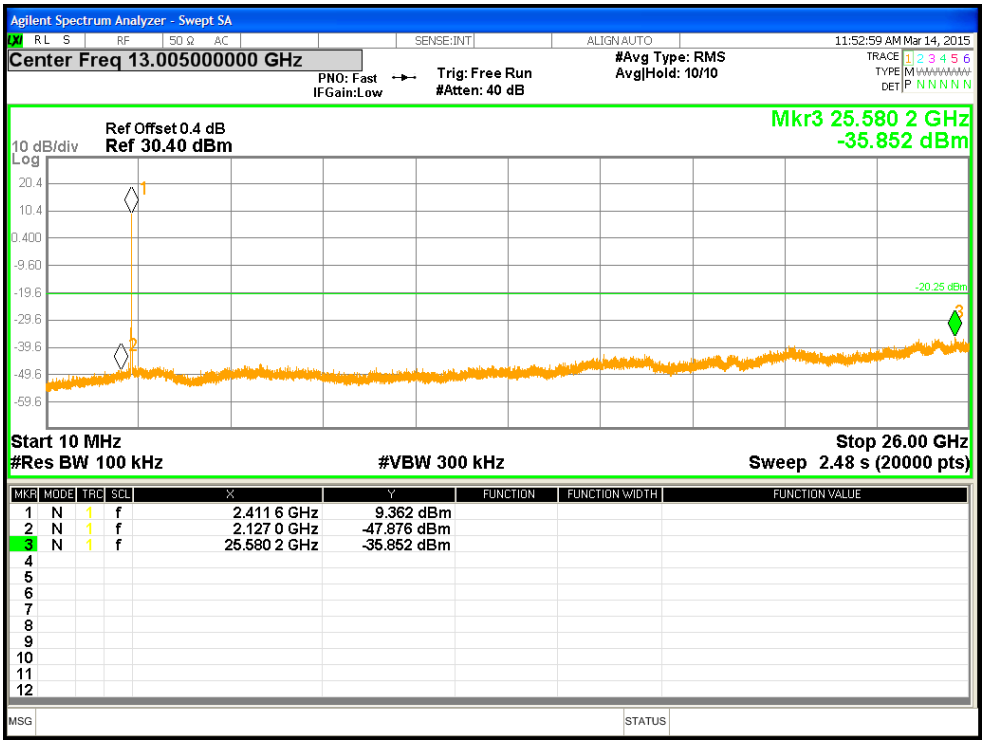


Figure 32: Out of Band Emissions for 802.11b-1Mbps at 2412 MHz, Chain 0

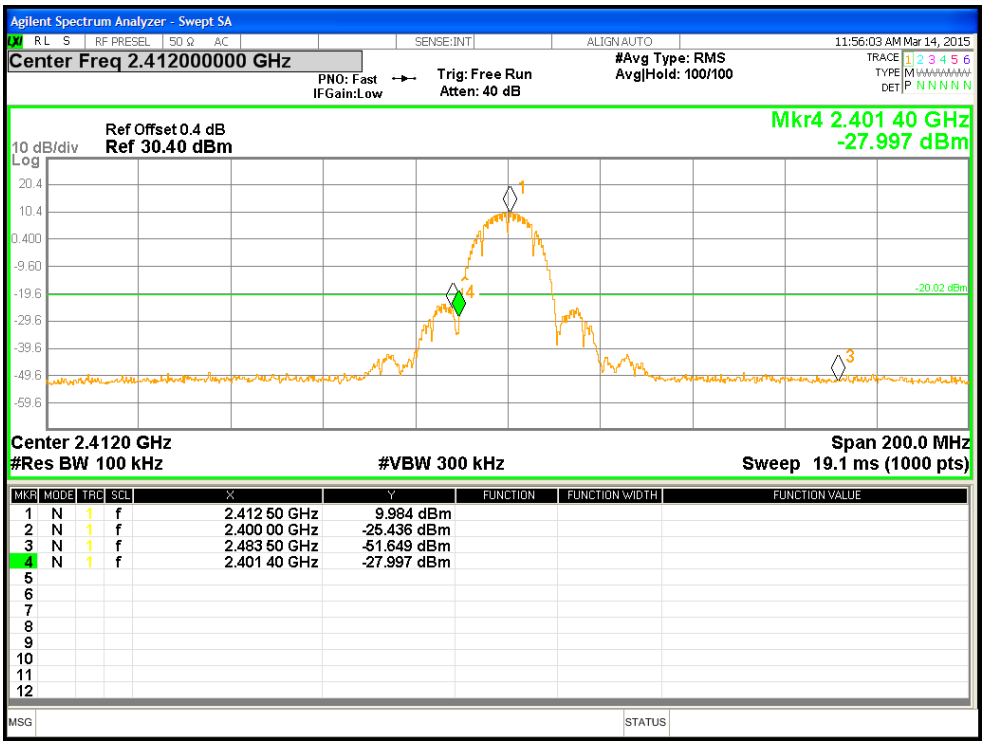


Figure 33: Measured Bandedge for 802.11b-1Mbps at 2412 MHz, Chain 1

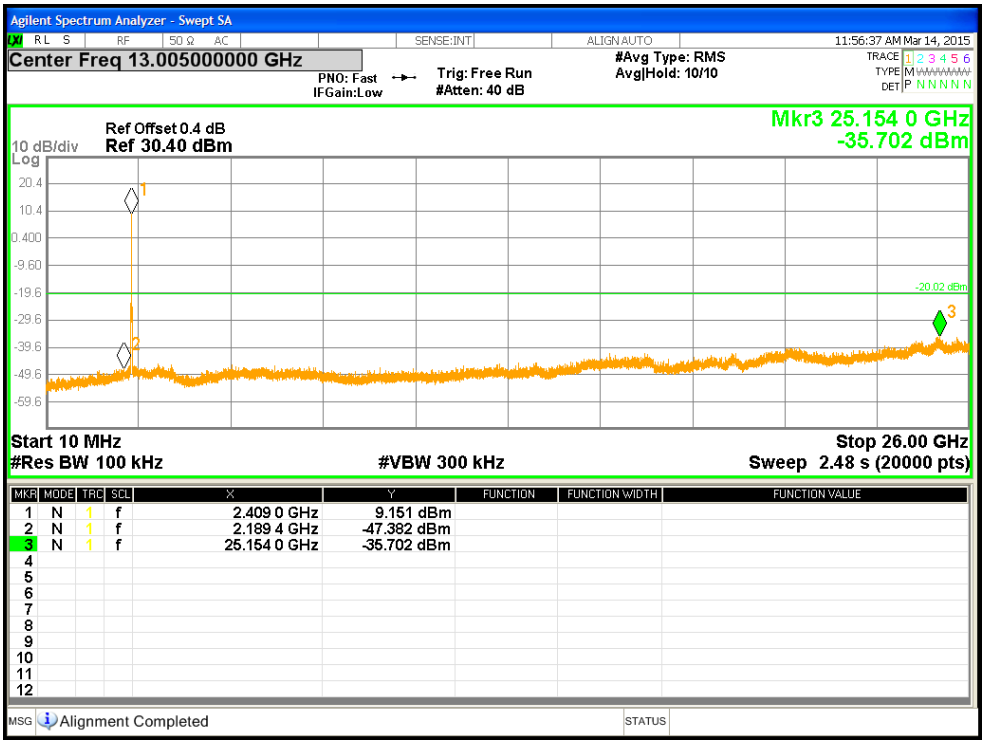


Figure 34: Out of Band Emissions for 802.11b-1Mbps at 2412 MHz, Chain 1

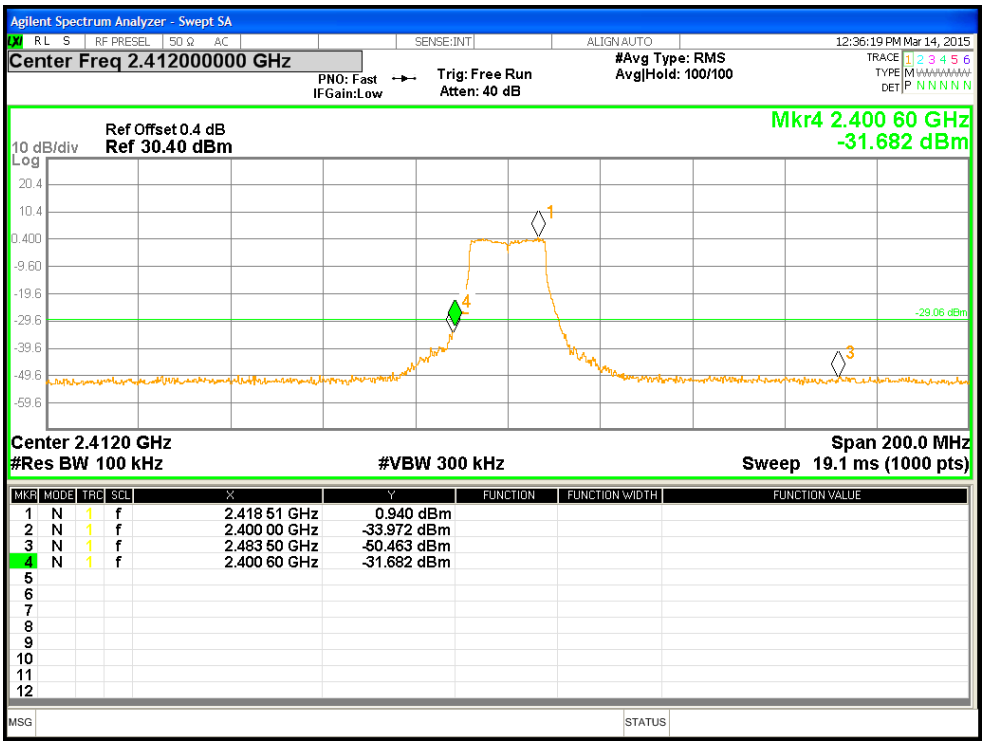


Figure 35: Measured Bandedge for 802.11g-6Mbps at 2412 MHz, Chain 0

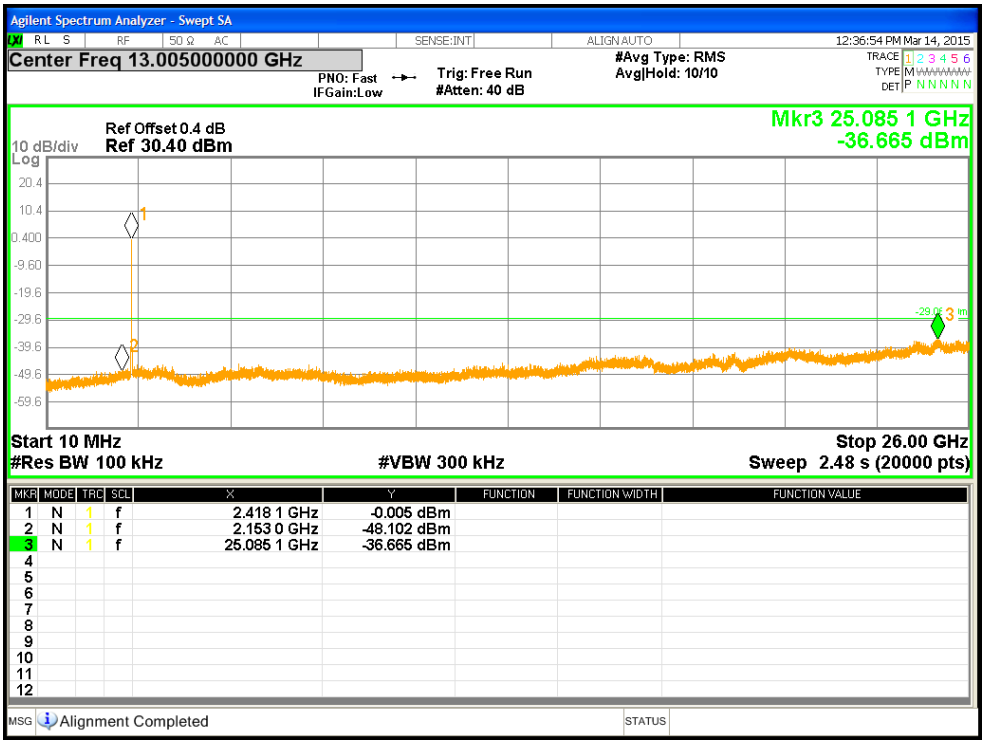


Figure 36: Out of Band Emissions for 802.11g-6Mbps at 2412 MHz, Chain 0

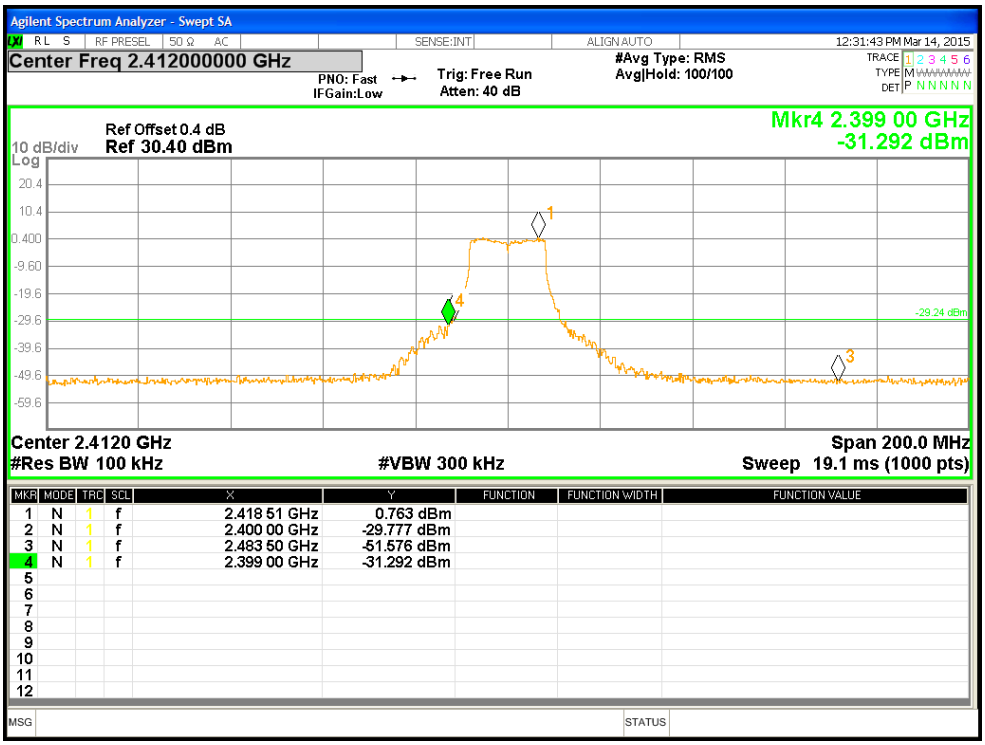


Figure 37: Measured Bandedge for 802.11g-6Mbps at 2412 MHz, Chain 1

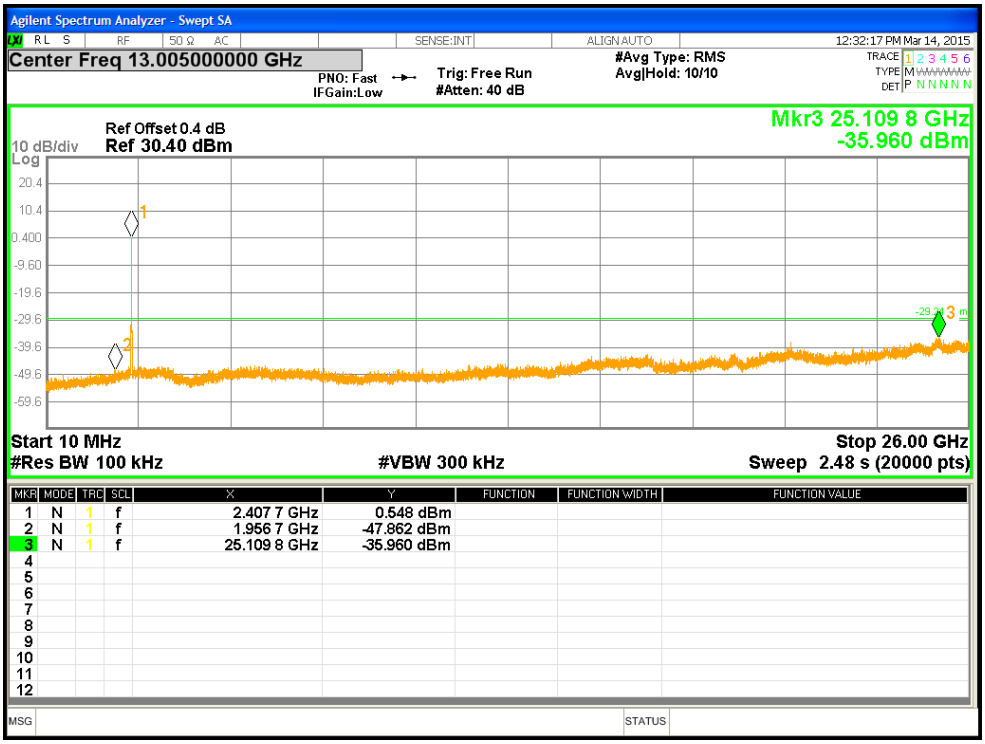


Figure 38: Out of Band Emissions for 802.11g-6Mbps at 2412 MHz, Chain 1

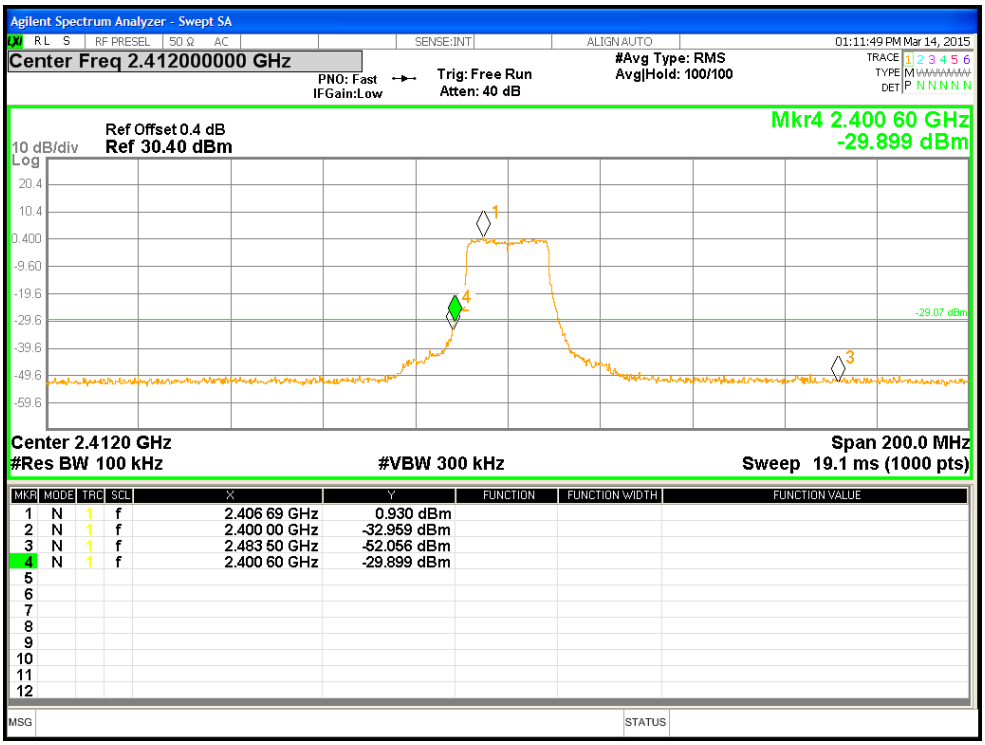


Figure 39: Measured Bandedge for HT20-MCS0 at 2412 MHz, Chain 0

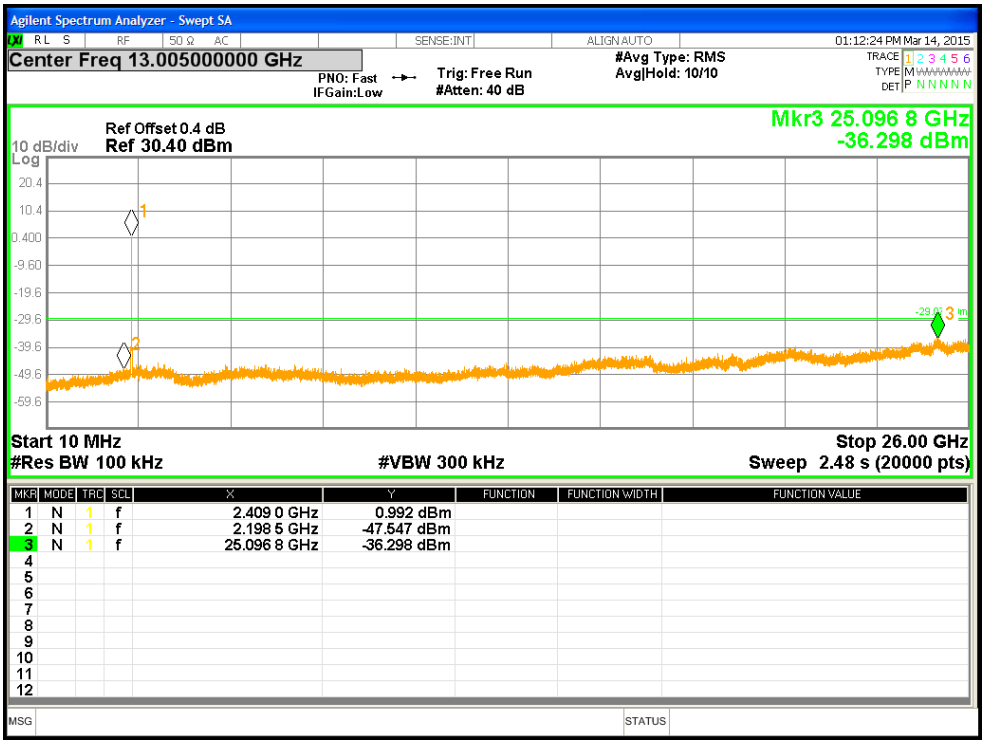


Figure 40: Out of Band Emissions for HT20-MCS0 at 2412 MHz, Chain 0

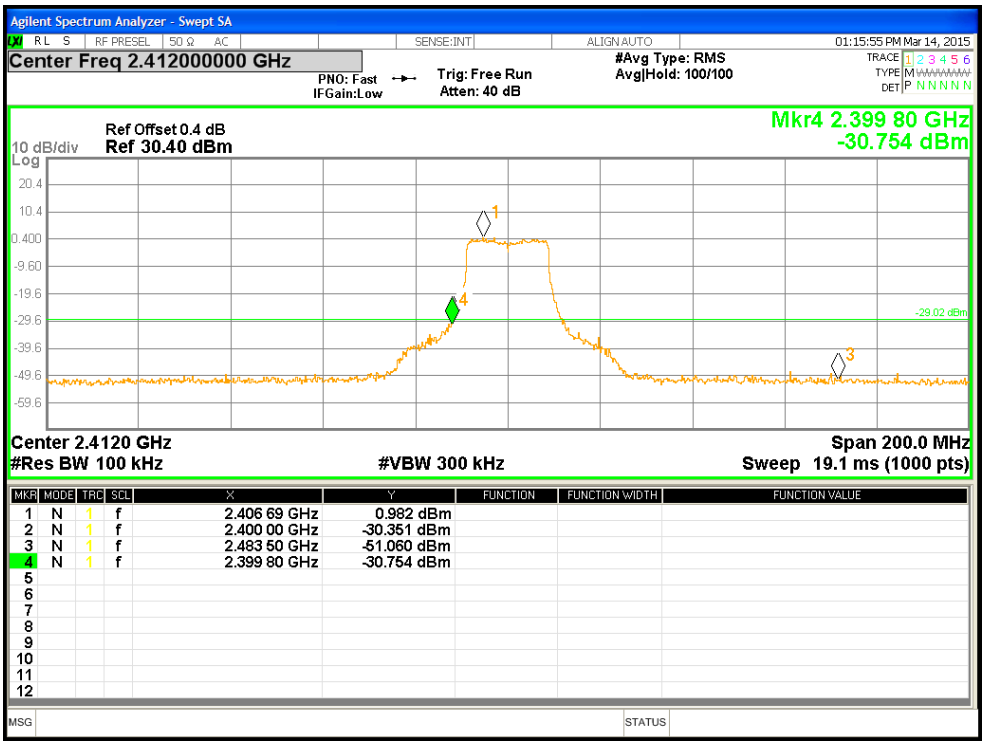


Figure 41: Measured Bandedge for HT20-MCS0 at 2412 MHz, Chain 1

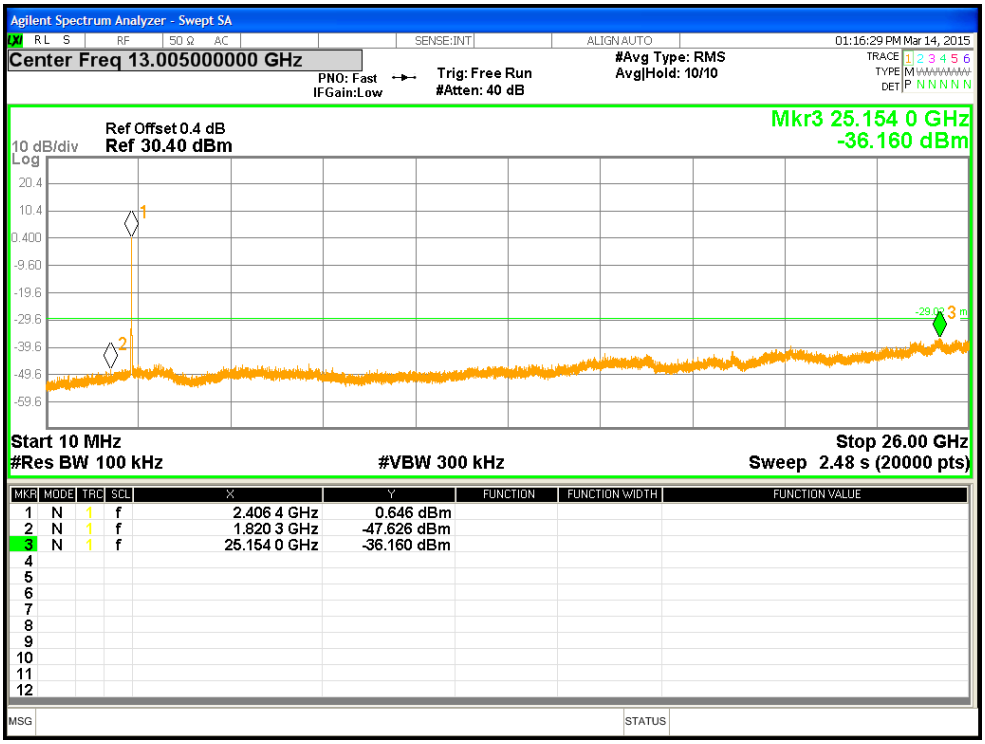


Figure 42: Out of Band Emissions for HT20-MCS0 at 2412 MHz, Chain 1

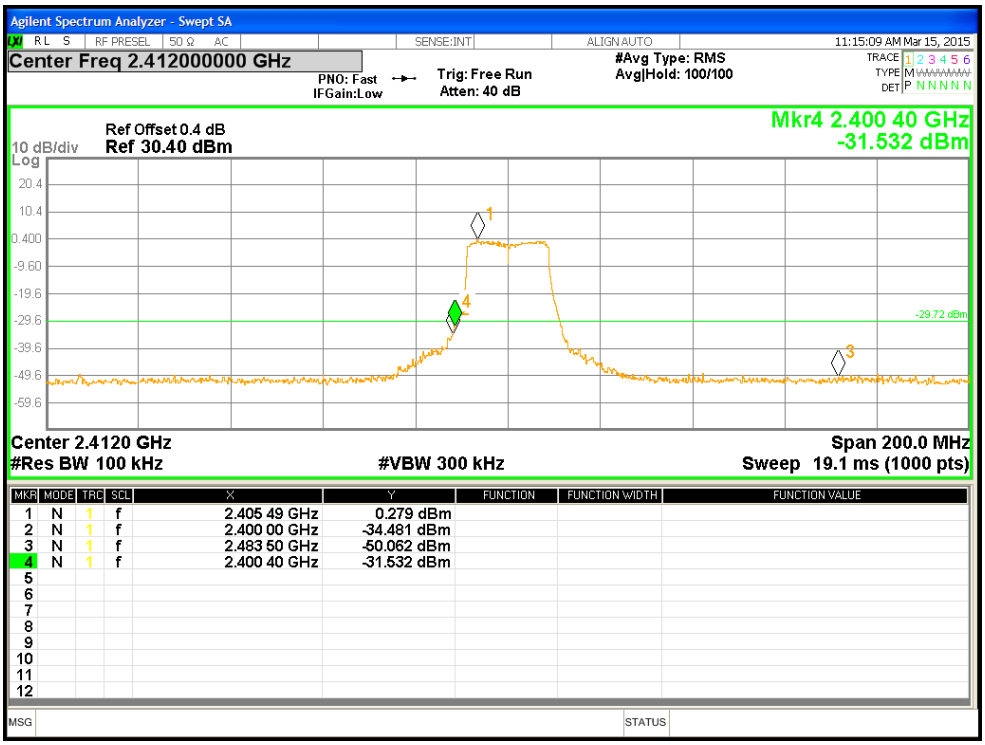


Figure 43: Measured Bandedge for HT20-MCS8 at 2412 MHz, Chain 0

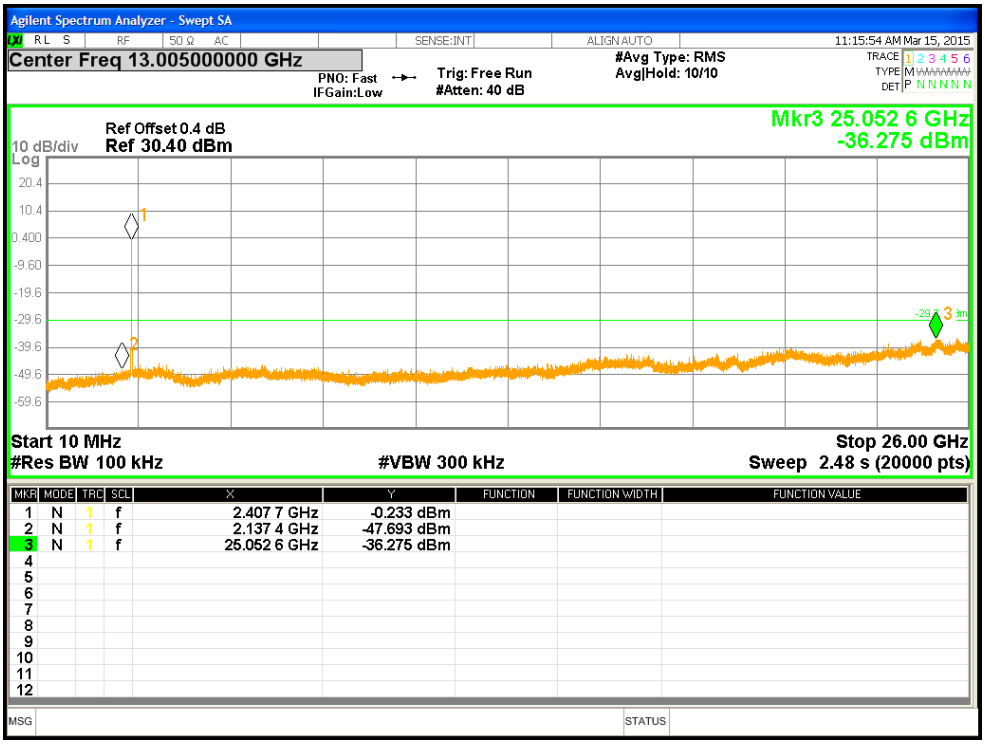


Figure 44: Out of Band Emissions for HT20-MCS8 at 2412 MHz, Chain 0

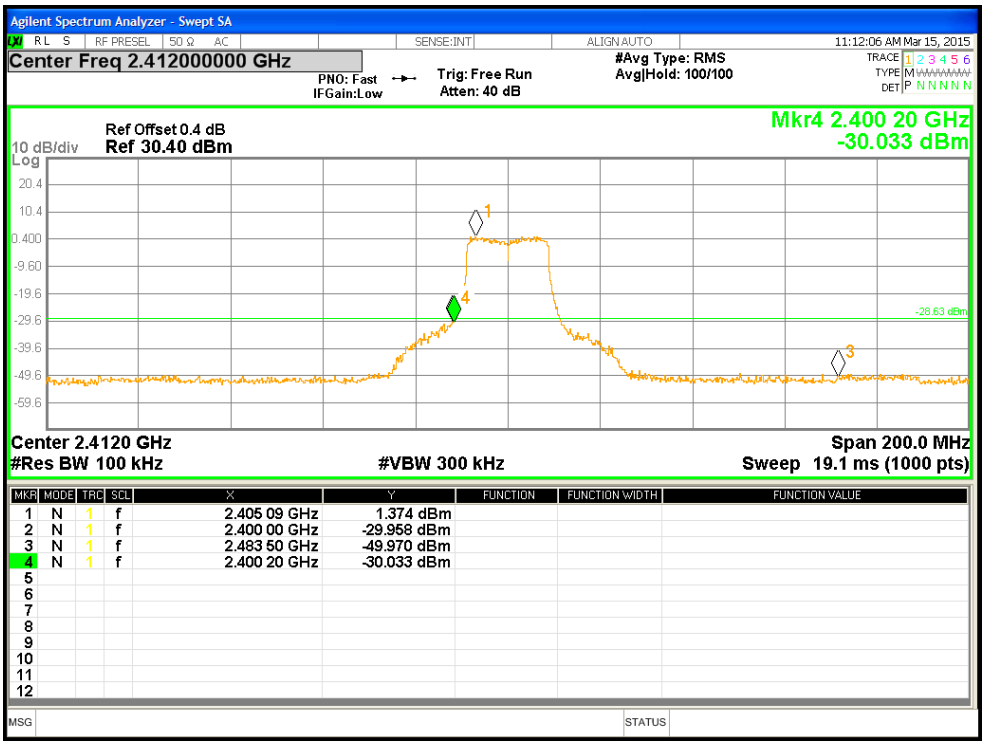


Figure 45: Measured Bandedge for HT20-MCS8 at 2412 MHz, Chain 1

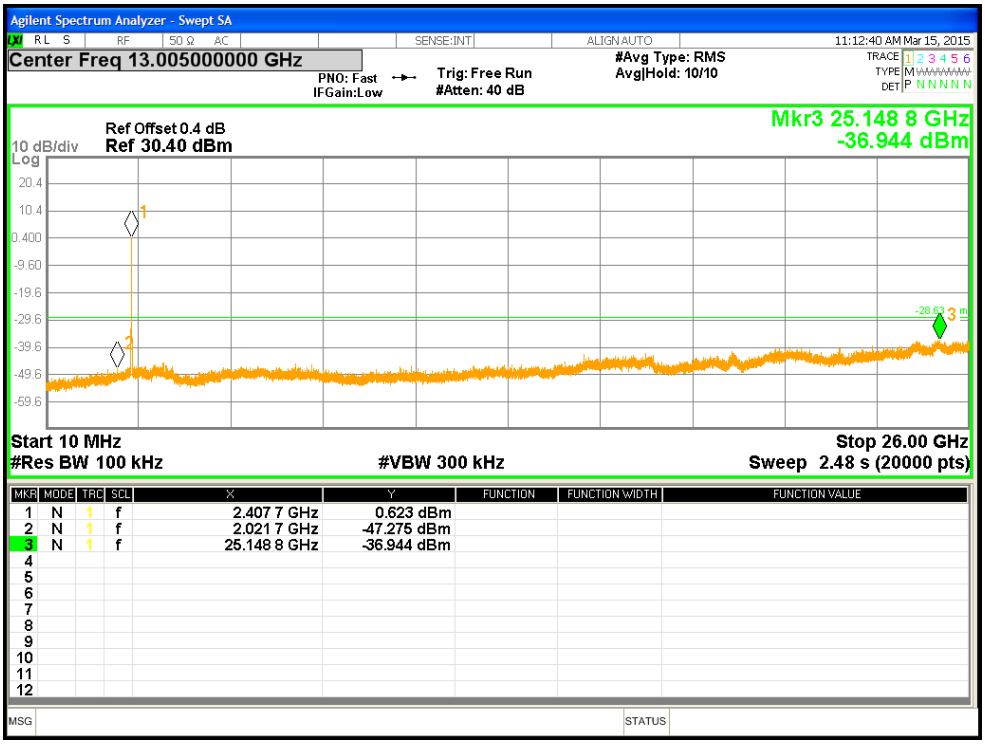


Figure 46: Out of Band Emissions for HT20-MCS8 at 2412 MHz, Chain 1

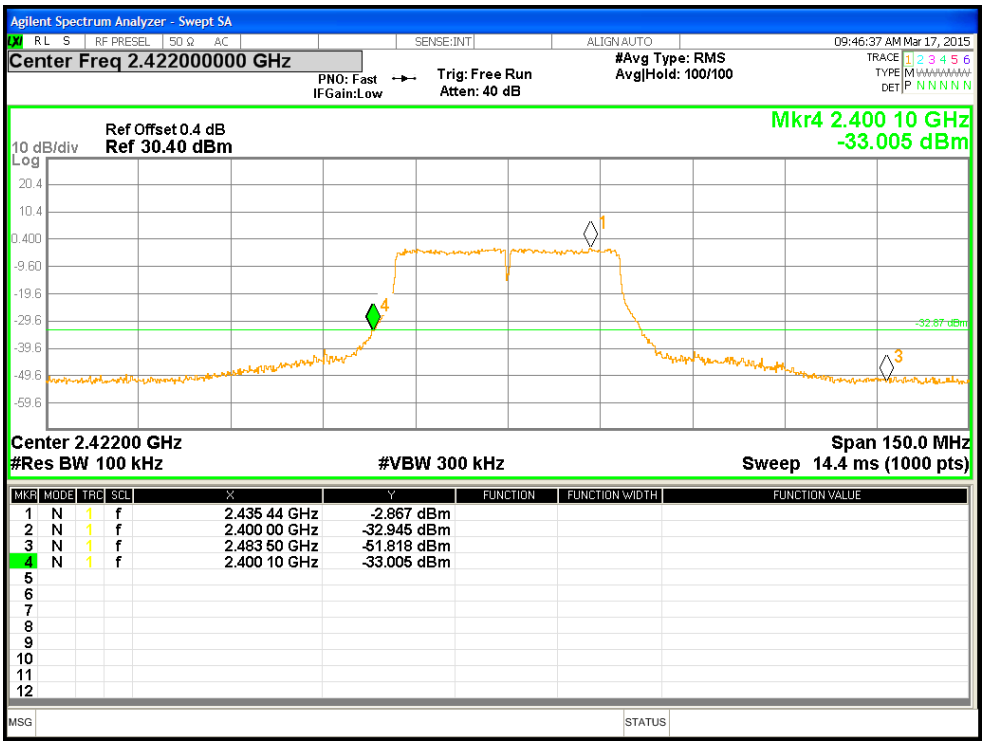


Figure 47: Measured Bandedge for HT40-MCS0 at 2422 MHz, Chain 0

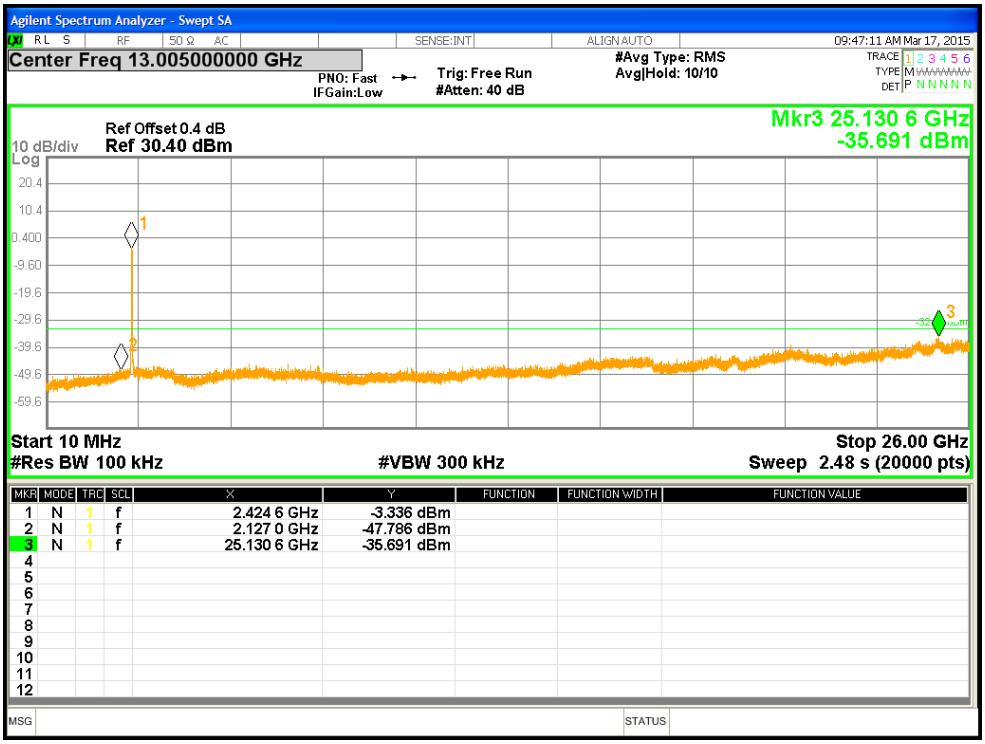


Figure 48: Out of Band Emissions for HT40-MCS0 at 2422 MHz, Chain 0

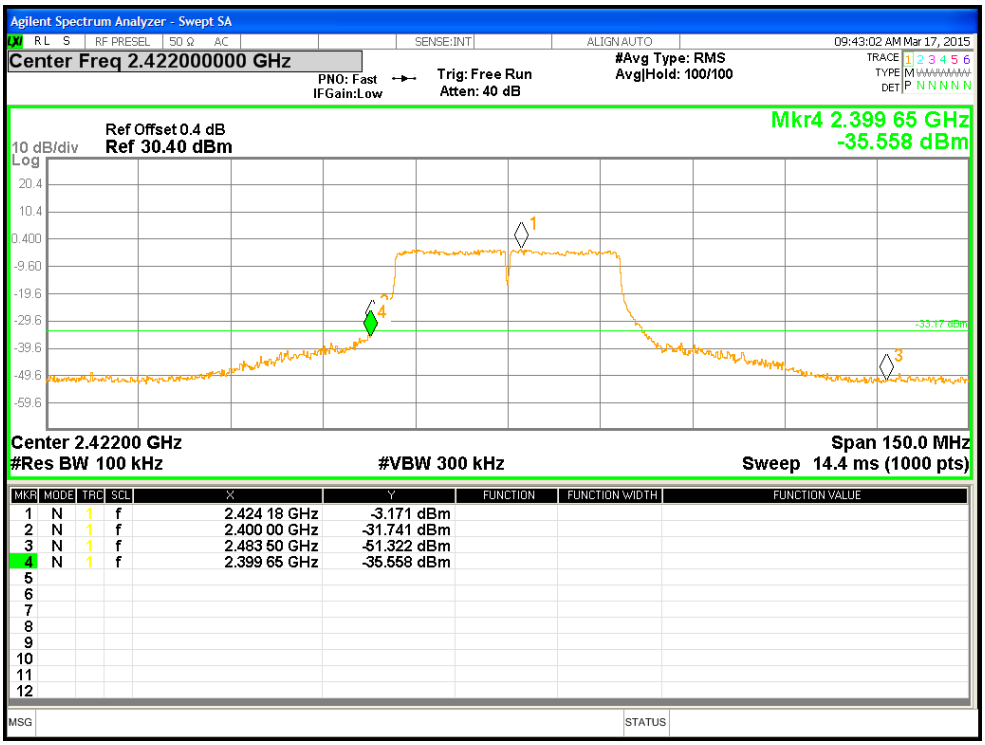


Figure 49: Measured Bandedge for HT40-MCS0 at 2422 MHz, Chain 1

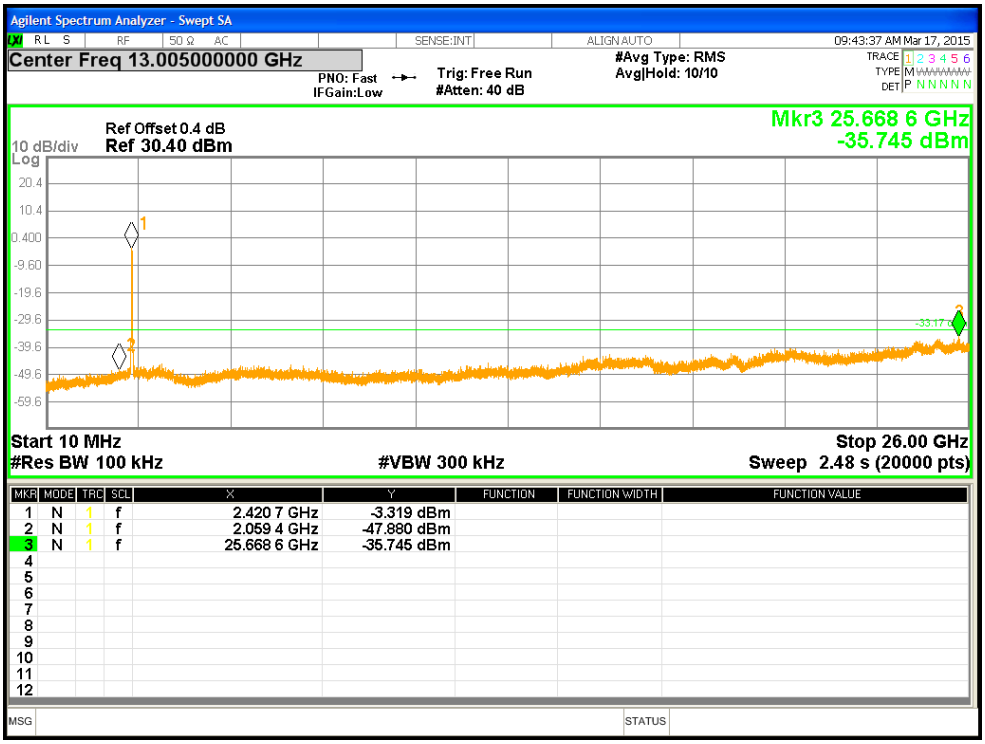


Figure 50: Out of Band Emissions for HT40-MCS0 at 2422 MHz, Chain 1

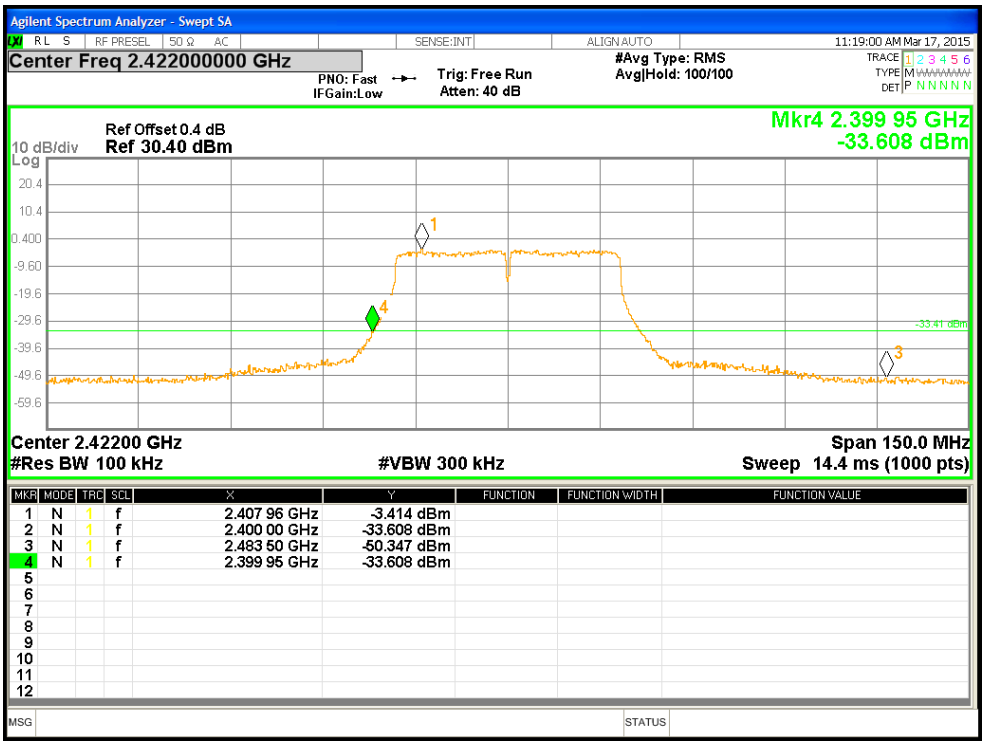


Figure 51: Measured Bandedge for HT40-MCS8 at 2422 MHz, Chain 0

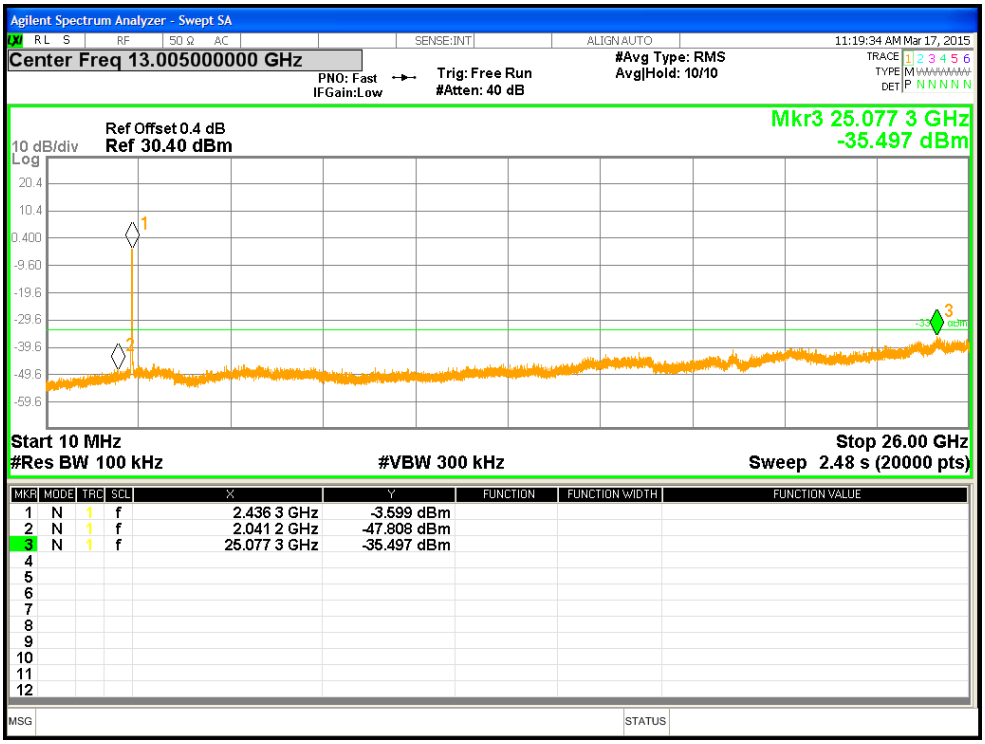


Figure 52: Out of Band Emissions for HT40-MCS8 at 2422 MHz, Chain 0

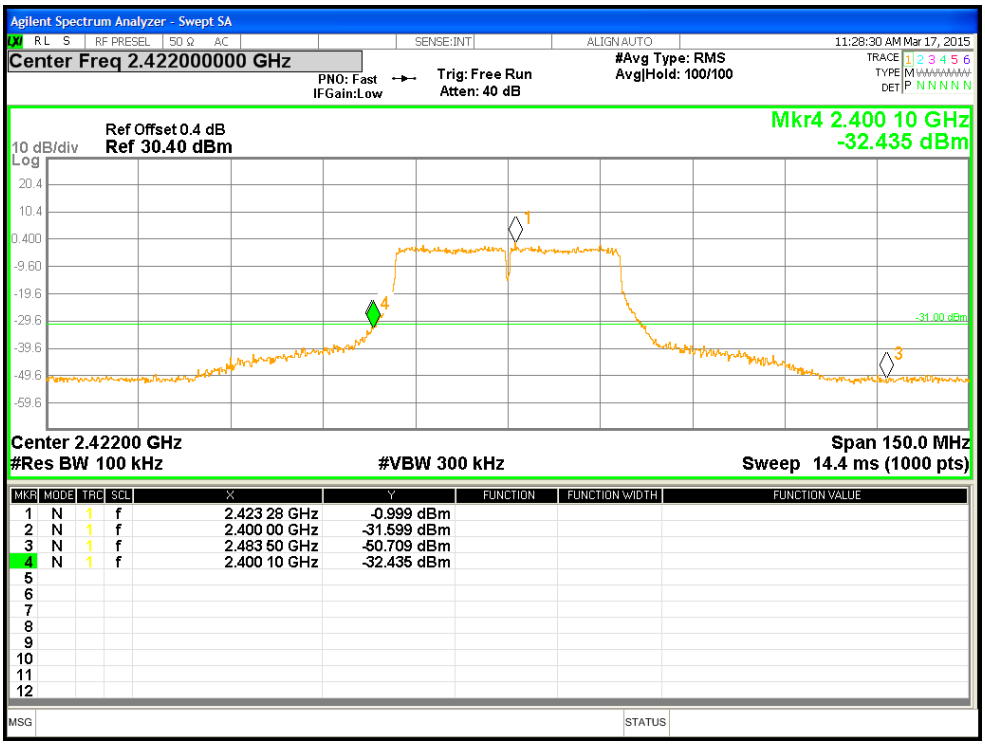


Figure 53: Measured Bandedge for HT40-MCS8 at 2422 MHz, Chain 1

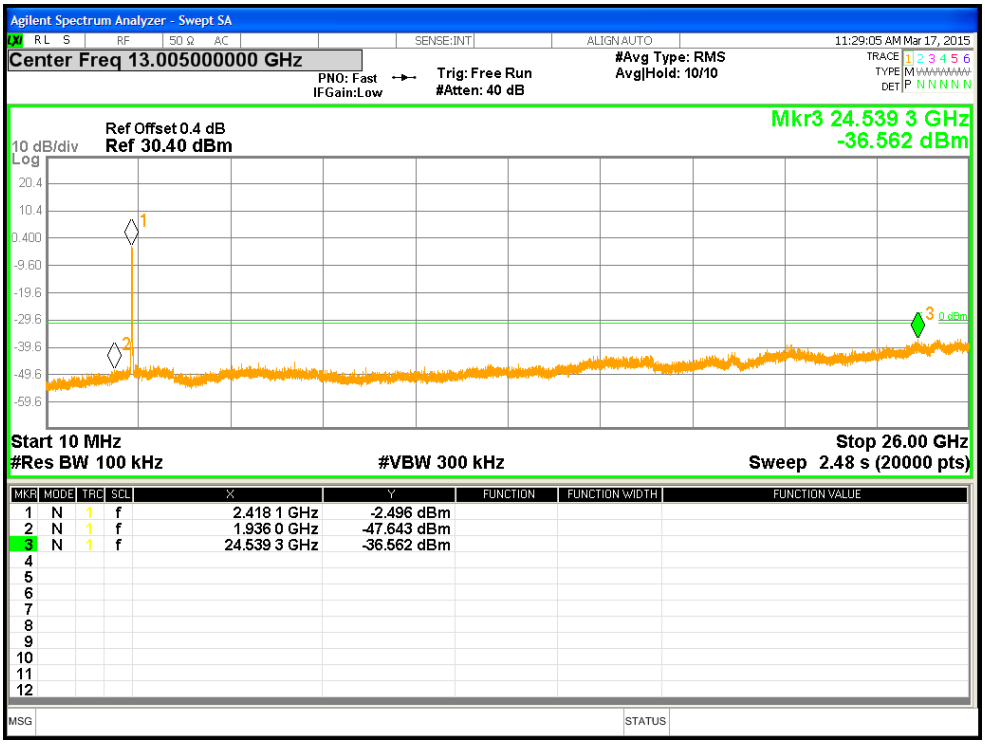


Figure 54: Out of Band Emissions for HT40-MCS8 at 2422 MHz, Chain 1

4.5 Out of Band Emissions

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

4.5.1 Test Methodology

4.5.1.1 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.

Pres-scans were performed to determine the worst data rate / chains.

4.5.1.2 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.

Final results are: 802.11b, 802.11g, HT20-MIMO (2x2), HT40, HT40-MIMO (2x2)

4.5.1.3 Deviations

None.

4.5.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2015 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

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

4.5.3 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 12: Transmit Spurious Emission at Band-Edge Requirements

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only								
Antenna Type: Patch				**Power Setting:** See test plan				
Max. Directional Gain: - 6 dBi (2.4 GHz)								
Beam Forming Gain: - 3 dBi (2.4 GHz)								
Signal State: Modulated at 100%.								
Ambient Temp.: 21 °C				**Relative Humidity:**32%				
Band-Edge Results								
Freq. (MHz)	Level (dBuV/m)	Pol. (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
2390	58.02	V	74	-15.98	Pk	292	290	PLOT 147: 11b-1Mbps-2412MHz-TX48-Ch1
2390	46.47	V	54	-7.53	Ave	292	290	PLOT 148: 11b-1Mbps-2412MHz-TX48-Ch1
2390	58.17	H	74	-15.83	Pk	42	190	PLOT 149: 11b-1Mbps-2412MHz-TX48-Ch1
2390	47.32	H	54	-6.68	Ave	42	190	PLOT 150: 11b-1Mbps-2412MHz-TX48-Ch1
2483.5	60.89	H	74	-13.11	Pk	239	181	PLOT 151: 11b-1Mbps-2462MHz-TX48-Ch1
2483.5	50.81	H	54	-3.19	Ave	239	181	PLOT 152: 11b-1Mbps-2462MHz-TX48-Ch1
2483.5	59.38	V	74	-14.62	Pk	348	180	PLOT 153: 11b-1Mbps-2462MHz-TX48-Ch1
2483.5	48.79	V	54	-5.21	Ave	348	180	PLOT 154: 11b-1Mbps-2462MHz-TX48-Ch1
2390	58.50	V	74	-15.50	Pk	291	285	PLOT 155: 11g-6Mbps-2412MHz-TX48-Ch1
2390	48.44	V	54	-5.56	Ave	291	285	PLOT 156: 11g-6Mbps-2412MHz-TX48-Ch1
2390	61.60	H	74	-12.40	Pk	59	236	PLOT 157: 11g-6Mbps-2412MHz-TX48-Ch1
2390	46.75	H	54	-7.25	Ave	59	236	PLOT 158: 11g-6Mbps-2412MHz-TX48-Ch1
2483.5	66.74	H	74	-7.26	Pk	52	338	PLOT 159: 11g-6Mbps-2462MHz-TX48-Ch1
2483.5	51.45	H	54	-2.55	Ave	52	338	PLOT 160: 11g-6Mbps-2462MHz-TX48-Ch1
2483.5	65.65	V	74	-8.35	Pk	288	221	PLOT 161: 11g-6Mbps-2462MHz-TX48-Ch1
2483.5	50.74	V	54	-3.26	Ave	288	221	PLOT 162: 11g-6Mbps-2462MHz-TX48-Ch1
Note: 1. The emissions were measured at the adjacent restricted band of the fundamental signal. 2. All the band-edge measurements met the restricted band requirements of CFR47 15.205.								

Band-Edge Results, continue								
Freq. (MHz)	Level (dBuV/m)	Pol. (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
2390	61.80	V	74	-12.20	Pk	294	286	PLOT 163: HT20-MCS8-2412MHz-TX55-Ch0-Ch1
2390	48.68	V	54	-5.32	Ave	294	286	PLOT 164: HT20-MCS8-2412MHz-TX55-Ch0-Ch1
2390	65.05	H	74	-8.95	Pk	215	344	PLOT 165: HT20-MCS8-2412MHz-TX55-Ch0-Ch1
2390	51.43	H	54	-2.57	Ave	215	344	PLOT 166: HT20-MCS8-2412MHz-TX55-Ch0-Ch1
2483.5	69.08	H	74	-4.92	Pk	31	343	PLOT 167: HT20-MCS8-2462MHz-TX55-Ch0-Ch1
2483.5	53.71	H	54	-0.29	Ave	31	343	PLOT 168: HT20-MCS8-2462MHz-TX55-Ch0-Ch1
2483.5	68.80	V	74	-5.20	Pk	289	331	PLOT 169: HT20-MCS8-2462MHz-TX55-Ch0-Ch1
2483.5	53.75	V	54	-0.25	Ave	289	331	PLOT 170: HT20-MCS8-2462MHz-TX55-Ch0-Ch1
2390	69.08	H	74	-4.92	Pk	31	343	PLOT 171: HT40-MCS0-2412MHz-TX52-Ch1
2390	53.71	H	54	-0.29	Ave	31	343	PLOT 172: HT40-MCS0-2412MHz-TX52-Ch1
2390	68.80	V	74	-5.20	Pk	289	331	PLOT 173: HT40-MCS0-2412MHz-TX52-Ch1
2390	53.75	V	54	-0.25	Ave	289	331	PLOT 174: HT40-MCS0-2412MHz-TX52-Ch1
2483.5	66.12	V	74	-7.88	Pk	130	327	PLOT 175: HT40-MCS0-2462MHz-TX52-Ch1
2483.5	53.09	V	54	-0.91	Ave	130	327	PLOT 176: HT40-MCS0-2462MHz-TX52-Ch1
2483.5	68.25	H	74	-5.75	Pk	219	326	PLOT 177: HT40-MCS0-2462MHz-TX52-Ch1
2483.5	53.09	H	54	-0.91	Ave	219	326	PLOT 178: HT40-MCS0-2462MHz-TX50-Ch1
2390	59.61	V	74	-14.39	Pk	288	334	PLOT 179: HT40-MCS8-2422MHz-TX52-Ch0_Ch1
2390	47.40	V	54	-6.60	Ave	288	334	PLOT 180: HT40-MCS8-2422MHz-TX52-Ch0_Ch1
2390	61.89	H	74	-12.11	Pk	221	339	PLOT 181: HT40-MCS8-2422MHz-TX52-Ch0_Ch1
2390	50.71	H	54	-3.29	Ave	221	339	PLOT 182: HT40-MCS8-2422MHz-TX52-Ch0_Ch1
2483.5	56.78	H	74	-17.22	Pk	42	347	PLOT 183: HT40-MCS8-2452MHz-TX52-Ch0_Ch1
2483.5	45.35	H	54	-8.65	Ave	42	347	PLOT 184: HT40-MCS8-2452MHz-TX52-Ch0_Ch1
2483.5	58.55	V	74	-15.45	Pk	73	290	PLOT 185: HT40-MCS8-2452MHz-TX52-Ch0_Ch1
2483.5	44.99	V	54	-9.01	Ave	73	290	PLOT 186: HT40-MCS8-2452MHz-TX52-Ch0_Ch1

Note: 1. The emissions were measured at the adjacent restricted band of the fundamental signal.
2. All the band-edge measurements met the restricted band requirements of CFR47 15.205.

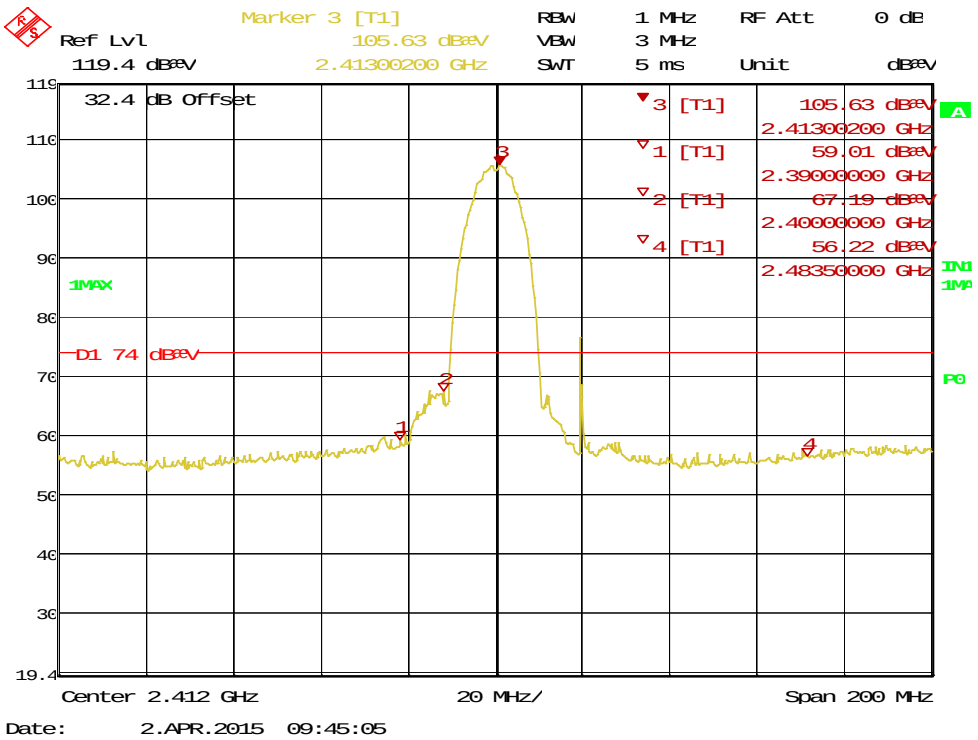


Figure 55: Radiated Emission at the Edge for 2390 MHz – Vert. (Pk)

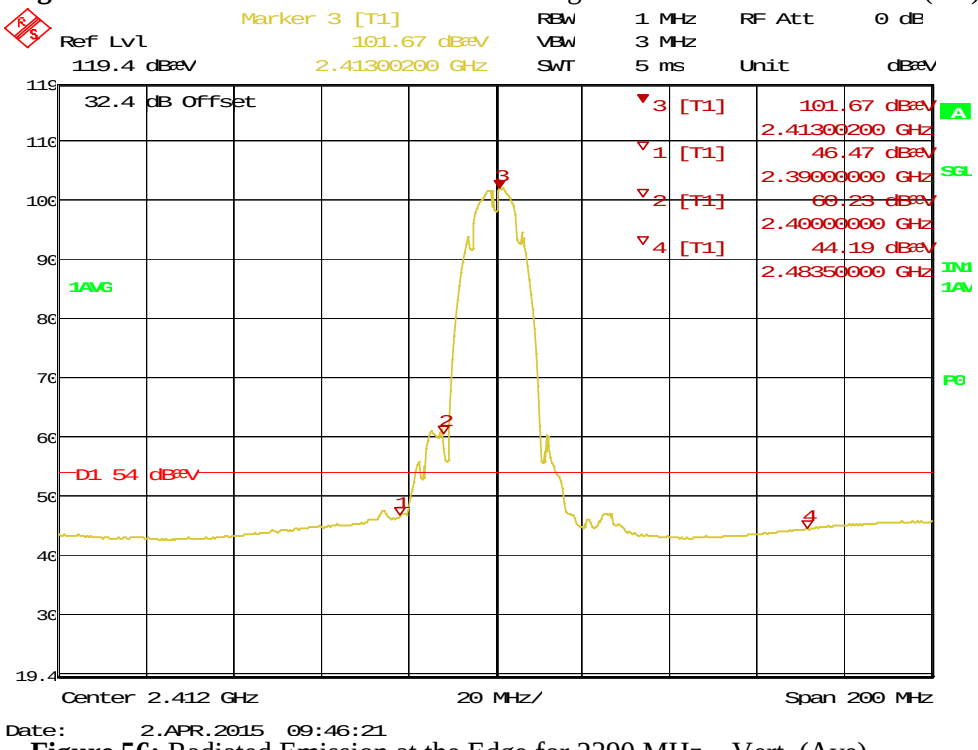


Figure 56: Radiated Emission at the Edge for 2390 MHz – Vert. (Ave)

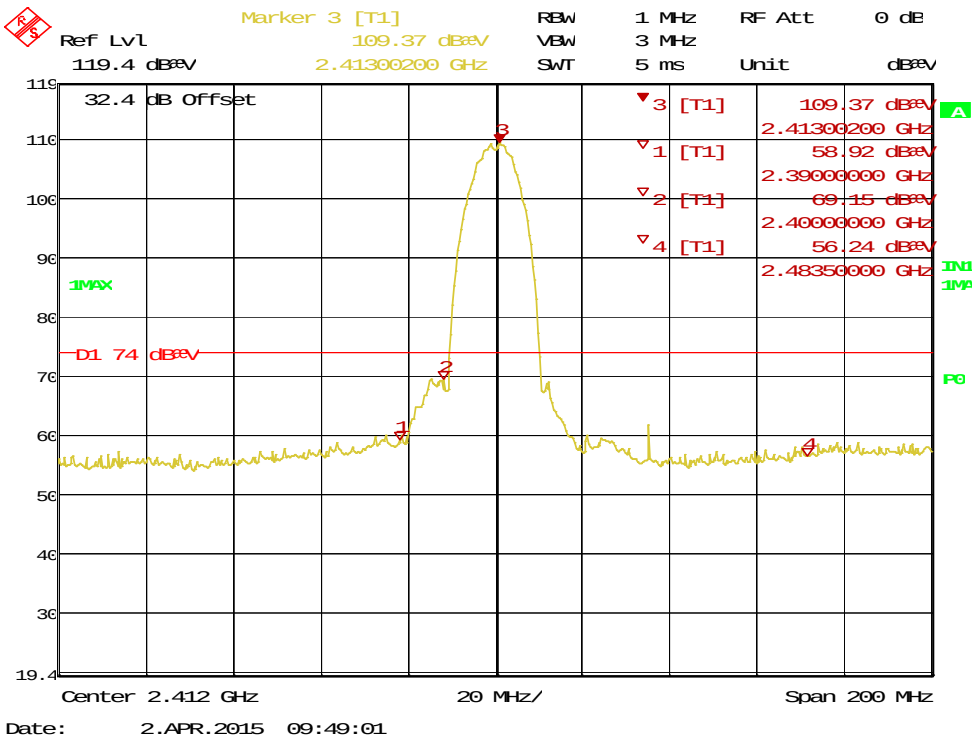


Figure 57: Radiated Emission at the Edge for 2390 MHz – Horz. (Pk)

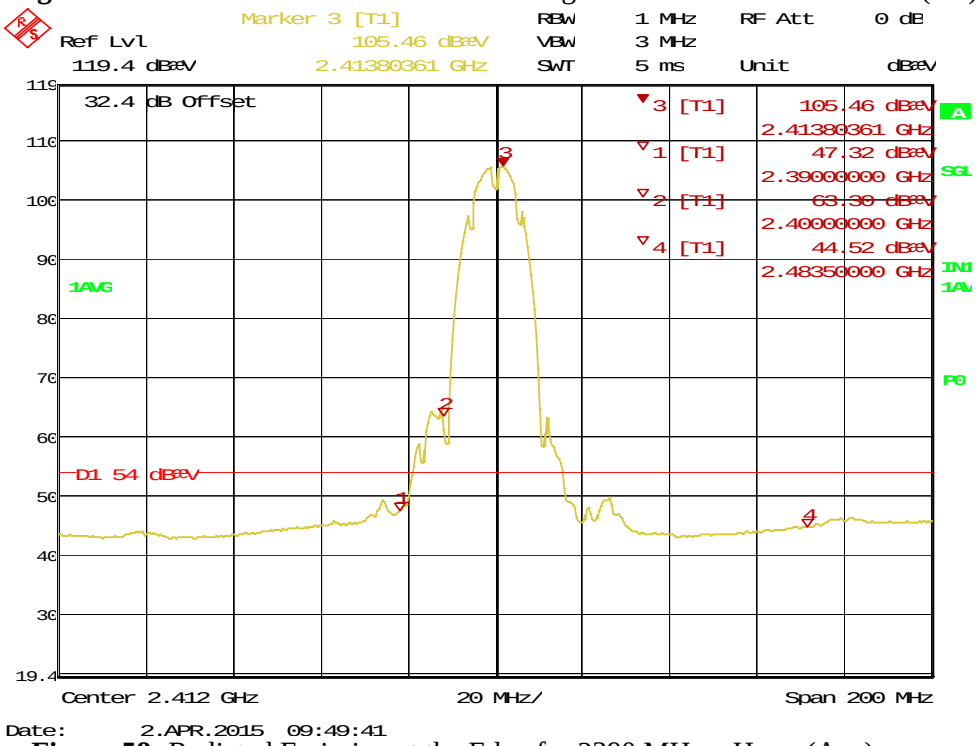


Figure 58: Radiated Emission at the Edge for 2390 MHz – Horz. (Ave)

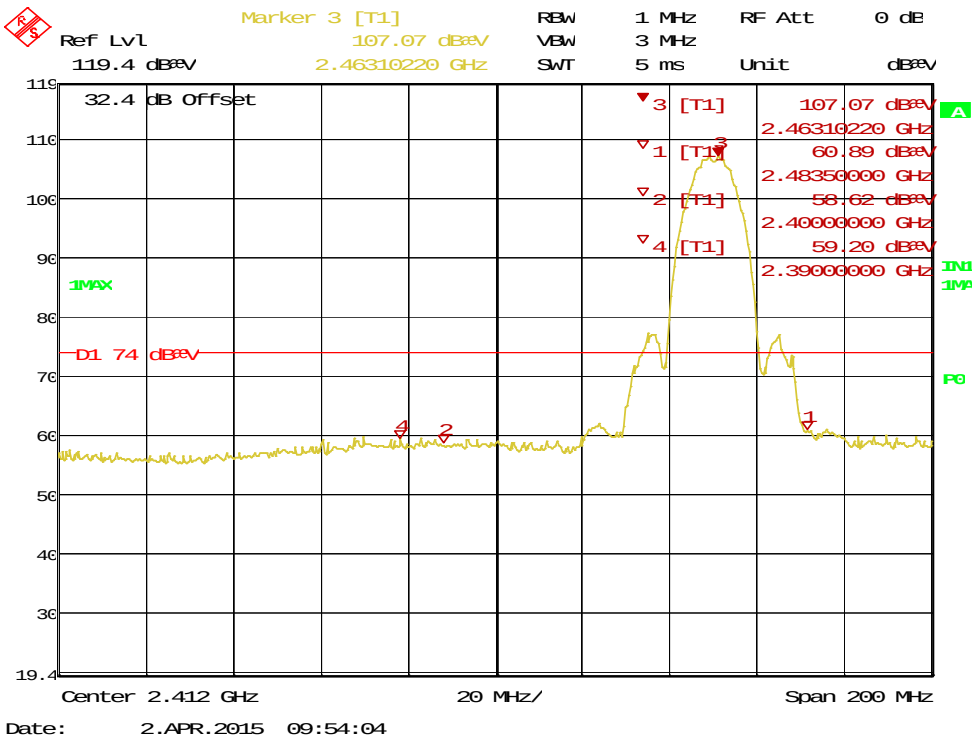


Figure 59: Radiated Emission at the Edge for 2384.5 MHz – Horz. (Pk)

Figure 60: Radiated Emission at the Edge for 2384.5 MHz – Horz. (Ave)

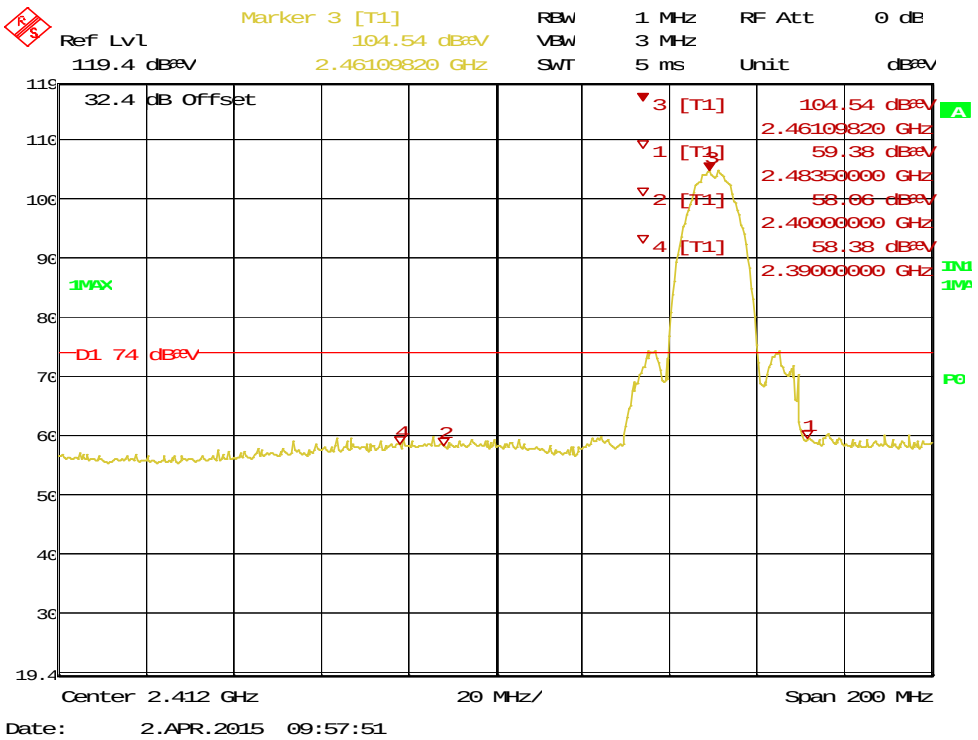


Figure 61: Radiated Emission at the Edge for 2384.5 MHz – Vert. (Pk)

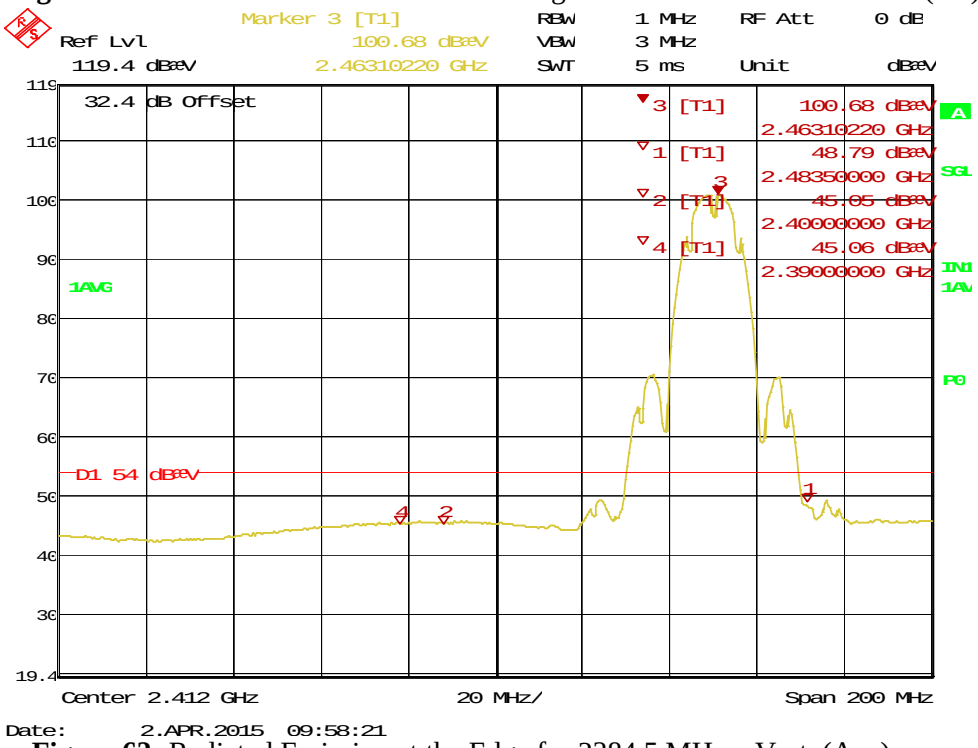


Figure 62: Radiated Emission at the Edge for 2384.5 MHz – Vert. (Ave)

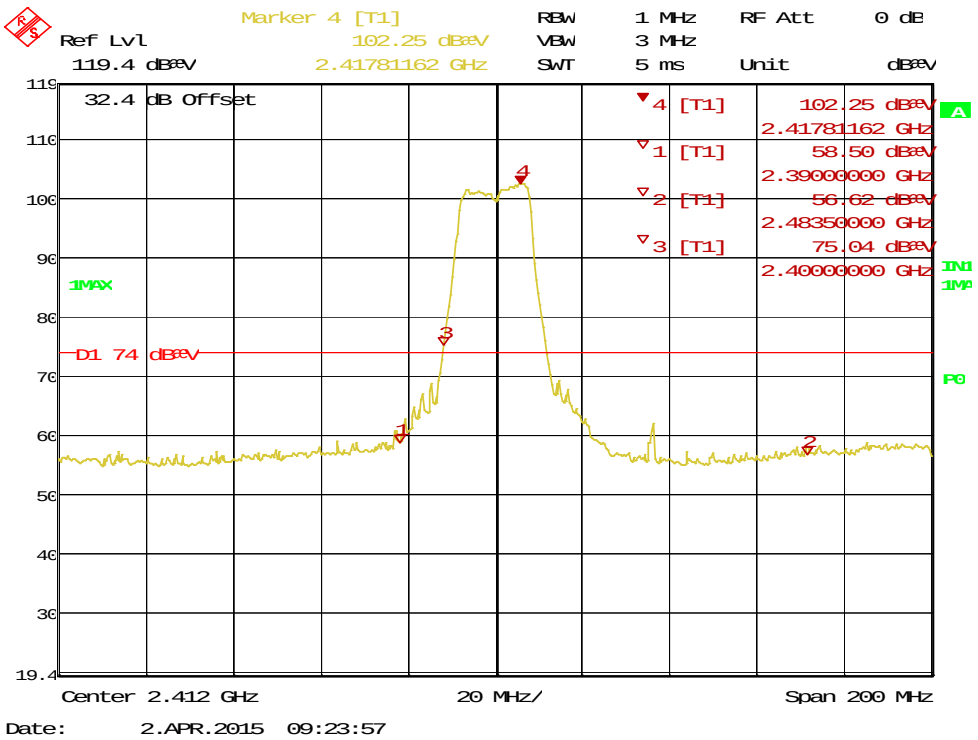


Figure 63: Radiated Emission at the Edge for 2390 MHz – Vert. (Pk)

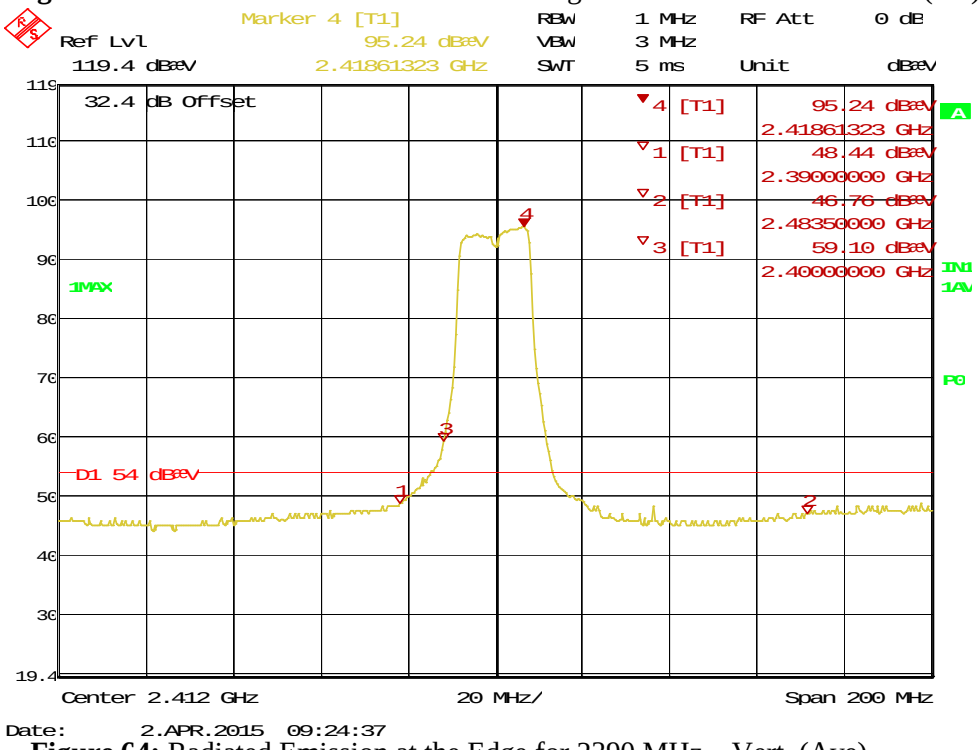


Figure 64: Radiated Emission at the Edge for 2390 MHz – Vert. (Ave)

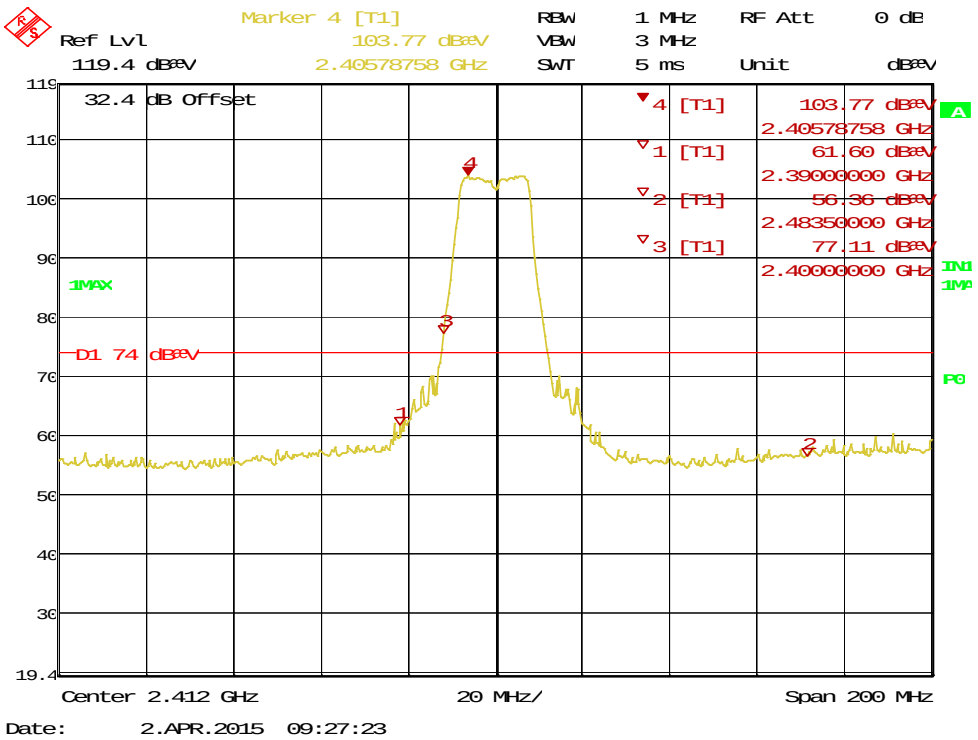


Figure 65: Radiated Emission at the Edge for 2390 MHz – Horz. (Pk)

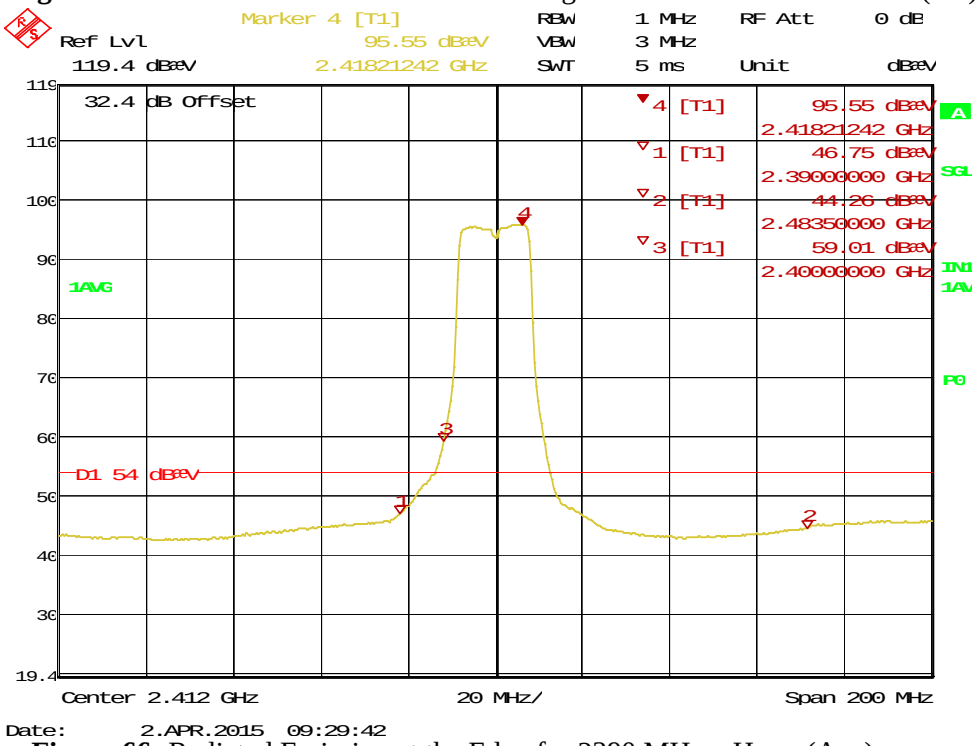


Figure 66: Radiated Emission at the Edge for 2390 MHz – Horz. (Ave)

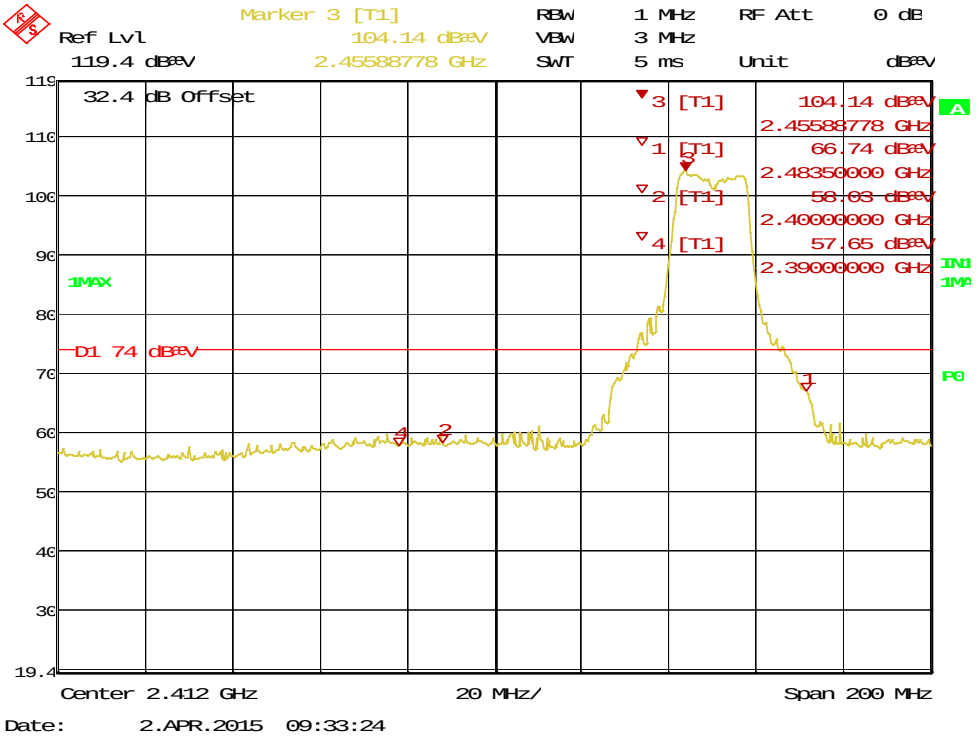


Figure 67: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Pk)

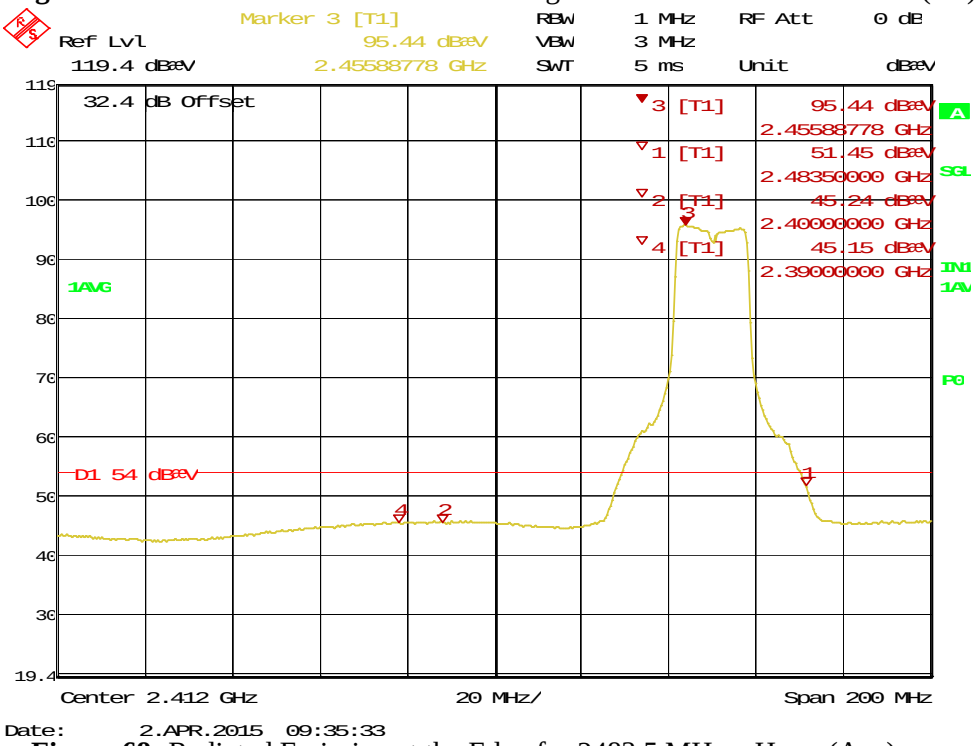


Figure 68: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Ave)

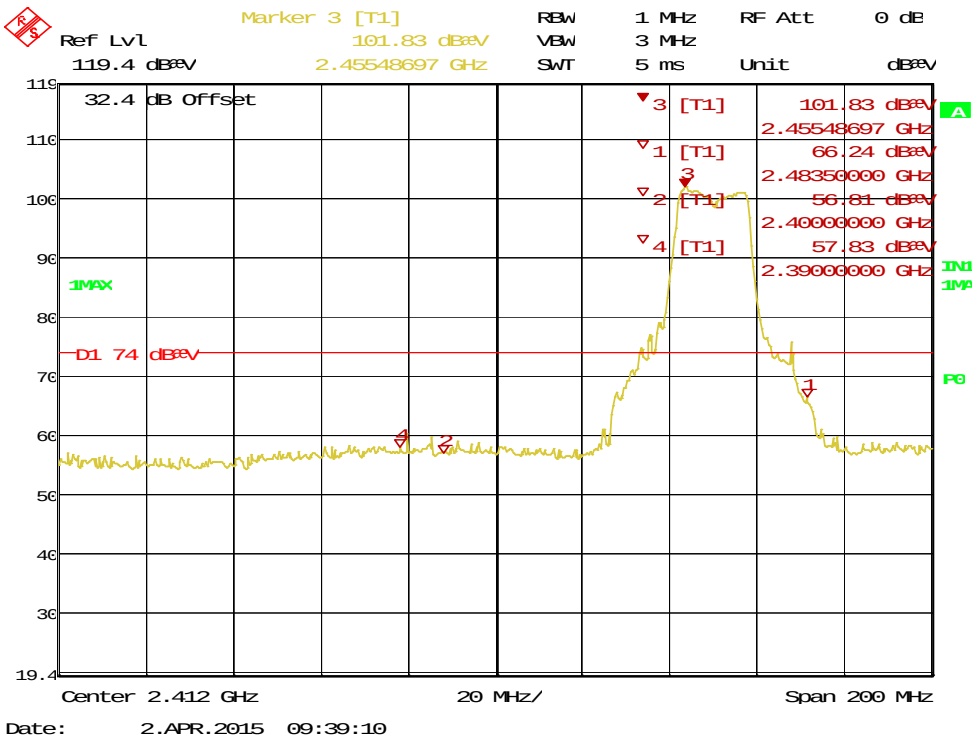


Figure 69: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Pk)

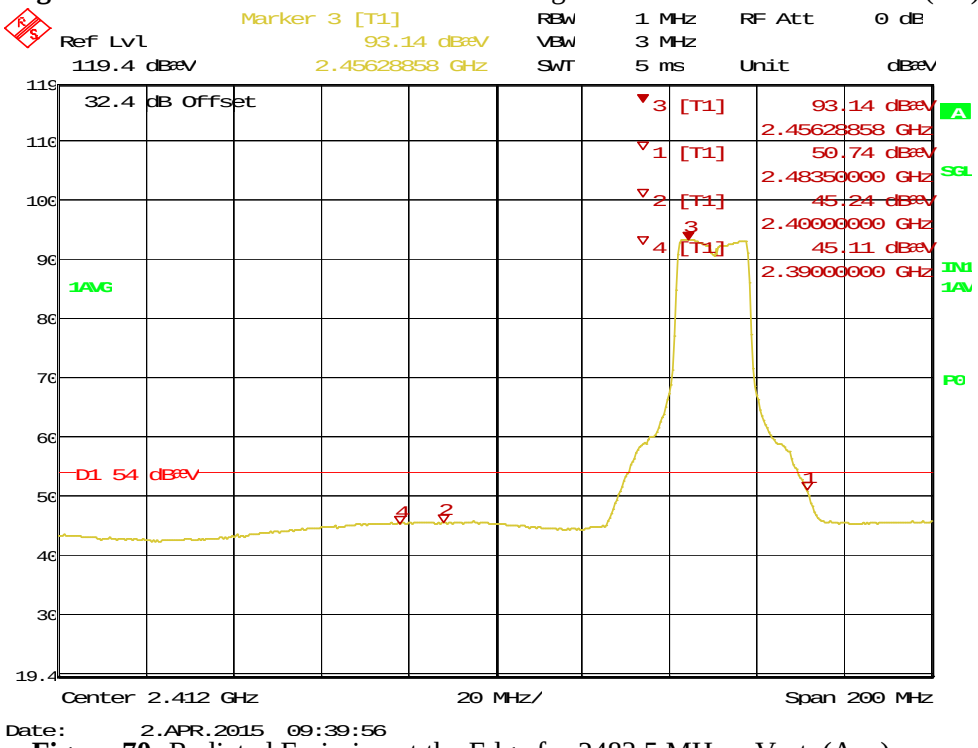


Figure 70: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Ave)

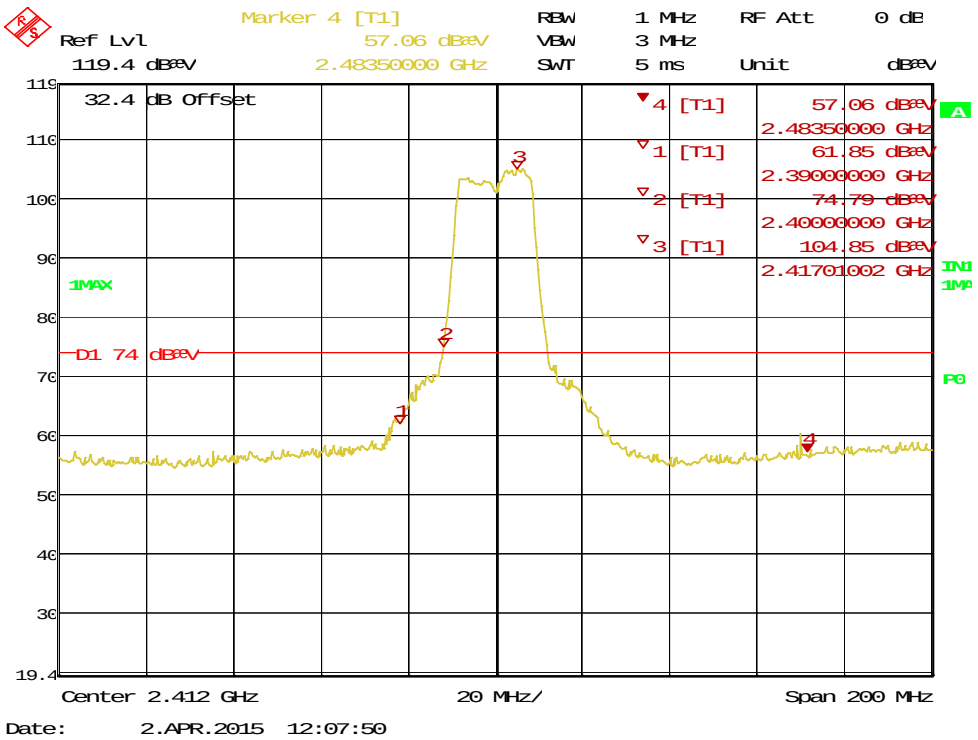


Figure 71: Radiated Emission at the Edge for 2390 MHz – Vert. (Pk)

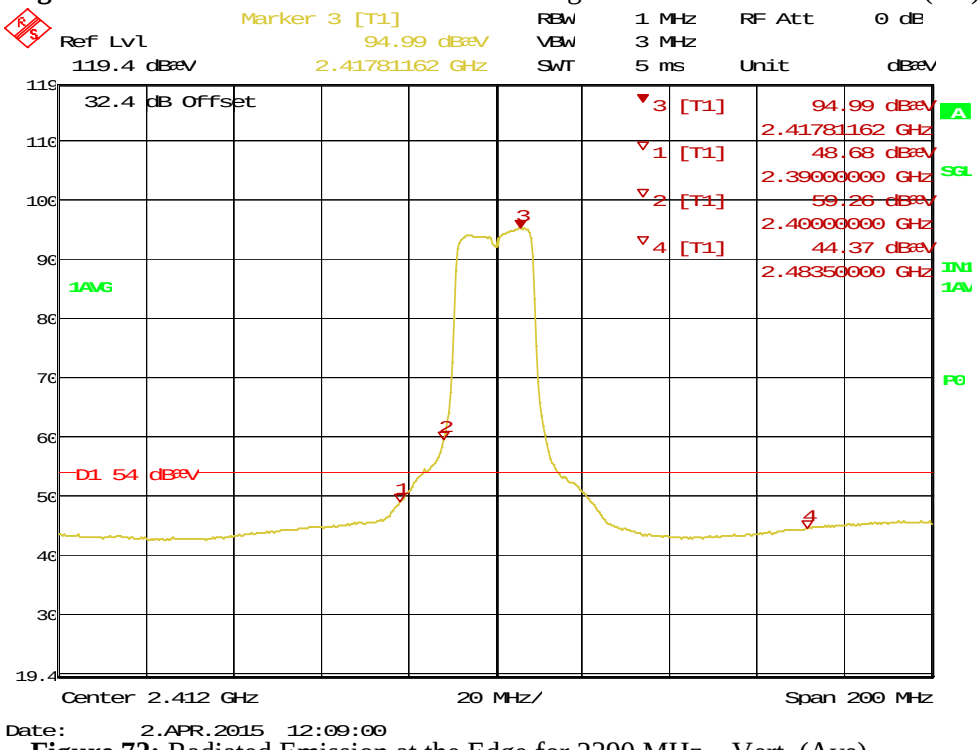


Figure 72: Radiated Emission at the Edge for 2390 MHz – Vert. (Ave)

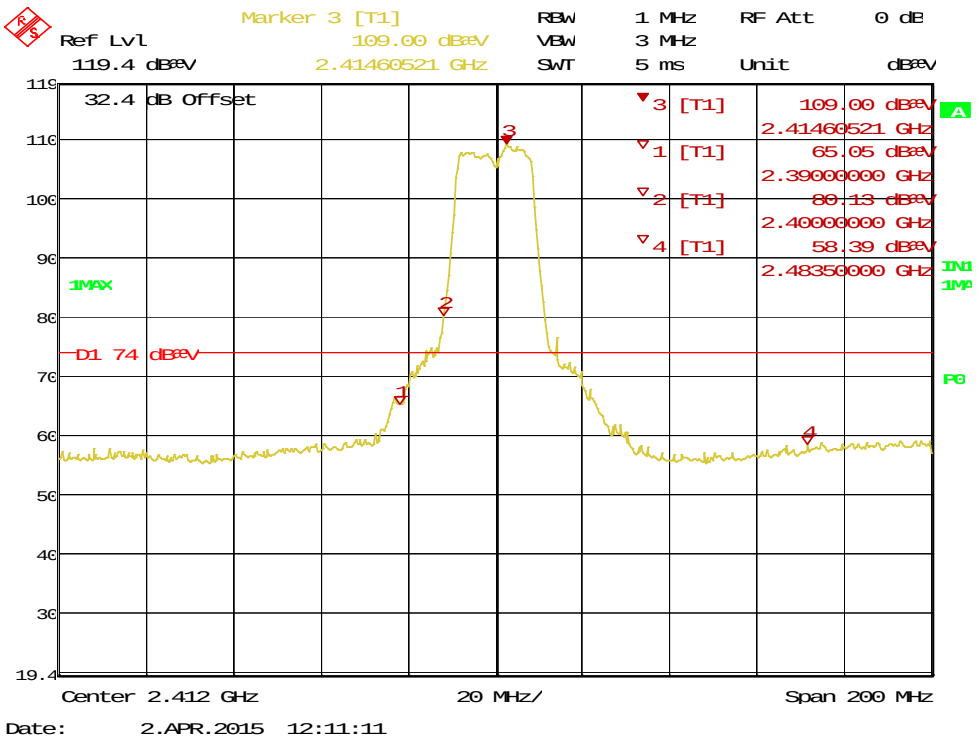


Figure 73: Radiated Emission at the Edge for 2390 MHz – Horz. (Pk)

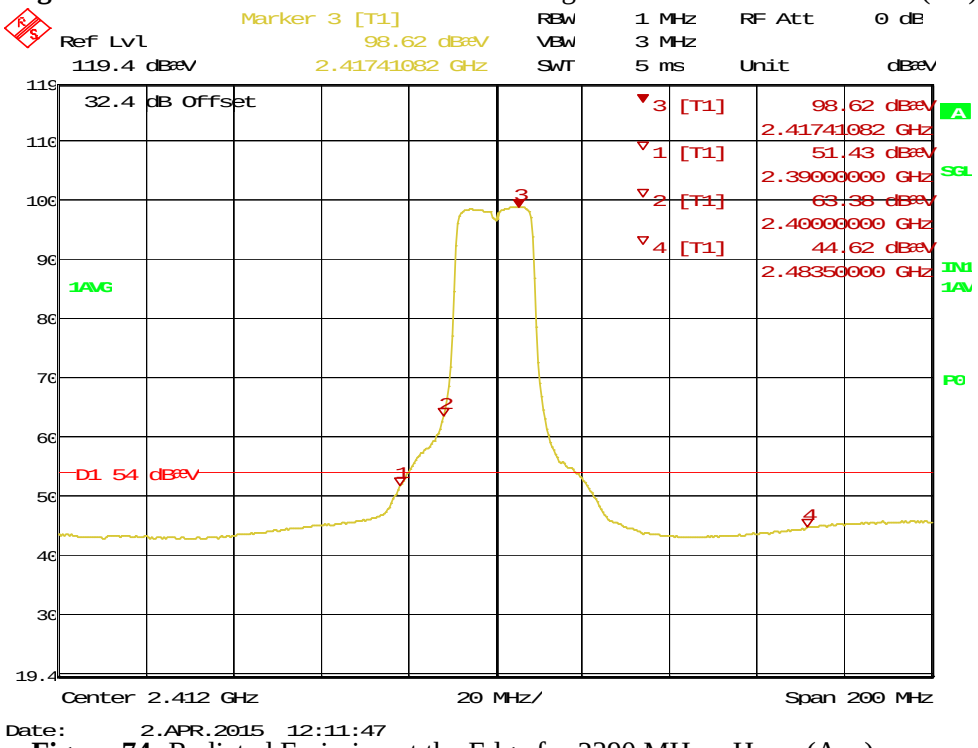


Figure 74: Radiated Emission at the Edge for 2390 MHz – Horz. (Ave)

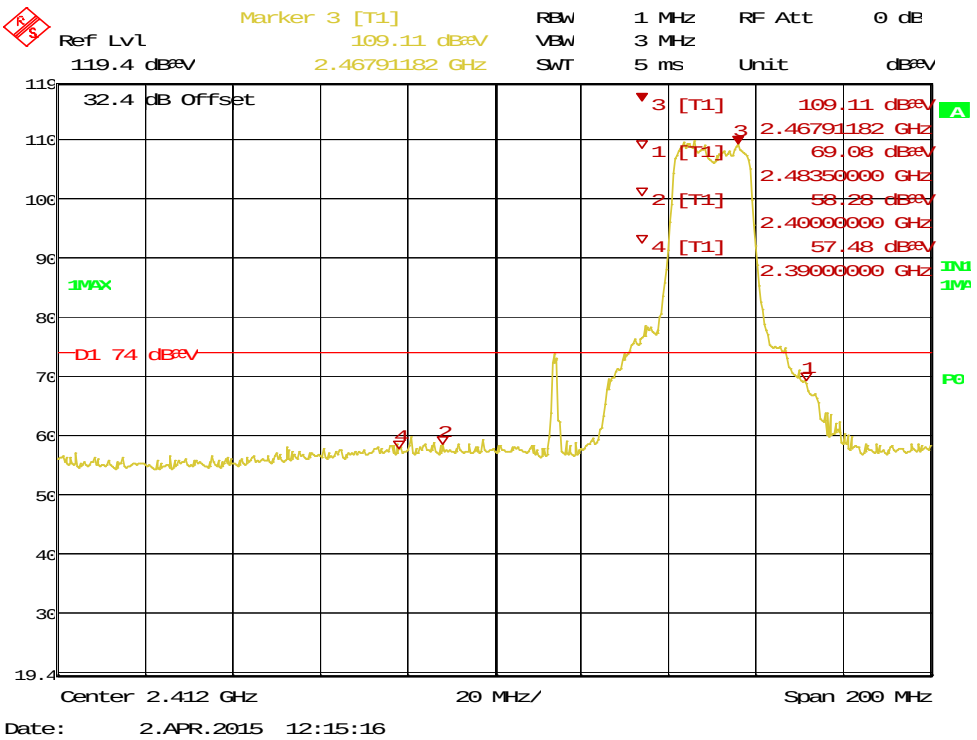


Figure 75: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Pk)

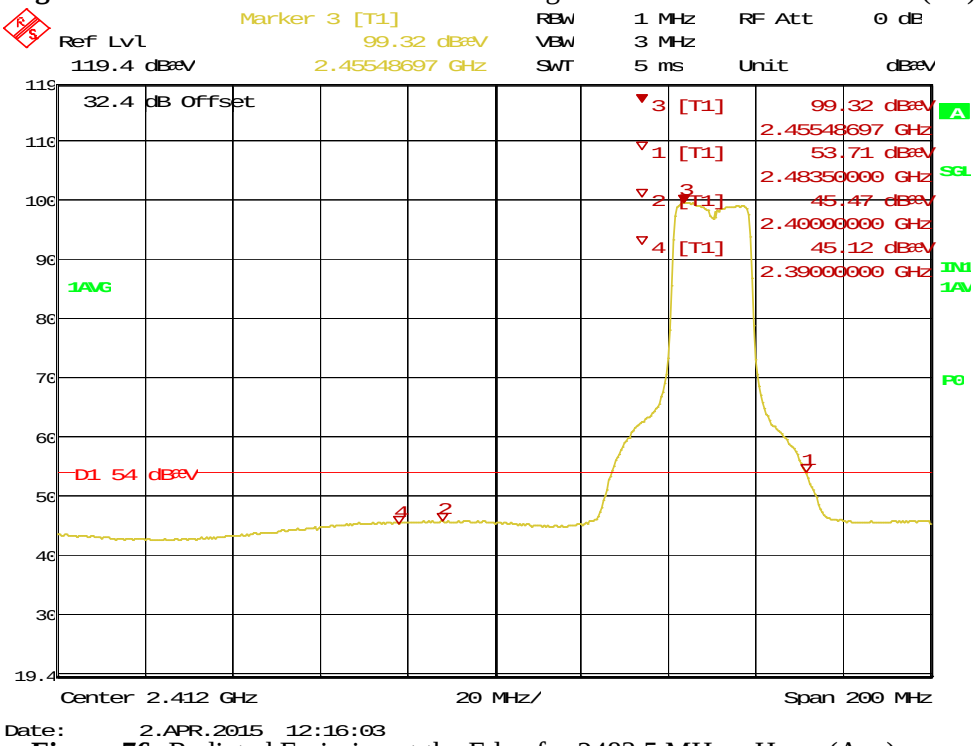


Figure 76: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Ave)

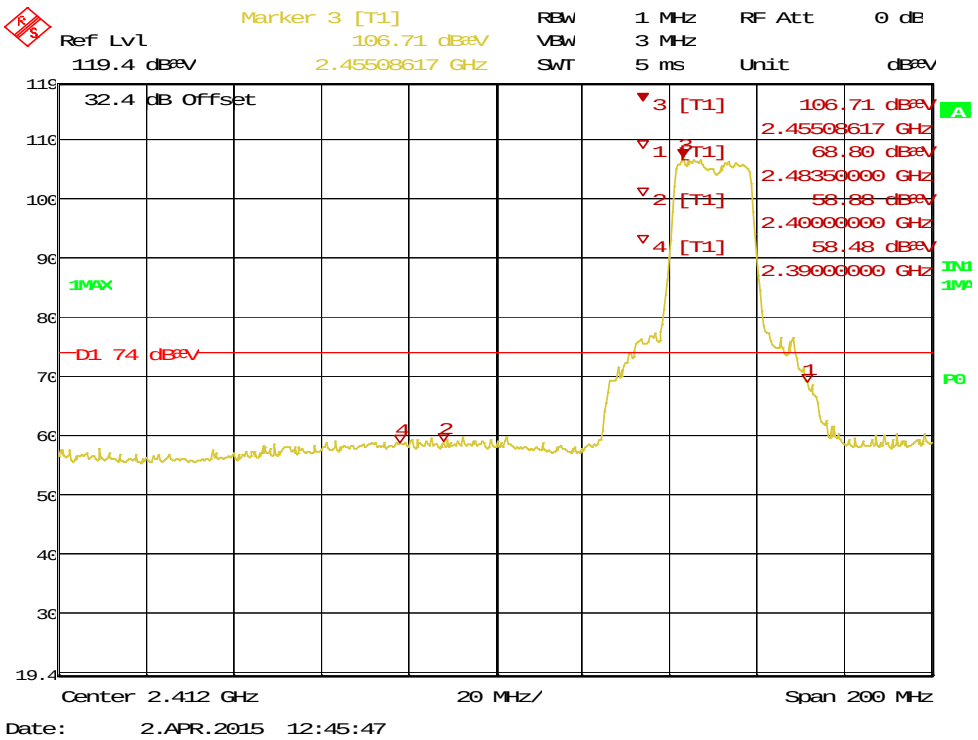


Figure 77: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Pk)

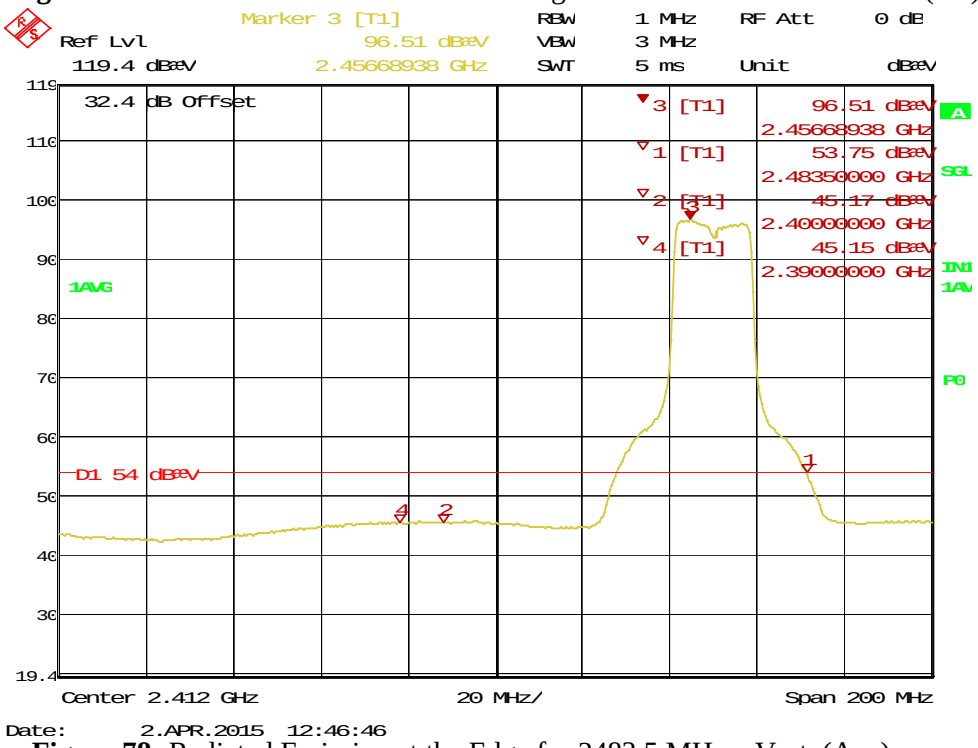


Figure 78: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Ave)

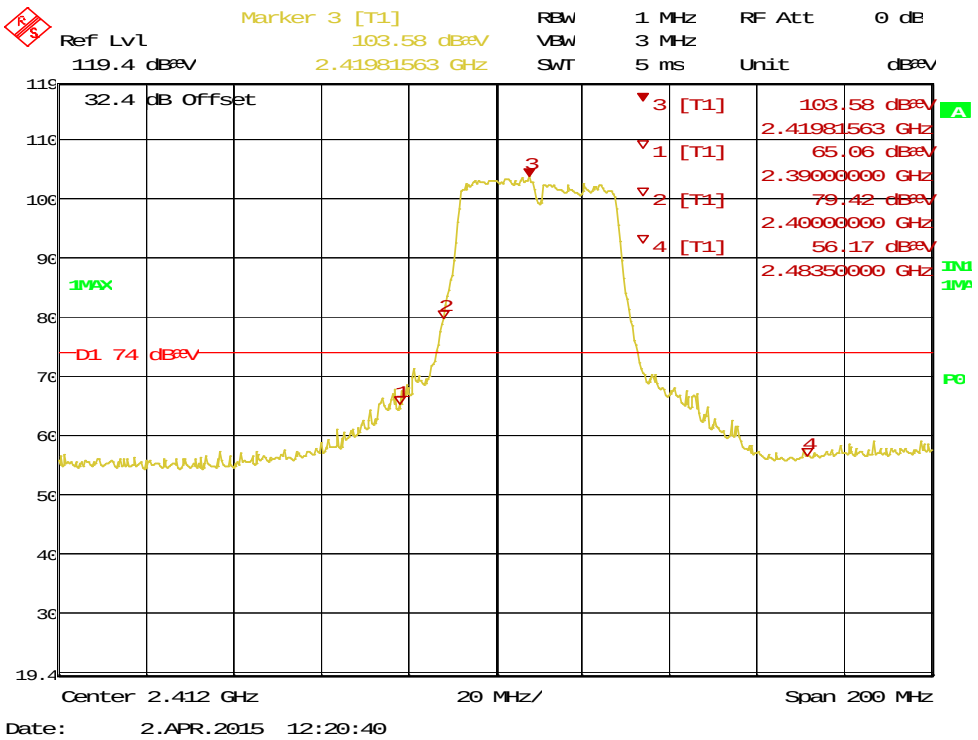


Figure 79: Radiated Emission at the Edge for 2390 MHz – Horz. (Pk)

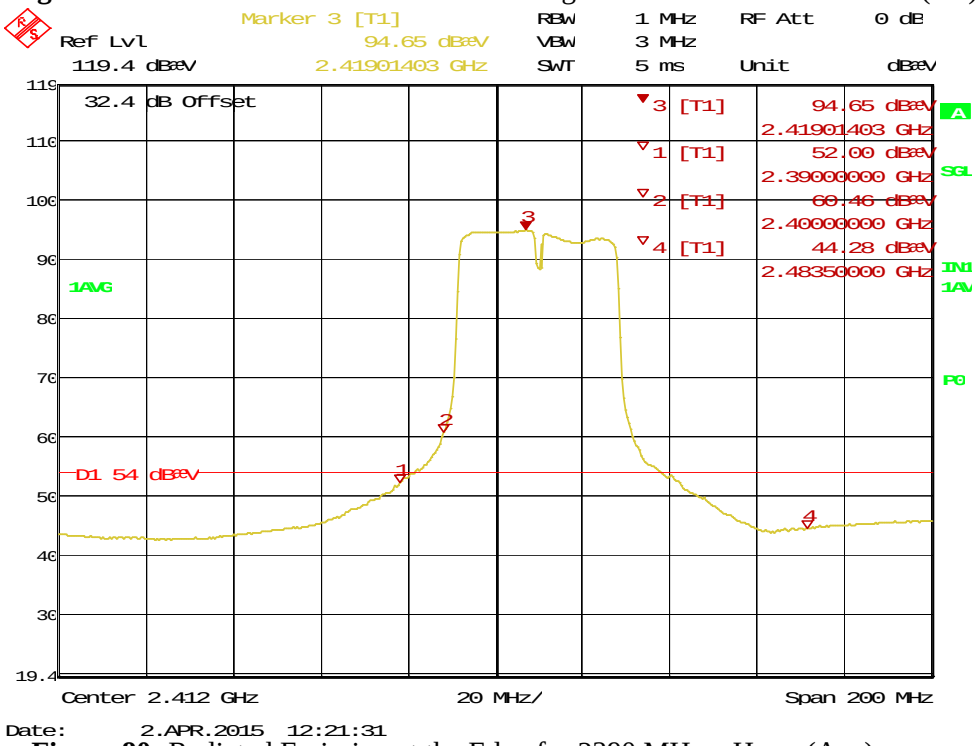


Figure 80: Radiated Emission at the Edge for 2390 MHz – Horz. (Ave)

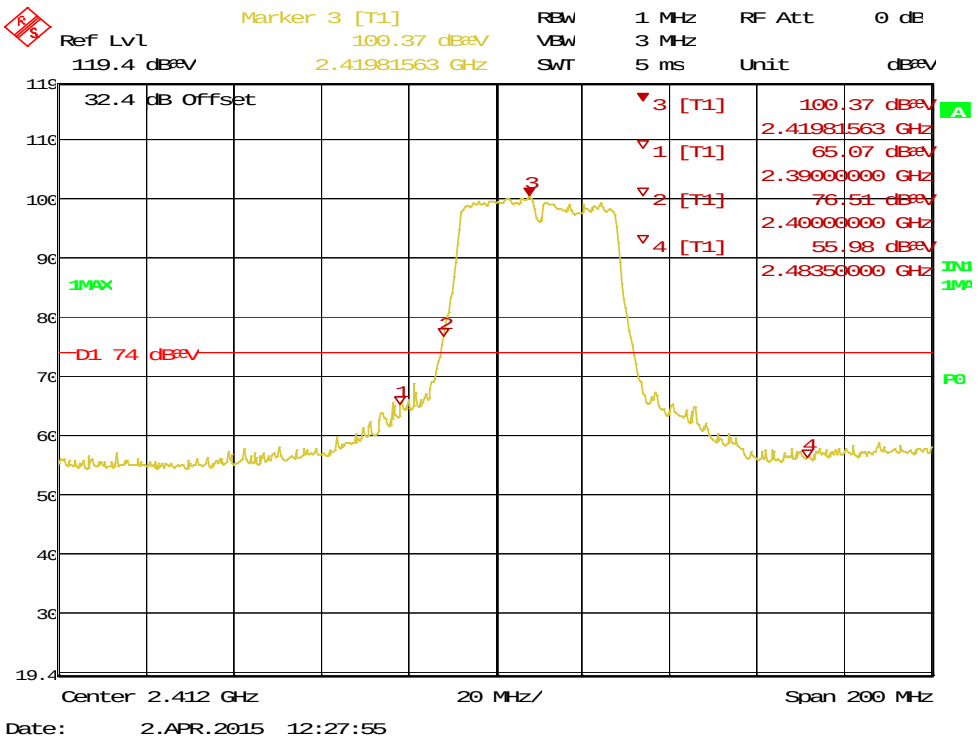


Figure 81: Radiated Emission at the Edge for 2390 MHz – Vert. (Pk)

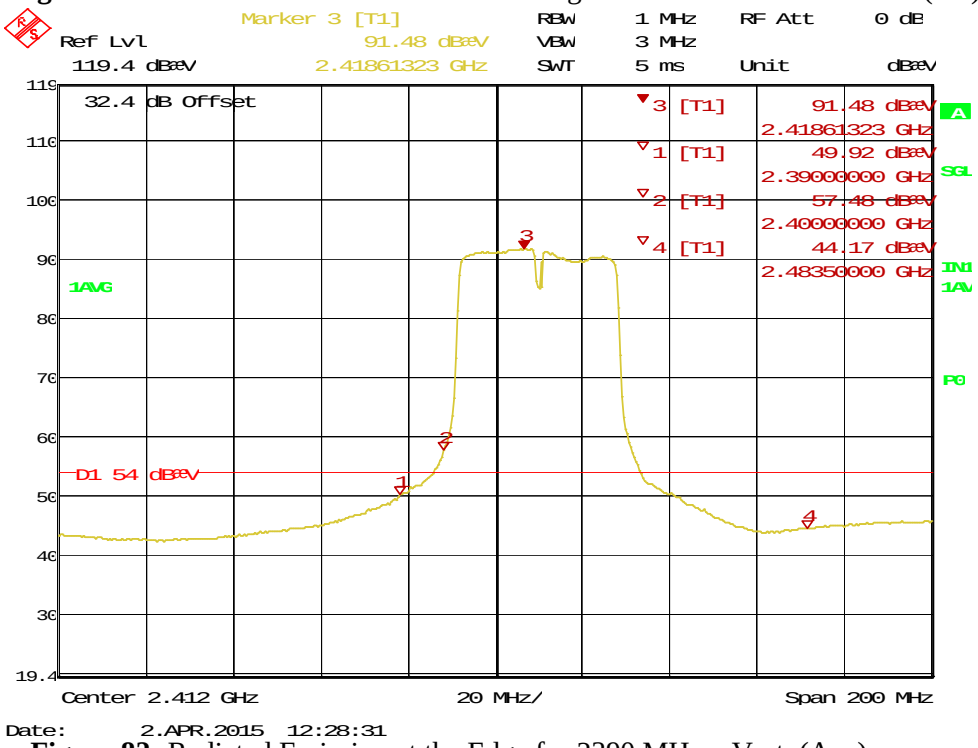


Figure 82: Radiated Emission at the Edge for 2390 MHz – Vert. (Ave)

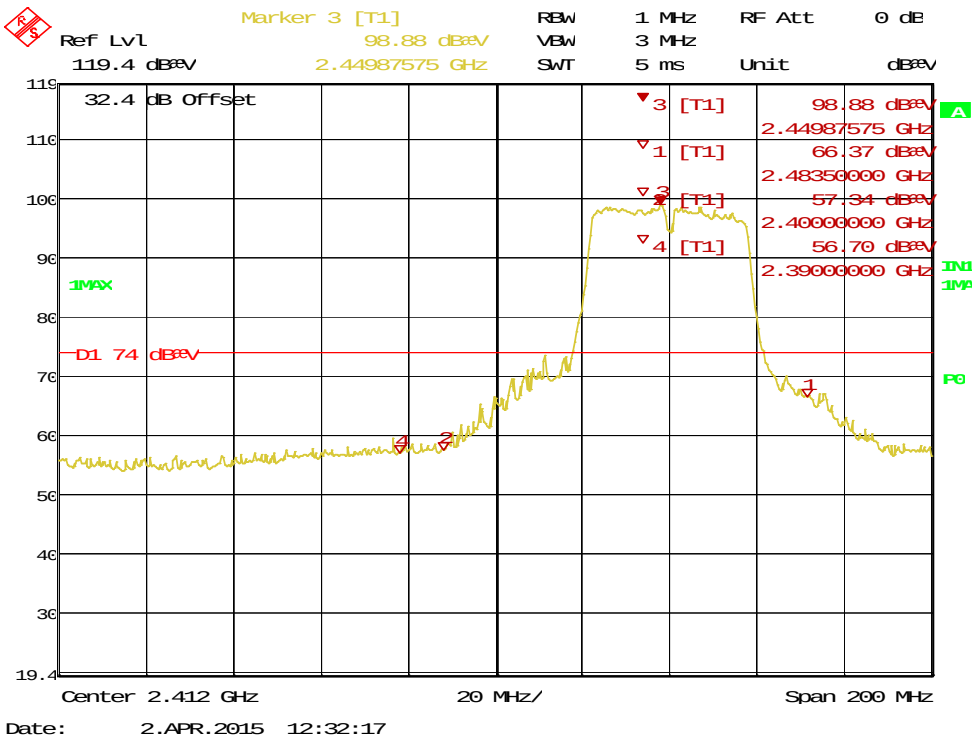


Figure 83: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Pk)

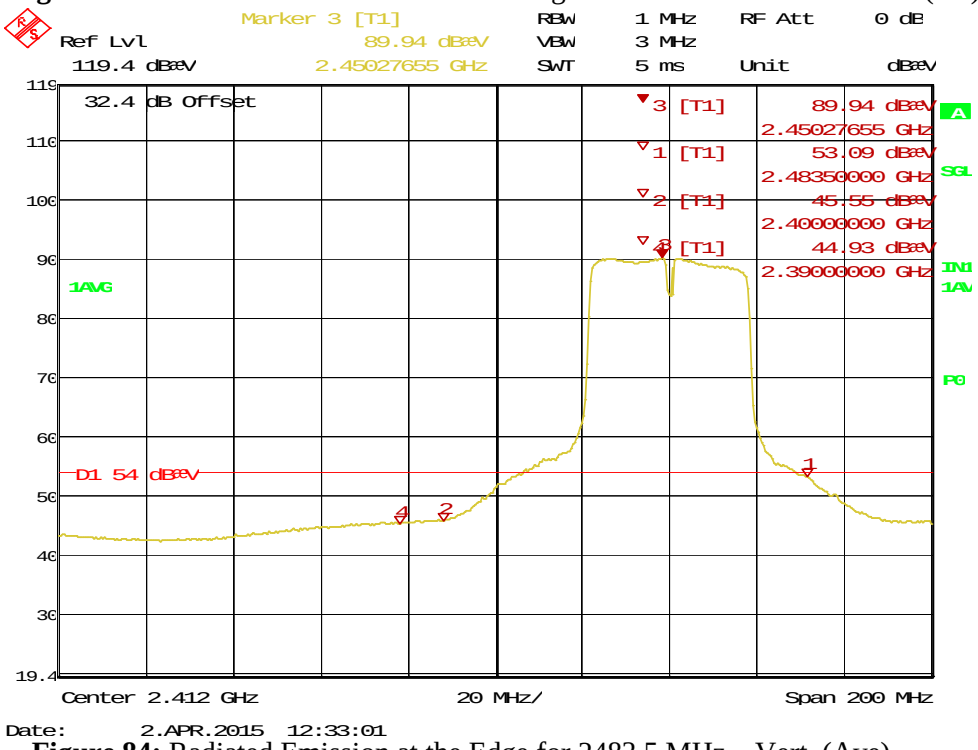


Figure 84: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Ave)

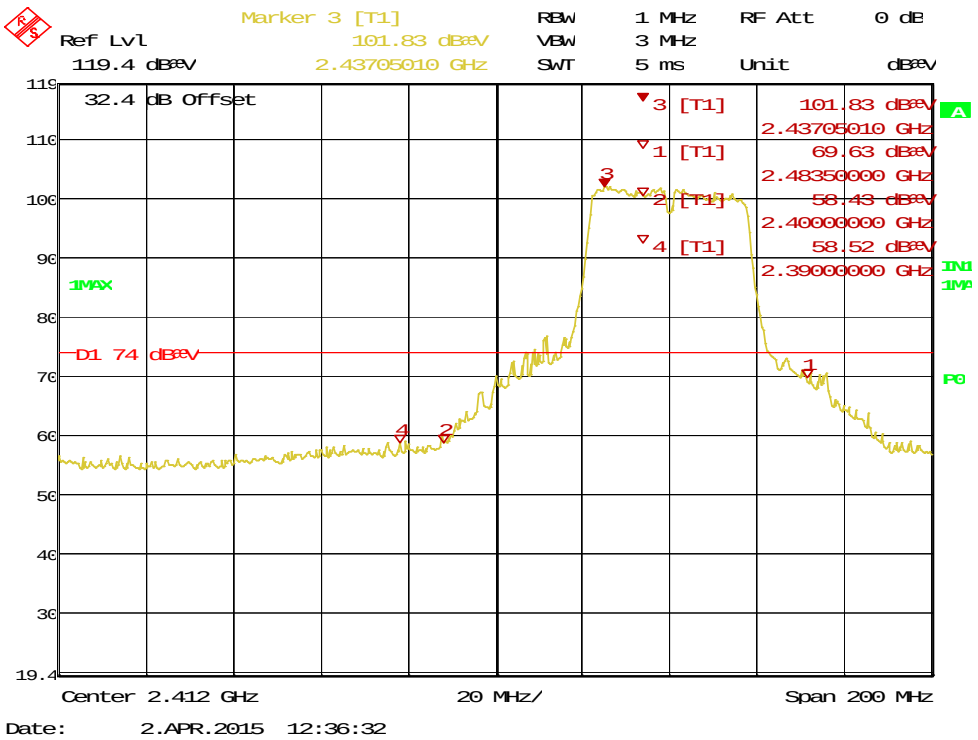


Figure 85: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Pk)

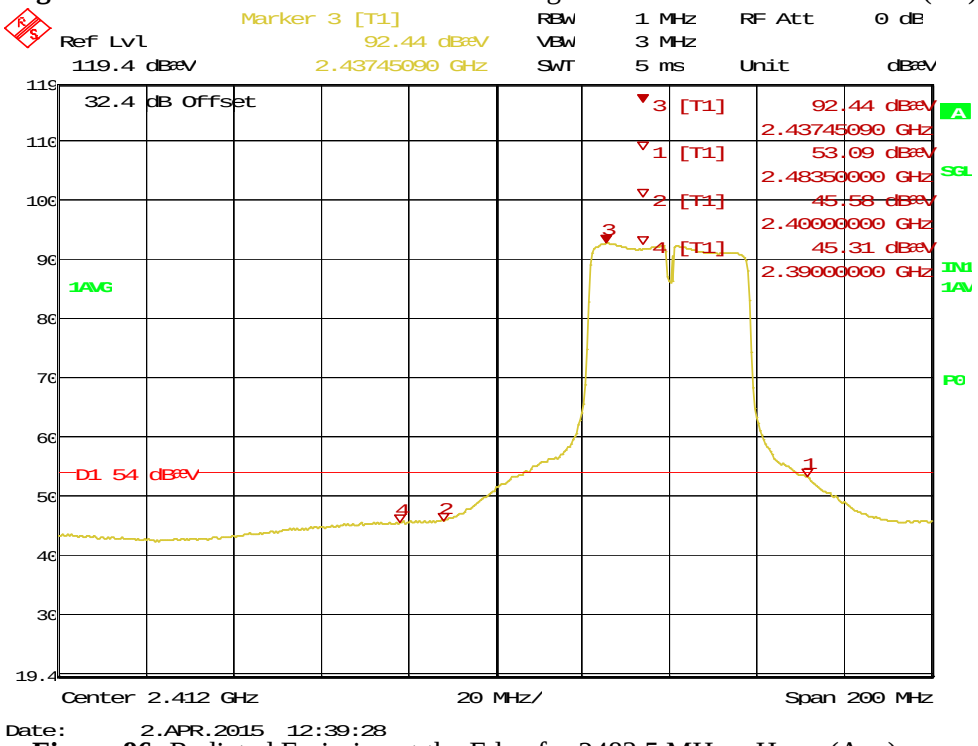


Figure 86: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Ave)

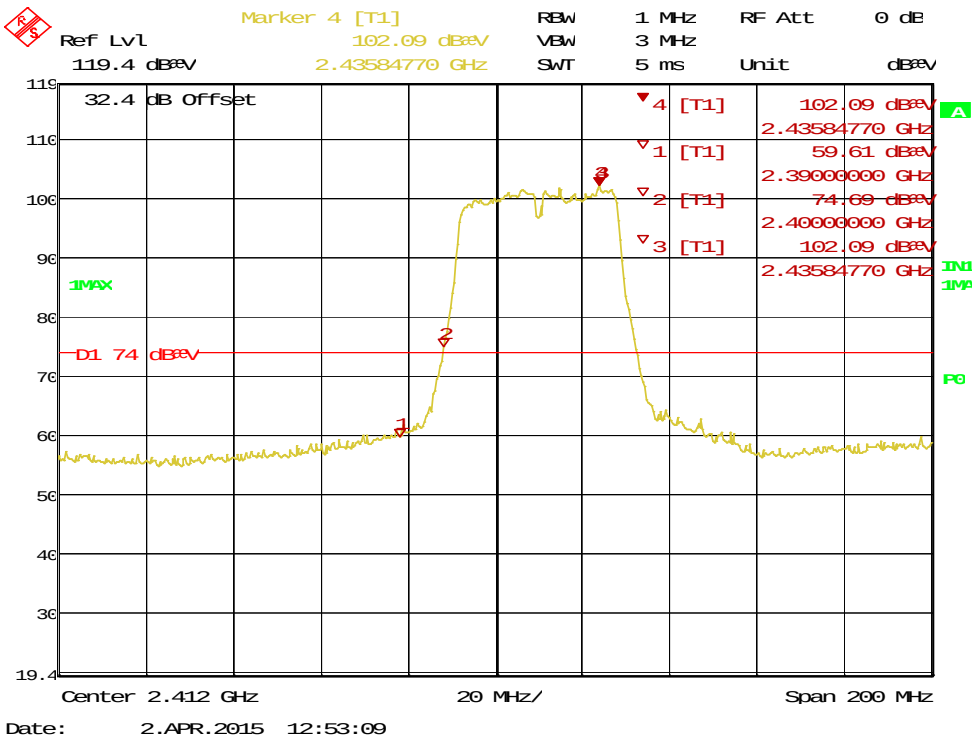


Figure 87: Radiated Emission at the Edge for 2390 MHz – Vert. (Pk)

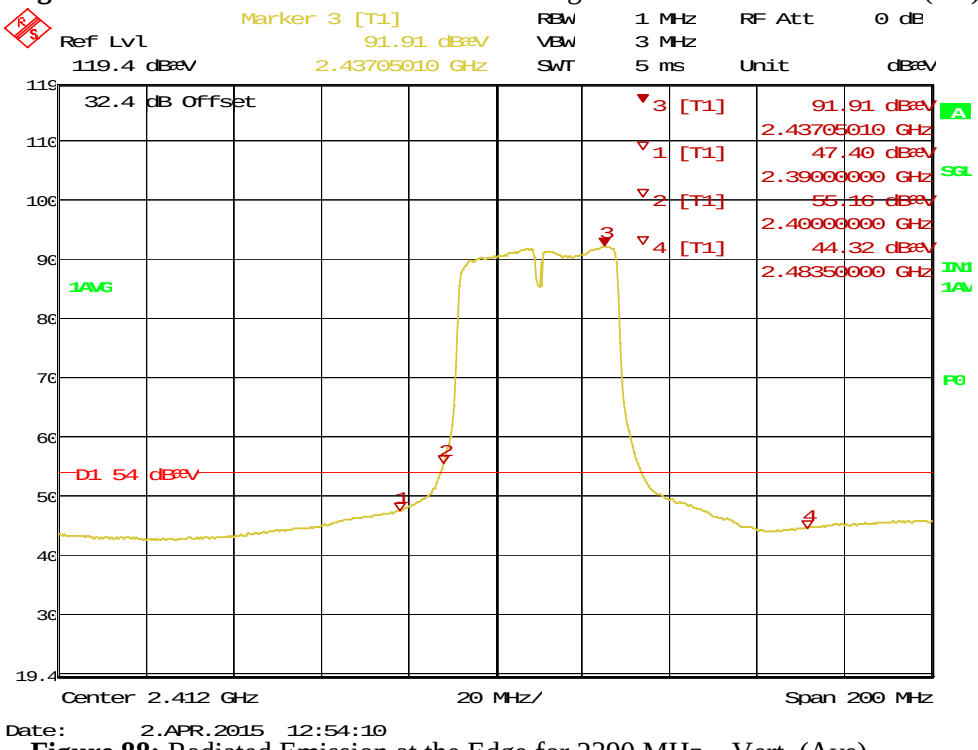


Figure 88: Radiated Emission at the Edge for 2390 MHz – Vert. (Ave)

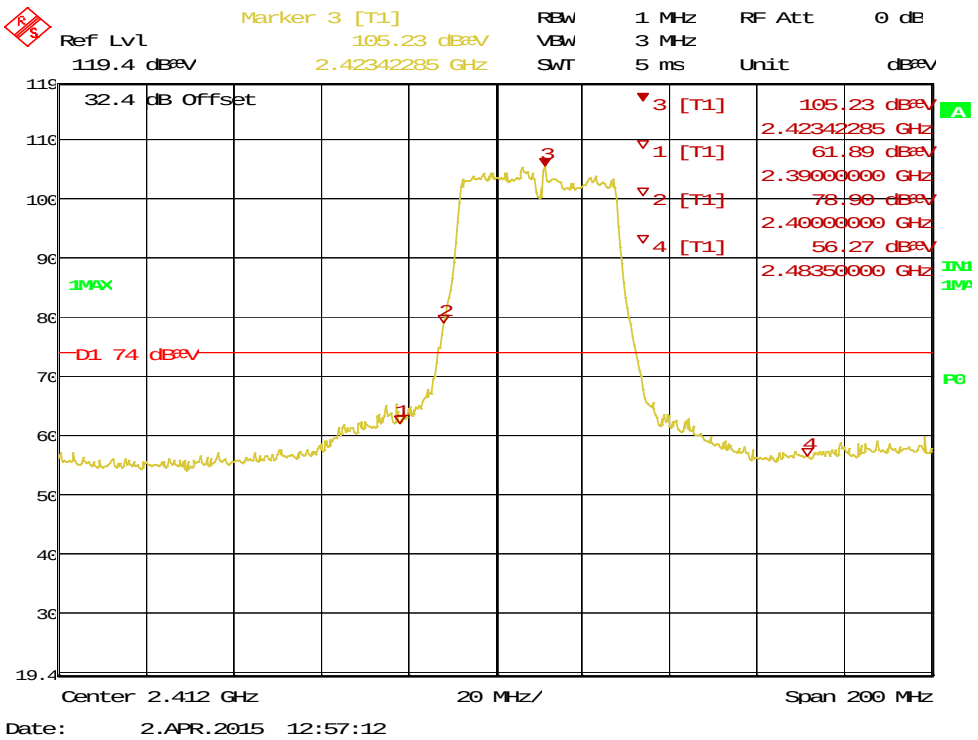


Figure 89: Radiated Emission at the Edge for 2390 MHz – Horz. (Pk)

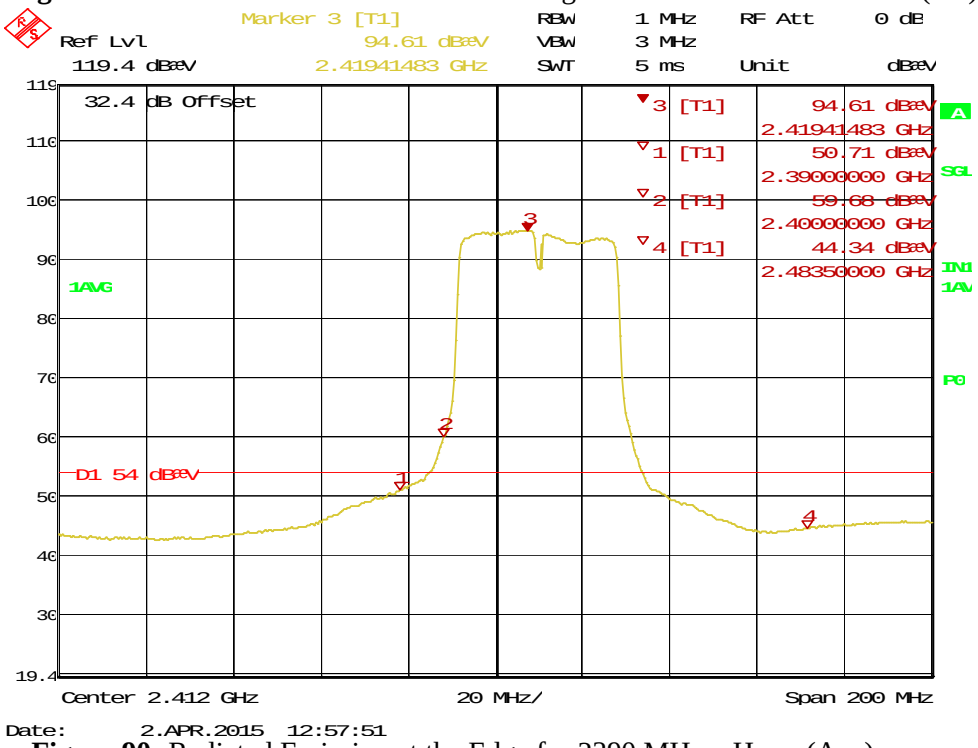


Figure 90: Radiated Emission at the Edge for 2390 MHz – Horz. (Ave)

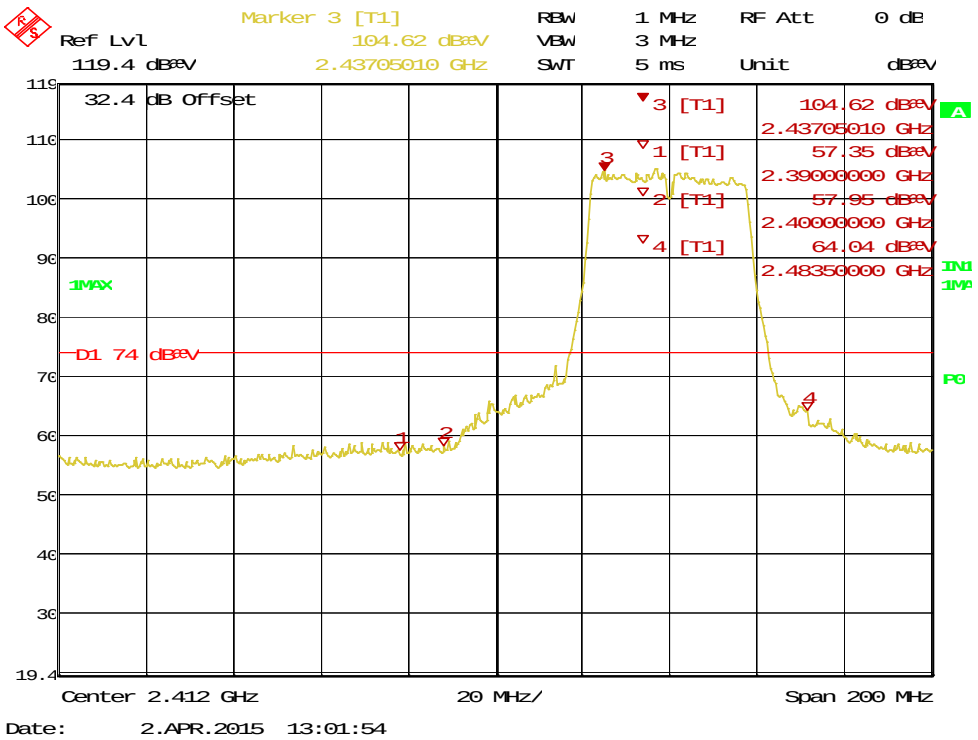


Figure 91: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Pk)

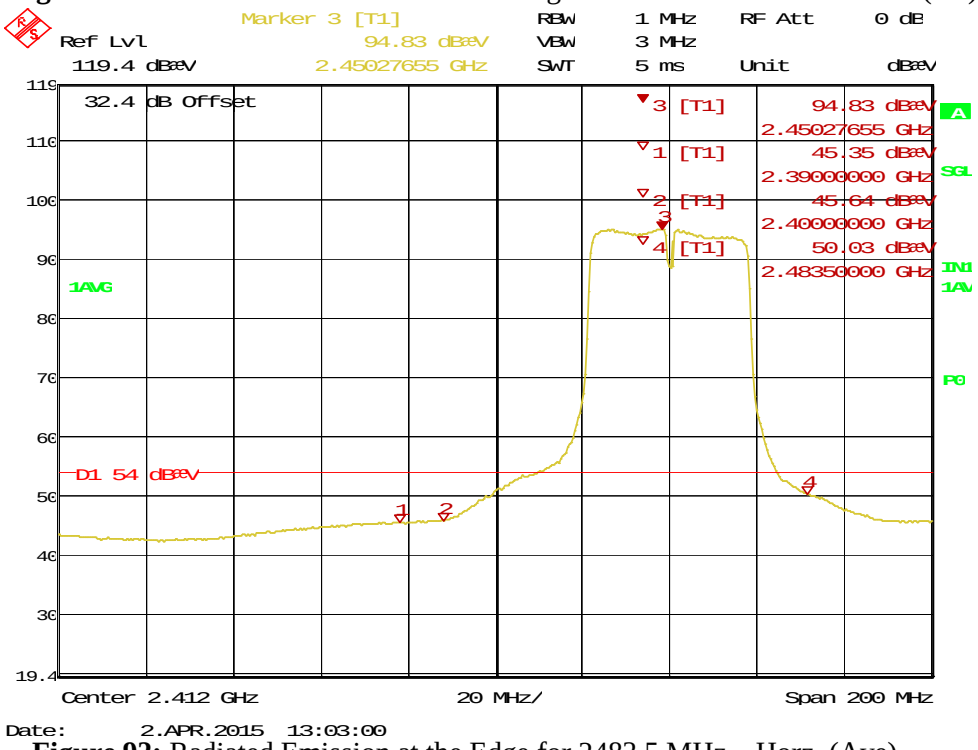


Figure 92: Radiated Emission at the Edge for 2483.5 MHz – Horz. (Ave)

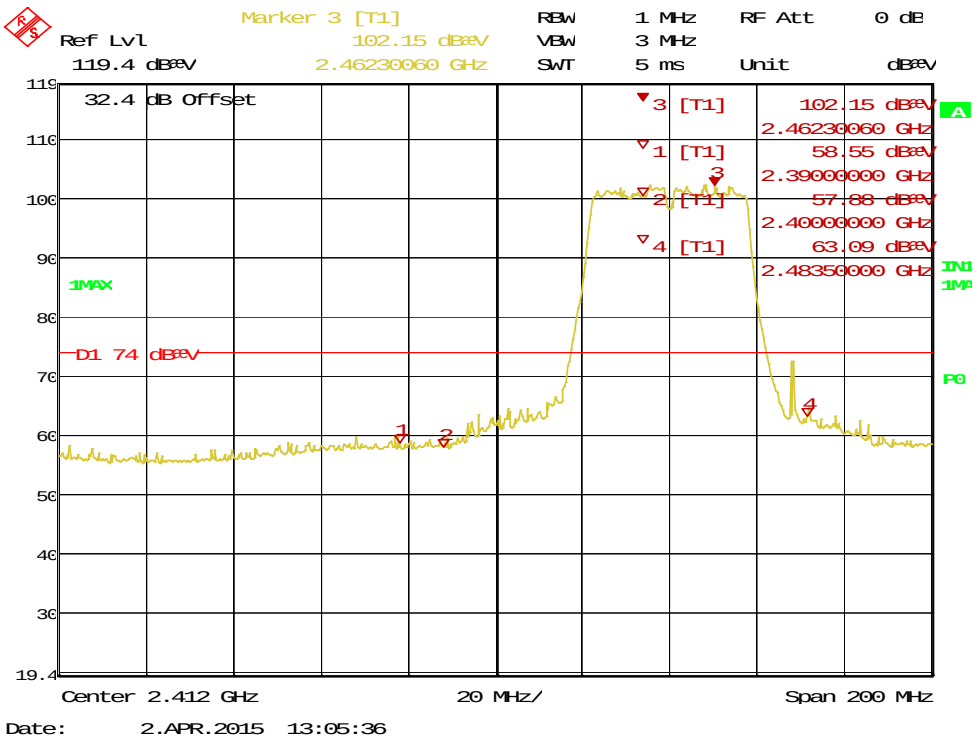


Figure 93: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Pk)

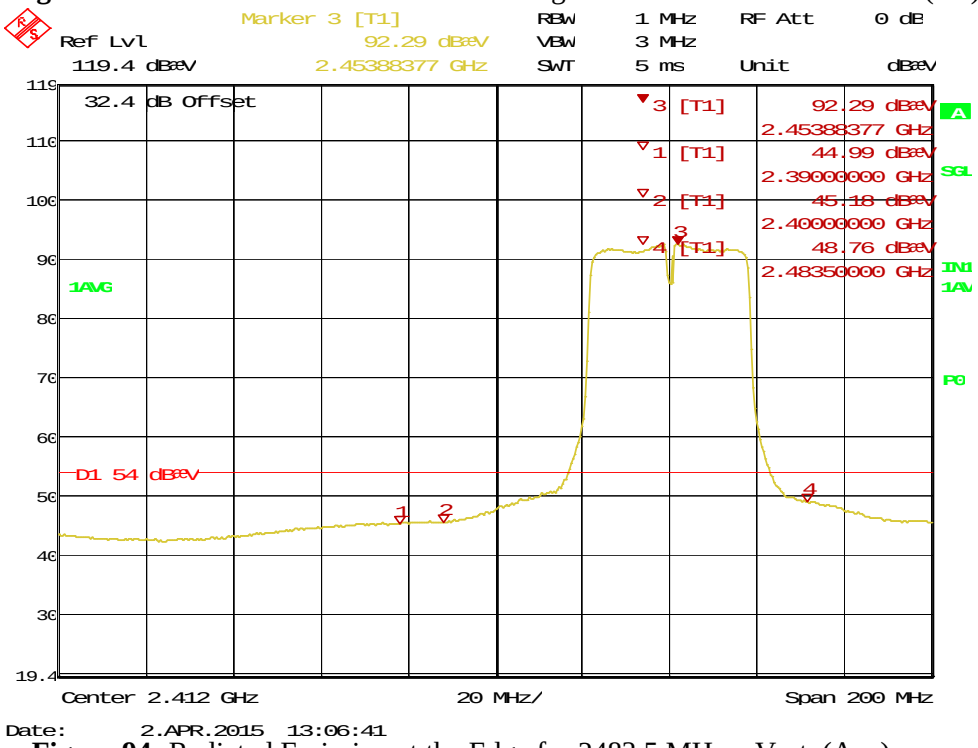
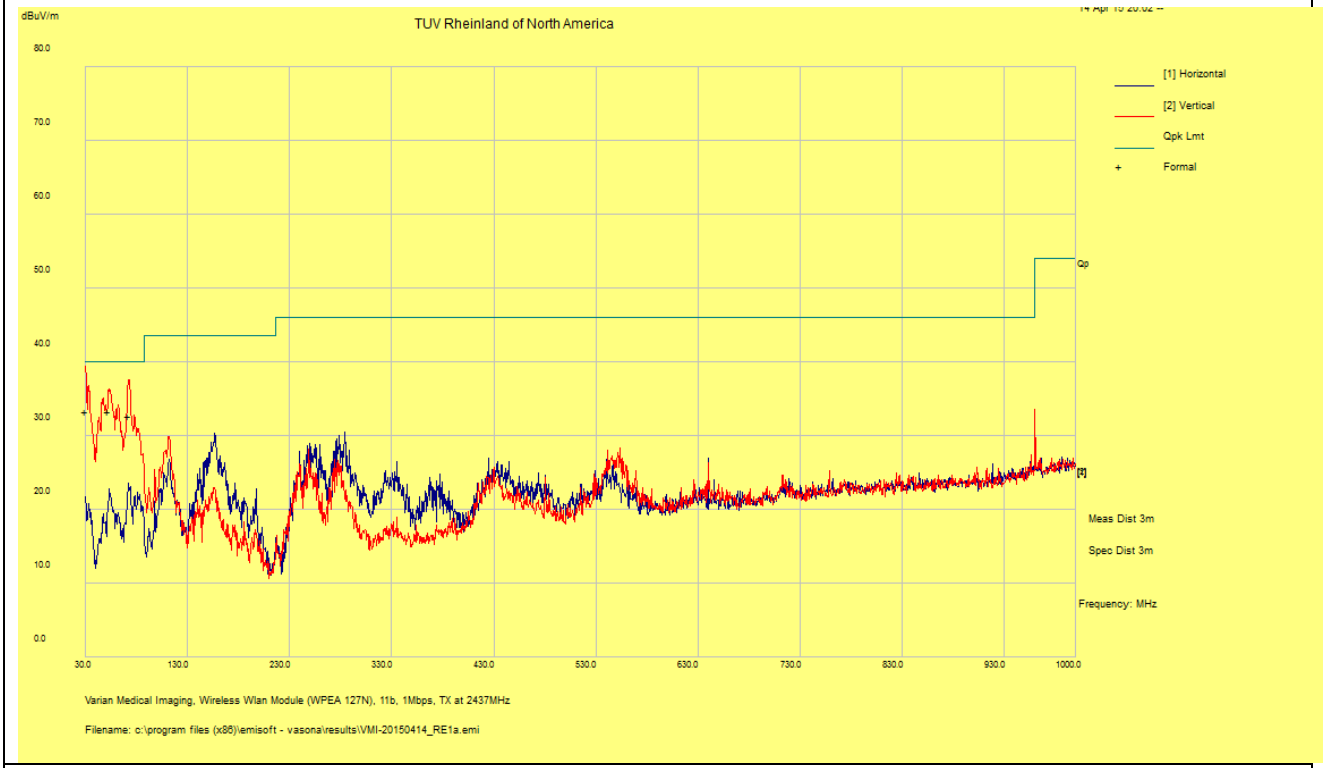


Figure 94: Radiated Emission at the Edge for 2483.5 MHz – Vert. (Ave)

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 1 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 14, 2015
EUT Model	EW5270UM	**Temp / Hum in**	21° C / 30%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	802.11b mode at 1.0 Mbps / chain 0	**Line AC / Freq**	5VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Kerwinn Corpuz

30 MHz – 1 GHz Transmit at 2437 MHz

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
30.00	41.48	2.60	-10.77	33.31	QP	V	115	116	40.00	-6.69
52.92	55.61	2.80	-25.13	33.28	QP	V	115	18	40.00	-6.72
72.85	54.13	2.95	-24.42	32.66	QP	V	117	356	40.00	-7.35



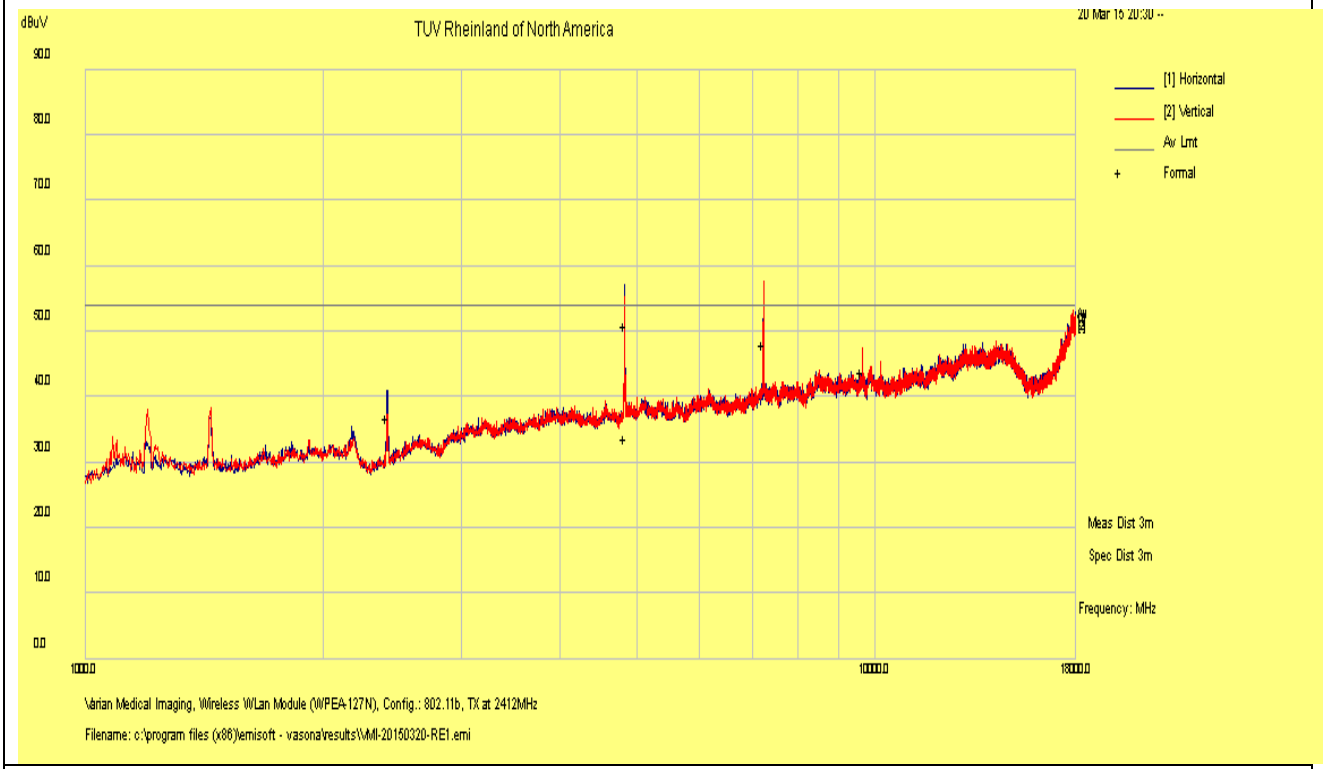
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on Mid channel and 802.11b mode.

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 2 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	802.11b mode at 1.0 Mbps / chain 0	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2412 MHz (Low Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
2411.16	57.47	1.24	-21.89	36.82	Average	H	205	242	54.00	-17.18
4824.02	64.96	1.89	-16.08	50.78	Average	H	249	52	54.00	-3.22
4834.93	47.63	1.89	-15.99	33.53	Average	H	187	50	54.00	-20.47
9647.92	49.13	2.68	-8.02	43.79	Average	H	140	248	54.00	-10.21
7235.71	57.17	2.28	-11.59	47.86	Average	V	106	357	54.00	-6.14



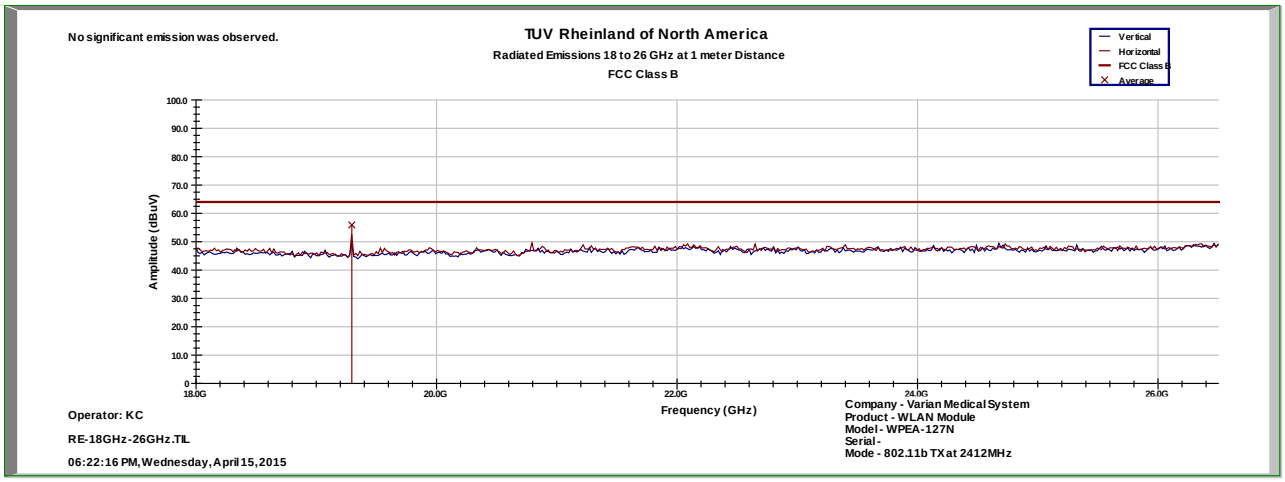
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on 802.11b

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 3 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	802.11b mode at 1.0 Mbps / chain 0	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2412 MHz (Low Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19296	56.07	55.89	63.98	-8.09	29	100	H	8.6



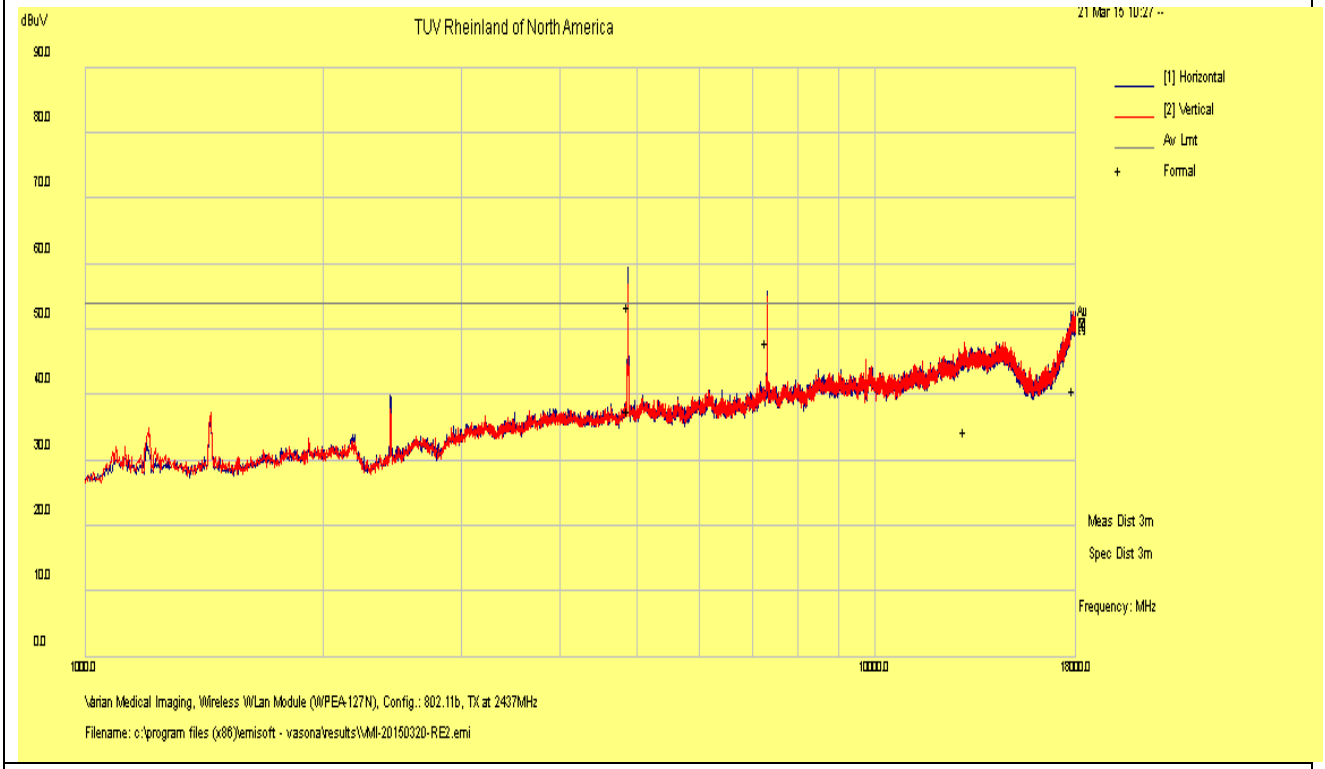
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on 802.11b.

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 4 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	802.11b mode at 1.0 Mbps / chain 0	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4874.05	67.40	1.88	-15.88	53.40	Average	H	104	52	54.00	-0.60
4885.08	51.50	1.88	-15.85	37.54	Average	H	100	49	54.00	-16.46
7310.57	56.97	2.30	-11.37	47.89	Average	H	138	360	54.00	-6.11
13021.25	40.00	3.17	-8.84	34.32	Average	V	212	286	54.00	-19.68
17862.45	37.31	3.99	-0.58	40.72	Average	V	230	129	54.00	-13.28



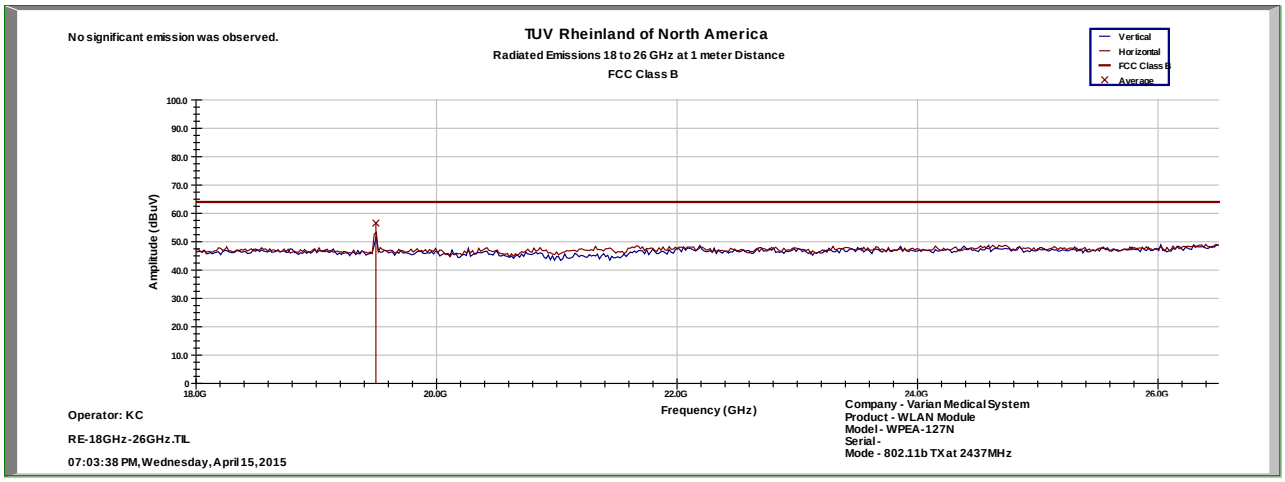
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on 802.11b

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 5 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	802.11b mode at 1.0 Mbps / chain 0	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19496	56.93	56.56	63.98	-7.42	29	101	H	8.74



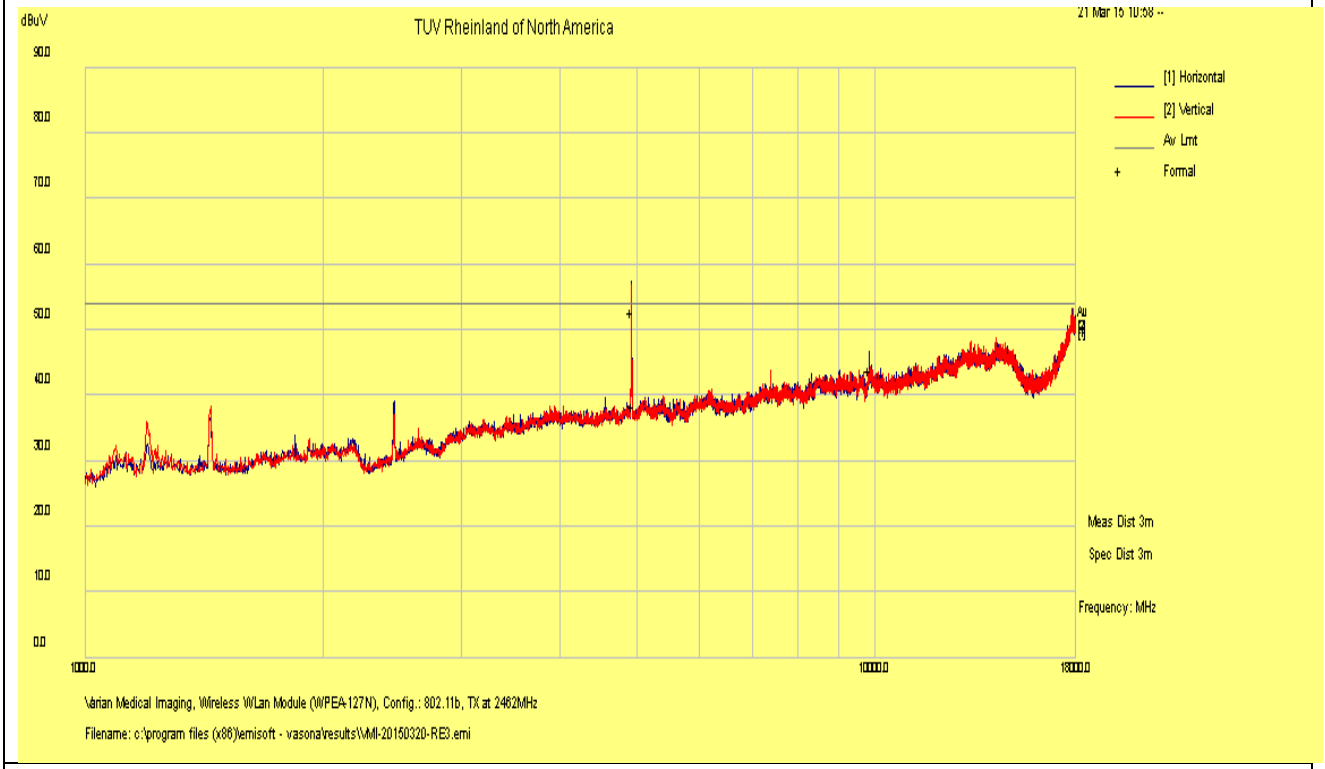
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on 802.11b.

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 6 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	802.11b mode at 1.0 Mbps / chain 0	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2462 MHz (High Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4923.94	66.44	1.89	-15.63	52.70	Average	H	239	355	54.00	-1.30
4934.98	52.06	1.88	-15.65	38.30	Average	H	112	2	54.00	-15.71
9848.07	48.97	2.71	-7.95	43.73	Average	H	111	226	54.00	-10.28



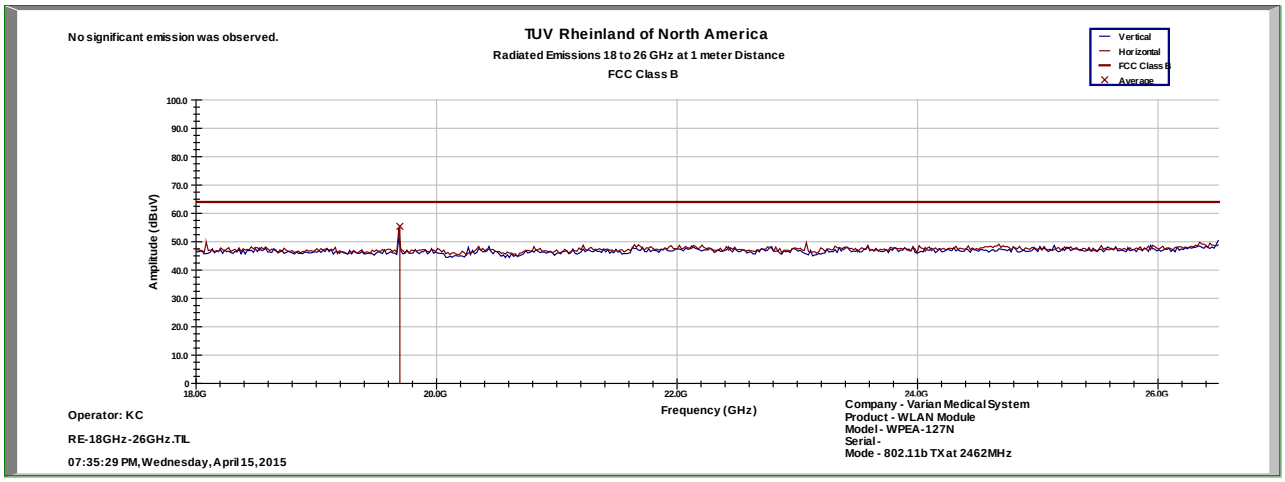
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on 802.11b

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 7 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	802.11b mode at 1.0 Mbps / chain 0	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2462 MHz (High Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19695.9	55.48	55.39	63.98	-8.59	344	101	H	8.93



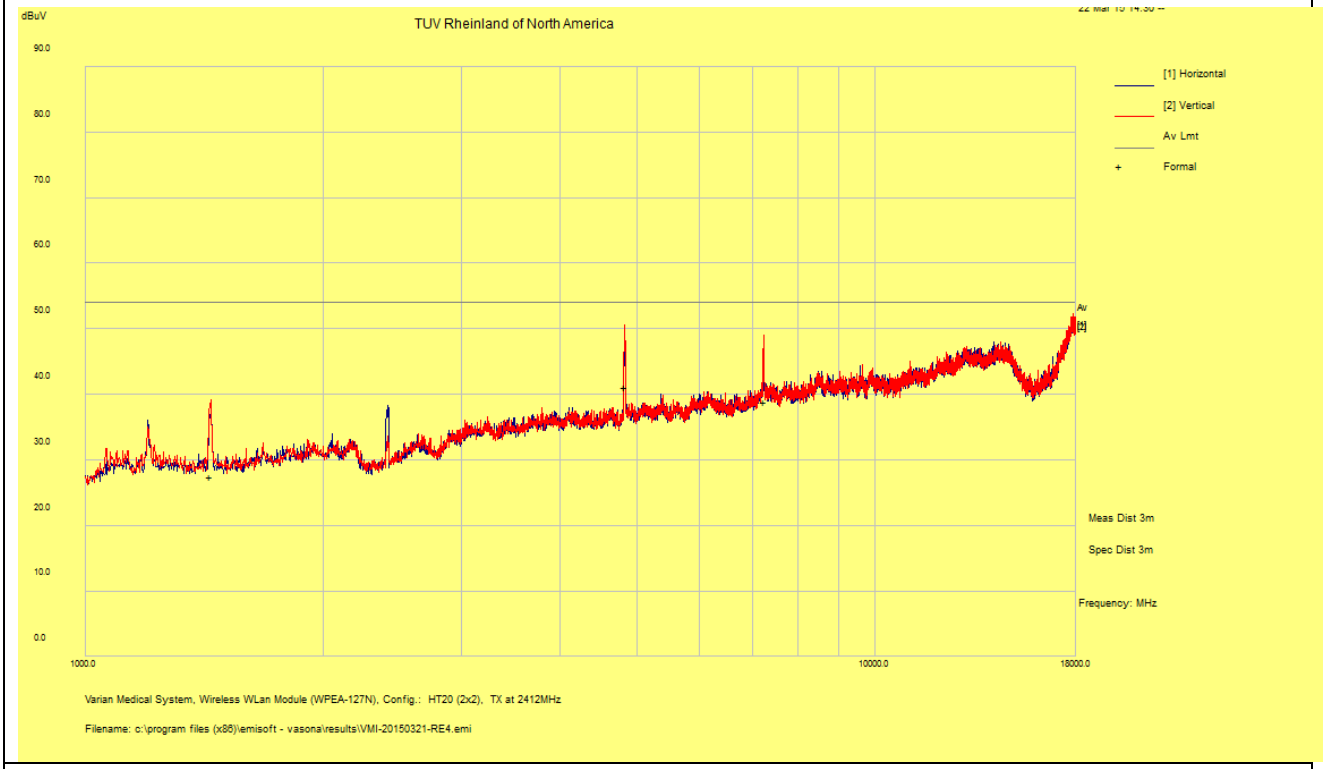
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on 802.11b.

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 8 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT20 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2412 MHz (Low Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
1439.98	51.69	0.94	-25.09	27.54	Average	V	220	182	54.00	-26.46
4822.86	55.40	1.90	-16.10	41.20	Average	V	238	36	54.00	-12.80
7240.11	48.10	2.30	-11.60	38.80	Average	V	124	356	54.00	-15.20



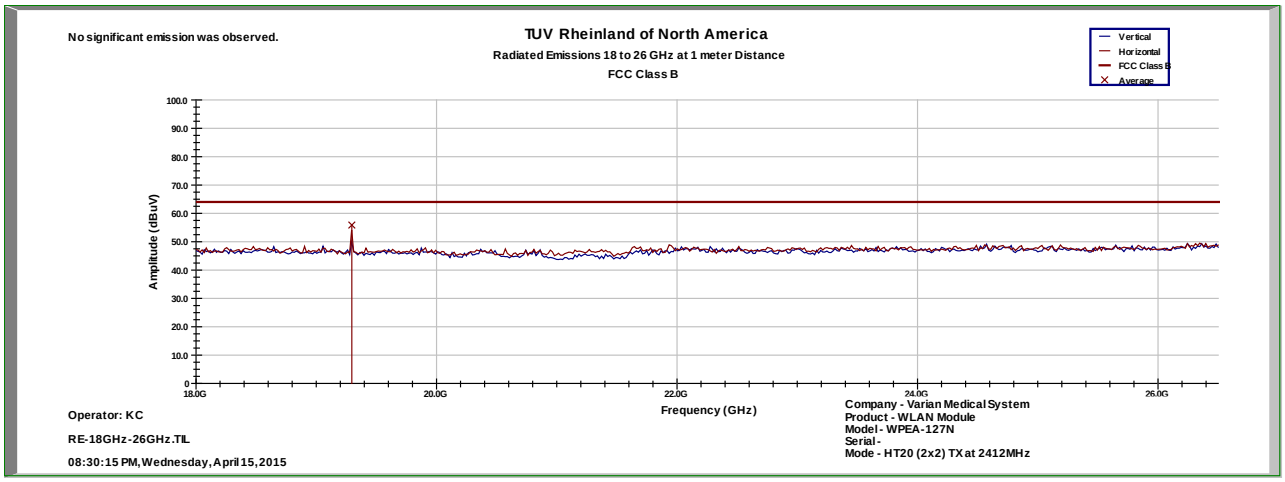
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT20 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 9 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT20 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2412 MHz (Low Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19296	56.09	55.85	63.98	-8.13	26	101	H	8.6



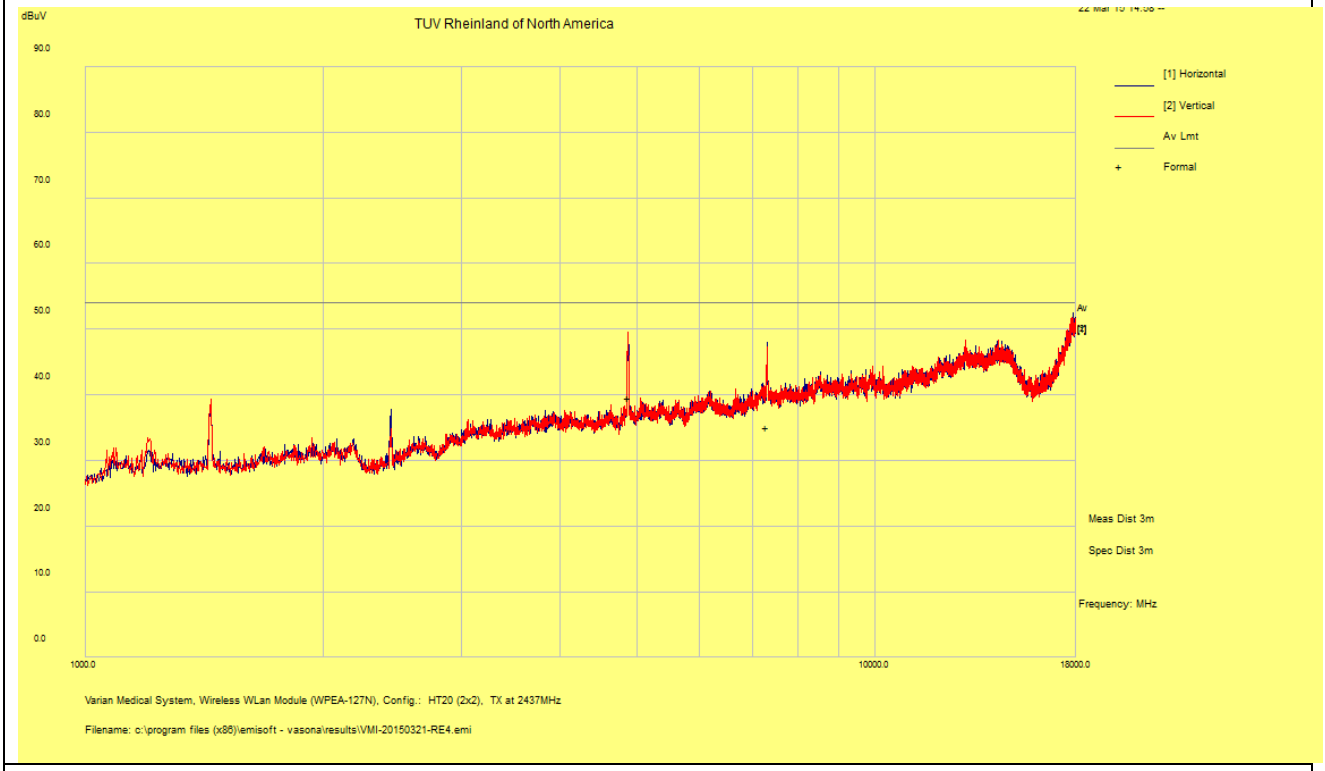
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT20 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 10 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT20 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
7307.75	44.20	2.30	-11.40	35.10	Average	H	175	364	54.00	-18.90
4872.92	53.60	1.90	-15.90	39.60	Average	V	181	27	54.00	-14.40



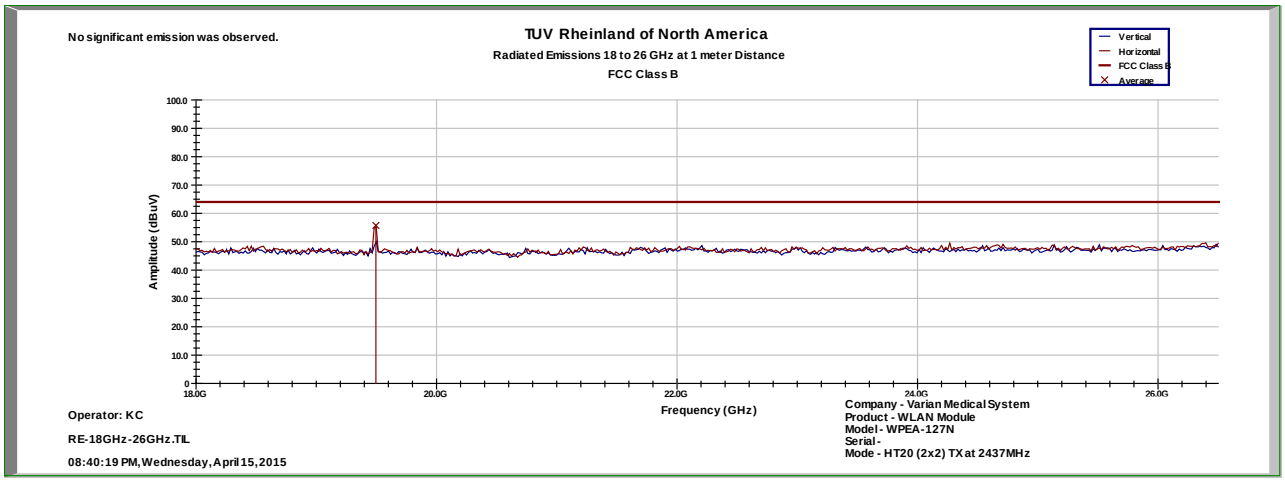
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT20 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 11 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT20 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19496.1	55.92	55.73	63.98	-8.25	29	103	H	8.74



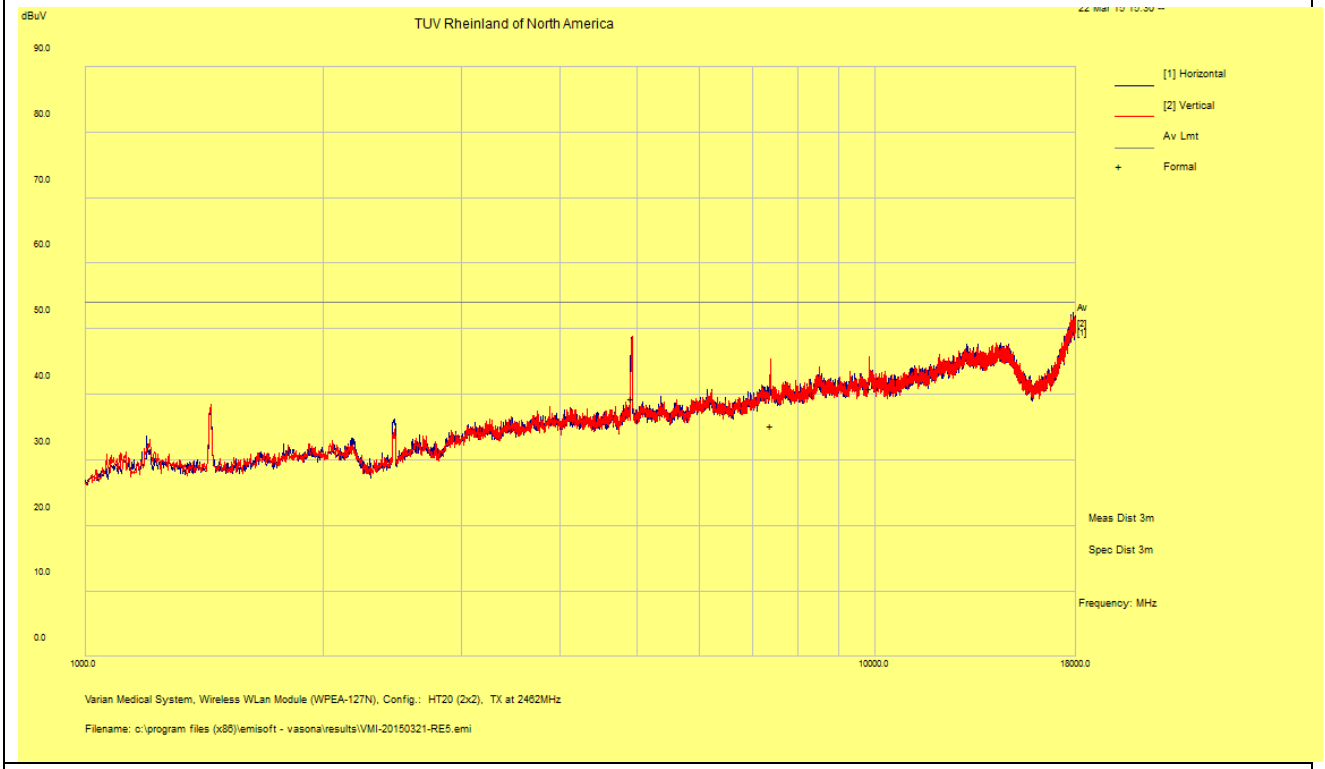
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT20 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 12 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT20 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2462 MHz (High Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4927.70	53.10	1.90	-15.60	39.40	Average	V	217	-8	54.00	-14.60
7389.14	44.20	2.30	-11.20	35.30	Average	V	147	364	54.00	-18.70
9848.08	46.19	2.71	-7.95	40.95	Average	V	244	350	54.00	-13.05



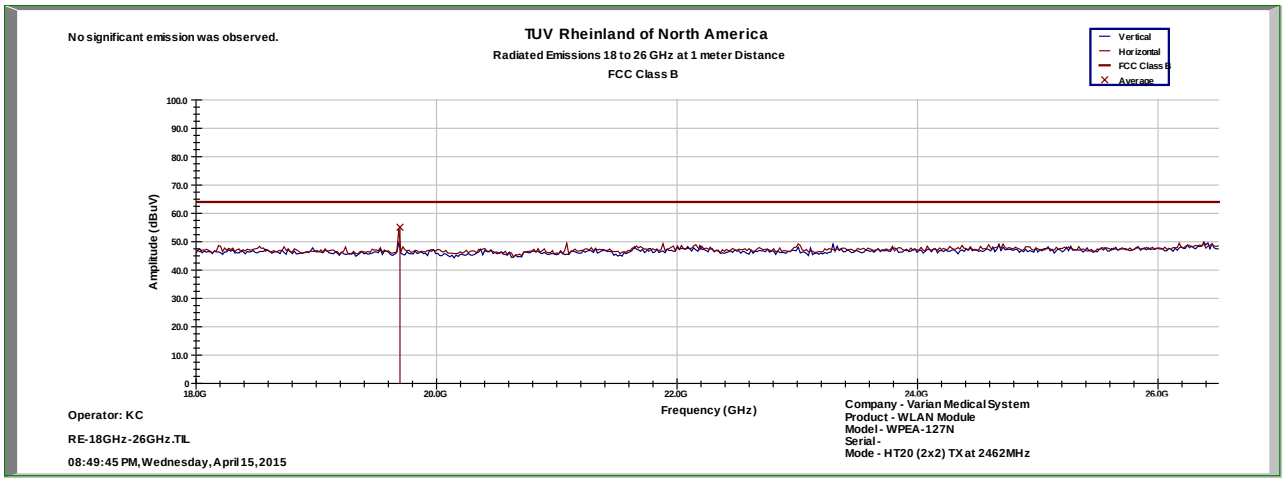
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT20 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 13 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT20 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2462 MHz (High Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19696.1	55.37	55.08	63.98	-8.9	28	104	H	8.93



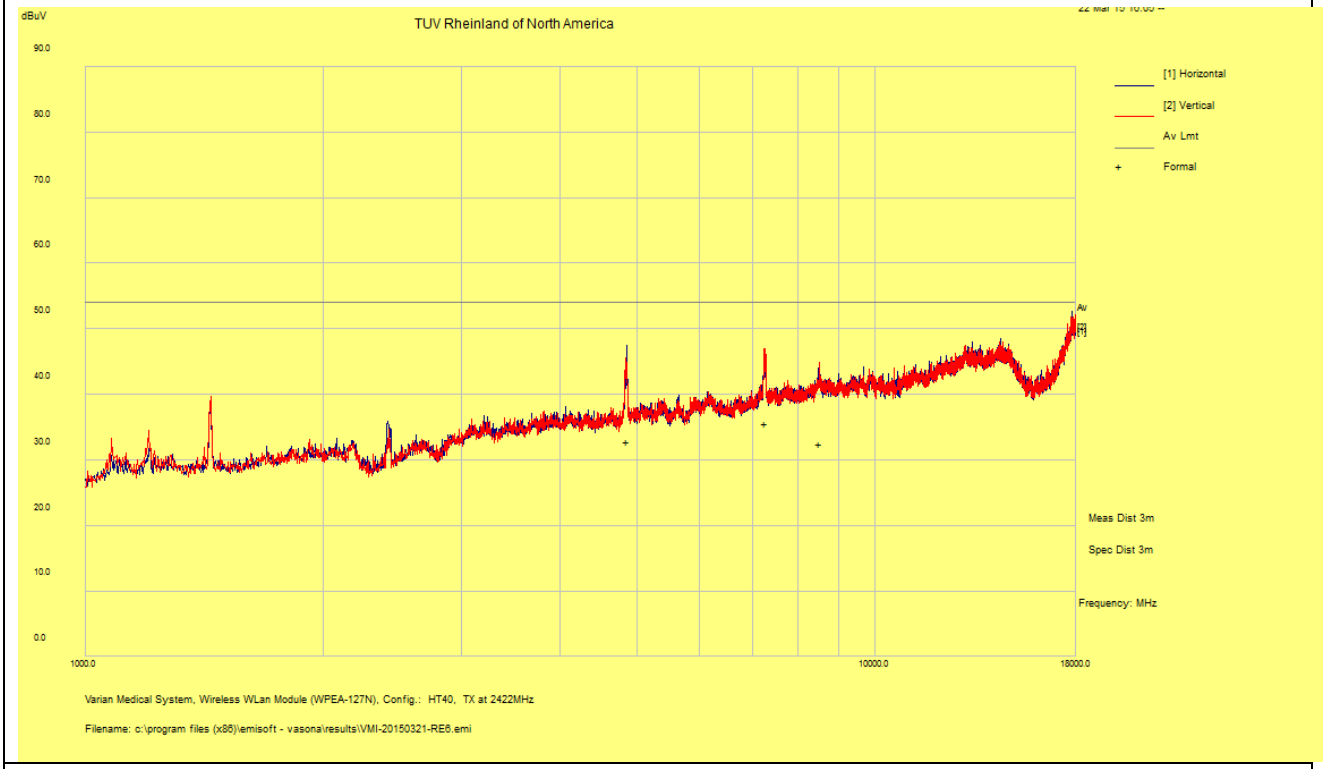
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT20 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 14 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS0 / chain 0	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2422 MHz (Low Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4854.10	46.80	1.90	-15.90	32.80	Average	H	206	36	54.00	-21.20
7276.14	44.80	2.30	-11.50	35.60	Average	V	105	12	54.00	-18.40
8526.81	38.50	2.50	-8.50	32.50	Average	V	234	269	54.00	-21.50



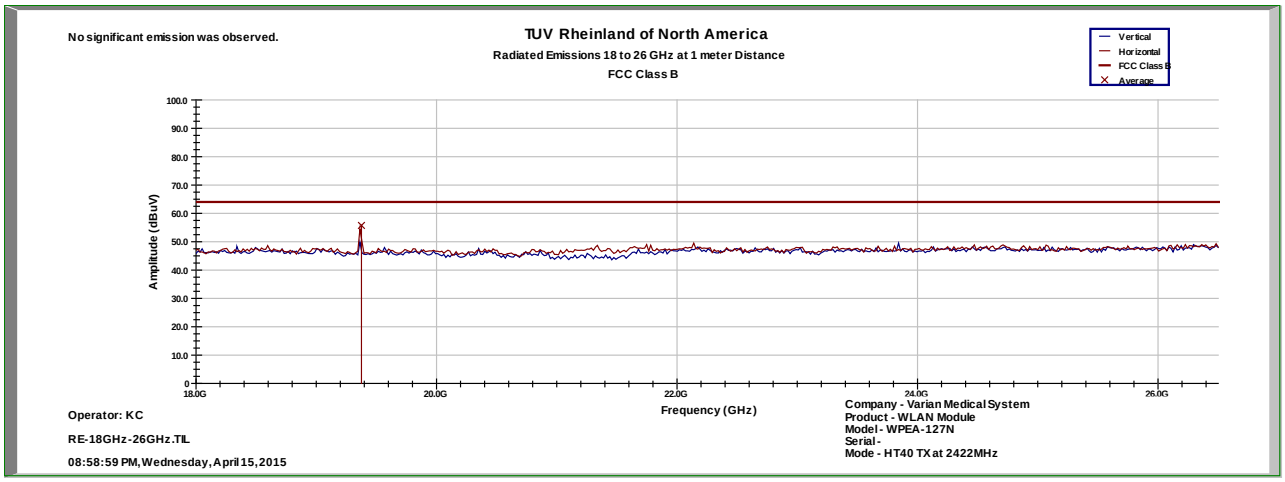
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS0

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 15 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS0 / chain 0	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2422 MHz (Low Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19375.9	56.49	55.73	63.98	-8.25	30	102	H	8.66



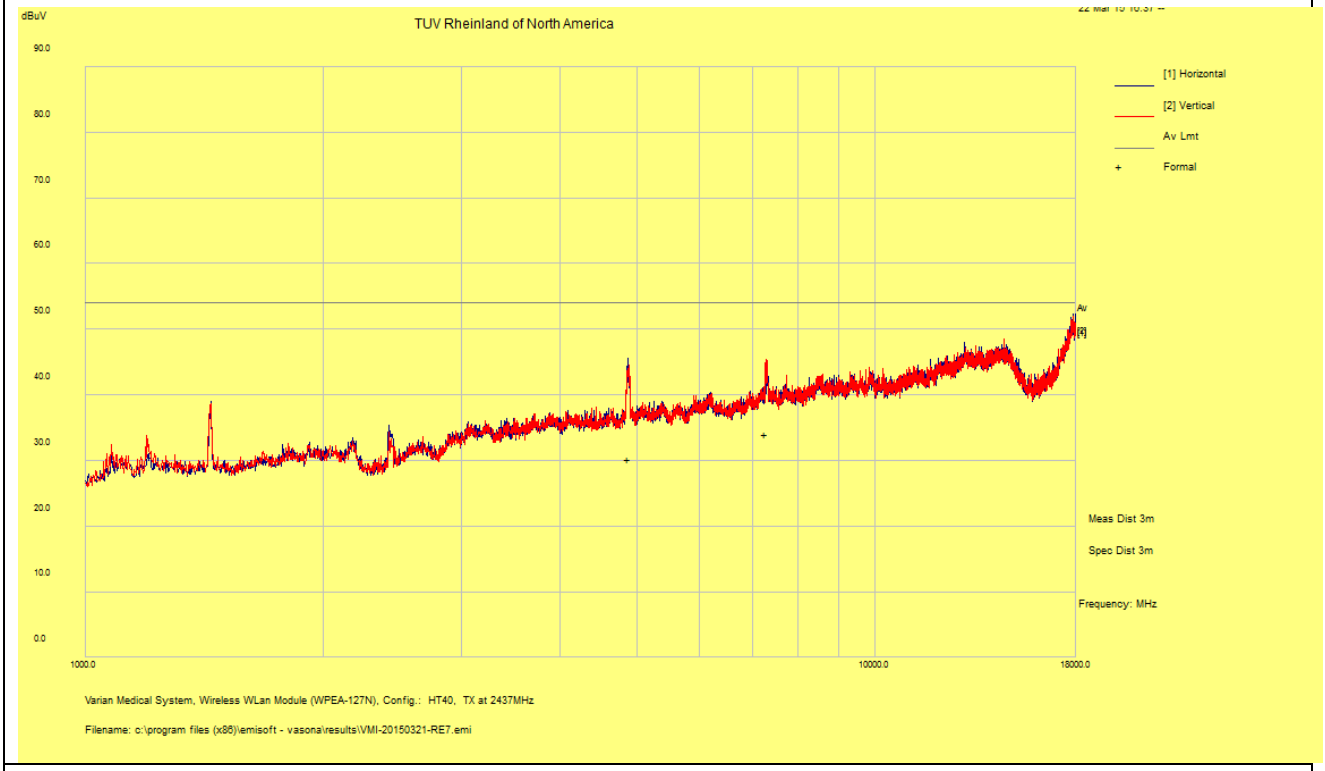
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS0

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 16 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS0 / chain 0	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4874.20	44.20	1.90	-15.90	30.20	Average	H	149	0	54.00	-23.80
7285.39	43.30	2.30	-11.50	34.10	Average	V	137	14	54.00	-19.90



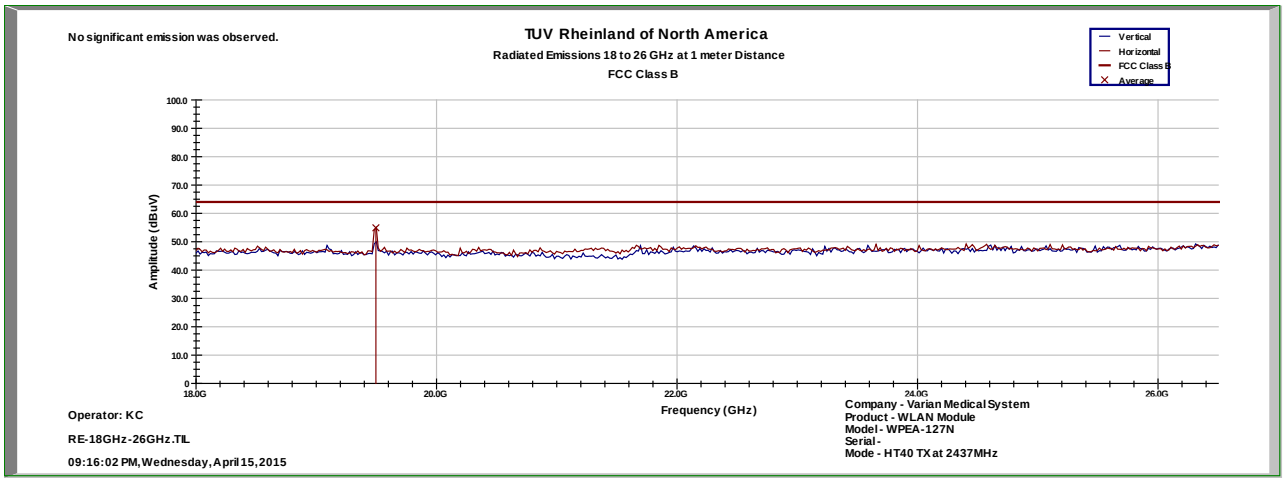
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS0

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 17 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS0 / chain 0	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19496.1	55.32	54.89	63.98	-9.09	28	103	H	8.74



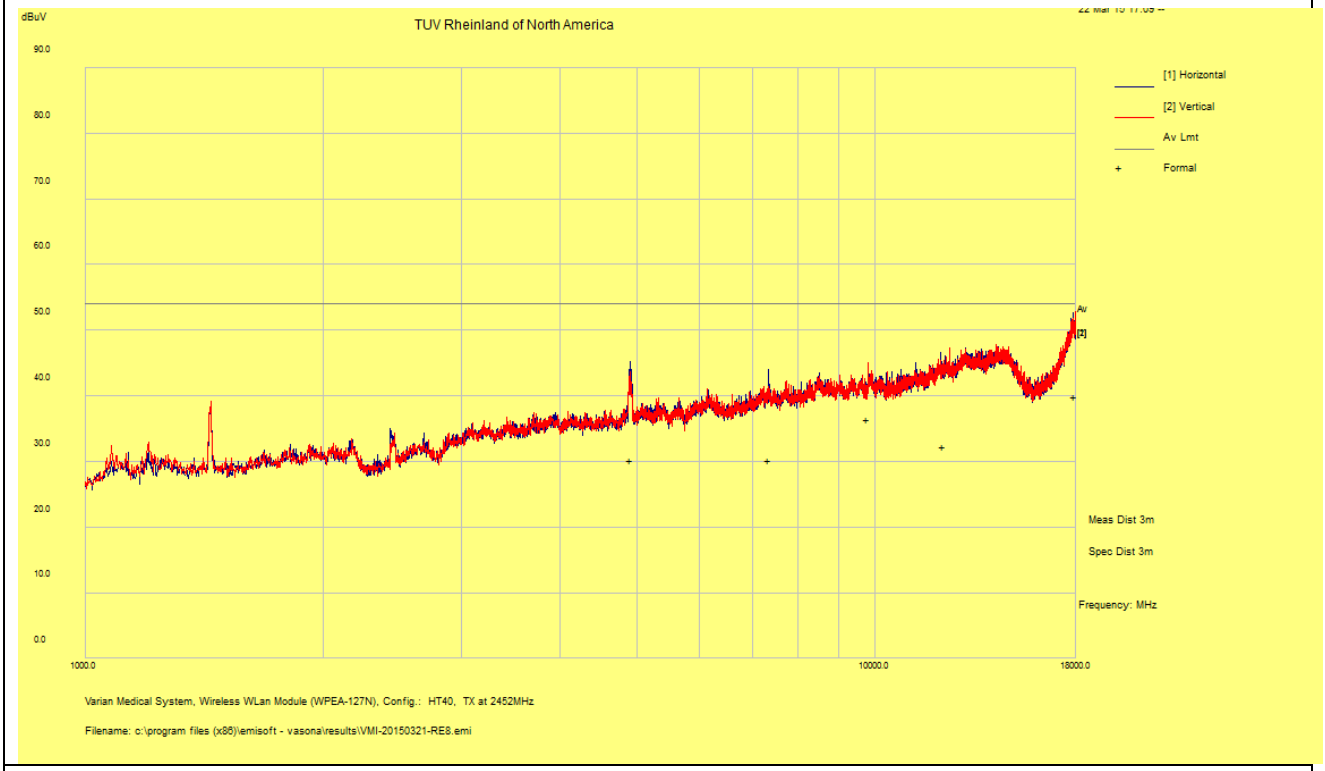
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS0

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 18 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS0 / chain 0	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2452 MHz (High Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4909.04	44.10	1.90	-15.70	30.30	Average	H	123	356	54.00	-23.70
7349.63	39.26	2.30	-11.33	30.23	Average	H	134	342	54.00	-23.77
9808.22	41.70	2.71	-7.96	36.45	Average	V	101	331	54.00	-17.55
12210.23	39.97	2.97	-10.67	32.27	Average	V	121	356	54.00	-21.73
17962.81	37.20	4.00	-1.30	39.90	Average	V	150	125	54.00	-14.10



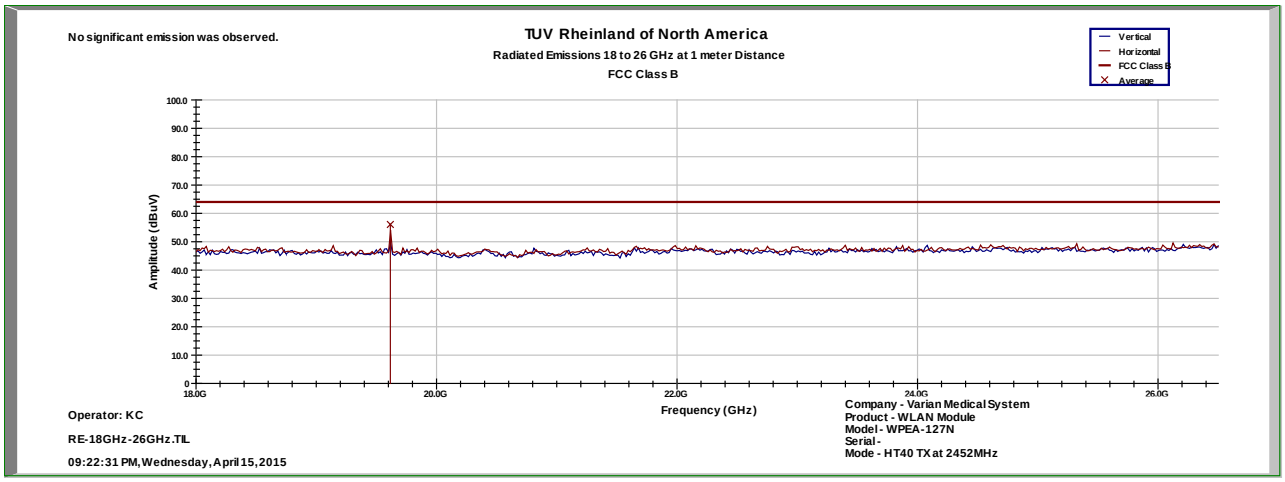
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS0

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 19 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS0 / chain 0	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2452 MHz (High Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19615.9	56.26	56.06	63.98	-7.92	27	101	H	8.85



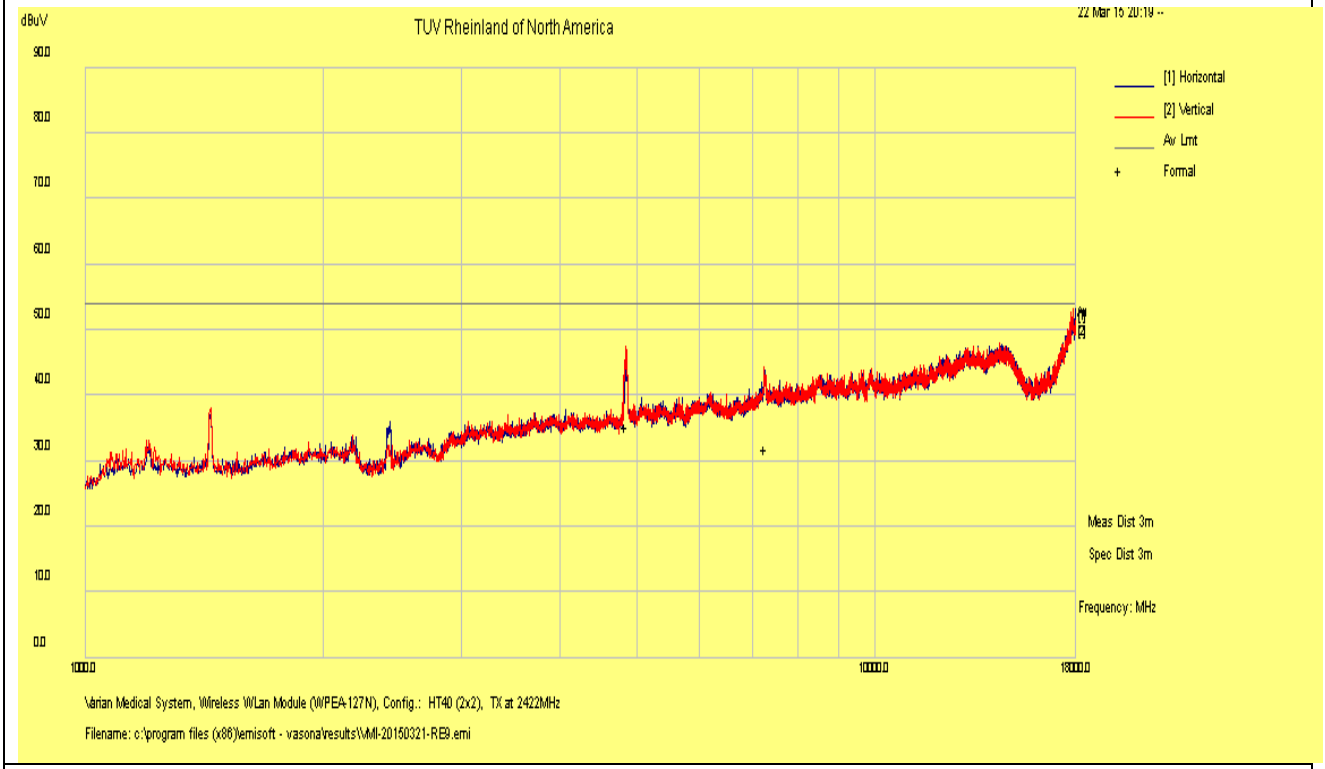
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS0

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 20 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2422 MHz (Low Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
7268.34	41.10	2.29	-11.51	31.88	Average	H	109	358	54.00	-22.12
4841.82	49.20	1.90	-15.90	35.20	Average	V	213	34	54.00	-18.80



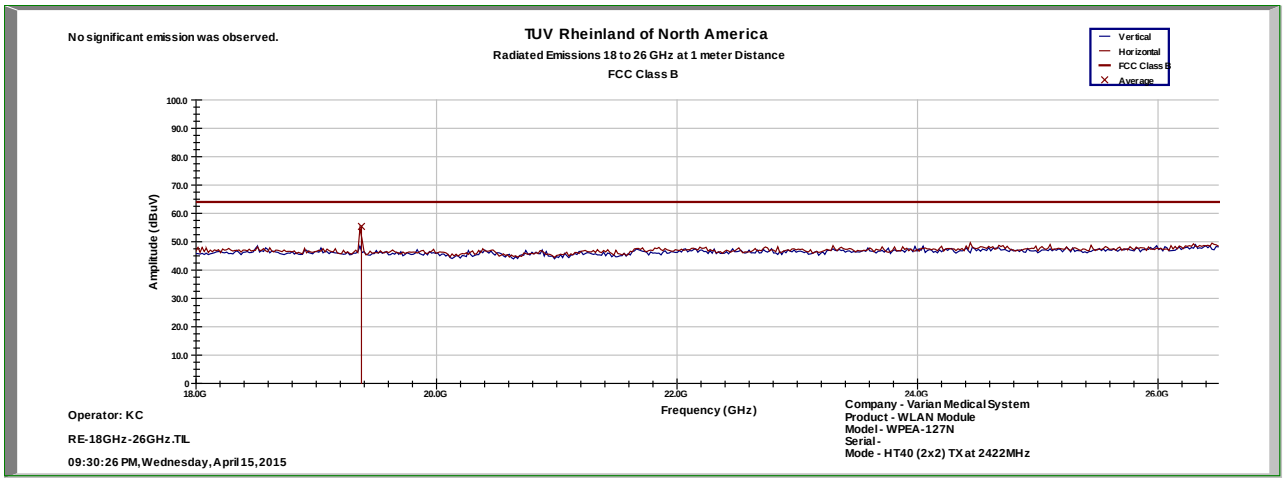
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 21 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2422 MHz (Low Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19376.2	55.47	55.36	63.98	-8.62	30	104	H	8.66



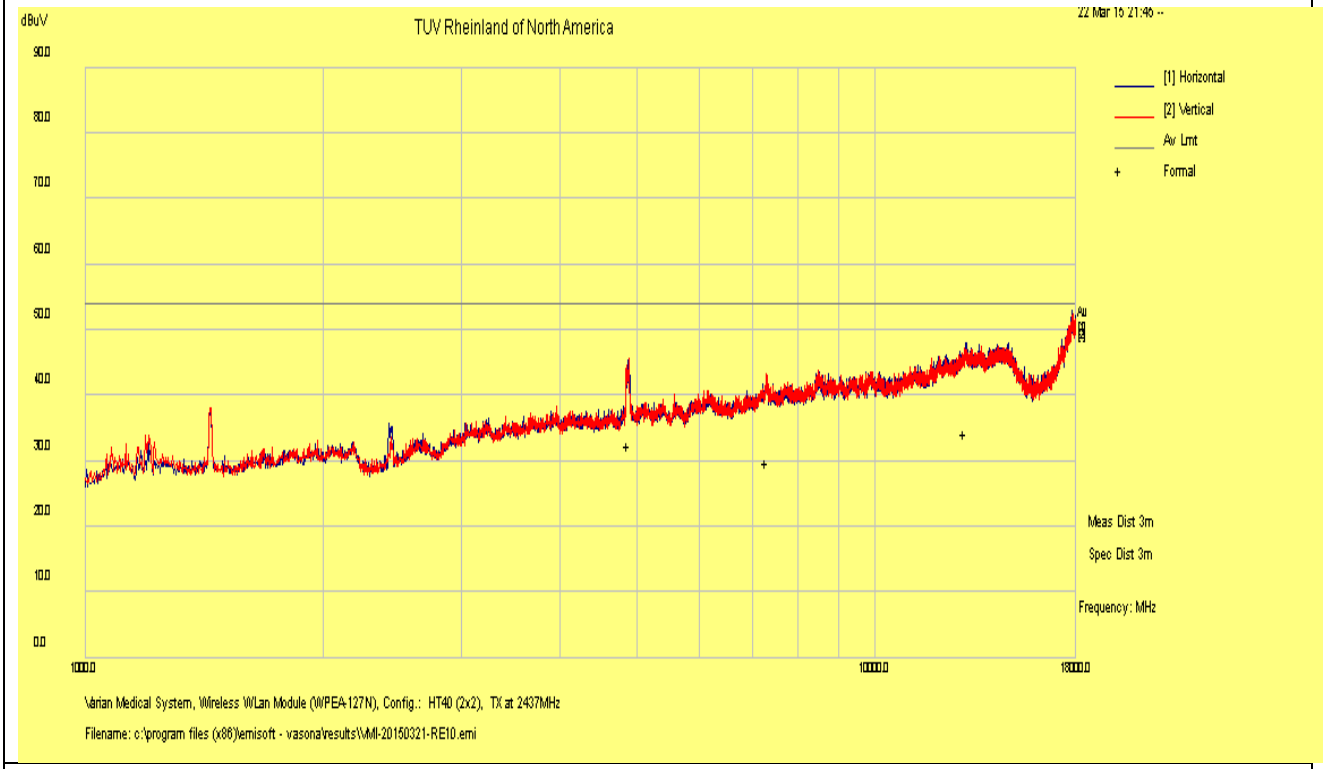
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 22 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
13034.83	39.89	3.17	-8.86	34.20	Average	H	97	363	54.00	-19.80
4882.31	46.26	1.88	-15.86	32.29	Average	V	231	-8	54.00	-21.72
7305.22	38.71	2.30	-11.38	29.63	Average	V	211	26	54.00	-24.37



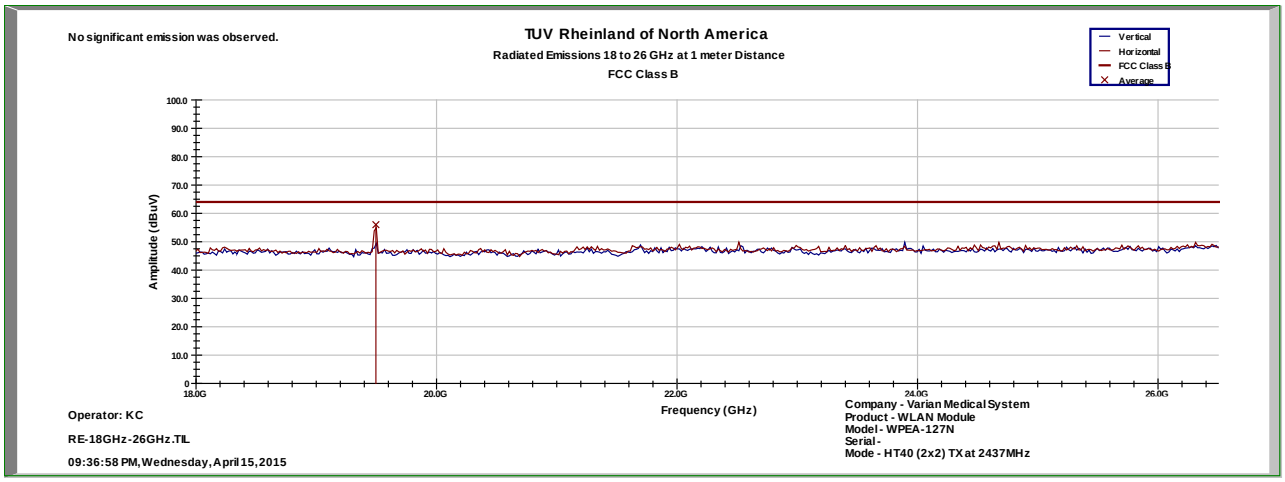
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 23 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19496.1	57.03	55.98	63.98	-8	26	102	H	8.74



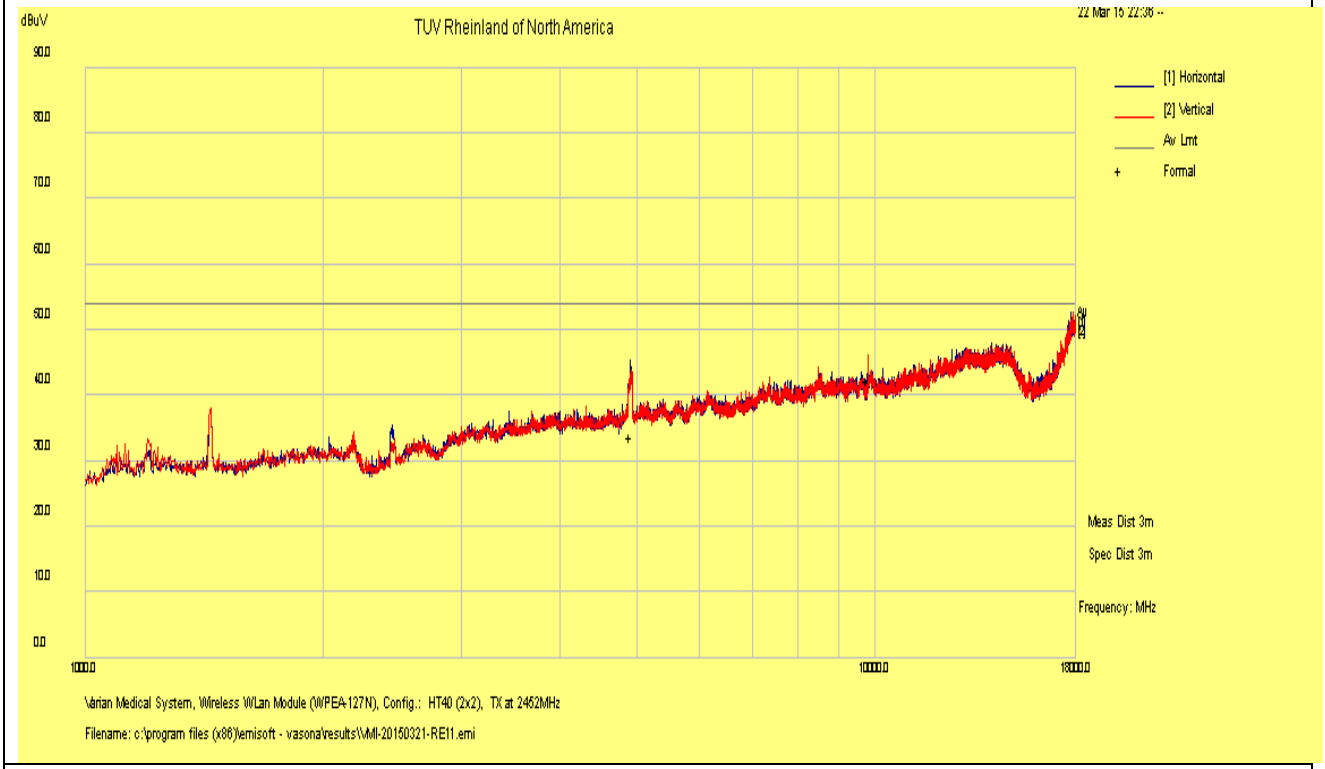
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 24 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 4, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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

1 – 18 GHz Transmit at 2452 MHz (High Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4903.80	47.42	1.89	-15.78	33.53	Average	H	116	64	54.00	-20.47
9808.01	47.43	2.71	-7.96	42.18	Average	V	245	-8	54.00	-11.82



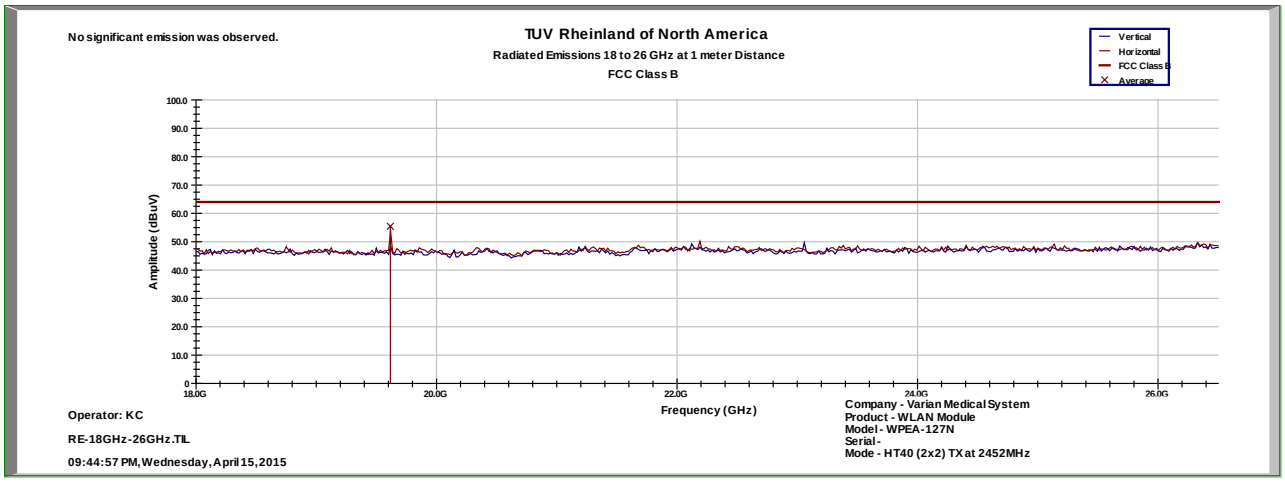
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS8

SOP 1 Radiated Emissions		Tracking # 31561114.001 Page 25 of 25	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	Apr 16, 2015
EUT Model	EW5270UM	**Temp / Hum in**	23° C / 33%rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	HT40 MCS8 / chain 0-1	**Line AC / Freq**	5VDC
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**	Kerwinn Corpuz

18 – 26 GHz Transmit at 2452 MHz (High Channel)

Frequency	Peak	Average	Limit	Margin	Azimuth	Height	Polarity	CF
MHz	dBuV/m	dBuV/m	dBuV/m	dB	degree	H/V	cm	dB
19616.1	56.1	55.39	63.98	-8.59	30	100	H	8.85



Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on HT40 MCS8

4.6 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2009. These test methods are listed under the laboratory's A2LA 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: 2015 and RSS 210: 2010.

4.6.1 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 50μH / 50Ω LISNs.

Testing is performed in Lab 5. 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.

4.6.1.1 Deviations

There were no deviations from this test methodology.

4.6.2 Test Results

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

Table 13: AC Conducted Emissions – Test Results

Test Conditions: Conducted Measurement at Normal Conditions only		
Antenna Type: Patch	**Power Level:** See Test Plan	
AC Power: 120 Vac/60 Hz	**Configuration:** Tabletop	
Ambient Temperature: 22° C	**Relative Humidity:** 34% 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 # 31561114.001 Page 1 of 4

EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	April 22, 2015
EUT Model	EW5270UM	**Temp / Hum in**	22° C / 34% rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Line AC / Freq**	120Vac/60Hz (Host)
Standard	CFR47 Part 15.207 and RSS 210	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 1	**Performed by**	Kerwinn Corpuz

Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB	
0.150	45.39	9.96	-0.10	55.25	QP	Live	66.00	-10.75	Pass
0.150	30.35	9.96	-0.10	40.21	Ave	Live	56.00	-15.79	Pass
0.542	27.72	9.99	-0.04	37.67	QP	Live	56.00	-18.33	Pass
0.542	29.22	9.99	-0.04	39.18	Ave	Live	46.00	-6.82	Pass
1.023	27.34	10.00	-0.04	37.30	QP	Live	56.00	-18.70	Pass
1.023	23.72	10.00	-0.04	33.68	Ave	Live	46.00	-12.32	Pass
1.418	26.59	10.02	-0.04	36.56	QP	Live	56.00	-19.44	Pass
1.418	20.82	10.02	-0.04	30.80	Ave	Live	46.00	-15.20	Pass
1.808	24.82	10.03	-0.04	34.80	QP	Live	56.00	-21.20	Pass
1.808	20.16	10.03	-0.04	30.15	Ave	Live	46.00	-15.85	Pass
2.606	23.78	10.04	-0.04	33.77	QP	Live	56.00	-22.23	Pass
2.606	21.25	10.04	-0.04	31.24	Ave	Live	46.00	-14.76	Pass

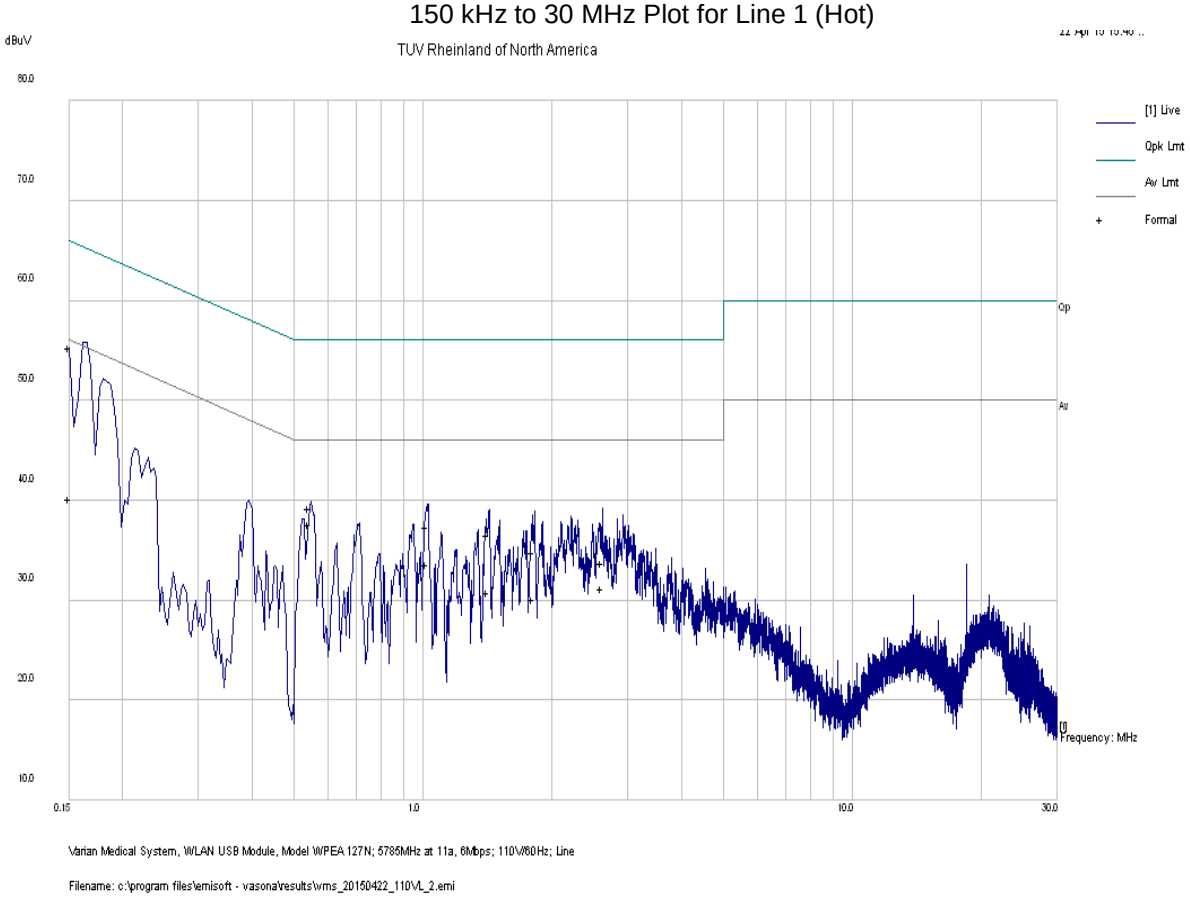
Spec Margin = QP./Ave. - Limit, ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment and transmitted at 5785 MHz in 802.11a at 6 Mbps

SOP 2 Conducted Emissions		Tracking # 31561114.001 Page 2 of 4	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	April 22, 2015
EUT Model	EW5270UM	**Temp / Hum in**	22° C / 34% rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Line AC**	120Vac/60Hz (Host)
Standard	CFR47 Part 15.207 and RSS 210	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 1	**Performed by**	Kerwinn Corpuz

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



Note: Met FCC Class B limit.

SOP 2 Conducted Emissions

Tracking # 31561114.001 Page 3 of 4

EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	April 22, 2015
EUT Model	EW5270UM	**Temp / Hum in**	22° C / 34% rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Line AC / Freq**	120Vac/60Hz (Host)
Standard	CFR47 Part 15.207 and RSS 210	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 2	**Performed by**	Kerwinn Corpuz

Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB	
0.150	45.89	9.96	-0.10	55.75	QP	Neutral	65.99	-10.24	Pass
0.150	32.03	9.96	-0.10	41.89	Ave	Neutral	55.99	-14.10	Pass
0.552	27.31	10.00	-0.04	37.26	QP	Neutral	56.00	-18.74	Pass
0.552	21.79	10.00	-0.04	31.74	Ave	Neutral	46.00	-14.26	Pass
1.013	28.03	10.00	-0.04	37.99	QP	Neutral	56.00	-18.01	Pass
1.013	23.57	10.00	-0.04	33.53	Ave	Neutral	46.00	-12.47	Pass
1.419	26.37	10.02	-0.04	36.34	QP	Neutral	56.00	-19.66	Pass
1.419	19.90	10.02	-0.04	29.87	Ave	Neutral	46.00	-16.13	Pass
2.023	22.19	10.03	-0.04	32.18	QP	Neutral	56.00	-23.82	Pass
2.023	21.94	10.03	-0.04	31.93	Ave	Neutral	46.00	-14.07	Pass
2.469	23.75	10.04	-0.04	33.74	QP	Neutral	56.00	-22.26	Pass
2.469	20.33	10.04	-0.04	30.32	Ave	Neutral	46.00	-15.68	Pass

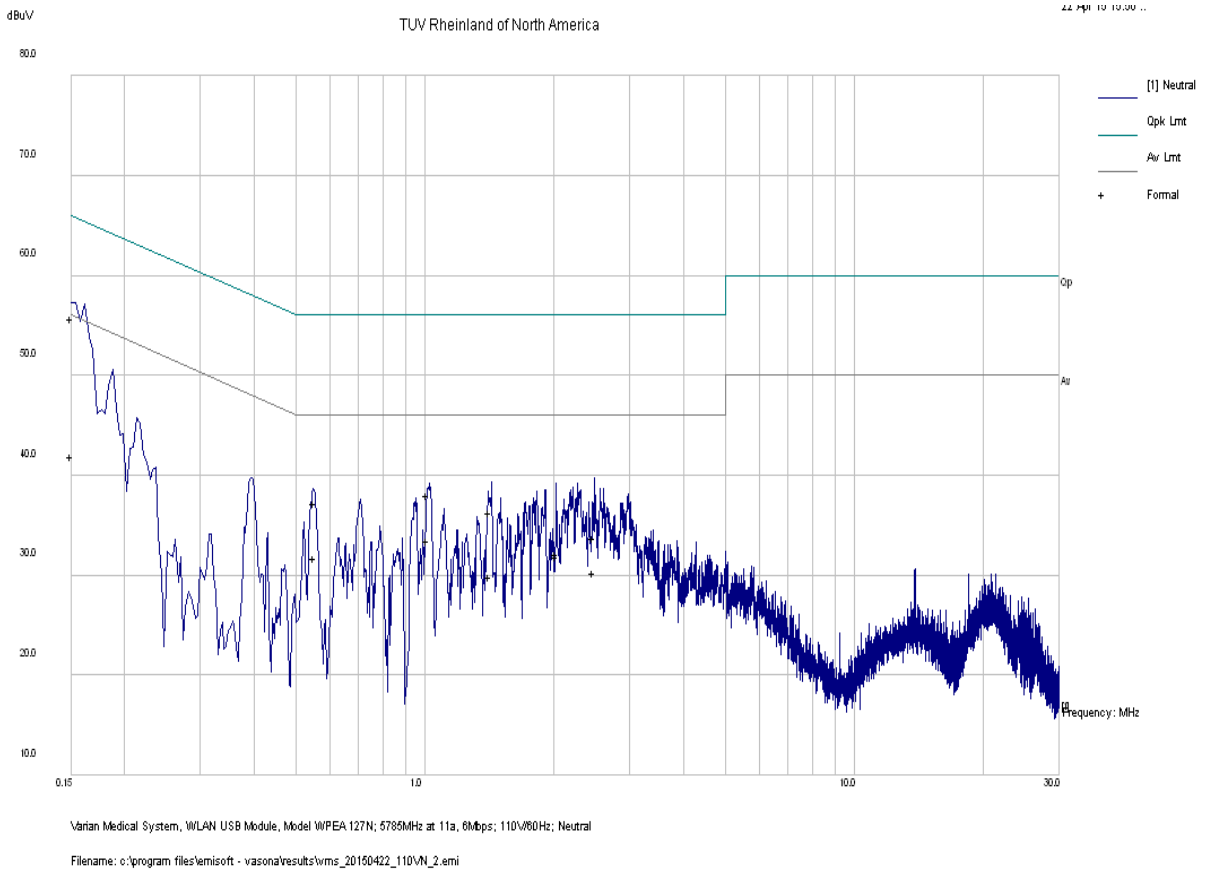
Spec Margin = QP./Ave. - Limit, ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment and transmitted at 5785 MHz in 802.11a at 6 Mbps

SOP 2 Conducted Emissions		Tracking # 31561114.001 Page 4 of 4	
EUT Name	WiFi 802.11ac/a/b/g/n 2x2 MIMO USB 3.0 Module	**Date**	April 22, 2015
EUT Model	EW5270UM	**Temp / Hum in**	22° C / 34% rh
EUT Serial	Prototype	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Line AC**	120Vac/60Hz (Host)
Standard	CFR47 Part 15.207 and RSS 210	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 2	**Performed by**	Kerwinn Corpuz

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



Note: Met FCC Class B Limit.

4.7 Maximum Permissible Exposure

4.7.1 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.

4.7.2 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

4.7.3 EUT Operating Condition

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

4.7.4 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**.

See below calculation for 2.412 GHz RF Exposure at a distance of 20cm.

SAR Testing has been evaluated for human body within 20cm away. Refer to SAR Test Report for more detail.

4.7.5 Test Results

4.7.5.1 Antenna Gain

The 2.412 GHz transmitting antenna beam forming gain was – 3 dBi or 0.50 (numeric).

4.7.5.2 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/cm^2

The highest measured total power is +20.41 dBm or 109.9 mW

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

Pd = (109.9*0.5) / (1600π) = 0.0109 mW/cm2, which is 0.9891mW/cm2 below to the limit.

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

4.7.6 Sample Calculation

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

Where;

Pd = power density in mW/cm^2
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).

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Bilog Antenna	Sunol Sciences	JB3	A102606	07/08/2014	07/08/2016
Horn Antenna	EMCO	3115	9710-5301	09/04/2013	09/04/2015
Antenna (18-26GHz)	CMT	RA42-K-F-4B-C	020131-004	07/24/2014	07/24/2015
Antenna (26-40 GHz)	CMT	RA28-K-F-4B-C	011469R-003	01//11/2015	01/11/2016
Spectrum Analyzer	Rohde & Schwarz	FSL6	100169	01/13/2015	01/13/2016
Spectrum Analyzer	Agilent	N9038A	MY51210195	01/12/2015	01/12/2016
Spectrum Analyzer	Agilent	N9030A	MY51380689	01/19/2015	01/19/2016
Spectrum Analyzer	Rohde Schwarz	ESIB	832427/002	01/13/2015	01/13/2016
Spectrum Analyzer	Rohde Schwarz	FSV40	1321.3008K40	11/01/2015	11/01/2016
Amplifier	Sonoma Instruments	310	213221	09/30/2014	09/30/2015
Amplifier	Miteq	TTA1800-30-4G	1842452	01/13/2015	01/13/2016
Amplifier	Rohde & Schwarz	TS-PR26	100011	07/24/2014	07/24/2016
Amplifier	Rohde & Schwarz	TS-PR40	100012	02/21/2015	02/21/2016
Power Meter	Agilent	E4418B	MY45103902	01/15/2015	01/15/2016
Power Sensor	Hewlett Packard	8482A	US37295801	01/15/2015	01/15/2016
Thermometer	Fluke	52II	96480032	06/28/2014	06/28/2015
Thermo Chamber	Espec	BTZ-133	0613436	03/16/2015	03/16/2016
DC Power Supply	Agilent	E3634A	MY400004331	01/12/2015	01/12/2016
Notch Filter	Micro-Tronics	BRM50716	003	01/30/2015	01/30/2016
Signal Generator	Anritsu	MG3694A	42803	01/13/2015	01/13/2016
Signal Generator	Rohde & Schwarz	SMF100A	1167.0000K02	10/14/2014	10/14/2015
Signal Generator	Rohde & Schwarz	SMBV100A	1407.6004K02	12/04/2014	12/04/2015
Power Sensors	Rohde & Schwarz	OSP120	1520.9010.02	12/19/2014	12/14/2015

* 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 14: Customer Information

Company Name	Varian Medical System, Inc.
Address	1678 Pioneer Road
City, State, Zip	Salt Lake City, UT 84104
Country	USA
Phone	(801) 978-5759
Fax	(801) 973-5772

Table 15: Technical Contact Information

Name	Maryann Mitchell
E-mail	Mark.Rieger@pace.com
Phone	(801) 978-5759
Fax	(801) 973-5772

6.3 Equipment Under Test (EUT)

Table 16: EUT Specifications

EUT Specifications	
Dimensions	72.6 mm x 22.6 mm
USB Module	5VDC (powered via USB port)
Environment	Indoor
Operating Temperature Range:	0 to 40 degrees C
Multiple Feeds:	☐ Yes and how many ☒ No
Hardware Version	M01-U7520
Part Number	119441
RF Software Version	RTL8812AU
802.11-radio modules	
Operating Mode	802.11b/g, HT20 and HT40
Transmitter Frequency Band	2.4 GHz – 2.4835 GHz
Max. Rated Power Output	See Channel Planning Table.
Power Setting @ Operating Channel	See Channel Planning Table.
Antenna Type	Qty 2 – Proprietary, stamped metal, Patch 2.4 GHz antennas
Antenna Gain	. ~ -6 dBi
Modulation Type	☐ AM ☐ FM ☒ DSSS ☒ OFDM ☐ Other describe: 16QAM and 64 QAM
Data Rate	802.11b: 1 Spatial Streams: 1, 2, 5.5, 11 Mbps 802.11g: 1 Spatial Streams: 6, 9, 12, 18, 24, 36, 54 Mbps 802.11n HT20: 2 Spatial Streams: 13, 26, 39, 52, 78, 104, 117, 130 /156 Mbps (LGI) 802.11n HT40: 2 Spatial Streams: 27, 54, 81, 108, 162, 216, 243, 270 / 324, 370 Mbps (LGI)
TX/RX Chain (s)	MIMO (2x2)
Directional Gain Type	☒ Correlated ☒ Beam-Forming ☐ Other describe:

EUT Specifications	
Type of Equipment	☒ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other:
Note: All 2 chains will be on / transmitted at all time.	

Table 17: EUT Channel Power Specifications

No.	Frequency (MHz)	Target Power Value dBm					
		802.11b	802.11g	802.11a	802.11n HT20/VHT20	802.11n HT40/VHT40	802.11AC VHT80
1	2412	20.41	14.87		17.72		
3	2422					17.01	
5	2432					17.67	
6	2437	20.34	14.91		17.29		
9	2452					17.12	
11	2462	19.96	14.84		17.26		
36	5180						
38	5190						
40	5200						
42	5210						
44	5220						
46	5230						
48	5240						
52	5260						
54	5270						
56	5280						
58	5290						
60	5300						
62	5310						
64	5320						
100	5500						
102	5510						
104	5520						
106	5530						
108	5540						
110	5550						
112	5560						
116	5580						
118	5590						

120	5600						
122	5610						
124	5620						
126	5630						
128	5640						
132	5660						
134	5670						
136	5680						
138	5690						
140	5700						
142	5710						
149	5745						
151	5755						
153	5765						
155	5775						
157	5785						
159	5795						
161	5805						
165	5825						
Note: The adjusted power target values are updated at the evaluated frequencies.							

Table 18: 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?
USB	USB	☐ No	☒ Metric: 2 m	☐ N/A

Table 19: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Dell	PP18L	4104098173	Setup EUT operating channel
Note: None.				

Table 20: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.407
EW5270UM	Prototype	Patch Antenna	TX Emission, AC Conducted Emission
		Direct Connection	Peak Transmit Power, Peak Power Spectral Density, Peak Excursion Ratio Occupied Bandwidth Frequency Stability Voltage Variation

Table 21: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
EW5270UM	Patch	Transmit	EUT laid flat.	EUT stood upright	EUT onside
Note: Pre-scans were performed in 2 supporting axis, and Y-axis was worst.					

6.4 Test Specifications

Testing requirements

Table 22: Test Specifications

Emissions and Immunity	
Standard	**Requirement**
CFR 47 Part 15.407: 2015	All
RSS 210 Issue 8, 2010	All

END OF REPORT