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Emissions Test Report

EUT Name: Home Wi-Fi Router

Model No.: A010001

CFR 47 Part 15.247: 2015 and RSS 247: 2015

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	12/09/2015	Original Document	N/A

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	eero inc 933 20th Street San Francisco, CA 94107 (415) 738-7972
Requester / Applicant:	Clifford Clarke
Name of Equipment:	Home Wi-Fi Router
Model No.	A010001
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247: 2015 and RSS 247: 2015
Test Dates:	03 Nov 2015 to 08 Dec 2015

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v03r02, KDB 662911 D01 Multiple Transmitter Output v02r01

Test Methods:

Emissions: ANSI C63.10-2013, 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 December 09, 2015	A2LA Signatory	Date December 09, 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 247: 2015 based on the results of testing performed on 03 Nov 2015 to 08 Dec 2015 on the Home Wi-Fi Router Model A010001 manufactured by eero 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, CFR47 15.247 (d) RSS-GEN Sect.8.9, RSS 247 Sect. 6.2.1.2	Class B	**Complied**
Restricted Bands of Operation	CFR47 15.205, RSS GEN 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 247 Sect. 5.4.4, 6.2.4.1	26.72 dBm (802.11g) 26.76 dBm (HT 20) 23.32 dBm (HT 40)	**Complied**
Peak Power Spectral Density	CFR47 15.247 (e), RSS 247 Sect. 5.2.2	< 8 dBm/3kHz	**Complied**
Out of Band Emission	CFR47 15.247 (d), RSS 247 Sect.5.5	30 MHz - 25 GHz < 30 dBm/100kHz	**Complied**
RF Exposure	CFR47 15.247 (i), 2.1093 RSS-102 Issue 5	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 C63.4-2014, 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 C63.4-2014, 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

2.3.3 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 A010001, Home Wi-Fi Router, is a Wi-Fi router for the home capable of operating in the 2.4 GHz and 5 GHz frequency bands over 20 MHz, 40 MHz and 80 MHz channels.

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 Home Wi-Fi Router has seven custom integrated antennas. The 2.4GHz band uses custom integrated antennas, Antenna 1 and Antenna 2, and has maximum gain + 1.5 dBi. There are no beam forming and no additional antenna available.

Refer to Table 13 for additional antenna information.

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2015 and RSS 247: 2015. 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 247: 2015 Sect. 5.4.4, and Sect. 6.2.4.

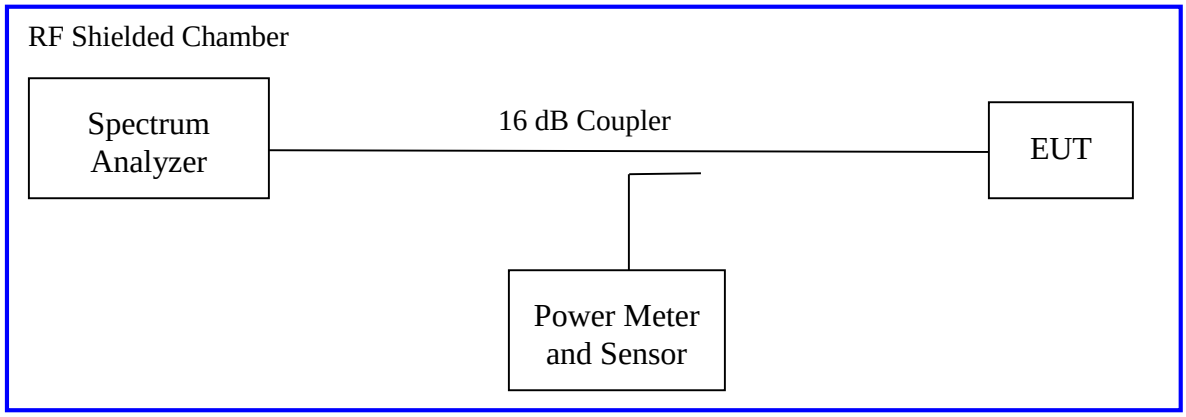
The maximum transmitted powers are

Band 2400-2483.5 MHz: 1 W

4.1.1 Test Method

The ANSI C63.10-2013 Section 11.9.2.2.2. 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 247 Sect. 5.4.4; 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: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 1.5 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 24° C			**Relative Humidity:**39%		
802.11g					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
2412.00	30.00	25.06	24.51	27.80	-2.20
2427.00	30.00	25.12	24.69	27.92	-2.08
2437.00	30.00	25.14	25.24	28.20	-1.80
2447.00	30.00	26.72	26.39	29.57	-0.43
2462.00	30.00	23.86	23.64	26.76	-3.24

Note: 1.The highest output power was observed at 802.11g mode, 6.0 Mbps, 1 Data Streams.
2. The sum of Ch0 and Ch1 = Total Power.
3. 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: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 1.5 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 24° C			**Relative Humidity:**39%		
802.11n					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
2412.00	30.00	24.91	24.32	27.64	-2.36
2417.00	30.00	24.93	24.12	27.55	-2.45
2422.00	30.00	24.29	23.49	26.92	-3.08
2427.00	30.00	25.1	24.67	27.90	-2.10
2432.00	30.00	24.94	24.72	27.84	-2.16
2437.00	30.00	25.34	25.27	28.32	-1.68
2442.00	30.00	26.15	25.99	29.08	-0.92
2447.00	30.00	26.76	26.61	29.70	-0.30
2452.00	30.00	25.49	25.07	28.30	-1.70
2457.00	30.00	25.08	24.7	27.90	-2.10
2462.00	30.00	24.04	24.1	27.08	-2.92

Note: 1. The highest output power was observed at HT20 MCS0, 1 Data Streams.

2. The sum of Ch0 and Ch1 = Total Power.

3. 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 4: RF Output Power at the Antenna Port – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature					
Antenna Type: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 1.5 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 24° C			**Relative Humidity:**39%		
802.11n					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
2422.00	30.00	22.47	22.41	25.45	-4.55
2452.00	30.00	23.32	23.15	26.25	-3.75

Note: 1. The highest output power was observed at HT40 MCS0, 1 Data Streams.

2. The sum of Ch0 and Ch1 = Total Power.

3. Plots for all the measurements stated above were taken, to reduce complexity and bulkiness of the report Highlighted Plots are placed in the report.

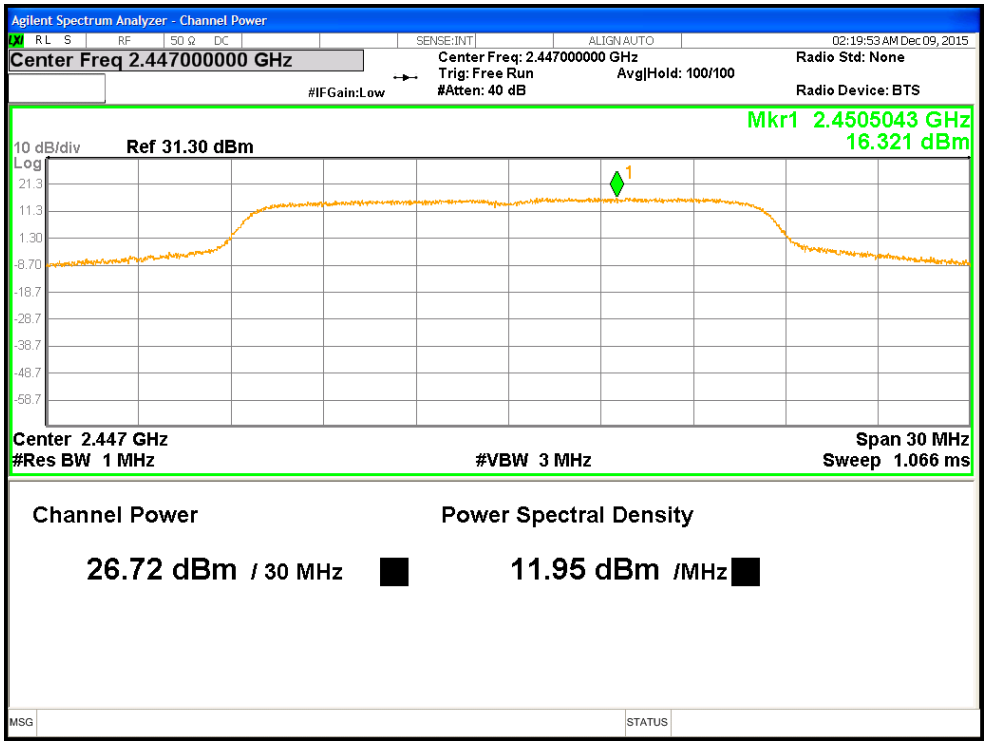


Figure 1: Maximum Transmitted Power, 2447 MHz at 11g 6Mbps, Chain 0

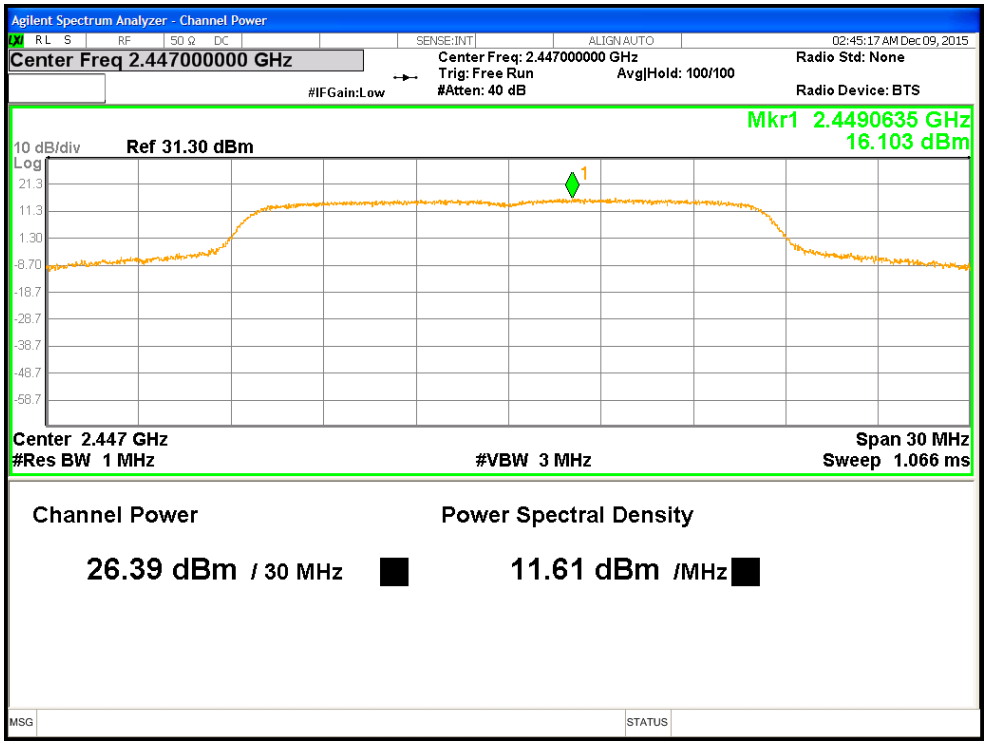


Figure 2: Maximum Transmitted Power, 2447 MHz at 11g 6Mbps, Chain 1

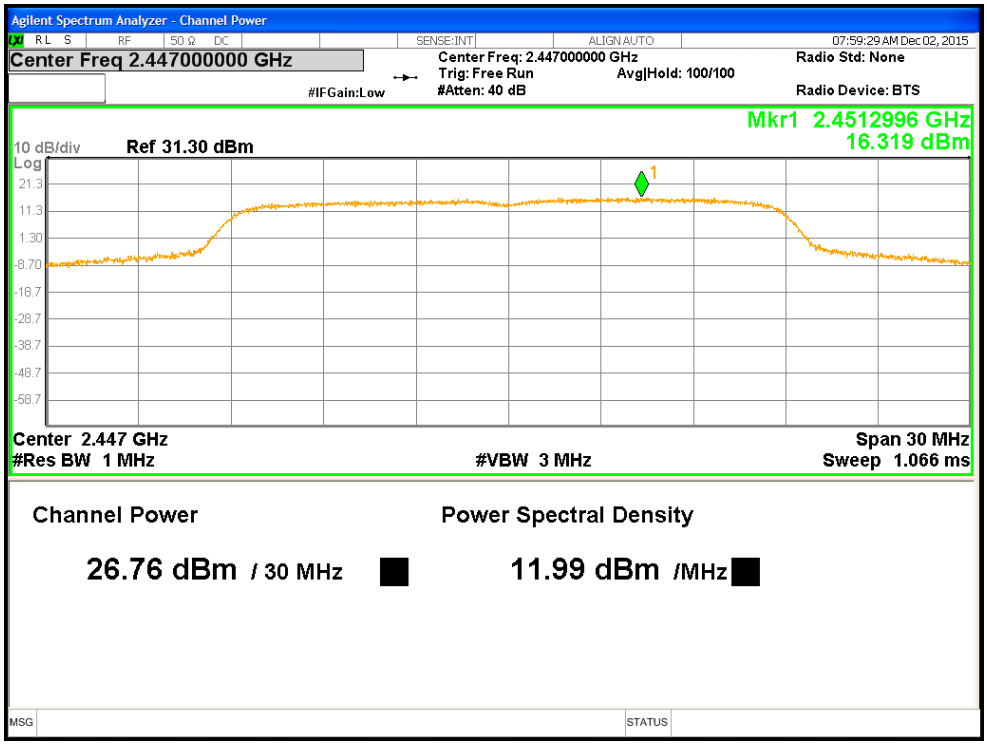


Figure 3: Maximum Transmitted Power, 2447 MHz at HT20 MCS0, Chain 0

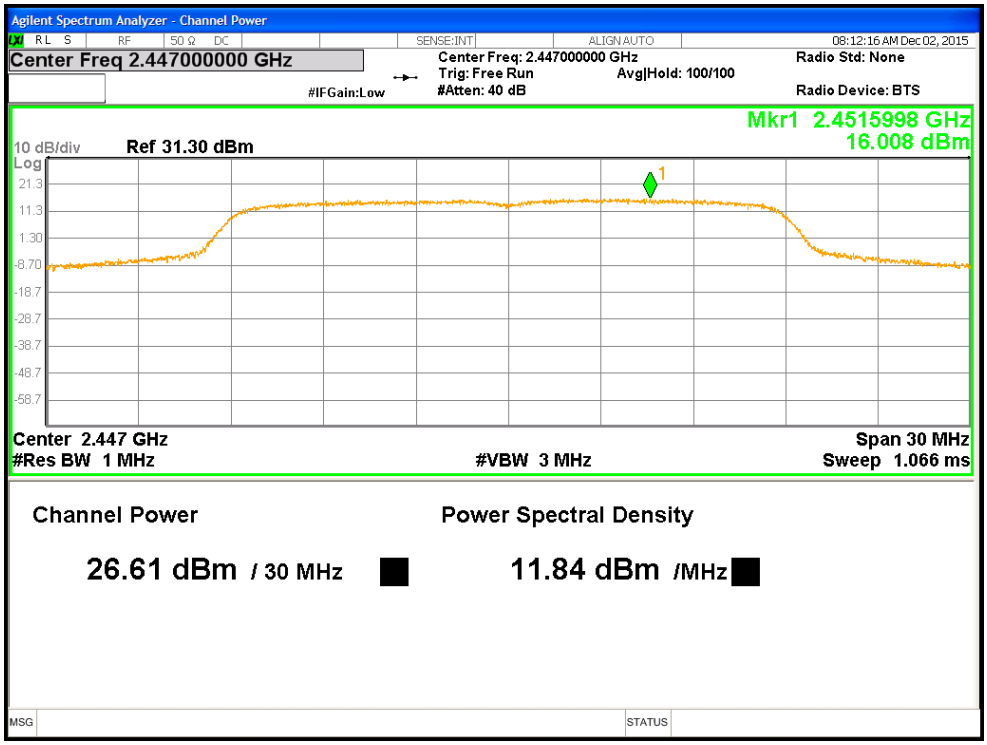


Figure 4: Maximum Transmitted Power, 2447 MHz at HT20 MCS0, Chain 1

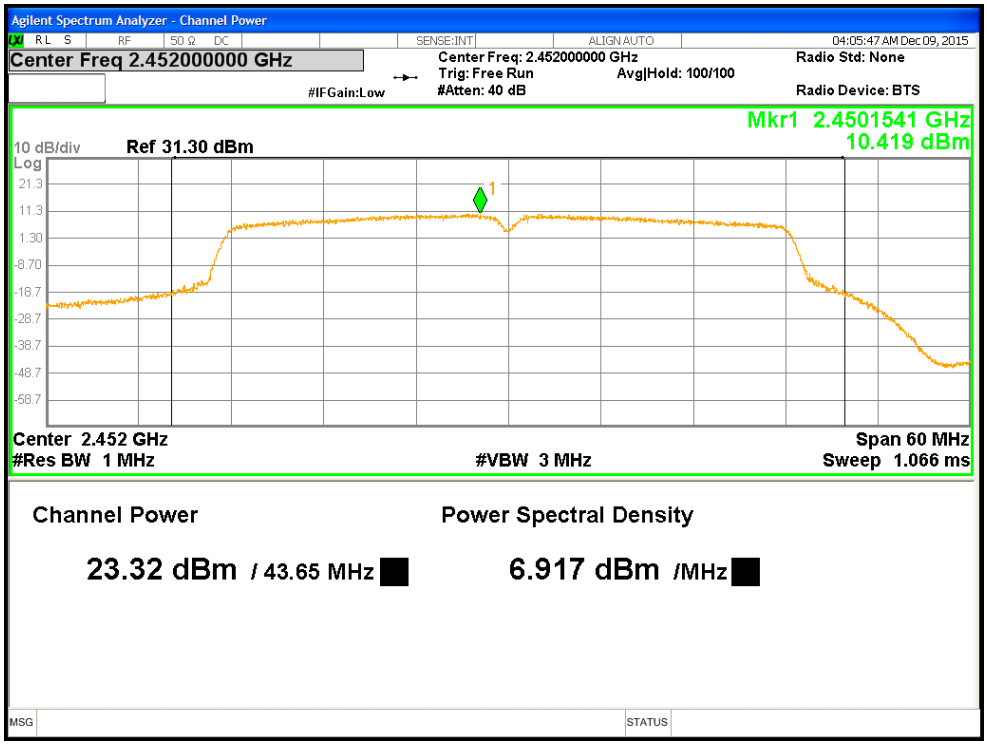


Figure 5: Maximum Transmitted Power, 2452 MHz at HT40 MCS0, Chain 0

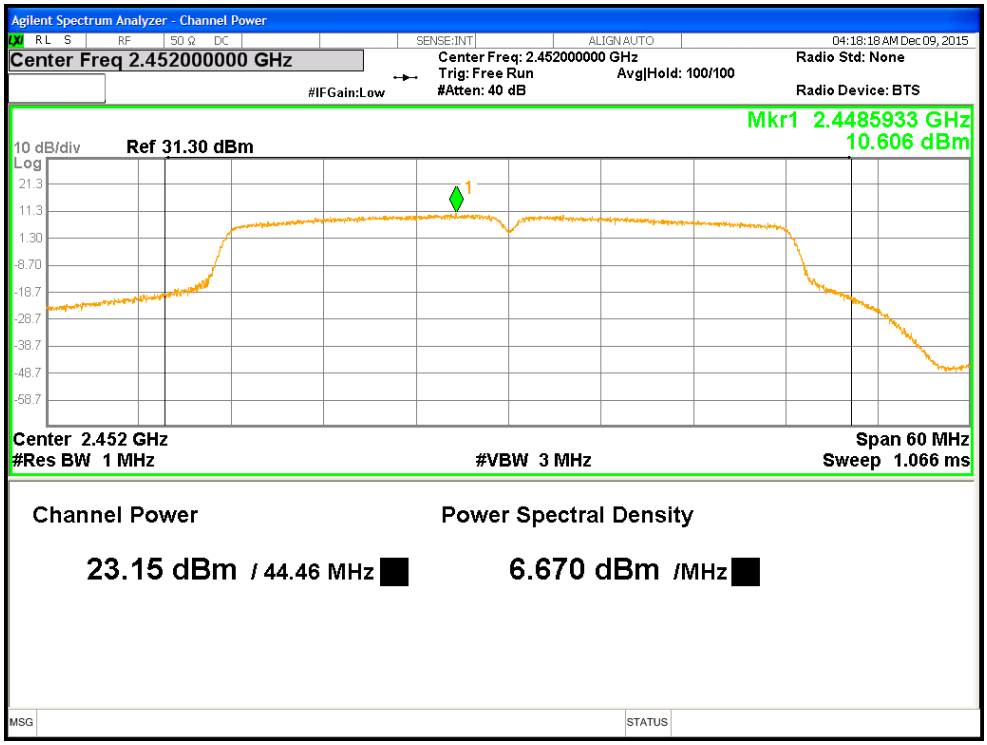


Figure 6: Maximum Transmitted Power, 2452 MHz at HT40 MCS0, Chain 1

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.

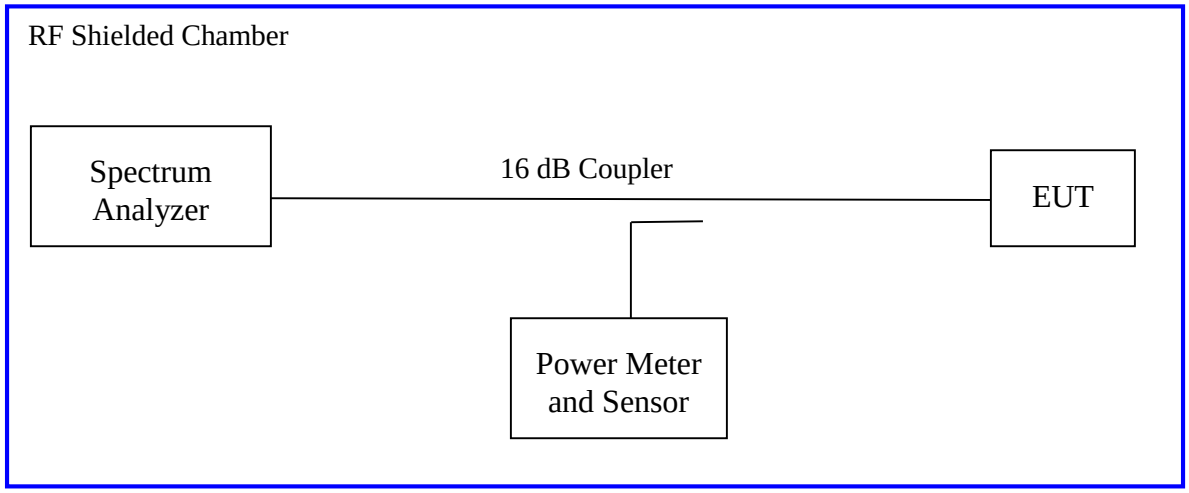
The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

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 C63.10:2013 Section 11.8. 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, 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				
Antenna Type: Custom Integrated			**Power Setting:** See test plan	
Max. Directional Gain: + 1.5 dBi				
Signal State: Modulated at 100%.				
Ambient Temp.: 24° C			**Relative Humidity:**39%	
Bandwidth (MHz) for 802.11g				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2412	15.63	15.79	16.36	16.38
2437	15.73	15.76	18.69	19.25
2462	15.75	15.93	16.67	16.73
Note: The bandwidth was measured at 6.0 Mbps				
Bandwidth (MHz) for 802.11n				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2412	15.44	15.32	17.54	17.56
2437	16.37	16.37	19.04	19.55
2462	16.36	16.32	17.75	17.83
Note: The bandwidth was measured at HT20 MCS0, 1 Data Streams				
Bandwidth (MHz) for 802.11n				
Freq. (MHz)	**6dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
2422	35.15	35.15	35.99	36.04
2452	35.11	35.13	35.81	35.90
Note: The bandwidth was measured at HT40 MCS0, 1 Data Streams				

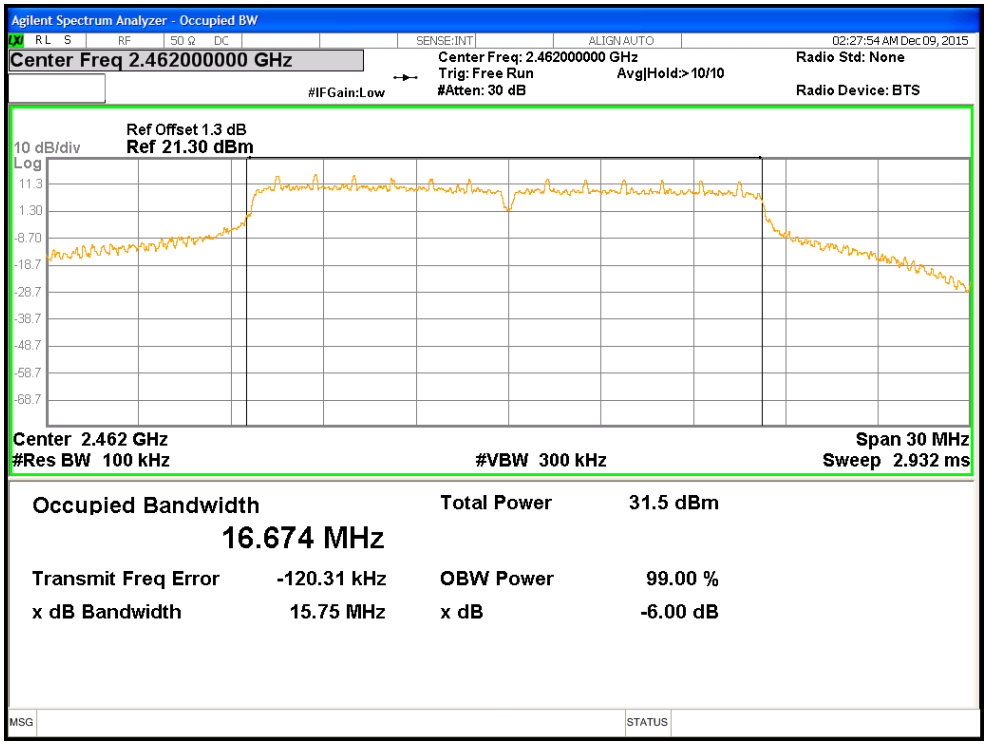


Figure 7: 6dB & 99% Occupied Bandwidth, 2462 MHz at 802.11g, Chain 0

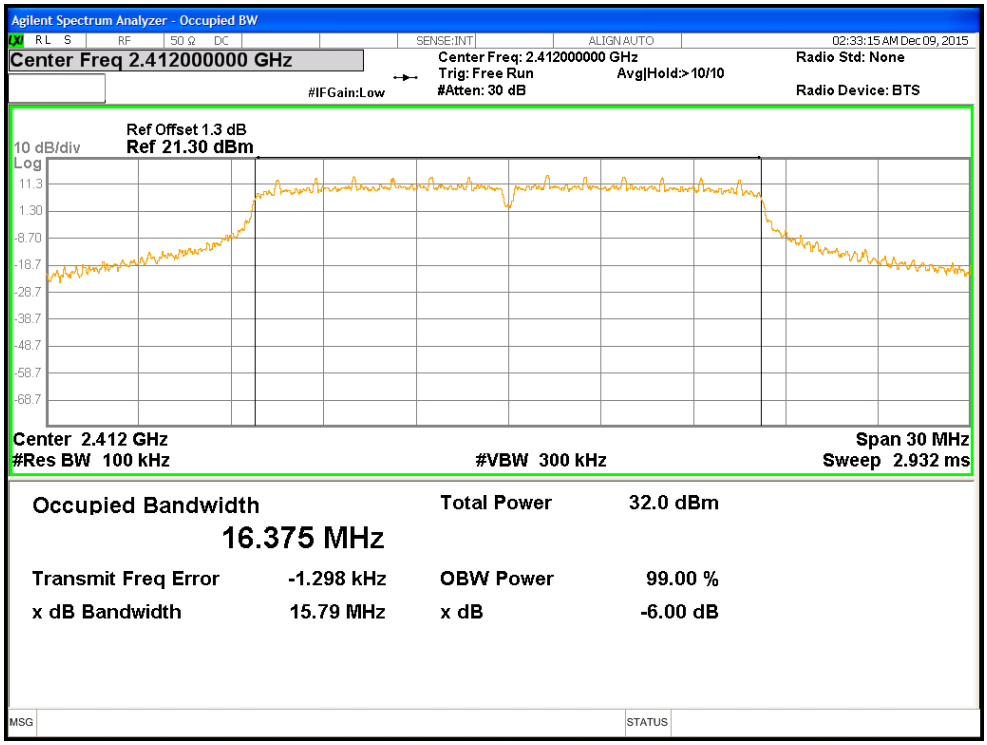


Figure 8: 6dB & 99% Occupied Bandwidth, 2412 MHz at 802.11g, Chain 1

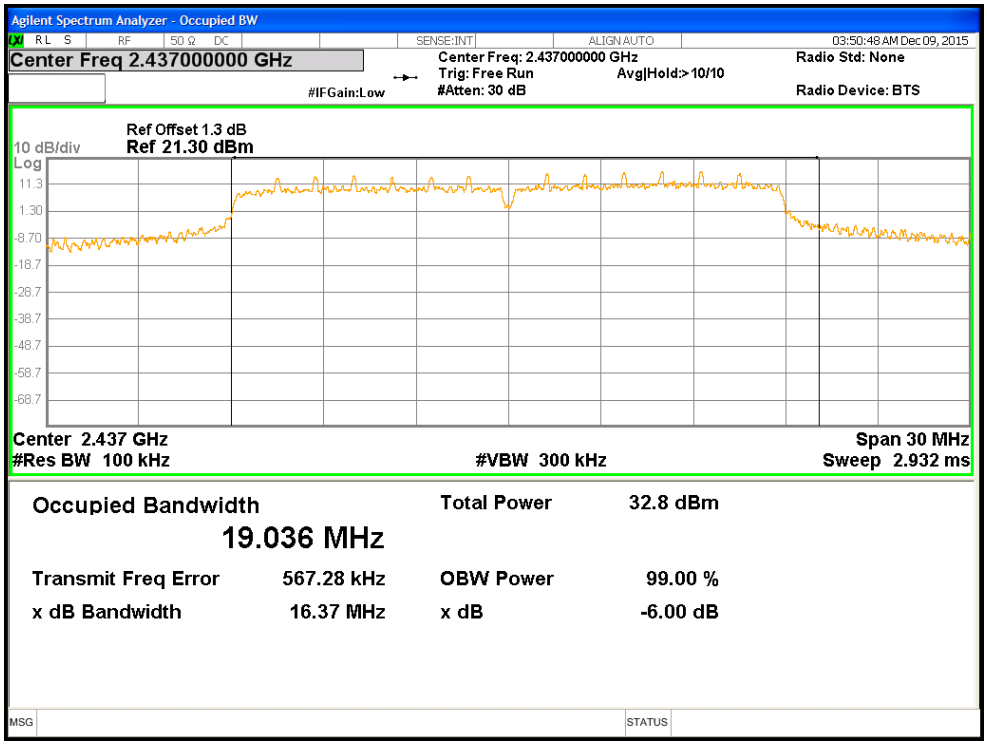


Figure 9: 6dB & 99% Occupied Bandwidth, 2437 MHz at HT20, Chain 0

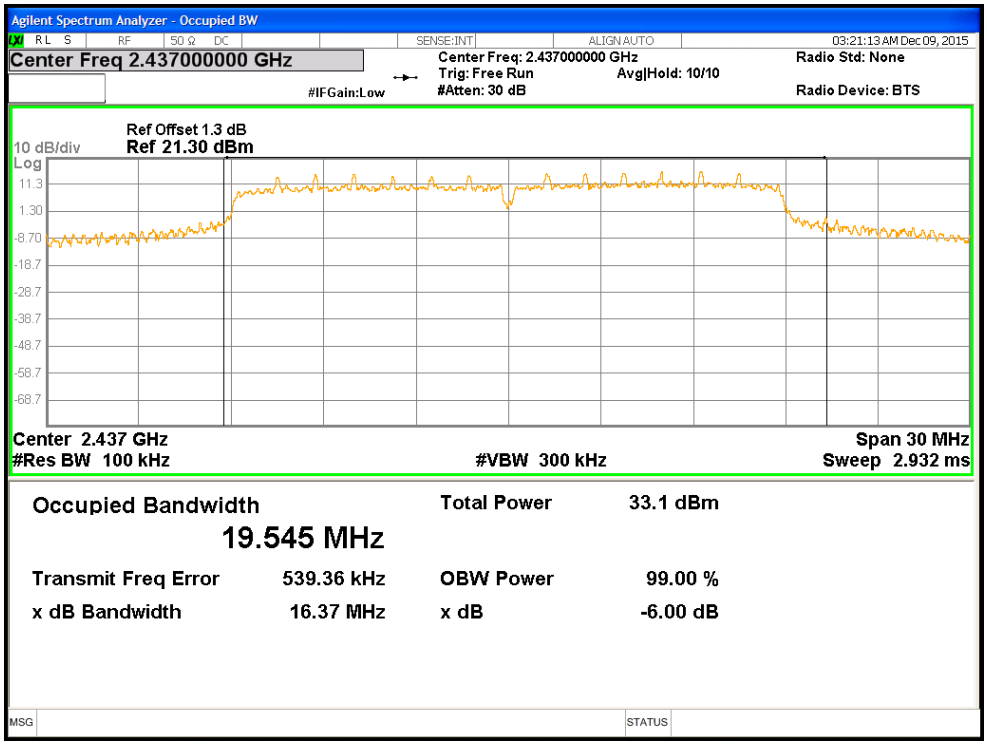


Figure 10: 6dB & 99% Occupied Bandwidth, 2437 MHz at HT20, Chain 1

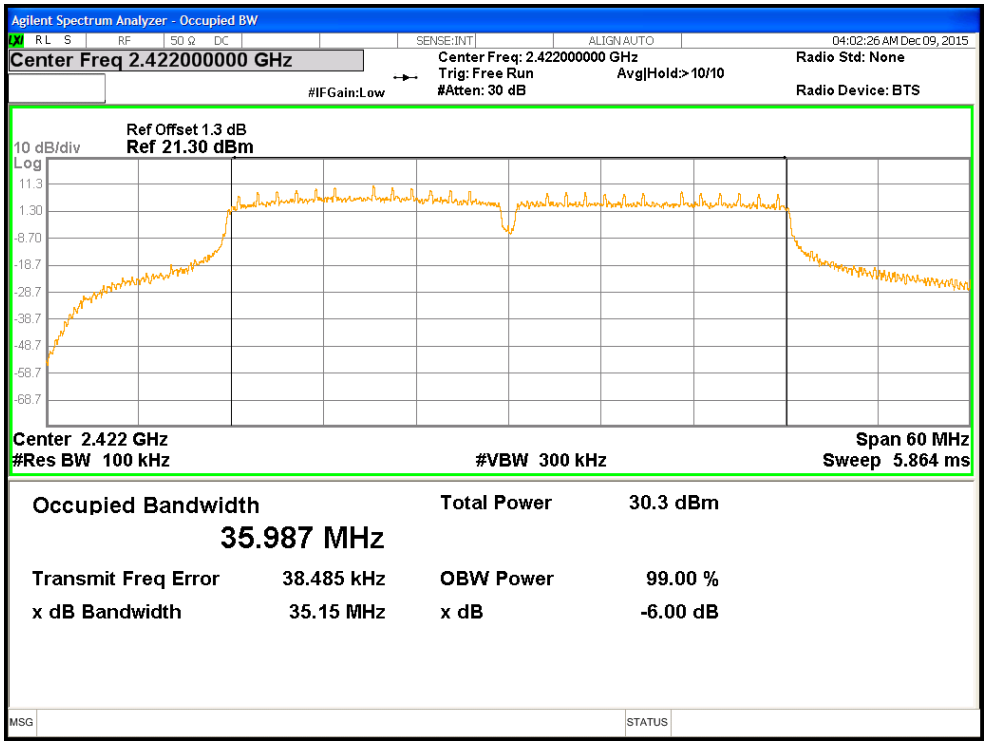


Figure 11: 6dB & 99% Occupied Bandwidth, 2422 MHz at HT40, Chain 0

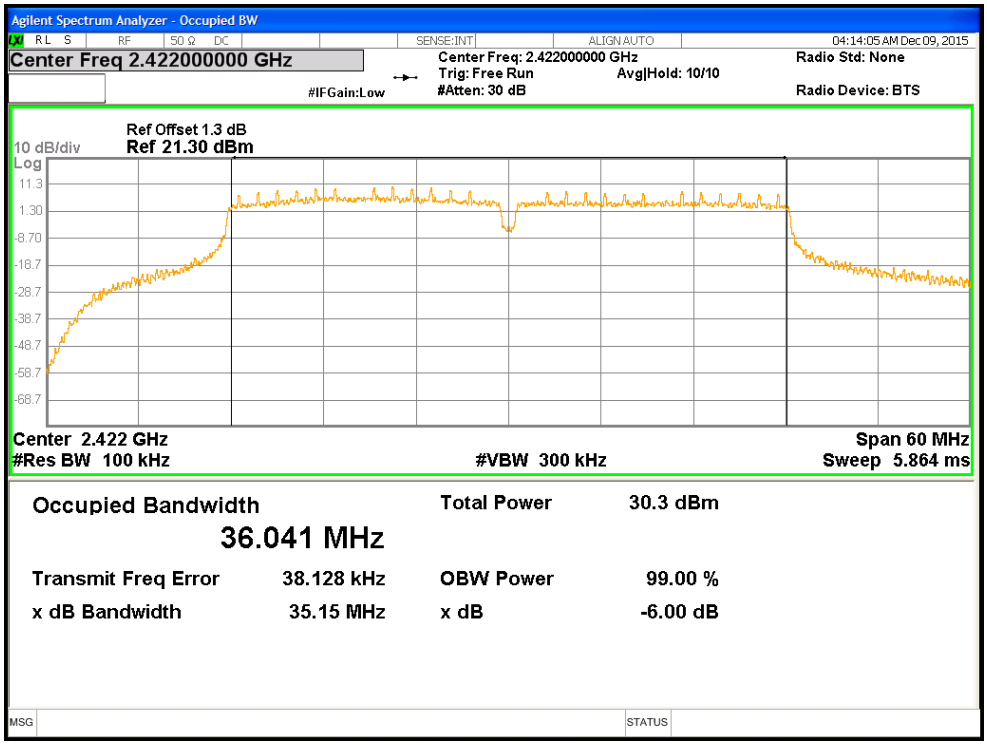


Figure 12: 6dB & 99% Occupied Bandwidth, 2422 MHz at HT40, Chain 1

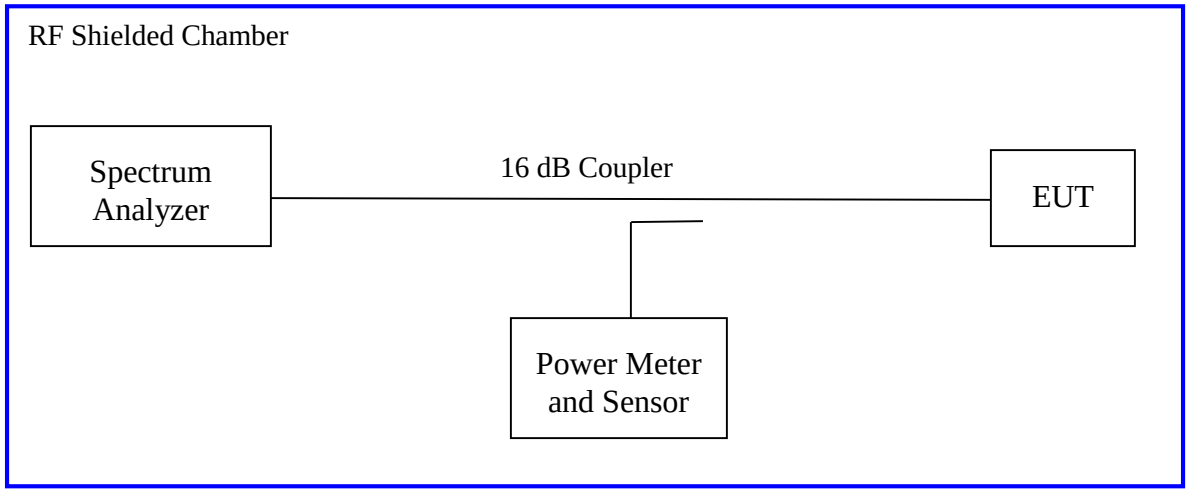
4.3 Peak Power Spectral Density

According to the CFR47 Part 15.247 (e) and RSS 247 Sect.5.2.2, 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 C63.10-2013 Section 11.10.3. The measurement was performed with modulation per CFR47 Part 15.247 (e) and RSS 247 Sect.5.2.2. 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 6: Peak Power Spectral Density – Test Results

Test Conditions: Conducted Measurement, Normal Temperature						
Antenna Type: Custom Integrated				**Power Setting:** See test plan		
Max. Directional Gain: + 1.5 dBi						
Signal State: Modulated at 100%.						
Ambient Temp.: 24° C				**Relative Humidity:**39%		
Peak Power Spectral Density						
802.11g						
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2412	-9.51	-10.07	-9.51	-6.77	8	-14.77
2437	-9.00	-8.93	-8.93	-5.95	8	-13.95
2462	-9.32	-10.29	-9.32	-6.77	8	-14.77
Note: 1. The highest peak output power was observed at **11g 6Mbps** per data stream. 2. The sum of Ch0 and Ch1 = Total PSD. 3. Limited number of plots are placed in the report.						
802.11n						
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2412	-9.70	-10.29	-9.70	-6.97	8	-14.97
2437	-9.09	-9.51	-9.09	-6.28	8	-14.28
2462	-10.42	-10.49	-10.42	-7.44	8	-15.44
Note: 1. The highest peak output power was observed at **HT20 MCS0** per data stream. 2. The sum of Ch0 and Ch1 = Total PSD. 3. Limited number of plots are placed in the report.						

Table 7: Peak Power Spectral Density – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature						
Antenna Type: Custom Integrated				**Power Setting:** See test plan		
Max. Directional Gain: + 1.5 dBi						
Signal State: Modulated at 100%.						
Ambient Temp.: 24° C				**Relative Humidity:**39%		
Peak Power Spectral Density						
802.11n						
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Max [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2422	-14.58	-14.88	-14.58	-11.72	8	-19.72
2452	-13.98	-13.71	-13.71	-10.83	8	-18.83

Note: 1. The highest peak output power was observed at **HT40 MCS0** per data stream.
2. The sum of Ch0 and Ch1 = Total PSD.
3. Limited number of plots are placed in the report.

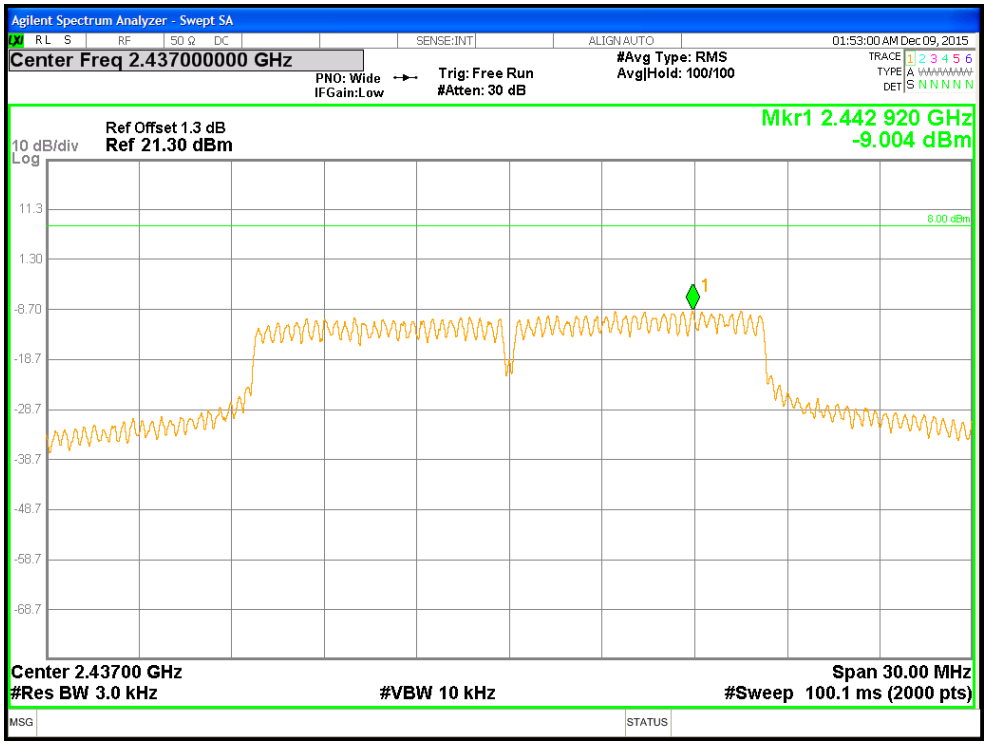


Figure 13: Power Spectral Density, 2437 MHz at 802.11g 6Mbps, Chain 0

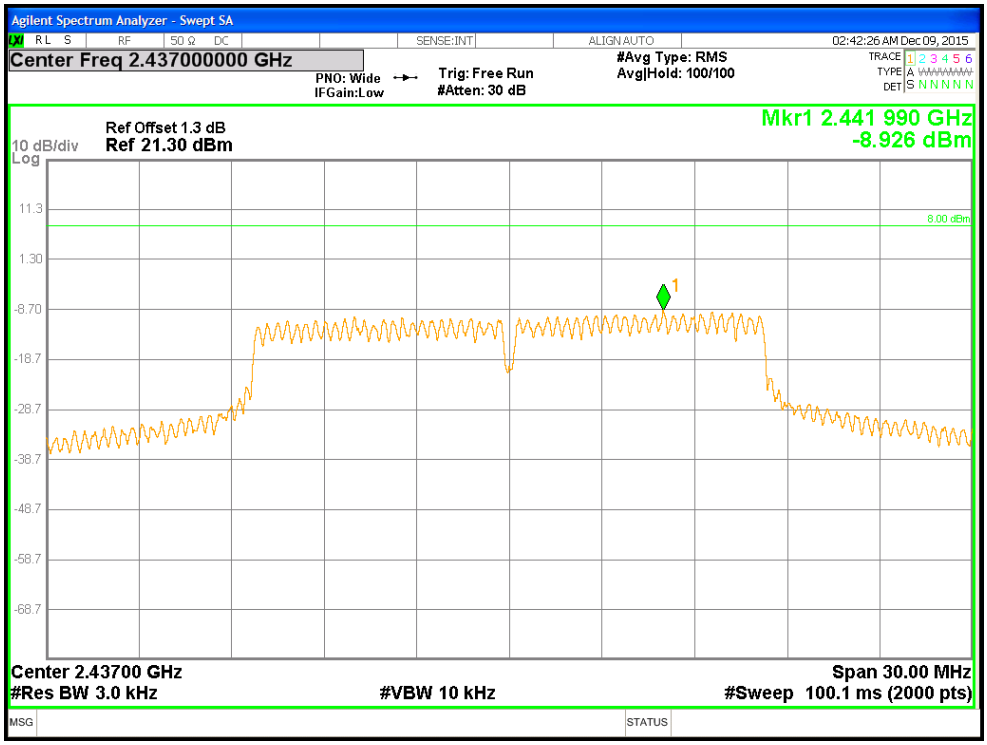


Figure 14: Power Spectral Density, 2437 MHz at 802.11g 6Mbps, Chain 1

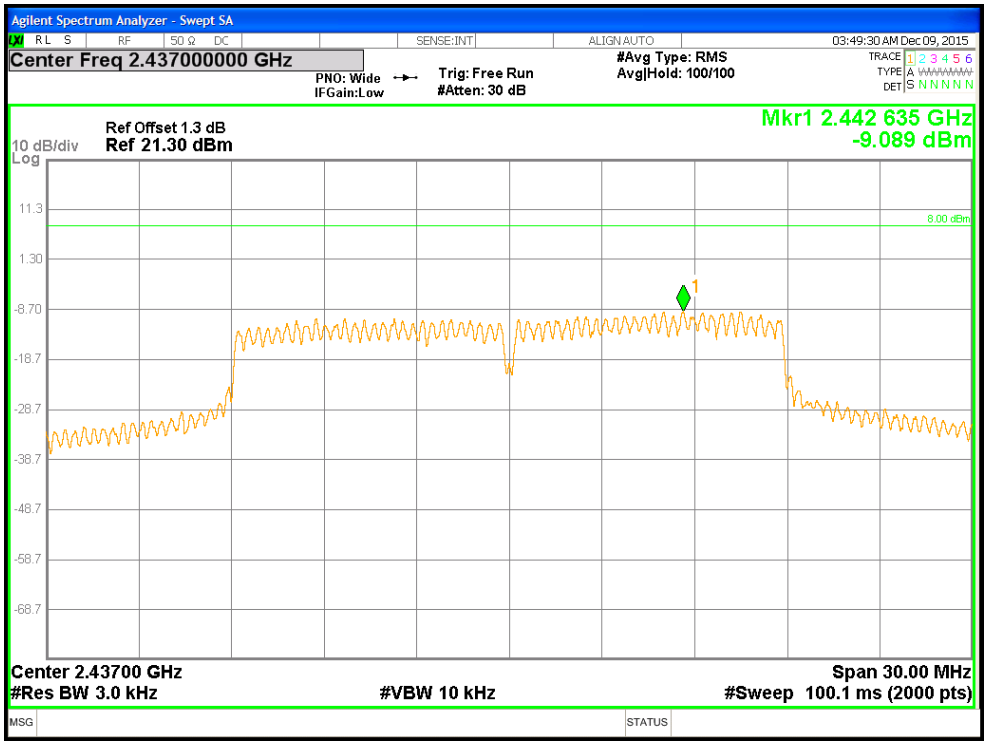


Figure 15: Power Spectral Density, 2437 MHz at HT20 MCS0, Chain 0

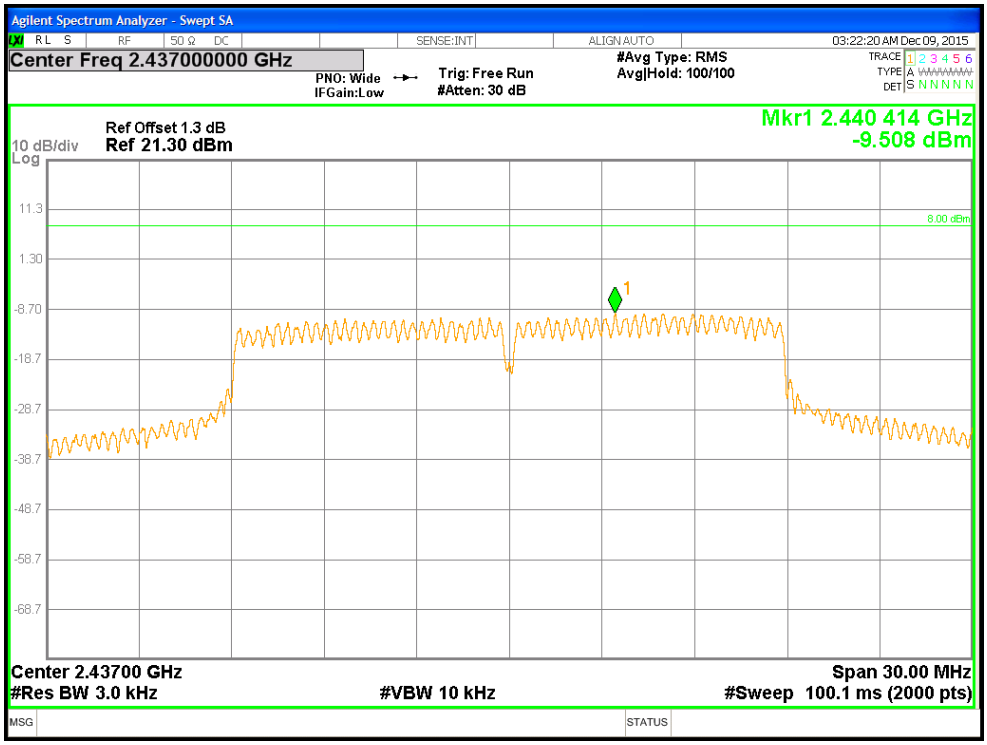


Figure 16: Power Spectral Density, 2437 MHz at HT20 MCS0, Chain 1

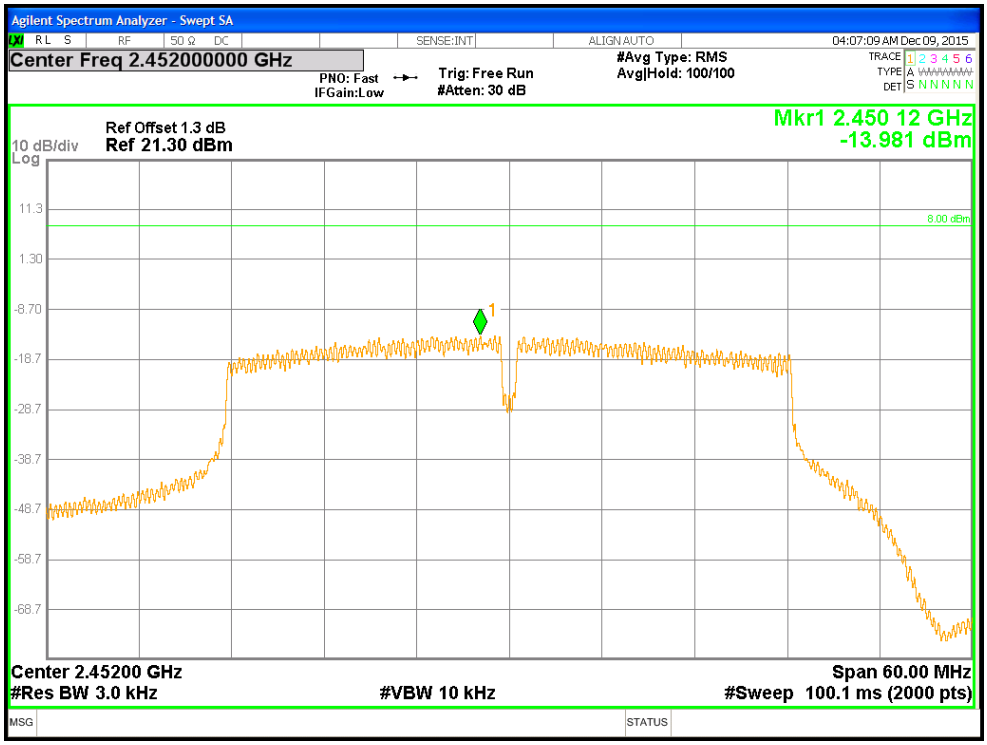


Figure 17: Power Spectral Density, 2452 MHz at HT40 MCS0, Chain 0

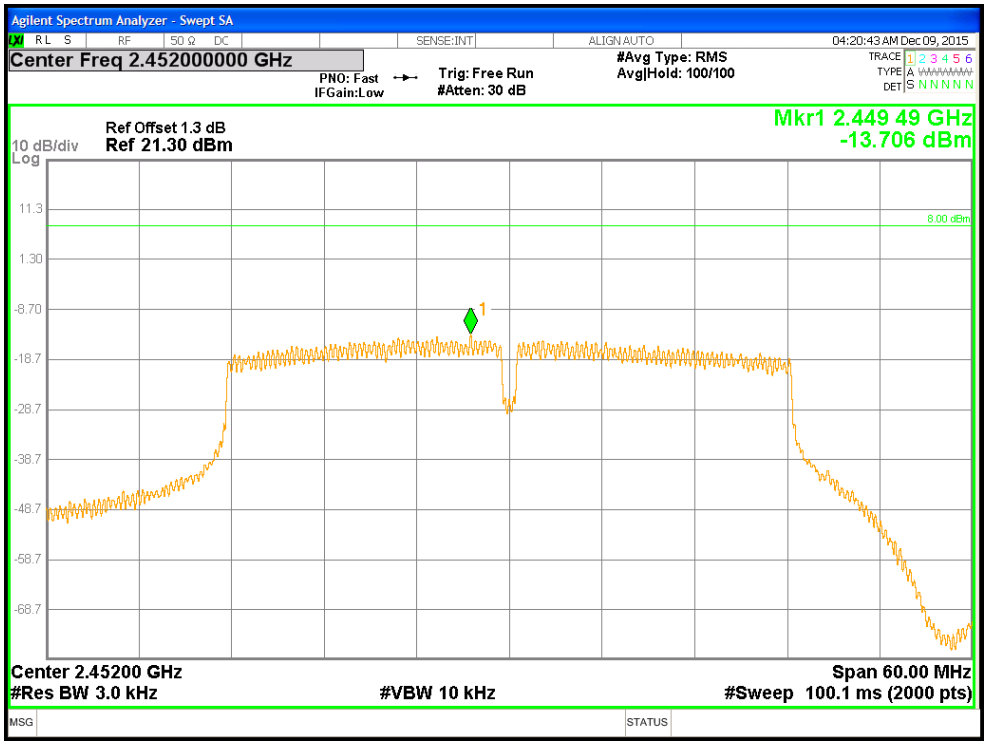


Figure 18: Power Spectral Density, 2452 MHz at HT40 MCS0, Chain 1

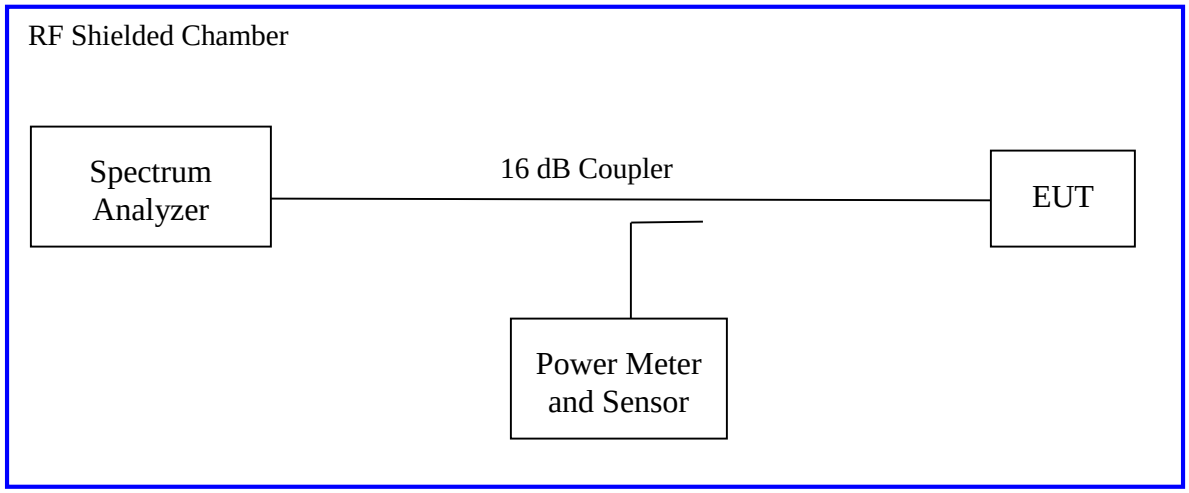
4.4 Out of Band Emissions

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-247 Sect. 5.5.

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 8: Emissions at the Band-Edge – Test Results

Test Conditions: Conducted Measurement, Normal Temperature						
Antenna Type: Custom Integrated			**Power Setting:** See test plan			
Max. Directional Gain: + 1.5 dBi						
Signal State: Modulated at 100%.						
Ambient Temp.: 24° C			**Relative Humidity:**39%			
Non-Restricted Frequency Band Emissions						
Freq. (MHz)	**Mode**	**Chain**	**Measured (dBm)**	**Limit (dBm)**	**Plots**	**TX Freq. (MHz)**
2400	11g-6Mbps	0	-20.34	-15.09	Fig. 19, 20	Pass
2400	11g-6Mbps	1	-18.80	-15.67	Fig. 21, 22	Pass
2483.5	11g-6Mbps	0	-45.51	-15.34	Fig. 23, 24	Pass
2483.5	11g-6Mbps	1	-46.34	-16.82	Fig. 25, 26	Pass
2400	HT20-MCS0	0	-18.86	-15.16	Fig. 27, 28	Pass
2400	HT20-MCS0	1	-20.24	-16.04	Fig. 29, 30	Pass
2483.5	HT20-MCS0	0	-44.28	-15.15	Fig. 31, 32	Pass
2483.5	HT20-MCS0	1	-44.83	-15.94	Fig. 33, 34	Pass
2400	HT40-MCS0	0	-22.31	-19.50	Fig. 35, 36	Pass
2400	HT40-MCS0	1	-23.07	-19.66	Fig. 37, 38	Pass
2483.5	HT40-MCS0	0	-44.18	-18.94	Fig. 39, 40	Pass
2483.5	HT40-MCS0	1	-46.72	-19.58	Fig. 41, 42	Pass
Note: 1. The stated limits for 30 dBr are relative to each individual output per KDB 662911 Method. 2. The worst case of each data rate is recorded.						

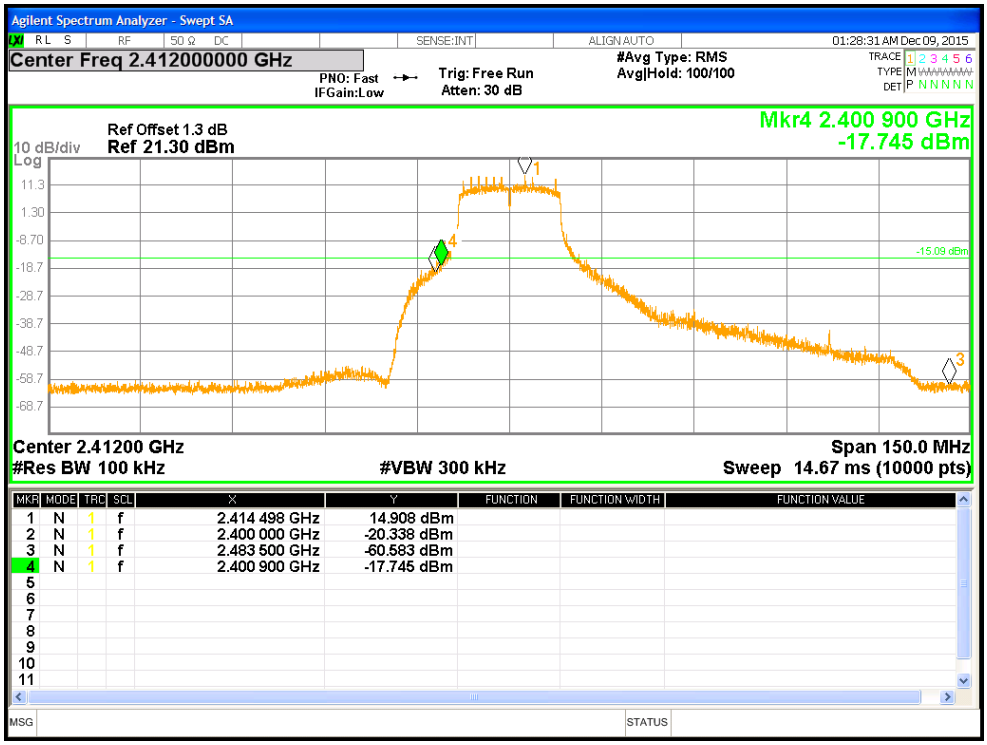


Figure 19: Measured Bandedge for 802.11g-6Mbps at 2412 MHz, Chain 0

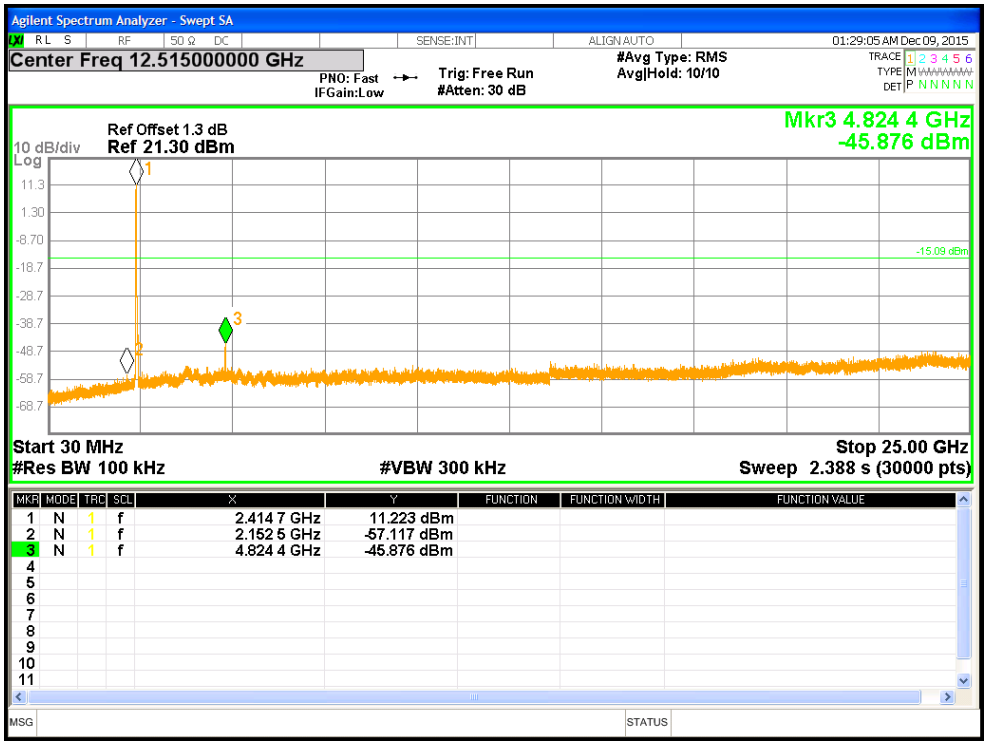


Figure 20: Out of Band Emissions for 802.11g-6Mbps at 2412 MHz, Chain 0

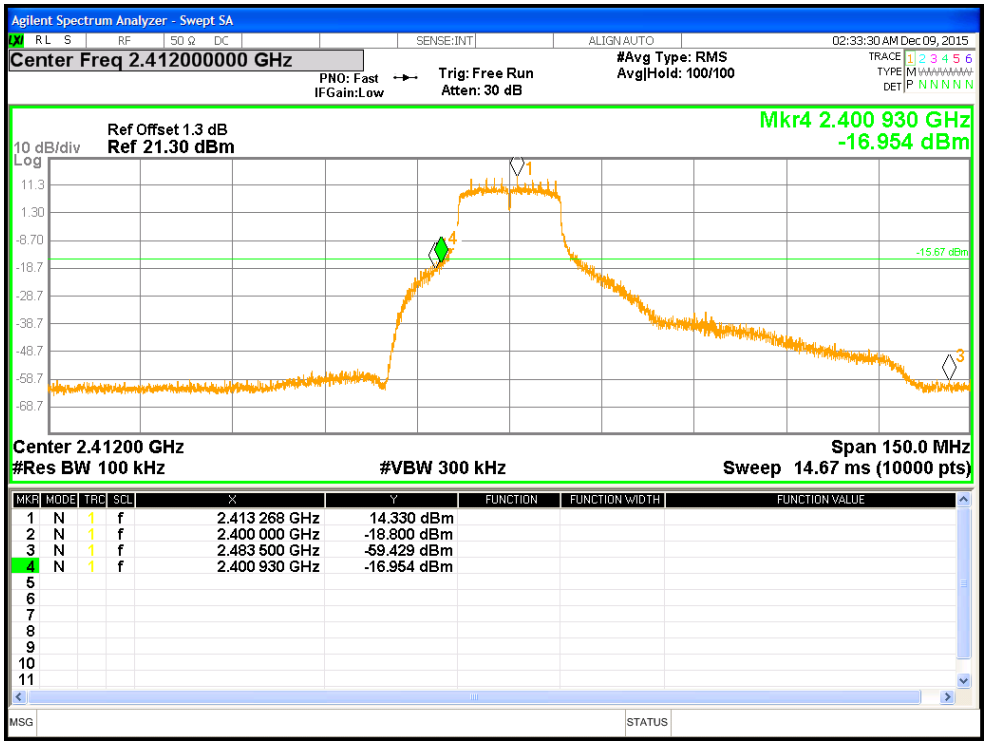


Figure 21: Measured Bandedge for 802.11g-6Mbps at 2412 MHz, Chain 1

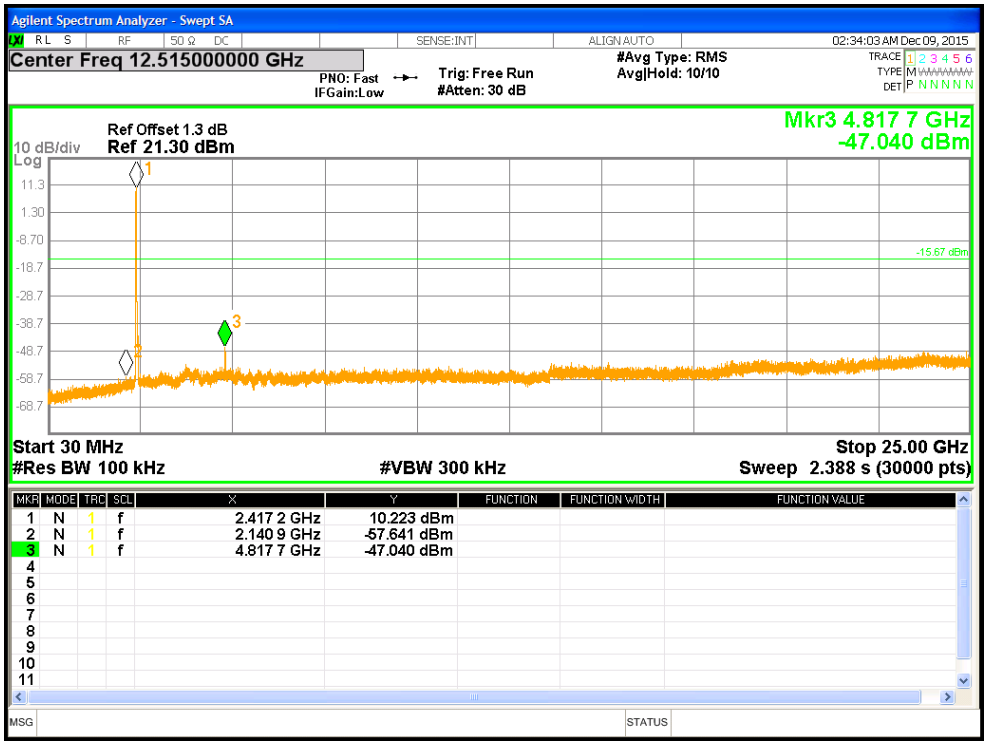


Figure 22: Out of Band Emissions for 802.11g-6Mbps at 2412 MHz, Chain 1

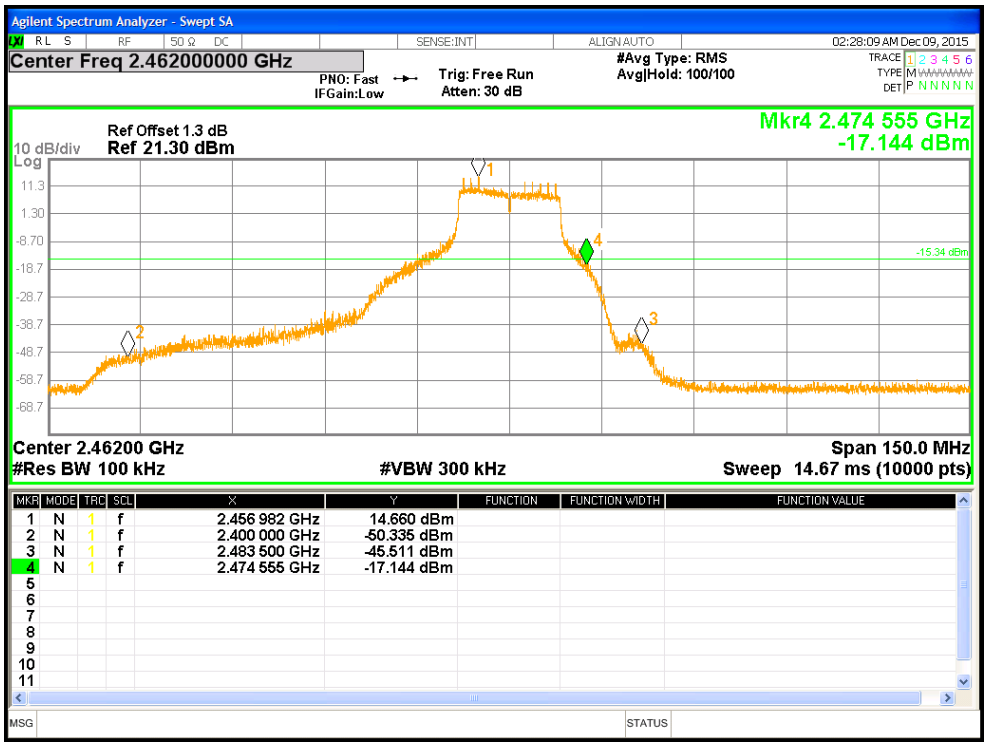


Figure 23: Measured Bandedge for 802.11g-6Mbps at 2483.5 MHz, Chain 0

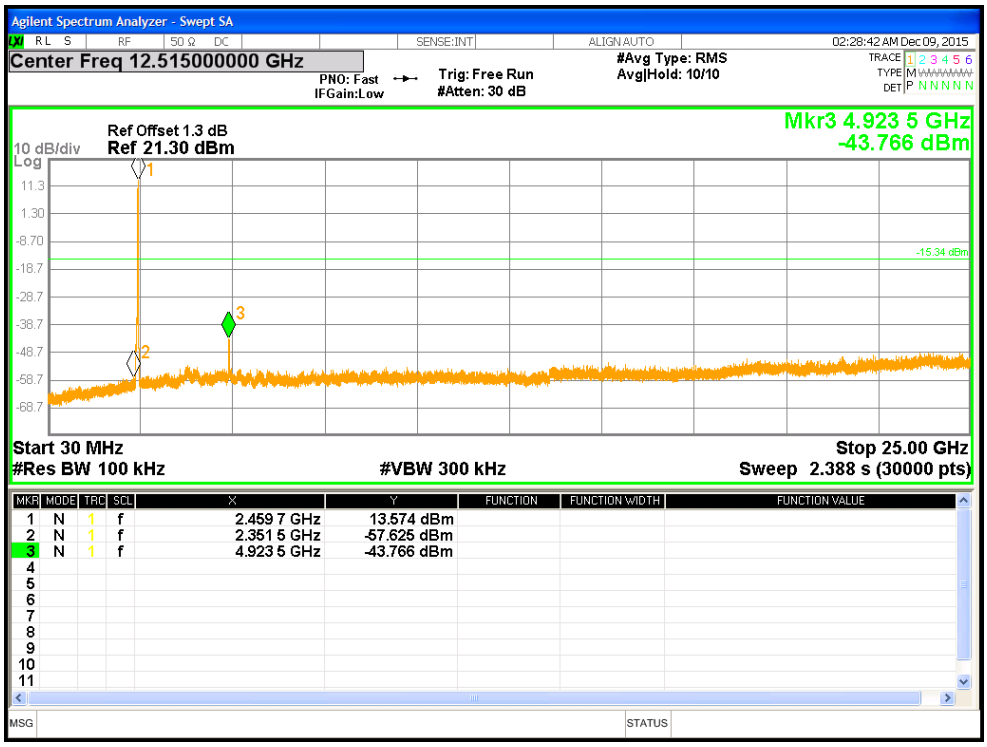


Figure 24: Out of Band Emissions for 802.11g-6Mbps at 2483.5 MHz, Chain 0

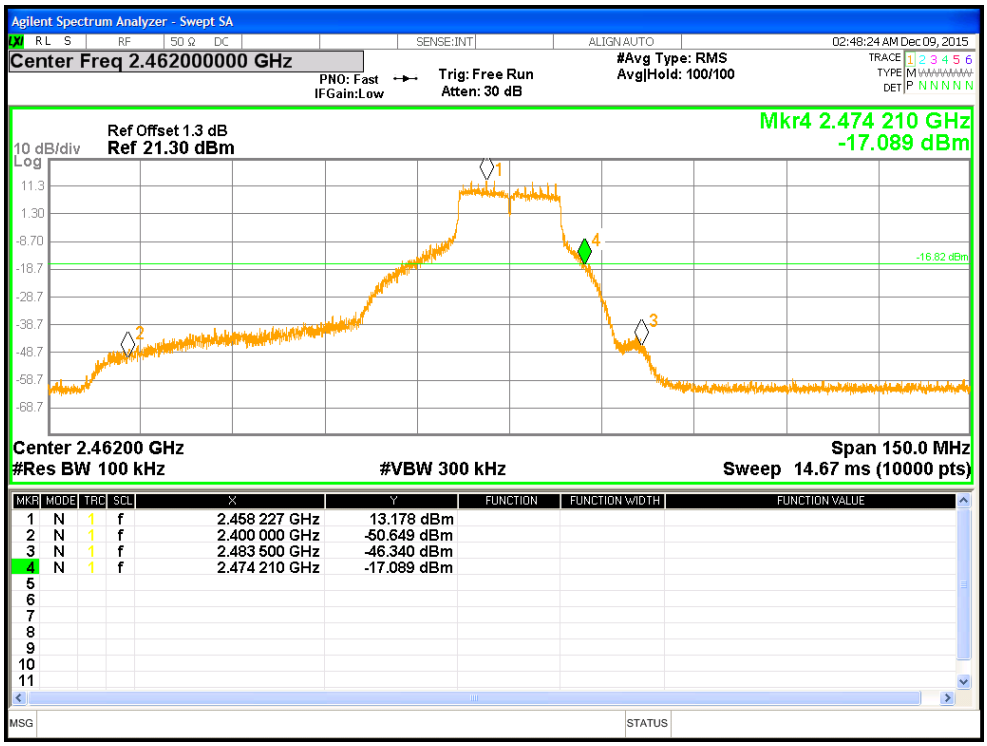


Figure 25: Measured Bandedge for 802.11g-6Mbps at 2483.5 MHz, Chain 1

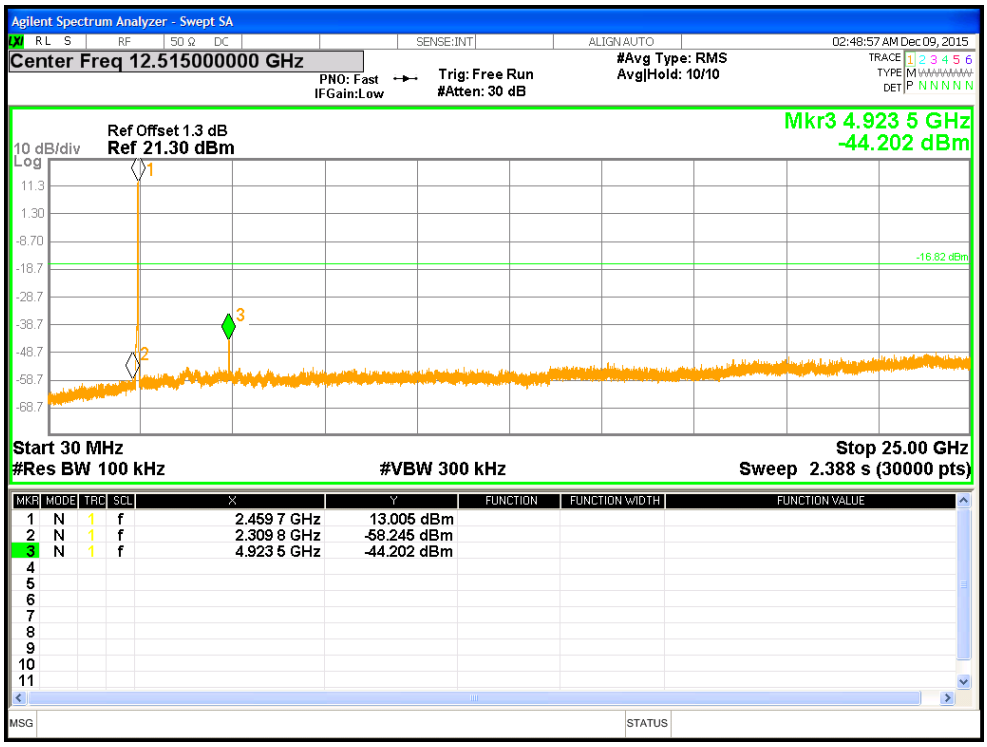


Figure 26: Out of Band Emissions for 802.11g-6Mbps at 2483.5 MHz, Chain 1

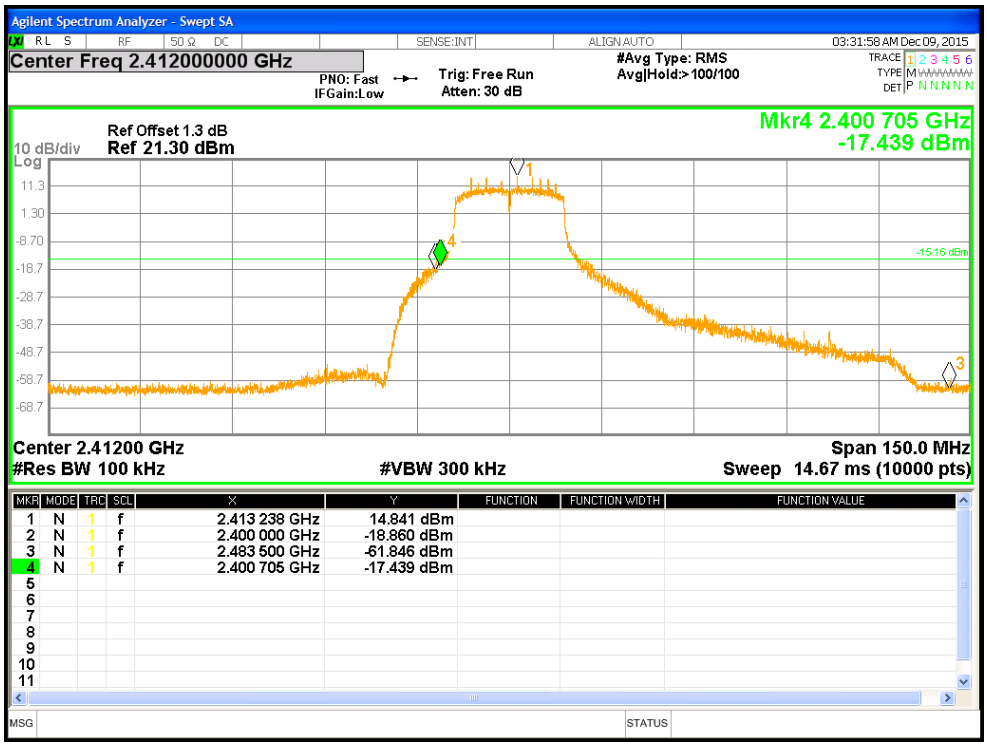


Figure 27: Measured Bandedge for HT20-MCS0 at 2412 MHz, Chain 0

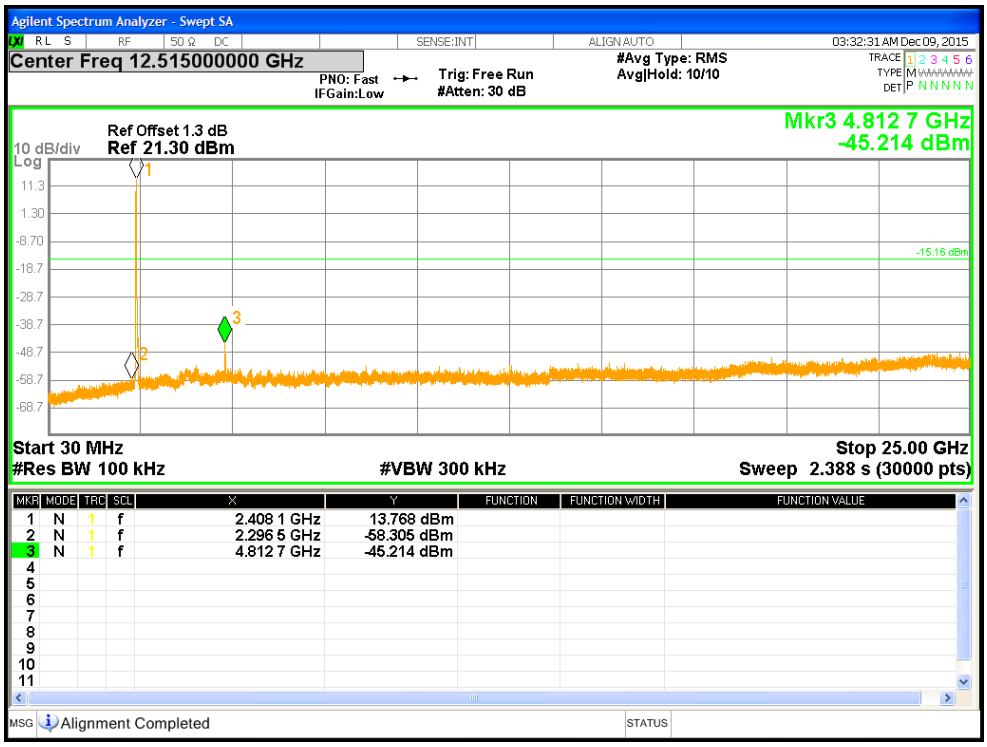


Figure 28: Out of Band Emissions for HT20-MCS0 at 2412 MHz, Chain 0

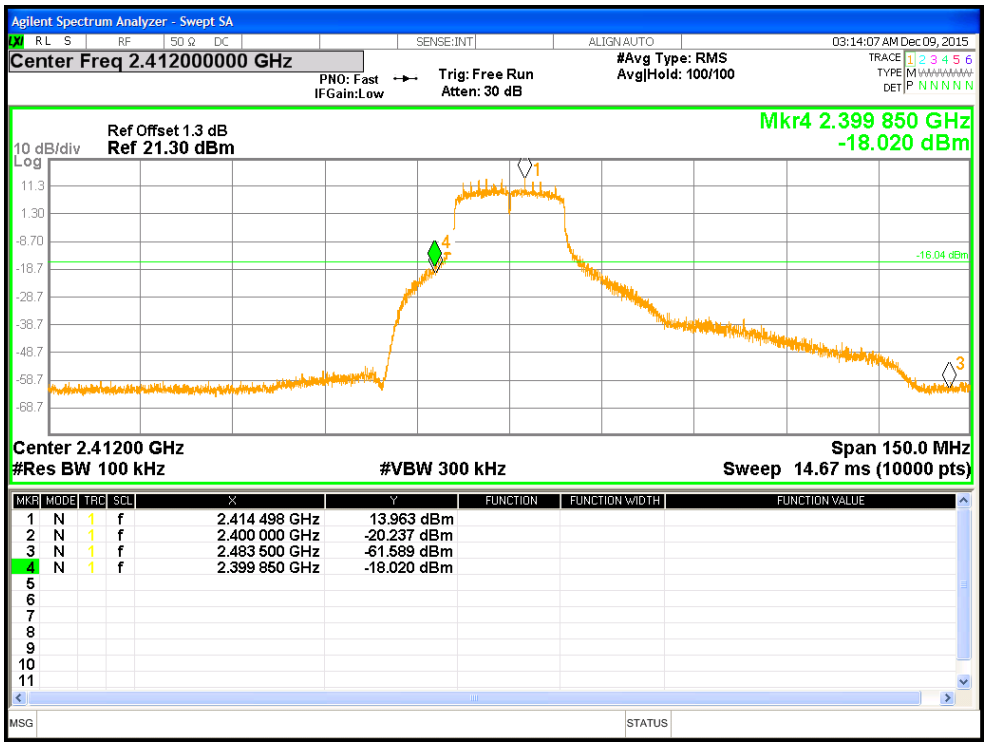


Figure 29: Measured Bandedge for HT20-MCS0 at 2412 MHz, Chain 1

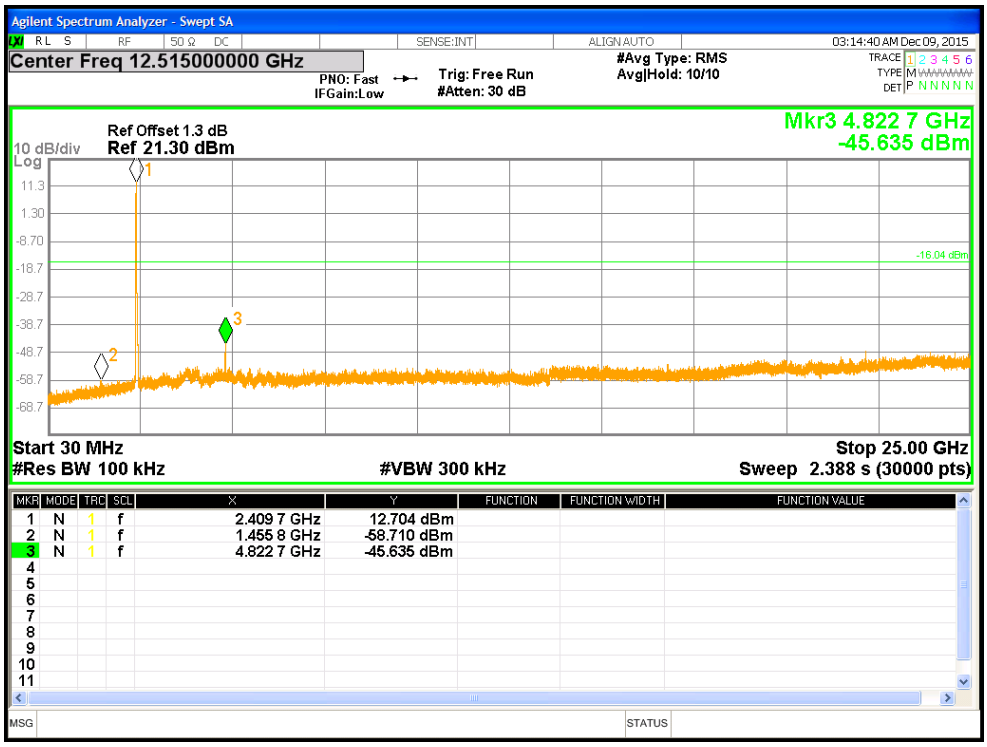


Figure 30: Out of Band Emissions for HT20-MCS0 at 2412 MHz, Chain 1

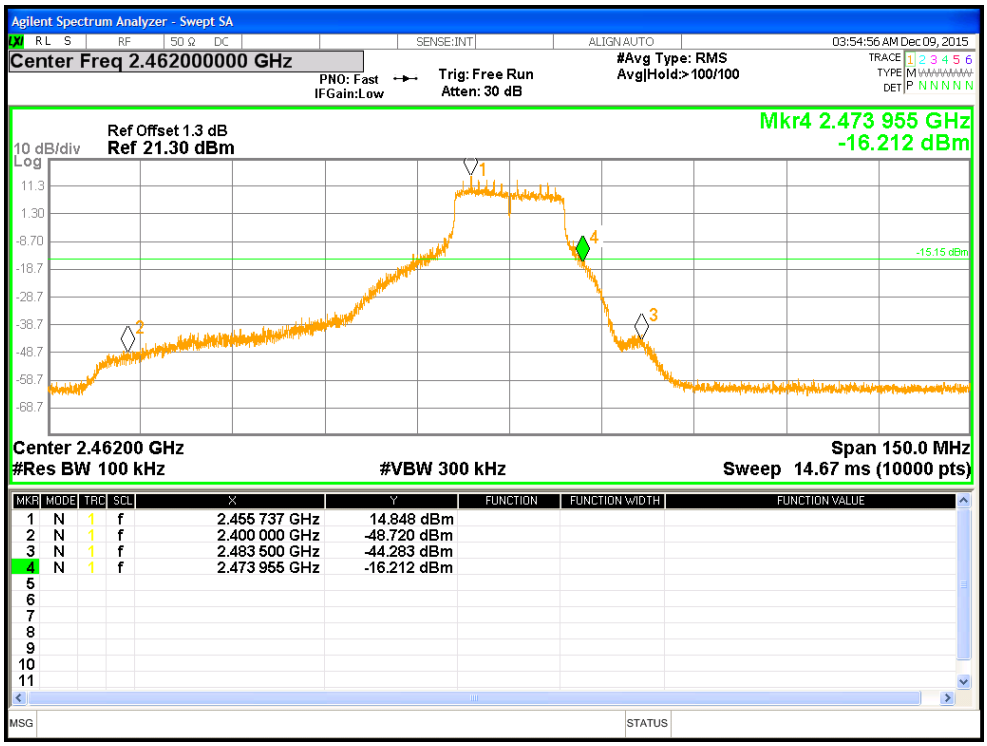


Figure 31: Measured Bandedge for HT20-MCS0 at 2483.5 MHz, Chain 0

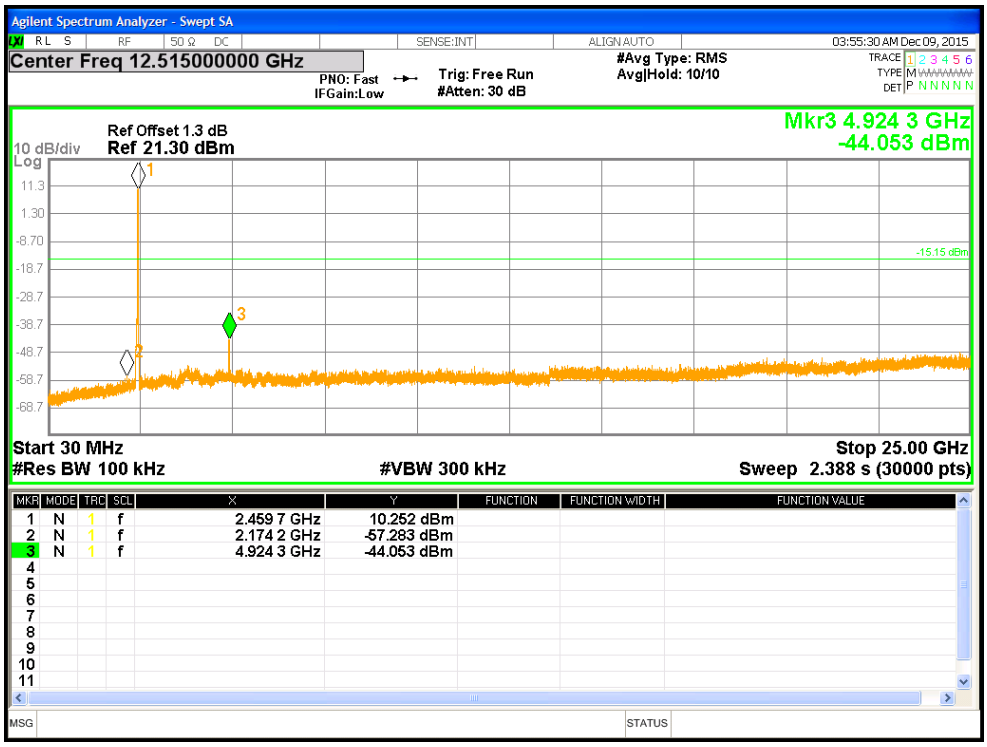


Figure 32: Out of Band Emissions for HT20-MCS0 at 2483.5 MHz, Chain 0

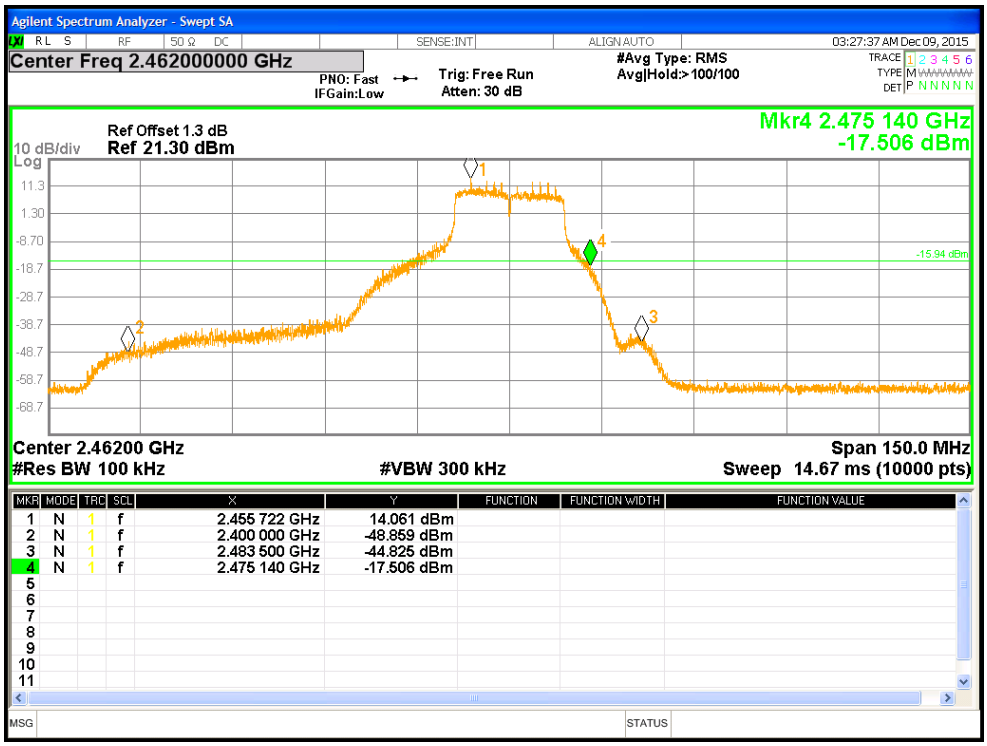


Figure 33: Measured Bandedge for HT20-MCS0 at 2483.5 MHz, Chain 1

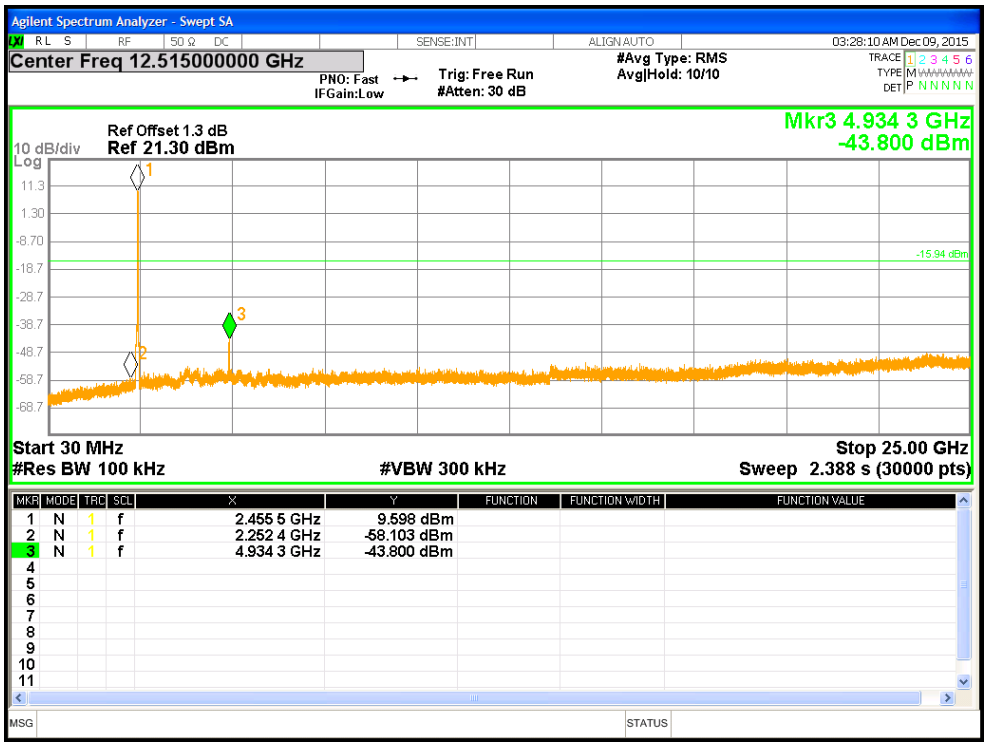


Figure 34: Out of Band Emissions for HT20-MCS0 at 2483.5 MHz, Chain 1

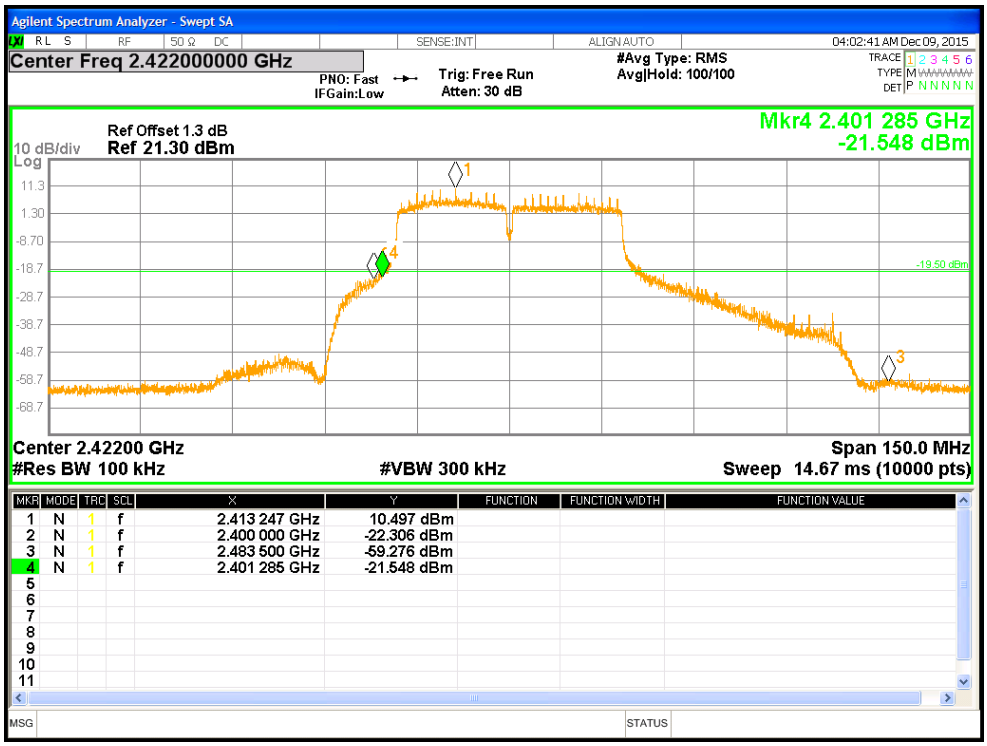


Figure 35: Measured Bandedge for HT40-MCS0 at 2422 MHz, Chain 0

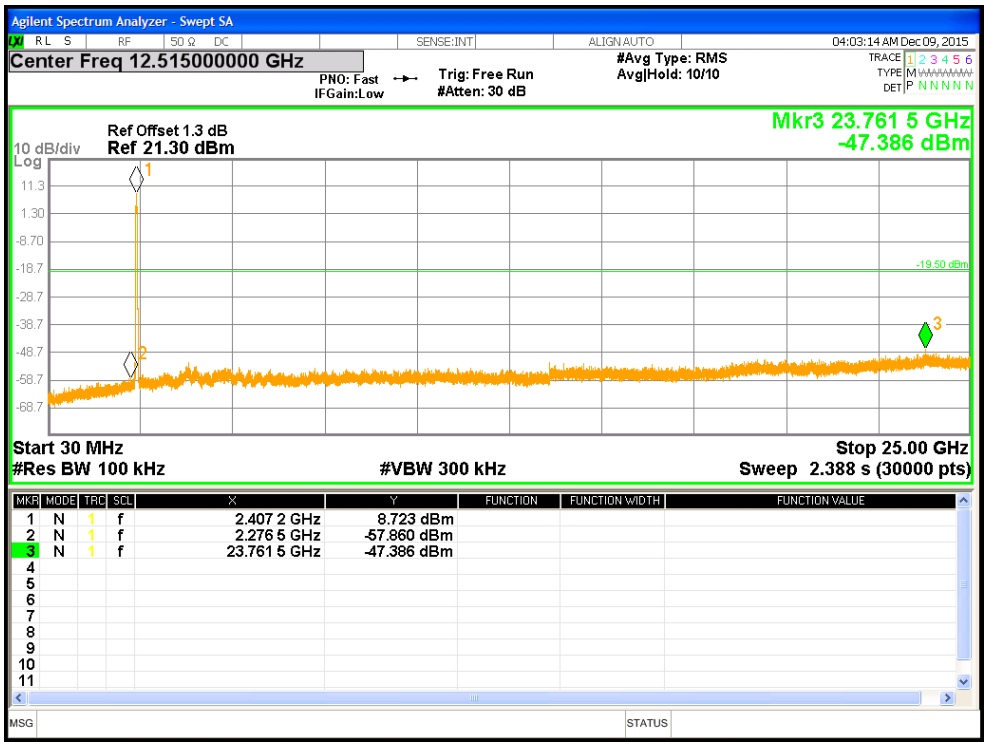


Figure 36: Out of Band Emissions for HT40-MCS0 at 2422 MHz, Chain 0

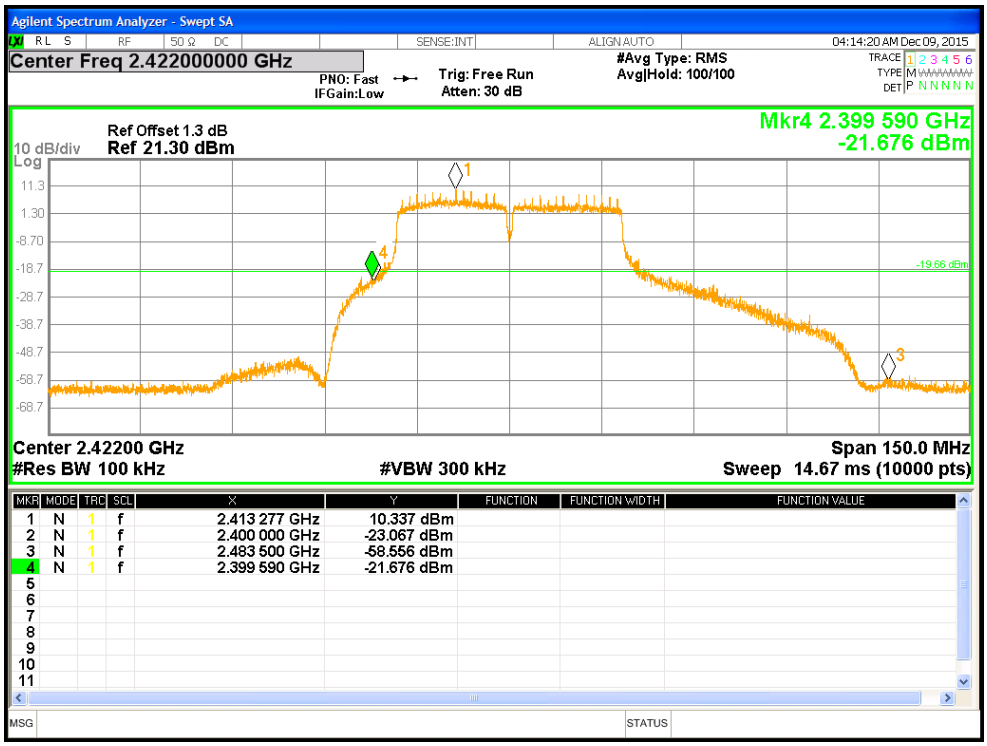


Figure 37: Measured Bandedge for HT40-MCS0 at 2422 MHz, Chain 1

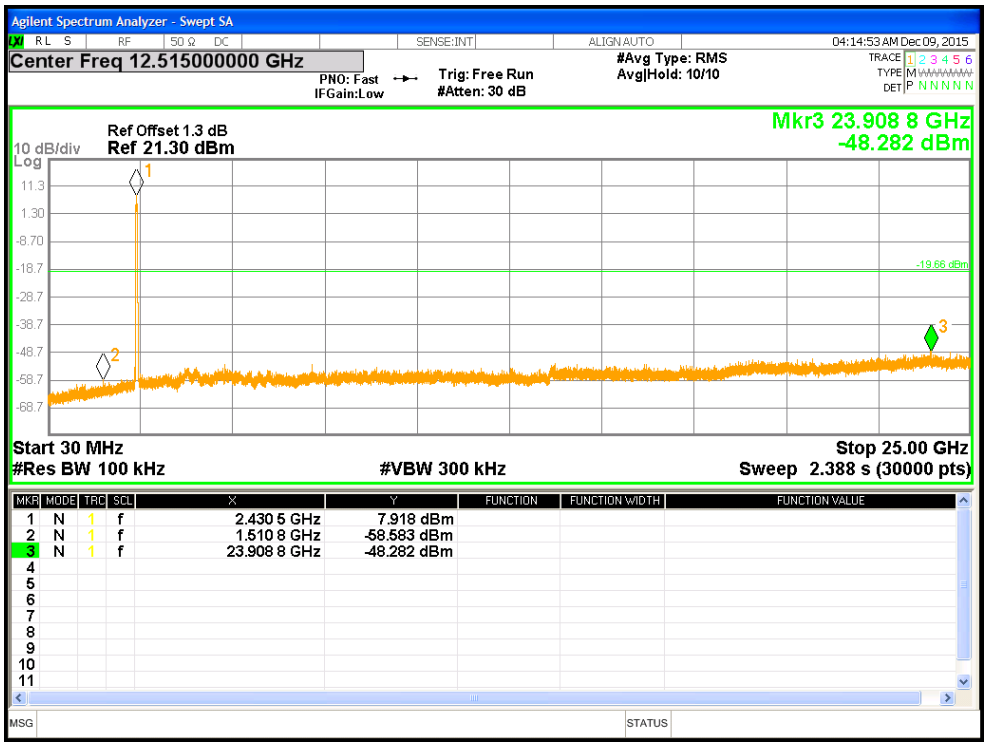


Figure 38: Out of Band Emissions for HT40-MCS0 at 2422 MHz, Chain 1

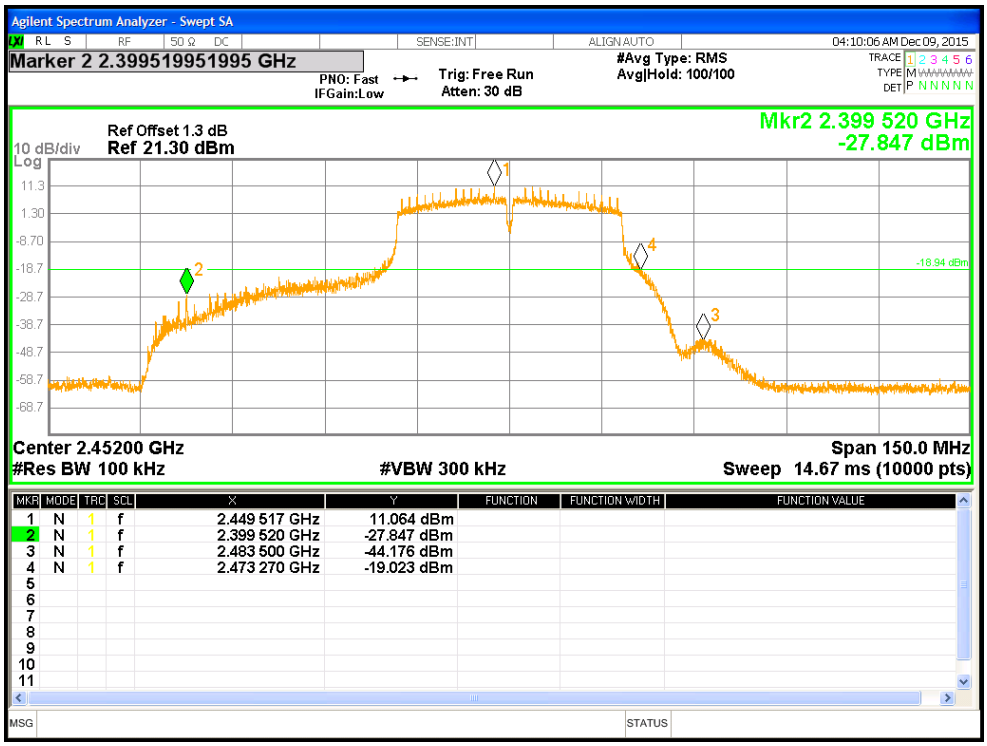


Figure 39: Measured Bandedge for HT40-MCS0 at 2452 MHz, Chain 0

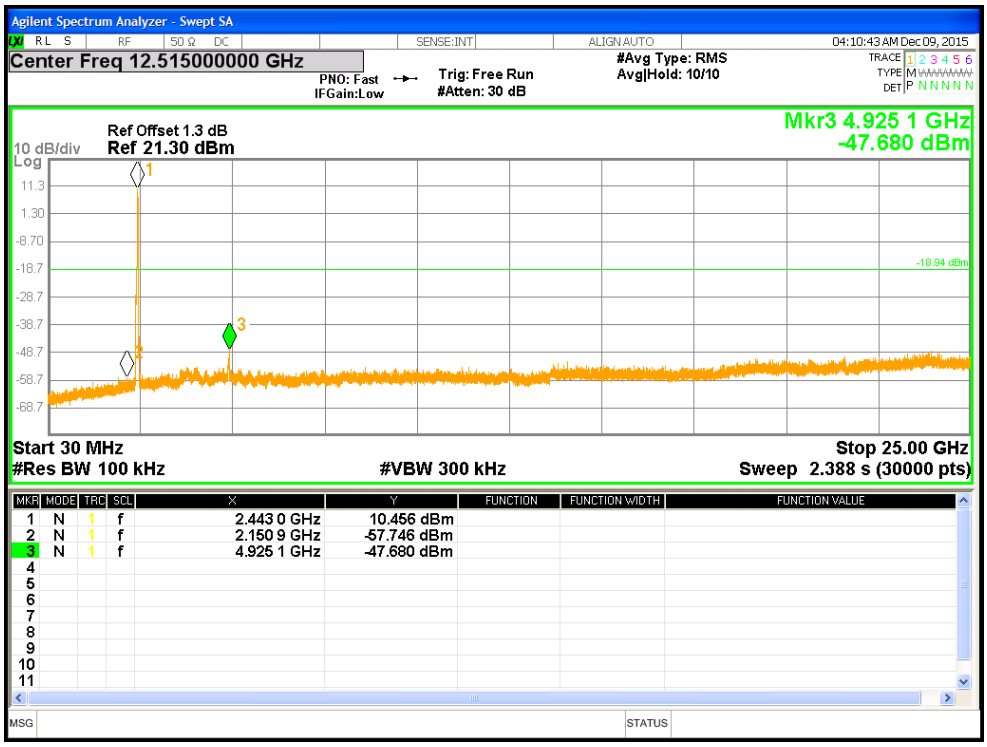


Figure 40: Out of Band Emissions for HT40-MCS0 at 2452 MHz, Chain 0

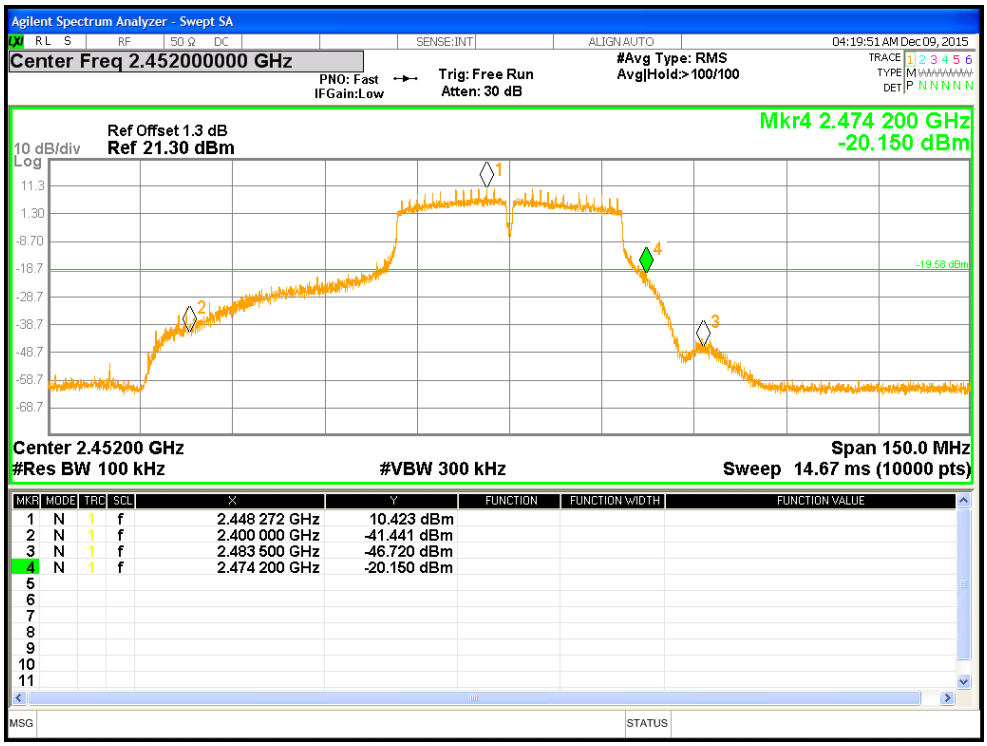


Figure 41: Measured Bandedge for HT40-MCS0 at 2452 MHz, Chain 1

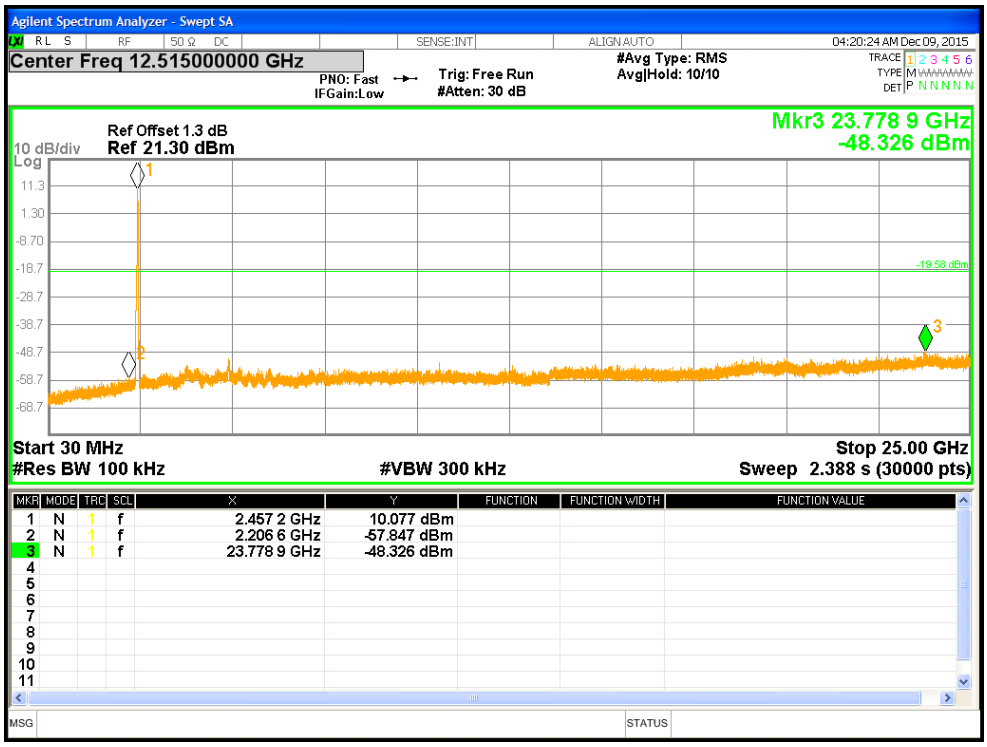


Figure 42: Out of Band Emissions for HT40-MCS0 at 2452 MHz, Chain 1

4.5 Transmit Spurious 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 247 Sect.5.5.

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 (<1 GHz) and 150cm (>1 GHz) 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.

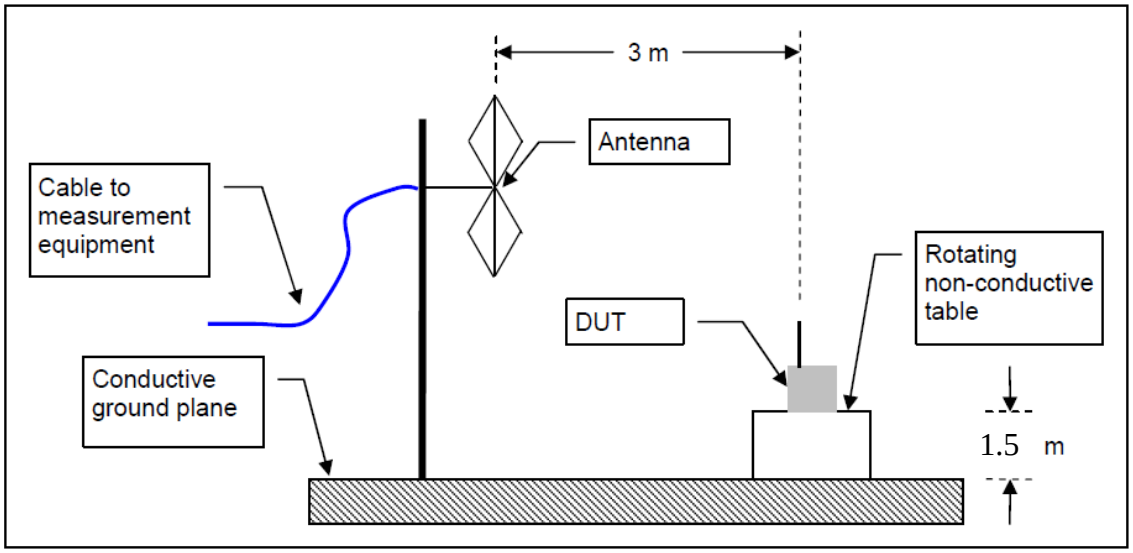
Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

Final results are: 802.11g (Chain 1 and Chain 2), HT20 (Chain 1 and Chain 2), HT40 (Chain 1 and Chain 2).

4.5.1.3 Deviations

None.

Test Setup:



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 Gen Sect. 8.10: 2014.

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 9: Transmit Spurious Emission at Band-Edge Requirements

Test Conditions: Radiated Measurement								
Antenna Type: Custom Integrated				**Power Setting:** See test plan				
Max. Directional Gain: + 1.5 dBi								
Signal State: Modulated at 100%.								
Ambient Temp.: 24° C				**Relative Humidity:**37%				
Band-Edge Results								
Freq. (MHz)	Level (dBuV/m)	Pol. (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
2390	67.58	V	74	-6.42	Pk	280	181	PLOT 43: 11g-6Mbps-2412MHz-TP26-Ch0-Ch1
2390	50.44	V	54	-3.56	Ave	280	181	PLOT 44: 11g-6Mbps-2412MHz- TP26-Ch0-Ch1
2390	72.73	H	74	-1.27	Pk	327	201	PLOT 45: 11g-6Mbps-2412MHz- TP26-Ch0-Ch1
2390	53.82	H	54	-0.18	Ave	327	201	PLOT 46: 11g-6Mbps-2412MHz- TP26-Ch0-Ch1
2483.5	68.74	H	74	-5.26	Pk	330	196	PLOT 47: 11g-6Mbps-2462MHz- TP26-Ch0-Ch1
2483.5	52.28	H	54	-1.72	Ave	330	196	PLOT 48: 11g-6Mbps-2462MHz- TP26-Ch0-Ch1
2483.5	68.14	V	74	-5.86	Pk	112	219	PLOT 49: 11g-6Mbps-2462MHz- TP26-Ch0-Ch1
2483.5	50.86	V	54	-3.14	Ave	112	219	PLOT 50: 11g-6Mbps-2462MHz- TP26-Ch0-Ch1
2390	65.56	V	74	-8.44	Pk	278	238	PLOT 51: HT20-MCS0-2412MHz- TP26-Ch0-Ch1
2390	51.39	V	54	-2.61	Ave	278	238	PLOT 52: HT20-MCS0-2412MHz- TP26-Ch0-Ch1
2390	68.86	H	74	-5.14	Pk	82	204	PLOT 53: HT20-MCS0-2412MHz- TP26-Ch0-Ch1
2390	53.42	H	54	-0.58	Ave	82	204	PLOT 54: HT20-MCS0-2412MHz- TP26-Ch0-Ch1
2483.5	59.89	V	74	-14.11	Pk	108	257	PLOT 55: HT20-MCS0-2462MHz- TP26-Ch0-Ch1
2483.5	46.11	V	54	-7.89	Ave	108	257	PLOT 56: HT20-MCS0-2462MHz- TP26-Ch0-Ch1
2483.5	59.68	H	74	-14.32	Pk	320	170	PLOT 57: HT20-MCS0-2462MHz- TP26-Ch0-Ch1
2483.5	46.00	H	54	-8.00	Ave	320	170	PLOT 58: HT20-MCS0-2462MHz- TP26-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.								

Band-Edge Results, continue								
Freq. (MHz)	Level (dBuV/m)	Pol. (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
2390	63.02	V	74	-10.98	Pk	114	260	PLOT 59: HT40-MCS0-2422MHz-TP25-Ch0-Ch1
2390	47.63	V	54	-6.37	Ave	114	260	PLOT 60: HT40-MCS0-2422MHz-TP25-Ch0-Ch1
2390	68.84	H	74	-5.16	Pk	79	200	PLOT 61: HT40-MCS0-2422MHz-TP25-Ch0-Ch1
2390	51.34	H	54	-2.66	Ave	79	200	PLOT 62: HT40-MCS0-2422MHz-TP25-Ch0-Ch1
2483.5	66.04	H	74	-7.96	Pk	324	196	PLOT 63: HT40-MCS0-2452MHz-TP25-Ch0-Ch1
2483.5	51.64	H	54	-2.36	Ave	324	196	PLOT 64: HT40-MCS0-2452MHz-TP25-Ch0-Ch1
2485.0	65.35	V	74	-8.65	Pk	107	254	PLOT 65: HT40-MCS0-2452MHz-TP25-Ch0-Ch1
2483.5	49.43	V	54	-4.57	Ave	107	254	PLOT 66: HT40-MCS0-2452MHz-TP25-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.

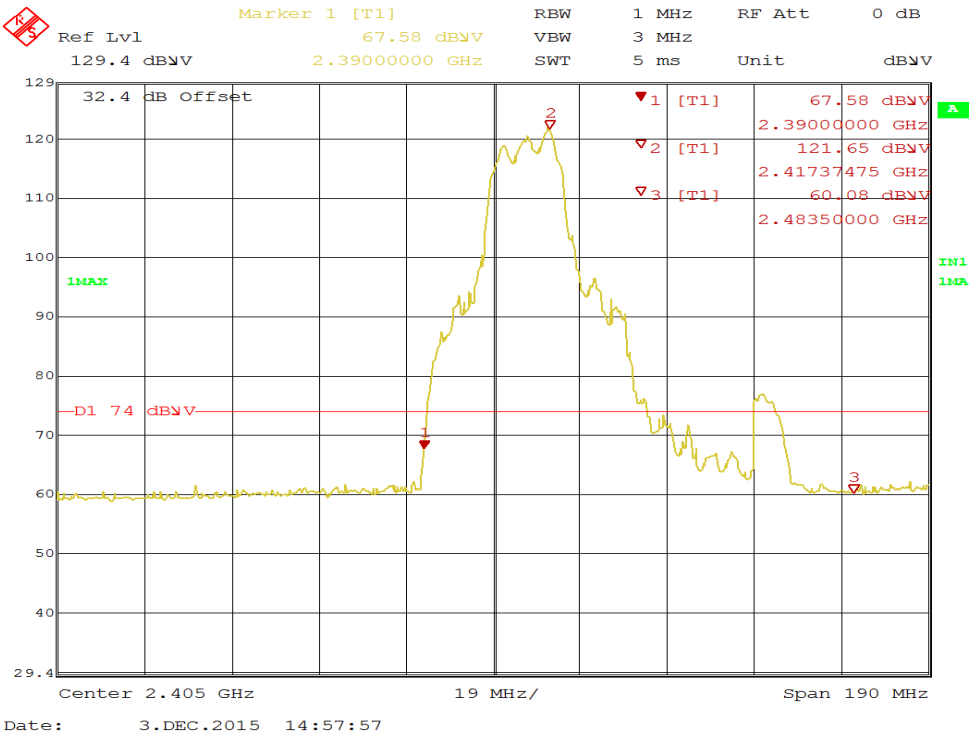


Figure 43: Radiated Emission at 2390 MHz Edge for 2412 MHz-802.11g – Vert. (Pk)

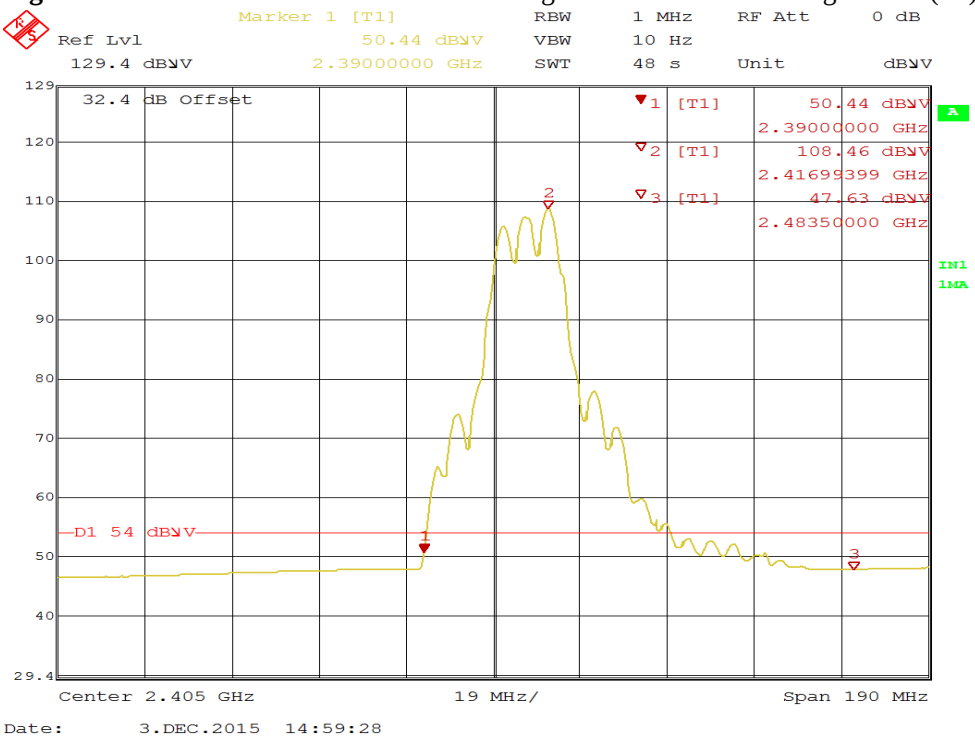


Figure 44: Radiated Emission at 2390 MHz Edge for 2412 MHz-802.11g – Vert. (Ave)

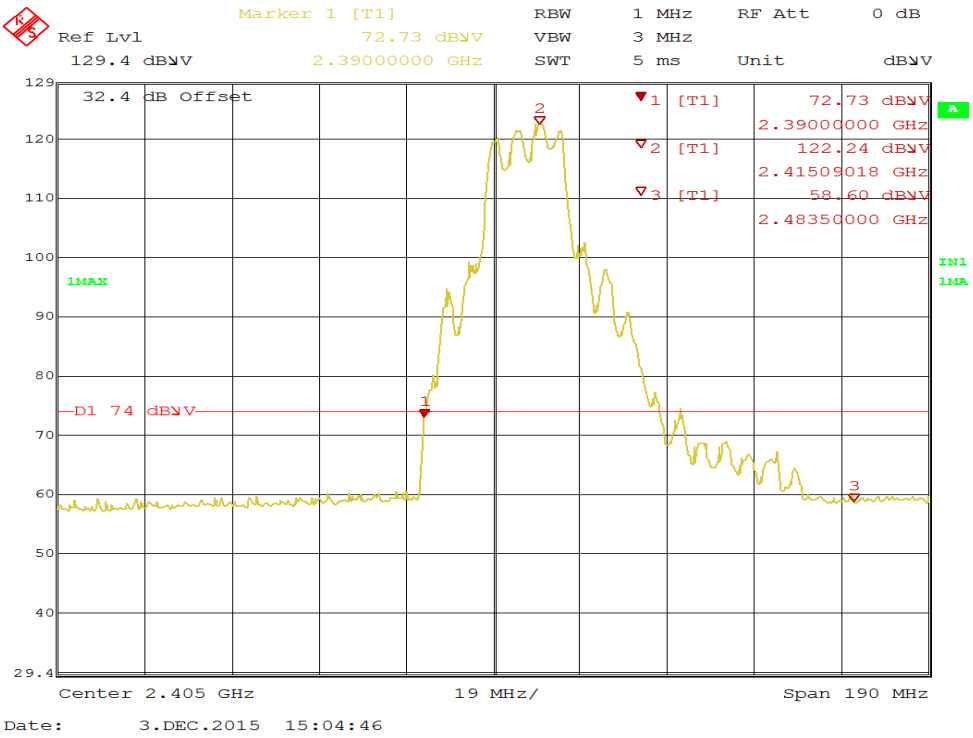


Figure 45: Radiated Emission at 2390 MHz Edge for 2412 MHz-802.11g – Horz. (Pk)

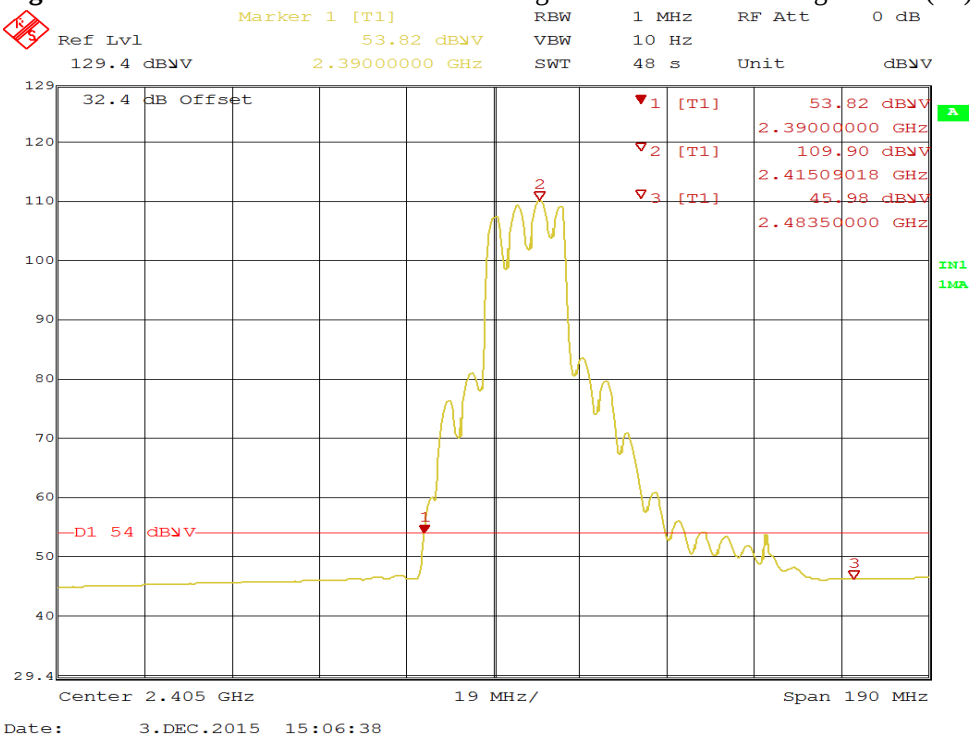


Figure 46: Radiated Emission at 2390 MHz Edge for 2412 MHz-802.11g – Horz. (Ave)

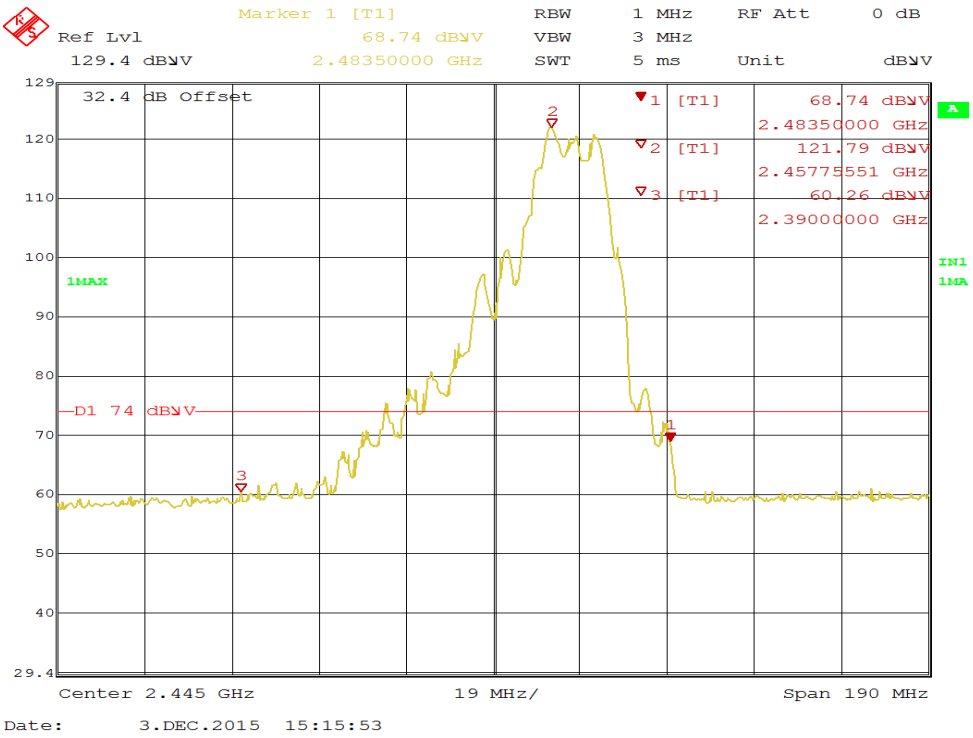


Figure 47: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-802.11g – Horz. (Pk)

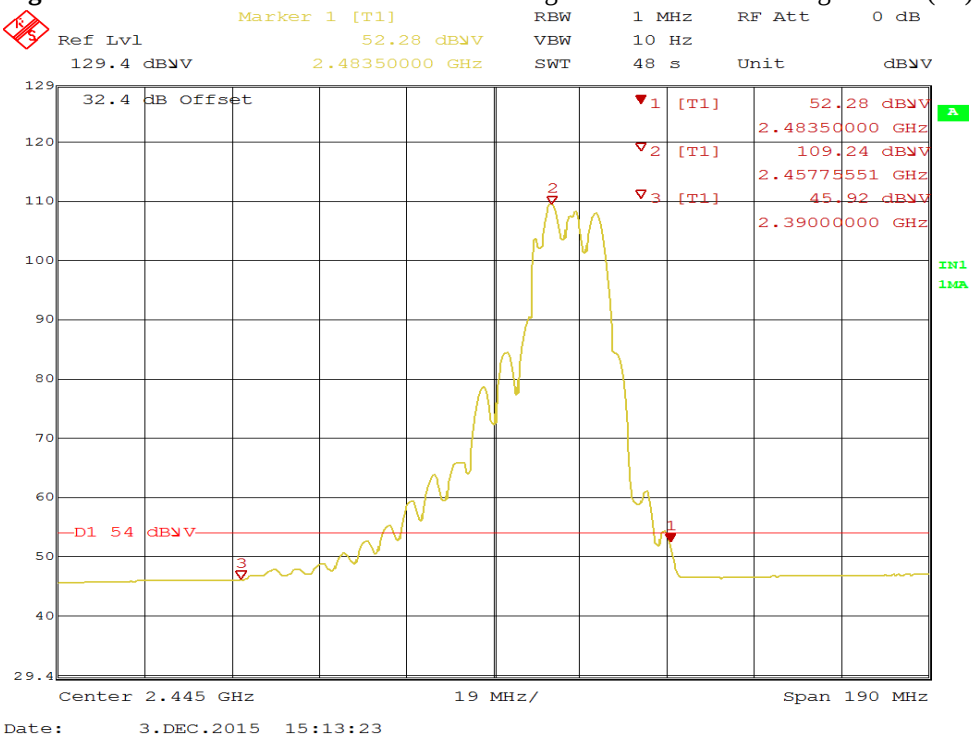


Figure 48: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-802.11g – Horz. (Ave)

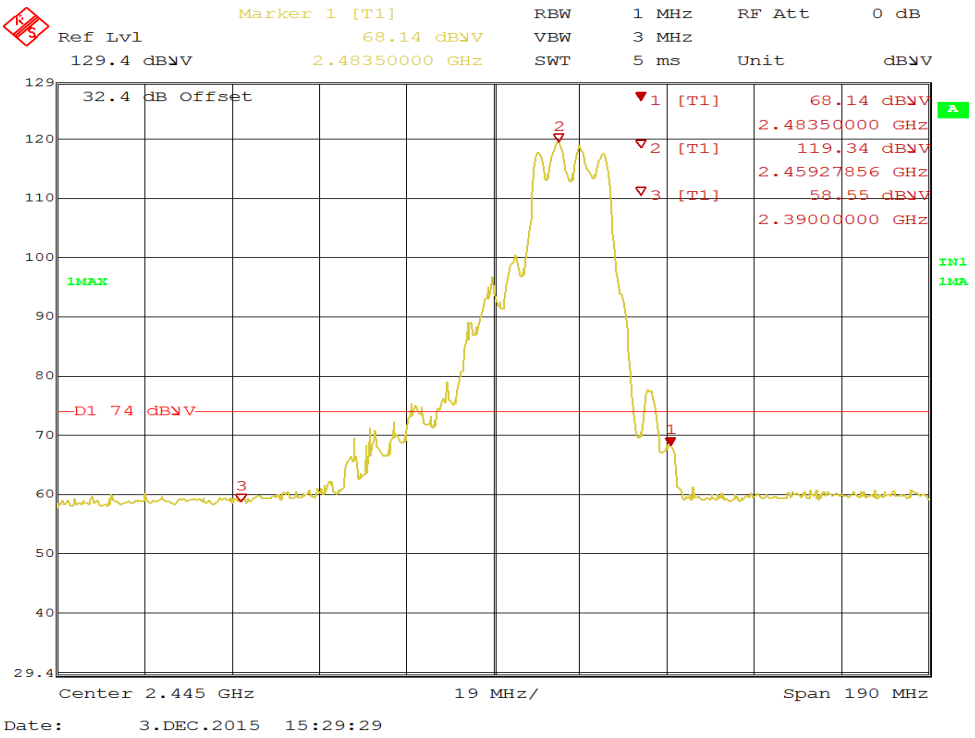


Figure 49: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-802.11g – Vert. (Pk)

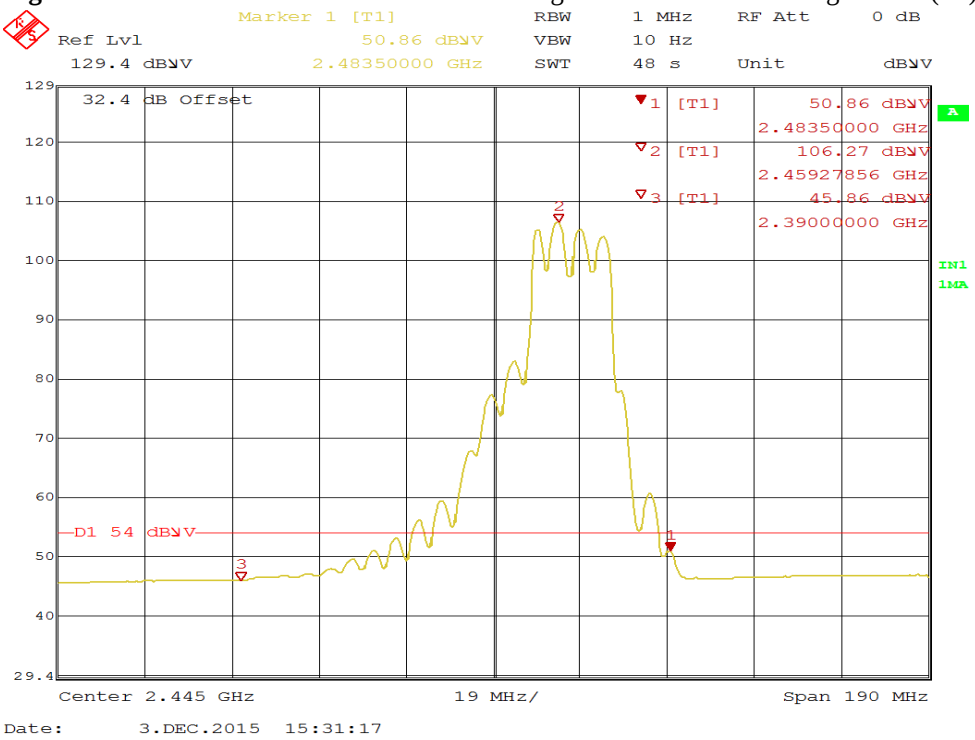


Figure 50: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-802.11g – Vert. (Ave)

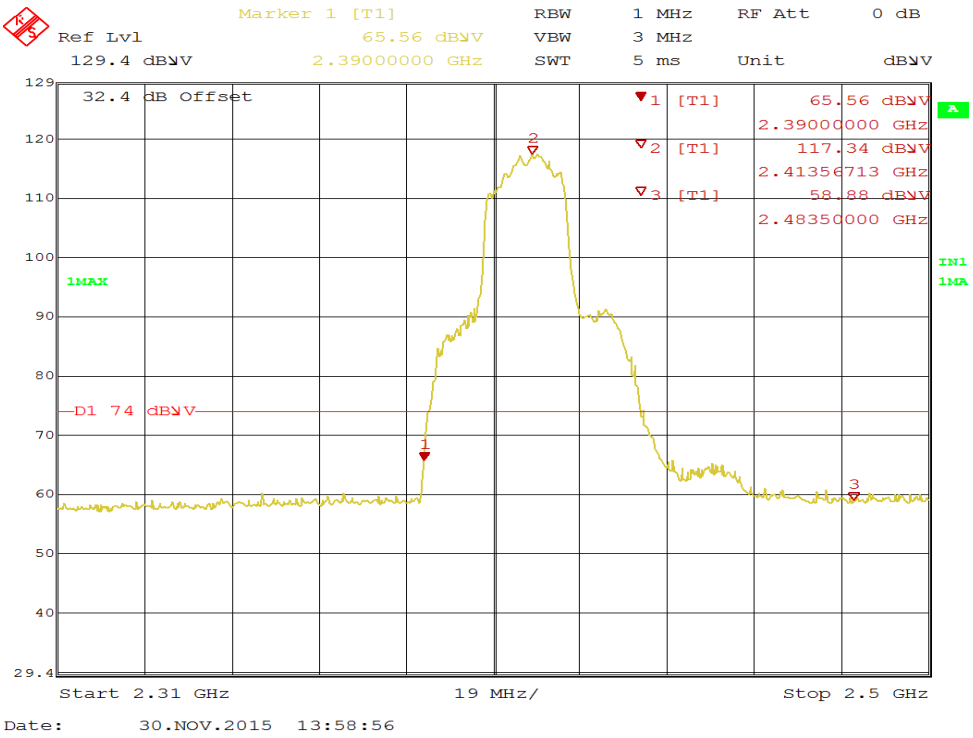


Figure 51: Radiated Emission at 2390 MHz Edge for 2412 MHz-HT20 – Vert. (Pk)

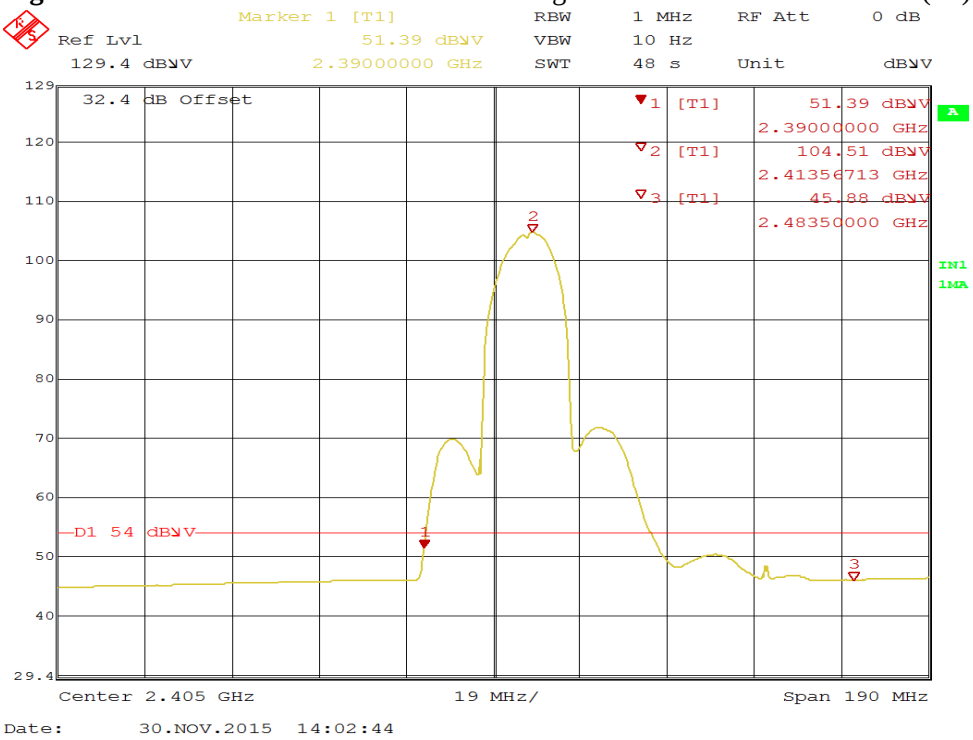


Figure 52: Radiated Emission at 2390 MHz Edge for 2412 MHz-HT20 – Vert. (Ave)

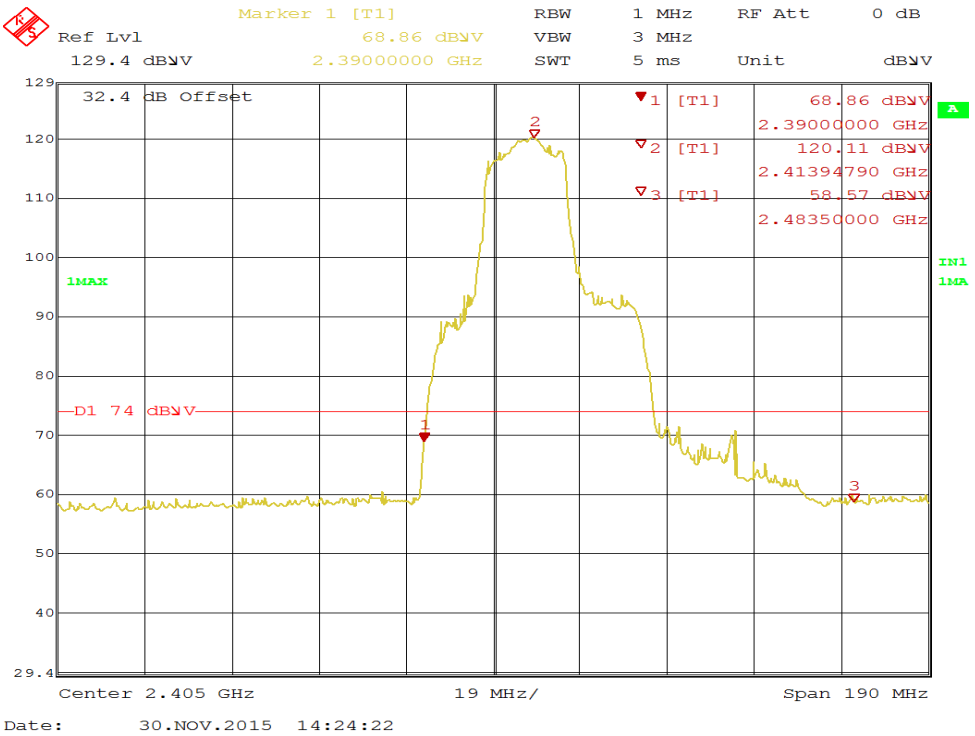


Figure 53: Radiated Emission at 2390 MHz Edge for 2412 MHz-HT20 – Horz. (Pk)

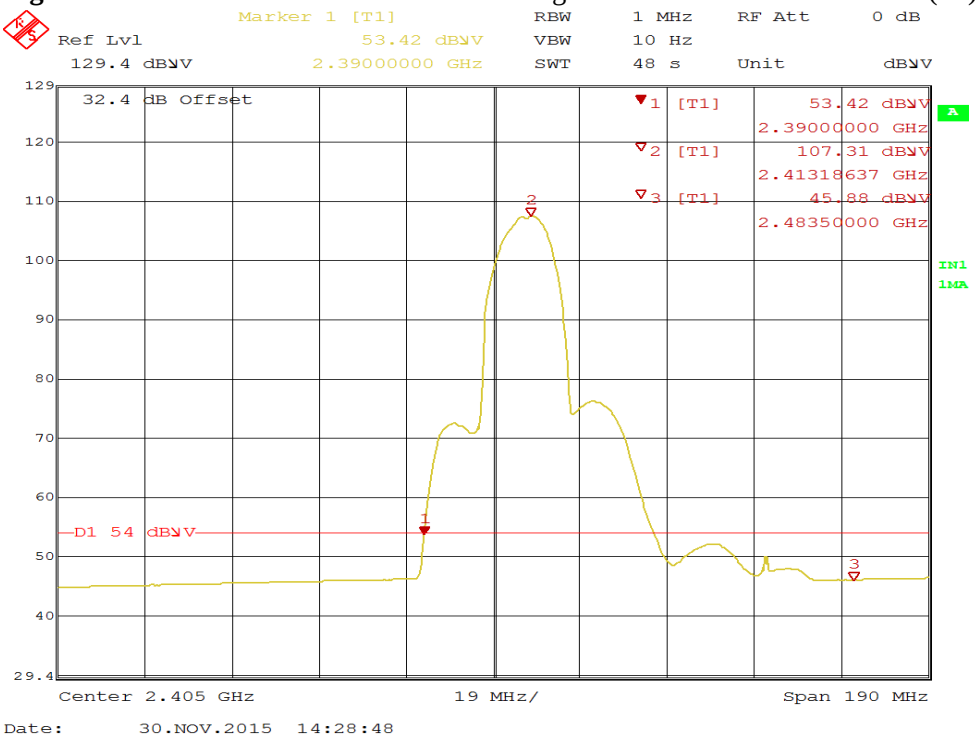


Figure 54: Radiated Emission at 2390 MHz Edge for 2412 MHz-HT20 – Horz. (Ave)

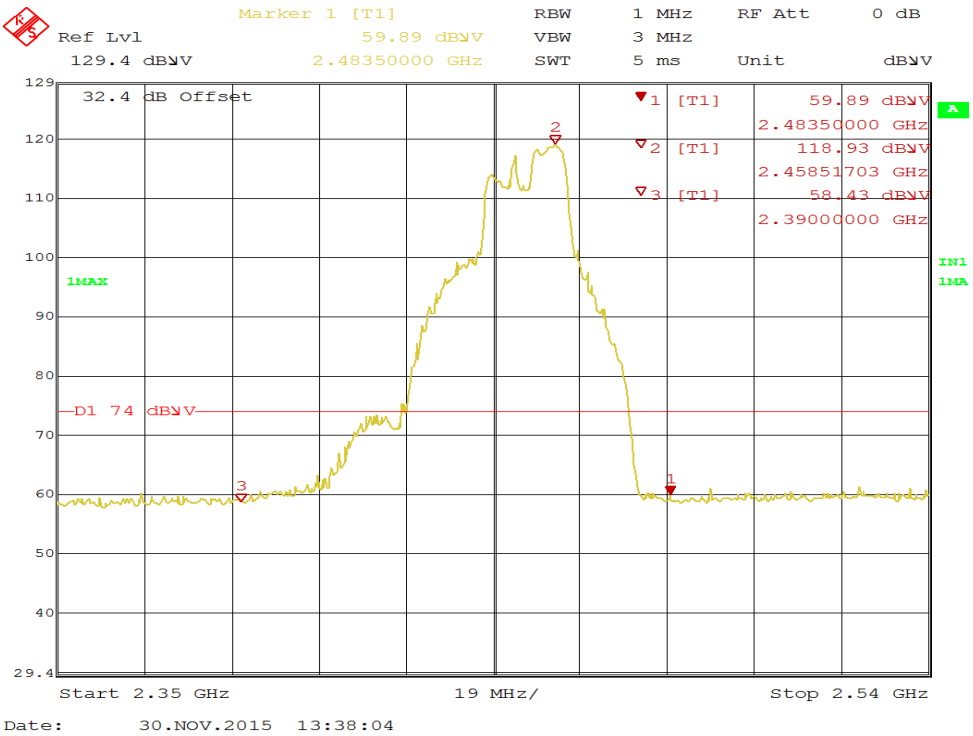


Figure 55: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-HT20 – Vert. (Pk)

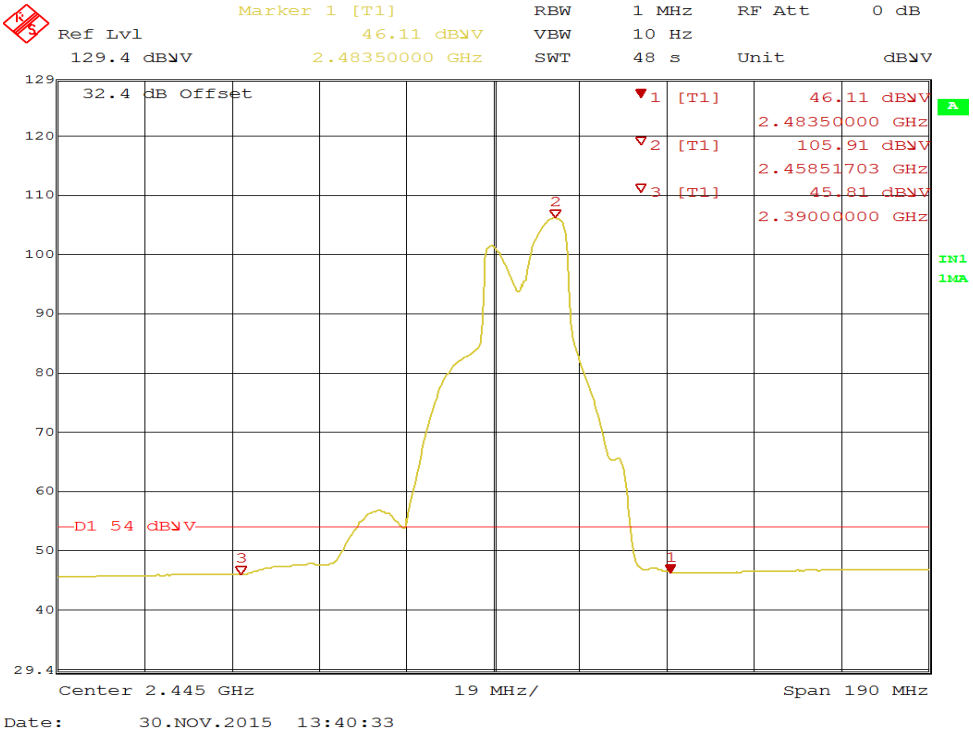


Figure 56: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-HT20 – Vert. (Ave)

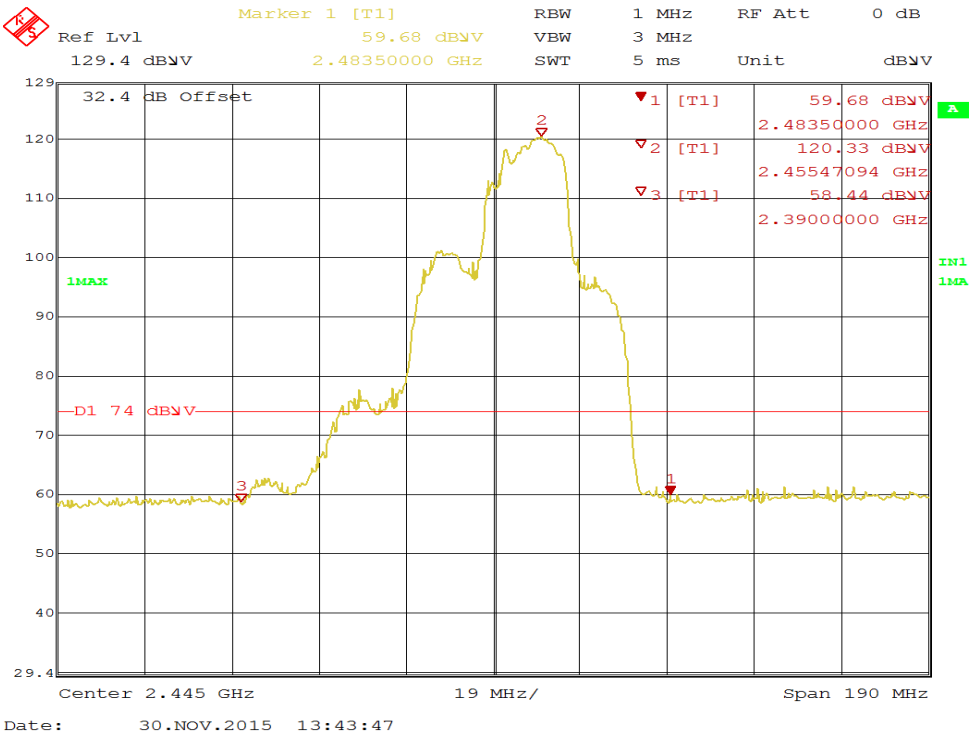


Figure 57: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-HT20 – Horz. (Pk)

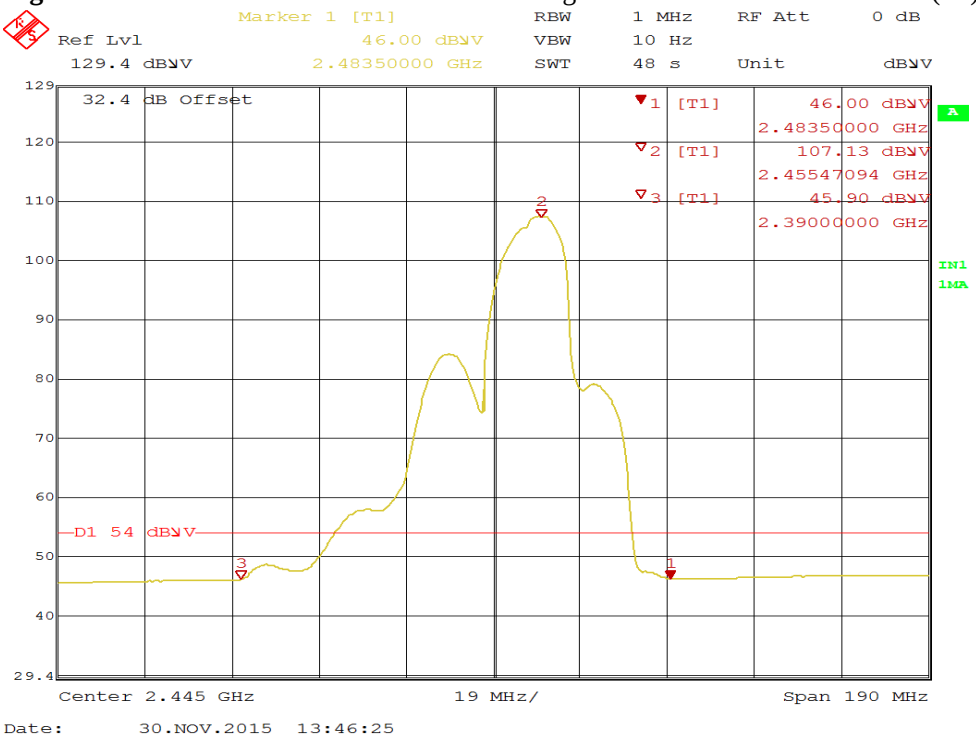


Figure 58: Radiated Emission at 2483.5 MHz Edge for 2462 MHz-HT20 – Horz. (Ave)

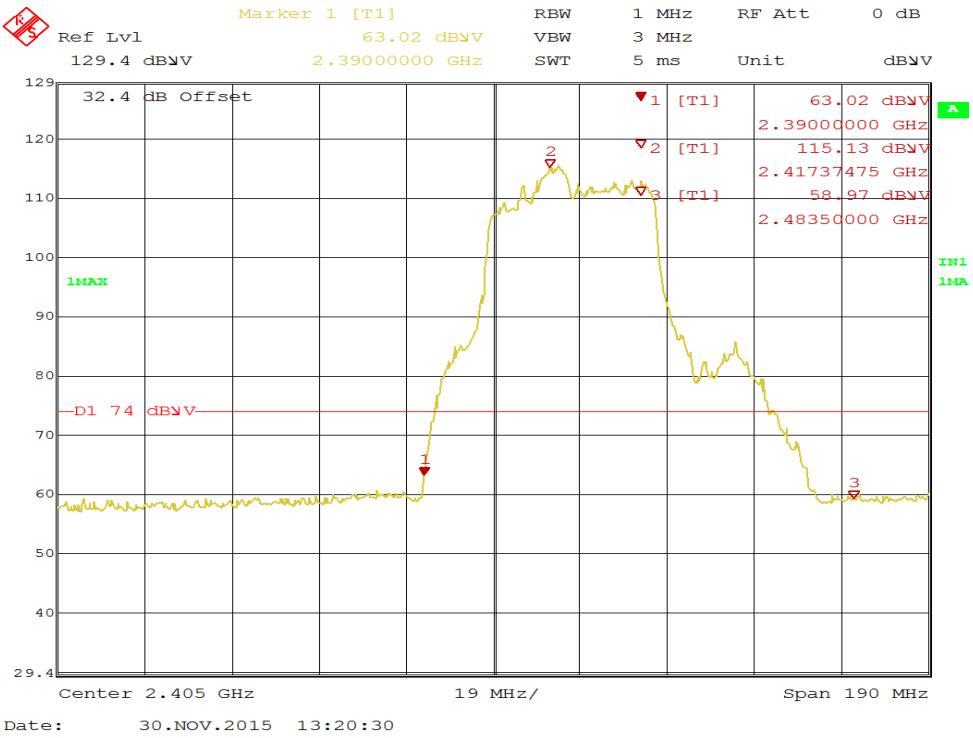


Figure 59: Radiated Emission at 2390 MHz Edge for 2422 MHz-HT40 – Vert. (Pk)

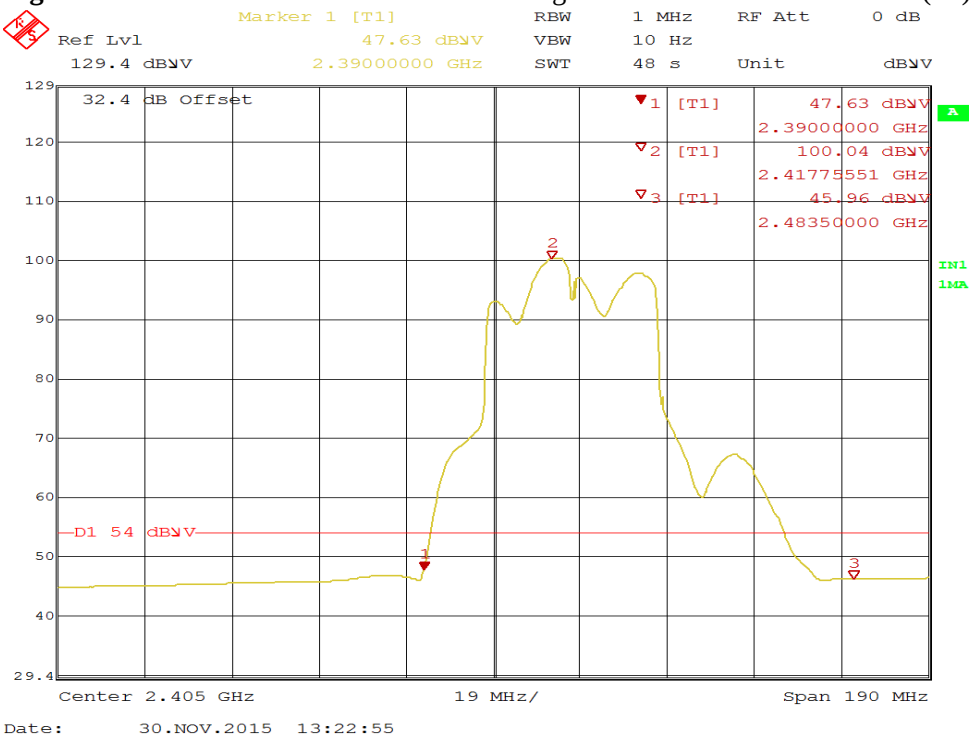


Figure 60: Radiated Emission at 2390 MHz Edge for 2422 MHz-HT40 – Vert. (Ave)

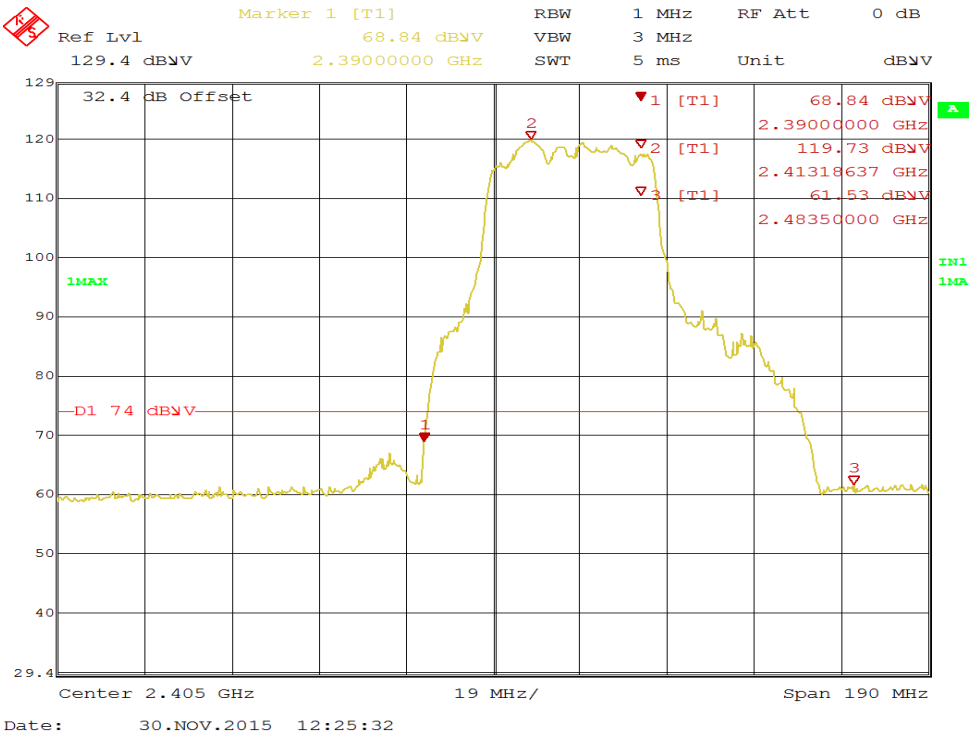


Figure 61: Radiated Emission at 2390 MHz Edge for 2422 MHz-HT40 – Horz. (Pk)

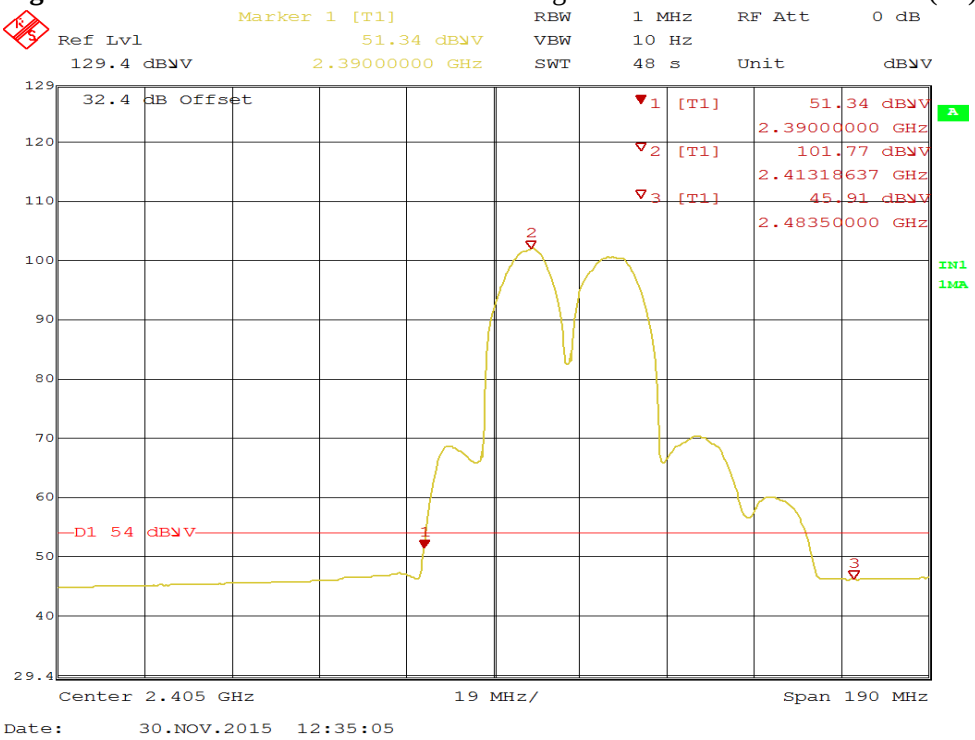


Figure 62: Radiated Emission at 2390 MHz Edge for 2422 MHz-HT40 – Horz. (Ave)

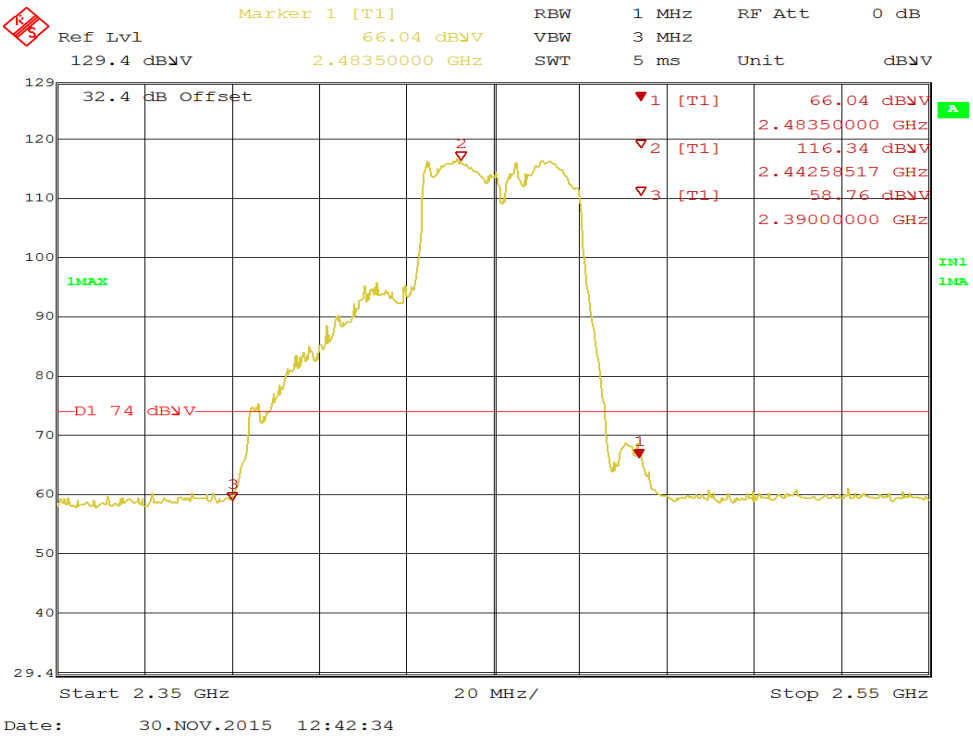


Figure 63: Radiated Emission at 2483.5 MHz Edge for 2452 MHz-HT40 – Horz. (Pk)

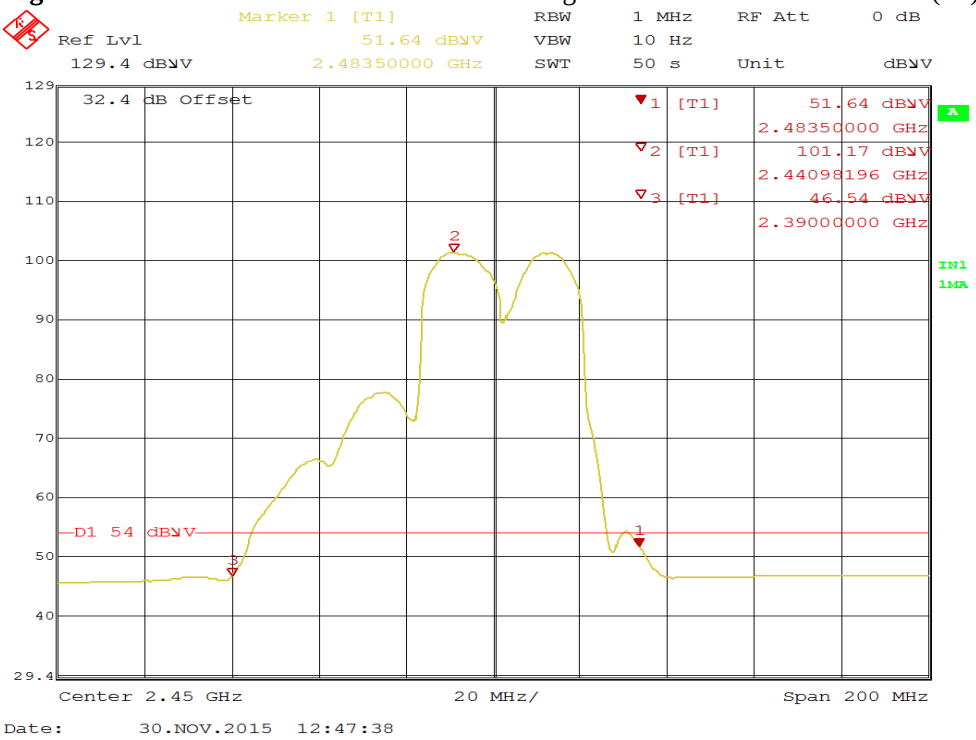


Figure 64: Radiated Emission at 2483.5 MHz Edge for 2452 MHz-HT40 – Horz. (Ave)

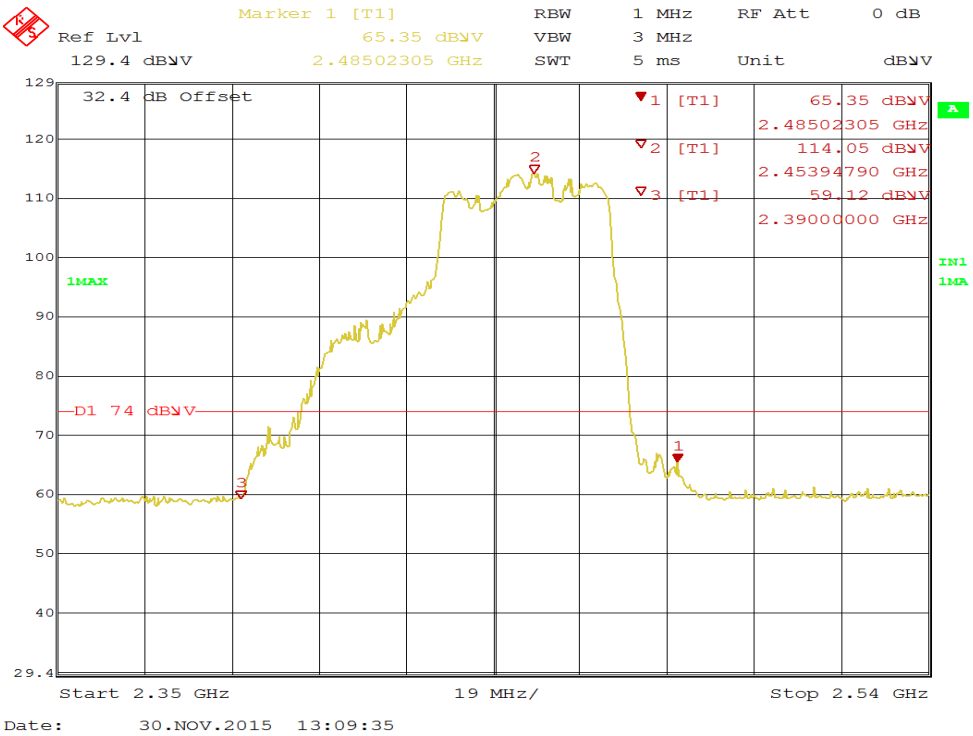


Figure 65: Radiated Emission at 2483.5 MHz Edge for 2452 MHz-HT40 – Vert. (Pk)

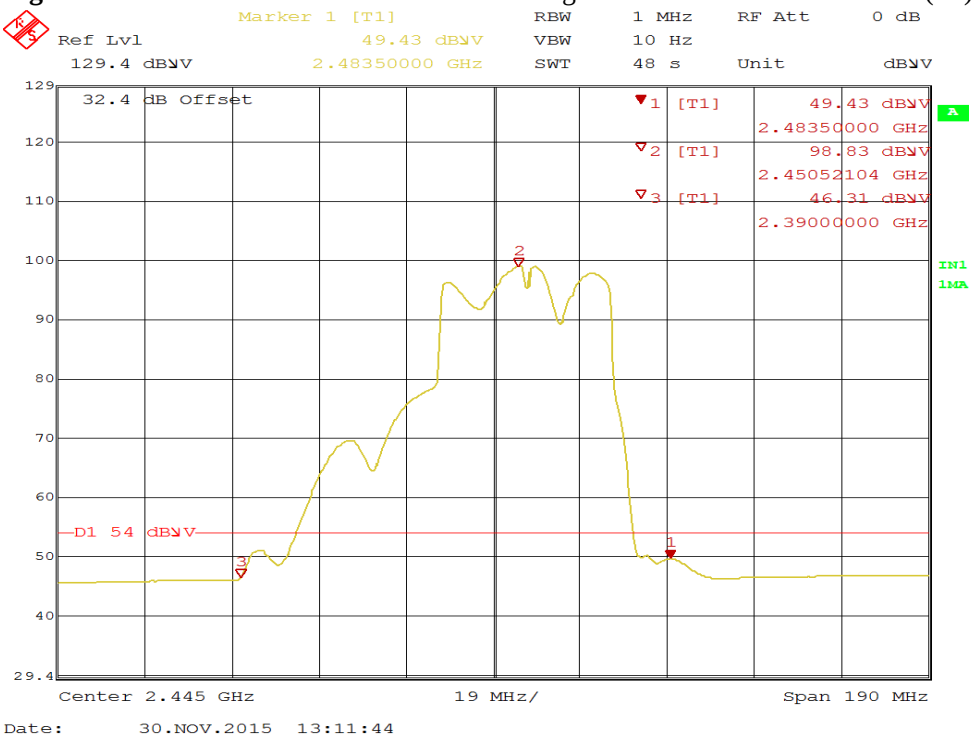


Figure 66: Radiated Emission at 2483.5 MHz Edge for 2452 MHz-HT40 – Vert. (Ave)

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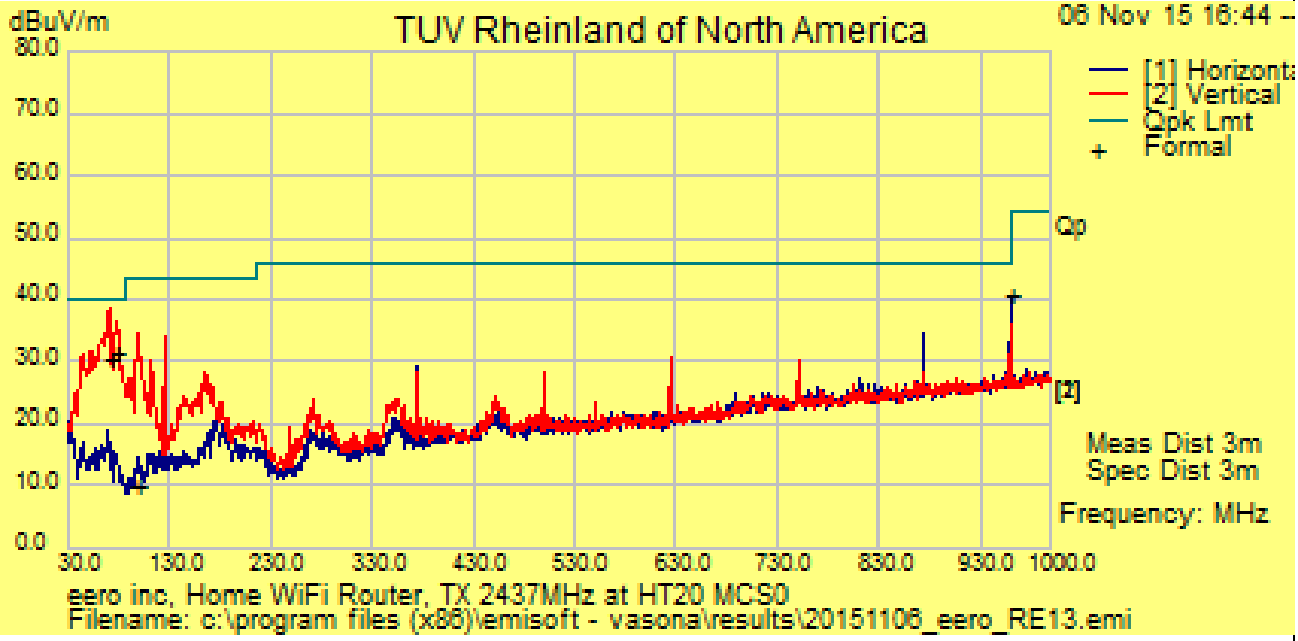
EUT Name	Home Wi-Fi Router	**Date**	Nov 06, 2015
EUT Model	A010001	**Temp / Hum in**	24° C / 34%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	120 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
960.02	42.08	5.86	-7.37	40.57	QP	H	157	96	54.00	-13.43
71.02	51.37	2.93	-23.79	30.51	QP	V	113	172	40.00	-9.49
78.08	52.52	2.98	-24.09	31.41	QP	V	141	179	40.00	-8.59
98.09	29.15	3.11	-22.34	9.91	QP	V	378	24	43.50	-33.59



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

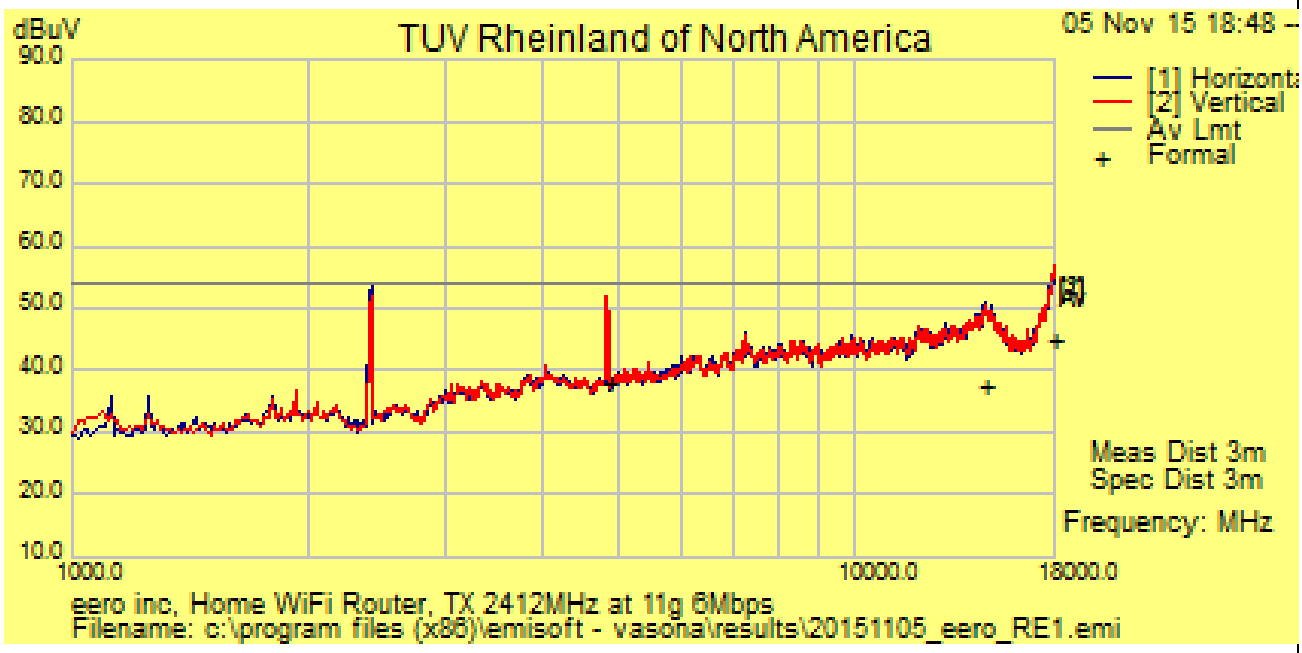
Note: 1. Worst case was observed on Mid channel of HT20 MCS0 mode.
2. Mode tested are 802.11g, HT20 and HT40 (low, mid & high channel).
3. To reduce complexity and bulkiness of the report Worst case Plots is placed in the report.

SOP 1 Radiated Emissions — Tracking # 31563403.001 Page 2 of 14

EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11g at 6Mbps / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
14673.62	39.74	4.42	-6.52	37.64	Average	H	112	238	54.00	-16.36
17988.98	37.50	5.04	2.21	44.74	Average	H	112	58	54.00	-9.26
4820.94	51.92	2.89	-17.08	37.73	Average	V	158	18	54.00	-16.27



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

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

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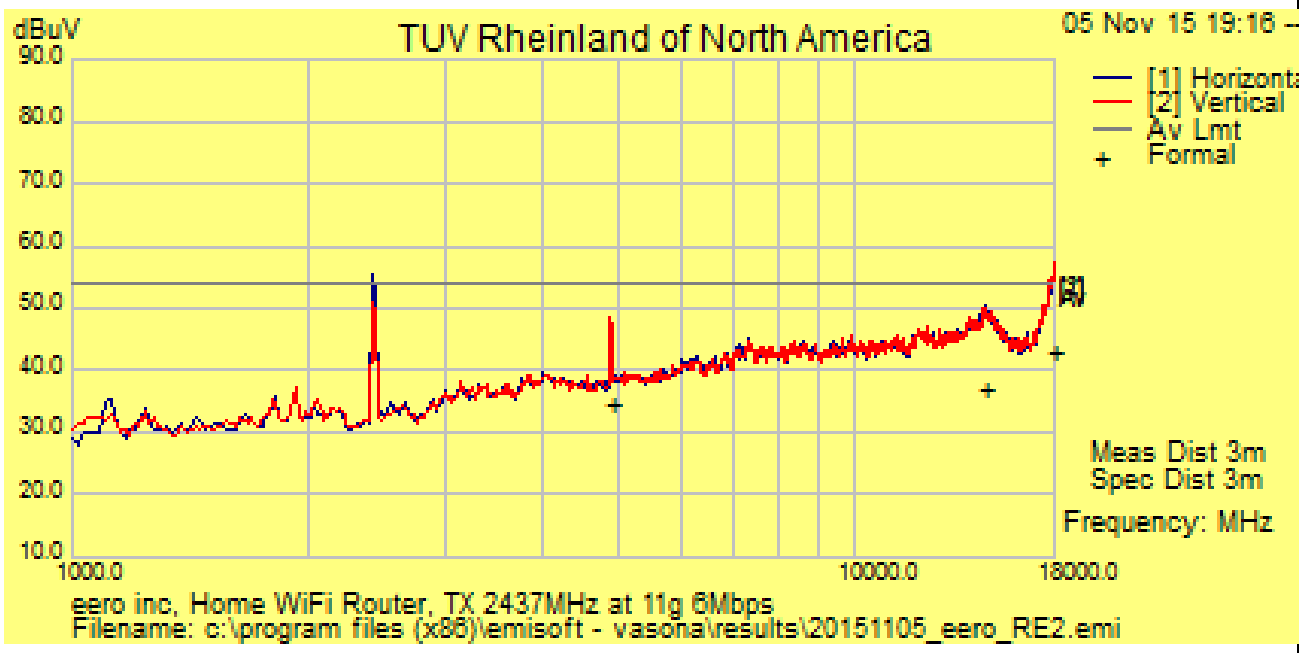
EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11g at 6Mbps / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
14626.37	39.56	4.43	-6.77	37.21	Average	H	157	302	54.00	-16.79
4876.17	48.30	2.88	-16.76	34.42	Average	V	102	44	54.00	-19.58
17948.24	36.86	5.02	1.10	42.98	Average	V	142	294	54.00	-11.02



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

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

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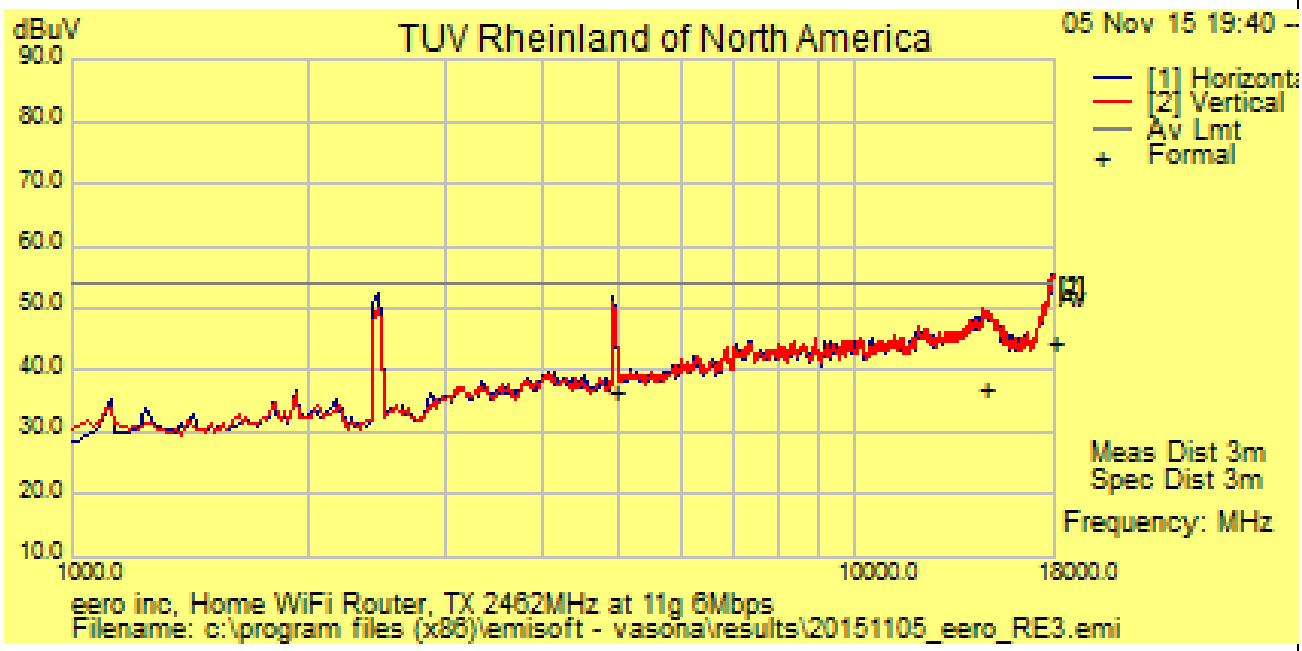
EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11g at 6Mbps / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
4919.17	50.19	2.89	-16.46	36.62	Average	H	175	-2	54.00	-17.38
14577.49	39.72	4.41	-6.94	37.20	Average	H	126	130	54.00	-16.80
18000.00	36.85	5.05	2.48	44.38	Average	H	160	56	54.00	-9.62



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

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

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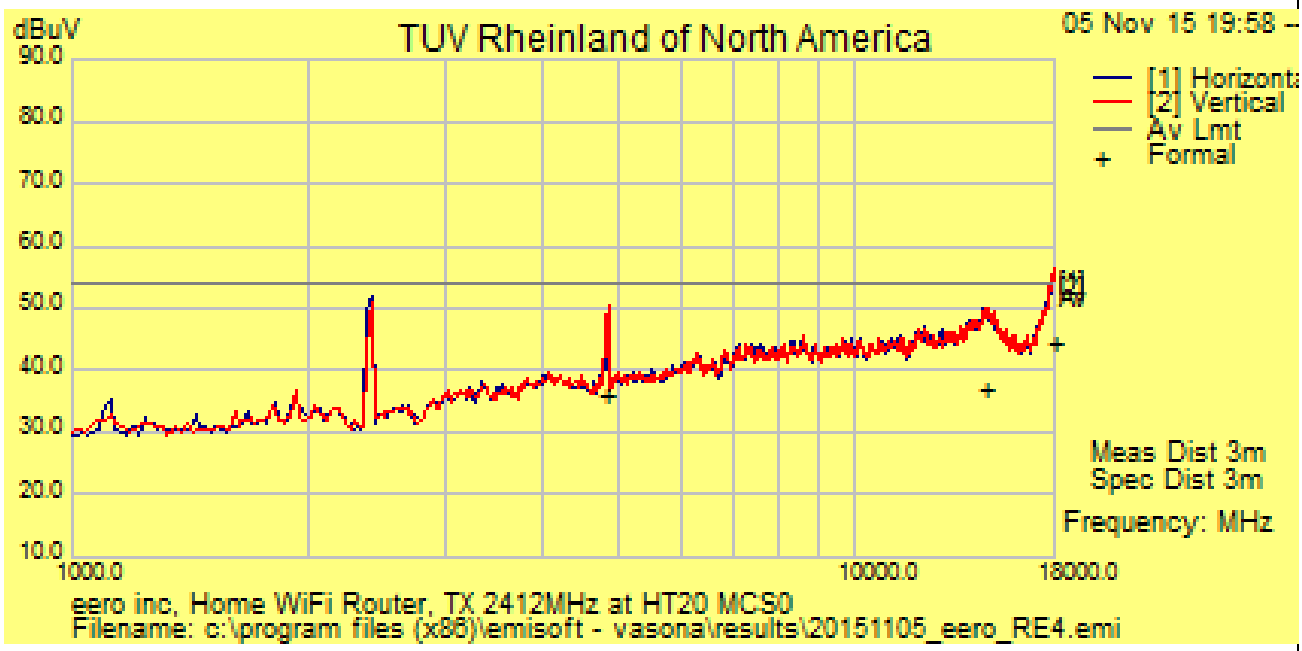
EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT20-MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
14561.09	39.88	4.42	-7.13	37.16	Average	H	223	272	54.00	-16.84
17998.70	36.77	5.05	2.45	44.27	Average	H	126	32	54.00	-9.73
4814.79	50.21	2.88	-17.09	36.00	Average	V	148	22	54.00	-18.00



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

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

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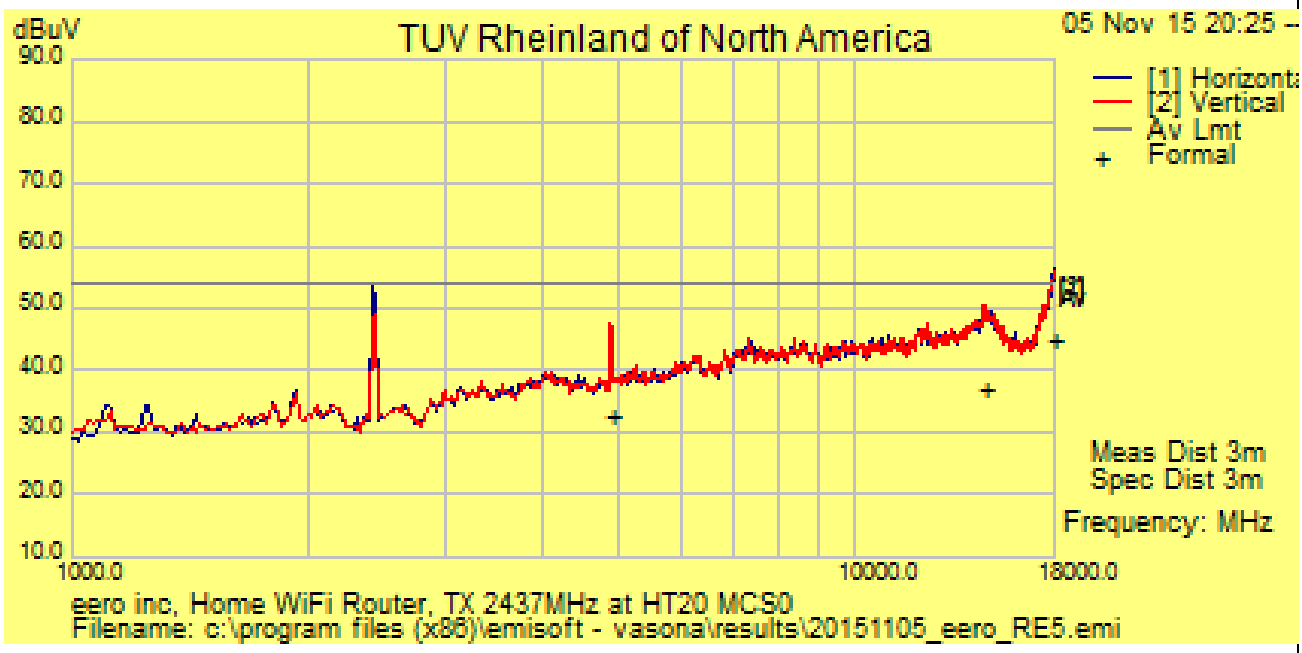
EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT20-MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
17983.40	37.68	5.03	2.07	44.79	Average	H	118	60	54.00	-9.21
4870.00	46.26	2.88	-16.77	32.37	Average	V	145	68	54.00	-21.63
14575.53	39.72	4.41	-6.95	37.19	Average	V	180	120	54.00	-16.81



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

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

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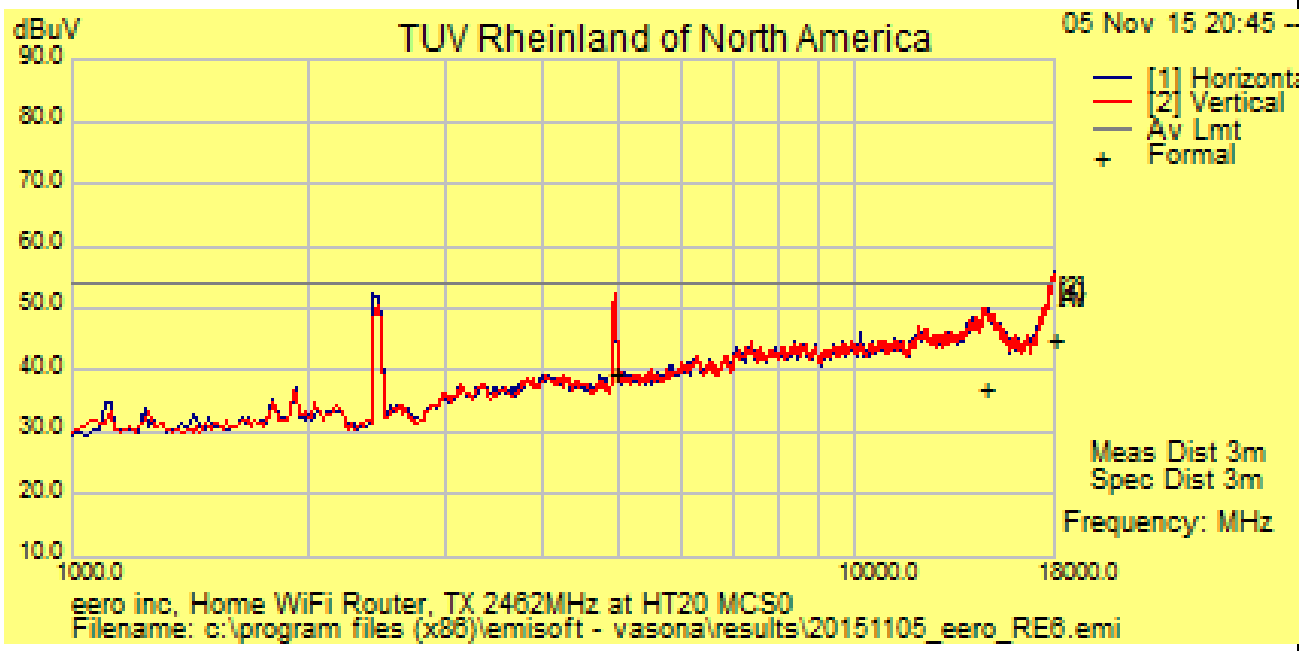
EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT20-MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
17982.07	37.68	5.03	2.04	44.75	Average	H	125	242	54.00	-9.25
4933.43	53.09	2.88	-16.42	39.56	Average	V	125	116	54.00	-14.44
14628.25	39.56	4.43	-6.77	37.23	Average	V	148	226	54.00	-16.77



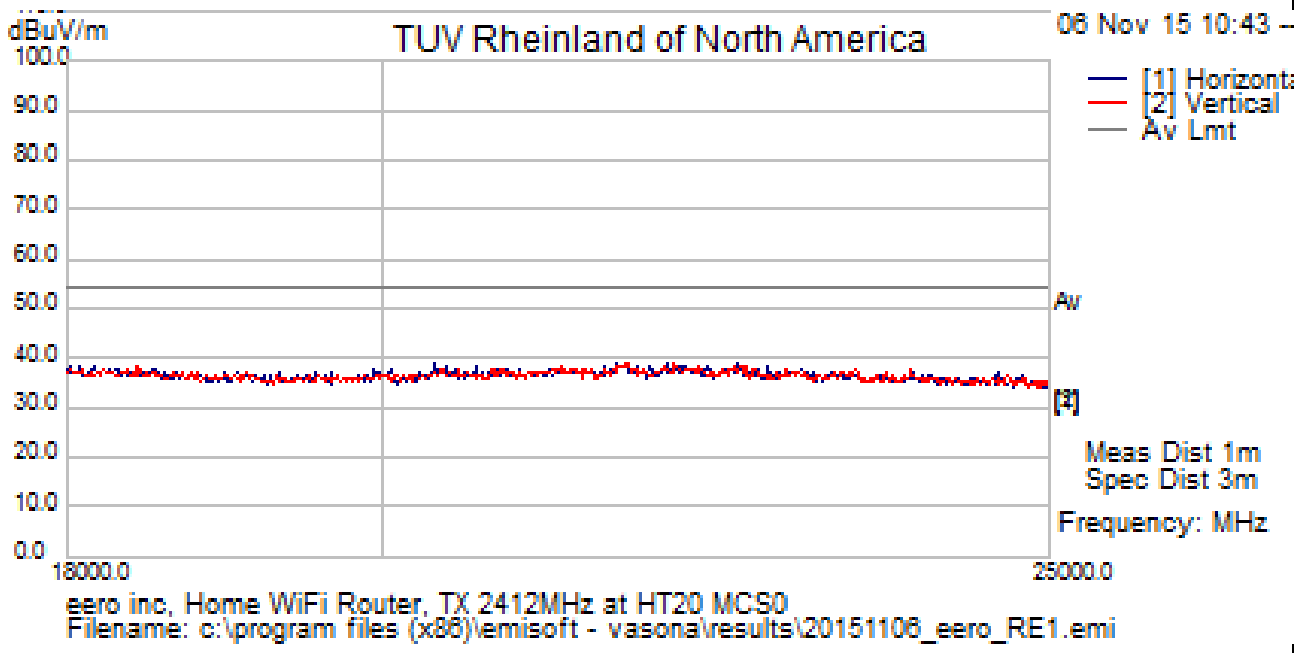
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

SOP 1 Radiated Emissions		Tracking # 31563403.001 Page 8 of 14	
EUT Name	Home Wi-Fi Router	**Date**	Nov 06, 2015
EUT Model	A010001	**Temp / Hum in**	24° C / 34%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 25 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
21619.24	43.45	5.40	-9.71	39.14	Peak	H	150	0	54.00	-14.86



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

Note: No significant emissions was observed for 802.11g and 802.11n - HT20. **Measured spectrum noise floor**.

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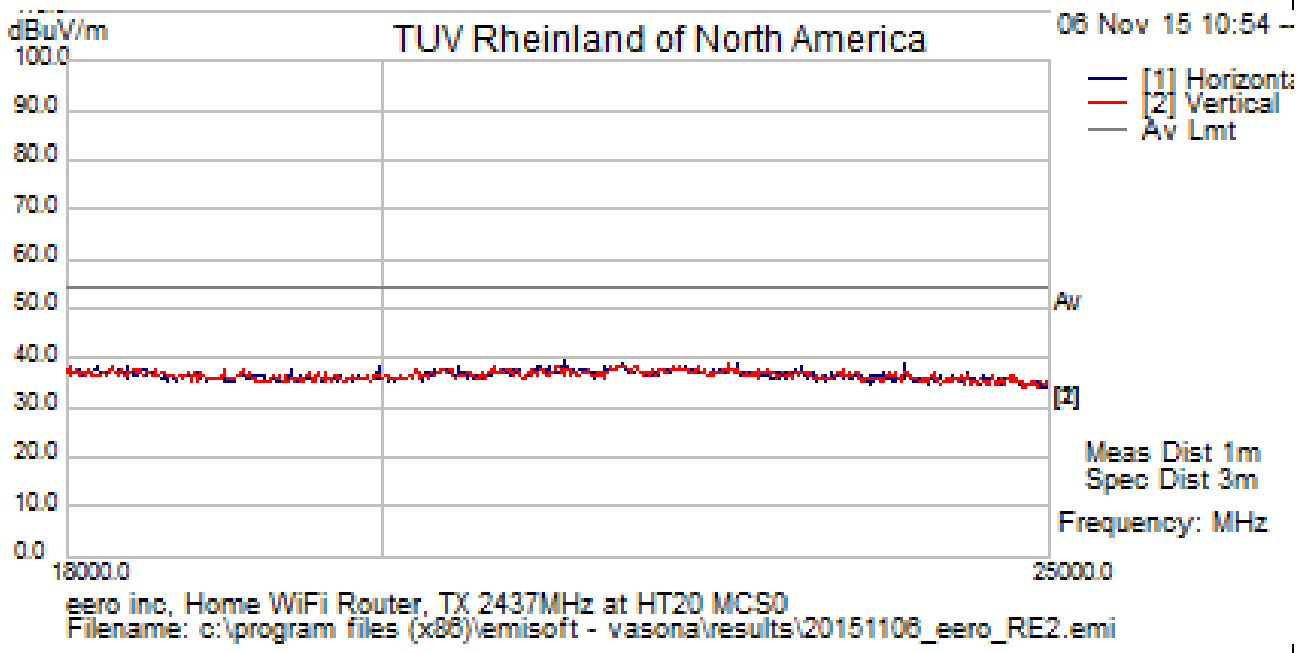
EUT Name	Home Wi-Fi Router	**Date**	Nov 06, 2015
EUT Model	A010001	**Temp / Hum in**	24° C / 34%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 25 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
21268.54	43.65	5.35	-9.41	39.59	Peak	H	150	0	54.00	-14.41



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

Note: No significant emissions was observed for 802.11g and 802.11n - HT20. **Measured spectrum noise floor**.

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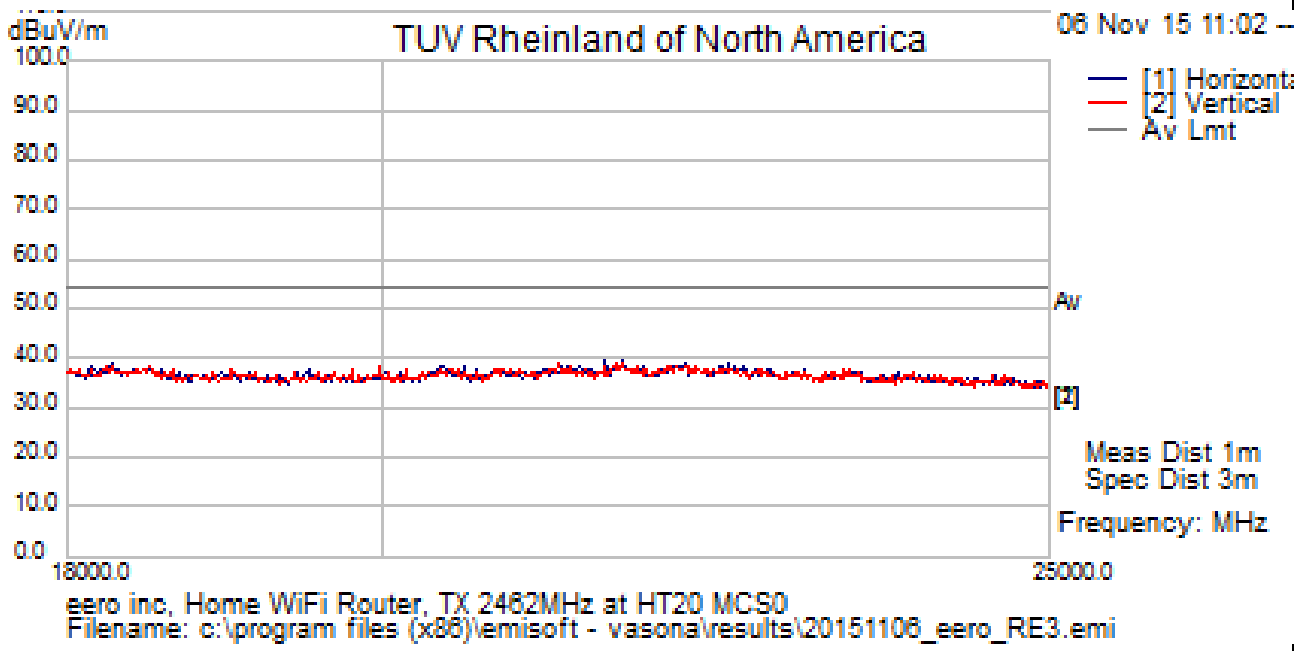
EUT Name	Home Wi-Fi Router	**Date**	Nov 06, 2015
EUT Model	A010001	**Temp / Hum in**	24° C / 34%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 25 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
21549.10	44.03	5.39	-9.62	39.79	Peak	H	150	0	54.00	-14.21



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

Note: No significant emissions was observed for 802.11g and 802.11n - HT20. **Measured spectrum noise floor**.

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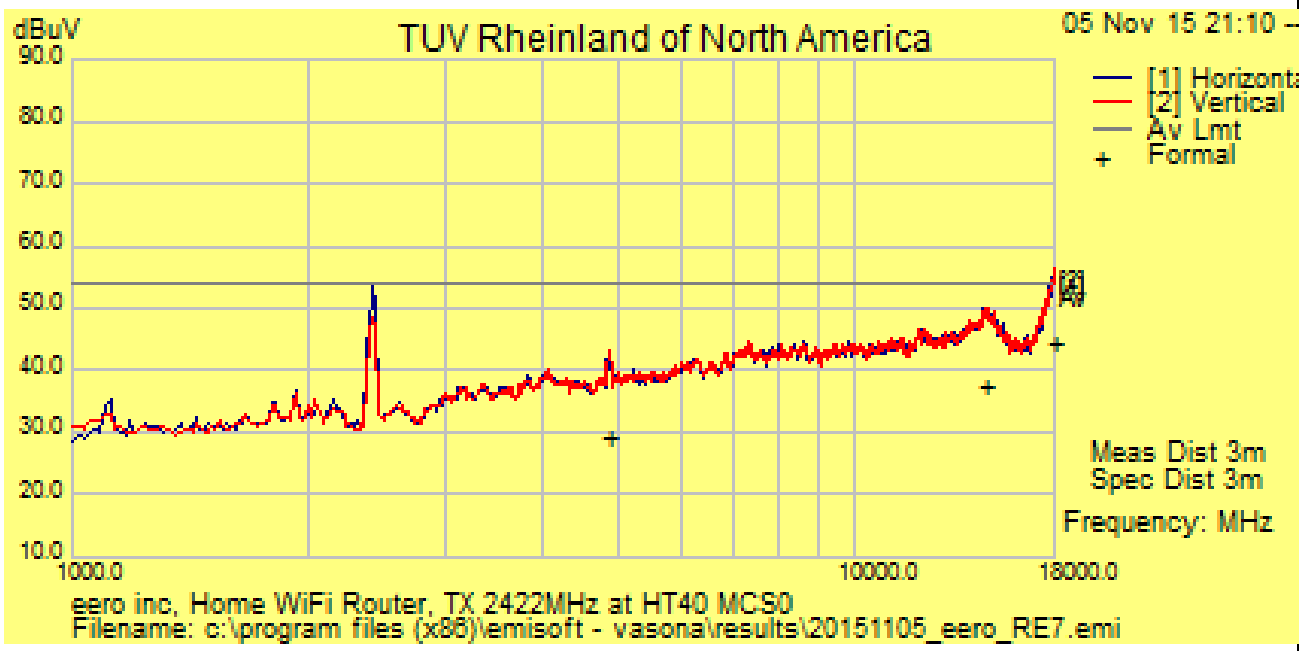
EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
14593.24	39.69	4.43	-6.88	37.24	Average	H	121	196	54.00	-16.76
4845.21	43.32	2.89	-16.86	29.35	Average	V	210	361	54.00	-24.65
18000.00	36.74	5.05	2.48	44.27	Average	V	101	320	54.00	-9.73



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

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

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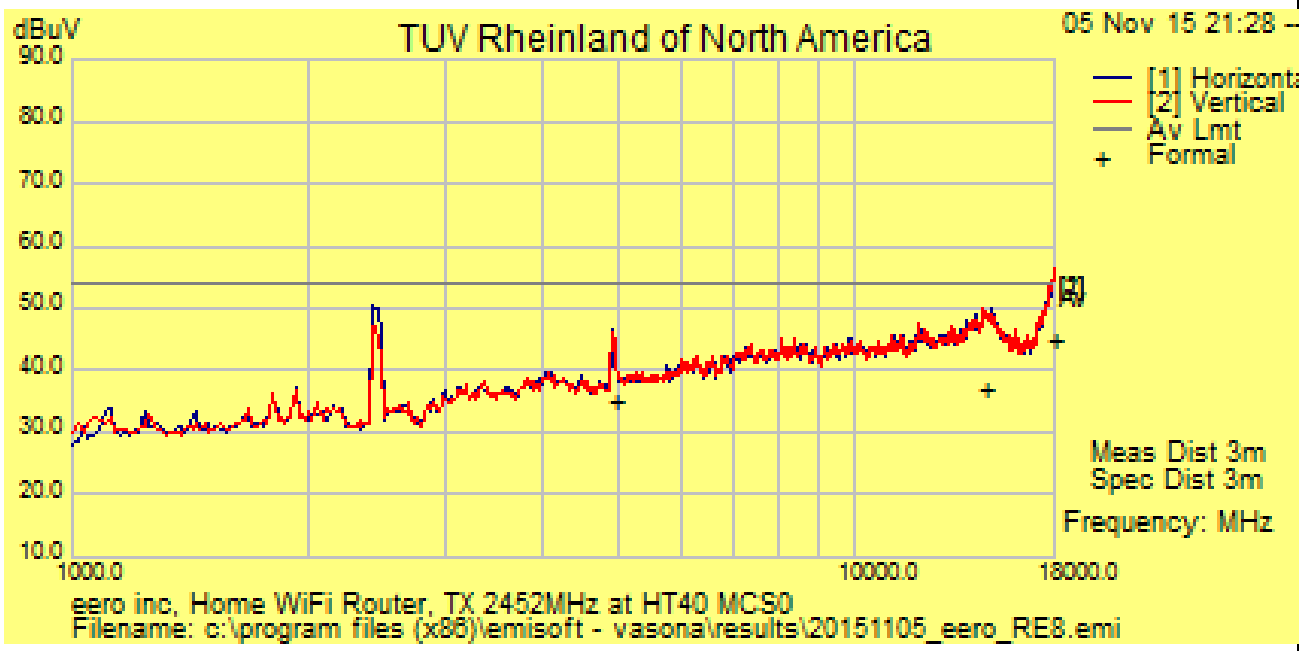
EUT Name	Home Wi-Fi Router	**Date**	Nov 05, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 38%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

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
4902.63	48.89	2.89	-16.61	35.16	Average	H	121	-2	54.00	-18.84
14575.92	39.66	4.41	-6.95	37.12	Average	V	132	264	54.00	-16.88
17982.15	37.68	5.03	2.04	44.75	Average	V	156	248	54.00	-9.25



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

Note: Other than spectrum noise floor, emission at the limit is the fundamental frequency.

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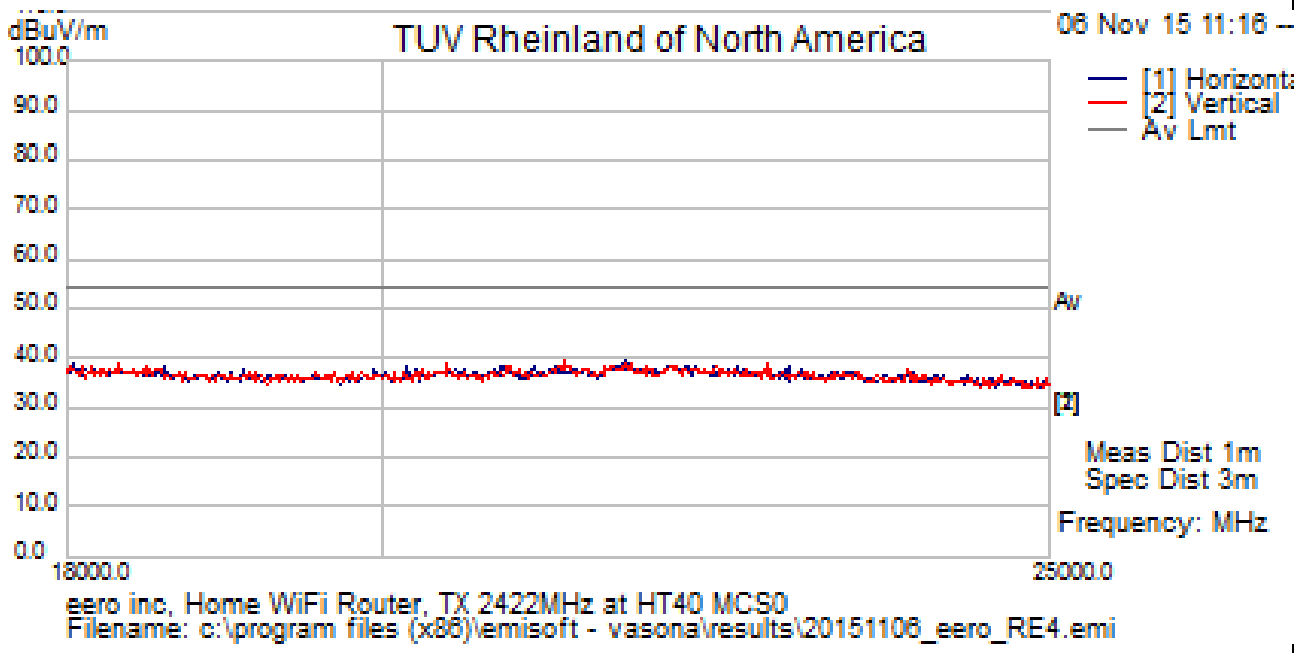
EUT Name	Home Wi-Fi Router	**Date**	Nov 06, 2015
EUT Model	A010001	**Temp / Hum in**	24° C / 34%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 25 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
21268.54	43.55	5.35	-9.41	39.49	Peak	V	150	0	54.00	-14.51



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

Note: No significant emissions was observed. **Measured spectrum noise floor**.

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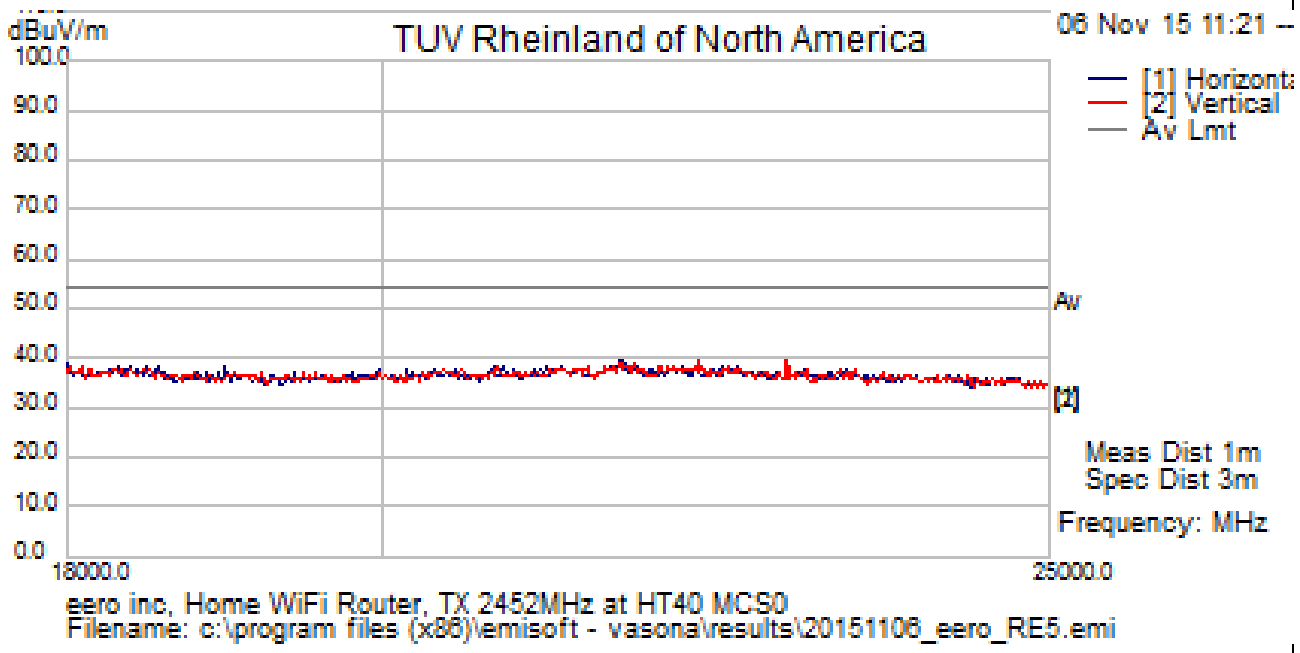
EUT Name	Home Wi-Fi Router	**Date**	Nov 06, 2015
EUT Model	A010001	**Temp / Hum in**	24° C / 34%rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 25 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
21675.35	44.04	5.40	-9.78	39.66	Peak	H	150	0	54.00	-14.34



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

Note: No significant emissions was observed. **Measured spectrum noise floor**.

4.6 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2014. 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 Gen: 2015 Sect. 8.8.

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 10: AC Conducted Emissions – Test Results

Test Conditions: Conducted Measurement at Normal Conditions only		
Antenna Type: Custom Integrated	**Power Level:** See Test Plan	
AC Power: 120 Vac/60 Hz	**Configuration:** Tabletop	
Ambient Temperature: 22° C	**Relative Humidity:** 37% 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

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EUT Name	Home Wi-Fi Router	**Date**	November 12, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 37% rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	TX mode / chain 0 & 1	**Line AC / Freq**	120Vac / 60Hz
Standard	CFR47 Part 15.207 and RSS Gen	**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	
0.395	30.44	9.96	0.09	40.49	QP	Live	57.96	-17.46	Pass
0.395	15.85	9.96	0.09	25.90	Ave	Live	47.96	-22.06	Pass
0.541	29.80	9.98	0.08	39.86	QP	Live	56.00	-16.14	Pass
0.541	10.18	9.98	0.08	20.24	Ave	Live	46.00	-25.76	Pass
0.561	29.09	9.98	0.08	39.15	QP	Live	56.00	-16.85	Pass
0.561	19.82	9.98	0.08	29.88	Ave	Live	46.00	-16.12	Pass
0.628	28.60	9.98	0.07	38.65	QP	Live	56.00	-17.35	Pass
0.628	18.06	9.98	0.07	28.11	Ave	Live	46.00	-17.89	Pass
1.241	26.50	10.00	0.06	36.55	QP	Live	56.00	-19.45	Pass
1.241	16.42	10.00	0.06	26.47	Ave	Live	46.00	-19.53	Pass
0.843	28.93	9.98	0.07	38.99	QP	Live	56.00	-17.01	Pass
0.843	7.35	9.98	0.07	17.40	Ave	Live	46.00	-28.60	Pass
0.252	33.55	9.96	0.13	43.64	QP	Live	61.70	-18.06	Pass
0.252	24.79	9.96	0.13	34.88	Ave	Live	51.70	-16.82	Pass

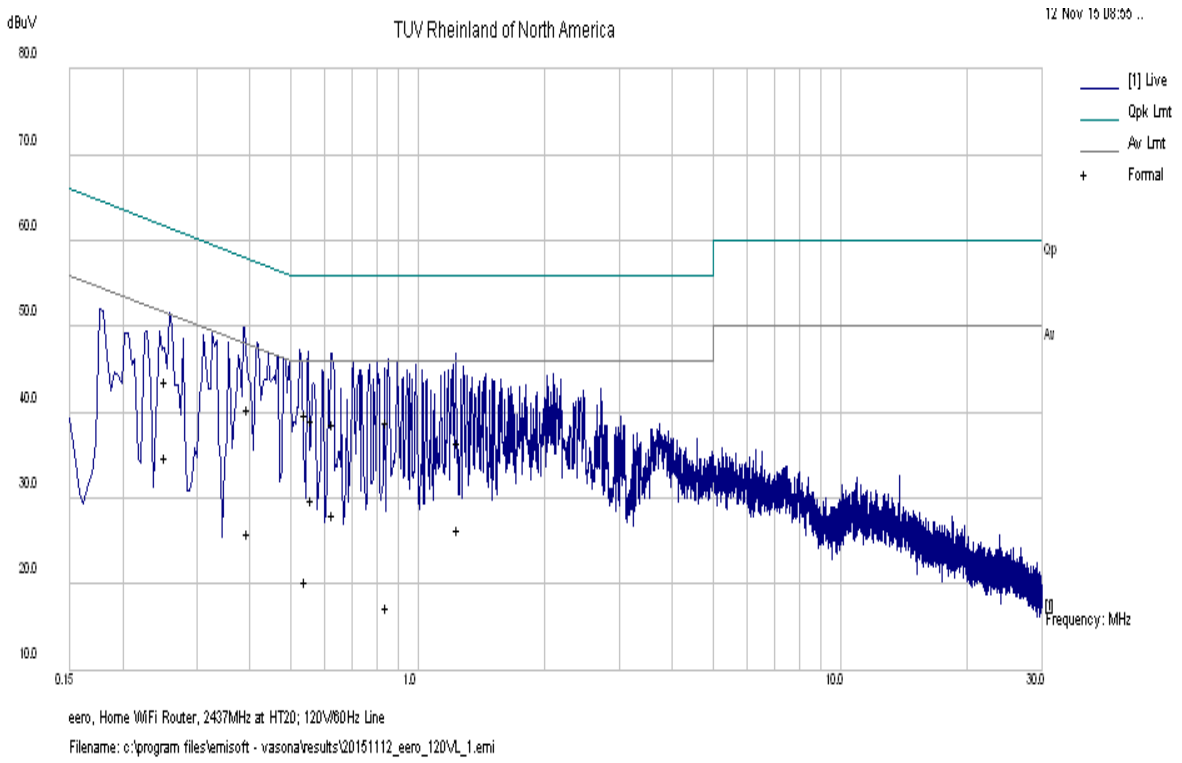
Spec Margin = QP./Ave. - Limit, ± Uncertainty

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 2437 MHz in 802.11n at HT20 MCS0

SOP 2 Conducted Emissions		Tracking # 31563403.001 Page 2 of 4	
EUT Name	Home Wi-Fi Router	**Date**	November 12, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 37% rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	TX mode / chain 0 & 1	**Line AC**	120Vac / 60Hz
Standard	CFR47 Part 15.207 and RSS Gen	**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

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EUT Name	Home Wi-Fi Router	**Date**	November 12, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 37% rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	TX mode / chain 0 & 1	**Line AC / Freq**	120Vac / 60Hz
Standard	CFR47 Part 15.207 and RSS Gen	**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	
0.944	28.09	9.99	0.06	38.14	QP	Neutral	56.00	-17.86	Pass
0.944	23.67	9.99	0.06	33.72	Ave	Neutral	46.00	-12.28	Pass
0.379	35.74	9.96	0.09	45.79	QP	Neutral	58.30	-12.51	Pass
0.379	29.67	9.96	0.09	39.73	Ave	Neutral	48.30	-8.57	Pass
0.505	32.43	9.98	0.08	42.49	QP	Neutral	56.00	-13.51	Pass
0.505	28.98	9.98	0.08	39.04	Ave	Neutral	46.00	-6.96	Pass
0.150	36.28	9.94	0.23	46.45	QP	Neutral	65.98	-19.53	Pass
0.150	15.90	9.94	0.23	26.07	Ave	Neutral	55.98	-29.91	Pass
0.817	27.41	9.98	0.07	37.46	QP	Neutral	56.00	-18.54	Pass
0.817	19.92	9.98	0.07	29.97	Ave	Neutral	46.00	-16.03	Pass
1.099	25.49	9.99	0.06	35.54	QP	Neutral	56.00	-20.46	Pass
1.099	13.85	9.99	0.06	23.90	Ave	Neutral	46.00	-22.10	Pass
0.187	35.41	9.95	0.18	45.54	QP	Neutral	64.19	-18.65	Pass
0.187	28.24	9.95	0.18	38.37	Ave	Neutral	54.19	-15.81	Pass

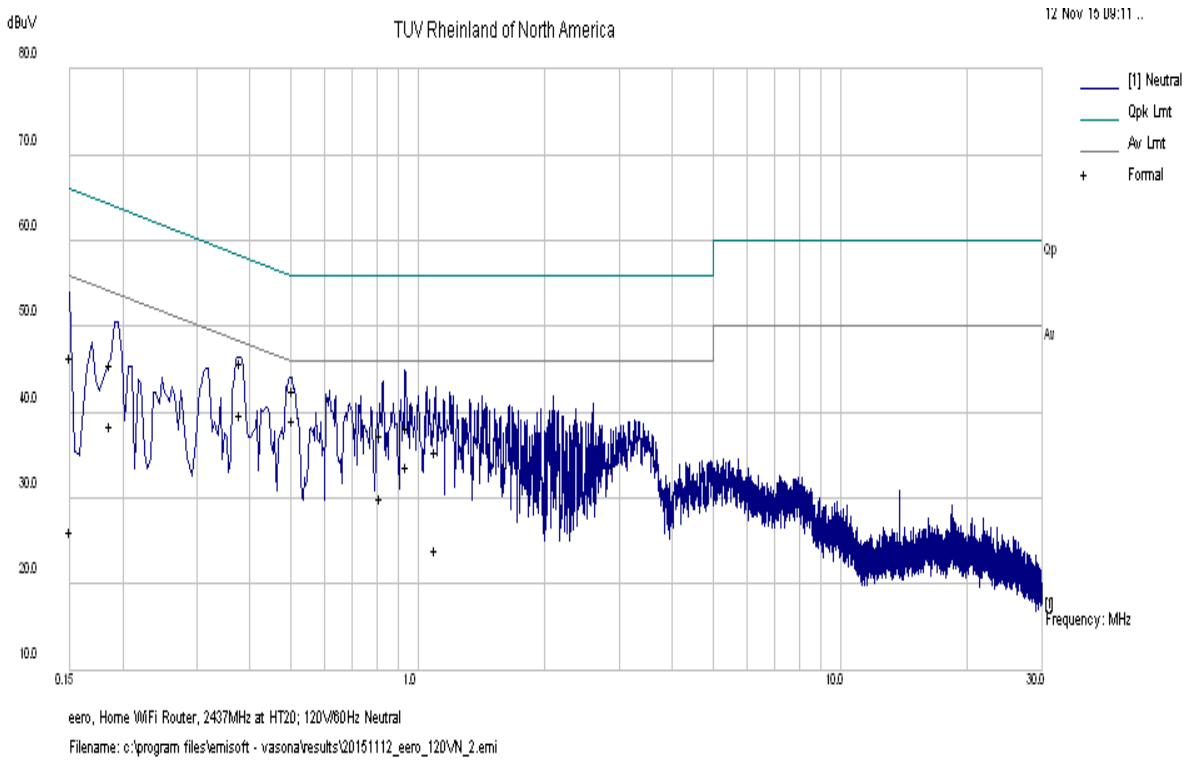
Spec Margin = QP./Ave. - Limit, ± Uncertainty

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 2437 MHz in 802.11n at HT20 MCS0

SOP 2 Conducted Emissions		Tracking # 31563403.001 Page 4 of 4	
EUT Name	Home Wi-Fi Router	**Date**	November 12, 2015
EUT Model	A010001	**Temp / Hum in**	23° C / 37% rh
EUT Serial	E59A-0053-5XKS-EP43	**Temp / Hum out**	N/A
EUT Config.	TX mode / chain 0 & 1	**Line AC**	120Vac / 60Hz
Standard	CFR47 Part 15.207 and RSS Gen	**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.

4.7.5 Test Results

4.7.5.1 Antenna Gain

The 2.412 GHz transmitting maximum antenna gain is +1.5 dBi or 1.41 (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 +29.57 dBm or 905.73 mW (summed 2 chains)

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

Pd = (296.76*1.41) / (1600π) = 0.2541 mW/cm^2, which is 0.7459 mW/cm^2 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	Sunol Sciences	DRH-118	A040806	02/10/2015	02/10/2016
Antenna (18-40 GHz)	Com-Power	AHA-840	105005	07/08/2015	07/08/2016
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	MY52350885	03/02/2015	03/02/2016
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	185516	01/13/2015	01/13/2016
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
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
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 11: Customer Information

Company Name	eero inc
Address	933 20th Street
City, State, Zip	San Francisco, CA 94107
Country	USA
Phone	(415) 738-7972
Fax	

Table 12: Technical Contact Information

Name	Clifford Clarke
E-mail	compliance@eero.com
Phone	(415) 738-7972
Fax	

6.3 Equipment Under Test (EUT)

Table 13: EUT Specifications

EUT Specifications	
Dimensions	W: 4.75in (121mm) x D: 4.75in (121mm) x H: 0.85-1.26in (22-33mm)
AC Input	100-240V AC, 50 – 60 Hz
Environment	Indoor
Operating Temperature Range:	0 to 35 degrees C
Multiple Feeds:	☐ Yes and how many ☒ No
Hardware Version	01A
Part Number	830-00001-14
RF Software Version	v1.0.0
802.11-radio modules	
Operating Mode	802.11g, 802.11n (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 7 – 2 custom antennas at 2.4GHz. See Table 13 for details
Antenna Gain	Antenna 1 = +1.5 dBi, Antenna 2 = -0.75 dBi
Modulation Type	☐ AM ☐ FM ☒ DSSS ☒ OFDM ☐ Other describe: 16QAM and 64 QAM
Data Rate	802.11g: 2 Spatial Streams: 6, 9, 12, 18, 24, 36, 48, 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); no beam forming
Directional Gain Type	☒ Correlated ☐ Beam-Forming ☐ Other describe:
Type of Equipment	☒ Table Top ☒ Wall-mount ☐ Floor standing cabinet ☐ Other:

EUT Specifications
Note: All 2 chains will be on / transmitted at all time.

Table 14: Antenna Information

Number	Antenna Type	Description	Max Gain (dBi)
Antenna 1	Stamped metal Planar Inverted F antenna(PIFA)	2.4 GHz Wi-Fi Chain 2	1.50
Antenna 2	Stamped metal PIFA	2.4 GHz Wi-Fi Chain 1	-0.75
Antenna 3	Stamped metal PIFA	Bluetooth	2.51
Antenna 5	Monopole	5 GHz Wi-Fi U-NII-1 Band, Chain 1	1.11
Antenna 6	Monopole	5 GHz Wi-Fi U-NII-1 Band, Chain 2	2.13
Antenna 7	Monopole	5 GHz Wi-Fi U-NII-3 Band, Chain 1	-1.01
Antenna 8	Monopole	5 GHz Wi-Fi U-NII-3 Band, Chain 2	2.24

Table 15: EUT Channel Power Specifications

Max Power for single Chain

TP Setting	No.	Frequency (MHz)	Target Power Value dBm			
			802.11b	802.11g	802.11n (HT20)	802.11n (HT40)
26	1	2412		25.06	24.91	
26	2	2417			24.93	
*	3	2422			24.29	22.47
29	4	2427		25.12	25.10	
29	5	2432			24.94	
29	6	2437		25.24	25.34	
29	7	2442			26.15	
29	8	2447		26.72	26.76	
*	9	2452			25.49	23.32
26	10	2457			25.08	
26	11	2462		23.86	24.10	

Note: 1. The adjusted power target values are updated at the evaluated frequencies.
2. *TP setting for HT20 = 26 and TP setting for HT40 = 25.

Table 16: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
Ethernet	RJ45	☒ No	☒ Metric: 2 m	☐ N/A

Table 17: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Dell	Latitude	35521341769	Setup EUT operating channel
Note: None.				

Table 18: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.247
Home Wi-Fi Router	E59A-0053-5XSK-EP43	Custom Integrated Antenna	Radiated Emissions, AC Conducted Emissions
	E5AN0264	Custom Integrated Antenna	Radiated Bandedge Emissions
	E5AN0264	Direct Connection	Peak Transmit Power, Peak Power Spectral Density, Occupied Bandwidth, Band-Edge, Out-of-Band Emissions

Table 19: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
Home Wi-Fi Router	Custom Integrated	Transmit	EUT laid flat.	N/A	N/A
Note: N/A.					

6.4 Test Specifications

Table 20: Test Specifications

Emissions and Immunity	
Standard	**Requirement**
CFR 47 Part 15.247: 2015	All
RSS 247 Issue 1, 2015	All

END OF REPORT