Emissions
Test Report

EUT Name: Home Wi-Fi Router

Model No.: A010001

CFR 47 Part 15.407 2015 and RSS 247: 2015

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	10/03/2015	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 USA (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 15.407 2015 and RSS 247: 2015
Test Dates:	04 Sep 2015 to 22 Sep 2015

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v01, KDB 662911 D01 Multiple Transmitter Output v02r01

Test Methods:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v01, 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 October 03, 2015	A2LA Signatory	Date October 03, 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 15.407 2015 and RSS 247: 2015 based on the results of testing performed on 04 Sep 2015 to 22 Sep 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 5180 MHz to 5240 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 15.407 (b) RSS-GEN Sect.7.2.3, 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 15.407 (a), RSS GEN Sect.6.6	See plots	**Complied**
Maximum Output Power	CFR47 15.407 (a) [see note 2]	24.34 dBm (11a mode) 24.45 dBm (HT 20) 24.35 dBm (VHT 20) 20.87 dBm (HT 40) 20.83 dBm (VHT 40) 19.81 dBm (VHT80)	**Complied**
Maximum Output Power	RSS 247 Sect.6.2.1.1 [see note 3]	66.68 mW (11a mode) 64.42 mW (HT 20) 64.27 mW (VHT 20) 56.89 mW (HT 40) 58.48 mW (VHT 40) 42.95 mW (VHT80)	**Complied**
Peak Power Spectral Density	CFR47 15.407 (a)	< 17 dBm/MHz	**Complied**
Peak Power Spectral Density	RSS 247 Sect.6.2.1.1	< 10 dBm/MHz (e.i.r.p)	**Complied**
Conducted Emission – Antenna Port	CFR47 15.407 (b), RSS 247 Sect.6.2.2.2	30 MHz - 40 GHz < -27 dBm/MHz	**Complied**
Frequency Stability	CFR47 15.407 (g), RSS GEN Sect. 6.11	±20 ppm	**Complied**
RF Exposure	CFR47 15.247 (i), 2.1091 RSS-102 Issue 5	General Population	**Complied**

Note: 1. This test report covers 5150 MHz to 5250MHz band.
2. Measurement are conducted.
3. Max power, 1 Spatial Stream, are in E.I.R.P.

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 5.2GHz band uses custom integrated antennas, Antenna 5 and Antenna 6, and has maximum gain + 2.13 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 15.407: 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 15.407 (a):2015 and RSS 247 Sect. 6.2.1.1: 2015.

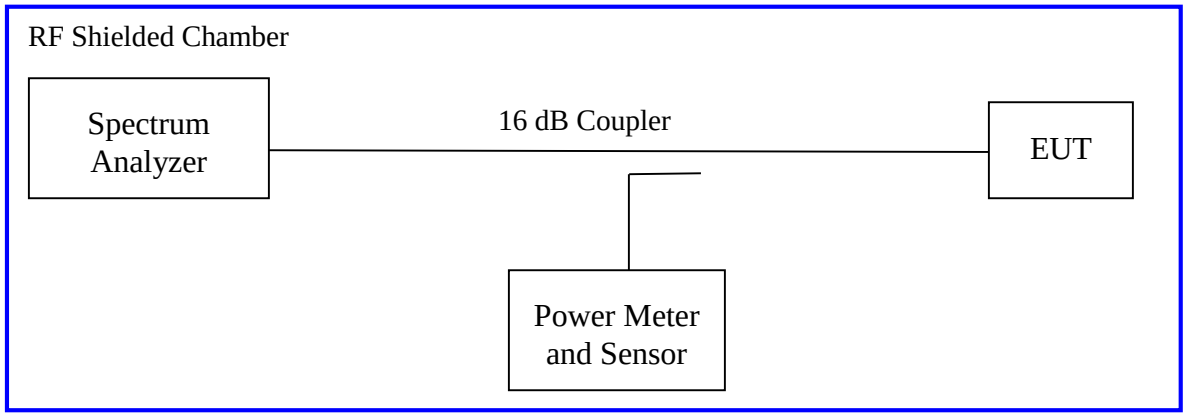
The maximum transmitted powers are

Band 5150-5250 MHz: 200 mW or 10 + 10Log(B) where B is the 99% emission bandwidth.

4.1.1 Test Method

The ANSI C63.10-2013 Section 12.3.2.2 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 15.407(a): 2015 and RSS 247 Sect. 6.2.1.1; 5150 MHz to 5250 MHz. The worst mode results indicated below.

Test Setup:



Method SA-1 of "Guidelines for Complance Testing of Unlicensed National Information Infrastructure (U-NII) Devices"applies since the EUT continuously transmit; where duty cycle is 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 and Voltage Only					
Antenna Type: Custom Integrated				**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 21° C				**Relative Humidity:**37%	
802.11a (FCC Limit)					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5180.00	30.00	22.48	21.02	24.82	-5.18
5200.00	30.00	24.34	23.68	27.03	-2.97
5240.00	30.00	21.08	19.53	23.38	-6.62
802.11a (RSS Limit)					
Operating Channel (MHz)	**E.I.R.P. Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**E.I.R.P. Total Power [dBm]**	**Margin [dB]**
5180.00	20.87	15.77	14.63	18.25	-2.62
5200.00	20.87	16.11	14.87	18.54	-2.33
5240.00	20.87	14.45	13.59	17.05	-3.82

Note: 1.The highest output power was observed at 6Mbps, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total Power.
3. RSS-247 Limit = 23 dBm – 2.13 dBi = 20.87 dBm.
4. 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 Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage Only					
Antenna Type: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 21° C			**Relative Humidity:**37%		
802.11n (FCC Limit)					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5180.00	30.00	23.17	20.82	25.16	-4.84
5200.00	30.00	24.45	23.56	27.04	-2.96
5240.00	30.00	21.25	19.65	23.53	-6.47
802.11n (RSS Limit)					
Operating Channel (MHz)	**E.I.R.P. Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**E.I.R.P. Total Power [dBm]**	**Margin [dB]**
5180.00	20.87	15.57	14.61	18.13	-2.74
5200.00	20.87	15.96	14.97	18.50	-2.37
5240.00	20.87	14.38	13.56	17.00	-3.87

Note: 1.The highest output power was observed at 6Mbps, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total Power.
3. RSS-247 Limit = 23 dBm – 2.13 dBi = 20.87 dBm.
4. 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 and Voltage Only					
Antenna Type: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 21° C			**Relative Humidity:**37%		
802.11ac (FCC Limit)					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5180.00	30.00	22.74	20.69	24.85	-5.15
5200.00	30.00	24.35	23.66	27.03	-2.97
5240.00	30.00	21.01	19.57	23.36	-6.64
802.11ac (RSS Limit)					
Operating Channel (MHz)	**E.I.R.P. Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**E.I.R.P. Total Power [dBm]**	**Margin [dB]**
5180.00	20.87	15.63	14.64	18.17	-2.70
5200.00	20.87	15.95	14.92	18.48	-2.39
5240.00	20.87	14.34	13.48	16.94	-3.93

Note: 1.The highest output power was observed at 6Mbps, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total Power.
3. RSS-247 Limit = 23 dBm – 2.13 dBi = 20.87 dBm.
4. 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 5: RF Output Power at the Antenna Port – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage Only					
Antenna Type: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 21° C			**Relative Humidity:**37%		
802.11n (FCC Limit)					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5190.00	30.00	19.67	19.75	22.72	-7.28
5230.00	30.00	20.87	19.41	23.21	-6.79
802.11n (RSS Limit)					
Operating Channel (MHz)	**E.I.R.P. Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**E.I.R.P. Total Power [dBm]**	**Margin [dB]**
5190.00	20.87	15.42	14.34	17.92	-2.95
5230.00	20.87	13.69	12.71	16.24	-4.63

Note: 1.The highest output power was observed at 6Mbps, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total Power.
3. RSS-247 Limit = 23 dBm – 2.13 dBi = 20.87 dBm.
4. 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 6: RF Output Power at the Antenna Port – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage Only					
Antenna Type: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 21° C			**Relative Humidity:**37%		
802.11ac (FCC Limit)					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5190.00	30.00	19.15	19.59	22.39	-7.61
5230.00	30.00	20.83	19.31	23.15	-6.85
802.11ac (RSS Limit)					
Operating Channel (MHz)	**E.I.R.P. Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**E.I.R.P. Total Power [dBm]**	**Margin [dB]**
5190.00	20.87	15.54	14.23	17.94	-2.93
5230.00	20.87	13.77	12.64	16.25	-4.62

Note: 1.The highest output power was observed at 6Mbps, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total Power.
3. RSS-247 Limit = 23 dBm – 2.13 dBi = 20.87 dBm.
4. 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 7: RF Output Power at the Antenna Port – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage Only					
Antenna Type: Custom Integrated				**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 21° C				**Relative Humidity:**37%	
802.11ac (FCC Limit)					
Operating Channel (MHz)	**Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total Power [dBm]**	**Margin [dB]**
5210.00	30.00	19.81	16.52	21.48	-8.52
802.11ac (RSS Limit)					
Operating Channel (MHz)	**E.I.R.P. Limit [dBm]**	**Ch0 [dBm]**	**Ch1 [dBm]**	**E.I.R.P. Total Power [dBm]**	**Margin [dB]**
5210.00	20.87	14.20	13.25	16.76	-4.11

Note: 1.The highest output power was observed at 6Mbps, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total Power.
3. RSS-247 Limit = 23 dBm – 2.13 dBi = 20.87 dBm.
4. Plots for all the measurements stated above were taken, to reduce complexity and bulkiness of the report Highlighted Plots are placed in the report.

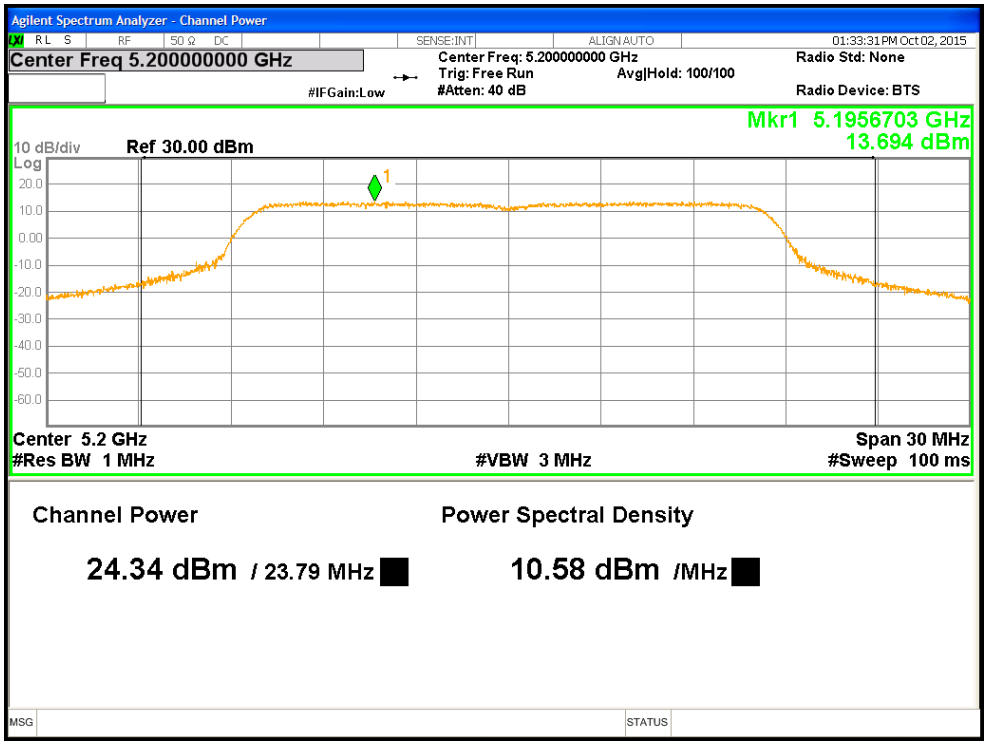


Figure 1: Maximum Transmitted Power (FCC), 5200 MHz at 11a, Chain 0

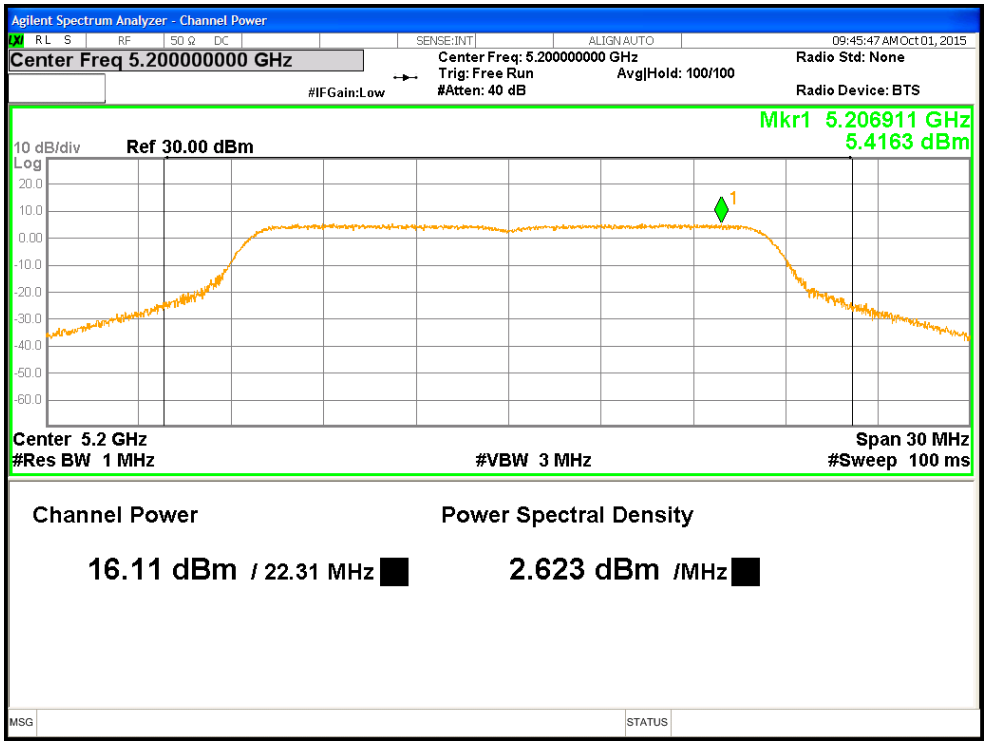


Figure 2: Maximum Transmitted Power (RSS), 5200 MHz at 11a, Chain 0

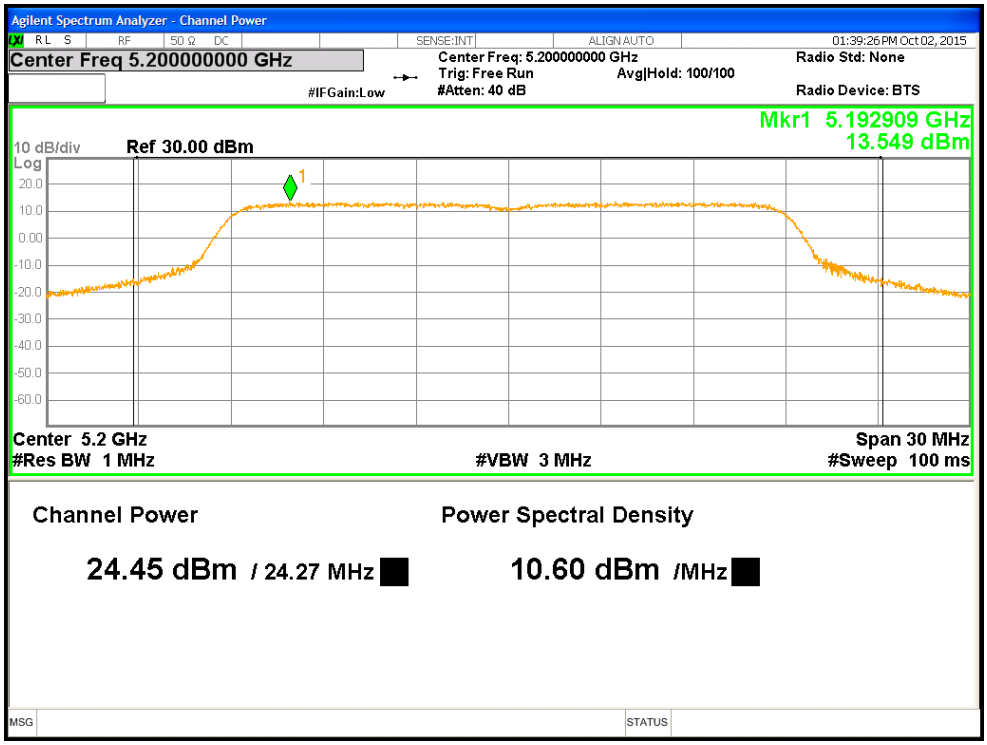


Figure 3: Maximum Transmitted Power (FCC), 5200 MHz at HT20 MCS0, Chain 0

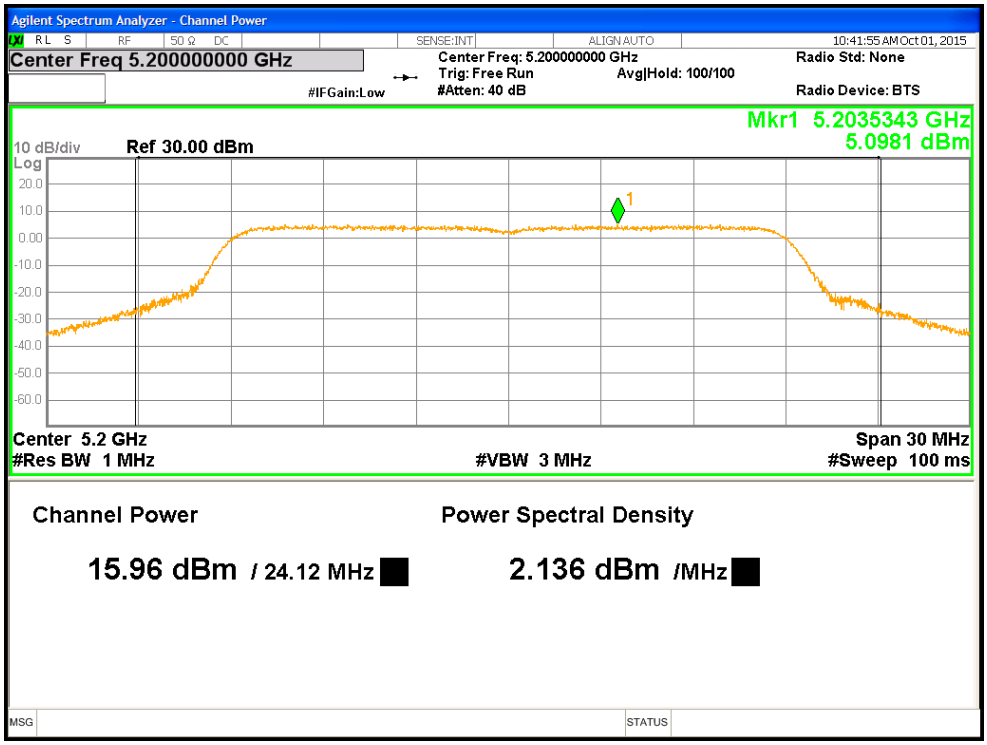


Figure 4: Maximum Transmitted Power (RSS), 5200 MHz at HT20 MCS0, Chain 0

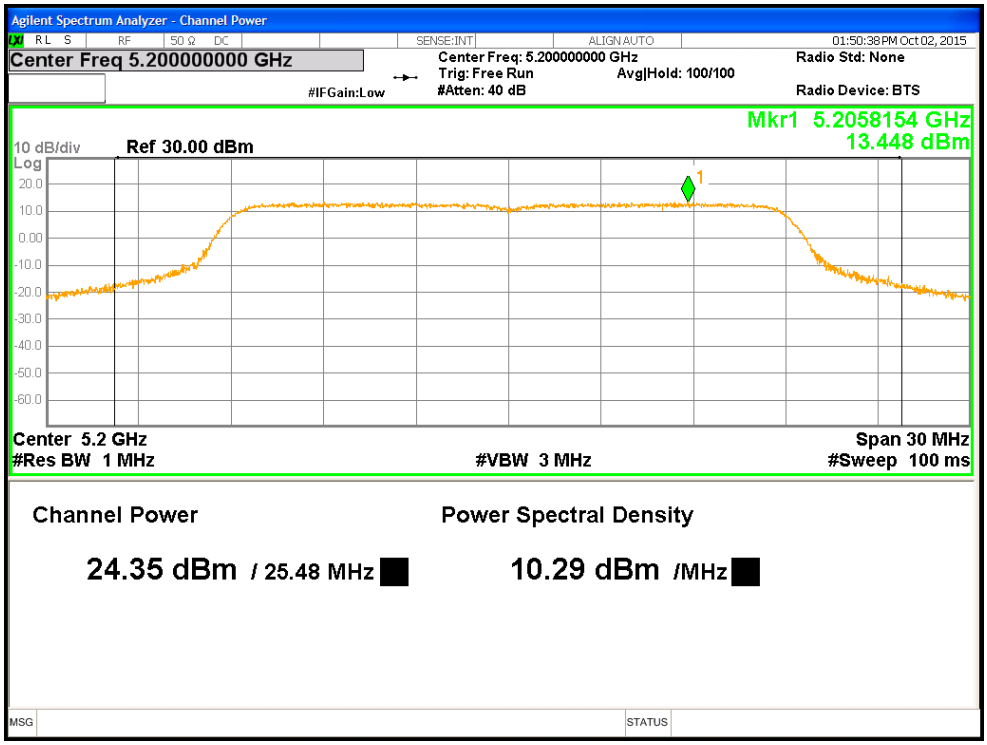


Figure 5: Maximum Transmitted Power (FCC), 5200 MHz at VHT20 MCS0, Chain 0

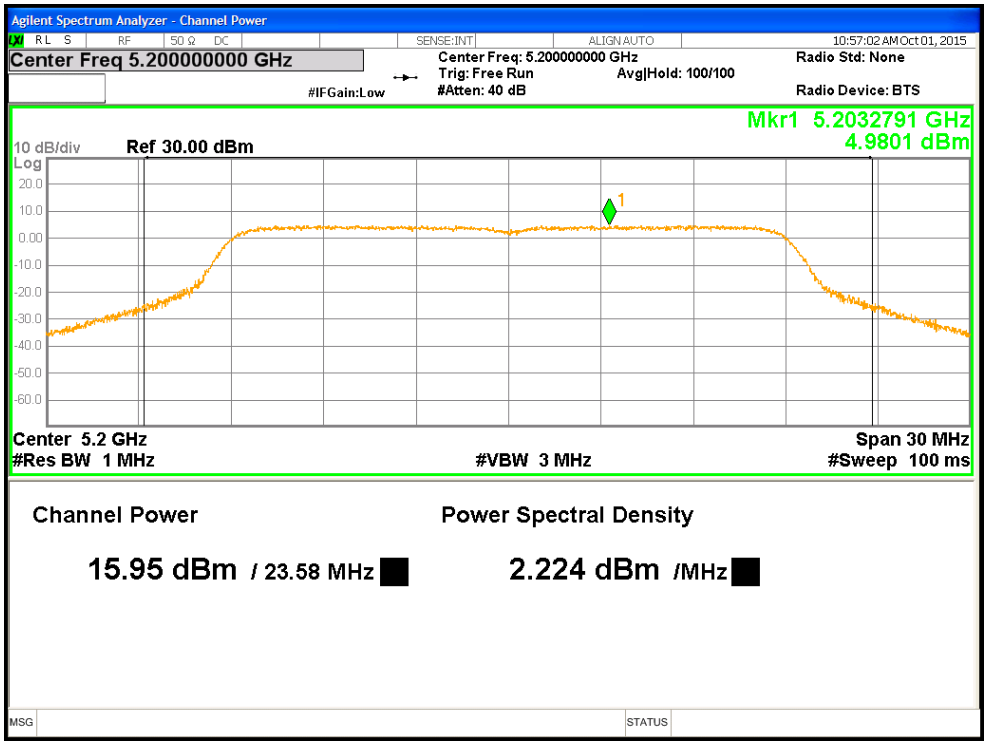


Figure 6: Maximum Transmitted Power (RSS), 5200 MHz at VHT20 MCS0, Chain 0

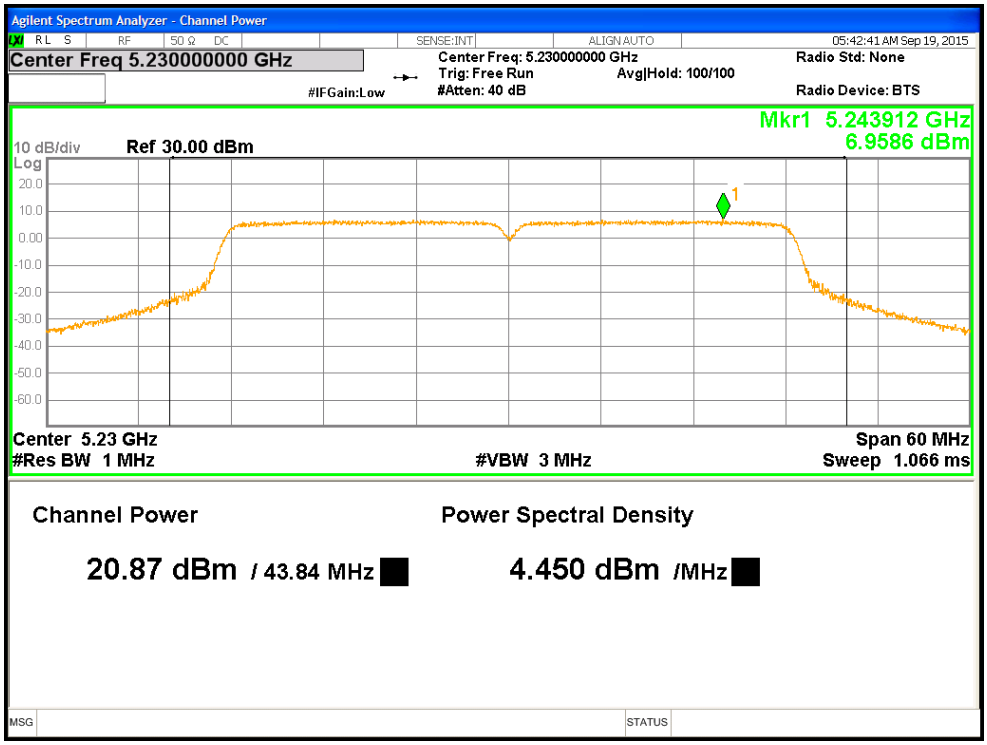


Figure 7: Maximum Transmitted Power (FCC), 5230 MHz at HT40 MCS0, Chain 0

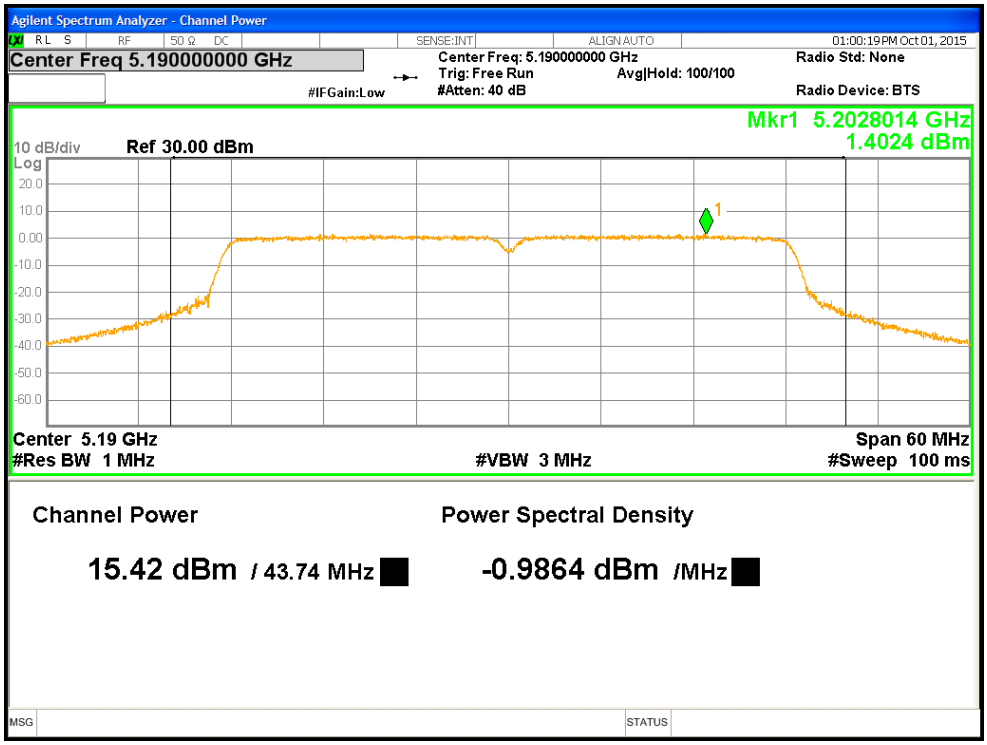


Figure 8: Maximum Transmitted Power (RSS), 5190 MHz at HT40 MCS0, Chain 0

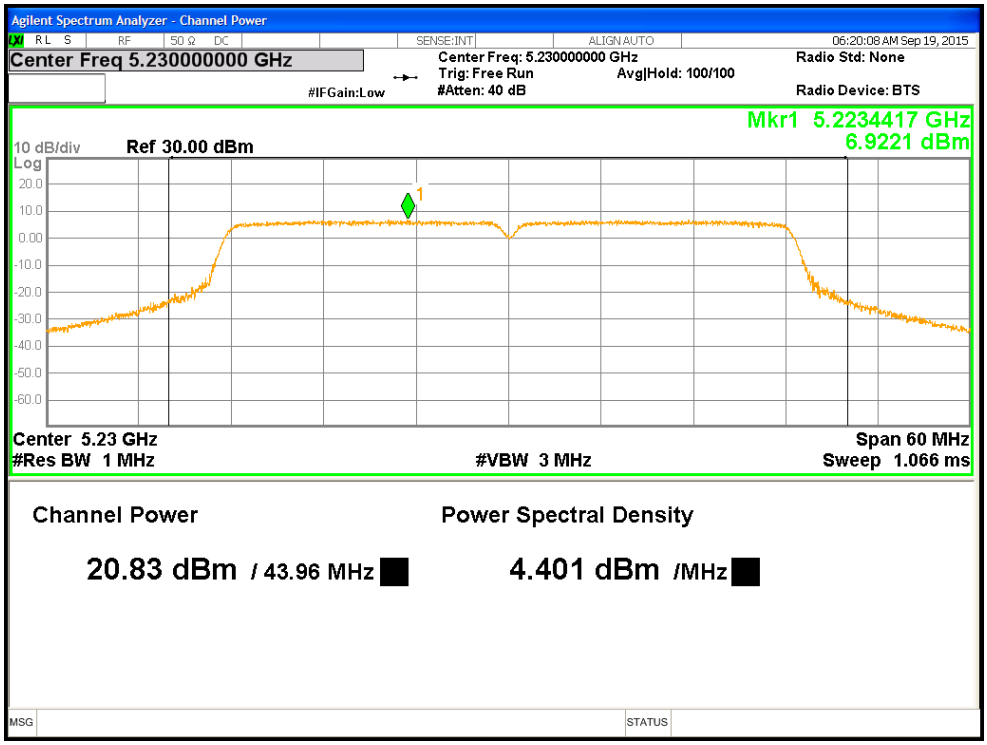


Figure 9: Maximum Transmitted Power (FCC), 5230 MHz at VHT40 MCS0, Chain 0

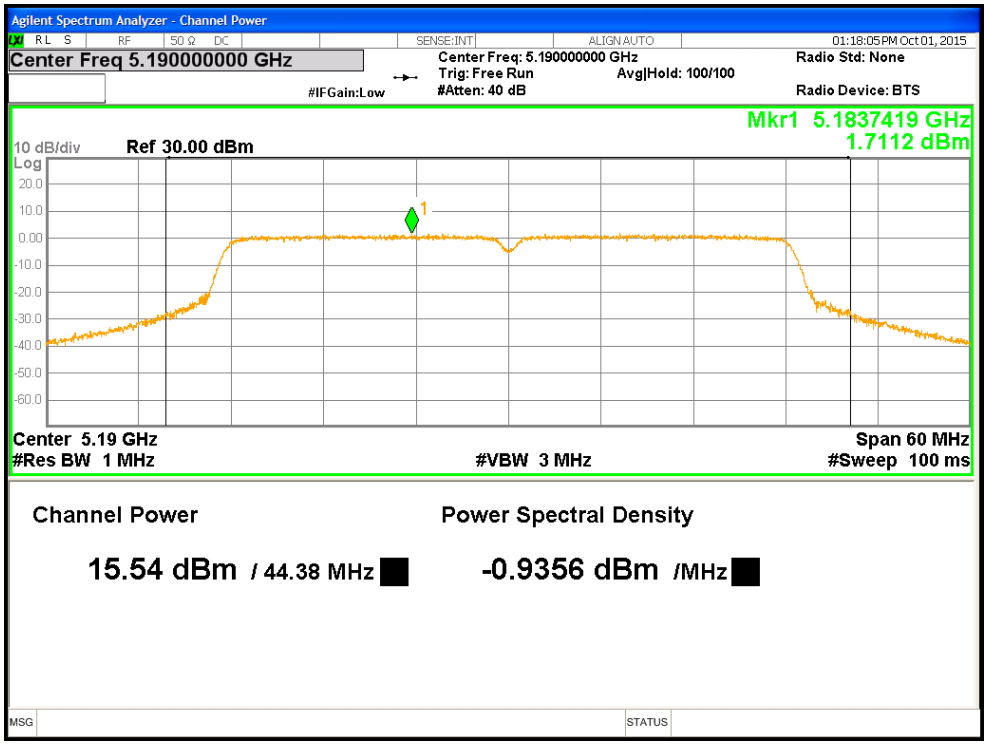


Figure 10: Maximum Transmitted Power (RSS), 5190 MHz at VHT40 MCS0, Chain 0

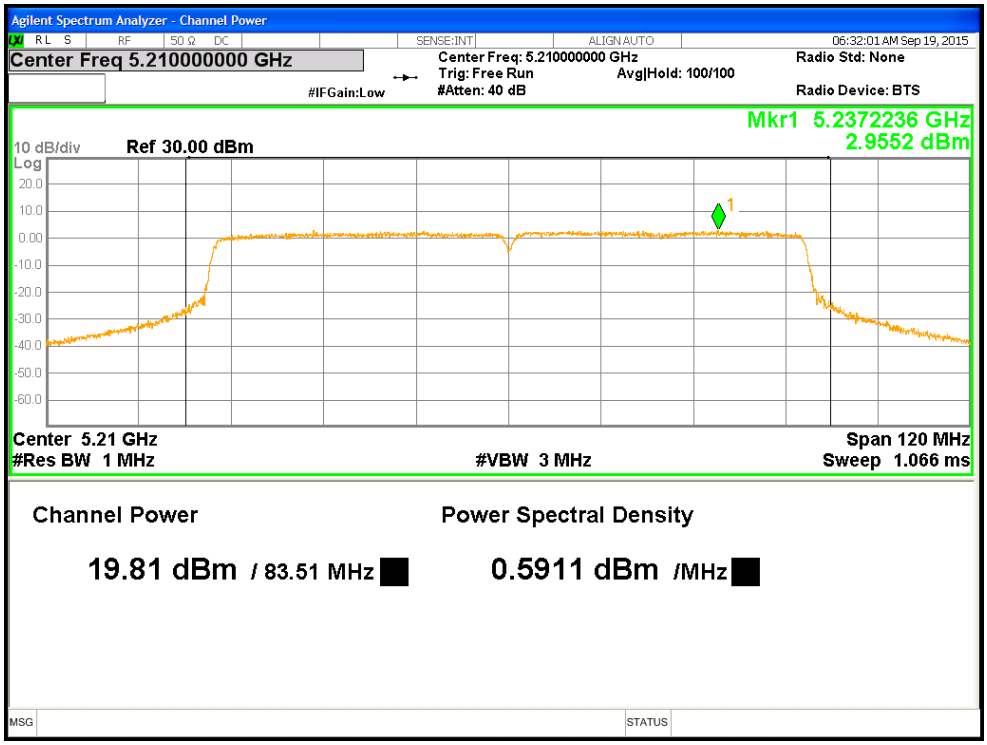


Figure 11: Maximum Transmitted Power (FCC), 5210 MHz at VHT80 MCS0, Chain 0

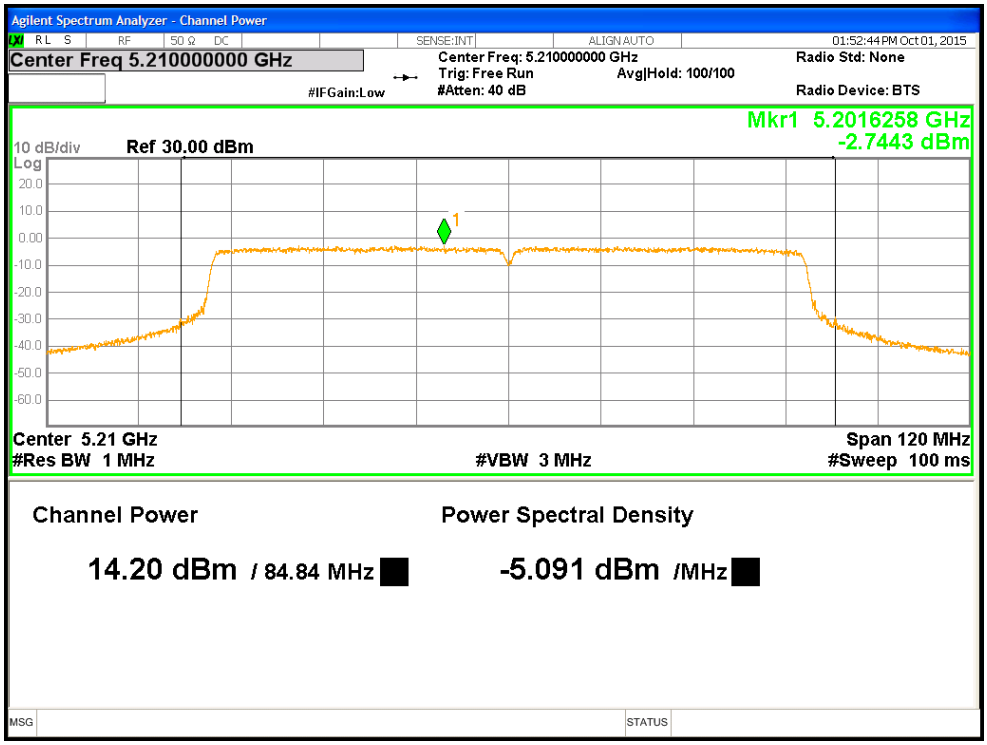


Figure 12: Maximum Transmitted Power (RSS), 5210 MHz at VHT80 MCS0, Chain 0

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.

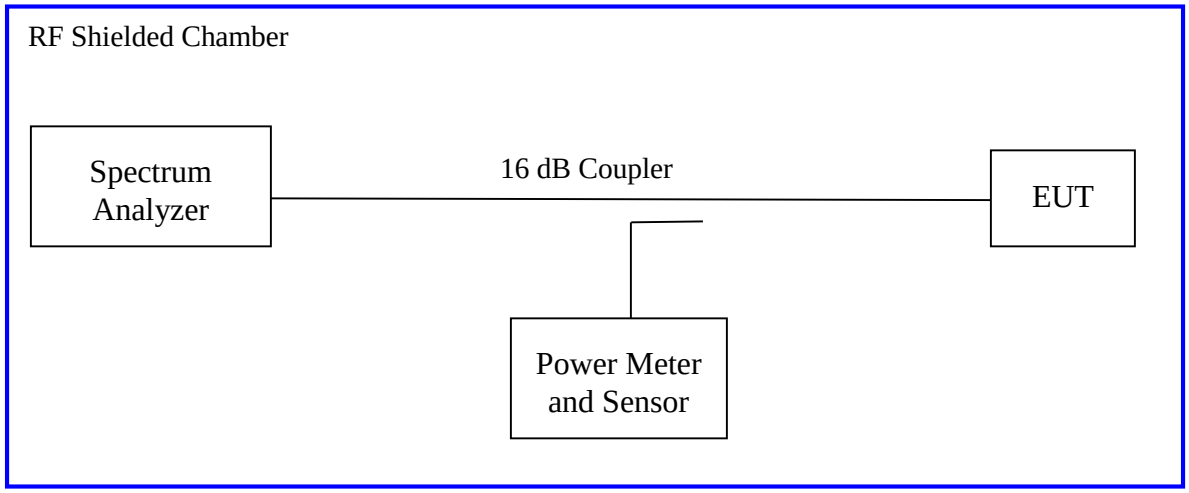
The 26 dB bandwidth is defined the bandwidth of 26 dBr from highest transmitted level of the fundamental frequency.

There is no restriction limits for the bandwidth. The 26 dB bandwidth was used to determine the limit for maximum conducted output power per CFR47 Part 15.407(a).

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth. The measurement was performed with modulation per CFR47 15.407(a) 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; 5150 MHz to 5250 MHz. The worst results indicated below.

Test Setup:



4.2.2 Results

These occupied bandwidth measurements were taken for references only.

Table 8: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only				
Antenna Type: Custom Integrated			**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi				
Signal State: Modulated at 100%.				
Ambient Temp.: 20° C			**Relative Humidity:**34%	
802.11a				
Freq. (MHz)	**26dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
5180	20.58	20.42	16.51	16.55
5200	27.13	21.15	16.75	16.54
5240	21.17	20.62	16.55	16.51
Note: 1. The bandwidth was measured at 6.0 Mbps. 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.				
802.11n				
Freq. (MHz)	**26dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
5180	22.49	20.92	17.70	17.69
5200	28.66	21.80	17.87	17.73
5240	21.46	22.06	17.75	17.71
Note: 1. The bandwidth was measured at HT20 MCS0, 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.				
802.11ac				
Freq. (MHz)	**26dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
5180	21.09	21.28	17.69	17.69
5200	26.19	22.05	17.81	17.69
5240	21.75	20.88	17.72	17.70
Note: 1. The bandwidth was measured at VHT20 MCS0, 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 9: Occupied Bandwidth – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only				
Antenna Type: Custom Integrated			**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi				
Signal State: Modulated at 100%.				
Ambient Temp.: 20° C			**Relative Humidity:**34%	
802.11n				
Freq. (MHz)	**26dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
5190	43.64	43.54	36.26	36.20
5230	42.55	42.15	36.26	36.29
Note: 1. The bandwidth was measured at HT40 MCS0, 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.				
802.11ac				
Freq. (MHz)	**26dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
5190	43.26	43.02	36.24	36.24
5230	41.82	42.90	36.24	36.20
Note: 1. The bandwidth was measured at VHT40 MCS0, 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.				
802.11ac				
Freq. (MHz)	**26dB Bandwidth (MHz)**		**99% Bandwidth (MHz)**	
	Ch0	**Ch1**	**Ch0**	**Ch1**
5210	83.16	83.07	75.73	75.72
Note: 1. The bandwidth was measured at VHT80 MCS0, 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.				

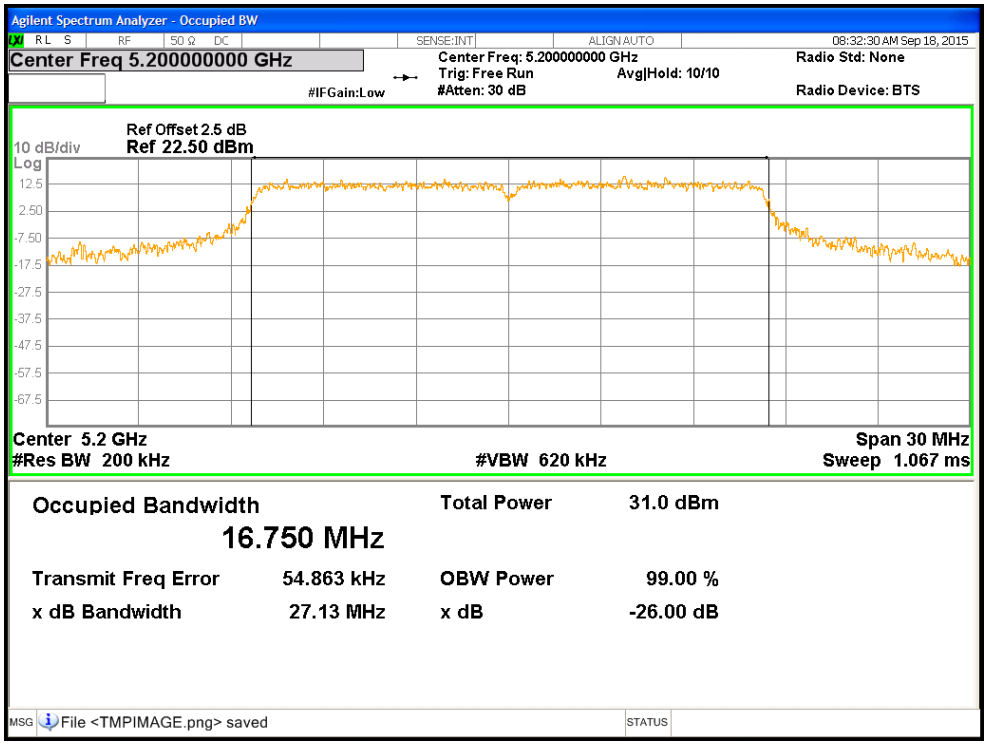


Figure 13: 26dB & 99% Occupied Bandwidth, 5200 MHz at 802.11a, Chain 0

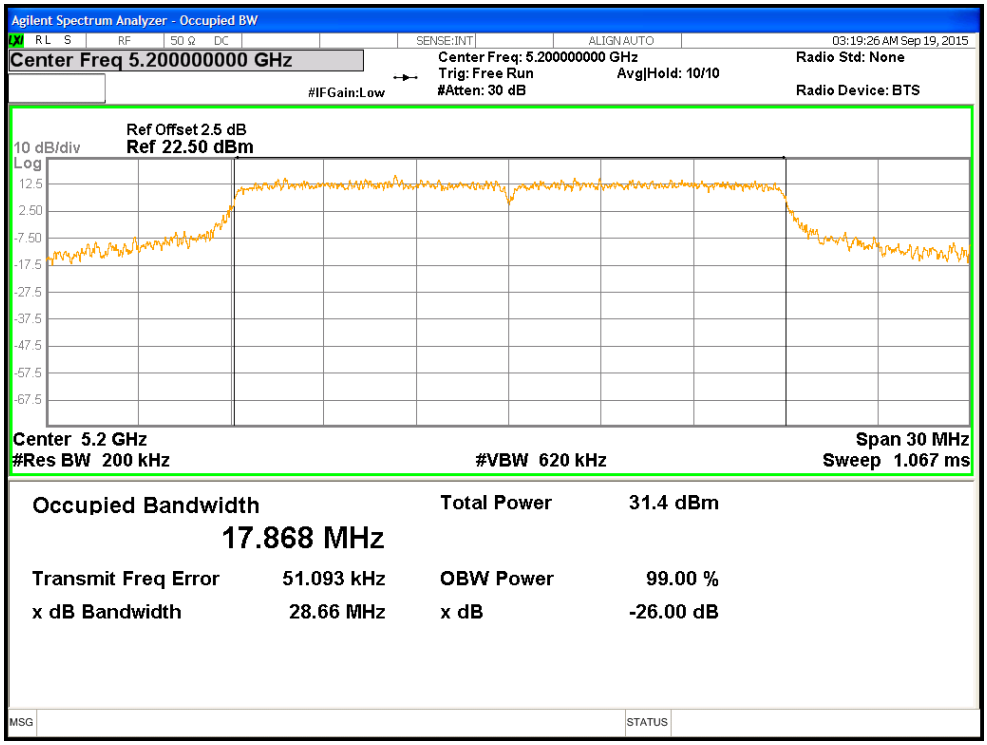


Figure 14: 26dB & 99% Occupied Bandwidth, 5200 MHz at HT20 MCS0, Chain 0

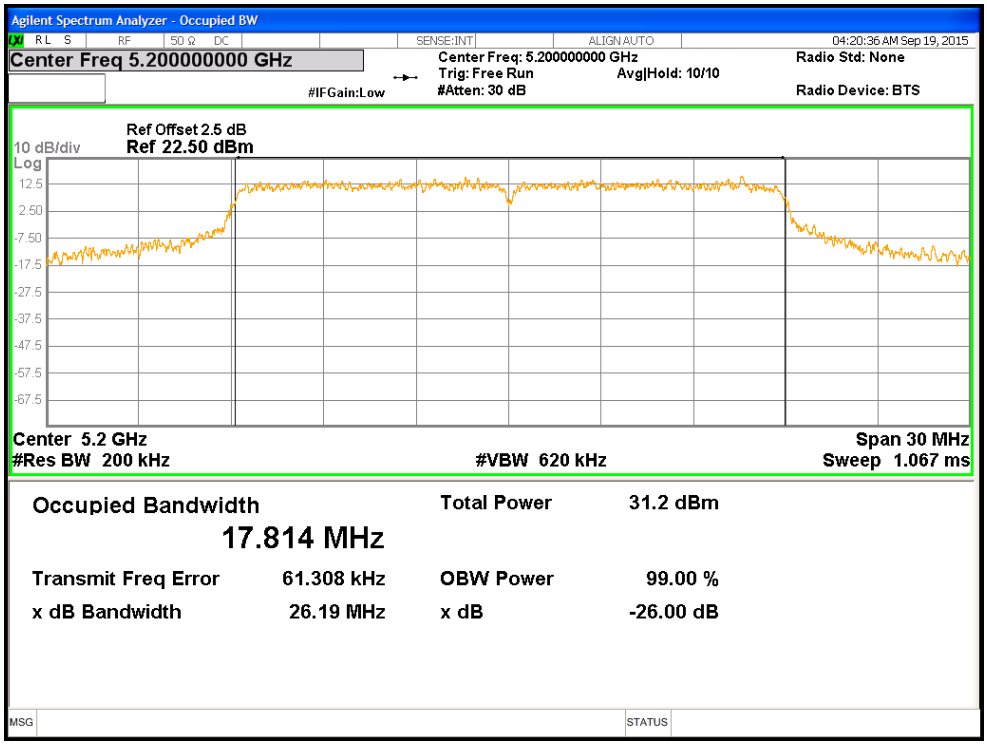


Figure 15: 26dB & 99% Occupied Bandwidth, 5200 MHz at VHT20 MCS0, Chain 0

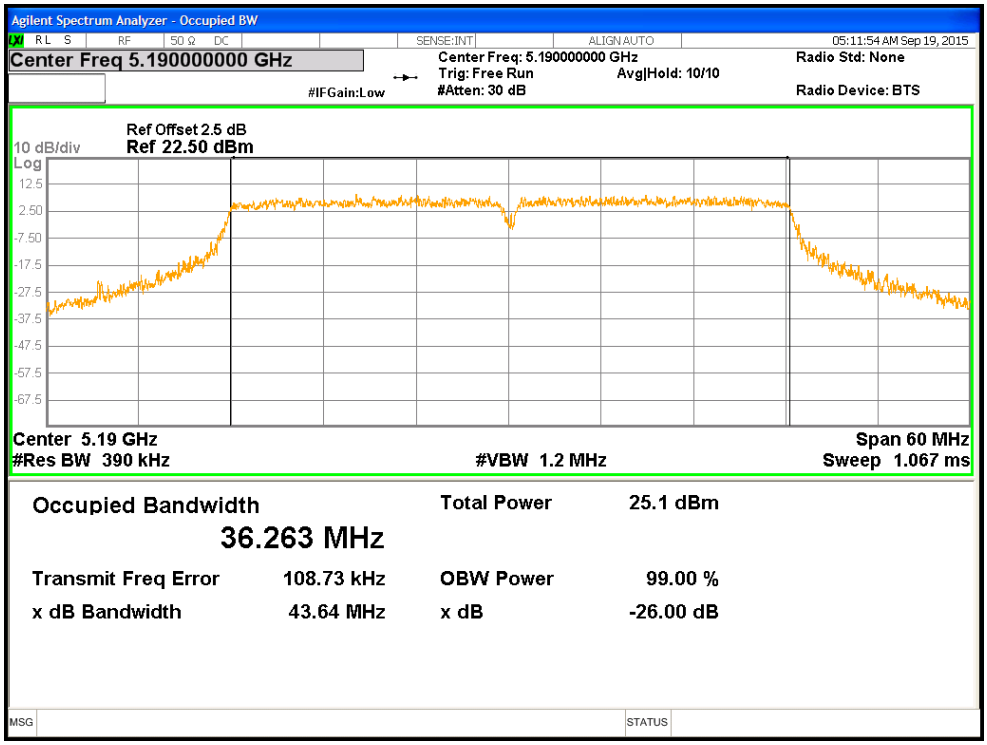


Figure 16: 26dB & 99% Occupied Bandwidth, 5190 MHz at HT40 MCS0, Chain 0

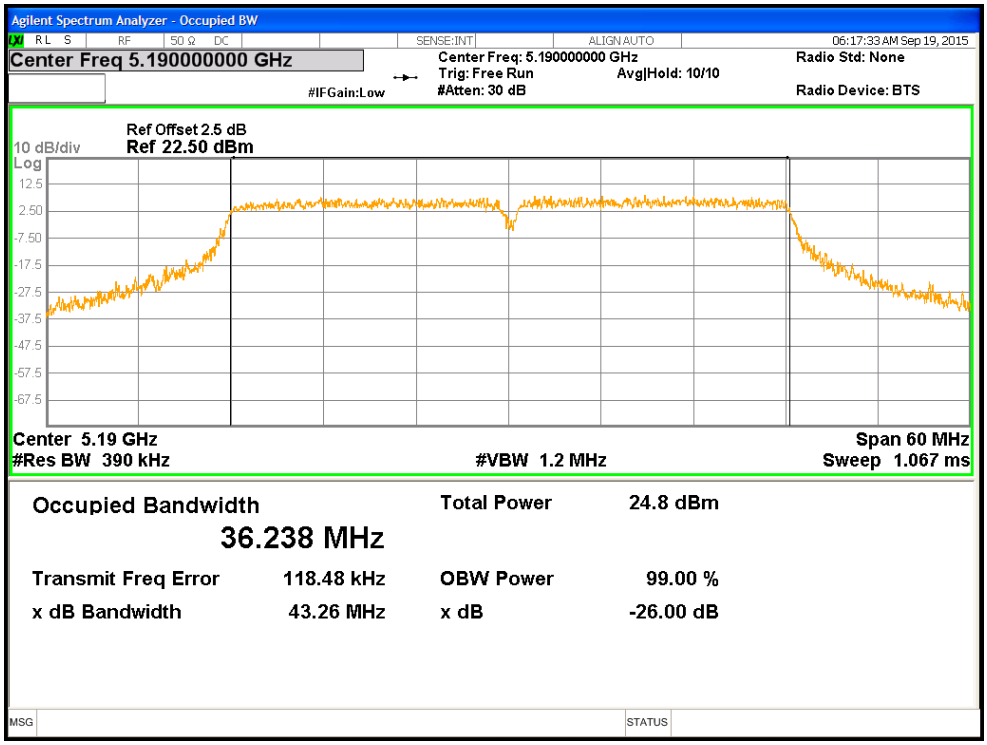


Figure 17: 26dB & 99% Occupied Bandwidth, 5190 MHz at VHT40 MCS0, Chain 0

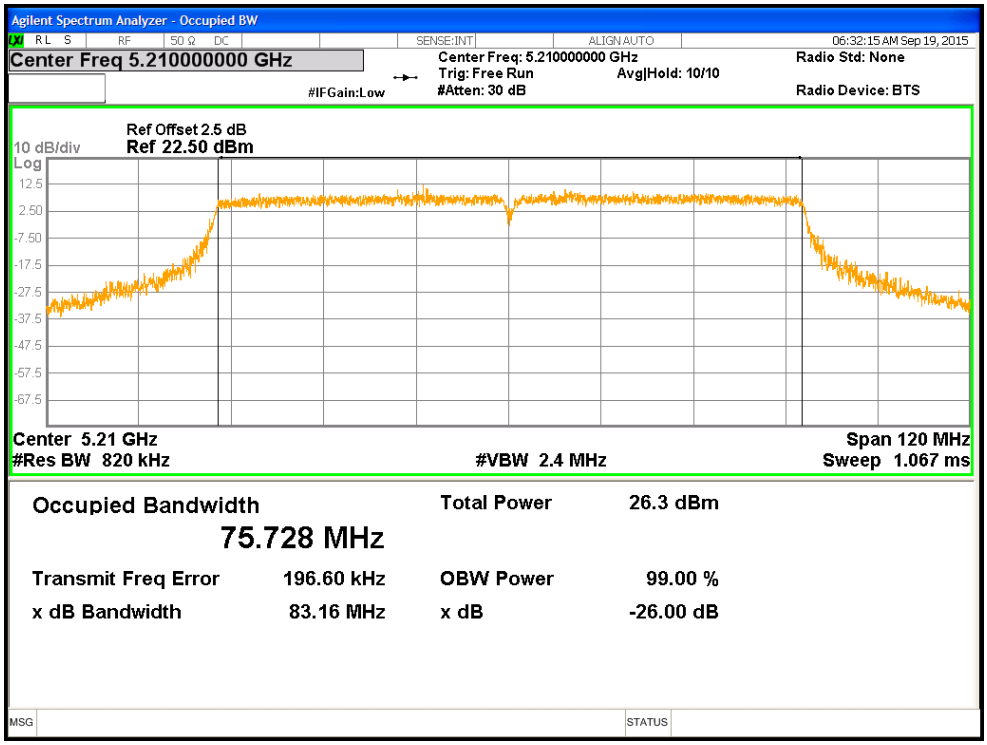


Figure 18: 26dB & 99% Occupied Bandwidth, 5210 MHz at VHT80 MCS0, Chain 0

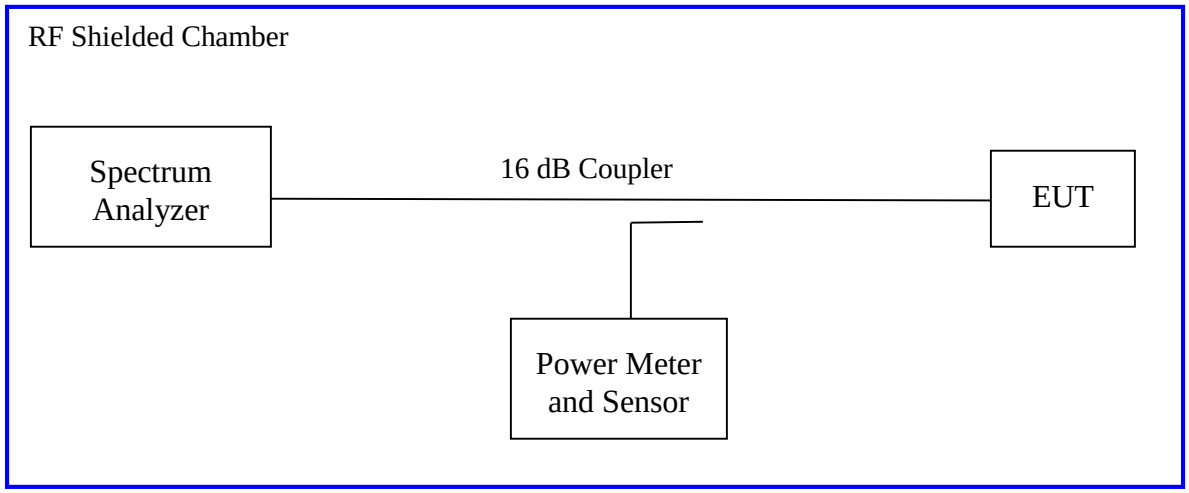
4.3 Peak Power Spectral Density

According to the CFR47 Part 15.407 (a) and RSS 247 Sect. 6.2.1.1 in the 5.15 – 5.25 GHz band, the spectral power density output of the antenna port shall be less than 11 dBm in any 1 MHz 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 12.3.2.2. The measurement was performed with modulation per CFR47 Part 15.407 (a) and RSS 247 Sect. 6.2.1.1. The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in each operating frequency range of 5150 MHz to 5250 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 10: Peak Power Spectral Density – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only					
Antenna Type: Custom Integrated				**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 20° C				**Relative Humidity:**34%	
Peak Power Spectral Density					
802.11a (FCC Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5180	12.09	10.36	14.32	17.00	-2.68
5200	13.96	13.35	16.35	17.00	-0.65
5240	10.68	8.86	12.87	17.00	-4.13
802.11a (RSS Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5180	5.04	3.77	7.26	7.87	-0.61
5200	5.20	4.09	7.28	7.87	-0.59
5240	3.75	3.07	6.17	7.87	-1.70

Note: 1.The highest output power was observed at 6Mbps, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total PSD.
3. RSS-247 Limit = 10 dBm – 2.13 dBi = 7.87 dBm.
4. 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 11: Peak Power Spectral Density – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only					
Antenna Type: Custom Integrated			**Power Setting:** See test plan		
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 20° C			**Relative Humidity:**34%		
Peak Power Spectral Density					
802.11n (FCC Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5180	12.27	9.76	14.20	17.00	-2.80
5200	13.48	12.47	15.83	17.00	-1.17
5240	10.53	8.87	12.79	17.00	-4.21
802.11n (RSS Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5180	4.69	3.67	6.74	7.87	-1.13
5200	5.00	3.82	7.00	7.87	-0.87
5240	3.3	2.45	5.67	7.87	-2.20

Note: 1.The highest output power was observed at HT20 MCS0, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total PSD.
3. RSS-247 Limit = 10 dBm – 2.13 dBi = 7.87 dBm.
4. 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 12: Peak Power Spectral Density – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only					
Antenna Type: Custom Integrated				**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 20° C				**Relative Humidity:**34%	
Peak Power Spectral Density					
802.11ac (FCC Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5180	11.84	9.74	13.93	17.00	-3.07
5200	13.25	12.67	15.60	17.00	-1.40
5240	10.06	8.84	12.50	17.00	-4.50
802.11ac (RSS Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5180	4.64	3.34	6.84	7.87	-1.03
5200	4.96	4.09	7.16	7.87	-0.71
5240	3.33	2.56	5.79	7.87	-2.08

Note: 1.The highest output power was observed at VHT20 MCS0, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total PSD.
3. RSS-247 Limit = 10 dBm – 2.13 dBi = 7.87 dBm.
4. 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 13: Peak Power Spectral Density – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only					
Antenna Type: Custom Integrated				**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 20° C				**Relative Humidity:**34%	
Peak Power Spectral Density					
802.11n (FCC Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5190	5.63	5.94	8.80	17.00	-8.20
5230	6.88	5.57	9.28	17.00	-7.72
802.11n (RSS Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5190	1.45	0.33	3.94	7.87	-3.93
5230	-0.19	-1.14	2.37	7.87	-5.50
Note: 1.The highest output power was observed at HT40 MCS0, 1 Data Stream. 2. The sum of Ch0 and Ch1 = Total PSD. 3. RSS-247 Limit = 10 dBm – 2.13 dBi = 7.87 dBm. 4. Plots for all the measurements stated above were taken, to reduce complexity and bulkiness of the report Highlighted Plots are placed in the report.					
802.11ac (FCC Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5190	5.43	5.78	8.62	17.00	-8.38
5230	6.67	5.30	9.05	17.00	-7.95
802.11ac (RSS Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5190	1.43	0.13	3.84	7.87	-4.03
5230	-0.11	-1.32	2.34	7.87	-5.53
Note: 1.The highest output power was observed at VHT40 MCS0, 1 Data Stream. 2. The sum of Ch0 and Ch1 = Total PSD. 3. RSS-247 Limit = 10 dBm – 2.13 dBi = 7.87 dBm. 4. 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 14: Peak Power Spectral Density – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only					
Antenna Type: Custom Integrated				**Power Setting:** See test plan	
Max. Directional Gain: + 2.13 dBi					
Signal State: Modulated at 100%.					
Ambient Temp.: 20° C				**Relative Humidity:**34%	
Peak Power Spectral Density					
802.11ac (FCC Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5210	2.88	-0.65	4.47	17.00	-12.53
802.11ac (RSS Limit)					
Freq. (MHz)	**Ch0 [dBm]**	**Ch1 [dBm]**	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5210	-2.82	-3.86	-0.30	7.87	-8.17

Note: 1.The highest output power was observed at VHT80 MCS0, 1 Data Stream.
2. The sum of Ch0 and Ch1 = Total PSD.
3. RSS-247 Limit = 10 dBm – 2.13 dBi = 7.87 dBm.
4. Plots for all the measurements stated above were taken, to reduce complexity and bulkiness of the report Highlighted Plots are placed in the report.

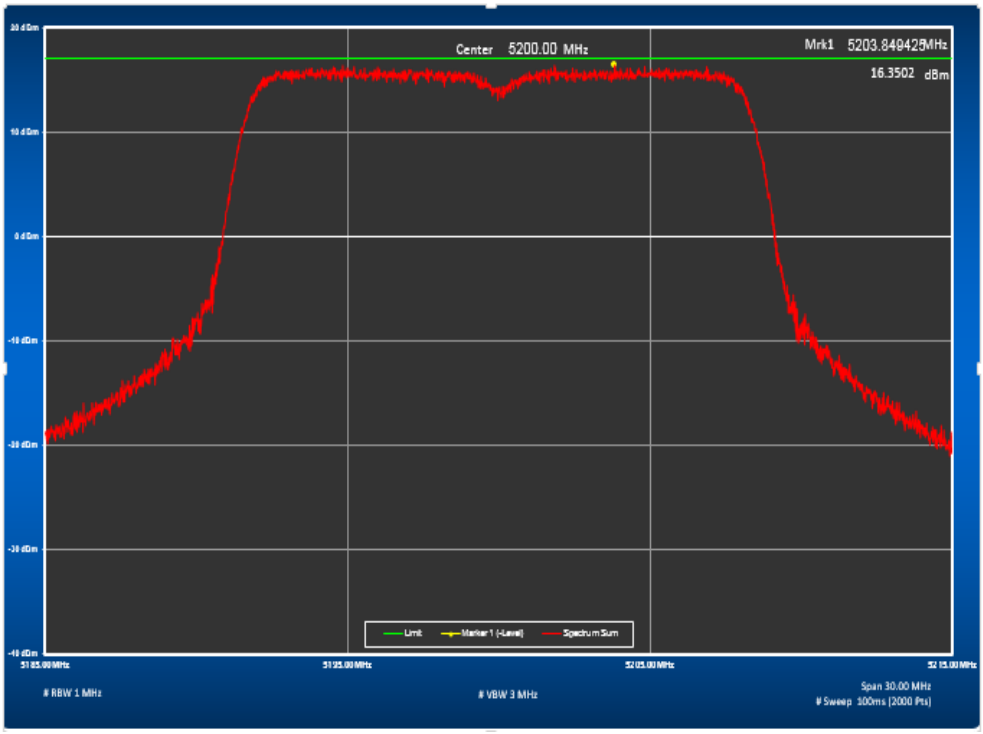


Figure 19: Power Spectral Density (FCC), 5200 MHz at 802.11a 6Mbps, Chain 0 & 1

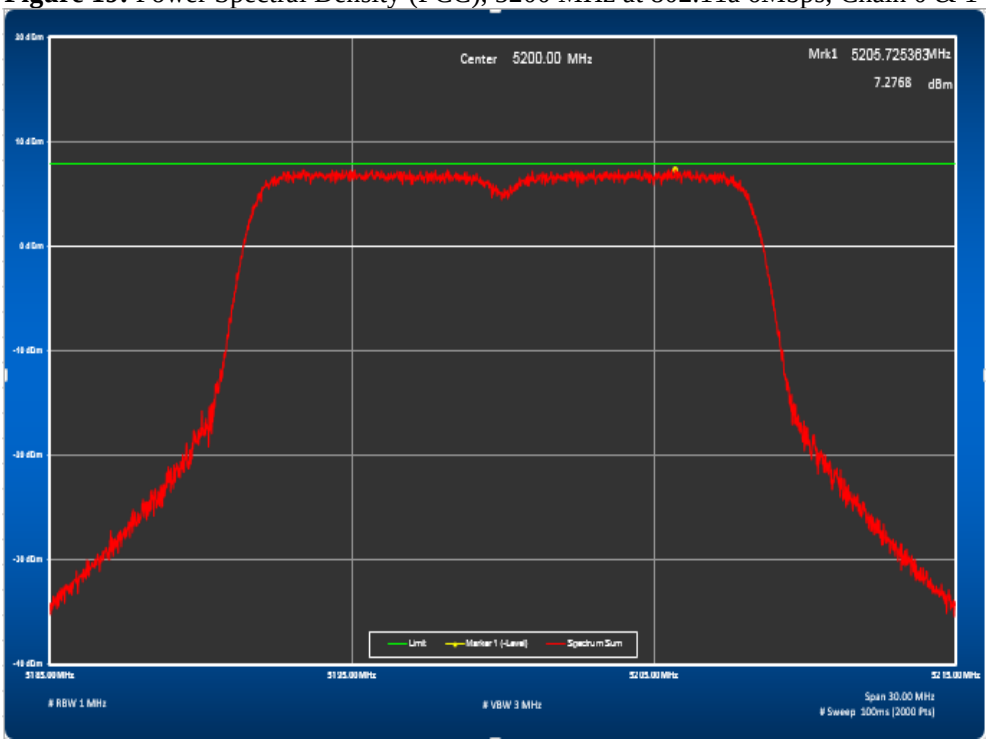


Figure 20: Power Spectral Density (RSS), 5200 MHz at 802.11a 6Mbps, Chain 0 & 1

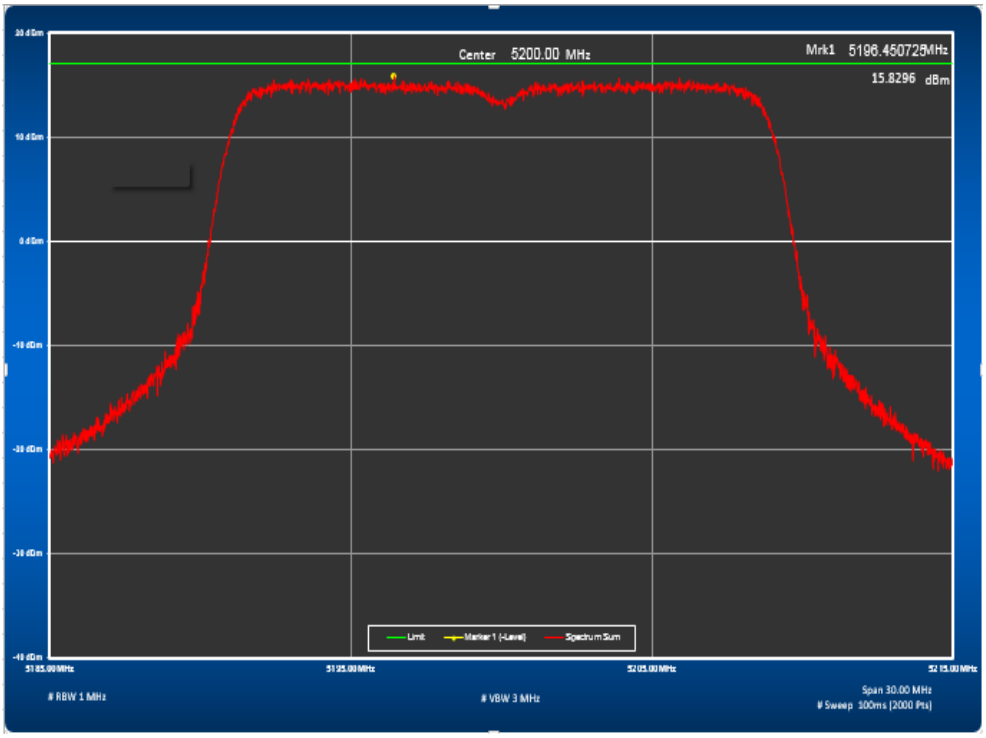


Figure 21: Power Spectral Density (FCC), 5200 MHz at HT20 MCS0, Chain 0 & 1

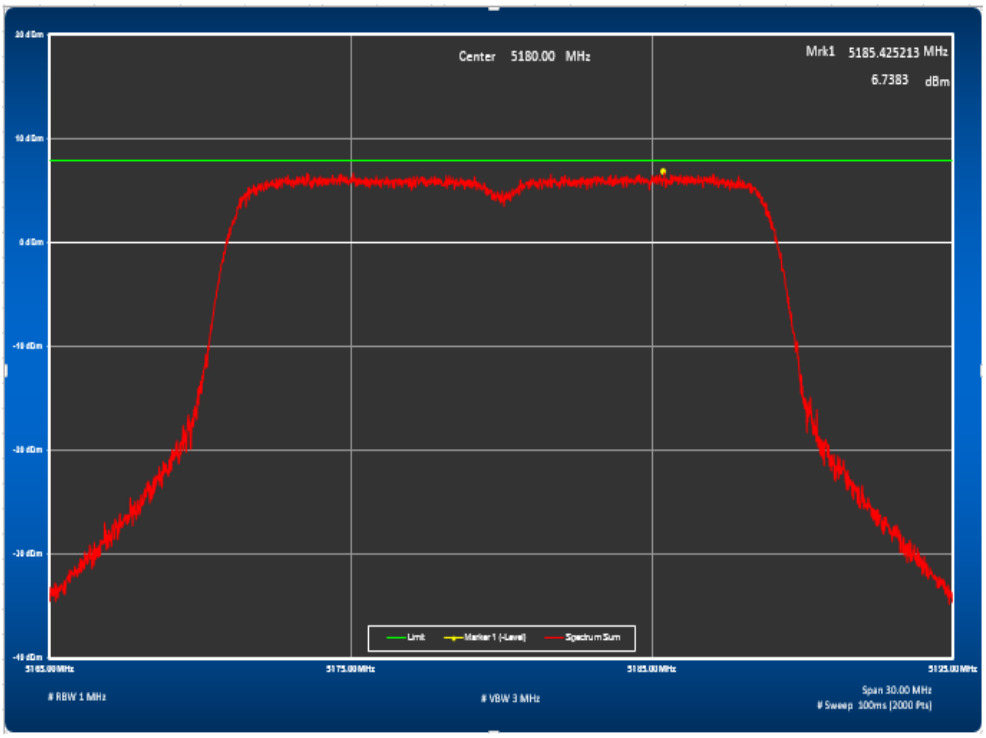


Figure 22: Power Spectral Density (RSS), 5200 MHz at HT20 MCS0, Chain 0 & 1

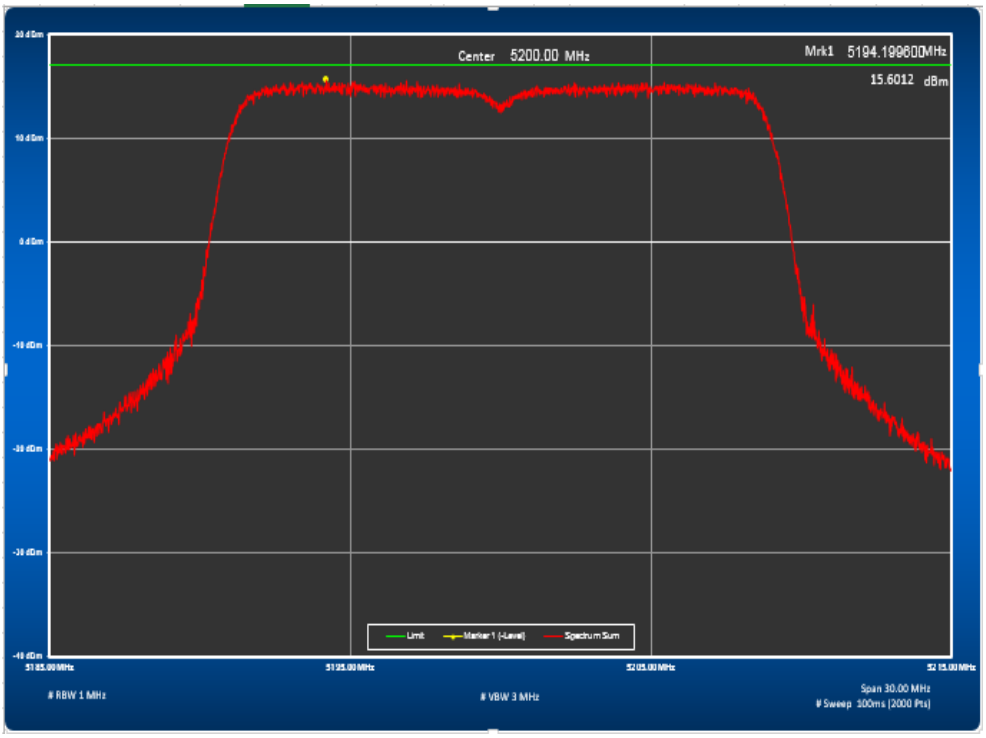


Figure 23: Power Spectral Density (FCC), 5200 MHz at VHT20 MCS0, Chain 0 & 1

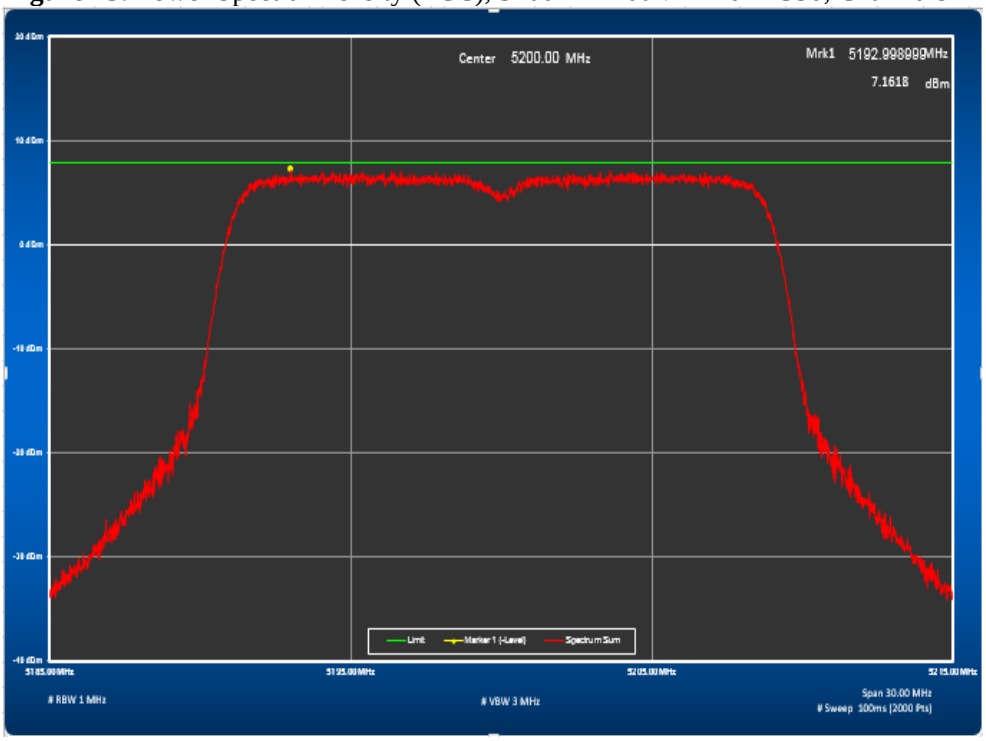


Figure 24: Power Spectral Density (RSS), 5200 MHz at VHT20 MCS0, Chain 0 & 1

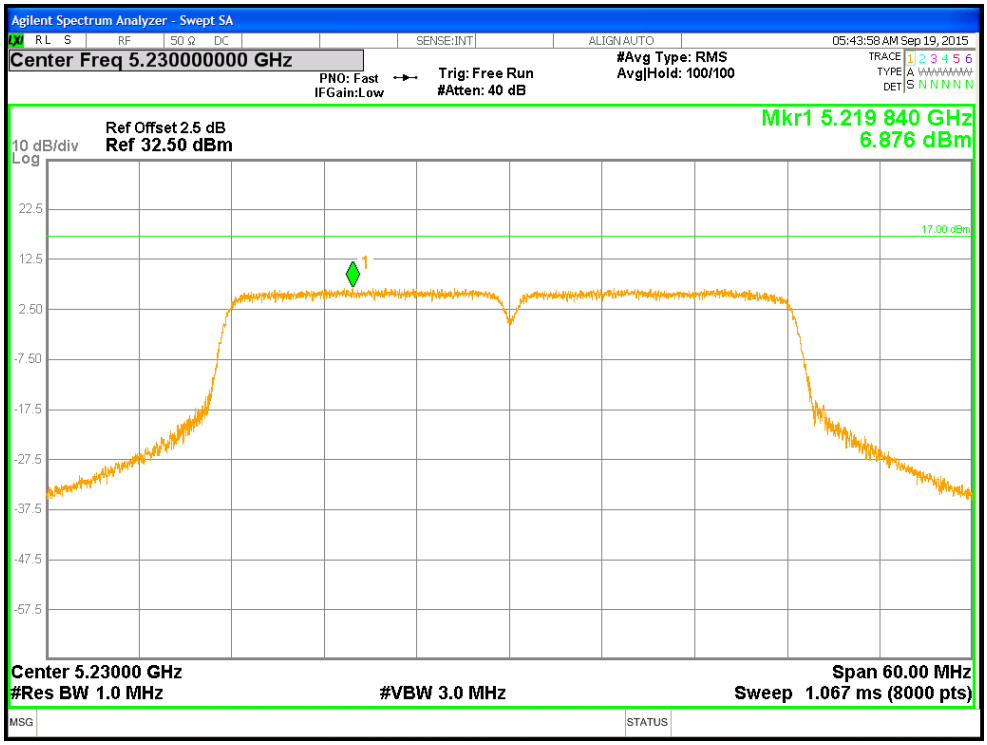


Figure 25: Power Spectral Density (FCC), 5230 MHz at HT40 MCS0, Chain 0

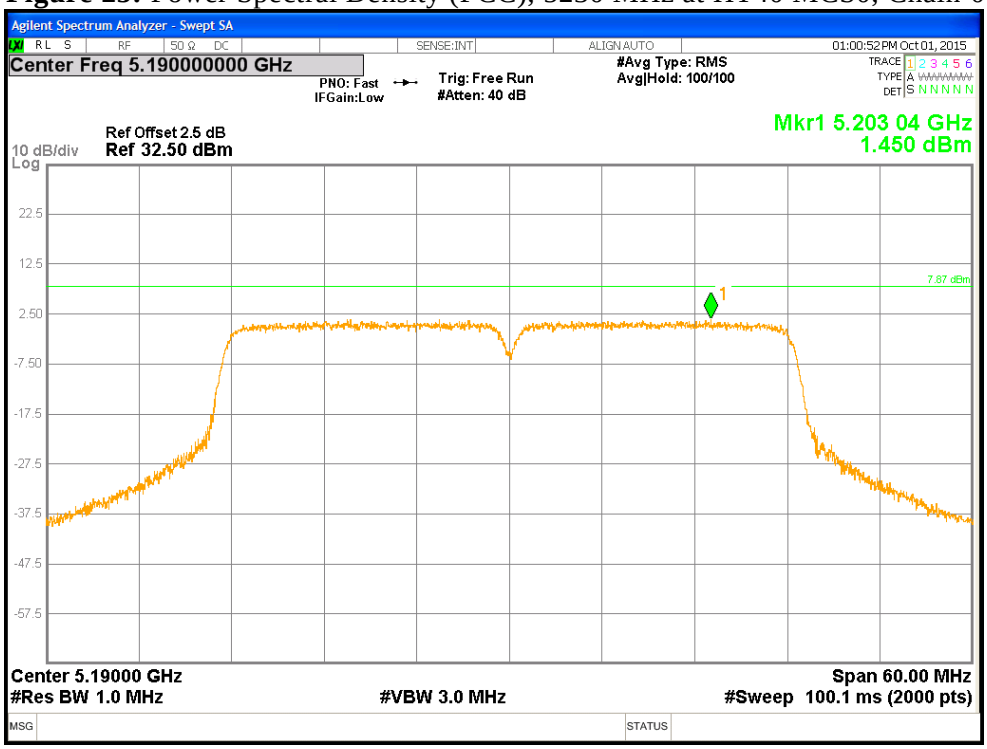


Figure 26: Power Spectral Density (RSS), 5190 MHz at HT40 MCS0, Chain 0

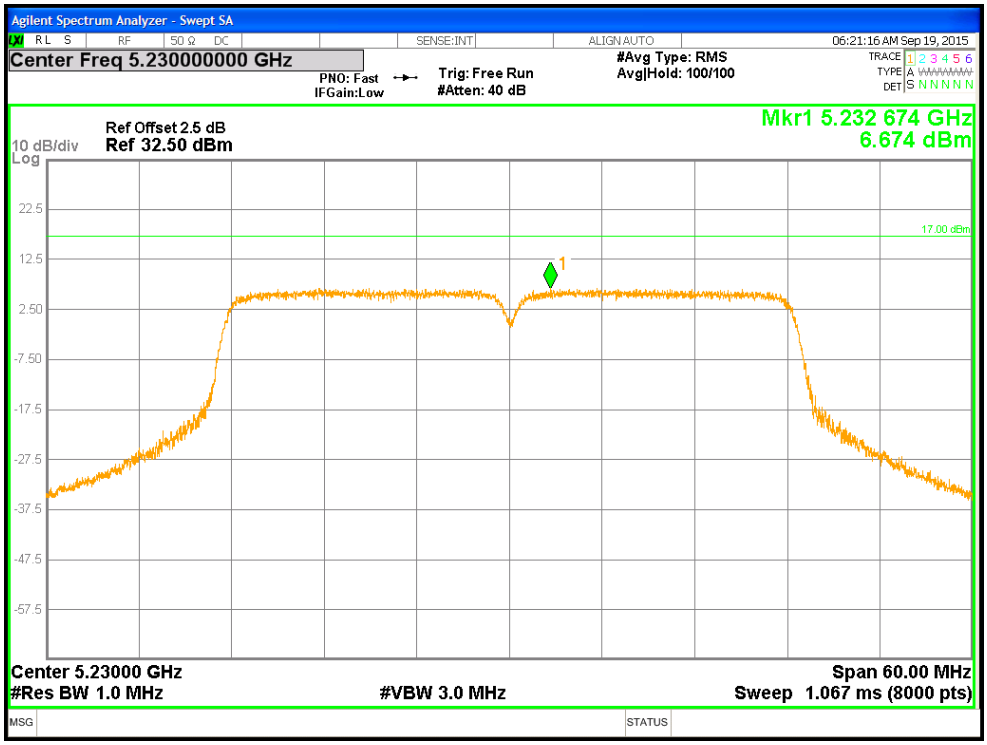


Figure 27: Power Spectral Density (FCC), 5230 MHz at VHT40 MCS0, Chain 0

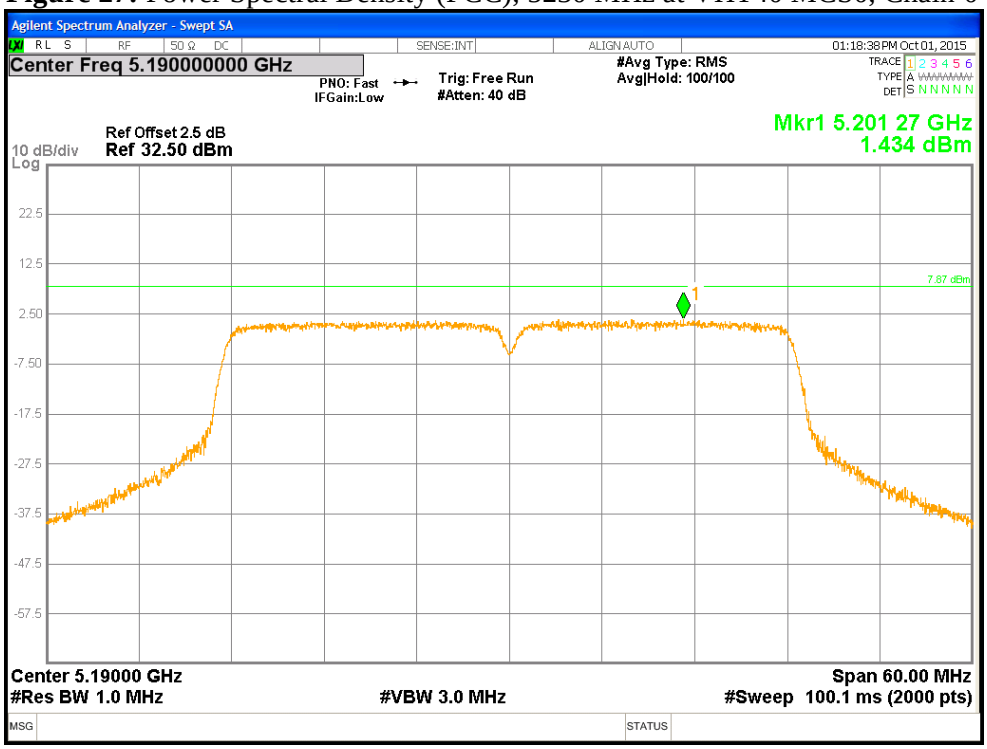


Figure 28: Power Spectral Density (RSS), 5190 MHz at VHT40 MCS0, Chain 0

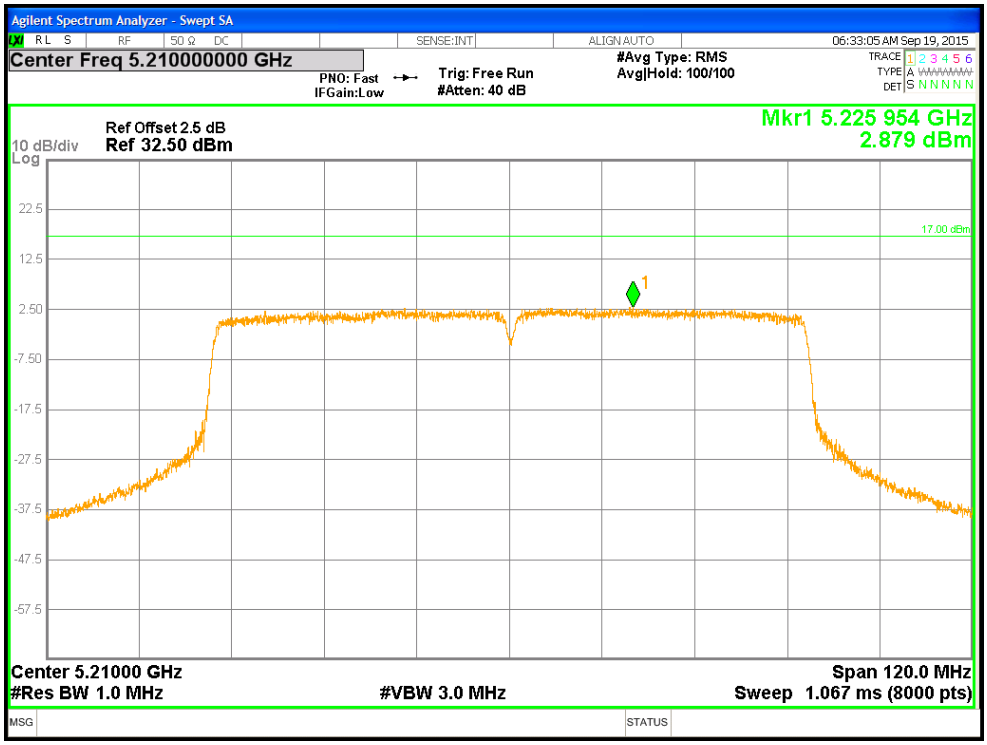


Figure 29: Power Spectral Density (FCC), 5210 MHz at VHT80 MCS0, Chain 0

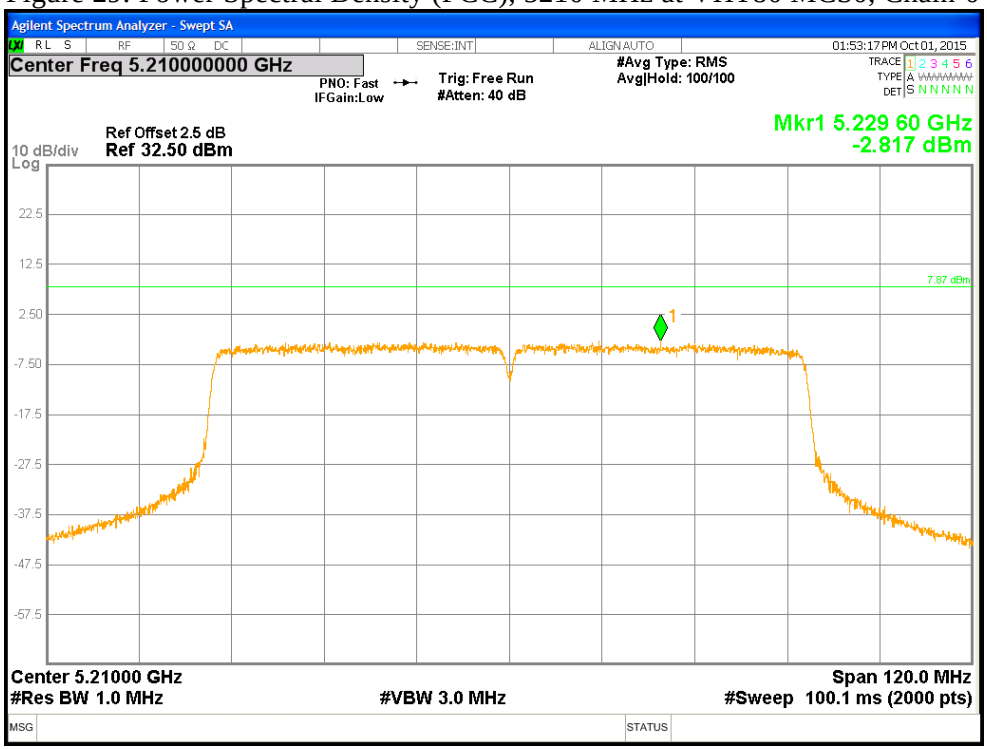


Figure 30: Power Spectral Density (RSS), 5210 MHz at VHT80 MCS0, Chain 0

4.4 Undesirable Emission Limits

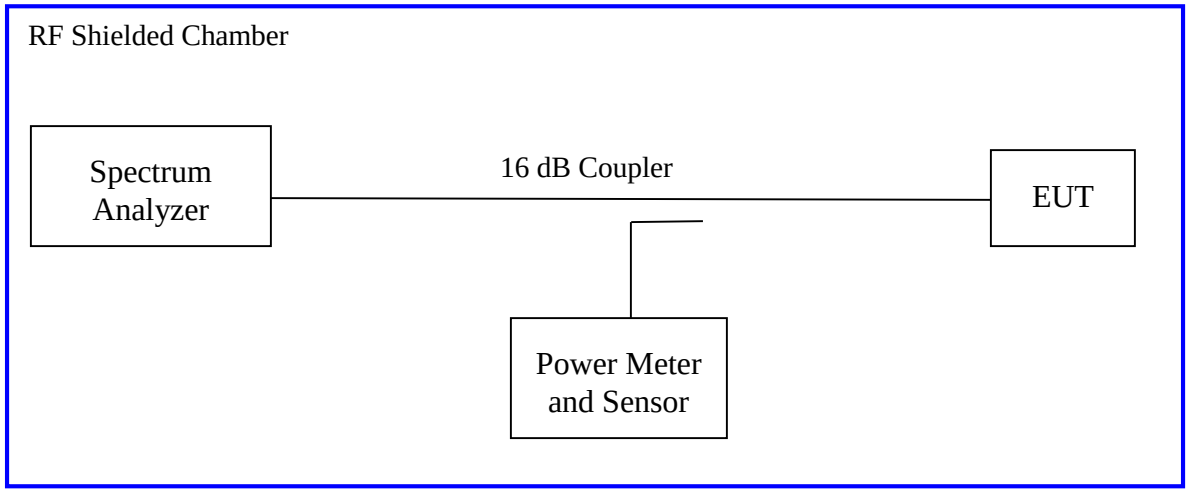
CFR47 15.407 (b) and RSS 247 Sect.6: The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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 15: Emissions at the Band-Edge – Test Results

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only						
Antenna Type: Custom Integrated			**Power Setting:** See test plan			
Max. Directional Gain: + 2.13 dBi						
Signal State: Modulated at 100%.						
Ambient Temp.: 20° C			**Relative Humidity:**32%			
Non-Restricted Frequency Band Emission						
Freq. (MHz)	**Mode**	**Chain**	**Measured (dBm)**	**Limit (dBm)**	**Plots**	**Comments**
5150	6Mbps	0	-34.34	-27.00	Fig. 31, 32	Pass
5149.25	6Mbps	1	-31.60	-27.00	Fig. 33, 34	Pass
5248.30	6Mbps	0	N/A	N/A	Fig. 35	Pass In-band-edge. No DFS needed.
5248.30	6Mbps	1	N/A	N/A	Fig. 36	Pass In-band-edge. No DFS needed.
5150	HT20-MCS0	0	-37.10	-27.00	Fig. 37, 38	Pass
5144.42	HT20-MCS0	1	-32.71	-27.00	Fig. 39, 40	Pass
5248.95	HT20-MCS0	0	N/A	N/A	Fig. 41	Pass In-band-edge. No DFS needed.
5248.89	HT20-MCS0	1	N/A	N/A	Fig. 42	Pass In-band-edge. No DFS needed.
5145.18	VHT20 MCS0	0	-29.85	-27.00	Fig. 43, 44	Pass
5146.28	VHT20 MCS0	1	-29.98	-27.00	Fig. 45, 46	Pass
5248.93	VHT20 MCS0	0	N/A	N/A	Fig. 47	Pass In-band-edge. No DFS needed.
5248.92	VHT20 MCS0	1	N/A	N/A	Fig. 48	Pass In-band-edge. No DFS needed.
5150	HT40 MCS0	0	-34.91	-27.00	Fig. 49, 50	Pass
5150	HT40 MCS0	1	-32.56	-27.00	Fig. 51, 52	Pass
5248.27	HT40 MCS0	0	N/A	N/A	Fig. 53	Pass In-band-edge. No DFS needed.
5248.20	HT40 MCS0	1	N/A	N/A	Fig. 54	Pass In-band-edge. No DFS needed.
Note: 1. All out of band emissions are lower than the 27dBr level. 2. The maximum out of band emission on each individual output is at least 27 dB below the maximum in-band PSD on that output per KDB 662911.						

Table 16: Emissions at the Band-Edge – Test Results Continues

Test Conditions: Conducted Measurement, Normal Temperature and Voltage only						
Antenna Type: Custom Integrated			**Power Setting:** See test plan			
Max. Directional Gain: + 2.13 dBi						
Signal State: Modulated at 100%.						
Ambient Temp.: 20° C			**Relative Humidity:**32%			
Non-Restricted Frequency Band Emission						
Freq. (MHz)	**Mode**	**Chain**	**Measured (dBm)**	**Limit (dBm)**	**Plots**	**Comments**
5150	VHT40 MCS0	0	-36.38	-27.00	Fig. 55, 56	Pass
5149.02	VHT40 MCS0	1	-29.74	-27.00	Fig. 57, 58	Pass
5248.19	VHT40 MCS0	0	N/A	N/A	Fig. 59	Pass In-band-edge. No DFS needed.
5248.24	VHT40 MCS0	1	N/A	N/A	Fig. 60	Pass In-band-edge. No DFS needed.
5150	VHT80 MCS0	0	-27.73	-27.00	Fig. 61, 62	Pass
5150	VHT80 MCS0	1	-34.44	-27.00	Fig. 63, 64	Pass
5248.03	VHT80 MCS0	0	N/A	N/A	Fig. 65	Pass In-band-edge. No DFS needed.
5248.06	VHT80 MCS0	1	N/A	N/A	Fig. 66	Pass In-band-edge. No DFS needed.
Note: 1. All out of band emissions are lower than the 27dBr level. 2. The maximum out of band emission on each individual output is at least 27 dB below the maximum in-band PSD on that output per KDB 662911.						

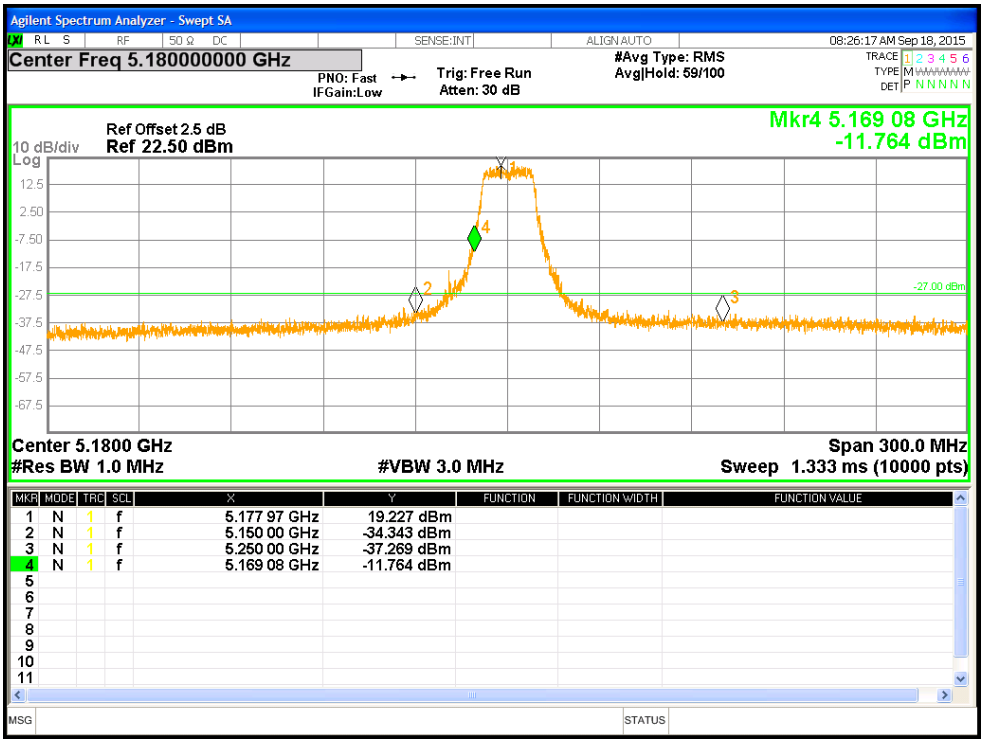


Figure 31: Measured Bandedge for 802.11a-6Mbps at 5180 MHz, Chain 0

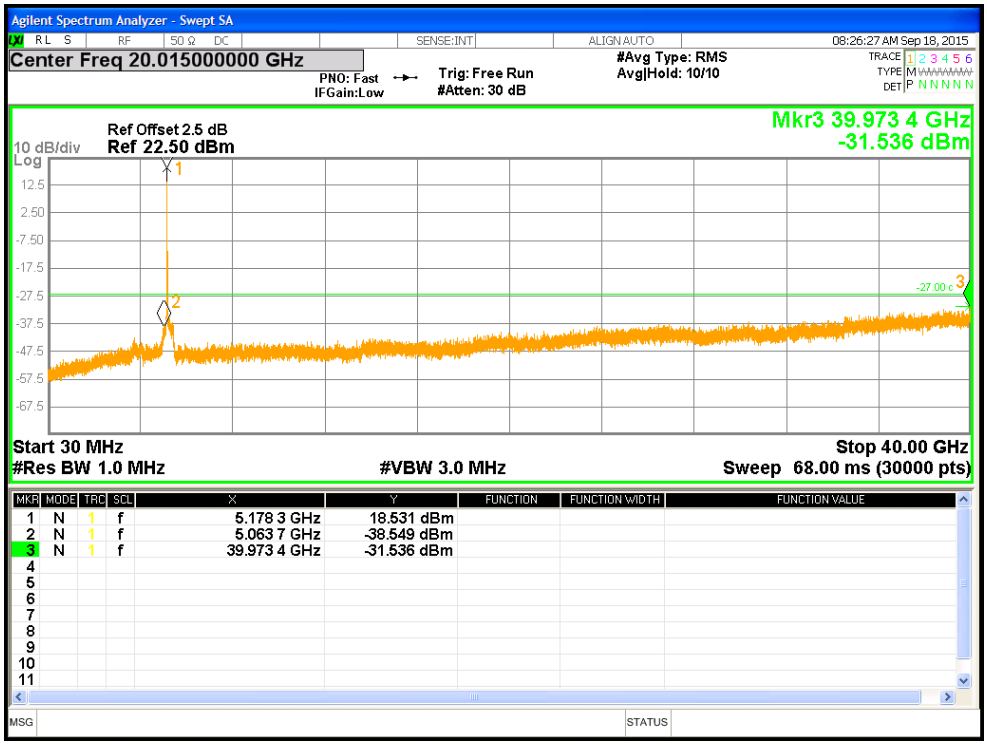


Figure 32: Undesirable Emission for 802.11a-6Mbps at 5180 MHz, Chain 0

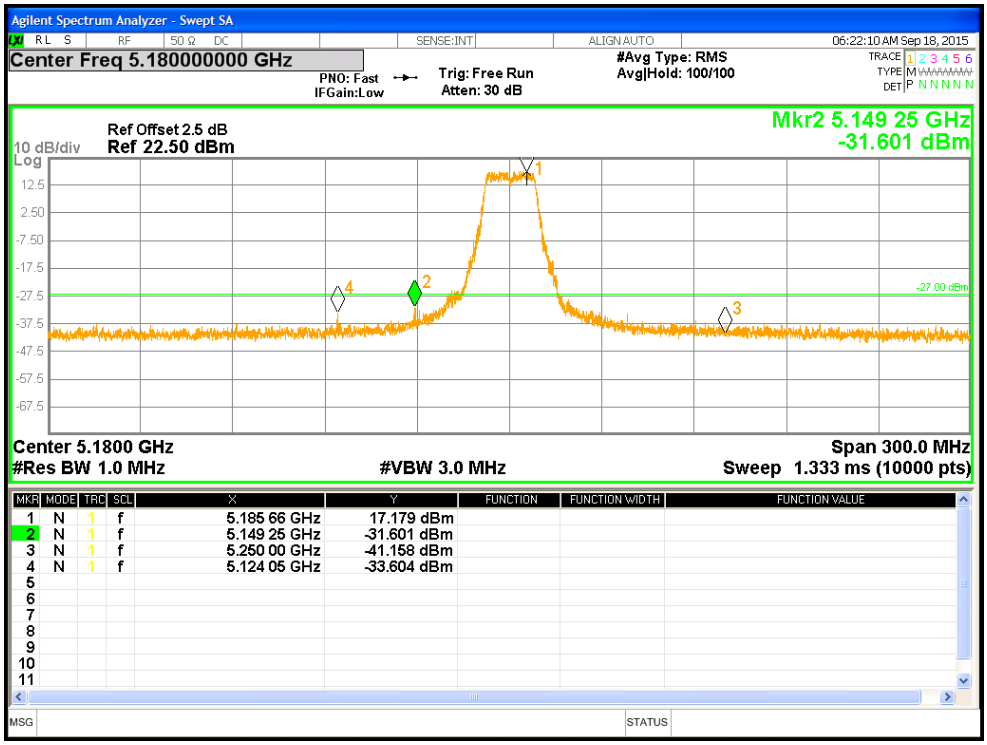


Figure 33: Measured Bandedge for 802.11a-6Mbps at 5180 MHz, Chain 1

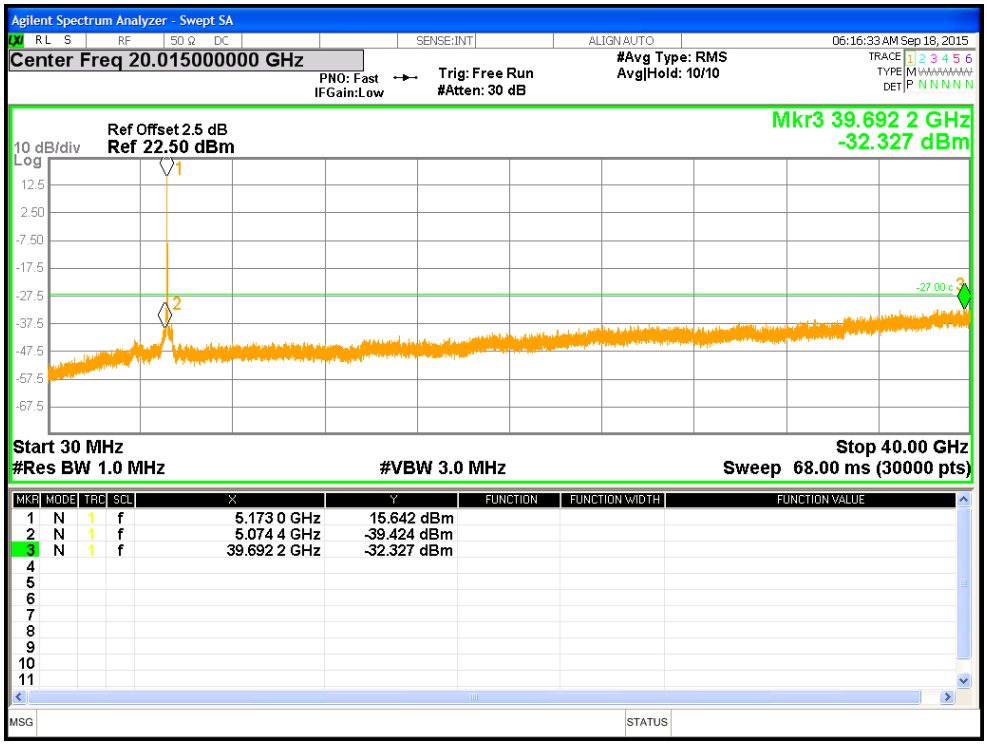


Figure 34: Undesirable Emission for 802.11a-6Mbps at 5180 MHz, Chain 1

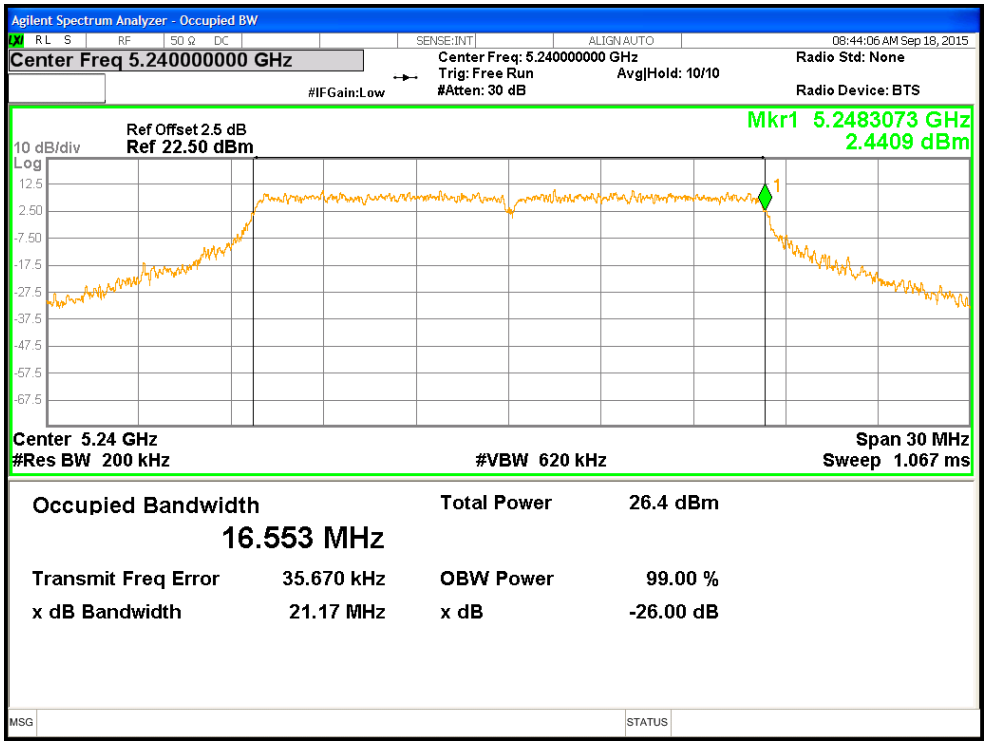


Figure 35: Measured In-Band edge for 802.11a-6Mbps at 5240 MHz, Chain 0

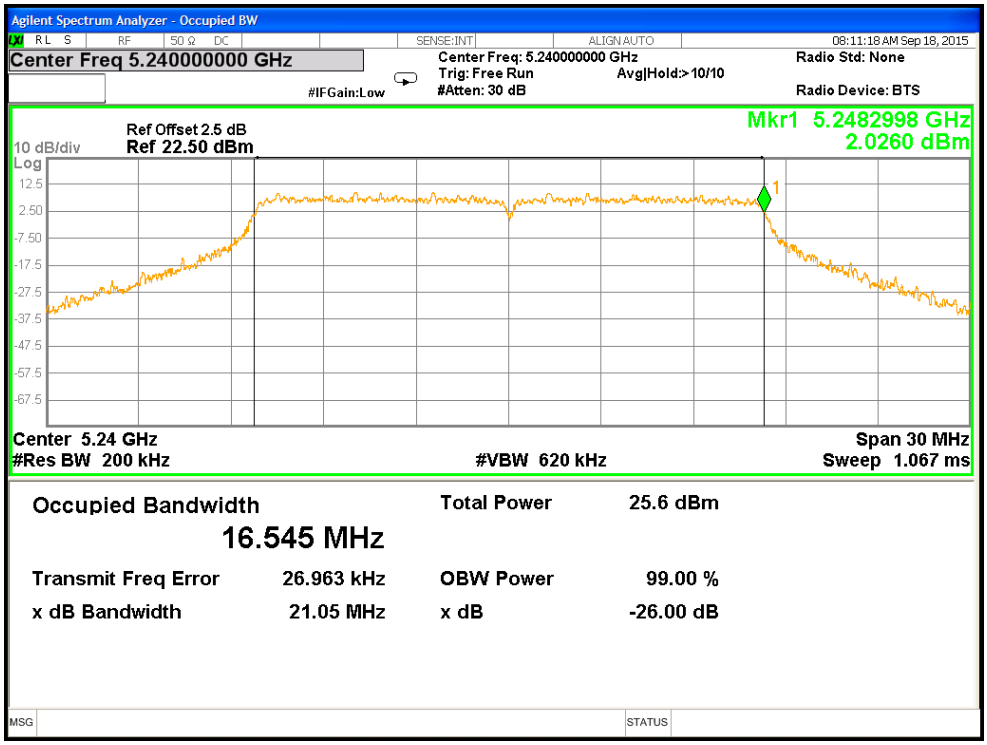


Figure 36: Measured In-Band edge for 802.11a-6Mbps at 5240 MHz, Chain 1

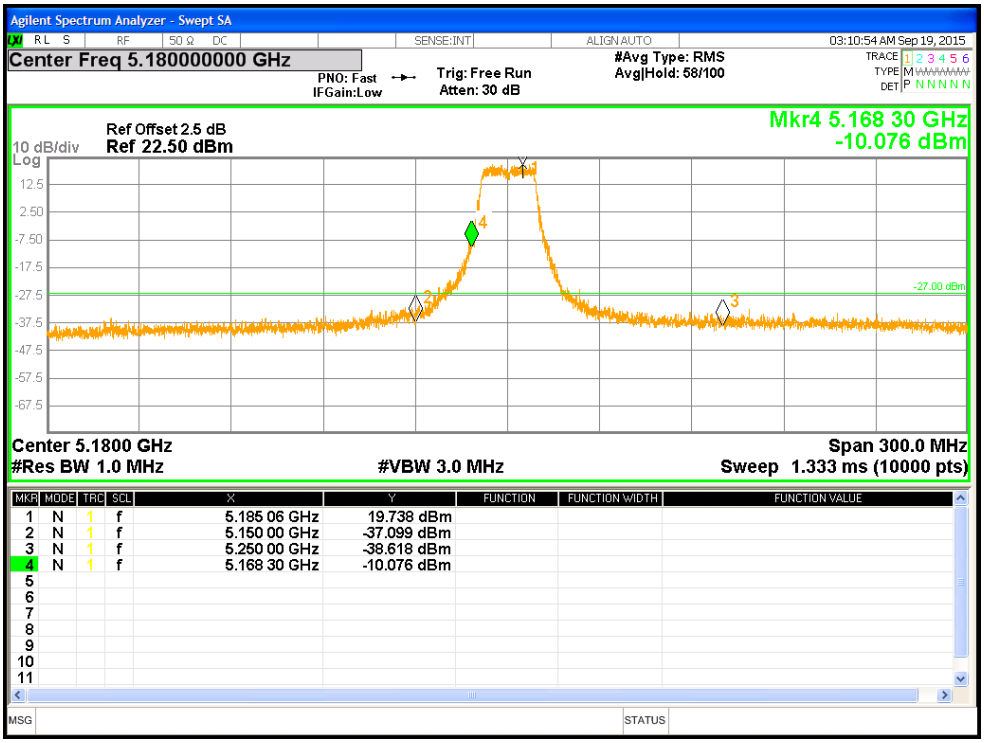


Figure 37: Measured Bandedge for HT20-MCS0 at 5180 MHz, Chain 0

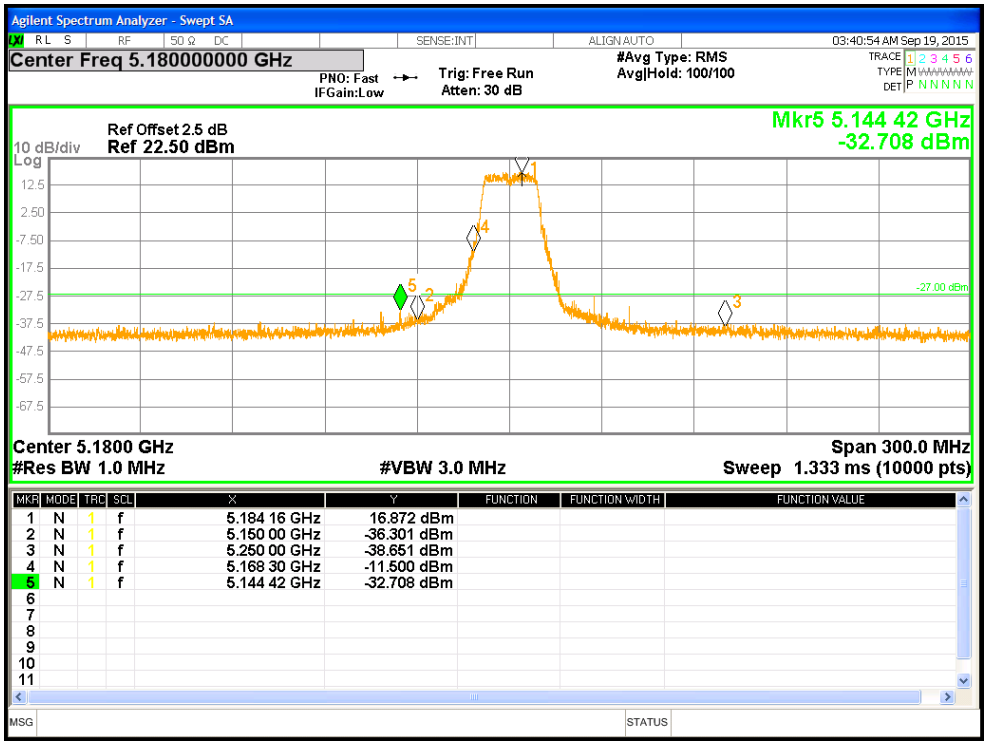


Figure 38: Undesirable Emission for HT20-MCS0 at 5180 MHz, Chain 0

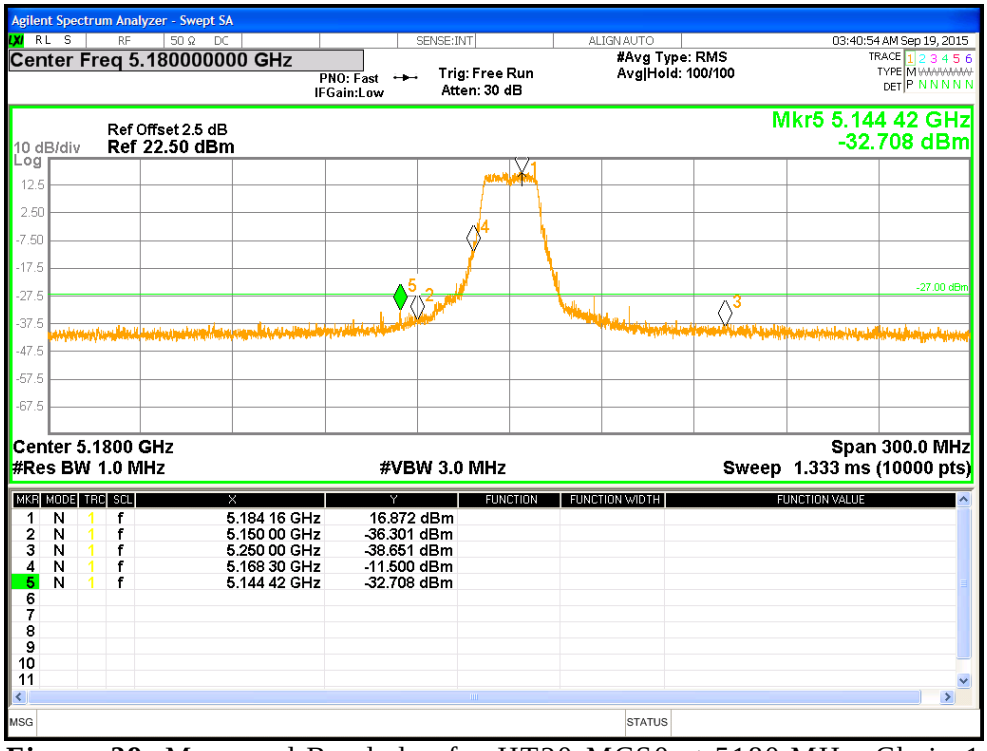


Figure 39: Measured Bandedge for HT20-MCS0 at 5180 MHz, Chain 1

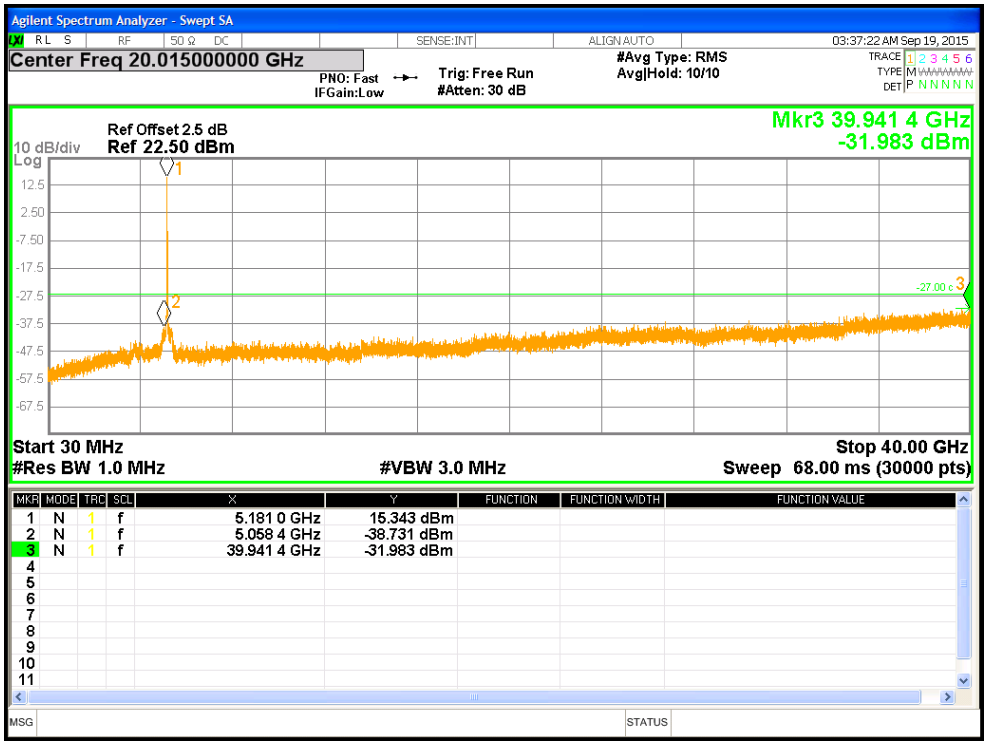


Figure 40: Undesirable Emission for HT20-MCS0 at 5180 MHz, Chain 1

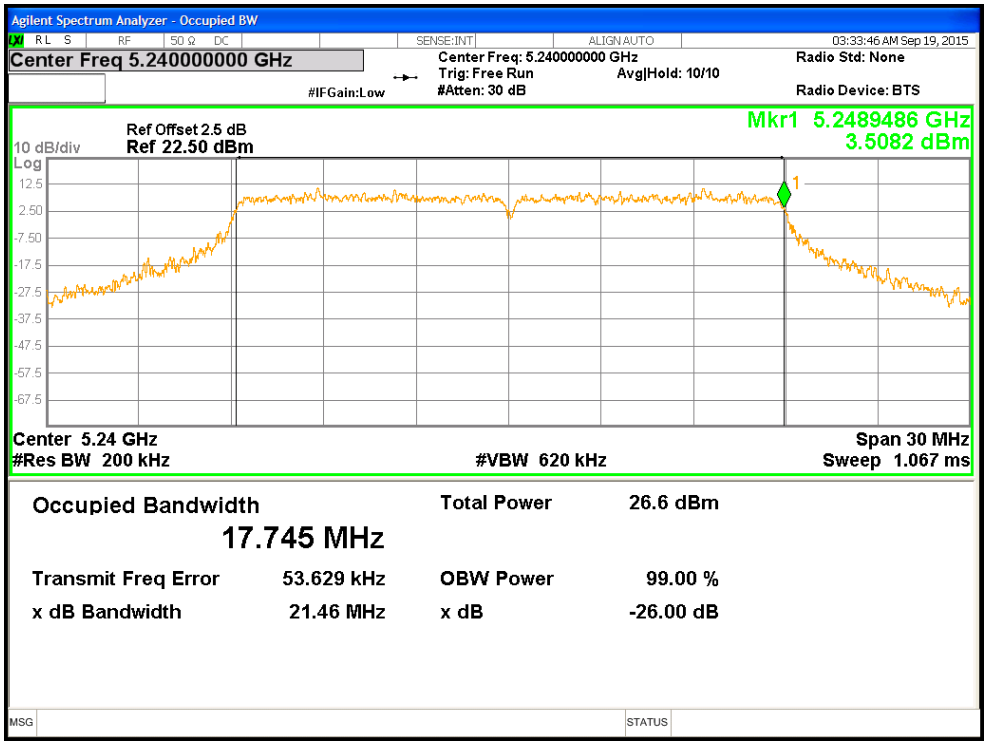


Figure 41: Measured In-Band edge for HT20-MCS0 at 5240 MHz, Chain 0

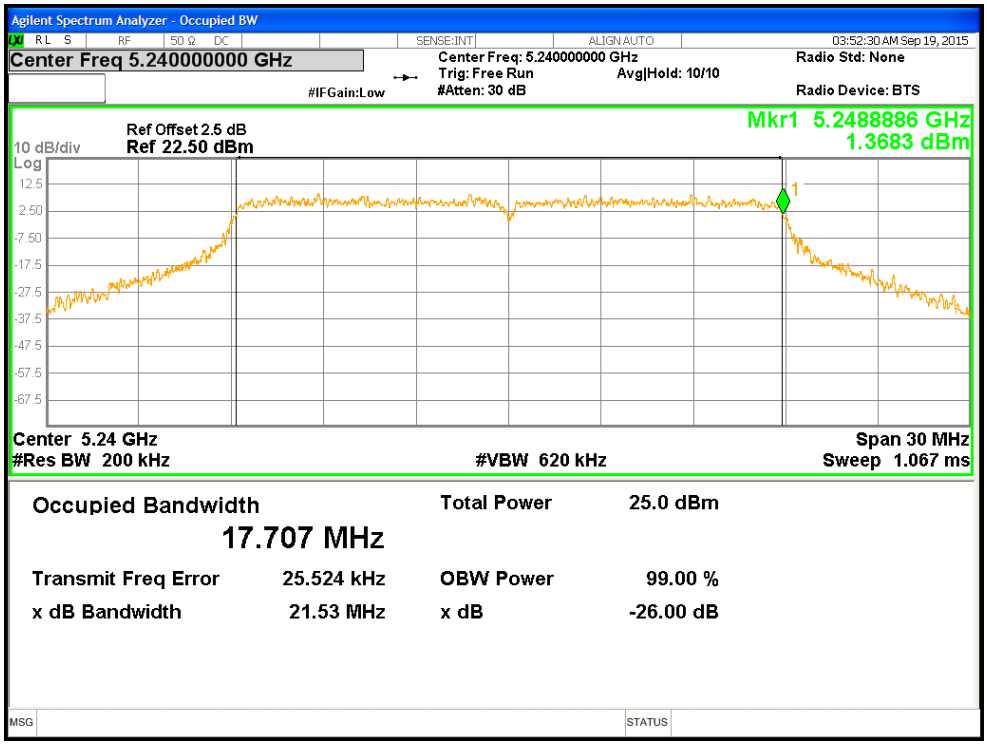


Figure 42: Measured In-Band edge for HT20-MCS0 at 5240 MHz, Chain 1

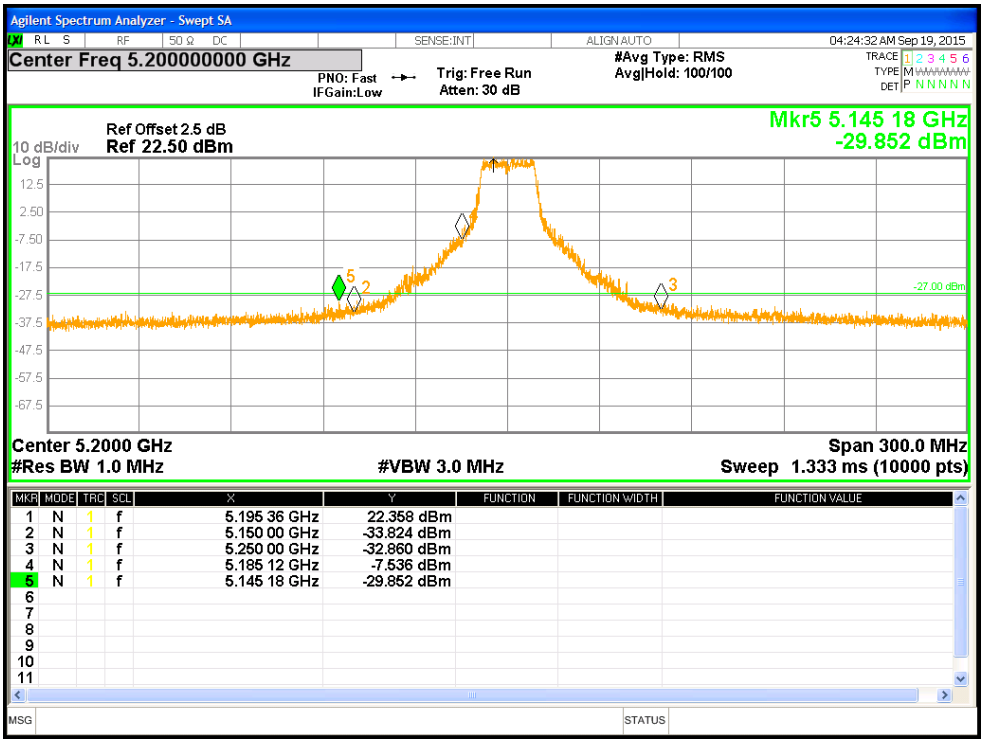


Figure 43: Measured Bandedge for VHT20-MCS0 at 5200 MHz, Chain 0

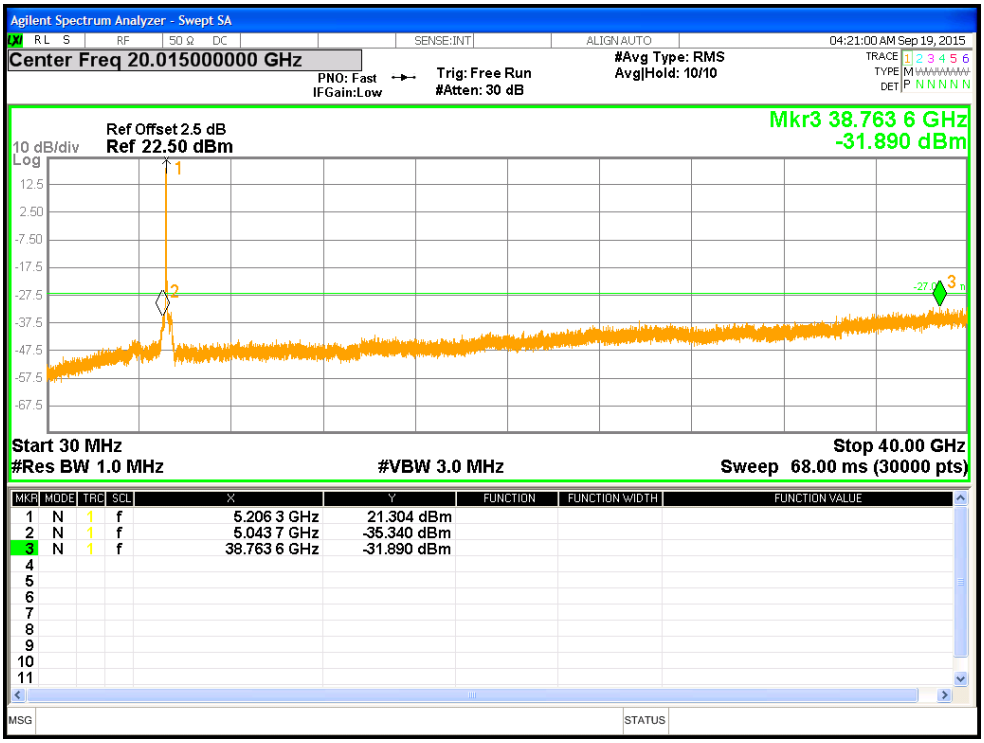


Figure 44: Undesirable Emission for VHT20-MCS0 at 5200 MHz, Chain 0

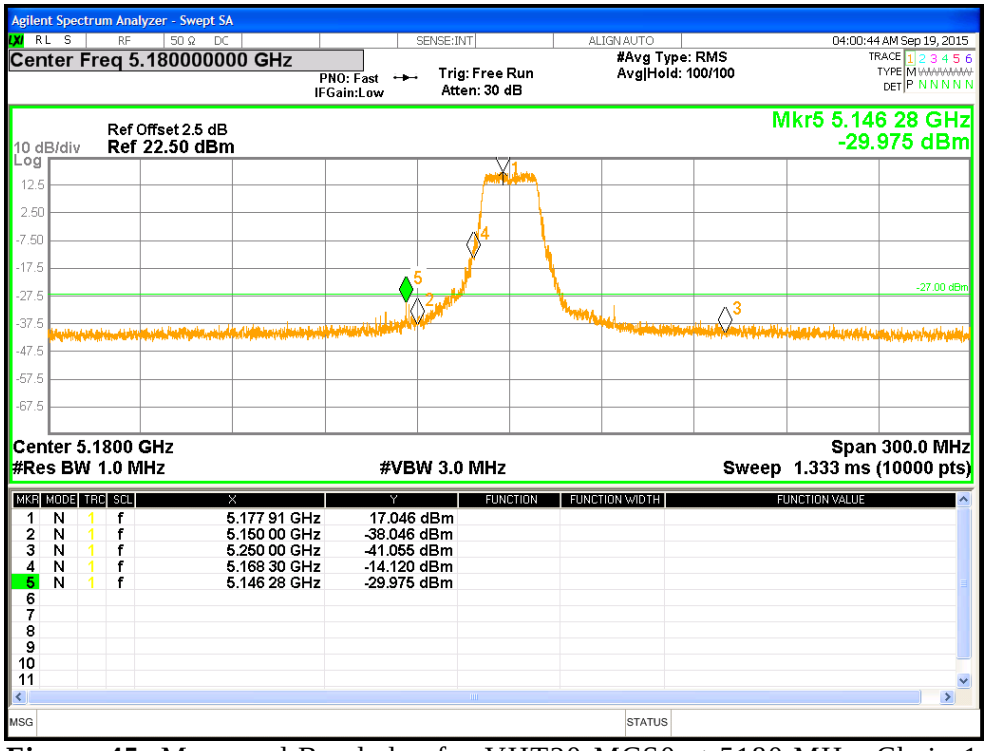


Figure 45: Measured Bandedge for VHT20-MCS0 at 5180 MHz, Chain 1

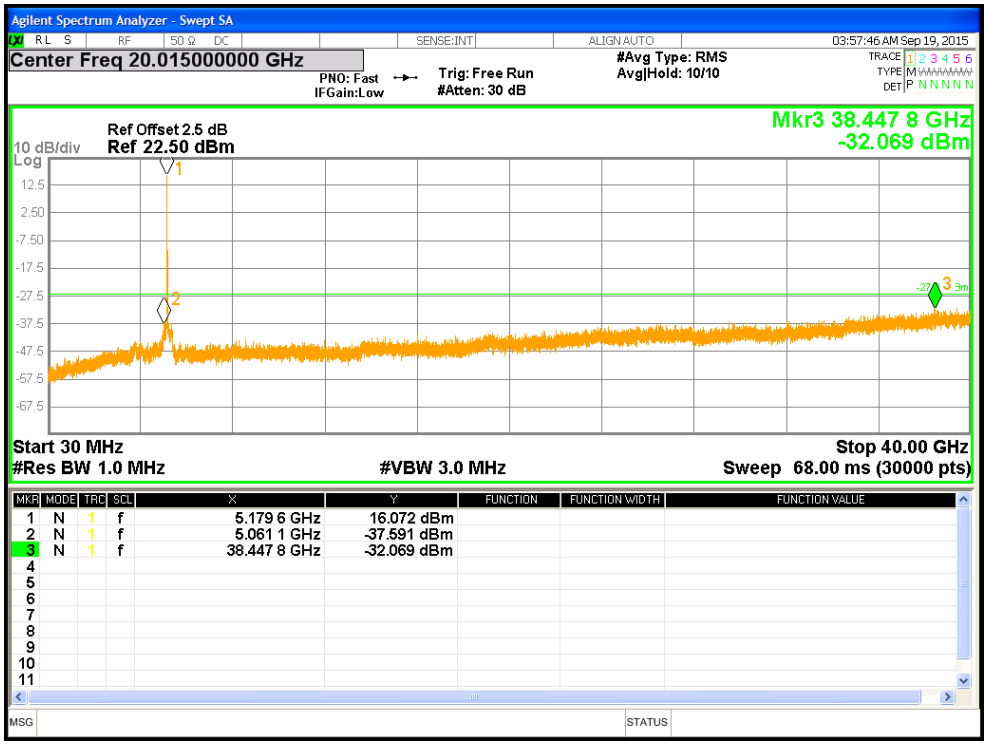


Figure 46: Undesirable Emission for VHT20-MCS0 at 5180 MHz, Chain 1

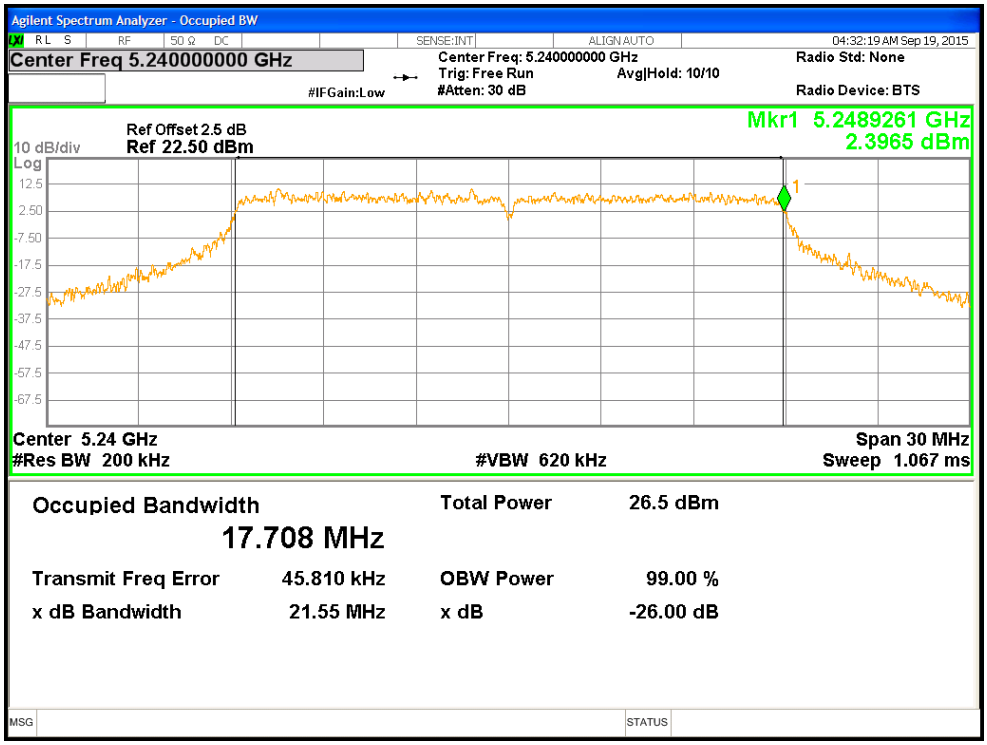


Figure 47: Measured In-Band edge for VHT20-MCS0 at 5240 MHz, Chain 0

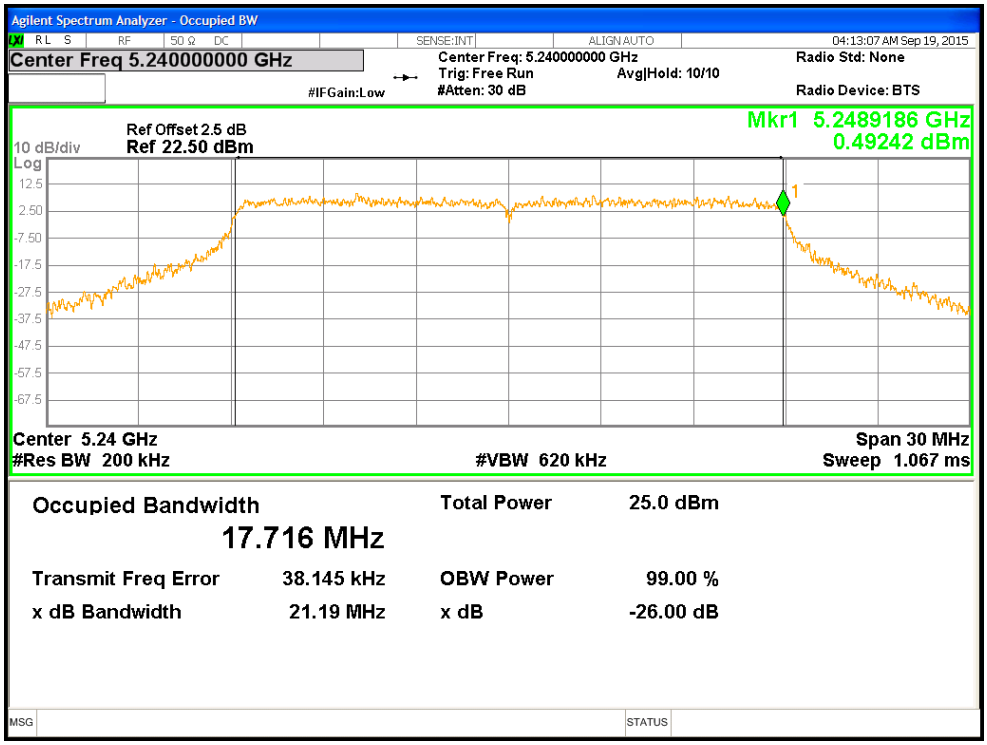


Figure 48: Measured In-Band edge for VHT20-MCS0 at 5240 MHz, Chain 1

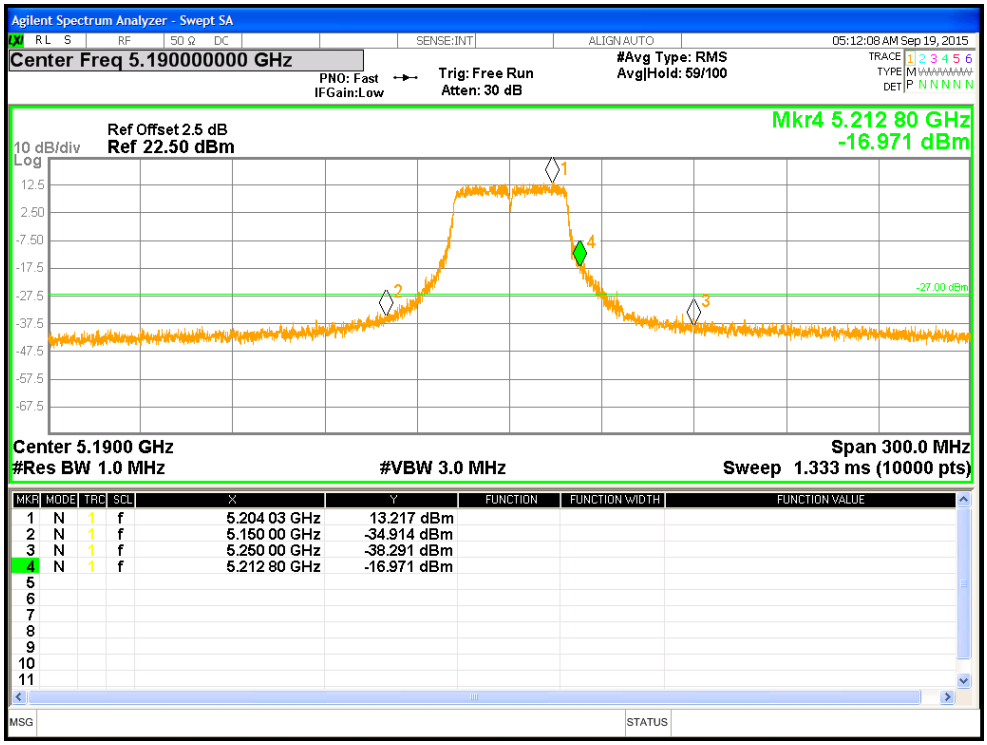


Figure 49: Measured Bandedge for HT40-MCS0 at 5190 MHz, Chain 0

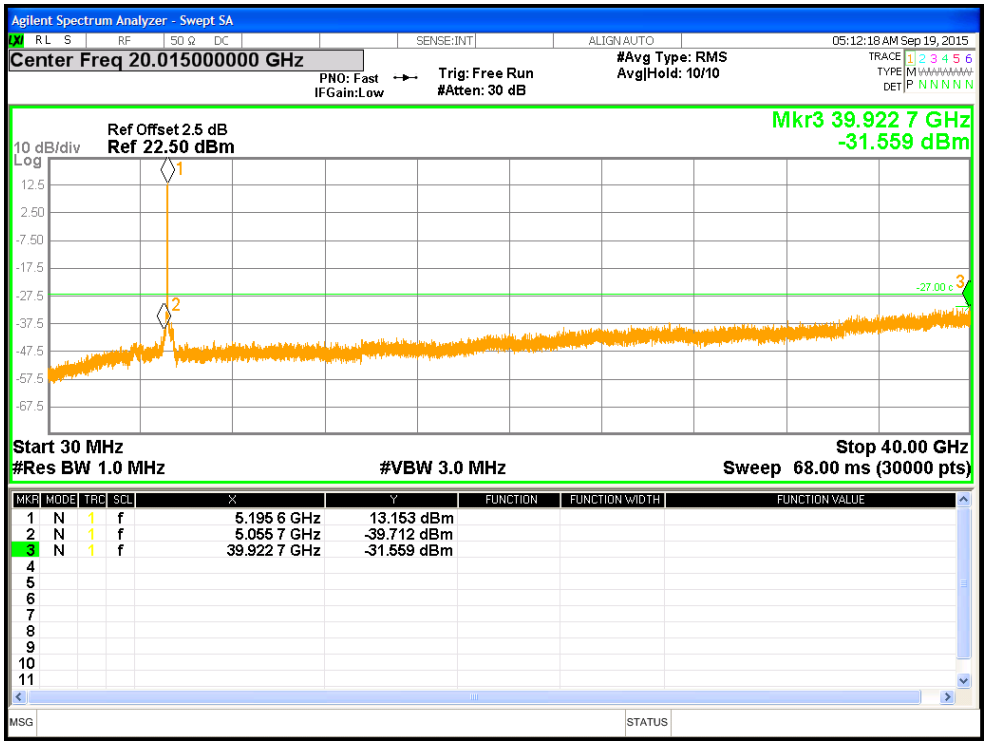


Figure 50: Undesirable Emission for HT40-MCS0 at 5190 MHz, Chain 0

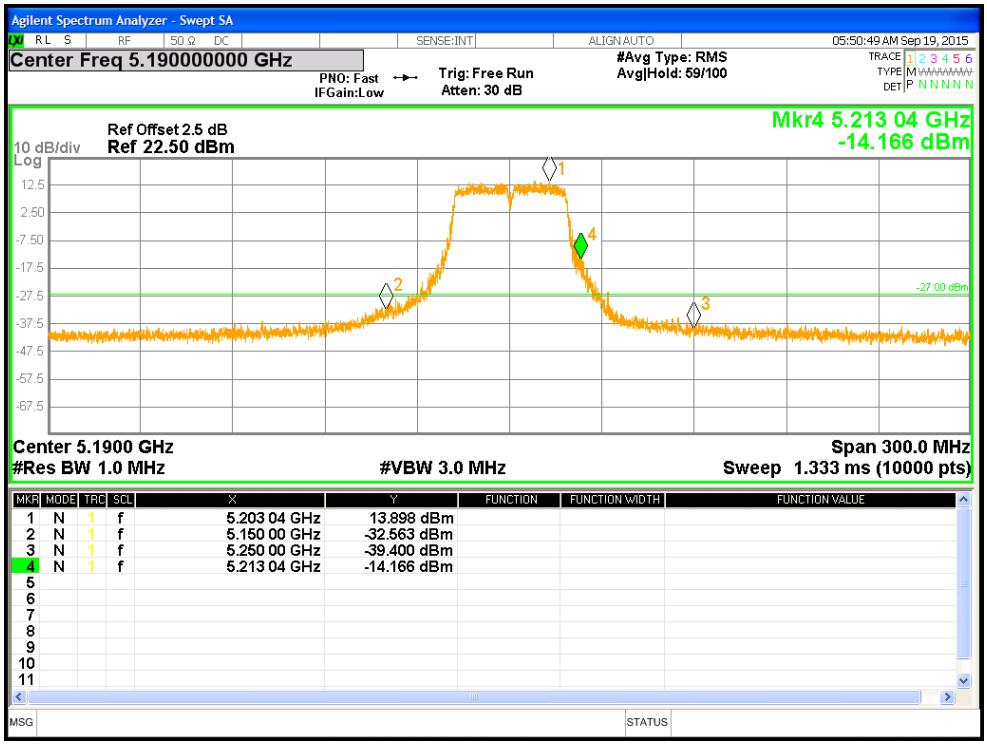


Figure 51: Measured Bandedge for HT40-MCS0 at 5190 MHz, Chain 1

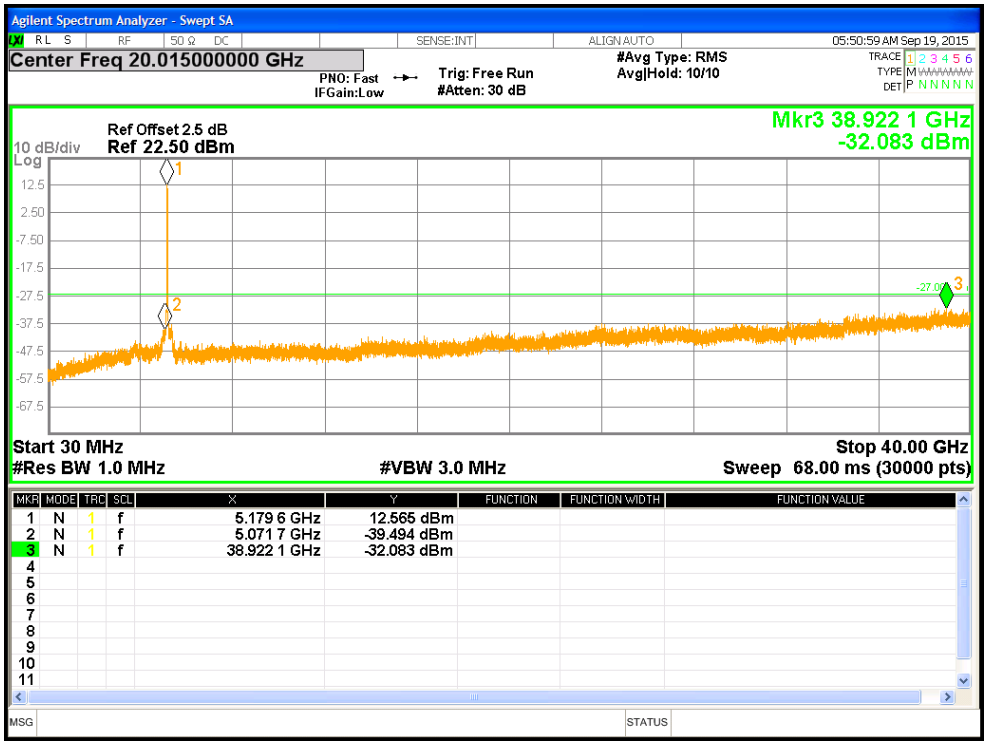


Figure 52: Undesirable Emission for HT40-MCS0 at 5190 MHz, Chain 1

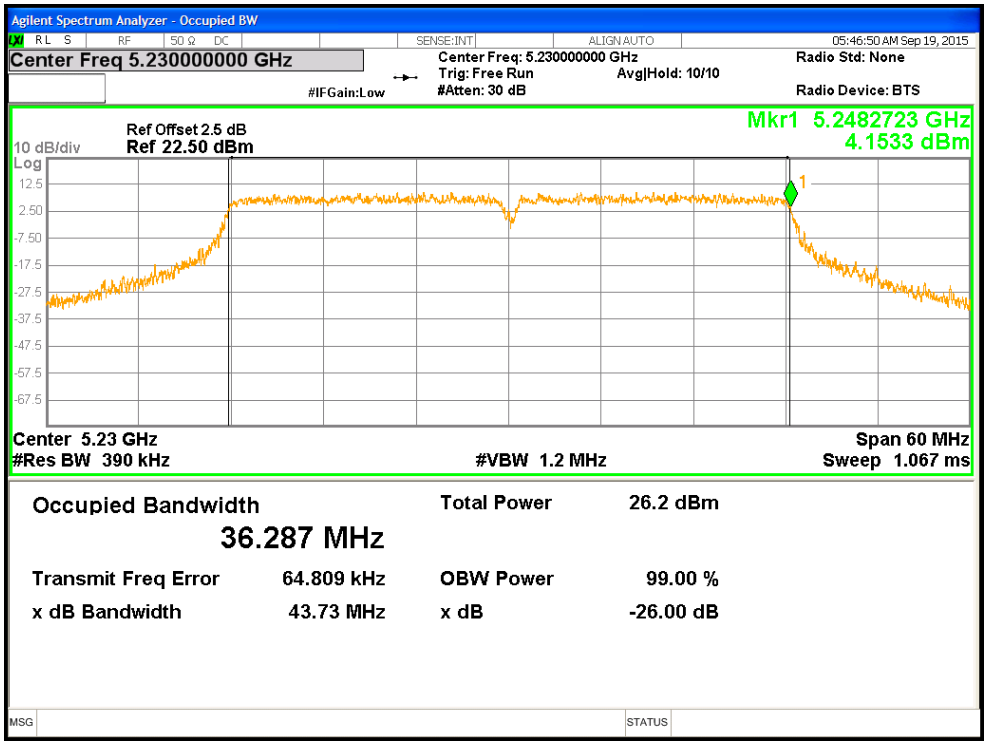


Figure 53: Measured In-Band edge for HT40-MCS0 at 5240 MHz, Chain 0

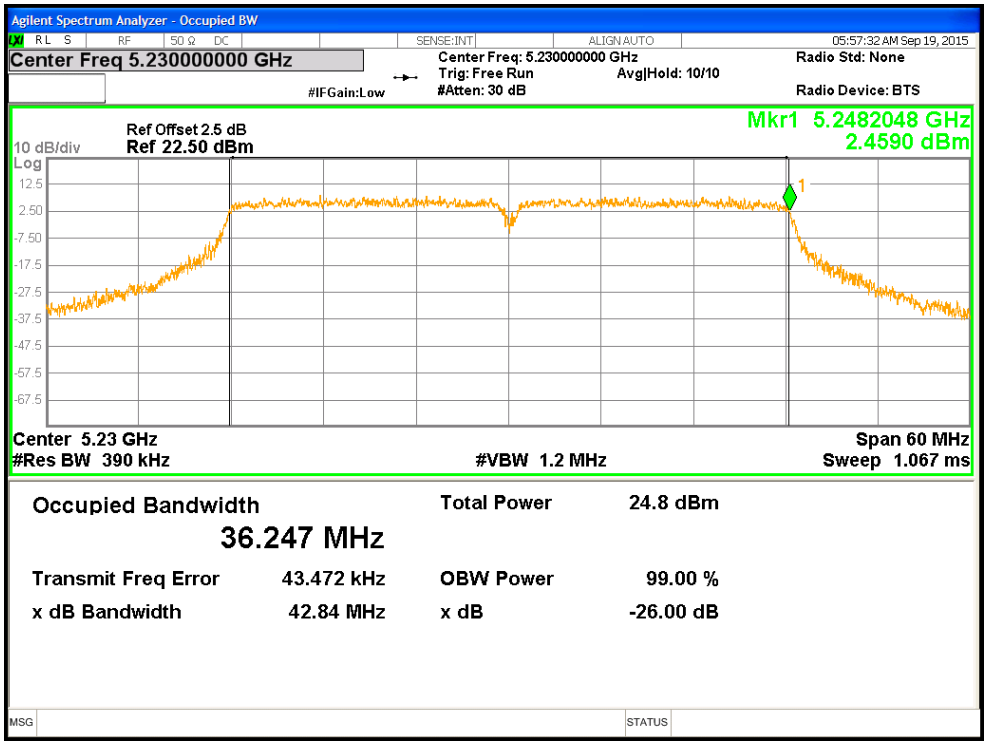


Figure 54: Measured In-Band edge for HT40-MCS0 at 5240 MHz, Chain 1

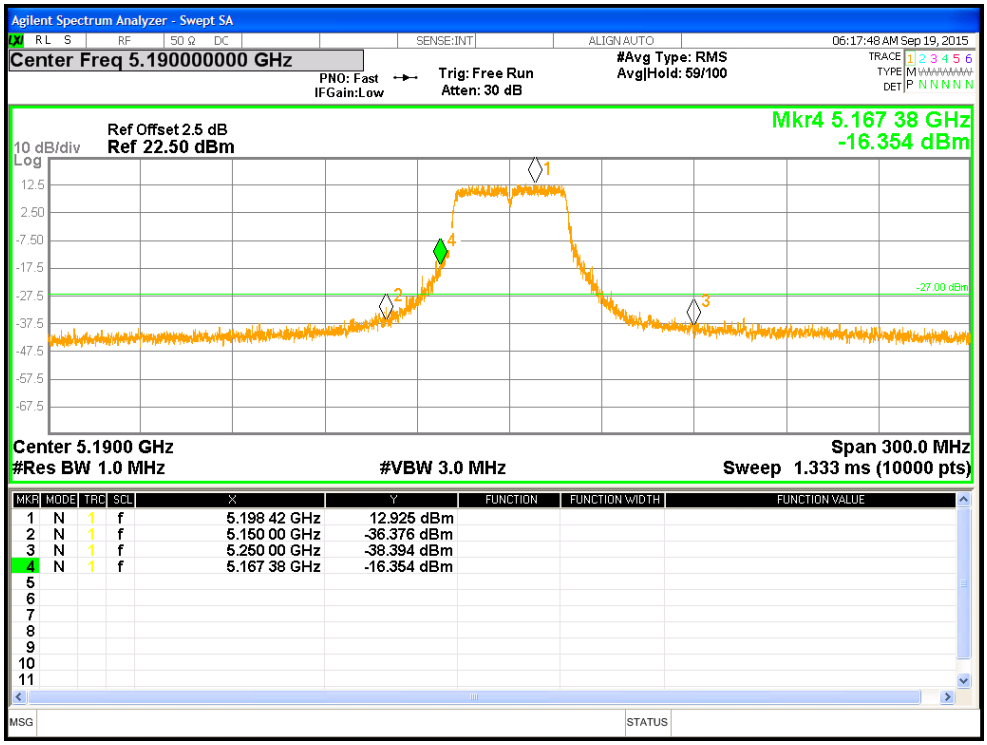


Figure 55: Measured Bandedge for VHT40-MCS0 at 5190 MHz, Chain 0

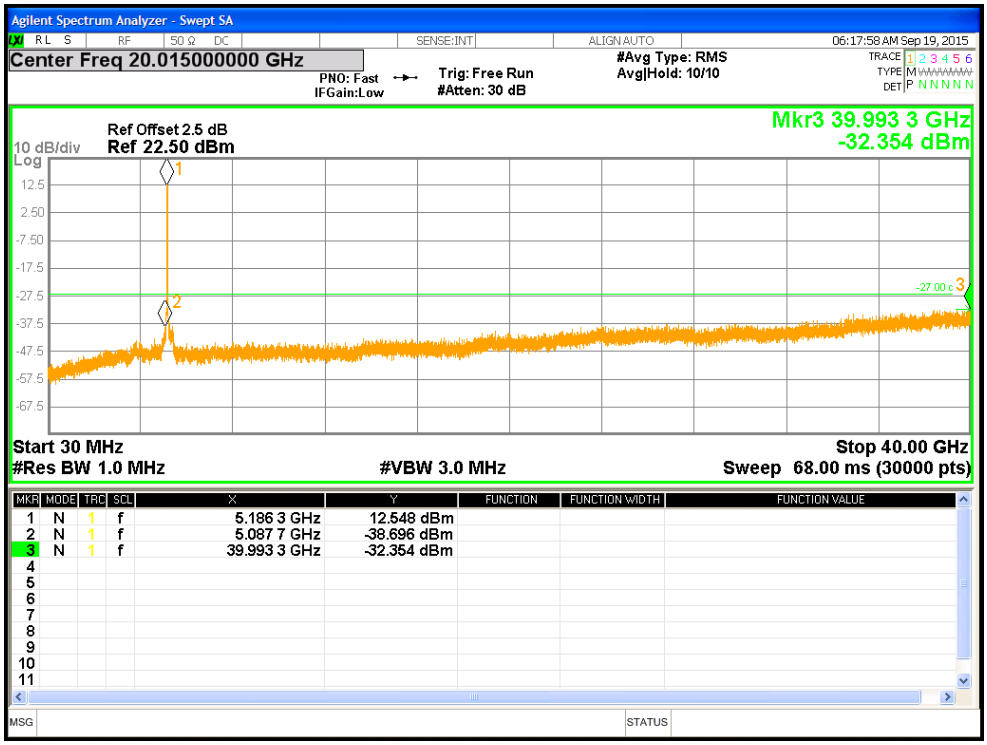


Figure 56: Undesirable Emission for VHT40-MCS0 at 5190 MHz, Chain 0

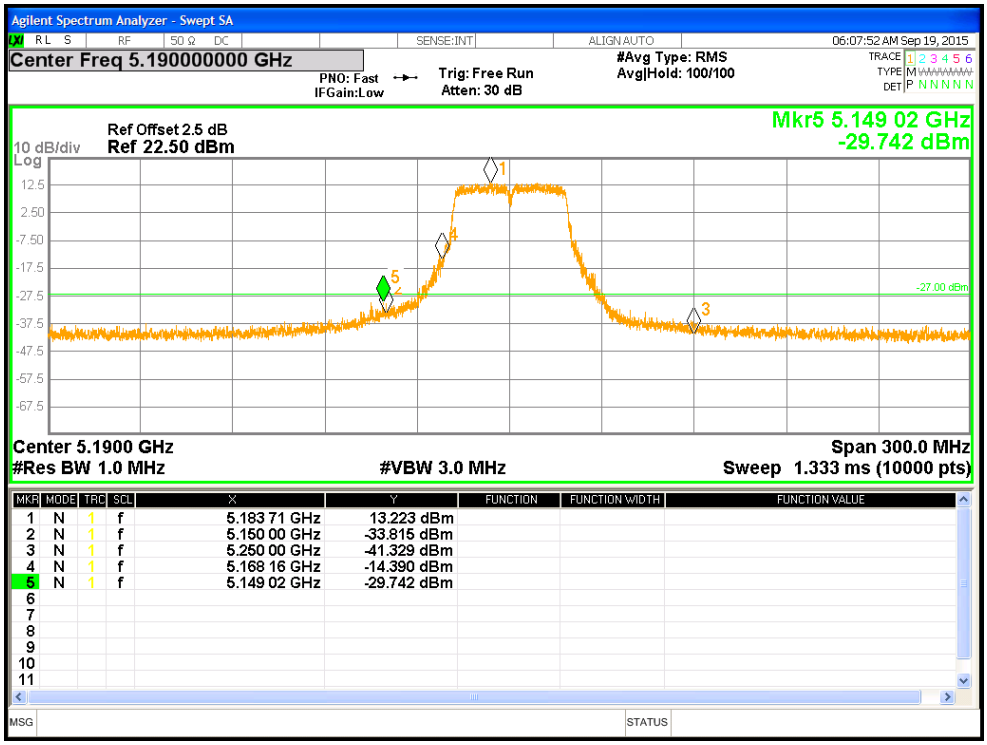


Figure 57: Measured Bandedge for VHT40-MCS0 at 5190 MHz, Chain 1

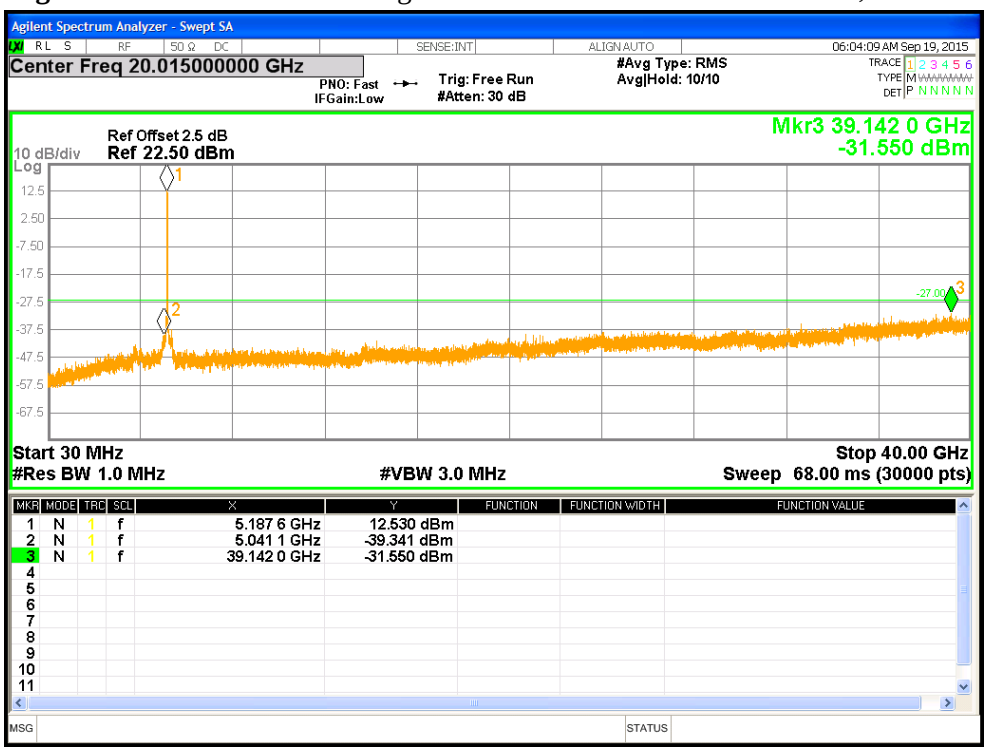


Figure 58: Undesirable Emission for VHT40-MCS0 at 5190 MHz, Chain 1

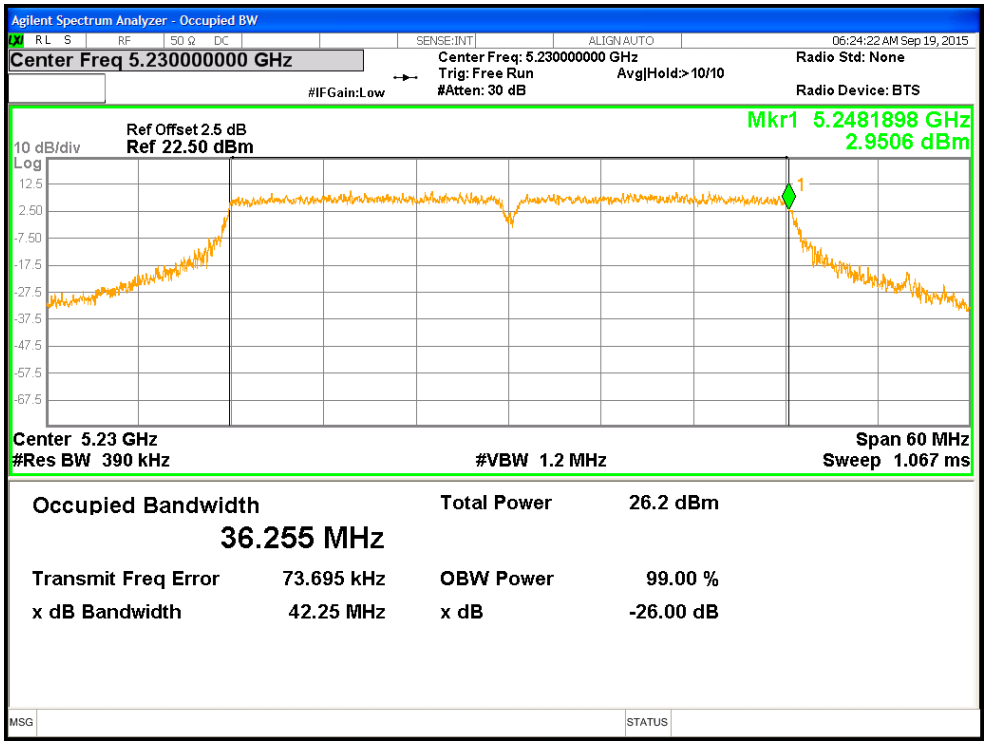


Figure 59: Measured In-Band edge for VHT40-MCS0 at 5240 MHz, Chain 0

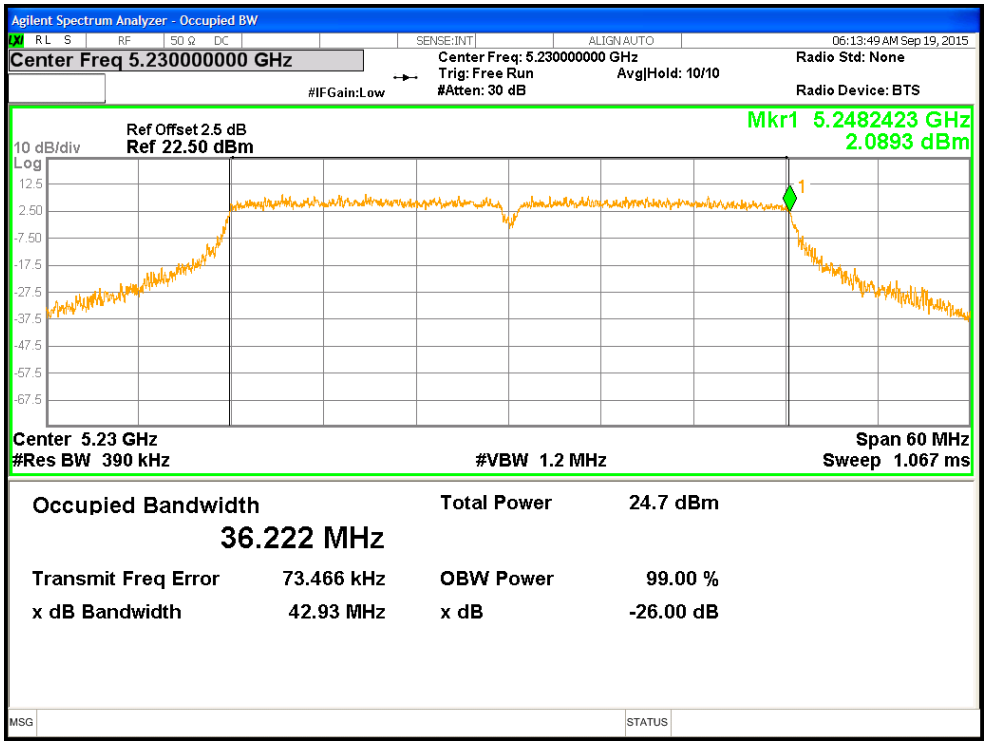


Figure 60: Measured In-Band edge for VHT40-MCS0 at 5240 MHz, Chain 1

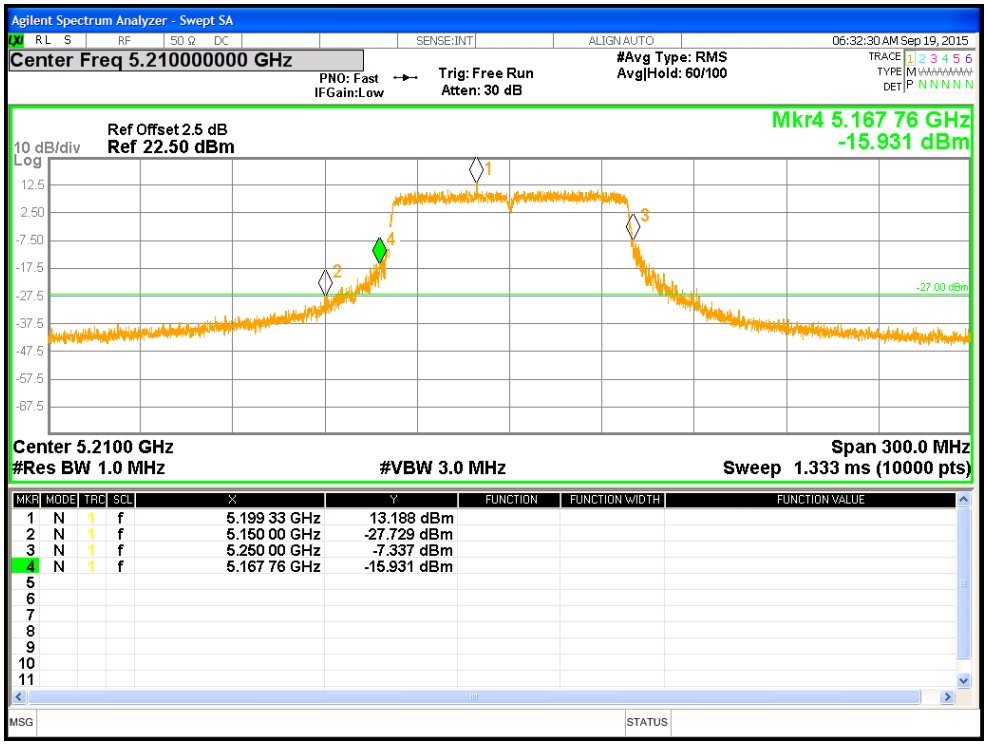


Figure 61: Measured Bandedge for VHT80-MCS0 at 5210 MHz, Chain 0

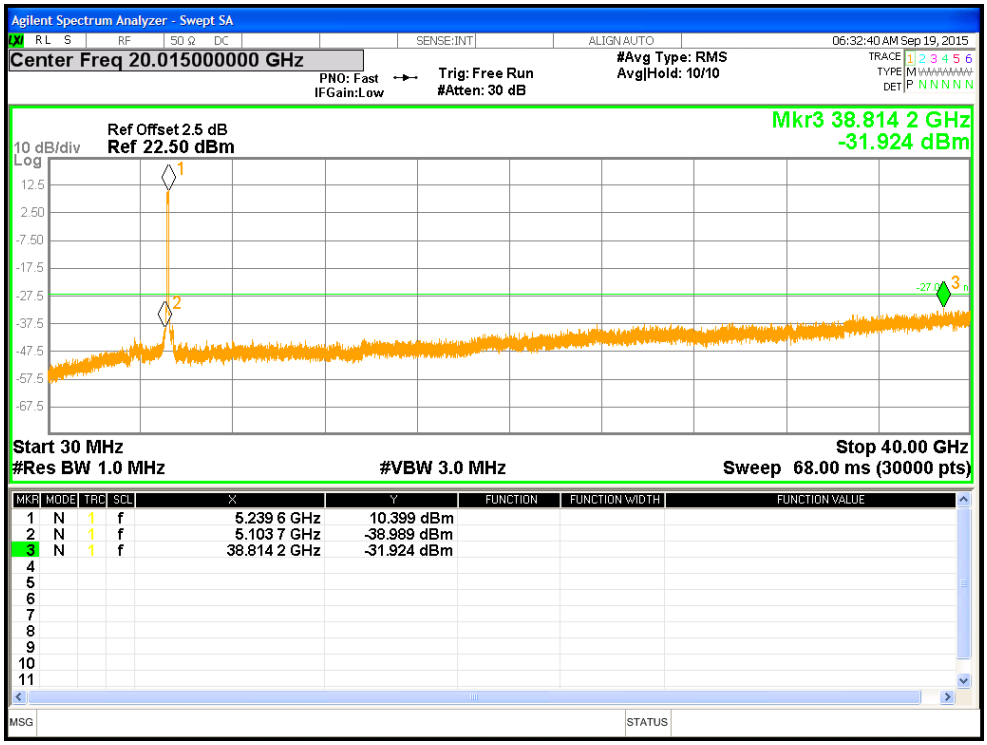


Figure 62: Undesirable Emission for VHT80-MCS0 at 5210 MHz, Chain 0

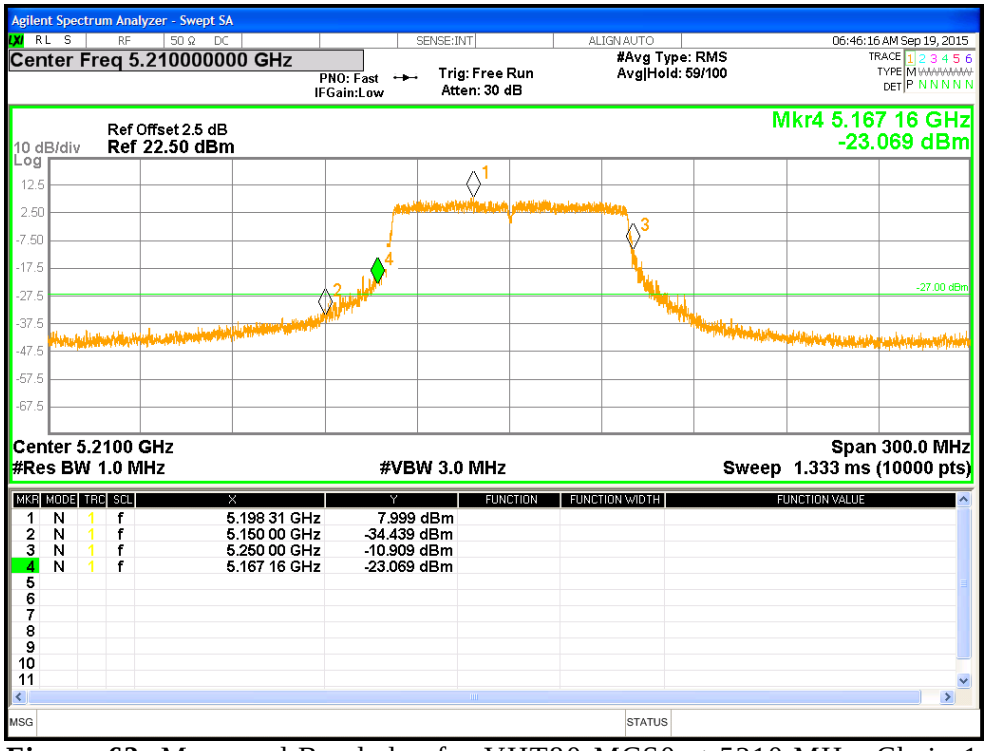


Figure 63: Measured Bandedge for VHT80-MCS0 at 5210 MHz, Chain 1

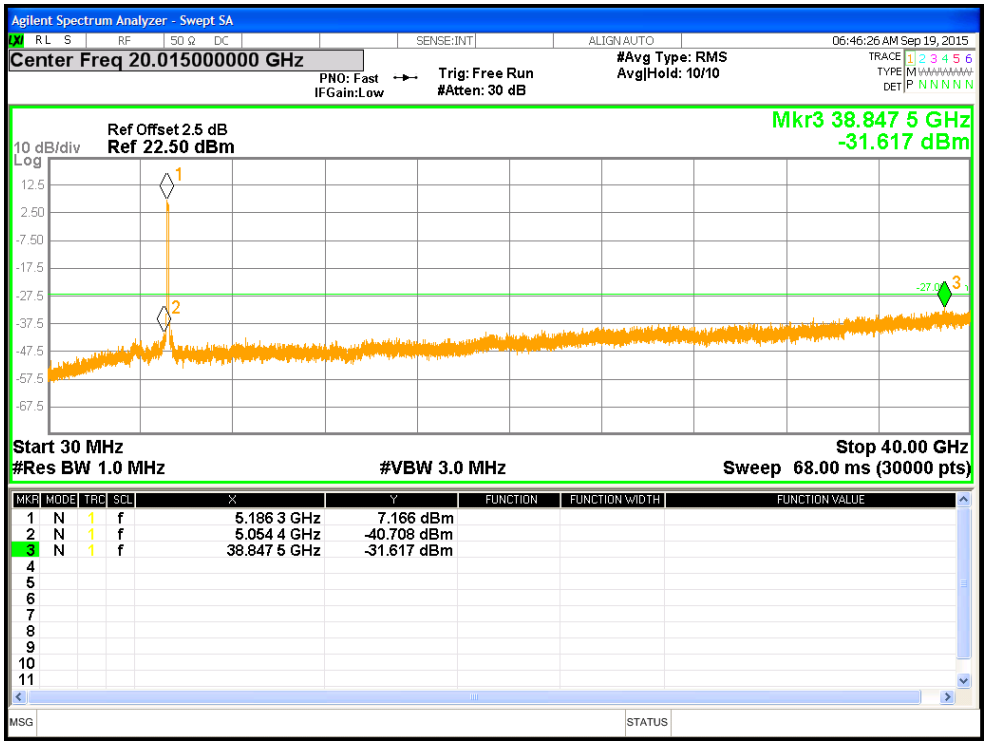


Figure 64: Undesirable Emission for VHT80-MCS0 at 5210 MHz, Chain 1

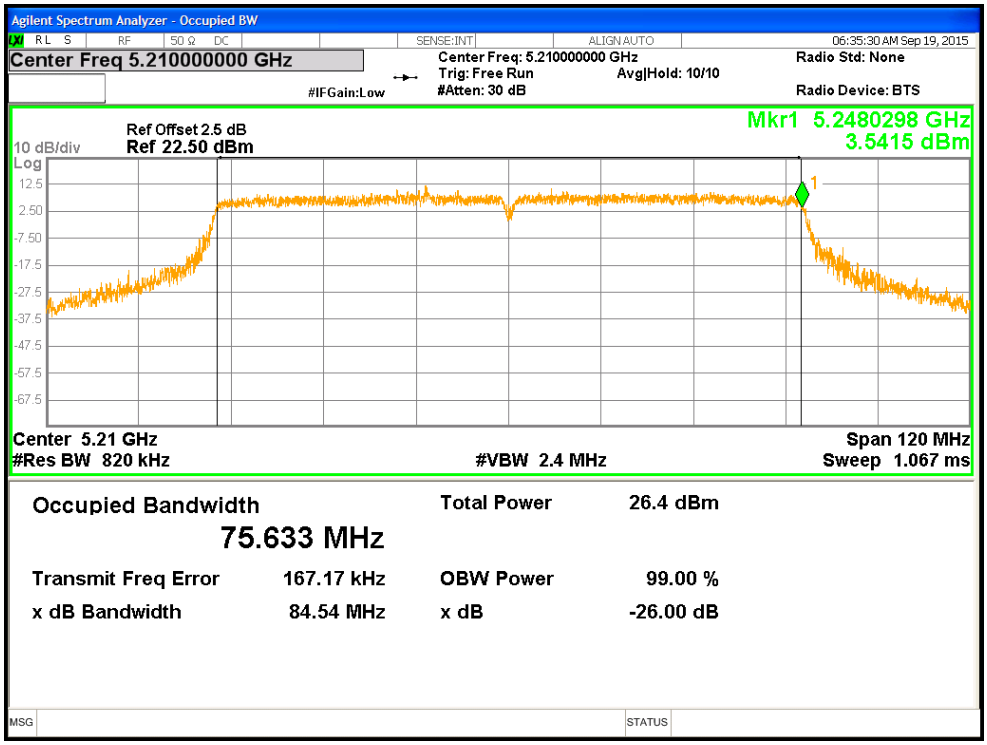


Figure 65: Measured In-Band edge for VHT80-MCS0 at 5240 MHz, Chain 0

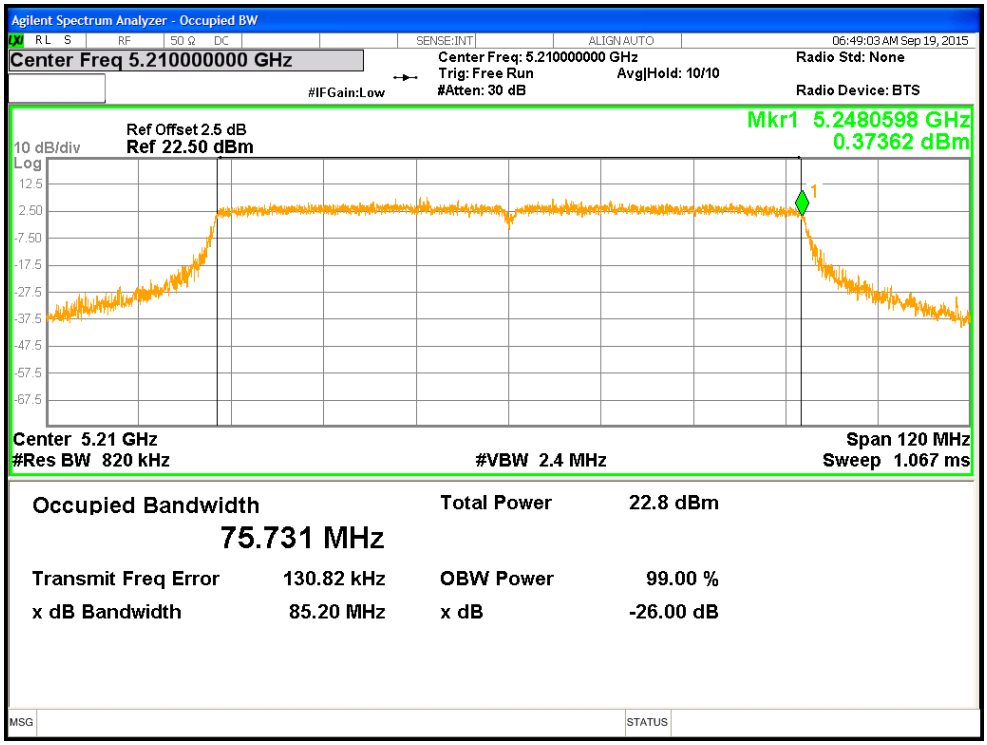


Figure 66: Measured In-Band edge for VHT80-MCS0 at 5240 MHz, Chain 1

4.5 Transmitter 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, 15.407(b), RSS 247 Sect. 6., RSS GEN Sect.8.9, 8.10

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 for 802.11a, 802.11n (HT20 and HT40), 802.11ac (VHT20, VHT40 and VHT80).

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.

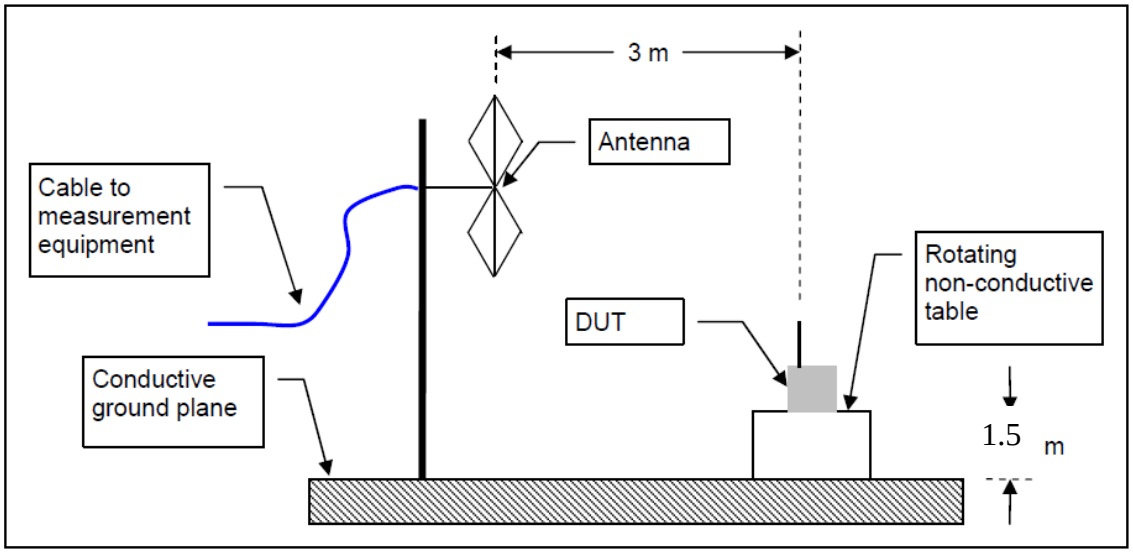
Final results are:

1. VHT20 at MCS0 with 2 Chains (covering 802.11a & HT20)
2. HT40 at MCS0 with 2 Chains (covering VHT40)
3. VHT80 at MCS0 with 2 Chains

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, RSS 247 Sect. 6: 2015, 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

According to CFR47 15.407 (b) and RSS 247 Sect. 6.2.1.2, all harmonics and spurious emissions which are outside the 5150 MHz - 5250 MHz, 5250 MHz – 5350 MHz, or 5470 MHz – 5725 MHz shall not exceed -27 dBm/MHz. This is equivalent to 68.2 dBuV/m at 3 meter distance.

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 17: Transmit Spurious Emission at Band-Edge Requirements

Test Conditions: Radiated Measurement, Normal Temperature and Voltage only								
Antenna Type: Custom Integrated				**Power Setting:** See test plan				
Max. Directional Gain: + 2.13 dBi								
Signal State: Modulated at 100%.								
Ambient Temp.: 20° C				**Relative Humidity:**33%				
Band-Edge Results								
Freq. (MHz)	Level (dBuV/m)	Pol. (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
5150	70.24	V	74.00	-3.76	Pk	163	185	PLOT 67: 11a-6Mbps-5180MHz-TX20-Ch0 & Ch1
5150	49.06	V	54.00	-4.94	Ave	163	185	PLOT 68: 11a-6Mbps-5180MHz-TX20-Ch0 & Ch1
5150	62.39	H	74.00	-11.61	Pk	161	165	PLOT 69: 11a-6Mbps-5180MHz-TX20-Ch0 & Ch1
5150	48.90	H	54.00	-5.10	Ave	161	165	PLOT 70: 11a-6Mbps-5180MHz-TX20-Ch0 & Ch1
5150	63.41	H	74.00	-10.59	Pk	154	150	PLOT 71: VHT20-MCS0-5180MHz-TX20-Ch0_Ch1
5150	48.92	H	54.00	-5.08	Ave	154	150	PLOT 72: VHT20-MCS0-5180MHz-TX20-Ch0_Ch1
5150	63.02	V	74.00	-10.68	Pk	121	135	PLOT 73: VHT20-MCS0-5180MHz-TX20-Ch0_Ch1
5150	48.92	V	54.00	-5.08	Ave	121	135	PLOT 74: VHT20-MCS0-5180MHz-TX20-Ch0_Ch1
5150	64.40	H	74.00	-9.60	Pk	147	152	PLOT 75: HT40-MCS0-5190MHz-TX20-Ch0_Ch1
5150	50.30	H	54.00	-3.70	Ave	147	152	PLOT 76: HT40-MCS0-5190MHz-TX20-Ch0_Ch1
5150	63.41	V	74.00	-10.59	Pk	154	144	PLOT 77: HT40-MCS0-5190MHz-TX20-Ch0_Ch1
5150	49.95	V	54.00	-4.05	Ave	154	144	PLOT 78: HT40-MCS0-5190MHz-TX20-Ch0_Ch1

Note: 1. Band-edge frequencies were taken at 5150 MHz since 5250-5350 MHz band is not a restricted band.

2. All the band-edge measurements met the restricted band requirements of CFR47 15.205.

3. For 5250 MHz In-band-edge, refer to Section 4.4.2.

4. Power lever is the same for both HT20 & VHT20. VHT20 found as worst case, therefore HT20 is covered for band-edge measurements.

Table 18: Transmit Spurious Emission at Band-Edge Requirements Continues

Test Conditions: Radiated Measurement, Normal Temperature and Voltage only								
Antenna Type: Custom Integrated				**Power Setting:** See test plan				
Max. Directional Gain: + 2.13 dBi								
Signal State: Modulated at 100%.								
Ambient Temp.: 20° C				**Relative Humidity:**33%				
Band-Edge Results								
Freq. (MHz)	Level (dBuV/m)	Pol. (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
5150	62.37	V	74.00	-11.63	Pk	166	150	PLOT 79: VHT40-MCS0-5190MHz-TX20-Ch0_Ch1
5150	50.19	V	54.00	-3.81	Ave	166	150	PLOT 80: VHT40-MCS0-5190MHz-TX20-Ch0_Ch1
5150	63.57	H	74.00	-10.43	Pk	156	141	PLOT 81: VHT40-MCS0-5190MHz-TX20-Ch0_Ch1
5150	50.42	H	54.00	-3.58	Ave	156	141	PLOT 82: VHT40-MCS0-5190MHz-TX20-Ch0_Ch1
5150	65.20	V	74.00	-8.80	Pk	163	131	PLOT 83: VHT80-MCS0-5210MHz-TX20-Ch0_Ch1
5150	50.68	V	54.00	-3.32	Ave	163	131	PLOT 84: VHT80-MCS0-5210MHz-TX20-Ch0_Ch1
5150	67.44	H	74.00	-6.56	Pk	156	151	PLOT 85: VHT80-MCS0-5210MHz-TX20-Ch0_Ch1
5150	52.74	H	54.00	-1.26	Ave	156	151	PLOT 86: VHT80-MCS0-5210MHz-TX20-Ch0_Ch1

Note: 1. Band-edge frequencies were taken at 5150 MHz since 5250-5350 MHz band is not a restricted band.
2. All the band-edge measurements met the restricted band requirements of CFR47 15.205.
3. For 5250 MHz In-band-edge, refer to Section 4.4.2.

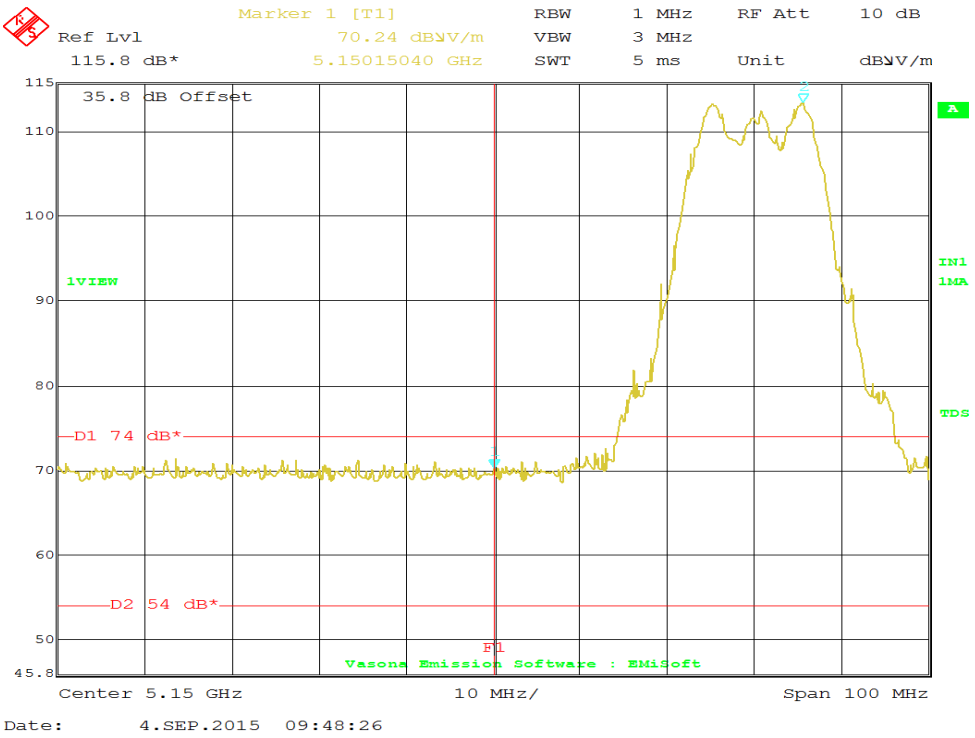


Figure 67: Radiated Emission 5150 MHz Edge for 11a 5180 MHz – Vert. (Pk)

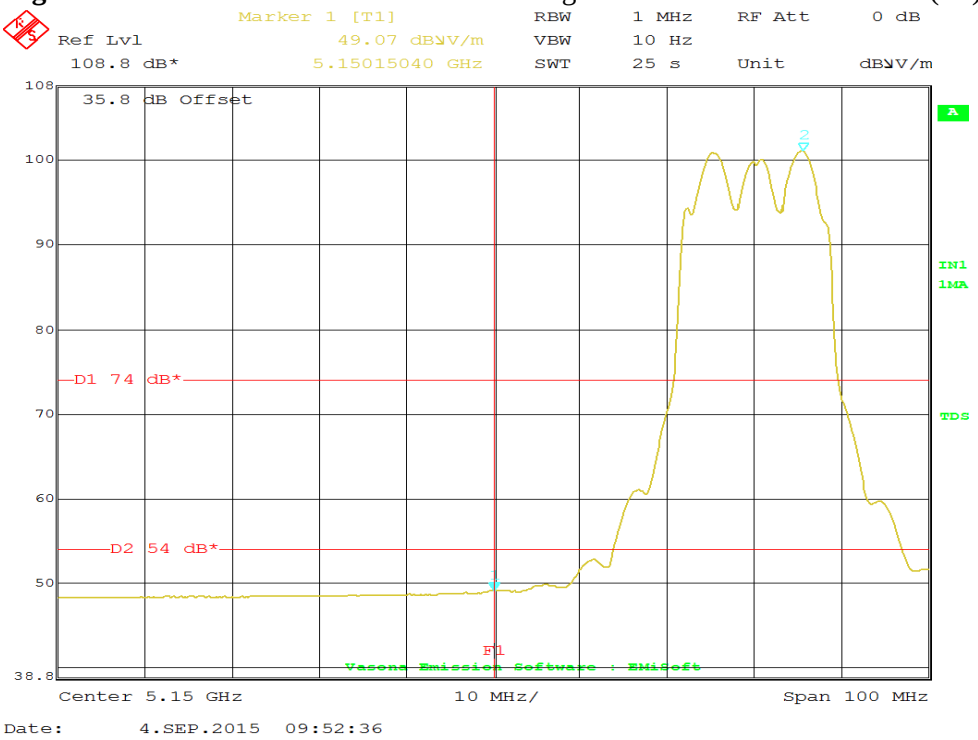


Figure 68: Radiated Emission 5150 MHz Edge for 11a 5180 MHz – Vert. (Ave)

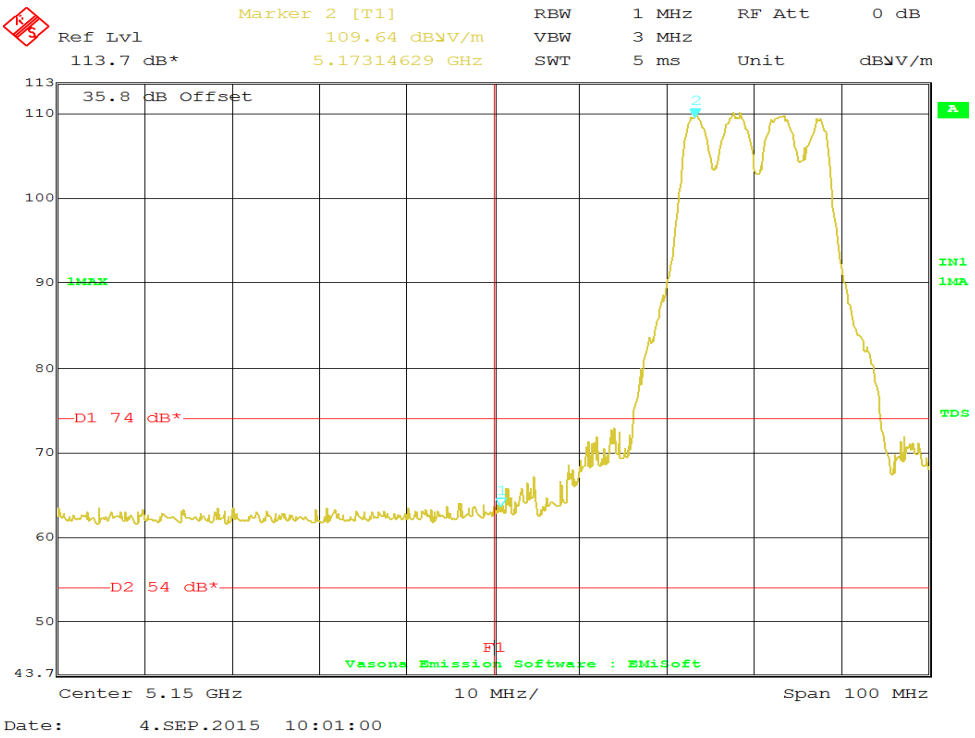


Figure 69: Radiated Emission 5150 MHz Edge for 11a 5180 MHz – Horz. (Pk)

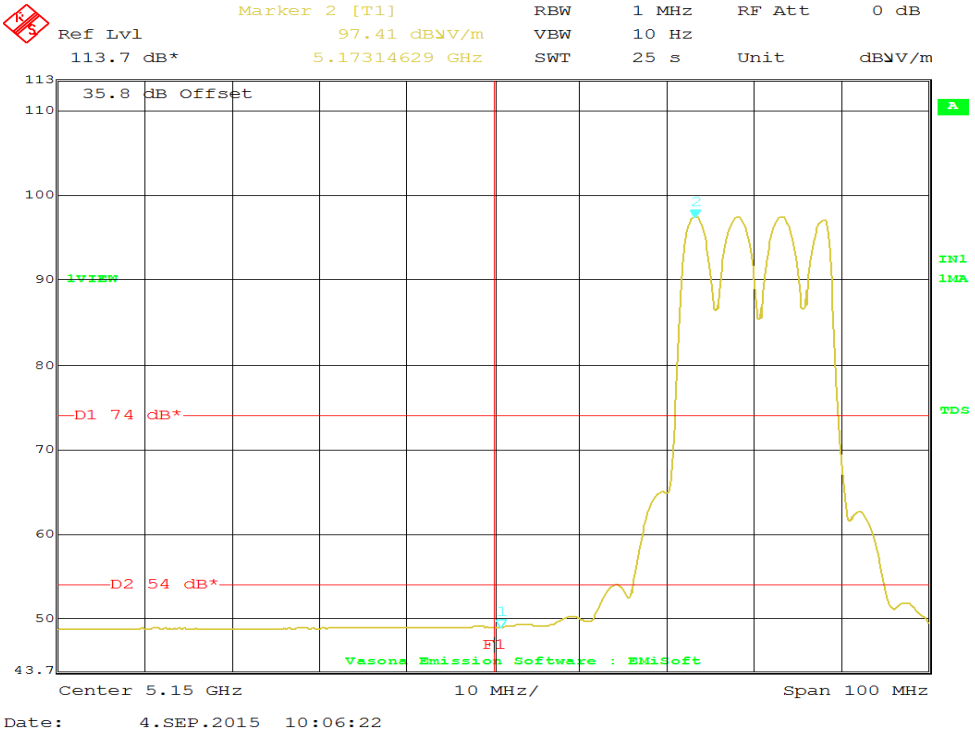


Figure 70: Radiated Emission 5150 MHz Edge for 11a 5180 MHz – Horz. (Ave)

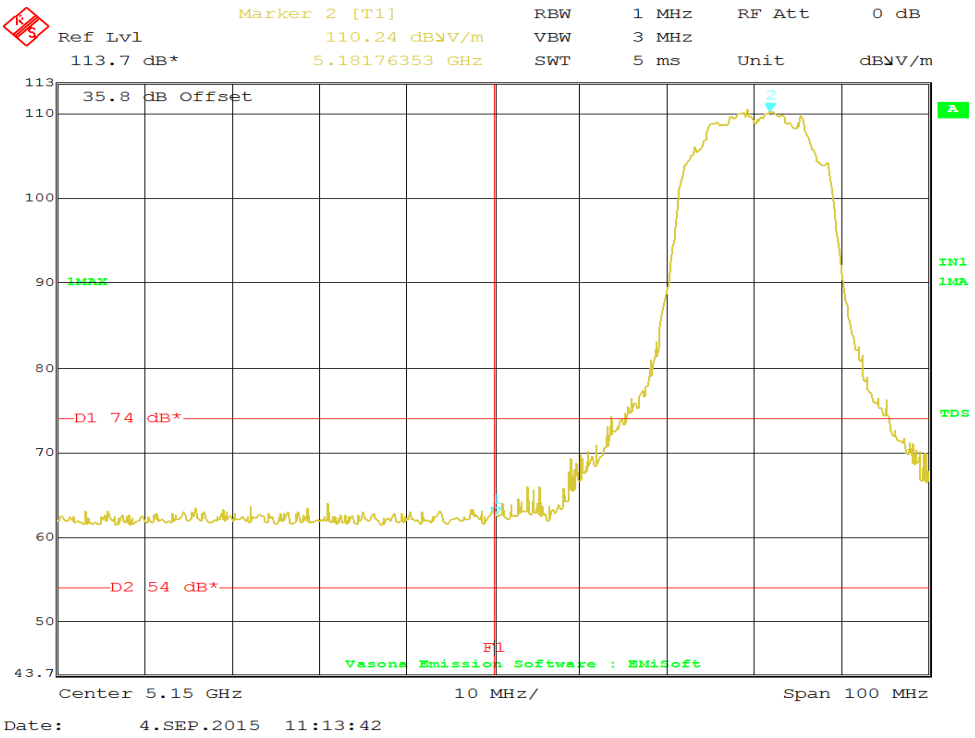


Figure 71: Radiated Emission 5150 MHz Edge for VHT20 5180 MHz – Horz. (Pk)

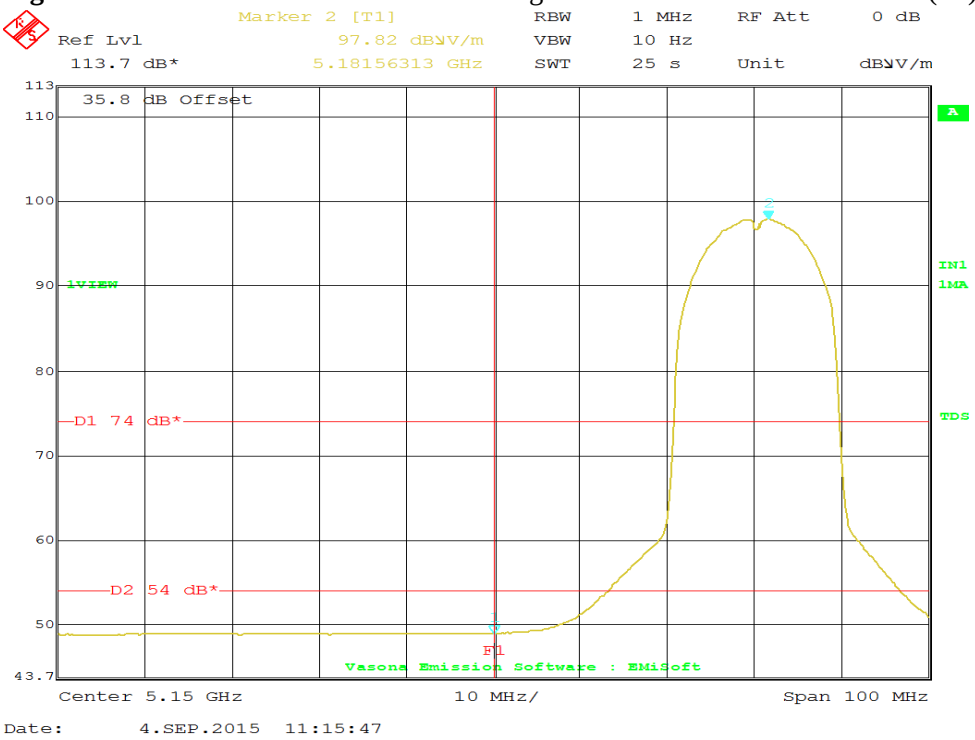


Figure 72: Radiated Emission 5150 MHz Edge for VHT20 5180 MHz – Horz. (Ave)

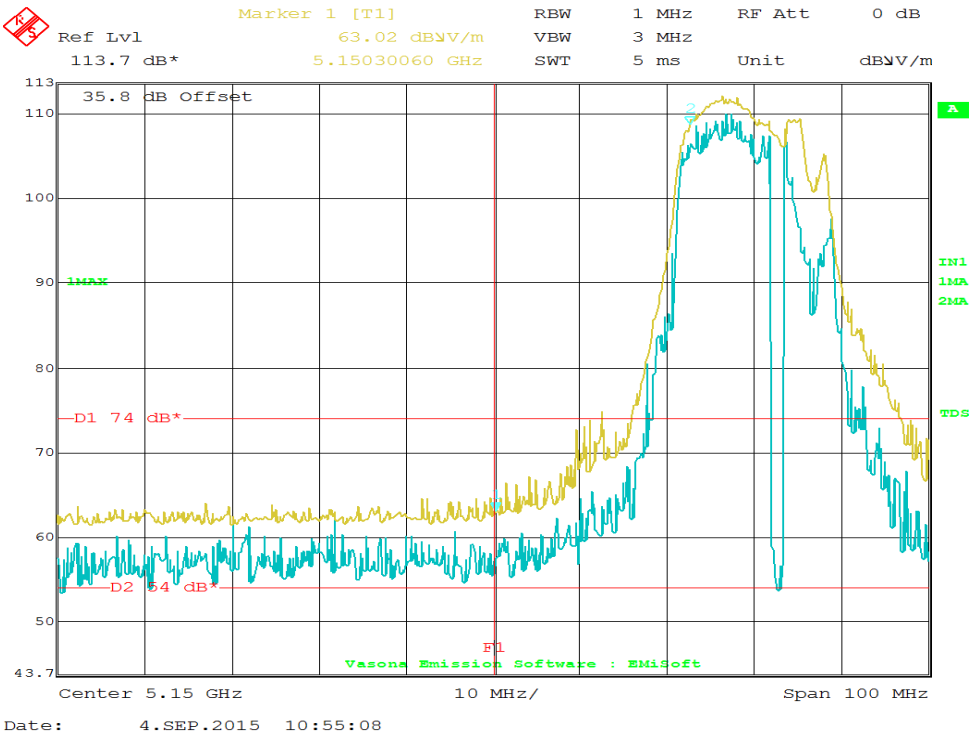


Figure 73: Radiated Emission 5150 MHz Edge for VHT20 5180 MHz – Vert. (Pk)

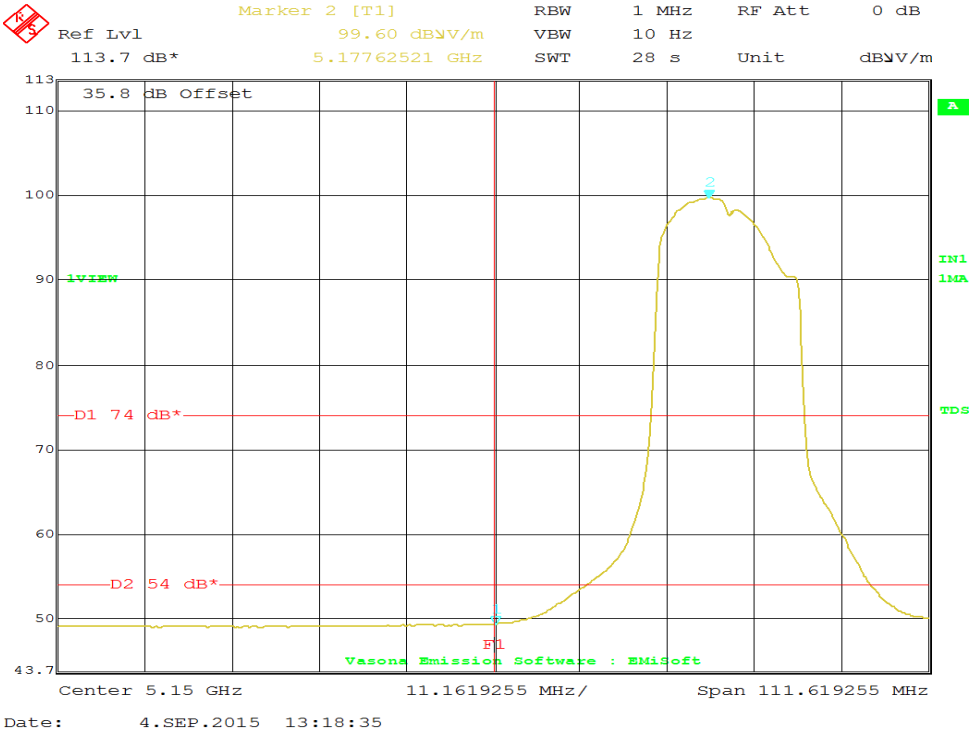


Figure 74: Radiated Emission 5150 MHz Edge for VHT20 5180 MHz – Vert. (Ave)

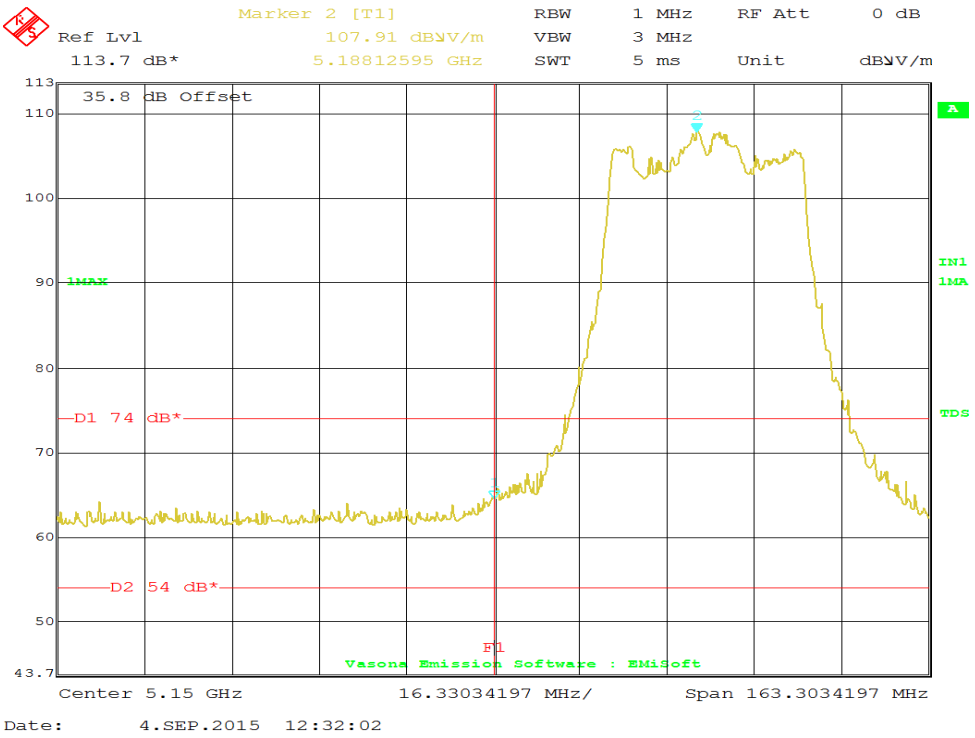


Figure 75: Radiated Emission 5150 MHz Edge for HT40 5190 MHz – Horz. (Pk)

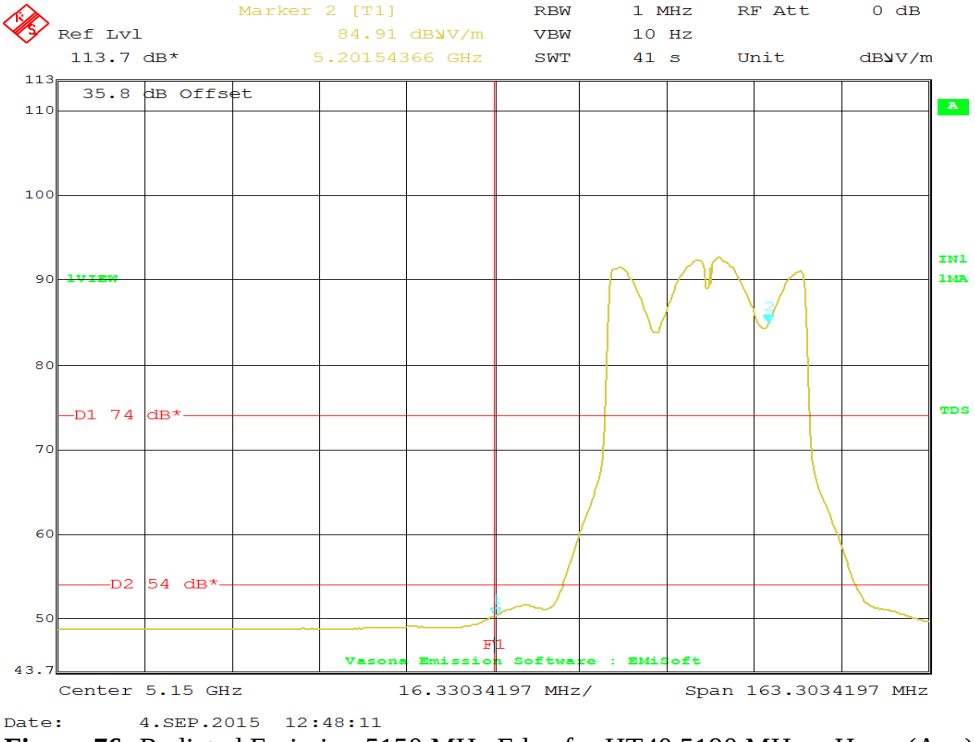


Figure 76: Radiated Emission 5150 MHz Edge for HT40 5190 MHz – Horz. (Ave)

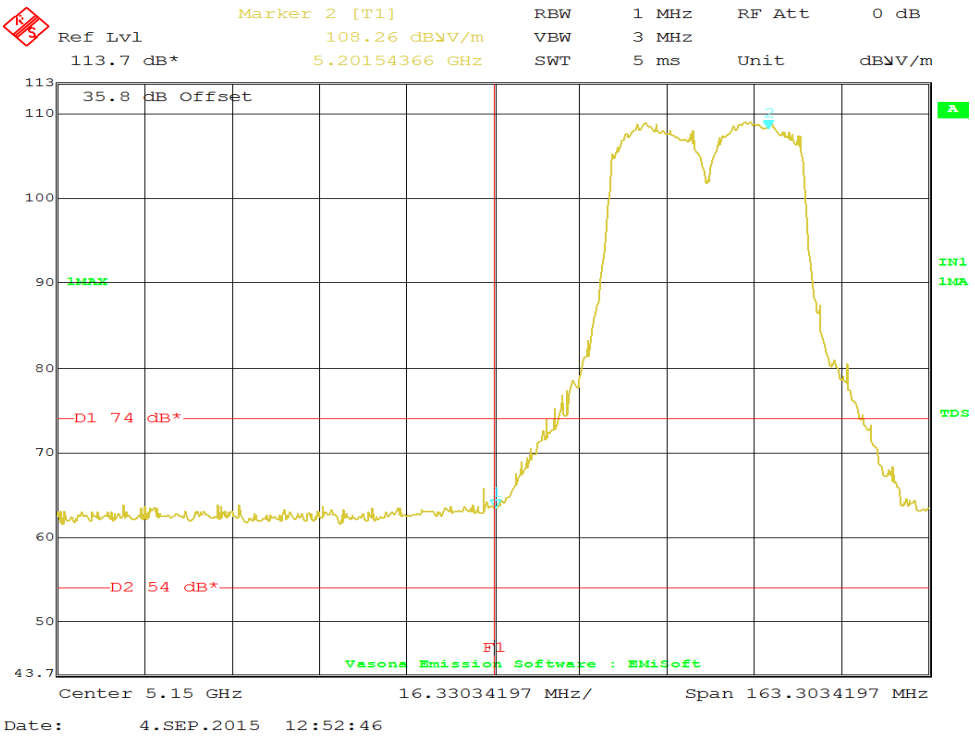


Figure 77: Radiated Emission 5150 MHz Edge for HT40 5190 MHz – Vert. (Pk)

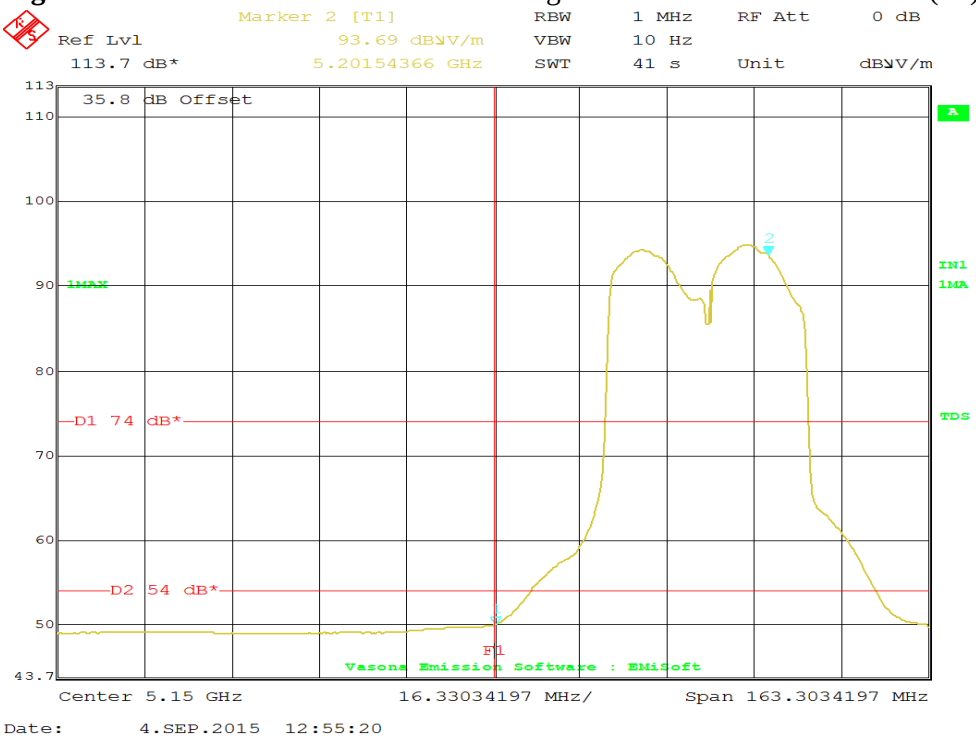


Figure 78: Radiated Emission 5150 MHz Edge for HT40 5190 MHz – Vert. (Ave)

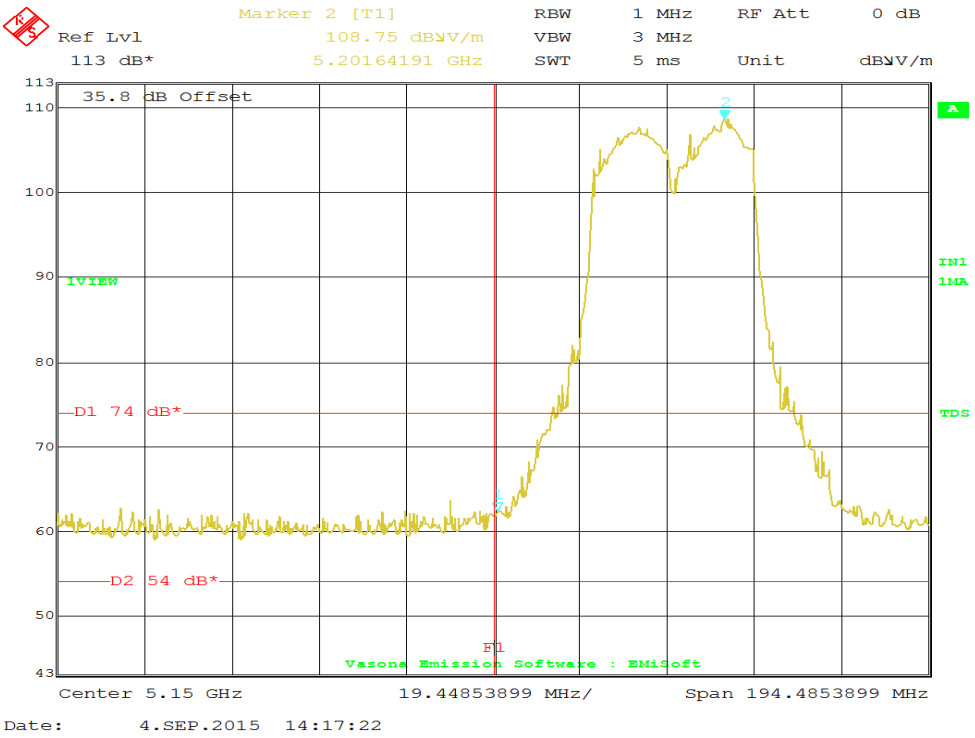


Figure 79: Radiated Emission 5150 MHz Edge for VHT40 5190 MHz – Vert. (Pk)

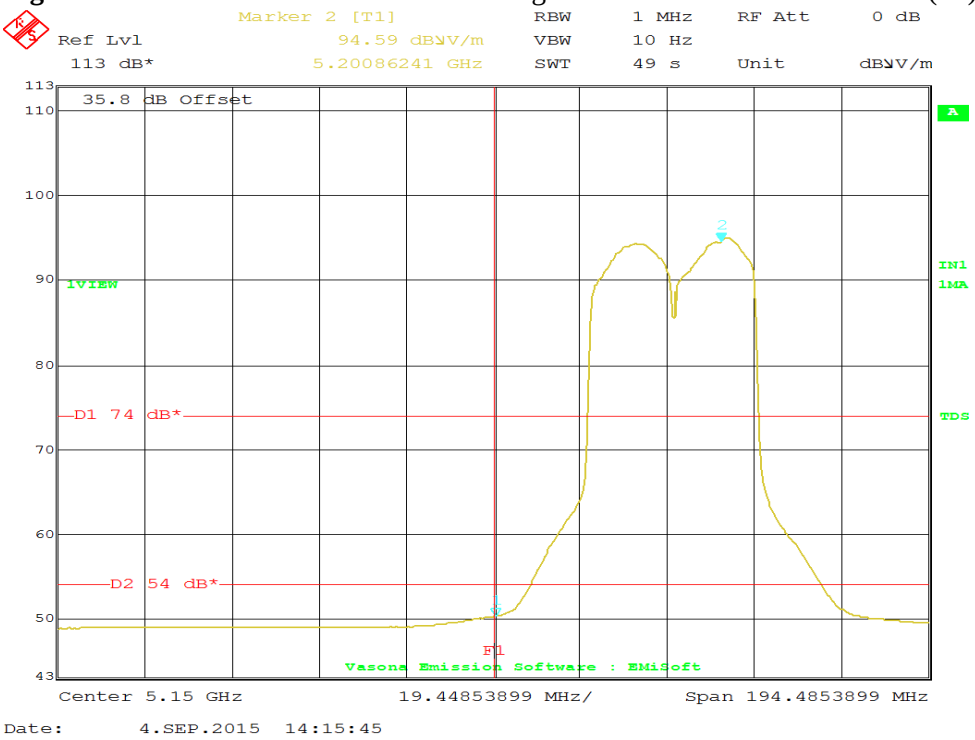


Figure 80: Radiated Emission 5150 MHz Edge for VHT40 5190 MHz – Vert. (Ave)

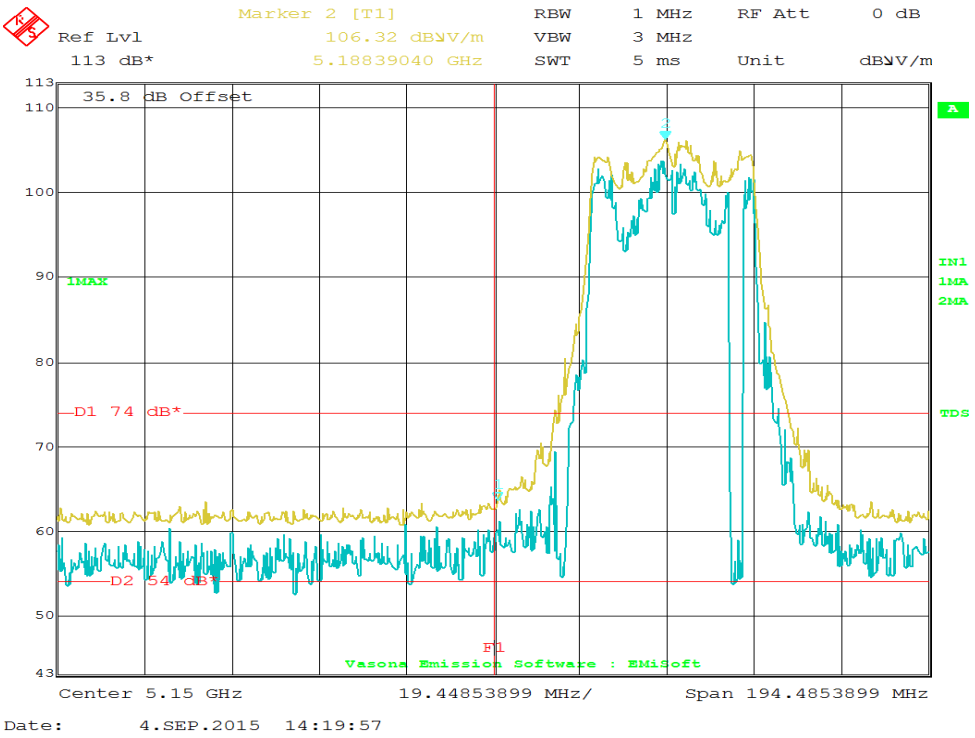


Figure 81: Radiated Emission 5150 MHz Edge for VHT40 5190 MHz – Horz. (Pk)

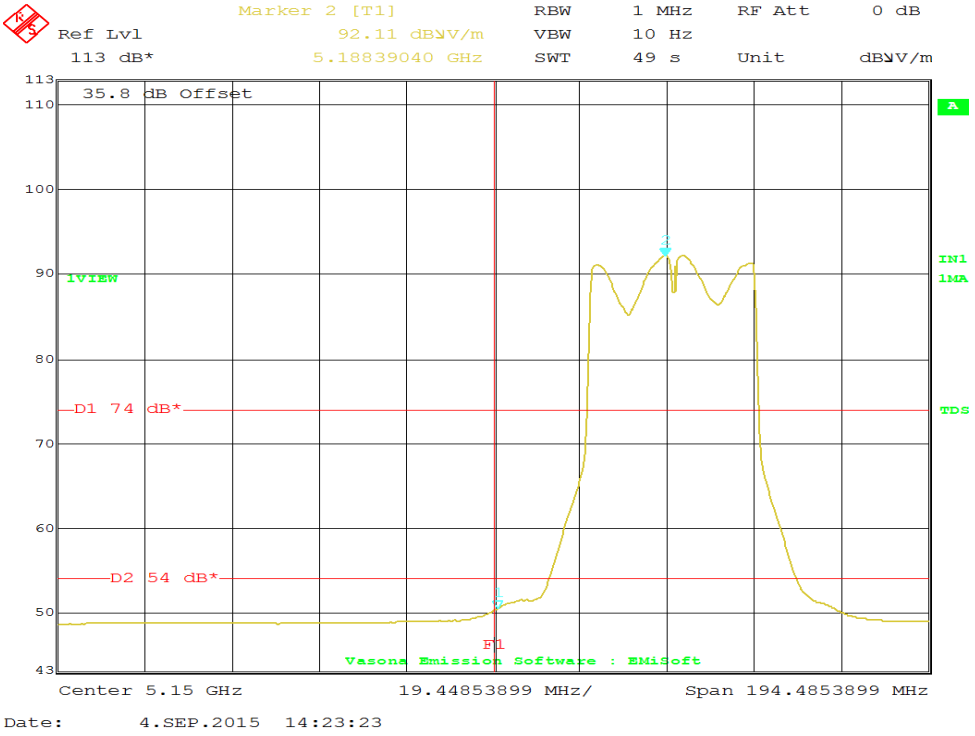


Figure 82: Radiated Emission 5150 MHz Edge for VHT40 5190 MHz – Horz. (Ave)

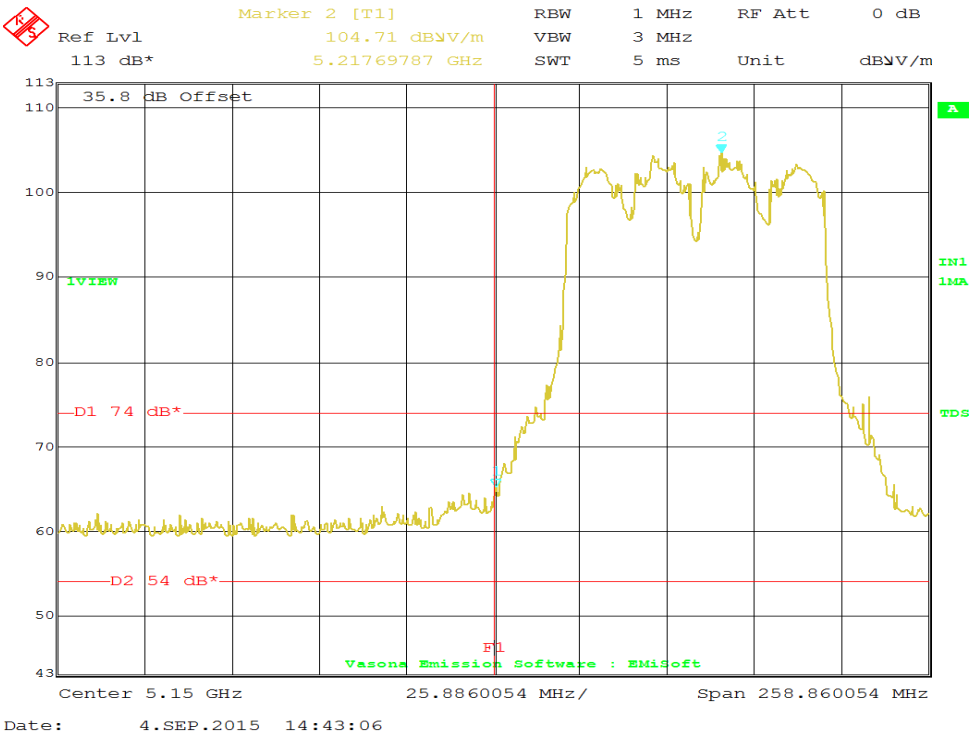


Figure 83: Radiated Emission 5150 MHz Edge for VHT80 5210 MHz – Vert. (Pk)

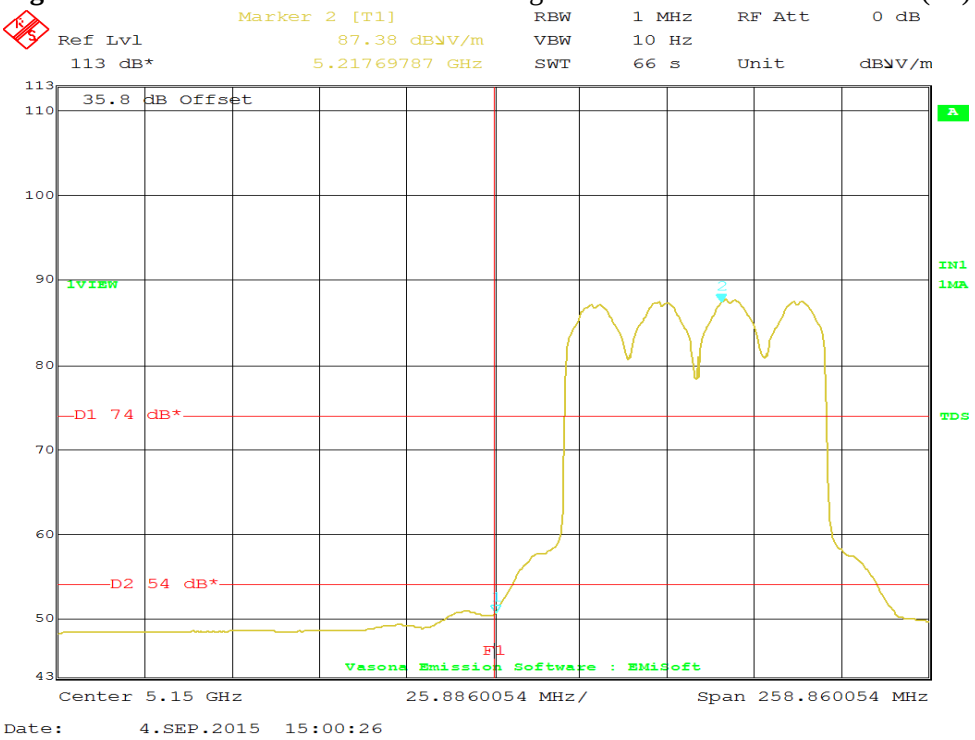


Figure 84: Radiated Emission 5150 MHz Edge for VHT80 5210 MHz – Vert. (Ave)

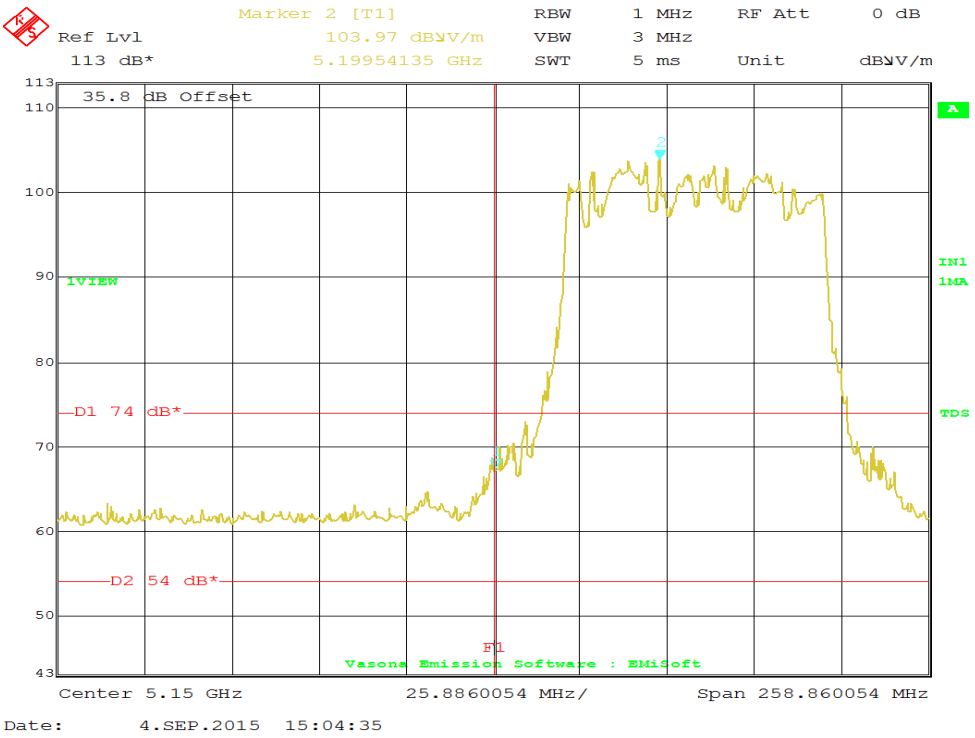


Figure 85: Radiated Emission 5150 MHz Edge for VHT80 5210 MHz – Horz. (Pk)

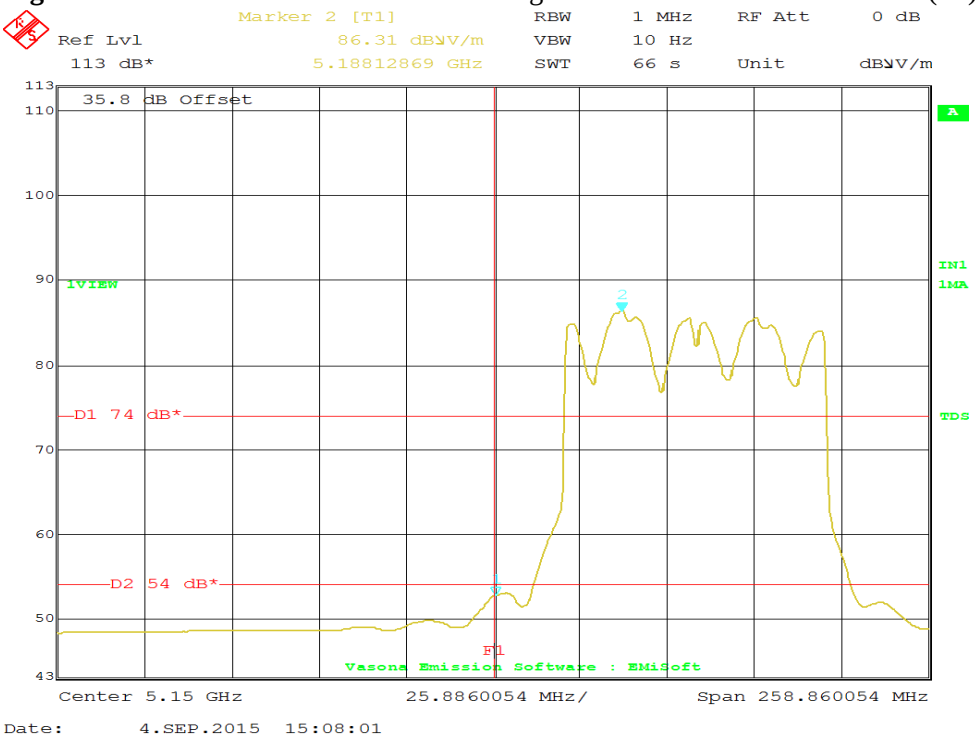


Figure 86: Radiated Emission 5150 MHz Edge for VHT80 5210 MHz – Horz. (Ave)

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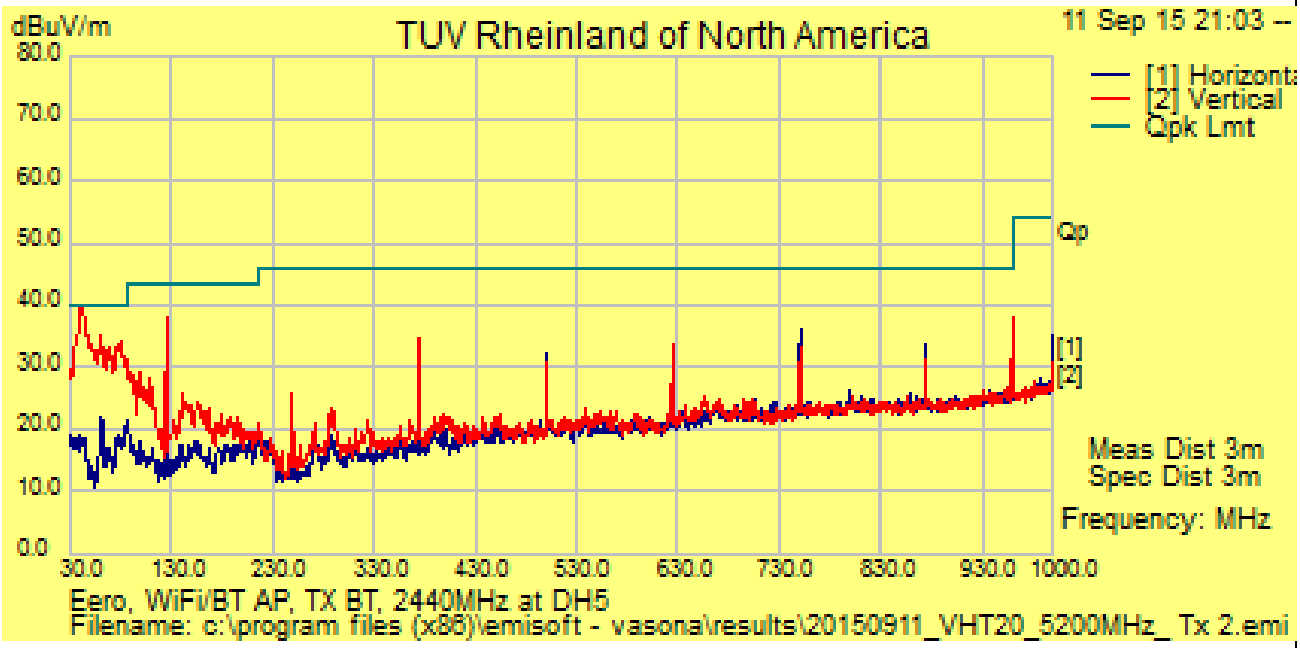
EUT Name	Home Wi-Fi Router	**Date**	September 11, 2015
EUT Model	A010001	**Temp / Hum in**	21° C / 35%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac/60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Chris Byleckie

30 MHz – 1 GHz Transmit at 5200 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
500.00	36.29	4.69	-14.97	26.01	QP	H	100	2	46.00	-19.99
142.29	34.81	3.36	-19.31	18.86	QP	V	239	12	43.50	-24.64
875.10	29.02	5.68	-10.42	24.27	QP	H	323	96	46.00	-21.73
90.70	43.96	3.06	-24.76	22.26	QP	V	107	106	43.50	-21.24
98.14	44.17	3.11	-22.71	24.57	QP	V	116	134	43.50	-18.93
60.36	48.58	2.86	-24.84	26.59	QP	V	111	142	40.00	-13.41
40.19	48.72	2.69	-18.16	33.25	QP	V	129	250	40.00	-6.75



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 VHT20 MCS0 mode.
2. Mode tested are 802.11a, HT20, VHT20, HT40, VHT40 & VHT80 (low, mid & high channel).
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.

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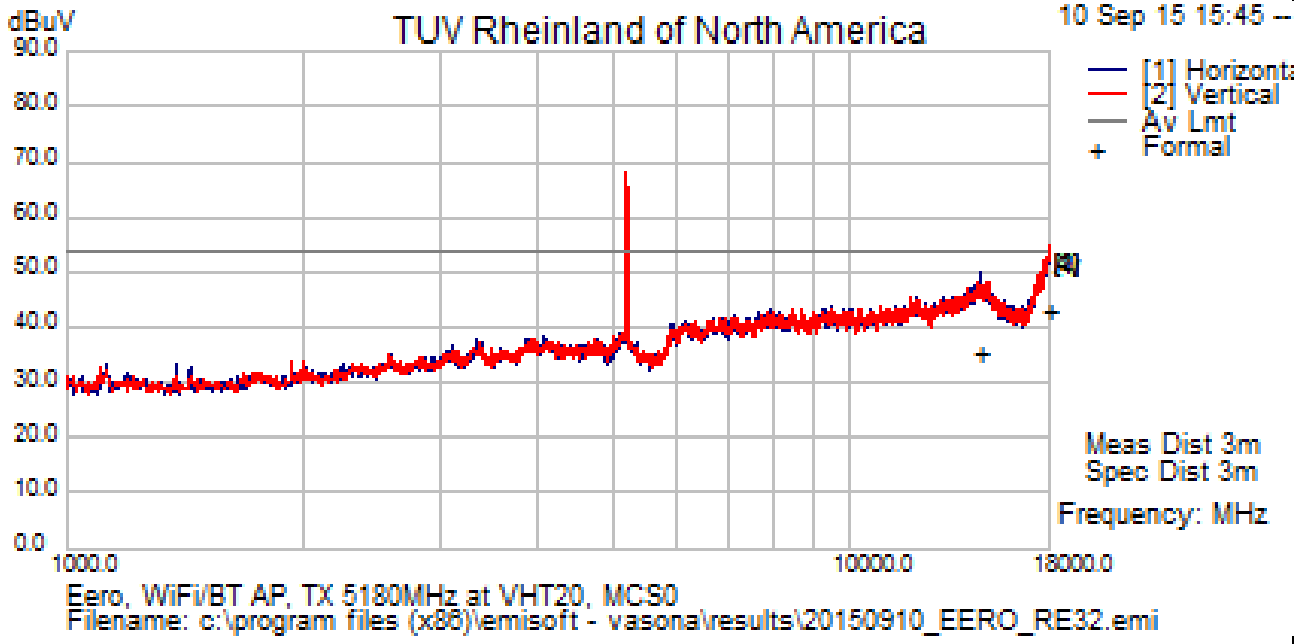
EUT Name	Home Wi-Fi Router	**Date**	September 10, 2015
EUT Model	A010001	**Temp / Hum in**	21° C / 34%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

1 – 18 GHz Transmit at 5180 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
14665.57	38.42	3.42	-6.57	35.28	Average	H	230	152	54.00	-18.73
17988.38	36.64	4.04	2.19	42.87	Average	V	236	278	54.00	-11.13



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

Note: 1. Worst case was observed on VHT20 MCS0 mode.
2. Modes covered are 802.11a and HT20.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.
4. Emission above the Spurious Limit is the Fundamental.

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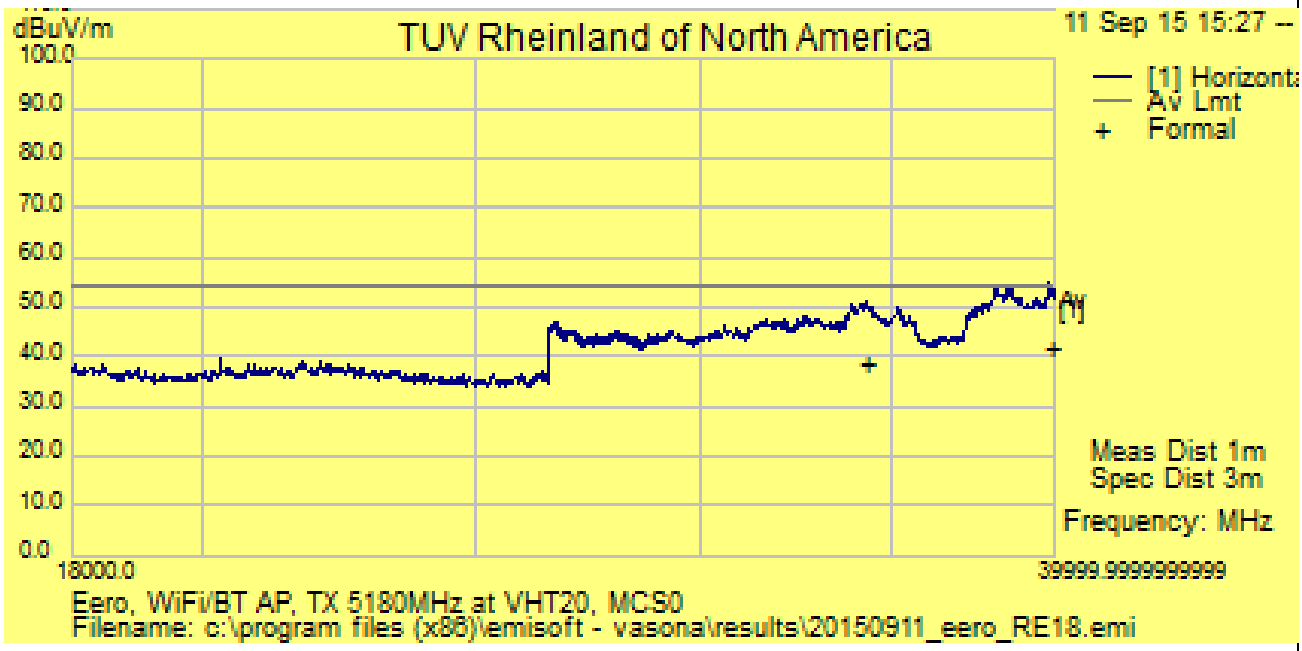
EUT Name	Home Wi-Fi Router	**Date**	September 11, 2015
EUT Model	A010001	**Temp / Hum in**	20° C / 37%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 40 GHz Transmit at 5180 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
34315.68	44.03	7.00	-12.44	38.59	Average	H	164	106	54.00	-15.41
39847.80	47.59	7.65	-13.54	41.70	Average	V	164	182	54.00	-12.30



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

Note: 1. Worst case was observed on VHT20 MCS0 mode.
2. Modes covered are 802.11a and HT20.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.

SOP 1 Radiated Emissions

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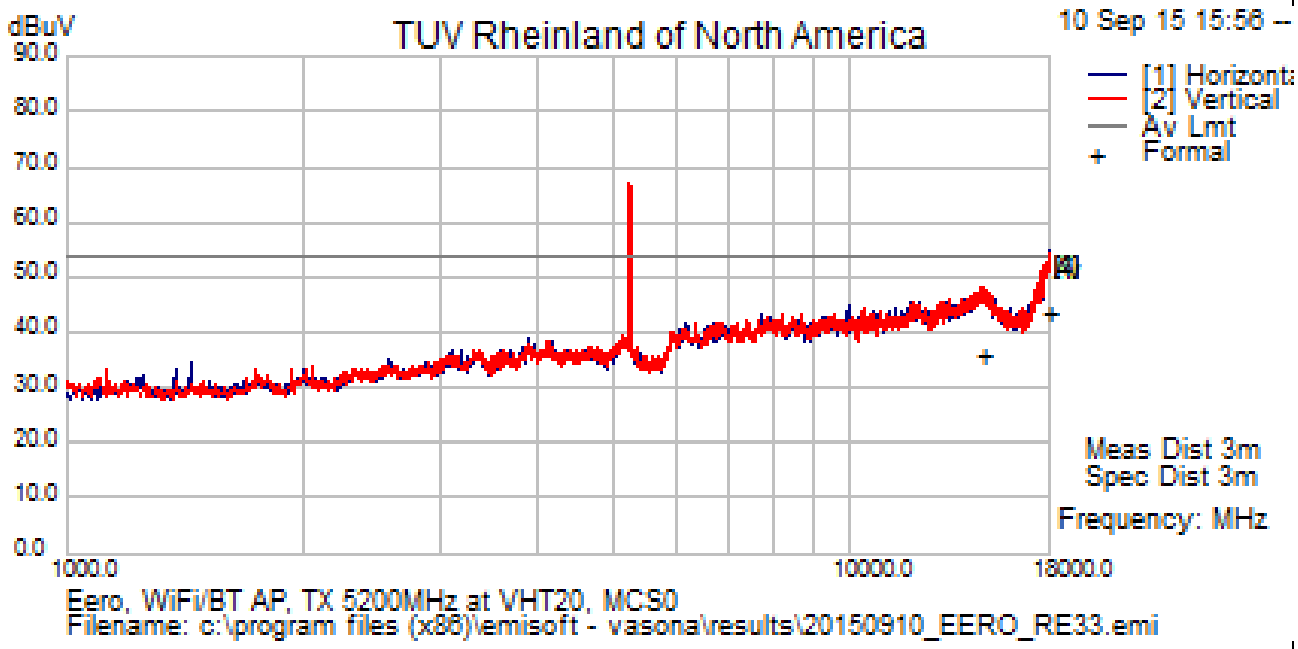
EUT Name	Home Wi-Fi Router	**Date**	September 10, 2015
EUT Model	A010001	**Temp / Hum in**	21° C / 34%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

1 – 18 GHz Transmit at 5200 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
14748.34	38.76	3.39	-6.35	35.80	Average	V	170	260	54.00	-18.20
17998.28	36.94	4.05	2.44	43.43	Average	V	140	248	54.00	-10.57



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

Note: 1. Worst case was observed on VHT20 MCS0 mode.
2. Modes covered are 802.11a and HT20.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.
4. Emission above the Spurious Limit is the Fundamental.

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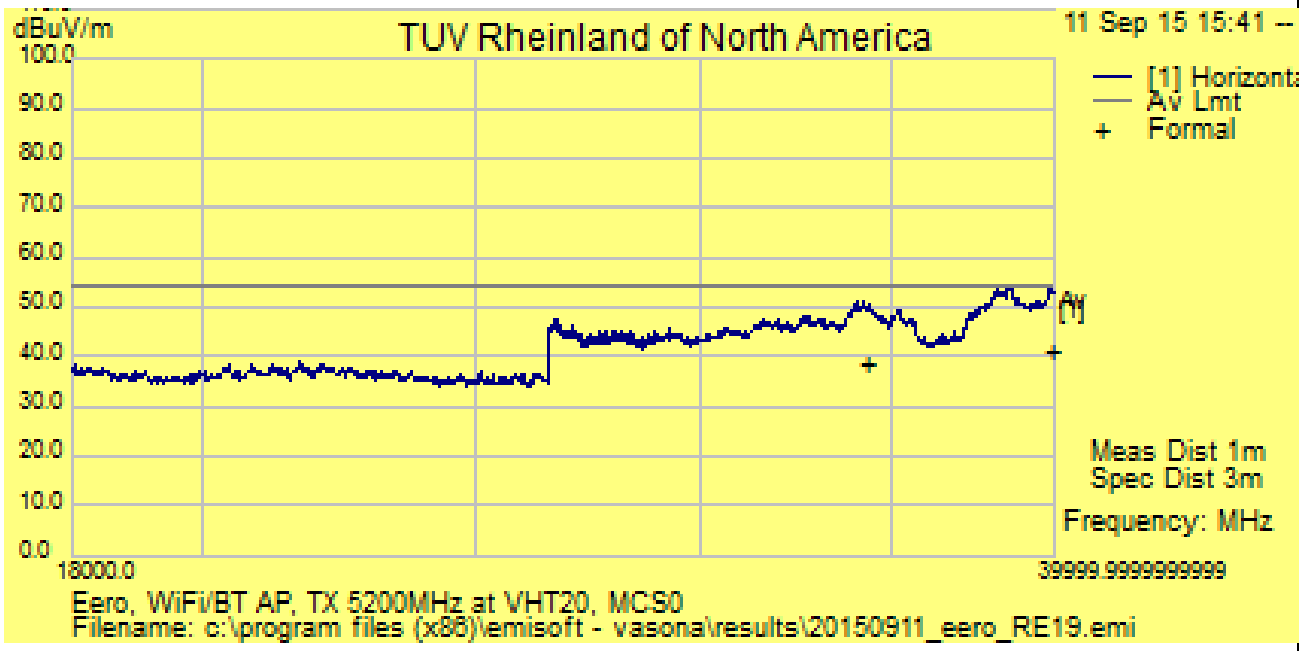
EUT Name	Home Wi-Fi Router	**Date**	September 11, 2015
EUT Model	A010001	**Temp / Hum in**	20° C / 37%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 40 GHz Transmit at 5200 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
34266.60	43.96	6.99	-12.43	38.52	Average	H	162	132	54.00	-15.48
39824.75	47.16	7.65	-13.54	41.27	Average	H	131	124	54.00	-12.73



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

Note: 1. Worst case was observed on VHT20 MCS0 mode.
2. Modes covered are 802.11a and HT20.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.

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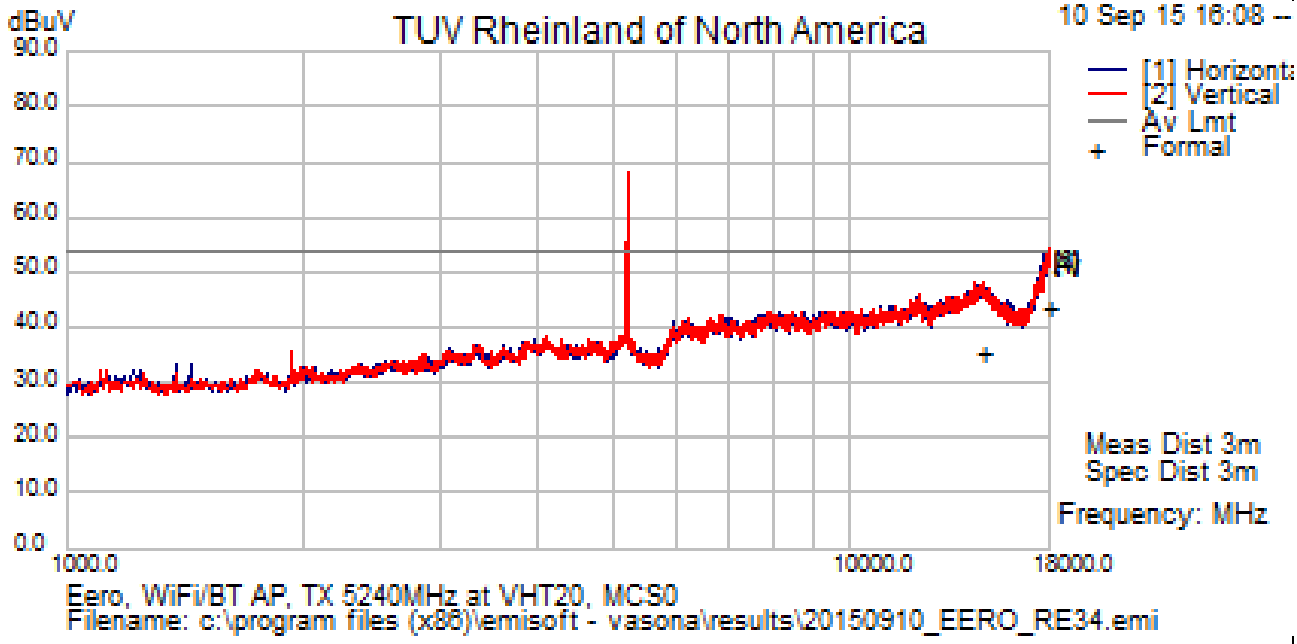
EUT Name	Home Wi-Fi Router	**Date**	September 10, 2015
EUT Model	A010001	**Temp / Hum in**	21° C / 34%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

1 – 18 GHz Transmit at 5240 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
14779.09	38.51	3.39	-6.45	35.45	Average	V	172	54	54.00	-18.55
17999.69	37.05	4.05	2.47	43.57	Average	V	159	144	54.00	-10.43



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

Note: 1. Worst case was observed on VHT20 MCS0 mode.
2. Modes covered are 802.11a and HT20.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.
4. Emission above the Spurious Limit is the Fundamental.

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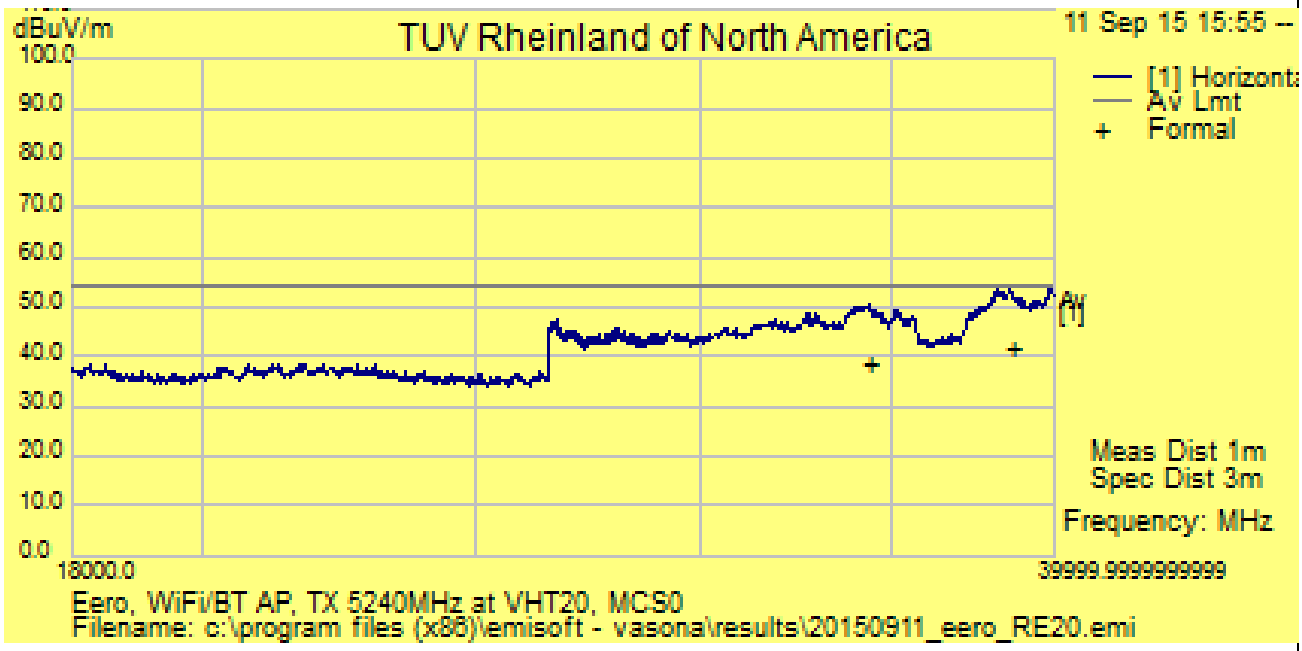
EUT Name	Home Wi-Fi Router	**Date**	September 11, 2015
EUT Model	A010001	**Temp / Hum in**	20° C / 37%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT20 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 40 GHz Transmit at 5240 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
34377.96	43.93	7.01	-12.44	38.50	Average	V	140	86	54.00	-15.50
38567.38	46.05	7.55	-12.00	41.60	Average	V	151	-2	54.00	-12.40



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

Note: 1. Worst case was observed on VHT20 MCS0 mode.
2. Modes covered are 802.11a and HT20.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.

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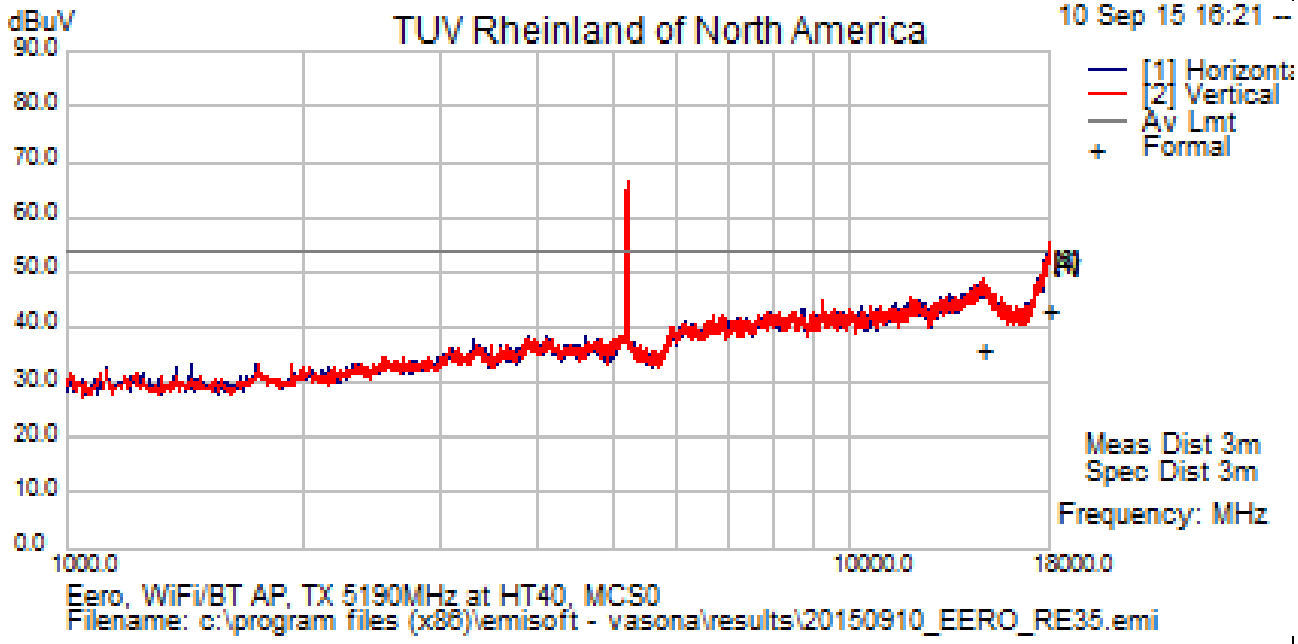
EUT Name	Home Wi-Fi Router	**Date**	September 10, 2015
EUT Model	A010001	**Temp / Hum in**	21° C / 34%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

1 – 18 GHz Transmit at 5190 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
14749.15	38.83	3.39	-6.34	35.87	Average	V	247	-2	54.00	-18.13
17995.40	36.85	4.04	2.37	43.26	Average	V	197	16	54.00	-10.74



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

Note: 1. Worst case was observed on HT40 MCS0 mode.
2. Mode covered is VHT40.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.
4. Emission above the Spurious Limit is the Fundamental.

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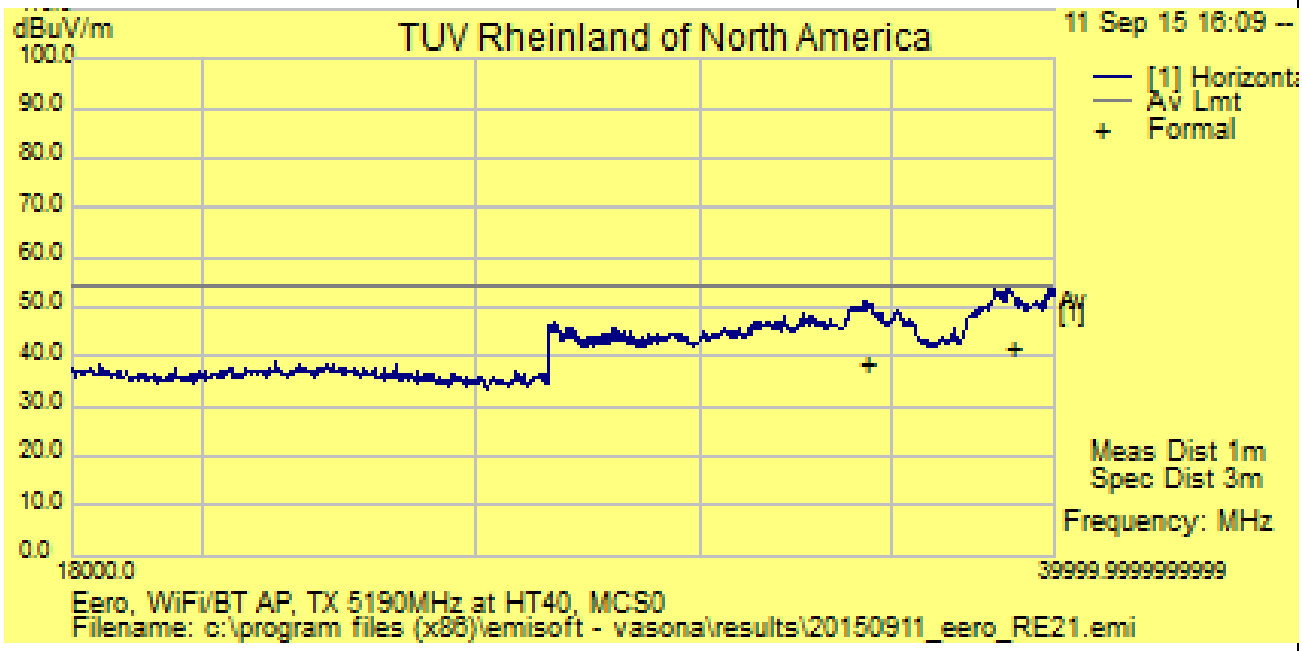
EUT Name	Home Wi-Fi Router	**Date**	September 11, 2015
EUT Model	A010001	**Temp / Hum in**	20° C / 37%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 40 GHz Transmit at 5190 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
34334.42	43.99	7.00	-12.44	38.55	Average	H	113	274	54.00	-15.45
38591.01	45.92	7.55	-12.04	41.42	Average	H	165	270	54.00	-12.58



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

Note: 1. Worst case was observed on HT40 MCS0 mode.
2. Mode covered is VHT40.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.

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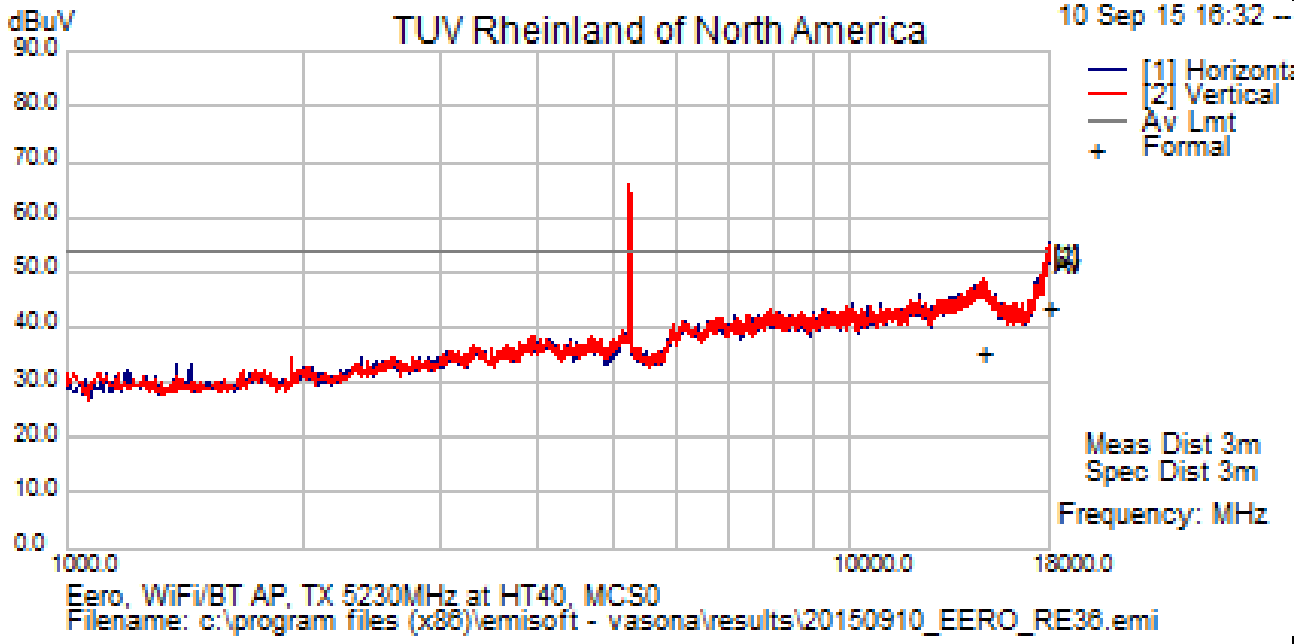
EUT Name	Home Wi-Fi Router	**Date**	September 10, 2015
EUT Model	A010001	**Temp / Hum in**	21° C / 34%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

1 – 18 GHz Transmit at 5230 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
18000.00	37.10	4.05	2.48	43.63	Average	H	224	6	54.00	-10.37
14777.29	38.61	3.39	-6.45	35.55	Average	V	215	-2	54.00	-18.45



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

Note: 1. Worst case was observed on HT40 MCS0 mode.
2. Mode covered is VHT40.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.
4. Emission above the Spurious Limit is the Fundamental.

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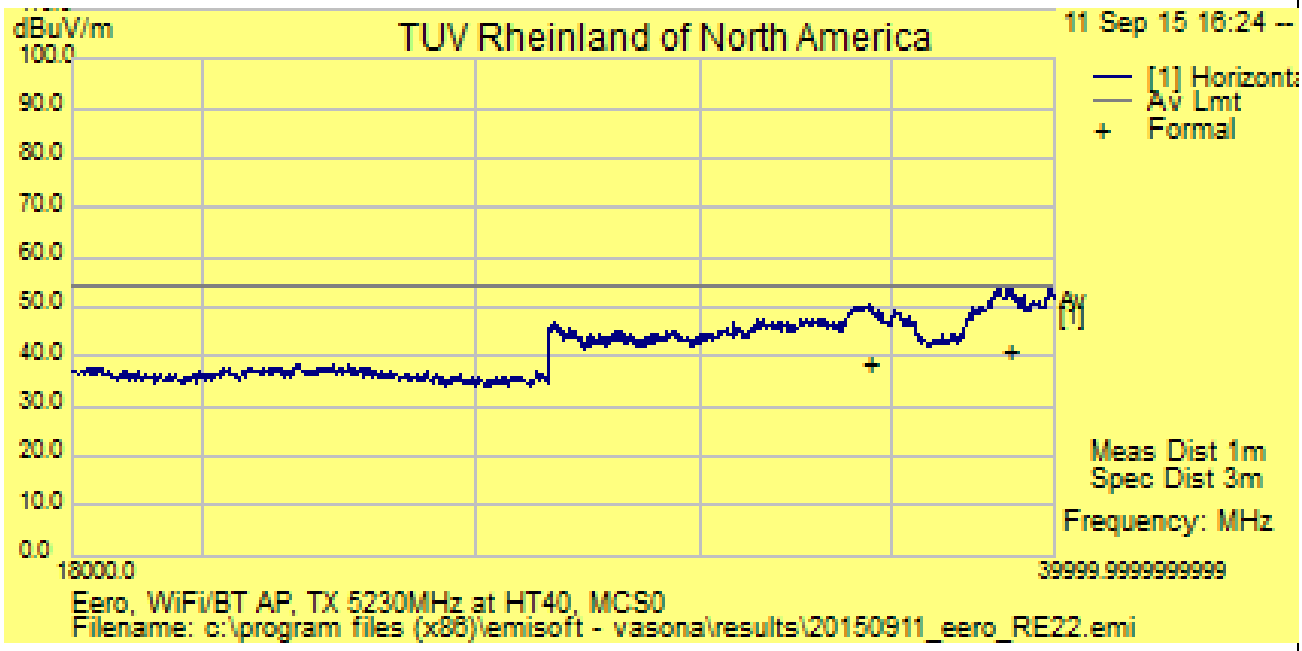
EUT Name	Home Wi-Fi Router	**Date**	September 11, 2015
EUT Model	A010001	**Temp / Hum in**	20° C / 37%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11n at HT40 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 40 GHz Transmit at 5230 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
38498.82	45.59	7.56	-11.88	41.27	Average	H	152	76	54.00	-12.73
34381.23	43.91	7.01	-12.44	38.49	Average	V	126	214	54.00	-15.51



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

Note: 1. Worst case was observed on HT40 MCS0 mode.
2. Mode covered is VHT40.
3. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.

SOP 1 Radiated Emissions

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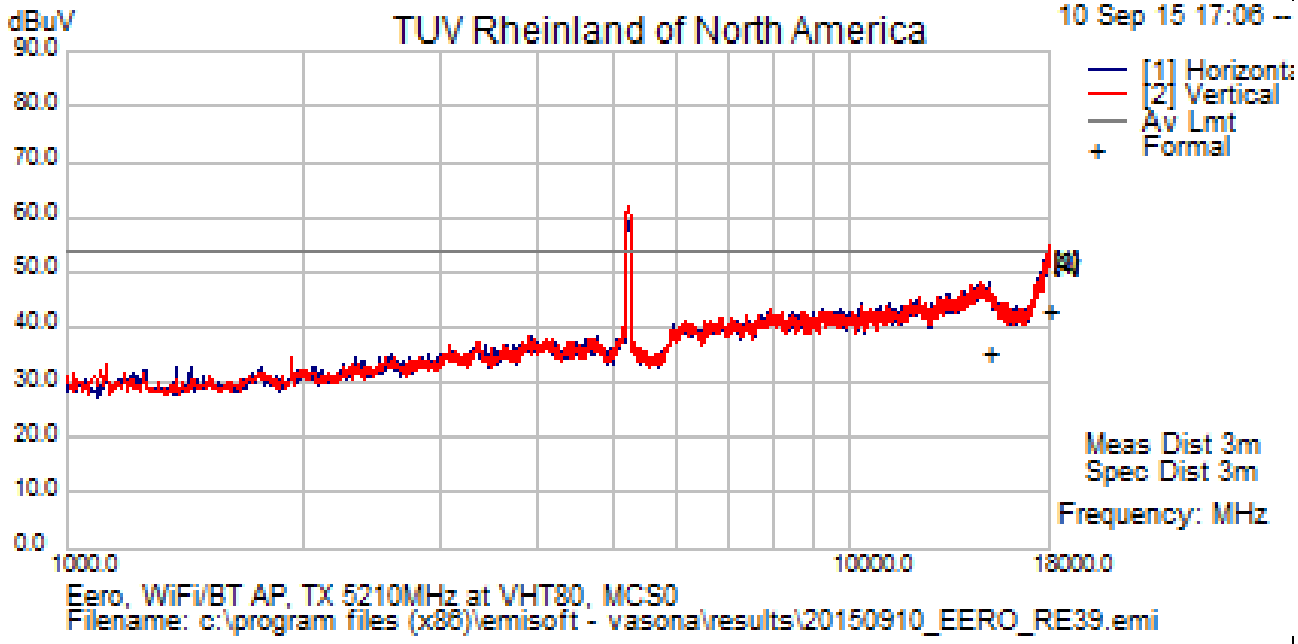
EUT Name	Home Wi-Fi Router	**Date**	September 10, 2015
EUT Model	A010001	**Temp / Hum in**	21° C / 34%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT80 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

1 – 18 GHz Transmit at 5210 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
15003.69	38.67	3.35	-6.96	35.07	Average	H	215	134	54.00	-18.93
17993.70	36.77	4.04	2.32	43.14	Average	V	234	126	54.00	-10.86



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

Note: 1. Worst case was observed on VHT80 MCS0 mode.
2. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.
3. Emission above the Spurious Limit is the Fundamental.

SOP 1 Radiated Emissions

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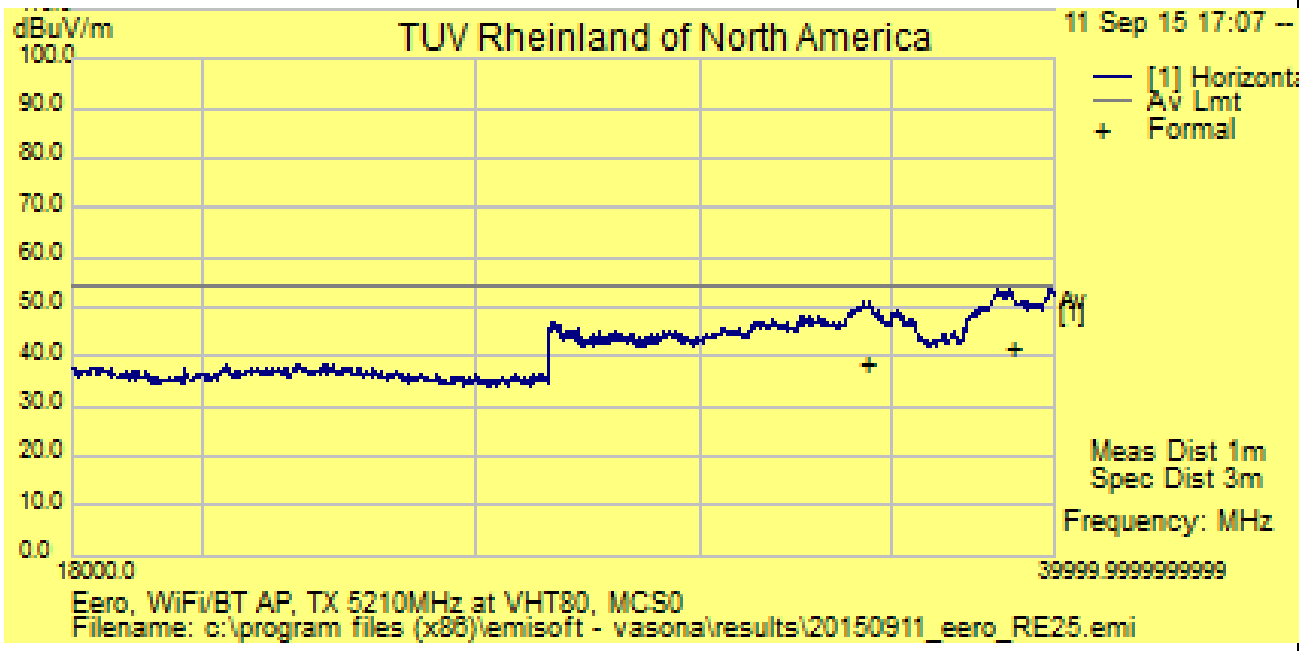
EUT Name	Home Wi-Fi Router	**Date**	September 11, 2015
EUT Model	A010001	**Temp / Hum in**	20° C / 37%rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	802.11ac at VHT80 MCS0 / chain 0 & 1	**Line AC / Freq**	120 Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Kerwinn Corpuz

18 – 40 GHz Transmit at 5210 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
38567.01	46.04	7.55	-12.00	41.59	Average	H	118	66	54.00	-12.41
34290.56	43.95	7.00	-12.43	38.51	Average	V	150	290	54.00	-15.49



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

Note: 1. Worst case was observed on VHT80 MCS0 mode.
2. To reduce complexity and bulkiness of the report Worst case Plots are placed in the report.

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: 2014.

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 19: 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:** 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**	September 15, 2015
EUT Model	A010001	**Temp / Hum in**	22° C / 37% rh
EUT Serial	E58V-0034-H6W8-7MJX	**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**	Chris Byleckie

Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB	
0.150	35.84	9.94	0.23	46.01	QP	Live	66.00	-19.99	Pass
0.150	27.23	9.94	0.23	37.40	Ave	Live	56.00	-18.60	Pass
0.380	38.50	9.96	0.09	48.56	QP	Live	58.28	-9.72	Pass
0.380	33.95	9.96	0.09	44.01	Ave	Live	48.28	-4.27	Pass
0.440	35.18	9.97	0.09	45.24	QP	Live	57.06	-11.81	Pass
0.440	33.03	9.97	0.09	43.09	Ave	Live	47.06	-3.96	Pass
0.883	22.97	9.99	0.07	33.03	QP	Live	56.00	-22.97	Pass
0.883	11.00	9.99	0.07	21.06	Ave	Live	46.00	-24.94	Pass
1.774	22.36	10.01	0.06	32.42	QP	Live	56.00	-23.58	Pass
1.774	11.97	10.01	0.06	22.04	Ave	Live	46.00	-23.96	Pass
2.032	20.96	10.01	0.05	31.02	QP	Live	56.00	-24.98	Pass
2.032	11.38	10.01	0.05	21.44	Ave	Live	46.00	-24.56	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 5200 MHz in 802.11ac at VHT20 MCS0

SOP 2 Conducted Emissions

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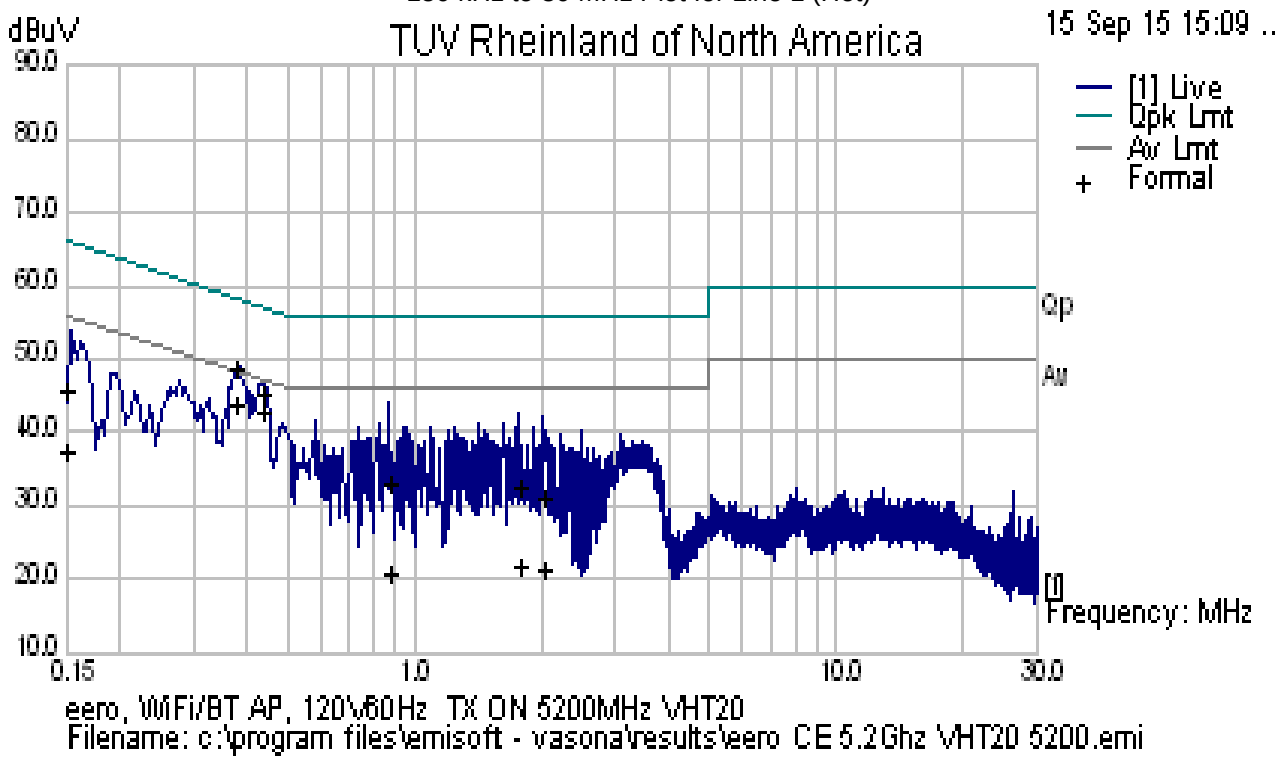
EUT Name	Home Wi-Fi Router	**Date**	September 15, 2015
EUT Model	A010001	**Temp / Hum in**	22° C / 37% rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	TX mode / chain 0 & 1	**Line AC**	120Vac/60Hz
Standard	CFR47 Part 15.207 and RSS Gen	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 1	**Performed by**	Chris Byleckie

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**	September 15, 2015
EUT Model	A010001	**Temp / Hum in**	22° C / 37% rh
EUT Serial	E58V-0034-H6W8-7MJX	**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**	Chris Byleckie

Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB	
0.382	37.38	9.96	0.09	47.43	QP	Neutral	58.24	-10.81	Pass
0.382	31.88	9.96	0.09	41.93	Ave	Neutral	48.24	-6.31	Pass
0.573	26.14	9.98	0.08	36.20	QP	Neutral	56.00	-19.80	Pass
0.573	17.82	9.98	0.08	27.88	Ave	Neutral	46.00	-18.12	Pass
0.647	29.80	9.98	0.07	39.85	QP	Neutral	56.00	-16.15	Pass
0.647	23.49	9.98	0.07	33.54	Ave	Neutral	46.00	-12.46	Pass
0.721	26.33	9.98	0.07	36.38	QP	Neutral	56.00	-19.62	Pass
0.721	16.14	9.98	0.07	26.19	Ave	Neutral	46.00	-19.81	Pass
0.796	27.82	9.98	0.07	37.87	QP	Neutral	56.00	-18.13	Pass
0.796	16.56	9.98	0.07	26.61	Ave	Neutral	46.00	-19.39	Pass
1.816	23.03	10.01	0.06	33.10	QP	Neutral	56.00	-22.90	Pass
1.816	12.85	10.01	0.06	22.92	Ave	Neutral	46.00	-23.08	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 5200 MHz in 802.11ac at VHT20 MCS0

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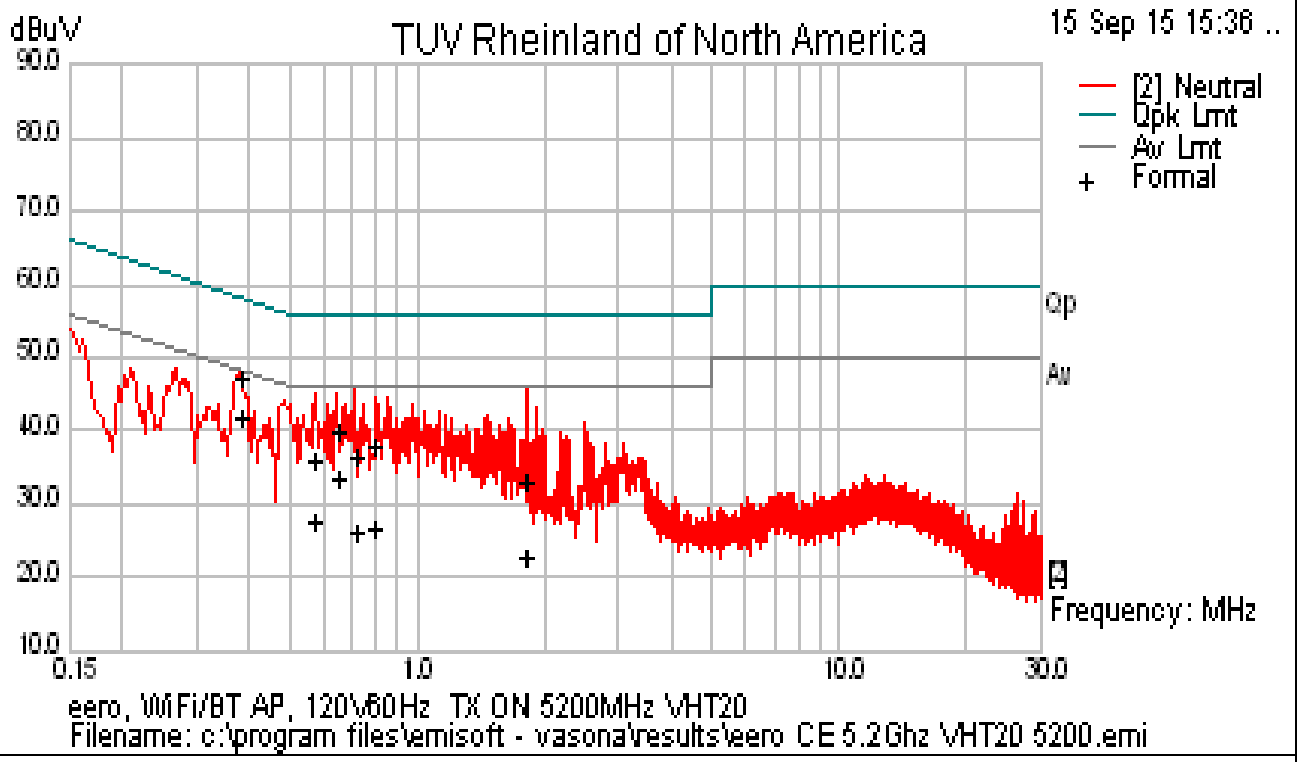
EUT Name	Home Wi-Fi Router	**Date**	September 15, 2015
EUT Model	A010001	**Temp / Hum in**	22° C / 37% rh
EUT Serial	E58V-0034-H6W8-7MJX	**Temp / Hum out**	N/A
EUT Config.	TX mode / chain 0 & 1	**Line AC**	120Vac/60Hz
Standard	CFR47 Part 15.207 and RSS Gen	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 2	**Performed by**	Chris Byleckie

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



Note: Met FCC Class B Limit.

4.7 Frequency Stability

In accordance with 47 CFR Part 15.407(g) and RSS GEN Sect. 6.11 the frequency stability of U-NII devices must be such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual. The Manufacturer calls out operating temperature ranges of +0º to +40º C

4.7.1 Test Methodology

The manufacturer of the equipment is responsible for ensuring that the frequency stability is such that emissions are always maintained within the band of operation under all conditions. This test performs according to ANSI C63.10-2013 Section 6.8

4.7.2 Manufacturer Declaration

The frequency stability of the reference oscillator sets the frequency stability of the RF transceiver signals. Therefore all of the RF signal should have ±20 ppm stability.

This stability accounts for room temp tolerance of the crystal oscillator circuit, frequency variation across temperature, and crystal ageing.

Worst case:
5.200 GHz - ±20 ppm/104 kHz

±20 ppm at 5.2 GHz translates to a maximum frequency shift of ±104 kHz. As the edge of the channels are at least one MHz from either of the band edges, ±103 kHz is more than sufficient to guarantee that the intentional emission will remain in the band over the entire operating range of the radio.

4.7.3 Limit

CFR47 Part 15.407(g) and RSS GEN Sect. 6.11 - Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

4.7.4 Test results:

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s) since the maximum frequency drift was 7.50 ppm.

Table 20: Frequency Stability – Test Results

Temperature	Time	PPM
0° C	Start	9.01
	2 Min.	13.70
	5 Min	17.67
	10 min	10.46
10° C	Start	10.82
	2 Min.	8.29
	5 Min	6.85
	10 min	10.46
20° C	Start	11.18
	2 Min.	0.36
	5 Min	8.65
	10 min	5.41
30° C	Start	1.08
	2 Min.	8.29
	5 Min	1.44
	10 min	8.65
40° C	Start	8.29
	2 Min.	7.21
	5 Min	1.44
	10 min	11.90
50° C	Start	7.93
	2 Min.	1.44
	5 Min	5.77
	10 min	4.69
Note: All frequency drifts were less than ±20 ppm. The worst frequency drift was 17.67 ppm		

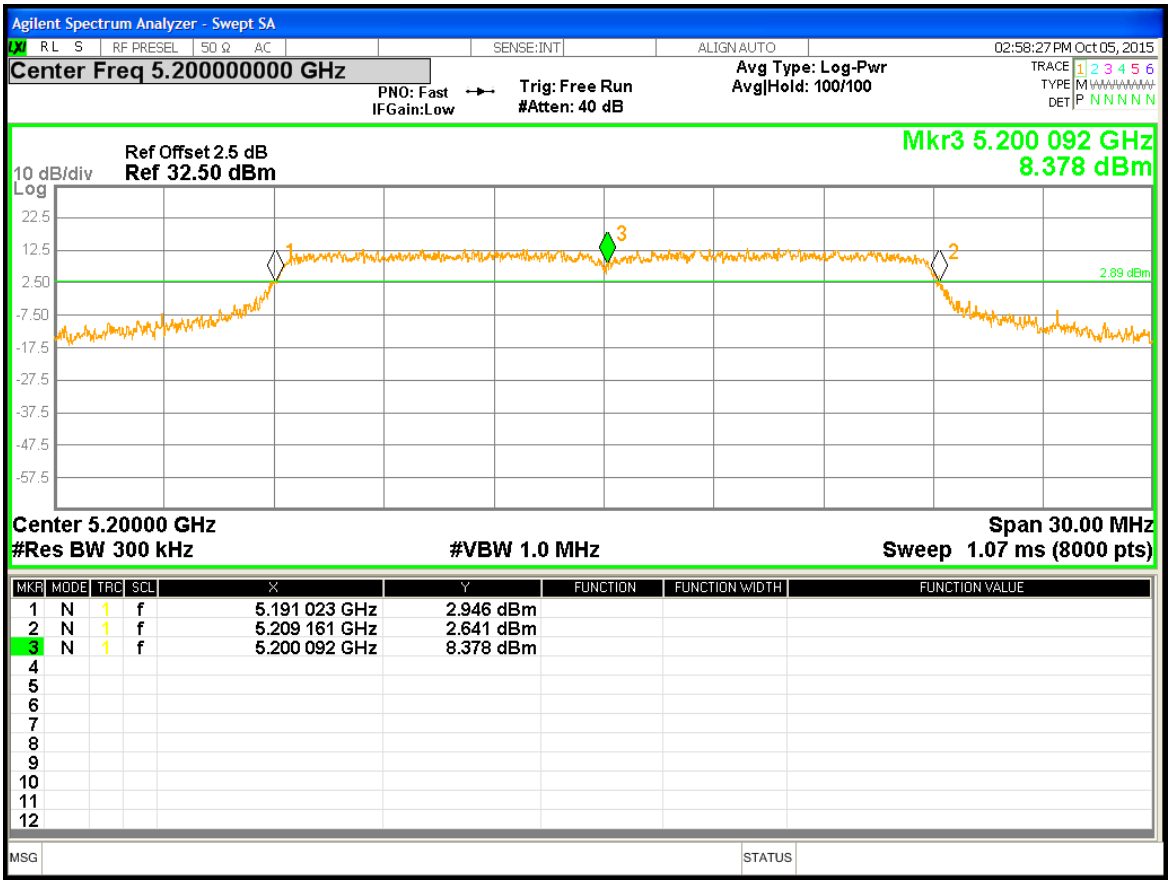


Figure 87: Frequency Stability – Worst Case

4.8 Voltage Variation

In accordance with 47 CFR Part 15.31 (e) intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.8.1 Test Methodology

The ac supply voltage was varied between 85% and 115% of the nominal rated supply voltage. The fundamental frequency was observed during the variation. The access point was powered 120 Vac / 60 Hz by programmable power supply. The voltage was varied from 102 Vac to 138 Vac mean while the fundamental frequencies were observed and record for the maximum drift in ppm; part per millions.

4.8.2 Test results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s). The fundamental frequencies drifted less than ±20 ppm.

Table 21: Voltage Variation – Test Results

Frequency MHz	**Nominal (120Vac)** MHz	**Lo Voltage (102Vac)** MHz	**Hi Voltage (138Vac)** MHz	**Max Drift** ppm
5200	0.013	-0.024	0.044	8.46

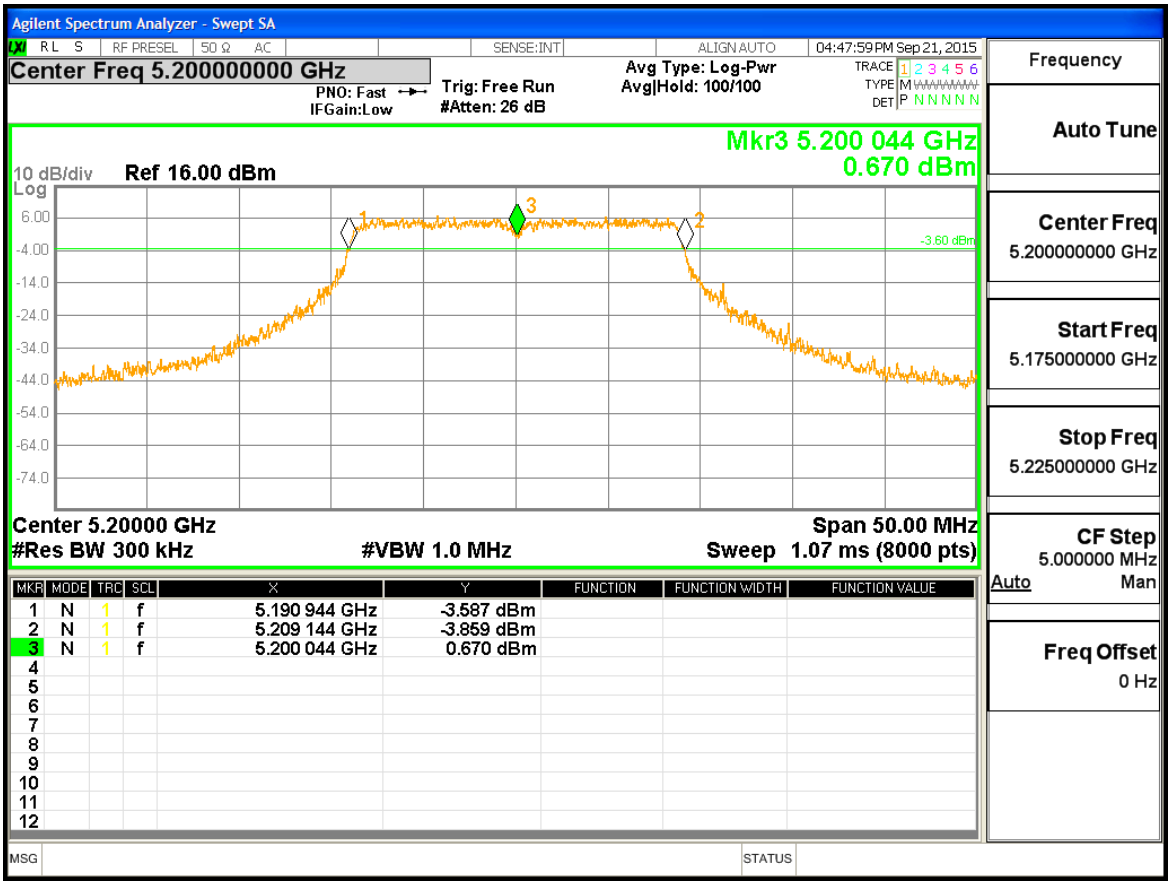


Figure 88: Voltage Variation – Worst Case

4.9 Maximum Permissible Exposure

4.9.1 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.

4.9.2 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

4.9.3 EUT Operating Condition

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

4.9.4 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 5.2 GHz, worse case, 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.

4.9.5 Test Results

4.9.5.1 Antenna Gain

The 5.2 GHz transmitting beam forming antenna gain was +2.13 dBi or 1.63 (numeric).

4.9.5.2 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 +27.038 dBm or 505.6 mW (summed 2 chains)

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

Pd = (505.6*1.63) / (1600π) = 0.1640 mW/cm2, which is 0.8360mW/cm2 (0.0836 W/m2) below to the limit.

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

4.9.6 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	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	07/24/2015	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	07/15/2015	07/15/2016
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
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 22: Customer Information

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

Table 23: Technical Contact Information

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

6.3 Equipment Under Test (EUT)

Table 24: 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	802.11a, 802.11n (HT20, HT40), 802.11ac (VHT20, VHT40,VHT80)
Transmitter Frequency Band	5.150 GHz – 5.250 GHz, U-NII-1 band
Max. Rated Power Output	See Channel Planning Table.
Power Setting @ Operating Channel	See Channel Planning Table.
Antenna Type	Qty 7 – 2 custom antennas at 5.2GHz. See Table 13 for details
Antenna Gain	Antenna 5 = +1.11 dBi, Antenna 6 = +2.13 dBi
Modulation Type	☐ AM ☐ FM ☒ DSSS ☒ OFDM ☐ Other describe: 16QAM and 64 QAM
Data Rate	802.11a: 1 Spatial Streams: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n/ac HT20/VHT20: 2 Spatial Streams: 13, 26, 39, 52, 78, 104, 117, 130 /156 Mbps (LGI) 802.11n/ac HT40/VHT40: 2 Spatial Streams: 27, 54, 81, 108, 162, 216, 243, 270 / 324, 370 Mbps (LGI) 802.11ac VHT 80: 2 Spatial Streams: 58.5, 117, 175.5, 234, 351, 468, 526.5, 585, 702, 780 Mbps (LGI)
TX/RX Chain (s)	MIMO (2x2); no beam forming
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 25: 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 26: EUT Channel Power Specifications

FCC Max Power for single Chain

No.	Frequency (MHz)	Target Power Value dBm					
		802.11a	802.11n HT20	802.11ac VHT20	802.11n HT40	802.11ac VHT40	802.11ac VHT80
36	5180	22.48	23.17	22.74			
38	5190				19.75	19.59	
40	5200	24.34	24.45	24.35			
42	5210						19.81
44	5220						
46	5230				20.87	20.83	
48	5240	21.08	21.25	21.01			

Note: 1. The adjusted power target values are updated at the evaluated frequencies.
2. TP setting = 20 for all Low and High channels. TP setting = 23 for 11a, HT20 and VHT20 on Mid channel.

RSS Max Power for single Chain

No.	Frequency (MHz)	Target Power Value dBm					
		802.11a	802.11n HT20	802.11ac VHT20	802.11n HT40	802.11ac VHT40	802.11ac VHT80
36	5180	15.77	15.57	15.63			
38	5190				15.42	15.54	
40	5200	16.11	15.96	15.95			
42	5210						14.20
44	5220						
46	5230				13.69	13.77	
48	5240	14.45	14.38	14.34			

Note: 1. The adjusted power target values are updated at the evaluated frequencies.
2. TP setting = 15 for all channels.

Table 27: 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 28: Supported Equipment

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

Table 29: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.407
Access Point	E58V-0034-H6W8-7MJX	Custom Integrated Antenna	TX Emission, AC Conducted Emission
		Direct Connection	Peak Transmit Power, Peak Power Spectral Density, Occupied Bandwidth Band-Edge Out-of-Band Emission

Table 30: Description of Test Configuration used for Radiated Measurement.

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

6.4 Test Specifications

Testing requirements

Table 31: Test Specifications

Emissions and Immunity	
Standard	**Requirement**
CFR 47 Part 15.407: 2015	All
RSS 247 Issue 1, 2015	All

END OF REPORT