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# Emissions
# Test Report

**EUT Name:** WiFi 802.11AC 2x2 5GHz Wireless Adapter

**Model No.:** AW500

CFR 47 Part 15.407 2014 and RSS 210:2010

*Prepared for:*

Mark Rieger
Pace Americas
310 Providence Mine Road, Ste. 200
Nevada City, CA 95959
Tel: (530) 274-5440
Fax: (530) 273-6340

*Prepared by:*

TUV Rheinland of North America, Inc.
1279 Quarry Lane
Pleasanton, CA 94566
Tel: (925) 249-9123
Fax: (925) 249-9124
http://www.tuv.com/

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Note: Latest revision report will replace all previous reports.

# Statement of Compliance

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|---|---|
| *Manufacturer:* | Pace Americas<br>310 Providence Mine Road, Ste. 200<br>Nevada City, CA 95959<br>(530) 274-5440 |
| *Requester / Applicant:* | Mark Rieger |
| *Name of Equipment:* | WiFi 802.11AC 2x2 5GHz Wireless Adapter |
| *Model No.* | |
| *Type of Equipment:* | Intentional Radiator |
| *Application of Regulations:* | CFR 47 Part 15.407 2014 and RSS 210:2010 |
| *Test Dates:* | Dec 20, 2014 to March 12, 2015 |

*Guidance Documents:*

Emissions: ANSI C63.10-2009, KDB 789033 D01 General UNII Test Procedure v01r03

*Test Methods:*

Emissions: ANSI C63.10-2009, KDB 789033 D01 General UNII Test Procedure v01r03

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.

| | | | |
|---|---|---|---|
| Suresh Kondapalli | 03/13/2015 | | 03/13/2013 |
| Test Engineer | Date | Sarbjit Shelopal | Date |

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

*1 Executive Summary* 7

**1.1 Scope** 7

**1.2 Purpose** 7

**1.3 Summary of Test Results** 8

**1.4 Special Accessories** 8

**1.5 Equipment Modifications** 8

*2 Laboratory Information* 9

**2.1 Accreditations & Endorsements** 9

2.1.1 US Federal Communications Commission 9

2.1.2 NIST / A2LA 9

2.1.3 Canada – Industry Canada 9

2.1.4 Japan – VCCI 9

2.1.5 Acceptance by Mutual Recognition Arrangement 10

**2.2 Test Facilities** 10

2.2.1 Emission Test Facility 10

2.2.2 Immunity Test Facility 10

**2.3 Measurement Uncertainty** 10

2.3.1 Sample Calculation – radiated & conducted emissions 11

2.3.2 Measurement Uncertainty 11

2.3.1 Measurement Uncertainty Immunity 12

**2.4 Calibration Traceability** 12

*3 Product Information* 13

**3.1 Product Description** 13

**3.2 Equipment Configuration** 13

**3.3 Operating Mode** 13

**3.4 Unique Antenna Connector** 14

3.4.1 Results 14

*4 Emissions* 15

**4.1 Output Power Requirements** 15

4.1.1 Test Method 15

4.1.2 Results 16

**4.2 Occupied Bandwidth** 28

4.2.1 Test Method 28

4.2.2 Results 29

**4.3 Power Spectral Density** 40

4.3.1 Test Method 40

4.3.2 Results 41

**4.4 Transmitter Spurious Emissions** 60

4.4.1 Test Methodology 60

4.4.2 Transmitter Spurious Emission Limit 61

4.4.3 Test Results 61
4.4.4 Sample Calculation 109

**4.5 AC Conducted Emissions 110**
4.5.1 Test Methodology 110
4.5.2 Test Results 110

**4.6 Frequency Stability 115**
4.6.1 Test Methodology 115
4.6.2 Manufacturer Declaration 115
4.6.3 Limit 116
4.6.4 Test results 116

**4.7 Voltage Variation 118**
4.7.1 Test Methodology 118
4.7.2 Test results 118

**4.8 Maximum Permissible Exposure 119**
4.8.1 Test Methodology 119
4.8.2 RF Exposure Limit 119
4.8.3 EUT Operating Condition 120
4.8.4 Classification 120
4.8.5 Test Results 120
4.8.6 Sample Calculation 121

***6 Test Equipment Use List 122***

**6.1 Equipment List 122**

***7 EMC Test Plan 123***

**7.1 Introduction 123**

**7.2 Customer 123**

**7.3 Equipment Under Test (EUT) 124**

**7.4 Test Specifications 130**

**Table 1:** Summary of Test Results ..... 8
**Table 2:** RF Output Power at the Antenna Port – Test Results ..... 16
**Table 3:** Output Power at the Antenna Port – ..... 18
**Table 4:** Occupied Bandwidth – Test Results ..... 29
**Table 5:** Power Spectral Density – Test Results ..... 41
**Table 6:** Transmit Spurious Emission at Band-Edge Requirements ..... 62
**Table 7:** AC Conducted Emissions – Test Results ..... 110
**Table 8:** Frequency Stability – Test Results ..... 116
**Table 9:** Voltage Variation – Test Results ..... 118
**Table 10:** Customer Information ..... 123
**Table 11:** Technical Contact Information ..... 123
**Table 12:** EUT Specifications ..... 124
**Table 13:** EUT Channel Power Specifications ..... 126
**Table 14:** Interface Specifications ..... 127
**Table 15**: Supported Equipment ..... 128
**Table 16:** Description of Sample used for Testing ..... 128
**Table 17:** Description of Test Configuration used for Radiated Measurement. ..... 128
**Table 18:** Final Test Mode for 5470 - 5725 Band ..... 128
**Table 19:** Test Specifications ..... 130

# 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 2014 and RSS 210:2010 based on the results of testing performed on Dec 20, 2014 to March 12, 2015 on the WiFi 802.11AC 2x2 5GHz Wireless Adapter Model manufactured by Pace Americas 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.

This report will document the result for operating frequency bands 5470 MHz to 5725 MHz and 5725 to 5850MHz.

## 1.3 Summary of Test Results

**Table 1:** Summary of Test Results

| Test | Test Method ANSI C63.10 | Test Parameters (from Standard) | Result |
|---|---|---|---|
| Spurious Emission in Transmitted Mode | CFR47 15.209, CFR47 15.407 (b) RSS-GEN Sect.7.2.3, RSS 210 Sect. A.9.2 | Class B | **Complied** |
| Restricted Bands of Operation | CFR47 15.205, RSS 210 Sect.2.6 | Class B | **Complied** |
| AC Power Conducted Emission | CFR47 15.207, RSS-GEN Sect.7.2.2 | Class B | **Complied** |
| Occupied Bandwidth | CFR47 15.407 (a), RSS GEN Sect.4.4.1 | Na | **N/A** |
| Maximum Output Power | CFR47 15.407 (a), RSS 210 Sect. A.9.2 | Band 2C: 250mWatts<br>Band 3: 1Watt | **Complied** |
| Peak Power Spectral Density | CFR47 15.407 (a),<br>RSS 210 Sect. A.9.2 | Band 2: 11 dBm/MHz | **Complied** |
| Conducted Emission – Antenna Port | CFR47 15.407 (b), RSS 210 Sect.6.2.2 | 30 MHz -40 GHz < 27 dBm/MHz | **Complied** |
| Frequency Stability | CFR47 15.407 (g), RSS GEN Sect. 4.7. | ±20 ppm | **Complied** |
| RF Exposure | CFR47 15.247 (i), 2.1091 | General Population | **Complied** |

Note: This report will cover only band 5470 MHz to 5825 MHz.

## 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-1). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). The accreditation is updated every 3 years.

### 2.1.4 Japan – VCCI

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

VCCI Registration No. for Pleasanton: A-0031

VCCI Registration No. for Santa Clara: A-0032

### 2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

## *2.2 Test Facilities*

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

### 2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2009, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2009, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

### 2.2.2 Immunity Test Facility

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

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

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

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

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

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

## *2.3 Measurement Uncertainty*

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

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

### 2.3.1 **Sample Calculation – radiated & conducted emissions**

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

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

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

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

**Sample radiated emissions calculation @ 30 MHz**

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

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

### 2.3.2 **Measurement Uncertainty**

| **Per CISPR 16-4-2** | **$U_{lab}$** | **$U_{cispr}$** |
|---|---|---|
| **Radiated Disturbance @ 10 meters** | | |
| 30 – 1,000 MHz | 2.25 dB | 4.51 dB |
| **Radiated Disturbance @ 3 meters** | | |
| 30 – 1,000 MHz | 2.26 dB | 4.52 dB |
| 1 – 6 GHz | 2.12 dB | 4.25 dB |
| 6 – 40 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 |

### 2.3.1 Measurement Uncertainty Immunity

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

**Thermo KeyTek EMC Pro**

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

**Measurement Uncertainty – Radio Testing**

| |
|---|
| The estimated combined standard uncertainty for frequency error measurements is ± 3.88 Hz |
| The estimated combined standard uncertainty for carrier power measurements is ± 1.59 dB. |
| The estimated combined standard uncertainty for adjacent channel power measurements is ± 1.47 dB. |
| The estimated combined standard uncertainty for modulation frequency response measurements is ± 0.46 dB. |
| The estimated combined standard uncertainty for transmitter conducted emission measurements is ± 4.01 dB |

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

## 2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

# 3 Product Information

## *3.1 Product Description*

The Pace Model AW500 wireless 802.11ac 2x2 (5 GHz) a radio module (Limited modular approval ) that can be installed into a Pace Model IPW9000 series digital STB cable product line. This Wi-Fi adapter is a custom, fully enclosed, USB type optional accessory designed to be installed into a Pace Model IPW9000 series digital STB cable product line. This accessory is used to seamlessly connect the IPW9000 series Set Top Box to the service provider's broadband network via a Wi-Fi Protected Setup (WPS) wireless network connection in the home.

The Pace Model AW500 wireless 802.11ac 2x2 (5 GHz) along with host device Pace Model IPW9000 series digital STB cable product line is considered as slave device works with compatible Master device Pace Access Points.

## *3.2 Equipment Configuration*

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

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

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

## *3.3 Operating Mode*

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

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

## *3.4 Unique Antenna Connector*

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

### 3.4.1 **Results**

The WiFi 802.11AC 2x2 5GHz Wireless Adapter has 2 internal fixed antennas. All antennas are integrated on the PCB. There is no external antenna connection available.

# 4 Emissions

Testing was performed in accordance with CFR 47 Part 15.407: 2012 and RSS 210 Annex 9: 2010. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

## *4.1 Output Power Requirements*

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

*The maximum output power and harmonics shall not exceed CFR47 Part 15.407 (a):2012 and RSS 210 A9.2: 2010.*

*The maximum transmitted powers are*

*Band 5150-5250 MHz:250 mW or 11 dBm + 10Log B.*

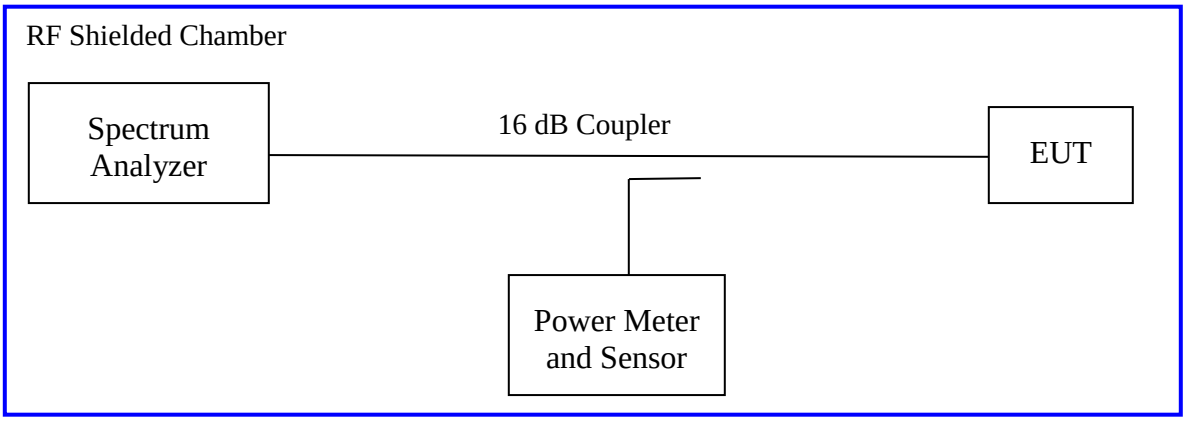
*Band 5250-5350 MHz, 5470-5725 MHz:250 mW or 11 dBm + 10Log B.*

*Band 5725-5825 MHz:1 W or 17 dBm + 10Log B. Where B is 26 dB Bandwidth.*

### 4.1.1 **Test Method**

The ANSI C63.10-2009 Section 6.10.3.1 conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate/ chain to determine the highest power output for each mode. The worst findings were conducted on 3 channels in each mode on the sample, S/N 09130M000104, per CFR47 Part 15.407(a): 2012 and RSS 210 A.9.2; 5470 MHz to 5725 MHz. The worst mode results indicated below.

Test Setup:




*Method SA-1 of "Guidelines for Compliance 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 KDB66291.

### 4.1.2 **Results**

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

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

| **Test Conditions:** Conducted Measurement, Normal Temperature | | | | | | |
|---|---|---|---|---|---|---|
| **Antenna Type:** Integrated | | | **Power Setting:** See test plan | | | |
| **Max. Directional Gain:** + 7.9 dBi | | | **Signal State:** Modulated at 98.3%. | | | |
| **Ambient Temp.:** 23 °C | | | **Relative Humidity:**30% | | | |
| **802.11a Mode,** | | | | | | |
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm]** | **Duty Cycle CF [dB]** | **Total Power [dBm]** | **Margin [dB]** |
| 5500 | 22.10 | 13.23 | 13.88 | 0.07 | 16.65 | -5.45 |
| 5600 | 22.10 | 13.80 | 13.79 | 0.07 | 16.88 | -5.22 |
| 5700 | 22.10 | 12.33 | 12.60 | 0.07 | 15.55 | -6.55 |
| **802.11n (HT20/VHT20) Mode, 2x2** | | | | | | |
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm** | **Duty Cycle CF [dB]** | **Total Power [dBm]** | **Margin [dB]** |
| 5500 | 22.10 | 13.79 | 13.77 | 0.20 | 16.99 | -5.11 |
| 5600 | 22.10 | 13.70 | 13.81 | 0.20 | 16.97 | -5.13 |
| 5700 | 22.10 | 12.52 | 12.60 | 0.20 | 15.77 | -6.33 |

Note: 1.The highest output power was observed at 802.11a mode 6.0mbps , 2 Data Streams.

2. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911.

3. The total directional gain would be 7.9dBi;

Antenna 1: 4.59dBi and Antenna 2 : 5.3dBi

Directional gain = 10 log[(10G1 /20 + 10G2 /20 + … + 10GN /20)2 /NANT]dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently. = 7.9dBi. or linear gain 6.1

4. As Per CFR47 Part 15.407 (a), the limit is reduced for every1 dB gain exceeding 6dBi. The limit would be 22.10dBm.

Note: Highlighted plots are available in this report

| 802.11n (HT40/VHT40) Mode, 2x2 | | | | | | |
|---|---|---|---|---|---|---|
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm]** | **CF [dBm]** | **Total Power [dBm]** | **Margin [dB]** |
| 5510 | 22.10 | 11.95 | 12.12 | 0.25 | 15.56 | -6.54 |
| 5550 | 22.10 | 13.08 | 12.85 | 0.25 | 16.23 | -5.66 |
| 5710 | 22.10 | 12.85 | 12.35 | 0.25 | 15.87 | -6.00 |

**Note:** 1.The highest output power was observed at HT40 13.5 Mbps, 2 Data Streams.
2. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911.

3. The total directional gain would be 7.9dBi;
Antenna 1: 4.77dBi and Antenna 2 : 5.48dBi
Directional gain = 10 log[(10G1 /20 + 10G2 /20 + … + 10GN /20)2 /NANT]dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently. = 7.9dBi. or linear gain 6.1
4. As Per CFR47 Part 15.407 (a), the limit is reduced for every1 dB gain exceeding 6dBi. The limit would be 22.10dBm.

| 802.11AC (VHT80) Mode, 2x2 | | | | | | |
|---|---|---|---|---|---|---|
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm]** | **CF [dBm]** | **Total Power [dBm]** | **Margin [dB]** |
| 5530 | 22.10 | 9.42 | 9.66 | 2.53 | 15.08 | -6.55 |
| 5610 | 22.10 | 10.78 | 10.58 | 2.53 | 16.22 | -5.52 |
| 5690 | 22.10 | 10.46 | 10.17 | 2.53 | 15.86 | -5.85 |

**Note:** 1.The highest output power was observed at HT80 , 2 Data Streams.
2. All chains will be on at all time and beam performing. RF output powers were summed per KDB 662911.

3. The total directional gain would be dBi; 2dBi +10*Log(4). Per CFR47 Part 15.407 (a), the limit is reduced for every dBi gain exceeding 6dBi. The limit would be 21.97 dBm

**Table 3:** Output Power at the Antenna Port –

| | | | | | | |
|---|---|---|---|---|---|---|
| **Test Conditions:** Conducted Measurement, Normal Temperature | | | | | | |
| **Antenna Type:** Integrated | | | **Power Setting:** See test plan | | | |
| **Max. Directional Gain:** + 7.9 dBi | | | **Signal State:** Modulated at 98.3%. | | | |
| **Ambient Temp.:** 23 °C | | | **Relative Humidity:**30% | | | |
| **802.11a Mode, 2x2** | | | | | | |
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm]** | **Duty Cycle CF [dB]** | **Total Power [dBm]** | **Margin [dB]** |
| 5745 | 28.10 | 12.03 | 11.80 | 0.07 | 15.00 | -13.10 |
| 5785 | 28.10 | 12.00 | 11.29 | 0.07 | 14.74 | -13.36 |
| 5825 | 28.10 | 11.69 | 11.08 | 0.07 | 14.48 | -13.62 |
| **802.11n (HT20) Mode, 2x2** | | | | | | |
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm]** | **Duty Cycle CF [dB]** | **Total Power [dBm]** | **Margin [dB]** |
| 5745 | 28.10 | 11.25 | 11.89 | 0.19 | 14.78 | -13.62 |
| 5785 | 28.10 | 12.14 | 11.52 | 0.19 | 15.04 | -12.79 |
| 5825 | 28.10 | 11.91 | 11.13 | 0.19 | 14.74 | -13.07 |
| **Note:** The highest output power was observed at HT20 6.5 Mbps, 2 Data Streams. | | | | | | |
| **802.11n (HT40) Mode, 2x2** | | | | | | |
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm]** | **Duty Cycle CF [dB]** | **Total Power [dBm]** | **Margin [dB]** |
| 5755 | 28.10 | 12.29 | 12.40 | 0.25 | 15.61 | -13.06 |
| 5795 | 28.10 | 12.66 | 12.35 | 0.25 | 15.77 | -12.33 |
| Note: The highest output power was observed at HT20 13.5Mbps, 2Data Streams. | | | | | | |

| 802.11n AC VHT80 Mode, 2x2 | | | | | | |
|---|---|---|---|---|---|---|
| **Operating Channel** | **Limit [dBm]** | **Ch0 [dBm]** | **Ch1 [dBm]** | **Duty Cycle CF [dB]** | **Total Power [dBm]** | **Margin [dB]** |
| 5775 | 28.10 | 9.88 | 10.19 | 2.53 | 15.88 | -12.22 |
| Note: The highest output power was observed at VHT80 | | | | | | |

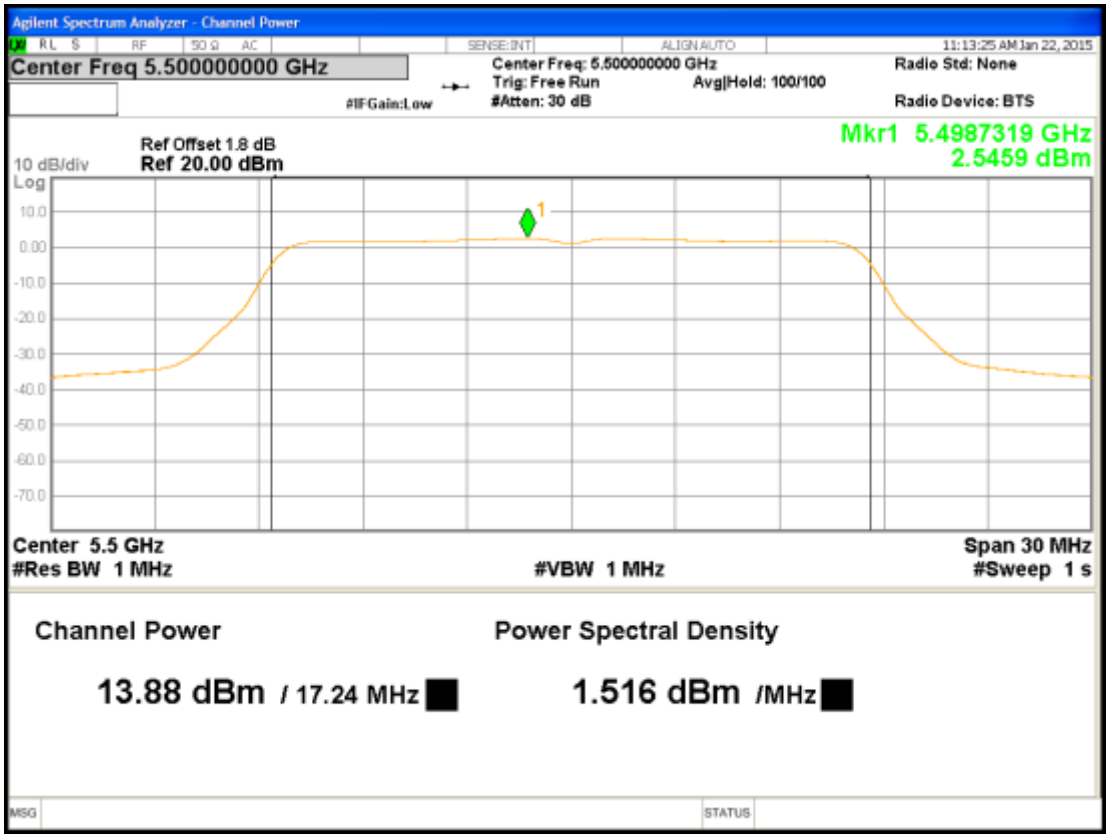



**Figure 1:** Maximum Transmitted Power, 5500 MHz at 11a mode, Chain 1

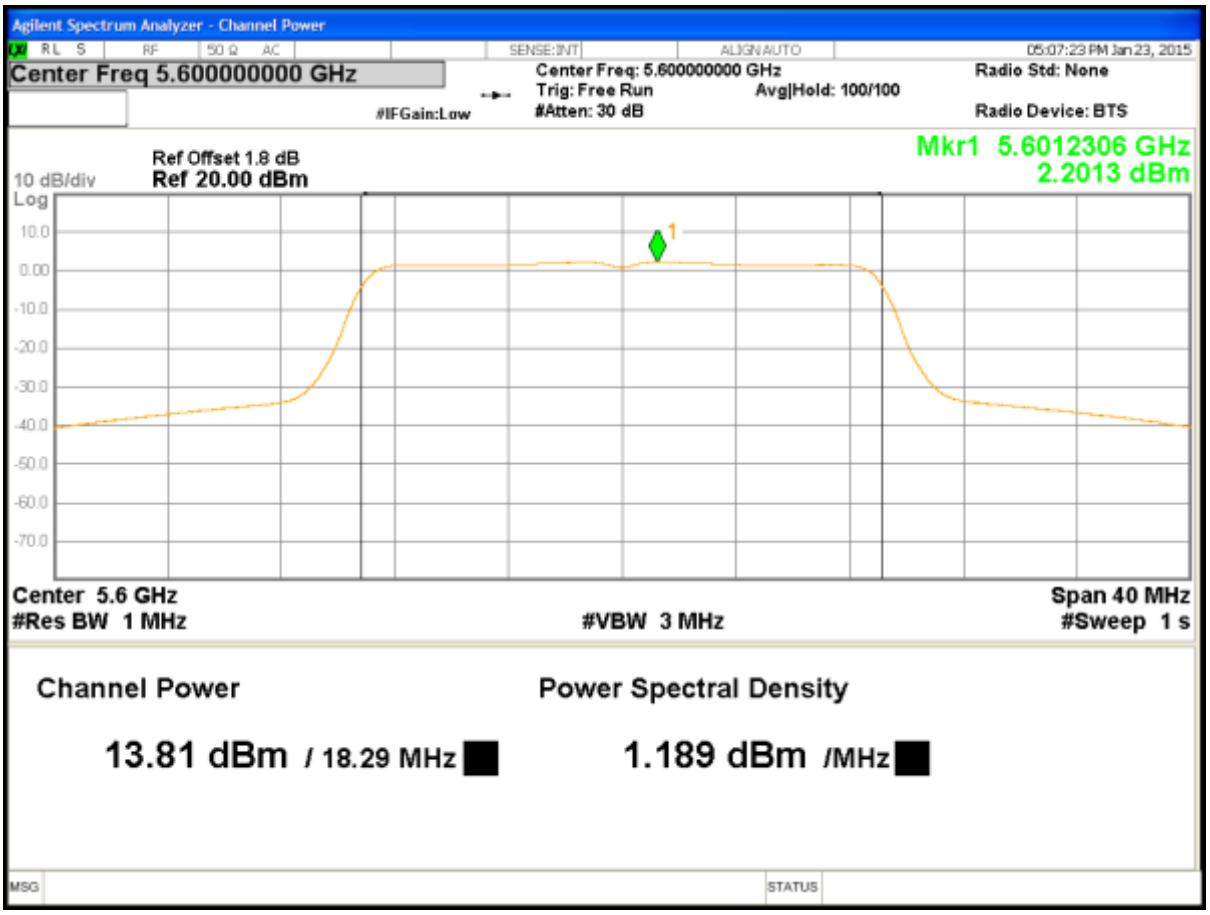



**Figure 2:** Maximum Transmitted Power, 5500 MHz at HT20, Chain 1

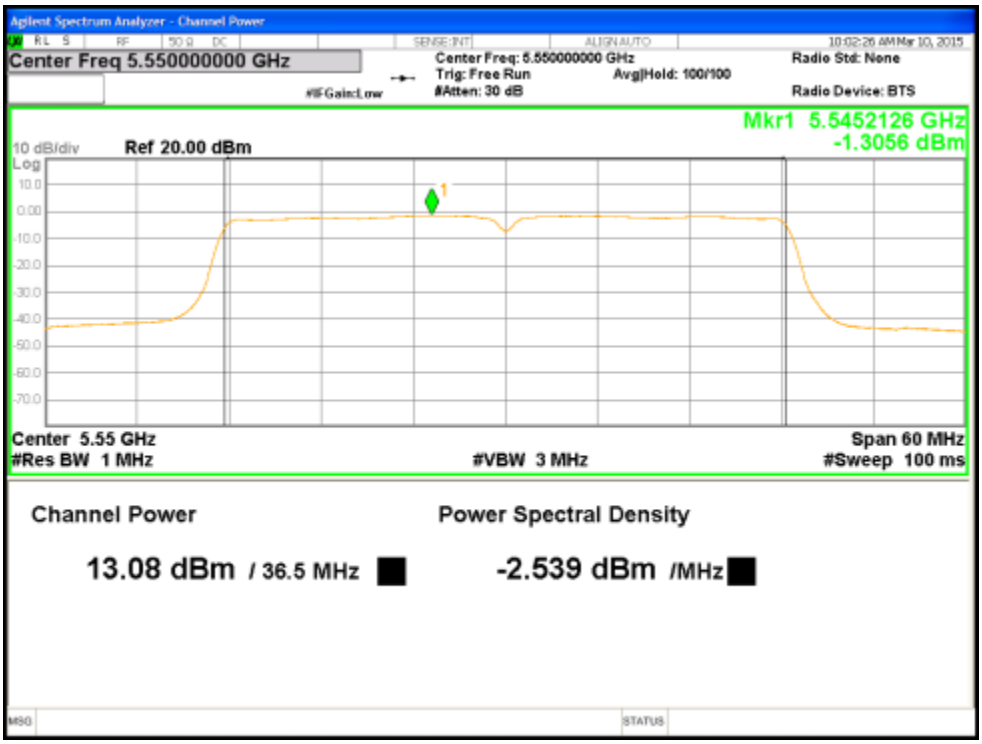



**Figure 3:** Maximum Transmitted Power, 5500 MHz at HT40, Chain 0

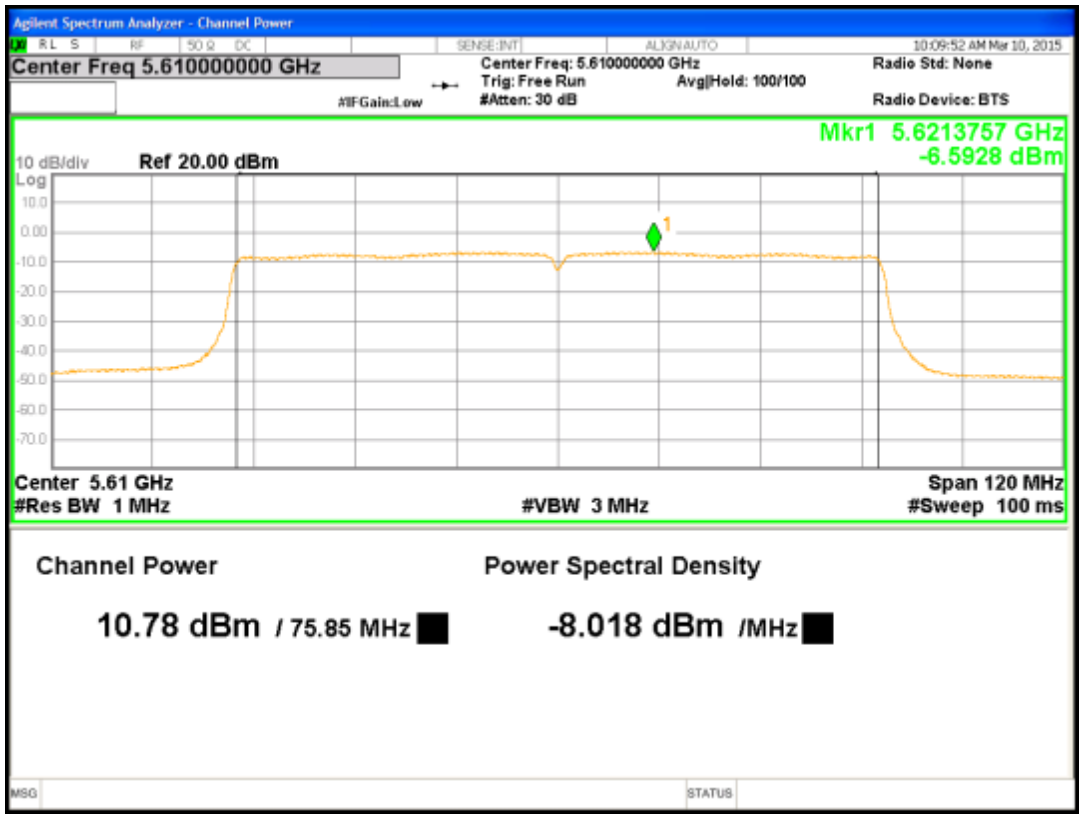



**Figure 4:** Maximum Transmitted Power, 5500 MHz at 11 AC VHT80, Chain0


**Figure 5:** Maximum Transmitted Power, 5745MHz at 11a mode, Chain 0

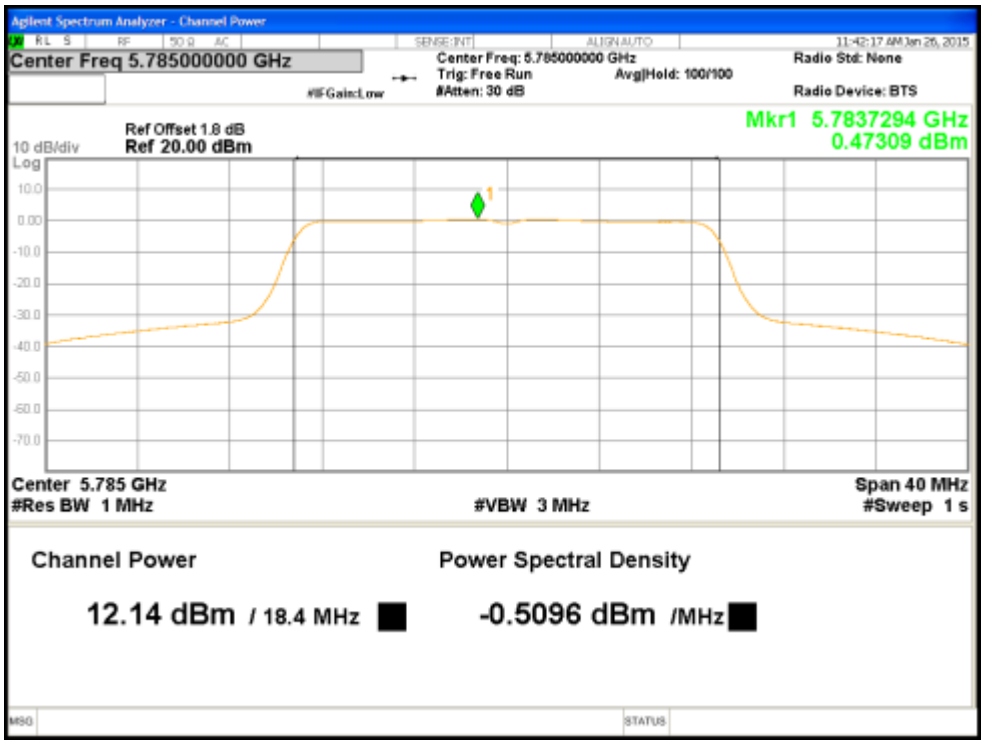



**Figure 6:** Maximum Transmitted Power, 5745 MHz at HT20, Chain0 6.5Mbps

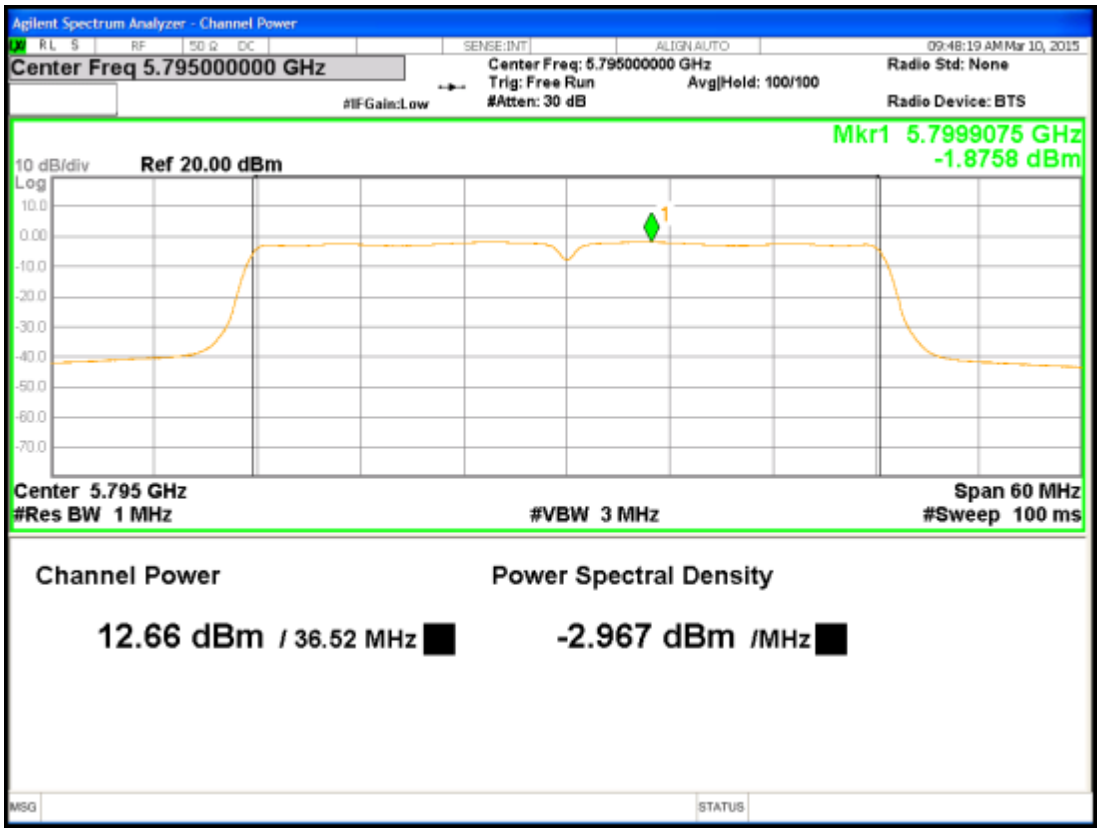



**Figure 7:** Maximum Transmitted Power, 5795MHz at HT40, Chain 0

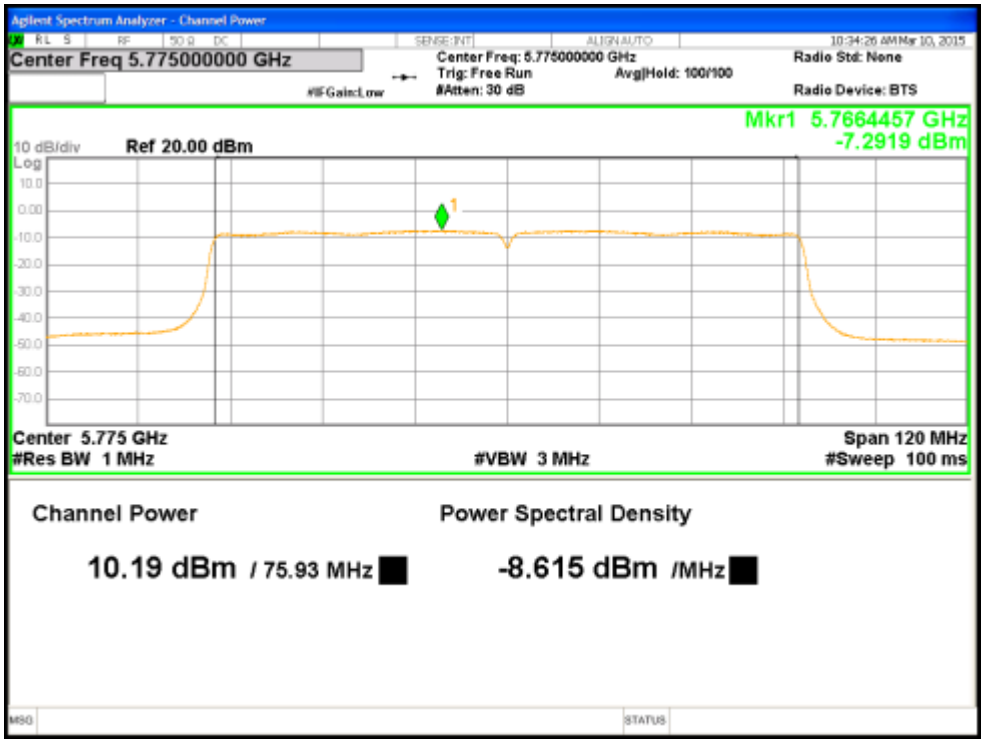



**Figure 8:** Maximum Transmitted Power, 5775MHz at 11AC VHT80, Chain 1

## *4.2 Occupied Bandwidth*

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

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

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

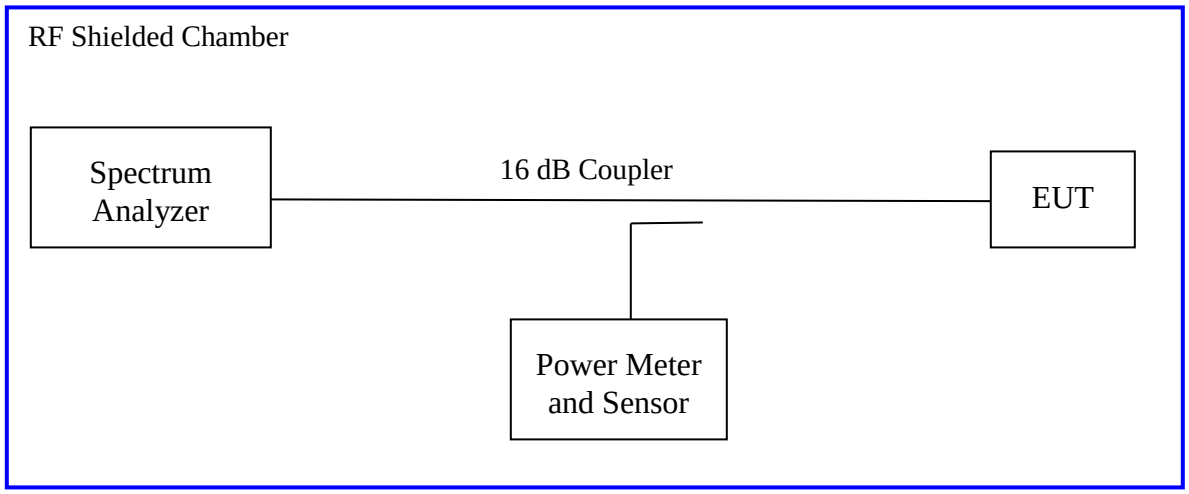
*There is no restriction limits for the bandwidth. The 26 dB bandwidth was used to determine the limit for maximum conducted output power per CFR47 Part 15.407(a).*

*To obtain the tighter limit,*

### 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) 2014 and RSS Gen Sect. 4.4.1:2010. 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; 5470 MHz to 5725 MHz and 5725 to 5850MHz on the sample, S/N 7. The results indicated below.

Test Setup:



### 4.2.2 **Results**

These occupied bandwidth measurements were taken for references only.

**Table 4:** Occupied Bandwidth – Test Results

| | | | | |
|---|---|---|---|---|
| **Test Conditions:** Conducted Measurement, Normal Temperature and Voltage only | | | | |
| **Antenna Type:** Integrated | | **Power Setting:** See Test Plan | | |
| **Max. Directional Gain:** + 7.9 dBi | | **Signal State:** Modulated at 100%. | | |
| **Ambient Temp.:** 23 °C | | **Relative Humidity:**30% | | |
| **Bandwidth (MHz) for 802.11a** | | | | |
| **Freq. (MHz)** | **26dB Bandwidth (MHz)** | | **99% Bandwidth (MHz)** | |
| | **Ch0** | **Ch1** | **Ch0** | **Ch1** |
| 5500 | 20.03 | 20.02 | 16.59 | 16.57 |
| 5600 | 20.15 | 20.03 | 16.59 | 16.58 |
| 5700 | 20.21 | 20.02 | 16.59 | 16.58 |
| **Note**: The bandwidth was measured at 6.0Mbps for 802.11a mode. | | | | |
| **Bandwidth (MHz) for 802.11n HT20/VHT20** | | | | |
| **Freq. (MHz)** | **26dB Bandwidth (MHz)** | | **99% Bandwidth (MHz)** | |
| | **Ch0** | **Ch1** | **Ch0** | **Ch1** |
| 5500 | 20.46 | 20.34 | 17.84 | 17.82 |
| 5600 | 20.35 | 20.36 | 17.83 | 17.82 |
| 5700 | 20.32 | 20.34 | 17.84 | 17.82 |
| **Note**: The bandwidth was measured at 6.5Mbps for 802.11n HT20 mode. | | | | |

| Bandwidth (MHz) for 802.11n HT40 | | | | |
|---|---|---|---|---|
| Freq. (MHz) | 26dB Bandwidth (MHz) | | 99% Bandwidth (MHz) | |
| | Ch0 | Ch1 | Ch0 | Ch1 |
| 5510 | 39.07 | 39.07 | 36.32 | 36.31 |
| 5690 | 39.11 | 39.14 | 36.33 | 36.31 |
| 5710 | 39.20 | 39.22 | 36.33 | 36.32 |
| **Note**: The bandwidth was measured at 13.5Mbps for 802.11n HT40 mode. | | | | |

| Bandwidth (MHz) for 802.11AC VHT80 | | | | |
|---|---|---|---|---|
| Freq. (MHz) | 26dB Bandwidth (MHz) | | 99% Bandwidth (MHz) | |
| | Ch0 | Ch1 | Ch0 | Ch1 |
| 5350 | 80.28 | 80.27 | 75.76 | 75.74 |
| 5610 | 80.11 | 80.31 | 75.72 | 75.70 |
| 5690 | 80.38 | 80.31 | 75.78 | 75.74 |
| **Note**: The bandwidth was measured at 56.5Mbps for 802.11n AC VHT80 mode. | | | | |

Occupied Bandwidth – Test Results 5725-5850MHz Band

| Bandwidth (MHz) for 802.11a | | | | |
|---|---|---|---|---|
| Freq. (MHz) | 6dB Bandwidth (MHz) | | 99% Bandwidth (MHz) | |
| | Ch0 | Ch1 | Ch0 | Ch1 |
| 5745 | 16.21 | 15.98 | 16.60 | 16.58 |
| 5785 | 16.25 | 15.99 | 16.60 | 16.58 |
| 5825 | 16.20 | 16.14 | 16.60 | 16.58 |
| **Note**: The bandwidth was measured at 6Mbps for 802.11a mode. | | | | |

| Bandwidth (MHz) for 802.11n HT20 | | | | |
|---|---|---|---|---|
| Freq. (MHz) | 6dB Bandwidth (MHz) | | 99% Bandwidth (MHz) | |
| | Ch0 | Ch1 | Ch0 | Ch1 |
| 5745 | 16.46 | 16.36 | 17.85 | 17.82 |
| 5785 | 16.61 | 16.35 | 17.85 | 17.82 |
| 5825 | 16.46 | 16.32 | 17.85 | 17.83 |
| **Note**: The bandwidth was measured at 6.5Mbps for 802.11n HT20 mode. | | | | |

| Bandwidth (MHz) for 802.11n HT40 | | | | |
|---|---|---|---|---|
| Freq. (MHz) | 6dB Bandwidth (MHz) | | 99% Bandwidth (MHz) | |
| | Ch0 | Ch1 | Ch0 | Ch1 |
| 5755 | 34.19 | 34.08 | 36.33 | 36.33 |
| 5795 | 34.11 | 34.10 | 36.34 | 36.32 |
| **Note**: The bandwidth was measured at 13.5Mbps for 802.11n HT40 mode. | | | | |

| Bandwidth (MHz) for 802.11AC VHT80 | | | | |
|---|---|---|---|---|
| Freq. (MHz) | 26dB Bandwidth (MHz) | | 99% Bandwidth (MHz) | |
| | Ch0 | Ch1 | Ch0 | Ch1 |
| 5775 | 74.37 | 74.19 | 75.74 | 75.71 |
| **Note**: The bandwidth was measured at 56.5 Mbps for 802.11n AC VHT80 mode. | | | | |

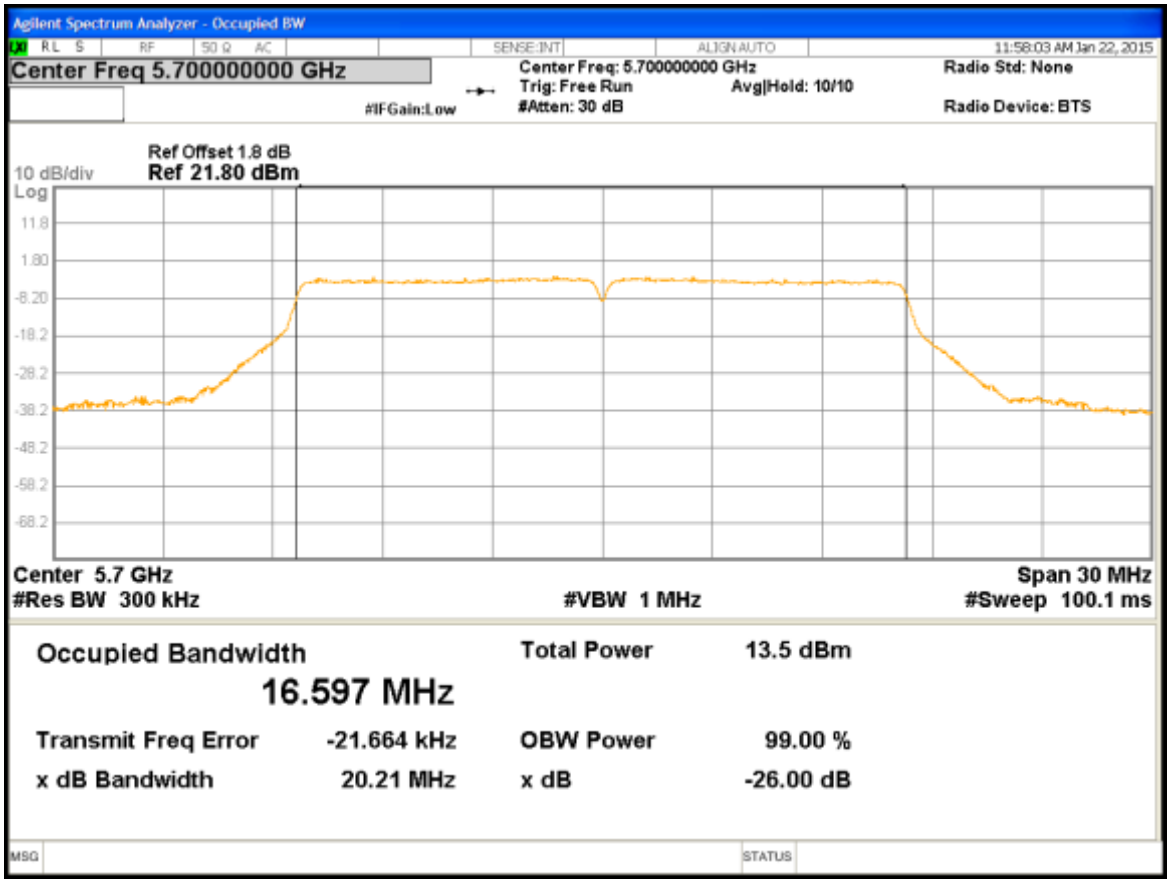



**Figure 9:** Occupied Bandwidth at 5700 MHz, Chain 0

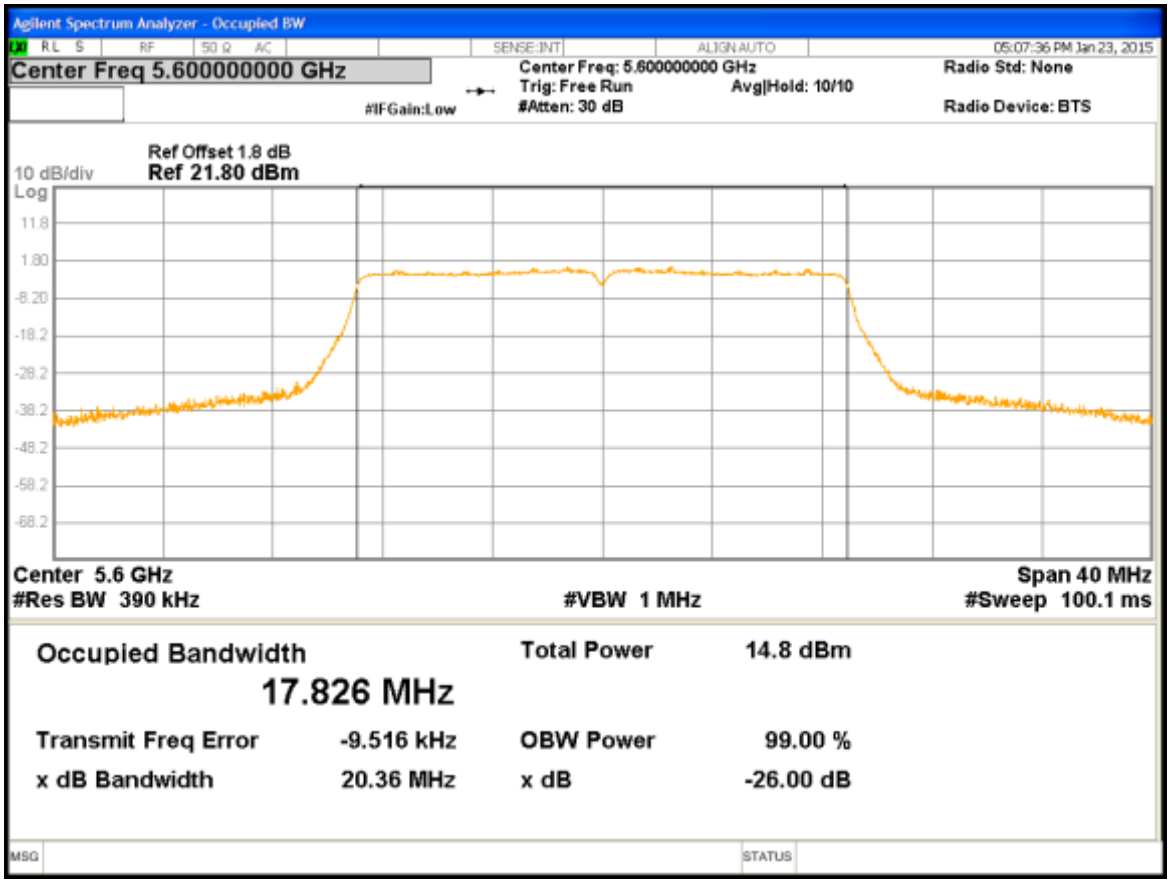



**Figure 10:** Occupied Bandwidth at 5600 MHz, Chain1 HT20 6.5Mbps

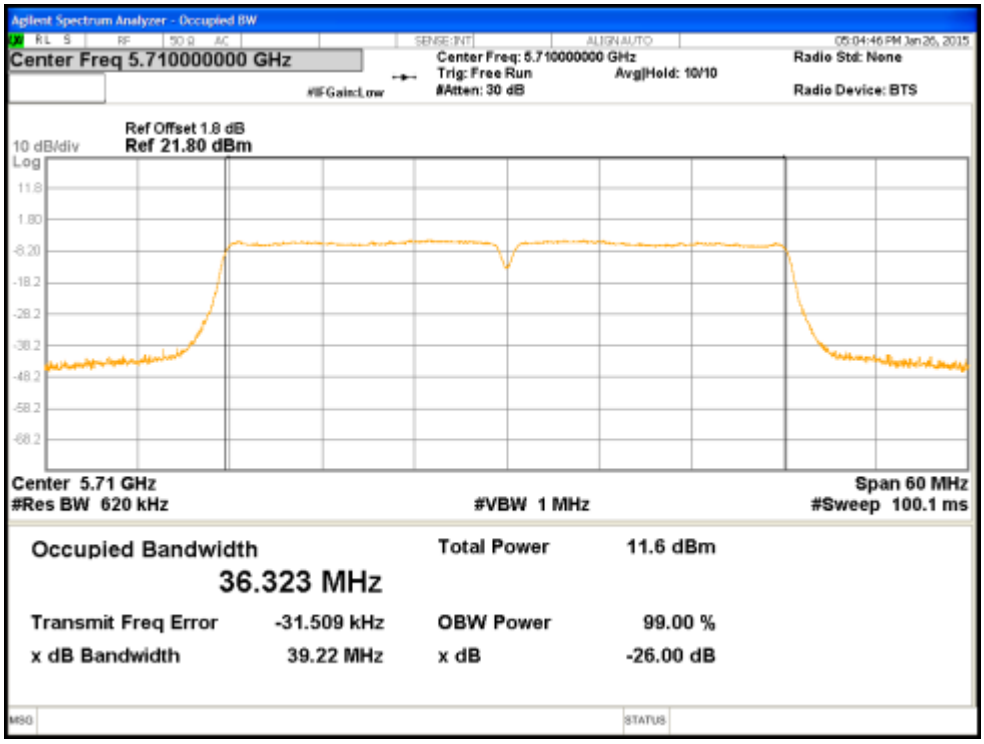



**Figure 11:** Occupied Bandwidth at 5710 MHz, HT40 13.5Mbps Chain 1

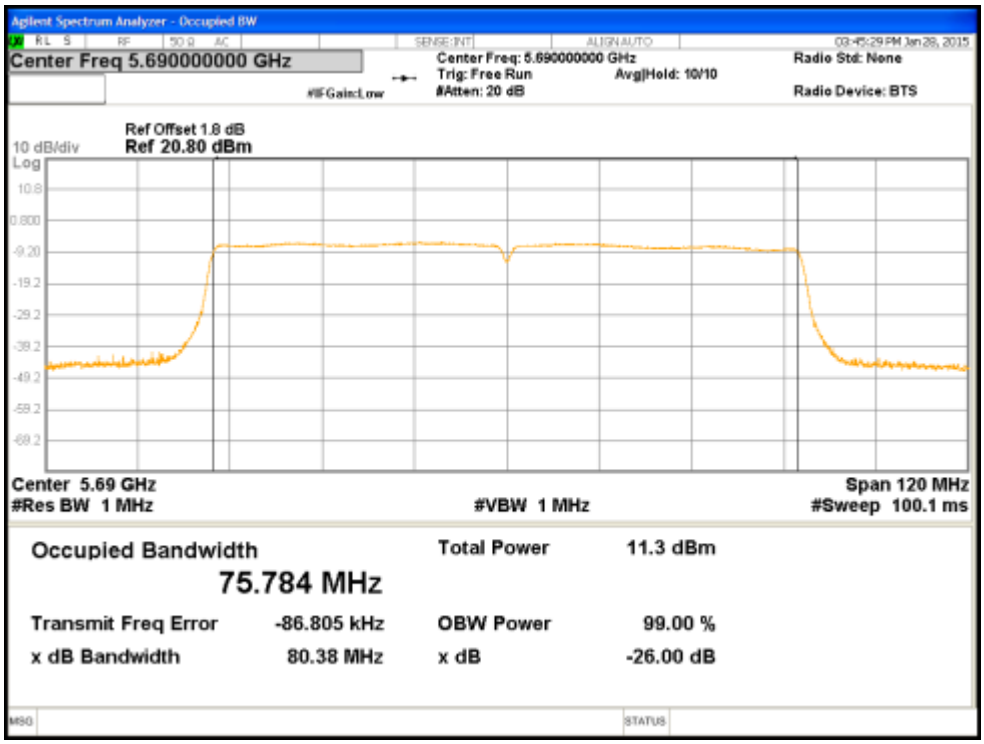



**Figure 12:** Occupied Bandwidth at 5690 MHz, 11n AC mode VHT80 Chain0

**UNII Band IV 5725- 5850MHz**

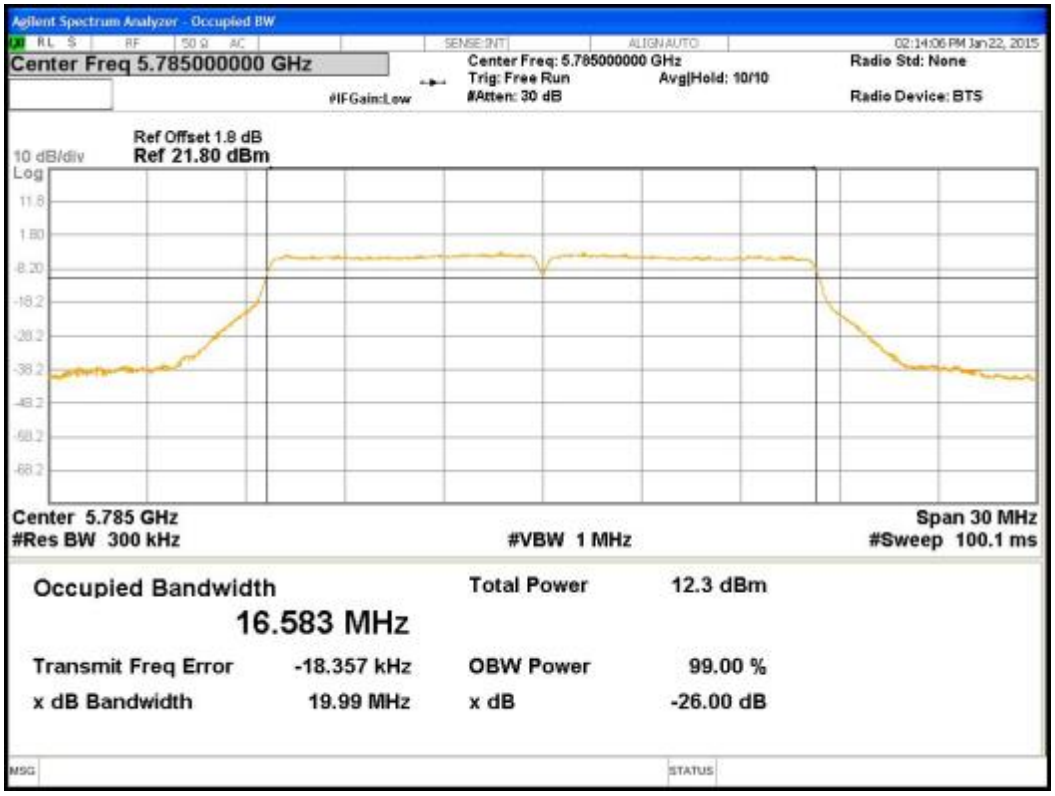



**Figure 13:** Occupied Bandwidth at 5785MHz, Chain 1

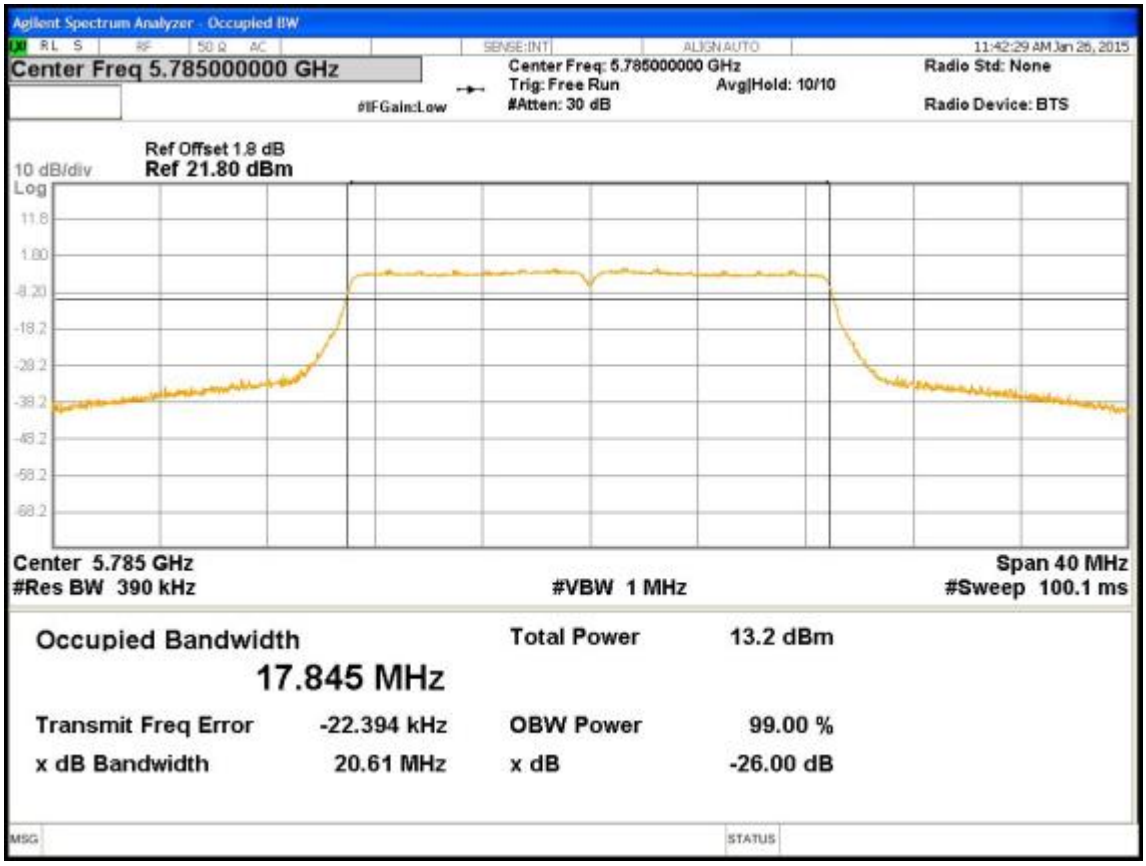



**Figure 14:** Occupied Bandwidth at 5785MHz, HT 20 6.5Mbps Chain 0

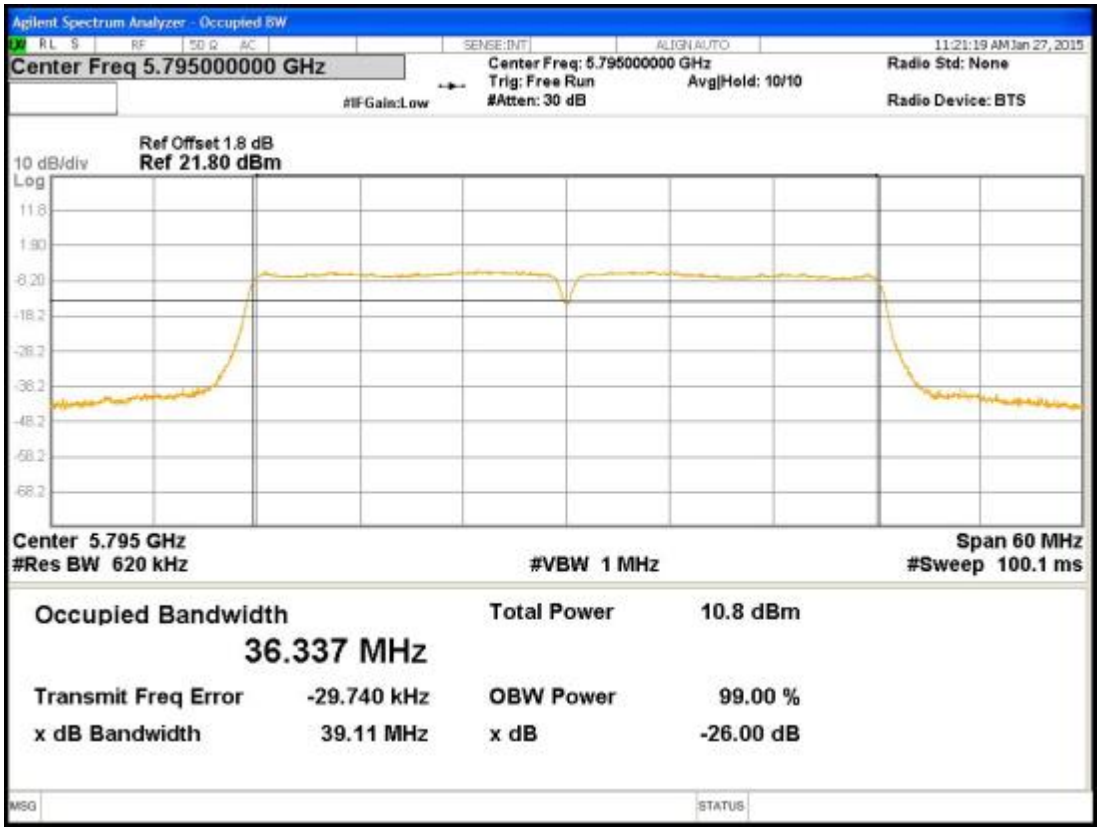



**Figure 15:** Occupied Bandwidth at 5795 MHz, HT40 mode 13.5Mbps Chain 0

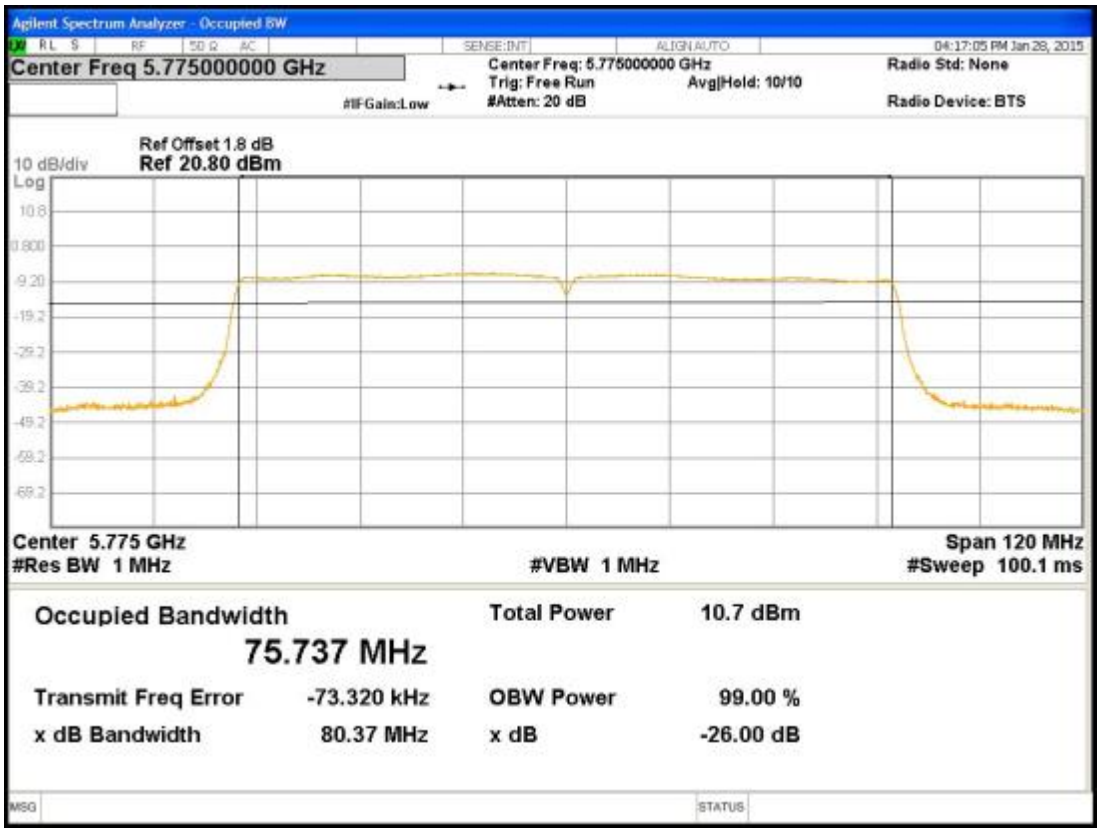



**Figure 16:** Occupied Bandwidth at 5775 MHz, 11nAC mode VHT80 Chain 0

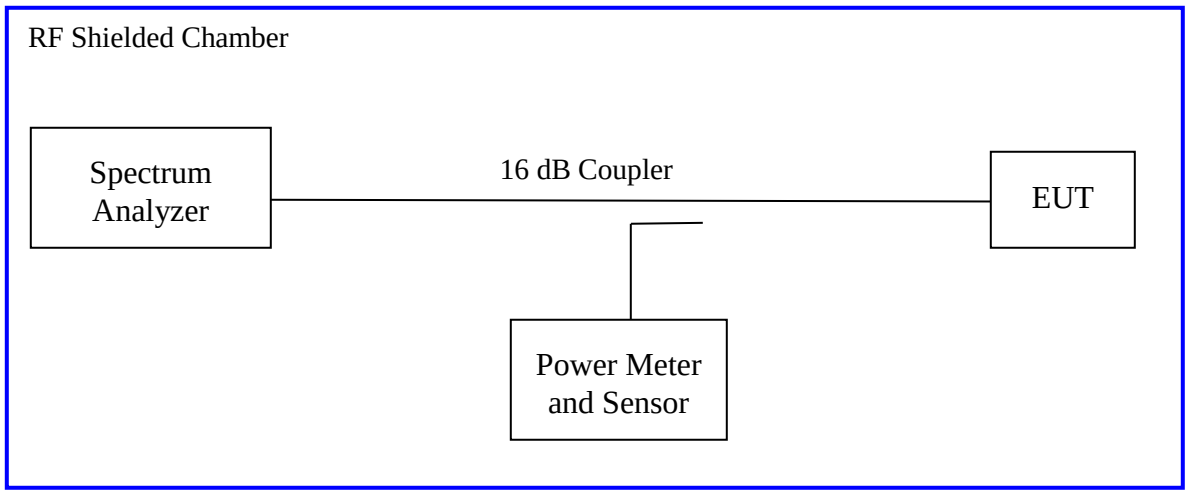
## *4.3 Power Spectral Density*

*According to the CFR47 Part 15.407 (a) and RSS 210 (A9.2), 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. For 5725 to 5850MHz band the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.*

### 4.3.1 **Test Method**

The conducted method was used to measure the power spectral density per ANSI C63.10-2009 Section 6.11.2. The measurement was performed with modulation per CFR47 Part 15.407 (a) and RSS 210 (A9.2). The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in each frequency range of 5470 MHz to 5725 MHz and 5725MHz to 5850 MHz for the test sample. The 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 5:** Power Spectral Density – Test Results

| | | | |
|---|---|---|---|
| **Test Conditions:** Conducted Measurement, Normal Temperature and Voltage only | | | |
| **Antenna Type:** Integrated | | **Power Setting:** See Test plan | |
| **Max. Directional Gain:** + 7.9 dBi | | **Signal State:** Correction factor added for < 100% | |
| **Ambient Temp.:** 23 °C | | **Relative Humidity:**28% | |
| **Power Spectral Density** | | | |
| **802.11a Mode** | | | |
| **Freq. (MHz)** | **Total PSD [dBm]** | **Limit [dBm]** | **Margin [dB]** |
| 5500 | 5.91 | 9.10 | -3.18 |
| 5600 | 6.00 | 9.10 | -3.10 |
| 5700 | 5.33 | 9.10 | -3.77 |

**Note:** 1. The highest power spectral density was observed at 11a Mode 6.0 Mbps per data stream.
2. According KDB 662911, amplitude bins of all chains were sum together.
. 3. The total directional gain would be 7.9dBi;
Antenna 1: 4.59dBi and Antenna 2 : 5.3dBi
Directional gain = 10 log[(10G1 /20 + 10G2 /20 + … + 10GN /20)2 /NANT]dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently. = 7.9dBi. or linear gain 6.1
4. As Per CFR47 Part 15.407 (a), the limit is reduced for every1 dB gain exceeding 6dBi. The limit would be 9.10dBm.
Highlighted plots are available in this report

| 802.11n (HT20/VHT20) Mode | | | |
|---|---|---|---|
| **Freq. (MHz)** | **Total PSD [dBm]** | **Limit [dBm]** | **Margin [dB]** |
| 5510 | 3.48 | 9.10 | -5.43 |
| 5550 | 5.88 | 9.10 | -3.03 |
| 5710 | 2.30 | 9.10 | -6.61 |

**Note:** 1. The highest Peak power Spectral density was observed at HT20 6.5 Mbps per data stream.
2. According KDB 662911, amplitude bins of all chains were sum together.
3. CF 0.19dB, Correction factor added for Duty cycle <100%

| | | | |
|---|---|---|---|
| **Test Conditions:** Conducted Measurement, Normal Temperature and Voltage only | | | |
| **Antenna Type:** Integrated | | **Power Setting:** See Test plan | |
| **Max. Directional Gain:** + 7.9 dBi | | **Signal State:** See below | |
| **Ambient Temp.:** 23 °C | | **Relative Humidity:**28% | |
| **Power Spectral Density** | | | |
| **802.11n (HT40/ VHT40) Mode** | | | |
| **Freq. (MHz)** | **Total PSD [dBm]** | **Limit [dBm]** | **Margin [dB]** |
| 5510 | -1.11 | 9.10 | -9.96 |
| 5590 | -1.24 | 9.10 | -10.09 |
| 5710 | -2.40 | 9.10 | -11.25 |
| **Note:** 1. The highest power spectral density was observed at HT40 13.5 per data stream.<br>2. According KDB 662911, amplitude bins of all chains were sum together.<br>3. CF 0.25dB, Correction factor added for Duty cycle <100% | | | |
| **802.11n AC VHT80 Mode** | | | |
| **Freq. (MHz)** | **Total PSD [dBm]** | **CF [dB]** | **Limit [dBm]** | **Margin [dB]** |
| 5530 | -6.90 | 2.53 | 9.10 | -13.47 |
| 5610 | -6.44 | 2.53 | 9.10 | -13.01 |
| 5690 | -7.25 | 2.53 | 9.10 | -13.82 |
| **Note:** 1. The highest peak output power was observed at VHT80 56.5Mbps per data stream.<br>2. According KDB 662911, amplitude bins of all chains were sum together.<br>3. Correction factor added for Duty cycle <100%<br>Highlighted plots are in the report | | | |

## UNII Band IV 5725MHz to 5850MHz

| | | | |
|---|---|---|---|
| **Test Conditions:** Conducted Measurement, Normal Temperature and Voltage only | | | |
| **Antenna Type:** Integrated | | **Power Setting:** See Test plan | |
| **Max. Directional Gain:** + 7.9 dBi | | **Signal State:** Modulated at 100%. | |
| **Ambient Temp.:** 23 °C | | **Relative Humidity:**28% | |
| **Power Spectral Density** | | | |
| **802.11a Mode** | | | |
| **Freq. (MHz)** | **Total PSD [dBm]** | **Limit [dBm]** | **Margin [dB]** |
| 5745 | 2.82 | 9.10 | -6.28 |
| 5785 | 2.80 | 9.10 | -6.30 |
| 5825 | 2.67 | 9.10 | -6.43 |
| **Note:** 1. The highest power spectral density was observed at 11a mode 6.0 Mbps per data stream.<br>2. According KDB 662911, amplitude bins of all chains were sum together. | | | |
| **802.11n (HT20) Mode** | | | |
| **Freq. (MHz)** | **Total PSD [dBm]** | **Limit [dBm]** | **Margin [dB]** |
| 5745 | 2.68 | 9.10 | -6.23 |
| 5785 | 2.67 | 9.10 | -6.24 |
| 5825 | 2.66 | 9.10 | -6.25 |
| **Note:** 1. The highest peak output power was observed at HT20 6.5 Mbps per data stream.<br>2. According KDB 662911, amplitude bins of all chains were sum together.<br>3. CF 0.19dB, Correction factor added for Duty cycle <100%<br>. | | | |

| | | | |
|---|---|---|---|
| **Test Conditions:** Conducted Measurement, Normal Temperature and Voltage only | | | |
| **Antenna Type:** Integrated | | **Power Setting:** See Test plan | |
| **Max. Directional Gain:** + 7.9 dBi | | **Signal State:** Modulated at 100%. | |
| **Ambient Temp.:** 23 °C | | **Relative Humidity:**28% | |
| **Power Spectral Density** | | | |
| **802.11n (HT40) Mode** | | | |
| **Freq. (MHz)** | **Total PSD [dBm]** | **Limit [dBm]** | **Margin [dB]** |
| 5755 | -3.25 | 9.10 | -12.10 |
| 5795 | -3.30 | 9.10 | -12.15 |
| **Note:** 1. The highest power spectral density was observed at HT40 13.5Mbps per data stream.<br>2. According KDB 662911, amplitude bins of all chains were sum together.<br>3. CF 0.25dB, Correction factor added for Duty cycle <100% | | | |
| **802.11n AC VHT80 Mode** | | | |
| **Freq. (MHz)** | **Total PSD [dBm]** | **Limit [dBm]** | **Margin [dB]** |
| 5775 | -15.99 | 9.10 | -22.56 |
| **ote:** 1. The highest peak output power was observed at VHT80 56.5Mbps per data stream.<br>2. According KDB 662911, amplitude bins of all chains were sum together.<br>3. CF 2.53dB, Correction factor added for Duty cycle <100% | | | |

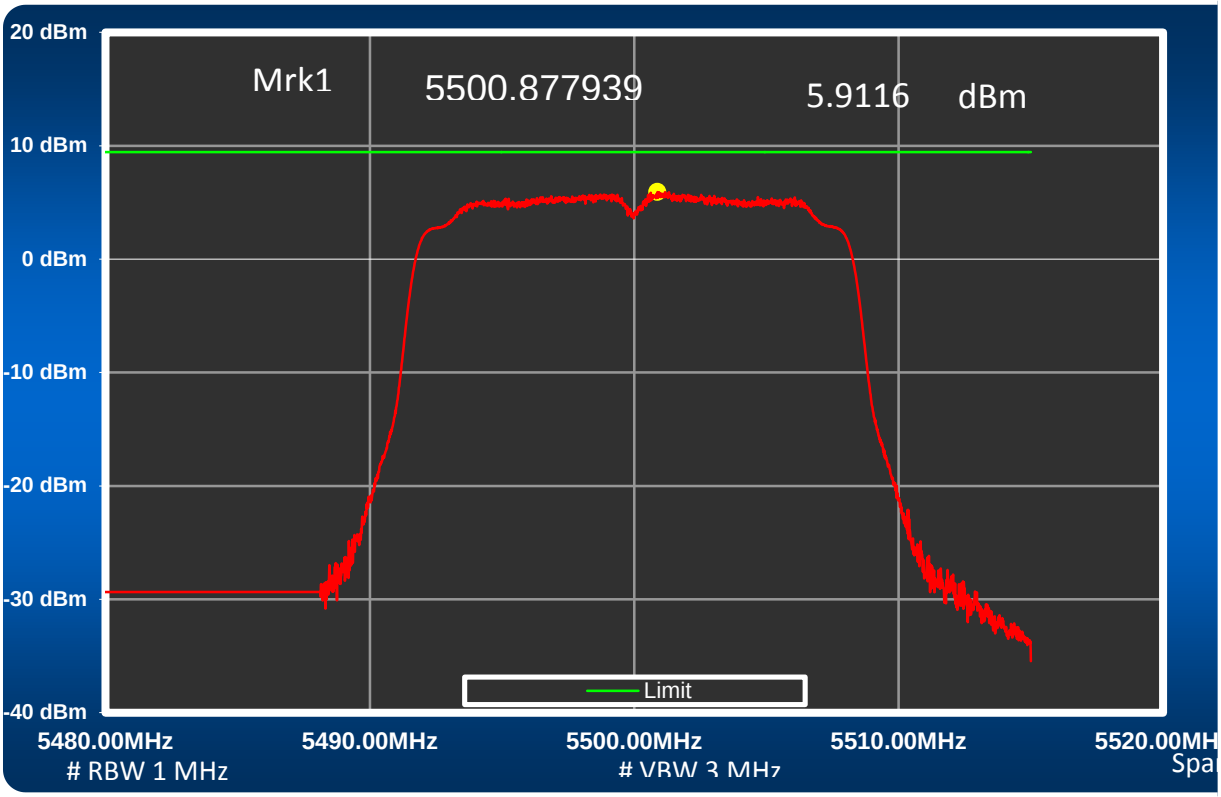



**Figure 17:** Power Spectral Density, 5500 MHz at 802.11a, Combined PSD – 6.5Mbps

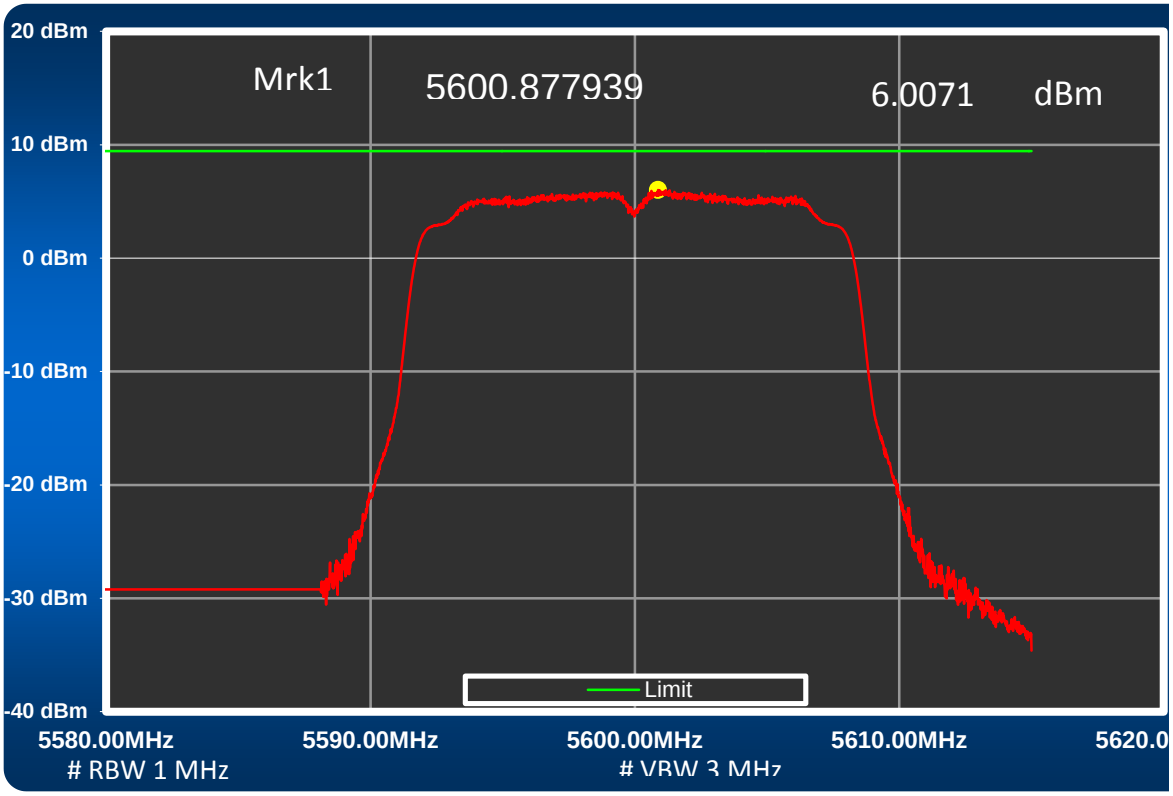



**Figure 18:** Power Spectral Density, 5600MHz at 80211.a combined PSD at – 6.0Mbps

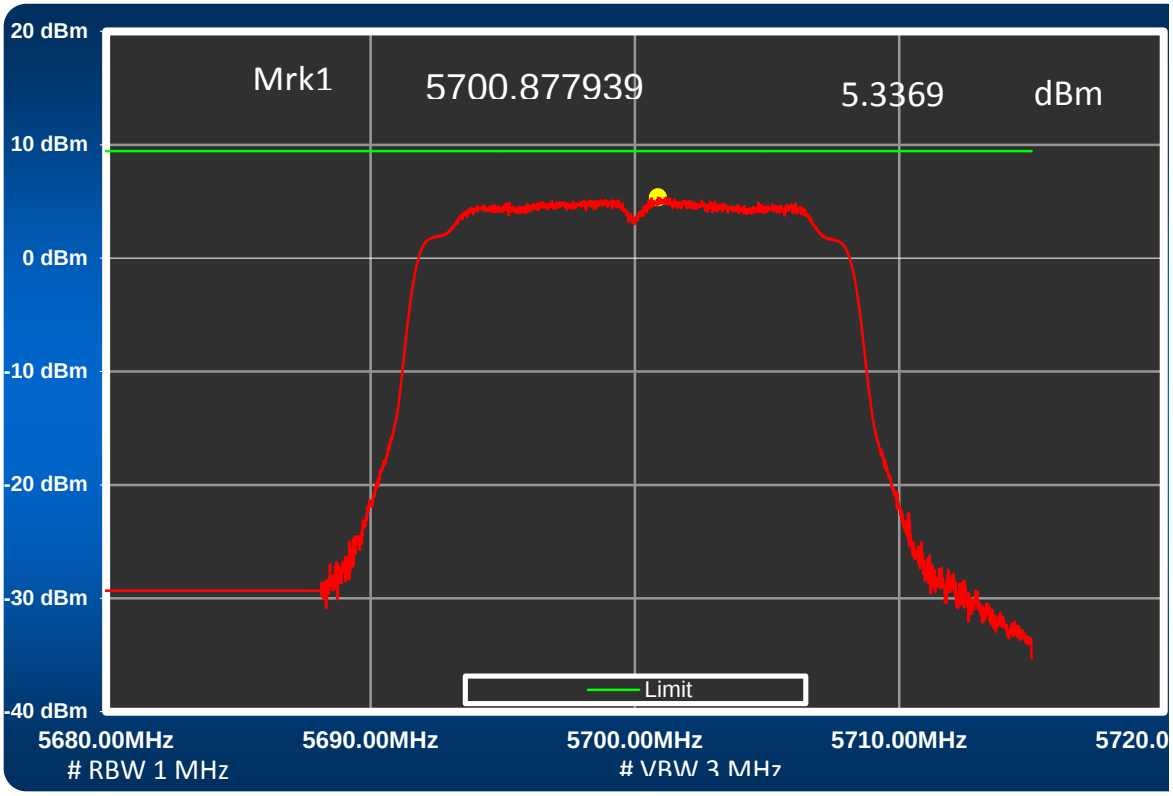



**Figure 19:** Power Spectral Density, 5700MHz at 802.11a, Combined PSD at 6.0Mbps

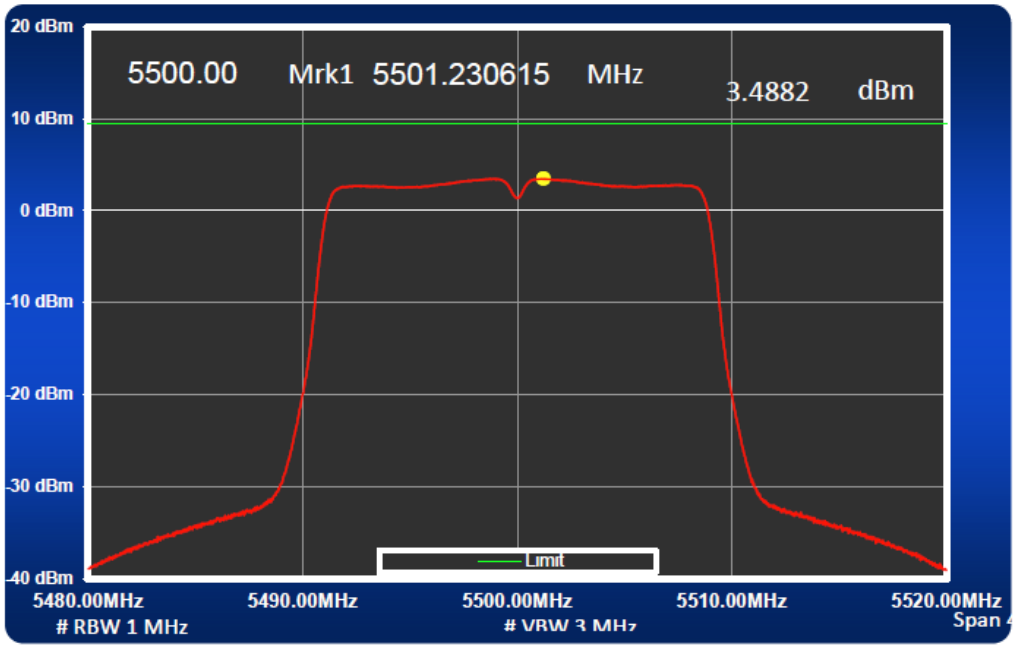



**Figure 20:** Power Spectral Density, 5500 MHz at 802.11n, HT20 Combined – 6.5Mbps

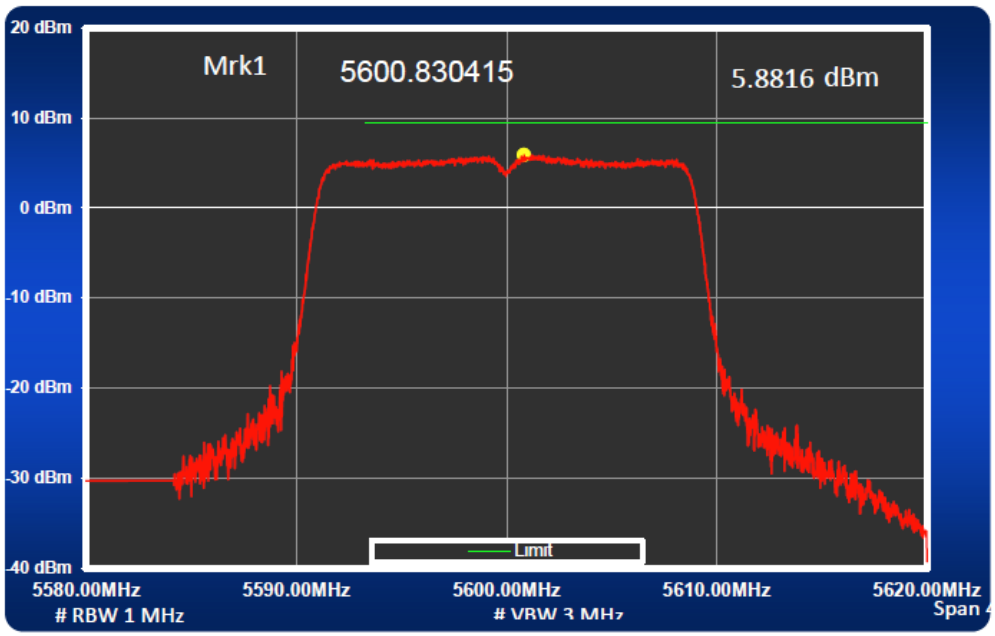



**Figure 21:** Power Spectral Density, 5600MHz at 802.11n, HT20 combined 6.5Mbps

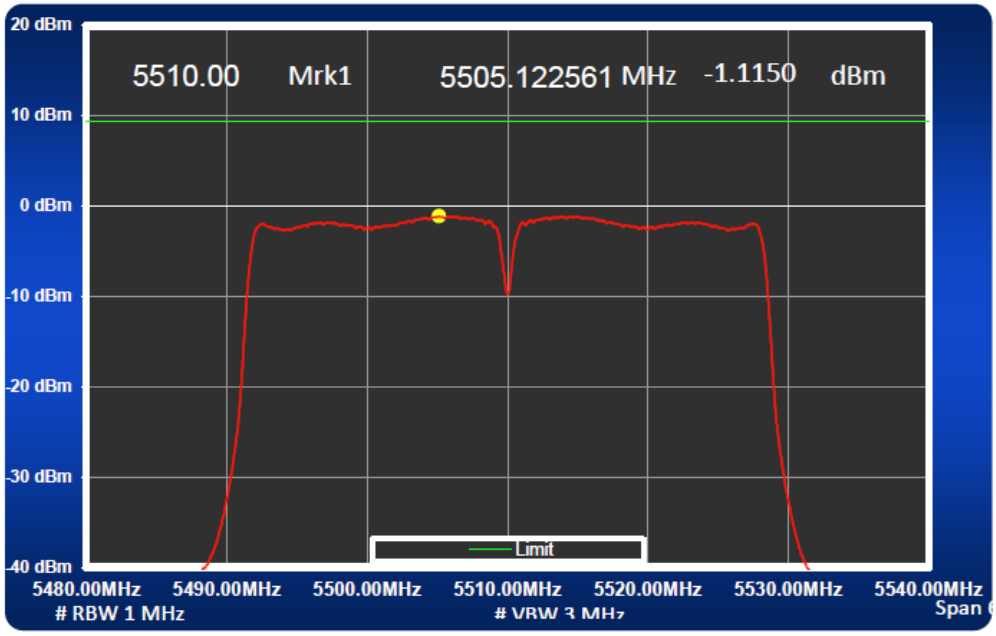



**Figure 22:** Total Sum of Power Spectral Density, 5510MHz at 802.11n, HT40 Combined 13.5Mbps

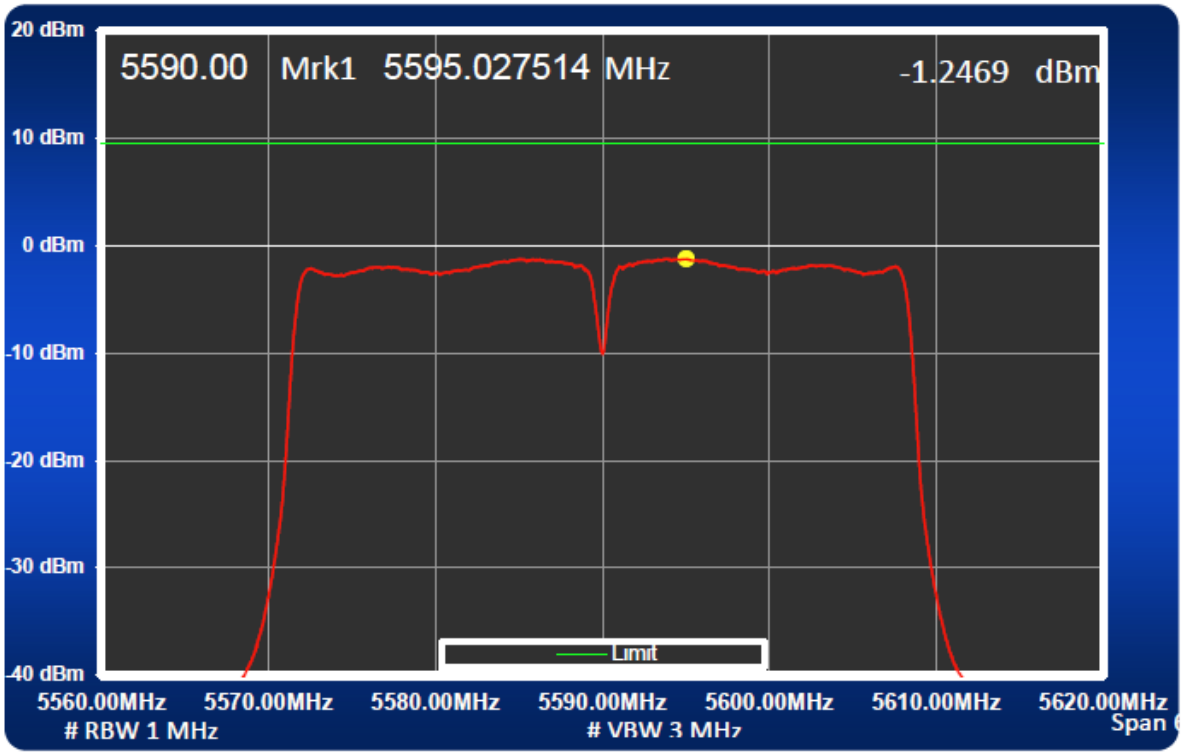



**Figure 23:** Power Spectral Density, 5595MHz at 802.11n, HT40 Combined 13.5Mbps

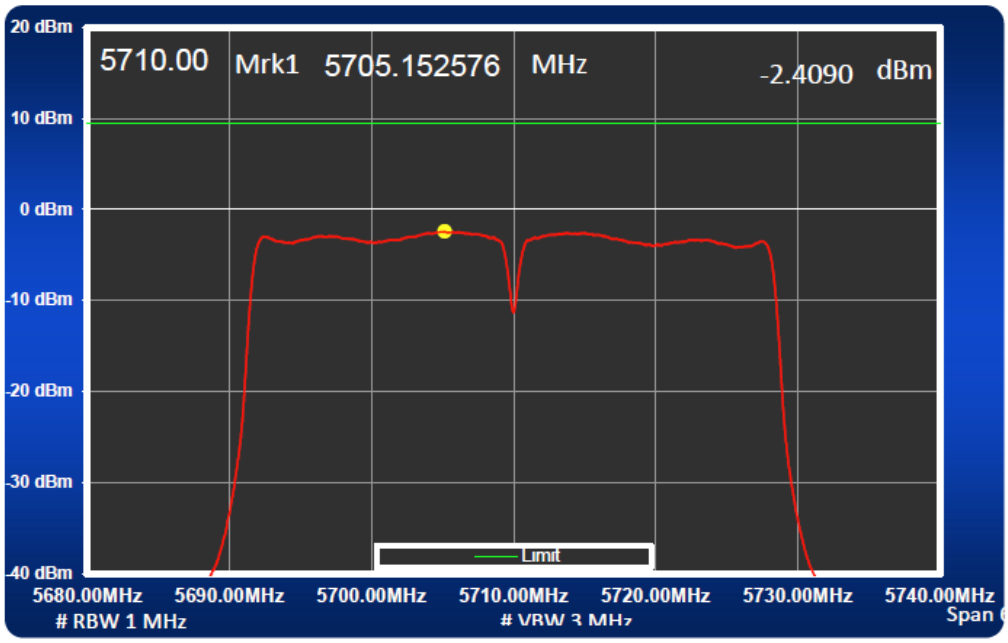



**Figure 24:** Power Spectral Density, 5710MHz at 802.11n, HT40 Combined 13.5Mbps

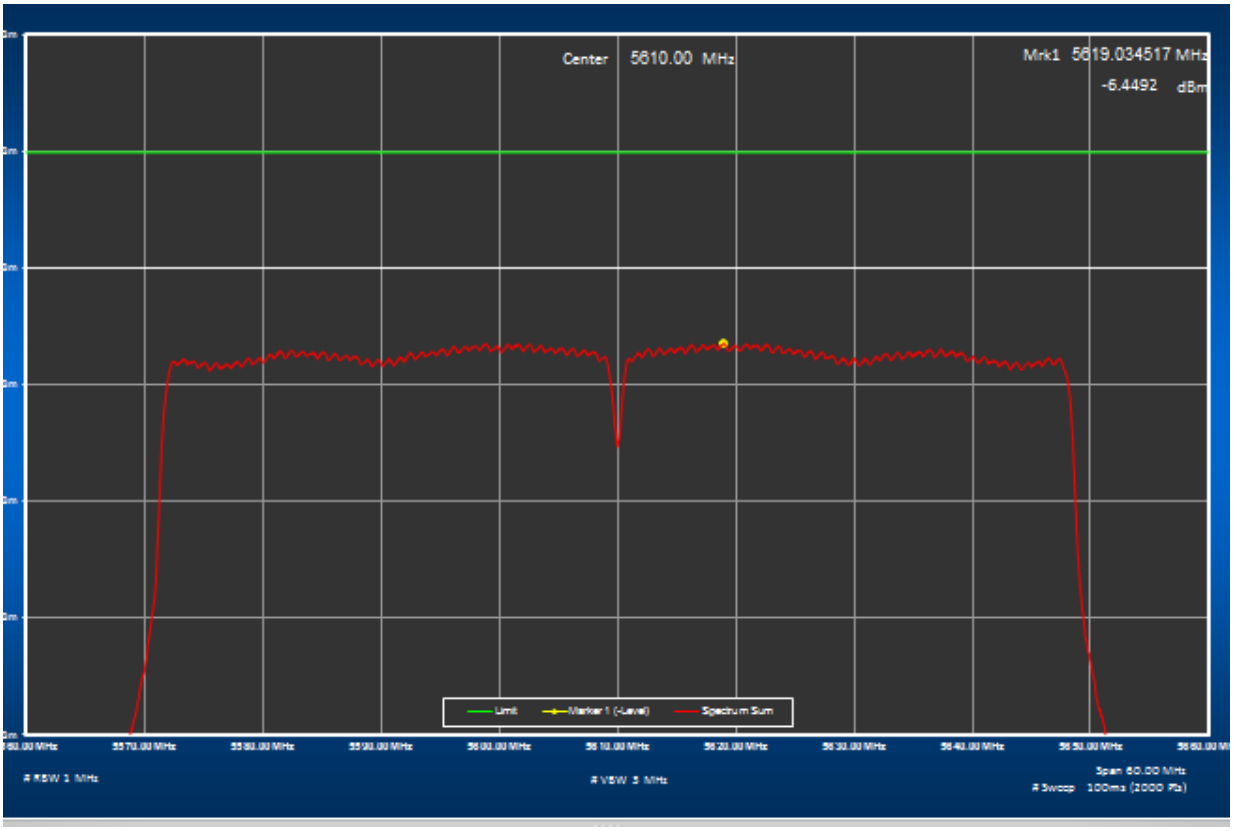



**Figure 25:** Power Spectral Density, 5610MHz at 802.11n AC VHT80 , Combined 56.5Mbps

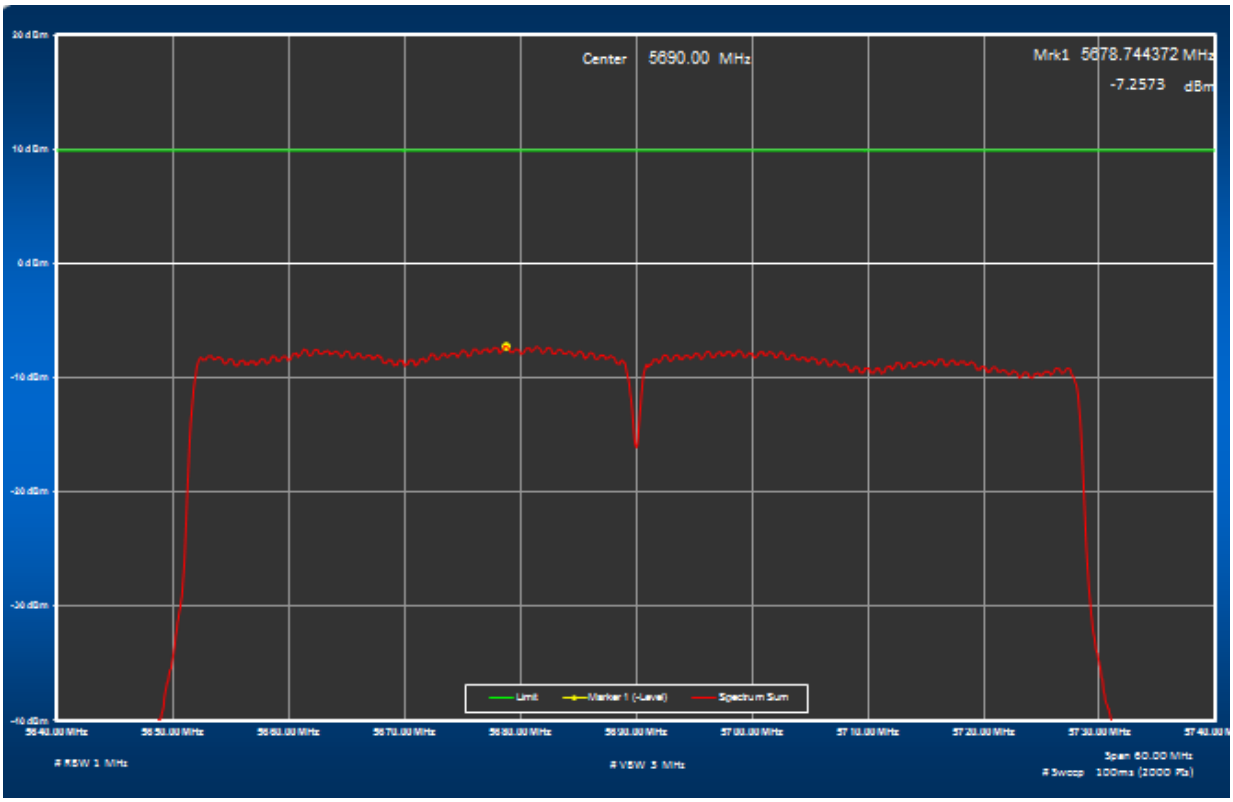



**Figure 26:** Power Spectral Density, 5690MHz at 802.11n AC VHT80 , Combined 56.5Mbps

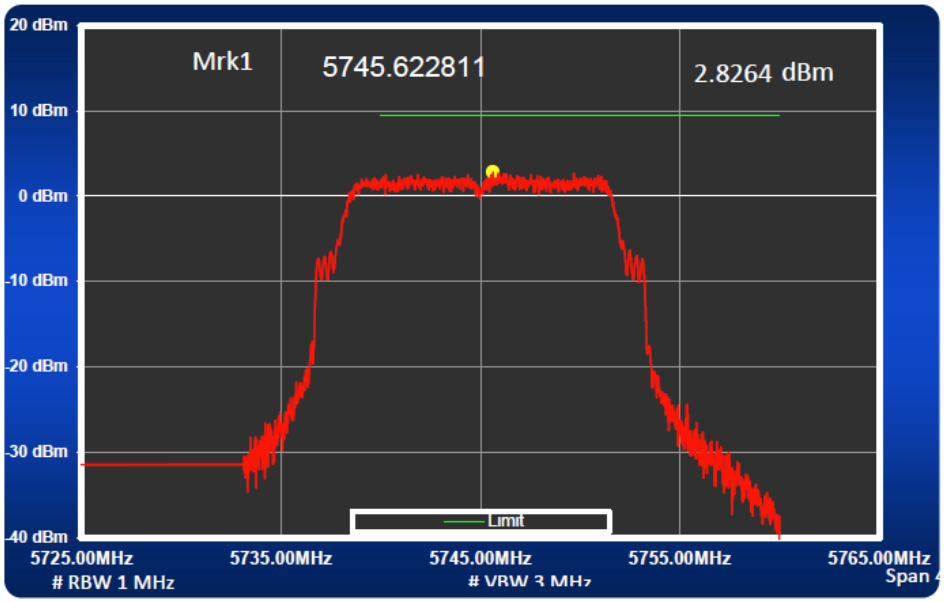



**Figure 27:** Power Spectral Density, 5745MHz at 802.11a, Combined – 6.0Mbps

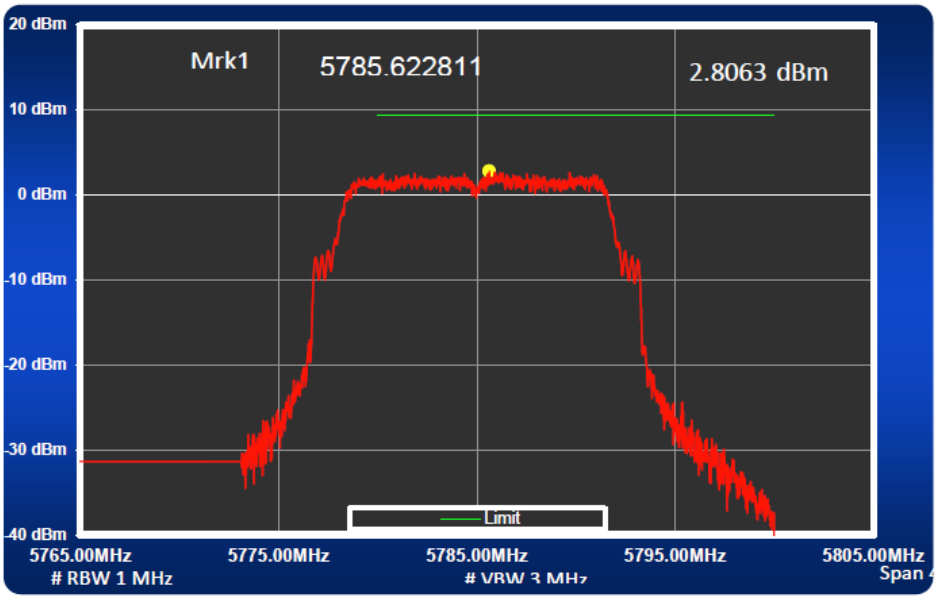



**Figure 28:** Power Spectral Density, 5785MHz at 802.11a Combined – 6.0Mbps

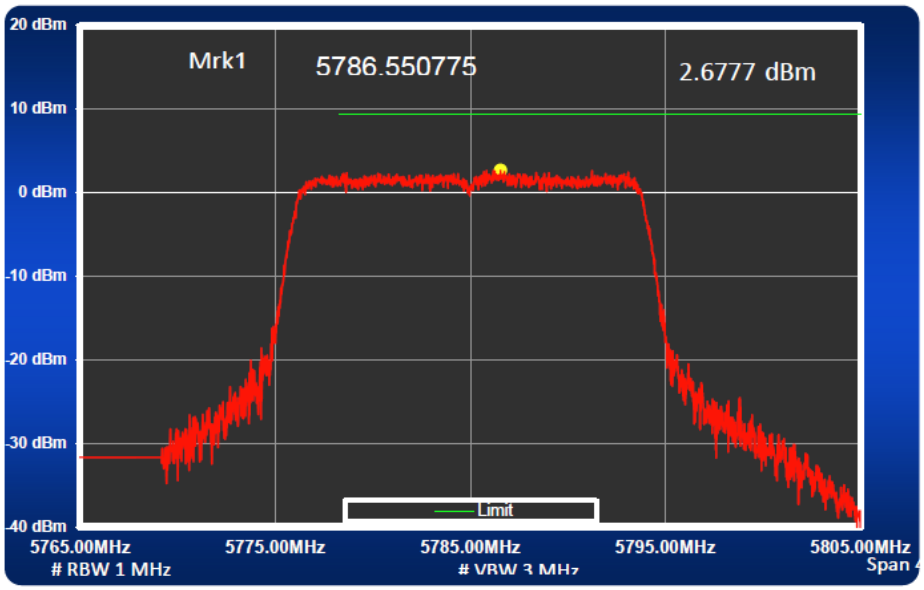



**Figure 29:** Power Spectral Density, 5785MHz at 802.11a, combined – 6.0Mbps

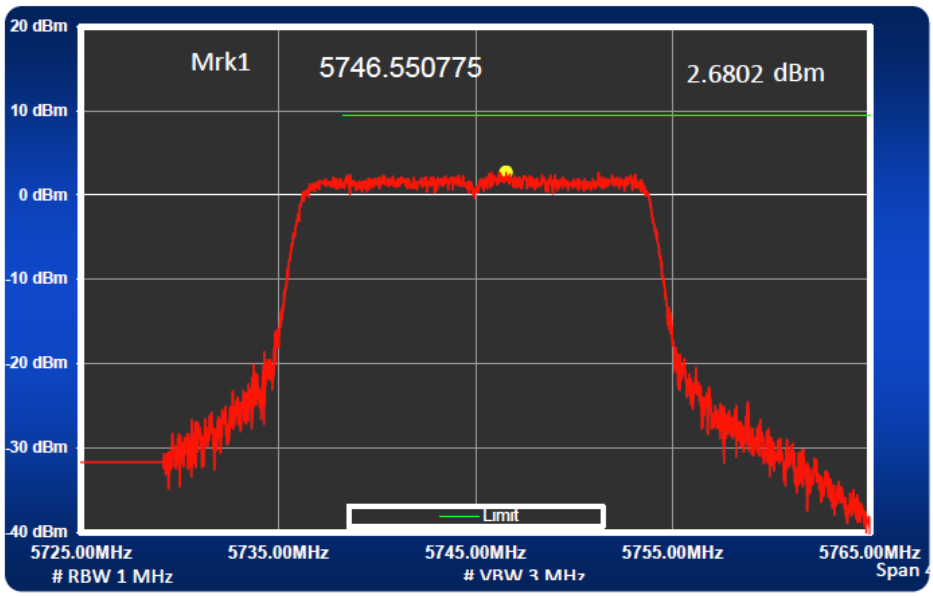



**Figure 30:** Power Spectral Density, 5745MHz at 802.11n, HT 20 Combined– 6.5Mbps

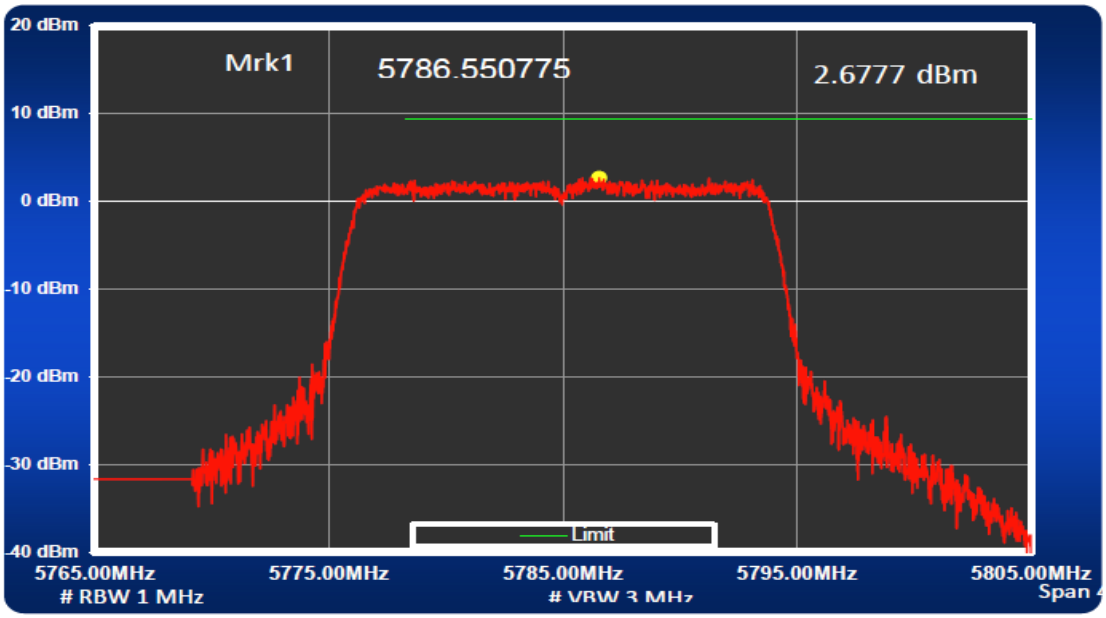



**Figure 31:** Power Spectral Density, 5785MHz at 802.11n, HT 20 Combined– 6.5Mbps

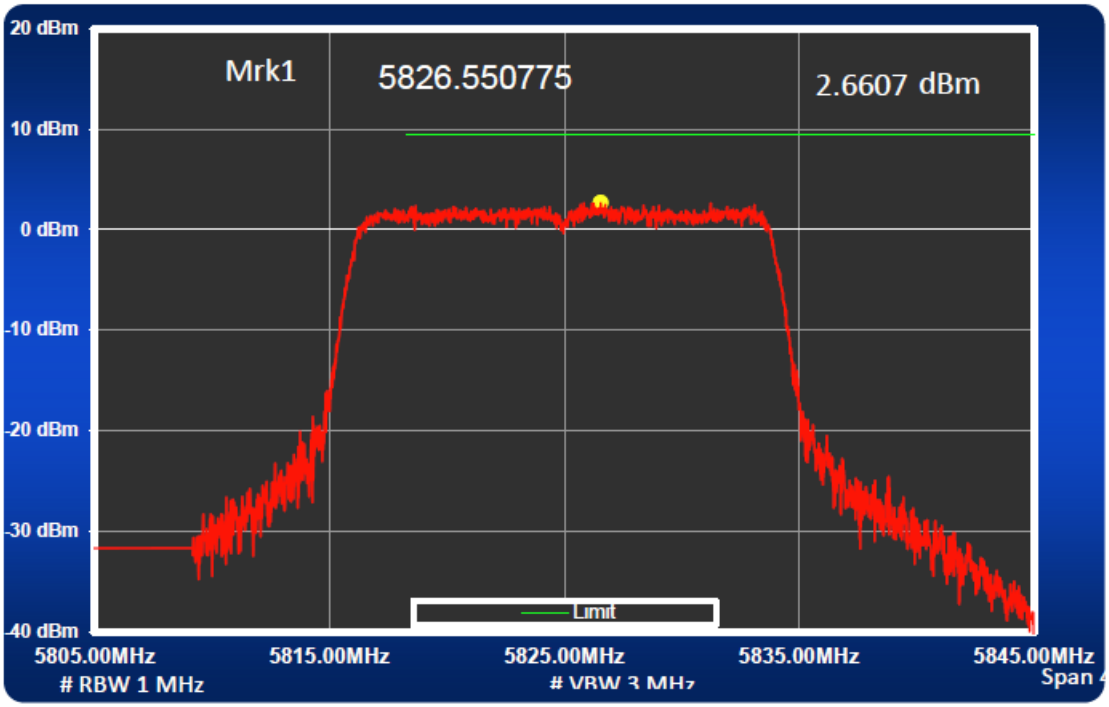



**Figure 32:** Total Sum of Power Spectral Density, 5825MHz at 802.11n, HT20 Combined 6.5Mbps

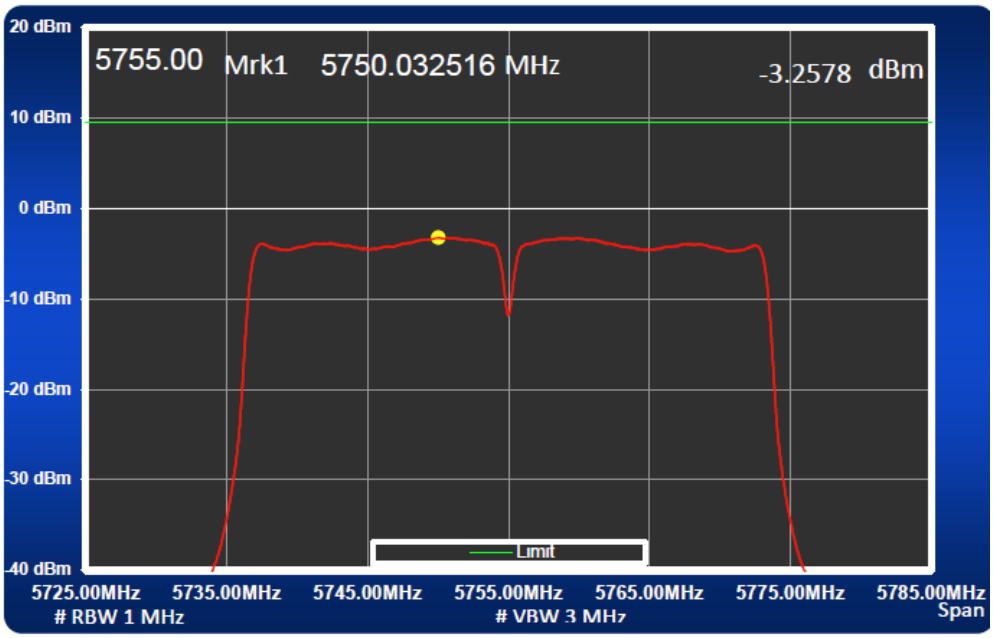



**Figure 33:** Power Spectral Density, 5755MHz at 802.11n, HT40 combined 13.5Mbps

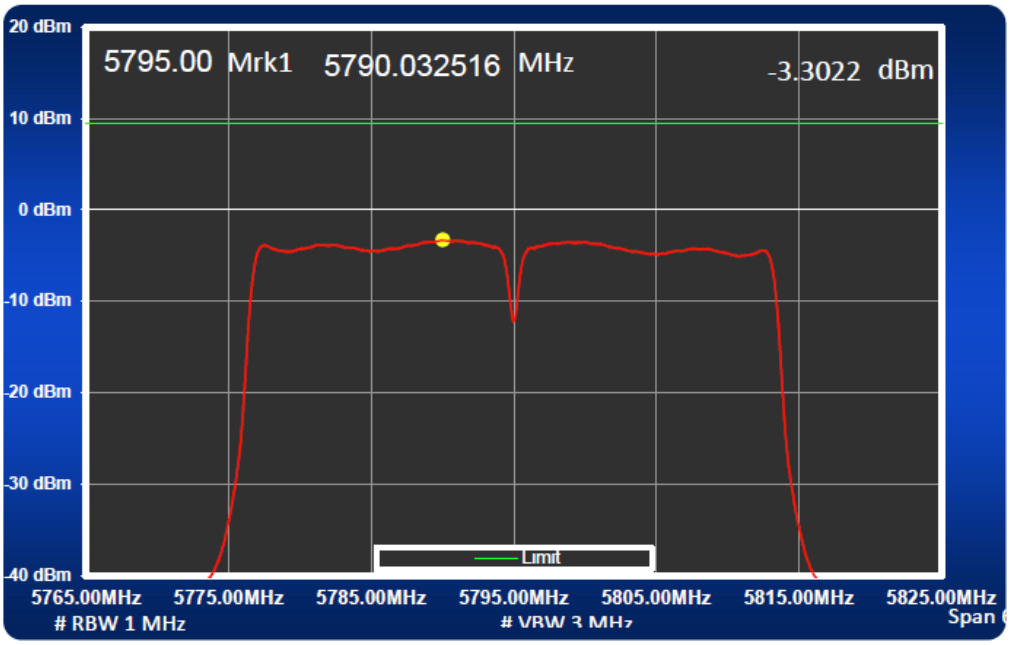



**Figure 34:** Power Spectral Density, 5795 MHz at 802.11n, HT40 combined 13.5Mbps

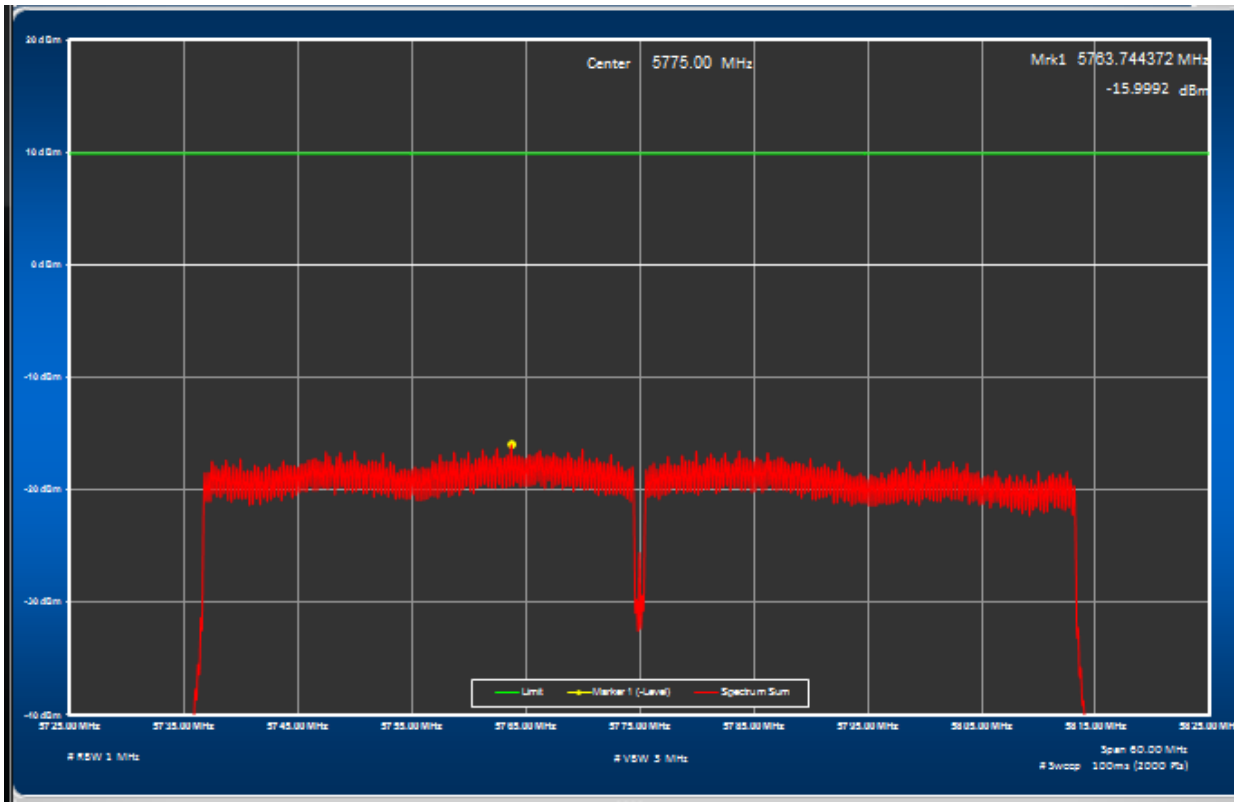



**Figure 35:** Power Spectral Density, 5775 MHz at 802.11n, HT80 combined 56.5Mbps

## *4.4 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 210 Sect. A.9.2*

### 4.4.1 **Test Methodology**

#### *4.4.1.1 Preliminary Test*

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

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

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

#### *4.4.1.2 Final Test*

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

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

The final scan for 30 MHz to 1 GHz was performed at 5500 MHz, 6.5 Mbit/s .

The above 1GHz final scans performed on the worst axis, X-Axis, for three operating channels;

6.0 Mbit/s for 802.11a Mode, 6.5Mbits 802.11n HT20/VHT20 Mode: 5500, 5600, 5700, 5745, 5785 and 5825MHz

13.5 Mbit/s for 802.11n HT40 Mode: 5510, 5590, 5710, 5755 and 5795MHz

56.5Mbit/s for 802.11n AC VHT80 Mode: 5530, 5610, 5690 and 5755MHz.

#### *4.4.1.3 Deviations*

None.

### 4.4.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2012 and RSS 210 A1.1.2 2010.

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

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

### 4.4.3 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 6:** Transmit Spurious Emission at Band-Edge Requirements

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Test Conditions:** Radiated Measurement, Normal Temperature and Voltage only | | | | | | | | |
| **Antenna Type:** Integrated | | | | **Power Setting:** See test plan | | | | |
| **Max. Directional Gain:** +7.9 dBi | | | | **Signal State:** Modulated at 100% | | | | |
| **Ambient Temp.:** 23 °C | | | | **Relative Humidity:** 31% | | | | |
| **Band-Edge Results** | | | | | | | | |
| Freq. (MHz) | Level (dBuV/m) | Polarity (H/V) | Limit (dBuV/m) | Margin (dB) | Det. | Table Deg. | Tower (cm) | Note |
| 5470 | 59.19 | H | 74.00 | −14.81 | Pk | 176 | 103 | 11a−5500MHz−14dBm |
| 5470 | 48.16 | H | 54.00 | −5.84 | Ave | 176 | 103 | 11a−5500MHz−14dBm |
| 5470 | 61.98 | V | 74.00 | −12.02 | Pk | 260 | 311 | 11a−5500MHz−14dBm |
| 5470 | 48.90 | V | 54.00 | −5.10 | Ave | 260 | 311 | 11a−5500MHz−14dBm |
| 5725 | 64.26 | H | 74.00 | −9.74 | Pk | 248 | 274 | 11a−5500MHz−14dBm |
| 5725 | 48.86 | H | 54.00 | −5.14 | Ave | 248 | 274 | 11a−5500MHz−14dBm |
| 5725 | 68.06 | V | 74.00 | −5.94 | Pk | 107 | 127 | 11a−5500MHz−14dBm |
| 5725 | 50.28 | V | 54.00 | −3.72 | Ave | 107 | 127 | 11a−5500MHz−14dBm |
| 5470 | 60.53 | V | 74.00 | −23.72 | Pk | 232 | 115 | HT20−5500MHz−14dBm |
| 5470 | 48.50 | V | 54.00 | −5.50 | Ave | 232 | 115 | HT20−5500MHz−14dBm |
| 5470 | 61.64 | H | 74.00 | −12.36 | Pk | 269 | 309 | HT40−5510MHz−12dBm |
| 5470 | 48.19 | H | 54.00 | −5.81 | Ave | 269 | 309 | HT40−5510MHz−12dBm |
| 5470 | 63.87 | V | 74.00 | −10.13 | Pk | 254 | 167 | HT40−5510MHz−12dBm |
| 5470 | 48.15 | V | 54.00 | −5.85 | Avg | 254 | 167 | HT40−5510MHz−12dBm |
| 5470 | 65.61 | V | 74.00 | −8.39 | Pk | 218 | 182 | HT40−5550MHz−14dBm |
| 5470 | 51.00 | V | 54.00 | −3.00 | Avg | 218 | 182 | HT40−5550MHz−14dBm |
| 5470 | 63.04 | H | 74.00 | −10.96 | Pk | 232 | 115 | HT40−5550MHz−14dBm |
| 5470 | 49.27 | H | 54.00 | −4.73 | Ave | 232 | 115 | HT40−5550MHz−14dBm |
| 5725 | 66.32 | V | 74.00 | −7.68 | Avg | 254 | 167 | HT40−5710MHz−14dBm |

| Band-Edge Results | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Level (dBuV/m) | Polarity (H/V) | Limit (dBuV/m) | Margin (dB) | Det. | Table Deg. | Tower (cm) | Note |
| 5470 | 65.93 | H | 74.00 | -8.07 | Pk | 158 | 101 | HT80-5530MHz-12dBm |
| 5470 | 53.04 | H | 54.00 | -0.96 | Ave | 158 | 101 | HT80-5530MHz-12dBm |
| 5470 | 68.63 | V | 74.00 | -5.37 | Pk | 158 | 101 | HT80-5530MHz-12dBm |
| 5470 | 53.95 | V | 54.00 | -.0.05 | Ave | 158 | 101 | HT80-5530MHz-12dBm |
| 5725 | 54.17 | V | 68.20 | -14.03 | Avg | 218 | 182 | HT80-5690MHz-14dBm |

**Note:** 1. Band-edge frequency at 5460MHz is at the restricted band.

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

3. It is also complied with the -27 dBm/MHz (68.2dBuV/m at 3m) requirements as stated in CFR47 15.407 (b) (1) to 15.407 (b) (3).

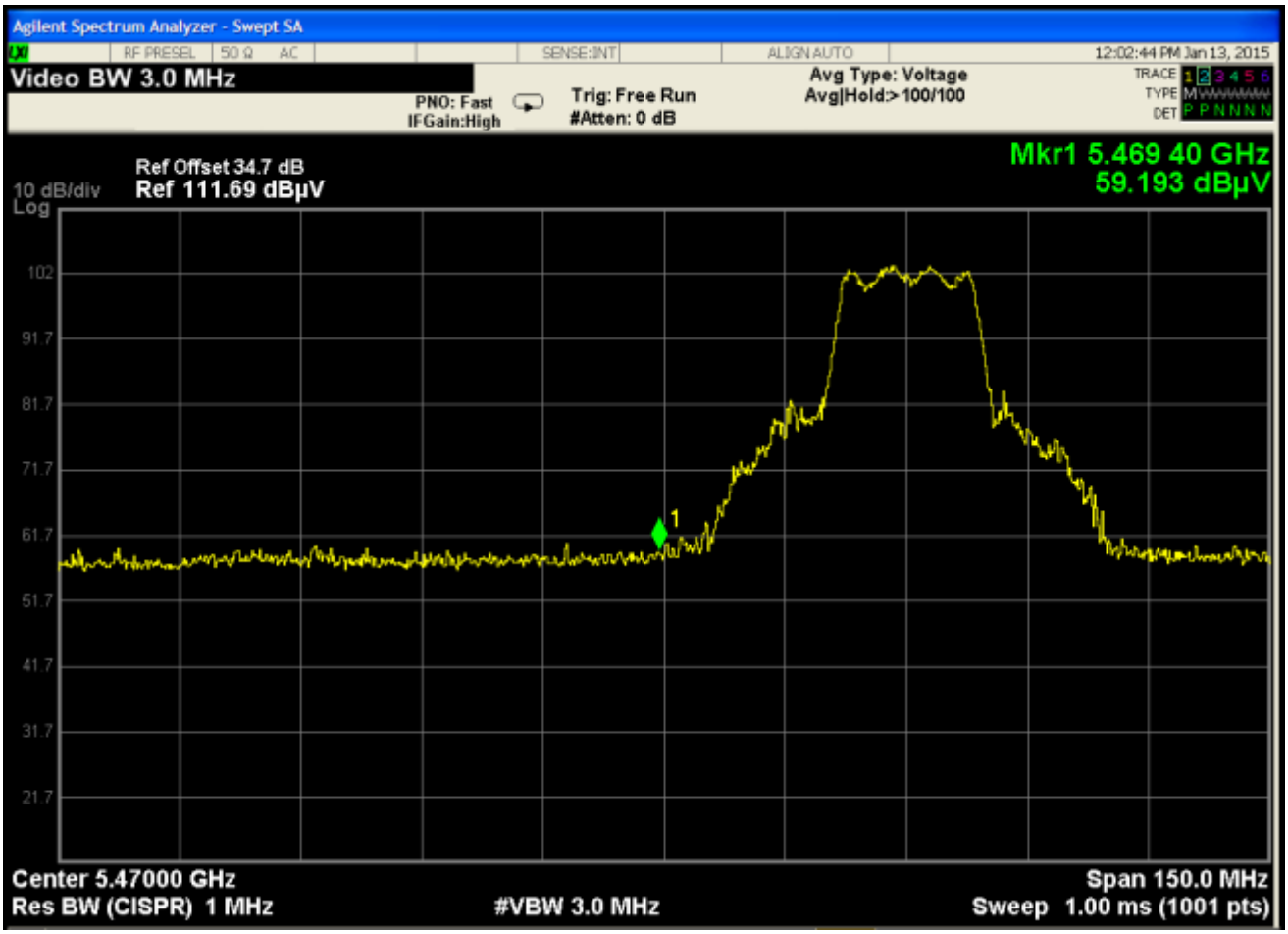



**Figure 36:** Radiated Emission at the Edge for Channel 5500 MHz at 6.0Mbps – Horz. (Peak)

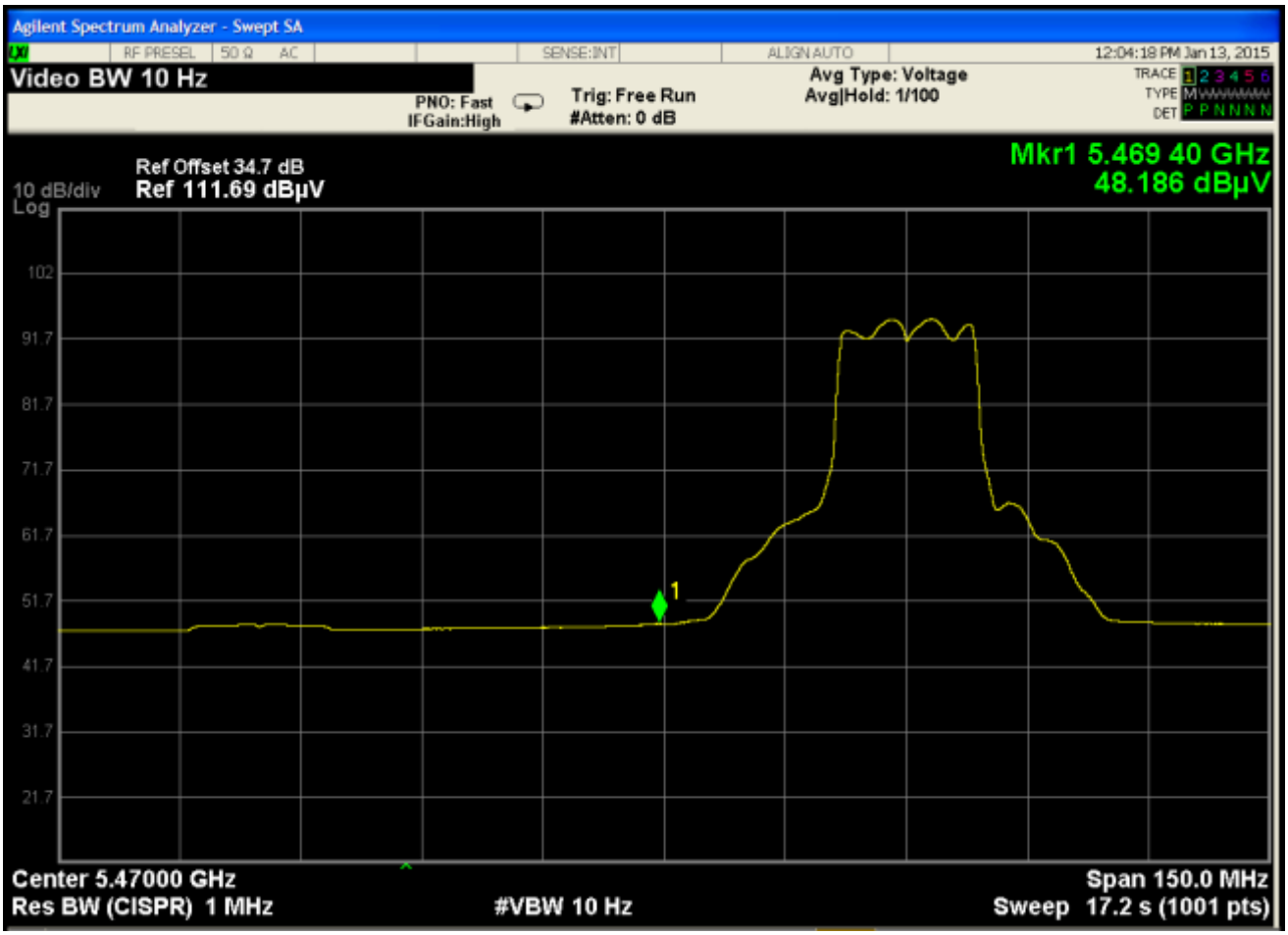



**Figure 37:** Radiated Emission at the Edge for Channel 5500 MHz at 6.0Mbps – Horz. (Ave.)

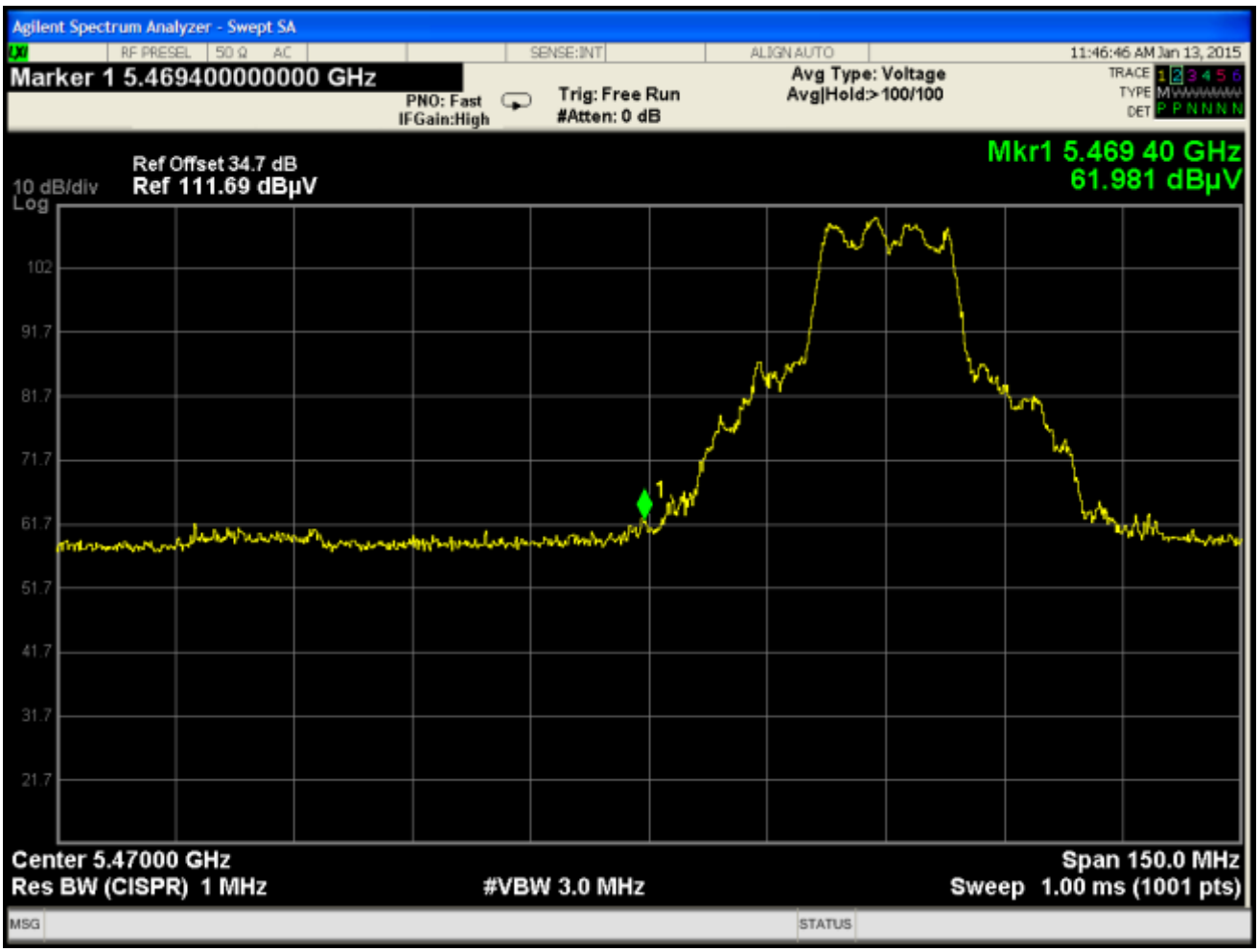



**Figure 38:** Radiated Emission at the Edge for Channel 5500 MHz at 6.5Mbps – Vert. (Peak)

Note: The bandedge at 5470MHz was under 68.2dBuV/m per CFR47 Part 15.407 (b) (1) to 15.407 (b) (3); however, it also met both peak and average requirements of CFR47 Part 15.205 for the restricted band, per above figures 6.

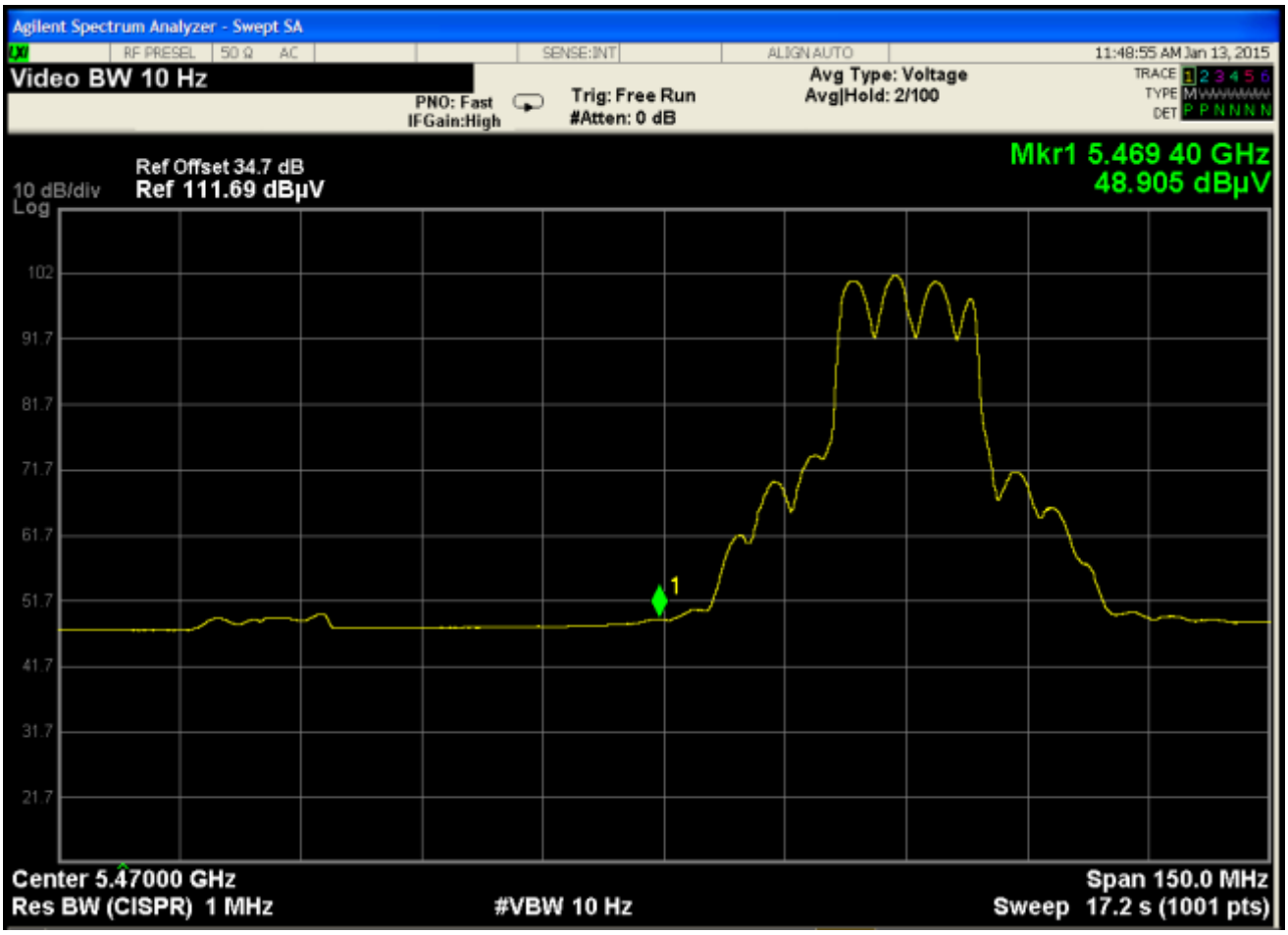



**Figure 39:** Radiated Emission at the Edge for Channel 5500 MHz at 6.0 Mbps– Vert. (Ave.)

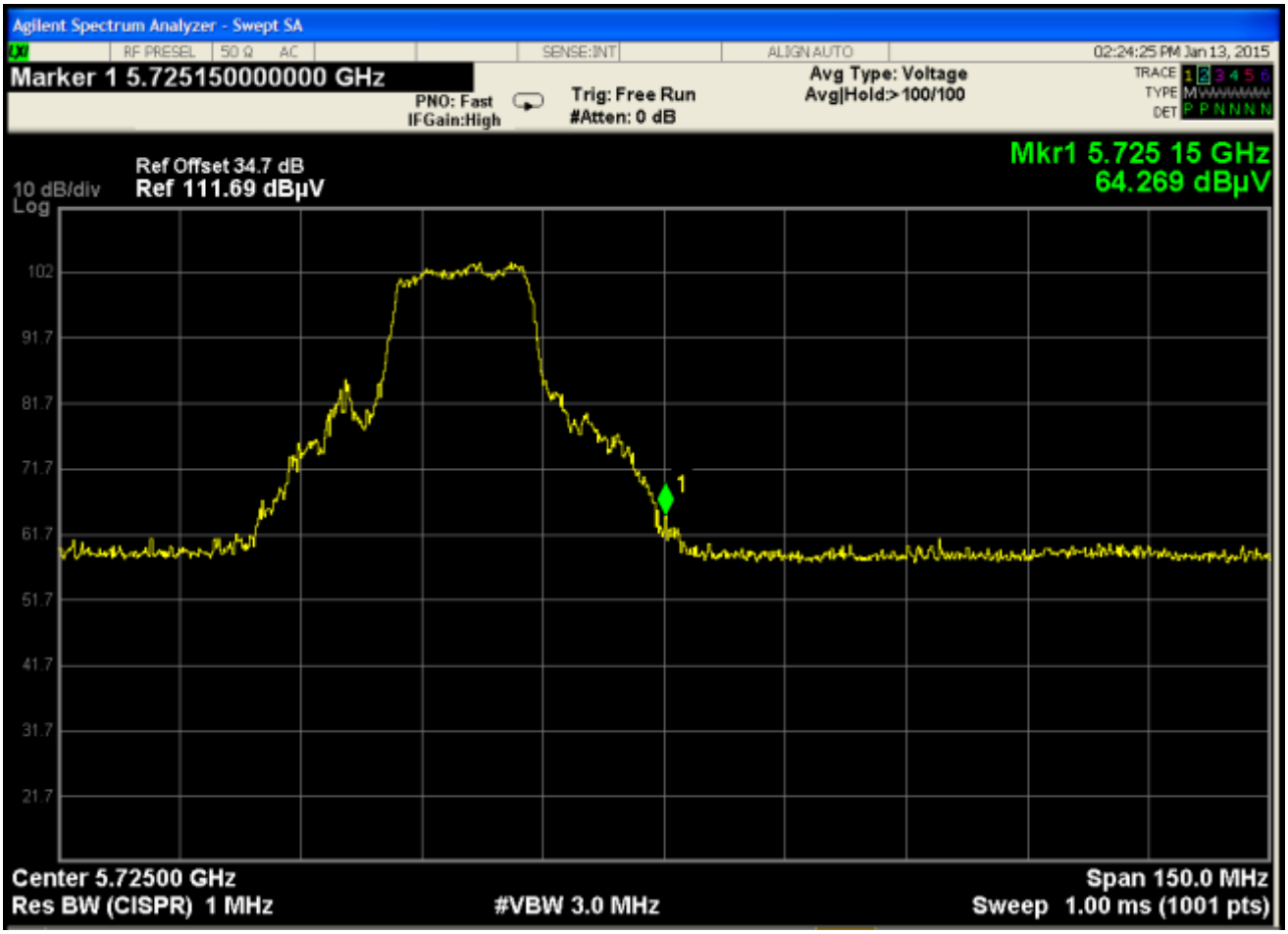



**Figure 40:** Radiated Emission at the Edge for Channel 5700 MHz at 6.0Mbps – Horz. (Peak)

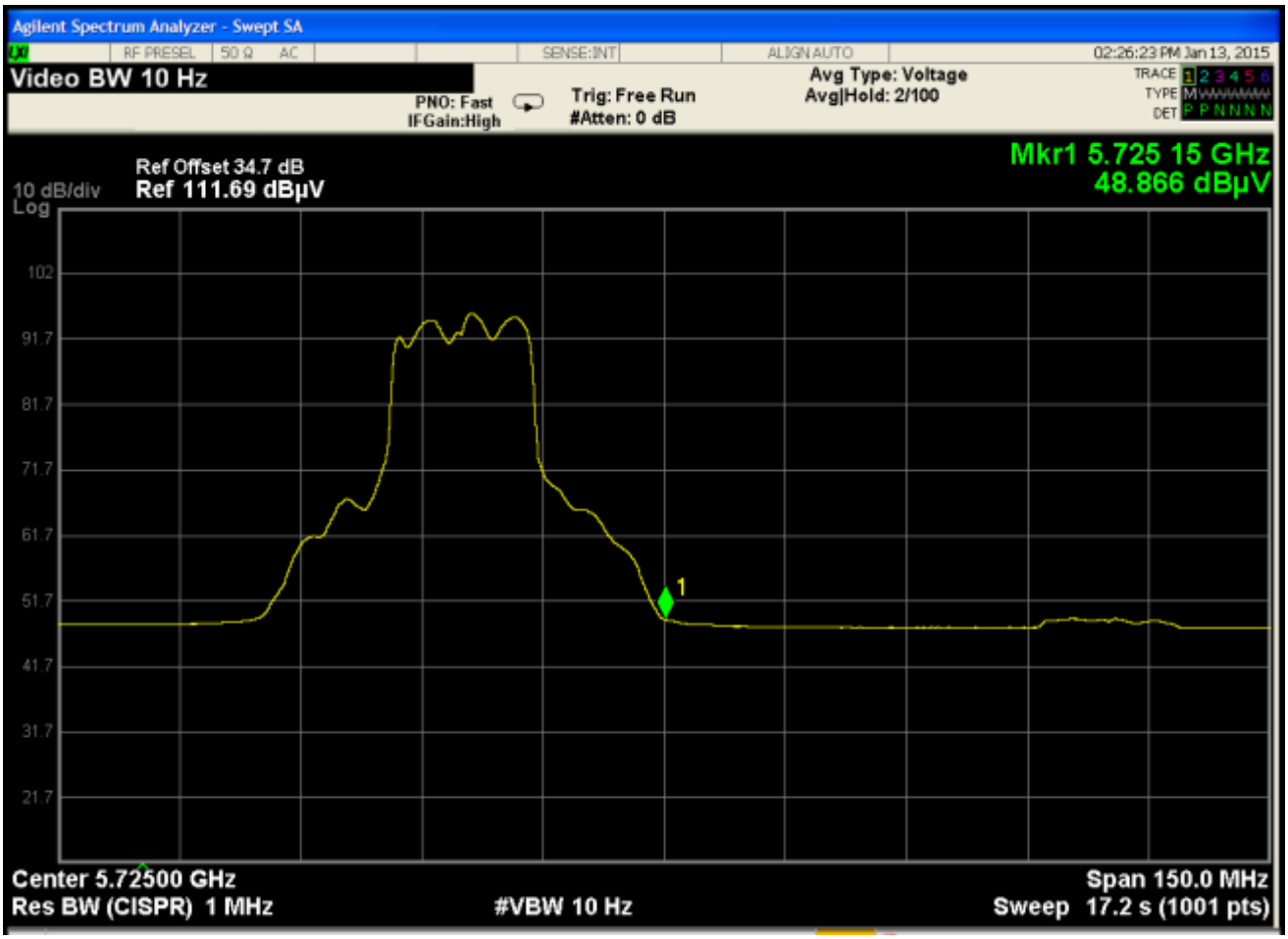



**Figure 41:** Radiated Emission at the Edge for Channel 5700 MHz at 6.0Mbps – Horz. (Ave.)

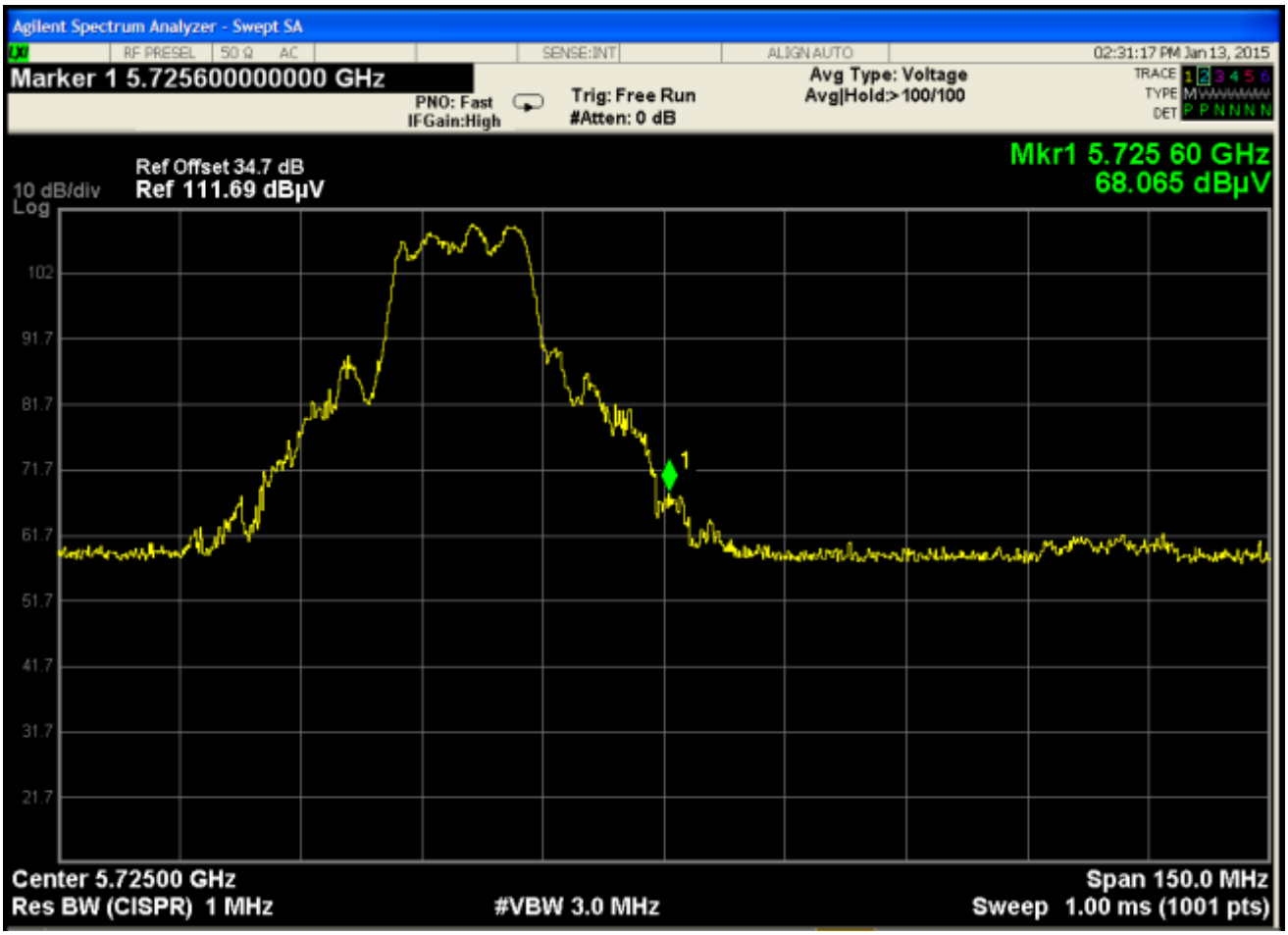



**Figure 42:** Radiated Emission at the Edge for Channel 5700 MHz at 6.0Mbps– Vert. (Peak)

Note: The band edge at 5725MHz is under 68.2dBuV/m per CFR47 Part 15.407 (b) (1) to 15.407 (b) (3); it met both peak and average requirements of CFR47 Part 15.205 for the restricted band, per Figs above.

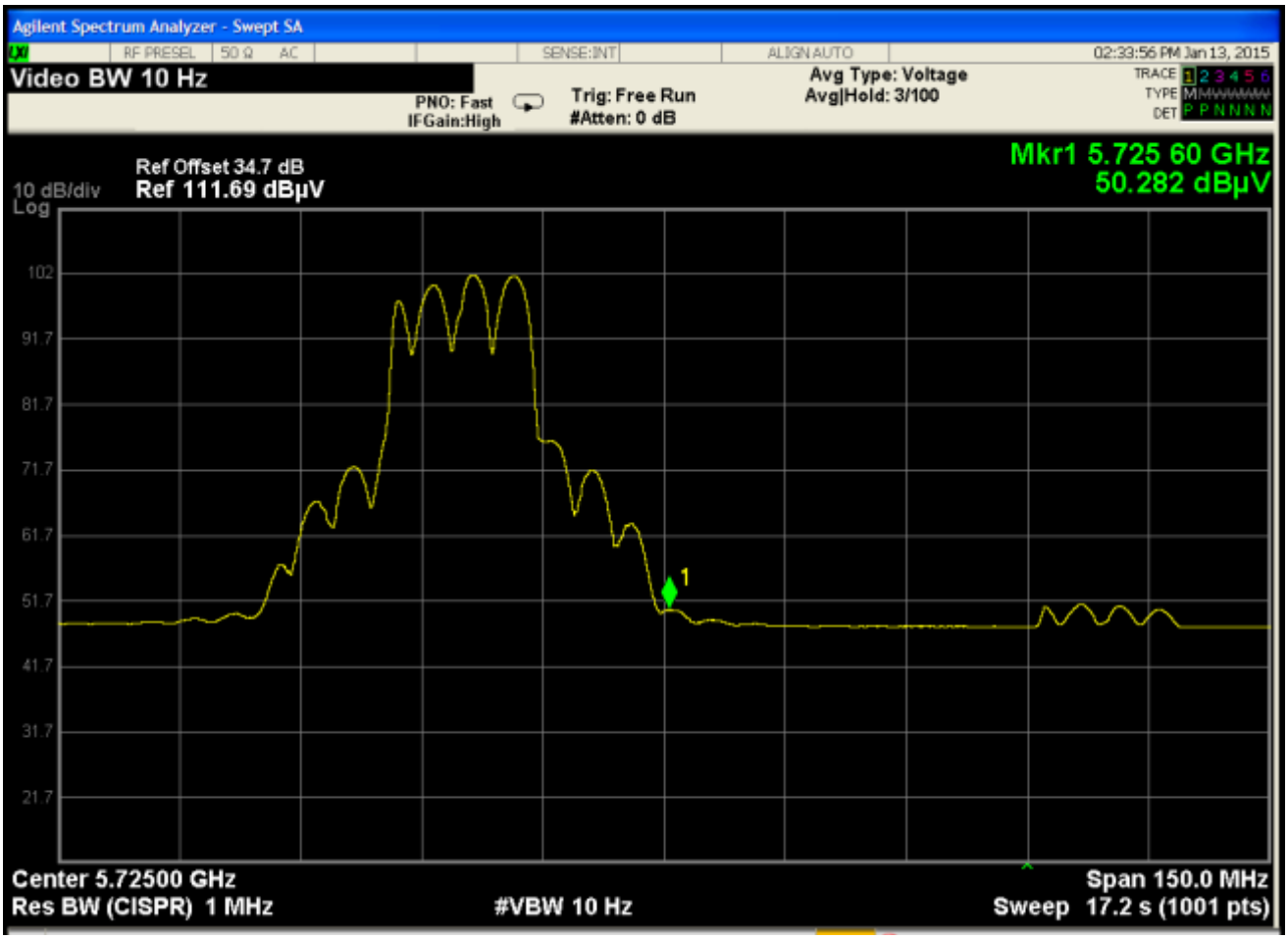



**Figure 43:** Radiated Emission at the Edge for Channel 5700 MHz at 6.0Mbps – Vert. (Ave.)

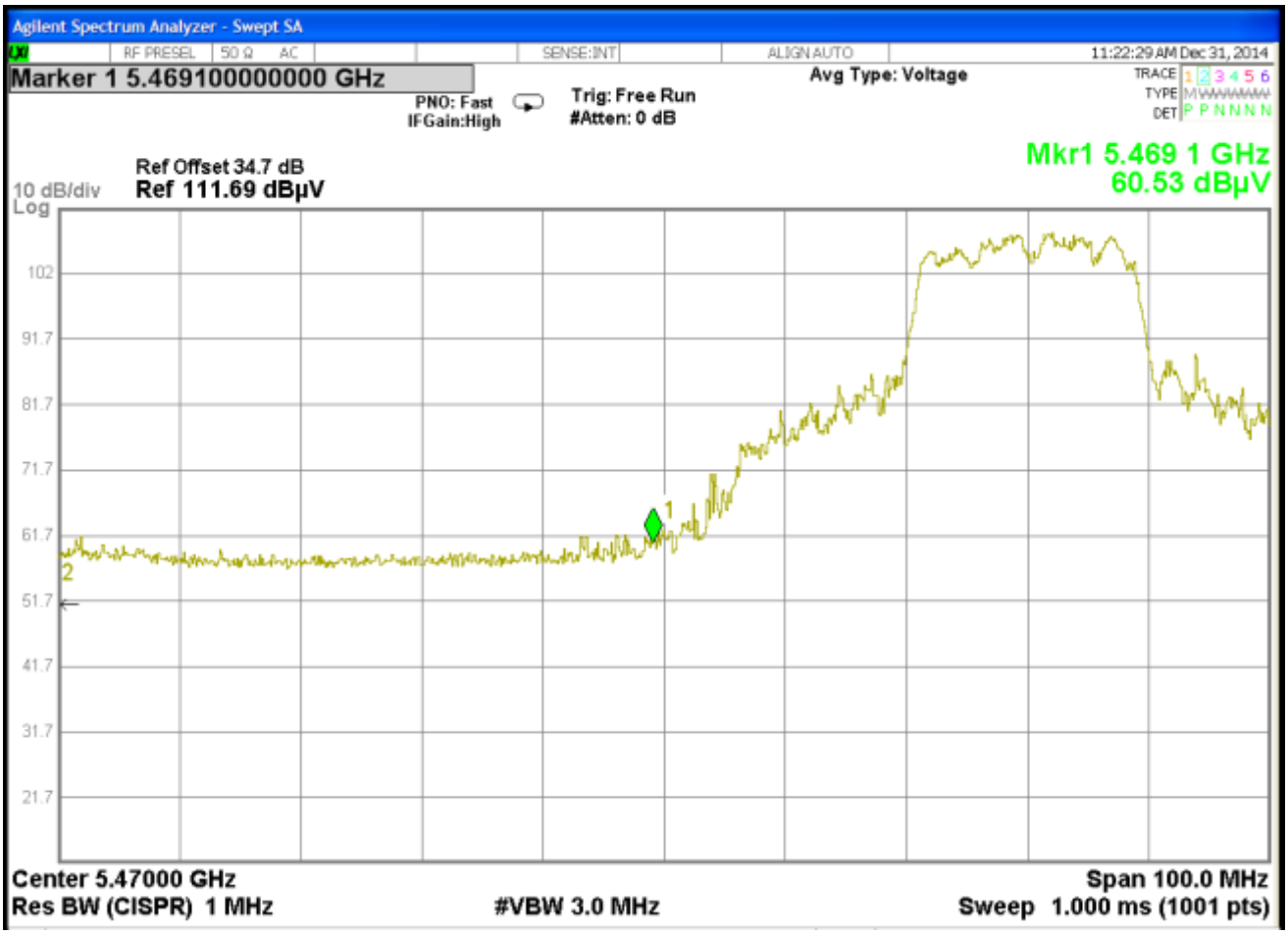



**Figure 44:** Radiated Emission at the Edge for Channel 5500 MHz at– Vert (Peak) 6.5 Mbps HT20

Note: The bandedge at 5470MHz is under 68.2dBuV/m per CFR47 Part 15.407 (b) (1) to 15.407 (b) (3); it also met both peak and average requirements of CFR47 Part 15.205 for the restricted band.

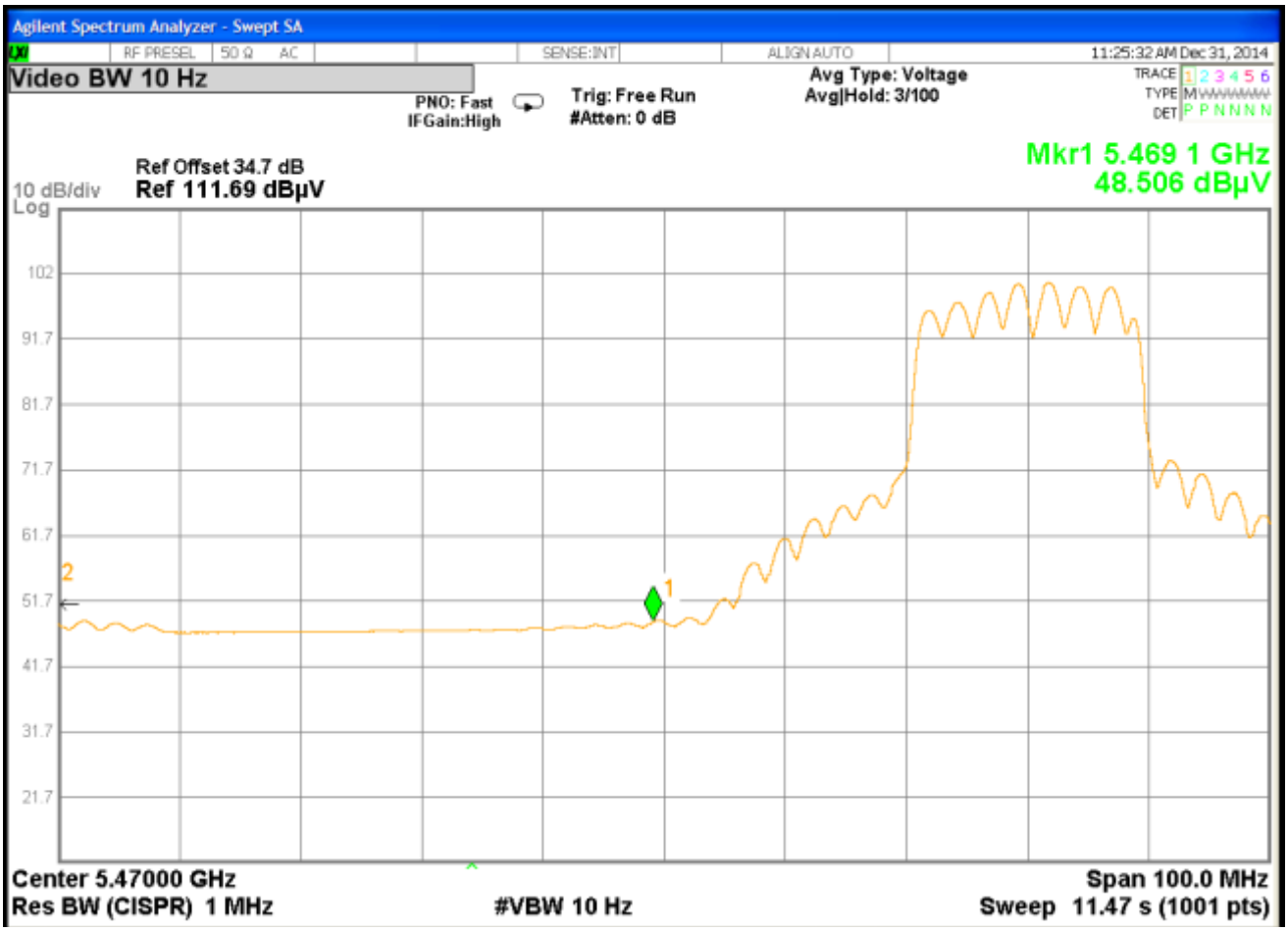



**Figure 45:** Radiated Emission at the Edge for Channel 5500 MHz at 6.5Mbps – Vert (Ave.) HT20

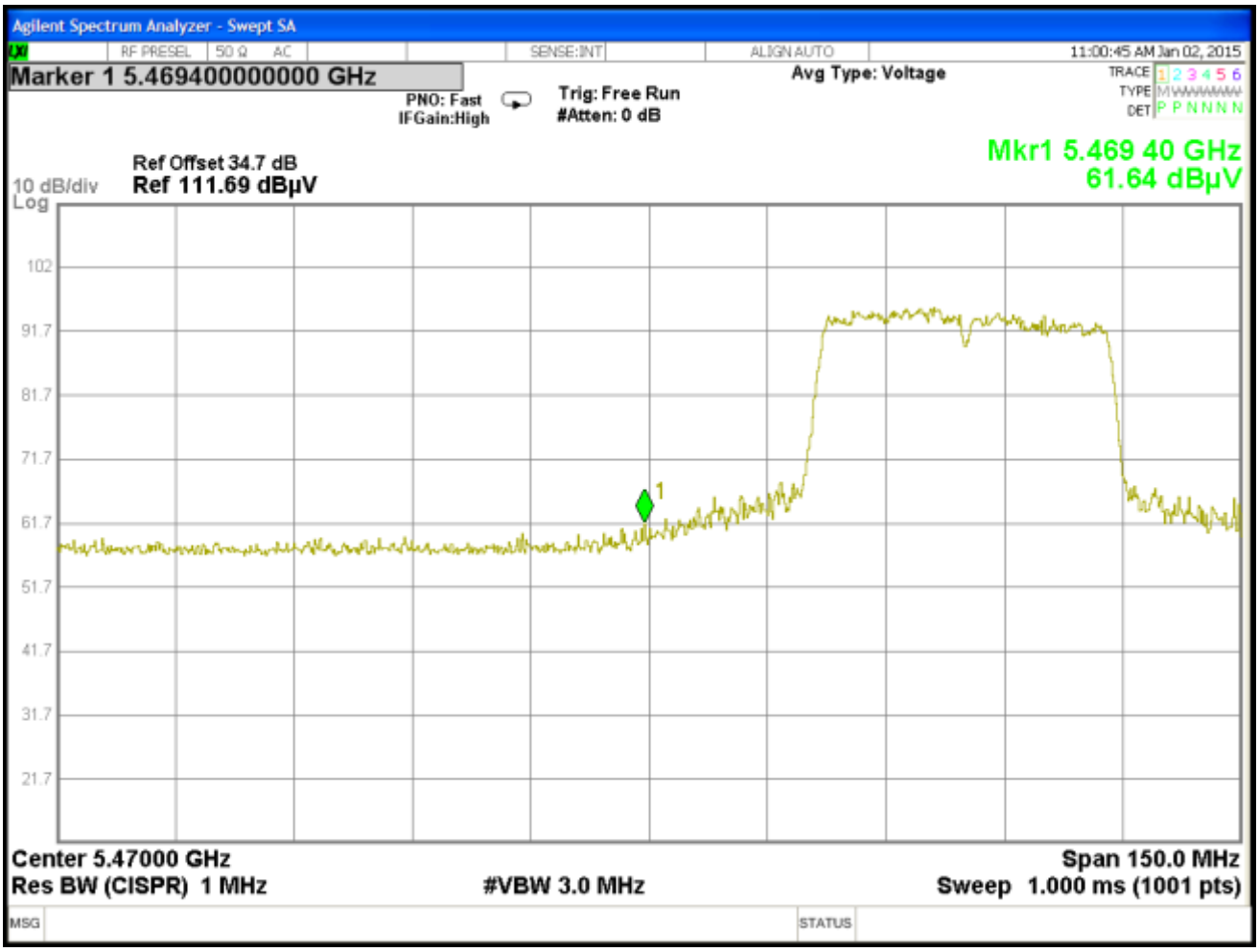



**Figure 46:** Radiated Emission at the Edge for Channel 5510 MHz at 13.5Mbps – Horz. (Peak)

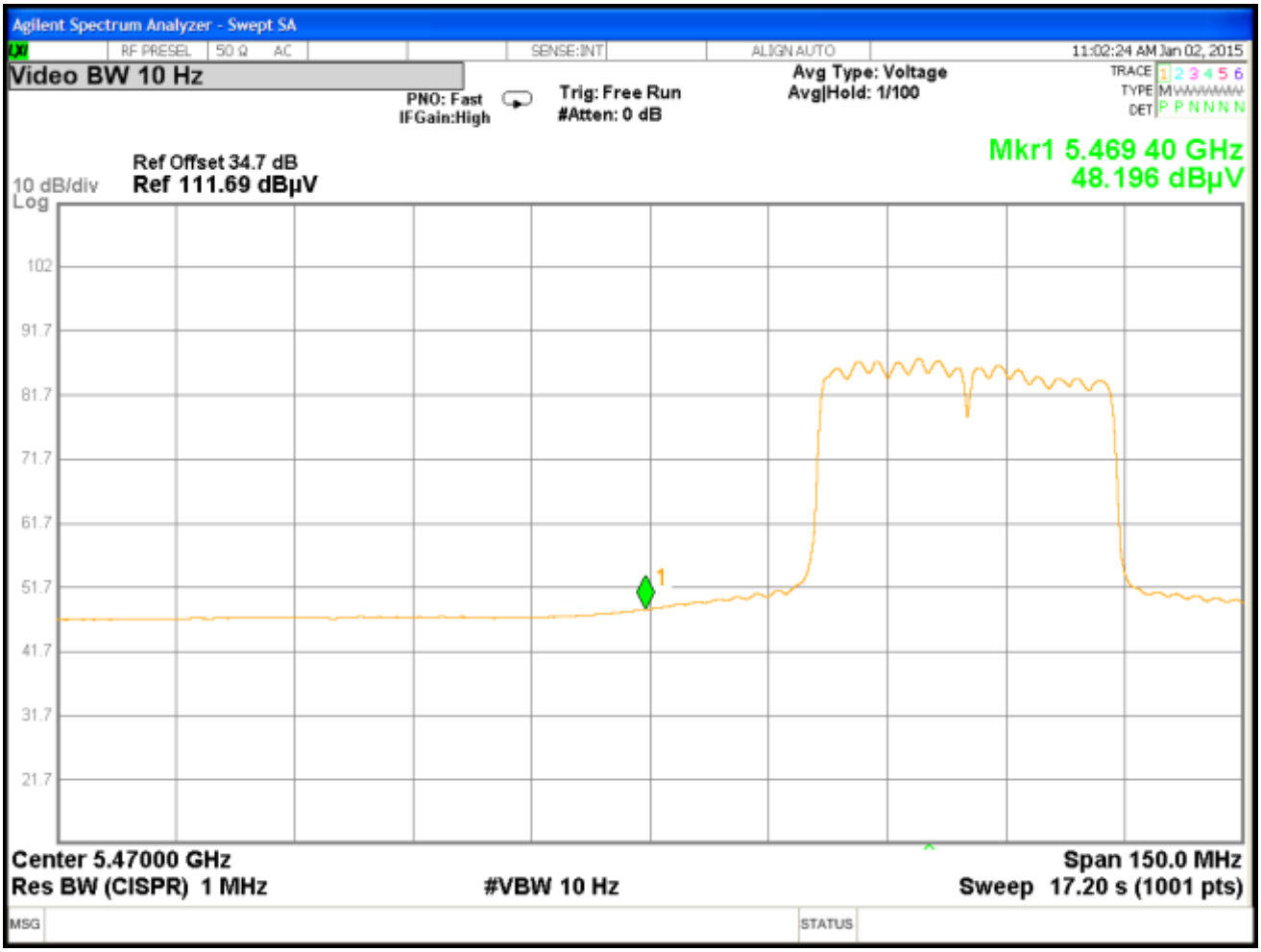



**Figure 47:** Radiated Emission at the Edge for Channel 5510 MHz at 13.5Mbps – Vert. (Ave.)

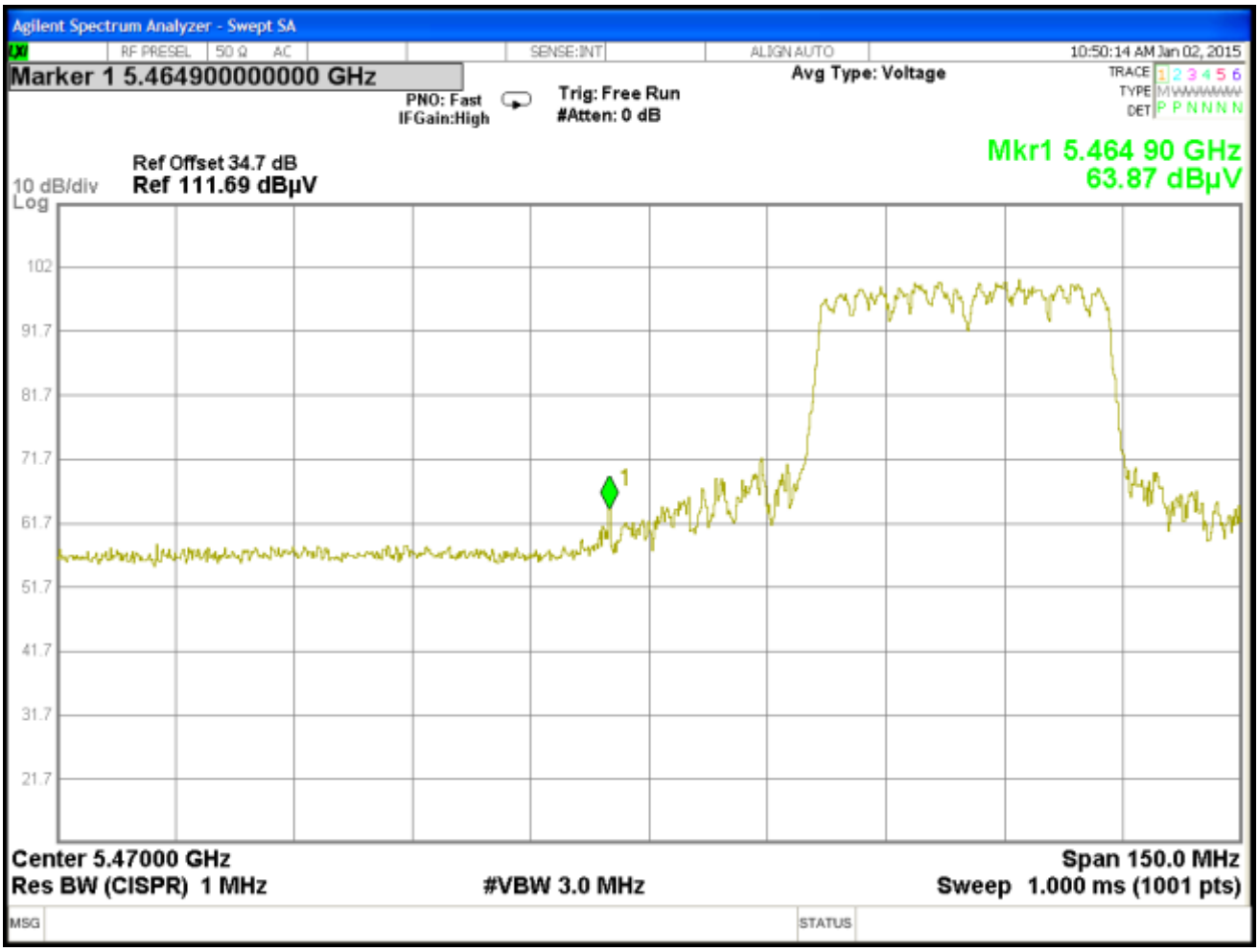



**Figure 48:** Radiated Emission at the Edge for Channel 5510 MHz at 13.5Mbps – Vert (Peak)

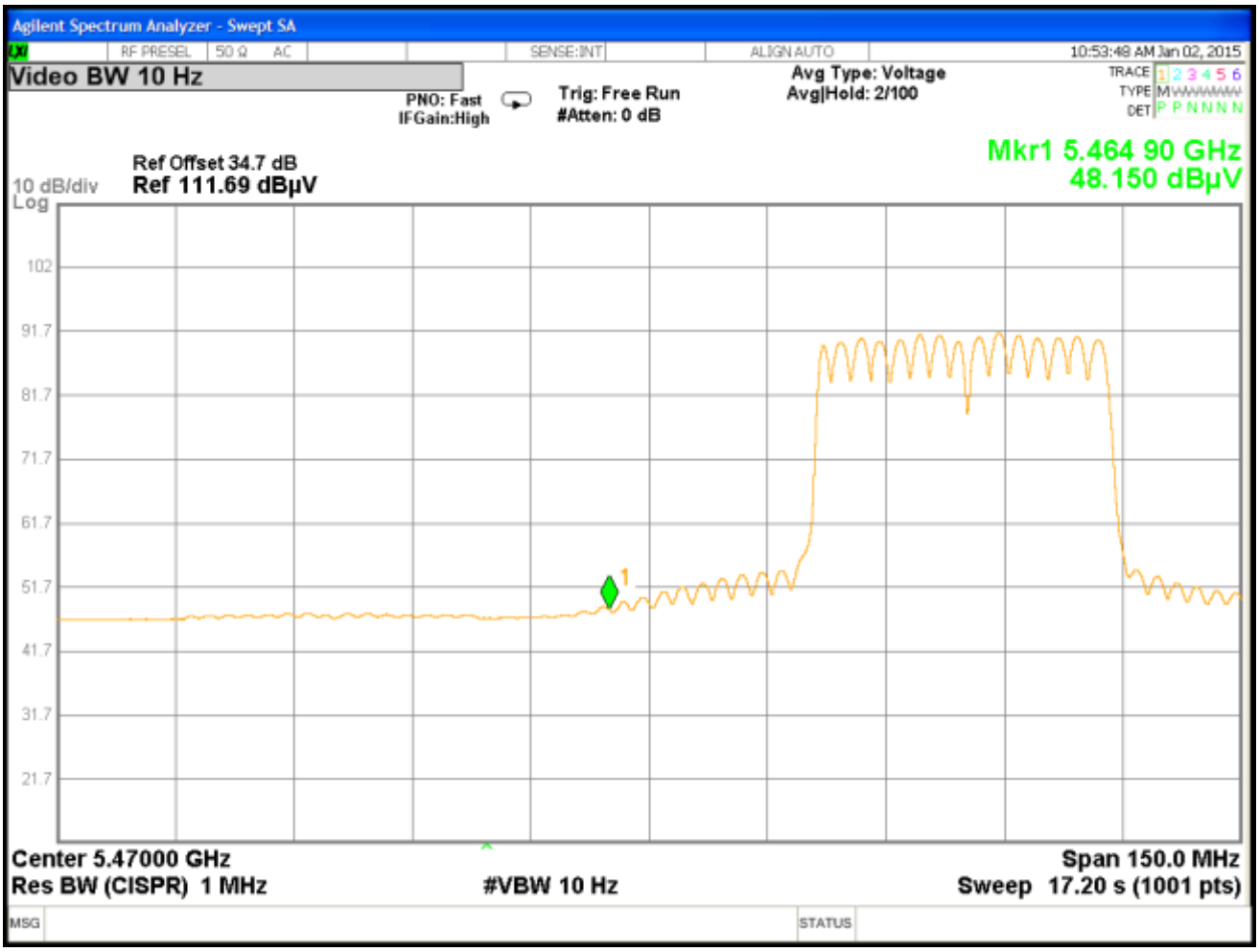



**Figure 49:** Radiated Emission at the Edge for Channel 5710 MHz at 13.5Mbps – Horz (Ave.)

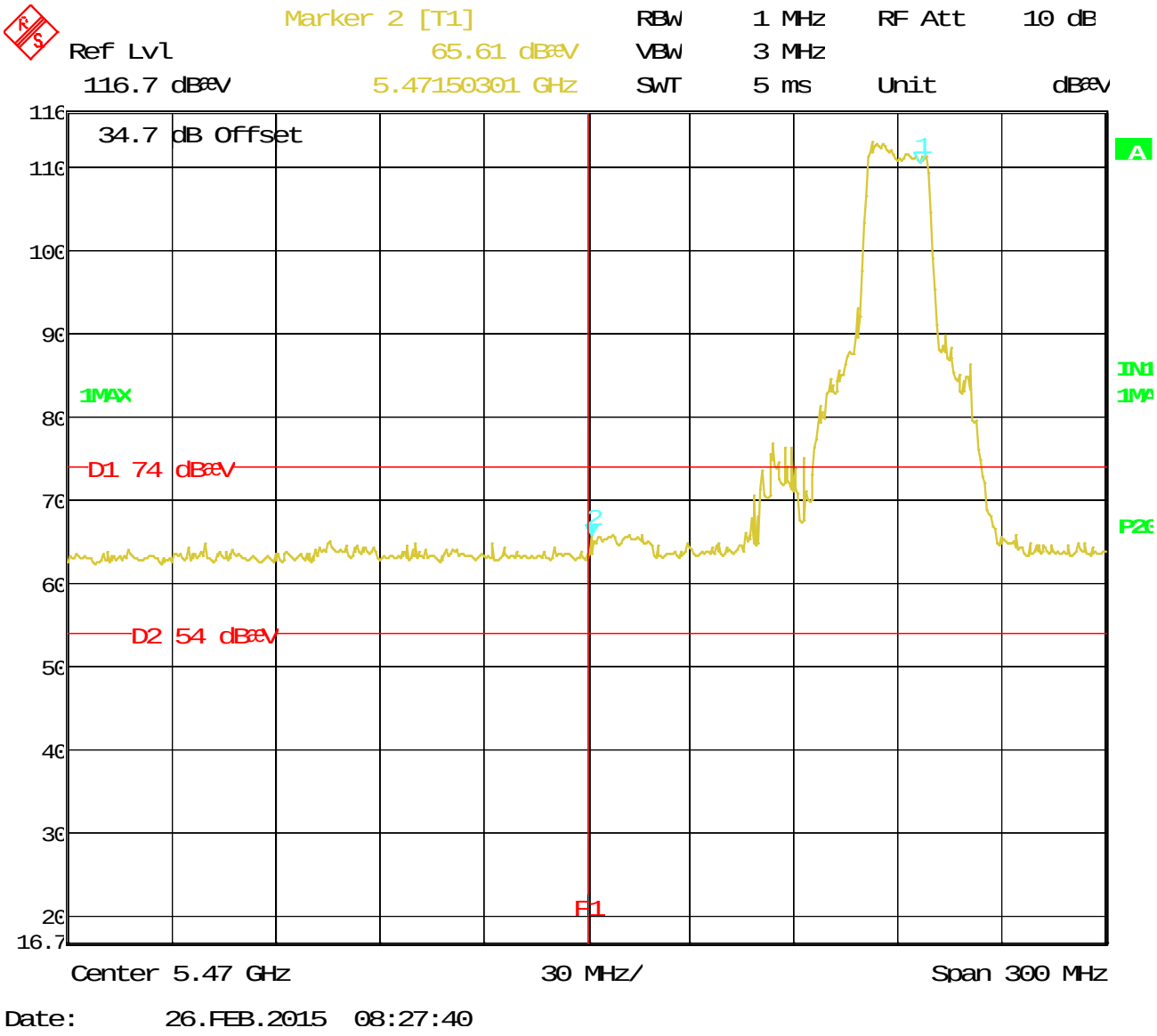



**Figure 50:** Radiated Emission at the Edge for Channel 5550 MHz at 13.5Mbps – Vert (Peak)

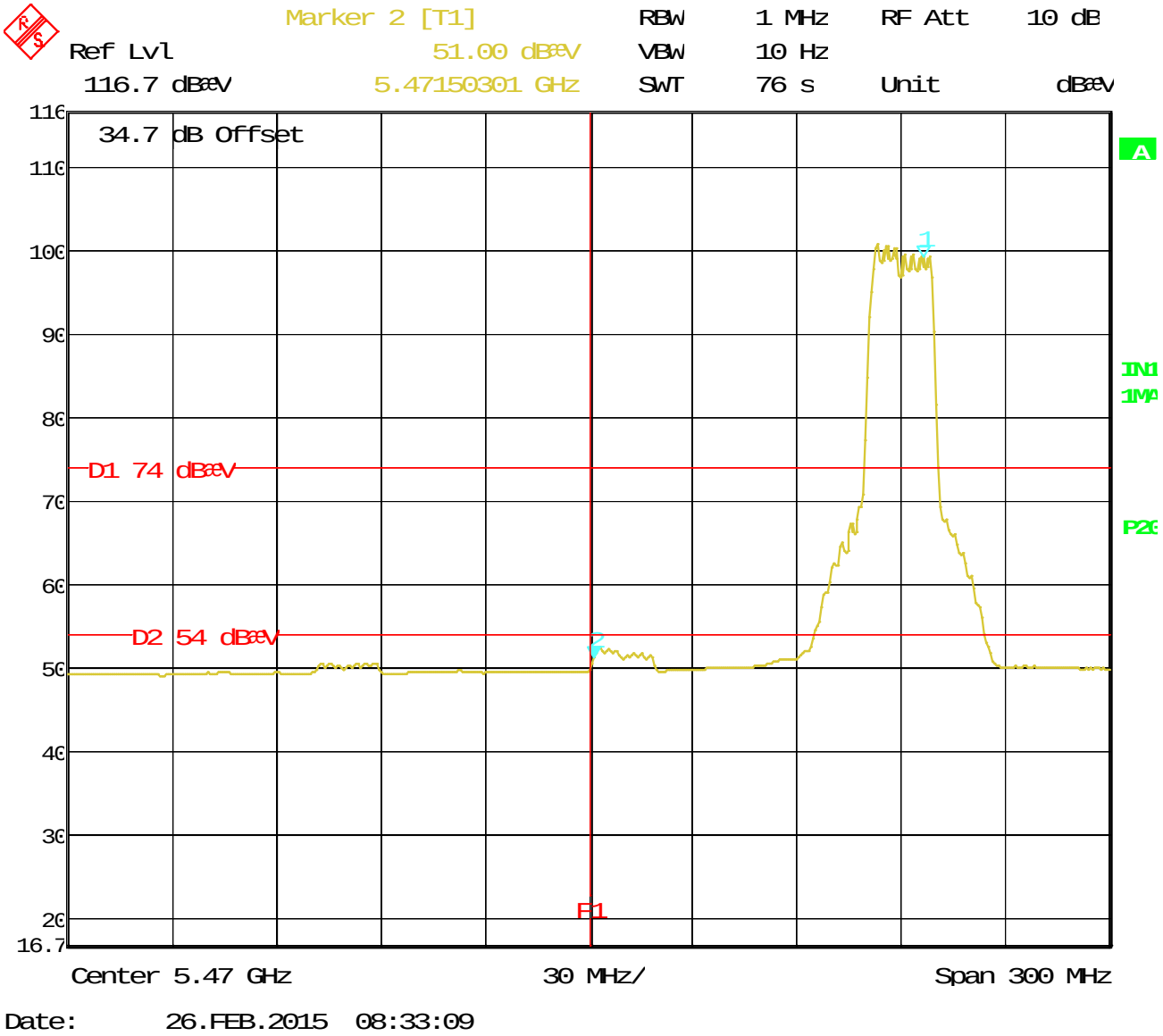



**Figure 51:** Radiated Emission at the Edge for Channel 5550 MHz at 13.5Mbps – Vert (Ave.)

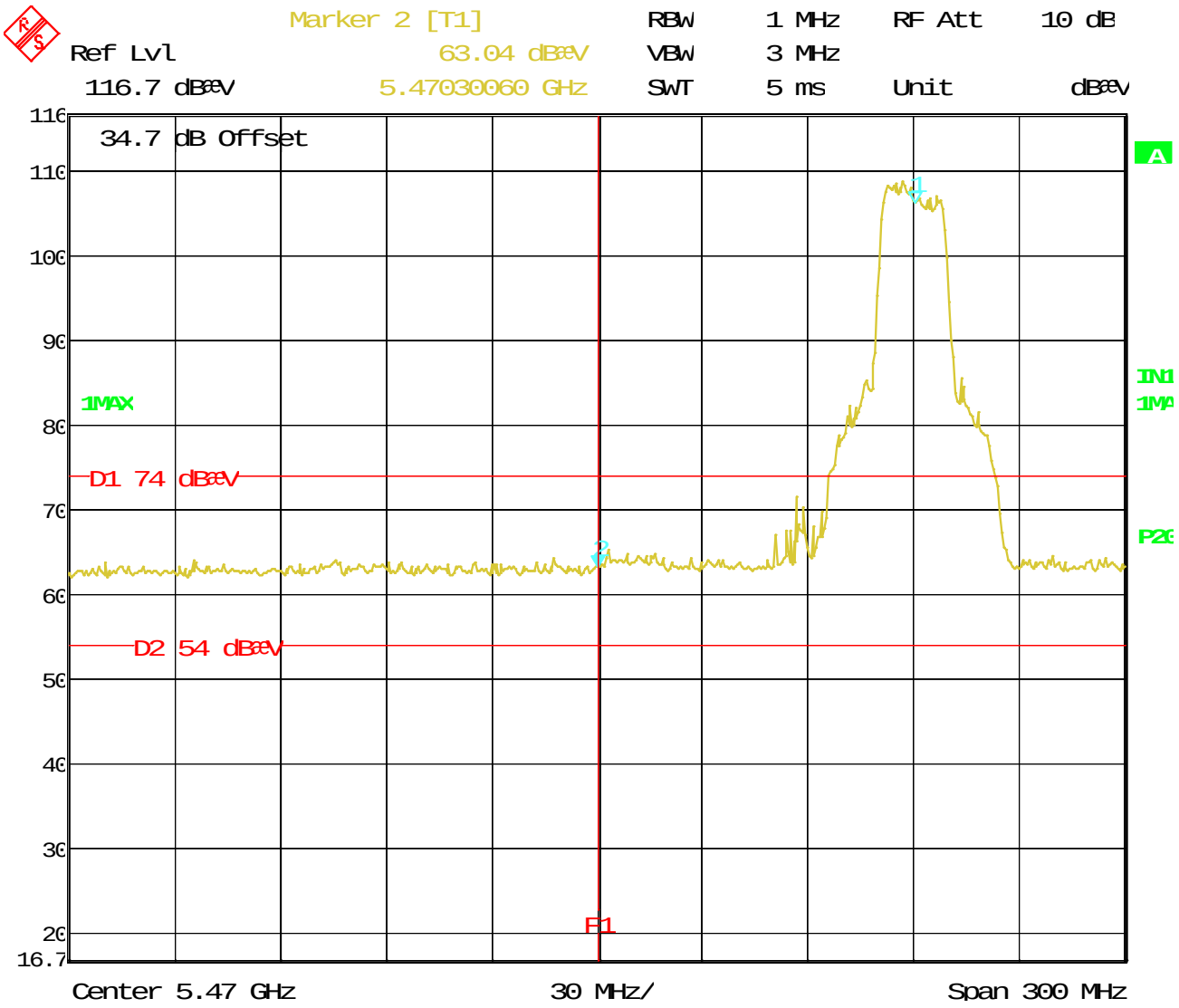



**Figure 52:** Radiated Emission at the Edge for Channel5550 MHz at 13.5Mbps – Horz (Peak)

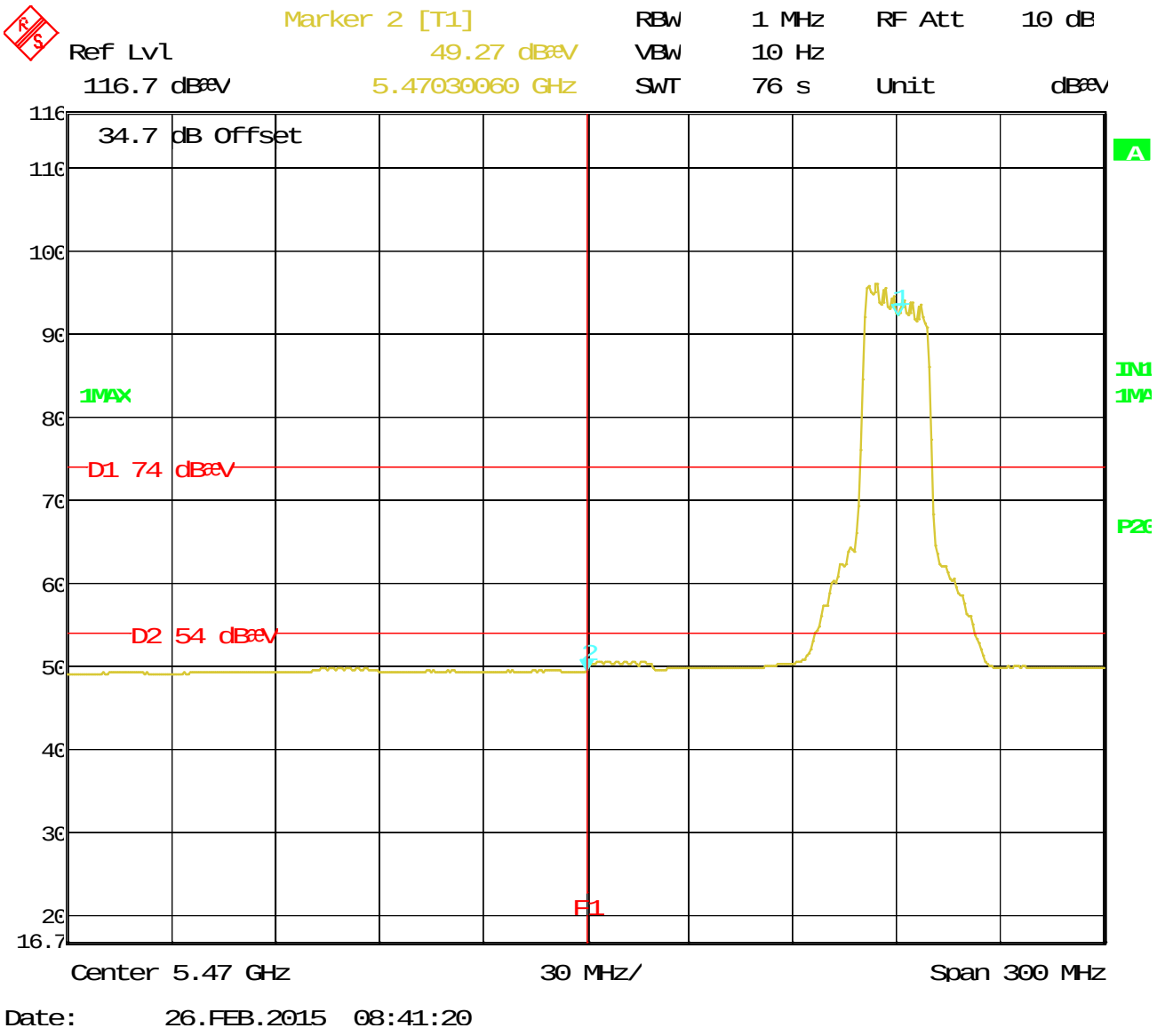



**Figure 53:** Radiated Emission at the Edge for Channel 5550 MHz at 13.5Mbps – Horz (Peak)

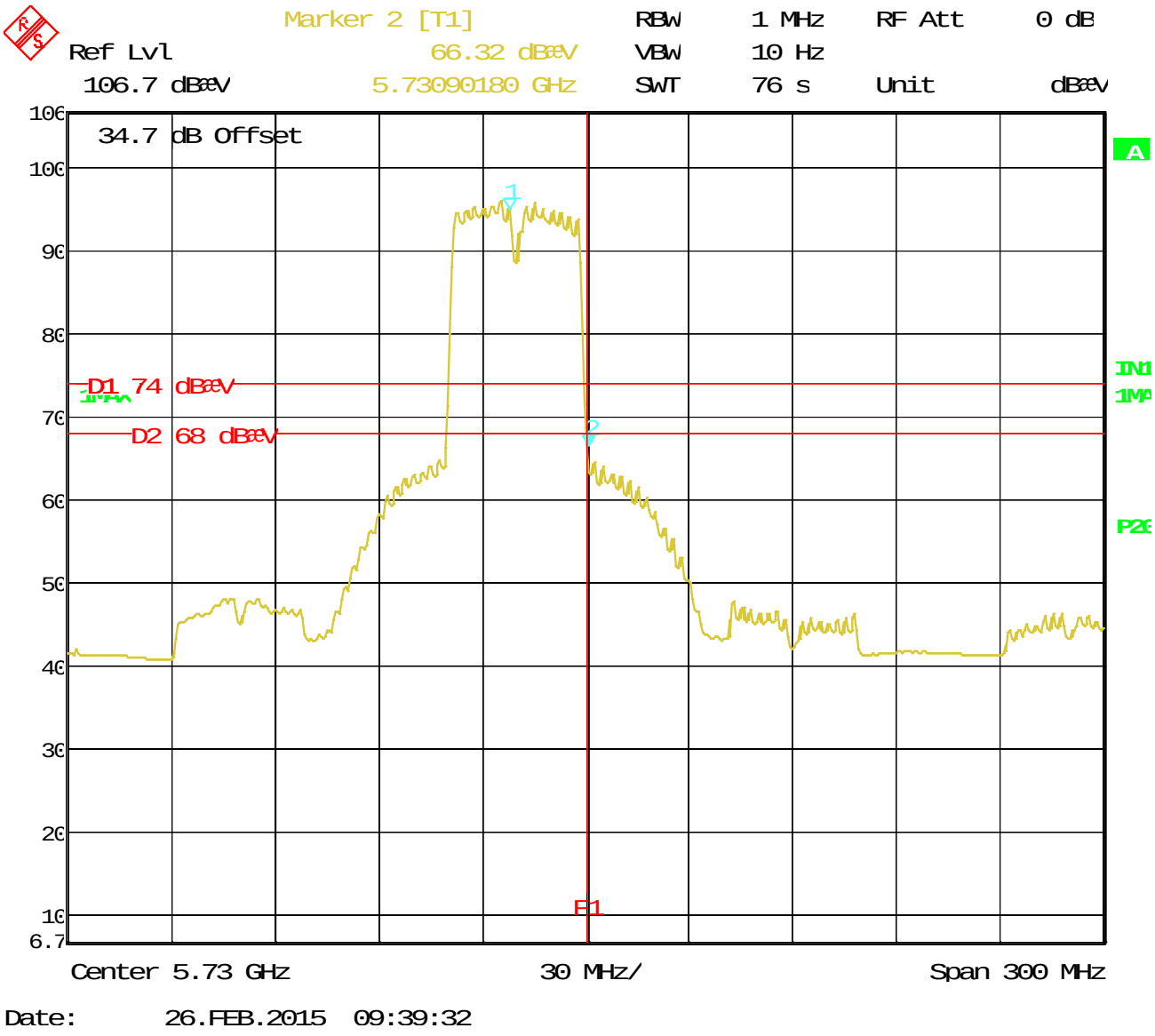



**Figure 54:** Radiated Emission at the Edge for Channel 5710 MHz at 13.5Mbps – Vert (Avg ) Band crossing channel

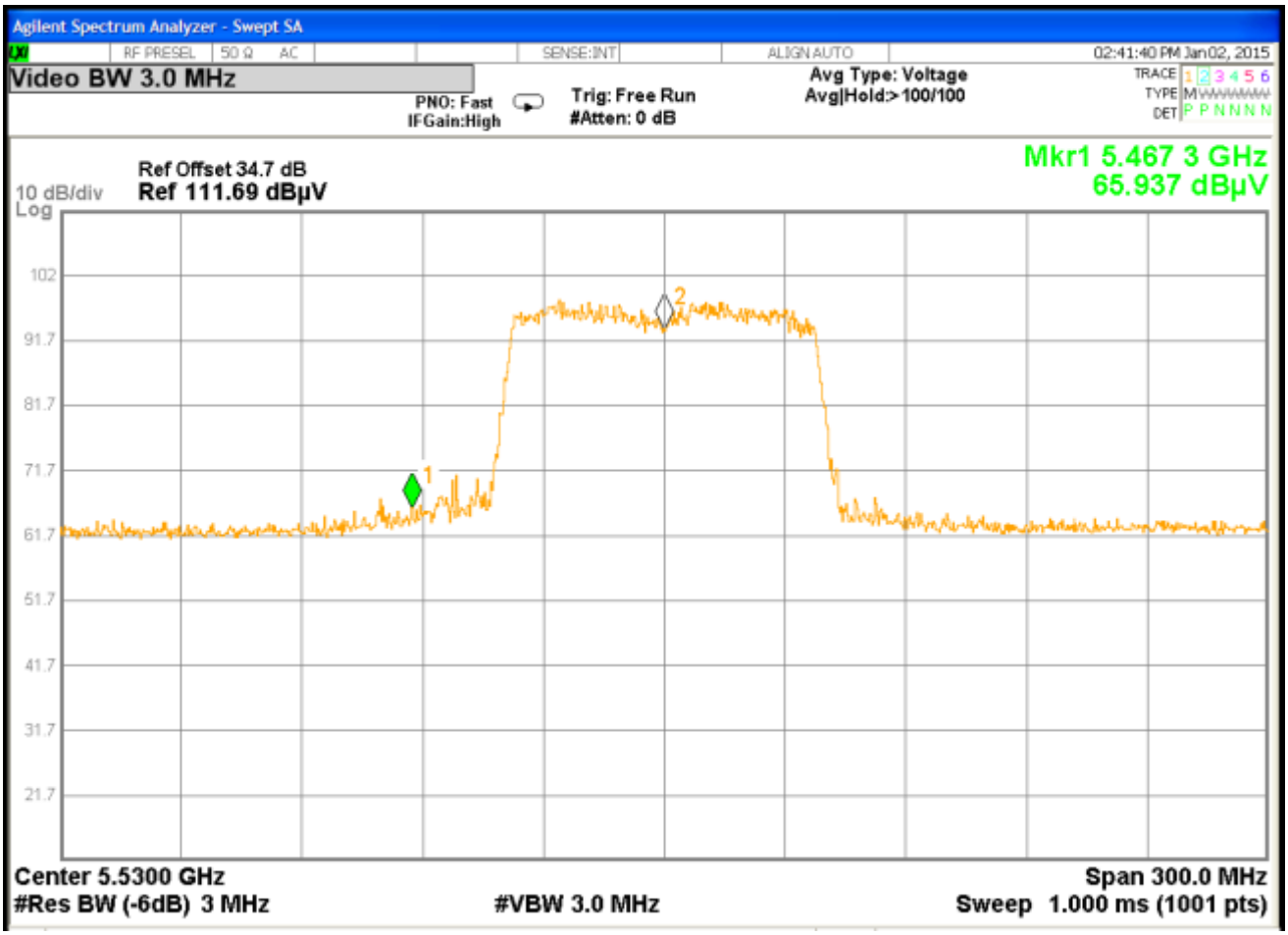



**Figure 55:** Radiated Emission at the Edge for Channel 5710 MHz at 11n AC mode 58.5Mbps – Horz (Peak)

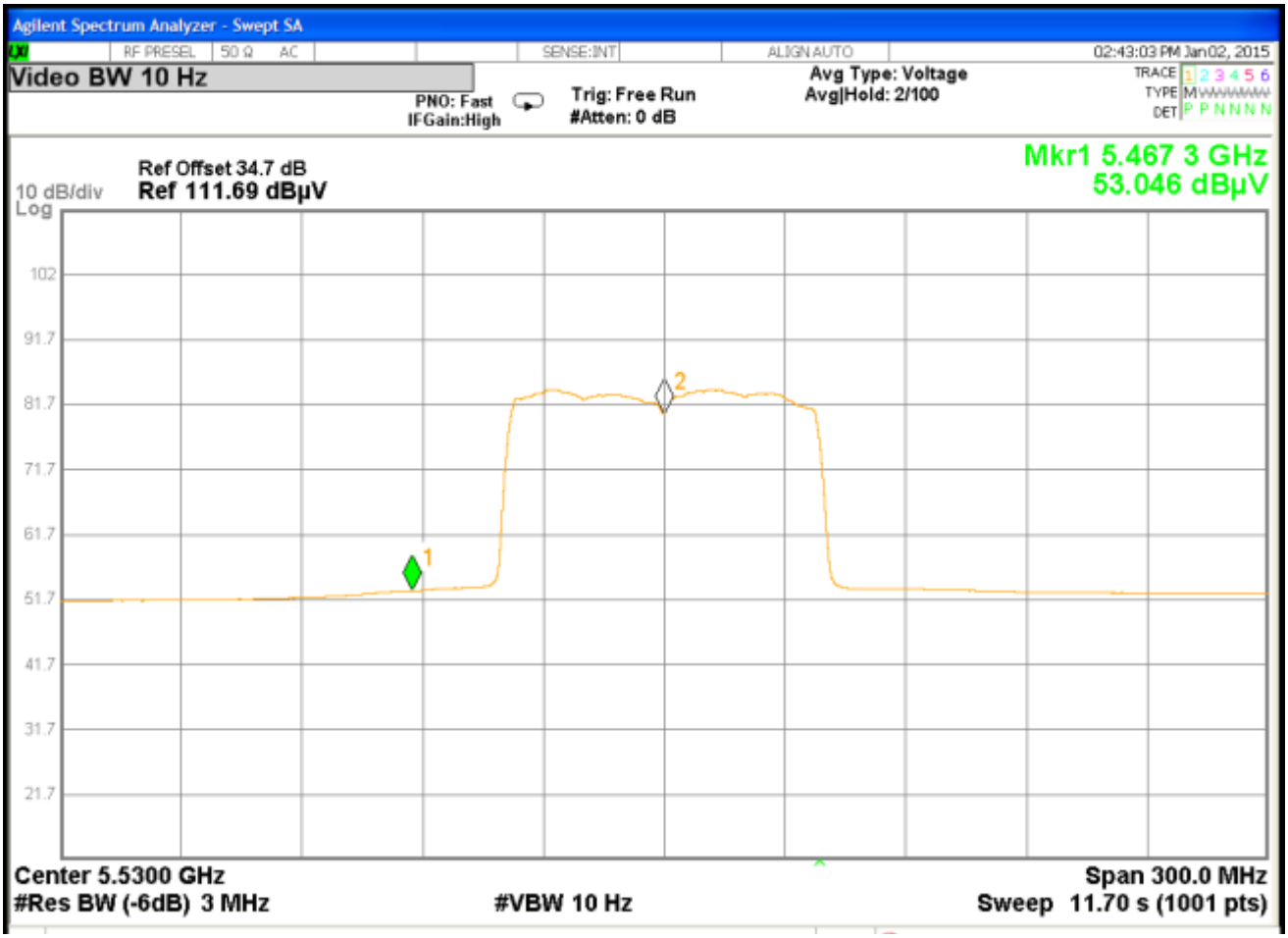



**Figure 56:** Radiated Emission at the Edge for Channel 5710 MHz at 11n AC mode 58.5Mbps – Horz (Avg)

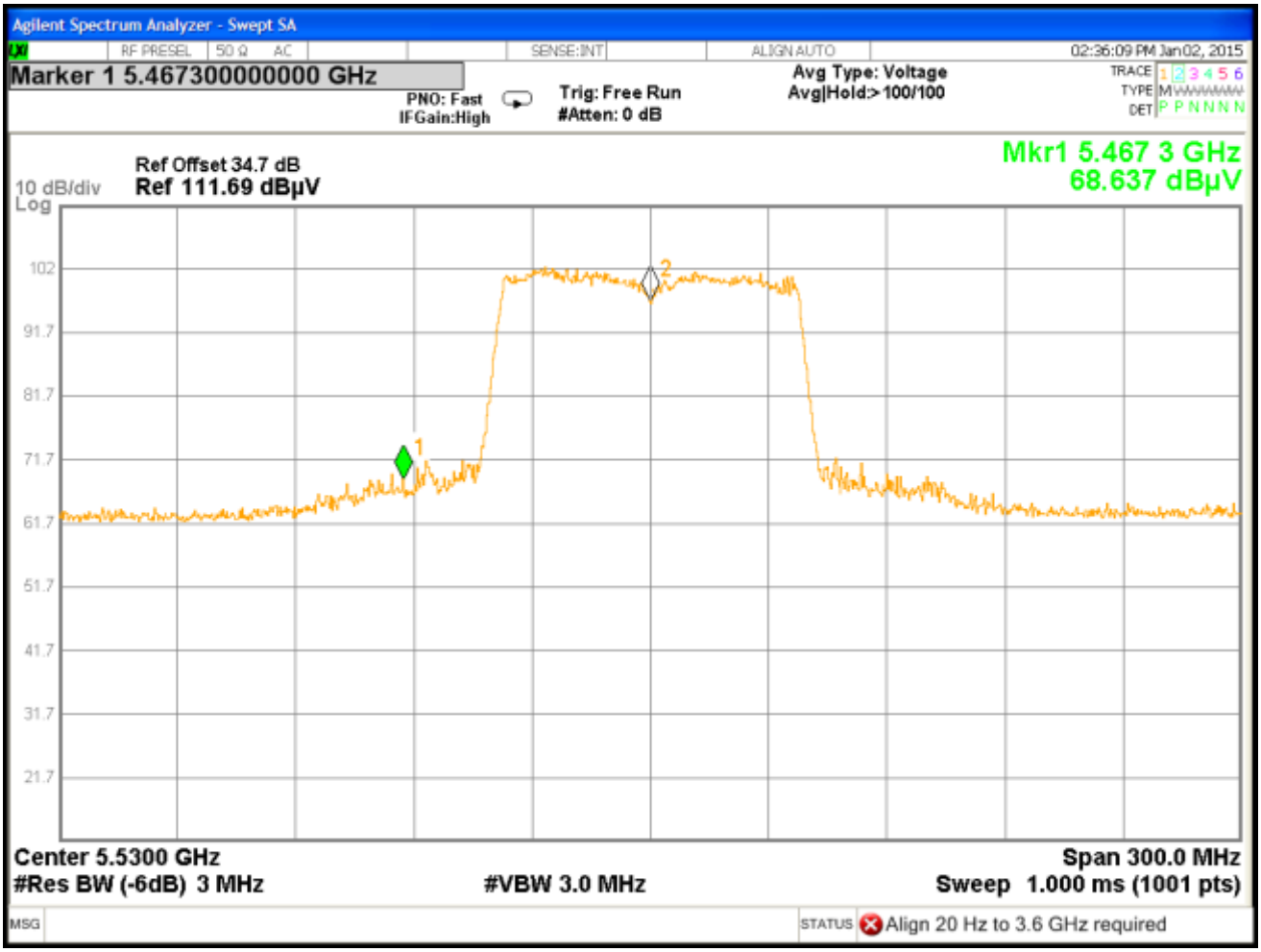



**Figure 57:** Radiated Emission at the Edge for Channel 5530MHz at 11n AC mode 58.5Mbps – Vert (Pk)

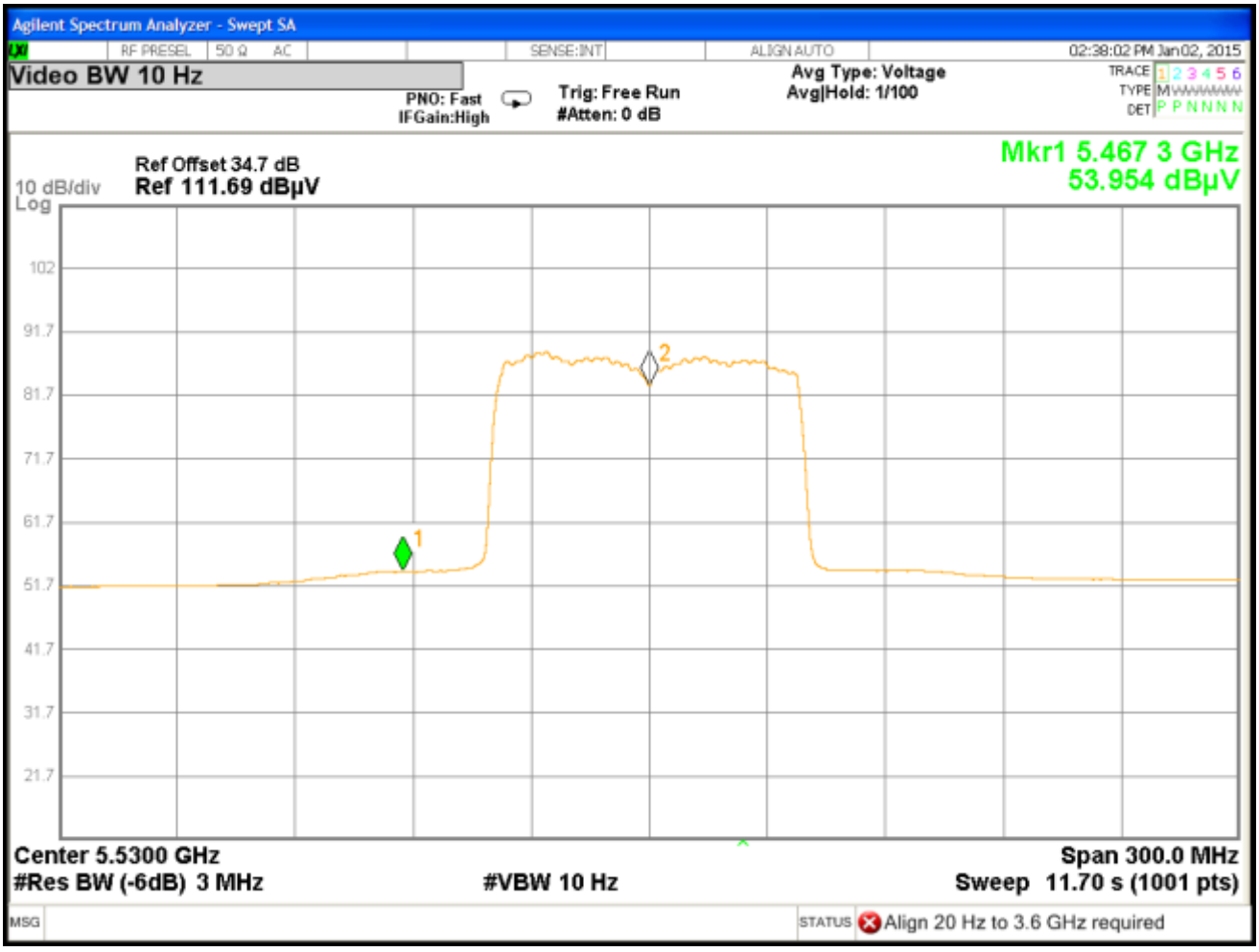



**Figure 58:** Radiated Emission at the Edge for Channel 5530 MHz at 11n AC mode 58.5Mbps – Vert (Avg)

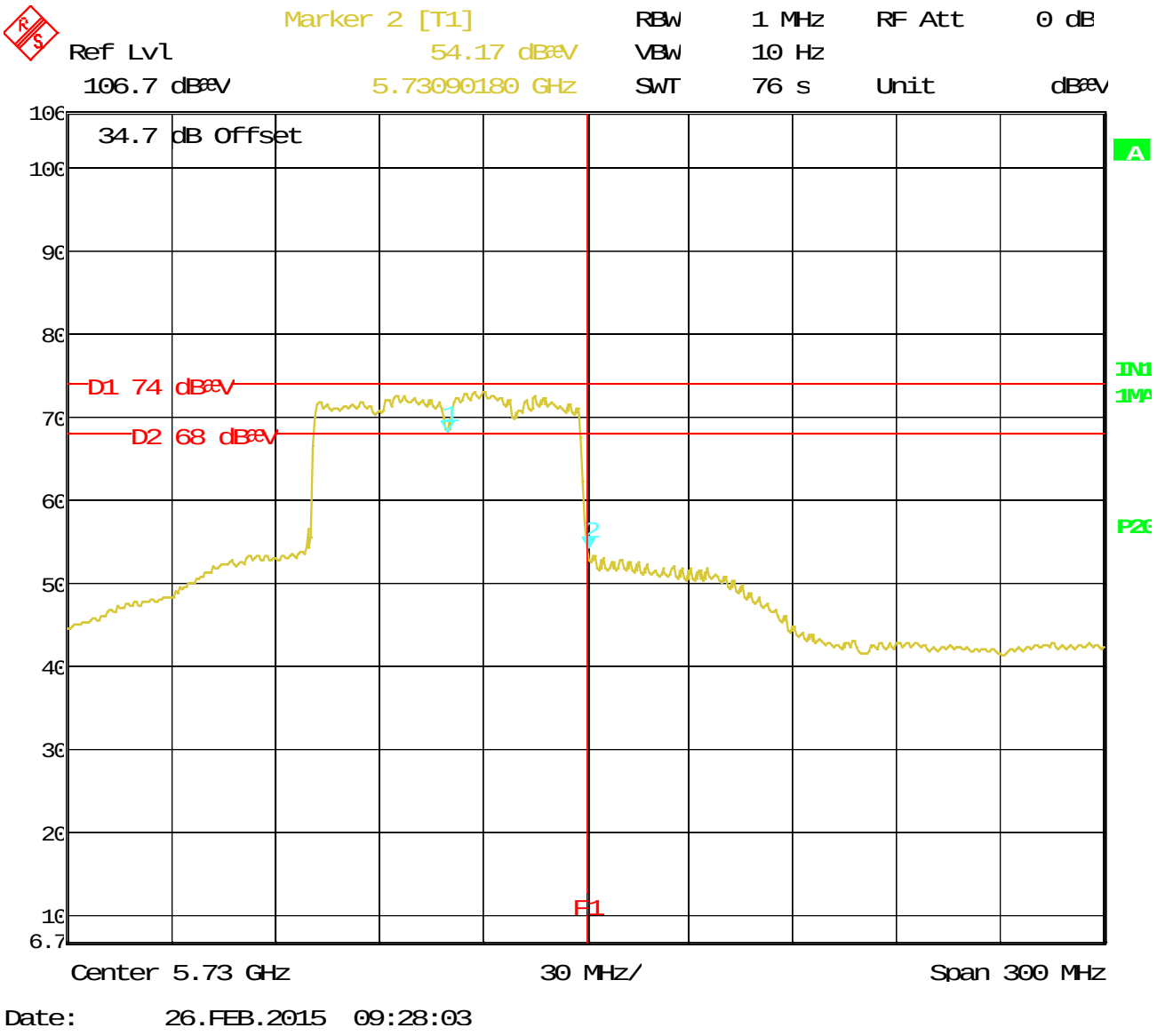



**Figure 59:** Radiated Emission at the Edge for Channel 5690 MHz at 11n AC mode 58.5Mbps – Vert (Avg) Band crossing

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 1 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 14, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 29%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11a mode at 6.0Mbps/ chain | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 120 kHz/ 300 kHz |
| **Dist/Ant Used** | 3m / JB3 | **Performed by** | Surersh K |

11a mode

| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Result |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| 259.08 | 46.26 | 1.90 | -20.19 | 27.97 | QP | H | 145 | 40 | 46.00 | -18.03 | Pass |
| 277.50 | 44.37 | 1.94 | -19.02 | 27.29 | QP | H | 119 | 216 | 46.00 | -18.72 | Pass |
| 809.97 | 34.98 | 2.75 | -10.99 | 26.73 | QP | H | 170 | 147 | 46.00 | -19.27 | Pass |
| 43.82 | 56.62 | 1.33 | -20.98 | 36.97 | QP | V | 112 | -8 | 40.00 | -3.03 | Pass |
| 49.83 | 50.00 | 1.36 | -24.07 | 27.29 | QP | V | 163 | 202 | 40.00 | -12.71 | Pass |
| 832.72 | 36.20 | 2.78 | -10.91 | 28.07 | QP | V | 131 | 17 | 46.00 | -17.93 | Pass |

Spec Margin = E-Field QP - Limit, E-Field QP = Raw QP+ Total CF ± Uncertainty
Total AF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ $k$ = 2 for 95% confidence

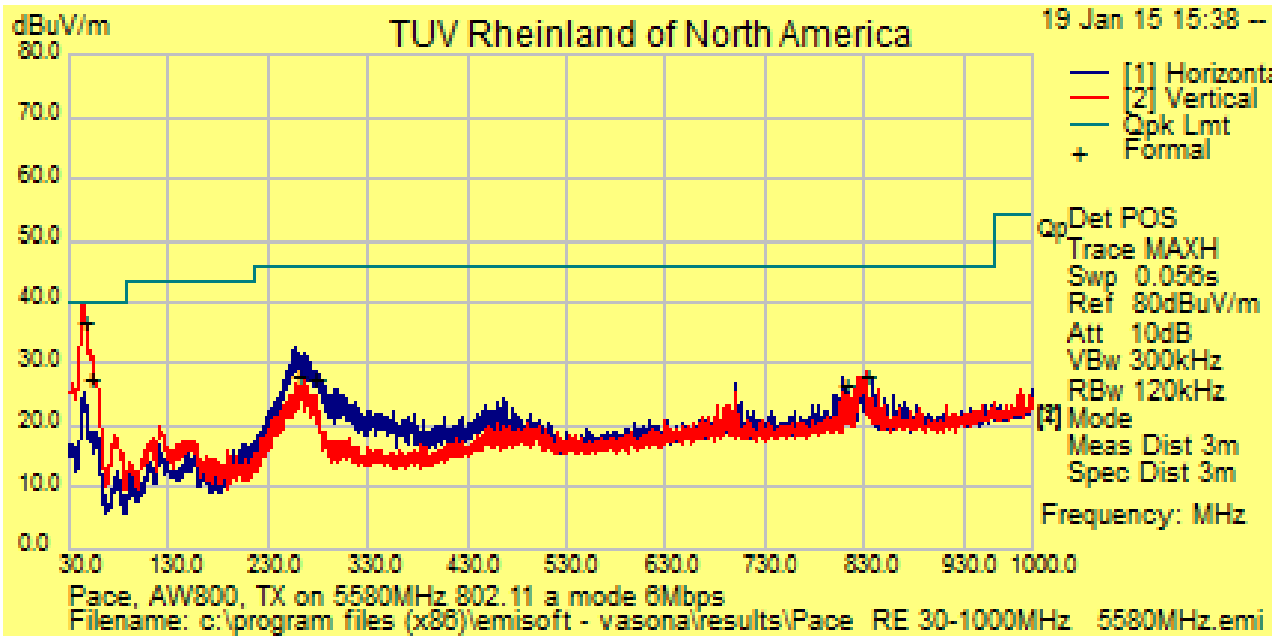
Notes: Worst case was observed on X-Axis at 802.11a mode, 5580 MHz 6.0 Mbps.
All other emissions passed Class B limit.

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 2 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 19, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 29%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11a Mode at 6.0Mbps/ chain | **Line AC** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 120 kHz/ 300 kHz |
| **Dist/Ant Used** | 3m – JB3 | **Performed by** | Suresh K |

30 MHz to 1GHz Plots for Transmit Mode at 5580 MHz




Notes: FCC Class B Limit.

**SOP 1** Radiated Emissions — Tracking # 31560164.004 Page 3 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 a 6.0Mbps | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz/ 3 MHz |
| **Dist/Ant Used** | 3m / EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Surersh K |

| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| TX ON 5500 11a mode | | | | | | | | | | | |
| 1450.32 | 44.65 | 0.89 | -25.56 | 19.98 | Avg | H | 175 | 316 | 54.00 | -34.03 | Spurious |
| 11002.58 | 48.39 | 2.61 | -10.60 | 40.40 | Avg | H | 141 | 280 | 54.00 | -13.60 | Harmonic |
| 1040.52 | 49.62 | 0.75 | -26.31 | 24.05 | Avg | V | 197 | 12 | 54.00 | -29.95 | Spurious |
| 1659.83 | 55.89 | 0.95 | -24.86 | 31.99 | Avg | V | 101 | 346 | 54.00 | -22.01 | Spurious |
| 3330.93 | 44.18 | 1.36 | -19.35 | 26.20 | Avg | V | 101 | 48 | 54.00 | -27.80 | Spurious |
| 17983.39 | 32.66 | 3.45 | -1.53 | 34.58 | Avg | V | 111 | 144 | 54.00 | -19.42 | Harmonic |
| TX ON 5600MHz 11a | | | | | | | | | | | |
| 11194.20 | 39.52 | 2.63 | -11.10 | 31.05 | Avg | H | 193 | 296 | 54.00 | -22.95 | Spurious |
| 1666.00 | 53.30 | 0.95 | -24.79 | 29.46 | Avg | V | 102 | 350 | 54.00 | -24.54 | Spurious |
| 2489.00 | 45.95 | 1.17 | -22.30 | 24.82 | Avg | V | 125 | -8 | 54.00 | -29.18 | Spurious |
| 3326.16 | 45.12 | 1.36 | -19.37 | 27.11 | Avg | V | 103 | 54 | 54.00 | -26.89 | Spurious |
| 6068.94 | 49.19 | 1.88 | -15.44 | 35.63 | Avg | V | 165 | 64 | 54.00 | -18.37 | Spurious |
| 16798.30 | 31.10 | 3.30 | -7.60 | 26.80 | Avg | V | 159 | -8 | 54.00 | -27.20 | Spurious |
| TX ON 5700MHz 11a | | | | | | | | | | | |
| 1660.92 | 54.91 | 0.95 | -24.84 | 31.02 | Avg | V | 145 | 342 | 54.00 | -22.98 | Spurious |
| 3303.06 | 45.27 | 1.35 | -19.45 | 27.17 | Avg | V | 133 | 48 | 54.00 | -26.83 | Spurious |
| 6176.30 | 47.38 | 1.89 | -15.18 | 34.09 | Avg | V | 164 | 302 | 54.00 | -19.91 | Spurious |
| 11401.21 | 39.63 | 2.65 | -11.53 | 30.74 | Avg | V | 190 | 180 | 54.00 | -23.26 | Spurious |
| 17098.13 | 32.02 | 3.35 | -6.15 | 29.21 | Avg | V | 175 | 292 | 54.00 | -24.79 | Spurious |

Spec Margin = E-Field Average - Limit, E-Field Average = Field Meas.+ Total CF ± Uncertainty Total CF= AF + Cable Loss, AF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case was observed on X-Axis, 6.5Mbps.

The frequency range 18GHz to 40GHz was measured at 1 meter distance; limit was extrapolated.

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 4 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT20 at 6.5Mbps | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz/ 3 MHz |
| **Dist/Ant Used** | 3m / EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Surersh K |

TX ON 5500 11n VHT/HT20 mode

| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| 1457.87 | 52.57 | 0.89 | -25.54 | 27.92 | Avg | H | 103 | 134 | 54.00 | -26.08 | Spurious |
| 5498.85 | 62.81 | 1.77 | -15.95 | 48.63 | Avg | H | 201 | 222 | 54.00 | -5.37 | Spurious |
| 1665.86 | 52.03 | 0.95 | -24.79 | 28.19 | Avg | V | 110 | 356 | 54.00 | -25.81 | Spurious |
| 3331.95 | 43.36 | 1.36 | -19.34 | 25.37 | Avg | V | 103 | 82 | 54.00 | -28.63 | Spurious |
| 5268.97 | 53.11 | 1.74 | -16.21 | 38.63 | Avg | V | 144 | 74 | 54.00 | -15.37 | Spurious |
| 10995.93 | 38.27 | 2.61 | -10.60 | 30.29 | Avg | V | 135 | 52 | 54.00 | -23.71 | Harmonic |
| TX ON 5580MHz | | | | | | | | | | | |
| 5578.73 | 60.01 | 1.79 | -15.98 | 45.82 | Avg | H | 179 | 220 | 54.00 | -8.18 | Spurious |
| 17989.95 | 28.77 | 3.46 | -1.57 | 30.66 | Avg | H | 184 | 160 | 54.00 | -23.34 | Spurious |
| 1665.69 | 54.24 | 0.95 | -24.79 | 30.40 | Avg | V | 154 | 10 | 54.00 | -23.60 | Spurious |
| 2486.71 | 47.29 | 1.17 | -22.31 | 26.15 | Avg | V | 197 | -5 | 54.00 | -27.85 | Spurious |
| 3331.66 | 43.79 | 1.36 | -19.35 | 25.81 | Avg | V | 153 | 68 | 54.00 | -28.19 | Spurious |
| 4599.96 | 39.98 | 1.61 | -16.91 | 24.68 | Avg | V | 106 | 292 | 54.00 | -29.32 | Spurious |
| TX ON 5700MHz | | | | | | | | | | | |
| 11402.50 | 36.24 | 2.65 | -11.53 | 27.35 | Avg | H | 170 | 314 | 54.00 | -26.65 | Harmonic |
| 1665.97 | 52.90 | 0.95 | -24.79 | 29.06 | Avg | V | 151 | 16 | 54.00 | -24.94 | Spurious |
| 1856.42 | 41.67 | 1.01 | -23.80 | 18.88 | Avg | V | 104 | -3 | 54.00 | -35.12 | Spurious |
| 2911.34 | 41.55 | 1.27 | -21.16 | 21.66 | Avg | V | 127 | 8 | 54.00 | -32.34 | Spurious |
| 4599.91 | 38.08 | 1.61 | -16.91 | 22.78 | Avg | V | 130 | 52 | 54.00 | -31.22 | Spurious |
| 5707.64 | 58.75 | 1.81 | -16.27 | 44.30 | Avg | V | 174 | 36 | 54.00 | -9.70 | Spurious |

| |
|---|
| Spec Margin = E-Field Average - Limit, E-Field Average = Field Meas.+ Total CF ± Uncertainty<br>Total CF= AF + Cable Loss, AF= Amp Gain + ANT Factor |
| Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ $k$ = 2 for 95% confidence |
| Notes: Worst case was observed on X-Axis, 6.5Mbps.<br>The frequency range 26GHz to 40GHz was measured at 1 meter distance; limit was extrapolated. |

HT40/VHT40

**SOP 1** Radiated Emissions — Tracking # 31560164.004 Page 5 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT40 at 13.5Mbps | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz/ 3 MHz |
| **Dist/Ant Used** | 3m / EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Surersh K |

| TX ON 5510 11n VHT/HT40 mode | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Type |
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| 4599.92 | 40.26 | 1.61 | -16.91 | 24.95 | Avg | H | 185 | 356 | 54.00 | -29.05 | Spurious |
| 5506.49 | 59.83 | 1.77 | -15.97 | 45.63 | Avg | H | 101 | 25 | 54.00 | -8.37 | Spurious |
| 1655.88 | 58.54 | 0.95 | -24.90 | 34.59 | Avg | V | 137 | 352 | 54.00 | -19.42 | Spurious |
| 3323.37 | 45.87 | 1.36 | -19.38 | 27.85 | Avg | V | 154 | 52 | 54.00 | -26.15 | Spurious |
| 11019.95 | 35.98 | 2.61 | -10.77 | 27.82 | Avg | V | 119 | -8 | 54.00 | -26.18 | Harmonic |
| 16529.91 | 31.14 | 3.27 | -8.25 | 26.17 | Avg | V | 114 | -8 | 54.00 | -27.83 | Harmonic |
| TX ON 5590MHz | | | | | | | | | | | |
| 5573.95 | 57.65 | 1.79 | -15.97 | 43.47 | Avg | H | 140 | 192 | 54.00 | -10.53 | Spurious |
| 1654.41 | 57.11 | 0.95 | -24.92 | 33.14 | Avg | V | 101 | -8 | 54.00 | -20.86 | Spurious |
| 4599.98 | 40.75 | 1.61 | -16.91 | 25.45 | Avg | V | 116 | 66 | 54.00 | -28.55 | Spurious |
| 11181.54 | 36.03 | 2.63 | -11.00 | 27.66 | Avg | V | 159 | -8 | 54.00 | -26.34 | Harmonic |
| 16769.21 | 30.33 | 3.29 | -7.68 | 25.93 | Avg | V | 160 | -8 | 54.00 | -28.07 | Harmonic |
| TX ON 5700MHz | | | | | | | | | | | |
| 11418.3 | 36.14 | 2.65 | -11.52 | 27.27 | Avg | V | 104 | -8 | 54 | -26.73 | Harmonic |
| 17128.2 | 31.68 | 3.36 | -5.91 | 29.13 | Avg | V | 130 | -8 | 54 | -24.87 | Harmonic |

| |
|---|
| Spec Margin = E-Field Average - Limit, E-Field Average = Field Meas.+ Total CF ± Uncertainty<br>Total CF= AF + Cable Loss, AF= Amp Gain + ANT Factor |
| Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ $k$ = 2 for 95% confidence |
| Notes: Worst case was observed on X-Axis,13.5Mbps.<br>The frequency range 18GHz to 40GHz was measured at 1 meter distance; limit was extrapolated. |

**SOP 1** Radiated Emissions — Tracking # 31560164.004 Page 8 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT80 at 56.8Mbps | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz/ 3 MHz |
| **Dist/Ant Used** | 3m / EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Surersh K |

**TX ON 553011n VHT/HT80 mode**

| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| 5541.21 | 53.48 | 1.78 | -16.03 | 39.24 | Avg | H | 161 | 226 | 54.00 | -14.76 | Spurious |
| 1663.63 | 53.66 | 0.95 | -24.81 | 29.79 | Avg | V | 115 | 352 | 54.00 | -24.21 | Spurious |
| 2487.41 | 45.98 | 1.17 | -22.31 | 24.85 | Avg | V | 134 | 352 | 54.00 | -29.16 | Spurious |
| 3323.29 | 44.54 | 1.36 | -19.38 | 26.52 | Avg | V | 184 | 62 | 54.00 | -27.49 | Spurious |
| 6144.45 | 52.35 | 1.89 | -15.24 | 39.00 | Avg | V | 154 | 320 | 54.00 | -15.01 | Harmonic |
| 17963.75 | 28.80 | 3.45 | -1.47 | 30.78 | Avg | V | 201 | 66 | 54.00 | -23.22 | Harmonic |
| **TX ON 5590MHz VHT/HT80 mode** | | | | | | | | | | | |
| 17912.31 | 28.59 | 3.44 | -1.38 | 30.65 | Avg | H | 200 | 14 | 54.00 | -23.35 | Harmonic |
| 1655.83 | 55.87 | 0.95 | -24.90 | 31.92 | Avg | V | 110 | 24 | 54.00 | -22.08 | Spurious |
| 2492.11 | 47.30 | 1.17 | -22.30 | 26.17 | Avg | V | 128 | 10 | 54.00 | -27.83 | Spurious |
| 3331.73 | 44.49 | 1.36 | -19.35 | 26.51 | Avg | V | 101 | 74 | 54.00 | -27.50 | Spurious |
| 4599.76 | 38.87 | 1.61 | -16.91 | 23.56 | Avg | V | 185 | 280 | 54.00 | -30.44 | Spurious |
| 5726.94 | 46.48 | 1.82 | -16.26 | 32.04 | Avg | V | 121 | 126 | 54.00 | -21.96 | Spurious |
| 11378.82 | 32.92 | 2.65 | -11.51 | 24.06 | Avg | V | 165 | 356 | 54.00 | -29.94 | Harmonic |

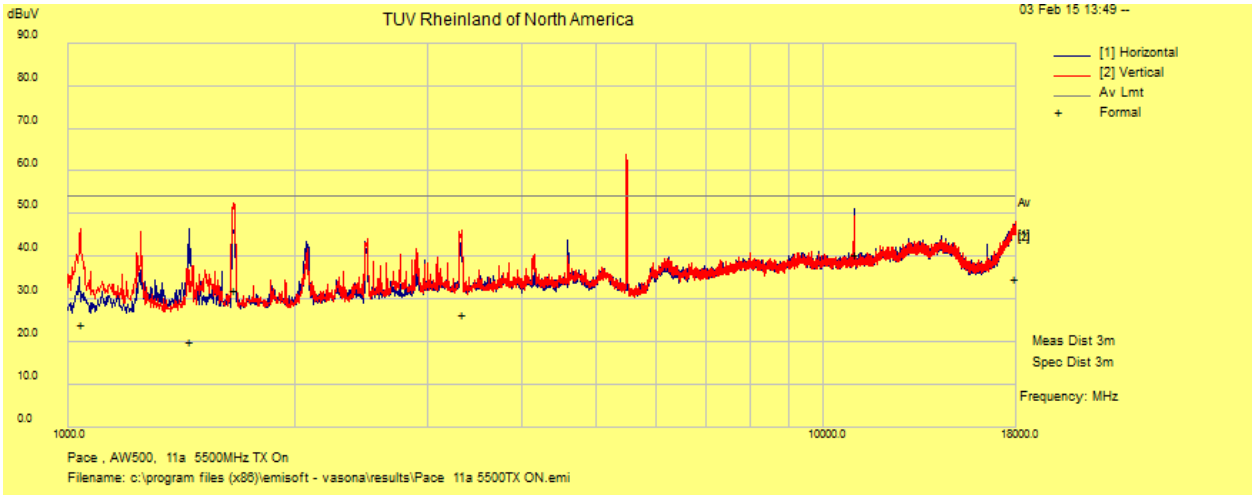
Spec Margin = E-Field Average - Limit, E-Field Average = Field Meas.+ Total CF ± Uncertainty
Total CF= AF + Cable Loss, AF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ $k$ = 2 for 95% confidence

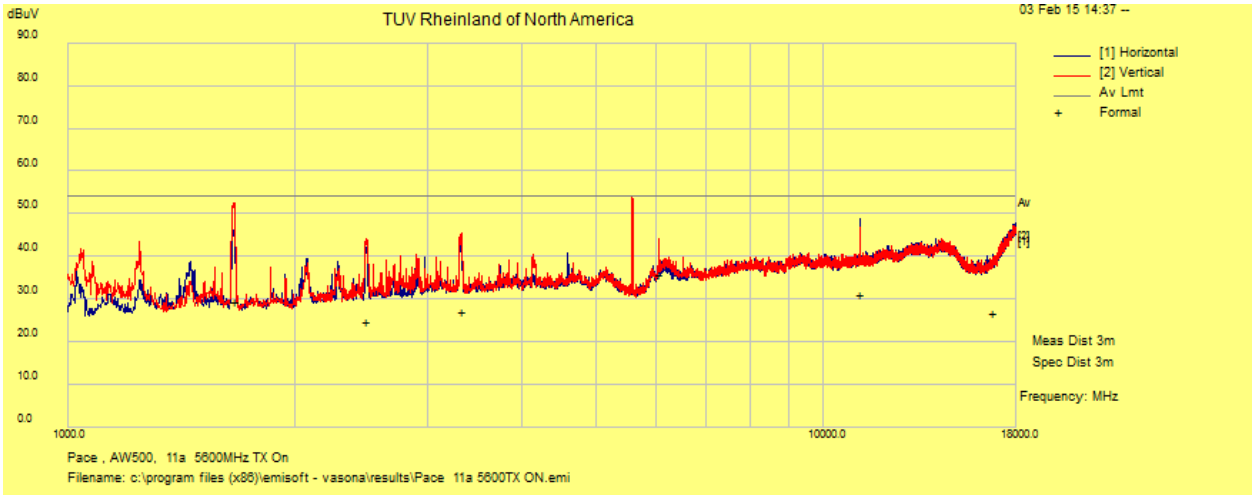
Notes: Worst case was observed on X-Axis, 6.5Mbps.
The frequency range 26GHz to 40GHz was measured at 1 meter distance; limit was extrapolated.

| SOP 1 Radiated Emissions | | Tracking # 31560164.004 Page 9 of 24 | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 15, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 30%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11n HT20 at 6.5Mbps | **Line AC** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Suresh K |

Above 1GHz Plots for Transmit Mode at 5500 MHz 11a Mode



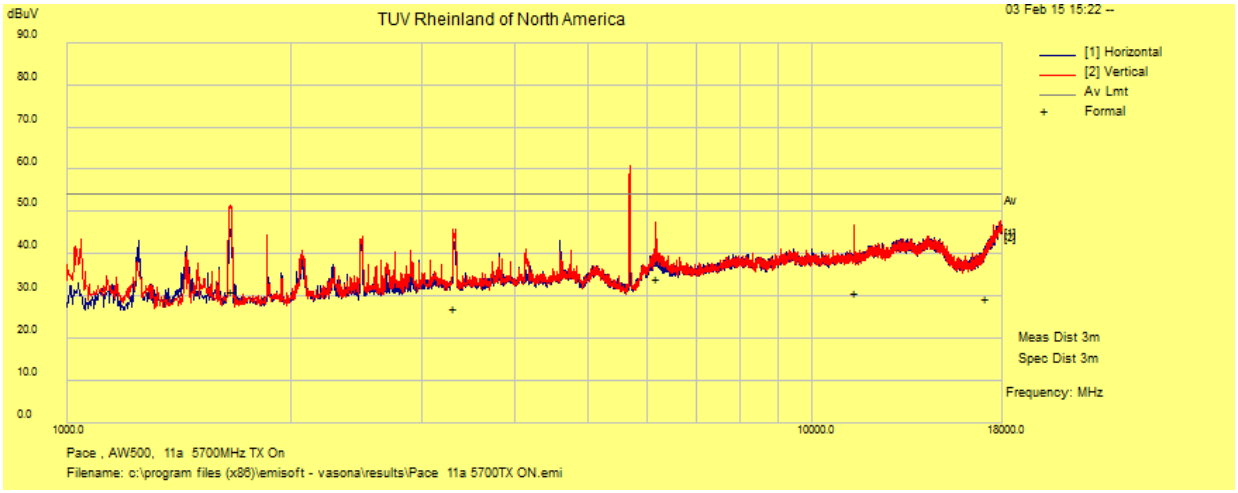

**Above 1GHz Plots for Transmit Mode at 5580 MHz 11aMode**

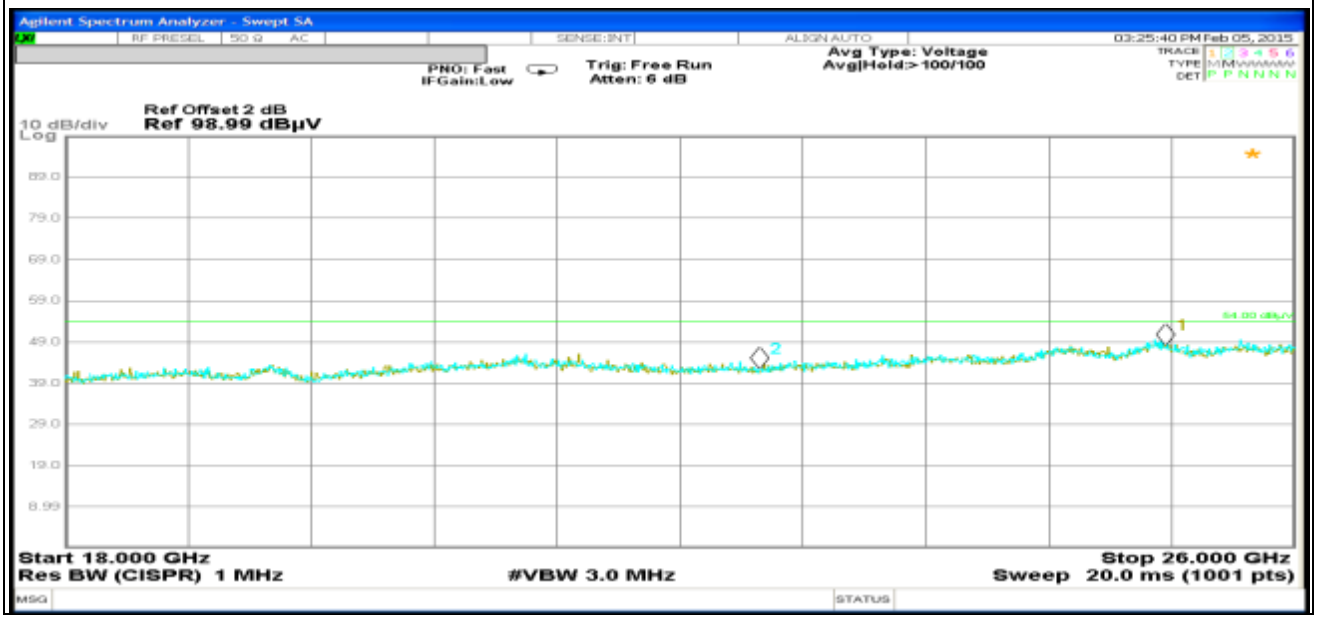


SOP 1 Radiated Emissions — Tracking # 31560164.004 Page 10 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 15, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 30%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11a at 6.0Mbps | **Line AC** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Suresh K |

**Above 1GHz Plots for Transmit Mode at 5700 MHz 11a Mode**



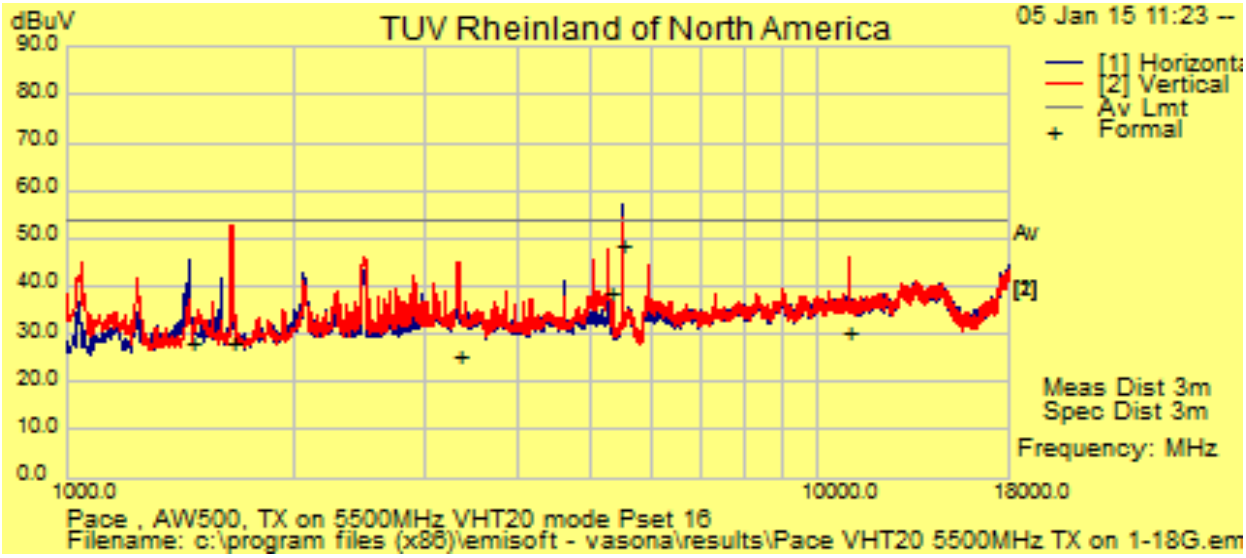

Note: All Emissions were below noise floor level or 26-to 40GHz

**SOP 1** Radiated Emissions

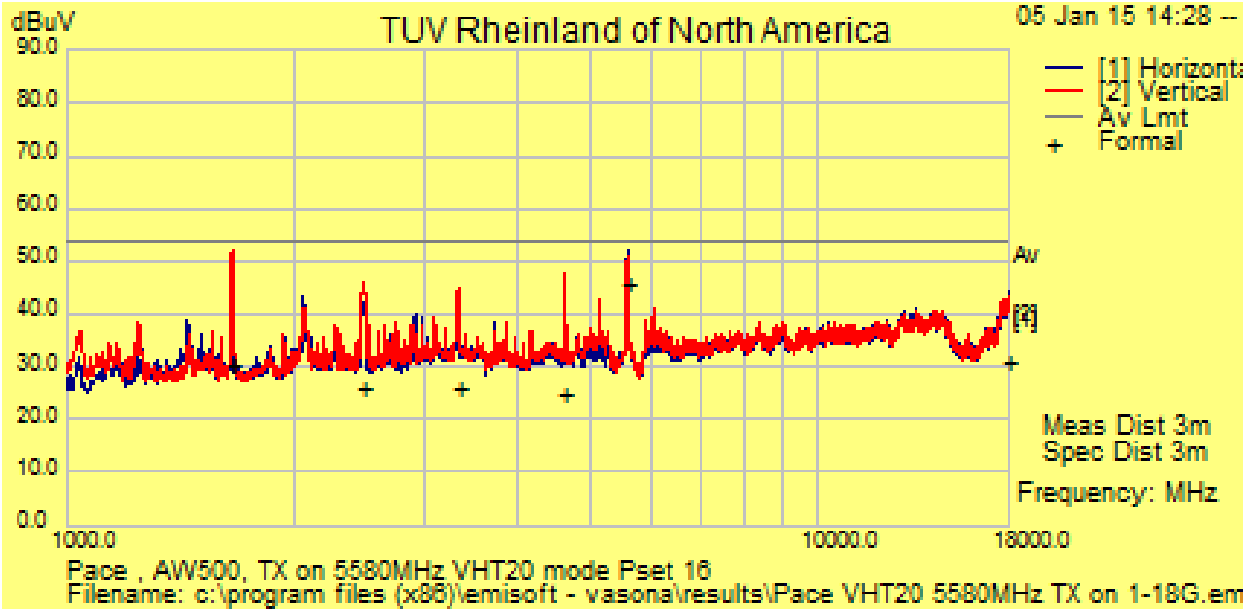
Tracking # 31560164.004 Page 11 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 30%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11n HT20 at 6.5Mbps | **Line AC** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Suresh K |

Above 1GHz Plots for Transmit Mode at 5500 MHz HT20 Mode




**Above 1GHz Plots for Transmit Mode at 5580 MHz HT20 Mode**



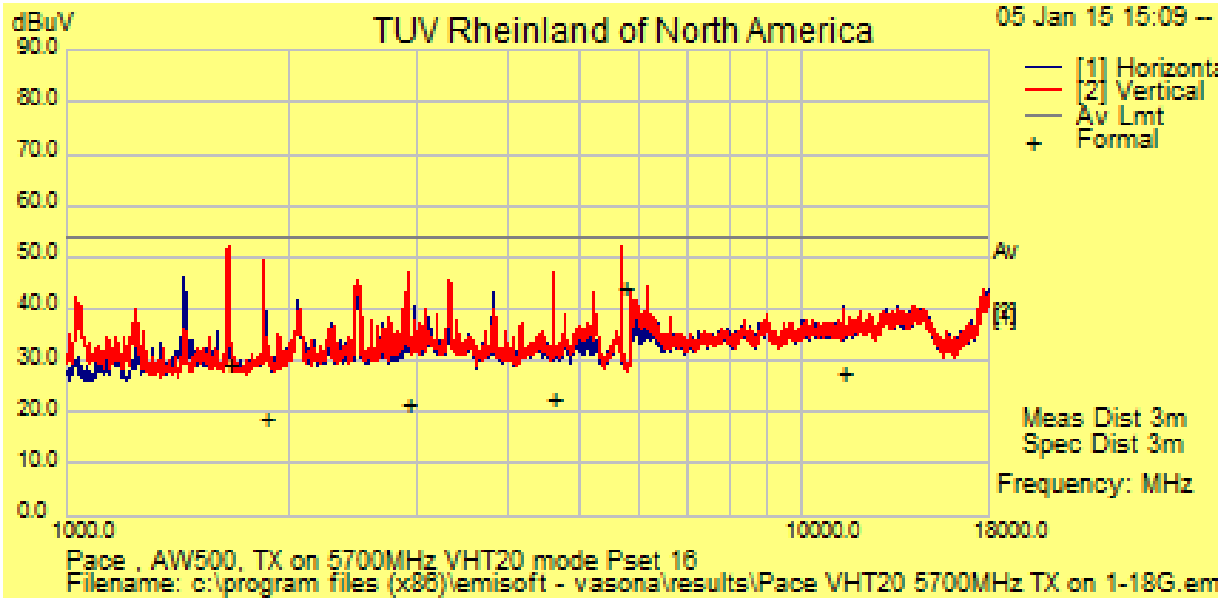

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range. Note: All Emissions were below noise floor level or 18-to 40GHz

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 12 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11n HT20 at 6.5Mbps | **Line AC** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 1m - RA42-K-F-4B-C | **Performed by** | Suresh |

Above 1GHz Plots for Transmit Mode at 5700 MHz HT20 mode



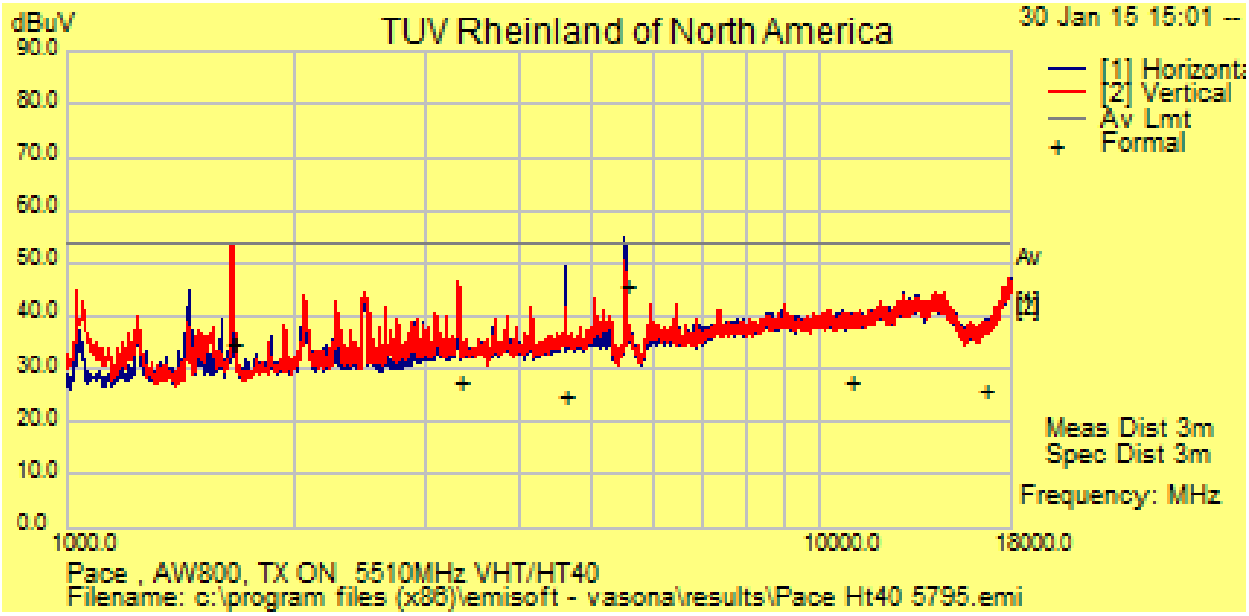

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range. Note: All Emissions were below noise floor level or 26-to 40GHz

**SOP 1** Radiated Emissions

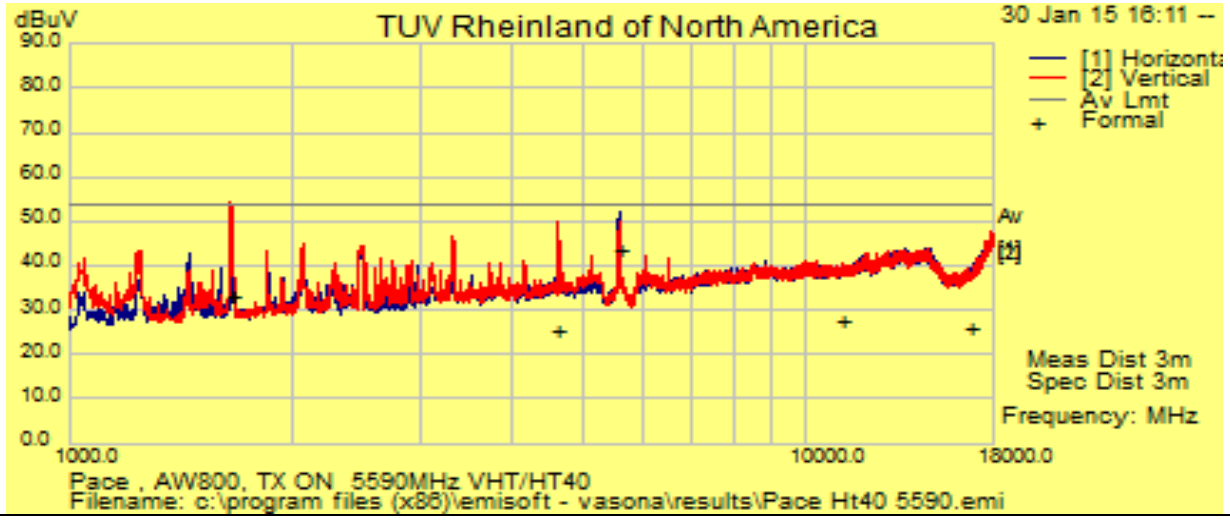
Tracking # 31560164.004 Page 13 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 30%rh |
| **EUT Serial** | | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11n HT40 at 13.5Mbps | **Line AC** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Suresh K |

**Above 1GHz Plots for Transmit Mode at 5510 MHz HT40/VHT40**




**Above 1GHz Plots for Transmit Mode at 5590 MHz HT40/VHT40**



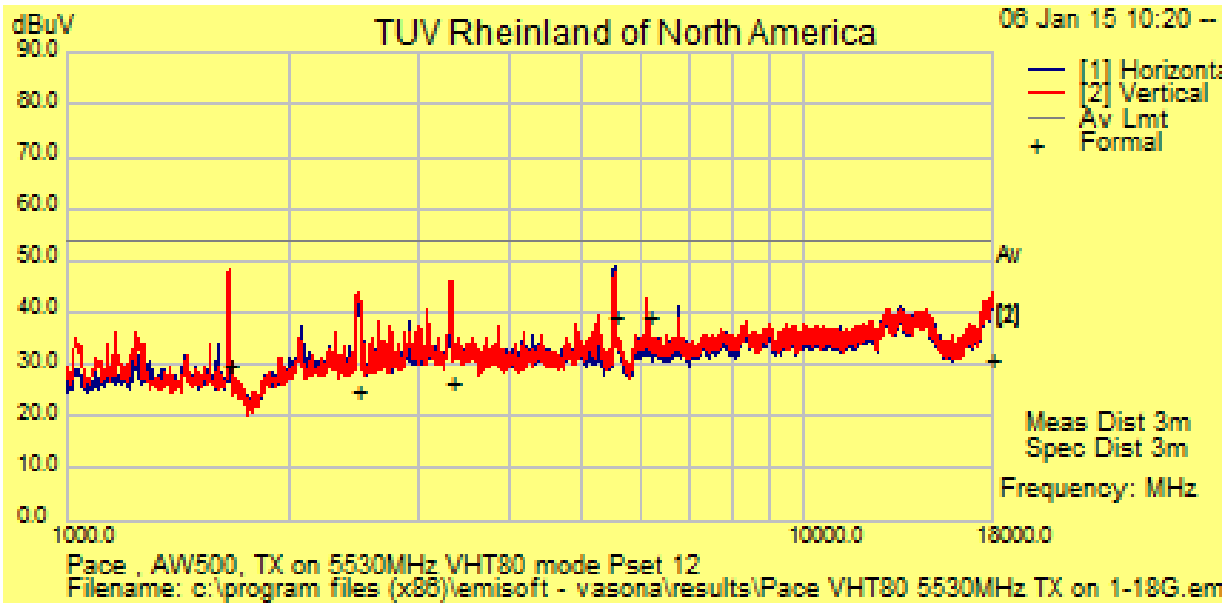

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range. Note: Note: All Emissions were below noise floor level or 18-to 40GHz

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 14 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 06, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11n HT80 at 58.6Mbps | **Line AC** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 1m - RA42-K-F-4B-C | **Performed by** | Suresh |

Above 1GHz Plots for Transmit Mode at 5530 MHz VHT 80



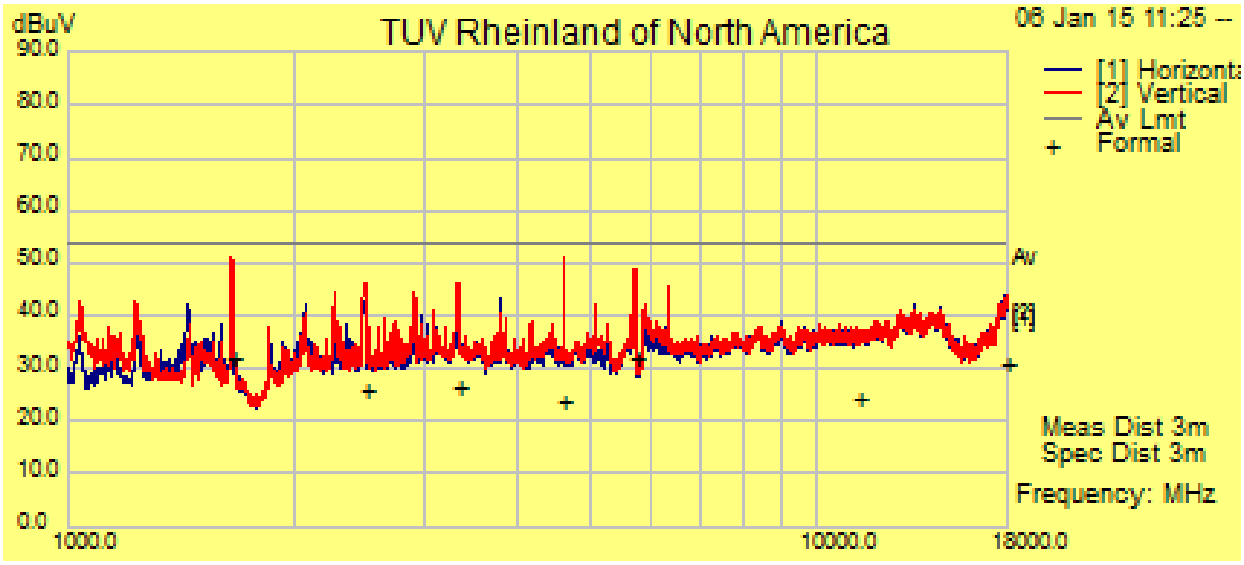

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range. Note: All Emissions were below noise floor level or 16-to 40GHz

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 15 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 06, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 23%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11n VHT80 at 56.5Mbps | **Line AC** | %V DC fby Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Suresh K |

Above 1GHz Plots for Transmit Mode at 5690MHz VHT80




Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range. All Emissions were below noise floor level or 18-to 40GHz

*5725 to 5850MHz Band*

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 16 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 a 6.0Mbps | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz/ 3 MHz |
| **Dist/Ant Used** | 3m / EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Surersh K |

| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| TX ON 5745 11a mode | | | | | | | | | | | |
| 11494.10 | 44.14 | 2.65 | -11.71 | 35.09 | Avg | H | 112 | 304 | 54.00 | -18.92 | Harmonic |
| 1665.81 | 54.61 | 0.95 | -24.79 | 30.77 | Avg | V | 156 | -8 | 54.00 | -23.23 | Spurious |
| 2483.18 | 46.10 | 1.17 | -22.32 | 24.96 | Avg | V | 121 | 342 | 54.00 | -29.05 | Spurious |
| 3306.84 | 47.30 | 1.35 | -19.44 | 29.22 | Avg | V | 131 | 44 | 54.00 | -24.78 | Spurious |
| 17233.57 | 32.30 | 3.38 | -5.29 | 30.39 | Avg | V | 179 | -8 | 54.00 | -23.61 | Harmonic |
| TX ON 5785MHz 11a | | | | | | | | | | | |
| 11569.49 | 45.89 | 2.66 | -11.67 | 36.88 | Avg | H | 138 | 310 | 54.00 | -17.12 | Harmonic |
| 1649.26 | 51.41 | 0.95 | -24.97 | 27.38 | Avg | V | 146 | 352 | 54.00 | -26.62 | Spurious |
| 3316.93 | 44.99 | 1.36 | -19.40 | 26.94 | Avg | V | 101 | 46 | 54.00 | -27.06 | Spurious |
| 4599.95 | 41.42 | 1.61 | -16.91 | 26.12 | Avg | V | 110 | 0 | 54.00 | -27.88 | Spurious |
| 6267.27 | 55.48 | 1.90 | -15.12 | 42.26 | Avg | V | 168 | 26 | 54.00 | -11.74 | Spurious |
| 17356.01 | 31.73 | 3.39 | -4.57 | 30.55 | Avg | V | 110 | -8 | 54.00 | -23.45 | Harmonic |
| TX ON 5825MHz 11a | | | | | | | | | | | |
| 11648.91 | 44.94 | 2.68 | -11.86 | 35.76 | Avg | H | 109 | 306 | 54.00 | -18.24 | Harmonic |
| 1653.00 | 55.82 | 0.95 | -24.93 | 31.83 | Avg | V | 100 | 2 | 54.00 | -22.17 | Spurious |
| 4600.06 | 41.03 | 1.61 | -16.91 | 25.73 | Avg | V | 154 | 4 | 54.00 | -28.27 | Spurious |
| 6309.03 | 51.34 | 1.91 | -15.10 | 38.15 | Avg | V | 198 | 24 | 54.00 | -15.85 | Spurious |
| 17483.51 | 31.67 | 3.39 | -3.65 | 31.41 | Avg | V | 168 | -8 | 54.00 | -22.59 | Harmonic |

Spec Margin = E-Field Average - Limit, E-Field Average = Field Meas.+ Total CF ± Uncertainty Total CF= AF + Cable Loss, AF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case was observed on X-Axis, 6.5Mbps.

The frequency range 18GHz to 40GHz was measured at 1 meter distance; limit was extrapolated.

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 17 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT20 6.5Mbps | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz/ 3 MHz |
| **Dist/Ant Used** | 3m / EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Surersh K |

| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| TX ON 5745 11n HT20/VHT20mode | | | | | | | | | | | |
| 4600.03 | 39.66 | 1.61 | -16.91 | 24.36 | Avg | H | 138 | 142 | 54.00 | -29.64 | Spurious |
| 1665.89 | 55.03 | 0.95 | -24.79 | 31.19 | Avg | V | 199 | -8 | 54.00 | -22.81 | Spurious |
| 5272.25 | 52.51 | 1.74 | -16.23 | 38.03 | Avg | V | 185 | 356 | 54.00 | -15.97 | Spurious |
| 5587.66 | 51.53 | 1.79 | -16.02 | 37.30 | Avg | V | 180 | 356 | 54.00 | -16.70 | Spurious |
| 5737.75 | 56.29 | 1.82 | -16.24 | 41.87 | Avg | V | 173 | 76 | 54.00 | -12.14 | Harmonic |
| TX ON 5785MHz 11n HT20/VHT20 | | | | | | | | | | | |
| 5788.37 | 55.13 | 1.83 | -16.22 | 40.73 | Avg | H | 111 | 344 | 54.00 | -13.27 | Spurious |
| 1665.88 | 55.19 | 0.95 | -24.79 | 31.35 | Avg | V | 128 | -8 | 54.00 | -22.65 | Spurious |
| 6025.85 | 48.64 | 1.87 | -15.54 | 34.97 | Avg | V | 188 | 302 | 54.00 | -19.03 | Spurious |
| 11568.71 | 36.85 | 2.66 | -11.66 | 27.85 | Avg | V | 142 | -8 | 54.00 | -26.15 | Spurious |
| 14234.32 | 35.97 | 2.99 | -8.39 | 30.57 | Avg | V | 189 | 84 | 54.00 | -23.43 | Harmonic |
| 17352.28 | 31.11 | 3.39 | -4.55 | 29.94 | Avg | V | 194 | -8 | 54.00 | -24.06 | Harmonic |
| TX ON 5825MHz 11n HT20/VHT20 | | | | | | | | | | | |
| 3883.47 | 62.23 | 1.47 | -17.45 | 46.25 | Avg | H | 116 | -8 | 54.00 | -7.75 | Spurious |
| 1651.93 | 57.32 | 0.95 | -24.94 | 33.33 | Avg | V | 139 | 356 | 54.00 | -20.67 | Spurious |
| 2498.77 | 47.48 | 1.17 | -22.29 | 26.36 | Avg | V | 130 | 356 | 54.00 | -27.64 | Spurious |
| 3312.60 | 45.47 | 1.36 | -19.42 | 27.41 | Avg | V | 163 | 50 | 54.00 | -26.59 | Spurious |
| 5981.34 | 57.45 | 1.86 | -15.74 | 43.57 | Avg | V | 100 | 178 | 54.00 | -10.43 | Spurious |
| 11648.66 | 37.47 | 2.68 | -11.86 | 28.29 | Avg | V | 197 | -8 | 54.00 | -25.71 | Harmonic |

Spec Margin = E-Field Average - Limit, E-Field Average = Field Meas.+ Total CF ± Uncertainty Total CF= AF + Cable Loss, AF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case was observed on X-Axis, 6.5Mbps. The frequency range 18GHz to 40GHz was measured at 1 meter distance; limit was extrapolated. No Emissions were found above noise floor level; 18 to 40GHz

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 18 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT40 13.5Mbps | **Line AC / Freq** | 5V DC by Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz/ 3 MHz |
| **Dist/Ant Used** | 3m / EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Surersh K |

| Frequency | Raw | Cable Loss | AF | Level | Detector | Polarity | Height | Azimuth | Limit | Margin | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dB | dB | dBuV/m | | H/V | cm | deg | dBuV/m | dB | |
| TX ON 5755 11n HT40VHT40mode | | | | | | | | | | | |
| 1651.57 | 58.71 | 0.95 | -24.95 | 34.71 | Avg | V | 128 | -1 | 54.00 | -19.29 | Spurious |
| 3322.74 | 46.67 | 1.36 | -19.38 | 28.65 | Avg | V | 195 | 48 | 54.00 | -25.35 | Spurious |
| 4599.89 | 40.23 | 1.61 | -16.91 | 24.93 | Avg | V | 121 | 38 | 54.00 | -29.07 | Spurious |
| 5749.20 | 44.88 | 1.82 | -16.22 | 30.48 | Avg | V | 179 | 356 | 54.00 | -23.52 | Spurious |
| 11510.94 | 36.74 | 2.65 | -11.75 | 27.64 | Avg | V | 137 | -8 | 54.00 | -26.36 | Harmonic |
| 17265.70 | 31.34 | 3.37 | -5.02 | 29.69 | Avg | V | 178 | -8 | 54.00 | -24.31 | Harmonic |
| TX ON 5795MHz 11n HT40/VHT40 | | | | | | | | | | | |
| 3863.37 | 59.21 | 1.47 | -17.45 | 43.23 | Avg | H | 103 | 348 | 54.00 | -10.77 | Spurious |
| 1657.99 | 56.60 | 0.95 | -24.88 | 32.67 | Avg | V | 136 | 352 | 54.00 | -21.33 | Spurious |
| 3323.49 | 45.44 | 1.36 | -19.38 | 27.42 | Avg | V | 120 | 46 | 54.00 | -26.58 | Spurious |
| 4829.17 | 60.27 | 1.66 | -16.38 | 45.55 | Avg | V | 195 | 288 | 54.00 | -8.45 | Spurious |
| 11591.24 | 36.43 | 2.67 | -11.71 | 27.38 | Avg | V | 174 | -8 | 54.00 | -26.62 | Harmonic |
| 17385.27 | 30.86 | 3.39 | -4.45 | 29.80 | Avg | V | 147 | -8 | 54.00 | -24.20 | Harmonic |
| TX ON 5775MHz 11AC VHT80 | | | | | | | | | | | |
| 1452.61 | 50.37 | 0.89 | -25.56 | 25.70 | Avg | H | 108 | 108 | 54.00 | -28.30 | Spurious |
| 1660.33 | 56.10 | 0.95 | -24.85 | 32.20 | Avg | V | 131 | -8 | 54.00 | -21.80 | Spurious |
| 3836.73 | 51.05 | 1.46 | -17.42 | 35.09 | Avg | V | 125 | 348 | 54.00 | -18.91 | Spurious |
| 4599.94 | 41.96 | 1.61 | -16.91 | 26.66 | Avg | V | 115 | 0 | 54.00 | -27.34 | Spurious |
| 11551.94 | 36.82 | 2.66 | -11.65 | 27.84 | Avg | V | 109 | -8 | 54.00 | -26.17 | Harmonic |
| 17323.53 | 31.84 | 3.37 | -4.65 | 30.56 | Avg | V | 130 | -8 | 54.00 | -23.44 | Harmonic |

Spec Margin = E-Field Average - Limit, E-Field Average = Field Meas.+ Total CF ± Uncertainty Total CF= AF + Cable Loss, AF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ $k$ = 2 for 95% confidence

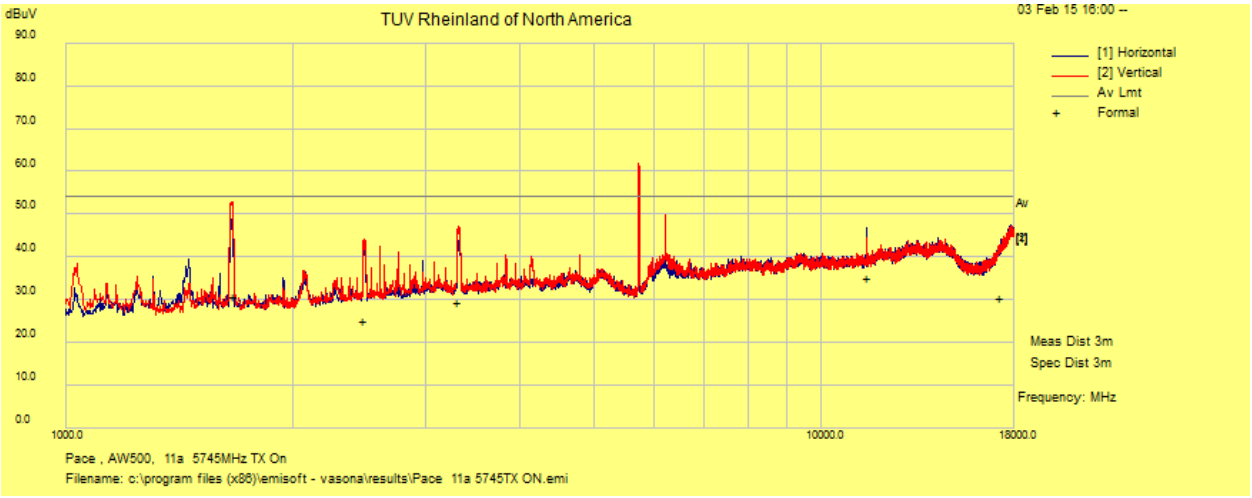
Notes: Worst case was observed on X-Axis, 6.5Mbps. The frequency range 18GHz to 40GHz was measured at 1 meter distance; limit was extrapolated. No Emissions were found above noise floor level; 18 to 40GHz

**SOP 1** Radiated Emissions

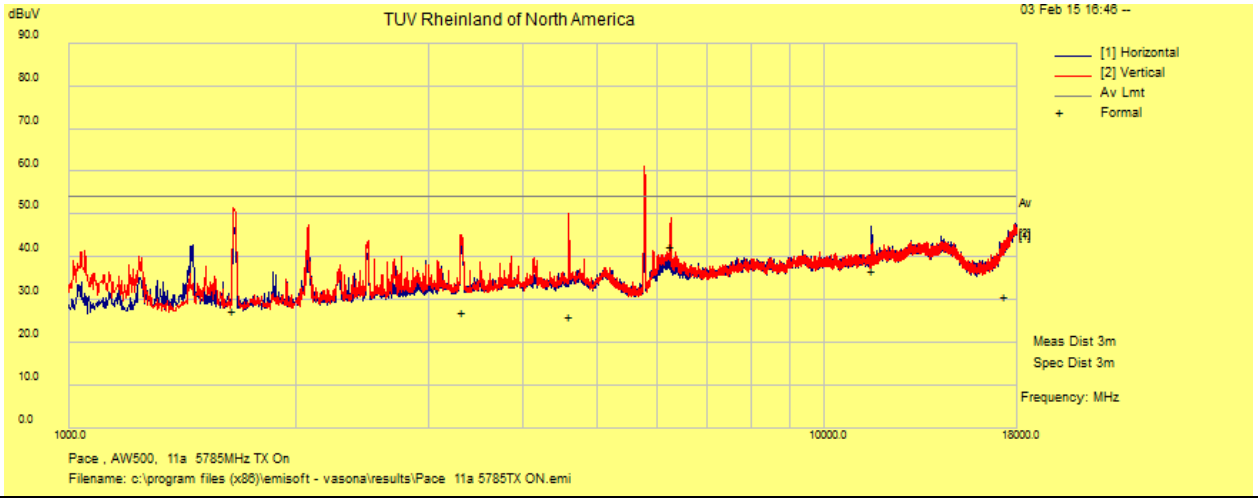
Tracking # 31560164.004 Page 19 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 15, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11n Ht20 | **Line AC** | 5V DC from Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 1m - RA42-K-F-4B-C | **Performed by** | Suresh |

Above 1GHz Plots for Transmit Mode at 5745 MHz




Above 1GHz Plots for Transmit Mode at 5785 MHz



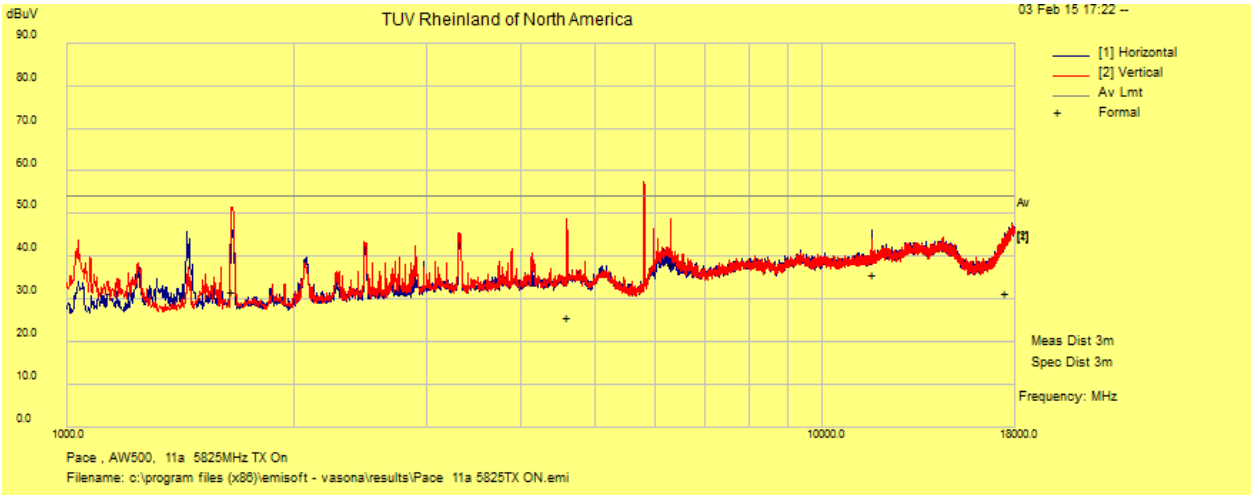

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range. No Emissions were found above noise floor level for 18 to 40 GHz

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 20 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 15, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 30%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11a 6.0 Mbps | **Line AC** | 5V DC from Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Jeremy Luong |

Above 1GHz Plots for Transmit Mode at 5825 MHz 11a mode



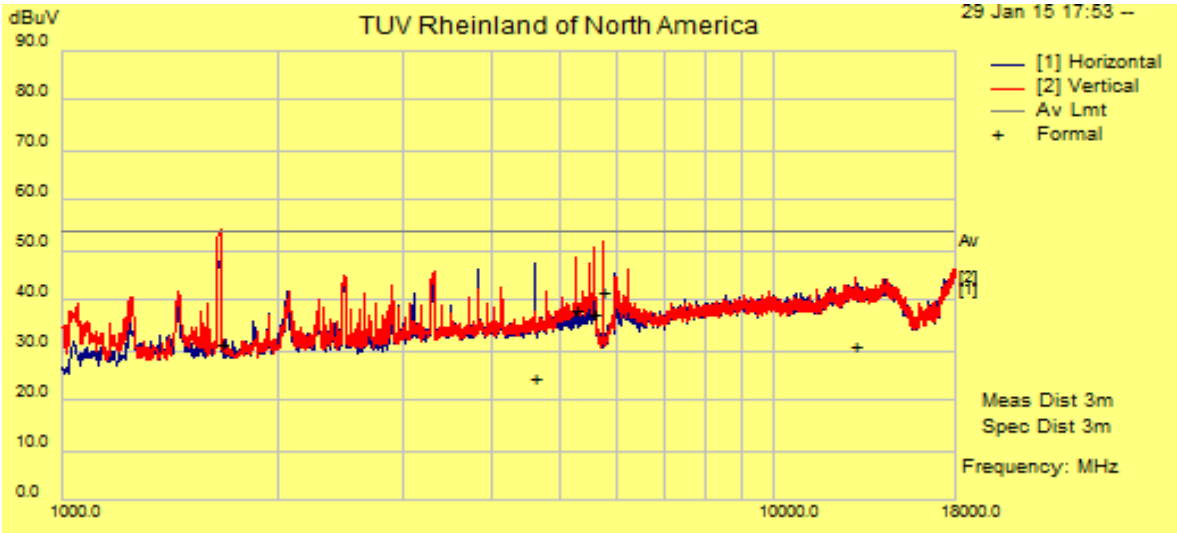

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range. No Emissions were found above noise floor level for 18 to 40 GHz

**SOP 1** Radiated Emissions

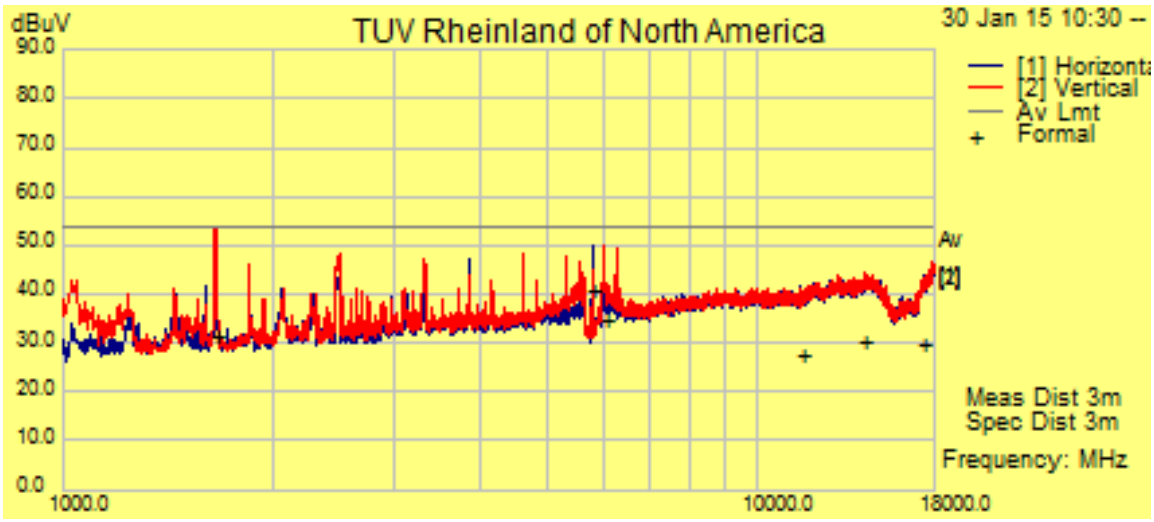
Tracking # 31560164.004 Page 21 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 30, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT40 at 13.5Mbps | **Line AC** | % V DC from Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 1m - RA42-K-F-4B-C | **Performed by** | SureshK |

Above 1GHz Plots for Transmit Mode at 5745 MHz HT20 Mode




Above 1GHz Plots for Transmit Mode at 5785 MHz HT20 Mode



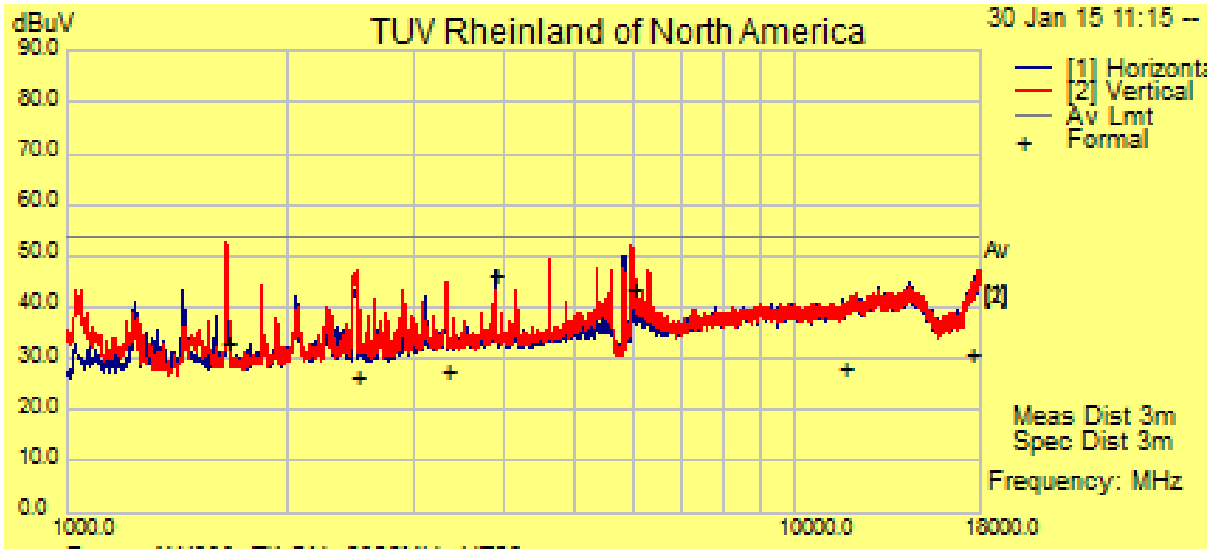

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range.

**SOP 1** Radiated Emissions

Tracking # 31560164.004 Page 22 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 30, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 30%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT20 at 6.5Mbps | **Line AC** | %V DC from Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Jeremy Luong |

Above 1GHz Plots for Transmit Mode at 5825Mhz HT20



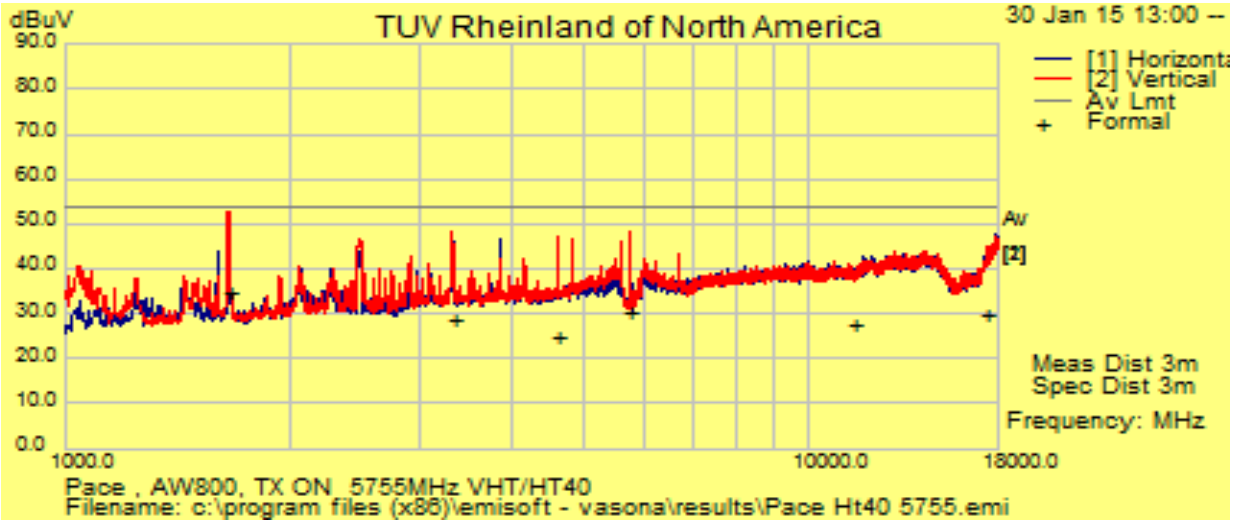

Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range.
1GHz – 25 GHz Setting: RBW = 1 MHz/ VBW = 3MHz

**SOP 1** Radiated Emissions

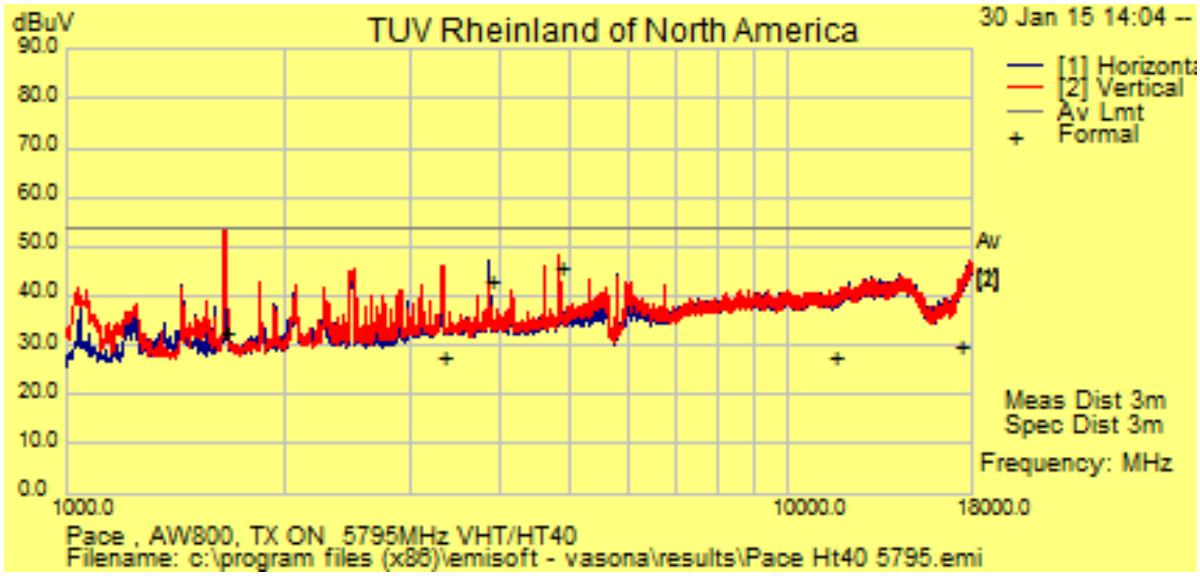
Tracking # 31560164.004 Page 23 of 24

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Jan 30, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 HT40 at 13.5Mbps | **Line AC** | 5V DC from Host |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Suresh K |

Above 1GHz Plots for Transmit HT40Mode at 5755MHz



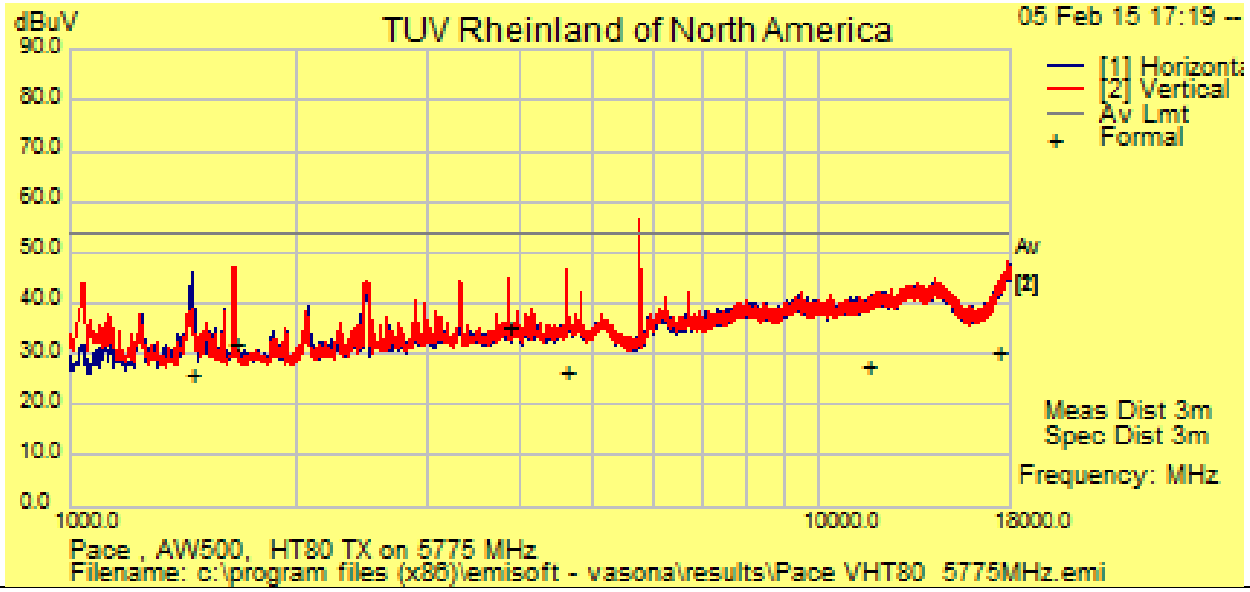

**Above 1GHz Plots for Transmit HT40Mode at 5795MHz**




Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range.

| **SOP 1** Radiated Emissions | | Tracking # 31560164.004 Page 24 of 24 | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 05, 2015 |
| **EUT Model** | AW500 | **Temp / Hum in** | 23°C / 28%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | X-Axis, 802.11 VHT80 at 56.8Mbps | **Line AC** | 120Vac 60Hz |
| **Standard** | CFR47 Part 15 Subpart C | **RBW / VBW** | 1 MHz / 3MHz |
| **Dist/Ant Used** | 3m - EMCO3115 / 1m - RA42-K-F-4B-C | **Performed by** | Jeremy Luong |

Above 1GHz Plots for Transmit Mode at 5775 MHz VHT 80




Notes: Limit was extrapolated to 1m distance for 18GHz – 40 GHz range.

### 4.4.4 **Sample Calculation**

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

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

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

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

## *4.5 AC Conducted Emissions*

Testing was performed in accordance with ANSI C63.4: 2010. 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: 2014 and RSS 210: 2010.

### 4.5.1 **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.

#### *4.5.1.1 Deviations*

There were no deviations from this test methodology.

### 4.5.2 **Test Results**

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

**Table 7:** AC Conducted Emissions – Test Results

| **Test Conditions:** Conducted Measurement at Normal Conditions only | | |
|---|---|---|
| **Antenna Type:** Attached | **Power Level:** See Test Plan | |
| **AC Power:** 120 Vac/60 Hz | **Configuration:** Tabletop | |
| **Ambient Temperature:** 23° C | **Relative Humidity:** 31% RH | |
| **Configuration** | **Frequency Range** | **Test Result** |
| Line 1 (Hot) | 0.15 to 30 MHz | Pass |
| Line 2 (Neutral) | 0.15 to 30 MHz | Pass |

**SOP 2** Conducted Emissions

Tracking # 31560164.004 Page 1 of 4

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 20, 2015 |
| **EUT Model** | AW500 in Host Device | **Temp / Hum in** | 23°C / 32%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | Attached Antenna | **Line AC / Freq** | 120V 60Hz |
| **Standard** | CFR47 Part 15.207 | **RBW / VBW** | 9kHz / 30 kHz |
| **Lab/LISN** | Lab #2 /Com-Power, Line 1 | **Performed by** | Suresh K |

| Frequency | Raw | Cable Loss | Ins. Loss | Level | Detector | Line | Limit | Margin | Result |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dB | dBuV | | | dBuV | dB | |
| 0.15 | 39.11 | 9.96 | -0.1 | 48.97 | QP | Live | 66.00 | -17.03 | Pass |
| 0.15 | 26.35 | 9.96 | -0.1 | 36.21 | Avg | Live | 56.00 | -19.79 | Pass |
| 0.35 | 31.62 | 9.99 | -0.05 | 41.55 | QP | Live | 58.99 | -17.44 | Pass |
| 0.35 | 23.93 | 9.99 | -0.05 | 33.87 | Avg | Live | 48.99 | -15.13 | Pass |
| 0.49 | 30.49 | 9.99 | -0.04 | 40.44 | QP | Live | 56.17 | -15.73 | Pass |
| 0.49 | 21.14 | 9.99 | -0.04 | 31.09 | Avg | Live | 46.17 | -15.09 | Pass |
| 3.46 | 26.4 | 10.05 | -0.03 | 36.42 | QP | Live | 56.00 | -19.58 | Pass |
| 3.46 | 17.24 | 10.05 | -0.03 | 27.26 | Avg | Live | 46.00 | -18.75 | Pass |
| 10.80 | 31.27 | 10.14 | 0.01 | 41.41 | QP | Live | 60.00 | -18.59 | Pass |
| 10.80 | 23.42 | 10.14 | 0.01 | 33.56 | Avg | Live | 50.00 | -16.44 | Pass |
| 11.00 | 30.75 | 10.14 | 0.01 | 40.9 | QP | Live | 60.00 | -19.1 | Pass |
| 11.00 | 23.02 | 10.14 | 0.01 | 33.17 | Avg | Live | 50.00 | -16.83 | 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

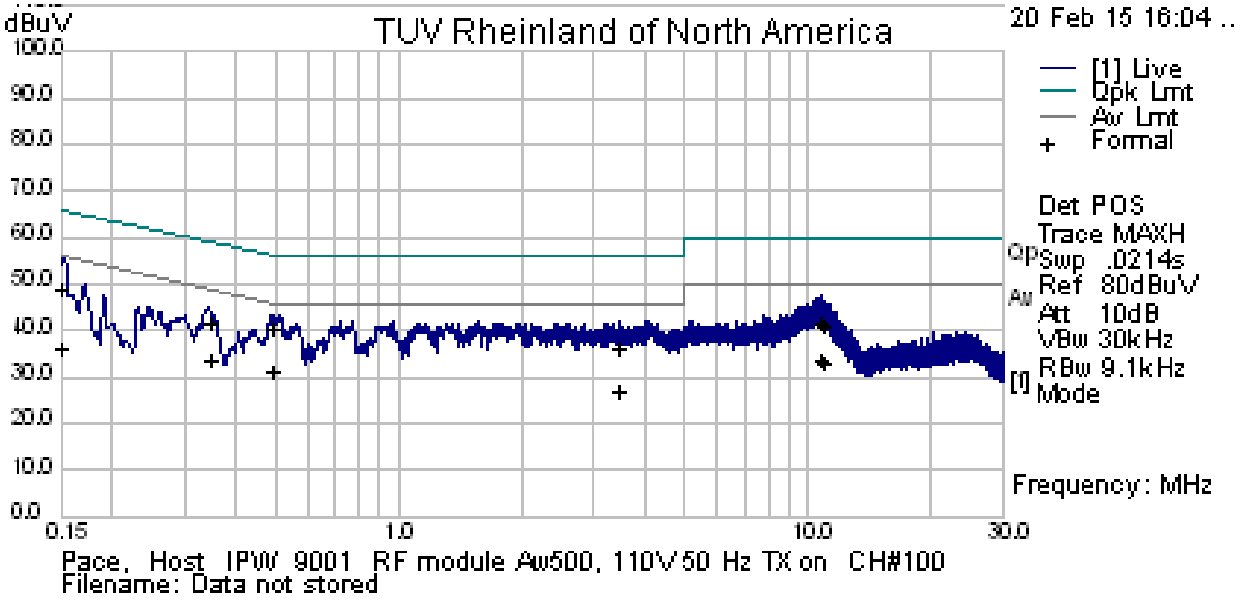
Notes: EUT was setup as table top equipment and transmitted at 5580 MHz in HT20 at 6.5Mbps

**SOP 2** Conducted Emissions

Tracking # 31560164.004 Page 2 of 4

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Fb 20, 2015 |
| **EUT Model** | AW500 with Host device IP9001 | **Temp / Hum in** | 23°C / 32%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | Attached Antenna | **Line AC** | 120V 60Hz |
| **Standard** | CFR47 Part 15.207 | **RBW / VBW** | 9kHz / 30 kHz |
| **Lab/LISN** | Lab #2 /Com-Power, Line 1 | **Performed by** | Suresh K |

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




Notes: Meet FCC Class B limit.

**SOP 2** Conducted Emissions

Tracking # 31560164.004 Page 3 of 4

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 20, 2015 |
| **EUT Model** | AW500 with Host Ip9001 | **Temp / Hum in** | 23°C / 32%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | Attached Antenna | **Line AC / Freq** | 120V/60Hz |
| **Standard** | CFR47 Part 15.207 | **RBW / VBW** | 9kHz / 30 kHz |
| **Lab/LISN** | Lab #2 /Com-Power, Line 2 | **Performed by** | Suresh |

| Frequency | Raw | Cable Loss | Ins. Loss | Level | Detector | Line | Limit | Margin | Result |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dB | dBuV | | | dBuV | dB | |
| 0.49 | 30.41 | 9.99 | -0.04 | 40.36 | QP | Neutral | 56.13 | -15.77 | Pass |
| 0.49 | 21.09 | 9.99 | -0.04 | 31.04 | Avg | Neutral | 46.13 | -15.10 | Pass |
| 0.89 | 28.12 | 10.00 | -0.04 | 38.08 | QP | Neutral | 56.00 | -17.92 | Pass |
| 0.89 | 18.22 | 10.00 | -0.04 | 28.18 | Avg | Neutral | 46.00 | -17.82 | Pass |
| 1.18 | 27.94 | 10.01 | -0.04 | 37.91 | QP | Neutral | 56.00 | -18.09 | Pass |
| 1.18 | 18.22 | 10.01 | -0.04 | 28.19 | Avg | Neutral | 46.00 | -17.81 | Pass |
| 1.72 | 27.81 | 10.02 | -0.04 | 37.79 | QP | Neutral | 56.00 | -18.21 | Pass |
| 1.72 | 17.48 | 10.02 | -0.04 | 27.46 | Avg | Neutral | 46.00 | -18.54 | Pass |
| 10.87 | 31.31 | 10.14 | 0.01 | 41.46 | QP | Neutral | 60.00 | -18.54 | Pass |
| 10.87 | 23.28 | 10.14 | 0.01 | 33.43 | Avg | Neutral | 50.00 | -16.57 | Pass |
| 11.07 | 30.76 | 10.14 | 0.01 | 40.91 | QP | Neutral | 60.00 | -19.09 | Pass |
| 11.07 | 22.81 | 10.14 | 0.01 | 32.96 | Avg | Neutral | 50.00 | -17.04 | 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

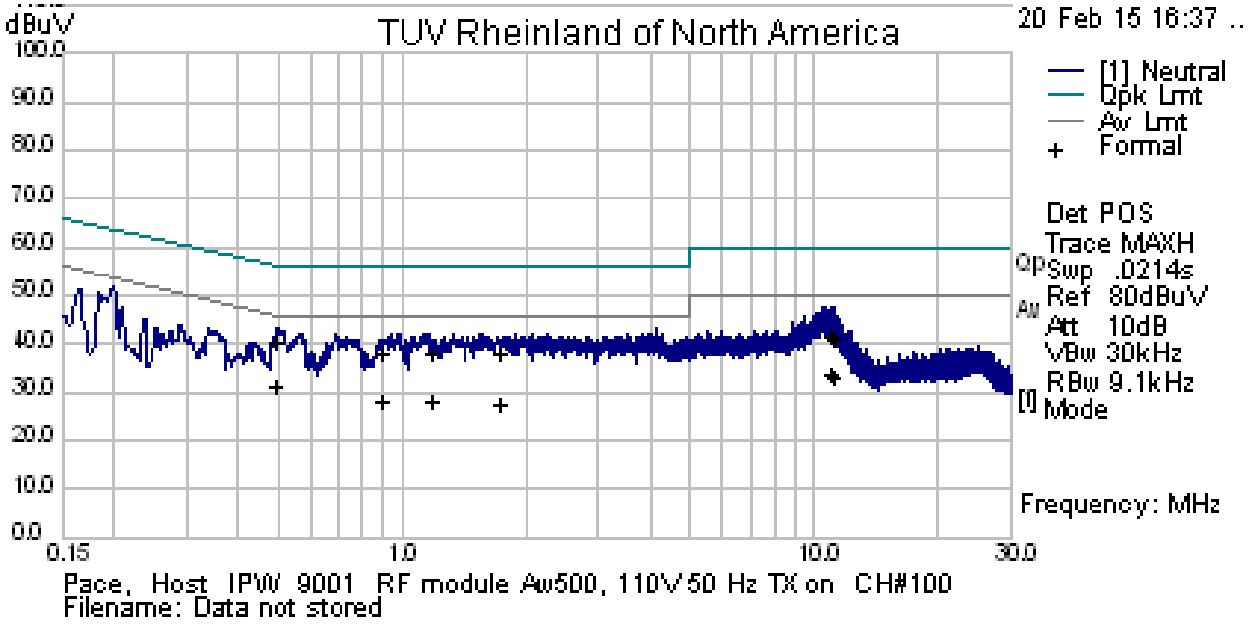
Notes: EUT was setup as table top equipment and transmitted at 5580 MHz in HT20 at 6.5Mbps

**SOP 2** Conducted Emissions

Tracking # 31560164.004 Page 4 of 4

| | | | |
|---|---|---|---|
| **EUT Name** | WiFi 802.11AC 2x2 5GHz Wireless Adapter | **Date** | Feb 20, 2015 |
| **EUT Model** | AW500 with Host IP9001 | **Temp / Hum in** | 23°C / 32%rh |
| **EUT Serial** | 7 | **Temp / Hum out** | N/A |
| **EUT Config.** | Attached Antenna | **Line AC** | 120V/60Hz |
| **Standard** | CFR47 Part 15.107 | **RBW / VBW** | 9kHz / 30 kHz |
| **Lab/LISN** | Lab #2 /Com-Power, Line 2 | **Performed by** | Suresh K |

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




Note: Meet FCC Class B Limit.

## *4.6 Frequency Stability*

In accordance with 47 CFR Part 15.407(g) 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

### 4.6.1 **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 C63.10-2009 Section 6.8

### 4.6.2 **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 ±20ppm 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 - ±20ppm/104 kHz

±20ppm at 5 GHz translates to a maximum frequency shift of ±103 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.

### 4.6.3 **Limit**

CFR47 Part 407(g) - 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.

### 4.6.4 **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 2.96 ppm.

**Table 8:** Frequency Stability – Test Results

| Temperature | Time | -26 dB Lower Edge (MHz) | +26 dB Upper Edge (MHz) | Center Frequency (MHz) | PPM |
|---|---|---|---|---|---|
| 0°C | Start | 5489.12826 | 5511.17234 | 5500.15030 | 2.73 |
| | 2 Min. | 5489.12826 | 5511.17234 | 5500.15030 | 2.73 |
| | 5 Min | 5489.12826 | 5511.17234 | 5500.15030 | 2.73 |
| | 10 min | 5489.12826 | 5511.07214 | 5500.10020 | 1.82 |
| 10°C | Start | 5489.22846 | 5511.09719 | 5500.16283 | 2.96 |
| | 2 Min. | 5489.22846 | 5511.09719 | 5500.16283 | 2.96 |
| | 5 Min | 5489.32866 | 5511.09719 | 5500.21293 | 3.87 |
| | 10 min | 5489.32866 | 5510.87174 | 5500.10020 | 1.82 |
| 20°C | Start | 5489.02806 | 5511.17234 | 5500.10020 | 1.82 |
| | 2 Min. | 5489.02806 | 5511.17234 | 5500.10020 | 1.82 |
| | 5 Min | 5489.02806 | 5510.97194 | 5500.00000 | 0.00 |
| | 10 min | 5489.12826 | 5511.07214 | 5500.10020 | 1.82 |
| 30°C | Start | 5489.02826 | 5511.07214 | 5500.05020 | 0.91 |
| | 2 Min. | 5489.02826 | 5511.07214 | 5500.05020 | 0.91 |
| | 5 Min | 5489.02826 | 5511.07214 | 5500.05020 | 0.91 |
| | 10 min | 5489.02826 | 5511.07214 | 5500.05020 | 0.91 |
| 40°C | Start | 5488.92786 | 5511.07214 | 5500.00000 | 0.00 |
| | 2 Min. | 5488.92786 | 5511.07214 | 5500.00000 | 0.00 |
| | 5 Min | 5489.02806 | 5511.07214 | 5500.05010 | 0.91 |
| | 10 min | 5489.02806 | 5511.07214 | 5500.05010 | 0.91 |

**Note:** 1. All frequency drifts were less than ±20 ppm. The worst frequency drift was 2.96ppm/ 16.28kHz.
2. Channel 5500MHz was selected to frequency stability.

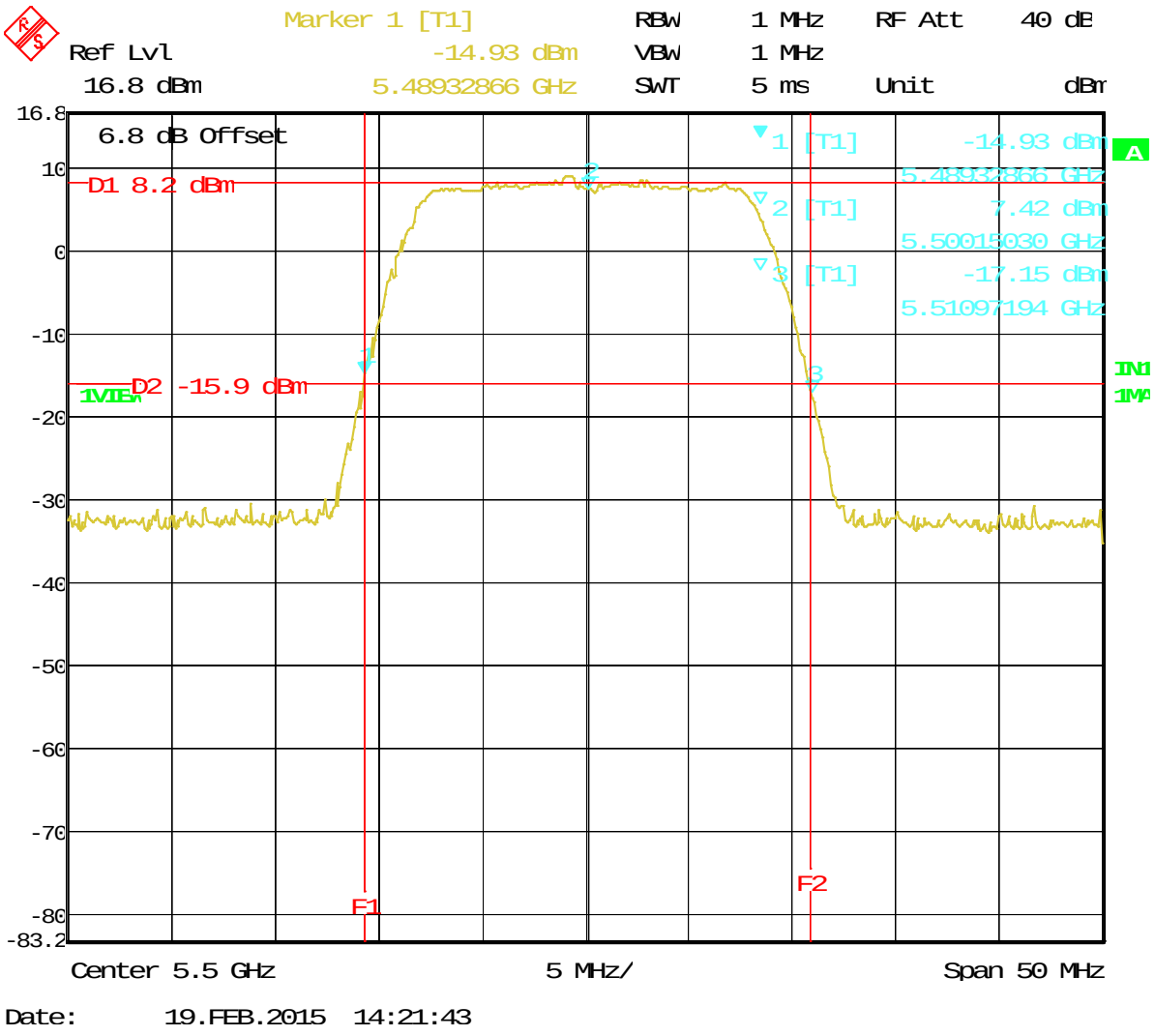



**Figure 60:** Frequency Stability – Worst Case

## *4.7 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.

### 4.7.1 **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 5V DC by programmable power supply. The voltage was varied from 3.5VDC to 6.5VDC mean while the fundamental frequencies were observed and record for the maximum drift in ppm; part per millions.

### 4.7.2 **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 ±20ppm.

**Table 9:** Voltage Variation – Test Results

| **Frequency** MHz | **Nominal (**5VDC) MHz | **Lo Voltage (3.5 VDC)** MHz | **Hi Voltage (6.5VDC)** MHz | **Max Drift** ppm |
|---|---|---|---|---|
| 5500 | 5500.00000 | 5500.05010 | 5500.05010 | 0.91 |

## *4.8 Maximum Permissible Exposure*

### 4.8.1 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.

### 4.8.2 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

### 4.8.3 **EUT Operating Condition**

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

### 4.8.4 **Classification**

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

### 4.8.5 **Test Results**

#### *4.8.5.1 Antenna Gain*

The transmitting antenna was integrated. The directional antenna gain was +7.9 dBi or 5.7 (numeric).

#### *4.8.5.2 Output Power into Antenna & RF Exposure value at distance 20cm:*

Calculations for this report are based on highest power measurement.

Limit for MPE (from FCC part 1.1310 table1) is 1.0 mW/cm2
The highest measured total power is +16.99 dBm or 50mW

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

Pd = (50*5.9) / (1600π) = 0.0586 mW/cm2, which is 0.941 mW/cm2 below to the limit.

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

### 4.8.6 **Sample Calculation**

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

Where;

Pd = power density in $mW/cm2$
Pout = output power to antenna in mW
G = gain of antenna in linear scale
$\pi \approx 3.1416$
R = distance between observation point and center of the radiator in cm

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

# 6 Test Equipment Use List

## *6.1 Equipment List*

| Equipment | Manufacturer | Model # | Serial/Inst # | Last Cal mm/dd/yy | Next Cal mm/dd/yy |
|---|---|---|---|---|---|
| Bilog Antenna | Sunol Sciences | JB3 | A102606 | 05/15/2014 | 05/15/2016 |
| Horn Antenna | EMCO | 3115 | 9211-3969 | 03/18/2013 | 03/18/2015 |
| Antenna (18-26GHz) | CMT | RA42-K-F-4B-C | 020131-004 | 07/24/2014 | 07/24/2015 |
| Antenna (26-40 GHz) | CMT | RA28-K-F-4B-C | 011469R-003 | 01//11/2015 | 01/11/2016 |
| Preamplifier | Sonoma Instrument | 310 | 213221 | 09/30/2014 | 09/30/2015 |
| Bilog Antenna | Sunol Sciences | JB3 | A020502 | 04/12/2013 | 04/12/2015 |
| Preamplifier | Milteq | TIA-30-HG- | 1842452 | 01/13/2015 | 01/13/2016 |
| Spectrum Analyzer | Rhode Schwarz | ESIB | 832427/002 | 01/08/2015 | 01/08/2016 |
| Amplifier | Rohde & Schwarz | TS-PR26 | 100011 | 07/24/2014 | 07/24/2015 |
| Amplifier | Rohde & Schwarz | TS-PR40 | 100012 | 01//11/2015 | 01/11/2016 |
| Signal Generator | Anritsu | MG3694A | 42803 | 01/13/2015 | 01/13/2016 |
| Notch Filter | Micro-Tronics | BRM50702 | 37 | 07/18/2014 | 07/18/2015 |
| Notch Filter | Micro-Tronics | BRC50703 | 11 | 07/18/2014 | 07/18/2015 |
| Notch Filter | Micro-Tronics | BRC50704 | 8 | 07/18/2014 | 07/18/2015 |
| Notch Filter | Micro-Tronics | BRC50705 | 9 | 07/18/2014 | 07/18/2015 |
| High Pass Filter (8.5 GHz) | Micro-Tronics | HPM50107 | 4 | 01/16/2015 | 01/16/2016 |
| Power Meter | Agilent | E4418B | MY45103902 | 01/09/2015 | 01/09/2016 |
| Power Sensor | Hewlett Packard | 8482A | 55-5131 | 01/09/2015 | 01/09/2016 |
| Thermo Chamber | Espec | BTZ-133 | 0613436 | 03/11/2014 | 03/11/2015 |
| Spectrum Analyzer | Agilent | N9038A | MY51210195 | 01/08/2015 | 01/08/2016 |

* 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.

# 7 EMC Test Plan

## 7.1 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.

## 7.2 Customer

**Table 10:** Customer Information

| | |
|---|---|
| **Company Name** | Pace Americas |
| **Address** | 310 Providence Mine Road, Ste. 200 |
| **City, State, Zip** | Nevada City, CA 95959 |
| **Country** | USA |
| **Phone** | (530) 274-5440 |
| **Fax** | (530) 273-6340 |

**Table 11:** Technical Contact Information

| | |
|---|---|
| **Name** | Mark Rieger |
| **E-mail** | Mark.Rieger@pace.com |
| **Phone** | (530) 274-5440 |
| **Fax** | (530) 273-6340 |

## *7.3 Equipment Under Test (EUT)*

**Table 12:** EUT Specifications

| EUT Specification | |
|---|---|
| Dimensions | 87x42x20cm |
| Power Supply | EUT is powered 5V DC by Host<br>Host AC Adapter (Pace M/N: WAC002);<br>Input Voltage: 100 -120Vac, 60Hz<br>Output Voltage: 5VDC<br>Output Current: 0.4A |
| Environment | Indoor and Outdoor |
| Operating Temperature Range: | 0 to 40 degrees C |
| Multiple Feeds: | ☒ Yes and how many 2<br>☐ No |
| Hardware Version | PD12-2230A1C |
| Part Number | E4282C20400 |
| RF Software Version | Version 1.43.4.5 (IPW9001) |
| 802.11-radio module | |
| Operating Mode | 802.11AC, HT20, HT40 and HT80 |
| Transmitter Frequency Band | 5.150 GHz – 5.250GHz, U-NII-1band<br>5.250 GHz – 5.350 GHz, U-NII-2A band<br>5.470 GHz – 5.725 GHz, U-NII-2C band<br>5.725 GHz – 5.850 GHz, U-NII-3 band |
| Max. Rated Power Output | See Channel Planning Table. |
| Power Setting @ Operating Channel | See Channel Planning Table. |
| Antenna Type | Qty 2 – Proprietary, stamped metal, vertically PCB mounted 5GHz antennas |
| Antenna Gain | . ~ 3.7 to 5.5 dBi |
| Modulation Type | ☐ AM ☐ FM ☒ DSSS ☒ OFDM<br>☒ Other describe: 16QAM and 64 QAM |
| Data Rate | 802.11n/ac HT20/VHT20:<br>2 Spatial Streams: 13, 26, 39, 52, 78, 104, 117, 130 /156 Mbps (LGI)<br>802.11n/ac HT40/VHT40:<br>2 Spatial Streams: 27, 54, 81, 108, 162, 216, 243, 270 / 324, 370 Mbps (LGI)<br>802.11ac VHT 80:<br>2 Spatial Streams: 58.5, 117, 175.5, 234, 351, 468, 526.5, 585, 702, 780 Mbps (LGI) |

| EUT Specification | |
|---|---|
| TX/RX Chain (s) | MIMO (2x2) |
| Directional Gain Type | ☒ Correlated ☒ Beam-Forming<br>☐ Other describe: |
| Type of Equipment | ☒ Table Top ☐ Wall-mount ☐ Floor standing cabinet<br>☐ Other |
| **Note: 1.** All two chains will be on / transmitted at all time. | |

**Table 13:** EUT Channel Power Specifications

| No. | Frequency (MHz) | Target Power Value dBm | | | | |
|---|---|---|---|---|---|---|
| | | 802.11a | 802.11n HT20/VHT20 | 802.11n HT40/VHT40 | 802.11AC VHT80 | |
| 36 | 5180 | 14 | 14 | | | |
| 38 | 5190 | | | 12 | | |
| 40 | 5200 | 14 | 14 | | | |
| 42 | 5210 | | | | 12 | |
| 44 | 5220 | 14 | 14 | | | |
| 46 | 5230 | | | 14 | | |
| 48 | 5240 | 14 | 14 | | | |
| 52 | 5260 | 14 | 14 | | | |
| 54 | 5270 | | | 14 | | |
| 56 | 5280 | 14 | 14 | | | |
| 58 | 5290 | | | | 12 | |
| 60 | 5300 | 14 | 14 | | | |
| 62 | 5310 | | | 12 | | |
| 64 | 5320 | 14 | 14 | | | |
| 100 | 5500 | 14 | 14 | | | |
| 102 | 5510 | | | 12 | | |
| 104 | 5520 | 14 | 14 | | | |
| 106 | 5530 | | | | 12 | |
| 108 | 5540 | 14 | 14 | | | |
| 110 | 5550 | | | 14 | | |
| 112 | 5560 | 14 | 14 | | | |
| 116 | 5580 | 14 | 14 | | | |
| 118 | 5590 | | | 14 | | |
| 120 | 5600 | 14 | 14 | | | |
| 122 | 5610 | | | | 14 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 124 | 5620 | 14 | 14 | | | |
| 126 | 5630 | | | 14 | | |
| 128 | 5640 | 14 | 14 | | | |
| 132 | 5660 | 14 | 14 | | | |
| 134 | 5670 | | | 14 | | |
| 136 | 5680 | 14 | 14 | | | |
| 138 | 5690 | | | | 14 | |
| 140 | 5700 | 14 | 14 | | | |
| 142 | 5710 | | | 14 | | |
| 149 | 5745 | 14 | 14 | | | |
| 151 | 5755 | | | 14 | | |
| 153 | 5765 | 14 | 14 | | | |
| 155 | 5775 | | | | 14 | |
| 157 | 5785 | 14 | 14 | | | |
| 159 | 5795 | 14 | 14 | 14 | | |
| 161 | 5805 | 14 | 14 | | | |
| 165 | 5825 | 14 | 14 | | | |

**Note:** 1. The center operating frequency is shifted upward by 10 MHz for HT40.
2. The adjusted power target values are updated at the evaluated frequencies.

**Table 14:** Interface Specifications

| Interface Type | Cabled with what type of cable? | Is the cable shielded? | Maximum potential length of the cable? | Metallic (M), Coax (C), Fiber (F), or Not Applicable? |
|---|---|---|---|---|
| USB | Plugs in to Host Device | ☐ No | ☐ NA | ☐ NA |

**Table 15**: Supported Equipment

| Equipment | Manufacturer | Model | Serial | Used for |
|---|---|---|---|---|
| Laptop | Dell | PP23LB | 9271001233 | Setup EUT operating channel |
| **Note:** None. | | | | |

**Table 16:** Description of Sample used for Testing

| Device | Serial | RF Connection | CFR47 Part 15.407 |
|---|---|---|---|
| AW500 | 7 and 20 | Integrated Antenna | TX Emission,<br>AC Conducted Emission |
| | | Direct Connection | Transmitted Output Power,<br>Power Spectral Density,<br>Peak Excursion Ratio<br>Occupied Bandwidth<br>Frequency Stability<br>Voltage Variation |

**Table 17:** Description of Test Configuration used for Radiated Measurement.

| Device | Antenna | Mode | Setup Photo (X-Axis) | Setup Photo (X-Axis) | Setup Photo (Z-Axis) |
|---|---|---|---|---|---|
| AW500 | Integrated | Transmit | EUT laid flat. | EUT stood upright | EUT on side. |
| **Note:** Pre-scans were performed in 3 supporting axis, and X-Axis was worst. | | | | | |

**Table 18:** Final Test Mode for 5470 - 5725 Band

| Test | 802.11a/ HT20 | 802.11n HT40 | 802.11n AC VHT80 |
|---|---|---|---|
| Occupied Bandwidth<br>FCC Part 15.407(a) | Band UNII 2C: 5500, 5600, 5700 MHz<br>2Streams – 6.0 and 6.5Mbps/ stream<br>Band 3: 5745, 5785 and 5825 | Band UNII 2C : 5510, 5590, 5710MHz<br>2Streams –13.5Mbps/ stream<br>Band 3: 5755 and 5795 | Band UNII 2C: 5530, , 5690MHz<br>2Streams – 56.5Mbps/ stream<br>Band 3: 5775 |
| Output Power<br>FCC Part 15.407(a)(1-2) | Band UNII 2C: 5500, 5600, 5700 MHz<br>2Streams – 6.0 and 6.5Mbps/ stream<br>Band 3: 5745, 5785 and 5825 | Band UNII 2C : 5510, 5590, 5710MHz<br>2Streams –13.5Mbps/ stream<br>Band 3: 5755 and 5795 | B and UNII 2C: 5530, , 5690MHz<br>2Streams – 56.5Mbps/ stream<br>Band 3: 5775 |
| Peak Excursion Ratio<br>FCC Part 15.407(a)(6) | Band UNII 2C: 5500, 5600, 5700 MHz<br>2Streams – 6.0 and 6.5Mbps/ stream<br>Band 3: 5745, 5785 and 5825 | Band UNII 2C : 5510, 5590, 5710MHz<br>2Streams –13.5Mbps/ stream<br>Band 3: 5755 and 5795 | and UNII 2C: 5530, , 5690MHz<br>2Streams – 56.5Mbps/ stream<br>Band 3: 5775 |

| Test | 802.11a/ HT20 | 802.11n HT40 | 802.11n AC VHT80 |
|---|---|---|---|
| Power Spectral Density<br>FCC Part 15.407(a) | Band UNII 2C: 5500, 5600, 5700 MHz<br>2Streams – 6.0 and 6.5Mbps/ stream<br>Band 3: 5745, 5785 and 5825 | Band UNII 2C : 5510, 5590, 5710MHz<br>2Streams –13.5Mbps/ stream<br>Band 3: 5755 and 5795 | Band UNII 2C: 5530, , 5690MHz<br>2Streams – 56.5Mbps/ stream<br>Band 3: 5775 |
| Band-Edge (Radiated)<br>FCC Part 15.205, 15.209, 15.407(b) | Band UNII 2C: 5500, 5600, 5700 MHz<br>2Streams – 6.0 and 6.5Mbps/ stream<br>Band 3: 5745, 5785 and 5825 | Band UNII 2C : 5510, 5590, 5710MHz<br>2Streams –13.5Mbps/ stream<br>Band 3: 5755 and 5795 | Band UNII 2C: 5530, , 5690MHz<br>2Streams – 56.5Mbps/ stream<br>Band 3: 5775 |
| Transmitted Spurious Emission (30 MHz – 1GHz)<br>FCC Part 15.205, 15.209, 15.407(b) | Band UNII 2C: 5500, 5600, 5700 MHz<br>2Streams – 6.0 and 6.5Mbps/ stream<br>Band 3: 5745, 5785 and 5825 | Band UNII 2C : 5510, 5590, 5710MHz<br>2Streams –13.5Mbps/ stream<br>Band 3: 5755 and 5795 | Band UNII 2C: 5530, , 5690MHz<br>2Streams – 56.5Mbps/ stream<br>Band 3: 5775 |
| Transmitted Spurious Emission (Above 1GHz)<br>FCC Part 15.205, 15.209, 15.407(b) | Band UNII 2C: 5500, 5600, 5700 MHz<br>2Streams – 6.0 and 6.5Mbps/ stream<br>Band 3: 5745, 5785 and 5825 | Band UNII 2C : 5510, 5590, 5710MHz<br>2Streams –13.5Mbps/ stream<br>Band 3: 5755 and 5795 | Band UNII 2C: 5530, , 5690MHz<br>2Streams – 56.5Mbps/ stream<br>Band 3: 5775 |
| Conducted Spurious Emission (antenna port). FCC Part 15.407 (b) | According to CFR47 15.407 (b) EIPR shall not exceed -27 dBm/MHz. This is equivalent to the field strength of 68.2dBuV/m at 3 meter distance. The EUT is satisfied the requirement by meeting the limit under CFR47 Part 15.209. | | |
| AC Conducted Emission<br>FCC Part 15.207 | | 5500 MHz at<br>2 Data Stream: 6.5Mbp | |
| Frequency Stability<br>FCC Part 15.407 (g) | CW Tone at 5500 MHz. | | |
| Voltage Variation<br>FCC Part 15.31 (e) | Continuous wave at 5500 MHz, | | |
| Dynamic Frequency Selection<br>FCC Part 15.407 (h) | 5470 – 5725 MHz band supports DFS. EUT is client device. See DFS test report. | | |

**Note:** 1. All radiated emission performed on X-Axis.
2. All two chains will be on at all time.
3. All tests were pre-scanned for worst case before final testing.

## 7.4 Test Specifications

Testing requirements

**Table 19:** Test Specifications

| Emissions and Immunity | |
|---|---|
| Standard | Requirement |
| CFR 47 Part 15.407: 2013 | All |
| RSS 210 Issue 8, 2010 | All |