

# Emissions Test Report

**EUT Name:** Wireless Audio Headset  
**Model No.:** Ear Force Stealth 700X  
CFR 47 Part 15.407 2017 and RSS 247: 2017

*Prepared for:*

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*Report/Issue Date:* October 12, 2017  
*Job #* 0000150094  
*Report Number:* 31763105.001

## Revisions

| Revision No. | Date MM/DD/YYYY | Reason for Change              | Author   |
|--------------|-----------------|--------------------------------|----------|
| 0            | 09/22/2017      | Original Document              | N/A      |
| 1            | 10/12/2017      | Remove RF Exposure Information | J. Luong |
|              |                 |                                |          |
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Note: Latest revision report will replace all previous reports.

# Statement of Compliance

**Manufacturer:** Voyetra Turtle Beach, Inc.  
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**Requester / Applicant:** Tim Blaney

**Name of Equipment:** Wireless Audio Headset  
**Model No.** Ear Force Stealth 700X (TB300-2770-01)  
**Type of Equipment:** Intentional Radiator  
**Application of Regulations:** CFR 47 Part 15.407 2017 and RSS 247: 2017  
**Test Dates:** May 22, 2017 to August 8, 2017

## Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v01r04

## Test Methods:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v01r04

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.



Jeremy Luong October 12, 2017

Test Engineer Date



David Spencer October 12, 2017

Laboratory Signatory Date



Industry  
Canada Industrie  
Canada

Testing Cert #3331.02

US1131

2932M

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# **1 Executive Summary**

## **1.1 Scope**

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.407 2017 and RSS 247: 2017 based on the results of testing performed on May 22, 2017 to August 8, 2017 on the Wireless Audio Headset Model Ear Force Stealth 700X manufactured by Voyetra Turtle Beach, Inc. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

## **1.2 Purpose**

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report. The 5180 MHz – 5320 MHz, 5500 MHz – 5700 MHz, and 5745 MHz – 5825 MHz frequency bands are covered in this document.

### 1.3 Summary of Test Results

**Table 1:** Summary of Test Results

| Test                                  | Test Method<br>ANSI C63.10:2013                                        | Test<br>Parameters                                          | Measured Value                                                                                         | Result          |
|---------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------|
| Duty Cycle                            | Information Only                                                       | N/A                                                         | 100%                                                                                                   | N/A             |
| Spurious Emission in Transmitted Mode | CFR47 15.209, CFR47 15.407 (b) RSS-GEN Sect.8.9, RSS 247 Sect. 6.2.1.2 | Class B                                                     | -7.80 dB Margin                                                                                        | <b>Complied</b> |
| Restricted Bands of Operation         | CFR47 15.205, RSS GEN Sect.8.10                                        | Class B                                                     |                                                                                                        | <b>Complied</b> |
| AC Power Conducted Emission           | CFR47 15.207, RSS-GEN Sect.8.8                                         | Class B                                                     | -8.24 dB Margin                                                                                        | <b>Complied</b> |
| Occupied Bandwidth                    | CFR47 15.407 (a) & (e), RSS GEN Sect.6.6, RSS-247 Sect.6.2.4.1         | DTS $\geq$ 500 kHz                                          | 99% BW: 16.83 MHz<br>26dB BW: 23.13 MHz<br>DTS BW: 16.32 MHz                                           | <b>Complied</b> |
| Maximum Output Power                  | CFR47 15.407 (a) RSS 247 Sect. 6.2                                     | UNII1: 250mW<br>UNII2a: 250mW<br>UNII2c: 250mW<br>UNII3: 1W | UNII1: 7.87dBm/ 6.12mW<br>UNII2a: 7.95dBm/ 6.24mW<br>UNII2c: 7.84dBm/ 6.08mW<br>UNII3: 7.91dBm/ 6.18mW | <b>Complied</b> |
| Peak Power Spectral Density           | CFR47 15.407 (a) RSS 247 Sect. 6.2 (UNII2a, UNII2c & UNII3)            | < 11 dBm/MHz<br>< 30 dBm/ 500 kHz                           | UNII1: -2.57 dBm/ MHz<br>UNII2a: -2.30 dBm/ MHz<br>UNII2c: -2.48 dBm/ MHz<br>UNII3: -5.46 dBm/ 500kHz  | <b>Complied</b> |
|                                       | RSS 247 Sect.6.2.1.1                                                   | < 10 dBm/MHz (e.i.r.p)                                      | UNII1: -2.57 dBm/ MHz                                                                                  | <b>Complied</b> |
| Conducted Emission – Antenna Port     | CFR47 15.407 (b)(1) (2)(3) RSS 247 Sect.6.2.1 to 6.2.3                 | < -27 dBm/MHz                                               | -10.22 dB Margin                                                                                       | <b>Complied</b> |
|                                       | CFR47 15.407 (b)(4) RSS 247 Sect.6.2.4                                 | Spectrum Mask                                               | -2.37 dB Margin                                                                                        | <b>Complied</b> |
| Frequency Stability                   | CFR47 15.407 (g), RSS GEN Sect. 6.11                                   | $\pm$ 20 ppm                                                | 7.89 ppm                                                                                               | <b>Complied</b> |
| Voltage Variation                     | CFR47 15.31(e)                                                         | $\pm$ 20 ppm                                                | 3.40 ppm                                                                                               | <b>Complied</b> |

### 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 (US1131). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

#### 2.1.2 NIST / A2LA



TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab Code Testing Cert #3331.02). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

#### 2.1.3 Canada – Industry Canada



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

#### 2.1.4 Japan – VCCI



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

VCCI Registration No. for Pleasanton: A-0268

#### 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.

### **2.2.1 Emission Test Facility**

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). A report detailing this site can be obtained from TUV Rheinland of North America.

### **2.2.2 Immunity Test Facility**

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

For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of  $10^9$  Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470-k $\Omega$  resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470-k $\Omega$  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*, 1<sup>st</sup> 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:

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

Where: RAW = Measured level before correction (dB $\mu$ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

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

#### Sample radiated emissions calculation @ 30 MHz

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

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

### 2.3.2 Measurement Uncertainty

| Per CISPR 16-4-2                               | U <sub>lab</sub> | U <sub>cispr</sub> |
|------------------------------------------------|------------------|--------------------|
| <b>Radiated Disturbance @ 10 meters</b>        |                  |                    |
| 30 – 1,000 MHz                                 | 2.25 dB          | 4.51 dB            |
| <b>Radiated Disturbance @ 3 meters</b>         |                  |                    |
| 30 – 1,000 MHz                                 | 2.26 dB          | 4.52 dB            |
| 1 – 6 GHz                                      | 2.12 dB          | 4.25 dB            |
| 6 – 18 GHz                                     | 2.47 dB          | 4.93 dB            |
| <b>Conducted Disturbance @ Mains Terminals</b> |                  |                    |
| 150 kHz – 30 MHz                               | 1.09 dB          | 2.18 dB            |
| <b>Disturbance Power</b>                       |                  |                    |
| 30 MHz – 300 MHz                               | 3.92 dB          | 4.3 dB             |

### Voltech PM6000A

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

### 2.3.3 Measurement Uncertainty Immunity

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

### Thermo KeyTek EMC Pro

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

### Measurement Uncertainty – Radio Testing

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
| The estimated combined standard uncertainty for frequency error measurements is $\pm 3.88$ Hz                |
| The estimated combined standard uncertainty for carrier power measurements is $\pm 1.59$ dB.                 |
| The estimated combined standard uncertainty for adjacent channel power measurements is $\pm 1.47$ dB.        |
| The estimated combined standard uncertainty for modulation frequency response measurements is $\pm 0.46$ dB. |
| The estimated combined standard uncertainty for transmitter conducted emission measurements is $\pm 4.01$ 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 Stealth 700X is a completely wireless Xbox One audio gaming headset. It wirelessly connects directly to the Xbox One console over either a 2.4 GHz or 5.0 GHz Wi-Fi link. The functionality in the headset consists of 50mm speaker drivers, a flip up non-removable microphone, microphone monitoring (adjustable via EFAH) and game/chat mix controls on the headset. Additional wireless functionality includes a Bluetooth radio that provides simultaneous connection to a Turtle Beach mobile application and device audio profile for communication with a mobile phone. Additionally, it has a ProSpecs alternative glasses relief ear pad design. With the Microsoft integrated radio module, this headset is also capable of working with compatible Windows PCs in the future.

### 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

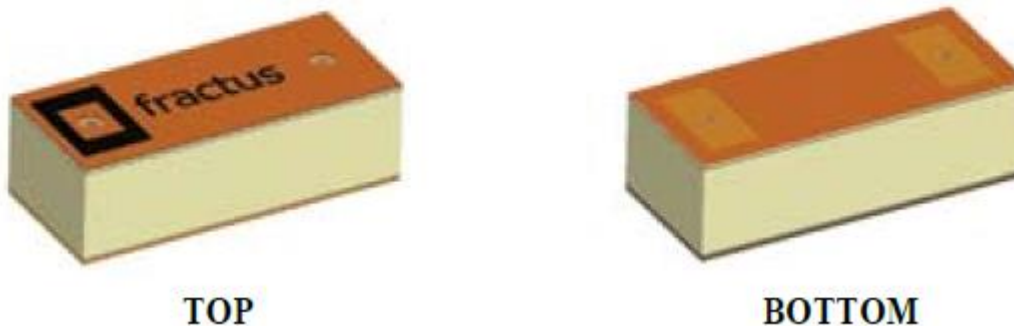
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply 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 Wireless Audio Headset uses a dual band Fractus chip antenna for operation in the 2.4 GHz and 5150 MHz to 5850 MHz bands. The chip antenna is integrated on the PCB. It has a peak gain of 1.8 dBi in the 2.4 GHz band and 4.9 dBi in the 5150 MHz to 5850 MHz band.

There is an additional antenna specification available in the submittal package.

**7.0 mm x 3.0 mm x 2.0 mm** (image larger than real size)

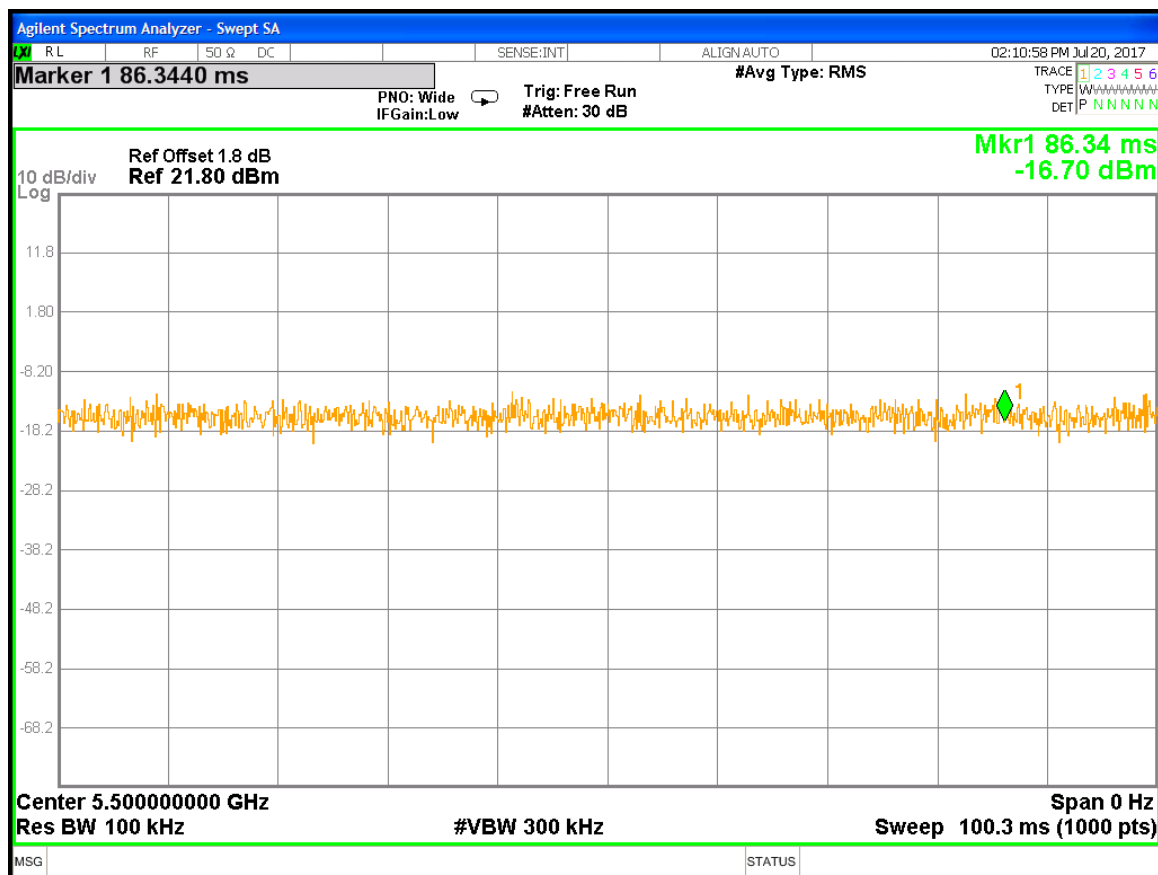


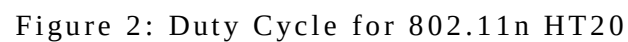
### 3.5 Duty Cycle

The Ear Force Stealth 700X, SN: PP1 was measured for the duty cycle

#### 3.5.1 Results

| Mode                                                                                                | On Time<br>(ms) | Period<br>(ms) | Duty Cycle<br>(%) | Duty Factor<br>(dB) |
|-----------------------------------------------------------------------------------------------------|-----------------|----------------|-------------------|---------------------|
| 802.11a                                                                                             | 100             | 0              | 100               | 0                   |
| 802.11n HT20                                                                                        | 100             | 0              | 100               | 0                   |
| <b>Notes:</b> EUT configured and measured for the duty cycle. All measurements use 100% duty cycle. |                 |                |                   |                     |





## 4 Emissions

Testing was performed in accordance with CFR 47 Part 15.407: 2017 and RSS 247: 2017. 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 transmitted power limits per CFR47 Part 15.407 and RSS-247 are*

*Part 15.407(a)(1)(iv) – Band 5150-5250 MHz: 250 mW.*

*Part 15.407(a)(2) – Band 5250-5350 MHz, 5470-5725 MHz: 250 mW or 11 dBm + 10Log B.*

*Part 15.407(a)(3) – Band 5725-5825 MHz: 1 W*

*RSS 247 Sect. 6.2.1.1 – Band 5150-5250 MHz (e.i.r.p.): 200 mW or 10 + 10Log(B)*

*RSS 247 Sect. 6.2.2.1 – Band 5250-5350 MHz, 5470-5725 MHz: 250 mW or 11 dBm + 10Log B*

*RSS 247 Sect. 6.2.2.1, 6.2.3.1 – Band 5250-5350 MHz, 5470-5725 MHz: 250 mW or 11 dBm + 10Log B.*

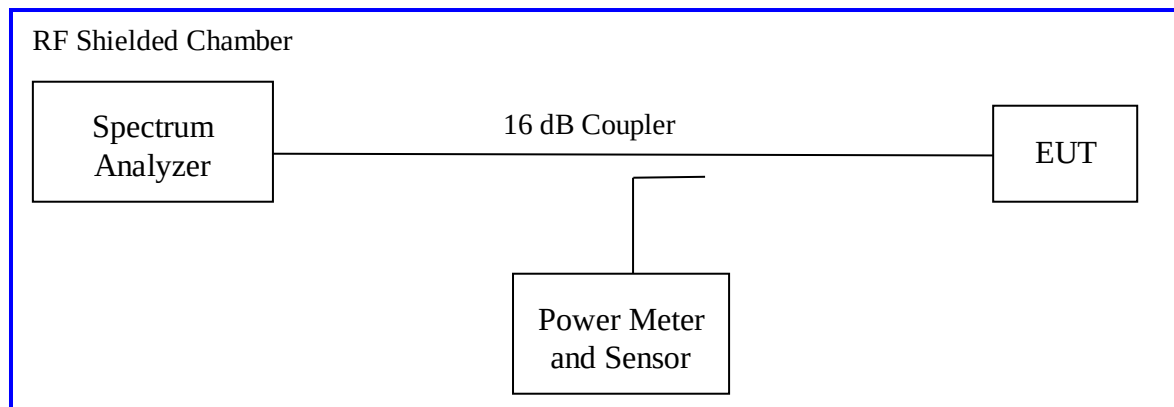
*RSS 247 Sect. 6.242.1 – Band 5725-5850 MHz: 1 W*

*Note: B is the 99% emission bandwidth.*

#### 4.1.1 Test Method

The ANSI C63.10-2013 Section 12.3.2.2 conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate/ chain to determine the highest power output for each mode. The worst findings were conducted on 3 channels in each operating range per CFR47 Part 15.407(a) and RSS 247 Sect. 6.2.1.1. The worst mode results indicated below.

Test Setup:



*Method SA-1 of “KDB 789033 D02 – 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.*

## 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 per FCC

| Test Conditions: Conducted Measurement                                                |                |                 | Date: July 17, 2017             |                  |                |
|---------------------------------------------------------------------------------------|----------------|-----------------|---------------------------------|------------------|----------------|
| Antenna Type: Chip                                                                    |                |                 | Power Setting: See test plan.   |                  |                |
| Antenna Gain: 4.9 dBi                                                                 |                |                 | Signal State: Modulated at 100% |                  |                |
| Ambient Temp.: 23 °C                                                                  |                |                 | Relative Humidity:38%           |                  |                |
| 802.11a at 6 Mbps (FCC Limit)                                                         |                |                 |                                 |                  |                |
| Frequency<br>(MHz)                                                                    | Limit<br>[dBm] | Output<br>[dBm] | Duty Cycle<br>[dB]              | ∑ Power<br>[dBm] | Margin<br>[dB] |
| 5180                                                                                  | 23.98          | 7.65            |                                 |                  | -16.33         |
| 5200                                                                                  | 23.98          | 7.79            |                                 |                  | -16.19         |
| 5240                                                                                  | 23.98          | 7.62            |                                 |                  | -16.36         |
| 5260                                                                                  | 23.98          | 7.64            |                                 |                  | -16.34         |
| 5300                                                                                  | 23.98          | 7.58            |                                 |                  | -16.40         |
| 5320                                                                                  | 23.98          | 7.81            |                                 |                  | -16.17         |
| 5500                                                                                  | 23.98          | 7.84            |                                 |                  | -16.14         |
| 5580                                                                                  | 23.98          | 7.76            |                                 |                  | -16.22         |
| 5700                                                                                  | 23.98          | 7.61            |                                 |                  | -16.37         |
| 5745                                                                                  | 30.00          | 7.63            |                                 |                  | -22.37         |
| 5785                                                                                  | 30.00          | 7.91            |                                 |                  | -22.09         |
| 5825                                                                                  | 30.00          | 7.85            |                                 |                  | -22.15         |
| Note: The headset is a client device.<br>Worst case condition was observed at 6 Mbps. |                |                 |                                 |                  |                |

| <b>802.11n HT20 at 6.5 Mbps (FCC Limit)</b>                                                    |                        |                         |                            |                                            |                        |
|------------------------------------------------------------------------------------------------|------------------------|-------------------------|----------------------------|--------------------------------------------|------------------------|
| <b>Frequency<br/>(MHz)</b>                                                                     | <b>Limit<br/>[dBm]</b> | <b>Output<br/>[dBm]</b> | <b>Duty Cycle<br/>[dB]</b> | <b><math>\Sigma</math> Power<br/>[dBm]</b> | <b>Margin<br/>[dB]</b> |
| 5180                                                                                           | 23.98                  | 7.70                    |                            |                                            | -16.28                 |
| 5200                                                                                           | 23.98                  | 7.60                    |                            |                                            | -16.38                 |
| 5240                                                                                           | 23.98                  | 7.87                    |                            |                                            | -16.11                 |
| 5260                                                                                           | 23.98                  | 7.56                    |                            |                                            | -16.42                 |
| 5300                                                                                           | 23.98                  | 7.95                    |                            |                                            | -16.03                 |
| 5320                                                                                           | 23.98                  | 7.68                    |                            |                                            | -16.30                 |
| 5500                                                                                           | 23.98                  | 7.73                    |                            |                                            | -16.25                 |
| 5580                                                                                           | 23.98                  | 7.63                    |                            |                                            | -16.35                 |
| 5700                                                                                           | 23.98                  | 7.51                    |                            |                                            | -16.47                 |
| 5745                                                                                           | 30.00                  | 7.61                    |                            |                                            | -22.39                 |
| 5785                                                                                           | 30.00                  | 7.82                    |                            |                                            | -22.18                 |
| 5825                                                                                           | 30.00                  | 7.73                    |                            |                                            | -22.27                 |
| <b>Note:</b> The headset is a client device.<br>Worst case condition was observed at 6.5 Mbps. |                        |                         |                            |                                            |                        |

**Table 3: RF Output Power at the Antenna Port – Test Results per RSS-247**

|                                                                                                                                                                   |                |                 |                                 |                  |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------|---------------------------------|------------------|----------------|
| Test Conditions: Conducted Measurement                                                                                                                            |                |                 | Date: July 17, 2017             |                  |                |
| Antenna Type: Chip                                                                                                                                                |                |                 | Power Setting: See test plan.   |                  |                |
| Antenna Gain: 4.9 dBi                                                                                                                                             |                |                 | Signal State: Modulated at 100% |                  |                |
| Ambient Temp.: 23 °C                                                                                                                                              |                |                 | Relative Humidity: 38%          |                  |                |
| 802.11a at 6 Mbps (RSS-247 Limit)                                                                                                                                 |                |                 |                                 |                  |                |
| Frequency<br>(MHz)                                                                                                                                                | Limit<br>[dBm] | Output<br>[dBm] | Duty Cycle<br>[dB]              | ∑ Power<br>[dBm] | Margin<br>[dB] |
| 5180                                                                                                                                                              | 18.10          | 7.65            |                                 |                  | -10.45         |
| 5200                                                                                                                                                              | 18.10          | 7.79            |                                 |                  | -10.31         |
| 5240                                                                                                                                                              | 18.10          | 7.62            |                                 |                  | -10.48         |
| 5260                                                                                                                                                              | 23.98          | 7.64            |                                 |                  | -16.34         |
| 5300                                                                                                                                                              | 23.98          | 7.58            |                                 |                  | -16.40         |
| 5320                                                                                                                                                              | 23.98          | 7.81            |                                 |                  | -16.17         |
| 5500                                                                                                                                                              | 23.98          | 7.84            |                                 |                  | -16.14         |
| 5580                                                                                                                                                              | 23.98          | 7.76            |                                 |                  | -16.22         |
| 5700                                                                                                                                                              | 23.98          | 7.61            |                                 |                  | -16.37         |
| 5745                                                                                                                                                              | 30.00          | 7.63            |                                 |                  | -22.37         |
| 5785                                                                                                                                                              | 30.00          | 7.91            |                                 |                  | -22.09         |
| 5825                                                                                                                                                              | 30.00          | 7.85            |                                 |                  | -22.15         |
| <b>Note:</b> The headset is a client device.<br>Worst case condition was observed at 6 Mbps.<br>For 5150 – 5250 MHz, RSS-247 Limit = 23 dBm – 4.9 dBi = 18.10 dBm |                |                 |                                 |                  |                |
| 802.11n HT20 at 6.5 Mbps (RSS-247 Limit)                                                                                                                          |                |                 |                                 |                  |                |
| Frequency<br>(MHz)                                                                                                                                                | Limit<br>[dBm] | Output<br>[dBm] | Duty Cycle<br>[dB]              | ∑ Power<br>[dBm] | Margin<br>[dB] |
| 5180                                                                                                                                                              | 18.10          | 7.70            |                                 |                  | -10.40         |
| 5200                                                                                                                                                              | 18.10          | 7.60            |                                 |                  | -10.50         |
| 5240                                                                                                                                                              | 18.10          | 7.87            |                                 |                  | -10.23         |
| 5260                                                                                                                                                              | 23.98          | 7.56            |                                 |                  | -16.42         |
| 5300                                                                                                                                                              | 23.98          | 7.95            |                                 |                  | -16.03         |
| 5320                                                                                                                                                              | 23.98          | 7.68            |                                 |                  | -16.30         |

|                                                                                                                                                                     |       |      |  |  |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|--|--|--------|
| 5500                                                                                                                                                                | 23.98 | 7.73 |  |  | -16.25 |
| 5580                                                                                                                                                                | 23.98 | 7.63 |  |  | -16.35 |
| 5700                                                                                                                                                                | 23.98 | 7.51 |  |  | -16.47 |
| 5745                                                                                                                                                                | 30.00 | 7.61 |  |  | -22.39 |
| 5785                                                                                                                                                                | 30.00 | 7.82 |  |  | -22.18 |
| 5825                                                                                                                                                                | 30.00 | 7.73 |  |  | -22.27 |
| <b>Note:</b> The headset is a client device.<br>Worst case condition was observed at 6.5 Mbps.<br>For 5150 – 5250 MHz, RSS-247 Limit = 23 dBm – 4.9 dBi = 18.10 dBm |       |      |  |  |        |

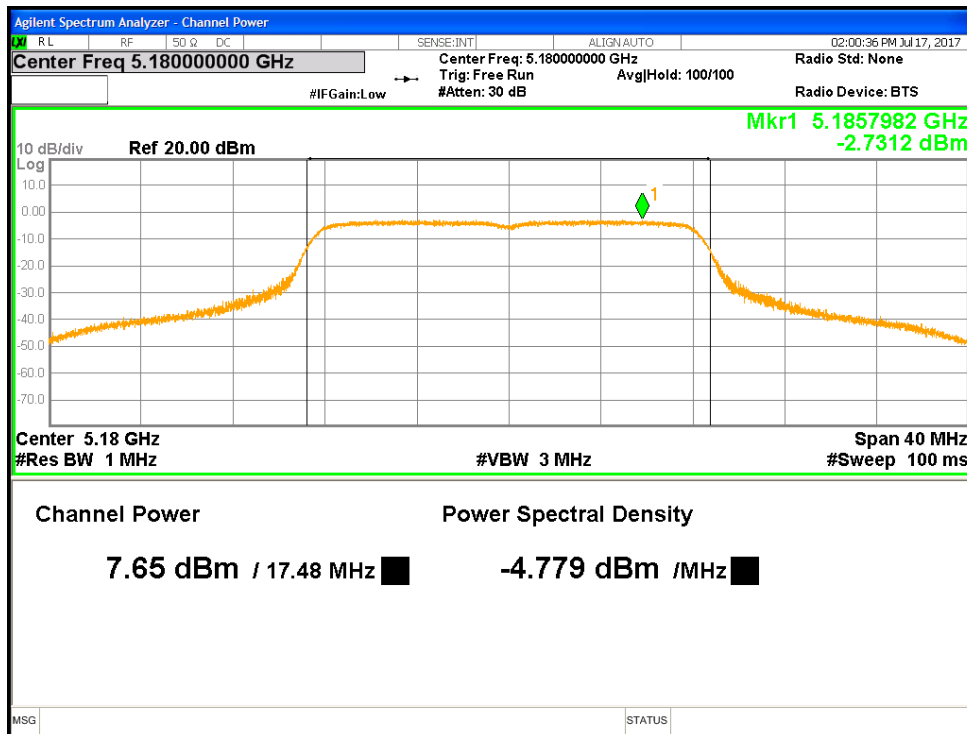


Figure 3: Conducted Output Power-5180 MHz-11a-6 Mbps

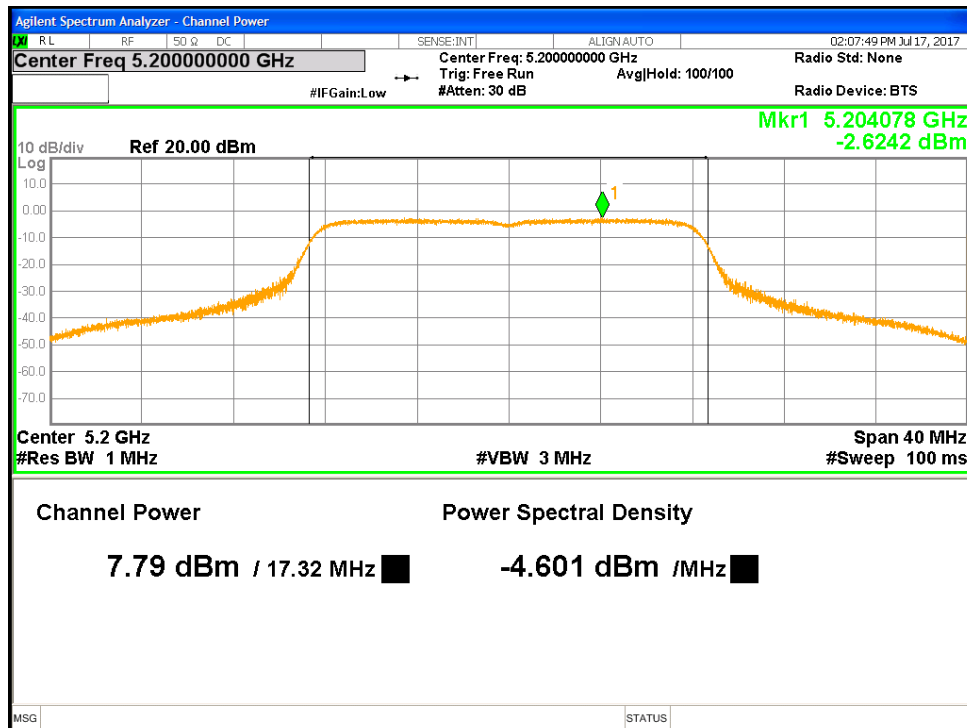


Figure 4: Conducted Output Power -5200 MHz-11a-6 Mbps

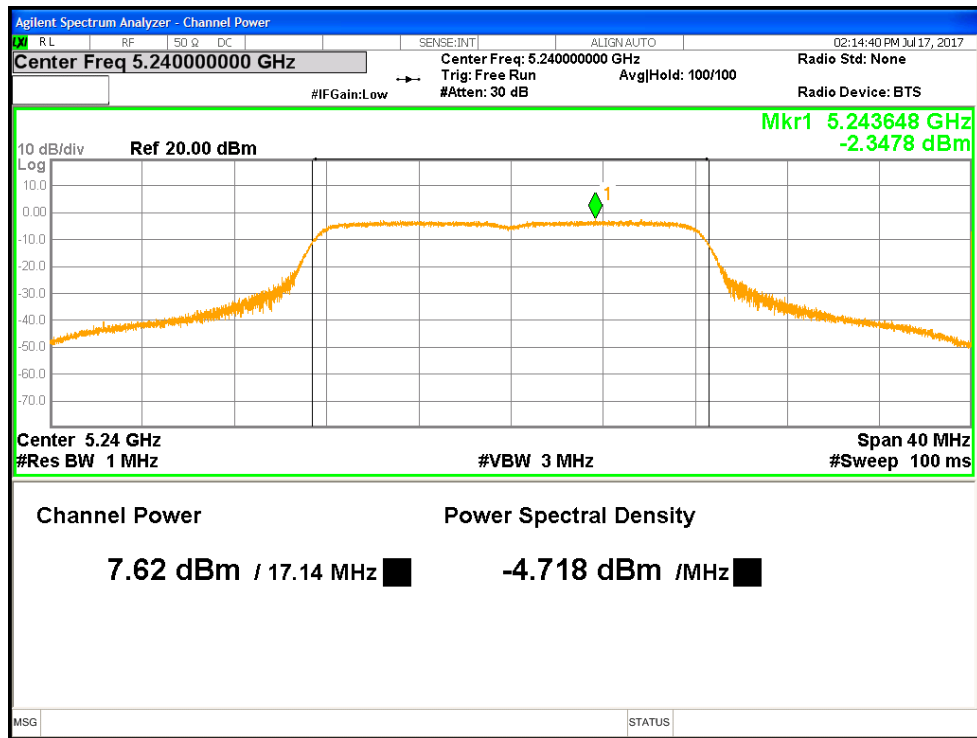


Figure 5: Conducted Output Power-5240 MHz-11a-6 Mbps

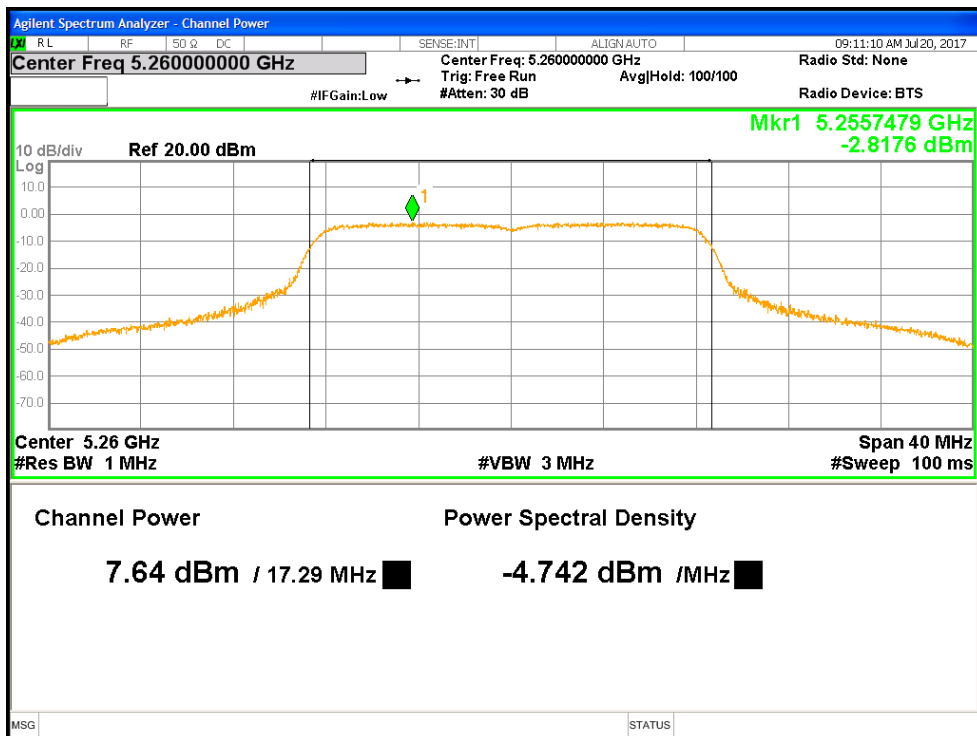


Figure 6: Conducted Output Power-5260 MHz-11a-6 Mbps

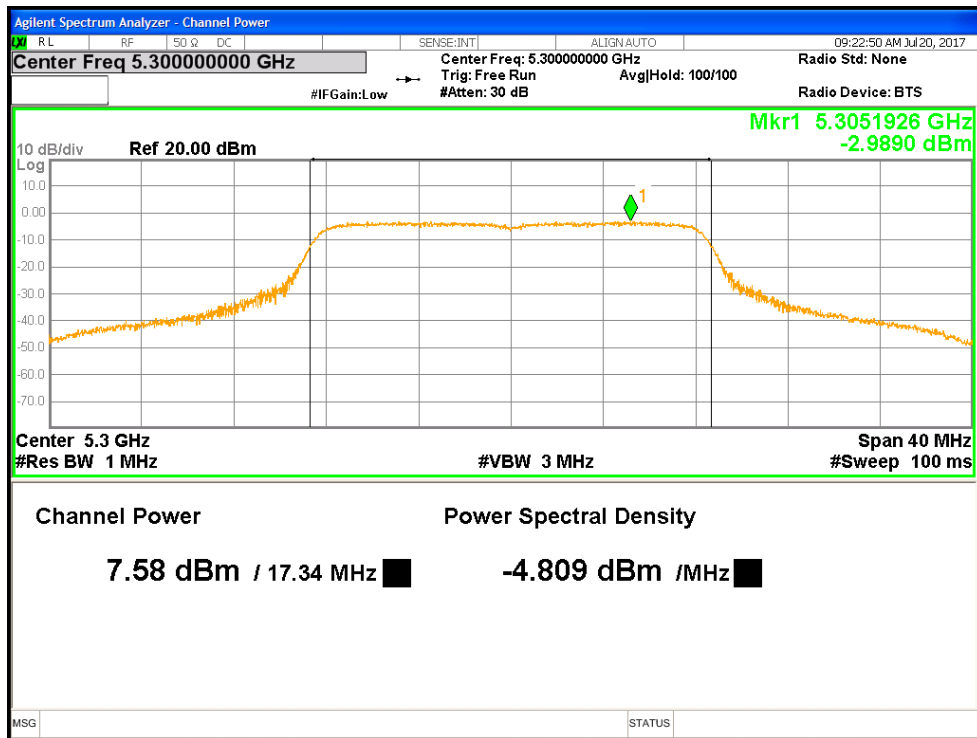


Figure 7: Conducted Output Power-5300 MHz-11a-6 Mbps

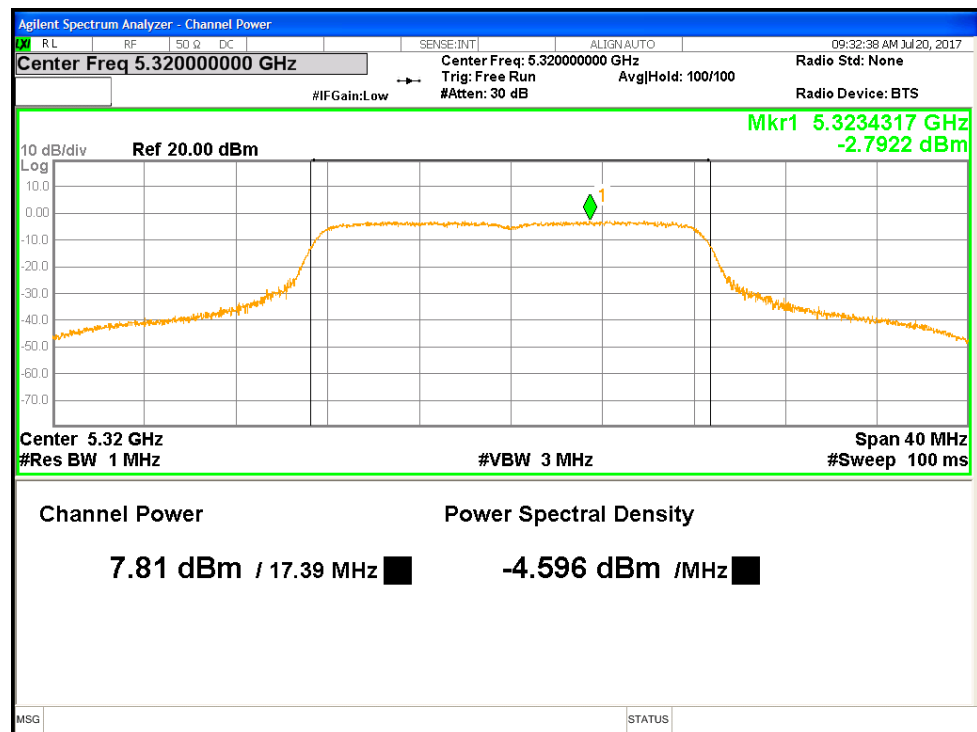


Figure 8: Conducted Output Power-5320 MHz-11a-6 Mbps

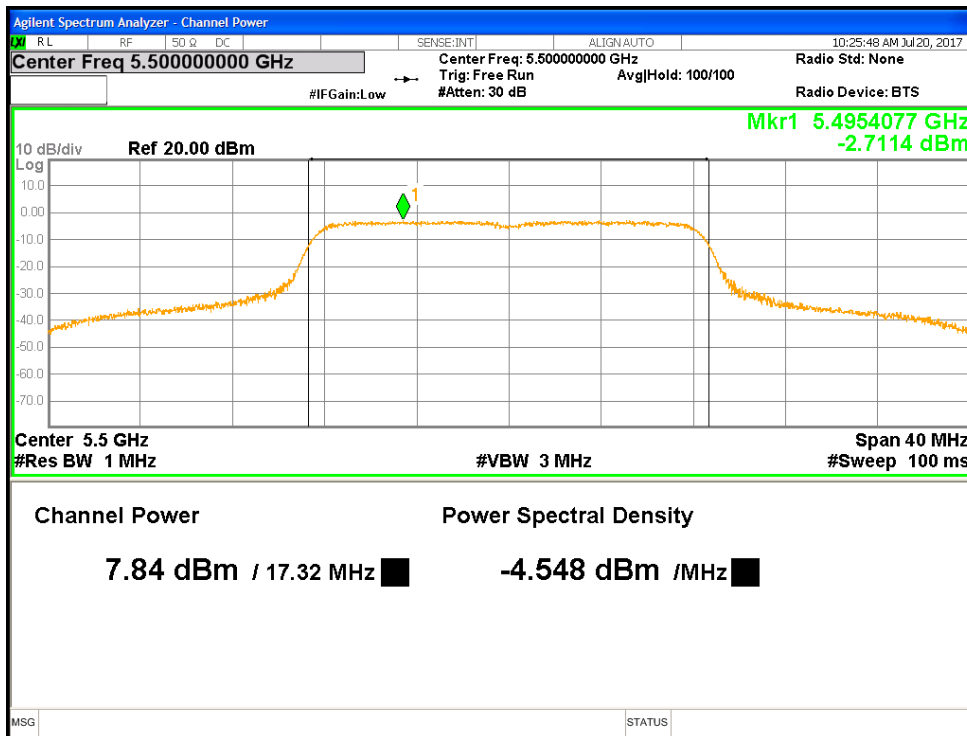


Figure 9: Conducted Output Power-5500 MHz-11a-6 Mbps

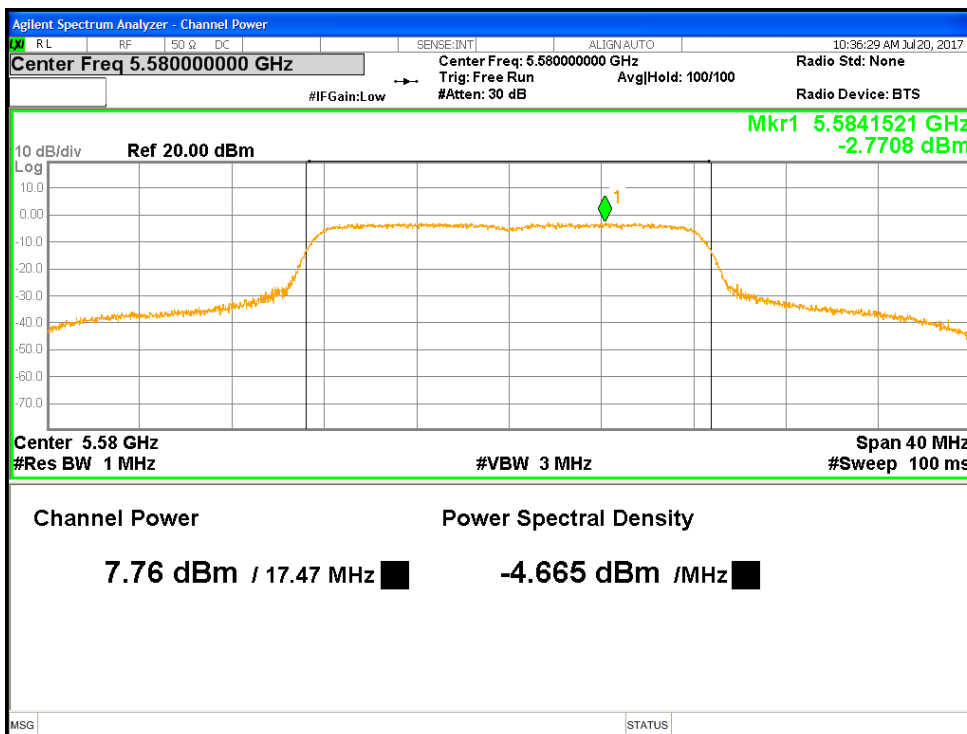


Figure 10: Conducted Output Power-5580 MHz-11a-6 Mbps

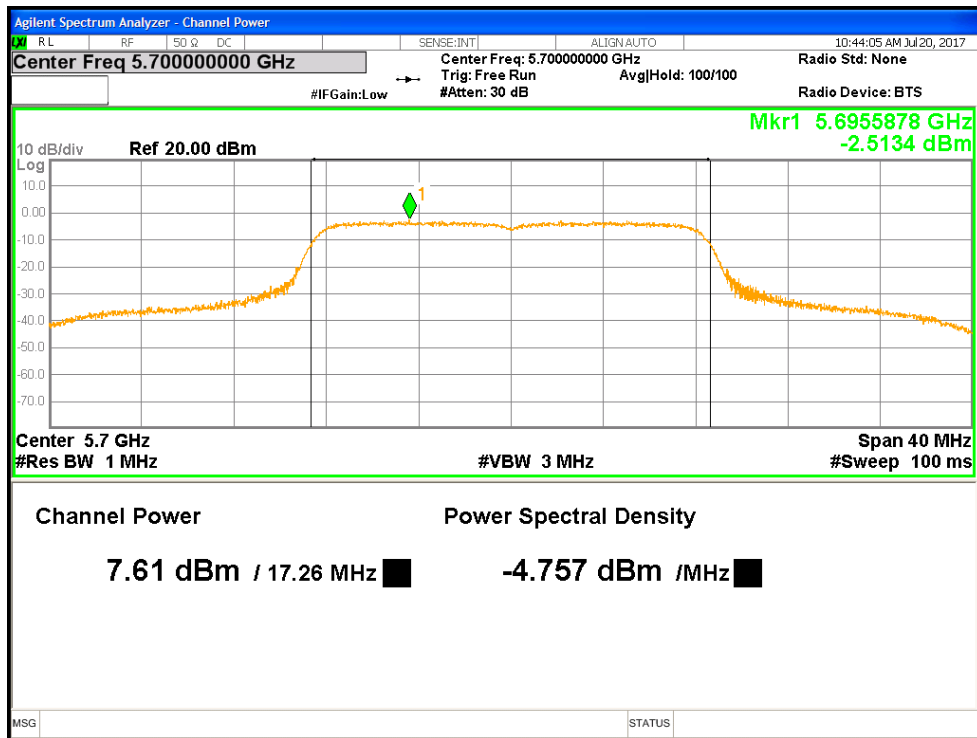


Figure 11: Conducted Output Power-5700 MHz-11a-6 Mbps

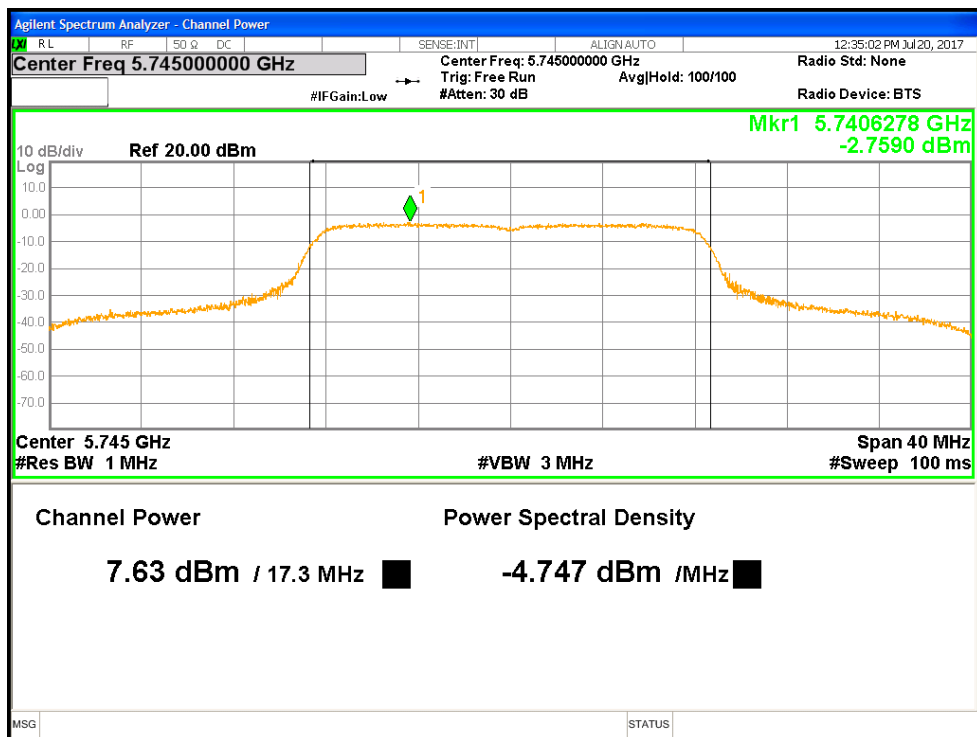


Figure 12: Conducted Output Power-5745 MHz-11a-6 Mbps

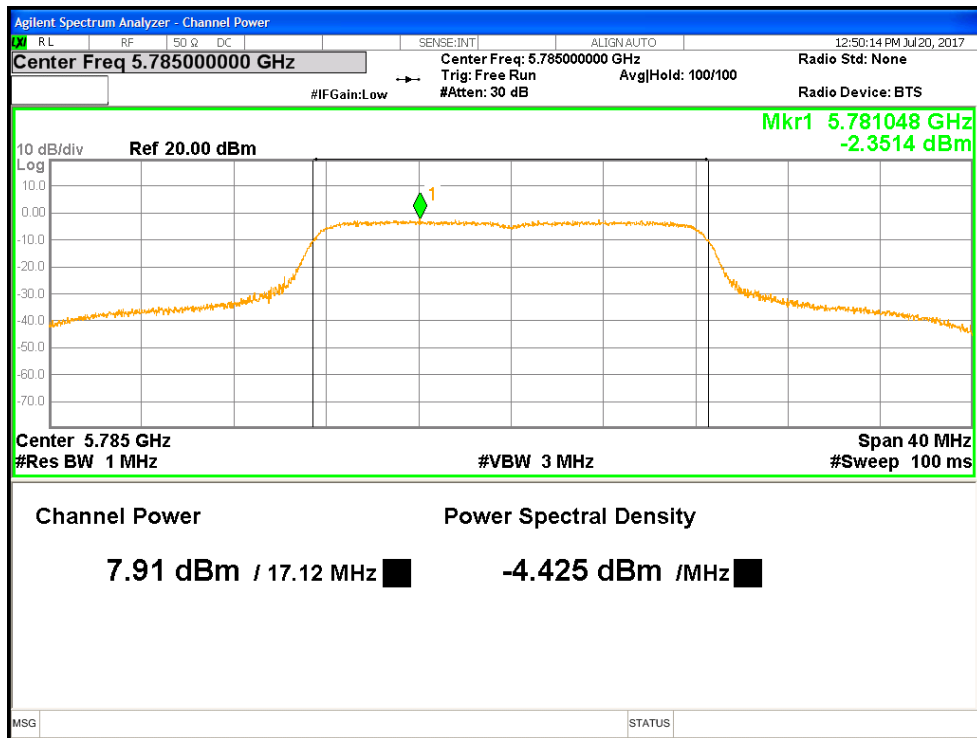


Figure 13: Conducted Output Power-5785 MHz-11a-6 Mbps

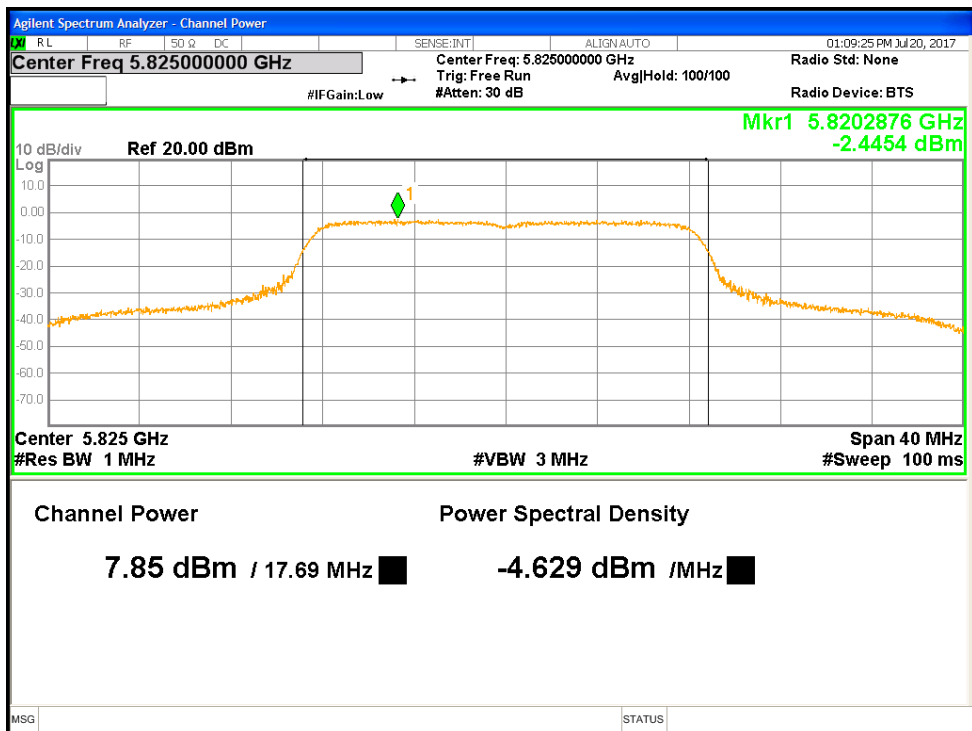


Figure 14: Conducted Output Power-5825 MHz-11a-6 Mbps

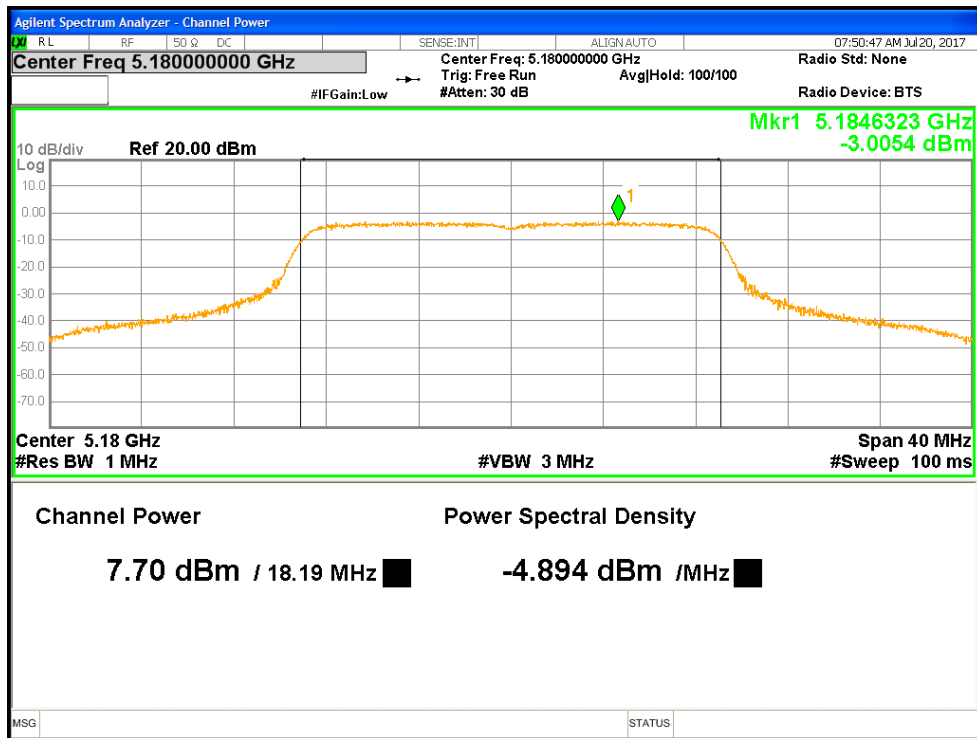


Figure 15: Conducted Output Power-5180 MHz-HT20-6.5 Mbps

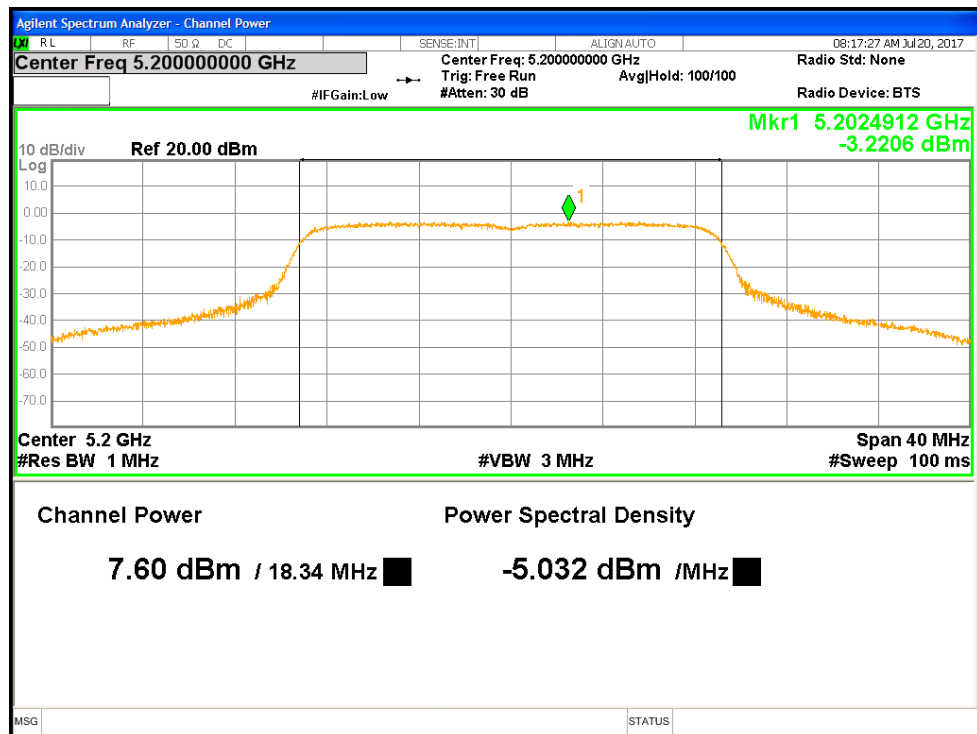


Figure 16: Conducted Output Power -5200 MHz-HT20-6.5 Mbps

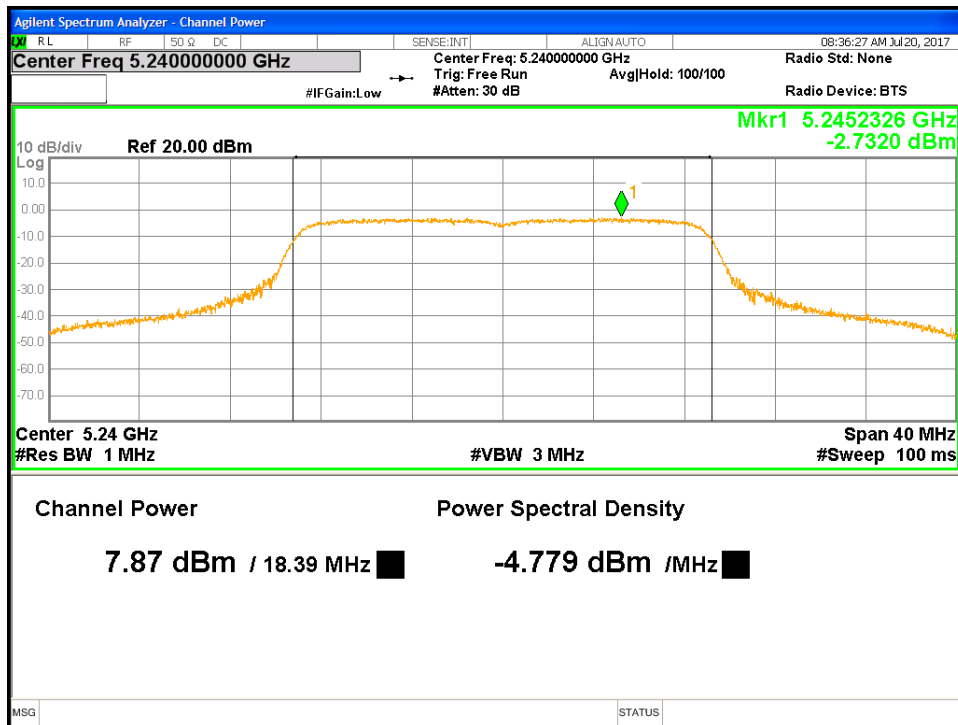


Figure 17: Conducted Output Power-5240 MHz-HT20-6.5 Mbps

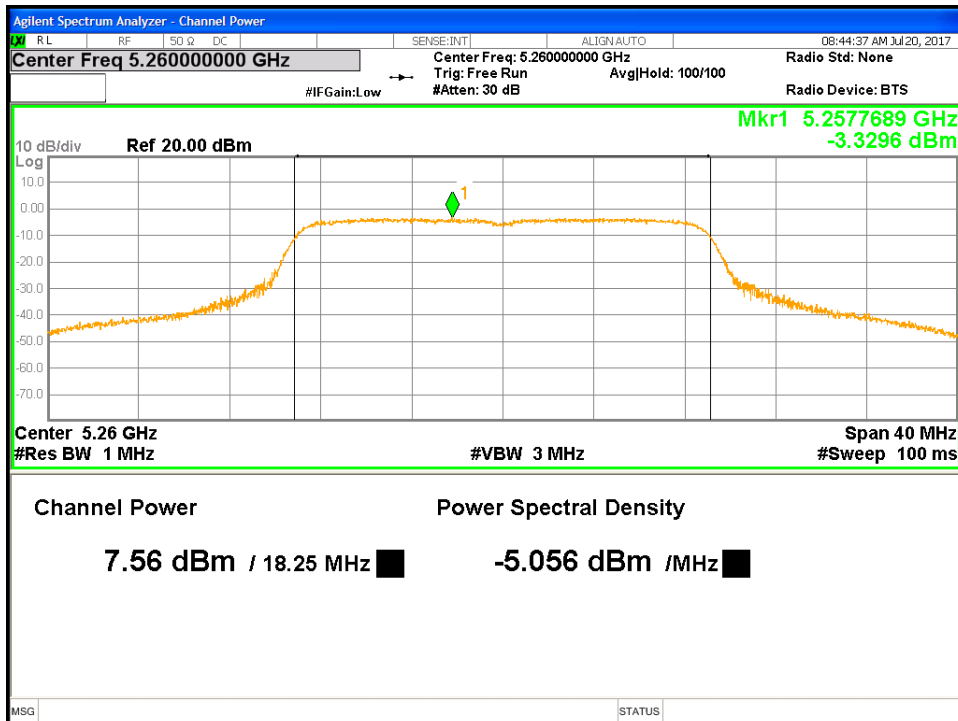


Figure 18: Conducted Output Power-5260 MHz-HT20-6.5 Mbps

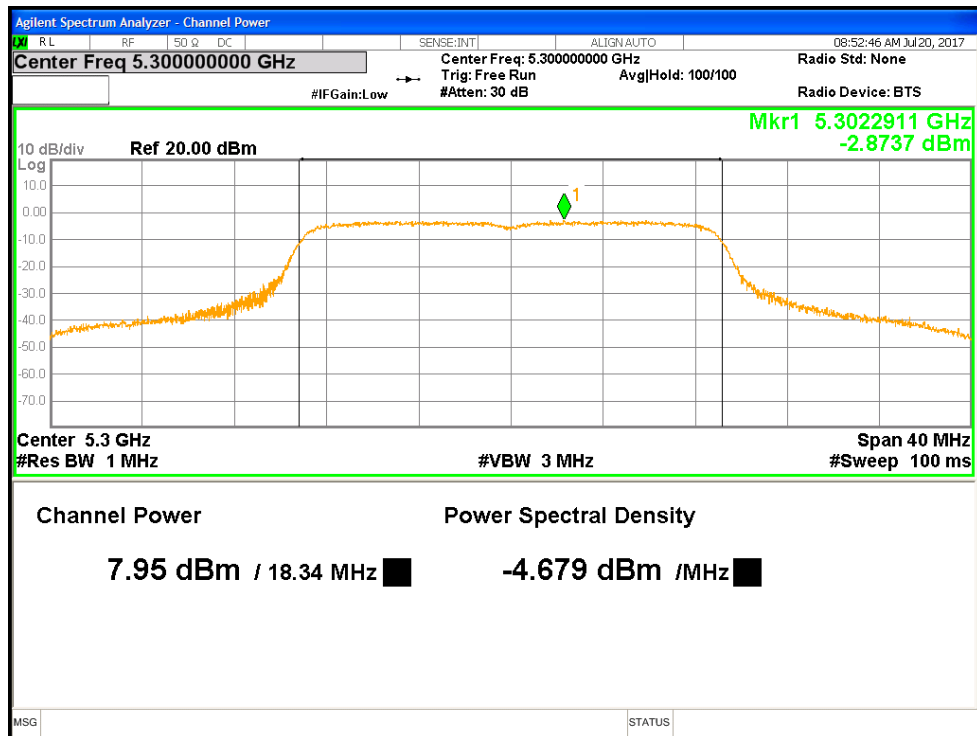


Figure 19: Conducted Output Power-5300 MHz-HT20-6.5 Mbps

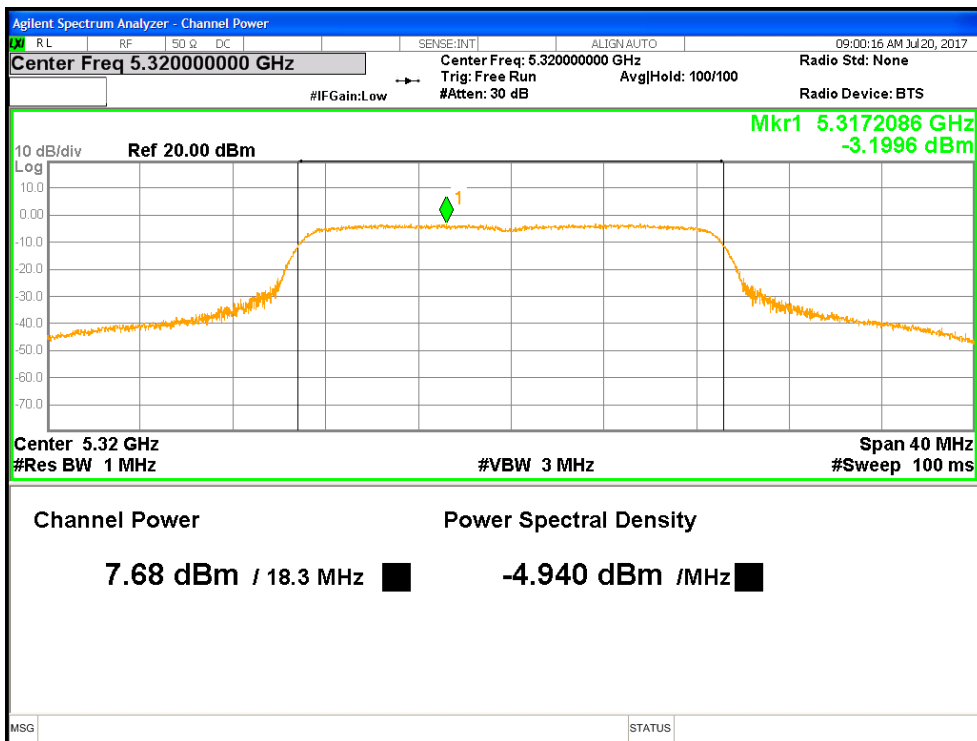


Figure 20: Conducted Output Power-5320 MHz-HT20-6.5 Mbps

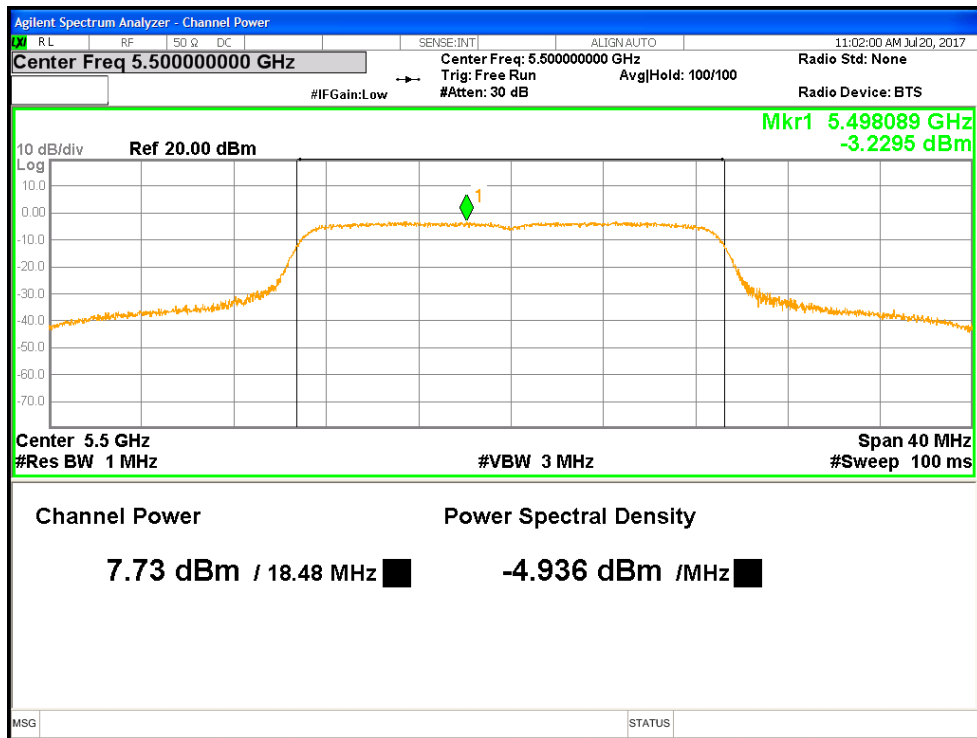


Figure 21: Conducted Output Power-5500 MHz-HT20-6.5 Mbps

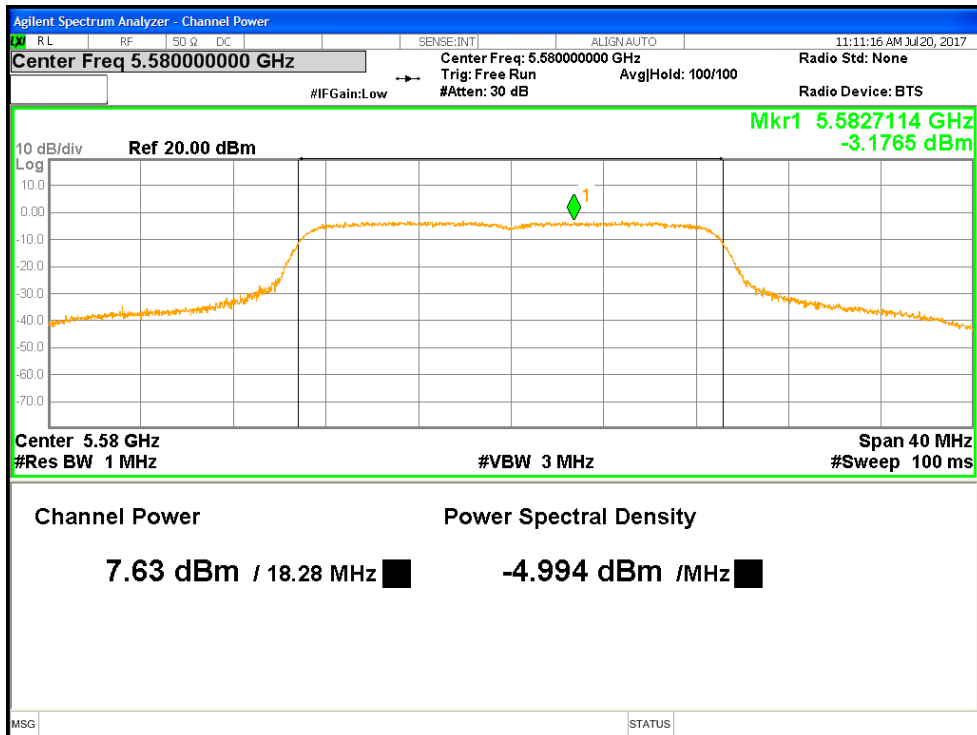


Figure 22: Conducted Output Power-5580 MHz-HT20-6.5 Mbps

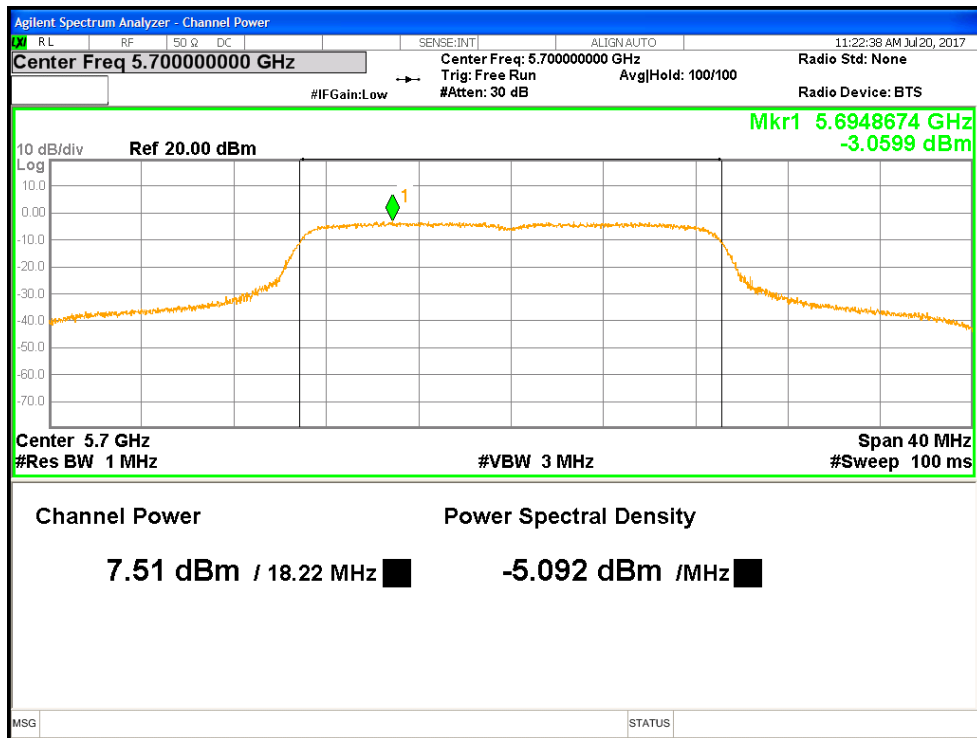


Figure 23: Conducted Output Power-5700 MHz-HT20-6.5 Mbps

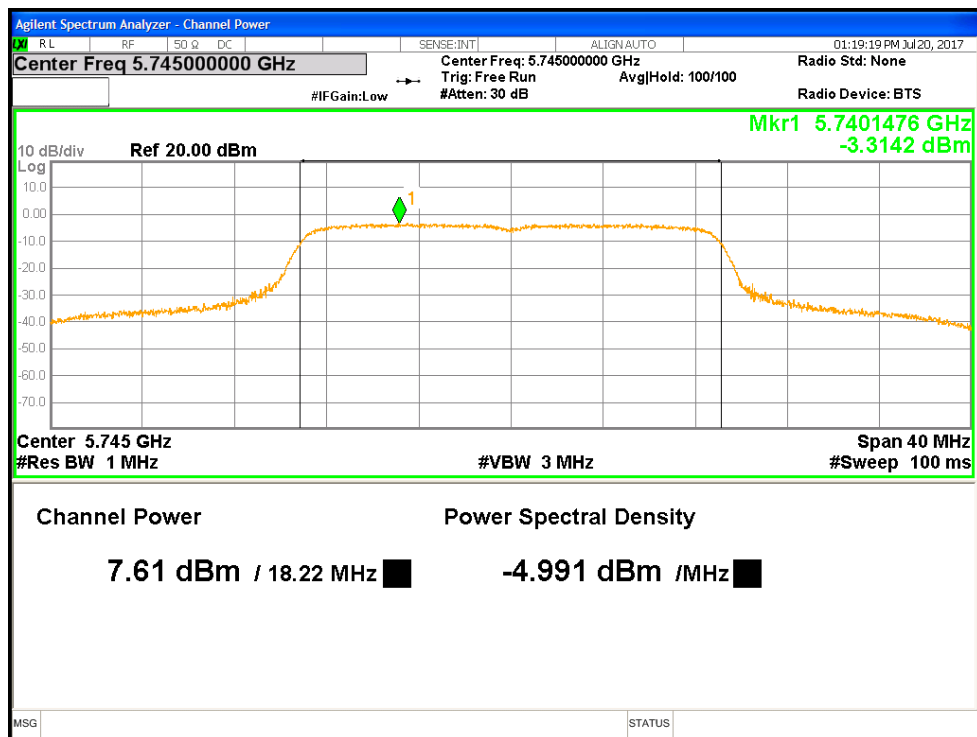


Figure 24: Conducted Output Power-5745 MHz-HT20-6.5 Mbps

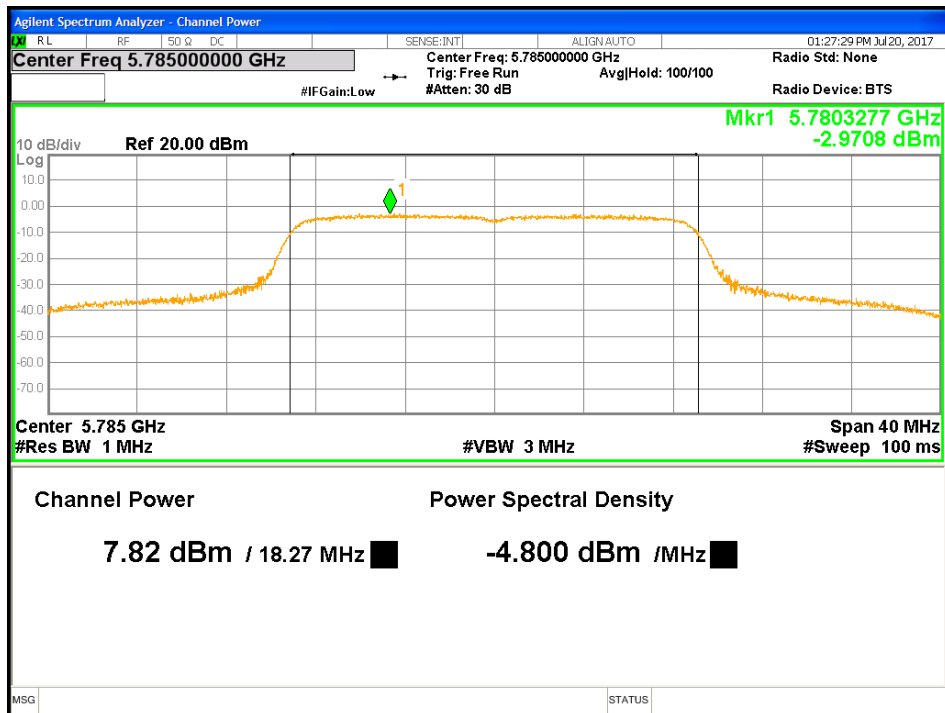


Figure 25: Conducted Output Power-5785 MHz-HT20-6.5 Mbps

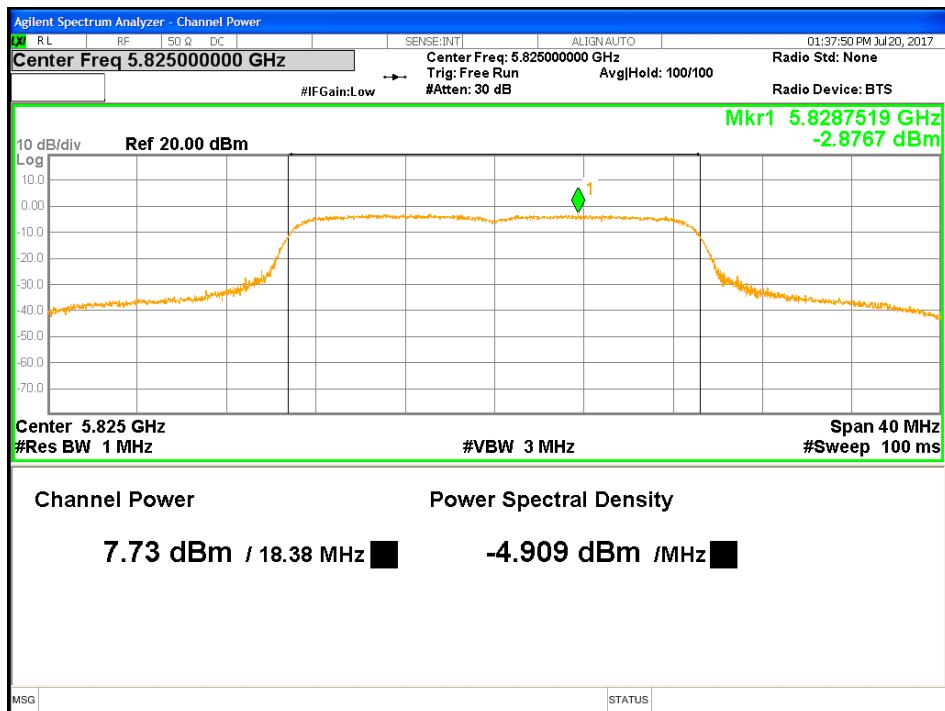


Figure 26: Conducted Output Power-5825 MHz-HT20-6.5 Mbps

## 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.*

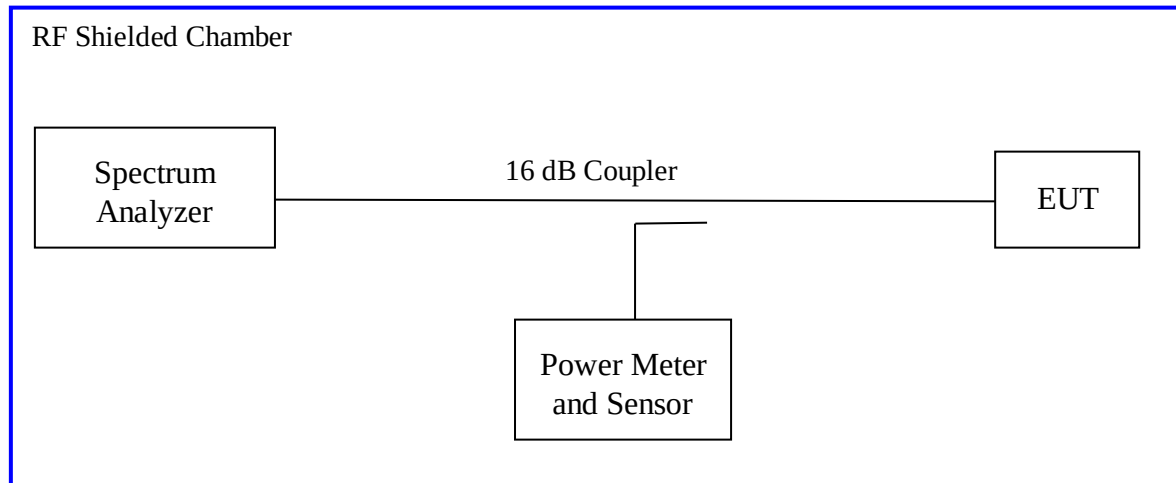
*The minimum 6 dB bandwidth shall be at least 500 kHz per Section CFR47 15.407(e) 2017 and RSS 247 Sect.6.2.4.1: 2017*

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

### 4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth. The measurement was performed with modulation per CFR47 15.407(a) & (e), RSS Gen Sect.6.6 and RSS-247 Sect.6.2.4.1. 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. The worst results indicated below.

Test Setup:



### 4.2.2 Results

These occupied bandwidth measurements were taken for reference only.

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

|                                                                                                                                                                                     |             |        |                                 |         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------|---------------------------------|---------|
| Test Conditions: Conducted Measurement                                                                                                                                              |             |        | Date: July 17, 2017             |         |
| Antenna Type: Chip                                                                                                                                                                  |             |        | Power Setting: See test plan.   |         |
| Antenna Gain: 4.9 dBi                                                                                                                                                               |             |        | Signal State: Modulated at 100% |         |
| Ambient Temp.: 23 °C                                                                                                                                                                |             |        | Relative Humidity:38%           |         |
| Bandwidth (MHz) for 802.11a                                                                                                                                                         |             |        |                                 |         |
| Frequency (MHz)                                                                                                                                                                     | Limit (kHz) | 99% BW | 26 dB BW                        | Results |
| 5180                                                                                                                                                                                | NA          | 16.851 | 23.130                          | NA      |
| 5200                                                                                                                                                                                | NA          | 16.847 | 23.760                          | NA      |
| 5240                                                                                                                                                                                | NA          | 16.841 | 23.410                          | NA      |
| 5260                                                                                                                                                                                | NA          | 16.840 | 23.600                          | NA      |
| 5300                                                                                                                                                                                | NA          | 16.839 | 23.33                           | NA      |
| 5320                                                                                                                                                                                | NA          | 16.835 | 23.130                          | NA      |
| 5500                                                                                                                                                                                | NA          | 16.849 | 24.050                          | NA      |
| 5580                                                                                                                                                                                | NA          | 16.866 | 23.890                          | NA      |
| 5700                                                                                                                                                                                | NA          | 16.874 | 24.300                          | NA      |
| Frequency (MHz)                                                                                                                                                                     | Limit (kHz) | 99% BW | 6 dB BW                         | Results |
| 5745                                                                                                                                                                                | 500         | 16.865 | 16.340                          | Pass    |
| 5785                                                                                                                                                                                | 500         | 16.854 | 16.320                          | Pass    |
| 5825                                                                                                                                                                                | 500         | 16.859 | 16.410                          | Pass    |
| Note: The bandwidth was measured at 6 Mbps for 802.11a mode.<br>The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits. |             |        |                                 |         |
| Bandwidth (MHz) for 802.11n HT20                                                                                                                                                    |             |        |                                 |         |
| Frequency (MHz)                                                                                                                                                                     | Limit (kHz) | 99% BW | 26 dB BW                        | Results |
| 5180                                                                                                                                                                                | NA          | 17.936 | 23.890                          | NA      |
| 5200                                                                                                                                                                                | NA          | 17.916 | 24.110                          | NA      |
| 5240                                                                                                                                                                                | NA          | 17.923 | 24.220                          | NA      |
| 5260                                                                                                                                                                                | NA          | 17.913 | 23.910                          | NA      |

| 5300                                                                                                                                                                                   | NA          | 17.914 | 24.340  | NA      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------|---------|---------|
| 5320                                                                                                                                                                                   | NA          | 17.921 | 24.460  | NA      |
| 5500                                                                                                                                                                                   | NA          | 17.937 | 24.210  | NA      |
| 5580                                                                                                                                                                                   | NA          | 17.933 | 25.420  | NA      |
| 5700                                                                                                                                                                                   | NA          | 17.933 | 25.080  | NA      |
| Frequency (MHz)                                                                                                                                                                        | Limit (kHz) | 99% BW | 6 dB BW | Results |
| 5745                                                                                                                                                                                   | 500         | 17.954 | 17.480  | Pass    |
| 5785                                                                                                                                                                                   | 500         | 17.932 | 17.530  | Pass    |
| 5825                                                                                                                                                                                   | 500         | 17.939 | 17.490  | Pass    |
| <b>Note:</b> The bandwidth was observed at MCS0, 6.5 Mbps mode.<br>The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits. |             |        |         |         |

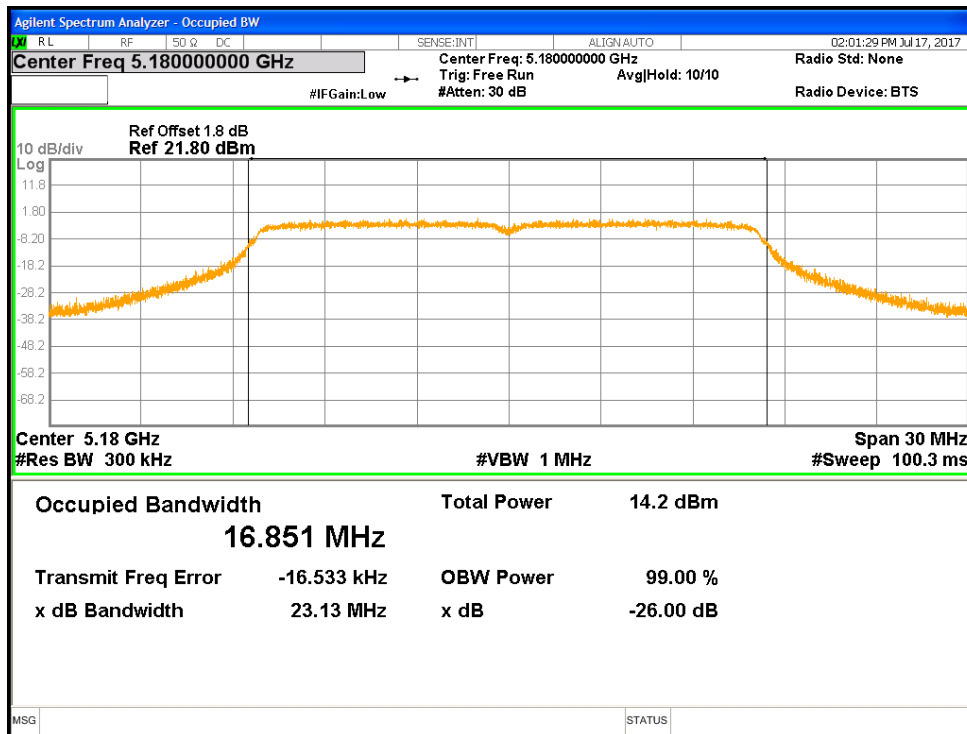


Figure 27: Occupied Bandwidth-5180 MHz-11a

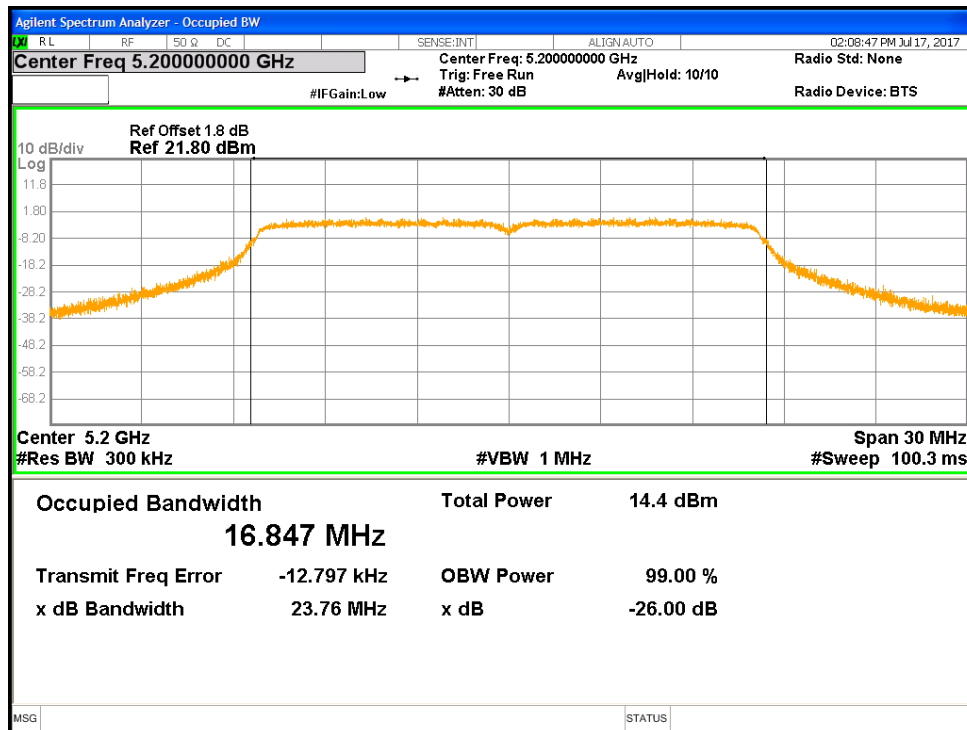


Figure 28: Occupied Bandwidth-5200 MHz-11a

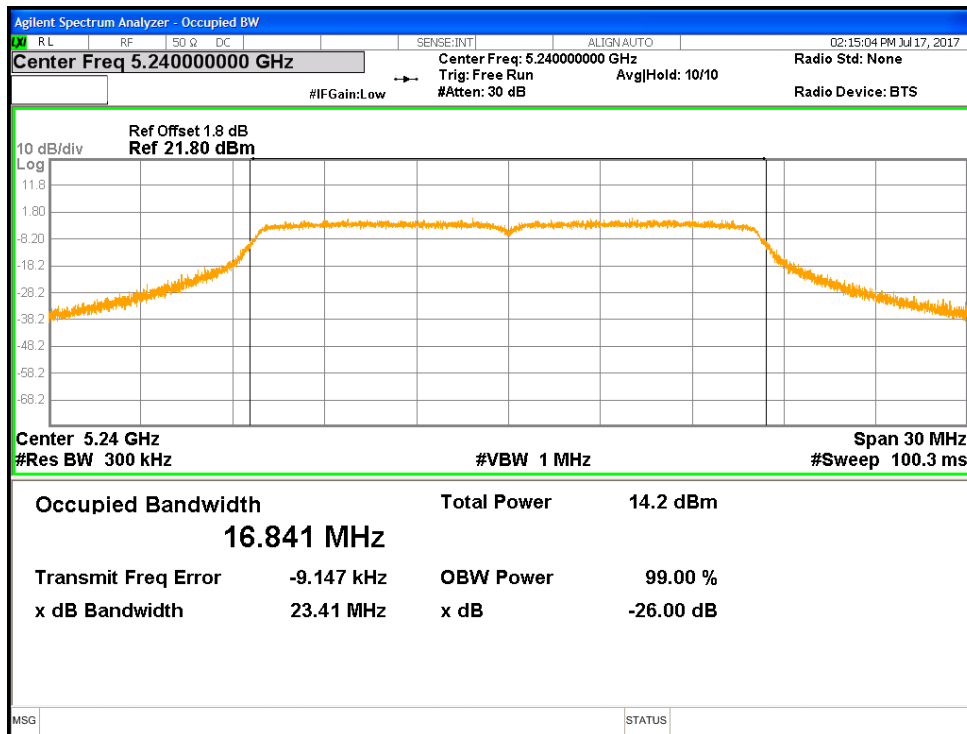


Figure 29: Occupied Bandwidth-5240 MHz-11a

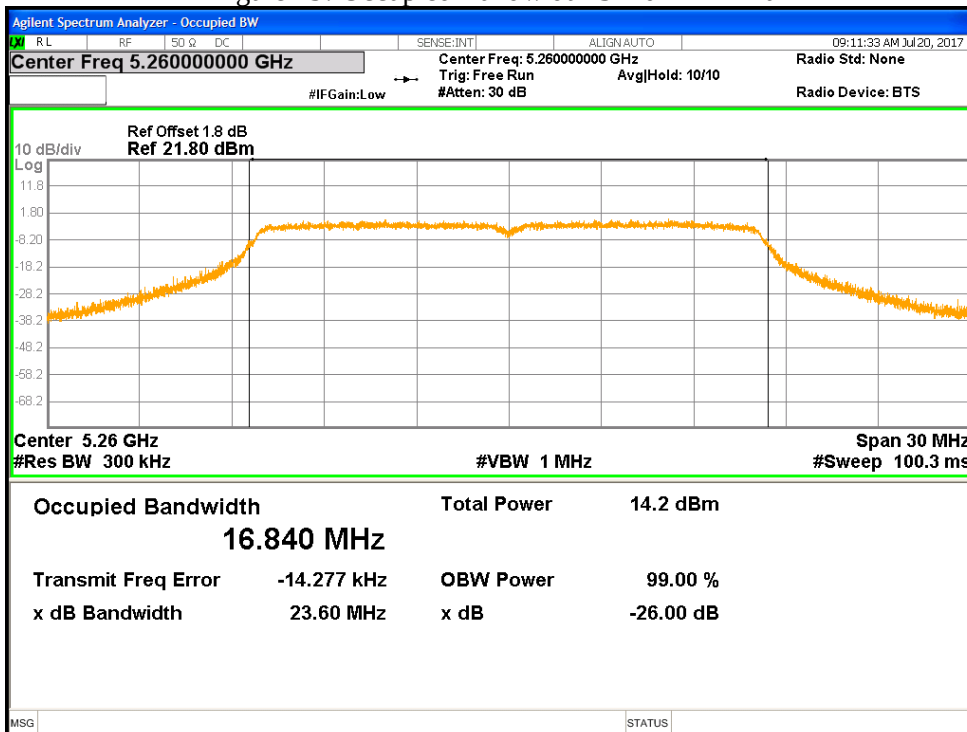


Figure 30: Occupied Bandwidth-5260 MHz-11a

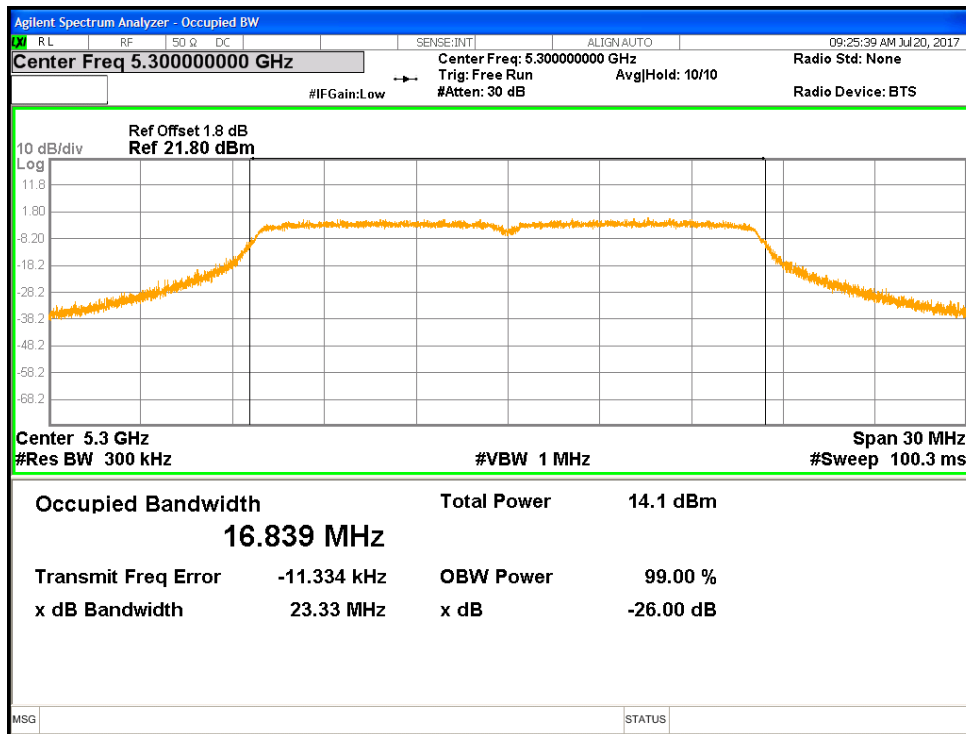


Figure 31: Occupied Bandwidth-5300 MHz-11a

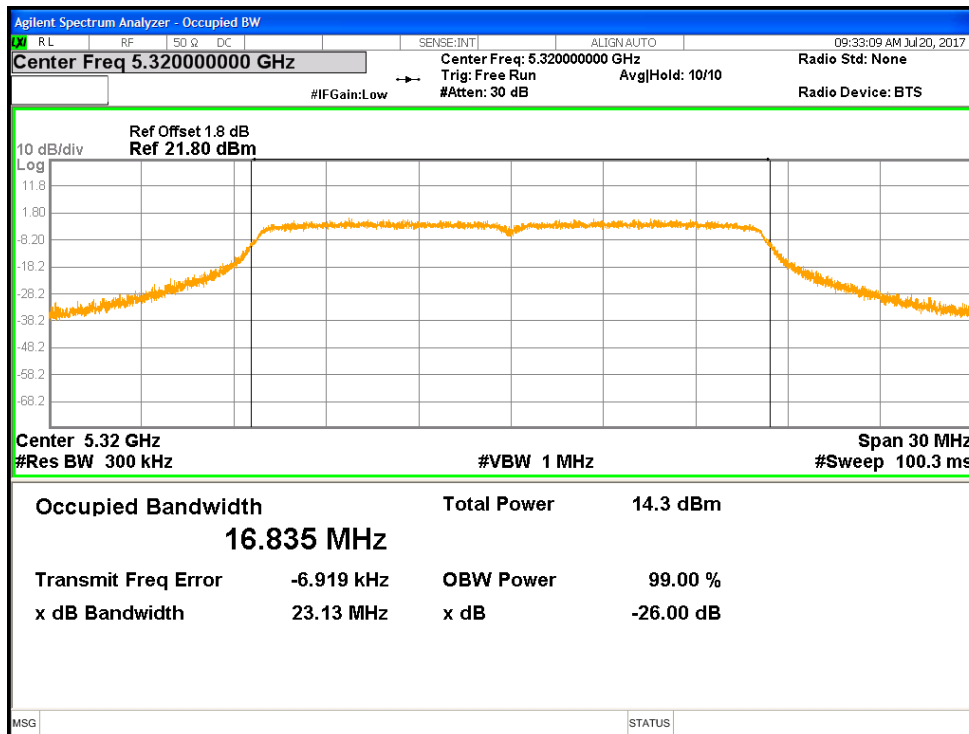


Figure 32: Occupied Bandwidth-5320 MHz-11a

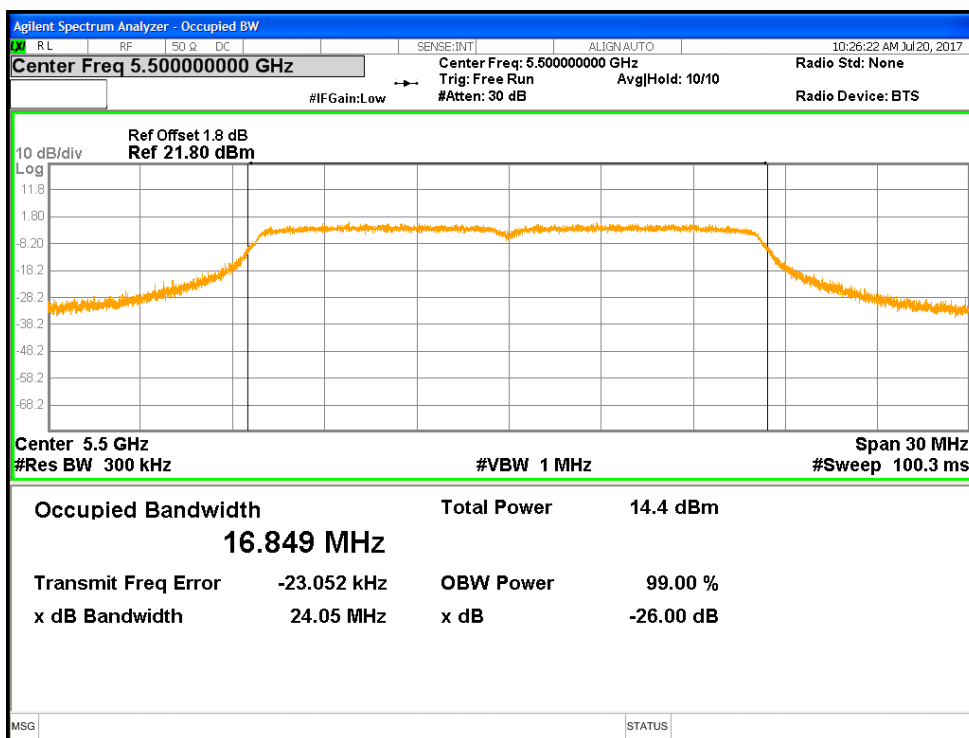


Figure 33: Occupied Bandwidth-5500 MHz-11a

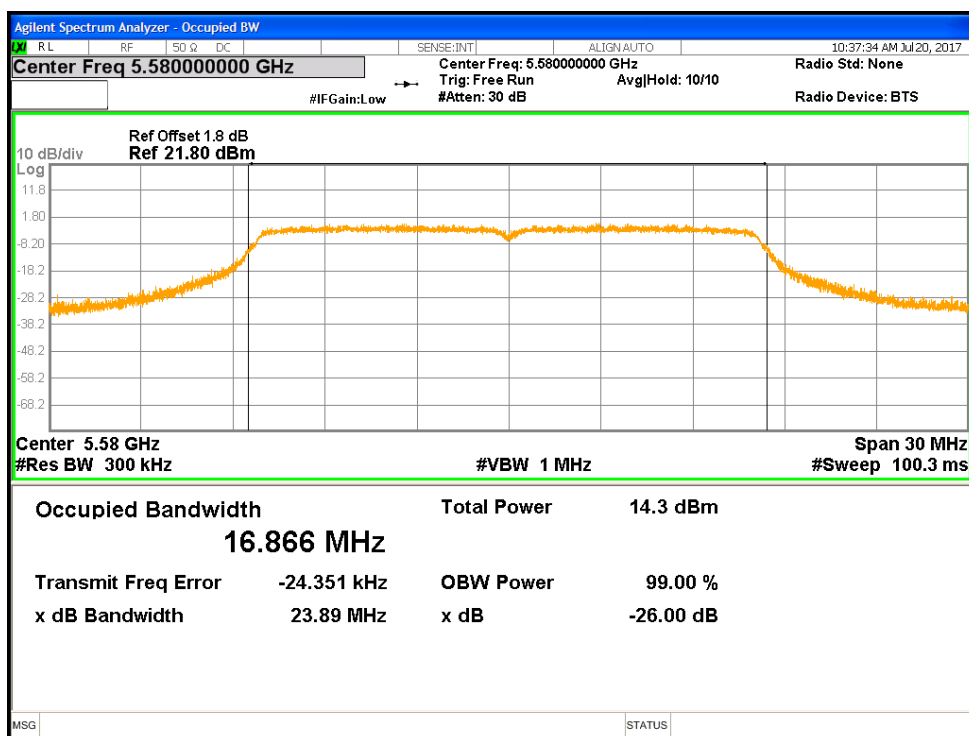


Figure 34: Occupied Bandwidth-5580 MHz-11a

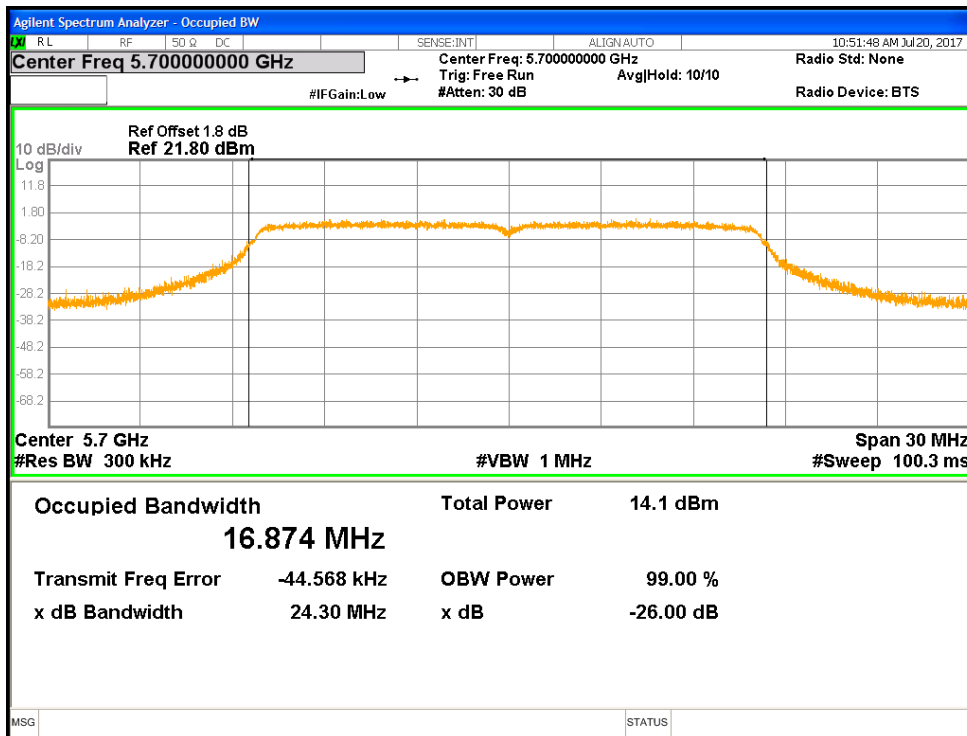


Figure 35: Occupied Bandwidth-5700 MHz-11a

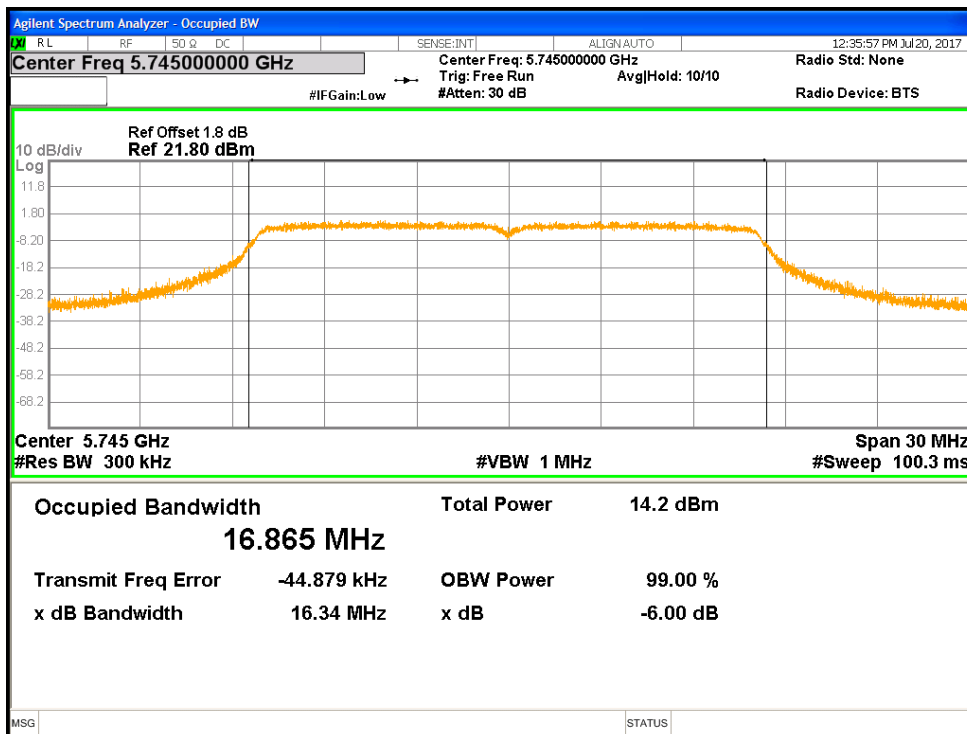


Figure 36: Occupied Bandwidth-5745 MHz-11a

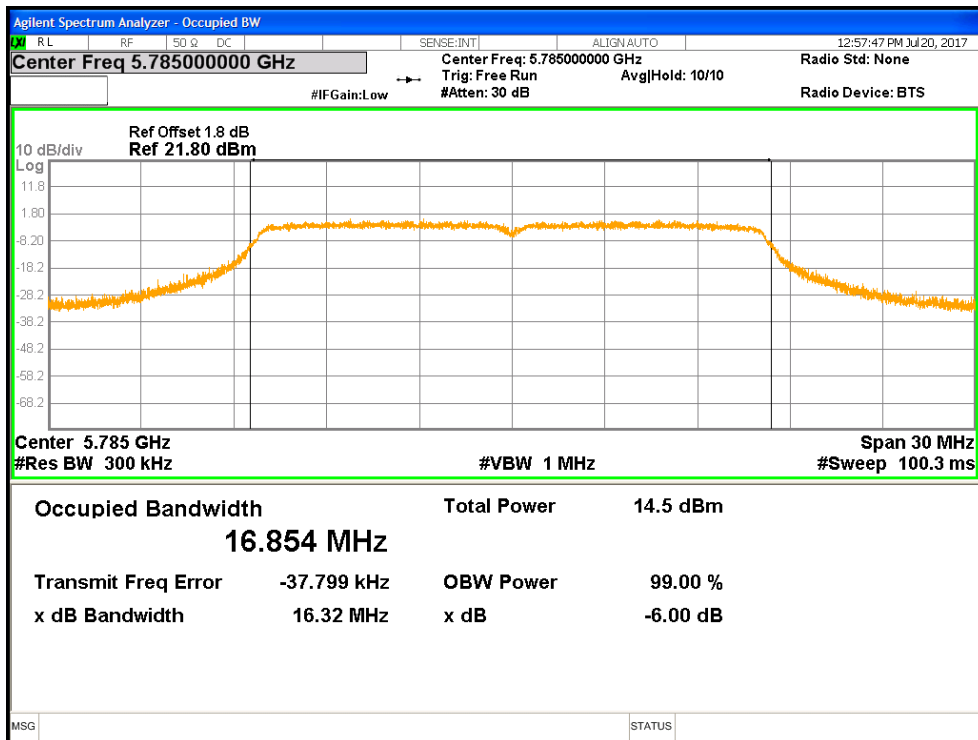


Figure 37: Occupied Bandwidth-5785 MHz-11a

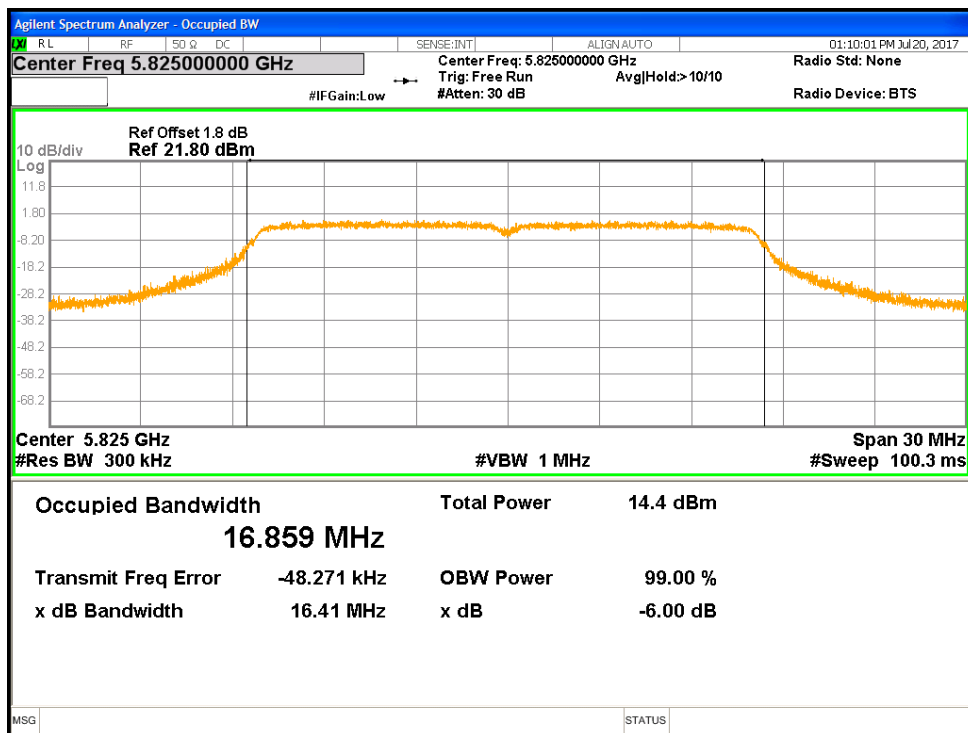


Figure 38: Occupied Bandwidth-5825 MHz-11a

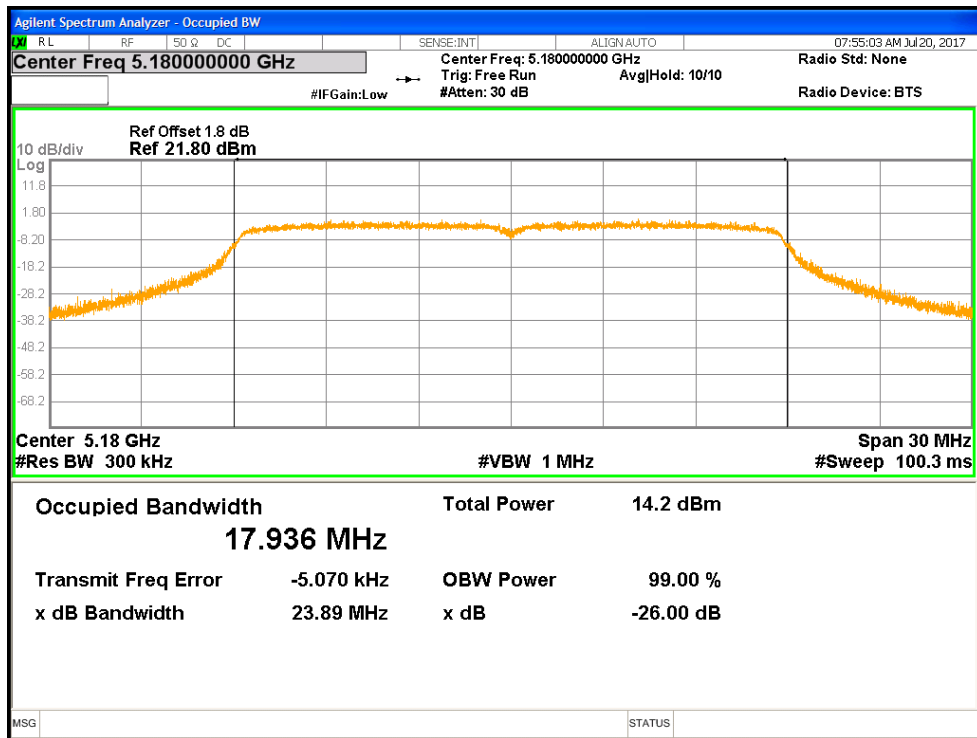


Figure 39: Occupied Bandwidth-5180 MHz-HT20

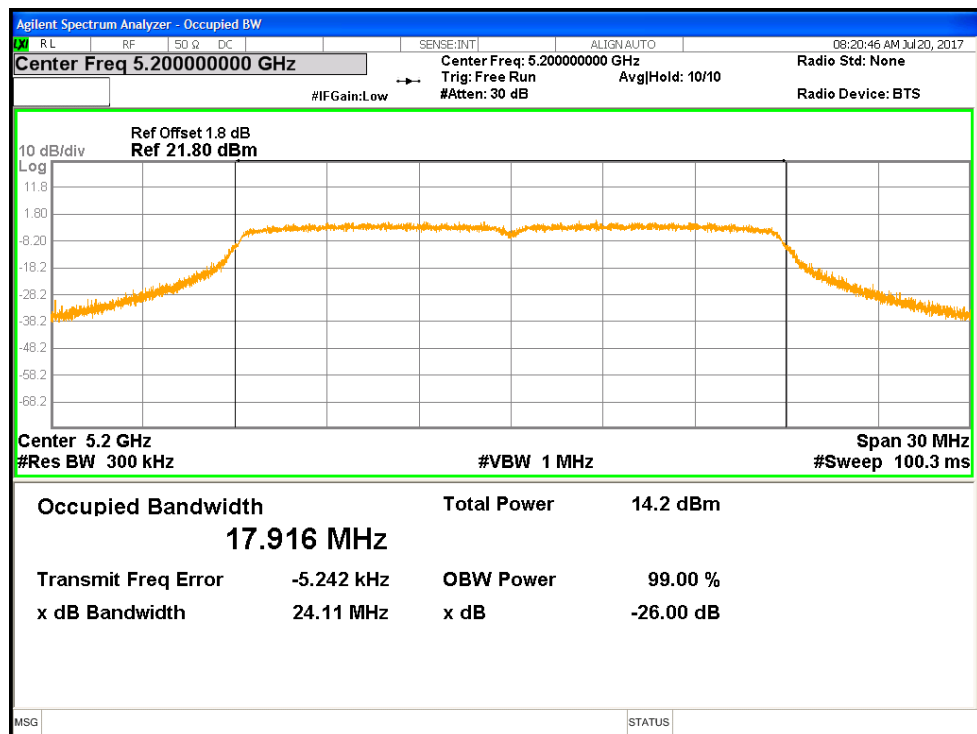


Figure 40: Occupied Bandwidth-5200 MHz-HT20

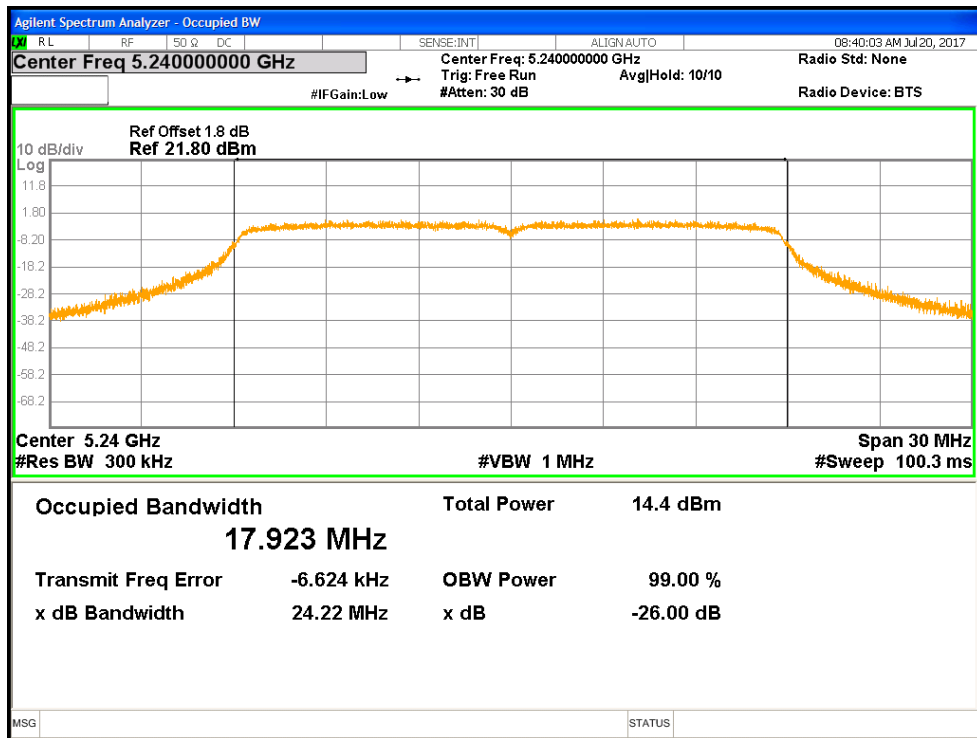


Figure 41: Occupied Bandwidth-5240 MHz-HT20

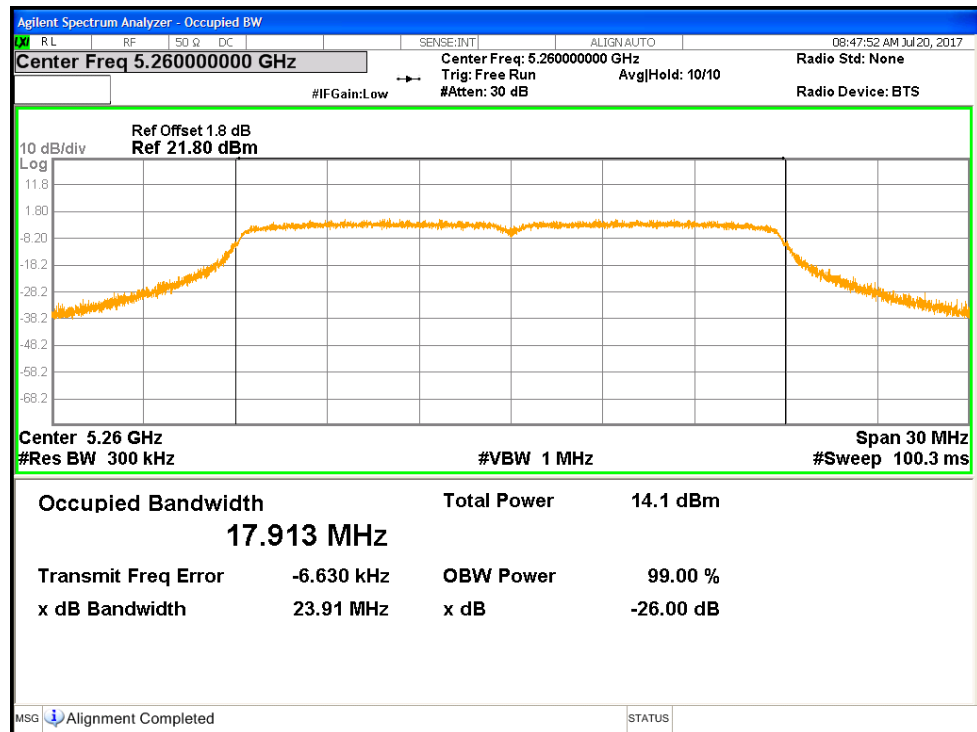


Figure 42: Occupied Bandwidth-5260 MHz-HT20

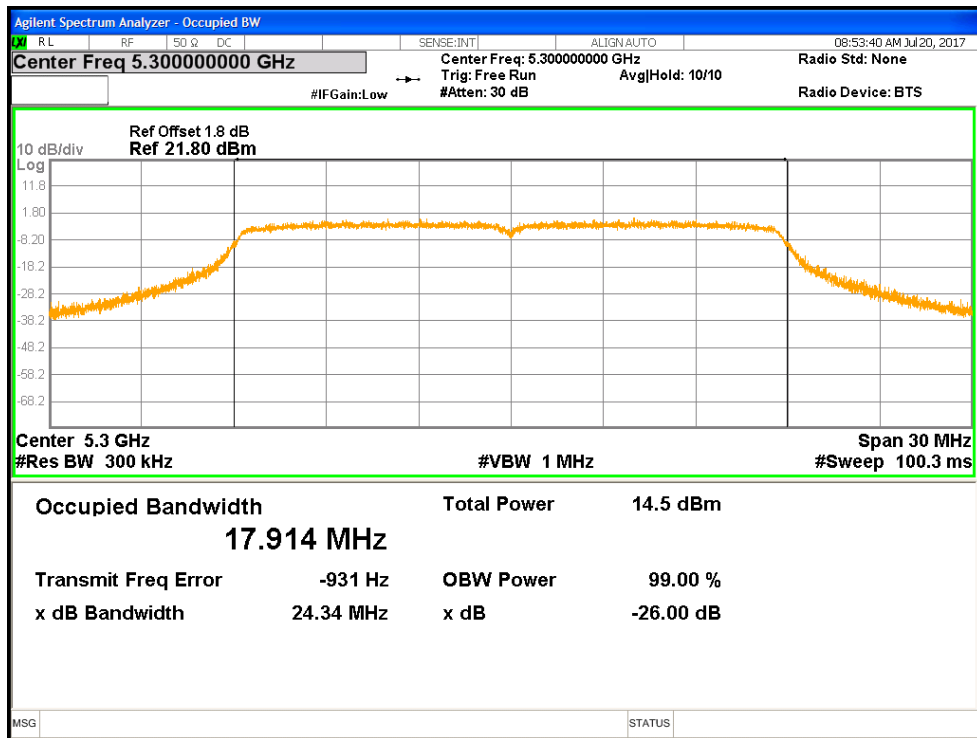


Figure 43: Occupied Bandwidth-5300 MHz-HT20

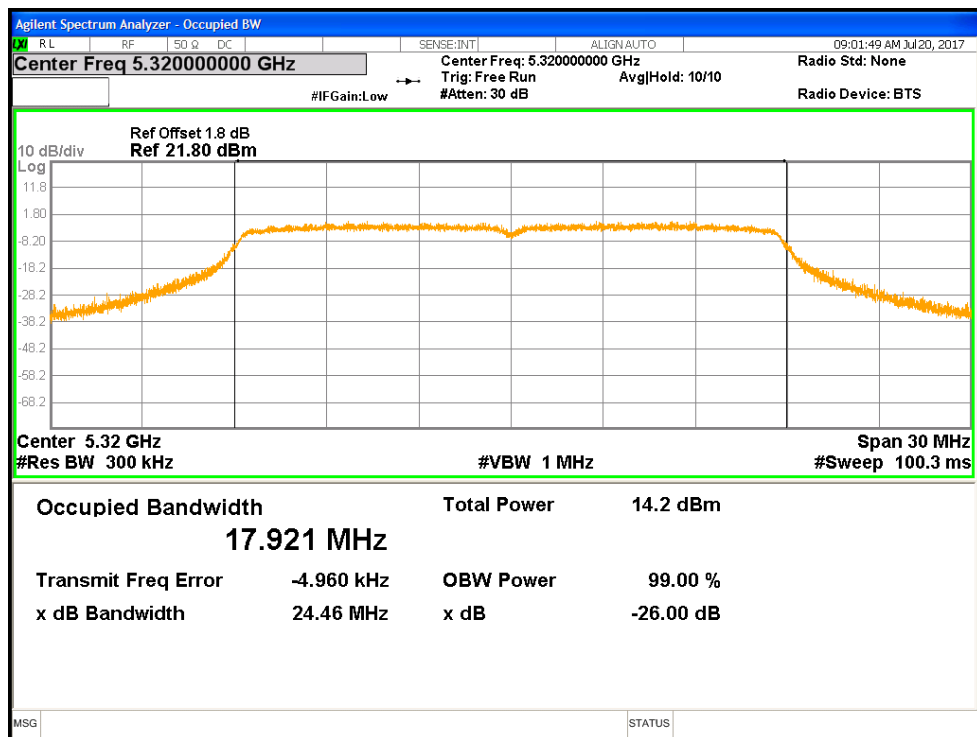


Figure 44: Occupied Bandwidth-5320 MHz-HT20

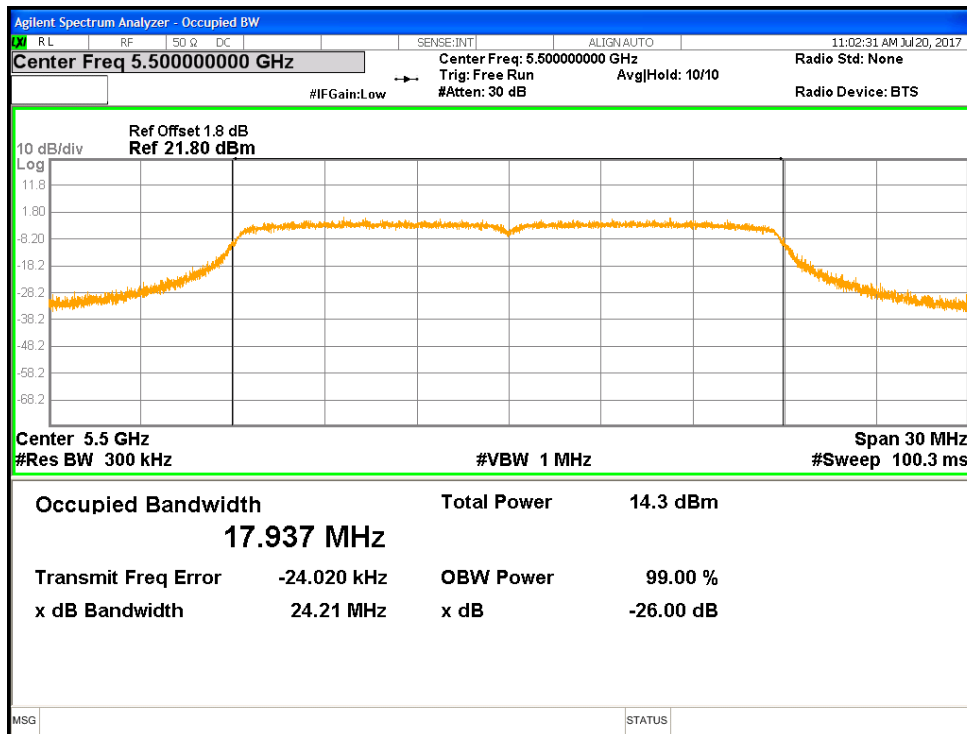


Figure 45: Occupied Bandwidth-5500 MHz-HT20

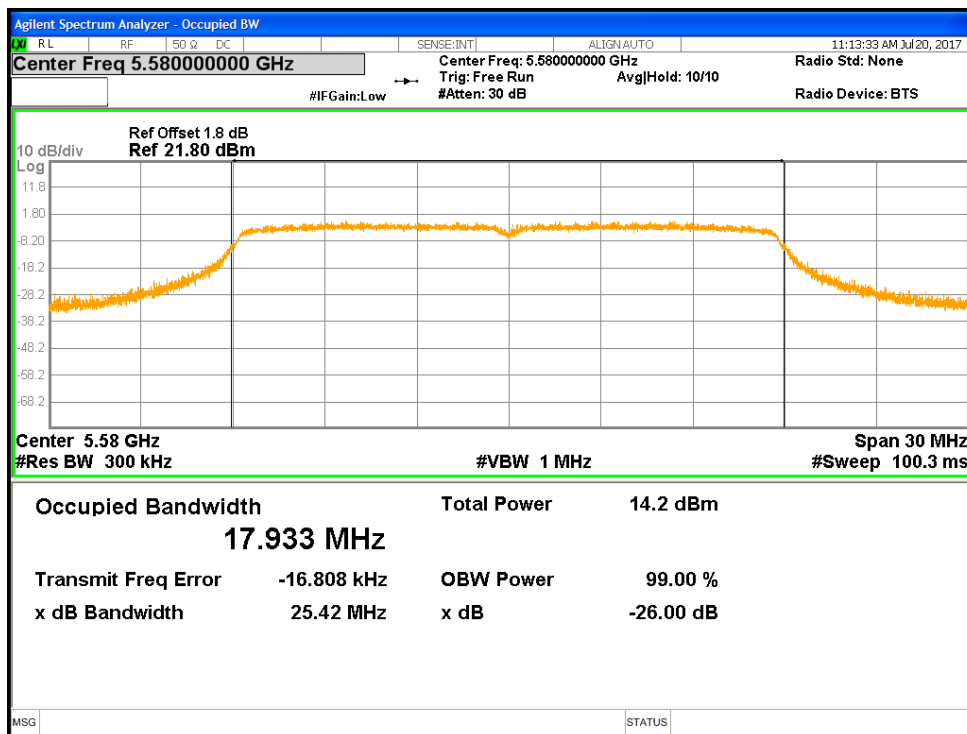


Figure 46: Occupied Bandwidth-5580 MHz-HT20

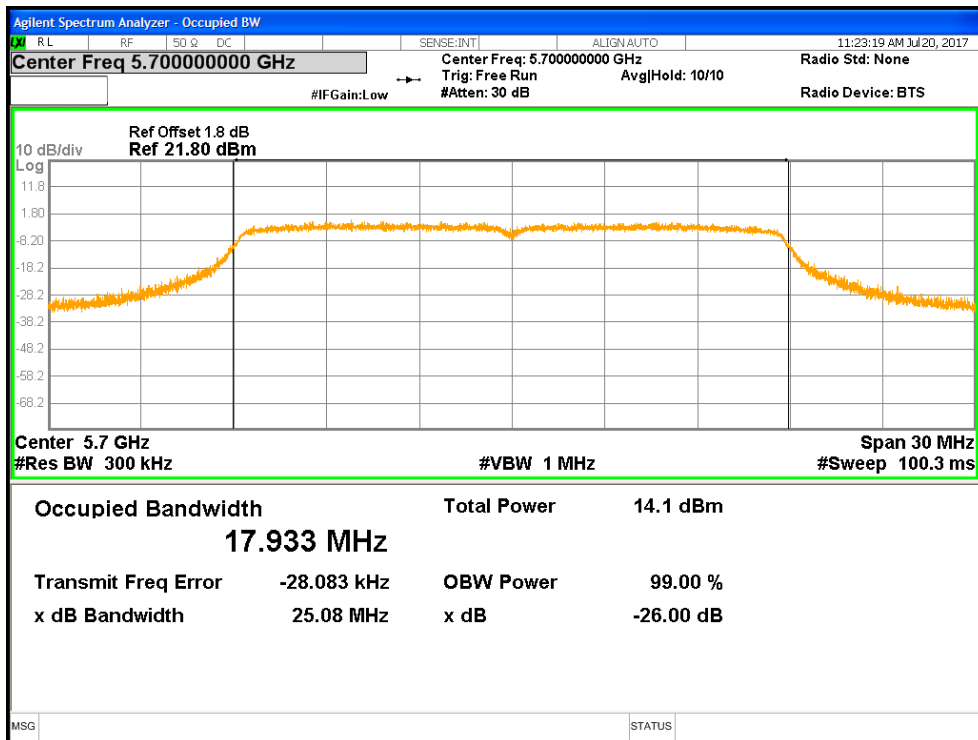


Figure 47: Occupied Bandwidth-5700 MHz-HT20

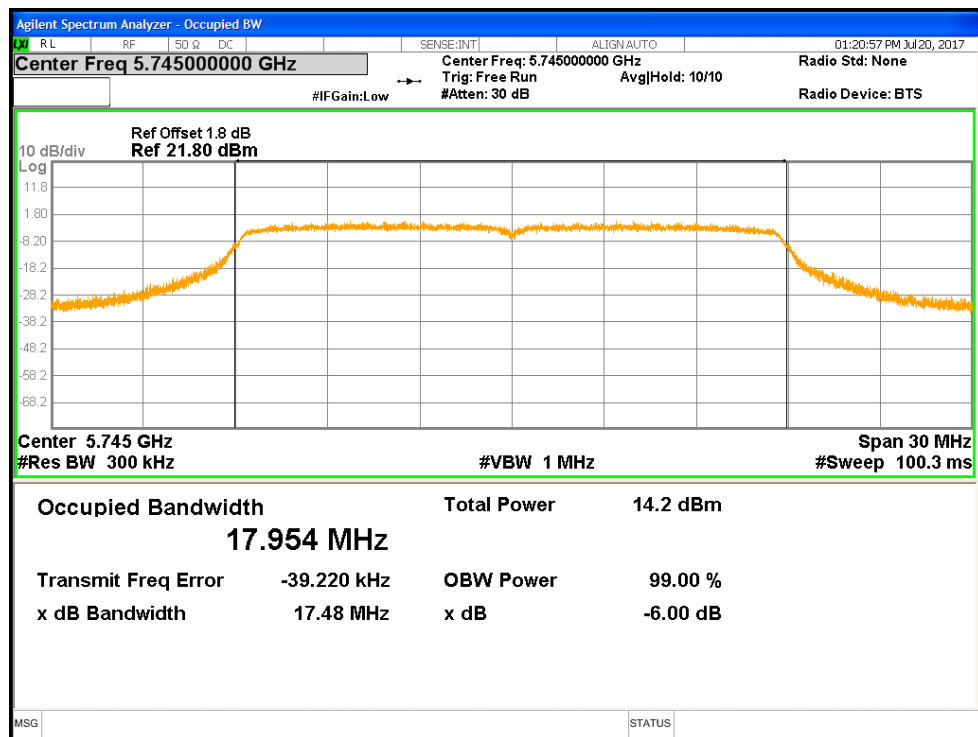


Figure 48: Occupied Bandwidth-5745 MHz-HT20

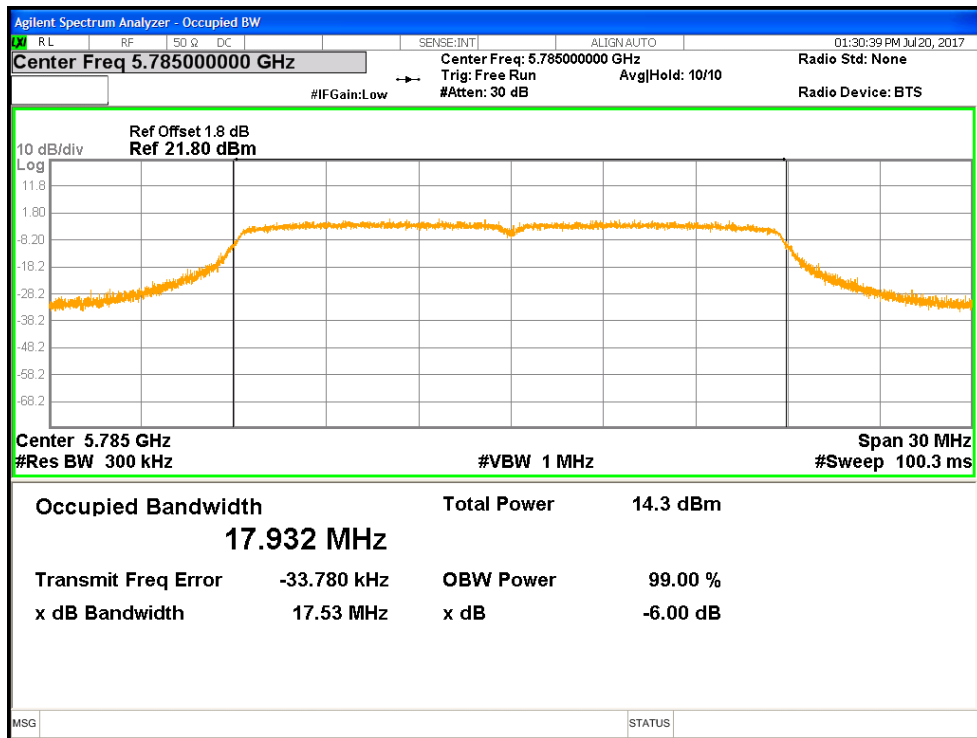


Figure 49: Occupied Bandwidth-5785 MHz-HT20

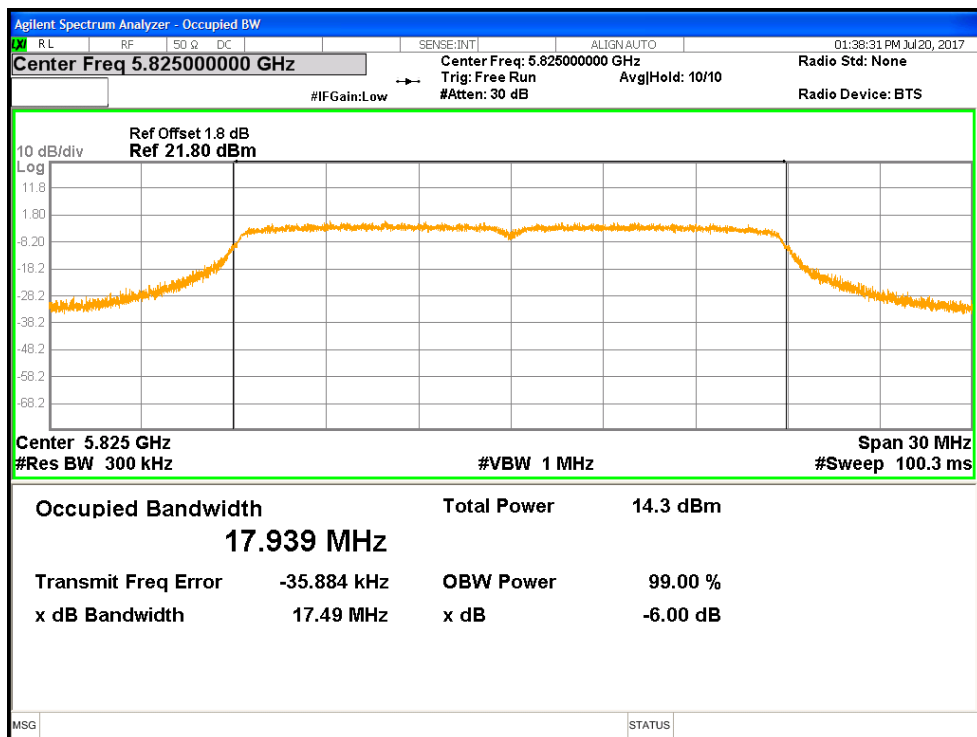


Figure 50: Occupied Bandwidth-5825 MHz-HT20

### 4.3 Power Spectral Density

*According to the CFR47 Part 15.407 (a) and RSS 247 Sect. 6.2, the spectral power density output of the antenna port shall be as followed listed below during any time interval of continuous transmission.*

*The power spectral density limits per CFR47 Part 15.407 (a):*

*Band 5150-5250 MHz, 5250-5350 MHz, and 5470-5725 MHz: 11 dBm in any 1 MHz band*

*Band 5725-5850 MHz: 30 dBm in any 500 kHz band.*

*The power spectral density limits per RSS-247 Section 6.2:*

*Band 5150-5250 MHz: 10 dBm in any 1 MHz band, E.I.R.P.*

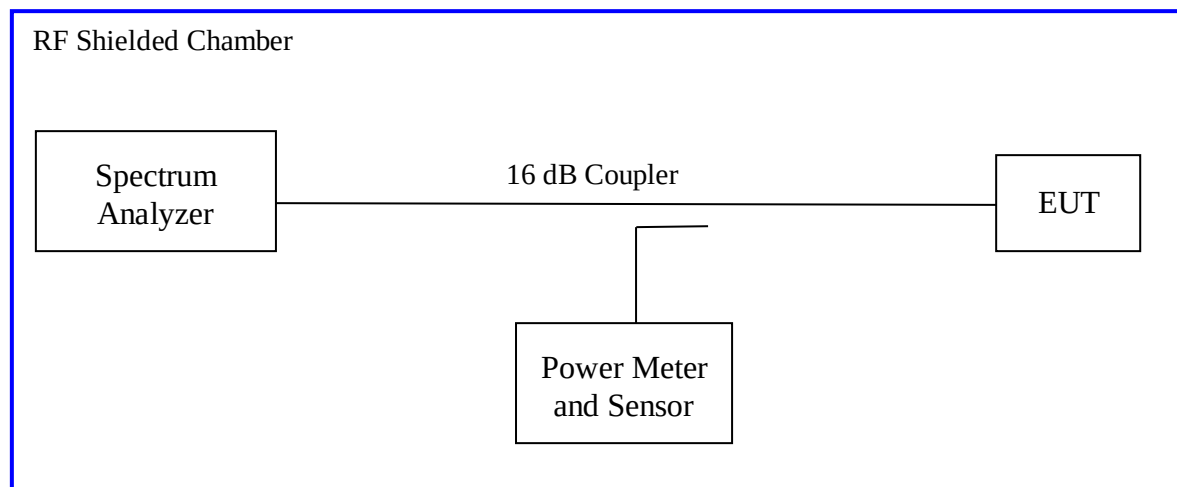
*Band 5250-5350 MHz, and 5470-5725 MHz: 11 dBm in any 1 MHz band*

*Band 5725-5850 MHz: 30 dBm in any 500 kHz band*

#### 4.3.1 Test Method

The conducted method was used to measure the channel power output per ANSI C63.10-2013 Section 12.3.2.2. The measurement was performed with modulation per CFR47 Part 15.407 (a) and RSS 247 Sect. 6.2. The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in each operating frequency range. The worst sample result indicated below.

Test Setup:



#### 4.3.2 Results

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

**Table 5: Power Spectral Density – Test Results for 802.11a**

|                                                                                                                                                                                                                                                                                                        |              |         |                                         |             |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|-----------------------------------------|-------------|-------------|
| Test Conditions: Conducted Measurement                                                                                                                                                                                                                                                                 |              |         | Date: July 20, 2017                     |             |             |
| Antenna Type: Chip                                                                                                                                                                                                                                                                                     |              |         | Power Setting: See test plan.           |             |             |
| Antenna Gain: 4.9 dBi                                                                                                                                                                                                                                                                                  |              |         | Signal State: Modulated at 100%, 6 Mbps |             |             |
| Ambient Temp.: 23 °C                                                                                                                                                                                                                                                                                   |              |         | Relative Humidity:35%                   |             |             |
| 802.11a                                                                                                                                                                                                                                                                                                |              |         |                                         |             |             |
| Freq. (MHz)                                                                                                                                                                                                                                                                                            | Output [dBm] | CF [dB] | Total PPD [dBm]                         | Limit [dBm] | Margin [dB] |
| 5180                                                                                                                                                                                                                                                                                                   | -2.82        |         |                                         | 11.00*      | -13.82      |
| 5200                                                                                                                                                                                                                                                                                                   | -2.70        |         |                                         | 11.00*      | -13.70      |
| 5240                                                                                                                                                                                                                                                                                                   | -2.77        |         |                                         | 11.00*      | -13.77      |
| 5260                                                                                                                                                                                                                                                                                                   | -2.79        |         |                                         | 11.00       | -13.79      |
| 5300                                                                                                                                                                                                                                                                                                   | -2.95        |         |                                         | 11.00       | -13.95      |
| 5320                                                                                                                                                                                                                                                                                                   | -2.81        |         |                                         | 11.00       | -13.81      |
| 5500                                                                                                                                                                                                                                                                                                   | -2.48        |         |                                         | 11.00       | -13.48      |
| 5580                                                                                                                                                                                                                                                                                                   | -2.76        |         |                                         | 11.00       | -13.76      |
| 5700                                                                                                                                                                                                                                                                                                   | -2.80        |         |                                         | 11.00       | -13.80      |
| 5745                                                                                                                                                                                                                                                                                                   | -2.45        | -3.01   | -5.46                                   | 30.00       | -35.46      |
| 5785                                                                                                                                                                                                                                                                                                   | -2.57        | -3.01   | -5.58                                   | 30.00       | -35.58      |
| 5825                                                                                                                                                                                                                                                                                                   | -2.49        | -3.01   | -5.50                                   | 30.00       | -35.50      |
| 802.11a (RSS-247 Limit)                                                                                                                                                                                                                                                                                |              |         |                                         |             |             |
| 5180                                                                                                                                                                                                                                                                                                   | -2.82        |         |                                         | 5.10        | -7.92       |
| 5200                                                                                                                                                                                                                                                                                                   | -2.70        |         |                                         | 5.10        | -7.80       |
| 5240                                                                                                                                                                                                                                                                                                   | -2.77        |         |                                         | 5.10        | -7.87       |
| Note: (*) FCC limit only, 5150-5250 MHz.<br>RSS-247 and CFR47 Part 15.407 have same PPD limit in 5250-5350 MHz, 5470-5725 MHz, and 5725-5850 MHz bands.<br>CF accounted for the measured RBW; 10*log (500kHz/1000kHz) or -3.01 dB.<br>RSS-247 Limit at 5150-5250 MHz is eirp; 10dBm - 4.9dBi = 5.1 dBm |              |         |                                         |             |             |

**Table 6: Power Spectral Density – Test Results for 802.11n HT20**

|                                                                                                                                                                                                                                                                                                               |              |         |                                           |             |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|-------------------------------------------|-------------|-------------|
| Test Conditions: Conducted Measurement                                                                                                                                                                                                                                                                        |              |         | Date: July 20, 2017                       |             |             |
| Antenna Type: Chip                                                                                                                                                                                                                                                                                            |              |         | Power Setting: See test plan.             |             |             |
| Antenna Gain: 4.9 dBi                                                                                                                                                                                                                                                                                         |              |         | Signal State: Modulated at 100%, 6.5 Mbps |             |             |
| Ambient Temp.: 23 °C                                                                                                                                                                                                                                                                                          |              |         | Relative Humidity:35%                     |             |             |
| 802.11n HT20                                                                                                                                                                                                                                                                                                  |              |         |                                           |             |             |
| Freq. (MHz)                                                                                                                                                                                                                                                                                                   | Output [dBm] | CF [dB] | Total PPD [dBm]                           | Limit [dBm] | Margin [dB] |
| 5180                                                                                                                                                                                                                                                                                                          | -3.09        |         |                                           | 11.00       | -14.09      |
| 5200                                                                                                                                                                                                                                                                                                          | -3.04        |         |                                           | 11.00       | -14.04      |
| 5240                                                                                                                                                                                                                                                                                                          | -2.57        |         |                                           | 11.00       | -13.57      |
| 5260                                                                                                                                                                                                                                                                                                          | -3.27        |         |                                           | 11.00       | -14.27      |
| 5300                                                                                                                                                                                                                                                                                                          | -2.30        |         |                                           | 11.00       | -13.30      |
| 5320                                                                                                                                                                                                                                                                                                          | -3.04        |         |                                           | 11.00       | -14.04      |
| 5500                                                                                                                                                                                                                                                                                                          | -2.87        |         |                                           | 11.00       | -13.87      |
| 5580                                                                                                                                                                                                                                                                                                          | -3.06        |         |                                           | 11.00       | -14.06      |
| 5700                                                                                                                                                                                                                                                                                                          | -3.18        |         |                                           | 11.00       | -14.18      |
| 5745                                                                                                                                                                                                                                                                                                          | -3.08        | -3.01   | -6.09                                     | 30.00       | -36.09      |
| 5785                                                                                                                                                                                                                                                                                                          | -2.63        | -3.01   | -5.64                                     | 30.00       | -35.64      |
| 5825                                                                                                                                                                                                                                                                                                          | -2.85        | -3.01   | -5.86                                     | 30.00       | -35.86      |
| 802.11n HT20 (RSS-247 Limit)                                                                                                                                                                                                                                                                                  |              |         |                                           |             |             |
| 5180                                                                                                                                                                                                                                                                                                          | -3.09        |         |                                           | 5.10        | -8.19       |
| 5200                                                                                                                                                                                                                                                                                                          | -3.04        |         |                                           | 5.10        | -8.14       |
| 5240                                                                                                                                                                                                                                                                                                          | -2.57        |         |                                           | 5.10        | -7.67       |
| <b>Note:</b> (*) FCC limit only, 5150-5250 MHz.<br>RSS-247 and CFR47 Part 15.407 have same PPD limit in 5250-5350 MHz, 5470-5725 MHz, and 5725-5850 MHz bands.<br>CF accounted for the measured RBW; 10*log (500kHz/1000kHz) or -3.01 dB.<br>RSS-247 Limit at 5150-5250 MHz is eirp; 10dBm - 4.9dBi = 5.1 dBm |              |         |                                           |             |             |

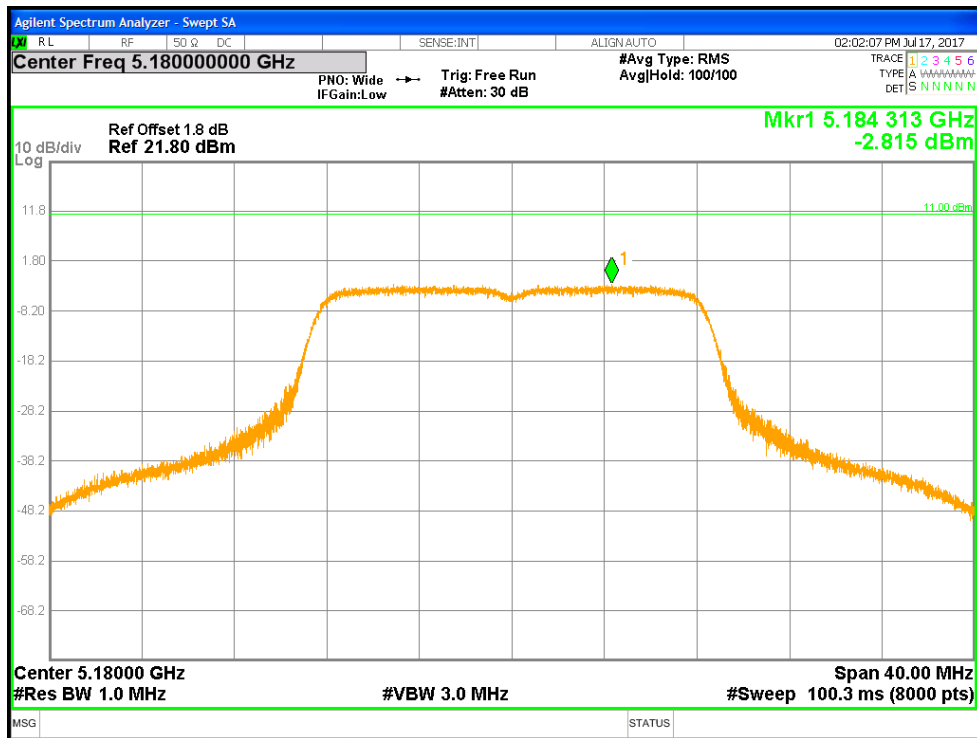


Figure 51: FCC-PPSD-5 GHz-5180 MHz-11a-6 Mbps

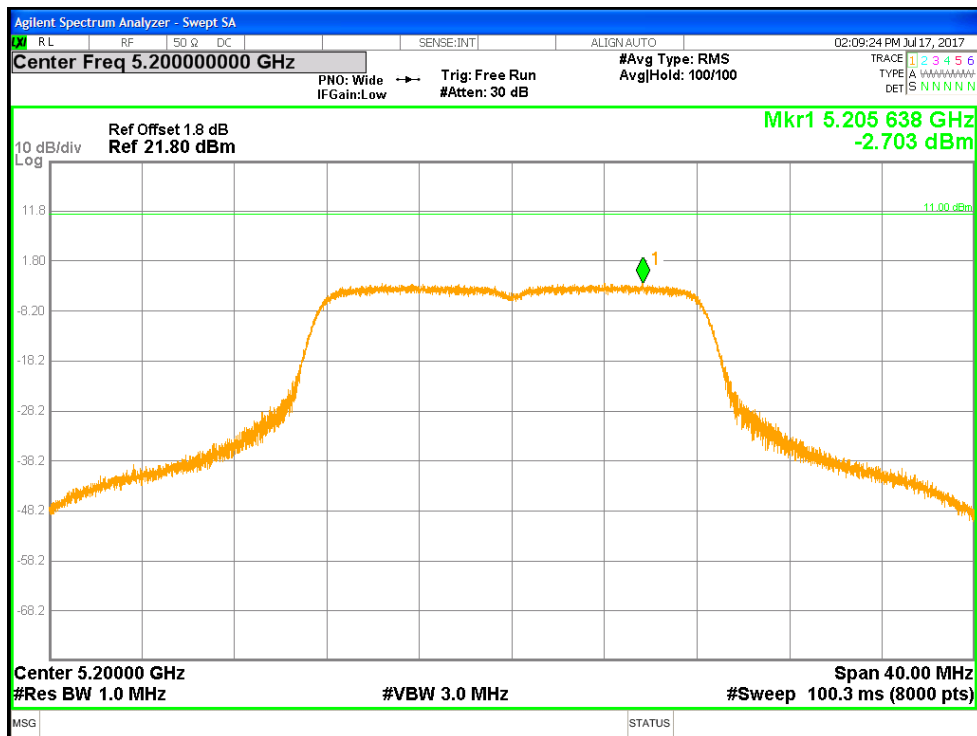


Figure 52: FCC-PPSD-5 GHz-5200 MHz-11a-6 Mbps

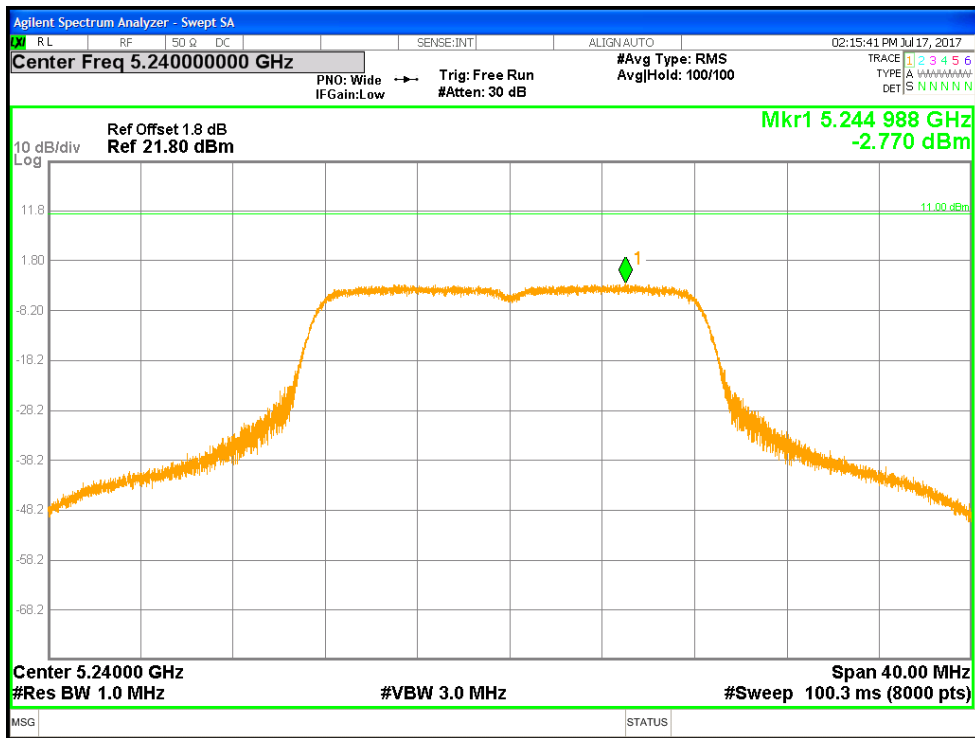


Figure 53: FCC-PPSD-5 GHz-5240 MHz-11a-6 Mbps

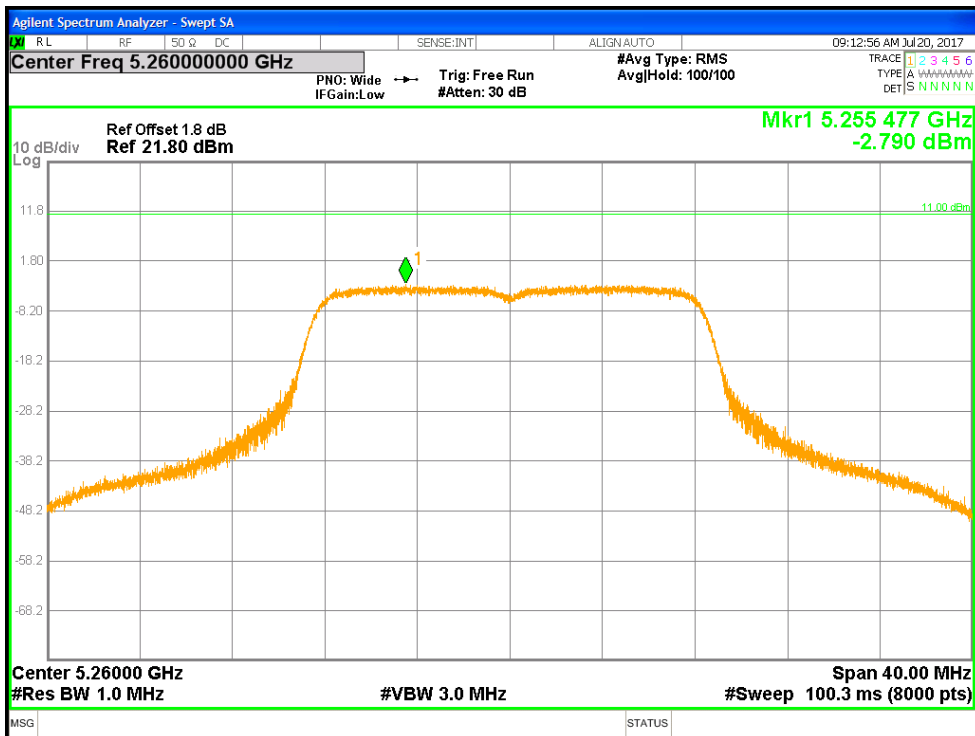


Figure 54: FCC-PPSD-5 GHz-5260 MHz-11a-6 Mbps

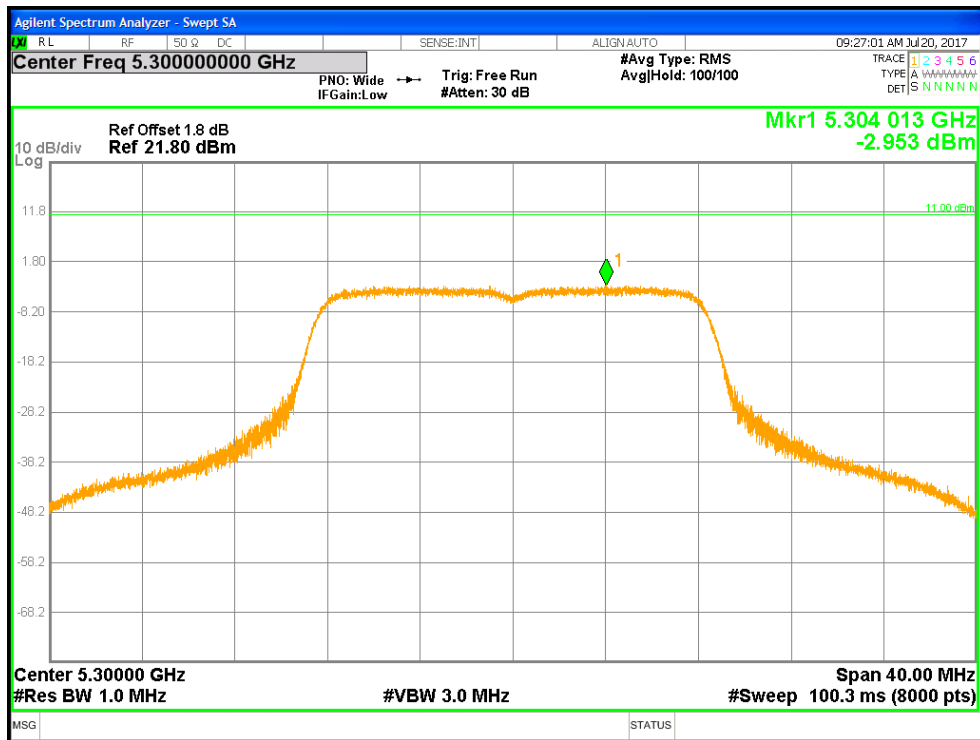


Figure 55: FCC-PPSD-5 GHz-5300 MHz-11a-6 Mbps

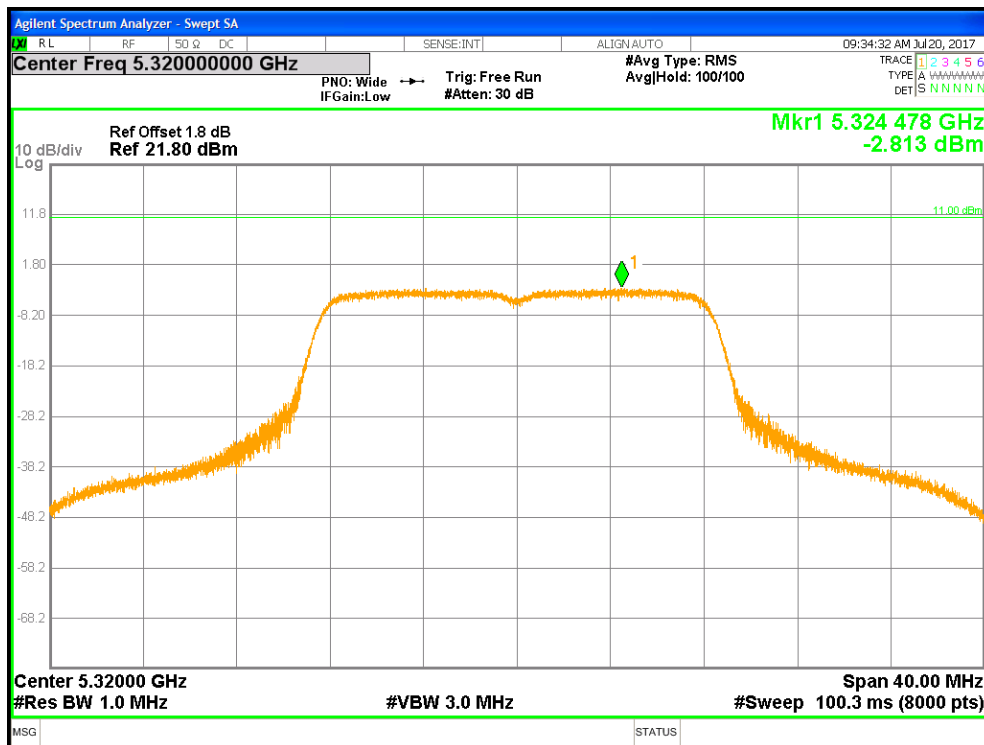


Figure 56: FCC-PPSD-5 GHz-5320 MHz-11a-6 Mbps

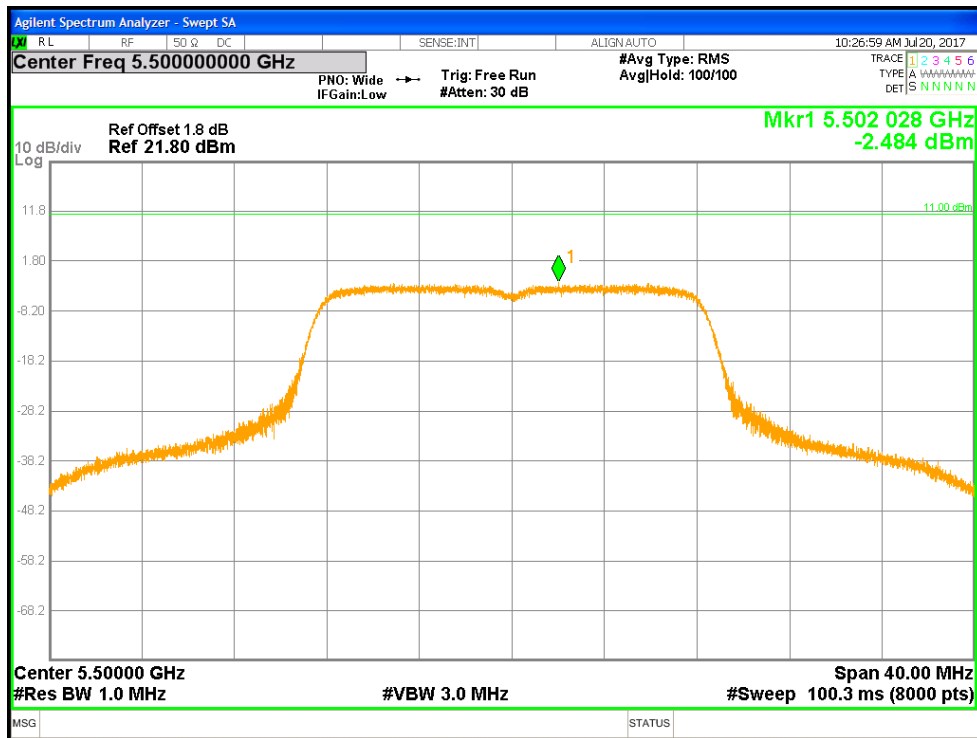


Figure 57: FCC-PPSD-5 GHz-5500 MHz-11a-6 Mbps

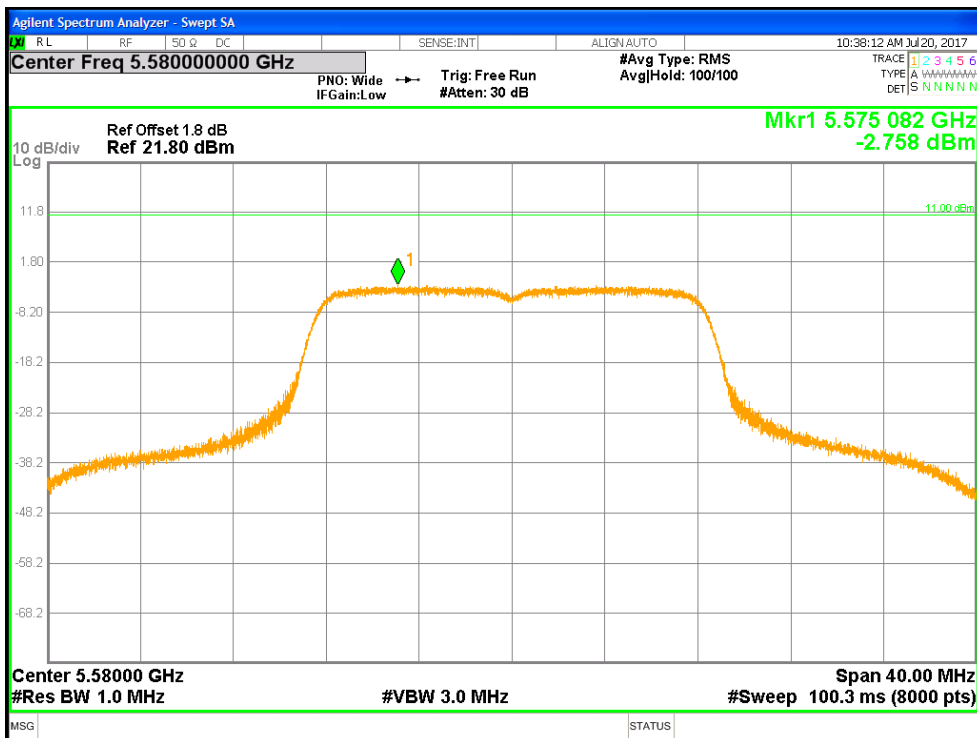


Figure 58: FCC-PPSD-5 GHz-5580 MHz-11a-6 Mbps

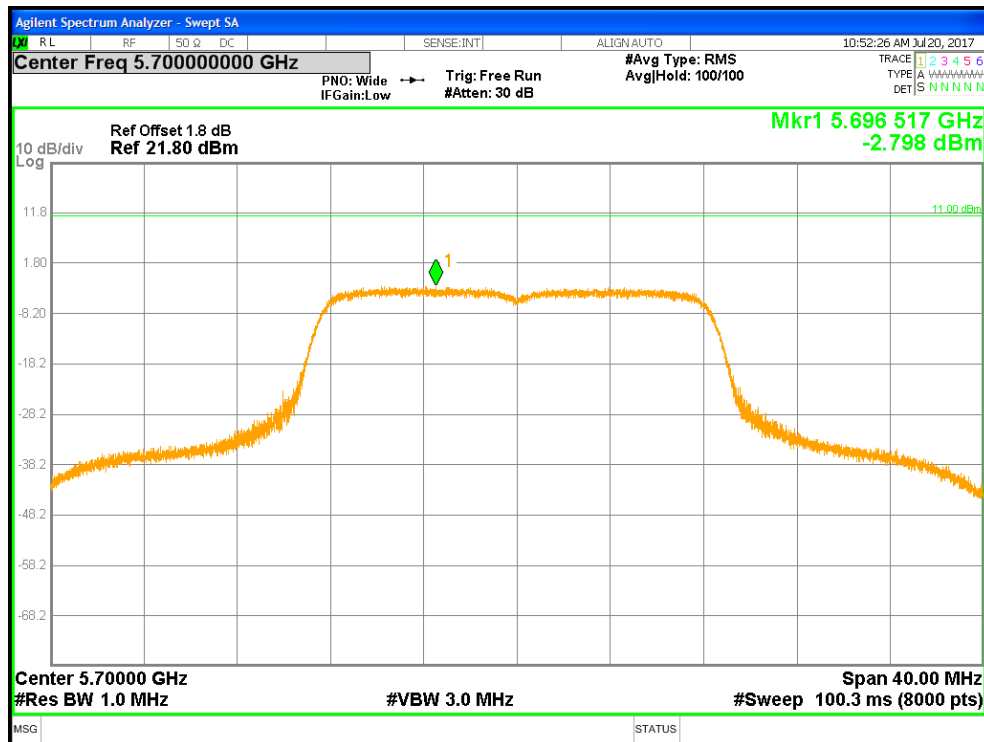


Figure 59: FCC-PPSD-5 GHz-5700 MHz-11a-6 Mbps

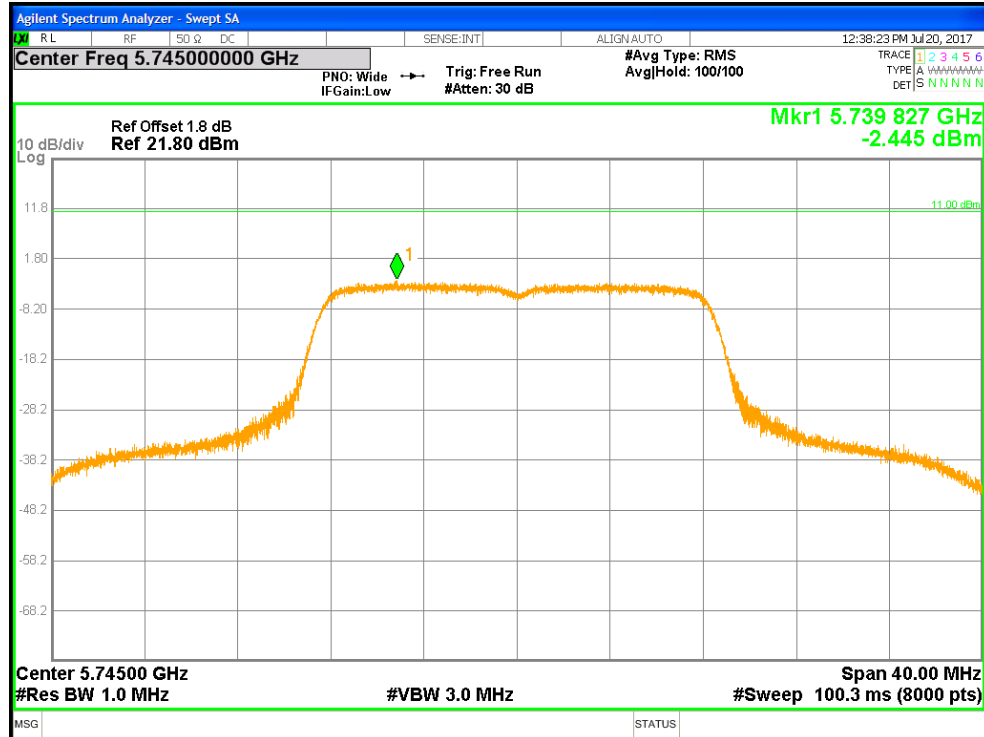


Figure 60: FCC-PPSD-5 GHz-5745 MHz-11a-6 Mbps

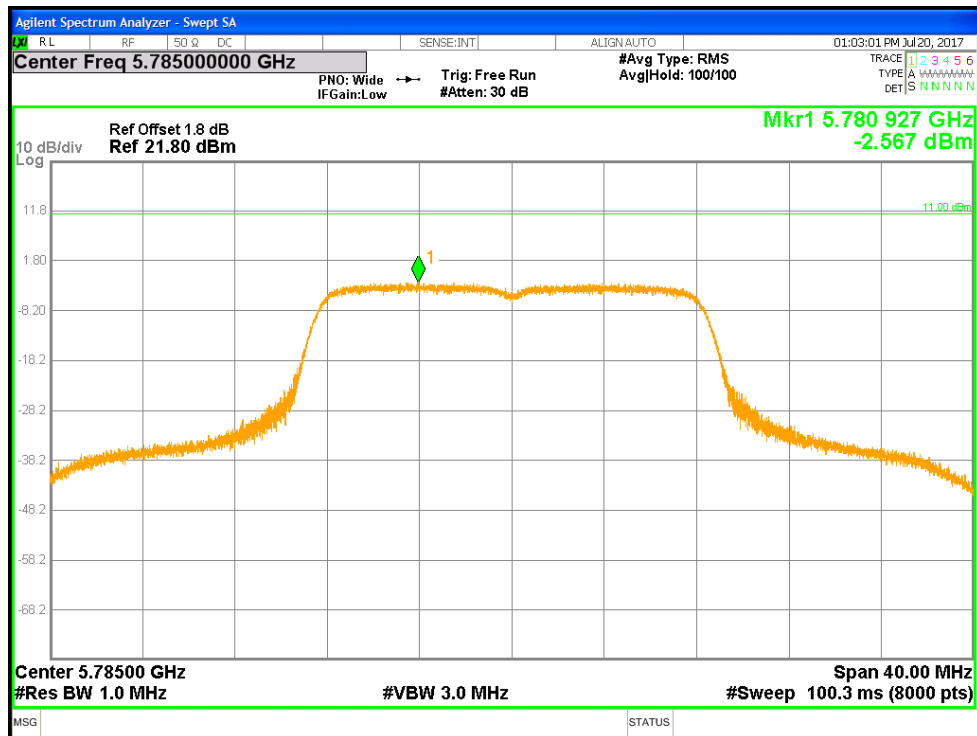


Figure 61: FCC-PPSD-5 GHz-5785 MHz-11a-6 Mbps

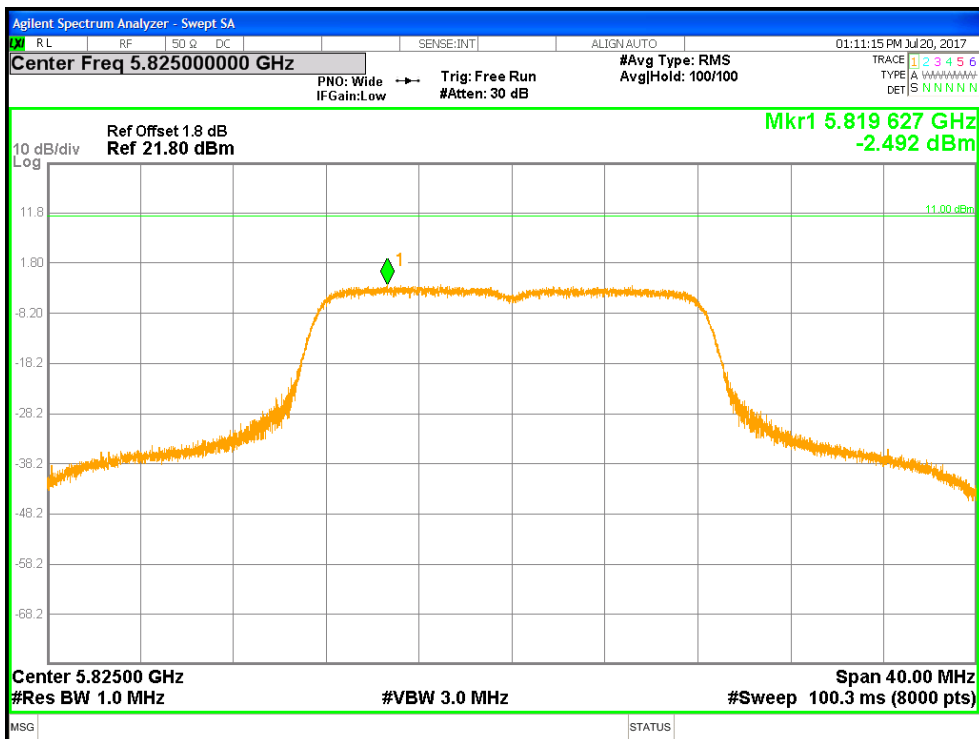


Figure 62: FCC-PPSD-5 GHz-5825 MHz-11a-6 Mbps

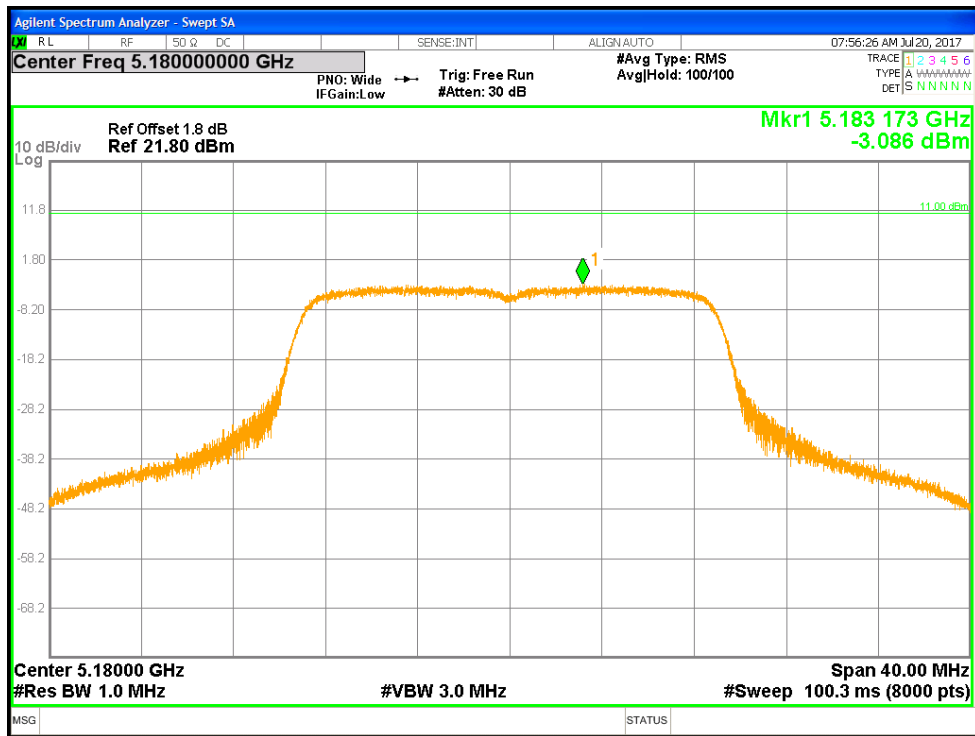


Figure 63: FCC-PPSD-5 GHz-5180 MHz-HT20-6.5 Mbps

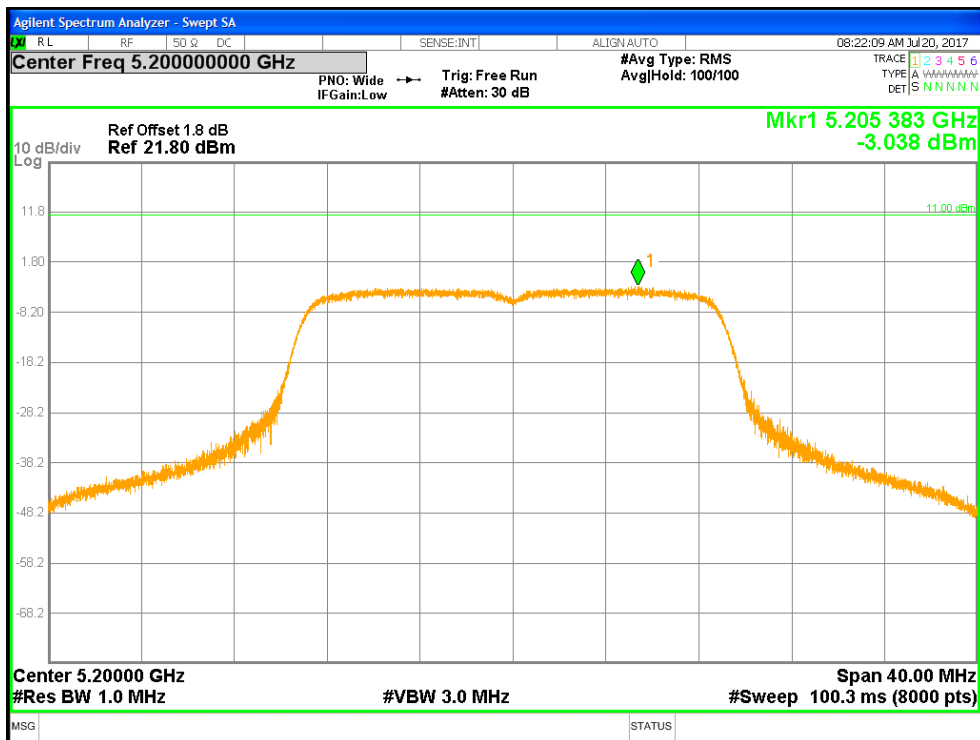


Figure 64: FCC-PPSD-5 GHz-5200 MHz-HT20-6.5 Mbps

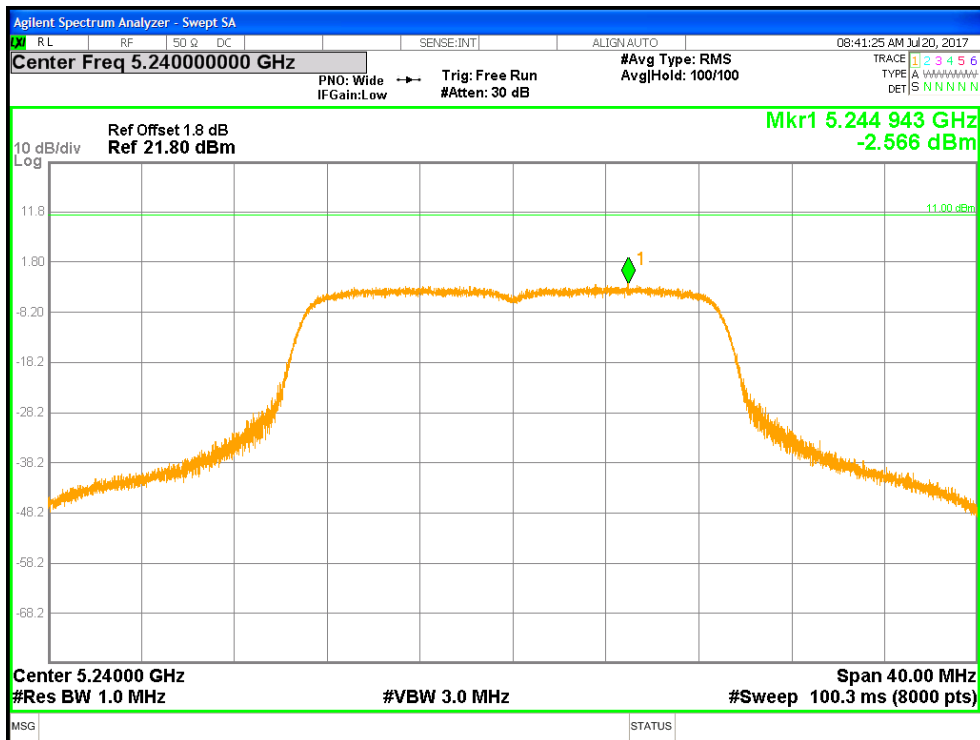


Figure 65: FCC-PPSD-5 GHz-5240 MHz-HT20-6.5 Mbps

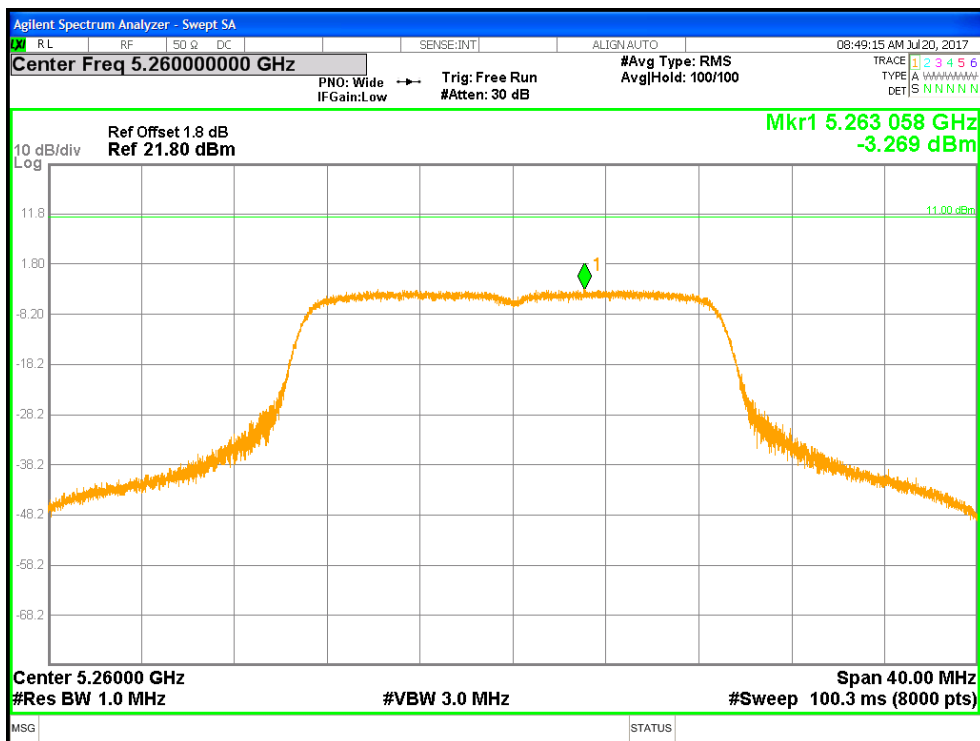


Figure 66: FCC-PPSD-5 GHz-5260 MHz-HT20-6.5 Mbps

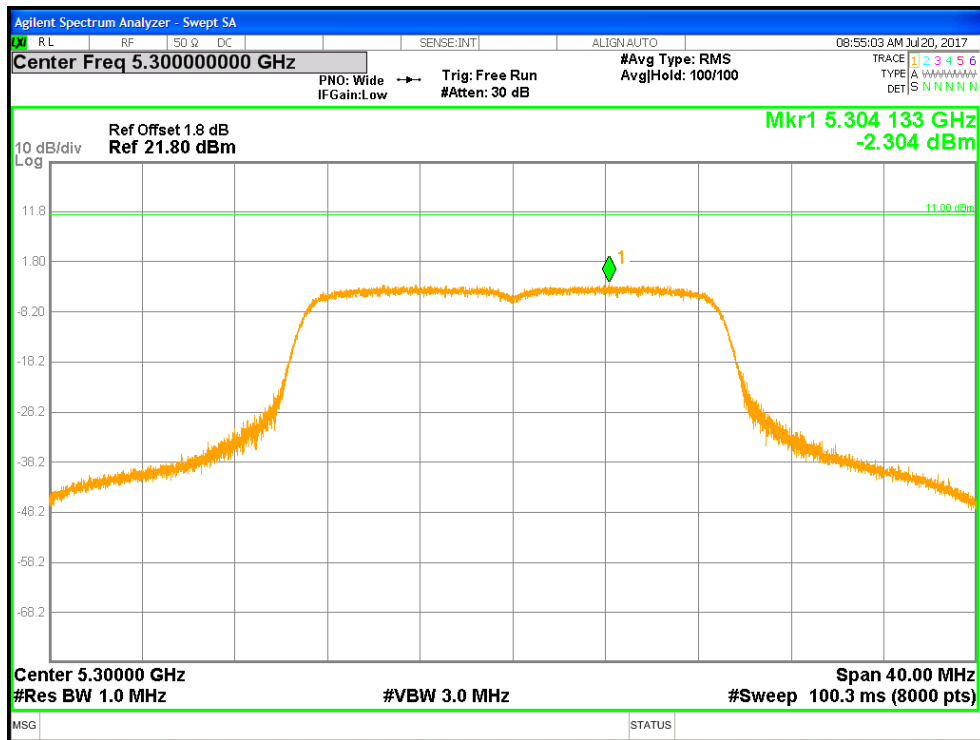


Figure 67: FCC-PPSD-5 GHz-5300 MHz-HT20-6.5 Mbps

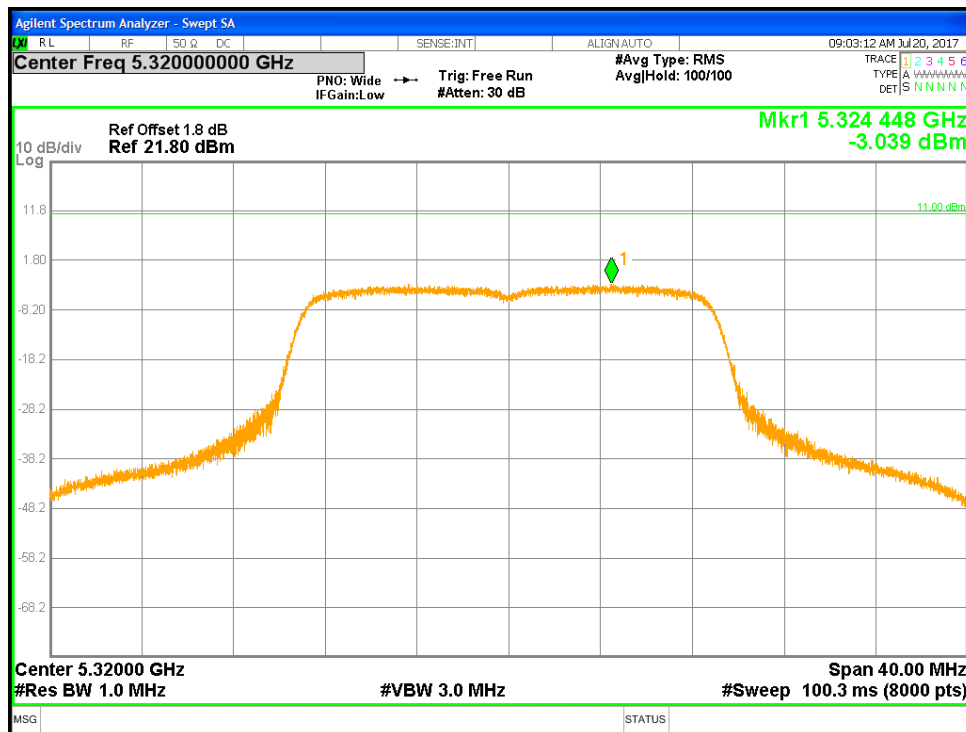


Figure 68: FCC-PPSD-5 GHz-5320 MHz-HT20-6.5 Mbps

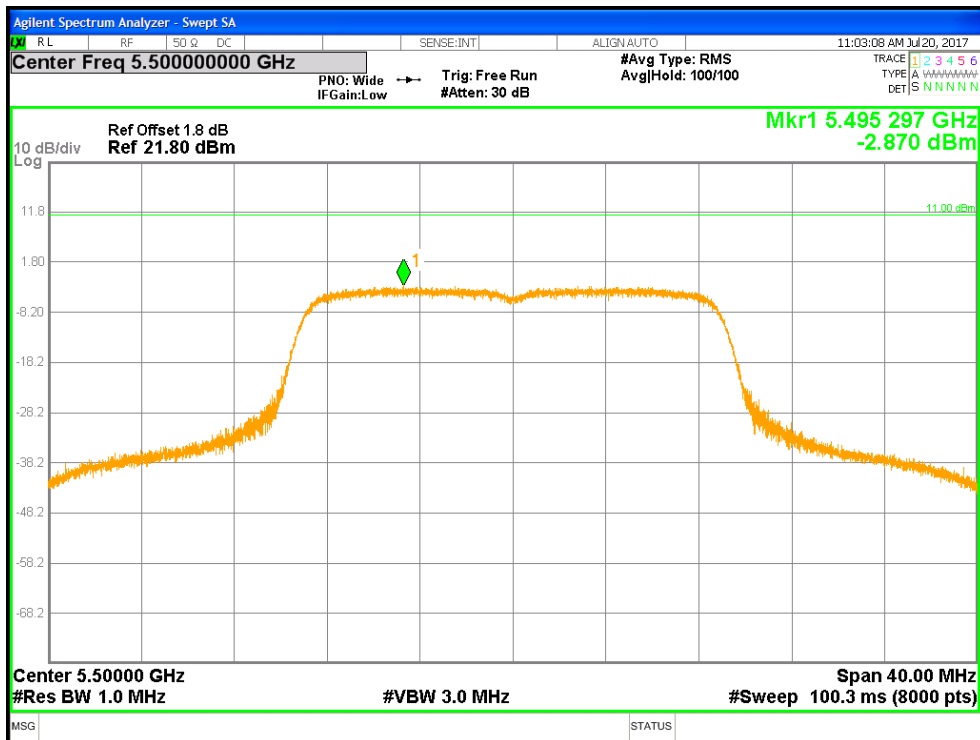


Figure 69: FCC-PPSD-5 GHz-5500 MHz-HT20-6.5 Mbps

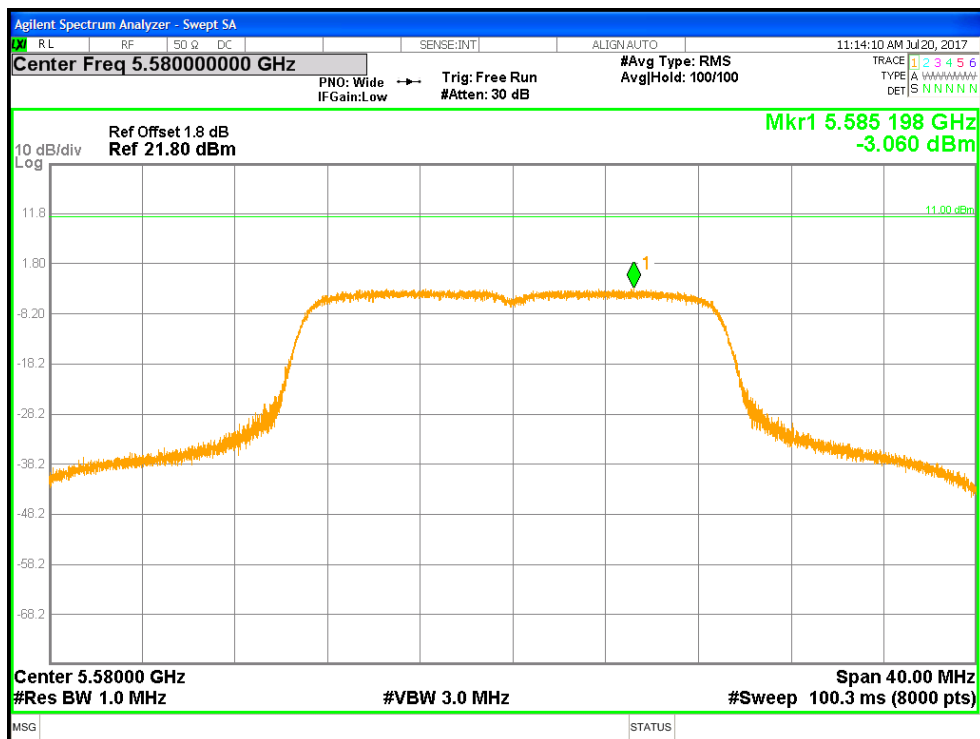


Figure 70: FCC-PPSD-5 GHz-5580 MHz-HT20-6.5 Mbps

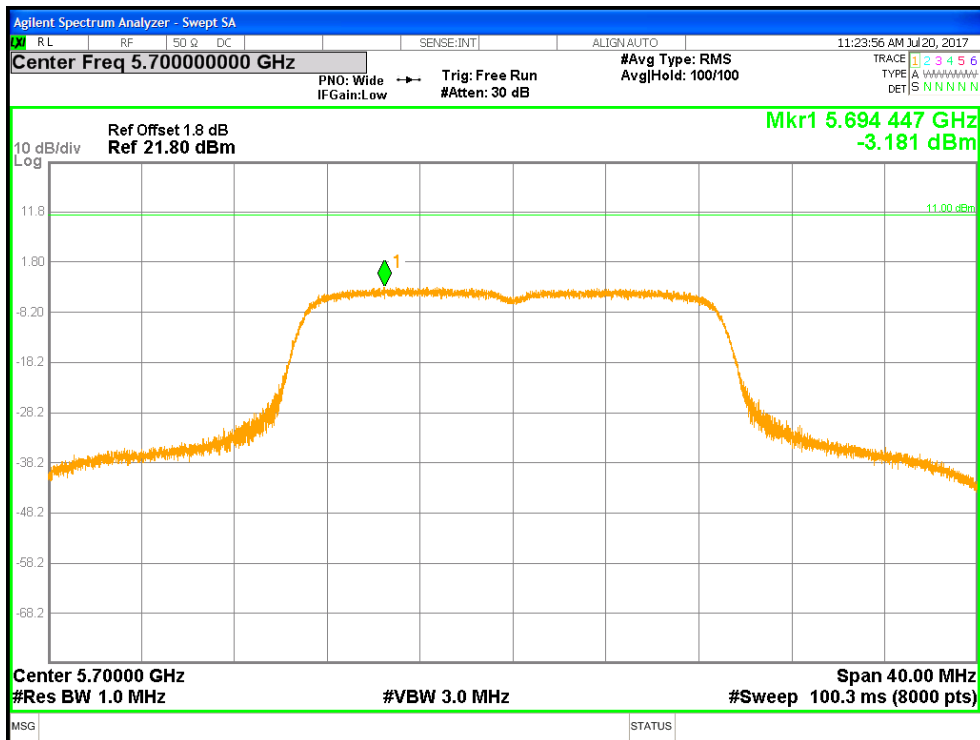


Figure 71: FCC-PPSD-5 GHz-5700 MHz-HT20-6.5 Mbps

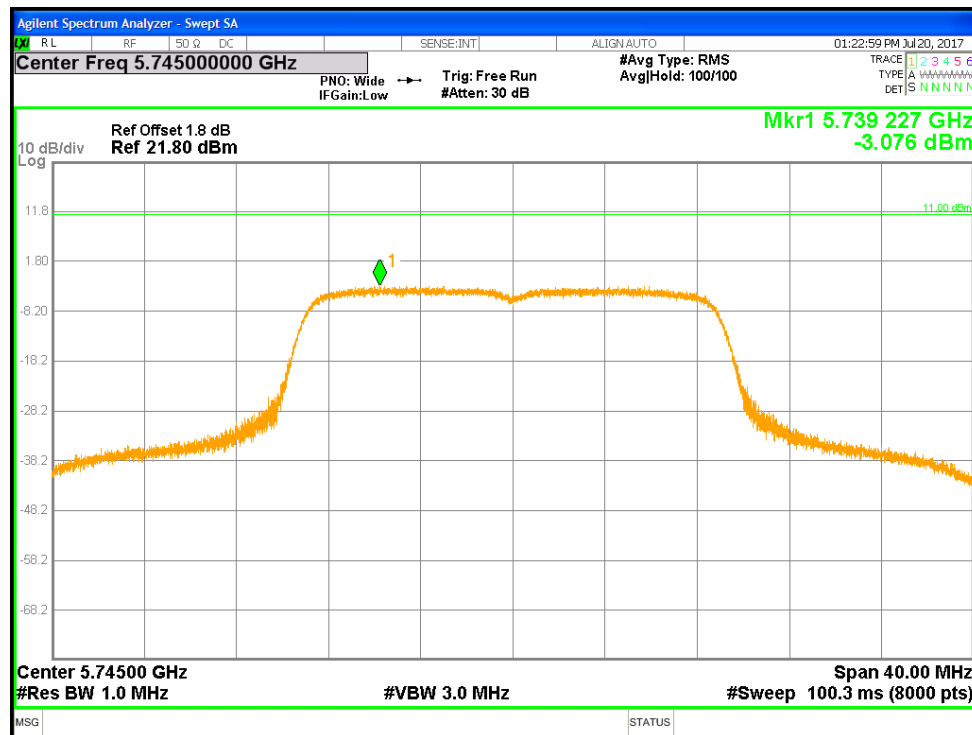


Figure 72: FCC-PPSD-5 GHz-5745 MHz-HT20-6.5 Mbps

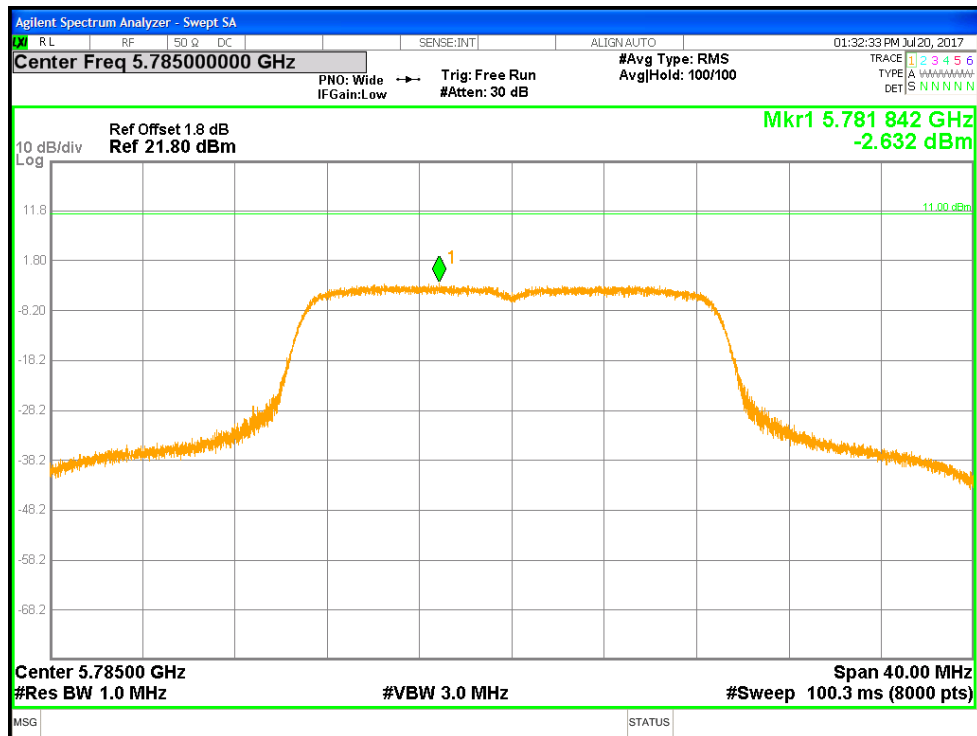


Figure 73: FCC-PPSD-5 GHz-5785 MHz-HT20-6.5 Mbps

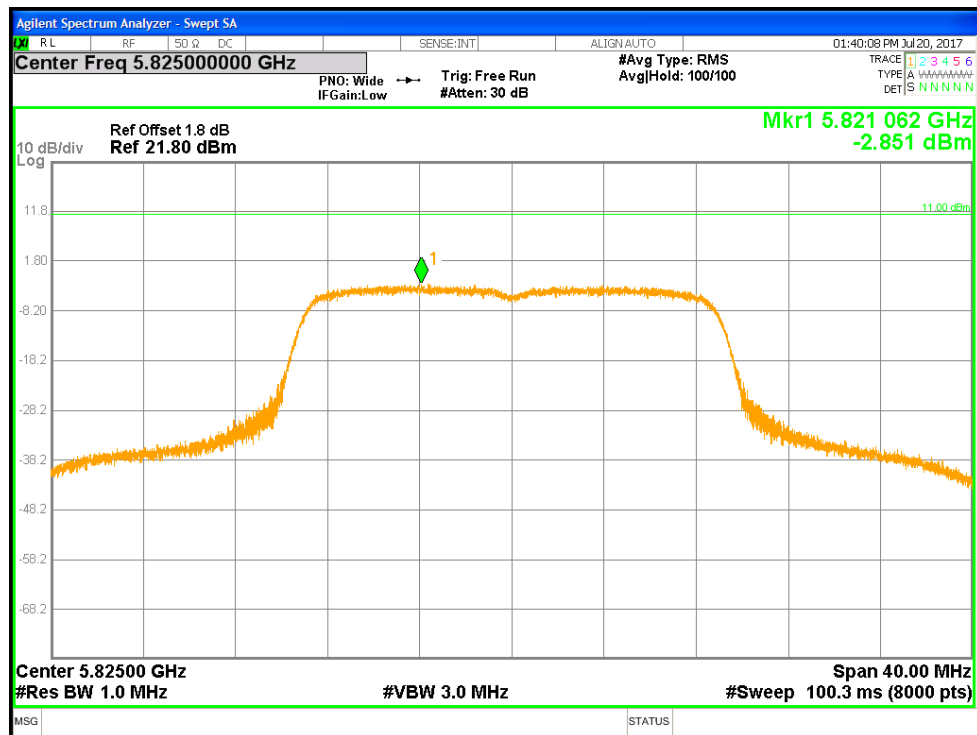


Figure 74: FCC-PPSD-5 GHz-5825 MHz-HT20-6.5 Mbps

#### 4.4 Undesirable Emission Limits

*CFR47 15.407 (b) and RSS 247 Sect.6.2.1.2, 6.2.2.2, and 6.2.3.2: The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:*

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

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

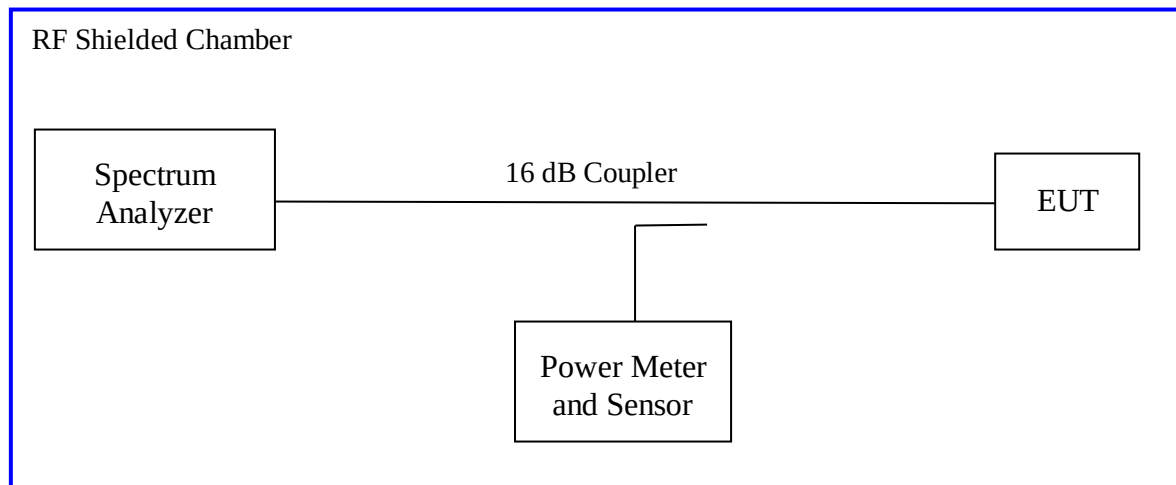
For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of  $-27$  dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

##### 4.4.1 Test Method

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

Test Setup:



##### 4.4.2 Results

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

**Table 7: Undesired Emissions for 802.11a – Test Results**

|                                                                                                                                                                                                                                                                                                      |        |      |      |                                 |        |                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|------|---------------------------------|--------|-----------------------|
| Test Conditions: Conducted Measurement                                                                                                                                                                                                                                                               |        |      |      | Date: July 20, 2017             |        |                       |
| Antenna Type: Chip                                                                                                                                                                                                                                                                                   |        |      |      | Power Setting: See test plan.   |        |                       |
| Antenna Gain: 4.9 dBi                                                                                                                                                                                                                                                                                |        |      |      | Signal State: Modulated at 100% |        |                       |
| Ambient Temp.: 23° C                                                                                                                                                                                                                                                                                 |        |      |      | Relative Humidity: 35%          |        |                       |
| Undesired Emissions for 802.11a                                                                                                                                                                                                                                                                      |        |      |      |                                 |        |                       |
| Frequency                                                                                                                                                                                                                                                                                            | Level  | Det. | Port | Limit                           | Margin | Comments              |
| MHz                                                                                                                                                                                                                                                                                                  | dBuV/m |      |      | cm                              | dB     |                       |
| 1732.60                                                                                                                                                                                                                                                                                              | -43.46 | Pk   | RF   | -27.00                          | -16.46 | 11a, 5180MHz, 6.0Mbps |
| 36963.70                                                                                                                                                                                                                                                                                             | -38.85 | Pk   | RF   | -27.00                          | -11.85 | 11a, 5180MHz, 6.0Mbps |
| 1738.60                                                                                                                                                                                                                                                                                              | -43.61 | Pk   | RF   | -27.00                          | -16.61 | 11a, 5200MHz, 6.0Mbps |
| 37217.60                                                                                                                                                                                                                                                                                             | -38.69 | Pk   | RF   | -27.00                          | -11.69 | 11a, 5200MHz, 6.0Mbps |
| 1743.60                                                                                                                                                                                                                                                                                              | -42.28 | Pk   | RF   | -27.00                          | -15.28 | 11a, 5240MHz, 6.0Mbps |
| 37026.70                                                                                                                                                                                                                                                                                             | -38.42 | Pk   | RF   | -27.00                          | -11.42 | 11a, 5240MHz, 6.0Mbps |
| 1755.60                                                                                                                                                                                                                                                                                              | -42.39 | Pk   | RF   | -27.00                          | -15.39 | 11a, 5260MHz, 6.0Mbps |
| 37012.70                                                                                                                                                                                                                                                                                             | -39.12 | Pk   | RF   | -27.00                          | -12.12 | 11a, 5260MHz, 6.0Mbps |
| 1761.60                                                                                                                                                                                                                                                                                              | -40.8  | Pk   | RF   | -27.00                          | -13.80 | 11a, 5300MHz, 6.0Mbps |
| 36394.80                                                                                                                                                                                                                                                                                             | -39.5  | Pk   | RF   | -27.00                          | -12.50 | 11a, 5300MHz, 6.0Mbps |
| 1773.60                                                                                                                                                                                                                                                                                              | -39.93 | Pk   | RF   | -27.00                          | -12.93 | 11a, 5320MHz, 6.0Mbps |
| 36969.70                                                                                                                                                                                                                                                                                             | -38.84 | Pk   | RF   | -27.00                          | -11.84 | 11a, 5320MHz, 6.0Mbps |
| 1837.60                                                                                                                                                                                                                                                                                              | -38.57 | Pk   | RF   | -27.00                          | -11.57 | 11a, 5500MHz, 6.0Mbps |
| 36438.80                                                                                                                                                                                                                                                                                             | -38.57 | Pk   | RF   | -27.00                          | -11.57 | 11a, 5500MHz, 6.0Mbps |
| 3720.20                                                                                                                                                                                                                                                                                              | -41.38 | Pk   | RF   | -27.00                          | -14.38 | 11a, 5580MHz, 6.0Mbps |
| 36043.90                                                                                                                                                                                                                                                                                             | -39.35 | Pk   | RF   | -27.00                          | -12.35 | 11a, 5580MHz, 6.0Mbps |
| 3800.10                                                                                                                                                                                                                                                                                              | -37.22 | Pk   | RF   | -27.00                          | -10.22 | 11a, 5700MHz, 6.0Mbps |
| 37018.70                                                                                                                                                                                                                                                                                             | -38.59 | Pk   | RF   | -27.00                          | -11.59 | 11a, 5700MHz, 6.0Mbps |
| 3830.10                                                                                                                                                                                                                                                                                              | -36.95 | Pk   | RF   | -27.00                          | -9.95  | 11a, 5745MHz, 6.0Mbps |
| 36595.80                                                                                                                                                                                                                                                                                             | -39.45 | Pk   | RF   | -27.00                          | -12.45 | 11a, 5745MHz, 6.0Mbps |
| 3856.10                                                                                                                                                                                                                                                                                              | -39.52 | Pk   | RF   | -27.00                          | -12.52 | 11a, 5785MHz, 6.0Mbps |
| 36980.70                                                                                                                                                                                                                                                                                             | -38.95 | Pk   | RF   | -27.00                          | -11.95 | 11a, 5785MHz, 6.0Mbps |
| 4846.90                                                                                                                                                                                                                                                                                              | -38.41 | Pk   | RF   | -27.00                          | -11.41 | 11a, 5825MHz, 6.0Mbps |
| 38810.30                                                                                                                                                                                                                                                                                             | -39.13 | Pk   | RF   | -27.00                          | -12.13 | 11a, 5825MHz, 6.0Mbps |
| Note: 1. Worst case condition observed at 6.0 Mbps.<br>2. All out of band emissions are lower than the -27dBm level.<br>3. 99% OBW emission of 5240 MHz operating channel did not leak into 5250 MHz-5350 MHz band. See Fig. 123.<br>4. Emissions of UNII3 channels met the band-edge spectrum mask. |        |      |      |                                 |        |                       |

**Table 8: Undesired Emissions for 802.11n HT20 – Test Results**

|                                                                                                                                                                                                                                                                                                      |        |      |      |                                 |        |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|------|---------------------------------|--------|------------------------|
| Test Conditions: Conducted Measurement                                                                                                                                                                                                                                                               |        |      |      | Date: July 17, 2017             |        |                        |
| Antenna Type: Chip                                                                                                                                                                                                                                                                                   |        |      |      | Power Setting: See test plan.   |        |                        |
| Antenna Gain: 4.9 dBi                                                                                                                                                                                                                                                                                |        |      |      | Signal State: Modulated at 100% |        |                        |
| Ambient Temp.: 23° C                                                                                                                                                                                                                                                                                 |        |      |      | Relative Humidity: 35%          |        |                        |
| Undesired Emissions for 802.11n HT20                                                                                                                                                                                                                                                                 |        |      |      |                                 |        |                        |
| Frequency                                                                                                                                                                                                                                                                                            | Level  | Det. | Port | Limit                           | Margin | Comments               |
| MHz                                                                                                                                                                                                                                                                                                  | dBuV/m |      |      | cm                              | dB     |                        |
| 1743.60                                                                                                                                                                                                                                                                                              | -42.46 | Pk   | RF   | -27.00                          | -15.46 | HT20, 5180MHz, 6.5Mbps |
| 39821.00                                                                                                                                                                                                                                                                                             | -39.39 | Pk   | RF   | -27.00                          | -12.39 | HT20, 5180MHz, 6.5Mbps |
| 1736.60                                                                                                                                                                                                                                                                                              | -42.31 | Pk   | RF   | -27.00                          | -15.31 | HT20, 5200MHz, 6.5Mbps |
| 37012.70                                                                                                                                                                                                                                                                                             | -38.12 | Pk   | RF   | -27.00                          | -11.12 | HT20, 5200MHz, 6.5Mbps |
| 1748.60                                                                                                                                                                                                                                                                                              | -41.60 | Pk   | RF   | -27.00                          | -14.60 | HT20, 5240MHz, 6.5Mbps |
| 39740.10                                                                                                                                                                                                                                                                                             | -39.17 | Pk   | RF   | -27.00                          | -12.17 | HT20, 5240MHz, 6.5Mbps |
| 1747.60                                                                                                                                                                                                                                                                                              | -42.39 | Pk   | RF   | -27.00                          | -15.39 | HT20, 5260MHz, 6.5Mbps |
| 36990.70                                                                                                                                                                                                                                                                                             | -38.79 | Pk   | RF   | -27.00                          | -11.79 | HT20, 5260MHz, 6.5Mbps |
| 1771.60                                                                                                                                                                                                                                                                                              | -40.26 | Pk   | RF   | -27.00                          | -13.26 | HT20, 5300MHz, 6.5Mbps |
| 37129.70                                                                                                                                                                                                                                                                                             | -39.50 | Pk   | RF   | -27.00                          | -12.50 | HT20, 5300MHz, 6.5Mbps |
| 1778.60                                                                                                                                                                                                                                                                                              | -39.99 | Pk   | RF   | -27.00                          | -12.99 | HT20, 5320MHz, 6.5Mbps |
| 36529.80                                                                                                                                                                                                                                                                                             | -39.29 | Pk   | RF   | -27.00                          | -12.29 | HT20, 5320MHz, 6.5Mbps |
| 1826.60                                                                                                                                                                                                                                                                                              | -37.99 | Pk   | RF   | -27.00                          | -10.99 | HT20, 5500MHz, 6.5Mbps |
| 36707.70                                                                                                                                                                                                                                                                                             | -39.13 | Pk   | RF   | -27.00                          | -12.13 | HT20, 5500MHz, 6.5Mbps |
| 3720.20                                                                                                                                                                                                                                                                                              | -42.07 | Pk   | RF   | -27.00                          | -15.07 | HT20, 5580MHz, 6.5Mbps |
| 36806.70                                                                                                                                                                                                                                                                                             | -39.90 | Pk   | RF   | -27.00                          | -12.90 | HT20, 5580MHz, 6.5Mbps |
| 3800.10                                                                                                                                                                                                                                                                                              | -38.14 | Pk   | RF   | -27.00                          | -11.14 | HT20, 5700MHz, 6.5Mbps |
| 36606.80                                                                                                                                                                                                                                                                                             | -39.21 | Pk   | RF   | -27.00                          | -12.21 | HT20, 5700MHz, 6.5Mbps |
| 3830.10                                                                                                                                                                                                                                                                                              | -37.65 | Pk   | RF   | -27.00                          | -10.65 | HT20, 5745MHz, 6.5Mbps |
| 37194.60                                                                                                                                                                                                                                                                                             | -37.63 | Pk   | RF   | -27.00                          | -10.63 | HT20, 5745MHz, 6.5Mbps |
| 3856.10                                                                                                                                                                                                                                                                                              | -37.75 | Pk   | RF   | -27.00                          | -10.75 | HT20, 5785MHz, 6.5Mbps |
| 37012.70                                                                                                                                                                                                                                                                                             | -38.88 | Pk   | RF   | -27.00                          | -11.88 | HT20, 5785MHz, 6.5Mbps |
| 3887.94                                                                                                                                                                                                                                                                                              | -33.39 | Pk   | RF   | -27.00                          | -6.39  | HT20, 5825MHz, 6.5Mbps |
| 4846.29                                                                                                                                                                                                                                                                                              | -29.37 | Pk   | RF   | -27.00                          | -2.37  | HT20, 5825MHz, 6.5Mbps |
| Note: 1. Worst case condition observed at 6.5 Mbps.<br>2. All out of band emissions are lower than the -27dBm level.<br>3. 99% OBW emission of 5240 MHz operating channel did not leak into 5250 MHz-5350 MHz band. See Fig. 124.<br>4. Emissions of UNII3 channels met the band-edge spectrum mask. |        |      |      |                                 |        |                        |

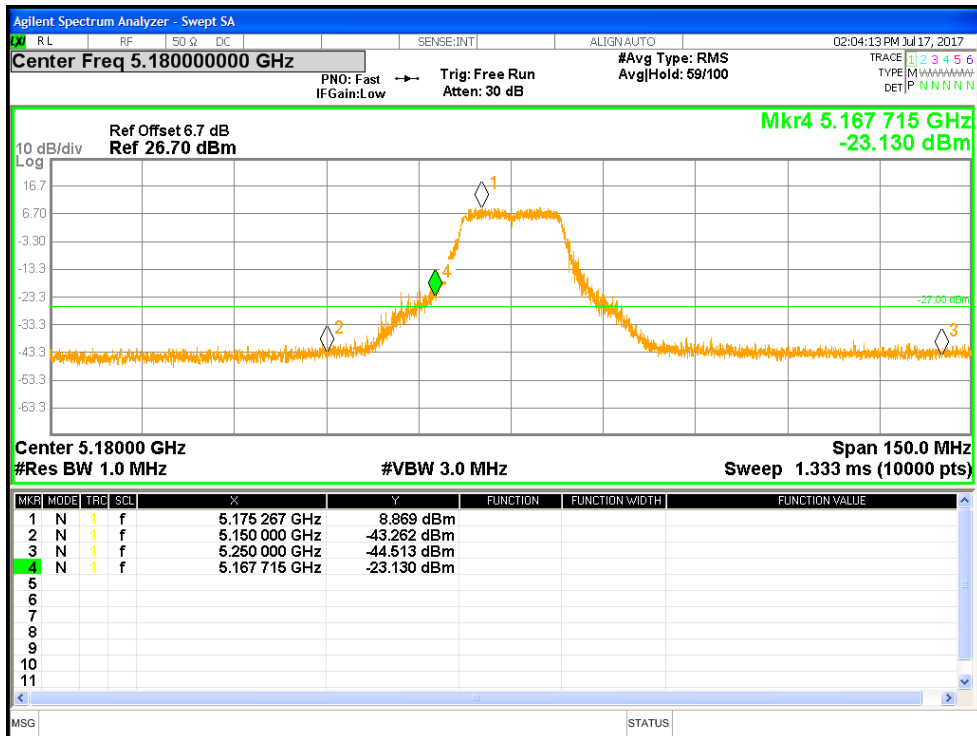


Figure 75: Measured Band-edge for 802.11a-6 Mbps at 5180 MHz

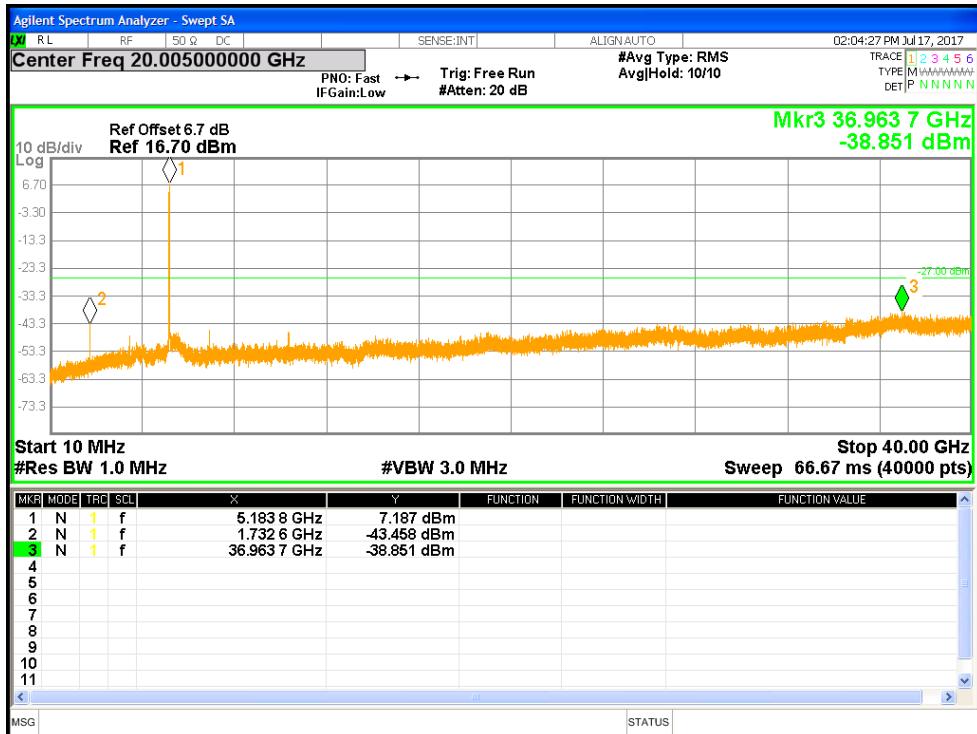


Figure 76: Undesirable Emission for 802.11a-6 Mbps at 5180 MHz

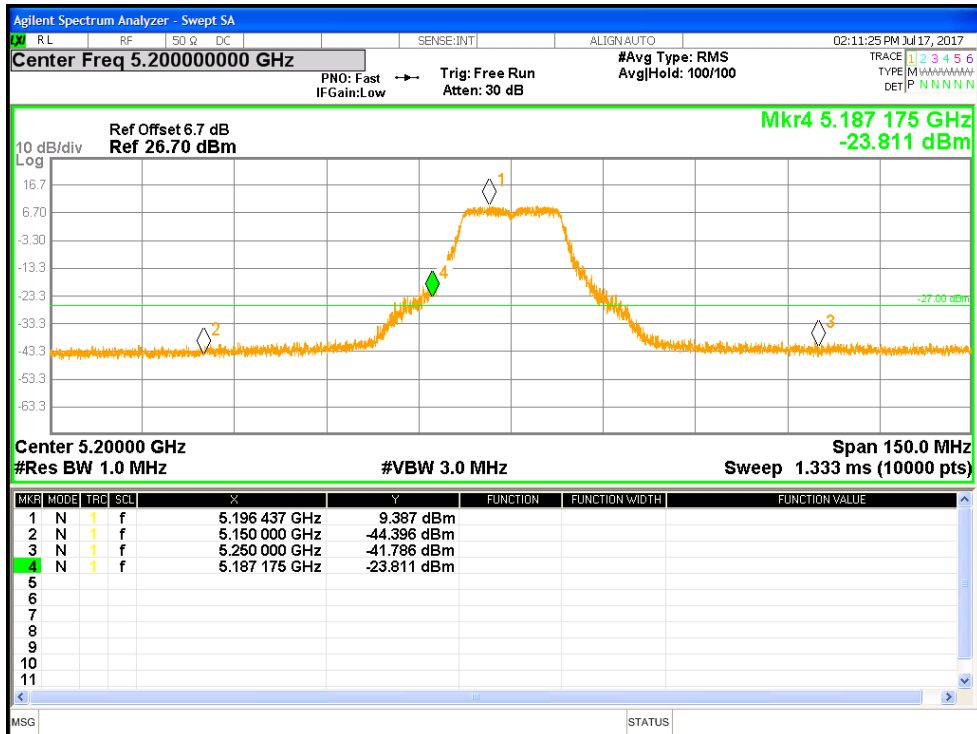


Figure 77: Measured Band-edge for 802.11a-6 Mbps at 5200 MHz

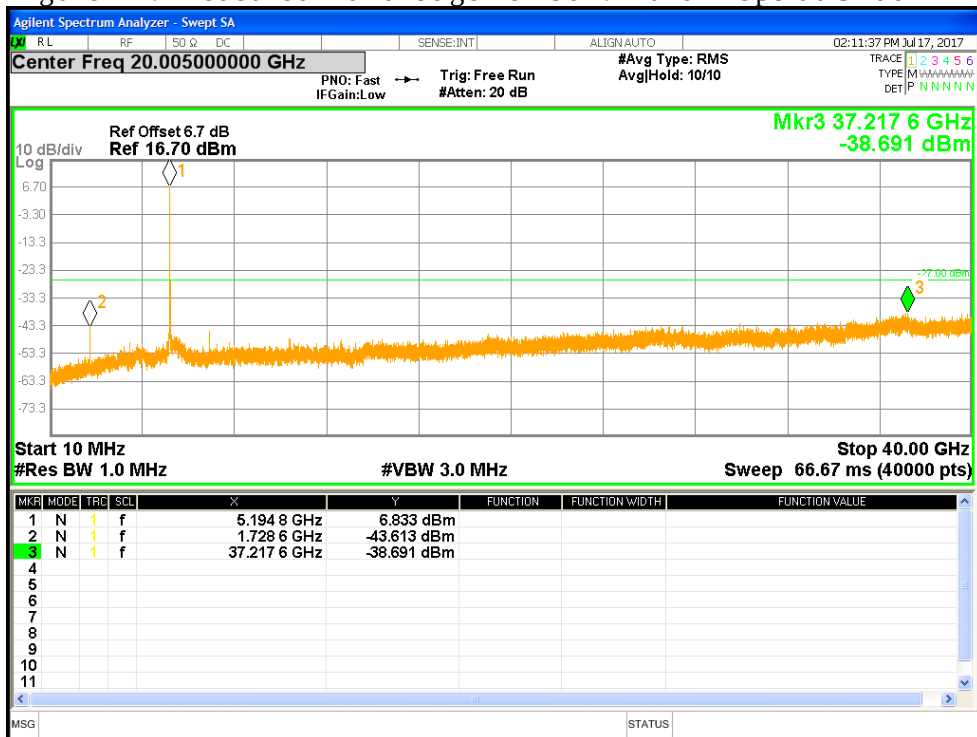


Figure 78: Undesirable Emission for 802.11a-6 Mbps at 5200 MHz

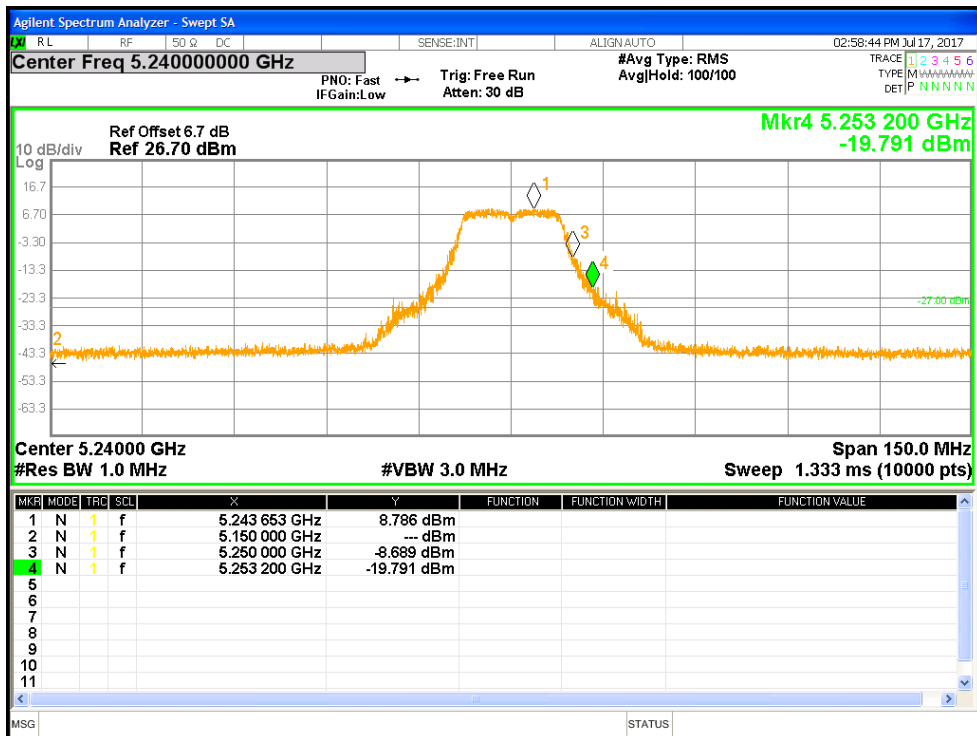


Figure 79: Measured In-Band Band-edge for 802.11a-6 Mbps at 5240 MHz

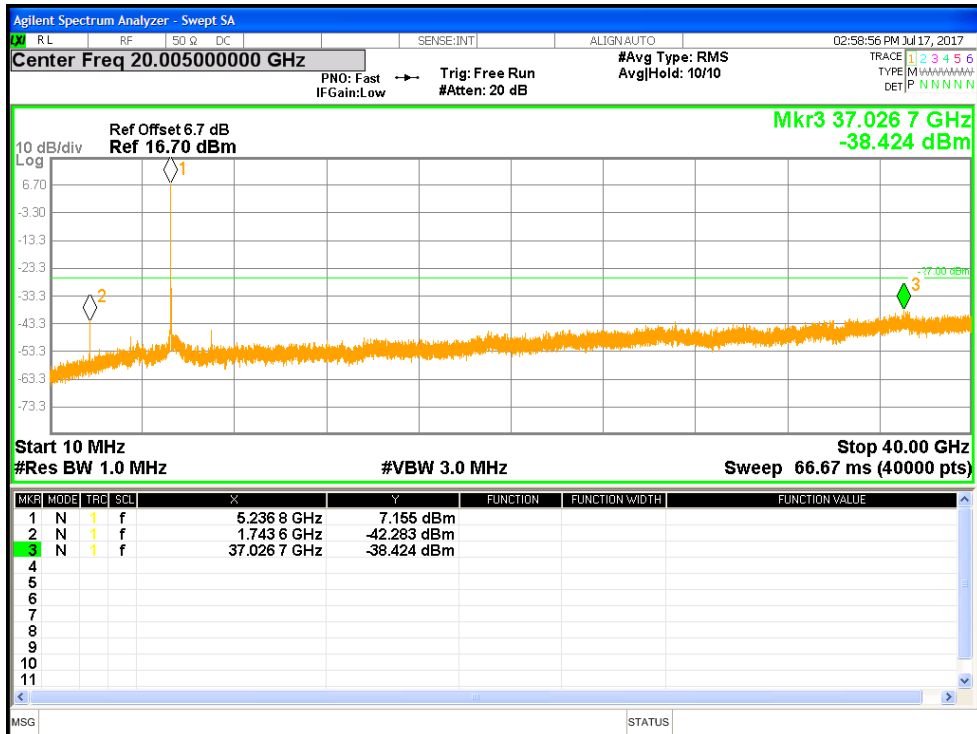


Figure 80: Measured In-Band Band-edge for 802.11a-6 Mbps at 5240 MHz

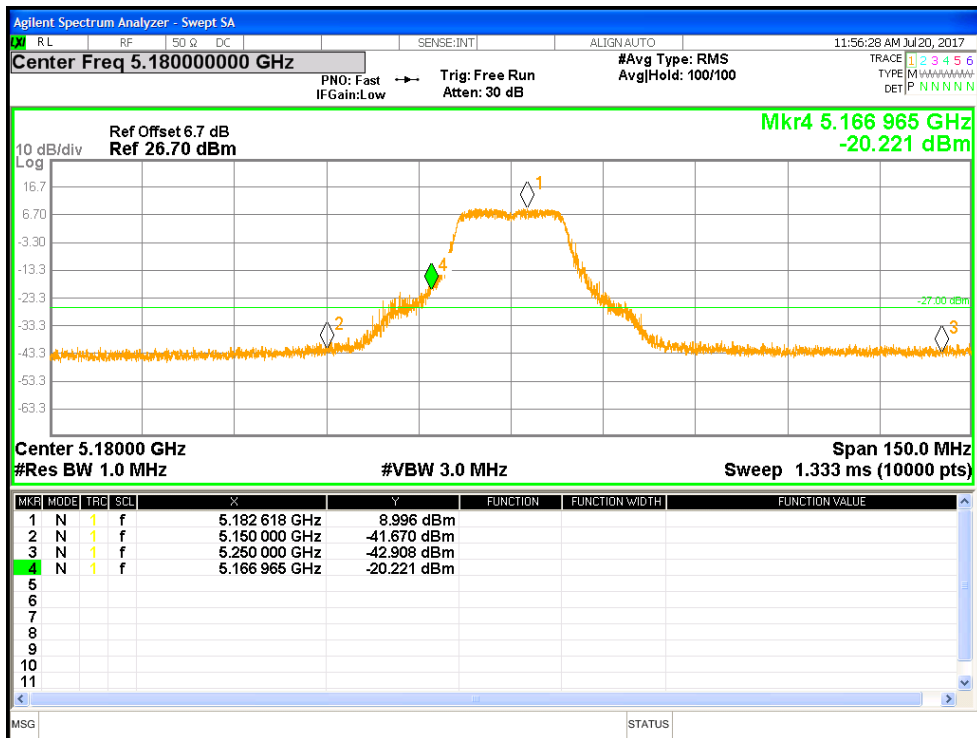


Figure 81: Measured Band-edge for HT20-MCS0 at 5180 MHz

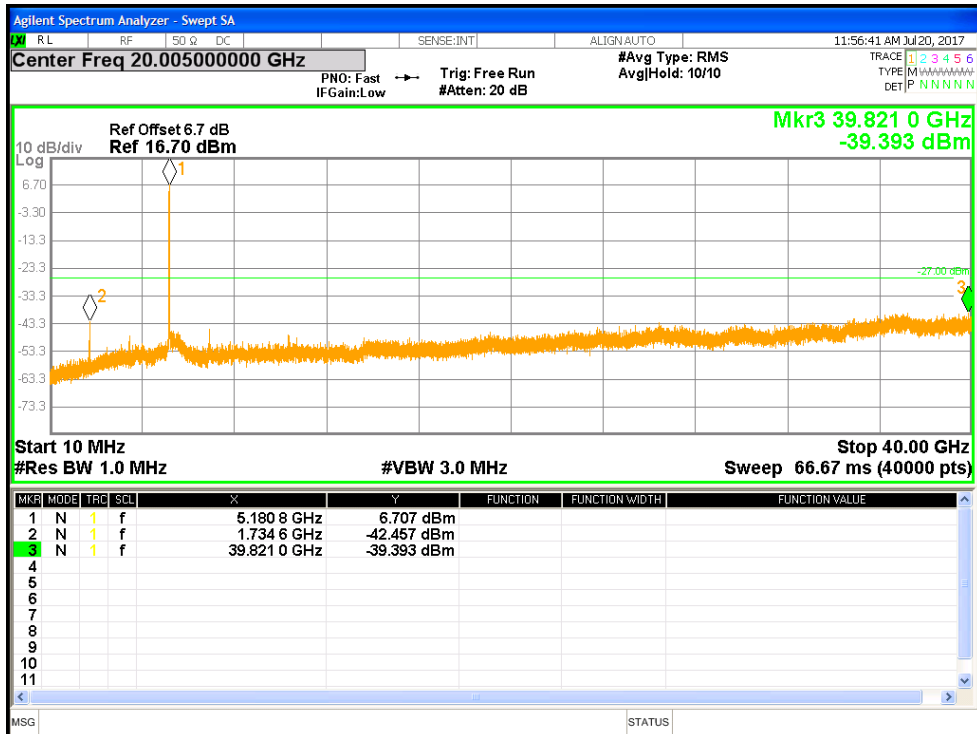


Figure 82: Undesirable Emission for HT20-MCS0 at 5180 MHz

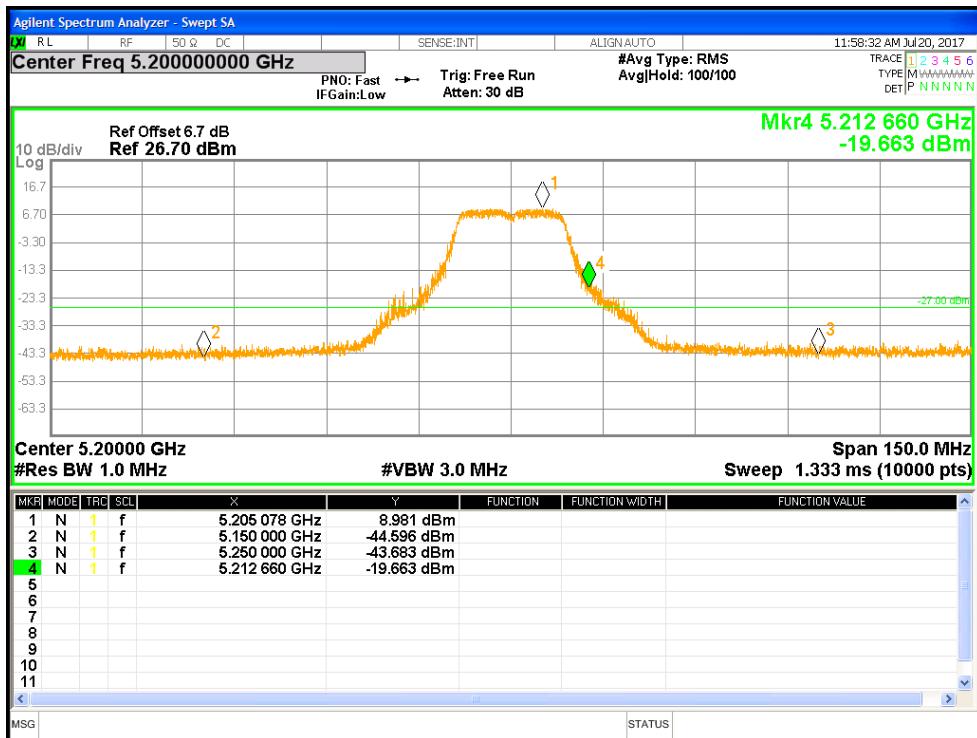


Figure 83: Measured In-Band Band-edge for HT20-MCS0 at 5200 MHz

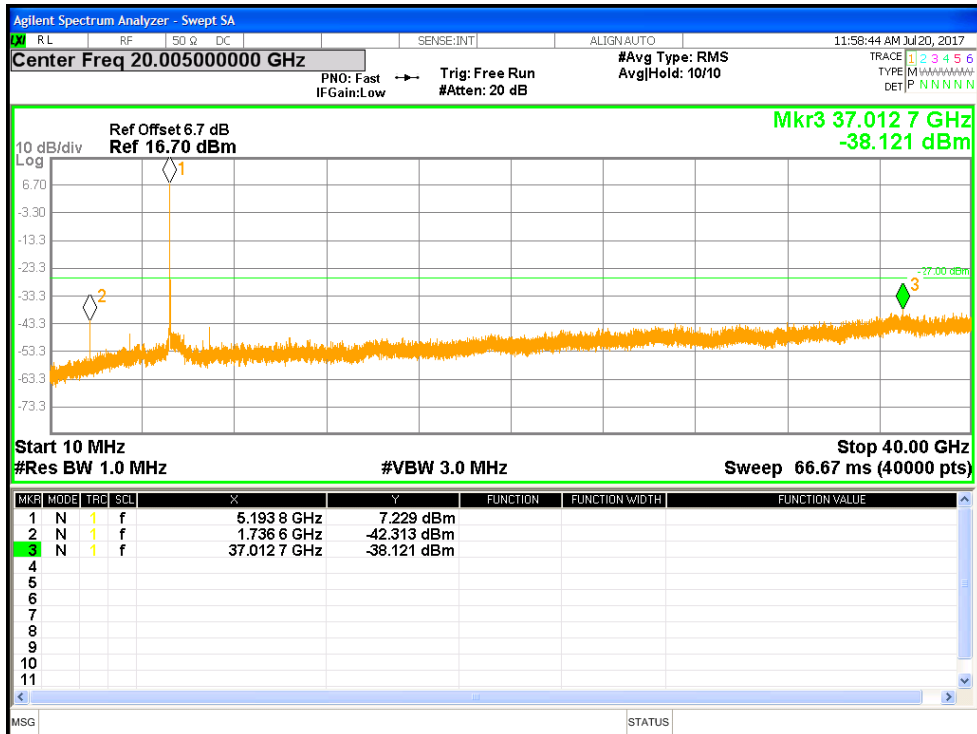


Figure 84: Measured In-Band Band-edge for HT20-MCS0 at 5200 MHz

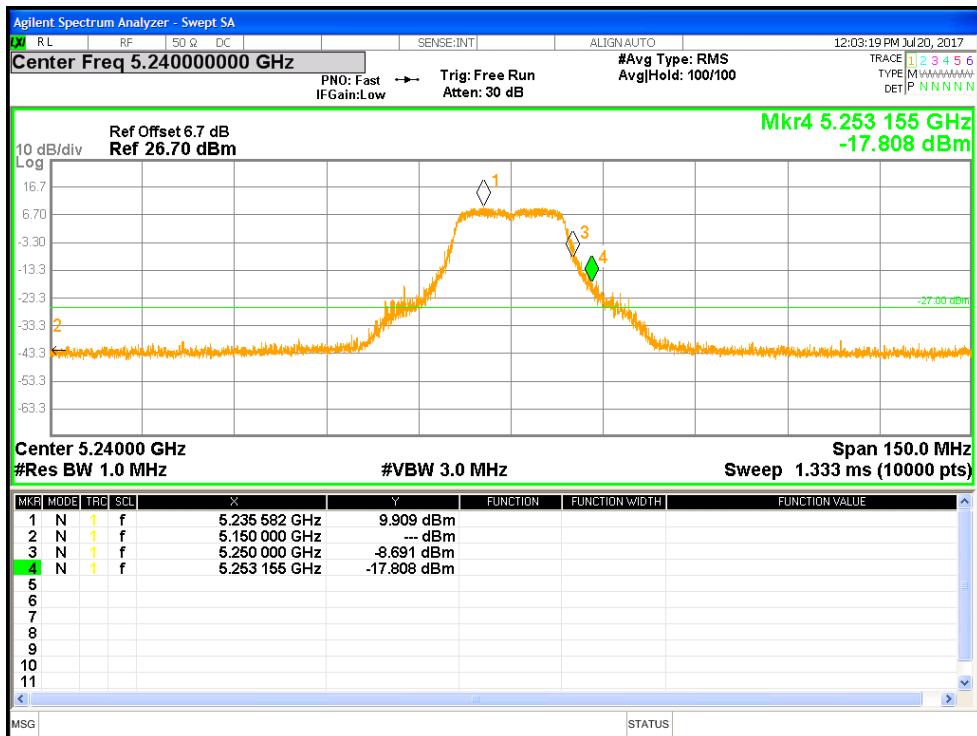


Figure 85: Measured Band-edge for HT20-MCS0 at 5240 MHz

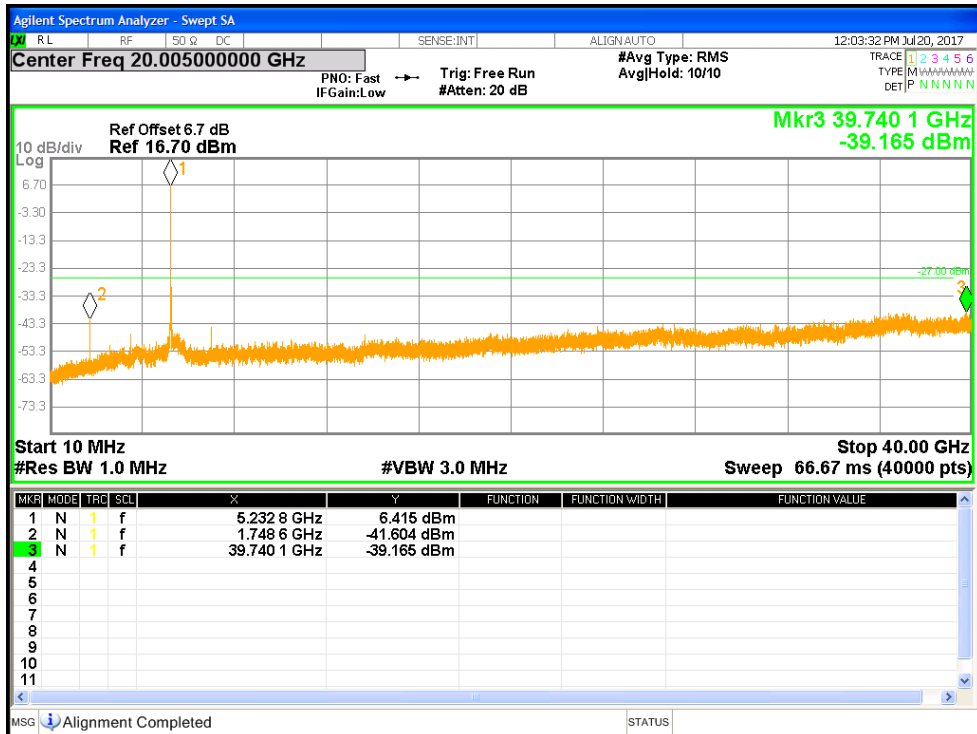


Figure 86: Undesirable Emission for HT20-MCS0 at 5240 MHz

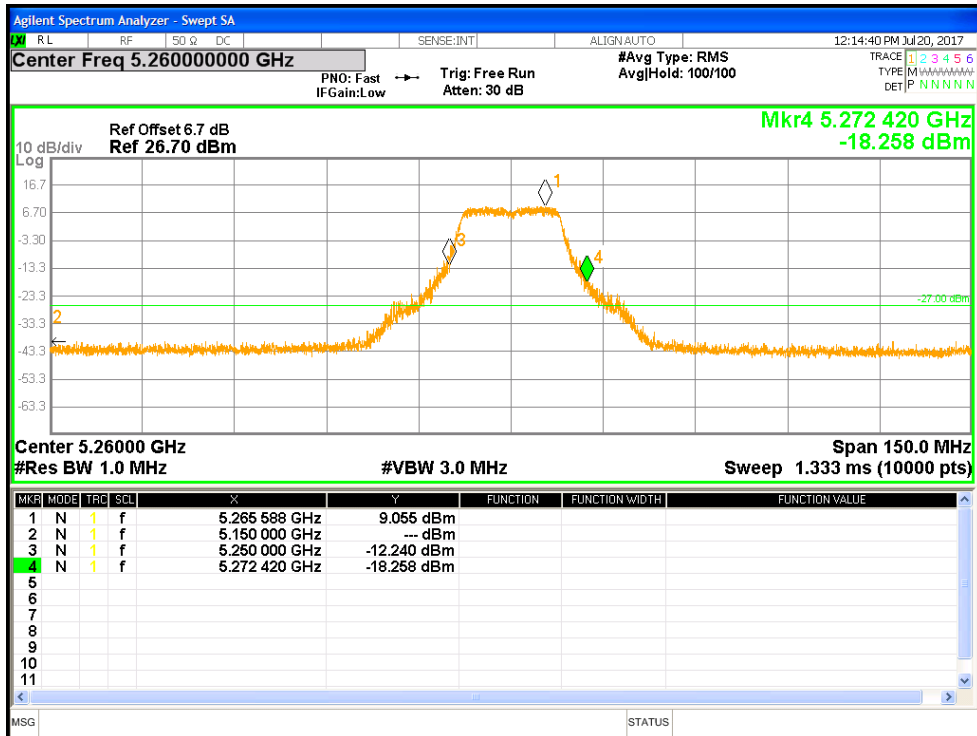


Figure 87: Measured Band-edge for 802.11a-6 Mbps at 5260 MHz

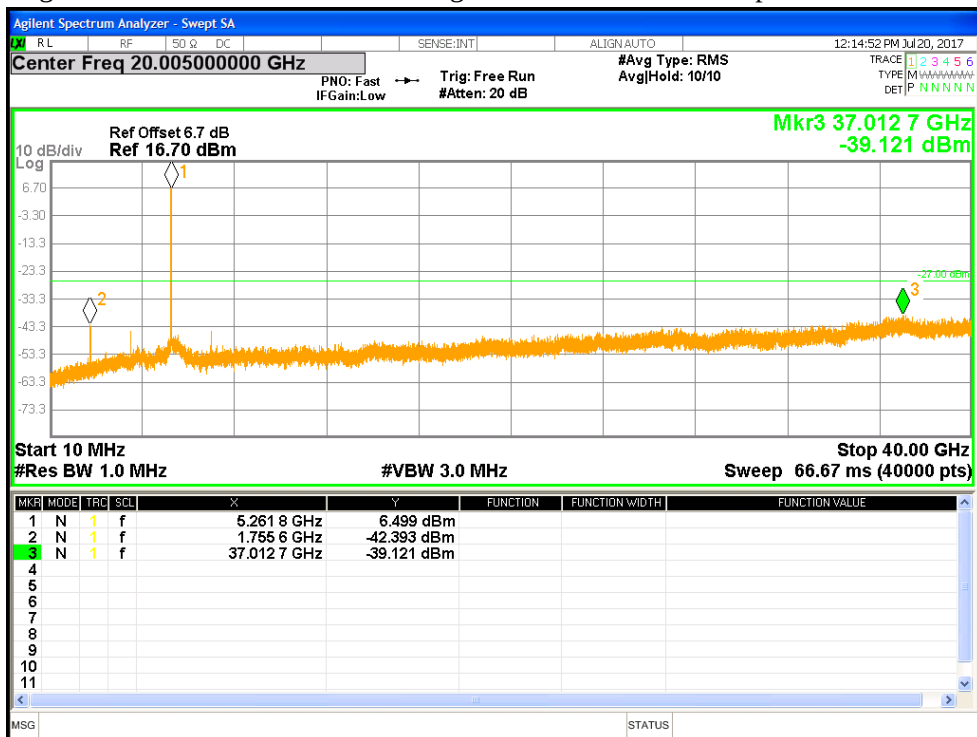


Figure 88: Undesirable Emission for 802.11a-6 Mbps at 5260 MHz

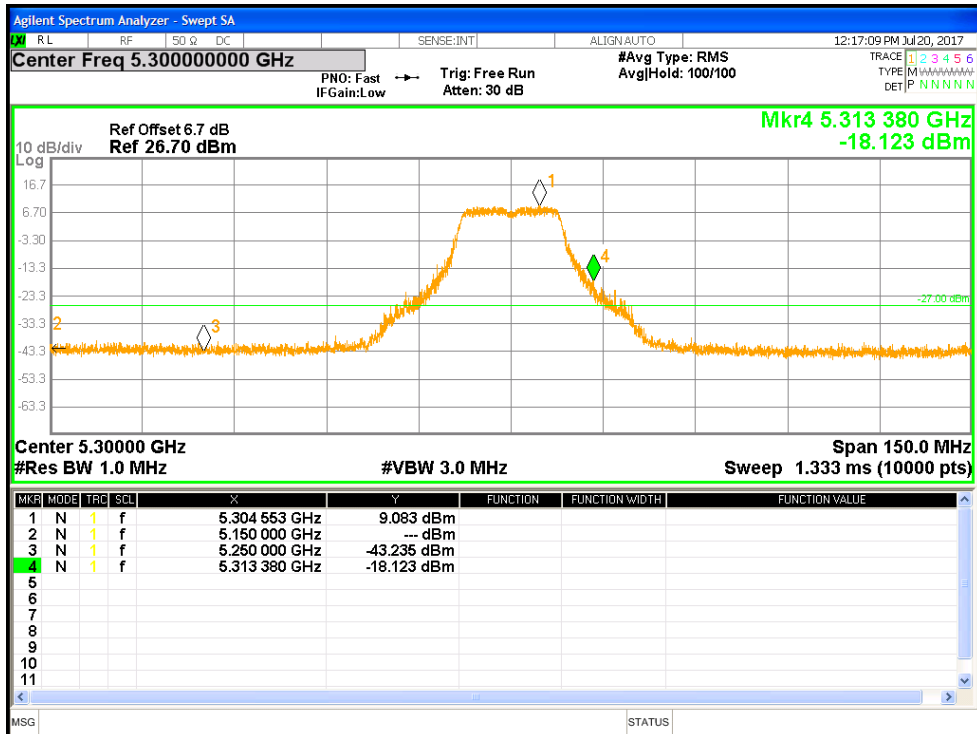


Figure 89: Measured Band-edge for 802.11a-6 Mbps at 5300 MHz

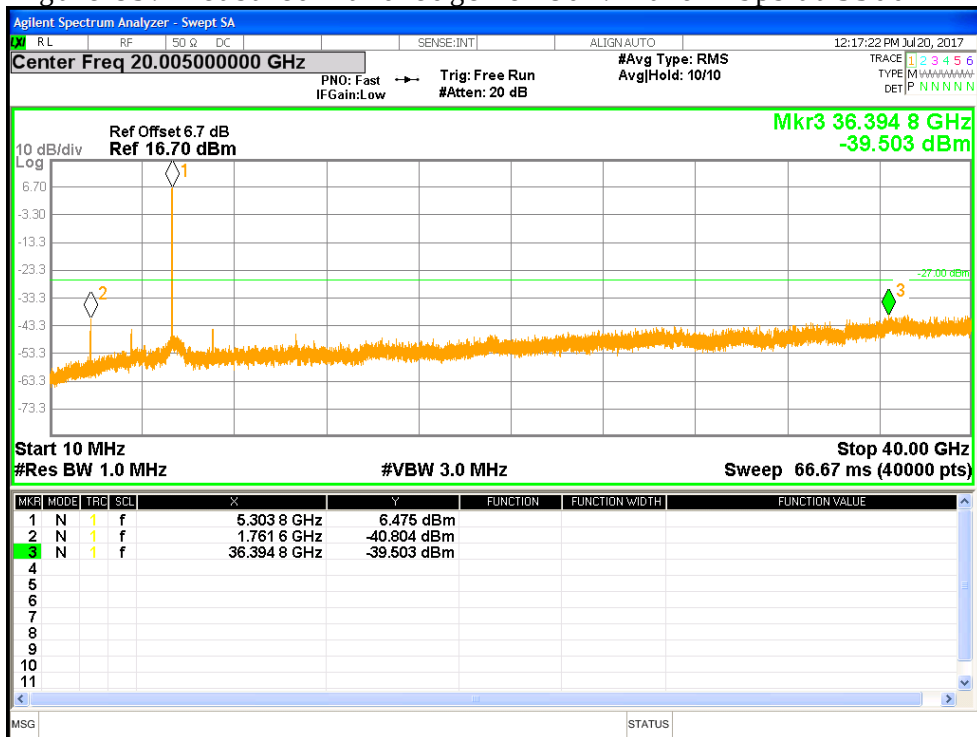


Figure 90: Undesirable Emission for 802.11a-6 Mbps at 5300 MHz

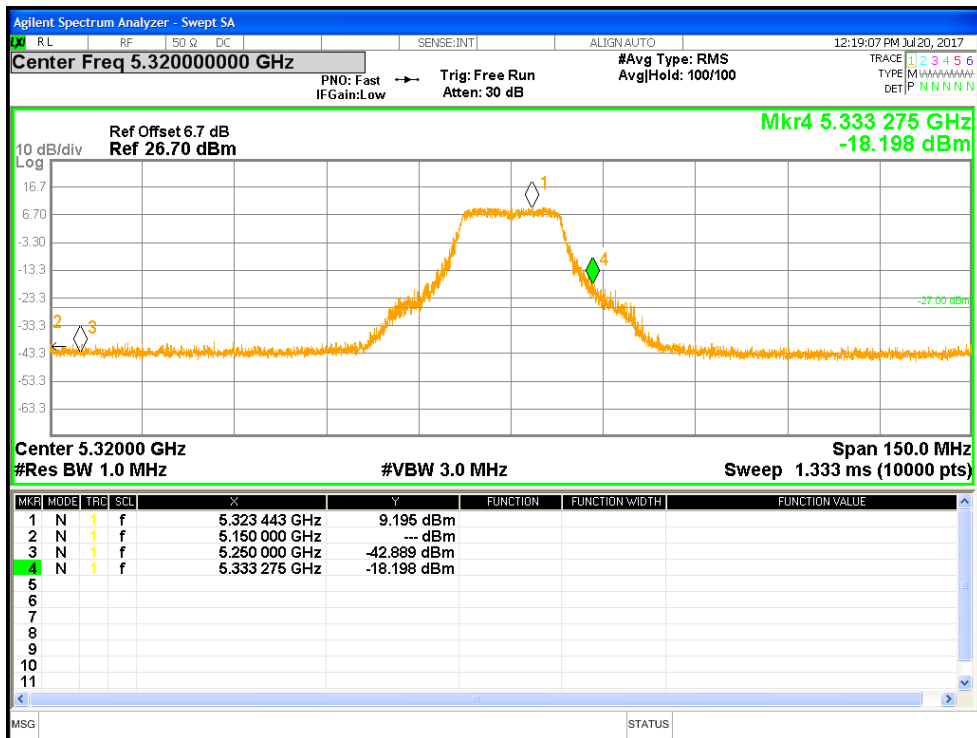


Figure 91: Measured In-Band Band-edge for 802.11a-6 Mbps at 5320 MHz

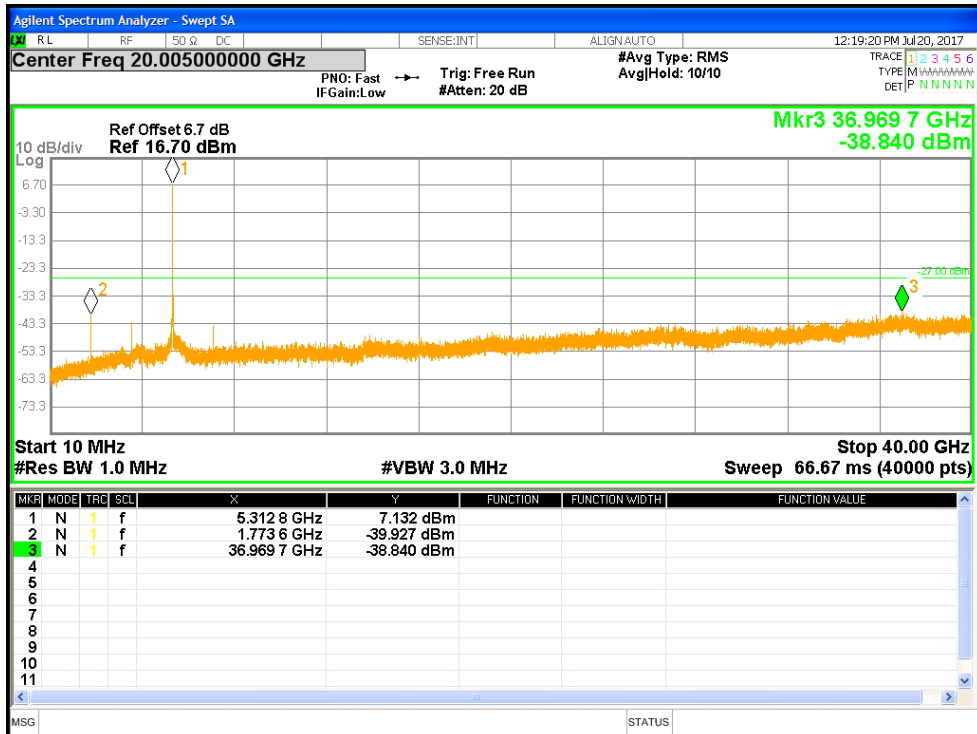


Figure 92: Measured In-Band Band-edge for 802.11a-6 Mbps at 5320 MHz

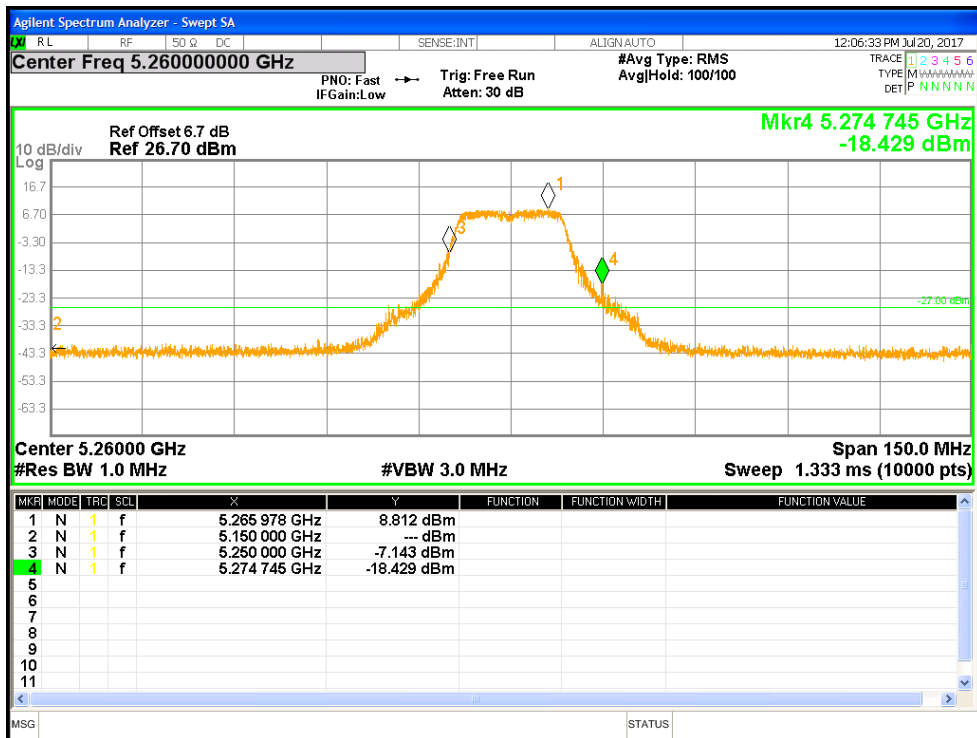


Figure 93: Measured Band-edge for HT20-MCS0 at 5260 MHz

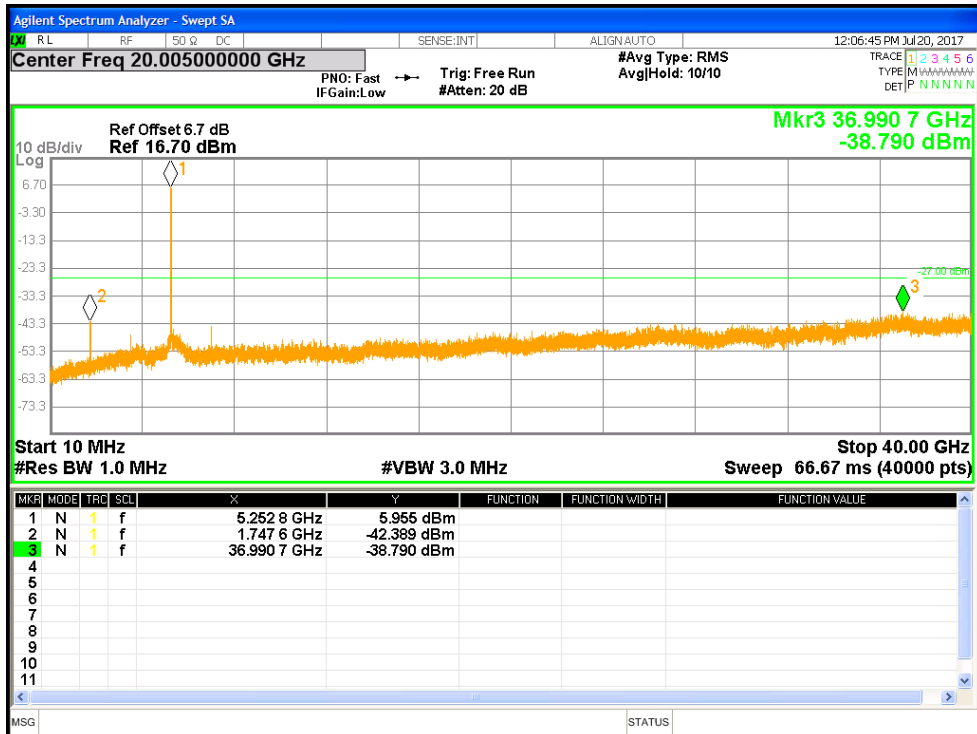


Figure 94: Undesirable Emission for HT20-MCS0 at 5260 MHz

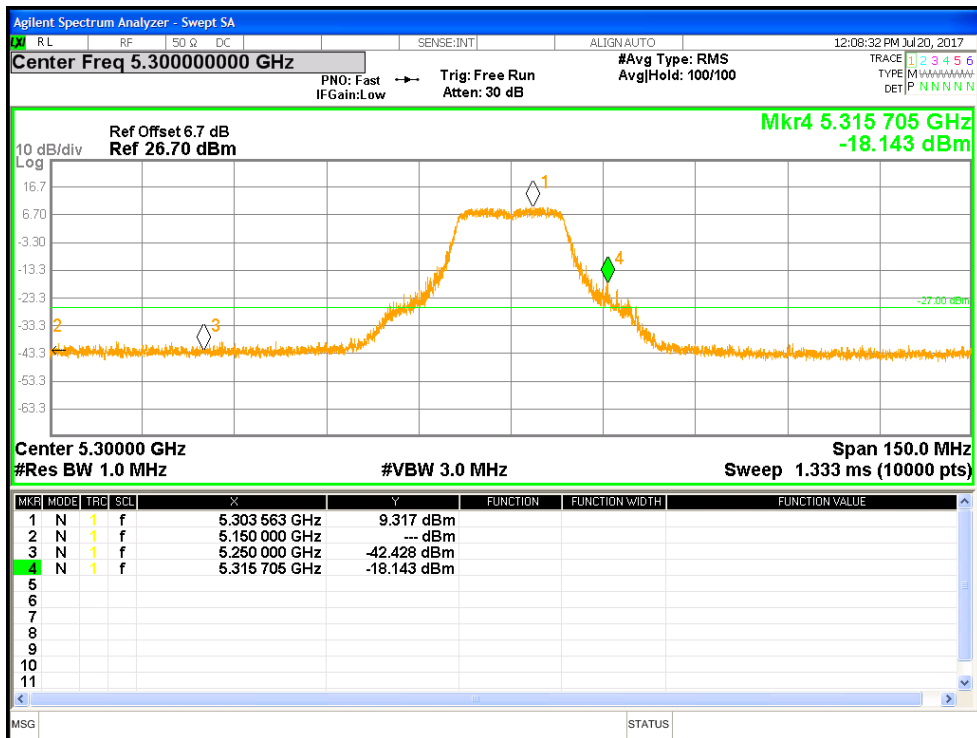


Figure 95: Measured In-Band Band-edge for HT20-MCS0 at 5300 MHz

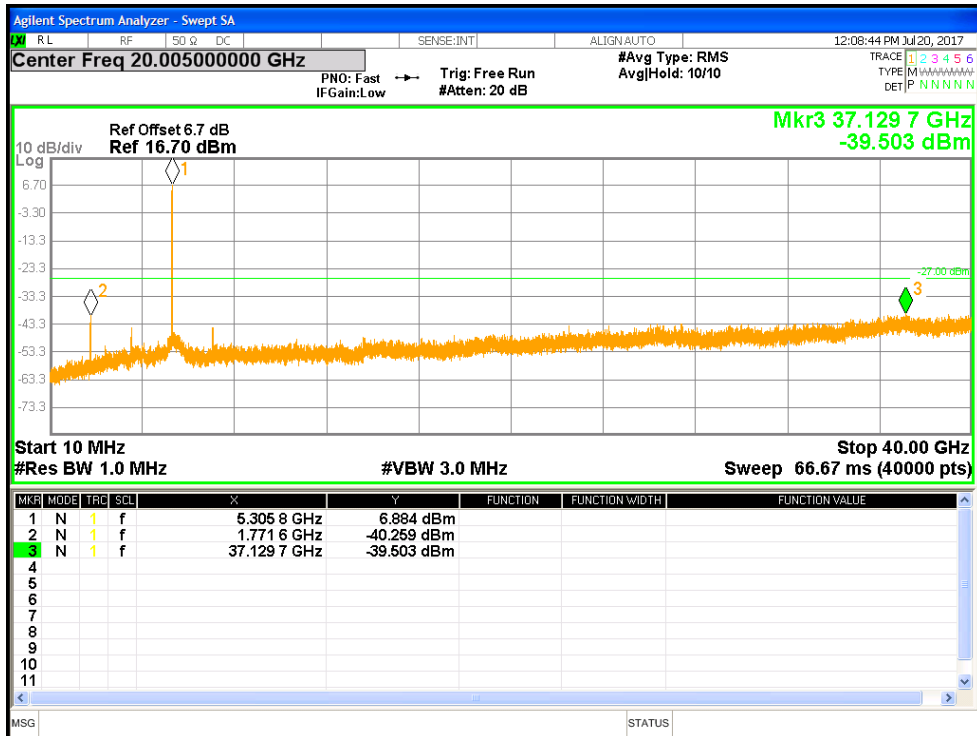


Figure 96: Measured In-Band Band-edge for HT20-MCS0 at 5300 MHz

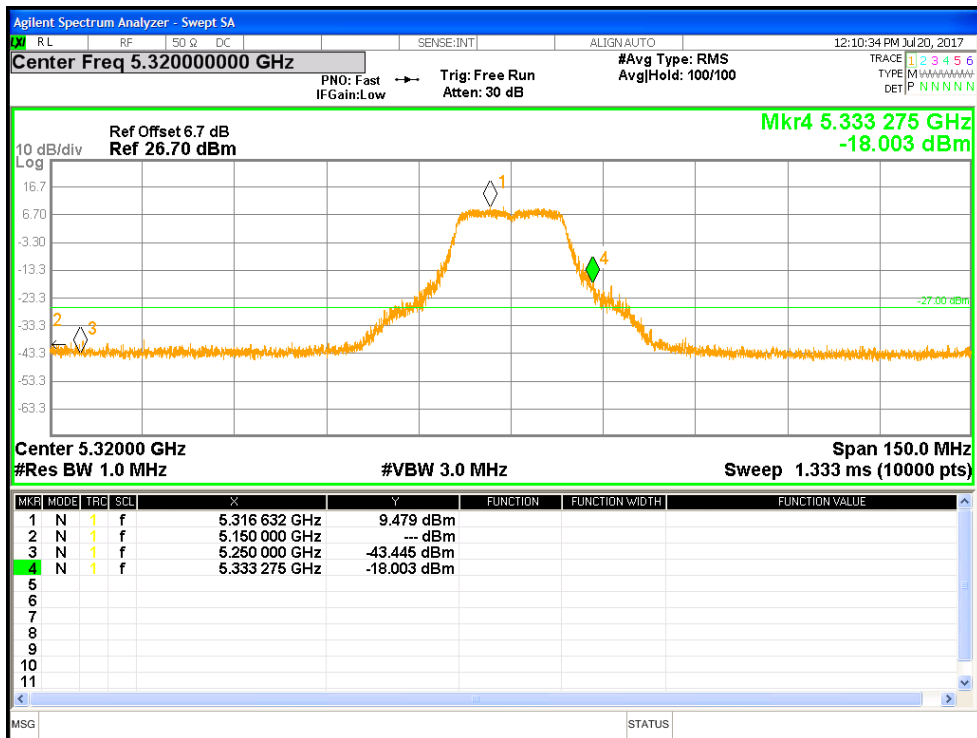


Figure 97: Measured Band-edge for HT20-MCS0 at 5320 MHz

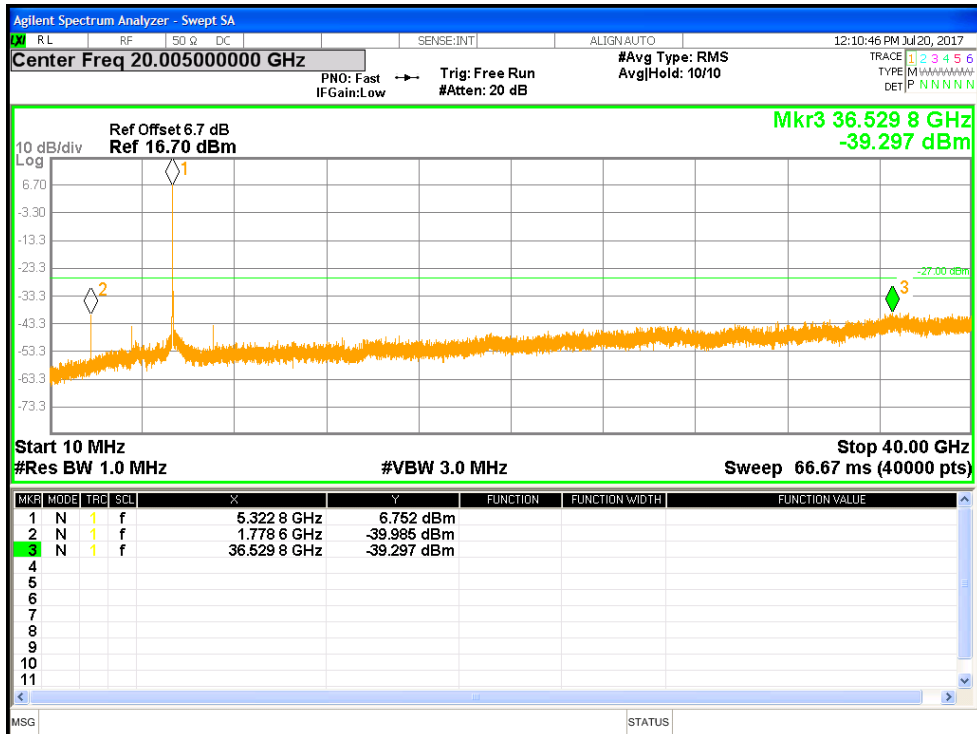


Figure 98: Undesirable Emission for HT20-MCS0 at 5320 MHz

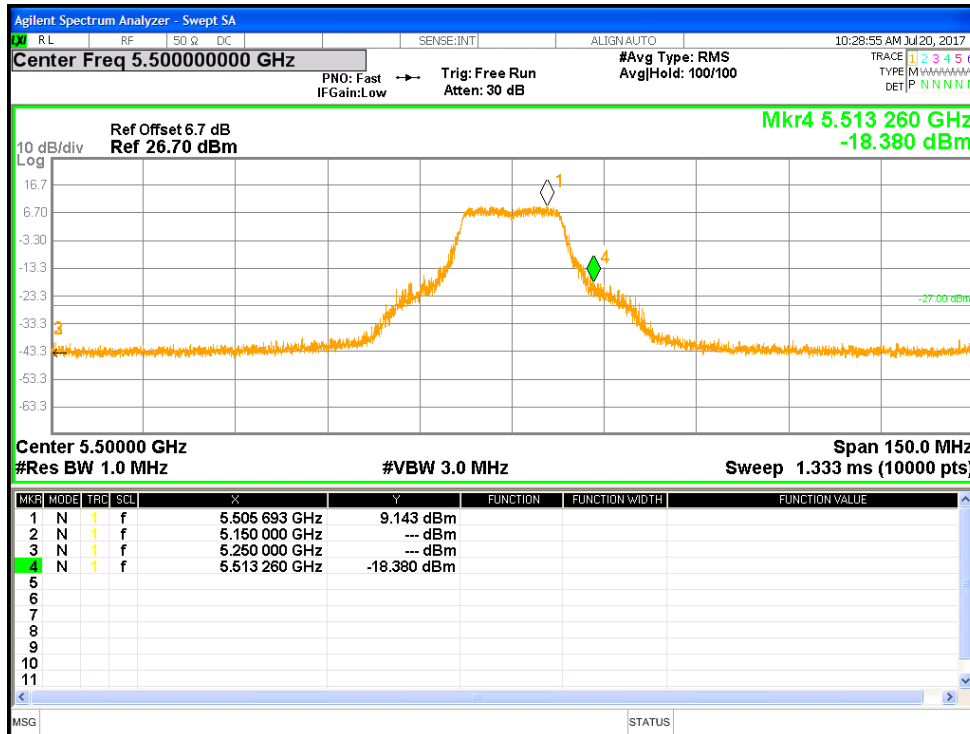


Figure 99: Measured Band-edge for 802.11a-6 Mbps at 5500 MHz

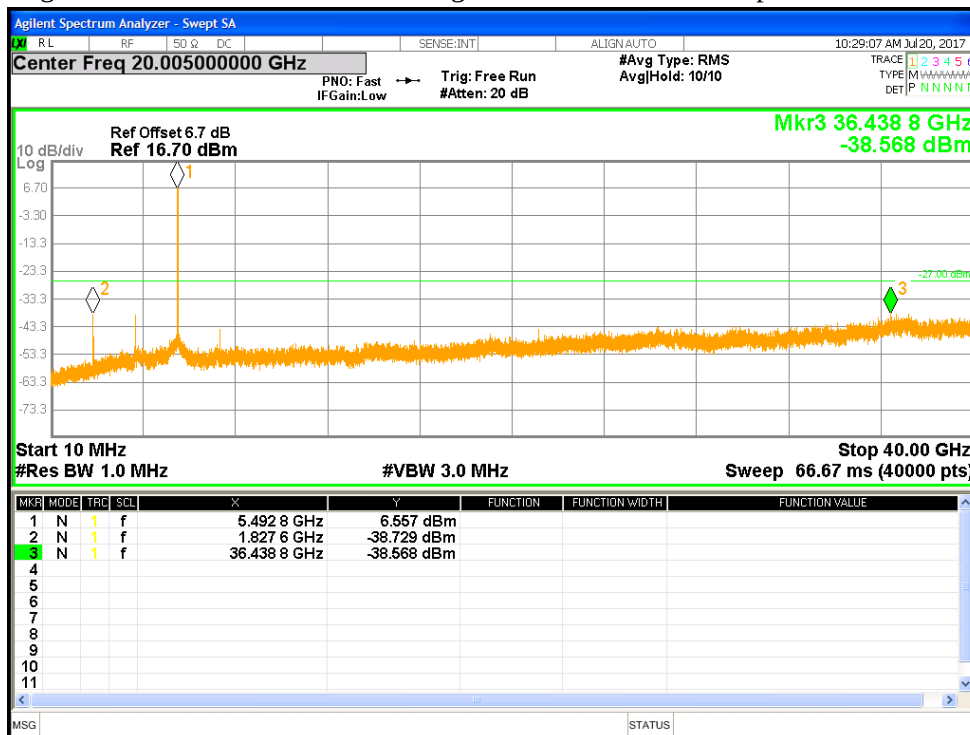


Figure 100: Undesirable Emission for 802.11a-6 Mbps at 5550 MHz

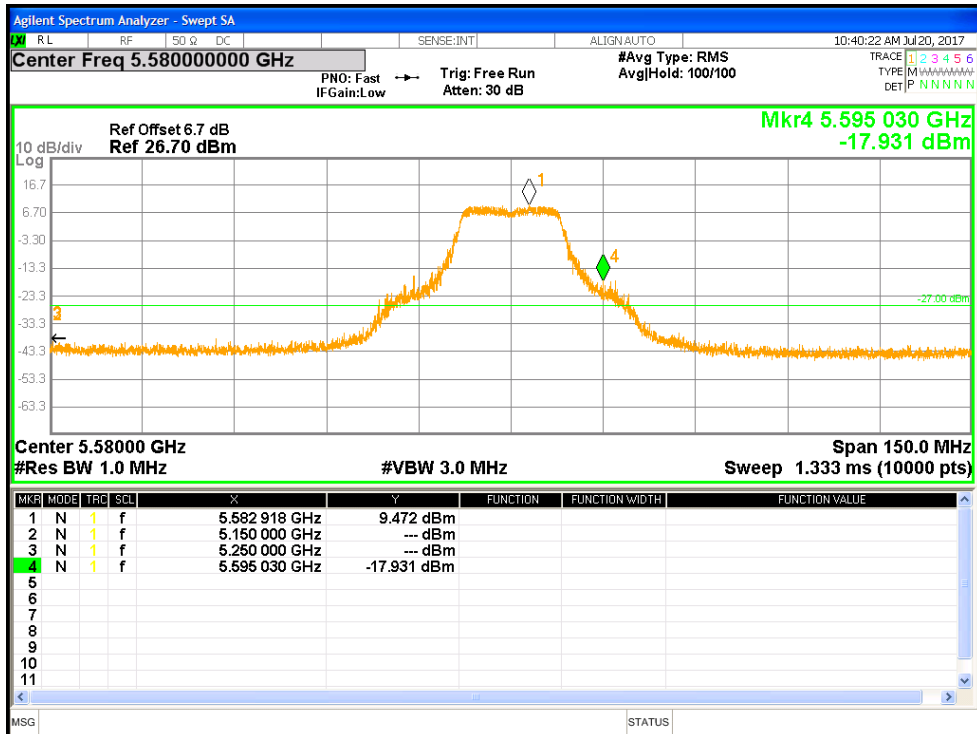


Figure 101: Measured Band-edge for 802.11a-6 Mbps at 5580 MHz

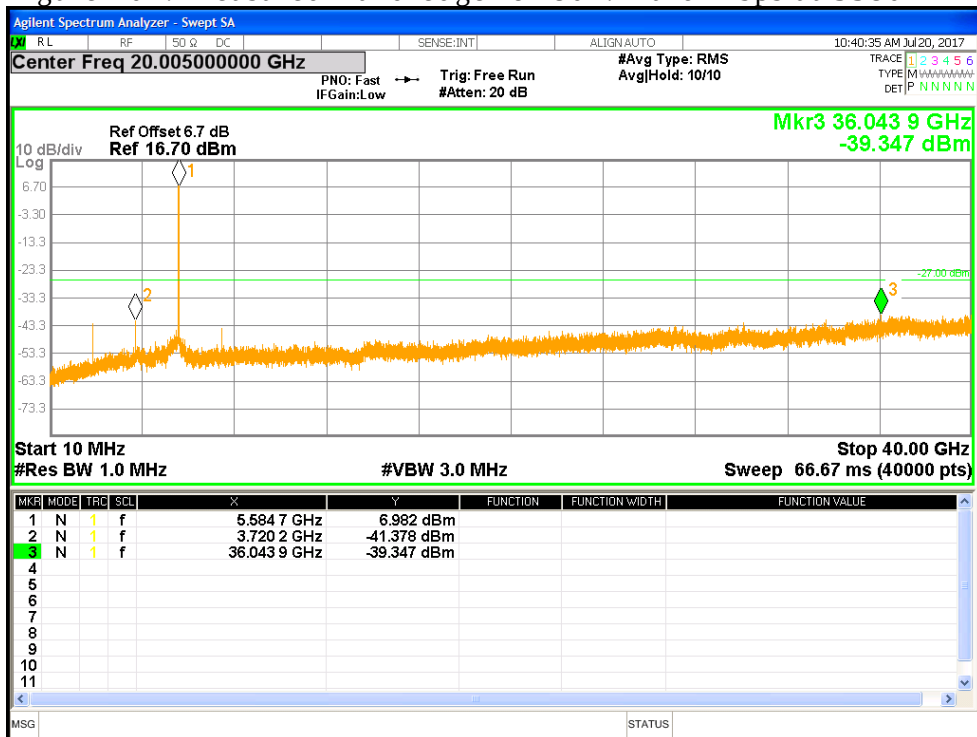


Figure 102: Undesirable Emission for 802.11a-6 Mbps at 5580 MHz

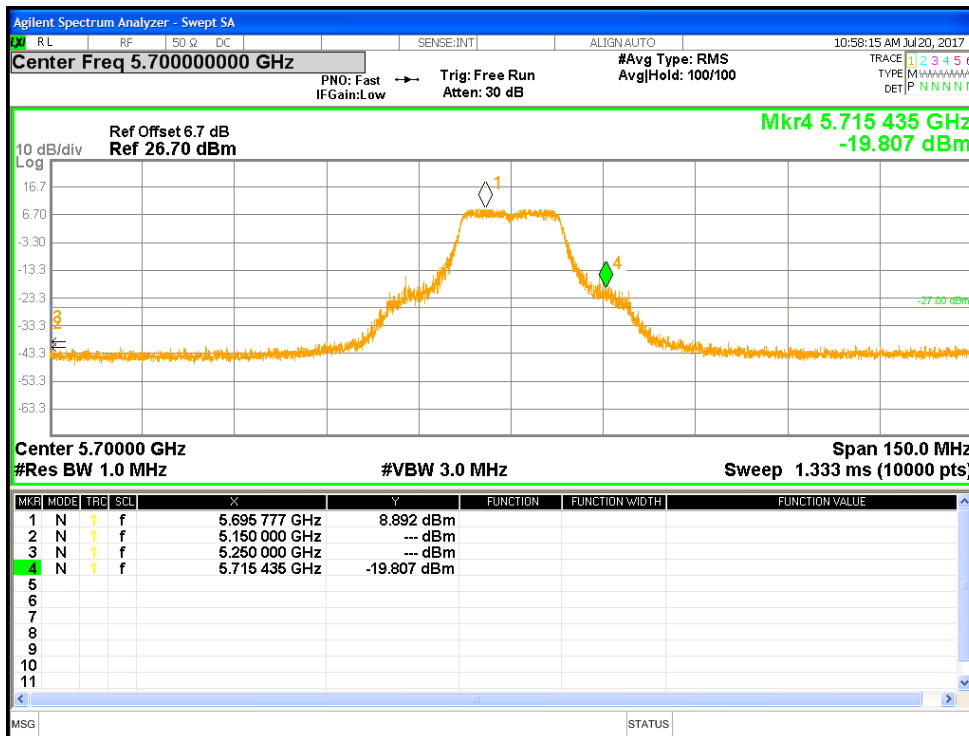


Figure 103: Measured In-Band Band-edge for 802.11a-6 Mbps at 5700 MHz

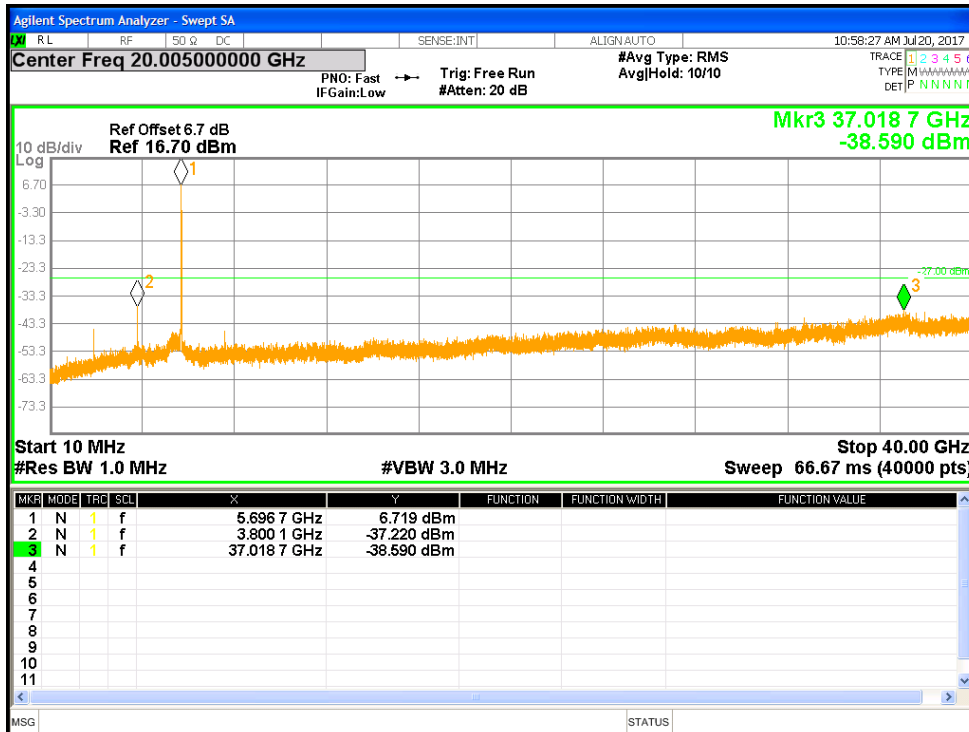


Figure 104: Measured In-Band Band-edge for 802.11a-6 Mbps at 5700 MHz

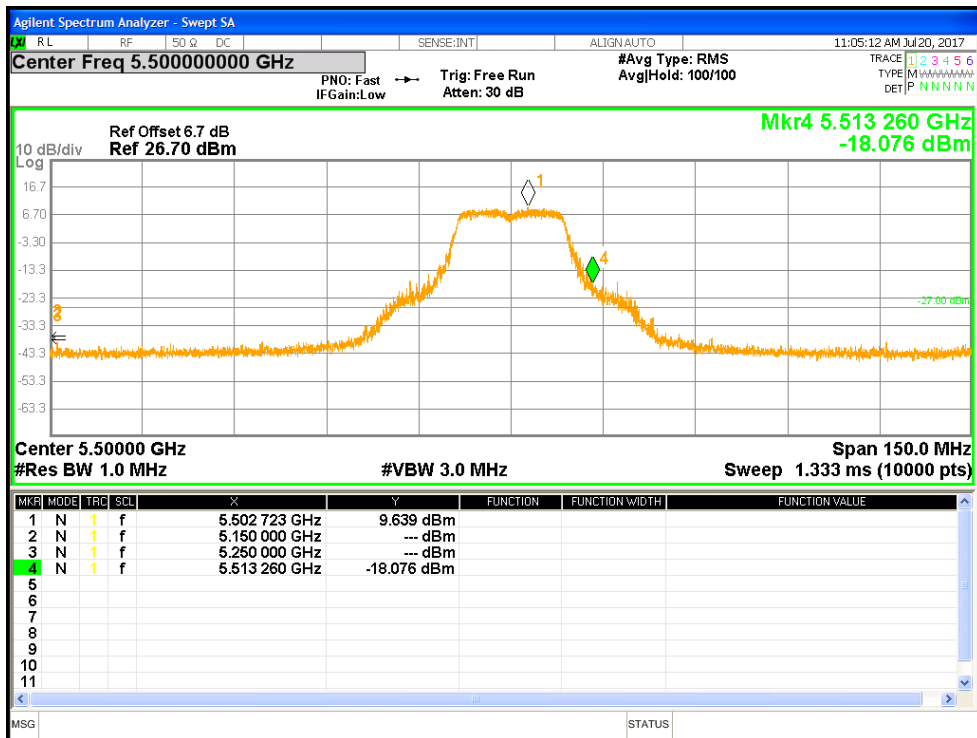


Figure 105: Measured Band-edge for HT20-MCS0 at 5500 MHz

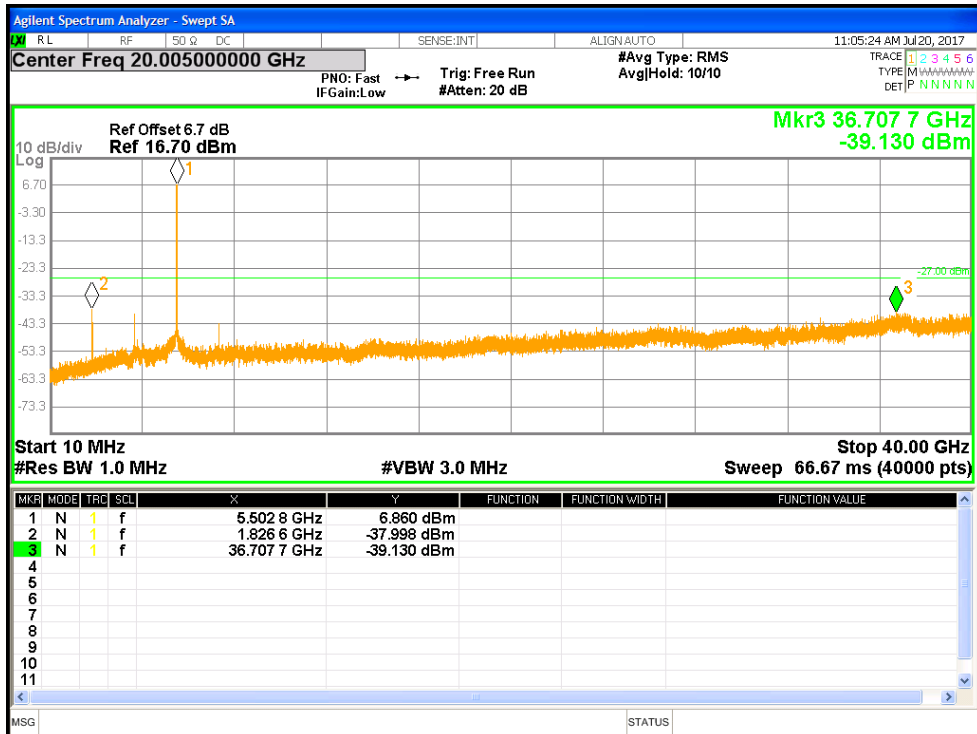


Figure 106: Undesirable Emission for HT20-MCS0 at 5500 MHz

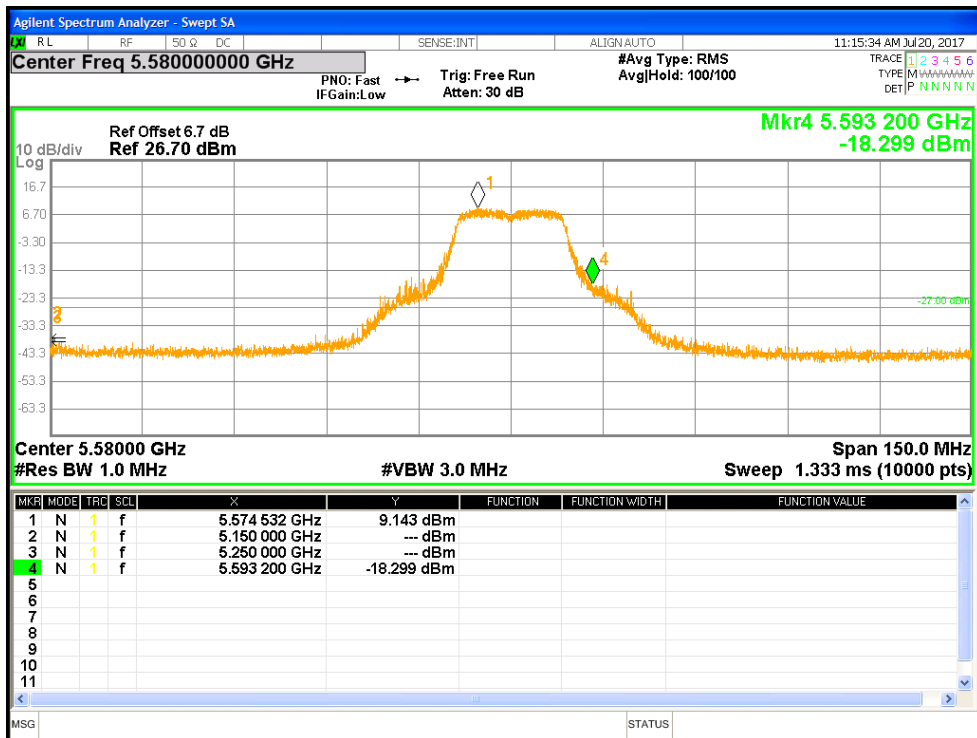


Figure 107: Measured In-Band Band-edge for HT20-MCS0 at 5580 MHz

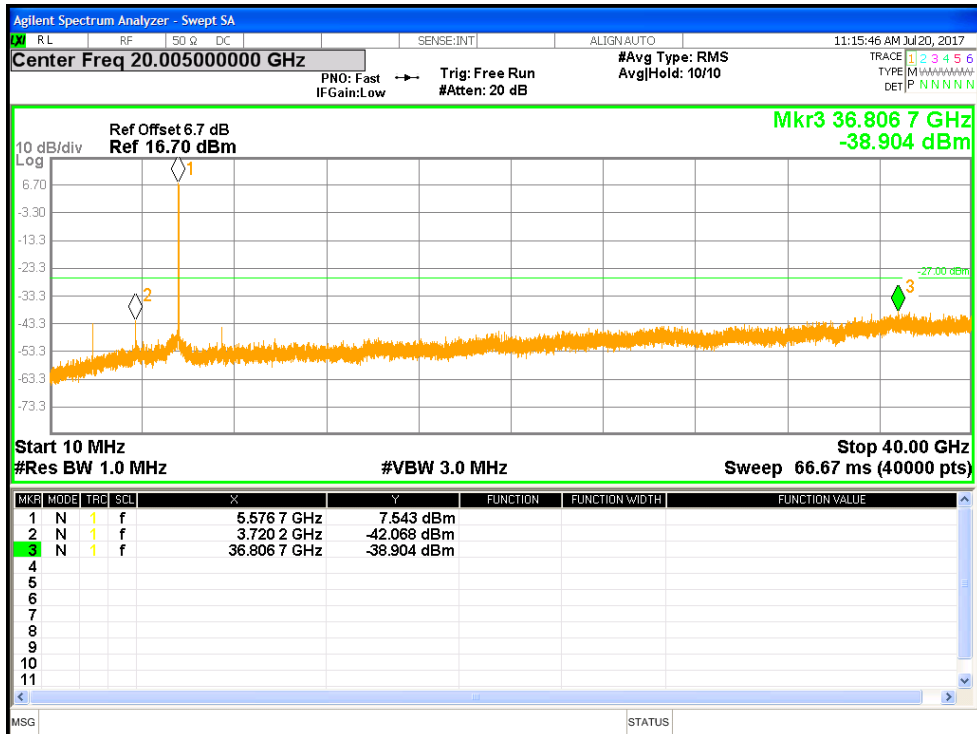


Figure 108: Measured In-Band Band-edge for HT20-MCS0 at 5580 MHz

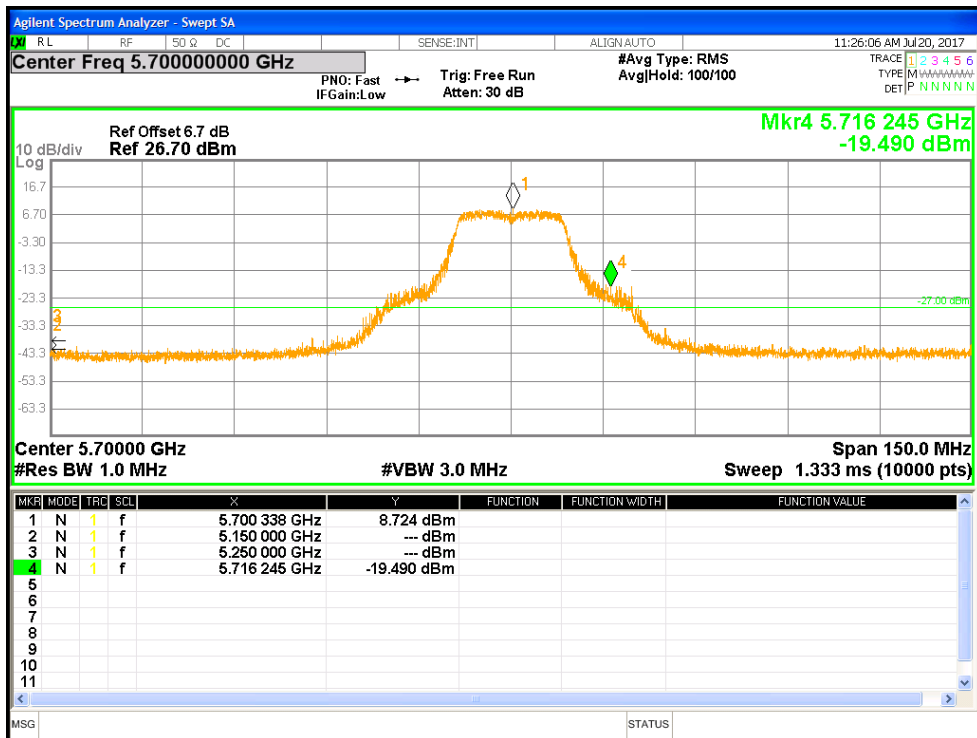


Figure 109: Measured Band-edge for HT20-MCS0 at 5700 MHz

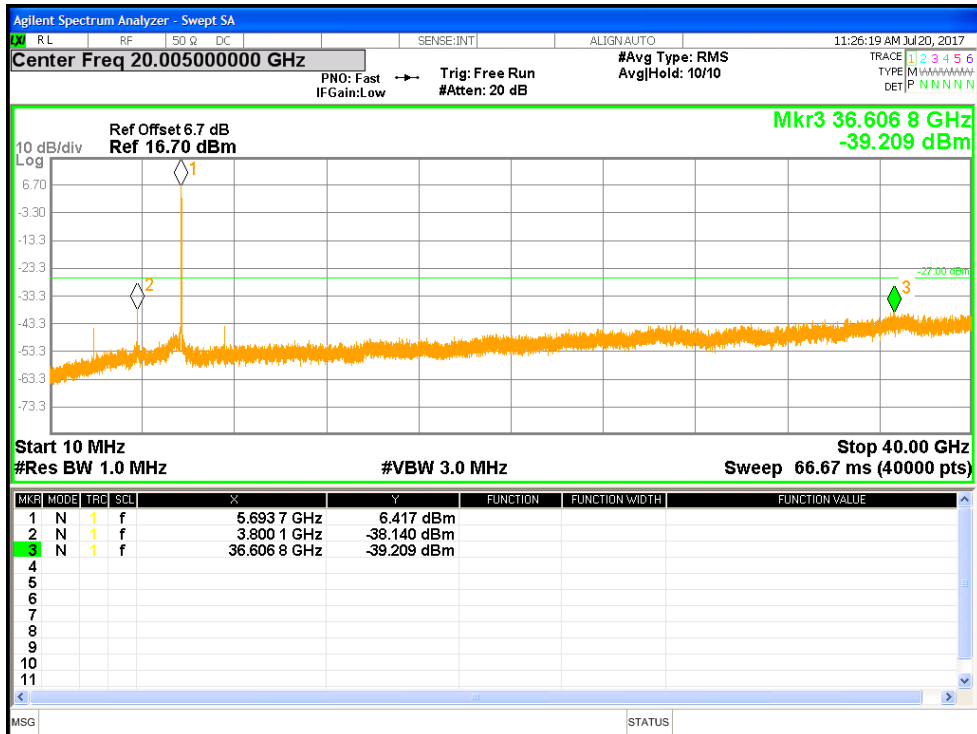


Figure 110: Undesirable Emission for HT20-MCS0 at 5700 MHz

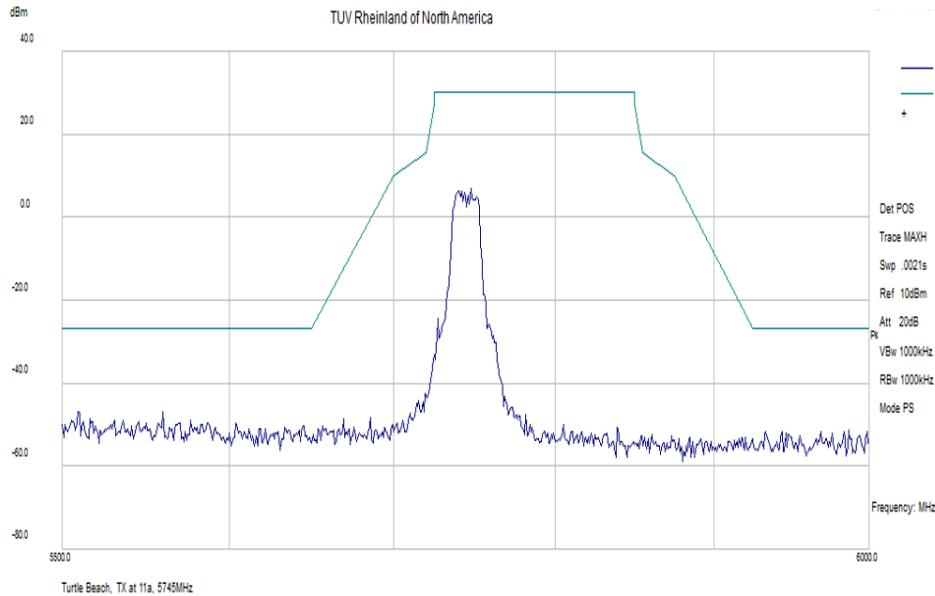


Figure 111: Measured Band-edge for 802.11a-6 Mbps at 5745 MHz

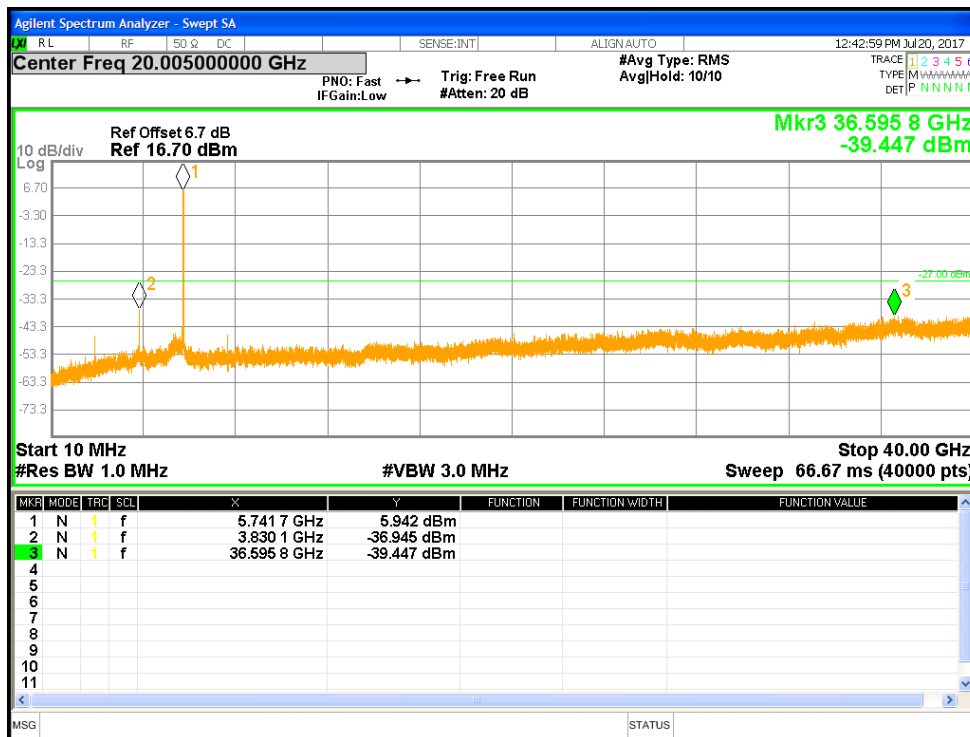


Figure 112: Undesirable Emission for 802.11a-6 Mbps at 5745 MHz

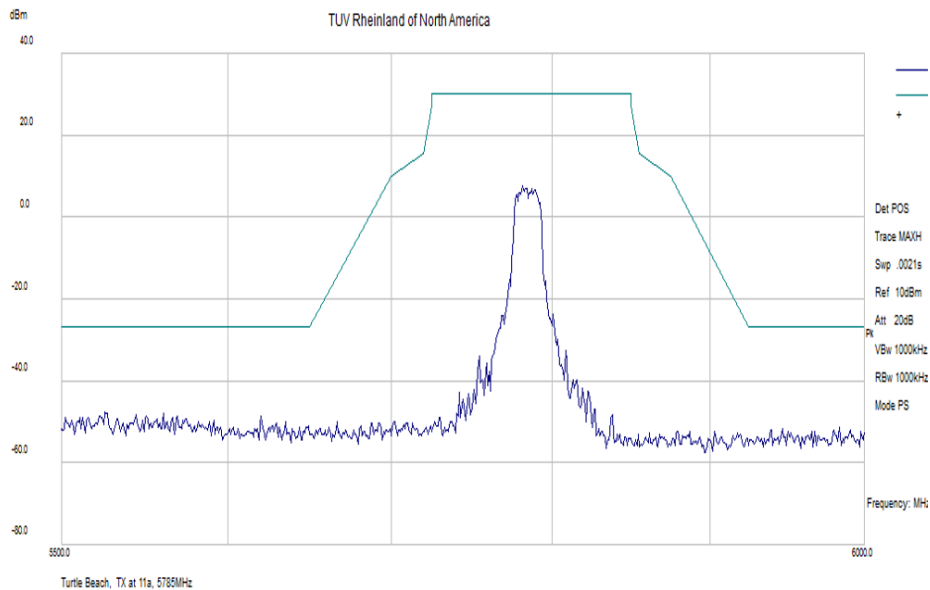


Figure 113: Measured Band-edge for 802.11a-6 Mbps at 5785 MHz

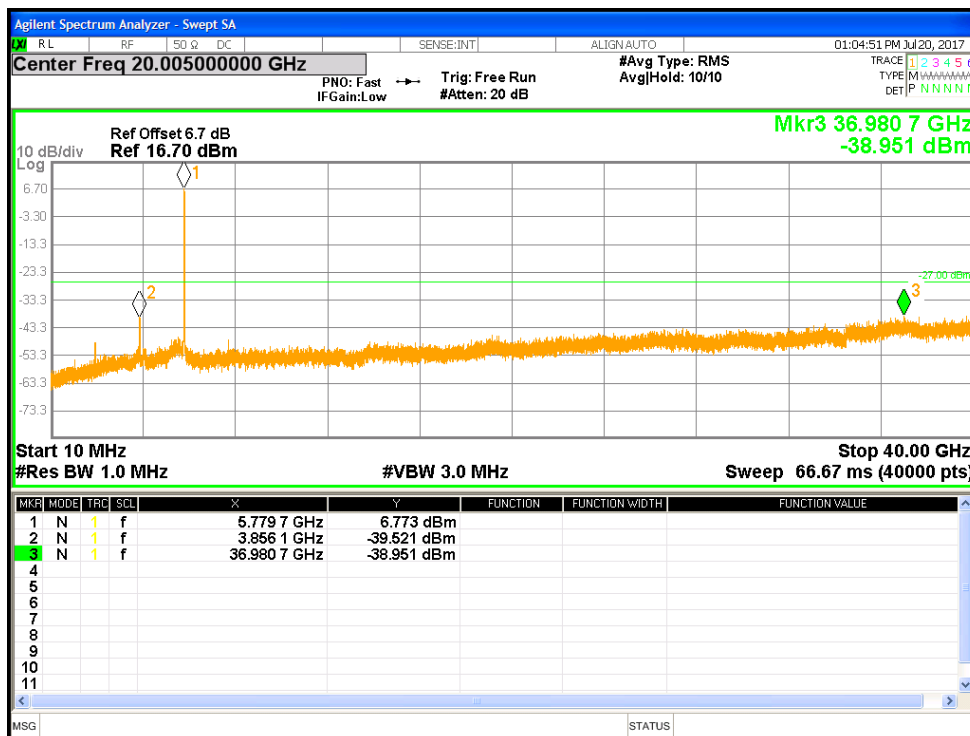


Figure 114: Undesirable Emission for 802.11a-6 Mbps at 5785 MHz

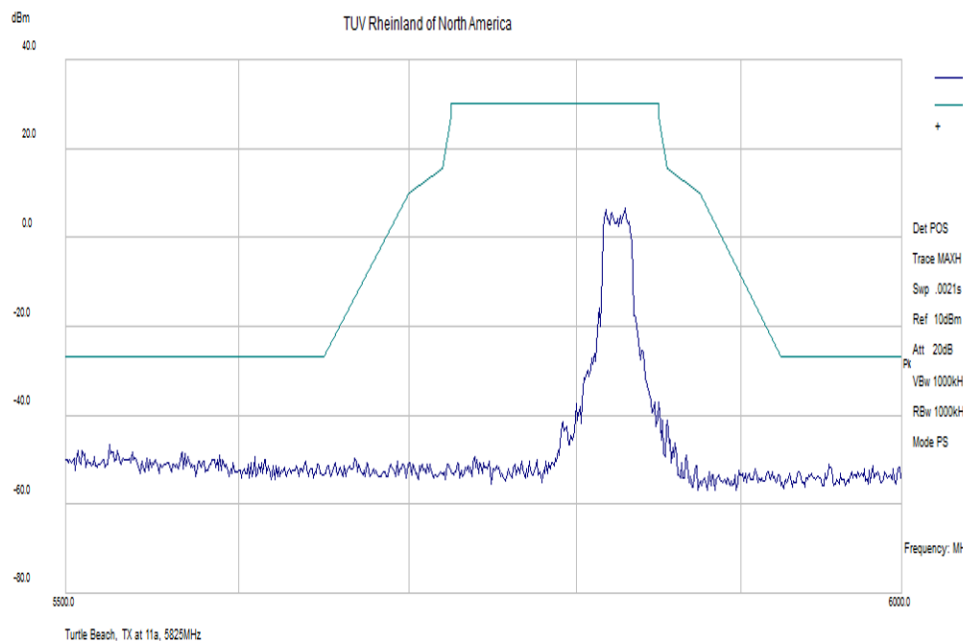


Figure 115: Measured In-Band Band-edge for 802.11a-6 Mbps at 5825 MHz

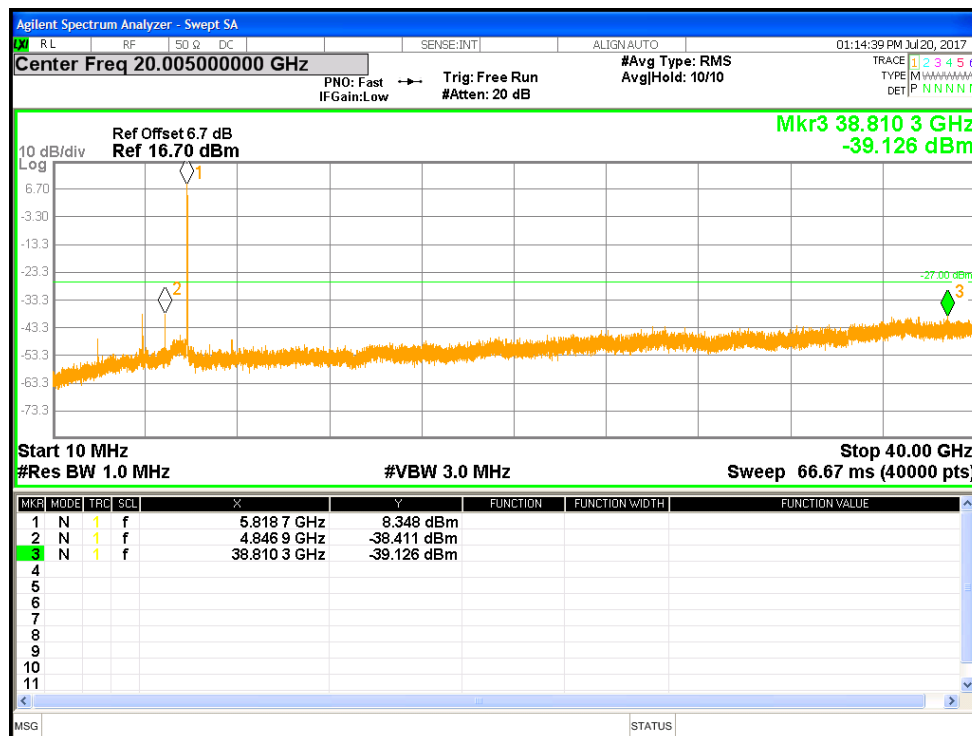


Figure 116: Measured In-Band Band-edge for 802.11a-6 Mbps at 5825 MHz

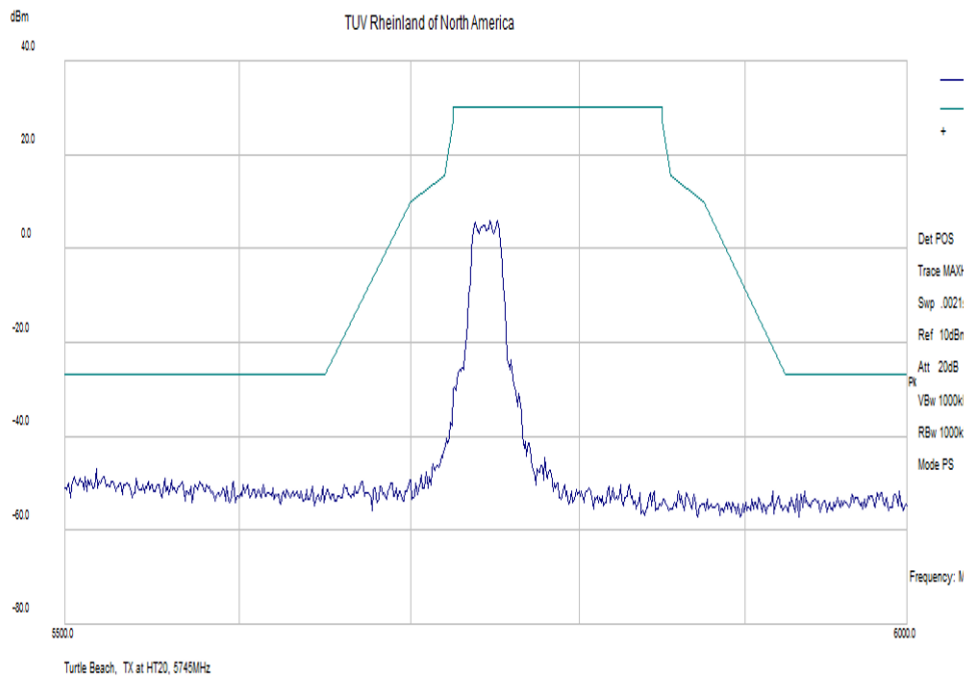


Figure 117: Measured Band-edge for HT20-MCS0 at 5745 MHz

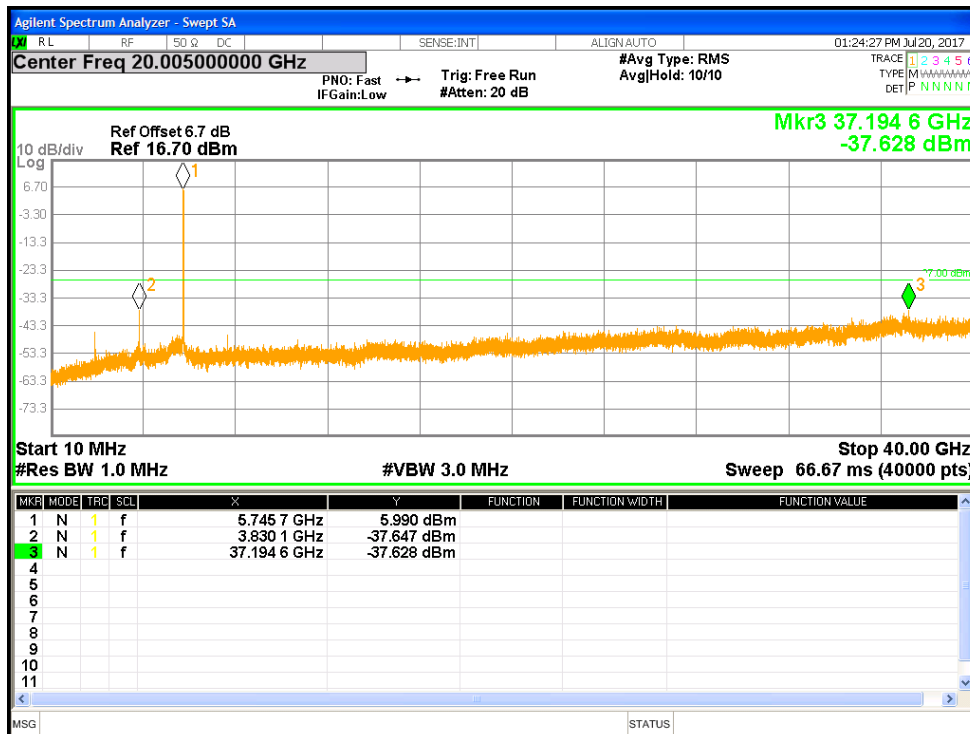


Figure 118: Undesirable Emission for HT20-MCS0 at 5745 MHz

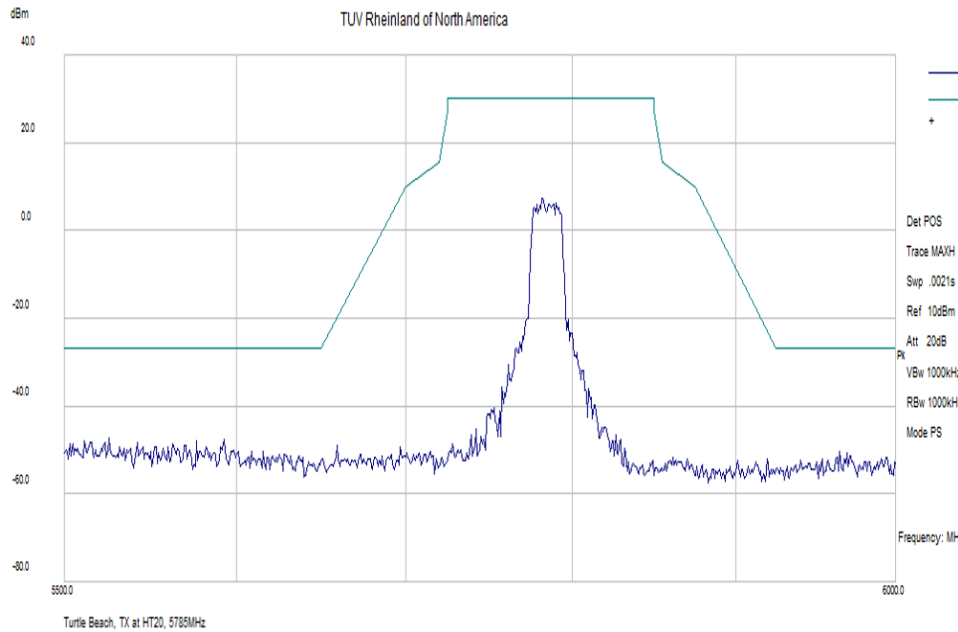


Figure 119: Measured In-Band Band-edge for HT20-MCS0 at 5785 MHz

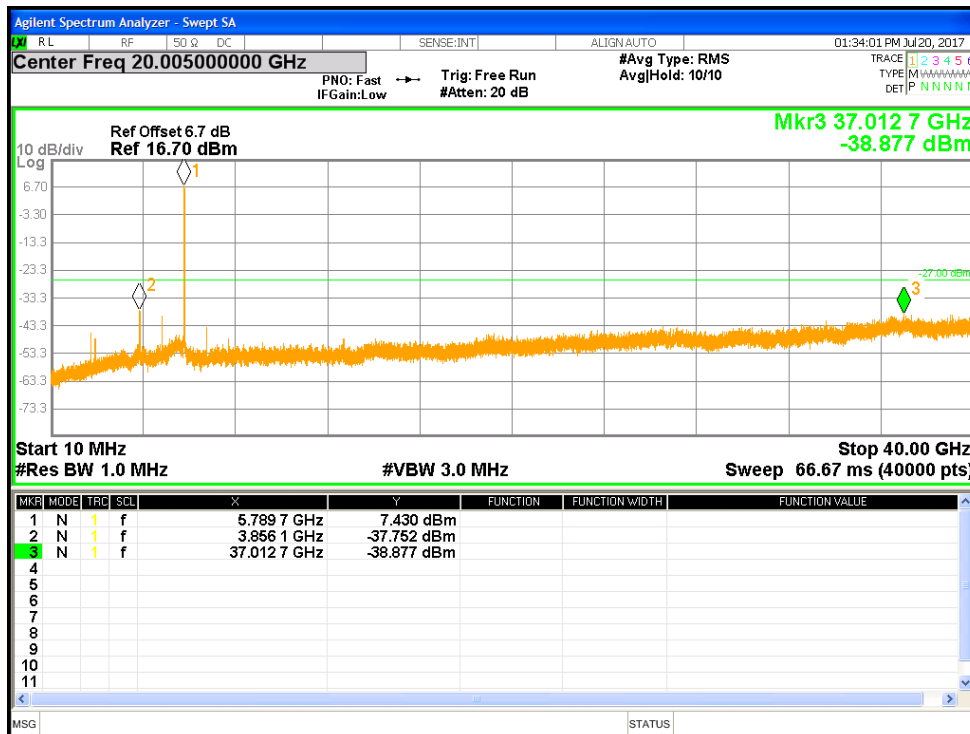


Figure 120: Measured In-Band Band-edge for HT20-MCS0 at 5785 MHz

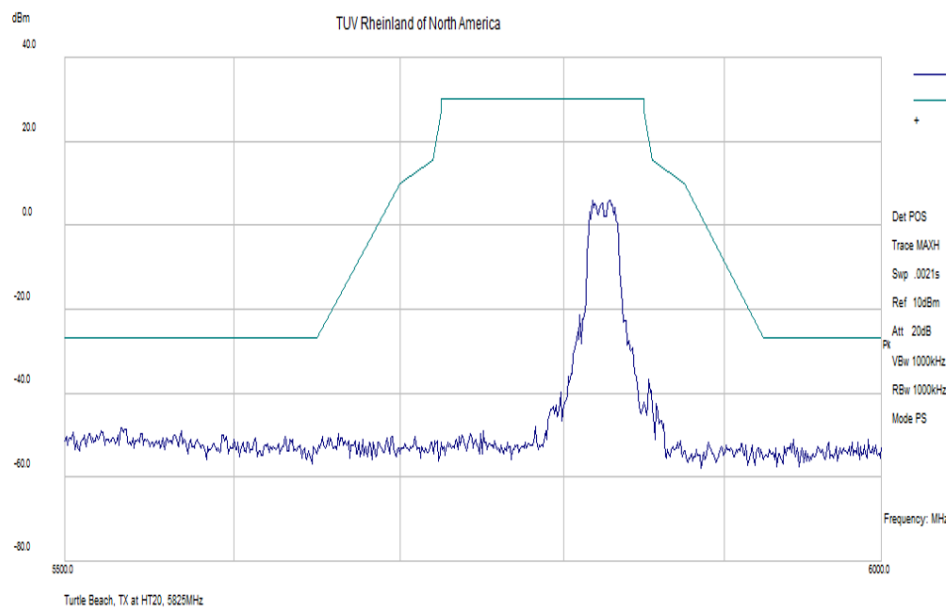


Figure 121: Measured Band-edge for HT20-MCS0 at 5825 MHz

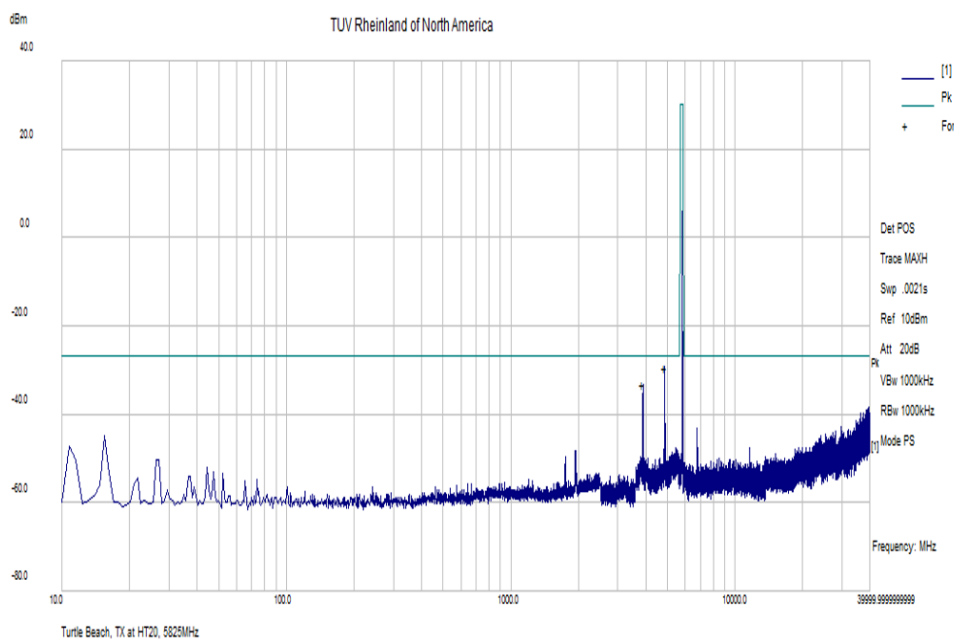


Figure 122: Undesirable Emission for HT20-MCS0 at 5825 MHz

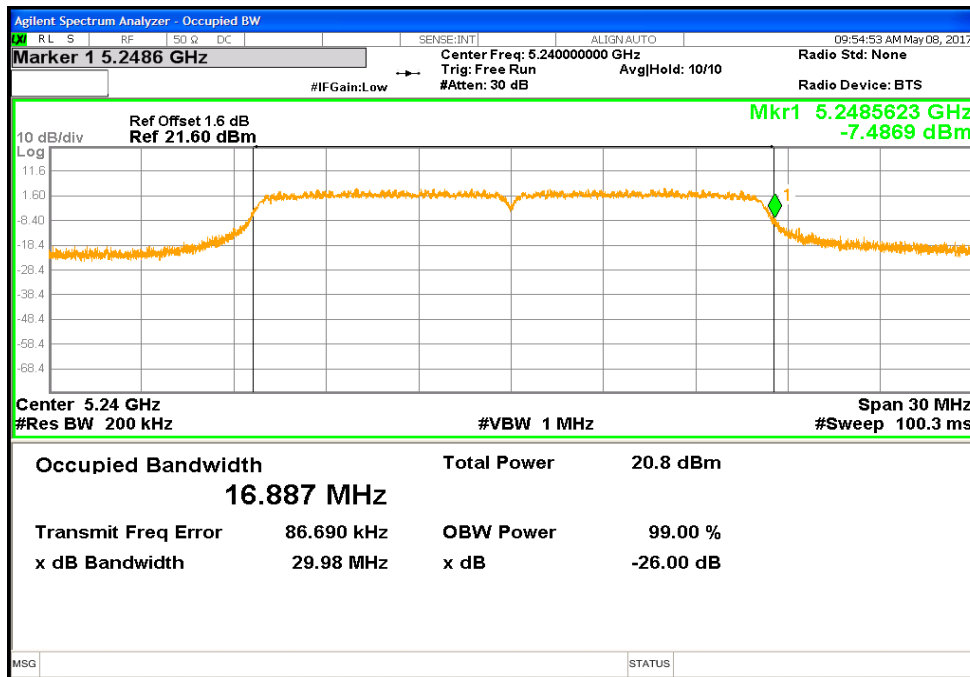


Figure 123: Measured Band-edge for 11a-6 Mbps at 5240 MHz

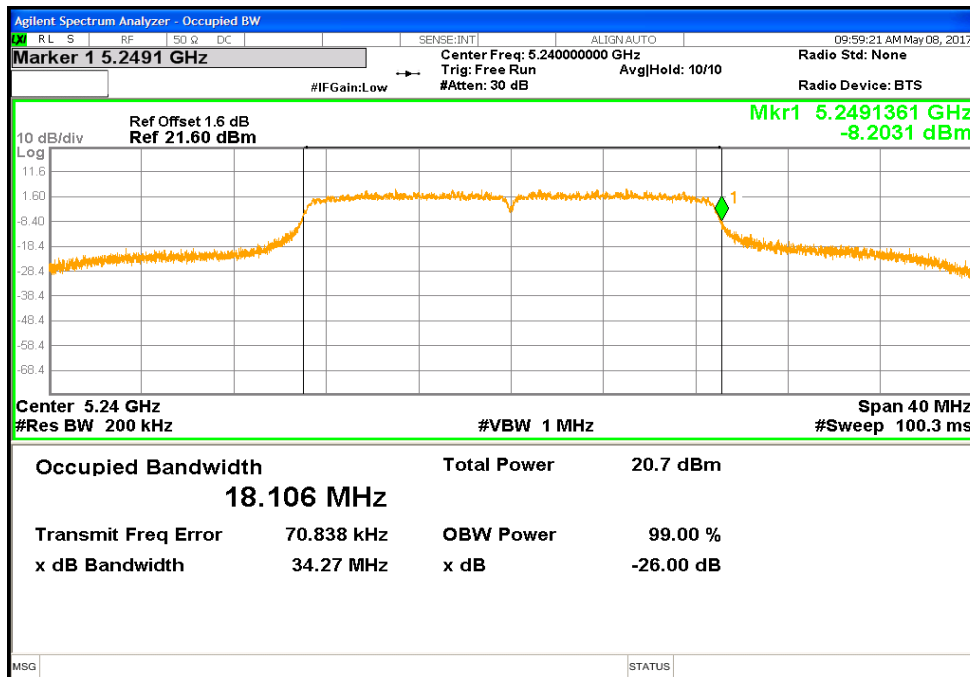


Figure 124: Measured Band-edge for HT20-MCS0 at 5240 MHz

**Note:** Since the 99% bandwidth emission did not cross over into the UNII2a band, DFS is not required for 5240 MHz operating channel.