

# RF TEST REPORT



Report No.: FCC\_SL16101901-RUC-037-W52W58 Rev 4.0  
Supersede Report No.: FCC\_SL16101901-RUC-037-W52W58 Rev 3.0

|   |   |  |
|---|---|--|
| Applicant   | : | Ruckus Wireless, Inc.  |
| Product Name  | : | R720 Access Point  |
| Model No.   | : | R720   |
| Test Standard   | : | 47 CFR 15.407  |
| Test Method   | : | ANSI C63.4: 2014<br>789033 D02 General UNII Test Procedures New Rules v01r02 |
| FCC ID  | : | S9GR720  |
| IC ID   | : | 5912A-R720   |
| Dates of test   | : | 12/05/2016 to 01/11/2017   |
| Issue Date  | : | 01/16/2017   |
| Test Result   | : | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail       |
| Equipment complied with the specification <input checked="" type="checkbox"/> |   |  |
| Equipment did not comply with the specification <input type="checkbox"/>      |   |  |

|  |                   |
|--|-------------------|
| This Test Report is Issued Under the Authority of:   |                   |
|  |                   |
| <b>Gary Chou</b>   | <b>Chen Ge</b>    |
| Test Engineer  | Engineer Reviewer |
| This test report may be reproduced in full only<br>Test result presented in this test report is applicable to the tested sample only |                   |

Issued By:  
SIEMIC Laboratories  
775 Montague Expressway, Milpitas, 95035 CA



775 Montague Expressway, Milpitas, CA 95035, USA • Phone: (+1) 408 526 1188 • Facsimile (+1) 408 526 1088

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## Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

### Accreditations for Conformity Assessment

| Country/Region | Accreditation Body     | Scope                             |
|----------------|------------------------|-----------------------------------|
| USA            | FCC, A2LA              | EMC, RF/Wireless, Telecom         |
| Canada         | IC, A2LA, NIST         | EMC, RF/Wireless, Telecom         |
| Taiwan         | BSMI, NCC, NIST        | EMC, RF, Telecom, Safety          |
| Hong Kong      | OFTA, NIST             | RF/Wireless, Telecom              |
| Australia      | NATA, NIST             | EMC, RF, Telecom, Safety          |
| Korea          | KCC/RRA, NIST          | EMI, EMS, RF, Telecom, Safety     |
| Japan          | VCCI, JATE, TELEC, RFT | EMI, RF/Wireless, Telecom         |
| Mexico         | NOM, COFETEL, Caniety  | Safety, EMC, RF/Wireless, Telecom |
| Europe         | A2LA, NIST             | EMC, RF, Telecom, Safety          |
| Israel         | MOC, NIST              | EMC, RF, Telecom, Safety          |

### Accreditations for Product Certifications

| Country   | Accreditation Body | Scope                 |
|-----------|--------------------|-----------------------|
| USA       | FCC TCB, NIST      | EMC, RF, Telecom      |
| Canada    | IC FCB, NIST       | EMC, RF, Telecom      |
| Singapore | iDA, NIST          | EMC, RF, Telecom      |
| EU        | NB                 | EMC & R&TTE Directive |
| Japan     | MIC (RCB 208)      | RF, Telecom           |
| Hong Kong | OFTA (US002)       | RF, Telecom           |

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## 1 Report Revision History

| Report No.                            | Report Version | Description                      | Issue Date |
|---------------------------------------|----------------|----------------------------------|------------|
| FCC_SL16101901-RUC-037-W52W58         | None           | Original                         | 12/22/2016 |
| FCC_SL16101901-RUC-037-W52W58 Rev 1.0 | Rev 1.0        | Updated power supply information | 01/09/2017 |
| FCC_SL16101901-RUC-037-W52W58 Rev 2.0 | Rev 2.0        | Updated conducted emission       | 01/11/2017 |
| FCC_SL16101901-RUC-037-W52W58 Rev 3.0 | Rev 3.0        | Updated EUT information          | 01/12/2017 |
| FCC_SL16101901-RUC-037-W52W58 Rev 4.0 | Rev 4.0        | Updated Beamforming              | 01/16/2017 |

## 2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Ruckus Wireless, Inc.  
Product: R720 Access Point  
Model: R720

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1<sup>st</sup> page.

## 3 Customer information

|                      |   |  |
|----------------------|---|--|
| Applicant Name       | : | Ruckus Wireless, Inc.                                  |
| Applicant Address    | : | 350 West Java Drive, Sunnyvale, California 94089 U.S.A |
| Manufacturer Name    | : | Ruckus Wireless, Inc.                                  |
| Manufacturer Address | : | 350 West Java Drive, Sunnyvale, California 94089 U.S.A |

## 4 Test site information

|                      |   |
|----------------------|---|
| Lab performing tests | SIEMIC Laboratories                         |
| Lab Address          | 775 Montague Expressway, Milpitas, CA 95035 |
| FCC Test Site No.    | 881796                                      |
| IC Test Site No.     | 4842D-2                                     |
| VCCI Test Site No.   | A0133                                       |

## 5 Modification

| Index | Item | Description | Note |
|-------|------|-------------|------|
| -     | -    | -           | -    |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |

## 6 EUT Information

### 6.1 EUT Description

|                           |                   |
|---------------------------|-------------------|
| Product Name              | R720 Access Point |
| Model No.                 | R720              |
| Trade Name                | Ruckus            |
| Serial No.                | 451606000010      |
| Host Model No.            | N/A               |
| Input Power               | 48VDC             |
| Power Adapter Manu/Model  | UMEC/UP0451H-54PP |
| Power Adapter SN          | CQ112128          |
| Date of EUT received      | 12/01/2016        |
| Equipment Class/ Category | DTS, UNII         |
| Port/Connectors           | PoE, Ethernet     |

### 6.2 Radio Description

| Radio Type             | 802.11a                                       | 802.11n-20M                     | 802.11n-40M                     | 802.11ac-80M                            |
|------------------------|---|---------------------------------|---------------------------------|---|
| Operating Frequency    | 5180-5240MHz<br>5745-5825MHz                  | 5180-5240MHz<br>5745-5825MHz    | 5190-5230MHz<br>5755-5795MHz    | 5210MHz<br>5775MHz                      |
| Modulation             | OFDM (BPSK, QPSK, 16QAM, 64QAM)               | OFDM (BPSK, QPSK, 16QAM, 64QAM) | OFDM (BPSK, QPSK, 16QAM, 64QAM) | OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) |
| Channel Spacing        | 20MHz   | 20MHz                           | 40MHz                           | 80MHz                                   |
| Number of Channels     | 9   | 9                               | 4                               | 2                                       |
| Antenna Type           | Internal Omni PCB Antenna                     |                                 |                                 |   |
| Antenna Gain (Peak)    | 5GHz: 3.5dBi                                  |                                 |                                 |   |
| Antenna Connector Type | U.FL  |                                 |                                 |   |
| Note                   | 2.4GHz and 5GHz Radio transmit simultaneously |                                 |                                 |   |

**EUT Power level setting**

| Mode         | Frequency | ART Power Setting |
|--------------|-----------|-------------------|
| 802.11-a     | 5180      | 20                |
| 802.11-a     | 5200      | 20                |
| 802.11-a     | 5240      | 20                |
| 802.11-n-20  | 5180      | 20                |
| 802.11-n-20  | 5200      | 20                |
| 802.11-n-20  | 5240      | 20                |
| 802.11-n-40  | 5190      | 20                |
| 802.11-n-40  | 5230      | 22                |
| 802.11-ac-80 | 5210      | 20                |
|              |           |                   |
| 802.11-a     | 5745      | 22                |
| 802.11-a     | 5785      | 22                |
| 802.11-a     | 5825      | 22                |
| 802.11-n-20  | 5745      | 22                |
| 802.11-n-20  | 5785      | 22                |
| 802.11-n-20  | 5825      | 22                |
| 802.11-n-40  | 5755      | 22                |
| 802.11-n-40  | 5795      | 22                |
| 802.11-ac-80 | 5775      | 21                |

Note: For 160MHz BW channels, the first two chains 1 & 2 are transmitting the first 80MHz frequency, 5210MHz. And the last two chains 3 & 4 are transmitting the second 80MHz frequency, 5290MHz.

The AP supports Beamforming mode and the power setting for Beamforming and Non-Beamforming modes are the same.

## 7 Supporting Equipment/Software and cabling Description

### 7.1 Supporting Equipment

| Item | Supporting Equipment Description | Model                | Serial Number | Manufacturer | Note |
|------|----------------------------------|----------------------|---------------|--------------|------|
| 1    | Laptop                           | PP01L Latitude E5440 | F1WPF12       | Dell         | -    |
| 2    | AC/DC power adapter              | UP0451H-54PP         | CQ2112128     | UMEC         | -    |
|      |                                  |                      |               |              |      |

### 7.2 Cabling Description

| Name | Connection Start |          | Connection Stop |          | Length / shielding Info |           | Note |
|------|------------------|----------|-----------------|----------|-------------------------|-----------|------|
|      | From             | I/O Port | To              | I/O Port | Length (m)              | Shielding |      |
|      |                  |          |                 |          |                         |           | -    |
|      |                  |          |                 |          |                         |           | -    |

### 7.3 Test Software Description

| Test Item  | Software | Description  |
|------------|----------|--|
| RF Testing | QCRT     | Set the EUT to transmit continuously in diferent test modes and channels |
|            |          |  |
|            |          |  |



## 8 Test Summary

| Test Item                      | Test standard |           | Test Method/Procedure   | Pass / Fail  |
|--------------------------------|---------------|-----------|---|--|
| Restricted Band of Operation   | FCC           | 15.205    | ANSI C63.4 – 2014<br>789033 D02 General UNII Test Procedures New Rules v01r02 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| AC Conducted Emissions Voltage | FCC           | 15.207(a) | ANSI C63.4 – 2014   | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |

| Test Item                                 | Test standard |                               | Test Method/Procedure   | Pass / Fail  |
|---|---------------|-------------------------------|---|--|
| 26 & 6 dB Emission Bandwidth              | FCC           | 15.407 (a) (2)                | 789033 D02 General UNII Test Procedures New Rules v01r02                      | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Maximum conducted Output Power            | FCC           | 15.407 (a) (2)                | 789033 D02 General UNII Test Procedures New Rules v01r02                      | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Power reduction (Antenna Gain > 6 dBi)    | FCC           | 15.407 (a) (2)                | -   | <input type="checkbox"/> Pass<br><input checked="" type="checkbox"/> N/A |
| Band Edge and Radiated Spurious Emissions | FCC           | 15.407(b)(2),<br>15.407(b)(6) | ANSI C63.4 – 2014<br>789033 D02 General UNII Test Procedures New Rules v01r02 | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Power Spectral Density                    | FCC           | 15.407 (a) (2)                | 789033 D02 General UNII Test Procedures New Rules v01r02                      | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |
| Frequency Stability                       | FCC           | 15.407 (g)                    | -   | <input type="checkbox"/> Pass<br><input checked="" type="checkbox"/> N/A |
| Transmit Power Control (TPC)              | FCC           | 15.407 (h)(1)                 | -   | <input type="checkbox"/> Pass<br><input checked="" type="checkbox"/> N/A |
| User Manual                               | FCC           | -                             | -   | <input checked="" type="checkbox"/> Pass<br><input type="checkbox"/> N/A |

|        |   |
|--------|---|
| Remark | <ol style="list-style-type: none"> <li>All measurement uncertainties are not taken into consideration for all presented test result.</li> <li>The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.</li> </ol> |
|--------|---|

## 9 Measurement Uncertainty

| Emissions                                 |                 |   |               |
|---|-----------------|---|---------------|
| Test Item                                 | Frequency Range | Description   | Uncertainty   |
| Band Edge and Radiated Spurious Emissions | 30MHz – 1GHz    | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +5.6dB/-4.5dB |
| Band Edge and Radiated Spurious Emissions | 1GHz – 40GHz    | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +4.3dB/-4.1dB |

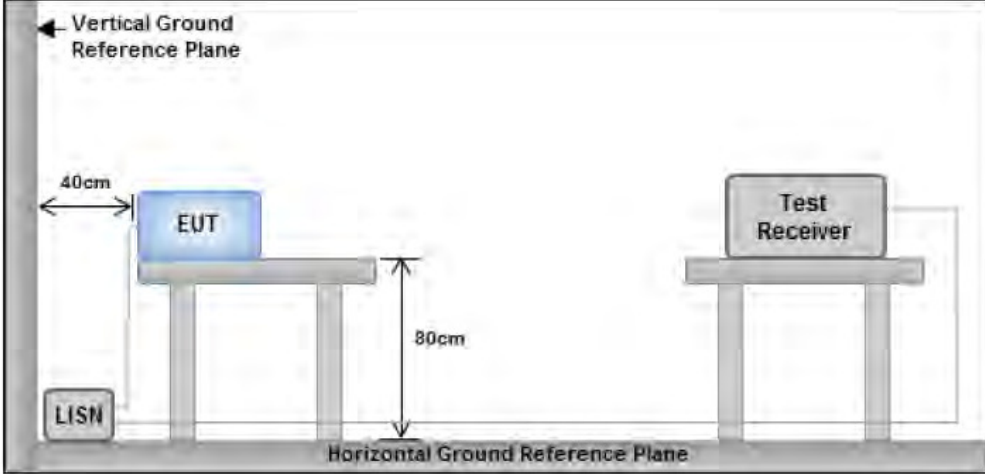
## 10 Measurements, Examination and Derived Results

### 10.1 Conducted Emissions

#### Conducted Emission Limit

| Frequency ranges (MHz) | Limit (dBuV) |         |
|------------------------|--------------|---------|
|                        | QP           | Average |
| 0.15 ~ 0.5             | 66 – 56      | 56 – 46 |
| 0.5 ~ 5                | 56           | 46      |
| 5 ~ 30                 | 60           | 50      |

| Spec         | Item | Requirement   | Applicable                          |
|--------------|------|---|-------------------------------------|
| RSS247(A8.1) | a)   | For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges. | <input checked="" type="checkbox"/> |

|            |   |
|------------|---|
| Test Setup |  <p style="text-align: center;">Note: 1. Support units were connected to second LISN.<br/>2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes</p> |
|------------|---|

|           |   |
|-----------|---|
| Procedure | <ul style="list-style-type: none"> <li>- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.</li> <li>- The power supply for the EUT was fed through a 50<math>\Omega</math>/50<math>\mu</math>H EUT LISN, connected to filtered mains.</li> <li>- The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.</li> <li>- All other supporting equipment was powered separately from another main supply.</li> </ul> |
|-----------|---|

|        |                                |
|--------|--------------------------------|
| Remark | EUT was tested at 120VAC, 60Hz |
|--------|--------------------------------|

|        |  |
|--------|--|
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |
|--------|--|

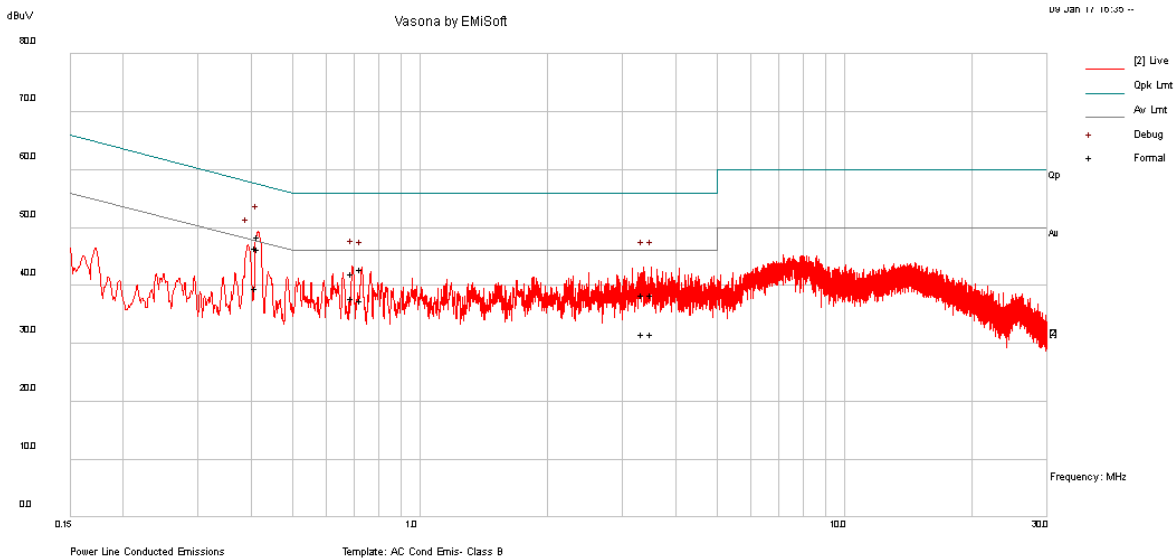
Test Data     Yes                       N/A

Test Plot     Yes (See below)               N/A

Test was done by Gary Chou at Conducted Emission test site.

### Conducted Emission Test Results

|                           |                     |      |  |         |   |
|---------------------------|---------------------|------|--|---------|---|
| Test specification:       | Conducted Emissions |      |  | Result: | <input checked="" type="checkbox"/> Pass<br><br><input type="checkbox"/> Fail |
| Environmental Conditions: | Temp(°C):           | 21   |  |         |   |
|                           | Humidity (%):       | 42   |  |         |   |
|                           | Atmospheric(mbar):  | 1021 |  |         |   |
| Mains Power:              | 120Vac, 60Hz        |      |  |         |   |
| Tested by:                | Gary Chou           |      |  |         |   |
| Test Date:                | 01/09/2017          |      |  |         |   |
| Remarks                   | AC/DC adapter, Line |      |  |         |   |

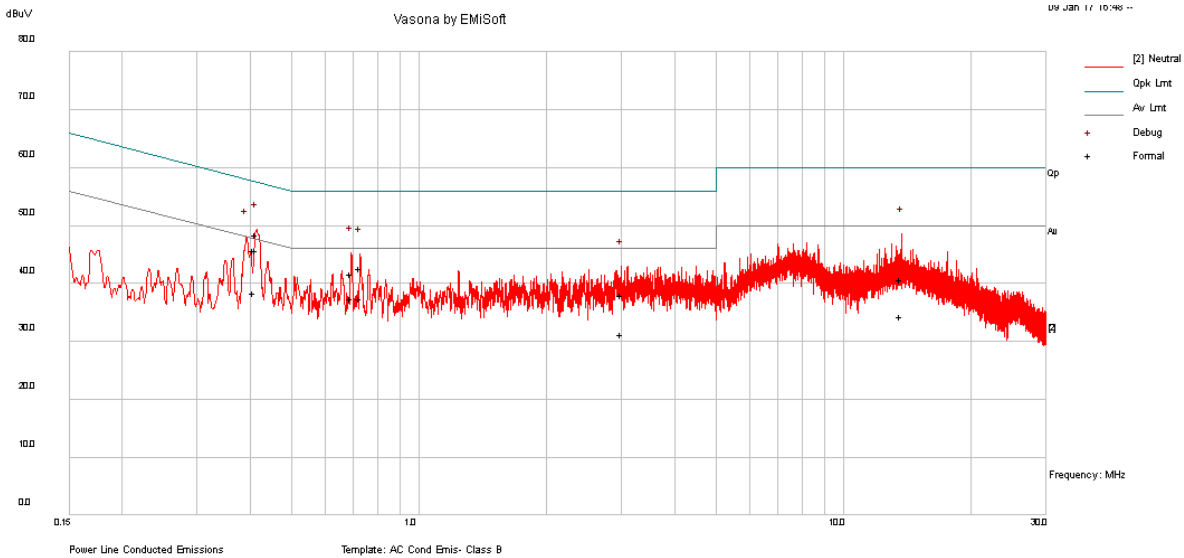


Line Plot at 120Vac, 60Hz

| Frequency (MHz) | Raw (dBuV) | Cable Loss (dB) | Factors (dB) | Level (dBuV) | Measurement Type | Line / Neutral | Limit (dBuV) | Margin (dB) | Pass /Fail |
|-----------------|------------|-----------------|--------------|--------------|------------------|----------------|--------------|-------------|------------|
| 0.42            | 37.77      | 10.01           | 0.69         | 48.46        | Quasi Peak       | Live           | 57.55        | -9.09       | Pass       |
| 0.41            | 35.74      | 10.01           | 0.69         | 46.44        | Quasi Peak       | Live           | 57.65        | -11.21      | Pass       |
| 0.69            | 31.47      | 10.01           | 0.56         | 42.04        | Quasi Peak       | Live           | 56           | -13.96      | Pass       |
| 0.73            | 32.19      | 10.01           | 0.56         | 42.76        | Quasi Peak       | Live           | 56           | -13.24      | Pass       |
| 3.51            | 27.93      | 10.03           | 0.5          | 38.46        | Quasi Peak       | Live           | 56           | -17.54      | Pass       |
| 3.35            | 27.9       | 10.03           | 0.5          | 38.43        | Quasi Peak       | Live           | 56           | -17.57      | Pass       |
| 0.42            | 35.59      | 10.01           | 0.69         | 46.29        | Average          | Live           | 47.55        | -1.26       | Pass       |
| 0.41            | 28.91      | 10.01           | 0.69         | 39.61        | Average          | Live           | 47.65        | -8.04       | Pass       |
| 0.69            | 27.2       | 10.01           | 0.56         | 37.77        | Average          | Live           | 46           | -8.23       | Pass       |
| 0.73            | 26.95      | 10.01           | 0.56         | 37.52        | Average          | Live           | 46           | -8.48       | Pass       |
| 3.51            | 21.1       | 10.03           | 0.5          | 31.63        | Average          | Live           | 46           | -14.37      | Pass       |
| 3.35            | 21.14      | 10.03           | 0.5          | 31.67        | Average          | Live           | 46           | -14.33      | Pass       |

### Conducted Emission Test Results

|                           |                        |      |  |         |   |
|---------------------------|------------------------|------|--|---------|---|
| Test specification:       | Conducted Emissions    |      |  | Result: | <input checked="" type="checkbox"/> Pass<br><br><input type="checkbox"/> Fail |
| Environmental Conditions: | Temp(°C):              | 21   |  |         |   |
|                           | Humidity (%):          | 42   |  |         |   |
|                           | Atmospheric(mbar):     | 1021 |  |         |   |
| Mains Power:              | 120Vac, 60Hz           |      |  |         |   |
| Tested by:                | Gary Chou              |      |  |         |   |
| Test Date:                | 01/09/2017             |      |  |         |   |
| Remarks                   | AC/DC adapter, Neutral |      |  |         |   |




Neutral Plot at 120Vac, 60Hz

| Frequency (MHz) | Raw (dBuV) | Cable Loss (dB) | Factors (dB) | Level (dBuV) | Measurement Type | Line / Neutral | Limit (dBuV) | Margin (dB) | Pass /Fail |
|-----------------|------------|-----------------|--------------|--------------|------------------|----------------|--------------|-------------|------------|
| 0.41            | 37.75      | 10.01           | 0.69         | 48.44        | Quasi Peak       | Neutral        | 57.58        | -9.13       | Pass       |
| 0.41            | 35.03      | 10.01           | 0.69         | 45.73        | Quasi Peak       | Neutral        | 57.67        | -11.94      | Pass       |
| 0.69            | 31.17      | 10.01           | 0.56         | 41.74        | Quasi Peak       | Neutral        | 56           | -14.26      | Pass       |
| 0.73            | 32.04      | 10.01           | 0.56         | 42.61        | Quasi Peak       | Neutral        | 56           | -13.39      | Pass       |
| 13.68           | 30.05      | 10.06           | 0.55         | 40.66        | Quasi Peak       | Neutral        | 60           | -19.34      | Pass       |
| 2.99            | 27.5       | 10.03           | 0.5          | 38.03        | Quasi Peak       | Neutral        | 56           | -17.97      | Pass       |
| 0.41            | 35.13      | 10.01           | 0.69         | 45.82        | Average          | Neutral        | 47.58        | -1.75       | Pass       |
| 0.41            | 27.73      | 10.01           | 0.69         | 38.43        | Average          | Neutral        | 47.67        | -9.25       | Pass       |
| 0.69            | 26.95      | 10.01           | 0.56         | 37.52        | Average          | Neutral        | 46           | -8.48       | Pass       |
| 0.73            | 26.88      | 10.01           | 0.56         | 37.45        | Average          | Neutral        | 46           | -8.55       | Pass       |
| 13.68           | 23.84      | 10.06           | 0.55         | 34.44        | Average          | Neutral        | 50           | -15.56      | Pass       |
| 2.99            | 20.72      | 10.03           | 0.5          | 31.25        | Average          | Neutral        | 46           | -14.75      | Pass       |

## 10.2 26 dB Bandwidth & 6 dB Bandwidth

### Requirement(s):

| Spec           | Item  | Requirement  | Applicable   |
|----------------|---|--|--|
| § 15.407       | -   | 26 dB Emission BW: Report only for reference.  | <input checked="" type="checkbox"/>  |
|                | a) (2)  | 26 dB Emission BW: Report only for power limit calculation.  | <input type="checkbox"/>   |
|                | e)  | Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz. | <input checked="" type="checkbox"/>  |
| Test Setup     |   |  |  |
| Test Procedure | <p>789033 D02 General UNII Test Procedures New Rules v01r02</p> <p><u>26dB Emission bandwidth measurement procedure (Other than 5.725-5.85 GHz)</u></p> <ul style="list-style-type: none"> <li>- Allow the trace to stabilize.</li> <li>- Use the spectrum analyzer built-in measurement function to determine the 26dB BW. <ul style="list-style-type: none"> <li>o Set RBW = around 1% of emission bandwidth</li> <li>o Set VBW &gt; RBW</li> <li>o Detector = Peak</li> <li>o Trace mode = max hold</li> </ul> </li> <li>- Capture the plot.</li> <li>- Repeat above steps for different test channel and other modulation type.</li> </ul> <p><u>6 dB Minimum emission bandwidth measurement procedure (for 5.725-5.85 GHz)</u></p> <ul style="list-style-type: none"> <li>- Allow the trace to stabilize.</li> <li>- Use the spectrum analyzer built-in measurement function to determine the 6dB BW. <ul style="list-style-type: none"> <li>o Set RBW = 100 KHz</li> <li>o Set VBW ≥ 3 x RBW</li> <li>o Detector = Peak</li> <li>o Trace mode = max hold</li> <li>o Sweep = auto couple</li> </ul> </li> <li>- Capture the plot.</li> <li>- Repeat above steps for different test channel and other modulation type.</li> </ul> |  |  |
| Test Date      | 12/05/2016 – 12/20/2016   | Environmental condition  | Temperature 22°C<br>Relative Humidity 38%<br>Atmospheric Pressure 1020mbar |
| Remark         | 99% BW result is presented here to show the channels in 5.1GHz is not crossing to DFS channel since the 26 dB BW is too wide.   |  |  |
| Result         | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail  |  |  |

Test Data     Yes       N/A  
 Test Plot     Yes       N/A

Test was done by Shuo Zhang at RF test site.

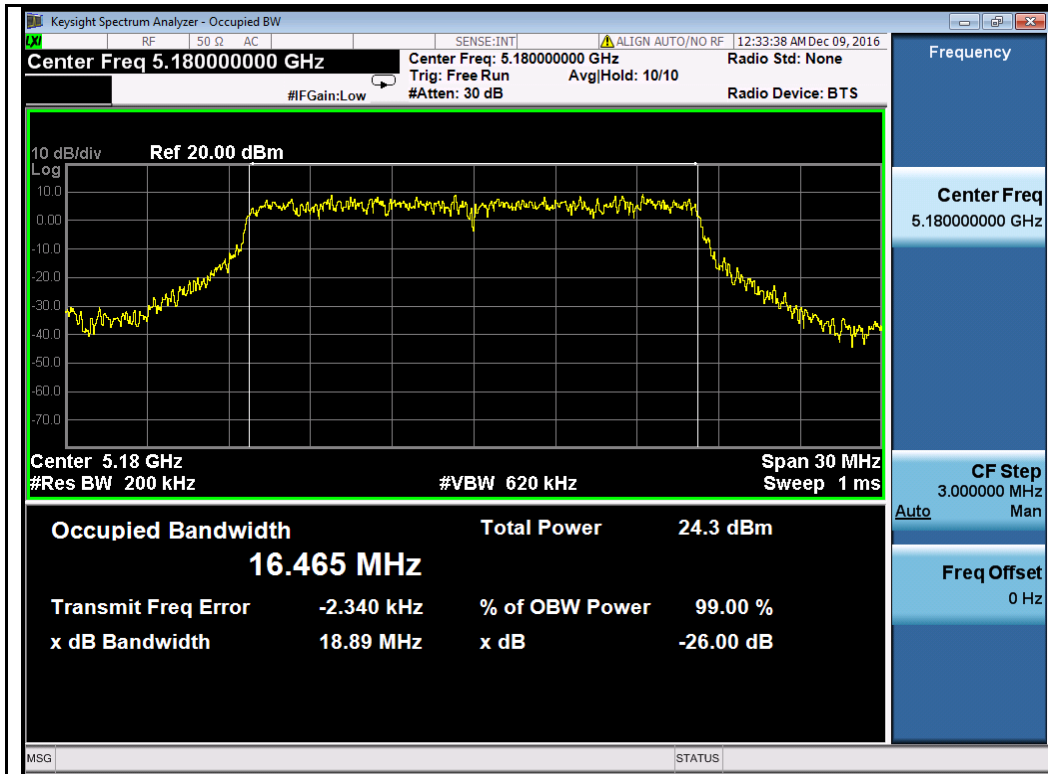
**26dB Bandwidth measurement result for 5.2GHz**

| Type    | Test mode   | Freq (MHz) | CH   | Result (MHz) | Limit (MHz) |
|---------|-------------|------------|------|--------------|-------------|
| 26dB BW | 802.11a     | 5180       | Low  | 18.89        | -           |
|         |             | 5200       | Mid  | 18.72        | -           |
|         |             | 5240       | High | 18.33        | -           |
|         | 802.11n-20  | 5180       | Low  | 20.15        | -           |
|         |             | 5200       | Mid  | 19.62        | -           |
|         |             | 5240       | High | 19.73        | -           |
|         | 802.11n-40  | 5190       | Low  | 38.48        | -           |
|         |             | 5230       | High | 39.20        | -           |
|         | 802.11ac-80 | 5210       | Mid  | 83.63        | -           |

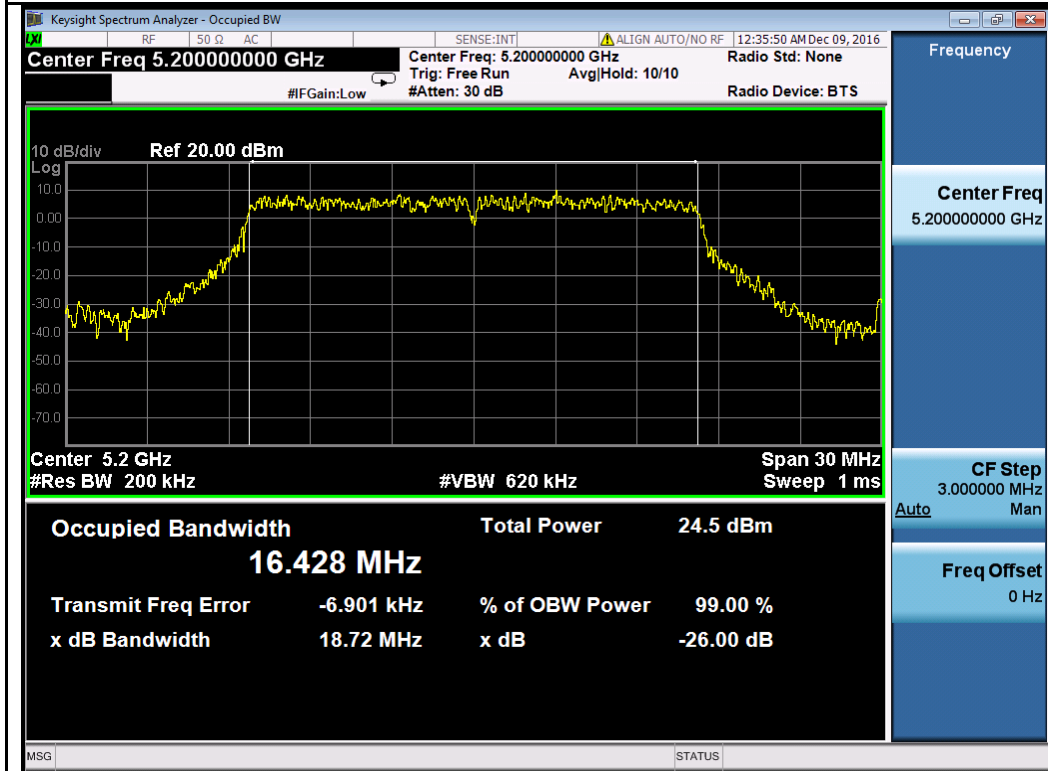
**6dB Bandwidth measurement result for 5.8GHz**

| Type   | Test mode   | Freq (MHz) | CH   | Result (MHz) | Limit (MHz) | Result |
|--------|-------------|------------|------|--------------|-------------|--------|
| 6dB BW | 802.11a     | 5745       | Low  | 16.43        | ≥0.5        | Pass   |
|        |             | 5785       | Mid  | 16.28        | ≥0.5        | Pass   |
|        |             | 5825       | High | 16.41        | ≥0.5        | Pass   |
|        | 802.11n-20  | 5745       | Low  | 17.59        | ≥0.5        | Pass   |
|        |             | 5785       | Mid  | 17.60        | ≥0.5        | Pass   |
|        |             | 5825       | High | 16.93        | ≥0.5        | Pass   |
|        | 802.11n-40  | 5755       | Low  | 36.29        | ≥0.5        | Pass   |
|        |             | 5795       | High | 36.26        | ≥0.5        | Pass   |
|        | 802.11ac-80 | 5775       | Mid  | 76.01        | ≥0.5        | Pass   |

**26dB Bandwidth Test Plots**  
**W52:**

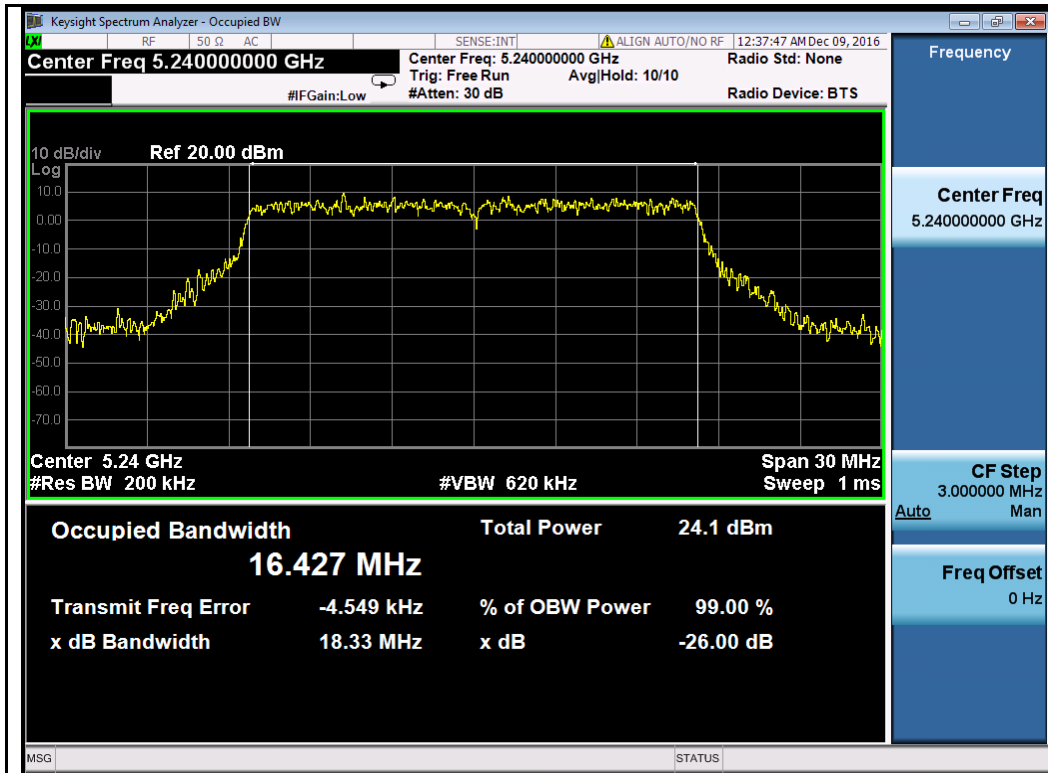


802.11a-5180MHz

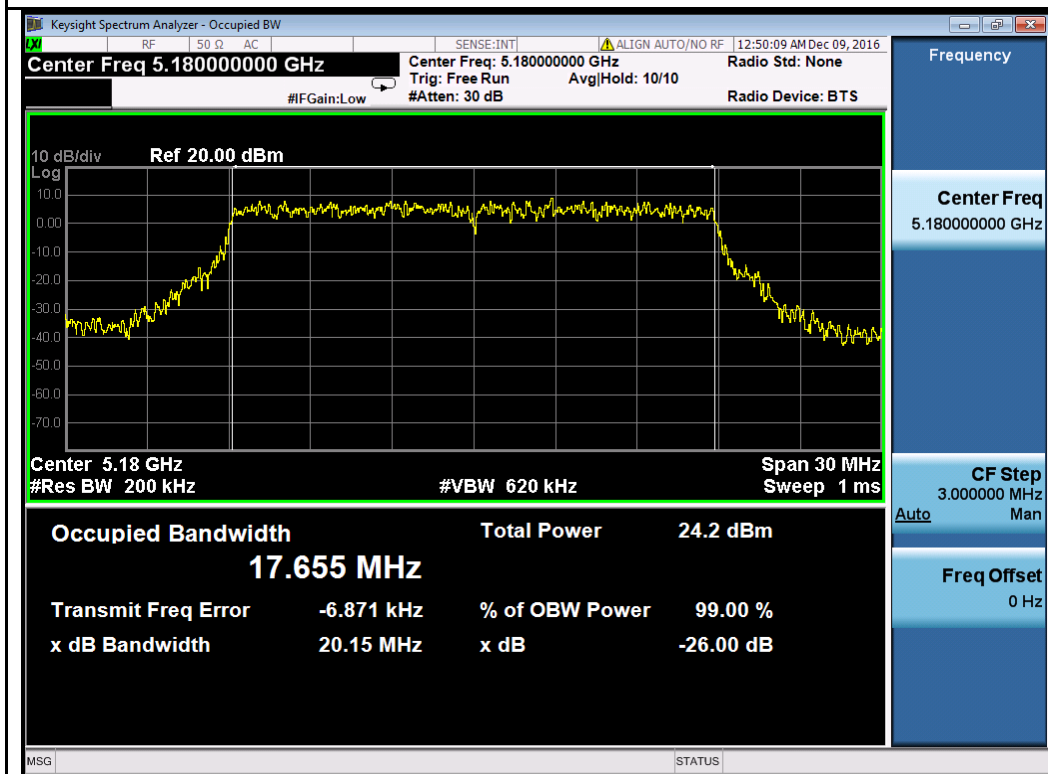


802.11a-5200MHz

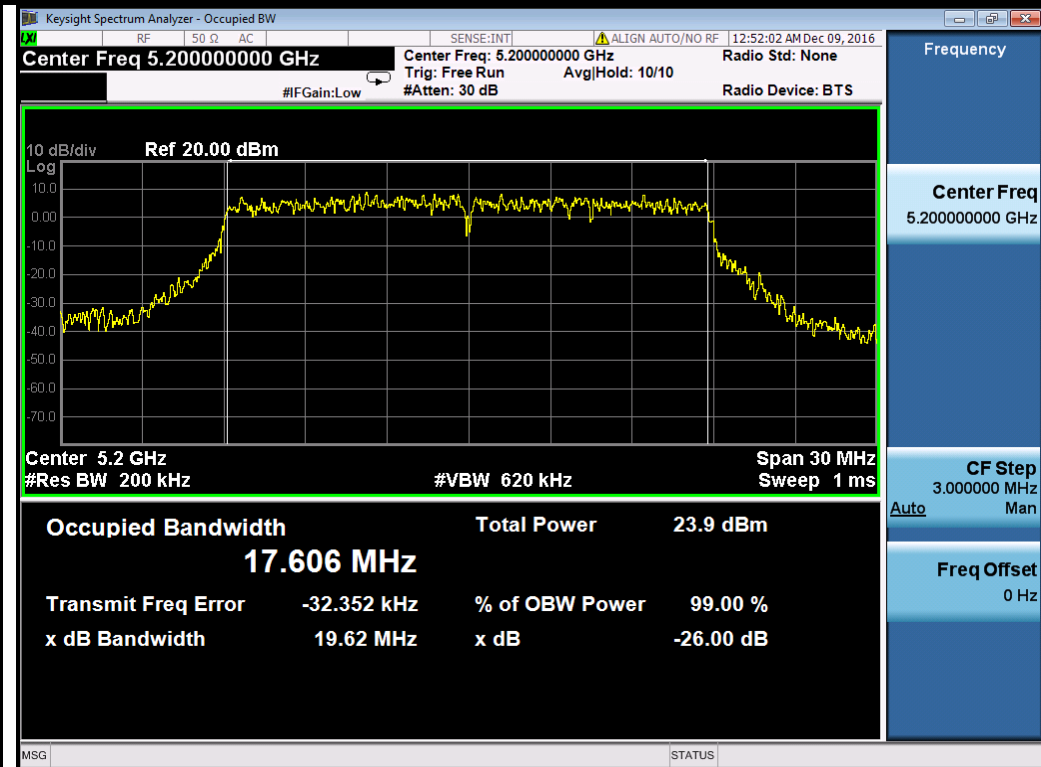




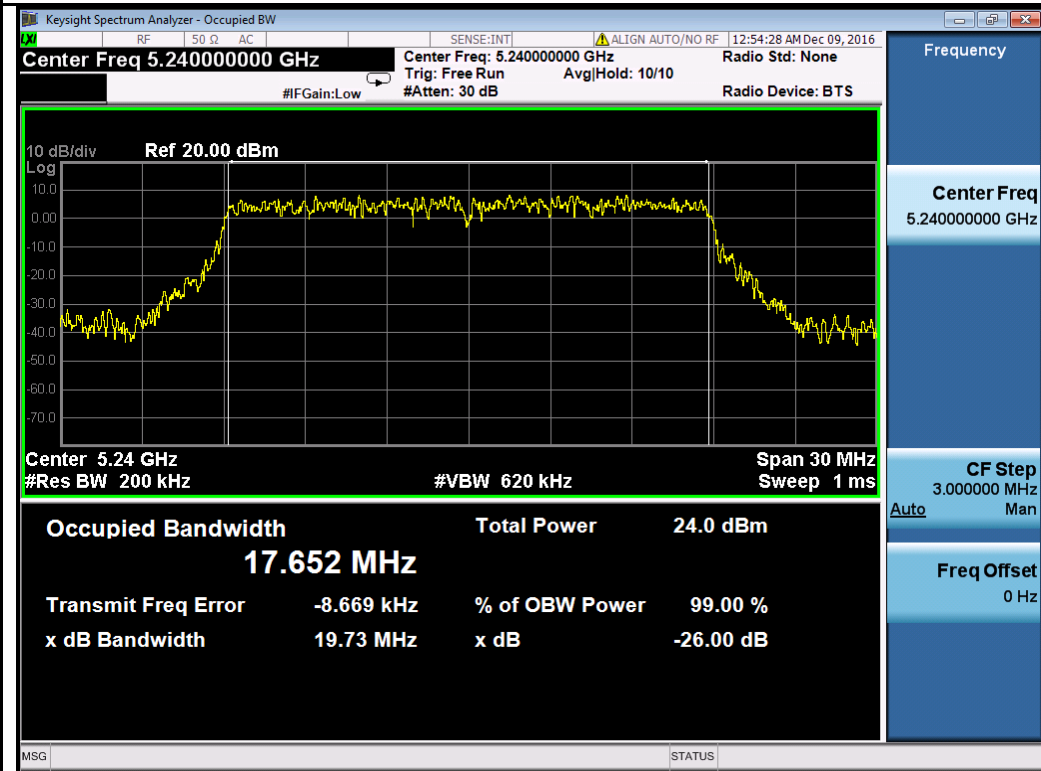
802.11a-5240MHz



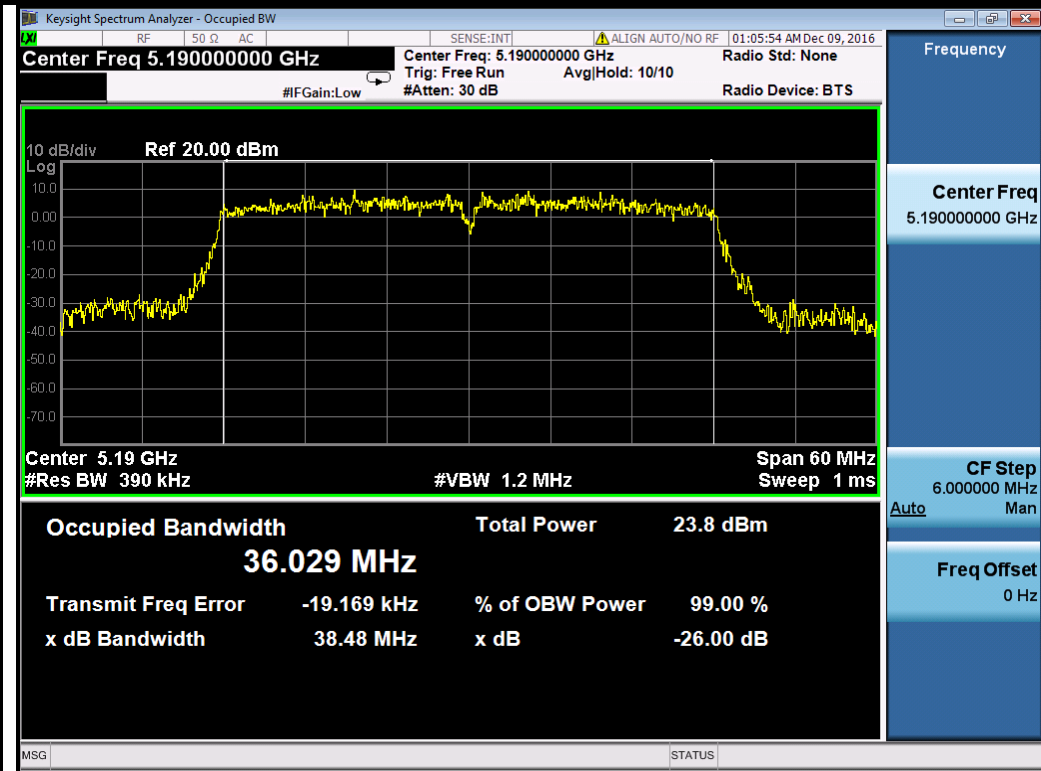
802.11n-HT20-5180MHz



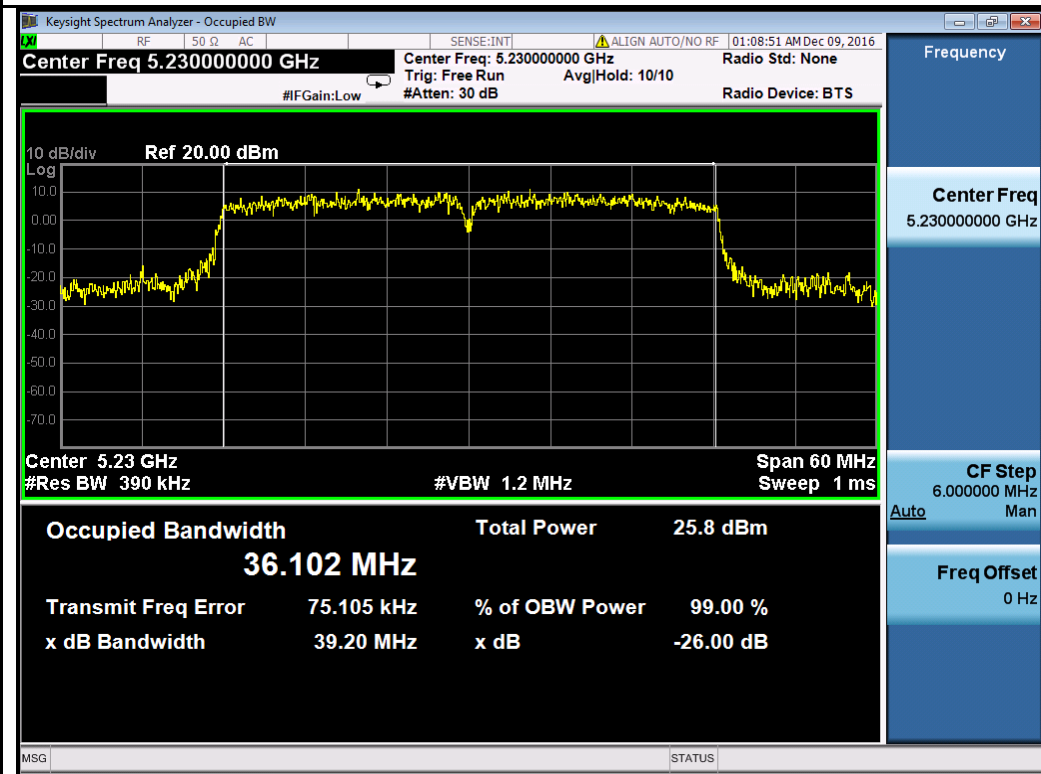
802.11n-HT20-5200MHz



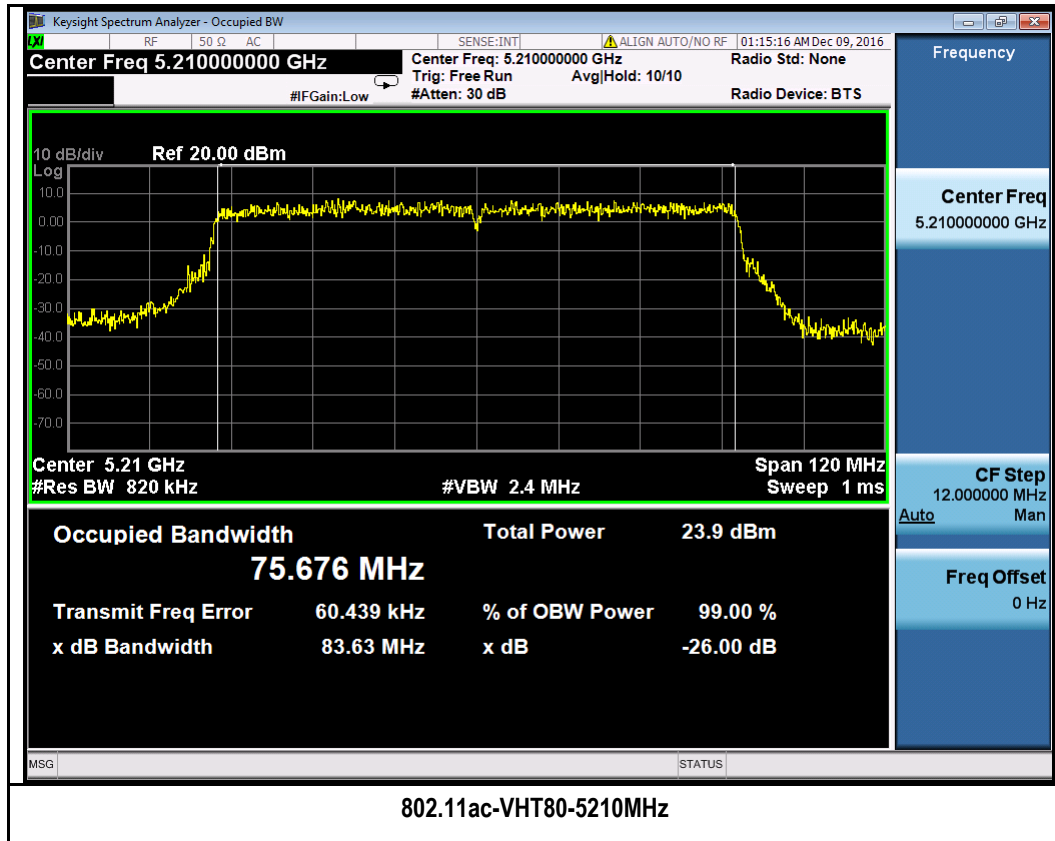
802.11n-HT20-5240MHz



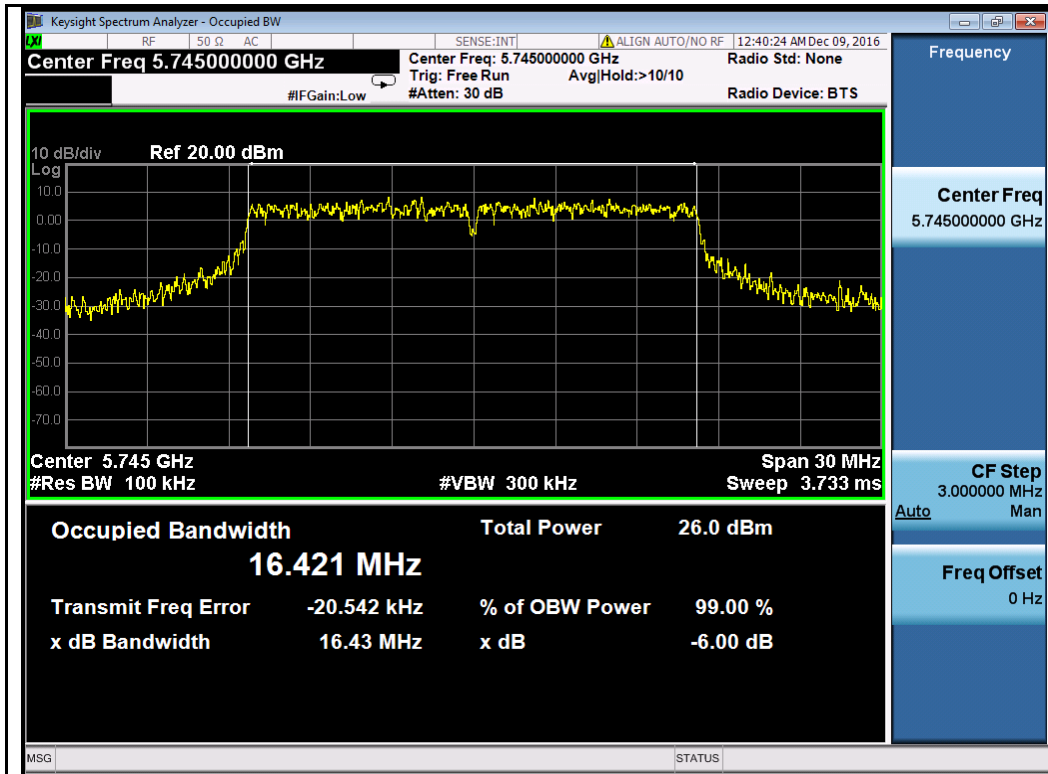
802.11n-HT40-5190MHz



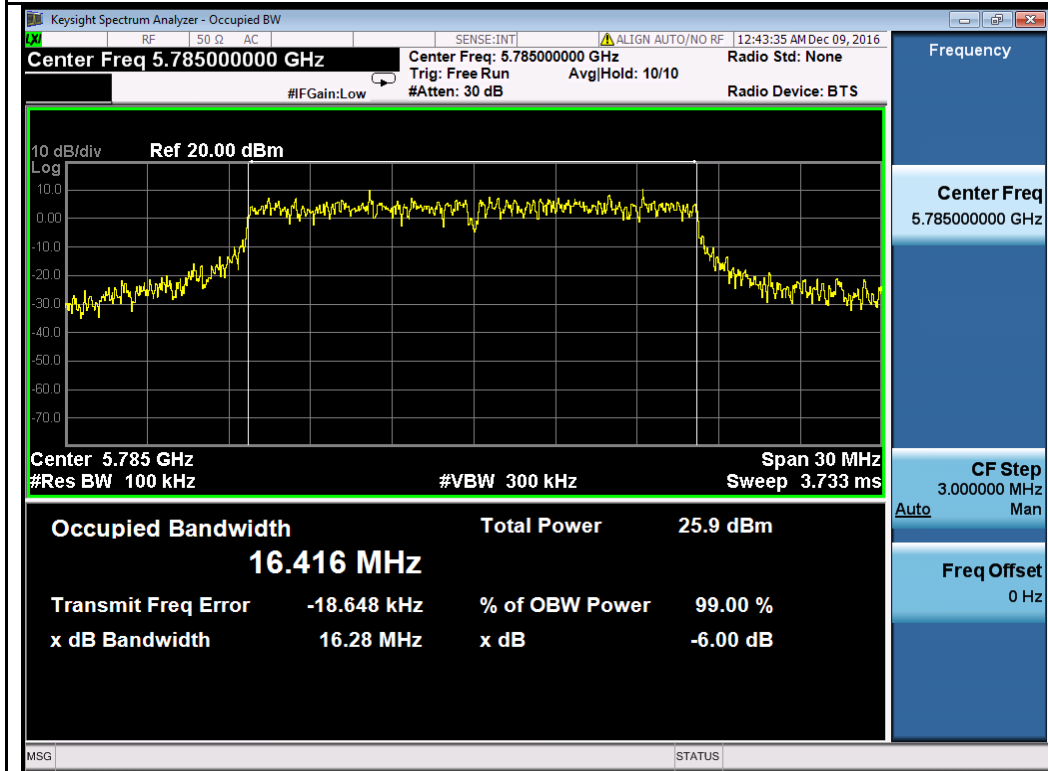
802.11n-HT40-5230MHz



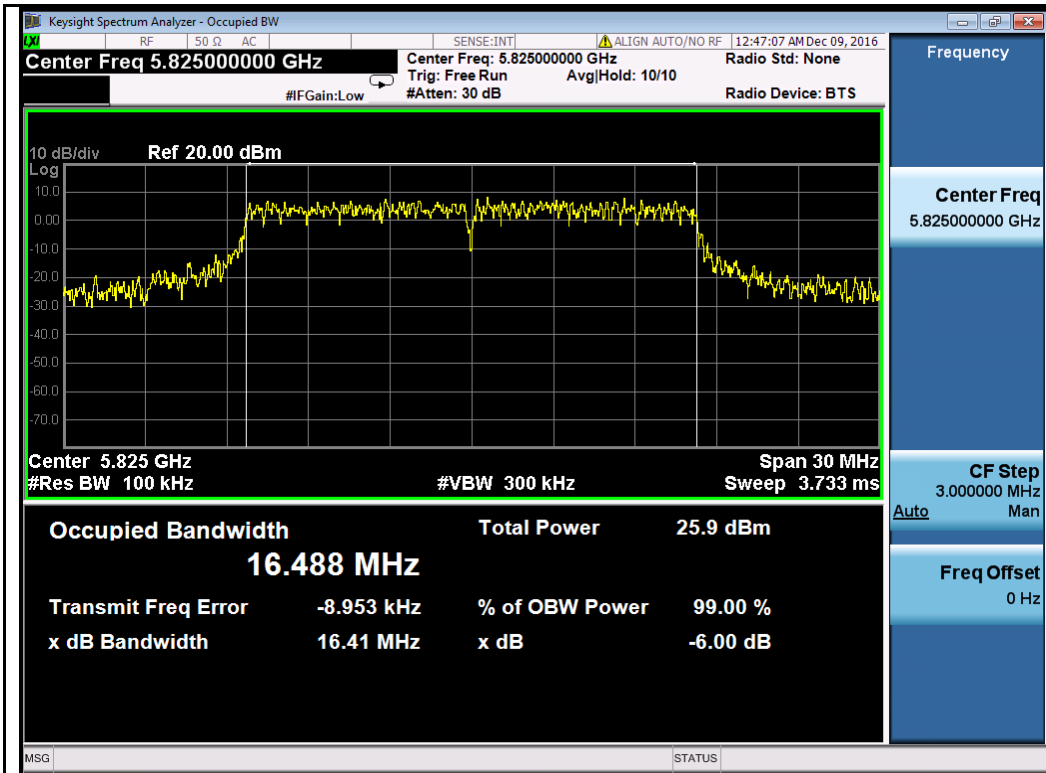
**6dB Bandwidth Test Plots**  
**W58:**



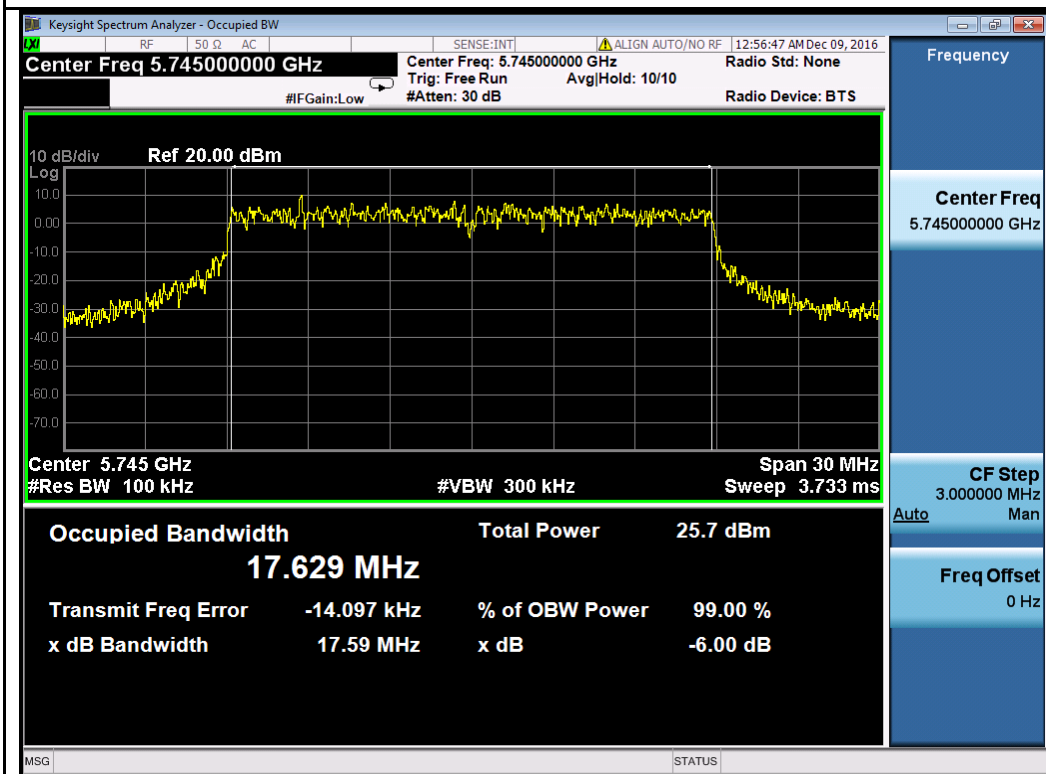
802.11a-5745MHz



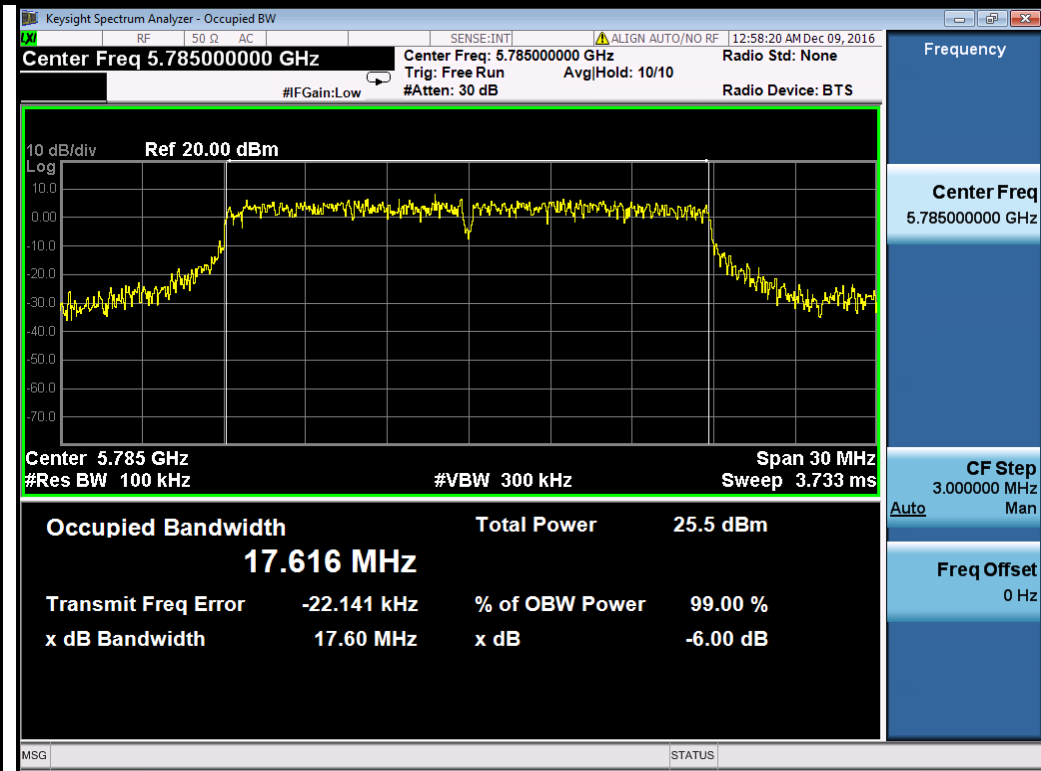
802.11a-5785MHz



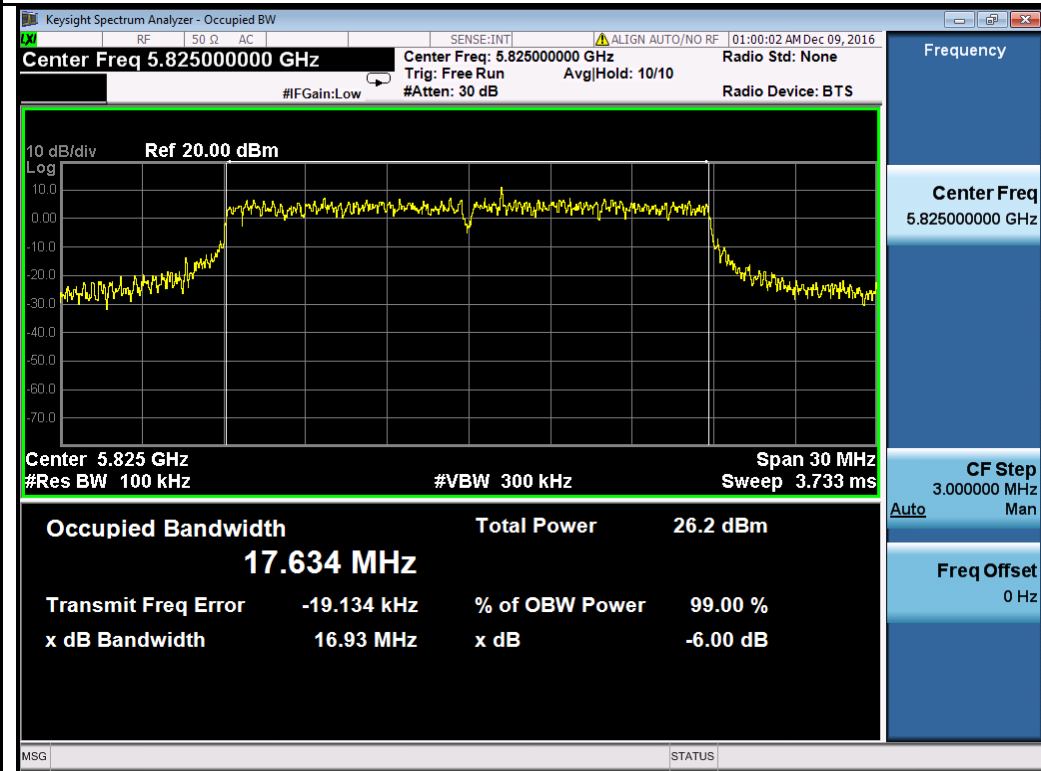
802.11a-5825MHz



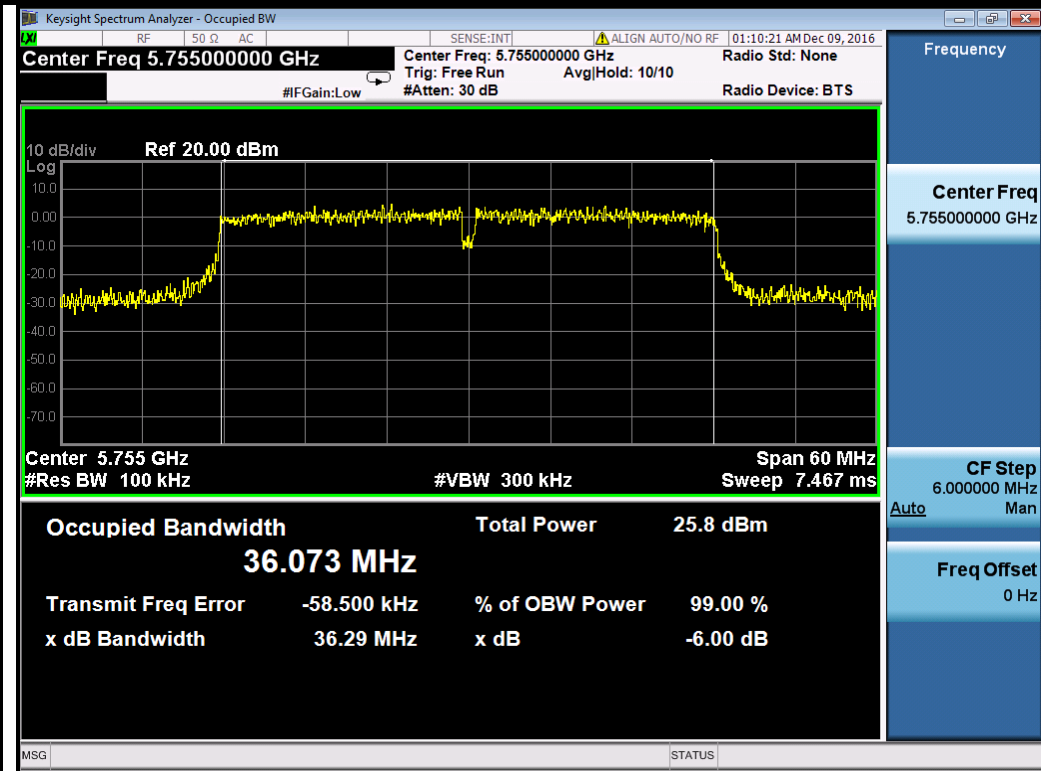
802.11n-HT20-5745MHz



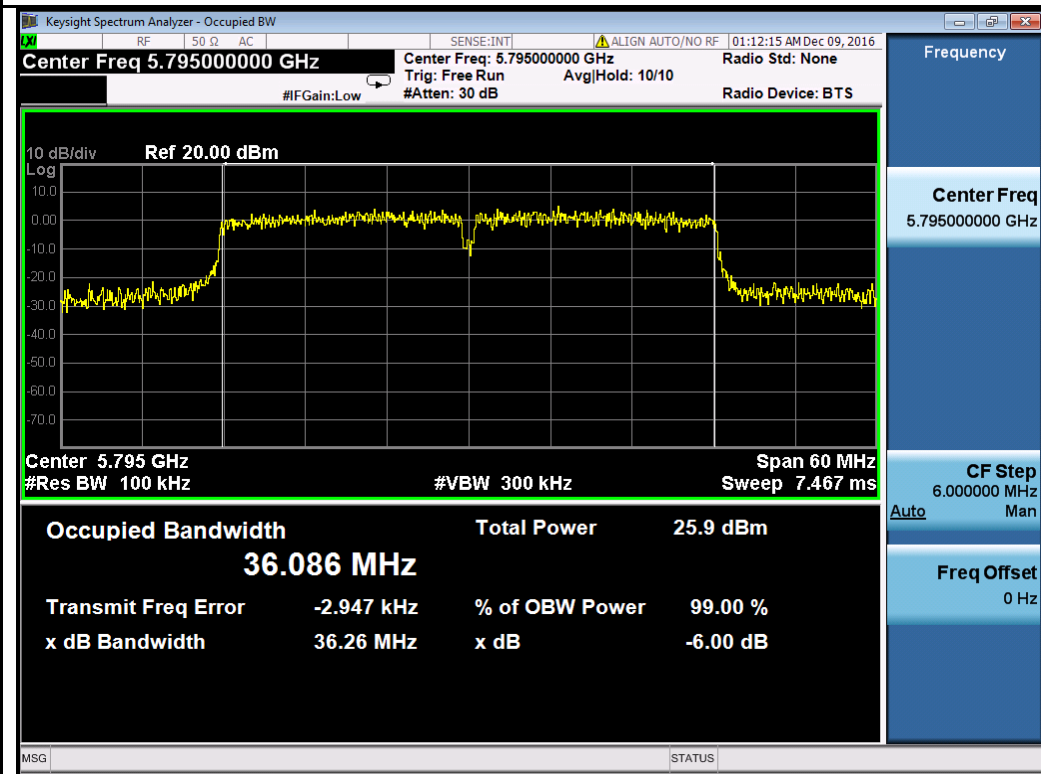
802.11n-HT20-5785MHz



802.11n-HT20-5825MHz

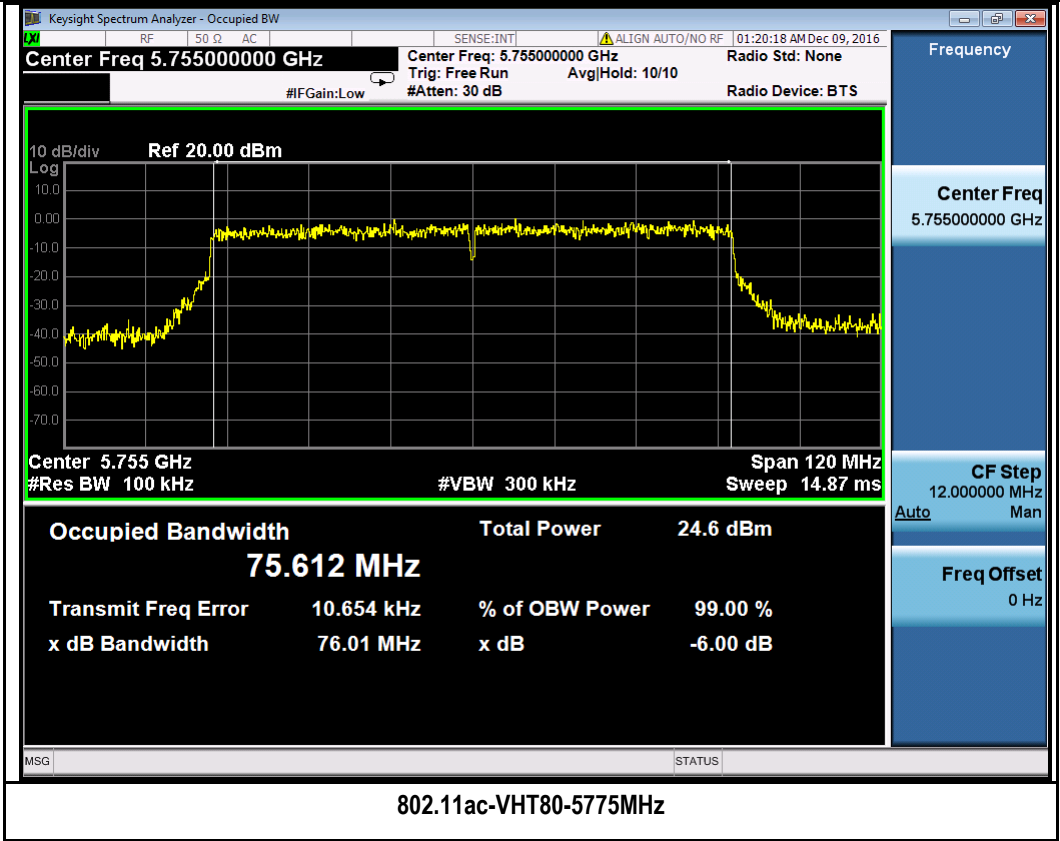


802.11n-HT40-5755MHz



802.11n-HT40-5795MHz

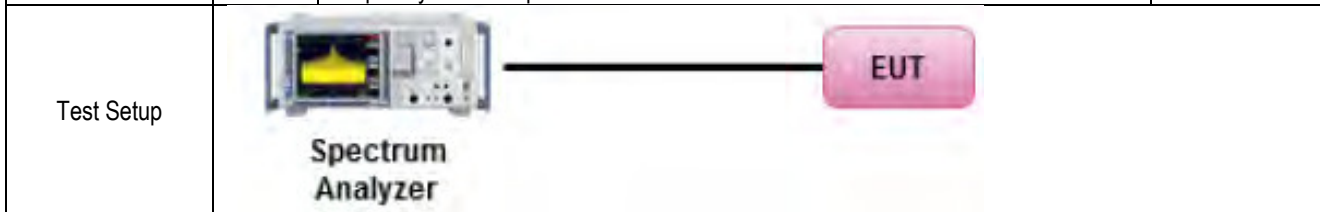




### 10.3 Output Power

**Requirement(s):**

| Spec     | Item      | Requirement   | Applicable                          |
|----------|-----------|---|-------------------------------------|
| § 15.407 | a)(1)(ii) | For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. | <input checked="" type="checkbox"/> |
|          | a)(3)     | For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.  | <input checked="" type="checkbox"/> |



|                |  |  |  |
|----------------|--|--|--|
| Test Procedure | <p>789033 D02 General UNII Test Procedures New Rules v01r02</p> <p><u>Measurement using a Spectrum Analyzer or EMI Receiver (SA)</u><br/>Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep):</p> <ul style="list-style-type: none"> <li>(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.</li> <li>(ii) Set RBW = 1 MHz</li> <li>(iii) Set VBW = 3 MHz</li> <li>(iv) Number of points in sweep <math>\geq 2 \times \text{span} / \text{RBW}</math>. (This ensures that bin-to-bin spacing is <math>\leq \text{RBW}/2</math>, so that narrowband signals are not lost between frequency bins.)</li> <li>(v) Sweep time = auto.</li> <li>(vi) Detector = power averaging (rms), if available. Otherwise, use sample detector mode.</li> <li>(vii) If transmit duty cycle &lt; 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle <math>\geq 98\%</math>, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."</li> <li>(viii) Trace average at least 100 traces in power averaging (rms) mode.</li> <li>(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.</li> </ul> |  |  |
|----------------|--|--|--|

|           |   |                         |  |
|-----------|---|-------------------------|--|
| Test Date | 12/05/2016 – 12/20/2016   | Environmental condition | Temperature 21°C<br>Relative Humidity 40%<br>Atmospheric Pressure 1019mbar |
| Remark    | Per KDB 662911 D01 Multiple Transmitter Output v02r01, the direction gain for horizontal polarization and vertical polarization is calculated separately. For 5GHz band, peak antenna gain = 3.5 dBi, directional gain = 3 dB, total gain = 6.5 dBi. Highest of total gain is 6.5 dBi. The power limit and PSD limit will be reduced by amount of 0.5 dB. |                         |  |
| Result    | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail  |                         |  |

Test Data     Yes                       N/A

Test Plot     Yes (See below)               N/A

**Test was done by Shuo Zhang at RF test site.**

**Output Power measurement result for 5.2GHz**

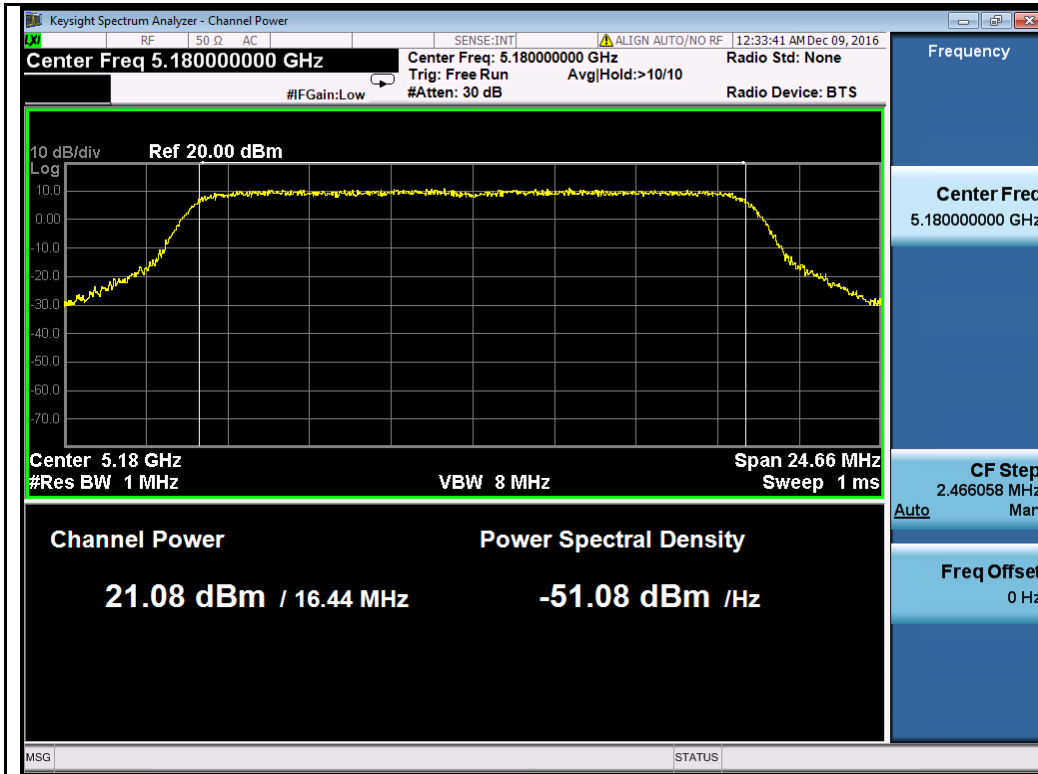
| Type         | Test mode   | Freq (MHz) | CH   | Conducted Power (dBm) |        |        |        |                | Limit (dBm) | Result |
|--------------|-------------|------------|------|-----------------------|--------|--------|--------|----------------|-------------|--------|
|              |             |            |      | Chain1                | Chain2 | Chain3 | Chain4 | Combined Power |             |        |
| Output Power | 802.11a     | 5180       | Low  | 21.08                 | 21.42  | 20.98  | 21.25  | 27.21          | 29.5        | Pass   |
|              |             | 5200       | Mid  | 21.05                 | 21.35  | 20.99  | 20.96  | 27.11          | 29.5        | Pass   |
|              |             | 5240       | High | 21.11                 | 21.49  | 21.11  | 21.01  | 27.20          | 29.5        | Pass   |
|              | 802.11n-20  | 5180       | Low  | 20.94                 | 21.23  | 20.79  | 21.09  | 27.04          | 29.5        | Pass   |
|              |             | 5200       | Mid  | 20.8                  | 21.2   | 20.85  | 20.91  | 26.96          | 29.5        | Pass   |
|              |             | 5240       | High | 20.79                 | 21.27  | 20.92  | 20.82  | 26.97          | 29.5        | Pass   |
|              | 802.11n-40  | 5190       | Low  | 20.96                 | 21.41  | 21.04  | 21.09  | 27.15          | 29.5        | Pass   |
|              |             | 5230       | High | 22.98                 | 23.26  | 23.41  | 23.02  | 29.19          | 29.5        | Pass   |
|              | 802.11ac-80 | 5210       | Mid  | 21.02                 | 21.26  | 20.92  | 20.92  | 27.05          | 29.5        | Pass   |

**Output Power measurement result for 5.8GHz**

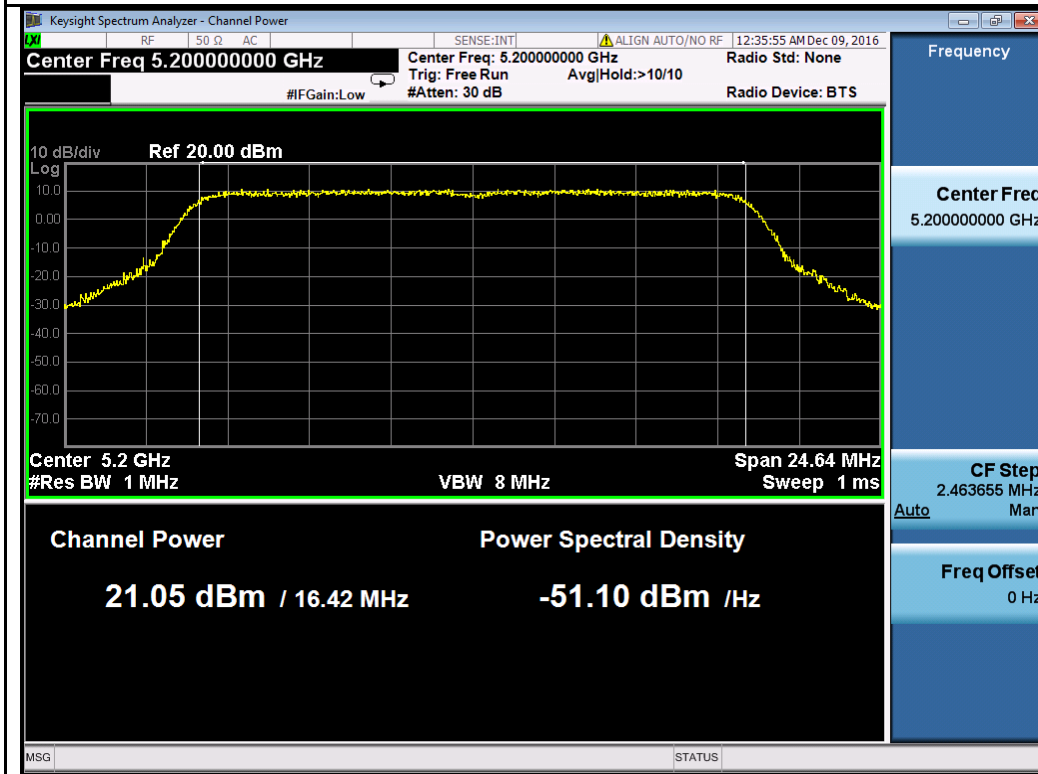
| Type         | Test mode   | Freq (MHz) | CH   | Conducted Power (dBm) |        |        |        |                | Limit (dBm) | Result |
|--------------|-------------|------------|------|-----------------------|--------|--------|--------|----------------|-------------|--------|
|              |             |            |      | Chain1                | Chain2 | Chain3 | Chain4 | Combined Power |             |        |
| Output Power | 802.11a     | 5745       | Low  | 22.56                 | 23.41  | 22.94  | 22.66  | 28.93          | 29.5        | Pass   |
|              |             | 5785       | Mid  | 22.54                 | 22.97  | 22.92  | 22.65  | 28.79          | 29.5        | Pass   |
|              |             | 5825       | High | 22.76                 | 23.10  | 23.02  | 22.59  | 28.89          | 29.5        | Pass   |
|              | 802.11n-20  | 5745       | Low  | 22.43                 | 22.99  | 22.85  | 22.63  | 28.75          | 29.5        | Pass   |
|              |             | 5785       | Mid  | 22.4                  | 22.81  | 22.89  | 22.58  | 28.69          | 29.5        | Pass   |
|              |             | 5825       | High | 22.65                 | 23.06  | 23.08  | 22.63  | 28.88          | 29.5        | Pass   |
|              | 802.11n-40  | 5755       | Low  | 22.69                 | 23.15  | 23.16  | 22.84  | 28.99          | 29.5        | Pass   |
|              |             | 5795       | High | 22.87                 | 23.23  | 23.51  | 22.99  | 29.18          | 29.5        | Pass   |
|              | 802.11ac-80 | 5775       | Mid  | 21.84                 | 22.01  | 22.24  | 21.70  | 27.97          | 29.5        | Pass   |

**Test Plot for W52:**

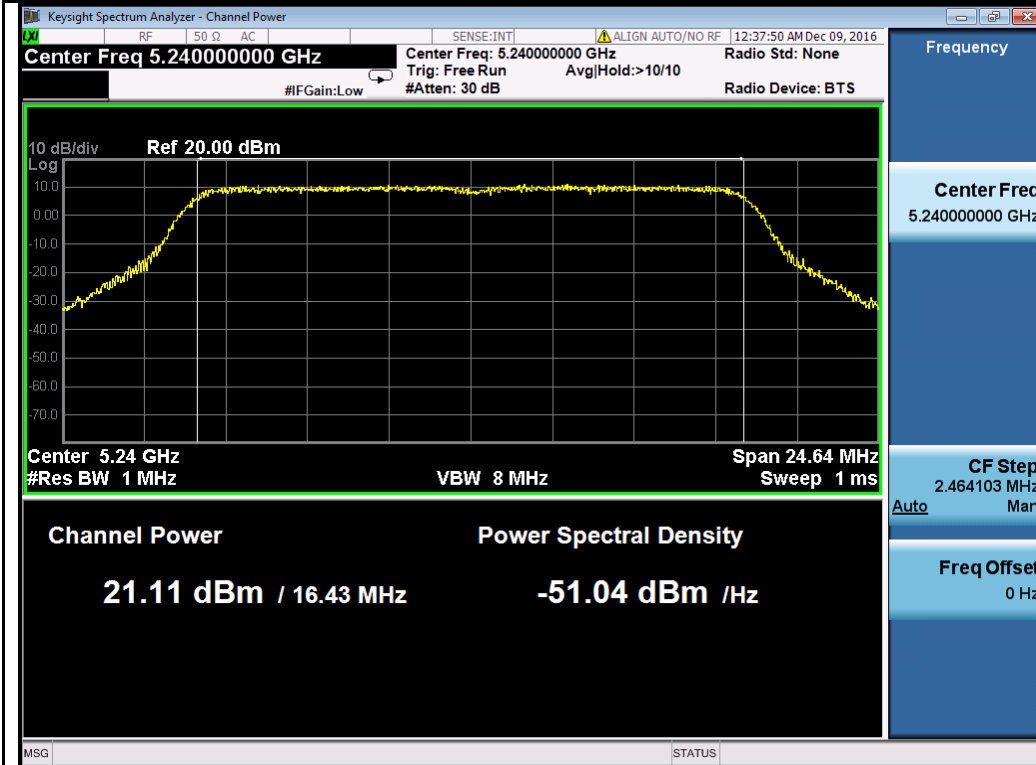
**Chain 1:**



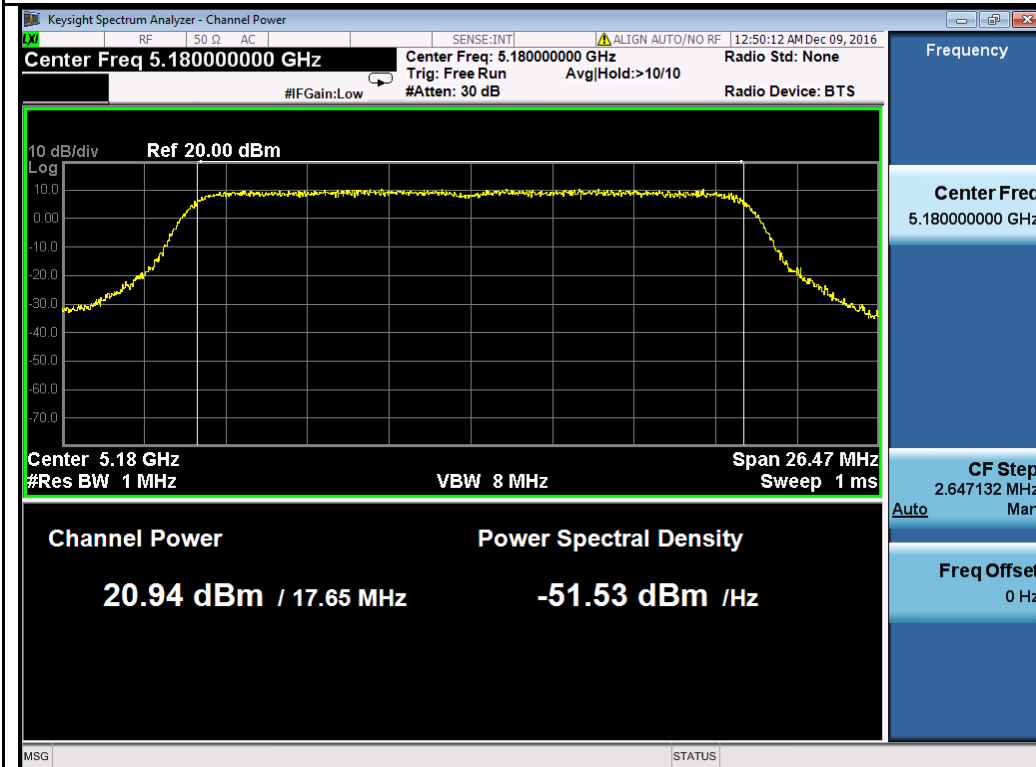
802.11a-5180M



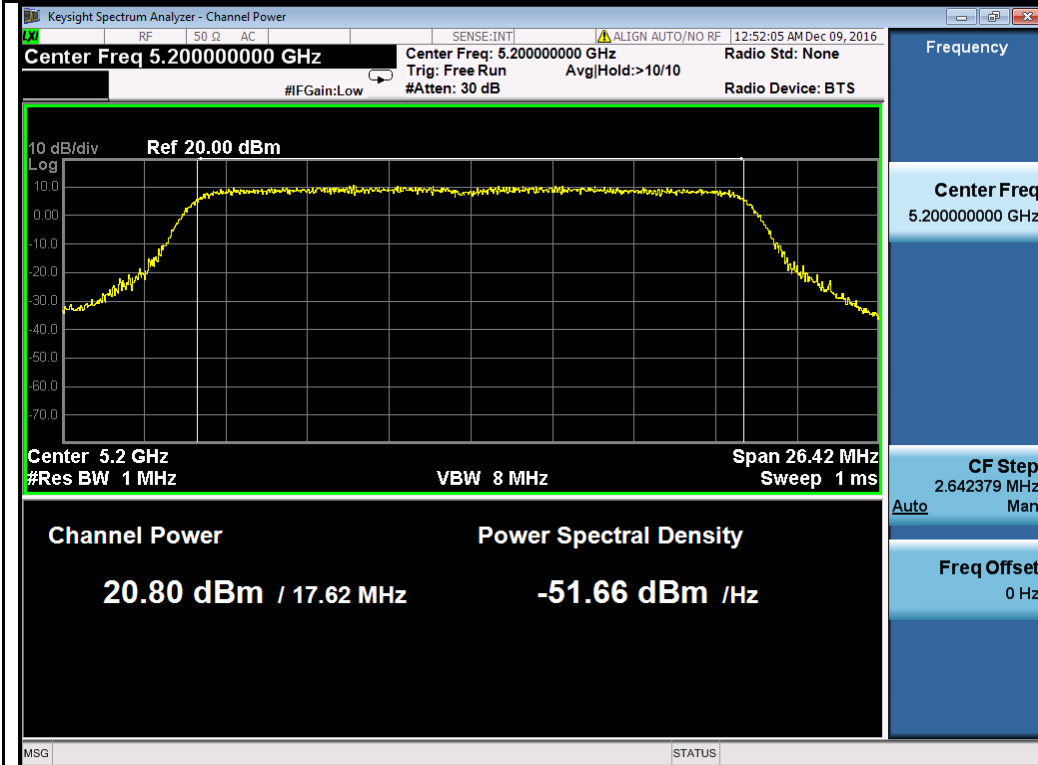
802.11a-5200M



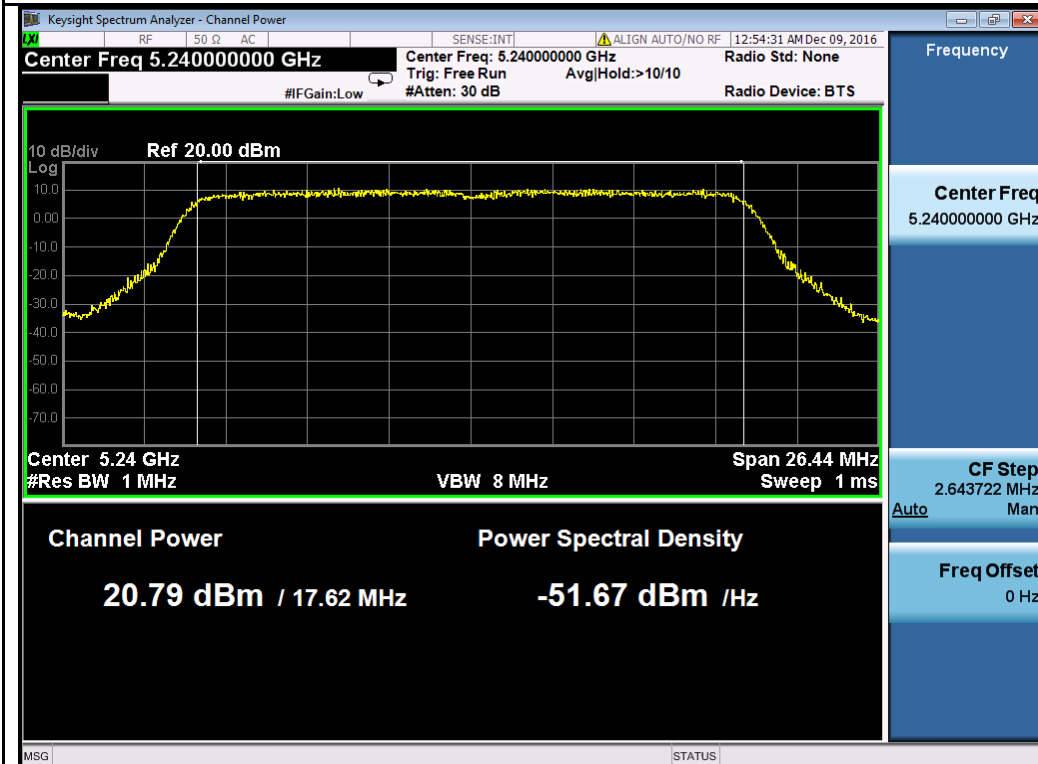
802.11a-5240M



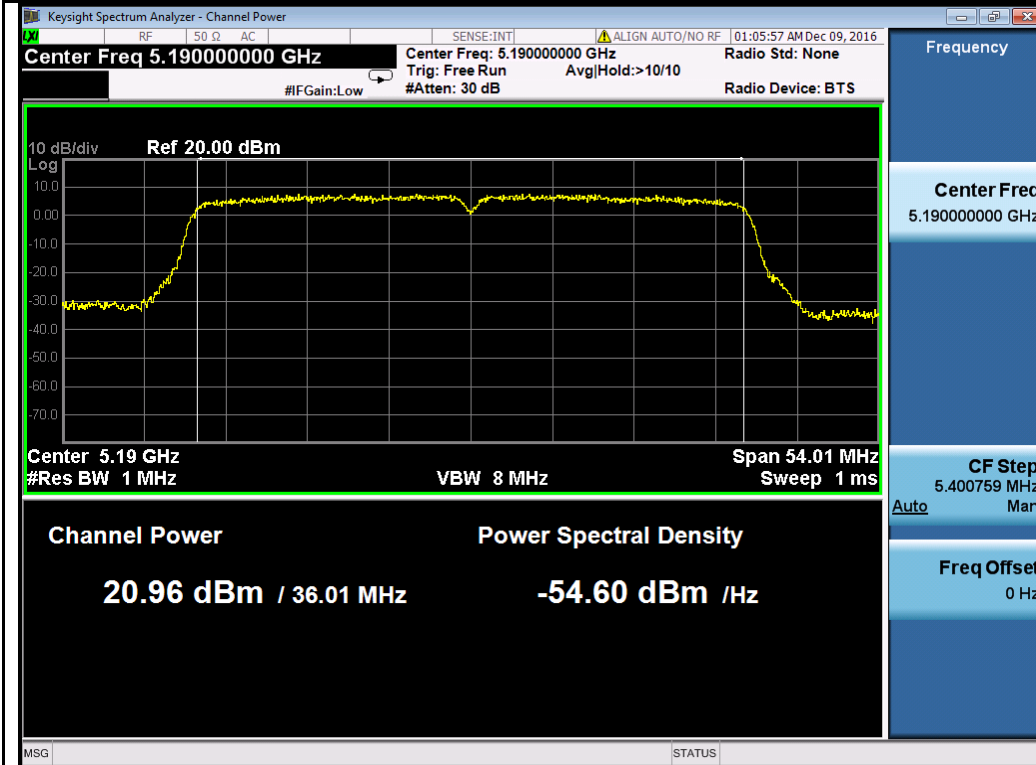
802.11n-HT20 5180M



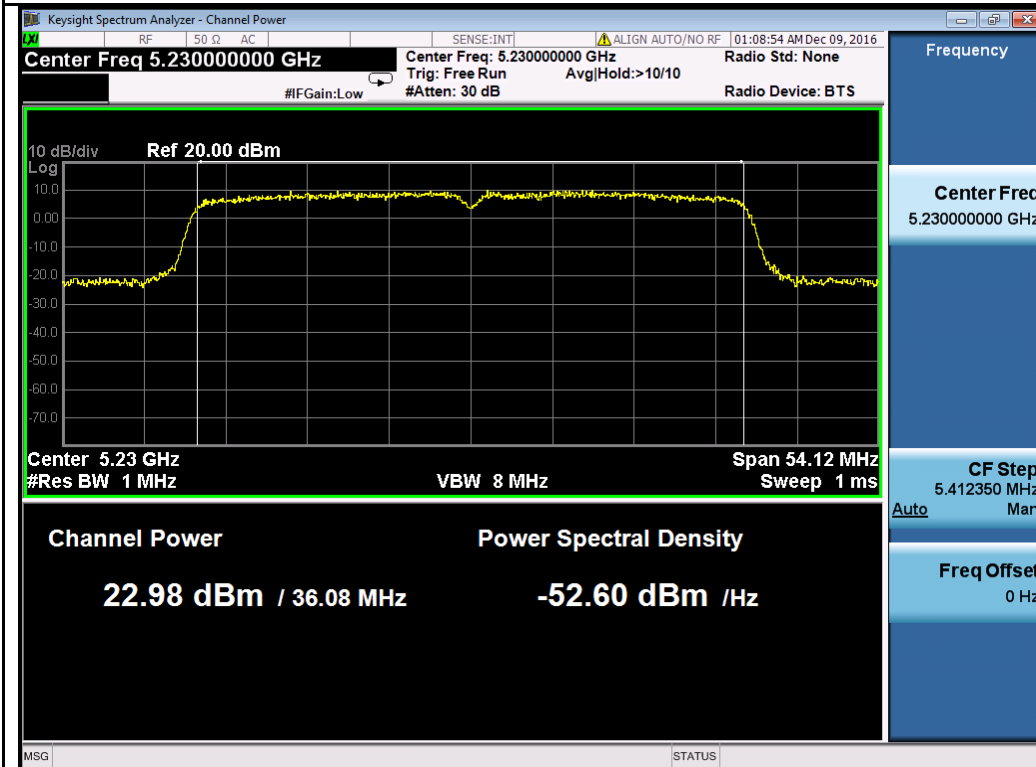
802.11n-HT20 5200M



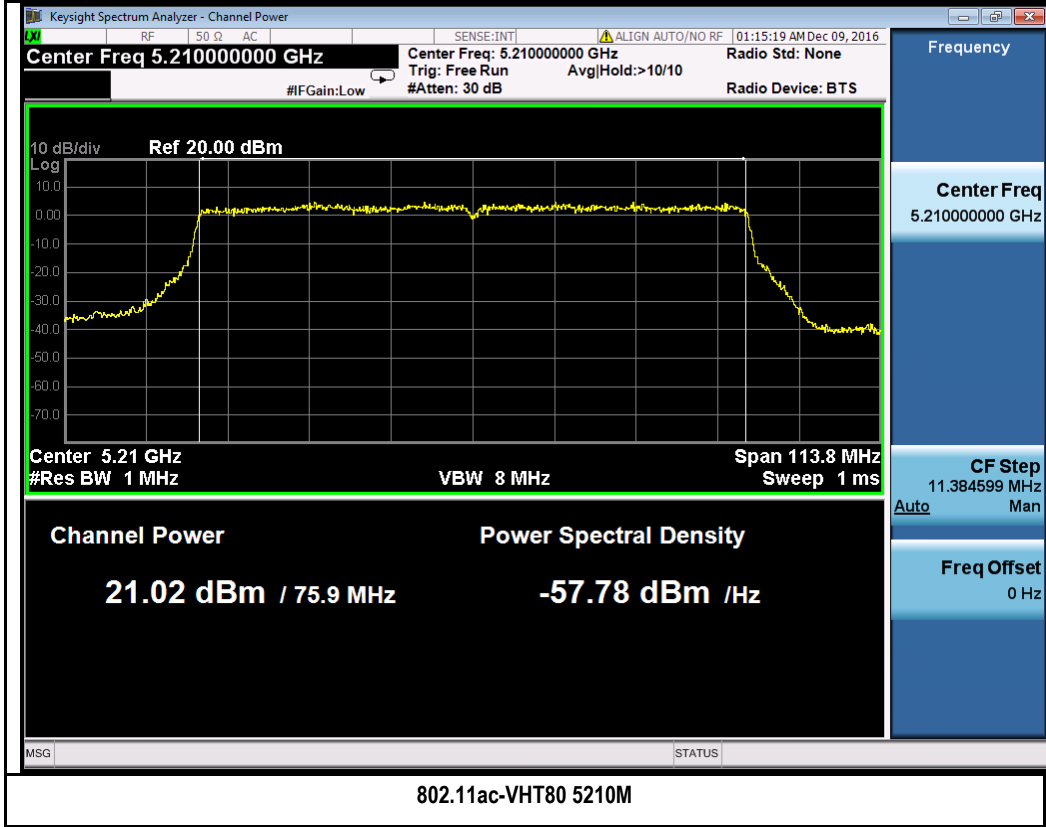
802.11n-HT20 5240M



802.11n-HT40 5190M

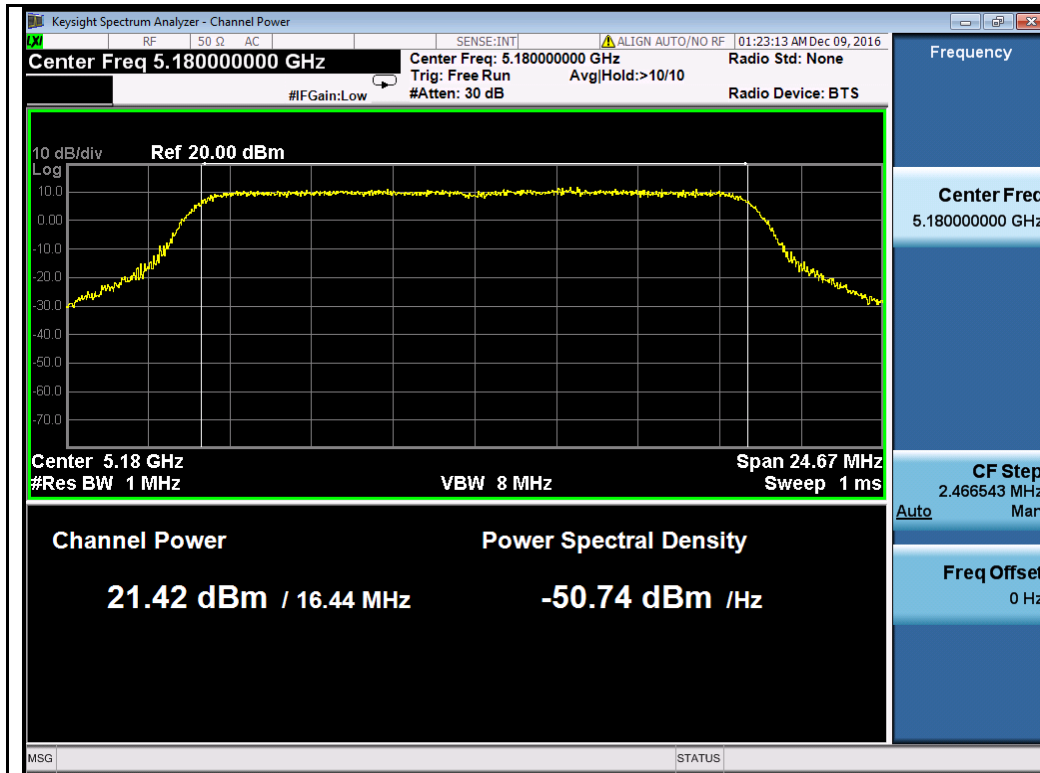


802.11n-HT40 5230M

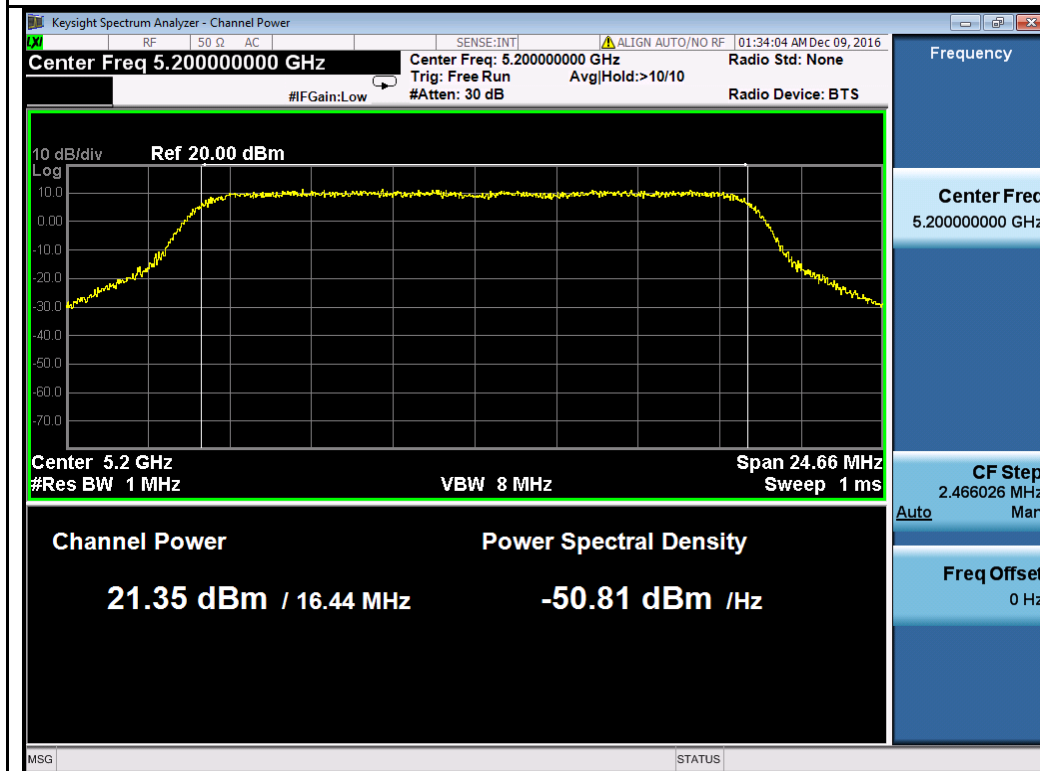




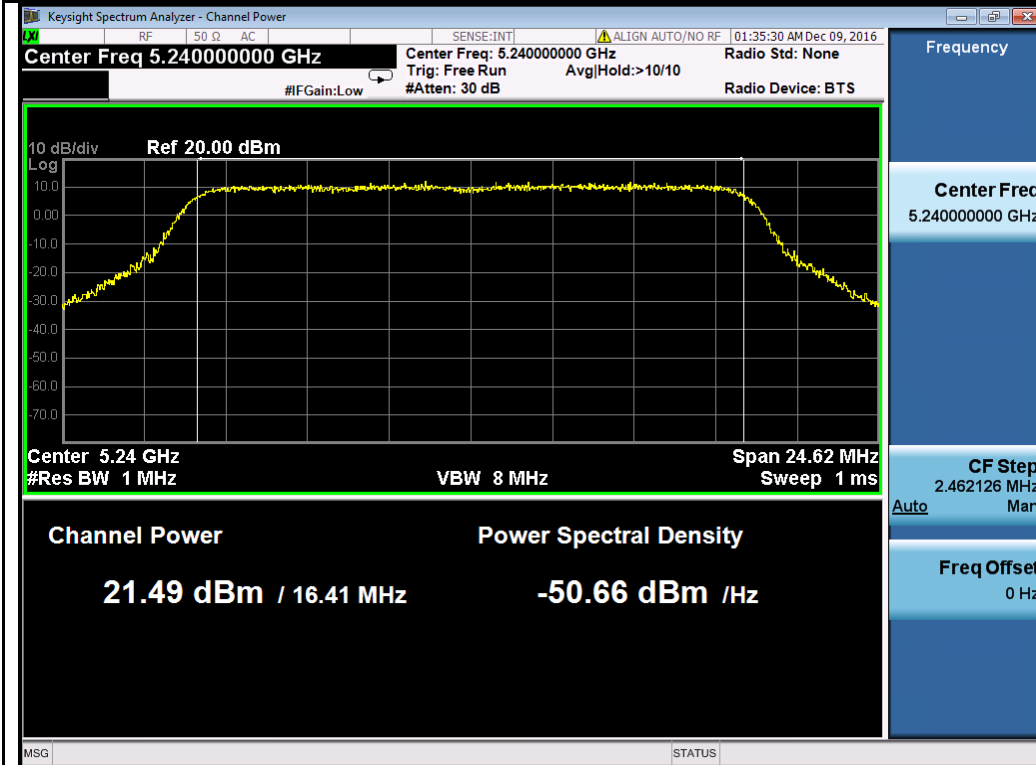
**Chain 2:**



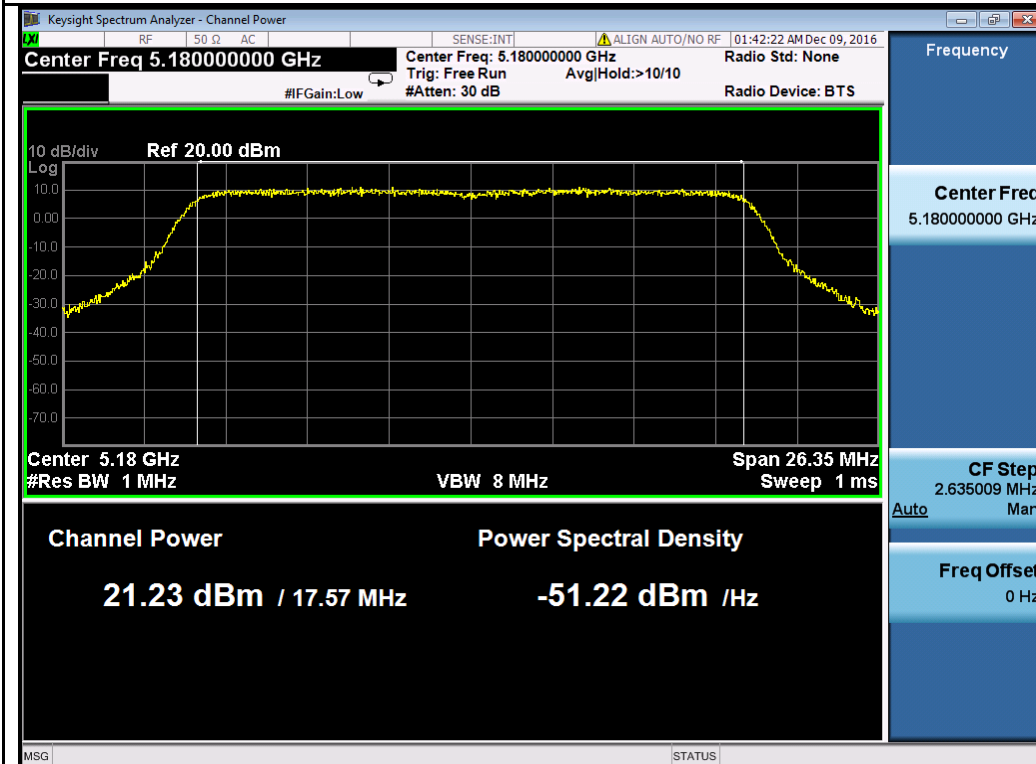
802.11a-5180M



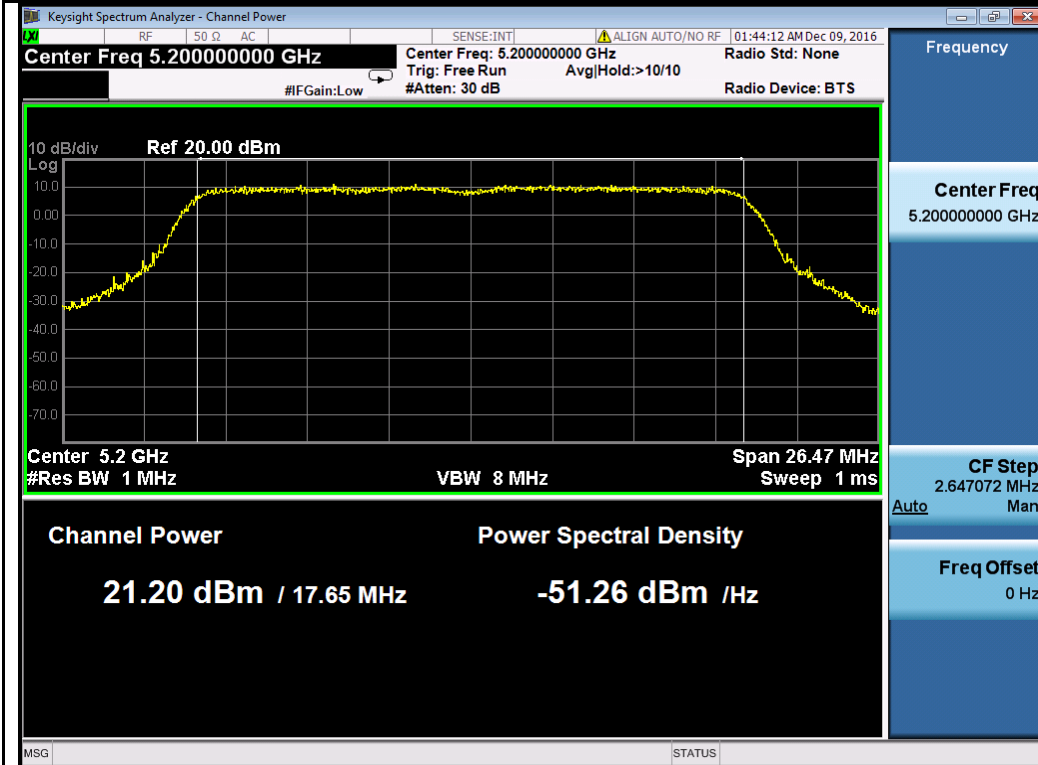
802.11a-5200M



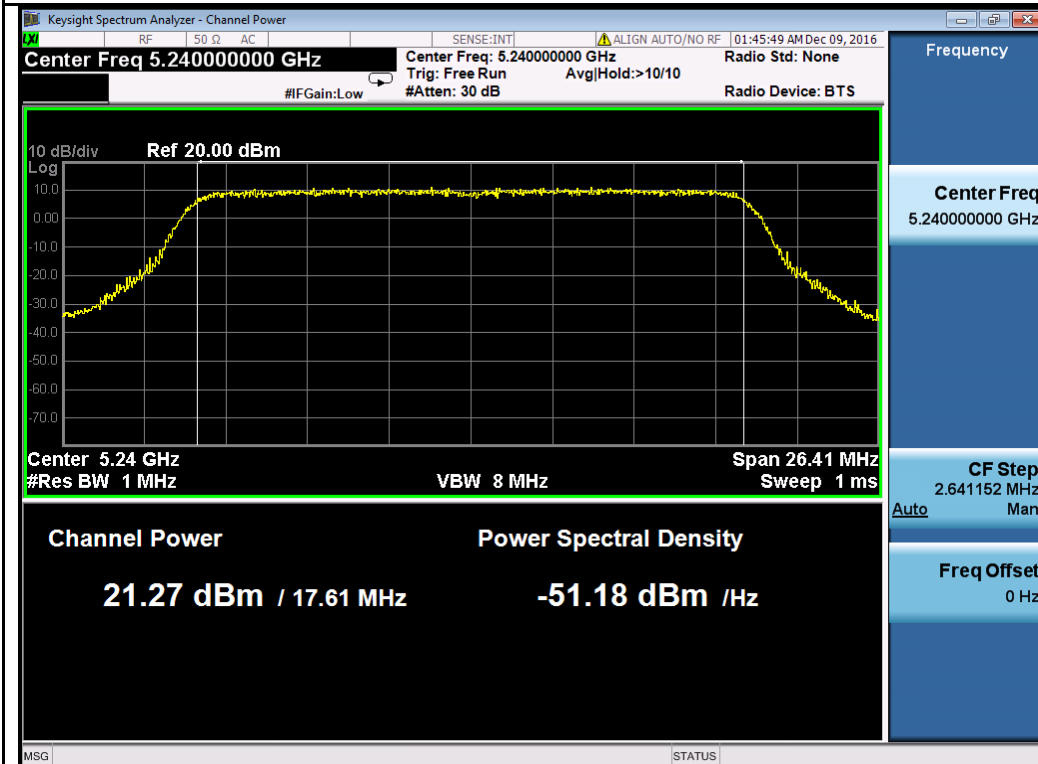
802.11a-5240M



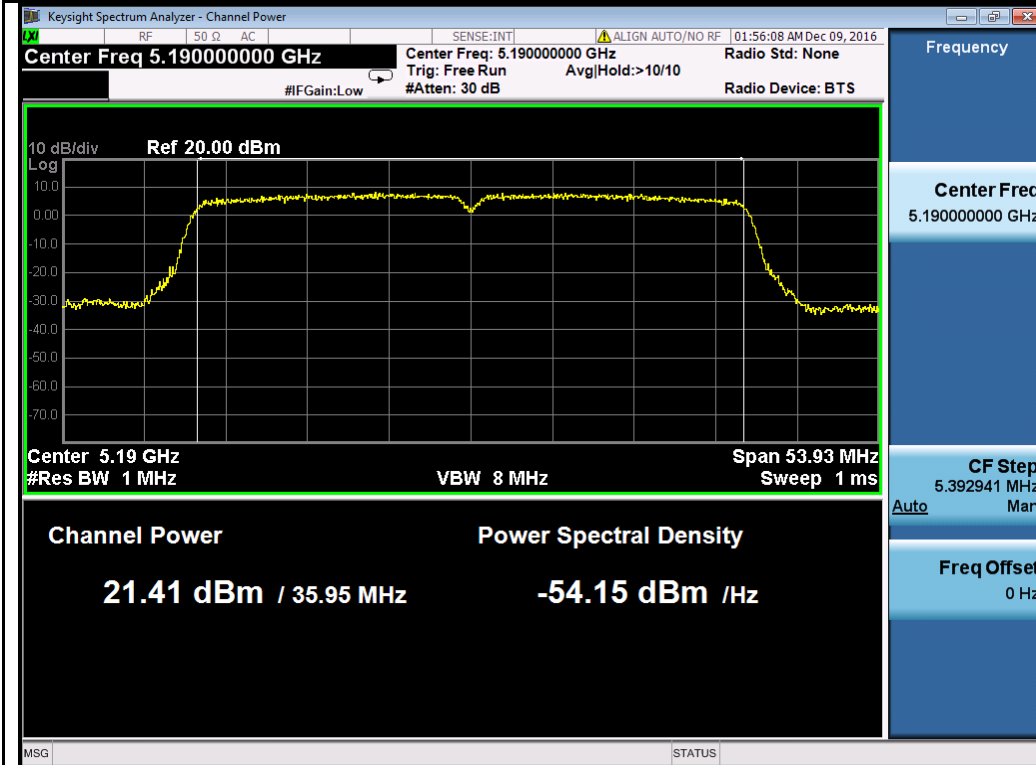
802.11n-HT20 5180M



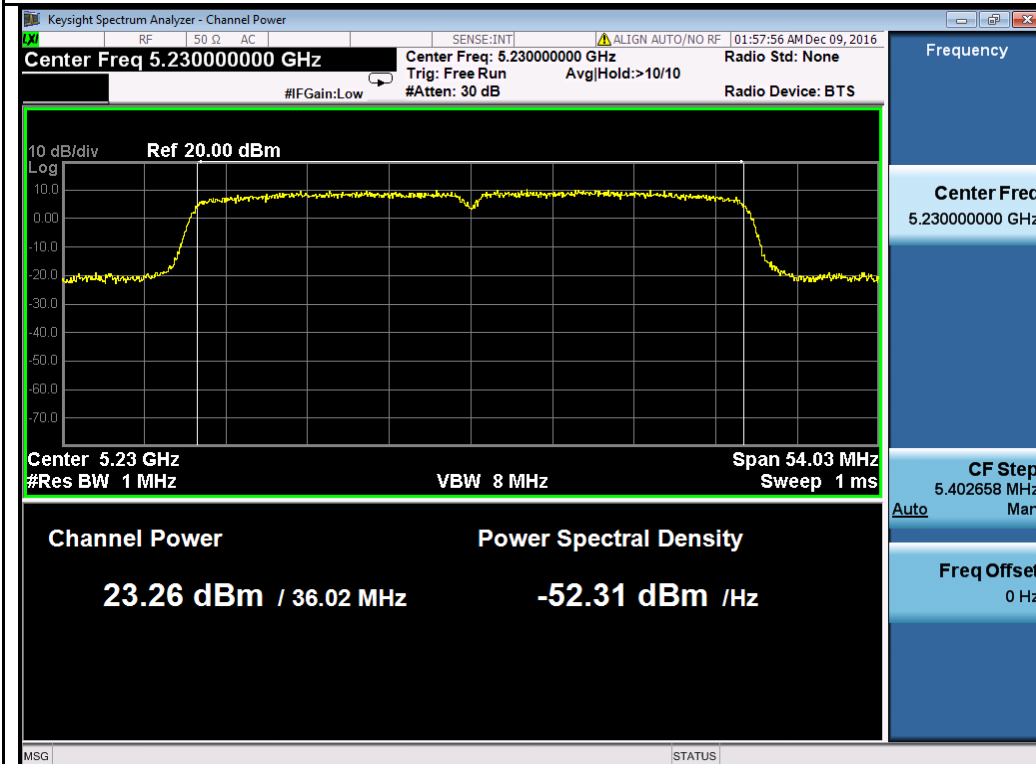
802.11n-NT20 5200M



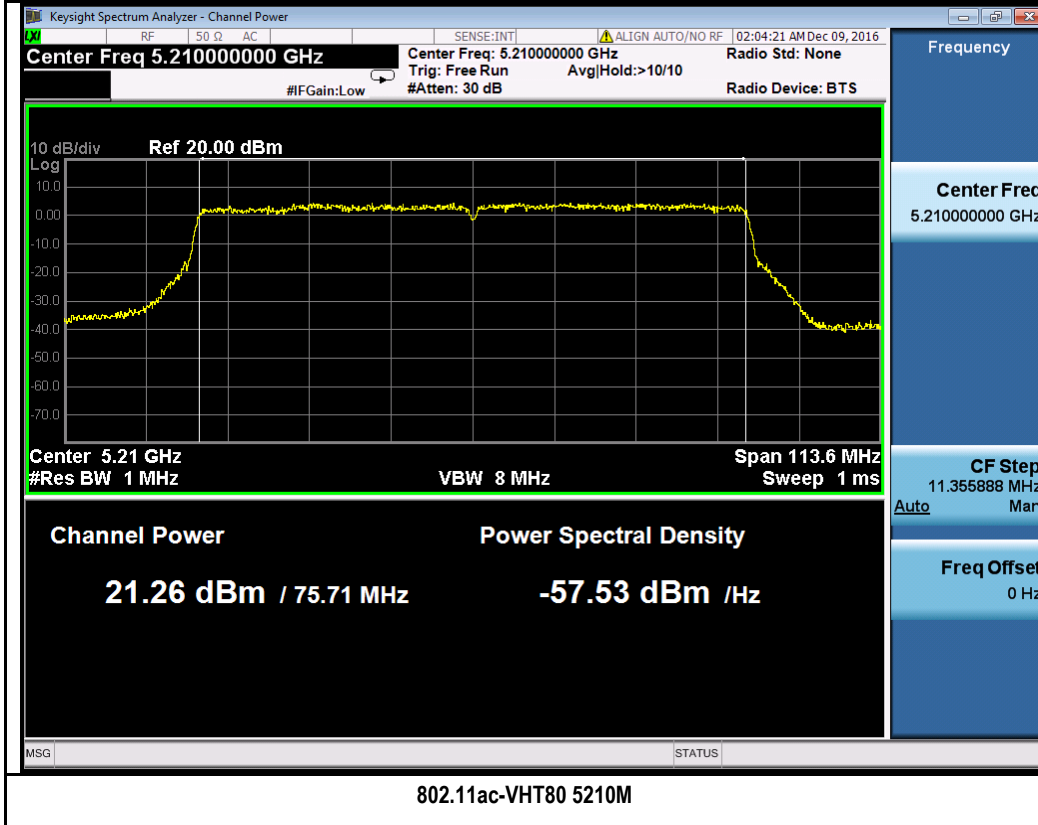
802.11n-NT20 5240M



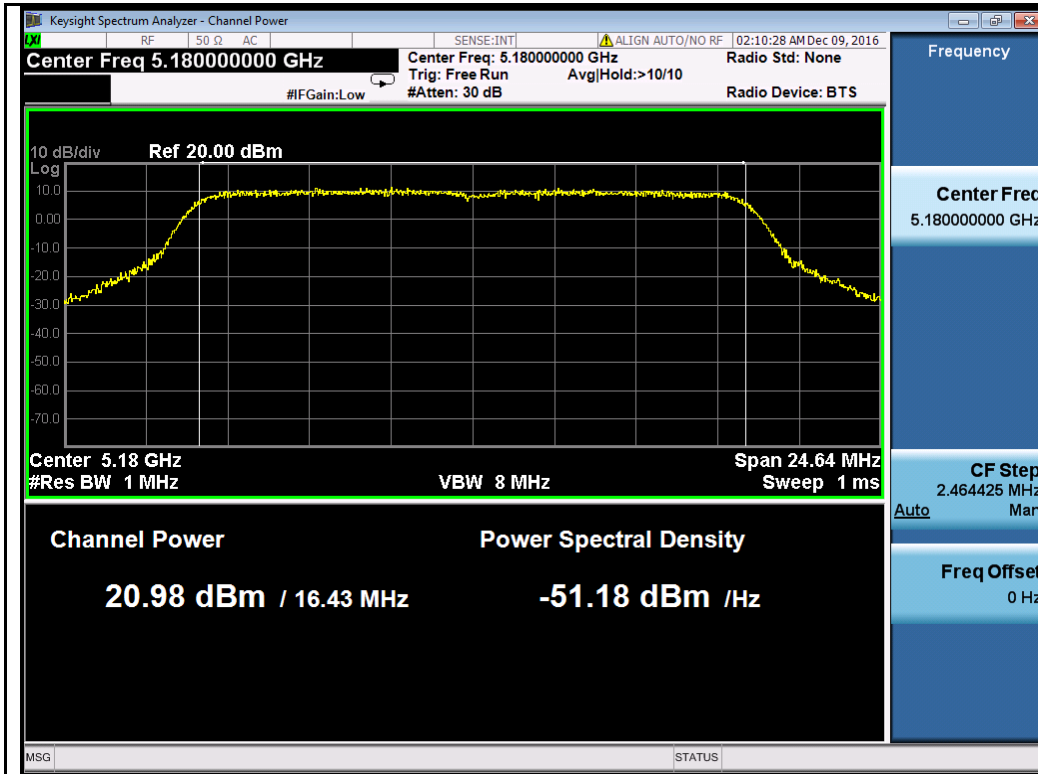
802.11n-HT40 5190M



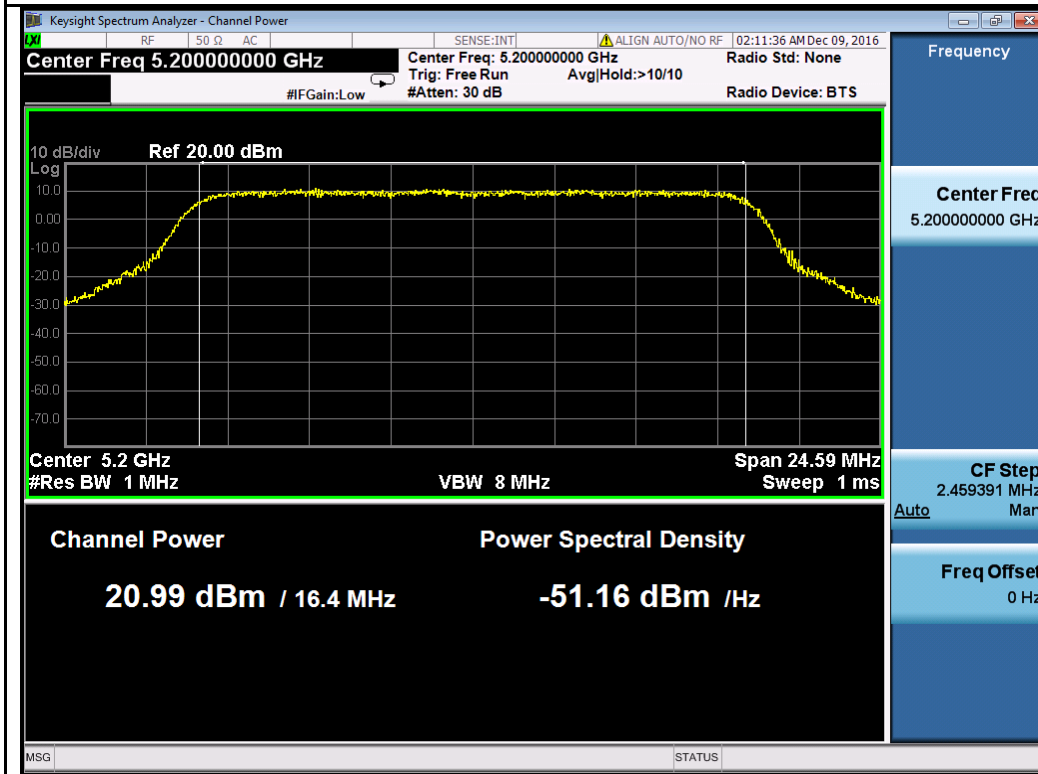
802.11n-HT40 5230M



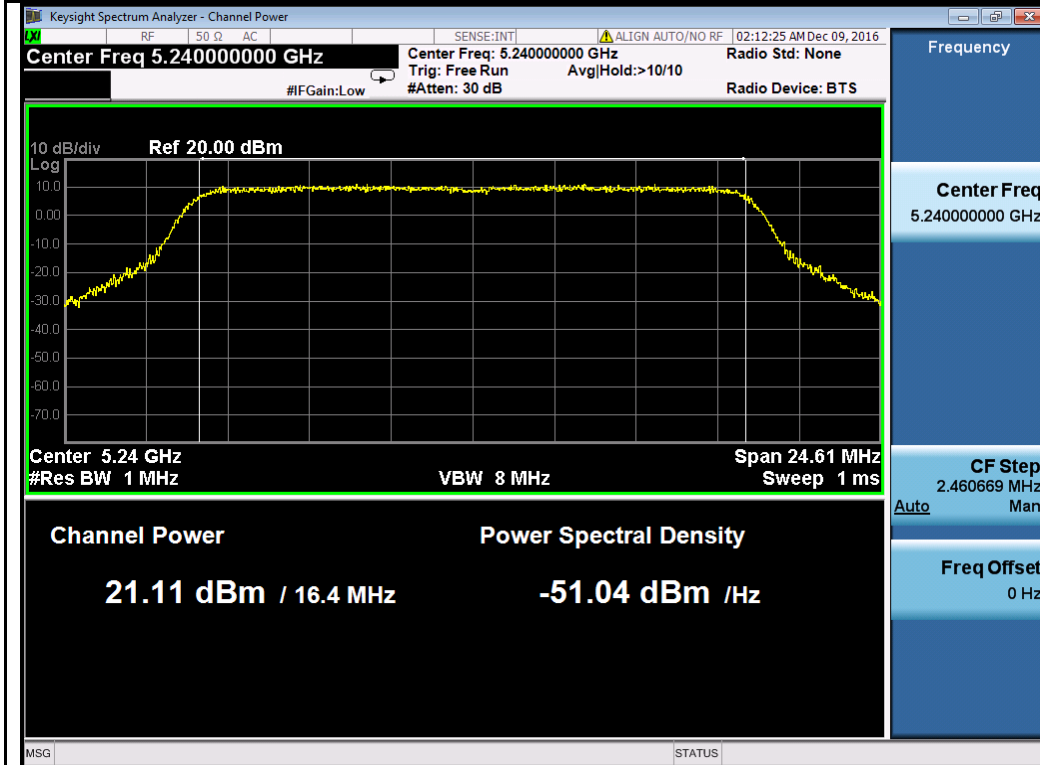
**Chain 3:**



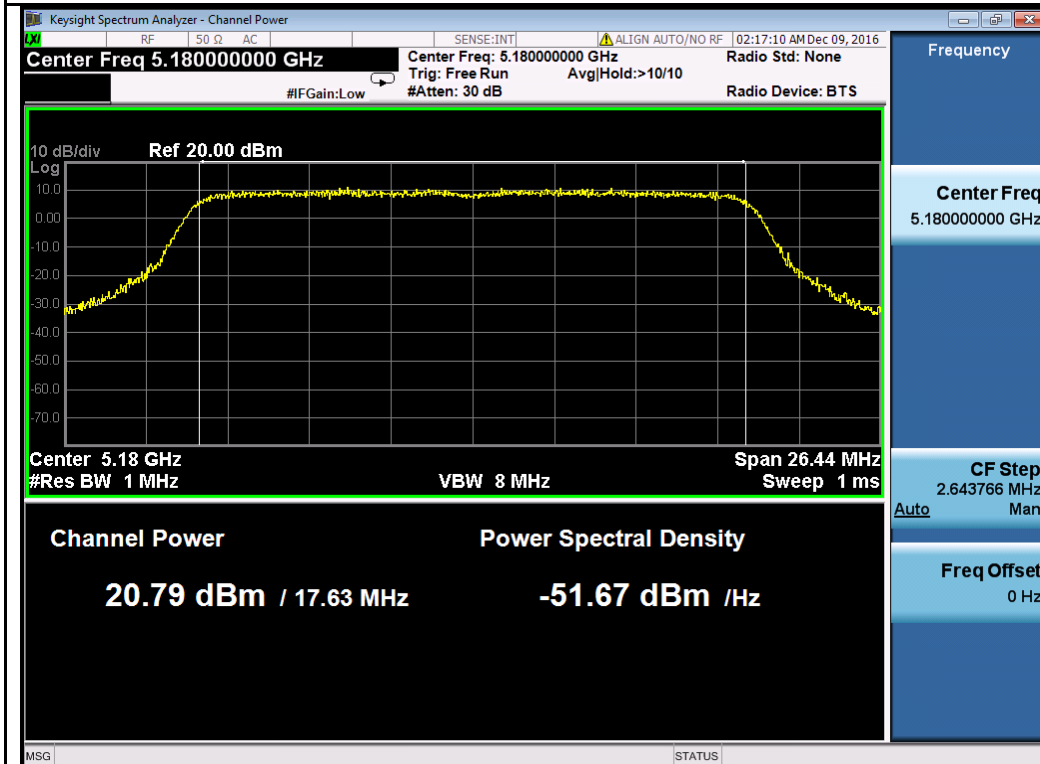
802.11a-5180M



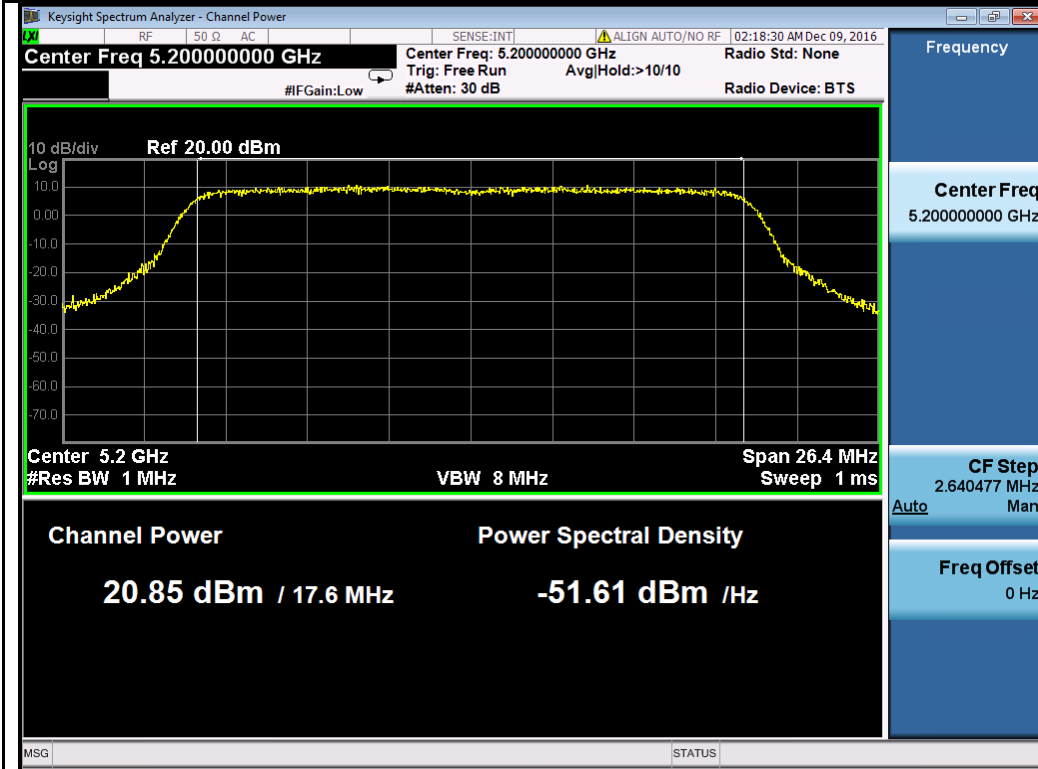
802.11a-5200M



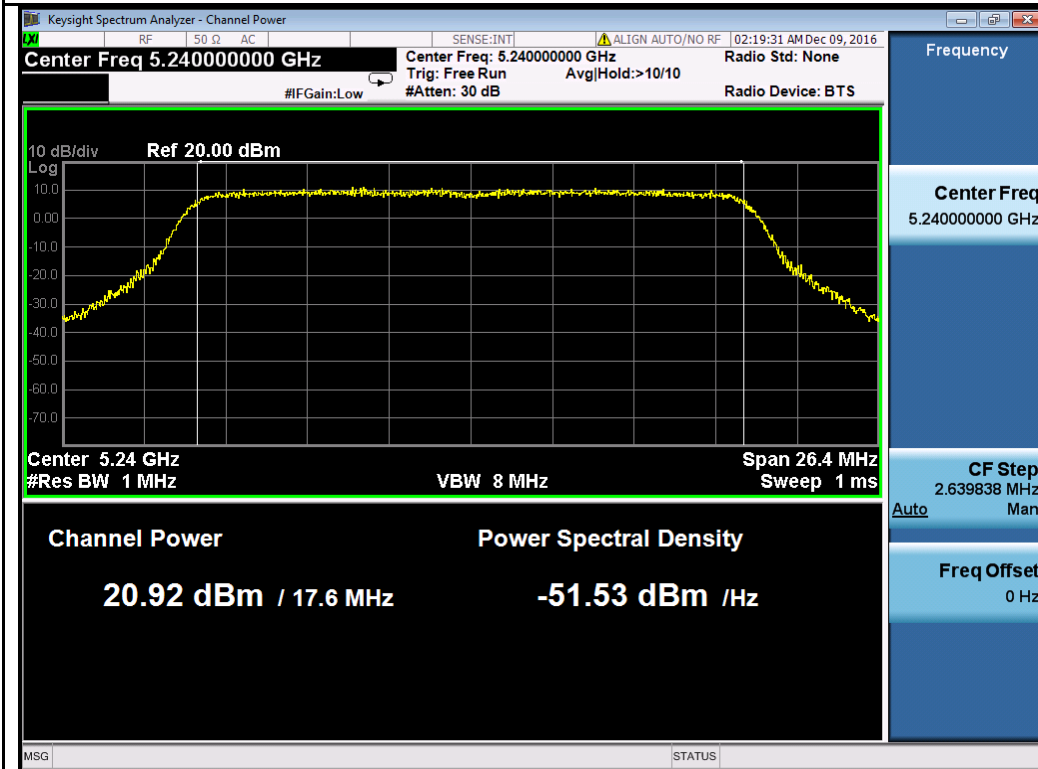
802.11a-5240M



802.11n-HT20 5180M

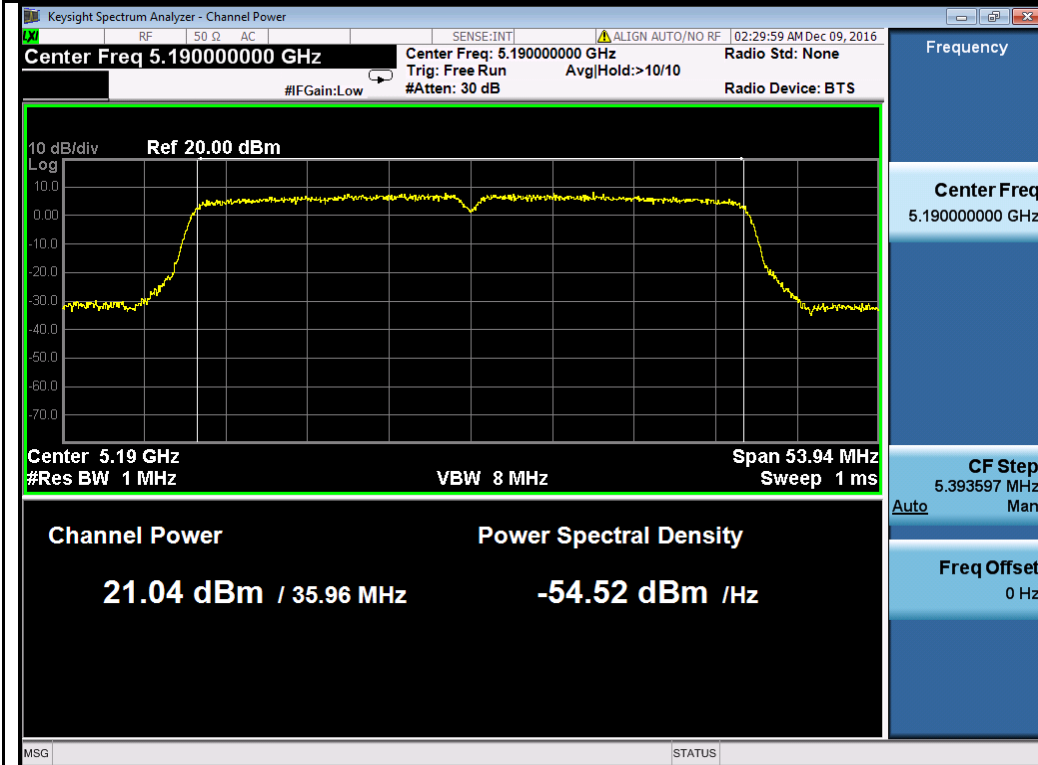


802.11n-NT20 5200M

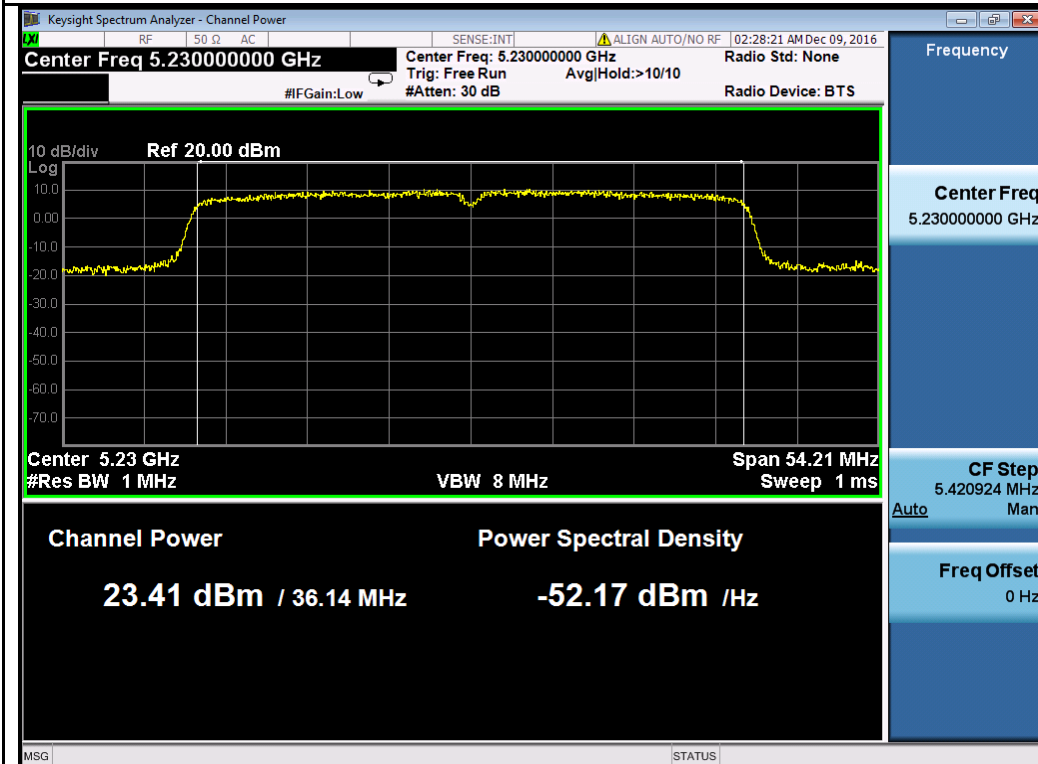


802.11n-NT20 5240M

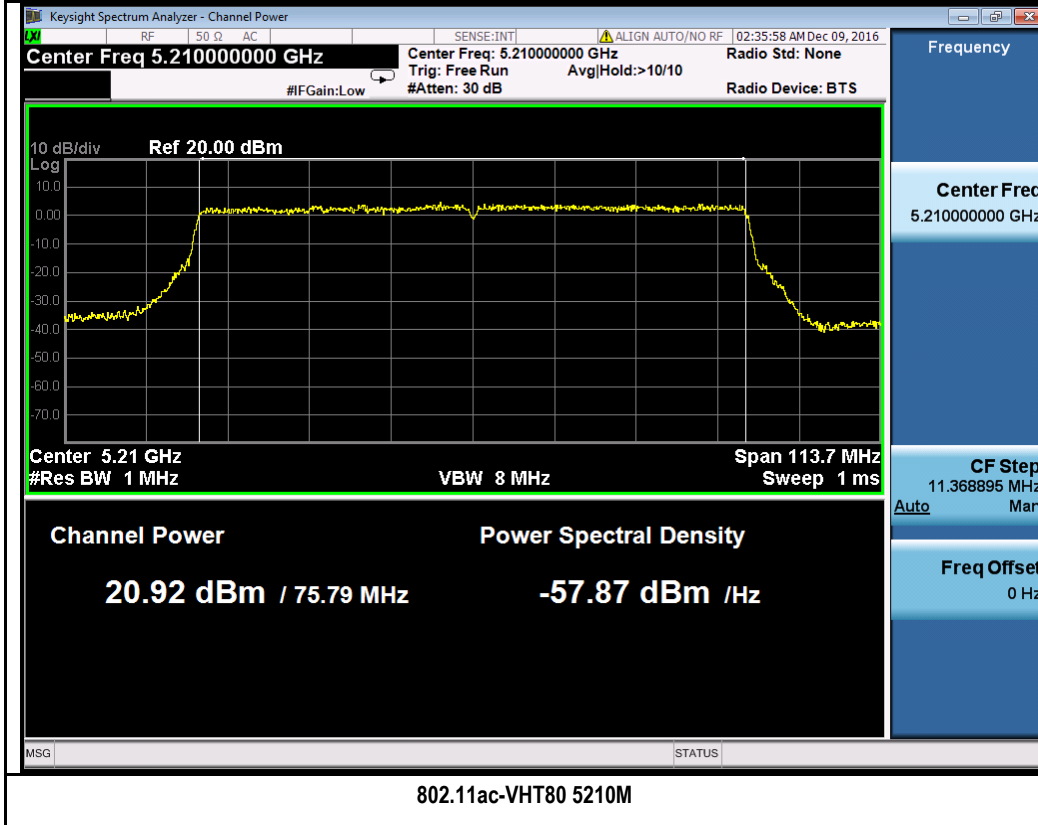




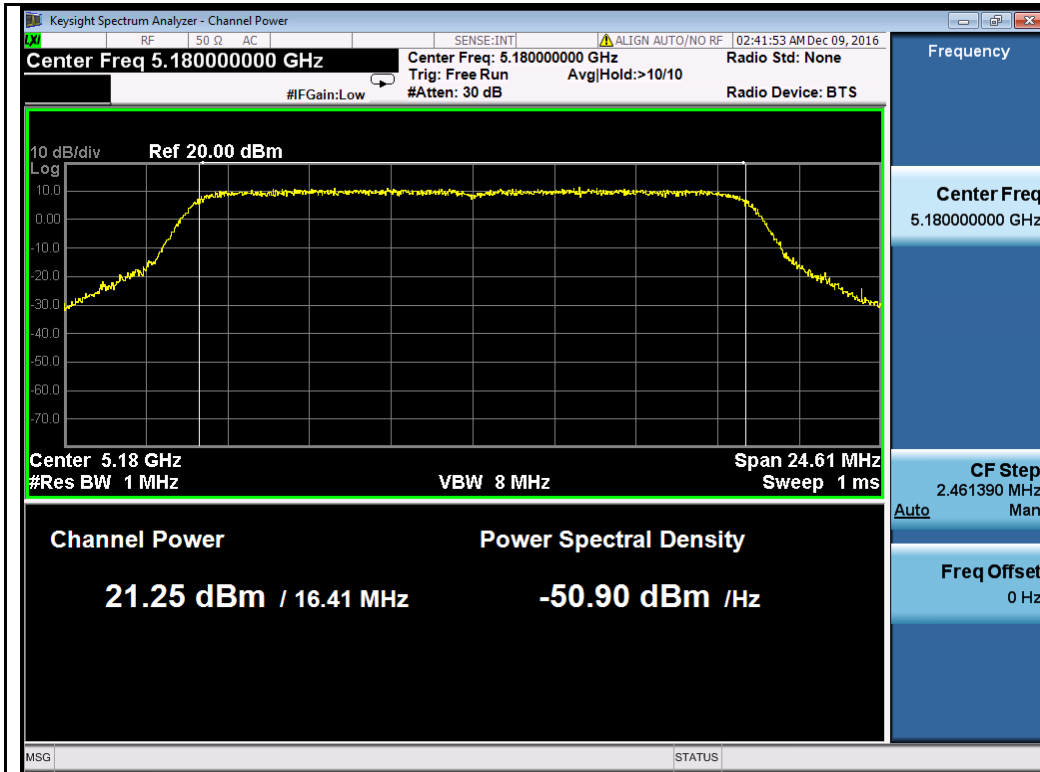
802.11n-HT40 5190M



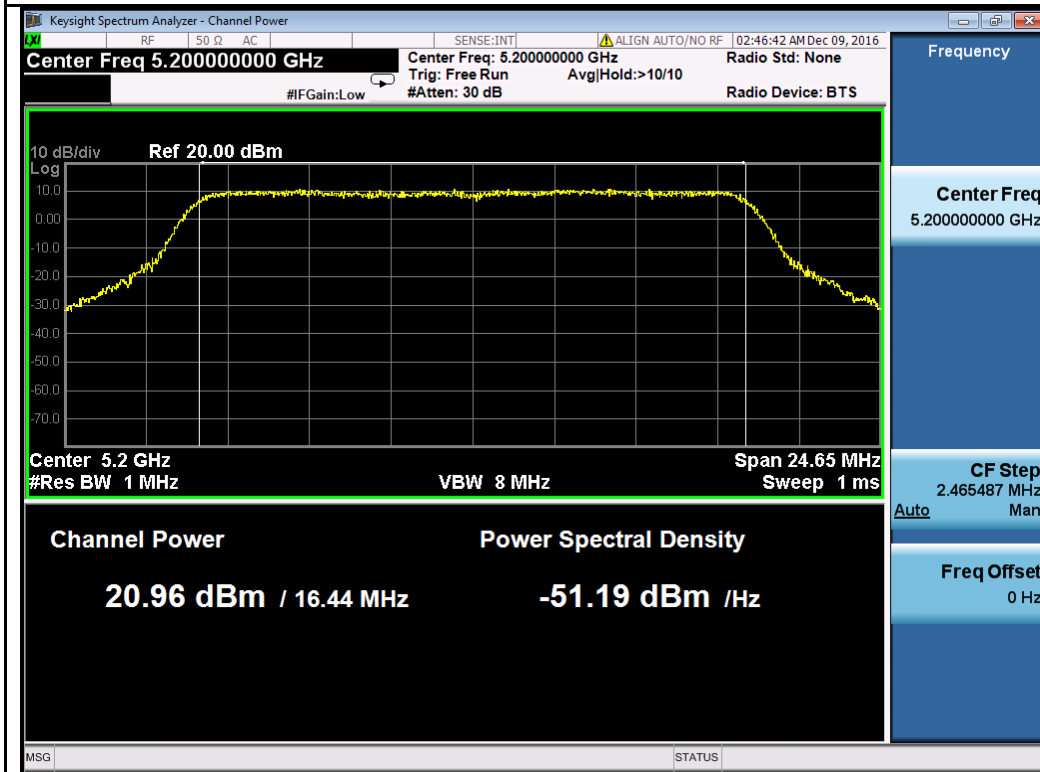
802.11n-HT40 5230M



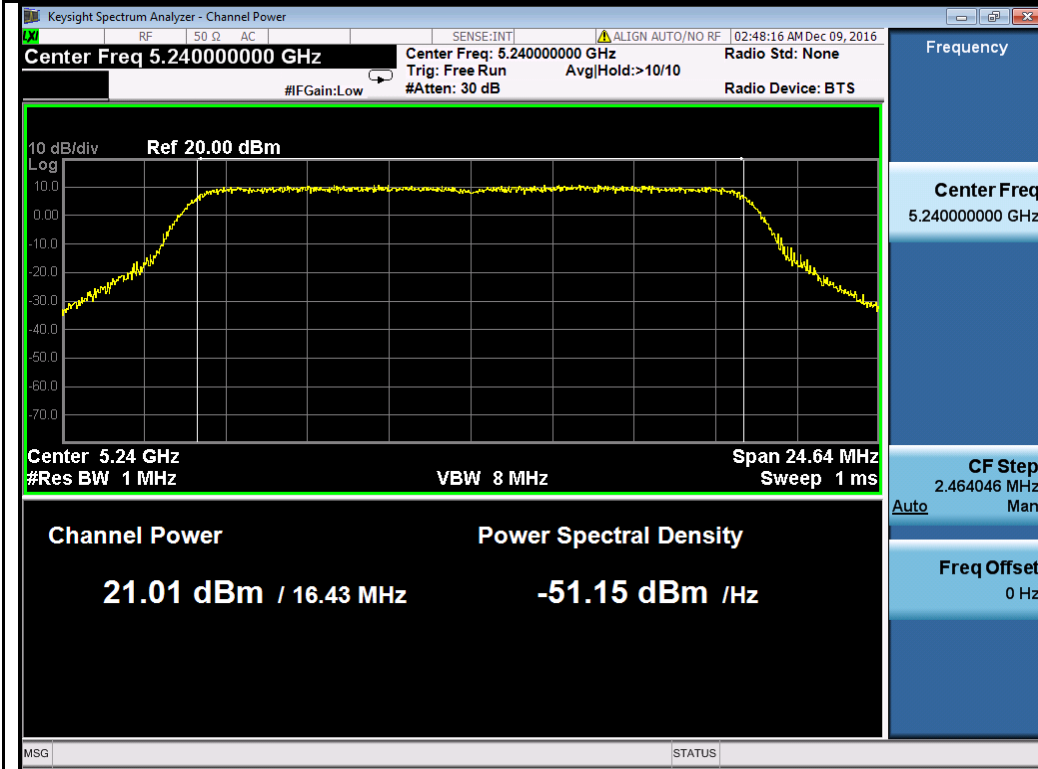
**Chain 4:**



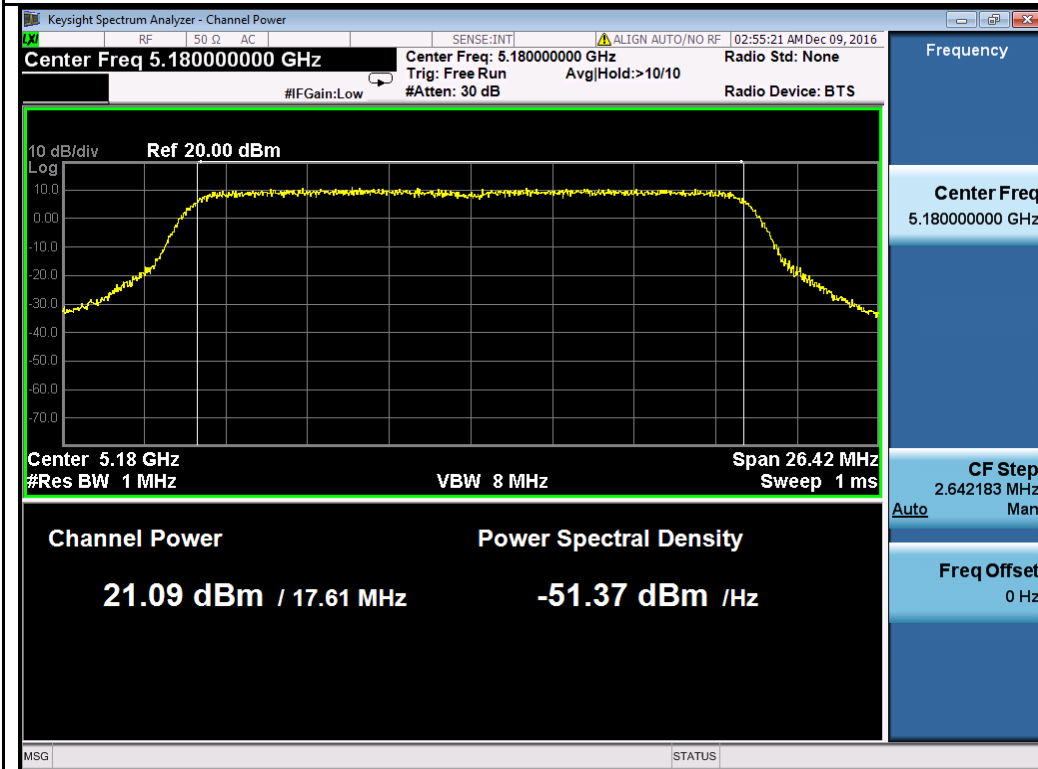
802.11a-5180M



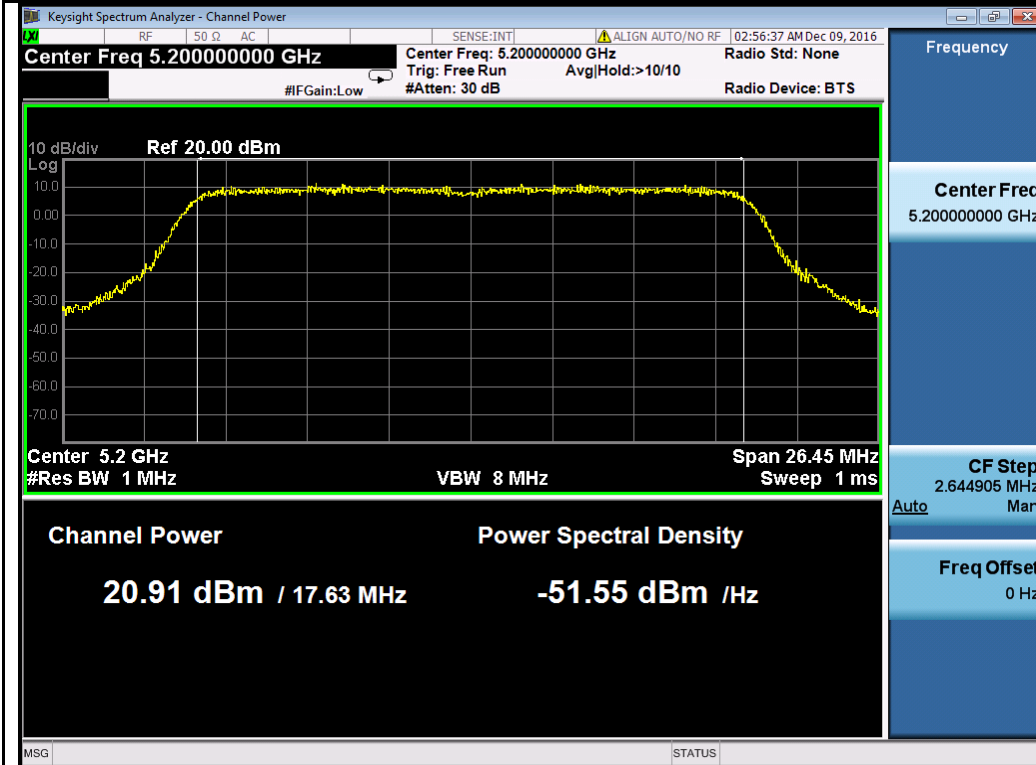
802.11a-5200M



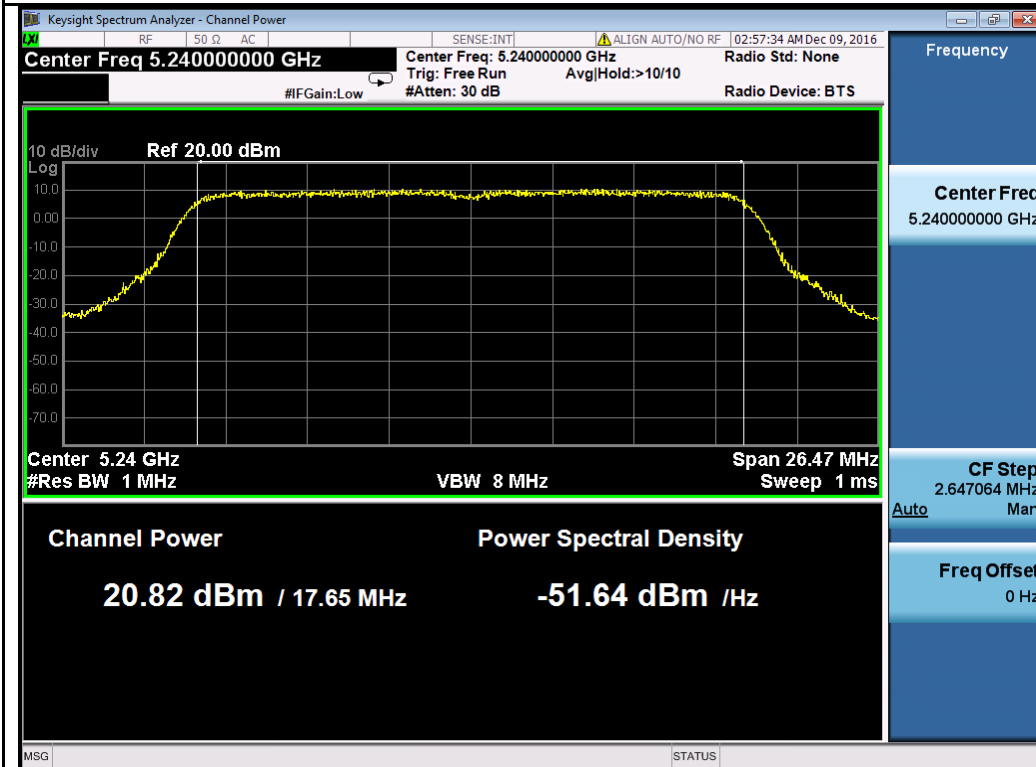
802.11a-5240M



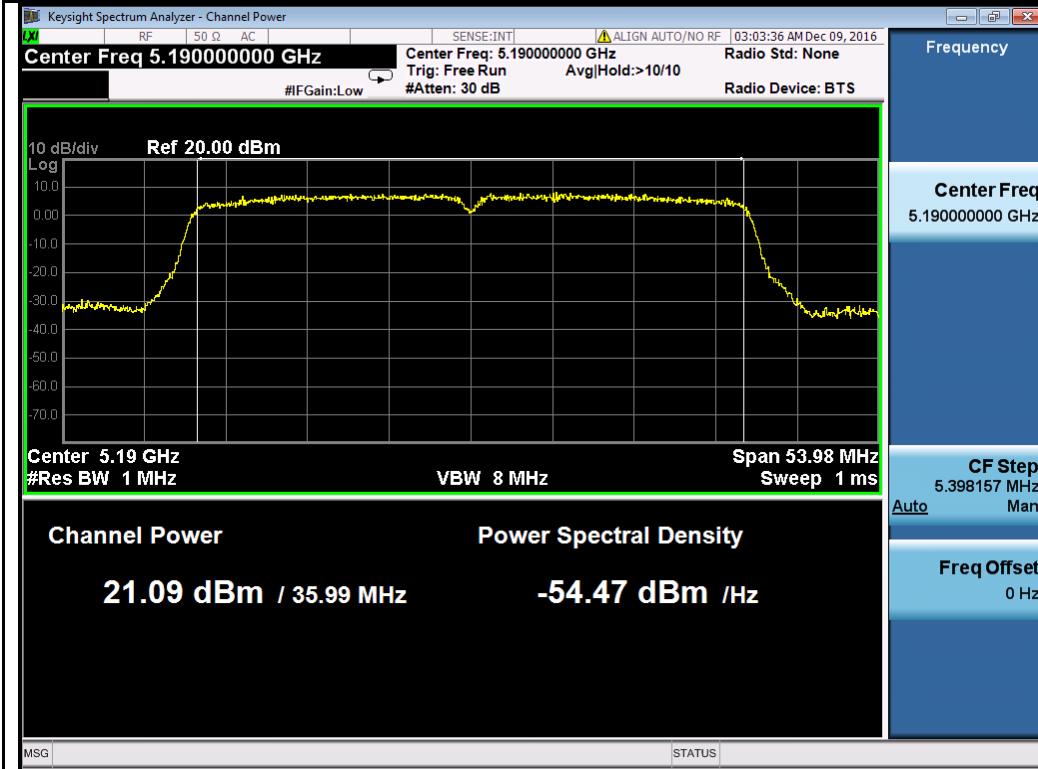
802.11n-HT20 5180M



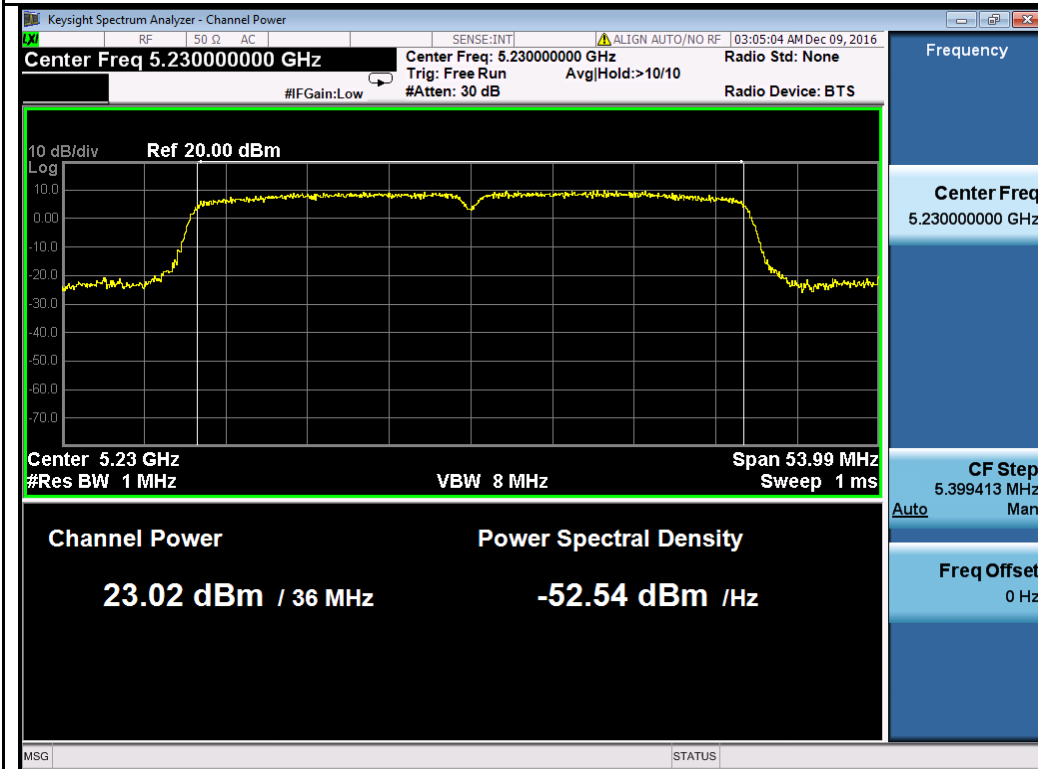
802.11n-NT20 5200M



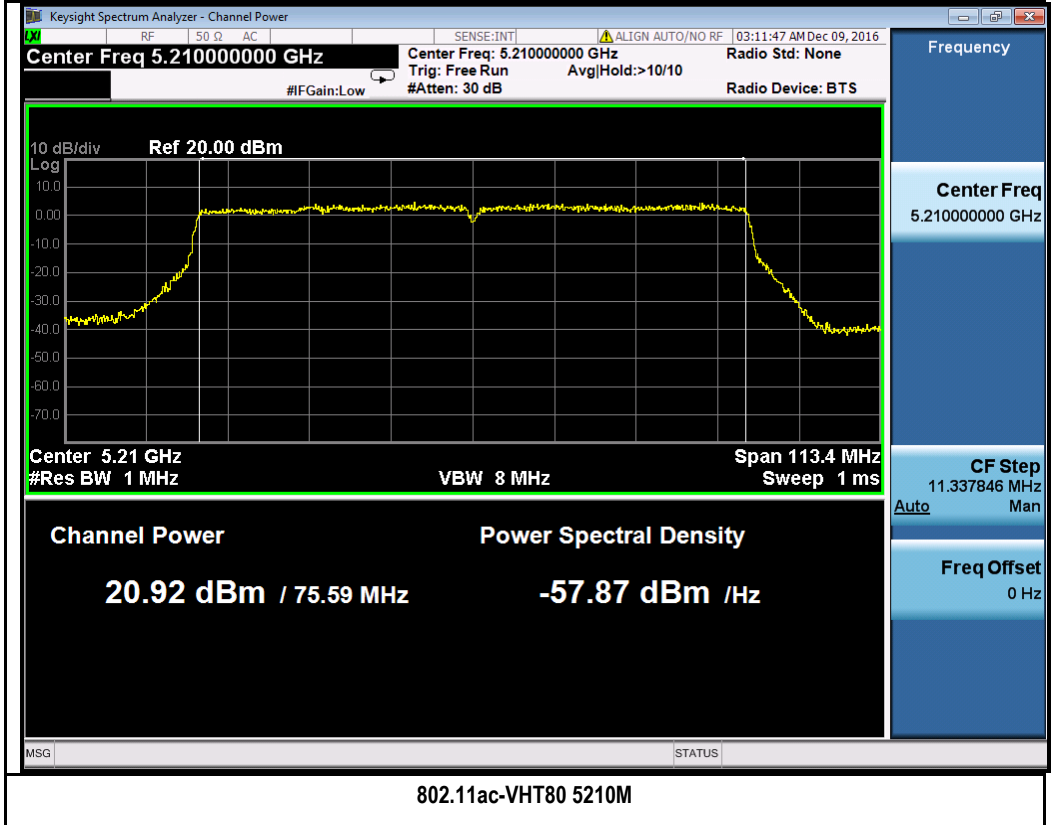
802.11n-NT20 5240M



802.11n-HT40 5190M

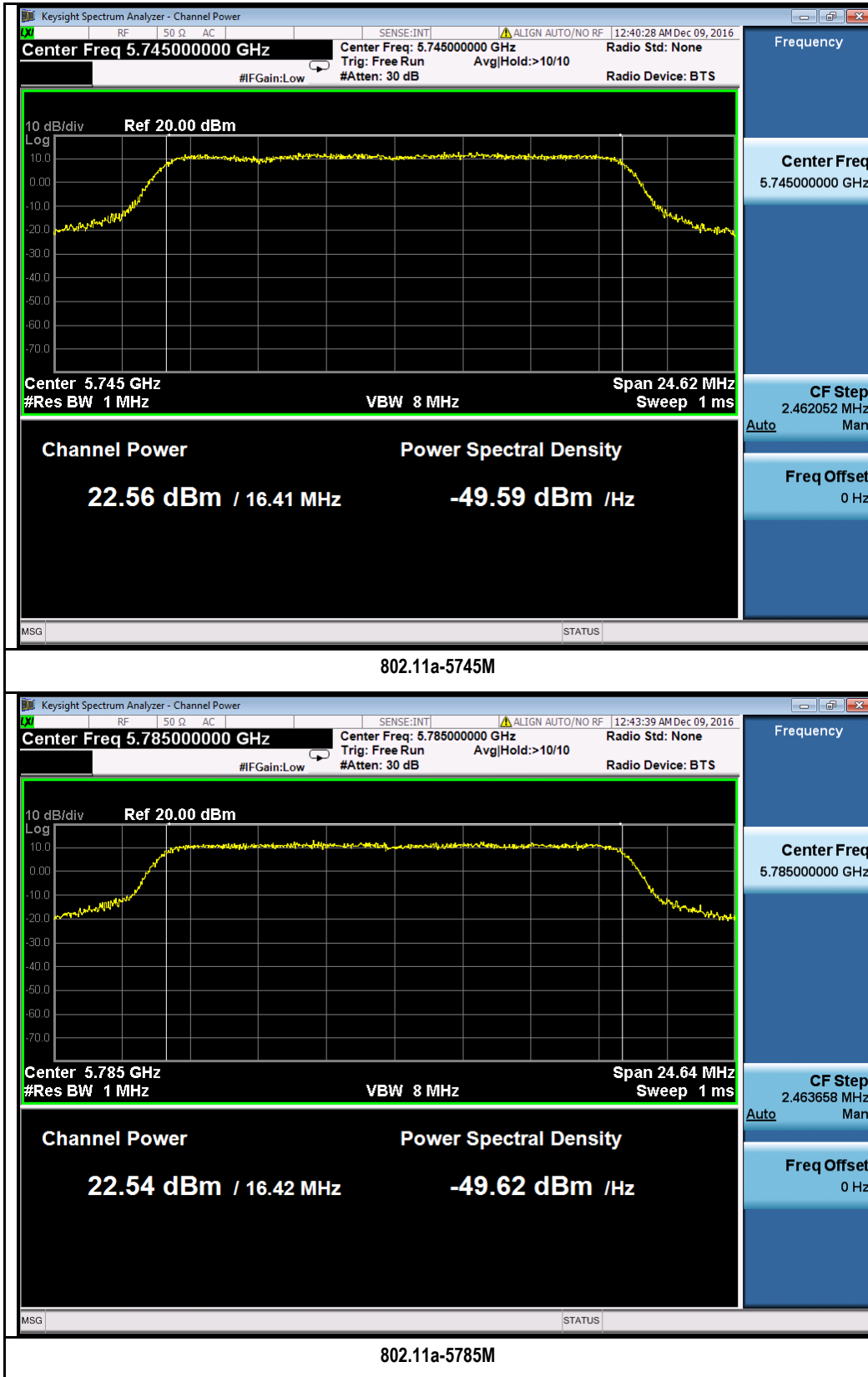


802.11n-HT40 5230M

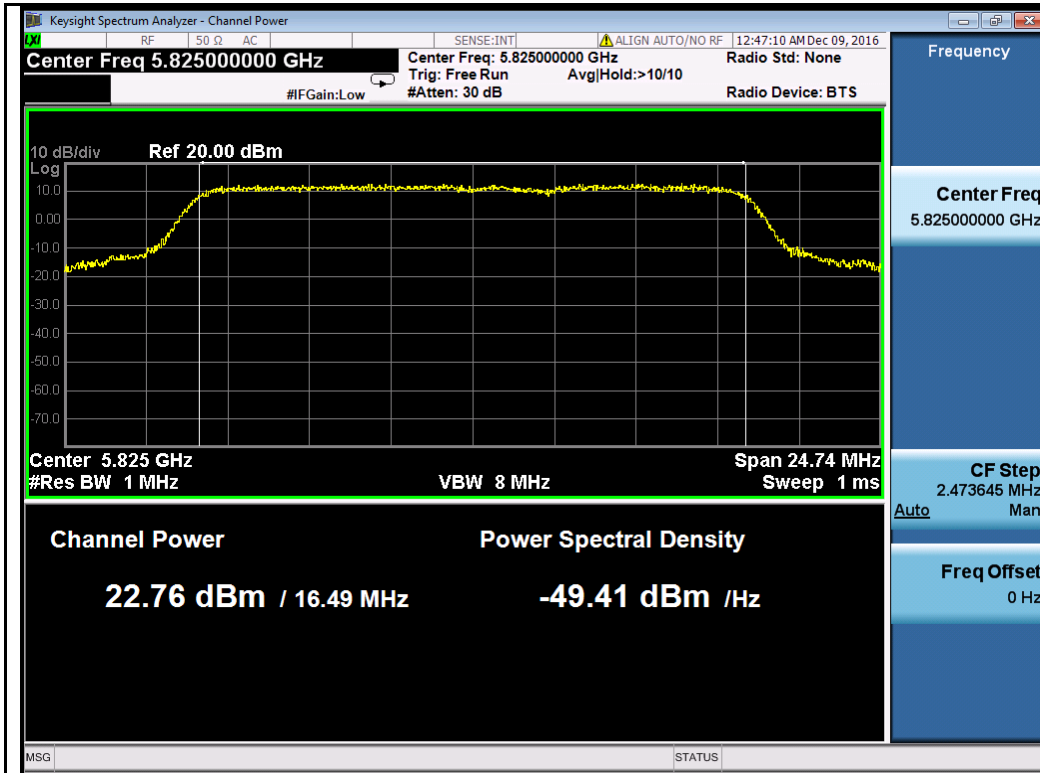


**Test Plot for W58:**

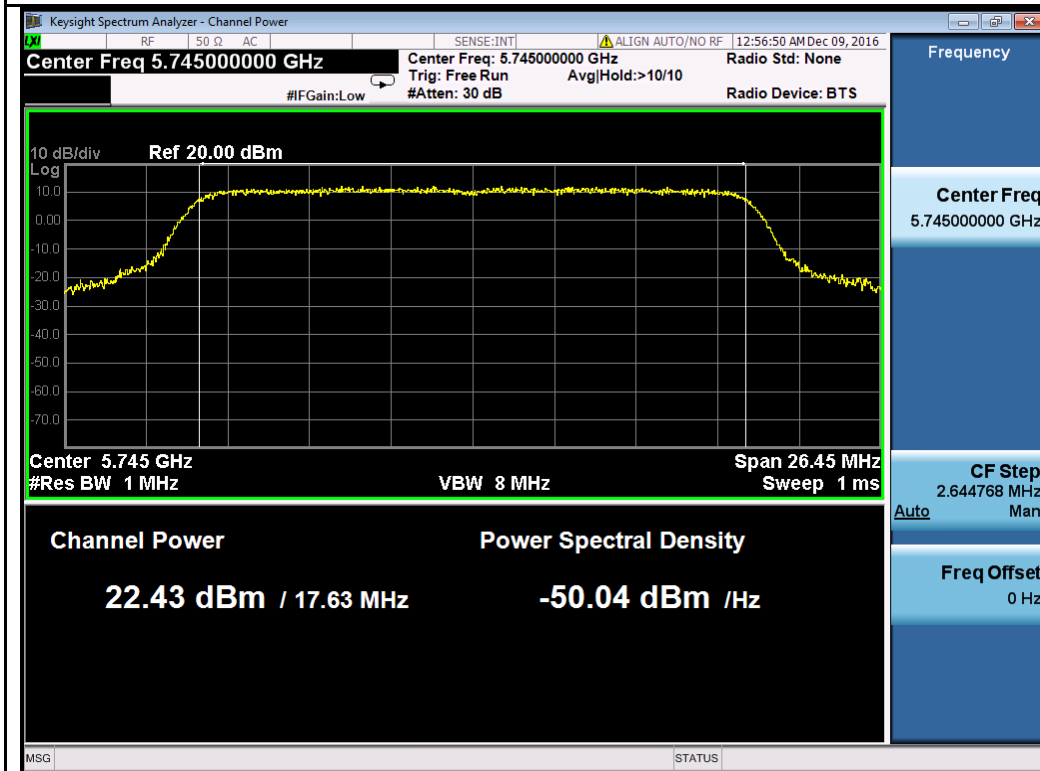
**Chain 1:**



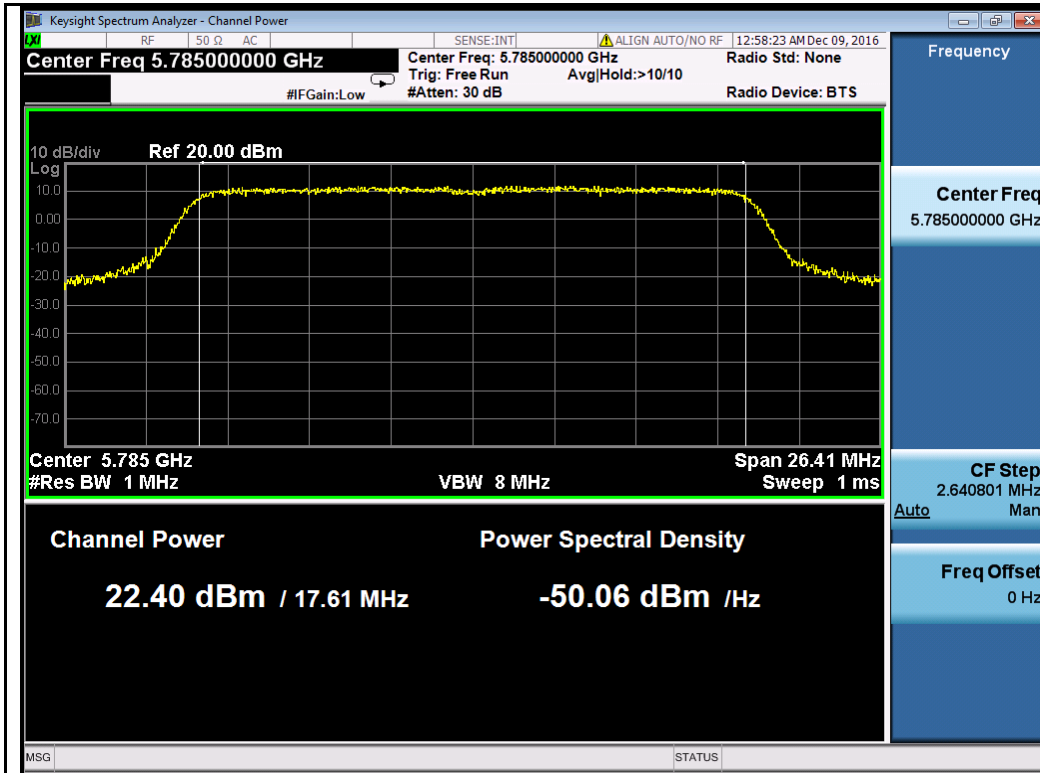




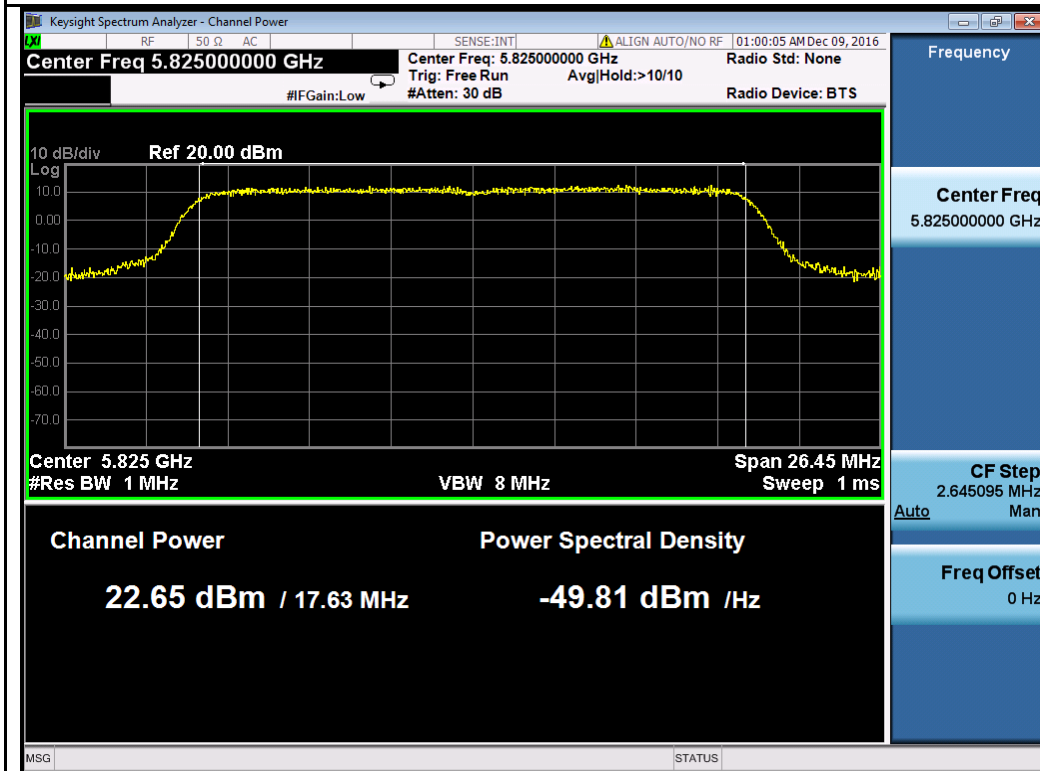
802.11a-5825M



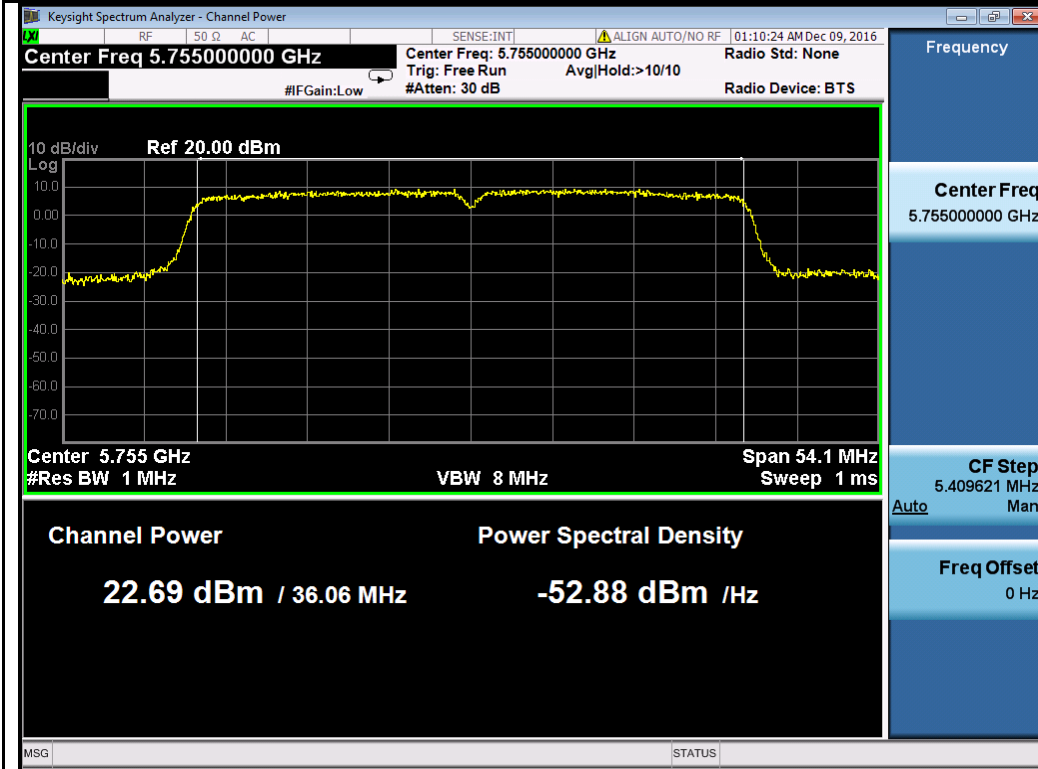
802.11n-HT20 5745M



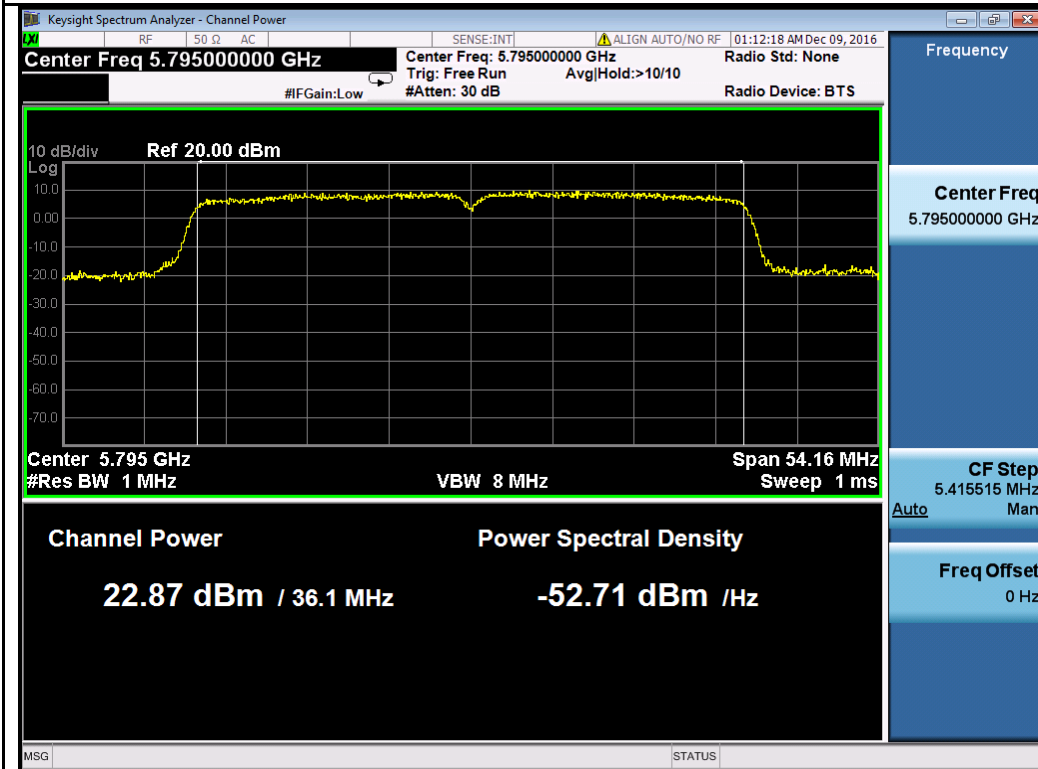
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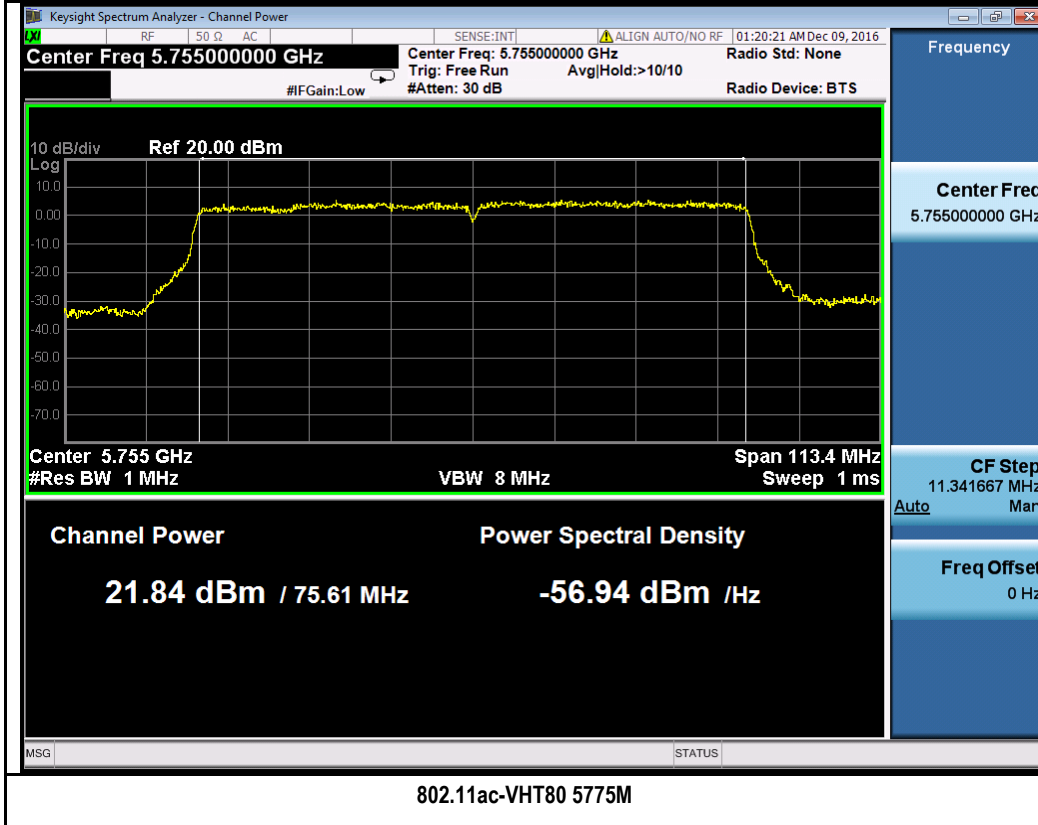
802.11n-HT20 5825M



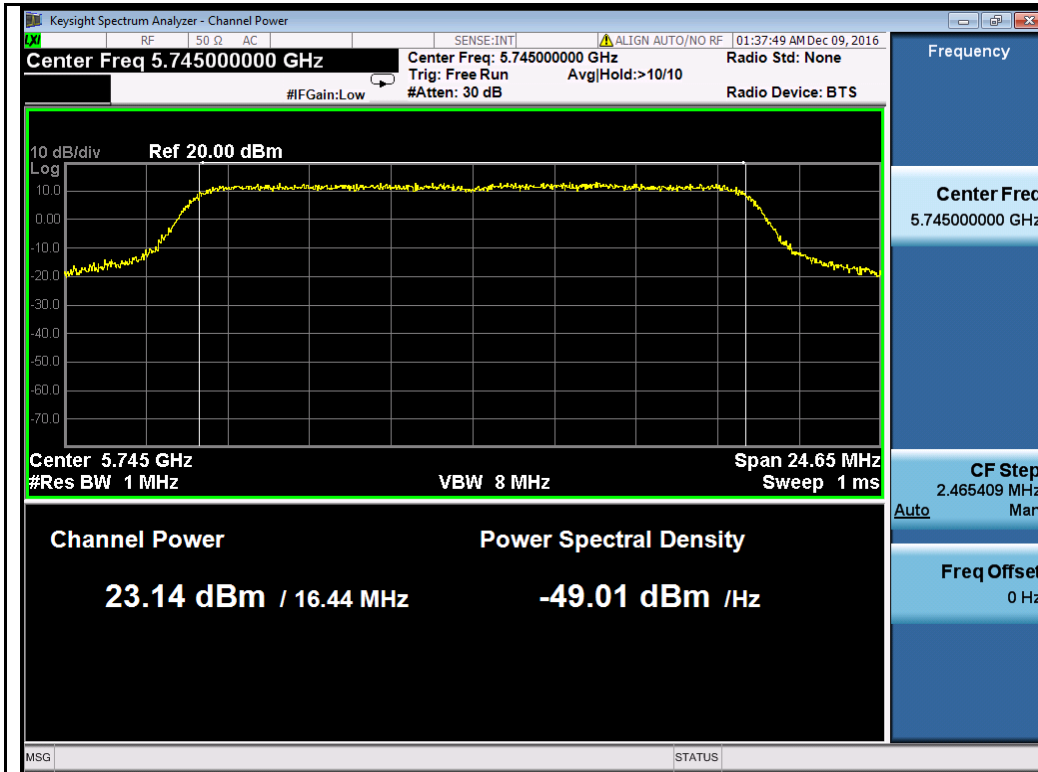
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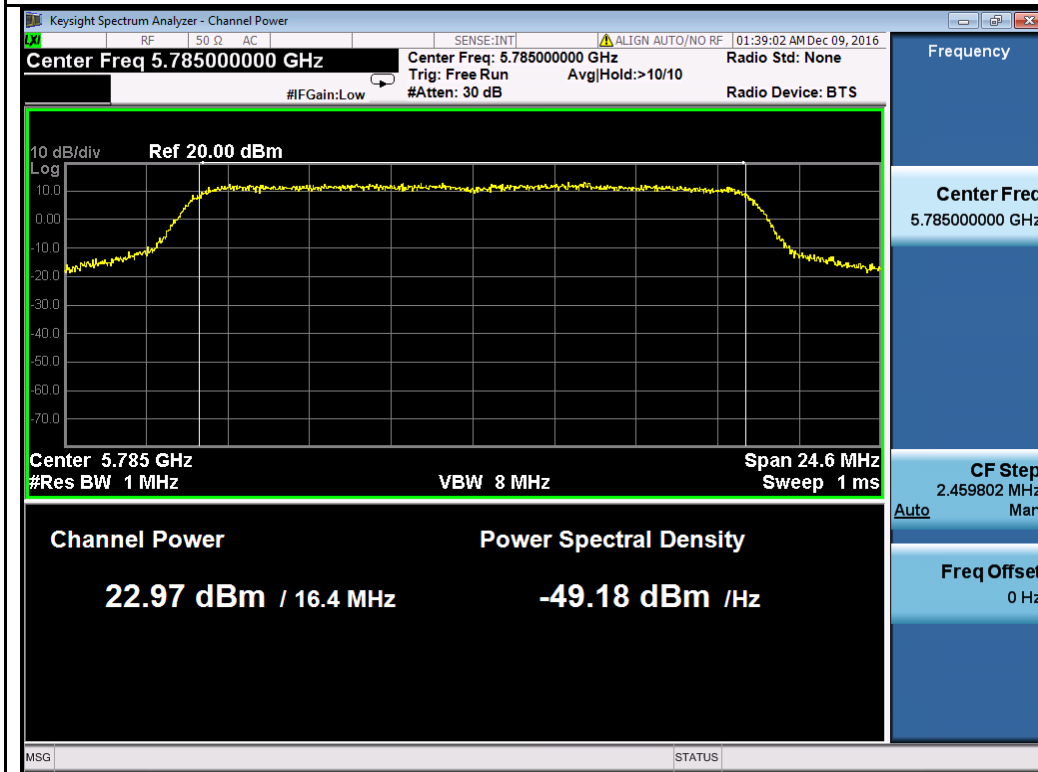
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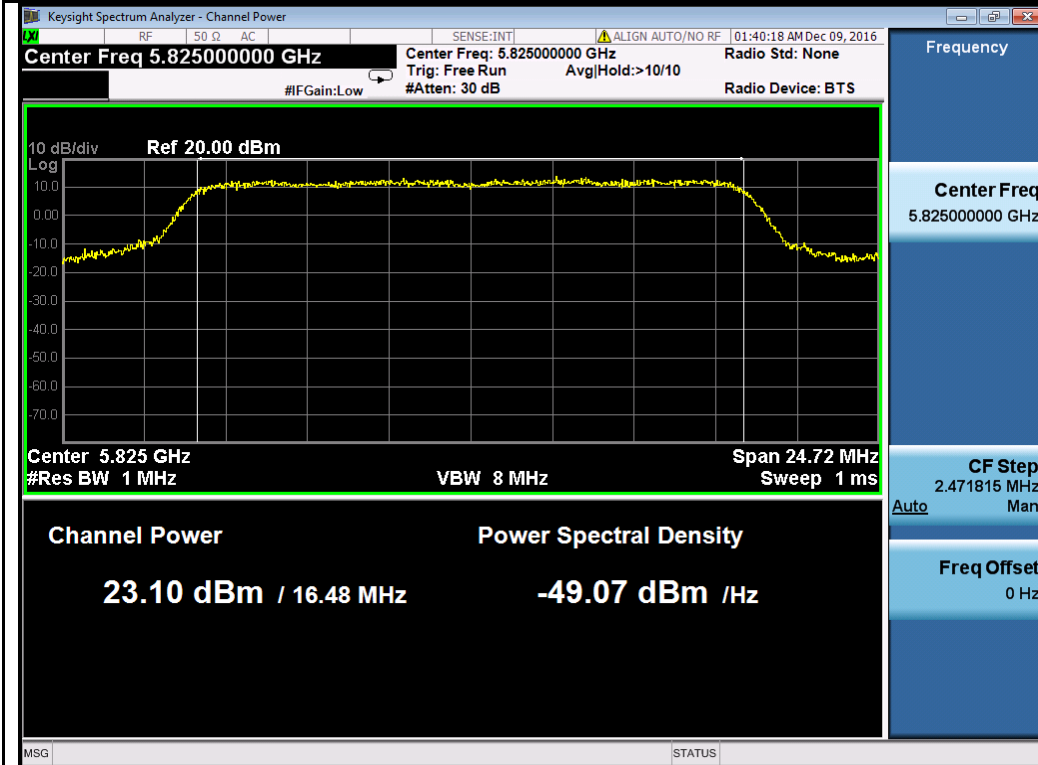
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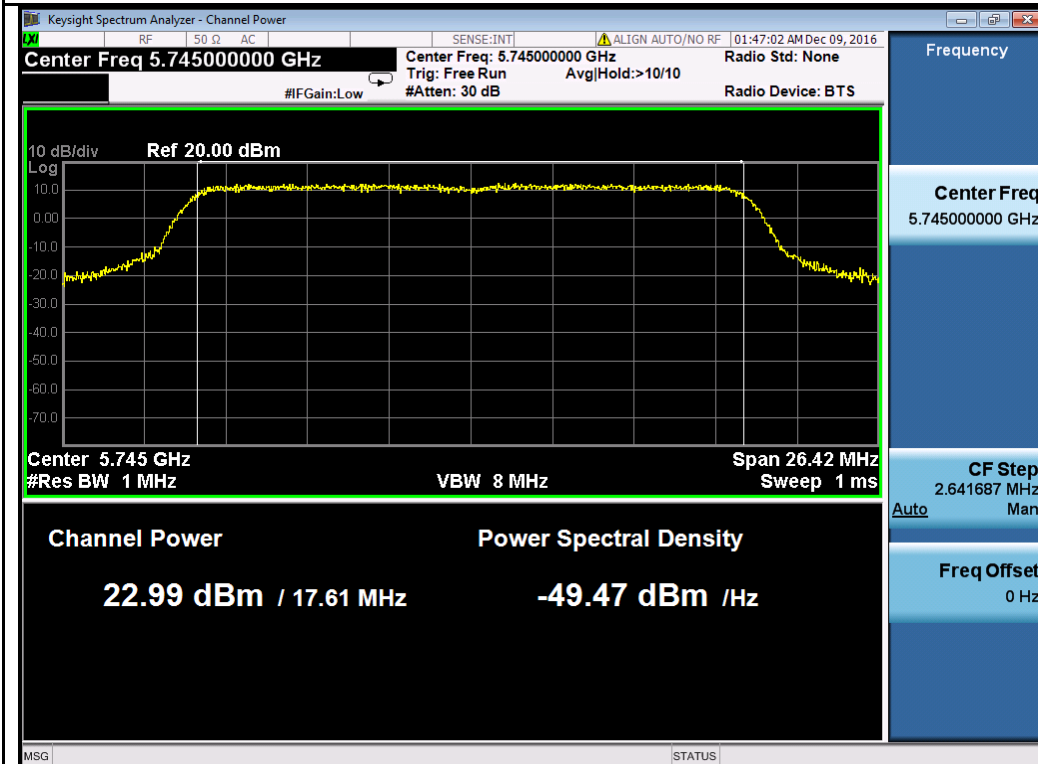
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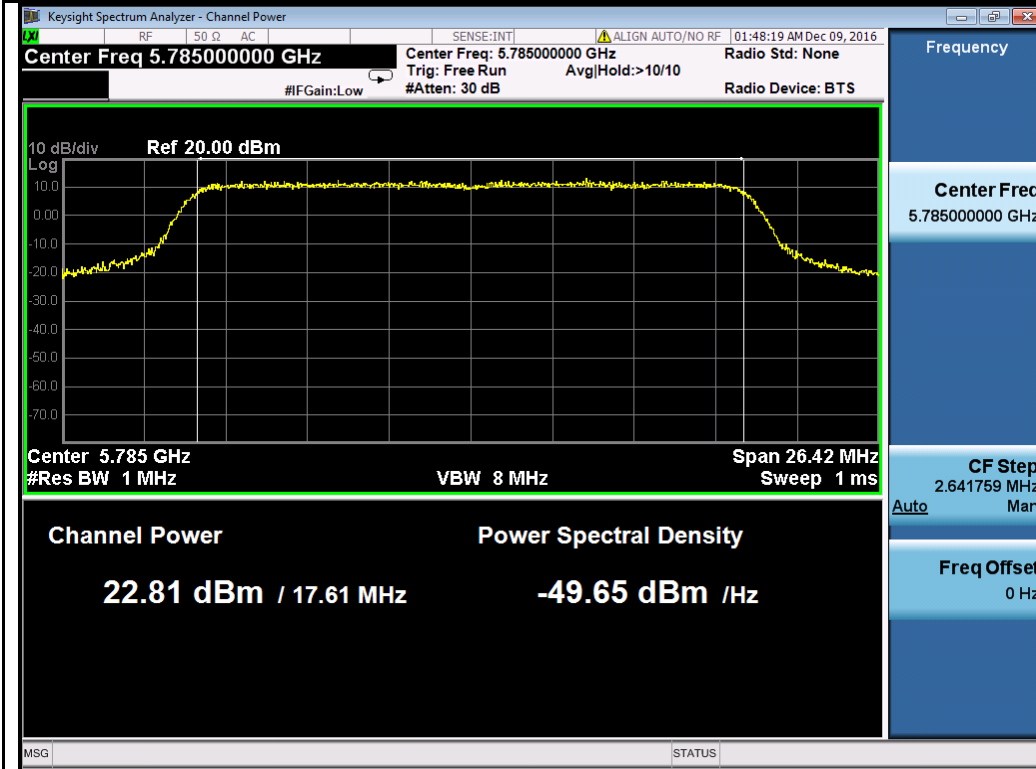
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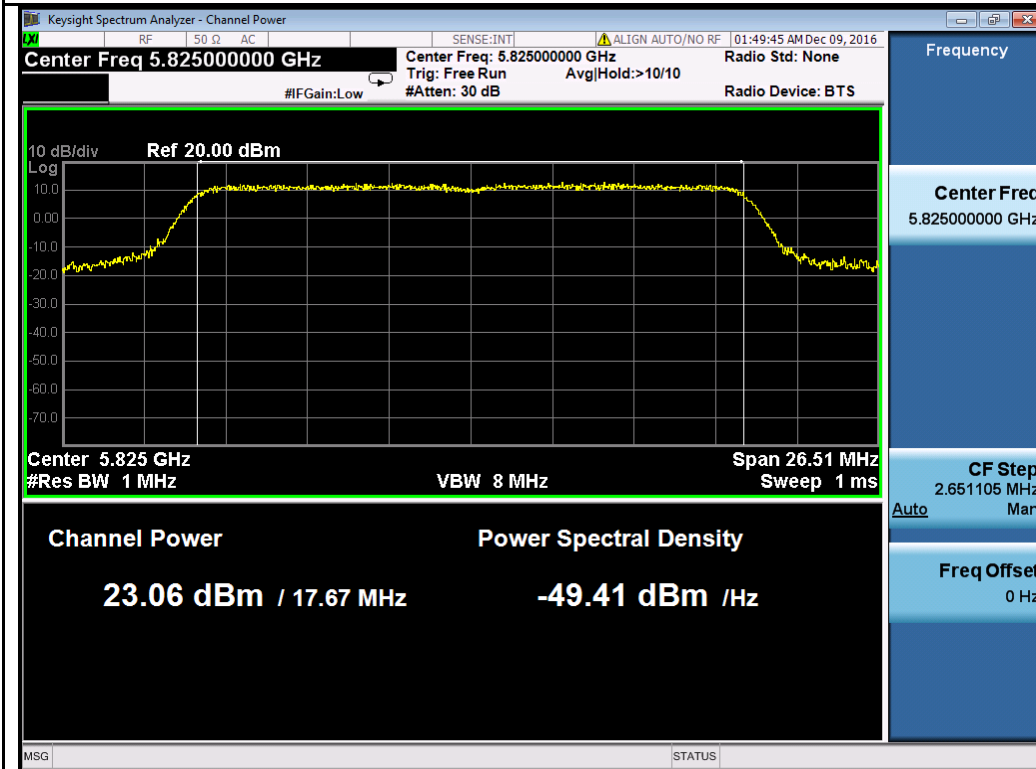
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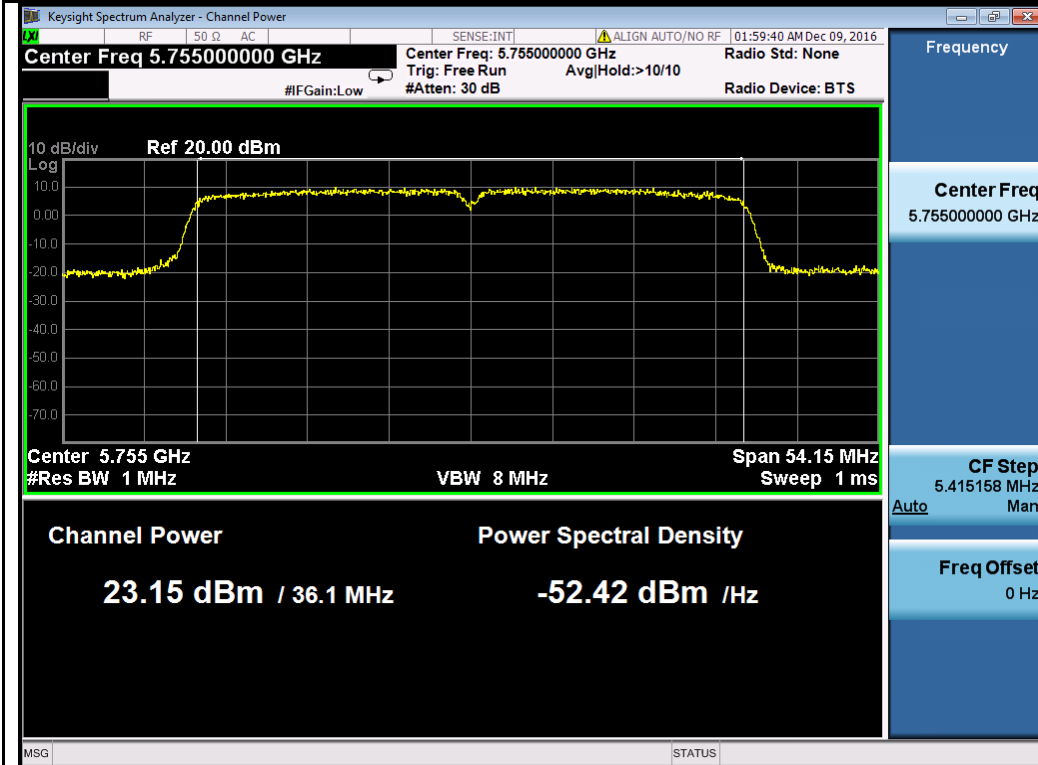
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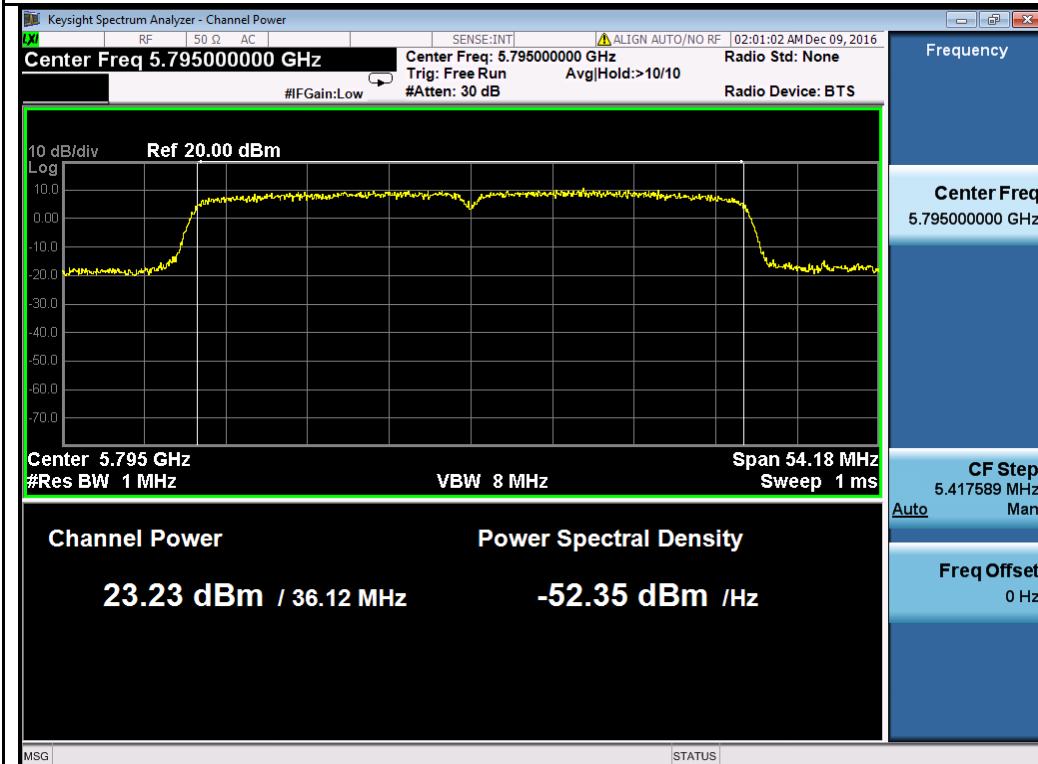
802.11n-HT20 5785M



802.11n-HT20 5825M

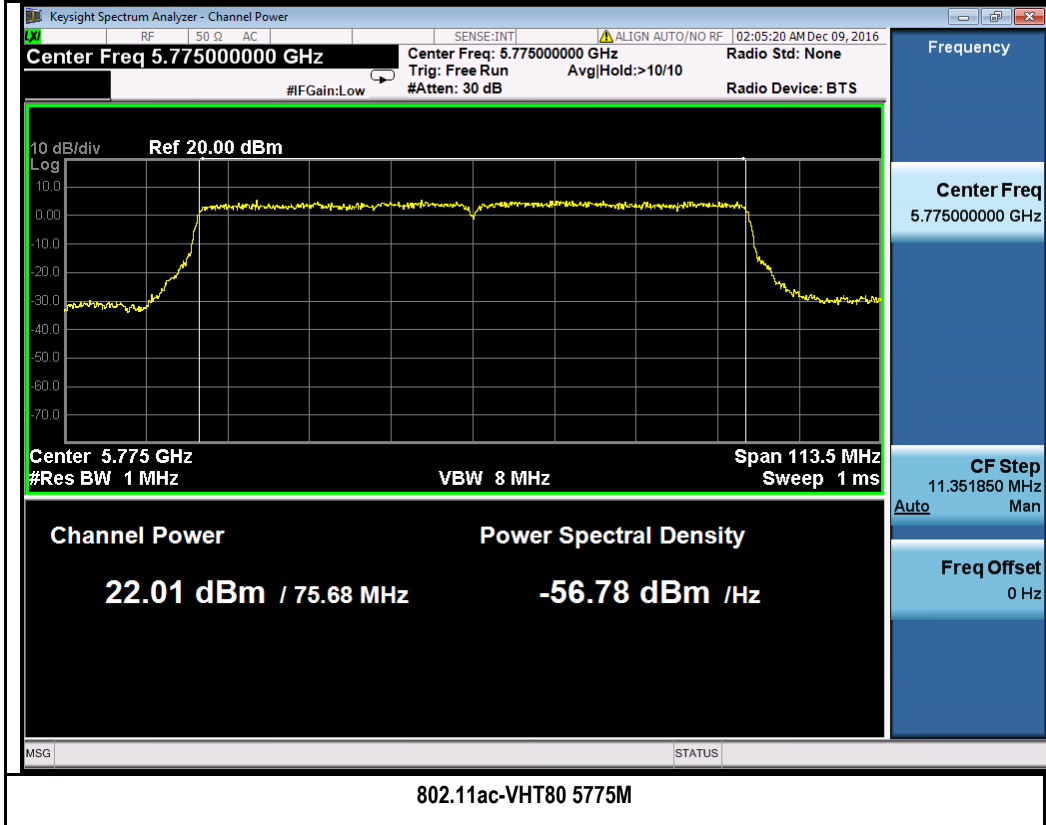


802.11n-HT40 5755M

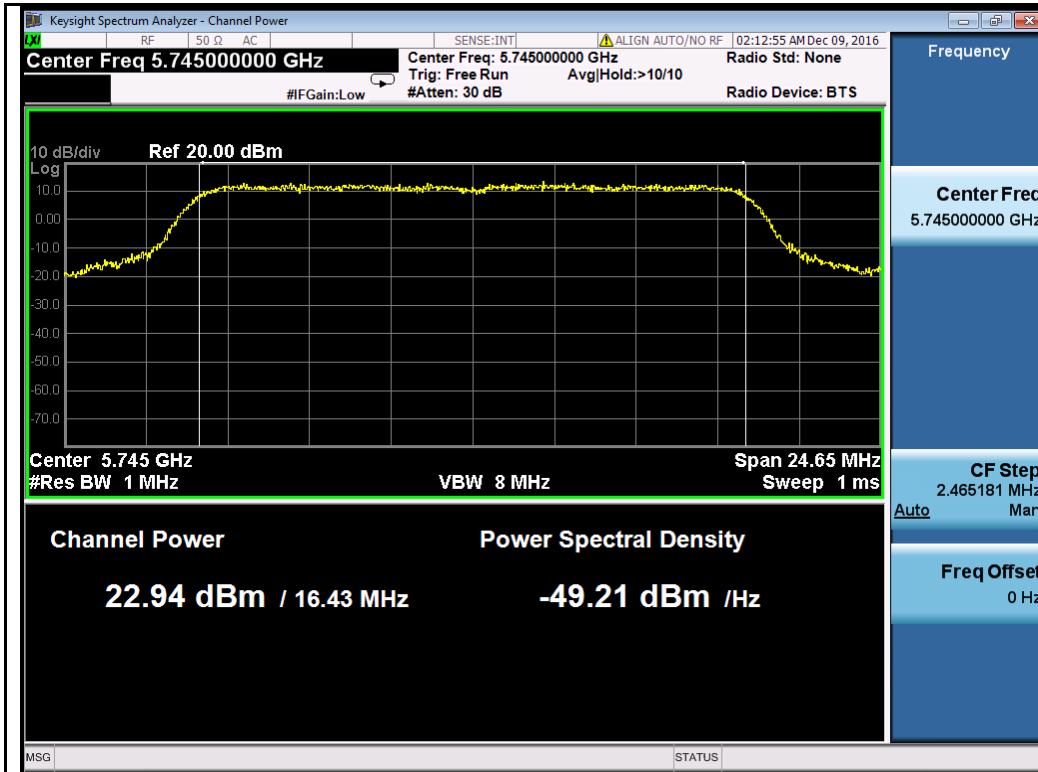


802.11n-HT40 5795M

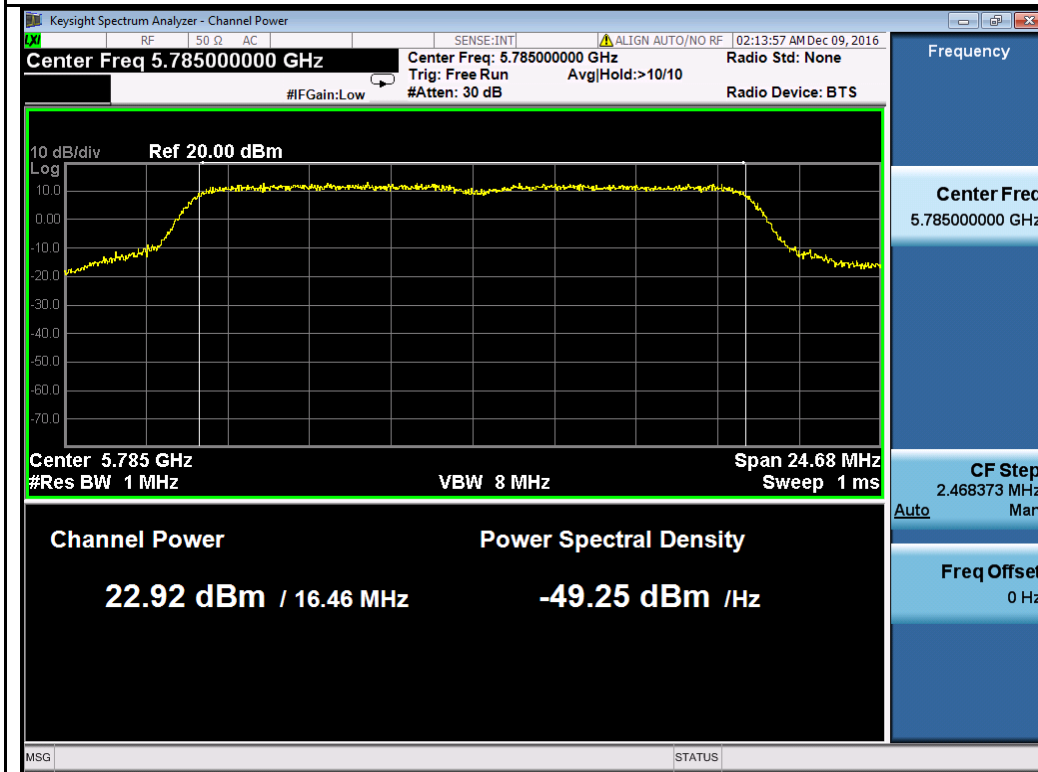




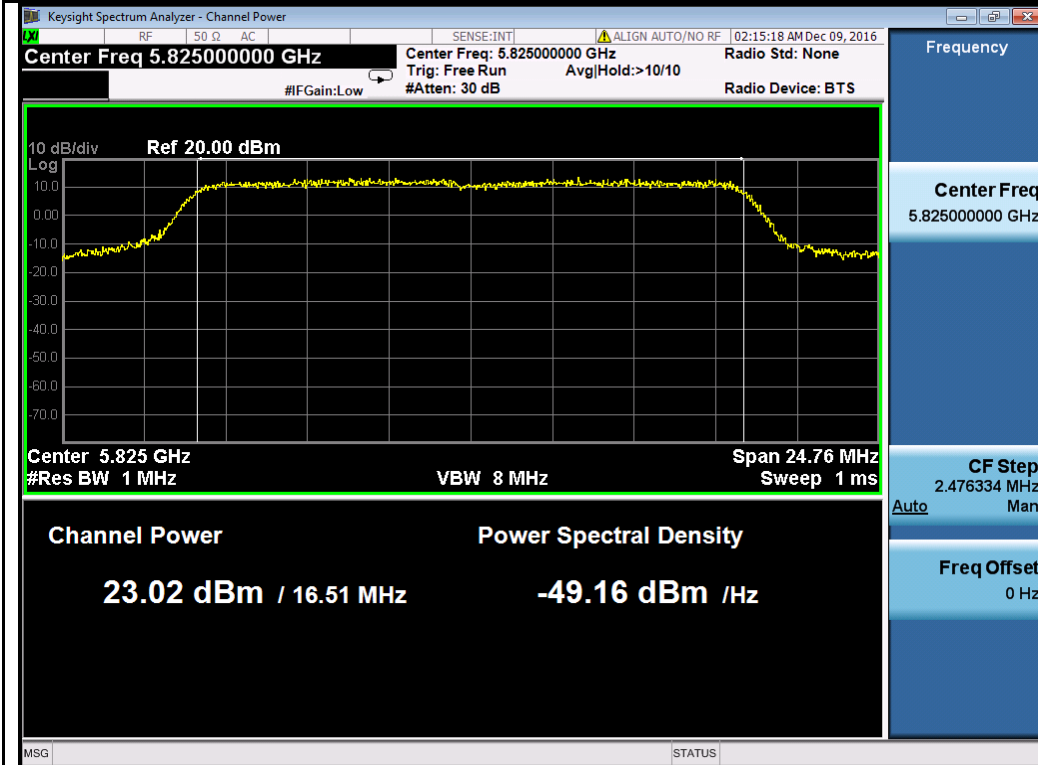
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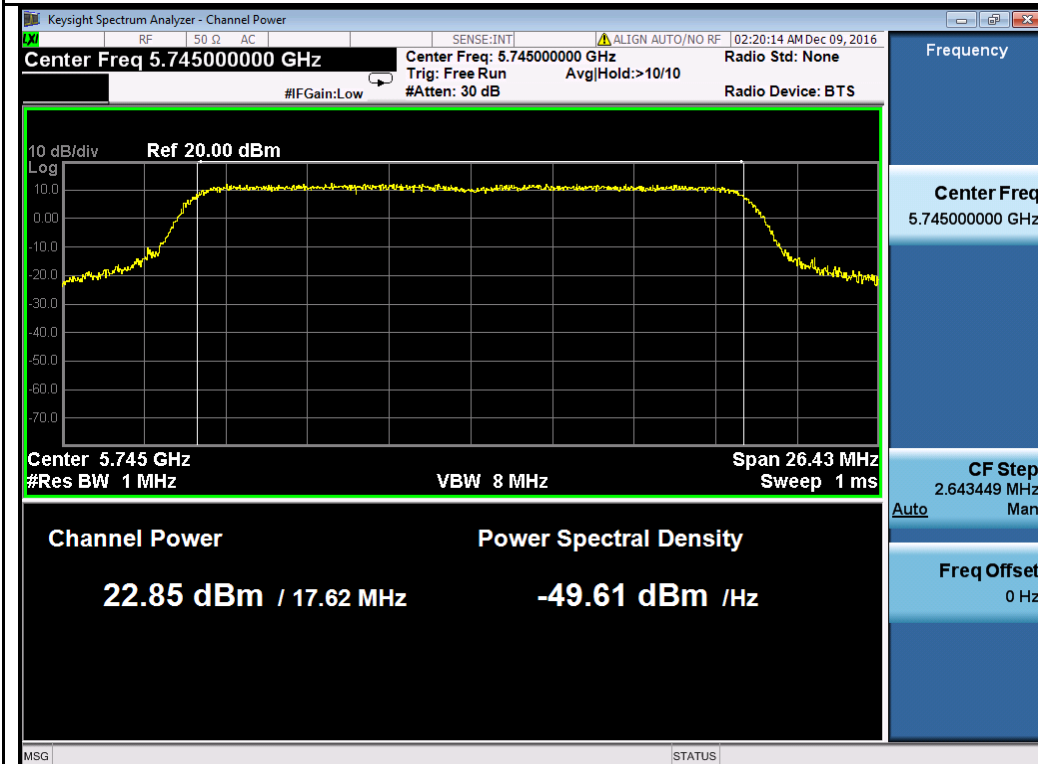
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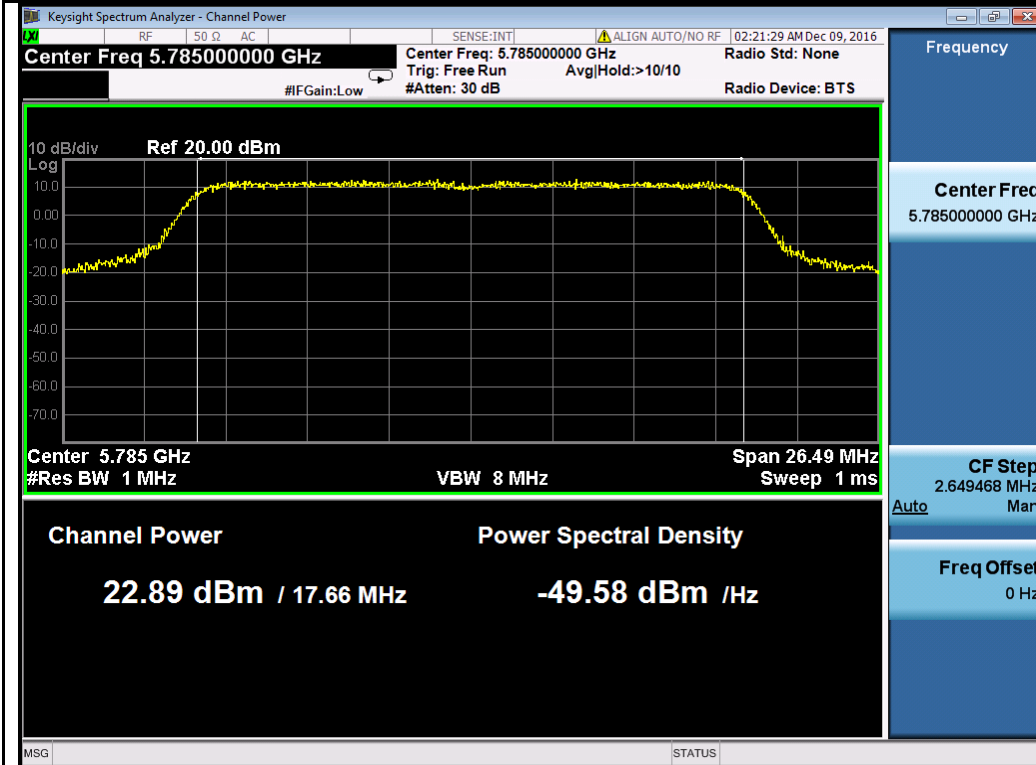
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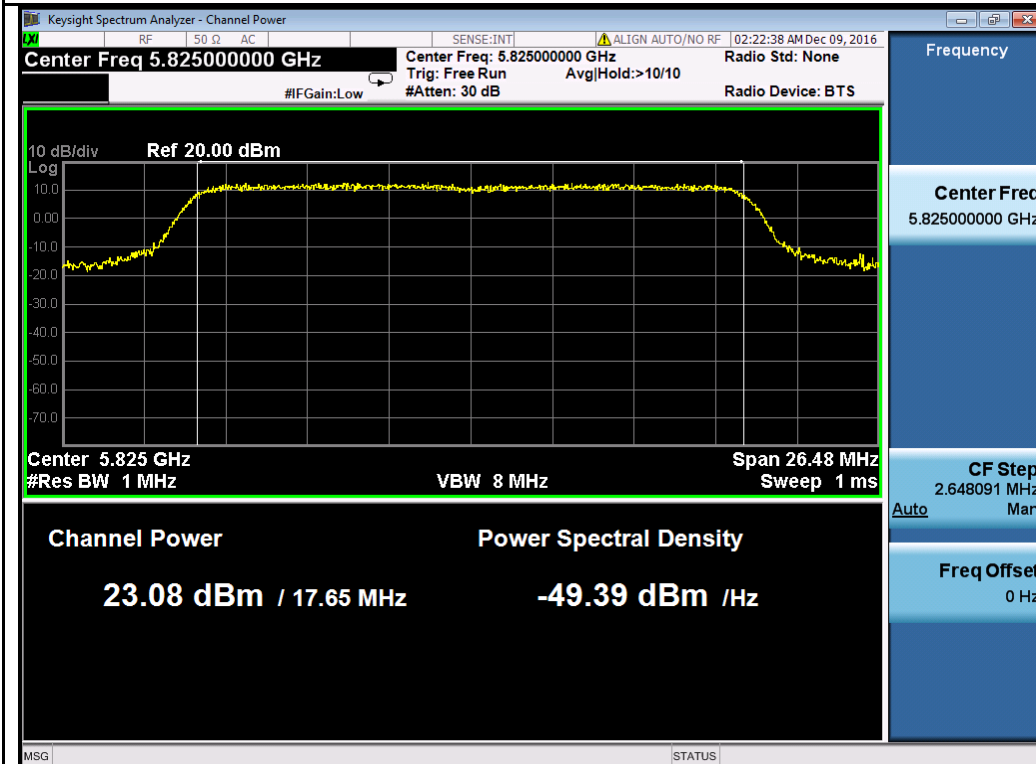
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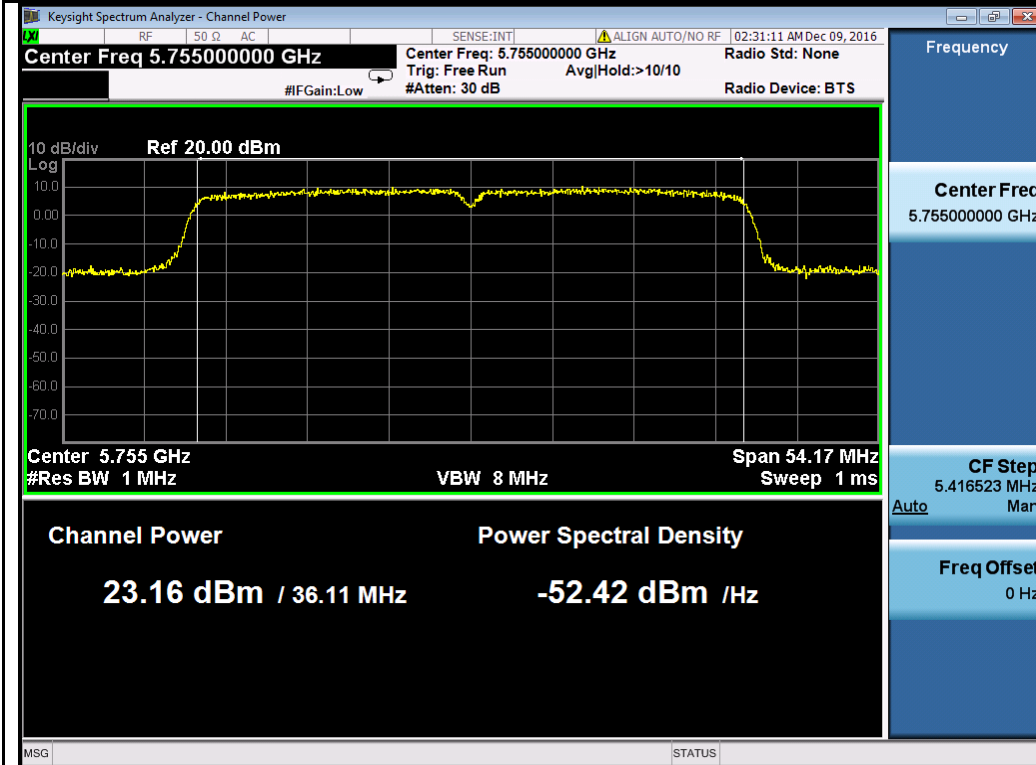
802.11n-HT20 5745M



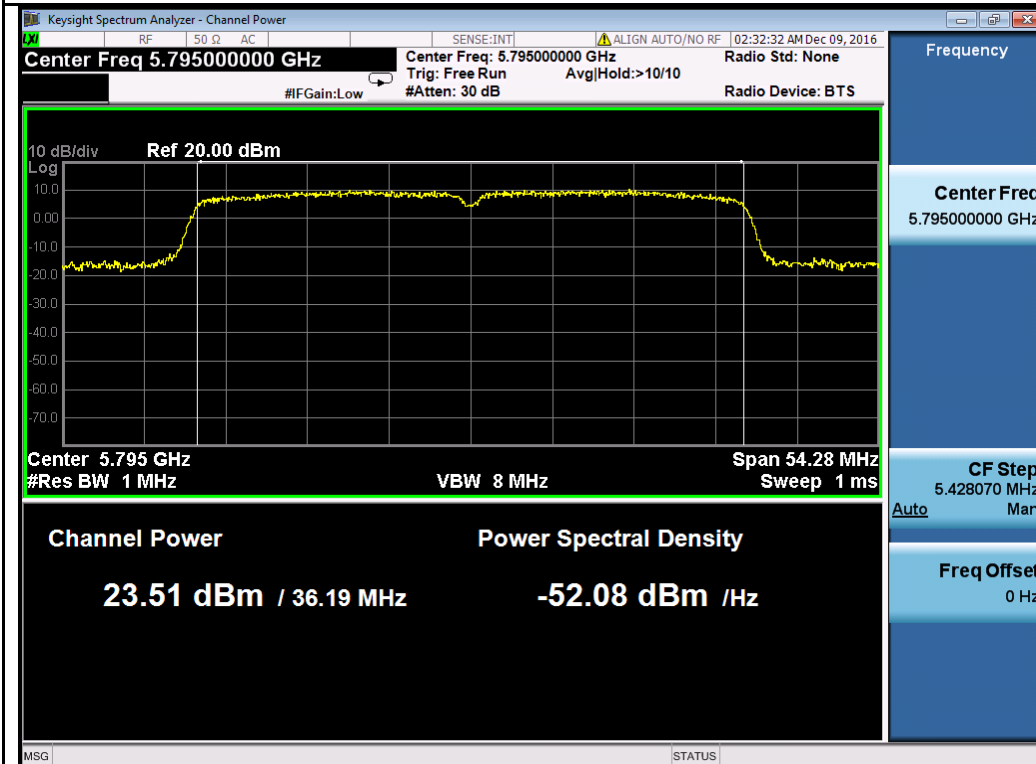
802.11n-HT20 5785M



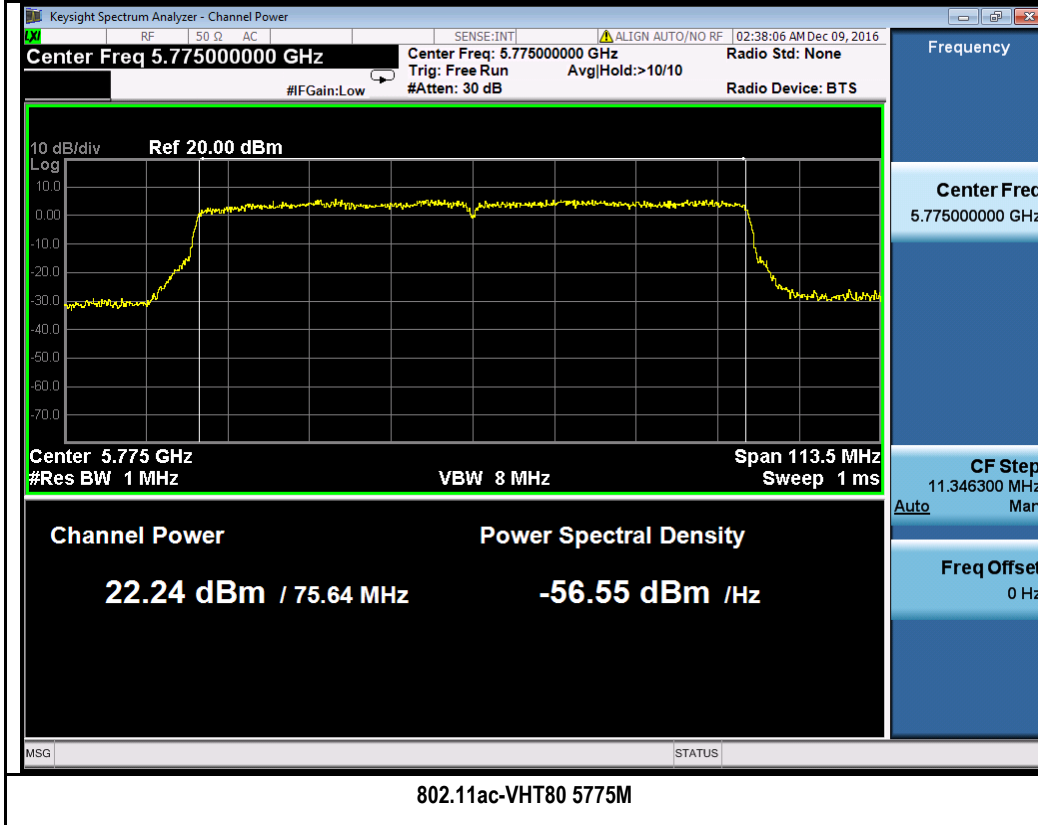
802.11n-HT20 5825M



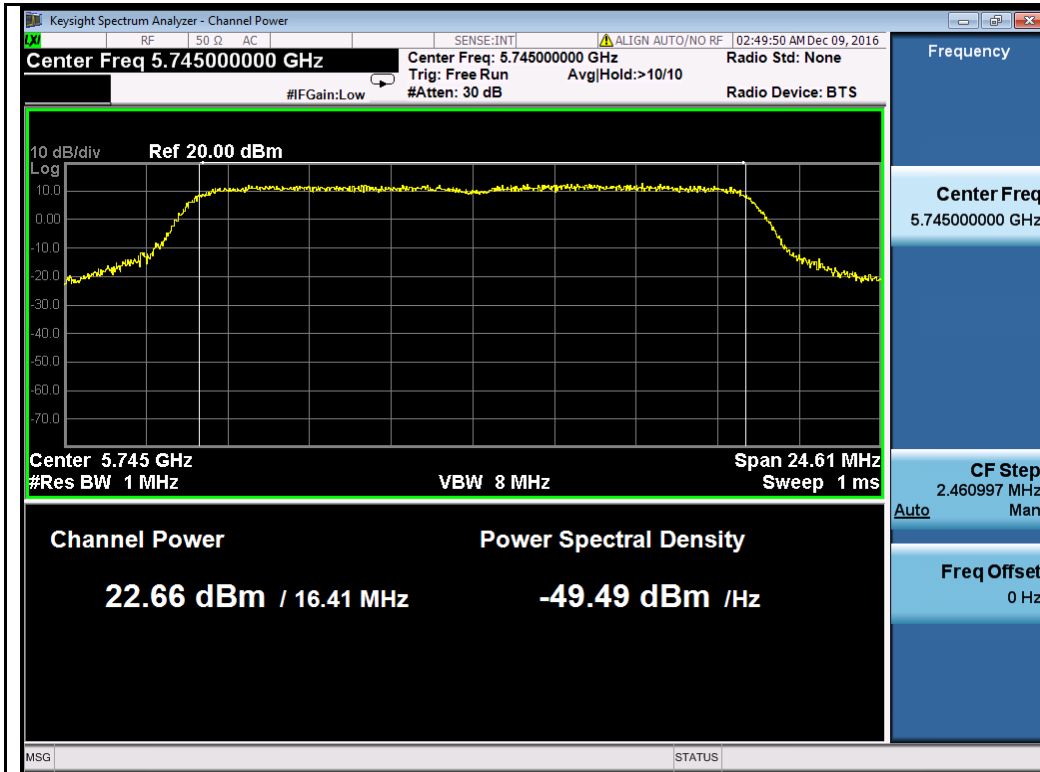
802.11n-HT40 5755M



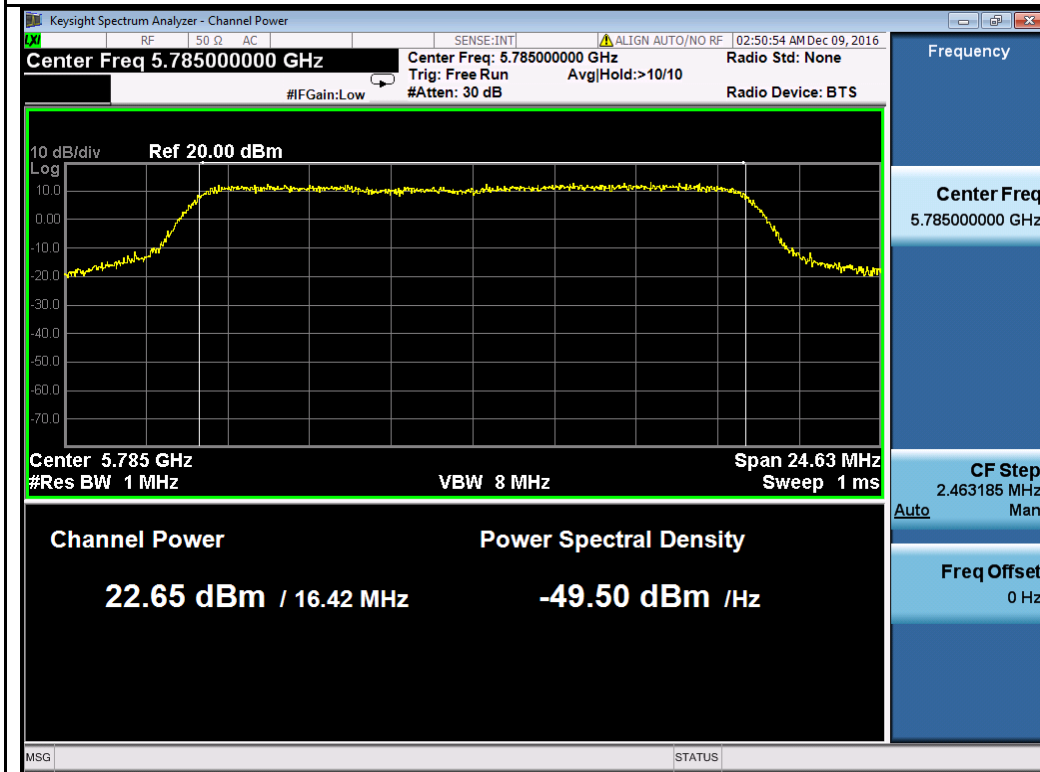
802.11n-HT40 5795M



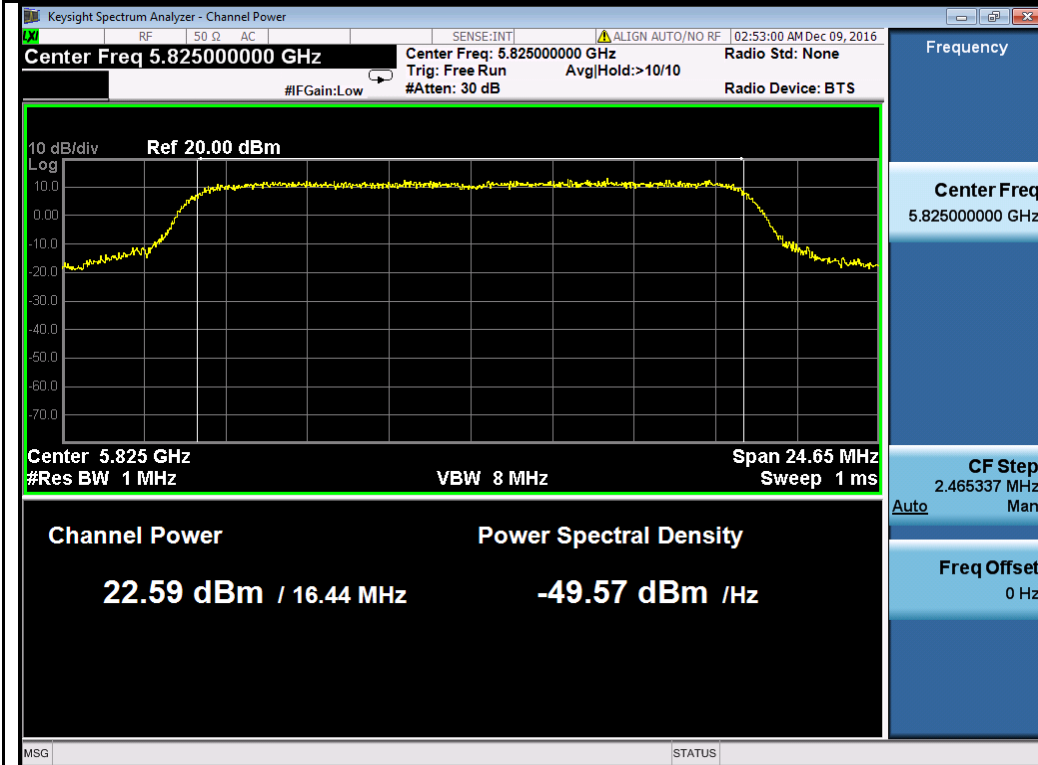
**Chain 4:**



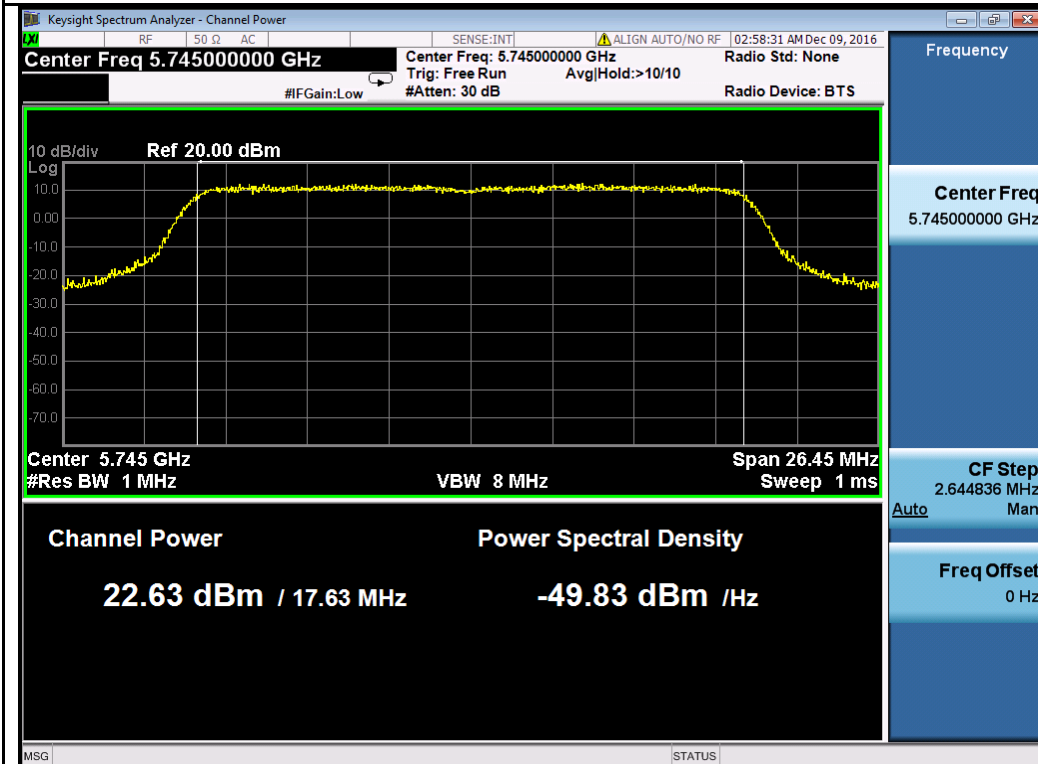
802.11a-5745M



802.11a-5785M



802.11a-5825M



802.11n-HT20 5745M



