## 8.8 Occupied Bandwidth (99%)

### ▣ Test Requirements

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured

### ▣ Test Configuration

Refer to the APPENDIX I.

### ▣ Test Procedure

**RSS-Gen[6.7]**

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

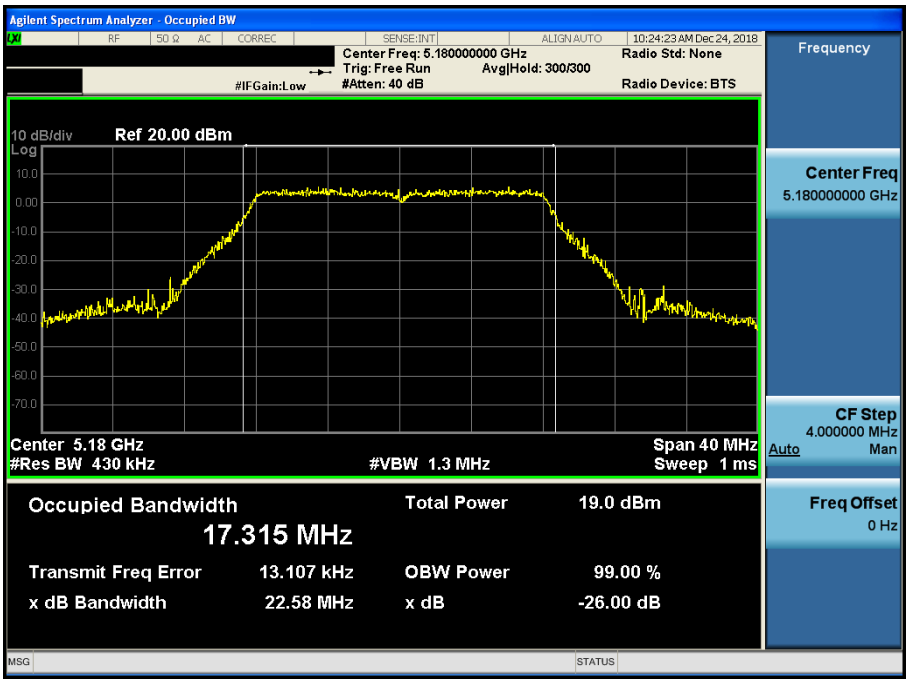
### ▣ Test Results : Comply

| Mode | Bands | Channel | Frequency [MHz] | Test Result [MHz] |
|---|---|---|---|---|
| 802.11a | U-NII 1 | 36 | 5180 | 17.32 |
| | | 40 | 5200 | 17.28 |
| | | 48 | 5240 | 17.30 |
| | U-NII 2A | 52 | 5260 | 17.28 |
| | | 60 | 5300 | 17.28 |
| | | 64 | 5320 | 17.29 |
| | U-NII 2C | 100 | 5500 | 17.24 |
| | | 116 | 5580 | 17.25 |
| | | 140 | 5700 | 17.26 |
| | U-NII 3 | 149 | 5745 | 17.27 |
| | | 157 | 5785 | 17.33 |
| | | 165 | 5825 | 17.26 |
| 802.11n(HT20) | U-NII 1 | 36 | 5180 | 18.24 |
| | | 40 | 5200 | 18.23 |
| | | 48 | 5240 | 18.25 |
| | U-NII 2A | 52 | 5260 | 18.19 |
| | | 60 | 5300 | 18.22 |
| | | 64 | 5320 | 18.24 |
| | U-NII 2C | 100 | 5500 | 18.18 |
| | | 116 | 5580 | 18.26 |
| | | 140 | 5700 | 18.18 |
| | U-NII 3 | 149 | 5745 | 18.22 |
| | | 157 | 5785 | 18.31 |
| | | 165 | 5825 | 18.25 |
| 802.11n(HT40) | U-NII 1 | 38 | 5190 | 36.33 |
| | | 46 | 5230 | 36.29 |
| | U-NII 2A | 54 | 5270 | 36.16 |
| | | 62 | 5310 | 36.29 |
| | U-NII 2C | 102 | 5510 | 36.26 |
| | | 110 | 5550 | 36.31 |
| | | 134 | 5670 | 36.30 |
| | U-NII 3 | 151 | 5755 | 36.32 |
| | | 159 | 5795 | 36.34 |
| 802.11ac(VHT80) | U-NII 1 | 42 | 5210 | 74.86 |
| | U-NII 2A | 58 | 5290 | 74.78 |
| | U-NII 2C | 106 | 5530 | 74.84 |
| | U-NII 3 | 155 | 5775 | 74.93 |

## ▣ Result Plots

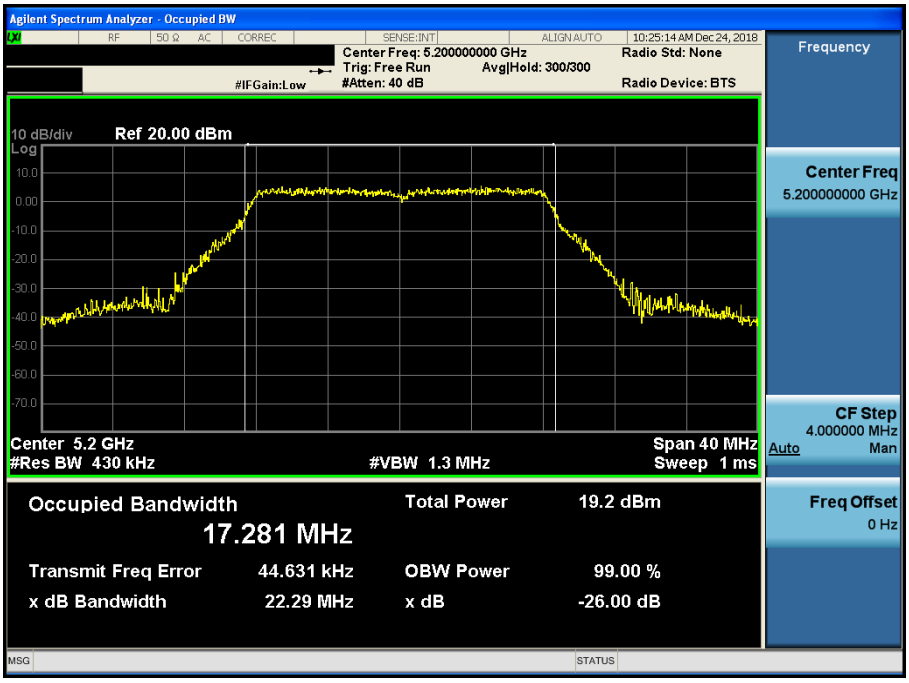
### Occupied Bandwidth 99%

Test Mode: 802.11a & Ch.36

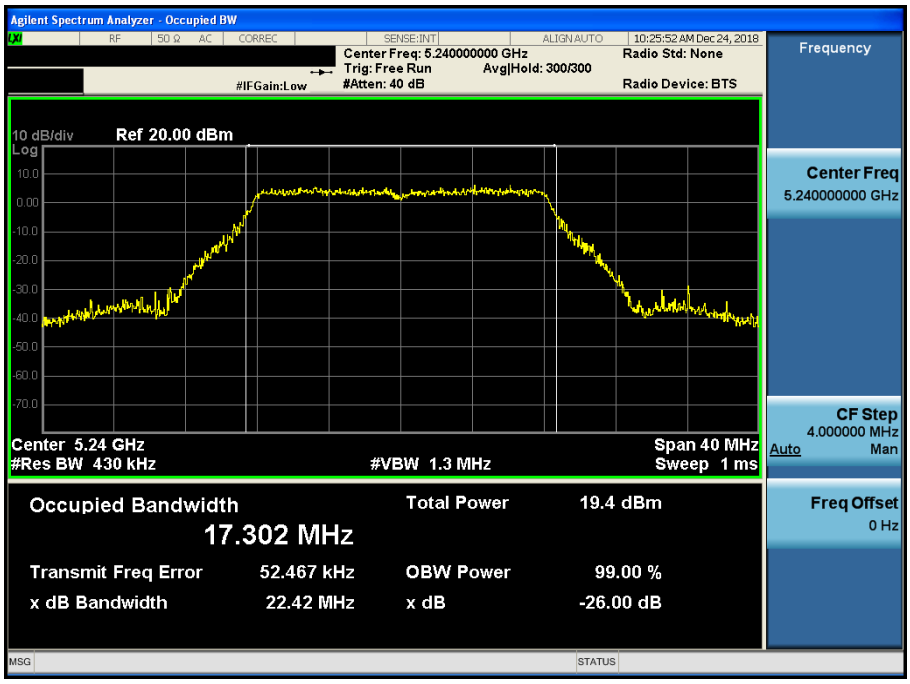



### Occupied Bandwidth 99%

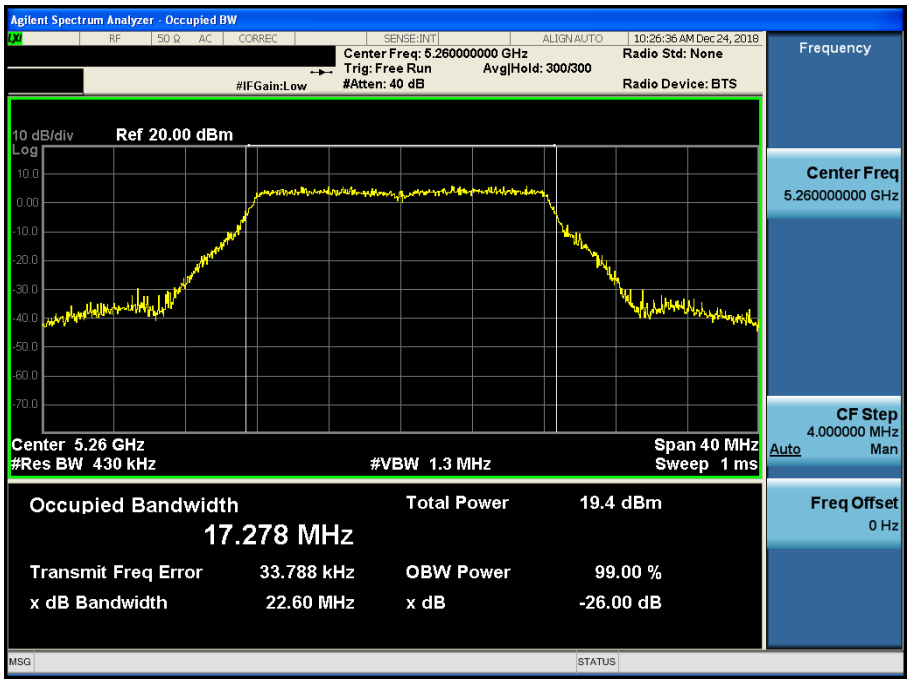
Test Mode: 802.11a & Ch.40



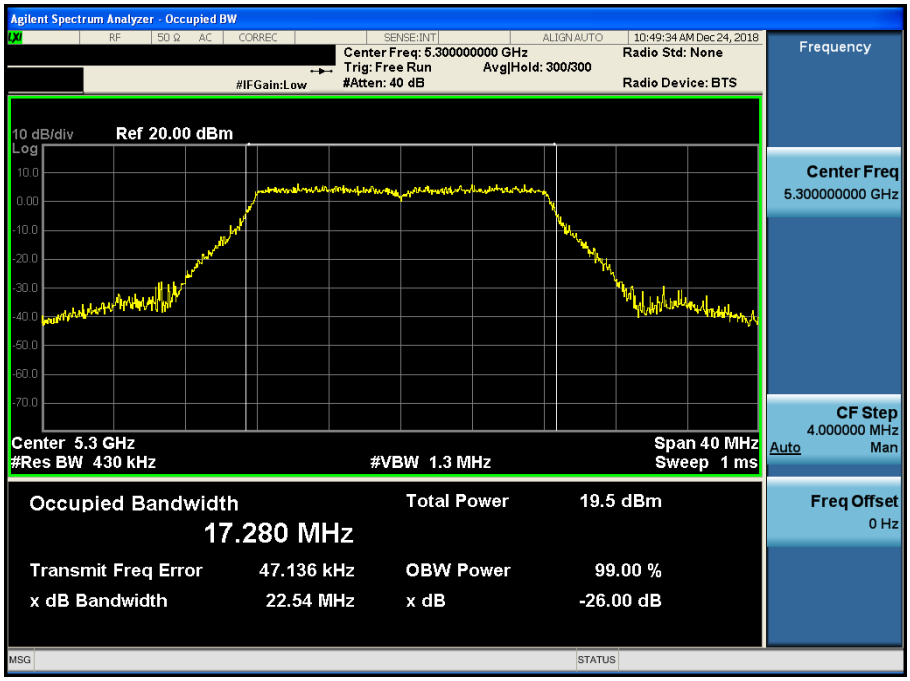
**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.48



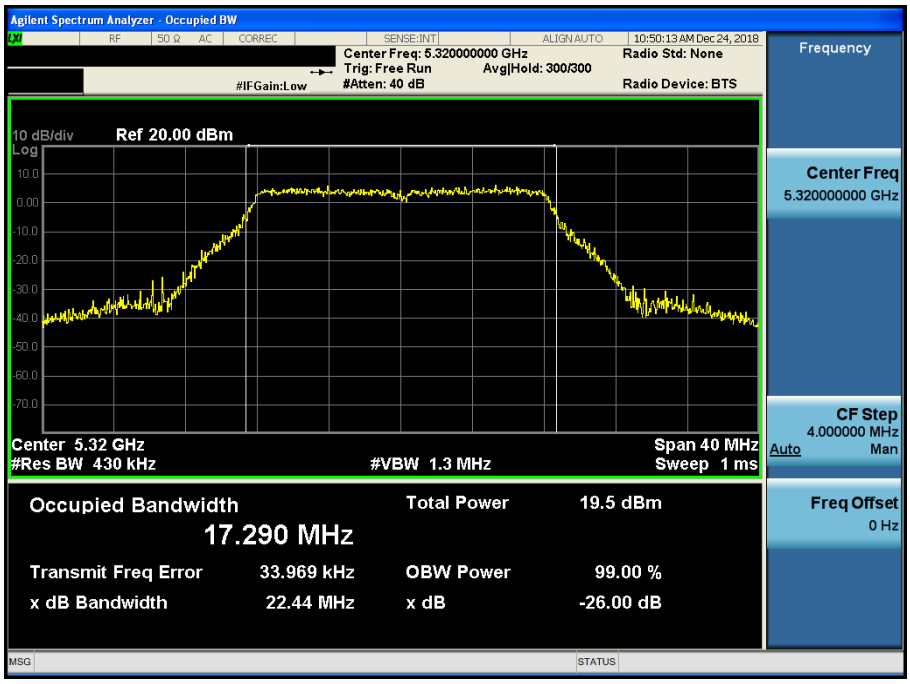
**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.52



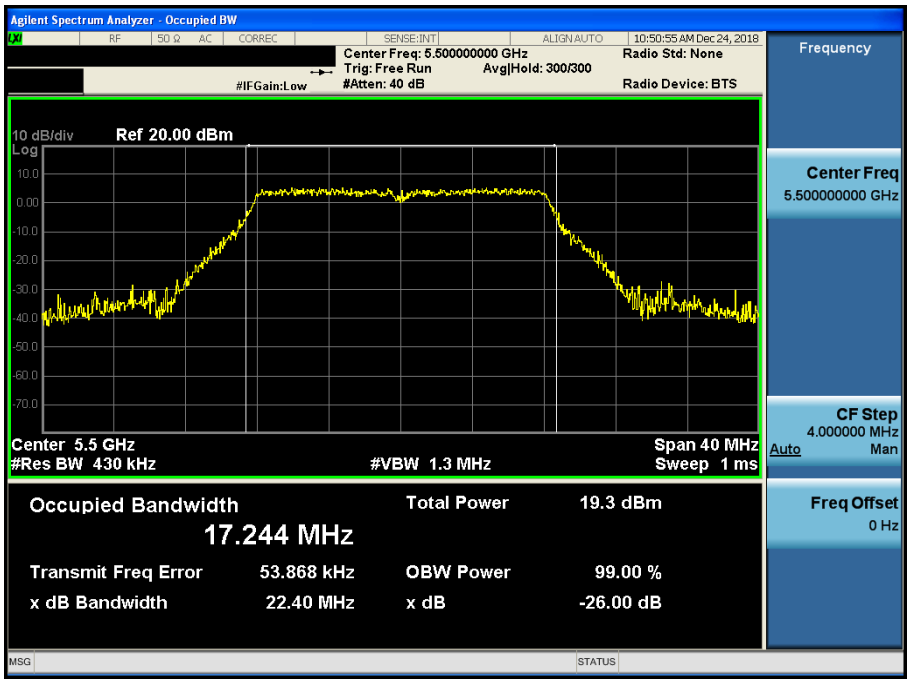

**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.60



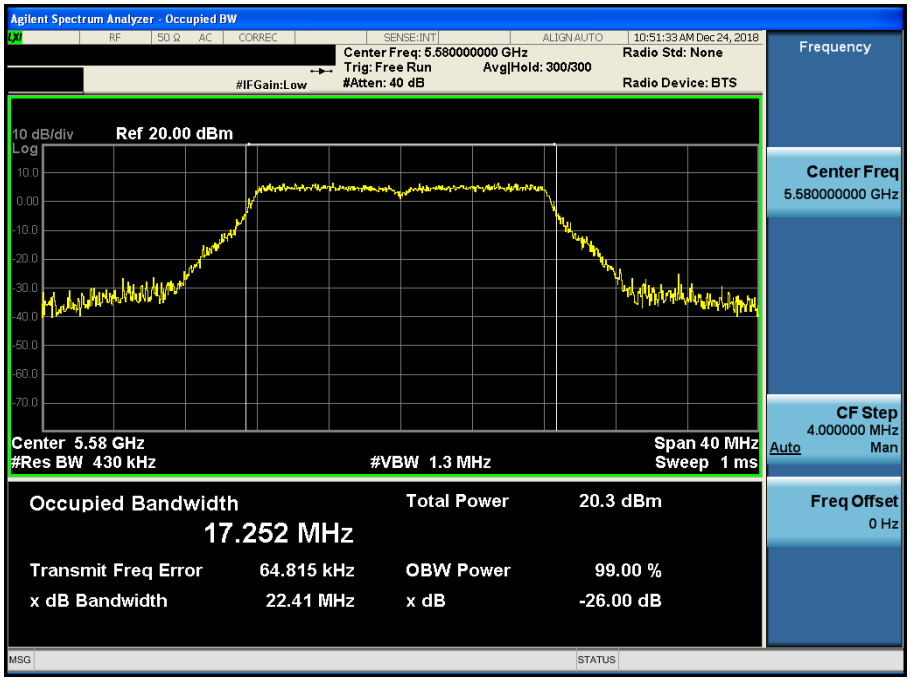
**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.64



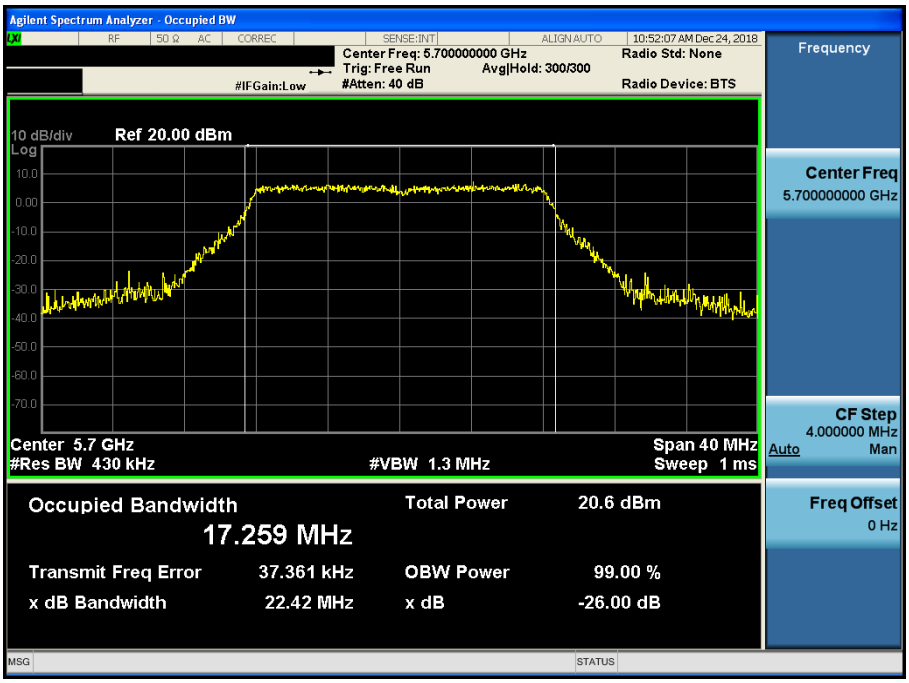
**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.100



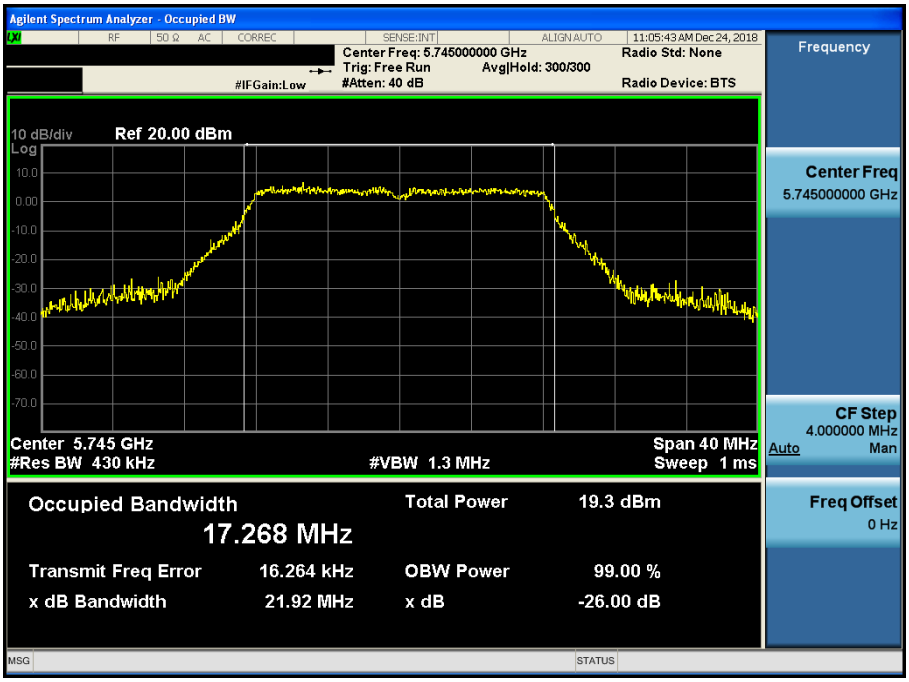

**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.116



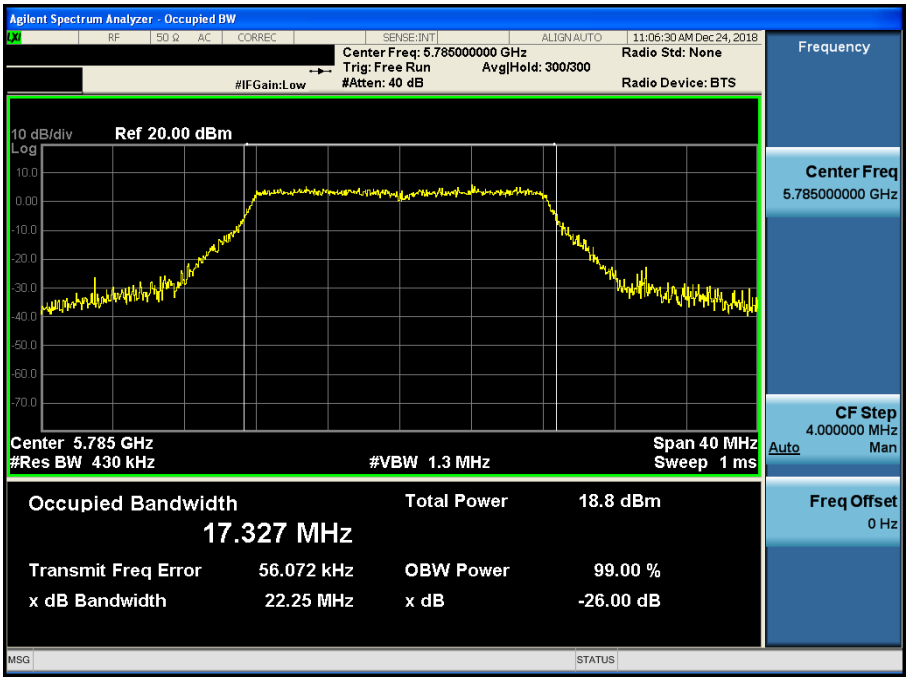
**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.140



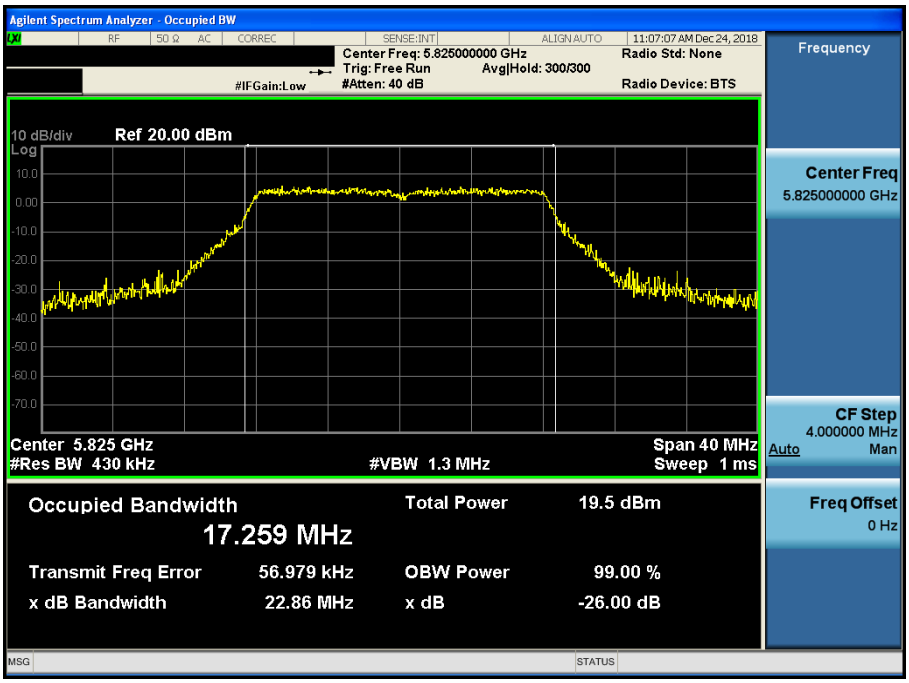
**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.149



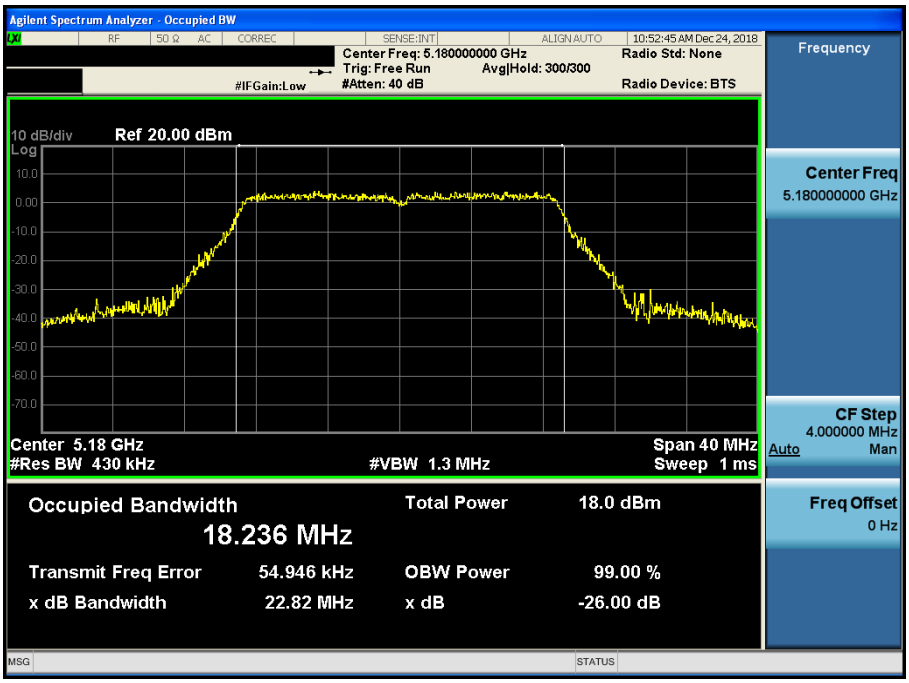

**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.157



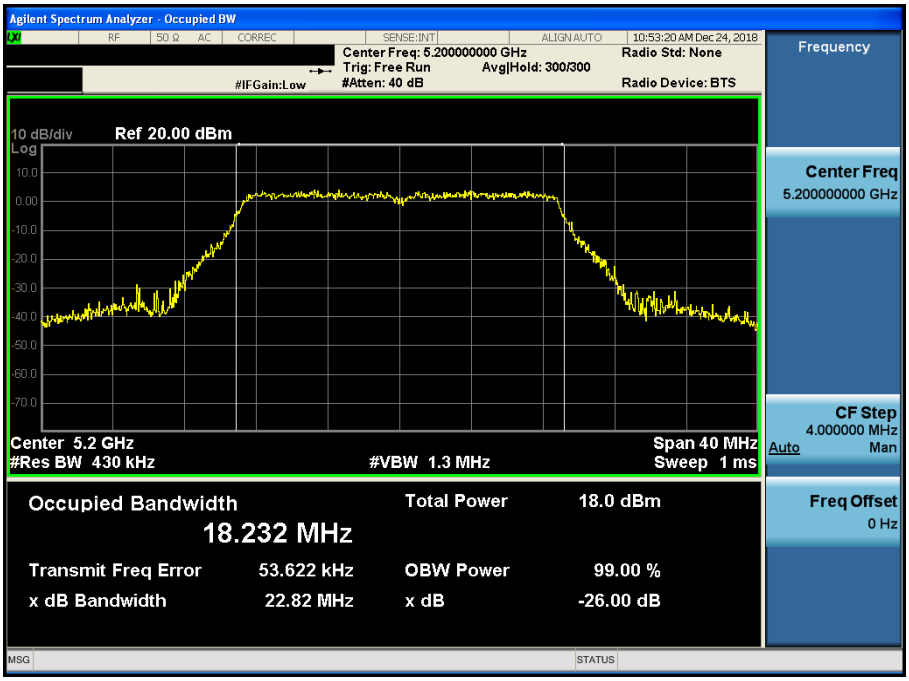
**Occupied Bandwidth 99%** Test Mode: 802.11a & Ch.165



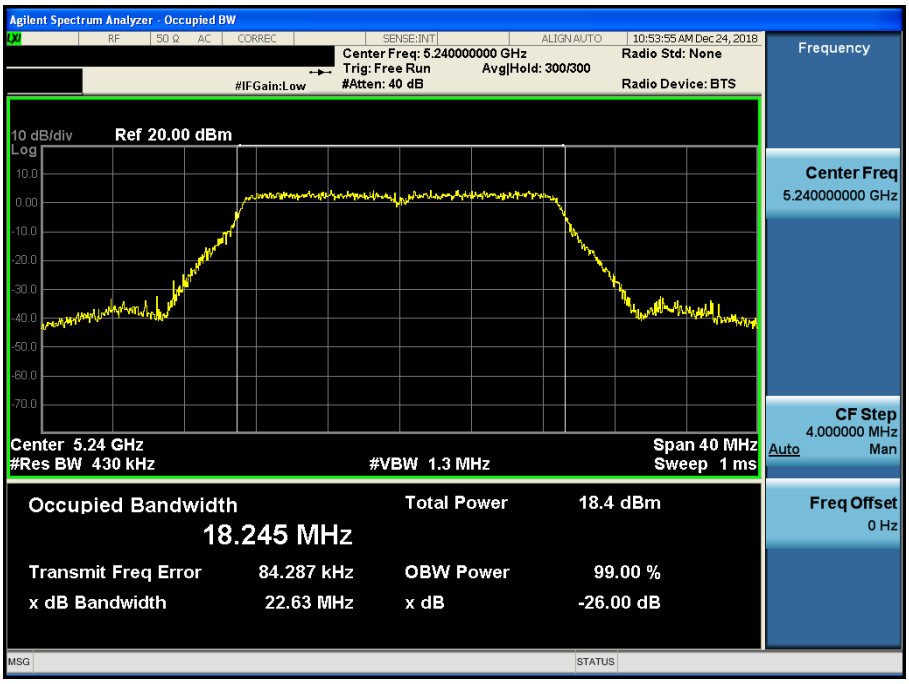
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.36



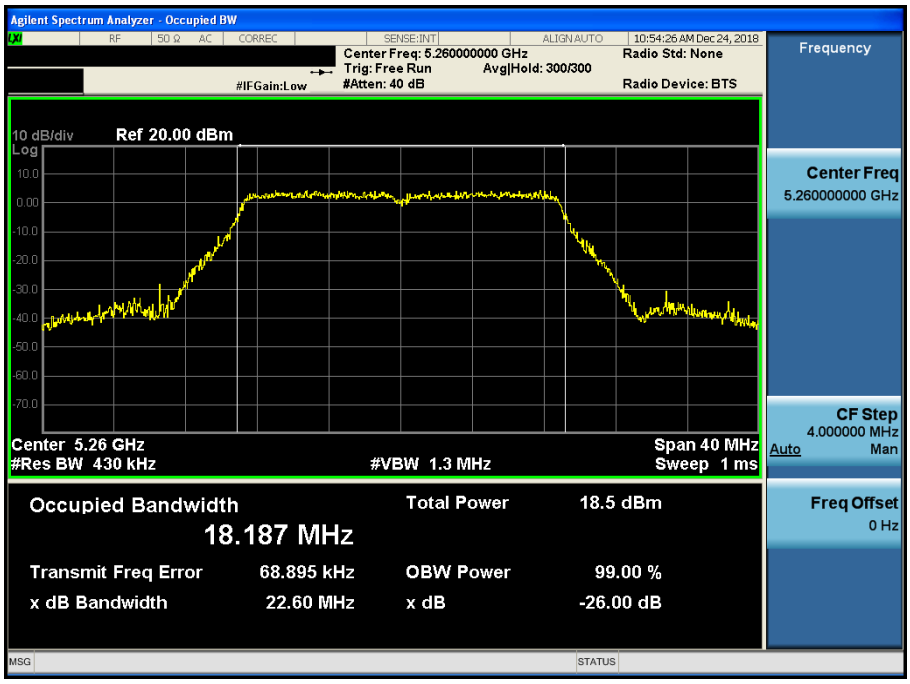

**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.40



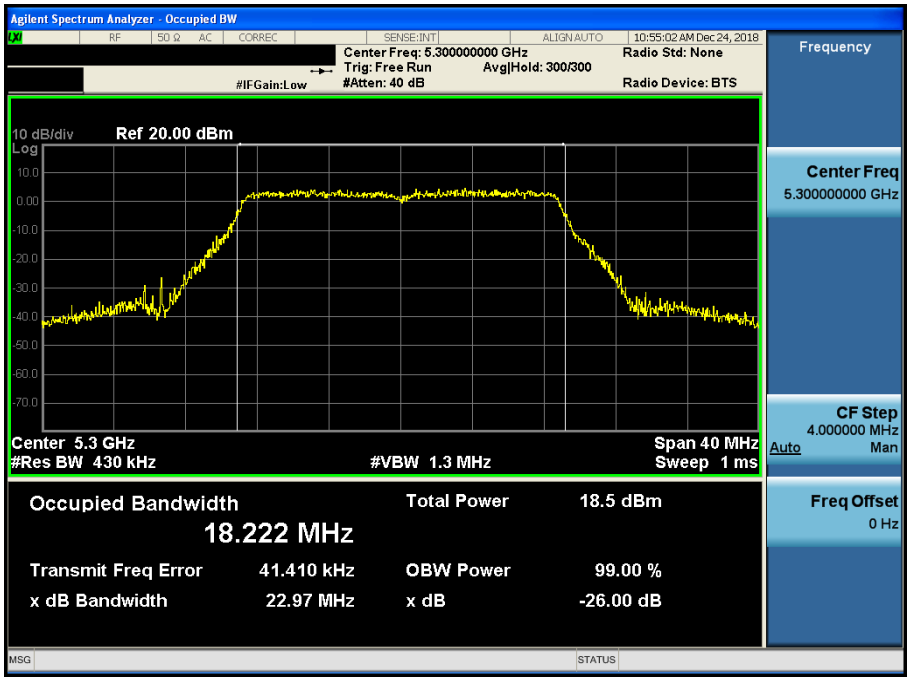
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.48



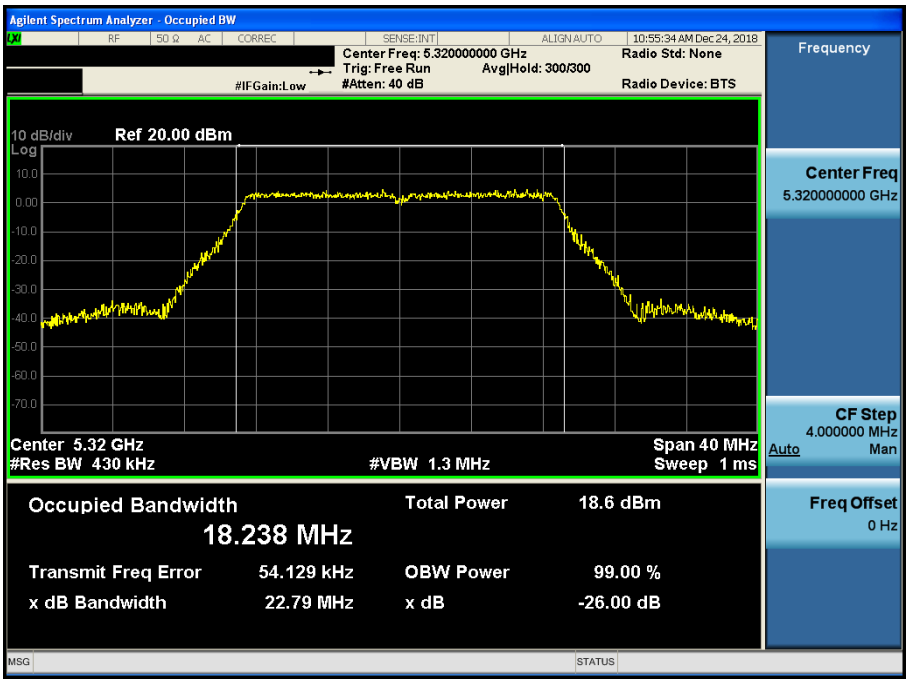
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.52



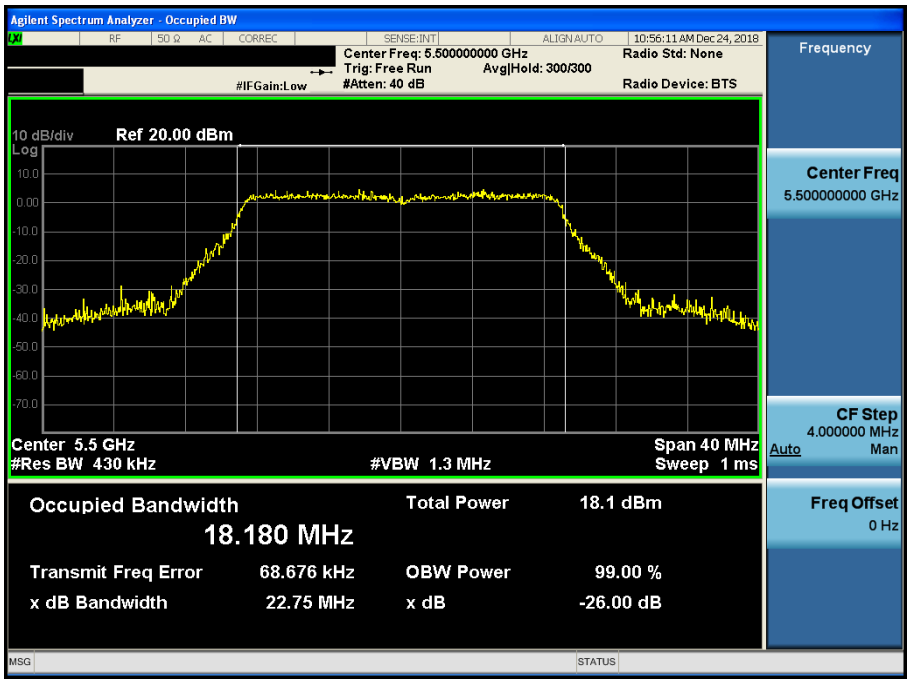

**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.60



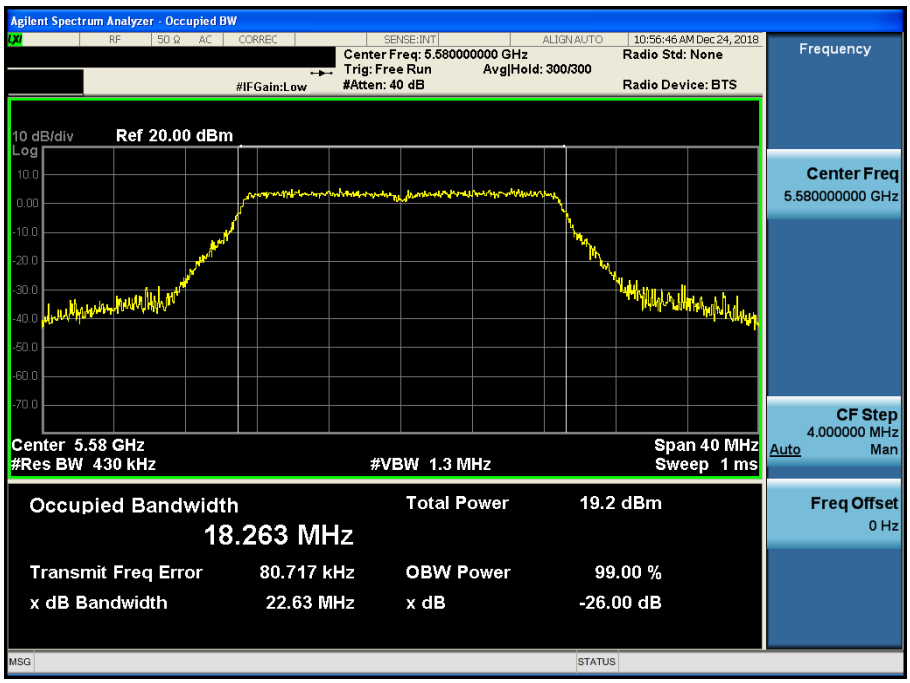
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.64



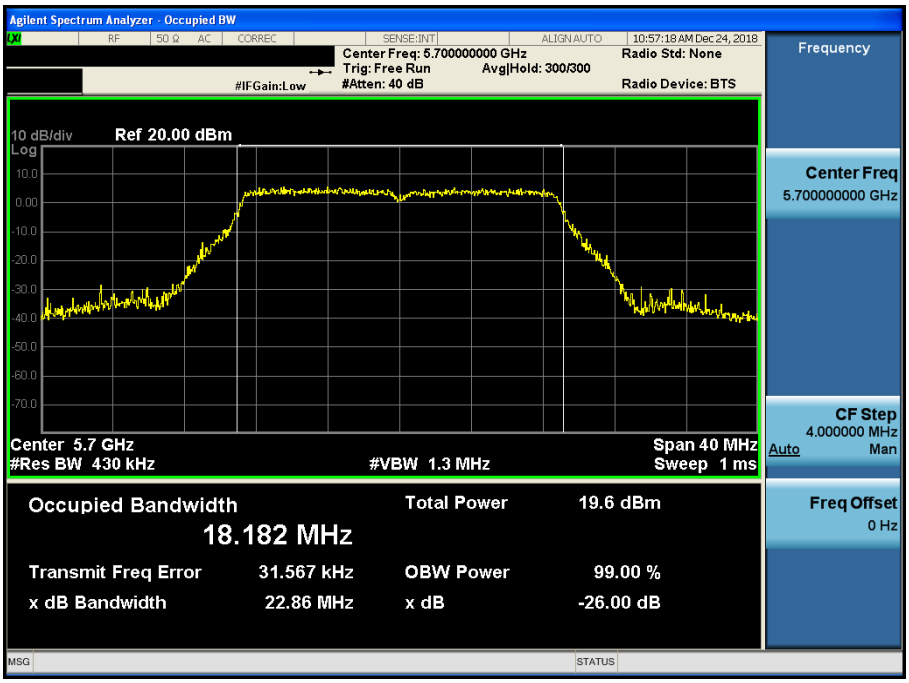
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.100



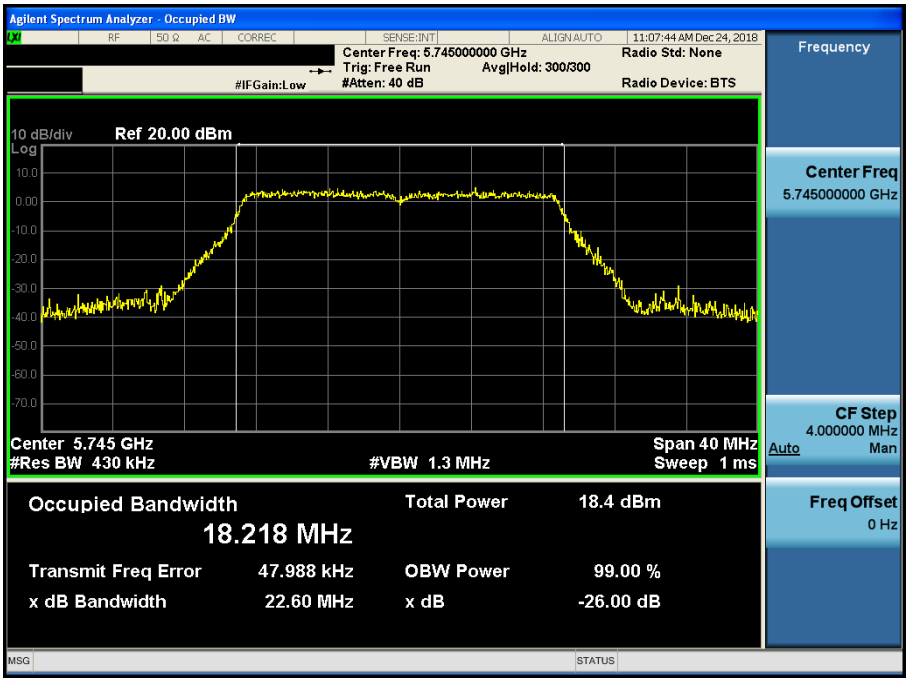

**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.116



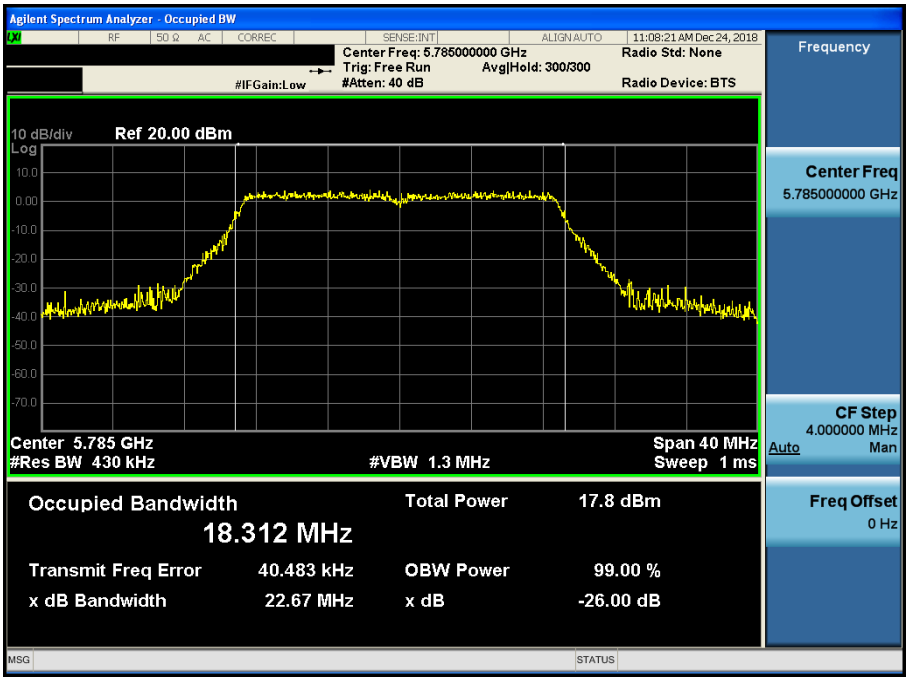
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.140



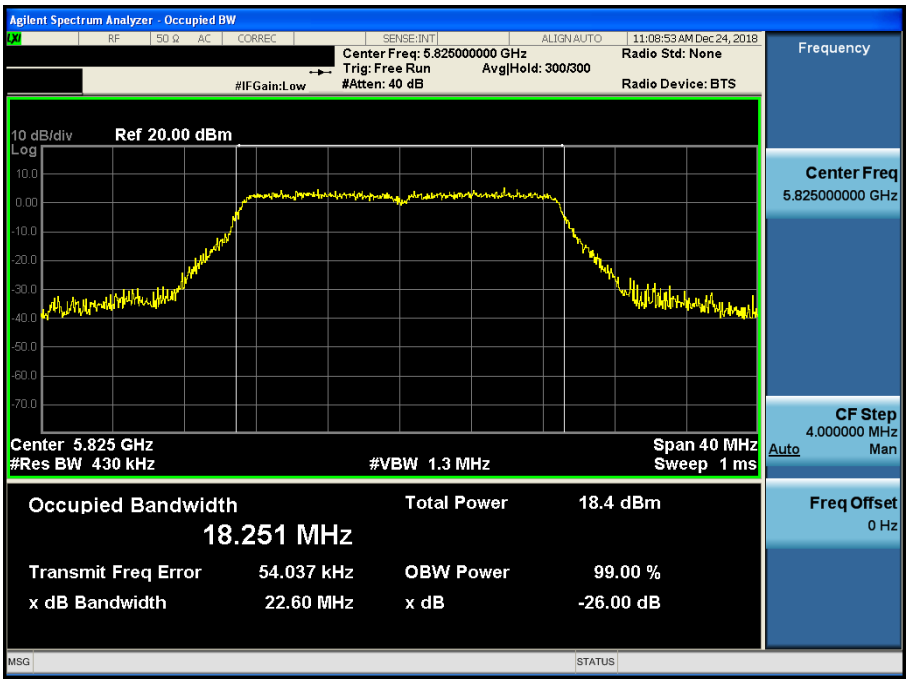
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.149



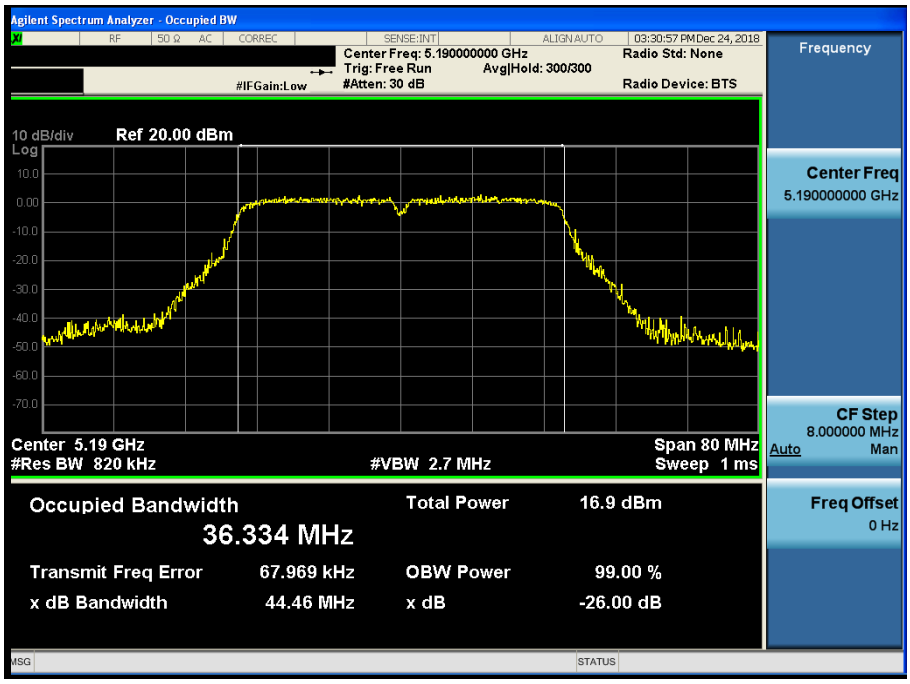

**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.157



**Occupied Bandwidth 99%** Test Mode: 802.11n(HT20) & Ch.165

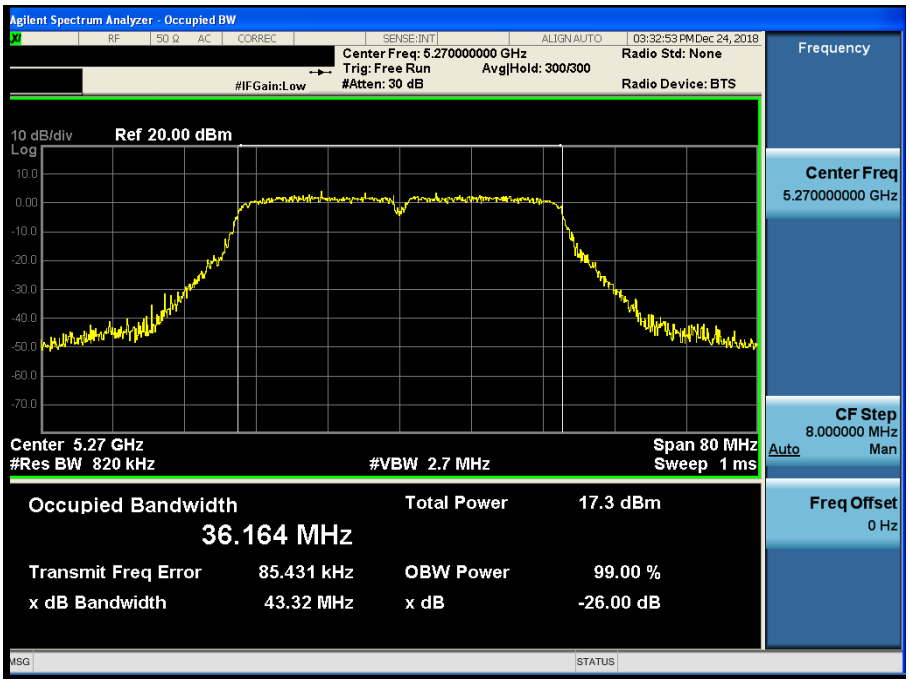


**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.38

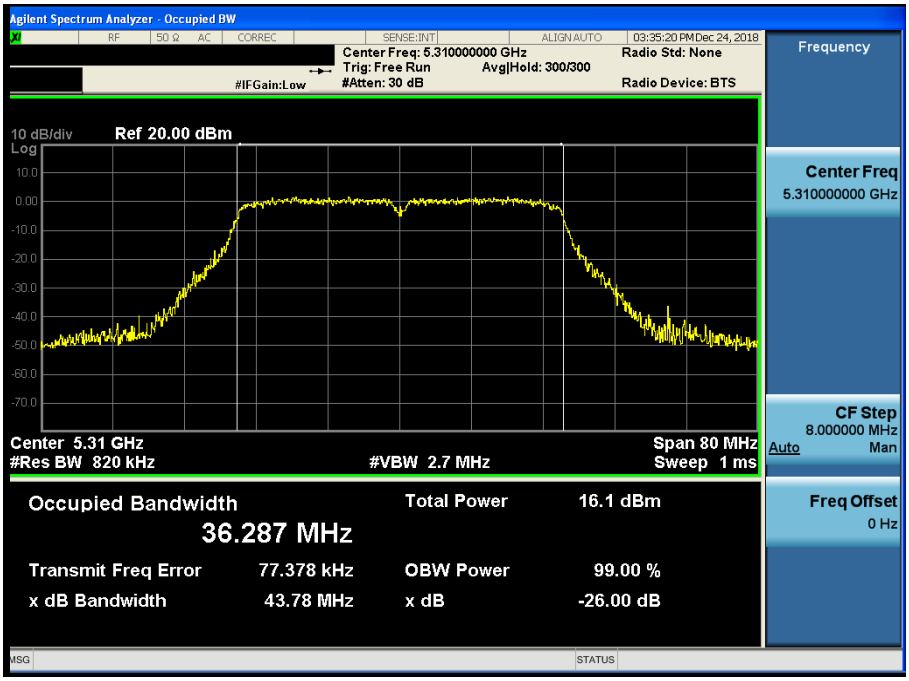



**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.46

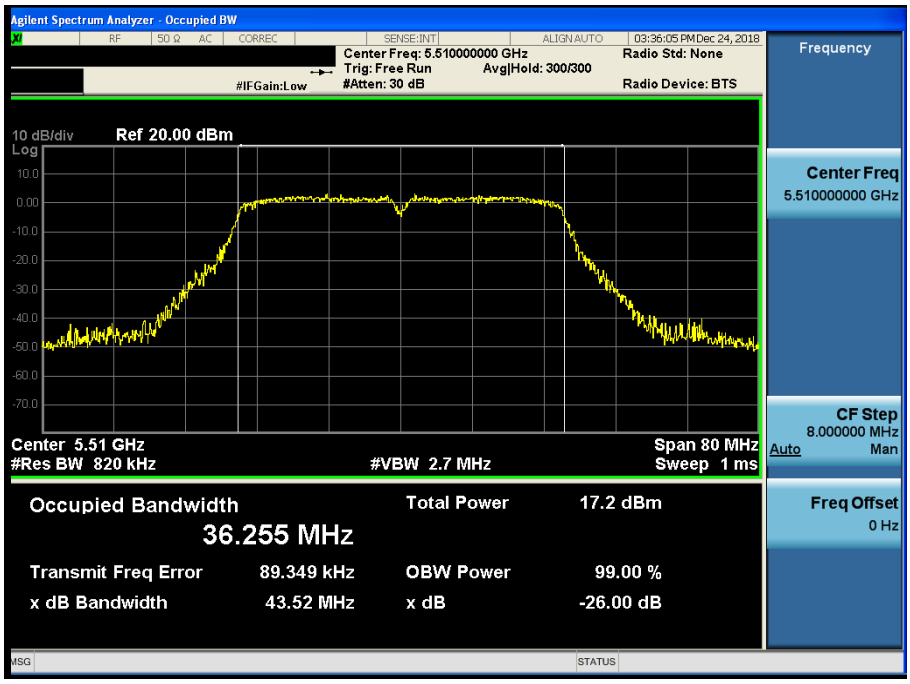
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.54



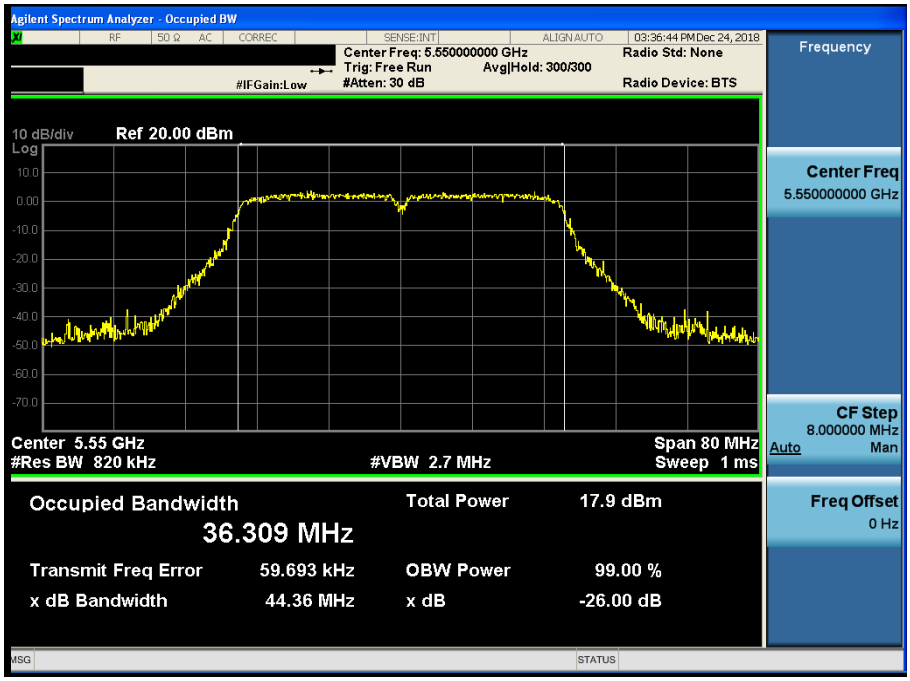

**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.62



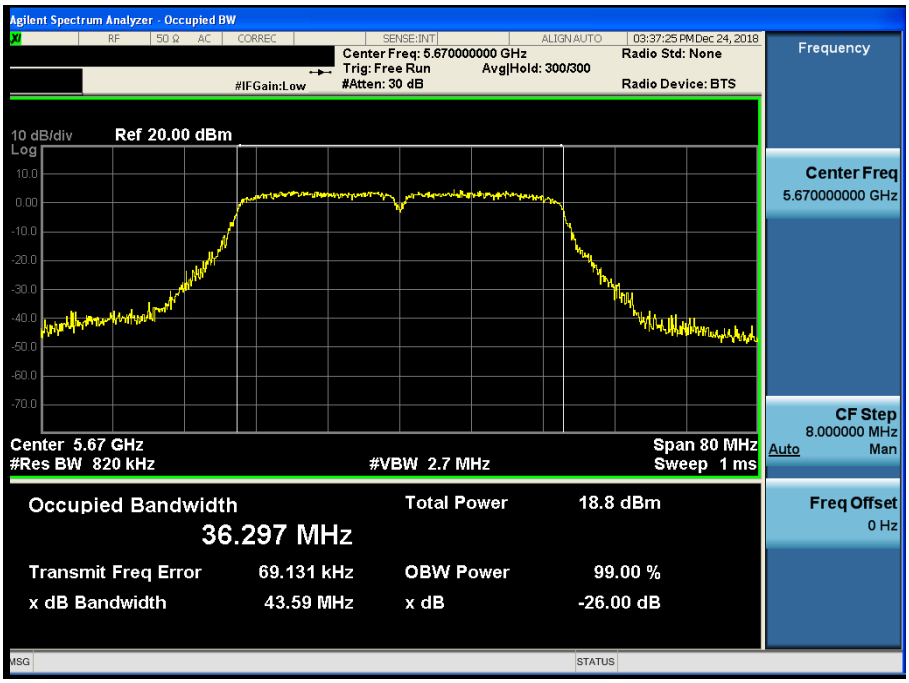
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.102



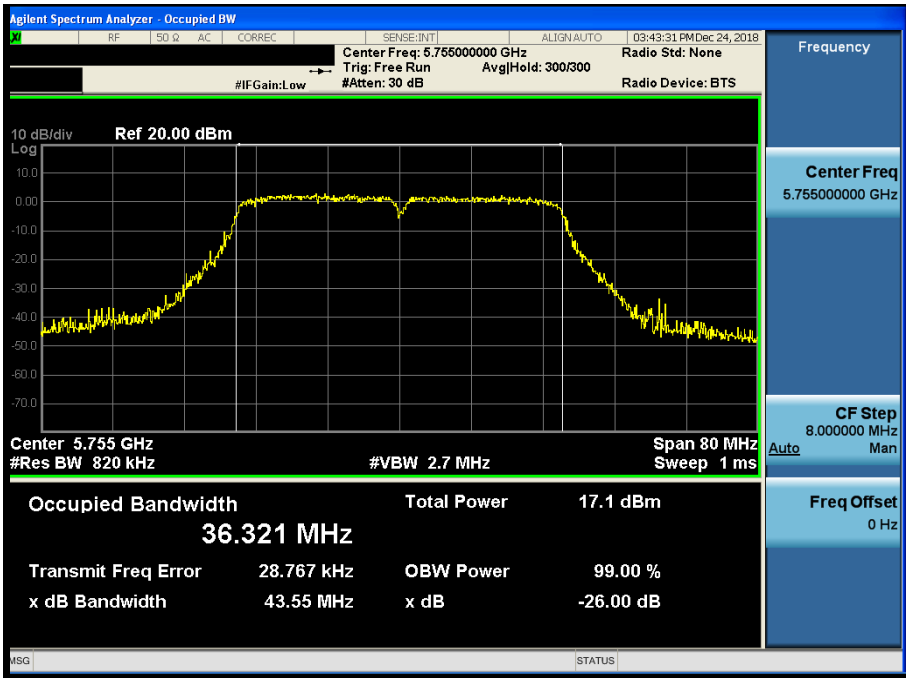

**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.110



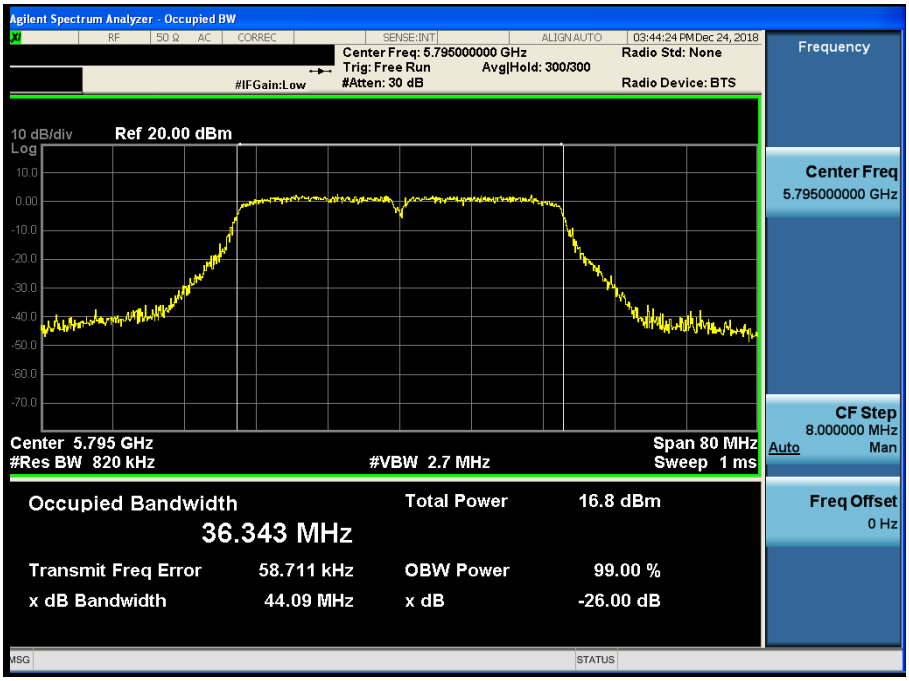
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.134



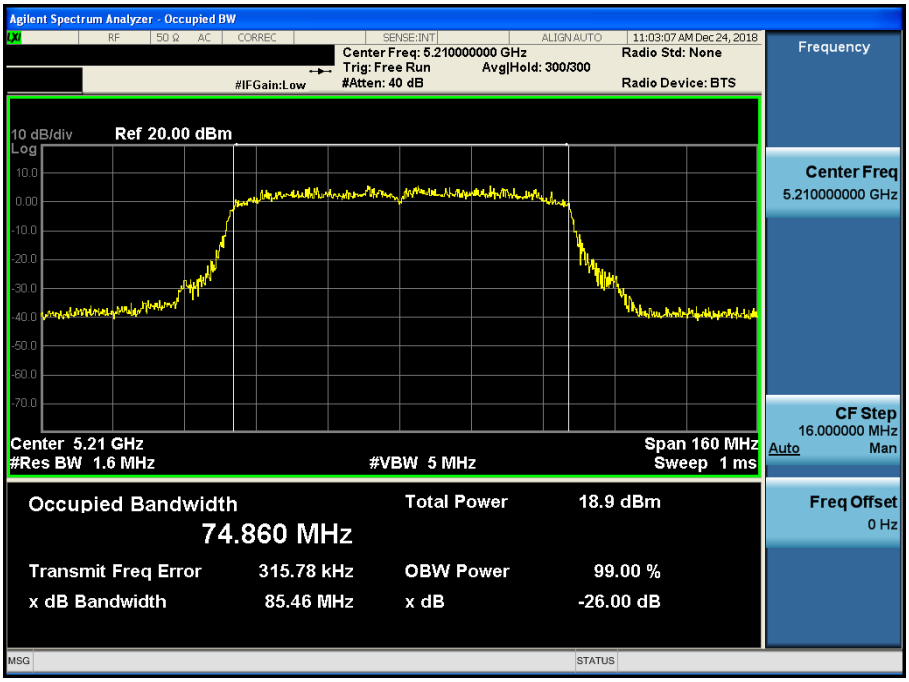
**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.151



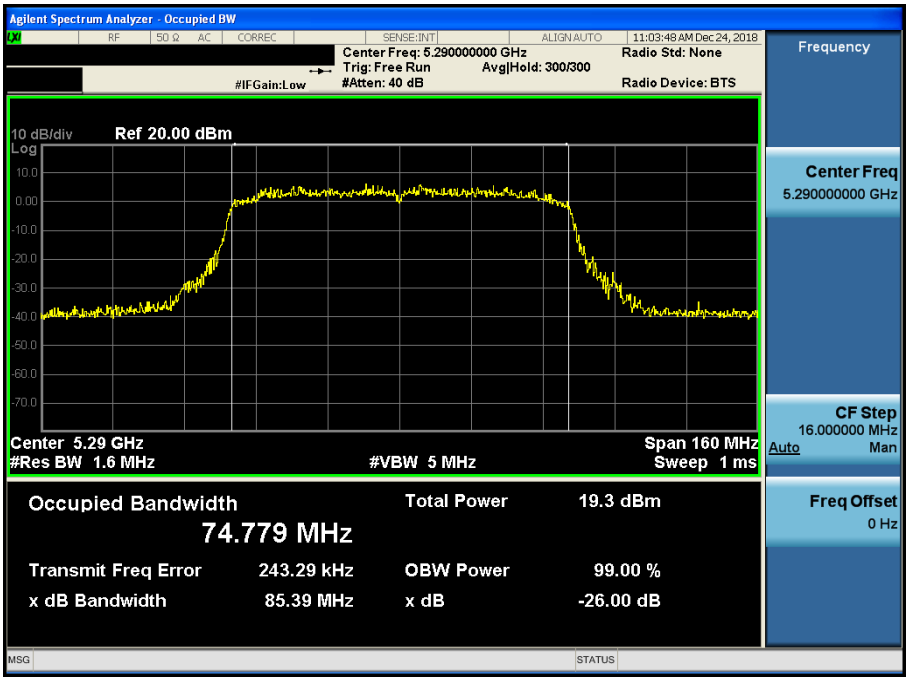

**Occupied Bandwidth 99%** Test Mode: 802.11n(HT40) & Ch.159



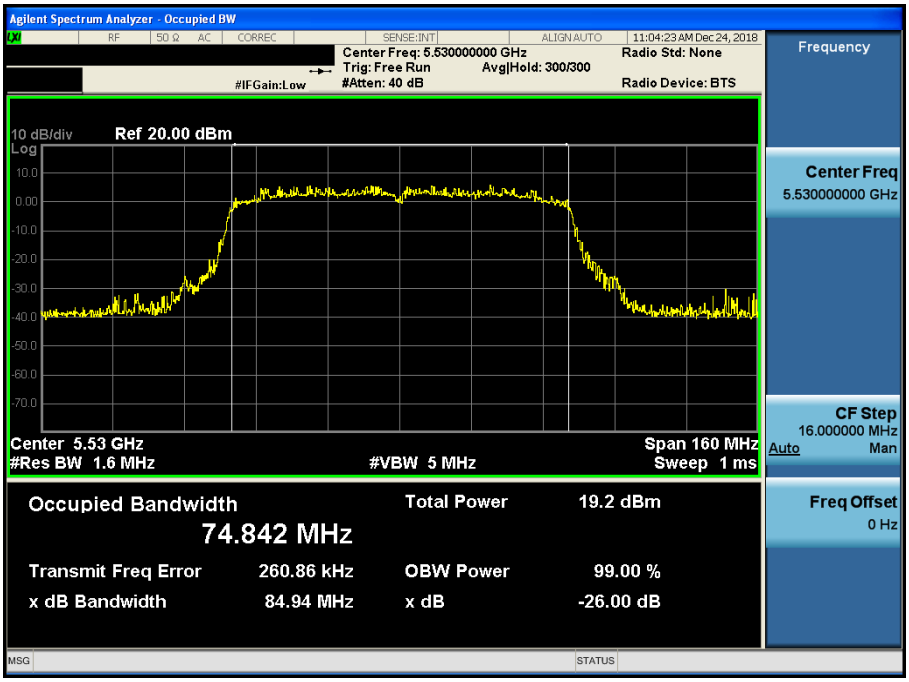
**Occupied Bandwidth 99%** Test Mode: 802.11ac(VHT80) & Ch.42



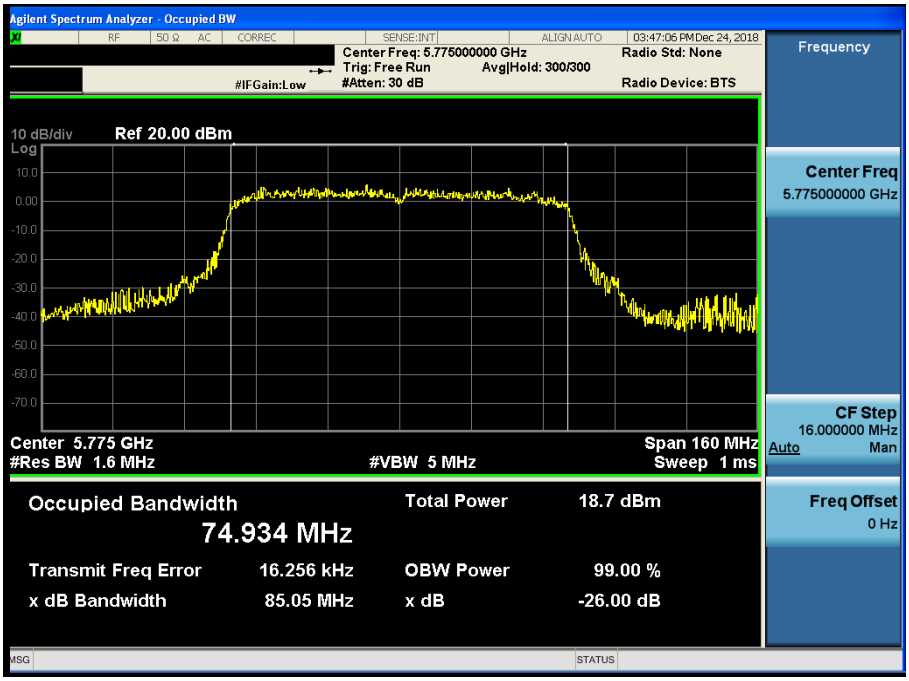

**Occupied Bandwidth 99%** Test Mode: 802.11ac(VHT80) & Ch.58



**Occupied Bandwidth 99%** Test Mode: 802.11ac(VHT80) & Ch.106




**Occupied Bandwidth 99%** Test Mode: 802.11ac(VHT80) & Ch.155



# 9. LIST OF TEST EQUIPMENT

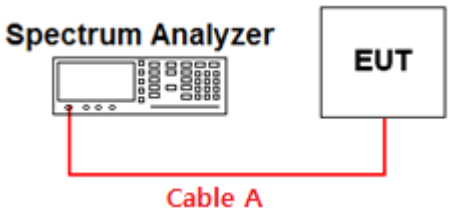
| Type | Manufacturer | Model | Cal.Date (yy/mm/dd) | Next.Cal.Date (yy/mm/dd) | S/N |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent Technologies | N9020A | 18/07/09 | 19/07/09 | MY50200834 |
| Spectrum Analyzer | Agilent Technologies | N9020A | 18/01/03 | 19/01/03 | MY48011700 |
| Spectrum Analyzer | Agilent Technologies | N9030A | 18/07/09 | 19/07/09 | MY53310140 |
| DC Power Supply | Agilent Technologies | 66332A | 18/07/02 | 19/07/02 | US37473422 |
| Multimeter | FLUKE | 17B | 17/12/26 | 18/12/26 | 26030065WS |
| Signal Generator | Rohde Schwarz | SMBV100A | 17/12/27 | 18/12/27 | 255571 |
| Signal Generator | ANRITSU | MG3695C | 18/02/12 | 19/02/12 | 173501 |
| Thermohygrometer | BODYCOM | BJ5478 | 18/01/03 | 19/01/03 | 120612-1 |
| Thermohygrometer | BODYCOM | BJ5478 | 18/01/03 | 19/01/03 | 120612-2 |
| Thermohygrometer | BODYCOM | BJ5478 | 18/07/09 | 19/07/09 | N/A |
| HYGROMETER | TESTO | 608-H1 | 18/02/10 | 19/02/10 | 34862883 |
| Temp & Humi Test Chamber | SJ Science | SJ-TH-S50 | 18/07/06 | 19/07/06 | U5542113 |
| Loop Antenna | Schwarzbeck | FMZB1513 | 18/01/30 | 20/01/30 | 1513-128 |
| BILOG ANTENNA | Schwarzbeck | VULB 9160 | 18/07/13 | 20/07/13 | 3359 |
| Horn Antenna | ETS-Lindgren | 3115 | 17/01/13 | 19/01/13 | 9202-3820 |
| Horn Antenna | Schwarzbeck | BBHA 9120C | 17/12/04 | 19/12/04 | 9120C-561 |
| Horn Antenna | A.H.Systems Inc. | SAS-574 | 17/07/31 | 19/07/31 | 155 |
| PreAmplifier | tsj | MLA-0118-J01-45 | 18/02/08 | 19/02/08 | 17138 |
| PreAmplifier | tsj | MLA-1840-J02-45 | 18/07/06 | 19/07/06 | 16966-10728 |
| PreAmplifier | H.P | 8447D | 17/12/26 | 18/12/26 | 2944A07774 |
| Attenuator | SMAJK | SMAJK-2-3 | 18/07/02 | 19/07/02 | 3 |
| Attenuator | Aeroflex/Weinschel | 56-3 | 18/07/02 | 19/07/02 | Y2370 |
| Attenuator | SRTechnology | F01-B0606-01 | 18/07/02 | 19/07/02 | 13092403 |
| Attenuator | Hefei Shunze | SS5T2.92-10-40 | 18/07/03 | 19/07/03 | 16012202 |
| High Pass Filter | Wainwright Instruments | WHNX8.0/26.5-6SS | 18/07/03 | 19/07/03 | 3 |
| High Pass Filter | Wainwright Instruments | WHKX12-935-1000-15000-40SS | 18/07/02 | 19/07/02 | 8 |
| High Pass Filter | Wainwright Instruments | WHKX10-2838-3300-18000-60SS | 18/07/02 | 19/07/02 | 1 |
| Power Meter & Wide Bandwidth Sensor | Anritsu | ML2495A MA2490A | 18/04/17 | 19/04/17 | 1306007 1249001 |
| EMI Test Receiver | Rohde Schwarz | ESR7 | 18/02/13 | 19/02/13 | 101061 |
| EMI Test Receiver | Rohde Schwarz | ESCI7 | 18/02/12 | 19/02/12 | 100910 |
| PULSE LIMITER | Rohde Schwarz | ESH3-Z2 | 18/09/27 | 19/09/27 | 101333 |
| LISN | SCHWARZBECK | NNLK 8121 | 18/03/20 | 19/03/20 | 06183 |
| Cable | Radiall | TESTPRO3 | 18/07/06 | 19/07/06 | M-01 |
| Cable | Junkosha | MWX315 | 18/11/19 | 19/11/19 | M-05 |
| Cable | Junkosha | MWX221 | 18/11/19 | 19/11/19 | M-06 |
| Cable | Junkosha | MWX241 | 18/06/25 | 19/06/25 | G-04 |
| Cable | Junkosha | MWX241 | 18/06/25 | 19/06/25 | G-07 |
| Cable | DT&C | Cable | 18/07/06 | 19/07/06 | G-13 |
| Cable | DT&C | Cable | 18/07/06 | 19/07/06 | G-14 |
| Cable | HUBER+SUHNER | SUCOFLEX 104 | 18/07/06 | 19/07/06 | G-15 |
| Cable | DT&C | CABLE | 18/07/05 | 19/07/05 | RF-82 |

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017
Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

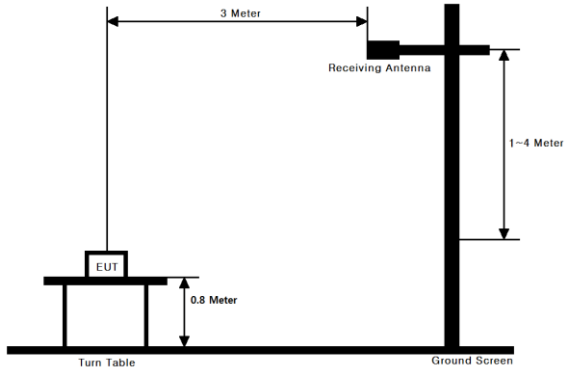
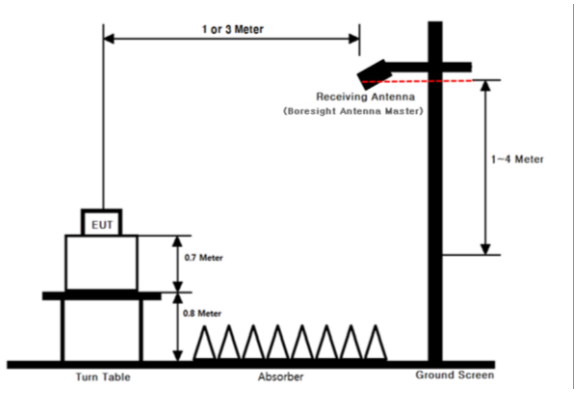
# APPENDIX I

## Test set up Diagram

### ▪ Conducted Measurement




### ▪ Radiated Measurement

| Below 1GHz | Above 1GHz |
|---|---|
|  |  |

# APPENDIX II

## Duty Cycle Information

### ▣ Test Procedure

**Duty Cycle [X = On Time / ( On + Off time )]** is measured using Measurement Procedure **of KDB789033 D02v02r01**

1. Set the center frequency of the spectrum analyzer to the center frequency of the transmission.
2. Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value.
3. Set VBW ≥ RBW. Set detector = peak.
4. Note : The zero-span measurement method shall not be used unless both **RBW and VBW are > 50/*T***, where *T* is defined in section II.B.1.a), and **the number of sweep points across duration *T* exceeds 100**. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if *T* ≤ 16.7 microseconds.)

   *T* : The minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
   (***T* = On time** of the above table since the EUT operates with above fixed Duty Cycle and it is the minimum On time)

### ▣ Test Results:

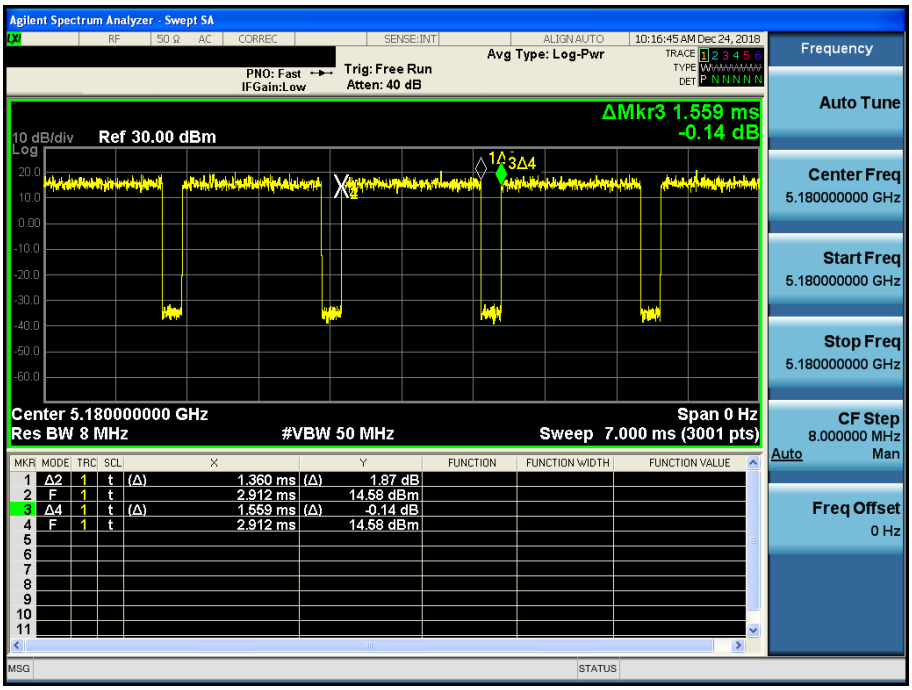
**Duty cycle**

| Mode | Data Rate | Tested Frequency [MHz] | Maximum Achievable Duty Cycle (*x*) = On / (On+Off) | | | Duty Cycle Correction Factor [dB] | 50/*T* [kHz] |
|---|---|---|---|---|---|---|---|
| | | | On Time [ms] | (On+Off) Time [ms] | *x* | | |
| 802.11a | 6Mbps | 5180 | 1.36 | 1.56 | 87.24 | 0.60 | 36.76 |
| 802.11n (HT20) | MCS0 | 5180 | 1.27 | 1.47 | 86.53 | 0.63 | 39.37 |
| 802.11n (HT40) | MCS0 | 5190 | 0.49 | 0.69 | 70.74 | 1.51 | 102.04 |
| 802.11ac (VHT80) | MCS0 | 5210 | 0.25 | 0.45 | 55.36 | 2.57 | 200.00 |

## Single Transmit

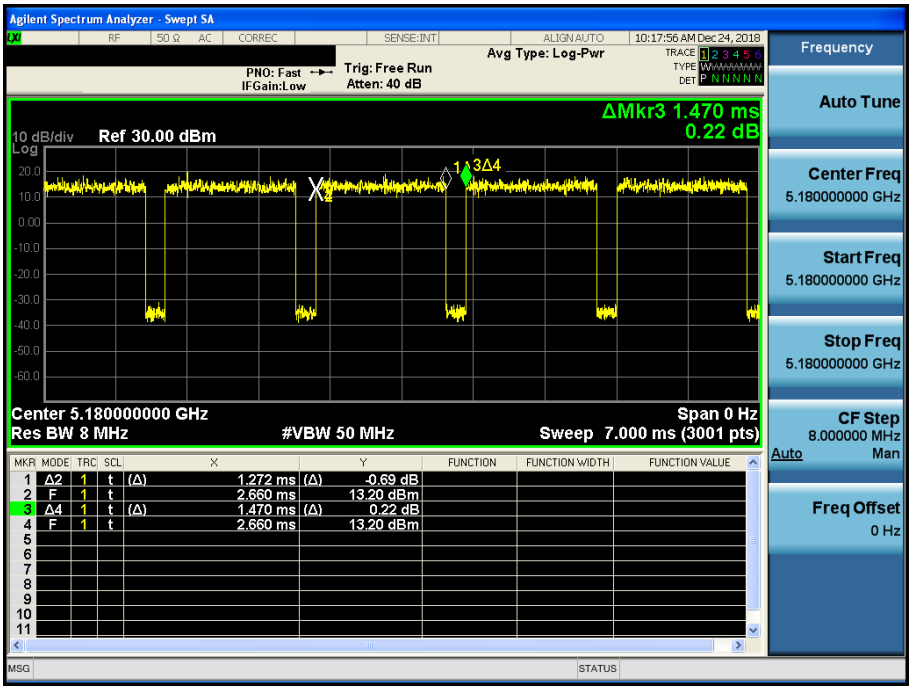
### Duty Cycle

Test Mode: 802.11a & Ch.36

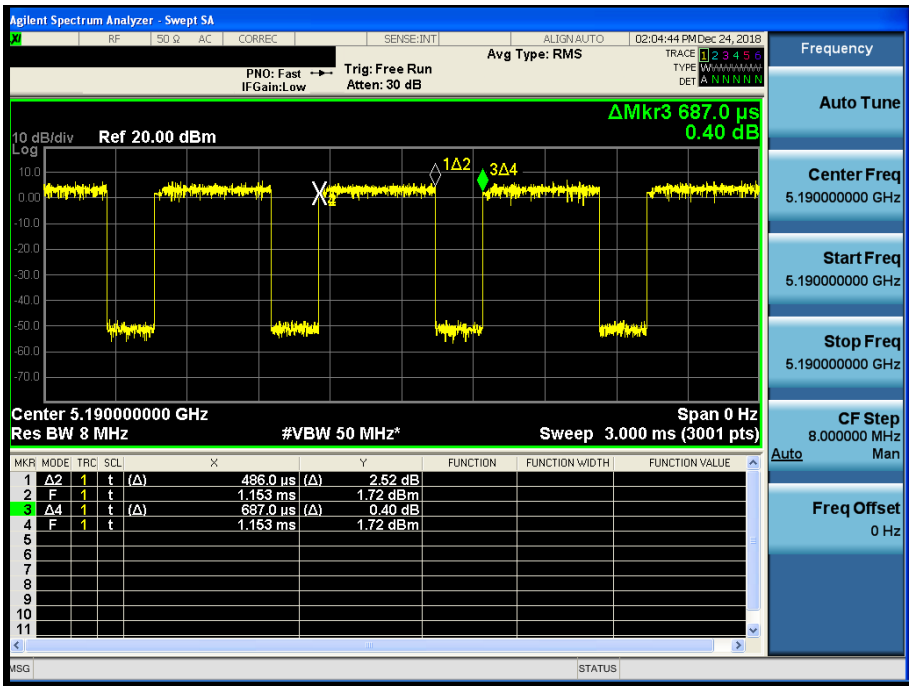



### Duty Cycle

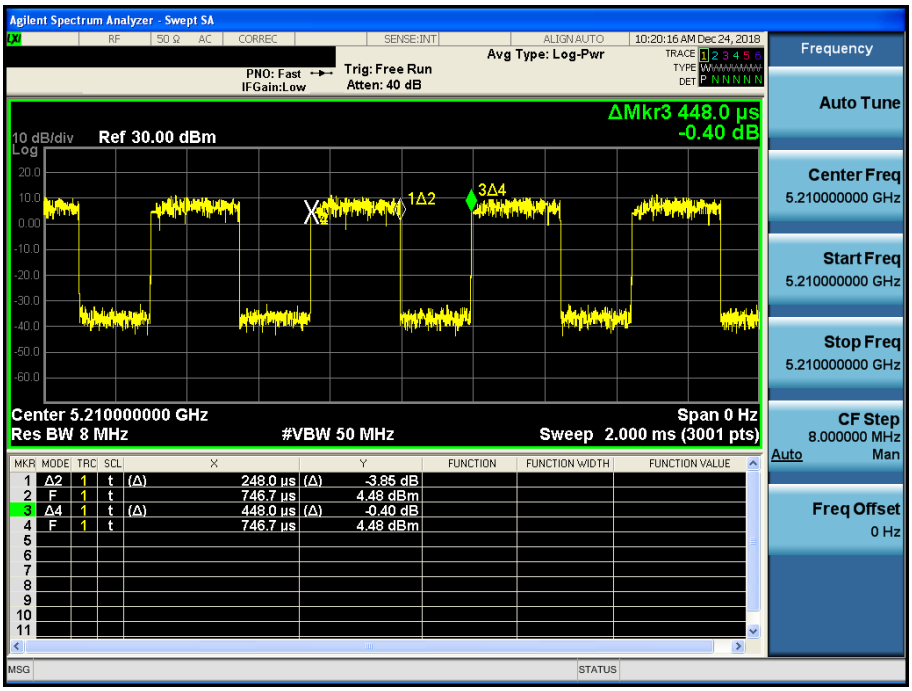
Test Mode: 802.11n HT20 & Ch.36



**Duty Cycle** Test Mode: 802.11n HT40 & Ch.38



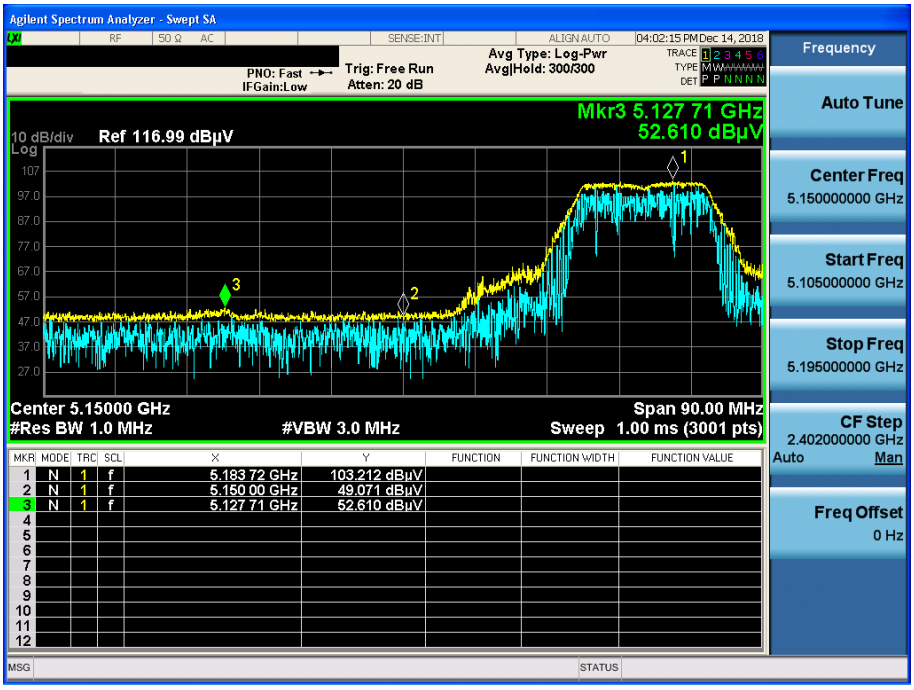

**Duty Cycle** Test Mode: 802.11ac VHT80 & Ch.42



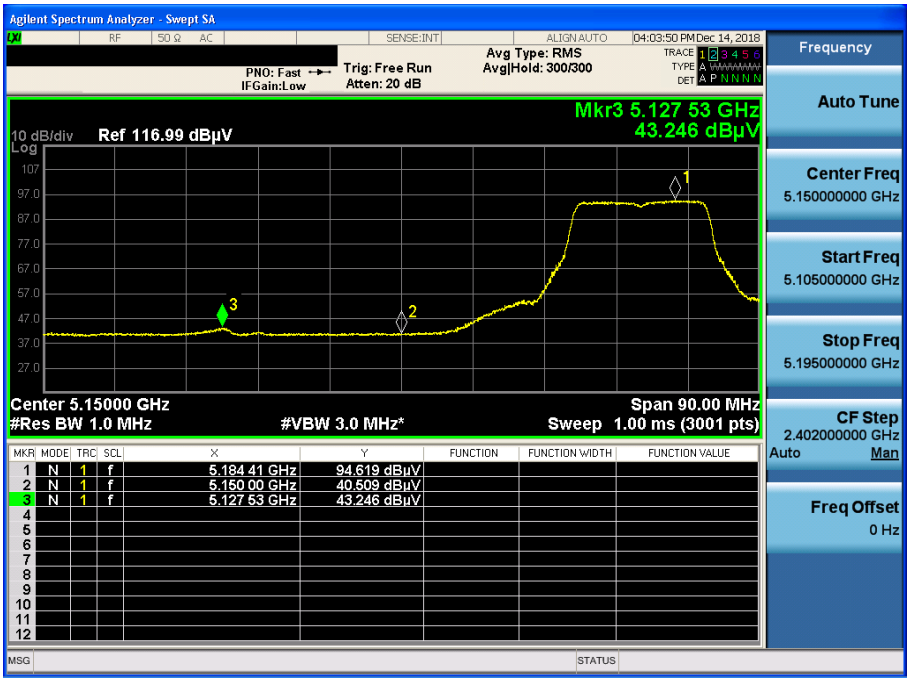
# APPENDIX III

## Unwanted Emissions (Radiated) Test Plot

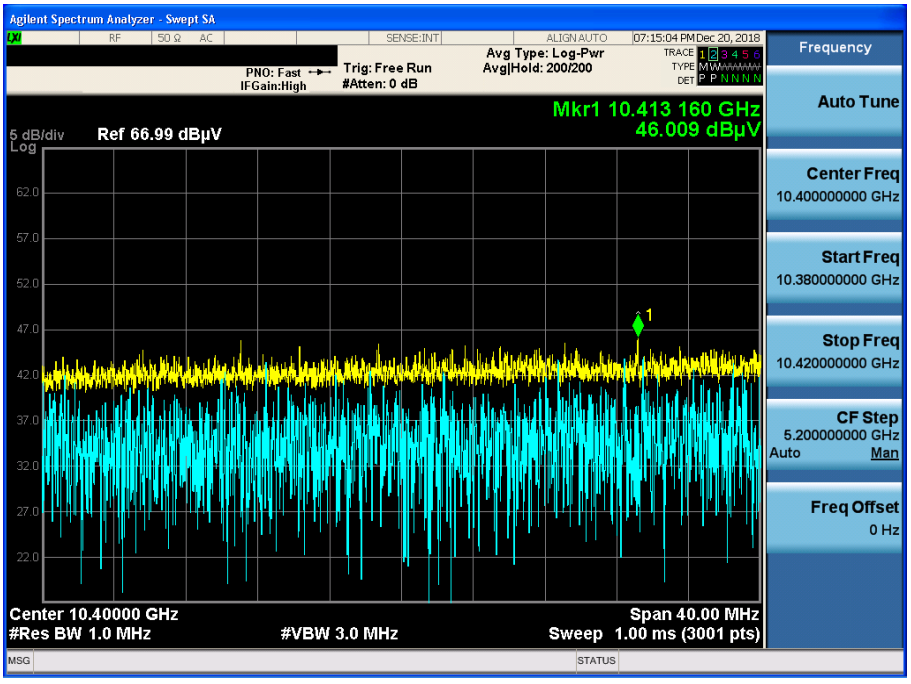
### 802.11a & U-NII 1 & Ch.36 & Z axis & Hor — Detector Mode : PK



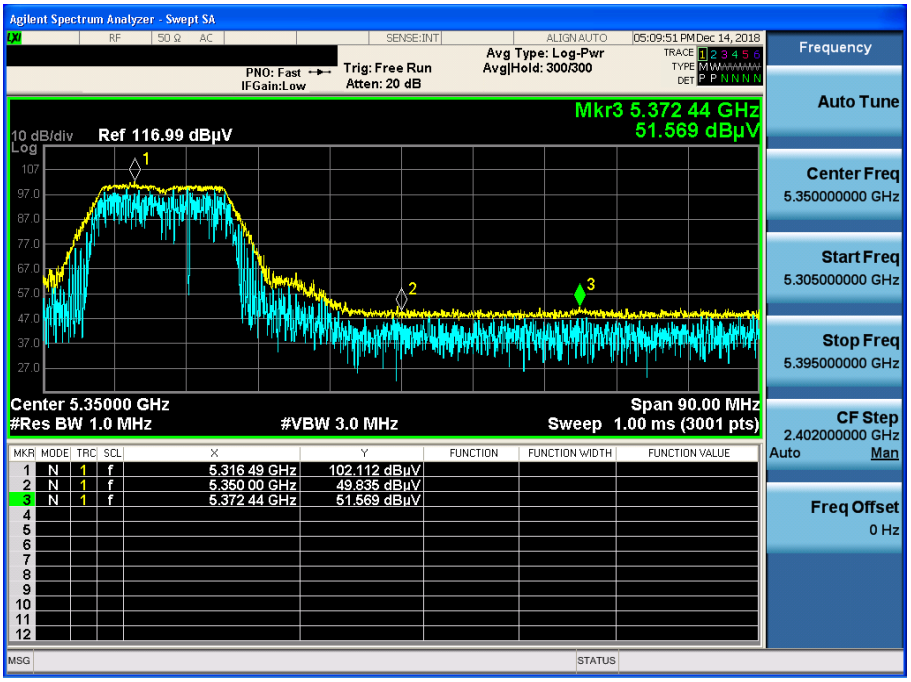

### 802.11a & U-NII 1 & Ch.36 & Z axis & Hor — Detector Mode : AV



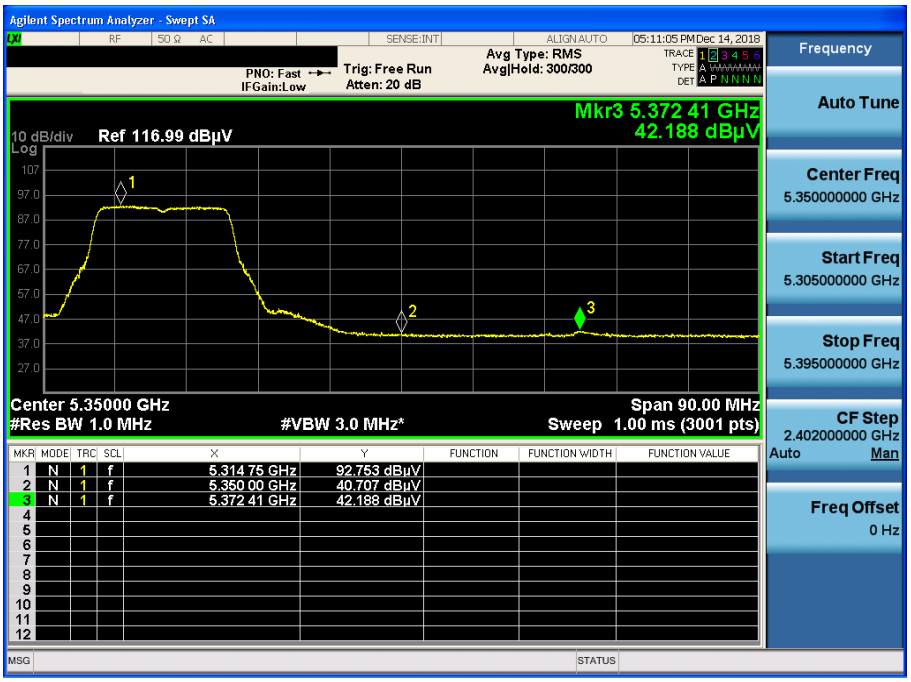
**802.11a & U-NII 1 & Ch.40 & Z axis & Hor** **Detector Mode : PK**



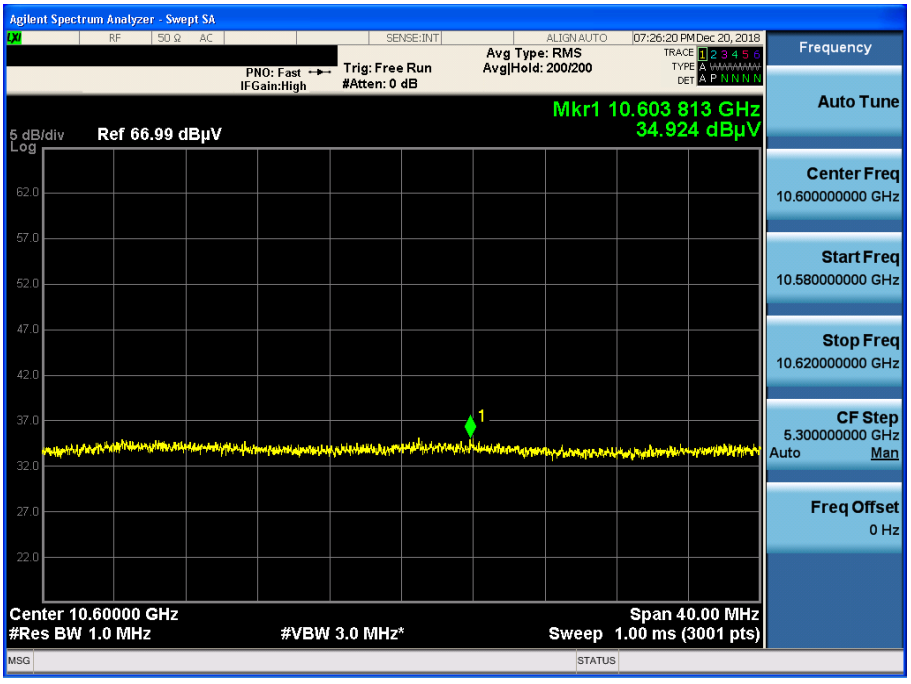
**802.11a & U-NII 2A & Ch.64 & Z axis & Hor** **Detector Mode : PK**



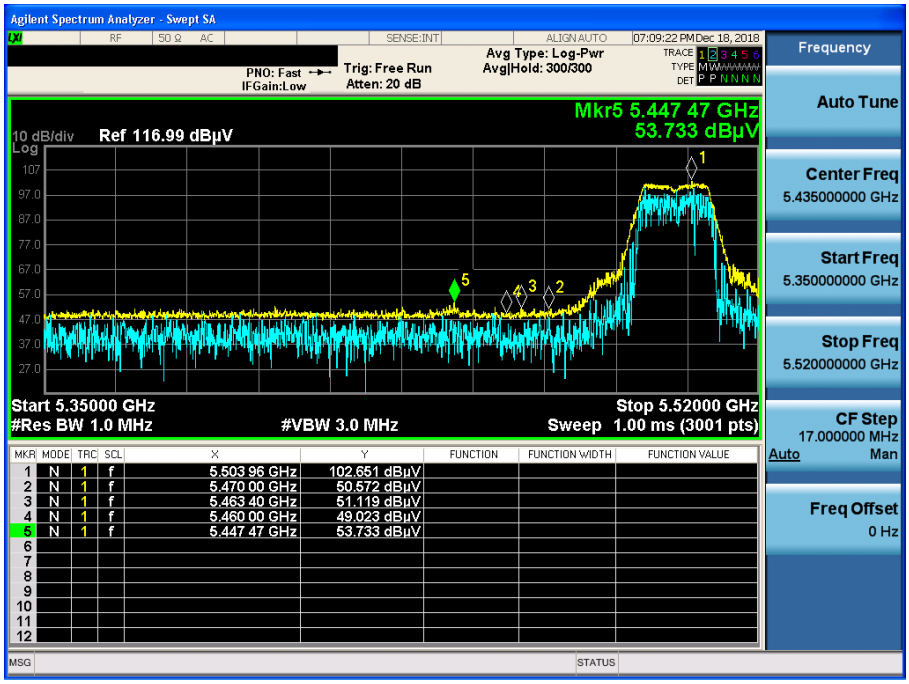

**802.11a & U-NII 2A & Ch.64 & Z axis & Hor** **Detector Mode : AV**



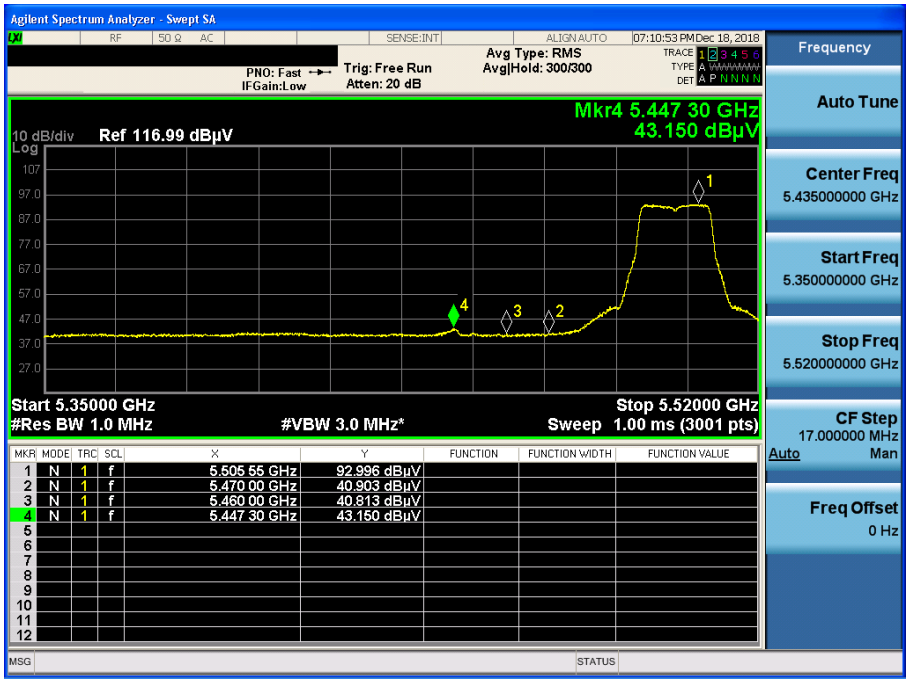
**802.11a & U-NII 2A & Ch.60 & Z axis & Hor** **Detector Mode : AV**



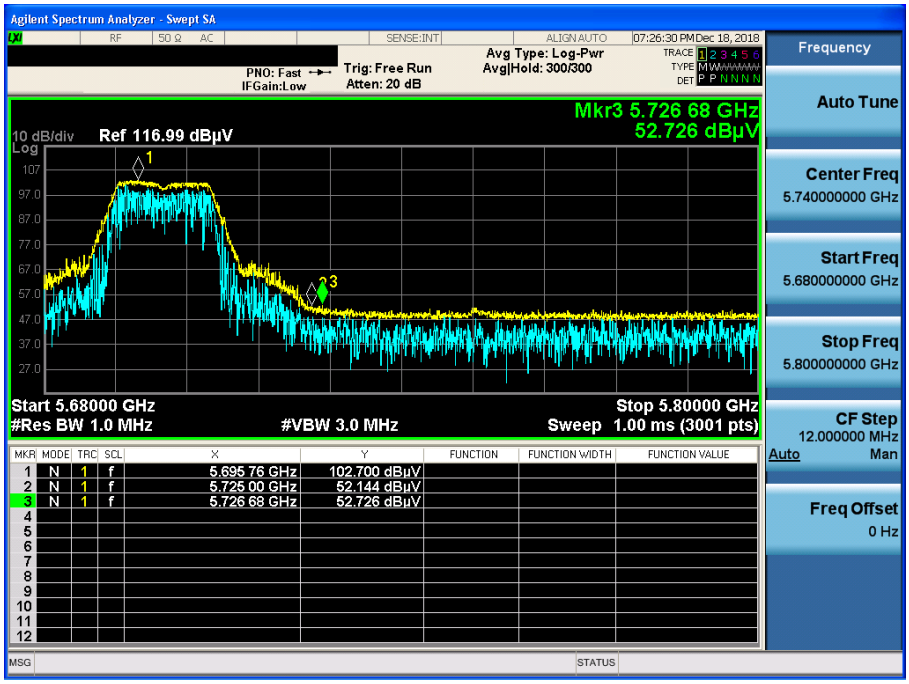
**802.11a & U-NII 2C & Ch.100 & X axis & Hor** **Detector Mode : PK**



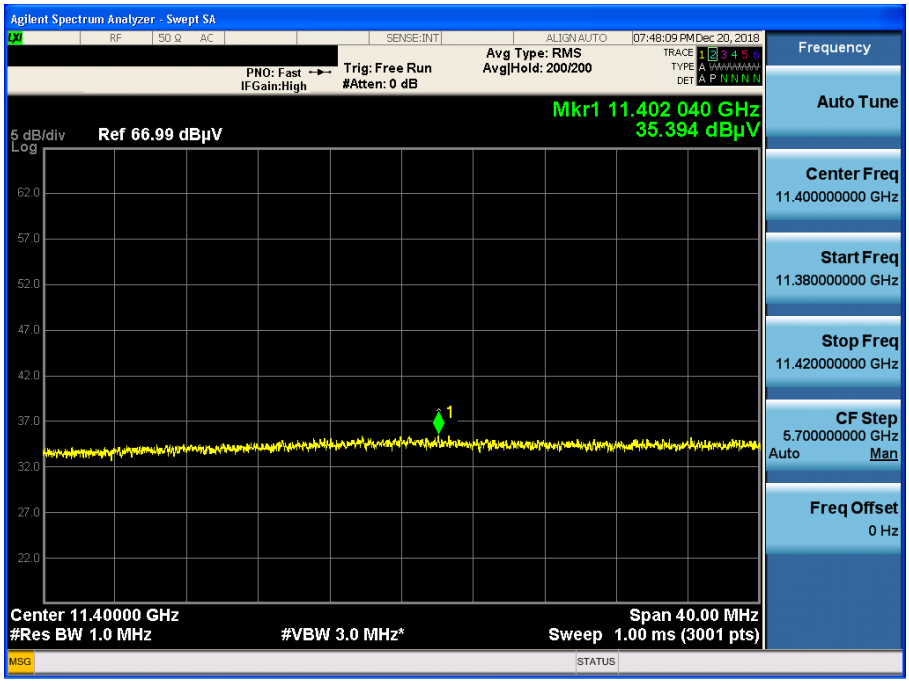

**802.11a & U-NII 2C & Ch.100 & X axis & Hor** **Detector Mode : AV**



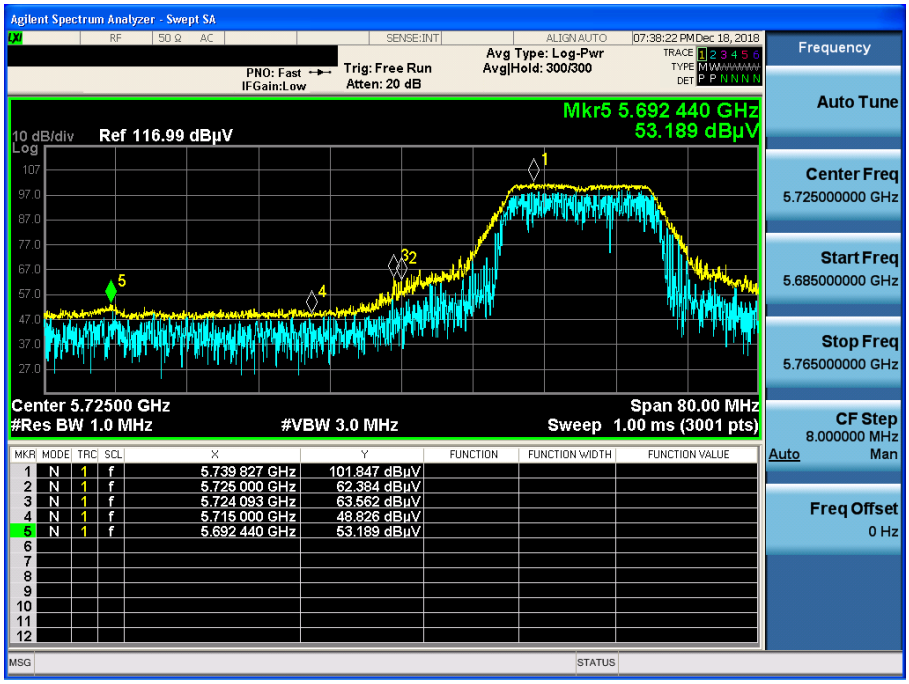
**802.11a & U-NII 2C & Ch.140 & X axis & Hor** **Detector Mode : PK**



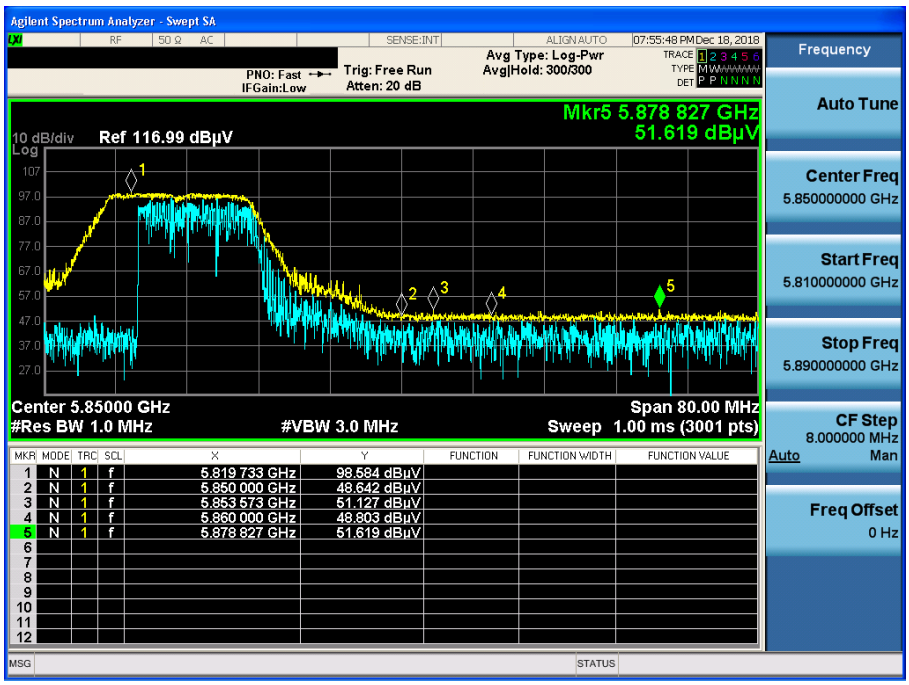

**802.11a & U-NII 2C & Ch.140 & X axis & Hor** **Detector Mode : AV**



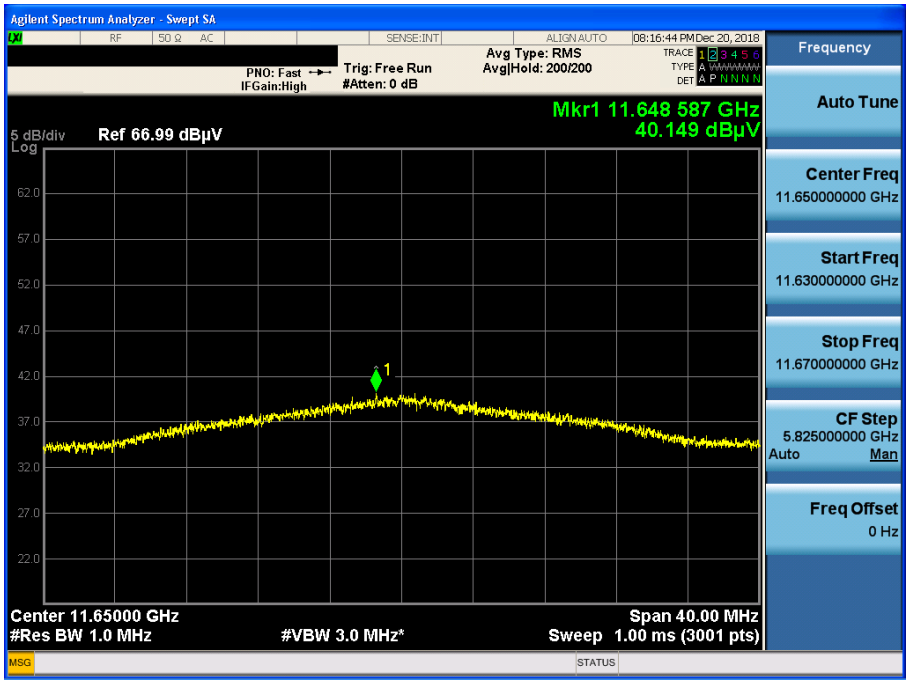
**802.11a & U-NII 3 & Ch.149 & X axis & Hor** **Detector Mode : PK**



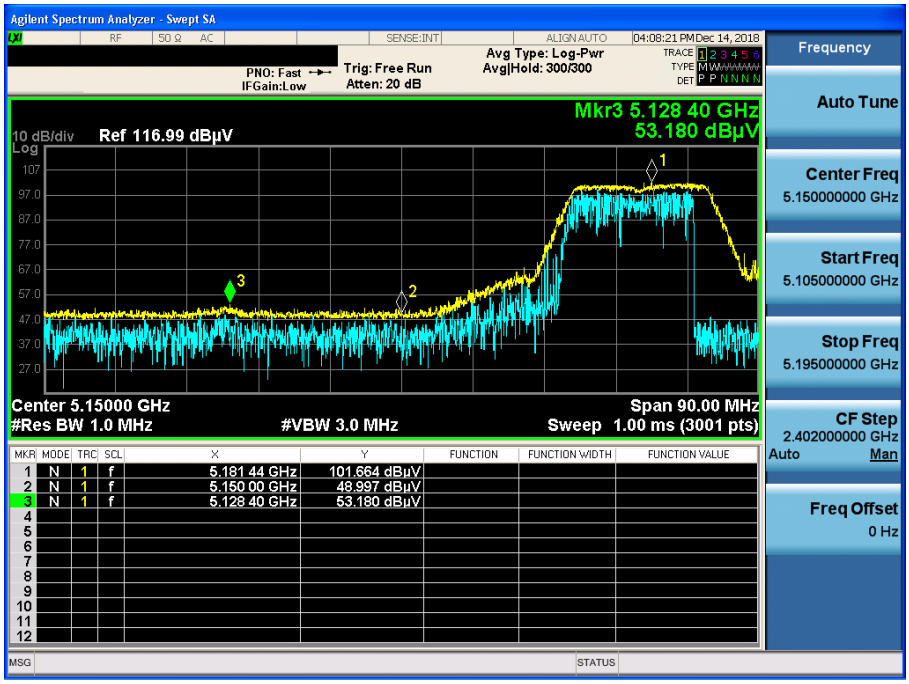

**802.11a & U-NII 3 & Ch.165 & X axis & Hor** **Detector Mode : PK**



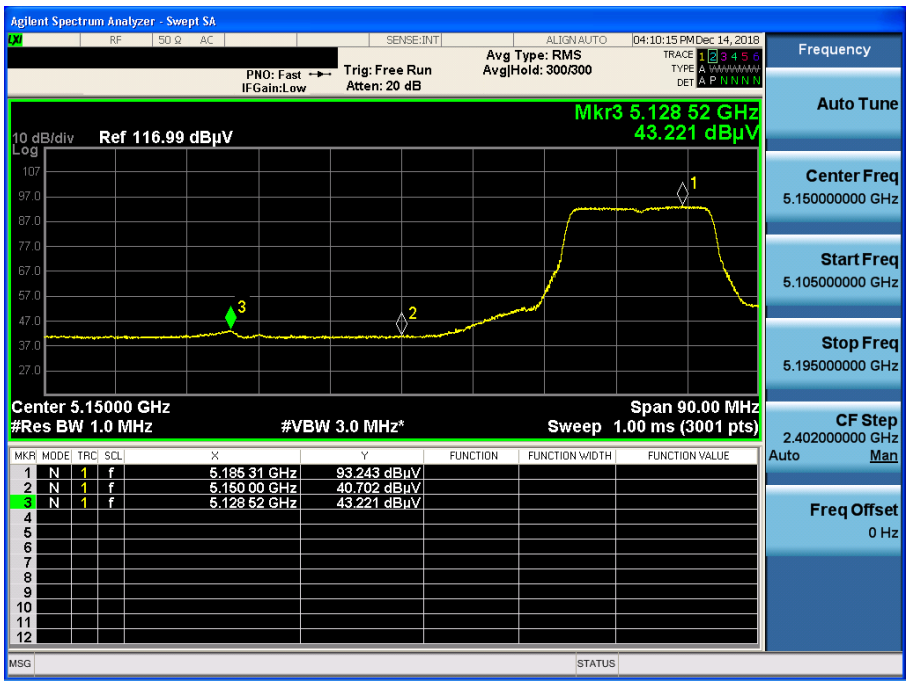
**802.11a & U-NII 3 & Ch.165 & X axis & Hor** **Detector Mode : AV**



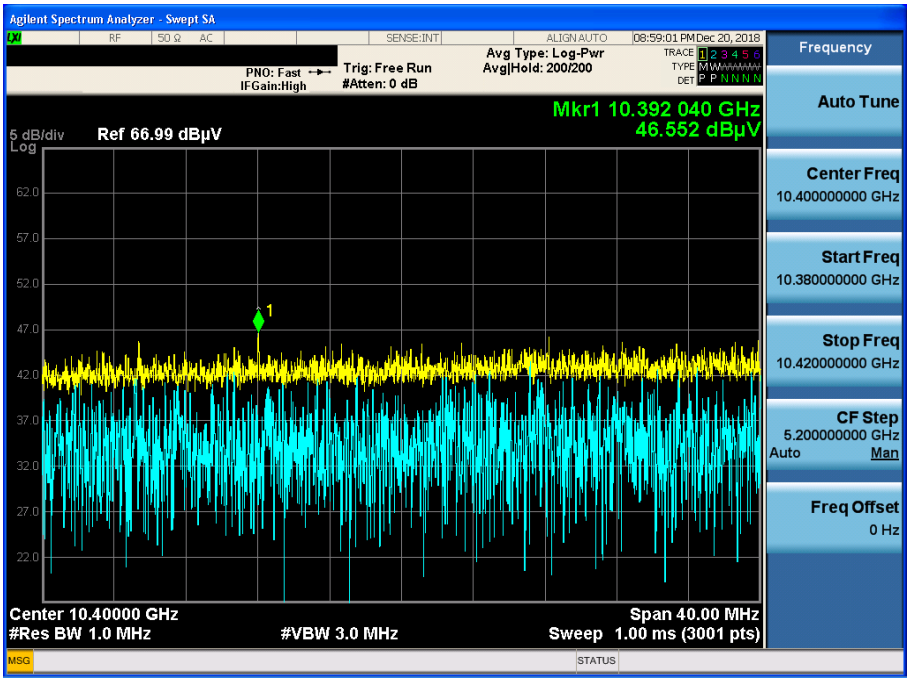
**802.11n(HT20) & U-NII 1 & Ch.36 & Z axis & Hor** **Detector Mode : PK**



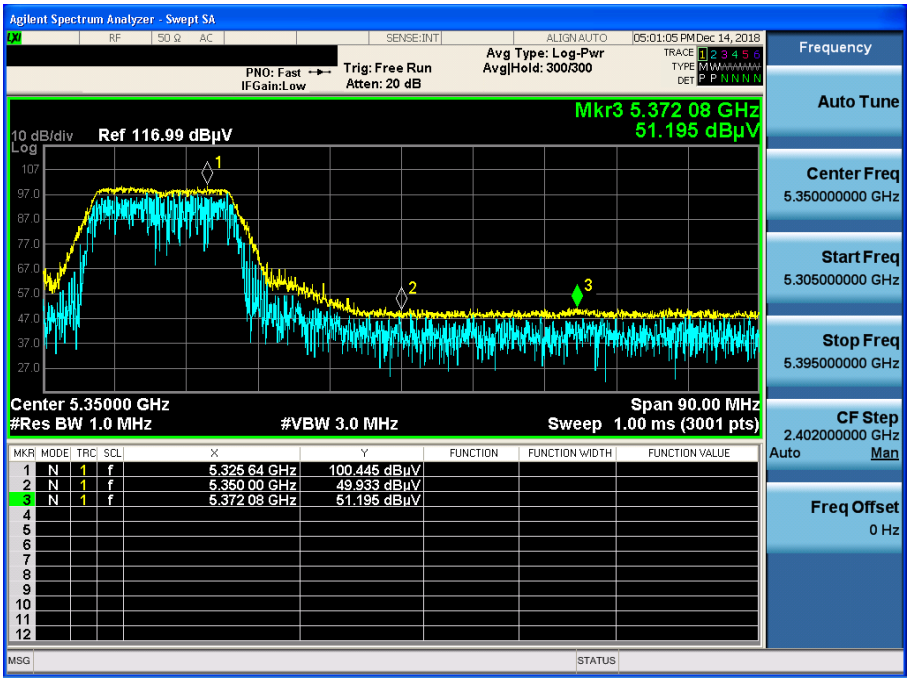

**802.11n(HT20) & U-NII 1 & Ch.36 & Z axis & Hor** **Detector Mode : AV**



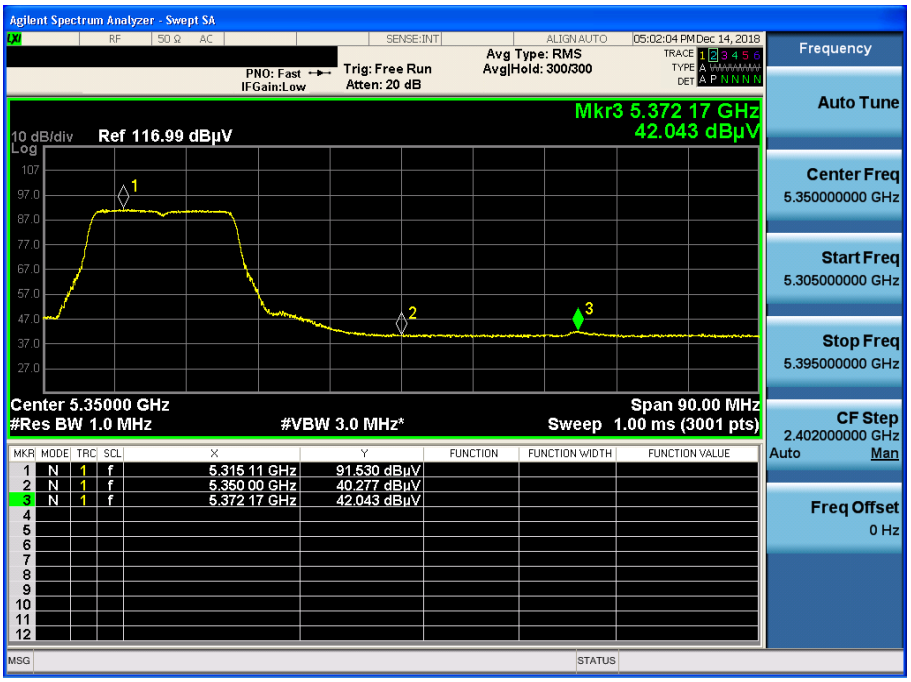
**802.11n(VHT20) & U-NII 1 & Ch.40 & Z axis & Hor Detector Mode : PK**



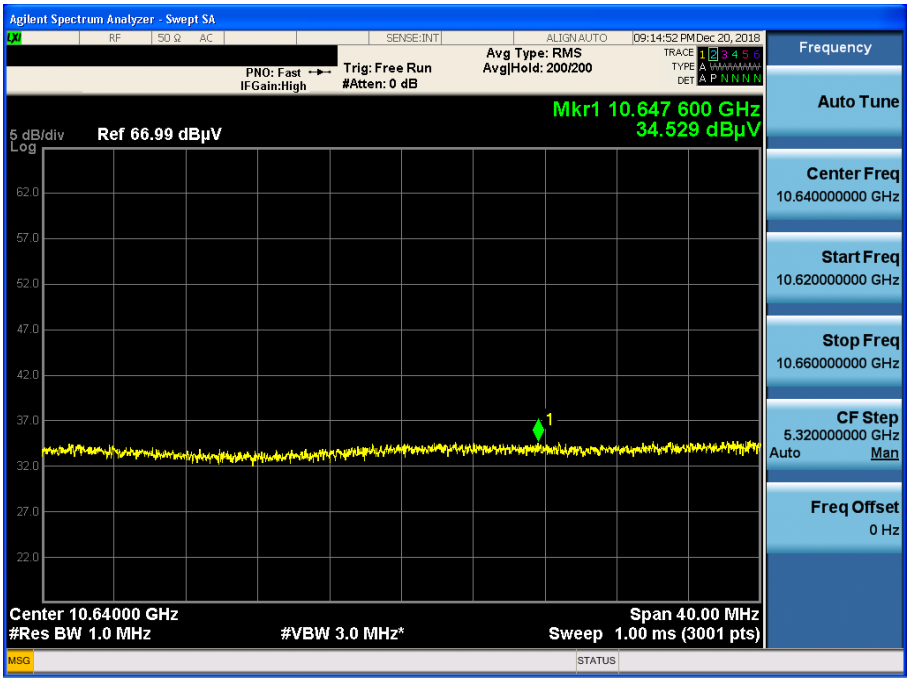
**802.11n(VHT20) & U-NII 2A & Ch.64 & Z axis & Hor** **Detector Mode : PK**



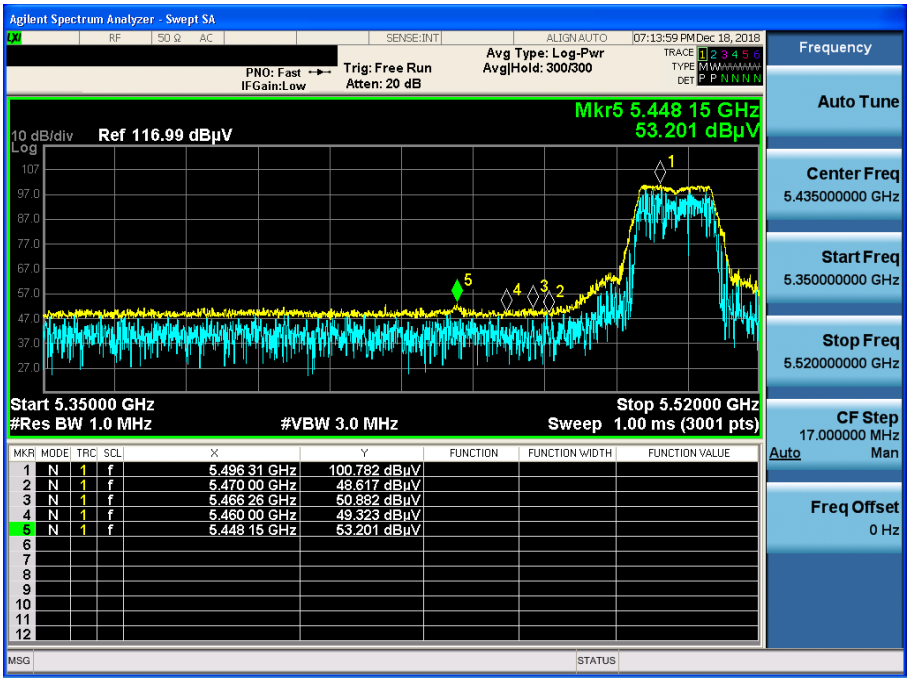

**802.11n(VHT20) & U-NII 2A & Ch.64 & Z axis & Hor** **Detector Mode : AV**



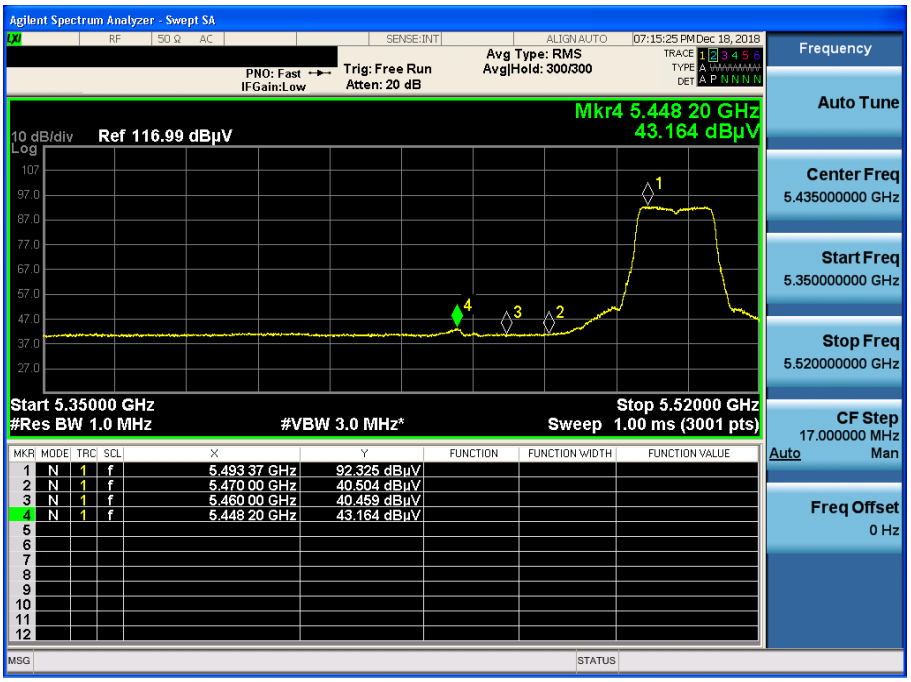
**802.11n(HT20) & U-NII 2A & Ch.64 & Z axis & Hor Detector Mode : AV**



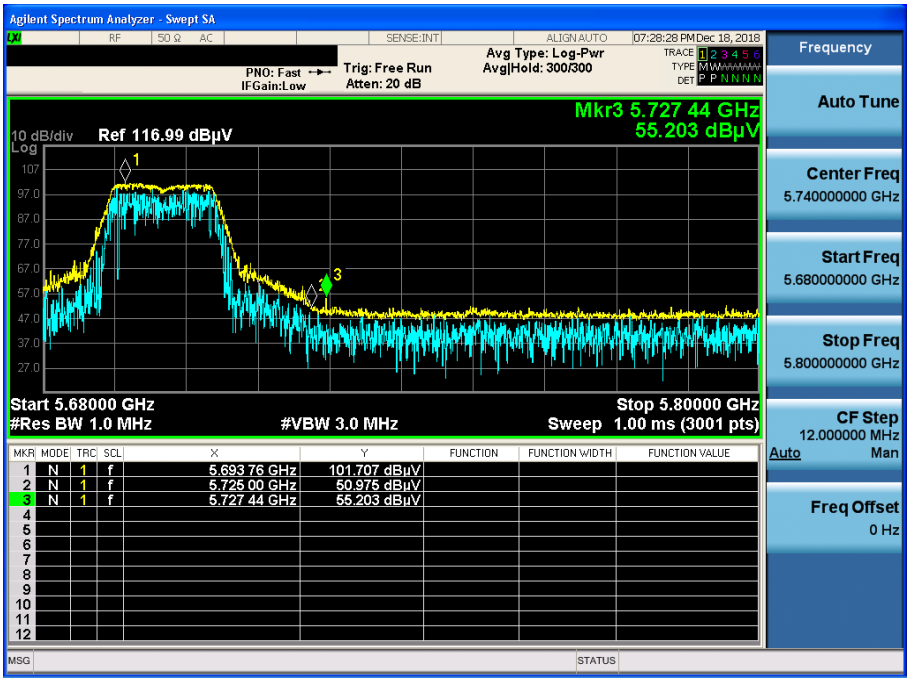
**802.11n(HT20) & U-NII 2C & Ch.100 & X axis & Hor Detector Mode : PK**



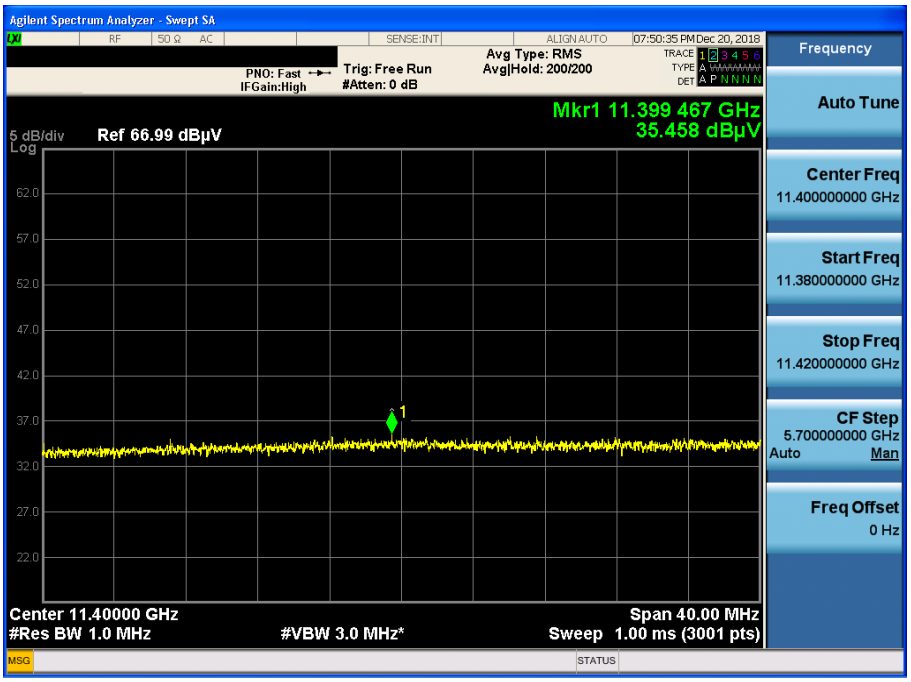

**802.11n(HT20) & U-NII 2C & Ch.100 & X axis & Hor Detector Mode : AV**



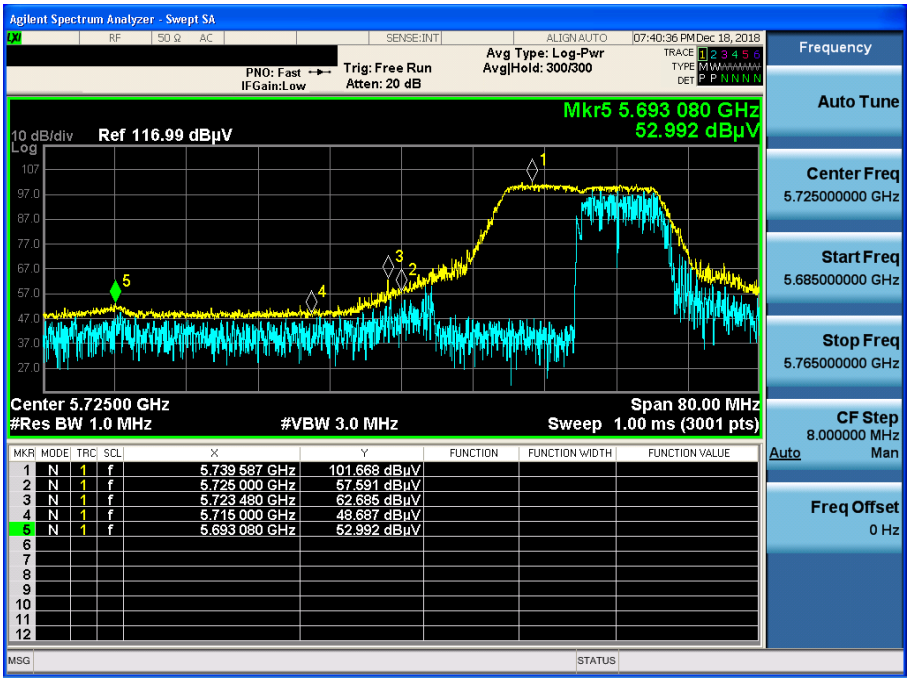
**802.11n(VHT20) & U-NII 2C & Ch.140 & X axis & Hor Detector Mode : PK**



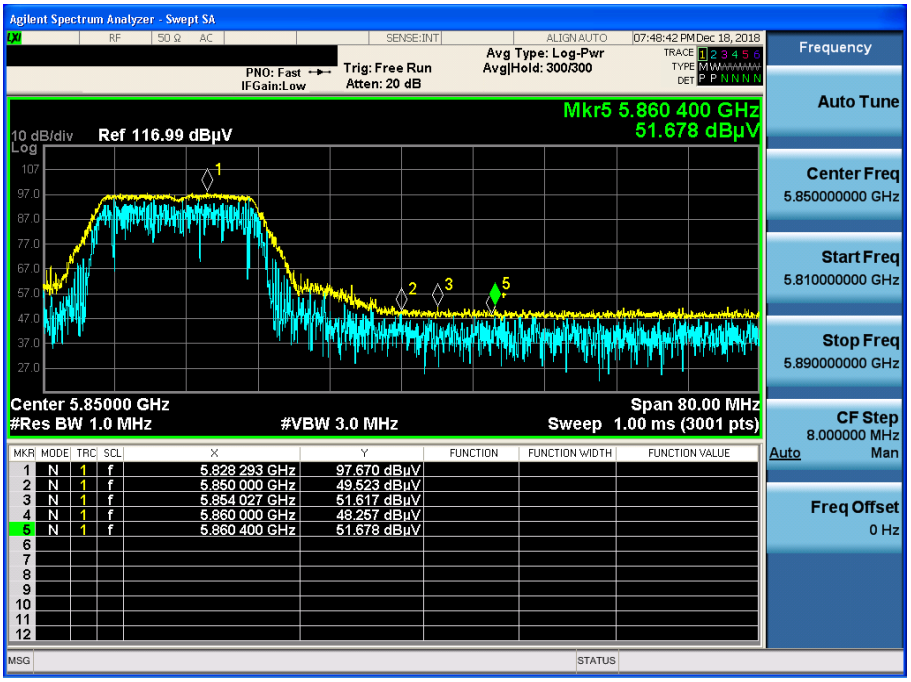

**802.11n(VHT20) & U-NII 2C & Ch.140 & X axis & Hor Detector Mode : AV**



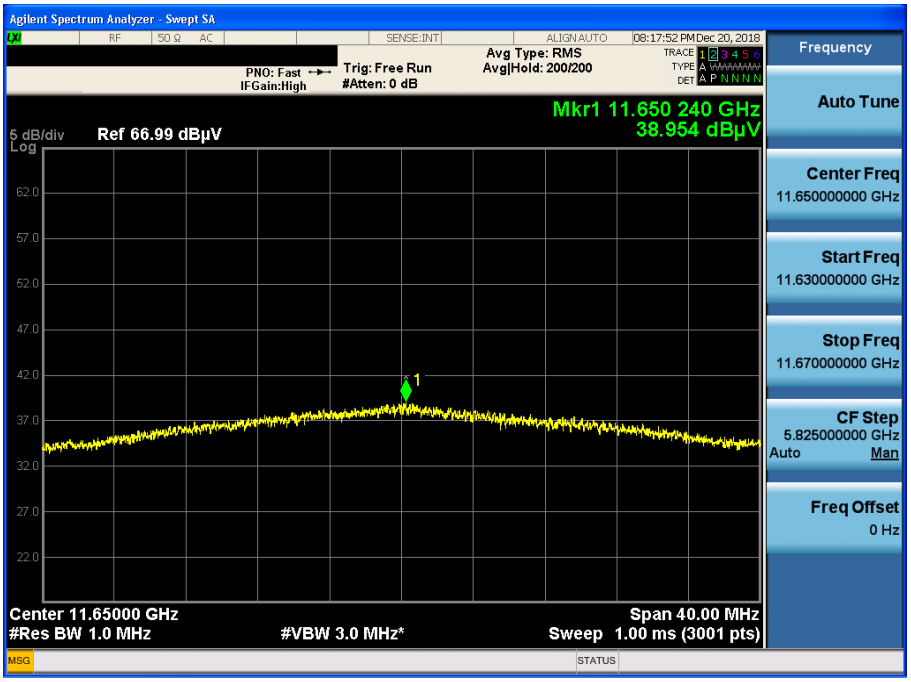
**802.11n(HT20) & U-NII 3 & Ch.149 & X axis & Hor** **Detector Mode : PK**



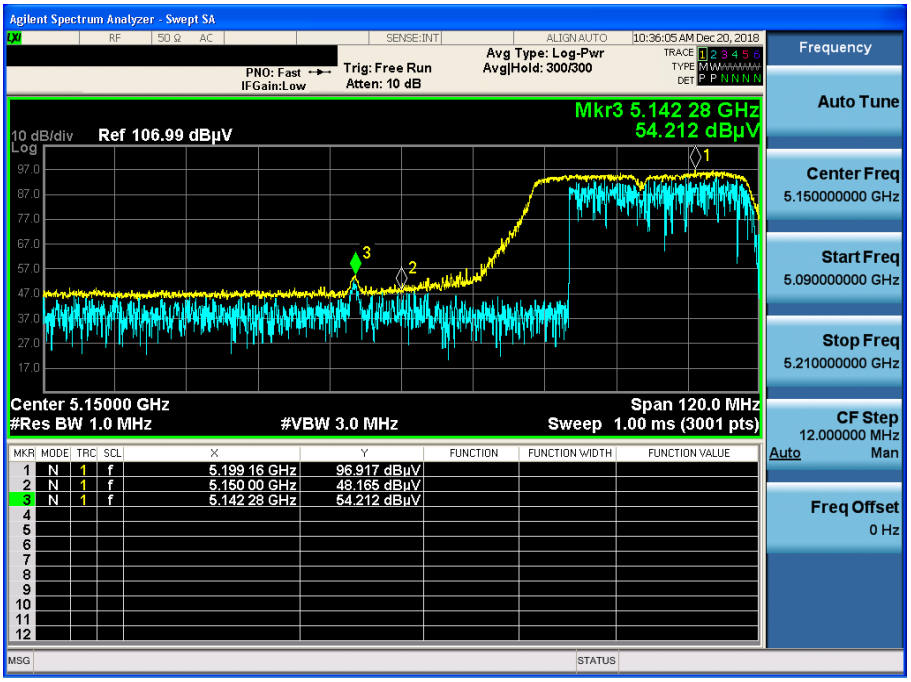

**802.11n(HT20) & U-NII 3 & Ch.165 & X axis & Hor** **Detector Mode : PK**



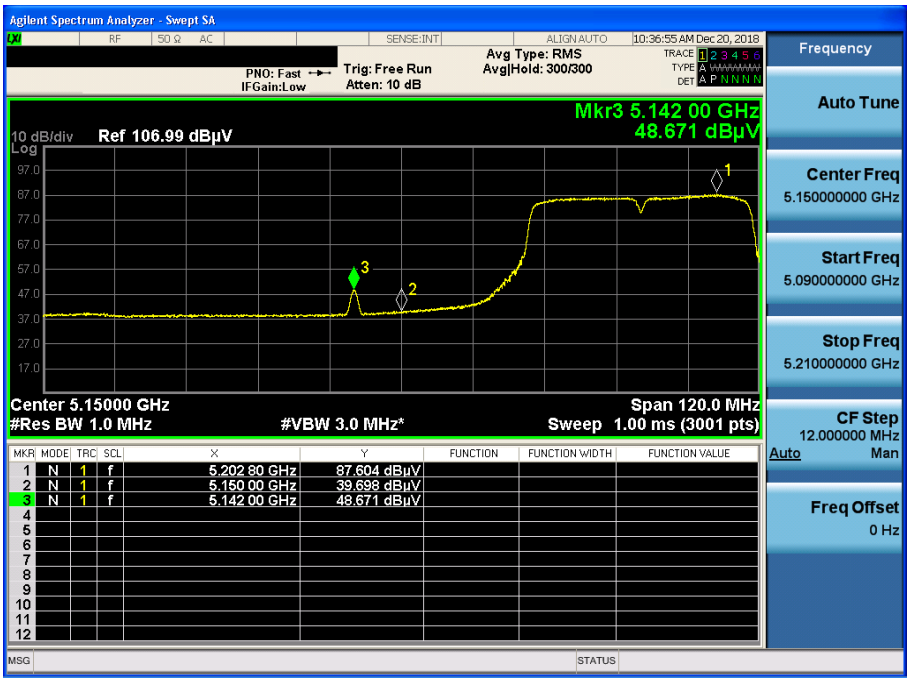
**802.11n(HT20) & U-NII 3 & Ch.165 & X axis & Hor Detector Mode : AV**



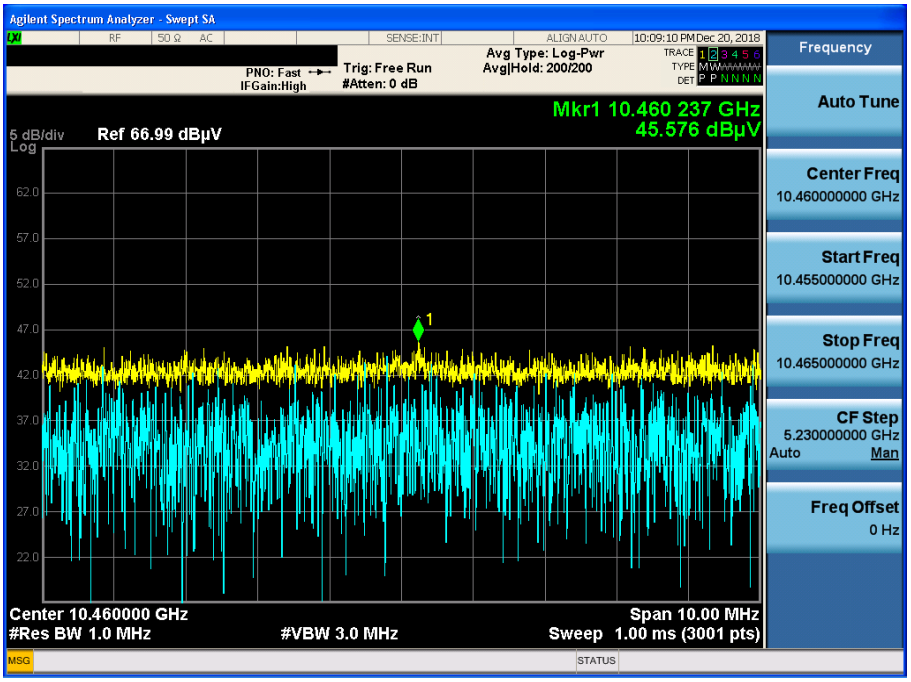
**802.11n(HT40) & U-NII 1 & Ch.38 & Z axis & Hor** **Detector Mode : PK**



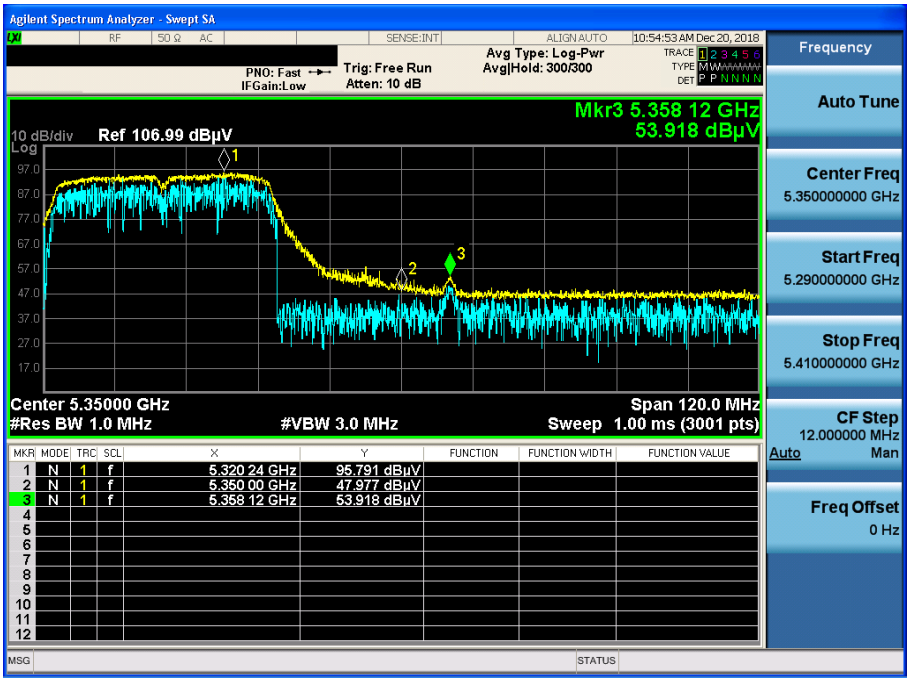

**802.11n(HT40) & U-NII 1 & Ch.38 & Z axis & Hor** **Detector Mode : AV**



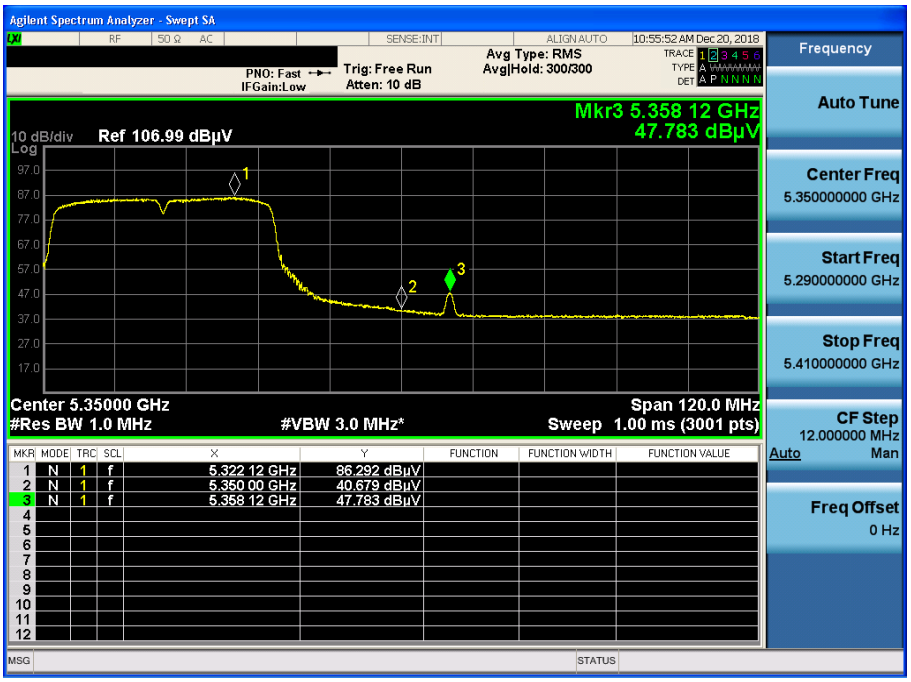
**802.11n(HT40) & U-NII 1 & Ch.46 & Z axis & Hor Detector Mode : PK**



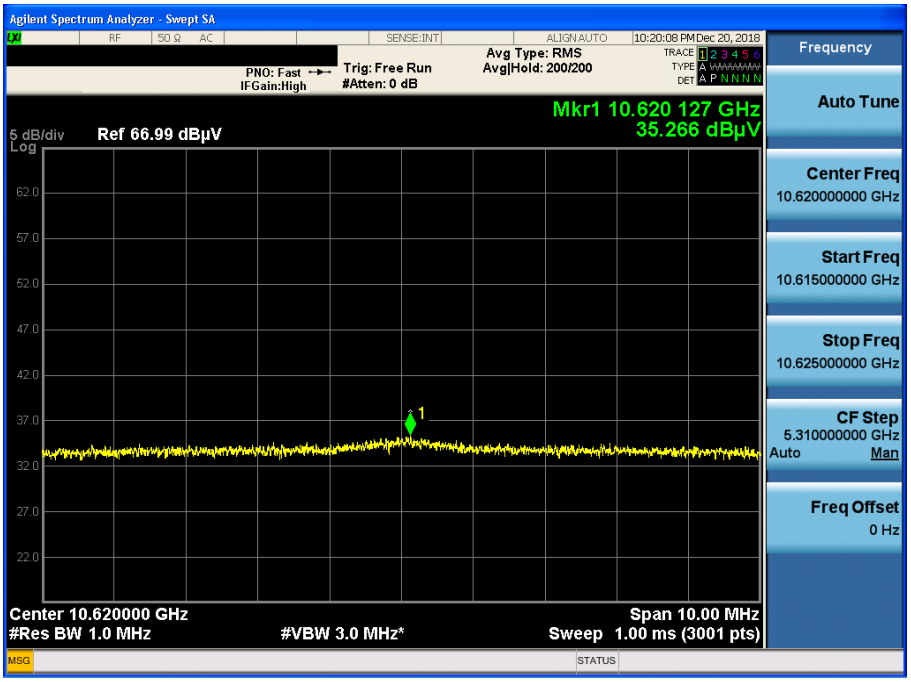
**802.11n(HT40) & U-NII 2A & Ch.62 & X axis & Hor** **Detector Mode : PK**



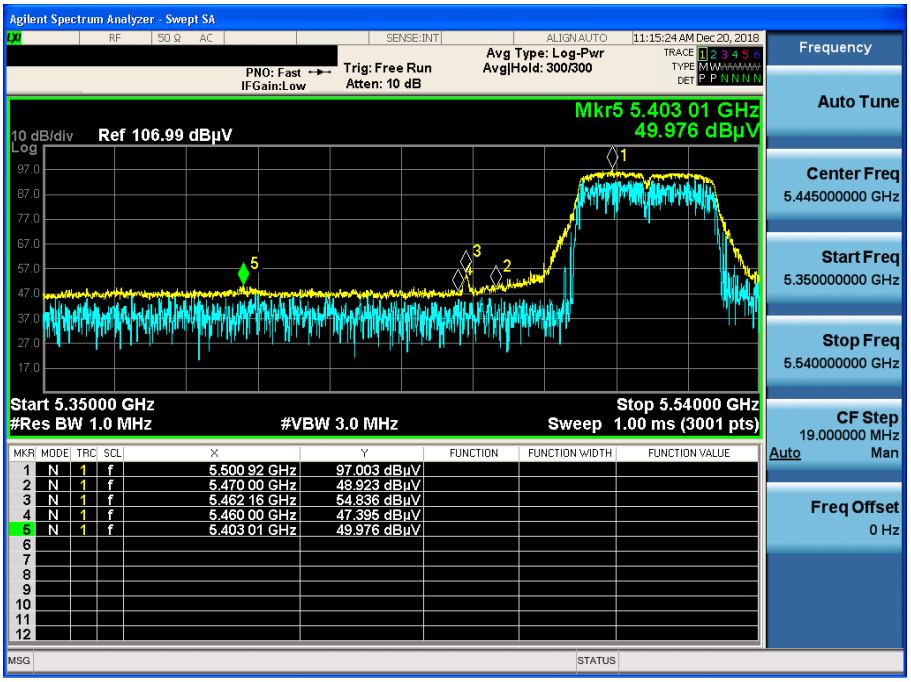

**802.11n(HT40) & U-NII 2A & Ch.62 & X axis & Hor** **Detector Mode : AV**



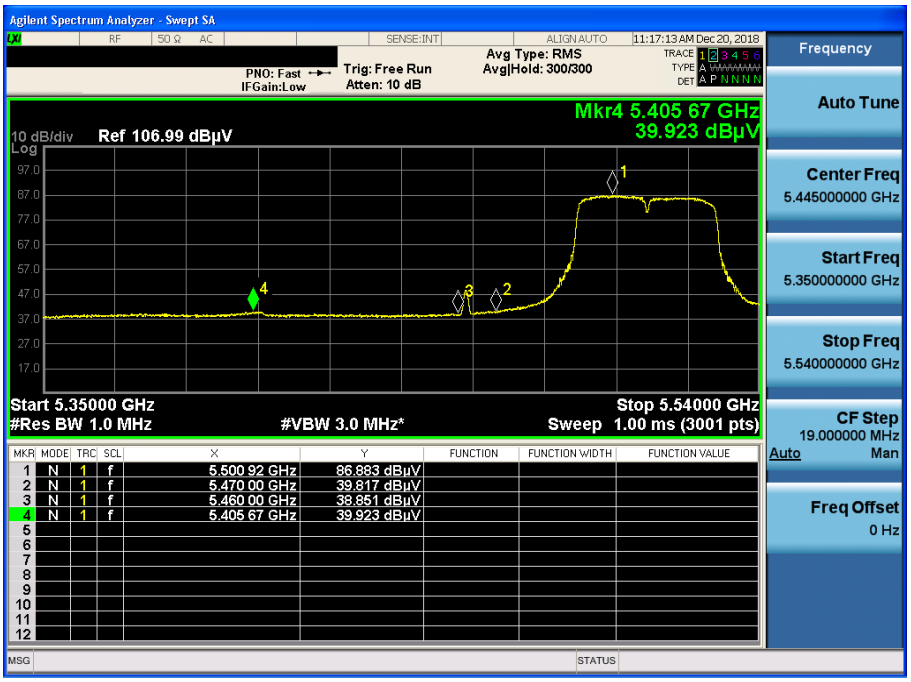
**802.11n(HT40) & U-NII 2A & Ch.62 & Z axis & Hor** **Detector Mode : AV**



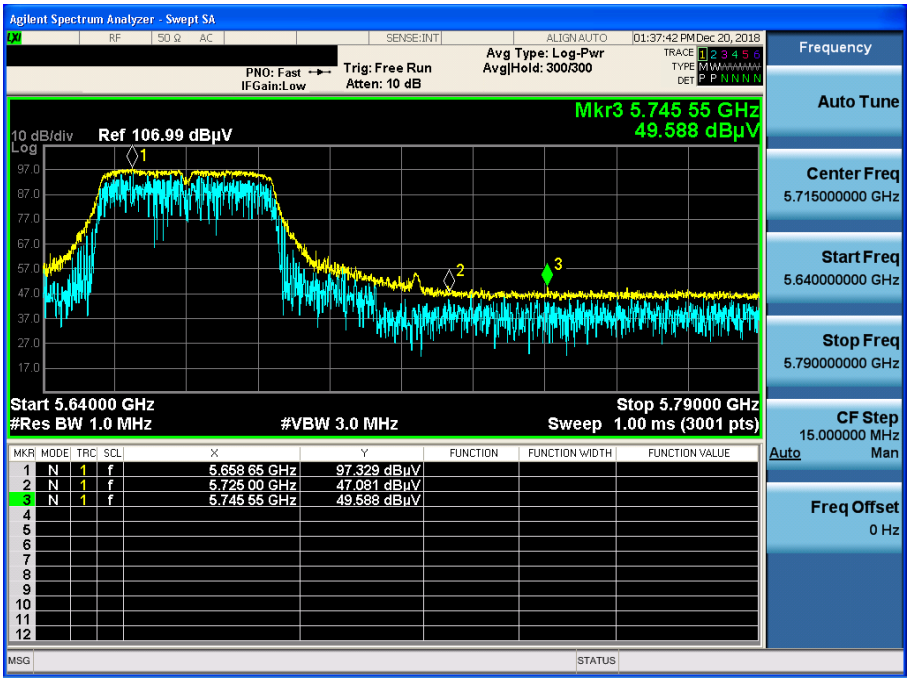
**802.11n(HT40) & U-NII 2C & Ch.102 & X axis & Hor Detector Mode : PK**



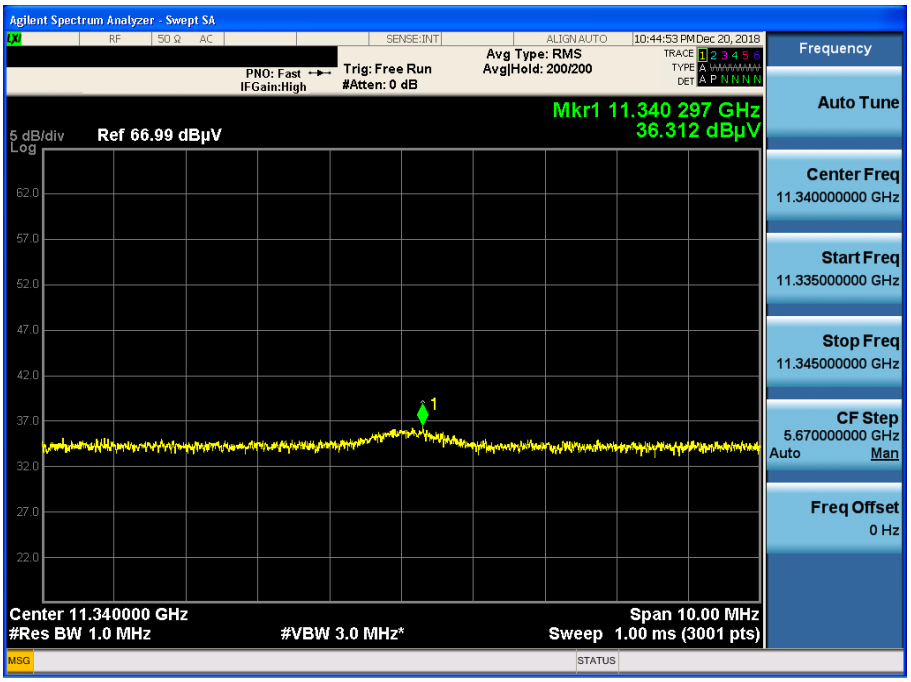

**802.11n(HT40) & U-NII 2C & Ch.102 & X axis & Hor Detector Mode : AV**



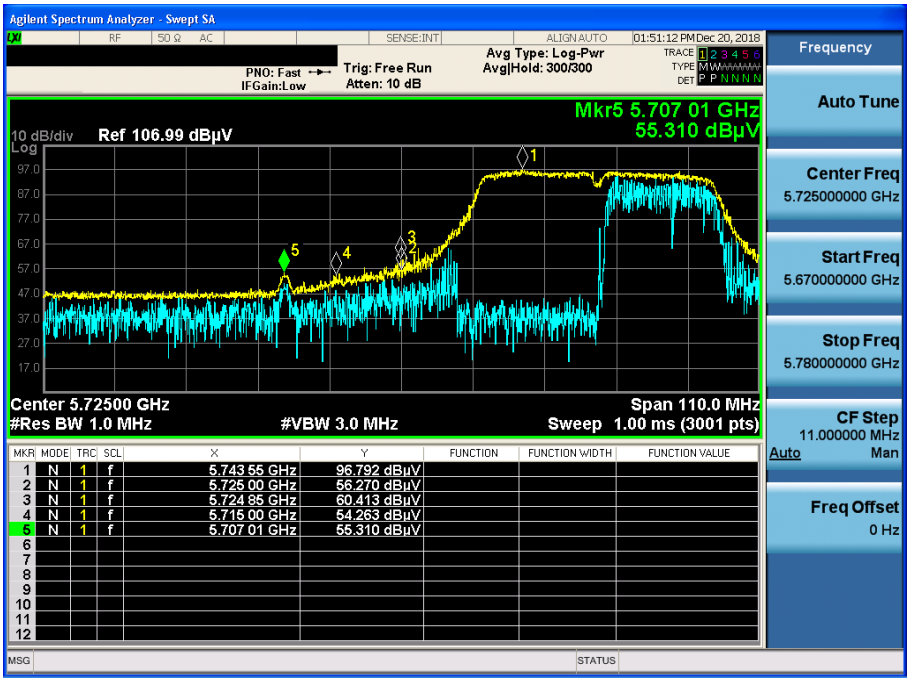
**802.11n(HT40) & U-NII 2C & Ch.134 & Y axis & Ver Detector Mode : PK**



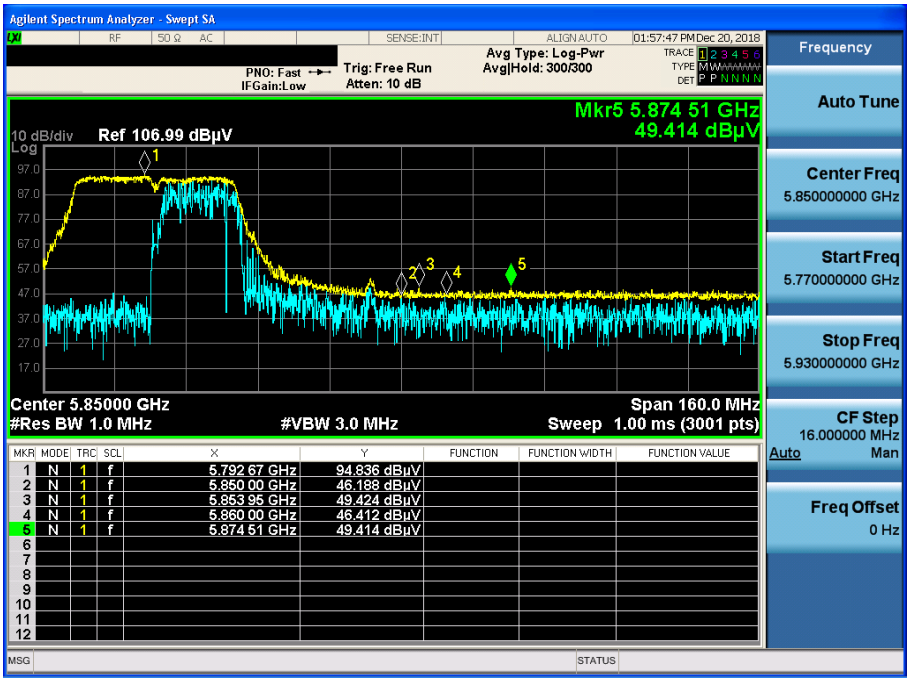

**802.11n(HT40) & U-NII 2C & Ch.134 & Z axis & Hor Detector Mode : AV**



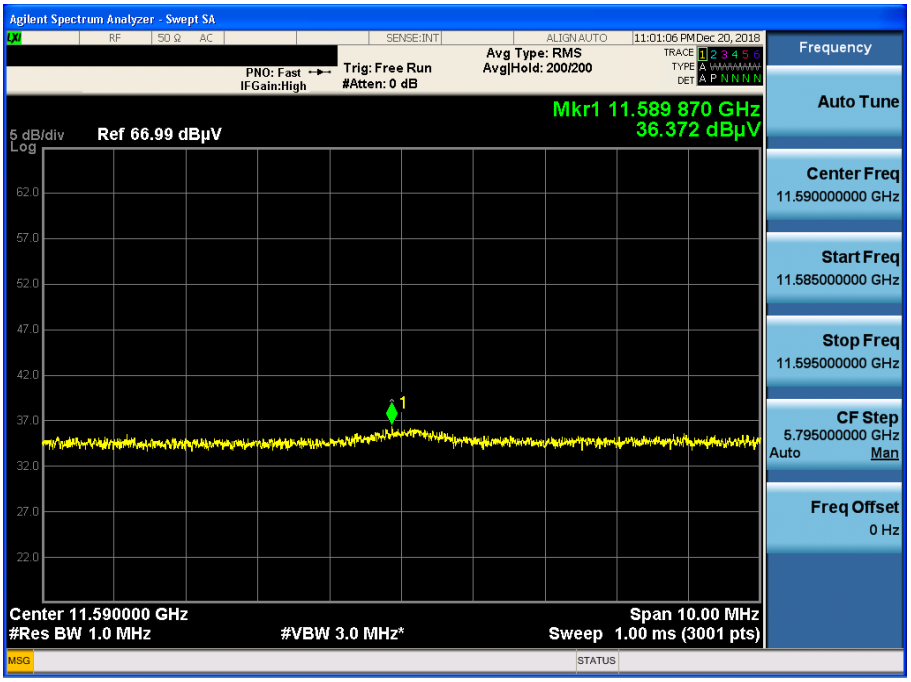
**802.11n(HT40) & U-NII 3 & Ch.151 & Y axis & Ver Detector Mode : PK**



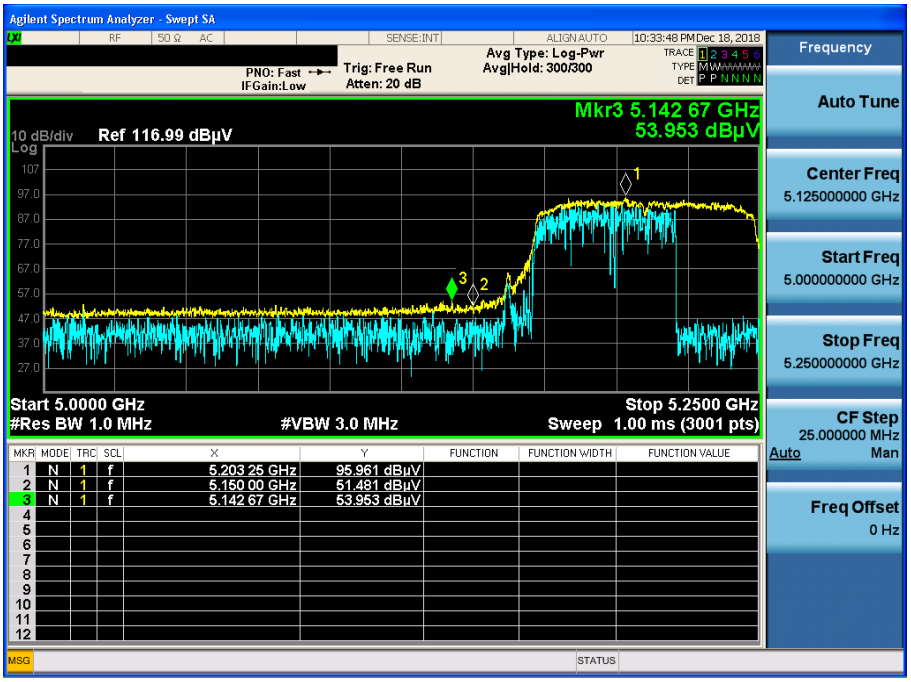

**802.11n(HT40) & U-NII 3 & Ch.159 & Y axis & Ver Detector Mode : PK**



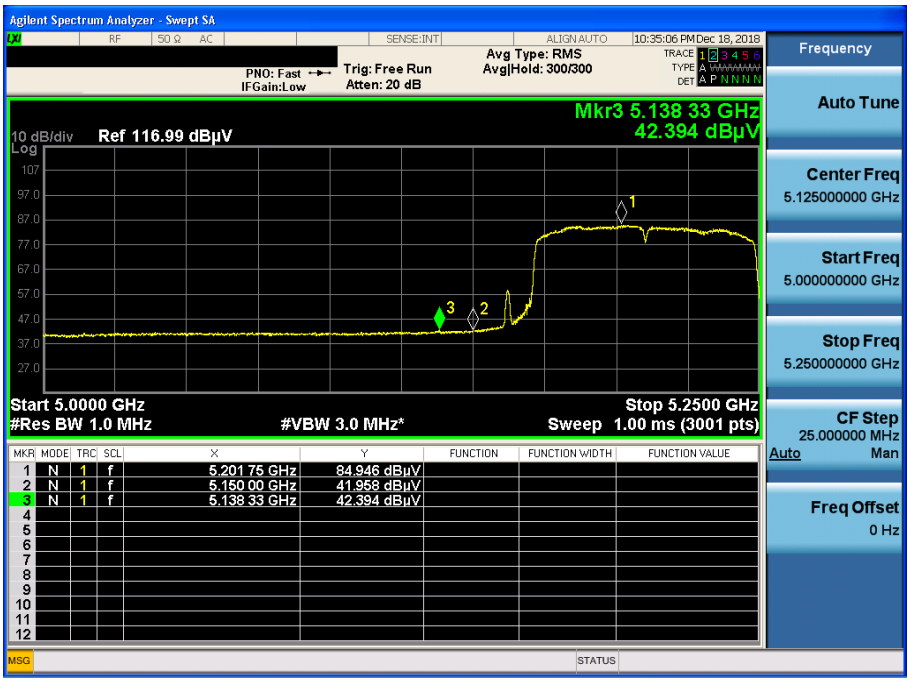
**802.11n(HT40) & U-NII 3 & Ch.159 & Y axis & Ver Detector Mode : AV**



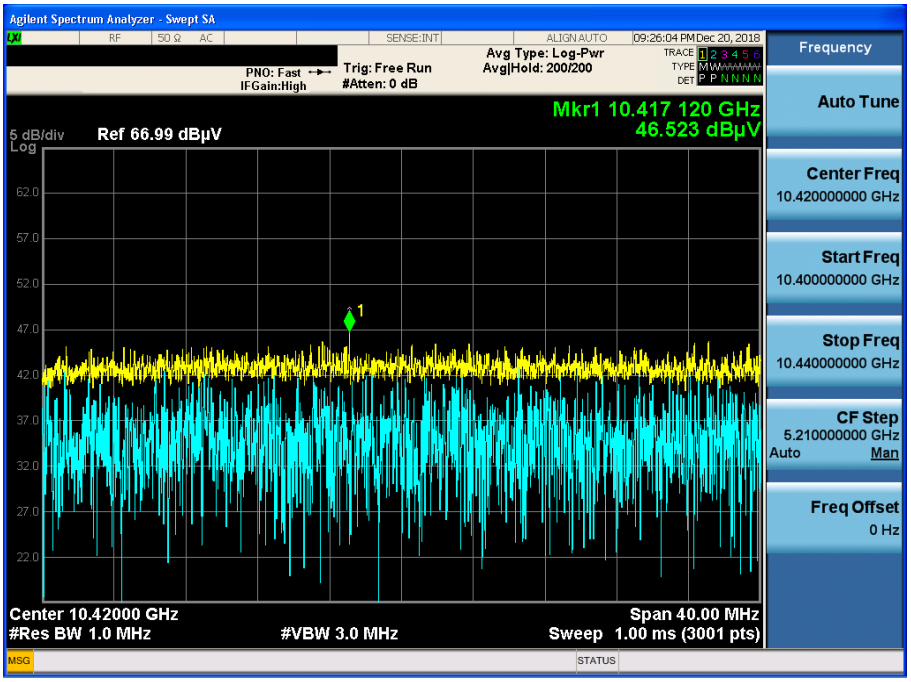
**802.11ac(VHT80) & U-NII 1 & Ch.42 & Z axis & Hor Detector Mode : PK**



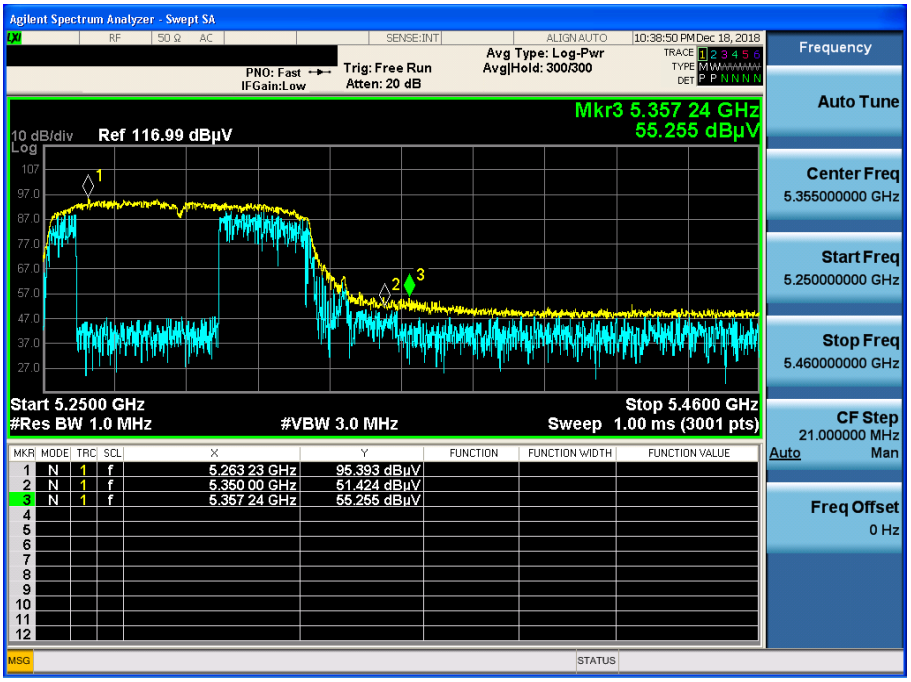

**802.11ac(VHT80) & U-NII 1 & Ch.42 & Z axis & Hor Detector Mode : AV**



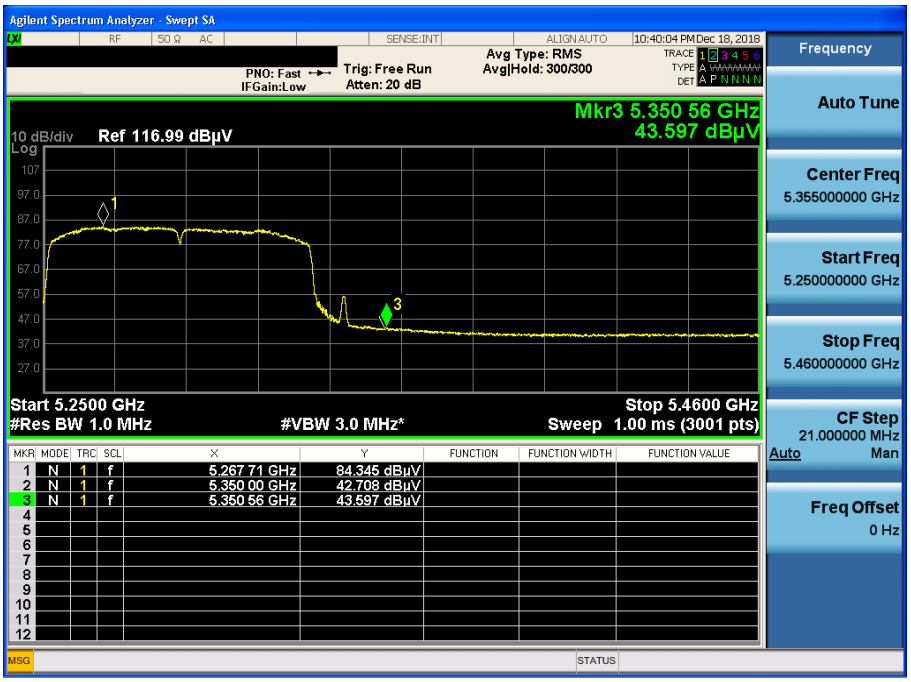
**802.11ac(VHT80) & U-NII 1 & Ch.42 & Z axis & Hor Detector Mode : PK**



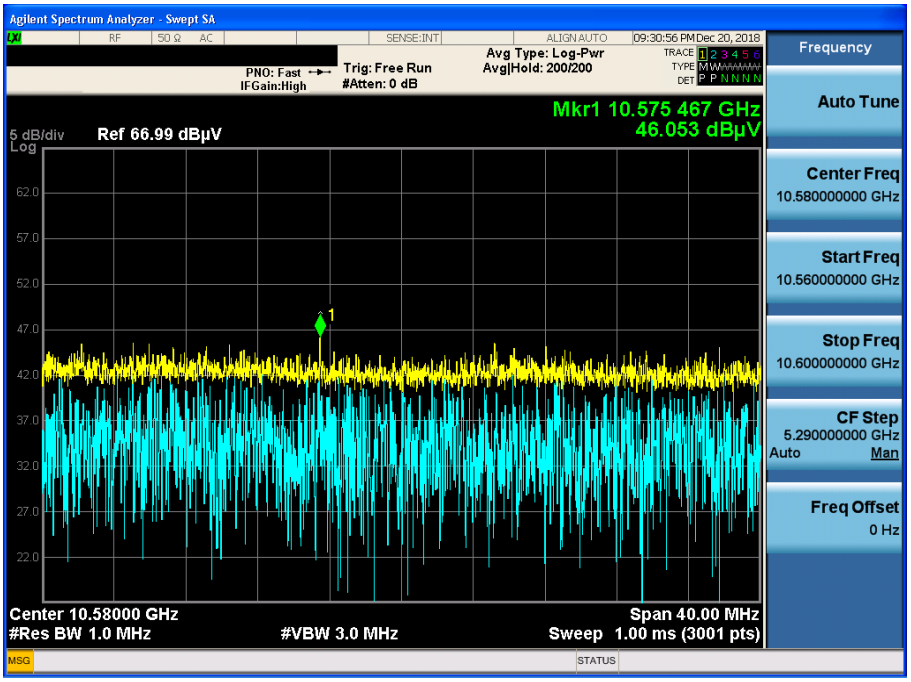
**802.11ac(VHT80) & U-NII 2A & Ch.58 & Z axis & Hor Detector Mode : PK**



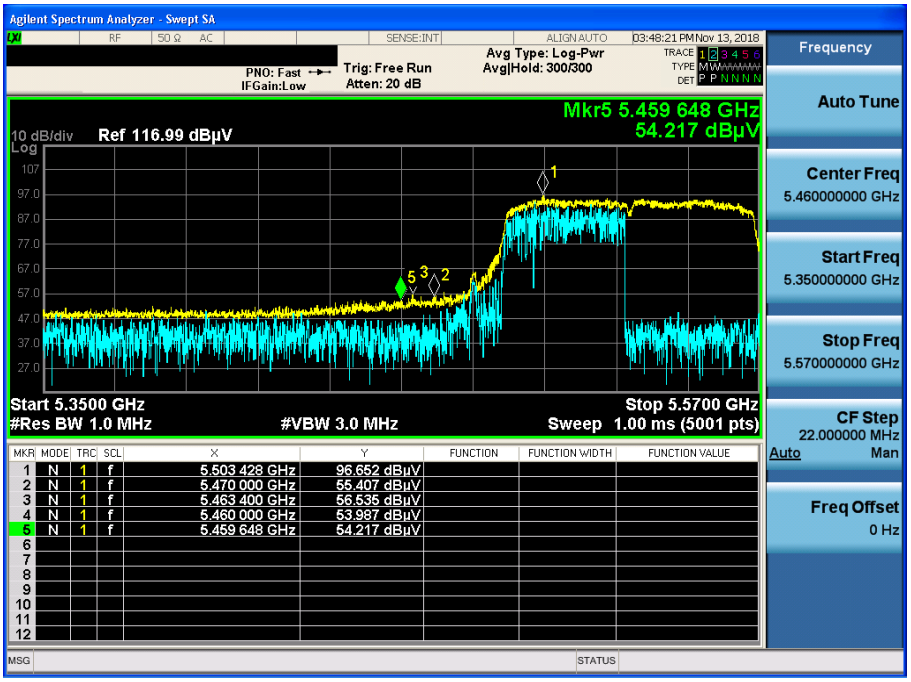

**802.11ac(VHT80) & U-NII 2A & Ch.58 & Z axis & Hor Detector Mode : AV**



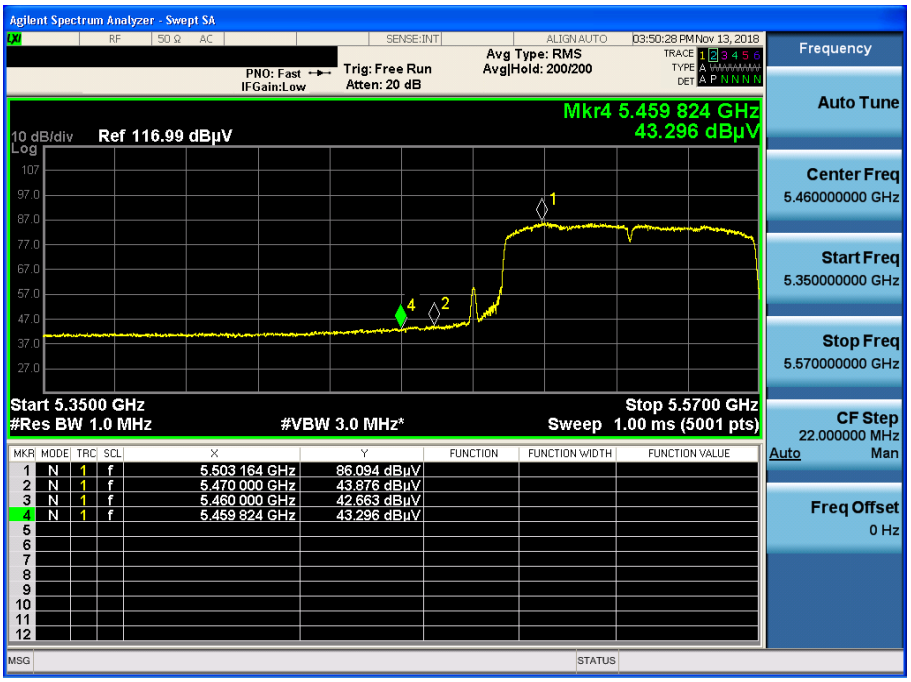
**802.11ac(VHT80) & U-NII 2A & Ch.58 & Z axis & Hor Detector Mode : PK**



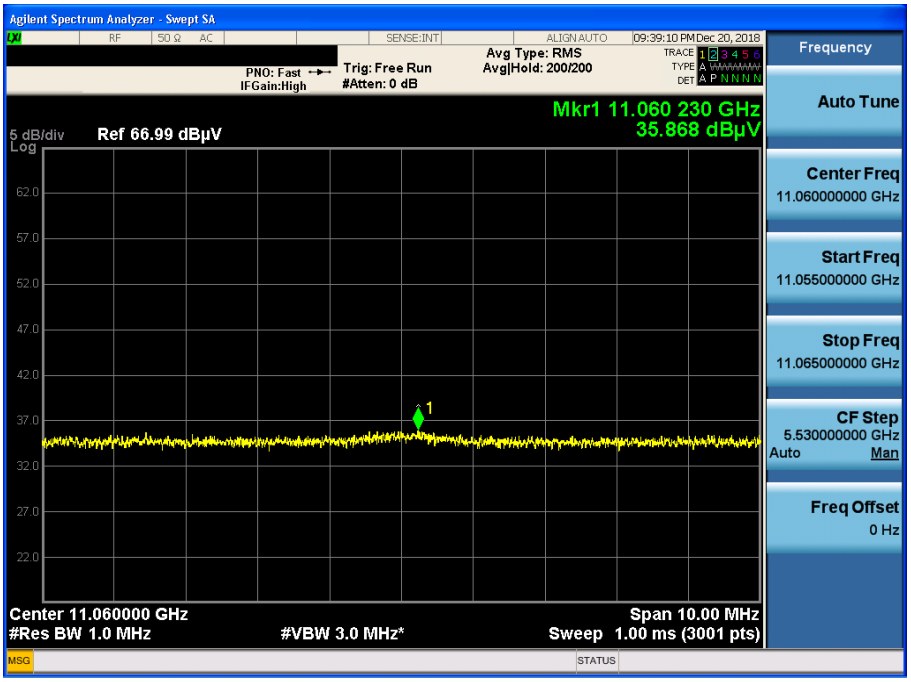
**802.11ac(VHT80) & U-NII 2C & Ch.106 & X axis & Hor Detector Mode : PK**



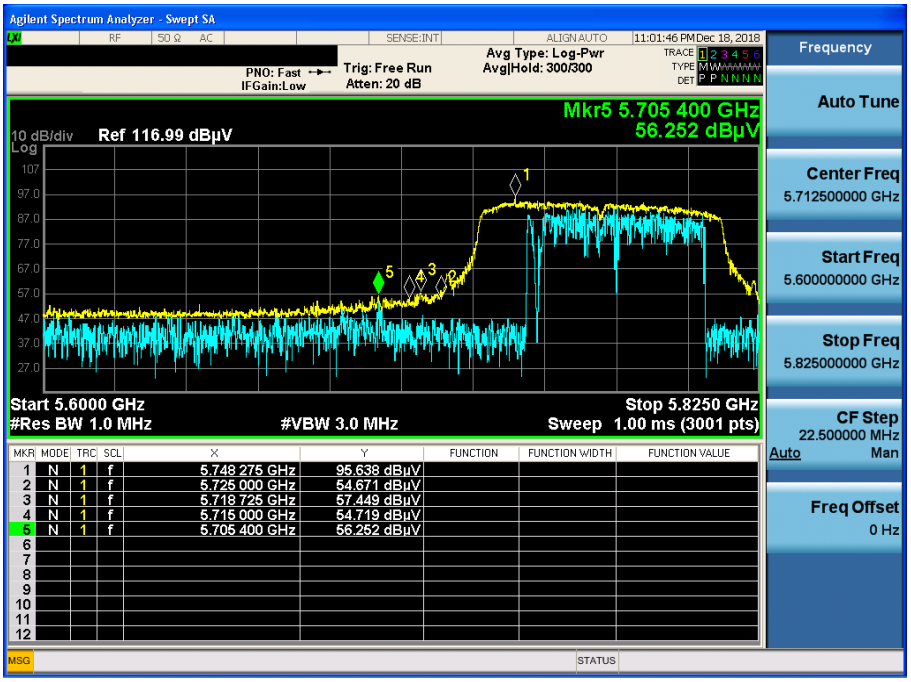

**802.11ac(VHT80) & U-NII 2C & Ch.106 & X axis & Hor Detector Mode : AV**



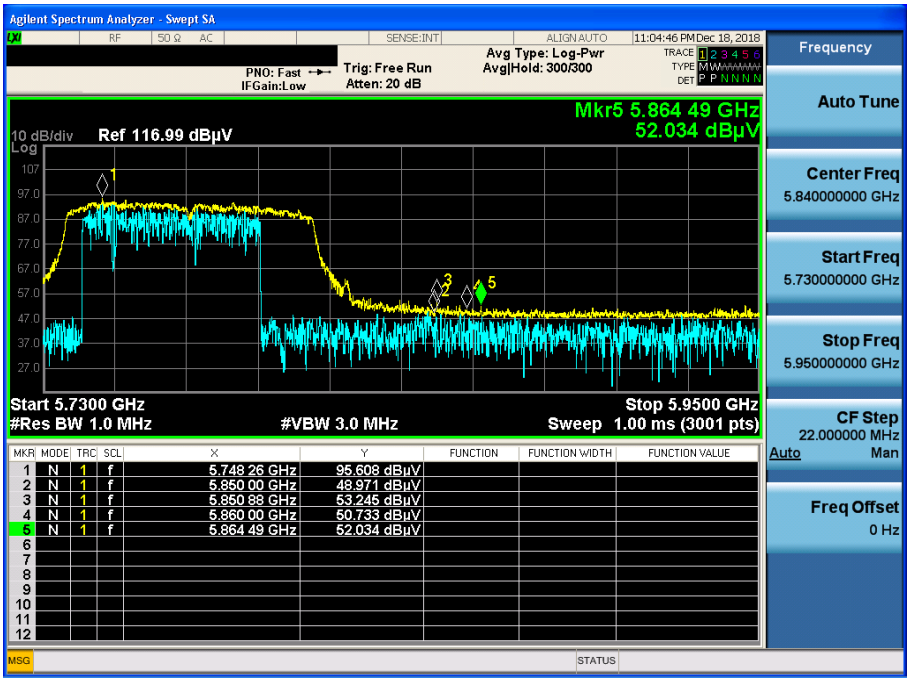
**802.11ac(VHT80) & U-NII 2C & Ch.106 & Z axis & Hor Detector Mode : AV**



**802.11ac(VHT80) & U-NII 3 & Ch.155 & X axis & Hor** **Detector Mode : PK**




**802.11ac(VHT80) & U-NII 3 & Ch.155 & X axis & Hor** **Detector Mode : PK**



**802.11ac(VHT80) & U-NII 3 & Ch.155 & Z axis & Hor Detector Mode : AV**