# MEASUREMENT REPORT

## FCC PART 15.407 WLAN 802.11a/n/ac

| | | |
|---|---|---|
| **FCC ID** | : | 2AI3GA7110 |
| **APPLICANT** | : | Pico Technology Co., Ltd. |
| **Application Type** | : | Certification |
| **Product** | : | VR All-In-One Headset |
| **Model No.** | : | A7110 |
| **Brand Name** | : | Pico |
| **FCC Classification** | : | Unlicensed National Information Infrastructure (UNII) |
| **FCC Rule Part(s)** | : | Part 15.407 |
| **Test Procedure(s)** | : | ANSI C63.10-2013, KDB 789033 D02v02r01 |
| **Test Date** | : | December 08, 2017 ~ January 08, 2018 |

Reviewed By : Jame Yuan
( Jame Yuan )

Approved By : Marlin Chen
( Marlin Chen )

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02v02r01. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

# Revision History

| Report No. | Version | Description | Issue Date | Note |
|---|---|---|---|---|
| 1711RSU00808 | Rev. 01 | Initial Report | 01-17-2018 | Valid |
| | | | | |

# CONTENTS

Description Page

**1. INTRODUCTION ..... 6**

1.1. Scope ..... 6
1.2. MRT Test Location ..... 6

**2. PRODUCT INFORMATION ..... 7**

2.1. Equipment Description ..... 7
2.2. Product Specification Subjective to this Report ..... 7
2.3. Operation Frequency / Channel list ..... 8
2.4. Description of Available Antennas ..... 9
2.5. Description of Antenna RF Port ..... 9
2.6. Test Mode ..... 10
2.7. Description of Test Software ..... 11
2.8. Device Capabilities ..... 13
2.9. Test Configuration ..... 14
2.10. EMI Suppression Device(s)/Modifications ..... 14
2.11. Labeling Requirements ..... 14

**3. DESCRIPTION OF TEST ..... 15**

3.1. Evaluation Procedure ..... 15
3.2. AC Line Conducted Emissions ..... 15
3.3. Radiated Emissions ..... 16

**4. ANTENNA REQUIREMENTS ..... 17**

**5. TEST EQUIPMENT CALIBRATION DATE ..... 18**

**6. MEASUREMENT UNCERTAINTY ..... 19**

**7. TEST RESULT ..... 20**

7.1. Summary ..... 20
7.2. 26dB Bandwidth Measurement ..... 21
7.2.1. Test Limit ..... 21
7.2.2. Test Procedure used ..... 21
7.2.3. Test Setting ..... 21
7.2.4. Test Setup ..... 21
7.2.5. Test Result ..... 22
7.3. 6dB Bandwidth Measurement ..... 39
7.3.1. Test Limit ..... 39
7.3.2. Test Procedure used ..... 39

7.3.3. Test Setting ..... 39
7.3.4. Test Setup ..... 39
7.3.5. Test Result ..... 40
7.4. Output Power Measurement ..... 45
7.4.1. Test Limit ..... 45
7.4.2. Test Procedure Used ..... 45
7.4.3. Test Setting ..... 45
7.4.4. Test Setup ..... 45
7.4.5. Test Result ..... 46
7.5. Power Spectral Density Measurement ..... 50
7.5.1. Test Limit ..... 50
7.5.2. Test Procedure Used ..... 50
7.5.3. Test Setting ..... 50
7.5.4. Test Setup ..... 51
7.5.5. Test Result ..... 52
7.6. Frequency Stability Measurement ..... 83
7.6.1. Test Limit ..... 83
7.6.2. Test Procedure Used ..... 83
7.6.3. Test Setup ..... 84
7.6.4. Test Result ..... 85
7.7. Radiated Spurious Emission Measurement ..... 86
7.7.1. Test Limit ..... 86
7.7.2. Test Procedure Used ..... 86
7.7.3. Test Setting ..... 86
7.7.4. Test Setup ..... 88
7.7.5. Test Result ..... 90
7.8. Radiated Restricted Band Edge Measurement ..... 157
7.8.1. Test Limit ..... 157
7.8.2. Test Result ..... 159
7.9. AC Conducted Emissions Measurement ..... 273
7.9.1. Test Limit ..... 273
7.9.2. Test Setup ..... 273
7.9.3. Test Result ..... 274

**8. CONCLUSION ..... 276**

## §2.1033 General Information

| | |
|---|---|
| **Applicant:** | Pico Technology Co., Ltd. |
| **Applicant Address:** | Room 2101, Shining Tower, No.35 Xueyuan Road, HaiDian District, Beijing, The People's Republic of China |
| **Manufacturer:** | Pico Technology Co., Ltd. |
| **Manufacturer Address:** | Room 2101, Shining Tower, No.35 Xueyuan Road, HaiDian District, Beijing, The People's Republic of China |
| **Test Site:** | MRT Technology (Suzhou) Co., Ltd |
| **Test Site Address:** | D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China |
| **FCC Registration No.:** | 893164 |
| **Test Device Serial No.:** | N/A ☐ Production ☒ Pre-Production ☐ Engineering |

### Test Facility / Accreditations

**Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.**

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

Accredited Laboratory

A2LA has accredited

MRT TECHNOLOGY (SUZHOU) CO., LTD.

Suzhou, Jiangsu, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 6th day of September 2016.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 3628.01
Valid to August 31, 2018

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

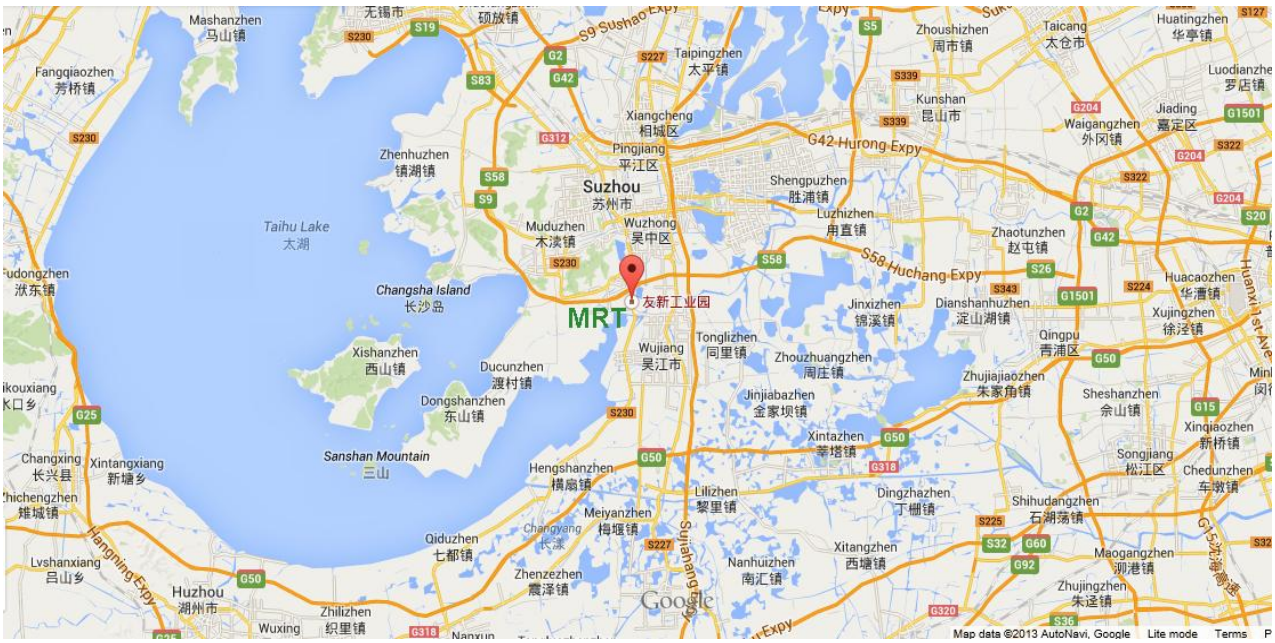
# 1. INTRODUCTION

## 1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

## 1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



# 2. PRODUCT INFORMATION

## 2.1. Equipment Description

| | |
|---|---|
| Product Name | VR All-In-One Headset |
| Model No. | A7110 |
| Wi-Fi Specification | 802.11a/b/g/n/ac |
| Bluetooth Version | v4.2 dual mode |
| Antenna Delivery | 2*TX + 2*RX |
| **Components** | |
| Adapter | M/N: HUUS090200-K00<br>INPUT: 100-240V ~ 50/60Hz, 0.5A<br>OUTPUT: 5Vdc, 2.0A OR 9Vdc, 2.0A |

## 2.2. Product Specification Subjective to this Report

| **Wi-Fi Specification** | |
|---|---|
| Frequency Range | For 802.11a/n-HT20/ac-VHT20:<br>5180~5320MHz, 5500~5720MHz, 5745~5825MHz<br>For 802.11n-HT40/ac-VHT40:<br>5190~5310MHz, 5510~5710MHz, 5755~5795MHz<br>For 802.11ac-VHT80:<br>5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz |
| Type of Modulation | 802.11a/n/ac: OFDM |
| Data Rate: | 802.11a: 6/9/12/18/24/36/48/54Mbps<br>802.11n: up to 300Mbps<br>802.11ac: up to 866.6Mbps |

Note: For other features of this EUT, test report will be issued separately.

## 2.3. Operation Frequency / Channel list

802.11a/n-HT20/ac-VHT20

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 36 | 5180 MHz | 40 | 5200 MHz | 44 | 5220 MHz |
| 48 | 5240 MHz | 52 | 5260 MHz | 56 | 5280 MHz |
| 60 | 5300 MHz | 64 | 5320 MHz | 100 | 5500 MHz |
| 104 | 5520 MHz | 108 | 5540 MHz | 112 | 5560 MHz |
| 116 | 5580 MHz | 120 | 5600 MHz | 124 | 5620 MHz |
| 128 | 5640 MHz | 132 | 5660 MHz | 136 | 5680 MHz |
| 140 | 5700 MHz | 144 | 5720 MHz | 149 | 5745 MHz |
| 153 | 5765 MHz | 157 | 5785 MHz | 161 | 5805 MHz |
| 165 | 5825 MHz | --- | --- | --- | --- |

802.11n-HT40/ac-VHT40

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 38 | 5190 MHz | 46 | 5230 MHz | 54 | 5270 MHz |
| 62 | 5310 MHz | 102 | 5510 MHz | 110 | 5550 MHz |
| 118 | 5590 MHz | 126 | 5630 MHz | 134 | 5670 MHz |
| 142 | 5710 MHz | 151 | 5755 MHz | 159 | 5795 MHz |

802.11ac-VHT80

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 42 | 5210 MHz | 58 | 5290 MHz | 106 | 5530 MHz |
| 122 | 5610 MHz | 138 | 5690 MHz | 155 | 5775 MHz |

## 2.4. Description of Available Antennas

| Antenna Type | Frequency Band (GHz) | TX Paths | Max Peak Gain (dBi) | | CDD Directional Gain (dBi) | |
|---|---|---|---|---|---|---|
| | | | Ant 1 | Ant 2 | For Power | For PSD |
| **Wi-Fi Internal Antenna** | | | | | | |
| FPC | 2.4 | 2 | 3.74 | 2.43 | 3.74 | 6.75 |
| | 5 | 2 | 4.87 | 4.15 | 4.87 | 7.88 |
| **Bluetooth Internal Antenna** | | | | | | |
| FPC | 2.4 | 1 | 3.74 | -- | -- | |

Note: The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

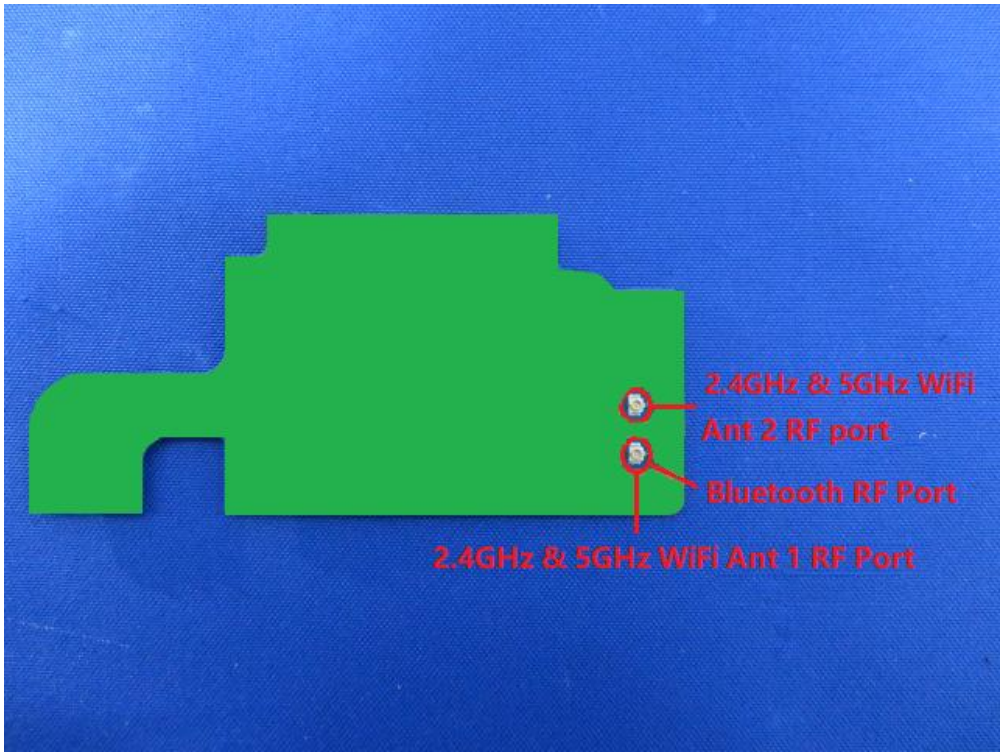
For CDD transmissions, directional gain is calculated as follows, $N_{ANT}$ = 2, $N_{SS}$ = 1.

Directional gain = $G_{ANT}$ + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,
  Array Gain = 10 log ($N_{ANT}$/ $N_{SS}$) dB = 3.01;
- For power measurements on IEEE 802.11 devices,
  Array Gain = 0 dB for $N_{ANT}$ ≤ 4;

## 2.5. Description of Antenna RF Port

| Antenna RF Port | | | | | |
|---|---|---|---|---|---|
| -- | 2.4GHz RF Port | | 5GHz RF Port | | Bluetooth(v4.2 dual mode) RF Port |
| Software Control Port | Ant 1 | Ant 2 | Ant 1 | Ant 2 | Bluetooth |



## 2.6. Test Mode

| | |
|---|---|
| Test Mode | Mode 1: Transmit by 802.11a (6Mbps) |
| | Mode 2: Transmit by 802.11n-HT20 (MCS0) |
| | Mode 3: Transmit by 802.11n-HT40 (MCS0) |
| | Mode 4: Transmit by 802.11ac-VHT20 (MCS0) |
| | Mode 5: Transmit by 802.11ac-VHT40 (MCS0) |
| | Mode 6: Transmit by 802.11ac-VHT80 (MCS0) |

## 2.7. Description of Test Software

The test utility software used during testing was “QRCT”, and the version was “3.0.268.0”.

| Test Mode | Channel No. | Frequency (MHz) | Power Parameter Value | Test Mode | Channel No. | Frequency (MHz) | Power Parameter Value |
|---|---|---|---|---|---|---|---|
| | | | Ant 1 + 2 | | | | Ant 1 + 2 |
| 802.11a | 36 | 5180 | 10 | 802.11 n-HT20 | 36 | 5180 | 10 |
| | 44 | 5220 | 10 | | 44 | 5220 | 10 |
| | 48 | 5240 | 10 | | 48 | 5240 | 10 |
| | 52 | 5260 | 10 | | 52 | 5260 | 10 |
| | 60 | 5300 | 10 | | 60 | 5300 | 10 |
| | 64 | 5320 | 10 | | 64 | 5320 | 10 |
| | 100 | 5500 | 10 | | 100 | 5500 | 10 |
| | 120 | 5600 | 10 | | 120 | 5600 | 10 |
| | 140 | 5700 | 10 | | 140 | 5700 | 10 |
| | 144 | 5720 | 10 | | 144 | 5720 | 10 |
| | 149 | 5745 | 10 | | 149 | 5745 | 10 |
| | 157 | 5785 | 10 | | 157 | 5785 | 10 |
| | 165 | 5825 | 10 | | 165 | 5825 | 10 |
| 802.11 n-HT40 | 38 | 5190 | 10 | 802.11 ac-VHT20 | 36 | 5180 | 10 |
| | 46 | 5230 | 10 | | 44 | 5220 | 10 |
| | 54 | 5270 | 10 | | 48 | 5240 | 10 |
| | 62 | 5310 | 10 | | 52 | 5260 | 10 |
| | 102 | 5510 | 10 | | 60 | 5300 | 10 |
| | 118 | 5590 | 10 | | 64 | 5320 | 10 |
| | 134 | 5670 | 10 | | 100 | 5500 | 10 |
| | 142 | 5710 | 10 | | 120 | 5600 | 10 |
| | 151 | 5755 | 10 | | 140 | 5700 | 10 |
| | 159 | 5795 | 10 | | 144 | 5720 | 10 |
| | -- | -- | -- | | 149 | 5745 | 10 |
| | -- | -- | -- | | 157 | 5785 | 10 |
| | -- | -- | -- | | 165 | 5825 | 10 |

| Mode | Channel No. | Frequency (MHz) | Power Parameter Value | Mode | Channel No. | Frequency (MHz) | Power Parameter Value |
|---|---|---|---|---|---|---|---|
| | | | Ant 1 + 2 | | | | Ant 1 + 2 |
| 802.11 ac-VHT40 | 38 | 5190 | 10 | 802.11 ac-VHT80 | 42 | 5210 | 10 |
| | 46 | 5230 | 10 | | 58 | 5290 | 10 |
| | 54 | 5270 | 10 | | 106 | 5530 | 10 |
| | 62 | 5310 | 10 | | 122 | 5610 | 10 |
| | 102 | 5510 | 10 | | 138 | 5690 | 10 |
| | 118 | 5590 | 10 | | 155 | 5775 | 10 |
| | 134 | 5670 | 10 | | -- | -- | -- |
| | 142 | 5710 | 10 | | -- | -- | -- |
| | 151 | 5755 | 10 | | -- | -- | -- |
| | 159 | 5795 | 10 | | -- | -- | -- |

## 2.8. Device Capabilities

This device contains the following capabilities:

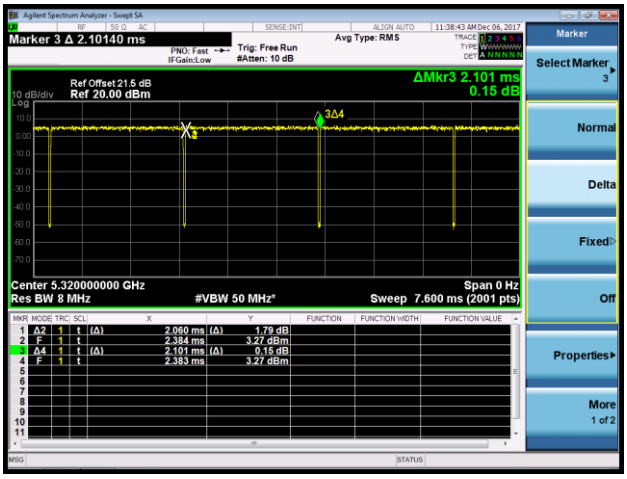
802.11a/b/g/n/ac Wi-Fi and Bluetooth (v4.2 dual mode) Device.

**Note:** 5GHz (UNII) operation is possible in 20MHz and 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz.

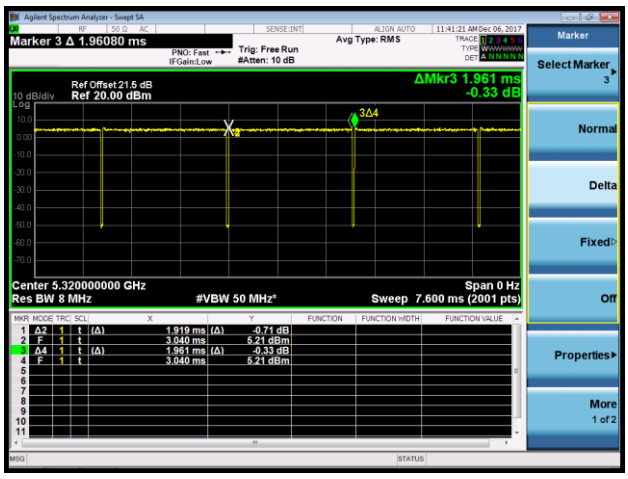
The duty cycles are as follows:

| Test Mode | Duty Cycle |
|---|---|
| 802.11a | 98.05 % |
| 802.11n-HT20 | 97.86 % |
| 802.11n-HT40 | 96.11 % |
| 802.11ac-VHT20 | 97.92 % |
| 802.11ac-VHT40 | 96.13 % |
| 802.11ac-VHT80 | 92.60 % |

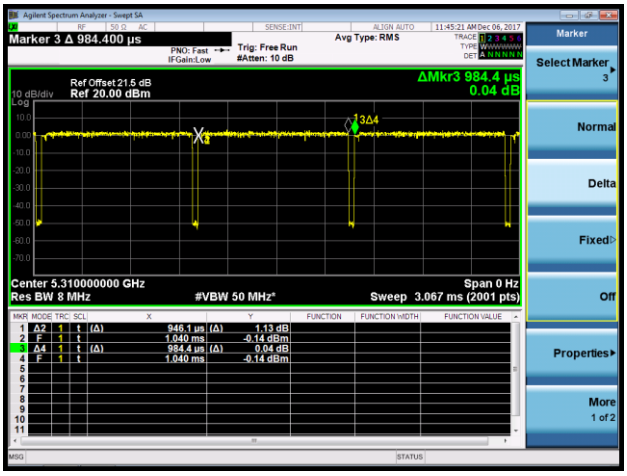
802.11a - T = 2.060 ms



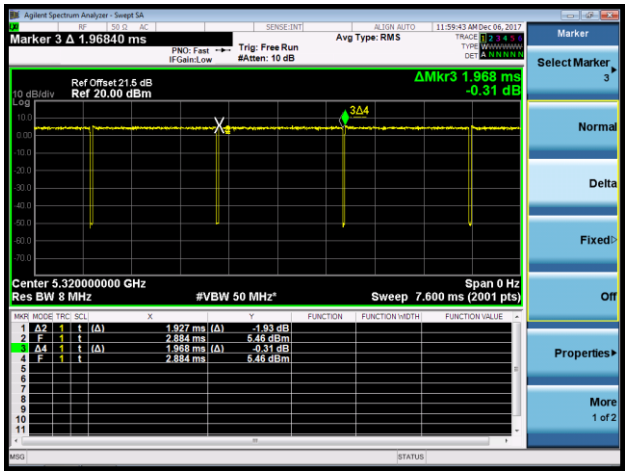

802.11n-HT20 - T = 1.919 ms

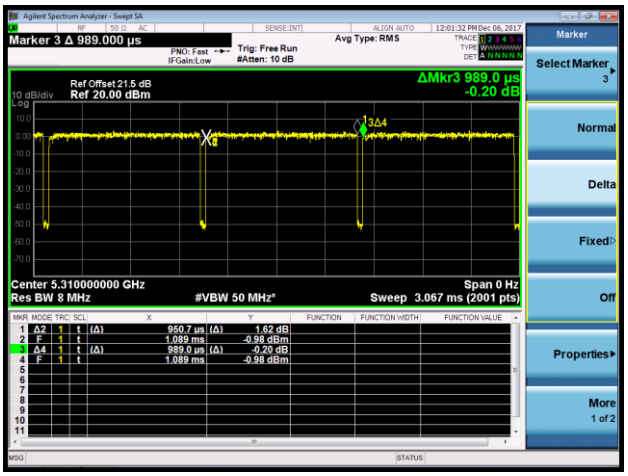
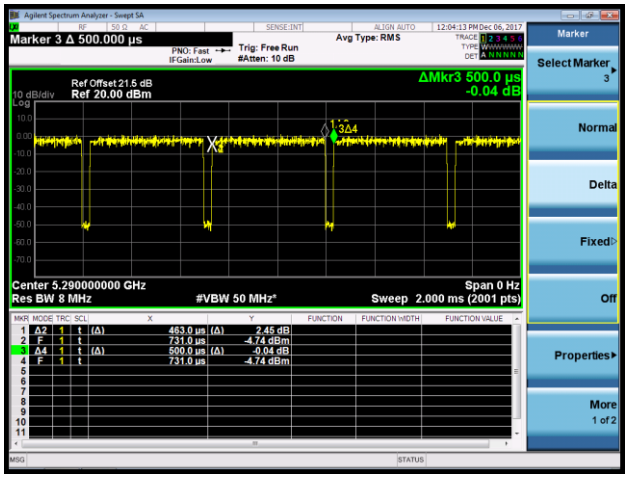



802.11n-HT40 - T = 946.1 us




802.11ac-VHT20 - T = 1.927 ms



| 802.11ac-VHT40 - T = 950.7 us | 802.11ac-VHT80 - T = 463.0 us |
|---|---|
|  |  |

## 2.9. Test Configuration

The **VR All-In-One Headset** was tested per the guidance of KDB 789033 D02v02r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

## 2.10. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

## 2.11. Labeling Requirements

<u>Per 2.1074 & 15.19; Docket 95-19</u>

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

# 3. DESCRIPTION OF TEST

## 3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 789033 D02v02r01 were used in the measurement of the **VR All-In-One Headset.**

**Deviation from measurement procedure…….....None**

## 3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

## 3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

# 4. ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antenna of the **VR All-In-One Headset** is **permanently attached.**
- There are no provisions for connection to an external antenna.

**Conclusion:**

The **VR All-In-One Headset** unit complies with the requirement of §15.203.

# 5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR7 | MRTSUE06001 | 1 year | 2018/08/18 |
| Two-Line V-Network | R&S | ENV216 | MRTSUE06002 | 1 year | 2018/06/21 |
| Two-Line V-Network | R&S | ENV216 | MRTSUE06003 | 1 year | 2018/06/21 |
| Thermohygrometer | Testo | 608-H1 | MRTSUE06404 | 1 year | 2018/08/14 |
| Shielding Anechoic Chamber | Mikebang | Chamber-SR2 | MRTSUE06215 | 1 year | 2018/05/10 |

Radiated Emission - AC2

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| MXE EMI Receiver | Agilent | N9038A | MRTSUE06125 | 1 year | 2018/08/18 |
| Broadband Coaxial Preamplifier | Schwarzbeck | BBV 9718 | MRTSUE06106 | 1 year | 2018/11/17 |
| Preamplifier | Schwarzbeck | BBV 9721 | MRTSUE06121 | 1 year | 2018/04/16 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2018/11/20 |
| Bilog Period Antenna | Schwarzbeck | VULB9162 | MRTSUE06022 | 1 year | 2018/10/21 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA9120D | MRTSUE06171 | 1 year | 2018/11/18 |
| Broadband Horn Antenna | Schwarzbeck | BBHA9170 | MRTSUE06024 | 1 year | 2018/01/04 |
| Digitial Thermometer & Hygrometer | Minggao | ETH529 | MRTSUE06170 | 1 year | 2017/12/12 |
| | | | | 1 year | 2018/12/12 |
| Anechoic Chamber | RIKEN | Chamber-AC2 | MRTSUE06213 | 1 year | 2018/05/09 |

Conducted Test Equipment - TR3

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | N9020A | MRTSUE06106 | 1 year | 2018/05/07 |
| Power Meter | Agilent | U2021XA | MRTSUE06030 | 1 year | 2018/12/06 |
| Temperature Humidity Chamber | BAOYT | BYH-150CL | MRTSUE06051 | 1 year | 2018/12/06 |
| Thermohygrometer | Testo | 608-H1 | MRTSUE06401 | 1 year | 2018/08/14 |

| Software | Version | Function |
|---|---|---|
| e3 | V8.3.5 | EMI Test Software |

# 6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| |
|---|
| AC Conducted Emission Measurement - SR2 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>150kHz~30MHz: 3.46dB |
| Radiated Emission Measurement - AC2 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>9kHz ~ 1GHz: 4.18dB<br>1GHz ~ 25GHz: 4.76dB |
| Spurious Emissions, Conducted - TR3 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>0.78dB |
| Output Power - TR3 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>1.13dB |
| Power Spectrum Density - TR3 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>1.15dB |
| Occupied Bandwidth - TR3 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>0.28% |

# 7. TEST RESULT

## 7.1. Summary

**Company Name:** **Pico Technology Co., Ltd.**

**FCC ID:** **2AI3GA7110**

| FCC Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|
| 15.407(a) | 26dB Bandwidth | N/A | Conducted | Pass | Section 7.2 |
| 15.407(e) | 6dB Bandwidth | ≥ 500kHz | | Pass | Section 7.3 |
| 15.407(a)(1)(iv), (2), (3) | Maximum Conducted Output Power | ≤ 23.98 dBm U-NII-1<br>≤ 23.98 dBm U-NII-2A<br>≤ 23.98 dBm U-NII-2C<br>≤ 30 dBm U-NII-3 | | Pass | Section 7.4 |
| 15.407(a)(1)(iv), (2), (3), (5) | Peak Power Spectral Density | Refer to Section 7.5 | | Pass | Section 7.5 |
| 15.407(g) | Frequency Stability | N/A | | Pass | Section 7.6 |
| 15.407(b)(1), (2), (3), (4)(i) | Undesirable Emissions | Refer to section 7.8 | Radiated | Pass | Section 7.7 & 7.8 |
| 15.205, 15.209 15.407(b)(5), (6), (7) | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Emissions in restricted bands must meet the radiated limits detailed in 15.209 | | Pass | |
| 15.207 | AC Conducted Emissions 150kHz - 30MHz | < FCC 15.207 limits | Line Conducted | Pass | Section 7.9 |

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) Test Items “26dB Bandwidth” & “6dB Bandwidth” have been assessed MIMO transmission, and showed the worst test data in this report.

## 7.2. 26dB Bandwidth Measurement

### 7.2.1.Test Limit

N/A

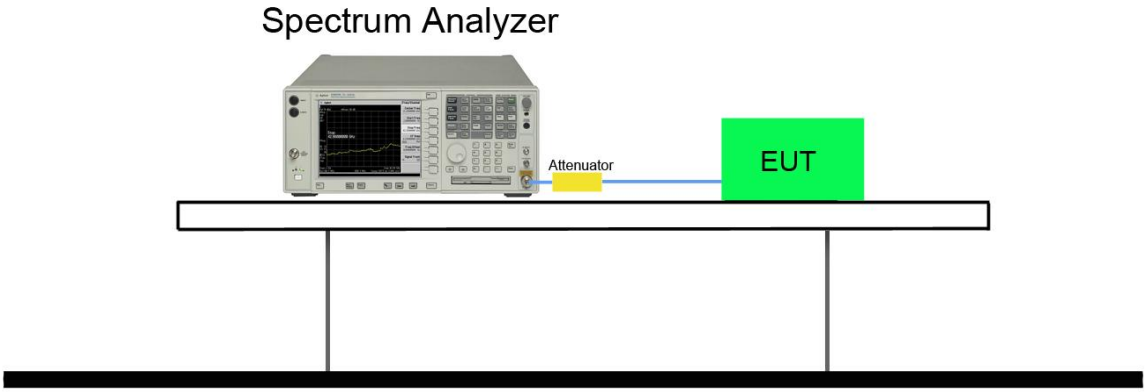
### 7.2.2.Test Procedure used

KDB 789033 D02v02r01 – Section C.1

### 7.2.3.Test Setting

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.

### 7.2.4.Test Setup



### 7.2.5.Test Result

| | | | |
|---|---|---|---|
| Product | VR All-In-One Headset | Temperature | 22°C |
| Test Engineer | Hunk Li | Relative Humidity | 54% |
| Test Site | TR3 | Test Date | 2017/12/09 |

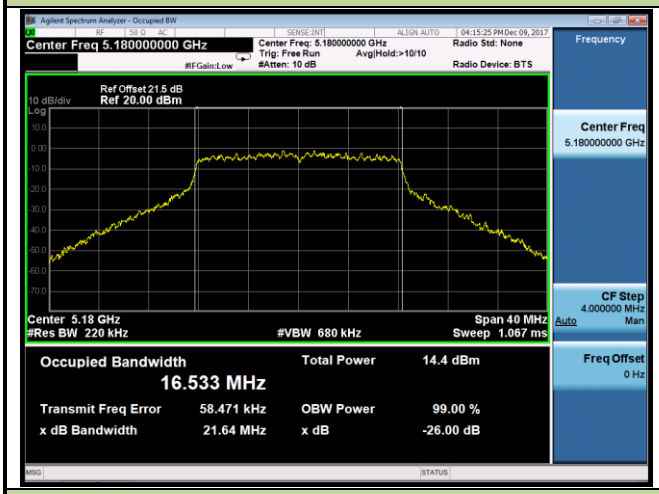
| Test Mode | Data Rate (Mbps) | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Result |
|---|---|---|---|---|---|---|
| Ant 2 / Ant 1 + 2 | | | | | | |
| 802.11a | 6 | 36 | 5180 | 21.64 | 16.53 | Pass |
| 802.11a | 6 | 44 | 5220 | 21.72 | 16.54 | Pass |
| 802.11a | 6 | 48 | 5240 | 21.05 | 16.52 | Pass |
| 802.11a | 6 | 52 | 5260 | 21.57 | 16.53 | Pass |
| 802.11a | 6 | 60 | 5300 | 21.70 | 16.53 | Pass |
| 802.11a | 6 | 64 | 5320 | 21.69 | 16.53 | Pass |
| 802.11a | 6 | 100 | 5500 | 21.59 | 16.54 | Pass |
| 802.11a | 6 | 120 | 5600 | 21.53 | 16.51 | Pass |
| 802.11a | 6 | 140 | 5700 | 22.17 | 16.51 | Pass |
| 802.11a | 6 | 144 | 5720 | 22.08 | 16.53 | Pass |
| 802.11a | 6 | 149 | 5745 | 21.50 | 16.53 | Pass |
| 802.11a | 6 | 157 | 5785 | 21.57 | 16.51 | Pass |
| 802.11a | 6 | 165 | 5825 | 21.55 | 16.53 | Pass |
| 802.11n-HT20 | MCS0 | 36 | 5180 | 23.20 | 17.76 | Pass |
| 802.11n-HT20 | MCS0 | 44 | 5220 | 23.34 | 17.72 | Pass |
| 802.11n-HT20 | MCS0 | 48 | 5240 | 22.93 | 17.77 | Pass |
| 802.11n-HT20 | MCS0 | 52 | 5260 | 23.23 | 17.75 | Pass |
| 802.11n-HT20 | MCS0 | 60 | 5300 | 23.29 | 17.76 | Pass |
| 802.11n-HT20 | MCS0 | 64 | 5320 | 22.97 | 17.75 | Pass |
| 802.11n-HT20 | MCS0 | 100 | 5500 | 22.93 | 17.76 | Pass |
| 802.11n-HT20 | MCS0 | 120 | 5600 | 22.87 | 17.73 | Pass |
| 802.11n-HT20 | MCS0 | 140 | 5700 | 22.56 | 17.73 | Pass |
| 802.11n-HT20 | MCS0 | 144 | 5720 | 23.28 | 17.72 | Pass |
| 802.11n-HT20 | MCS0 | 149 | 5745 | 23.39 | 17.72 | Pass |
| 802.11n-HT20 | MCS0 | 157 | 5785 | 22.73 | 17.73 | Pass |
| 802.11n-HT20 | MCS0 | 165 | 5825 | 22.89 | 17.74 | Pass |

| Test Mode | Data Rate (Mbps) | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Result |
|---|---|---|---|---|---|---|
| Ant 2 / Ant 1 + 2 | | | | | | |
| 802.11n-HT40 | MCS0 | 38 | 5190 | 41.01 | 36.18 | Pass |
| 802.11n-HT40 | MCS0 | 46 | 5230 | 41.04 | 36.15 | Pass |
| 802.11n-HT40 | MCS0 | 54 | 5270 | 40.69 | 36.17 | Pass |
| 802.11n-HT40 | MCS0 | 62 | 5310 | 40.83 | 36.16 | Pass |
| 802.11n-HT40 | MCS0 | 102 | 5510 | 40.99 | 36.15 | Pass |
| 802.11n-HT40 | MCS0 | 118 | 5590 | 41.27 | 36.21 | Pass |
| 802.11n-HT40 | MCS0 | 134 | 5670 | 41.56 | 36.18 | Pass |
| 802.11n-HT40 | MCS0 | 142 | 5710 | 41.32 | 36.19 | Pass |
| 802.11n-HT40 | MCS0 | 151 | 5755 | 41.65 | 36.19 | Pass |
| 802.11n-HT40 | MCS0 | 159 | 5795 | 40.93 | 36.15 | Pass |
| 802.11ac-VHT20 | MCS0 | 36 | 5180 | 23.21 | 17.77 | Pass |
| 802.11ac-VHT20 | MCS0 | 44 | 5220 | 23.64 | 17.75 | Pass |
| 802.11ac-VHT20 | MCS0 | 48 | 5240 | 23.19 | 17.78 | Pass |
| 802.11ac-VHT20 | MCS0 | 52 | 5260 | 23.30 | 17.77 | Pass |
| 802.11ac-VHT20 | MCS0 | 60 | 5300 | 23.25 | 17.77 | Pass |
| 802.11ac-VHT20 | MCS0 | 64 | 5320 | 22.88 | 17.75 | Pass |
| 802.11ac-VHT20 | MCS0 | 100 | 5500 | 22.99 | 17.78 | Pass |
| 802.11ac-VHT20 | MCS0 | 120 | 5600 | 22.24 | 17.71 | Pass |
| 802.11ac-VHT20 | MCS0 | 140 | 5700 | 22.37 | 17.72 | Pass |
| 802.11ac-VHT20 | MCS0 | 144 | 5720 | 23.15 | 17.73 | Pass |
| 802.11ac-VHT20 | MCS0 | 149 | 5745 | 22.69 | 17.72 | Pass |
| 802.11ac-VHT20 | MCS0 | 157 | 5785 | 23.20 | 17.73 | Pass |
| 802.11ac-VHT20 | MCS0 | 165 | 5825 | 23.35 | 17.73 | Pass |
| 802.11ac-VHT40 | MCS0 | 38 | 5190 | 41.78 | 36.20 | Pass |
| 802.11ac-VHT40 | MCS0 | 46 | 5230 | 40.91 | 36.17 | Pass |
| 802.11ac-VHT40 | MCS0 | 54 | 5270 | 41.33 | 36.14 | Pass |
| 802.11ac-VHT40 | MCS0 | 62 | 5310 | 41.36 | 36.15 | Pass |
| 802.11ac-VHT40 | MCS0 | 102 | 5510 | 41.02 | 36.12 | Pass |
| 802.11ac-VHT40 | MCS0 | 118 | 5590 | 41.56 | 36.19 | Pass |
| 802.11ac-VHT40 | MCS0 | 134 | 5670 | 41.31 | 36.24 | Pass |
| 802.11ac-VHT40 | MCS0 | 142 | 5710 | 41.25 | 36.21 | Pass |
| 802.11ac-VHT40 | MCS0 | 151 | 5755 | 41.22 | 36.18 | Pass |
| 802.11ac-VHT40 | MCS0 | 159 | 5795 | 40.79 | 36.17 | Pass |

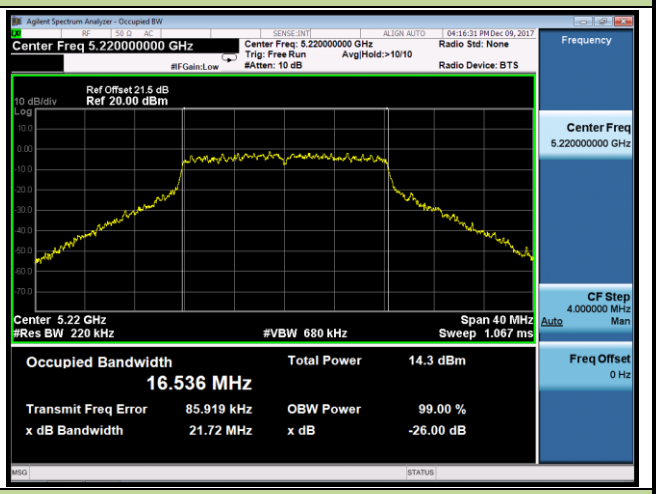
| Test Mode | Data Rate (Mbps) | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Result |
|---|---|---|---|---|---|---|
| Ant 2 / Ant 1 + 2 | | | | | | |
| 802.11ac-VHT80 | MCS0 | 42 | 5210 | 82.56 | 75.59 | Pass |
| 802.11ac-VHT80 | MCS0 | 58 | 5290 | 82.70 | 75.60 | Pass |
| 802.11ac-VHT80 | MCS0 | 106 | 5530 | 82.17 | 75.55 | Pass |
| 802.11ac-VHT80 | MCS0 | 122 | 5610 | 83.43 | 75.67 | Pass |
| 802.11ac-VHT80 | MCS0 | 138 | 5690 | 83.44 | 75.66 | Pass |
| 802.11ac-VHT80 | MCS0 | 155 | 5775 | 82.25 | 75.62 | Pass |

## 802.11a 26dB Bandwidth & 99% Bandwidth - Ant 2 / Ant 1 + 2

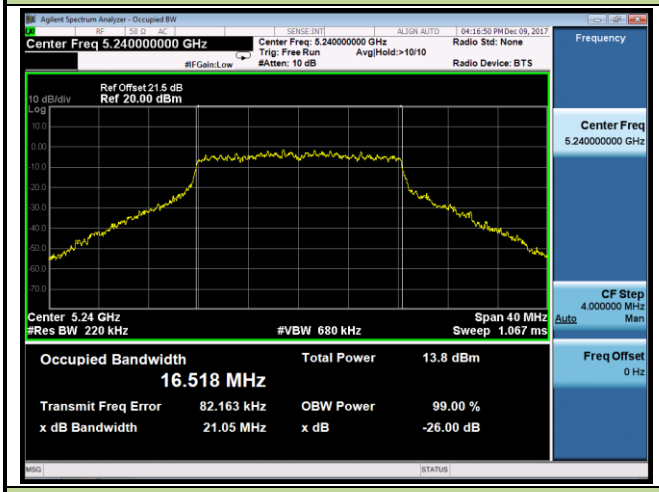
### Channel 36 (5180MHz)



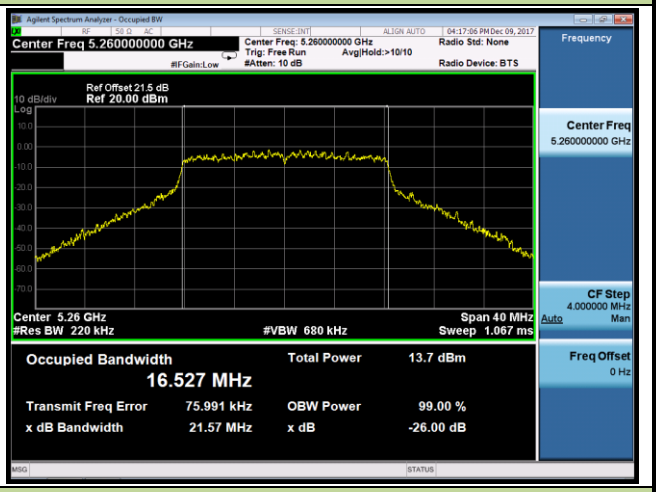

### Channel 44 (5220MHz)



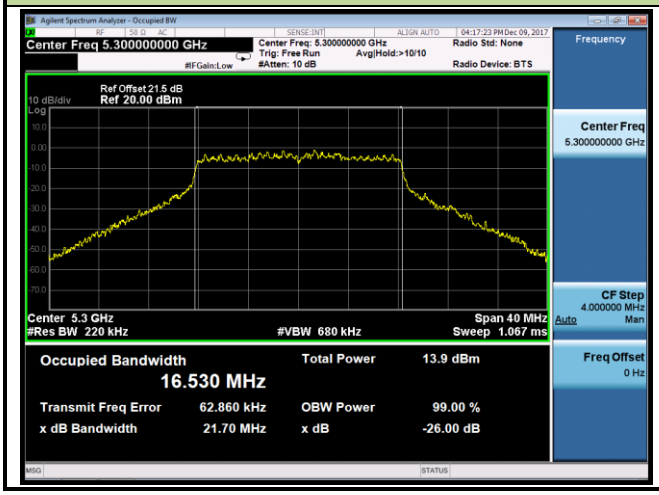

### Channel 48 (5240MHz)




### Channel 52 (5260MHz)



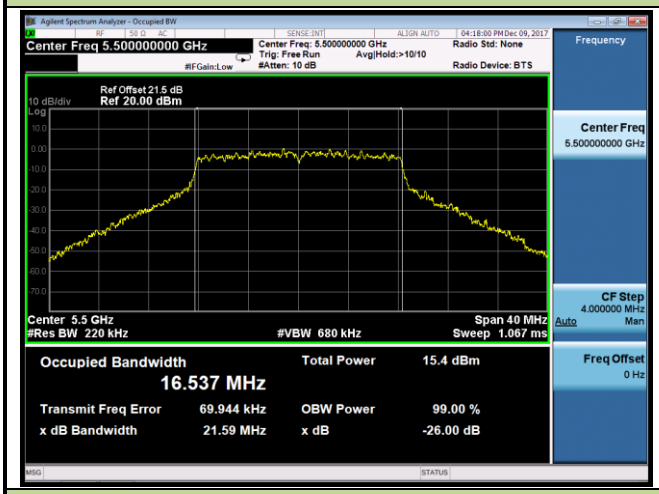

### Channel 60 (5300MHz)



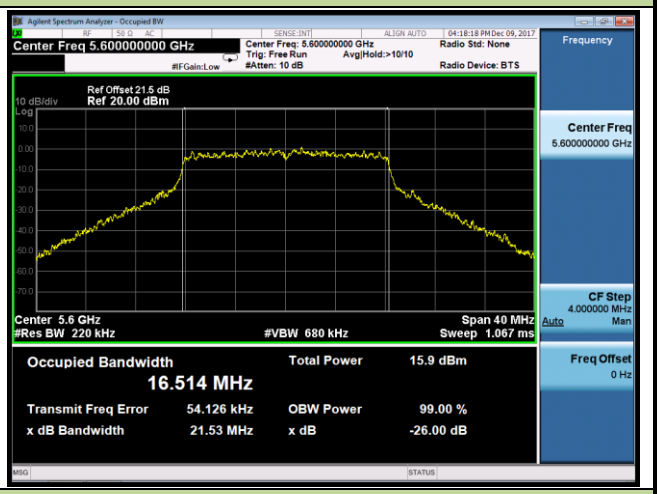

### Channel 64 (5320MHz)

## 802.11a 26dB Bandwidth & 99% Bandwidth - Ant 2 / Ant 1 + 2

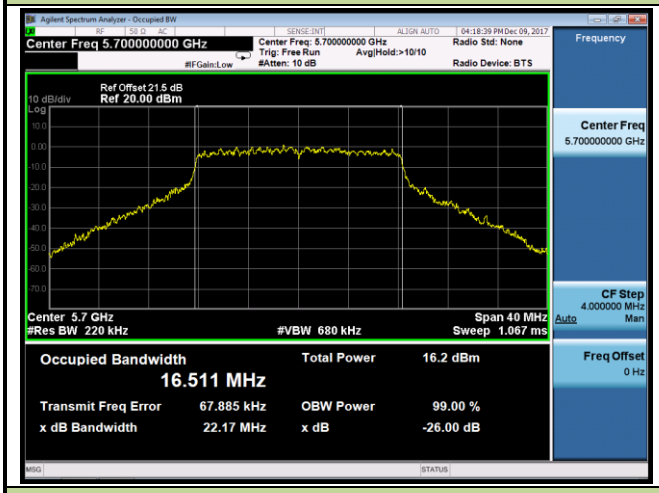
### Channel 100 (5500MHz)




### Channel 120 (5600MHz)

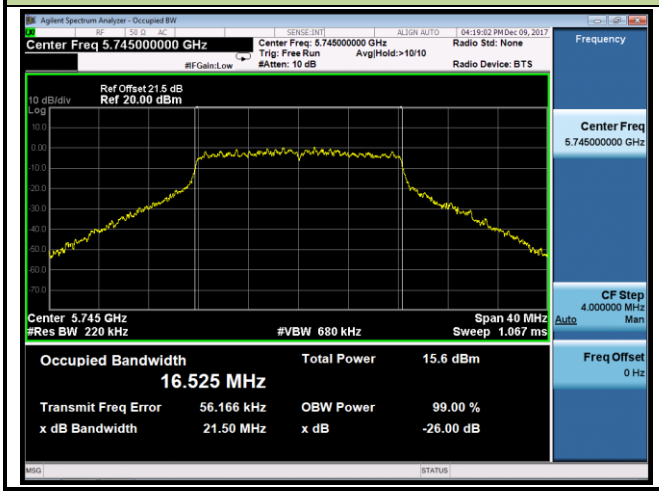



### Channel 140 (5700MHz)

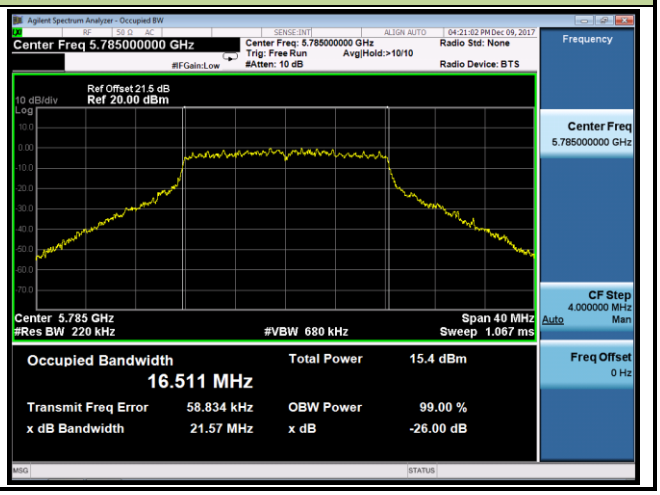


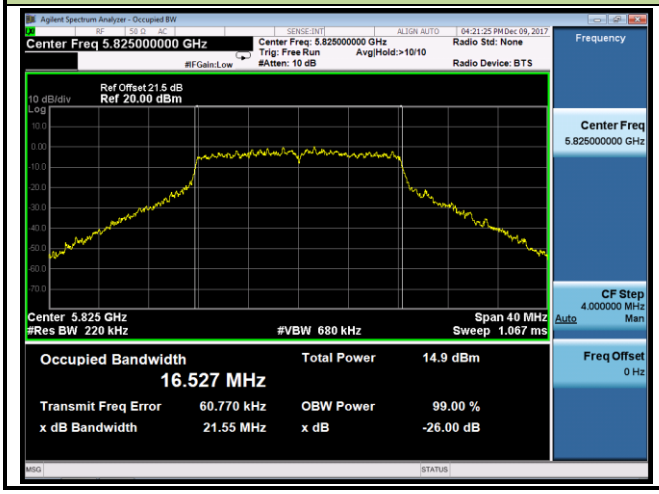

### Channel 144 (5720MHz)

### Channel 149 (5745MHz)



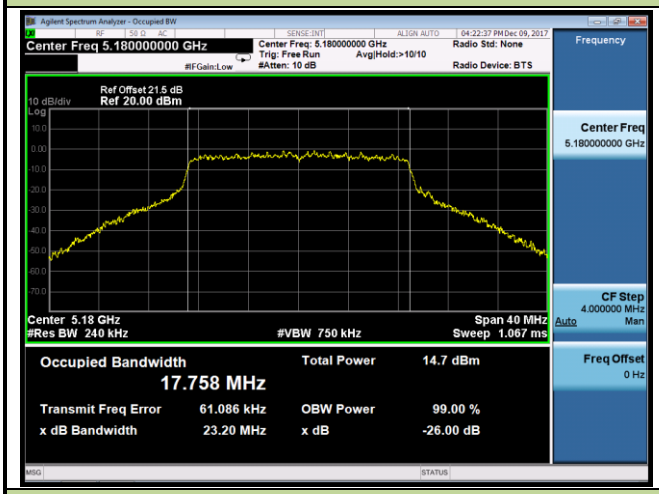

### Channel 157 (5785MHz)



| Channel 165 (5825MHz) | |
|---|---|
|  | |

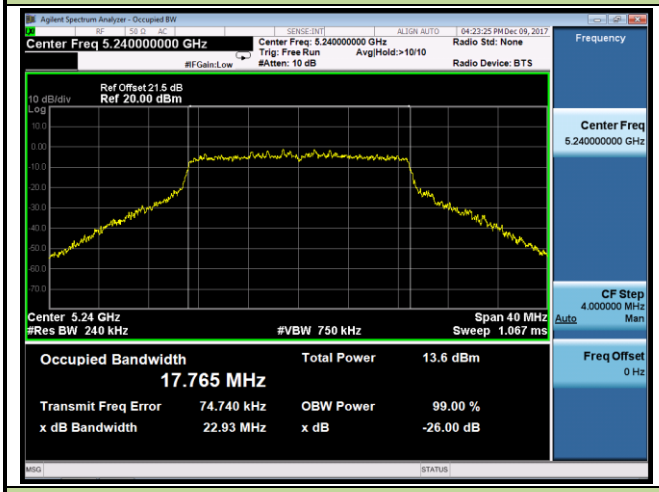
## 802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 2 / Ant 1 + 2

### Channel 36 (5180MHz)

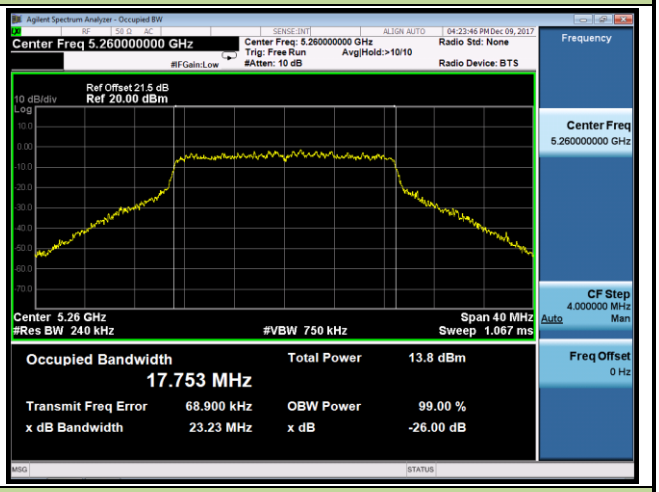



### Channel 44 (5220MHz)

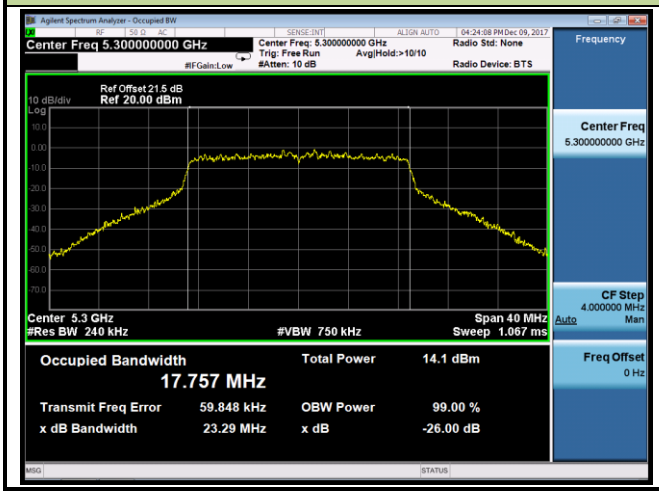
### Channel 48 (5240MHz)



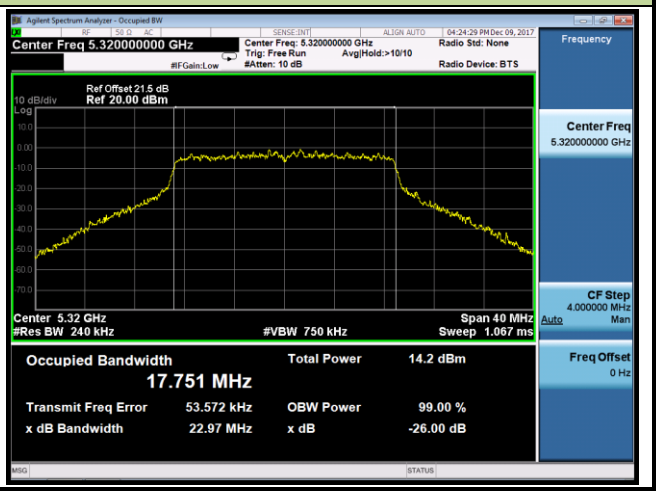

### Channel 52 (5260MHz)




### Channel 60 (5300MHz)

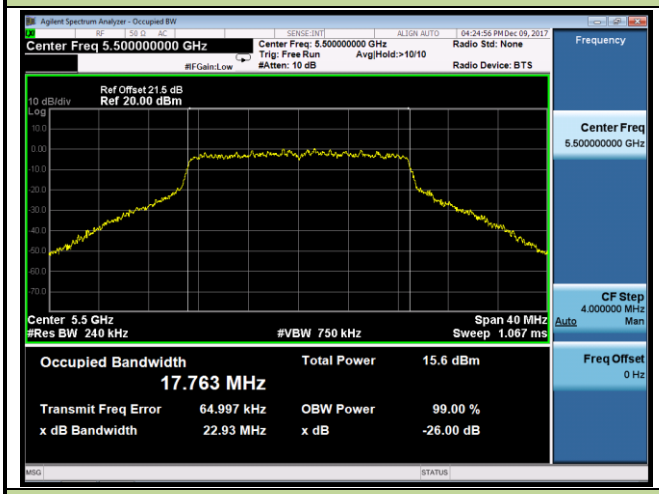



### Channel 64 (5320MHz)

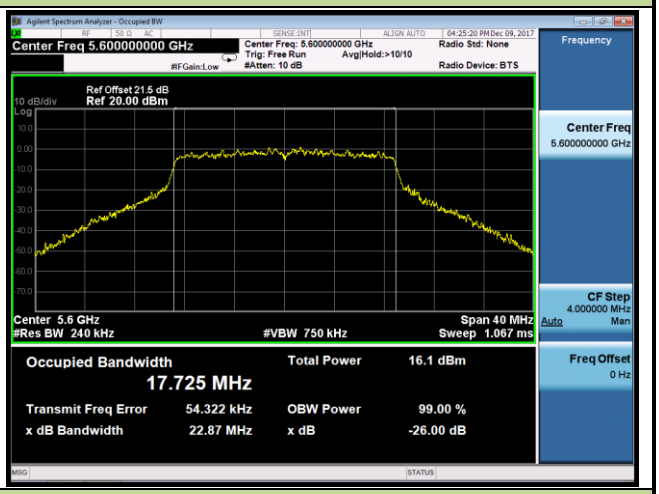


## 802.11n-HT20 26dB Bandwidth & 99% Bandwidth - Ant 2 / Ant 1 + 2

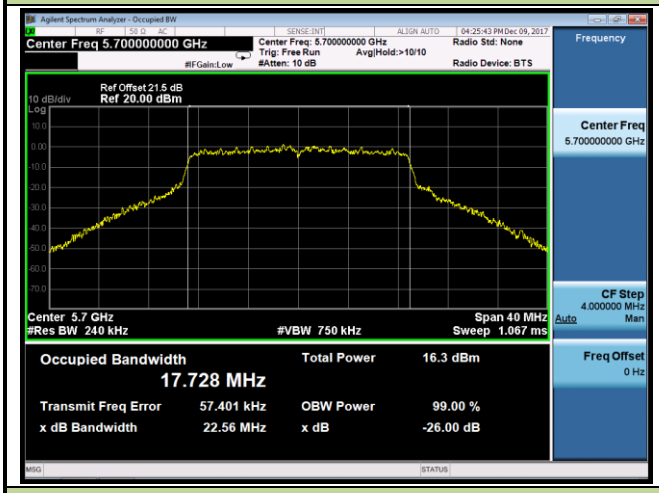
### Channel 100 (5500MHz)



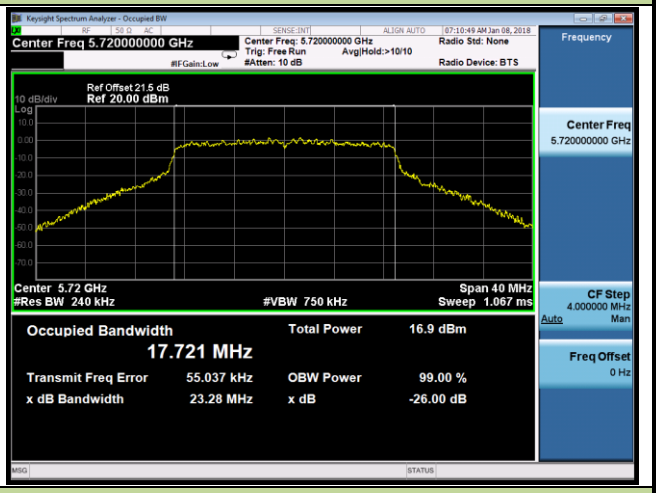

### Channel 120 (5600MHz)



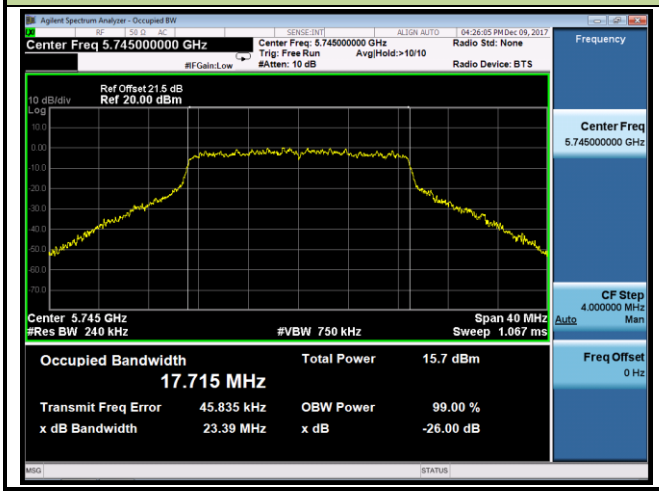

### Channel 140 (5700MHz)



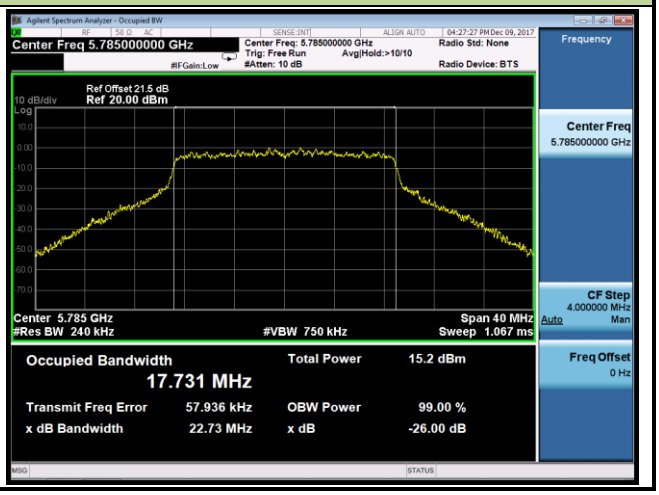

### Channel 144 (5720MHz)

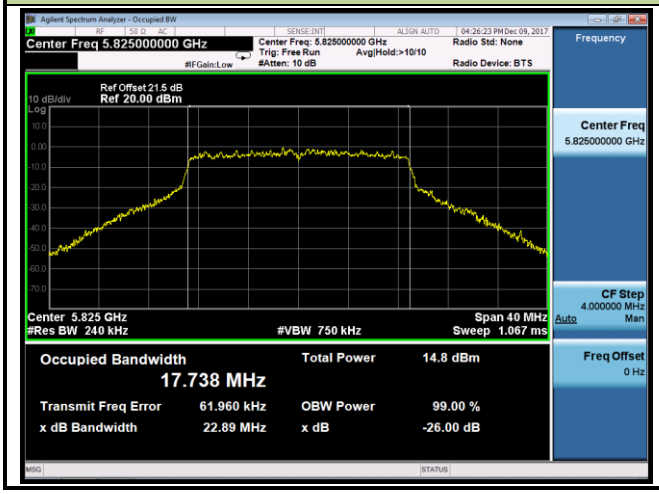



### Channel 149 (5745MHz)



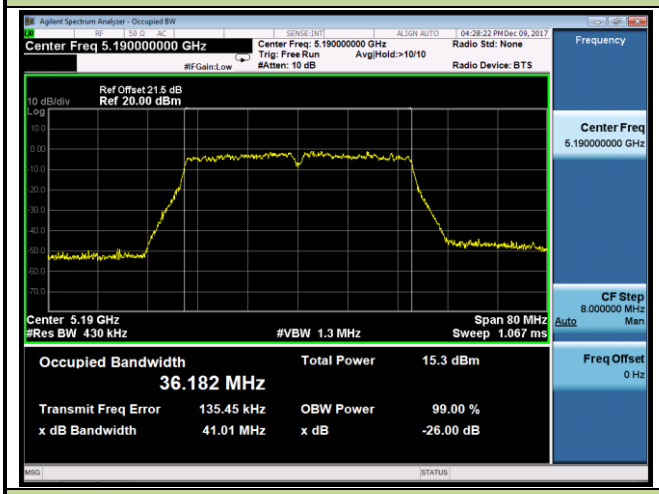

### Channel 157 (5785MHz)



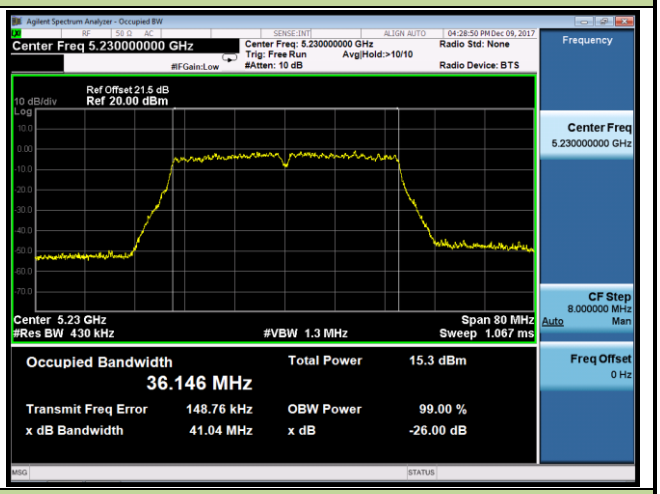
| Channel 165 (5825MHz) | |
|---|---|
|  | |

## 802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 2 / Ant 1 + 2

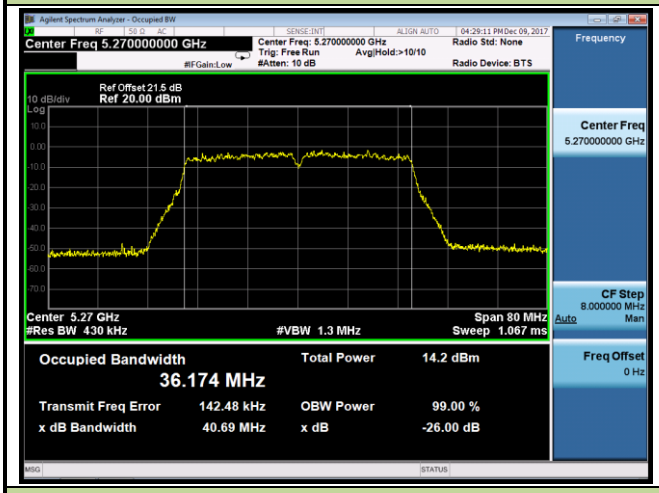
### Channel 38 (5190MHz)



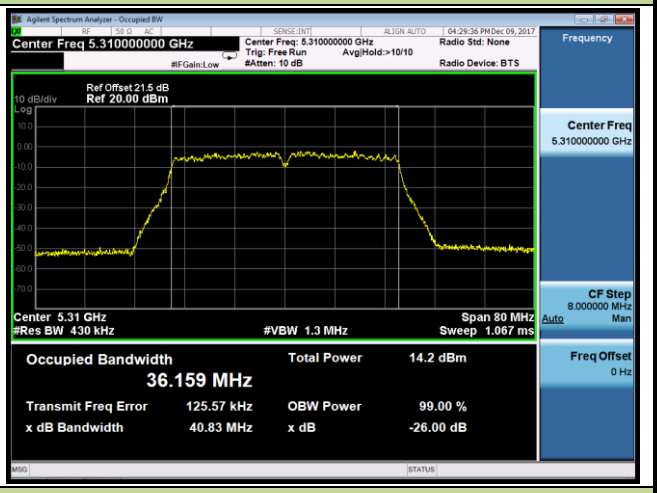

### Channel 46 (5230MHz)



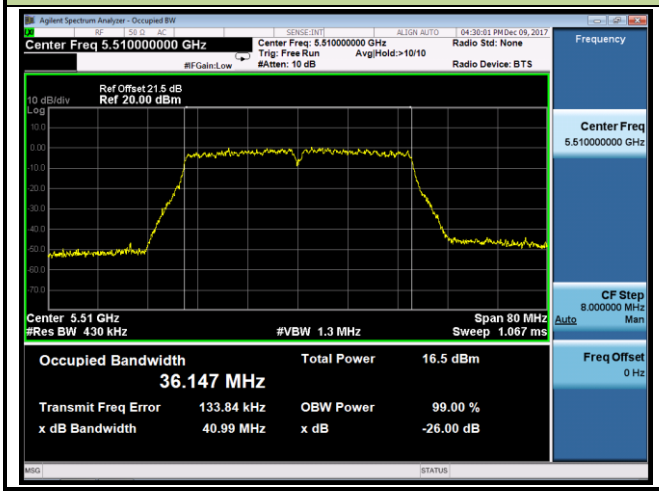

### Channel 54 (5270MHz)




### Channel 62 (5310MHz)



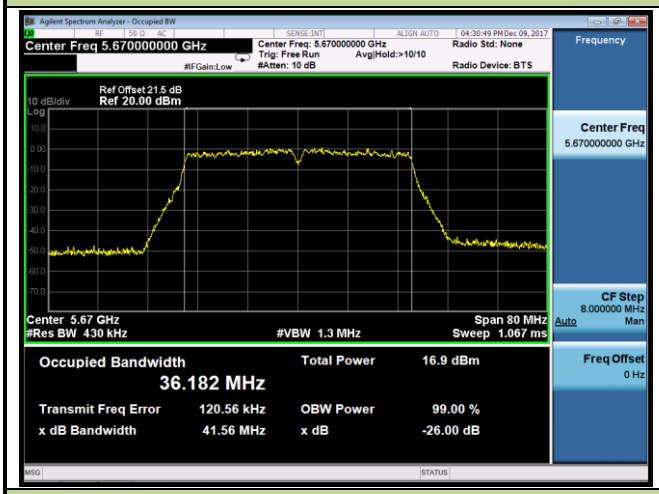

### Channel 102 (5510MHz)




### Channel 118 (5590MHz)

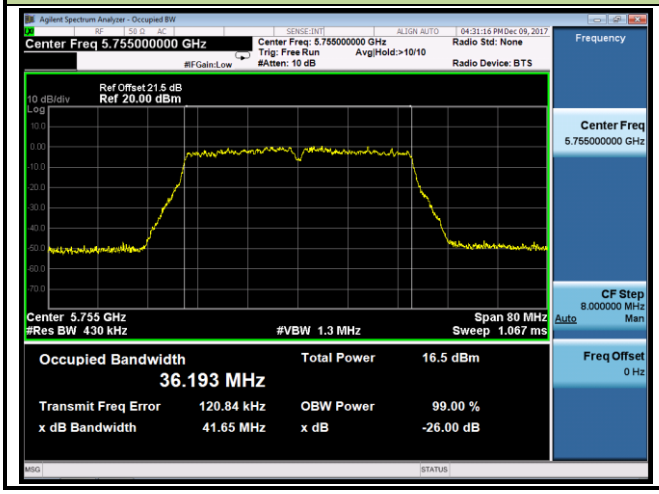
## 802.11n-HT40 26dB Bandwidth & 99% Bandwidth - Ant 2 / Ant 1 + 2

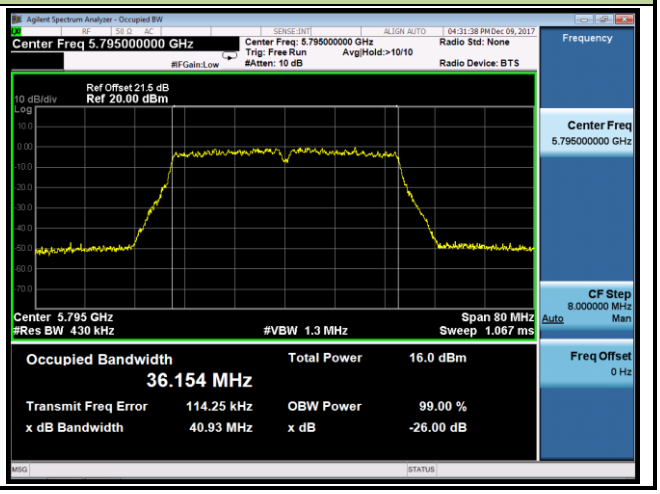
### Channel 134 (5670MHz)




### Channel 142 (5710MHz)

### Channel 151 (5755MHz)




### Channel 159 (5795MHz)