



## RF MEASUREMENT REPORT

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**FCC ID:** HD5-EDA521

**Applicant:** Honeywell International Inc  
Honeywell Safety and Productivity Solutions

**Application Type:** Certification

**Product:** Mobile Computer

**Model No.:** EDA52-1

**Brand Name:** Honeywell

**FCC Classification:** Unlicensed National Information Infrastructure (NII)

**FCC Rule Part(s):** Part 15 Subpart E (Section 15.407)

**Test Date:** March 16, 2021 ~ January 07, 2022

**Reviewed By:**

\_\_\_\_\_  
Jame Yuan

**Approved By:**

\_\_\_\_\_  
Robin Wu



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 ANSI C63.10-2013. 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  |
|---------------|---------|----------------|------------|-------|
| 2112RSU039-U4 | Rev. 01 | Initial Report | 01-20-2022 | Valid |
|               |         |                |            |       |

Note: EDA52-1 is a variation on the existing EDA52-0 (FCC ID: HD5-EDA520), added one LTE chipset, any others are the same. So EDA52-1 reuse all conducted test data from test report 2102RSU043-U4, and the radiated spurious emission items were fully tested.

## CONTENTS

| Description                              | Page      |
|------------------------------------------|-----------|
| <b>1. General Information .....</b>      | <b>6</b>  |
| 1.1. Applicant .....                     | 6         |
| 1.2. Manufacturer .....                  | 6         |
| 1.3. Testing Facility .....              | 6         |
| 1.4. Product Information.....            | 7         |
| 1.5. Radio Specification .....           | 7         |
| 1.6. Working Frequencies .....           | 8         |
| <b>2. Test Configuration .....</b>       | <b>9</b>  |
| 2.1. Test Mode.....                      | 9         |
| 2.2. Test System Connection Diagram..... | 9         |
| 2.3. Test Software .....                 | 9         |
| 2.4. Applied Standards.....              | 10        |
| 2.5. Test Environment Condition .....    | 10        |
| <b>3. Antenna Requirements .....</b>     | <b>11</b> |
| <b>4. Measuring Instrument .....</b>     | <b>12</b> |
| <b>5. Measurement Uncertainty.....</b>   | <b>14</b> |
| <b>6. Test Result.....</b>               | <b>15</b> |
| 6.1. Summary .....                       | 15        |
| 6.2. 26dB Bandwidth .....                | 16        |
| 6.2.1. Test Limit .....                  | 16        |
| 6.2.2. Test Procedure used .....         | 16        |
| 6.2.3. Test Setting .....                | 16        |
| 6.2.4. Test Setup .....                  | 17        |
| 6.2.5. Test Result .....                 | 17        |
| 6.3. 6dB Bandwidth .....                 | 18        |
| 6.3.1. Test Limit .....                  | 18        |
| 6.3.2. Test Procedure used .....         | 18        |
| 6.3.3. Test Setting .....                | 18        |
| 6.3.4. Test Setup .....                  | 18        |
| 6.3.5. Test Result .....                 | 18        |
| 6.4. Output Power .....                  | 19        |
| 6.4.1. Test Limit .....                  | 19        |
| 6.4.2. Test Procedure Used .....         | 19        |
| 6.4.3. Test Setting .....                | 19        |
| 6.4.4. Test Setup .....                  | 19        |

|         |                                     |    |
|---------|-------------------------------------|----|
| 6.4.5.  | Test Result .....                   | 20 |
| 6.5.    | Transmit Power Control .....        | 21 |
| 6.5.1.  | Test Limit .....                    | 21 |
| 6.5.2.  | Test Procedure Used .....           | 21 |
| 6.5.3.  | Test Setting .....                  | 21 |
| 6.5.4.  | Test Setup .....                    | 21 |
| 6.5.5.  | Test Result .....                   | 21 |
| 6.6.    | Power Spectral Density .....        | 22 |
| 6.6.1.  | Test Limit .....                    | 22 |
| 6.6.2.  | Test Procedure Used .....           | 22 |
| 6.6.3.  | Test Setting .....                  | 22 |
| 6.6.4.  | Test Setup .....                    | 23 |
| 6.6.5.  | Test Result .....                   | 23 |
| 6.7.    | Frequency Stability .....           | 24 |
| 6.7.1.  | Test Limit .....                    | 24 |
| 6.7.2.  | Test Procedure Used .....           | 24 |
| 6.7.3.  | Test Setup .....                    | 25 |
| 6.7.4.  | Test Result .....                   | 25 |
| 6.8.    | Radiated Spurious Emission .....    | 26 |
| 6.8.1.  | Test Limit .....                    | 26 |
| 6.8.2.  | Test Procedure Used .....           | 26 |
| 6.8.3.  | Test Setting .....                  | 26 |
| 6.8.4.  | Test Setup .....                    | 28 |
| 6.8.5.  | Test Result .....                   | 28 |
| 6.9.    | Radiated Restricted Band Edge ..... | 29 |
| 6.9.1.  | Test Limit .....                    | 29 |
| 6.9.2.  | Test Procedure Used .....           | 30 |
| 6.9.3.  | Test Setting .....                  | 30 |
| 6.9.4.  | Test Setup .....                    | 31 |
| 6.9.5.  | Test Result .....                   | 31 |
| 6.10.   | AC Conducted Emissions .....        | 32 |
| 6.10.1. | Test Limit .....                    | 32 |
| 6.10.2. | Test Setup .....                    | 32 |
| 6.10.3. | Test Result .....                   | 32 |

## **Appendix A – Test Result.....33**

|     |                                        |    |
|-----|----------------------------------------|----|
| A.1 | Duty Cycle Test Result .....           | 33 |
| A.2 | 26dB & 99% Bandwidth Test Result ..... | 34 |
| A.3 | 6dB Bandwidth Test Result .....        | 48 |
| A.4 | Output Power Test Result .....         | 52 |

|                                                 |                                                         |            |
|-------------------------------------------------|---------------------------------------------------------|------------|
| A.5                                             | Power Spectral Density Test Result.....                 | 56         |
| A.6                                             | Frequency Stability Test Result.....                    | 71         |
| A.7                                             | Radiated Spurious Emission Measurement Test Result..... | 72         |
| A.8                                             | Radiated Restricted Band Edge Test Result.....          | 144        |
| A.9                                             | AC Conducted Emissions Test Result .....                | 250        |
| <b>Appendix B – Test Setup Photograph .....</b> |                                                         | <b>252</b> |
| <b>Appendix C – EUT Photograph .....</b>        |                                                         | <b>253</b> |

## 1. General Information

### 1.1. Applicant

Honeywell International Inc  
Honeywell Safety and Productivity Solutions  
9680 Old Bailes Road, Fort Mill, SC 29707 United States

## 1.2. Manufacturer

Honeywell International Inc  
Honeywell Safety and Productivity Solutions  
9680 Old Bales Road, Fort Mill, SC 29707 United States

### 1.3. Testing Facility

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | <b>Test Site – MRT Suzhou Laboratory</b><br><b>Laboratory Location (Suzhou - Wuzhong)</b><br>D8 Building, No.2 Tian’edang Rd., Wuzhong Economic Development Zone, Suzhou, China<br><b>Laboratory Location (Suzhou - SIP)</b><br>4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China<br><b>Laboratory Accreditations</b><br>A2LA: 3628.01 CNAS: L10551<br>FCC: CN1166 ISED: CN0001<br>VCCI: <input type="checkbox"/> R-20025 <input type="checkbox"/> G-20034 <input type="checkbox"/> C-20020 <input type="checkbox"/> T-20020<br><input type="checkbox"/> R-20141 <input type="checkbox"/> G-20134 <input type="checkbox"/> C-20103 <input type="checkbox"/> T-20104 |
| <input checked="" type="checkbox"/> | <b>Test Site – MRT Shenzhen Laboratory</b><br><b>Laboratory Location (Shenzhen)</b><br>1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China<br><b>Laboratory Accreditations</b><br>A2LA: 3628.02 CNAS: L10551<br>FCC: CN1284 ISED: CN0105                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <input type="checkbox"/>            | <b>Test Site – MRT Taiwan Laboratory</b><br><b>Laboratory Location (Taiwan)</b><br>No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)<br><b>Laboratory Accreditations</b><br>TAF: L3261-190725<br>FCC: 291082, TW3261 ISED: TW3261                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

#### 1.4. Product Information

|                                                                                                                                                       |                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Product Name                                                                                                                                          | Mobile Computer                                |
| Model No.                                                                                                                                             | EDA52-1                                        |
| Serial No.                                                                                                                                            | Conducted Sample: 20210209Sample#01            |
|                                                                                                                                                       | Radiated Sample: 21356B28C7                    |
| Wi-Fi Specification                                                                                                                                   | 802.11a/b/g/n/ac                               |
| Bluetooth Specification                                                                                                                               | v5.0 dual mode                                 |
| NFC Specification                                                                                                                                     | Active, 13.56MHz                               |
| GNSS Specification                                                                                                                                    | GPS/Galileo/BDS/GLONASS                        |
| 3GPP Specification                                                                                                                                    | GSM 850/1900, WCDMA Band 2/4/5                 |
|                                                                                                                                                       | LTE Band 2/4/5/7/12/13/17/25/26/30/38/40/41/66 |
| Antenna Information                                                                                                                                   | Refer to section 1.5                           |
| Working Voltage                                                                                                                                       | 3.8Vdc                                         |
| Accessories                                                                                                                                           |                                                |
| Adapter                                                                                                                                               | Model No.: ADS-12B-06 05010E                   |
|                                                                                                                                                       | Input Power: 100 - 240V ~ 50/60Hz, Max. 0.3A   |
|                                                                                                                                                       | Output Power: 5VDC 2.0A                        |
| Rechargeable Li-ion Battery                                                                                                                           | Model No.: EDA52-BAT-US                        |
|                                                                                                                                                       | Capacitance: 4500mAh 17.1Wh                    |
|                                                                                                                                                       | Rated Voltage: 3.8V                            |
| Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. |                                                |

#### 1.5. Radio Specification

|                    |                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Range    | For 802.11a/n-HT20/ac-VHT20:<br>5180~5240MHz, 5260~5320MHz, 5500~5720MHz, 5745~5825MHz<br>For 802.11n-HT40/ac-VHT40:<br>5190~5230MHz, 5270~5310MHz, 5510~5710MHz, 5755~5795MHz<br>For 802.11ac-VHT80:<br>5210MHz, 5290MHz, 5530MHz, 5610 MHz, 5690MHz, 5775MHz |
| Type of Modulation | 802.11a/n/ac: OFDM                                                                                                                                                                                                                                             |
| Data Rate          | 802.11a: 6/9/12/18/24/36/48/54Mbps                                                                                                                                                                                                                             |
|                    | 802.11n: up to 150Mbps                                                                                                                                                                                                                                         |
|                    | 802.11ac: up to 433.3Mbps                                                                                                                                                                                                                                      |
| Antenna Type       | FPC Antenna                                                                                                                                                                                                                                                    |
| Antenna Gain       | 3.53dBi                                                                                                                                                                                                                                                        |

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

## 1.6. Working Frequencies

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  |

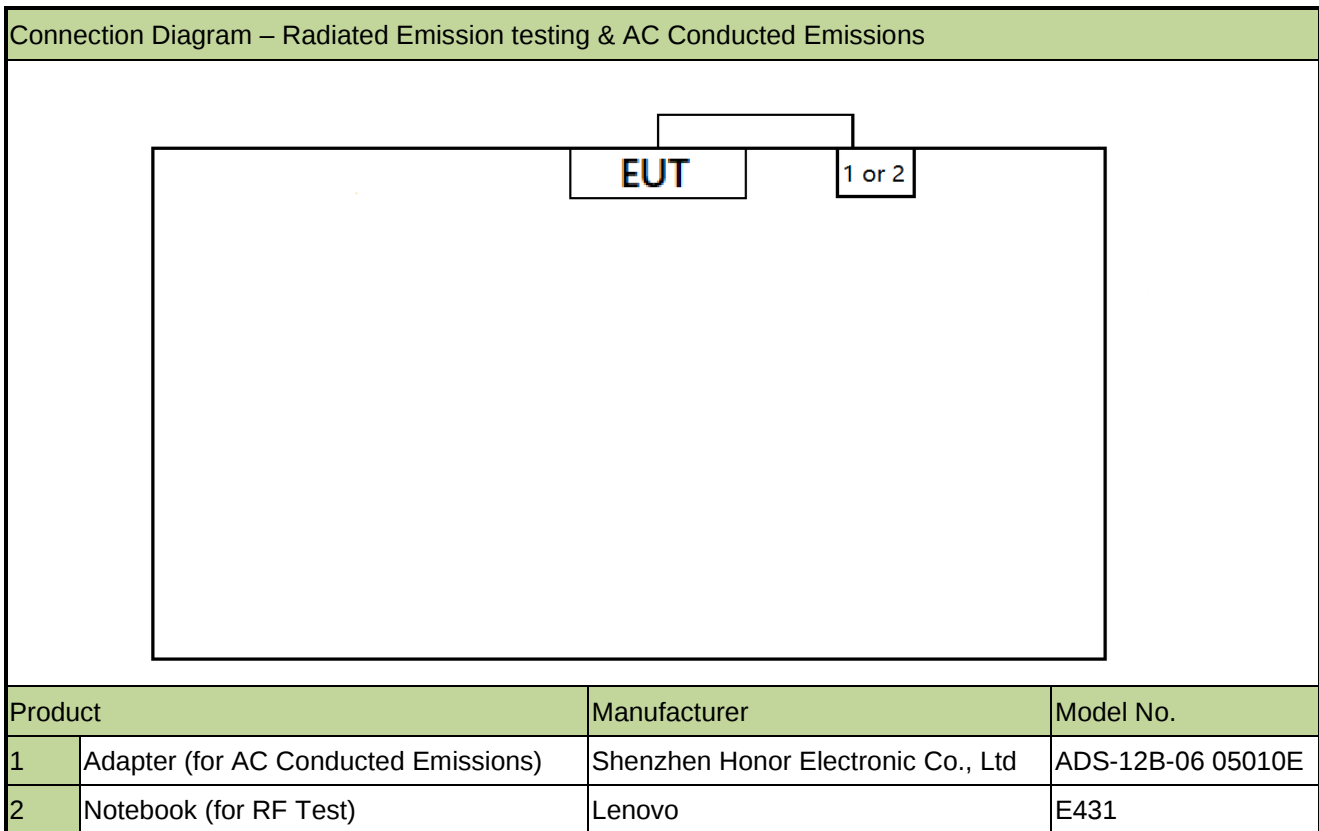
## 2. Test Configuration

### 2.1. 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) |

### 2.2. Test System Connection Diagram

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.



### 2.3. Test Software

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

#### 2.4. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.407
- KDB 789033 D02v02r01
- ANSI C63.10-2013

#### 2.5. Test Environment Condition

|                     |            |
|---------------------|------------|
| Ambient Temperature | 15 ~ 35°C  |
| Relative Humidity   | 20 ~ 75%RH |

### 3. 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 **Mobile Computer** is **permanently attached**.
- There are no provisions for connection to an external antenna.

#### **Conclusion:**

The unit complies with the requirement of §15.203.

#### 4. Measuring Instrument

##### Conducted Test Equipment

| Instrument                          | Manufacturer | Model No.   | Asset No.   | Cali. Interval | Cali. Due Date | Test Site |
|-------------------------------------|--------------|-------------|-------------|----------------|----------------|-----------|
| EXA Signal Analyzer                 | Agilent      | N9020A      | MRTSUE06106 | 1 year         | 2021/04/14     | WZ-TR3    |
|                                     |              |             |             | 1 year         | 2022/04/13     | WZ-TR3    |
| EXA Signal Analyzer                 | Keysight     | N9010B      | MRTSUE06607 | 1 year         | 2022/01/07     | WZ-TR3    |
| Signal Analyzer                     | R&S          | FSV40       | MRTSUE06218 | 1 year         | 2021/04/14     | WZ-TR3    |
|                                     |              |             |             | 1 year         | 2022/04/13     | WZ-TR3    |
| Power Meter                         | Agilent      | U2021XA     | MRTSUE06030 | 1 year         | 2021/10/22     | WZ-TR3    |
| USB wideband power sensor           | Keysight     | U2021XA     | MRTSUE06446 | 1 year         | 2021/08/30     | WZ-TR3    |
| USB wideband power sensor           | Keysight     | U2021XA     | MRTSUE06447 | 1 year         | 2021/08/08     | WZ-TR3    |
| Bluetooth Test Set                  | Anritsu      | MT8852B-042 | MRTSUE06389 | 1 year         | 2021/06/11     | WZ-TR3    |
| Audio Analyzer                      | Agilent      | U8903B      | MRTSUE06143 | 1 year         | 2021/06/11     | WZ-TR3    |
| Modulation Analyzer                 | HP           | HP8901A     | MRTSUE06098 | 1 year         | 2021/09/26     | WZ-TR3    |
| Wideband Radio Communication Tester | R&S          | CMW 500     | MRTSUE06243 | 1 year         | 2021/10/20     | WZ-TR3    |
| DC Power Supply                     | GWINSTEK     | DPS-3303C   | MRTSUE06064 | N/A            | N/A            | WZ-TR3    |
| Temperature & Humidity Chamber      | BAOYT        | BYH-150CL   | MRTSUE06051 | 1 year         | 2021/10/22     | WZ-TR3    |
| Thermal Hygrometer                  | testo        | 608-H1      | MRTSUE06401 | 1 year         | 2021/07/26     | WZ-TR3    |
| Attenuator                          | MVE          | 6dB         | MRTSUE06534 | 1 year         | N/A            | WZ-TR3    |
| Attenuator                          | MVE          | 10dB        | MRTSUE06543 | 1 year         | N/A            | WZ-TR3    |

##### Radiated Test Equipment

| Instrument        | Manufacturer | Model No.   | Asset No.   | Cali. Interval | Cali. Due Date | Test Site     |
|-------------------|--------------|-------------|-------------|----------------|----------------|---------------|
| Signal Analyzer   | Agilent      | N9010A      | MRTSUE06195 | 1 year         | 2022/3/17      | NS-AC1/NS-TR2 |
| Horn Antenna      | Schwarzbeck  | BBHA 9170   | MRTSUE06292 | 1 year         | 2022/10/20     | NS-AC1        |
| Anechoic Chamber  | BOOMWAVE     | NS-AC1      | MRTSUE06496 | 1 year         | 2022/7/24      | NS-AC1        |
| Loop Antenna      | Schwarzbeck  | FMZB 1519 B | MRTSUE06937 | 1 year         | 2022/3/9       | SIP-AC3       |
| Horn Antenna      | Schwarzbeck  | BBHA 9120D  | MRTSUE06572 | 1 year         | 2022/3/14      | NS-AC1        |
| TRILOG Antenna    | Schwarzbeck  | VULB 9162   | MRTSUE06573 | 1 year         | 2022/6/29      | NS-AC1        |
| Preamplifier      | Schwarzbeck  | BBV 9718    | MRTSUE06574 | 1 year         | 2022/7/12      | NS-AC1        |
| EMI Test Receiver | R&S          | ESR3        | MRTSUE06575 | 1 year         | 2022/6/27      | NS-AC1        |
| Thermohygrometer  | DELI         | NO.8813     | MRTSUE06588 | 1 year         | 2022/6/30      | NS-AC1        |
| Preamplifier      | EMCI         | EMC184045SE | MRTSUE06641 | 1 year         | 2022/1/12      | NS-AC1        |

---

|                 |          |        |             |        |           |               |
|-----------------|----------|--------|-------------|--------|-----------|---------------|
| Signal Analyzer | Keysight | N9020A | MRTSUE10065 | 1 year | 2022/1/10 | NS-AC1/NS-TR2 |
|-----------------|----------|--------|-------------|--------|-----------|---------------|

| Software     | Version | Function          |
|--------------|---------|-------------------|
| EMI Software | V3      | EMI Test Software |

## 5. 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  $k = 2$ .

|                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AC Conducted Emission Measurement</b>                                                                                                                                                                                                       |
| Measurement Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):<br>9kHz~150kHz: 3.74dB<br>150kHz~30MHz: 3.44dB                                                                                                                        |
| <b>Radiated Emission Measurement</b>                                                                                                                                                                                                           |
| Measurement Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):<br>Horizontal:<br>30MHz~300MHz: 5.04dB<br>300MHz~1GHz: 4.95dB<br>1GHz~40GHz: 6.40dB<br>Vertical:<br>30MHz~300MHz: 5.24dB<br>300MHz~1GHz: 6.03dB<br>1GHz~40GHz: 6.40dB |
| <b>Spurious Emissions, Conducted</b>                                                                                                                                                                                                           |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):<br>0.78dB                                                                                                                                                               |
| <b>Output Power</b>                                                                                                                                                                                                                            |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):<br>1.13dB                                                                                                                                                               |
| <b>Power Spectrum Density</b>                                                                                                                                                                                                                  |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):<br>1.15dB                                                                                                                                                               |
| <b>Occupied Bandwidth</b>                                                                                                                                                                                                                      |
| Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):<br>0.28%                                                                                                                                                                |

## 6. Test Result

### 6.1. Summary

| FCC Section(s)                             | Test Description                                                                 | Test Condition | Verdict |
|--------------------------------------------|----------------------------------------------------------------------------------|----------------|---------|
| 15.407(a)                                  | 26dB Bandwidth                                                                   | Conducted      | Pass    |
| 15.407(e)                                  | 6dB Bandwidth                                                                    |                | Pass    |
| 15.407(a)(1)(iv), (2), (3)(i)              | Maximum Conducted Output Power                                                   |                | Pass    |
| 15.407(h)(1)                               | Transmit Power Control                                                           |                | N/A     |
| 15.407(a)(1)(iv), (2), (3)(i), (12)        | Peak Power Spectral Density                                                      |                | Pass    |
| 15.407(g)                                  | Frequency Stability                                                              |                | Pass    |
| 15.407(b)(1), (2), (3), (4)(i)             | Undesirable Emissions                                                            |                | Pass    |
| 15.205, 15.209<br>15.407(b)(9), (10), (11) | General Field Strength Limits<br>(Restricted Bands and Radiated Emission Limits) | Radiated       | Pass    |
| 15.207                                     | AC Conducted Emissions<br>150kHz - 30MHz                                         | Line Conducted | Pass    |

#### Remark:

- 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.
- 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.
- “N/A” means that the test item is not applicable, and the detailed information refers to relevant section.

## **6.2. 26dB Bandwidth**

### **6.2.1. Test Limit**

N/A

### **6.2.2. Test Procedure used**

KDB 789033 D02v02r01- Section C.1 (26dB Bandwidth)

KDB 789033 D02v02r01- Section D (99% Bandwidth)

### **6.2.3. Test Setting**

#### **26dB Bandwidth**

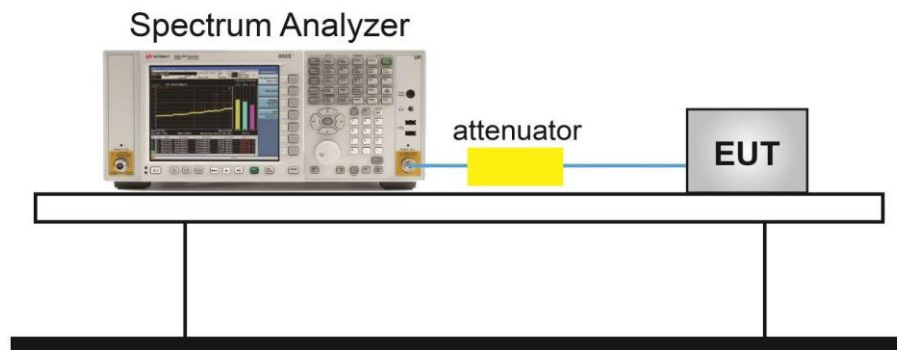
1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to  $X = 26$ . The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth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

#### **99% Bandwidth**

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1% to 5% of the OBW
4. Set VBW  $\geq 3 \times$  RBW
5. Detector = Peak.

Use the 99% power bandwidth function of the instrument.

#### 6.2.4. Test Setup



#### 6.2.5. Test Result

Refer to Appendix A.2.

### 6.3. 6dB Bandwidth

#### 6.3.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

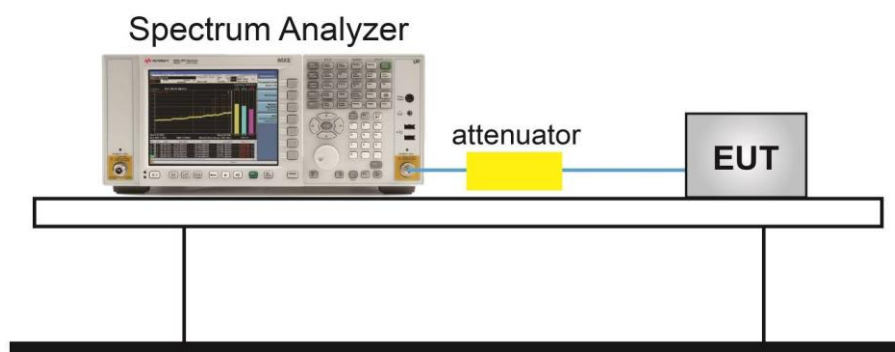
#### 6.3.2. Test Procedure used

KDB 789033 D02v02r01- Section C.2

#### 6.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW  $3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 6.3.4. Test Setup



#### 6.3.5. Test Result

Refer to Appendix A.3.

## 6.4. Output Power

### 6.4.1. Test Limit

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm).

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 6.4.2. Test Procedure Used

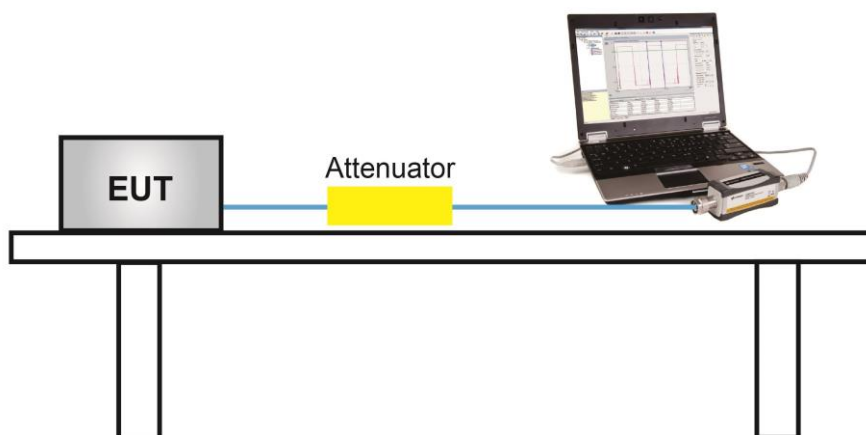
KDB 789033D02v02r01- Section E)3)b) Method PM-G

### 6.4.3. Test Setting

#### Average Power Measurement

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

### 6.4.4. Test Setup



#### **6.4.5. Test Result**

Refer to Appendix A.4.

## 6.5. Transmit Power Control

### 6.5.1. Test Limit

The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.

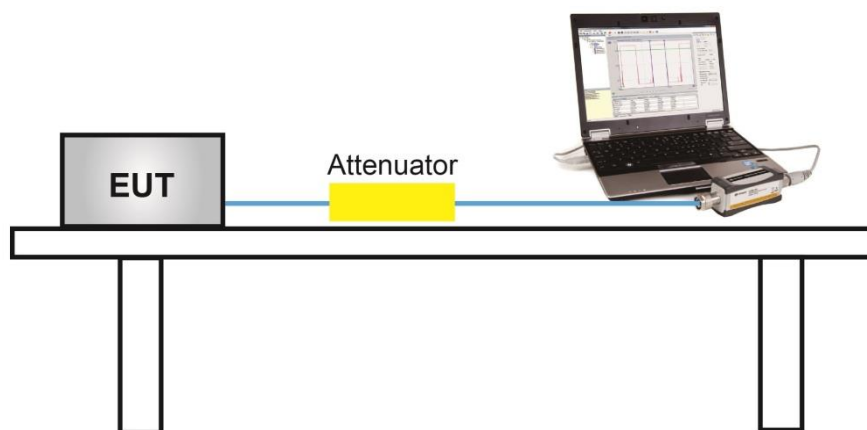
### 6.5.2. Test Procedure Used

KDB 789033 D02v01- Section E)3)b) Method PM-G

### 6.5.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

### 6.5.4. Test Setup



### 6.5.5. Test Result

A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

## **6.6. Power Spectral Density**

### **6.6.1. Test Limit**

For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

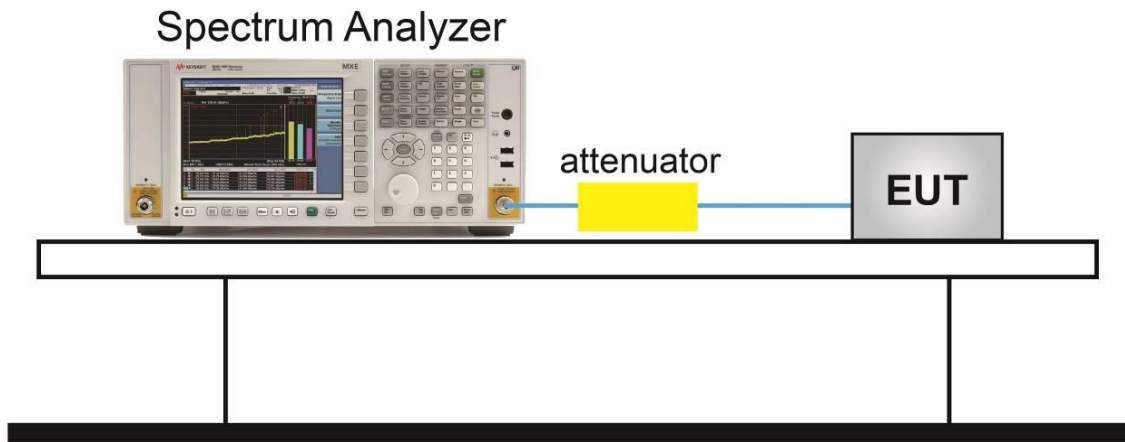
### **6.6.2. Test Procedure Used**

KDB 789033 D02v02r01-SectionF

### **6.6.3. Test Setting**

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal
3. RBW = 1MHz (510kHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz), VBW = 3MHz
4. Number of sweep points  $\geq 2 \times (\text{span} / \text{RBW})$
5. Detector = power averaging (Average)
6. Sweep time = auto
7. Trigger = free run
8. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
9. Add  $10 \cdot \log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \cdot \log(1/0.25) = 6$  dB if the duty cycle is 25 percent.

#### 6.6.4. Test Setup



#### 6.6.5. Test Result

Refer to Appendix A.5.

## **6.7. Frequency Stability**

### **6.7.1. Test Limit**

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

### **6.7.2. Test Procedure Used**

#### **Frequency Stability Under Temperature Variations:**

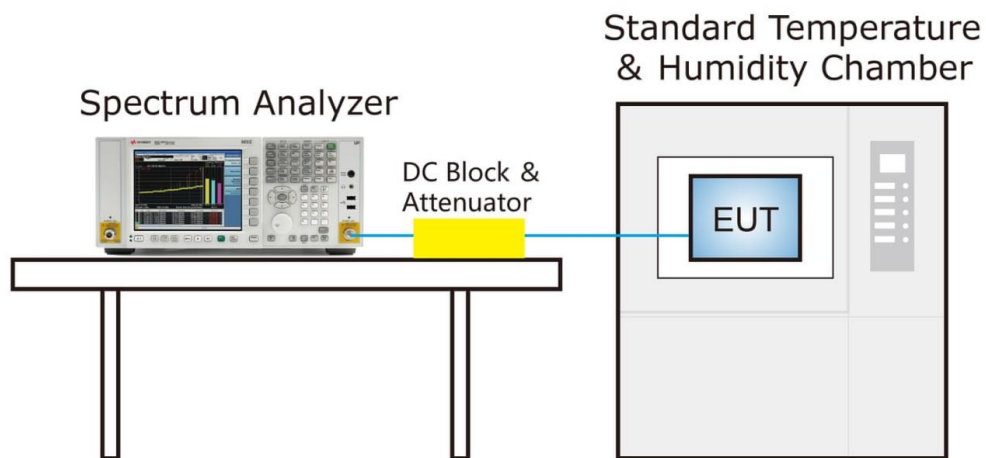
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

#### **Frequency Stability Under Voltage Variations:**

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.

### 6.7.3. Test Setup



### 6.7.4. Test Result

Refer to Appendix A.5.

## 6.8. Radiated Spurious Emission

### 6.8.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

| FCC Part 15 Subpart C Paragraph 15.209 |                          |                               |
|----------------------------------------|--------------------------|-------------------------------|
| Frequency<br>[MHz]                     | Field Strength<br>[uV/m] | Measured Distance<br>[Meters] |
| 0.009 - 0.490                          | 2400/F (kHz)             | 300                           |
| 0.490 - 1.705                          | 24000/F (kHz)            | 30                            |
| 1.705 - 30                             | 30                       | 30                            |
| 30 - 88                                | 100                      | 3                             |
| 88 - 216                               | 150                      | 3                             |
| 216 - 960                              | 200                      | 3                             |
| Above 960                              | 500                      | 3                             |

### 6.8.2. Test Procedure Used

KDB 789033 D02v02r01- Section G

### 6.8.3. Test Setting

**Table 1 - RBW as a function of frequency**

| Frequency     | RBW           |
|---------------|---------------|
| 9 ~ 150 kHz   | 200 ~ 300 Hz  |
| 0.15 ~ 30 MHz | 9 ~ 10 kHz    |
| 30 ~ 1000 MHz | 100 ~ 120 kHz |
| > 1000MHz     | 1MHz          |

**Quasi-Peak Measurements below 1GHz**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

**Peak Measurements above 1GHz**

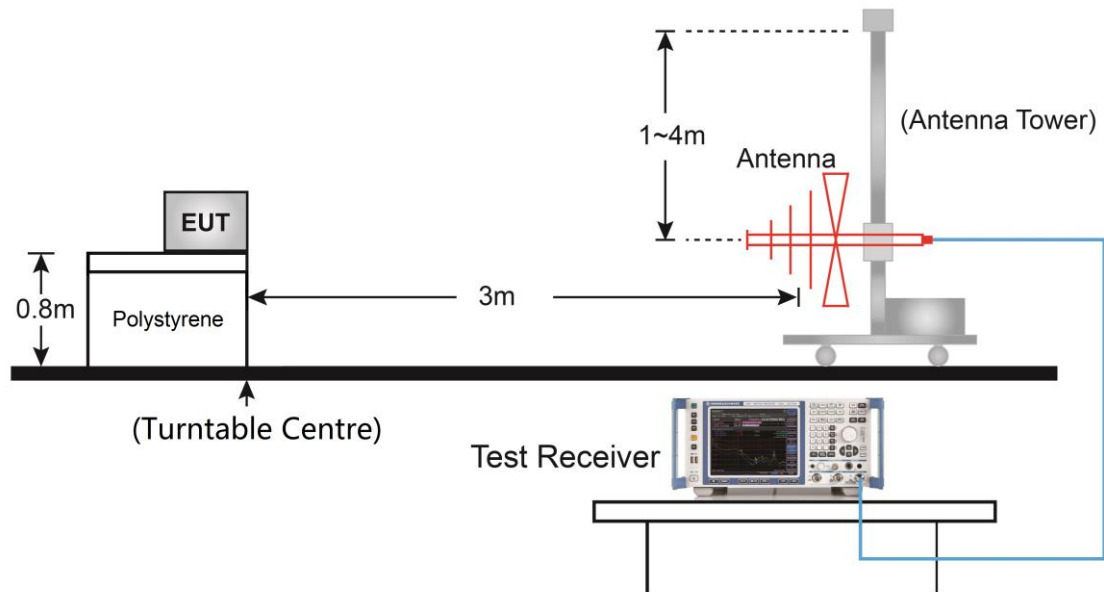
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

**Average Measurements above 1GHz (Method VB)**

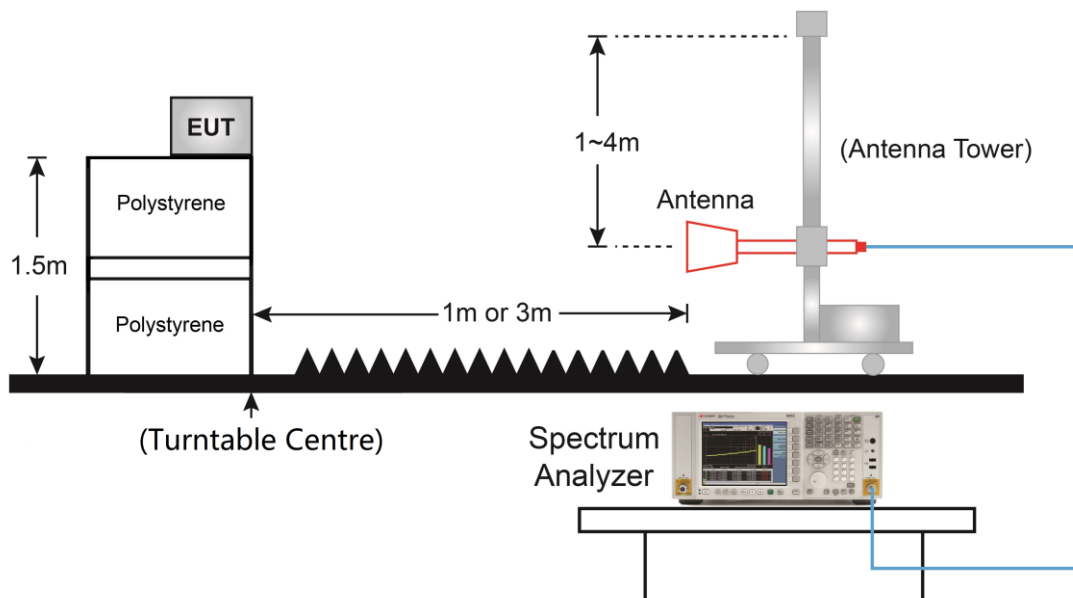
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10 Hz.  
If the EUT duty cycle is  $< 98\%$ , set VBW  $\geq 1/T$ . T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

#### 6.8.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



#### 6.8.5. Test Result

Refer to Appendix A.6.

## 6.9. Radiated Restricted Band Edge

### 6.9.1. Test Limit

#### For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

| Frequency<br>(MHz)         | Frequency<br>(MHz)    | Frequency<br>(MHz) | Frequency<br>(GHz) |
|----------------------------|-----------------------|--------------------|--------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410        | 4.5 - 5.15         |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525   | 608 - 614          | 5.35 - 5.46        |
| 2.1735 - 2.1905            | 16.80425 - 16.80475   | 960 - 1240         | 7.25 - 7.75        |
| 4.125 - 4.128              | 25.5 - 25.67          | 1300 - 1427        | 8.025 - 8.5        |
| 4.17725 - 4.17775          | 37.5 - 38.25          | 1435 - 1626.5      | 9.0 - 9.2          |
| 4.20725 - 4.20775          | 73 - 74.6             | 1645.5 - 1646.5    | 9.3 - 9.5          |
| 6.215 - 6.218              | 74.8 - 75.2           | 1660 - 1710        | 10.6 - 12.7        |
| 6.26775 - 6.26825          | 108 - 121.94          | 1718.8 - 1722.2    | 13.25 - 13.4       |
| 6.31175 - 6.31225          | 123 - 138             | 2200 - 2300        | 14.47 - 14.5       |
| 8.291 - 8.294              | 149.9 - 150.05        | 2310 - 2390        | 15.35 - 16.2       |
| 8.362 - 8.366              | 156.52475 - 156.52525 | 2483.5 - 2500      | 17.7 - 21.4        |
| 8.37625 - 8.38675          | 156.7 - 156.9         | 2690 - 2900        | 22.01 - 23.12      |
| 8.41425 - 8.41475          | 162.0125 - 167.17     | 3260 - 3267        | 23.6 - 24.0        |
| 12.29 - 12.293             | 167.72 - 173.2        | 3332 - 3339        | 31.2 - 31.8        |
| 12.51975 - 12.52025        | 240 - 285             | 3345.8 - 3358      | 36.43 - 36.5       |
| 12.57675 - 12.57725        | 322 - 335.4           | 3600 - 4400        | ( <sup>2</sup> )   |
| 13.36 - 13.41              | --                    | --                 | --                 |

For 15.407(b) requirement:

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

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

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

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

of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Refer to KDB 789033 D02v02r01 G)2)c), as specified in § 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a maximum emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in § 15.407(b)(4)). However, an out-of-band emission that complies with both the peak and average limits of § 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz maximum emission limit.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

| FCC Part 15 Subpart C Paragraph 15.209 |                          |                               |
|----------------------------------------|--------------------------|-------------------------------|
| Frequency<br>[MHz]                     | Field Strength<br>[uV/m] | Measured Distance<br>[Meters] |
| 0.009 - 0.490                          | 2400/F (kHz)             | 300                           |
| 0.490 - 1.705                          | 24000/F (kHz)            | 30                            |
| 1.705 - 30                             | 30                       | 30                            |
| 30 - 88                                | 100                      | 3                             |
| 88 - 216                               | 150                      | 3                             |
| 216 - 960                              | 200                      | 3                             |
| Above 960                              | 500                      | 3                             |

### 6.9.2. Test Procedure Used

KDB 789033 D02v02r01- Section G

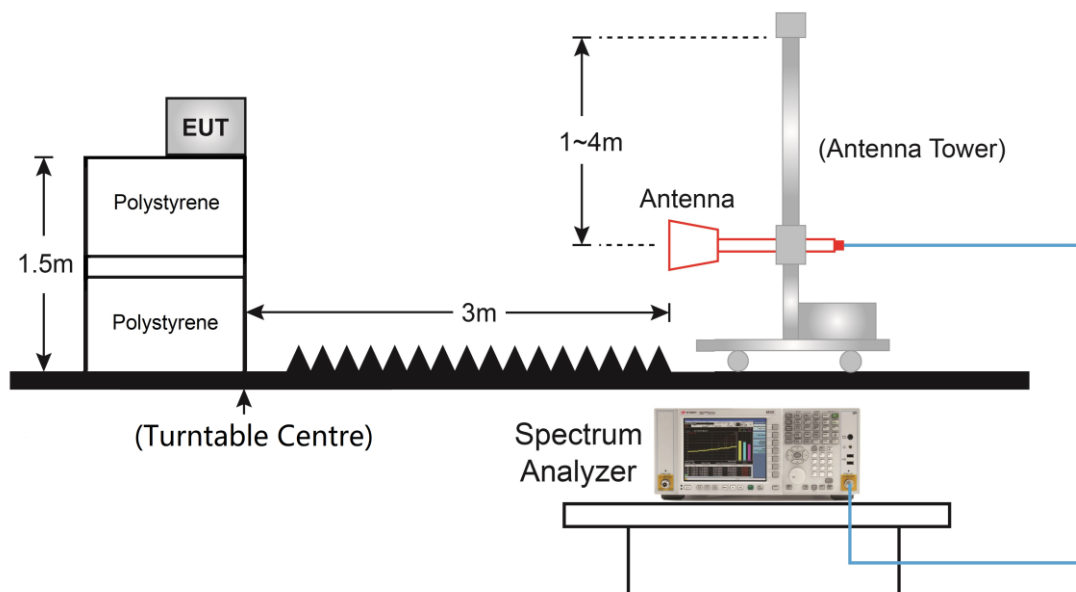
### 6.9.3. Test Setting

#### Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

**Average Measurements above 1GHz (Method VB)**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; if the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10Hz
4. If the EUT duty cycle is  $< 98\%$ , set VBW  $\geq 1/T$ . T is the minimum transmission duration
5. Detector = Peak
6. Sweep time = Auto
7. Trace mode = Max hold
8. Trace was allowed to stabilize

**6.9.4. Test Setup****6.9.5. Test Result**

Refer to Appendix A.7.

## 6.10. AC Conducted Emissions

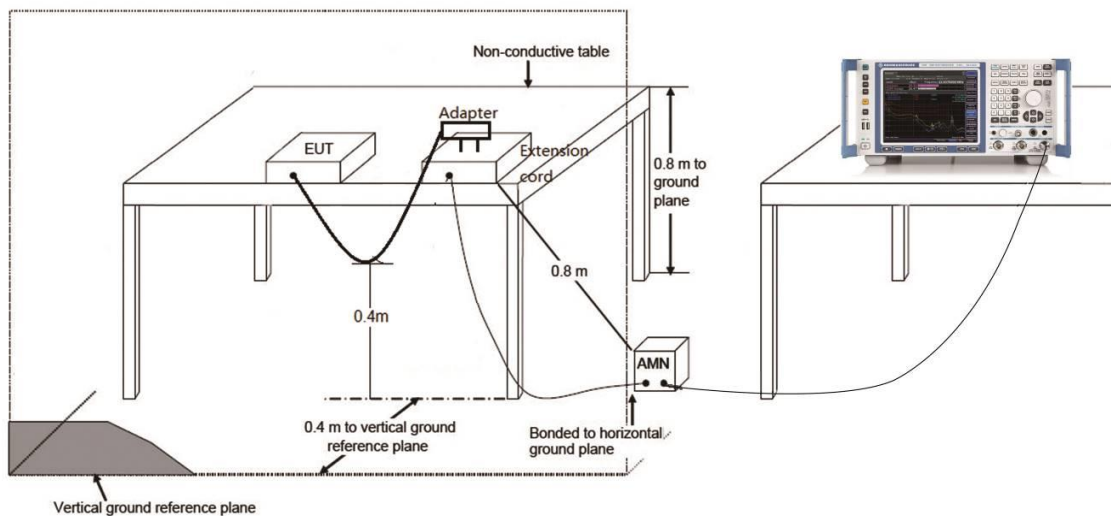
### 6.10.1. Test Limit

| FCC Part 15.207 Limits |           |           |
|------------------------|-----------|-----------|
| Frequency (MHz)        | QP (dBuV) | AV (dBuV) |
| 0.15 - 0.50            | 66 - 56   | 56 - 46   |
| 0.50 - 5.0             | 56        | 46        |
| 5.0 - 30               | 60        | 50        |

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

### 6.10.2. Test Setup



### 6.10.3. Test Result

Refer to Appendix A.8.

## Appendix A – Test Result

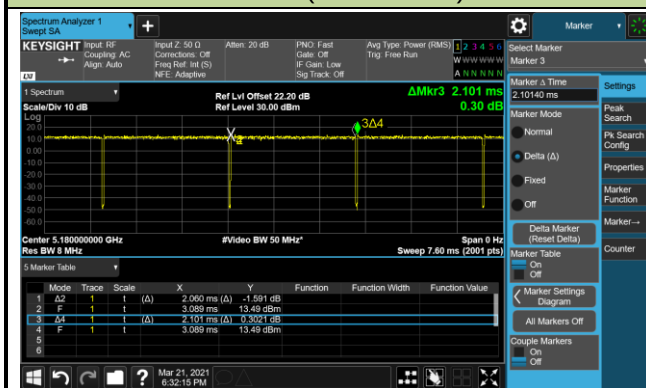
### A.1 Duty Cycle Test Result

|           |            |               |           |
|-----------|------------|---------------|-----------|
| Test Site | WZ-TR3     | Test Engineer | Luis Yang |
| Test Date | 2021/03/21 |               |           |

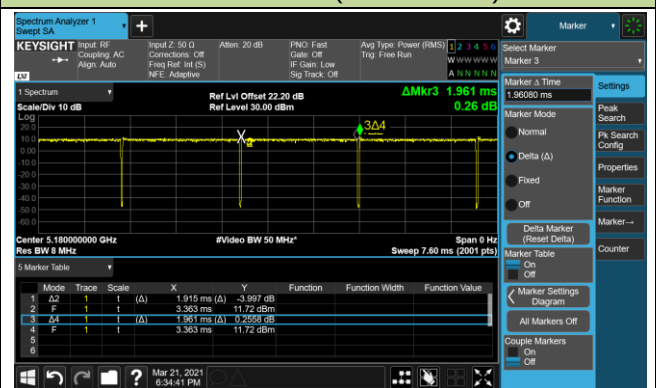
| Test Mode    | Duty Cycle | Test Mode      | Duty Cycle |
|--------------|------------|----------------|------------|
| 802.11a      | 98.05%     | 802.11ac-VHT20 | 97.71%     |
| 802.11n-HT20 | 97.65%     | 802.11ac-VHT40 | 95.66%     |
| 802.11n-HT40 | 96.11%     | 802.1ac-VHT80  | 92.42%     |

Duty Cycle (T = Transmission Duration)

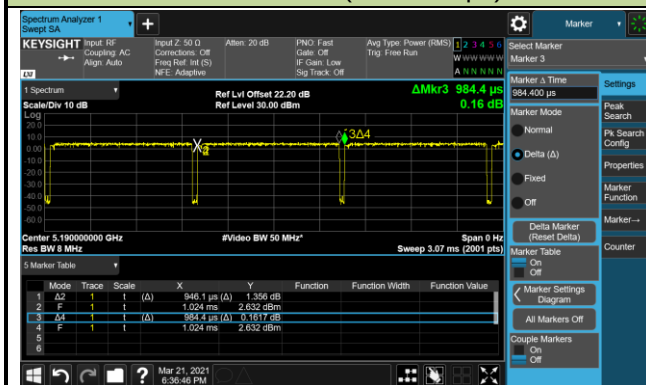
802.11a (T = 2.060ms)



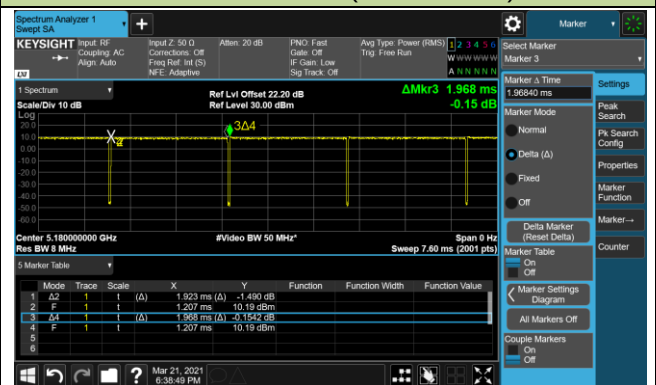
802.11n-HT20 (T = 1.915ms)



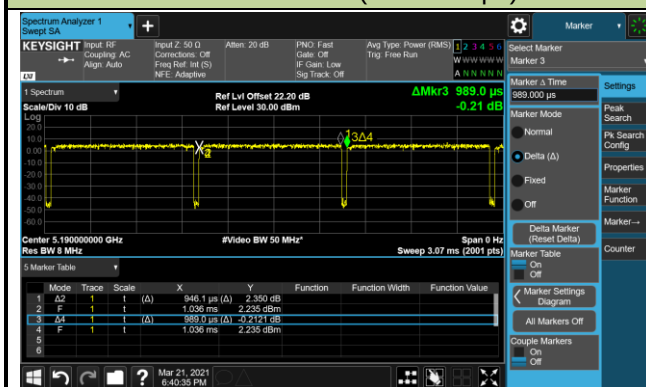
802.11n-HT40 (T = 946.1μs)



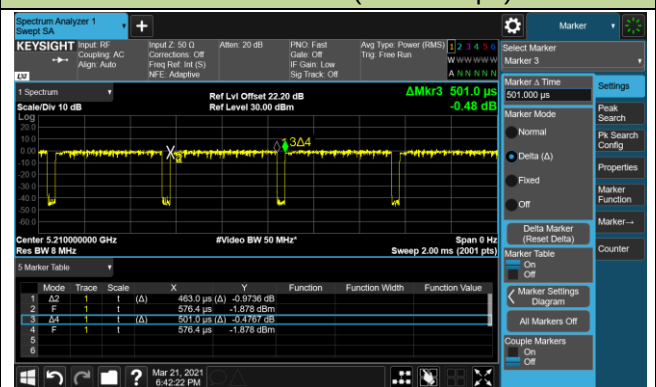
802.11ac-VHT20 (T = 1.923ms)



802.11ac-VHT40 (T = 946.1μs)



802.11ac-VHT80 (T = 463.0μs)



## A.2 26dB & 99% Bandwidth Test Result

|           |                       |               |           |
|-----------|-----------------------|---------------|-----------|
| Test Site | WZ-TR3                | Test Engineer | Luis Yang |
| Test Date | 2021/03/19~2021/04/29 |               |           |

| Test Mode    | Data Rate/<br>MCS | Channel No. | Frequency<br>(MHz) | 26dB Bandwidth<br>(MHz) | 99% Bandwidth<br>(MHz) |
|--------------|-------------------|-------------|--------------------|-------------------------|------------------------|
| 802.11a      | 6Mbps             | 36          | 5180               | 23.38                   | 16.65                  |
| 802.11a      | 6Mbps             | 44          | 5220               | 22.13                   | 16.60                  |
| 802.11a      | 6Mbps             | 48          | 5240               | 23.21                   | 16.59                  |
| 802.11a      | 6Mbps             | 52          | 5260               | 22.81                   | 16.59                  |
| 802.11a      | 6Mbps             | 60          | 5300               | 22.52                   | 16.59                  |
| 802.11a      | 6Mbps             | 64          | 5320               | 22.69                   | 16.58                  |
| 802.11a      | 6Mbps             | 100         | 5500               | 23.01                   | 16.61                  |
| 802.11a      | 6Mbps             | 116         | 5580               | 22.84                   | 16.62                  |
| 802.11a      | 6Mbps             | 120         | 5600               | 22.67                   | 16.60                  |
| 802.11a      | 6Mbps             | 140         | 5700               | 23.59                   | 16.62                  |
| 802.11a      | 6Mbps             | 144         | 5720               | 23.05                   | 16.60                  |
| 802.11a      | 6Mbps             | 149         | 5745               | 22.60                   | 16.58                  |
| 802.11a      | 6Mbps             | 157         | 5785               | 23.71                   | 16.60                  |
| 802.11a      | 6Mbps             | 165         | 5825               | 23.78                   | 16.61                  |
| 802.11n-HT20 | MCS0              | 36          | 5180               | 22.84                   | 17.81                  |
| 802.11n-HT20 | MCS0              | 44          | 5220               | 23.14                   | 17.78                  |
| 802.11n-HT20 | MCS0              | 48          | 5240               | 22.46                   | 17.77                  |
| 802.11n-HT20 | MCS0              | 52          | 5260               | 23.42                   | 17.76                  |
| 802.11n-HT20 | MCS0              | 60          | 5300               | 22.68                   | 17.79                  |
| 802.11n-HT20 | MCS0              | 64          | 5320               | 23.14                   | 17.78                  |
| 802.11n-HT20 | MCS0              | 100         | 5500               | 23.16                   | 17.81                  |
| 802.11n-HT20 | MCS0              | 116         | 5580               | 23.20                   | 17.80                  |
| 802.11n-HT20 | MCS0              | 120         | 5600               | 23.10                   | 17.80                  |
| 802.11n-HT20 | MCS0              | 140         | 5700               | 23.10                   | 17.78                  |
| 802.11n-HT20 | MCS0              | 144         | 5720               | 23.25                   | 17.78                  |
| 802.11n-HT20 | MCS0              | 149         | 5745               | 22.88                   | 17.81                  |
| 802.11n-HT20 | MCS0              | 157         | 5785               | 22.86                   | 17.82                  |
| 802.11n-HT20 | MCS0              | 165         | 5825               | 22.63                   | 17.82                  |

| Test Mode      | Data Rate/<br>MCS | Channel No. | Frequency<br>(MHz) | 26dB Bandwidth<br>(MHz) | 99% Bandwidth<br>(MHz) |
|----------------|-------------------|-------------|--------------------|-------------------------|------------------------|
| 802.11n-HT40   | MCS0              | 38          | 5190               | 41.57                   | 36.16                  |
| 802.11n-HT40   | MCS0              | 46          | 5230               | 41.10                   | 36.18                  |
| 802.11n-HT40   | MCS0              | 54          | 5270               | 41.19                   | 36.19                  |
| 802.11n-HT40   | MCS0              | 62          | 5310               | 41.12                   | 36.19                  |
| 802.11n-HT40   | MCS0              | 102         | 5510               | 41.17                   | 36.19                  |
| 802.11n-HT40   | MCS0              | 110         | 5550               | 41.57                   | 36.19                  |
| 802.11n-HT40   | MCS0              | 118         | 5590               | 40.90                   | 36.19                  |
| 802.11n-HT40   | MCS0              | 134         | 5670               | 41.18                   | 36.14                  |
| 802.11n-HT40   | MCS0              | 142         | 5710               | 40.93                   | 36.18                  |
| 802.11n-HT40   | MCS0              | 151         | 5755               | 41.19                   | 36.19                  |
| 802.11n-HT40   | MCS0              | 159         | 5795               | 41.01                   | 36.17                  |
| 802.11ac-VHT20 | MCS0              | 36          | 5180               | 22.64                   | 17.78                  |
| 802.11ac-VHT20 | MCS0              | 44          | 5220               | 22.91                   | 17.80                  |
| 802.11ac-VHT20 | MCS0              | 48          | 5240               | 23.11                   | 17.78                  |
| 802.11ac-VHT20 | MCS0              | 52          | 5260               | 22.41                   | 17.78                  |
| 802.11ac-VHT20 | MCS0              | 60          | 5300               | 22.99                   | 17.82                  |
| 802.11ac-VHT20 | MCS0              | 64          | 5320               | 23.08                   | 17.80                  |
| 802.11ac-VHT20 | MCS0              | 100         | 5500               | 23.30                   | 17.78                  |
| 802.11ac-VHT20 | MCS0              | 116         | 5580               | 23.04                   | 17.73                  |
| 802.11ac-VHT20 | MCS0              | 120         | 5600               | 23.42                   | 17.80                  |
| 802.11ac-VHT20 | MCS0              | 140         | 5700               | 23.71                   | 17.80                  |
| 802.11ac-VHT20 | MCS0              | 144         | 5720               | 23.17                   | 17.81                  |
| 802.11ac-VHT20 | MCS0              | 149         | 5745               | 22.57                   | 17.77                  |
| 802.11ac-VHT20 | MCS0              | 157         | 5785               | 23.19                   | 17.80                  |
| 802.11ac-VHT20 | MCS0              | 165         | 5825               | 23.10                   | 17.79                  |

| Test Mode      | Data Rate/<br>MCS | Channel No. | Frequency<br>(MHz) | 26dB Bandwidth<br>(MHz) | 99% Bandwidth<br>(MHz) |
|----------------|-------------------|-------------|--------------------|-------------------------|------------------------|
| 802.11ac-VHT40 | MCS0              | 38          | 5190               | 41.31                   | 36.14                  |
| 802.11ac-VHT40 | MCS0              | 46          | 5230               | 41.21                   | 36.16                  |
| 802.11ac-VHT40 | MCS0              | 54          | 5270               | 40.77                   | 36.17                  |
| 802.11ac-VHT40 | MCS0              | 62          | 5310               | 40.83                   | 36.14                  |
| 802.11ac-VHT40 | MCS0              | 102         | 5510               | 40.65                   | 36.11                  |
| 802.11ac-VHT40 | MCS0              | 110         | 5550               | 40.78                   | 36.15                  |
| 802.11ac-VHT40 | MCS0              | 118         | 5590               | 41.19                   | 36.12                  |
| 802.11ac-VHT40 | MCS0              | 134         | 5670               | 41.02                   | 36.17                  |
| 802.11ac-VHT40 | MCS0              | 142         | 5710               | 40.93                   | 36.16                  |
| 802.11ac-VHT40 | MCS0              | 151         | 5755               | 41.38                   | 36.14                  |
| 802.11ac-VHT40 | MCS0              | 159         | 5795               | 40.74                   | 36.15                  |
| 802.11ac-VHT80 | MCS0              | 42          | 5210               | 82.54                   | 75.54                  |
| 802.11ac-VHT80 | MCS0              | 58          | 5290               | 82.94                   | 75.54                  |
| 802.11ac-VHT80 | MCS0              | 106         | 5530               | 82.26                   | 75.57                  |
| 802.11ac-VHT80 | MCS0              | 122         | 5610               | 82.36                   | 75.50                  |
| 802.11ac-VHT80 | MCS0              | 138         | 5690               | 83.26                   | 75.61                  |
| 802.11ac-VHT80 | MCS0              | 155         | 5775               | 82.74                   | 75.55                  |

## 802.11a 26dB &amp; 99% Bandwidth

Channel 36 (5180MHz)



Channel 44 (5220MHz)



Channel 48 (5240MHz)



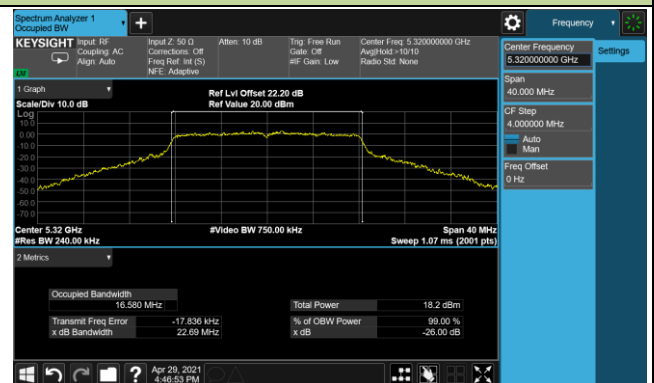
Channel 52 (5260MHz)



Channel 60 (5300MHz)



Channel 64 (5320MHz)

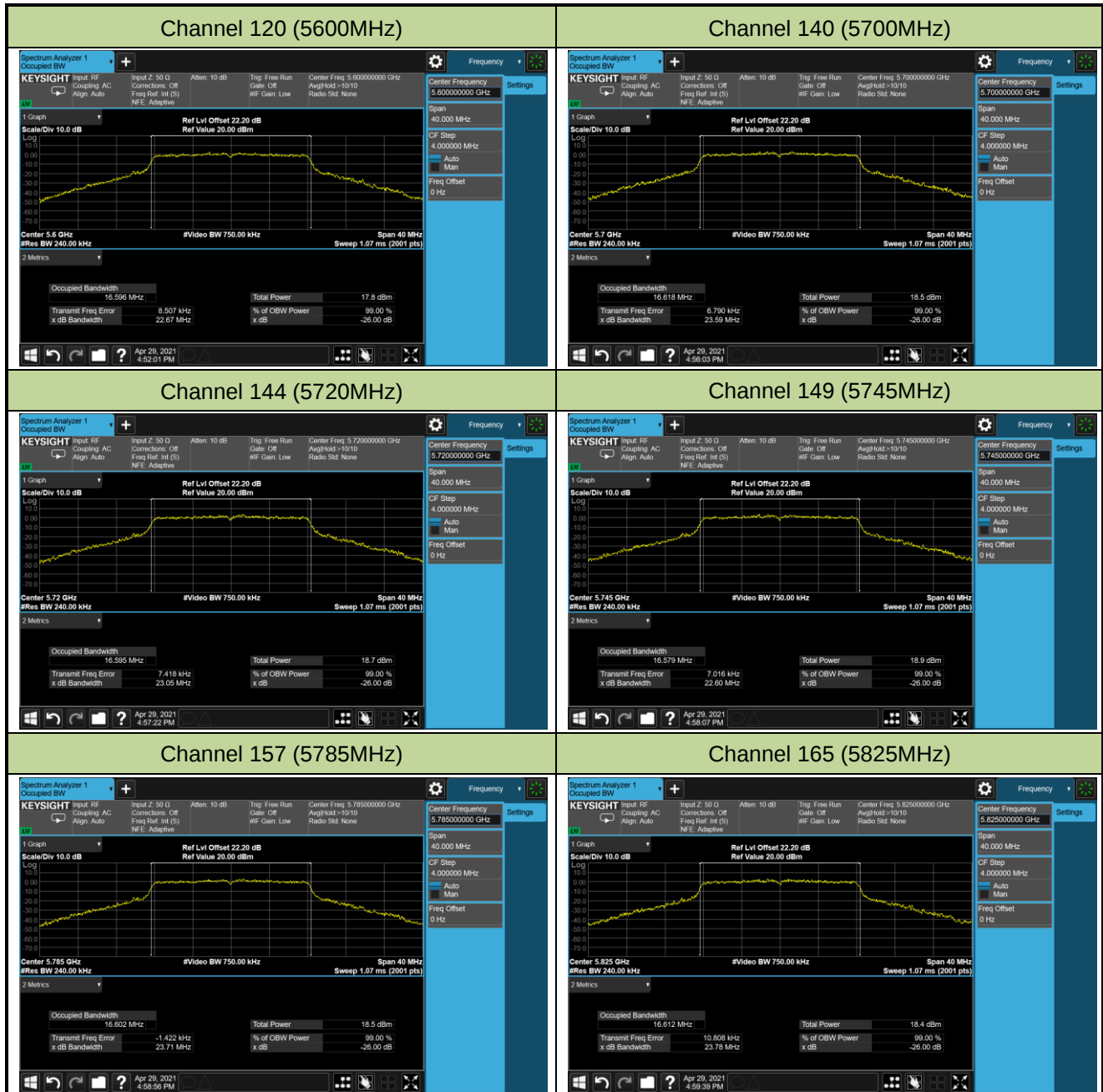


Channel 100 (5500MHz)



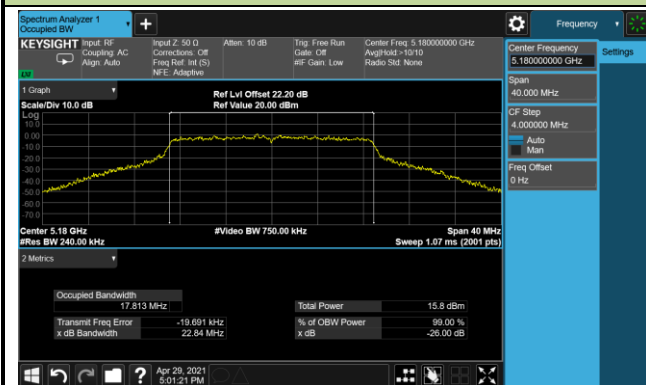
Channel 116 (5580MHz)



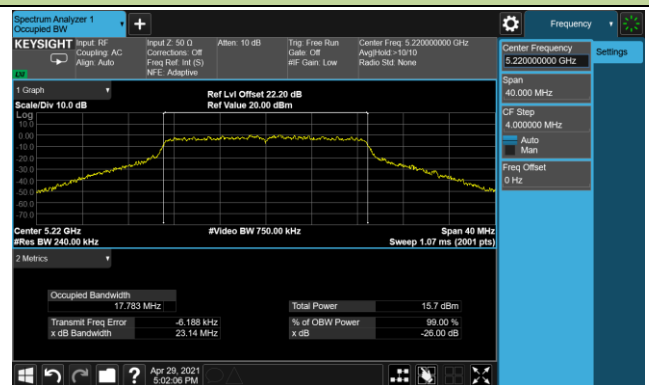


## 802.11n-HT20 26dB &amp; 99% Bandwidth

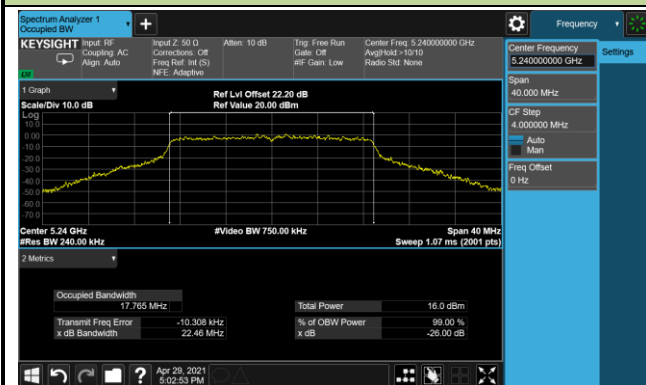
Channel 36 (5180MHz)



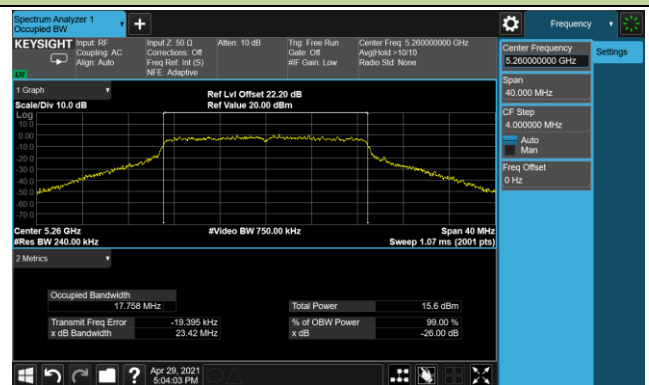
Channel 44 (5220MHz)



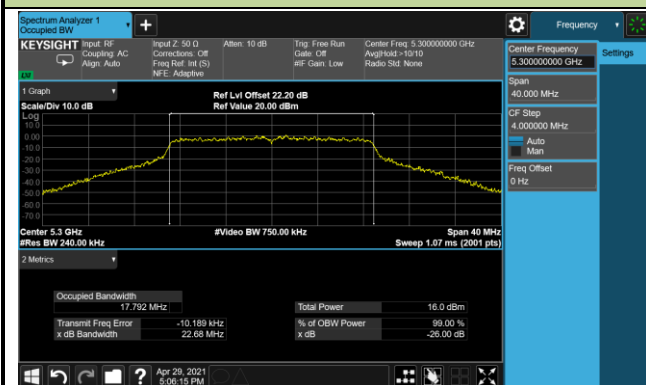
Channel 48 (5240MHz)



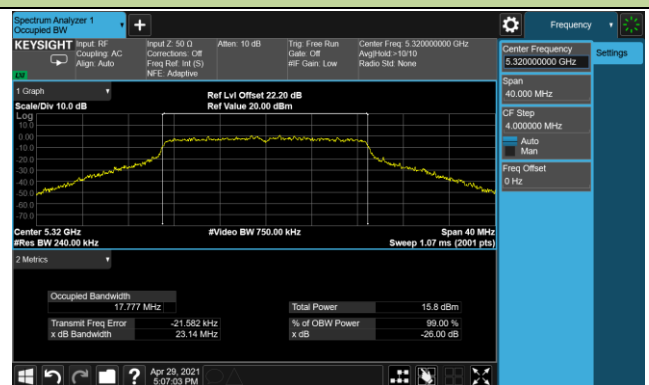
Channel 52 (5260MHz)



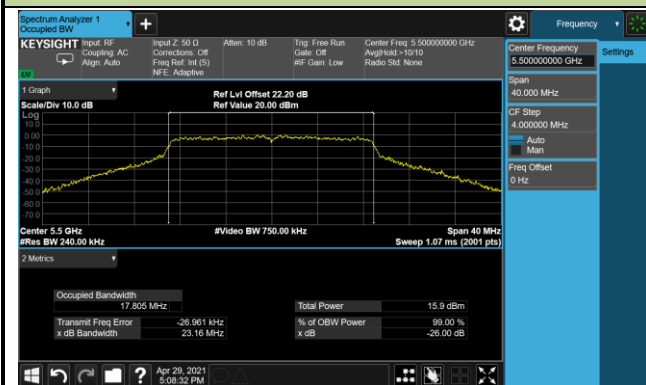
Channel 60 (5300MHz)



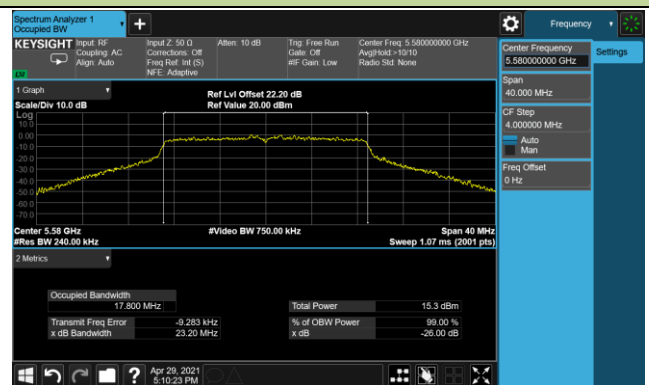
Channel 64 (5320MHz)

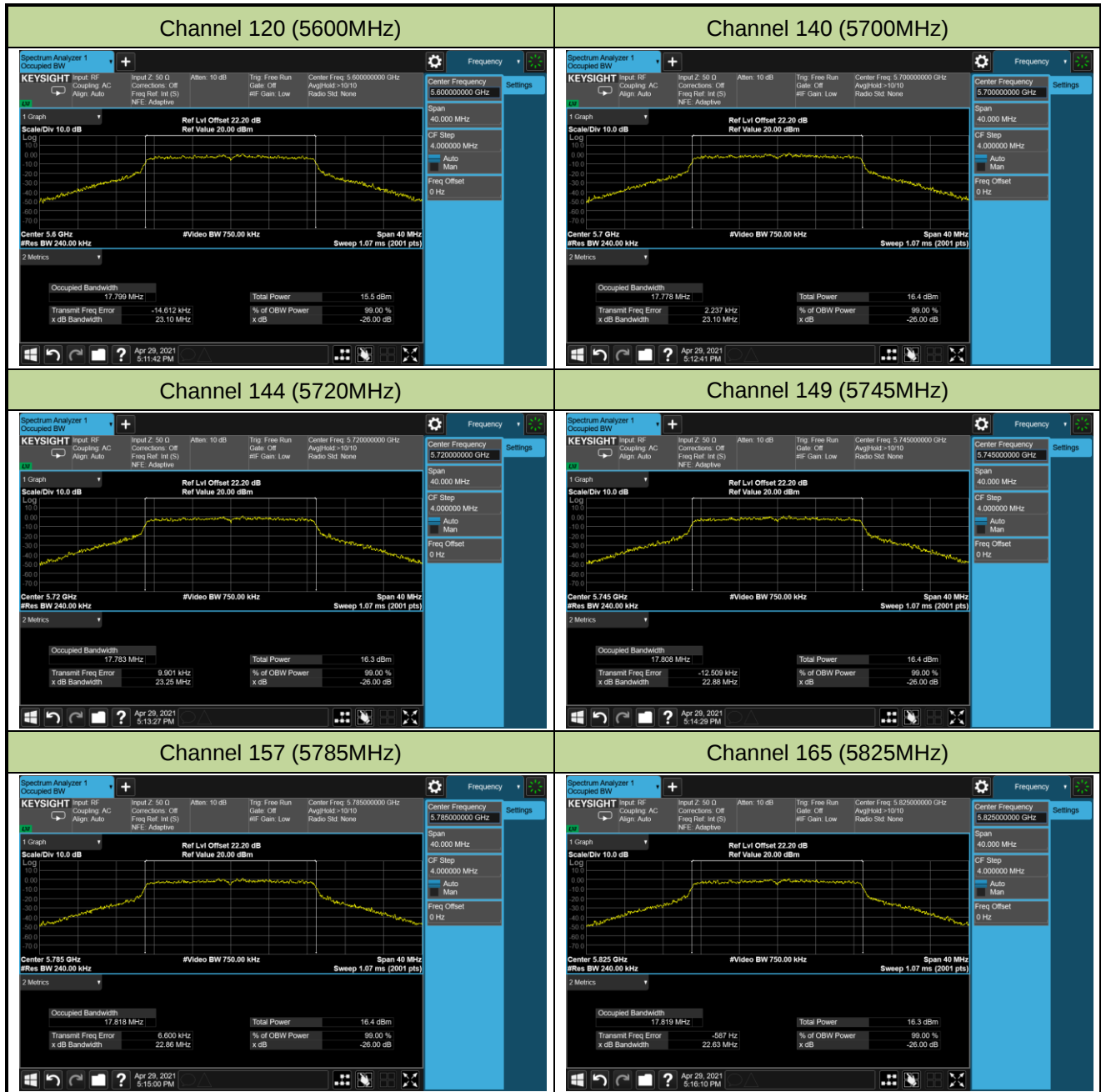


Channel 100 (5500MHz)



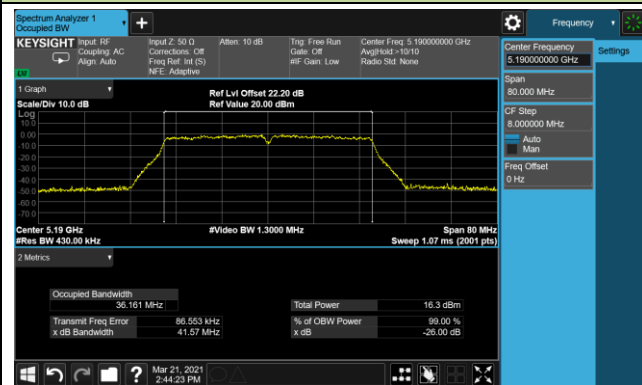
Channel 116 (5580MHz)



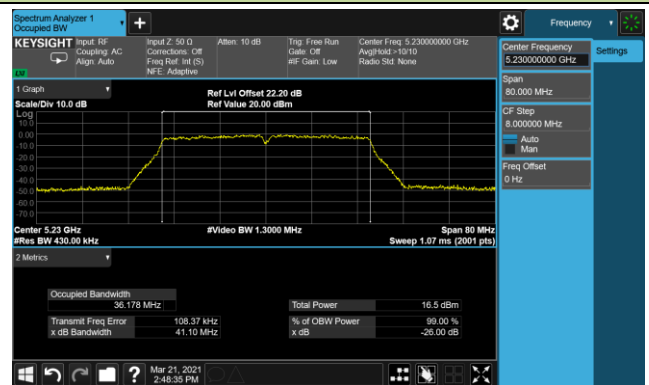


## 802.11n-HT40 26dB &amp; 99% Bandwidth

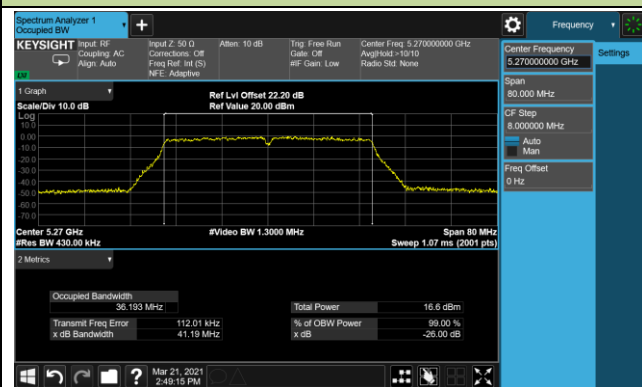
## Channel 38 (5190MHz)



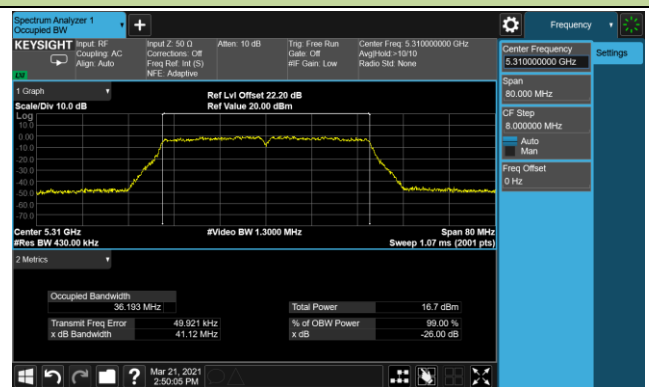
## Channel 46 (5230MHz)



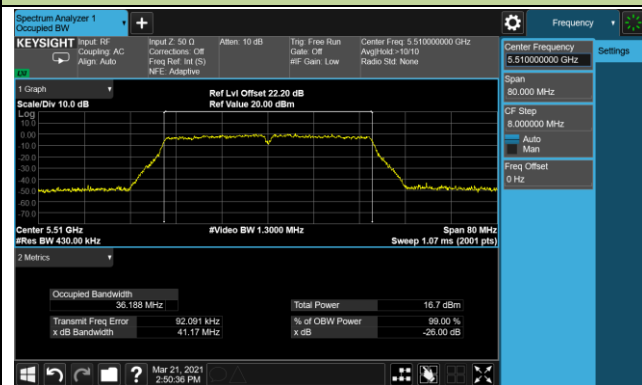
## Channel 54 (5270MHz)



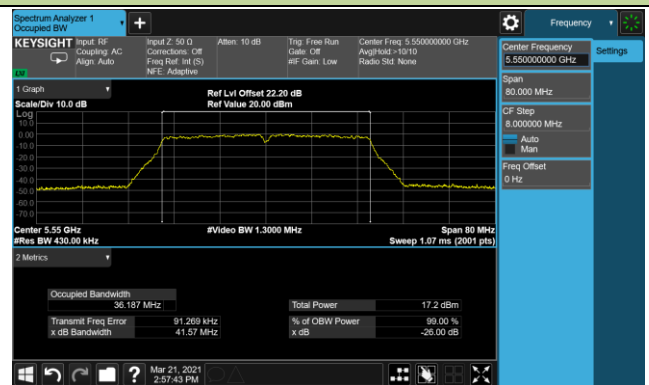
## Channel 62 (5310MHz)



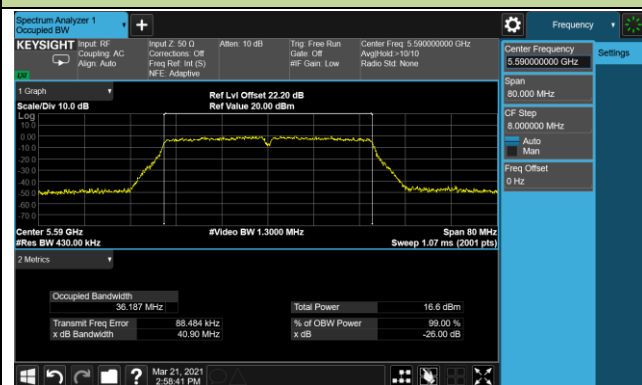
## Channel 102 (5510MHz)



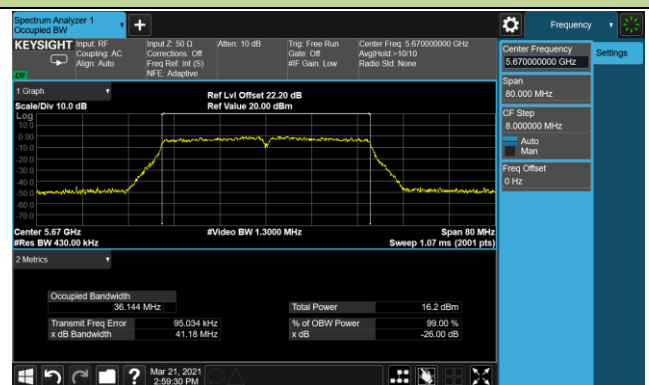
## Channel 110 (5550MHz)

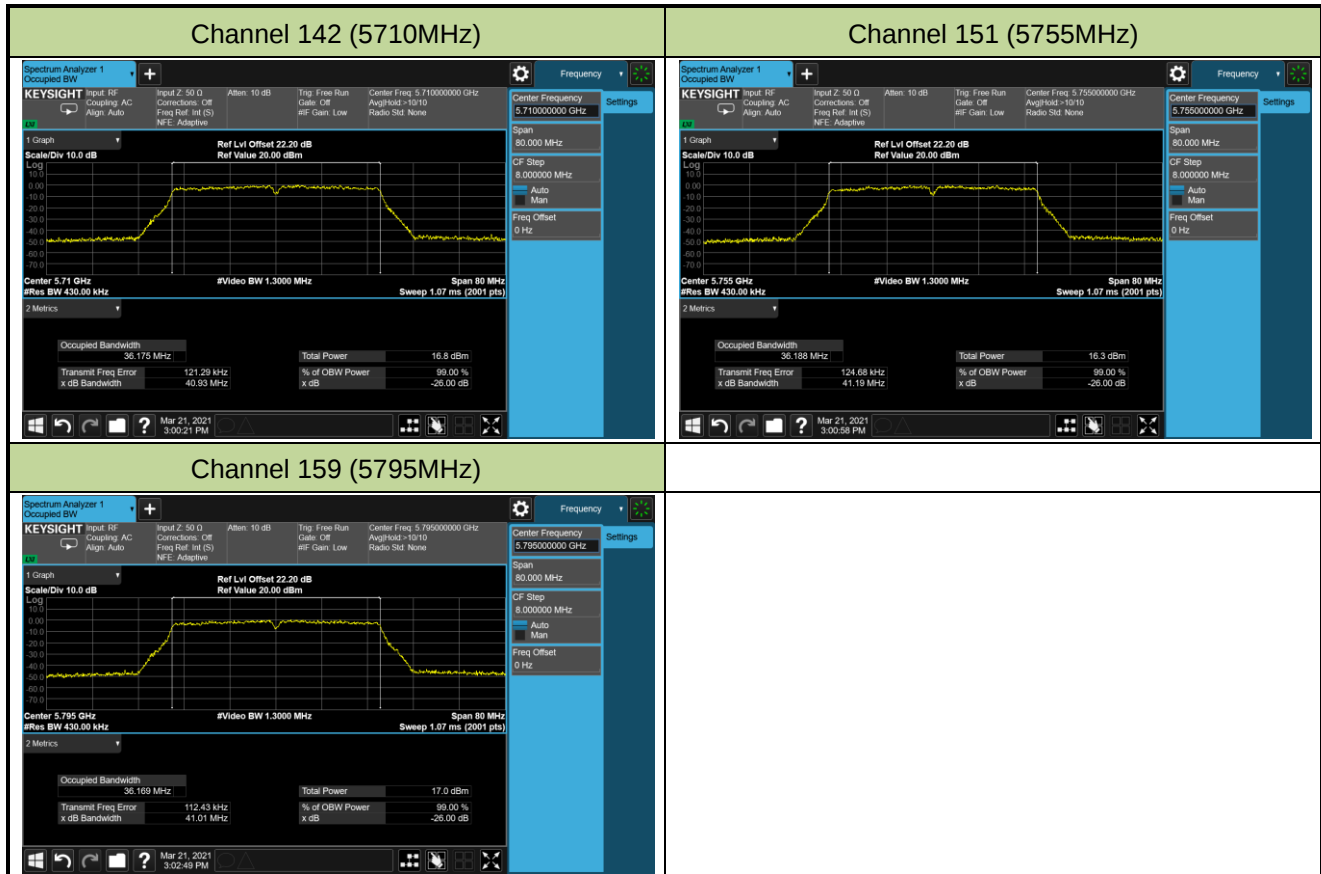


## Channel 118 (5590MHz)



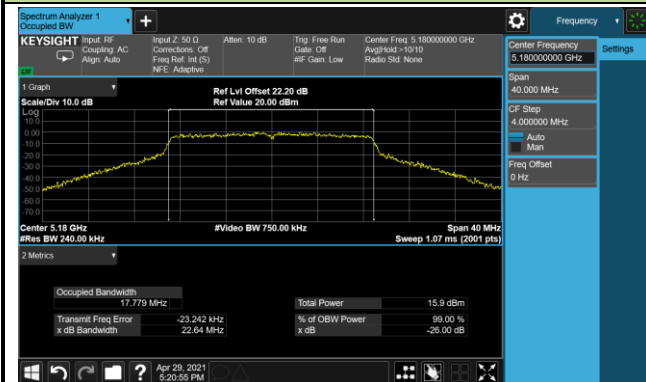
## Channel 134 (5670MHz)



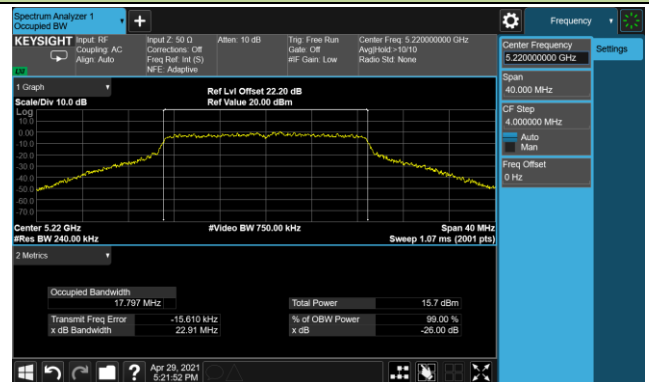


## 802.11ac-VHT20 26dB &amp; 99% Bandwidth

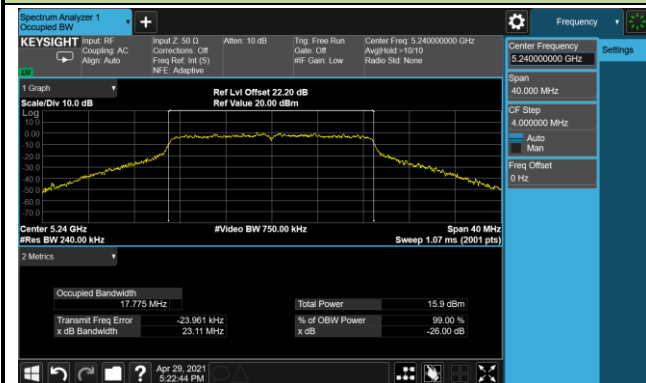
## Channel 36 (5180MHz)



## Channel 44 (5220MHz)



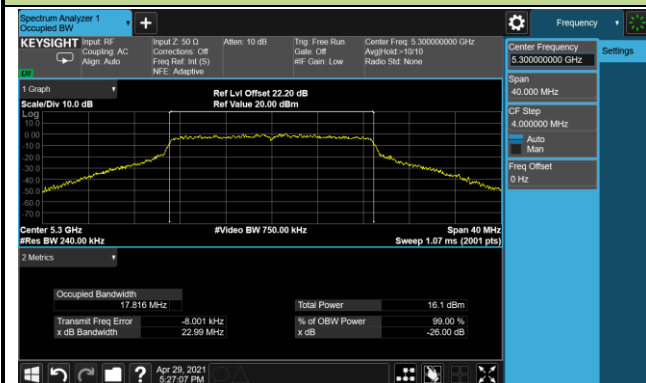
## Channel 48 (5240MHz)



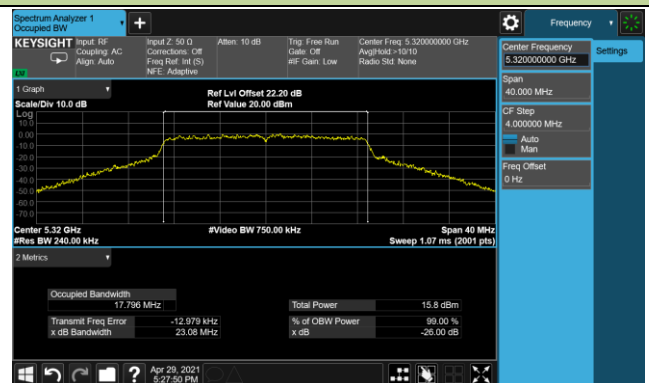
## Channel 52 (5260MHz)



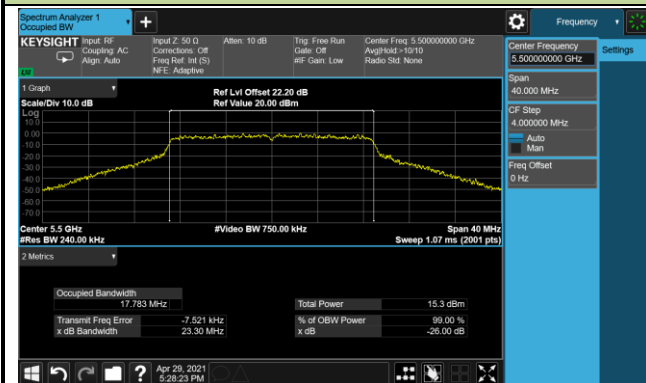
## Channel 60 (5300MHz)



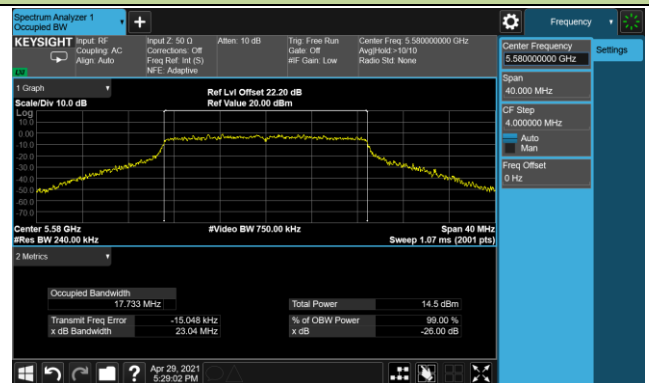
## Channel 64 (5320MHz)

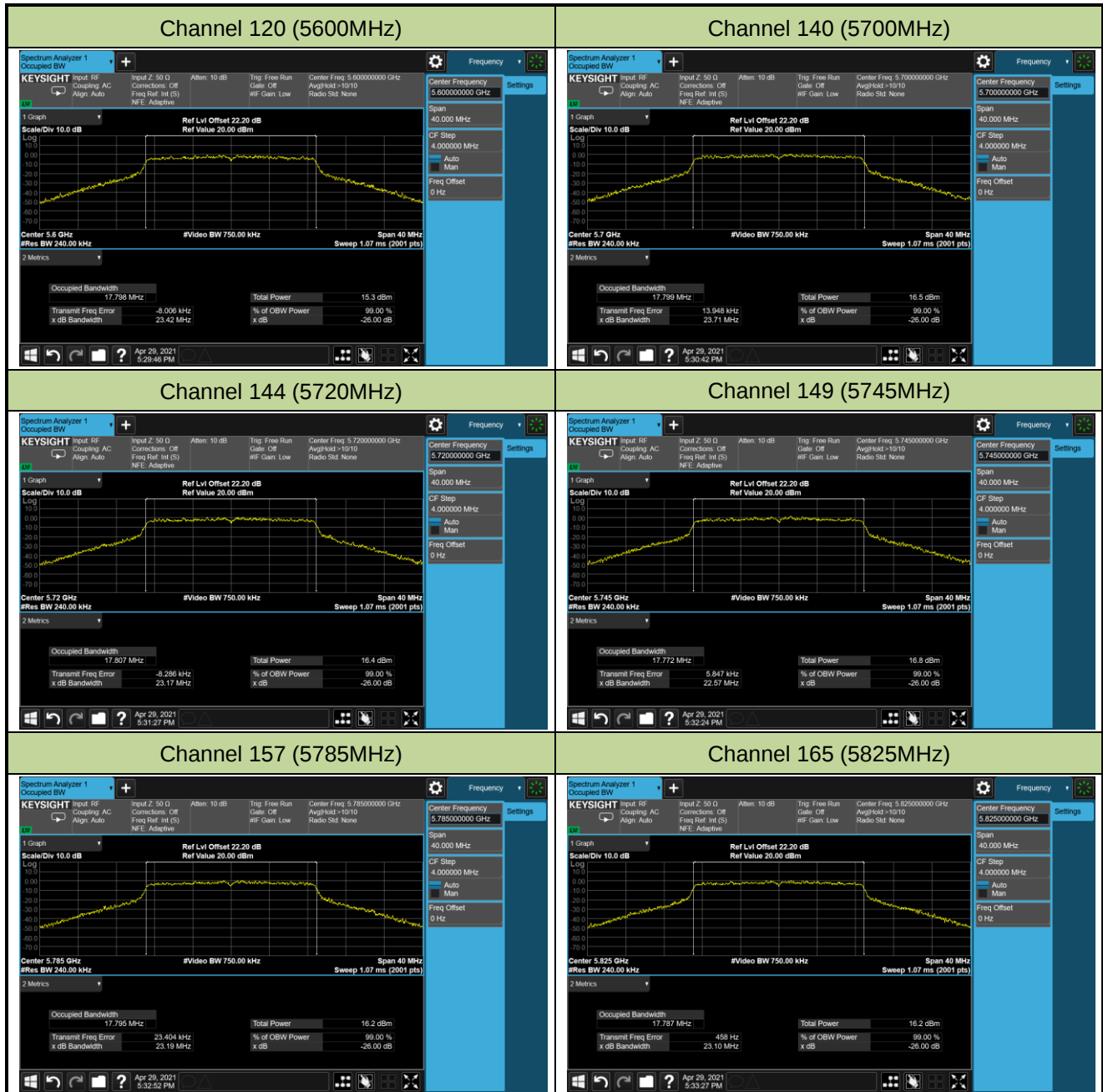


## Channel 100 (5500MHz)



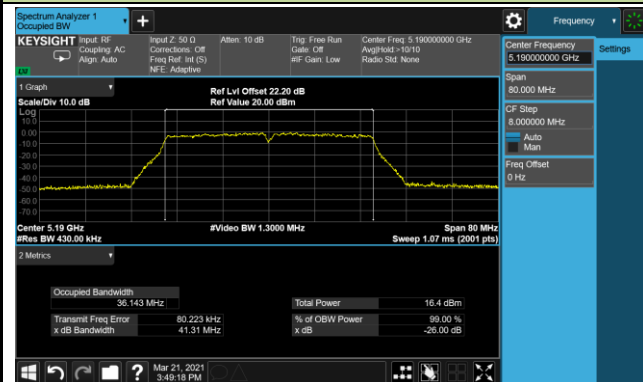
## Channel 116 (5580MHz)



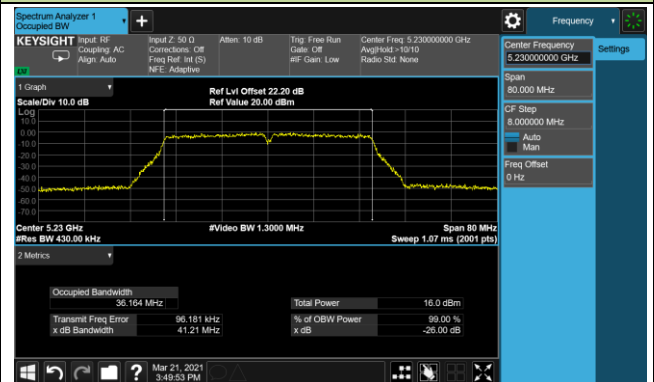


## 802.11ac-VHT40 26dB &amp; 99% Bandwidth

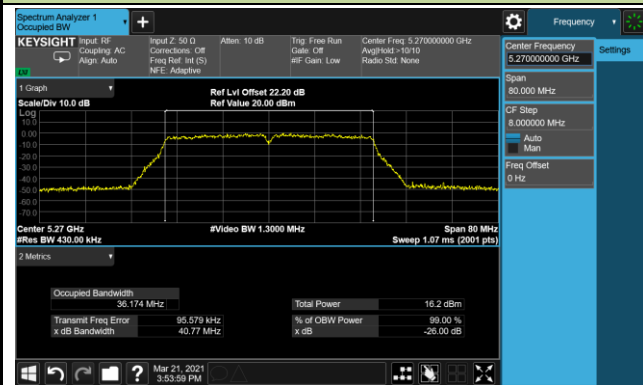
## Channel 38 (5190MHz)



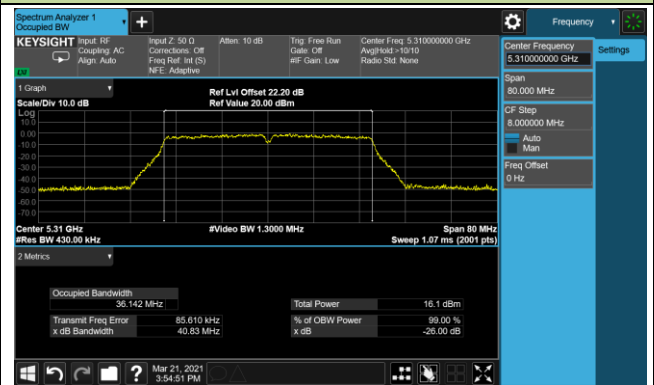
## Channel 46 (5230MHz)



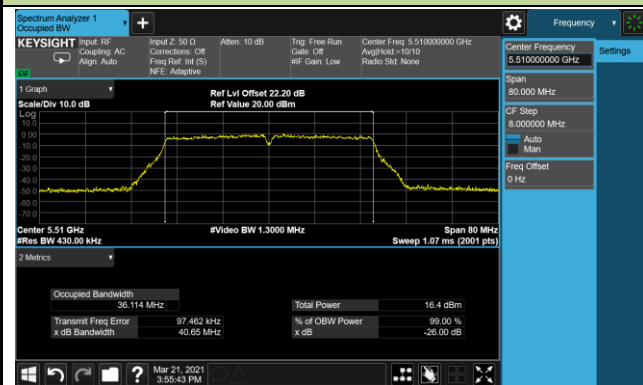
## Channel 54 (5270MHz)



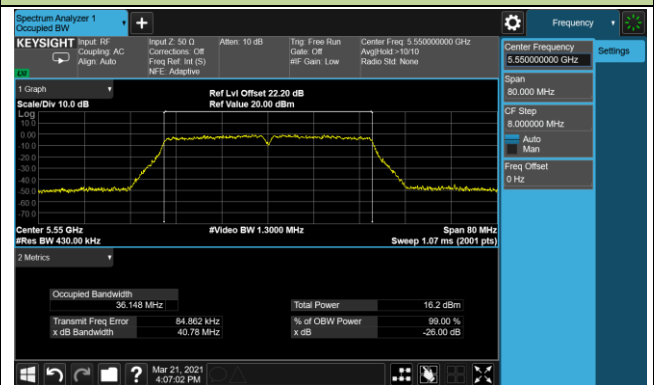
## Channel 62 (5310MHz)



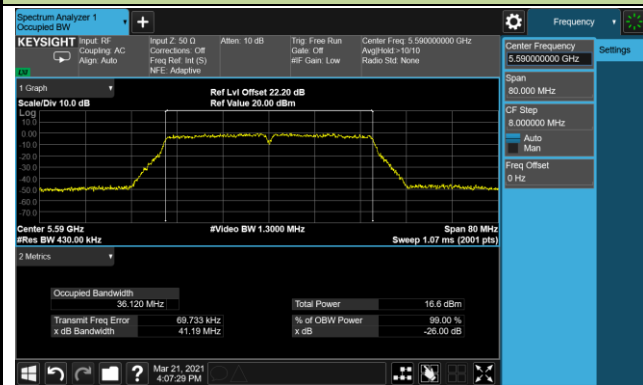
## Channel 102 (5510MHz)



## Channel 110 (5550MHz)



## Channel 118 (5590MHz)



## Channel 134 (5670MHz)

