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Report No.: 1504RSU00402
Report Version: V01
Issue Date: 04-05-2015

# MEASUREMENT REPORT
## FCC PART 15.407 WLAN 802.11a/n

| | |
|---|---|
| **FCC ID:** | WL6-TR10RS1AP6330 |
| **APPLICANT:** | ELITEGROUP COMPUTER SYSTEMS CO., LTD |

| | |
|---|---|
| **Application Type:** | Certification |
| **Product:** | Tablet PC |
| **Model No.:** | TR10RS1 |
| **Trademark:** | ECS ELITEGROUP |
| **FCC Classification:** | Unlicensed National Information Infrastructure (UNII) |
| **FCC Rule Part(s):** | Part 15.407 |
| **Test Procedure(s):** | ANSI C63.10-2009, KDB 789033 D02v01 |
| **Test Date:** | Apr. 03 ~ 04, 2015 |

Reviewed By : Robin Wu
( Robin Wu )

Approved By : Marlin Chen
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ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

# Revision History

| Report No. | Version | Description | Issue Date |
|---|---|---|---|
| 1504RSU00402 | Rev. 01 | Initial report | 04-05-2015 |
| | | | |

# CONTENTS

Description Page

**§2.1033 General Information ..... 6**

**1. INTRODUCTION ..... 7**

1.1. Scope ..... 7
1.2. MRT Test Location ..... 7

**2. PRODUCT INFORMATION ..... 8**

2.1. Equipment Description ..... 8
2.2. Working Frequencies ..... 8
2.3. Test Mode ..... 8
2.4. Test Software ..... 8
2.5. Device Capabilities ..... 9
2.6. Test Configuration ..... 9
2.7. EMI Suppression Device(s)/Modifications ..... 9
2.8. Labeling Requirements ..... 10

**3. DESCRIPTION OF TEST ..... 11**

3.1. Evaluation Procedure ..... 11
3.2. AC Line Conducted Emissions ..... 11
3.3. Radiated Emissions ..... 12

**4. ANTENNA REQUIREMENTS ..... 13**

**5. TEST EQUIPMENT CALIBRATION DATE ..... 14**

**6. MEASUREMENT UNCERTAINTY ..... 15**

**7. TEST RESULT ..... 16**

7.1. Summary ..... 16
7.2. 26dB Bandwidth Measurement ..... 18
7.2.1. Test Limit ..... 18
7.2.2. Test Procedure used ..... 18
7.2.3. Test Setting ..... 18
7.2.4. Test Setup ..... 18
7.2.5. Test Result ..... 19
7.3. 6dB Bandwidth Measurement ..... 24
7.3.1. Test Limit ..... 24
7.3.2. Test Procedure used ..... 24
7.3.3. Test Setting ..... 24

7.3.4. Test Setup ..... 24
7.3.5. Test Result ..... 25
7.4. Output Power Measurement ..... 27
7.4.1. Test Limit ..... 27
7.4.2. Test Procedure Used ..... 27
7.4.3. Test Setting ..... 27
7.4.4. Test Setup ..... 28
7.4.5. Test Result ..... 29
7.5. Transmit Power Control ..... 31
7.5.1. Test Limit ..... 31
7.5.2. Test Procedure Used ..... 31
7.5.3. Test Setting ..... 31
7.5.4. Test Setup ..... 31
7.5.5. Test Result ..... 31
7.6. Power Spectral Density Measurement ..... 32
7.6.1. Test Limit ..... 32
7.6.2. Test Procedure Used ..... 32
7.6.3. Test Setting ..... 32
7.6.4. Test Setup ..... 33
7.6.5. Test Result ..... 34
7.7. Frequency Stability Measurement ..... 40
7.7.1. Test Limit ..... 40
7.7.2. Test Procedure Used ..... 40
7.7.3. Test Setup ..... 40
7.7.4. Test Result ..... 41
7.8. Radiated Spurious Emission Measurement ..... 43
7.8.1. Test Limit ..... 43
7.8.2. Test Procedure Used ..... 43
7.8.3. Test Setting ..... 43
7.8.4. Test Setup ..... 44
7.8.5. Test Result ..... 46
7.9. Radiated Restricted Band Edge Measurement ..... 76
7.9.1. Test Limit ..... 76
7.9.2. Test Result of Radiated Restricted Band Edge ..... 78
7.10. AC Conducted Emissions Measurement ..... 126
7.10.1. Test Limit ..... 126
7.10.2. Test Procedure ..... 126
7.10.3. Test Setup ..... 127

7.10.4. Test Result.....128

**8. CONCLUSION.....130**

## §2.1033 General Information

| | |
|---|---|
| **Applicant:** | ELITEGROUP COMPUTER SYSTEMS CO., LTD |
| **Applicant Address:** | No.239, Sec. 2, Tiding Blvd., Neihu Dist, Taipei City 14, Taiwan (R.O.C) |
| **Manufacturer:** | ELITEGROUP COMPUTER SYSTEMS CO., LTD |
| **Manufacturer Address:** | No.239, Sec. 2, Tiding Blvd., Neihu Dist, Taipei City 14, Taiwan (R.O.C) |
| **Test Site:** | MRT Technology (Suzhou) Co., Ltd |
| **Test Site Address:** | D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China |
| **MRT FCC Registration No.:** | 809388 |
| **FCC Rule Part(s):** | Part 15.407 |
| **Model No.:** | TR10RS1 |
| **FCC ID:** | WL6-TR10RS1AP6330 |
| **Test Device Serial No.:** | N/A ☐ Production ☒ Pre-Production ☐ Engineering |
| **FCC Classification:** | Unlicensed National Information Infrastructure (UNII) |

### 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. 809388) 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-4179, G-814, C-4664, T-2206) 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.**

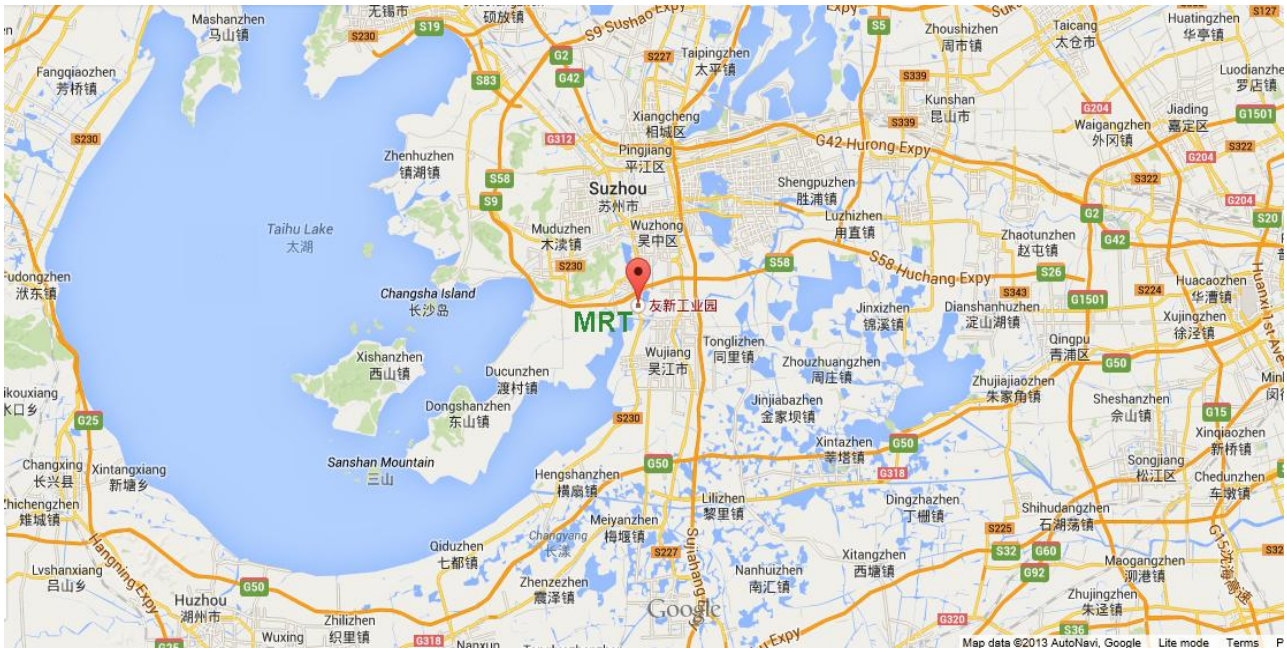
# 1. INTRODUCTION

## 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 | Tablet PC |
| Model No. | TR10RS1 |
| Frequency Range | For 802.11a/n-HT20:<br>5180~5320MHz, 5500~5700MHz, 5745~5825MHz |
| Maximum Output Power | 802.11a: 13.22dBm<br>802.11n-HT20: 12.78dBm |
| Type of Modulation | 802.11a/n: OFDM |
| Antenna Gain | **For 2.4GHz**<br>0.77dBi for 2.4GHz<br>**For 5GHz**<br>1.08dBi for 5.2GHz<br>0.90dBi for 5.3GHz<br>0.56dBi for 5.6GHz<br>0.53dBi for 5.8GHz |

## 2.2. Working Frequencies

**Channel List for 802.11a/n-HT20**

| 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 | 149 | 5745 MHz | 153 | 5765 MHz |
| 157 | 5785 MHz | 161 | 5805 MHz | 165 | 5825 MHz |

## 2.3. Test Mode

| | |
|---|---|
| Test Mode | Mode 1: Transmit by 802.11a |
| | Mode 2: Transmit by 802.11n-HT20 |

## 2.4. Test Software

The test utility software used during testing was “rftesttool”.

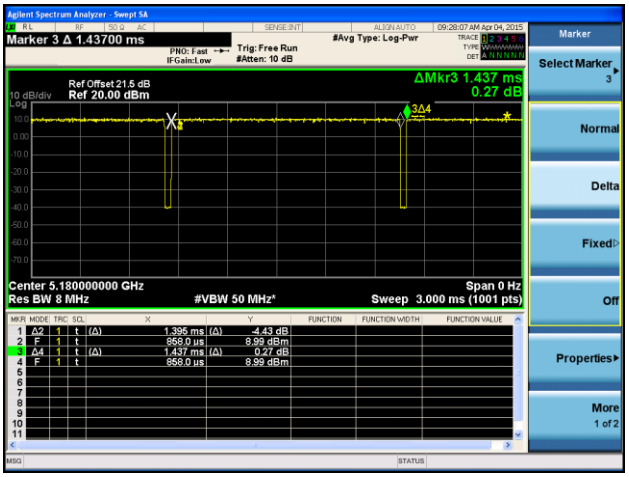
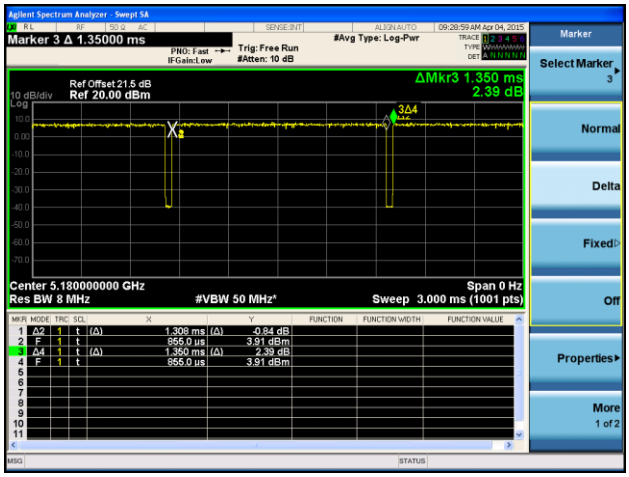
## 2.5. Device Capabilities

This device contains the following capabilities:

2.4GHz WLAN (DTS) & 5GHz WLAN (UNII).

**Note:** 5GHz (UNII) operation is possible in 20MHz 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, and detector = peak per the guidance of Section B)2)b) of KDB 789033 D02v01. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

| Test Mode | Duty Cycle |
|---|---|
| 802.11a | 97.1% |
| 802.11n-HT20 | 96.9% |

| 802.11a - Duty Cycle | 802.11n-HT20 - Duty Cycle |
|---|---|
|  |  |



## 2.6. Test Configuration

The **Tablet PC FCC ID: WL6-TR10RS1AP6330** was tested per the guidance of KDB 789033 D02v01. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

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

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

## 2.8. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

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 trade name and 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 C63.10-2009), and the guidance provided in KDB 789033 D02v01 were used in the measurement of the **Tablet PC FCC ID: WL6-TR10RS1AP6330.**

**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 C63.10-2009.

Line conducted emissions test results are shown in Section 7.10.

### 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 was placed on top of the 0.8 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 BeamWidth 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 **Tablet PC** is **permanently attached.**
- There are no provisions for connection to an external antenna.

**Conclusion:**

The **Tablet PC FCC ID: WL6-TR10RS1AP6330** unit complies with the requirement of §15.203.

# 5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

| Instrument | Manufacturer | Type No. | Serial No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR7 | 101209 | 1 year | 2015/11/07 |
| Two-Line V-Network | R&S | ENV216 | 101683 | 1 year | 2015/11/07 |
| Two-Line V-Network | R&S | ENV216 | 101684 | 1 year | 2015/11/07 |
| Temperature/ Meter Humidity | Anymetre | TH101B | SR2-01 | 1 year | 2015/11/14 |

Radiated Emission

| Instrument | Manufacturer | Type No. | Serial No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4447A | MY45300136 | 1 year | 2015/10/09 |
| EMI Test Receiver | R&S | ESR7 | 101209 | 1 year | 2015/11/07 |
| Preamplifier | MRT | AP18G40 | S-001 | 1 year | 2015/10/06 |
| Preamplifier | Agilent | 83017A | MY53270040 | 1 year | 2015/12/13 |
| Loop Antenna | Schwarzbeck | FMZB1519 | 1519-041 | 1 year | 2015/11/08 |
| TRILOG Antenna | Schwarzbeck | VULB9162 | 9162-047 | 1 year | 2015/11/08 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA9120D | 9120D-1167 | 1 year | 2015/11/08 |
| Broadband Horn Antenna | Schwarzbeck | BBHA9170 | 9170-549 | 1 year | 2016/01/05 |
| Temperature/Humidity Meter | Anymetre | TH101B | AC1-01 | 1 year | 2015/11/14 |

Conducted Test Equipment

| Instrument | Manufacturer | Type No. | Serial No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent | N9020A | MY52090106 | 1 year | 2015/04/23 |
| USB Wideband Power Sensor | Boonton | 55006 | 8911 | 1 year | 2015/10/15 |
| Temperature & Humidity Chamber | BAOYT | BYH-1500L | 1309W043 | 1 year | 2015/11/20 |
| Temperature/Humidity Meter | Anymetre | TH101B | TR3-01 | 1 year | 2015/11/14 |

# 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 |
|---|
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>150kHz~30MHz: 3.46dB |
| **Radiated Emission Measurement** |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>9kHz ~ 1GHz: 4.18dB<br>1GHz ~ 40GHz: 4.76dB |

# 7. TEST RESULT

## 7.1. Summary

**Product Name:** **Tablet PC**

**FCC ID:** **WL6-TR10RS1AP6330**

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

**Data Rate(s) Tested:** **6Mbps ~ 54Mbps (a);**
**6.5/7.2Mbps ~ 65/72.2Mbps (n-HT20MHz BW);**

| FCC Part 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)(ii), (2), (3) | Maximum Conducted Output Power | < 30.00 dBm U-NII-1<br>< 23.98 dBm U-NII-2a<br>< 23.98 dBm U-NII-2b<br>< 30.00 dBm U-NII-3 | | Pass | Section 7.4 |
| 15.407(h)(1) | Transmit Power Control | < 24 dBm | | Pass | Section 7.5 |
| 15.407(a)(1)(ii), (2), (3), (5) | Peak Power Spectral Density | < 17 dBm/MHz U-NII-1<br>< 11 dBm/MHz U-NII-2a<br>< 11 dBm/MHz U-NII-2b<br>< 30 dBm/500kHz U-NII-3 | | Pass | Section 7.6 |
| 15.407(g) | Frequency Stability | N/A | | Pass | Section 7.7 |
| 15.407(b)(1), (2), (3), (4) | Undesirable Emissions | < -27dBm/MHz EIRP<br>< -17dBm/MHz EIRP | Radiated | Pass | Section 7.8 & 7.9 |
| 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 7.10 |

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) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

## 7.2. 26dB Bandwidth Measurement

### 7.2.1. Test Limit

N/A

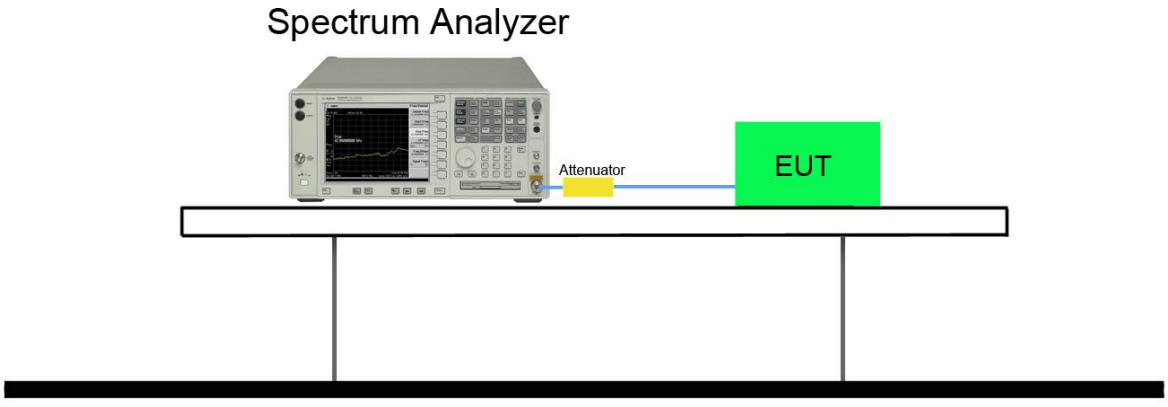
### 7.2.2. Test Procedure used

KDB 789033 D02v01 - 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

| Test Mode | Data Rate (Mbps) | Channel No. | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 6 | 36 | 5180 | 18.79 | 16.47 | Pass |
| 802.11a | 6 | 44 | 5220 | 18.82 | 16.45 | Pass |
| 802.11a | 6 | 48 | 5240 | 19.33 | 16.44 | Pass |
| 802.11a | 6 | 52 | 5260 | 19.84 | 16.52 | Pass |
| 802.11a | 6 | 60 | 5300 | 19.04 | 16.45 | Pass |
| 802.11a | 6 | 64 | 5320 | 18.97 | 16.49 | Pass |
| 802.11a | 6 | 100 | 5500 | 18.83 | 16.45 | Pass |
| 802.11a | 6 | 120 | 5600 | 18.86 | 16.42 | Pass |
| 802.11a | 6 | 140 | 5700 | 19.07 | 16.47 | Pass |
| 802.11a | 6 | 149 | 5745 | 20.46 | 16.56 | Pass |
| 802.11a | 6 | 157 | 5785 | 22.16 | 16.51 | Pass |
| 802.11a | 6 | 165 | 5825 | 22.62 | 16.57 | Pass |
| 802.11n-HT20 | 6.5 | 36 | 5180 | 19.13 | 17.45 | Pass |
| 802.11n-HT20 | 6.5 | 44 | 5220 | 19.17 | 17.49 | Pass |
| 802.11n-HT20 | 6.5 | 48 | 5240 | 19.06 | 17.48 | Pass |
| 802.11n-HT20 | 6.5 | 52 | 5260 | 19.20 | 17.47 | Pass |
| 802.11n-HT20 | 6.5 | 60 | 5300 | 19.12 | 17.46 | Pass |
| 802.11n-HT20 | 6.5 | 64 | 5320 | 19.10 | 17.47 | Pass |
| 802.11n-HT20 | 6.5 | 100 | 5500 | 19.15 | 17.49 | Pass |
| 802.11n-HT20 | 6.5 | 120 | 5600 | 19.09 | 17.47 | Pass |
| 802.11n-HT20 | 6.5 | 140 | 5700 | 19.20 | 17.47 | Pass |
| 802.11n-HT20 | 6.5 | 149 | 5745 | 19.06 | 17.50 | Pass |
| 802.11n-HT20 | 6.5 | 157 | 5785 | 20.42 | 17.50 | Pass |
| 802.11n-HT20 | 6.5 | 165 | 5825 | 20.77 | 17.52 | Pass |

## 802.11a 26dB Bandwidth & 99% Bandwidth

### Channel 36 (5180MHz)

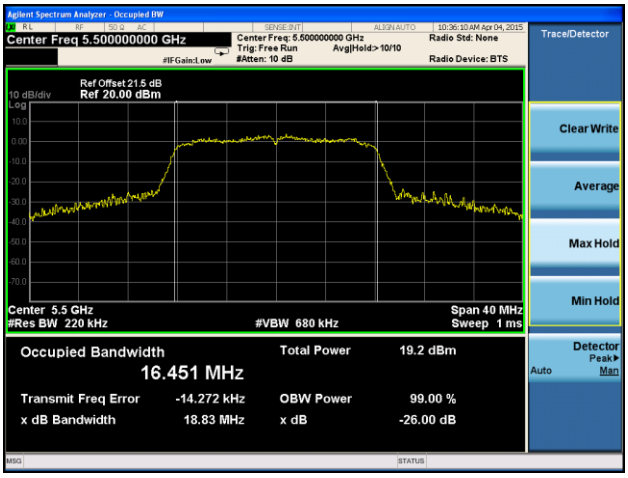
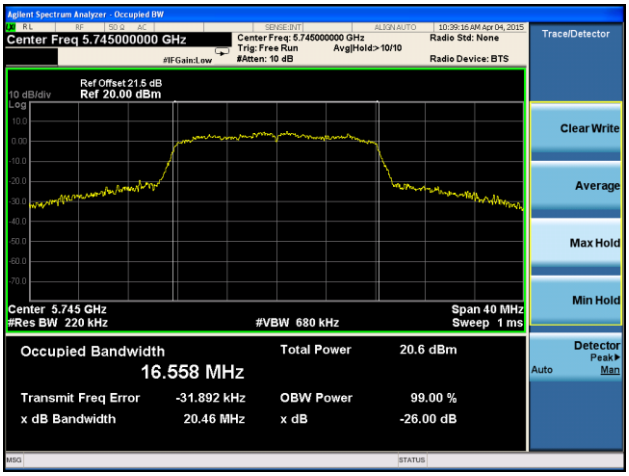
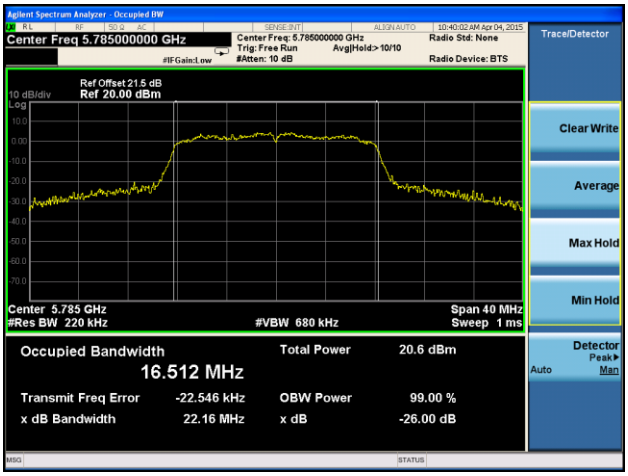
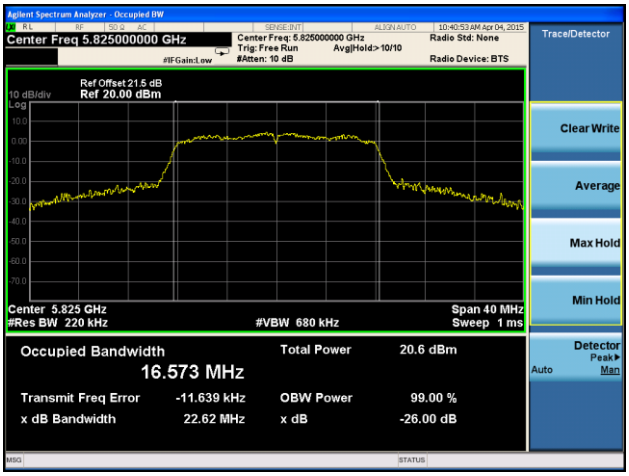

### Channel 44 (5220MHz)


### Channel 48 (5240MHz)


### Channel 52 (5260MHz)

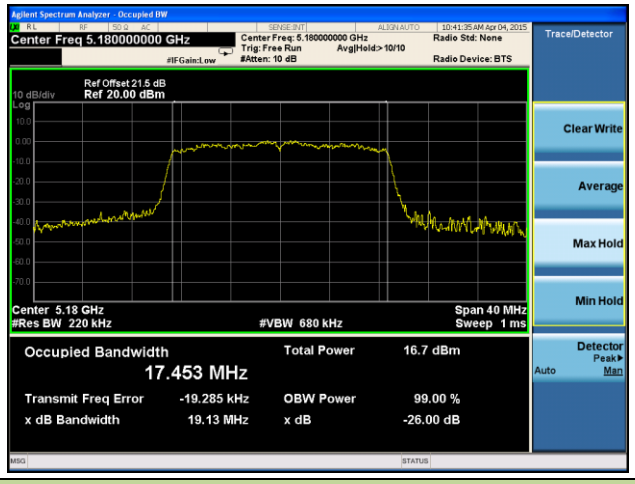

### Channel 60 (5300MHz)


### Channel 64 (5320MHz)

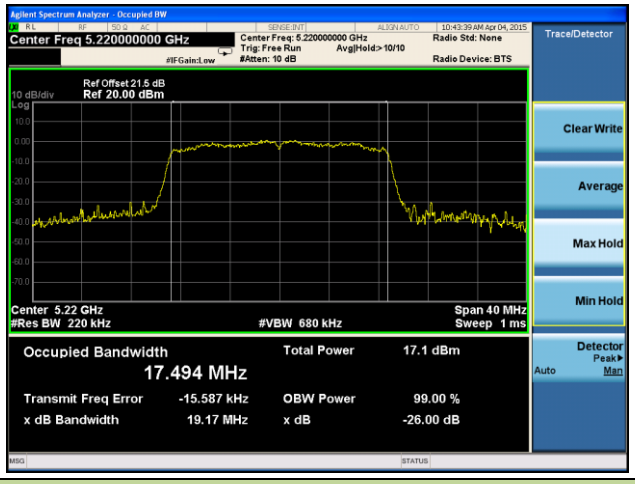
| Channel 100 (5500MHz) | Channel 120 (5600MHz) |
|---|---|
|  |  |
| **Channel 140 (5700MHz)** | **Channel 149 (5745MHz)** |
|  |  |
| **Channel 157 (5785MHz)** | **Channel 165 (5825MHz)** |
|  |  |

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

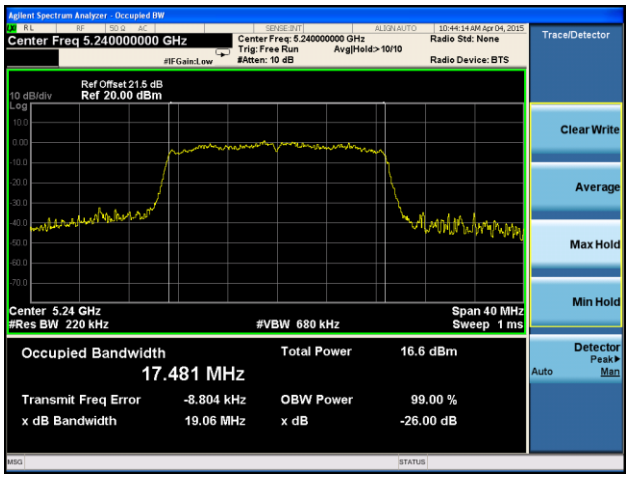
### Channel 36 (5180MHz)



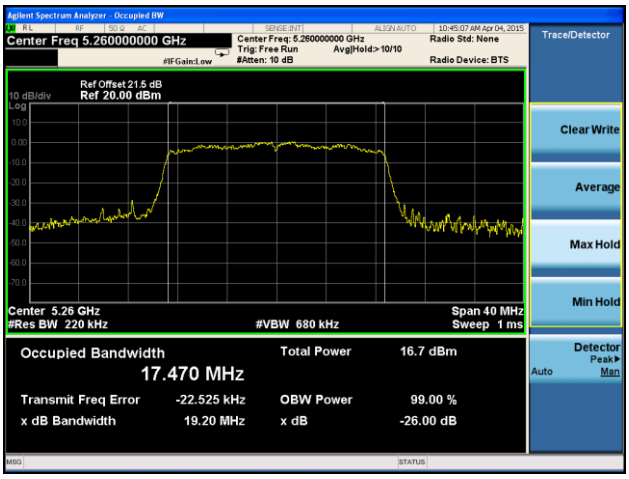

### Channel 44 (5220MHz)



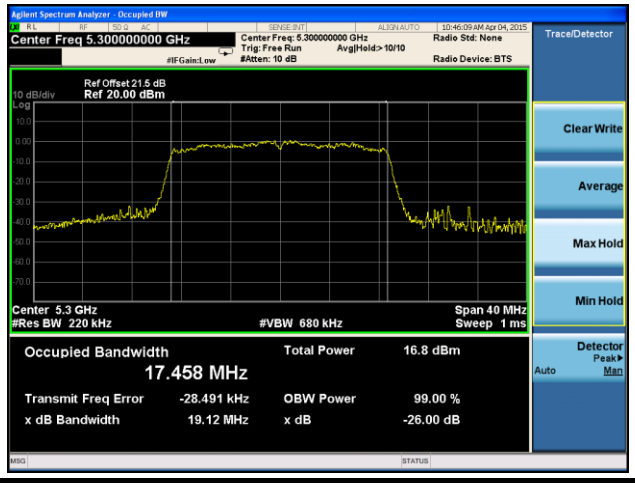

### Channel 48 (5240MHz)



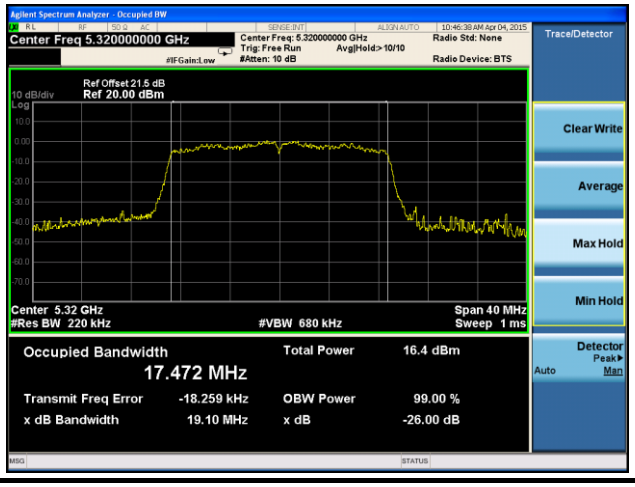

### Channel 52 (5260MHz)

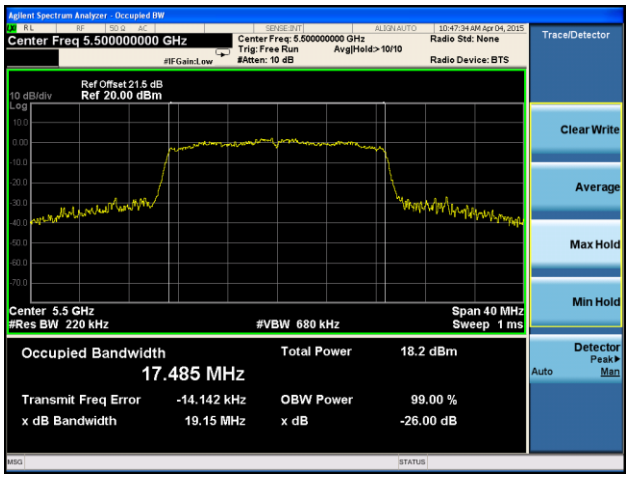
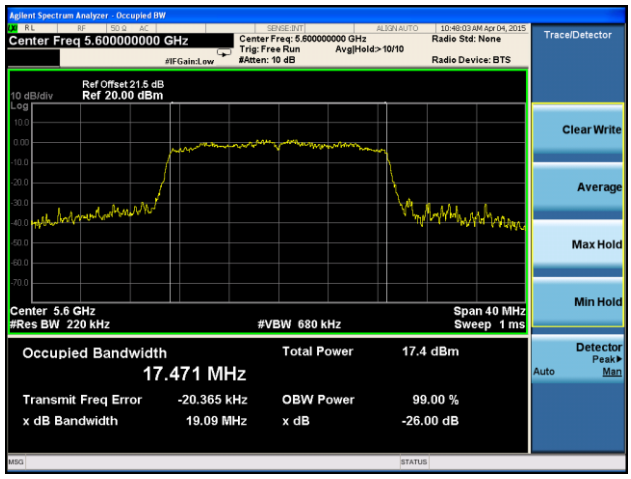
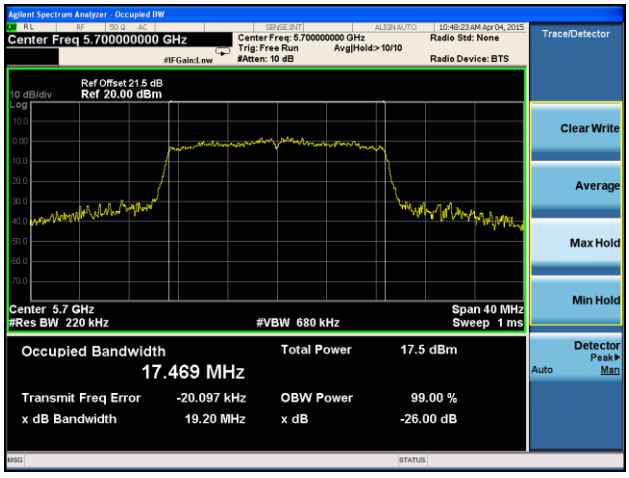
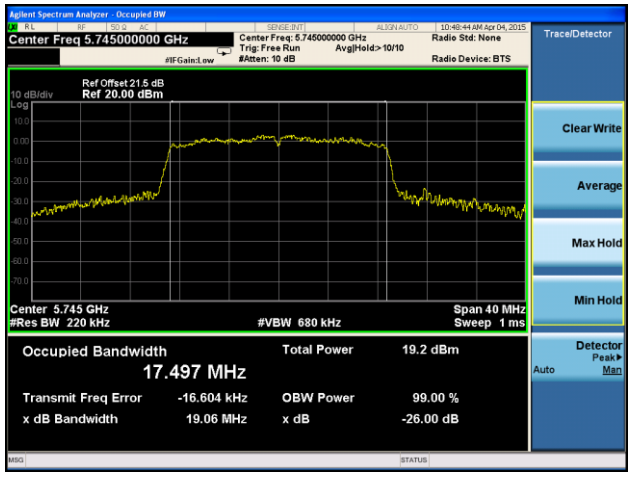
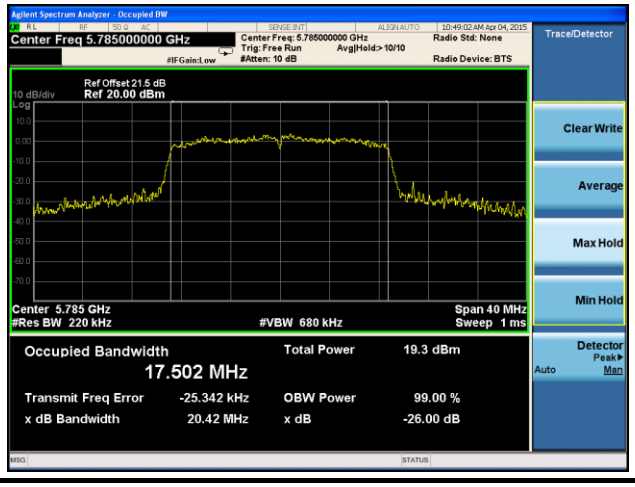
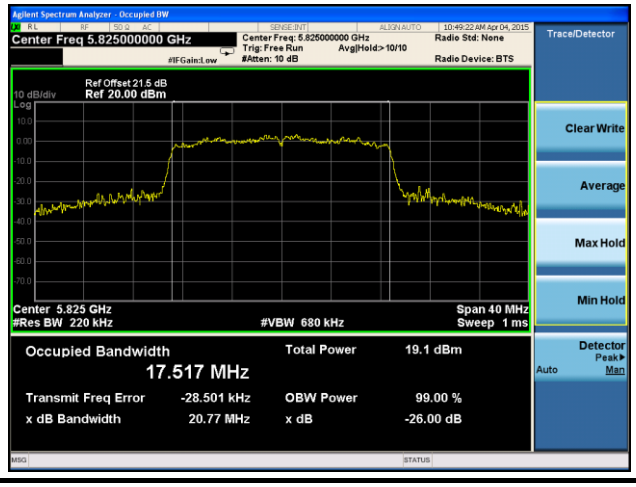



### Channel 60 (5300MHz)




### Channel 64 (5320MHz)



| Channel 100 (5500MHz) | Channel 120 (5600MHz) |
|---|---|
|  |  |
| **Channel 140 (5700MHz)** | **Channel 149 (5745MHz)** |
|  |  |
| **Channel 157 (5785MHz)** | **Channel 165 (5825MHz)** |
|  |  |

## 7.3. 6dB Bandwidth Measurement

### 7.3.1. Test Limit

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

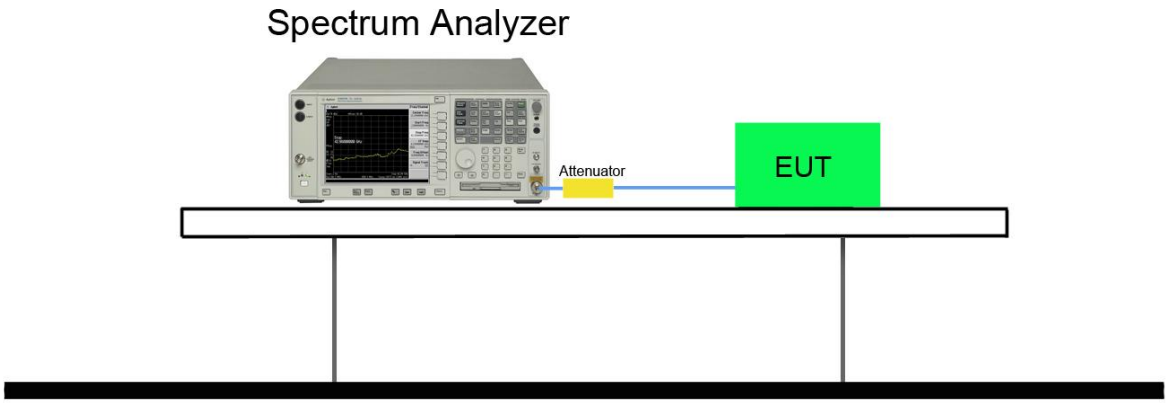
### 7.3.2. Test Procedure used

KDB 789033 D02v01 - Section C.2

### 7.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW ≧ 3 × 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.

### 7.3.4. Test Setup

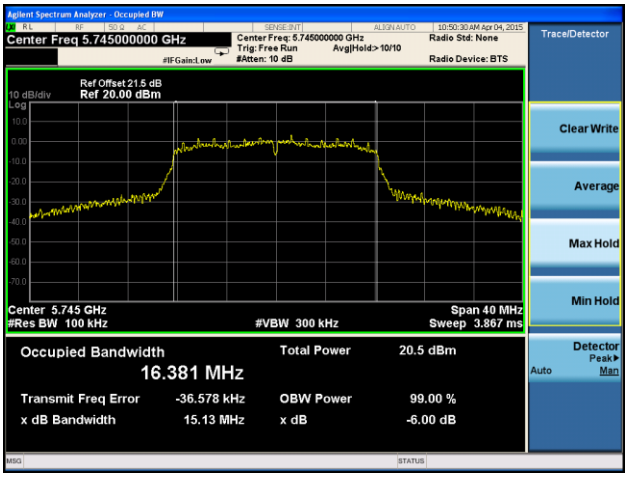


### 7.3.5. Test Result

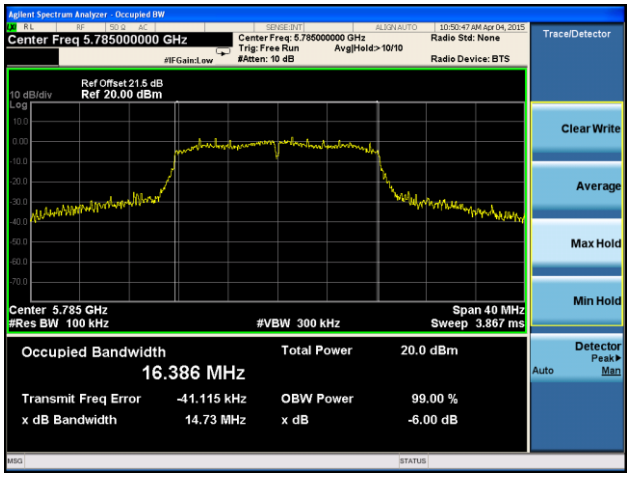
| Test Mode | Data Rate (Mbps) | Channel No. | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (MHz) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 6 | 149 | 5745 | 15.13 | ≥0.5 | Pass |
| 802.11a | 6 | 157 | 5785 | 14.73 | ≥0.5 | Pass |
| 802.11a | 6 | 165 | 5825 | 15.12 | ≥0.5 | Pass |
| 802.11n-HT20 | 6.5 | 149 | 5745 | 15.10 | ≥0.5 | Pass |
| 802.11n-HT20 | 6.5 | 157 | 5785 | 15.04 | ≥0.5 | Pass |
| 802.11n-HT20 | 6.5 | 165 | 5825 | 14.22 | ≥0.5 | Pass |

**802.11a 6dB Bandwidth**

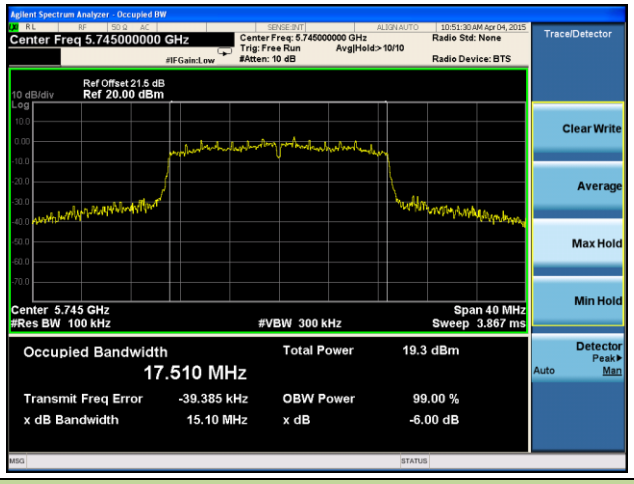
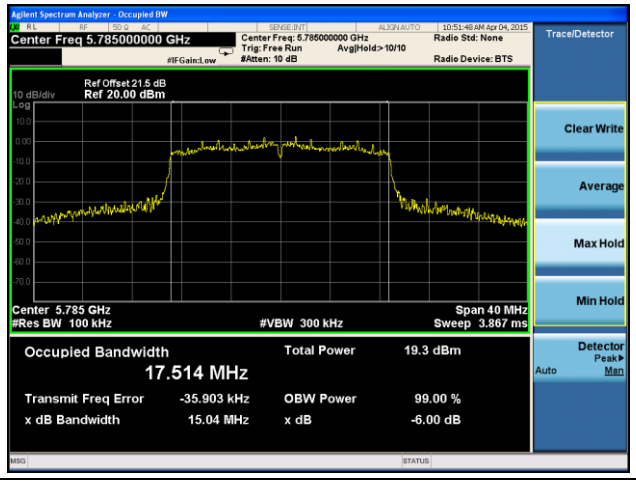
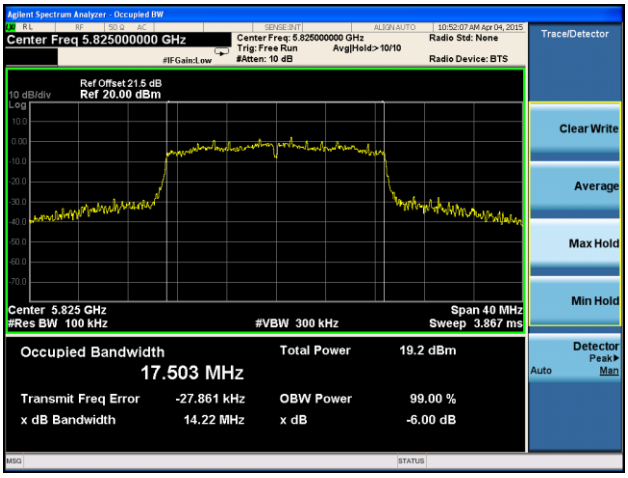
**Channel 149 (5745MHz)**




**Channel 157 (5785MHz)**




**Channel 165 (5825MHz)**

| 802.11n-HT20 6dB Bandwidth | |
|---|---|
| **Channel 149 (5745MHz)** | **Channel 157 (5785MHz)** |
|  |  |
| **Channel 165 (5825MHz)** | |
|  | |

## 7.4. Output Power Measurement

### 7.4.1. Test Limit

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm).

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 (23.98dBm) or 11 dBm 10 log (26dB BW).

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.

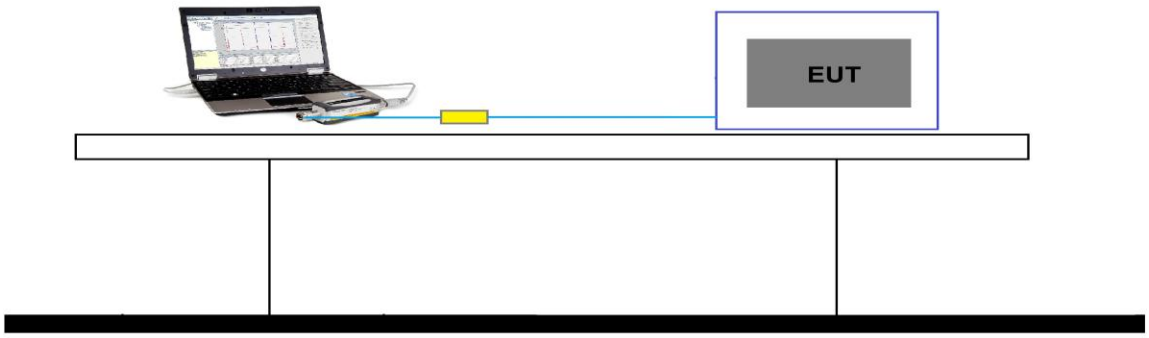
### 7.4.2. Test Procedure Used

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

### 7.4.3. Test Setting

Average power measurements were perform 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.

### 7.4.4. Test Setup



### 7.4.5. Test Result

**Output power at various data rates for 802.11a/n**

| Test Mode | Bandwidth (MHz) | Channel | Frequency (MHz) | Data Rate (Mbps) | Average Power (dBm) |
|---|---|---|---|---|---|
| 802.11a | 20 | 60 | 5180 | 6 | 12.76 |
| | | | | 24 | 12.54 |
| | | | | 54 | 12.49 |
| 802.11n | 20 | 60 | 5180 | 6.5 | 10.15 |
| | | | | 7.2 | 10.06 |
| | | | | 39 | 9.92 |
| | | | | 43.3 | 9.88 |
| | | | | 65 | 9.77 |
| | | | | 72.2 | 9.73 |

| Test Mode | Data Rate (Mbps) | Channel No. | Frequency (MHz) | Average Power (dBm) | Limit (MHz) | Result |
|---|---|---|---|---|---|---|
| 802.11a | 6 | 36 | 5180 | 12.76 | ≤30.00 | Pass |
| 802.11a | 6 | 44 | 5220 | 12.63 | ≤30.00 | Pass |
| 802.11a | 6 | 48 | 5240 | 12.56 | ≤30.00 | Pass |
| 802.11a | 6 | 52 | 5260 | 12.50 | ≤23.98 | Pass |
| 802.11a | 6 | 60 | 5300 | 12.39 | ≤23.98 | Pass |
| 802.11a | 6 | 64 | 5320 | 12.36 | ≤23.98 | Pass |
| 802.11a | 6 | 100 | 5500 | 11.98 | ≤23.98 | Pass |
| 802.11a | 6 | 120 | 5600 | 11.75 | ≤23.98 | Pass |
| 802.11a | 6 | 140 | 5700 | 11.55 | ≤23.98 | Pass |
| 802.11a | 6 | 149 | 5745 | 13.10 | ≤30.00 | Pass |
| 802.11a | 6 | 157 | 5785 | 13.22 | ≤30.00 | Pass |
| 802.11a | 6 | 165 | 5825 | 13.21 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 36 | 5180 | 10.15 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 44 | 5220 | 10.12 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 48 | 5240 | 10.03 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 52 | 5260 | 9.93 | ≤23.98 | Pass |
| 802.11n-HT20 | 6.5 | 60 | 5300 | 9.78 | ≤23.98 | Pass |
| 802.11n-HT20 | 6.5 | 64 | 5320 | 9.72 | ≤23.98 | Pass |
| 802.11n-HT20 | 6.5 | 100 | 5500 | 11.39 | ≤23.98 | Pass |
| 802.11n-HT20 | 6.5 | 120 | 5600 | 11.14 | ≤23.98 | Pass |
| 802.11n-HT20 | 6.5 | 140 | 5700 | 10.96 | ≤23.98 | Pass |
| 802.11n-HT20 | 6.5 | 149 | 5745 | 12.69 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 157 | 5785 | 12.78 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 165 | 5825 | 12.75 | ≤30.00 | Pass |

## 7.5. Transmit Power Control

### 7.5.1. 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.

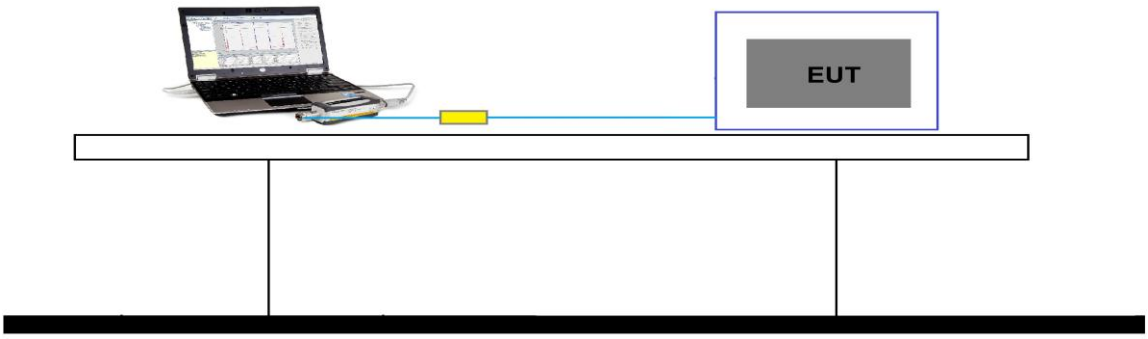
### 7.5.2. Test Procedure Used

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

### 7.5.3. Test Setting

Average power measurements were perform 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.

### 7.5.4. Test Setup




### 7.5.5. Test Result

The device maximum e.i.r.p power less than 500mW (27dBm), not assessed this test.

## 7.6. Power Spectral Density Measurement

### 7.6.1. Test Limit

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 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.

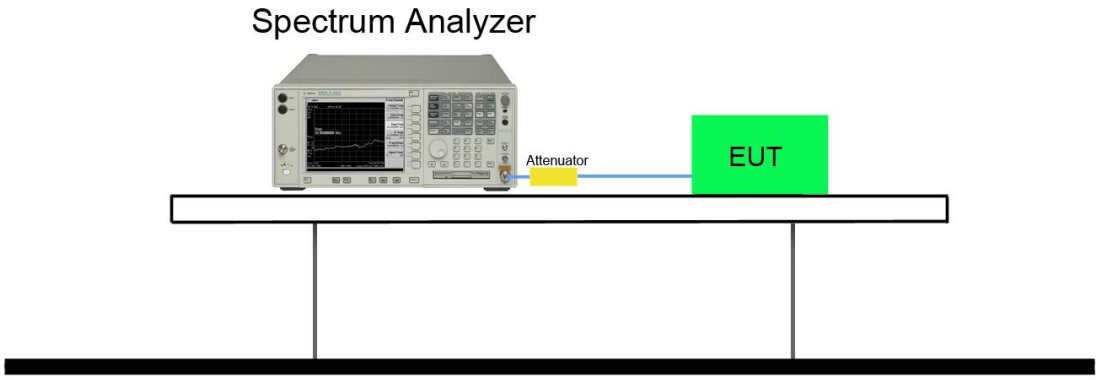
### 7.6.2. Test Procedure Used

KDB 789033 D02v01 - Section F

### 7.6.3. 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, if measurement bandwidth of Maximum PSD is specified in 500 kHz, RBW = 100 kHz
4. VBW = 3MHz
5. Number of sweep points ≥ 2 × (span / RBW)
6. Detector = power averaging (RMS)
7. Sweep time = auto
8. Trigger = free run
9. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
10. Add 10*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*log(1/0.25) = 6 dB if the duty cycle is 25 percent.
11. When the measurement bandwidth of Maximum PSD is specified in 500 kHz, add a constant factor 10*log(500kHz/100kHz) = 7 dB to the measured result

### 7.6.4. Test Setup



### 7.6.5. Test Result

| Test Mode | Data Rate (Mbps) | Frequency (MHz) | PSD (dBm/MHz) | Duty Cycle (%) | Total PSD (dBm/MHz) | Limit (dBm/MHz) | Result |
|---|---|---|---|---|---|---|---|
| 802.11a | 6 | 5180 | 2.75 | 97.1 | 2.88 | ≤17.00 | Pass |
| 802.11a | 6 | 5220 | 2.51 | 97.1 | 2.64 | ≤17.00 | Pass |
| 802.11a | 6 | 5240 | 2.53 | 97.1 | 2.66 | ≤17.00 | Pass |
| 802.11a | 6 | 5260 | 2.59 | 97.1 | 2.72 | ≤11.00 | Pass |
| 802.11a | 6 | 5300 | 2.40 | 97.1 | 2.53 | ≤11.00 | Pass |
| 802.11a | 6 | 5320 | 2.74 | 97.1 | 2.87 | ≤11.00 | Pass |
| 802.11a | 6 | 5500 | 1.83 | 97.1 | 1.96 | ≤11.00 | Pass |
| 802.11a | 6 | 5600 | 1.73 | 97.1 | 1.86 | ≤11.00 | Pass |
| 802.11a | 6 | 5700 | 1.70 | 97.1 | 1.83 | ≤11.00 | Pass |
| 802.11n-HT20 | 6.5 | 5180 | -0.33 | 96.9 | -0.19 | ≤17.00 | Pass |
| 802.11n-HT20 | 6.5 | 5220 | -0.57 | 96.9 | -0.43 | ≤17.00 | Pass |
| 802.11n-HT20 | 6.5 | 5240 | -0.76 | 96.9 | -0.62 | ≤17.00 | Pass |
| 802.11n-HT20 | 6.5 | 5260 | -0.68 | 96.9 | -0.54 | ≤11.00 | Pass |
| 802.11n-HT20 | 6.5 | 5300 | -0.86 | 96.9 | -0.72 | ≤11.00 | Pass |
| 802.11n-HT20 | 6.5 | 5320 | -0.43 | 96.9 | -0.29 | ≤11.00 | Pass |
| 802.11n-HT20 | 6.5 | 5500 | 0.91 | 96.9 | 1.05 | ≤11.00 | Pass |
| 802.11n-HT20 | 6.5 | 5600 | 0.38 | 96.9 | 0.52 | ≤11.00 | Pass |
| 802.11n-HT20 | 6.5 | 5700 | 0.55 | 96.9 | 0.69 | ≤11.00 | Pass |

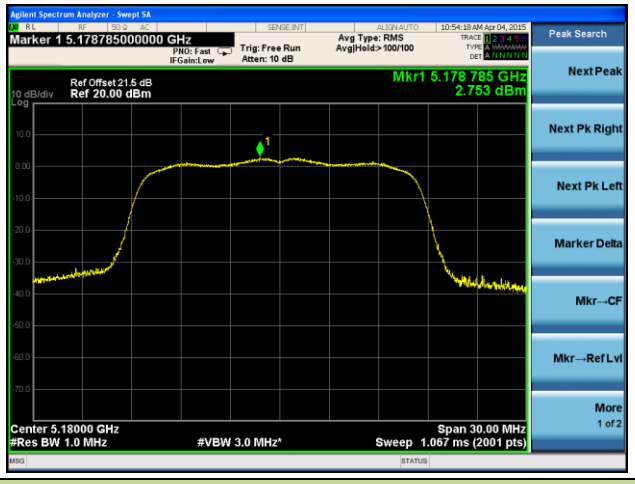
Note: When EUT duty cycle < 98%, the total PSD = PSD + 10*log(1/duty cycle)

| Test Mode | Data Rate (Mbps) | Frequency (MHz) | PSD (dBm/ 100kHz) | Duty Cycle (%) | Constant Factor | Total PSD (dBm/ 500kHz) | Limit (dBm/ 500kHz) | Result |
|---|---|---|---|---|---|---|---|---|
| 802.11a | 6 | 5745 | -4.41 | 97.1 | 7 | -4.28 | ≤30.00 | Pass |
| 802.11a | 6 | 5785 | -4.67 | 97.1 | 7 | -4.54 | ≤30.00 | Pass |
| 802.11a | 6 | 5825 | -4.46 | 97.1 | 7 | -4.33 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 5745 | -5.27 | 96.9 | 7 | -5.13 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 5785 | -5.77 | 96.9 | 7 | -5.63 | ≤30.00 | Pass |
| 802.11n-HT20 | 6.5 | 5825 | -5.54 | 96.9 | 7 | -5.40 | ≤30.00 | Pass |

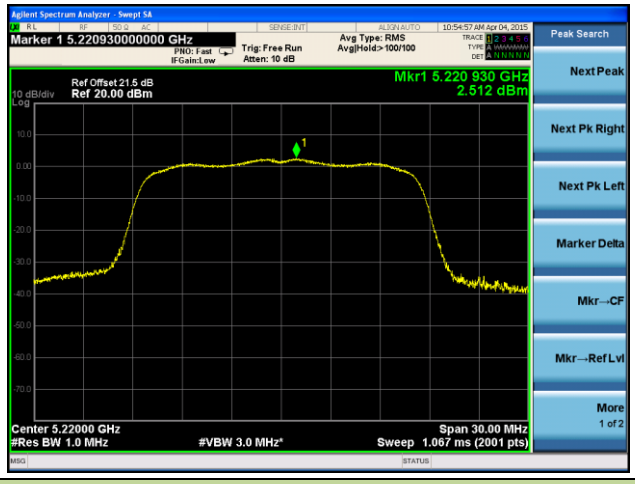
Note: When EUT duty cycle < 98%, the total PSD = PSD + 10*log(1/duty cycle) + Constant Factor.

## 802.11a Power Spectral Density

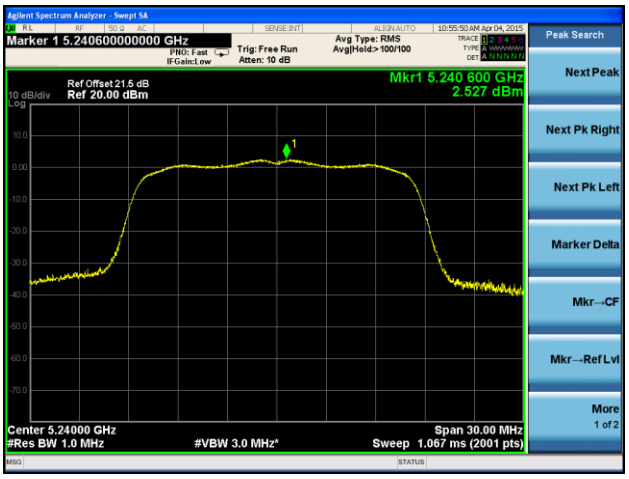
### Channel 36 (5180MHz)



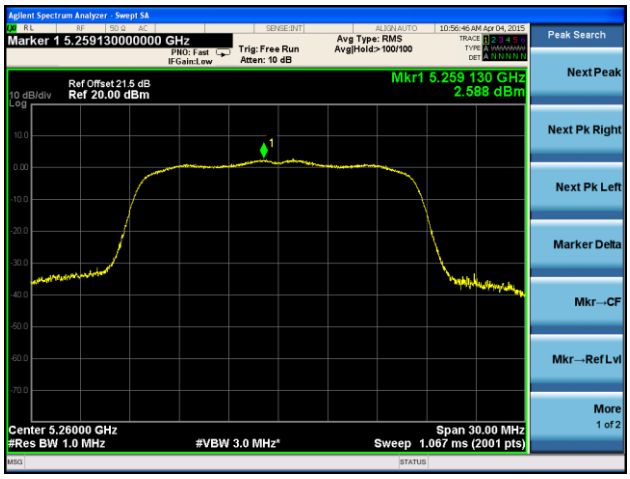

### Channel 44 (5220MHz)



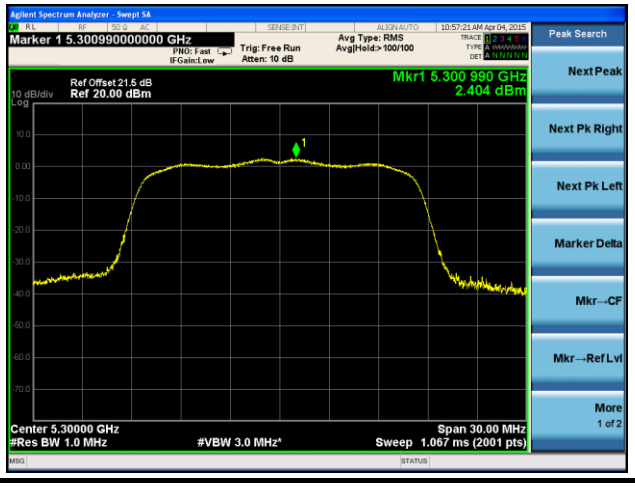

### Channel 48 (5240MHz)



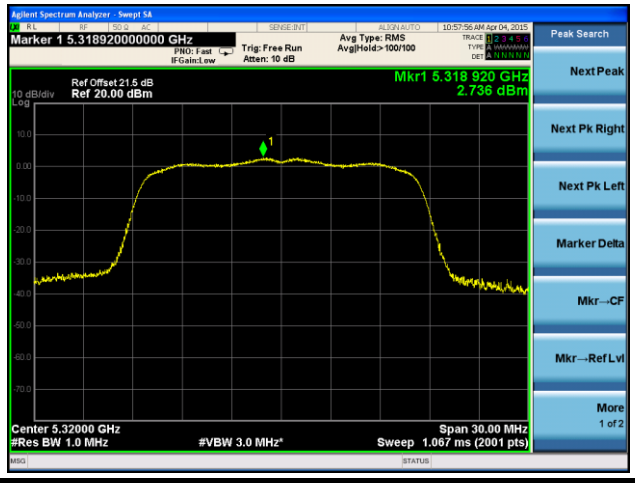

### Channel 52 (5260MHz)

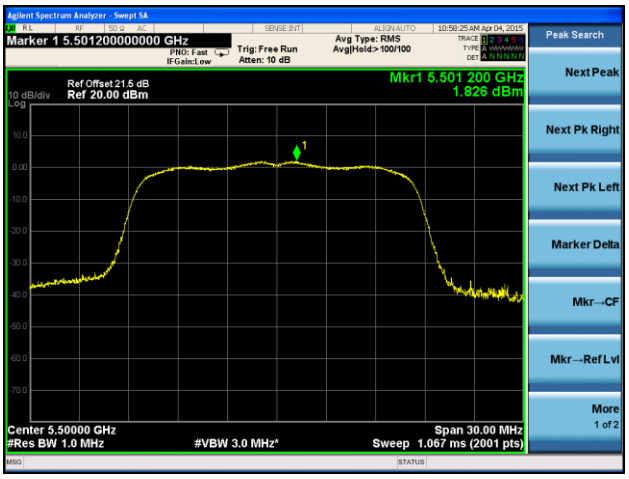
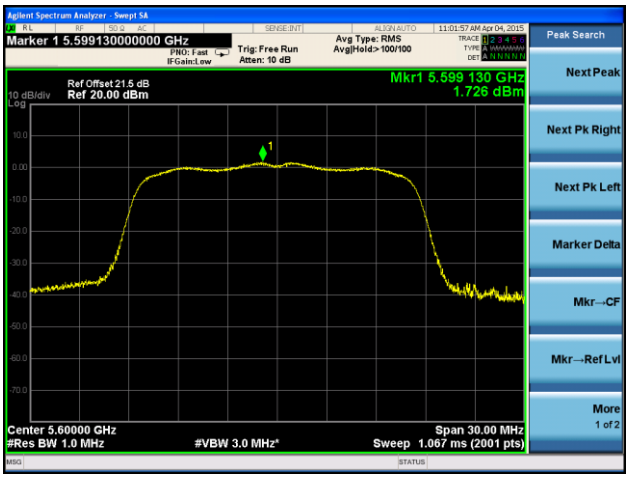
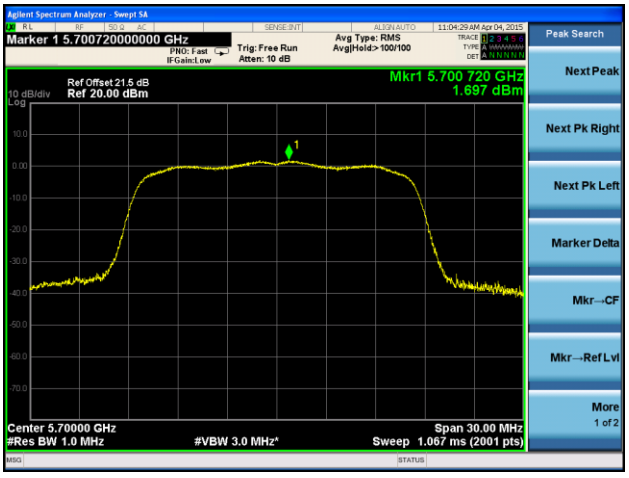
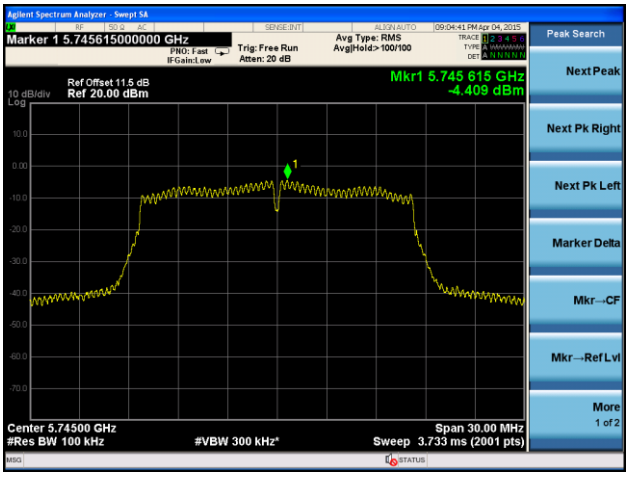
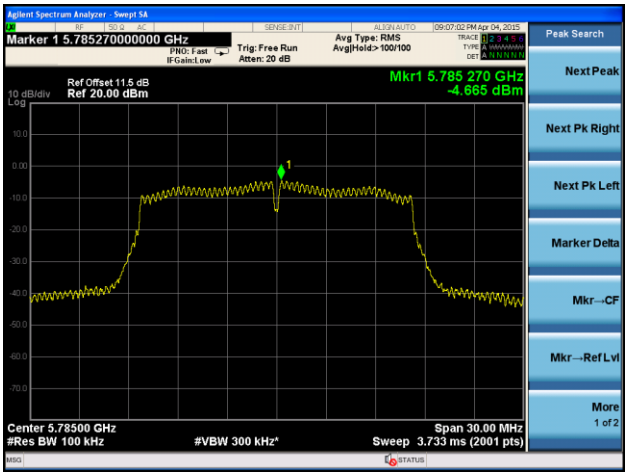
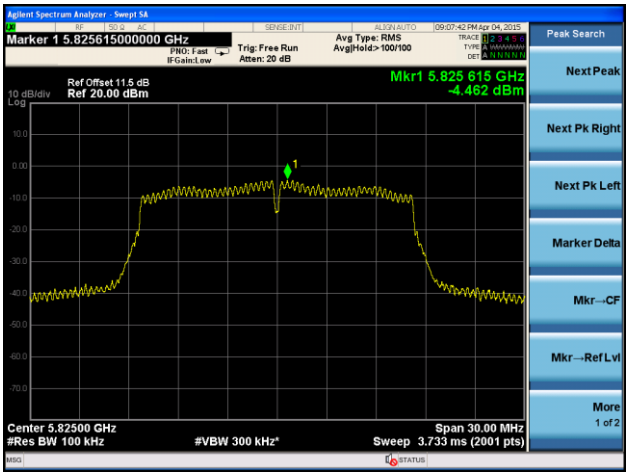


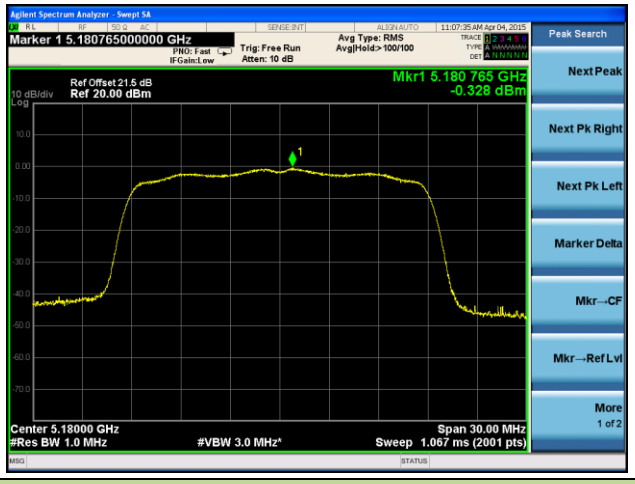
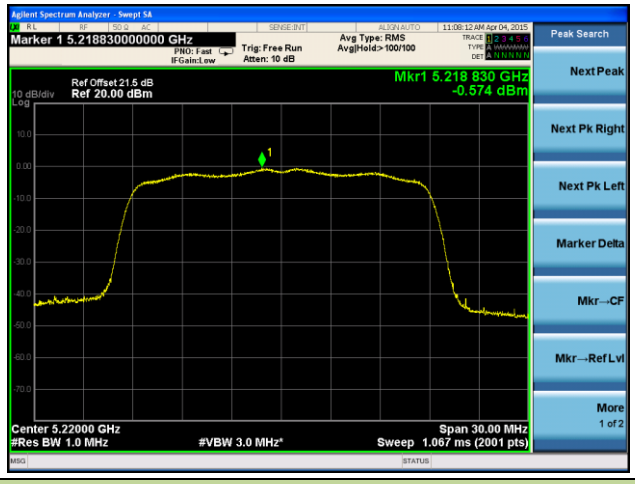
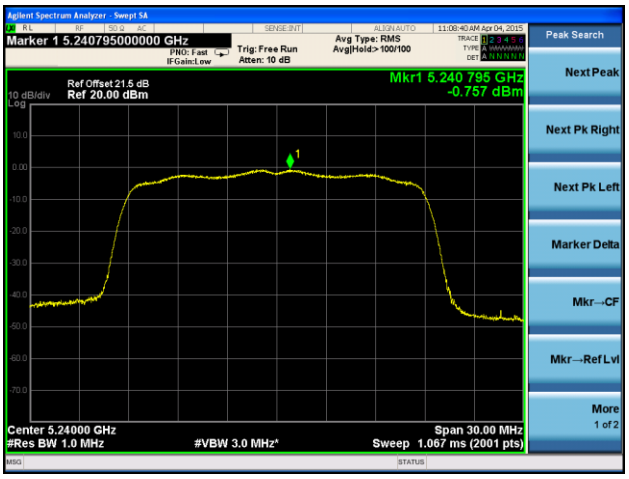
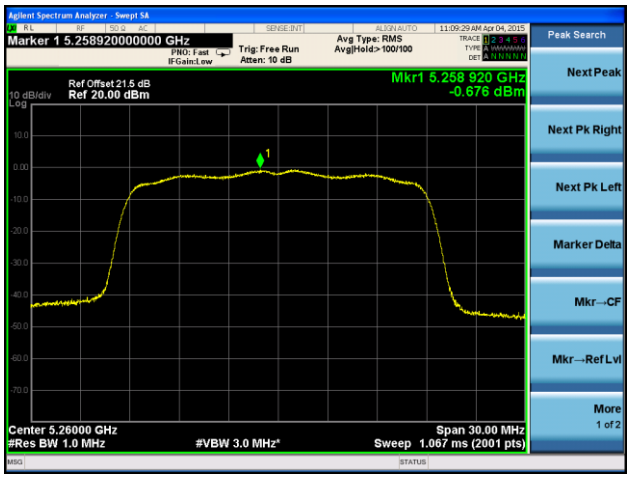
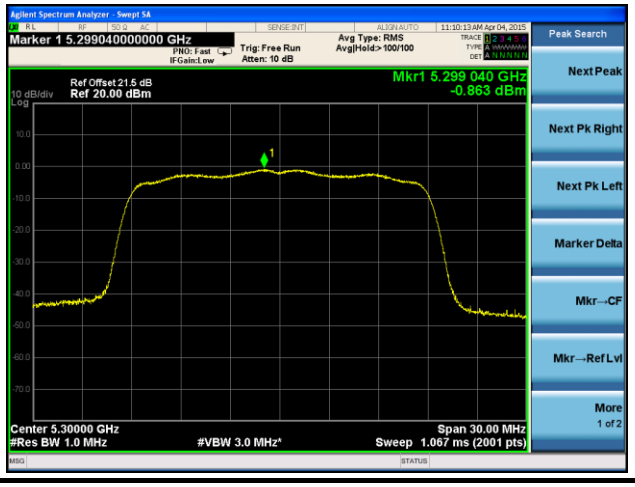
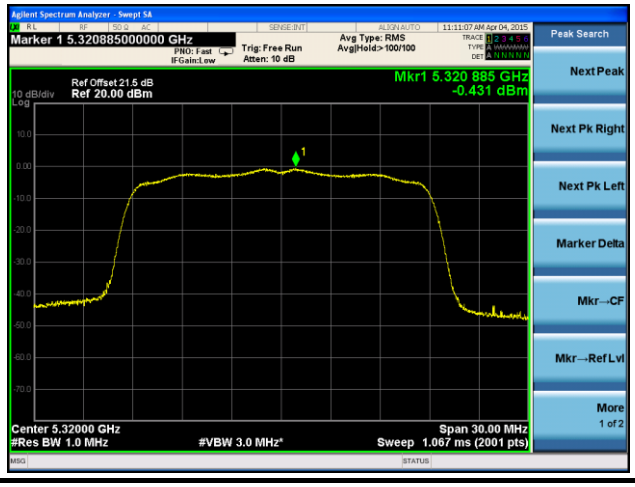

### Channel 60 (5300MHz)

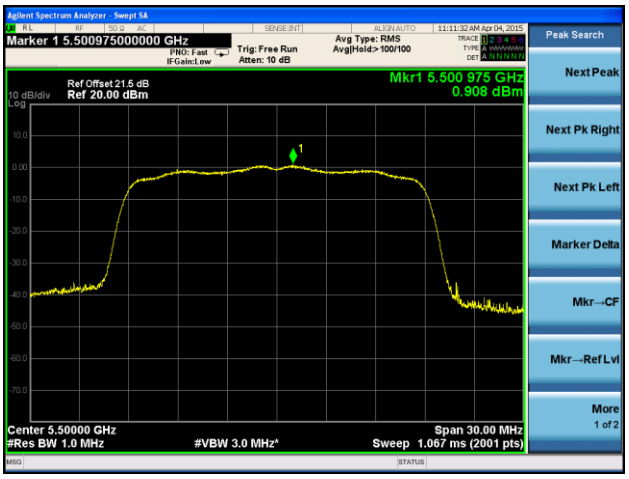
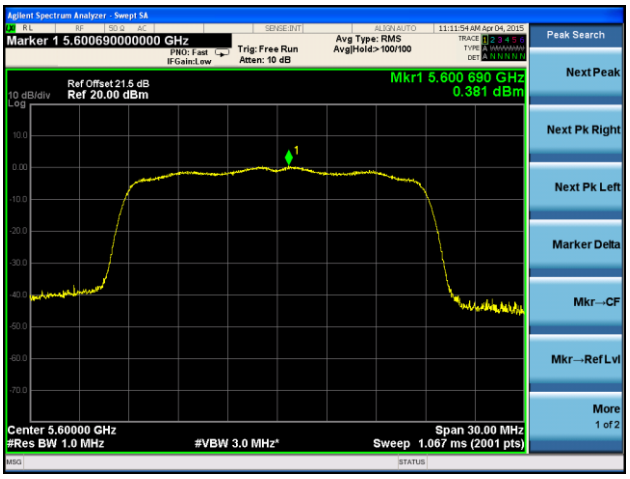
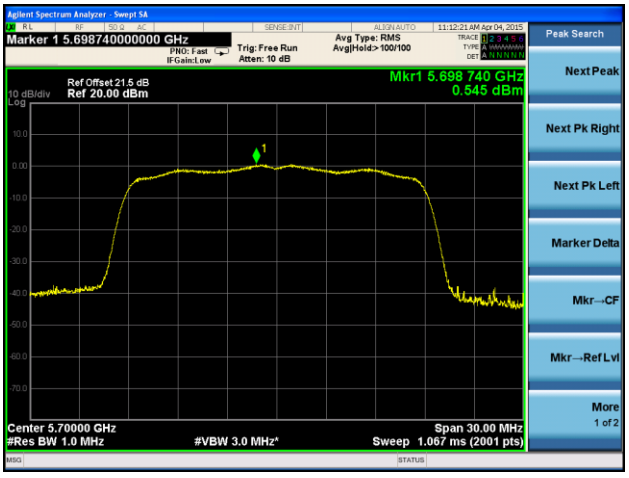
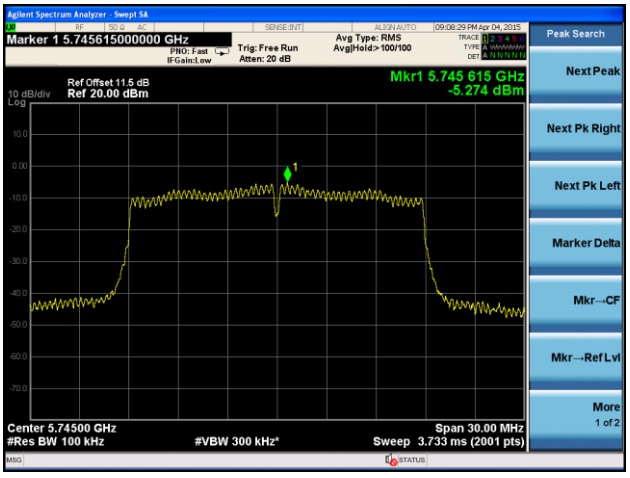
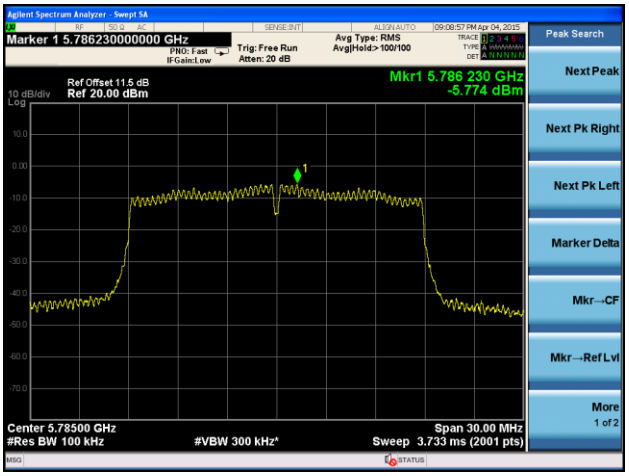
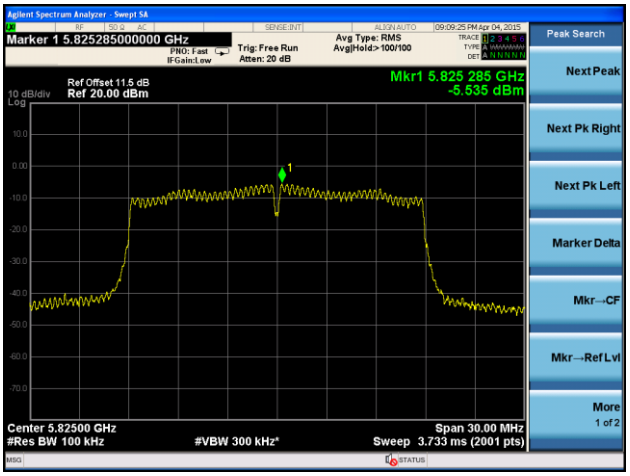



### Channel 64 (5320MHz)



| Channel 100 (5500MHz) | Channel 120 (5600MHz) |
|---|---|
|  |  |
| **Channel 140 (5700MHz)** | **Channel 149 (5745MHz)** |
|  |  |
| **Channel 157 (5785MHz)** | **Channel 165 (5825MHz)** |
|  |  |

| 802.11n-HT20 Power Spectral Density | |
|---|---|
| **Channel 36 (5180MHz)** | **Channel 44 (5220MHz)** |
|  |  |
| **Channel 48 (5240MHz)** | **Channel 52 (5260MHz)** |
|  |  |
| **Channel 60 (5300MHz)** | **Channel 64 (5320MHz)** |
|  |  |

| Channel 100 (5500MHz) | Channel 120 (5600MHz) |
|---|---|
|  |  |
| **Channel 140 (5700MHz)** | **Channel 149 (5745MHz)** |
|  |  |
| **Channel 157 (5785MHz)** | **Channel 165 (5825MHz)** |
|  |  |

## 7.7. Frequency Stability Measurement

### 7.7.1. 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.

### 7.7.2. 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 (±15%) and endpoint, record the maximum frequency change.

### 7.7.3. Test Setup