

# TEST REPORT

FCC/ISED UNII Test for DA3510TAN&DA3500TKN  
Certification

**APPLICANT**  
HYUNDAI MOBIS CO., LTD.

**REPORT NO.**  
HCT-RF-2105-FI012

**DATE OF ISSUE**  
June 1, 2021

**Tested by**  
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**TEST  
REPORT**

FCC/ISED  
UNII Test for  
DA3510TAN &  
DA3500TKN

**REPORT NO.**

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**Additional Model**

FCC : DA3500TGG, DA3500TGN, DA3500TGL, DA3500TEG, DA3500TEP,  
DA3500TAN, DA3500TAU, DA3520TGG, DA3510TEG, DA3510TEP, DA3500TBB,  
DA3500TFN

**Applicant**

**HYUNDAI MOBIS CO., LTD.**

203, Teheran-ro, Gangnam-gu, Seoul, 135-977, South Korea

<b>Eut Type</b>	CAR AUDIO SYSTEM
<b>FCC Model Name</b>	DA3510TAN
<b>ISED Model Name</b>	DA3500TKN

<b>FCC ID</b>	TQ8-DA3510TAN
<b>IC</b>	5074A-DA3500TKN

<b>Modulation type</b>	OFDM
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<b>FCC Classification</b>	Unlicensed National Information Infrastructure(NII)
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<b>FCC Rule Part(s)</b>	Part 15.407
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<b>ISED Rule Part(s)</b>	RSS-247 Issue 2 (February 2017) RSS-Gen Issue 5_Amendment 1 (March 2019)
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The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test results were applied only to the test methods required by the standard.

## REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	June 01, 2021	Initial Release

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC / ISED Rules under normal use and maintenance.

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## 1. GENERAL INFORMATION

### EUT DESCRIPTION

FCC Model	DA3510TAN	
ISED Model	DA3500TKN	
FCC Additional Model	DA3500TGG, DA3500TGN, DA3500TGL, DA3500TEG, DA3500TEP, DA3500TAN, DA3500TAU, DA3520TGG, DA3510TEG, DA3510TEP, DA3500TBB, DA3500TFN	
ISED Additional Model	-	
EUT Type	CAR AUDIO SYSTEM	
Power Supply	DC 14.4 V	
Modulation Type	OFDM : 802.11a, 802.11n, 802.11ac	
Frequency Range (MHz)	U-NII-1	20MHz BW : 5180 - 5240 40MHz BW : 5190 - 5230 80MHz BW : 5210
	U-NII-2A	20MHz BW : 5260 - 5320 40MHz BW : 5270 - 5310 80MHz BW : 5290
	U-NII-2C	20MHz BW : 5500 - 5720 40MHz BW : 5510 - 5710 80MHz BW : 5530 - 5690
	U-NII-3	20MHz BW : 5745 - 5825 40MHz BW : 5755 - 5795 80MHz BW : 5775
Antenna Specification	Antenna type: Wi-Fi Dual Band Antenna Peak Gain : UNII-1: -0.61 dBi, UNII-2A: -0.18 dBi UNII-2C: -0.77 dBi, UNII-3: -0.18 dBi	
Straddle channel	Supported	
TDWR Band	Not Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	April 27, 2021 ~ May 26, 2021	
PMN (Product Marketing Number)	DA3500TKN	
HVIN (Hardware Version Identification Number)	DA3500TKN	
FVIN (Firmware Version Identification Number)	SG2_HEV.USA.0000.116.001.210319	
HMN (Host Marketing Name)	N/A	
EUT serial numbers	Conducted : 96160-AT410 (FCC), 96160-AT400 (ISED) Radiated : 96160-AT410 (FCC), 96160-AT400 (ISED)	

## 2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

Band	Mode	RF Output Power (dBm)	RF Output Power (W)
UNII-1	802.11a	7.99	0.006
	802.11n (HT20)	7.99	0.006
	802.11n (HT40)	4.16	0.003
	802.11ac (VHT20)	7.87	0.006
	802.11ac (VHT40)	4.12	0.003
	802.11ac (VHT80)	4.39	0.003
UNII-2A	802.11a	8.13	0.007
	802.11n (HT20)	8.02	0.006
	802.11n (HT40)	6.64	0.005
	802.11ac (VHT20)	8.02	0.006
	802.11ac (VHT40)	6.75	0.005
	802.11ac (VHT80)	7.13	0.005
UNII-2C	802.11a	5.61	0.004
	802.11n (HT20)	5.52	0.004
	802.11n (HT40)	5.15	0.003
	802.11ac (VHT20)	5.56	0.004
	802.11ac (VHT40)	5.20	0.003
	802.11ac (VHT80)	5.23	0.003
UNII-3	802.11a	2.69	0.002
	802.11n (HT20)	2.45	0.002
	802.11n (HT40)	2.03	0.002
	802.11ac (VHT20)	2.55	0.002
	802.11ac (VHT40)	1.93	0.002
	802.11ac (VHT80)	1.60	0.001

### 3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 dated December 14, 2017 entitled “Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part15, Subpart E” and ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’ were used in the measurement.

#### EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E. / RSS-Gen issue 5, RSS-247 issue 2.

#### GENERAL TEST PROCEDURES

##### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013)

## DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

## 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

## 5. FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032 ).

For ISED, test facility was accepted dated February 14, 2019 (CAB identifier: KR0032).

### 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



## 6. ANTENNA REQUIREMENTS

According to FCC 47 CFR § 15.203, § 15.407 / RSS-Gen (Issue 5) Section 8:

“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.”

- (1) The antennas of this E.U.T are permanently attached.
- (2) The E.U.T Complies with the requirement of § 15.203, § 15.407

## 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicate a 95 % level of confidence.

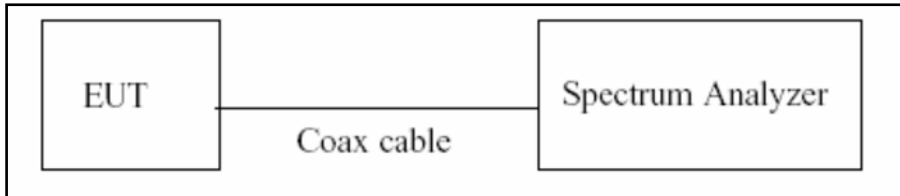
The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance

Parameter	Expanded Uncertainty ( $\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

## 8. DESCRIPTION OF TESTS

### 8.1. Duty Cycle

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure B.2 in KDB 789033 D02 v02r01.

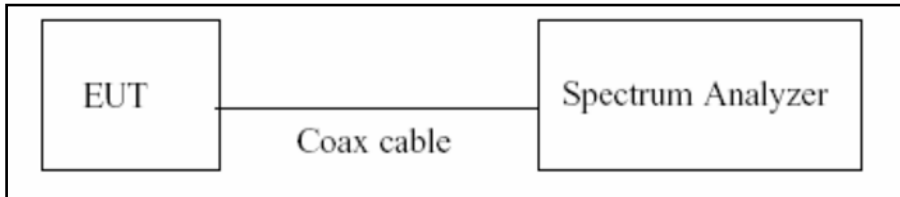
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ( $\geq$  RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure  $T_{total}$  and  $T_{on}$
8. Calculate Duty Cycle =  $T_{on} / T_{total}$  and Duty Cycle Factor =  $10\log(1/\text{Duty Cycle})$

## 8.2. 6dB Bandwidth & 26dB Bandwidth & 99 % Bandwidth

### Limit

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### Test Configuration



### Test Procedure(26dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure C.1 in KDB 789033 D02 v02r01.

1. RBW = approximately 1 % of the emission bandwidth
2. VBW > RBW
3. Detector = Peak
4. Trace mode = max hold
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

### Test Procedure (6dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure C.2 in KDB 789033 D02 v02r01.

1. RBW = 100 kHz
2. VBW  $\geq$  3 x RBW
3. Detector = Peak
4. Trace mode = max hold
5. Allow the trace to stabilize
6. 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.

### Note:

1. We tested X dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

2. DFS test channels should be defined. So, We performed the OBW test to prove that no part of the fundamental emissions of any channels belong to UNII1 and UNII3 band for DFS.
3. The 26 dB bandwidth is used to determine the conducted power limits.

#### **Test Procedure (99 % Bandwidth for ISED)**

The transmitter output is connected to the spectrum analyzer.

RBW = 1% ~ 5% of the occupied bandwidth

VBW  $\hat{=}$  3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

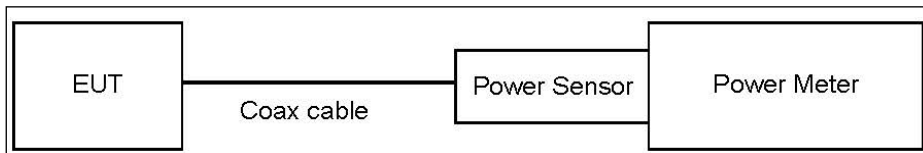
### 8.3. Output Power Measurement

**Limit**

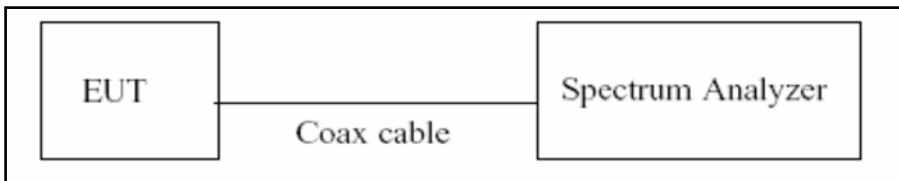
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$ , (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30dBm)

**Test Configuration**

Power Meter



Spectrum Analyzer(Only Straddle Channel)



**Test Procedure(Power Meter)**

We tested according to Procedure E.3.a in KDB 789033 D02 v02r01.

1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. 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.

**Test Procedure(Spectrum Analyzer)**

The transmitter output is connected to the Spectrum Analyzer.

We use the spectrum analyzer’s integrated band power measurement function.

We tested according to Procedure E.2.d) in KDB 789033 D02 v02r01.

1. Measure the duty cycle.
2. Set span to encompass the 26 dB EBW of the signal.
3. RBW = 1 MHz.
4. VBW  $\geq$  3 MHz.
5. Number of points in sweep  $\geq$  2 x span/RBW.
6. Sweep time = auto.
7. Detector = RMS.
8. Do not use sweep triggering. Allow the sweep to “free run”.
9. Trace average at least 100 traces in power averaging(RMS) mode
10. Integrated bandwidth = OBW
11. 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.

### Sample Calculation

Total Power(dBm) = Reading Value(dBm) + ATT loss(dB) + Cable loss(dB) + Duty Cycle Factor(dB)

### Note

1. Spectrum reading values are not plot data.

The power results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Spectrum offset = Attenuator loss(20 dB) + Cable loss

3. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1	21.98
UNII 2A	21.98
UNII 2C	21.98
UNII 3	21.98

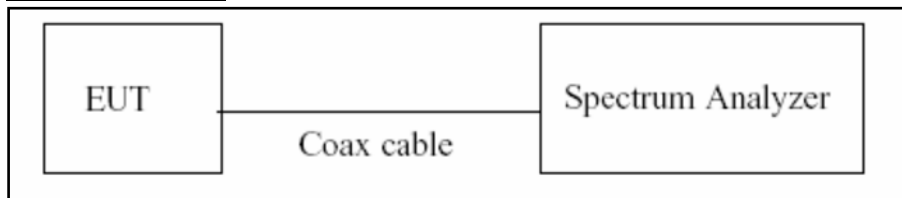
(Actual value of loss for the attenuator and cable combination)

### 8.4. Power Spectral Density

**Limit**

Band	Limit
UNII 1	11 dBm/MHz
UNII 2A, 2C	11 dBm/MHz
UNII 3	30 dBm/500 kHz

**Test Configuration**



**Test Procedure**

We tested according to Procedure F in KDB 789033 D02 v02r01.

1. Set span to encompass the entire emission bandwidth(EBW) of the signal.
2. RBW = 1 MHz(510 kHz for UNII 3)
3. VBW  $\geq$  3 MHz
4. Number of points in sweep  $\geq$  2 x span/RBW.
5. Sweep time = auto.
6. Detector = RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
7. Do not use sweep triggering. Allow the sweep to “free run”.
8. Trace average at least 100 traces in power averaging(RMS) mode
9. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
10. If Method SA-2 was used, add  $10 \log(1/x)$ , where x is the duty cycle, to the peak of the spectrum.

**Sample Calculation**

Total PSD(dBm) = Reading Value(dBm) + ATT loss(dB) + Cable loss(dB) + Duty Cycle Factor(dB)

**Note**

1. Spectrum reading values are not plot data.

The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Spectrum offset = Attenuator loss(20 dB) + Cable loss

3. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1	21.98
UNII 2A	21.98
UNII 2C	21.98
UNII 3	21.98

(Actual value of loss for the attenuator and cable combination)

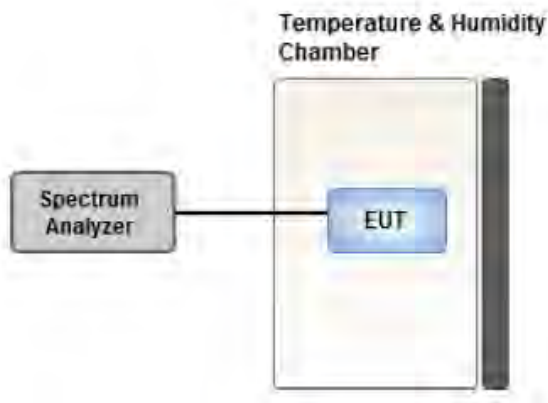


## 8.5. Frequency Stability

### Limit

Maintained within the band

### Test Configuration



### Test Procedure

1. The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between -30 °C and 50 °C.
2. The temperature was incremented by 10 °C intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.
3. The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.
4. While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

## 8.6. AC Power line Conducted Emissions

### Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 <sup>(a)</sup>	56 to 46 <sup>(a)</sup>
0.50 to 5	56	46
5 to 30	60	50

<sup>(a)</sup>Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

### Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.

### Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

**8.7. Radiated Test**

**Limit**

1. UNII 1: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of  $-27$  dBm/MHz.
  
2. UNII 2A, 2C: All emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of  $-27$  dBm/MHz.
  
3. UNII 3: 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.
  
4. 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 Section 15.209.

**FCC**

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30

**ISED**

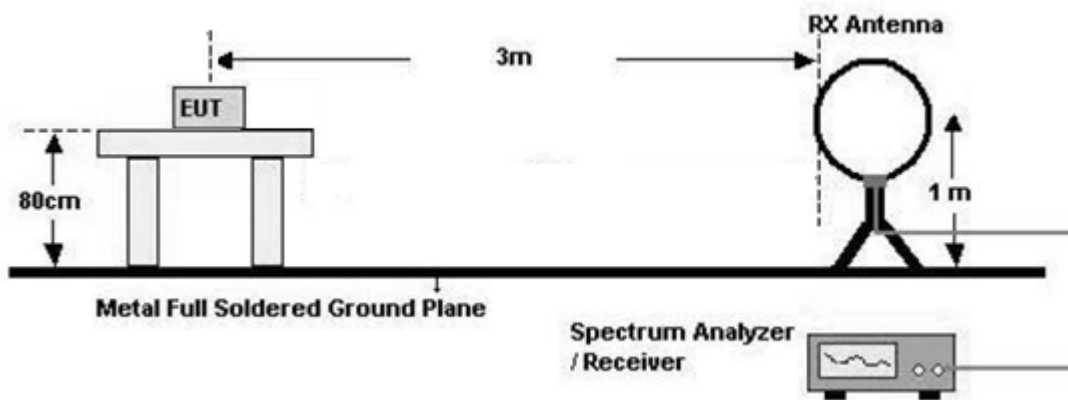
Frequency (MHz)	Field Strength (uA/m)	Measurement Distance (m)
0.009 – 0.490	$6.37/F(\text{kHz})$	300
0.490 – 1.705	$63.7/F(\text{kHz})$	30
1.705 – 30	0.08	30

**FCC&ISED**

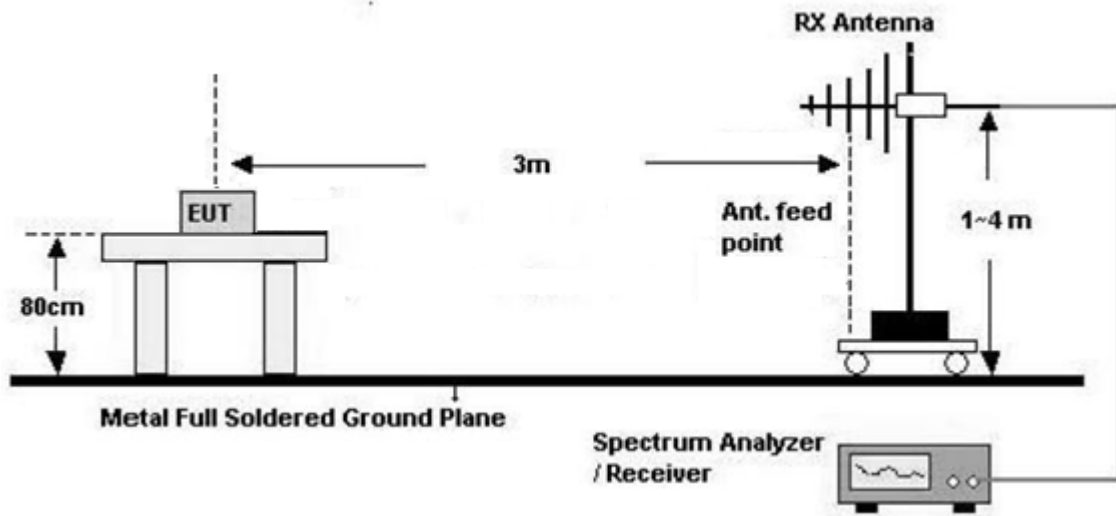
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Test Configuration**

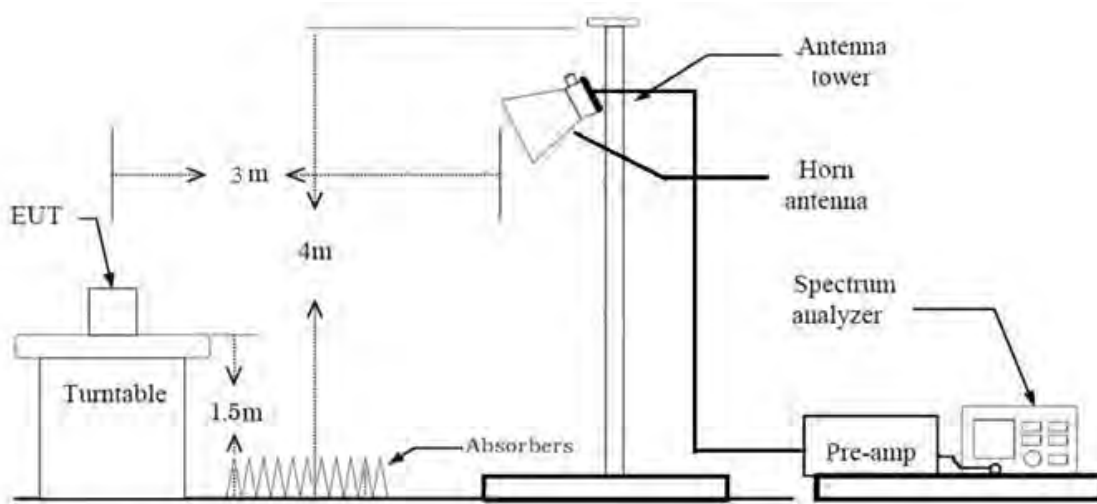
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



**Test Procedure of Radiated spurious emissions(Below 30 MHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Distance Correction Factor(0.009 MHz – 0.490 MHz) =  $40\log(3\text{ m}/300\text{ m}) = -80\text{ dB}$

Measurement Distance : 3 m

7. Distance Correction Factor(0.490 MHz – 30 MHz) =  $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$

Measurement Distance : 3 m

8. Spectrum Setting

- Frequency Range = 9 kHz ~ 30 MHz

- Detector = Peak

- Trace = Maxhold

- RBW = 9 kHz

- VBW  $\geq 3 \times$  RBW

9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

#### **KDB 414788 OFS and Chamber Correlation Justification**

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

#### **Test Procedure of Radiated spurious emissions(Below 1GHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.

2. The EUT is placed on a turntable, which is 0.8m above ground plane.

3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.

4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Spectrum Setting

(1) Measurement Type(Peak):

- Measured Frequency Range : 30 MHz – 1 GHz

- Detector = Peak

- Trace = Maxhold

- RBW = 100 kHz

- VBW  $\geq 3 \times$  RBW

## (2) Measurement Type(Quasi-peak):

- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Quasi-Peak
- RBW = 120 kHz

※In general, (1) is used mainly

7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

**Test Procedure of Radiated spurious emissions (Above 1 GHz)**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

## (1) Measurement Type (Peak, G.5 in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW  $\geq$  3 MHz
- Detector = Peak
- Sweep Time = auto
- Trace mode = max hold
- Allow sweeps to continue until the trace stabilizes.

Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle.

## (2) Measurement Type (Average, G.6.d in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW(Duty cycle  $\geq$  98 percent) = VBW  $\leq$  RBW/100(i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) = VBW  $\geq$  1/T, where T is the minimum transmission duration.
- The analyzer is set to linear detector mode.
- Detector = Peak.

- Sweep time = auto.
- Trace mode = max hold.
- Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of  $1/x$ , where  $x$  is the duty cycle.



9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor
10. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency
11. Distance extrapolation factor =  $20\log(\text{test distance} / \text{specific distance})$  (dB)
12. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

### **Test Procedure of Radiated Restricted Band Edge**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.

#### 8. Spectrum Setting

(1) Measurement Type(Peak, G.5 in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW  $\geq$  3 MHz
- Detector = Peak
- Sweep Time = auto
- Trace mode = max hold
- Allow sweeps to continue until the trace stabilizes.

Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately  $1/x$ , where  $x$  is the duty cycle.

(2) Measurement Type(Average, G.6.d in KDB 789033 v02r01):

- RBW = 1 MHz
- VBW(Duty cycle  $\geq$  98 percent) =  $VBW \leq RBW/100$ (i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) =  $VBW \geq 1/T$ , where T is the minimum transmission duration.
- The analyzer is set to linear detector mode.
- Detector = Peak.
- Sweep time = auto.
- Trace mode = max hold.
- Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of  $1/x$ , where  $x$  is the duty cycle.

9. Measured Frequency Range :

- 4 500 MHz ~ 5 150 MHz
- 5 350 MHz ~ 5 460 MHz
- 5 460 MHz ~ 5 470 MHz
- (75 MHz or more below the 5 725 MHz) ~ 5 725 MHz
- 5 850 MHz ~ (75 MHz or more above the 5 850 MHz)

10. Distance extrapolation factor =  $20\log(\text{test distance} / \text{specific distance})$  (dB)

11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Attenuator  
+ Distance Factor(D.F)

**The actual setting value of VBW**

Mode	Worst Data rate (Mbps)	Duty Cycle	Duty Cycle Factor (dB)	The actual setting value of VBW (Hz)
802.11a	6	0.954	0.205	1000
802.11n(HT20)	MCS 0(6.5)	0.950	0.224	1000
802.11n(HT40)	MCS 0(13.5)	0.904	0.438	2000
802.11ac(VHT20)	MCS 0(6.5)	0.950	0.223	1000
802.11ac(VHT40)	MCS 0(13.5)	0.903	0.444	2000
802.11ac(VHT80)	MCS 0(29.3)	0.819	0.866	3000

### 8.8. Receiver Spurious Emissions

#### Limit

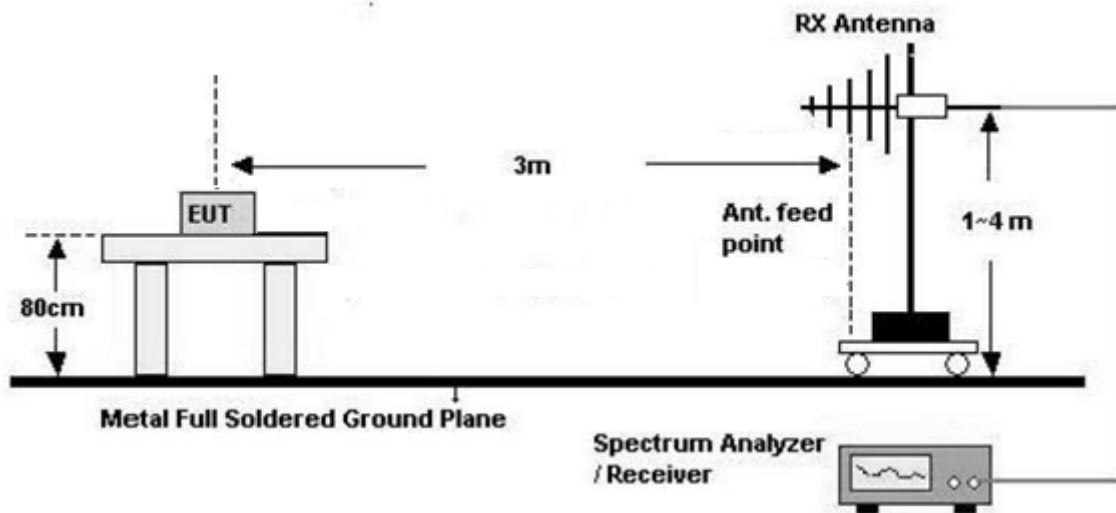
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

#### Test Configuration

30 MHz - 1 GHz



#### Test Procedure of Receiver Spurious Emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Spectrum Setting

(1) Measurement Type(Peak):

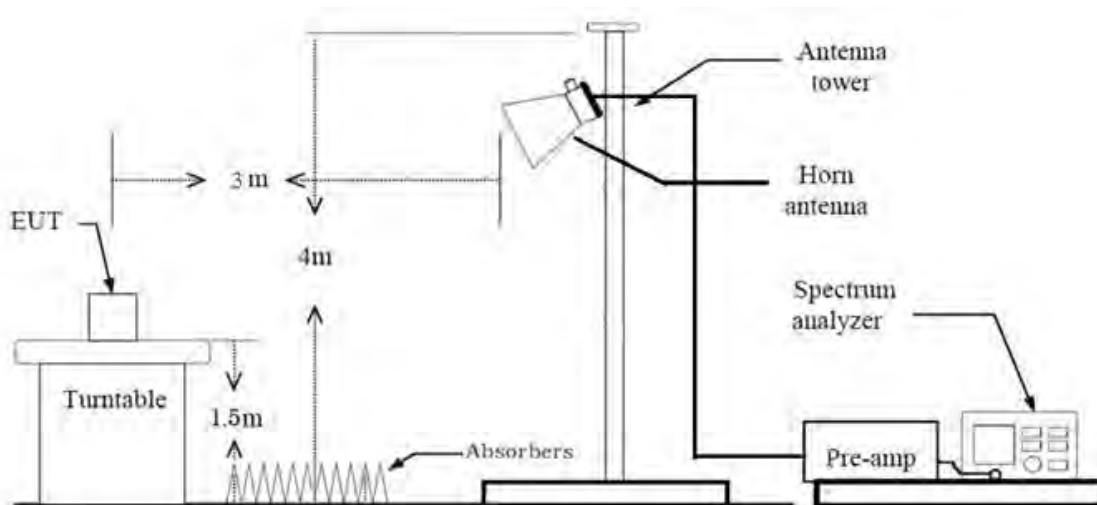
- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 100 kHz
- VBW  $\geq$  3 x RBW

(2) Measurement Type(Quasi-peak):

- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Quasi-Peak
- RBW = 120 kHz

7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

Above 1 GHz



**Test Procedure of Radiated spurious emissions (Above 1 GHz)**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq 3 \times$  RBW
  - (2) Measurement Type(Average):
    - We performed using a reduced video BW method was done with the analyzer in linear mode
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds

The actual setting value of VBW = 1 kHz
9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
10. Distance extrapolation factor =  $20\log(\text{test distance} / \text{specific distance})$  (dB)
11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

## 8.9. Worst case configuration and mode

### Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone , Stand alone + Shark Antenna
  - Mode : Stand alone + Shark Antenna
2. EUT Axis
  - Radiated Spurious Emissions : X
  - Radiated Restricted Band Edge : X
3. All datarate of operation were investigated and the worst case datarate results are reported
  - 802.11a : 6Mbps
  - 802.11n\_HT20 : MCS0
  - 802.11n\_HT40 : MCS0
  - 802.11ac\_VHT20 : MCS0
  - 802.11ac\_VHT40 : MCS0
  - 802.11ac\_VHT80 : MCS0
4. Radiated Spurious Emission
  - All modulation of operation were investigated and the worst case modulation results are reported.  
(Worstcase : 802.11a\_6 Mbps)
5. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
  - Position : Horizontal, Vertical, Parallel to the ground plane
6. DA3510TAN(FCC)& DA3500TKN(ISED), Additional Model were tested and the worst case results are reported.  
(Worst case : DA3510TAN(FCC)& DA3500TKN(ISED))

### AC Power line Conducted Emissions

1. We don't perform powerline conducted emission test. Because this EUT is used with vehicle.

### Conducted test

1. All datarate of operation were investigated and the worst case datarate results are reported.
2. DA3510TAN(FCC)& DA3500TKN(ISED), Additional Model were tested and the worst case results are reported.  
(Worst case : DA3510TAN(FCC)& DA3500TKN(ISED))

## 9. SUMMARY OF TEST RESULTS

### FCC

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§ 15.407 (for Power Measurement)	N/A	Conducted	PASS
6 dB Bandwidth	§ 15.407(e)	>500 kHz (5725-5850 MHz)		PASS
Maximum Conducted Output Power	§ 15.407(a)(1),(2),(3)	< 250 mW(5150-5250 MHz) < 250 mW or 11+10log <sub>10</sub> (BW) dBm (5250-5350 MHz) < 250 mW or 11+10log <sub>10</sub> (BW) dBm (5470-5725 MHz) <1 W(5725-5850 MHz)		PASS
Peak Power Spectral Density	§ 15.407(a)(1),(2),(3)	<11 dBm/ MHz (5150-5250 MHz) <11 dBm/ MHz (5250-5350 MHz) <11 dBm/ MHz (5470-5725 MHz) <30 dBm/500 kHz(5725-5850 MHz)		PASS
Frequency Stability	§ 15.407(g) § 2.1055	Maintained within the band		PASS
AC Conducted Emissions 150 kHz-30 MHz	§ 15.207 § 15.407(b)(8)	<FCC 15.207 limits		N/A (#Note1)
Undesirable Emissions	§ 15.407(b) (1)(2)(3)(4)	<-27 dBm/MHz EIRP (UNII1, 2A, 2C) cf. Section 8.7 (UNII 3)		Radiated
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	§ 15.205, 15.407(b)(9), (10)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	PASS	

#Note1 : Not Tested.

ISED				
Test Description	ISED Part Section(s)	Test Limit	Test Condition	Test Result
99% Bandwidth	RSS-GEN, 6.7	N/A	CONDUCTED	PASS
6 dB Bandwidth	RSS-247, 6.2.4.1	> 500 kHz (5725~5850 MHz)		PASS
Maximum Conducted Output Power,	RSS-247, 6.2	< 250 mW or $11+10 \log_{10}$ (BW) dBm (5470-5600, 5650-5725 MHz) Whichever power is less		PASS
	RSS-247, 6.2.4.1	< 1 W (5725-5850 MHz)		
Maximum e.i.r.p	RSS-247, 6.2	< 30 mW or $1.76+10 \log_{10}$ (BW) dBm (5150-5250 MHz)		PASS
		< 30 mW or $1.76+10 \log_{10}$ (BW) dBm (5250-5350 MHz) < 1 W or $17+10 \log_{10}$ (BW) dBm (5470-5725 MHz) Whichever power is less		
Power Spectral Density	RSS-247 6.2	<10 dBm/ MHz(e.i.r.p.) (5150-5250 MHz)		PASS
	RSS-247, 6.2.4.1	<11 dBm/MHz(Conducted) (5250-5350 MHz, 5470-5600 MHz, 5650-5725 MHz)		
	RSS-247, 6.2.4.1	<30 dBm/500 kHz(Conducted) (5725-5850 MHz)		PASS
	RSS-GEN 8.11	should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation.		
AC Conducted Emissions 150 kHz-30 MHz	RSS-GEN, 8.8	RSS-GEN section 8.8 table 4	N/A (#Note1)	
Undesirable Emissions	RSS-247, 6.2.1.2	26 dBc at 5250~5350 MHz (5150~5350 MHz)	PASS	
	RSS-247, 6.2	<-27 dBm/ MHz EIRP (5150-5350 MHz, 5470-5725 MHz)	PASS	
	RSS-247, 6.2.4.2	cf. Section 9.8.1 (UNII 3)		
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	RSS-Gen, 8.9 RSS-Gen, 8.10	RSS-Gen section 8.9 table 5, 6 section 8.10 table 7	RADIATED	PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.3	RSS-GEN section 7.3 table 3	PASS	

#Note1 : Not Tested.



## 10. TEST RESULT

### 10.1 DUTY CYCLE

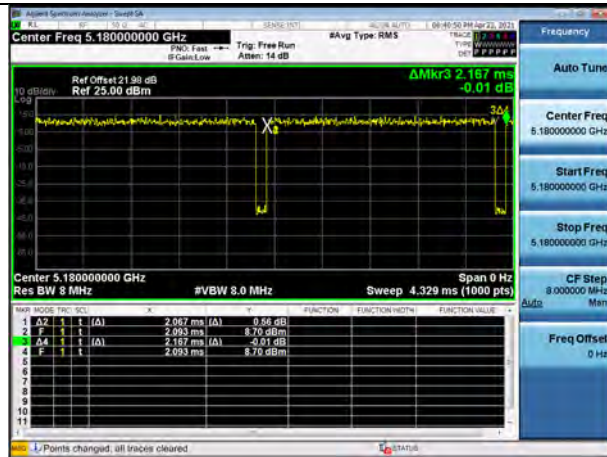
Mode	Data Rate (Mbps)	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11a	6	2.067	2.167	0.954	0.205
	9	1.382	1.482	0.933	0.302
	12	1.045	1.146	0.912	0.401
	18	0.704	0.805	0.874	0.583
	24	0.532	0.634	0.840	0.756
	36	0.364	0.465	0.783	1.064
	48	0.276	0.377	0.732	1.354
	54	0.248	0.349	0.711	1.484
Mode	MCS Index	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	1.919	2.021	0.950	0.224
	1	0.980	1.083	0.905	0.433
	2	0.664	0.765	0.868	0.616
	3	0.509	0.610	0.834	0.787
	4	0.352	0.454	0.775	1.104
	5	0.271	0.373	0.728	1.377
	6	0.248	0.349	0.710	1.487
	7	0.228	0.329	0.693	1.595
802.11n (HT40)	0	0.945	1.045	0.904	0.438
	1	0.493	0.593	0.831	0.804
	2	0.340	0.441	0.772	1.122
	3	0.264	0.365	0.723	1.409
	4	0.188	0.289	0.650	1.869
	5	0.152	0.254	0.601	2.213
	6	0.140	0.242	0.581	2.359
	7	0.128	0.229	0.558	2.532

Mode	MCS Index	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11ac (VHT20)	0	1.932	2.033	0.950	0.223
	1	0.988	1.089	0.907	0.424
	2	0.672	0.773	0.870	0.607
	3	0.515	0.617	0.834	0.786
	4	0.356	0.457	0.778	1.093
	5	0.280	0.381	0.734	1.343
	6	0.252	0.354	0.712	1.476
	7	0.233	0.334	0.696	1.572
	8	0.200	0.302	0.662	1.791
802.11ac (VHT40)	0	0.951	1.054	0.903	0.444
	1	0.496	0.596	0.831	0.804
	2	0.343	0.445	0.771	1.127
	3	0.268	0.370	0.725	1.398
	4	0.193	0.294	0.655	1.839
	5	0.156	0.258	0.606	2.174
	6	0.144	0.246	0.587	2.316
	7	0.133	0.234	0.568	2.460
	8	0.116	0.217	0.535	2.716
	9	0.112	0.214	0.525	2.801
802.11ac (VHT80)	0	0.460	0.561	0.819	0.866
	1	0.252	0.353	0.714	1.464
	2	0.179	0.281	0.637	1.959
	3	0.147	0.249	0.590	2.289
	4	0.114	0.213	0.535	2.715
	5	0.094	0.196	0.480	3.191
	6	0.089	0.189	0.471	3.271
	7	0.085	0.185	0.459	3.378
	8	0.077	0.177	0.435	3.615
	9	0.071	0.172	0.413	3.843

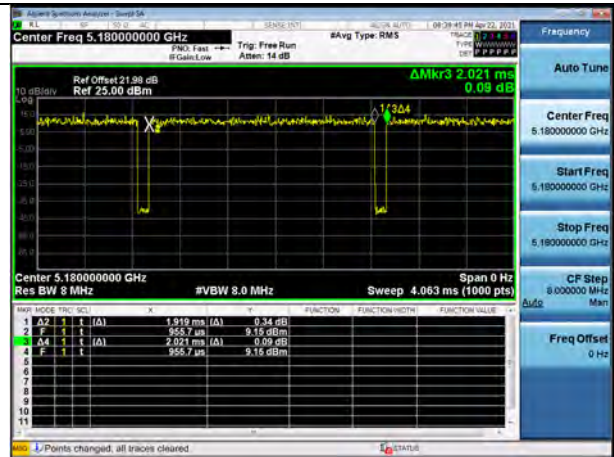
**Note:**

In order to simplify the report, attached plots were only lowest datarate.

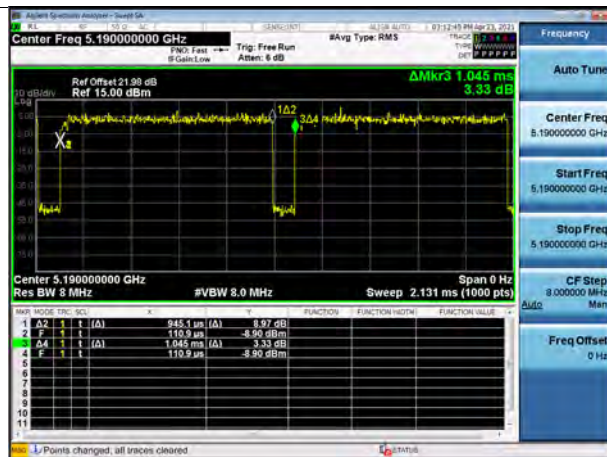
802.11a



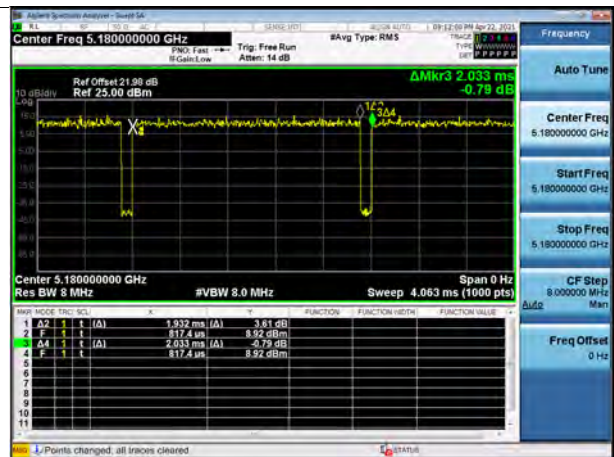
802.11n(HT20)



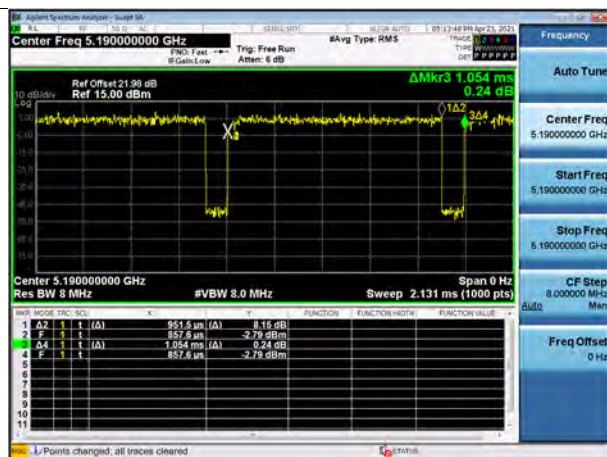
802.11n(HT40)



802.11ac(VHT20)



802.11ac(VHT40)



802.11ac(VHT80)



## 10.2 26dB BANDWIDTH & 99 % BANDWIDTH

### FCC

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.04	16.585
5200	40	21.00	16.594
5240	48	20.98	16.604
5260	52	20.72	16.598
5300	60	21.00	16.601
5320	64	20.96	16.607
5500	100	20.99	16.642
5580	116	20.79	16.617
5720	144	20.65	16.606
5745	149	21.01	16.618
5785	157	21.01	16.685
5825	165	21.11	16.641

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.12	17.800
5200	40	21.28	17.768
5240	48	21.25	17.746
5260	52	21.35	17.813
5300	60	21.27	17.775
5320	64	21.18	17.774
5500	100	21.39	17.750
5580	116	21.28	17.780
5720	144	21.27	17.739
5745	149	21.46	17.799
5785	157	21.33	17.787
5825	165	21.32	17.791

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.39	36.101
5230	46	39.44	36.105
5270	54	39.54	36.119
5310	62	39.52	36.121
5510	102	39.56	36.133
5550	110	39.54	36.139
5710	142	39.83	36.128
5755	151	39.39	36.085
5795	159	39.75	36.112

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.24	17.780
5200	40	21.40	17.760
5240	48	21.44	17.752
5260	52	21.11	17.783
5300	60	21.15	17.755
5320	64	21.46	17.783
5500	100	21.22	17.794
5580	116	21.24	17.771
5720	144	21.40	17.811
5745	149	21.26	17.793
5785	157	21.42	17.765
5825	165	21.55	17.787

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.48	36.054
5230	46	39.48	36.062
5270	54	39.58	36.048
5310	62	39.40	36.116
5510	102	39.61	36.100
5550	110	39.62	36.130
5710	142	39.54	36.158
5755	151	39.34	36.137
5795	159	39.79	36.174

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	81.42	75.519
5290	58	80.79	75.446
5530	106	81.42	75.521
5690	138	81.28	75.519
5775	155	81.38	75.605



▣ Test Plots(802.11a)

Note:

In order to simplify the report, attached plots were only the most wide channel.

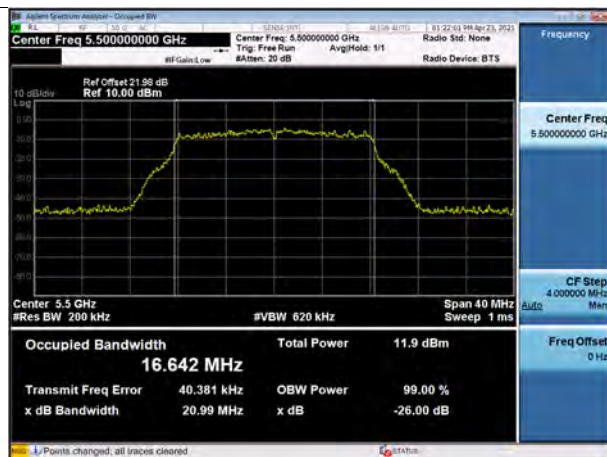
802.11a UNII 1 BAND 26dB Bandwidth (CH 36)



802.11a UNII 2A BAND 26dB Bandwidth (CH 60)



802.11a UNII 2C BAND 26dB Bandwidth (CH100)



802.11a UNII 3 BAND 26dB Bandwidth (CH 165)





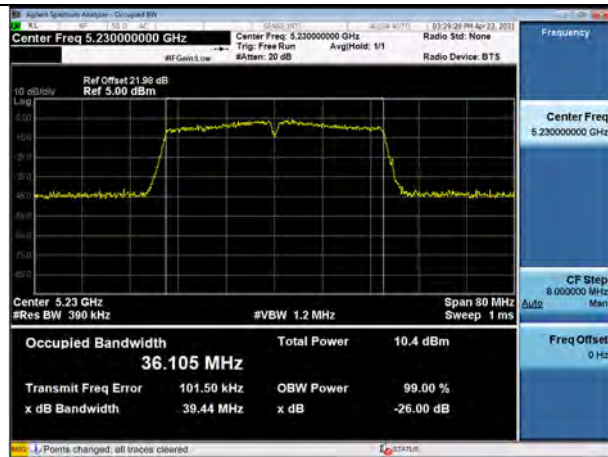


▣ Test Plots(802.11n(HT40))

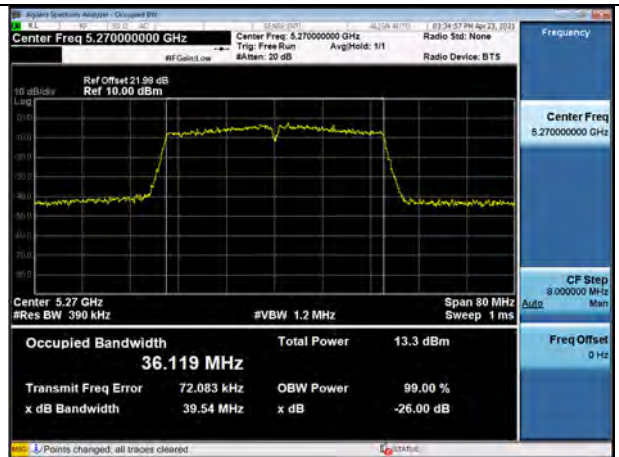
Note:

In order to simplify the report, attached plots were only the most wide channel.

802.11n\_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)



802.11n\_HT40 UNII 2A BAND 26dB Bandwidth (CH 54)



802.11n\_HT40 UNII 2C BAND 26dB Bandwidth(CH 142)



802.11n\_HT40 UNII 3 BAND 26dB Bandwidth (CH 159)

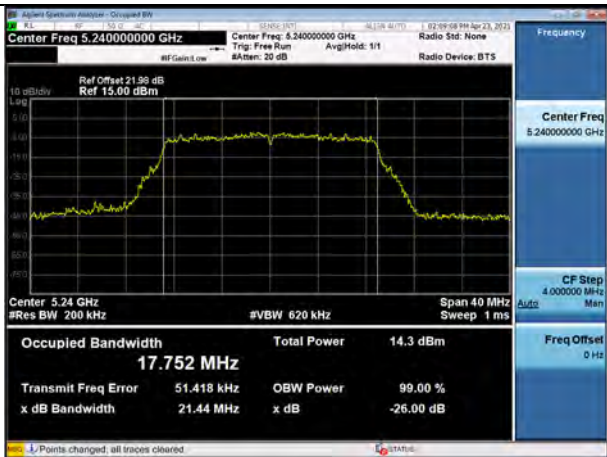


▣ Test Plots(802.11ac(VHT20))

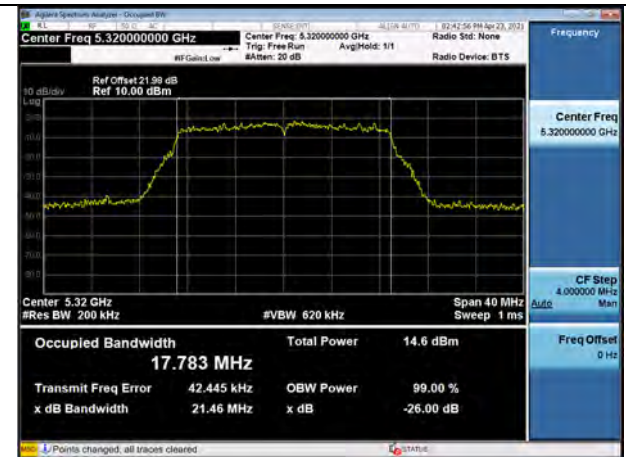
Note:

In order to simplify the report, attached plots were only the most wide channel.

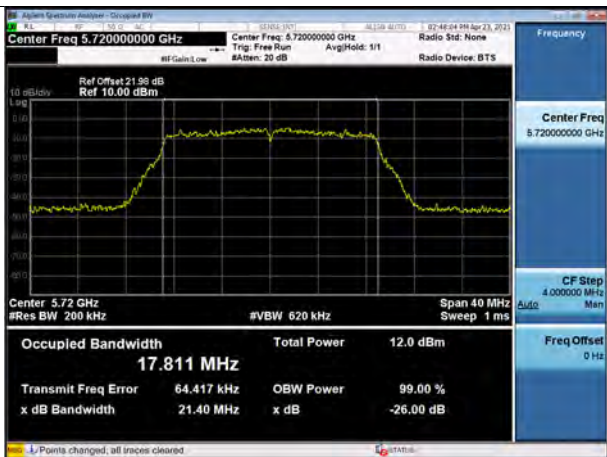
802.11ac\_VHT20 UNII 1 BAND 26dB Bandwidth(CH 48)



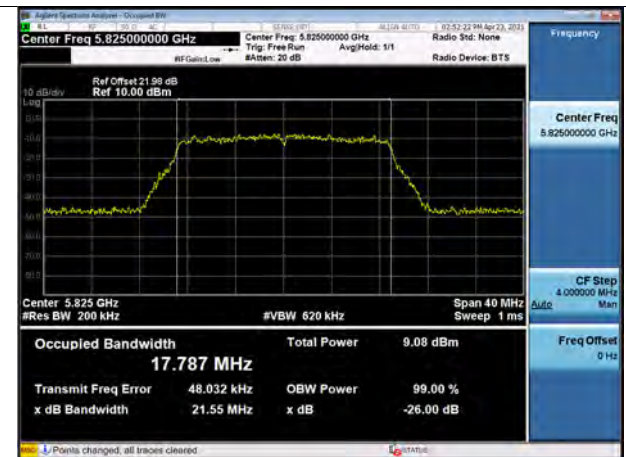
802.11ac\_VHT20 UNII 2A BAND 26dB Bandwidth(CH 64)



802.11ac\_VHT20 UNII 2C BAND 26dB Bandwidth(CH 144)



802.11ac\_VHT20 UNII 3 BAND 26dB Bandwidth(CH 165)



▣ Test Plots(802.11ac(VHT40))

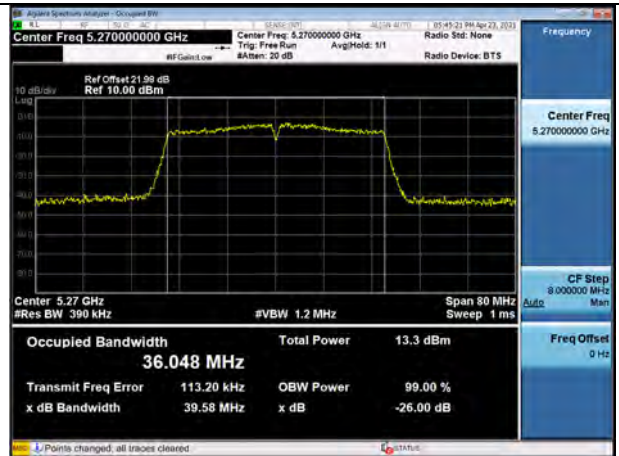
Note:

In order to simplify the report, attached plots were only the most wide channel.

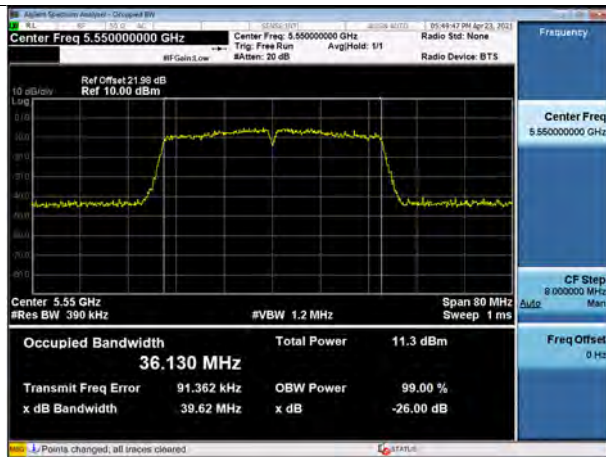
802.11ac\_VHT40 UNII 1 BAND 26dB Bandwidth(CH 46)



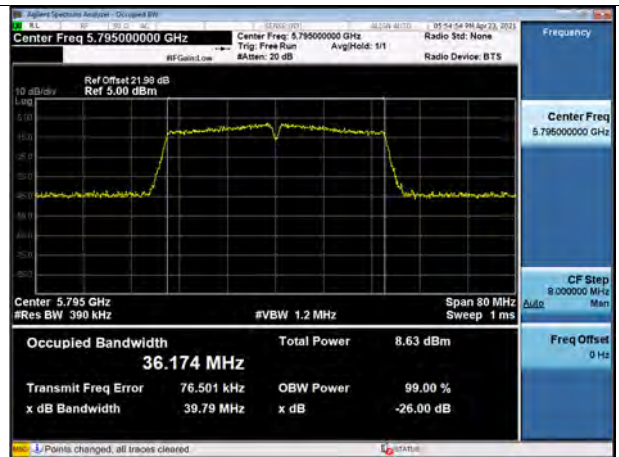
802.11ac\_VHT40 UNII 2A BAND 26dB Bandwidth (CH 54)



802.11ac\_VHT40 UNII 2C BAND 26dB Bandwidth(CH 110)



802.11ac\_VHT40 UNII 3 BAND 26dB Bandwidth (CH 159)



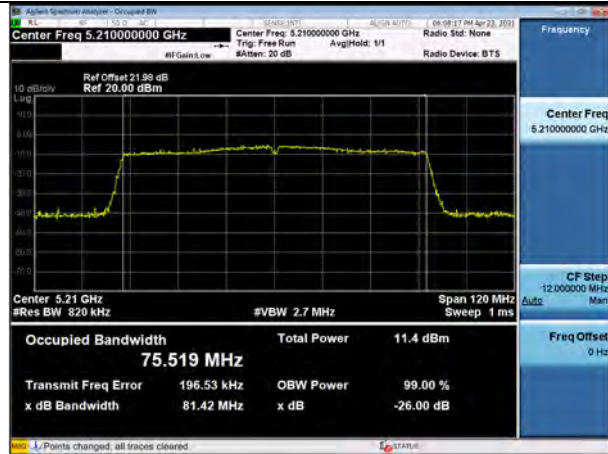


▣ Test Plots(802.11ac(VHT80))

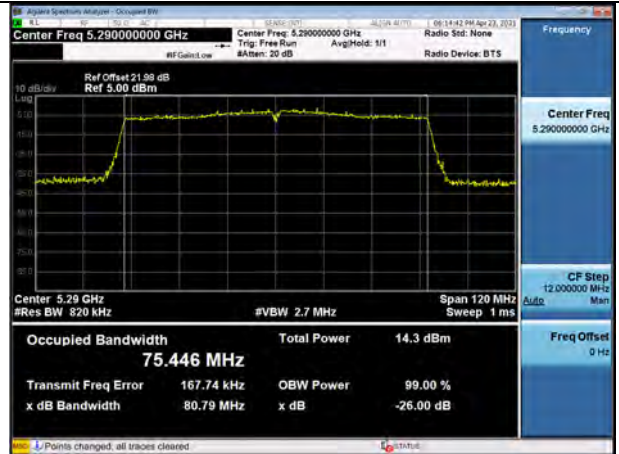
Note:

In order to simplify the report, attached plots were only the most wide channel.

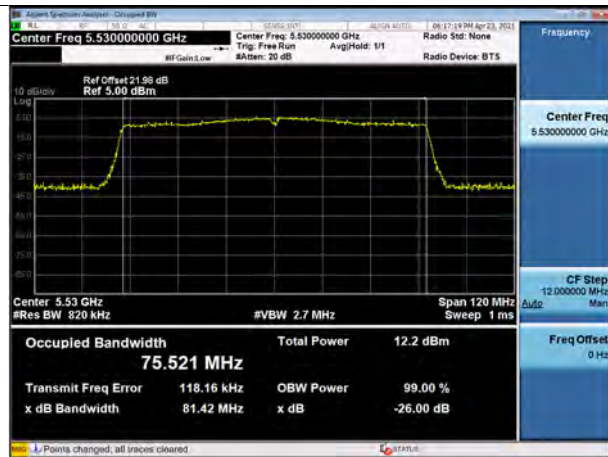
802.11ac\_VHT80 UNII 1 BAND 26dB Bandwidth(CH 42)



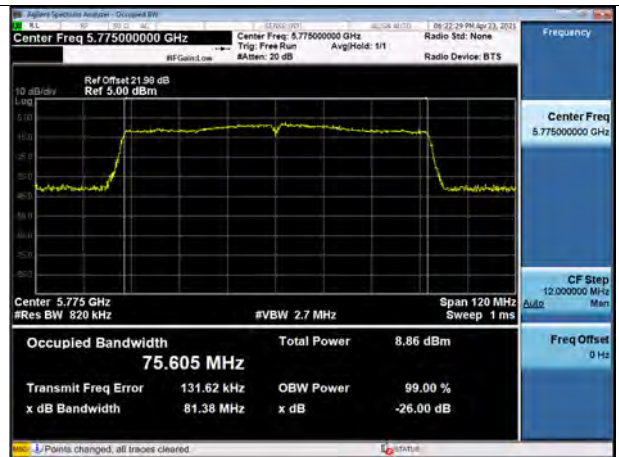
802.11ac\_VHT80 UNII 2A BAND 26dB Bandwidth (CH 58)



802.11ac\_VHT80 UNII 2C BAND 26dB Bandwidth(CH 106)



802.11ac\_VHT80 UNII 3 BAND 26dB Bandwidth (CH 155)



**99% bandwidth UNII-3 (ISED)**

802.11a Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	16.638
5785	157	16.619
5825	165	16.622

802.11n(HT20) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	17.789
5785	157	17.784
5825	165	17.761

802.11n(HT40) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5755	151	36.129
5795	159	36.170

802.11ac(VHT20) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	17.770
5785	157	17.750
5825	165	17.825

802.11ac(VHT40) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5755	151	36.144
5795	159	36.149

802.11ac(VHT80) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5775	155	75.601

▣ Test Plots

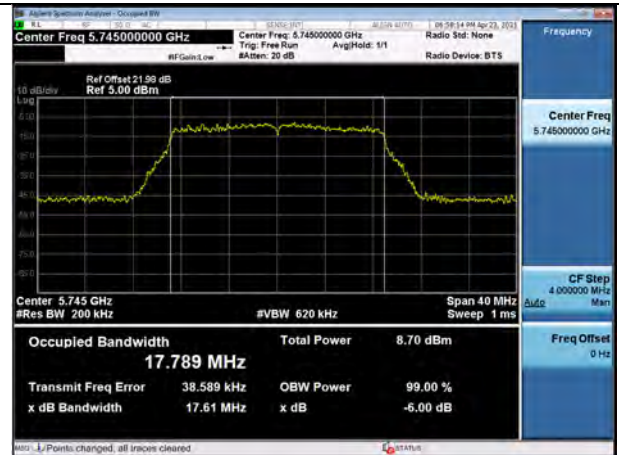
Note:

In order to simplify the report, attached plots were only the most wide channel.

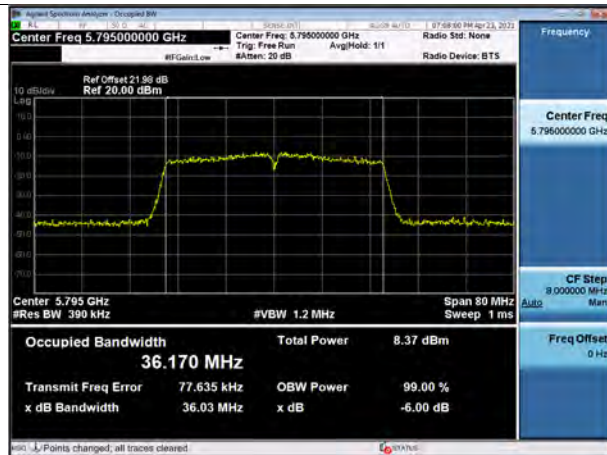
802.11a UNII 3 BAND 26dB Bandwidth (CH 149)



802.11n\_HT20 UNII 3 BAND 26dB Bandwidth(CH 149)



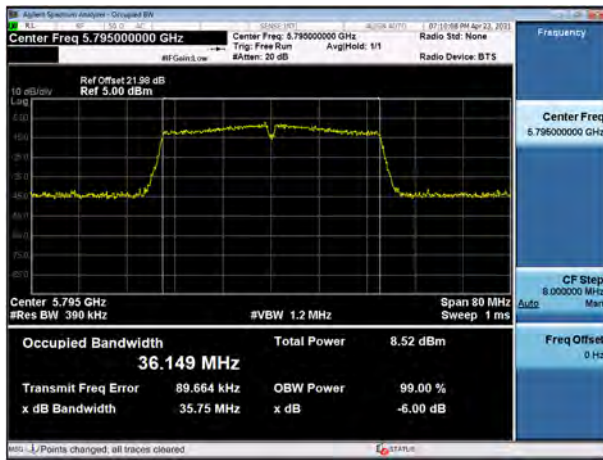
802.11n\_HT40 UNII 3 BAND 26dB Bandwidth (CH 159)



802.11ac\_VHT20 UNII 3 BAND 26dB Bandwidth(CH 165)



802.11ac\_VHT40 UNII 3 BAND 26dB Bandwidth (CH 159)



802.11ac\_VHT80 UNII 3 BAND 26dB Bandwidth (CH 155)



### 10.3 6DB BANDWIDTH

FCC

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.34	> 0.5	Pass
5785	157	16.36	> 0.5	Pass
5825	165	16.33	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.06	> 0.5	Pass
5785	157	17.55	> 0.5	Pass
5825	165	17.62	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.25	> 0.5	Pass
5795	159	35.56	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.60	> 0.5	Pass
5785	157	17.61	> 0.5	Pass
5825	165	17.55	> 0.5	Pass

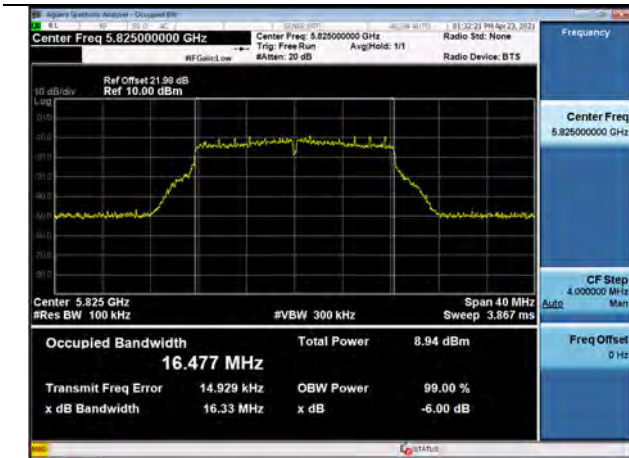
802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.69	> 0.5	Pass
5795	159	35.65	> 0.5	Pass

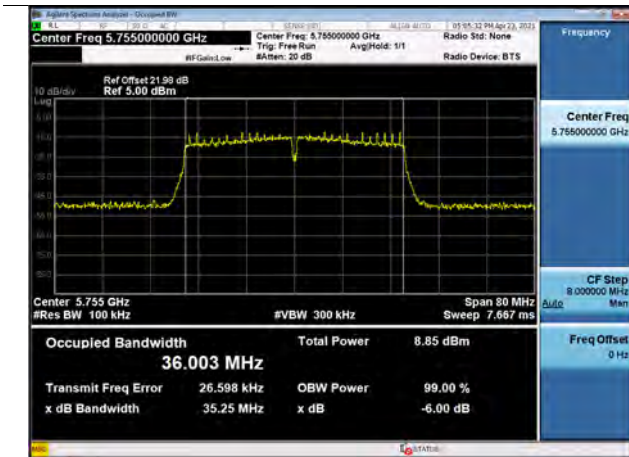
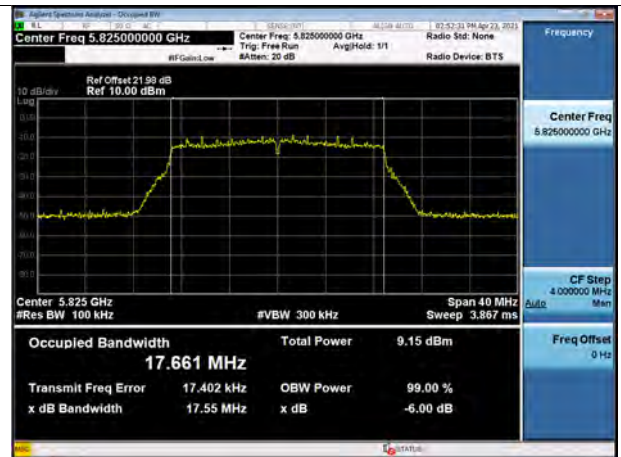
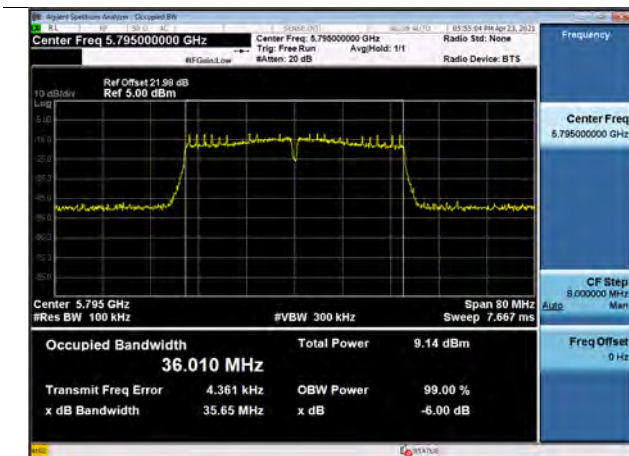
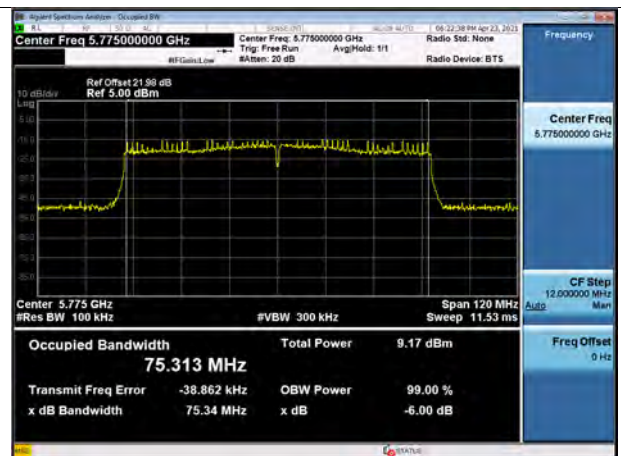


802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.34	> 0.5	Pass

**Test Plots**

Note: In order to simplify the report, attached plots were only the most narrow channel.

**802.11a (CH.165)**

**802.11n(HT20) (CH.149)**

**802.11n(HT40) (CH.151)**

**802.11ac(VHT20) (CH.165)**

**802.11ac(VHT40) (CH.159)**

**802.11ac(VHT80) (CH.155)**


**ISED 6dB bandwidth UNII-3 (ISED)**

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.29	> 0.5	Pass
5785	157	16.08	> 0.5	Pass
5825	165	16.35	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.61	> 0.5	Pass
5785	157	17.62	> 0.5	Pass
5825	165	17.48	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.01	> 0.5	Pass
5795	159	36.03	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.60	> 0.5	Pass
5785	157	17.44	> 0.5	Pass
5825	165	17.65	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.63	> 0.5	Pass
5795	159	35.75	> 0.5	Pass

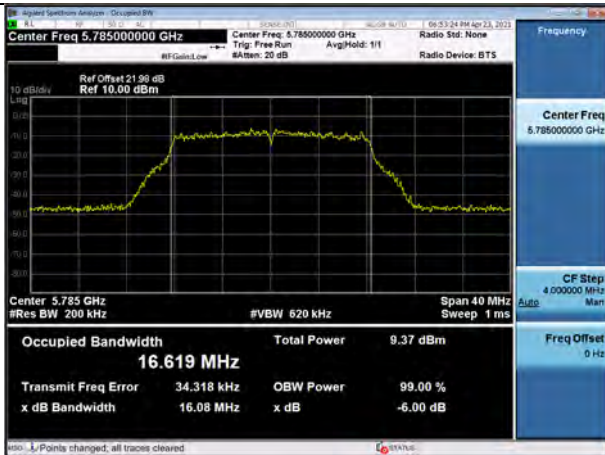
802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.76	> 0.5	Pass

Test Plots

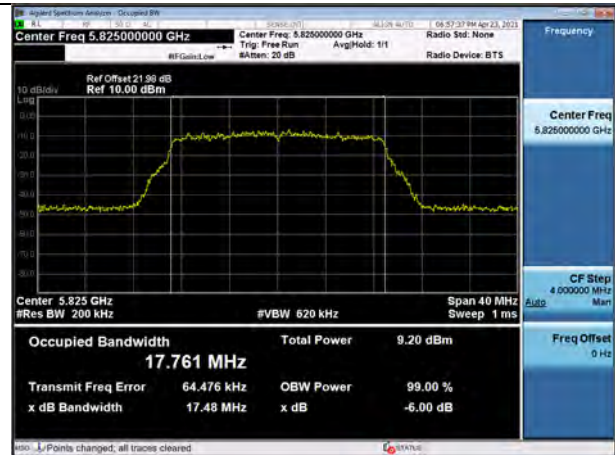
Note:

In order to simplify the report, attached plots were only the most wide channel.

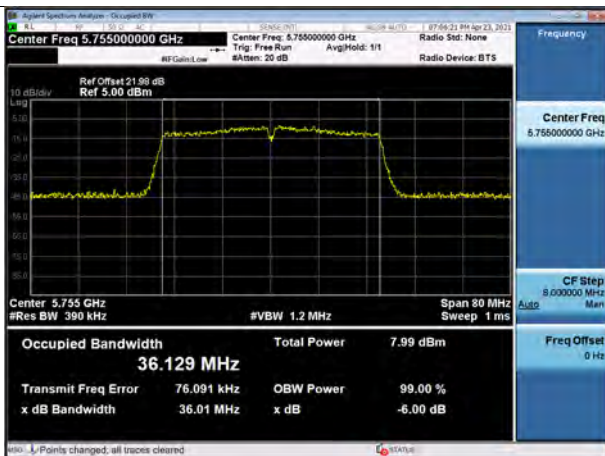
802.11a (CH.157)



802.11n(HT20) (CH.165)



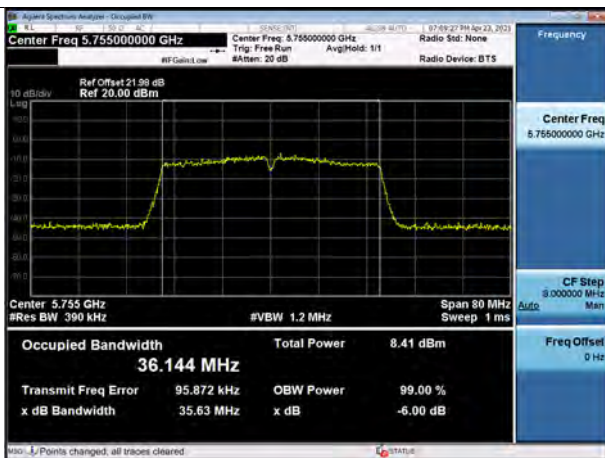
802.11n(HT40) (CH.151)



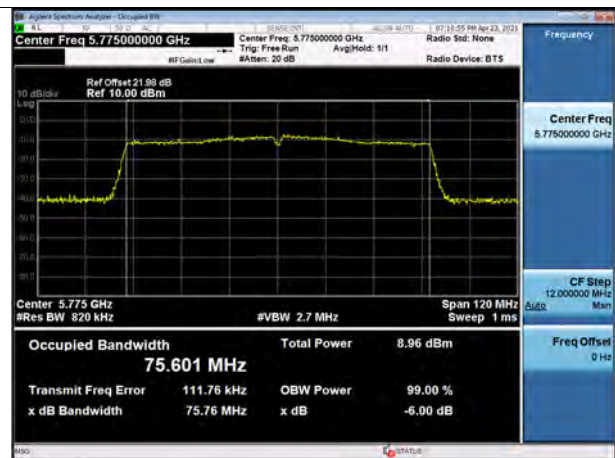
802.11ac(VHT20) (CH.157)



802.11ac(VHT40) (CH.151)



802.11ac(VHT80) (CH.155)



### 10.4 OUTPUT POWER MEASUREMENT

Straddle channel data in the table below are for reporting purposes only.

Straddle channel data were added in section 10.7.3.

802.11a Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5180	36	7.53	0.21	7.73	-0.61	7.12	13.96	23.98
5200	40	7.31	0.21	7.51	-0.61	6.90	13.96	
5240	48	7.78	0.21	7.99	-0.61	7.38	13.96	
5260	52	7.93	0.21	8.13	-0.18	7.95	13.96	23.98
5300	60	7.55	0.21	7.76	-0.18	7.58	13.96	
5320	64	7.62	0.21	7.83	-0.18	7.65	13.96	
5500	100	5.41	0.21	5.61	-	-	23.98	23.98
5580	116	5.15	0.21	5.35	-	-		
5720	144	4.91	0.21	5.12	-	-		
5745	149	2.23	0.21	2.43	-	-	30.00	30.00
5785	157	2.48	0.21	2.69	-	-		
5825	165	2.06	0.21	2.26	-	-		

802.11n(HT20) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5180	36	7.77	0.22	7.99	-0.61	7.38	14.26	23.98
5200	40	7.49	0.22	7.71	-0.61	7.10	14.26	
5240	48	7.38	0.22	7.61	-0.61	7.00	14.25	
5260	52	7.64	0.22	7.86	-0.18	7.68	14.27	23.98
5300	60	7.78	0.22	8.01	-0.18	7.83	14.26	
5320	64	7.80	0.22	8.02	-0.18	7.84	14.26	
5500	100	5.25	0.22	5.48	-	-	23.98	23.98
5580	116	5.29	0.22	5.52	-	-		
5720	144	4.95	0.22	5.17	-	-		
5745	149	1.74	0.22	1.96	-	-	30.00	30.00
5785	157	2.23	0.22	2.45	-	-		
5825	165	2.06	0.22	2.28	-	-		



802.11ac(VHT20) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5180	36	7.65	0.22	7.87	-0.61	7.26	14.26	23.98
5200	40	7.56	0.22	7.79	-0.61	7.18	14.25	
5240	48	7.48	0.22	7.70	-0.61	7.09	14.25	
5260	52	7.63	0.22	7.85	-0.18	7.67	14.26	23.98
5300	60	7.80	0.22	8.02	-0.18	7.84	14.25	
5320	64	7.68	0.22	7.91	-0.18	7.73	14.26	
5500	100	5.32	0.22	5.54	-	-	23.98	23.98
5580	116	5.34	0.22	5.56	-	-		
5720	144	5.11	0.22	5.33	-	-		
5745	149	1.94	0.22	2.16	-	-	30.00	30.00
5785	157	2.33	0.22	2.55	-	-		
5825	165	2.25	0.22	2.47	-	-		

802.11n(HT40) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5190	38	3.72	0.44	4.16	-0.61	3.55	14.77	23.98
5230	46	3.28	0.44	3.72	-0.61	3.11	14.77	
5270	54	6.14	0.44	6.58	-0.18	6.40	14.77	23.98
5310	62	6.20	0.44	6.64	-0.18	6.46	14.77	
5510	102	4.71	0.44	5.15	-	-	23.98	23.98
5550	110	4.22	0.44	4.65	-	-		
5710	142	4.32	0.44	4.76	-	-		
5755	151	1.25	0.44	1.69	-	-	30.00	30.00
5795	159	1.59	0.44	2.03	-	-		

802.11ac(VHT40) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5190	38	3.68	0.44	4.12	-0.61	3.51	14.77	23.98
5230	46	3.30	0.44	3.74	-0.61	3.13	14.77	
5270	54	6.23	0.44	6.67	-0.18	6.49	14.77	23.98
5310	62	6.31	0.44	6.75	-0.18	6.57	14.77	
5510	102	4.76	0.44	5.20	-	-	23.98	23.98
5550	110	4.25	0.44	4.69	-	-		
5710	142	4.24	0.44	4.69	-	-		
5755	151	1.21	0.44	1.65	-	-	30.00	30.00
5795	159	1.48	0.44	1.93	-	-		

802.11ac(VHT80) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5210	42	3.52	0.87	4.39	-0.61	3.78	14.77	23.98
5290	58	6.26	0.87	7.13	-0.18	6.95	14.77	23.98
5530	106	4.12	0.87	4.99	-	-	23.98	23.98
5690	138	4.37	0.87	5.23	-	-		
5775	155	0.74	0.87	1.60	-	-	30.00	30.00

Note :

# FCC&ISED Worst Limit applied

U-NII-1	► ISED Maximun E.I.R.P Worst Limit < 30 mW or $1.76+10 \log_{10} (BW)$ dBm (5150-5250 MHz)
U-NII-2A	► ISED Maximun E.I.R.P Worst Limit < 30 mW or $1.76+10 \log_{10} (BW)$ dBm (5250-5350 MHz)
U-NII-2C	► FCC&ISED Conducted Power Limit < 250 mW or $11+10 \log_{10} (BW)$ dBm (5470-5600, 5650-5725 MHz)Whichecker power is less



### 10.5 POWER SPECTRAL DENSITY

#### FCC & ISED

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5180	36	-2.672	0.205	-2.467	11 dBm/MHz
5200	40	-2.914	0.205	-2.709	
5240	48	-2.403	0.205	-2.198	
5260	52	-2.321	0.205	-2.116	
5300	60	-2.522	0.205	-2.317	
5320	64	-2.480	0.205	-2.275	
5500	100	-4.675	0.205	-4.470	
5580	116	-4.961	0.205	-4.756	
5720	144	-5.116	0.205	-4.911	
5745	149	-10.631	0.205	-10.426	
5785	157	-10.368	0.205	-10.163	
5825	165	-10.696	0.205	-10.491	

802.11n(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5180	36	-2.800	0.224	-2.576	11 dBm/MHz
5200	40	-2.904	0.224	-2.680	
5240	48	-2.794	0.224	-2.570	
5260	52	-2.743	0.224	-2.519	
5300	60	-2.510	0.224	-2.286	
5320	64	-2.456	0.224	-2.232	
5500	100	-5.003	0.224	-4.779	
5580	116	-5.027	0.224	-4.803	
5720	144	-5.187	0.224	-4.963	
5745	149	-11.157	0.224	-10.933	
5785	157	-11.062	0.224	-10.838	
5825	165	-11.167	0.224	-10.943	

802.11n(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5190	38	-9.682	0.438	-9.244	11 dBm/MHz
5230	46	-9.947	0.438	-9.509	
5270	54	-6.926	0.438	-6.488	
5310	62	-6.751	0.438	-6.313	
5510	102	-8.648	0.438	-8.210	
5500	110	-8.999	0.438	-8.561	
5710	142	-8.941	0.438	-8.503	30 dBm /500kHz
5755	151	-14.867	0.438	-14.429	
5795	159	-14.582	0.438	-14.144	

802.11ac(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5180	36	-2.662	0.223	-2.439	11 dBm/MHz
5200	40	-2.808	0.223	-2.585	
5240	48	-2.948	0.223	-2.725	
5260	52	-2.549	0.223	-2.326	
5300	60	-2.647	0.223	-2.424	
5320	64	-2.785	0.223	-2.562	
5500	100	-5.068	0.223	-4.845	
5580	116	-5.056	0.223	-4.833	
5720	144	-5.323	0.223	-5.100	
5745	149	-11.290	0.223	-11.067	30 dBm/500kHz
5785	157	-10.724	0.223	-10.501	
5825	165	-10.878	0.223	-10.655	

802.11ac(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5190	38	-9.475	0.444	-9.031	11 dBm/MHz
5230	46	-9.900	0.444	-9.456	
5270	54	-6.928	0.444	-6.484	
5310	62	-6.723	0.444	-6.279	
5510	102	-8.334	0.444	-7.890	
5500	110	-8.891	0.444	-8.447	
5710	142	-8.878	0.444	-8.434	30 dBm/500kHz
5755	151	-14.976	0.444	-14.532	
5795	159	-14.596	0.444	-14.152	

802.11ac(80MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5210	42	-12.897	0.866	-12.031	11 dBm/MHz
5290	58	-9.880	0.866	-9.014	
5530	106	-12.288	0.866	-11.422	
5690	138	-11.980	0.866	-11.114	
5775	155	-18.714	0.866	-17.848	30 dBm/500kHz

**ISED Only**
**EIRP(UNII-1) # NOTE : Only UNII1 bands were calculated as EIRP.**

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5180	36	-2.672	0.205	-2.467	-0.61	-3.077	10 dBm/MHz
5200	40	-2.914	0.205	-2.709	-0.61	-3.319	
5240	48	-2.403	0.205	-2.198	-0.61	-2.808	

802.11n(HT20) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5180	36	-2.800	0.224	-2.576	-0.61	-3.186	10 dBm/MHz
5200	40	-2.904	0.224	-2.680	-0.61	-3.290	
5240	48	-2.794	0.224	-2.570	-0.61	-3.180	

802.11n(HT40) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5190	38	-9.682	0.438	-9.244	-0.61	-9.854	10 dBm/MHz
5230	46	-9.947	0.438	-9.509	-0.61	-10.119	

802.11ac(VHT20)Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5180	36	-2.662	0.223	-2.439	-0.61	-3.049	10 dBm/MHz
5200	40	-2.808	0.223	-2.585	-0.61	-3.195	
5240	48	-2.948	0.223	-2.725	-0.61	-3.335	

802.11ac(VHT40)Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5190	38	-9.475	0.444	-9.031	-0.61	-9.641	10 dBm/MHz
5230	46	-9.900	0.444	-9.456	-0.61	-10.066	

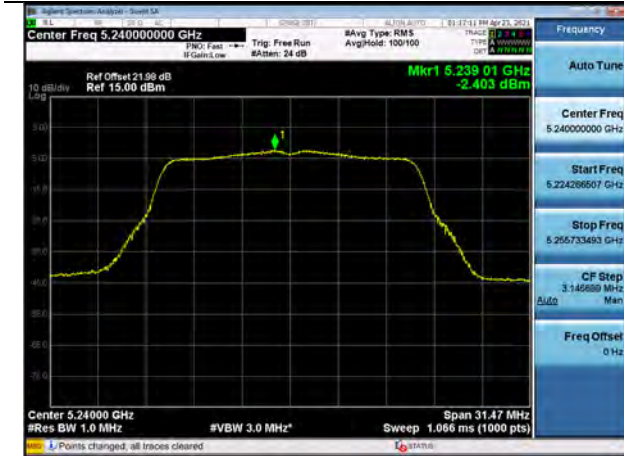
802.11ac(VHT80)Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5210	42	-12.897	0.866	-12.031	-0.61	-12.641	10 dBm/MHz

▣ Test Plots(802.11a)

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 48)



UNII 2A (Ch. 52)



UNII 2C (Ch. 100)



UNII 3 (Ch. 157)

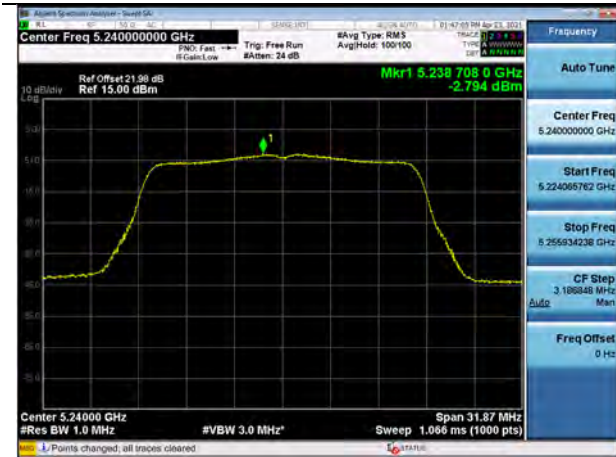


▣ Test Plots(802.11n(HT20))

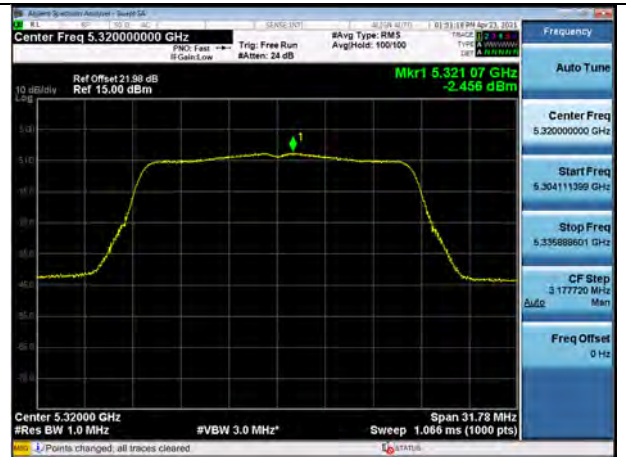
Note:

In order to simplify the report, attached plots were only channel of highest power.

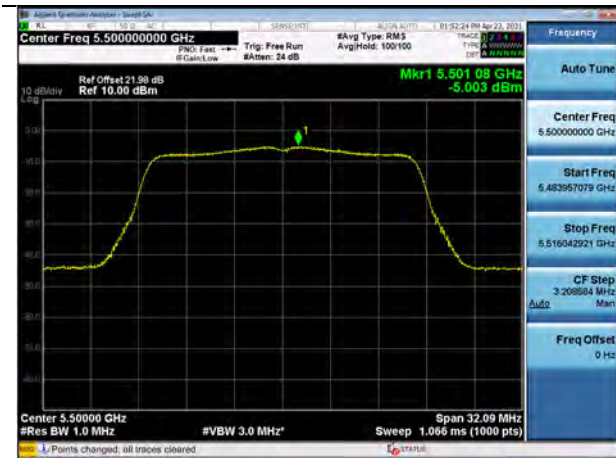
UNII 1 (Ch. 48)



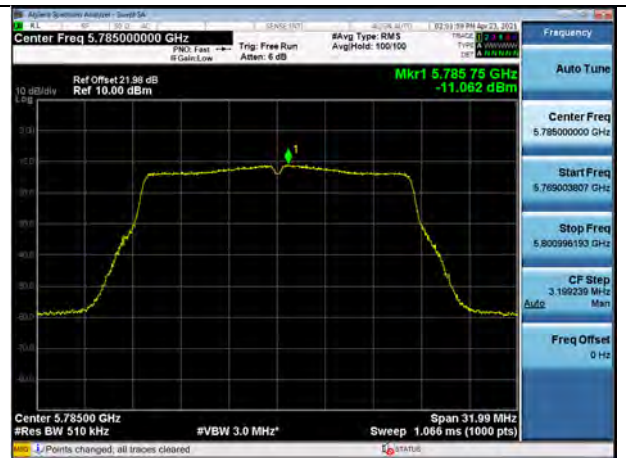
UNII 2A (Ch. 64)



UNII 2C (Ch. 100)



UNII 3 (Ch. 157)





▣ Test Plots(802.11n(HT40))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 38)



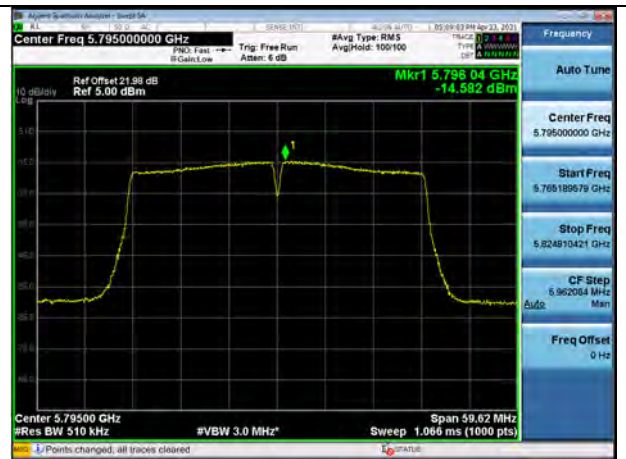
UNII 2A (Ch. 62)



UNII 2C (Ch. 102)



UNII 3 (Ch. 159)



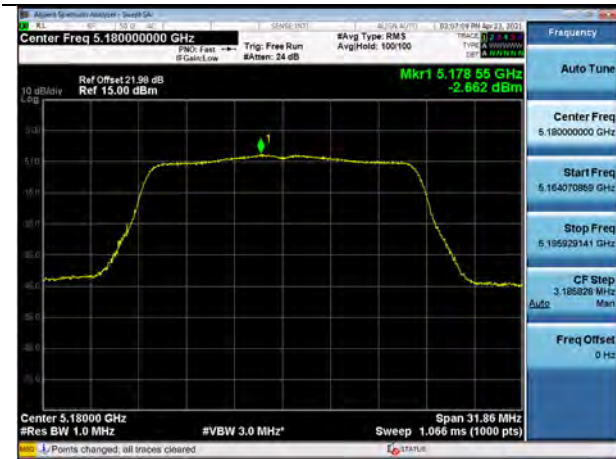


▣ Test Plots(802.11ac(VHT20))

Note:

In order to simplify the report, attached plots were only channel of highest power.

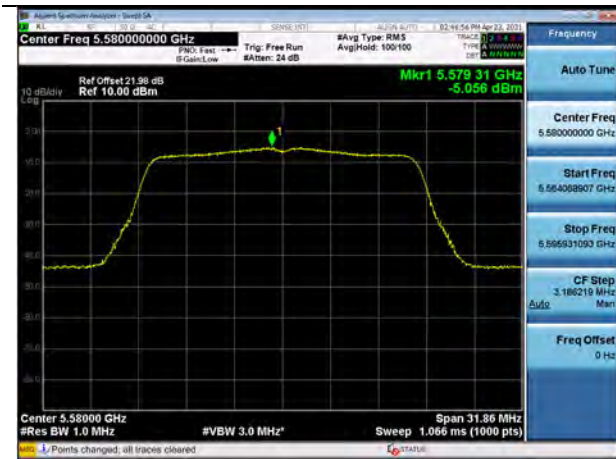
UNII 1 (Ch. 36)



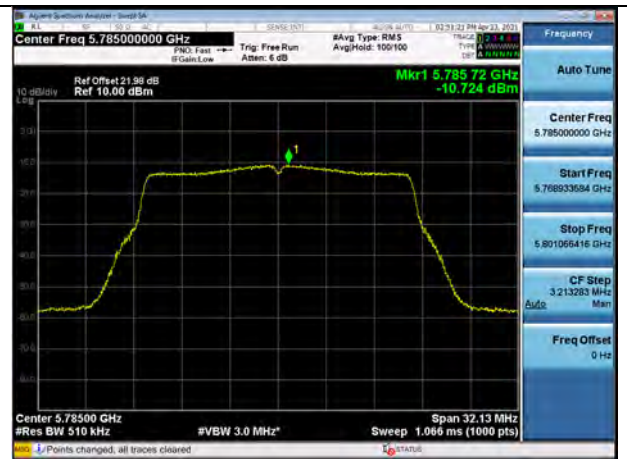
UNII 2A (Ch. 52)



UNII 2C (Ch. 116)



UNII 3 (Ch. 157)



Test Plots(802.11ac(VHT40))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 38)



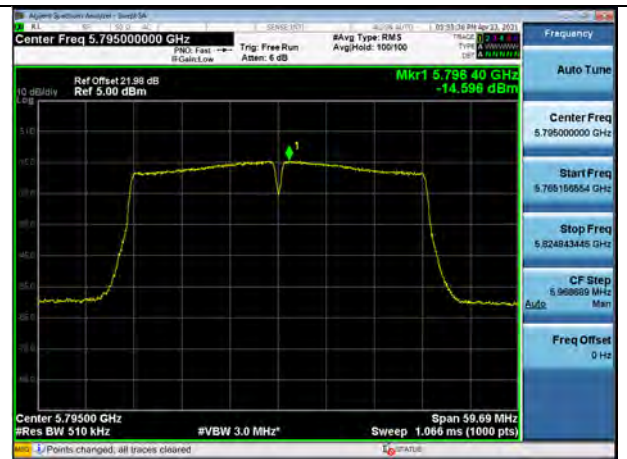
UNII 2A (Ch. 62)



UNII 2C (Ch. 102)



UNII 3 (Ch. 159)



▣ Test Plots(802.11ac(VHT80))

Note:

In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 42)



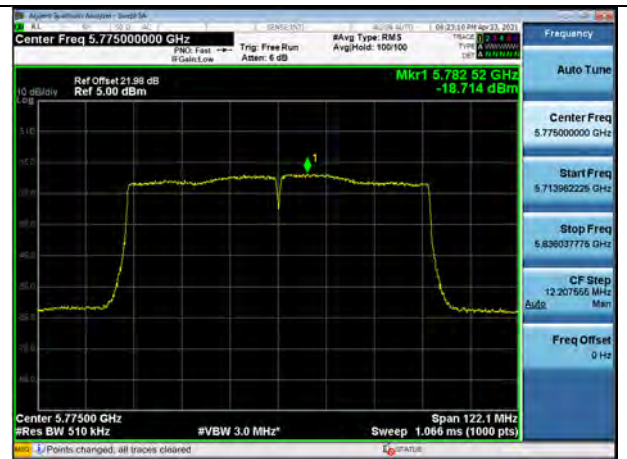
UNII 2A (Ch. 58)



UNII 2C (Ch. 138)



UNII 3 (Ch. 155)



## 10.6 FREQUENCY STABILITY.

### 10.6.1 80MHz BW

#### Startup after the EUT is energized

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,210,000,000 Hz
CHANNEL:	42
REFERENCE VOLTAGE:	14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5210050.92	50.92
100%		-30	5210008.15	8.15
100%		-20	5210014.38	14.38
100%		-10	5210020.52	20.52
100%		0	5210020.92	20.92
100%		+10	5210029.26	29.26
100%		+30	5210039.04	39.04
100%		+40	5210044.31	44.31
100%		+50	5210051.62	51.62
LOW		9.00	+20	5210050.64
HIGH	16.00	+20	5210051.25	51.25

#### Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2A  
 OPERATING FREQUENCY: 5,290,000,000 Hz  
 CHANNEL: 58  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5290051.34	51.34
100%		-30	5290010.90	10.90
100%		-20	5290015.11	15.11
100%		-10	5290019.20	19.2
100%		0	5290023.96	23.96
100%		+10	5290027.51	27.51
100%		+30	5290040.46	40.46
100%		+40	5290045.86	45.86
100%		+50	5290051.12	51.12
LOW		9.00	+20	5290052.19
HIGH	16.00	+20	5290052.69	52.69

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2C  
 OPERATING FREQUENCY: 5,530,000,000 Hz  
 CHANNEL: 106  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5530053.47	53.47
100%		-30	5530006.11	6.11
100%		-20	5530014.34	14.34
100%		-10	5530017.07	17.07
100%		0	5530022.50	22.5
100%		+10	5530029.17	29.17
100%		+30	5530040.70	40.7
100%		+40	5530044.24	44.24
100%		+50	5530053.67	53.67
LOW		9.00	+20	5530055.79
HIGH	16.00	+20	5530053.30	53.3

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



OPERATING BAND: UNII Band 3  
 OPERATING FREQUENCY: 5,775,000,000 Hz  
 CHANNEL: 155  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5775052.20	52.20
100%		-30	5775005.37	5.37
100%		-20	5775011.88	11.88
100%		-10	5775016.99	16.99
100%		0	5775025.97	25.97
100%		+10	5775030.65	30.65
100%		+30	5775040.14	40.14
100%		+40	5775048.39	48.39
100%		+50	5775059.02	59.02
LOW		9.00	+20	5775053.02
HIGH	16.00	+20	5775050.28	50.28

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

**2 minutes after the EUT is energized**

OPERATING BAND: UNII Band 1  
 OPERATING FREQUENCY: 5,210,000,000 Hz  
 CHANNEL: 42  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5210055.11	55.11
100%		-30	5210007.56	7.56
100%		-20	5210013.02	13.02
100%		-10	5210016.67	16.67
100%		0	5210023.21	23.21
100%		+10	5210030.08	30.08
100%		+30	5210037.29	37.29
100%		+40	5210049.30	49.30
100%		+50	5210054.41	54.41
LOW		9.00	+20	5210052.84
HIGH	16.00	+20	5210051.48	51.48

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



OPERATING BAND: UNII Band 2A  
 OPERATING FREQUENCY: 5,290,000,000 Hz  
 CHANNEL: 58  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5290054.48	54.48
100%		-30	5290008.62	8.62
100%		-20	5290015.13	15.13
100%		-10	5290016.38	16.38
100%		0	5290025.35	25.35
100%		+10	5290026.46	26.46
100%		+30	5290037.17	37.17
100%		+40	5290040.77	40.77
100%		+50	5290054.22	54.22
LOW		9.00	+20	5290054.95
HIGH	16.00	+20	5290052.65	52.65

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2C  
 OPERATING FREQUENCY: 5,530,000,000 Hz  
 CHANNEL: 106  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5530054.06	54.06
100%		-30	5530010.05	10.05
100%		-20	5530011.35	11.35
100%		-10	5530017.69	17.69
100%		0	5530024.04	24.04
100%		+10	5530029.74	29.74
100%		+30	5530035.07	35.07
100%		+40	5530047.10	47.1
100%		+50	5530053.31	53.31
LOW		9.00	+20	5530054.39
HIGH	16.00	+20	5530052.48	52.48

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 3  
 OPERATING FREQUENCY: 5,775,000,000 Hz  
 CHANNEL: 155  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5775054.51	54.51
100%		-30	5775010.80	10.80
100%		-20	5775014.44	14.44
100%		-10	5775015.93	15.93
100%		0	5775023.40	23.4
100%		+10	5775026.87	26.87
100%		+30	5775038.99	38.99
100%		+40	5775040.08	40.08
100%		+50	5775055.46	55.46
LOW		9.00	+20	5775055.09
HIGH	16.00	+20	5775050.92	50.92

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

**5 minutes after the EUT is energized**

OPERATING BAND: UNII Band 1  
 OPERATING FREQUENCY: 5,210,000,000 Hz  
 CHANNEL: 42  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5210054.39	54.39
100%		-30	5210009.73	9.73
100%		-20	5210012.40	12.40
100%		-10	5210015.38	15.38
100%		0	5210022.26	22.26
100%		+10	5210027.82	27.82
100%		+30	5210036.76	36.76
100%		+40	5210044.08	44.08
100%		+50	5210057.38	57.38
LOW		9.00	+20	5210052.37
HIGH	16.00	+20	5210055.50	55.5

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2A  
 OPERATING FREQUENCY: 5,290,000,000 Hz  
 CHANNEL: 58  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5290055.78	55.78
100%		-30	5290005.36	5.36
100%		-20	5290014.75	14.75
100%		-10	5290019.52	19.52
100%		0	5290023.55	23.55
100%		+10	5290029.72	29.72
100%		+30	5290040.72	40.72
100%		+40	5290047.66	47.66
100%		+50	5290055.51	55.51
LOW		9.00	+20	5290052.70
HIGH	16.00	+20	5290051.06	51.06

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2C  
 OPERATING FREQUENCY: 5,530,000,000 Hz  
 CHANNEL: 106  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5530050.29	50.29
100%		-30	5530007.90	7.90
100%		-20	5530011.42	11.42
100%		-10	5530015.06	15.06
100%		0	5530024.42	24.42
100%		+10	5530025.40	25.4
100%		+30	5530036.92	36.92
100%		+40	5530048.45	48.45
100%		+50	5530051.89	51.89
LOW		9.00	+20	5530052.55
HIGH	16.00	+20	5530054.70	54.7

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 3  
 OPERATING FREQUENCY: 5,775,000,000 Hz  
 CHANNEL: 155  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5775050.62	50.62
100%		-30	5775009.94	9.94
100%		-20	5775013.77	13.77
100%		-10	5775018.02	18.02
100%		0	5775022.12	22.12
100%		+10	5775029.37	29.37
100%		+30	5775035.36	35.36
100%		+40	5775041.89	41.89
100%		+50	5775058.92	58.92
LOW		9.00	+20	5775051.12
HIGH	16.00	+20	5775050.86	50.86

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

**10 minutes after the EUT is energized**

OPERATING BAND: UNII Band 1  
 OPERATING FREQUENCY: 5,210,000,000 Hz  
 CHANNEL: 42  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.4	+20(Ref)	5210055.84	55.84
100%		-30	5210010.04	10.04
100%		-20	5210014.67	14.67
100%		-10	5210020.11	20.11
100%		0	5210024.87	24.87
100%		+10	5210030.77	30.77
100%		+30	5210035.87	35.87
100%		+40	5210041.64	41.64
100%		+50	5210059.93	59.93
LOW		9.00	+20	5210052.70
HIGH	16.00	+20	5210051.33	51.33

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



OPERATING BAND: UNII Band 2A  
 OPERATING FREQUENCY: 5,290,000,000 Hz  
 CHANNEL: 58  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.4	+20(Ref)	5290052.35	52.35
100%		-30	5290010.83	10.83
100%		-20	5290010.83	10.83
100%		-10	5290017.82	17.82
100%		0	5290024.50	24.5
100%		+10	5290027.69	27.69
100%		+30	5290040.74	40.74
100%		+40	5290043.60	43.6
100%		+50	5290052.16	52.16
LOW		9.00	+20	5290055.11
HIGH	16.00	+20	5290054.25	54.25

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 2C  
 OPERATING FREQUENCY: 5,530,000,000 Hz  
 CHANNEL: 106  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.4	+20(Ref)	5530055.99	55.99
100%		-30	5530009.07	9.07
100%		-20	5530013.46	13.46
100%		-10	5530020.09	20.09
100%		0	5530023.65	23.65
100%		+10	5530028.71	28.71
100%		+30	5530036.32	36.32
100%		+40	5530050.61	50.61
100%		+50	5530057.02	57.02
LOW		9.00	+20	5530053.57
HIGH	16.00	+20	5530051.67	51.67

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 3  
 OPERATING FREQUENCY: 5,775,000,000 Hz  
 CHANNEL: 155  
 REFERENCE VOLTAGE: 14.4 VDC

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.4	+20(Ref)	5775054.47	54.47
100%		-30	5775008.10	8.10
100%		-20	5775015.92	15.92
100%		-10	5775017.38	17.38
100%		0	5775025.76	25.76
100%		+10	5775026.21	26.21
100%		+30	5775037.83	37.83
100%		+40	5775049.12	49.12
100%		+50	5775059.75	59.75
LOW		9.00	+20	5775055.32
HIGH	16.00	+20	5775050.17	50.17

**Note:**

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

## 10.7 STRADDLE CHANNEL

### 10.7.1 26dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26dB Bandwidth [MHz]
802.11a	UNII 2C	5720	144	5709.52	15.48
802.11n(HT20)				5709.52	15.48
802.11ac(VHT20)				5709.44	15.56
802.11a	UNII 3	5720	144	5730.48	5.48
802.11n(HT20)				5730.64	5.64
802.11ac(VHT20)				5730.72	5.72

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26dB Bandwidth [MHz]
802.11n(HT40)	UNII 2C	5710	142	5690.40	34.60
802.11ac(VHT40)				5690.16	34.84
802.11n(HT40)	UNII 3	5710	142	5729.76	4.76
802.11ac(VHT40)				5729.92	4.92

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26dB Bandwidth [MHz]
802.11ac(VHT80)	UNII 2C	5690	138	5649.68	75.32
	UNII 3	5690	138	5730.92	5.92

**Note:**

[UNII 2C] 26dB Bandwidth = 5725MHz - Measured Frequency[MHz]

[UNII 3C] 26dB Bandwidth = Measured Frequency[MHz] -5725MHz

▣ Test Plots (26dB Bandwidth)

802.11a UNII Band



802.11n(HT20) UNII Band



802.11ac(VHT20) UNII Band



▣ Test Plots (26dB Bandwidth)

802.11n(HT40) UNII Band



802.11ac(VHT40) UNII Band



802.11ac(VHT80) UNII Band



### 10.7.2 6dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
802.11a	UNII 3	5720	144	5728.24	3.24	> 0.5
802.11n(HT20)				5728.84	3.84	> 0.5
802.11ac(VHT20)				5728.84	3.84	> 0.5

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
802.11n(HT40)	UNII 3	5710	142	5728.00	3.00	> 0.5
802.11ac(VHT40)				5727.84	2.84	> 0.5

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT80)	UNII 3	5690	138	5727.68	2.68	> 0.5

**Note:**

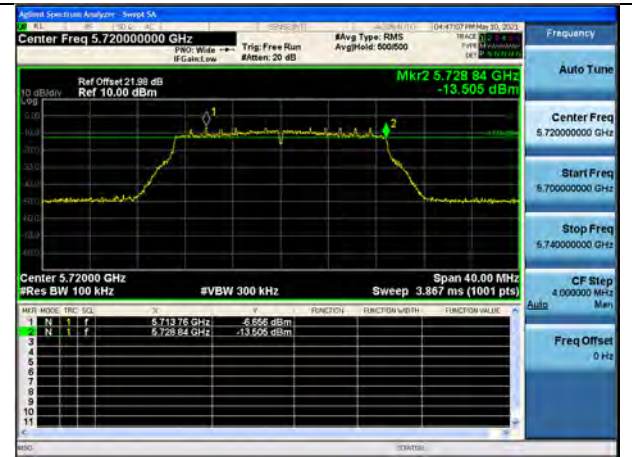
6dB Bandwidth = Measured Frequency[MHz] – 5725MHz

Test Plots (UNII 3 Band 6dB Bandwidth)

802.11a CH.144



802.11n\_HT20 CH.144

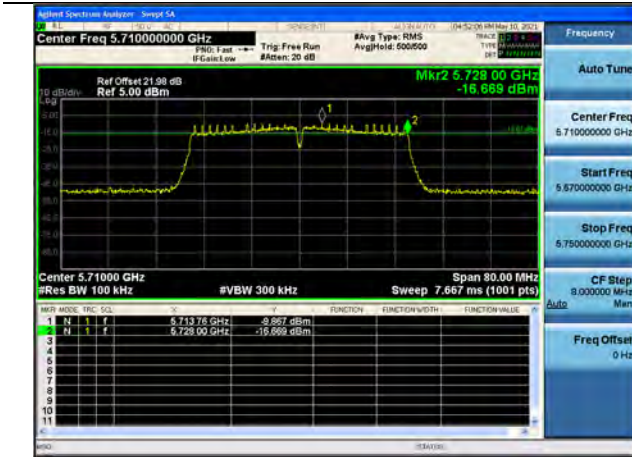


802.11ac\_VHT20 CH.144

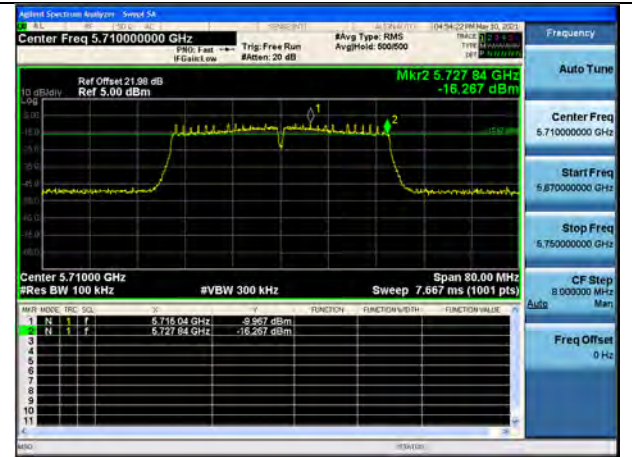




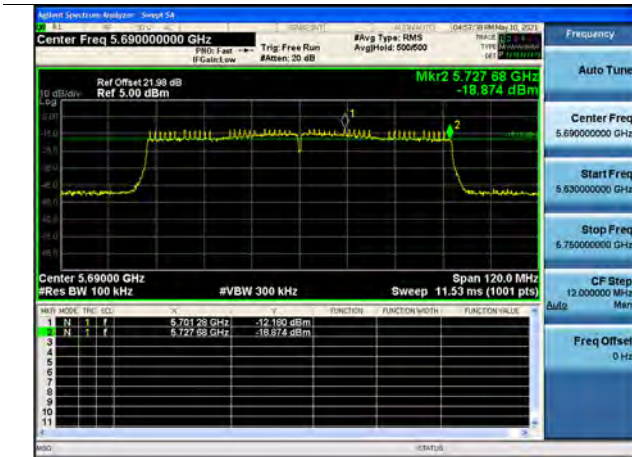
802.11n\_HT40 CH.142



802.11ac\_VHT40 CH.142



802.11ac\_VHT80 CH.138



### 10.7.3 Output Power

Mode	Frequency [MHz]	Channel	Measured Power (dBm)	Duty Cycle Factor (dB)	Total Power (dBm)	Limit (dBm)
802.11a	5720 (UNII 2C Band)	144	4.10	0.205	4.31	22.90
802.11n(HT20)			3.92	0.224	4.14	22.90
802.11ac(VHT20)			3.82	0.223	4.05	22.92
802.11a	5720 (UNII 3 Band)	144	-3.16	0.205	-2.96	30.00
802.11n(HT20)			-2.84	0.224	-2.62	30.00
802.11ac(VHT20)			-2.87	0.223	-2.64	30.00

Mode	Frequency [MHz]	Channel	Measured Power (dBm)	Duty Cycle Factor (dB)	Total Power (dBm)	Limit (dBm)
802.11n(HT40)	5710 (UNII 2C Band)	142	3.57	0.438	4.01	23.98
802.11ac(VHT40)			3.48	0.444	3.92	23.98
802.11n(HT40)	5710 (UNII 3 Band)	142	-8.23	0.438	-7.79	30.00
802.11ac(VHT40)			-8.27	0.444	-7.82	30.00

Mode	Frequency [MHz]	Channel	Measured Power (dBm)	Duty Cycle Factor (dB)	Total Power (dBm)	Limit (dBm)
802.11ac(VHT80)	5690 (UNII 2C Band)	138	3.69	0.866	4.56	23.98
	5690 (UNII 3 Band)	138	-11.50	0.866	-10.63	30.00

/  
 ■ Test Plots

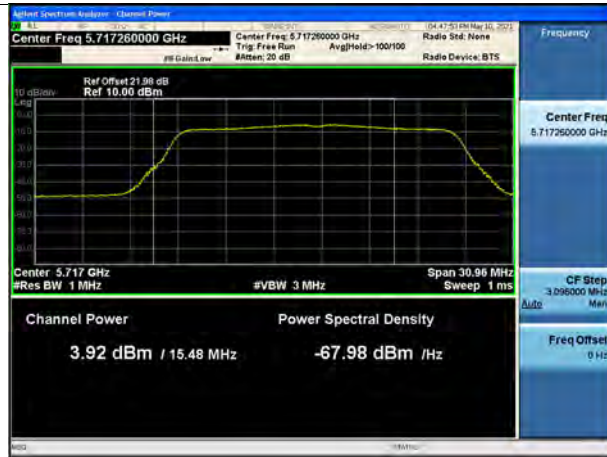
802.11a UNII 2C Band



802.11a UNII 3 Band



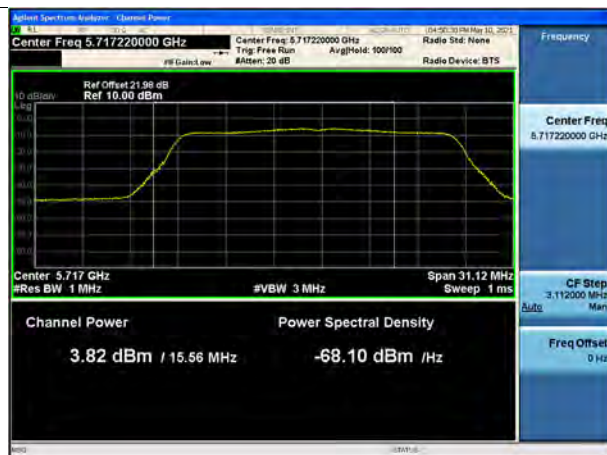
802.11n(HT20) UNII 2C Band



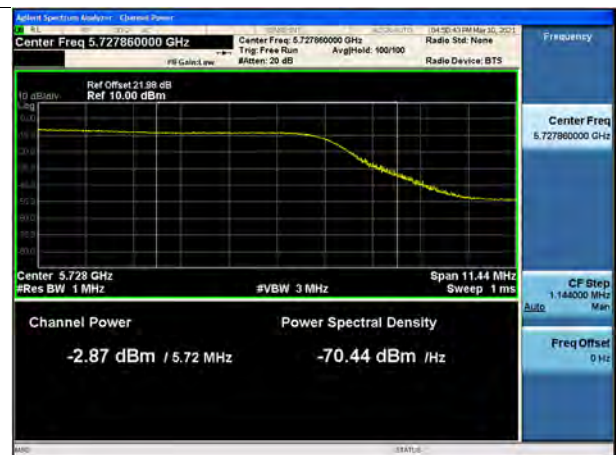
802.11n(HT20) UNII 3 Band



802.11ac(VHT20) UNII 2C Band



802.11ac(VHT20) UNII 3 Band





802.11n(HT40) UNII 2C Band



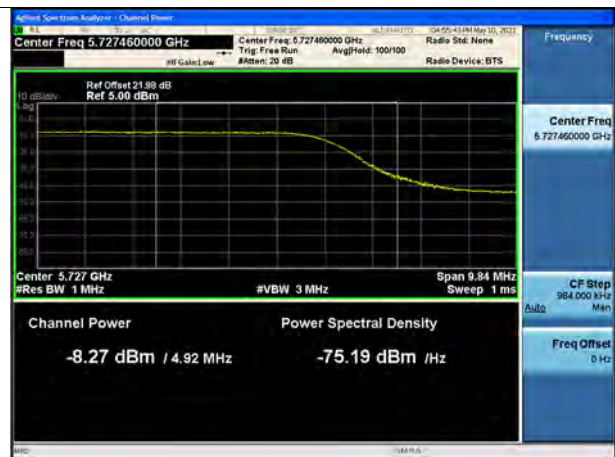
802.11n(HT40) UNII 3 Band



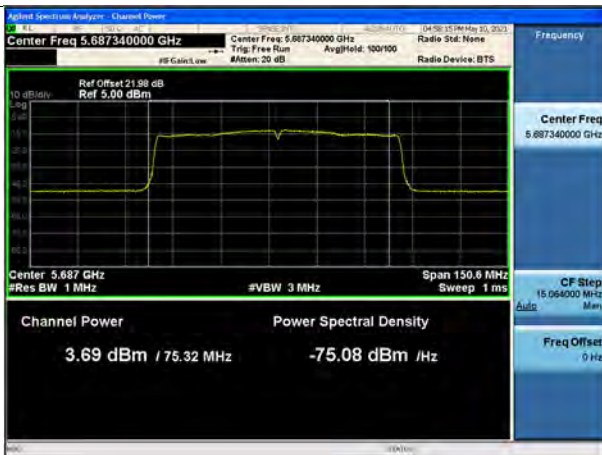
802.11ac(VHT40) UNII 2C Band



802.11ac(VHT40) UNII 3 Band



802.11ac(VHT80) UNII 2C Band



802.11ac(VHT80) UNII 3 Band



### 10.7.4 Power Spectral Density

Mode	Frequency [MHz]	Channel	Measured Density (dBm)	Duty Cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)
802.11a	5720 (UNII 2C Band)	144	-5.251	0.205	-5.046	11dBm/ MHz
802.11n(HT20)			-5.641	0.224	-5.417	
802.11ac(VHT20)			-5.816	0.223	-5.593	
802.11a	5720 (UNII 3 Band)	144	-10.477	0.205	-10.272	30dBm/ 500kHz
802.11n(HT20)			-10.754	0.224	-10.530	
802.11ac(VHT20)			-10.950	0.223	-10.727	

Mode	Frequency [MHz]	Channel	Measured Density (dBm)	Duty Cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)
802.11n(HT40)	5710 (UNII 2C Band)	142	-9.367	0.438	-8.929	11dBm/ MHz
802.11ac(VHT40)			-9.304	0.444	-8.860	
802.11n(HT40)	5710 (UNII 3 Band)	142	-15.219	0.438	-14.781	30dBm/ 500kHz
802.11ac(VHT40)			-15.409	0.444	-14.965	

Mode	Frequency [MHz]	Channel	Measured Density (dBm)	Duty Cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)
802.11ac(VHT80)	5690 (UNII 2C Band)	138	-12.265	0.866	-11.399	11dBm/ MHz
	5690 (UNII 3 Band)	138	-18.698	0.866	-17.832	30dBm/ 500kHz

Test Plots

802.11a UNII 2C Band



802.11a UNII 3 Band



802.11n(HT20) UNII 2C Band



802.11n(HT20) UNII 3 Band



802.11ac(VHT20) UNII 2C Band



802.11ac(VHT20) UNII 3 Band





802.11n(HT40) UNII 2C Band



802.11n(HT40) UNII 3 Band



802.11ac(VHT40) UNII 2C Band



802.11ac(VHT40) UNII 3 Band



802.11ac(VHT80) UNII 2C Band



802.11ac(VHT80) UNII 3 Band



### 10.8 RADIATED SPURIOUS EMISSIONS

#### Frequency Range : 9 kHz – 30MHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB

No Critical peaks found

**Note:**

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor =  $40 \log(\text{specific distance} / \text{test distance})$  (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor

#### Frequency Range : Below 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB

No Critical peaks found

**Note:**

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode



Frequency Range : Above 1 GHz

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
10360	52.95	0.24	V	53.19	68.20	15.01	PK
15540	55.78	2.16	V	57.94	73.98	16.04	PK
15540	38.88	2.16	V	41.04	53.98	12.94	AV
10360	52.41	0.24	H	52.65	68.20	15.55	PK
15540	55.68	2.16	H	57.84	73.98	16.14	PK
15540	38.72	2.16	H	40.88	53.98	13.10	AV

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
10400	52.95	0.74	V	53.69	68.20	14.51	PK
15600	52.88	1.81	V	54.69	73.98	19.29	PK
15600	37.89	1.81	V	39.70	53.98	14.28	AV
10400	52.51	0.74	H	53.25	68.20	14.95	PK
15600	56.04	1.81	H	57.85	73.98	16.13	PK
15600	38.94	1.81	H	40.75	53.98	13.23	AV

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
10480	52.94	-0.25	V	52.69	68.20	15.51	PK
15720	54.52	1.16	V	55.68	73.98	18.30	PK
15720	38.21	1.16	V	39.37	53.98	14.61	AV
10480	51.89	-0.25	H	51.64	68.20	16.56	PK
15720	54.61	1.16	H	55.77	73.98	18.21	PK
15720	38.55	1.16	H	39.71	53.98	14.27	AV

Band :	UNII 2A
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5260 MHz
Channel No.	52 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
10520	52.87	-0.20	V	52.67	68.20	15.53	PK
15780	54.21	1.20	V	55.41	73.98	18.57	PK
15780	38.34	1.20	V	39.54	53.98	14.44	AV
10520	52.32	-0.20	H	52.12	68.20	16.08	PK
15780	55.66	1.20	H	56.86	73.98	17.12	PK
15780	38.99	1.20	H	40.19	53.98	13.79	AV

Band :	UNII 2A
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5300 MHz
Channel No.	60 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
10600	52.14	0.10	V	52.24	73.98	21.74	PK
10600	39.44	0.10	V	39.54	53.98	14.44	AV
15900	54.61	1.04	V	55.65	73.98	18.33	PK
15900	38.66	1.04	V	39.70	53.98	14.28	AV
10600	52.57	0.10	H	52.67	73.98	21.31	PK
10600	39.27	0.10	H	39.37	53.98	14.61	AV
15900	56.18	1.04	H	57.22	73.98	16.76	PK
15900	39.24	1.04	H	40.28	53.98	13.70	AV

Band :	UNII 2A
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
10640	51.99	0.35	V	52.34	73.98	21.64	PK
10640	39.77	0.35	V	40.12	53.98	13.86	AV
15960	53.22	1.12	V	54.34	73.98	19.64	PK
15960	37.55	1.12	V	38.67	53.98	15.31	AV
10640	51.71	0.35	H	52.06	73.98	21.92	PK
10640	38.92	0.35	H	39.27	53.98	14.71	AV
15960	55.73	1.12	H	56.85	73.98	17.13	PK
15960	38.58	1.12	H	39.70	53.98	14.28	AV

Band :	UNII 2C
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5500 MHz
Channel No.	100 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
11000	52.01	0.40	V	52.41	73.98	21.57	PK
11000	39.81	0.40	V	40.21	53.98	13.77	AV
16500	54.12	1.16	V	55.28	68.20	12.92	PK
11000	51.65	0.40	H	52.05	73.98	21.93	PK
11000	38.83	0.40	H	39.23	53.98	14.75	AV
16500	55.41	1.16	H	56.57	68.20	11.63	PK

Band :	UNII 2C
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5580 MHz
Channel No.	116 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
11160	51.97	-0.26	V	51.71	73.98	22.27	PK
11160	39.89	-0.26	V	39.63	53.98	14.35	AV
16740	56.48	1.16	V	57.64	68.20	10.56	PK
11160	52.10	-0.26	H	51.84	73.98	22.14	PK
11160	40.62	-0.26	H	40.36	53.98	13.62	AV
16740	56.54	1.16	H	57.70	68.20	10.50	PK

Band :	<u>UNII 2C</u>
Operation Mode:	<u>802.11 a</u>
Transfer Rate:	<u>6 Mbps</u>
Operating Frequency	<u>5720 MHz</u>
Channel No.	<u>144 Ch</u>

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
11440	51.99	0.14	V	52.13	73.98	21.85	PK
11440	40.52	0.14	V	40.66	53.98	13.32	AV
17160	55.86	1.35	V	57.21	68.20	10.99	PK
11440	52.19	0.14	H	52.33	73.98	21.65	PK
11440	40.80	0.14	H	40.94	53.98	13.04	AV
17160	63.33	1.35	H	64.68	68.20	3.52	PK

Band :	<u>UNII 3</u>
Operation Mode:	<u>802.11 a</u>
Transfer Rate:	<u>6 Mbps</u>
Operating Frequency	<u>5745MHz</u>
Channel No.	<u>149 Ch</u>

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
11490	52.12	-0.14	V	51.98	73.98	22.00	PK
11490	40.47	-0.14	V	40.33	53.98	13.65	AV
17235	54.89	1.61	V	56.50	68.20	11.70	PK
11490	51.93	-0.14	H	51.79	73.98	22.19	PK
11490	38.72	-0.14	H	38.58	53.98	15.40	AV
17235	55.81	1.61	H	57.42	68.20	10.78	PK

Band :	UNII 3
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5785 MHz
Channel No.	157 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
11570	51.99	0.07	V	52.06	73.98	21.92	PK
11570	41.08	0.07	V	41.15	53.98	12.83	AV
17355	53.57	1.69	V	55.26	68.20	12.94	PK
11570	51.22	0.07	H	51.29	73.98	22.69	PK
11570	39.77	0.07	H	39.84	53.98	14.14	AV
17355	55.55	1.69	H	57.24	68.20	10.96	PK

Band :	UNII 3
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
11650	52.38	-0.70	V	51.68	73.98	22.30	PK
11650	41.81	-0.70	V	41.11	53.98	12.87	AV
17475	52.99	2.65	V	55.64	68.20	12.56	PK
11650	51.78	-0.70	H	51.08	73.98	22.90	PK
11650	39.68	-0.70	H	38.98	53.98	15.00	AV
17475	53.71	2.65	H	56.36	68.20	11.84	PK

**Note:**

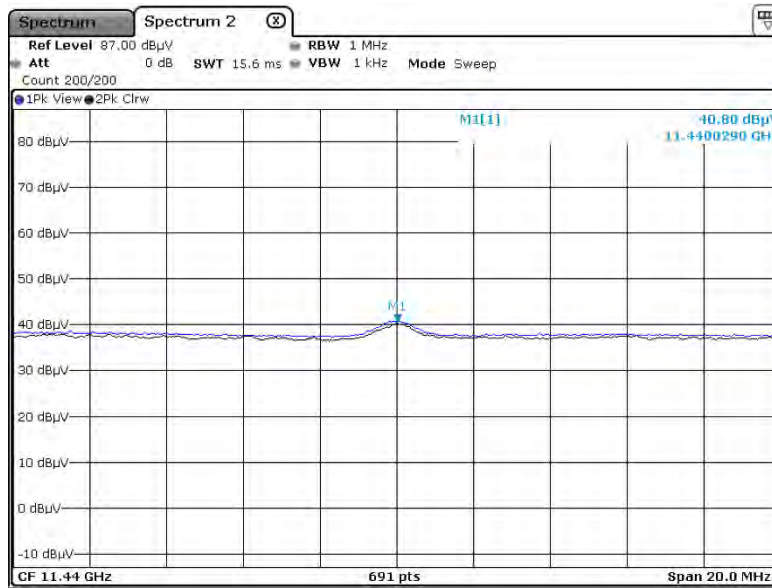
All Modes of operation were investigated and the worst case configuration results are reported.

[Worst case]

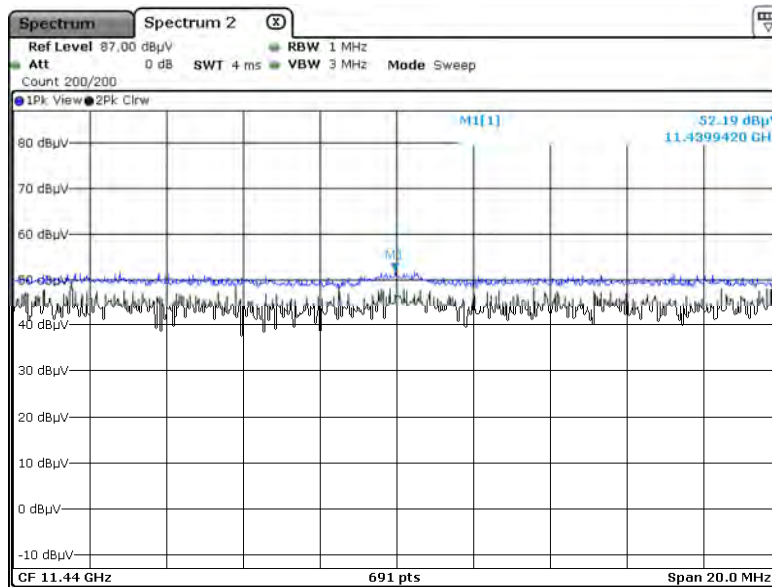
- Worstcase : UNII 1, 2A, 2C, 3 : 802.11a

## Test Plots

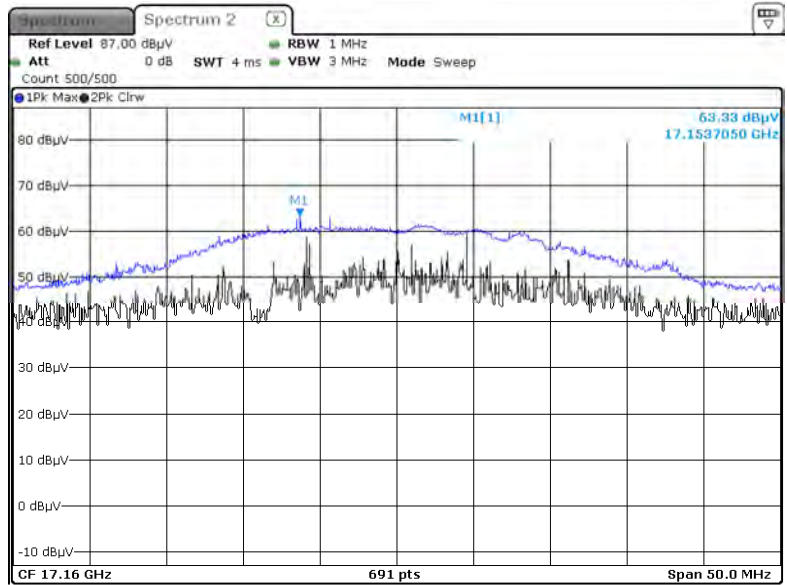
Average Reading (802.11a, Ch.144 2nd Harmonic, X-H)



Peak Reading (802.11a, Ch.144 2nd Harmonic, X-H)



Peak Reading (802.11a, Ch.144 3rd Harmonic, X-H)



**Note:**

Only the worst case plots for Radiated Spurious Emissions.



**10.9 RADIATED RESTRICTED BAND EDGE**

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	44.69	6.72	H	51.41	73.98	22.57	PK
5150	33.50	6.72	H	40.22	53.98	13.76	AV
5150	44.44	6.72	V	51.16	73.98	22.82	PK
5150	32.62	6.72	V	39.34	53.98	14.64	AV

Band :	UNII 2A
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	47.92	7.24	H	55.16	73.98	18.82	PK
5350	34.97	7.24	H	42.21	53.98	11.77	AV
5350	44.96	7.24	V	52.2	73.98	21.78	PK
5350	32.69	7.24	V	39.93	53.98	14.05	AV

Band :	UNII 2C
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5500 MHz
Channel No.	100 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	45.72	7.90	H	53.62	73.98	20.36	PK
5460	33.26	7.90	H	41.16	53.98	12.82	AV
5470	46.73	8.24	H	54.97	68.20	13.23	PK
5460	44.93	7.90	V	52.83	73.98	21.15	PK
5460	32.05	7.90	V	39.95	53.98	14.03	AV
5470	46.06	8.24	V	54.3	68.20	13.90	PK

Band :	UNII 1
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	44.78	6.72	H	51.50	73.98	22.48	PK
5150	33.34	6.72	H	40.06	53.98	13.92	AV
5150	43.25	6.72	V	49.97	73.98	24.01	PK
5150	32.25	6.72	V	38.97	53.98	15.01	AV

Band :	UNII 2A
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	47.67	7.24	H	54.91	73.98	19.07	PK
5350	34.86	7.24	H	42.1	53.98	11.88	AV
5350	44.99	7.24	V	52.23	73.98	21.75	PK
5350	32.77	7.24	V	40.01	53.98	13.97	AV

Band :	UNII 2C
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5500 MHz
Channel No.	100 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	45.47	7.90	H	53.37	73.98	20.61	PK
5460	33.52	7.90	H	41.42	53.98	12.56	AV
5470	47.28	8.24	H	55.52	68.20	12.68	PK
5460	44.45	7.90	V	52.35	73.98	21.63	PK
5460	32.12	7.90	V	40.02	53.98	13.96	AV
5470	46.75	8.24	V	54.99	68.20	13.21	PK

Band :	UNII 1
Operation Mode:	802.11 ac_VHT20
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	44.46	6.72	H	51.18	73.98	22.80	PK
5150	33.32	6.72	H	40.04	53.98	13.94	AV
5150	43.10	6.72	V	49.82	73.98	24.16	PK
5150	32.12	6.72	V	38.84	53.98	15.14	AV

Band :	UNII 2A
Operation Mode:	802.11 ac_VHT20
Transfer MCS Index:	0
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	47.48	7.24	H	54.72	73.98	19.26	PK
5350	34.91	7.24	H	42.15	53.98	11.83	AV
5350	44.85	7.24	V	52.09	73.98	21.89	PK
5350	32.82	7.24	V	40.06	53.98	13.92	AV

Band :	UNII 2C
Operation Mode:	802.11 ac_VHT20
Transfer MCS Index:	0
Operating Frequency	5500 MHz
Channel No.	100 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	46.10	7.90	H	54.00	73.98	19.98	PK
5460	33.74	7.90	H	41.64	53.98	12.34	AV
5470	47.34	8.24	H	55.58	68.20	12.62	PK
5460	44.48	7.90	V	52.38	73.98	21.60	PK
5460	32.52	7.90	V	40.42	53.98	13.56	AV
5470	46.88	8.24	V	55.12	68.20	13.08	PK

Band :	UNII 1
Operation Mode:	802.11 n_HT40
Transfer MCS Index:	0
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	44.43	6.72	H	51.15	73.98	22.83	PK
5150	32.83	6.72	H	39.55	53.98	14.43	AV
5150	43.89	6.72	V	50.61	73.98	23.37	PK
5150	32.37	6.72	V	39.09	53.98	14.89	AV

Band :	UNII 2A
Operation Mode:	802.11 n_HT40
Transfer MCS Index:	0
Operating Frequency	5310 MHz
Channel No.	62 Ch

Frequency	Reading	CL+AF+DF-AG+ATT	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	49.55	7.24	H	56.79	73.98	17.19	PK
5350	35.45	7.24	H	42.69	53.98	11.29	AV
5350	47.57	7.24	V	54.81	73.98	19.17	PK
5350	34.85	7.24	V	42.09	53.98	11.89	AV

Band :	UNII 2C
Operation Mode:	802.11 n_HT40
Transfer MCS Index:	0
Operating Frequency	5510 MHz
Channel No.	102 Ch

Frequency	Reading	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	46.87	7.90	H	54.77	73.98	19.21	PK
5460	34.57	7.90	H	42.47	53.98	11.51	AV
5470	48.90	8.24	H	57.14	68.20	11.06	PK
5460	44.79	7.90	V	52.69	73.98	21.29	PK
5460	32.52	7.90	V	40.42	53.98	13.56	AV
5470	45.32	8.24	V	53.56	68.20	14.64	PK



Band :	UNII 1
Operation Mode:	802.11 ac_VHT40
Transfer MCS Index:	0
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency	Reading	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	44.65	6.72	H	51.37	73.98	22.61	PK
5150	32.99	6.72	H	39.71	53.98	14.27	AV
5150	43.99	6.72	V	50.71	73.98	23.27	PK
5150	32.56	6.72	V	39.28	53.98	14.70	AV

Band :	UNII 2A
Operation Mode:	802.11 ac_VHT40
Transfer MCS Index:	0
Operating Frequency	5310 MHz
Channel No.	62 Ch

Frequency	Reading	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	49.12	7.24	H	56.36	73.98	17.62	PK
5350	35.55	7.24	H	42.79	53.98	11.19	AV
5350	47.12	7.24	V	54.36	73.98	19.62	PK
5350	33.25	7.24	V	40.49	53.98	13.49	AV

Band :	UNII 2C
Operation Mode:	802.11 ac_VHT40
Transfer MCS Index:	0
Operating Frequency	5510 MHz
Channel No.	102 Ch

Frequency	Reading	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	46.43	7.90	H	54.33	73.98	19.65	PK
5460	34.29	7.90	H	42.19	53.98	11.79	AV
5470	49.16	8.24	H	57.4	68.20	10.80	PK
5460	44.85	7.90	V	52.75	73.98	21.23	PK
5460	32.62	7.90	V	40.52	53.98	13.46	AV
5470	45.22	8.24	V	53.46	68.20	14.74	PK

Band :	UNII 1
Operation Mode:	802.11 ac_VHT80
Transfer MCS Index:	0
Operating Frequency	5210 MHz
Channel No.	42 Ch

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	45.45	6.72	H	52.17	73.98	21.81	PK
5150	34.66	6.72	H	41.38	53.98	12.60	AV
5150	44.92	6.72	V	51.64	73.98	22.34	PK
5150	34.12	6.72	V	40.84	53.98	13.14	AV

Band :	UNII 2A
Operation Mode:	802.11 ac_VHT80
Transfer MCS Index:	0
Operating Frequency	5290 MHz
Channel No.	58 Ch

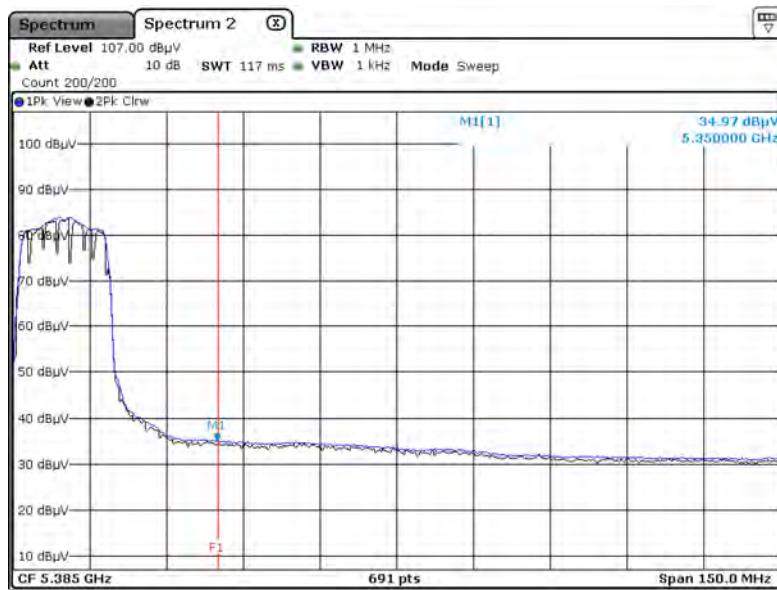
Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	50.27	7.24	H	57.51	73.98	16.47	PK
5350	37.29	7.24	H	44.53	53.98	9.45	AV
5350	49.21	7.24	V	56.45	73.98	17.53	PK
5350	36.52	7.24	V	43.76	53.98	10.22	AV

Band :	UNII 2C
Operation Mode:	802.11 ac_VHT80
Transfer MCS Index:	0
Operating Frequency	5530 MHz
Channel No.	106 Ch

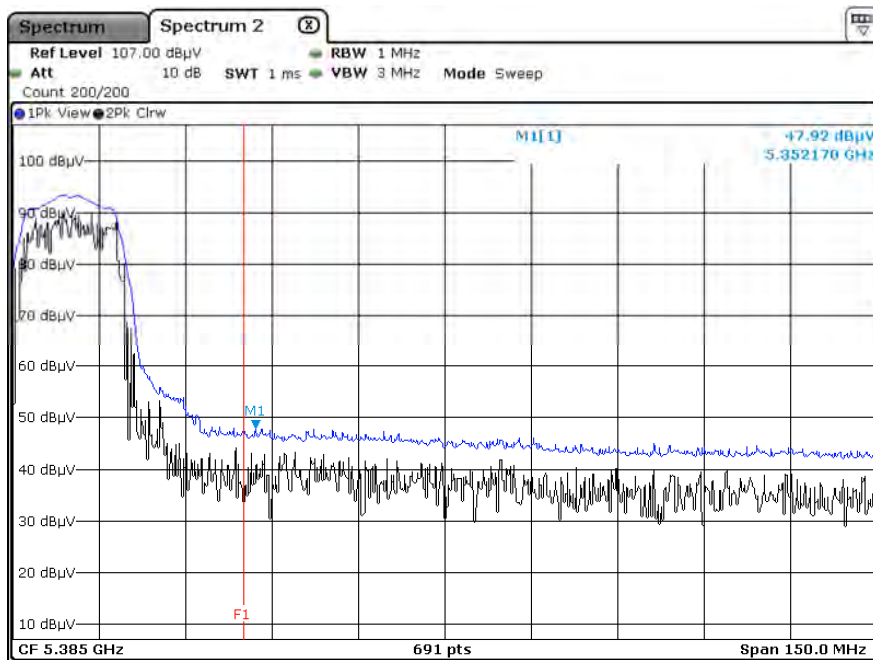
Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	47.04	7.90	H	54.94	73.98	19.04	PK
5460	35.04	7.90	H	42.94	53.98	11.04	AV
5470	51.75	8.24	H	59.99	68.20	8.21	PK
5460	46.25	7.90	V	54.15	73.98	19.83	PK
5460	34.12	7.90	V	42.02	53.98	11.96	AV
5470	50.58	8.24	V	58.82	68.20	9.38	PK

▣ Test Plots(UNII 1, 2A, 2C)(X-H)

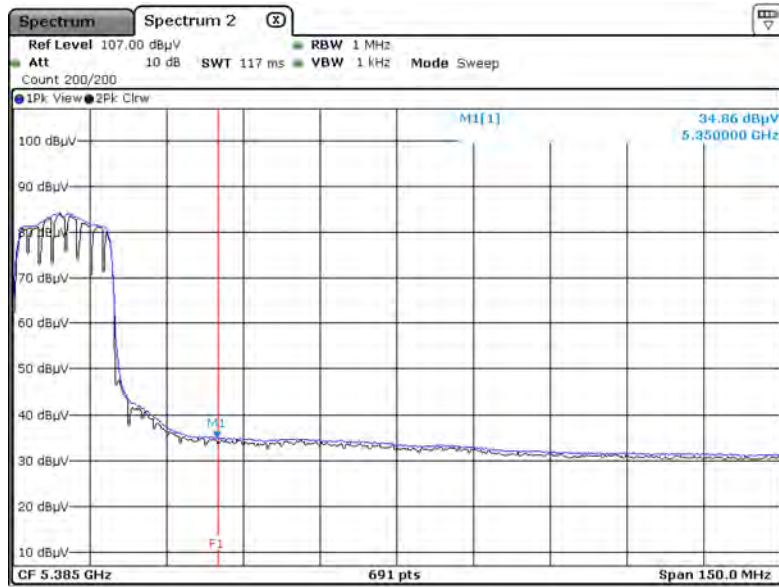
Average Reading (802.11a, Ch.64)



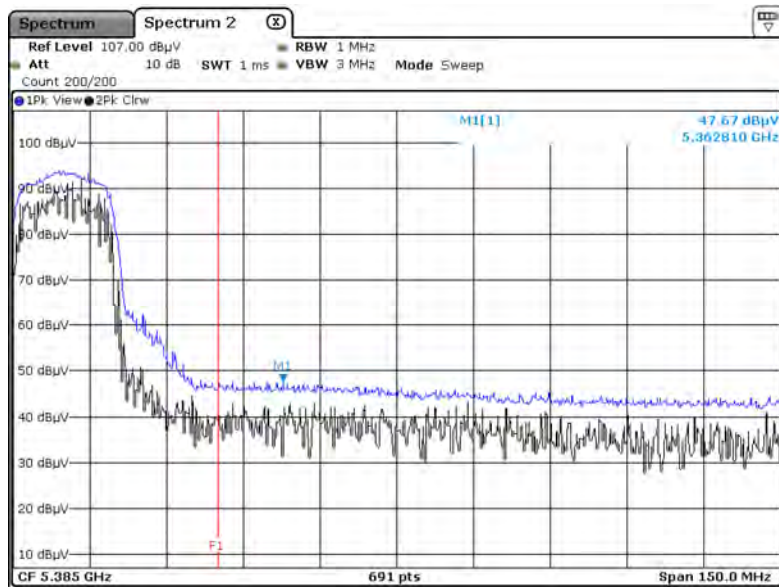
Peak Reading (802.11a, Ch.64)



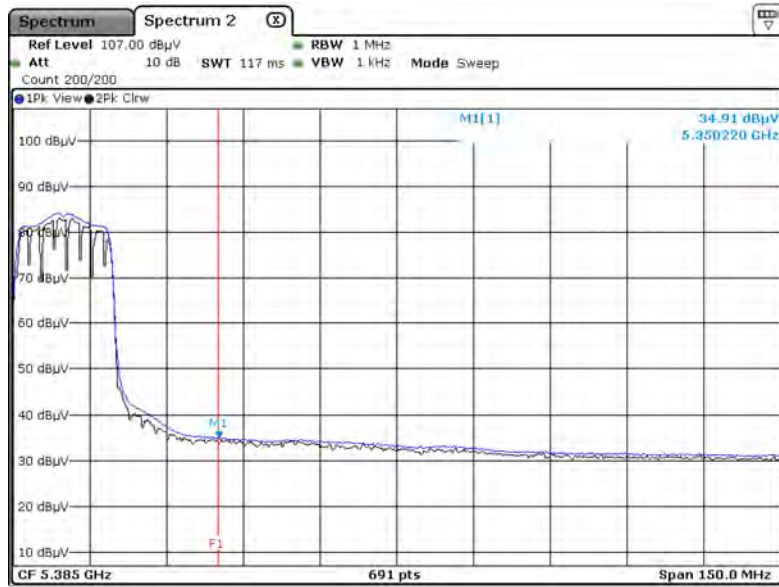
Average Reading (802.11 n\_HT20, Ch.64)



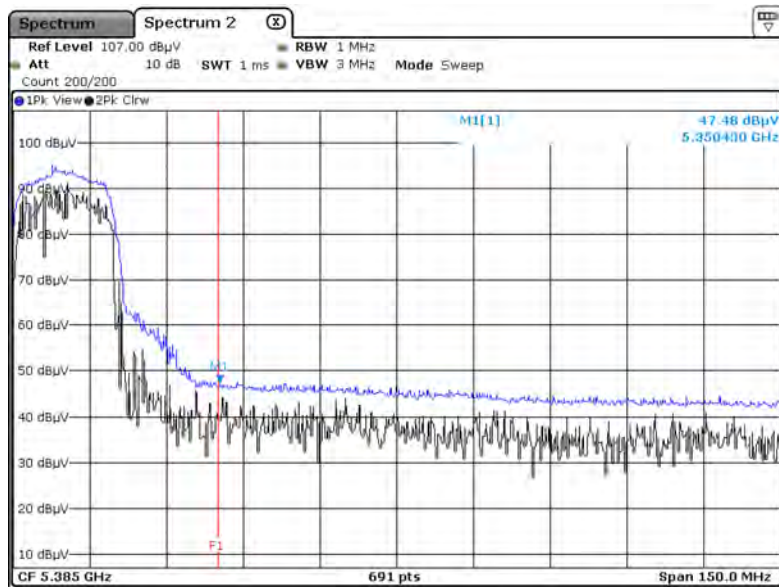
Average Reading (802.11 n\_HT20, Ch.64)



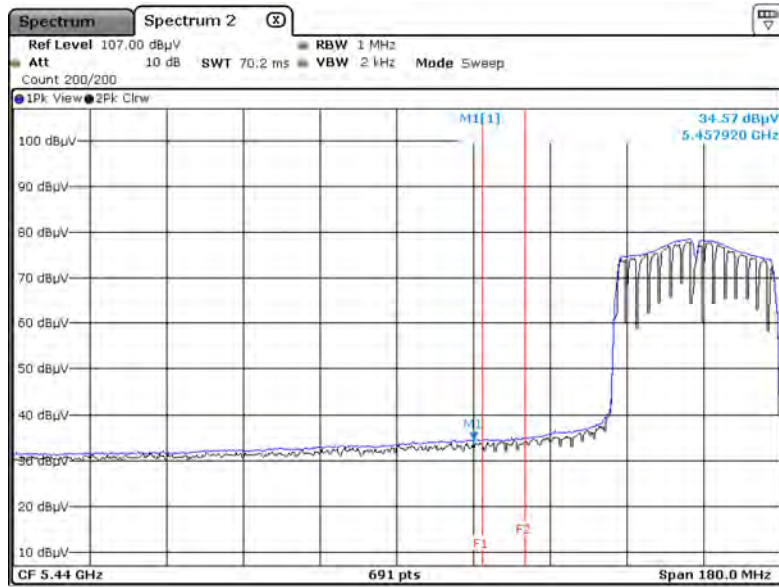
### Average Reading (802.11 ac\_VHT20, Ch.64)



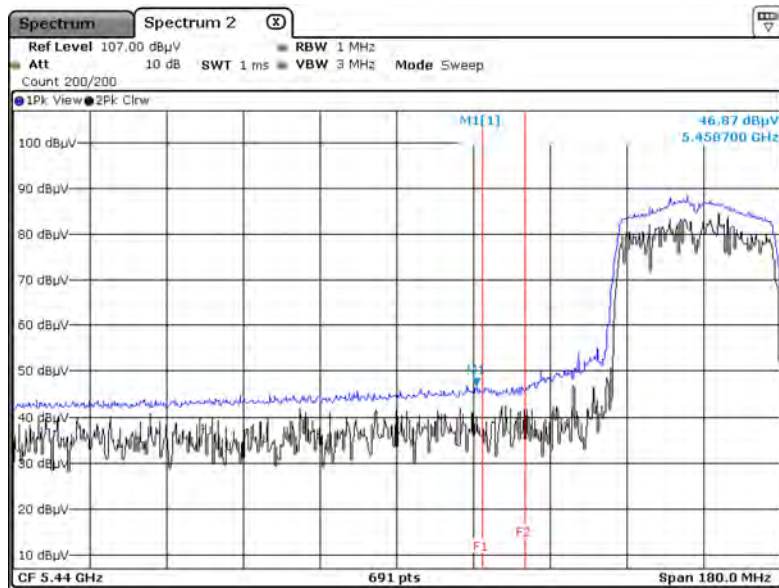
### Peak Reading (802.11 ac\_VHT20, Ch.64)



### Average Reading (802.11 n\_HT40, Ch.102)

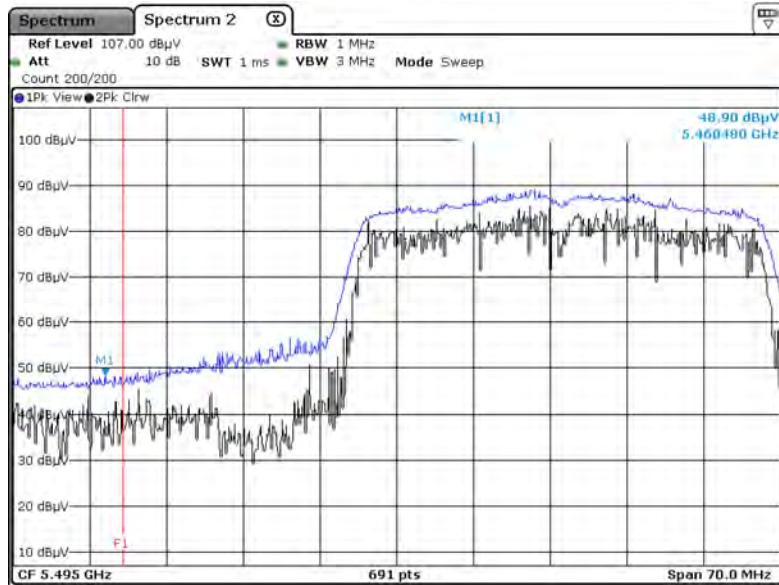


### Peak Reading (802.11 n\_HT40, Ch.102)

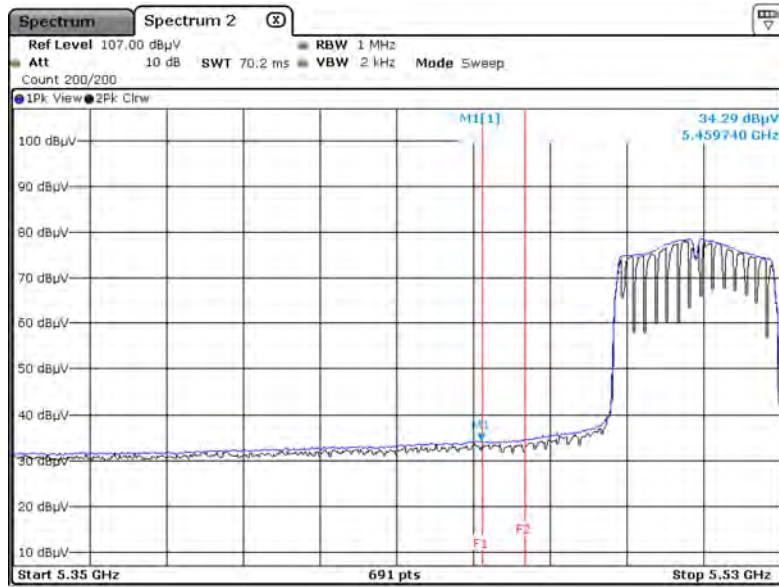




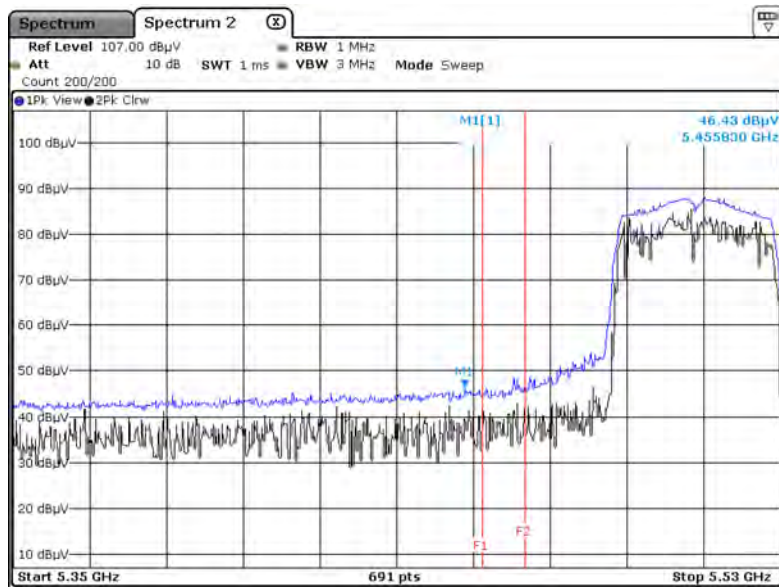
Peak Reading (802.11 n\_HT40, Ch.102)



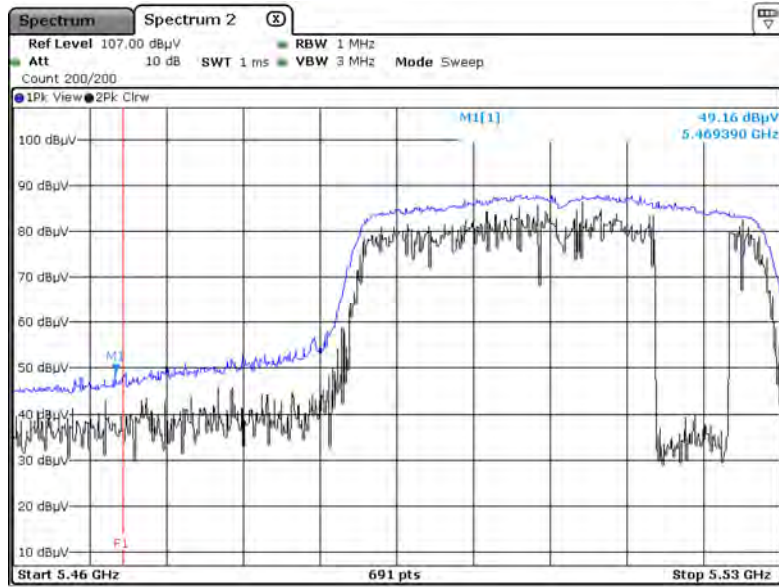
Average Reading (802.11 ac\_VHT40, Ch.102)



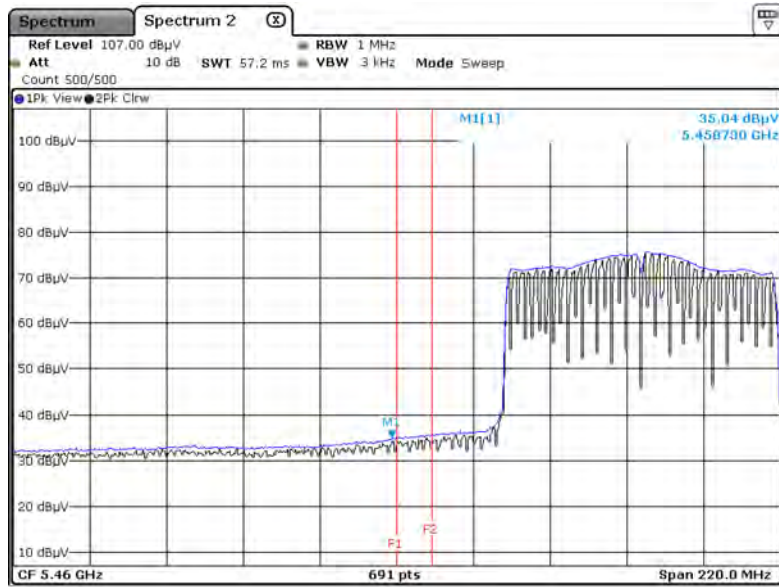
Peak Reading (802.11 ac\_VHT40, Ch.102)



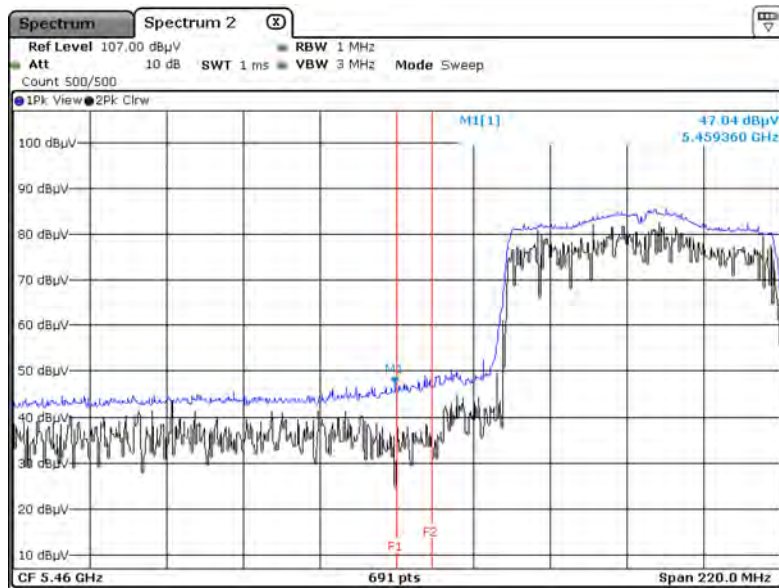
Peak Reading (802.11 ac\_VHT40, Ch.102)



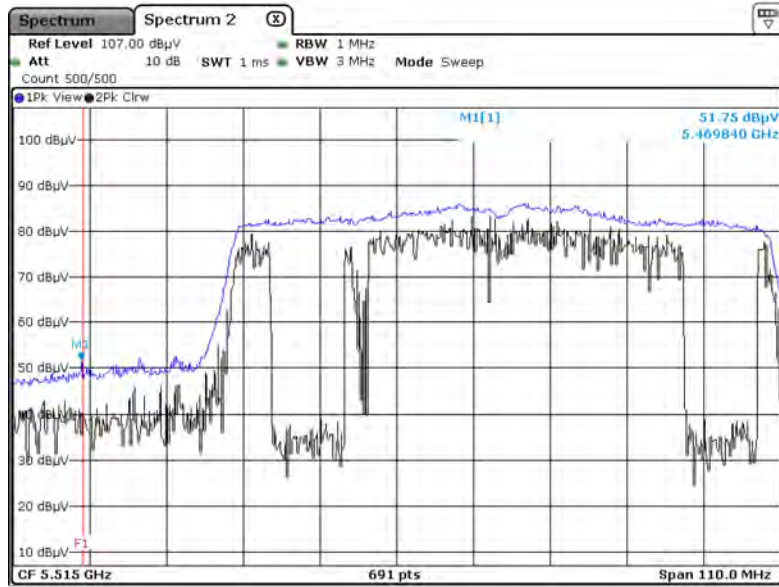
### Average Reading (802.11 ac\_VHT80, Ch.106)



### Peak Reading (802.11 ac\_VHT80, Ch.106)



Peak Reading (802.11 ac\_VHT80, Ch.106)

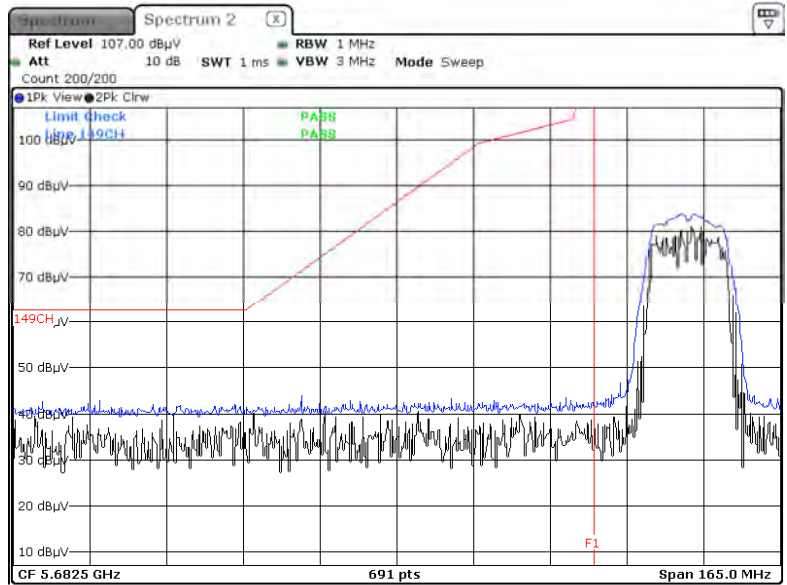


**Note:**

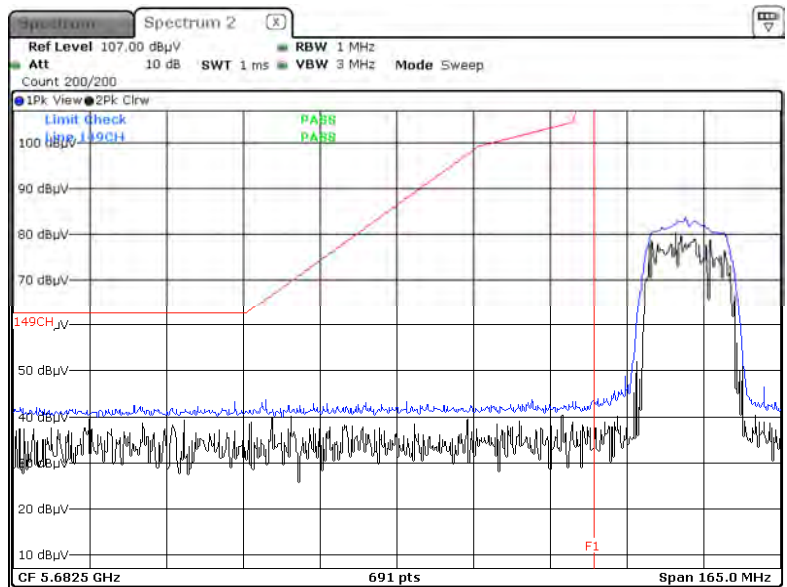
Only the worst case plots for Radiated Restricted Band Edge.

### Test Plots(UNII 3)

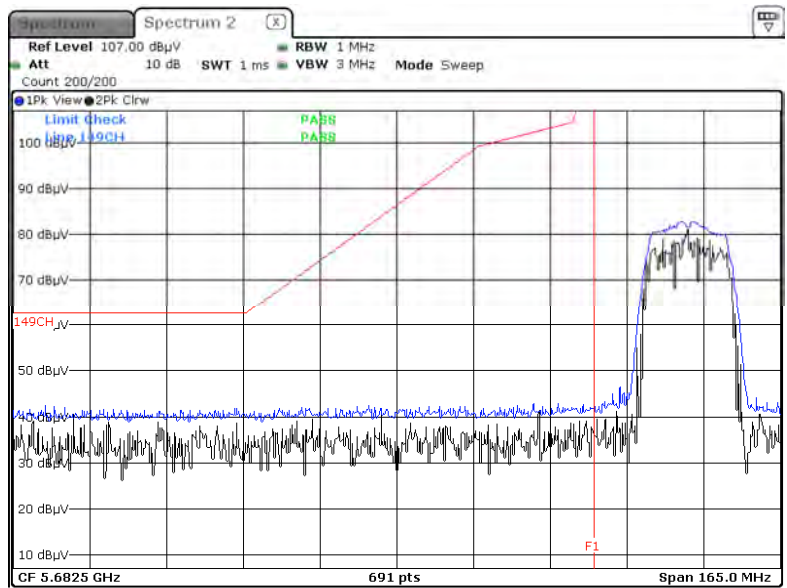
Peak Reading (802.11a, Ch.149, X-H)



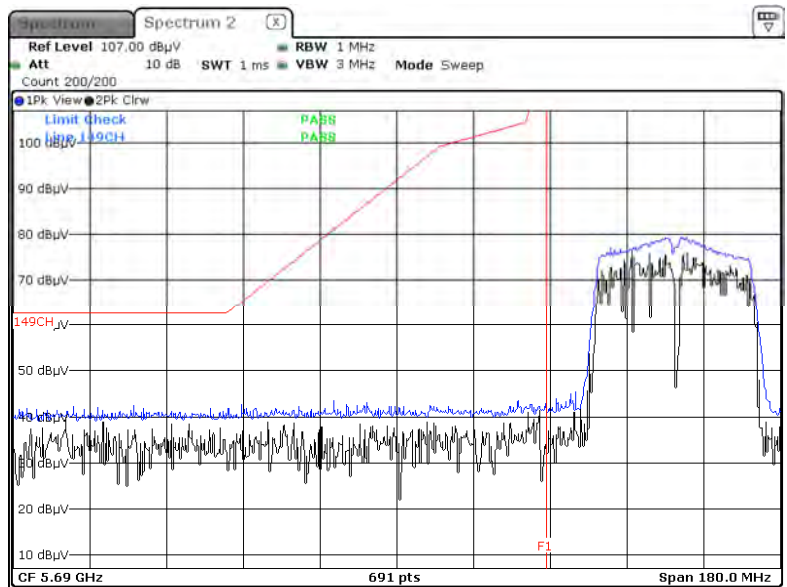
Peak Reading (802.11n\_HT20, Ch.149, X-H)



### Peak Reading (802.11ac\_VHT20, Ch.149, X-H)

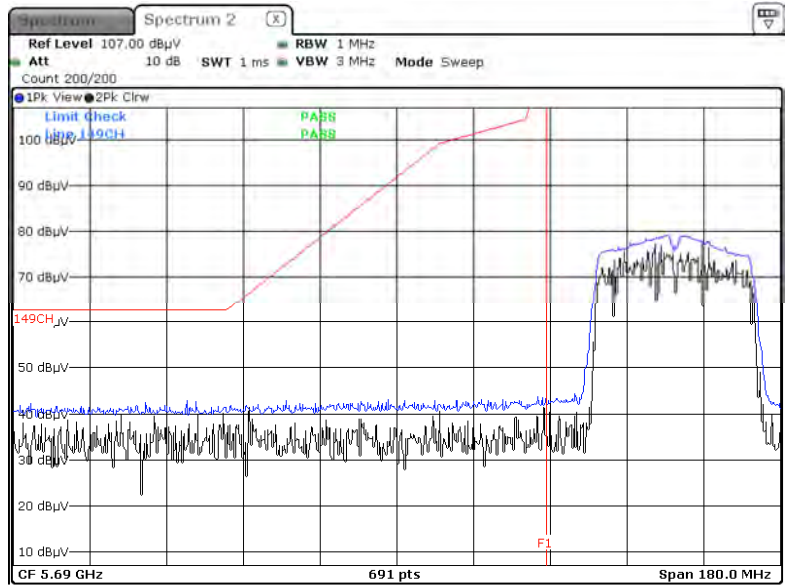


### Peak Reading (802.11n\_HT40, Ch.151, X-H)

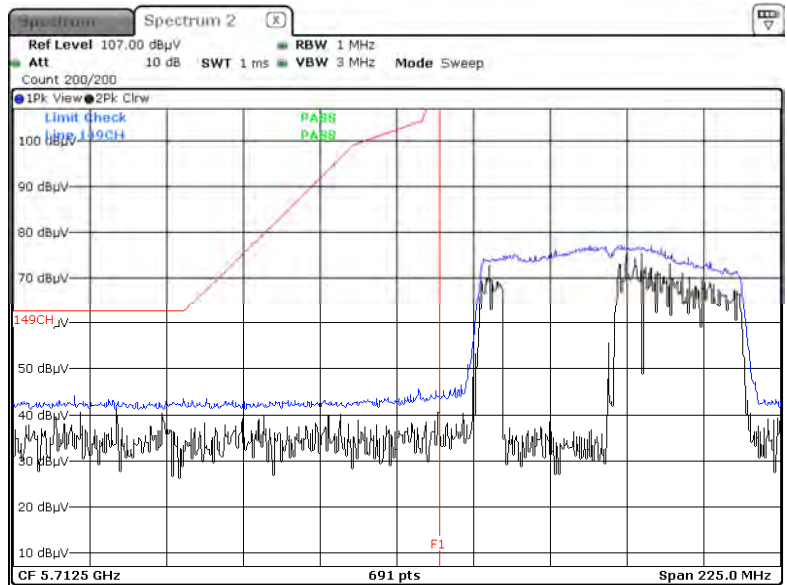




### Peak Reading (802.11ac\_VHT40, Ch.151, X-H)

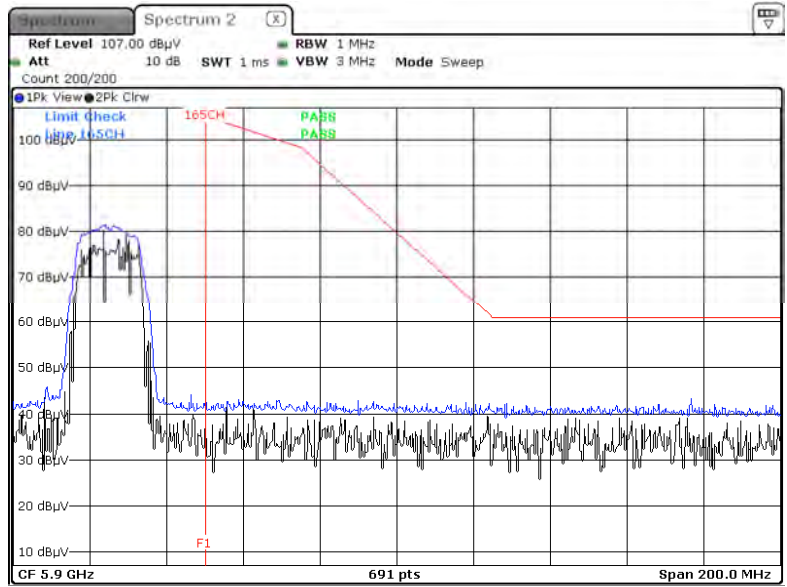


### Peak Reading (802.11ac\_VHT80, Ch.155, X-H)

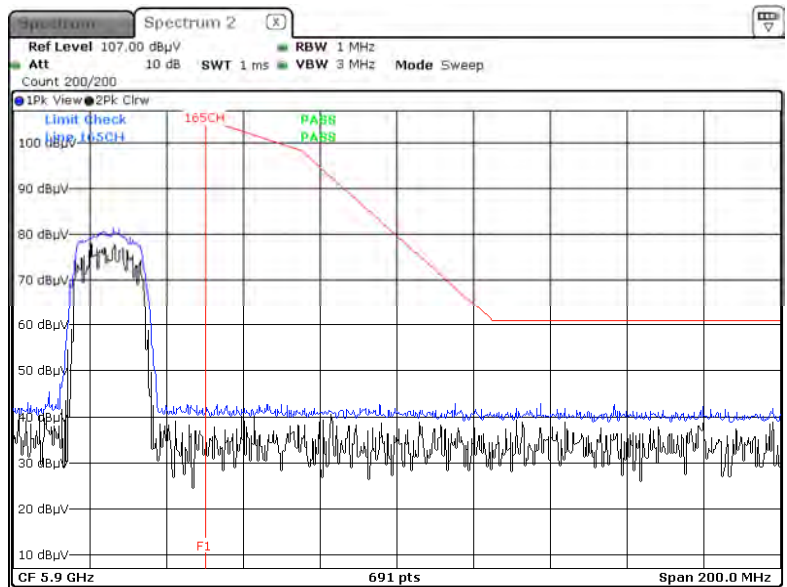




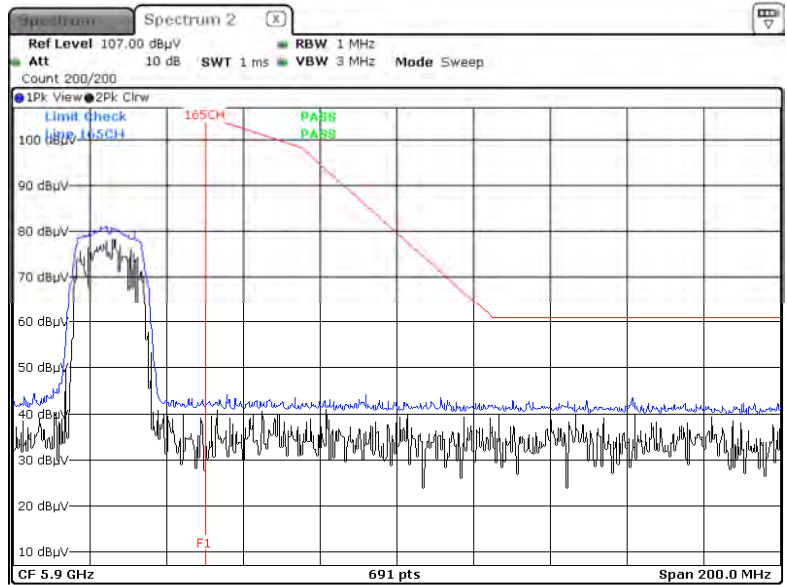
### Peak Reading (802.11a, Ch.165, X-H)



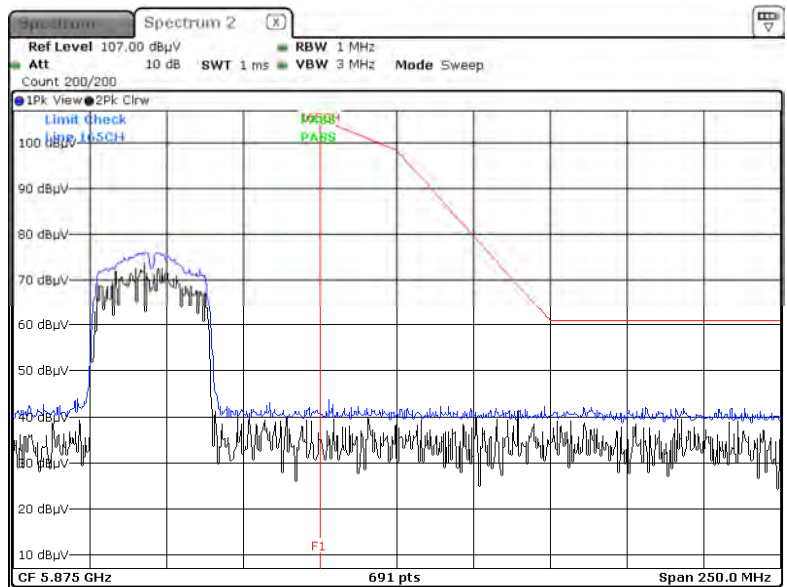
### Peak Reading (802.11n\_HT20, Ch.165, X-H)



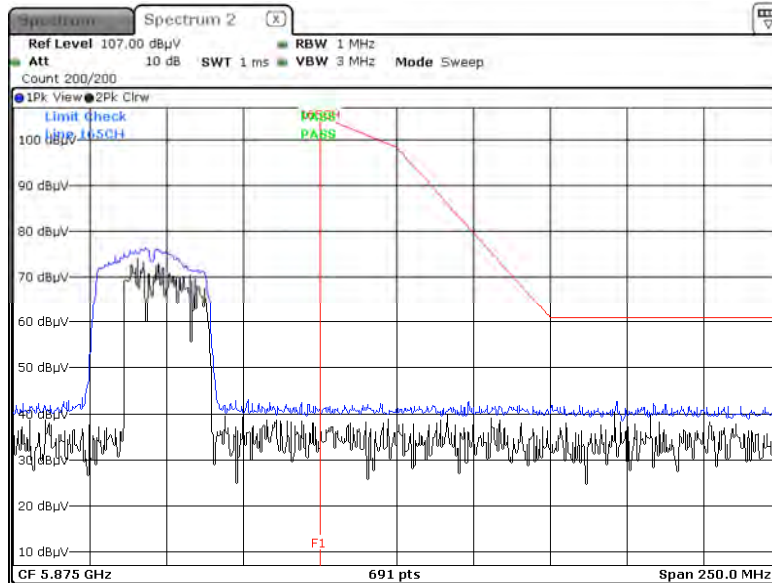
Peak Reading (802.11ac\_VHT20, Ch.165, X-H)



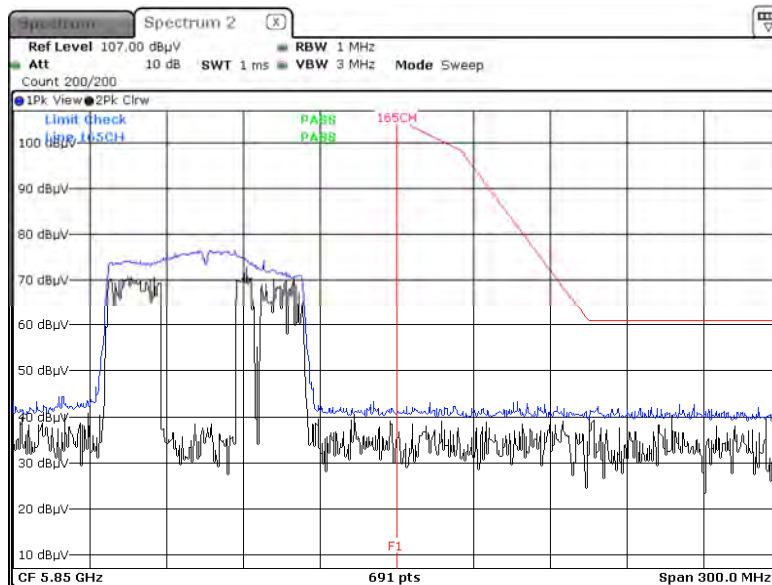
Peak Reading (802.11n\_HT40, Ch.159, X-H)



Peak Reading (802.11ac\_VHT40, Ch.159, X-H)



Peak Reading (802.11ac\_VHT80, Ch.155, X-H)



**Note :**

1. Only the worst case plots for U-NII-3 Out of Band e.i.r.p Emission.
2. U-NII-3 Low & High Band Edge RedLine is Final Test Limit about factor value compensation.

### 10.10 RECEIVER SPURIOUS EMISSIONS

#### Frequency Range : Below 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

**Note:**

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

#### Frequency Range : Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

## 11. LIST OF TEST EQUIPMENT

### Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/04/2020	Annual	102245
Rohde & Schwarz	ESR / EMI Test Receiver	09/16/2020	Annual	101910
ESPACE	SU-642 / Temperature Chamber	03/15/2021	Annual	0093008124
Agilent	N9030A / Signal Analyzer	01/11/2021	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/02/2020	Annual	101231
Agilent	N1911A / Power Meter	04/08/2021	Annual	MY45100523
Keysight	N1921A / Power Sensor	04/08/2021	Annual	MY57820067
Agilent	87300B / Directional Coupler	11/10/2020	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	02/09/2021	Annual	10545
Hewlett Packard	E3632A / DC Power Supply	06/12/2020	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	06/26/2020	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A

#### Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

**Radiated Test**

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	05/18/2020	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	02/22/2021	Biennial	760
Schwarzbeck	BBHA 9120D / Horn Antenna	02/17/2021	Biennial	9120D-937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	11/29/2019	Biennial	BBHA9170541
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	07/28/2020	Annual	102168
Agilent	N9030A / Signal Analyzer	01/11/2021	Annual	MY49431210
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	01/06/2021	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	02/08/2021	Annual	1
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	02/03/2021	Annual	8
Wainwright Instruments	WHKX8-6090-7000-18000-40SS/ High Pass Filter	02/03/2021	Annual	25
Api tech.	18B-03 / Attenuator (3 dB)	02/03/2021	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	02/03/2021	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	02/03/2021	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	02/03/2021	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	12/04/2020	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	03/23/2021	Annual	25956

**Note:**

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).

## 12. ANNEX A\_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2105-FI012-P