FCC UNII REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Date of Issue:
January 19, 2023

Test Site/Location:
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

Report No.: HCT-RF-2301-FC078

FCC ID:	**A3LSMA546B**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : A3LSMA546E report.

Model: SM-A546B/DS
Additional Model: -
EUT Type: Mobile Phone
Modulation type OFDM
FCC Classification: Unlicensed National Information Infrastructure(NII)
FCC Rule Part(s): Part 15.407

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 Rules under normal use and maintenance.

REVIEWED BY

Report prepared by : Kyung Jun Woo
Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

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

This laboratory is not accredited for the test results marked *.
The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

* The report shall not be reproduced except in full(only partly) without approval of the laboratory.

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2301-FC078	January 19, 2023	- First Approval Report

Table of Contents

1. GENERAL INFORMATION

EUT DESCRIPTION

Model	SM-A546B/DS	
Additional Model	–	
EUT Type	Mobile Phone	
Power Supply	DC 3.85 V	
Modulation Type	OFDM : 802.11a, 802.11n, 802.11ac	
Frequency Range (MHz)	U-NII-1	20 MHz BW : 5180 - 5240
		40 MHz BW : 5190 - 5230
		80 MHz BW : 5210
	U-NII-2A	20 MHz BW : 5260 - 5320
		40 MHz BW : 5270 - 5310
		80 MHz BW : 5290
	U-NII-2C	20 MHz BW : 5500 - 5720
		40 MHz BW : 5510 - 5710
		80 MHz BW : 5530 – 5690
	U-NII-3	20 MHz BW : 5745 - 5825
		40 MHz BW : 5755 - 5795
		80 MHz BW : 5775
Straddle channel	Supported	
TDWR Band	Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	November 30, 2022 ~ January 16, 2023	
Serial number	Radiated: R3CTA04MCRJ Conducted: R3CTA04MCBE	

ANTENNA CONFIGURATIONS

1. Antenna configuration

Configurations	SISO		MIMO	
	Ant.1	Ant.2	CDD	SDM
802.11a	X	O	O	X
802.11n	X	O	X	O
802.11ac	X	O	X	O

Note:

(1) O = Support,   X = Not Support

(2) SISO = Single Input Single Output

(3) SDM = Spatial Diversity Multiplexing

(4) CDD = Cyclic Delay Diversity

2. This device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the 2.4 GHz and 5 GHz bands simultaneously on each antenna.

RSDB Scenario	5 GHz WiFi Ant.1	5 GHz WiFi Ant.2	Bluetooth Ant.1
Bluetooth ANT.1 + 5 GHz WiFi MIMO	on	on	on
Bluetooth ANT.1 + 5 GHz WiFi ANT.2		on	on

3. Directional Gain Calculation

According to KDB 662911 D01 Multiple Transmitter Output v02r01 F) 2) e) (iii), f) ii)

$$\text{Directional gain(SDM)} = G_{max} + 10 \cdot \log(N_{ANT}/ N_{ss}),$$

$$\text{Directional Gain(CDD)} = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\{\sum_{k=1}^{N_{ANT}} g_{j,k}\}^2}{N_{ANT}}\right]$$

Band	Ant Gain (dBi)		N_{ANT}/ N_{ss}	Directional Gain (dBi)	
				SDM	CDD
UNII 1	ANT1	-7.43	2 / 2	-6.93	-4.17
	ANT2	-6.93			
UNII 2A	ANT1	-7.30	2 / 2	-6.00	-3.62
	ANT2	-6.00			
UNII 2C	ANT1	-6.10	2 / 2	-6.10	-3.11
	ANT2	-6.14			
UNII 3	ANT1	-6.10	2 / 2	-6.03	-3.05
	ANT2	-6.03			

Note

According to Ansi C63.10-2013 section 14.4.3, the directional gain is calculated using the formula, where G_N is the gain of the nth antenna and N_{ANT} is the total number of antennas used.

Directional gain(SDM) = G_{max} + 10· log(N_{ANT}/ N_{ss}),

Directional Gain(CDD) = 10·log((($10^{(ANT1\ Gain/20)}$+$10^{(ANT2\ Gain/20)}$)^2)/2) dBi

Sample MIMO Calculation:

Ex) Ant 1 : 11.58 dBm   Ant 2 : 12.08 dBm

Ant. 1 + Ant. 2 = MIMO

(11.58 dBm + 12.08 dBm) = (14.387 mW + 16.143 mW) = 30.53 mW = 14.88 dBm

2. MAXIMUM OUTPUT POWER

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

Band	Mode	SISO (Ant. 2)		MIMO	
		(dBm)	(W)	(dBm)	(W)
UNII1	802.11a	16.21	0.042	19.21	0.083
	802.11n (HT20)	16.28	0.042	19.11	0.081
	802.11n (HT40)	14.69	0.029	17.47	0.056
	802.11ac (VHT20)	16.44	0.044	19.51	0.089
	802.11ac (VHT40)	14.65	0.029	17.23	0.053
	802.11ac (VHT80)	11.57	0.014	14.38	0.027
UNII2A	802.11a	16.52	0.045	19.40	0.087
	802.11n (HT20)	16.59	0.046	19.58	0.091
	802.11n (HT40)	14.76	0.030	17.55	0.057
	802.11ac (VHT20)	16.59	0.046	19.66	0.093
	802.11ac (VHT40)	14.92	0.031	17.48	0.056
	802.11ac (VHT80)	11.30	0.013	14.65	0.029
UNII2C	802.11a	16.45	0.044	19.48	0.089
	802.11n (HT20)	16.42	0.044	19.41	0.087
	802.11n (HT40)	14.81	0.030	17.45	0.056
	802.11ac (VHT20)	16.59	0.046	19.70	0.093
	802.11ac (VHT40)	14.81	0.030	17.59	0.057
	802.11ac (VHT80)	11.46	0.014	14.82	0.030
UNII3	802.11a	16.65	0.046	19.83	0.096
	802.11n (HT20)	16.74	0.047	19.89	0.098
	802.11n (HT40)	14.65	0.029	17.54	0.057
	802.11ac (VHT20)	16.88	0.049	19.83	0.096
	802.11ac (VHT40)	14.73	0.030	17.59	0.057
	802.11ac (VHT80)	10.99	0.013	14.61	0.029

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. Additionally, for U-NII-4 band, use the following measurement procedure KDB 291074 D02 EMC Measurement v01

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.

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 30 MHz 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 1 GHz. Above 1 GHz with 1.5 m 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).

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:

  "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_{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 (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	2.00 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.74 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.51 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.92 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.48 (Confidence level about 95 %, k=2)

8. DESCRIPTION OF TESTS

8.1. Duty Cycle

Test Configuration
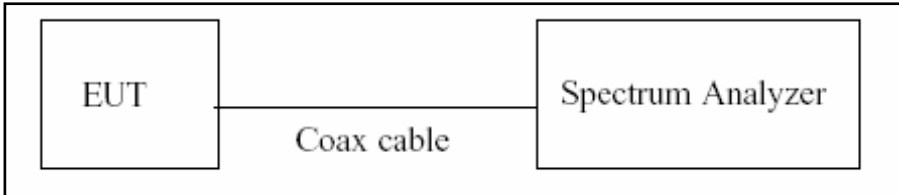
Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

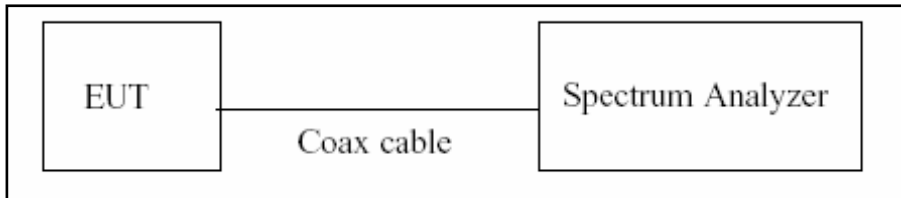We tested according to Procedure B.2 in KDB 789033 D02 v02r01.

1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (≥ 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 = 10log(1/Duty Cycle)

8.2. 6 dB Bandwidth & 26 dB 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(26 dB 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 (6 dB 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 ≥ 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 lever 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.

8.3. Output Power Measurement

Limit

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

Test Configuration

Power Meter
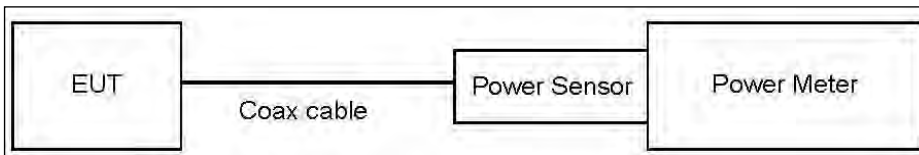
Spectrum Analyzer(Only Straddle Channel)
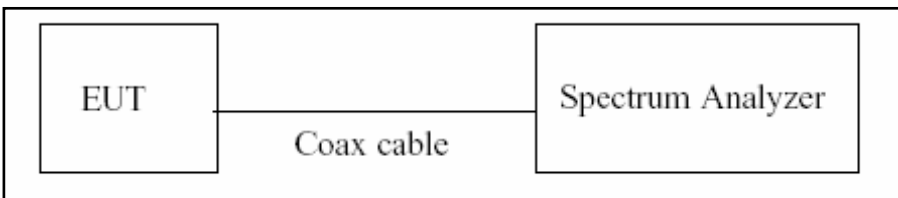
Test Procedure(Power Meter)

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 ≥ 3 MHz.

5. Number of points in sweep ≥ 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 10log(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) = Measured Value(dBm) + ATT loss(dB) + Cable loss(dB) + Duty Cycle Factor(dB)

Note

1. Spectrum Measured Levels are not plot data.

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

   cable combination.

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

Band	Loss(dB)
UNII 1	11.87
UNII 2A	11.87
UNII 2C	11.87
UNII 3	11.87

(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
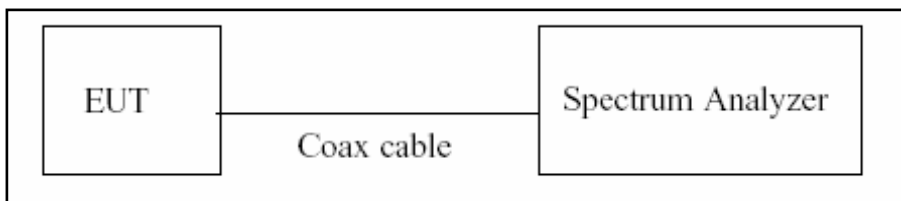
Test Procedure

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 ≥ 3 MHz

4. Number of points in sweep ≥ 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) = Measured Value(dBm) + ATT loss(dB) + Cable loss(dB) + Duty Cycle Factor(dB)

Note

1. Spectrum Measured Levels are not plot data.

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

   cable combination.

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

Band	Loss(dB)
UNII 1	11.87
UNII 2A	11.87
UNII 2C	11.87
UNII 3	11.87

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

8.5. Frequency Stability

Limit

Maintained within the band

Test Configuration
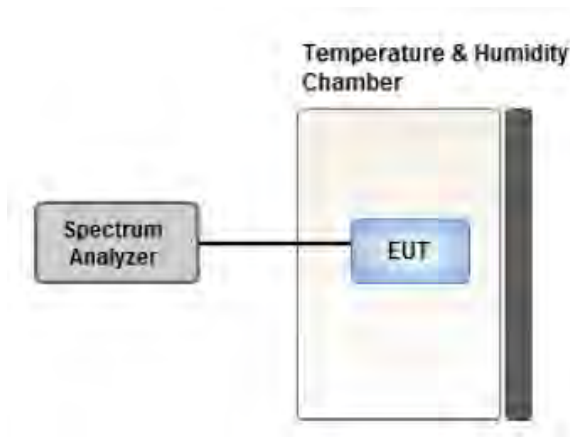
Test Procedure

1. The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between -30 ℃ and 50 ℃.

2. The temperature was incremented by 10 ℃ 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 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56[a]	56 to 46[a]
0.50 to 5	56	46
5 to 30	60	50

[a]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) = Measured 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.

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

Below 30 MHz
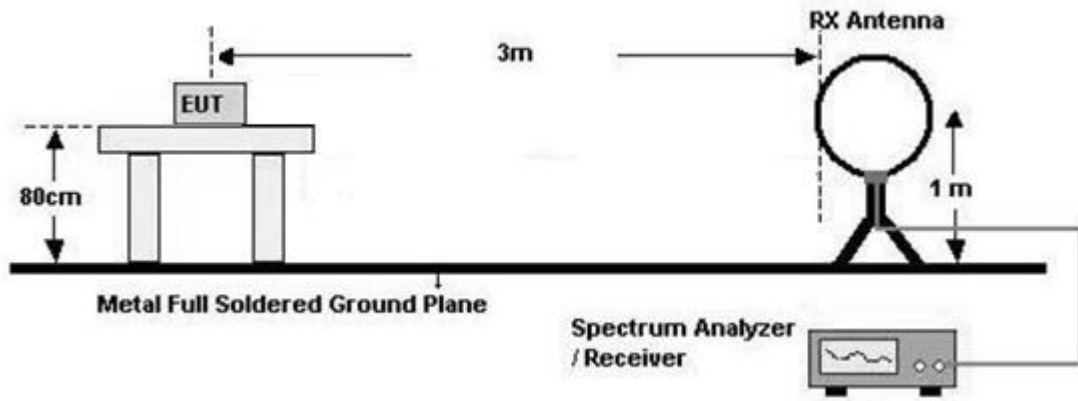
30 MHz - 1 GHz
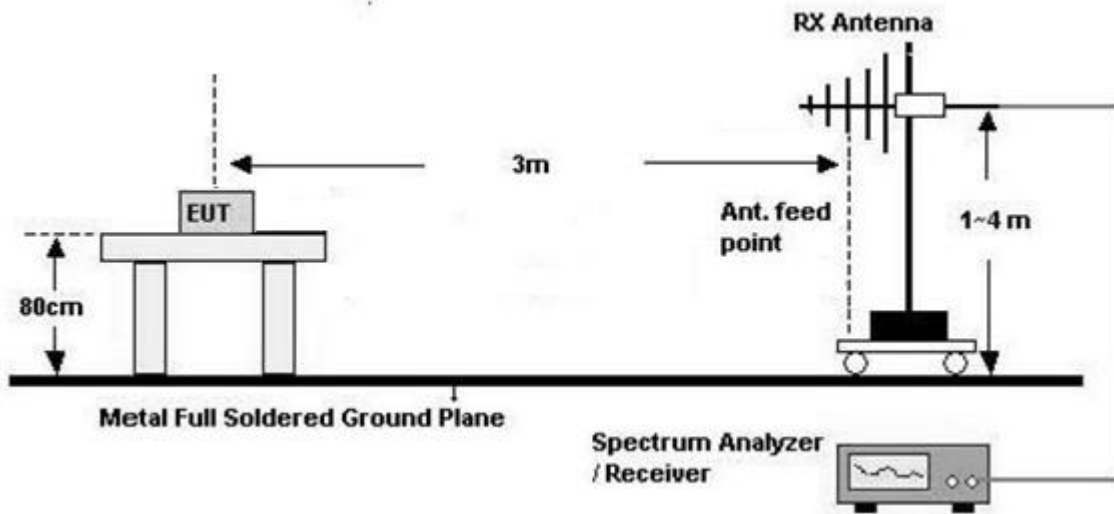
Above 1 GHz
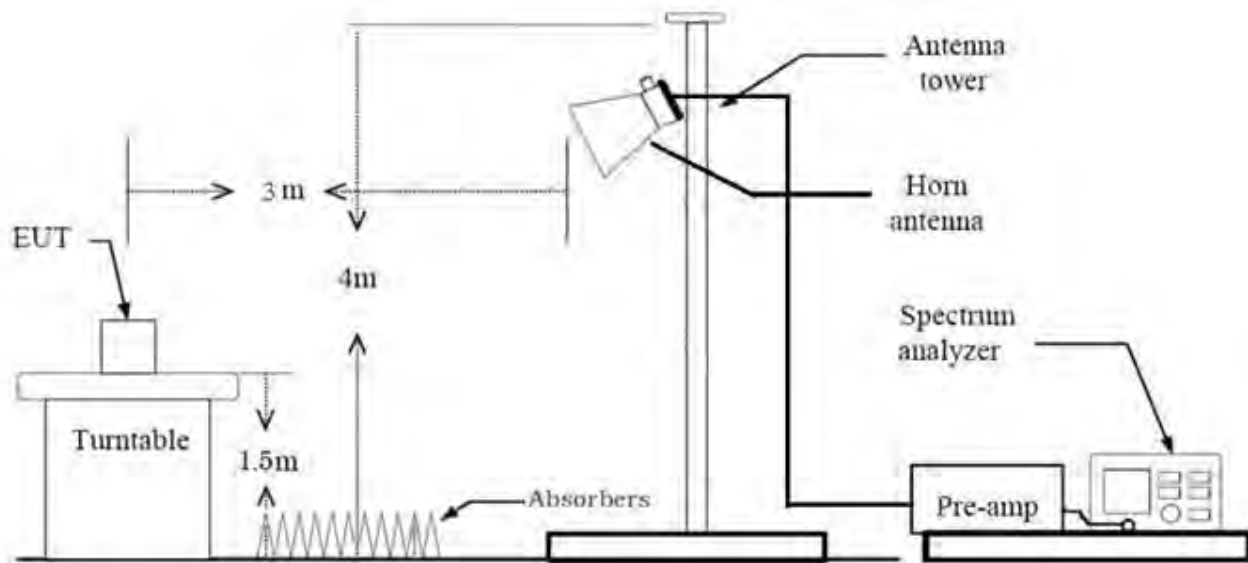
Test Procedure of Radiated spurious emissions(Below 30 MHz)

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

2. The loop antenna was placed at a location 3 m from the EUT

3. The EUT is placed on a turntable, which is 0.8 m 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) = 40log(3 m/300 m) = - 80 dB

    Measurement Distance : 3 m

7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40log(3 m/30 m) = - 40 dB

    Measurement Distance : 3 m

8. Spectrum Setting

        - Frequency Range = 9 kHz ~ 30 MHz

        - Detector = Peak

        - Trace = Maxhold

        - RBW = 9 kHz

        - VBW ≥ 3 x RBW

9. Total = Measured 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 1 GHz)

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 0.8 m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1 m to 4 m 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 ≥ 3 x 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 = Measured 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 1 m to 4 m 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 ≥ 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 ≥ 98 %) = VBW ≤ RBW/100(i.e., 10 kHz) but not less than 10 Hz.
      - VBW(Duty cycle is < 98 %) = VBW ≥ 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 %
        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 = 20log (test distance / specific distance) (dB)

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

The actual setting value of VBW

Mode		Worst Data rate	Duty Cycle	Duty Cycle Factor (dB)	The actual setting value of VBW (Hz)
SISO/MIMO	802.11a	6 Mbps	0.916	0.379	1000
SISO	802.11n(HT20)	MCS 0	0.918	0.374	1000
	802.11n(HT40)	MCS 0	0.860	0.654	3000
	802.11ac(VHT20)	MCS 0	0.918	0.372	1000
	802.11ac(VHT40)	MCS 0	0.850	0.707	3000
	802.11ac(VHT80)	MCS 0	0.738	1.321	3000
MIMO	802.11n(HT20)	MCS 8	0.876	0.575	3000
	802.11n(HT40)	MCS 8	0.751	1.245	3000
	802.11ac(VHT20)	MCS 0	0.855	0.680	3000
	802.11ac(VHT40)	MCS 0	0.739	1.314	3000
	802.11ac(VHT80)	MCS 0	0.620	2.075	10000

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 1 m to 4 m 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 ≥ 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.c in KDB 789033 v02r01):

    - Detector = RMS

    - Averaging type = power (*i.e.*, RMS)

    - RBW = 1 MHz

    - VBW ≥ 3 MHz

    - Sweep time = auto.

    - Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of $1/x$, where x is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—rather than turning on and off with the transmit cycle, at least 100 traces shall be averaged.)

    - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.

    - Duty Cycle Factor (dB) : Please refer to the please refer to section 10.1.

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 = 20log (test distance / specific distance) (dB)

11. Measured Frequency Range :

   - 4 500 MHz ~ 5 150 MHz

   - 5 350 MHz ~ 5 460 MHz

   - Measurement Result

   1) Total(Measurement Type : Peak)

    = Measured value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

   2) Total(Measurement Type : Average, Duty cycle ≥ 98 %)

    = Measured value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

   3) Total(Measurement Type : Average, Duty cycle < 98 %)

    = Measured value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty Cycle Factor

13. Measured Frequency Range :

   - 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)

   - Measurement Result

   1) Total(Measurement Type : Peak)

    = Measured value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – Amp Gain(A.G)

   2) Total(Measurement Type : Average, Duty cycle ≥ 98 %)

    = Measured value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – Amp Gain(A.G)

   3) Total(Measurement Type : Average, Duty cycle < 98 %)

    = Measured value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – Amp Gain(A.G)

   + Duty Cycle Factor

8.8. 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, Standalone + External accessories(Earphone, etc)

   - Worstcase : Stand alone

2. EUT Axis

   - Radiated Spurious Emissions : Y

   - Radiated Restricted Band Edge : Y

3. All datarate of operation were investigated and the worst case datarate results are reported.

   - Mode : SISO(Ant. 2), MIMO(SDM), MIMO(CDD)

   - Worstcase : MIMO

   - 802.11a : 6 Mbps(CDD)

   - 802.11n_HT20 : MCS8(SDM)

   - 802.11n_HT40 : MCS8(SDM)

   - 802.11ac_VHT20 : MCS0(SDM)

   - 802.11ac_VHT40 : MCS0(SDM)

   - 802.11ac_VHT80 : MCS0(SDM)

4. Radiated Spurious Emission

   - All modulation of operation were investigated and the worst case modulation results are reported.

     (Worstcase : 802.11a_6Mbps MIMO)

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

AC Power line Conducted Emissions

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

   - Mode : Stand alone + External accessories(Earphone,etc) + Travel Adapter,

           Standalone + Travel Adapter

   - Worstcase : Standalone + Travel Adapter

Conducted test

1. All datarate of operation were investigated and the worst case datarate results are reported.

9. SUMMARY OF TEST RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26 dB Bandwidth	§15.407	N/A	Conducted	PASS
6 dB Bandwidth	§15.407(e)	>500 kHz (5725-5850 MHz)(UNII-3)		PASS
Maximum Conducted Output Power	§15.407(a)(1),(2),(3)	< 250 mW(5150-5250 MHz) < 250 mW or $11+10\log_{10}$ (BW) dBm (5250-5350 MHz) < 250 mW or $11+10\log_{10}$ (BW) dBm (5470-5725 MHz) <1 W (5725-5850 MHz)		PASS
Maximum 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
AC Conducted Emissions 150 kHz-30 MHz	15.207 15.407(b)(9)	<FCC 15.207 limits		PASS
Frequency Stability	§15.407(g) §2.1055	Maintained within the band		PASS
Undesirable Emissions	§15.407(b) (1),(2),(3),(4)	<-27 dBm/MHz EIRP (UNII1, 2A, 2C)	Radiated	PASS
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

10. TEST RESULT

10.1 DUTY CYCLE

[SISO/MIMO(CDD)]

Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11a	6	1.425	1.555	0.916	0.379
	9	0.958	1.069	0.896	0.478
	12	0.719	0.821	0.877	0.572
	18	0.491	0.593	0.829	0.814
	24	0.375	0.481	0.779	1.085
	36	0.253	0.364	0.697	1.568
	48	0.198	0.296	0.669	1.748
	54	0.182	0.284	0.643	1.919

[SISO]

Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	1.335	1.455	0.918	0.374
	1	0.689	0.790	0.872	0.596
	2	0.471	0.588	0.802	0.960
	3	0.360	0.481	0.747	1.265
	4	0.258	0.355	0.729	1.375
	5	0.198	0.293	0.674	1.715
	6	0.182	0.289	0.631	1.999
	7	0.167	0.269	0.623	2.058
802.11n (HT40)	0	0.664	0.772	0.860	0.654
	1	0.350	0.471	0.742	1.296
	2	0.248	0.350	0.710	1.487
	3	0.198	0.306	0.647	1.892
	4	0.142	0.233	0.608	2.160
	5	0.117	0.203	0.574	2.410
	6	0.106	0.201	0.529	2.763
	7	0.101	0.200	0.507	2.953

Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11ac (VHT20)	0	1.341	1.461	0.918	0.372
	1	0.694	0.811	0.856	0.674
	2	0.471	0.593	0.795	0.997
	3	0.370	0.476	0.777	1.098
	4	0.263	0.377	0.699	1.553
	5	0.203	0.295	0.686	1.635
	6	0.187	0.289	0.649	1.877
	7	0.167	0.262	0.637	1.956
	8	0.152	0.242	0.629	2.013
802.11ac (VHT40)	0	0.667	0.785	0.850	0.707
	1	0.355	0.471	0.753	1.234
	2	0.248	0.370	0.671	1.731
	3	0.198	0.299	0.661	1.798
	4	0.147	0.238	0.619	2.085
	5	0.122	0.228	0.533	2.730
	6	0.111	0.225	0.495	3.050
	7	0.101	0.213	0.476	3.224
	8	0.096	0.213	0.452	3.445
	9	0.091	0.208	0.439	3.575
802.11ac (VHT80)	0	0.332	0.450	0.738	1.321
	1	0.187	0.304	0.617	2.099
	2	0.137	0.253	0.540	2.676
	3	0.117	0.233	0.500	3.010
	4	0.091	0.190	0.480	3.185
	5	0.076	0.177	0.429	3.680
	6	0.076	0.187	0.405	3.921
	7	0.071	0.179	0.396	4.020
	8	0.066	0.167	0.396	4.027
	9	0.066	0.167	0.394	4.046

[MIMO(SDM)]

Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	0.692	0.790	0.876	0.575
	1	0.370	0.486	0.760	1.189
	2	0.258	0.380	0.680	1.675
	3	0.203	0.324	0.625	2.041
	4	0.152	0.274	0.556	2.553
	5	0.127	0.242	0.523	2.812
	6	0.117	0.238	0.489	3.104
	7	0.106	0.233	0.457	3.405
802.11n (HT40)	0	0.356	0.474	0.751	1.243
	1	0.198	0.319	0.619	2.083
	2	0.147	0.258	0.569	2.452
	3	0.122	0.238	0.511	2.919
	4	0.096	0.213	0.452	3.445
	5	0.079	0.195	0.405	3.924
	6	0.076	0.194	0.392	4.070
	7	0.076	0.193	0.394	4.047

| Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11ac (VHT20)	0	0.696	0.814	0.855	0.680
	1	0.370	0.497	0.745	1.279
	2	0.263	0.365	0.722	1.413
	3	0.208	0.325	0.640	1.941
	4	0.157	0.269	0.585	2.329
	5	0.127	0.221	0.574	2.409
	6	0.122	0.236	0.515	2.880
	7	0.111	0.229	0.488	3.117
	8	0.101	0.218	0.466	3.319
802.11ac (VHT40)	0	0.360	0.488	0.738	1.321
	1	0.203	0.304	0.667	1.761
	2	0.152	0.261	0.582	2.348
	3	0.127	0.243	0.521	2.833
	4	0.101	0.218	0.465	3.324
	5	0.081	0.182	0.444	3.522
	6	0.081	0.208	0.390	4.087
	7	0.076	0.200	0.380	4.202
	8	0.071	0.187	0.378	4.221
	9	0.071	0.187	0.378	4.221
802.11ac (VHT80)	0	0.192	0.310	0.619	2.081
	1	0.122	0.238	0.511	2.919
	2	0.096	0.213	0.452	3.445
	3	0.086	0.203	0.425	3.716
	4	0.071	0.172	0.412	3.854
	5	0.061	0.172	0.353	4.523
	6	0.066	0.182	0.361	4.424
	7	0.061	0.179	0.340	4.689
	8	0.061	0.177	0.343	4.649
	9	0.056	0.175	0.318	4.969

Note:

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

◉ **Test Plots [SISO]**

802.11a	802.11n(HT20)
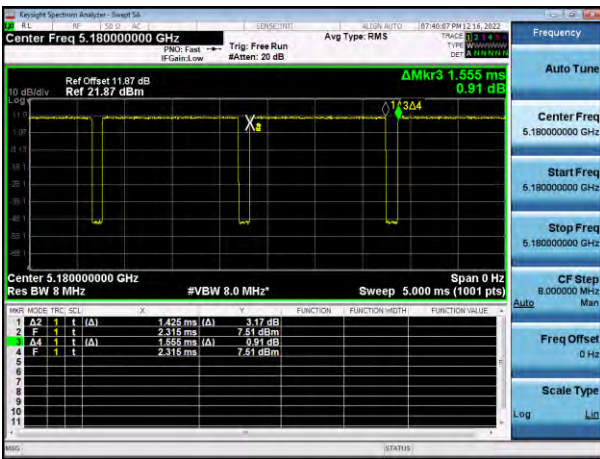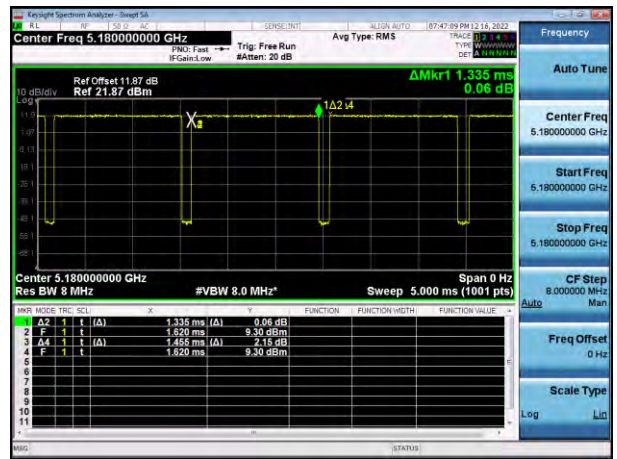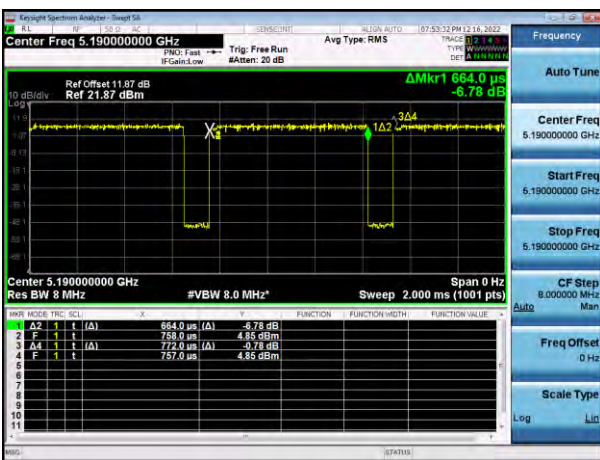
802.11n(HT40)	802.11ac(VHT20)
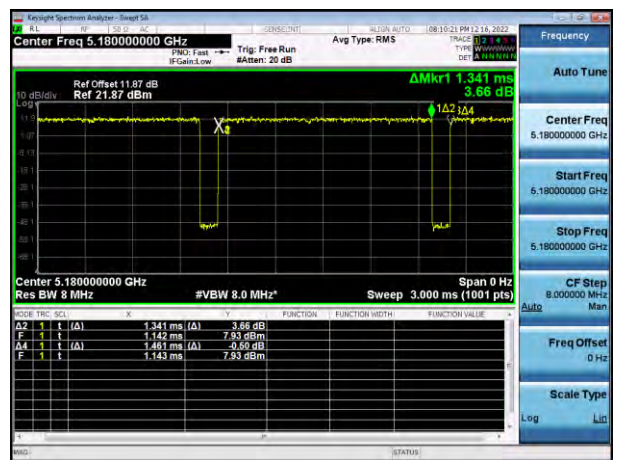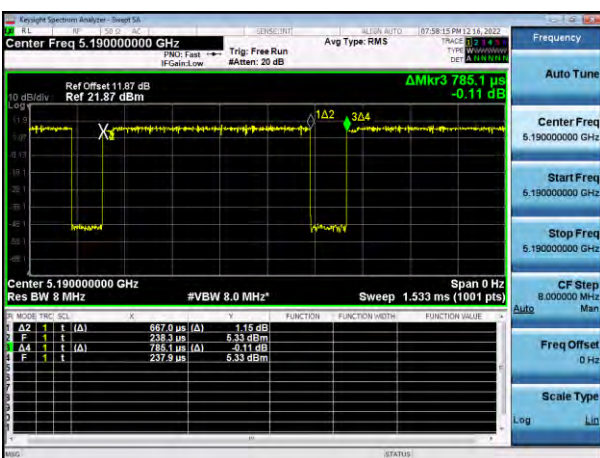
802.11ac(VHT40)	802.11ac(VHT80)
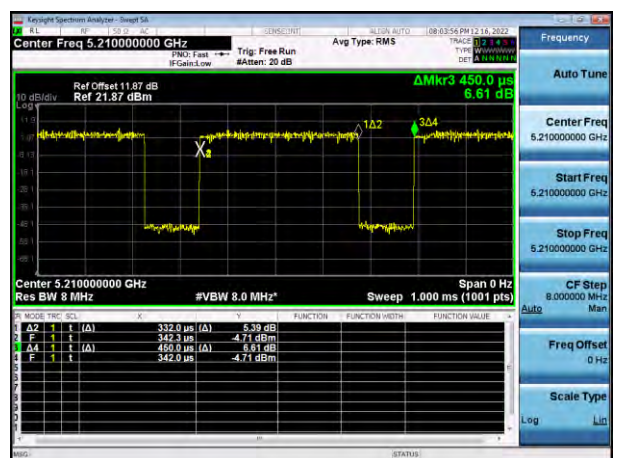
☑ **Test Plots [MIMO]**

802.11a	802.11n(HT20)
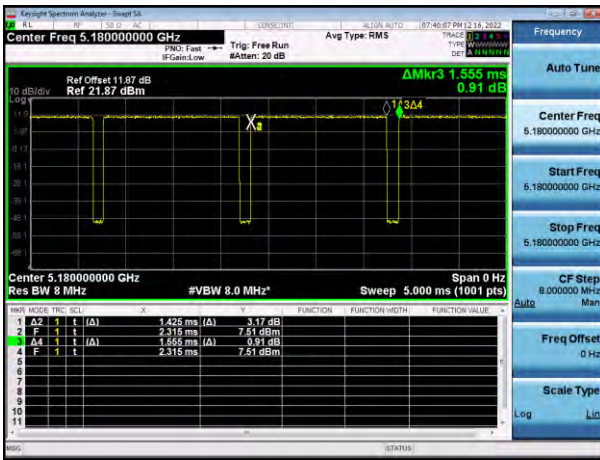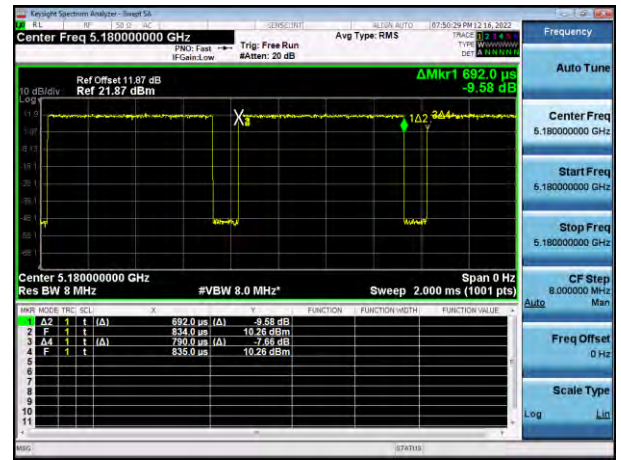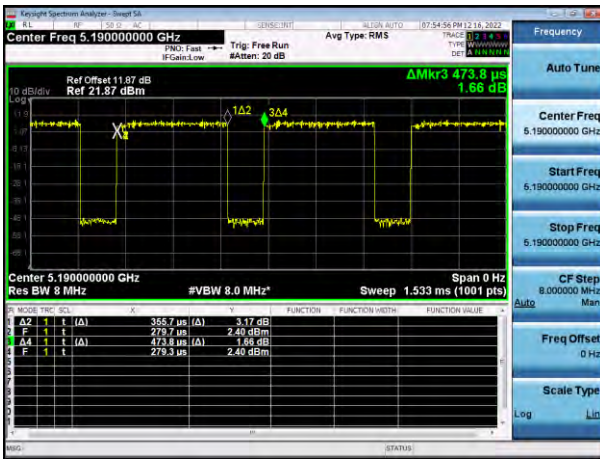
802.11n(HT40)	802.11ac(VHT20)
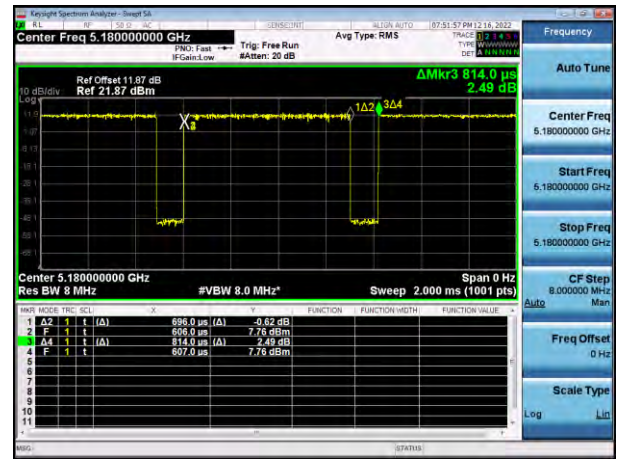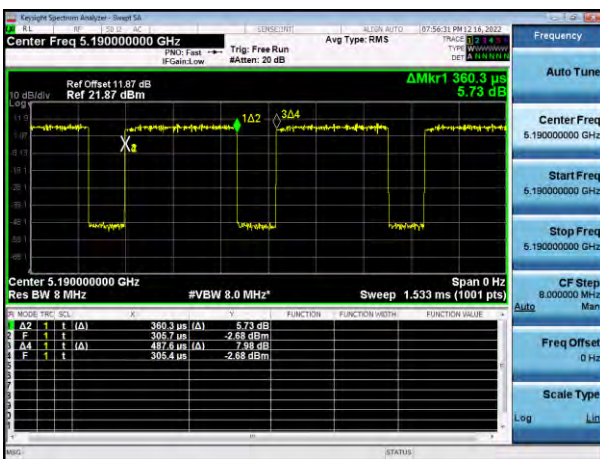
802.11ac(VHT40)	802.11ac(VHT80)
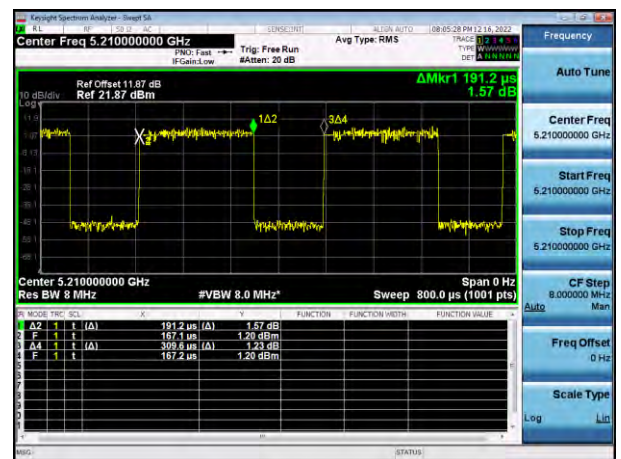
10.2 26 dB Bandwidth

Straddle channel data in the table below are for reporting purposes only. Straddle channel data were added in section 10.7.1.

[SISO Ant.2]

802.11a Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	28.03	18.174
5200	40	26.31	18.014
5240	48	25.45	17.995
5260	52	26.75	18.158
5300	60	29.24	18.018
5320	64	29.32	18.215
5500	100	27.06	18.050
5600	120	26.77	17.966
5720	144	24.94	18.197
5745	149	29.01	18.066
5785	157	27.50	18.088
5825	165	27.53	18.045

802.11n(HT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	30.47	19.587
5200	40	30.28	19.407
5240	48	29.88	19.125
5260	52	30.58	19.636
5300	60	29.43	19.418
5320	64	30.27	19.258
5500	100	30.18	19.640
5600	120	30.64	19.378
5720	144	30.19	19.419
5745	149	30.50	19.537
5785	157	30.56	19.390
5825	165	30.45	19.142

802.11n(HT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	46.73	36.763
5230	46	45.07	36.828
5270	54	45.87	36.881
5310	62	46.40	36.714
5510	102	45.66	36.708
5590	118	45.91	36.784
5710	142	44.98	36.818
5755	151	46.09	36.731
5795	159	**47.17**	36.843

802.11ac(VHT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	30.67	19.508
5200	40	30.34	19.252
5240	48	30.19	19.502
5260	52	30.37	19.753
5300	60	30.24	19.638
5320	64	30.60	19.646
5500	100	30.67	19.290
5600	120	30.29	19.397
5720	144	30.36	19.408
5745	149	30.66	19.467
5785	157	30.47	19.351
5825	165	30.34	19.355

802.11ac(VHT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	46.08	36.834
5230	46	45.22	36.816
5270	54	46.35	36.894
5310	62	46.41	36.786
5510	102	45.72	36.781
5590	118	46.37	36.866
5710	142	45.61	36.793
5755	151	46.20	36.833
5795	159	46.45	36.929

802.11ac(VHT80) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	87.40	76.157
5290	58	87.82	76.277
5530	106	86.80	76.350
5610	122	88.22	76.148
5690	138	89.00	76.305
5775	155	86.55	76.270

[MIMO Ant.1]

802.11a Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	27.09	18.037
5200	40	29.25	18.322
5240	48	28.01	18.239
5260	52	27.49	18.044
5300	60	27.67	18.068
5320	64	29.34	18.271
5500	100	29.17	18.132
5600	120	28.97	18.055
5720	144	27.64	18.206
5745	149	27.13	17.898
5785	157	25.99	18.131
5825	165	25.91	18.179

802.11n(HT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	30.42	19.329
5200	40	30.61	19.224
5240	48	30.19	19.055
5260	52	30.57	18.969
5300	60	30.51	19.236
5320	64	30.03	18.809
5500	100	30.42	19.059
5600	120	30.23	19.091
5720	144	30.30	19.083
5745	149	30.25	19.056
5785	157	30.50	18.960
5825	165	30.05	19.004

802.11n(HT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	45.85	36.787
5230	46	47.17	36.888
5270	54	46.55	36.768
5310	62	45.86	36.738
5510	102	47.77	36.798
5590	118	46.61	36.786
5710	142	45.77	36.775
5755	151	47.31	36.801
5795	159	46.45	36.900

802.11ac(VHT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	29.99	19.004
5200	40	30.47	19.081
5240	48	29.82	19.069
5260	52	29.54	18.980
5300	60	29.96	19.026
5320	64	30.11	18.918
5500	100	30.46	18.875
5600	120	29.22	18.969
5720	144	30.62	18.913
5745	149	29.90	18.922
5785	157	28.82	18.950
5825	165	29.94	18.935

802.11ac(VHT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	45.94	36.896
5230	46	46.18	36.769
5270	54	44.91	36.793
5310	62	45.89	36.701
5510	102	46.63	36.809
5590	118	45.19	36.711
5710	142	45.78	36.701
5755	151	45.38	36.950
5795	159	46.47	36.912

802.11ac(VHT80) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	86.98	76.344
5290	58	86.03	76.193
5530	106	85.86	76.161
5610	122	86.07	76.115
5690	138	86.33	76.089
5775	155	87.50	76.168

[MIMO Ant.2]

802.11a Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	25.13	18.014
5200	40	24.13	17.720
5240	48	26.44	17.998
5260	52	27.59	18.087
5300	60	27.57	18.064
5320	64	26.15	18.077
5500	100	25.02	17.765
5600	120	25.53	17.728
5720	144	26.17	17.885
5745	149	26.00	17.693
5785	157	25.98	17.890
5825	165	24.71	17.910

802.11n(HT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	28.66	18.685
5200	40	28.74	18.610
5240	48	31.69	18.902
5260	52	28.85	19.042
5300	60	29.54	18.720
5320	64	28.40	18.890
5500	100	28.82	18.654
5600	120	28.26	18.848
5720	144	28.34	18.789
5745	149	28.74	18.926
5785	157	28.18	18.767
5825	165	28.95	18.993

802.11n(HT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	44.05	36.508
5230	46	44.27	36.522
5270	54	44.72	36.578
5310	62	44.14	36.647
5510	102	44.19	36.596
5590	118	43.33	36.515
5710	142	44.84	36.537
5755	151	45.25	36.560
5795	159	44.34	36.572

802.11ac(VHT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	29.60	18.775
5200	40	27.58	18.744
5240	48	32.80	18.976
5260	52	30.44	19.216
5300	60	27.69	18.713
5320	64	29.19	18.810
5500	100	29.60	18.822
5600	120	29.42	18.884
5720	144	28.75	18.904
5745	149	30.21	18.825
5785	157	28.22	18.799
5825	165	30.06	18.997

802.11ac(VHT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	44.41	36.590
5230	46	44.56	36.559
5270	54	44.13	36.513
5310	62	44.74	36.565
5510	102	44.24	36.491
5590	118	44.10	36.623
5710	142	44.64	36.552
5755	151	44.36	36.472
5795	159	44.28	36.564

802.11ac(VHT80) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	85.63	76.130
5290	58	85.95	76.094
5530	106	86.34	75.961
5610	122	86.23	76.034
5690	138	86.41	76.139
5775	155	86.26	76.257

Note:

In order to simplify the report, attached plots were only the widest channel.
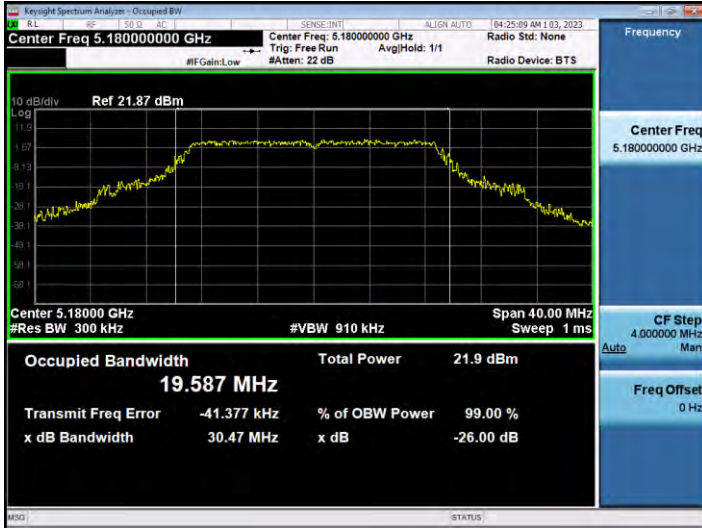
[SISO Ant. 2]

☑ Test Plots(802.11a)

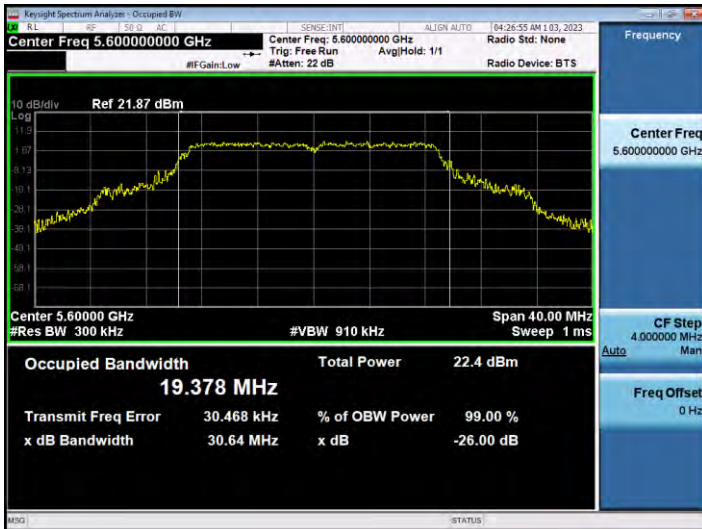| 802.11a UNII 1 BAND 26 dB Bandwidth (CH 36)	802.11a UNII 2A BAND 26 dB Bandwidth (CH 64)

802.11a UNII 2C BAND 26 dB Bandwidth (CH 100)	802.11a UNII 3 BAND 26 dB Bandwidth (CH 149)
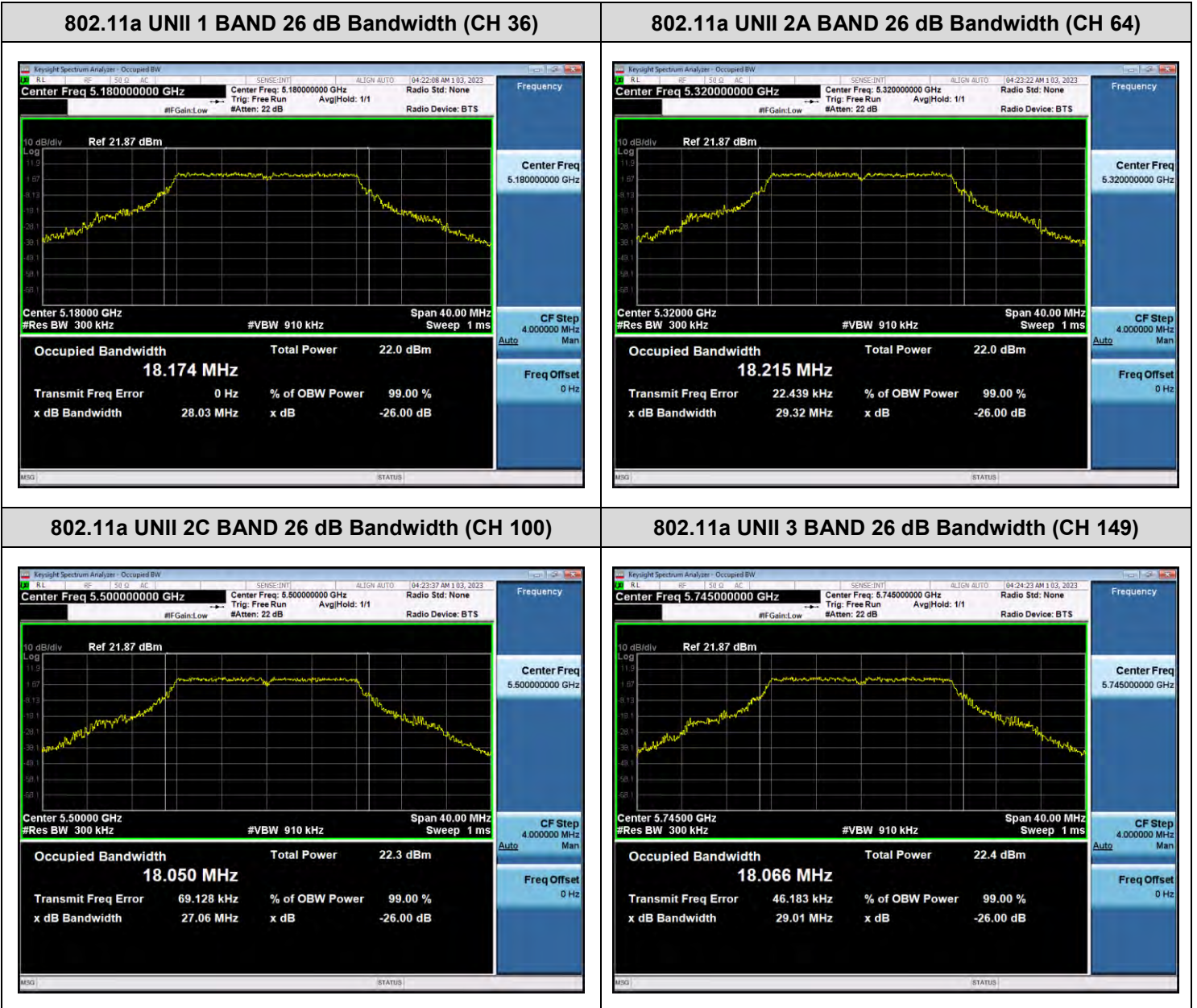
☑ Test Plots(802.11n(HT20))
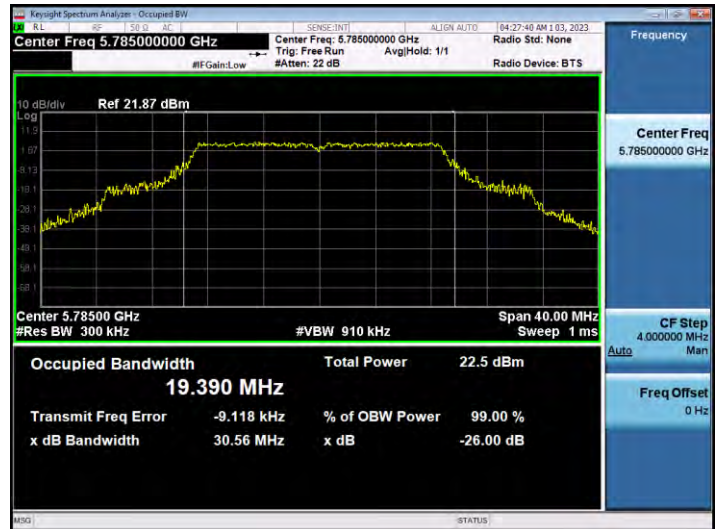
802.11n_HT20 UNII 1 BAND 26 dB Bandwidth(CH 36)	802.11n_HT20 UNII 2A BAND 26 dB Bandwidth(CH 52)

802.11n_HT20 UNII 2C BAND 26 dB Bandwidth(CH 120)	802.11n_HT20 UNII 3 BAND 26 dB Bandwidth(CH 157)

☑ Test Plots(802.11n(HT40))
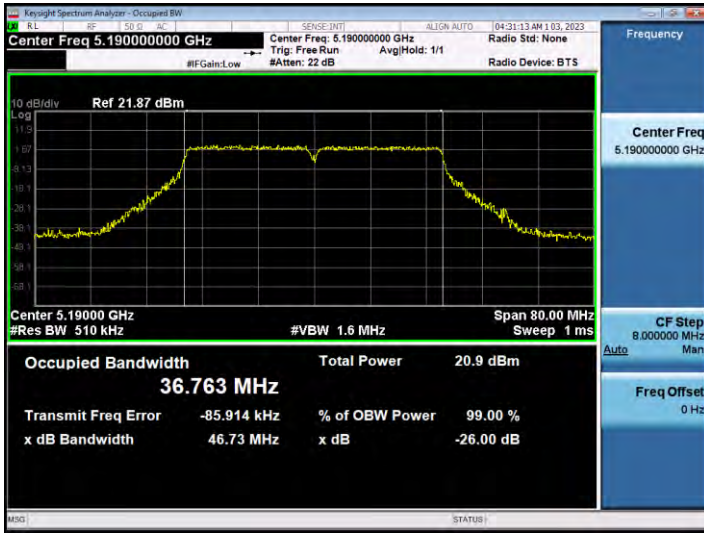
802.11n_HT40 UNII 1 BAND 26 dB Bandwidth(CH 38)	802.11n_HT40 UNII 2A BAND 26 dB Bandwidth (CH 62)

802.11n_HT40 UNII 2C BAND 26 dB Bandwidth(CH 118)	802.11n_HT40 UNII 3 BAND 26 dB Bandwidth (CH 159)
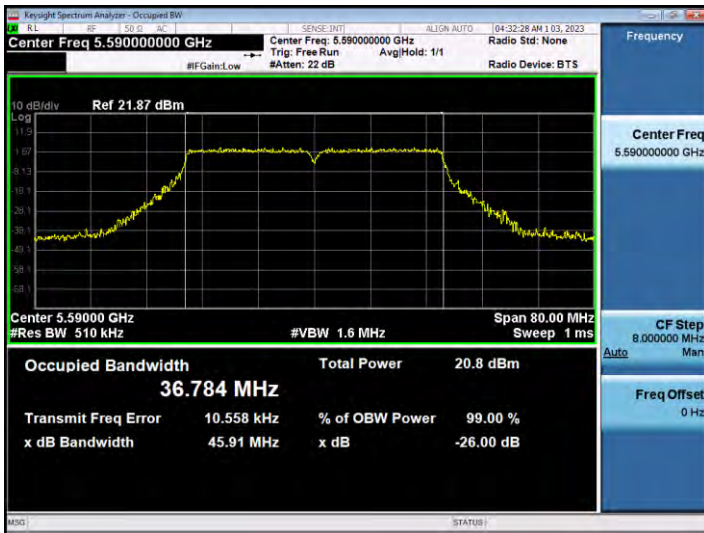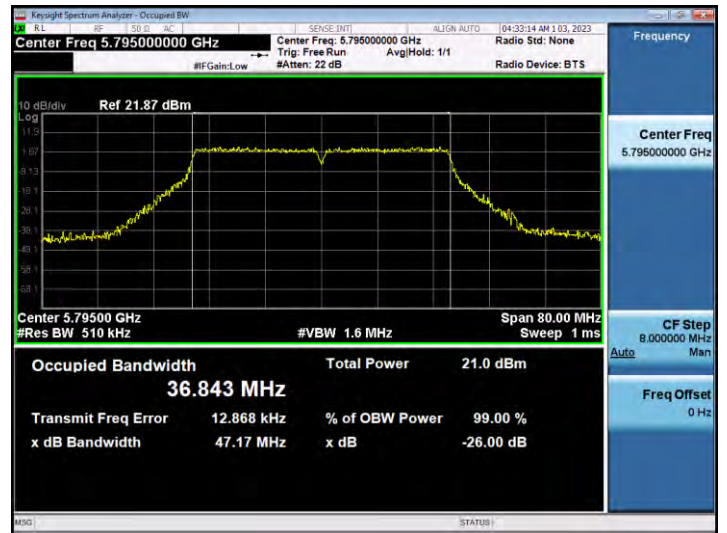
◉ Test Plots(802.11ac(VHT20))

802.11ac_VHT20 UNII 1 BAND 26 dB Bandwidth(CH 36)	802.11ac_VHT20 UNII 2A BAND 26 dB Bandwidth(CH 64)

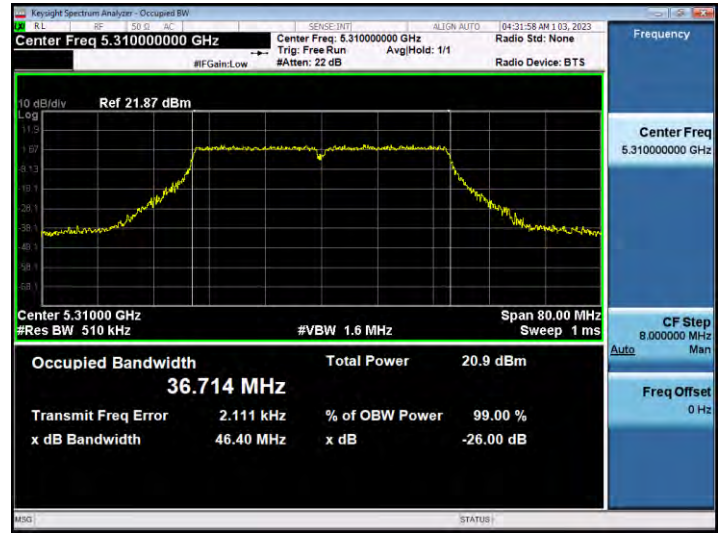| 802.11ac_VHT20 UNII 2C BAND 26 dB Bandwidth(CH 100)	802.11ac_VHT20 UNII 3 BAND 26 dB Bandwidth(CH 149)
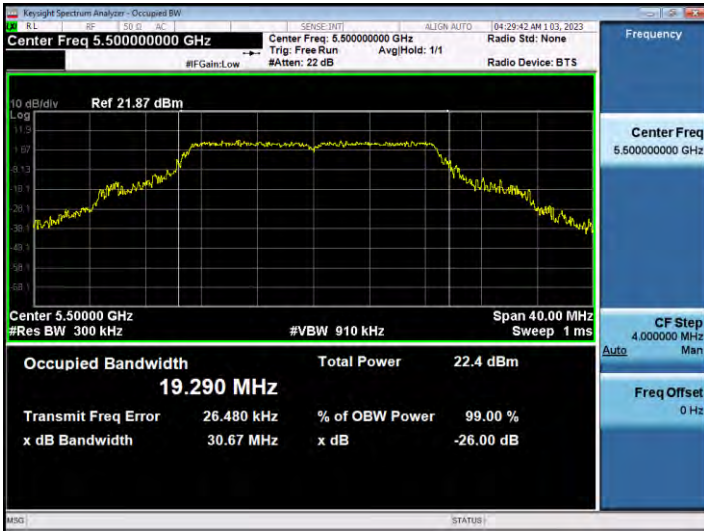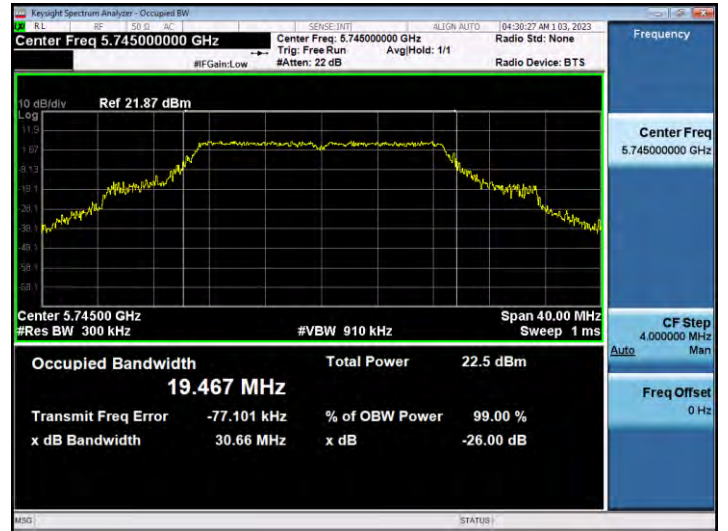
▣ Test Plots(802.11ac(VHT40))

802.11ac_VHT40 UNII 1 BAND 26 dB Bandwidth(CH 38)	802.11ac_VHT40 UNII 2A BAND 26 dB Bandwidth (CH 62)
802.11ac_VHT40 UNII 2C BAND 26 dB Bandwidth(CH 118)	**802.11ac_VHT40 UNII 3 BAND 26 dB Bandwidth (CH 159)**
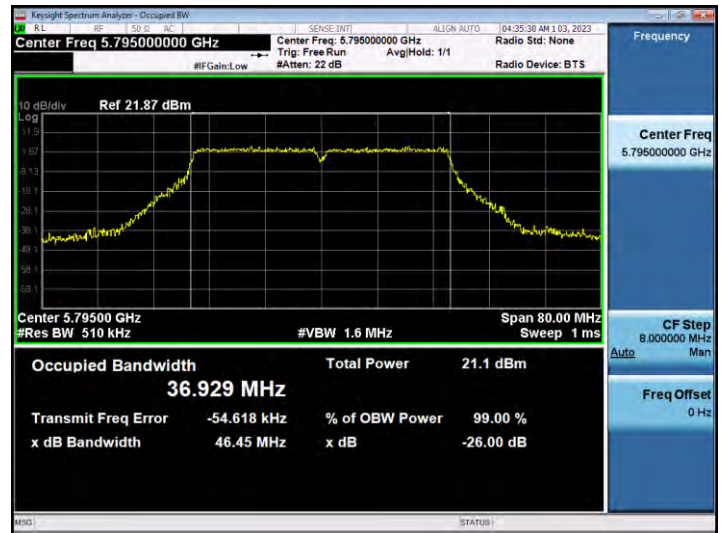
▣ Test Plots(802.11ac(VHT80))

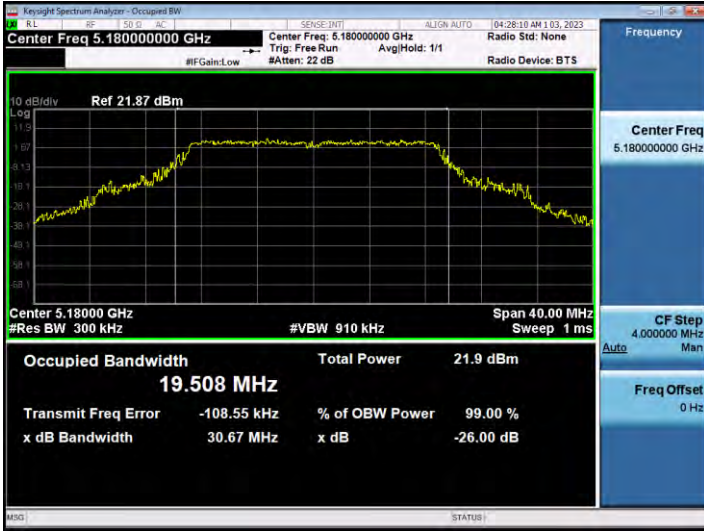| 802.11ac_VHT80 UNII 1 BAND 26 dB Bandwidth(CH 42)	802.11ac_VHT80 UNII 2A BAND 26 dB Bandwidth (CH 58)

802.11ac_VHT80 UNII 2C BAND 26 dB Bandwidth(CH 138)	802.11ac_VHT80 UNII 3 BAND 26 dB Bandwidth (CH 155)

[MIMO Ant.1]

☑ Test Plots(802.11a)
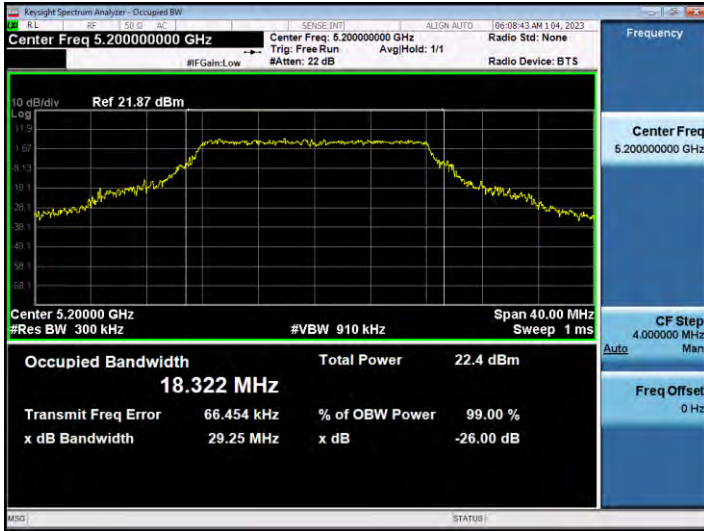
802.11a UNII 1 BAND 26 dB Bandwidth (CH 40)	802.11a UNII 2A BAND 26 dB Bandwidth (CH 64)
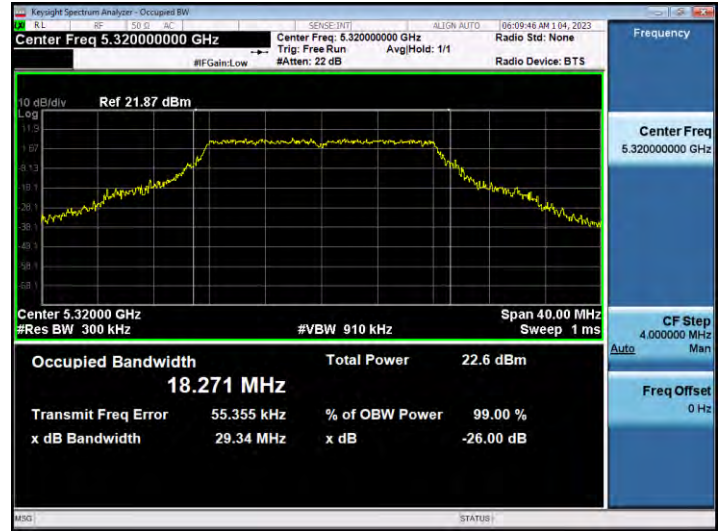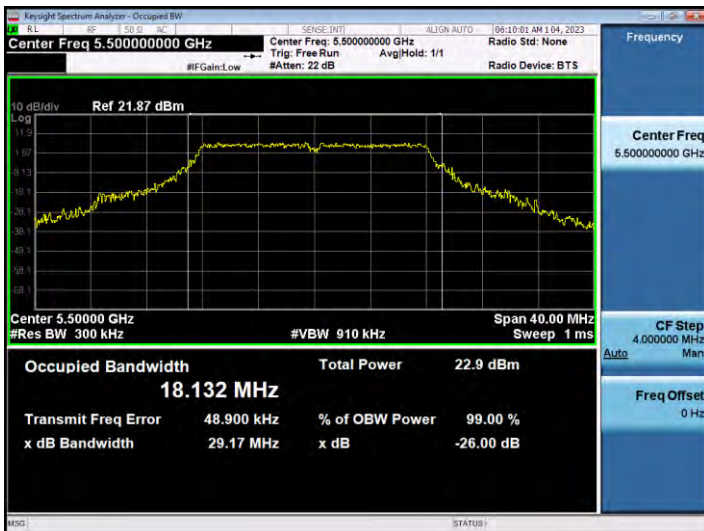
802.11a UNII 2C BAND 26 dB Bandwidth (CH 100)	802.11a UNII 3 BAND 26 dB Bandwidth (CH 149)
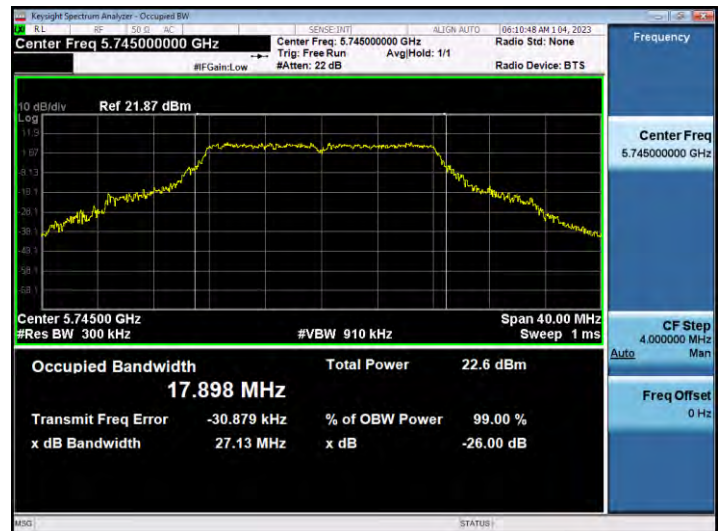
▣ Test Plots(802.11n(HT20))

802.11n_HT20 UNII 1 BAND 26 dB Bandwidth(CH 40)	802.11n_HT20 UNII 2A BAND 26 dB Bandwidth(CH 52)
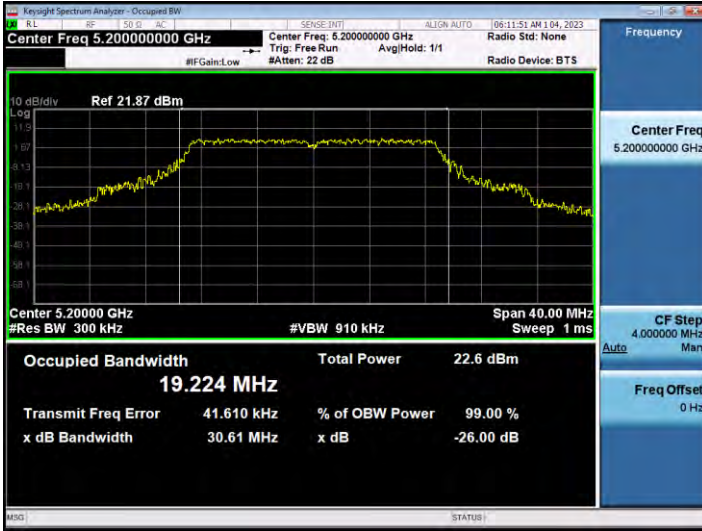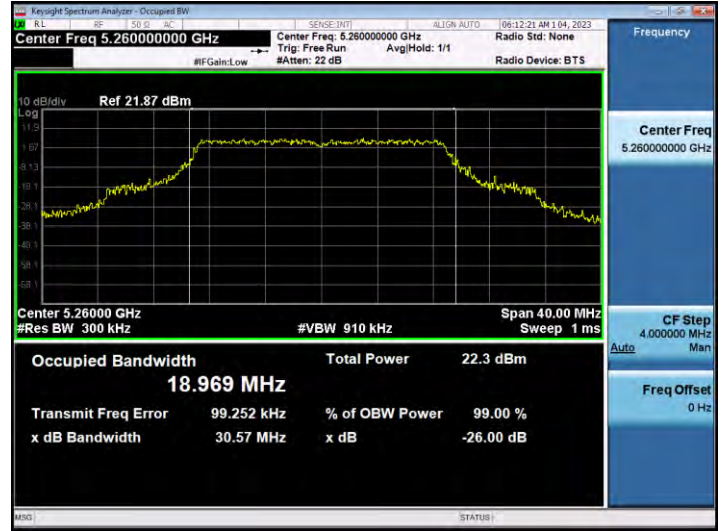
802.11n_HT20 UNII 2C BAND 26 dB Bandwidth(CH 100)	802.11n_HT20 UNII 3 BAND 26 dB Bandwidth(CH 157)
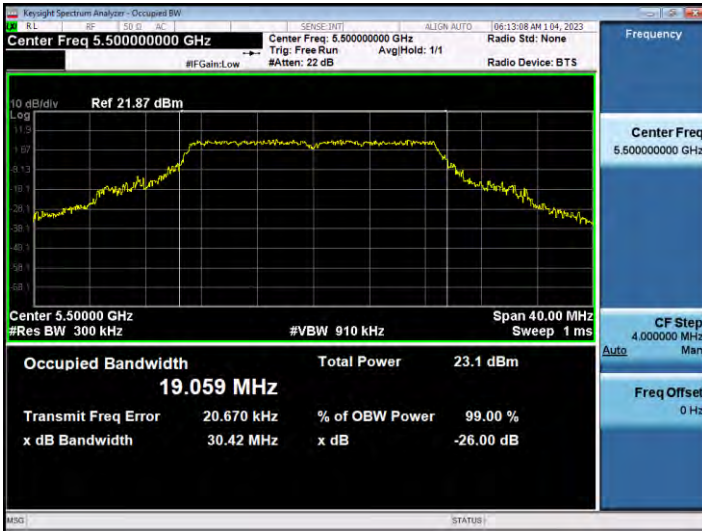
◙ Test Plots(802.11n(HT40))

802.11n_HT40 UNII 1 BAND 26 dB Bandwidth(CH 46)	802.11n_HT40 UNII 2A BAND 26 dB Bandwidth (CH 54)
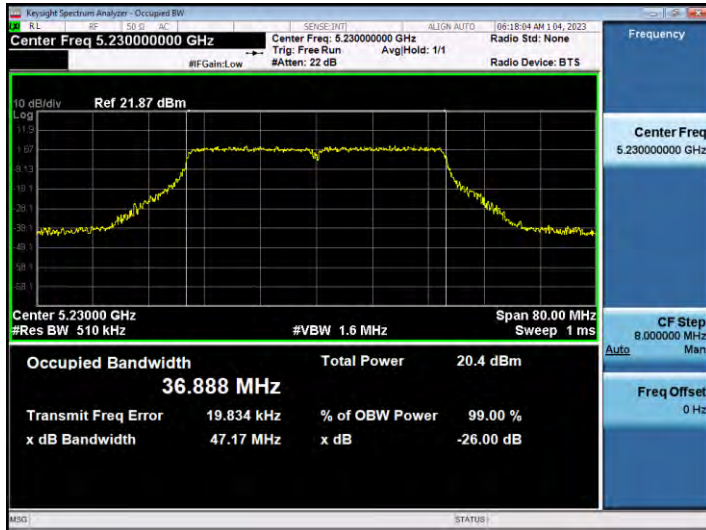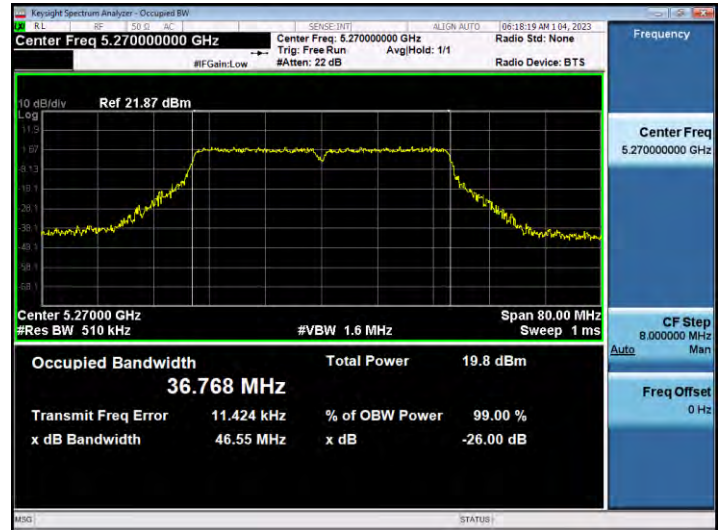
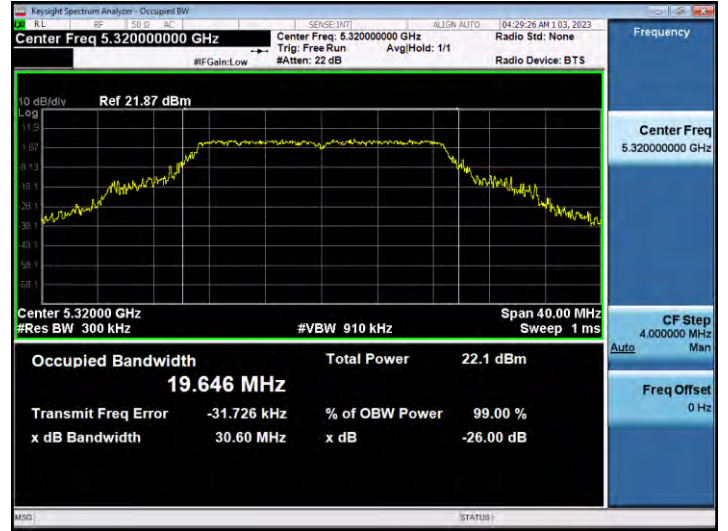| 802.11n_HT40 UNII 2C BAND 26 dB Bandwidth(CH 102)	802.11n_HT40 UNII 3 BAND 26 dB Bandwidth (CH 151)
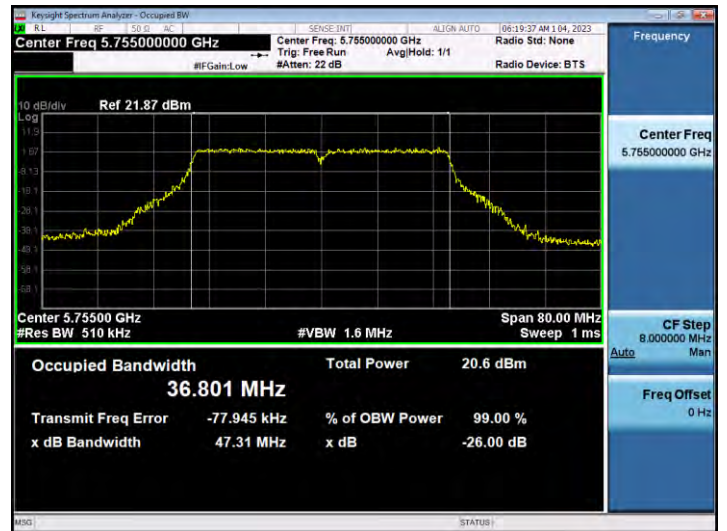
▣ Test Plots(802.11ac(VHT20))

802.11ac_VHT20 UNII 1 BAND 26 dB Bandwidth(CH 40)	802.11ac_VHT20 UNII 2A BAND 26 dB Bandwidth(CH 64)
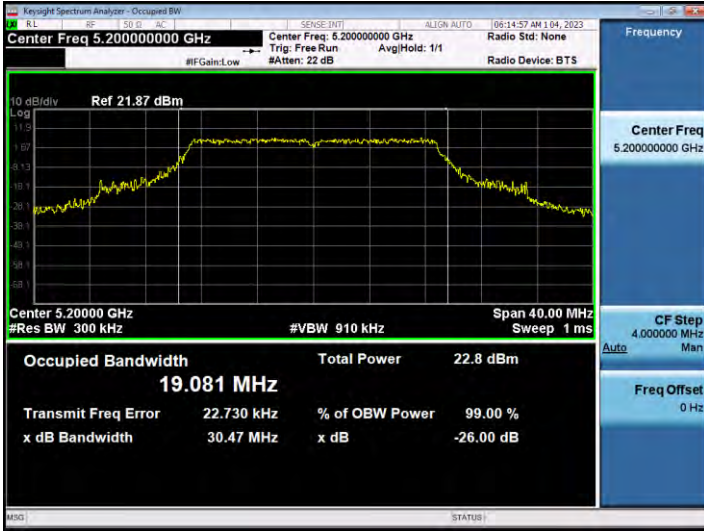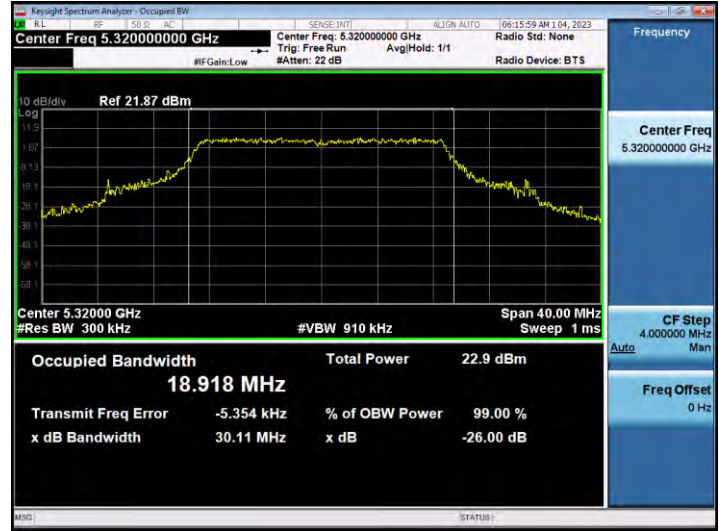
802.11ac_VHT20 UNII 2C BAND 26 dB Bandwidth(CH 144)	802.11ac_VHT20 UNII 3 BAND 26 dB Bandwidth(CH 165)
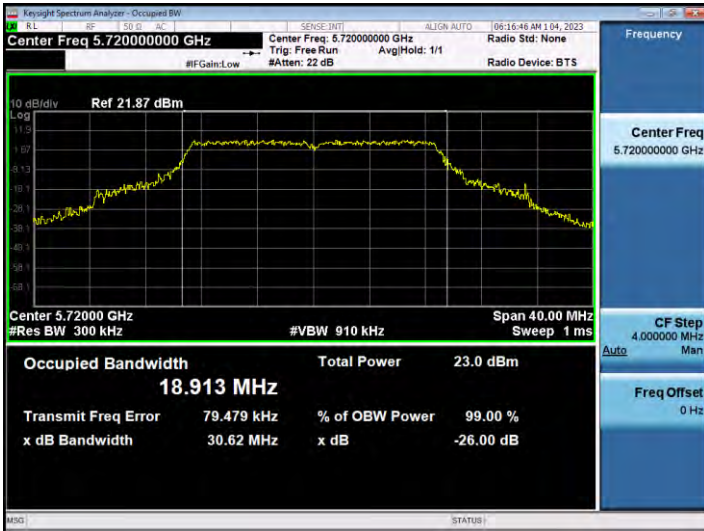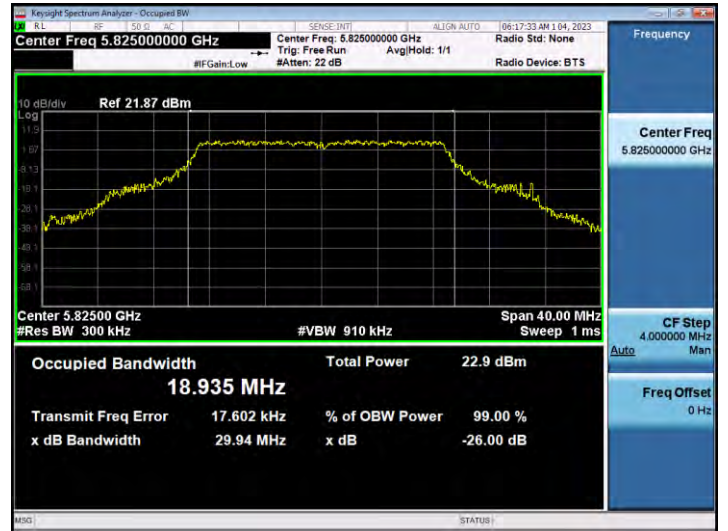
▣ Test Plots(802.11ac(VHT40))
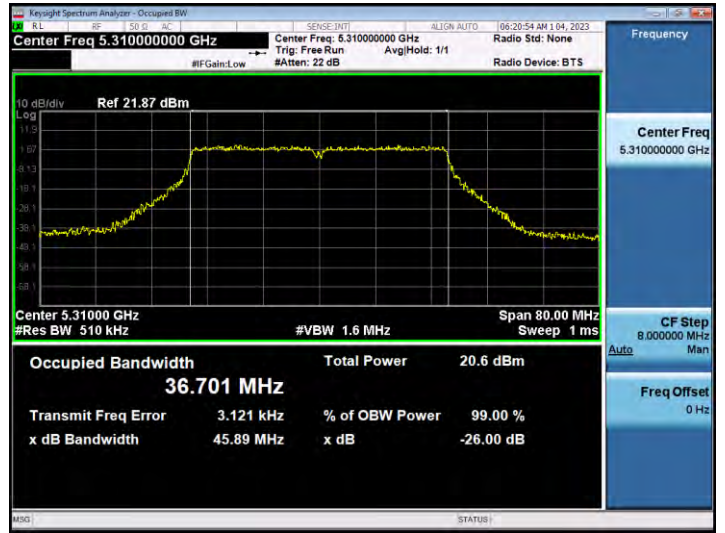
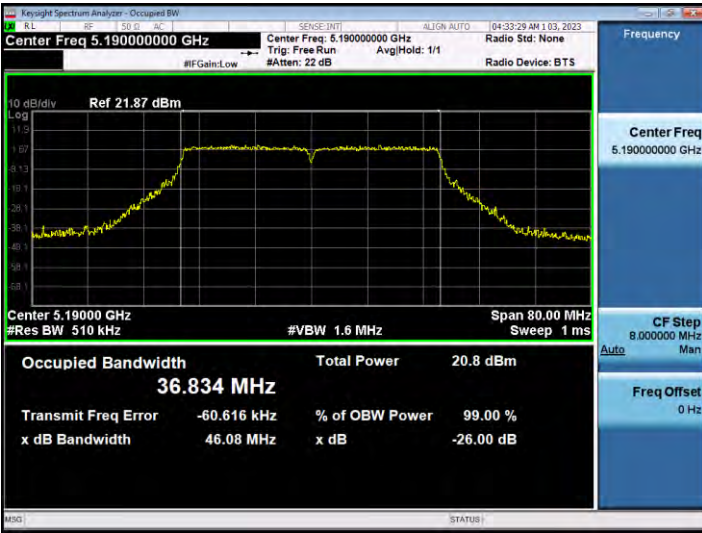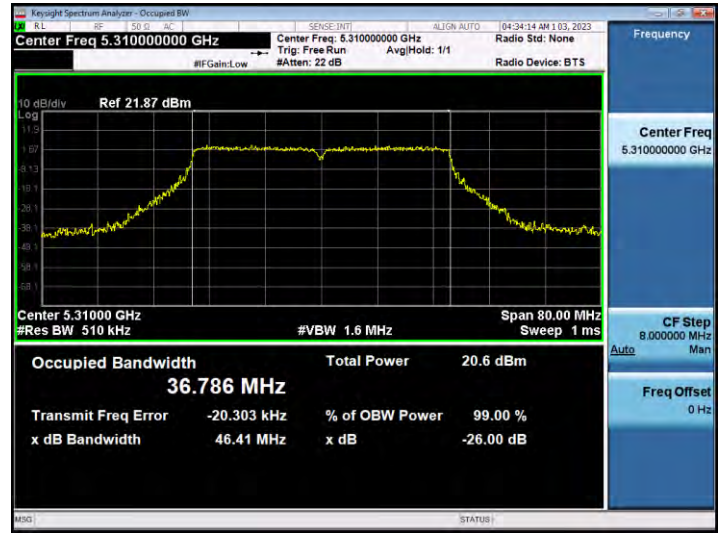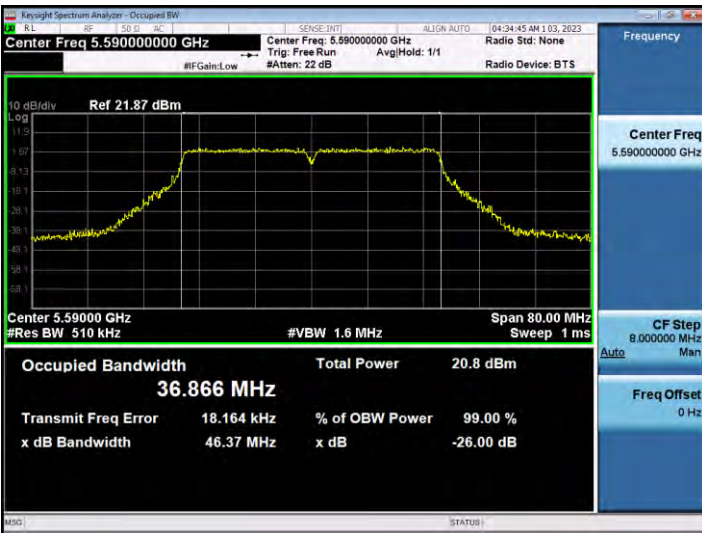| 802.11ac_VHT40 UNII 1 BAND 26 dB Bandwidth(CH 46)	802.11ac_VHT40 UNII 2A BAND 26 dB Bandwidth (CH 62)
802.11ac_VHT40 UNII 2C BAND 26 dB Bandwidth(CH 102)	802.11ac_VHT40 UNII 3 BAND 26 dB Bandwidth (CH 159)
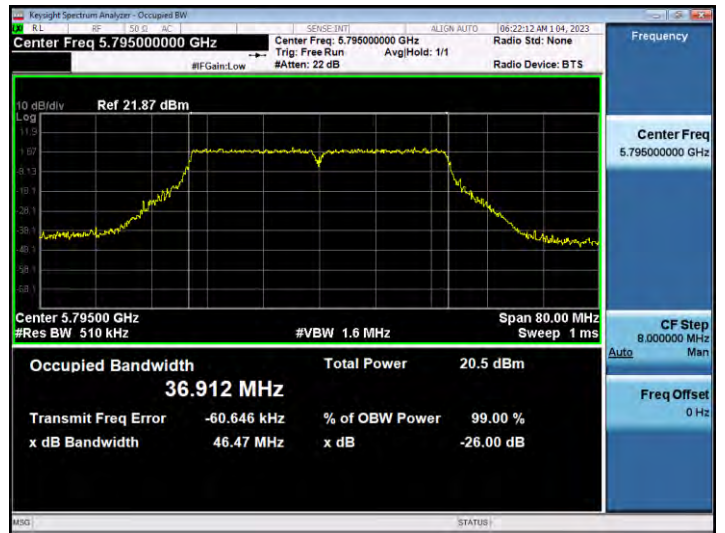
▣ Test Plots(802.11ac(VHT80))

802.11ac_VHT80 UNII 1 BAND 26 dB Bandwidth(CH 42)	802.11ac_VHT80 UNII 2A BAND 26 dB Bandwidth (CH 58)
802.11ac_VHT80 UNII 2C BAND 26 dB Bandwidth(CH 138)	802.11ac_VHT80 UNII 3 BAND 26 dB Bandwidth (CH 155)
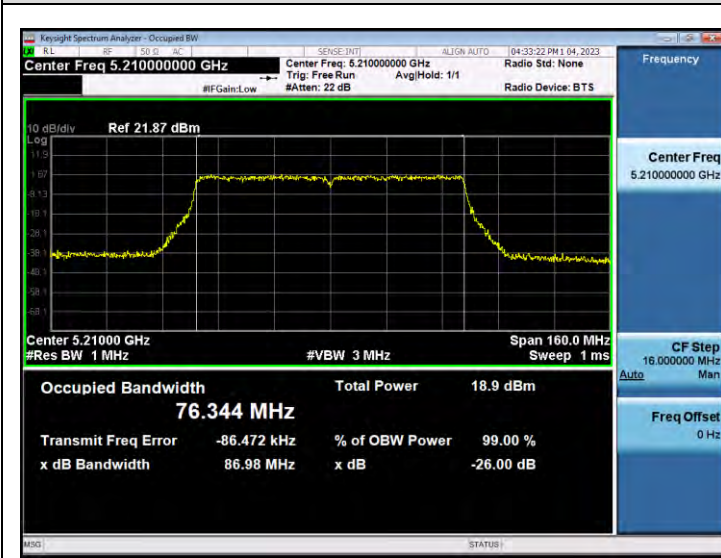
[MIMO Ant.2]

▣ Test Plots(802.11a)

802.11a UNII 1 BAND 26 dB Bandwidth (CH 48)	802.11a UNII 2A BAND 26 dB Bandwidth (CH 52)
802.11a UNII 2C BAND 26 dB Bandwidth (CH 144)	802.11a UNII 3 BAND 26 dB Bandwidth (CH 149)
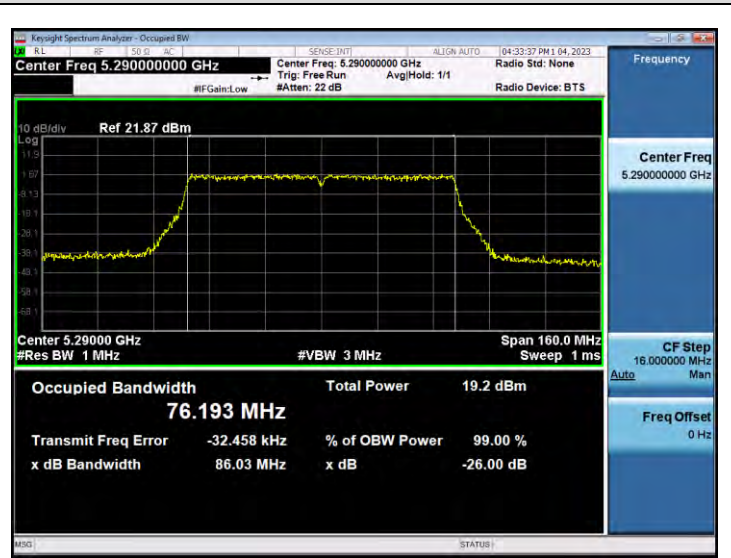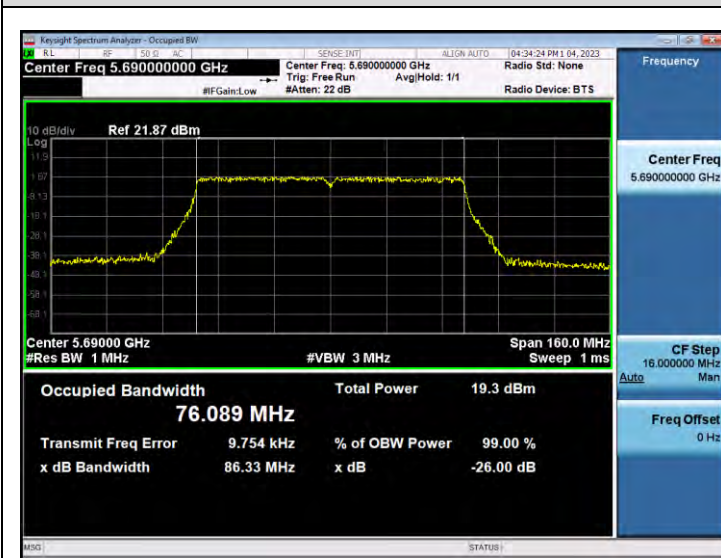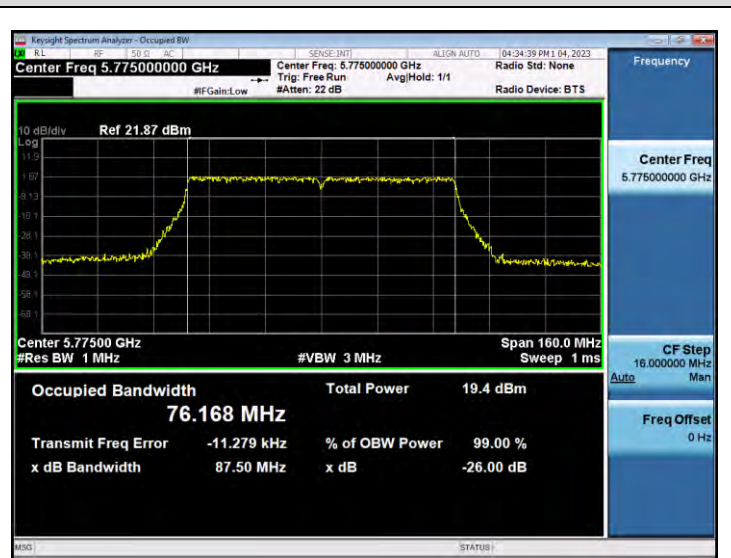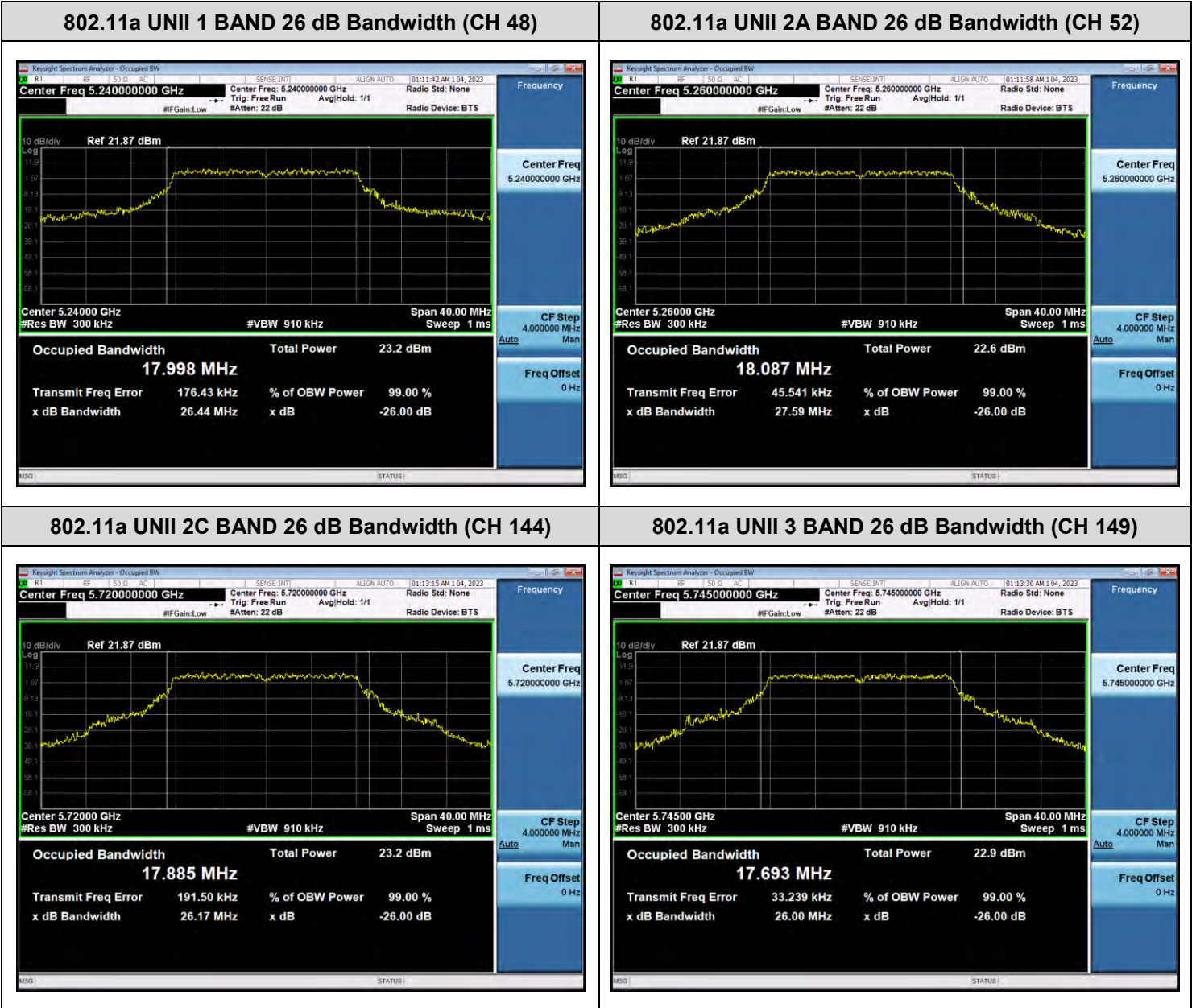
▣ Test Plots(802.11n(HT20))
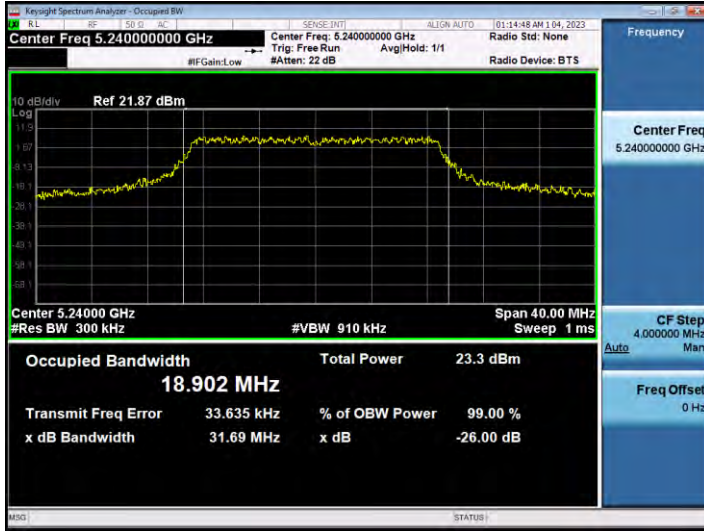
802.11n_HT20 UNII 1 BAND 26 dB Bandwidth(CH 48)	802.11n_HT20 UNII 2A BAND 26 dB Bandwidth(CH 60)
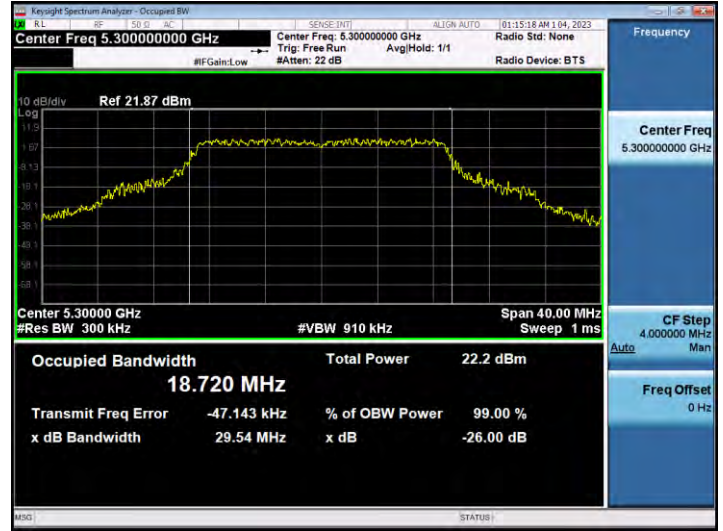
802.11n_HT20 UNII 2C BAND 26 dB Bandwidth(CH 100)	802.11n_HT20 UNII 3 BAND 26 dB Bandwidth(CH 165)
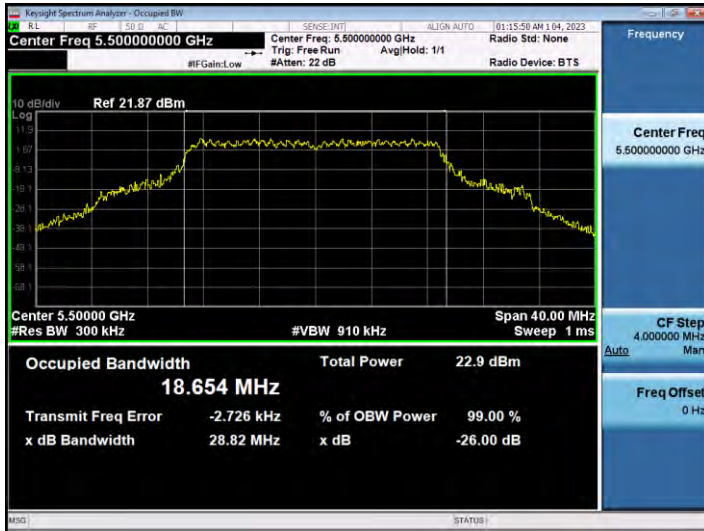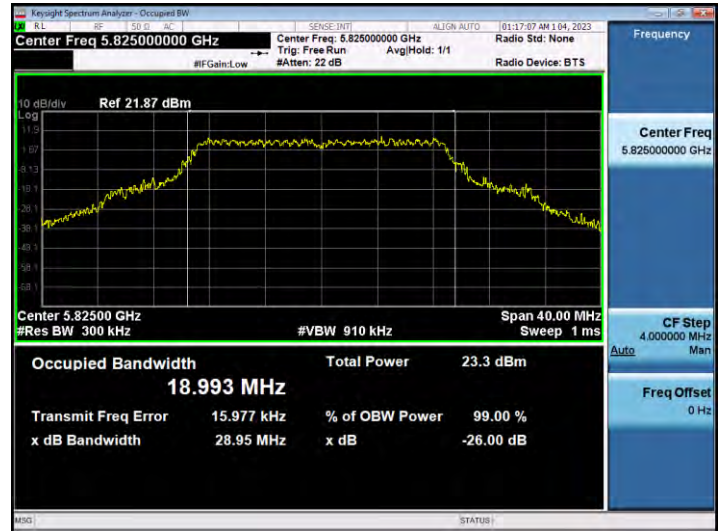
▣ Test Plots(802.11n(HT40))
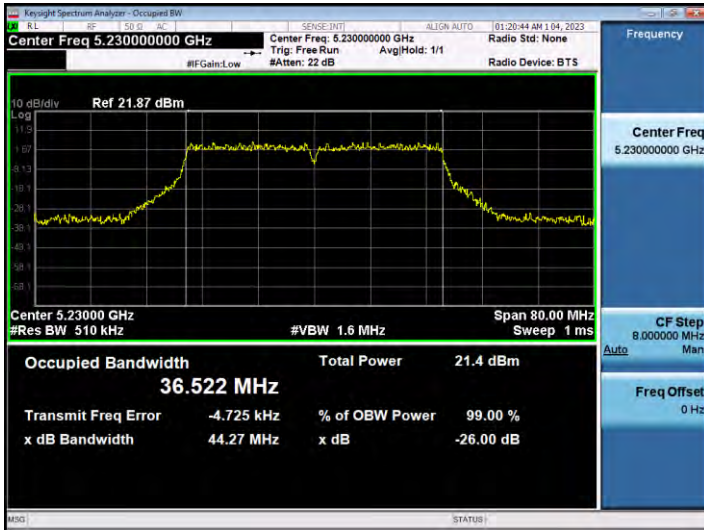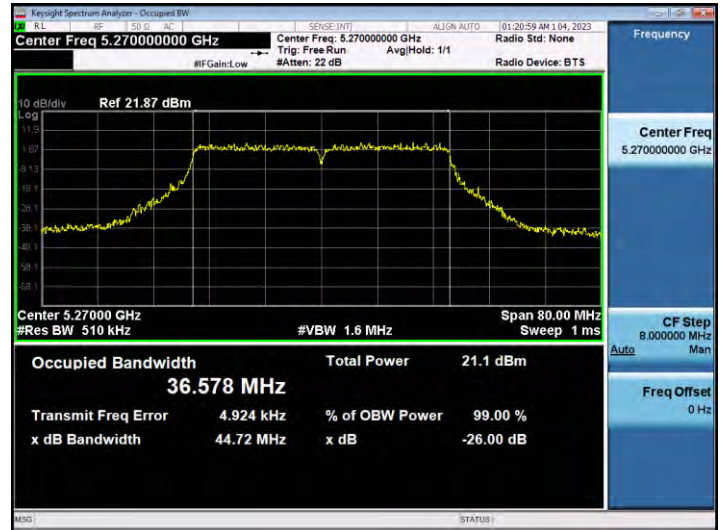
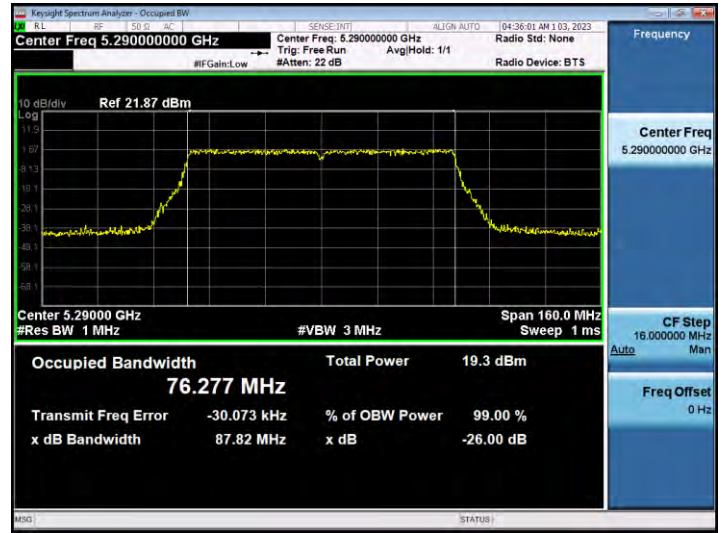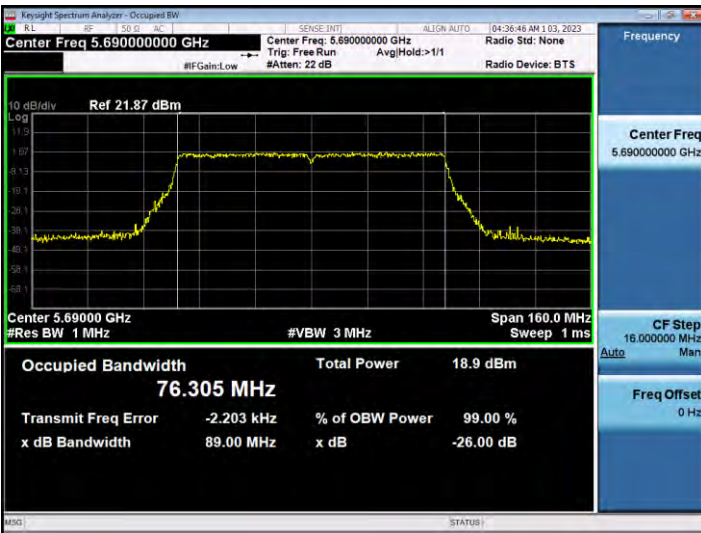| 802.11n_HT40 UNII 1 BAND 26 dB Bandwidth(CH 46)	802.11n_HT40 UNII 2A BAND 26 dB Bandwidth (CH 54)
802.11n_HT40 UNII 2C BAND 26 dB Bandwidth(CH 142)	802.11n_HT40 UNII 3 BAND 26 dB Bandwidth (CH 151)
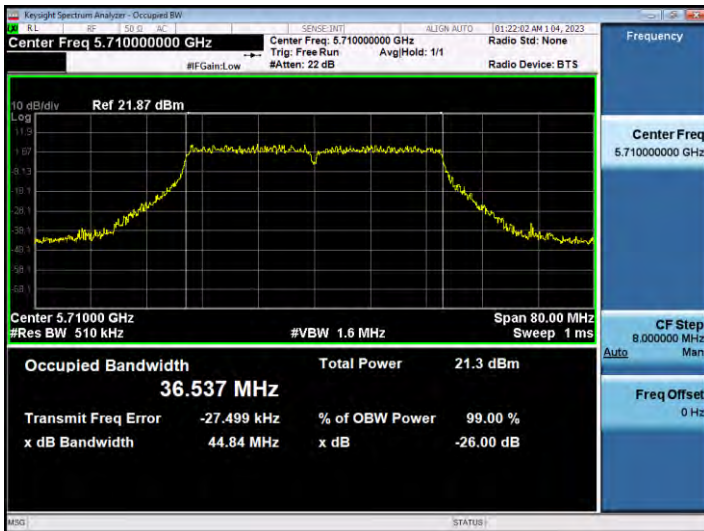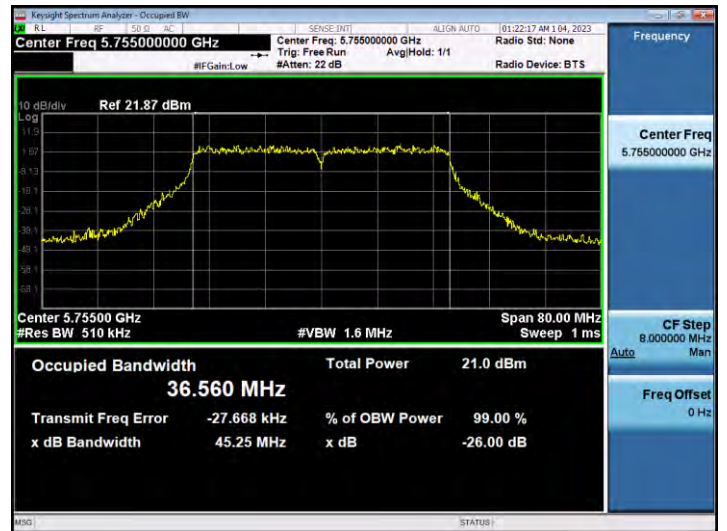
◙ Test Plots(802.11ac(VHT20))
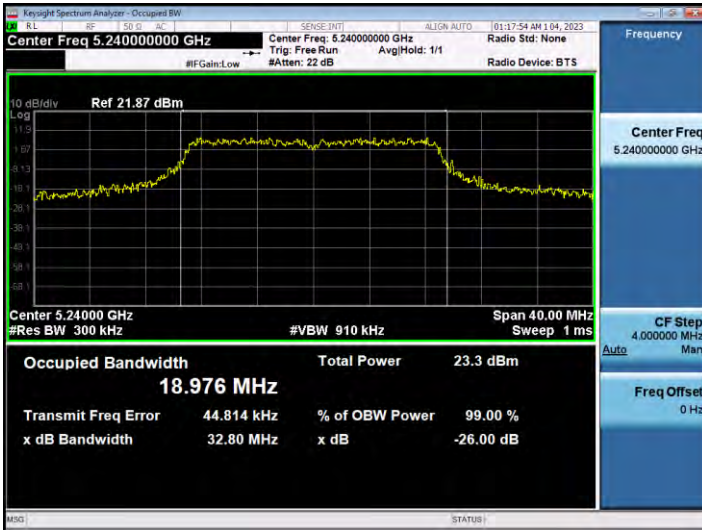
802.11ac_VHT20 UNII 1 BAND 26 dB Bandwidth(CH 48)	802.11ac_VHT20 UNII 2A BAND 26 dB Bandwidth(CH 52)
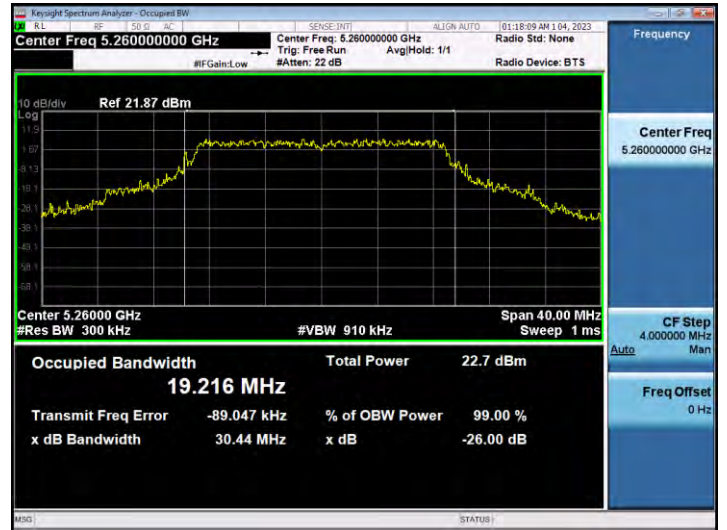
802.11ac_VHT20 UNII 2C BAND 26 dB Bandwidth(CH 100)	802.11ac_VHT20 UNII 3 BAND 26 dB Bandwidth(CH 149)
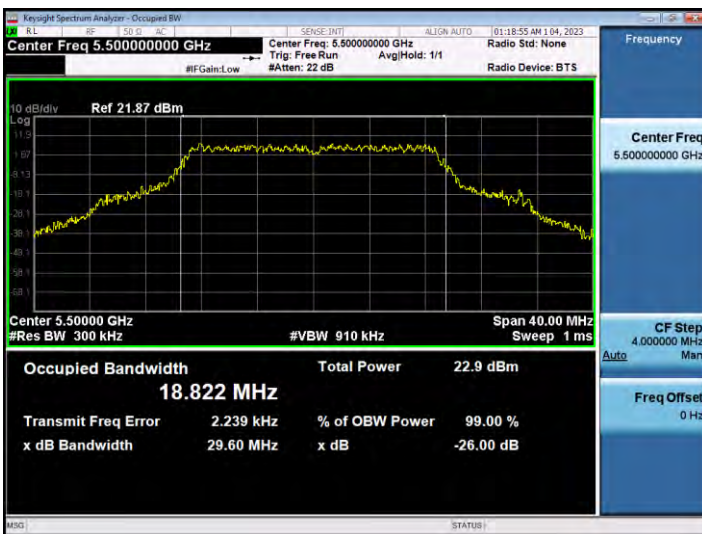
▣ Test Plots(802.11ac(VHT40))
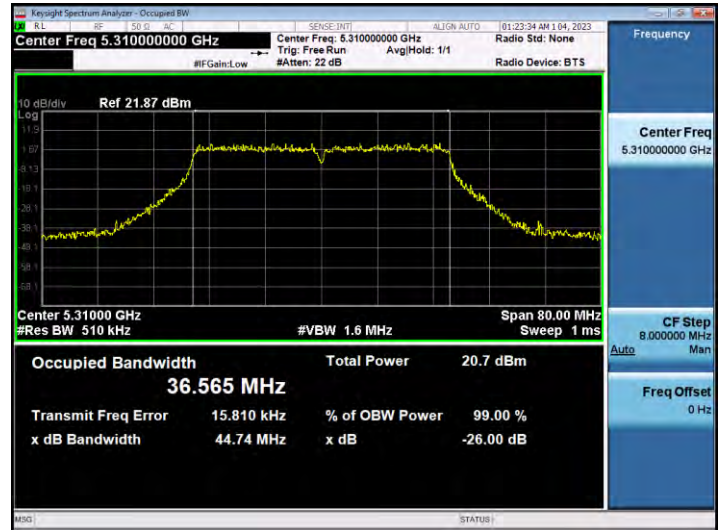
802.11ac_VHT40 UNII 1 BAND 26 dB Bandwidth(CH 46)	802.11ac_VHT40 UNII 2A BAND 26 dB Bandwidth (CH 62)
802.11ac_VHT40 UNII 2C BAND 26 dB Bandwidth(CH 142)	**802.11ac_VHT40 UNII 3 BAND 26 dB Bandwidth (CH 151)**
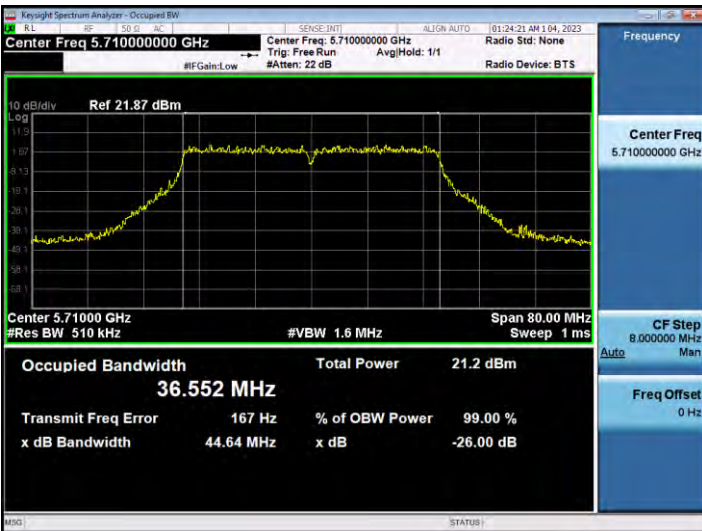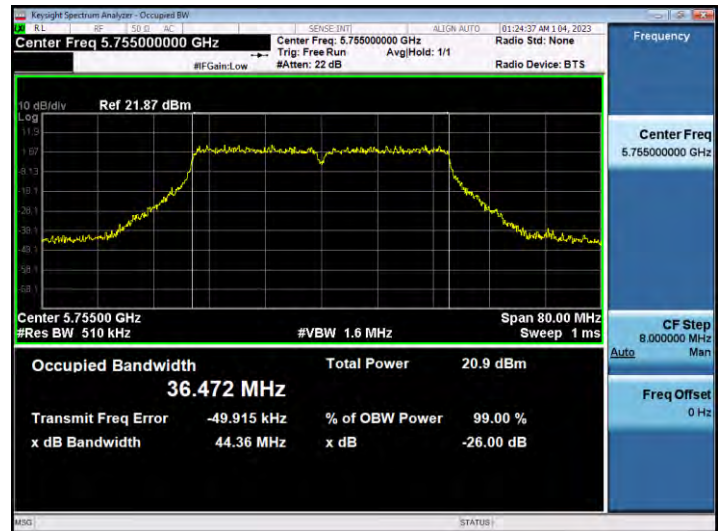
☑ Test Plots(802.11ac(VHT80))
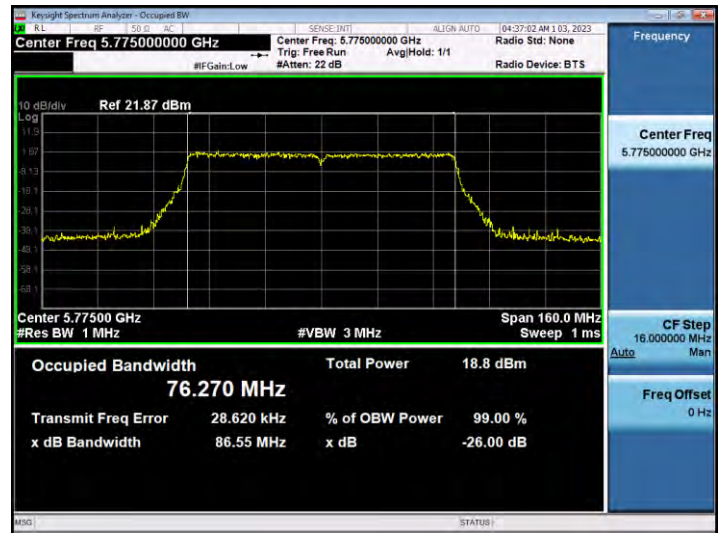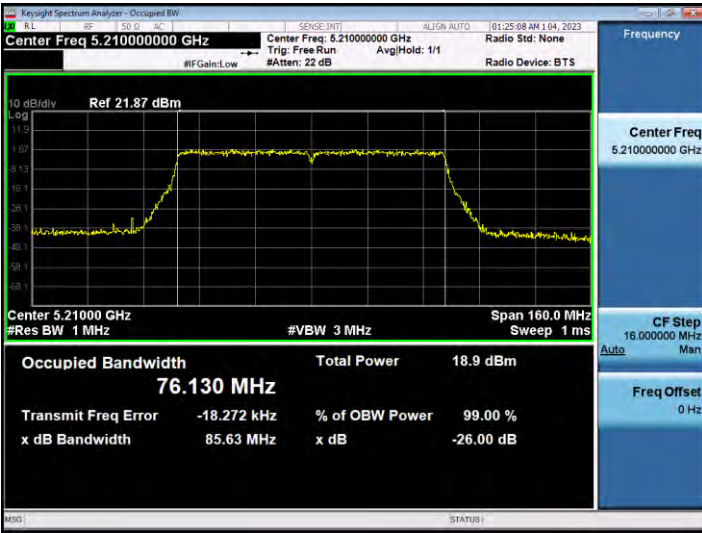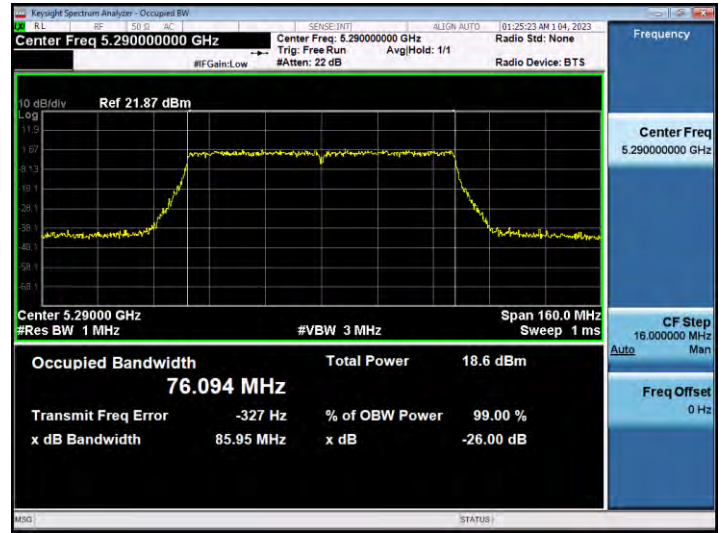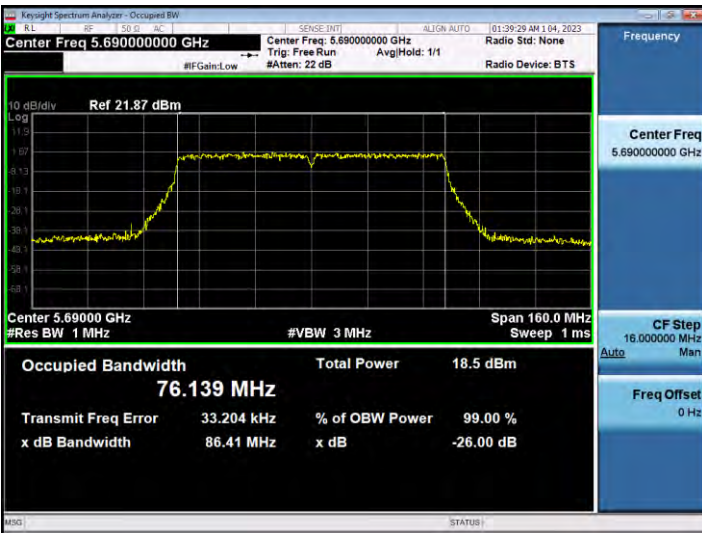
802.11ac_VHT80 UNII 1 BAND 26 dB Bandwidth(CH 42)	802.11ac_VHT80 UNII 2A BAND 26 dB Bandwidth (CH 58)
802.11ac_VHT80 UNII 2C BAND 26 dB Bandwidth(CH 138)	**802.11ac_VHT80 UNII 3 BAND 26 dB Bandwidth (CH 155)**
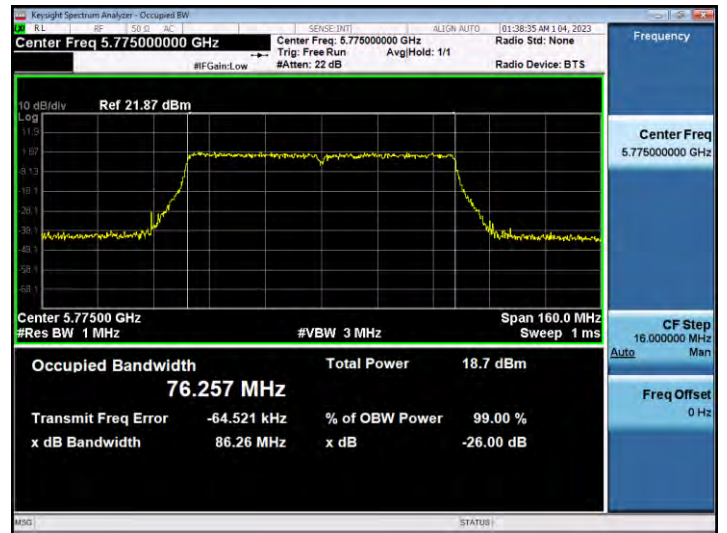
10.3 6 dB BANDWIDTH

[SISO Ant.2]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.42	> 0.5	Pass
5785	157	16.45	> 0.5	Pass
5825	165	16.44	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.86	> 0.5	Pass
5785	157	17.65	> 0.5	Pass
5825	165	17.66	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.41	> 0.5	Pass
5795	159	36.41	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.64	> 0.5	Pass
5785	157	17.64	> 0.5	Pass
5825	165	17.66	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.42	> 0.5	Pass
5795	159	36.40	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	76.52	> 0.5	Pass

[MIMO Ant.1]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.41	> 0.5	Pass
5785	157	16.41	> 0.5	Pass
5825	165	16.39	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.65	> 0.5	Pass
5785	157	17.65	> 0.5	Pass
5825	165	17.65	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.41	> 0.5	Pass
5795	159	36.43	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.63	> 0.5	Pass
5785	157	17.63	> 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	36.41	> 0.5	Pass
5795	159	36.41	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	76.43	> 0.5	Pass

[MIMO Ant.2]

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.43	> 0.5	Pass
5785	157	16.44	> 0.5	Pass
5825	165	16.44	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.70	> 0.5	Pass
5785	157	17.67	> 0.5	Pass
5825	165	17.64	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.45	> 0.5	Pass
5795	159	36.44	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.64	> 0.5	Pass
5785	157	17.65	> 0.5	Pass
5825	165	17.63	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	36.43	> 0.5	Pass
5795	159	36.43	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	76.48	> 0.5	Pass

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

[SISO Ant.2]

◙ **Test Plots**

802.11a (CH.149)	802.11n(HT20) (CH.157)

802.11n(HT40) (CH.151)	802.11ac(VHT20) (CH.149)

802.11ac(VHT40) (CH.159)	802.11ac(VHT80) (CH.155)

[MIMO Ant. 1]

☑ **Test Plots**

802.11a (CH.165)	802.11n(HT20) (CH.157)
802.11n(HT40) (CH.151)	**802.11ac(VHT20) (CH.157)**
802.11ac(VHT40) (CH.159)	**802.11ac(VHT80) (CH.155)**

[MIMO Ant. 2]

◙ **Test Plots**

802.11a (CH.149)	802.11n(HT20) (CH.165)

802.11n(HT40) (CH.159)	802.11ac(VHT20) (CH.165)

802.11ac(VHT40) (CH.159)	802.11ac(VHT80) (CH.155)
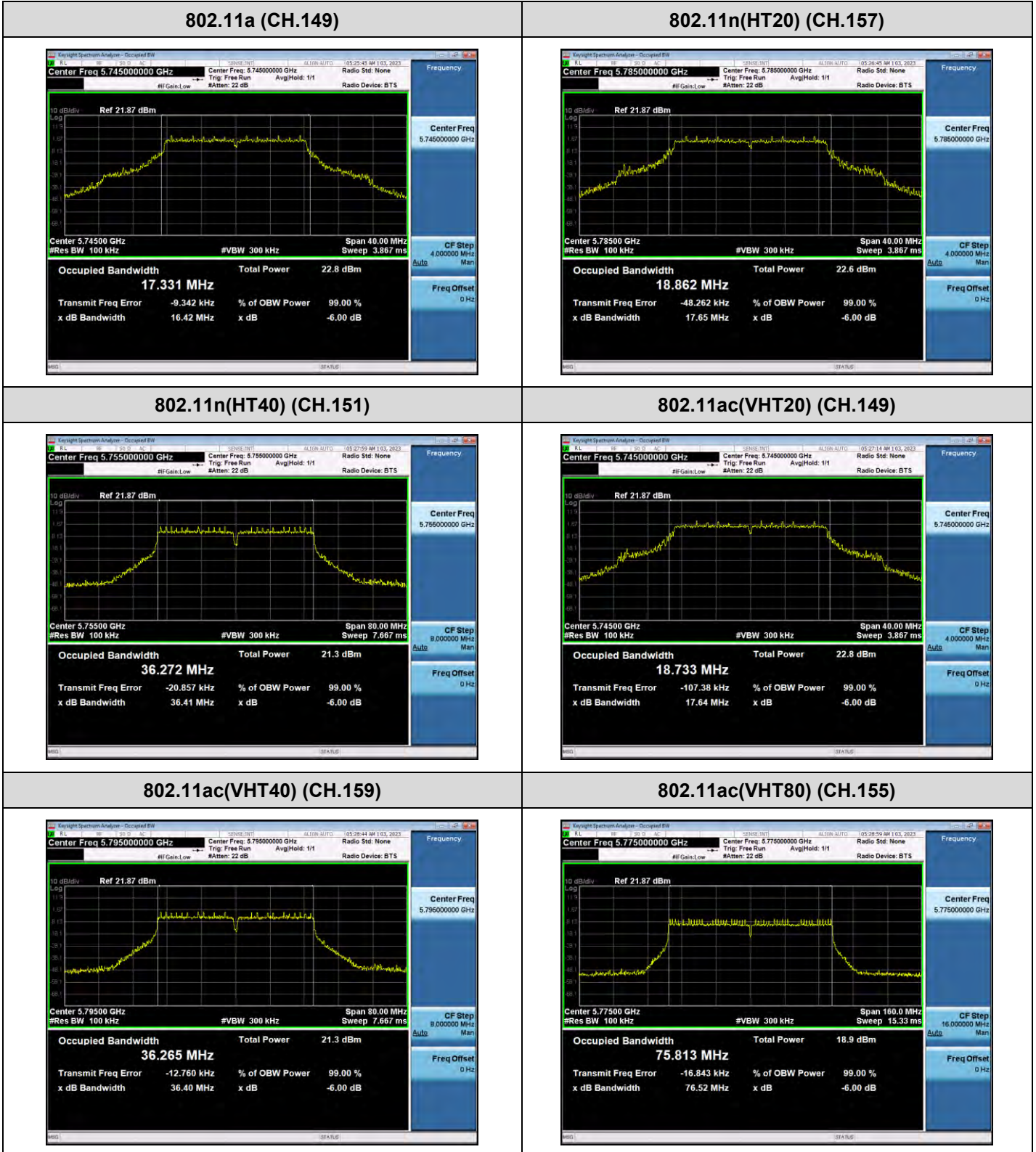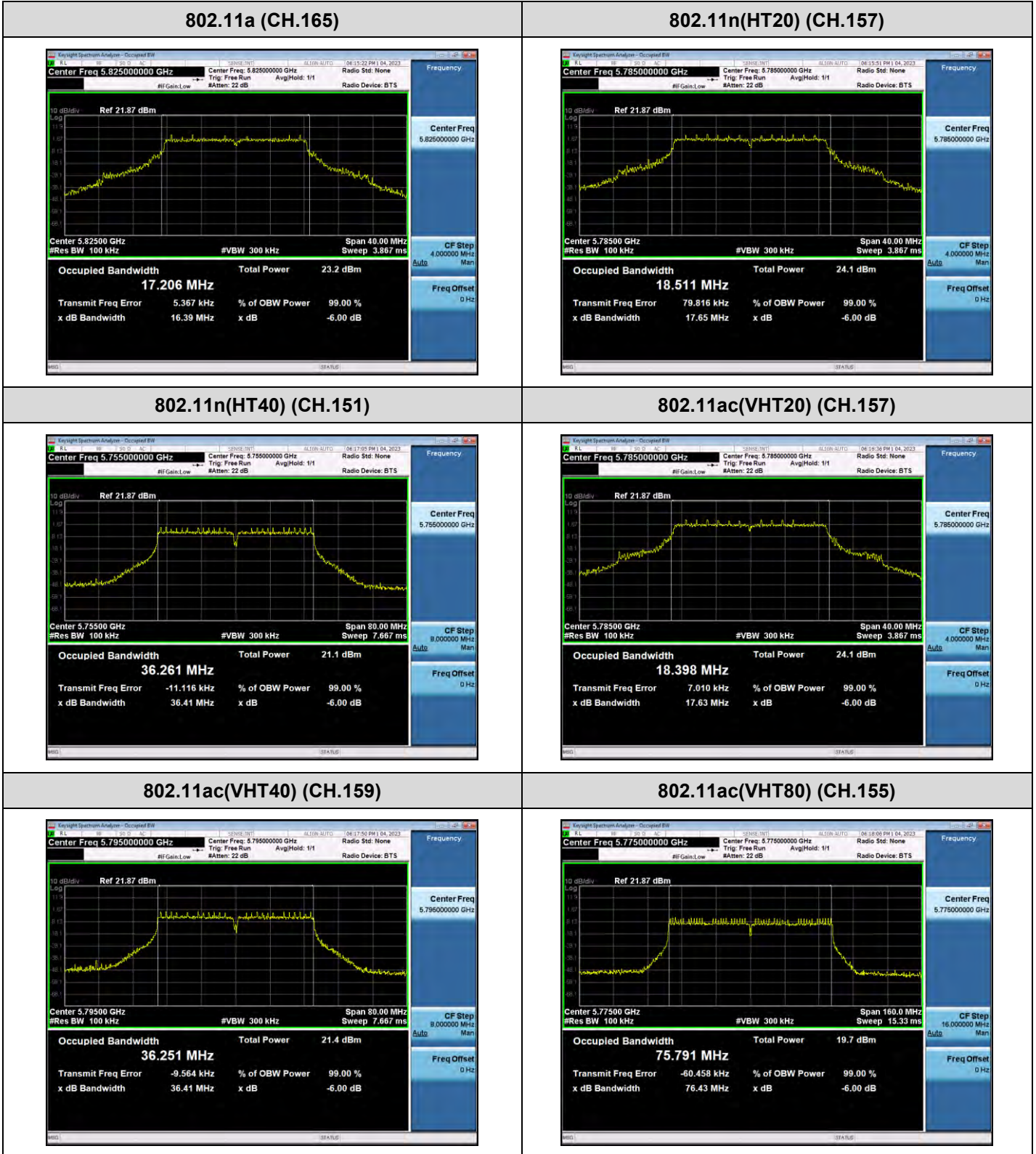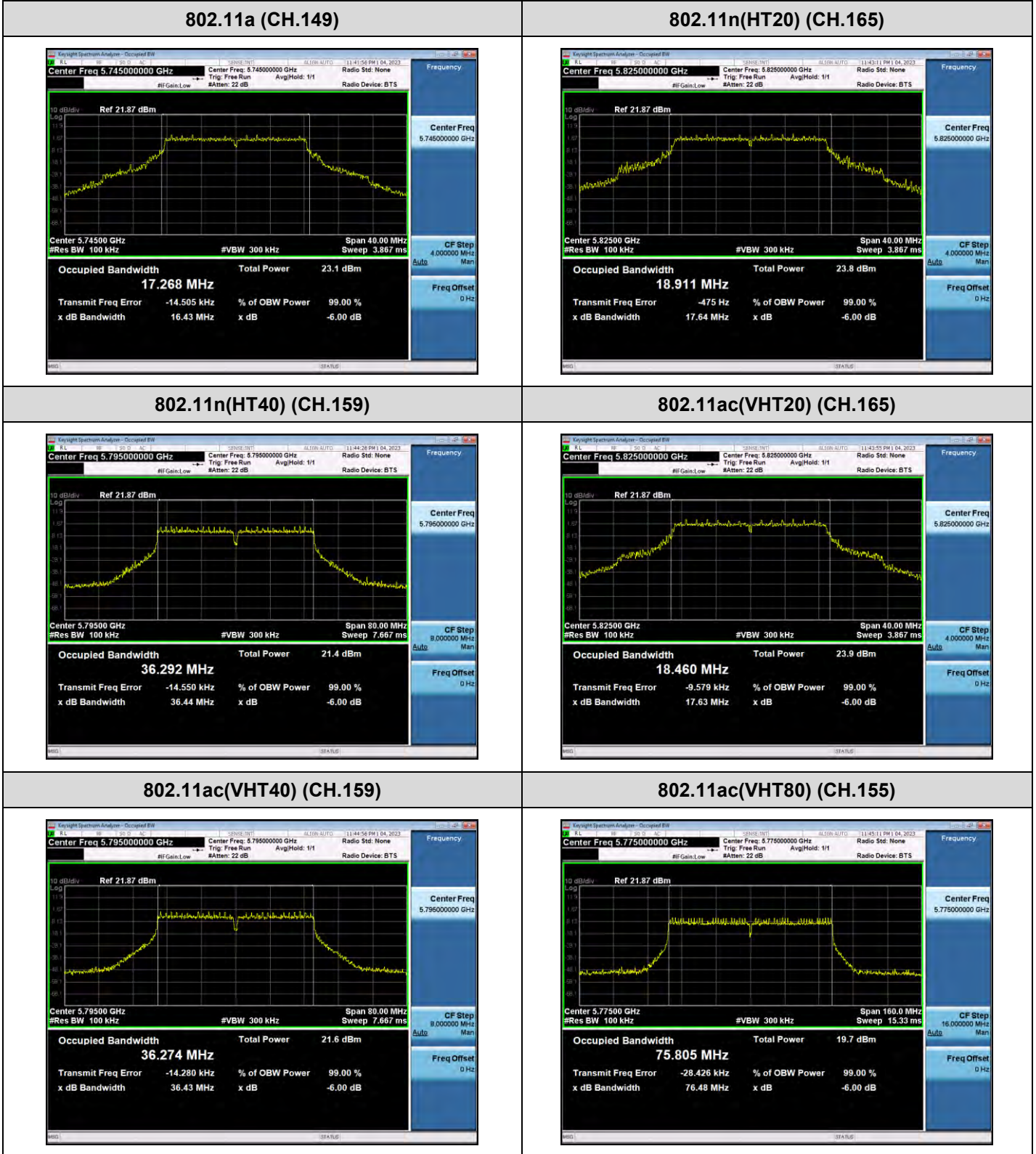
10.4 OUTPUT POWER MEASUREMENT

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

Straddle channel data were added in section 10.7.3.

Limit

(UNII 1) : 23.98 dBm

(UNII 2A, 2C) : 23.98 dBm or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)

(UNII 3) : 30.00 dBm

[SISO Ant.2]

802.11a Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.33		15.71	23.98	
5200	40	15.64		16.02	23.98	
5240	48	15.83		16.21	23.98	
5260	52	15.94		16.32	23.98	
5300	60	16.14		16.52	23.98	
5320	64	15.87	0.379	16.25	23.98	6 Mbps
5500	100	16.07		16.45	23.98	
5600	120	15.95		16.33	23.98	
5720	144	15.64		16.02	23.98	
5745	149	15.60		15.98	30.00	
5785	157	16.27		16.65	30.00	
5825	165	16.17		16.55	30.00	

802.11n(20 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.42		15.79	23.98	
5200	40	15.77		16.14	23.98	
5240	48	15.91		16.28	23.98	
5260	52	15.93		16.30	23.98	
5300	60	16.22		16.59	23.98	
5320	64	15.92	0.374	16.29	23.98	MCS0
5500	100	15.91		16.28	23.98	
5600	120	16.05		16.42	23.98	
5720	144	15.94		16.31	23.98	
5745	149	15.77		16.14	30.00	
5785	157	16.37		16.74	30.00	
5825	165	16.33		16.70	30.00	

802.11n(40 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	13.43		14.08	23.98	
5230	46	14.04		14.69	23.98	
5270	54	13.73		14.38	23.98	
5310	62	14.11		14.76	23.98	
5510	102	14.16	0.654	14.81	23.98	MCS0
5590	118	14.12		14.77	23.98	
5710	142	13.96		14.61	23.98	
5755	151	13.94		14.59	30.00	
5795	159	14.00		14.65	30.00	

802.11ac(20 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.31		15.68	23.98	
5200	40	15.84		16.21	23.98	
5240	48	16.07		16.44	23.98	
5260	52	15.82		16.19	23.98	
5300	60	16.22		16.59	23.98	
5320	64	16.00		16.37	23.98	
5500	100	16.22	0.372	16.59	23.98	MCS0
5600	120	16.18		16.55	23.98	
5720	144	15.95		16.32	23.98	
5745	149	16.22		16.59	30.00	
5785	157	16.51		16.88	30.00	
5825	165	16.38		16.75	30.00	

802.11ac(40 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	13.75		14.46	23.98	
5230	46	13.94		14.65	23.98	
5270	54	13.88		14.59	23.98	
5310	62	14.21		14.92	23.98	
5510	102	14.03	0.707	14.74	23.98	MCS0
5590	118	14.10		14.81	23.98	
5710	142	13.99		14.70	23.98	
5755	151	13.97		14.68	30.00	
5795	159	14.02		14.73	30.00	

802.11ac(80 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5210	42	10.25		11.57	23.98	
5290	58	9.98		11.30	23.98	
5530	106	10.14	1.321	11.46	23.98	MCS0
5610	122	9.91		11.23	23.98	
5690	138	9.78		11.10	23.98	
5775	155	9.67		10.99	30.00	

[MIMO Ant.1]

802.11a Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.31		15.69	23.98	
5200	40	15.79		16.17	23.98	
5240	48	15.86		16.24	23.98	
5260	52	15.97		16.35	23.98	
5300	60	16.21		16.59	23.98	
5320	64	15.89	0.379	16.27	23.98	6 Mbps
5500	100	15.74		16.12	23.98	
5600	120	16.16		16.54	23.98	
5720	144	16.22		16.60	23.98	
5745	149	16.56		16.94	30.00	
5785	157	16.03		16.41	30.00	
5825	165	16.54		16.92	30.00	

802.11n(20 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.41		15.99	23.98	
5200	40	15.53		16.11	23.98	
5240	48	15.51		16.09	23.98	
5260	52	15.64		16.22	23.98	
5300	60	16.13		16.71	23.98	
5320	64	15.59	0.575	16.17	23.98	MCS8
5500	100	15.78		16.36	23.98	
5600	120	15.56		16.14	23.98	
5720	144	15.64		16.22	23.98	
5745	149	16.08		16.66	30.00	
5785	157	15.81		16.39	30.00	
5825	165	16.35		16.93	30.00	

802.11n(40 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	12.86		14.10	23.98	
5230	46	13.30		14.54	23.98	
5270	54	13.63		14.87	23.98	
5310	62	13.44		14.68	23.98	
5510	102	13.26	1.243	14.50	23.98	MCS8
5590	118	13.13		14.37	23.98	
5710	142	13.05		14.29	23.98	
5755	151	13.31		14.55	30.00	
5795	159	13.08		14.32	30.00	

802.11ac(20 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.41		16.09	23.98	
5200	40	15.56		16.24	23.98	
5240	48	15.79		16.47	23.98	
5260	52	15.66		16.34	23.98	
5300	60	16.10		16.78	23.98	
5320	64	15.55		16.23	23.98	
5500	100	15.52	0.680	16.20	23.98	MCS0
5600	120	16.02		16.70	23.98	
5720	144	15.66		16.34	23.98	
5745	149	16.25		16.93	30.00	
5785	157	15.74		16.42	30.00	
5825	165	16.26		16.94	30.00	

802.11ac(40 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	12.96		14.28	23.98	
5230	46	12.90		14.22	23.98	
5270	54	13.34		14.66	23.98	
5310	62	13.17		14.49	23.98	
5510	102	12.95	1.321	14.27	23.98	MCS0
5590	118	13.15		14.47	23.98	
5710	142	13.06		14.38	23.98	
5755	151	13.46		14.78	30.00	
5795	159	13.02		14.34	30.00	

802.11ac(80 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5210	42	9.31		11.39	23.98	
5290	58	9.83		11.91	23.98	
5530	106	9.88	2.081	11.96	23.98	MCS0
5610	122	9.46		11.54	23.98	
5690	138	9.94		12.02	23.98	
5775	155	10.04		12.12	30.00	

[MIMO Ant.2]

802.11a Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.06		15.44	23.98	
5200	40	15.71		16.09	23.98	
5240	48	15.79		16.17	23.98	
5260	52	15.62		16.00	23.98	
5300	60	15.81		16.19	23.98	
5320	64	15.70		16.08	23.98	
5500	100	15.96	0.379	16.34	23.98	6 Mbps
5600	120	16.01		16.39	23.98	
5720	144	15.96		16.34	23.98	
5745	149	16.23		16.61	30.00	
5785	157	16.37		16.75	30.00	
5825	165	16.34		16.72	30.00	

802.11n(20 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	14.86		15.44	23.98	
5200	40	15.41		15.99	23.98	
5240	48	15.54		16.12	23.98	
5260	52	15.38		15.96	23.98	
5300	60	15.85		16.43	23.98	
5320	64	15.71		16.29	23.98	
5500	100	15.86	0.575	16.44	23.98	MCS8
5600	120	16.08		16.66	23.98	
5720	144	15.73		16.31	23.98	
5745	149	15.91		16.49	30.00	
5785	157	16.25		16.83	30.00	
5825	165	16.26		16.84	30.00	

802.11n(40 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	12.51	1.243	13.75	23.98	MCS8
5230	46	13.13		14.37	23.98	
5270	54	12.94		14.18	23.98	
5310	62	13.05		14.29	23.98	
5510	102	13.10		14.34	23.98	
5590	118	13.27		14.51	23.98	
5710	142	12.98		14.22	23.98	
5755	151	13.26		14.50	30.00	
5795	159	12.96		14.20	30.00	

802.11ac(20 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase MCS Index
Frequency [MHz]	Channel No.					
5180	36	15.12	0.680	15.80	23.98	MCS0
5200	40	15.82		16.50	23.98	
5240	48	15.84		16.52	23.98	
5260	52	15.77		16.45	23.98	
5300	60	15.84		16.52	23.98	
5320	64	15.51		16.19	23.98	
5500	100	15.99		16.67	23.98	
5600	120	16.00		16.68	23.98	
5720	144	15.97		16.65	23.98	
5745	149	15.84		16.52	30.00	
5785	157	16.23		16.91	30.00	
5825	165	16.01		16.69	30.00	

802.11ac(40 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	12.83	1.321	14.15	23.98	MCS0
5230	46	12.84		14.16	23.98	
5270	54	12.88		14.20	23.98	
5310	62	13.13		14.45	23.98	
5510	102	13.05		14.37	23.98	
5590	118	13.36		14.68	23.98	
5710	142	13.19		14.51	23.98	
5755	151	13.05		14.37	30.00	
5795	159	13.20		14.52	30.00	

802.11ac(80 MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5210	42	9.27	2.081	11.35	23.98	MCS0
5290	58	9.28		11.36	23.98	
5530	106	9.58		11.66	23.98	
5610	122	9.45		11.53	23.98	
5690	138	9.44		11.52	23.98	
5775	155	8.92		11.00	30.00	

[MIMO]

802.11a Mode		Ant. 1 Power (dBm)	Ant. 2 Power (dBm)	MIMO Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.69	15.44	18.58	23.98	6 Mbps
5200	40	16.17	16.09	19.14	23.98	
5240	48	16.24	16.17	19.21	23.98	
5260	52	16.35	16.00	19.19	23.98	
5300	60	16.59	16.19	19.40	23.98	
5320	64	16.27	16.08	19.19	23.98	
5500	100	16.12	16.34	19.24	23.98	
5600	120	16.54	16.39	19.48	23.98	
5720	144	16.60	16.34	19.48	23.98	
5745	149	16.94	16.61	19.79	30.00	
5785	157	16.41	16.75	19.59	30.00	
5825	165	16.92	16.72	19.83	30.00	

802.11n(20 MHz) Mode		Ant. 1 Power (dBm)	Ant. 2 Power (dBm)	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	15.99	15.44	18.73	23.98	MCS8
5200	40	16.11	15.99	19.06	23.98	
5240	48	16.09	16.12	19.11	23.98	
5260	52	16.22	15.96	19.10	23.98	
5300	60	16.71	16.43	19.58	23.98	
5320	64	16.17	16.29	19.24	23.98	
5500	100	16.36	16.44	19.41	23.98	
5600	120	16.14	16.66	19.41	23.98	
5720	144	16.22	16.31	19.27	23.98	
5745	149	16.66	16.49	19.58	30.00	
5785	157	16.39	16.83	19.62	30.00	
5825	165	16.93	16.84	19.89	30.00	

802.11n(40 MHz) Mode		Ant. 1 Power (dBm)	Ant. 2 Power (dBm)	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	14.10	13.75	16.94	23.98	
5230	46	14.54	14.37	17.47	23.98	
5270	54	14.87	14.18	17.55	23.98	
5310	62	14.68	14.29	17.50	23.98	
5510	102	14.50	14.34	17.43	23.98	MCS8
5590	118	14.37	14.51	17.45	23.98	
5710	142	14.29	14.22	17.27	23.98	
5755	151	14.55	14.50	17.54	30.00	
5795	159	14.32	14.20	17.27	30.00	

802.11ac(20 MHz) Mode		Ant. 1 Power (dBm)	Ant. 2 Power (dBm)	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5180	36	16.09	15.80	18.96	23.98	
5200	40	16.24	16.50	19.38	23.98	
5240	48	16.47	16.52	19.51	23.98	
5260	52	16.34	16.45	19.41	23.98	
5300	60	16.78	16.52	19.66	23.98	
5320	64	16.23	16.19	19.22	23.98	
5500	100	16.20	16.67	19.45	23.98	MCS0
5600	120	16.70	16.68	19.70	23.98	
5720	144	16.34	16.65	19.51	23.98	
5745	149	16.93	16.52	19.74	30.00	
5785	157	16.42	16.91	19.68	30.00	
5825	165	16.94	16.69	19.83	30.00	

802.11ac(40 MHz) Mode		Ant. 1 Power (dBm)	Ant. 2 Power (dBm)	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5190	38	14.28	14.15	17.23	23.98	MCS0
5230	46	14.22	14.16	17.20	23.98	
5270	54	14.66	14.20	17.45	23.98	
5310	62	14.49	14.45	17.48	23.98	
5510	102	14.27	14.37	17.33	23.98	
5590	118	14.47	14.68	17.59	23.98	
5710	142	14.38	14.51	17.46	23.98	
5755	151	14.78	14.37	17.59	30.00	
5795	159	14.34	14.52	17.44	30.00	

802.11ac(80 MHz) Mode		Ant. 1 Power (dBm)	Ant. 2 Power (dBm)	MIMO Total Power [dBm]	Limit (dBm)	Worstcase Datarate
Frequency [MHz]	Channel No.					
5210	42	11.39	11.35	14.38	23.98	MCS0
5290	58	11.91	11.36	14.65	23.98	
5530	106	11.96	11.66	14.82	23.98	
5610	122	11.54	11.53	14.55	23.98	
5690	138	12.02	11.52	14.79	23.98	
5775	155	12.12	11.00	14.61	30.00	

10.5 POWER SPECTRAL DENSITY

[SISO Ant.2]

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	3.779		4.158		
5200	40	4.553		4.932		
5240	48	4.944		5.323		
5260	52	4.445		4.824		
5300	60	4.071		4.450		11 dBm/MHz
5320	64	4.125	0.379	4.504	6 Mbps	
5500	100	4.400		4.779		
5600	120	4.461		4.840		
5720	144	4.656		5.035		
5745	149	2.349		2.728		
5785	157	2.382		2.761		30 dBm/500 kHz
5825	165	2.851		3.230		

802.11n(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	3.559		3.933		
5200	40	4.348		4.722		
5240	48	4.233		4.607		
5260	52	4.421		4.795		
5300	60	3.696		4.070		11 dBm/MHz
5320	64	3.482	0.374	3.856	MCS0	
5500	100	4.041		4.415		
5600	120	4.182		4.556		
5720	144	4.363		4.737		
5745	149	2.257		2.631		
5785	157	2.260		2.634		30 dBm/500 kHz
5825	165	2.427		2.801		

802.11n(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-0.763		-0.109		
5230	46	-0.650		0.004		
5270	54	-0.657		-0.003		
5310	62	-1.132		-0.478		11 dBm/MHz
5510	102	-1.118	0.654	-0.464	MCS0	
5590	118	-1.137		-0.483		
5710	142	-0.876		-0.222		
5755	151	-3.977		-3.323		30 dBm /500 kHz
5795	159	-3.799		-3.145		

802.11ac(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	3.393		3.765		
5200	40	3.902		4.274		
5240	48	4.100		4.472		
5260	52	4.245		4.617		
5300	60	3.773		4.145		11 dBm/MHz
5320	64	3.547		3.919		
5500	100	3.906	0.372	4.278	MCS0	
5600	120	3.875		4.247		
5720	144	4.298		4.670		
5745	149	2.028		2.400		
5785	157	2.328		2.700		30 dBm/500 kHz
5825	165	2.814		3.186		

802.11ac(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-1.058		-0.351		
5230	46	-0.812		-0.105		
5270	54	-0.776		-0.069		
5310	62	-1.031		-0.324		11 dBm/MHz
5510	102	-1.073	0.707	-0.366	MCS0	
5590	118	-1.143		-0.436		
5710	142	-0.591		0.116		
5755	151	-3.905		-3.198		30 dBm/500 kHz
5795	159	-3.575		-2.868		

802.11ac(80 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5210	42	-7.018		-5.697		
5290	58	-7.384		-6.063		
5530	106	-7.276	1.321	-5.955	MCS0	11 dBm/MHz
5610	122	-7.089		-5.768		
5690	138	-7.731		-6.410		
5775	155	-10.328		-9.007		30 dBm/500 kHz

[MIMO Ant.1]

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	4.470		4.849		
5200	40	4.687		5.066		
5240	48	4.806		5.185		
5260	52	4.752		5.131		
5300	60	5.207		5.586		11 dBm/MHz
5320	64	4.893		5.272		
5500	100	5.337	0.379	5.716	6 Mbps	
5600	120	5.016		5.395		
5720	144	5.236		5.615		
5745	149	2.130		2.509		
5785	157	2.867		3.246		30 dBm/500 kHz
5825	165	2.222		2.601		

802.11n(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	4.074		4.649		
5200	40	4.434		5.009		
5240	48	4.140		4.715		
5260	52	4.250		4.825		
5300	60	4.760		5.335		11 dBm/MHz
5320	64	4.352		4.927		
5500	100	4.851	0.575	5.426	MCS8	
5600	120	4.684		5.259		
5720	144	4.628		5.203		
5745	149	1.916		2.491		
5785	157	2.345		2.920		30 dBm/500 kHz
5825	165	1.971		2.546		

802.11n(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-1.539		-0.296		
5230	46	-1.587		-0.344		
5270	54	-1.961		-0.718		
5310	62	-1.472		-0.229		11 dBm/MHz
5510	102	-1.593	1.243	-0.350	MCS8	
5590	118	-1.463		-0.220		
5710	142	-1.461		-0.218		
5755	151	-4.092		-2.849		30 dBm /500 kHz
5795	159	-3.786		-2.543		

802.11ac(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	4.002		4.682		
5200	40	4.390		5.070		
5240	48	4.081		4.761		
5260	52	4.013		4.693		
5300	60	4.496		5.176		11 dBm/MHz
5320	64	4.393	0.680	5.073	MCS0	
5500	100	4.634		5.314		
5600	120	4.393		5.073		
5720	144	4.441		5.121		
5745	149	1.553		2.233		
5785	157	2.384		3.064		30 dBm/500 kHz
5825	165	1.848		2.528		

802.11ac(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-1.983		-0.662		
5230	46	-1.776		-0.455		
5270	54	-2.068		-0.747		
5310	62	-1.461		-0.140		11 dBm/MHz
5510	102	-1.786	1.321	-0.465	MCS0	
5590	118	-1.607		-0.286		
5710	142	-1.701		-0.380		
5755	151	-4.495		-3.174		30 dBm/500 kHz
5795	159	-4.315		-2.994		

802.11ac(80 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5210	42	-7.739		-5.658		
5290	58	-7.611		-5.530		
5530	106	-8.485	2.081	-6.404	MCS0	11 dBm/MHz
5610	122	-7.994		-5.913		
5690	138	-7.452		-5.371		
5775	155	-9.989		-7.908		30 dBm/500 kHz

[MIMO Ant.2]

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	4.058		4.437		11 dBm/MHz
5200	40	4.657		5.036		
5240	48	4.937		5.316		
5260	52	4.654		5.033		
5300	60	4.399	0.379	4.778	6 Mbps	
5320	64	4.350		4.729		
5500	100	4.780		5.159		
5600	120	4.709		5.088		
5720	144	5.213		5.592		
5745	149	1.830		2.209		30 dBm/500 kHz
5785	157	1.925		2.304		
5825	165	2.171		2.550		

802.11n(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	3.536		4.111		11 dBm/MHz
5200	40	3.802		4.377		
5240	48	4.632		5.207		
5260	52	4.083		4.658		
5300	60	3.803		4.378		
5320	64	3.711	0.575	4.286	MCS8	
5500	100	4.353		4.928		
5600	120	4.162		4.737		
5720	144	4.611		5.186		
5745	149	1.710		2.285		30 dBm/500 kHz
5785	157	1.441		2.016		
5825	165	1.951		2.526		

802.11n(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-2.051		-0.808		
5230	46	-1.308		-0.065		
5270	54	-1.203		0.040		
5310	62	-1.962		-0.719		11 dBm/MHz
5510	102	-1.596	1.243	-0.353	MCS8	
5590	118	-1.558		-0.315		
5710	142	-1.261		-0.018		
5755	151	-4.739		-3.496		30 dBm /500 kHz
5795	159	-4.301		-3.058		

802.11ac(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	3.646		4.326		
5200	40	3.743		4.423		
5240	48	4.612		5.292		
5260	52	4.008		4.688		
5300	60	3.721		4.401		11 dBm/MHz
5320	64	3.692		4.372		
5500	100	4.519	0.680	5.199	MCS0	
5600	120	4.122		4.802		
5720	144	4.414		5.094		
5745	149	1.854		2.534		
5785	157	1.443		2.123		30 dBm/500 kHz
5825	165	2.028		2.708		

802.11ac(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-1.894		-0.573		
5230	46	-0.771		0.550		
5270	54	-1.313		0.008		
5310	62	-1.868		-0.547		11 dBm/MHz
5510	102	-1.773	1.321	-0.452	MCS0	
5590	118	-1.622		-0.301		
5710	142	-1.283		0.038		
5755	151	-4.541		-3.220		30 dBm/500 kHz
5795	159	-4.009		-2.688		

802.11ac(80 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5210	42	-6.834		-4.753		
5290	58	-7.024		-4.943		
5530	106	-7.181	2.081	-5.100	MCS0	11 dBm/MHz
5610	122	-6.982		-4.901		
5690	138	-7.077		-4.996		
5775	155	-9.970		-7.889		30 dBm/500 kHz

[MIMO]

802.11a Mode		Ant. 1 PSD (dBm)	Ant. 2 PSD (dBm)	MIMO PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	4.849	4.437	7.658	6 Mbps	11 dBm/MHz
5200	40	5.066	5.036	8.061		
5240	48	5.185	5.316	8.261		
5260	52	5.131	5.033	8.093		
5300	60	5.586	4.778	8.211		
5320	64	5.272	4.729	8.019		
5500	100	5.716	5.159	8.457		
5600	120	5.395	5.088	8.255		
5720	144	5.615	5.592	8.614		
5745	149	2.509	2.209	5.372		30 dBm/500 kHz
5785	157	3.246	2.304	5.811		
5825	165	2.601	2.550	5.586		

802.11n(20 MHz) Mode		Ant. 1 PSD (dBm)	Ant. 2 PSD (dBm)	MIMO PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	4.649	4.111	7.399	MCS8	11 dBm/MHz
5200	40	5.009	4.377	7.715		
5240	48	4.715	5.207	7.978		
5260	52	4.825	4.658	7.753		
5300	60	5.335	4.378	7.893		
5320	64	4.927	4.286	7.629		
5500	100	5.426	4.928	8.195		
5600	120	5.259	4.737	8.016		
5720	144	5.203	5.186	8.205		
5745	149	2.491	2.285	5.400		30 dBm/500 kHz
5785	157	2.920	2.016	5.502		
5825	165	2.546	2.526	5.547		

802.11n(40 MHz) Mode		Ant. 1 PSD (dBm)	Ant. 2 PSD (dBm)	MIMO PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-0.296	-0.808	2.466	MCS8	11 dBm/MHz
5230	46	-0.344	-0.065	2.808		
5270	54	-0.718	0.040	2.688		
5310	62	-0.229	-0.719	2.543		
5510	102	-0.350	-0.353	2.659		
5590	118	-0.220	-0.315	2.743		
5710	142	-0.218	-0.018	2.894		
5755	151	-2.849	-3.496	-0.150		30 dBm/500 kHz
5795	159	-2.543	-3.058	0.218		

802.11ac(20 MHz) Mode		Ant. 1 PSD (dBm)	Ant. 2 PSD (dBm)	MIMO PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5180	36	4.682	4.326	7.518	MCS0	11 dBm/MHz
5200	40	5.070	4.423	7.769		
5240	48	4.761	5.292	8.045		
5260	52	4.693	4.688	7.701		
5300	60	5.176	4.401	7.816		
5320	64	5.073	4.372	7.747		
5500	100	5.314	5.199	8.267		
5600	120	5.073	4.802	7.950		
5720	144	5.121	5.094	8.118		
5745	149	2.233	2.534	5.397		30 dBm/500 kHz
5785	157	3.064	2.123	5.629		
5825	165	2.528	2.708	5.629		

802.11ac(40 MHz) Mode		Ant. 1 PSD (dBm)	Ant. 2 PSD (dBm)	MIMO PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5190	38	-0.662	-0.573	2.393	MCS0	11 dBm/MHz
5230	46	-0.455	0.550	3.087		
5270	54	-0.747	0.008	2.657		
5310	62	-0.140	-0.547	2.672		
5510	102	-0.465	-0.452	2.552		
5590	118	-0.286	-0.301	2.717		
5710	142	-0.380	0.038	2.845		
5755	151	-3.174	-3.220	-0.186		30 dBm/500 kHz
5795	159	-2.994	-2.688	0.172		

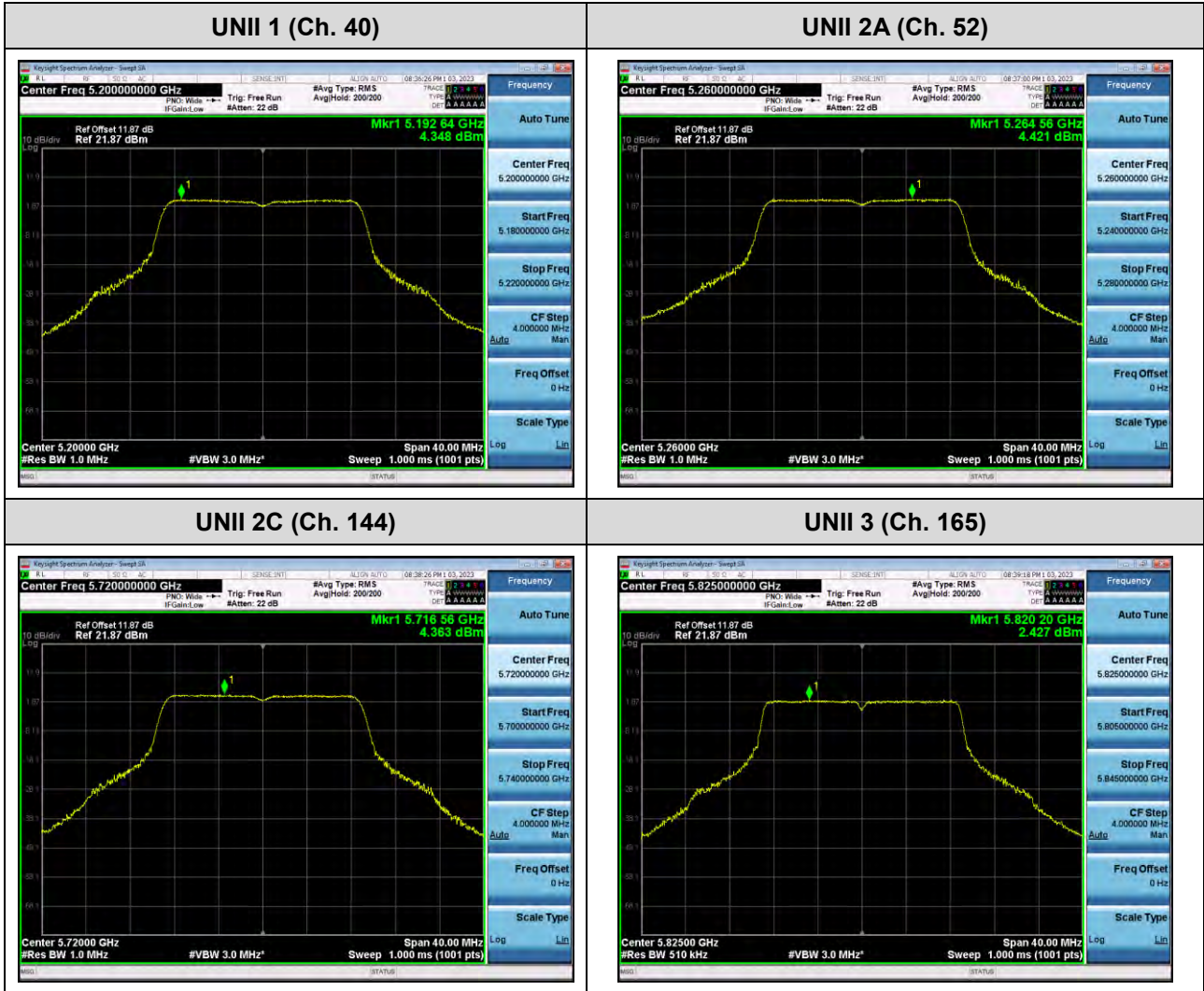| 802.11ac(80 MHz) Mode		Ant. 1 PSD (dBm)	Ant. 2 PSD (dBm)	MIMO PSD [dBm]	Worstcase Datarate	Limit
Frequency [MHz]	Channel No.					
5210	42	-5.658	-4.753	-2.172	MCS0	11 dBm/MHz
5290	58	-5.530	-4.943	-2.217		
5530	106	-6.404	-5.100	-2.693		
5610	122	-5.913	-4.901	-2.368		
5690	138	-5.371	-4.996	-2.170		
5775	155	-7.908	-7.889	-4.889		30 dBm/500 kHz

Note:

In order to simplify the report, attached plots were only channel of the highest PSD of each band.
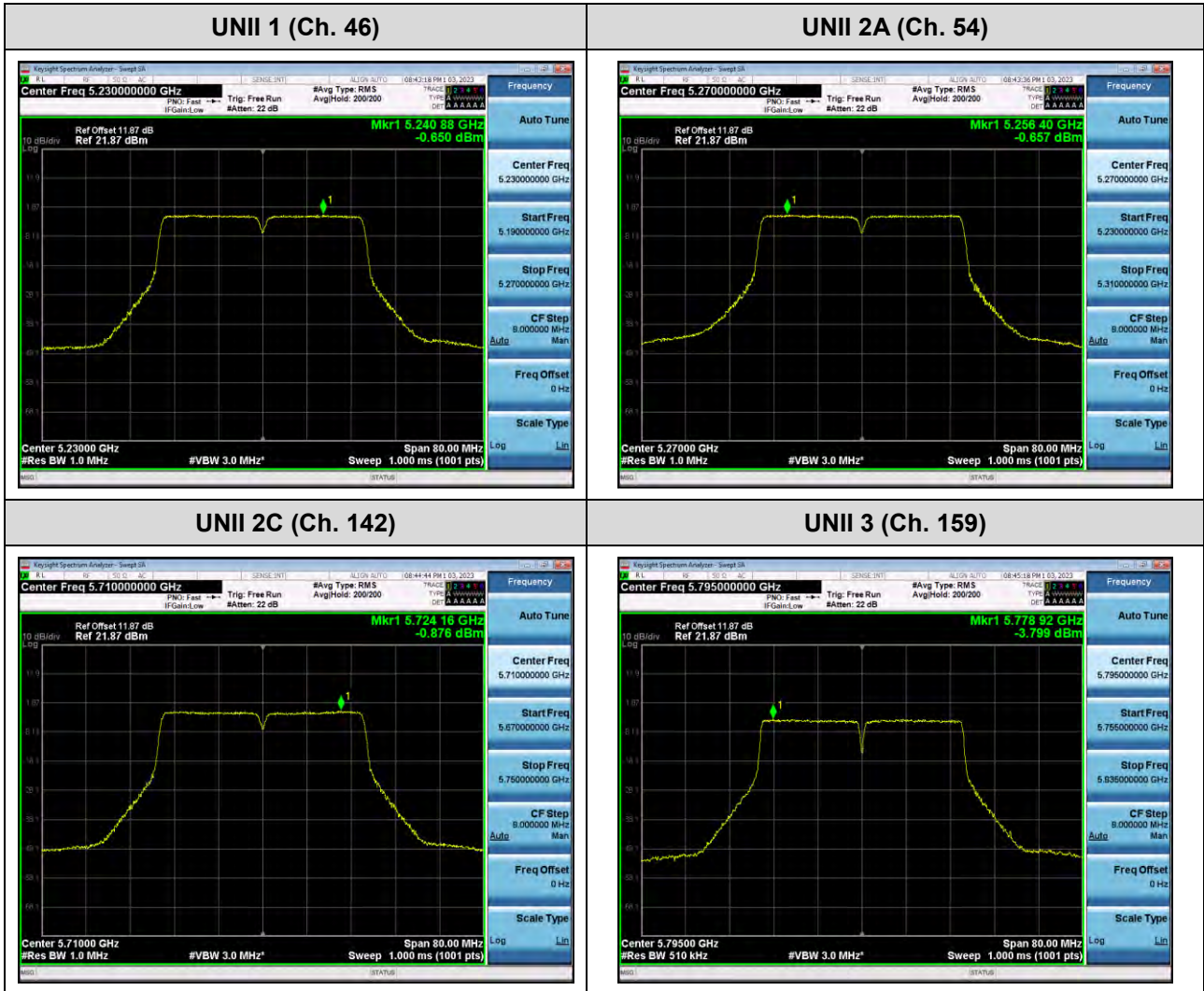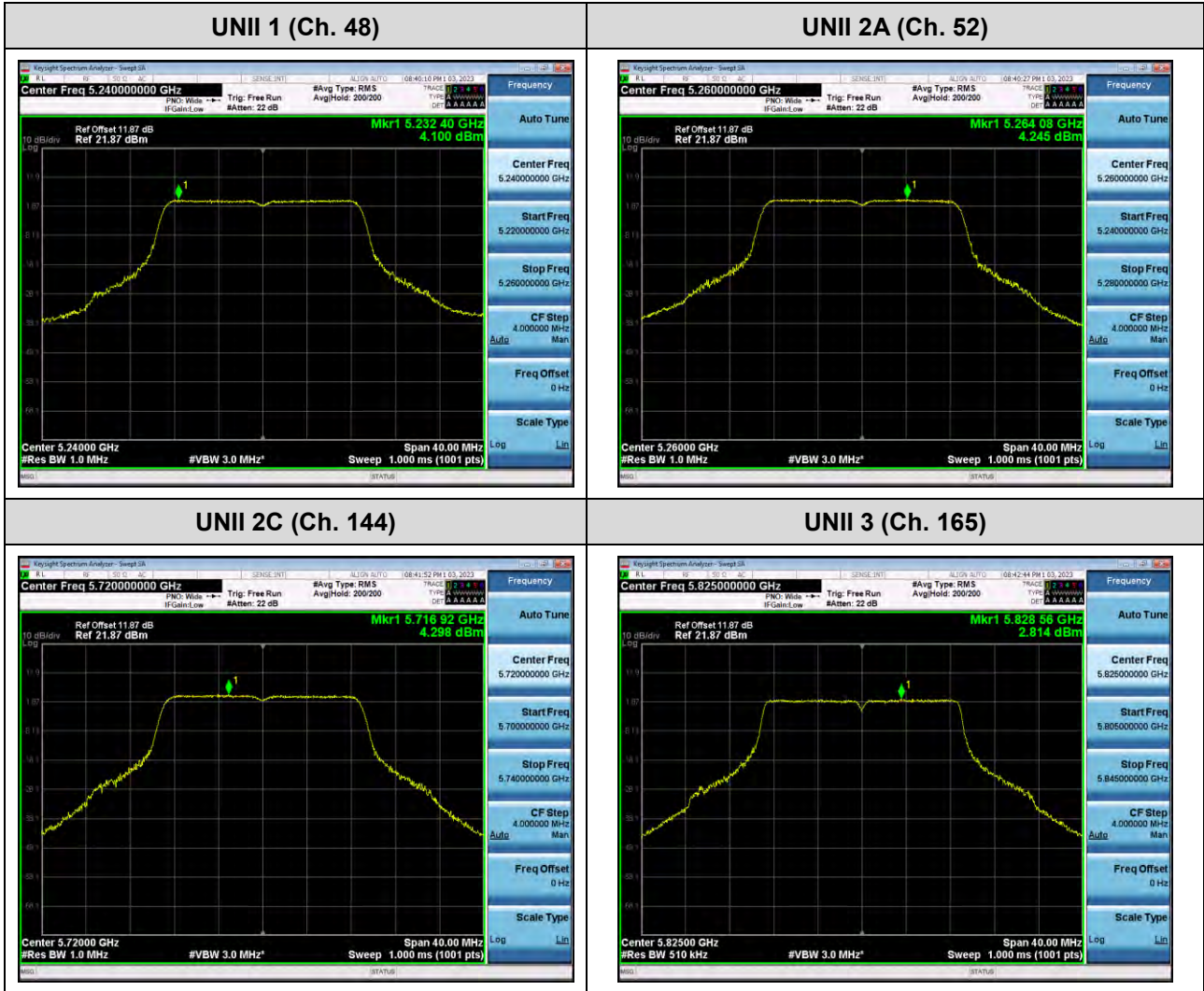

[SISO Ant.2]

◉ Test Plots(802.11a)

UNII 1 (Ch. 48)	UNII 2A (Ch. 52)

UNII 2C (Ch. 144)	UNII 3 (Ch. 165)

▣ Test Plots(802.11n(HT20))

UNII 1 (Ch. 40)	UNII 2A (Ch. 52)
UNII 2C (Ch. 144)	**UNII 3 (Ch. 165)**

◉ Test Plots(802.11n(HT40))

UNII 1 (Ch. 46)	UNII 2A (Ch. 54)

UNII 2C (Ch. 142)	UNII 3 (Ch. 159)

▣ Test Plots(802.11ac(VHT20))

UNII 1 (Ch. 48)	UNII 2A (Ch. 52)
UNII 2C (Ch. 144)	**UNII 3 (Ch. 165)**

▣ Test Plots(802.11ac(VHT40))

UNII 1 (Ch. 46)	UNII 2A (Ch. 54)

UNII 2C (Ch. 142)	UNII 3 (Ch. 159)

☑ Test Plots(802.11ac(VHT80))

UNII 1 (Ch. 42)	UNII 2A (Ch. 58)

UNII 2C (Ch. 122)	UNII 3 (Ch. 155)

[MIMO Ant.1]

▣ Test Plots(802.11a)

UNII 1 (Ch. 48)	UNII 2A (Ch. 60)

UNII 2C (Ch. 100)	UNII 3 (Ch. 157)

▣ Test Plots(802.11n(HT20))

UNII 1 (Ch. 40)	UNII 2A (Ch. 60)
UNII 2C (Ch. 100)	**UNII 3 (Ch. 157)**