TEST REPORT

FCC/ISED UNII Test for WLC21SSAK00
Certification

APPLICANT
Hanwha NxMD Corporation

REPORT NO.
HCT-RF-2403-FI004-R1

DATE OF ISSUE
April 23, 2024

Tested by
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Applicant	**Hanwha NxMD Corporation** 10th floor, 20, Pangyoyeok-ro 241beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Product Name Model Name	WLAN Module WLC21SSAK00
FCC ID IC	2BFGU-WLC21SSAK00 32218- WLC21SSAK00
Date of Test	January 26, 2024 ~ March 28, 2024
Location of Test	■ Permanent Testing Lab ☐ On Site Testing (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)
Modulation type	OFDM
FCC Classification	Unlicensed National Information Infrastructure(NII)
Test Standard Used	FCC Rule: Part 15.407 ISED Rule: RSS-247 Issue 3 (August 2023), RSS-Gen Issue 5_Amendment 2 (February 2021)
Test Results	PASS

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	March 28, 2024	Initial Release
1	April 23, 2024	Revised Frequency Stability test item

Notice

Content
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. The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s). The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***. When confirmation of authenticity of this test report is required, please contact www.hct.co.kr The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

CONTENTS

1. GENERAL INFORMATION

EUT DESCRIPTION

Model	WLC21SSAK00	
Additional Model	-	
EUT Type	WLAN Module	
Power Supply	DC 3.30 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 type	Antenna type: Dielectric Chip Antenna Peak Gain : 1.43 dBi(UNII 1)/1.66 dBi(UNII 2A, UNII 2C) /-0.10 dBi(UNII 3)	
Straddle channel	Supported	
TDWR Band	Not Supported	
Dynamic Frequency Selection	Slave without radar detection	
PMN (Product Marketing Number)	WLAN Module	
HVIN (Hardware Version Identification Number)	WLC21SSAK00	
FVIN (Firmware Version Identification Number)	N/A	
HMN (Host Marketing Name)	N/A	
EUT serial numbers	Conducted : C1 Radiated : R1	

2. MAXIMUM OUTPUT POWER

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

Band	Mode	Output Power	
		(dBm)	(W)
UNII1	802.11a	11.70	0.015
	802.11n (HT20)	11.65	0.015
	802.11n (HT40)	11.05	0.013
	802.11ac (VHT20)	11.81	0.015
	802.11ac (VHT40)	11.15	0.013
	802.11ac (VHT80)	10.77	0.012
UNII2A	802.11a	11.59	0.014
	802.11n (HT20)	11.47	0.014
	802.11n (HT40)	11.02	0.013
	802.11ac (VHT20)	11.59	0.014
	802.11ac (VHT40)	11.05	0.013
	802.11ac (VHT80)	10.79	0.012
UNII2C	802.11a	11.83	0.015
	802.11n (HT20)	11.81	0.015
	802.11n (HT40)	11.17	0.013
	802.11ac (VHT20)	11.93	0.016
	802.11ac (VHT40)	11.42	0.014
	802.11ac (VHT80)	11.49	0.014
UNII3	802.11a	11.55	0.014
	802.11n (HT20)	11.40	0.014
	802.11n (HT40)	11.17	0.013
	802.11ac (VHT20)	11.43	0.014
	802.11ac (VHT40)	11.38	0.014
	802.11ac (VHT80)	11.14	0.013

Band	Mode	Output Power			
		(dBm)	Peak Ant. Gain (dBi)	EIRP (dBm)	(W)
UNII1 (E.I.R.P)	802.11a	11.70	1.43	13.13	0.021
	802.11n (HT20)	11.65	1.43	13.08	0.020
	802.11n (HT40)	11.05	1.43	12.48	0.018
	802.11ac (VHT20)	11.81	1.43	13.24	0.021
	802.11ac (VHT40)	11.15	1.43	12.58	0.018
	802.11ac (VHT80)	10.77	1.43	12.20	0.017

Band	Mode	Output Power			
		(dBm)	Peak Ant. Gain (dBi)	EIRP (dBm)	(W)
UNII2A (E.I.R.P)	802.11a	11.59	1.66	13.25	0.021
	802.11n (HT20)	11.47	1.66	13.13	0.021
	802.11n (HT40)	11.02	1.66	12.68	0.019
	802.11ac (VHT20)	11.59	1.66	13.25	0.021
	802.11ac (VHT40)	11.05	1.66	12.71	0.019
	802.11ac (VHT80)	10.79	1.66	12.45	0.018

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.

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 RSS-Gen issue 5, RSS-247 issue 3.

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 Measurement Typeor 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 March 11, 2024 (CAB identifier: KR0032).
For ISED, test facility was accepted dated March 13, 2024 (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 Measurement Typeors 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

According to RSS-Gen(Issue 5) Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

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.

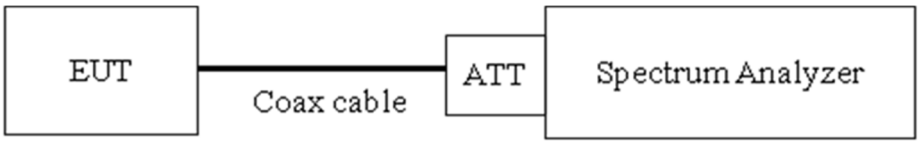
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.98 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.36 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.52 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.66 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.58 (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.

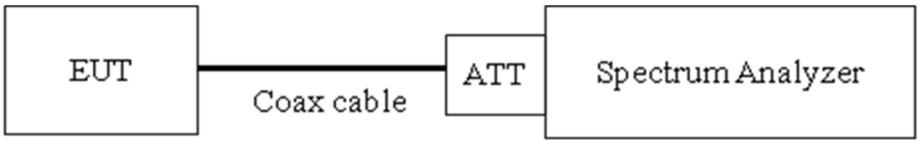
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Measurement Typeor = Average
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

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

Test Procedure (99 % Bandwidth for ISED)

The transmitter output is connected to the spectrum analyzer.

RBW = 1% ~ 5% of the occupied bandwidth
VBW ≒ 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

FCC Limit

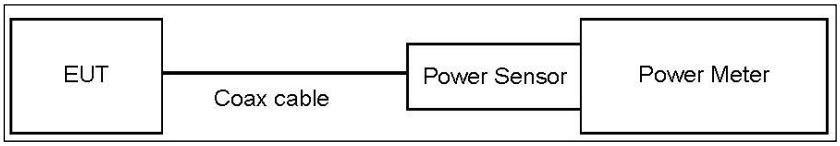
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30 dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30 dBm)

ISED Limit

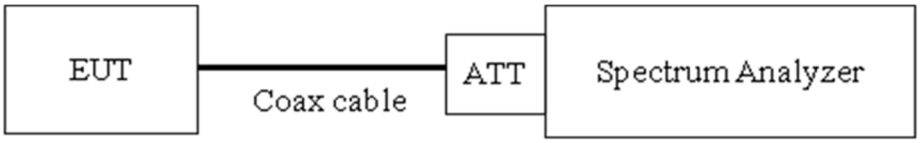
Band	Limit
UNII 1, 2A (EIRP)	For OEM devices installed in vehicles, 30 mW (14.77dBm) or 1.76 + 10 log B dBm, whichever power is less (where B is the 99% bandwidth in megahertz)
UNII 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 99% bandwidth in megahertz.)
UNII 2C (EIRP)	Not exceed the lesser of 1 W or 17 dBm + 10 log B, dBm (where B is the 99% 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. Measurement Typeor = 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	12.82
UNII 2A	12.82
UNII 2C	12.82
UNII 3	12.82

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

8.4. Power Spectral Density

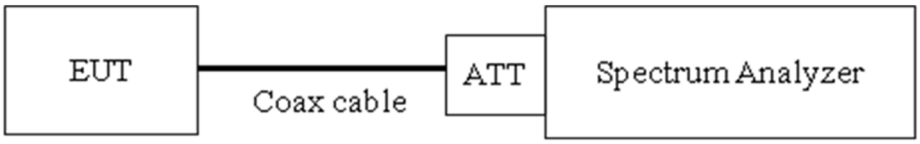
FCC Limit

Band	Limit
UNII 1	11 dBm/MHz
UNII 2A	11 dBm/MHz

FCC & ISED Limit

Band	Limit
UNII 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)
   ➔For portion within the NII-3 be used RBW 510kHz
3. VBW ≥ 3 MHz
4. Number of points in sweep ≥ 2 x span/RBW.
5. Sweep time = auto.
6. Measurement Typeor = RMS(i.e., power averaging), if available. Otherwise, use sample Measurement Typeor 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	12.82
UNII 2A	12.82
UNII 2C	12.82
UNII 3	12.82

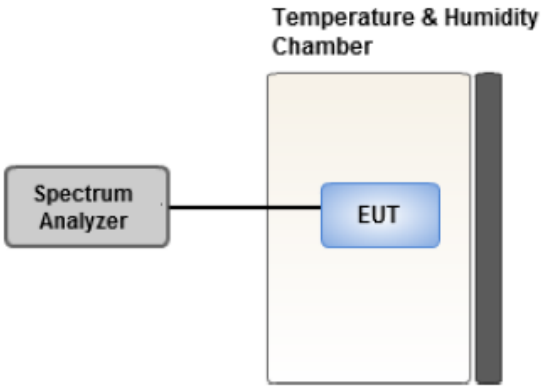
(Actual value of loss for the attenuator and cable combination)

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 battety 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#	56 to 46#
0.50 to 5	56	46
5 to 30	60	50

#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. Measurement Typeors : Quasi Peak and Average Measurement Typeor.

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.

FCC

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

ISED

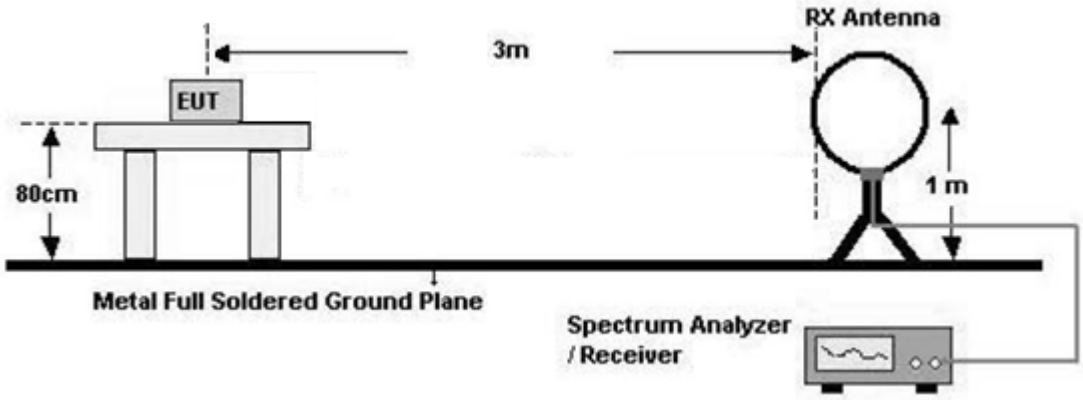
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

FCC&ISED

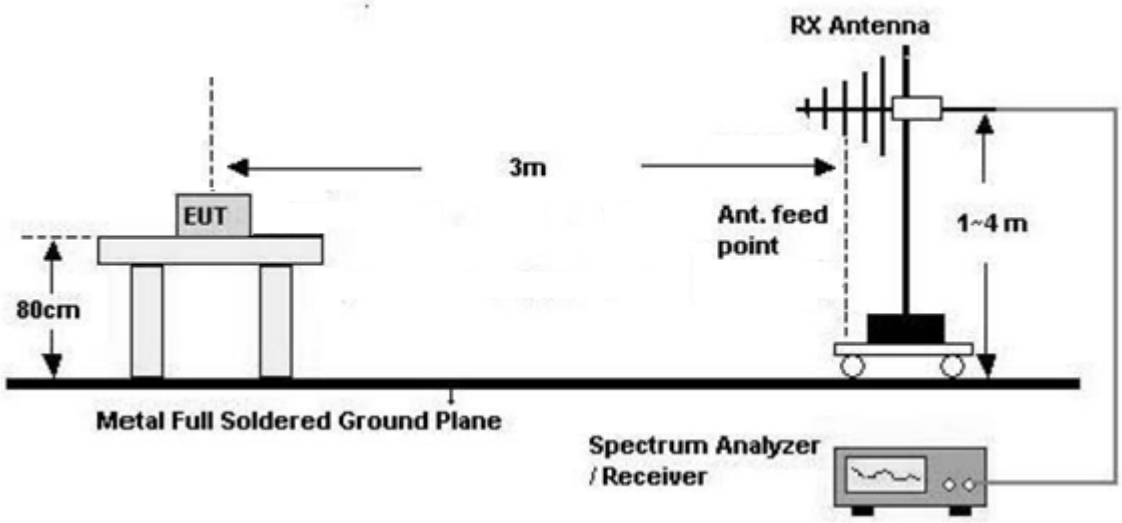
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

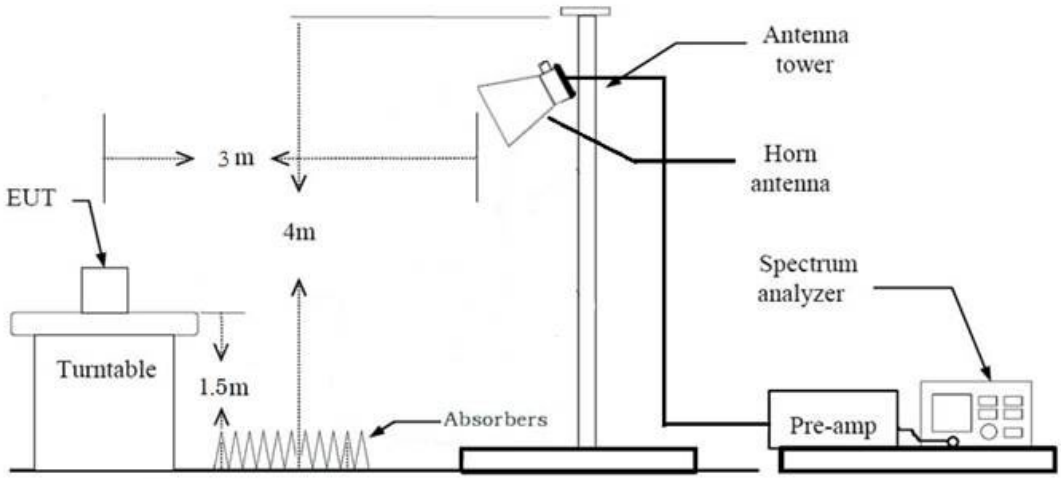
Below 30 MHz



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 3 m 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 Measurement Typeing 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
   - Measurement Typeor = Peak
   - Trace = Max Hold
   - 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 0.8m 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 Measurement Typeing 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
      - Measurement Typeor = Peak
      - Trace = Max Hold
      - RBW = 100 kHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Quasi-peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Measurement Typeor = 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 Measurement Typeing 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
   - Measurement Typeor = 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 percent) = VBW ≤ RBW/100(i.e., 10 kHz) but not less than 10 Hz.
   - VBW(Duty cycle is < 98 percent) = VBW ≥ 1/T, where T is the minimum transmission duration.
   - The analyzer is set to linear Measurement Typeor mode.
   - Measurement Typeor = 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 = 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)

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 Measurement Typeing 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
   - Measurement Typeor = 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 percent) = VBW ≤ RBW/100(i.e., 10 kHz) but not less than 10 Hz.
   - VBW(Duty cycle is < 98 percent) = VBW ≥ 1/T, where T is the minimum transmission duration.
   - The analyzer is set to linear Measurement Typeor mode.
   - Measurement Typeor = 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 = 20log (test distance / specific distance) (dB)

11. Total

(1)Measurement(Peak)

= Measured Value(Peak)

(2)Measurement(Avg)

= Measured Value (Avg)

- We apply to the offset in the range 1 GHz - 18 GHz.
- The offset = Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – Amp. Gain(A.G) + Attenuator(ATT)

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	0.934	0.297	1 000
802.11n(HT20)	MCS0	0.930	0.314	1 000
802.11n(HT40)	MCS0	0.868	0.616	2 000
802.11ac(VHT20)	MCS0	0.930	0.315	1 000
802.11ac(VHT40)	MCS0	0.867	0.618	2 000
802.11ac(VHT80)	MCS0	0.769	1.143	5 000

8.8. Receiver Spurious Emissions

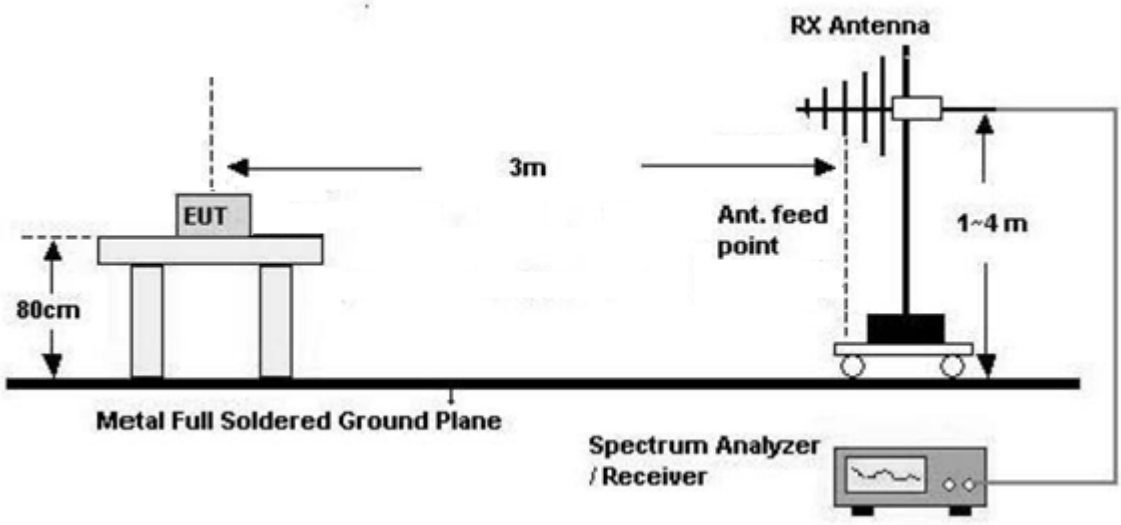
Limit

Frequency (MHz)	Field Strength (μV/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

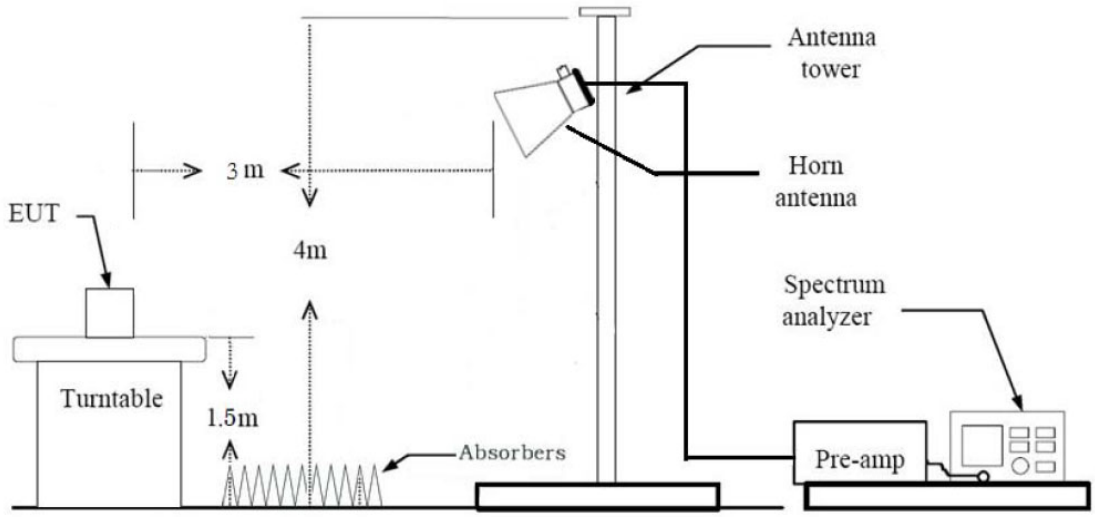
30 MHz - 1 GHz



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 ≥ 3 x RBW
7. Total = Measured 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(Average):
      - RBW = 1 MHz
      - VBW = 3 MHz
      - Detector = Average(RMS)
      - Trace = Average
      - Trace was allowed to stabilize
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. Total = Measured 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
3. EUT Axis
   - Radiated Spurious Emissions : Y
   - Radiated Restricted Band Edge : X
4. All data rate of operation were investigated and the worst case data rate results are reported
   - 802.11a : 6 Mbps
   - 802.11n : MCS0
   - 802.11ac : MCS0
5. Radiated Spurious Emission
   - All modulation of operation were investigated and the worst case modulation results are reported.
   (Worstcase : 802.11a_6 Mbps)
6. 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

Conducted test

1. All data rate of operation were investigated and the worst case data rate results are reported.
   - 802.11a : 6 Mbps
   - 802.11n : MCS0
   - 802.11ac : MCS0

9. SUMMARY OF TEST RESULTS

FCC

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26 dB Bandwidth	§ 15.407 (for Power Measurement)	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+10log$_{10}$ (BW) dBm (5250-5350 MHz) < 250 mW or 11+10log$_{10}$ (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
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 (#Note)
Undesirable Emissions	§ 15.407(b) (1),(2),(3),(4) § 15.407(b)(5)(ii),(iii) § 15.35(b)	<-27 dBm/MHz EIRP (UNII1, 2A, 2C) cf. Section 8.7 (UNII 3)		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	Radiated	PASS

#Note: 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-247,6.2.4.2	> 500 kHz UNII-3(5725~5850 MHz)		PASS
Maximum Conducted Output Power,	RSS-247,6.2	<250 mW or 11+10 log $_{10}$ (BW) dBm UNII-2C(5470-5600 MHz & 5650-5725 MHz), Whichever power is less		PASS
	RSS-247,6.2.4 2	<1 W UNII-3 (5725-5850 MHz)		
Maximum e.i.r.p	RSS-247,6.2 RSS-247,6.2.5.2	<30 mW or 1.76 + 10 log $_{10}$ (BW) dBm, For OEM devices installed in vehicles, UNII-1, 2A(5150-5250 & 5250-5350 MHz) <1 W or 17+10 log $_{10}$ (BW) dBm UNII-2C(5650-5725 MHz)		PASS
Power Spectral Density	RSS-247, 6.2	<11 dBm/MHz(Conducted) UNII-2C(5470-5600 MHz and 5650-5725 MHz)		PASS
	RSS-247,6.2.4.2	<30 dBm/500 kHz(Conducted) UNII-3(5725-5850 MHz)		
Frequency Stability	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.		PASS
AC Conducted Emissions 150 kHz-30 MHz	RSS-GEN, 8.8	RSS-GEN section 8.8 table 4		N/A (#Note)
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)	Radiated	PASS
	RSS-247, 6.2.4.3	cf. Section 8.7(NII-3) e.i.r.p spectral Density		
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		PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.3	RSS-GEN section 7.3 table 3		PASS

#Note: Not Tested.

10. TEST RESULT

10.1 DUTY CYCLE

Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11a	6	1.426	1.527	0.934	0.297
	9	0.960	1.061	0.905	0.436
	12	0.725	0.826	0.877	0.569
	18	0.494	0.593	0.833	0.792
	24	0.372	0.474	0.786	1.045
	36	0.258	0.357	0.723	1.406
	48	0.198	0.296	0.667	1.761
	54	0.182	0.281	0.649	1.880

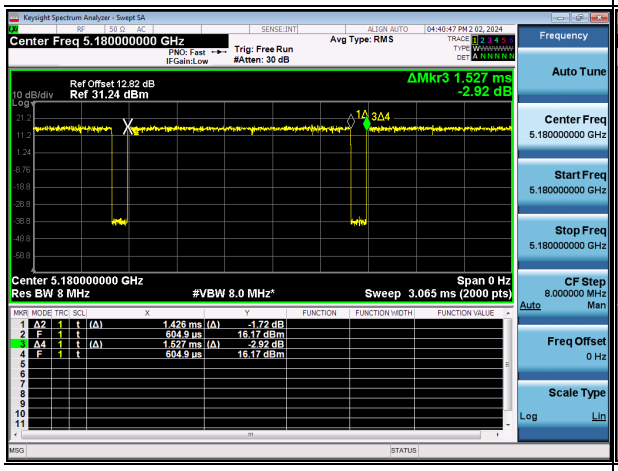
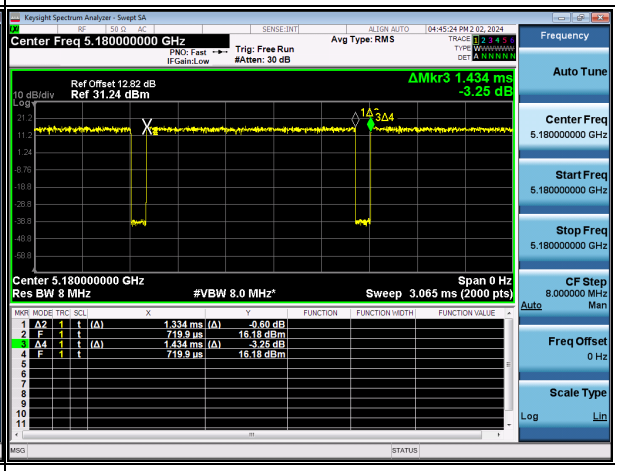
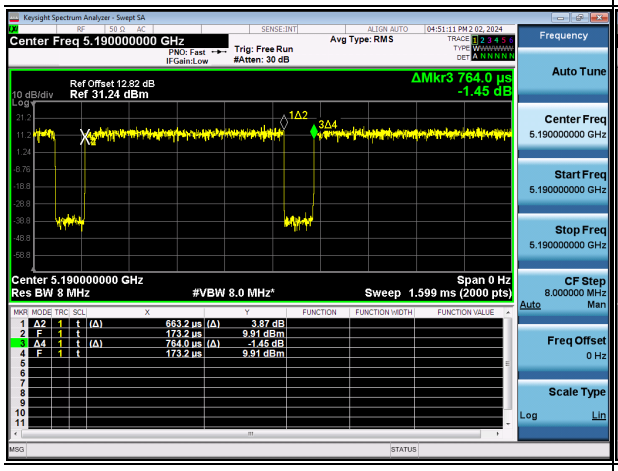
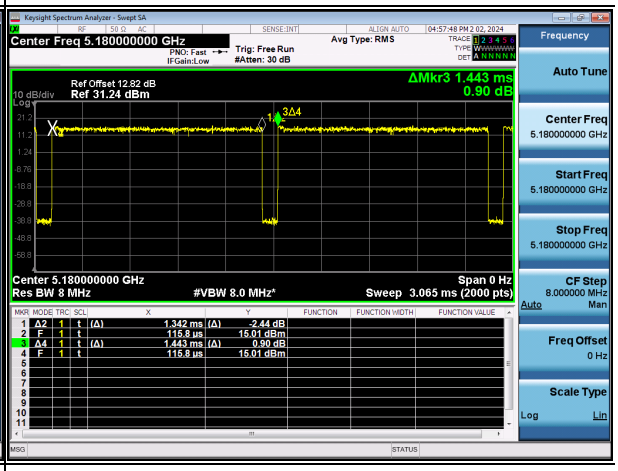
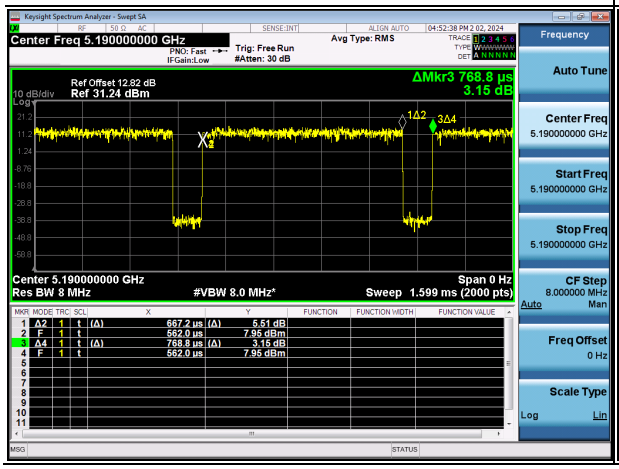
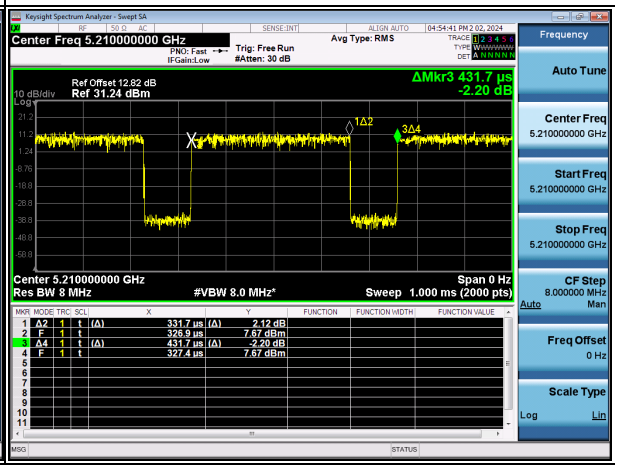
Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	1.334	1.434	0.930	0.314
	1	0.689	0.790	0.872	0.596
	2	0.476	0.573	0.832	0.800
	3	0.367	0.466	0.788	1.034
	4	0.258	0.357	0.723	1.406
	5	0.203	0.301	0.672	1.725
	6	0.185	0.286	0.646	1.898
	7	0.172	0.269	0.642	1.928
802.11n (HT40)	0	0.663	0.764	0.868	0.616
	1	0.355	0.453	0.782	1.067
	2	0.251	0.350	0.717	1.442
	3	0.200	0.296	0.675	1.706
	4	0.144	0.246	0.588	2.309
	5	0.119	0.215	0.553	2.573
	6	0.111	0.208	0.537	2.704
	7	0.101	0.200	0.506	2.956

Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11ac (VHT20)	0	1.342	1.443	0.930	0.315
	1	0.694	0.793	0.875	0.578
	2	0.479	0.578	0.829	0.815
	3	0.370	0.469	0.789	1.028
	4	0.263	0.360	0.732	1.353
	5	0.208	0.304	0.683	1.654
	6	0.193	0.289	0.667	1.761
	7	0.175	0.274	0.639	1.946
	8	0.152	0.253	0.600	2.218
802.11ac (VHT40)	0	0.667	0.769	0.867	0.618
	1	0.360	0.456	0.789	1.030
	2	0.256	0.352	0.727	1.387
	3	0.205	0.301	0.681	1.671
	4	0.152	0.248	0.612	2.131
	5	0.124	0.220	0.563	2.493
	6	0.114	0.213	0.536	2.711
	7	0.104	0.205	0.507	2.953
	8	0.096	0.197	0.489	3.111
	9	0.091	0.187	0.486	3.129
802.11ac (VHT80)	0	0.332	0.432	0.769	1.143
	1	0.190	0.289	0.658	1.818
	2	0.139	0.241	0.579	2.374
	3	0.119	0.215	0.553	2.573
	4	0.094	0.193	0.487	3.126
	5	0.081	0.180	0.451	3.461
	6	0.076	0.176	0.432	3.647
	7	0.073	0.172	0.426	3.701
	8	0.071	0.170	0.418	3.789
	9	0.068	0.165	0.415	3.816

▣ Test Plots

Note:

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

802.11a	802.11n(HT20)
	
802.11n(HT40)	**802.11ac(VHT20)**
	
802.11ac(VHT40)	**802.11ac(VHT80)**
	

10.2 26 dB Bandwidth & 99 % BANDWIDTH

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

Mode	Frequency [MHz]	Channel No.	26 dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]
802.11a	5180	36	21.60	16.984
	5200	40	21.66	17.000
	5240	48	21.65	16.990
	5260	52	21.59	16.969
	5300	60	21.62	17.000
	5320	64	21.67	16.994
	5500	100	21.76	17.018
	5600	120	21.71	17.018
	5720	144	21.75	17.027
	5745	149	21.71	16.985
	5785	157	21.70	17.038
	5825	165	21.69	17.018

Mode	Frequency [MHz]	Channel No.	26 dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]
802.11n (HT20)	5180	36	21.87	18.087
	5200	40	21.72	18.084
	5240	48	21.76	18.116
	5260	52	22.03	18.094
	5300	60	21.65	18.082
	5320	64	21.71	18.082
	5500	100	21.70	18.038
	5600	120	21.75	18.085
	5720	144	21.74	18.040
	5745	149	21.83	18.097
	5785	157	21.75	18.077
	5825	165	21.76	18.092

Mode	Frequency [MHz]	Channel No.	26 dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]
802.11ac (VHT20)	5180	36	21.90	18.051
	5200	40	21.73	18.009
	5240	48	21.74	18.048
	5260	52	21.77	18.041
	5300	60	21.72	18.046
	5320	64	21.79	18.064
	5500	100	21.64	18.053
	5600	120	21.86	18.095
	5720	144	21.84	18.077
	5745	149	21.73	18.091
	5785	157	21.89	18.086
	5825	165	21.88	18.087

Mode	Frequency [MHz]	Channel No.	26 dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]
802.11n (HT40)	5190	38	40.02	36.368
	5230	46	40.26	36.438
	5270	54	39.98	36.432
	5310	62	39.98	36.374
	5510	102	40.11	36.409
	5590	118	40.03	36.429
	5710	142	40.14	36.481
	5755	151	40.02	36.515
	5795	159	40.16	36.445

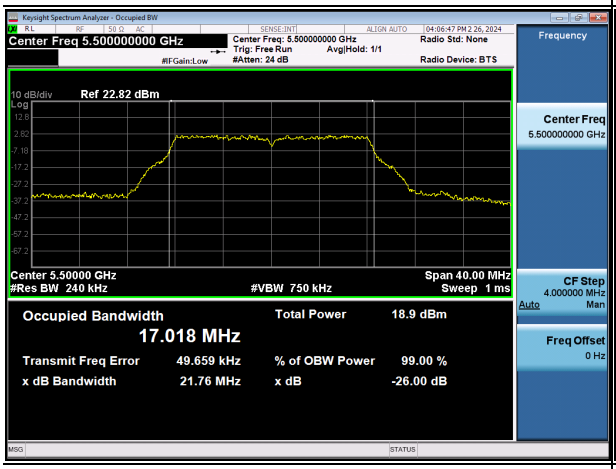
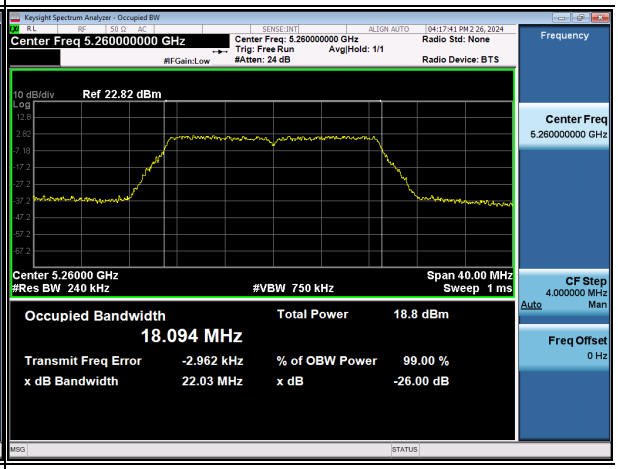
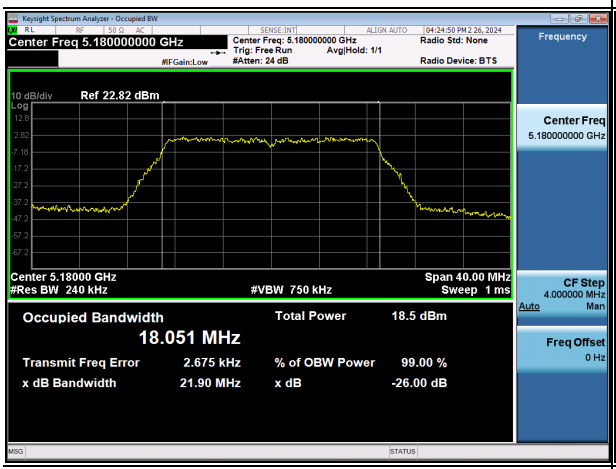
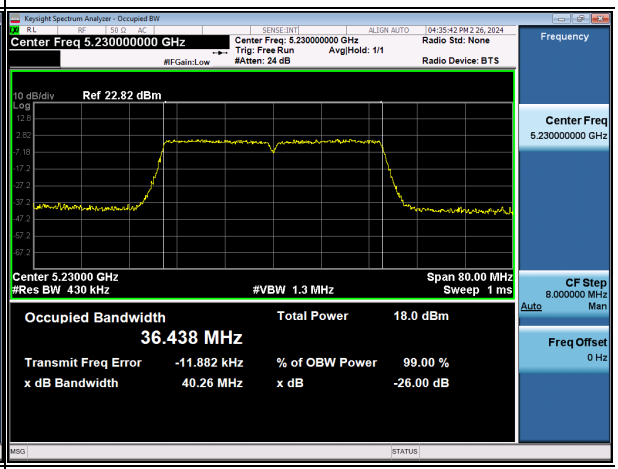
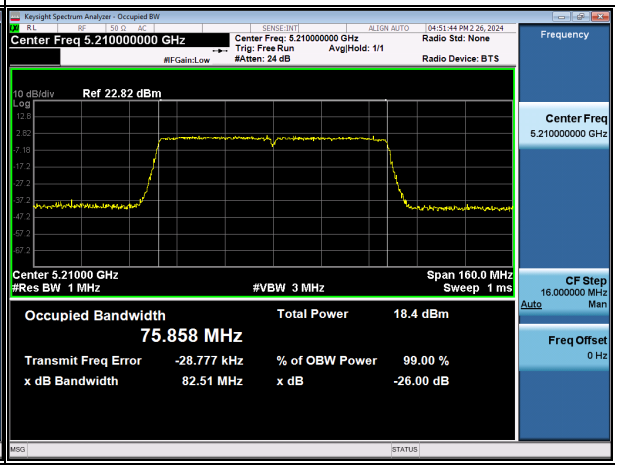
Mode	Frequency [MHz]	Channel No.	26 dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]
802.11ac (VHT40)	5190	38	40.31	36.434
	5230	46	40.36	36.384
	5270	54	40.35	36.437
	5310	62	40.20	36.429
	5510	102	40.50	36.418
	5590	118	40.24	36.449
	5710	142	40.25	36.420
	5755	151	40.24	36.462
	5795	159	39.97	36.426

Mode	Frequency [MHz]	Channel No.	26 dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]
802.11ac (VHT80)	5210	42	82.51	75.858
	5290	58	82.22	75.795
	5530	106	82.18	75.958
	5610	122	81.82	76.007
	5690	138	81.68	75.906
	5775	155	82.35	75.987

▣ Test Plots

Note:

In order to simplify the report, attached plots were only the widest channel per channel bandwidth.

802.11a 26 dB Bandwidth (CH 100)	802.11n(HT20) 26 dB Bandwidth (CH 52)
	
802.11ac(VHT20) 26 dB Bandwidth (CH 36)	**802.11n(HT40) 26 dB Bandwidth (CH 46)**
	
802.11ac(VHT40) 26 dB Bandwidth (CH 102)	**802.11ac(VHT80) 26 dB Bandwidth (CH 42)**
	

10.3 6 dB BANDWIDTH

[FCC]

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11a	5745	149	16.40	0.500
	5785	157	16.41	0.500
	5825	165	16.42	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11n(HT20)	5745	149	17.66	0.500
	5785	157	17.66	0.500
	5825	165	17.65	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT20)	5745	149	17.64	0.500
	5785	157	17.63	0.500
	5825	165	17.65	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11n(HT40)	5755	151	36.40	0.500
	5795	159	36.38	0.500

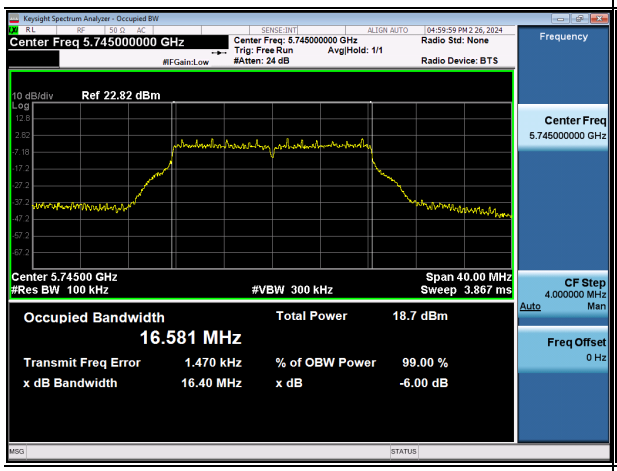
Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT40)	5755	151	36.38	0.500
	5795	159	36.41	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT80)	5775	155	75.71	0.500

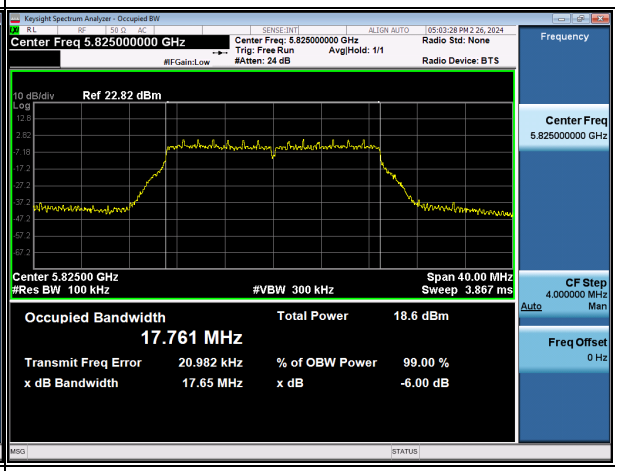
▣ Test Plots

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

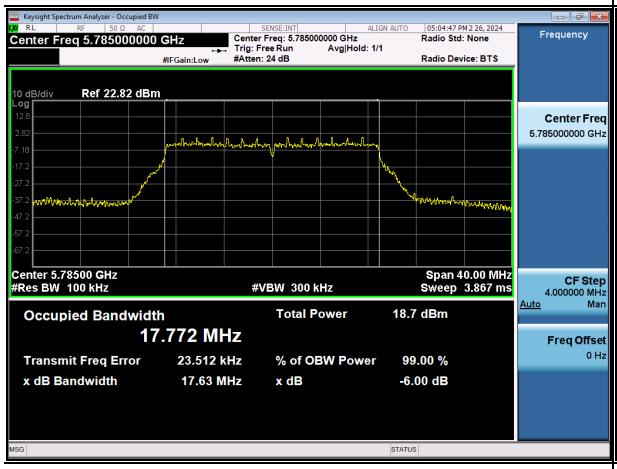
802.11a (CH.149)



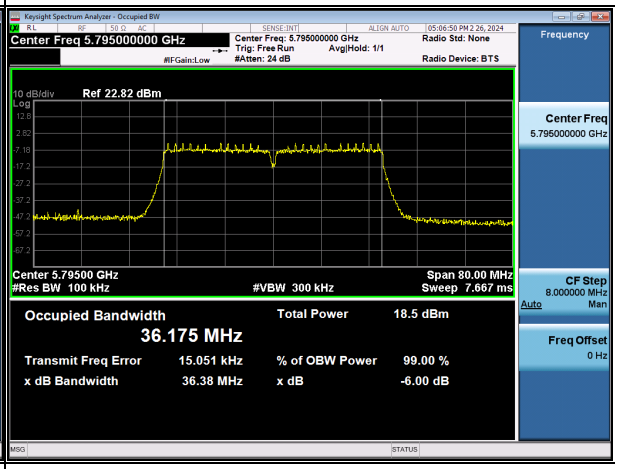
802.11n(HT20) (CH.165)



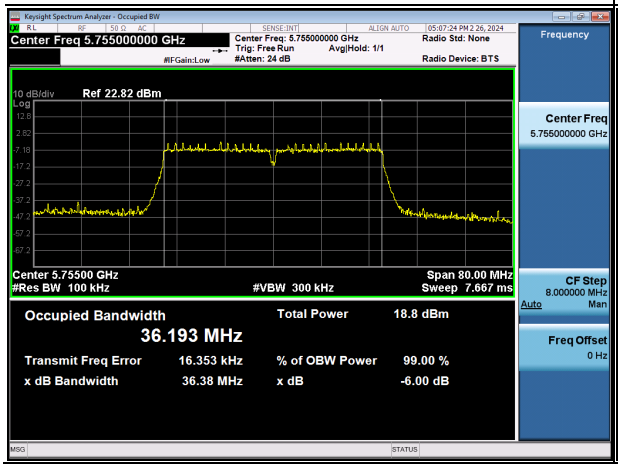
802.11ac(VHT20) (CH.157)



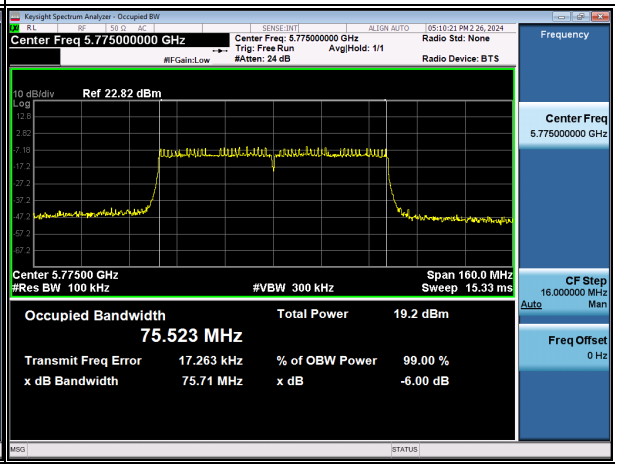
802.11n(HT40) (CH.159)



802.11ac(VHT40) (CH.151)



802.11ac(VHT80) (CH.155)



[ISED]

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11a	5745	149	16.52	0.500
	5785	157	16.55	0.500
	5825	165	16.54	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11n(HT20)	5745	149	17.71	0.500
	5785	157	17.78	0.500
	5825	165	17.75	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT20)	5745	149	17.72	0.500
	5785	157	17.78	0.500
	5825	165	17.73	0.500

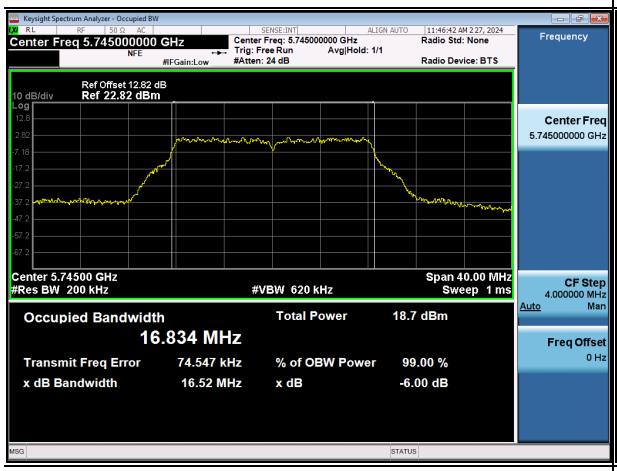
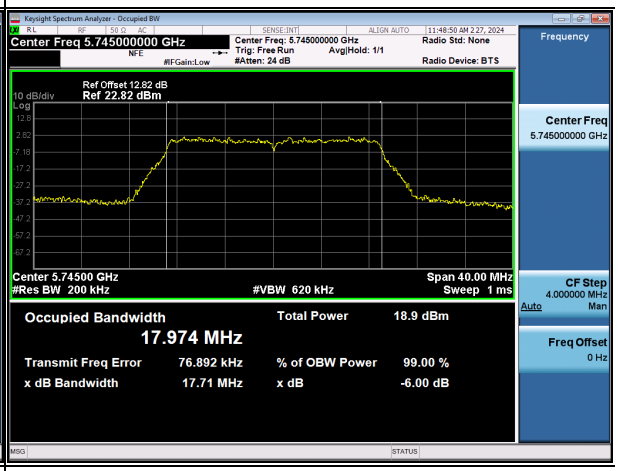
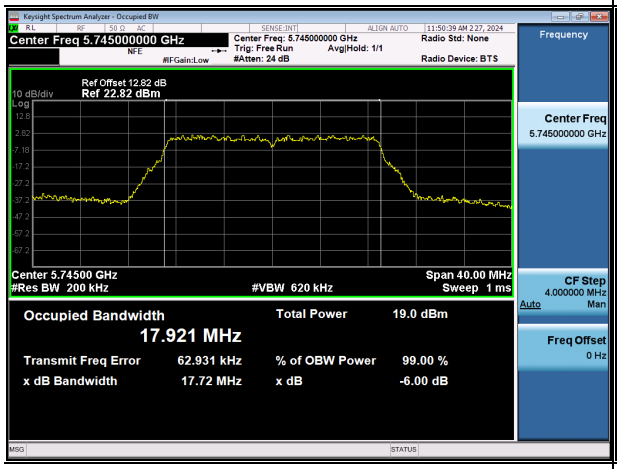
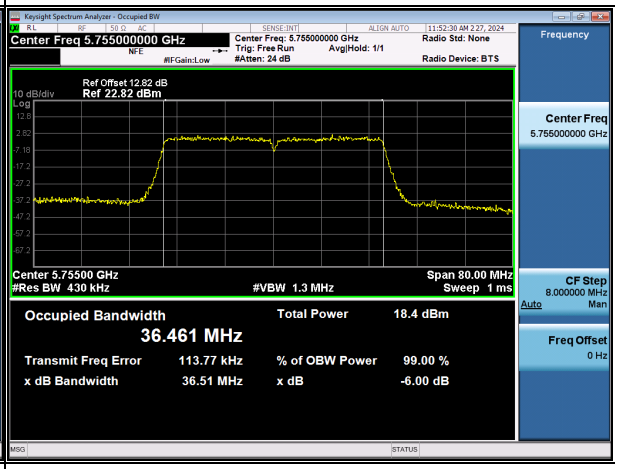
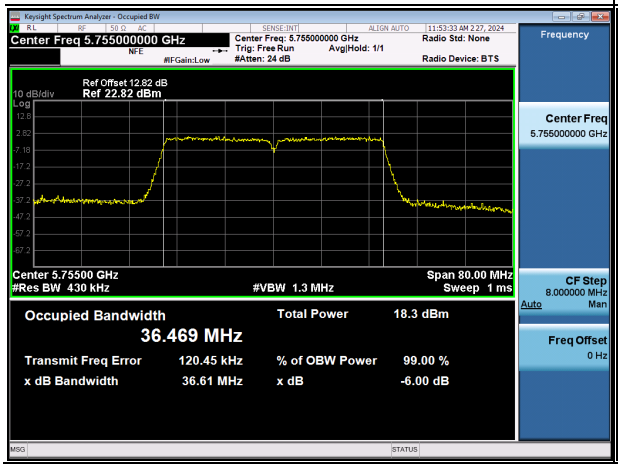
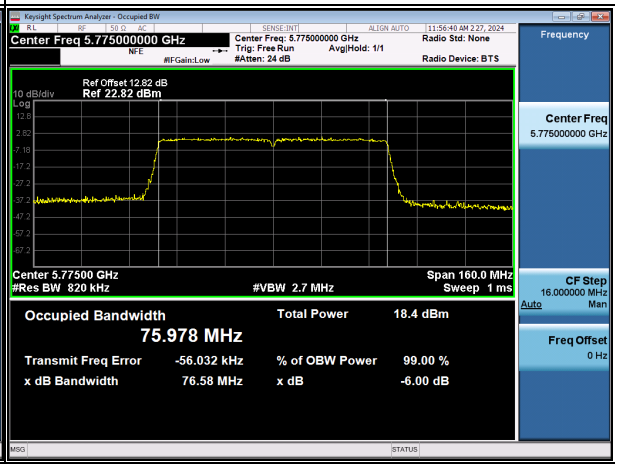
Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11n(HT40)	5755	151	36.51	0.500
	5795	159	36.63	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT40)	5755	151	36.61	0.500
	5795	159	36.62	0.500

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT80)	5775	155	76.58	0.500

▣ Test Plots

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

802.11a (CH.149)	802.11n(HT20) (CH.149)
	
802.11ac(VHT20) (CH.149)	**802.11n(HT40) (CH.151)**
	
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.

Note:

1. Limit

FCC Limit

(UNII 1) : 23.98 dBm

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

(UNII 3) : 30.00 dBm

ISED Limit

(UNII 1, 2A) EIRP : 30 mW (14.77 dBm) or 1.76 + 10 log B dBm, (where B is the 99% bandwidth in megahertz.)

(UNII 2C) Worst limit : 23.98 dBm or 11 + 10 log B dBm, (where B is the 99% Bandwidth in megahertz.)

(UNII 3) : 30.00 dBm

2. Ant Total Power [dBm] = Measured Power [dBm] + Duty Cycle Factor [dB]

Mode	Frequency [MHz]	Channel No.	Datarate	Conducted Average Power [dBm]			Peak Ant. Gain [dBi]	E.I.R.P [dBm]	FCC Limit [dBm]	ISED Limit [dBm]
				Measured Value	D.C.F	Summed				
802.11a	5180	36	6 Mbps	11.07	0.297	11.37	1.43	12.80	23.98	14.06
	5200	40	6 Mbps	11.26	0.297	11.56	1.43	12.99	23.98	14.06
	5240	48	6 Mbps	11.40	0.297	11.70	1.43	13.13	23.98	14.06
	5260	52	6 Mbps	11.29	0.297	11.59	1.66	13.25	23.98	14.06
	5300	60	6 Mbps	11.20	0.297	11.50	1.66	13.16	23.98	14.06
	5320	64	6 Mbps	11.17	0.297	11.47	1.66	13.13	23.98	14.06
	5500	100	6 Mbps	11.53	0.297	11.83	-	-	23.98	-
	5600	120	6 Mbps	11.14	0.297	11.44	-	-	23.98	-
	5720	144	6 Mbps	10.44	0.297	10.74	-	-	23.98	-
	5745	149	6 Mbps	11.25	0.297	11.55	-	-	30.00	-
	5785	157	6 Mbps	11.14	0.297	11.44	-	-	30.00	-
	5825	165	6 Mbps	10.85	0.297	11.15	-	-	30.00	-
802.11n 20 (HT20)	5180	36	MCS 0	11.10	0.314	11.41	1.43	12.84	23.98	14.33
	5200	40	MCS 0	11.05	0.314	11.36	1.43	12.79	23.98	14.33
	5240	48	MCS 0	11.34	0.314	11.65	1.43	13.08	23.98	14.34
	5260	52	MCS 0	11.11	0.314	11.42	1.66	13.08	23.98	14.34
	5300	60	MCS 0	11.16	0.314	11.47	1.66	13.13	23.98	14.33
	5320	64	MCS 0	11.16	0.314	11.47	1.66	13.13	23.98	14.33
	5500	100	MCS 0	11.50	0.314	11.81	-	-	23.98	-
	5600	120	MCS 0	10.98	0.314	11.29	-	-	23.98	-
	5720	144	MCS 0	10.22	0.314	10.53	-	-	23.98	-
	5745	149	MCS 0	11.09	0.314	11.40	-	-	30.00	-
	5785	157	MCS 0	10.91	0.314	11.22	-	-	30.00	-
	5825	165	MCS 0	10.83	0.314	11.14	-	-	30.00	-

Mode	Frequency [MHz]	Channel No.	Datarate	Conducted Average Power [dBm]			Peak Ant. Gain [dBi]	E.I.R.P [dBm]	FCC Limit [dBm]	ISED Limit [dBm]
				Measured Value	D.C.F	Summed				
802.11ac 20 (VHT20)	5180	36	MCS 0	11.05	0.315	11.37	1.43	12.80	23.98	14.33
	5200	40	MCS 0	11.13	0.315	11.45	1.43	12.88	23.98	14.31
	5240	48	MCS 0	11.49	0.315	11.81	1.43	13.24	23.98	14.32
	5260	52	MCS 0	11.25	0.315	11.57	1.66	13.23	23.98	14.32
	5300	60	MCS 0	11.27	0.315	11.59	1.66	13.25	23.98	14.32
	5320	64	MCS 0	11.20	0.315	11.52	1.66	13.18	23.98	14.33
	5500	100	MCS 0	11.61	0.315	11.93	-	-	23.98	-
	5600	120	MCS 0	11.14	0.315	11.46	-	-	23.98	-
	5720	144	MCS 0	10.35	0.315	10.67	-	-	23.98	-
	5745	149	MCS 0	10.25	0.315	10.57	-	-	30.00	-
	5785	157	MCS 0	11.11	0.315	11.43	-	-	30.00	-
	5825	165	MCS 0	10.81	0.315	11.13	-	-	30.00	-
802.11n 40 (HT40)	5190	38	MCS 0	10.28	0.616	10.90	1.43	12.33	23.98	14.77
	5230	46	MCS 0	10.43	0.616	11.05	1.43	12.48	23.98	14.77
	5270	54	MCS 0	10.40	0.616	11.02	1.66	12.68	23.98	14.77
	5310	62	MCS 0	10.34	0.616	10.96	1.66	12.62	23.98	14.77
	5510	102	MCS 0	10.43	0.616	11.05	-	-	23.98	-
	5590	118	MCS 0	10.13	0.616	10.75	-	-	23.98	-
	5710	142	MCS 0	10.55	0.616	11.17	-	-	23.98	-
	5755	151	MCS 0	10.17	0.616	10.79	-	-	30.00	-
	5795	159	MCS 0	10.55	0.616	11.17	-	-	30.00	-

Mode	Frequency [MHz]	Channel No.	Datarate	Conducted Average Power [dBm]			Peak Ant. Gain [dBi]	E.I.R.P [dBm]	FCC Limit [dBm]	ISED Limit [dBm]
				Measured Value	D.C.F	Summed				
802.11ac 40 (VHT40)	5190	38	MCS 0	10.53	0.618	11.15	1.43	12.58	23.98	14.77
	5230	46	MCS 0	10.42	0.618	11.04	1.43	12.47	23.98	14.77
	5270	54	MCS 0	10.43	0.618	11.05	1.66	12.71	23.98	14.77
	5310	62	MCS 0	10.33	0.618	10.95	1.66	12.61	23.98	14.77
	5510	102	MCS 0	10.80	0.618	11.42	-	-	23.98	-
	5590	118	MCS 0	10.45	0.618	11.07	-	-	23.98	-
	5710	142	MCS 0	10.76	0.618	11.38	-	-	23.98	-
	5755	151	MCS 0	10.76	0.618	11.38	-	-	30.00	-
	5795	159	MCS 0	10.44	0.618	11.06	-	-	30.00	-
802.11ac 80 (VHT80)	5210	42	MCS 0	9.63	1.143	10.77	1.43	12.20	23.98	14.77
	5290	58	MCS 0	9.65	1.143	10.79	1.66	12.45	23.98	14.77
	5530	106	MCS 0	10.35	1.143	11.49	-	-	23.98	-
	5610	122	MCS 0	10.00	1.143	11.14	-	-	23.98	-
	5690	138	MCS 0	9.61	1.143	10.75	-	-	23.98	-
	5775	155	MCS 0	10.00	1.143	11.14	-	-	30.00	-

10.5 POWER SPECTRAL DENSITY

1. Limit

FCC Limit

(UNII 1) : 11 dBm/MHz

(UNII 2A) : 11 dBm/MHz

FCC & ISED Limit

(UNII 2C) : 11 dBm/MHz

(UNII 3) : 30 dBm/500 kHz

2. Ant Total PSD [dBm] = Measured PSD [dBm] + Duty Cycle Factor [dB]

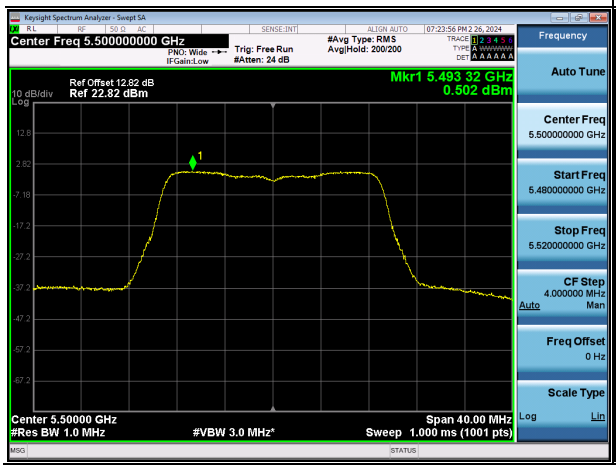
Mode	Frequency [MHz]	Channel No.	Datarate	Power Spectral Density [dBm]			Limit
				Measured Value	D.C.F	Summed	
802.11a	5180	36	6 Mbps	0.162	0.30	0.459	11 dBm/MHz
	5200	40	6 Mbps	0.540	0.30	0.837	11 dBm/MHz
	5240	48	6 Mbps	1.072	0.30	1.369	11 dBm/MHz
	5260	52	6 Mbps	0.715	0.30	1.012	11 dBm/MHz
	5300	60	6 Mbps	0.497	0.30	0.794	11 dBm/MHz
	5320	64	6 Mbps	0.341	0.30	0.638	11 dBm/MHz
	5500	100	6 Mbps	-0.301	0.30	-0.004	11 dBm/MHz
	5600	120	6 Mbps	-0.595	0.30	-0.298	11 dBm/MHz
	5720	144	6 Mbps	-0.342	0.30	-0.045	11 dBm/MHz
	5745	149	6 Mbps	-2.417	0.30	-2.120	30 dBm/500 kHz
	5785	157	6 Mbps	-2.604	0.30	-2.307	30 dBm/500 kHz
	5825	165	6 Mbps	-2.608	0.30	-2.311	30 dBm/500 kHz
802.11n 20 (HT20)	5180	36	MCS 0	0.075	0.31	0.389	11 dBm/MHz
	5200	40	MCS 0	0.058	0.31	0.372	11 dBm/MHz
	5240	48	MCS 0	0.238	0.31	0.552	11 dBm/MHz
	5260	52	MCS 0	-0.067	0.31	0.247	11 dBm/MHz
	5300	60	MCS 0	0.264	0.31	0.578	11 dBm/MHz
	5320	64	MCS 0	0.005	0.31	0.319	11 dBm/MHz
	5500	100	MCS 0	0.598	0.31	0.912	11 dBm/MHz
	5600	120	MCS 0	-0.073	0.31	0.241	11 dBm/MHz
	5720	144	MCS 0	-0.538	0.31	-0.224	11 dBm/MHz
	5745	149	MCS 0	-2.554	0.31	-2.240	30 dBm/500 kHz
	5785	157	MCS 0	-2.754	0.31	-2.440	30 dBm/500 kHz

Mode	Frequency [MHz]	Channel No.	Datarate	Power Spectral Density [dBm]			Limit
				Measured Value	D.C.F	Summed	
	5825	165	MCS 0	-2.950	0.31	-2.636	30 dBm/500 kHz
802.11ac 20 (VHT20)	5180	36	MCS 0	0.073	0.32	0.388	11 dBm/MHz
	5200	40	MCS 0	-0.093	0.32	0.222	11 dBm/MHz
	5240	48	MCS 0	0.246	0.32	0.561	11 dBm/MHz
	5260	52	MCS 0	0.137	0.32	0.452	11 dBm/MHz
	5300	60	MCS 0	0.238	0.32	0.553	11 dBm/MHz
	5320	64	MCS 0	0.023	0.32	0.338	11 dBm/MHz
	5500	100	MCS 0	0.502	0.32	0.817	11 dBm/MHz
	5600	120	MCS 0	0.046	0.32	0.361	11 dBm/MHz
	5720	144	MCS 0	-2.204	0.32	-1.889	11 dBm/MHz
	5745	149	MCS 0	-2.534	0.32	-2.219	30 dBm/500 kHz
	5785	157	MCS 0	-2.812	0.32	-2.497	30 dBm/500 kHz
	5825	165	MCS 0	-2.913	0.32	-2.598	30 dBm/500 kHz
802.11n 40 (HT40)	5190	38	MCS 0	-6.414	0.62	-5.798	11 dBm/MHz
	5230	46	MCS 0	-6.217	0.62	-5.601	11 dBm/MHz
	5270	54	MCS 0	-3.988	0.62	-3.372	11 dBm/MHz
	5310	62	MCS 0	-3.855	0.62	-3.239	11 dBm/MHz
	5510	102	MCS 0	-3.571	0.62	-2.955	11 dBm/MHz
	5590	118	MCS 0	-4.044	0.62	-3.428	11 dBm/MHz
	5710	142	MCS 0	-3.668	0.62	-3.052	11 dBm/MHz
	5755	151	MCS 0	-6.343	0.62	-5.727	30 dBm/500 kHz
	5795	159	MCS 0	-6.603	0.62	-5.987	30 dBm/500 kHz
802.11ac 40 (VHT40)	5190	38	MCS 0	-3.961	0.62	-3.343	11 dBm/MHz
	5230	46	MCS 0	-3.860	0.62	-3.242	11 dBm/MHz
	5270	54	MCS 0	-3.856	0.62	-3.238	11 dBm/MHz
	5310	62	MCS 0	-7.795	0.62	-7.177	11 dBm/MHz
	5510	102	MCS 0	-3.614	0.62	-2.996	11 dBm/MHz
	5590	118	MCS 0	-3.926	0.62	-3.308	11 dBm/MHz
	5710	142	MCS 0	-3.623	0.62	-3.005	11 dBm/MHz
	5755	151	MCS 0	-6.155	0.62	-5.537	30 dBm/500 kHz
	5795	159	MCS 0	-6.936	0.62	-6.318	30 dBm/500 kHz
802.11ac 80 (VHT80)	5210	42	MCS 0	-8.245	1.14	-7.102	11 dBm/MHz
	5290	58	MCS 0	-8.364	1.14	-7.221	11 dBm/MHz
	5530	106	MCS 0	-7.501	1.14	-6.358	11 dBm/MHz
	5610	122	MCS 0	-9.168	1.14	-8.025	11 dBm/MHz
	5690	138	MCS 0	-8.228	1.14	-7.085	11 dBm/MHz
	5775	155	MCS 0	-10.224	1.14	-9.081	30 dBm/500 kHz

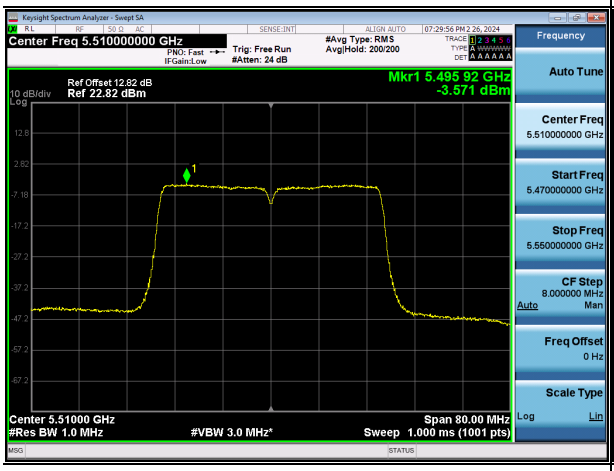
▣ Test Plots

Note:

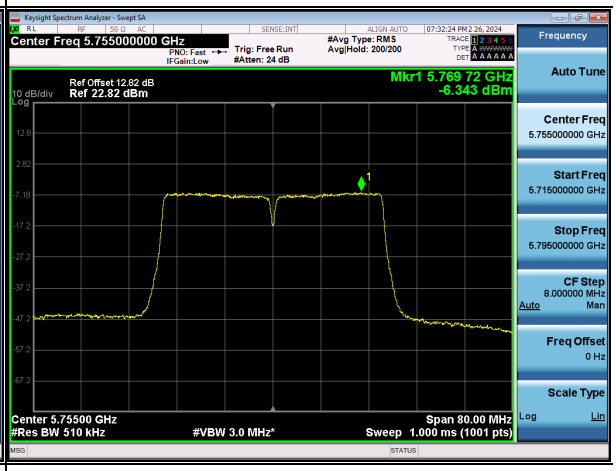
In order to simplify the report, attached plots were only channel of the highest PSD.

802.11a UNII 1-2C (Ch.48)	802.11a UNII 3 (Ch.149)
	
802.11n(HT20) UNII 1-2C (Ch.100)	**802.11 n(HT20) UNII 3 (Ch.149)**
	
802.11ac(VHT20) UNII 1-2C (Ch.100)	**802.11 ac(VHT20) UNII 3 (Ch.149)**
	

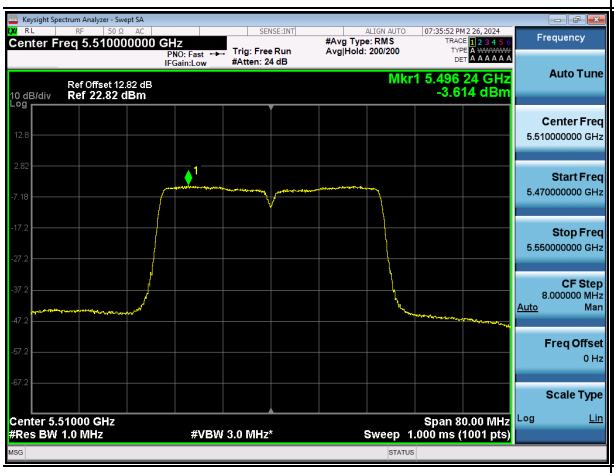
802.11n(HT40) UNII 1-2C (Ch.102)



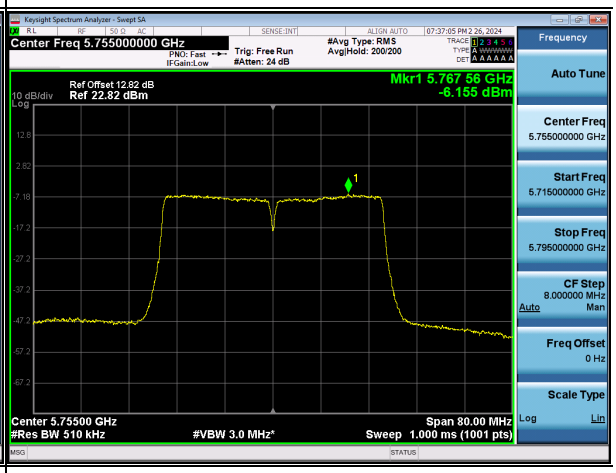
802.11n(HT40) UNII 3 (Ch.151)



802.11ac(VHT40) UNII 1-2C (Ch.102)



802.11 ac(VHT40) UNII 3 (Ch.151)



802.11ac(VHT80) UNII 1-2C (Ch.106)

802.11 ac(VHT80) UNII 3 (Ch.155)

10.6 FREQUENCY STABILITY

Note:

1. All modes of operation were investigated and the worst case configuration results are reported.
2. 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.

10.6.1 80 MHz BW

Startup after the EUT is energized

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,210,000,000 Hz
CHANNEL:	42
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 210 077.95	77.95
100%		-30	5 210 095.57	95.57
100%		-20	5 210 023.56	23.56
100%		-10	5 210 081.65	81.65
100%		0	5 210 048.03	48.03
100%		+10	5 210 093.57	93.57
100%		+30	5 210 001.19	1.19
100%		+40	5 210 070.85	70.85
100%		+50	5 210 099.87	99.87
High	3.50	+20	5 210 085.92	85.92
Low	3.13	+20	5 210 049.20	49.20

OPERATING BAND:	UNII Band 2A
OPERATING FREQUENCY:	5,290,000,000 Hz
CHANNEL:	58
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 290 068.72	68.72
100%		-30	5 290 019.74	19.74
100%		-20	5 290 042.39	42.39
100%		-10	5 290 052.84	52.84
100%		0	5 290 054.18	54.18
100%		+10	5 290 064.89	64.89
100%		+30	5 290 031.25	31.25
100%		+40	5 290 002.77	2.77
100%		+50	5 290 095.71	95.71
High	3.50	+20	5 290 013.74	13.74
Low	3.13	+20	5 290 083.69	83.69

OPERATING BAND:	UNII Band 2C
OPERATING FREQUENCY:	5,530,000,000 Hz
CHANNEL:	106
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 530 040.02	40.02
100%		-30	5 530 057.43	57.43
100%		-20	5 530 045.58	45.58
100%		-10	5 530 059.38	59.38
100%		0	5 530 086.45	86.45
100%		+10	5 530 021.79	21.79
100%		+30	5 530 081.79	81.79
100%		+40	5 530 031.11	31.11
100%		+50	5 530 033.04	33.04
High	3.50	+20	5 530 024.71	24.71
Low	3.13	+20	5 530 029.58	29.58

OPERATING BAND:	UNII Band 3
OPERATING FREQUENCY:	5,775,000,000 Hz
CHANNEL:	155
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 775 081.51	81.51
100%		-30	5 775 011.23	11.23
100%		-20	5 775 027.07	27.07
100%		-10	5 775 016.81	16.81
100%		0	5 775 042.47	42.47
100%		+10	5 775 088.91	88.91
100%		+30	5 775 017.50	17.50
100%		+40	5 775 052.96	52.96
100%		+50	5 775 018.10	18.10
High	3.50	+20	5 775 059.37	59.37
Low	3.13	+20	5 775 078.78	78.78

2 minutes after the EUT is energized

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,210,000,000 Hz
CHANNEL:	42
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 210 004.71	4.71
100%		-30	5 210 036.87	36.87
100%		-20	5 210 020.82	20.82
100%		-10	5 210 029.62	29.62
100%		0	5 210 043.86	43.86
100%		+10	5 210 054.73	54.73
100%		+30	5 210 079.84	79.84
100%		+40	5 210 077.69	77.69
100%		+50	5 210 041.21	41.21
High	3.50	+20	5 210 002.83	2.83
Low	3.13	+20	5 210 066.72	66.72

OPERATING BAND:	UNII Band 2A
OPERATING FREQUENCY:	5,290,000,000 Hz
CHANNEL:	58
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 290 025.84	25.84
100%		-30	5 290 055.31	55.31
100%		-20	5 290 046.55	46.55
100%		-10	5 290 044.37	44.37
100%		0	5 290 088.56	88.56
100%		+10	5 290 046.88	46.88
100%		+30	5 290 071.53	71.53
100%		+40	5 290 042.14	42.14
100%		+50	5 290 088.69	88.69
High	3.50	+20	5 290 026.30	26.30
Low	3.13	+20	5 290 043.44	43.44

OPERATING BAND:	UNII Band 2C
OPERATING FREQUENCY:	5,530,000,000 Hz
CHANNEL:	106
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 530 090.69	90.69
100%		-30	5 530 090.67	90.67
100%		-20	5 530 021.11	21.11
100%		-10	5 530 008.70	8.70
100%		0	5 530 083.68	83.68
100%		+10	5 530 079.98	79.98
100%		+30	5 530 089.58	89.58
100%		+40	5 530 003.38	3.38
100%		+50	5 530 094.08	94.08
High	3.50	+20	5 530 056.26	56.26
Low	3.13	+20	5 530 073.24	73.24

OPERATING BAND:	UNII Band 3
OPERATING FREQUENCY:	5,775,000,000 Hz
CHANNEL:	155
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 775 002.98	2.98
100%		-30	5 775 078.77	78.77
100%		-20	5 775 074.19	74.19
100%		-10	5 775 047.09	47.09
100%		0	5 775 052.66	52.66
100%		+10	5 775 060.13	60.13
100%		+30	5 775 017.37	17.37
100%		+40	5 775 006.94	6.94
100%		+50	5 775 057.55	57.55
High	3.50	+20	5 775 070.65	70.65
Low	3.13	+20	5 775 087.06	87.06

5 minutes after the EUT is energized

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,210,000,000 Hz
CHANNEL:	42
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 210 096.86	96.86
100%		-30	5 210 009.38	9.38
100%		-20	5 210 087.43	87.43
100%		-10	5 210 079.74	79.74
100%		0	5 210 002.69	2.69
100%		+10	5 210 030.37	30.37
100%		+30	5 210 084.31	84.31
100%		+40	5 210 032.07	32.07
100%		+50	5 210 063.03	63.03
High	3.50	+20	5 210 058.67	58.67
Low	3.13	+20	5 210 088.14	88.14

OPERATING BAND:	UNII Band 2A
OPERATING FREQUENCY:	5,290,000,000 Hz
CHANNEL:	58
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 290 011.82	11.82
100%		-30	5 290 055.41	55.41
100%		-20	5 290 086.60	86.60
100%		-10	5 290 065.04	65.04
100%		0	5 290 072.61	72.61
100%		+10	5 290 094.29	94.29
100%		+30	5 290 014.50	14.50
100%		+40	5 290 023.74	23.74
100%		+50	5 290 039.08	39.08
High	3.50	+20	5 290 042.92	42.92
Low	3.13	+20	5 290 089.73	89.73

OPERATING BAND:	UNII Band 2C
OPERATING FREQUENCY:	5,530,000,000 Hz
CHANNEL:	106
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 530 078.49	78.49
100%		-30	5 530 070.29	70.29
100%		-20	5 530 055.19	55.19
100%		-10	5 530 090.66	90.66
100%		0	5 530 056.90	56.90
100%		+10	5 530 065.63	65.63
100%		+30	5 530 032.84	32.84
100%		+40	5 530 007.36	7.36
100%		+50	5 530 021.20	21.20
High	3.50	+20	5 530 029.97	29.97
Low	3.13	+20	5 530 066.25	66.25

OPERATING BAND:	UNII Band 3
OPERATING FREQUENCY:	5,775,000,000 Hz
CHANNEL:	155
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 775 014.04	14.04
100%		-30	5 775 049.88	49.88
100%		-20	5 775 031.72	31.72
100%		-10	5 775 084.92	84.92
100%		0	5 775 098.65	98.65
100%		+10	5 775 057.21	57.21
100%		+30	5 775 069.66	69.66
100%		+40	5 775 085.86	85.86
100%		+50	5 775 052.72	52.72
High	3.50	+20	5 775 011.64	11.64
Low	3.13	+20	5 775 012.69	12.69

10 minutes after the EUT is energized

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,210,000,000 Hz
CHANNEL:	42
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 210 074.42	74.42
100%		-30	5 210 075.30	75.30
100%		-20	5 210 031.51	31.51
100%		-10	5 210 015.16	15.16
100%		0	5 210 028.98	28.98
100%		+10	5 210 003.83	3.83
100%		+30	5 210 029.12	29.12
100%		+40	5 210 053.94	53.94
100%		+50	5 210 043.21	43.21
High	3.50	+20	5 210 056.15	56.15
Low	3.13	+20	5 210 096.85	96.85

OPERATING BAND:	UNII Band 2A
OPERATING FREQUENCY:	5,290,000,000 Hz
CHANNEL:	58
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 290 091.53	91.53
100%		-30	5 290 015.47	15.47
100%		-20	5 290 083.46	83.46
100%		-10	5 290 043.78	43.78
100%		0	5 290 038.65	38.65
100%		+10	5 290 013.92	13.92
100%		+30	5 290 013.64	13.64
100%		+40	5 290 024.36	24.36
100%		+50	5 290 039.19	39.19
High	3.50	+20	5 290 026.67	26.67
Low	3.13	+20	5 290 045.75	45.75

OPERATING BAND:	UNII Band 2C
OPERATING FREQUENCY:	5,530,000,000 Hz
CHANNEL:	106
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 530 060.17	60.17
100%		-30	5 530 073.43	73.43
100%		-20	5 530 054.90	54.90
100%		-10	5 530 007.30	7.30
100%		0	5 530 027.46	27.46
100%		+10	5 530 074.35	74.35
100%		+30	5 530 026.97	26.97
100%		+40	5 530 009.47	9.47
100%		+50	5 530 065.58	65.58
High	3.50	+20	5 530 051.31	51.31
Low	3.13	+20	5 530 012.16	12.16

OPERATING BAND:	UNII Band 3
OPERATING FREQUENCY:	5,775,000,000 Hz
CHANNEL:	155
REFERENCE VOLTAGE:	3.30 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5 775 002.09	2.09
100%		-30	5 775 008.64	8.64
100%		-20	5 775 041.62	41.62
100%		-10	5 775 007.56	7.56
100%		0	5 775 077.91	77.91
100%		+10	5 775 047.77	47.77
100%		+30	5 775 031.45	31.45
100%		+40	5 775 001.05	1.05
100%		+50	5 775 072.77	72.77
High	3.50	+20	5 775 064.69	64.69
Low	3.13	+20	5 775 075.32	75.32

10.7 STRADDLE CHANNEL

10.7.1 26 dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26 dB Bandwidth [MHz]
802.11a	UNII 2C	5720	144	5 709.16	15.84
802.11n(HT20)				5 709.08	15.92
802.11ac(VHT20)				5 709.20	15.80
802.11a	UNII 3	5720	144	5 730.84	5.84
802.11n(HT20)				5 730.96	5.96
802.11ac(VHT20)				5 731.04	6.04

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26 dB Bandwidth [MHz]
802.11n(HT40)	UNII 2C	5710	142	5 689.76	35.24
802.11ac(VHT40)				5 689.92	35.08
802.11n(HT40)	UNII 3	5710	142	5 730.08	5.08
802.11ac(VHT40)				5 730.08	5.08

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26 dB Bandwidth [MHz]
802.11ac(VHT80)	UNII 2C	5690	138	5 649.04	75.96
	UNII 3	5690	138	5 731.44	6.44

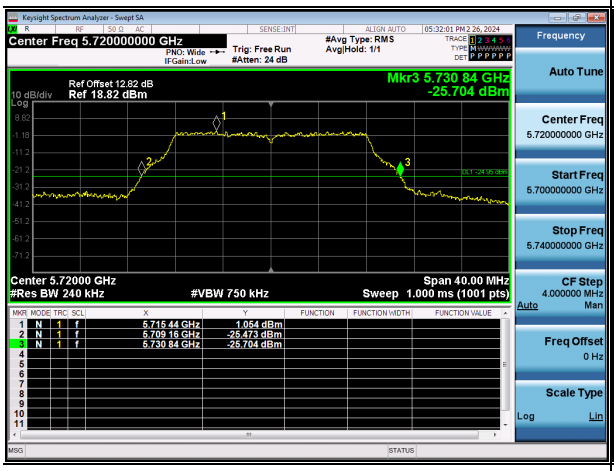
Note:

[UNII 2C] 26 dB Bandwidth = 5 725 MHz - Measured Frequency[MHz]

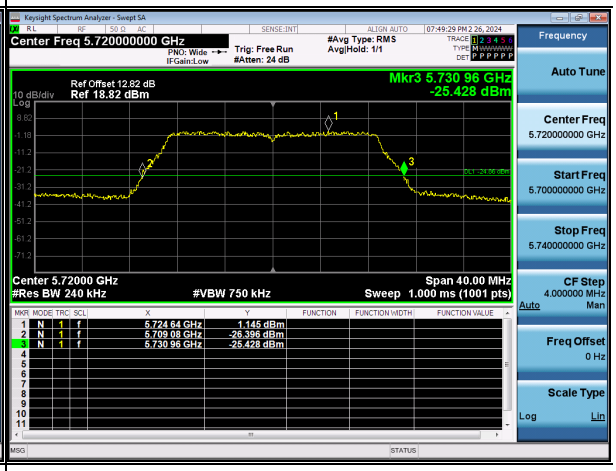
[UNII 3C] 26 dB Bandwidth = Measured Frequency[MHz] – 5 725 MHz

▣ Test Plots (26 dB Bandwidth)

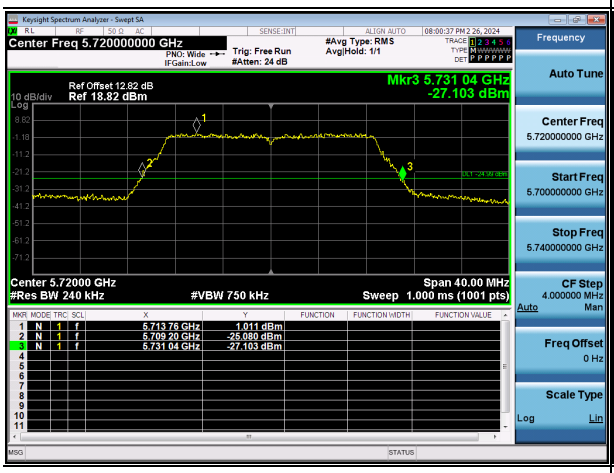
802.11a UNII Band



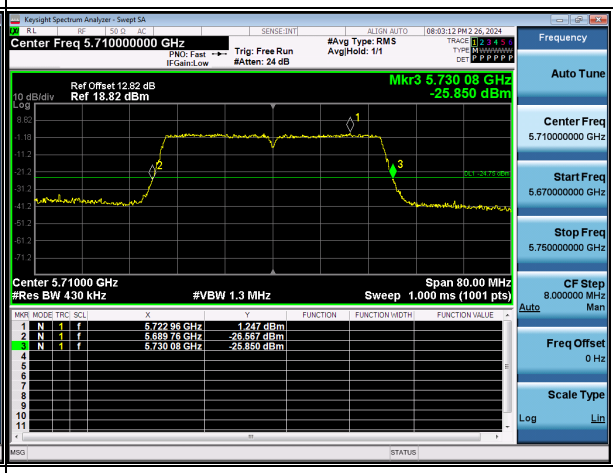
802.11n(HT20) UNII Band



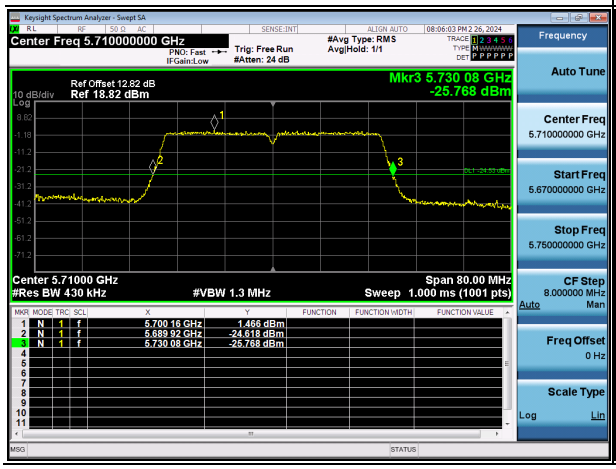
802.11ac(VHT20) UNII Band



802.11n(HT40) UNII Band



802.11ac(VHT40) UNII Band



802.11ac(VHT80) UNII Band

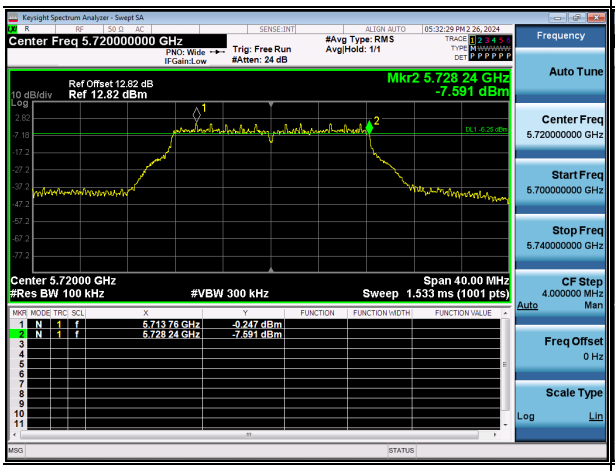
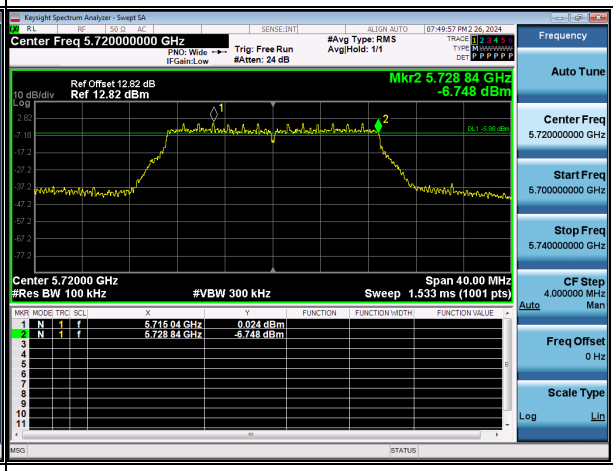
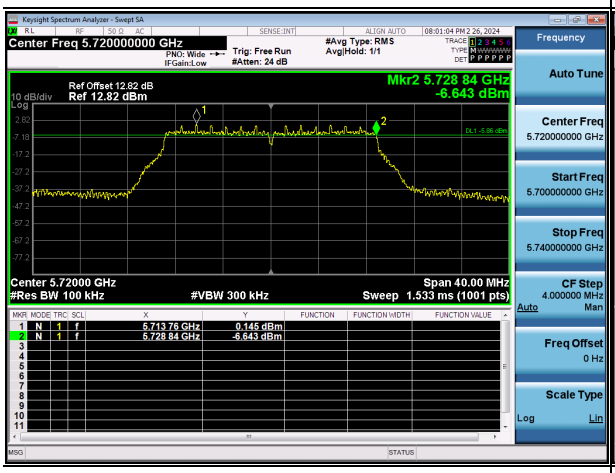
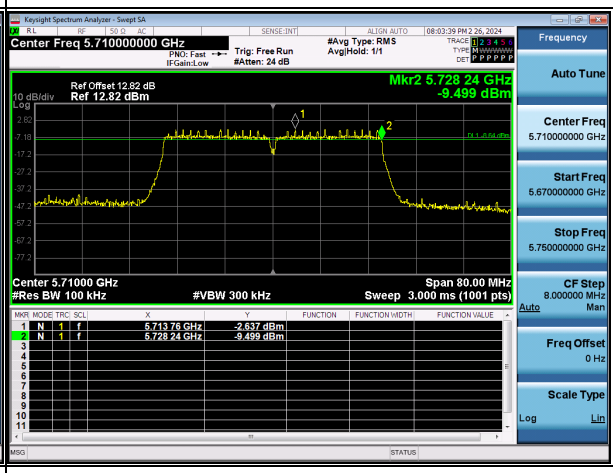
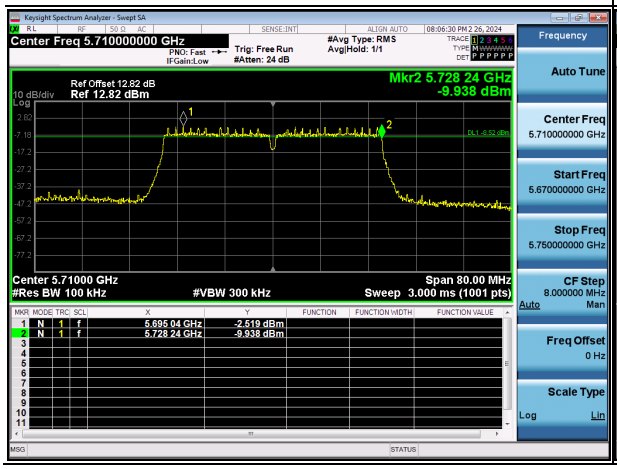
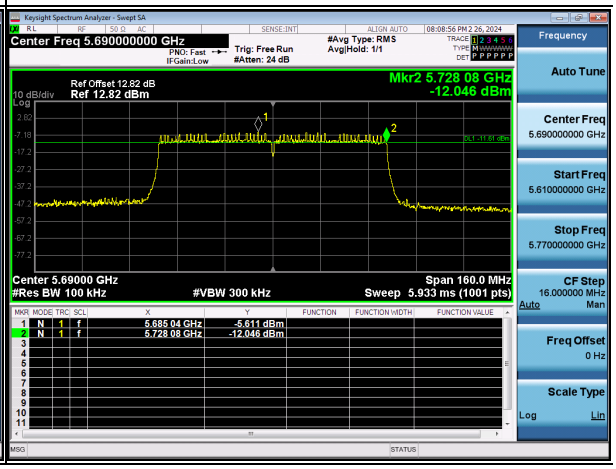
10.7.2 6 dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
802.11a	UNII3	5720	144	5 728.24	3.24	> 0.5
802.11n(HT20)				5 728.84	3.84	> 0.5
802.11ac(VHT20)				5 728.84	3.84	> 0.5
802.11n(HT40)	UNII3	5710	142	5 728.24	3.24	> 0.5
802.11ac(VHT40)				5 728.24	3.24	> 0.5
802.11ac(VHT80)	UNII3	5690	138	5 728.08	3.08	> 0.5

Note:

6 dB Bandwidth = Measured Frequency[MHz] – 5 725MHz

▣ Test Plots(UNII 3 Band 6 dB Bandwidth)

802.11a UNII Band	802.11n(HT20) UNII Band
	
802.11ac(VHT20) UNII Band	**802.11n(HT40) UNII Band**
	
802.11ac(VHT40) UNII Band	**802.11ac(VHT80) UNII Band**
	

10.7.3 Output Power

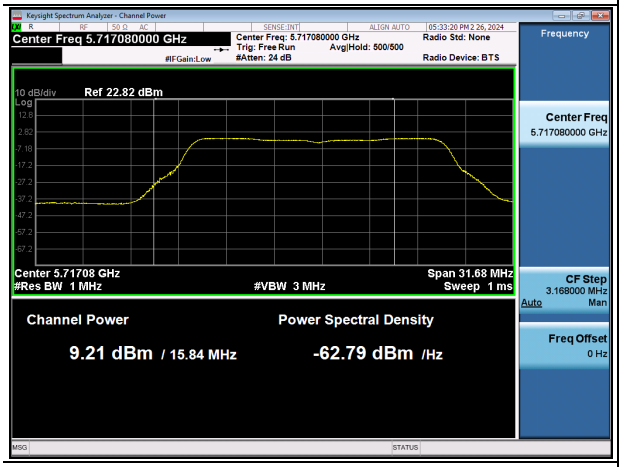
Mode	Frequency [MHz]	Channel	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
802.11a	5720 (UNII 2C Band)	144	9.21	0.297	9.51	23.00	6 Mbps
802.11n(HT20)			9.28	0.314	9.60	23.02	MCS0
802.11ac(VHT20)			9.31	0.315	9.63	22.99	MCS0
802.11a	5720 (UNII 3 Band)	144	3.86	0.297	4.15	30.00	6 Mbps
802.11n(HT20)			4.55	0.314	4.87	30.00	MCS0
802.11ac(VHT20)			4.55	0.315	4.87	30.00	MCS0

Mode	Frequency [MHz]	Channel	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
802.11n(HT40)	5710 (UNII 2C Band)	142	10.42	0.616	11.03	23.98	MCS0
802.11ac(VHT40)			10.52	0.618	11.14	23.98	MCS0
802.11n(HT40)	5710 (UNII 3 Band)	142	0.62	0.616	1.24	30.00	MCS0
802.11ac(VHT40)			0.72	0.618	1.34	30.00	MCS0

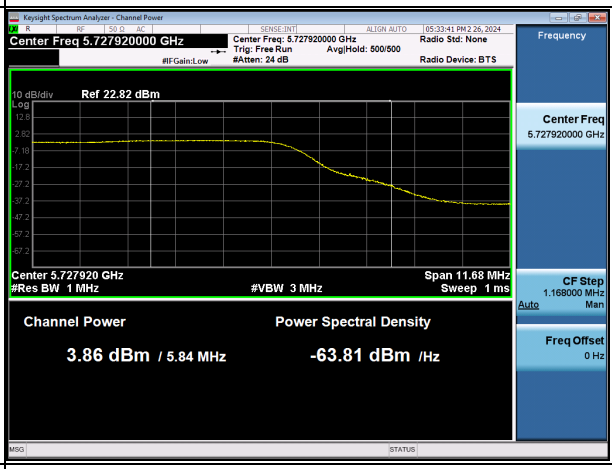
Mode	Frequency [MHz]	Channel	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
802.11ac(VHT80)	5690 (UNII 2C Band)	138	9.28	1.143	10.42	23.98	MCS0
	5690 (UNII 3 Band)	138	-4.58	1.143	-3.43	30.00	MCS0

▣ Test Plots

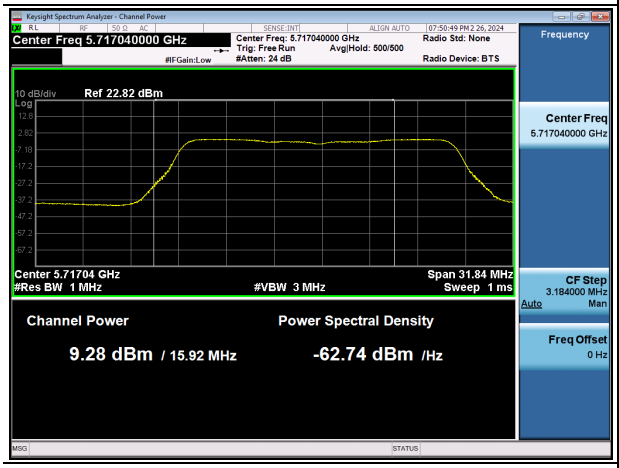
802.11a UNII 2C Band



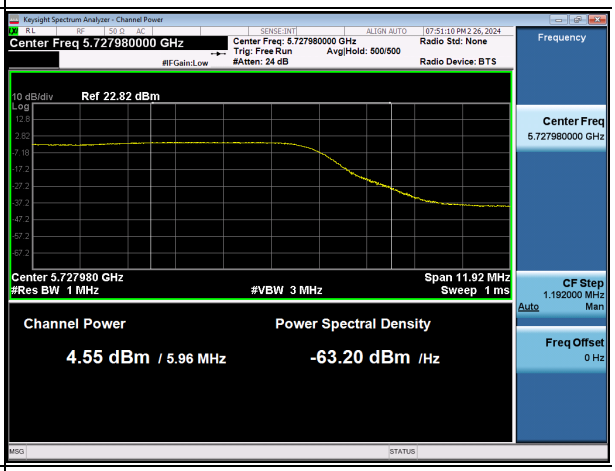
802.11a UNII 3 Band



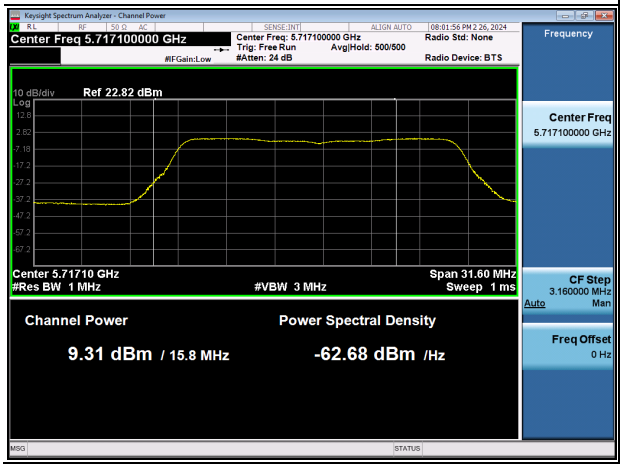
802.11n(HT20) UNII 2C Band



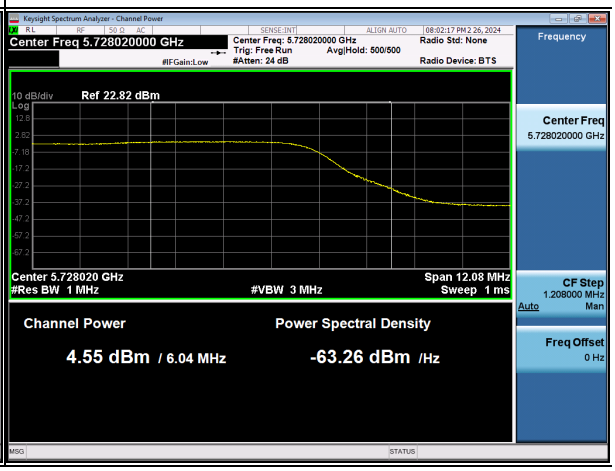
802.11n(HT20) UNII 3 Band

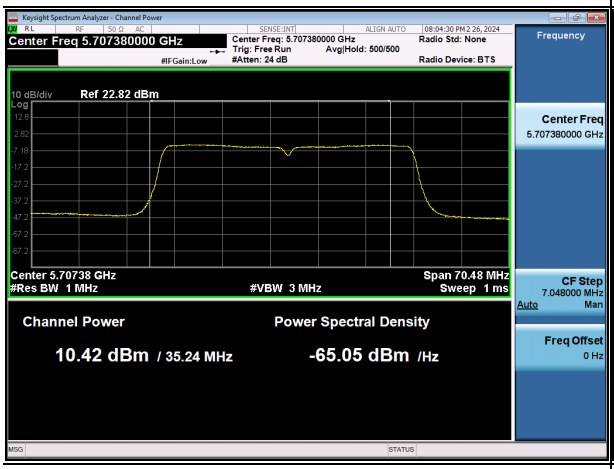
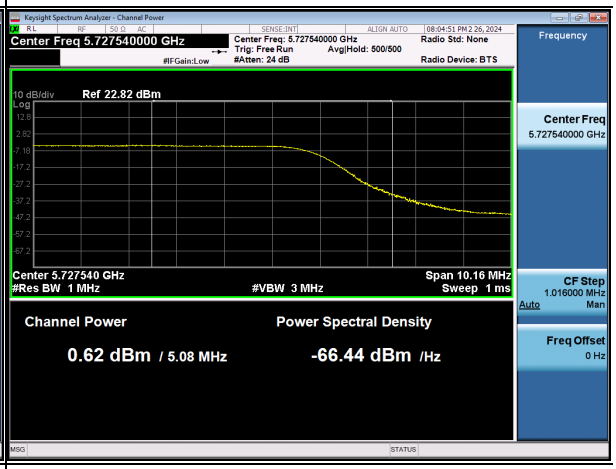
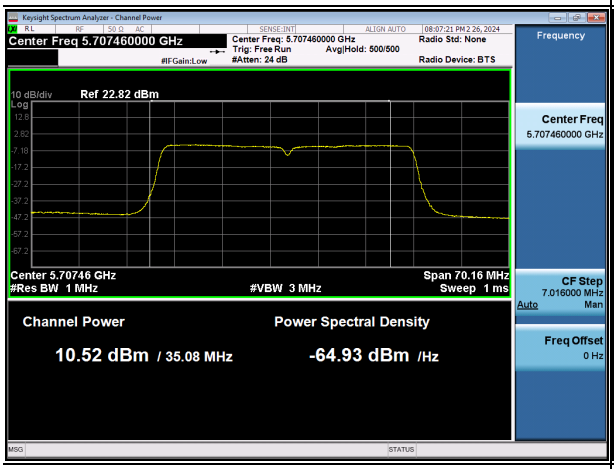
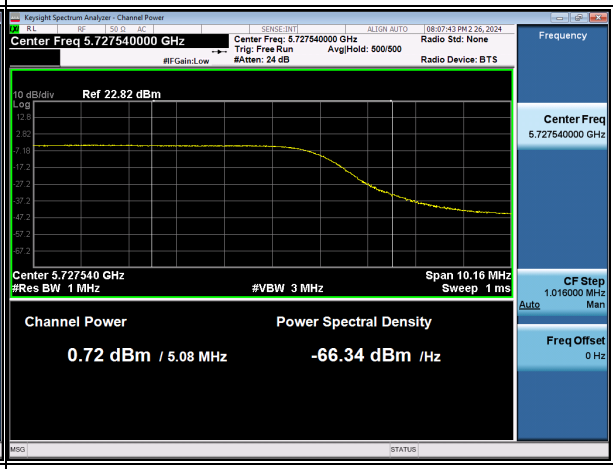
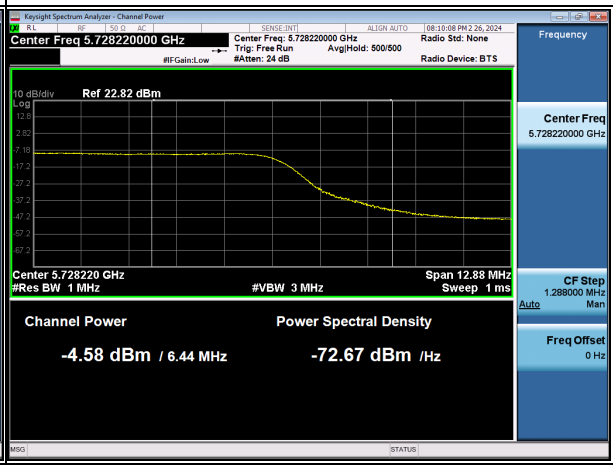


802.11ac(VHT20) UNII 2C Band



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]	Worstcase Datarate
802.11a	5720 (UNII 2C Band)	144	-0.692	0.297	-0.394	11 dBm/ MHz	6 Mbps
802.11n(HT20)			-0.564	0.314	-0.250		MCS0
802.11ac(VHT20)			-0.669	0.315	-0.354		MCS0
802.11a	5720 (UNII 3 Band)	144	-3.666	0.297	-3.369	30 dBm/ 500 kHz	6 Mbps
802.11n(HT20)			-3.549	0.314	-3.235		MCS0
802.11ac(VHT20)			-3.382	0.315	-3.067		MCS0

Mode	Frequency [MHz]	Channel	Measured Density [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Limit [dBm]	Worstcase Datarate
802.11n(HT40)	5710 (UNII 2C Band)	142	-3.473	0.616	-2.857	11 dBm/ MHz	MCS0
802.11ac(VHT40)			-3.472	0.618	-2.854		MCS0
802.11n(HT40)	5710 (UNII 3 Band)	142	-6.483	0.616	-5.867	30 dBm/ 500 kHz	MCS0
802.11ac(VHT40)			-6.601	0.618	-5.983		MCS0

Mode	Frequency [MHz]	Channel	Measured Density [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Limit [dBm]	Worstcase Datarate
802.11ac(VHT80)	5690 (UNII 2C Band)	138	-8.022	1.143	-6.879	11 dBm/ MHz	MCS0
	5690 (UNII 3 Band)	138	-12.165	1.143	-11.021	30 dBm/ 500 kHz	MCS0

▣ Test Plots

802.11a UNII 2C Band

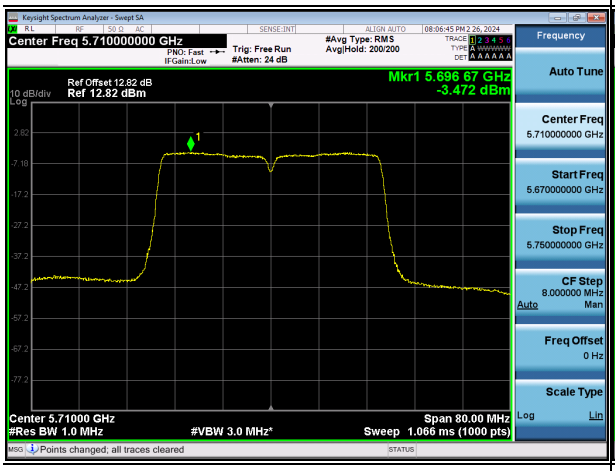
802.11a UNII 3 Band

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 – 30 MHz

Frequency	Measured Value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]
No Critical peaks found						

Note:

1. The Measured Val;ue 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 = 40log (specific distance / test distance) (dB)
3. Limit line = specific Limits (dBµV) + Distance extrapolation factor

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F+C.L	ANT. POL	Total	Limit	Margin
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/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 Measurement Typeor mode

Frequency Range : Above 1 GHz

Band :	UNII 1		Operation Mode : 802.11a				
CH.36	5180	MHz	Transfer Rate : 6Mbps				
Frequency [MHz]	Measured value [dBµV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
10 360	49.82	6.13	V	55.95	68.20	12.25	PK
15 540	47.06	6.58	V	53.64	73.98	20.34	PK
15 540	34.28	6.58	V	40.86	53.98	13.12	AV
10 360	50.89	6.13	H	57.02	68.20	11.18	PK
15 540	47.90	6.58	H	54.48	73.98	19.50	PK
15 540	34.34	6.58	H	40.92	53.98	13.06	AV

Band :	UNII 1		Operation Mode : 802.11a				
CH.40	5200	MHz	Transfer Rate : 6Mbps				
Frequency [MHz]	Measured value [dBµV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
10 400	49.85	5.41	V	55.26	68.20	12.94	PK
15 600	47.05	6.11	V	53.16	73.98	20.82	PK
15 600	33.24	6.11	V	39.35	53.98	14.63	AV
10 400	50.09	5.41	H	55.50	68.20	12.70	PK
15 600	47.11	6.11	H	53.22	73.98	20.76	PK
15 600	33.52	6.11	H	39.63	53.98	14.35	AV

Band :	UNII 1		Operation Mode : 802.11a				
CH.48	5240	MHz	Transfer Rate : 6Mbps				
Frequency [MHz]	Measured value [dBµV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
10 480	50.14	6.43	V	56.57	68.20	11.63	PK
15 720	47.05	5.50	V	52.55	73.98	21.43	PK
15 720	33.58	5.50	V	39.08	53.98	14.90	AV
10 480	50.29	6.43	H	56.72	68.20	11.48	PK
15 720	47.08	5.50	H	52.58	73.98	21.40	PK
15 720	33.86	5.50	H	39.36	53.98	14.62	AV

Band :	UNII 2A		Operation Mode : 802.11a				
CH.52	5260	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
10 520	49.61	5.80	V	55.41	68.20	12.79	PK
15 780	47.15	5.84	V	52.99	73.98	20.99	PK
15 780	34.18	5.84	V	40.02	53.98	13.96	AV
10 520	49.74	5.80	H	55.54	68.20	12.66	PK
15 780	47.26	5.84	H	53.10	73.98	20.88	PK
15 780	34.27	5.84	H	40.11	53.98	13.87	AV

Band :	UNII 2A		Operation Mode : 802.11a				
CH.60	5300	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
10 600	49.00	5.96	V	54.96	73.98	19.02	PK
10 600	36.28	5.96	V	42.24	53.98	11.74	AV
15 900	46.81	6.96	V	53.77	73.98	20.21	PK
15 900	34.33	6.96	V	41.29	53.98	12.69	AV
10 600	49.04	5.96	H	55.00	73.98	18.98	PK
10 600	36.35	5.96	H	42.31	53.98	11.67	AV
15 900	46.98	6.96	H	53.94	73.98	20.04	PK
15 900	34.35	6.96	H	41.31	53.98	12.67	AV

Band :	UNII 2A		Operation Mode : 802.11a				
CH.64	5320	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
10 640	49.21	5.85	V	55.06	73.98	18.92	PK
10 640	36.15	5.85	V	42.00	53.98	11.98	AV
15 960	47.56	6.67	V	54.23	73.98	19.75	PK
15 960	34.42	6.67	V	41.09	53.98	12.89	AV
10 640	49.27	5.85	H	55.12	73.98	18.86	PK
10 640	36.20	5.85	H	42.05	53.98	11.93	AV
15 960	47.79	6.67	H	54.46	73.98	19.52	PK
15 960	34.58	6.67	H	41.25	53.98	12.73	AV

Band :	UNII 2C		Operation Mode : 802.11a				
CH.100	5500	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
11 000	48.25	6.46	V	54.71	73.98	19.27	PK
11 000	35.29	6.46	V	41.75	53.98	12.23	AV
16 500	48.16	8.21	V	56.37	68.20	11.83	PK
11 000	49.00	6.46	H	55.46	73.98	18.52	PK
11 000	35.82	6.46	H	42.28	53.98	11.70	AV
16 500	48.21	8.21	H	56.42	68.20	11.78	PK

Band :	UNII 2C		Operation Mode : 802.11a				
CH.116	5580	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
11 160	48.56	5.74	V	54.30	73.98	19.68	PK
11 160	35.29	5.74	V	41.03	53.98	12.95	AV
16 740	46.15	9.68	V	55.83	68.20	12.37	PK
11 160	48.85	5.74	H	54.59	73.98	19.39	PK
11 160	35.45	5.74	H	41.19	53.98	12.79	AV
16 740	46.26	9.68	H	55.94	68.20	12.26	PK

Band :	UNII 2C		Operation Mode : 802.11a				
CH.144	5720	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
11 440	47.81	5.45	V	53.26	73.98	20.72	PK
11 440	34.58	5.45	V	40.03	53.98	13.95	AV
17 160	46.80	9.47	V	56.27	68.20	11.93	PK
11 440	47.89	5.45	H	53.34	73.98	20.64	PK
11 440	34.81	5.45	H	40.26	53.98	13.72	AV
17 160	46.85	9.47	H	56.32	68.20	11.88	PK

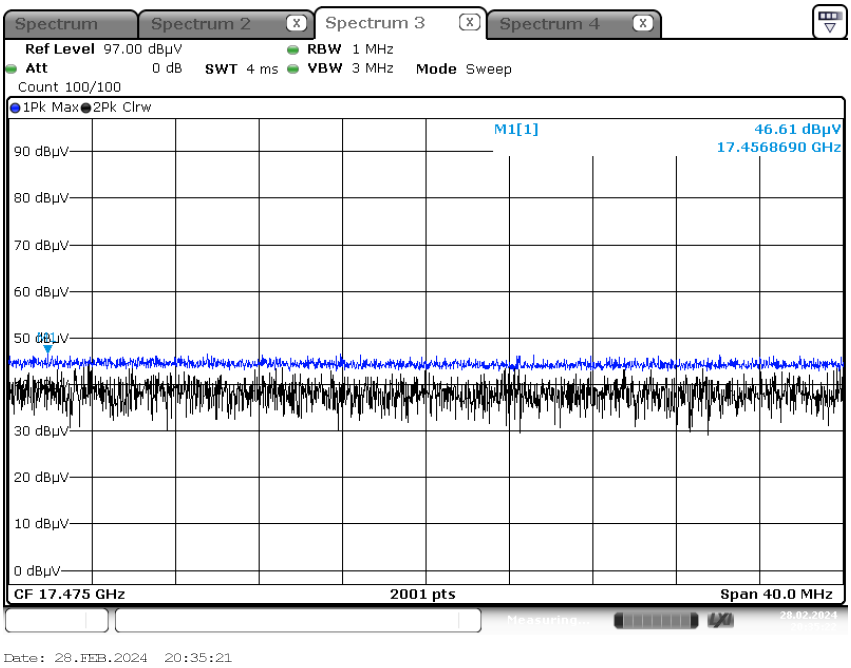
Band :	UNII 3		Operation Mode : 802.11a				
CH.149	5745	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
11 490	48.33	5.98	V	54.31	73.98	19.67	PK
11 490	35.22	5.98	V	41.20	53.98	12.78	AV
17 235	46.59	10.47	V	57.06	68.20	11.14	PK
11 490	48.35	5.98	H	54.33	73.98	19.65	PK
11 490	35.29	5.98	H	41.27	53.98	12.71	AV
17 235	46.66	10.47	H	57.13	68.20	11.07	PK

Band :	UNII 3		Operation Mode : 802.11a				
CH.157	5785	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
11 570	48.28	5.78	V	54.06	73.98	19.92	PK
11 570	35.16	5.78	V	40.94	53.98	13.04	AV
17 355	45.55	11.19	V	56.74	68.20	11.46	PK
11 570	48.35	5.78	H	54.13	73.98	19.85	PK
11 570	35.24	5.78	H	41.02	53.98	12.96	AV
17 355	45.65	11.19	H	56.84	68.20	11.36	PK

Band :	UNII 3		Operation Mode : 802.11a				
CH.165	5825	MHz	Transfer Rate : 6Mbps				
Frequency	Measured value	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
11 650	48.33	4.99	V	53.32	73.98	20.66	PK
11 650	35.28	4.99	V	40.27	53.98	13.71	AV
17 475	46.55	11.48	V	58.03	68.20	10.17	PK
11 650	48.51	4.99	H	53.50	73.98	20.48	PK
11 650	35.39	4.99	H	40.38	53.98	13.60	AV
17 475	46.61	11.48	H	58.09	68.20	10.11	PK

▣ Test Plots

Radiated Spurious Emissions plot – Peak Result (802.11a, Ch.165 Spurious Emissions, 3rd Harmonic, Y-H)



Note:

Only the worst case plot for Radiated Spurious Emissions.

10.9 RADIATED RESTRICTED BAND EDGE

Operation Mode: 802.11a(6 Mbps)

Band	UNII 1
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5150	55.34	H	55.34	73.98	18.64	PK
5150	42.13	H	42.13	53.98	11.85	AV
5150	55.29	V	55.29	73.98	18.69	PK
5150	42.11	V	42.11	53.98	11.87	AV

Band	UNII 2A
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5350	55.70	H	55.70	73.98	18.28	PK
5350	42.44	H	42.44	53.98	11.54	AV
5350	55.64	V	55.64	73.98	18.34	PK
5350	42.39	V	42.39	53.98	11.59	AV

Band	UNII 2C
Operating Frequency	5500 MHz
Channel No.	100 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5460	56.04	H	56.04	73.98	17.94	PK
5460	42.22	H	42.22	53.98	11.76	AV
# 5470	57.31	H	57.31	68.20	**10.89**	PK
5460	55.91	V	55.91	73.98	18.07	PK
5460	42.20	V	42.20	53.98	11.78	AV
# 5470	56.97	V	56.97	68.20	11.23	PK

Note : # Integration method Used (KDB 789033 D02 v02r01 Section 3) d) (ii)

Operation Mode: 802.11n (HT20) (MCS0)

Band	UNII 1
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5150	54.21	H	54.21	73.98	19.77	PK
5150	42.08	H	42.08	53.98	11.90	AV
5150	54.18	V	54.18	73.98	19.80	PK
5150	41.99	V	41.99	53.98	11.99	AV

Band	UNII 2A
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5350	55.95	H	55.95	73.98	18.03	PK
5350	42.51	H	42.51	53.98	11.47	AV
5350	55.39	V	55.39	73.98	18.59	PK
5350	42.46	V	42.46	53.98	11.52	AV

Band	UNII 2C
Operating Frequency	5500 MHz
Channel No.	100 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5460	54.86	H	54.86	73.98	19.12	PK
5460	42.11	H	42.11	53.98	11.87	AV
# 5470	58.11	H	58.11	68.20	**10.09**	PK
5460	54.39	V	54.39	73.98	19.59	PK
5460	42.05	V	42.05	53.98	11.93	AV
# 5470	58.02	V	58.02	68.20	10.18	PK

Note : # Integration method Used (KDB 789033 D02 v02r01 Section 3) d) (ii)

Operation Mode: 802.11ac (VHT20) (MCS0)

Band	UNII 1
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5150	54.21	H	54.21	73.98	19.77	PK
5150	42.15	H	42.15	53.98	11.83	AV
5150	54.11	V	54.11	73.98	19.87	PK
5150	42.06	V	42.06	53.98	11.92	AV

Band	UNII 2A
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5350	56.03	H	56.03	73.98	17.95	PK
5350	42.08	H	42.08	53.98	11.90	AV
5350	55.97	V	55.97	73.98	18.01	PK
5350	41.93	V	41.93	53.98	12.05	AV

Band	UNII 2C
Operating Frequency	5500 MHz
Channel No.	100 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5460	54.44	H	54.44	73.98	19.54	PK
5460	42.06	H	42.06	53.98	11.92	AV
# 5470	57.05	H	57.05	68.20	**11.15**	PK
5460	54.39	V	54.39	73.98	19.59	PK
5460	41.66	V	41.66	53.98	12.32	AV
# 5470	56.87	V	56.87	68.20	11.33	PK

Note : # Integration method Used (KDB 789033 D02 v02r01 Section 3) d) (ii)

Operation Mode: 802.11n (HT40) (MCS0)

Band	UNII 1
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5150	55.08	H	55.08	73.98	18.90	PK
5150	42.61	H	42.61	53.98	11.37	AV
5150	54.56	V	54.56	73.98	19.42	PK
5150	41.58	V	41.58	53.98	12.40	AV

Band	UNII 2A
Operating Frequency	5310 MHz
Channel No.	62 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5350	56.17	H	56.17	73.98	17.81	PK
5350	43.00	H	43.00	53.98	10.98	AV
5350	55.81	V	55.81	73.98	18.17	PK
5350	42.58	V	42.58	53.98	11.40	AV

Band	UNII 2C
Operating Frequency	5510 MHz
Channel No.	102 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5460	55.79	H	55.79	73.98	18.19	PK
5460	43.23	H	43.23	53.98	10.75	AV
# 5470	62.34	H	62.34	68.20	**5.86**	PK
5460	54.97	V	54.97	73.98	19.01	PK
5460	42.69	V	42.69	53.98	11.29	AV
# 5470	61.54	V	61.54	68.20	6.66	PK

Note : # Integration method Used (KDB 789033 D02 v02r01 Section 3) d) (ii)

Operation Mode: 802.11ac (VHT40) (MCS0)

Band	UNII 1
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5150	55.84	H	55.84	73.98	18.14	PK
5150	42.55	H	42.55	53.98	11.43	AV
5150	55.76	V	55.76	73.98	18.22	PK
5150	41.62	V	41.62	53.98	12.36	AV

Band	UNII 2A
Operating Frequency	5310 MHz
Channel No.	62 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5350	56.54	H	56.54	73.98	17.44	PK
5350	43.07	H	43.07	53.98	10.91	AV
5350	55.97	V	55.97	73.98	18.01	PK
5350	42.66	V	42.66	53.98	11.32	AV

Band	UNII 2C
Operating Frequency	5510 MHz
Channel No.	102 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5460	55.69	H	55.69	73.98	18.29	PK
5460	42.99	H	42.99	53.98	10.99	AV
# 5470	61.36	H	61.36	68.20	**6.84**	PK
5460	54.75	V	54.75	73.98	19.23	PK
5460	42.24	V	42.24	53.98	11.74	AV
# 5470	61.25	V	61.25	68.20	6.95	PK

Note : # Integration method Used (KDB 789033 D02 v02r01 Section 3) d) (ii)

Operation Mode: 802.11ac (VHT80) (MCS0)

Band	UNII 1
Operating Frequency	5210 MHz
Channel No.	42 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5150	53.94	H	53.94	73.98	20.04	PK
5150	43.53	H	43.53	53.98	10.45	AV
5150	53.25	V	53.25	73.98	20.73	PK
5150	43.48	V	43.48	53.98	10.50	AV

Band	UNII 2A
Operating Frequency	5290 MHz
Channel No.	58 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5350	54.51	H	54.51	73.98	19.47	PK
5350	42.94	H	42.94	53.98	11.04	AV
5350	54.48	V	54.48	73.98	19.50	PK
5350	42.64	V	42.64	53.98	11.34	AV

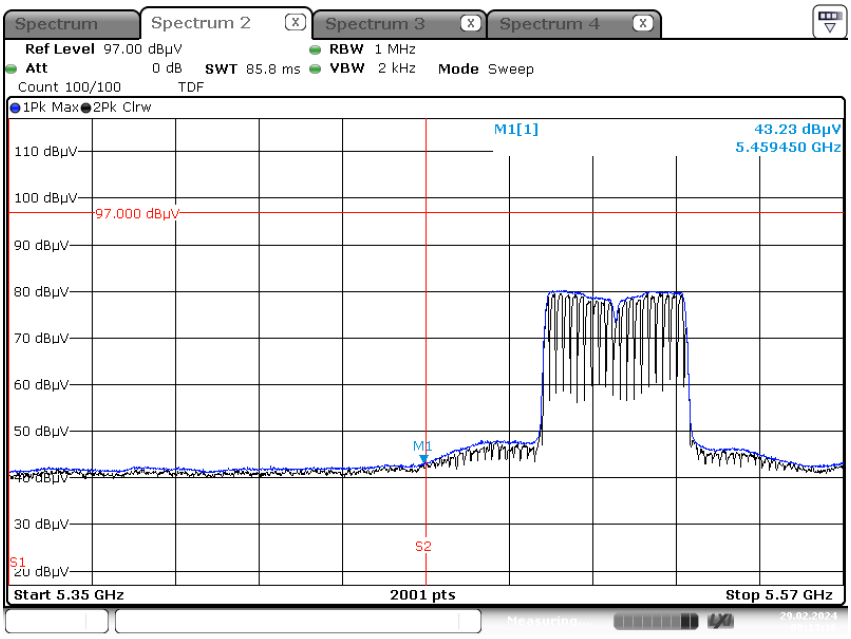
Band	UNII 2C
Operating Frequency	5530 MHz
Channel No.	106 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
5460	56.70	H	56.70	73.98	17.28	PK
5460	44.65	H	44.65	53.98	**9.33**	AV
# 5470	55.99	H	55.99	68.20	12.21	PK
5460	56.48	V	56.48	73.98	17.50	PK
5460	44.62	V	44.62	53.98	9.36	AV
# 5470	55.69	V	55.69	68.20	12.51	PK

Note : # Integration method Used (KDB 789033 D02 v02r01 Section 3) d) (ii)

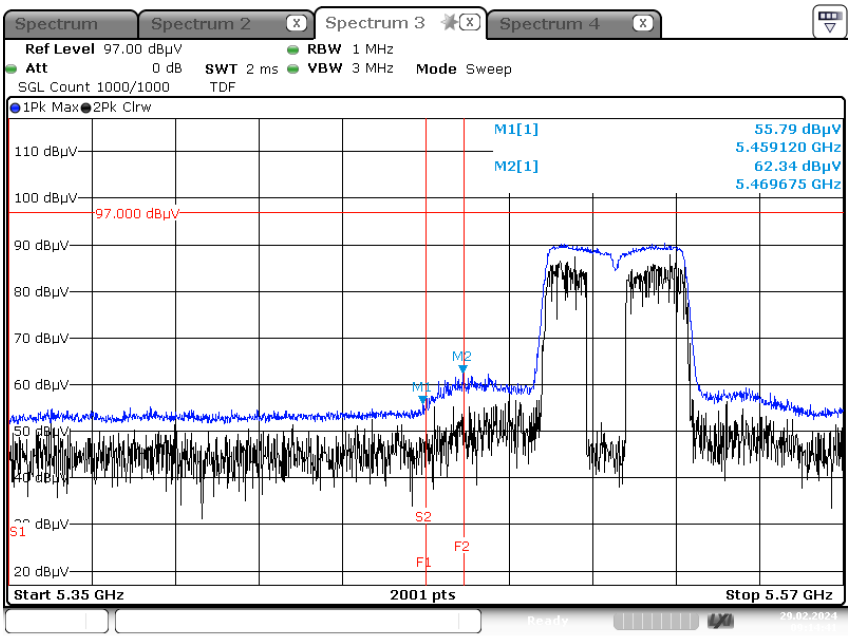
▣ Test Plots(UNII 1, 2A, 2C)

Average Result (802.11n (HT40) (MCS0), Ch.102, X-H)



Date: 29.FEB.2024 09:13:16

Peak Result (802.11n (HT40) (MCS0), Ch.102, X-H)



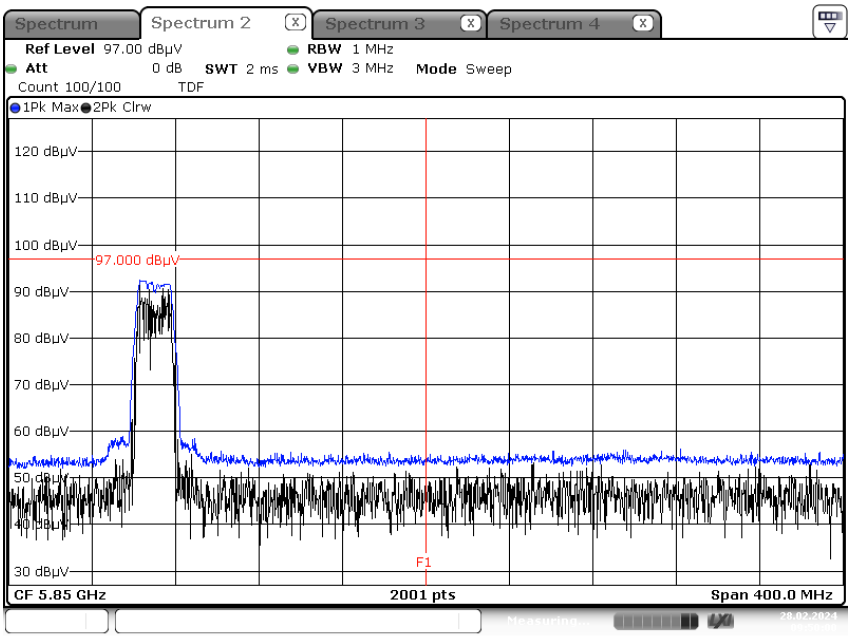
Date: 29.FEB.2024 09:14:41

Note:

Only the worst case plots for Radiated Restricted Band Edge.

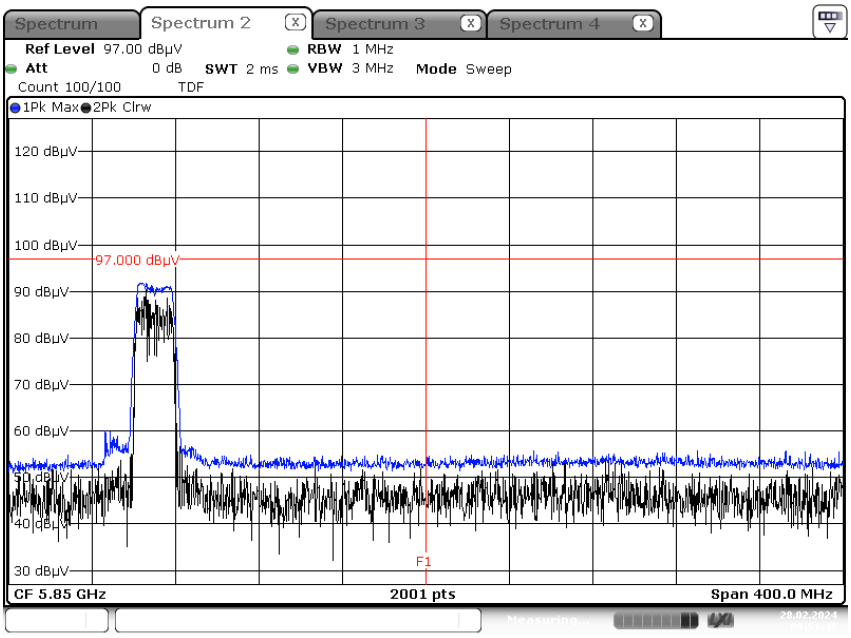
▣ Test Plots(Straddle Channel)

Peak Result (802.11a, Ch.144, X-H)



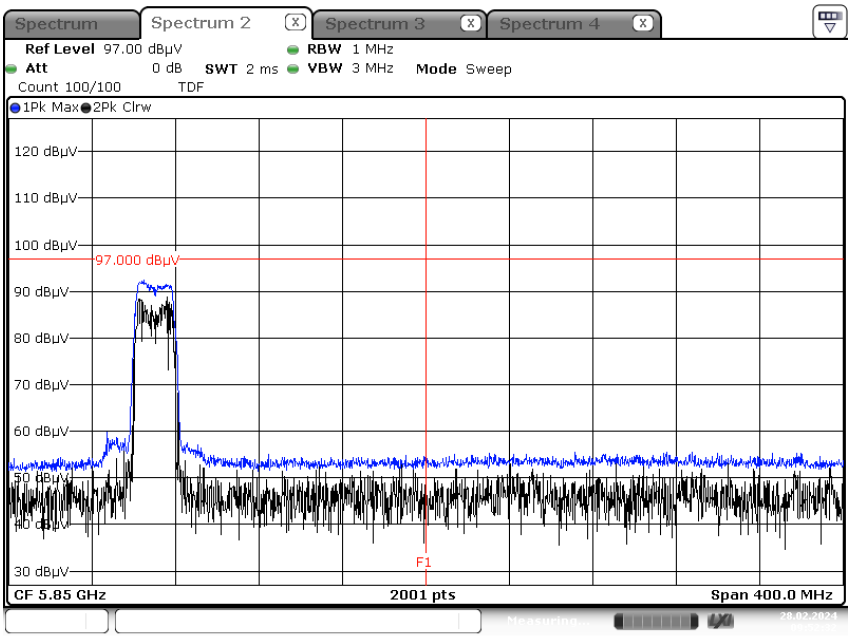
Date: 28.FEB.2024 09:50:01

Peak Result (802.11n_HT20, Ch.144, X-H)



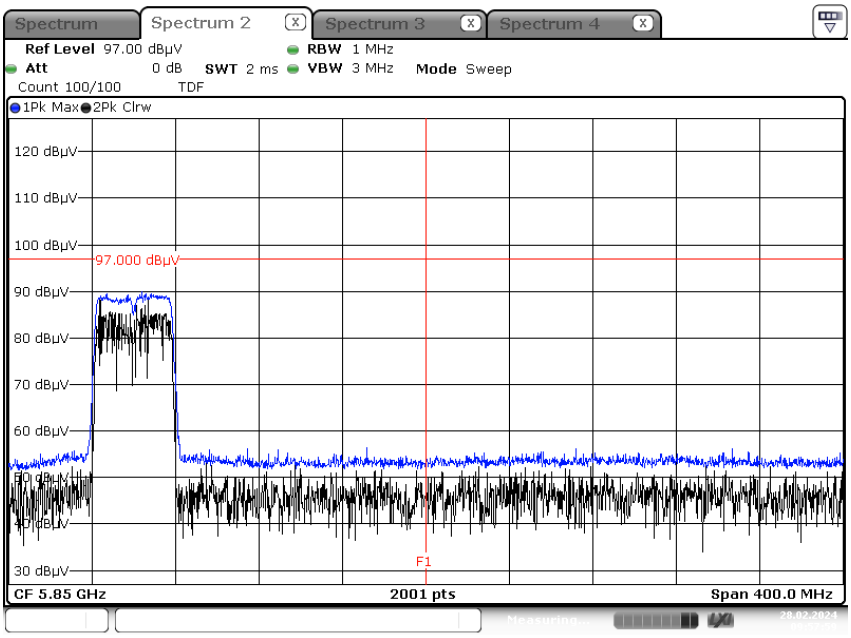
Date: 28.FEB.2024 09:51:49

Peak Result (802.11ac_VHT20, Ch.144, X-H)



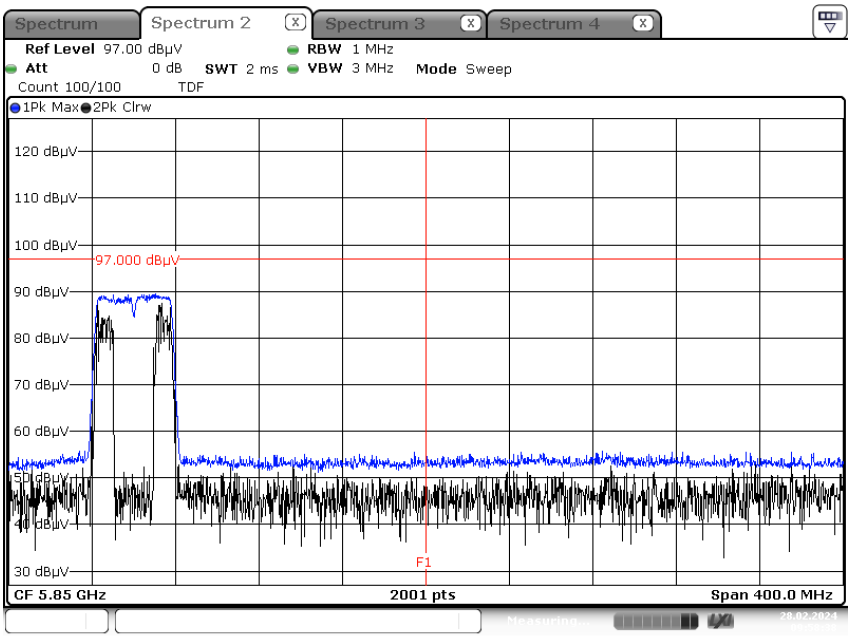
Date: 28.FEB.2024 09:52:33

Peak Result (802.11n_HT40, Ch.142, X-H)



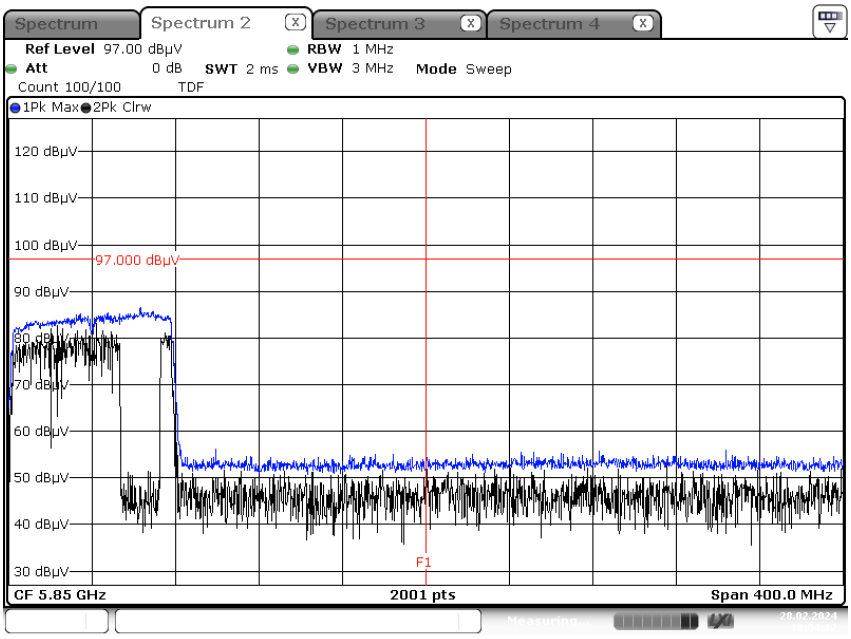
Date: 28.FEB.2024 09:57:59

Peak Result (802.11ac_VHT40, Ch.142, X-H)



Date: 28.FEB.2024 09:58:39

Peak Result (802.11ac_VHT80, Ch.138, X-H)



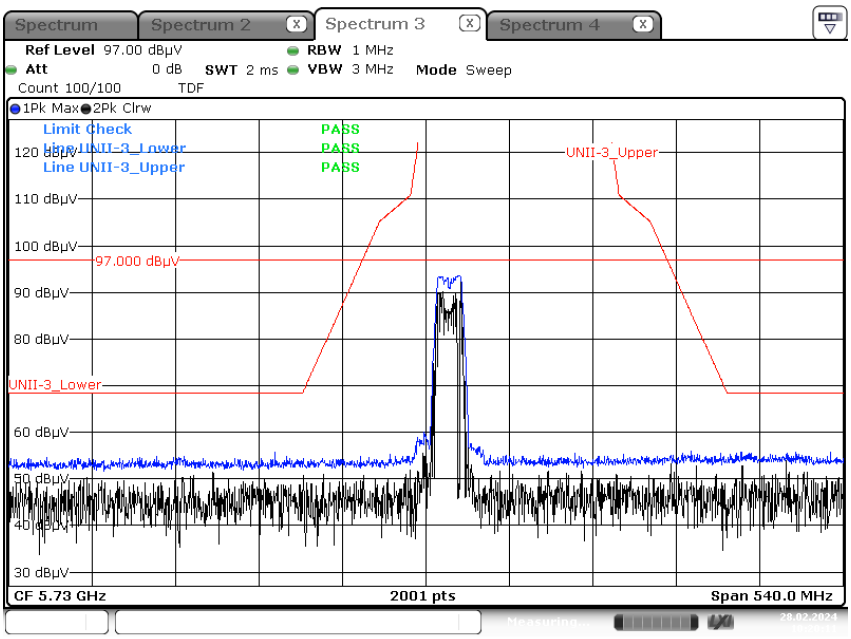
Date: 28.FEB.2024 10:04:13

Note :

1. Only the worst case plots for Radiated Restricted Band Edge.
2. Red line : 5 850 MHz
3. Ambient Noise (Because of ambient noise, We attached only the worst plot without a data table)

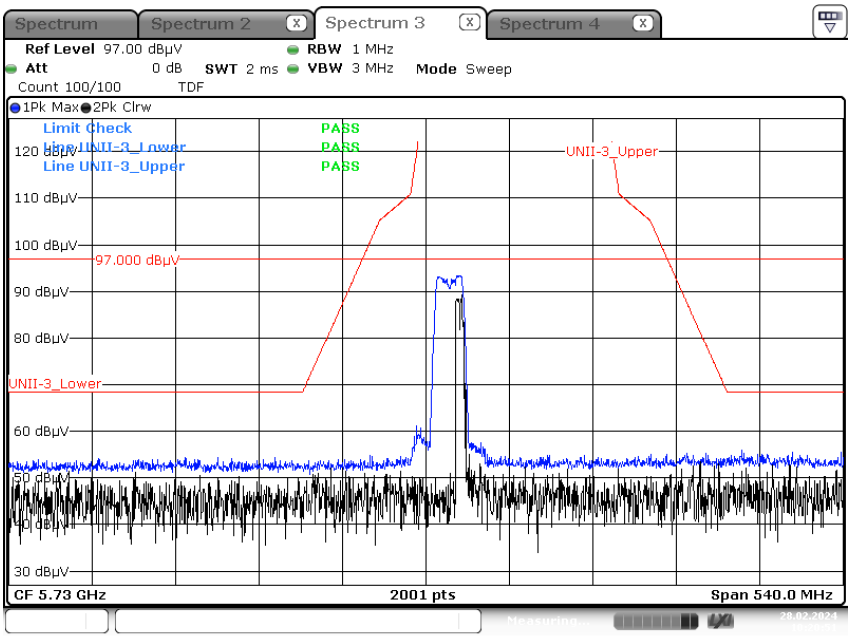
▣ Test Plots(UNII 3)

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



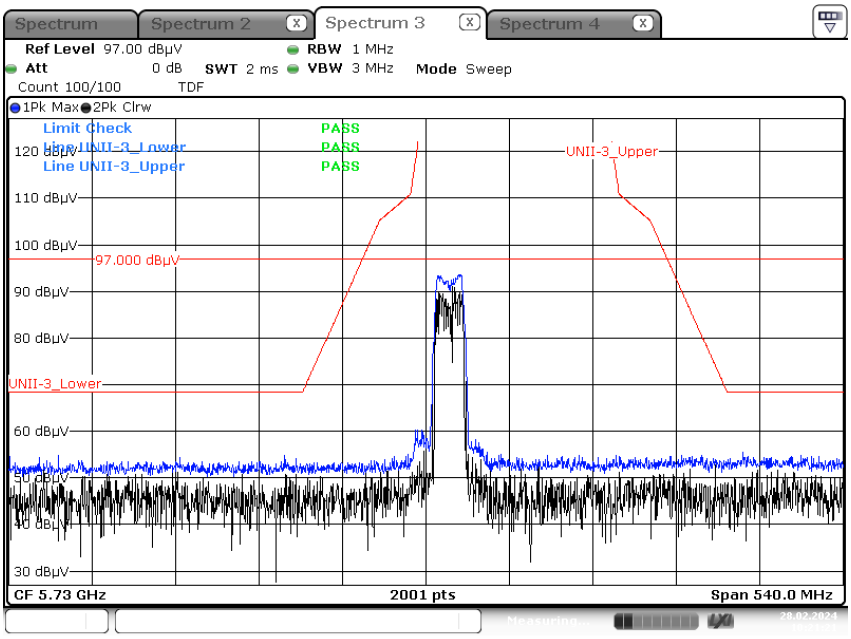
Date: 28.FEB.2024 10:20:11

Peak Result (802.11n_HT20, Ch.149, X-H)



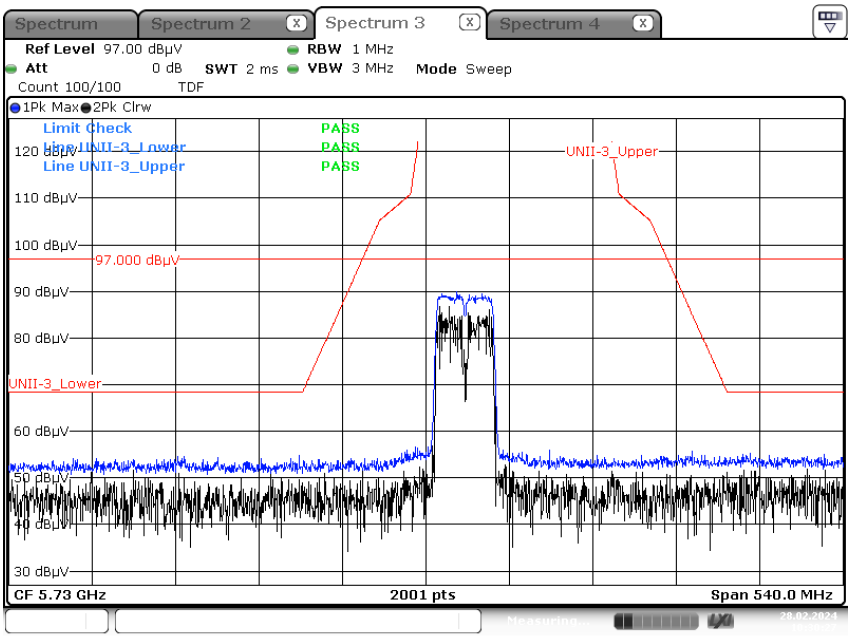
Date: 28.FEB.2024 10:20:51

Peak Result (802.11ac_VHT20, Ch.149, X-H)



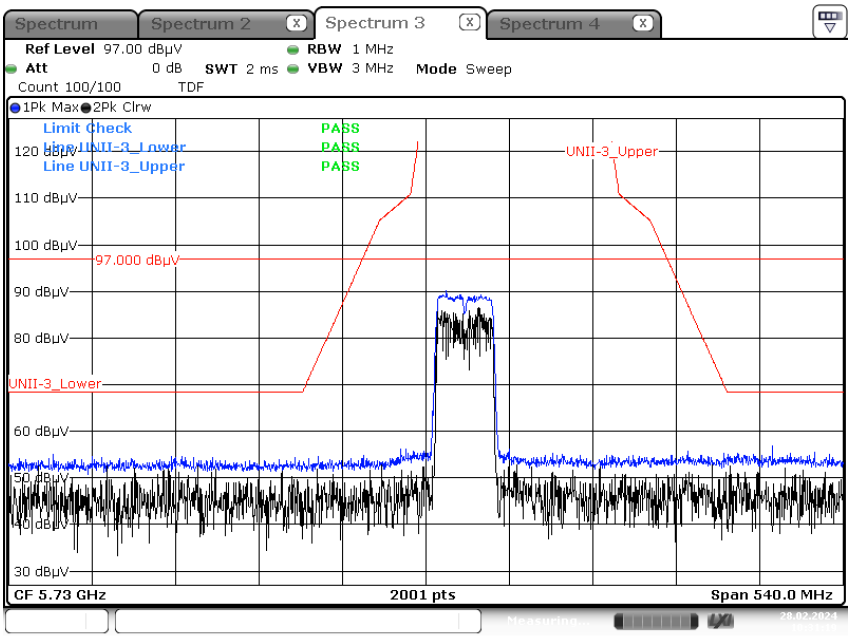
Date: 28.FEB.2024 10:21:22

Peak Result (802.11n_HT40, Ch.151, X-H)



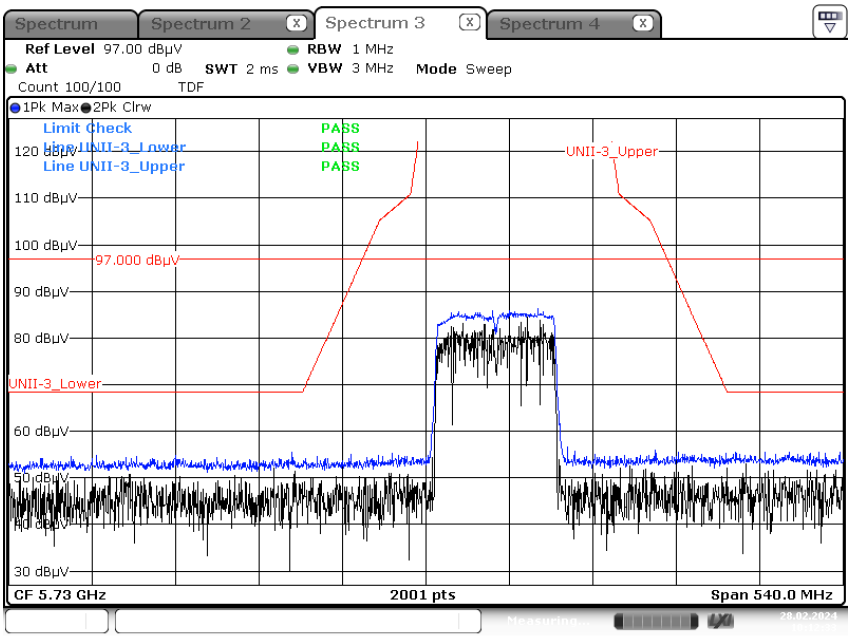
Date: 28.FEB.2024 10:30:28

Peak Result (802.11ac_VHT40, Ch.151, X-H)



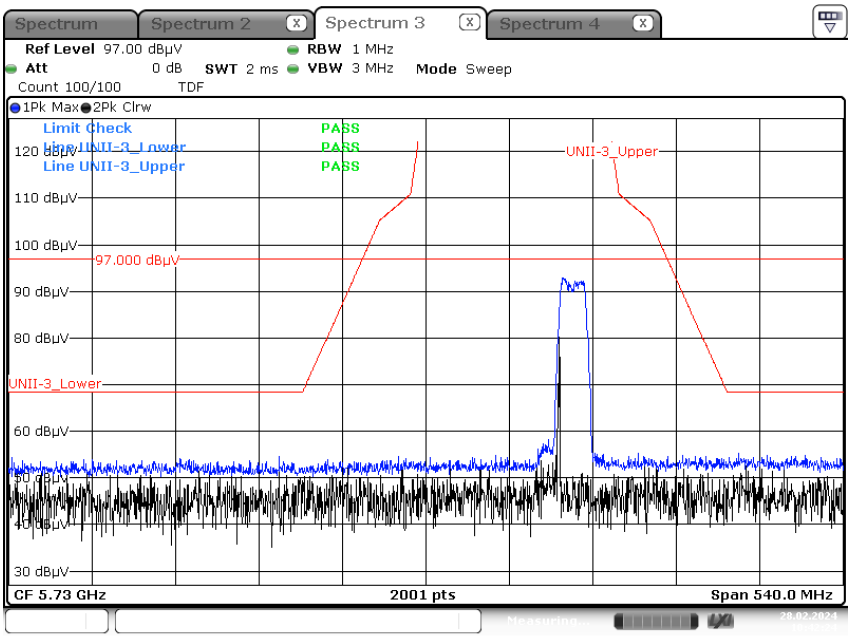
Date: 28.FEB.2024 10:31:20

Peak Result (802.11ac_VHT80, Ch.155, X-H)



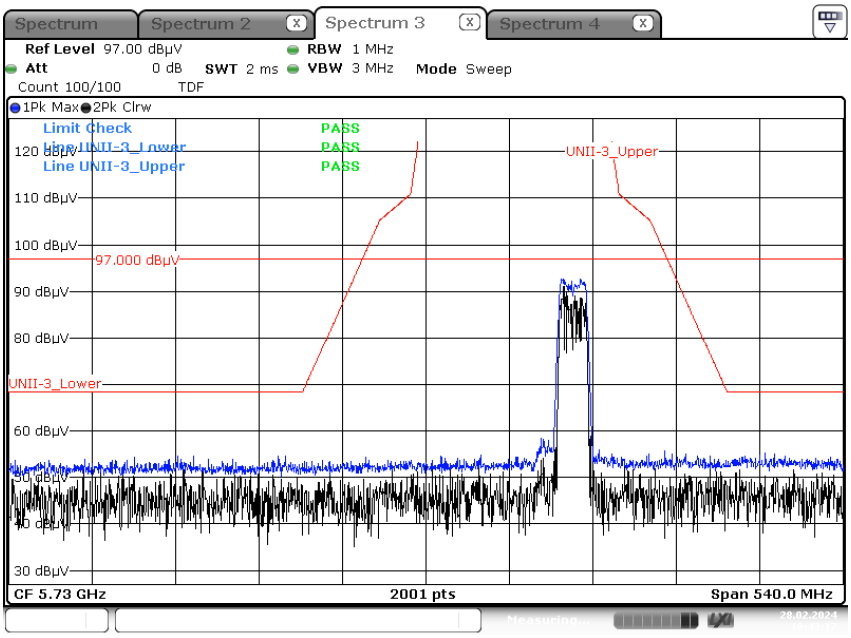
Date: 28.FEB.2024 10:12:33

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



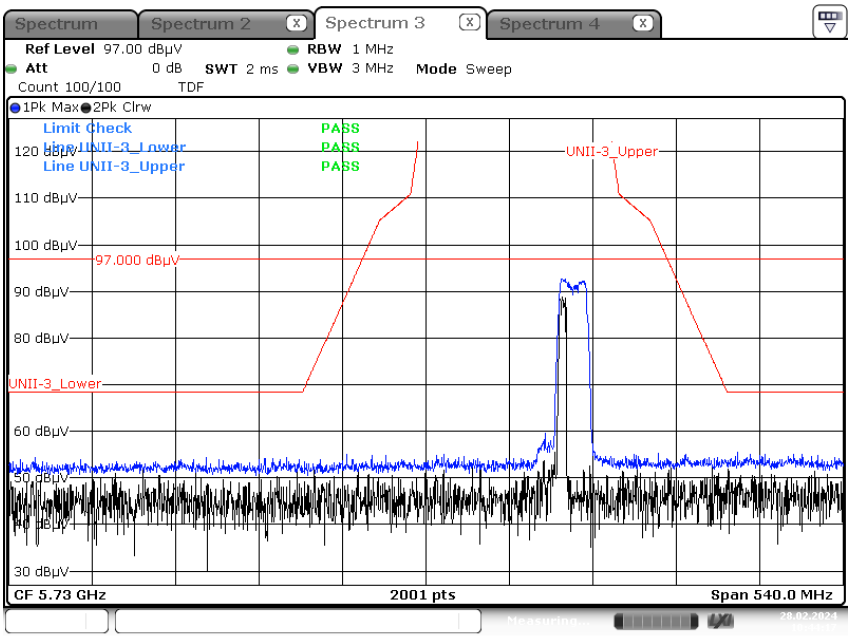
Date: 28.FEB.2024 10:42:25

Peak Result (802.11n_HT20, Ch.165, X-H)



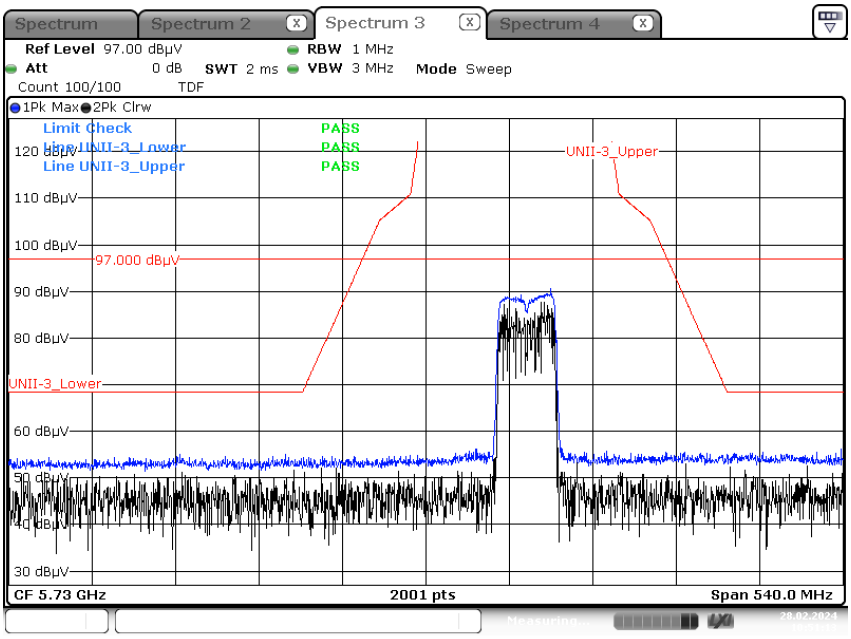
Date: 28.FEB.2024 10:43:18

Peak Result (802.11ac_VHT20, Ch.165, X-H)



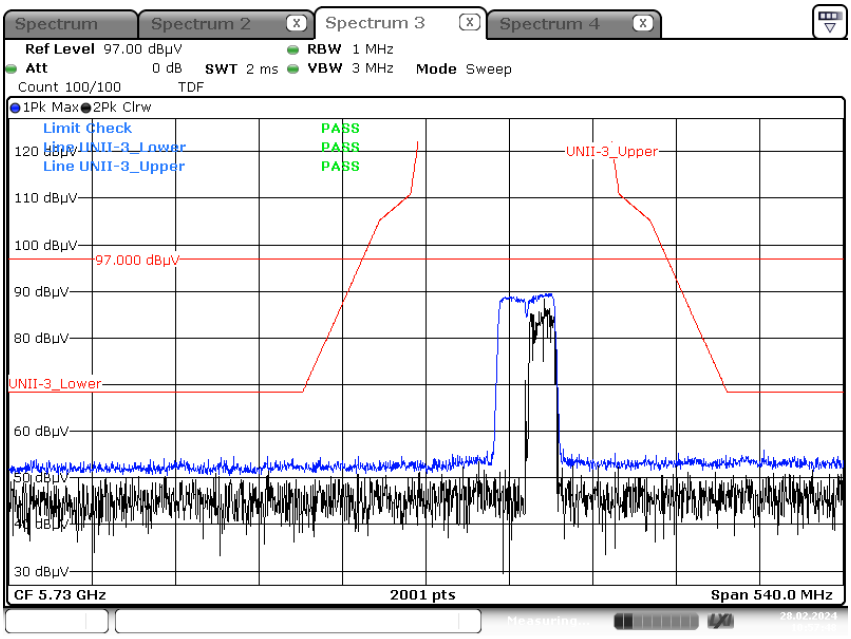
Date: 28.FEB.2024 10:44:18

Peak Result (802.11n_HT40, Ch.159, X-H)



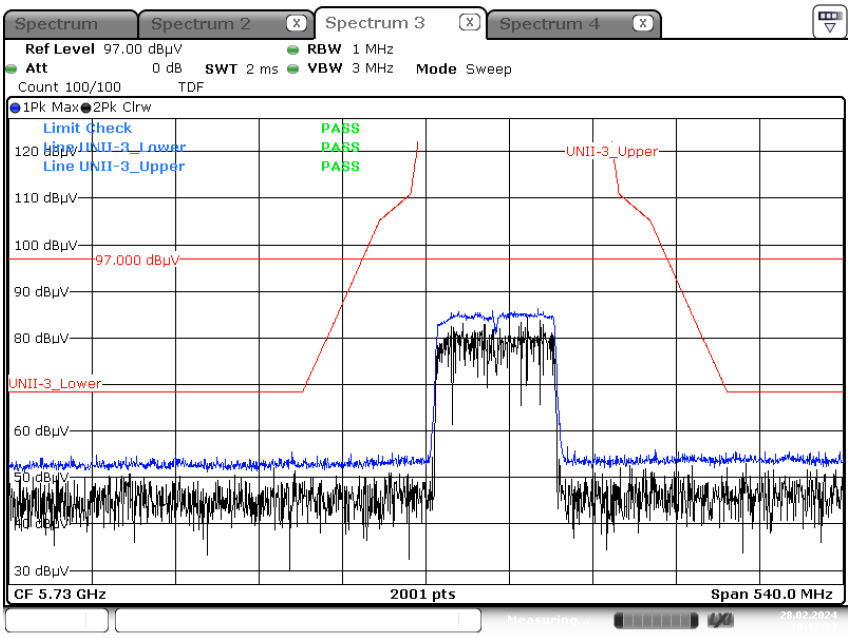
Date: 28.FEB.2024 10:51:14

Peak Result (802.11ac_VHT40, Ch.159, X-H)



Date: 28.FEB.2024 10:57:48

Peak Result (802.11ac_VHT80, Ch.155, X-H)



Date: 28.FEB.2024 10:12:33

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	Measured Value	A.F+C.L	POL	Total	Limit	Margin
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/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	Measured Value	A.F+C.L+A.G+D.F	POL	Total	Limit	Margin
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]
No Critical peaks found						

11. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/02/2024	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	05/26/2024	Annual
Temperature Chamber	SU-642	ESPEC	93008124	02/19/2025	Annual
Signal Analyzer	N9030A	Keysight	MY55410508	09/04/2024	Annual
Power Meter	N1911A	Agilent	MY45100523	02/28/2025	Annual
Power Sensor	N1921A	Agilent	MY57820067	02/22/2025	Annual
Directional Coupler	87300B	Agilent	3116A03621	10/30/2024	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2025	Annual
DC Power Supply	E3632A	Agilent	KR75305528	01/02/2025	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C-010	Agilent	08285	06/02/2024	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	02/20/2025	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	HCT CO., LTD.	N/A	N/A	N/A
Bluetooth Tester	CBT	Rohde & Schwarz	100808	02/15/2025	Annual

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

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	S3AM	08/03/2025	Biennial
Controller	EM2090	Emco	060520	N/A	N/A
Turn Table	N/A	Ets	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/07/2026	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/07/2025	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Amp & Filter Bank Switch Controller	FBSM-01A	TNM system	0	N/A	N/A
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/02/2025	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/12/2024	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/12/2024	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/14/2025	Annual
RF Switching System	FBSR-03A (3G HPF+LNA)	T&M SYSTEM	S3L1	11/17/2024	Annual
RF Switching System	FBSR-03A (10dB ATT+LNA)	T&M SYSTEM	S3L2	11/17/2024	Annual
RF Switching System	FBSR-03A (7G HPF+LNA)	T&M SYSTEM	S3L3	11/17/2024	Annual
RF Switching System	FBSR-03A (3dB ATT+LNA)	T&M SYSTEM	S3L4	11/17/2024	Annual
Power Amplifier	CBL18265035	CERNEX	22966	11/17/2024	Annual
Power Amplifier	CBL26405040	CERNEX	25956	02/26/2025	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/19/2025	Annual
Spectrum Analyzer	FSV40 (9 kHz ~ 40 GHz)	Rohde & Schwarz	100900	12/06/2024	Annual

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_EUT AND TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2403-FI004-P