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TEST REPORT

FCC/ISED UNII Test for VT250TWAN&VT250GYKN
Certification

APPLICANT
HYUNDAI MOBIS CO., LTD.

REPORT NO.
HCT-RF-2103-FC005

DATE OF ISSUE
March 4, 2021

Tested by
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TEST REPORT

FCC/ISED UNII Test for VT250TWAN& VT250GYKN

REPORT NO.
HCT-RF-2103-FC005

DATE OF ISSUE
March 04, 2021

Additional Model
FCC : VT250JWAN, VT251JWAN, VT260TWAN, VT260JWAN, VT261JWAN, VT261TWAN, VT262JWAN, VT263JWAN
ISED: VT250JWKN, VT251JWKN, VT260GYKN, VT260JWKN, VT261JWKN, VT261GYKN, VT262JWKN, VT263JWKN

Applicant	**HYUNDAI MOBIS CO., LTD.** 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, South Korea
Eut Type	Car Audio System
FCC Model Name	VT250TWAN
ISED Model Name	VT250GYKN
FCC ID	TQ8-VT250TWAN
IC	5074A-VT250GYKN
Modulation type	OFDM
FCC Classification	Unlicensed National Information Infrastructure(NII)
FCC Rule Part(s)	Part 15.407
ISED Rule Part(s)	RSS-247 Issue 2 (February 2017) RSS-Gen Issue 5_Amendment 1 (March 2019)

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	March 04, 2021	Initial Release

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

CONTENTS

1. GENERAL INFORMATION

EUT DESCRIPTION

FCC Model	VT250TWAN	
ISED Model	VT250GYKN	
FCC Additional Model	VT250JWAN, VT251JWAN, VT260TWAN, VT260JWAN, VT261JWAN, VT261TWAN, VT262JWAN, VT263JWAN	
ISED Additional Model	VT250JWKN, VT251JWKN, VT260GYKN, VT260JWKN, VT261JWKN, VT261GYKN, VT262JWKN, VT263JWKN	
EUT Type	Car Audio System	
Power Supply	DC 14.4 V	
Modulation Type	OFDM : 802.11a, 802.11n, 802.11ac	
Frequency Range (MHz)	U-NII-1	20MHz BW : 5180 - 5240 40MHz BW : 5190 - 5230 80MHz BW : 5210
	U-NII-2A	20MHz BW : 5260 - 5320 40MHz BW : 5270 - 5310 80MHz BW : 5290
	U-NII-2C	20MHz BW : 5500 - 5720 40MHz BW : 5510 - 5710 80MHz BW : 5530 – 5690
	U-NII-3	20MHz BW : 5745 - 5825 40MHz BW : 5755 - 5795 80MHz BW : 5775
Antenna Specification	Antenna type: Wi-Fi Dual Band Antenna Peak Gain : UNII-1: 0.59 dBi, UNII-2A: 2.00 dBi UNII-2C: 4.58 dBi, UNII-3: 4.19 dBi	
Straddle channel	Supported	
TDWR Band	Not Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	February 01, 2021 ~ February 28, 2021	
PMN (Product Marketing Number)	VT250GYKN, VT250JWKN, VT251JWKN, VT260GYKN, VT260JWKN, VT261JWKN, VT261GYKN, VT262JWKN, VT263JWKN	
HVIN (Hardware Version Identification Number)	VT250GYKN, VT250JWKN, VT251JWKN, VT260GYKN, VT260JWKN, VT261JWKN, VT261GYKN, VT262JWKN, VT263JWKN	
FVIN (Firmware Version Identification Number)	NQ5.USA.0000.V038.001.201222	
HMN (Host Marketing Name)	N/A	
EUT serial numbers	Conducted : 96560-DW000 (FCC), 96560-P1030 (ISED) Radiated : 96560-DW000 (FCC), 96560-P1030 (ISED)	

2. MAXIMUM OUTPUT POWER

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

Band	Mode	RF Output Power (dBm)	RF Output Power (W)
UNII-1	802.11a	7.37	0.005
	802.11n (HT20)	7.08	0.005
	802.11n (HT40)	4.39	0.003
	802.11ac (VHT20)	7.73	0.006
	802.11ac (VHT40)	3.10	0.002
	802.11ac (VHT80)	2.86	0.002
UNII-2A	802.11a	7.71	0.006
	802.11n (HT20)	7.47	0.006
	802.11n (HT40)	7.62	0.006
	802.11ac (VHT20)	7.68	0.006
	802.11ac (VHT40)	7.79	0.006
	802.11ac (VHT80)	6.36	0.004
UNII-2C	802.11a	7.48	0.006
	802.11n (HT20)	7.49	0.006
	802.11n (HT40)	6.75	0.005
	802.11ac (VHT20)	7.48	0.006
	802.11ac (VHT40)	6.97	0.005
	802.11ac (VHT80)	6.65	0.005
UNII-3	802.11a	7.13	0.005
	802.11n (HT20)	6.86	0.005
	802.11n (HT40)	6.57	0.005
	802.11ac (VHT20)	7.21	0.005
	802.11ac (VHT40)	6.88	0.005
	802.11ac (VHT80)	6.36	0.004

3. TEST METHODOLOGY

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

EUT CONFIGURATION

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

EUT EXERCISE

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

GENERAL TEST PROCEDURES

Conducted Emissions

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

Radiated Emissions

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

DESCRIPTION OF TEST MODES

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

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.
Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,
Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.
The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.
Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).
For ISED, test facility was accepted dated February 14, 2019 (CAB identifier: KR0032).

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6. ANTENNA REQUIREMENTS

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

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

(1) The antennas of this E.U.T are permanently attached.

(2) The E.U.T Complies with the requirement of § 15.203, § 15.407

7. MEASUREMENT UNCERTAINTY

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

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

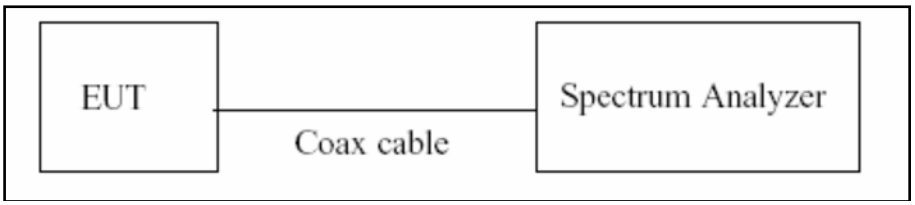
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance

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

8. DESCRIPTION OF TESTS

8.1. Duty Cycle

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

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

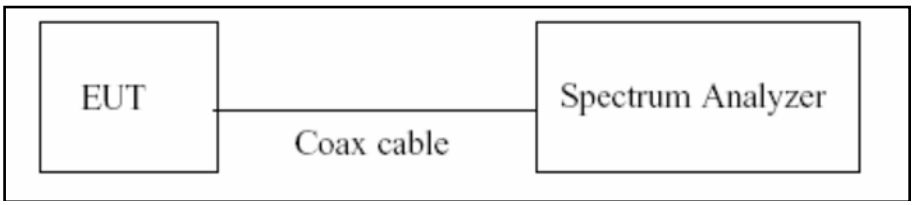
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

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

Limit

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

Test Configuration



Test Procedure(26dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

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

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

Test Procedure (6dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

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

1. RBW = 100 kHz
2. VBW ≥ 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.

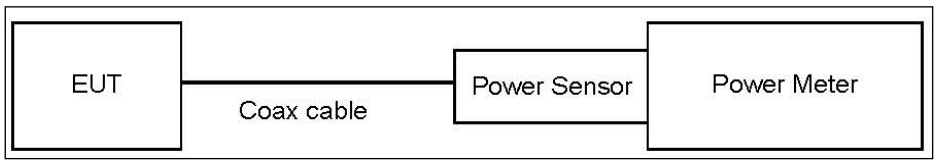
8.3. Output Power Measurement

Limit

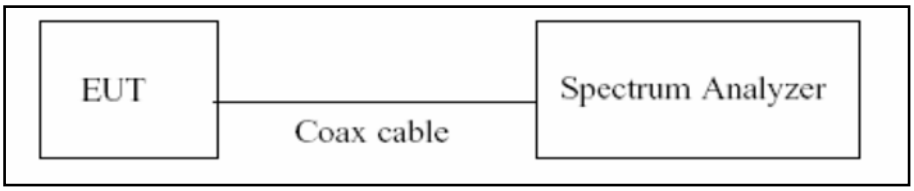
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30dBm)

Test Configuration

Power Meter



Spectrum Analyzer(Only Straddle Channel)



Test Procedure(Power Meter)

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

1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Test Procedure(Spectrum Analyzer)

The transmitter output is connected to the Spectrum Analyzer.

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

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

1. Measure the duty cycle.
2. Set span to encompass the 26 dB EBW of the signal.
3. RBW = 1 MHz.
4. VBW ≥ 3 MHz.
5. Number of points in sweep ≥ 2 x span/RBW.
6. Sweep time = auto.
7. Detector = RMS.
8. Do not use sweep triggering. Allow the sweep to “free run”.
9. Trace average at least 100 traces in power averaging(RMS) mode
10. Integrated bandwidth = OBW
11. Add 10log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Sample Calculation

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

Note

1. Spectrum reading values are not plot data.
   The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss(20 dB) + Cable loss
3. Actual value of loss for the attenuator and cable combination is below table.

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

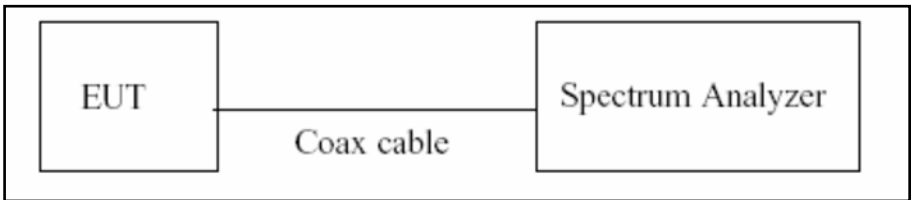
(Actual value of loss for the attenuator and cable combination)

8.4. Power Spectral Density

Limit

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

Test Configuration



Test Procedure

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

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

Sample Calculation

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

Note

1. Spectrum reading values are not plot data.
   The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss(20 dB) + Cable loss
3. Actual value of loss for the attenuator and cable combination is below table.

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

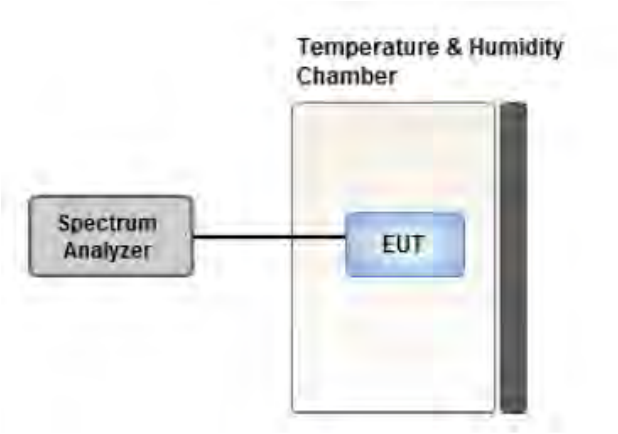
(Actual value of loss for the attenuator and cable combination)

8.5. Frequency Stability

Limit

Maintained within the band

Test Configuration



Test Procedure

1. The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between -30 °C and 50 °C.
2. The temperature was incremented by 10 °C intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.
3. The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the 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[a]	56 to 46[a]
0.50 to 5	56	46
5 to 30	60	50

[a]Decreases with the logarithm of the frequency.

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

Test Configuration

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

Test Procedure

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

Sample Calculation

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

8.7. Radiated Test

Limit

1. UNII 1: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz.

2. UNII 2A, 2C: All emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.

3. UNII 3: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

FCC

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

ISED

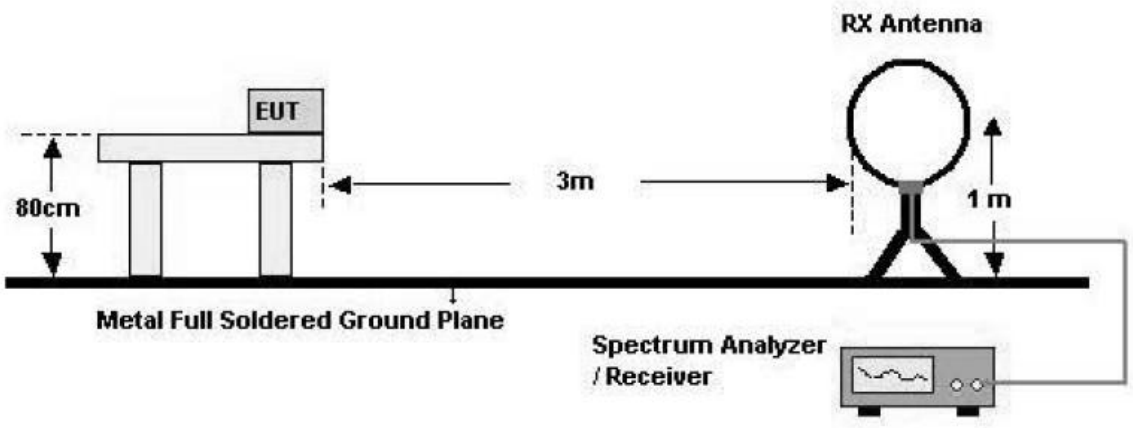
Frequency (MHz)	Field Strength (uA/m)	Measurement Distance (m)
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

FCC&ISED

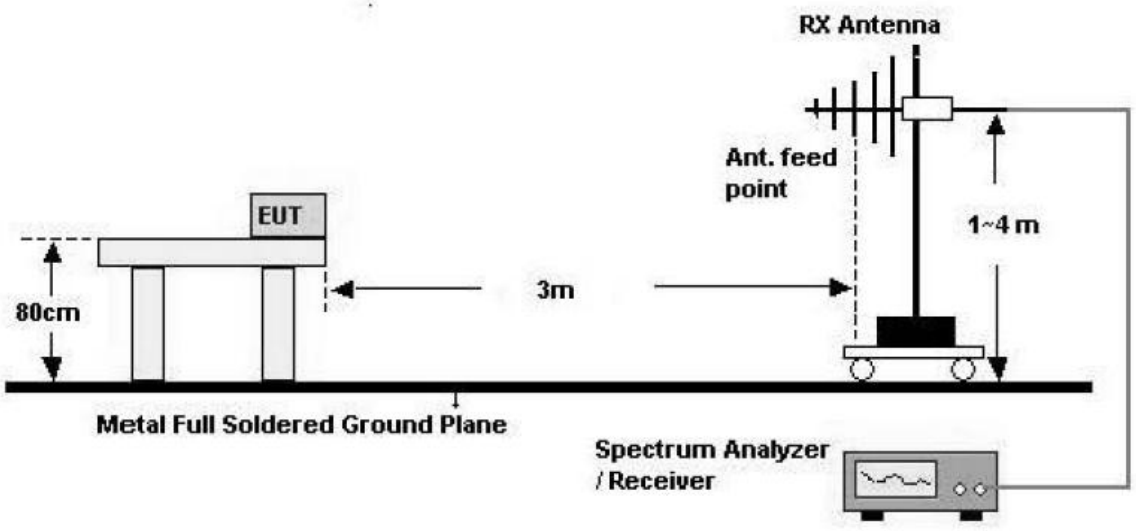
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

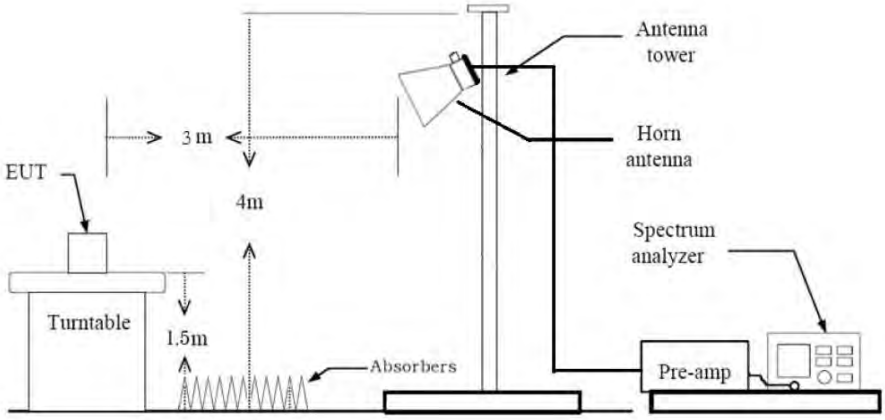
Below 30 MHz



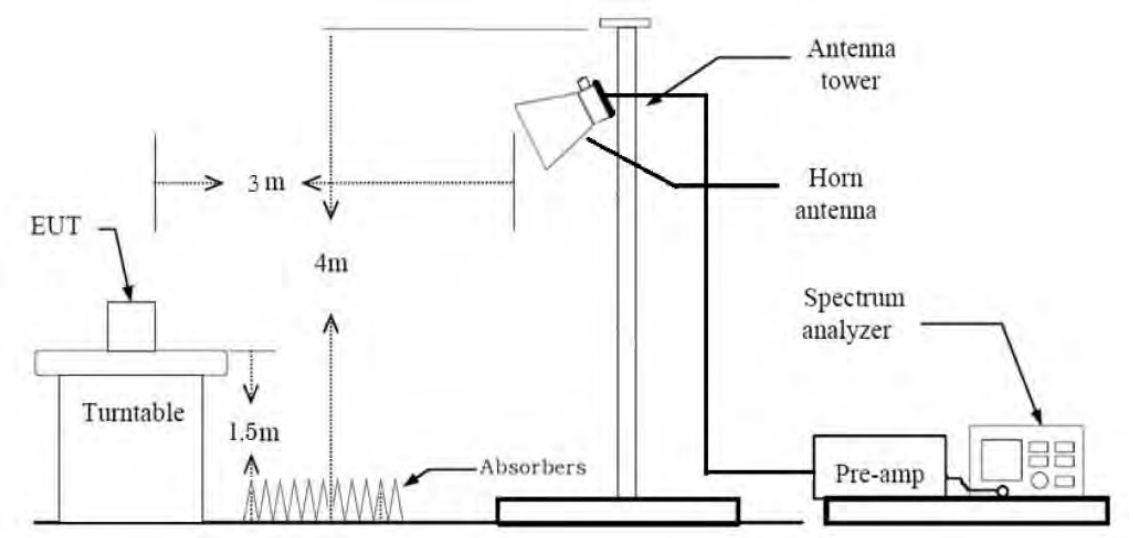
30 MHz - 1 GHz



Above 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. .We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = 40log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3 x RBW
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in

the regulations; however, an attempt should be made to avoid making measurements in the near field.

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

Test Procedure of Radiated spurious emissions(Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Quasi-peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Quasi-Peak
      - RBW = 120 kHz

   ※In general, (1) is used mainly
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

Test Procedure of Radiated spurious emissions (Above 1 GHz)

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

horizontal and vertical.

7. The unit was tested with its standard battery.

8. Spectrum Setting

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

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

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

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

- RBW = 1 MHz
- VBW(Duty cycle ≥ 98 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 detector mode.
- Detector = Peak.
- Sweep time = auto.
- Trace mode = max hold.
- Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimym 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 = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

Test Procedure of Radiated Restricted Band Edge

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
   (1) Measurement Type(Peak, G.5 in KDB 789033 v02r01):
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep Time = auto
   - Trace mode = max hold
   - Allow sweeps to continue until the trace stabilizes.
     Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle.

   (2) Measurement Type(Average, G.6.d in KDB 789033 v02r01):
   - RBW = 1 MHz
   - VBW(Duty cycle ≥ 98 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 detector mode.
   - Detector = Peak.
   - Sweep time = auto.
   - Trace mode = max hold.
   - Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimym 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 = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Attenuator + Distance Factor(D.F)

The actual setting value of VBW

Mode	Worst Data rate (Mbps)	Duty Cycle	Duty Cycle Factor (dB)	The actual setting value of VBW (Hz)
802.11a	6	0.934	0.297	1000
802.11n(HT20)	MCS 0(6.5)	0.930	0.315	1000
802.11n(HT40)	MCS 0(13.5)	0.868	0.616	3000
802.11ac(VHT20)	MCS 0(6.5)	0.930	0.315	1000
802.11ac(VHT40)	MCS 0(13.5)	0.869	0.610	3000
802.11ac(VHT80)	MCS 0(29.3)	0.768	1.149	5000

8.8. Receiver Spurious Emissions

Limit

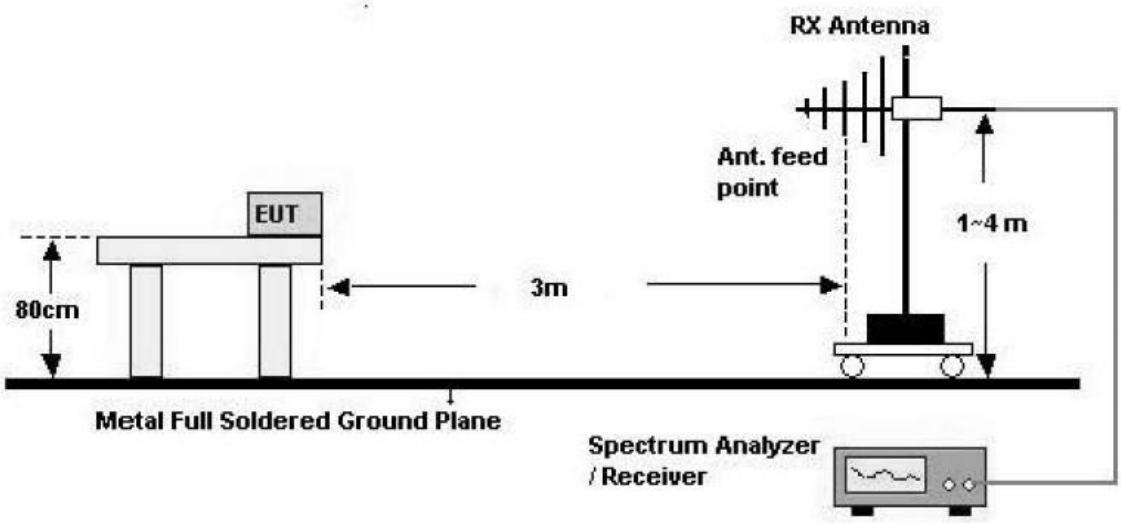
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

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

Test Configuration

30 MHz - 1 GHz



Test Procedure of Receiver Spurious Emissions (Below 1GHz)

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

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

6. Spectrum Setting

(1) Measurement Type(Peak):

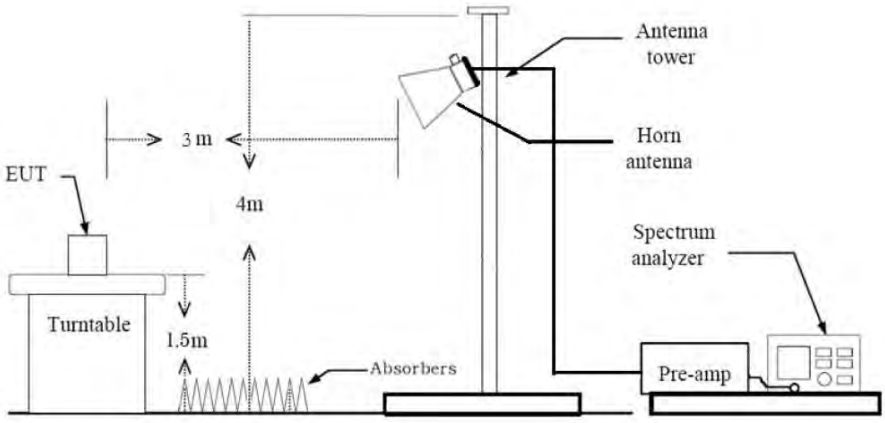
- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 100 kHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Quasi-peak):

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

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

Above 1 GHz



Test Procedure of Radiated spurious emissions (Above 1 GHz)

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

7. The unit was tested with its standard battery.

8. Spectrum Setting

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Average):

- We performed using a reduced video BW method was done with the analyzer in linear mode
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW ≥ 1/τ Hz, where τ = pulse width in seconds

The actual setting value of VBW = 1 kHz

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

10. Distance extrapolation factor = 20log (test distance / specific distance) (dB)

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

8.9. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
2. All configurations of antenna were investigated and the worst case configuration results are reported.
   -UNII 1, 2A, 2C, 3 : 802.11a
   - In order to simplify the report, We only have attached RSE result of worst case.
   (= Highest power of Each bands)
3. EUT Axis
   - Radiated Spurious Emissions : X
   - Radiated Restricted Band Edge : X
4. All datarate of operation were investigated and the worst case datarate results are reported
   - 802.11a : 6Mbps
   - 802.11n : MCS0
   - 802.11ac : MCS0
   - R.S.E Worstcase : 802.11a(UNII 1, 2A, 2C, 3)

5. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
   - Position : Horizontal, Vertical, Parallel to the ground plane
6. VT250TWAN(FCC)& VT250GYKN(ISED), Additional Model were tested and the worst case results are reported.
(Worst case : VT250TWAN(FCC)& VT250GYKN(ISED))

AC Power line Conducted Emissions

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

Conducted test

1. All datarate of operation were investigated and the worst case datarate results are reported.
2. VT250TWAN(FCC)& VT250GYKN(ISED), Additional Model were tested and the worst case results are reported.
(Worst case : VT250TWAN(FCC)& VT250GYKN(ISED))

9. SUMMARY OF TEST RESULTS

FCC

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§ 15.407 (for Power Measurement)	N/A	Conducted	PASS
6 dB Bandwidth	§ 15.407(e)	>500 kHz (5725-5850 MHz)		PASS
Maximum Conducted Output Power	§ 15.407(a)(1)	< 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
Peak Power Spectral Density	§ 15.407(a)(1),(5)	<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	<FCC 15.207 limits		PASS
Undesirable Emissions	§ 15.407(b)	<-27 dBm/MHz EIRP (UNII1, 2A, 2C) cf. Section 8.7 (UNII 3)	Radiated	PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	15.205, 15.407(b)(5), (6)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS

ISED

Test Description	ISED Part Section(s)	Test Limit	Test Condition	Test Result
99% Bandwidth	RSS-GEN, 6.7	N/A	CONDUCTED	PASS
6 dB Bandwidth	RSS-247, 6.2.4.1	> 500 kHz (5725~5850 MHz)		PASS
Maximum Conducted Output Power,	RSS-247, 6.2	< 250 mW or 11+10 log $_{10}$ (BW) dBm (5470-5600, 5650-5725 MHz) Whichever power is less		PASS
	RSS-247, 6.2.4 1	<1 W (5725-5850 MHz)		
Maximum e.i.r.p	RSS-247, 6.2	< 30 mW or 1.76+10 log $_{10}$ (BW) dBm (5150-5250 MHz) < 30 mW or 1.76+10 log $_{10}$ (BW) dBm (5250-5350 MHz) < 1 W or 17+10 log $_{10}$ (BW) dBm (5470-5725 MHz) Whichever power is less		PASS
Power Spectral Density	RSS-247 6.2	<10 dBm/ MHz(e.i.r.p.) (5150-5250 MHz) <11 dBm/MHz(Conducted) (5250-5350 MHz, 5470-5600 MHz, 5650-5725 MHz)		PASS
	RSS-247, 6.2.4 1	<30 dBm/500 kHz(Conducted) (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		PASS
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 2	cf. Section 9.8.1 (UNII 3)		
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	RSS-Gen, 8.9 RSS-Gen, 8.10	RSS-Gen section 8.9 table 5, 6 section 8.10 table 7		PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.3	RSS-GEN section 7.3 table 3		PASS

10. TEST RESULT

10.1 DUTY CYCLE

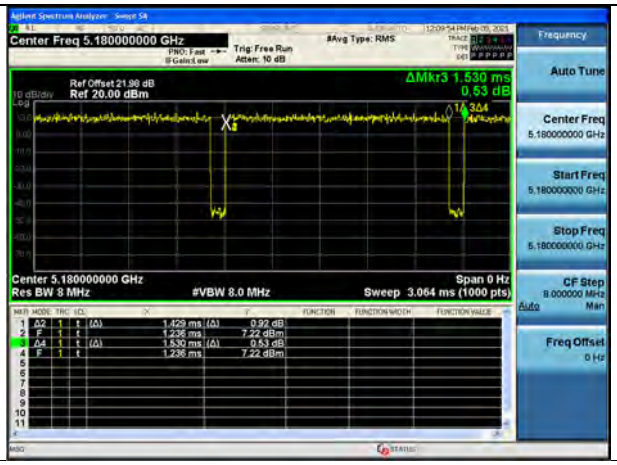
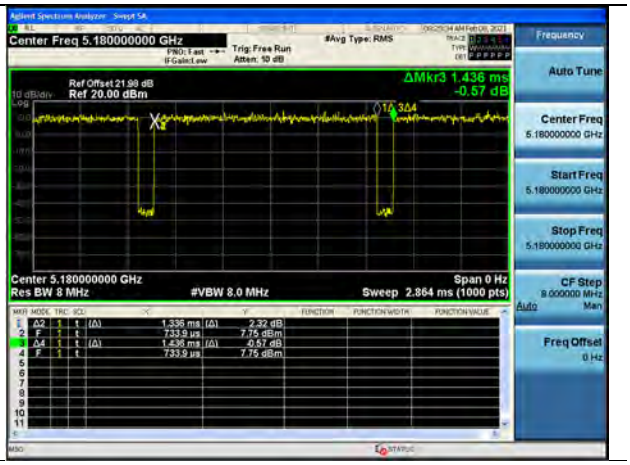
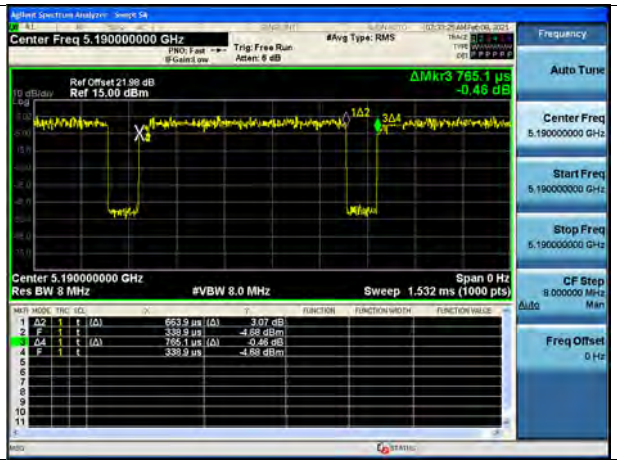
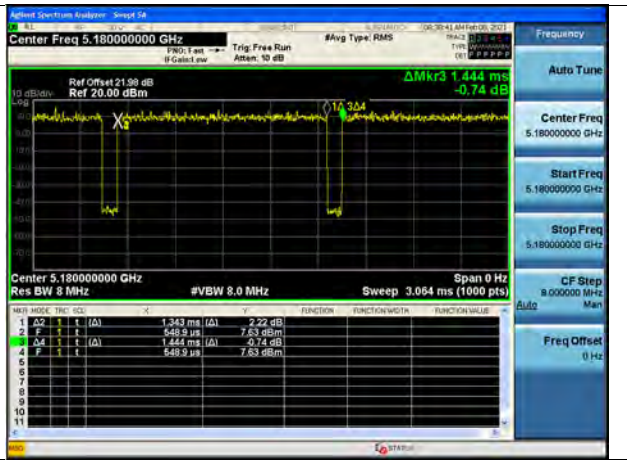
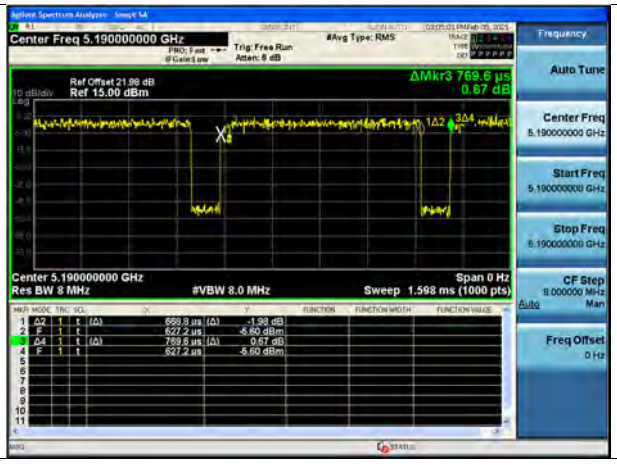
Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11a	6	1.429	1.530	0.934	0.297
	9	0.959	1.060	0.904	0.436
	12	0.725	0.827	0.877	0.568
	18	0.492	0.594	0.828	0.818
	24	0.372	0.474	0.785	1.052
	36	0.256	0.358	0.717	1.447
	48	0.196	0.297	0.659	1.809
	54	0.180	0.281	0.640	1.941

Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11n (HT20)	0	1.336	1.436	0.930	0.315
	1	0.689	0.791	0.872	0.595
	2	0.472	0.573	0.824	0.843
	3	0.364	0.465	0.783	1.064
	4	0.256	0.357	0.717	1.444
	5	0.200	0.302	0.663	1.784
	6	0.184	0.285	0.646	1.898
	7	0.168	0.269	0.623	2.058
802.11n (HT40)	0	0.664	0.765	0.868	0.616
	1	0.352	0.453	0.776	1.099
	2	0.248	0.349	0.710	1.487
	3	0.196	0.297	0.659	1.809
	4	0.144	0.246	0.587	2.314
	5	0.116	0.218	0.534	2.727
	6	0.108	0.209	0.517	2.865
	7	0.100	0.202	0.497	3.039

Mode	MCS Index	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
802.11ac (VHT20)	0	1.343	1.444	0.930	0.315
	1	0.693	0.794	0.873	0.588
	2	0.476	0.577	0.825	0.834
	3	0.367	0.469	0.783	1.065
	4	0.260	0.361	0.721	1.423
	5	0.204	0.306	0.667	1.757
	6	0.188	0.290	0.649	1.877
	7	0.172	0.274	0.630	2.006
	8	0.151	0.252	0.600	2.218
802.11ac (VHT40)	0	0.669	0.770	0.869	0.610
	1	0.356	0.458	0.778	1.090
	2	0.252	0.354	0.713	1.471
	3	0.200	0.301	0.665	1.772
	4	0.148	0.249	0.593	2.272
	5	0.120	0.222	0.542	2.663
	6	0.104	0.205	0.507	2.946
	7	0.096	0.198	0.486	3.136
	8	0.088	0.189	0.465	3.328
	9	0.088	0.189	0.467	3.311
802.11ac (VHT80)	0	0.332	0.432	0.768	1.149
	1	0.188	0.289	0.651	1.862
	2	0.140	0.241	0.580	2.366
	3	0.116	0.217	0.536	2.710
	4	0.092	0.193	0.477	3.214
	5	0.080	0.182	0.442	3.547
	6	0.076	0.177	0.429	3.680
	7	0.072	0.174	0.416	3.810
	8	0.068	0.169	0.401	3.965
	9	0.064	0.165	0.388	4.108

Note:

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

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

10.2 26dB BANDWIDTH & 99 % BANDWIDTH

FCC(26dB) & ISED(99%BW)

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.05	16.625
5200	40	20.79	16.620
5240	48	21.09	16.638
5260	52	20.87	16.614
5300	60	21.10	16.676
5320	64	21.14	16.623
5500	100	21.26	16.656
5580	116	20.84	16.665
5720	144	21.12	16.607
5745	149	21.07	16.629
5785	157	21.01	16.643
5825	165	21.18	16.626

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.22	17.806
5200	40	21.24	17.737
5240	48	21.42	17.764
5260	52	21.26	17.790
5300	60	21.22	17.777
5320	64	21.37	17.810
5500	100	21.18	17.746
5580	116	21.12	17.781
5720	144	21.20	17.769
5745	149	21.03	17.780
5785	157	21.17	17.749
5825	165	21.35	17.792

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.32	36.125
5230	46	39.41	36.099
5270	54	39.76	36.140
5310	62	39.45	36.121
5510	102	39.21	36.116
5550	110	39.29	36.011
5710	142	39.26	36.126
5755	151	39.47	36.114
5795	159	39.44	36.123

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	21.38	17.735
5200	40	21.30	17.774
5240	48	21.46	17.761
5260	52	21.07	17.753
5300	60	21.31	17.759
5320	64	21.39	17.785
5500	100	21.19	17.749
5580	116	21.28	17.788
5720	144	21.29	17.749
5745	149	21.28	17.751
5785	157	21.38	17.771
5825	165	21.32	17.768

802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.29	36.068
5230	46	39.41	36.017
5270	54	39.50	36.129
5310	62	39.60	36.136
5510	102	39.54	36.128
5550	110	39.29	36.092
5710	142	39.92	36.057
5755	151	39.64	36.087
5795	159	39.49	36.149

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	80.84	75.542
5290	58	81.53	75.507
5530	106	81.14	75.533
5690	138	81.29	75.589
5775	155	81.21	75.478

▣ Test Plots(802.11a)

Note:

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

802.11a UNII 1 BAND 26dB Bandwidth (CH 48)

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

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

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

▣ Test Plots(802.11n(HT20))

Note:

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

802.11n_HT20 UNII 1 BAND 26dB Bandwidth(CH 48)

802.11n_HT20 UNII 2A BAND 26dB Bandwidth(CH 64)

802.11n_HT20 UNII 2C BAND 26dB Bandwidth(CH 144)

802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 165)

▣ Test Plots(802.11n(HT40))

Note:

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

802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)

802.11n_HT40 UNII 2A BAND 26dB Bandwidth (CH 54)

802.11n_HT40 UNII 2C BAND 26dB Bandwidth(CH 110)

802.11n_HT40 UNII 3 BAND 26dB Bandwidth (CH 151)

▣ Test Plots(802.11ac(VHT20))

Note:

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

802.11ac_VHT20 UNII 1 BAND 26dB Bandwidth(CH 48)

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

802.11ac_VHT20 UNII 2C BAND 26dB Bandwidth(CH 144)

802.11ac_VHT20 UNII 3 BAND 26dB Bandwidth(CH 157)

▣ Test Plots(802.11ac(VHT40))

Note:

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

802.11ac_VHT40 UNII 1 BAND 26dB Bandwidth(CH 46)

802.11ac_VHT40 UNII 2A BAND 26dB Bandwidth (CH 62)

802.11ac_VHT40 UNII 2C BAND 26dB Bandwidth(CH 142)

802.11ac_VHT40 UNII 3 BAND 26dB Bandwidth (CH 151)

▣ Test Plots(802.11ac(VHT80))

Note:

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

802.11ac_VHT80 UNII 1 BAND 26dB Bandwidth(CH 42)

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

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

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

99% bandwidth UNII-3 (ISED)

802.11a Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	17.151
5785	157	17.203
5825	165	17.178

802.11n(HT20) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	18.195
5785	157	18.160
5825	165	18.197

802.11n(HT40) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5755	151	36.313
5795	159	36.303

802.11ac(VHT20) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5745	149	18.175
5785	157	18.144
5825	165	18.161

802.11ac(VHT40) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5755	151	36.333
5795	159	36.317

802.11ac(VHT80) Mode		99% bandwidth [MHz]
Frequency [MHz]	Channel No.	
5775	155	75.478

▣ Test Plots

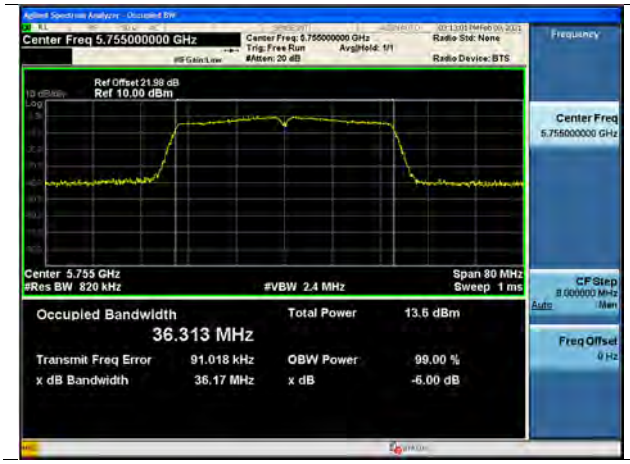
Note:

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

802.11a UNII 3 BAND 26dB Bandwidth (CH 157)

802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 165)

802.11n_HT40 UNII 3 BAND 26dB Bandwidth (CH 151)



802.11ac_VHT20 UNII 3 BAND 26dB Bandwidth(CH 149)

802.11ac_VHT40 UNII 3 BAND 26dB Bandwidth (CH 151)	802.11ac_VHT80 UNII 3 BAND 26dB Bandwidth (CH 155)
	

10.3 6DB BANDWIDTH

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	16.30	> 0.5	Pass
5785	157	16.35	> 0.5	Pass
5825	165	16.36	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.59	> 0.5	Pass
5785	157	17.58	> 0.5	Pass
5825	165	17.32	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.33	> 0.5	Pass
5795	159	35.45	> 0.5	Pass

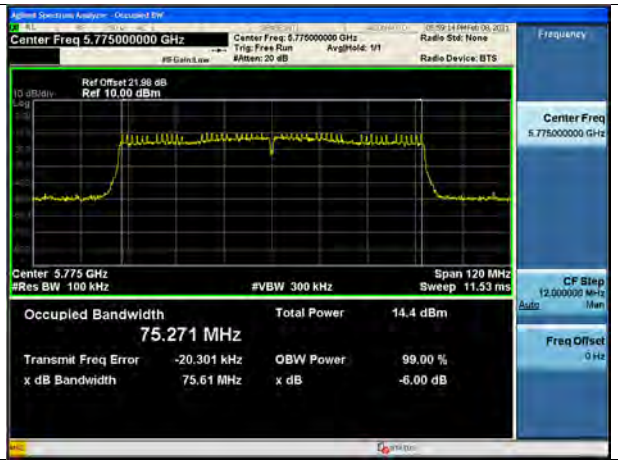
802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	17.58	> 0.5	Pass
5785	157	17.57	> 0.5	Pass
5825	165	17.60	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.79	> 0.5	Pass
5795	159	35.83	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.61	> 0.5	Pass

▣ Test Plots

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

802.11a (CH.149)	802.11n(HT20) (CH.165)
	
802.11n(HT40) (CH.151)	**802.11ac(VHT20) (CH.157)**
	
802.11ac(VHT40) (CH.151)	**802.11ac(VHT80) (CH.155)**
	

10.4 OUTPUT POWER MEASUREMENT

Straddle channel data in the table below are for reporting purposes only.
Straddle channel data were added in section 10.7.3.

802.11a Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5180	36	6.33	0.57	6.89	0.59	7.48	13.97	23.98
5200	40	5.91	0.57	6.48	0.59	7.07		
5240	48	6.80	0.57	7.37	0.59	7.96		
5260	52	6.95	0.57	7.52	2.00	9.52	13.96	23.20
5300	60	6.92	0.57	7.49	2.00	9.49		
5320	64	7.41	0.30	7.71	2.00	9.71		
5500	100	7.18	0.30	7.48	-	-	23.20	23.20
5580	116	6.60	0.57	7.17	-	-		
5720	144	6.42	0.44	6.85	-	-		
5745	149	6.56	0.57	7.13	-	-	30.00	30.00
5785	157	6.14	0.57	6.70	-	-		
5825	165	6.31	0.57	6.88	-	-		

802.11n(HT20) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5180	36	6.04	0.59	6.64	0.59	7.23	14.25	23.98
5200	40	5.52	0.84	6.37	0.59	6.96		
5240	48	6.48	0.59	7.08	0.59	7.67		
5260	52	6.40	0.84	7.24	2.00	9.24	14.26	23.50
5300	60	6.77	0.59	7.36	2.00	9.36		
5320	64	6.87	0.59	7.47	2.00	9.47		
5500	100	6.64	0.84	7.49	-	-	23.49	23.49
5580	116	6.42	0.84	7.26	-	-		
5720	144	6.08	0.59	6.68	-	-		
5745	149	6.27	0.59	6.86	-	-	30.00	30.00
5785	157	6.12	0.31	6.43	-	-		
5825	165	5.60	0.84	6.44	-	-		

802.11ac(VHT20) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5180	36	6.19	0.59	6.78	0.59	7.37	14.25	23.98
5200	40	6.76	0.32	7.07	0.59	7.66		
5240	48	7.41	0.32	7.73	0.59	8.32		
5260	52	6.85	0.83	7.68	2.00	9.68	14.25	23.49
5300	60	6.62	0.83	7.45	2.00	9.45		
5320	64	7.09	0.59	7.68	2.00	9.68		
5500	100	6.64	0.83	7.48	-	-	23.49	23.49
5580	116	6.52	0.59	7.11	-	-		
5720	144	6.11	0.83	6.95	-	-		
5745	149	6.63	0.59	7.21	-	-	30.00	30.00
5785	157	5.82	0.83	6.65	-	-		
5825	165	6.19	0.59	6.78	-	-		

802.11n(HT40) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5190	38	1.67	2.31	3.99	0.59	4.58	14.77	23.98
5230	46	2.90	1.49	4.39	0.59	4.98		
5270	54	5.81	1.81	7.62	2.00	9.62	14.77	23.98
5310	62	5.27	2.31	7.58	2.00	9.58		
5510	102	4.40	2.31	6.72	-	-	23.98	23.98
5550	110	4.92	1.81	6.73	-	-		
5710	142	4.44	2.31	6.75	-	-		
5755	151	5.08	1.49	6.57	-	-	30.00	30.00
5795	159	3.41	2.86	6.28	-	-		

802.11ac(VHT40) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5190	38	-0.22	3.33	3.10	0.59	3.69	14.77	23.98
5230	46	-0.37	3.33	2.96	0.59	3.55		
5270	54	4.67	2.95	7.62	2.00	9.62	14.77	23.98
5310	62	4.46	3.33	7.79	4.58	12.37		
5510	102	3.46	3.14	6.59	-	-	23.98	23.98
5550	110	3.33	3.33	6.66	-	-		
5710	142	3.83	3.14	6.97	-	-		
5755	151	3.56	3.33	6.88	-	-	30.00	30.00
5795	159	4.02	2.27	6.29	-	-		

802.11ac(VHT80) Mode		Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	ISED Limit [dBm]	FCC Limit [dBm]
Frequency [MHz]	Channel No.							
5210	42	1.00	1.86	2.86	0.59	3.45	14.77	23.98
5290	58	2.40	3.96	6.36	2.00	8.36	14.77	23.98
5530	106	5.17	1.15	6.32	-	-	23.98	23.98
5690	138	2.54	4.11	6.65	-	-	23.98	23.98
5775	155	2.39	3.96	6.36	-	-	30.00	30.00

Note :

FCC&ISED Worst Limit applied

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

10.5 POWER SPECTRAL DENSITY

FCC & ISED

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5180	36	-3.720	0.568	-3.152	11 dBm/MHz
5200	40	-4.373	0.568	-3.805	
5240	48	-3.347	0.568	-2.779	
5260	52	-3.114	0.568	-2.546	
5300	60	-3.172	0.568	-2.604	
5320	64	-2.780	0.297	-2.483	
5500	100	-3.009	0.297	-2.712	
5580	116	-3.443	0.568	-2.875	
5720	144	-3.646	0.436	-3.210	
5745	149	-6.094	0.568	-5.526	30 dBm/500kHz
5785	157	-6.529	0.568	-5.961	
5825	165	-6.842	0.568	-6.274	

802.11n(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5180	36	-4.081	0.595	-3.486	11 dBm/MHz
5200	40	-4.785	0.843	-3.942	
5240	48	-3.347	0.595	-2.752	
5260	52	-4.192	0.843	-3.349	
5300	60	-3.796	0.595	-3.201	
5320	64	-3.562	0.595	-2.967	
5500	100	-3.484	0.843	-2.641	
5580	116	-3.794	0.843	-2.951	
5720	144	-4.174	0.595	-3.579	
5745	149	-6.776	0.595	-6.181	30 dBm/500kHz
5785	157	-7.017	0.315	-6.702	
5825	165	-7.199	0.843	-6.356	

802.11n(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5190	38	-11.622	2.314	-9.308	11 dBm/MHz
5230	46	-10.391	1.487	-8.904	
5270	54	-7.216	1.809	-5.407	
5310	62	-7.477	2.314	-5.163	
5510	102	-8.698	2.314	-6.384	
5500	110	-8.549	1.809	-6.740	
5710	142	-8.502	2.314	-6.188	
5755	151	-10.626	1.487	-9.139	30 dBm /500kHz
5795	159	-12.508	2.865	-9.643	

802.11ac(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5180	36	-3.839	0.588	-3.251	11 dBm/MHz
5200	40	-3.418	0.315	-3.103	
5240	48	-3.025	0.315	-2.710	
5260	52	-3.398	0.834	-2.564	
5300	60	-3.535	0.834	-2.701	
5320	64	-3.414	0.588	-2.826	
5500	100	-3.477	0.834	-2.643	
5580	116	-3.694	0.588	-3.106	
5720	144	-3.997	0.834	-3.163	
5745	149	-6.772	0.588	-6.184	30 dBm/500kHz
5785	157	-7.122	0.834	-6.288	
5825	165	-6.854	0.588	-6.266	

802.11ac(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5190	38	-12.574	3.328	-9.246	11 dBm/MHz
5230	46	-13.506	3.328	-10.178	
5270	54	-8.274	2.946	-5.328	
5310	62	-8.475	3.328	-5.147	
5510	102	-9.755	3.136	-6.619	
5500	110	-9.631	3.328	-6.303	
5710	142	-9.121	3.136	-5.985	
5755	151	-11.921	3.328	-8.593	30 dBm/500kHz
5795	159	-11.670	2.272	-9.398	

802.11ac(80MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit
Frequency [MHz]	Channel No.				
5210	42	-15.480	1.862	-13.618	11 dBm/MHz
5290	58	-14.236	3.965	-10.271	
5530	106	-10.872	1.149	-9.723	
5690	138	-13.952	4.108	-9.844	
5775	155	-16.201	3.965	-12.236	30 dBm/500kHz

ISED Only

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

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5180	36	-3.720	0.568	-3.152	0.59	-2.562	10 dBm/MHz
5200	40	-4.373	0.568	-3.805	0.59	-3.215	
5240	48	-3.347	0.568	-2.779	0.59	-2.189	

802.11n(HT20) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5180	36	-4.081	0.595	-3.486	0.59	-2.896	10 dBm/MHz
5200	40	-4.785	0.843	-3.942	0.59	-3.352	
5240	48	-3.347	0.595	-2.752	0.59	-2.162	

802.11n(HT40) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5190	38	-11.622	2.314	-9.308	0.59	-8.718	10 dBm/MHz
5230	46	-10.391	1.487	-8.904	0.59	-8.314	

802.11ac(VHT20)Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5180	36	-3.839	0.588	-3.251	0.59	-2.661	10 dBm/MHz
5200	40	-3.418	0.315	-3.103	0.59	-2.513	
5240	48	-3.025	0.315	-2.710	0.59	-2.120	

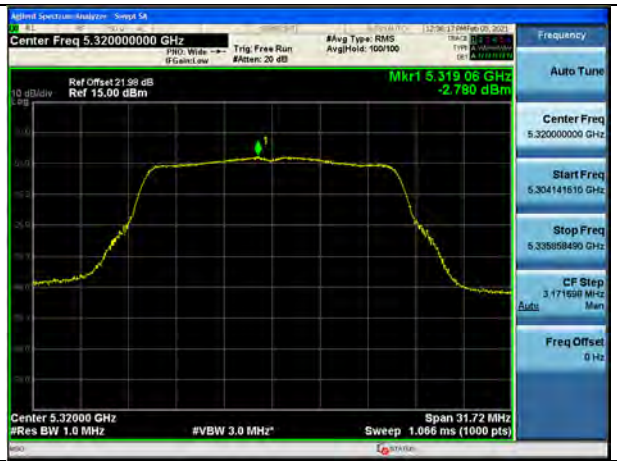
802.11ac(VHT40)Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5190	38	-12.574	3.328	-9.246	0.59	-8.656	10 dBm/MHz
5230	46	-13.506	3.328	-10.178	0.59	-9.588	

802.11ac(VHT80)Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Ant. Gain (dBi)	EIRP PSD (dBm)	EIRP PSD Limit
Frequency [MHz]	Channel No.						
5210	42	-15.480	1.862	-13.618	0.59	-13.028	10 dBm/MHz

▣ Test Plots(802.11a)

Note:

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

UNII 1 (Ch. 48)	UNII 2A (Ch. 64)
	

UNII 2C (Ch. 100)	UNII 3 (Ch. 149)
	

▣ Test Plots(802.11n(HT20))

Note:

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

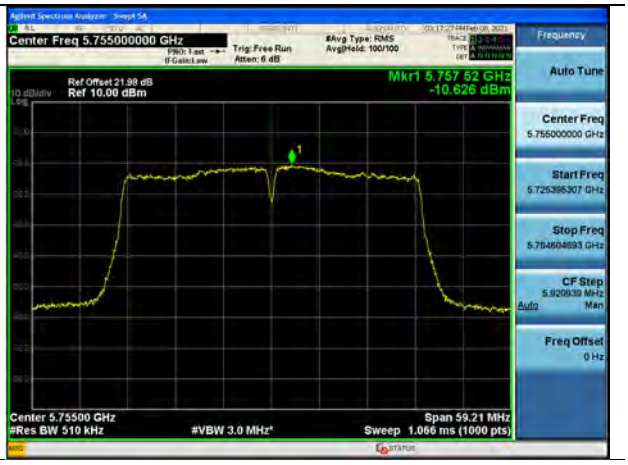
UNII 1 (Ch. 48)	UNII 2A (Ch. 64)
	
UNII 2C (Ch. 100)	UNII 3 (Ch. 149)
	

▣ Test Plots(802.11n(HT40))

Note:

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

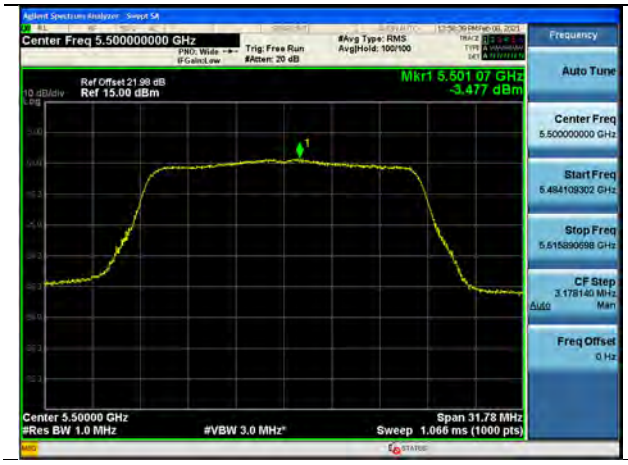
UNII 1 (Ch. 46)	UNII 2A (Ch. 62)
	

UNII 2C (Ch. 142)	UNII 3 (Ch. 151)
	

▣ Test Plots(802.11ac(VHT20))

Note:

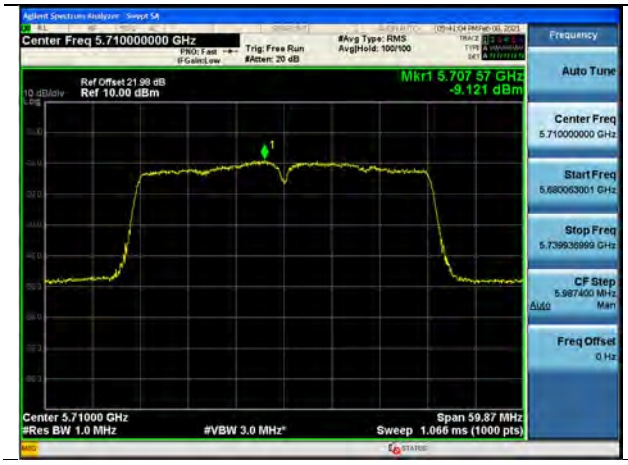
In order to simplify the report, attached plots were only channel of highest power.

UNII 1 (Ch. 48)	UNII 2A (Ch. 52)
	
UNII 2C (Ch. 100)	**UNII 3 (Ch. 149)**
	

▣ Test Plots(802.11ac(VHT40))

Note:

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

UNII 1 (Ch. 38)	UNII 2A (Ch. 62)
	
UNII 2C (Ch. 142)	**UNII 3 (Ch. 151)**
	

▣ Test Plots(802.11ac(VHT80))

Note:

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

UNII 1 (Ch. 42)	UNII 2A (Ch. 58)
	
UNII 2C (Ch. 106)	**UNII 3 (Ch. 155)**
	

10.6 FREQUENCY STABILITY.

10.6.1 80MHz BW

Startup after the EUT is energized

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.40	+20(Ref)	5210023.11	23.11
100%		-30	5210047.76	47.76
100%		-20	5210039.96	39.96
100%		-10	5210034.16	34.16
100%		0	5210030.24	30.24
100%		+10	5210026.16	26.16
100%		+30	5210026.98	26.98
100%		+40	5210036.05	36.05
100%		+50	5210041.00	41.00
LOW	9.00	+20	5210041.16	41.16
HIGH	16.00	+20	5210037.80	37.80

Note:

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

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.40	+20(Ref)	5290042.53	42.53
100%		-30	5290066.91	66.91
100%		-20	5290060.20	60.20
100%		-10	5290053.47	53.47
100%		0	5290050.26	50.26
100%		+10	5290048.02	48.02
100%		+30	5290045.84	45.84
100%		+40	5290055.43	55.43
100%		+50	5290058.64	58.64
LOW	9.00	+20	5290062.32	62.32
HIGH	16.00	+20	5290056.13	56.13

Note:

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

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

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5530013.80	13.80
100%		-30	5530036.74	36.74
100%		-20	5530030.20	30.20
100%		-10	5530023.38	23.38
100%		0	5530018.55	18.55
100%		+10	5530015.56	15.56
100%		+30	5530017.51	17.51
100%		+40	5530026.16	26.16
100%		+50	5530030.59	30.59
LOW	9.00	+20	5530032.37	32.37
HIGH	16.00	+20	5530027.33	27.33

Note:

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

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.40	+20(Ref)	5775024.19	24.19
100%		-30	5775048.61	48.61
100%		-20	5775041.03	41.03
100%		-10	5775035.87	35.87
100%		0	5775030.96	30.96
100%		+10	5775027.94	27.94
100%		+30	5775026.38	26.38
100%		+40	5775036.44	36.44
100%		+50	5775039.96	39.96
LOW	9.00	+20	5775043.67	43.67
HIGH	16.00	+20	5775038.05	38.05

Note:

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

2 minutes after the EUT is energized

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.40	+20(Ref)	5210037.31	37.31
100%		-30	5210060.65	60.65
100%		-20	5210053.46	53.46
100%		-10	5210047.24	47.24
100%		0	5210042.17	42.17
100%		+10	5210038.83	38.83
100%		+30	5210039.56	39.56
100%		+40	5210048.10	48.10
100%		+50	5210052.94	52.94
LOW	9.00	+20	5210055.47	55.47
HIGH	16.00	+20	5210053.32	53.32

Note:

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

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

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5290046.53	46.53
100%		-30	5290060.35	60.35
100%		-20	5290053.89	53.89
100%		-10	5290047.70	47.70
100%		0	5290043.35	43.35
100%		+10	5290039.61	39.61
100%		+30	5290040.01	40.01
100%		+40	5290049.75	49.75
100%		+50	5290053.68	53.68
LOW	9.00	+20	5290052.74	52.74
HIGH	16.00	+20	5290054.53	54.53

Note:

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

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

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5530019.56	19.56
100%		-30	5530043.57	43.57
100%		-20	5530036.77	36.77
100%		-10	5530031.44	31.44
100%		0	5530026.56	26.56
100%		+10	5530023.49	23.49
100%		+30	5530021.83	21.83
100%		+40	5530031.53	31.53
100%		+50	5530035.47	35.47
LOW	9.00	+20	5530038.62	38.62
HIGH	16.00	+20	5530034.73	34.73

Note:

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

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.40	+20(Ref)	5775022.75	22.75
100%		-30	5775042.69	42.69
100%		-20	5775034.97	34.97
100%		-10	5775029.17	29.17
100%		0	5775025.80	25.80
100%		+10	5775023.03	23.03
100%		+30	5775021.84	21.84
100%		+40	5775031.45	31.45
100%		+50	5775035.99	35.99
LOW	9.00	+20	5775035.60	35.60
HIGH	16.00	+20	5775038.99	38.99

Note:

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

5 minutes after the EUT is energized

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.40	+20(Ref)	5210015.75	15.75
100%		-30	5210039.99	39.99
100%		-20	5210033.88	33.88
100%		-10	5210028.02	28.02
100%		0	5210023.21	23.21
100%		+10	5210020.71	20.71
100%		+30	5210018.83	18.83
100%		+40	5210028.95	28.95
100%		+50	5210032.41	32.41
LOW	9.00	+20	5210035.29	35.29
HIGH	16.00	+20	5210029.59	29.59

Note:

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

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

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5290019.86	19.86
100%		-30	5290040.02	40.02
100%		-20	5290032.54	32.54
100%		-10	5290025.88	25.88
100%		0	5290022.56	22.56
100%		+10	5290018.72	18.72
100%		+30	5290018.58	18.58
100%		+40	5290026.82	26.82
100%		+50	5290032.69	32.69
LOW	9.00	+20	5290033.12	33.12
HIGH	16.00	+20	5290033.90	33.90

Note:

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

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

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.40	+20(Ref)	5530021.79	21.79
100%		-30	5530045.20	45.20
100%		-20	5530038.44	38.44
100%		-10	5530031.51	31.51
100%		0	5530027.97	27.97
100%		+10	5530024.21	24.21
100%		+30	5530024.95	24.95
100%		+40	5530033.18	33.18
100%		+50	5530037.18	37.18
LOW	9.00	+20	5530040.79	40.79
HIGH	16.00	+20	5530034.92	34.92

Note:

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

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.40	+20(Ref)	5775013.22	13.22
100%		-30	5775044.95	44.95
100%		-20	5775037.20	37.2
100%		-10	5775031.01	31.01
100%		0	5775027.55	27.55
100%		+10	5775023.57	23.57
100%		+30	5775025.06	25.06
100%		+40	5775033.34	33.34
100%		+50	5775038.99	38.99
LOW	9.00	+20	5775038.94	38.94
HIGH	16.00	+20	5775041.62	41.62

Note:

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

10 minutes after the EUT is energized

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.4	+20(Ref)	5210018.20	18.20
100%		-30	5210042.48	42.48
100%		-20	5210036.36	36.36
100%		-10	5210030.94	30.94
100%		0	5210026.83	26.83
100%		+10	5210023.68	23.68
100%		+30	5210020.46	20.46
100%		+40	5210029.91	29.91
100%		+50	5210034.78	34.78
LOW	9.00	+20	5210036.33	36.33
HIGH	16.00	+20	5210032.93	32.93

Note:

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

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

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.4	+20(Ref)	5290013.92	13.92
100%		-30	5290041.66	41.66
100%		-20	5290034.37	34.37
100%		-10	5290029.25	29.25
100%		0	5290025.83	25.83
100%		+10	5290022.79	22.79
100%		+30	5290020.40	20.40
100%		+40	5290029.97	29.97
100%		+50	5290035.66	35.66
LOW	9.00	+20	5290035.39	35.39
HIGH	16.00	+20	5290035.40	35.40

Note:

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

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

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	14.4	+20(Ref)	5530038.13	38.13
100%		-30	5530062.27	62.27
100%		-20	5530055.68	55.68
100%		-10	5530049.68	49.68
100%		0	5530046.19	46.19
100%		+10	5530044.03	44.03
100%		+30	5530040.24	40.24
100%		+40	5530050.25	50.25
100%		+50	5530054.33	54.33
LOW	9.00	+20	5530057.05	57.05
HIGH	16.00	+20	5530053.49	53.49

Note:

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

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

Voltage	Power	Temp.	Frequency	Frequency
(%)	(AC)	(°C)	(kHz)	Error (kHz)
100%	14.4	+20(Ref)	5775026.15	26.15
100%		-30	5775049.05	49.05
100%		-20	5775042.69	42.69
100%		-10	5775037.20	37.20
100%		0	5775032.41	32.41
100%		+10	5775029.11	29.11
100%		+30	5775028.56	28.56
100%		+40	5775037.68	37.68
100%		+50	5775042.36	42.36
LOW	9.00	+20	5775044.47	44.47
HIGH	16.00	+20	5775039.82	39.82

Note:

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

10.7 STRADDLE CHANNEL

10.7.1 26dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26dB Bandwidth [MHz]
802.11a	UNII 2C	5720	144	5709.52	15.48
802.11n(HT20)				5709.28	15.72
802.11ac(VHT20)				5709.44	15.56
802.11a	UNII 3	5720	144	5730.40	5.40
802.11n(HT20)				5730.76	5.76
802.11ac(VHT20)				5730.80	5.80

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26dB Bandwidth [MHz]
802.11n(HT40)	UNII 2C	5710	142	5690.40	34.60
802.11ac(VHT40)				5690.24	34.76
802.11n(HT40)	UNII 3	5710	142	5729.84	4.84
802.11ac(VHT40)				5730.00	5.00

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26dB Bandwidth [MHz]
802.11ac(VHT80)	UNII 2C	5690	138	5649.68	75.32
	UNII 3	5690	138	5731.04	6.04

Note:

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

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

▣ Test Plots (26dB Bandwidth)

802.11a UNII Band

802.11n(HT20) UNII Band

802.11ac(VHT20) UNII Band

▣ Test Plots (26dB Bandwidth)

802.11n(HT40) UNII Band

802.11ac(VHT40) UNII Band

802.11ac(VHT80) UNII Band

10.7.2 6dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
802.11a	UNII 3	5720	144	5728.16	3.16	> 0.5
802.11n(HT20)				5728.80	3.80	> 0.5
802.11ac(VHT20)				5728.80	3.80	> 0.5

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

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT80)	UNII 3	5690	138	5727.92	2.92	> 0.5

Note:

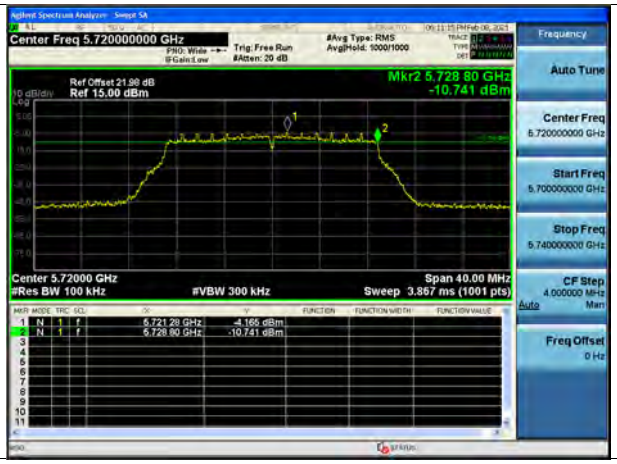
6dB Bandwidth = Measured Frequency[MHz] – 5725MHz

▣ Test Plots(UNII 3 Band 6dB Bandwidth)

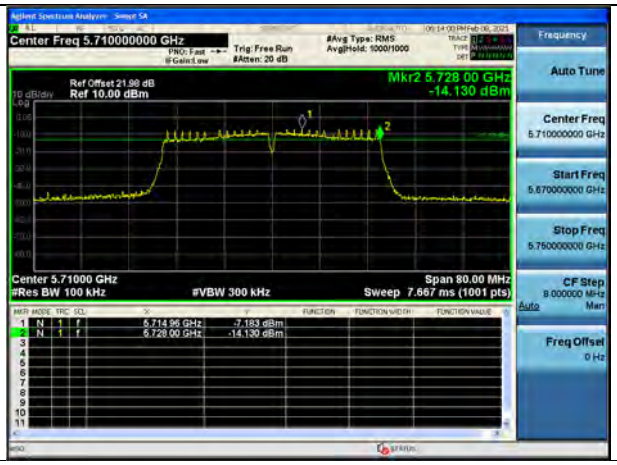
802.11a CH.144

802.11n_HT20 CH.144

802.11ac_VHT20 CH.144

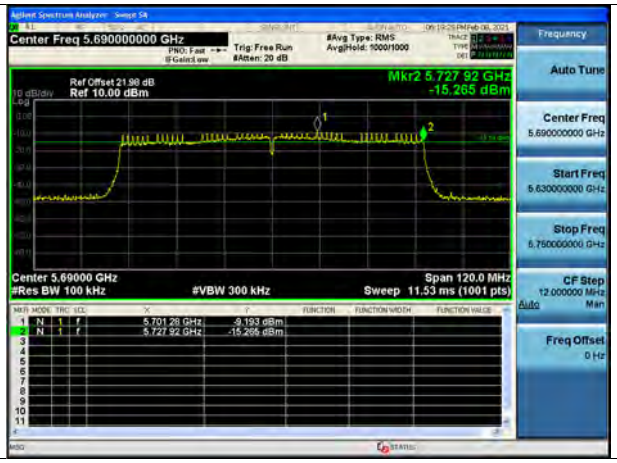


802.11n_HT40 CH.142



802.11ac_VHT40 CH.142

802.11ac_VHT80 CH.138



10.7.3 Output Power

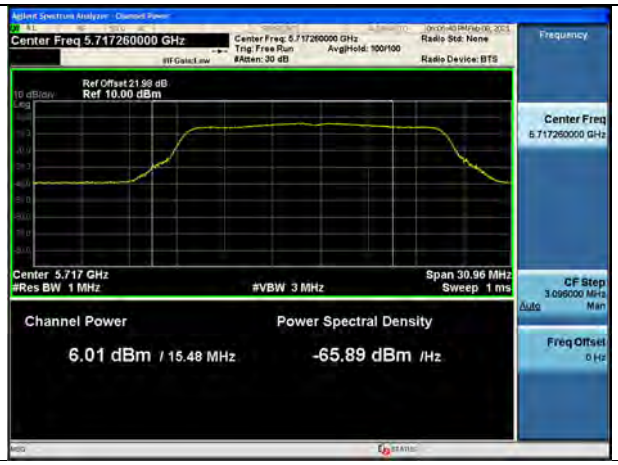
Mode	Frequency [MHz]	Channel	Measured Power (dBm)	Duty Cycle Factor (dB)	Total Power (dBm)	Limit (dBm)
802.11a	5720 (UNII 2C Band)	144	6.01	0.436	6.44	22.90
802.11n(HT20)			5.63	0.595	6.22	22.96
802.11ac(VHT20)			5.56	0.834	6.39	22.92
802.11a	5720 (UNII 3 Band)	144	-1.15	0.436	-0.72	30.00
802.11n(HT20)			-0.92	0.595	-0.32	30.00
802.11ac(VHT20)			-1.12	0.834	-0.29	30.00

Mode	Frequency [MHz]	Channel	Measured Power (dBm)	Duty Cycle Factor (dB)	Total Power (dBm)	Limit (dBm)
802.11n(HT40)	5710 (UNII 2C Band)	142	4.42	2.314	6.73	23.98
802.11ac(VHT40)			3.54	3.136	6.68	23.98
802.11n(HT40)	5710 (UNII 3 Band)	142	-6.65	2.314	-4.33	30.00
802.11ac(VHT40)			-7.33	3.136	-4.20	30.00

Mode	Frequency [MHz]	Channel	Measured Power (dBm)	Duty Cycle Factor (dB)	Total Power (dBm)	Limit (dBm)
802.11ac(VHT80)	5690 (UNII 2C Band)	138	2.11	4.108	6.21	23.98
	5690 (UNII 3 Band)	138	-10.33	4.108	-6.23	30.00

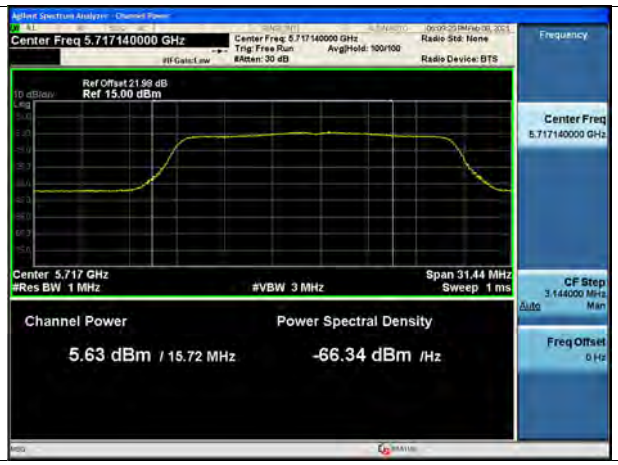
▣ Test Plots_

802.11a UNII 2C Band



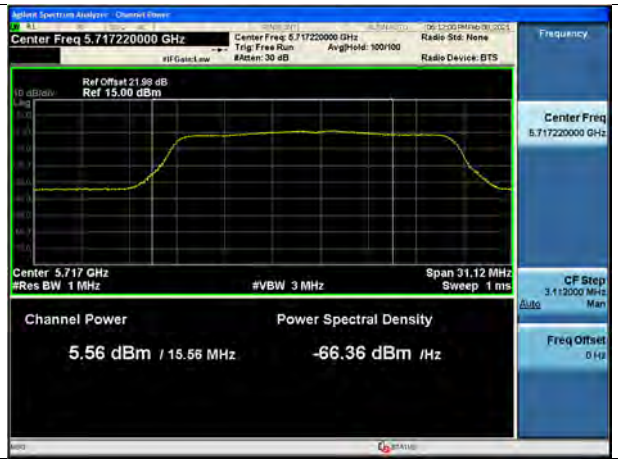
802.11a UNII 3 Band

802.11n(HT20) UNII 2C Band

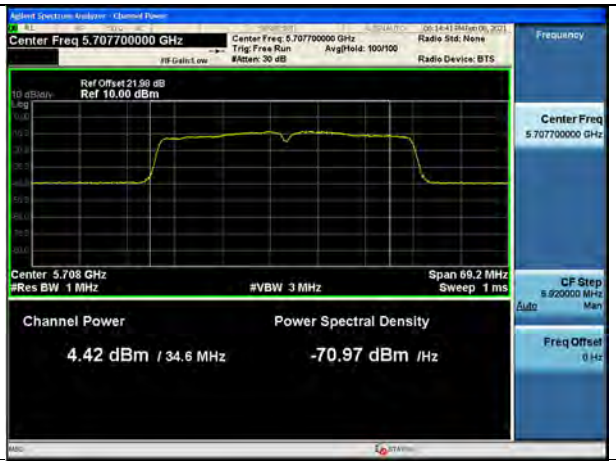


802.11n(HT20) UNII 3 Band

802.11ac(VHT20) UNII 2C Band



802.11ac(VHT20) UNII 3 Band

802.11n(HT40) UNII 2C Band	802.11n(HT40) UNII 3 Band
	
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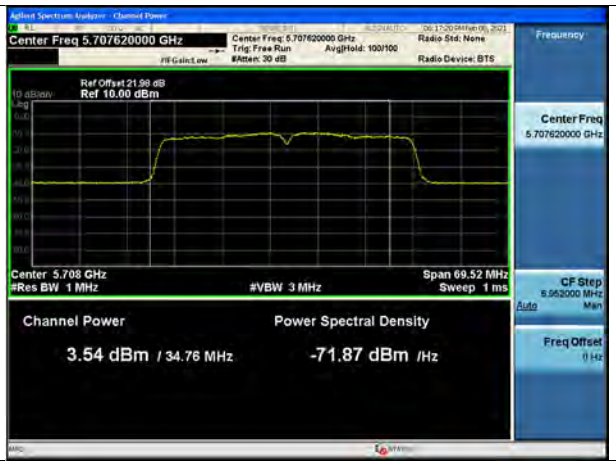	
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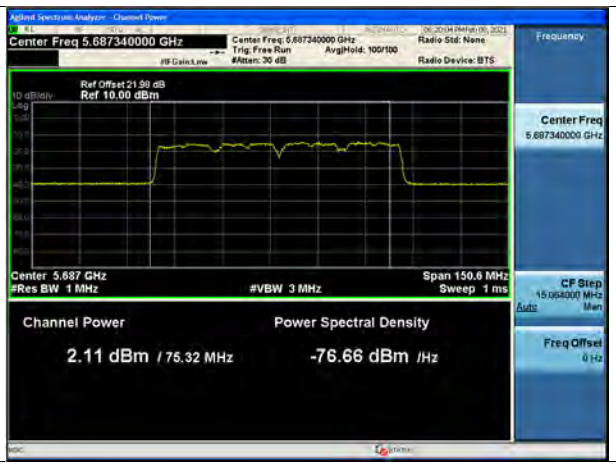
	

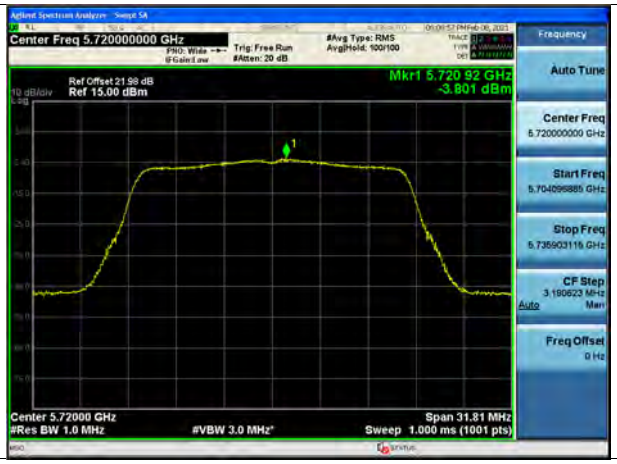
10.7.4 Power Spectral Density

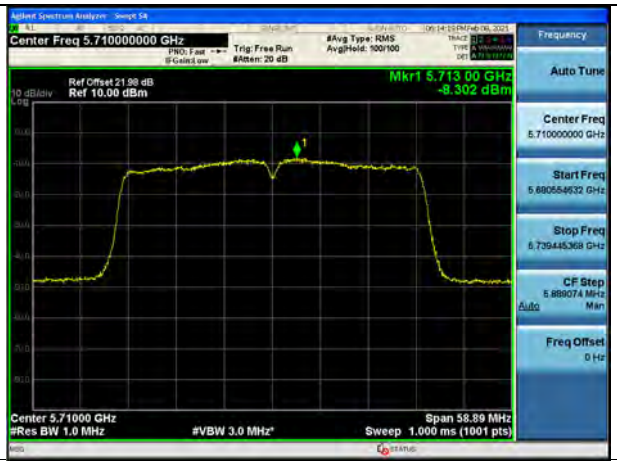
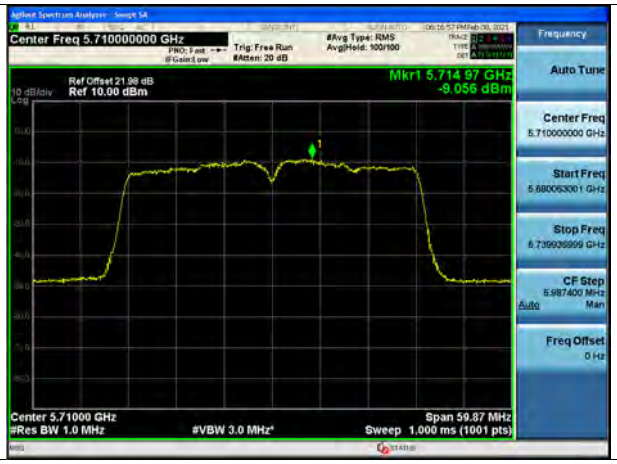
Mode	Frequency [MHz]	Channel	Measured Density (dBm)	Duty Cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)
802.11a	5720 (UNII 2C Band)	144	-3.131	0.436	-2.695	11dBm/ MHz
802.11n(HT20)			-3.801	0.595	-3.206	
802.11ac(VHT20)			-3.917	0.834	-3.083	
802.11a	5720 (UNII 3 Band)	144	-8.497	0.436	-8.061	30 dBm /500kHz
802.11n(HT20)			-8.779	0.595	-8.184	
802.11ac(VHT20)			-8.942	0.834	-8.108	

Mode	Frequency [MHz]	Channel	Measured Density (dBm)	Duty Cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)
802.11n(HT40)	5710 (UNII 2C Band)	142	-8.302	2.314	-5.988	11dBm/ MHz
802.11ac(VHT40)			-9.056	3.136	-5.920	
802.11n(HT40)	5710 (UNII 3 Band)	142	-13.286	2.314	-10.972	30 dBm/ 500kHz
802.11ac(VHT40)			-13.615	3.136	-10.479	

Mode	Frequency [MHz]	Channel	Measured Density (dBm)	Duty Cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)
802.11ac(VHT80)	5690 (UNII 2C Band)	138	-13.894	4.108	-9.786	11dBm/ MHz
	5690 (UNII 3 Band)	138	-17.316	4.108	-13.208	30 dBm/ 500kHz

▣ Test Plots_

802.11a UNII 2C Band	802.11a UNII 3 Band
	
802.11n(HT20) UNII 2C Band	802.11n(HT20) UNII 3 Band
	
802.11ac(VHT20) UNII 2C Band	802.11ac(VHT20) UNII 3 Band
	

802.11n(HT40) UNII 2C Band	802.11n(HT40) UNII 3 Band
	
802.11ac(VHT40) UNII 2C Band	802.11ac(VHT40) UNII 3 Band
	
802.11ac(VHT80) UNII 2C Band	802.11ac(VHT80) UNII 3 Band
	

10.8 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

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

Note:

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

Frequency Range : Below 1 GHz

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

Note:

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

Frequency Range : Above 1 GHz

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
10360	43.61	8.90	V	52.51	68.20	15.69	PK
15540	41.40	13.15	V	54.55	73.98	19.43	PK
15540	27.57	13.15	V	40.72	53.98	13.26	AV
10360	43.49	8.90	H	52.39	68.20	15.81	PK
15540	41.19	13.15	H	54.34	73.98	19.64	PK
15540	27.11	13.15	H	40.26	53.98	13.72	AV

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
10400	43.81	9.11	V	52.92	68.20	15.28	PK
15600	40.14	13.41	V	53.55	73.98	20.43	PK
15600	26.76	13.41	V	40.17	53.98	13.81	AV
10400	43.68	9.11	H	52.79	68.20	15.41	PK
15600	39.92	13.41	H	53.33	73.98	20.65	PK
15600	26.33	13.41	H	39.74	53.98	14.24	AV

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
10480	43.75	9.54	V	53.29	68.20	14.91	PK
15720	40.35	13.05	V	53.40	73.98	20.58	PK
15720	26.60	13.05	V	39.65	53.98	14.33	AV
10480	44.29	9.54	H	53.83	68.20	14.37	PK
15720	39.96	13.05	H	53.01	73.98	20.97	PK
15720	26.43	13.05	H	39.48	53.98	14.50	AV

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
10520	43.52	9.80	V	53.32	68.20	14.88	PK
15780	41.79	13.51	V	55.30	73.98	18.68	PK
15780	27.31	13.51	V	40.82	53.98	13.16	AV
10520	43.75	9.80	H	53.55	68.20	14.65	PK
15780	42.25	13.51	H	55.76	73.98	18.22	PK
15780	27.74	13.51	H	41.25	53.98	12.73	AV

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
10600	42.67	10.27	V	52.94	73.98	21.04	PK
10600	30.34	10.27	V	40.61	53.98	13.37	AV
15900	41.56	13.01	V	54.57	73.98	19.41	PK
15900	27.80	13.01	V	40.81	53.98	13.17	AV
10600	43.17	10.27	H	53.44	73.98	20.54	PK
10600	31.05	10.27	H	41.32	53.98	12.66	AV
15900	41.47	13.01	H	54.48	73.98	19.50	PK
15900	27.59	13.01	H	40.60	53.98	13.38	AV

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
10640	42.86	10.41	V	53.27	73.98	20.71	PK
10640	30.73	10.41	V	41.14	53.98	12.84	AV
15960	41.40	13.53	V	54.93	73.98	19.05	PK
15960	27.72	13.53	V	41.25	53.98	12.73	AV
10640	43.11	10.41	H	53.52	73.98	20.46	PK
10640	31.41	10.41	H	41.82	53.98	12.16	AV
15960	41.34	13.53	H	54.87	73.98	19.11	PK
15960	27.58	13.53	H	41.11	53.98	12.87	AV

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
11000	42.70	10.99	V	53.69	73.98	20.29	PK
11000	30.24	10.99	V	41.23	53.98	12.75	AV
16500	42.42	12.68	V	55.10	68.20	13.10	PK
11000	42.38	10.99	H	53.37	73.98	20.61	PK
11000	30.06	10.99	H	41.05	53.98	12.93	AV
16500	42.32	12.68	H	55.00	68.20	13.20	PK

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
11160	42.49	10.82	V	53.31	73.98	20.67	PK
11160	29.98	10.82	V	40.80	53.98	13.18	AV
16740	41.71	13.47	V	55.18	68.20	13.02	PK
11160	42.17	10.82	H	52.99	73.98	20.99	PK
11160	29.72	10.82	H	40.54	53.98	13.44	AV
16740	41.12	13.47	H	54.59	68.20	13.61	PK

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
11440	41.23	11.37	V	52.60	73.98	21.38	PK
11440	29.34	11.37	V	40.71	53.98	13.27	AV
17160	40.91	15.11	V	56.02	68.20	12.18	PK
11440	41.90	11.37	H	53.27	73.98	20.71	PK
11440	29.86	11.37	H	41.23	53.98	12.75	AV
17160	40.99	15.11	H	56.10	68.20	12.10	PK

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
11490	41.67	11.29	V	52.96	73.98	21.02	PK
11490	29.62	11.29	V	40.91	53.98	13.07	AV
17235	40.87	15.41	V	56.28	68.20	11.92	PK
11490	41.83	11.29	H	53.12	73.98	20.86	PK
11490	29.75	11.29	H	41.04	53.98	12.94	AV
17235	41.19	15.41	H	56.60	68.20	11.60	PK

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
11570	42.24	10.65	V	52.89	73.98	21.09	PK
11570	31.03	10.65	V	41.68	53.98	12.30	AV
17355	40.05	16.11	V	56.16	68.20	12.04	PK
11570	41.62	10.65	H	52.27	73.98	21.71	PK
11570	30.56	10.65	H	41.21	53.98	12.77	AV
17355	40.55	16.11	H	56.66	68.20	11.54	PK

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

Frequency	Reading	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBuV]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	
11650	42.86	10.20	V	53.06	73.98	20.92	PK
11650	30.95	10.20	V	41.15	53.98	12.83	AV
17475	40.02	17.45	V	57.47	68.20	10.73	PK
11650	41.99	10.20	H	52.19	73.98	21.79	PK
11650	30.57	10.20	H	40.77	53.98	13.21	AV
17475	41.57	17.45	H	59.02	68.20	9.18	PK

Note:

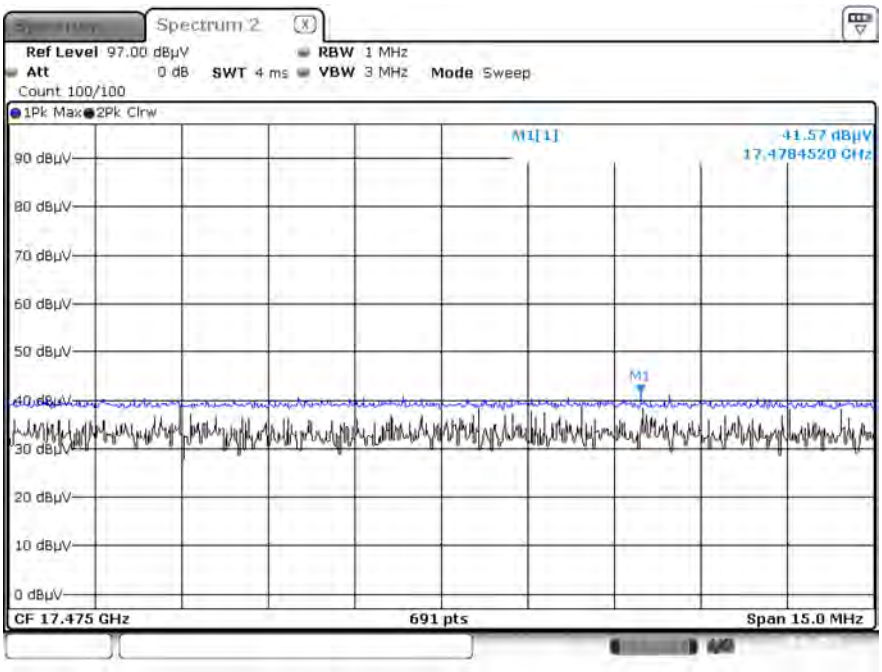
All Modes of operation were investigated and the worst case configuration results are reported.

[Worst case]

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

▣ Test Plots

Peak Reading (802.11a, Ch.165 3rd Harmonic, X-H)



Note:

Only the worst case plots for Radiated Spurious Emissions.

10.9 RADIATED RESTRICTED BAND EDGE

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	44.64	7.81	H	52.45	73.98	21.53	PK
5150	32.67	7.81	H	40.48	53.98	13.50	AV
5150	47.31	7.81	V	55.12	73.98	18.86	PK
5150	34.16	7.81	V	41.97	53.98	12.01	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	46.25	7.51	H	53.76	73.98	20.22	PK
5350	33.13	7.51	H	40.64	53.98	13.34	AV
5350	46.64	7.51	V	54.15	73.98	19.83	PK
5350	33.21	7.51	V	40.72	53.98	13.26	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	46.11	8.15	H	54.26	73.98	19.72	PK
5460	33.25	8.15	H	41.40	53.98	12.58	AV
5470	47.99	8.21	H	56.20	68.20	12.00	PK
5460	46.46	8.15	V	54.61	73.98	19.37	PK
5460	33.39	8.15	V	41.54	53.98	12.44	AV
5470	48.34	8.21	V	56.55	68.20	11.65	PK

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	43.65	7.81	H	51.46	73.98	22.52	PK
5150	33.37	7.81	H	41.18	53.98	12.80	AV
5150	46.22	7.81	V	54.03	73.98	19.95	PK
5150	34.88	7.81	V	42.69	53.98	11.29	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	45.98	7.51	H	53.49	73.98	20.49	PK
5350	32.99	7.51	H	40.50	53.98	13.48	AV
5350	46.01	7.51	V	53.52	73.98	20.46	PK
5350	33.17	7.51	V	40.68	53.98	13.30	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	46.15	8.15	H	54.30	73.98	19.68	PK
5460	33.22	8.15	H	41.37	53.98	12.61	AV
5470	47.33	8.21	H	55.54	68.20	12.66	PK
5460	46.86	8.15	V	55.01	73.98	18.97	PK
5460	33.32	8.15	V	41.47	53.98	12.51	AV
5470	47.60	8.21	V	55.81	68.20	12.39	PK

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	43.88	7.81	H	51.69	73.98	22.29	PK
5150	33.15	7.81	H	40.96	53.98	13.02	AV
5150	46.61	7.81	V	54.42	73.98	19.56	PK
5150	34.63	7.81	V	42.44	53.98	11.54	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	45.74	7.51	H	53.25	73.98	20.73	PK
5350	32.93	7.51	H	40.44	53.98	13.54	AV
5350	45.97	7.51	V	53.48	73.98	20.50	PK
5350	33.14	7.51	V	40.65	53.98	13.33	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	45.88	8.15	H	54.03	73.98	19.95	PK
5460	33.28	8.15	H	41.43	53.98	12.55	AV
5470	47.91	8.21	H	56.12	68.20	12.08	PK
5460	46.03	8.15	V	54.18	73.98	19.80	PK
5460	33.41	8.15	V	41.56	53.98	12.42	AV
5470	48.28	8.21	V	56.49	68.20	11.71	PK

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	42.91	7.81	H	50.72	73.98	23.26	PK
5150	30.97	7.81	H	38.78	53.98	15.20	AV
5150	44.56	7.81	V	52.37	73.98	21.61	PK
5150	33.15	7.81	V	40.96	53.98	13.02	AV

Band :	UNII 1
Operation Mode:	802.11 n_HT40
Transfer MCS Index:	0
Operating Frequency	5310 MHz
Channel No.	62 Ch

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	48.11	7.51	H	55.62	73.98	18.36	PK
5350	35.51	7.51	H	43.02	53.98	10.96	AV
5350	48.67	7.51	V	56.18	73.98	17.80	PK
5350	35.57	7.51	V	43.08	53.98	10.90	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	45.23	8.15	H	53.38	73.98	20.60	PK
5460	33.29	8.15	H	41.44	53.98	12.54	AV
5470	50.04	8.21	H	58.25	68.20	9.95	PK
5460	46.57	8.15	V	54.72	73.98	19.26	PK
5460	33.94	8.15	V	42.09	53.98	11.89	AV
5470	50.89	8.21	V	59.10	68.20	9.10	PK

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	42.87	7.81	H	50.68	73.98	23.30	PK
5150	32.12	7.81	H	39.93	53.98	14.05	AV
5150	44.59	7.81	V	52.40	73.98	21.58	PK
5150	33.60	7.81	V	41.41	53.98	12.57	AV

Band :	UNII 1
Operation Mode:	802.11 ac_VHT40
Transfer MCS Index:	0
Operating Frequency	5310 MHz
Channel No.	62 Ch

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	47.16	7.51	H	54.67	73.98	19.31	PK
5350	34.63	7.51	H	42.14	53.98	11.84	AV
5350	47.59	7.51	V	55.10	73.98	18.88	PK
5350	34.75	7.51	V	42.26	53.98	11.72	AV

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	45.81	8.15	H	53.96	73.98	20.02	PK
5460	33.67	8.15	H	41.82	53.98	12.16	AV
5470	50.68	8.21	H	58.89	68.20	9.31	PK
5460	46.38	8.15	V	54.53	73.98	19.45	PK
5460	34.22	8.15	V	42.37	53.98	11.61	AV
5470	51.57	8.21	V	59.78	68.20	8.42	PK

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

Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5150	45.23	7.81	H	53.04	73.98	20.94	PK
5150	34.05	7.81	H	41.86	53.98	12.12	AV
5150	46.82	7.81	V	54.63	73.98	19.35	PK
5150	35.41	7.81	V	43.22	53.98	10.76	AV

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

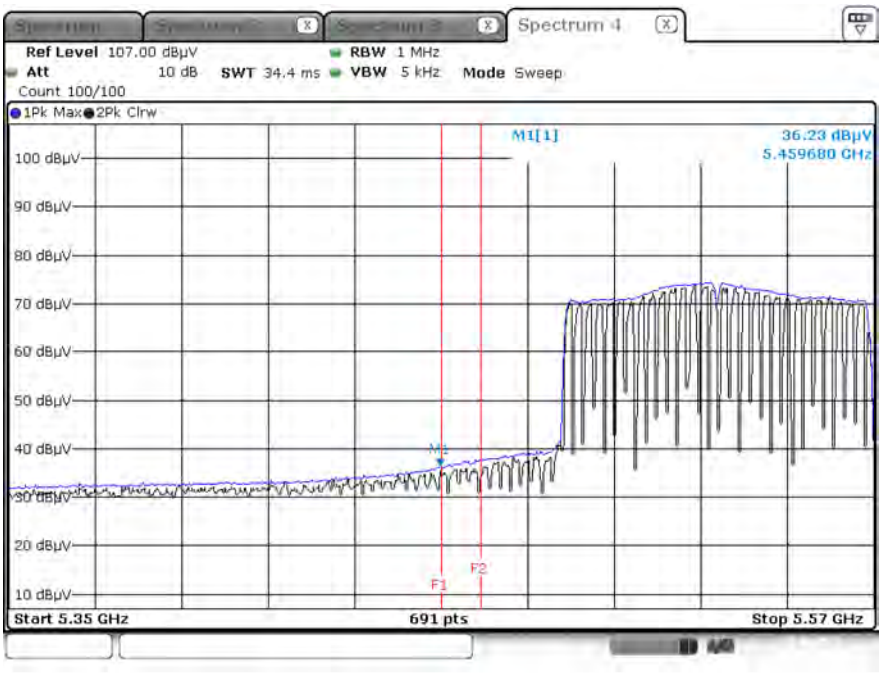
Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5350	45.84	7.51	H	53.35	73.98	20.63	PK
5350	34.26	7.51	H	41.77	53.98	12.21	AV
5350	46.12	7.51	V	53.63	73.98	20.35	PK
5350	34.46	7.51	V	41.97	53.98	12.01	AV

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

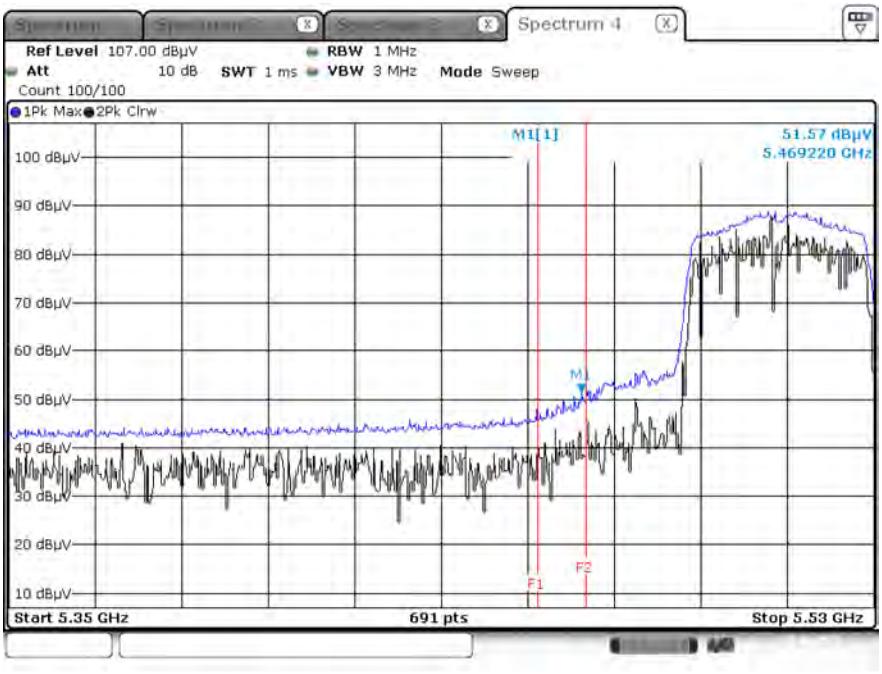
Frequency	Reading	A.F+C.L-A.G+ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	dBuV	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Type
5460	47.26	8.15	H	55.41	73.98	18.57	PK
5460	35.02	8.15	H	43.17	53.98	10.81	AV
5470	49.00	8.21	H	57.21	68.20	10.99	PK
5460	48.49	8.15	V	56.64	73.98	17.34	PK
5460	36.23	8.15	V	44.38	53.98	9.60	AV
5470	50.24	8.21	V	58.45	68.20	9.75	PK

▣ Test Plots(UNII 1, 2A, 2C)(X-V)

Average Reading (802.11ac(VHT80), Ch.106)



Peak Reading (802.11ac(VHT40), Ch.102)

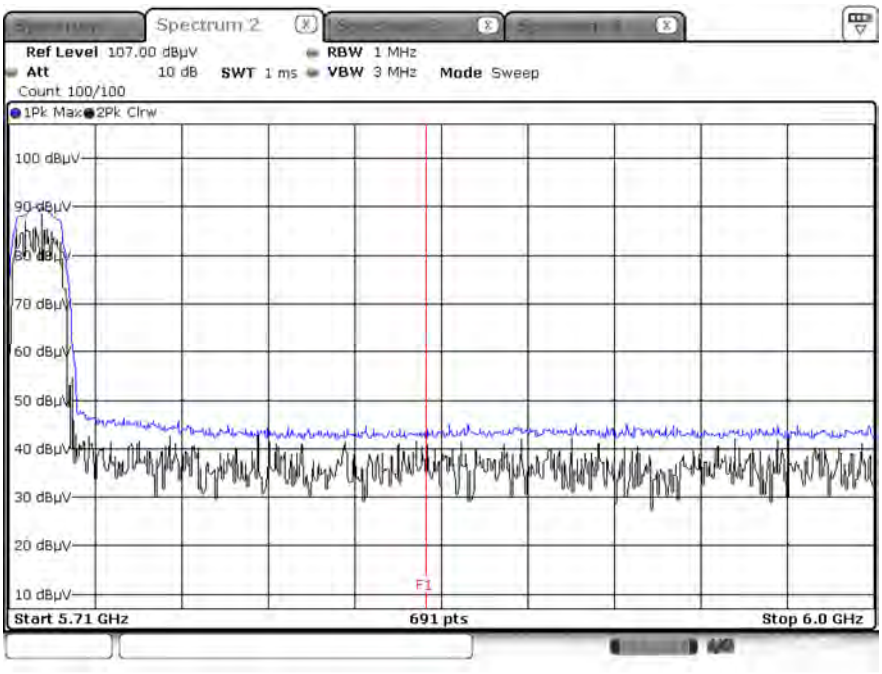


Note:

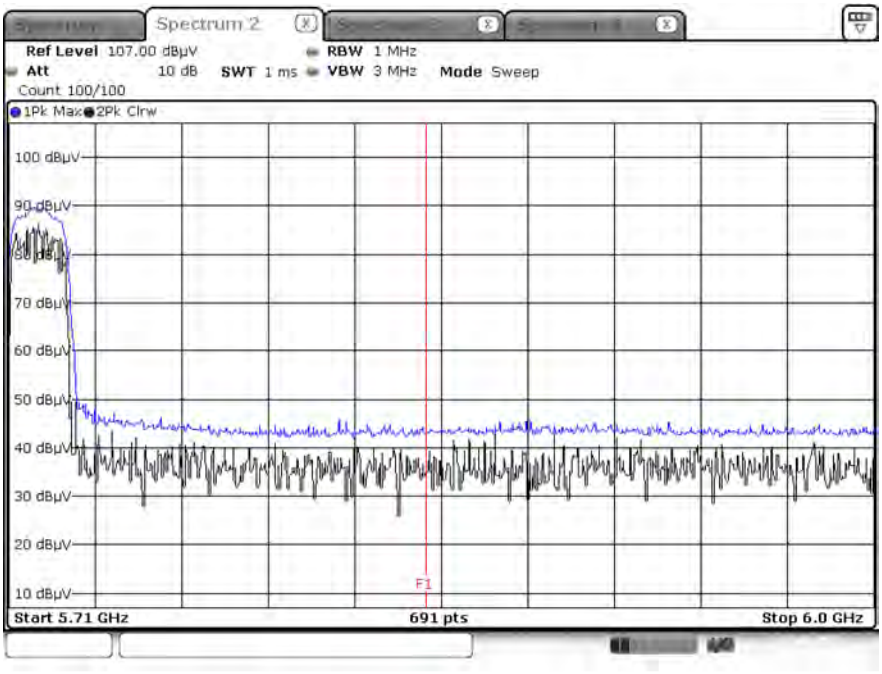
Only the worst case plots for Radiated Restricted Band Edge.

▣ Test Plots(Straddle Channel)

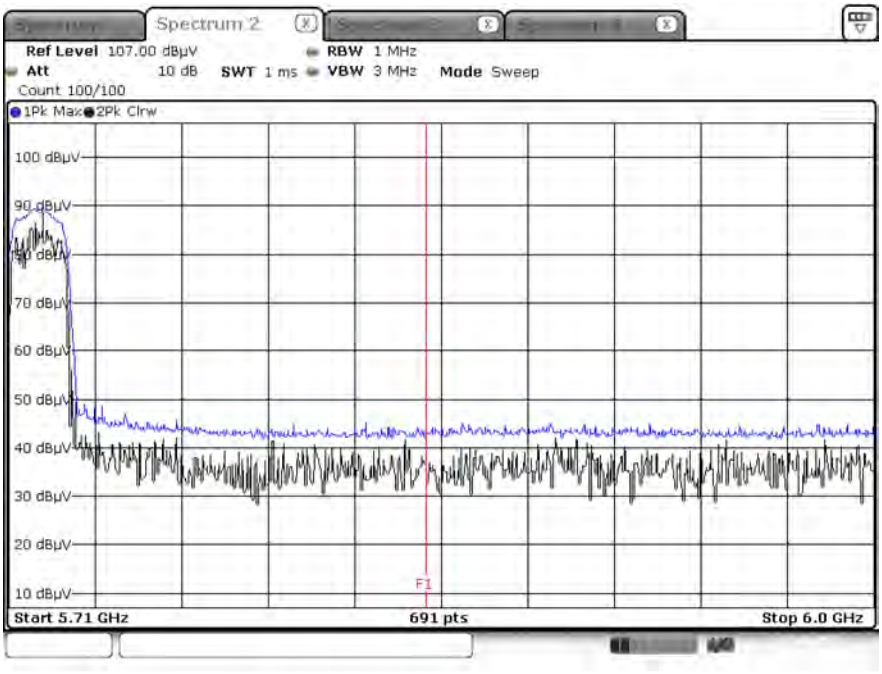
Peak Reading (802.11a, Ch.144, X-V)



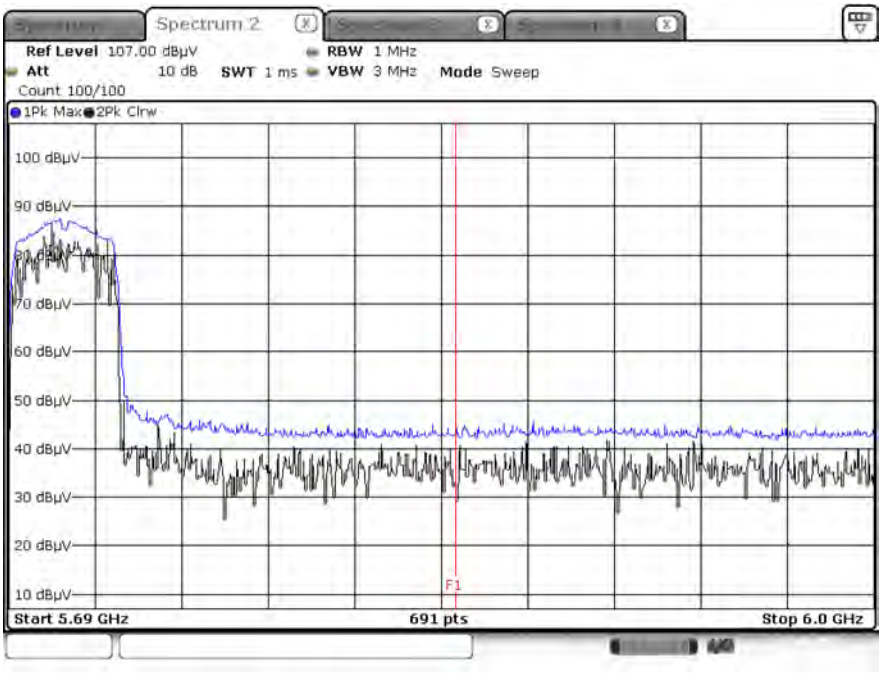
Peak Reading (802.11n_HT20, Ch.144, X-V)



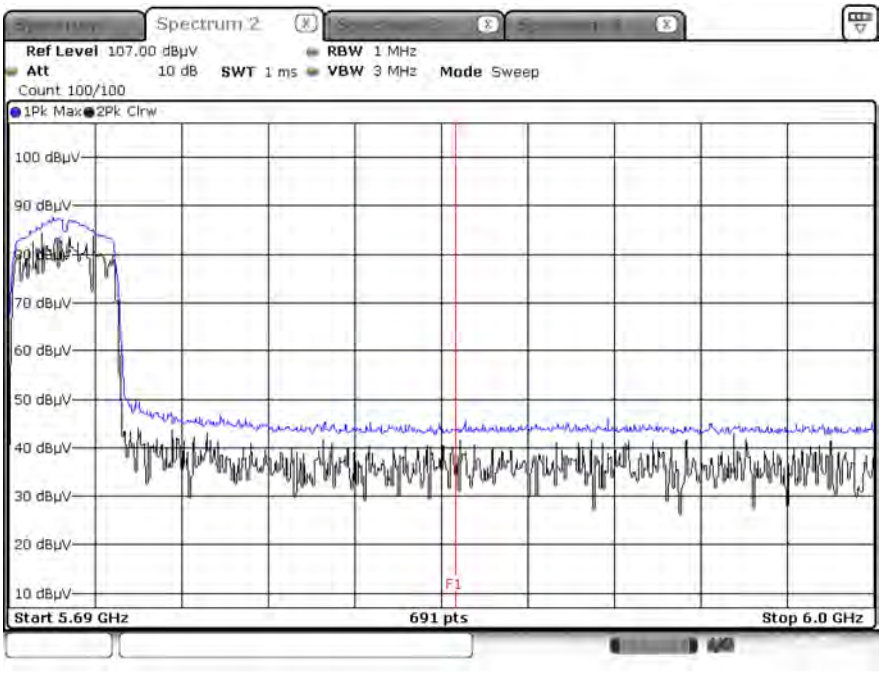
Peak Reading (802.11ac_VHT20, Ch.144, X-V)



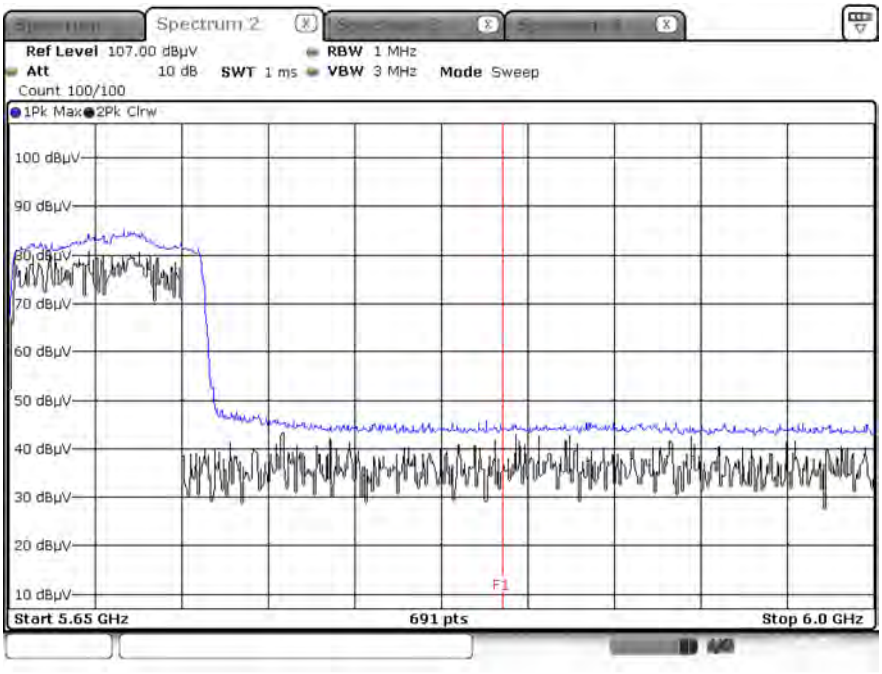
Peak Reading (802.11n_HT40, Ch.142, X-V)



Peak Reading (802.11ac_VHT40, Ch.142, X-V)



Peak Reading (802.11ac_VHT80, Ch.138, X-V)

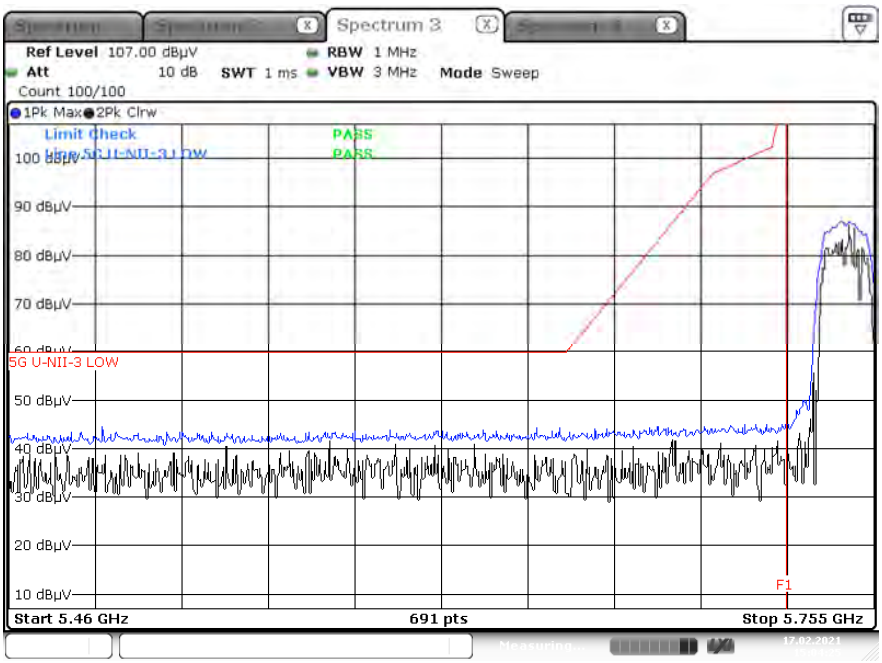


Note :

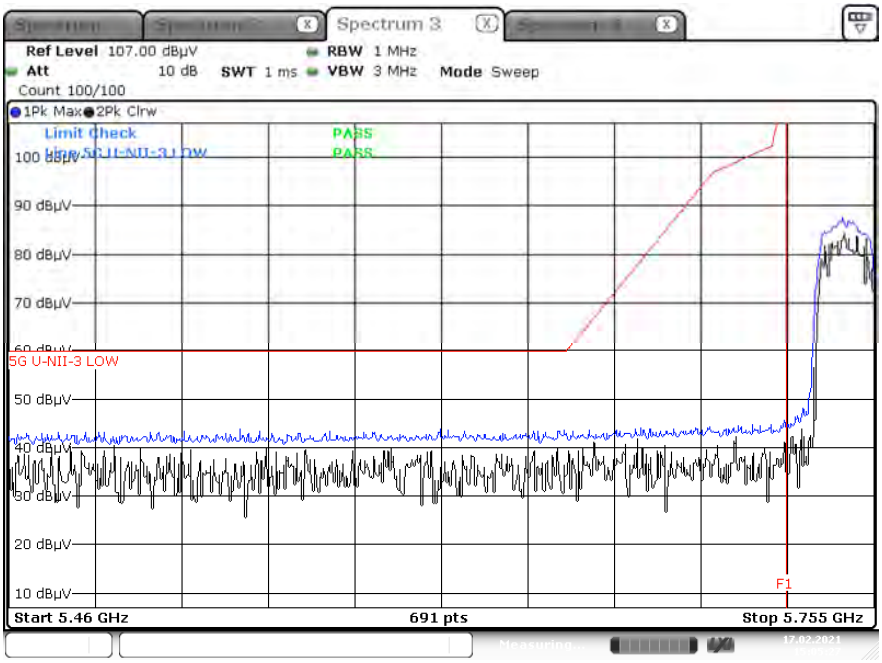
1. Only the worst case plots for Radiated Restricted Band Edge.
2. Red line : 5 850 MHz
3. Ambient Noise (Because of ambient noise, We attached only the worst plot without a data table)

▣ Test Plots(UNII 3)

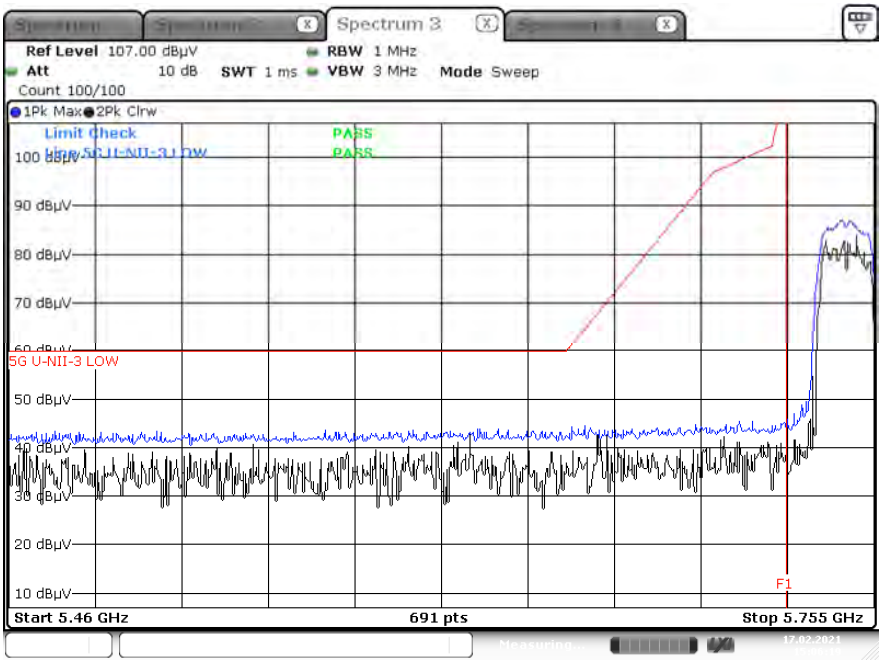
Peak Reading (802.11a, Ch.149, X-V)



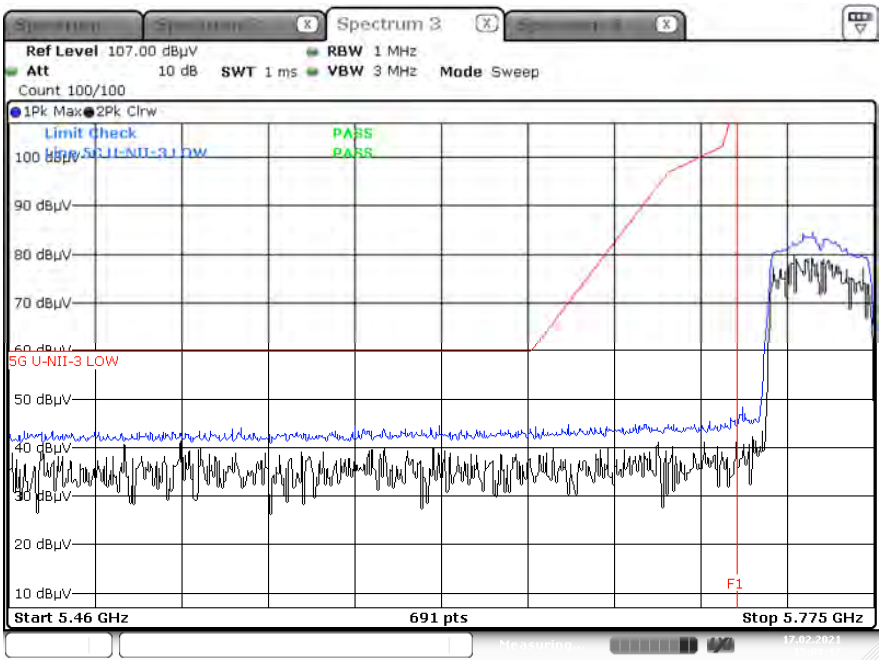
Peak Reading (802.11n_HT20, Ch.149, X-V)



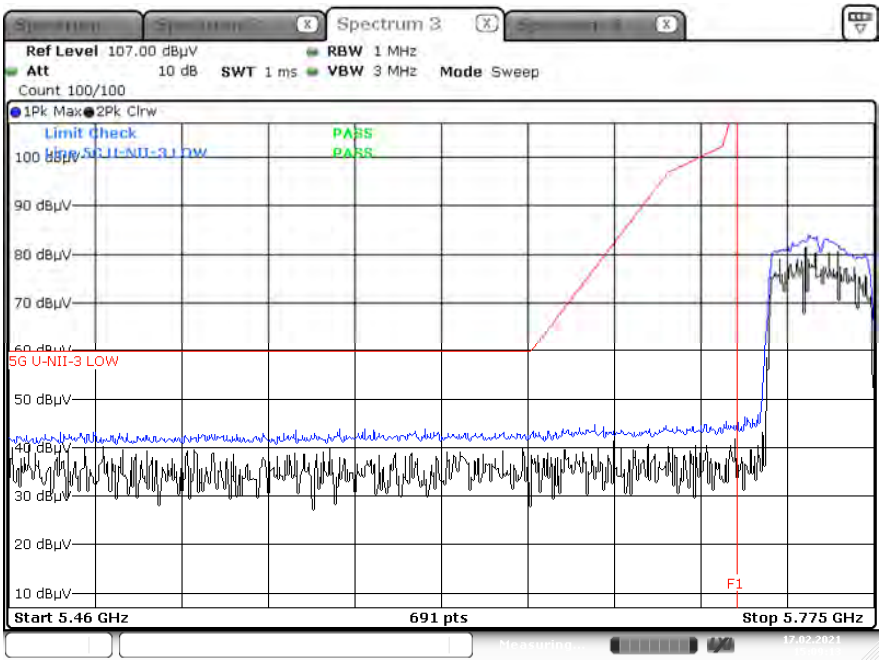
Peak Reading (802.11ac_VHT20, Ch.149, X-V)



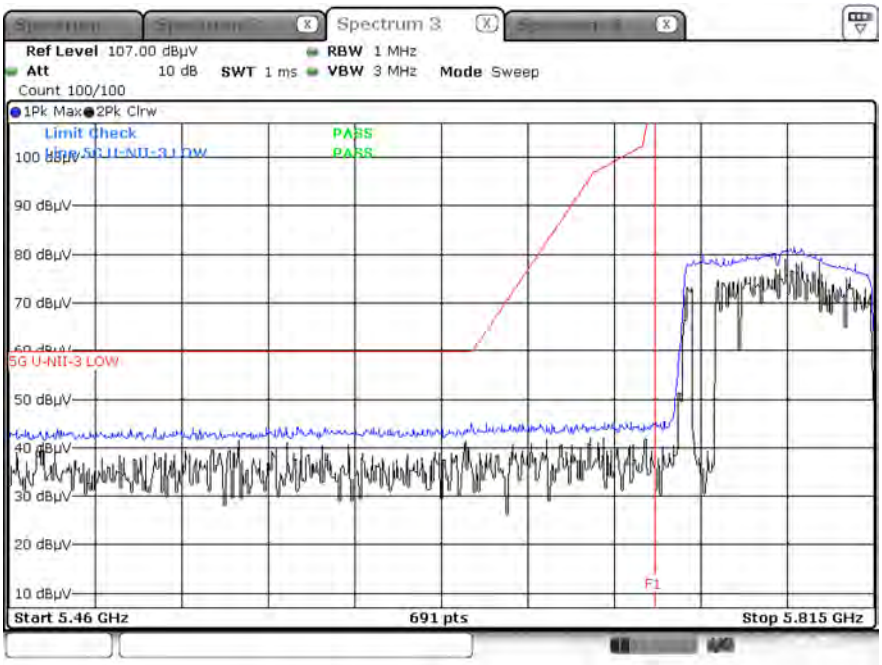
Peak Reading (802.11n_HT40, Ch.151, X-V)



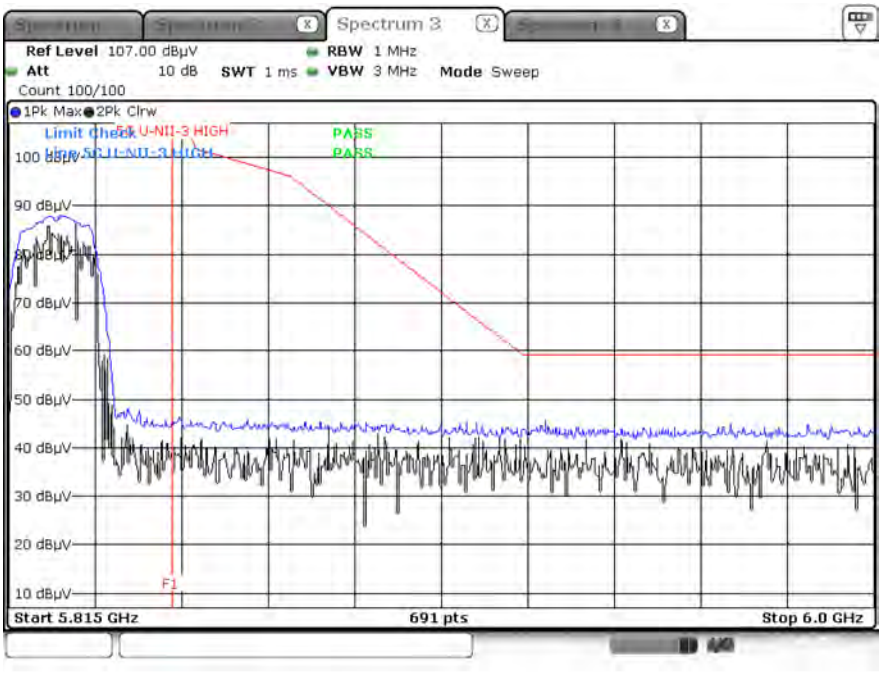
Peak Reading (802.11ac_VHT40, Ch.151, X-V)



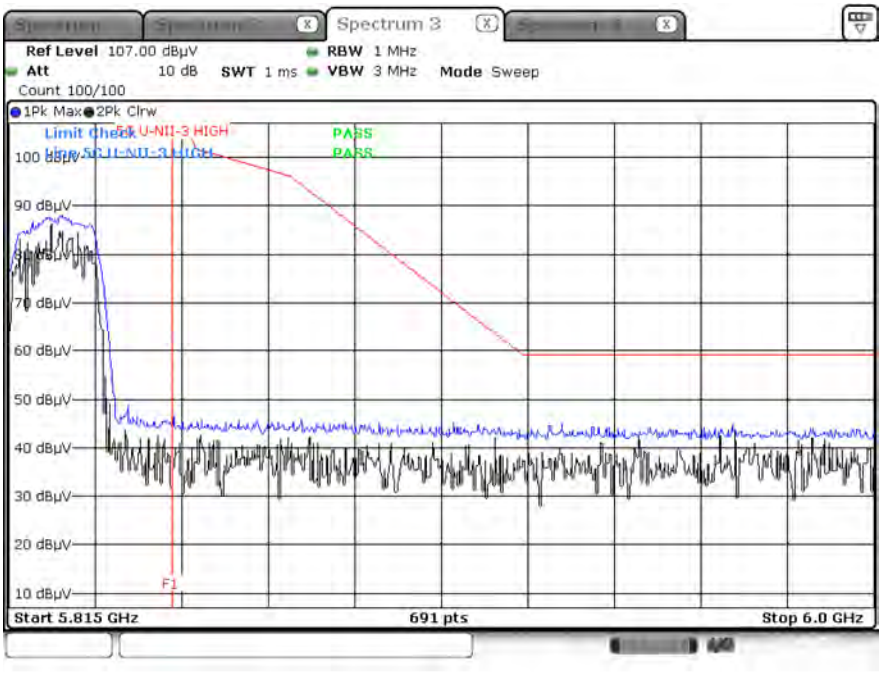
Peak Reading (802.11ac_VHT80, Ch.155, X-V)



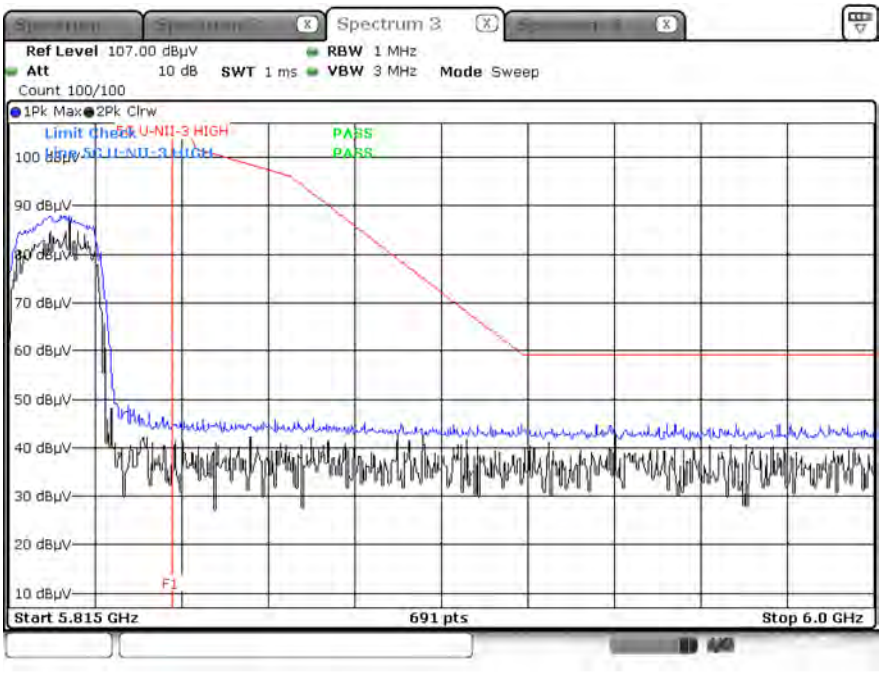
Peak Reading (802.11a, Ch.165, X-V)



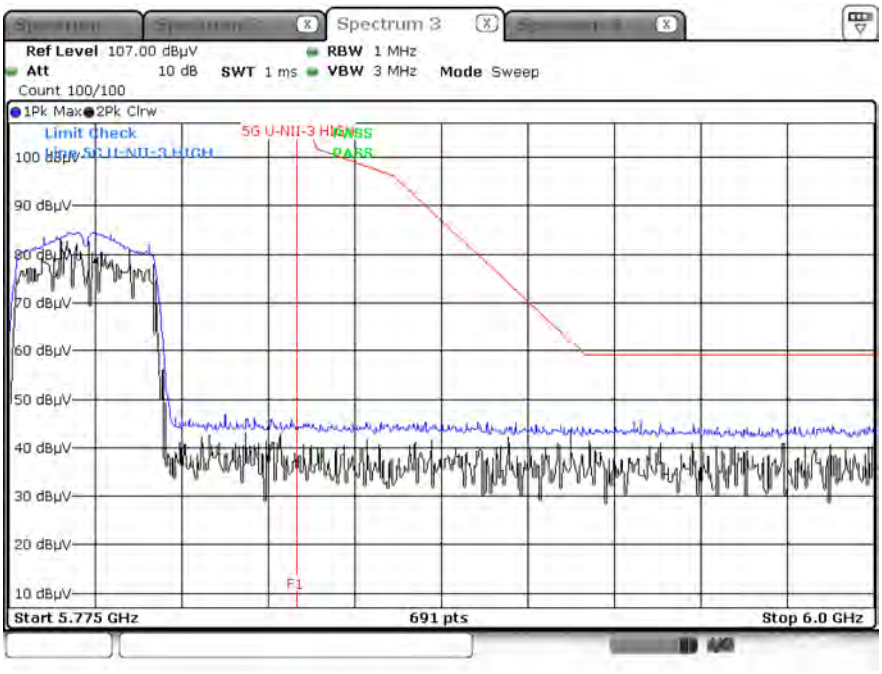
Peak Reading (802.11n_HT20, Ch.165, X-V)



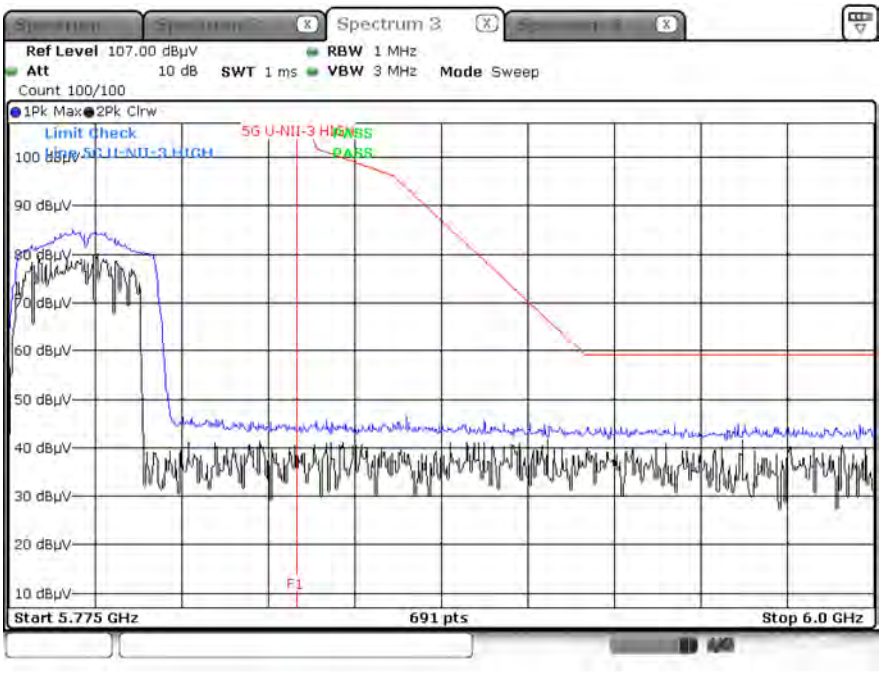
Peak Reading (802.11ac_VHT20, Ch.165, X-V)



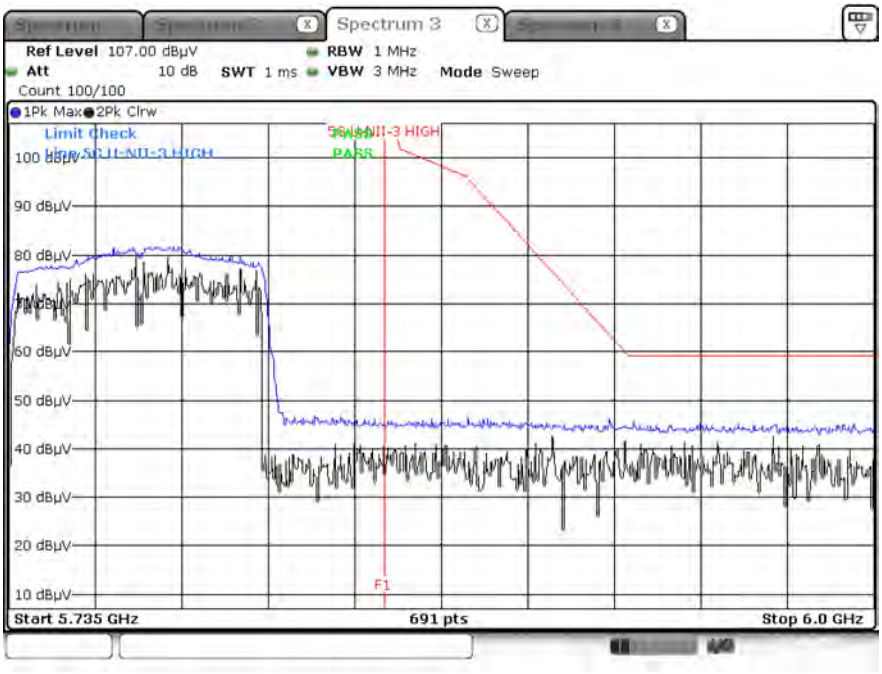
Peak Reading (802.11n_HT40, Ch.159, X-V)



Peak Reading (802.11ac_VHT40, Ch.159, X-V)



Peak Reading (802.11ac_VHT80, Ch.155, X-V)



Note :

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

10.10 RECEIVER SPURIOUS EMISSIONS

Frequency Range : Below 1 GHz

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

Note:

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

Frequency Range : Above 1 GHz

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

11. LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/04/2020	Annual	102245
Rohde & Schwarz	ESR / EMI Test Receiver	09/16/2020	Annual	101910
ESPEC	SU-642 /Temperature Chamber	07/30/2020	Annual	0093000718
Agilent	N9020A / Signal Analyzer	05/11/2020	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	03/23/2020	Annual	MY49432108
Agilent	N1911A / Power Meter	04/07/2020	Annual	MY45100523
Agilent	N1921A / Power Sensor	06/08/2020	Annual	MY57820067
Agilent	87300B / Directional Coupler	11/10/2020	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	04/27/2020	Annual	11275
HP	E3632A / DC Power Supply	09/16/2020	Annual	MY40004427
HP	8493C / Attenuator(10 dB)(DC-26.5 GHz)	06/26/2020	Annual	07560
HP	8493C / Attenuator(10 dB)(DC-26.5 GHz)	07/03/2020	Annual	08285
Rohde & Schwarz	18N-20dB / Attenuator(20 dB)	03/23/2020	Annual	8
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A

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

Radiated Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
TNM system	FBSM-01B / Amp & Filter Bank Switch Controller	N/A	N/A	N/A
Schwarzbeck	Loop Antenna	05/18/2020	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	08/02/2019	Biennial	01039
Schwarzbeck	BBHA 9120D / Horn Antenna	08/01/2019	Biennial	912D-1151
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	04/29/2019	Biennial	BBHA9170342
Rohde & Schwarz	FSP(10 Hz ~ 40 GHz) / Spectrum Analyzer	05/13/2020	Annual	101055
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	01/06/2021	Annual	2
Wainwright Instruments	WRCJV12-4900-5100-5900-6100-50SS	06/24/2020	Annual	5
Wainwright Instruments	WRCJV12-4900-5100-5900-6100-50SS	06/24/2020	Annual	6
CERNEX	CBL18265035 / Power Amplifier	12/04/2020	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	03/23/2020	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/18/2020	Annual	3000C000276
TNM system	FBSM-05B / HPF(3~18GHz) + LNA1(1~18GHz)	01/20/2021	Annual	F6
TNM system	FBSM-05B / ATT(10dB) + LNA1(1~18GHz)	01/20/2021	Annual	None
TNM system	FBSM-05B / ATT(3dB) + LNA1(1~18GHz)	01/20/2021	Annual	None
TNM system	FBSM-05B / LNA1(1~18GHz)	01/20/2021	Annual	25540
TNM system	FBSM-05B / HPF(7~18GHz) + LNA2(6~18GHz)	01/20/2021	Annual	28550
TNM system	FBSM-05B / Thru(30MHz ~ 18GHz)	01/20/2021	Annual	None
Weinschel	2-3 / Attenuator (3 dB)	10/07/2020	Annual	BR0617
H+S	5910-N-50-010 / Attenuator(10 dB)	10/28/2020	Annual	None

Note:

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

12. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2103-FC005-P