

FCC UNII REPORT

Certification

Applicant Name: SAMSUNG Electronics Co., Ltd.	Date of Issue: October 20, 2021
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	Report No.: HCT-RF-2110-FC012

FCC ID:	A3LSMA136U
APPLICANT:	SAMSUNG Electronics Co., Ltd.

Model:	SM-A136U
Additional Model:	SM-A136U1, SM-S136DL
EUT Type:	Mobile Phone
Modulation type	OFDM
FCC Classification:	Unlicensed National Information Infrastructure(NII)
FCC Rule Part(s):	Part 15.407

Engineering Statement:

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

Report No.: HCT-RF-2110-FC012

REVIEWED BY



Report prepared by : Woong Jin Kim
Engineer of Telecommunication Testing Center

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

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

This laboratory is not accredited for the test results marked *.

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2110-FC012	October 20, 2021	- First Approval Report

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1. GENERAL INFORMATION

EUT DESCRIPTION

Model	SM-A136U	
Additional Model	SM-A136U1, SM-S136DL	
EUT Type	Mobile Phone	
Power Supply	DC 3.85 V	
Modulation Type	OFDM : 802.11a, 802.11n, 802.11ac	
Frequency Range (MHz)	U-NII-1	20 MHz BW : 5180 - 5240 40 MHz BW : 5190 - 5230 80 MHz BW : 5210
	U-NII-2A	20 MHz BW : 5260 - 5320 40 MHz BW : 5270 - 5310 80 MHz BW : 5290
	U-NII-2C	20 MHz BW : 5500 - 5720 40 MHz BW : 5510 - 5710 80 MHz BW : 5530 - 5690
	U-NII-3	20 MHz BW : 5745 - 5825 40 MHz BW : 5755 - 5795 80 MHz BW : 5775
Straddle channel	Supported	
TDWR Band	Supported	
Dynamic Frequency Selection	Slave without radar detection	
Date(s) of Tests	September 15, 2021~ October 18, 2021	
Serial number	Radiated: 4200750ff2b4885f Conducted: 4200750ff2b3883d	

2. MAXIMUM OUTPUT POWER

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

Band	Mode	Output Power	
		(dBm)	(W)
UNII1	802.11a	16.57	0.045
	802.11n (HT20)	17.18	0.052
	802.11n (HT40)	16.75	0.047
	802.11ac (VHT20)	16.54	0.045
	802.11ac (VHT40)	15.74	0.037
	802.11ac (VHT80)	14.61	0.029
UNII2A	802.11a	15.98	0.040
	802.11n (HT20)	16.60	0.046
	802.11n (HT40)	16.14	0.041
	802.11ac (VHT20)	15.98	0.040
	802.11ac (VHT40)	15.17	0.033
	802.11ac (VHT80)	13.78	0.024
UNII2C	802.11a	15.62	0.036
	802.11n (HT20)	16.48	0.044
	802.11n (HT40)	15.88	0.039
	802.11ac (VHT20)	16.39	0.044
	802.11ac (VHT40)	15.64	0.037
	802.11ac (VHT80)	14.75	0.030
UNII3	802.11a	16.82	0.048
	802.11n (HT20)	16.45	0.044
	802.11n (HT40)	15.98	0.040
	802.11ac (VHT20)	15.79	0.038
	802.11ac (VHT40)	15.02	0.032
	802.11ac (VHT80)	13.65	0.023

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.

GENERAL TEST PROCEDURES

Conducted Emissions

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

Radiated Emissions

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

DESCRIPTION OF TEST MODES

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

4. INSTRUMENT CALIBRATION

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

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

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

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

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

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

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203, §15.407:

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

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

7. MEASUREMENT UNCERTAINTY

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

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

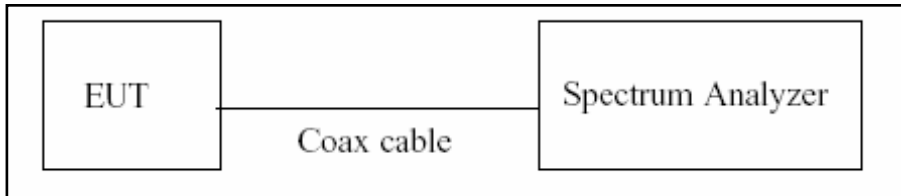
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (Confidence level about 95 %, $k=2$)

8. DESCRIPTION OF TESTS

8.1. Duty Cycle

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

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

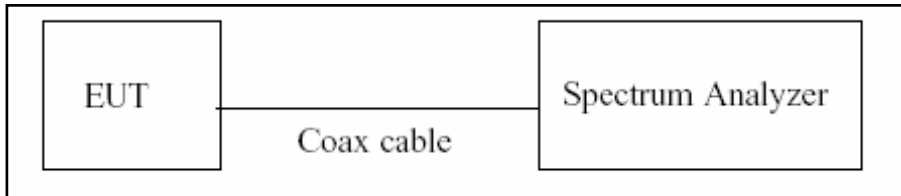
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (\geq RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = $10\log(1/\text{Duty Cycle})$

8.2. 6 dB Bandwidth & 26 dB Bandwidth

Limit

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

Test Configuration



Test Procedure(26 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

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

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

Test Procedure (6 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

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

1. RBW = 100 kHz
2. VBW $\geq 3 \times$ RBW
3. Detector = Peak
4. Trace mode = max hold
5. Allow the trace to stabilize
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points(upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note:

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

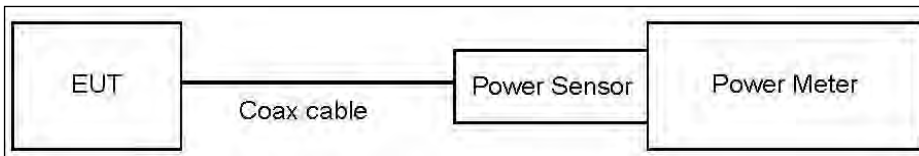
8.3. Output Power Measurement

Limit

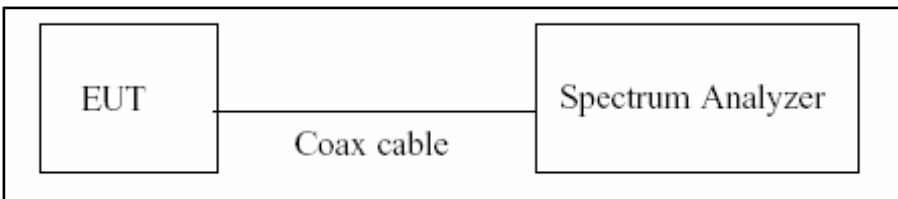
Band	Limit
UNII 1	- Master : Not exceed 1 W(=30 dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 2A, 2C	Not exceed the lesser of 250 mW or 11 dBm + 10 log B, (where B is the 26 dB emission bandwidth in megahertz.)
UNII 3	Not exceed 1 W(=30 dBm)

Test Configuration

Power Meter



Spectrum Analyzer(Only Straddle Channel)



Test Procedure(Power Meter)

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

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

Test Procedure(Spectrum Analyzer)

The transmitter output is connected to the Spectrum Analyzer.

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

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

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

Sample Calculation

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

Note

1. Spectrum Measured Value 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

Loss = Attenuator loss(10 dB) + Cable loss

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

Band	Loss(dB)
UNII 1	10.73
UNII 2A	10.73
UNII 2C	10.73
UNII 3	10.73

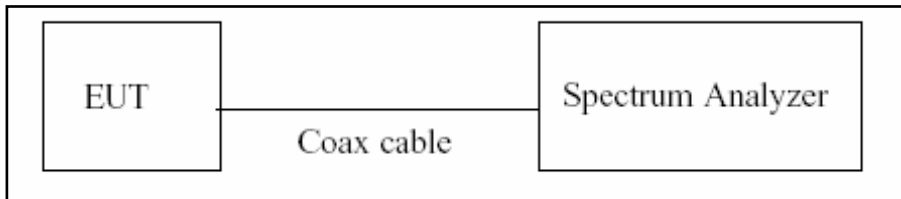
(Actual value of loss for the attenuator and cable combination)

8.4. Power Spectral Density

Limit

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

Test Configuration



Test Procedure

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

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

Sample Calculation

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

Note

1. Spectrum Measured Value 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

Loss = Attenuator loss(10 dB) + Cable loss

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

Band	Loss(dB)
UNII 1	10.73
UNII 2A	10.73
UNII 2C	10.73
UNII 3	10.73

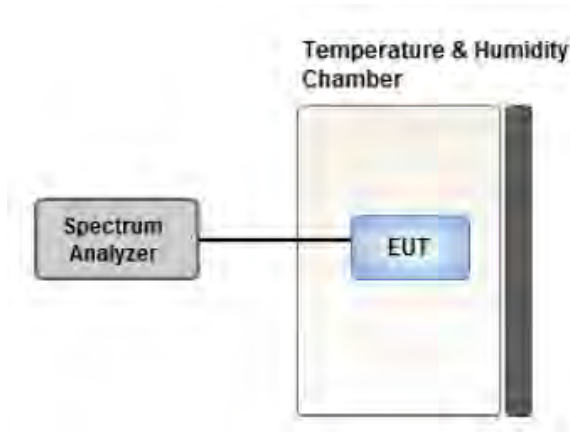
(Actual value of loss for the attenuator and cable combination)

8.5. Frequency Stability

Limit

Maintained within the band

Test Configuration



Test Procedure

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

8.6. AC Power line Conducted Emissions

Limit

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

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)Decreases with the logarithm of the frequency.

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

Test Configuration

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

Test Procedure

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

Sample Calculation

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

8.7. Radiated Test

Limit

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

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

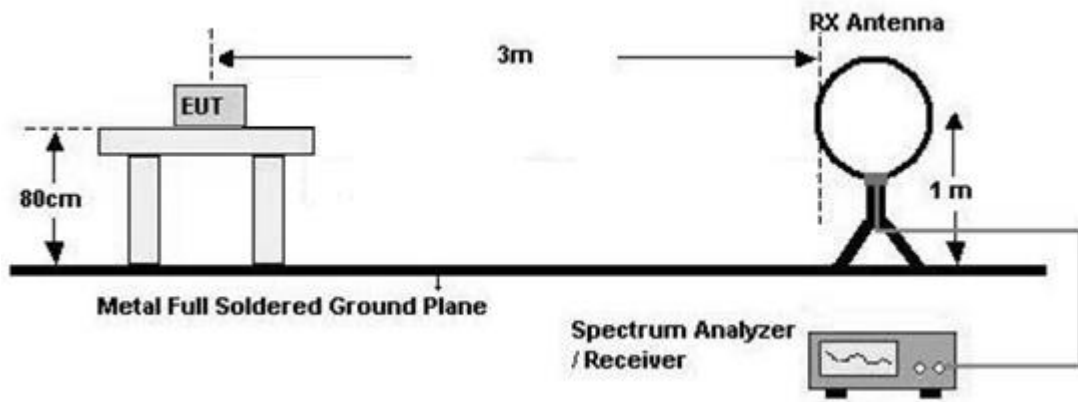
3. UNII 3: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below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

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

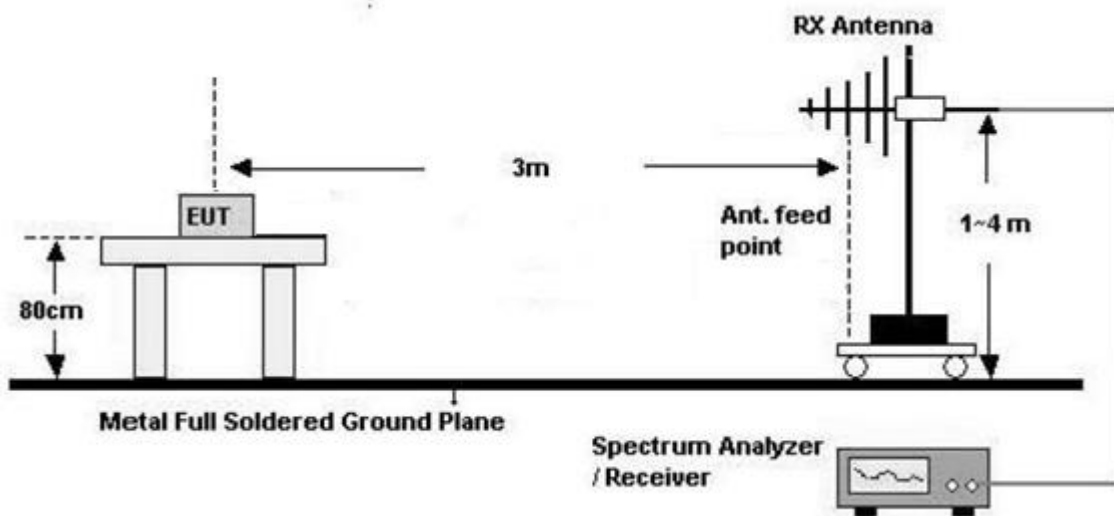
Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

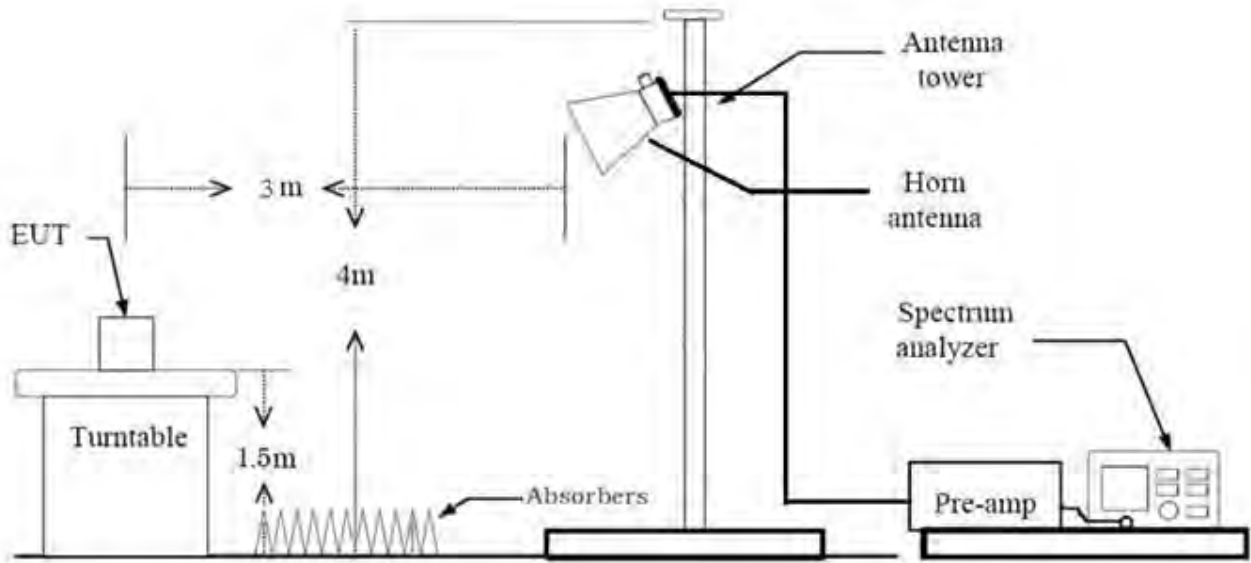
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz

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

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

KDB 414788 OFS and Chamber Correlation Justification

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

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

Test Procedure of Radiated spurious emissions(Below 1 GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8 m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1 m to 4 m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Measured Frequency Range : 30 MHz – 1 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 100 kHz
 - VBW \geq 3 x RBW
 - (2) Measurement Type(Quasi-peak):
 - Measured Frequency Range : 30 MHz – 1 GHz
 - Detector = Quasi-Peak
 - RBW = 120 kHz
- ※ In general, (1) is used mainly
7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

Test Procedure of Radiated spurious emissions (Above 1 GHz)

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

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

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

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

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

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

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

Test Procedure of Radiated Restricted Band Edge

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
 - (1) Measurement Type(Peak, G.5 in KDB 789033 v02r01):
 - RBW = 1 MHz
 - VBW \geq 3 MHz
 - Detector = Peak
 - Sweep Time = auto
 - Trace mode = max hold
 - Allow sweeps to continue until the trace stabilizes.Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately $1/x$, where x is the duty cycle.
 - (2) Measurement Type(Average, G.6.d in KDB 789033 v02r01):
 - RBW = 1 MHz
 - VBW(Duty cycle \geq 98 %) = $\text{VBW} \leq \text{RBW}/100$ (i.e., 10 kHz) but not less than 10 Hz.
 - VBW(Duty cycle is < 98 %) = $\text{VBW} \geq 1/T$, where T is the minimum transmission duration.
 - The analyzer is set to linear detector mode.
 - Detector = Peak.
 - Sweep time = auto.
 - Trace mode = max hold.
 - Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 % duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of $1/x$, where x is the duty cycle.

9. Measured Frequency Range :

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

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

11. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Attenuator(ATT)
+ 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	0.969	0.138	1000
802.11n(HT20)	MCS0	0.970	0.132	1000
802.11n(HT40)	MCS0	0.938	0.279	3000
802.11ac(VHT20)	MCS0	0.963	0.163	1000
802.11ac(VHT40)	MCS0	0.939	0.276	3000
802.11ac(VHT80)	MCS0	0.880	0.553	5000

8.8. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone, Stand alone + External accessories(Earphone, etc)
 - Worstcase : Stand alone
2. EUT Axis
 - Radiated Spurious Emissions : X, Y
 - Radiated Restricted Band Edge : X, Y
3. All datarate of operation were investigated and the worst case datarate results are reported.
 - 802.11a : 6 Mbps
 - 802.11n_HT20 : MCS0
 - 802.11n_HT40 : MCS0
 - 802.11ac_VHT20 : MCS0
 - 802.11ac_VHT40 : MCS0
 - 802.11ac_VHT80 : MCS0
4. Radiated Spurious Emission
 - All modulation of operation were investigated and the worst case modulation results are reported.
(Worstcase : 802.11n_MCS 0)
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. We were performed the RSE test in condition of co-location. There has no significant emission raised.
 - WWAN+WLAN 5 GHz+BT
7. SM-A136U, SM-A136U1, SM-S136DL were tested and the worst case results are reported.
(Worst case : SM-A136U)

Radiated test(DBS)

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone, Stand alone + External accessories(Earphone, etc)
 - Worstcase : Stand alone
2. EUT Axis
 - Radiated Spurious Emissions : X
3. The following tables show the worst case configurations determined during testing.

Description	Bluetooth Emission	5 GHz Emission
Antenna	WIFI/BT	WIFI/BT
Channel	78	60
Data Rate	1 Mbps	MCS 0
Mode	GFSK : DH5	802.11n(20)

4. SM-A136U, SM-A136U1, SM-S136DL were tested and the worst case results are reported.
(Worst case : SM-A136U)

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone + External accessories(Earphone, etc) + Travel Adapter, Stand alone + Travel Adapter
 - Worstcase : Stand alone + Travel Adapter
2. SM-A136U, SM-A136U1, SM-S136DL were tested and the worst case results are reported.
(Worst case : SM-A136U)

Conducted test

1. All datarate of operation were investigated and the worst case datarate results are reported.
2. SM-A136U, SM-A136U1, SM-S136DL were tested and the worst case results are reported.
(Worst case : SM-A136U)

9. SUMMARY OF TEST RESULTS

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

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	1.392	1.437	0.969	0.138
	9	0.936	0.981	0.954	0.204
	12	0.708	0.753	0.940	0.268
	18	0.477	0.522	0.914	0.392
	24	0.363	0.408	0.890	0.508
	36	0.252	0.297	0.848	0.714
	48	0.192	0.237	0.810	0.914
	54	0.174	0.219	0.795	0.999

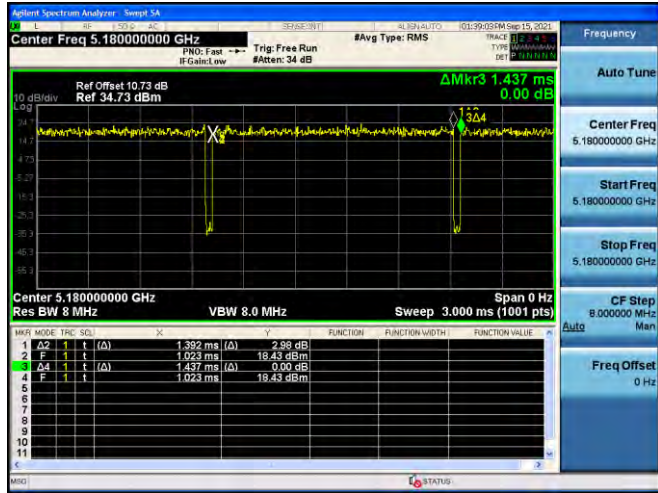
Mode	MCS Index	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11n (HT20)	0	1.300	1.340	0.970	0.132
	1	0.665	0.710	0.937	0.284
	2	0.460	0.505	0.911	0.405
	3	0.350	0.395	0.886	0.525
	4	0.250	0.295	0.847	0.719
	5	0.195	0.240	0.813	0.902
	6	0.180	0.225	0.800	0.969
	7	0.165	0.210	0.786	1.047
802.11n (HT40)	0	0.649	0.692	0.938	0.279
	1	0.344	0.388	0.886	0.528
	2	0.239	0.284	0.843	0.741
	3	0.192	0.236	0.812	0.905
	4	0.141	0.184	0.766	1.156
	5	0.117	0.160	0.730	1.364
	6	0.104	0.149	0.699	1.553
	7	0.100	0.144	0.692	1.598

Mode	MCS Index	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11ac (VHT20)	0	1.310	1.360	0.963	0.163
	1	0.675	0.720	0.938	0.280
	2	0.465	0.510	0.912	0.401
	3	0.360	0.405	0.889	0.512
	4	0.250	0.295	0.847	0.719
	5	0.195	0.240	0.813	0.902
	6	0.180	0.225	0.800	0.969
	7	0.170	0.215	0.791	1.020
	8	0.145	0.190	0.763	1.174
802.11ac (VHT40)	0	0.653	0.696	0.939	0.276
	1	0.347	0.391	0.886	0.525
	2	0.244	0.288	0.846	0.728
	3	0.196	0.241	0.813	0.898
	4	0.144	0.189	0.764	1.172
	5	0.120	0.164	0.729	1.371
	6	0.107	0.152	0.707	1.507
	7	0.104	0.147	0.707	1.509
	8	0.092	0.137	0.674	1.713
	9	0.087	0.150	0.583	2.346
802.11ac (VHT80)	0	0.324	0.368	0.880	0.553
	1	0.184	0.228	0.807	0.931
	2	0.135	0.179	0.755	1.219
	3	0.110	0.156	0.705	1.517
	4	0.088	0.150	0.588	2.304
	5	0.075	0.146	0.514	2.893
	6	0.071	0.133	0.534	2.726
	7	0.072	0.134	0.539	2.685
	8	0.064	0.143	0.448	3.492
	9	0.063	0.143	0.441	3.560

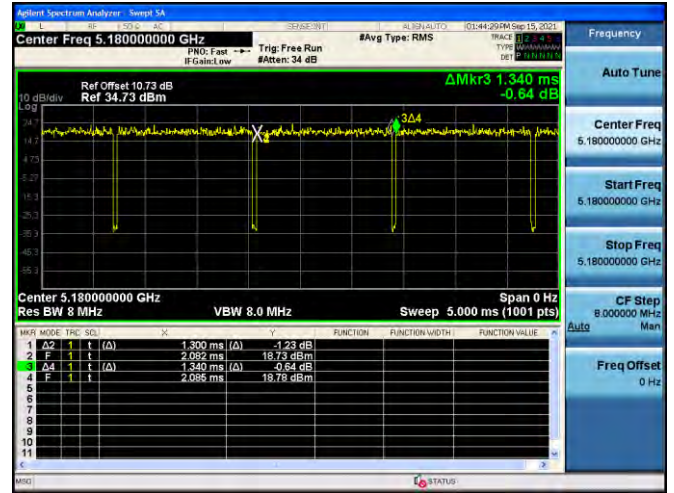
Note:

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

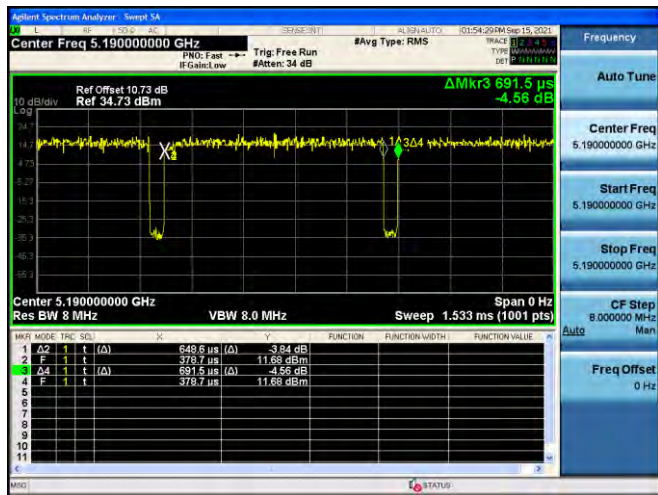
802.11a



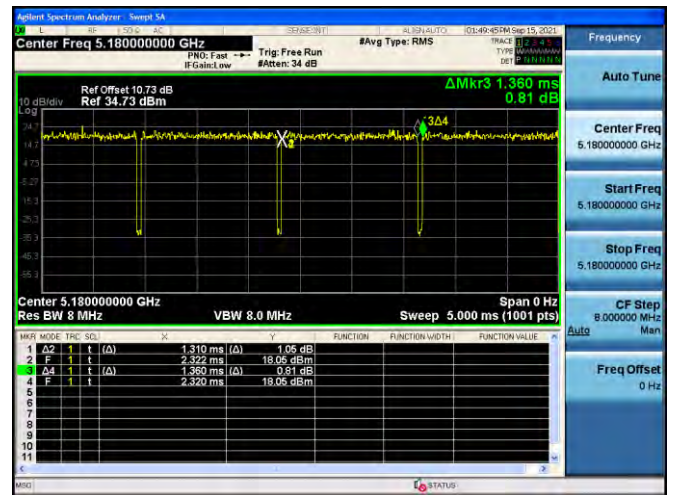
802.11n(HT20)



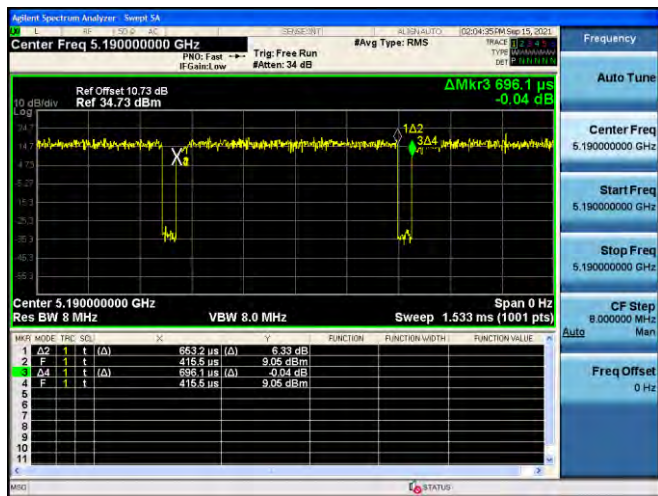
802.11n(HT40)



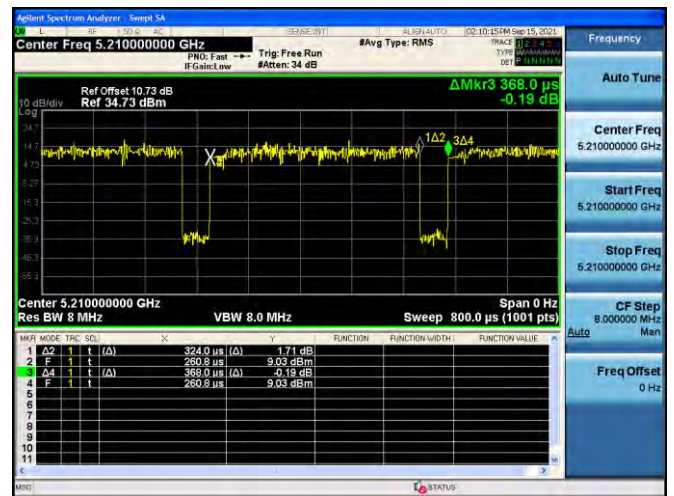
802.11ac(VHT20)



802.11ac(VHT40)



802.11ac(VHT80)



10.2 26 dB Bandwidth

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

Straddle channel data were added in section 10.7.1.

802.11a Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.69	16.484
5200	40	20.32	16.502
5240	48	21.04	16.464
5260	52	19.63	16.456
5300	60	19.86	16.453
5320	64	19.78	16.494
5500	100	19.46	16.418
5600	120	19.66	16.407
5720	144	19.70	16.443
5745	149	19.56	16.446
5785	157	19.55	16.425
5825	165	19.99	16.390

802.11n(HT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.16	17.585
5200	40	20.09	17.578
5240	48	20.41	17.597
5260	52	20.15	17.587
5300	60	20.01	17.559
5320	64	20.04	17.571
5500	100	20.04	17.526
5600	120	20.13	17.589
5720	144	20.03	17.604
5745	149	19.87	17.541
5785	157	20.05	17.578
5825	165	20.16	17.578

802.11n(HT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.53	36.042
5230	46	40.84	36.038
5270	54	40.21	35.988
5310	62	40.30	35.998
5510	102	40.34	36.014
5590	118	40.05	35.960
5710	142	40.24	36.020
5755	151	40.54	36.015
5795	159	40.03	35.956

802.11ac(VHT20) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.08	17.534
5200	40	20.01	17.585
5240	48	20.00	17.577
5260	52	20.12	17.552
5300	60	20.08	17.557
5320	64	20.11	17.544
5500	100	20.24	17.557
5600	120	19.96	17.569
5720	144	20.07	17.535
5745	149	20.01	17.539
5785	157	20.19	17.587
5825	165	20.03	17.551

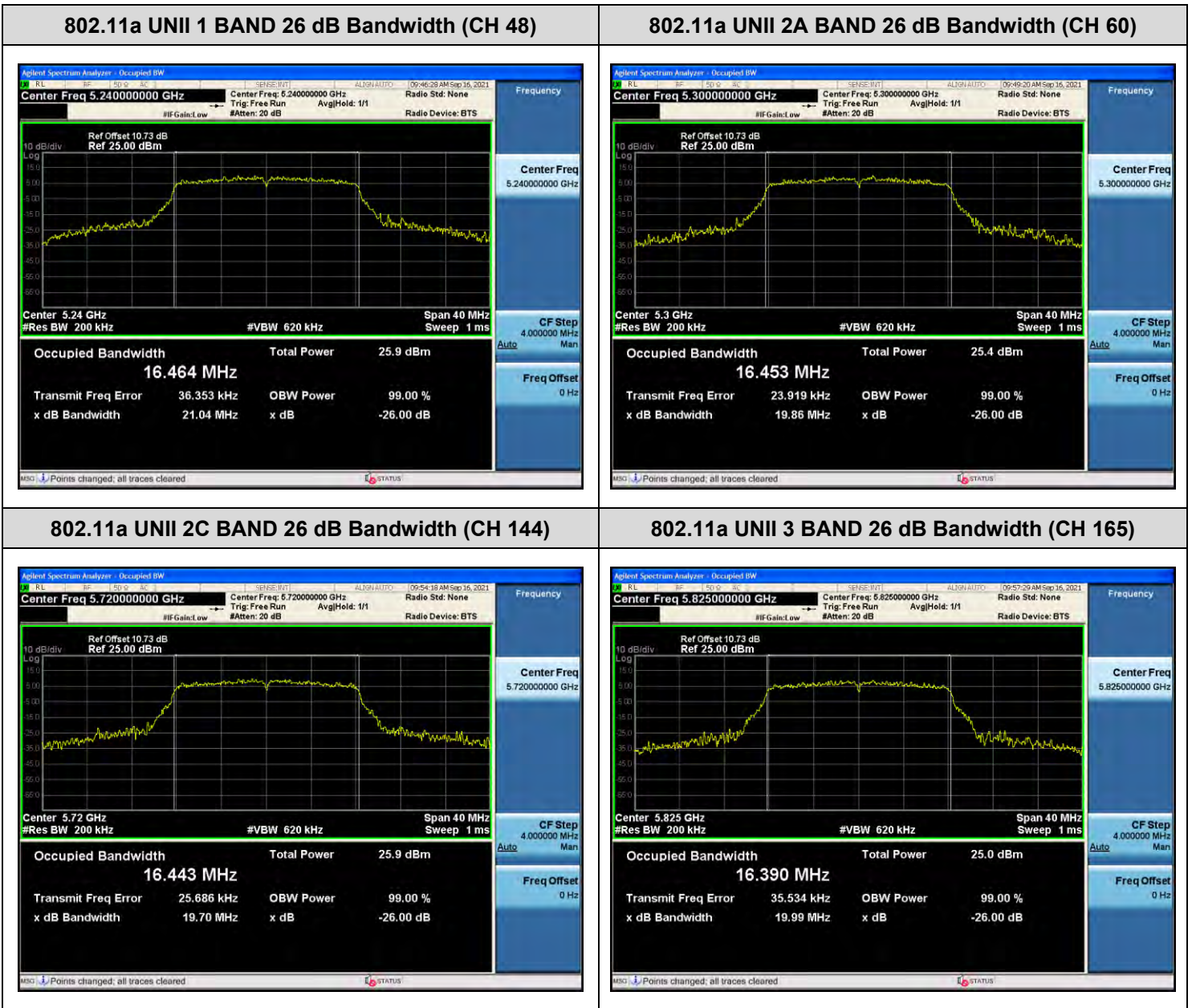
802.11ac(VHT40) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	39.88	35.900
5230	46	40.18	35.879
5270	54	40.07	35.979
5310	62	39.93	35.960
5510	102	40.08	35.945
5590	118	39.90	35.905
5710	142	40.33	35.876
5755	151	40.18	35.955
5795	159	40.12	35.936

802.11ac(VHT80) Mode		26 dB Bandwidth [MHz]	99 % bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	80.66	75.085
5290	58	80.69	75.128
5530	106	80.57	75.103
5610	122	80.68	75.167
5690	138	80.28	75.185
5775	155	80.35	75.112

☐ Test Plots(802.11a)

Note:

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



☐ Test Plots(802.11n(HT20))

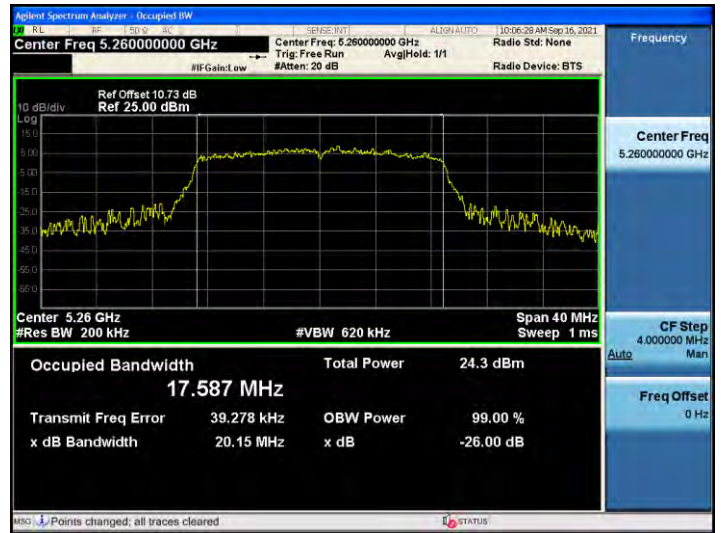
Note:

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

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



802.11n_HT20 UNII 2A BAND 26 dB Bandwidth(CH 52)



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



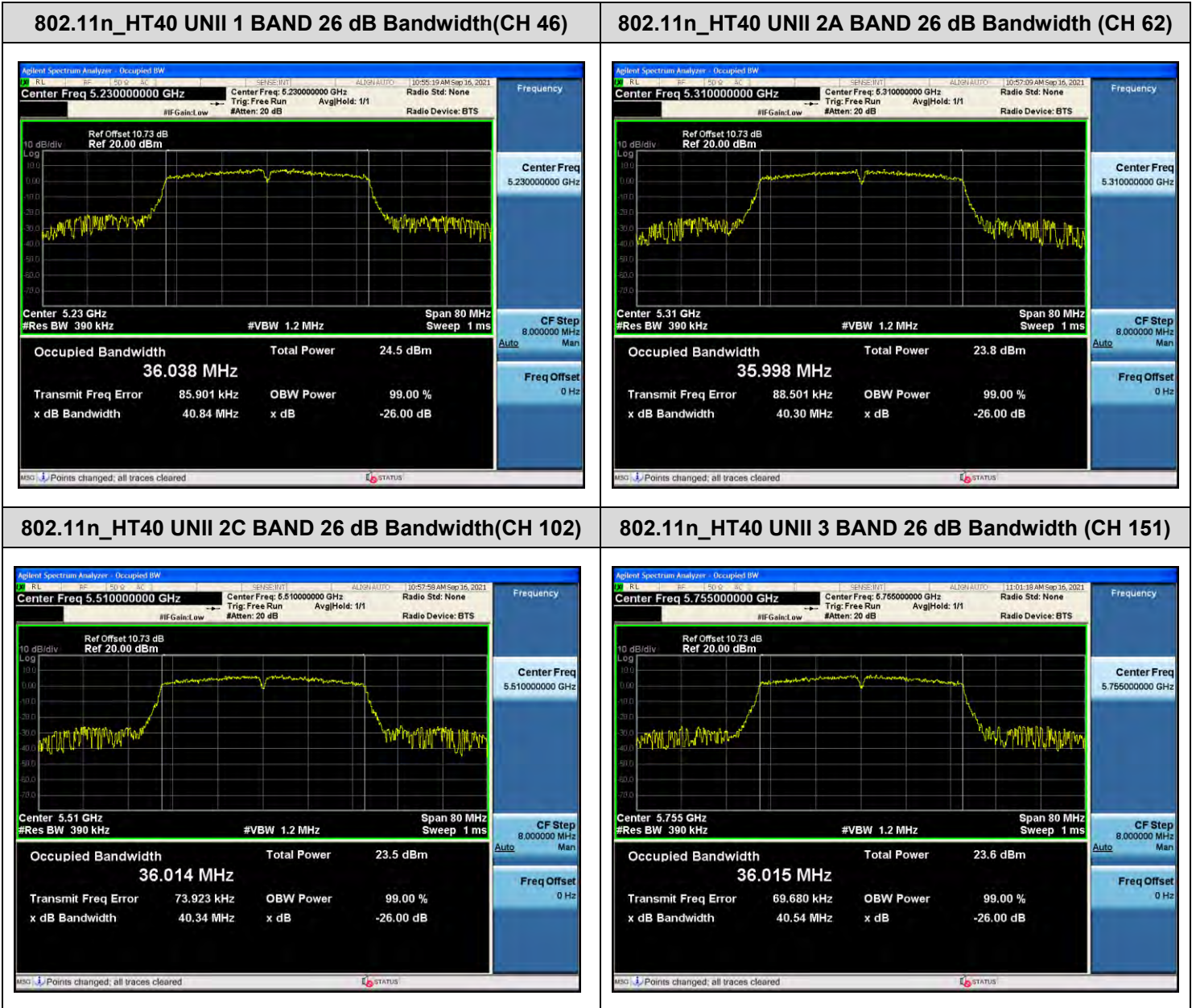
802.11n_HT20 UNII 3 BAND 26 dB Bandwidth(CH 165)



☐ Test Plots(802.11n(HT40))

Note:

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



☐ Test Plots(802.11ac(VHT20))

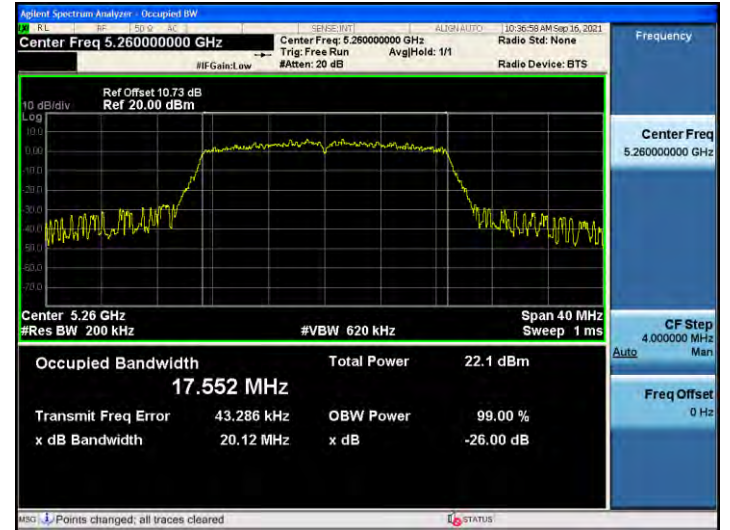
Note:

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

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



802.11ac_VHT20 UNII 2A BAND 26 dB Bandwidth(CH 52)



802.11ac_VHT20 UNII 2C BAND 26 dB Bandwidth(CH 100)



802.11ac_VHT20 UNII 3 BAND 26 dB Bandwidth(CH 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 26 dB Bandwidth(CH 46)



802.11ac_VHT40 UNII 2A BAND 26 dB Bandwidth (CH 54)



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



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



☐ Test Plots(802.11ac(VHT80))

Note:

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

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



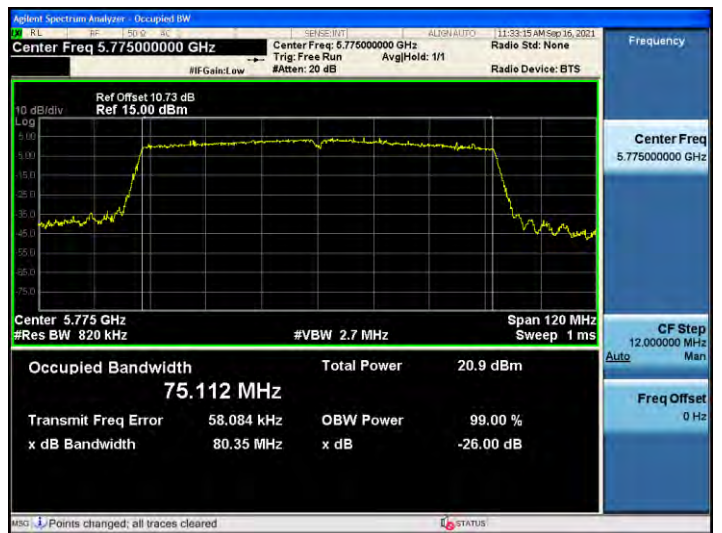
802.11ac_VHT80 UNII 2A BAND 26 dB Bandwidth (CH 58)



802.11ac_VHT80 UNII 2C BAND 26 dB Bandwidth(CH 122)



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



10.3 6 dB BANDWIDTH

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	13.62	> 0.5	Pass
5785	157	15.13	> 0.5	Pass
5825	165	15.65	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.17	> 0.5	Pass
5785	157	15.13	> 0.5	Pass
5825	165	15.06	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.16	> 0.5	Pass
5795	159	35.16	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.14	> 0.5	Pass
5785	157	15.14	> 0.5	Pass
5825	165	15.08	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	33.86	> 0.5	Pass
5795	159	35.17	> 0.5	Pass

802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.19	> 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.165)



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		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase Datarate [Mbps]
Frequency [MHz]	Channel No.						
5180	36	15	15.90	0.138	16.04	23.98	6 M
5200	40	15	16.09	0.138	16.23	23.98	6 M
5240	48	15	16.43	0.138	16.57	23.98	6 M
5260	52	15	15.47	0.138	15.61	23.93	6 M
5300	60	15	15.78	0.138	15.91	23.98	6 M
5320	64	15	15.85	0.138	15.98	23.96	6 M
5500	100	15	15.48	0.138	15.62	23.89	6 M
5600	120	15	15.24	0.138	15.38	23.94	6 M
5720	144	15	15.40	0.138	15.54	23.94	6 M
5745	149	16	16.69	0.138	16.82	30.00	6 M
5785	157	16	16.57	0.138	16.71	30.00	6 M
5825	165	16	16.30	0.138	16.44	30.00	6 M

802.11n(20 MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5180	36	16.5	16.57	0.132	16.70	23.98	MCS0
5200	40	16.5	16.63	0.132	16.76	23.98	MCS0
5240	48	16.5	17.05	0.132	17.18	23.98	MCS0
5260	52	16.5	16.07	0.132	16.20	23.98	MCS0
5300	60	16.5	16.41	0.132	16.54	23.98	MCS0
5320	64	16.5	16.47	0.132	16.60	23.98	MCS0
5500	100	16.5	16.35	0.132	16.48	23.98	MCS0
5600	120	16.5	16.06	0.132	16.19	23.98	MCS0
5720	144	16.5	16.33	0.132	16.46	23.98	MCS0
5745	149	16.5	16.32	0.132	16.45	30.00	MCS0
5785	157	16.5	16.18	0.132	16.31	30.00	MCS0
5825	165	16.5	16.19	0.132	16.33	30.00	MCS0

802.11n(40 MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5190	38	15	16.16	0.279	16.44	23.98	MCS0
5230	46	15	16.48	0.279	16.75	23.98	MCS0
5270	54	15	15.50	0.279	15.78	23.98	MCS0
5310	62	15	15.86	0.279	16.14	23.98	MCS0
5510	102	15	15.60	0.279	15.88	23.98	MCS0
5590	118	15	15.18	0.279	15.46	23.98	MCS0
5710	142	15	15.53	0.279	15.81	23.98	MCS0
5755	151	15	15.70	0.279	15.98	30.00	MCS0
5795	159	15	15.56	0.279	15.84	30.00	MCS0

802.11ac(20 MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5180	36	15	15.84	0.163	16.00	23.98	MCS0
5200	40	15	15.91	0.163	16.07	23.98	MCS0
5240	48	15	16.38	0.163	16.54	23.98	MCS0
5260	52	15	15.32	0.163	15.49	23.98	MCS0
5300	60	15	15.76	0.163	15.92	23.98	MCS0
5320	64	15	15.82	0.163	15.98	23.98	MCS0
5500	100	15	15.34	0.163	15.50	23.98	MCS0
5600	120	16	16.00	0.163	16.17	23.98	MCS0
5720	144	16	16.23	0.163	16.39	23.98	MCS0
5745	149	15	15.63	0.163	15.79	30.00	MCS0
5785	157	15	15.57	0.163	15.74	30.00	MCS0
5825	165	15	15.10	0.163	15.26	30.00	MCS0

802.11ac(40 MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5190	38	14	15.22	0.276	15.49	23.98	MCS0
5230	46	14	15.46	0.276	15.74	23.98	MCS0
5270	54	14	14.57	0.276	14.84	23.98	MCS0
5310	62	14	14.90	0.276	15.17	23.98	MCS0
5510	102	14	14.50	0.276	14.78	23.98	MCS0
5590	118	15	15.15	0.276	15.43	23.98	MCS0
5710	142	15	15.37	0.276	15.64	23.98	MCS0
5755	151	14	14.75	0.276	15.02	30.00	MCS0
5795	159	14	14.72	0.276	14.99	30.00	MCS0

802.11ac(80 MHz) Mode		Power Level Setting	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase MCS Index
Frequency [MHz]	Channel No.						
5210	42	13	14.06	0.553	14.61	23.98	MCS0
5290	58	13	13.23	0.553	13.78	23.98	MCS0
5530	106	13	13.24	0.553	13.79	23.98	MCS0
5610	122	14	13.81	0.553	14.36	23.98	MCS0
5690	138	14	14.20	0.553	14.75	23.98	MCS0
5775	155	13	13.10	0.553	13.65	30.00	MCS0

10.5 POWER SPECTRAL DENSITY

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase Datarate [Mbps]	Limit
Frequency [MHz]	Channel No.					
5180	36	5.723	0.138	5.861	6 M	11 dBm/MHz
5200	40	5.885	0.138	6.023	6 M	
5240	48	6.360	0.138	6.498	6 M	
5260	52	5.286	0.138	5.424	6 M	
5300	60	5.737	0.138	5.875	6 M	
5320	64	5.813	0.138	5.951	6 M	
5500	100	5.326	0.138	5.464	6 M	
5600	120	5.002	0.138	5.140	6 M	
5720	144	5.363	0.138	5.501	6 M	
5745	149	4.134	0.138	4.272	6 M	30 dBm/500 kHz
5785	157	3.793	0.138	3.931	6 M	
5825	165	3.570	0.138	3.708	6 M	

802.11n(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	6.473	0.132	6.605	MCS0	11 dBm/MHz
5200	40	6.504	0.132	6.636	MCS0	
5240	48	6.947	0.132	7.079	MCS0	
5260	52	6.108	0.132	6.240	MCS0	
5300	60	6.303	0.132	6.435	MCS0	
5320	64	6.462	0.132	6.594	MCS0	
5500	100	5.994	0.132	6.126	MCS0	
5600	120	5.652	0.132	5.784	MCS0	
5720	144	6.098	0.132	6.230	MCS0	
5745	149	3.424	0.132	3.556	MCS0	30 dBm/500 kHz
5785	157	3.459	0.132	3.591	MCS0	
5825	165	3.162	0.132	3.294	MCS0	

802.11n(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	2.898	0.279	3.177	MCS0	11 dBm/MHz
5230	46	3.234	0.279	3.513	MCS0	
5270	54	2.285	0.279	2.564	MCS0	
5310	62	2.834	0.279	3.113	MCS0	
5510	102	2.570	0.279	2.849	MCS0	
5590	118	1.834	0.279	2.113	MCS0	
5710	142	2.411	0.279	2.690	MCS0	
5755	151	-0.326	0.279	-0.047	MCS0	30 dBm /500 kHz
5795	159	-0.536	0.279	-0.257	MCS0	

802.11ac(20 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5180	36	5.554	0.163	5.717	MCS0	11 dBm/MHz
5200	40	5.602	0.163	5.765	MCS0	
5240	48	5.881	0.163	6.044	MCS0	
5260	52	4.987	0.163	5.150	MCS0	
5300	60	5.446	0.163	5.609	MCS0	
5320	64	5.403	0.163	5.566	MCS0	
5500	100	5.045	0.163	5.208	MCS0	
5600	120	5.820	0.163	5.983	MCS0	
5720	144	6.061	0.163	6.224	MCS0	
5745	149	2.476	0.163	2.639	MCS0	30 dBm/500 kHz
5785	157	2.270	0.163	2.433	MCS0	
5825	165	1.915	0.163	2.078	MCS0	

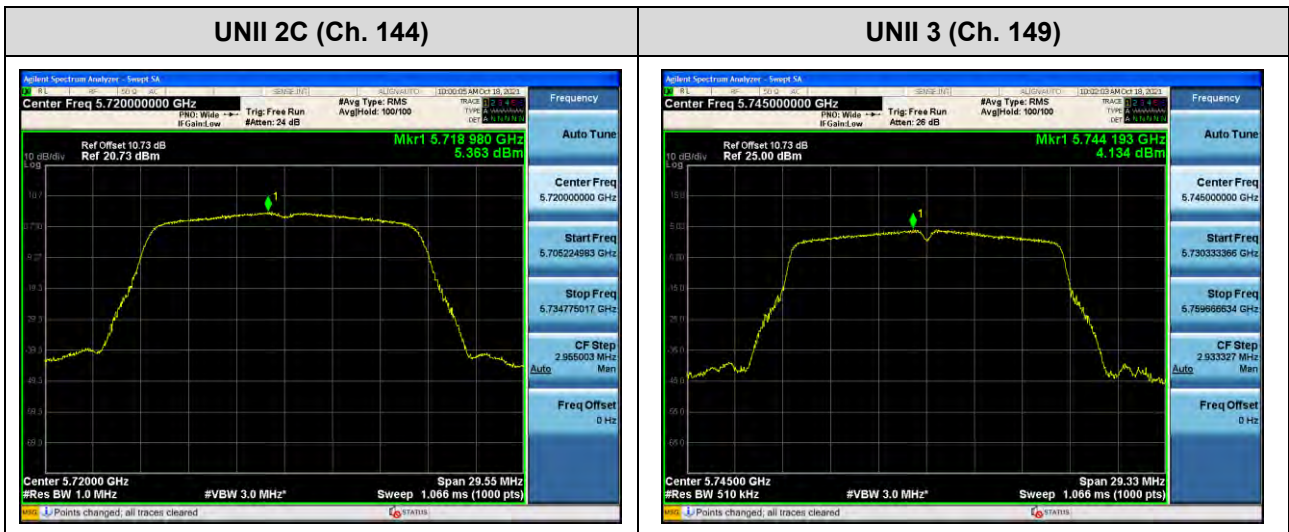
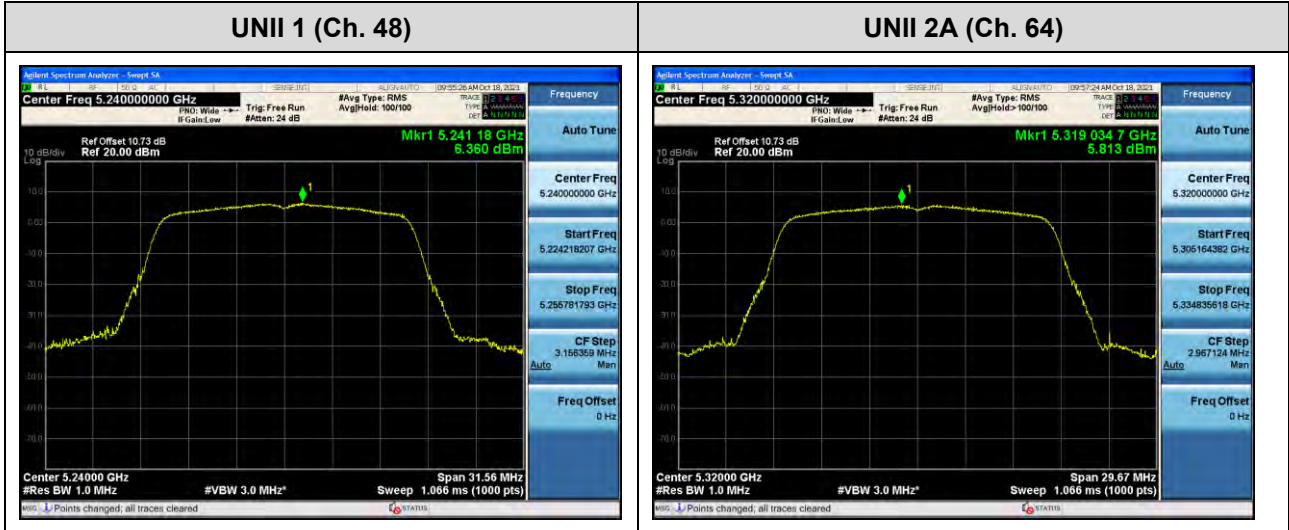
802.11ac(40 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5190	38	2.163	0.276	2.439	MCS0	11 dBm/MHz
5230	46	2.437	0.276	2.713	MCS0	
5270	54	1.277	0.276	1.553	MCS0	
5310	62	1.694	0.276	1.970	MCS0	
5510	102	1.152	0.276	1.428	MCS0	
5590	118	1.993	0.276	2.269	MCS0	
5710	142	2.167	0.276	2.443	MCS0	
5755	151	-1.514	0.276	-1.238	MCS0	30 dBm/500 kHz
5795	159	-1.671	0.276	-1.395	MCS0	

802.11ac(80 MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Worstcase MCS Index	Limit
Frequency [MHz]	Channel No.					
5210	42	-2.306	0.553	-1.753	MCS0	11 dBm/MHz
5290	58	-2.930	0.553	-2.377	MCS0	
5530	106	-3.027	0.553	-2.474	MCS0	
5610	122	-2.311	0.553	-1.758	MCS0	
5690	138	-2.095	0.553	-1.542	MCS0	
5775	155	-5.974	0.553	-5.421	MCS0	30 dBm/500 kHz

☐ Test Plots(802.11a)

Note:

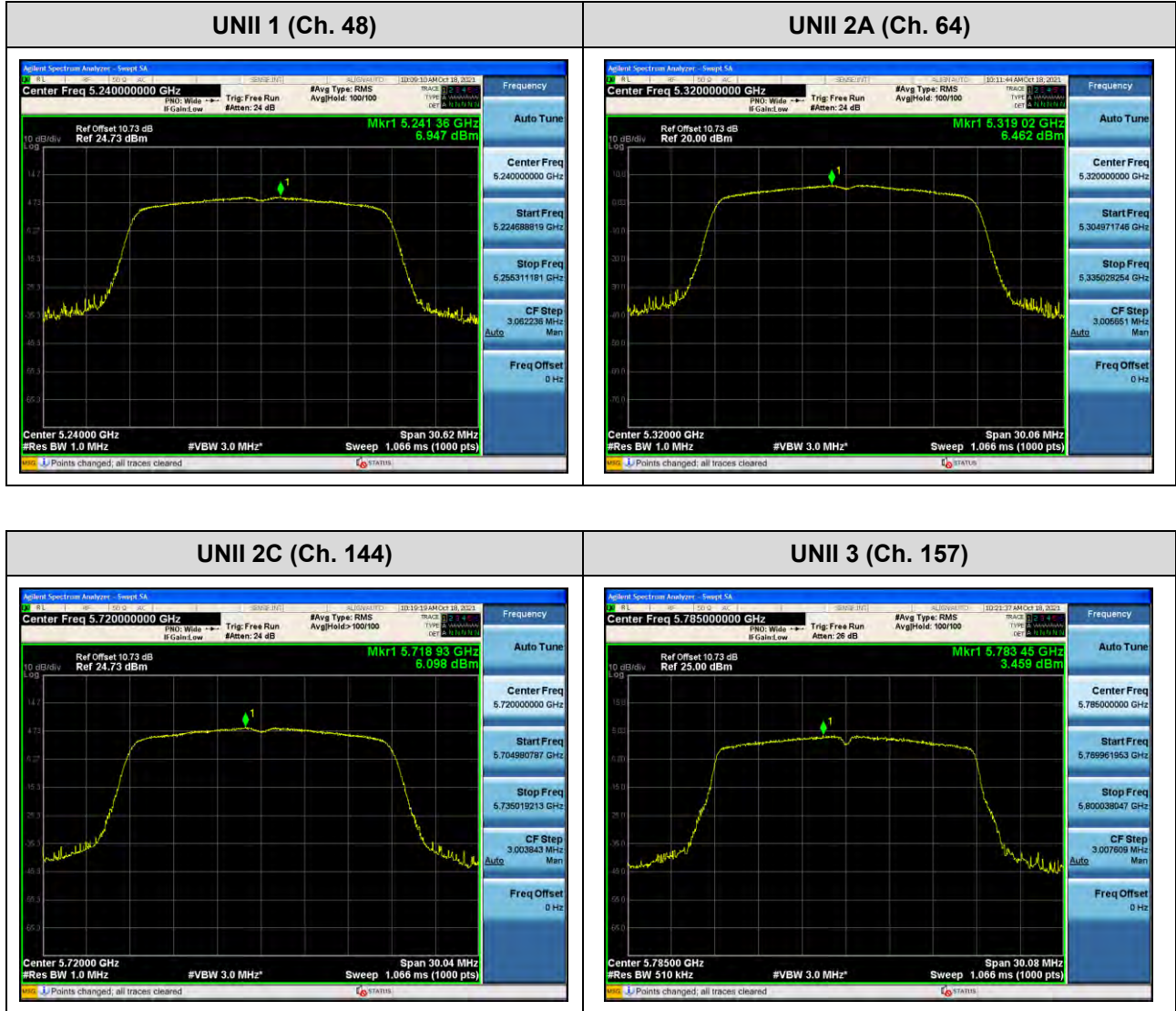
In order to simplify the report, attached plots were only channel of highest power.



☐ Test Plots(802.11n(HT20))

Note:

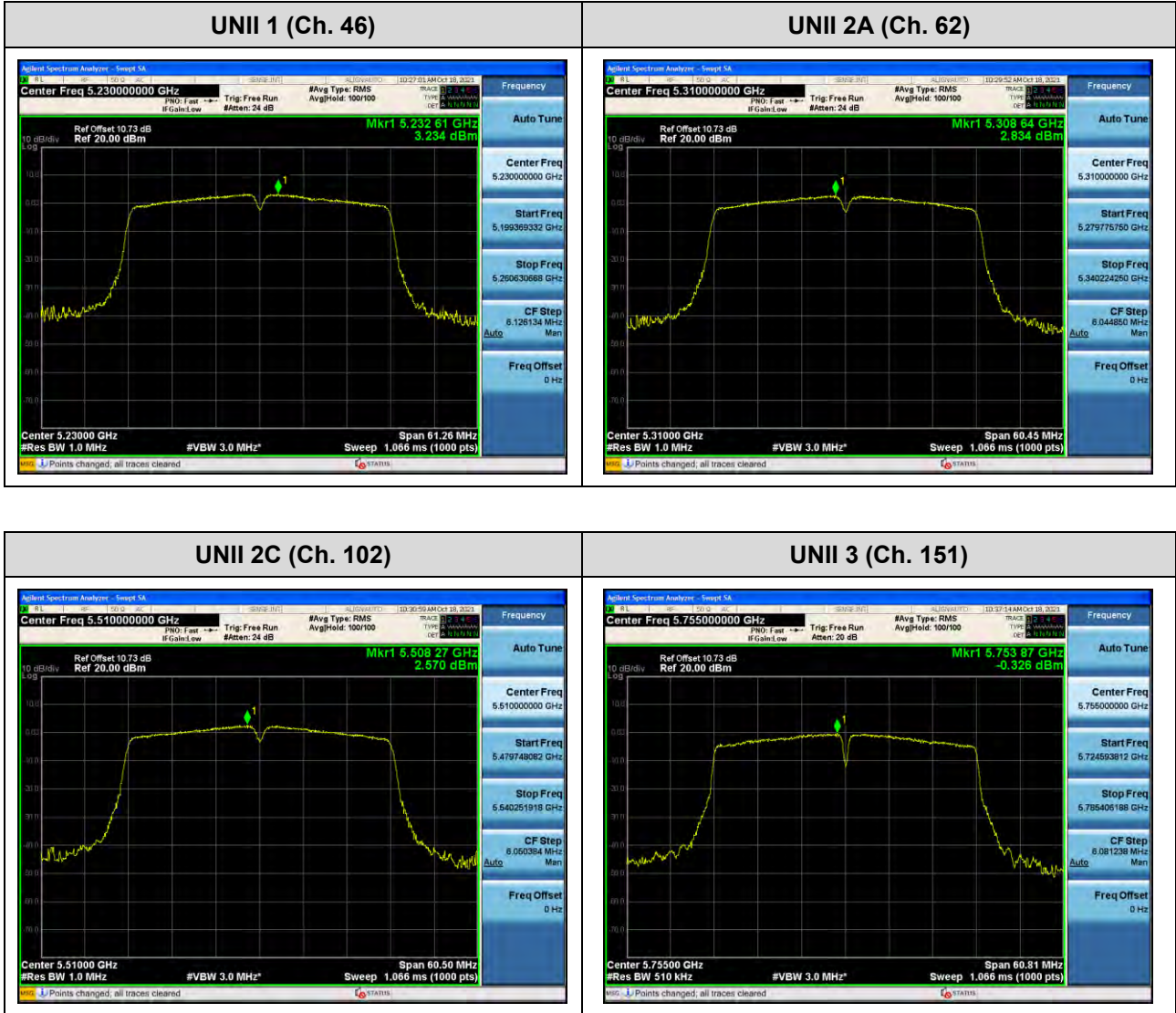
In order to simplify the report, attached plots were only channel of highest power.



☐ Test Plots(802.11n(HT40))

Note:

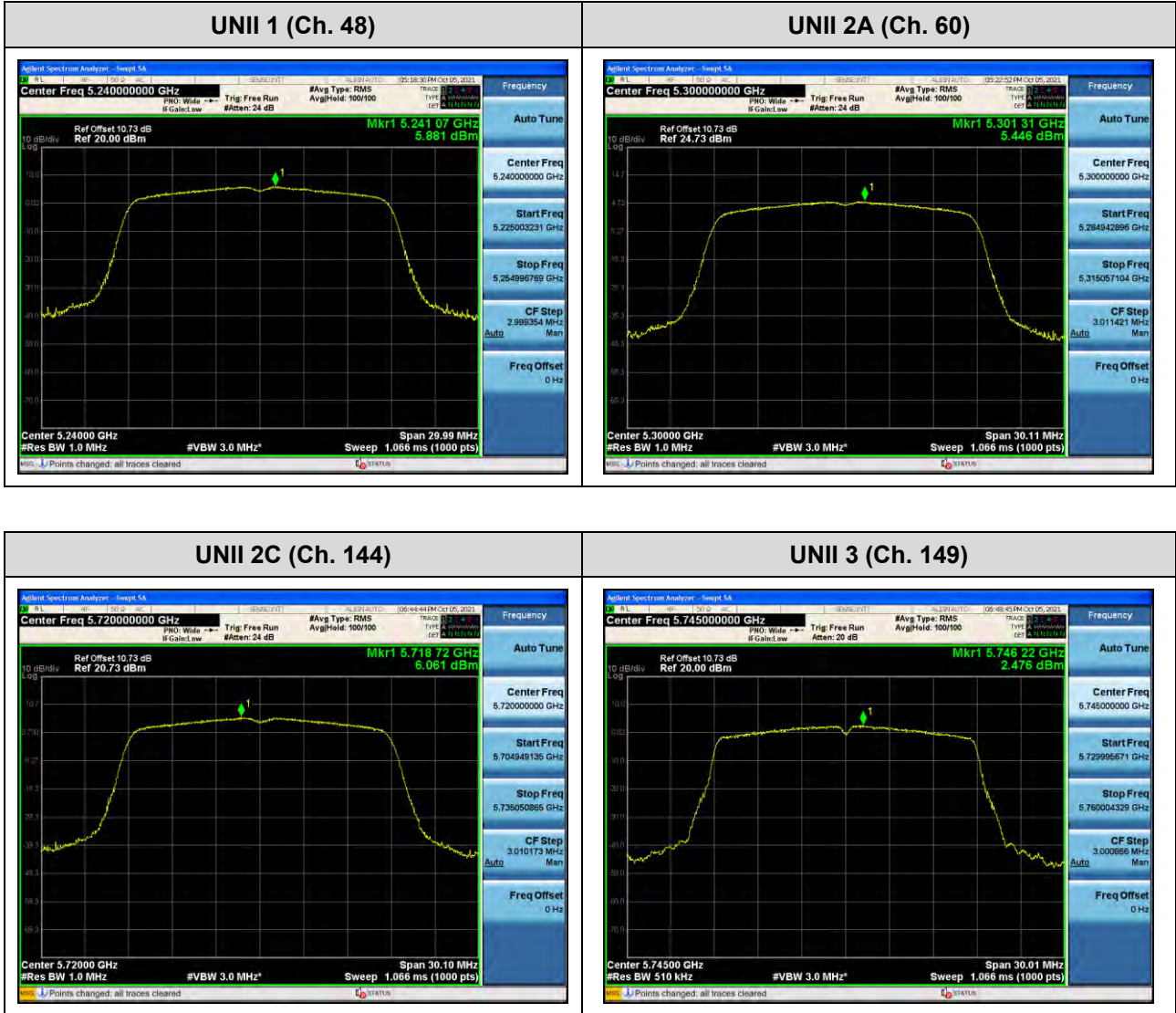
In order to simplify the report, attached plots were only channel of highest power.



Test Plots(802.11ac(VHT20))

Note:

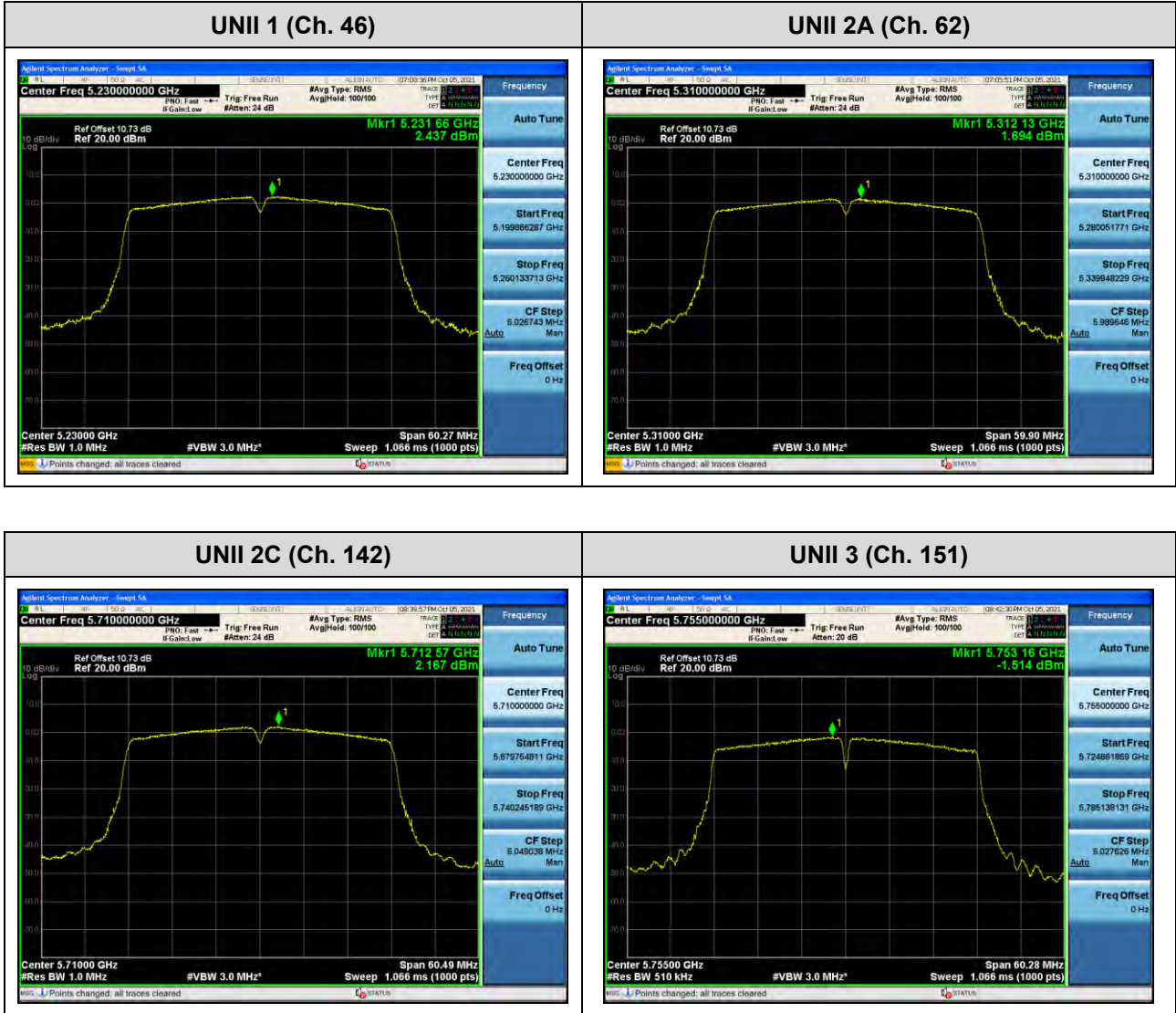
In order to simplify the report, attached plots were only channel of highest power.



Test Plots(802.11ac(VHT40))

Note:

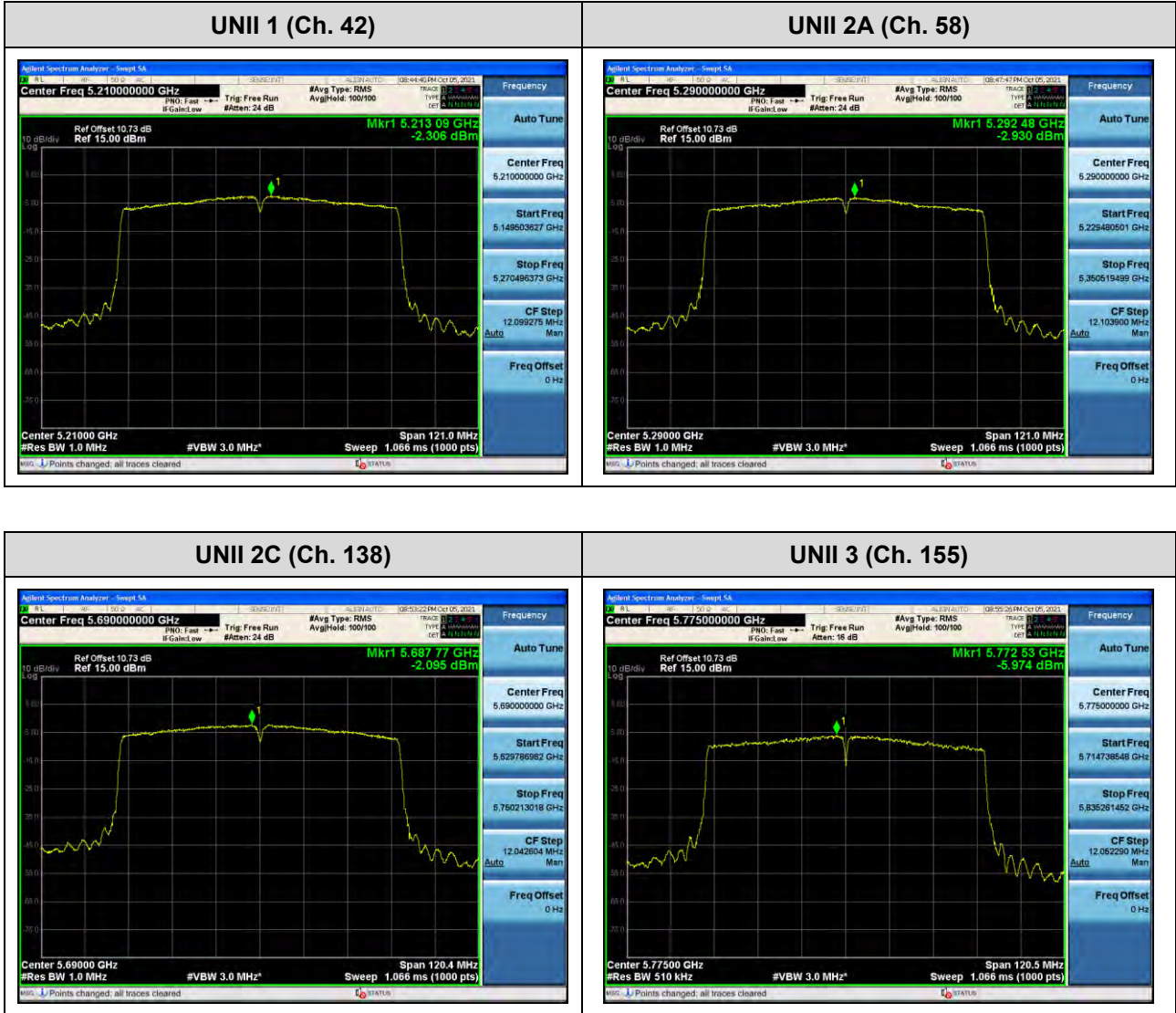
In order to simplify the report, attached plots were only channel of highest power.



Test Plots(802.11ac(VHT80))

Note:

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



10.6 FREQUENCY STABILITY.

10.6.1 80 MHz BW

Startup after the EUT is energized

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,210,000,000 Hz
CHANNEL:	42
REFERENCE VOLTAGE:	3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5210031.26	31.26
100%		-30	5210008.62	8.62
100%		-20	5210013.12	13.12
100%		-10	5210020.07	20.07
100%		0	5210024.04	24.04
100%		+10	5210025.91	25.91
100%		+30	5210038.07	38.07
100%		+40	5210047.33	47.33
100%		+50	5210058.60	58.60
Batt. Endpoint	3.4	+20	5210030.14	30.14

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5290035.11	35.11
100%		-30	5290005.56	5.56
100%		-20	5290010.08	10.08
100%		-10	5290019.43	19.43
100%		0	5290023.85	23.85
100%		+10	5290028.24	28.24
100%		+30	5290040.57	40.57
100%		+40	5290047.26	47.26
100%		+50	5290051.76	51.76
Batt. Endpoint	3.4	+20	5290031.97	31.97

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:	3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5530034.52	34.52
100%		-30	5530010.59	10.59
100%		-20	5530011.91	11.91
100%		-10	5530020.94	20.94
100%		0	5530021.96	21.96
100%		+10	5530030.93	30.93
100%		+30	5530038.52	38.52
100%		+40	5530045.49	45.49
100%		+50	5530059.76	59.76
Batt. Endpoint	3.4	+20	5530033.41	33.41

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5775032.03	32.03
100%		-30	5775010.62	10.62
100%		-20	5775014.45	14.45
100%		-10	5775016.83	16.83
100%		0	5775021.33	21.33
100%		+10	5775027.67	27.67
100%		+30	5775037.81	37.81
100%		+40	5775043.12	43.12
100%		+50	5775059.36	59.36
Batt. Endpoint	3.4	+20	5775035.73	35.73

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.

2 minutes after the EUT is energized

OPERATING BAND: UNII Band 1
 OPERATING FREQUENCY: 5,210,000,000 Hz
 CHANNEL: 42
 REFERENCE VOLTAGE: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5210035.78	35.78
100%		-30	5210007.78	7.78
100%		-20	5210012.73	12.73
100%		-10	5210019.02	19.02
100%		0	5210024.71	24.71
100%		+10	5210026.57	26.57
100%		+30	5210038.53	38.53
100%		+40	5210044.12	44.12
100%		+50	5210057.51	57.51
Batt. Endpoint	3.4	+20	5210031.24	31.24

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5290032.22	32.22
100%		-30	5290006.49	6.49
100%		-20	5290014.12	14.12
100%		-10	5290018.69	18.69
100%		0	5290023.60	23.6
100%		+10	5290030.81	30.81
100%		+30	5290038.72	38.72
100%		+40	5290040.38	40.38
100%		+50	5290054.96	54.96
Batt. Endpoint	3.4	+20	5290030.89	30.89

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5530035.64	35.64
100%		-30	5530005.59	5.59
100%		-20	5530014.74	14.74
100%		-10	5530016.97	16.97
100%		0	5530024.92	24.92
100%		+10	5530025.74	25.74
100%		+30	5530040.29	40.29
100%		+40	5530047.42	47.42
100%		+50	5530058.41	58.41
Batt. Endpoint	3.4	+20	5530033.47	33.47

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5775031.45	31.45
100%		-30	5775005.84	5.84
100%		-20	5775011.57	11.57
100%		-10	5775018.33	18.33
100%		0	5775024.66	24.66
100%		+10	5775026.05	26.05
100%		+30	5775039.66	39.66
100%		+40	5775040.91	40.91
100%		+50	5775059.37	59.37
Batt. Endpoint	3.4	+20	5775035.73	35.73

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.

5 minutes after the EUT is energized

OPERATING BAND: UNII Band 1
 OPERATING FREQUENCY: 5,210,000,000 Hz
 CHANNEL: 42
 REFERENCE VOLTAGE: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5210031.43	31.43
100%		-30	5210009.49	9.49
100%		-20	5210013.03	13.03
100%		-10	5210018.25	18.25
100%		0	5210021.24	21.24
100%		+10	5210026.23	26.23
100%		+30	5210039.75	39.75
100%		+40	5210047.75	47.75
100%		+50	5210053.93	53.93
Batt. Endpoint	3.4	+20	5210033.78	33.78

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5290034.10	34.10
100%		-30	5290035.83	35.83
100%		-20	5290034.51	34.51
100%		-10	5290032.52	32.52
100%		0	5290035.45	35.45
100%		+10	5290033.13	33.13
100%		+30	5290033.54	33.54
100%		+40	5290032.18	32.18
100%		+50	5290034.47	34.47
Batt. Endpoint	3.4	+20	5290033.84	33.84

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:	3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5530035.93	35.93
100%		-30	5530005.74	5.74
100%		-20	5530011.22	11.22
100%		-10	5530015.90	15.9
100%		0	5530020.64	20.64
100%		+10	5530028.22	28.22
100%		+30	5530036.89	36.89
100%		+40	5530046.45	46.45
100%		+50	5530057.46	57.46
Batt. Endpoint	3.4	+20	5530030.96	30.96

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5775033.49	33.49
100%		-30	5775010.92	10.92
100%		-20	5775010.18	10.18
100%		-10	5775019.43	19.43
100%		0	5775020.19	20.19
100%		+10	5775028.68	28.68
100%		+30	5775037.54	37.54
100%		+40	5775042.50	42.5
100%		+50	5775057.94	57.94
Batt. Endpoint	3.4	+20	5775031.71	31.71

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5210034.49	34.49
100%		-30	5210007.71	7.71
100%		-20	5210014.55	14.55
100%		-10	5210019.25	19.25
100%		0	5210021.99	21.99
100%		+10	5210027.35	27.35
100%		+30	5210039.08	39.08
100%		+40	5210046.54	46.54
100%		+50	5210055.71	55.71
Batt. Endpoint	3.4	+20	5210033.11	33.11

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5290034.87	34.87
100%		-30	5290007.23	7.23
100%		-20	5290012.78	12.78
100%		-10	5290020.52	20.52
100%		0	5290022.02	22.02
100%		+10	5290028.77	28.77
100%		+30	5290038.77	38.77
100%		+40	5290048.68	48.68
100%		+50	5290050.71	50.71
Batt. Endpoint	3.4	+20	5290031.04	31.04

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: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5530033.05	33.05
100%		-30	5530007.35	7.35
100%		-20	5530015.16	15.16
100%		-10	5530016.92	16.92
100%		0	5530021.24	21.24
100%		+10	5530026.68	26.68
100%		+30	5530036.78	36.78
100%		+40	5530041.42	41.42
100%		+50	5530057.34	57.34
Batt. Endpoint	3.4	+20	5530030.69	30.69

Note:

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

OPERATING BAND: UNII Band 3
 OPERATING FREQUENCY: 5,775,000,000 Hz
 CHANNEL: 155
 REFERENCE VOLTAGE: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5775031.87	31.87
100%		-30	5775008.47	8.47
100%		-20	5775013.81	13.81
100%		-10	5775018.70	18.7
100%		0	5775022.35	22.35
100%		+10	5775026.98	26.98
100%		+30	5775036.48	36.48
100%		+40	5775047.93	47.93
100%		+50	5775058.65	58.65
Batt. Endpoint	3.4	+20	5775032.48	32.48

Note:

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

10.7 STRADDLE CHANNEL

10.7.1 26 dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26 dB Bandwidth [MHz]
802.11a	UNII 2C	5720	144	5710.28	14.72
802.11n(HT20)				5710.00	15.00
802.11ac(VHT20)				5709.96	15.04
802.11a	UNII 3	5720	144	5729.88	4.88
802.11n(HT20)				5730.12	5.12
802.11ac(VHT20)				5730.08	5.08

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26 dB Bandwidth [MHz]
802.11n(HT40)	UNII 2C	5710	142	5690.00	35.00
802.11ac(VHT40)				5690.00	35.00
802.11n(HT40)	UNII 3	5710	142	5729.92	4.92
802.11ac(VHT40)				5730.00	5.00

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	26 dB Bandwidth [MHz]
802.11ac(VHT80)	UNII 2C	5690	138	5649.68	75.32
	UNII 3	5690	138	5730.56	5.56

Note:

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

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

Test Plots (26 dB Bandwidth)

802.11a UNII Band



802.11n(HT20) UNII Band



802.11ac(VHT20) UNII Band



Test Plots (26 dB Bandwidth)

802.11n(HT40) UNII Band



802.11ac(VHT40) UNII Band



802.11ac(VHT80) UNII Band



10.7.2 6 dB Bandwidth

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
802.11a	UNII 3	5720	144	5727.56	2.56	> 0.5
802.11n(HT20)				5727.60	2.60	> 0.5
802.11ac(VHT20)				5727.60	2.60	> 0.5

Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
802.11n(HT40)	UNII 3	5710	142	5727.60	2.60	> 0.5
802.11ac(VHT40)				5727.60	2.60	> 0.5

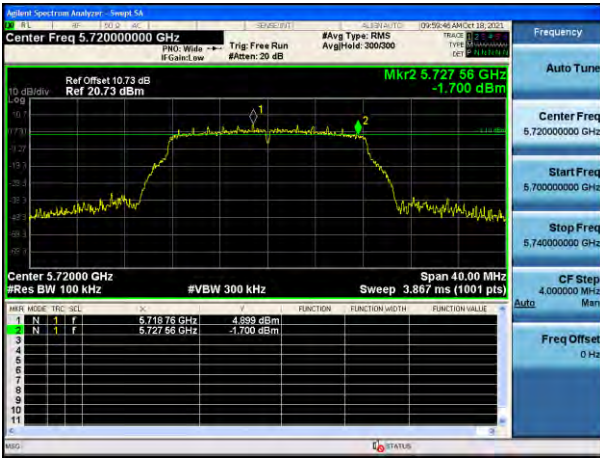
Mode	Band	Frequency [MHz]	Channel	Measured Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
802.11ac(VHT80)	UNII 3	5690	138	5727.68	2.68	> 0.5

Note:

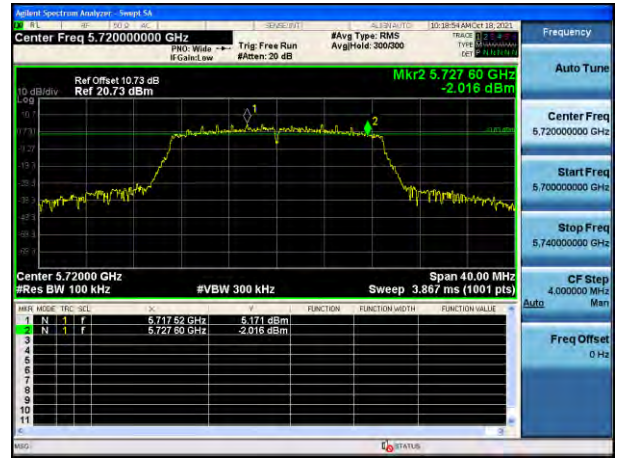
6 dB Bandwidth = Measured Frequency[MHz] – 5 725MHz

☐ Test Plots(UNII 3 Band 6 dB Bandwidth)

802.11a CH.144



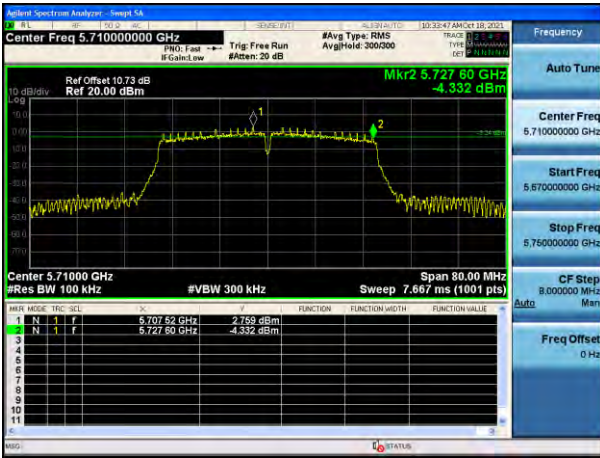
802.11n_HT20 CH.144



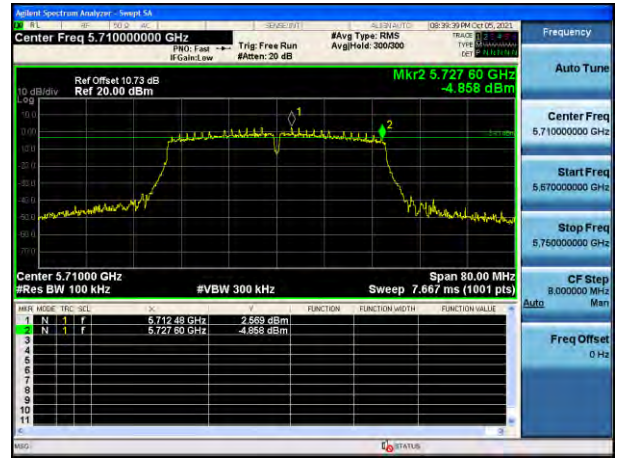
802.11ac_VHT20 CH. 144



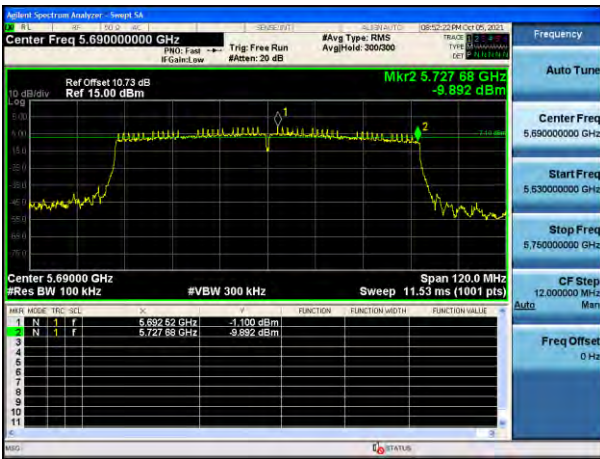
802.11n_HT40 CH.142



802.11ac_VHT40 CH.142



802.11ac_VHT80 CH.138



10.7.3 Output Power

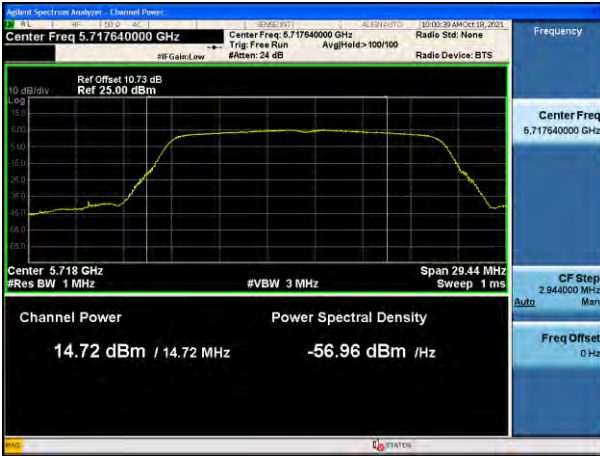
Mode	Frequency [MHz]	Channel	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
802.11a	5720	144	14.72	0.138	14.86	22.68	6 M
802.11n(HT20)	(UNII 2C		15.56	0.132	15.69	22.76	MCS0
802.11ac(VHT20)	Band)		15.70	0.163	15.86	22.77	MCS0
802.11a	5720	144	7.03	0.138	7.17	30.00	6 M
802.11n(HT20)	(UNII 3		8.29	0.132	8.42	30.00	MCS0
802.11ac(VHT20)	Band)		8.43	0.163	8.59	30.00	MCS0

Mode	Frequency [MHz]	Channel	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
802.11n(HT40)	5710	142	15.29	0.279	15.57	23.98	MCS0
802.11ac(VHT40)	(UNII 2C Band)		15.18	0.276	15.46	23.98	MCS0
802.11n(HT40)	5710	142	2.58	0.279	2.85	30.00	MCS0
802.11ac(VHT40)	(UNII 3 Band)		2.31	0.276	2.59	30.00	MCS0

Mode	Frequency [MHz]	Channel	Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	Limit [dBm]	Worstcase Datarate
802.11ac(VHT80)	5690 (UNII 2C Band)	138	14.31	0.553	14.86	23.98	MCS0
	5690 (UNII 3 Band)	138	-2.15	0.553	-1.60	30.00	MCS0

Test Plots

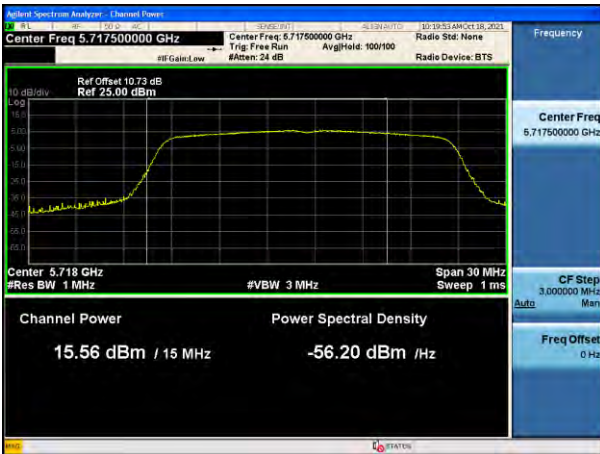
802.11a UNII 2C Band



802.11a UNII 3 Band



802.11n(HT20) UNII 2C Band



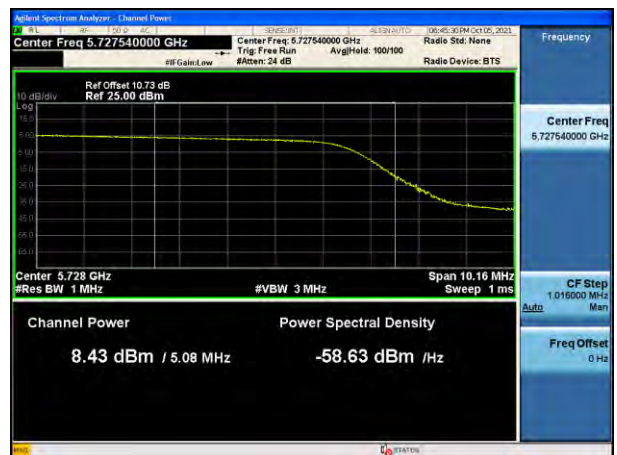
802.11n(HT20) UNII 3 Band



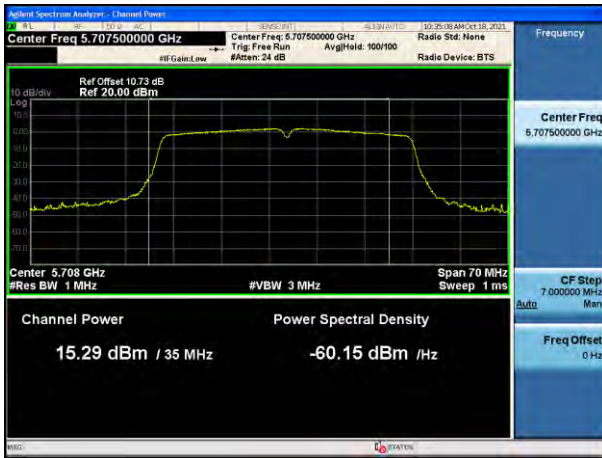
802.11ac(VHT20) UNII 2C Band



802.11ac(VHT20) UNII 3 Band



802.11n(HT40) UNII 2C Band



802.11n(HT40) UNII 3 Band



802.11ac(VHT40) UNII 2C Band



802.11ac(VHT40) UNII 3 Band



802.11ac(VHT80) UNII 2C Band



802.11ac(VHT80) UNII 3 Band



10.7.4 Power Spectral Density

Mode	Frequency [MHz]	Channel	Measured Density [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Limit [dBm]	Worstcase Datarate
802.11a	5720	144	5.429	0.138	5.567	11dBm/ MHz	6 M
802.11n(HT20)	(UNII 2C		6.045	0.132	6.177		MCS0
802.11ac(VHT20)	Band)		6.129	0.163	6.292		MCS0
802.11a	5720 (UNII 3 Band)	144	0.460	0.138	0.598	30 dB/ 500 kHz	6 M
802.11n(HT20)			1.443	0.132	1.575		MCS0
802.11ac(VHT20)			1.114	0.163	1.277		MCS0

Mode	Frequency [MHz]	Channel	Measured Density [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Limit [dBm]	Worstcase Datarate
802.11n(HT40)	5710	142	2.438	0.279	2.717	11dBm/ MHz	MCS0
802.11ac(VHT40)	(UNII 2C Band)		2.124	0.276	2.400		MCS0
802.11n(HT40)	5710	142	-4.306	0.279	-4.027	30 dBm/ 500 kHz	MCS0
802.11ac(VHT40)	(UNII 3 Band)		-4.346	0.276	-4.070		MCS0

Mode	Frequency [MHz]	Channel	Measured Density [dBm]	Duty Cycle Factor [dB]	Total PSD [dBm]	Limit [dBm]	Worstcase Datarate
802.11ac(VHT80)	5690 (UNII 2C Band)	138	-2.016	0.553	-1.463	11dBm/ MHz	MCS0
	5690 (UNII 3 Band)	138	-8.941	0.553	-8.388	30 dBm/ 500 kHz	MCS0

Test Plots

802.11a UNII 2C Band



802.11a UNII 3 Band



802.11n(HT20) UNII 2C Band



802.11n(HT20) UNII 3 Band



802.11ac(VHT20) UNII 2C Band



802.11ac(VHT20) UNII 3 Band



802.11n(HT40) UNII 2C Band



802.11n(HT40) UNII 3 Band



802.11ac(VHT40) UNII 2C Band



802.11ac(VHT40) UNII 3 Band



802.11ac(VHT80) UNII 2C Band



802.11ac(VHT80) UNII 3 Band



10.8 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30 MHz

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

Note:

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

Frequency Range : Below 1 GHz

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

Note:

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

Frequency Range : Above 1 GHz

Band :	UNII 1
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
10360	53.11	0.24	V	53.35	68.20	14.85	PK
15540	51.40	2.16	V	53.56	73.98	20.42	PK
15540	37.11	2.16	V	39.27	53.98	14.71	AV
10360	53.02	0.24	H	53.26	68.20	14.94	PK
15540	51.32	2.16	H	53.48	73.98	20.50	PK
15540	36.99	2.16	H	39.15	53.98	14.83	AV

Band :	UNII 1
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
10400	52.87	0.74	V	53.61	68.20	14.59	PK
15600	50.25	1.81	V	52.06	73.98	21.92	PK
15600	36.90	1.81	V	38.71	53.98	15.27	AV
10400	52.77	0.74	H	53.51	68.20	14.69	PK
15600	36.78	1.81	H	38.59	73.98	35.39	PK
15600	36.78	1.81	H	38.59	53.98	15.39	AV

Band :	UNII 1
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
10480	52.79	-0.25	V	52.54	68.20	15.66	PK
15720	50.61	1.16	V	51.77	73.98	22.21	PK
15720	37.26	1.16	V	38.42	53.98	15.56	AV
10480	52.55	-0.25	H	52.30	68.20	15.90	PK
15720	50.55	1.16	H	51.71	73.98	22.27	PK
15720	37.02	1.16	H	38.18	53.98	15.80	AV

Band :	UNII 2A
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5260 MHz
Channel No.	52 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
10520	53.11	-0.20	V	52.91	68.20	15.29	PK
15780	50.55	1.20	V	51.75	73.98	22.23	PK
15780	37.48	1.20	V	38.68	53.98	15.30	AV
10520	53.22	-0.20	H	53.02	68.20	15.18	PK
15780	50.61	1.20	H	51.81	73.98	22.17	PK
15780	37.57	1.20	H	38.77	53.98	15.21	AV

Band :	UNII 2A
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5300 MHz
Channel No.	60 Ch

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
10600	52.68	0.10	V	52.78	73.98	21.20	PK
10600	39.78	0.10	V	39.88	53.98	14.10	AV
15900	51.32	1.04	V	52.36	73.98	21.62	PK
15900	38.01	1.04	V	39.05	53.98	14.93	AV
10600	52.75	0.10	H	52.85	73.98	21.13	PK
10600	39.83	0.10	H	39.93	53.98	14.05	AV
15900	51.40	1.04	H	52.44	73.98	21.54	PK
15900	38.10	1.04	H	39.14	53.98	14.84	AV

Band :	UNII 2A
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
10640	53.07	0.35	V	53.42	73.98	20.56	PK
10640	39.23	0.35	V	39.58	53.98	14.40	AV
15960	51.16	1.12	V	52.28	73.98	21.70	PK
15960	37.85	1.12	V	38.97	53.98	15.01	AV
10640	52.98	0.35	H	53.33	73.98	20.65	PK
10640	39.11	0.35	H	39.46	53.98	14.52	AV
15960	51.08	1.12	H	52.20	73.98	21.78	PK
15960	37.68	1.12	H	38.80	53.98	15.18	AV

Report No.: HCT-RF-2110-FC012

Band : UNII 2C
 Operation Mode: 802.11 n(20)
 Transfer MCS Index: 0
 Operating Frequency 5500 MHz
 Channel No. 100 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
11000	52.68	0.40	V	53.08	73.98	20.90	PK
11000	39.33	0.40	V	39.73	53.98	14.25	AV
16500	50.85	1.16	V	52.01	68.20	16.19	PK
11000	52.83	0.40	H	53.23	73.98	20.75	PK
11000	39.44	0.40	H	39.84	53.98	14.14	AV
16500	50.95	1.16	H	52.11	68.20	16.09	PK

Band : UNII 2C
 Operation Mode: 802.11 n(20)
 Transfer MCS Index: 0
 Operating Frequency 5600 MHz
 Channel No. 120 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
11200	52.78	-0.40	V	52.38	73.98	21.60	PK
11200	39.02	-0.40	V	38.62	53.98	15.36	AV
16800	51.48	0.65	V	52.13	68.20	16.07	PK
11200	52.86	-0.40	H	52.46	73.98	21.52	PK
11200	39.12	-0.40	H	38.72	53.98	15.26	AV
16800	51.55	0.65	H	52.20	68.20	16.00	PK

Band : UNII 2C
 Operation Mode: 802.11 n(20)
 Transfer MCS Index: 0
 Operating Frequency 5720 MHz
 Channel No. 144 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F. [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
11440	53.32	0.14	V	53.46	73.98	20.52	PK
11440	39.55	0.14	V	39.69	53.98	14.29	AV
17160	51.68	1.35	V	53.03	68.20	15.17	PK
11440	53.03	0.14	H	53.17	73.98	20.81	PK
11440	39.49	0.14	H	39.63	53.98	14.35	AV
17160	51.58	1.35	H	52.93	68.20	15.27	PK

Band : UNII 3
 Operation Mode: 802.11 n(20)
 Transfer MCS Index: 0
 Operating Frequency 5745MHz
 Channel No. 149 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F. [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
11490	52.48	-0.14	V	52.34	73.98	21.64	PK
11490	39.12	-0.14	V	38.98	53.98	15.00	AV
17235	51.11	1.61	V	52.72	68.20	15.48	PK
11490	52.57	-0.14	H	52.43	73.98	21.55	PK
11490	39.33	-0.14	H	39.19	53.98	14.79	AV
17235	51.23	1.61	H	52.84	68.20	15.36	PK

Band :	UNII 3
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5785 MHz
Channel No.	157 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
11570	52.78	0.07	V	52.85	73.98	21.13	PK
11570	39.15	0.07	V	39.22	53.98	14.76	AV
17355	51.32	1.69	V	53.01	68.20	15.19	PK
11570	53.11	0.07	H	53.18	73.98	20.80	PK
11570	39.30	0.07	H	39.37	53.98	14.61	AV
17355	51.46	1.69	H	53.15	68.20	15.05	PK

Band :	UNII 3
Operation Mode:	802.11 n(20)
Transfer MCS Index:	0
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Measured Value [dBμV]	A.F+C.L -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
11650	53.14	-0.70	V	52.44	73.98	21.54	PK
11650	39.19	-0.70	V	38.49	53.98	15.49	AV
17475	51.30	2.65	V	53.95	68.20	14.25	PK
11650	52.93	-0.70	H	52.23	73.98	21.75	PK
11650	39.02	-0.70	H	38.32	53.98	15.66	AV
17475	51.02	2.65	H	53.67	68.20	14.53	PK

Note:

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

[Worst case]

UNII 1, UNII 2A, UNII 2C, UNII 3 : 802.11n(20)_MCS 0

[DBS Mode]

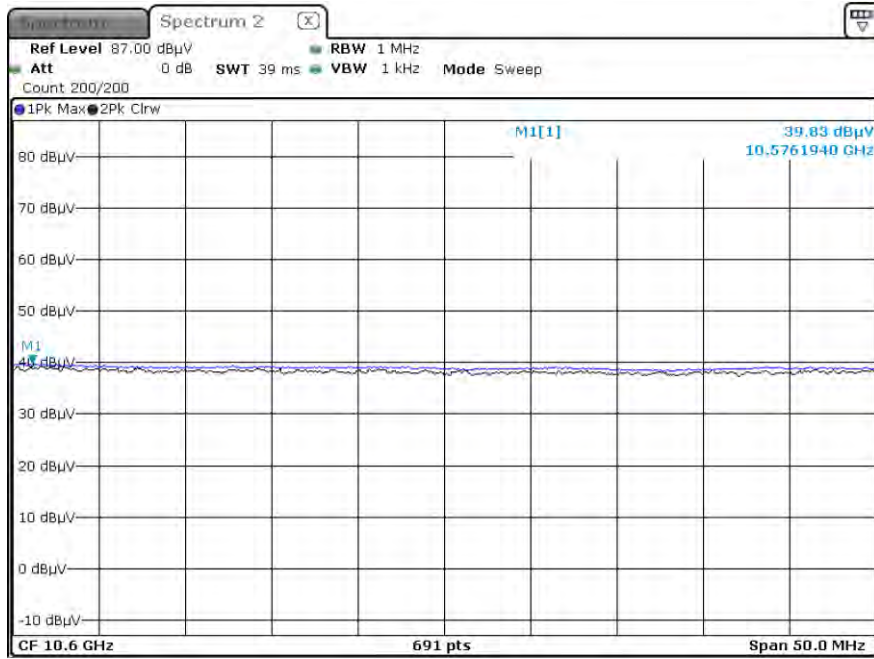
WLAN/BT Ant : 802.11n(20) ch. 60 & Bluetooth Ch. 78 (GFSK)

Frequency [MHz]	Measured Value [dB μ V]	A.F.+C.L. -A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
10600	52.71	0.10	V	52.81	73.98	21.17	PK
10600	39.88	0.10	V	39.98	53.98	14.00	AV
15900	51.11	1.04	V	52.15	73.98	21.83	PK
15900	37.81	1.04	V	38.85	53.98	15.13	AV
10600	52.85	0.10	H	52.95	73.98	21.03	PK
10600	39.94	0.10	H	40.04	53.98	13.94	AV
15900	51.29	1.04	H	52.33	73.98	21.65	PK
15900	37.99	1.04	H	39.03	53.98	14.95	AV

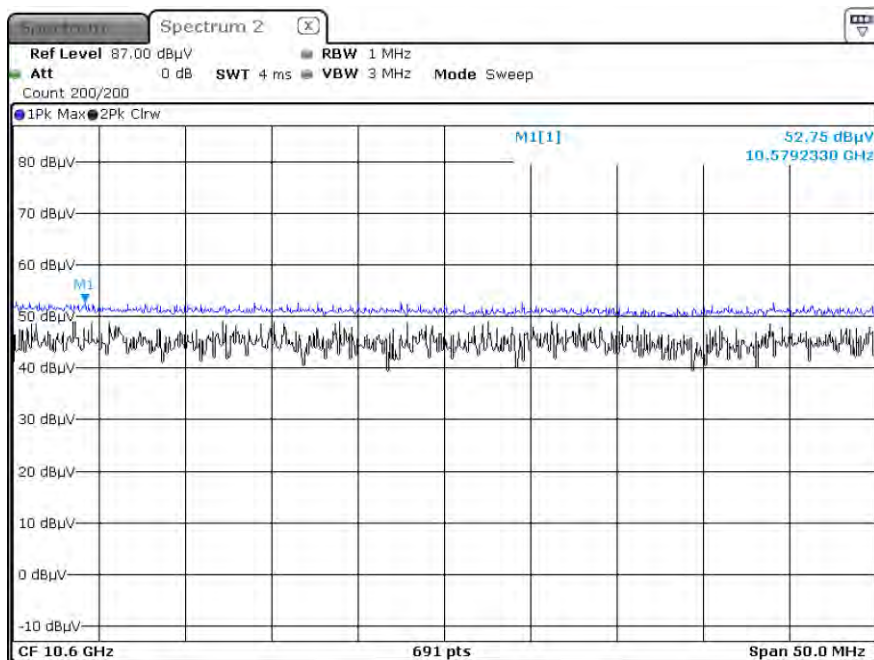
Note : Bluetooth DBS Data refer to BT Test Report.

▣ Test Plots

Average Result (802.11n(20), Ch.60 2nd Harmonic, X-H)



Peak Result (802.11n(20), Ch.60 2nd Harmonic, X-H)



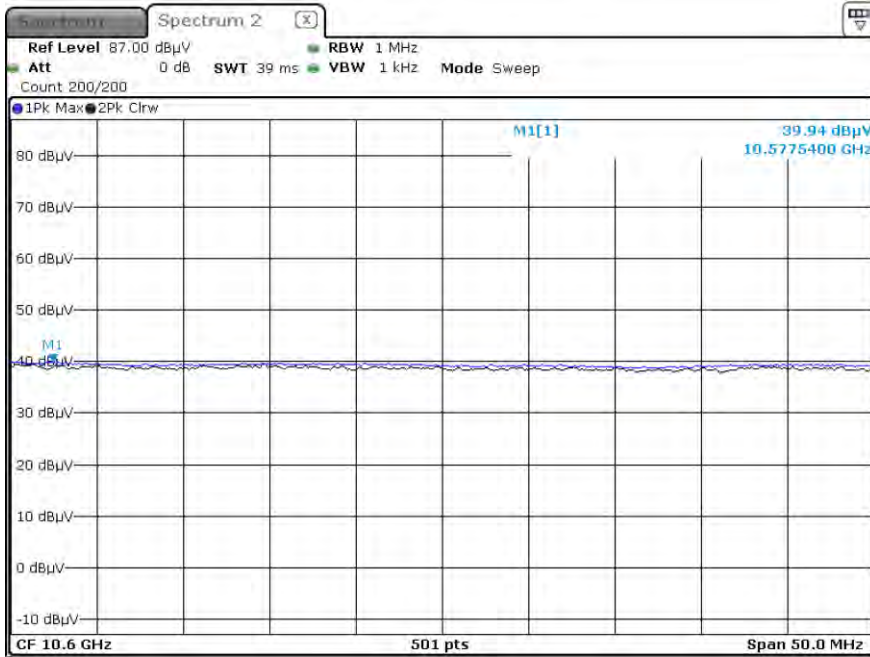
Note:

Only the worst case plots for Radiated Spurious Emissions.

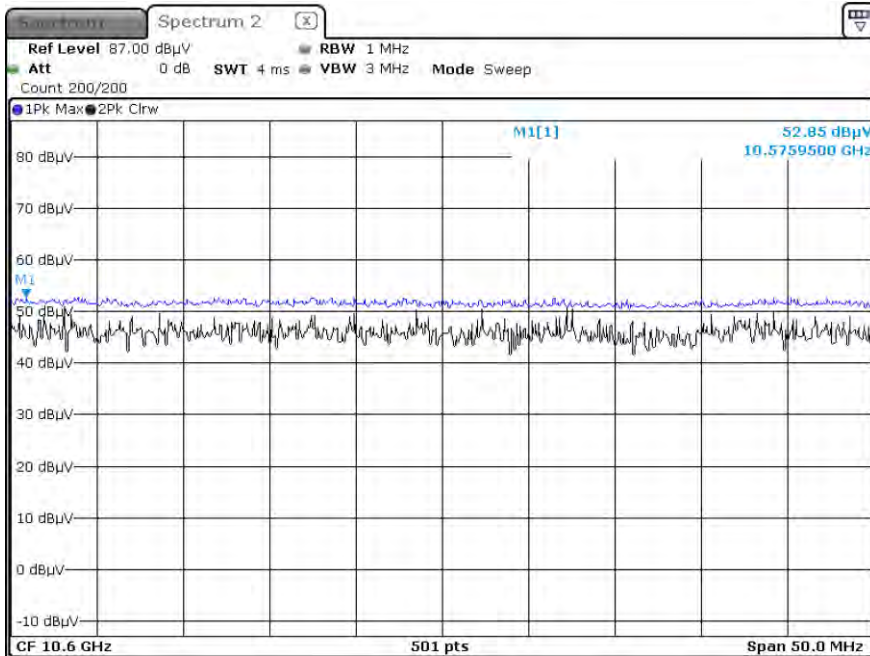
▣ Test Plots(DBS)

WLAN/BT Ant : 802.11n(20) ch. 60 & Bluetooth Ch. 78 (GFSK)

Average Result (2nd Harmonic, X-H)



Peak Result (2nd 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 [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5150	49.96	6.72	H	56.68	73.98	17.30	PK
5150	35.46	6.72	H	42.18	53.98	11.80	AV
5150	47.35	6.72	V	54.07	73.98	19.91	PK
5150	34.22	6.72	V	40.94	53.98	13.04	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5350	53.09	7.24	H	60.33	73.98	13.65	PK
5350	35.77	7.24	H	43.01	53.98	10.97	AV
5350	52.87	7.24	V	60.11	73.98	13.87	PK
5350	35.35	7.24	V	42.59	53.98	11.39	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5460	46.84	7.90	H	54.74	73.98	19.24	PK
5460	34.54	7.90	H	42.44	53.98	11.54	AV
5470	47.90	8.24	H	56.14	68.20	12.06	PK
5460	45.78	7.90	V	53.68	73.98	20.30	PK
5460	33.41	7.90	V	41.31	53.98	12.67	AV
5470	47.59	8.24	V	55.83	68.20	12.37	PK

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5150	51.28	6.72	H	58.00	73.98	15.98	PK
5150	37.32	6.72	H	44.04	53.98	9.94	AV
5150	50.98	6.72	V	57.7	73.98	16.28	PK
5150	37.02	6.72	V	43.74	53.98	10.24	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5350	59.47	7.24	H	66.71	73.98	7.27	PK
5350	36.49	7.24	H	43.73	53.98	10.25	AV
5350	59.02	7.24	V	66.26	73.98	7.72	PK
5350	36.12	7.24	V	43.36	53.98	10.62	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5460	48.29	7.90	H	56.19	73.98	17.79	PK
5460	35.32	7.90	H	43.22	53.98	10.76	AV
5470	52.21	8.24	H	60.45	68.20	7.75	PK
5460	48.01	7.90	V	55.91	73.98	18.07	PK
5460	35.12	7.90	V	43.02	53.98	10.96	AV
5470	52.09	8.24	V	60.33	68.20	7.87	PK

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5150	48.75	6.72	H	55.47	73.98	18.51	PK
5150	35.68	6.72	H	42.4	53.98	11.58	AV
5150	48.45	6.72	V	55.17	73.98	18.81	PK
5150	35.32	6.72	V	42.04	53.98	11.94	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5350	46.89	7.24	H	54.13	73.98	19.85	PK
5350	34.52	7.24	H	41.76	53.98	12.22	AV
5350	47.02	7.24	V	54.26	73.98	19.72	PK
5350	34.37	7.24	V	41.61	53.98	12.37	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5460	47.02	7.90	H	54.92	73.98	19.06	PK
5460	34.43	7.90	H	42.33	53.98	11.65	AV
5470	47.81	8.24	H	56.05	68.20	12.15	PK
5460	46.89	7.90	V	54.79	73.98	19.19	PK
5460	34.22	7.90	V	42.12	53.98	11.86	AV
5470	47.68	8.24	V	55.92	68.20	12.28	PK

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5150	47.99	13.63	H	61.62	73.98	12.36	PK
5150	34.07	13.63	H	47.7	53.98	6.28	AV
5150	47.69	13.63	V	61.32	73.98	12.66	PK
5150	33.85	13.63	V	47.48	53.98	6.50	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5350	52.83	14.13	H	66.96	73.98	7.02	PK
5350	34.08	14.13	H	48.21	53.98	5.77	AV
5350	52.68	14.13	V	66.81	73.98	7.17	PK
5350	33.92	14.13	V	48.05	53.98	5.93	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5460	45.55	14.77	H	60.32	73.98	13.66	PK
5460	33.17	14.77	H	47.94	53.98	6.04	AV
5470	50.38	15.12	H	65.5	68.20	2.70	PK
5460	45.12	14.77	V	59.89	73.98	14.09	PK
5460	32.84	14.77	V	47.61	53.98	6.37	AV
5470	50.02	15.12	V	65.14	68.20	3.06	PK

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5150	44.85	13.63	H	58.48	73.98	15.50	PK
5150	33.62	13.63	H	47.25	53.98	6.73	AV
5150	44.68	13.63	V	58.31	73.98	15.67	PK
5150	33.48	13.63	V	47.11	53.98	6.87	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5350	45.88	14.13	H	60.01	73.98	13.97	PK
5350	33.20	14.13	H	47.33	53.98	6.65	AV
5350	45.63	14.13	V	59.76	73.98	14.22	PK
5350	32.96	14.13	V	47.09	53.98	6.89	AV

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5460	44.84	14.77	H	59.61	73.98	14.37	PK
5460	33.04	14.77	H	47.81	53.98	6.17	AV
5470	45.61	15.12	H	60.73	68.20	7.47	PK
5460	44.68	14.77	V	59.45	73.98	14.53	PK
5460	32.98	14.77	V	47.75	53.98	6.23	AV
5470	45.48	15.12	V	60.6	68.20	7.60	PK

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

Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5150	46.21	13.63	H	59.84	73.98	14.14	PK
5150	34.75	13.63	H	48.38	53.98	5.60	AV
5150	46.02	13.63	V	59.65	73.98	14.33	PK
5150	34.59	13.63	V	48.22	53.98	5.76	AV

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

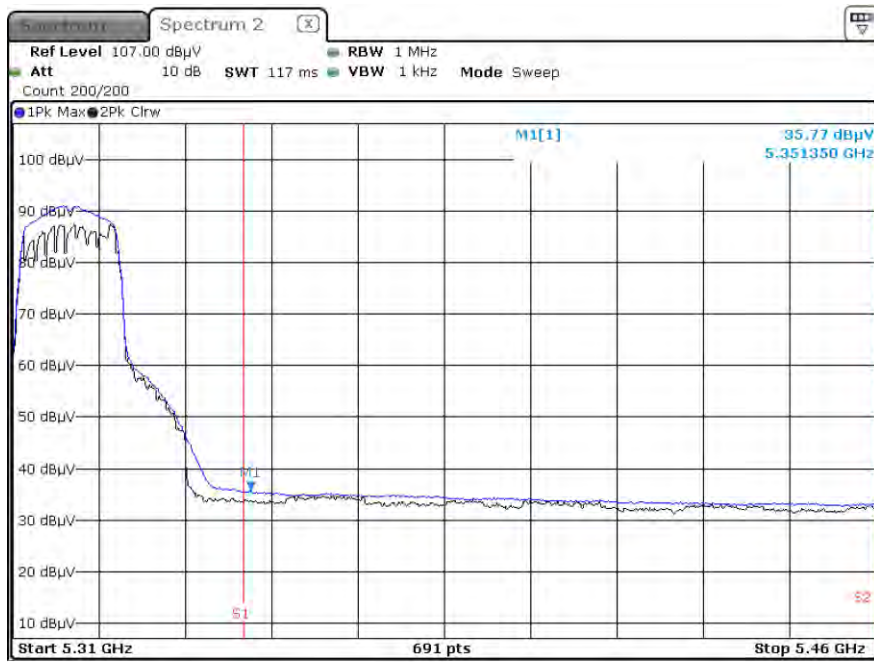
Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5350	45.60	14.13	H	59.73	73.98	14.25	PK
5350	34.40	14.13	H	48.53	53.98	5.45	AV
5350	45.55	14.13	V	59.68	73.98	14.30	PK
5350	34.07	14.13	V	48.2	53.98	5.78	AV

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

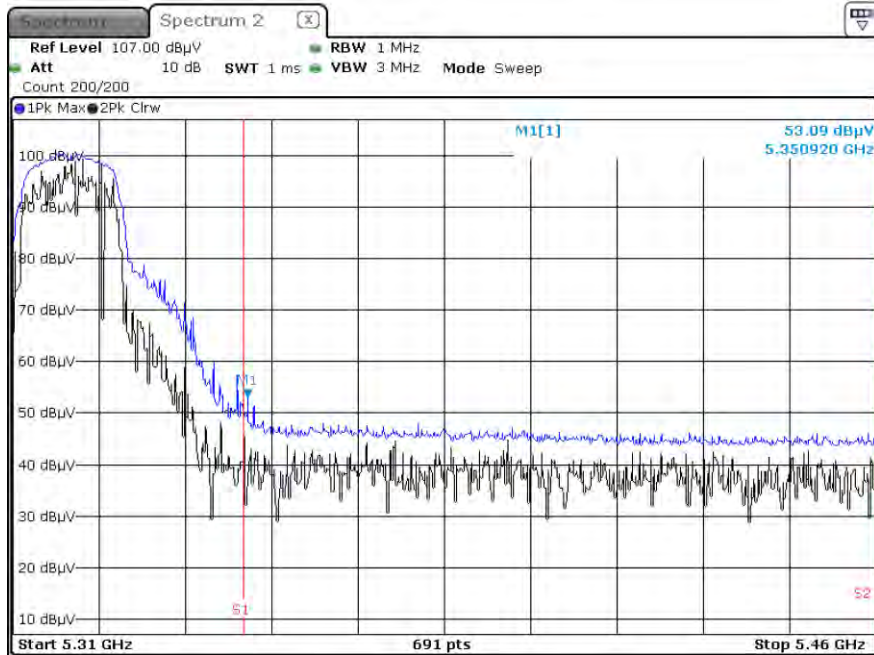
Frequency [MHz]	Measured Value [dBμV]	A.F+ C.L+ D.F-A.G + ATT [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
5460	45.11	14.77	H	59.88	73.98	14.10	PK
5460	33.94	14.77	H	48.71	53.98	5.27	AV
5470	46.55	15.12	H	61.67	68.20	6.53	PK
5460	44.89	14.77	V	59.66	73.98	14.32	PK
5460	33.78	14.77	V	48.55	53.98	5.43	AV
5470	46.32	15.12	V	61.44	68.20	6.76	PK

Test Plots(UNII 1, 2A, 2C)

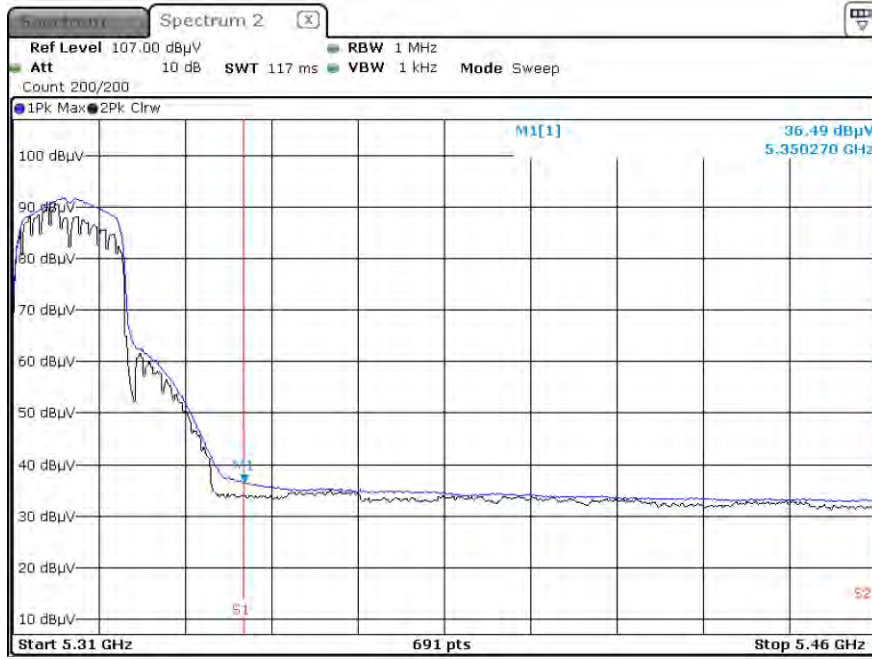
Average Result (802.11 a_6 Mbps, Ch.64, Y-H)



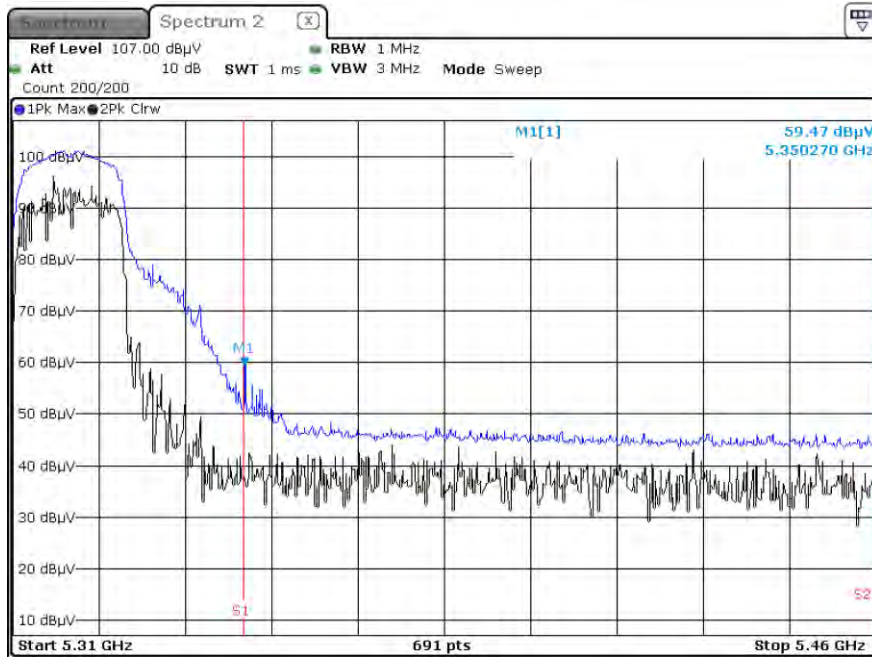
Peak Result (802.11 a_6 Mbps, Ch.64, Y-H)



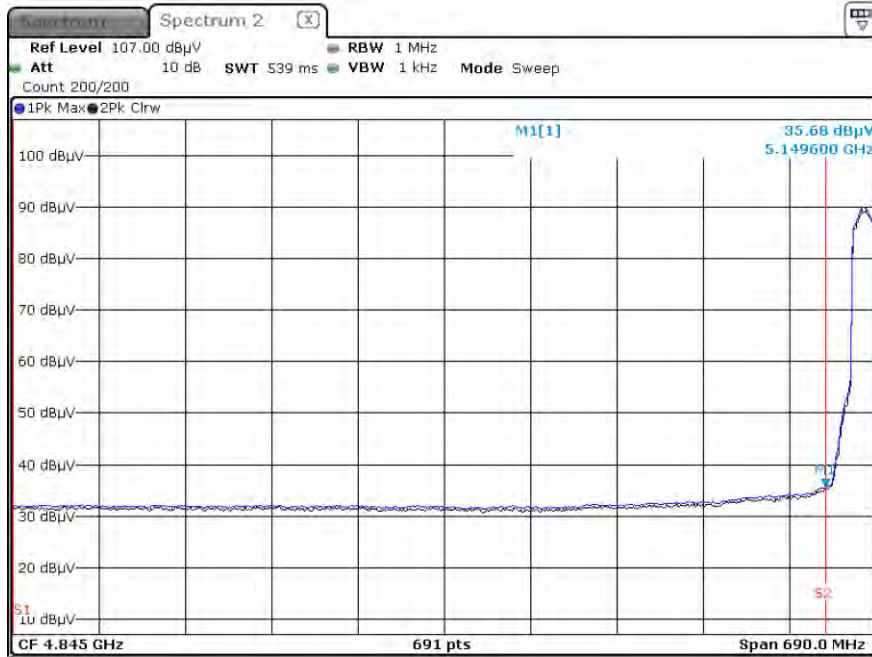
Average Result (802.11 n(HT20)_MCS0, Ch.64, Y-H)



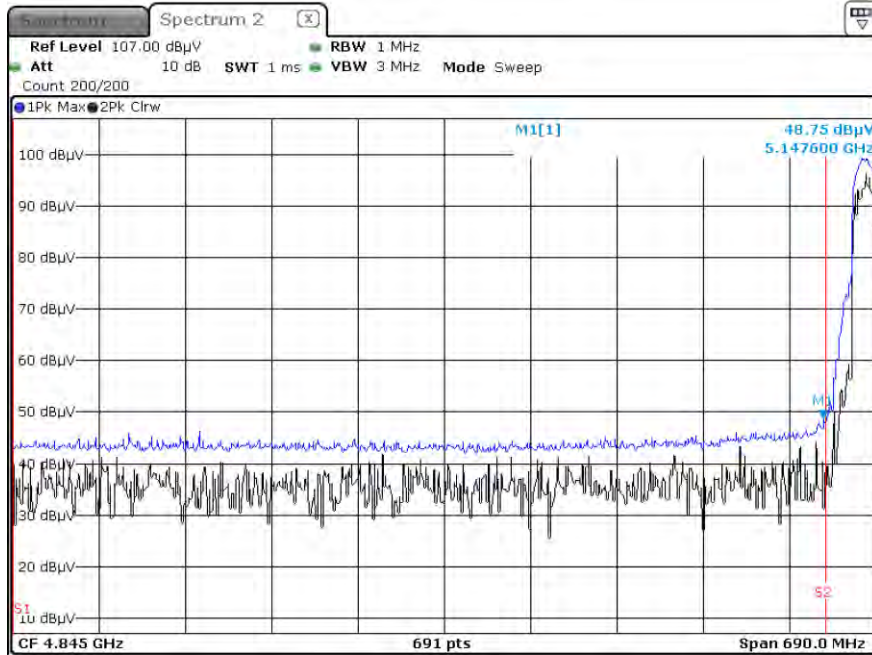
Peak Result (802.11 n(HT20)_MCS0, Ch.64, Y-H)



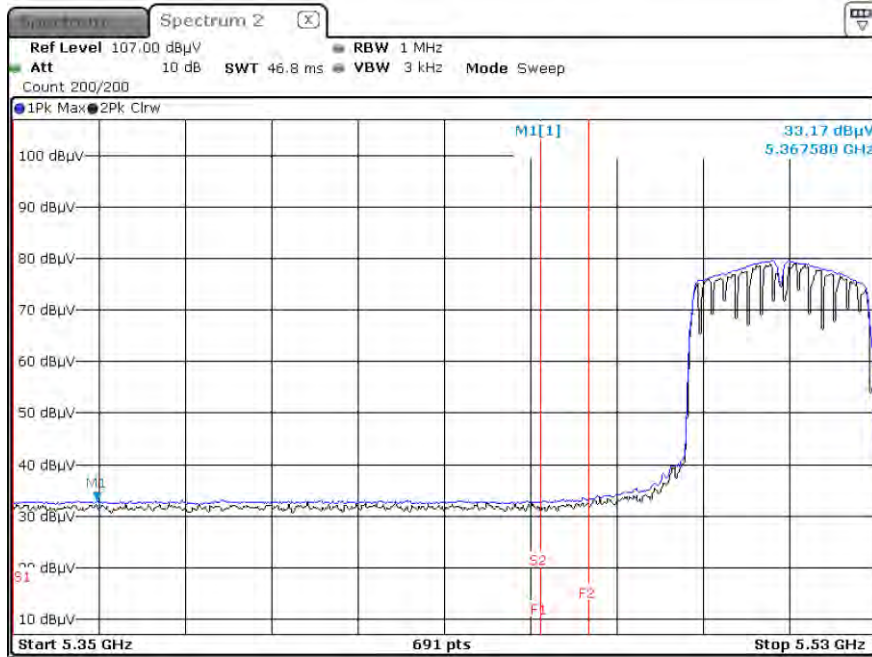
Average Result (802.11 ac(VHT20)_MCS0, Ch.36, X-H)



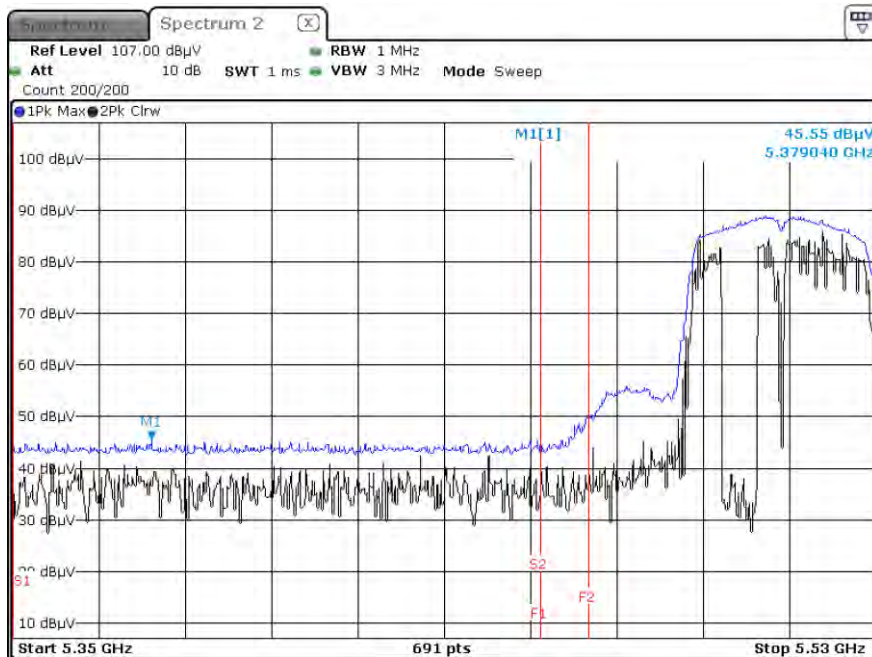
Peak Result (802.11 ac(VHT20)_MCS0, Ch.36, X-H)



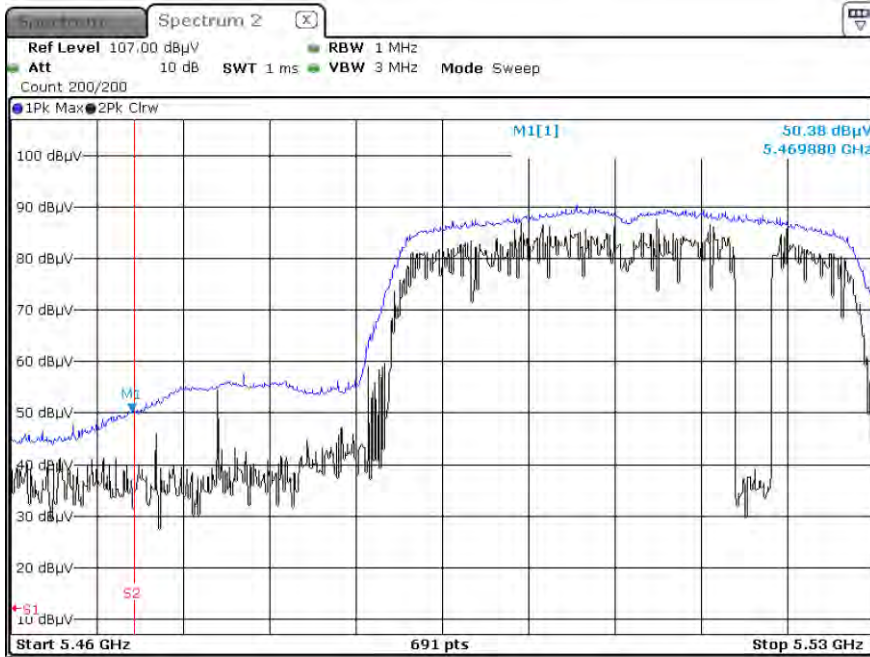
Average Result (802.11 n(HT40)_MCS0, Ch.102, X-H)



Peak Result (802.11 n(HT40)_MCS0, Ch.102, X-H)



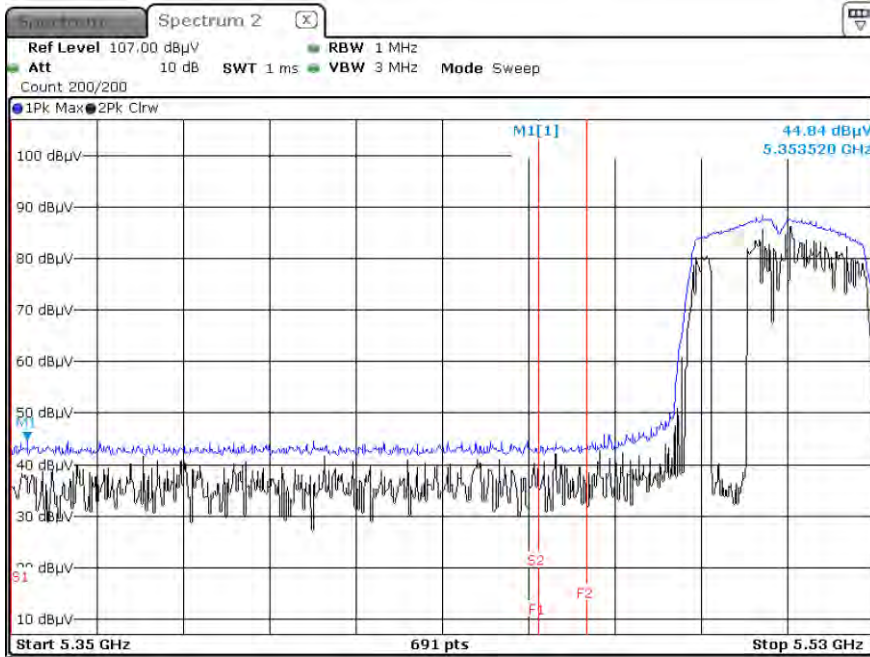
Peak Result (802.11 n(HT40)_MCS0, Ch.102, X-H)



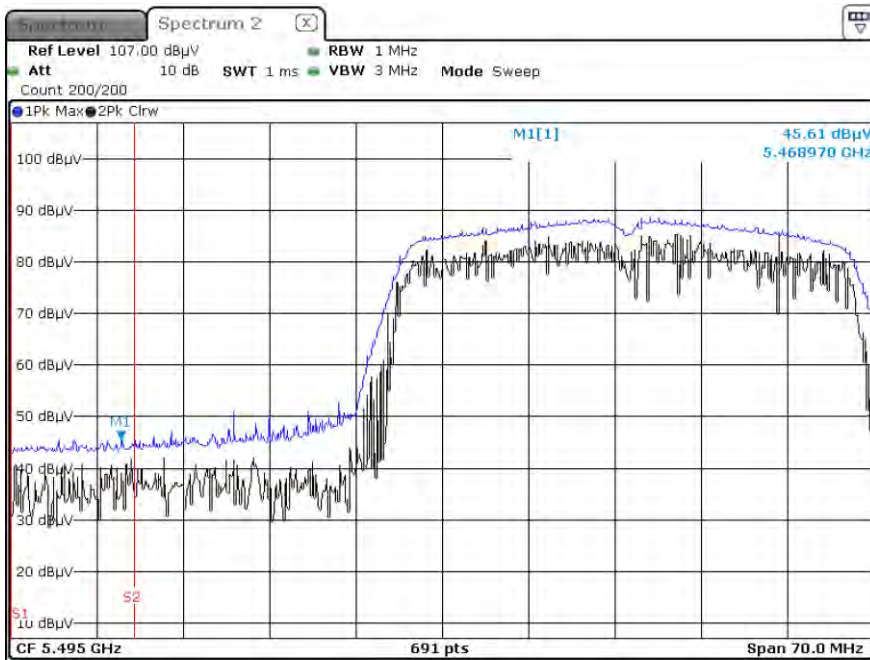
Average Result (802.11 ac(VHT40)_MCS0, Ch.102, X-H)



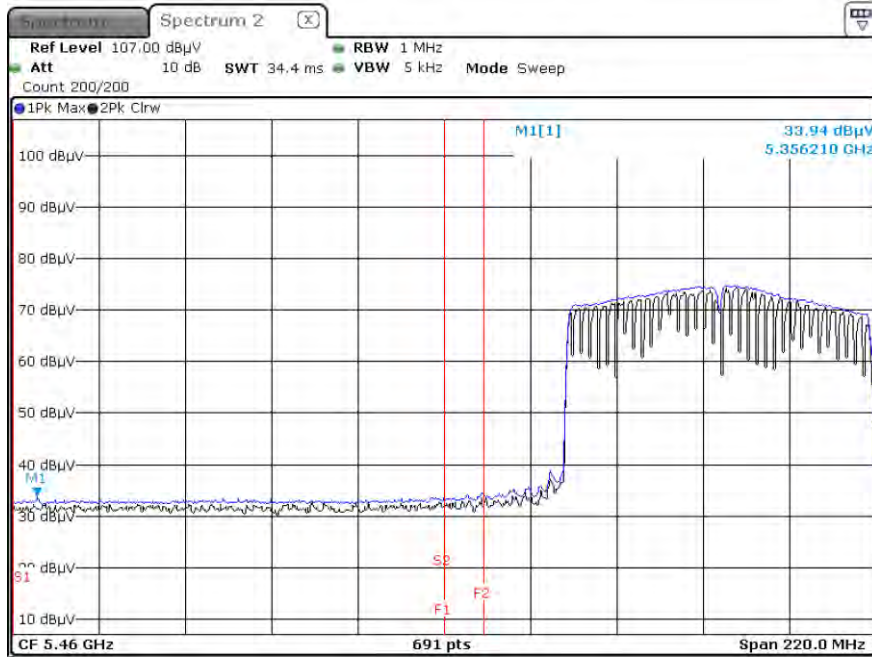
Peak Result (802.11 ac(VHT40)_MCS0, Ch.102, X-H)



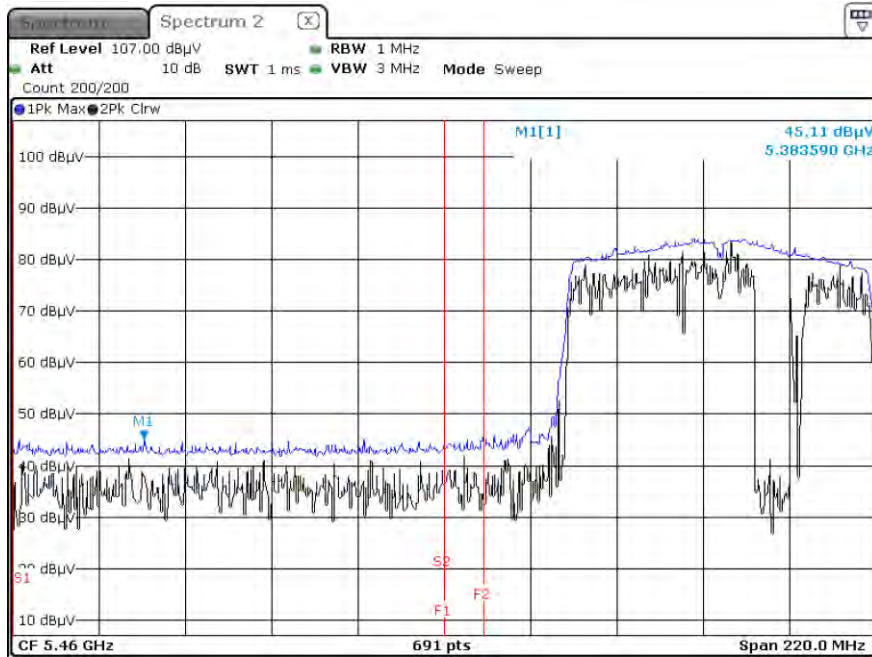
Peak Result (802.11 ac(VHT40)_MCS0, Ch.102, X-H)



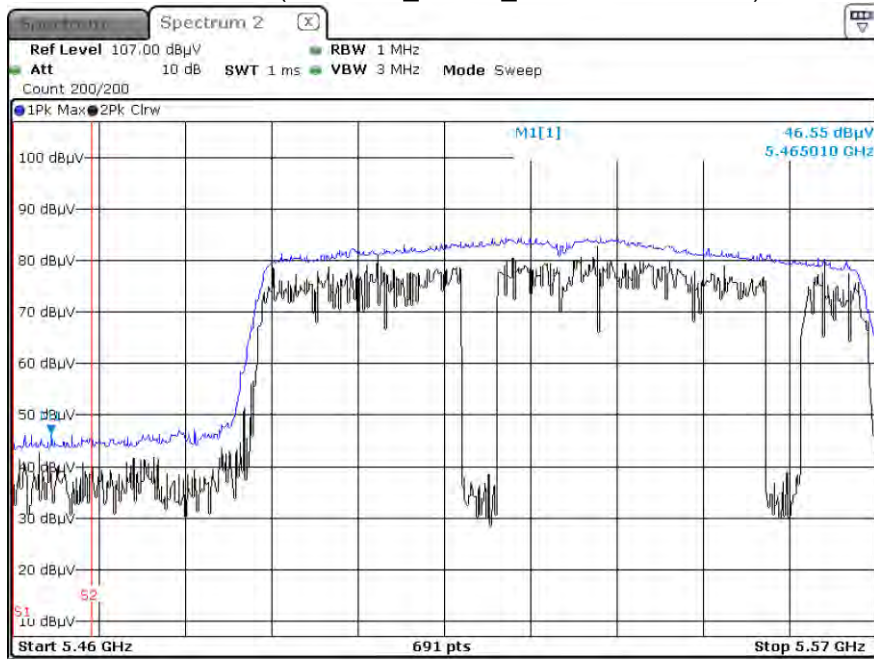
Average Result (802.11 ac_VHT80_MCS0, Ch.106, X-H)



Peak Result (802.11 ac_VHT80_MCS0, Ch.106, X-H)



Peak Result (802.11 ac_VHT80_MCS0, Ch.106, X-H)

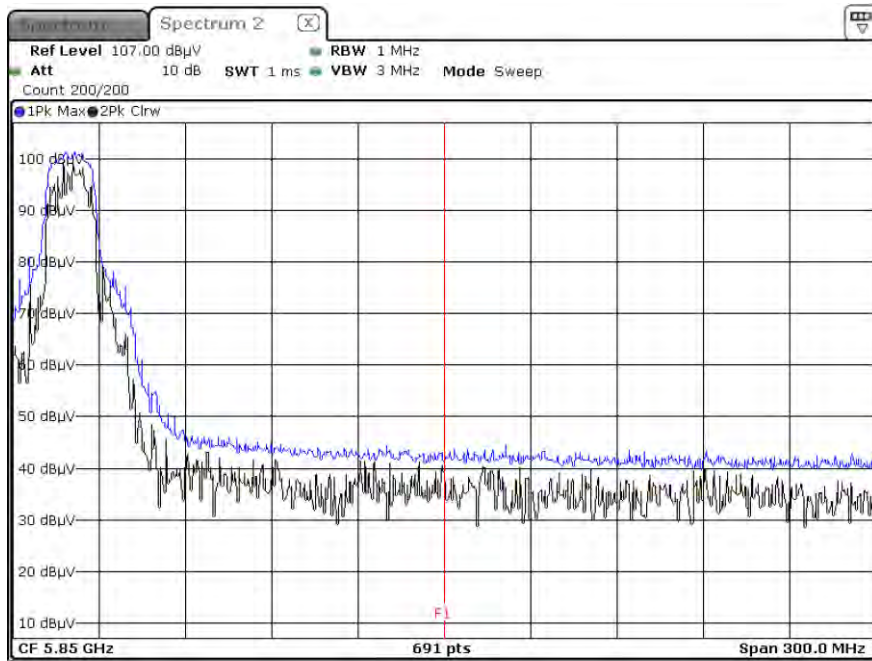


Note:

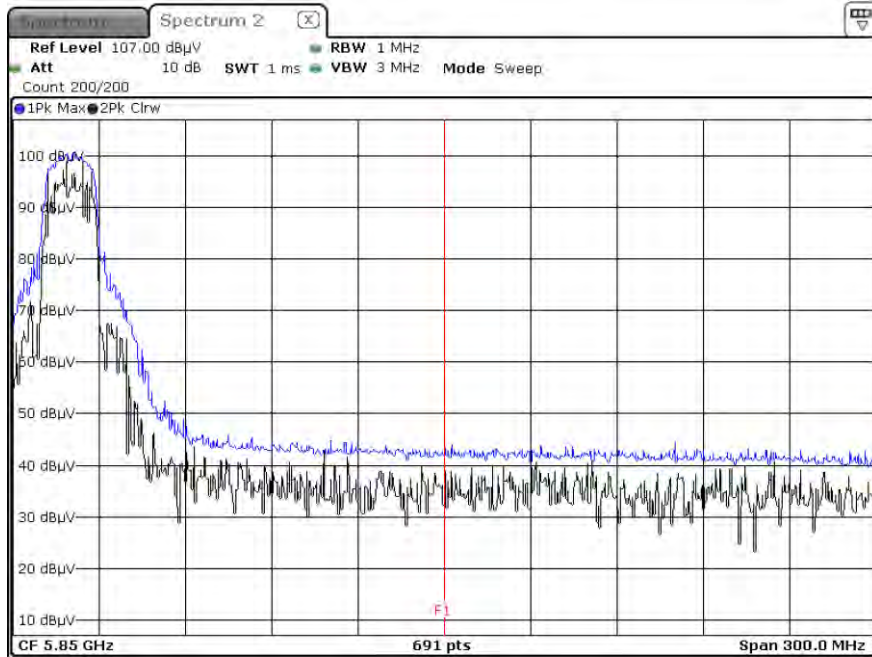
Only the worst case plots for Radiated Restricted Band Edge.

▣ Test Plots(Straddle Channel)

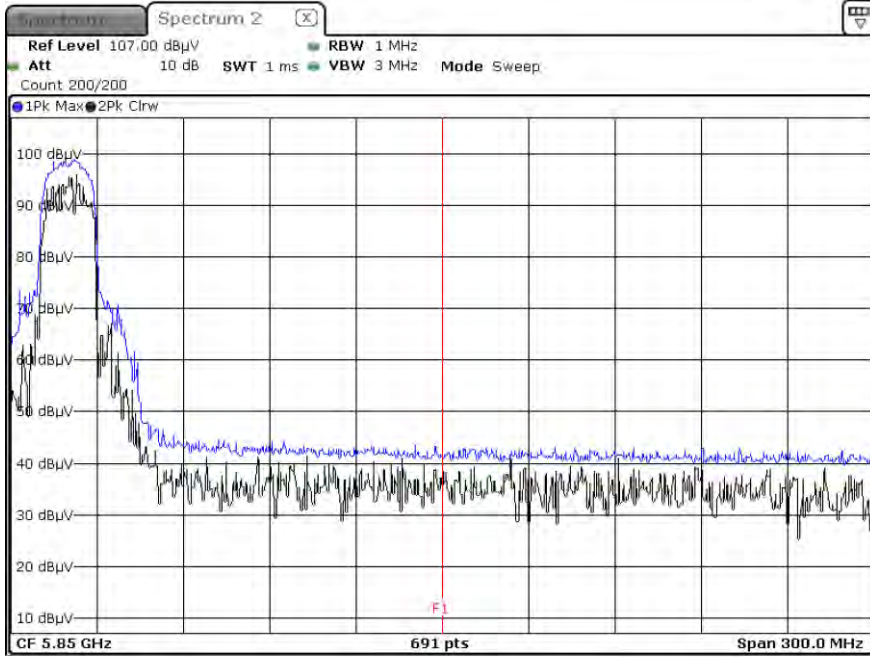
Peak Result (802.11a, Ch.144, X-H)



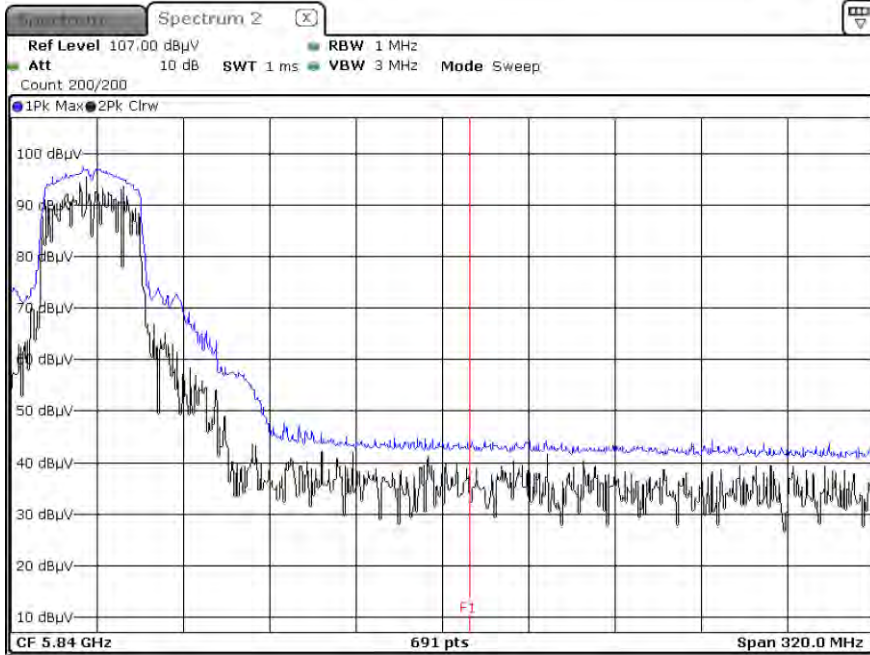
Peak Result (802.11n_HT20, Ch.144, X-H)



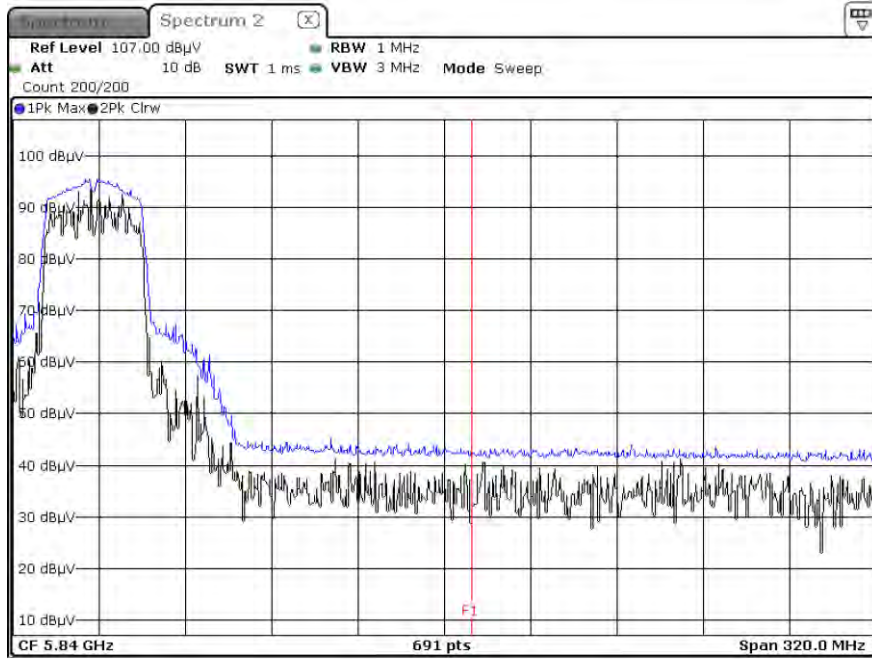
Peak Result (802.11ac_VHT20, Ch.144, X-H)



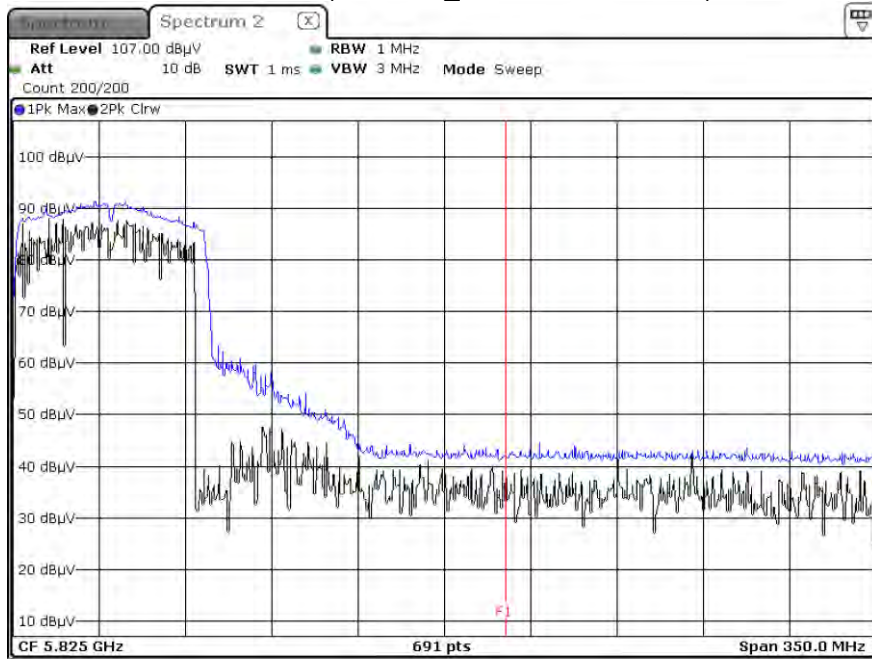
Peak Result (802.11n_HT40, Ch.142, X-H)



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



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

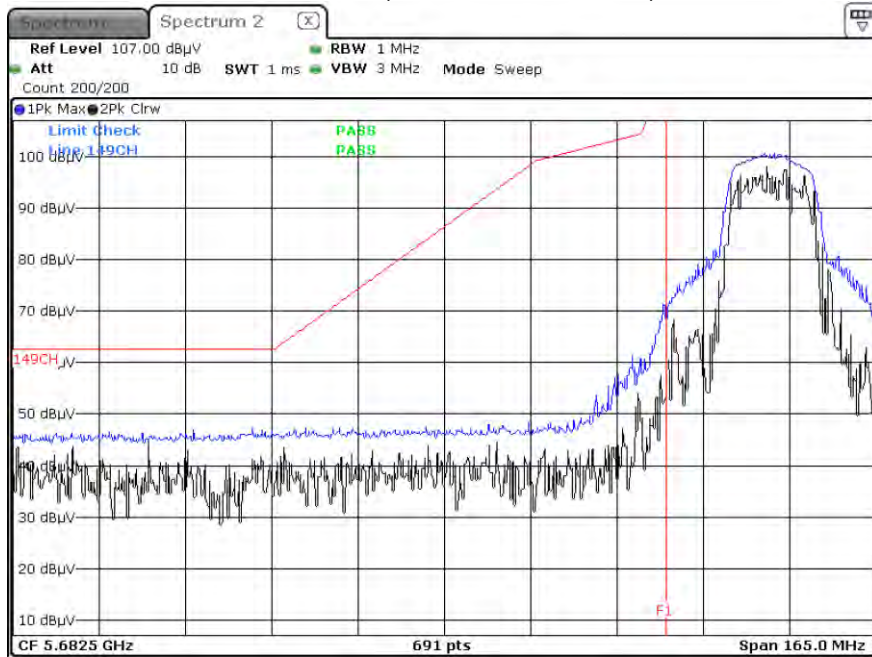


Note :

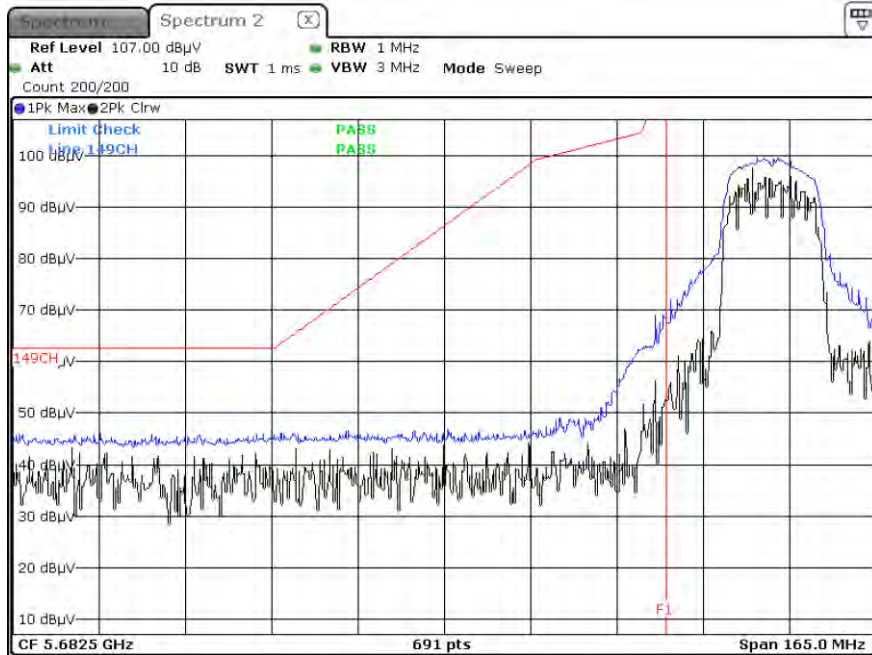
1. Only the worst case plots for Radiated Restricted Band Edge.
2. Red line : 5850 MHz
3. Ambient Noise (Because of ambient noise, We attached only the worst plot without a data table)

Test Plots(UNII 3)

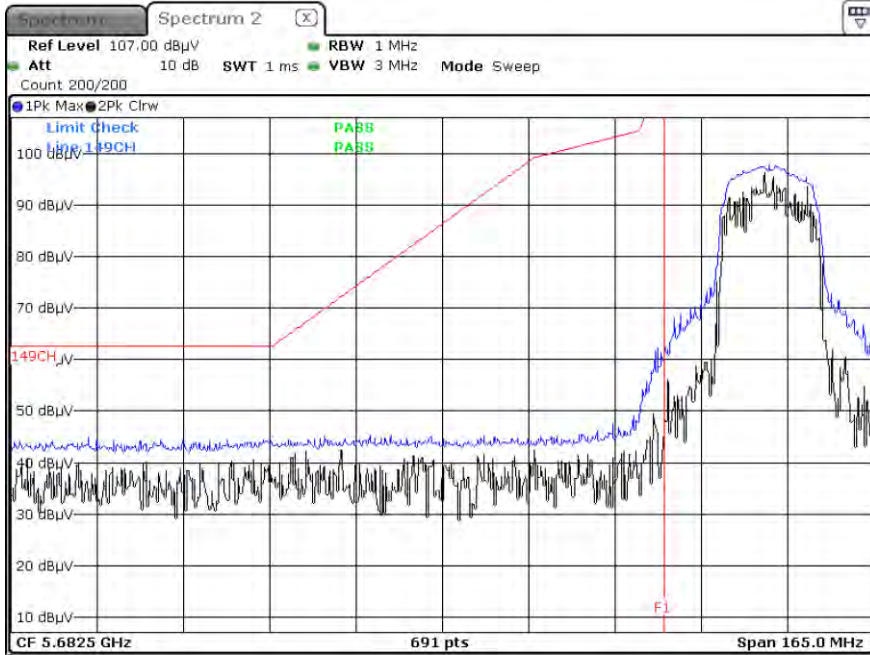
Peak Result (802.11a, Ch.149, X-H)



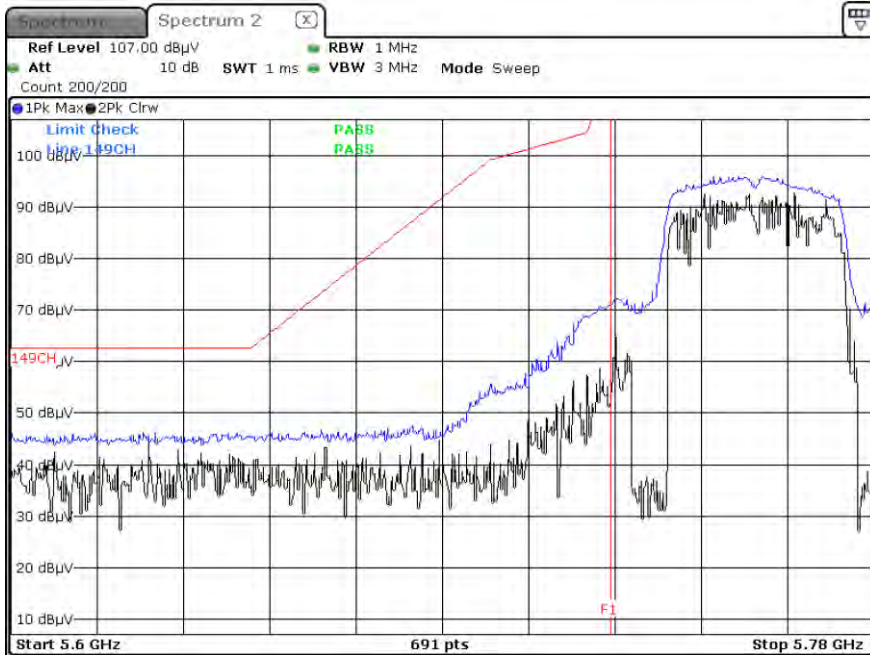
Peak Result (802.11n_HT20, Ch.149, X-H)



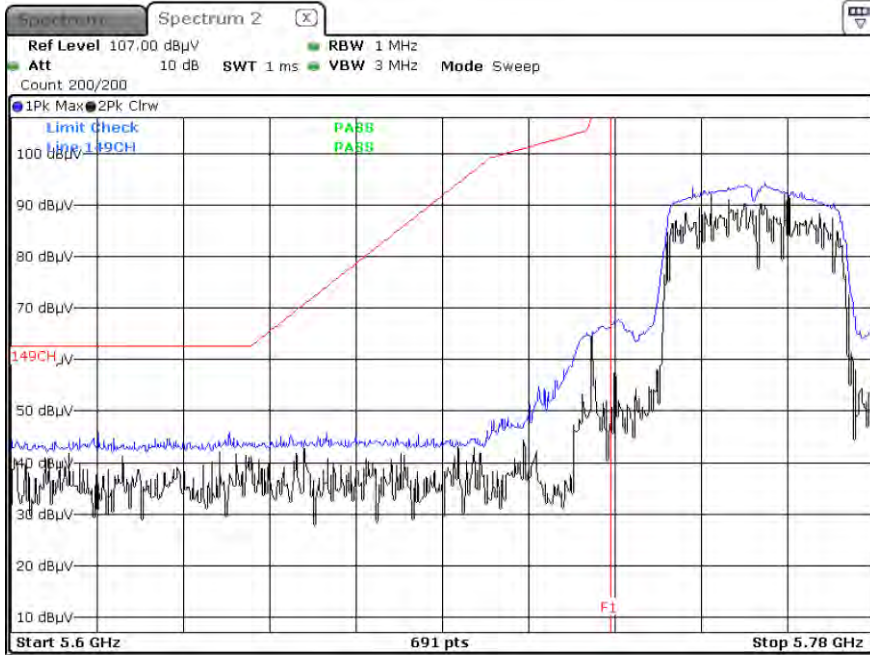
Peak Result (802.11ac_VHT20, Ch.149, X-H)



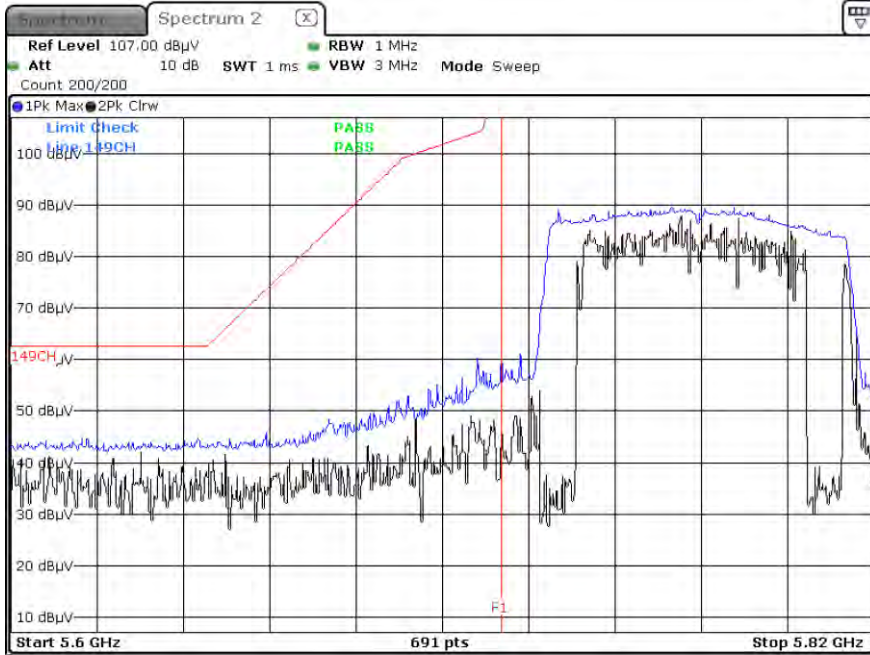
Peak Result (802.11n_HT40, Ch.151, X-H)



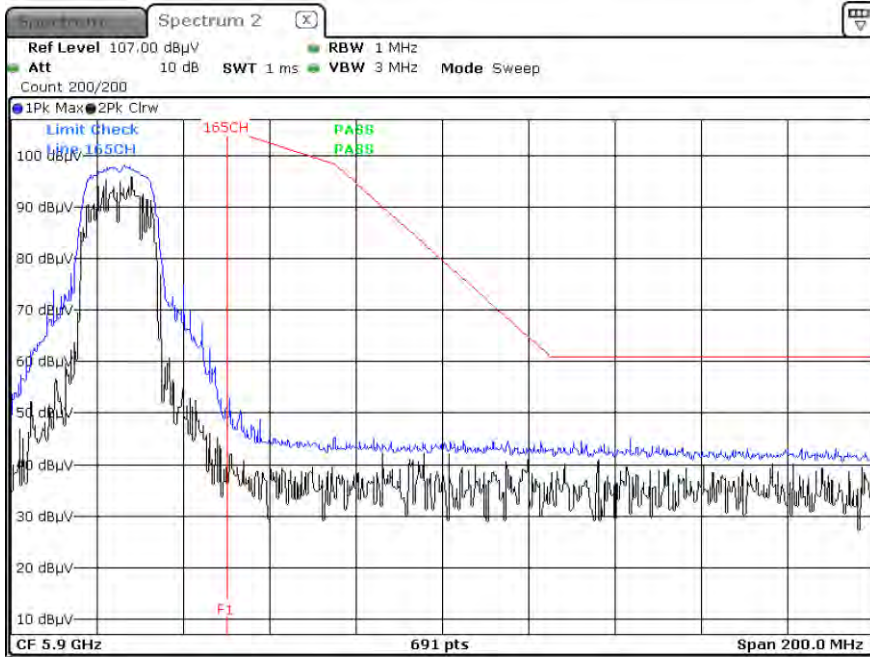
Peak Result (802.11ac_VHT40, Ch.151, X-H)



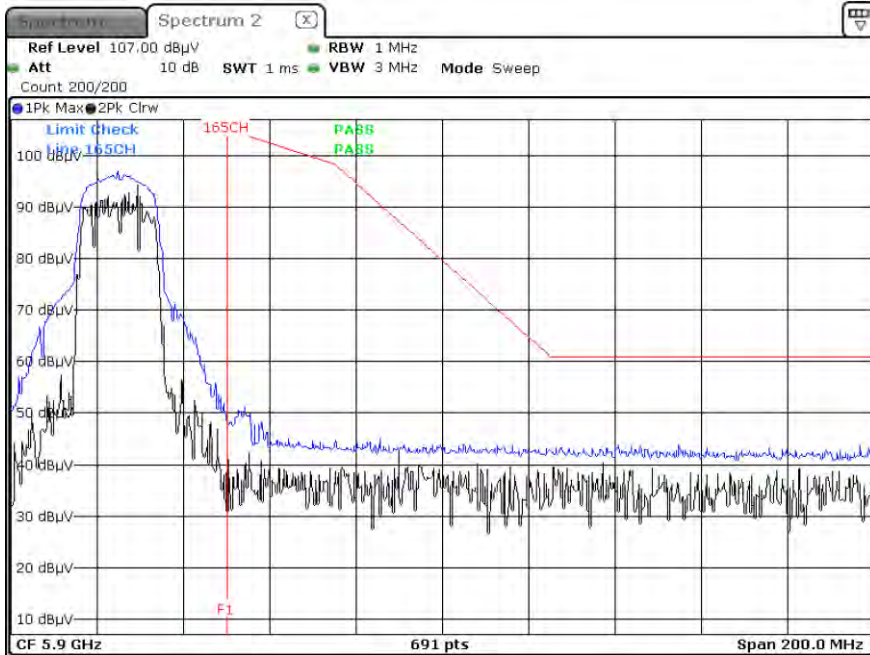
Peak Result (802.11ac_VHT80, Ch.155, X-H)



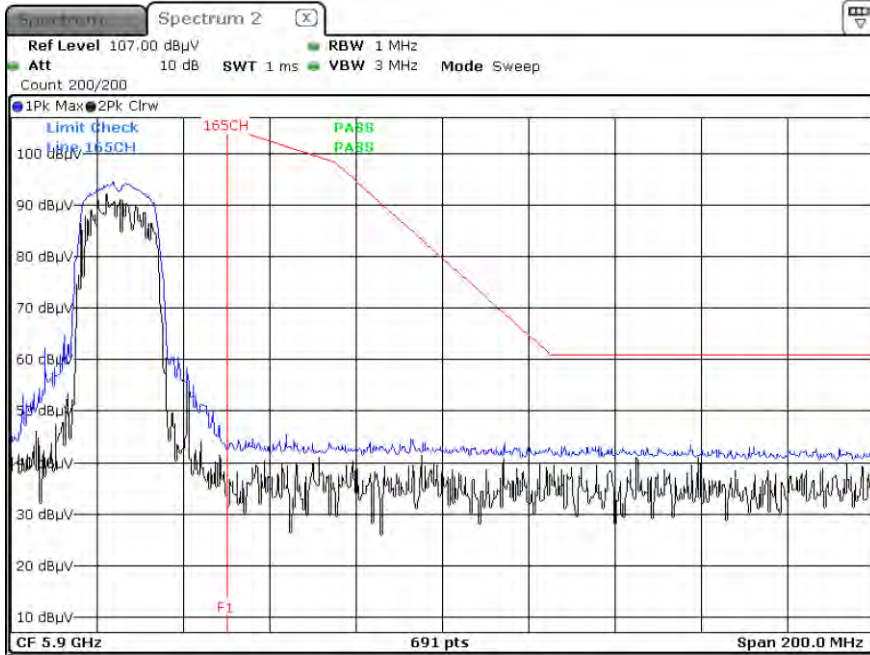
Peak Result (802.11a, Ch.165, X-H)



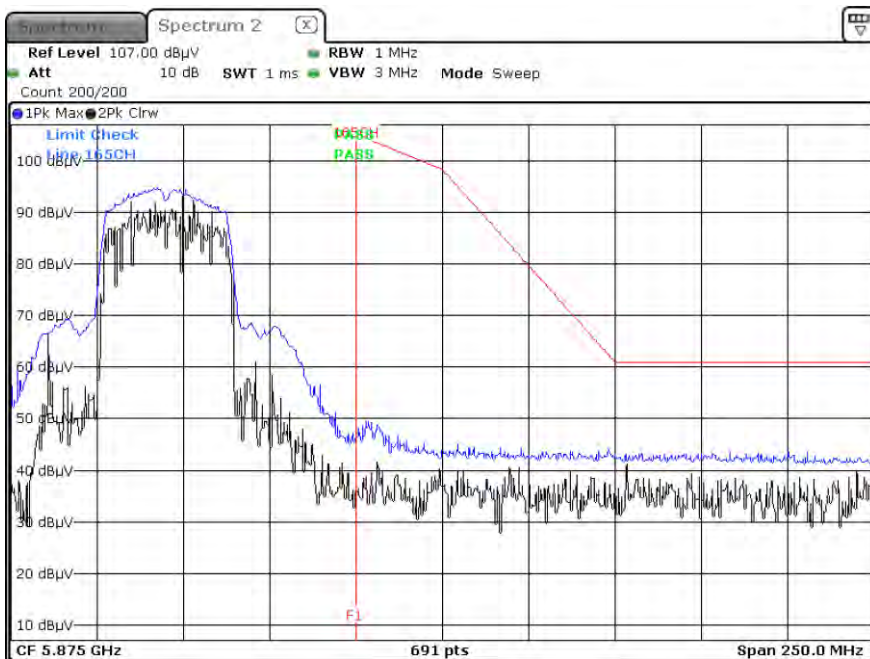
Peak Result (802.11n_HT20, Ch.165, X-H)



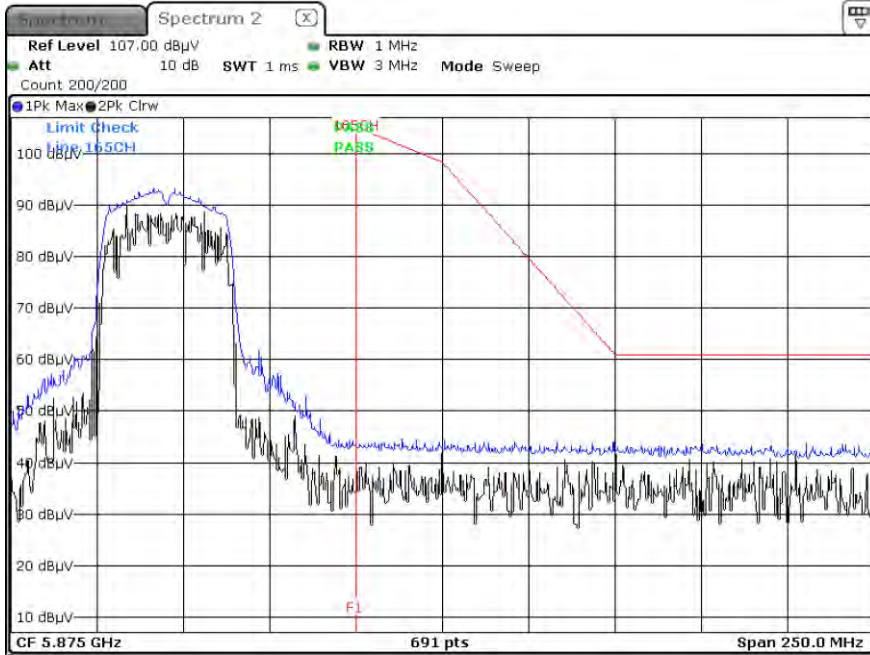
Peak Result (802.11ac_VHT20, Ch.165, X-H)



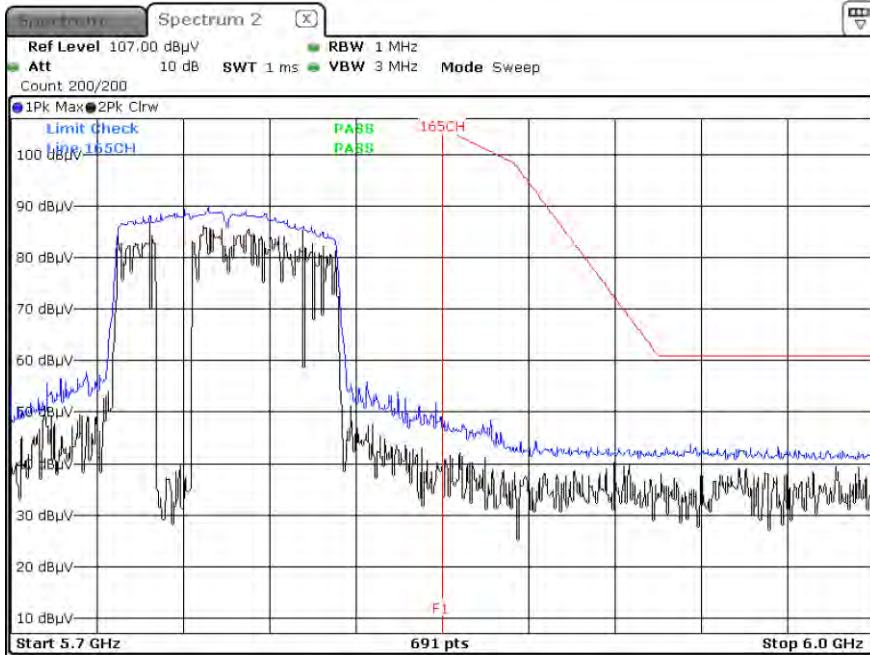
Peak Result (802.11n_HT40, Ch.159, X-H)



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



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



10.10 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

WLAN 5G_L1

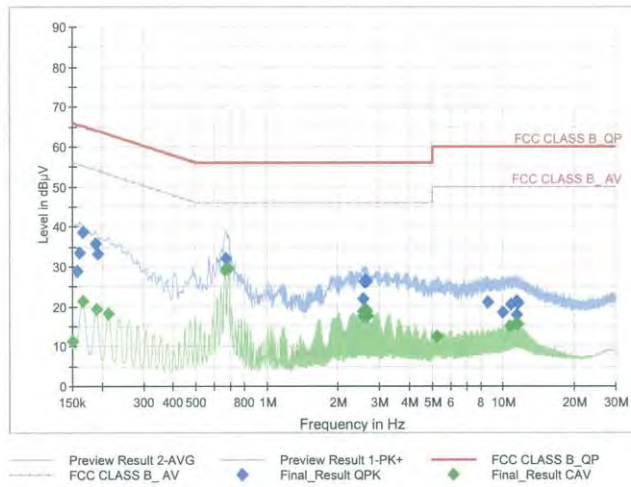
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Test Report

Common Information

EUT : SM-A136U
 Manufacturer : SAMSUNG
 Test Site: SHIELD ROOM
 Operating Conditions : WLAN 5G MODE_L1

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1568	28.96	65.63	36.67	9.000	L1	OFF	9.6
0.1613	33.44	65.40	31.96	9.000	L1	OFF	9.6
0.1658	38.56	65.17	26.61	9.000	L1	OFF	9.6
0.1883	35.90	64.11	28.21	9.000	L1	OFF	9.6
0.1928	33.26	63.92	30.66	9.000	L1	OFF	9.6
0.6733	31.88	56.00	24.12	9.000	L1	OFF	9.7
2.5588	21.99	56.00	34.01	9.000	L1	OFF	9.8
2.5678	18.70	56.00	37.30	9.000	L1	OFF	9.8
2.5790	26.35	56.00	29.65	9.000	L1	OFF	9.8
2.6015	26.29	56.00	29.71	9.000	L1	OFF	9.8
2.6263	26.43	56.00	29.57	9.000	L1	OFF	9.8
2.6488	26.29	56.00	29.71	9.000	L1	OFF	9.8
8.6338	21.07	60.00	38.93	9.000	L1	OFF	10.0
10.0018	18.36	60.00	41.64	9.000	L1	OFF	10.1
10.7398	20.52	60.00	39.48	9.000	L1	OFF	10.1
11.4238	21.24	60.00	38.76	9.000	L1	OFF	10.1
11.4418	17.98	60.00	42.02	9.000	L1	OFF	10.1
11.4710	20.78	60.00	39.22	9.000	L1	OFF	10.1

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WLAN 5G_L1

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Final_Result_CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	11.15	56.00	44.85	9.000	L1	OFF	9.6
0.1658	21.37	55.17	33.80	9.000	L1	OFF	9.6
0.1905	19.25	54.02	34.76	9.000	L1	OFF	9.6
0.2130	18.30	53.09	34.79	9.000	L1	OFF	9.6
0.6620	29.18	46.00	16.82	9.000	L1	OFF	9.7
0.6868	29.51	46.00	16.49	9.000	L1	OFF	9.7
2.5543	17.95	46.00	28.35	9.000	L1	OFF	9.8
2.5790	18.61	46.00	27.39	9.000	L1	OFF	9.8
2.6015	19.30	46.00	26.70	9.000	L1	OFF	9.8
2.6263	19.15	46.00	26.85	9.000	L1	OFF	9.8
2.6488	18.67	46.00	27.33	9.000	L1	OFF	9.8
2.6735	17.51	46.00	28.49	9.000	L1	OFF	9.8
5.2745	12.31	50.00	37.69	9.000	L1	OFF	9.9
10.6655	14.86	50.00	35.14	9.000	L1	OFF	10.1
11.3990	15.46	50.00	34.54	9.000	L1	OFF	10.1
11.4238	15.85	50.00	34.15	9.000	L1	OFF	10.1
11.4463	15.55	50.00	34.45	9.000	L1	OFF	10.1
11.4710	15.46	50.00	34.54	9.000	L1	OFF	10.1

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Conducted Emissions (Line 2)

WLAN 5G_N

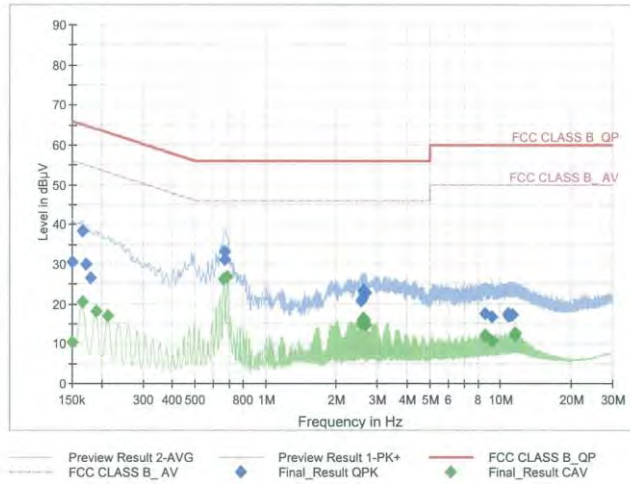
1 / 2

Test Report

Common Information

EUT : SM-A136U
 Manufacturer : SAMSUNG
 Test Site: SHIELD ROOM
 Operating Conditions : WLAN 5G MODE_N

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	30.60	66.00	35.40	9.000	N	OFF	9.6
0.1658	38.38	65.17	26.79	9.000	N	OFF	9.6
0.1725	29.95	64.84	34.89	9.000	N	OFF	9.6
0.1793	26.66	64.52	37.86	9.000	N	OFF	9.6
0.6688	33.17	56.00	22.83	9.000	N	OFF	9.6
0.6733	31.15	56.00	24.85	9.000	N	OFF	9.6
2.5543	20.90	56.00	35.10	9.000	N	OFF	9.8
2.5768	21.48	56.00	34.52	9.000	N	OFF	9.8
2.6015	23.30	56.00	32.70	9.000	N	OFF	9.8
2.6263	22.83	56.00	33.17	9.000	N	OFF	9.8
2.6488	22.60	56.00	33.40	9.000	N	OFF	9.8
2.6735	22.83	56.00	33.17	9.000	N	OFF	9.8
8.6090	17.69	60.00	42.31	9.000	N	OFF	10.0
9.2255	16.87	60.00	43.13	9.000	N	OFF	10.0
10.7375	17.58	60.00	42.42	9.000	N	OFF	10.1
10.7645	16.93	60.00	43.07	9.000	N	OFF	10.1
10.9963	17.00	60.00	43.00	9.000	N	OFF	10.1
11.2370	17.40	60.00	42.60	9.000	N	OFF	10.1

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WLAN 5G_N

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Final Result_CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	10.25	56.00	45.75	9.000	N	OFF	9.6
0.1658	20.55	55.17	34.62	9.000	N	OFF	9.6
0.1905	18.23	54.02	35.78	9.000	N	OFF	9.6
0.2130	16.95	53.09	36.14	9.000	N	OFF	9.6
0.6620	26.39	46.00	19.61	9.000	N	OFF	9.6
0.6868	26.84	46.00	19.16	9.000	N	OFF	9.6
2.5543	15.02	46.00	30.98	9.000	N	OFF	9.8
2.5790	15.77	46.00	30.23	9.000	N	OFF	9.8
2.6015	16.55	46.00	29.45	9.000	N	OFF	9.8
2.6263	16.44	46.00	29.56	9.000	N	OFF	9.8
2.6488	15.79	46.00	30.21	9.000	N	OFF	9.8
2.6735	14.59	46.00	31.41	9.000	N	OFF	9.8
8.5865	11.87	50.00	38.13	9.000	N	OFF	10.0
8.6090	12.20	50.00	37.80	9.000	N	OFF	10.0
8.6338	12.23	50.00	37.77	9.000	N	OFF	10.0
9.2255	10.82	50.00	39.18	9.000	N	OFF	10.0
11.4710	12.78	50.00	37.22	9.000	N	OFF	10.1
11.5903	12.12	50.00	37.88	9.000	N	OFF	10.1

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11. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/23/2022	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	06/17/2022	Annual
Temperature Chamber	SU-642	ESPAC	0093008124	03/15/2022	Annual
Signal Analyzer	N9030A	Agilent	MY49431210	01/11/2022	Annual
Power Measurement Set	OSP 120	Rohde & Schwarz	101231	07/02/2022	Annual
Power Meter	N1911A	Agilent	MY45100523	04/08/2022	Annual
Power Sensor	N1921A	Keysight	MY57820067	04/08/2022	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/10/2021	Annual
Power Splitter	11667B	Hewlett Packard	05001	05/20/2022	Annual
DC Power Supply	E3632A	Hewlett Packard	MY50360067	02/16/2022	Annual
Attenuator(10 dB)	8493C	Hewlett Packard	07560	06/18/2022	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	HCT CO., LTD.	N/A	N/A	N/A

Note:

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

Radiated Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	EM1000	Audix	060520	N/A	N/A
Turn Table	N/A	Audix	N/A	N/A	N/A
Bluetooth Tester	TC-3000B	TESCOM	3000B670110	12/18/2021	Annual
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/19/2022	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	760	02/22/2023	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	02299	05/19/2022	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170541	11/29/2021	Biennial
Spectrum Analyzer	FSV40-N	Rohde & Schwarz	102168	07/05/2022	Annual
Signal Analyzer	N9030A	Agilent	MY49431210	01/11/2022	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/24/2022	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/24/2022	Annual
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/06/2022	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/08/2022	Annual
High Pass Filter	WHK3.0/18G-10EF	Wainwright Instruments	8	02/03/2022	Annual
High Pass Filter	WHKX8-6090-7000-18000-40SS	Wainwright Instruments	25	02/03/2022	Annual
Attenuator (3 dB)	18B-03	Api tech.	1	02/03/2022	Annual
Attenuator(10 dB)	8493C-10	Agilent	08285	02/03/2022	Annual
Power Amplifier	CBLU1183540	CERNEX	22964	02/03/2022	Annual
Power Amplifier	CBL06185030	CERNEX	22965	02/03/2022	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/04/2021	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	Annual

Note:

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

12. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2110-FC012-P