

# FCC / IC UNII REPORT

## Certification

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**Date of Issue:**  
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**Report No.:** HCT-RF-1902-FI004

<b>FCC ID:</b>	<b>BEJ-WK7</b>
<b>IC:</b>	<b>2703H-WK7</b>
<b>APPLICANT:</b>	<b>LG Electronics Inc.</b>

**Model:** WK7  
**Additional Model:** WK7W  
**EUT Type:** ThinQ Speaker  
**Modulation type** OFDM  
**FCC Classification:** Unlicensed National Information Infrastructure(UNII)  
**FCC Rule Part(s):** Part 15.407  
**ISED Rule Part(s):** RSS-247 Issue 2 (February 2017), RSS-Gen Issue 5(April 2018)

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 / IC Rules under normal use and maintenance.



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## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1902-FI004	February 11, 2019	- First Approval Report

# Table of Contents

1. GENERAL INFORMATION .....	4 #
EUT DESCRIPTION .....	4 #
2. MAXIMUM OUTPUT POWER .....	5 #
3. TEST METHODOLOGY .....	6 #
EUT CONFIGURATION .....	6 #
EUT EXERCISE.....	6 #
GENERAL TEST PROCEDURES.....	6 #
DESCRIPTION OF TEST MODES .....	6 #
4. INSTRUMENT CALIBRATION .....	7 #
5. FACILITIES AND ACCREDITATIONS.....	7 #
5.1 FACILITIES .....	7 #
5.2 EQUIPMENT.....	7 #
6. ANTENNA REQUIREMENTS.....	7 #
7. MEASUREMENT UNCERTAINTY .....	8 #
8. DESCRIPTION OF TESTS .....	9 #
9. SUMMARY OF TEST RESULTS .....	2 8 #
9.1 FCC Part.....	2 8 #
9.2 IC Part .....	2 9 #
10. TEST RESULT .....	3 0 #
10.1 DUTY CYCLE .....	3 0 #
10.2 26DB BANDWIDTH.....	3 2 #
10.3 6DB BANDWIDTH.....	3 7 #
10.4 OUTPUT POWER MEASUREMENT .....	4 0 #
10.4.1 Maximum Conducted Output Power.....	4 0 #
10.4.2 Maximum E.I.R.P (Only IC).....	4 2 #
10.5 POWER SPECTRAL DENSITY .....	4 4 #
10.6 FREQUENCY STABILITY.....	4 9 #
10.6.1 20MHz BW .....	4 9 #
10.6.2 40MHz BW .....	5 1 #
10.6.3 80MHz BW .....	5 3 #
10.7 RADIATED SPURIOUS EMISSIONS.....	5 5 #
10.8 RADIATED RESTRICTED BAND EDGE.....	7 1 #
10.9 RECEIVER SPURIOUS EMISSIONS.....	8 4 #
10.10 POWERLINE CONDUCTED EMISSIONS .....	8 5 #
11. LIST OF TEST EQUIPMENT .....	8 9 #
12. ANNEX A_ TEST SETUP PHOTO .....	9 1 #

# 1. GENERAL INFORMATION

## EUT DESCRIPTION

Model	WK7	
Additional Model	WK7W	
EUT Type	ThinQ Speaker	
Power Supply	AC 100 ~ 240 V	
Modulation Type	OFDM : 802.11a, 802.11n, 802.11ac	
Frequency Range (MHz)	UNII 1	20MHz BW : 5180 - 5240 40MHz BW : 5190 - 5230 80MHz BW : 5210
	UNII 3	20MHz BW : 5745 - 5825 40MHz BW : 5755 - 5795 80MHz BW : 5775
Antenna Type	FPCB Antenna	
Antenna Peak gain (dBi)	UNII 1 : -0.60 / UNII 3 : 0.87	
Straddle channel	Not Supported	
TDWR Band	Not Supported	
Dynamic Frequency Selection	Not Supported	
Date(s) of Tests	January 17, 2019 ~ February 11, 2019	
PMN (Product Marketing Number)	ThinQ Speaker	
HVIN (Hardware Version Identification Number)	WK7	
FVIN (Firmware Version Identification Number)	1.0	
HMN (Host Marketing Name)	N/A	

## 2. MAXIMUM OUTPUT POWER

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

Band	Mode	RF Output Power	
		(dBm)	(W)
UNII1	802.11a	14.46	0.028
	802.11n (HT20)	12.37	0.017
	802.11n (HT40)	11.90	0.015
	802.11ac (VHT20)	12.35	0.017
	802.11ac (VHT40)	11.96	0.016
	802.11ac (VHT80)	6.79	0.005
UNII3	802.11a	15.68	0.037
	802.11n (HT20)	13.65	0.023
	802.11n (HT40)	13.46	0.022
	802.11ac (VHT20)	13.63	0.023
	802.11ac (VHT40)	13.34	0.022
	802.11ac (VHT80)	12.11	0.016

### 3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04 dated May 2, 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. For 802.11ac, KDB644545 D03 v01 dated August 14, 2014

#### EUT CONFIGURATION

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

#### EUT EXERCISE

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

#### GENERAL TEST PROCEDURES

##### Conducted Emissions

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

##### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 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 8 of ANSI C63.10. (Version: 2013)

##### Conducted Antenna Terminal

See Section from 8.1 to 8.4.( KDB 789033 D02 v02r01)

#### DESCRIPTION OF TEST MODES

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

## 4. INSTRUMENT CALIBRATION

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

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

## 5. FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,

Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

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

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

For ISED, test facility was accepted dated December 20, 2016(Registration Number: 5944A-3)

### 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."

\* The antennas of this E.U.T are permanently attached.

\* The E.U.T Complies with the requirement of §15.203, §15.407 / RSS-Gen

## 7. MEASUREMENT UNCERTAINTY

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

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

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

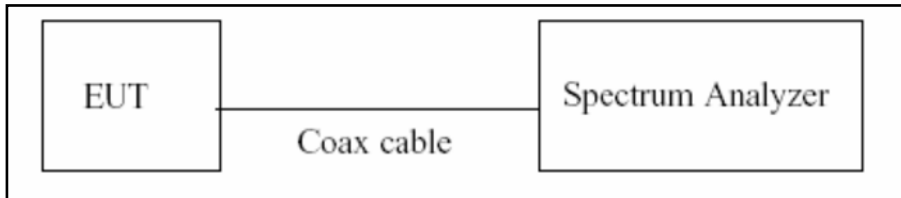
Parameter	Expanded Uncertainty ( $\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.71



## 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.

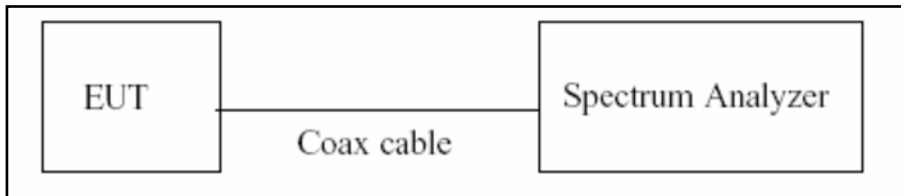
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ( $\geq$  RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure  $T_{total}$  and  $T_{on}$
8. Calculate Duty Cycle =  $T_{on} / T_{total}$  and Duty Cycle Factor =  $10 \cdot \log(1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

## 8.2. Bandwidth Measurement

### Limit

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

### Test Configuration



### Test Procedure(26dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

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

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

### Test Procedure(6dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

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

1. RBW = 100 kHz
2. VBW  $\geq$  3\*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**

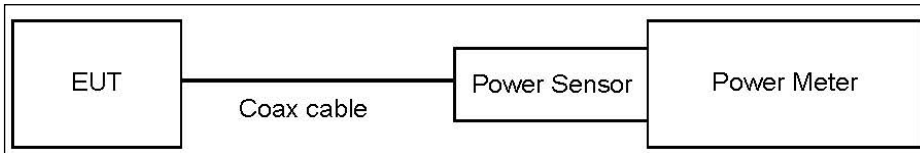
**Limit**

Band	FCC Limit
UNII 1	- Master : Not exceed 1 W(=30dBm) - Slave : Not exceed 250 mW(=23.98 dBm)
UNII 3	Not exceed 1 W(=30dBm)

Band	IC Limit
UNII 1	Maximum e.i.r.p. shall not exceed 200 mW(=23dBm) or $10 + 10 \log_{10}(BW)$ dBm (BW = 99% emission bandwidth in megahertz)
UNII 3	Not exceed 1 W(=30dBm)

**Test Configuration**

Power Meter



**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.

**Sample Calculation**

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

**Note**

1. Spectrum reading values are not plot data.

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

2. Spectrum offset = Attenuator loss + Cable loss

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

Band	Loss(dB)
UNII 1	21.88
UNII 3	21.88

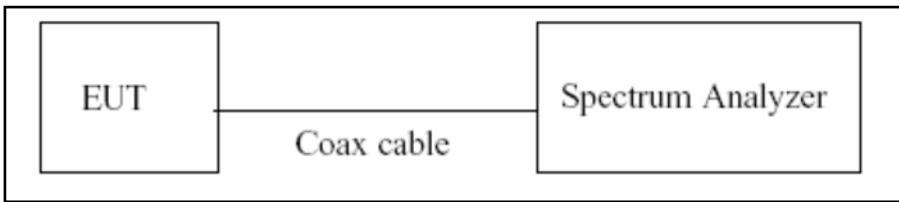
(Actual value of loss for the attenuator and cable combination)

**8.4. Power Spectral Density**

**Limit**

Band	Limit
UNII 1	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\*span/RBW.
5. Sweep time = auto.
6. Detector = RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
7. Do not use sweep triggering. Allow the sweep to “free run”.
8. Trace average at least 100 traces in power averaging(RMS) mode
9. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
10. If Method SA-2 was used, add  $10 \log(1/x)$ , where x is the duty cycle, to the peak of the spectrum.

**Sample Calculation**

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

**Note**

1. Spectrum reading values are not plot data.

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

2. Spectrum offset = Attenuator loss + Cable loss

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

Band	Loss(dB)
UNII 1	21.88
UNII 3	21.88

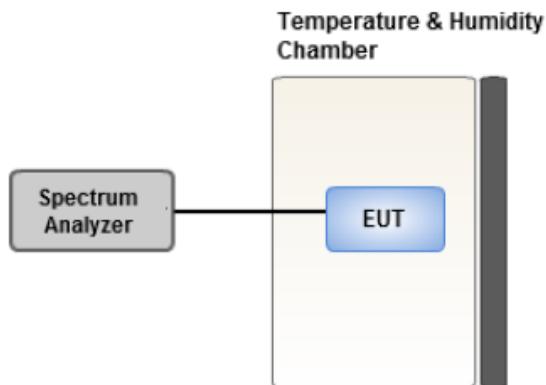
(Actual value of loss for the attenuator and cable combination)

## 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.

## 8.6. AC Power line Conducted Emissions

### Limit

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

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

\*Decreases with the logarithm of the frequency.

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

### Test Configuration

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

### Test Procedure

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

### Sample Calculation

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



**8.7. Radiated Test**

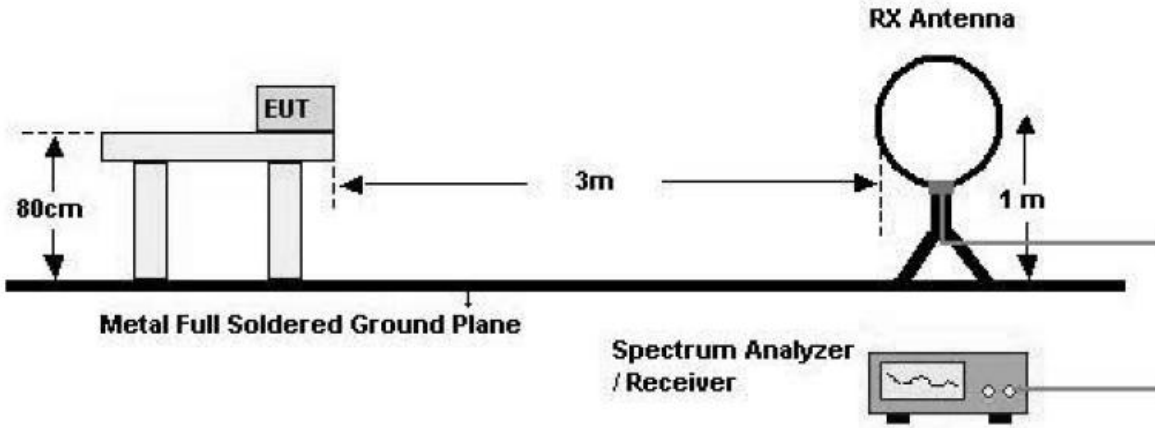
**Limit**

1. UNII 1: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
2. UNII 2A, 2C: All emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
3. UNII 3: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
4. All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Section 15.209.

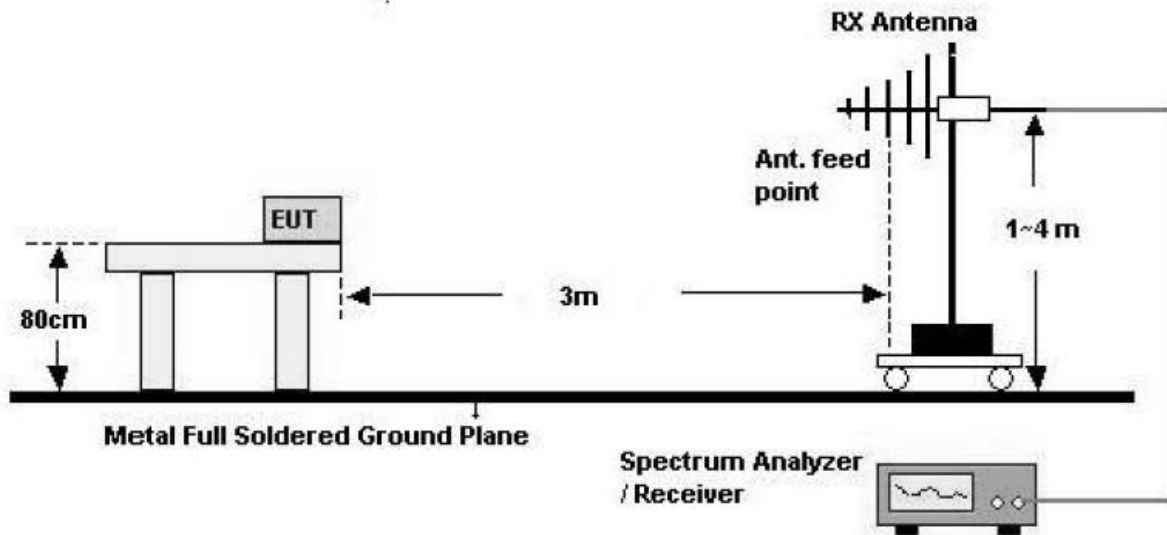
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Test Configuration**

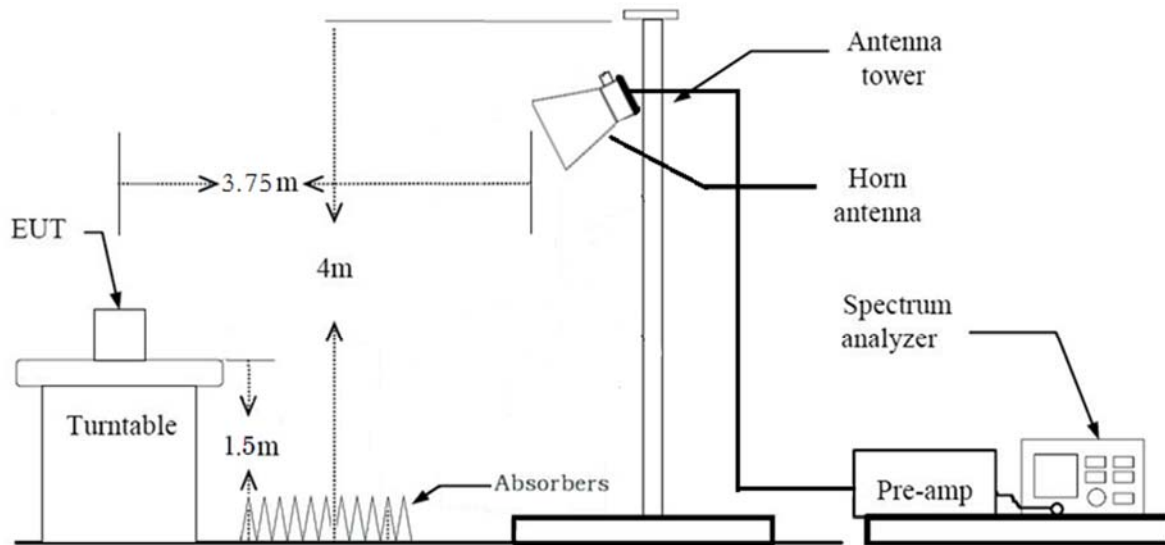
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz

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

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization 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) =  $40 \cdot \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$   
Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) =  $40 \cdot \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$   
Measurement Distance : 3 m
8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 9 kHz
  - VBW  $\geq 3 \cdot \text{RBW}$
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. The test results for below 30 MHz is correlated to an open site.  
The result on OATS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

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

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting

## (1) Measurement Type(Peak):

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

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

**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 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.

## 9. Spectrum Setting

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

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

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

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

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

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

11. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency

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

**Test Procedure of Radiated Restricted Band Edge**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting

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

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

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

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

- RBW = 1 MHz
- VBW(Duty cycle  $\geq$  98 percent) =  $\text{VBW} \leq \text{RBW}/100$ (i.e., 10 kHz) but not less than 10 Hz.
- VBW(Duty cycle is < 98 percent) =  $\text{VBW} \geq 1/T$ , 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 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of  $1/x$ , where  $x$  is the duty cycle.

10. Measured Frequency Range :

- 4500MHz ~ 5150MHz
- 5350MHz ~ 5460MHz
- 5460MHz ~ 5470MHz
- (75 MHz or more below the 5725MHz) ~ 5725MHz
- 5850MHz ~ (75 MHz or more above the 5850MHz)

11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + 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)
a	6	0.936	0.289	1000
802.11n(HT20)	MCS0	0.929	0.318	1000
802.11n(HT40)	MCS0	0.868	0.615	3000
802.11ac(VHT20)	MCS0	0.930	0.317	1000
802.11ac(VHT40)	MCS0	0.869	0.611	3000
802.11ac(VHT80)	MCS0	0.771	1.130	10000

**8.8. Receiver Spurious Emissions****Limit**

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

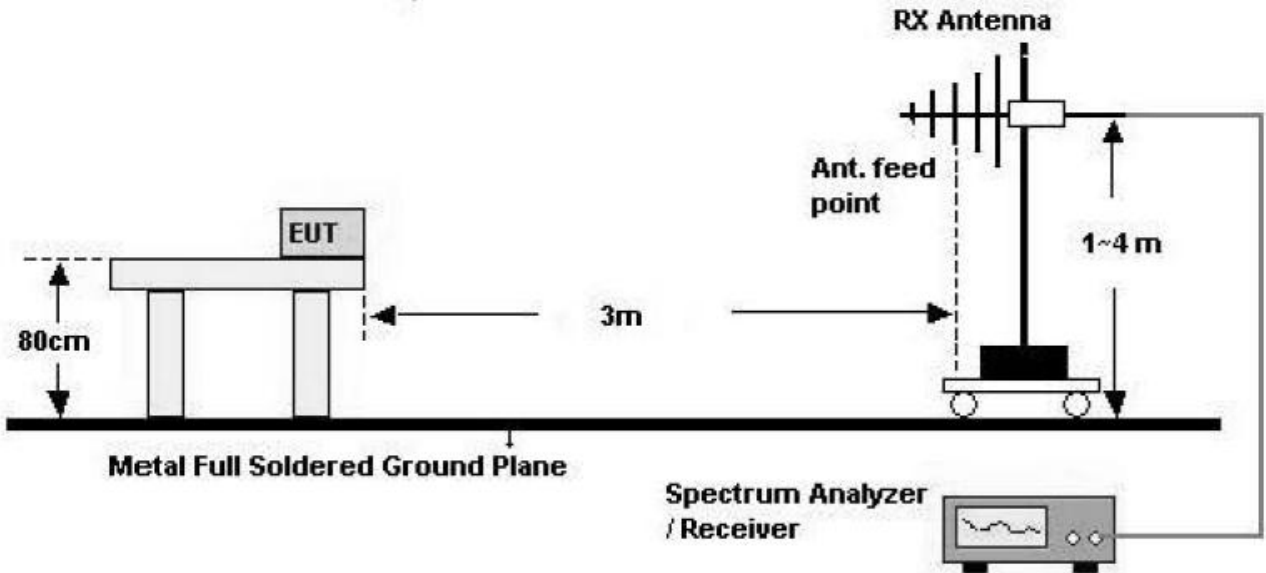
Note:

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

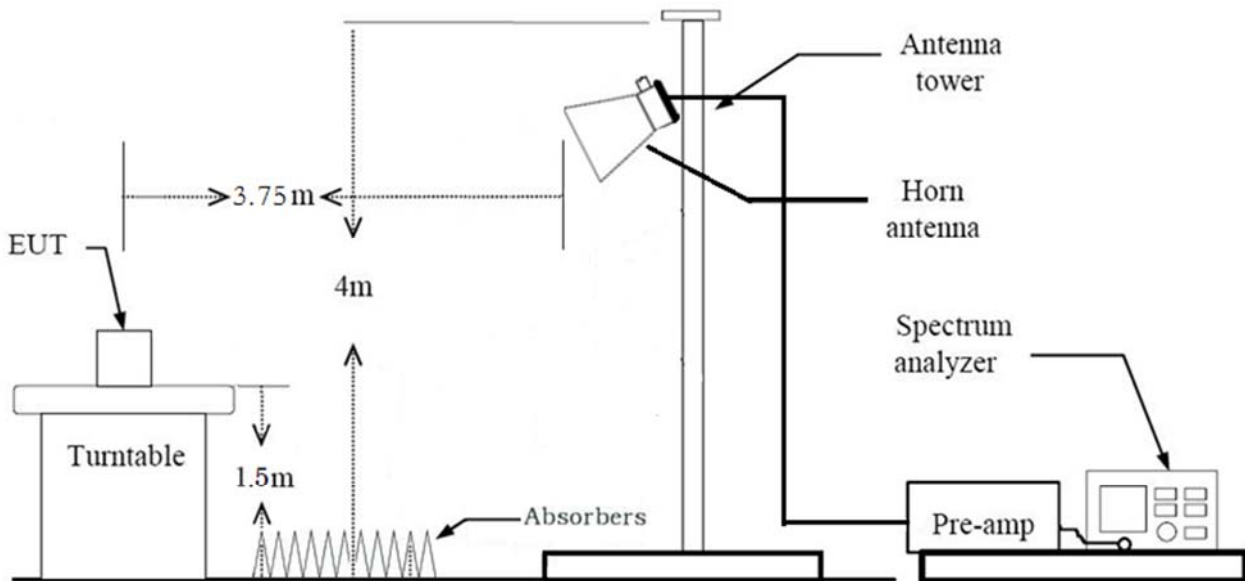


**Test Configuration**

30 MHz - 1 GHz



Above 1 GHz



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

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq 3 \cdot \text{RBW}$
  - (2) Measurement Type(Average):
    - We performed using a reduced video BW method was done with the analyzer in linear mode
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in secondsThe actual setting value of VBW = 1 kHz
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.
11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

**8.9. Worst case configuration and mode****Radiated test**

1. All modes of operation were investigated and the worst case configuration results are reported.
2. EUT Axis
  - Radiated Spurious Emissions : Y
  - Radiated Restricted Band Edge : Y
3. All datarate of operation were investigated and the worst case datarate results are reported
  - 802.11a : 6Mbps
  - 802.11n : MCS0
  - 802.11ac : MCS0

**Conducted test**

1. All datarate of operation were investigated and the worst case datarate results are reported
  - 802.11a : 18Mbps
  - 802.11n(HT20) : MCS2
  - 802.11n(HT40) : MCS0
  - 802.11ac(VHT20) : MCS2
  - 802.11ac(VHT40) : MCS0
  - 802.11ac(VHT80) : MCS0

## 9. SUMMARY OF TEST RESULTS

### 9.1 FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§15.407 (for Power Measurement)	N/A	Conducted	PASS
6 dB Bandwidth	§15.407(e)	>500 kHz (5725-5850 MHz)		PASS
Maximum Conducted Output Power	§15.407(a)(1)	< 250 mW(5150-5250 MHz) <1 W(5725-5850 MHz)		PASS
Peak Power Spectral Density	§15.407(a)(1),(5)	<11 dBm/ MHz (5150-5250 MHz) <30 dBm/500 kHz(5725-5850 MHz)		PASS
Frequency Stability	§15.407(g) §2.1055	Maintained within the band		PASS
Transmit Power Control (TPC)	§15.407(h)(1)	The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.		N/A (See Note1)
AC Conducted Emissions 150 kHz-30 MHz	15.207	<FCC 15.207 limits		N/A (See Note2)
Undesirable Emissions	§15.407(b)	<-27 dBm/MHz EIRP (UNII1) cf. Section 8.7 (UNII 3)	Radiated	PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	15.205, 15.407(b)(5), (6)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS

## 9.2 IC Part

Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
99% Bandwidth	RSS-GEN, 6.7	N/A	CONDUCTED	PASS
6 dB Bandwidth	RSS-247, 6.2.4.1	> 500 kHz (5725~5850 MHz)		PASS
Maximum Conducted Output Power, & Maximum e.i.r.p	RSS-247, 6.2	<ul style="list-style-type: none"> <li>■ Maximum e.i.r.p. shall not exceed 200 mW(=23dBm) or 10 + 10 log10(BW)dBm</li> <li>■ &lt;1 W(5725-5850 MHz)</li> </ul>		PASS
Power Spectral Density	RSS-247 6.2	<ul style="list-style-type: none"> <li>&lt;11 dBm/ MHz (5150-5250 MHz)</li> <li>&lt;30 dBm/500 kHz(5725-5850 MHz)</li> </ul>		PASS
AC Conducted Emissions 150 kHz-30 MHz	RSS-GEN, 8.8	cf. Section 8.6		N/A (See Note2)
Undesirable Emissions	RSS-247 6.2	<ul style="list-style-type: none"> <li>■ &lt;-27 dBm/MHz EIRP (UNII1)</li> <li>■ cf. Section 8.7 (UNII 3)</li> </ul>	RADIATED	PASS
				PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	RSS-GEN, 8.9	cf. Section 8.7		PASS
Receiver Spurious Emissions	RSS-GEN, 7	cf. Section 8.8		PASS

**Note:**

1. TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW

## 10. TEST RESULT

### 10.1 DUTY CYCLE

Mode	Data Rate(Mbps)	Duty Cycle	Duty Cycle Factor(dB)
802.11a	6	0.936	0.289
	9	0.904	0.439
	12	0.878	0.567
	18	0.829	0.813
	24	0.787	1.043
	36	0.722	1.416
	48	0.661	1.797
	54	0.642	1.924
802.11n(HT20)	MCS0	0.929	0.318
	MCS1	0.872	0.596
	MCS2	0.825	0.836
	MCS3	0.782	1.071
	MCS4	0.717	1.447
	MCS5	0.665	1.775
	MCS6	0.651	1.865
	MCS7	0.623	2.053
802.11n(HT40)	MCS0	0.868	0.615
	MCS1	0.778	1.093
	MCS2	0.714	1.465
	MCS3	0.662	1.794
	MCS4	0.569	2.450
	MCS5	0.453	3.439
	MCS6	0.422	3.743
	MCS7	0.359	4.447
802.11ac(VHT20)	MCS0	0.930	0.317
	MCS1	0.873	0.592
	MCS2	0.826	0.831
	MCS3	0.787	1.039
	MCS4	0.718	1.441
	MCS5	0.673	1.720

Mode	Data Rate(Mbps)	Duty Cycle	Duty Cycle Factor(dB)
	MCS0	0.930	0.317
	MCS1	0.873	0.592
	MCS2	0.826	0.831
802.11ac(VHT20)	MCS3	0.787	1.039
	MCS4	0.718	1.441
	MCS5	0.673	1.720
	MCS6	0.654	1.845
	MCS7	0.631	2.002
	MCS8	0.580	2.363
802.11ac(VHT40)	MCS0	0.869	0.611
	MCS1	0.781	1.071
	MCS2	0.713	1.469
	MCS3	0.669	1.747
	MCS4	0.556	2.553
	MCS5	0.473	3.253
	MCS6	0.434	3.621
	MCS7	0.422	3.743
	MCS8	0.365	4.377
	MCS9	0.355	4.503
802.11ac(VHT80)	MCS0	0.771	1.130
	MCS1	0.652	1.859
	MCS2	0.544	2.644
	MCS3	0.444	3.529
	MCS4	0.356	4.488
	MCS5	0.310	5.082
	MCS6	0.301	5.209
	MCS7	0.290	5.369
	MCS8	0.256	5.916
	MCS9	0.268	5.718

## 10.2 26DB BANDWIDTH

802.11a Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	19.55	16.493
5200	40	19.47	16.475
5240	48	19.58	16.497
5745	149	24.56	16.680
5785	157	24.98	16.732
5825	165	24.38	16.642

802.11n(HT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	19.97	17.560
5200	40	20.05	17.577
5240	48	19.96	17.575
5745	149	20.47	17.604
5785	157	19.90	17.607
5825	165	19.97	17.602

802.11n(HT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.32	36.229
5230	46	40.33	36.221
5755	151	42.47	36.282
5795	159	42.52	36.274

802.11ac(VHT20) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5180	36	20.03	17.579
5200	40	20.05	17.568
5240	48	19.93	17.549
5745	149	20.04	17.626
5785	157	20.07	17.604
5825	165	20.05	17.632



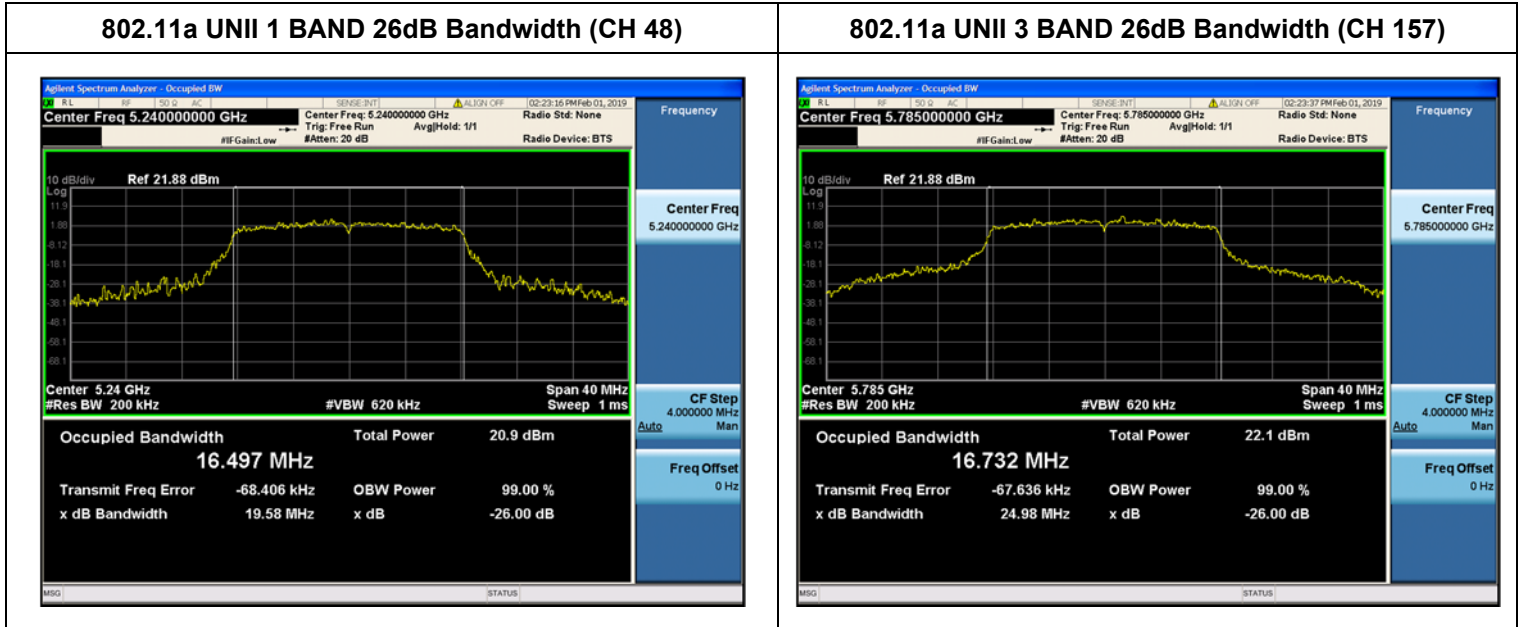
802.11ac(VHT40) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5190	38	40.21	36.127
5230	46	40.50	36.126
5755	151	40.43	36.193
5795	159	40.25	36.172

802.11ac(VHT80) Mode		26dB Bandwidth [MHz]	99% bandwidth [MHz]
Frequency [MHz]	Channel No.		
5210	42	81.30	75.816
5775	155	81.68	75.918

**Test Plots(802.11a)**

**Note:**

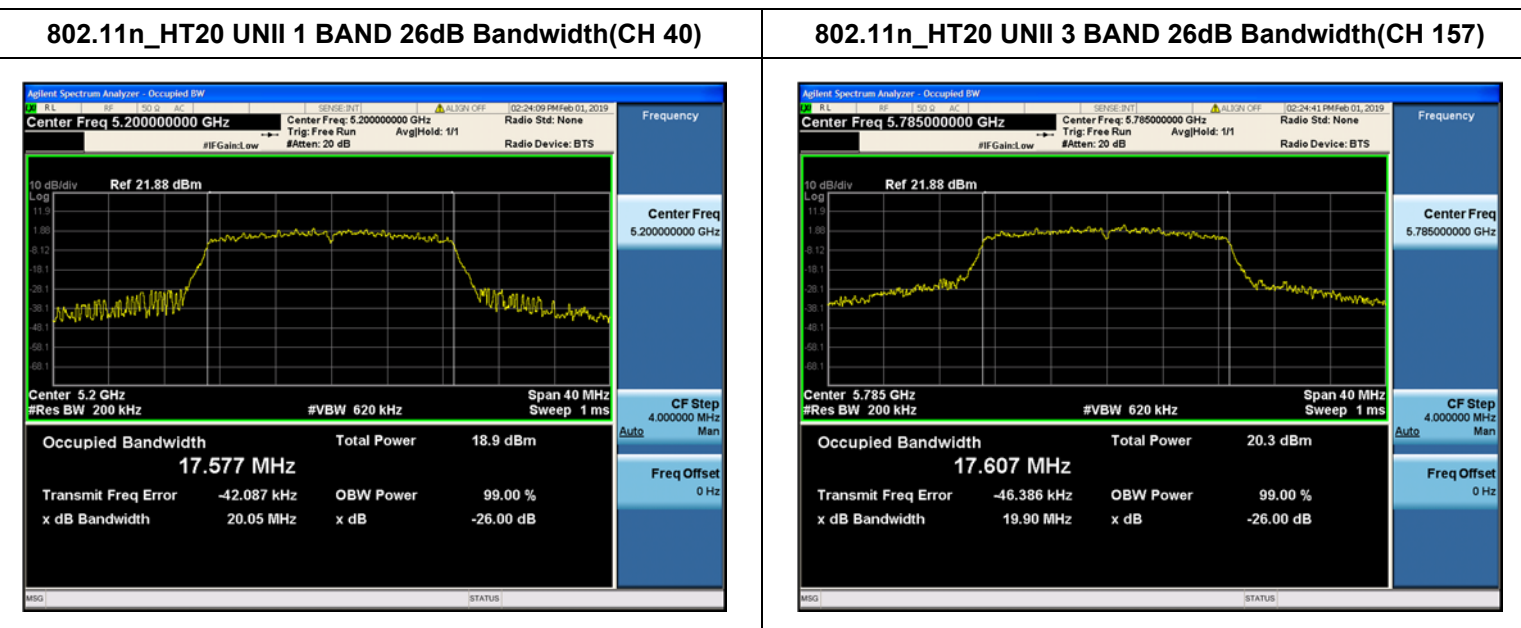
In order to simplify the report, attached plots were only the most wide channel.



**Test Plots(802.11n(HT20))**

**Note:**

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

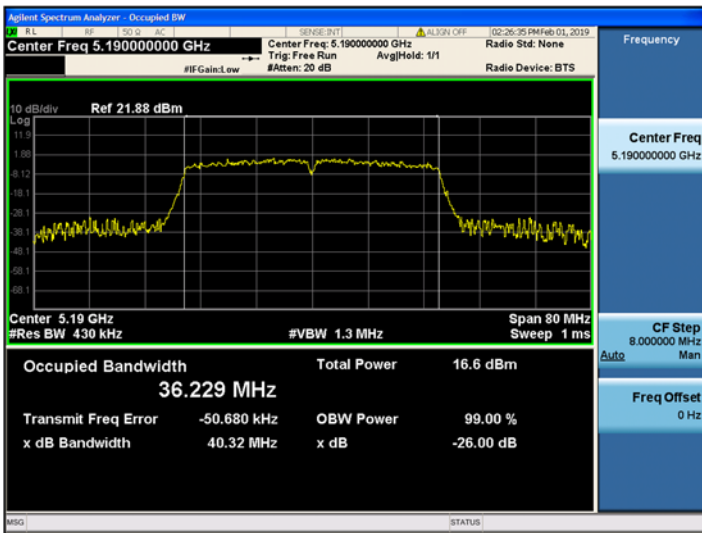


**Test Plots(802.11n(HT40))**

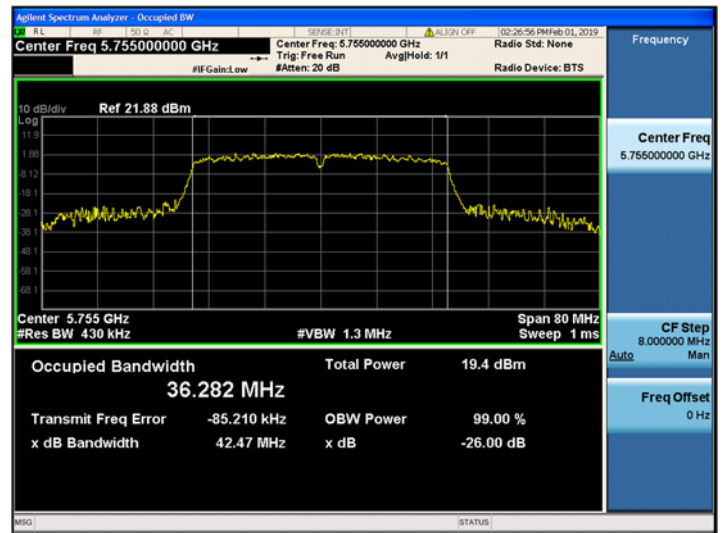
**Note:**

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

**802.11n\_HT40 UNII 1 BAND 26dB Bandwidth(CH 38)**



**802.11n\_HT40 UNII 3 BAND 26dB Bandwidth (CH 151)**

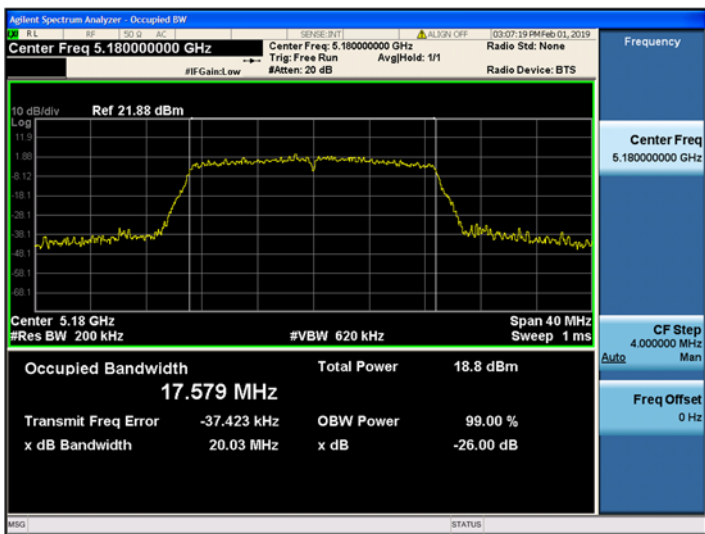


**Test Plots(802.11ac(VHT20))**

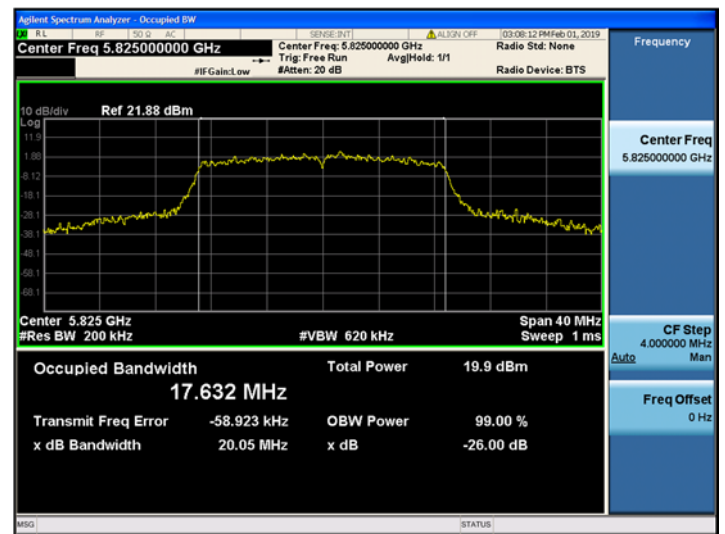
**Note:**

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

**802.11ac\_VHT20 UNII 1 BAND 26dB Bandwidth(CH 36)**



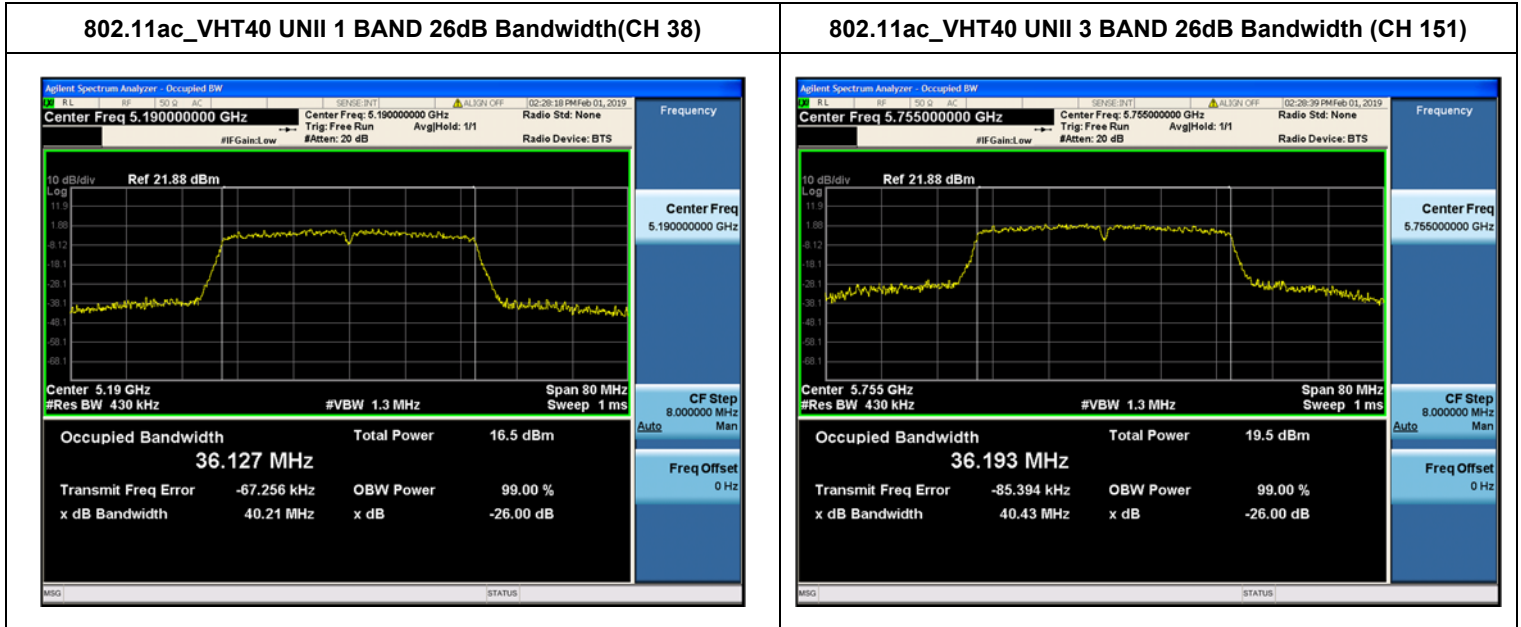
**802.11ac\_VHT20 UNII 3 BAND 26dB Bandwidth(CH 165)**



■ Test Plots(802.11ac(VHT40))

**Note:**

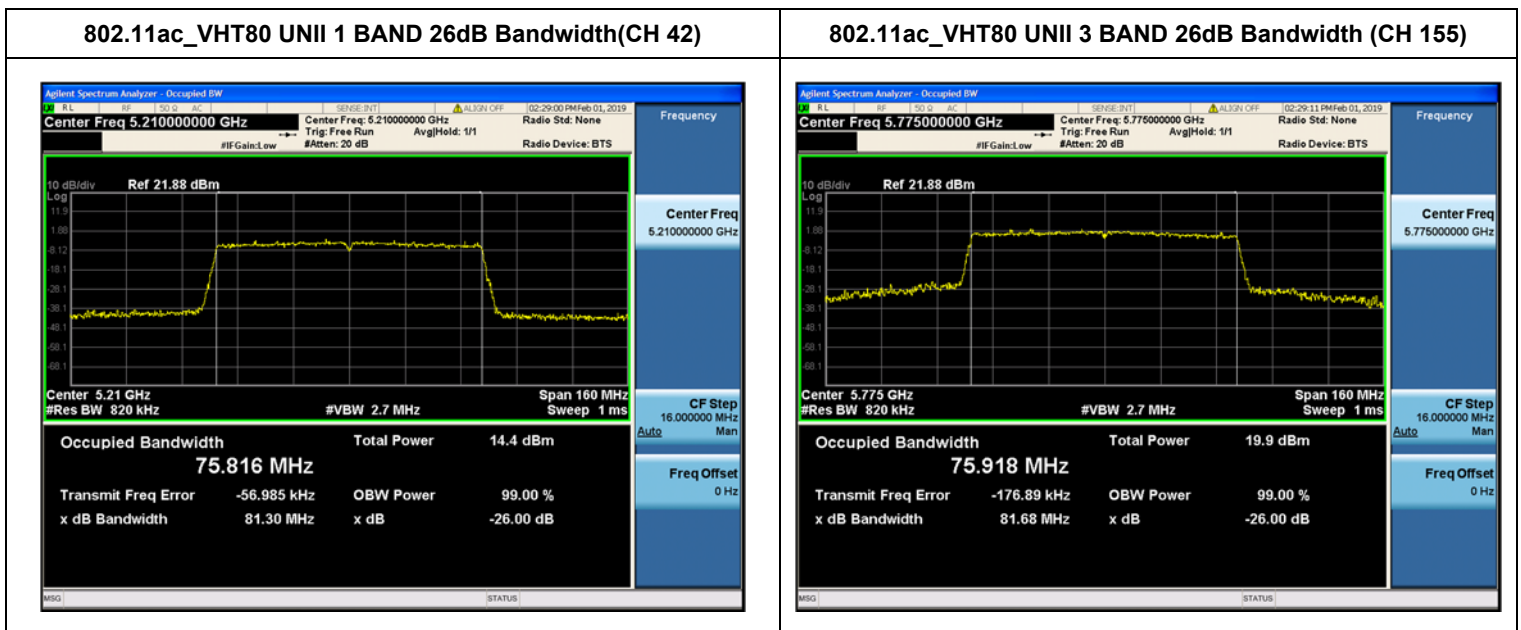
In order to simplify the report, attached plots were only the most wide channel.



■ Test Plots(802.11ac(VHT80))

**Note:**

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



### 10.3 6DB BANDWIDTH

802.11a Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	13.90	> 0.5	Pass
5785	157	15.51	> 0.5	Pass
5825	165	13.94	> 0.5	Pass

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.05	> 0.5	Pass
5785	157	15.14	> 0.5	Pass
5825	165	14.99	> 0.5	Pass

802.11n(HT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.21	> 0.5	Pass
5795	159	35.15	> 0.5	Pass

802.11ac(VHT20) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.12	> 0.5	Pass
5785	157	13.94	> 0.5	Pass
5825	165	13.78	> 0.5	Pass

802.11ac(VHT40) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.24	> 0.5	Pass
5795	159	35.24	> 0.5	Pass

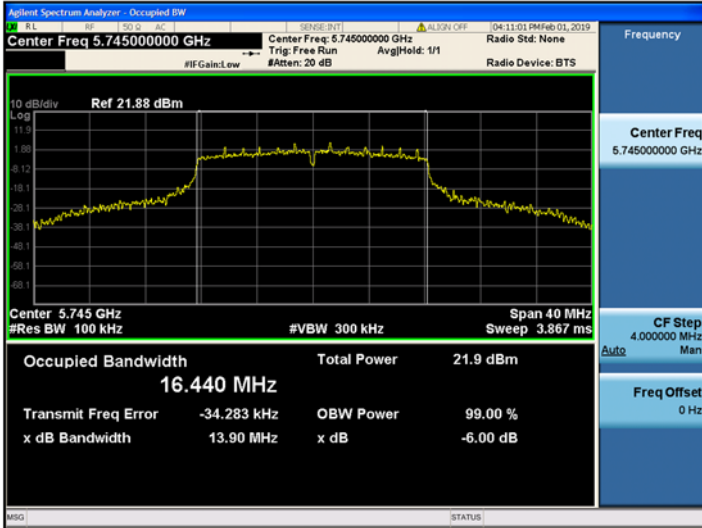
802.11ac(VHT80) Mode		Measured Bandwidth [MHz]	Limit [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5775	155	75.83	> 0.5	Pass

**Test Plots**

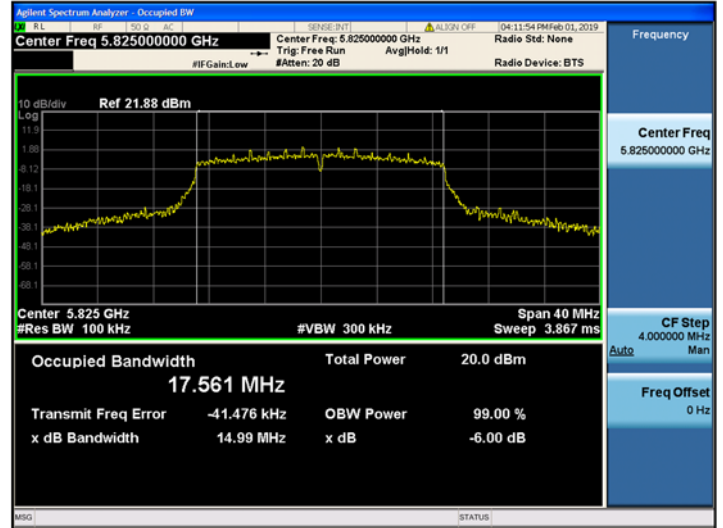
**Note:**

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

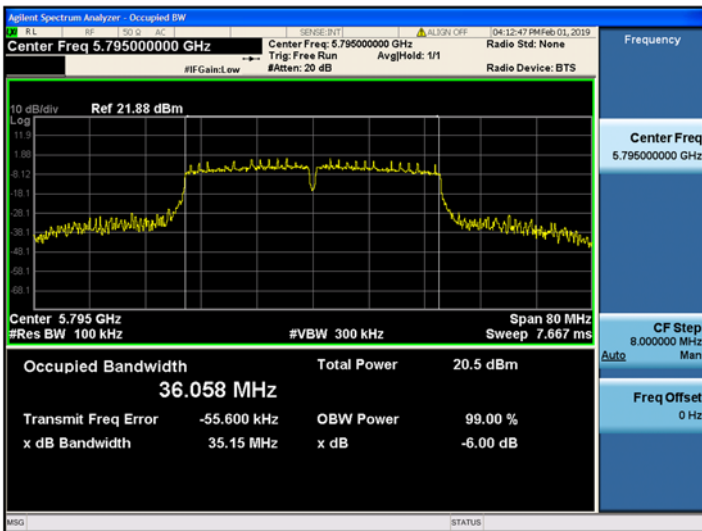
**802.11a (CH.149)**



**802.11n(HT20) (CH.165)**



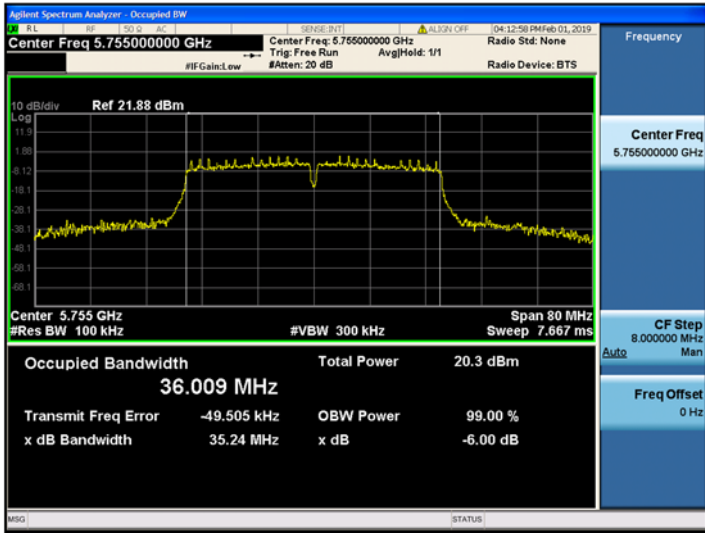
**802.11n(HT40) (CH.159)**



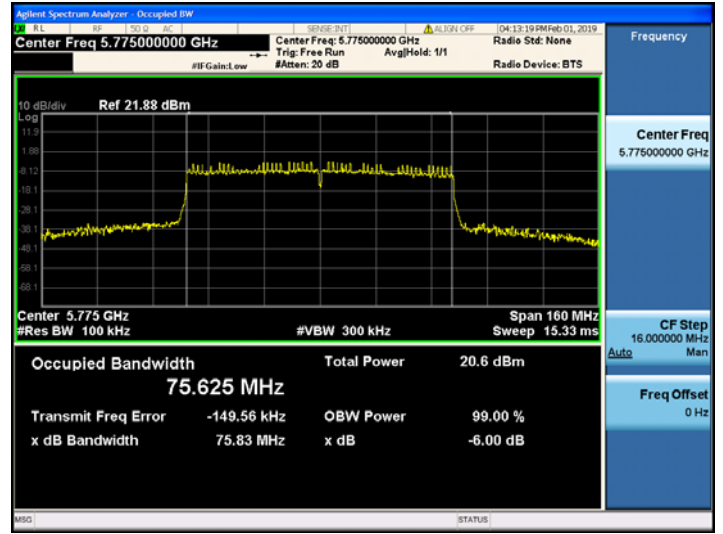
**802.11ac(VHT20) (CH.165)**



**802.11ac(VHT40) (CH.151)**



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



## 10.4 OUTPUT POWER MEASUREMENT

### 10.4.1 Maximum Conducted Output Power

802.11a Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	13.60	0.813	14.42	23.98
5200	40	13.63	0.813	14.44	23.98
5240	48	13.64	0.813	14.46	23.98
5745	149	14.51	0.813	15.32	30.00
5785	157	14.87	0.813	15.68	30.00
5825	165	14.59	0.813	15.40	30.00

802.11n(20MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	11.50	0.836	12.34	23.98
5200	40	11.50	0.836	12.34	23.98
5240	48	11.53	0.836	12.37	23.98
5745	149	12.48	0.836	13.31	30.00
5785	157	12.81	0.836	13.65	30.00
5825	165	12.56	0.836	13.39	30.00

802.11n(40MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5190	38	9.61	0.615	10.22	23.98
5230	46	11.29	0.615	11.90	23.98
5755	151	12.55	0.615	13.17	30.00
5795	159	12.84	0.615	13.46	30.00



802.11ac(20MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	11.52	0.831	12.35	23.98
5200	40	11.48	0.831	12.31	23.98
5240	48	11.50	0.831	12.33	23.98
5745	149	12.45	0.831	13.28	30.00
5785	157	12.79	0.831	13.63	30.00
5825	165	12.51	0.831	13.34	30.00

802.11ac(40MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5190	38	9.59	0.611	10.20	23.98
5230	46	11.35	0.611	11.96	23.98
5755	151	12.52	0.611	13.13	30.00
5795	159	12.73	0.611	13.34	30.00

802.11ac(80MHz) Mode		Measured Power [dBm]	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5210	42	5.65	1.130	6.79	23.98
5775	155	10.98	1.130	12.11	30.00

### 10.4.2 Maximum E.I.R.P (Only IC)

802.11a Mode		Conducted Output Power [dBm]	Peak Ant Gain (dBi)	E.I.R.P [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	13.60	-0.60	13.00	22.17
5200	40	13.63	-0.60	13.03	22.17
5240	48	13.64	-0.60	13.04	22.17

802.11n(20MHz) Mode		Conducted Output Power [dBm]	Peak Ant Gain (dBi)	E.I.R.P [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	11.50	-0.60	10.90	22.45
5200	40	11.50	-0.60	10.90	22.45
5240	48	11.53	-0.60	10.93	22.45

802.11n(40MHz) Mode		Conducted Output Power [dBm]	Peak Ant Gain (dBi)	E.I.R.P [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5190	38	9.61	-0.60	9.01	25.59
5230	46	11.29	-0.60	10.69	25.59

802.11ac(20MHz) Mode		Conducted Output Power [dBm]	Peak Ant Gain (dBi)	E.I.R.P [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	11.52	-0.60	10.92	22.45
5200	40	11.48	-0.60	10.88	22.45
5240	48	11.50	-0.60	10.90	22.44

802.11ac(40MHz) Mode		Conducted Output Power [dBm]	Peak Ant Gain (dBi)	E.I.R.P [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5190	38	9.59	-0.60	8.99	25.58
5230	46	11.35	-0.60	10.75	25.58

802.11ac(80MHz) Mode		Conducted Output Power [dBm]	Peak Ant Gain (dBi)	E.I.R.P [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5210	42	5.65	-0.60	5.05	28.80

### 10.5 POWER SPECTRAL DENSITY

802.11a Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	3.356	0.813	4.169	11
5200	40	3.961	0.813	4.774	11
5240	48	3.281	0.813	4.094	11
5745	149	1.903	0.813	2.716	30
5785	157	2.171	0.813	2.984	30
5825	165	2.065	0.813	2.878	30

802.11n(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	1.376	0.836	2.212	11
5200	40	1.487	0.836	2.323	11
5240	48	1.407	0.836	2.243	11
5745	149	-0.640	0.836	0.196	30
5785	157	-0.137	0.836	0.699	30
5825	165	-0.744	0.836	0.092	30

802.11n(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5190	38	-4.100	0.615	-3.485	11
5230	46	-2.122	0.615	-1.507	11
5755	151	-3.730	0.615	-3.115	30
5795	159	-3.867	0.615	-3.252	30

802.11ac(20MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5180	36	1.283	0.831	2.114	11
5200	40	0.930	0.831	1.761	11
5240	48	1.194	0.831	2.025	11
5745	149	-0.413	0.831	0.418	30
5785	157	-0.226	0.831	0.605	30
5825	165	-0.223	0.831	0.608	30

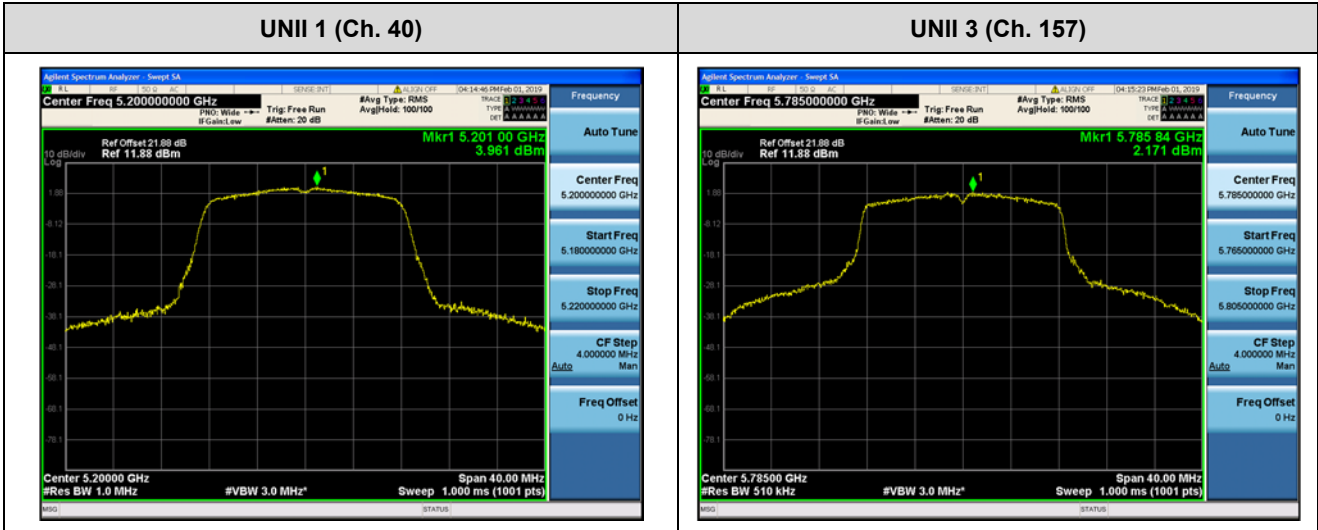
802.11ac(40MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5190	38	-3.902	0.611	-3.291	11
5230	46	-1.898	0.611	-1.287	11
5755	151	-3.651	0.611	-3.040	30
5795	159	-3.313	0.611	-2.702	30

802.11ac(80MHz) Mode		Measured PSD [dBm]	Duty Cycle Factor (dB)	Total PSD [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
5210	42	-11.600	1.130	-10.470	11
5775	155	-9.138	1.130	-8.008	30

**Test Plots(802.11a)**

**Note:**

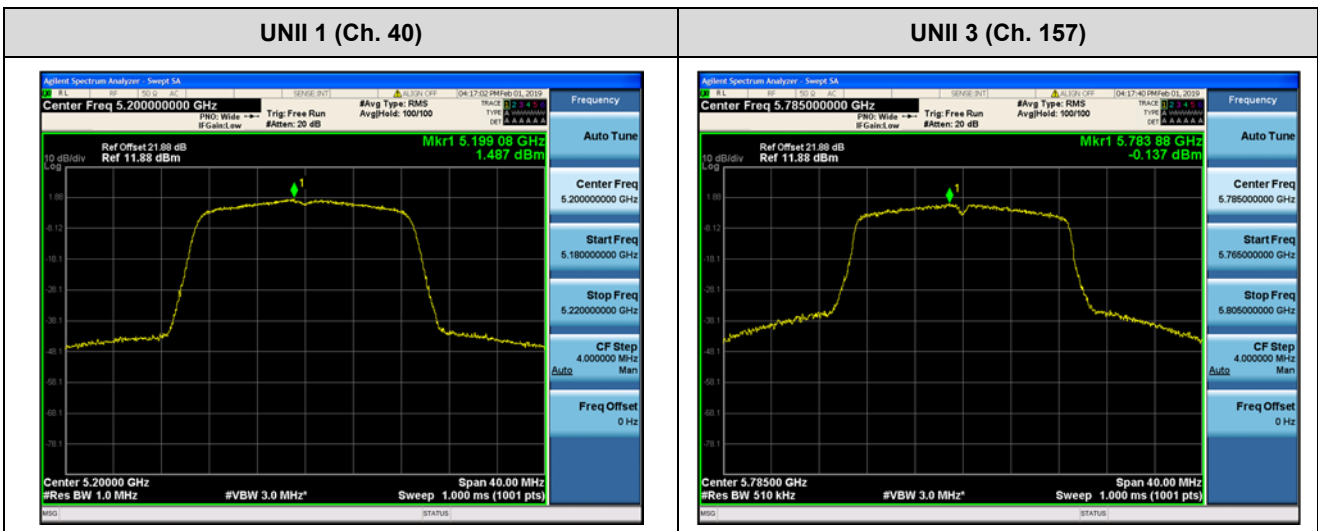
In order to simplify the report, attached plots were only channel of highest power.



**Test Plots(802.11n(HT20))**

**Note:**

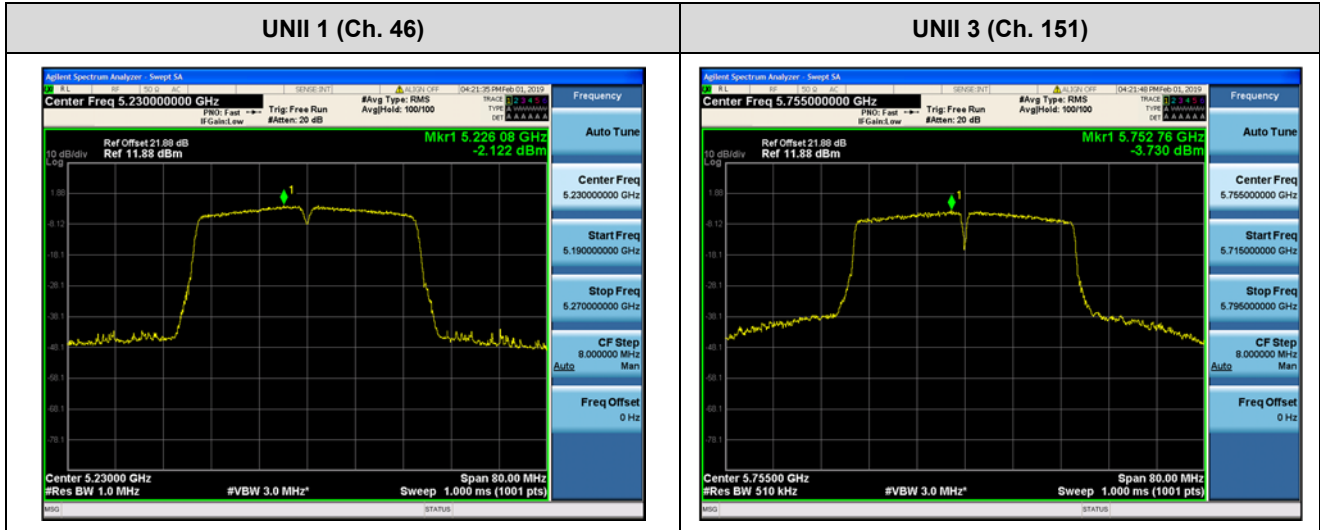
In order to simplify the report, attached plots were only channel of highest power.



■ Test Plots(802.11n(HT40))

**Note:**

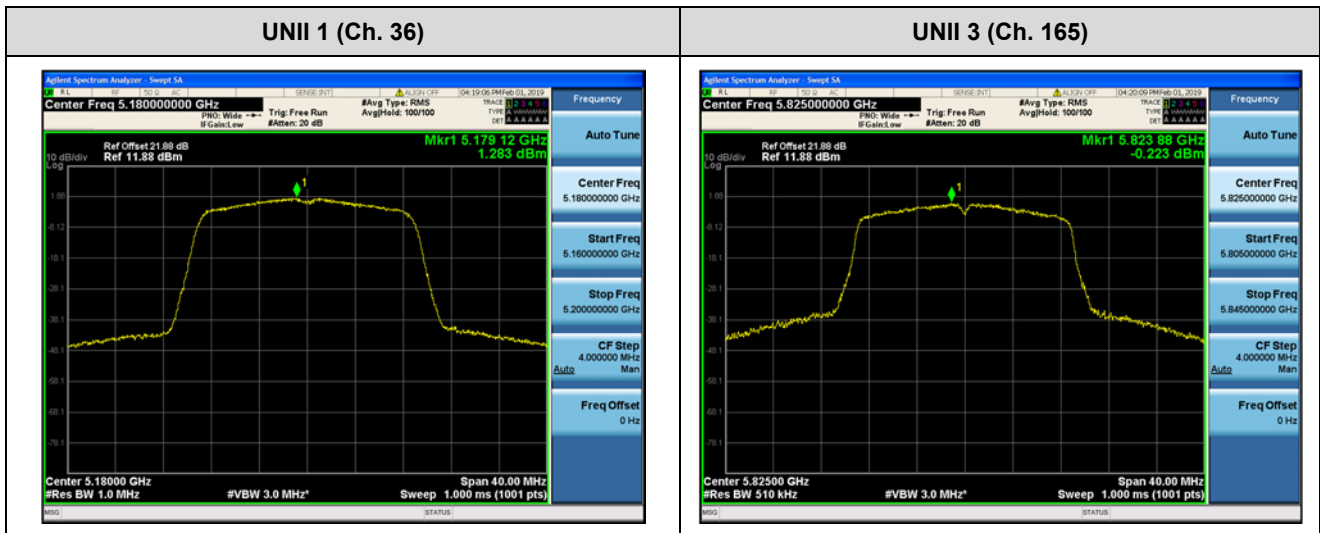
In order to simplify the report, attached plots were only channel of highest power.



■ Test Plots(802.11ac(VHT20))

**Note:**

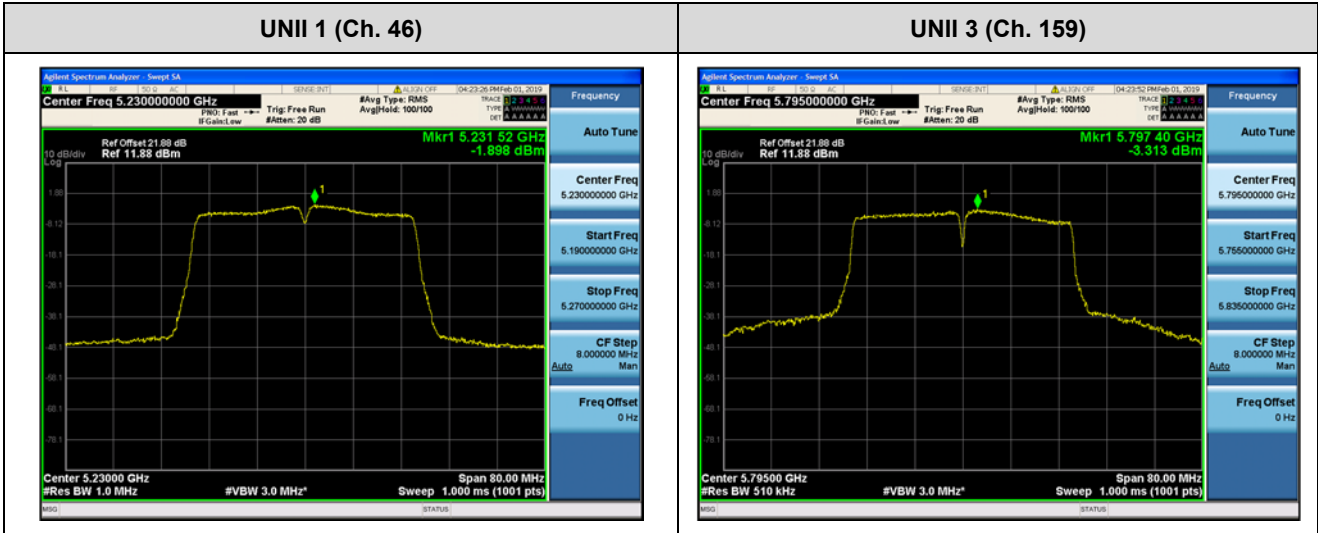
In order to simplify the report, attached plots were only channel of highest power.



**Test Plots(802.11ac(VHT40))**

**Note:**

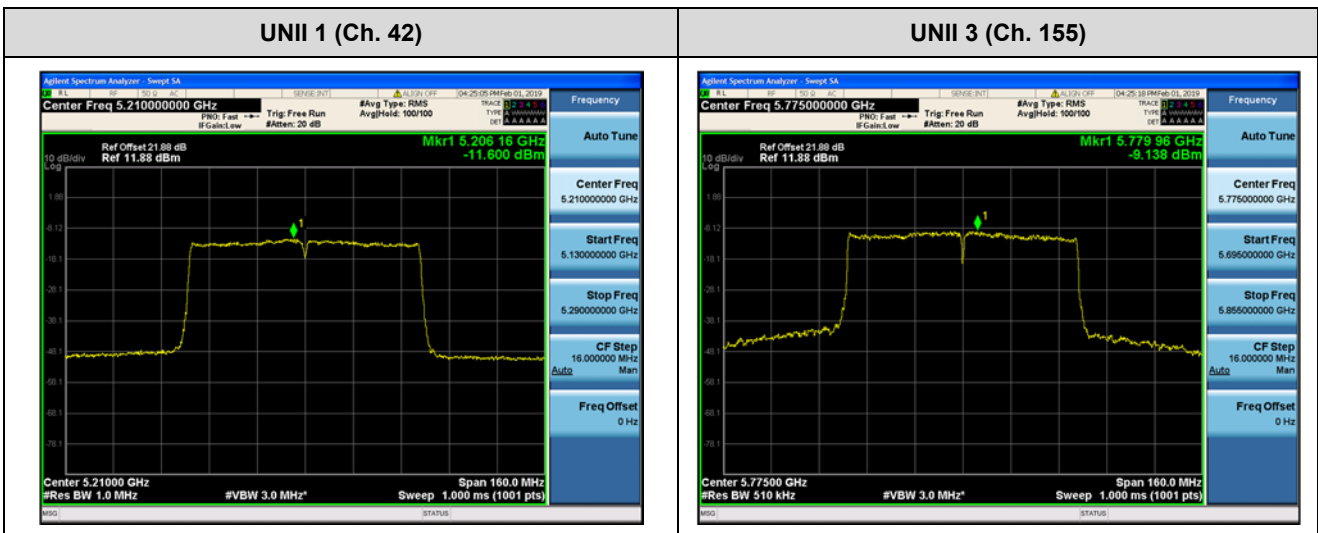
In order to simplify the report, attached plots were only channel of highest power.



**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 20MHz BW**

**Startup after the EUT is energized**

OPERATING BAND: UNII Band 1  
 OPERATING FREQUENCY: 5,180,000,000 Hz  
 CHANNEL: 36

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	175	+20(Ref)	5180024.88	24.88
100%		-30	5180030.49	30.49
100%		-20	5180026.01	26.01
100%		-10	5180005.63	5.63
100%		0	5180025.25	25.25
100%		10	5180003.79	3.79
100%		30	5180023.47	23.47
100%		40	5180005.81	5.81
100%		50	5180033.38	33.38
Max.		240	20	5180029.52
Min.	100	20	5180012.08	12.08

**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: 5,745,000,000 Hz  
 CHANNEL: 149

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	175	+20(Ref)	5745012.75	12.75
100%		-30	5745032.14	32.14
100%		-20	5745011.12	11.12
100%		-10	5745009.99	9.99
100%		0	5745014.49	14.49
100%		10	5745022.25	22.25
100%		30	5745030.20	30.20
100%		40	5745011.81	11.81
100%		50	5745020.88	20.88
Max.		240	20	5745001.36
Min.	100	20	5745034.07	34.07

**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.

### 10.6.2 40MHz BW

**Startup after the EUT is energized**

OPERATING BAND: UNII Band 1  
 OPERATING FREQUENCY: 5,190,000,000 Hz  
 CHANNEL: 38

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	175	+20(Ref)	5190031.46	31.46
100%		-30	5190009.02	9.02
100%		-20	5190001.01	1.01
100%		-10	5190010.03	10.03
100%		0	5190018.63	18.63
100%		10	5190007.93	7.93
100%		30	5190028.41	28.41
100%		40	5190005.11	5.11
100%		50	5190021.62	21.62
Max.		240	20	5190024.17
Min.	100	20	5190007.96	7.96

**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: 5,755,000,000 Hz  
 CHANNEL: 151

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	175	+20(Ref)	5755021.01	21.01
100%		-30	5755014.46	14.46
100%		-20	5755022.82	22.82
100%		-10	5755008.44	8.44
100%		0	5755025.29	25.29
100%		10	5755015.30	15.30
100%		30	5755012.96	12.96
100%		40	5755001.80	1.80
100%		50	5755001.18	1.18
Max.		240	20	5755016.61
Min.	100	20	5755007.00	7.00

**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.

### 10.6.3 80MHz BW

#### Startup after the EUT is energized

OPERATING BAND: UNII Band 1  
 OPERATING FREQUENCY: 5,210,000,000 Hz  
 CHANNEL: 42

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	175	+20(Ref)	5210019.73	19.73
100%		-30	5210003.73	3.73
100%		-20	5210016.71	16.71
100%		-10	5210004.57	4.57
100%		0	5210016.96	16.96
100%		10	5210019.64	19.64
100%		30	5210019.22	19.22
100%		40	5210012.17	12.17
100%		50	5210020.70	20.70
Max.		240	20	5210021.05
Min.	100	20	5210020.17	20.17

**Note:**

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

OPERATING BAND: UNII Band 3  
 OPERATING FREQUENCY: 5,775,000,000 Hz  
 CHANNEL: 155

Voltage (%)	Power (AC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	175	+20(Ref)	5775017.65	17.65
100%		-30	5775015.53	15.53
100%		-20	5775003.33	3.33
100%		-10	5775008.88	8.88
100%		0	5775022.50	22.50
100%		10	5775027.84	27.84
100%		30	5775006.02	6.02
100%		40	5775023.12	23.12
100%		50	5775003.31	3.31
Max.		240	20	5775020.29
Min.	100	20	5775030.28	30.28

**Note:**

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

## 10.7 RADIATED SPURIOUS EMISSIONS

### Frequency Range : 9 kHz – 30MHz

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

**Note:**

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor =  $40 \cdot \log(\text{specific distance} / \text{test distance})$  (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor
4. The test results for below 30 MHz is correlated to an open site.  
The result on OATS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

### Frequency Range : Below 1 GHz

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

**Note:**

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

**Frequency Range : Above 1 GHz**

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	51.55	6.89	V	58.44	68.20	9.76	PK
15540	44.61	12.57	V	57.18	73.98	16.80	PK
15540	31.31	12.57	V	43.88	53.98	10.10	AV
10360	50.87	6.89	H	57.76	68.20	10.44	PK
15540	44.26	12.57	H	56.83	73.98	17.15	PK
15540	31.23	12.57	H	43.80	53.98	10.18	AV

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	50.55	6.94	V	57.49	68.20	10.71	PK
15600	44.20	11.47	V	55.67	73.98	18.31	PK
15600	30.85	11.47	V	42.32	53.98	11.66	AV
10400	50.19	6.94	H	57.13	68.20	11.07	PK
15600	44.11	11.47	H	55.58	73.98	18.40	PK
15600	30.65	11.47	H	42.12	53.98	11.86	AV



Report No.: HCT-RF-1902-FI004

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	50.97	7.65	V	58.62	68.20	9.58	PK
15720	44.05	11.66	V	55.71	73.98	18.27	PK
15720	30.15	11.66	V	41.81	53.98	12.17	AV
10480	49.89	7.65	H	57.54	68.20	10.66	PK
15720	43.32	11.66	H	54.98	73.98	19.00	PK
15720	30.02	11.66	H	41.68	53.98	12.30	AV

Band : UNII 1  
 Operation Mode: 802.11 n(HT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5180 MHz  
 Channel No. 36 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	50.43	6.89	V	57.32	68.20	10.88	PK
15540	44.82	12.57	V	57.39	73.98	16.59	PK
15540	31.30	12.57	V	43.87	53.98	10.11	AV
10360	49.07	6.89	H	55.96	68.20	12.24	PK
15540	44.28	12.57	H	56.85	73.98	17.13	PK
15540	30.05	12.57	H	42.62	53.98	11.36	AV

Band : UNII 1  
 Operation Mode: 802.11 n(HT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5200 MHz  
 Channel No. 40 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	49.36	6.94	V	56.30	68.20	11.90	PK
15600	44.32	11.47	V	55.79	73.98	18.19	PK
15600	30.91	11.47	V	42.38	53.98	11.60	AV
10400	48.95	6.94	H	55.89	68.20	12.31	PK
15600	44.08	11.47	H	55.55	73.98	18.43	PK
15600	30.69	11.47	H	42.16	53.98	11.82	AV

Band : UNII 1  
 Operation Mode: 802.11 n(HT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5240 MHz  
 Channel No. 48 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	48.68	7.65	V	56.33	68.20	11.87	PK
15720	43.59	11.66	V	55.25	73.98	18.73	PK
15720	30.09	11.66	V	41.75	53.98	12.23	AV
10480	47.44	7.65	H	55.09	68.20	13.11	PK
15720	42.85	11.66	H	54.51	73.98	19.47	PK
15720	30.04	11.66	H	41.70	53.98	12.28	AV

Report No.: HCT-RF-1902-FI004

Band : UNII 1  
 Operation Mode: 802.11 ac(VHT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5180 MHz  
 Channel No. 36 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	49.58	6.89	V	56.47	68.20	11.73	PK
15540	44.78	12.57	V	57.35	73.98	16.63	PK
15540	31.31	12.57	V	43.88	53.98	10.10	AV
10360	48.79	6.89	H	55.68	68.20	12.52	PK
15540	44.59	12.57	H	57.16	73.98	16.82	PK
15540	31.09	12.57	H	43.66	53.98	10.32	AV

Band : UNII 1  
 Operation Mode: 802.11 ac(VHT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5200 MHz  
 Channel No. 40 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	49.45	6.94	V	56.39	68.20	11.81	PK
15600	44.51	11.47	V	55.98	73.98	18.00	PK
15600	30.80	11.47	V	42.27	53.98	11.71	AV
10400	48.80	6.94	H	55.74	68.20	12.46	PK
15600	44.07	11.47	H	55.54	73.98	18.44	PK
15600	30.05	11.47	H	41.52	53.98	12.46	AV

Report No.: HCT-RF-1902-FI004

Band : UNII 1  
 Operation Mode: 802.11 ac(VHT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5240 MHz  
 Channel No. 48 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	48.69	7.65	V	56.34	68.20	11.86	PK
15720	43.69	11.66	V	55.35	73.98	18.63	PK
15720	30.13	11.66	V	41.79	53.98	12.19	AV
10480	47.84	7.65	H	55.49	68.20	12.71	PK
15720	42.65	11.66	H	54.31	73.98	19.67	PK
15720	30.03	11.66	H	41.69	53.98	12.29	AV

Band : UNII 1  
 Operation Mode: 802.11 n(HT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5190 MHz  
 Channel No. 38 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10380	46.63	6.54	V	53.17	68.20	15.03	PK
15570	44.75	11.95	V	56.70	73.98	17.28	PK
15570	31.78	11.95	V	43.73	53.98	10.25	AV
10380	44.98	6.54	H	51.52	68.20	16.68	PK
15570	43.64	11.95	H	55.59	73.98	18.39	PK
15570	31.54	11.95	H	43.49	53.98	10.49	AV

Band : UNII 1  
 Operation Mode: 802.11 n(HT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5230 MHz  
 Channel No. 46 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10460	46.89	7.97	V	54.86	68.20	13.34	PK
15690	44.33	12.00	V	56.33	73.98	17.65	PK
15690	31.02	12.00	V	43.02	53.98	10.96	AV
10460	45.90	7.97	H	53.87	68.20	14.33	PK
15690	43.53	12.00	H	55.53	73.98	18.45	PK
15690	30.99	12.00	H	42.99	53.98	10.99	AV

Band : UNII 1  
 Operation Mode: 802.11 ac(VHT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5190 MHz  
 Channel No. 38 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10380	46.23	6.54	V	52.77	68.20	15.43	PK
15570	44.48	11.95	V	56.43	73.98	17.55	PK
15570	31.66	11.95	V	43.61	53.98	10.37	AV
10380	45.35	6.54	H	51.89	68.20	16.31	PK
15570	43.56	11.95	H	55.51	73.98	18.47	PK
15570	31.06	11.95	H	43.01	53.98	10.97	AV

Band : UNII 1  
 Operation Mode: 802.11 ac(VHT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5230 MHz  
 Channel No. 46 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10460	45.24	7.97	V	53.21	68.20	14.99	PK
15690	44.03	12.00	V	56.03	73.98	17.95	PK
15690	31.15	12.00	V	43.15	53.98	10.83	AV
10460	44.57	7.97	H	52.54	68.20	15.66	PK
15690	43.15	12.00	H	55.15	73.98	18.83	PK
15690	30.85	12.00	H	42.85	53.98	11.13	AV

Band : UNII 1  
 Operation Mode: 802.11 ac(VHT80)  
 Transfer MCS Index: 0  
 Operating Frequency 5210 MHz  
 Channel No. 42 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10420	44.41	7.88	V	52.29	68.20	15.91	PK
15630	44.50	12.05	V	56.55	73.98	17.43	PK
15630	32.64	12.05	V	44.69	53.98	9.29	AV
10420	43.69	7.88	H	51.57	68.20	16.63	PK
15630	44.21	12.05	H	56.26	73.98	17.72	PK
15630	32.50	12.05	H	44.55	53.98	9.43	AV

Report No.: HCT-RF-1902-FI004

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11490	50.27	9.31	V	59.58	73.98	14.40	PK
11490	36.54	9.31	V	45.85	53.98	8.13	AV
17235	42.89	14.49	V	57.38	68.20	10.82	PK
11490	51.17	9.31	H	60.48	73.98	13.50	PK
11490	38.05	9.31	H	47.36	53.98	6.62	AV
17235	43.20	14.49	H	57.69	68.20	10.51	PK

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11570	52.16	9.38	V	61.54	73.98	12.44	PK
11570	38.50	9.38	V	47.88	53.98	6.10	AV
17355	43.77	15.74	V	59.51	68.20	8.69	PK
11570	49.65	9.38	H	59.03	73.98	14.95	PK
11570	36.37	9.38	H	45.75	53.98	8.23	AV
17355	42.65	15.74	H	58.39	68.20	9.81	PK

Report No.: HCT-RF-1902-FI004

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11650	52.65	8.33	V	60.98	73.98	13.00	PK
11650	39.43	8.33	V	47.76	53.98	6.22	AV
17475	44.69	16.79	V	61.48	68.20	6.72	PK
11650	52.11	8.33	H	60.44	73.98	13.54	PK
11650	38.36	8.33	H	46.69	53.98	7.29	AV
17475	44.06	16.79	H	60.85	68.20	7.35	PK

Band : UNII 3  
 Operation Mode: 802.11 n(HT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5745MHz  
 Channel No. 149 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11490	50.79	9.31	V	60.10	73.98	13.88	PK
11490	35.09	9.31	V	44.40	53.98	9.58	AV
17235	41.66	14.49	V	56.15	68.20	12.05	PK
11490	49.95	9.31	H	59.26	73.98	14.72	PK
11490	34.68	9.31	H	43.99	53.98	9.99	AV
17235	40.42	14.49	H	54.91	68.20	13.29	PK



Band : UNII 3  
 Operation Mode: 802.11 n(HT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5785 MHz  
 Channel No. 157 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11570	51.05	9.38	V	60.43	73.98	13.55	PK
11570	35.22	9.38	V	44.60	53.98	9.38	AV
17355	43.26	15.74	V	59.00	68.20	9.20	PK
11570	50.92	9.38	H	60.30	73.98	13.68	PK
11570	34.68	9.38	H	44.06	53.98	9.92	AV
17355	42.71	15.74	H	58.45	68.20	9.75	PK

Band : UNII 3  
 Operation Mode: 802.11 n(HT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5825 MHz  
 Channel No. 165 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11650	51.60	8.33	V	59.93	73.98	14.05	PK
11650	36.07	8.33	V	44.40	53.98	9.58	AV
17475	44.01	16.79	V	60.80	68.20	7.40	PK
11650	50.89	8.33	H	59.22	73.98	14.76	PK
11650	35.48	8.33	H	43.81	53.98	10.17	AV
17475	43.98	16.79	H	60.77	68.20	7.43	PK

Band : UNII 3  
 Operation Mode: 802.11 ac(VHT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5745MHz  
 Channel No. 149 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11490	50.55	9.31	V	59.86	73.98	14.12	PK
11490	35.09	9.31	V	44.40	53.98	9.58	AV
17235	44.91	14.49	V	59.40	68.20	8.80	PK
11490	49.88	9.31	H	59.19	73.98	14.79	PK
11490	34.57	9.31	H	43.88	53.98	10.10	AV
17235	43.81	14.49	H	58.30	68.20	9.90	PK

Band : UNII 3  
 Operation Mode: 802.11 ac(VHT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5785 MHz  
 Channel No. 157 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11570	51.81	9.38	V	61.19	73.98	12.79	PK
11570	35.92	9.38	V	45.30	53.98	8.68	AV
17355	44.24	15.74	V	59.98	68.20	8.22	PK
11570	50.47	9.38	H	59.85	73.98	14.13	PK
11570	34.81	9.38	H	44.19	53.98	9.79	AV
17355	43.30	15.74	H	59.04	68.20	9.16	PK

Band : UNII 3  
 Operation Mode: 802.11 ac(VHT20)  
 Transfer MCS Index: MCS0  
 Operating Frequency 5825 MHz  
 Channel No. 165 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11650	51.32	8.33	V	59.65	73.98	14.33	PK
11650	35.90	8.33	V	44.23	53.98	9.75	AV
17475	44.57	16.79	V	61.36	68.20	6.84	PK
11650	50.81	8.33	H	59.14	73.98	14.84	PK
11650	34.98	8.33	H	43.31	53.98	10.67	AV
17475	43.67	16.79	H	60.46	68.20	7.74	PK

Band : UNII 3  
 Operation Mode: 802.11 n(HT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5755 MHz  
 Channel No. 151 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11510	47.21	9.19	V	56.40	73.98	17.58	PK
11510	34.52	9.19	V	43.71	53.98	10.27	AV
17265	44.27	14.32	V	58.59	68.20	9.61	PK
11510	46.51	9.19	H	55.70	73.98	18.28	PK
11510	34.10	9.19	H	43.29	53.98	10.69	AV
17265	43.82	14.32	H	58.14	68.20	10.06	PK

Band : UNII 3  
 Operation Mode: 802.11 n(HT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5795 MHz  
 Channel No. 159 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11590	48.52	9.46	V	57.98	73.98	16.00	PK
11590	35.20	9.46	V	44.66	53.98	9.32	AV
17385	45.29	15.37	V	60.66	68.20	7.54	PK
11590	47.64	9.46	H	57.10	73.98	16.88	PK
11590	34.95	9.46	H	44.41	53.98	9.57	AV
17385	43.60	15.37	H	58.97	68.20	9.23	PK

Band : UNII 3  
 Operation Mode: 802.11 ac(VHT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5755 MHz  
 Channel No. 151 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11510	47.06	9.19	V	56.25	73.98	17.73	PK
11510	34.68	9.19	V	43.87	53.98	10.11	AV
17265	43.80	14.32	V	58.12	68.20	10.08	PK
11510	45.90	9.19	H	55.09	73.98	18.89	PK
11510	34.02	9.19	H	43.21	53.98	10.77	AV
17265	42.86	14.32	H	57.18	68.20	11.02	PK

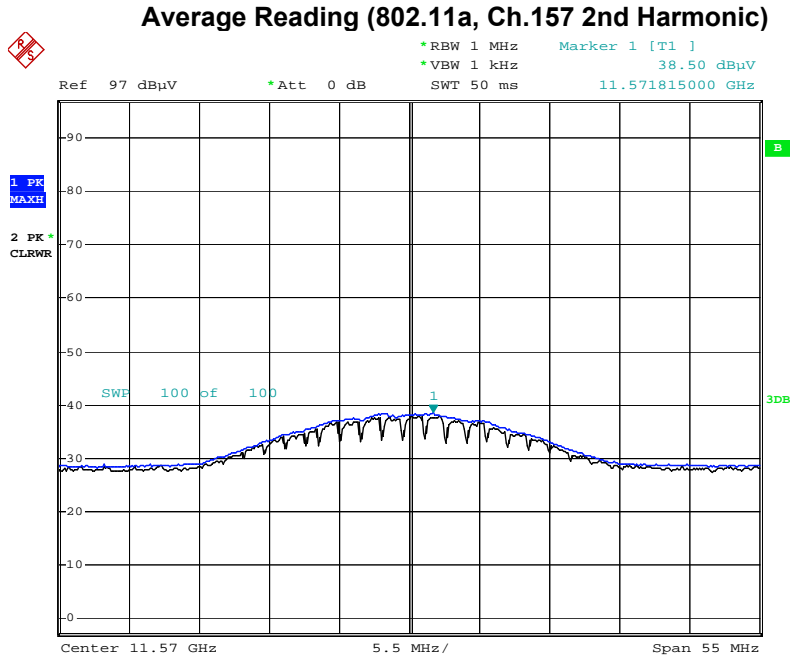
Band : UNII 3  
 Operation Mode: 802.11 ac(VHT40)  
 Transfer MCS Index: 0  
 Operating Frequency 5795 MHz  
 Channel No. 159 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11590	48.77	9.46	V	58.23	73.98	15.75	PK
11590	34.37	9.46	V	43.83	53.98	10.15	AV
17385	44.91	15.37	V	60.28	68.20	7.92	PK
11590	47.60	9.46	H	57.06	73.98	16.92	PK
11590	34.24	9.46	H	43.70	53.98	10.28	AV
17385	43.88	15.37	H	59.25	68.20	8.95	PK

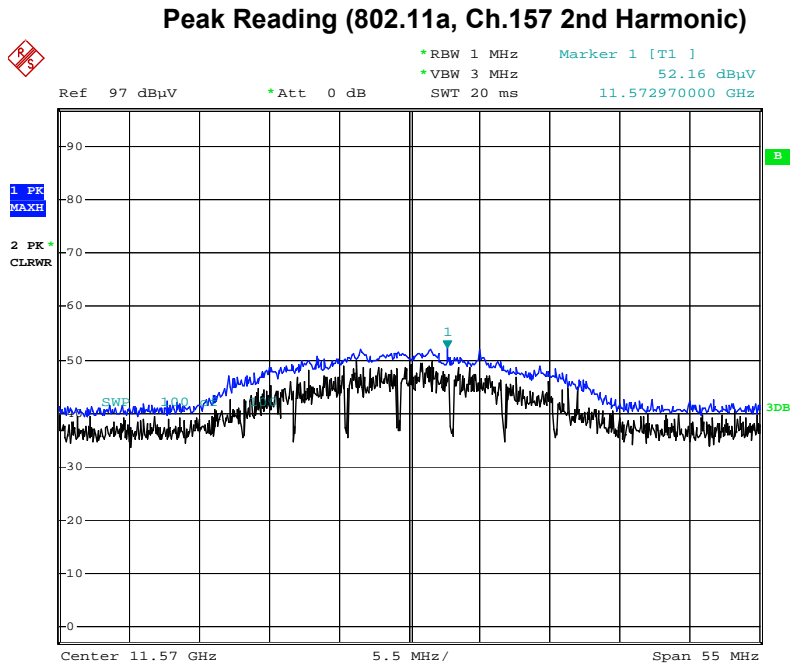
Band : UNII 3  
 Operation Mode: 802.11 ac(VHT80)  
 Transfer MCS Index: 0  
 Operating Frequency 5775 MHz  
 Channel No. 155 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11550	45.71	8.90	V	54.61	73.98	19.37	PK
11550	34.38	8.90	V	43.28	53.98	10.70	AV
17325	44.31	15.33	V	59.64	68.20	8.56	PK
11550	44.86	8.90	H	53.76	73.98	20.22	PK
11550	34.07	8.90	H	42.97	53.98	11.01	AV
17325	43.86	15.33	H	59.19	68.20	9.01	PK

■ Test Plots



Date: 1.FEB.2019 16:43:10



Date: 1.FEB.2019 16:41:57

**Note : Only the worst case plots for Radiated Spurious Emissions.**

### 10.8 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]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	56.27	5.75	H	62.02	73.98	11.96	PK
5150	41.85	5.75	H	47.60	53.98	6.38	AV
5150	57.48	5.75	V	63.23	73.98	10.75	PK
5150	42.92	5.75	V	48.67	53.98	5.31	AV

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

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5350	54.67	6.66	H	61.33	73.98	12.65	PK
5350	41.53	6.66	H	48.19	53.98	5.79	AV
5350	51.53	6.66	V	58.19	73.98	15.79	PK
5350	40.42	6.66	V	47.08	53.98	6.90	AV

Band : UNII 1  
 Operation Mode: 802.11 n\_HT20  
 Transfer MCS Index: 0  
 Operating Frequency 5180 MHz  
 Channel No. 36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	56.50	5.75	H	62.25	73.98	11.73	PK
5150	40.85	5.75	H	46.60	53.98	7.38	AV
5150	57.10	5.75	V	62.85	73.98	11.13	PK
5150	41.95	5.75	V	47.70	53.98	6.28	AV

Band : UNII 1  
 Operation Mode: 802.11 n\_HT20  
 Transfer MCS Index: 0  
 Operating Frequency 5240 MHz  
 Channel No. 48 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5350	54.30	6.66	H	60.96	73.98	13.02	PK
5350	41.20	6.66	H	47.86	53.98	6.12	AV
5350	52.56	6.66	V	59.22	73.98	14.76	PK
5350	40.91	6.66	V	47.57	53.98	6.41	AV



Band : UNII 1  
 Operation Mode: 802.11 ac\_VHT20  
 Transfer MCS Index: 0  
 Operating Frequency 5180 MHz  
 Channel No. 36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	52.99	5.75	H	58.74	73.98	15.24	PK
5150	40.85	5.75	H	46.6	53.98	7.38	AV
5150	53.42	5.75	V	59.17	73.98	14.81	PK
5150	41.74	5.75	V	47.49	53.98	6.49	AV

Band : UNII 1  
 Operation Mode: 802.11 ac\_VHT20  
 Transfer MCS Index: 0  
 Operating Frequency 5240 MHz  
 Channel No. 48 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5350	54.22	6.66	H	60.88	73.98	13.10	PK
5350	41.42	6.66	H	48.08	53.98	5.90	AV
5350	51.28	6.66	V	57.94	73.98	16.04	PK
5350	41.07	6.66	V	47.73	53.98	6.25	AV

Band : UNII 1  
 Operation Mode: 802.11 n\_HT40  
 Transfer MCS Index: 0  
 Operating Frequency 5190 MHz  
 Channel No. 38 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	60.40	5.75	H	66.15	73.98	7.83	PK
5150	42.85	5.75	H	48.6	53.98	5.38	AV
5150	61.54	5.75	V	67.29	73.98	6.69	PK
5150	44.87	5.75	V	50.62	53.98	3.36	AV

Band : UNII 1  
 Operation Mode: 802.11 n\_HT40  
 Transfer MCS Index: 0  
 Operating Frequency 5230 MHz  
 Channel No. 46 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5350	54.28	6.66	H	60.94	73.98	13.04	PK
5350	41.67	6.66	H	48.33	53.98	5.65	AV
5350	52.49	6.66	V	59.15	73.98	14.83	PK
5350	40.82	6.66	V	47.48	53.98	6.50	AV

Band : UNII 1  
 Operation Mode: 802.11 ac\_VHT40  
 Transfer MCS Index: 0  
 Operating Frequency 5190 MHz  
 Channel No. 38 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	54.12	5.75	H	59.87	73.98	14.11	PK
5150	43.11	5.75	H	48.86	53.98	5.12	AV
5150	61.75	5.75	V	67.5	73.98	6.48	PK
5150	44.71	5.75	V	50.46	53.98	3.52	AV

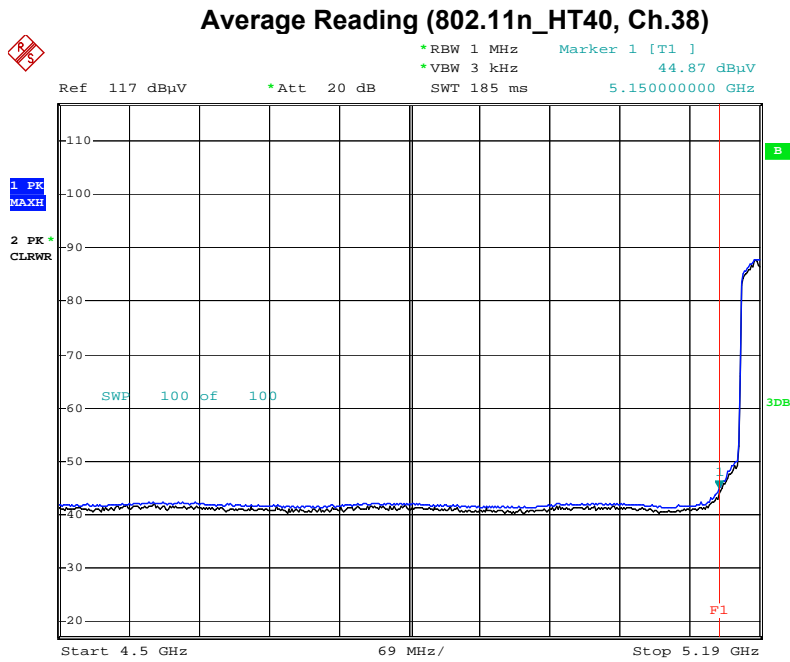
Band : UNII 1  
 Operation Mode: 802.11 ac\_VHT40  
 Transfer MCS Index: 0  
 Operating Frequency 5230 MHz  
 Channel No. 46 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5350	54.63	6.66	H	61.29	73.98	12.69	PK
5350	41.75	6.66	H	48.41	53.98	5.57	AV
5350	51.87	6.66	V	58.53	73.98	15.45	PK
5350	40.52	6.66	V	47.18	53.98	6.80	AV

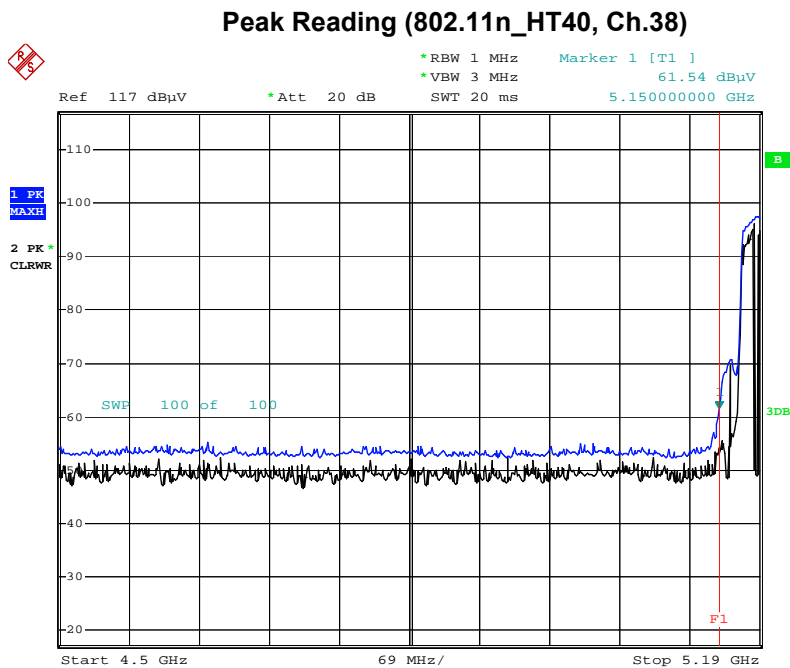
Band : UNII 1  
 Operation Mode: 802.11 ac\_VHT80  
 Transfer MCS Index: 0  
 Operating Frequency 5210 MHz  
 Channel No. 42 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. +D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	54.88	5.75	H	60.63	73.98	13.35	PK
5150	44.41	5.75	H	50.16	53.98	3.82	AV
5150	53.85	5.75	V	59.6	73.98	14.38	PK
5150	43.53	5.75	V	49.28	53.98	4.70	AV
5350	53.43	6.66	H	60.09	73.98	13.89	PK
5350	42.68	6.66	H	49.34	53.98	4.64	AV
5350	52.55	6.66	V	59.21	73.98	14.77	PK
5350	41.27	6.66	V	47.93	53.98	6.05	AV

■ Test Plots(UNII 1)



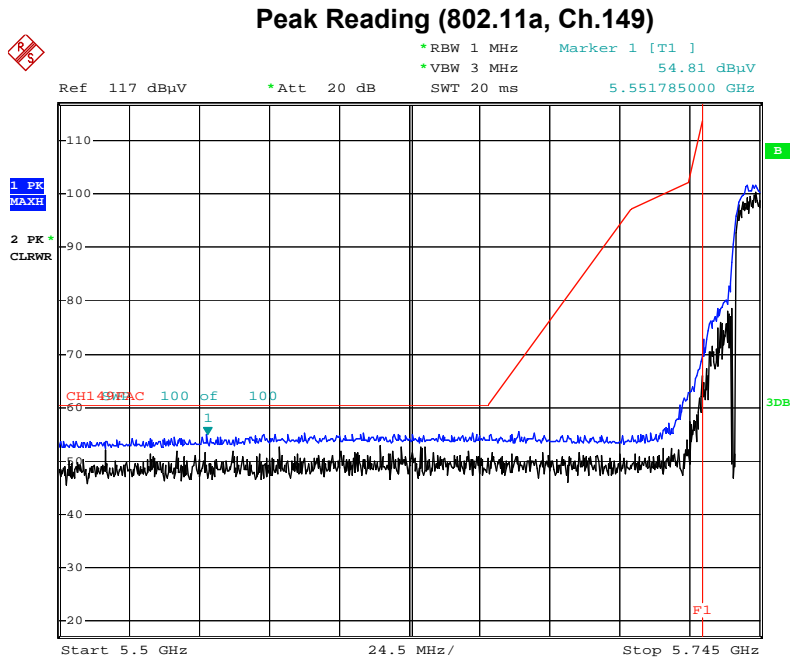
Date: 29.JAN.2019 09:04:49



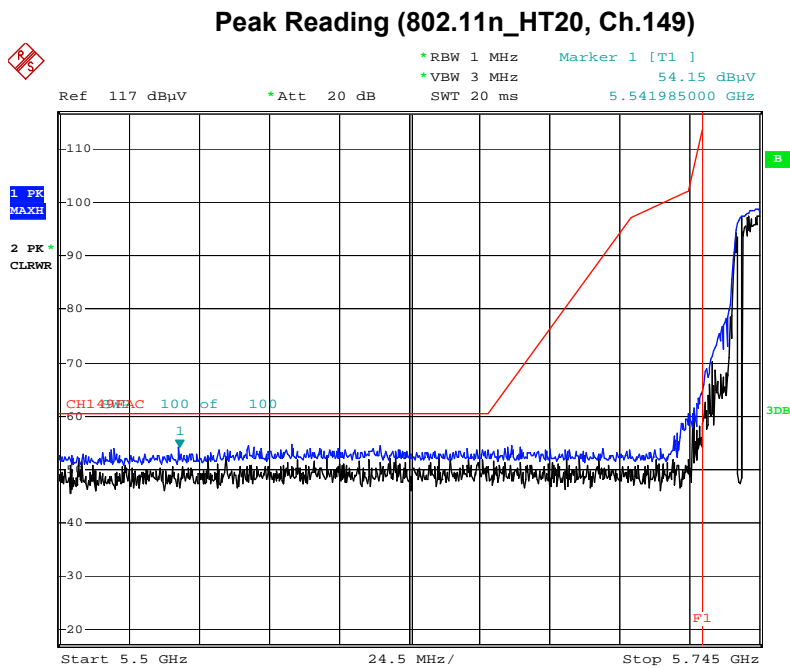
Date: 29.JAN.2019 09:08:15

**Note : Only the worst case plots for Radiated Spurious Emissions.**

■ Test Plots(UNII 3)\_Low Band Edge Plot

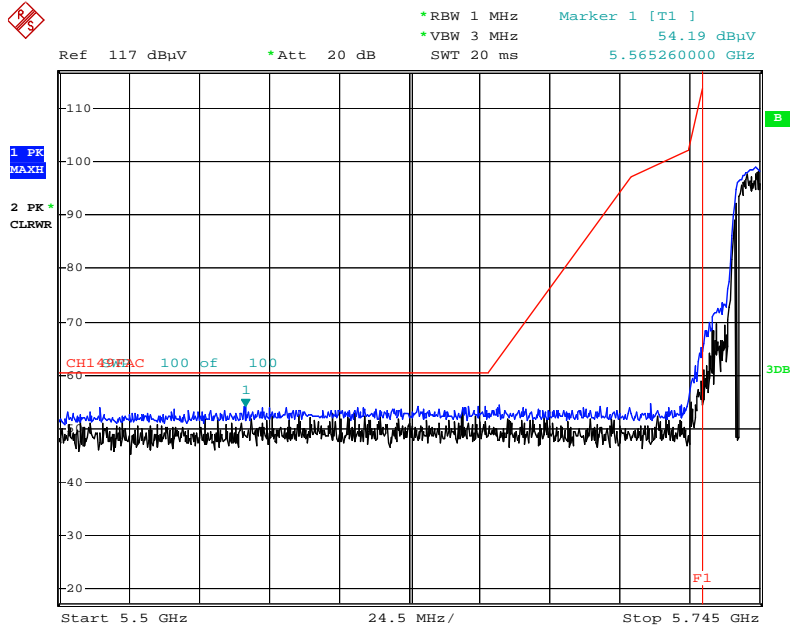


Date: 1.FEB.2019 11:42:07



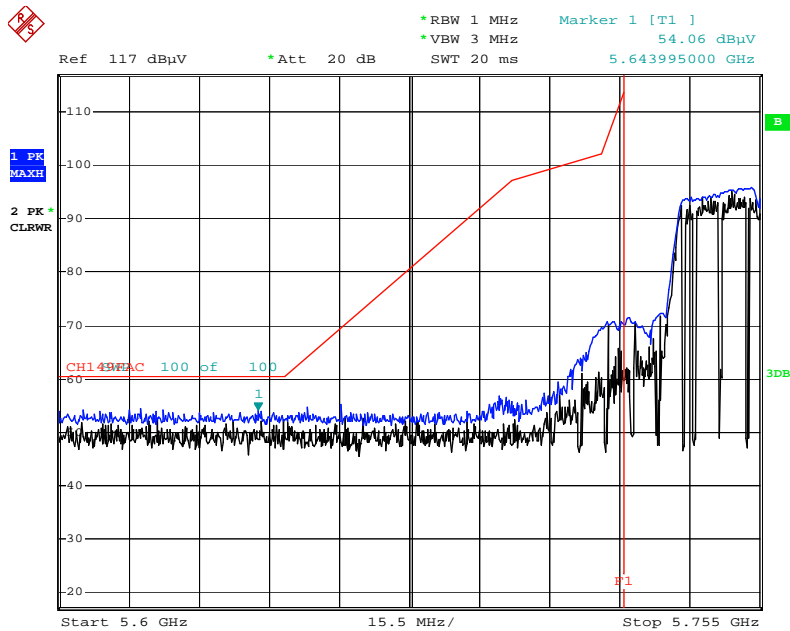
Date: 1.FEB.2019 11:43:21

**Peak Reading (802.11ac\_VHT20, Ch.149)**



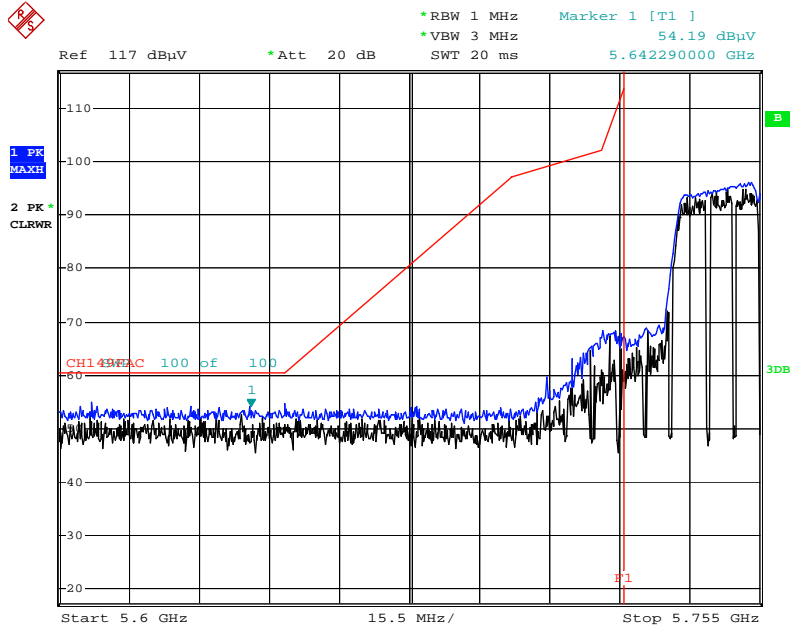
Date: 1.FEB.2019 11:44:23

**Peak Reading (802.11n\_HT40, Ch.151)**



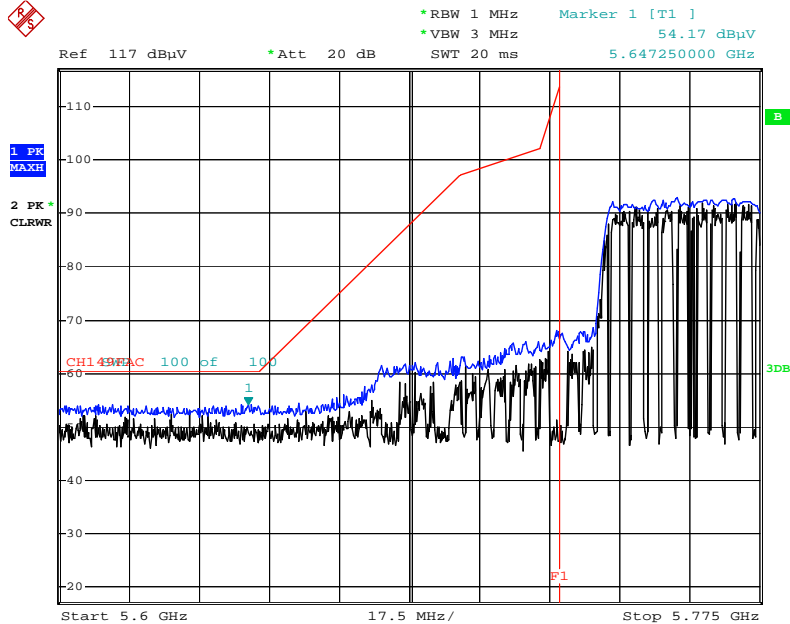
Date: 1.FEB.2019 11:54:28

**Peak Reading (802.11ac\_VHT40, Ch.151)**



Date: 1.FEB.2019 11:53:31

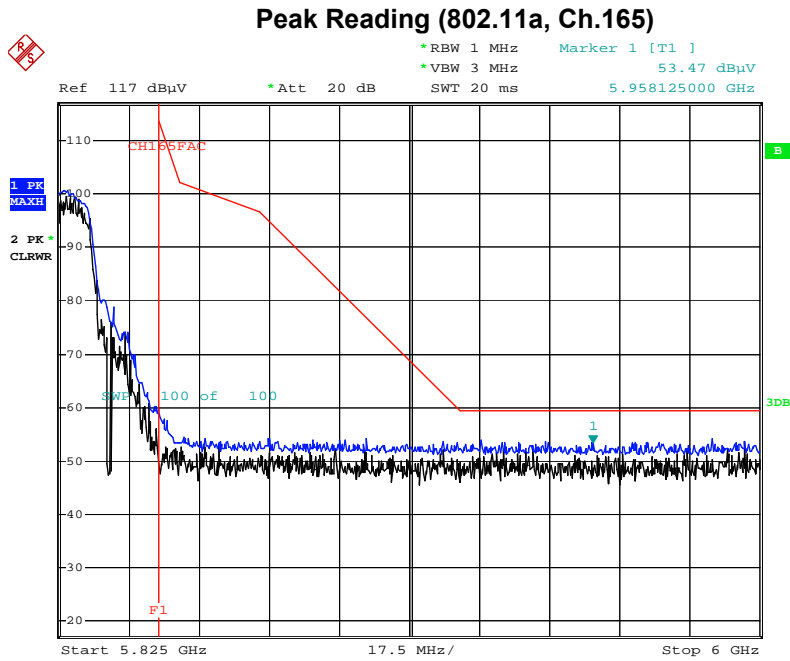
**Peak Reading (802.11ac\_VHT80, Ch.155)**



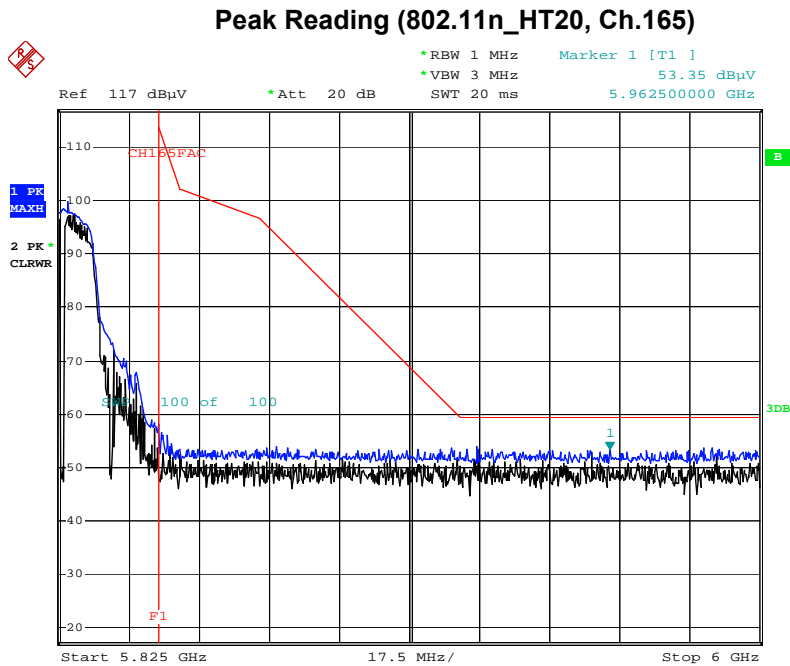
Date: 1.FEB.2019 11:52:19



■ Test Plots(UNII 3)\_High Band Edge Plot

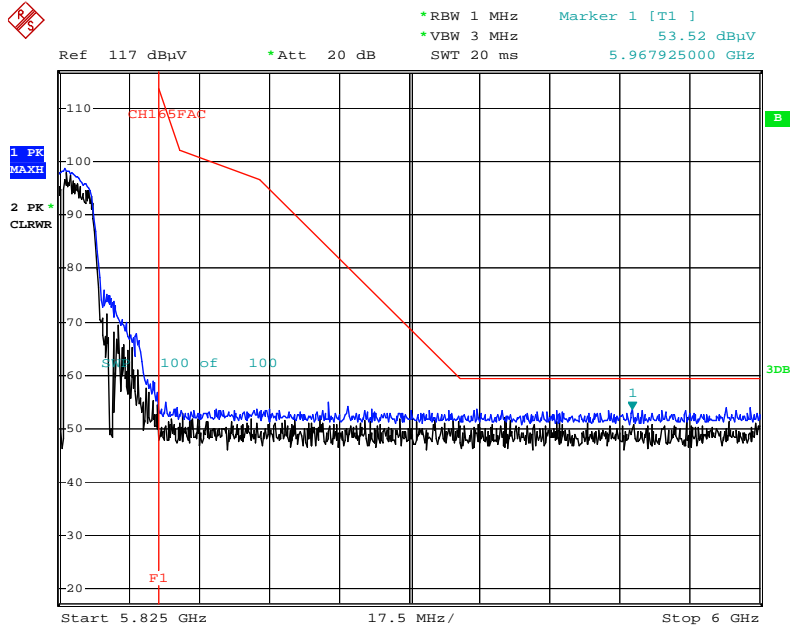


Date: 1.FEB.2019 13:23:00



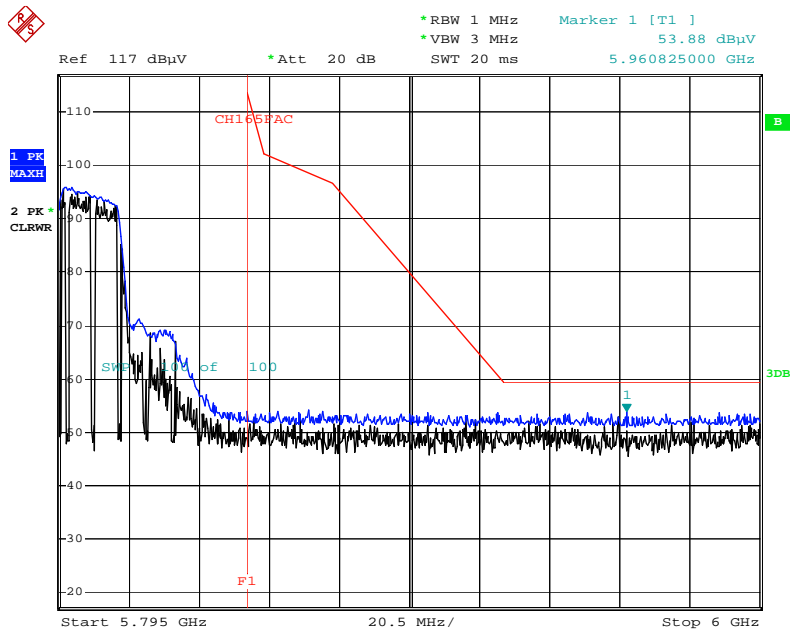
Date: 1.FEB.2019 13:21:53

**Peak Reading (802.11ac\_VHT20, Ch.165)**



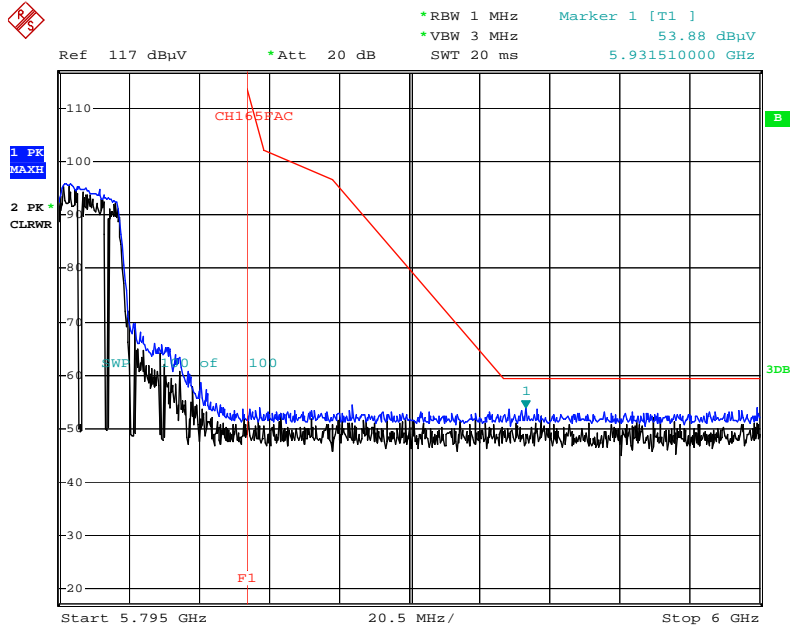
Date: 1.FEB.2019 13:20:47

**Peak Reading (802.11n\_HT40, Ch.159)**



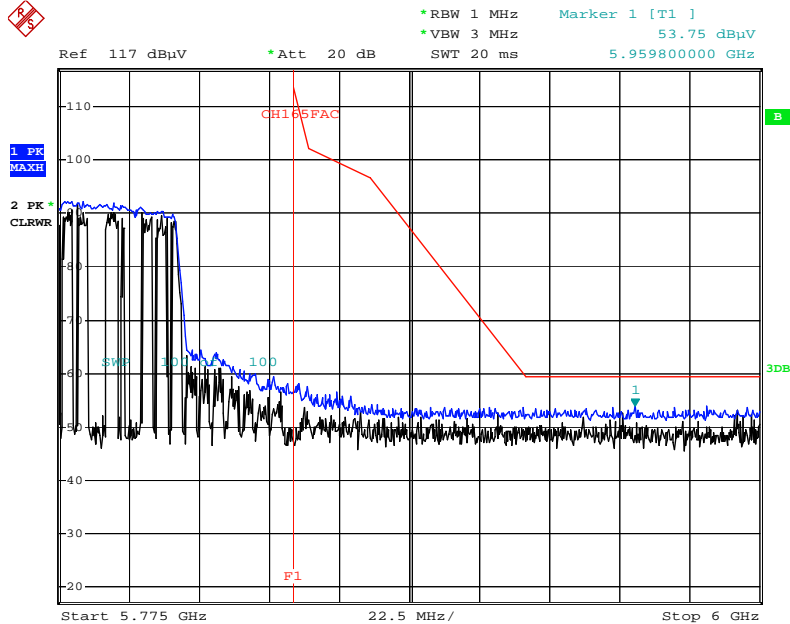
Date: 1.FEB.2019 13:18:53

**Peak Reading (802.11ac\_VHT40, Ch.159)**



Date: 1.FEB.2019 13:17:41

**Peak Reading (802.11ac\_VHT80, Ch.155)**



Date: 1.FEB.2019 13:16:19

## 10.9 RECEIVER SPURIOUS EMISSIONS

### Frequency Range : Below 1 GHz

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

**Note:**

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

### Frequency Range : Above 1 GHz

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

**10.10 POWERLINE CONDUCTED EMISSIONS**  
**Conducted Emissions (Line 1)**

5G WLAN\_N

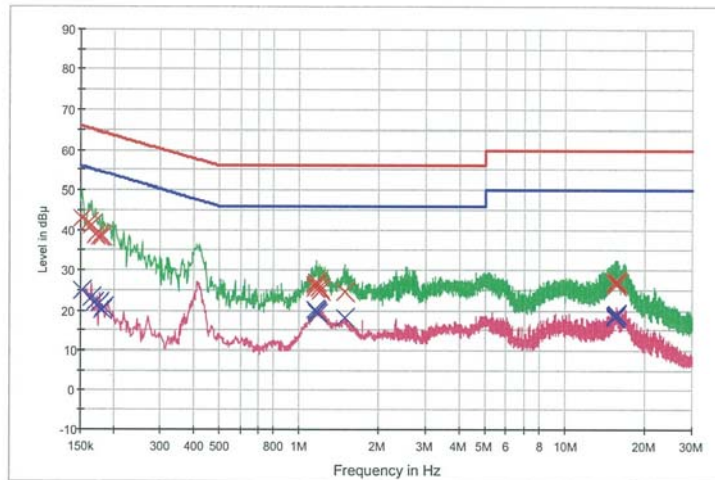
1 / 2

**HCT TEST Report**

**Common Information**

EUT: WK7  
 Manufacturer: LG  
 Test Site: SHIELD ROOM  
 Operating Conditions: 5G WLAN\_N

FCC CLASS B\_Exten Cable



— FCC CLASS B\_QP      — FCC CLASS B\_AV      — Preview Result 1-PK+  
 — Preview Result 2-AVG      × Final Result 1-QPK      × Final Result 2-CAV

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	43.0	9.000	Off	N	9.8	22.9	65.9
0.160000	41.7	9.000	Off	N	9.8	23.8	65.5
0.164000	41.3	9.000	Off	N	9.8	24.0	65.3
0.170000	38.9	9.000	Off	N	9.8	26.1	65.0
0.176000	38.5	9.000	Off	N	9.8	26.2	64.7
0.180000	38.5	9.000	Off	N	9.8	26.0	64.5
1.148000	25.7	9.000	Off	N	10.0	30.3	56.0
1.152000	26.3	9.000	Off	N	10.0	29.7	56.0
1.166000	27.0	9.000	Off	N	10.0	29.0	56.0
1.190000	25.5	9.000	Off	N	10.0	30.5	56.0
1.196000	24.9	9.000	Off	N	10.0	31.1	56.0
1.482000	24.6	9.000	Off	N	10.1	31.4	56.0
15.394000	26.7	9.000	Off	N	10.7	33.3	60.0
15.412000	26.5	9.000	Off	N	10.7	33.5	60.0
15.492000	26.9	9.000	Off	N	10.7	33.1	60.0
15.502000	26.4	9.000	Off	N	10.7	33.6	60.0
15.624000	27.1	9.000	Off	N	10.7	32.9	60.0
15.720000	26.6	9.000	Off	N	10.7	33.4	60.0

2019-01-30

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5G WLAN\_N

2 / 2

**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	25.1	9.000	Off	N	9.8	30.8	55.9
0.164000	23.3	9.000	Off	N	9.8	32.0	55.3
0.168000	21.9	9.000	Off	N	9.8	33.2	55.1
0.176000	21.9	9.000	Off	N	9.8	32.7	54.7
0.180000	20.2	9.000	Off	N	9.8	34.2	54.5
0.184000	20.7	9.000	Off	N	9.8	33.6	54.3
1.150000	20.2	9.000	Off	N	10.0	25.8	46.0
1.154000	20.2	9.000	Off	N	10.0	25.8	46.0
1.162000	19.6	9.000	Off	N	10.0	26.4	46.0
1.166000	19.7	9.000	Off	N	10.0	26.3	46.0
1.170000	19.3	9.000	Off	N	10.0	26.7	46.0
1.482000	18.0	9.000	Off	N	10.1	28.0	46.0
15.406000	18.6	9.000	Off	N	10.7	31.4	50.0
15.412000	18.0	9.000	Off	N	10.7	32.0	50.0
15.472000	18.7	9.000	Off	N	10.7	31.3	50.0
15.492000	18.5	9.000	Off	N	10.7	31.5	50.0
15.502000	18.9	9.000	Off	N	10.7	31.1	50.0
15.624000	19.1	9.000	Off	N	10.7	30.9	50.0

2019-01-30

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**Conducted Emissions (Line 2)**

5G WLAN\_L1

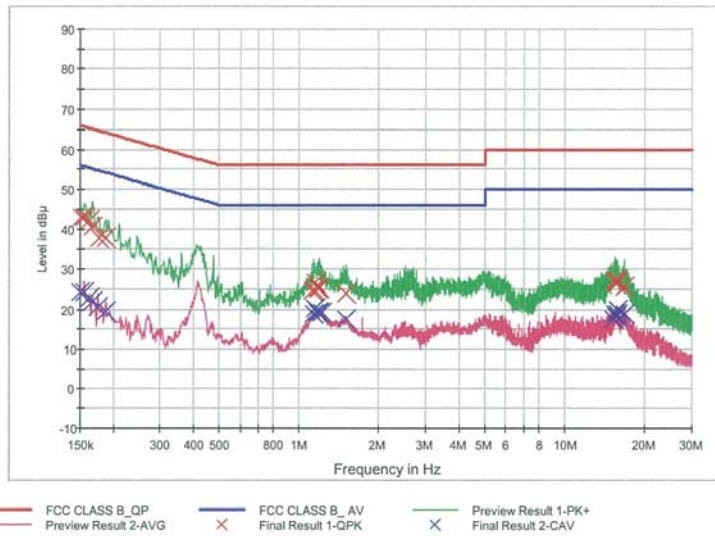
1 / 2

**HCT TEST Report**

**Common Information**

EUT: WK7  
 Manufacturer: LG  
 Test Site: SHIELD ROOM  
 Operating Conditions: 5G WLAN\_L1

FCC CLASS B\_Exten Cable



**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.152000	43.0	9.000	Off	L1	9.7	22.9	65.9
0.156000	42.9	9.000	Off	L1	9.7	22.8	65.7
0.162000	42.1	9.000	Off	L1	9.7	23.2	65.4
0.166000	40.7	9.000	Off	L1	9.7	24.5	65.2
0.176000	37.8	9.000	Off	L1	9.7	26.9	64.7
0.188000	37.7	9.000	Off	L1	9.7	26.4	64.1
1.122000	24.6	9.000	Off	L1	9.8	31.4	56.0
1.134000	24.9	9.000	Off	L1	9.8	31.1	56.0
1.152000	26.5	9.000	Off	L1	9.8	29.5	56.0
1.170000	25.4	9.000	Off	L1	9.8	30.6	56.0
1.194000	25.2	9.000	Off	L1	9.8	30.8	56.0
1.502000	24.0	9.000	Off	L1	9.9	32.0	56.0
15.404000	26.6	9.000	Off	L1	10.4	33.4	60.0
15.490000	27.1	9.000	Off	L1	10.4	32.9	60.0
15.654000	26.8	9.000	Off	L1	10.4	33.2	60.0
15.664000	26.1	9.000	Off	L1	10.4	33.9	60.0
15.710000	27.0	9.000	Off	L1	10.4	33.0	60.0
16.638000	25.7	9.000	Off	L1	10.5	34.3	60.0

2019-01-30

오후 7:05:43

5G WLAN\_L1

2 / 2

**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	24.2	9.000	Off	L1	9.7	31.8	56.0
0.156000	24.4	9.000	Off	L1	9.7	31.3	55.7
0.162000	23.0	9.000	Off	L1	9.7	32.3	55.4
0.166000	21.8	9.000	Off	L1	9.7	33.3	55.2
0.174000	20.6	9.000	Off	L1	9.7	34.2	54.8
0.188000	19.4	9.000	Off	L1	9.7	34.7	54.1
1.134000	18.7	9.000	Off	L1	9.8	27.3	46.0
1.150000	20.1	9.000	Off	L1	9.8	25.9	46.0
1.170000	19.2	9.000	Off	L1	9.8	26.8	46.0
1.194000	19.1	9.000	Off	L1	9.8	26.9	46.0
1.216000	19.3	9.000	Off	L1	9.8	26.7	46.0
1.502000	17.3	9.000	Off	L1	9.9	28.7	46.0
15.254000	17.3	9.000	Off	L1	10.4	32.7	50.0
15.490000	18.6	9.000	Off	L1	10.4	31.4	50.0
15.664000	18.1	9.000	Off	L1	10.4	31.9	50.0
15.710000	19.8	9.000	Off	L1	10.4	30.2	50.0
15.724000	19.0	9.000	Off	L1	10.4	31.0	50.0
16.638000	18.9	9.000	Off	L1	10.5	31.1	50.0

2019-01-30

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## 11. LIST OF TEST EQUIPMENT

### Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/12/2018	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/27/2018	Annual	100033
ESPAC	SU-642 / Temperature Chamber	03/30/2018	Annual	0093008124
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	11/20/2018	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/26/2018	Annual	101231
Agilent	N1911A / Power Meter	04/16/2018	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/16/2018	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/20/2018	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/07/2018	Annual	05001
DYENTC	DFSS60 / AC Power Supply	04/05/2018	Annual	1003030-1
Agilent	8493C / Attenuator(10 dB)	07/10/2018	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A
Rohde & Schwarz	CBT / Bluetooth Tester	05/17/2018	Annual	100422

### Note:

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

**Radiated Test**

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	08/23/2018	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/06/2017	Biennial	760
Schwarzbeck	VULB 9168 / Hybrid Antenna	08/09/2018	Annual	3368
Schwarzbeck	BBHA 9120D / Horn Antenna	06/30/2017	Biennial	1300
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	12/04/2017	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 40 GHz) / Spectrum Analyzer	07/24/2018	Annual	100843
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/07/2018	Annual	8
Wainwright Instruments	WHFX7.0/18G-8SS / High Pass Filter	05/09/2018	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/29/2018	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/03/2019	Annual	2
Weinschel	2-3 / Attenuator (3 dB)	10/10/2018	Annual	BR0617
H+S	5910-N-50-010 / Attenuator(10 dB)	11/08/2018	Annual	NONE
CERNEX	CBLU1183540B-01 / Power Amplifier	12/21/2018	Annual	25540
CERNEX	CBL06185030 / Power Amplifier	03/28/2018	Annual	28550
CERNEX	CBL18265035 / Power Amplifier	01/03/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/29/2018	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/27/2018	Annual	3000C000276

**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.

## 12. ANNEX A\_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-1902-FI003-P
2	HCT-RF-1902-FI004-P
3	HCT-RF-1902-FI005-P
4	HCT-RF-1902-FI006-P