

# FCC DTS REPORT

## Certification

<b>Applicant Name:</b> SAMSUNG Electronics Co., Ltd.	<b>Date of Issue:</b> January 07, 2021
<b>Address:</b> 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea	<b>Test Site/Location:</b> 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
	<b>Report No.:</b> HCT-RF-2101-FC012

<b>FCC ID:</b>	<b>A3LSMA022M</b>
<b>APPLICANT:</b>	<b>SAMSUNG Electronics Co., Ltd.</b>

<b>Model:</b>	SM-A022M/DS
<b>Additional Model:</b>	SM-A022M, SM-M022M/DS
<b>EUT Type:</b>	Mobile Phone
<b>Average Output Power:</b>	802.11b : 17.53 dBm / 802.11g : 16.75 dBm / 802.11n(HT20) : 16.65 dBm
<b>Frequency Range:</b>	2 412 MHz ~ 2 472 MHz
<b>Modulation type:</b>	CCK/DSSS/OFDM
<b>FCC Classification:</b>	Digital Transmission System(DTS)
<b>FCC Rule Part(s):</b>	Part 15.247

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-2101-FC012

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REVIEWED BY



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Report prepared by : Se Wook Park  
Engineer of Telecommunication Testing Center

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

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

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

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

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

## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2101-FC012	January 07, 2021	- First Approval Report

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**1. EUT DESCRIPTION**

<b>Model</b>	SM-A022M/DS	
<b>Additional Model</b>	SM-A022M, SM-M022M/DS	
<b>EUT Type</b>	Mobile Phone	
<b>Power Supply</b>	DC 3.85 V	
<b>Frequency Range</b>	2 412 MHz ~ 2 472 MHz	
<b>Max. RF Output Power</b>	<u>Peak Power</u> (For information only)	802.11b : 23.78 dBm 802.11g : 26.11 dBm 802.11n(HT20) : 25.75 dBm
	<u>Average Power</u>	802.11b : 17.53 dBm 802.11g : 16.75 dBm 802.11n(HT20) : 16.65 dBm
<b>Modulation Type</b>	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n	
<b>Number of Channels</b>	13 Channels	
<b>Date(s) of Tests</b>	December 10, 2020 ~ January 06, 2021	
<b>Serial number</b>	Radiated : R38NB03QV4P	
	Conducted : R38NB03QVTY	

## **2. TEST METHODOLOGY**

FCC KDB 558074 D01 15.247 Meas Guidance v05r02 dated April 02, 2019 entitled “guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices and the measurement procedure described in ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

### **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 15.247 under the FCC Rules Part 15 Subpart C.

## **GENERAL TEST PROCEDURES**

### **Conducted Emissions**

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

### **Radiated Emissions**

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

## **DESCRIPTION OF TEST MODES**

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

### **3. 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).

### **4. FACILITIES AND ACCREDITATIONS**

#### **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).

#### **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."

## 5. ANTENNA REQUIREMENTS

### According to FCC 47 CFR §15.203:

“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

## 6. 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.

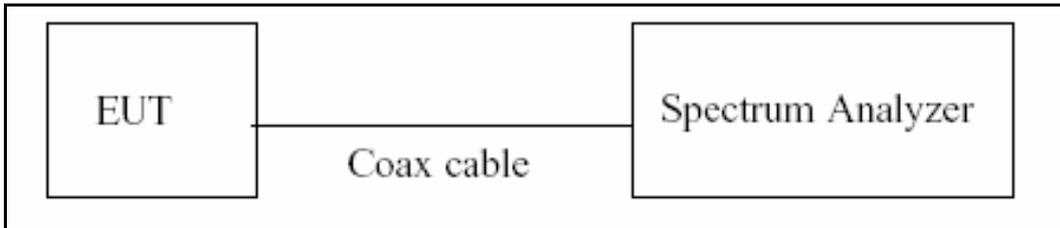
The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

## 7. DESCRIPTION OF TESTS

### 7.1. Duty Cycle

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method.

The largest available value of RBW is 8 MHz and VBW is 50 MHz.

The zero-span method of measuring duty cycle shall not be used if  $T \leq 6.25$  microseconds. ( $50/6.25 = 8$ )

The zero-span method was used because all measured T data are  $> 6.25$  microseconds and both RBW and VBW are  $> 50/T$ .

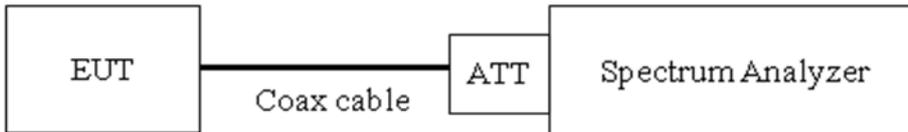
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ( $\geq$  RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep  $> 100$
6. Trace mode = Clear write
7. Measure  $T_{total}$  and  $T_{on}$
8. Calculate Duty Cycle =  $T_{on} / T_{total}$  and Duty Cycle Factor =  $10\log(1/\text{Duty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

## 7.2. 6dB Bandwidth

### Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

### Test Configuration



### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 11.8.1 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW  $\geq 3 \times$  RBW
- 3) Detector = Peak
- 4) Trace mode = max hold
- 5) Sweep = auto couple
- 6) Allow the trace to stabilize
- 7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

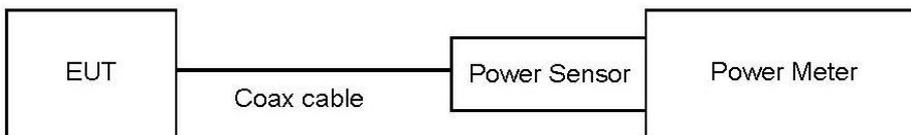
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

### 7.3. Output Power

#### Limit

The maximum permissible conducted output power is 1 Watt.

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Power Meter.

- Peak Power (Procedure 11.9.1.3 in ANSI 63.10-2013)  
: Measure the peak power of the transmitter.
  
- Average Power (Procedure 11.9.2.3 in ANSI 63.10-2013)
  - 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

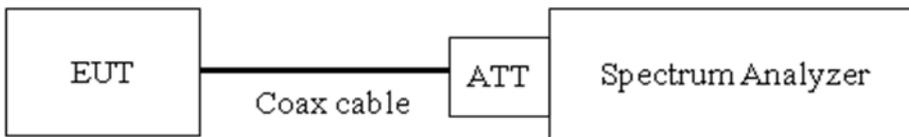
- Conducted Output Power(Peak) = Reading Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

## 7.4. Power Spectral Density

### Limit

The transmitter power density average over 1-second interval shall not be greater than 8 dBm in any 3kHz BW.

### Test Configuration



### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 8.4 in KDB 558074 v05r02, Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set span to at least 1.5 times the OBW.
- 3)  $RBW = 3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$ .
- 4)  $VBW \geq 3 \times RBW$ .
- 5) Sweep = auto couple
- 6) Detector = power averaging (rms) or sample detector (when rms not available).
- 7) Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / RBW]$ .
- 8) Employ trace averaging (rms) mode over a minimum of 100 traces
- 9) Use the peak marker function to determine the maximum amplitude level.
- 10) Use the peak marker function to determine the maximum amplitude level within the RBW.  
If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
- 11) if then duty factor shall be added to adjust the result if the duty cycle is less than 98%

### Sample Calculation

- Power Spectral Density = Reading Value + ATT loss + Cable loss

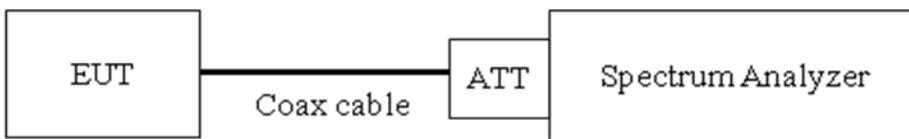
## 7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

### Limit

The maximum conducted (Average) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least relative to the maximum in-band peak PSD level in 100 kHz.

[ Conducted > 30 dBc ]

### Test Configuration



### Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 11.11 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW  $\geq 3 \times$  RBW
- 3) Set span to encompass the spectrum to be examined
- 4) Detector = Peak
- 5) Trace Mode = max hold
- 6) Sweep time = auto couple
- 7) Ensure that the number of measurement points  $\geq 2 \times$  Span/RBW
- 8) Allow trace to fully stabilize.
- 9) Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

**Factors for frequency**

Freq(MHz)	Factor(dB)
30	10.04
100	10.07
200	10.12
300	10.17
400	10.20
500	10.21
600	10.21
700	10.23
800	10.24
900	10.26
1000	10.27
2000	10.41
2400	10.45
2500	10.47
3000	10.52
4000	10.60
5000	10.71
6000	10.73
7000	10.80
8000	10.85
9000	10.91
10000	10.97
11000	11.02
12000	11.10
13000	11.19
14000	11.16
15000	11.21
16000	11.22
17000	11.25
18000	11.30
19000	11.32
20000	11.36
21000	11.48
22000	11.55
23000	11.55
24000	11.59
25000	11.68
26000	11.69

Note : 1. 2400 ~ 2500 MHz is fundamental frequency range.

2. Factor = Attenuator loss + Cable loss

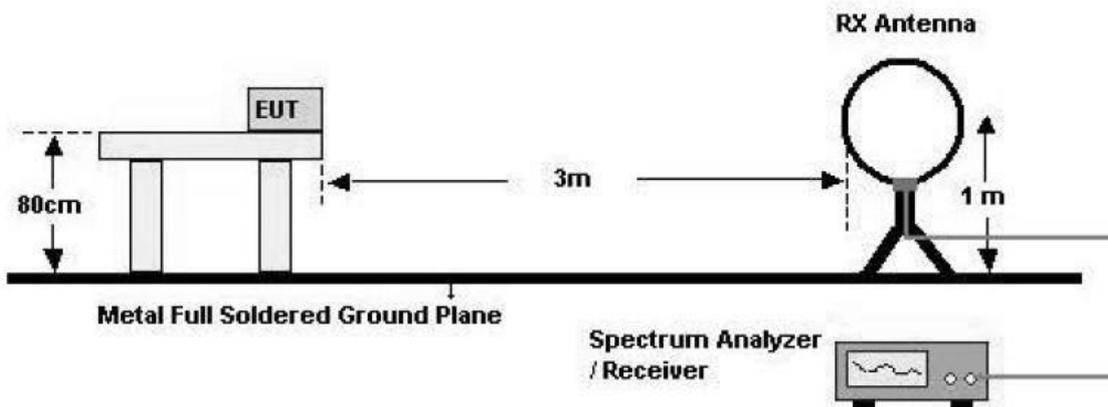
**7.6. Radiated Test**

**Limit**

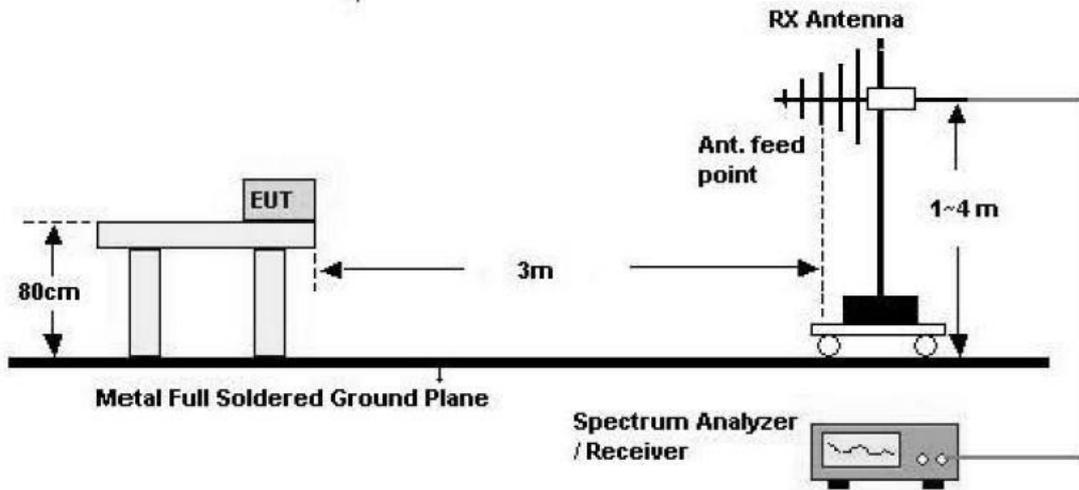
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Test Configuration**

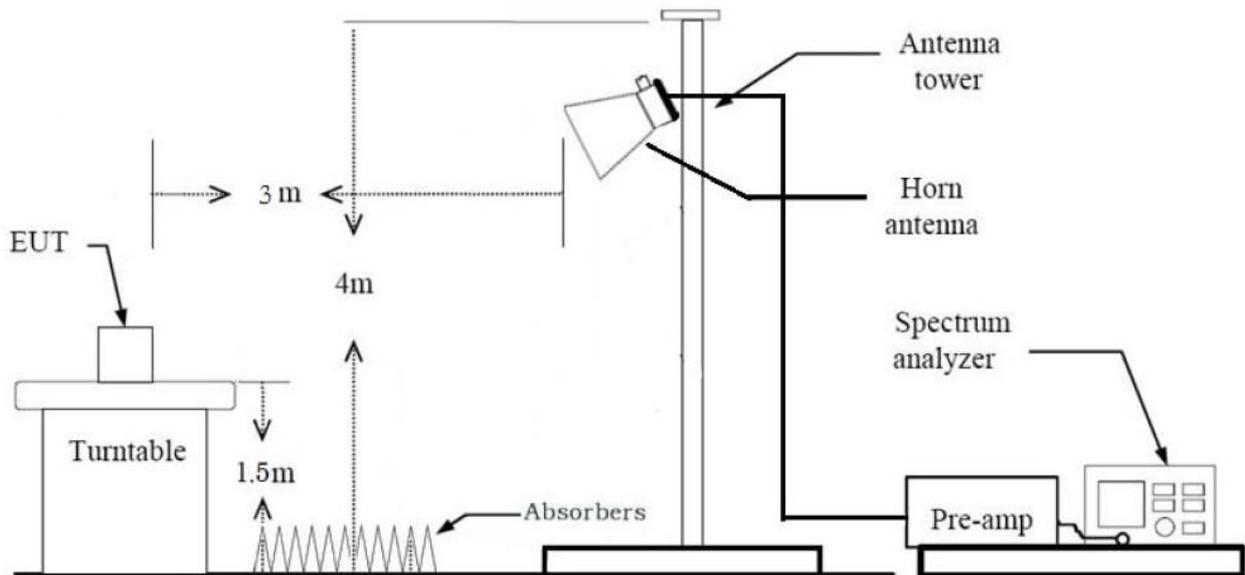
Below 30 MHz



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

**KDB 414788 OFS and Chamber Correlation Justification**

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

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

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

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

(1) Measurement Type(Peak):

- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 100 kHz
- VBW  $\geq$  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 = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

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

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak

- Trace = Maxhold

- RBW = 1 MHz

- VBW  $\geq 3 \times$  RBW

(2) Measurement Type(Average): Duty cycle  $\geq 98\%$

- Measured Frequency Range : 1 GHz – 25 GHz

- Detector = RMS

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

- RBW = 1 MHz

- VBW  $\geq 3 \times$  RBW

- Sweep time = auto.

- Trace mode = average (at least 100 traces).

(3) Measurement Type(Average): Duty cycle  $< 98\%$ , duty cycle variations are less than  $\pm 2\%$

- Measured Frequency Range : 1 GHz – 25 GHz

- Detector = RMS

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

- RBW = 1 MHz

- VBW  $\geq 3 \times$  RBW

- Sweep time = auto.

- Trace mode = average (at least 100 traces).

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

- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

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

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

11. Total(Measurement Type : Peak)

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

Total(Measurement Type : Average, Duty cycle  $\geq 98\%$ )

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

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

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

### **Test Procedure of Radiated Restricted Band Edge**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Average): Duty cycle  $\geq$  98%,
    - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
    - Detector = RMS
    - Averaging type = power (*i.e.*, RMS)
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
    - Sweep time = auto.
    - Trace mode = average (at least 100 traces).
  - (3) Measurement Type(Average): Duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$ 
    - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
    - Detector = RMS
    - Averaging type = power (*i.e.*, RMS)
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
    - Sweep time = auto.
    - Trace mode = average (at least 100 traces).
    - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
    - Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
10. Distance extrapolation factor =  $20\log(\text{test distance} / \text{specific distance})$  (dB)
11. Total(Measurement Type : Peak)  
= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
- Total(Measurement Type : Average, Duty cycle  $\geq$  98%)  
= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
- Total(Measurement Type : Average, Duty cycle < 98%)  
= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty Cycle Factor

**7.7. AC Power line Conducted Emissions**

**Limit**

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

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 <sup>(a)</sup>	56 to 46 <sup>(a)</sup>
0.50 to 5	56	46
5 to 30	60	50

<sup>(a)</sup>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

## **7.8. 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,Z
  - Radiated Restricted Band Edge : X,Y
3. Duty cycle factor applies only 802.11g/n (Duty cycle < 98%).
4. All data rate of operation were investigated and the test results are worst case in lowest datarate of each mode.
  - 802.11b : 1 Mbps
  - 802.11g : 6 Mbps
  - 802.11n\_HT20 : MCS0
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. SM-A022M/DS, SM-A022M, SM-M022M/DS were tested and the worst case results are reported.  
(Worst case : SM-A022M/DS)

### **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-A022M/DS, SM-A022M, SM-M022M/DS were tested and the worst case results are reported.  
(Worst case : SM-A022M/DS)

### **Conducted test**

1. The EUT was configured with data rate of highest power.
2. SM-A022M/DS, SM-A022M, SM-M022M/DS were tested and the worst case results are reported.  
(Worst case : SM-A022M/DS)

**8. SUMMARY TEST OF RESULTS**

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	Conducted	PASS
Conducted Maximum Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	§15.247(d)	Conducted > 30 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 7.7		PASS
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 7.6		PASS

## 9. TEST RESULT

### 9.1 DUTY CYCLE

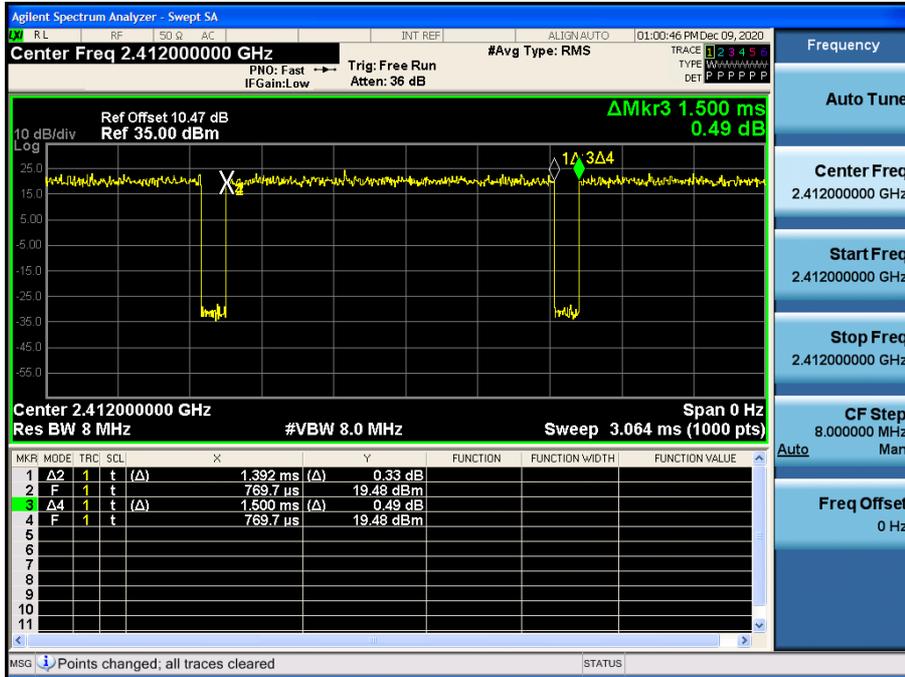
Mode	Data Rate (Mbps)	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	8.392	8.483	0.989	0.047
	2	4.196	4.294	0.977	0.100
	5.5	1.585	1.687	0.940	0.269
	11	0.841	0.942	0.893	0.494
802.11g	6	1.392	1.500	0.928	0.323
	9	0.936	1.044	0.897	0.472
	12	0.709	0.816	0.868	0.613
	18	0.480	0.588	0.817	0.880
	24	0.364	0.471	0.772	1.122
	36	0.252	0.360	0.699	1.552
	48	0.192	0.300	0.641	1.934
	54	0.176	0.284	0.621	2.071
802.11n (HT20)	6.5 (MCS0)	1.299	1.408	0.922	0.351
	13 (MCS1)	0.669	0.777	0.861	0.649
	19.5 (MCS2)	0.461	0.568	0.810	0.913
	26 (MCS3)	0.352	0.459	0.766	1.156
	39 (MCS4)	0.248	0.356	0.697	1.569
	52 (MCS5)	0.196	0.304	0.646	1.896
	58.5 (MCS6)	0.180	0.288	0.625	2.041
	65 (MCS7)	0.164	0.272	0.603	2.199

Test Plots

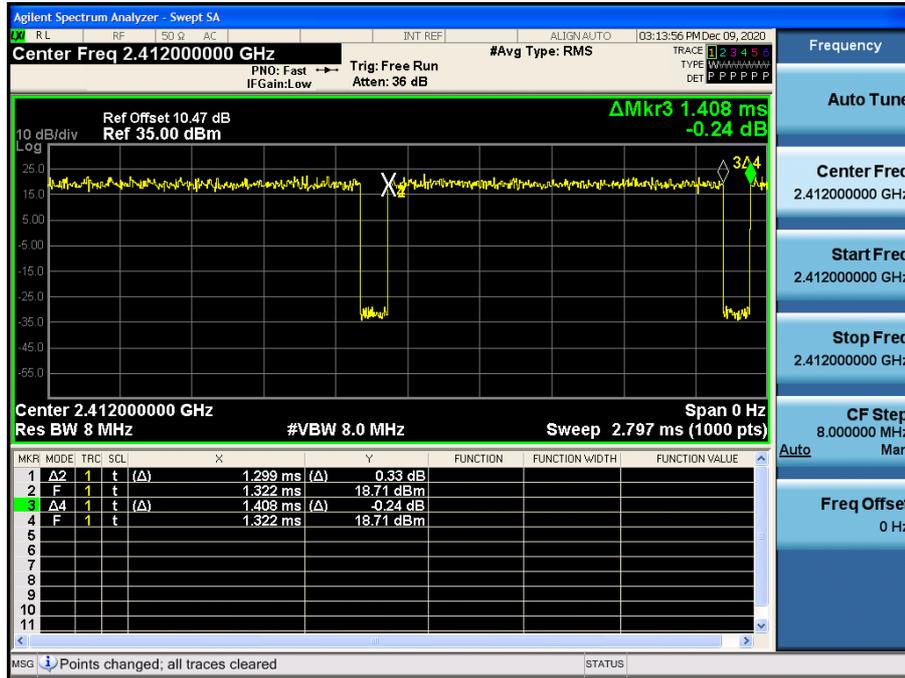
Duty cycle plot (802.11b(1Mbps))



Duty cycle plot (802.11g(6Mbps))



Duty cycle plot (802.11n(MCS0))



**Note:**

In order to simplify the report, attached plots were only the most lowest data rate.

**9.2 6dB BANDWIDTH**

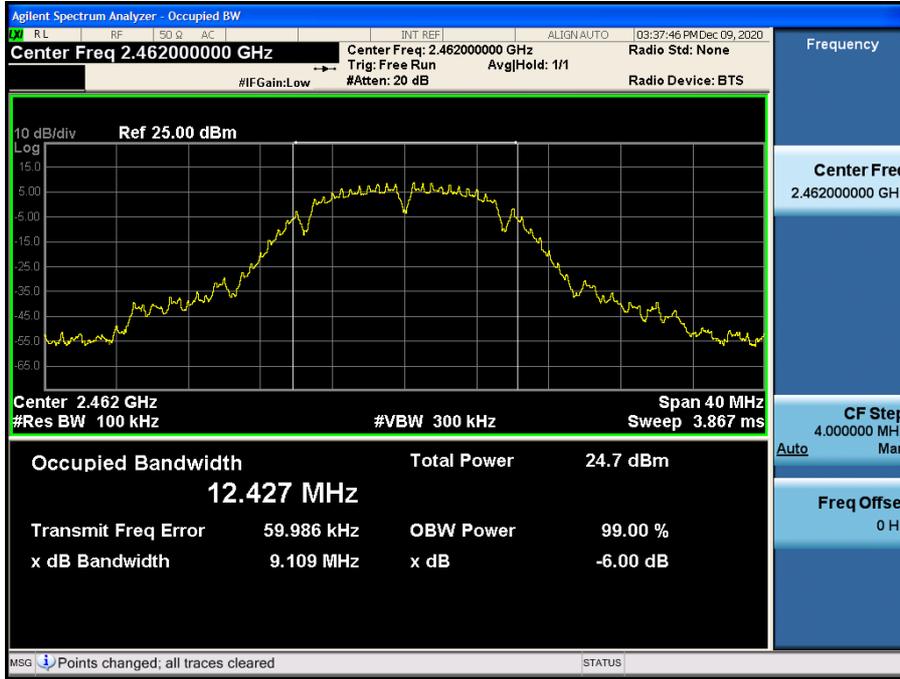
802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	9.131	0.5
2437	6	9.579	0.5
2462	11	9.109	0.5
2467	12	10.07	0.5
2472	13	10.11	0.5

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.72	0.5
2437	6	15.17	0.5
2462	11	15.17	0.5
2467	12	16.39	0.5
2472	13	16.39	0.5

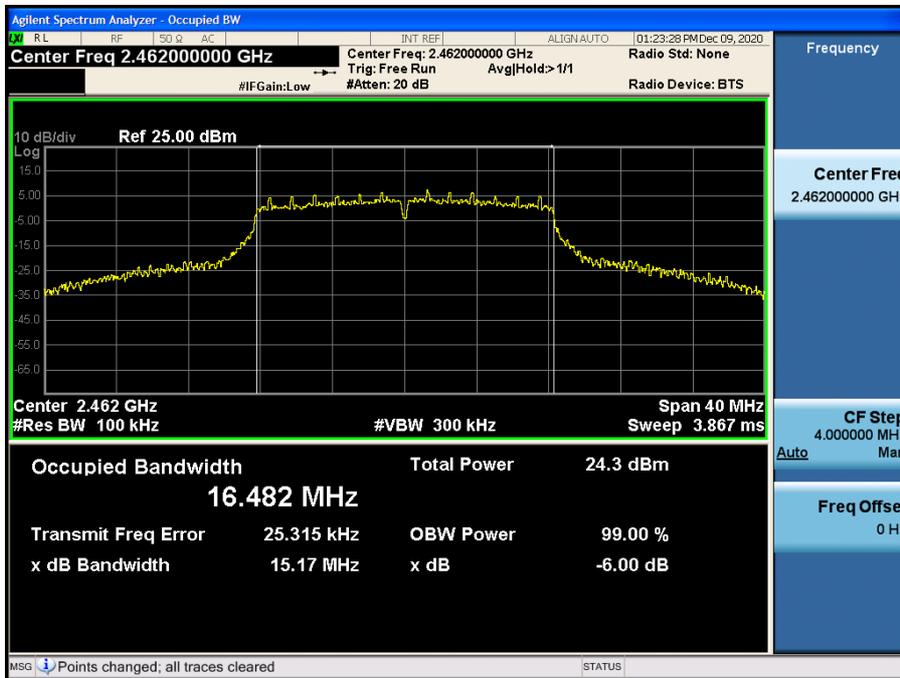
802.11n(HT20) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	16.10	0.5
2437	6	15.15	0.5
2462	11	15.14	0.5
2467	12	17.61	0.5
2472	13	17.61	0.5

▣ Test Plots

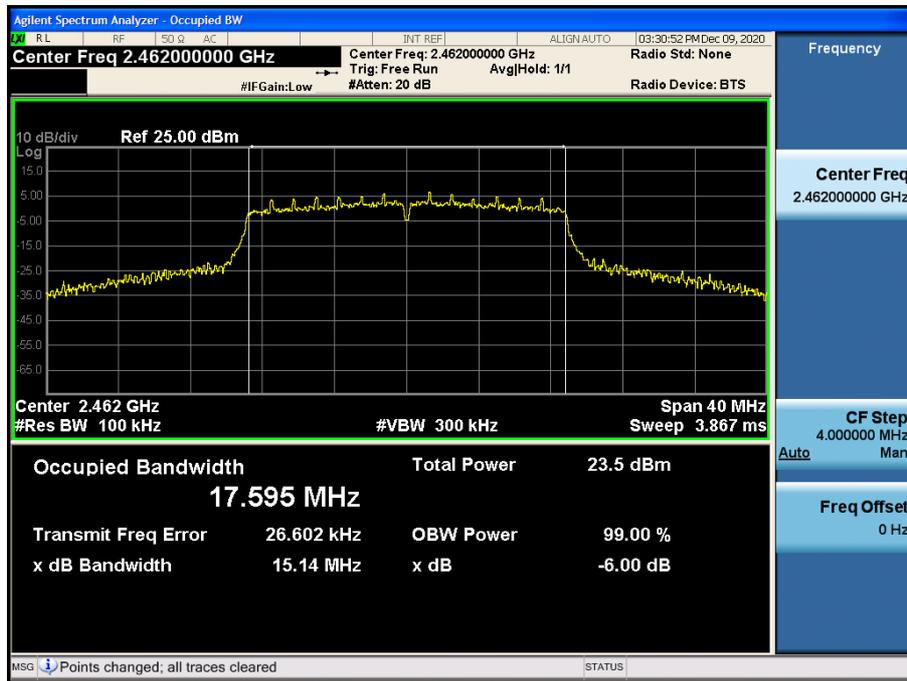
6dB Bandwidth plot (802.11b-CH 11)



6dB Bandwidth plot (802.11g-CH 11)



6dB Bandwidth plot (802.11n\_HT20-CH 11)



**Note:**

In order to simplify the report, attached plots were only the most narrow 6 dB BW channel.

**9.3 OUTPUT POWER**

**Peak Power**

1. Power Meter offset = Attenuator loss + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.  
So, 10.47 dB is offset for 2.4 GHz Band

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	1	19.64	30	19
		2	20.33	30	
		5.5	21.81	30	
		11	23.71	30	
2437	6	1	19.85	30	19
		2	20.35	30	
		5.5	21.90	30	
		11	23.78	30	
2462	11	1	19.90	30	19
		2	20.38	30	
		5.5	21.85	30	
		11	23.71	30	
2467	12	1	9.75	30	9
		2	10.24	30	
		5.5	11.66	30	
		11	13.33	30	
2472	13	1	9.52	30	9
		2	9.87	30	
		5.5	11.25	30	
		11	13.20	30	

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	6	24.90	30	18
		9	24.96	30	
		12	25.48	30	
		18	25.35	30	
		24	25.60	30	
		36	25.63	30	
		48	25.93	30	
		54	25.99	30	
2437	6	6	25.03	30	18
		9	25.15	30	
		12	25.48	30	
		18	25.58	30	
		24	25.65	30	
		36	25.51	30	
		48	26.11	30	
		54	25.92	30	
2462	11	6	23.04	30	17
		9	23.44	30	
		12	23.65	30	
		18	23.45	30	
		24	23.65	30	
		36	23.54	30	
		48	24.15	30	
		54	24.03	30	
2467	12	6	15.39	30	9
		9	15.32	30	
		12	15.72	30	
		18	15.62	30	
		24	15.85	30	
		36	15.86	30	
		48	16.12	30	
		54	16.35	30	
2472	13	6	15.18	30	9
		9	15.21	30	
		12	15.43	30	
		18	15.42	30	
		24	15.73	30	
		36	15.82	30	
		48	15.72	30	
		54	15.75	30	

802.11n(HT20) Mode		MCS Index	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	0	24.95	30	18
		1	25.05	30	
		2	24.90	30	
		3	25.36	30	
		4	25.42	30	
		5	25.51	30	
		6	25.54	30	
		7	25.55	30	
2437	6	0	24.73	30	18
		1	24.72	30	
		2	24.85	30	
		3	25.38	30	
		4	25.30	30	
		5	25.75	30	
		6	25.68	30	
		7	25.75	30	
2462	11	0	22.12	30	16
		1	22.15	30	
		2	22.53	30	
		3	22.51	30	
		4	22.85	30	
		5	22.75	30	
		6	22.65	30	
		7	22.72	30	
2467	12	0	15.29	30	9
		1	15.54	30	
		2	15.32	30	
		3	15.75	30	
		4	15.83	30	
		5	16.04	30	
		6	16.05	30	
		7	16.08	30	
2472	13	0	15.22	30	9
		1	15.25	30	
		2	15.25	30	
		3	15.75	30	
		4	15.76	30	
		5	15.65	30	
		6	15.75	30	
		7	15.73	30	

**Average Power**

1. Power Meter offset = Attenuator loss + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.  
So, 10.47 dB is offset for 2.4 GHz Band.

802.11b Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	1	17.17	0.047	17.22	30	19
		2	17.34	0.100	17.44	30	
		5.5	17.26	0.269	17.53	30	
		11	17.01	0.494	17.50	30	
2437	6	1	17.02	0.047	17.07	30	19
		2	17.25	0.100	17.35	30	
		5.5	17.22	0.269	17.49	30	
		11	17.01	0.494	17.50	30	
2462	11	1	17.20	0.047	17.25	30	19
		2	17.22	0.100	17.32	30	
		5.5	17.15	0.269	17.42	30	
		11	17.02	0.494	17.51	30	
2467	12	1	7.16	0.047	7.21	30	9
		2	7.15	0.100	7.25	30	
		5.5	6.97	0.269	7.24	30	
		11	6.73	0.494	7.22	30	
2472	13	1	6.87	0.047	6.92	30	9
		2	6.85	0.100	6.95	30	
		5.5	6.65	0.269	6.92	30	
		11	6.51	0.494	7.00	30	

802.11g Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	6	16.09	0.323	16.41	30	18
		9	15.94	0.472	16.42	30	
		12	15.92	0.613	16.53	30	
		18	15.71	0.880	16.59	30	
		24	15.12	1.122	16.24	30	
		36	14.71	1.552	16.26	30	
		48	14.42	1.934	16.35	30	
		54	14.34	2.071	16.41	30	
2437	6	6	15.86	0.323	16.19	30	18
		9	15.64	0.472	16.11	30	
		12	16.14	0.613	16.75	30	
		18	15.66	0.880	16.54	30	
		24	15.04	1.122	16.17	30	
		36	14.67	1.552	16.23	30	
		48	14.74	1.934	16.68	30	
		54	14.64	2.071	16.71	30	
2462	11	6	14.98	0.323	15.30	30	17
		9	14.95	0.472	15.42	30	
		12	14.94	0.613	15.55	30	
		18	14.71	0.880	15.59	30	
		24	14.29	1.122	15.41	30	
		36	13.80	1.552	15.35	30	
		48	13.58	1.934	15.51	30	
		54	13.45	2.071	15.52	30	
2467	12	6	7.10	0.323	7.42	30	9
		9	6.83	0.472	7.30	30	
		12	6.84	0.613	7.45	30	
		18	6.66	0.880	7.54	30	
		24	6.33	1.122	7.45	30	
		36	5.89	1.552	7.44	30	
		48	5.54	1.934	7.47	30	
		54	5.35	2.071	7.42	30	
2472	13	6	6.73	0.323	7.05	30	9
		9	6.60	0.472	7.07	30	
		12	6.47	0.613	7.08	30	
		18	6.27	0.880	7.15	30	
		24	5.98	1.122	7.10	30	
		36	5.32	1.552	6.87	30	
		48	5.23	1.934	7.16	30	
		54	5.20	2.071	7.27	30	

802.11n(HT20) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	0	16.07	0.351	16.42	30	18
		1	15.46	0.649	16.11	30	
		2	15.30	0.913	16.21	30	
		3	15.13	1.156	16.29	30	
		4	14.74	1.569	16.31	30	
		5	14.46	1.896	16.36	30	
		6	14.32	2.041	16.36	30	
		7	14.27	2.199	16.47	30	
2437	6	0	15.82	0.351	16.17	30	18
		1	15.52	0.649	16.17	30	
		2	15.38	0.913	16.29	30	
		3	14.99	1.156	16.15	30	
		4	14.65	1.569	16.22	30	
		5	14.75	1.896	16.65	30	
		6	14.42	2.041	16.47	30	
		7	14.28	2.199	16.48	30	
2462	11	0	14.15	0.351	14.50	30	16
		1	13.68	0.649	14.33	30	
		2	13.55	0.913	14.46	30	
		3	13.15	1.156	14.31	30	
		4	12.78	1.569	14.35	30	
		5	12.68	1.896	14.58	30	
		6	12.44	2.041	14.48	30	
		7	12.33	2.199	14.53	30	
2467	12	0	7.10	0.351	7.45	30	9
		1	6.62	0.649	7.27	30	
		2	6.44	0.913	7.35	30	
		3	6.22	1.156	7.38	30	
		4	5.90	1.569	7.47	30	
		5	5.63	1.896	7.53	30	
		6	5.42	2.041	7.46	30	
		7	5.20	2.199	7.40	30	
2472	13	0	6.66	0.351	7.01	30	9
		1	6.42	0.649	7.07	30	
		2	6.21	0.913	7.12	30	
		3	5.86	1.156	7.02	30	
		4	5.26	1.569	6.83	30	
		5	5.26	1.896	7.16	30	
		6	5.15	2.041	7.19	30	
		7	5.01	2.199	7.21	30	

**9.4 POWER SPECTRAL DENSITY**

Mode	Frequency (MHz)	Channel No.	Test Result			Limit (dBm)
			Measured PSD (dBm)	Duty Cycle Factor	Measured PSD(dBm) + Duty Cycle Factor	
802.11b	2412	1	-1.032	0.269	-0.763	8
	2437	6	-1.161	0.494	-0.667	
	2462	11	-1.164	0.494	-0.670	
	2467	12	-10.08	0.100	-9.980	
	2472	13	-12.54	0.494	-12.042	
802.11g	2412	1	-3.758	0.880	-2.878	
	2437	6	-3.383	0.613	-2.770	
	2462	11	-4.969	0.880	-4.089	
	2467	12	-13.85	0.880	-12.971	
	2472	13	-14.91	2.071	-12.836	
802.11n	2412	1	-3.972	2.199	-1.773	
	2437	6	-3.755	1.896	-1.859	
	2462	11	-5.945	1.896	-4.049	
	2467	12	-13.94	1.896	-12.040	
	2472	13	-14.53	2.199	-12.330	

**Note :**

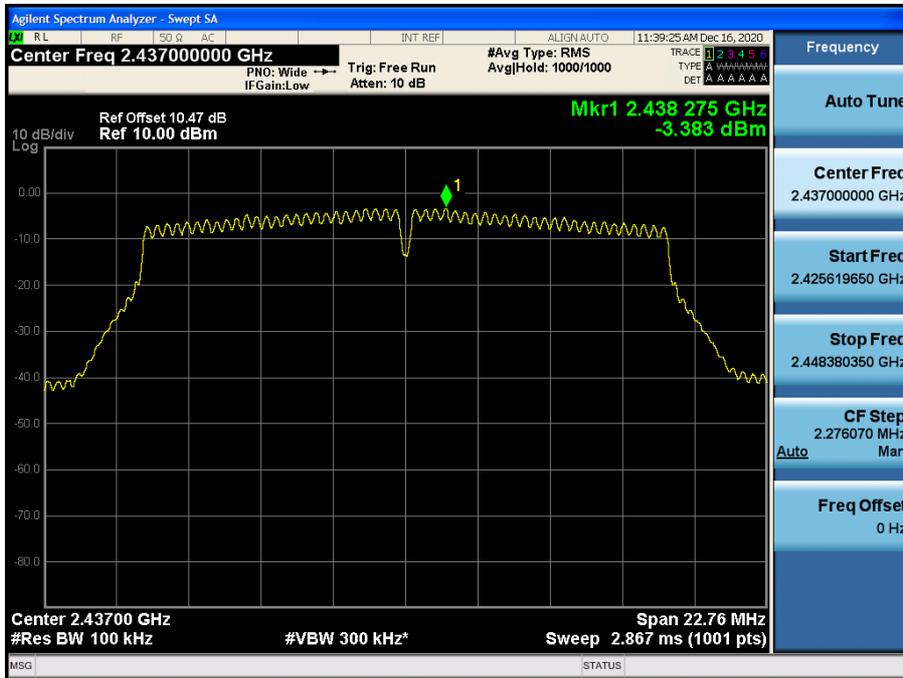
1. Spectrum reading values are not plot data.  
The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss(10 dB) + Cable loss
3. 10.47 dB is offset for 2.4 GHz Band.

▣ Test Plots

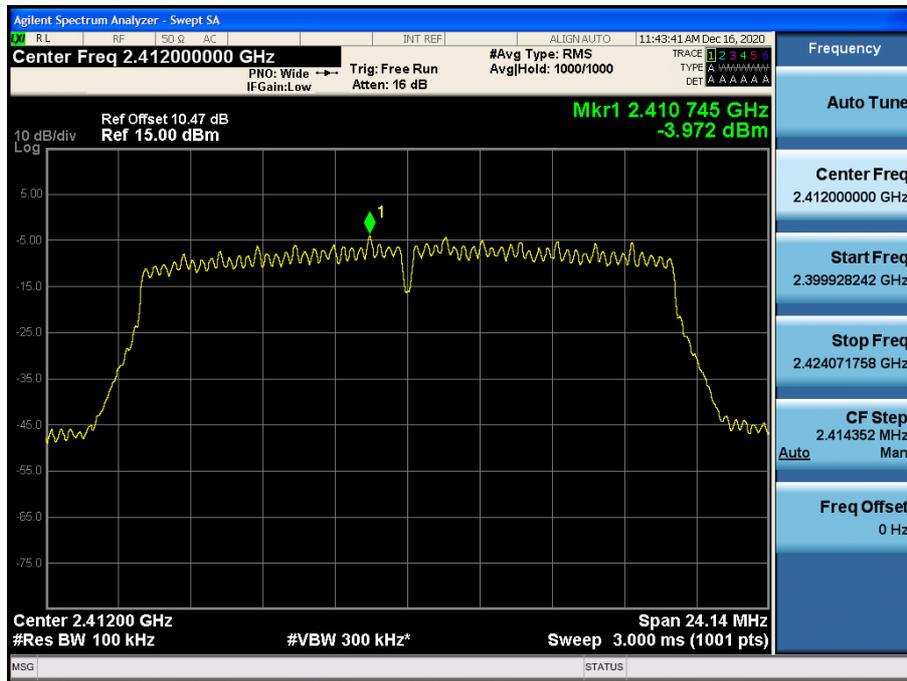
Power Spectral Density (802.11b-CH 6)



Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n\_HT20 -CH 1)



**Note :**

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

## 9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Result : please refer to the plot below.

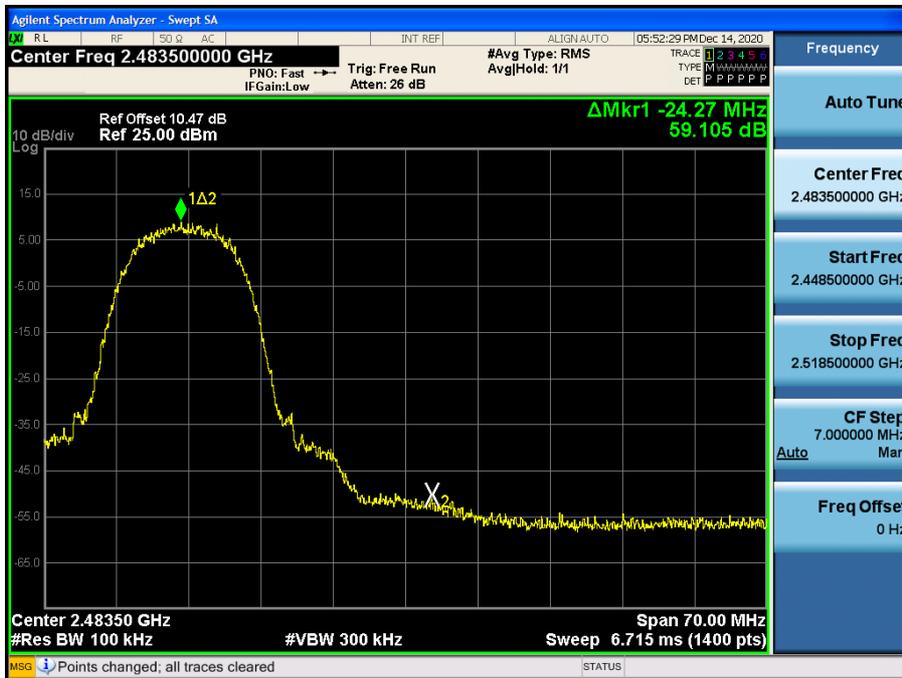
In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ Test Plots(BandEdge)

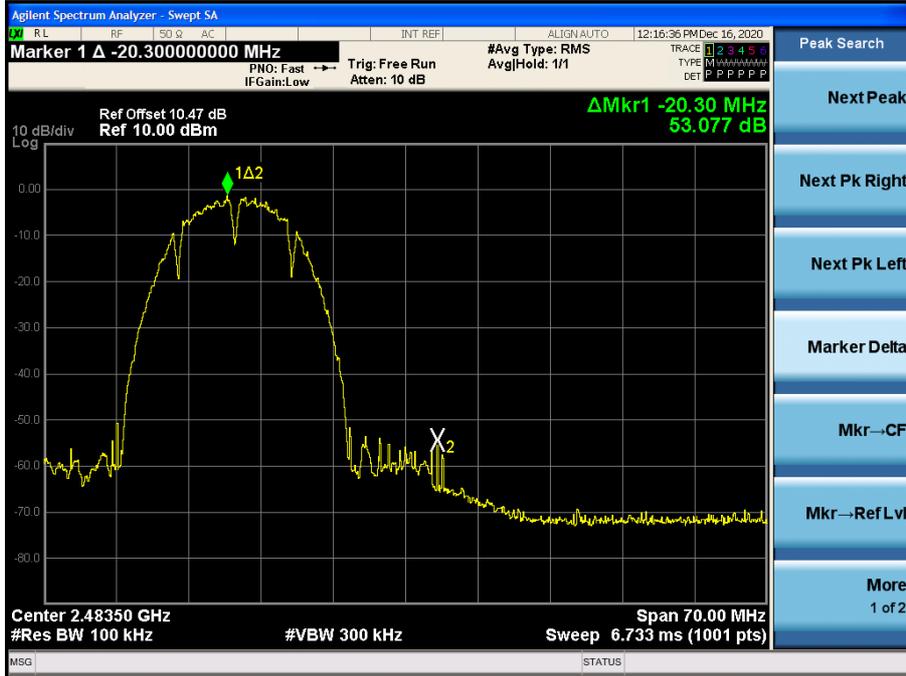
Band Edge (802.11b-CH1)



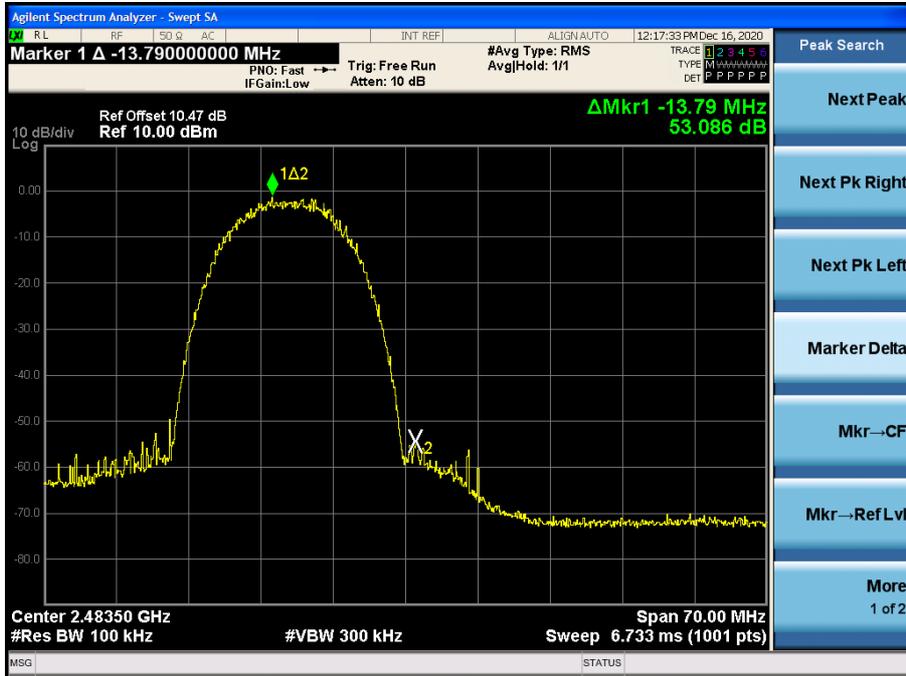
Band Edge (802.11b-CH11)



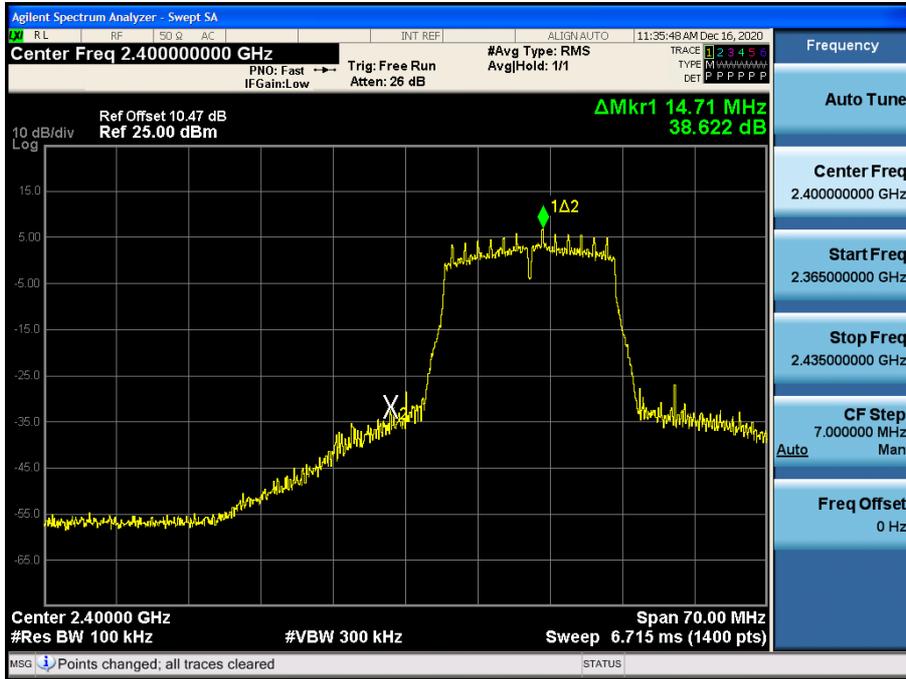
Band Edge (802.11b-CH12)



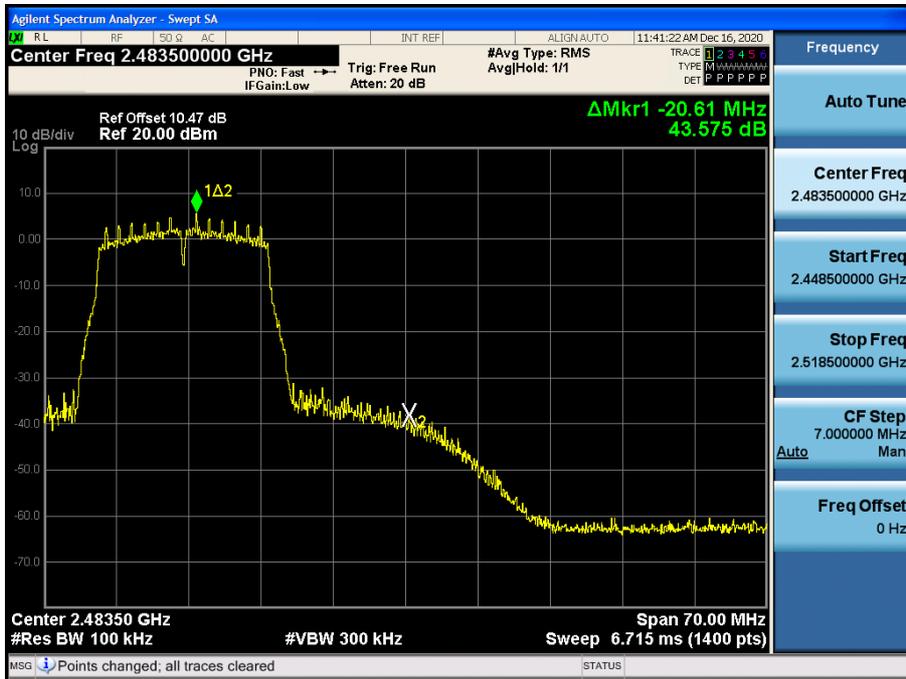
Band Edge (802.11b-CH13)



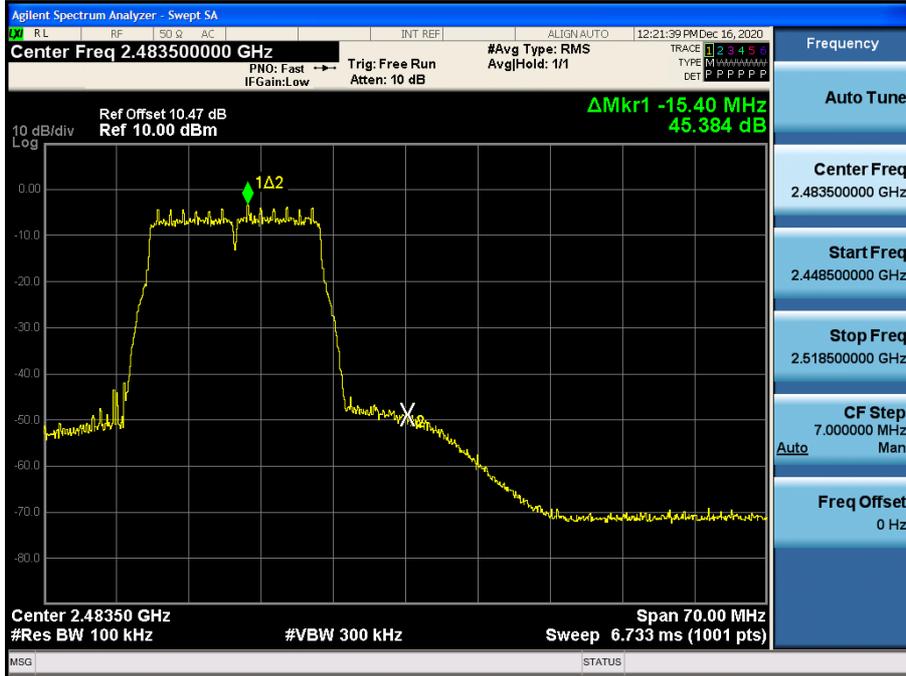
Band Edge (802.11g-CH1)



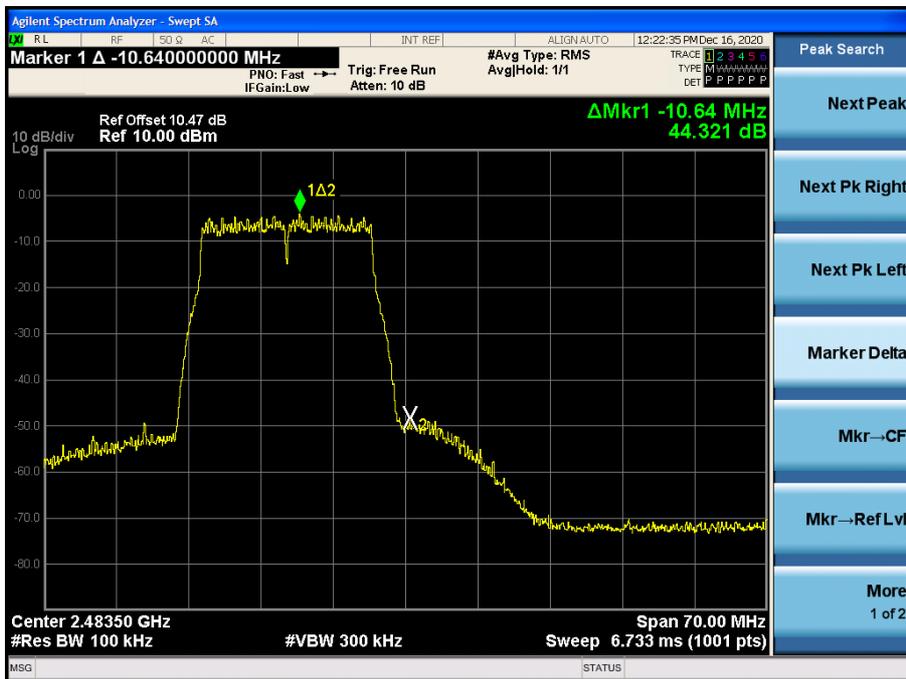
Band Edge (802.11g-CH11)



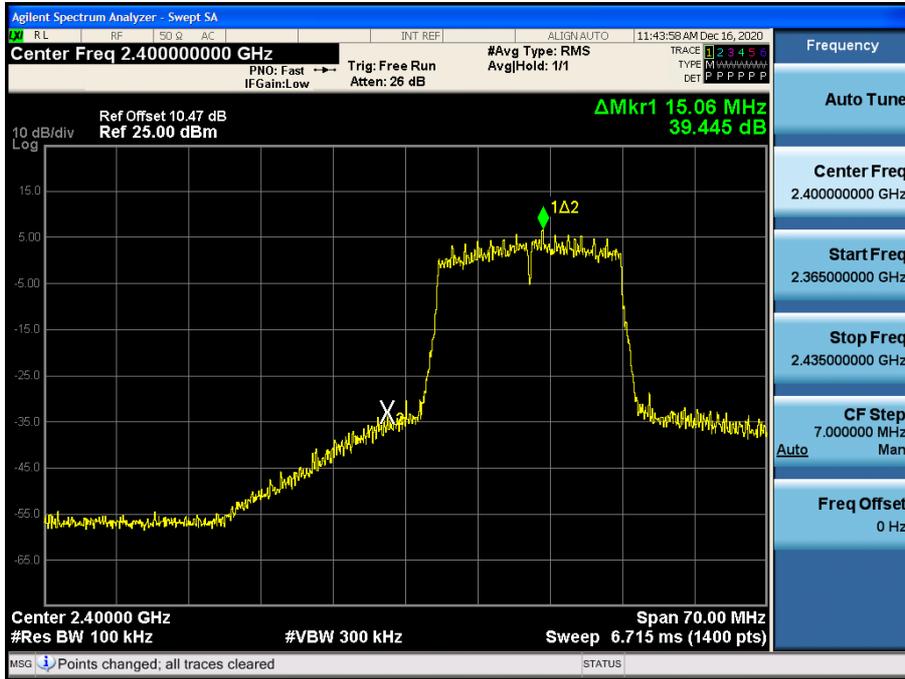
Band Edge (802.11g-CH12)



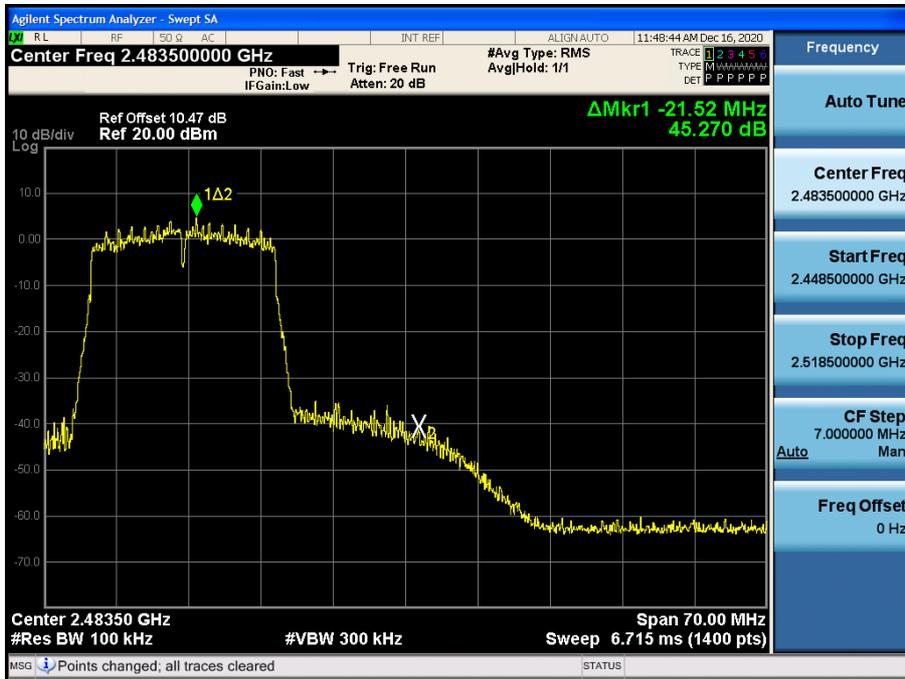
Band Edge (802.11g-CH13)



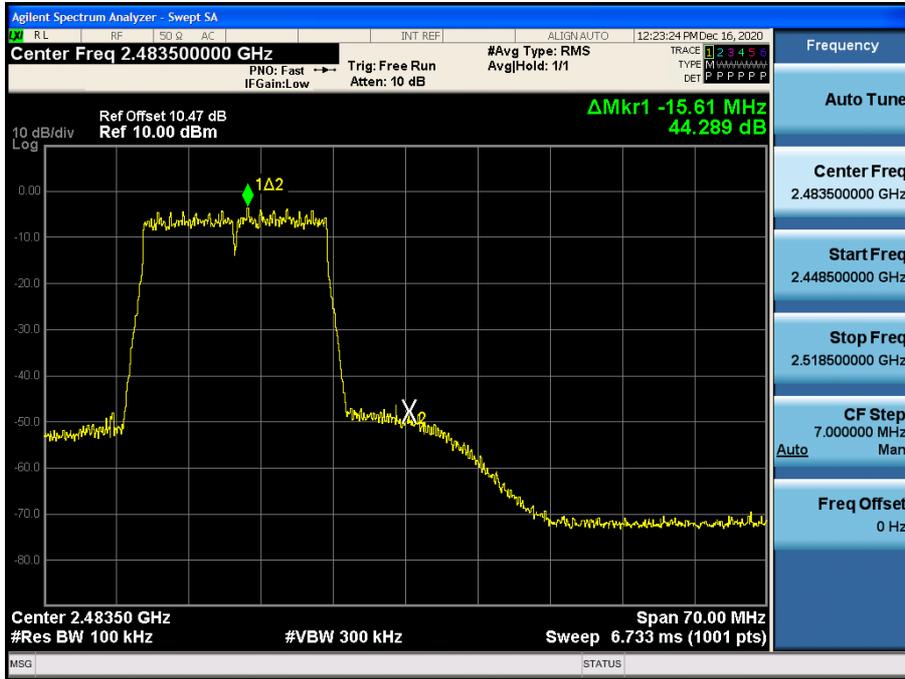
Band Edge (802.11n\_HT20 -CH1)



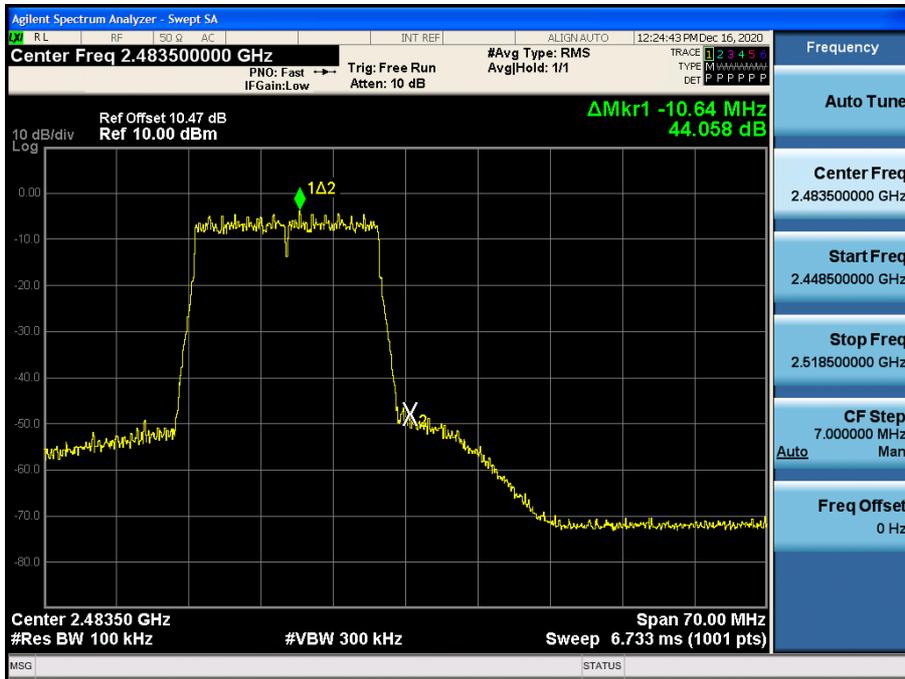
Band Edge (802.11n\_HT20 -CH11)



Band Edge (802.11n\_HT20 -CH12)



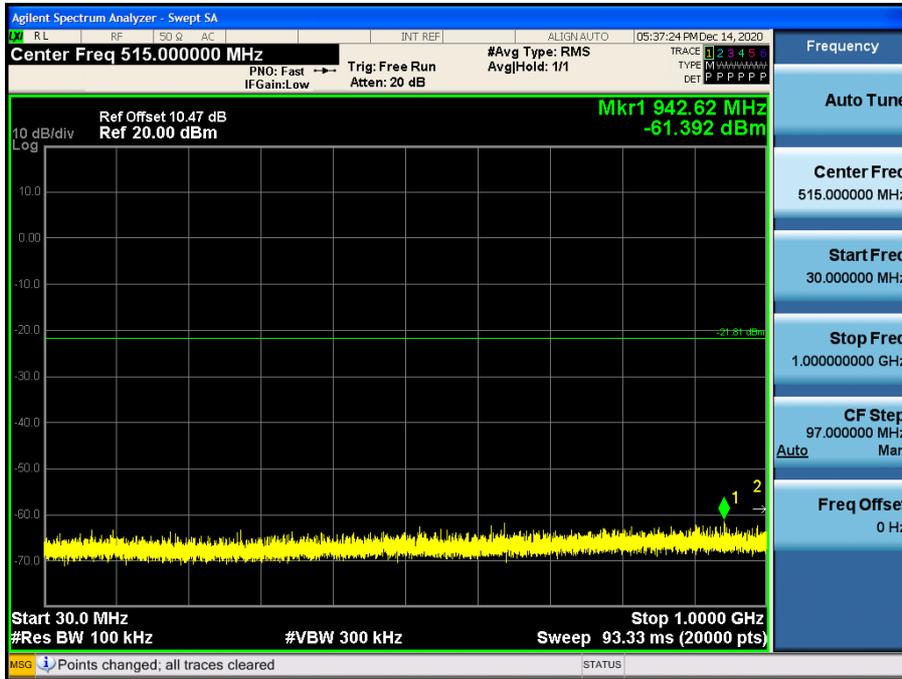
Band Edge (802.11n\_HT20 -CH13)



**Test Plots(Conducted Spurious Emission)**

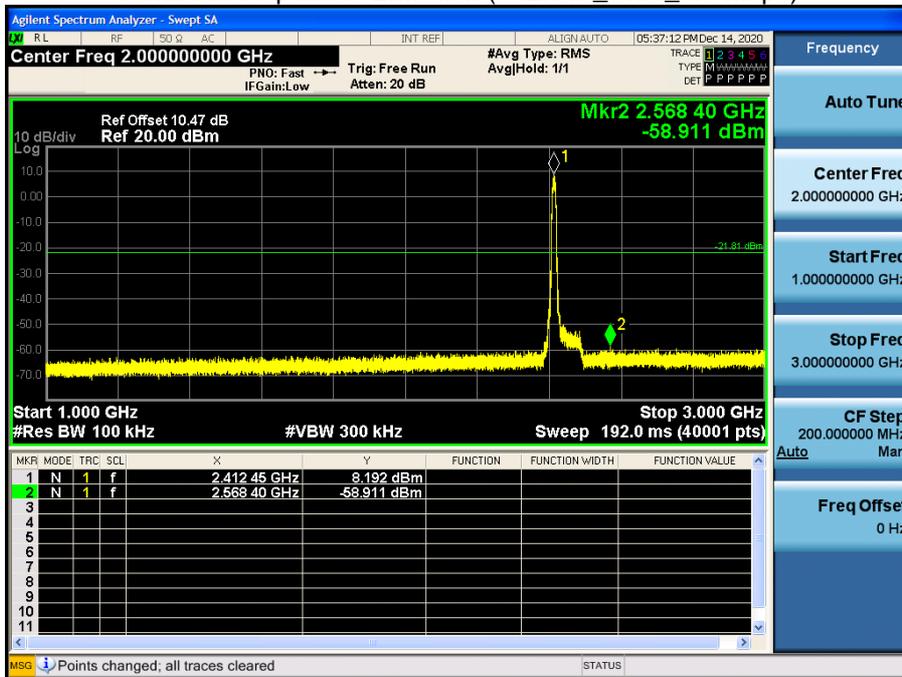
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



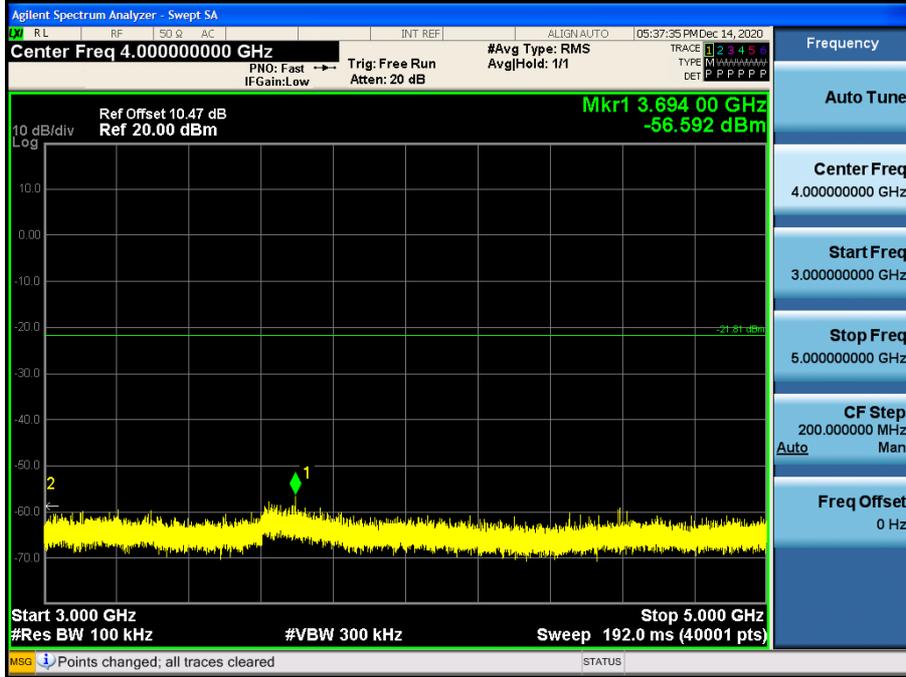
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



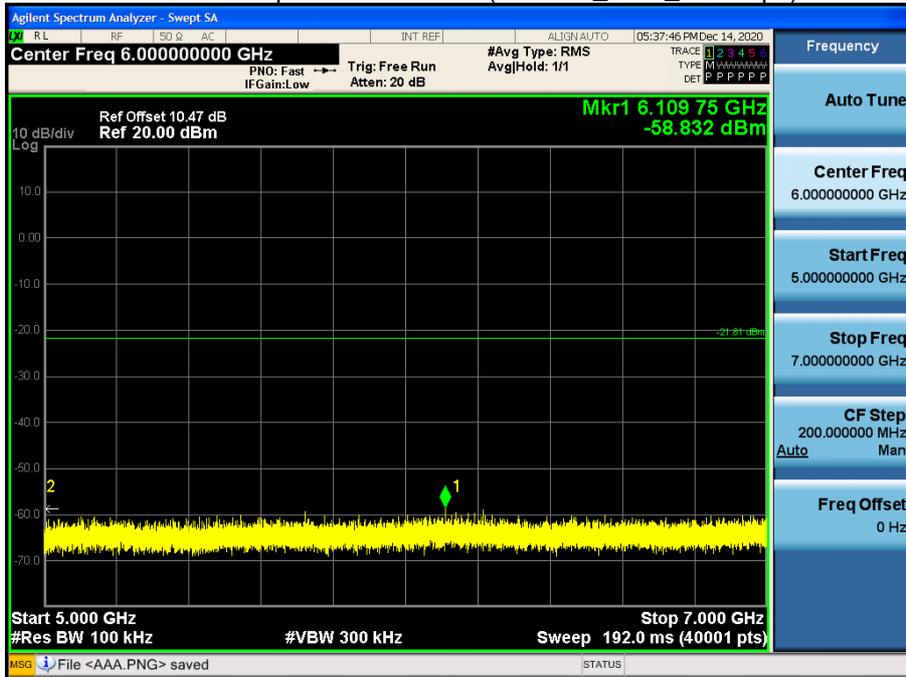
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



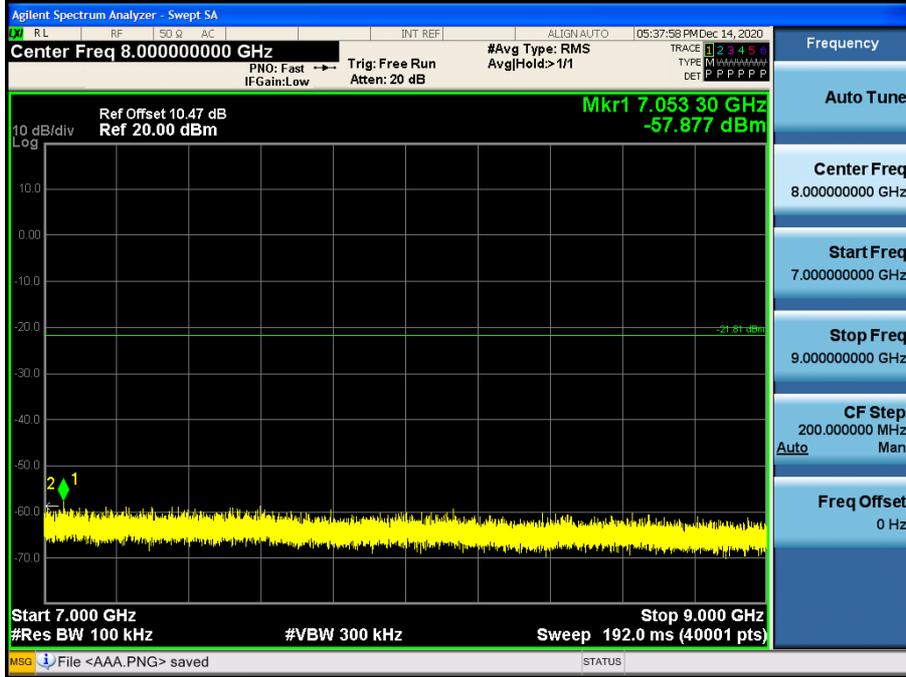
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



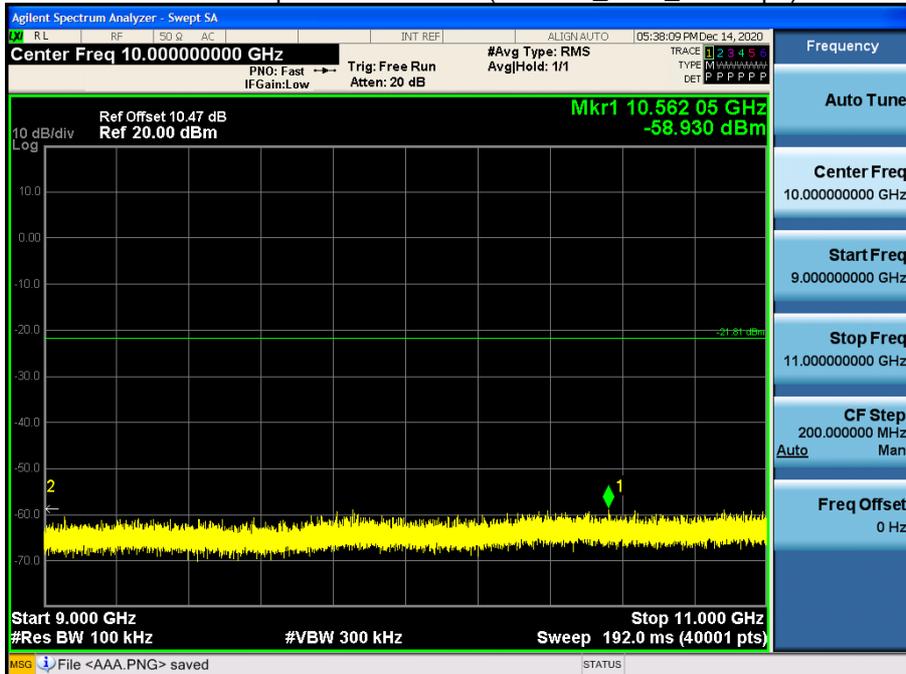
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



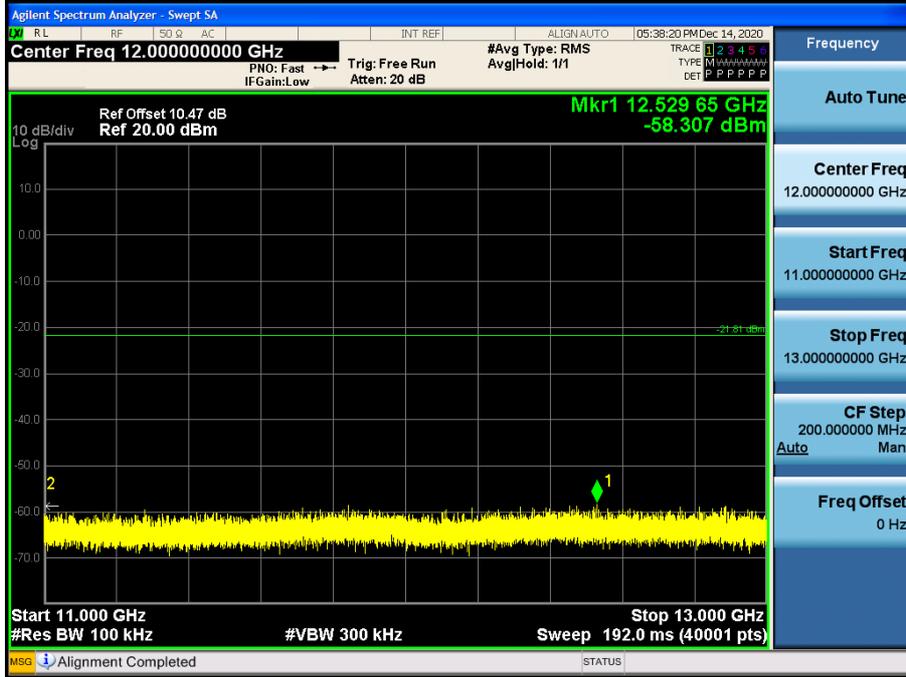
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



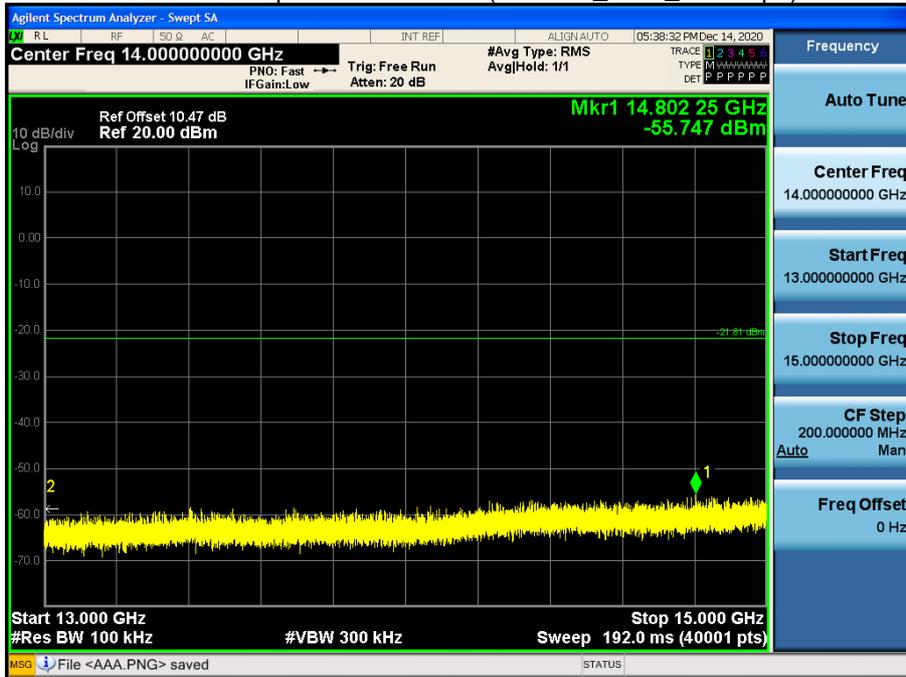
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



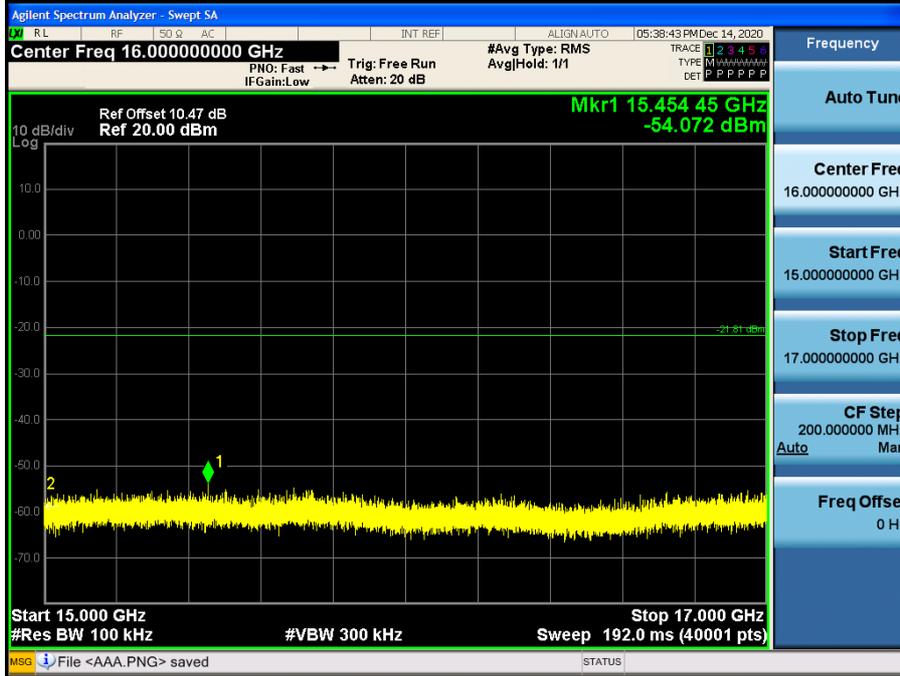
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



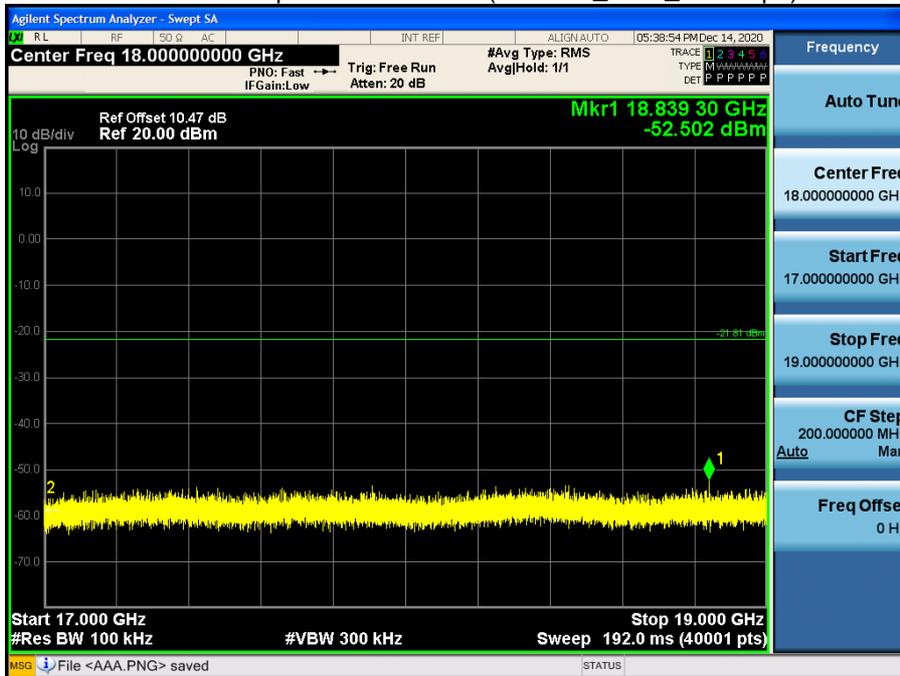
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



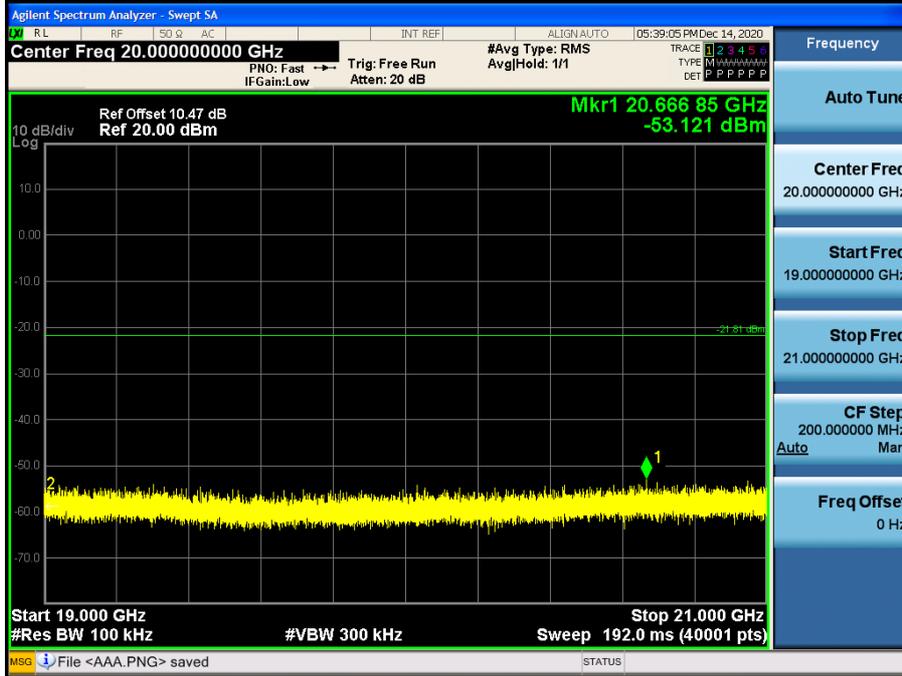
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



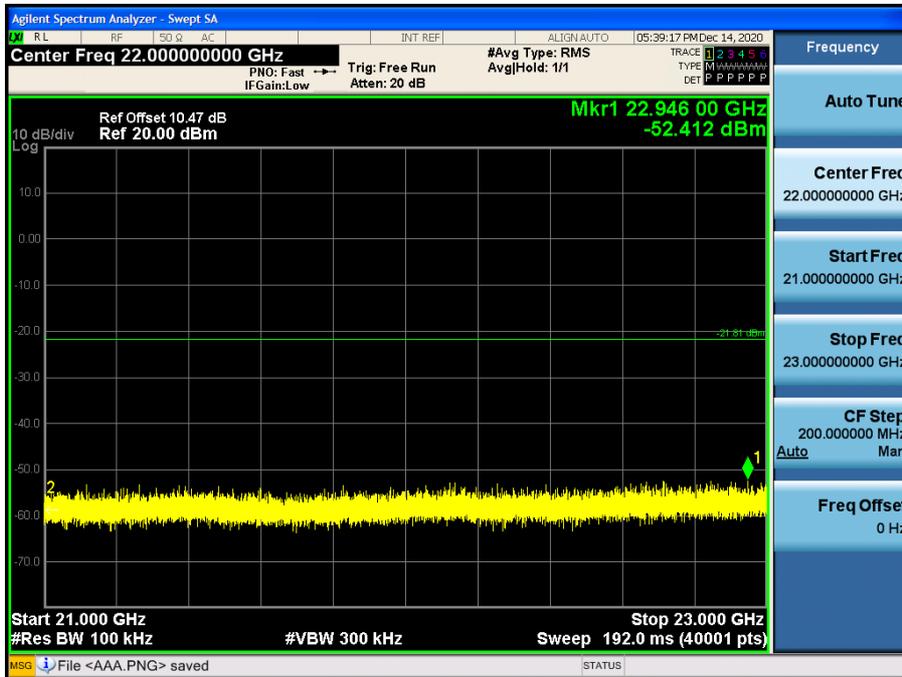
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



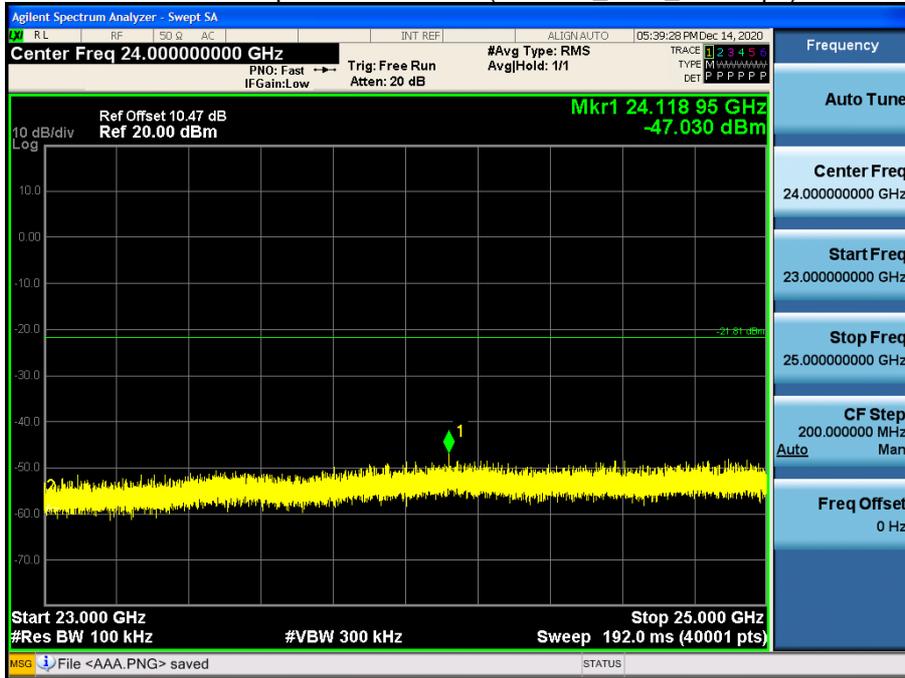
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11b\_Ch.1\_5.5 Mbps)



**9.6 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 =  $40 \log(\text{specific distance} / \text{test distance})$  (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor

**Frequency Range : Below 1 GHz**

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

**Note:**

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

**Frequency Range : Above 1 GHz**

Operation Mode: 802.11b  
 Transfer Rate: 1 Mbps  
 Operating Frequency: 2412  
 Channel No. 01 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
4824	42.59	1.76	V	44.35	73.98	29.63	PK
4824	32.15	1.76	V	33.91	53.98	20.07	AV
7236	38.58	12.28	V	50.86	73.98	23.12	PK
7236	26.38	12.28	V	38.66	53.98	15.32	AV
4824	43.03	1.76	H	44.79	73.98	29.19	PK
4824	32.83	1.76	H	34.59	53.98	19.39	AV
7236	38.74	12.28	H	51.02	73.98	22.96	PK
7236	26.42	12.28	H	38.70	53.98	15.28	AV

Operation Mode: 802.11b  
 Transfer Rate: 1 Mbps  
 Operating Frequency: 2437  
 Channel No. 06 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
4874	42.61	1.96	V	44.57	73.98	29.41	PK
4874	32.02	1.96	V	33.98	53.98	20.00	AV
7311	38.64	11.45	V	50.09	73.98	23.89	PK
7311	26.99	11.45	V	38.44	53.98	15.54	AV
4874	42.74	1.96	H	44.70	73.98	29.28	PK
4874	32.33	1.96	H	34.29	53.98	19.69	AV
7311	38.74	11.45	H	50.19	73.98	23.79	PK
7311	27.12	11.45	H	38.57	53.98	15.41	AV

Operation Mode: 802.11b  
 Transfer Rate: 1 Mbps  
 Operating Frequency: 2462  
 Channel No.: 11 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
4924	41.85	2.83	V	44.68	73.98	29.30	PK
4924	30.25	2.83	V	33.08	53.98	20.90	AV
7386	37.99	11.87	V	49.86	73.98	24.12	PK
7386	26.42	11.87	V	38.29	53.98	15.69	AV
4924	41.99	2.83	H	44.82	73.98	29.16	PK
4924	30.38	2.83	H	33.21	53.98	20.77	AV
7386	38.10	11.87	H	49.97	73.98	24.01	PK
7386	26.52	11.87	H	38.39	53.98	15.59	AV

**Note:**

Channel 12 and 13 are less powerful than channel 11 so the test for high channel was performed at channel 11.

Operation Mode: 802.11g  
 Transfer Rate: 6 Mbps  
 Operating Frequency: 2412  
 Channel No.: 01 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G + D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	42.62	0.00	1.76	V	44.38	73.98	29.60	PK
4824	30.12	0.32	1.76	V	32.20	53.98	21.78	AV
7236	38.41	0.00	12.28	V	50.69	73.98	23.29	PK
7236	26.52	0.32	12.28	V	39.12	53.98	14.86	AV
4824	42.71	0.00	1.76	H	44.47	73.98	29.51	PK
4824	30.22	0.32	1.76	H	32.30	53.98	21.68	AV
7236	38.51	0.00	12.28	H	50.79	73.98	23.19	PK
7236	26.60	0.32	12.28	H	39.20	53.98	14.78	AV

Operation Mode: 802.11g  
 Transfer Rate: 6 Mbps  
 Operating Frequency: 2437  
 Channel No.: 06 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G + D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	42.45	0.00	1.96	V	44.41	73.98	29.57	PK
4874	30.22	0.32	1.96	V	32.50	53.98	21.48	AV
7311	38.85	0.00	11.45	V	50.30	73.98	23.68	PK
7311	27.02	0.32	11.45	V	38.79	53.98	15.19	AV
4874	42.50	0.00	1.96	H	44.46	73.98	29.52	PK
4874	30.28	0.32	1.96	H	32.56	53.98	21.42	AV
7311	38.91	0.00	11.45	H	50.36	73.98	23.62	PK
7311	27.12	0.32	11.45	H	38.89	53.98	15.09	AV

Operation Mode: 802.11g  
 Transfer Rate: 6 Mbps  
 Operating Frequency: 2462  
 Channel No. 11 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G + D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measure ment Type
4924	41.52	0.00	2.83	V	44.35	73.98	29.63	PK
4924	29.52	0.32	2.83	V	32.67	53.98	21.31	AV
7386	38.45	0.00	11.87	V	50.32	73.98	23.66	PK
7386	26.02	0.32	11.87	V	38.21	53.98	15.77	AV
4924	41.61	0.00	2.83	H	44.44	73.98	29.54	PK
4924	29.64	0.32	2.83	H	32.79	53.98	21.19	AV
7386	38.58	0.00	11.87	H	50.45	73.98	23.53	PK
7386	26.03	0.32	11.87	H	38.22	53.98	15.76	AV

**Note:**

Channel 12 and 13 are less powerful than channel 11 so the test for high channel was performed at channel 11.

Operation Mode: 802.11n (HT20)  
 Transfer MCS Index: 0  
 Operating Frequency: 2412  
 Channel No.: 01 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G + D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	42.35	0.00	1.76	V	44.11	73.98	29.87	PK
4824	30.15	0.35	1.76	V	32.26	53.98	21.72	AV
7236	38.42	0.00	12.28	V	50.70	73.98	23.28	PK
7236	26.52	0.35	12.28	V	39.15	53.98	14.83	AV
4824	42.41	0.00	1.76	H	44.17	73.98	29.81	PK
4824	30.18	0.35	1.76	H	32.29	53.98	21.69	AV
7236	38.56	0.00	12.28	H	50.84	73.98	23.14	PK
7236	26.63	0.35	12.28	H	39.26	53.98	14.72	AV

Operation Mode: 802.11n (HT20)  
 Transfer MCS Index: 0  
 Operating Frequency: 2437  
 Channel No.: 06 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G + D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	42.52	0.00	1.96	V	44.48	73.98	29.50	PK
4874	30.11	0.35	1.96	V	32.42	53.98	21.56	AV
7311	38.95	0.00	11.45	V	50.40	73.98	23.58	PK
7311	27.02	0.35	11.45	V	38.82	53.98	15.16	AV
4874	42.62	0.00	1.96	H	44.58	73.98	29.40	PK
4874	30.26	0.35	1.96	H	32.57	53.98	21.41	AV
7311	39.03	0.00	11.45	H	50.48	73.98	23.50	PK
7311	27.15	0.35	11.45	H	38.95	53.98	15.03	AV

Operation Mode: 802.11n (HT20)  
 Transfer MCS Index: 0  
 Operating Frequency: 2462  
 Channel No. 11 Ch

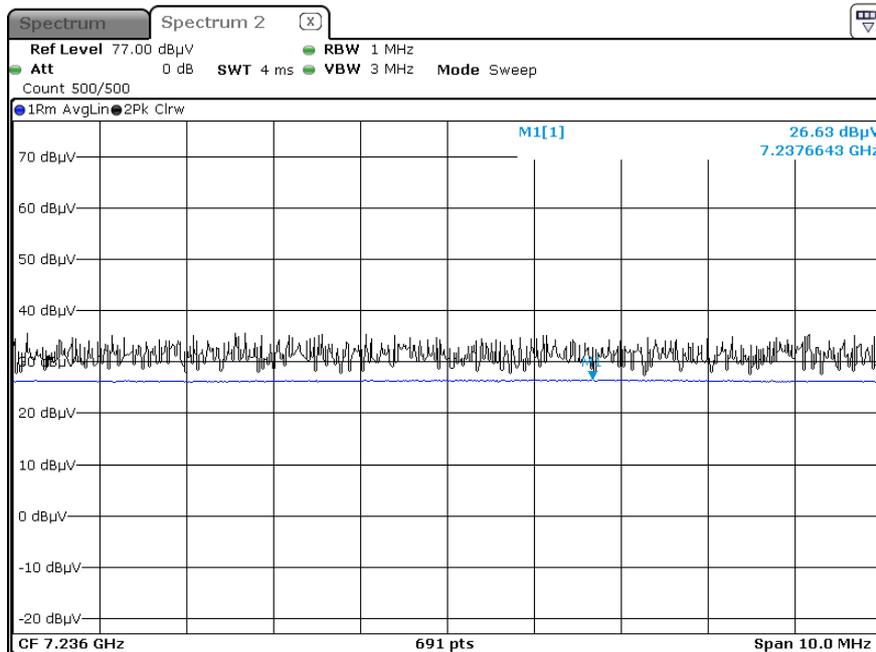
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.- A.G + D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measure ment Type
4924	41.52	0.00	2.83	V	44.35	73.98	29.63	PK
4924	29.52	0.35	2.83	V	32.70	53.98	21.28	AV
7386	38.61	0.00	11.87	V	50.48	73.98	23.50	PK
7386	25.85	0.35	11.87	V	38.07	53.98	15.91	AV
4924	41.67	0.00	2.83	H	44.50	73.98	29.48	PK
4924	29.65	0.35	2.83	H	32.83	53.98	21.15	AV
7386	38.72	0.00	11.87	H	50.59	73.98	23.39	PK
7386	26.02	0.35	11.87	H	38.24	53.98	15.74	AV

**Note:**

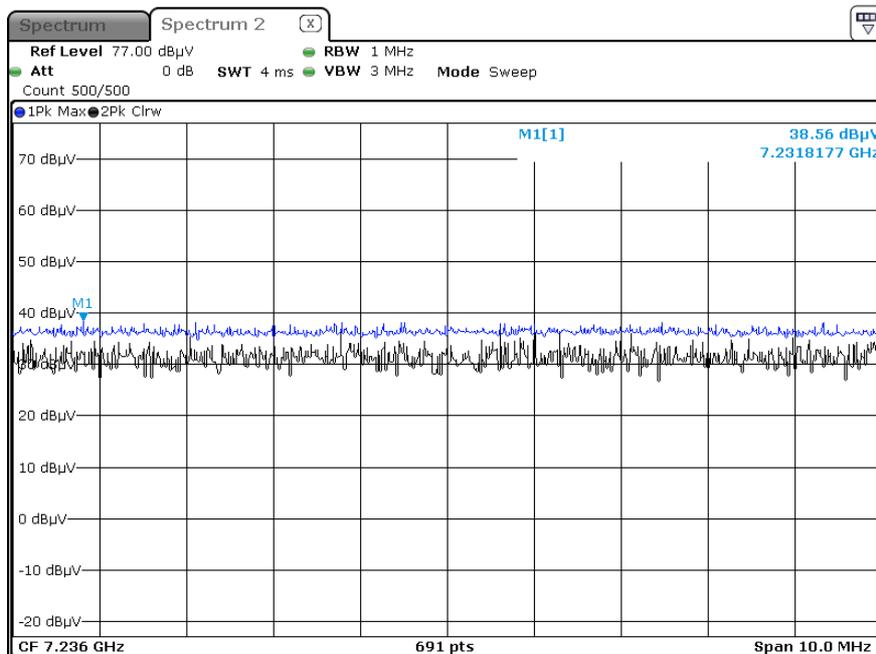
Channel 12 and 13 are less powerful than channel 11 so the test for high channel was performed at channel 11.

▣ Test Plots (Worst case : Y-H)

Radiated Spurious Emissions plot – Average Reading (802.11n (HT20)\_MCS0, Ch.1 3rd Harmonic)



Radiated Spurious Emissions plot – Peak Reading (802.11n (HT20)\_MCS0, Ch.1 3rd Harmonic)



**Note:** Plot of worst case are only reported.

**9.7 RADIATED RESTRICTED BAND EDGES**

Operation Mode: 802.11b  
 Transfer Rate: 1 Mbps  
 Operating Frequency: 2412 MHz, 2462 MHz  
 Channel No.: 01 Ch, 11 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+ C.L+ D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	21.999	34.77	H	56.77	73.98	17.21	PK
2390.0	9.852	34.77	H	44.62	53.98	9.36	AV
2390.0	21.791	34.77	V	56.56	73.98	17.42	PK
2390.0	9.803	34.77	V	44.57	53.98	9.41	AV
2483.5	23.113	34.25	H	57.36	73.98	16.62	PK
2483.5	12.064	34.25	H	46.31	53.98	7.67	AV
2483.5	21.913	34.25	V	56.16	73.98	17.82	PK
2483.5	11.995	34.25	V	46.25	53.98	7.74	AV

Operation Mode: 802.11b  
 Transfer Rate: 1 Mbps  
 Operating Frequency: 2467 MHz, 2472 MHz  
 Channel No.: 12 Ch, 13 Ch

Ch	Frequency [MHz]	Reading [dBuV]	A.F.+ C.L+ D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
12	2483.5	21.491	34.77	H	56.26	73.98	17.72	PK
	2483.5	9.936	34.77	H	44.71	53.98	9.27	AV
	2483.5	21.321	34.77	V	56.09	73.98	17.89	PK
	2483.5	9.852	34.77	V	44.62	53.98	9.36	AV
13	2483.5	21.503	34.25	H	55.75	73.98	18.23	PK
	2483.5	11.503	34.25	H	45.75	53.98	8.23	AV
	2483.5	22.326	34.25	V	56.58	73.98	17.40	PK
	2483.5	11.521	34.25	V	45.77	53.98	8.21	AV

Operation Mode: 802.11g  
 Transfer Rate: 6 Mbps  
 Operating Frequency: 2412 MHz, 2462 MHz  
 Channel No.: 01 Ch, 11 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+ C.L+ D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	31.153	0.00	34.77	H	65.92	73.98	8.06	PK
2390.0	14.652	0.32	34.77	H	49.75	53.98	4.23	AV
2390.0	30.347	0.00	34.77	V	65.12	73.98	8.86	PK
2390.0	14.456	0.32	34.77	V	49.55	53.98	4.43	AV
2483.5	35.091	0.00	34.25	H	69.34	73.98	4.64	PK
# 2483.5~2484.5	16.120	0.32	34.25	H	50.69	53.98	3.29	AV
2484.5	15.215	0.32	34.25	H	49.79	53.98	4.19	AV
2483.5	36.343	0.00	34.25	V	70.59	73.98	3.39	PK
# 2483.5~2484.5	16.680	0.32	34.25	V	51.25	53.98	2.73	AV
2484.5	16.222	0.32	34.25	V	50.80	53.98	3.19	AV

Note : # integration method Used (ANSI C63.10 Section11.13.3)

Operation Mode: 802.11g  
 Transfer Rate: 6 Mbps  
 Operating Frequency: 2467 MHz, 2472 MHz  
 Channel No.: 12 Ch, 13 Ch

Ch	Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+ C.L+ D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
12	2483.5	21.425	0.00	34.77	H	56.20	73.98	17.79	PK
	2483.5	10.725	0.32	34.77	H	45.82	53.98	8.16	AV
	2483.5	21.321	0.00	34.77	V	56.09	73.98	17.89	PK
	2483.5	10.683	0.32	34.77	V	45.78	53.98	8.20	AV
13	2483.5	29.554	0.00	34.25	H	63.80	73.98	10.18	PK
	2483.5	11.515	0.32	34.25	H	46.09	53.98	7.89	AV
	2483.5	27.316	0.00	34.25	V	61.57	73.98	12.41	PK
	2483.5	11.448	0.32	34.25	V	46.02	53.98	7.96	AV

Operation Mode: 802.11n (HT20)  
 Transfer Rate: MCS0  
 Operating Frequency: 2412 MHz, 2462 MHz  
 Channel No.: 01 Ch, 11 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+ C.L+ D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	36.393	0.00	34.77	H	71.16	73.98	2.82	PK
# 2389~2390	15.930	0.35	34.77	H	51.05	53.98	2.93	AV
2389.0	14.922	0.35	34.77	H	50.04	53.98	3.94	AV
2390.0	35.613	0.00	34.77	V	70.38	73.98	3.60	PK
# 2389~2390	15.650	0.35	34.77	V	50.77	53.98	3.21	AV
2389	14.752	0.35	34.77	V	49.87	53.98	4.11	AV
2483.5	35.326	0.00	34.25	H	69.58	73.98	4.40	PK
2483.5	16.685	0.35	34.25	H	51.29	53.98	2.69	AV
2483.5	35.087	0.00	34.25	V	69.34	73.98	4.64	PK
2483.5	16.750	0.35	34.25	V	51.35	53.98	2.63	AV

Note : # integration method Used (ANSI C63.10 Section11.13.3)

Operation Mode: 802.11n (HT20)  
 Transfer Rate: MCS0  
 Operating Frequency: 2467 MHz, 2472 MHz  
 Channel No.: 12 Ch, 13 Ch

Ch	Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+ C.L+ D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
12	2483.5	24.640	0.00	34.77	H	59.41	73.98	14.57	PK
	2483.5	10.668	0.35	34.77	H	45.79	53.98	8.19	AV
	2483.5	23.985	0.00	34.77	V	58.76	73.98	15.23	PK
	2483.5	10.470	0.35	34.77	V	45.59	53.98	8.39	AV
13	2483.5	31.692	0.00	34.25	H	65.94	73.98	8.04	PK
	2483.5	11.852	0.35	34.25	H	46.45	53.98	7.53	AV
	2483.5	31.056	0.00	34.25	V	65.31	73.98	8.67	PK
	2483.5	12.022	0.35	34.25	V	46.62	53.98	7.36	AV

■ Test Plots (Worst case : Z-V)

Radiated Restricted Band Edges plot – Average Reading (802.11n (HT20)\_MCS0 Ch.11)



Radiated Restricted Band Edges plot – Peak Reading (802.11n (HT20)\_ MCS0 Ch.11)



Radiated Restricted Band Edges plot – Average Reading (802.11n (HT20)\_ MCS0 Ch.13)



Radiated Restricted Band Edges plot – Peak Reading (802.11n (HT20)\_ MCS0 Ch.13)



**Note:**

Plot of worst case are only reported.

**9.8 POWERLINE CONDUCTED EMISSIONS**

**Conducted Emissions (Line 1)**

Test

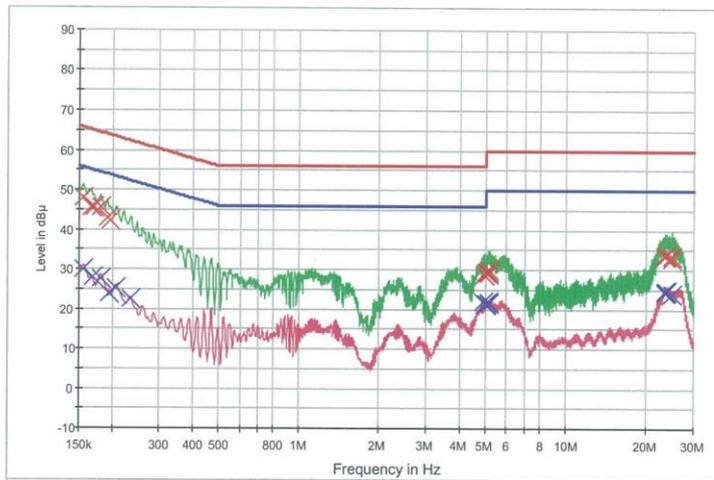
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**HCT TEST Report**

**Common Information**

EUT: SM-A022M/DS  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: 2.4G WLAN MODE\_L1

FCC CLASS B\_Exten Cable



— FCC CLASS B\_OP      —×— 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 (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	47.9	9.000	Off	L1	9.8	17.8	65.8
0.165750	45.7	9.000	Off	L1	9.8	19.4	65.2
0.170250	45.5	9.000	Off	L1	9.8	19.5	64.9
0.181500	45.5	9.000	Off	L1	9.8	18.9	64.4
0.192750	42.7	9.000	Off	L1	9.8	21.2	63.9
0.197250	42.1	9.000	Off	L1	9.8	21.6	63.7
4.941500	28.7	9.000	Off	L1	10.0	27.3	56.0
5.013500	29.4	9.000	Off	L1	10.0	30.6	60.0
5.108000	29.2	9.000	Off	L1	10.0	30.8	60.0
5.135000	29.9	9.000	Off	L1	10.0	30.1	60.0
5.139500	29.3	9.000	Off	L1	10.0	30.7	60.0
5.159750	29.1	9.000	Off	L1	10.0	30.9	60.0
23.364500	33.8	9.000	Off	L1	10.6	26.2	60.0
23.528750	33.5	9.000	Off	L1	10.6	26.5	60.0
23.555750	33.4	9.000	Off	L1	10.6	26.6	60.0
23.803250	33.6	9.000	Off	L1	10.6	26.4	60.0
24.932750	33.3	9.000	Off	L1	10.7	26.7	60.0
24.962000	32.8	9.000	Off	L1	10.7	27.2	60.0

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Test

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**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154500	30.0	9.000	Off	L1	9.8	25.8	55.8
0.168000	27.9	9.000	Off	L1	9.8	27.2	55.1
0.181500	27.7	9.000	Off	L1	9.8	26.7	54.4
0.195000	23.9	9.000	Off	L1	9.8	29.9	53.8
0.206250	25.1	9.000	Off	L1	9.8	28.2	53.4
0.233250	22.6	9.000	Off	L1	9.8	29.8	52.3
4.903250	21.8	9.000	Off	L1	10.0	24.2	46.0
5.009000	21.3	9.000	Off	L1	10.0	28.7	50.0
5.031500	21.5	9.000	Off	L1	10.0	28.5	50.0
5.112500	21.7	9.000	Off	L1	10.0	28.3	50.0
5.139500	21.4	9.000	Off	L1	10.0	28.6	50.0
5.155250	21.7	9.000	Off	L1	10.0	28.3	50.0
23.362250	24.4	9.000	Off	L1	10.6	25.6	50.0
23.418500	24.2	9.000	Off	L1	10.6	25.8	50.0
23.445500	24.3	9.000	Off	L1	10.6	25.7	50.0
23.803250	24.7	9.000	Off	L1	10.6	25.3	50.0
23.830250	24.6	9.000	Off	L1	10.6	25.4	50.0
24.959750	24.0	9.000	Off	L1	10.7	26.0	50.0

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**Conducted Emissions (Line 2)**

Test

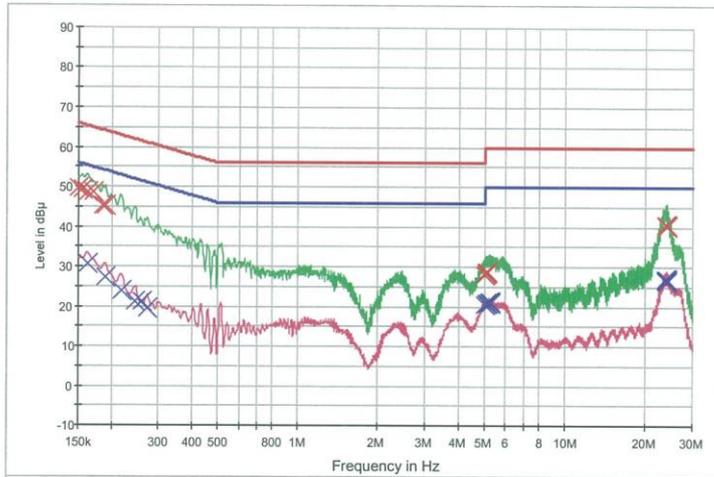
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**HCT TEST Report**

**Common Information**

EUT: SM-A022M/DS  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: 2.4G WLAN MODE\_N

FCC CLASS B\_Exten Cable



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

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	49.6	9.000	Off	N	9.8	16.4	66.0
0.154500	49.4	9.000	Off	N	9.8	16.3	65.8
0.163500	48.7	9.000	Off	N	9.8	16.5	65.3
0.170250	48.8	9.000	Off	N	9.8	16.2	64.9
0.186000	45.3	9.000	Off	N	9.8	18.9	64.2
0.190500	45.3	9.000	Off	N	9.8	18.7	64.0
5.000000	27.8	9.000	Off	N	10.0	28.2	56.0
5.078750	28.6	9.000	Off	N	10.0	31.4	60.0
5.085500	28.2	9.000	Off	N	10.0	31.8	60.0
5.096750	28.3	9.000	Off	N	10.0	31.7	60.0
5.105750	28.5	9.000	Off	N	10.0	31.5	60.0
5.123750	28.6	9.000	Off	N	10.0	31.4	60.0
23.796500	40.6	9.000	Off	N	10.8	19.4	60.0
23.888750	40.7	9.000	Off	N	10.8	19.3	60.0
23.915750	40.5	9.000	Off	N	10.8	19.5	60.0
23.990000	40.5	9.000	Off	N	10.8	19.5	60.0
24.017000	40.3	9.000	Off	N	10.8	19.7	60.0
24.044000	40.3	9.000	Off	N	10.8	19.7	60.0

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**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.163500	30.7	9.000	Off	N	9.8	24.6	55.3
0.190500	27.3	9.000	Off	N	9.8	26.7	54.0
0.217500	24.0	9.000	Off	N	9.8	28.9	52.9
0.244500	21.2	9.000	Off	N	9.8	30.8	51.9
0.260250	21.1	9.000	Off	N	9.8	30.3	51.4
0.271500	19.6	9.000	Off	N	9.8	31.5	51.1
5.000000	20.4	9.000	Off	N	10.0	25.6	46.0
5.081000	20.7	9.000	Off	N	10.0	29.3	50.0
5.139500	21.0	9.000	Off	N	10.0	29.0	50.0
5.193500	21.2	9.000	Off	N	10.0	28.8	50.0
5.256500	20.9	9.000	Off	N	10.0	29.1	50.0
5.272250	21.3	9.000	Off	N	10.0	28.7	50.0
23.798750	26.6	9.000	Off	N	10.8	23.4	50.0
23.864000	27.0	9.000	Off	N	10.8	23.0	50.0
23.888750	26.9	9.000	Off	N	10.8	23.1	50.0
23.913500	26.8	9.000	Off	N	10.8	23.2	50.0
23.940500	26.4	9.000	Off	N	10.8	23.6	50.0
24.046250	26.6	9.000	Off	N	10.8	23.4	50.0

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## 10. LIST OF TEST EQUIPMENT

### Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/04/2020	Annual	102245
Rohde & Schwarz	ESR / EMI Test Receiver	09/16/2020	Annual	101910
ESPAC	SU-642 / Temperature Chamber	03/18/2020	Annual	0093008124
Agilent	N9020A / Signal Analyzer	05/11/2020	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	01/13/2020	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/02/2020	Annual	101231
Agilent	N1911A / Power Meter	04/07/2020	Annual	MY45100523
Keysight	N1921A / Power Sensor	06/08/2020	Annual	MY57820067
Agilent	87300B / Directional Coupler	11/10/2020	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	05/25/2020	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/12/2020	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	06/26/2020	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

### 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	05/18/2020	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	03/22/2019	Biennial	760
Schwarzbeck	BBHA 9120D / Horn Antenna	04/29/2019	Biennial	9120D-937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	11/29/2019	Biennial	BBHA9170541
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	07/28/2020	Annual	102168
Agilent	N9030A / Signal Analyzer	01/13/2020	Annual	MY49431210
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	01/21/2020	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	02/10/2020	Annual	1
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	03/02/2020	Annual	8
Wainwright Instruments	WHKX8-6090-7000-18000-40SS/ High Pass Filter	03/02/2020	Annual	25
Api tech.	18B-03 / Attenuator (3 dB)	03/02/2020	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	03/02/2020	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	03/02/2020	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	03/02/2020	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	12/04/2020	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	03/23/2020	Annual	25956

**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).

## 11. ANNEX A\_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2101-FC012-P