

FCC DTS REPORT

Certification

Applicant Name: SAMSUNG Electronics Co., Ltd.	Date of Issue: June 14, 2021
Address: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea	Test Site/Location: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
	Report No.: HCT-RF-2106-FC026

FCC ID:	A3LSMG990B
APPLICANT:	SAMSUNG Electronics Co., Ltd.

Model:	SM-G990B/DS
Additional Model:	SM-G990B
EUT Type:	Mobile Phone
Average Output Power:	Ant.1 - 802.11b : 18.97 dBm, 802.11g : 15.61 dBm, 802.11n(HT20) : 14.62 dBm Ant.2 - 802.11b : 18.63 dBm, 802.11g : 15.42 dBm, 802.11n(HT20) : 14.33 dBm Ant.1&2 - 802.11g : 18.52 dBm, 802.11n(HT20) : 17.49 dBm
Frequency Range:	2 412 MHz ~ 2 462 MHz
Modulation type:	CCK/DSSS/OFDM
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s):	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-2106-FC026

REVIEWED BY



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

Report approved by : Kwon Jeong
Manager of Telecommunication Testing Center

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

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

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

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2106-FC026	June 14, 2021	- First Approval Report

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1. EUT DESCRIPTION

Model	SM-G990B/DS		
Additional Model	SM-G990B		
EUT Type	Mobile Phone		
Power Supply	DC 4.20 V		
Frequency Range	2 412 MHz ~ 2 462 MHz		
Max. RF Output Power	<u>Peak Power</u> (For information only)	Ant. 1	802.11b : 24.93 dBm (SISO) 802.11g : 23.85 dBm 802.11n(HT20) : 22.76 dBm
		Ant.2	802.11b : 24.67 dBm (SISO) 802.11g : 23.43 dBm 802.11n(HT20) : 22.78 dBm
		Ant.1&2 (MIMO)	802.11g : 26.61 dBm 802.11n(HT20) : 25.76 dBm
	<u>Average Power</u>	Ant. 1	802.11b : 18.97 dBm (SISO) 802.11g : 15.61 dBm 802.11n(HT20) : 14.62 dBm
		Ant.2	802.11b : 18.63 dBm (SISO) 802.11g : 15.42 dBm 802.11n(HT20) : 14.33 dBm
		Ant.1&2 (MIMO)	802.11g : 18.52 dBm 802.11n(HT20) : 17.49 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n		
Number of Channels	11 Channels		
Date(s) of Tests	April 24, 2021~ June 10, 2021		
Serial number	Radiated: 544a5f8570207ece Conducted: 524d0f145f1e7ece		

ANTENNA CONFIGURATIONS

1. The device employs MIMO technology. Below are the possible configurations

Configurations	SISO		SDM	CDD
	Ant1	Ant2	Ant1 + Ant2	Ant1 + Ant2
802.11b	O	O	X	X
802.11g	X	X	X	O
802.11n(HT20)	X	X	O	O

Note:

- (1) O = Support, X = Not Support
- (2) SISO = Single Input Single Output
- (3) SDM = Spatial Diversity Multiplexing
- (4) CDD = Cyclic Delay Diversity

2.This device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna.

RSDB Scenario	2.4 GHz	2.4 GHz	5GHz	5GHz
	WiFi Ant.1	WiFi Ant.2	WiFi Ant.1	WiFi Ant.2
2.4 GHz WiFi + 5GHz WiFi MIMO	On		On	On
2.4 GHz WiFi + 5GHz WiFi MIMO		On	On	On
2.4 GHz WiFi MIMO + 5GHz WiFi MIMO	On	On	On	On

Non-DBS	5GHz WiFi Ant.1	5GHz WiFi Ant.2	Bluetooth
5GHz WiFi MIMO + Bluetooth	On	On	On

3. Directional Gain Calculation

According to KDB 662911 D01 Multiple Transmitter Output v02r01 F) 2) f) (ii)

Directional gain =

$$\bullet \quad \text{DirectionalGain} = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

Ant Gain (dBi)		N _{ANT} / N _{SS}	Directional Gain (dBi)
Ant.1	-2.0		
Ant.2	-3.9		

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.

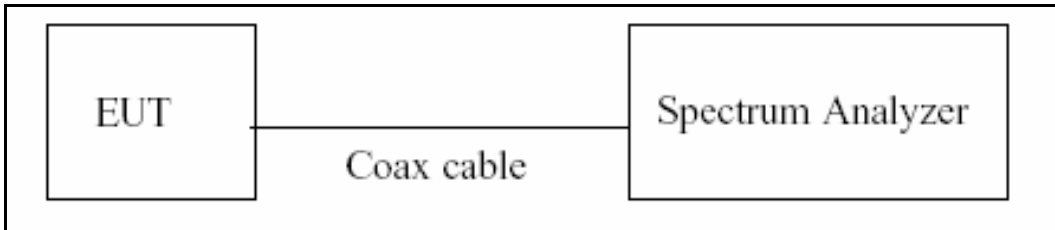
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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 $> 50/T$.

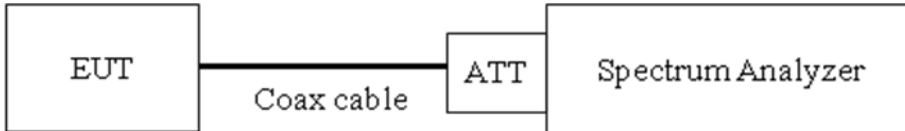
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (\geq RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/T_{total} and Duty Cycle Factor = $10\log(1/\text{Duty Cycle})$

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.

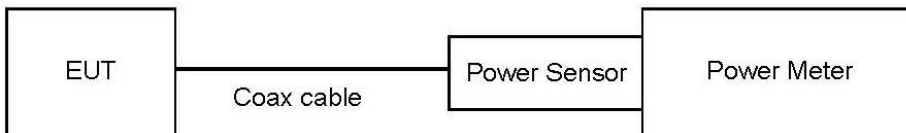
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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

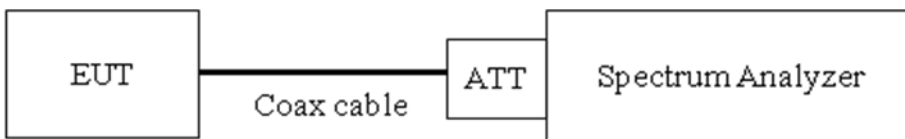
- Conducted Output Power(Peak) = Reading Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

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

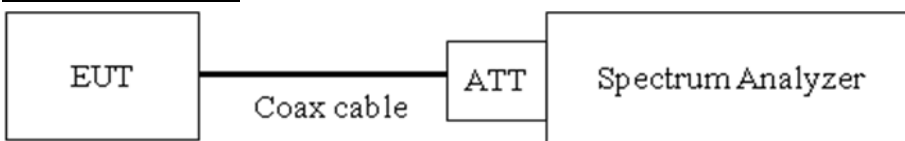
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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(10 dB) + Cable loss(1ea)

3. EUT Cable loss = 0.35 dB

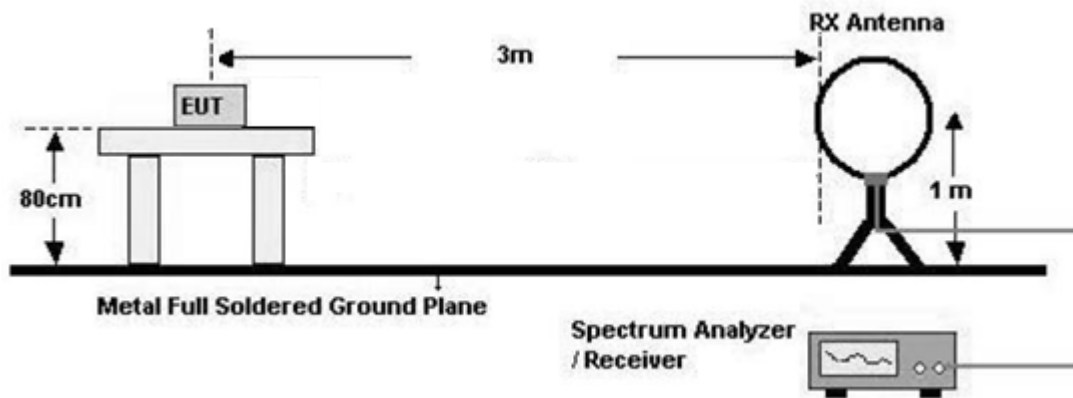
7.6. Radiated Test

Limit

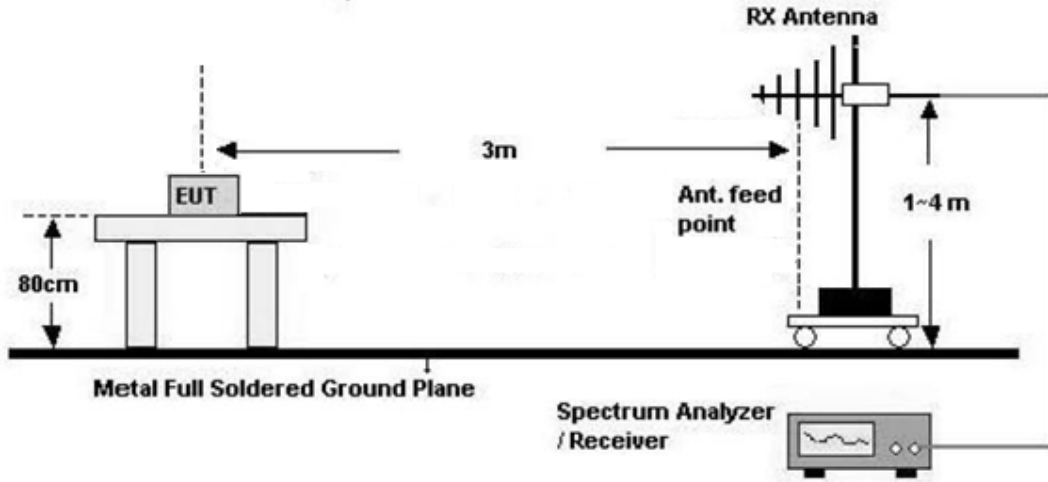
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

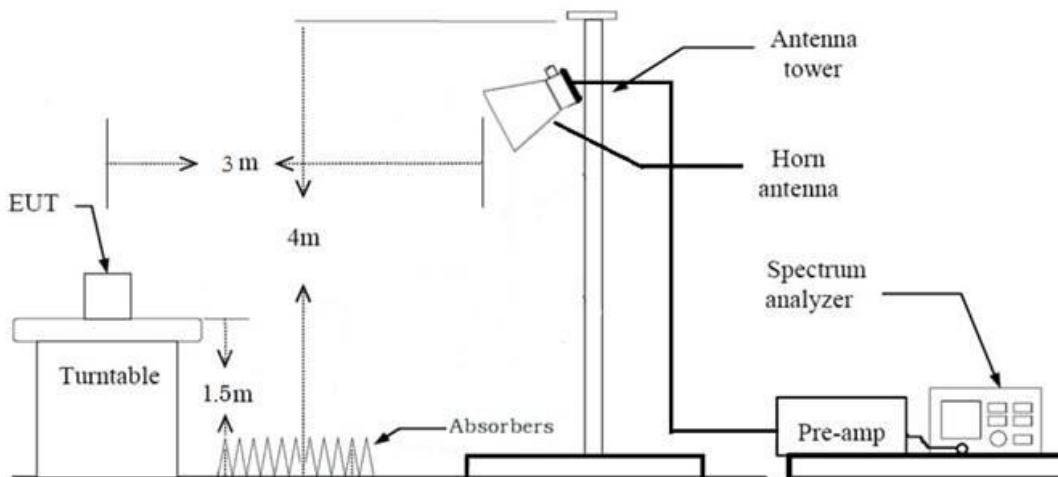
Below 30 MHz



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 x 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 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 : 1 GHz – 25 GHz
- 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 = $20\log$ (test distance / specific distance) (dB)

11. Total(Measurement Type : Peak)

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

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

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

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

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

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 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

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

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

Test Configuration

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

Test Procedure

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

Sample Calculation

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

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, Y
 - Radiated Restricted Band Edge : X, Z
3. Duty cycle factor applies only 802.11g/n/ac (Duty cycle < 98%).
4. All data rate of operation were investigated and the test results are worst case in lowest Data Rate 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-G990B/DS, SM-G990B were tested and the worst case results are reported.
(Worst case : SM-G990B/DS)

Radiated test(DBS)

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone, Stand alone + External accessories(Earphone, etc)
 - Worstcase : Stand alone
2. EUT Axis
 - Radiated Spurious Emissions : X, Z
3. Test case

RSDB Scenario	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5GHz WiFi Ant.1	5GHz WiFi Ant.2	Test case
2.4 GHz WiFi + 5GHz WiFi MIMO	On		On	On	<u>Case 1</u>
2.4 GHz WiFi + 5GHz WiFi MIMO		On	On	On	-
2.4 GHz WiFi MIMO + 5GHz WiFi MIMO	On	On	On	On	<u>Case 2</u>

Non-DBS	5GHz WiFi Ant.1	5GHz WiFi Ant.2	Bluetooth Ant.1	Test case
5GHz WiFi MIMO + Bluetooth	On	On	On	Case 3

4. The following tables show the worst case configurations determined during testing.

(Worst case: The lowest margin condition the channels and modes were selected for test.)

(Test case 3 Result : Please refer to the SM-G990B/DS [BT] Test Report.)

Test case	Description	2.4 GHz Emission	5 GHz Emission	Bluetooth Emission
1	Antenna	Ant 1	Ant All	-
	Channel	1	36	-
	Data Rate	1 Mbps	6 Mbps	-
	Mode	802.11b	802.11a	-

Test case	Description	2.4 GHz Emission	5 GHz Emission	Bluetooth Emission
2	Antenna	Ant All	Ant All	-
	Channel	1	36	-
	Data Rate	MCS0	6 Mbps	-
	Mode	802.11n(HT20)	802.11a	-

Test case	Description	5 GHz Emission	Bluetooth Emission
3	Antenna	Ant All	Ant 1
	Channel	36	0
	Data Rate	6 Mbps	3 Mbps
	Mode	802.11a	8DPSK

5. SM-G990B/DS, SM-G990B were tested and the worst case results are reported.

(Worst case : SM-G990B/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-G990B/DS, SM-G990B were tested and the worst case results are reported.

(Worst case : SM-G990B/DS)

Conducted test

1. The EUT was configured with data rate of highest power.

2. SM-G990B/DS, SM-G990B were tested and the worst case results are reported.

(Worst case : SM-G990B/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

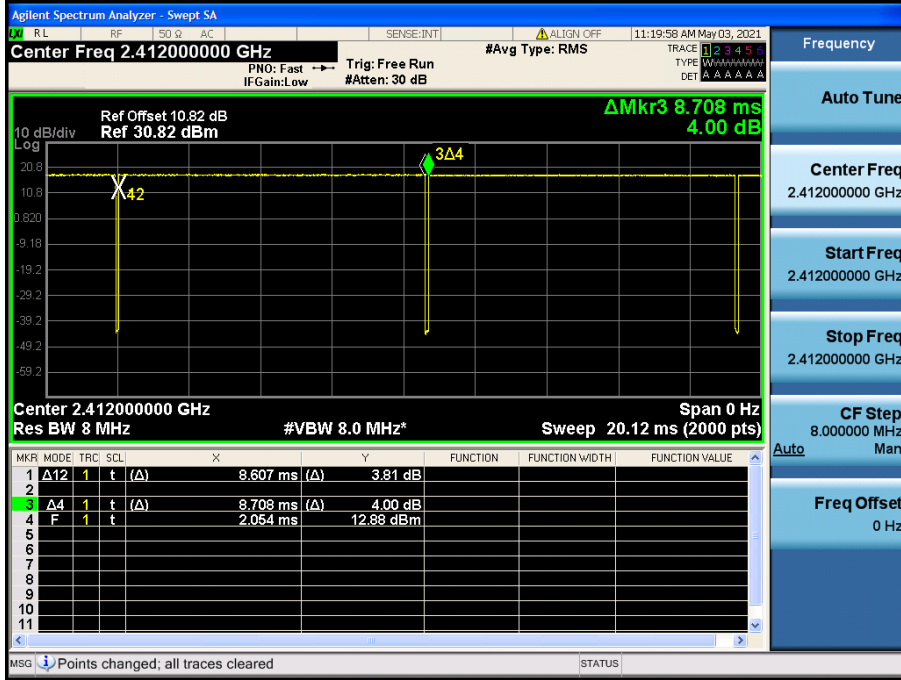
9. TEST RESULT

9.1 DUTY CYCLE

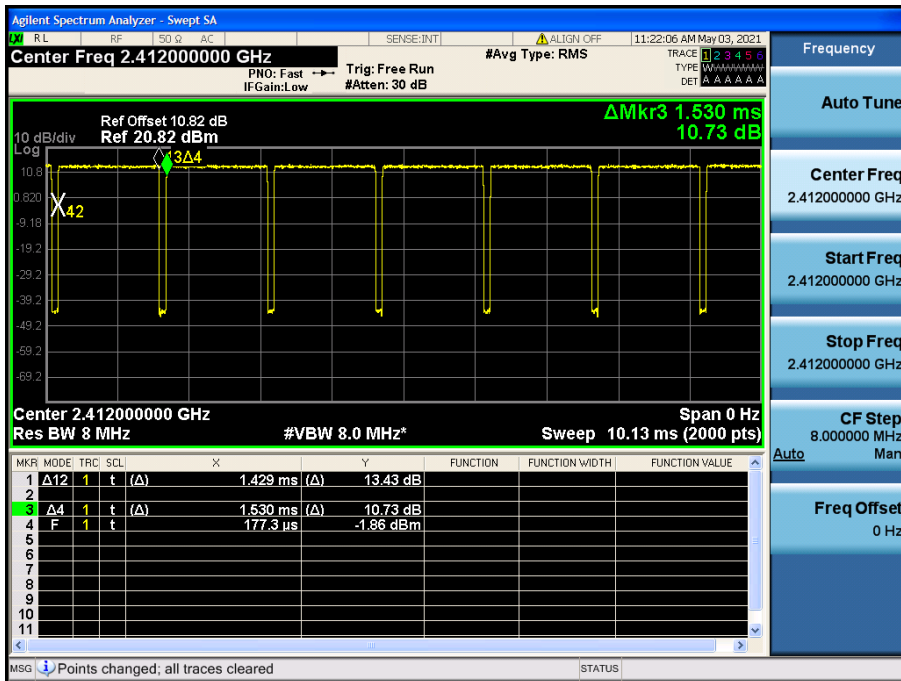
Mode	Data Rate (Mbps)	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	8.607	8.708	0.988	0.051
	2	4.309	4.399	0.979	0.090
	5.5	1.626	1.723	0.944	0.250
	11	0.856	0.958	0.894	0.486
802.11g	6	1.429	1.530	0.934	0.298
	9	0.958	1.059	0.904	0.437
	12	0.725	0.826	0.877	0.569
	18	0.491	0.593	0.829	0.814
	24	0.370	0.471	0.785	1.052
	36	0.253	0.355	0.714	1.461
	48	0.193	0.294	0.655	1.836
	54	0.177	0.279	0.636	1.963
802.11n (HT20)	6.5 (MCS0)	1.333	1.434	0.929	0.318
	13 (MCS1)	0.689	0.790	0.872	0.596
	19.5 (MCS2)	0.476	0.573	0.832	0.800
	26 (MCS3)	0.365	0.466	0.783	1.065
	39 (MCS4)	0.253	0.355	0.714	1.461
	52 (MCS5)	0.198	0.299	0.661	1.798
	58.5 (MCS6)	0.182	0.284	0.643	1.919
	65 (MCS7)	0.172	0.269	0.642	1.928

▣ Test Plots

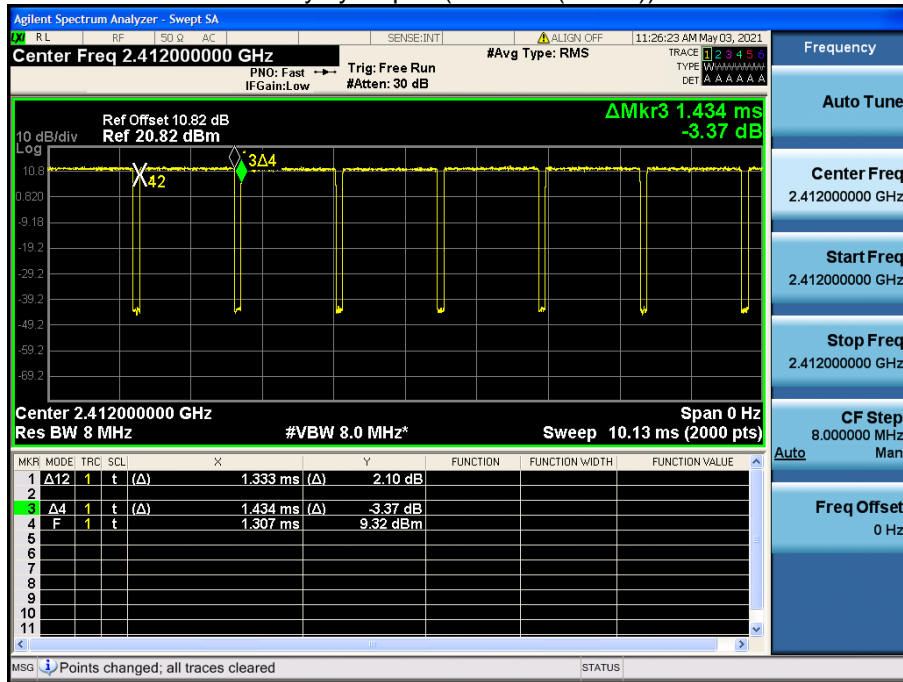
Duty cycle plot (802.11b(1Mbps))



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

[Ant.1]

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	7.614	0.5
2437	6	7.595	0.5
2462	11	8.070	0.5

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	16.06	0.5
2437	6	16.08	0.5
2462	11	16.30	0.5

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	16.34	0.5
2437	6	16.34	0.5
2462	11	16.96	0.5

[Ant.2]

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	7.554	0.5
2437	6	7.572	0.5
2462	11	8.053	0.5

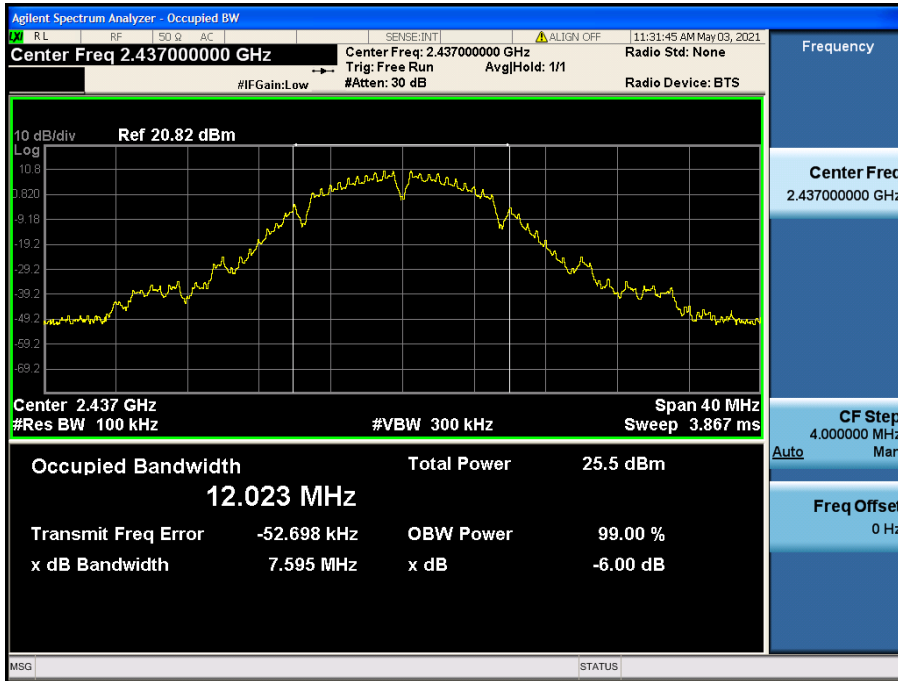
802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	16.11	0.5
2437	6	15.97	0.5
2462	11	15.82	0.5

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	17.30	0.5
2437	6	17.18	0.5
2462	11	16.57	0.5

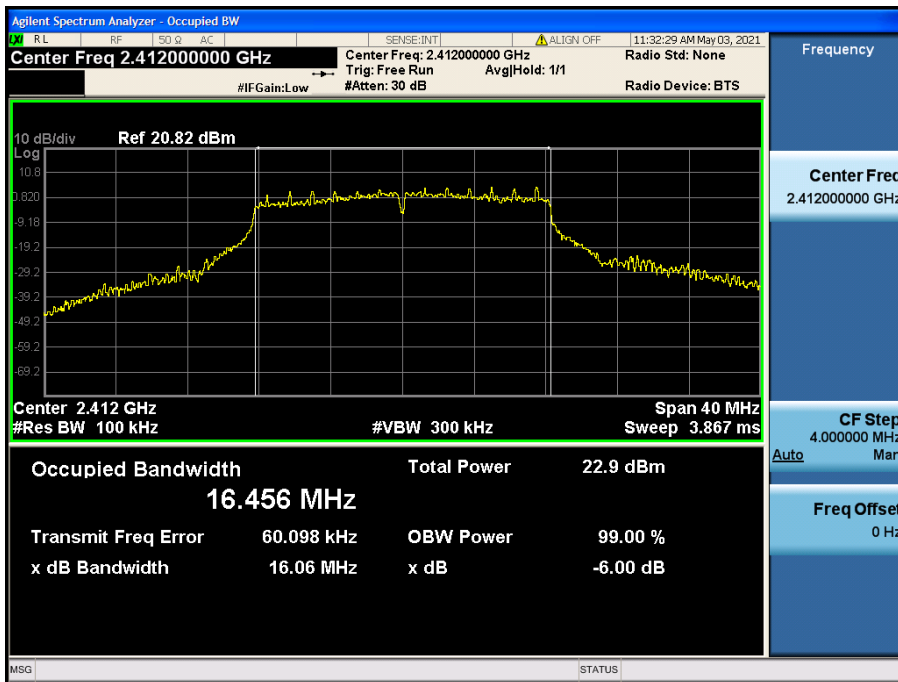
[Ant.1]

▣ Test Plots

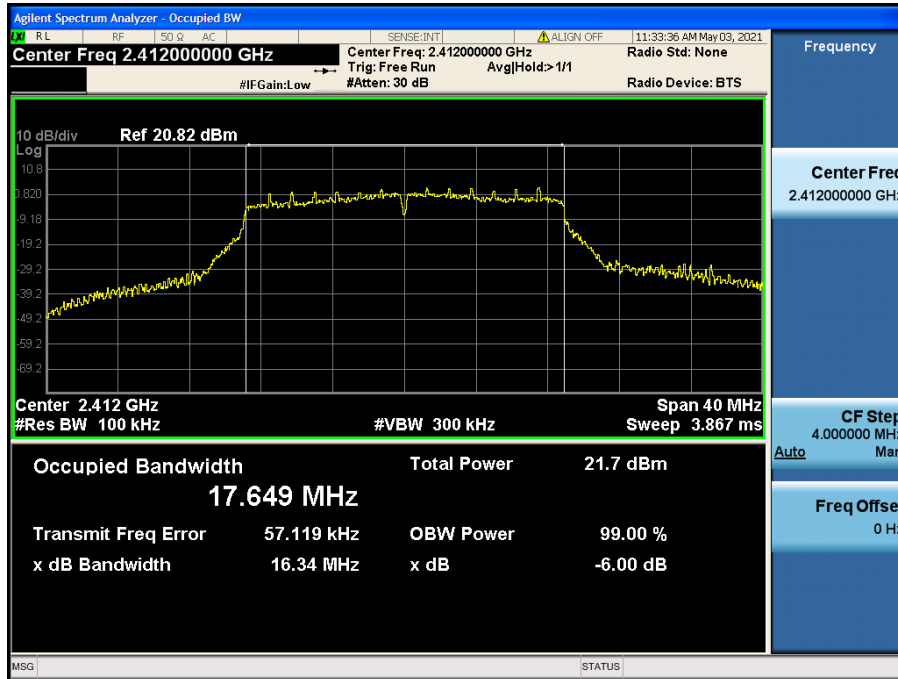
6dB Bandwidth plot (802.11b-CH 6)



6dB Bandwidth plot (802.11g-CH 1)



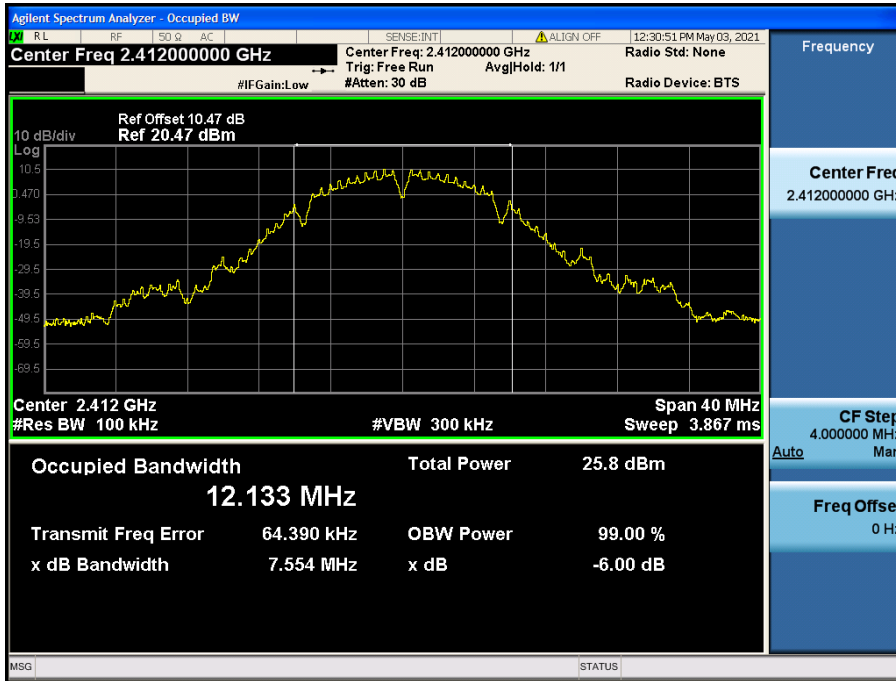
6dB Bandwidth plot (802.11n_HT20-CH 1)



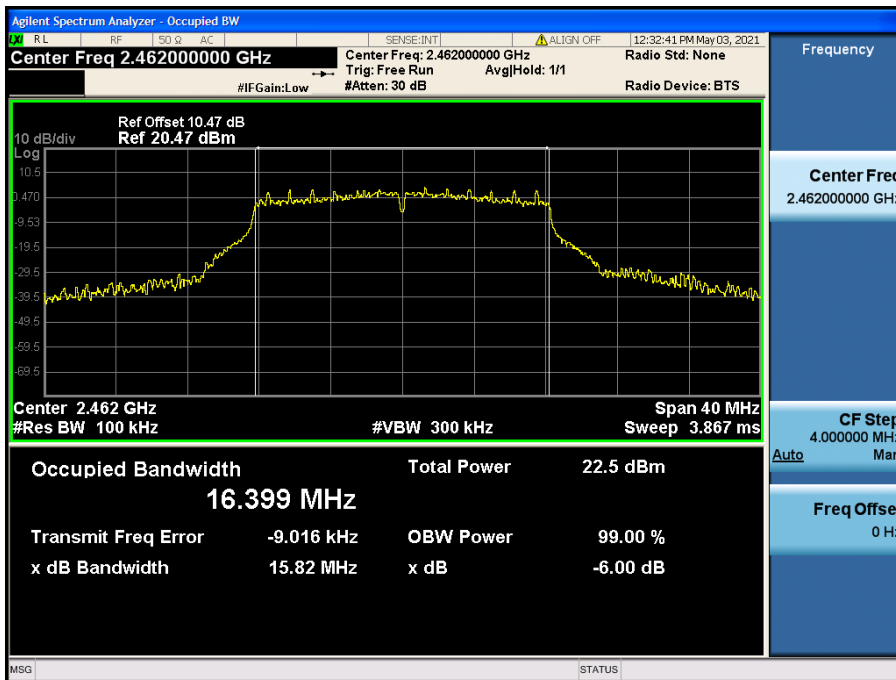
[Ant.2]

▣ Test Plots

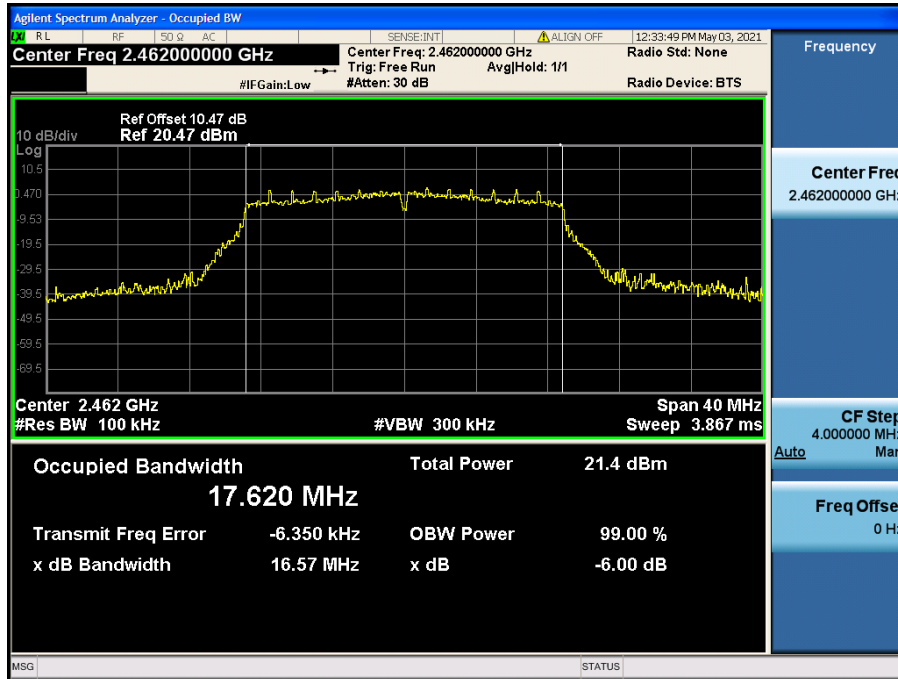
6dB Bandwidth plot (802.11b-CH 1)



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

Ant1 Loss = Attenuator loss(10 dB) + Cable loss + EUT Cable loss

Ant2 Loss = Attenuator loss(10 dB) + Cable loss

[Ant.1]

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	1	21.04	30	18
		2	21.19	30	
		5.5	23.43	30	
		11	24.93	30	
2437	6	1	20.33	30	
		2	20.87	30	
		5.5	22.78	30	
		11	24.30	30	
2462	11	1	20.47	30	
		2	21.02	30	
		5.5	23.11	30	
		11	24.61	30	

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	6	22.46	30	15
		9	22.32	30	
		12	22.57	30	
		18	22.08	30	
		24	22.34	30	
		36	22.46	30	
		48	22.35	30	
		54	22.19	30	
2437	6	6	23.85	30	16
		9	23.75	30	
		12	23.75	30	
		18	23.02	30	
		24	23.41	30	
		36	23.42	30	
		48	23.66	30	
		54	23.54	30	
2462	11	6	20.18	30	13
		9	20.02	30	
		12	20.34	30	
		18	19.70	30	
		24	20.12	30	
		36	20.16	30	
		48	20.34	30	
		54	20.22	30	

802.11n(HT20) Mode		MCS Index	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	0	21.31	30	14
		1	21.45	30	
		2	21.29	30	
		3	21.69	30	
		4	21.62	30	
		5	21.59	30	
		6	21.71	30	
		7	21.49	30	
2437	6	0	22.39	30	15
		1	22.49	30	
		2	22.42	30	
		3	22.71	30	
		4	22.69	30	
		5	22.62	30	
		6	22.76	30	
		7	22.61	30	
2462	11	0	19.31	30	12
		1	19.49	30	
		2	19.38	30	
		3	19.87	30	
		4	19.72	30	
		5	19.71	30	
		6	19.77	30	
		7	19.66	30	

[Ant.2]

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	1	20.72	30	18
		2	21.06	30	
		5.5	23.07	30	
		11	24.58	30	
2437	6	1	20.53	30	
		2	20.58	30	
		5.5	22.50	30	
		11	24.10	30	
2462	11	1	20.63	30	
		2	21.07	30	
		5.5	23.24	30	
		11	24.67	30	

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	6	22.08	30	15
		9	22.27	30	
		12	22.27	30	
		18	21.83	30	
		24	22.10	30	
		36	22.10	30	
		48	22.19	30	
		54	22.56	30	
2437	6	6	23.34	30	16
		9	23.15	30	
		12	23.43	30	
		18	23.13	30	
		24	23.20	30	
		36	23.20	30	
		48	23.40	30	
		54	23.33	30	
2462	11	6	20.69	30	13
		9	20.56	30	
		12	20.66	30	
		18	20.13	30	
		24	20.46	30	
		36	20.43	30	
		48	20.57	30	
		54	20.46	30	

802.11n(HT20) Mode		MCS Index	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	0	21.45	30	14
		1	21.65	30	
		2	21.41	30	
		3	21.91	30	
		4	21.93	30	
		5	22.00	30	
		6	21.94	30	
		7	21.62	30	
2437	6	0	22.39	30	15
		1	22.38	30	
		2	22.14	30	
		3	22.78	30	
		4	22.78	30	
		5	22.72	30	
		6	22.47	30	
		7	22.76	30	
2462	11	0	19.28	30	12
		1	19.43	30	
		2	19.38	30	
		3	19.91	30	
		4	19.73	30	
		5	19.80	30	
		6	19.84	30	
		7	19.70	30	

[MIMO]

802.11g Mode		Rate (Mbps)	Ant.1 Measured Power(dBm)	Ant.2 Measured Power(dBm)	MIMO Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.						
2412	1	6	22.46	22.08	25.28	30	15
		9	22.32	22.27	25.30	30	
		12	22.57	22.27	25.43	30	
		18	22.08	21.83	24.96	30	
		24	22.34	22.10	25.23	30	
		36	22.46	22.10	25.29	30	
		48	22.35	22.19	25.28	30	
		54	22.19	22.56	25.39	30	
2437	6	6	23.85	23.34	26.61	30	16
		9	23.75	23.15	26.47	30	
		12	23.75	23.43	26.61	30	
		18	23.02	23.13	26.09	30	
		24	23.41	23.20	26.32	30	
		36	23.42	23.20	26.32	30	
		48	23.66	23.40	26.54	30	
		54	23.54	23.33	26.45	30	
2462	11	6	20.18	20.69	23.45	30	13
		9	20.02	20.56	23.31	30	
		12	20.34	20.66	23.51	30	
		18	19.70	20.13	22.93	30	
		24	20.12	20.46	23.30	30	
		36	20.16	20.43	23.31	30	
		48	20.34	20.57	23.47	30	
		54	20.22	20.46	23.36	30	

802.11n(HT20) Mode		MCS Index	Ant.1 Measured Power(dBm)	Ant.2 Measured Power(dBm)	MIMO Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.						
2412	1	0	21.31	21.45	24.39	30	14
		1	21.45	21.65	24.56	30	
		2	21.29	21.41	24.36	30	
		3	21.69	21.91	24.81	30	
		4	21.62	21.93	24.79	30	
		5	21.59	22.00	24.81	30	
		6	21.71	21.94	24.84	30	
		7	21.49	21.62	24.57	30	
2437	6	0	22.39	22.39	25.40	30	15
		1	22.49	22.38	25.45	30	
		2	22.42	22.14	25.29	30	
		3	22.71	22.78	25.76	30	
		4	22.69	22.78	25.74	30	
		5	22.62	22.72	25.68	30	
		6	22.76	22.47	25.63	30	
		7	22.61	22.76	25.70	30	
2462	11	0	19.31	19.28	22.30	30	12
		1	19.49	19.43	22.47	30	
		2	19.38	19.38	22.39	30	
		3	19.87	19.91	22.90	30	
		4	19.72	19.73	22.74	30	
		5	19.71	19.80	22.76	30	
		6	19.77	19.84	22.82	30	
		7	19.66	19.70	22.69	30	

Average Power

1. Power Meter offset

Ant1 Loss = Attenuator loss(10 dB) + Cable loss + EUT Cable loss

Ant2 Loss = Attenuator loss(10 dB) + Cable loss

[Ant.1]

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	18.21	0.051	18.26	30	18
		2	18.28	0.090	18.37	30	
		5.5	18.72	0.250	18.97	30	
		11	18.30	0.486	18.79	30	
2437	6	1	17.66	0.051	17.71	30	
		2	17.79	0.090	17.88	30	
		5.5	18.12	0.250	18.37	30	
		11	17.74	0.486	18.23	30	
2462	11	1	17.72	0.051	17.77	30	
		2	17.80	0.090	17.89	30	
		5.5	18.31	0.250	18.56	30	
		11	17.86	0.486	18.35	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	14.07	0.298	14.37	30	15
		9	13.82	0.437	14.26	30	
		12	13.69	0.569	14.26	30	
		18	13.54	0.814	14.35	30	
		24	13.23	1.052	14.28	30	
		36	12.88	1.461	14.34	30	
		48	12.39	1.836	14.23	30	
		54	12.22	1.963	14.19	30	
2437	6	6	15.31	0.298	15.61	30	16
		9	15.17	0.437	15.61	30	
		12	15.01	0.569	15.58	30	
		18	14.67	0.814	15.48	30	
		24	14.48	1.052	15.53	30	
		36	14.14	1.461	15.60	30	
		48	13.71	1.836	15.55	30	
		54	13.62	1.963	15.58	30	
2462	11	6	11.92	0.298	12.22	30	13
		9	11.77	0.437	12.21	30	
		12	11.61	0.569	12.18	30	
		18	11.37	0.814	12.19	30	
		24	11.11	1.052	12.16	30	
		36	10.70	1.461	12.16	30	
		48	10.35	1.836	12.19	30	
		54	10.21	1.963	12.17	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	13.07	0.318	13.39	30	14
		1	12.88	0.596	13.48	30	
		2	12.57	0.800	13.37	30	
		3	12.35	1.065	13.41	30	
		4	11.94	1.461	13.40	30	
		5	11.69	1.798	13.49	30	
		6	11.54	1.919	13.46	30	
		7	11.31	1.928	13.24	30	
2437	6	0	14.24	0.318	14.56	30	15
		1	13.91	0.596	14.50	30	
		2	13.60	0.800	14.39	30	
		3	13.38	1.065	14.44	30	
		4	13.02	1.461	14.48	30	
		5	12.82	1.798	14.62	30	
		6	12.55	1.919	14.47	30	
		7	12.39	1.928	14.31	30	
2462	11	0	11.03	0.318	11.35	30	12
		1	10.76	0.596	11.35	30	
		2	10.53	0.800	11.33	30	
		3	10.33	1.065	11.40	30	
		4	9.95	1.461	11.41	30	
		5	9.64	1.798	11.44	30	
		6	9.43	1.919	11.35	30	
		7	9.28	1.928	11.21	30	

[Ant.2]

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	17.96	0.051	18.01	30	18
		2	18.13	0.090	18.22	30	
		5.5	18.34	0.250	18.59	30	
		11	17.95	0.486	18.43	30	
2437	6	1	17.66	0.051	17.71	30	
		2	17.52	0.090	17.61	30	
		5.5	17.82	0.250	18.07	30	
		11	17.48	0.486	17.96	30	
2462	11	1	17.81	0.051	17.86	30	
		2	17.86	0.090	17.95	30	
		5.5	18.38	0.250	18.63	30	
		11	17.90	0.486	18.39	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	13.99	0.298	14.29	30	15
		9	13.78	0.437	14.21	30	
		12	13.69	0.569	14.26	30	
		18	13.36	0.814	14.17	30	
		24	13.09	1.052	14.14	30	
		36	12.76	1.461	14.22	30	
		48	12.27	1.836	14.10	30	
		54	12.25	1.963	14.21	30	
2437	6	6	15.12	0.298	15.42	30	16
		9	14.84	0.437	15.28	30	
		12	14.67	0.569	15.23	30	
		18	14.60	0.814	15.41	30	
		24	14.26	1.052	15.31	30	
		36	13.81	1.461	15.27	30	
		48	13.48	1.836	15.32	30	
		54	13.34	1.963	15.30	30	
2462	11	6	12.29	0.298	12.59	30	13
		9	12.07	0.437	12.51	30	
		12	11.91	0.569	12.48	30	
		18	11.69	0.814	12.51	30	
		24	11.53	1.052	12.58	30	
		36	10.98	1.461	12.44	30	
		48	10.63	1.836	12.47	30	
		54	10.52	1.963	12.48	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	13.01	0.318	13.33	30	14
		1	12.69	0.596	13.29	30	
		2	12.47	0.800	13.27	30	
		3	12.24	1.065	13.31	30	
		4	11.94	1.461	13.40	30	
		5	11.69	1.798	13.49	30	
		6	11.56	1.919	13.48	30	
		7	11.38	1.928	13.31	30	
2437	6	0	13.85	0.318	14.17	30	15
		1	13.59	0.596	14.19	30	
		2	13.36	0.800	14.16	30	
		3	13.06	1.065	14.12	30	
		4	12.81	1.461	14.27	30	
		5	12.53	1.798	14.33	30	
		6	12.08	1.919	14.00	30	
		7	12.33	1.928	14.26	30	
2462	11	0	11.08	0.318	11.39	30	12
		1	10.85	0.596	11.44	30	
		2	10.58	0.800	11.38	30	
		3	10.44	1.065	11.51	30	
		4	9.98	1.461	11.44	30	
		5	9.72	1.798	11.52	30	
		6	9.60	1.919	11.51	30	
		7	9.42	1.928	11.35	30	

[MIMO]

802.11g Mode		Rate (Mbps)	Ant.1 Measured Power(dBm) + Duty Cycle Factor	Ant.2 Measured Power(dBm) + Duty Cycle Factor	MIMO Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	6	14.37	14.29	17.34	30	15
		9	14.26	14.21	17.25	30	
		12	14.26	14.26	17.27	30	
		18	14.35	14.17	17.27	30	
		24	14.28	14.14	17.22	30	
		36	14.34	14.22	17.29	30	
		48	14.23	14.10	17.18	30	
		54	14.19	14.21	17.21	30	
2437	6	6	15.61	15.42	18.52	30	16
		9	15.61	15.28	18.46	30	
		12	15.58	15.23	18.42	30	
		18	15.48	15.41	18.46	30	
		24	15.53	15.31	18.43	30	
		36	15.60	15.27	18.45	30	
		48	15.55	15.32	18.45	30	
		54	15.58	15.30	18.45	30	
2462	11	6	12.22	12.59	15.42	30	13
		9	12.21	12.51	15.37	30	
		12	12.18	12.48	15.34	30	
		18	12.19	12.51	15.36	30	
		24	12.16	12.58	15.39	30	
		36	12.16	12.44	15.31	30	
		48	12.19	12.47	15.34	30	
		54	12.17	12.48	15.34	30	

802.11n(HT20) Mode		MCS Index	Ant.1 Measured Power(dBm) + Duty Cycle Factor	Ant.2 Measured Power(dBm) + Duty Cycle Factor	MIMO Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	0	13.39	13.33	16.37	30	14
		1	13.48	13.29	16.39	30	
		2	13.37	13.27	16.33	30	
		3	13.41	13.31	16.37	30	
		4	13.40	13.40	16.41	30	
		5	13.49	13.49	16.50	30	
		6	13.46	13.48	16.48	30	
		7	13.24	13.31	16.29	30	
2437	6	0	14.56	14.17	17.38	30	15
		1	14.50	14.19	17.36	30	
		2	14.39	14.16	17.29	30	
		3	14.44	14.12	17.30	30	
		4	14.48	14.27	17.39	30	
		5	14.62	14.33	17.49	30	
		6	14.47	14.00	17.25	30	
		7	14.31	14.26	17.30	30	
2462	11	0	11.35	11.39	14.38	30	12
		1	11.35	11.44	14.41	30	
		2	11.33	11.38	14.36	30	
		3	11.40	11.51	14.46	30	
		4	11.41	11.44	14.44	30	
		5	11.44	11.52	14.49	30	
		6	11.35	11.51	14.44	30	
		7	11.21	11.35	14.29	30	

9.4 POWER SPECTRAL DENSITY

[Ant.1]

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	-2.427	0.250	-2.177	8 dBm / 3 kHz
	2437	6	-3.335	0.250	-3.085	
	2462	11	-3.555	0.250	-3.305	
802.11g	2412	1	-8.981	0.298	-8.683	
	2437	6	-7.534	0.298	-7.236	
	2462	11	-10.933	0.298	-10.635	
802.11n(HT20)	2412	1	-11.099	1.798	-9.301	
	2437	6	-10.266	1.798	-8.468	
	2462	11	-14.048	1.798	-12.250	

[Ant.2]

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	-3.289	0.250	-3.039	8 dBm / 3 kHz
	2437	6	-3.778	0.250	-3.528	
	2462	11	-3.249	0.250	-2.999	
802.11g	2412	1	-8.461	0.298	-8.163	
	2437	6	-8.520	0.298	-8.222	
	2462	11	-10.358	0.298	-10.060	
802.11n(HT20)	2412	1	-11.371	1.798	-9.573	
	2437	6	-10.528	1.798	-8.730	
	2462	11	-13.223	1.798	-11.425	

[MIMO]

Mode	Frequency (MHz)	Channel No.	Test Result			
			Ant.1 Measured Power(dBm) + Duty Cycle Factor	Ant.2 Measured Power(dBm) + Duty Cycle Factor	MIMO Measured Power(dBm)	Limit (dBm)
802.11g	2412	1	-8.683	-8.163	-5.405	8 dBm / 3 kHz
	2437	6	-7.236	-8.222	-4.691	
	2462	11	-10.635	-10.060	-7.328	
802.11n(HT20)	2412	1	-9.301	-9.573	-6.425	
	2437	6	-8.468	-8.730	-5.587	
	2462	11	-12.250	-11.425	-8.808	

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

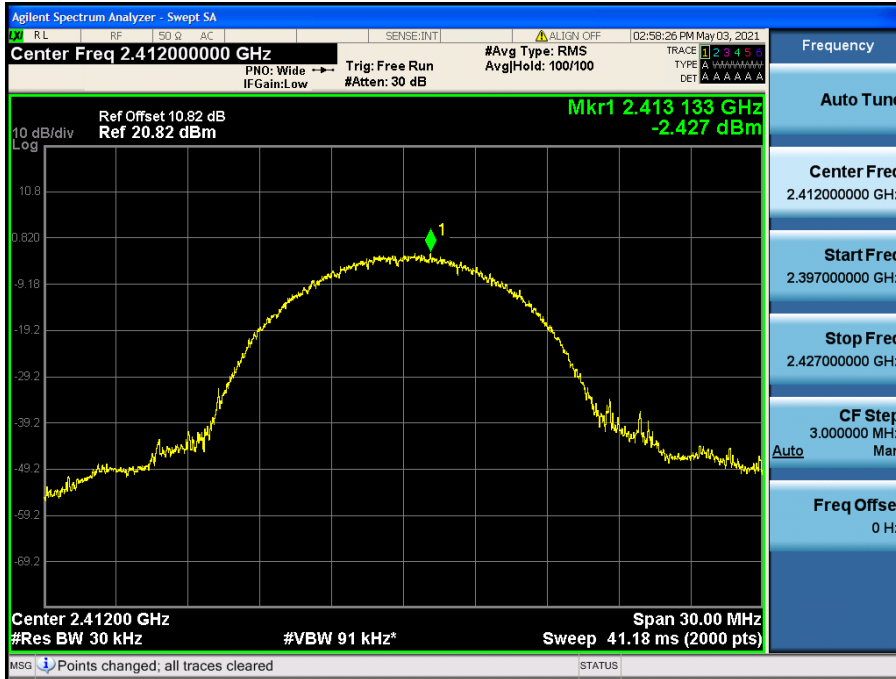
Ant1 Loss = Attenuator loss(10 dB) + Cable loss + EUT Cable loss

Ant2 Loss = Attenuator loss(10 dB) + Cable loss

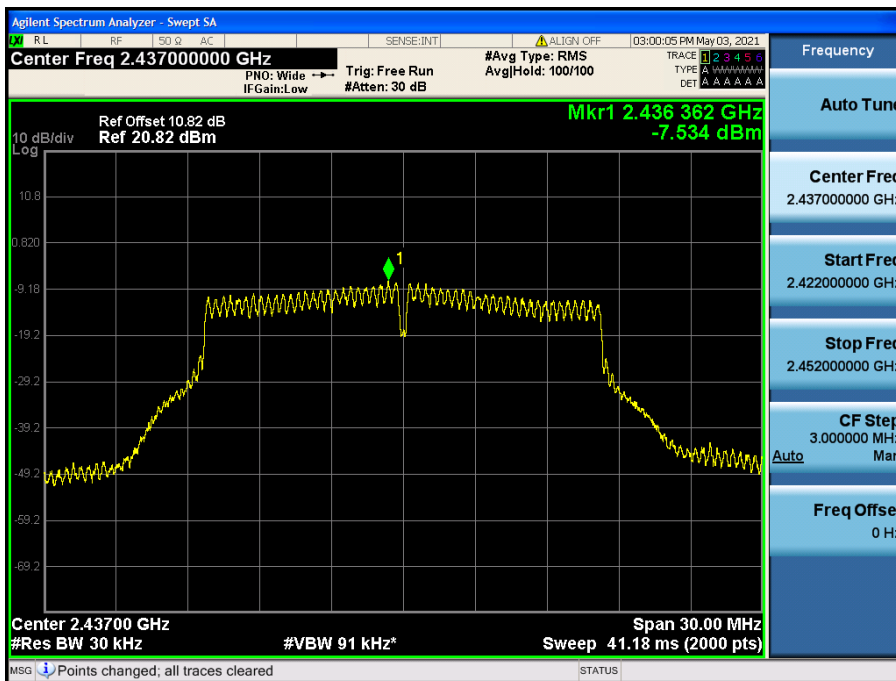
[Ant.1]

▣ Test Plots

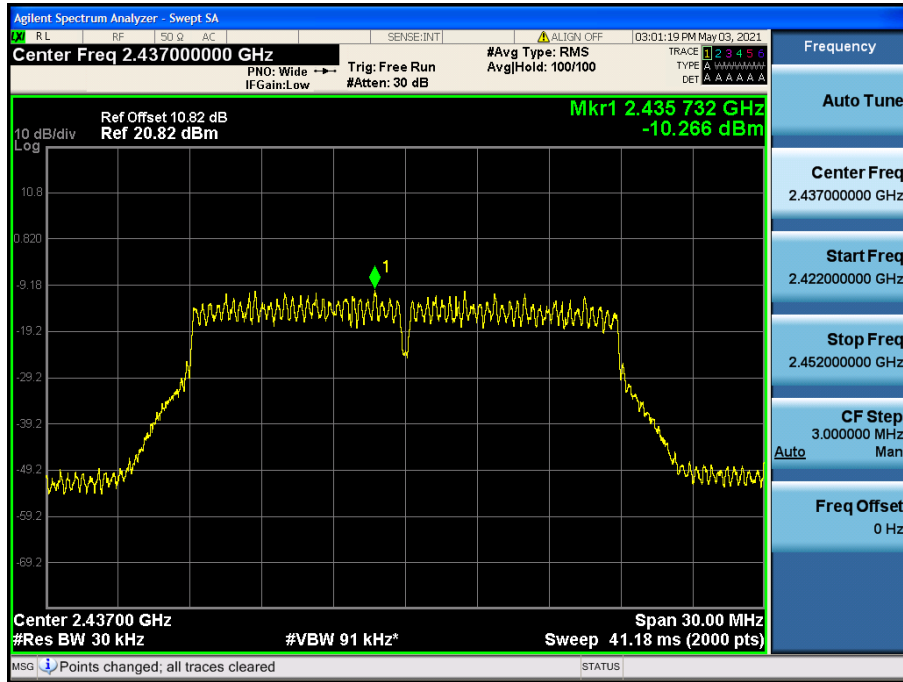
Power Spectral Density (802.11b-CH 1)



Power Spectral Density (802.11g-CH 6)



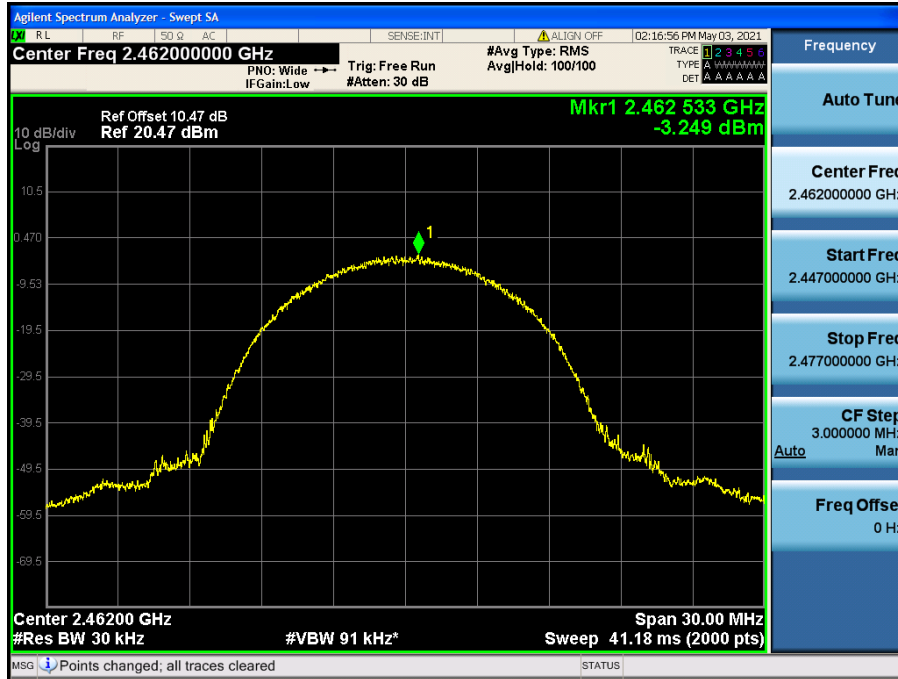
Power Spectral Density (802.11n_HT20-CH 6)



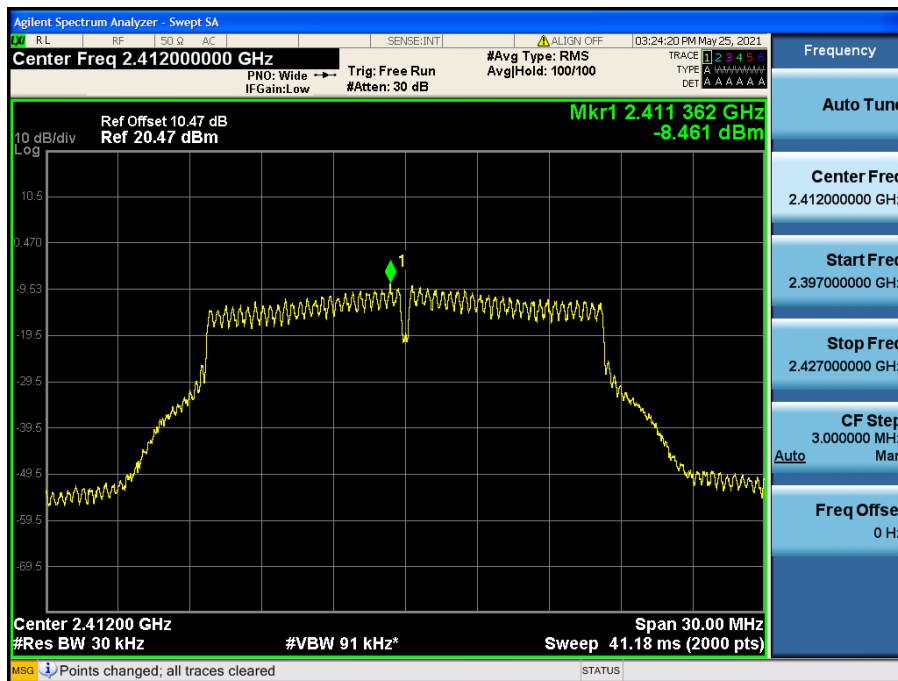
[Ant.2]

▣ Test Plots

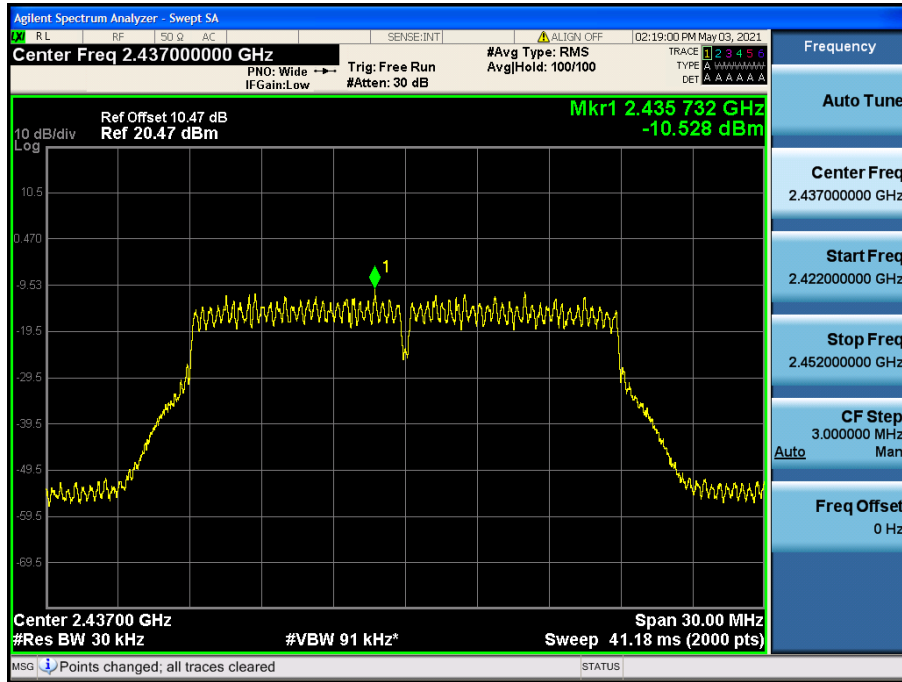
Power Spectral Density (802.11b-CH 11)



Power Spectral Density (802.11g-CH 1)



Power Spectral Density (802.11n_HT20-CH 6)



Note :

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

9.5 BAND EDGE / CONDUCTED SPURIOUS EMISSIONS

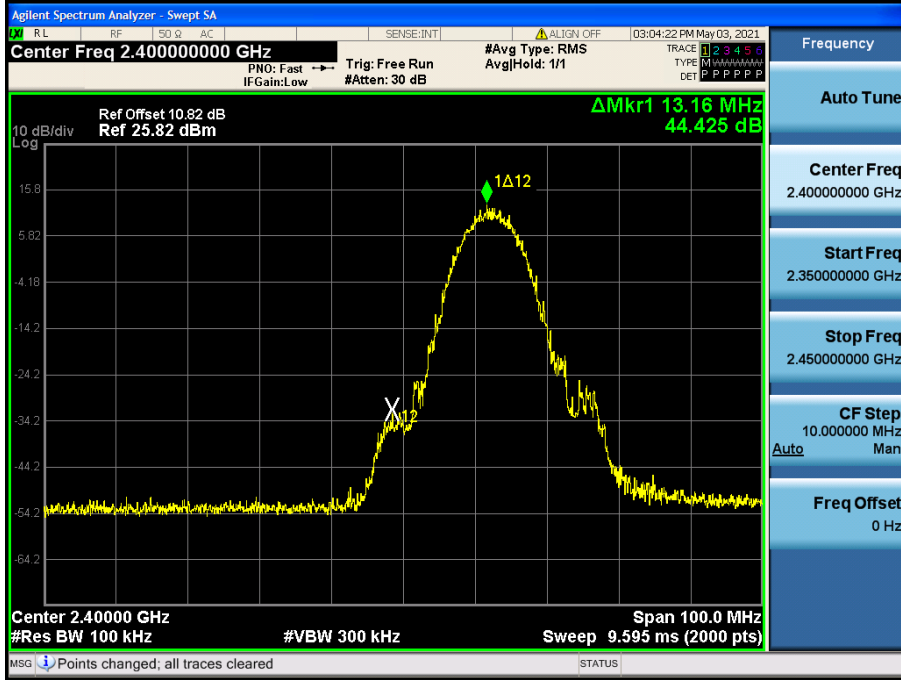
Test Result : please refer to the plot below.

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

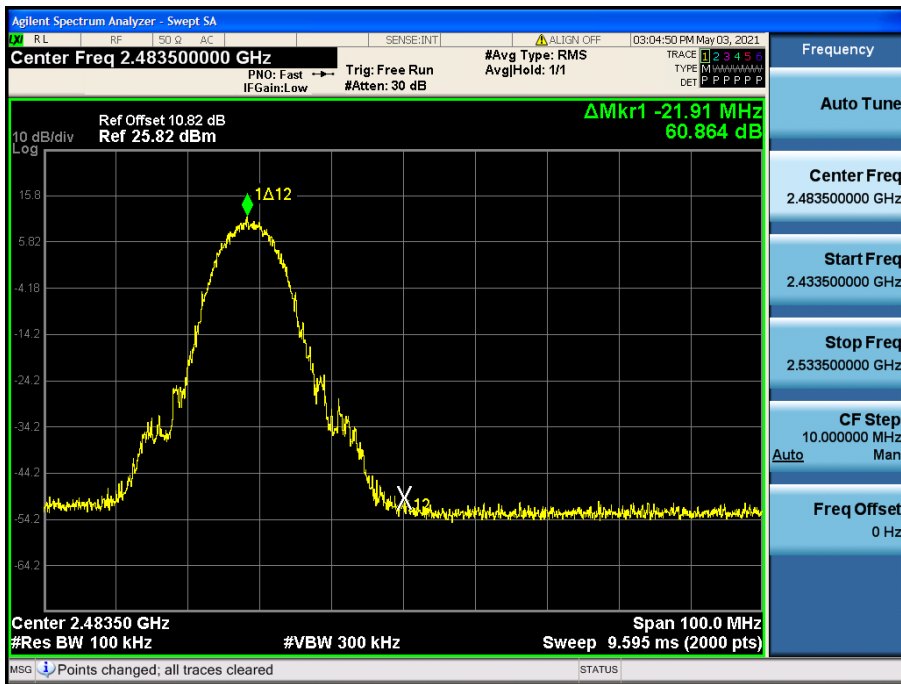
[Ant.1]

▣ Test Plots(BandEdge)

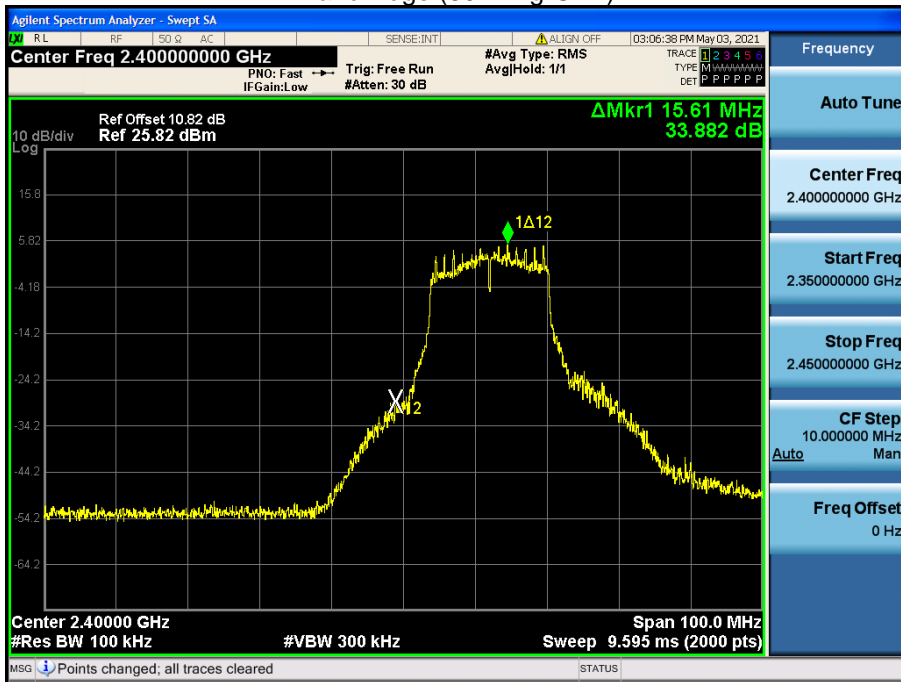
Band Edge (802.11b-CH1)



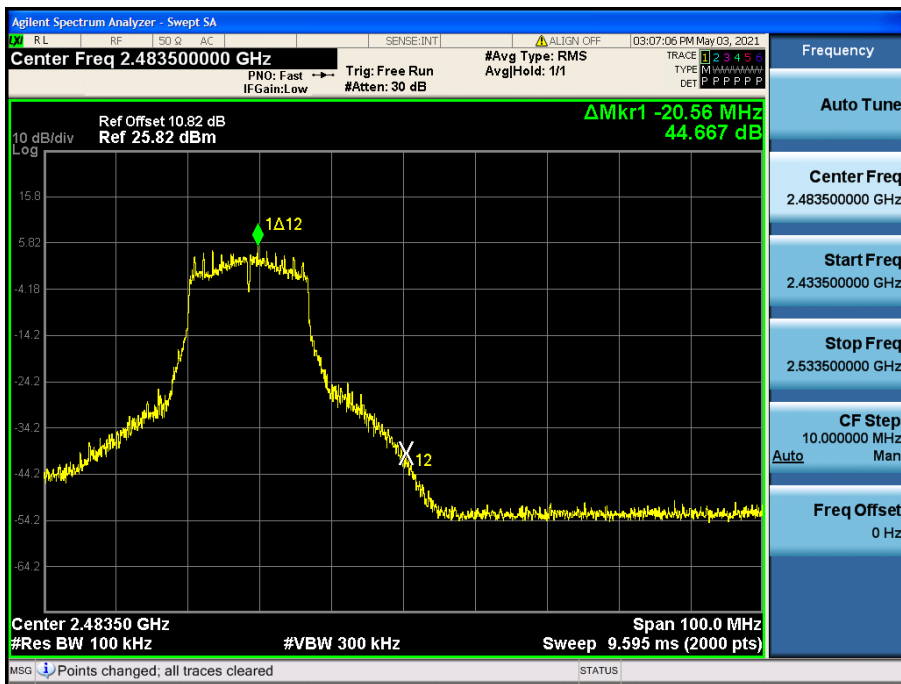
Band Edge (802.11b-CH11)



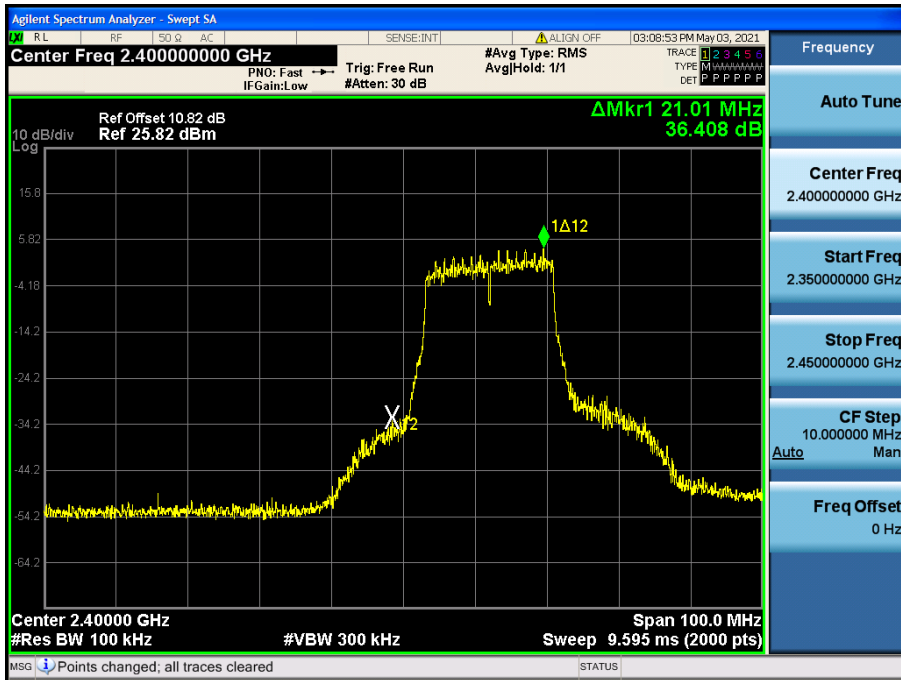
Band Edge (802.11g-CH1)



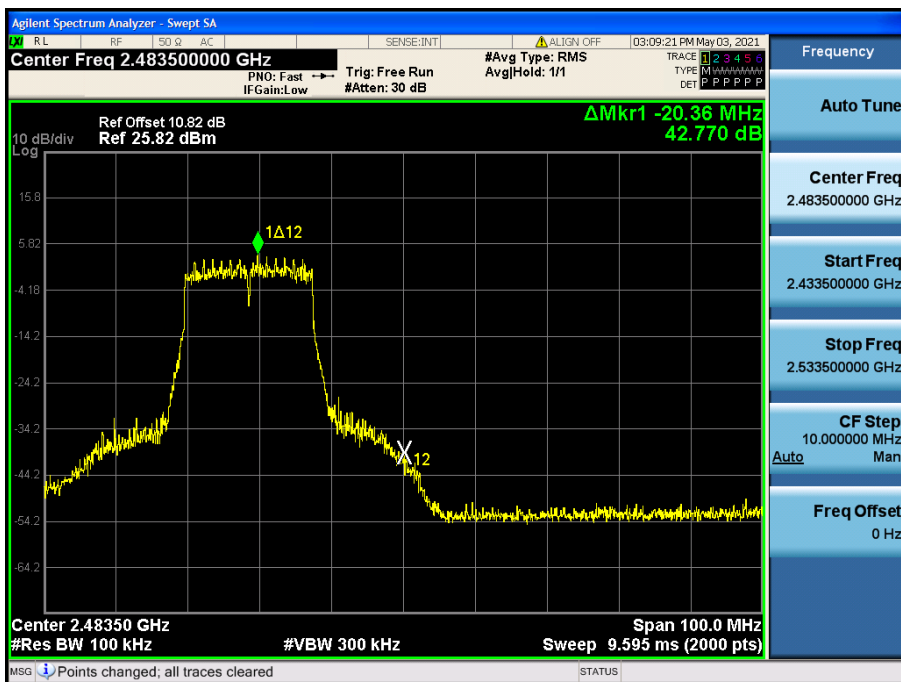
Band Edge (802.11g-CH11)



Band Edge (802.11n_HT20 -CH1)



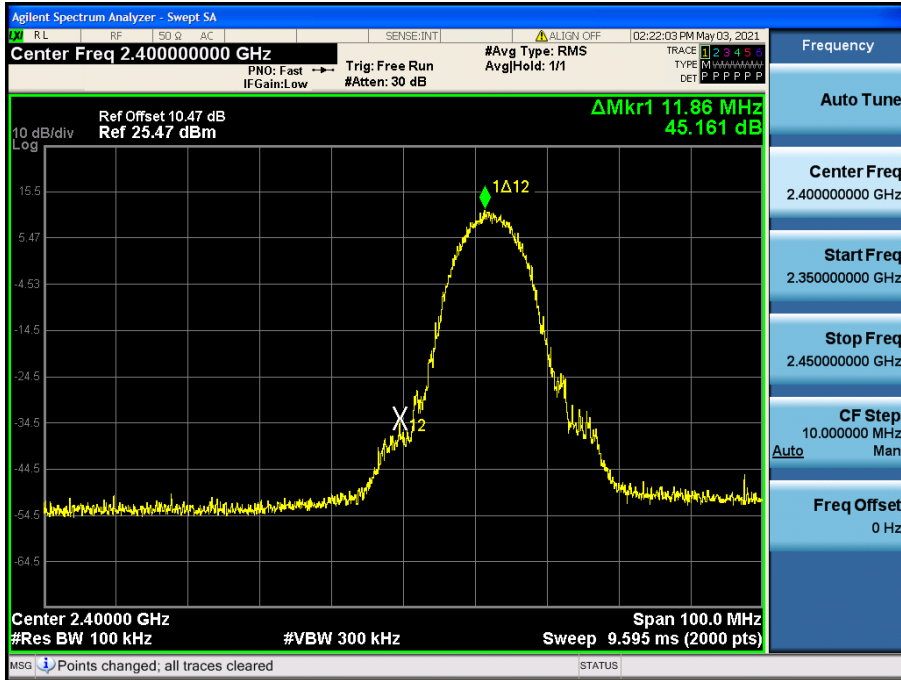
Band Edge (802.11n_HT20 -CH11)



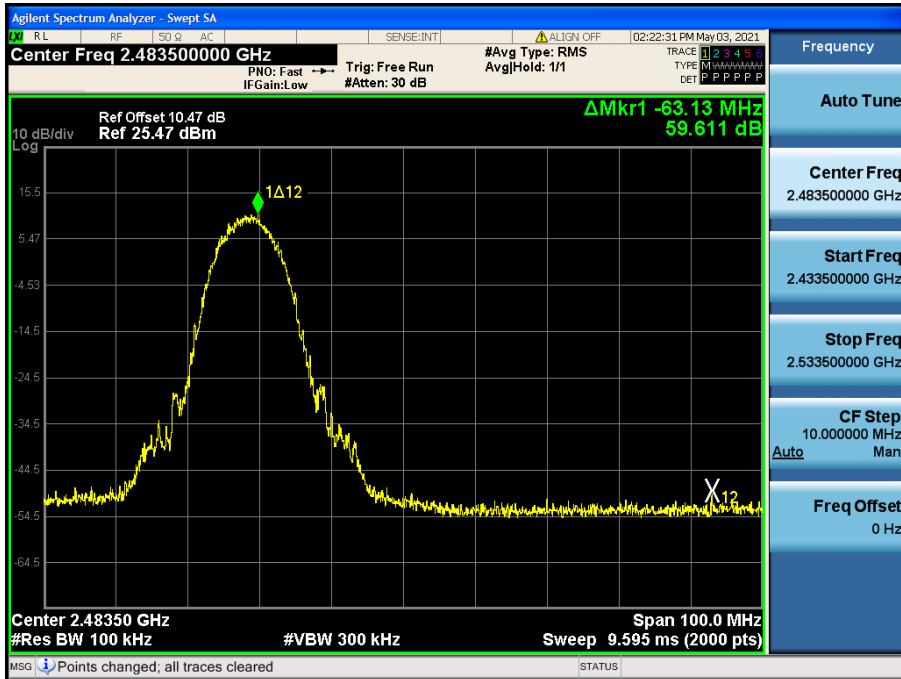
[Ant.2]

☐ Test Plots(BandEdge)

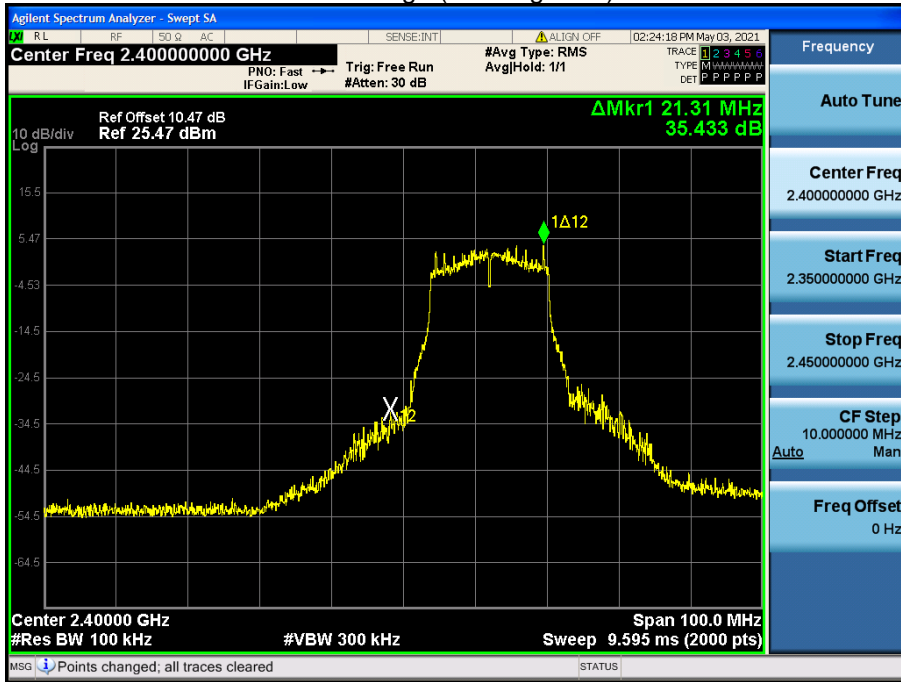
Band Edge (802.11b-CH1)



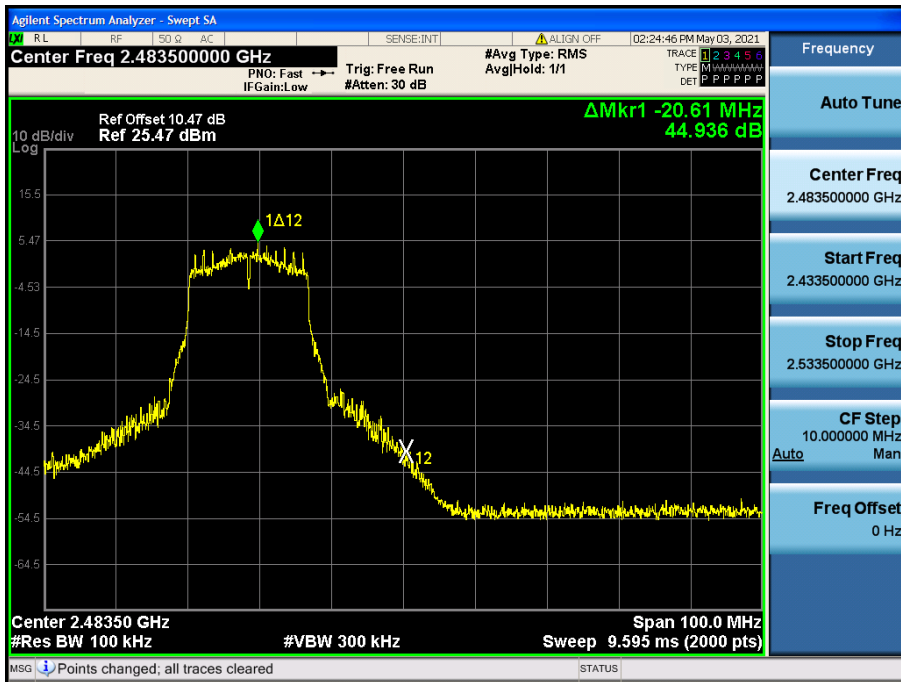
Band Edge (802.11b-CH11)



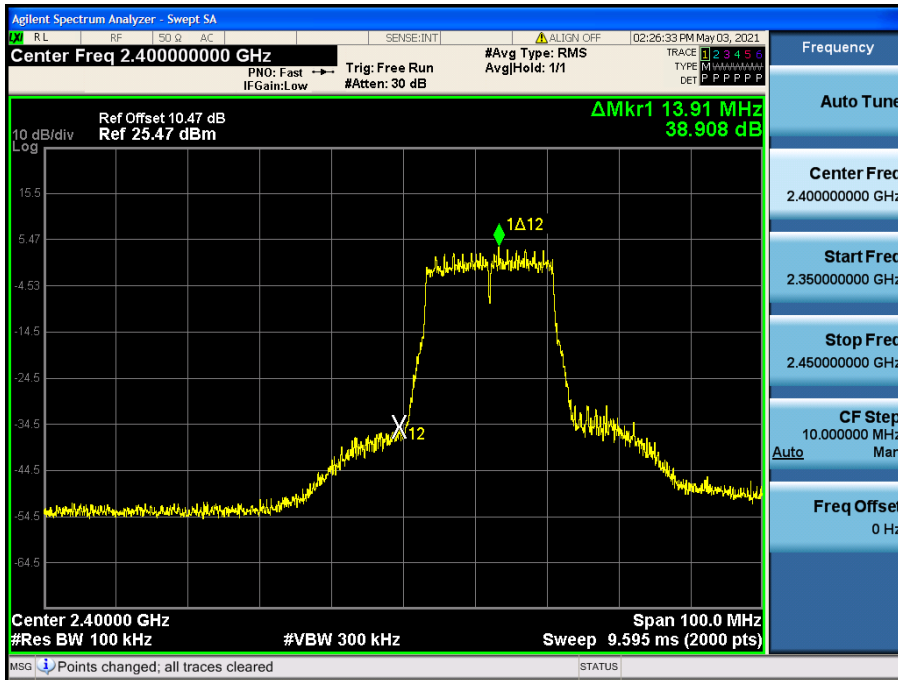
Band Edge (802.11g-CH1)



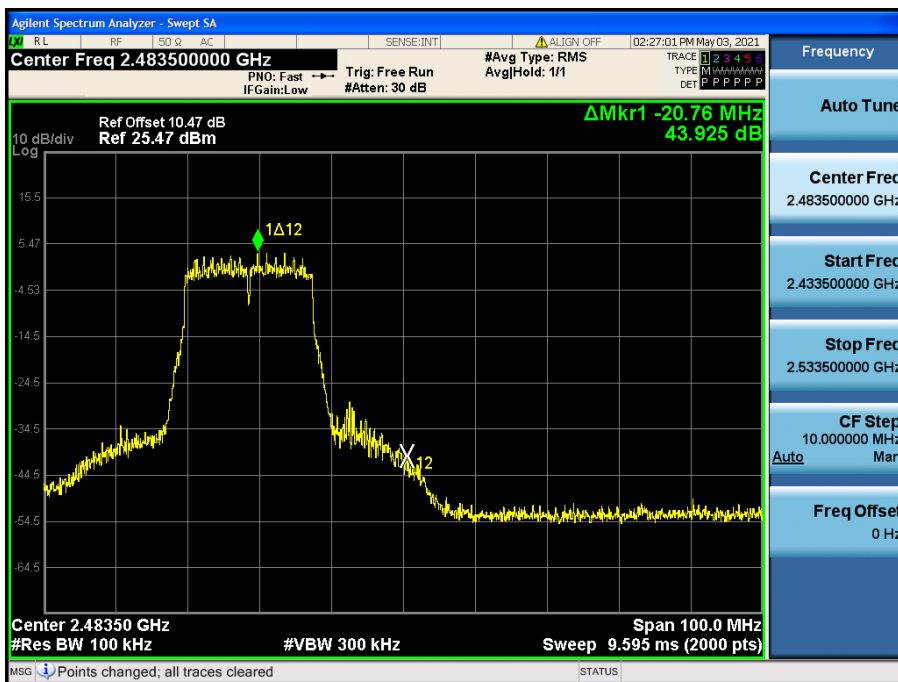
Band Edge (802.11g-CH11)



Band Edge (802.11n_HT20 -CH1)



Band Edge (802.11n_HT20 -CH11)

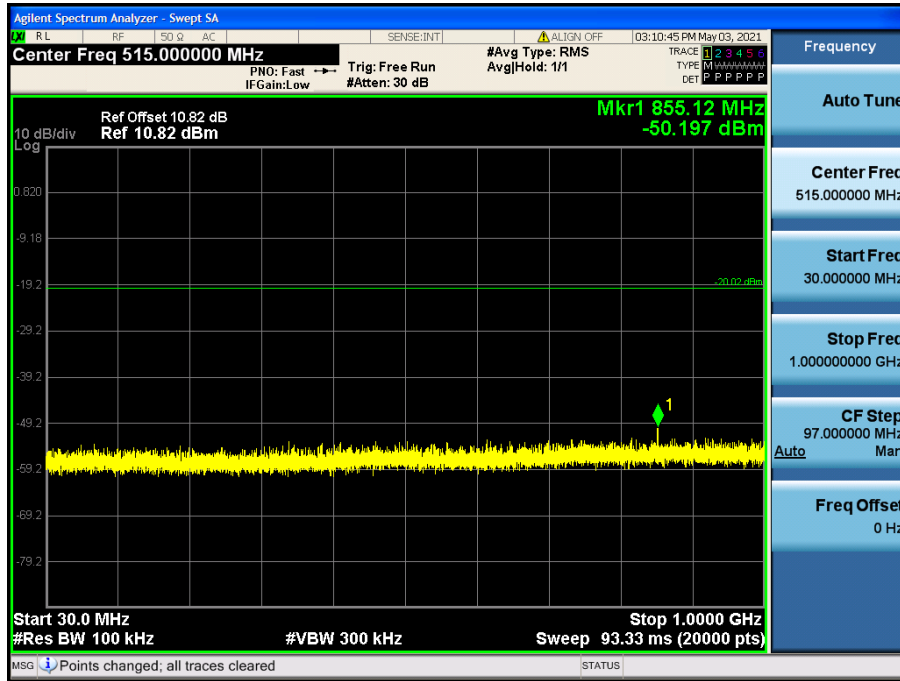


[Ant.1]

☑ Test Plots(Conducted Spurious Emission)

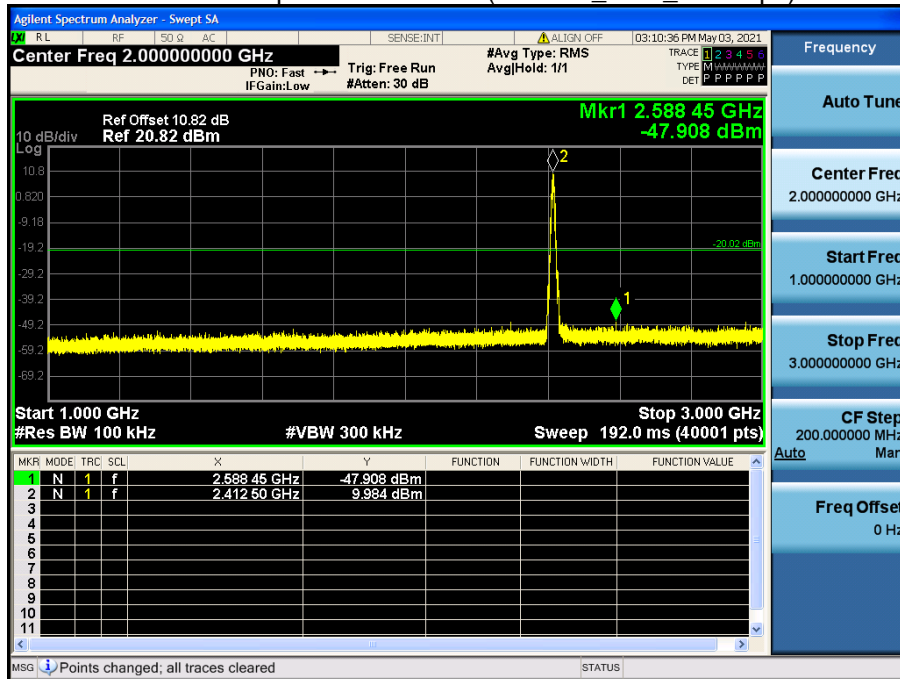
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



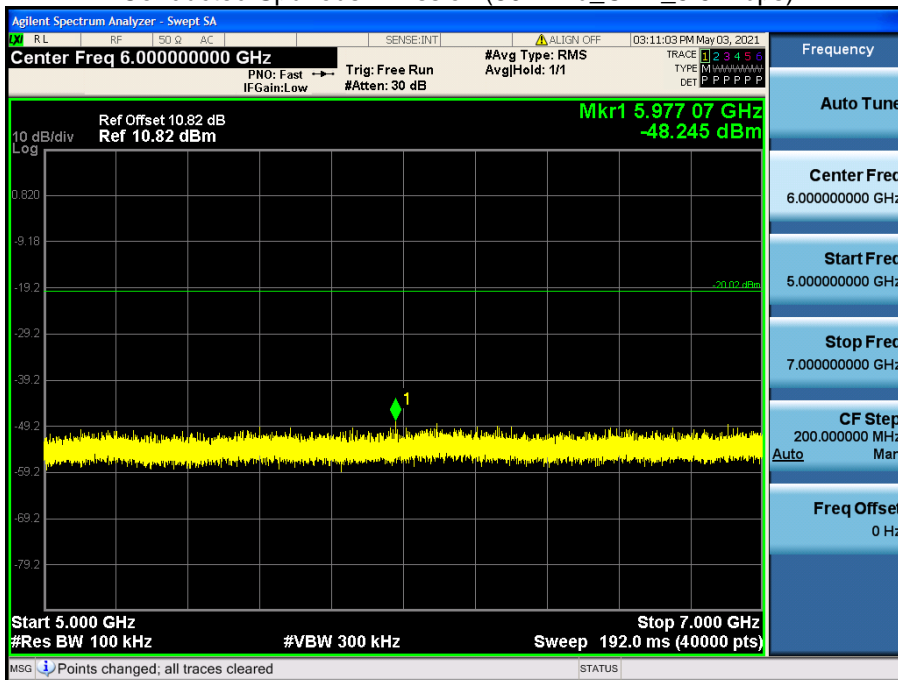
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



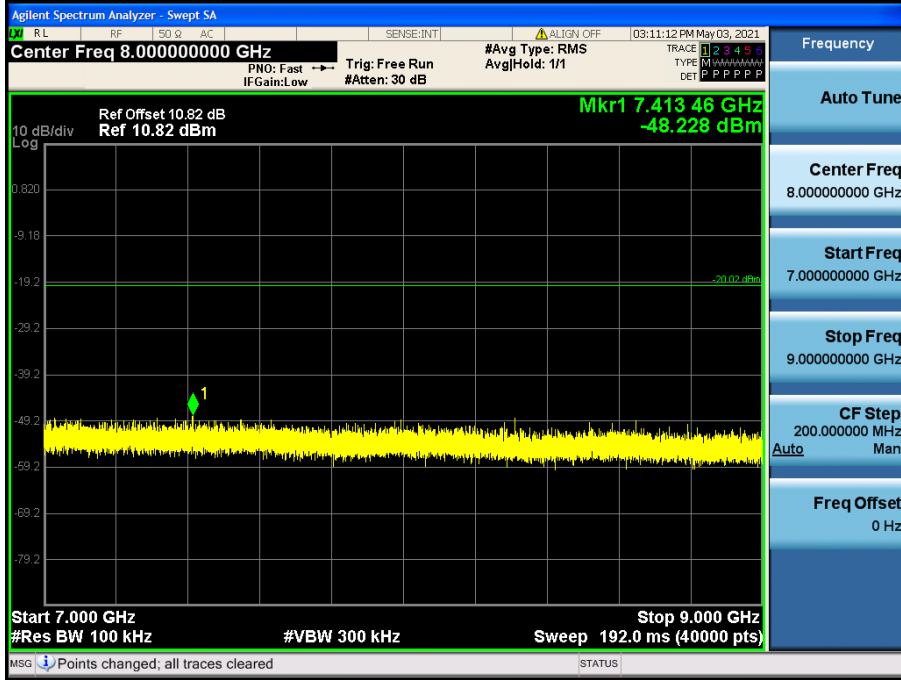
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



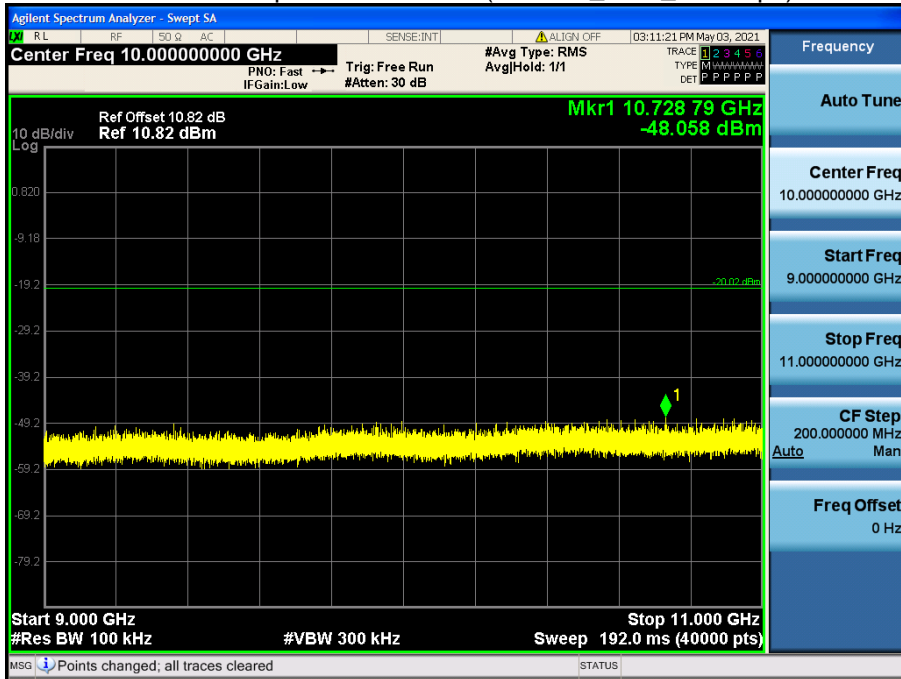
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



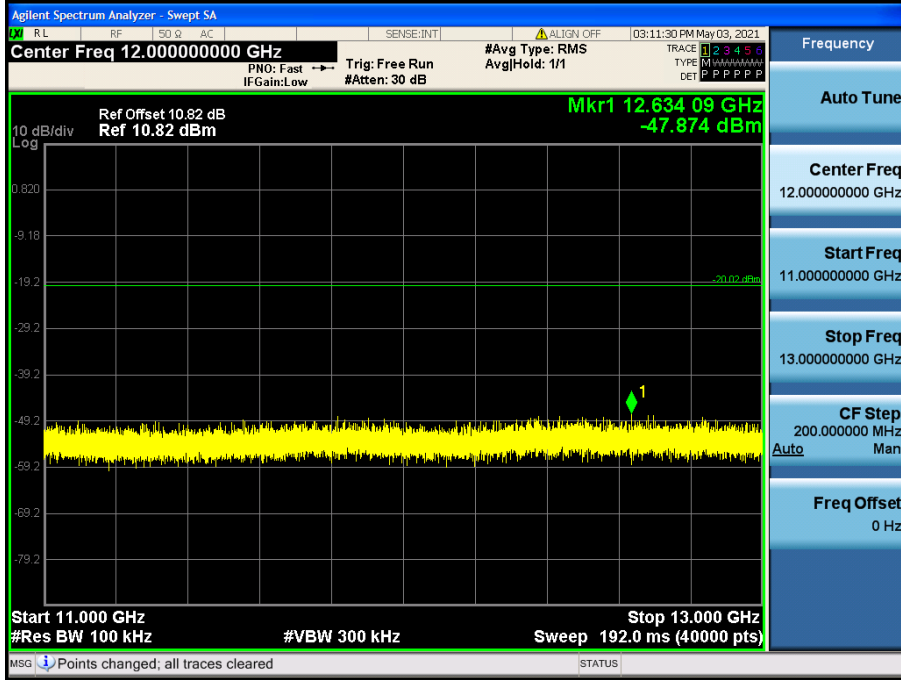
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



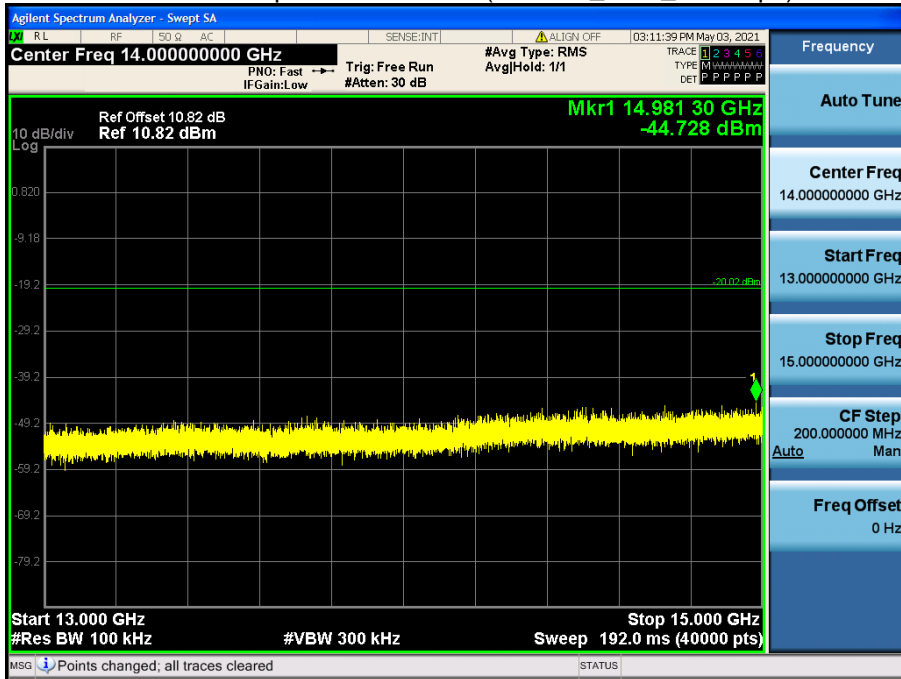
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



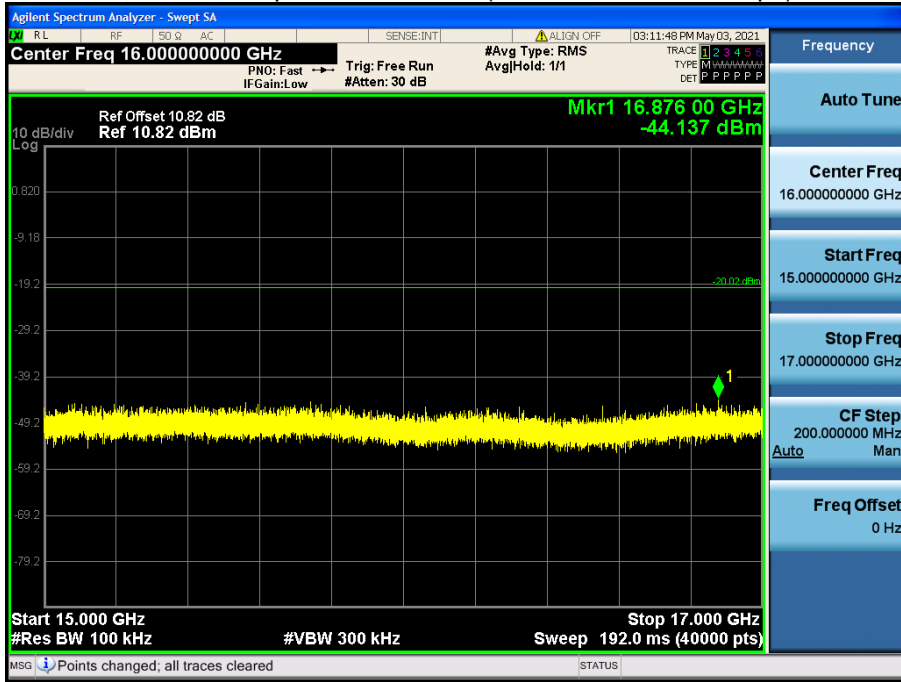
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



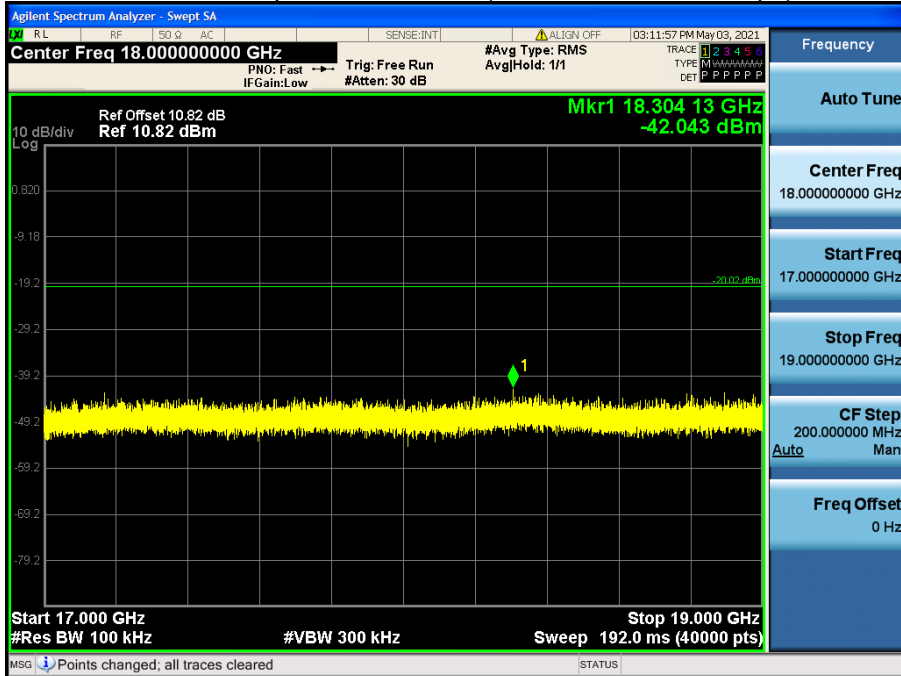
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



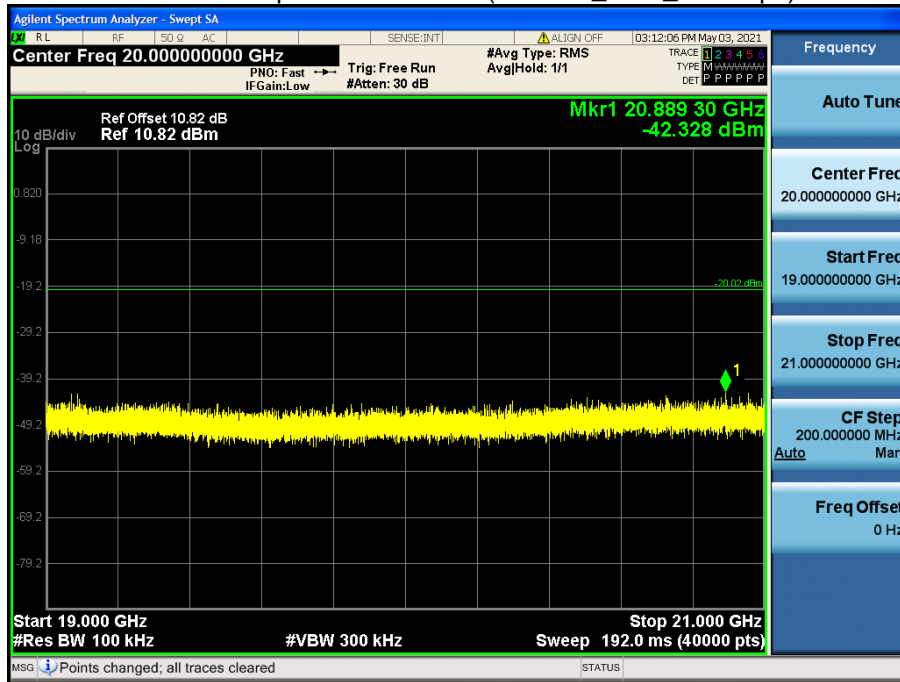
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



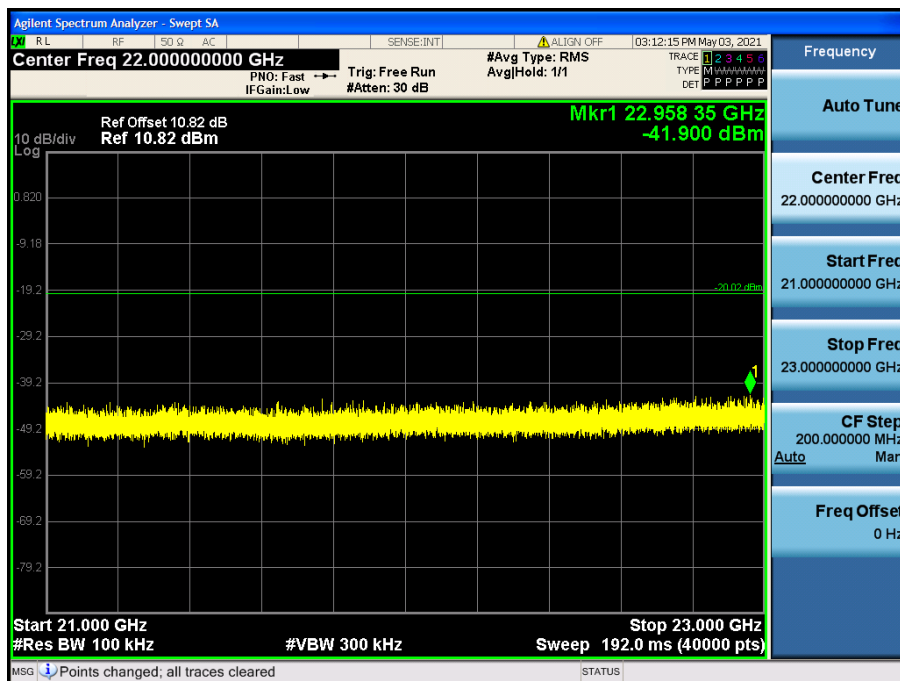
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



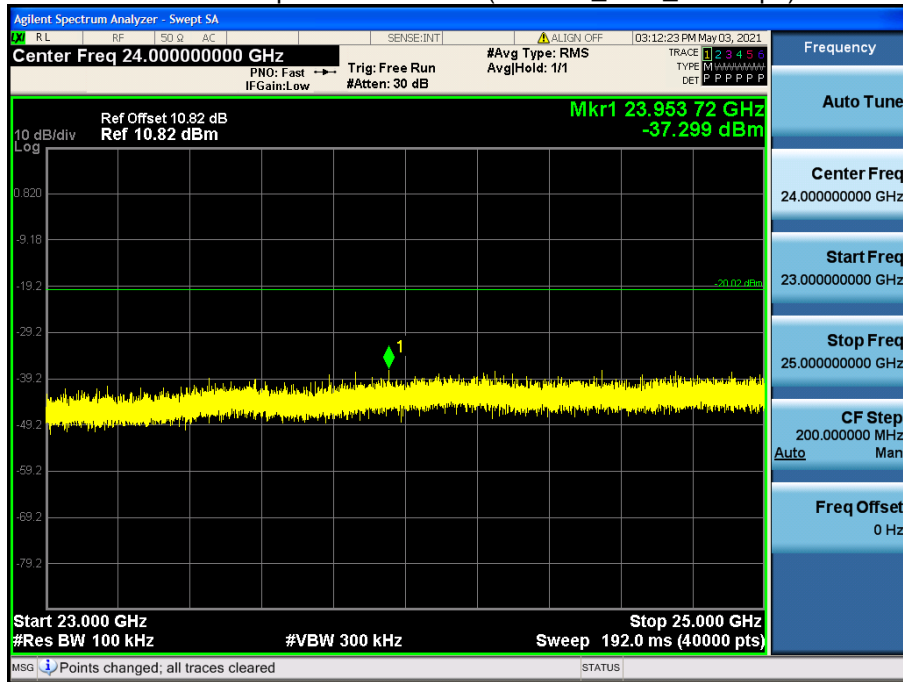
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11b_Ch.1_5.5 Mbps)

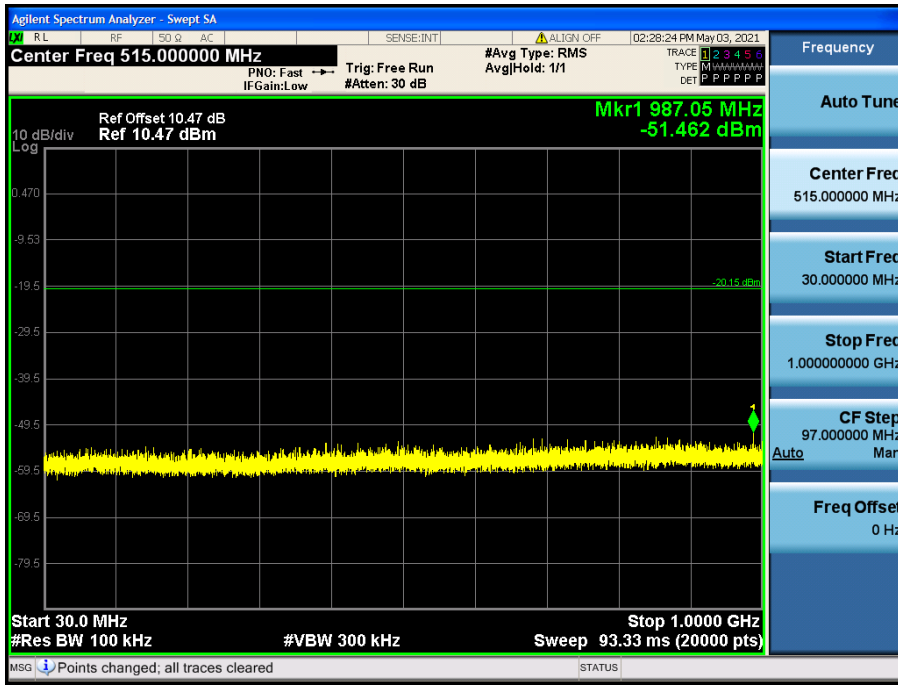


[Ant.2]

▣ Test Plots(Conducted Spurious Emission)

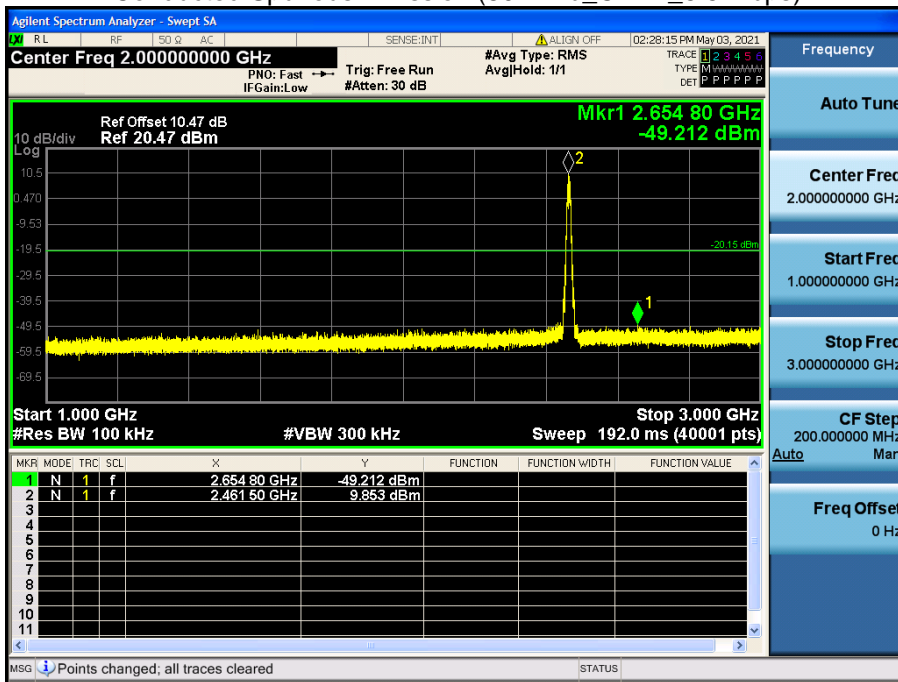
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



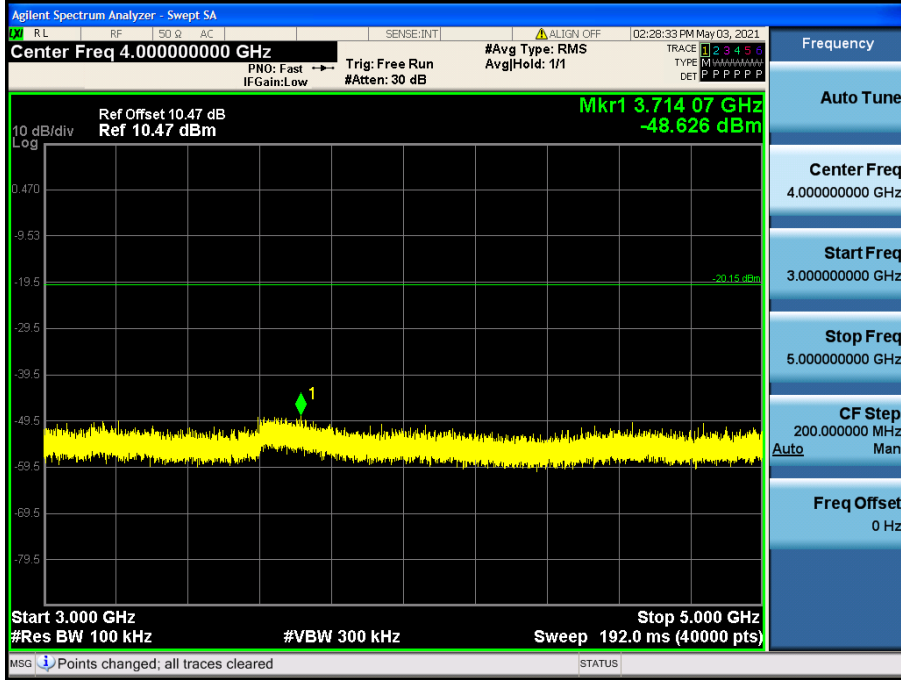
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



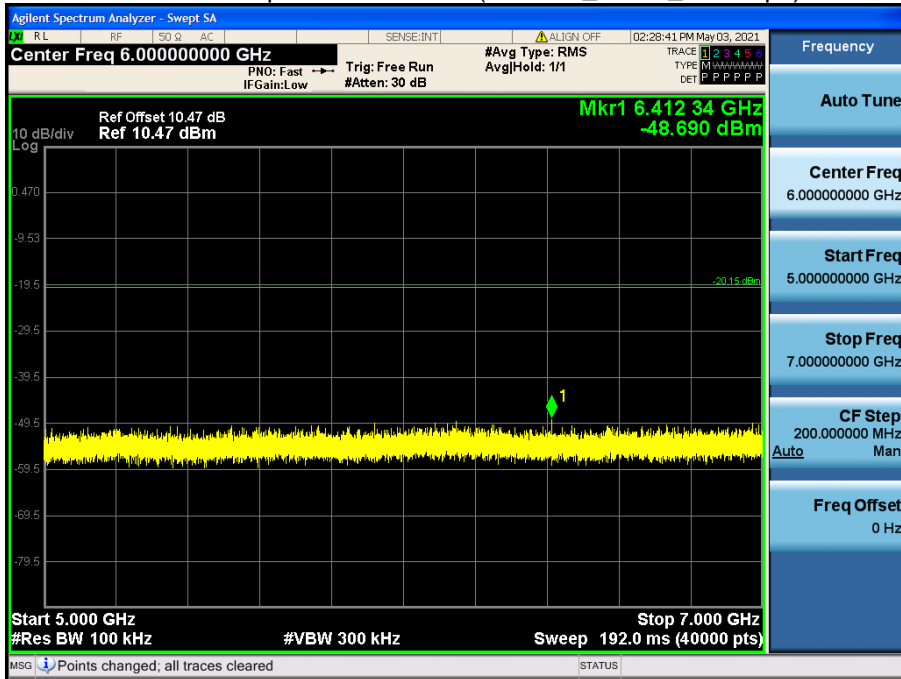
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



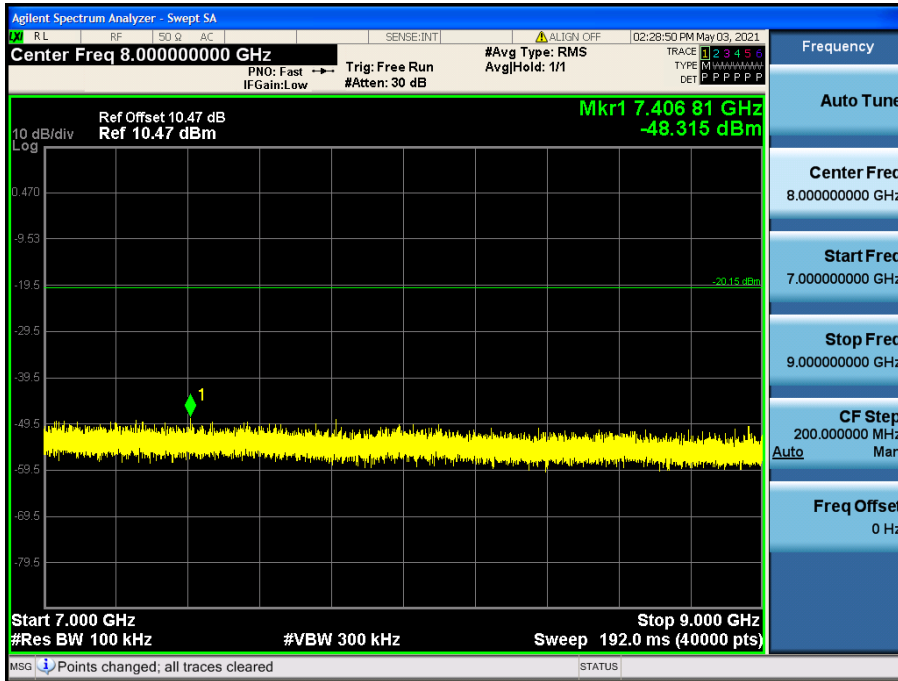
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



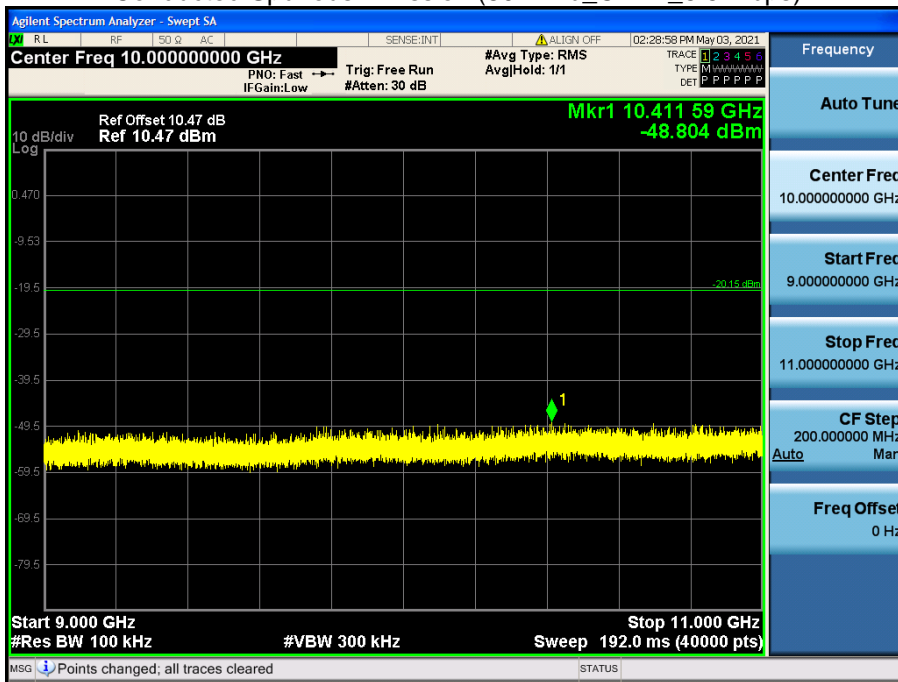
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



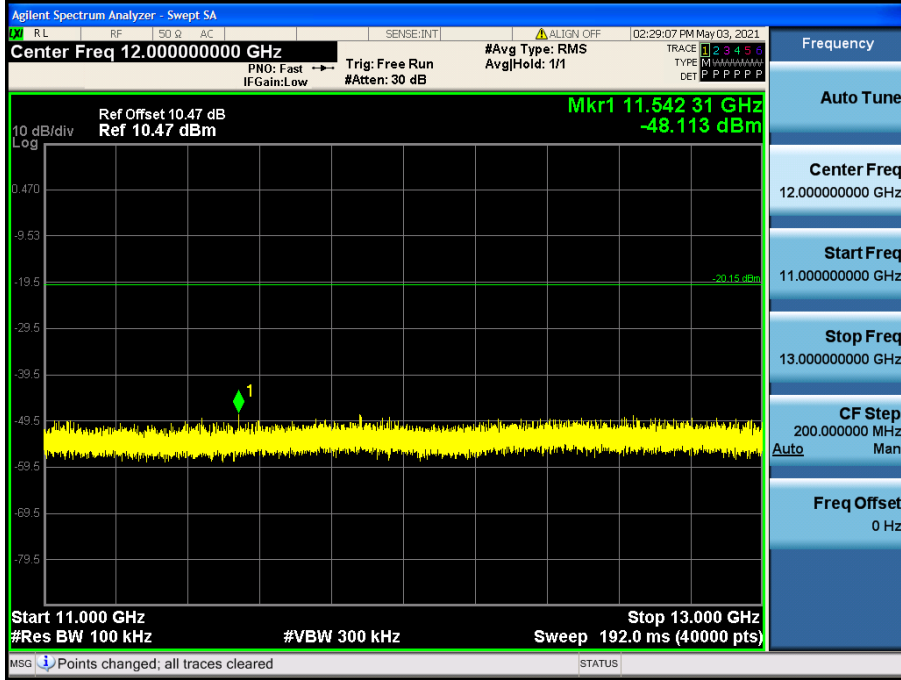
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



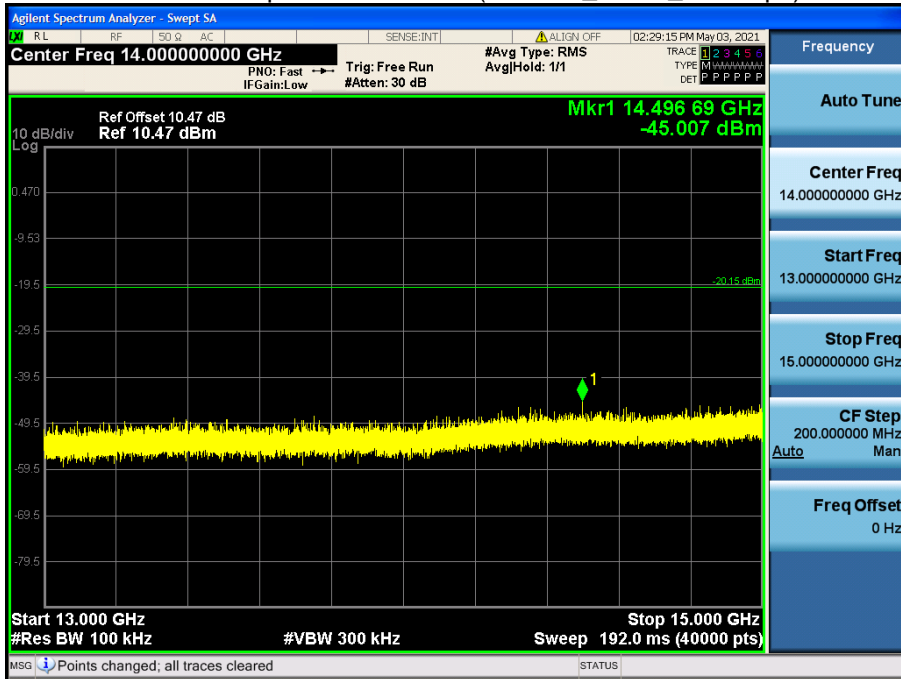
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



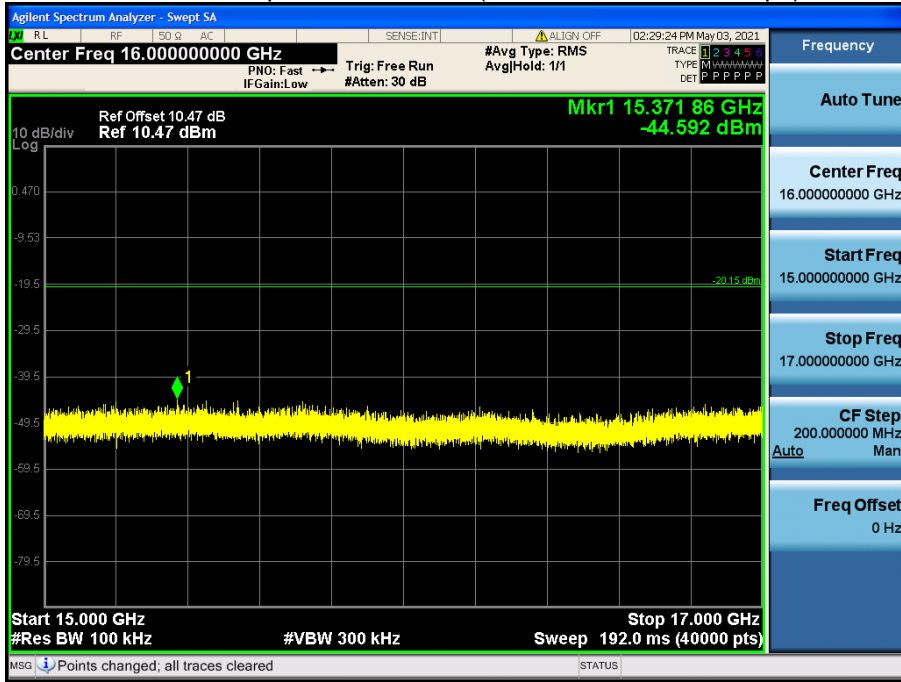
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



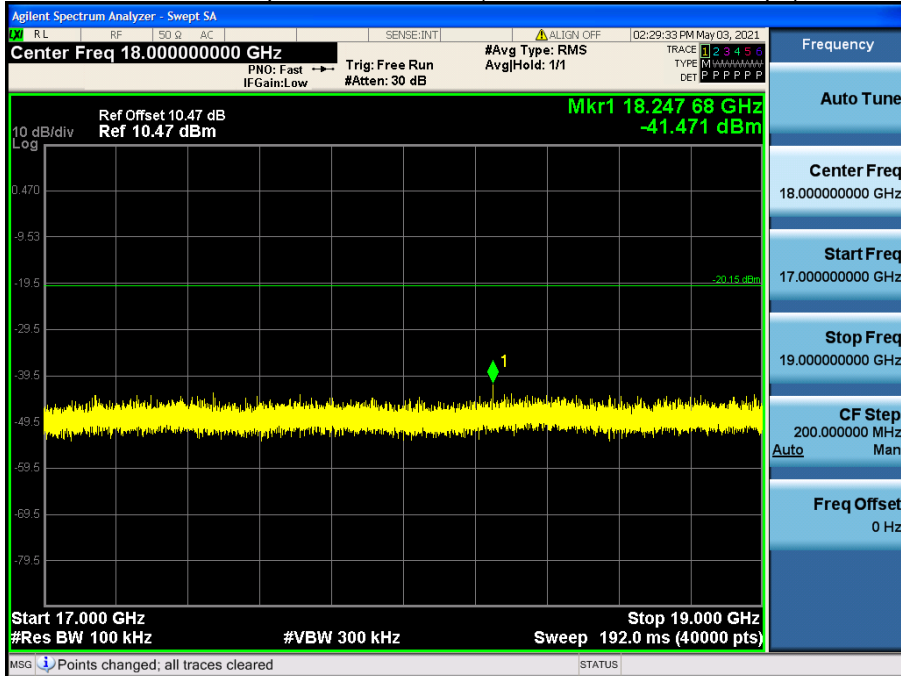
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



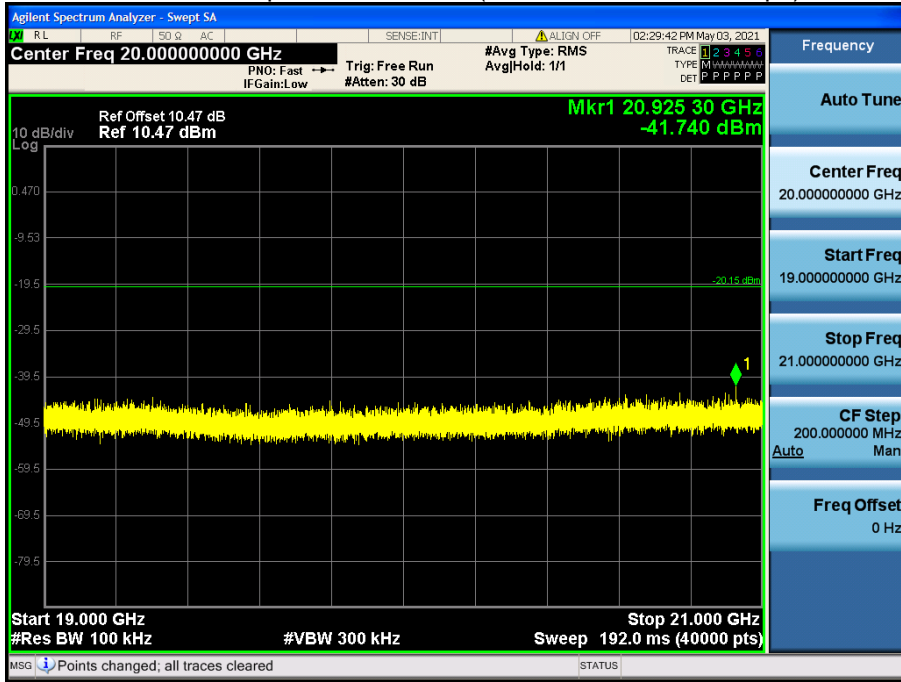
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



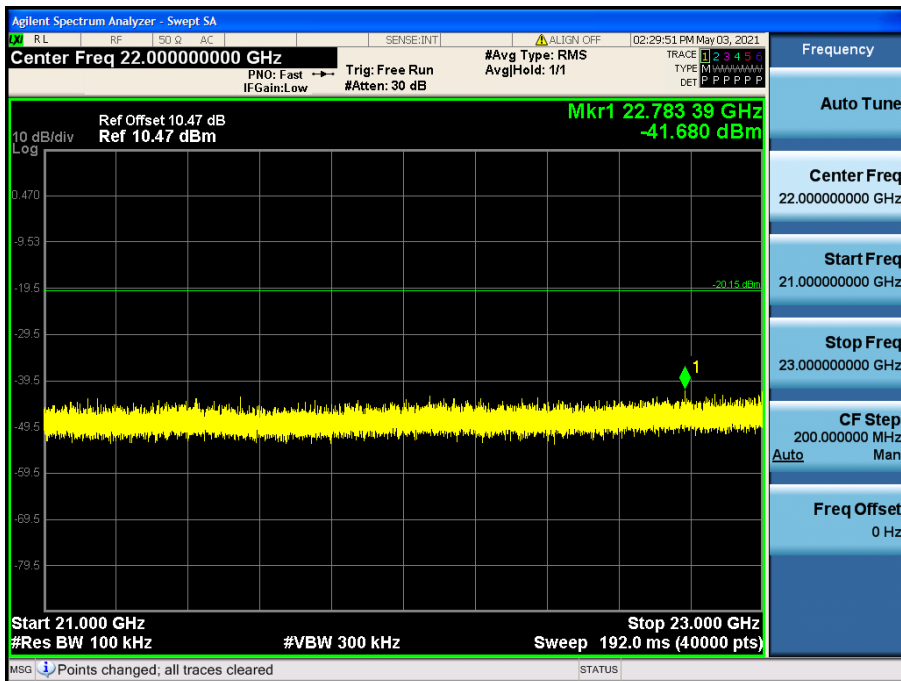
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



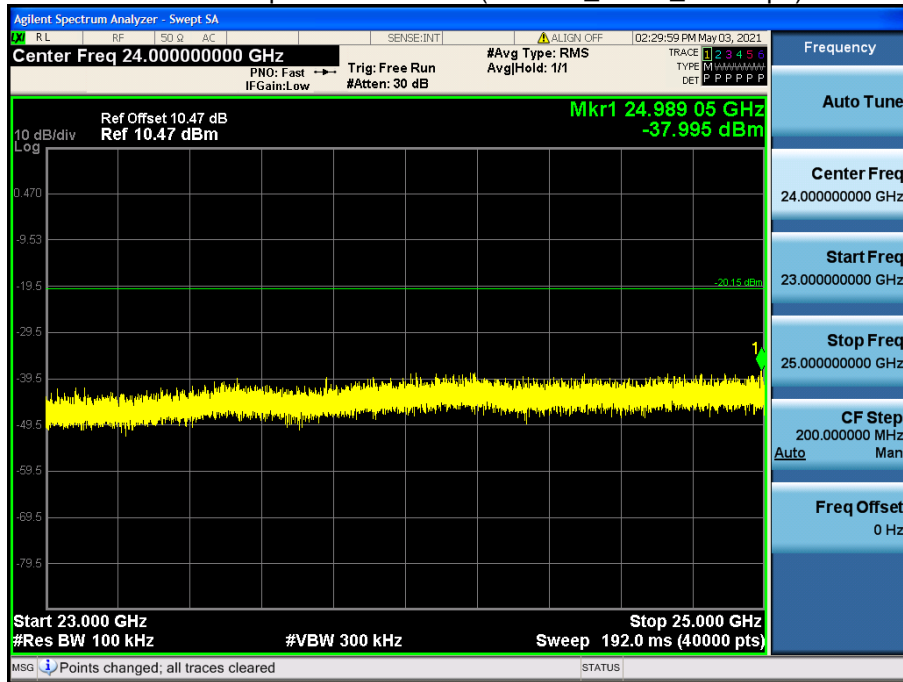
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b_Ch.11_5.5 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11b_Ch.11_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
[Ant.1(SISO)]

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency: 2412 MHz
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	43.68	3.46	V	47.14	73.98	26.84	PK
4824	35.22	3.46	V	38.68	53.98	15.30	AV
7236	38.44	12.51	V	50.95	73.98	23.03	PK
7236	26.22	12.51	V	38.73	53.98	15.25	AV
4824	44.22	3.46	H	47.68	73.98	26.30	PK
4824	35.74	3.46	H	39.20	53.98	14.78	AV
7236	38.54	12.51	H	51.05	73.98	22.93	PK
7236	26.30	12.51	H	38.81	53.98	15.17	AV

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency: 2437 MHz
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	42.12	3.42	V	45.54	73.98	28.44	PK
4874	31.02	3.42	V	34.44	53.98	19.54	AV
7311	38.89	11.76	V	50.65	73.98	23.33	PK
7311	26.78	11.76	V	38.54	53.98	15.44	AV
4874	42.32	3.42	H	45.74	73.98	28.24	PK
4874	31.33	3.42	H	34.75	53.98	19.23	AV
7311	39.12	11.76	H	50.88	73.98	23.10	PK
7311	26.85	11.76	H	38.61	53.98	15.37	AV

Operation Mode: 802.11b
 Transfer Rate: 1 Mbps
 Operating Frequency: 2462 MHz
 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	41.62	4.55	V	46.17	73.98	27.81	PK
4924	32.86	4.55	V	37.41	53.98	16.57	AV
7386	37.85	12.13	V	49.98	73.98	24.00	PK
7386	25.66	12.13	V	37.79	53.98	16.19	AV
4924	42.94	4.55	H	47.49	73.98	26.49	PK
4924	33.92	4.55	H	38.47	53.98	15.51	AV
7386	38.09	12.13	H	50.22	73.98	23.76	PK
7386	25.77	12.13	H	37.90	53.98	16.08	AV

[Ant.2(SISO)]

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency: 2412 MHz
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	41.59	3.46	V	45.05	73.98	28.93	PK
4824	31.12	3.46	V	34.58	53.98	19.40	AV
7236	38.74	12.51	V	51.25	73.98	22.73	PK
7236	26.22	12.51	V	38.73	53.98	15.25	AV
4824	41.25	3.46	H	44.71	73.98	29.27	PK
4824	30.62	3.46	H	34.08	53.98	19.90	AV
7236	38.55	12.51	H	51.06	73.98	22.92	PK
7236	26.12	12.51	H	38.63	53.98	15.35	AV

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency: 2437 MHz
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	41.62	3.42	V	45.04	73.98	28.94	PK
4874	29.66	3.42	V	33.08	53.98	20.90	AV
7311	38.99	11.76	V	50.75	73.98	23.23	PK
7311	26.75	11.76	V	38.51	53.98	15.47	AV
4874	41.78	3.42	H	45.20	73.98	28.78	PK
4874	29.78	3.42	H	33.20	53.98	20.78	AV
7311	39.16	11.76	H	50.92	73.98	23.06	PK
7311	26.82	11.76	H	38.58	53.98	15.40	AV

Operation Mode: 802.11b
 Transfer Rate: 1 Mbps
 Operating Frequency: 2462 MHz
 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	41.82	4.55	V	46.37	73.98	27.61	PK
4924	29.85	4.55	V	34.40	53.98	19.58	AV
7386	37.58	12.13	V	49.71	73.98	24.27	PK
7386	25.62	12.13	V	37.75	53.98	16.23	AV
4924	41.95	4.55	H	46.50	73.98	27.48	PK
4924	30.22	4.55	H	34.77	53.98	19.21	AV
7386	37.75	12.13	H	49.88	73.98	24.10	PK
7386	25.74	12.13	H	37.87	53.98	16.11	AV

[Ant.1&Ant.2_MIMO(CDD)]

Operation Mode: 802.11g
 Transfer Rate: 6 Mbps
 Operating Frequency: 2412 MHz
 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]	Measure ment Type
4824	43.43	0.00	3.46	V	46.89	73.98	27.09	PK
4824	30.98	0.30	3.46	V	34.74	53.98	19.24	AV
7236	38.69	0.00	12.51	V	51.20	73.98	22.78	PK
7236	26.22	0.30	12.51	V	39.03	53.98	14.95	AV
4824	43.51	0.00	3.46	H	46.97	73.98	27.01	PK
4824	31.05	0.30	3.46	H	34.81	53.98	19.17	AV
7236	38.77	0.00	12.51	H	51.28	73.98	22.70	PK
7236	26.48	0.30	12.51	H	39.29	53.98	14.69	AV

Operation Mode: 802.11g
 Transfer Rate: 6 Mbps
 Operating Frequency: 2437 MHz
 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]	Measure ment Type
4874	42.52	0.00	3.42	V	45.94	73.98	28.04	PK
4874	30.33	0.30	3.42	V	34.05	53.98	19.93	AV
7311	38.98	0.00	11.76	V	50.74	73.98	23.24	PK
7311	26.75	0.30	11.76	V	38.81	53.98	15.17	AV
4874	42.71	0.00	3.42	H	46.13	73.98	27.85	PK
4874	30.47	0.30	3.42	H	34.19	53.98	19.79	AV
7311	39.11	0.00	11.76	H	50.87	73.98	23.11	PK
7311	26.91	0.30	11.76	H	38.97	53.98	15.01	AV

Operation Mode: 802.11g
 Transfer Rate: 6 Mbps
 Operating Frequency: 2462 MHz
 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	41.32	0.00	4.55	V	45.87	73.98	28.11	PK
4924	29.22	0.30	4.55	V	34.07	53.98	19.91	AV
7386	38.22	0.00	12.13	V	50.35	73.98	23.63	PK
7386	25.82	0.30	12.13	V	38.25	53.98	15.73	AV
4924	41.41	0.00	4.55	H	45.96	73.98	28.02	PK
4924	29.35	0.30	4.55	H	34.20	53.98	19.78	AV
7386	38.33	0.00	12.13	H	50.46	73.98	23.52	PK
7386	25.93	0.30	12.13	H	38.36	53.98	15.62	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz
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]	Measure ment Type
4824	42.01	0.00	3.46	V	45.47	73.98	28.51	PK
4824	30.12	0.32	3.46	V	33.90	53.98	20.08	AV
7236	38.85	0.00	12.51	V	51.36	73.98	22.62	PK
7236	26.33	0.32	12.51	V	39.16	53.98	14.82	AV
4824	42.11	0.00	3.46	H	45.57	73.98	28.41	PK
4824	30.28	0.32	3.46	H	34.06	53.98	19.92	AV
7236	39.09	0.00	12.51	H	51.60	73.98	22.38	PK
7236	26.58	0.32	12.51	H	39.41	53.98	14.57	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
Operating Frequency	2437 MHz
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]	Measure ment Type
4874	42.51	0.00	3.42	V	45.93	73.98	28.05	PK
4874	30.12	0.32	3.42	V	33.86	53.98	20.12	AV
7311	39.12	0.00	11.76	V	50.88	73.98	23.10	PK
7311	26.82	0.32	11.76	V	38.90	53.98	15.08	AV
4874	42.62	0.00	3.42	H	46.04	73.98	27.94	PK
4874	30.22	0.32	3.42	H	33.96	53.98	20.02	AV
7311	39.16	0.00	11.76	H	50.92	73.98	23.06	PK
7311	26.98	0.32	11.76	H	39.06	53.98	14.92	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
Operating Frequency	2462 MHz
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	41.11	0.00	4.55	V	45.66	73.98	28.32	PK
4924	29.01	0.32	4.55	V	33.88	53.98	20.10	AV
7386	38.45	0.00	12.13	V	50.58	73.98	23.40	PK
7386	25.88	0.32	12.13	V	38.33	53.98	15.65	AV
4924	41.22	0.00	4.55	H	45.77	73.98	28.21	PK
4924	29.12	0.32	4.55	H	33.99	53.98	19.99	AV
7386	38.56	0.00	12.13	H	50.69	73.98	23.29	PK
7386	25.98	0.32	12.13	H	38.43	53.98	15.55	AV

[DBS Mode]
Test case 1
802.11b Ch.1 2 412 GHz Ant 1 & 802.11a Ch.36 5 180 GHz UNII-1 Ant ALL

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	47.83	3.46	V	51.29	73.98	22.69	PK
4824	38.67	3.46	V	42.13	53.98	11.85	AV
7236	38.42	12.51	V	50.93	73.98	23.05	PK
7236	26.54	12.51	V	39.05	53.98	14.93	AV
4824	48.37	3.46	H	51.83	73.98	22.15	PK
4824	42.13	3.46	H	45.59	53.98	8.39	AV
7236	38.56	12.51	H	51.07	73.98	22.91	PK
7236	26.72	12.51	H	39.23	53.98	14.75	AV

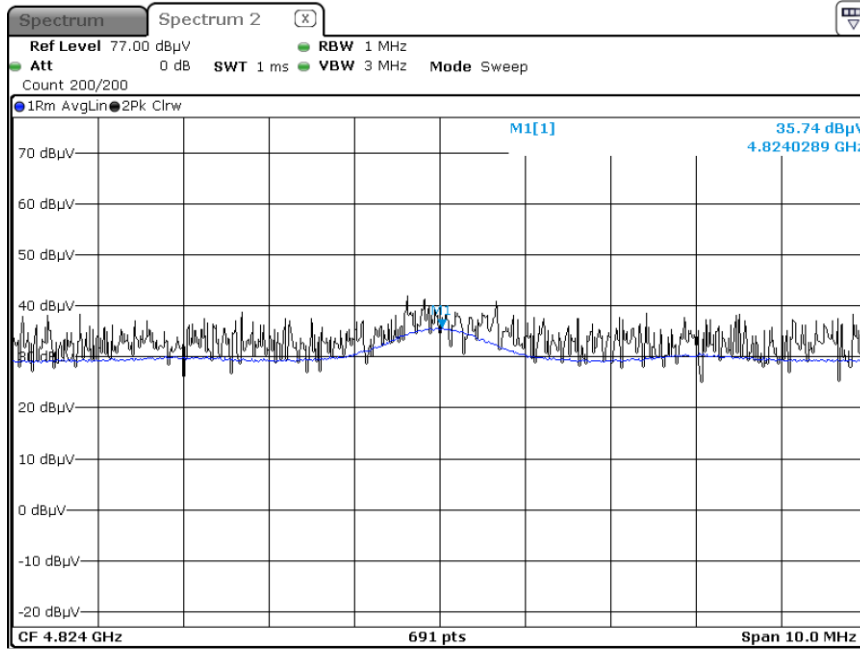
Test case 2
802.11n(HT20) Ch.1 2 412 GHz Ant ALL & 802.11a Ch.36 5 180 GHz UNII-1 Ant ALL

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
4824	49.35	0.00	3.46	V	52.81	73.98	21.17	PK
4824	35.15	0.32	3.46	V	38.93	53.98	15.05	AV
7236	38.02	0.00	12.51	V	50.53	73.98	23.45	PK
7236	26.53	0.32	12.51	V	39.36	53.98	14.62	AV
4824	50.05	0.00	3.46	H	53.51	73.98	20.47	PK
4824	35.84	0.32	3.46	H	39.62	53.98	14.36	AV
7236	38.43	0.00	12.51	H	50.94	73.98	23.04	PK
7236	26.71	0.32	12.51	H	39.54	53.98	14.44	AV

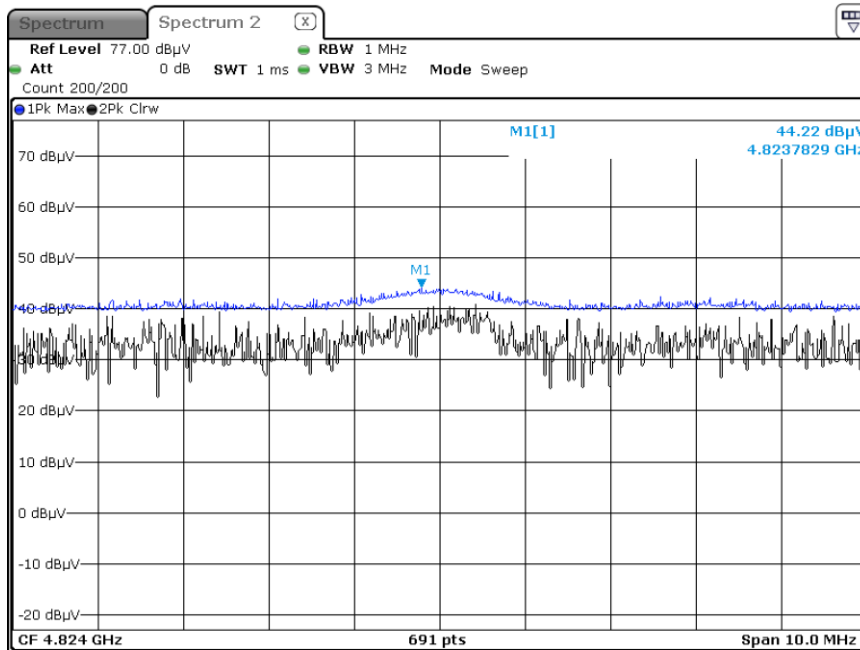
[Ant.1(SISO)]

☑ Test Plots (Worst case : Z-H)

Radiated Spurious Emissions plot – Average Reading (802.11b_1 Mbps, Ch.1 2nd Harmonic)



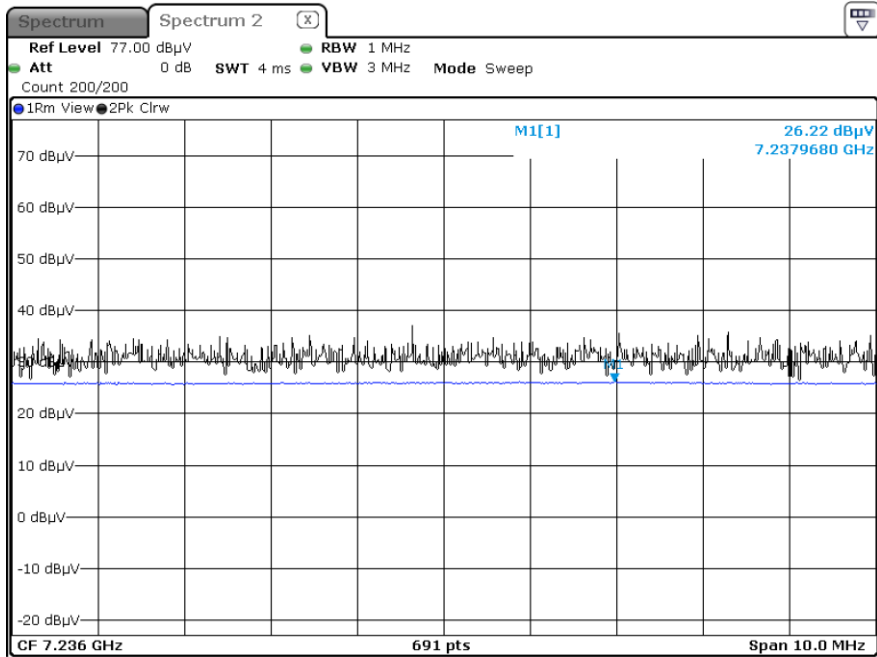
Radiated Spurious Emissions plot – Peak Reading (802.11b_1 Mbps, Ch.1 2nd Harmonic)



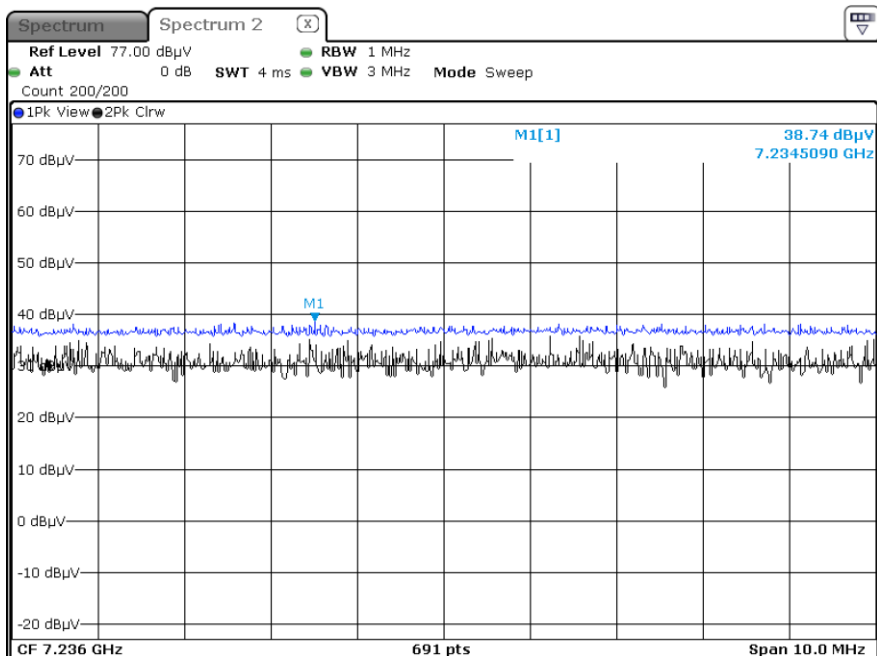
[Ant.2(SISO)]

☑ Test Plots (Worst case : Y-V)

Radiated Spurious Emissions plot – Average Reading (802.11b_1 Mbps, Ch.1 3rd Harmonic)



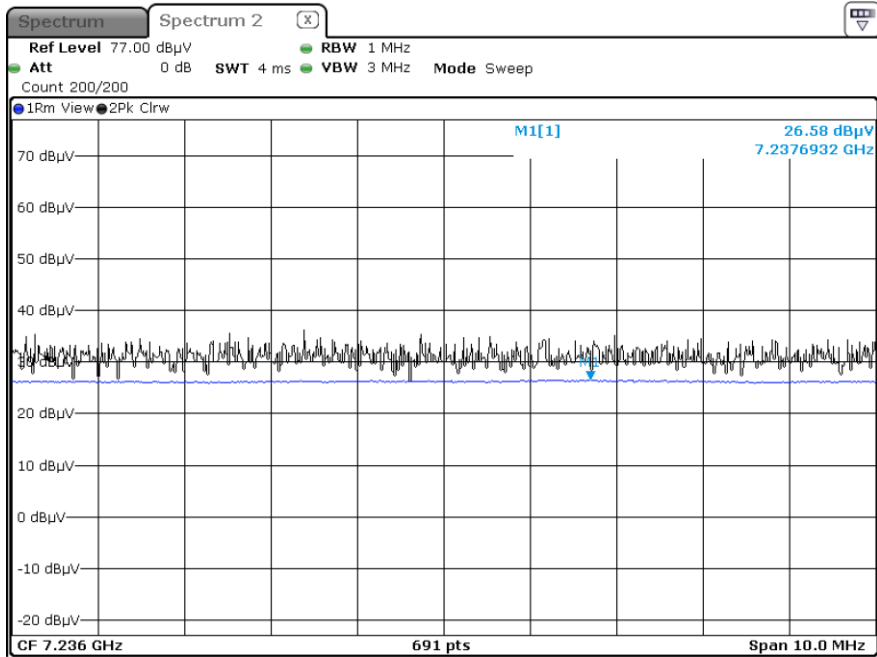
Radiated Spurious Emissions plot – Peak Reading (802.11b_1 Mbps, Ch.1 3rd Harmonic)



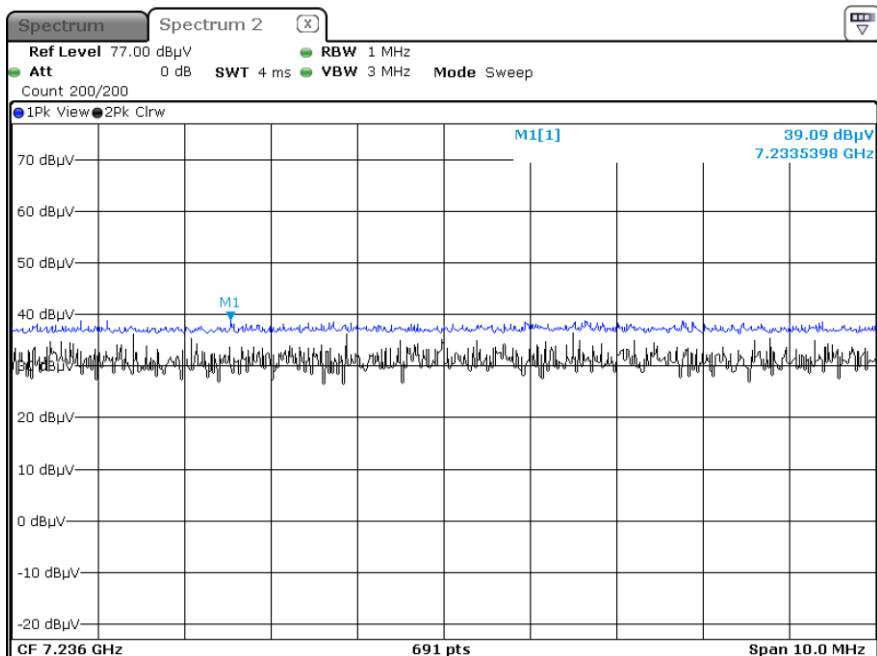
[Ant.1&Ant.2_MIMO(CDD)]

▣ Test Plots (Worst case : Y-H)

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



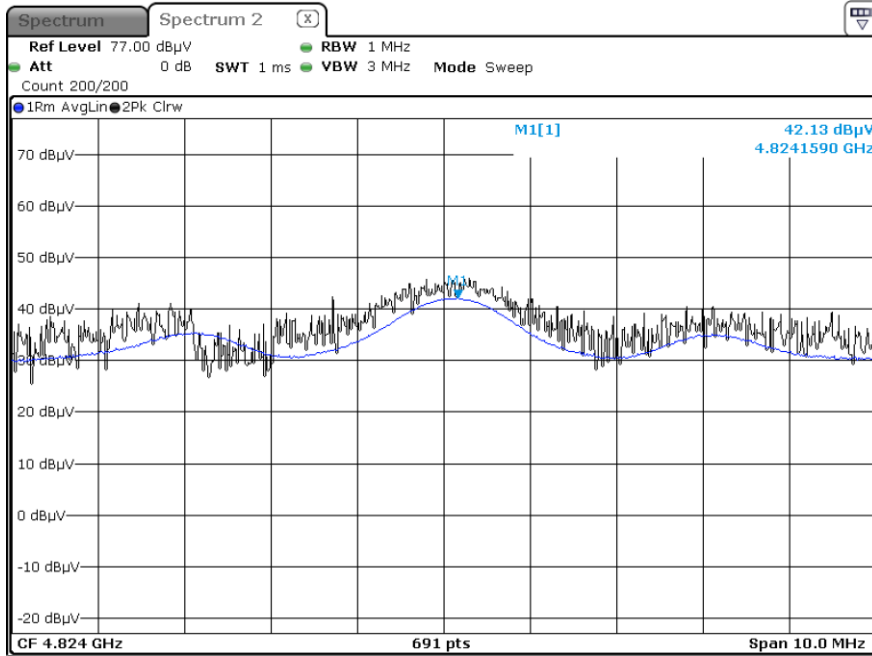
Radiated Spurious Emissions plot – Peak Reading (802.11n (HT20)_MCS0, Ch.1 3rd Harmonic)



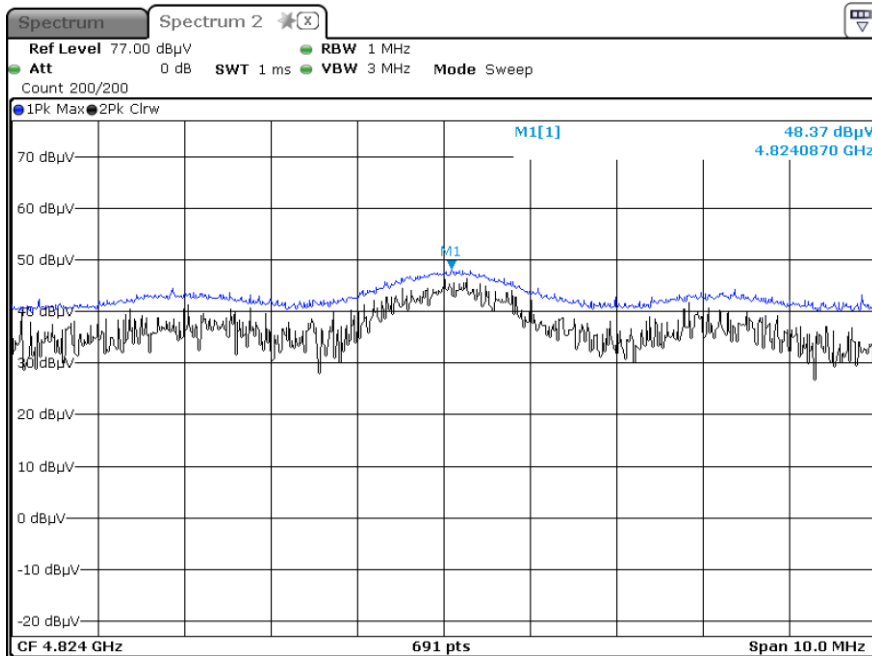
Note: Plot of worst case are only reported.

[DBS]

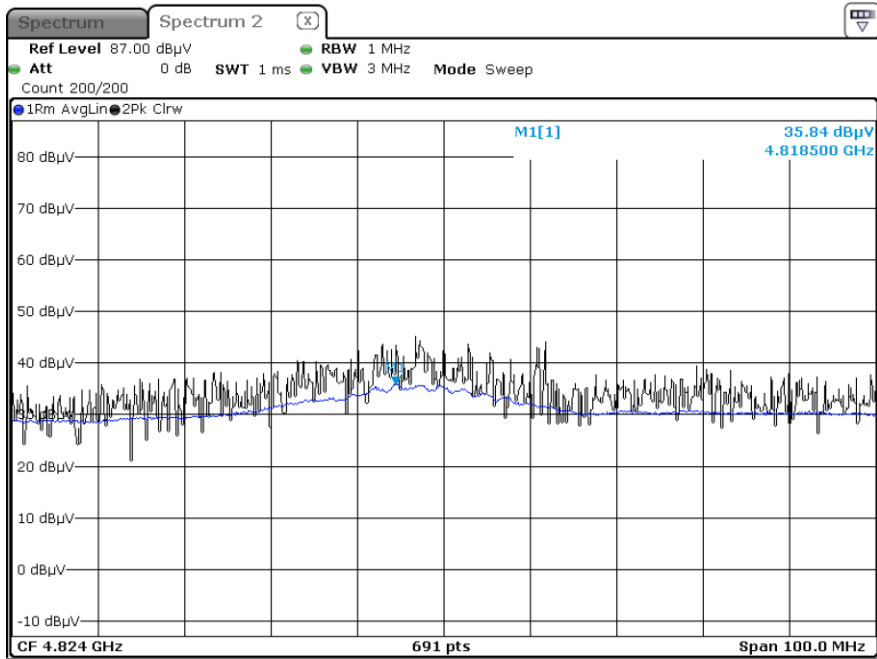
Radiated Spurious Emissions plot – Average Reading (Test case 1_ Z-H_2nd Harmonic)



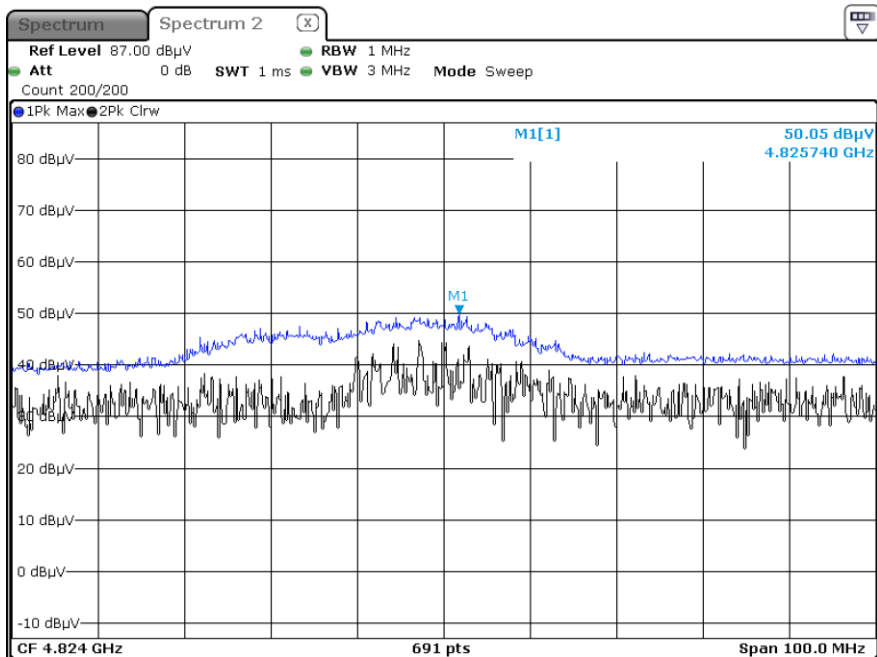
Radiated Spurious Emissions plot – Peak Reading (Test case 1_ Z-H_2nd Harmonic)



Radiated Spurious Emissions plot – Average Reading (Test case 2_Z-H_ 2nd Harmonic)



Radiated Spurious Emissions plot – Peak Reading (Test case 2_Z-H_ 2nd Harmonic)



Note: Plot of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

[Ant.1(SISO)]

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	21.433	34.04	H	55.47	73.98	18.51	PK
2390.0	10.275	34.04	H	44.32	53.98	9.67	AV
2390.0	21.352	34.04	V	55.39	73.98	18.59	PK
2390.0	10.125	34.04	V	44.17	53.98	9.82	AV
2483.5	28.694	35.00	H	63.69	73.98	10.29	PK
2483.5	11.457	35.00	H	46.46	53.98	7.52	AV
2483.5	27.737	35.00	V	62.74	73.98	11.24	PK
2483.5	11.212	35.00	V	46.21	53.98	7.77	AV

[Ant.2(SISO)]

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	21.762	34.04	H	55.80	73.98	18.18	PK
2390.0	10.869	34.04	H	44.91	53.98	9.07	AV
2390.0	21.598	34.04	V	55.64	73.98	18.34	PK
2390.0	10.685	34.04	V	44.73	53.98	9.26	AV
2483.5	24.293	35.00	H	59.29	73.98	14.69	PK
2483.5	11.216	35.00	H	46.22	53.98	7.76	AV
2483.5	23.652	35.00	V	58.65	73.98	15.33	PK
2483.5	10.521	35.00	V	45.52	53.98	8.46	AV

[Ant.1&Ant.2_MIMO(CDD)]

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
2310~2390	33.133	0.00	34.04	H	67.17	73.98	6.81	PK
# 2389.5	16.870	0.30	34.04	H	51.21	53.98	2.77	AV
2310~2389	16.550	0.30	34.04	H	50.89	53.98	3.09	AV
2310~2390	30.165	0.00	34.04	V	64.21	73.98	9.78	PK
# 2389.5	14.870	0.30	34.04	V	49.21	53.98	4.77	AV
2310~2389	15.300	0.30	34.04	V	49.64	53.98	4.34	AV
# 2484	28.680	0.00	35.00	H	63.68	73.98	10.30	PK
# 2484	15.580	0.30	35.00	H	50.88	53.98	3.10	AV
2484.5~2500	33.677	0.00	35.00	H	68.68	73.98	5.30	PK
2484.5~2500	15.001	0.30	35.00	H	50.30	53.98	3.68	AV
# 2484	30.310	0.00	35.00	V	65.31	73.98	8.67	PK
# 2484	16.580	0.30	35.00	V	51.88	53.98	2.10	AV
2484.5~2500	35.348	0.00	35.00	V	70.35	73.98	3.63	PK
2484.5~2500	15.955	0.30	35.00	V	51.26	53.98	2.73	AV

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

Operation Mode:	802.11n (HT20)
Transfer Rate:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

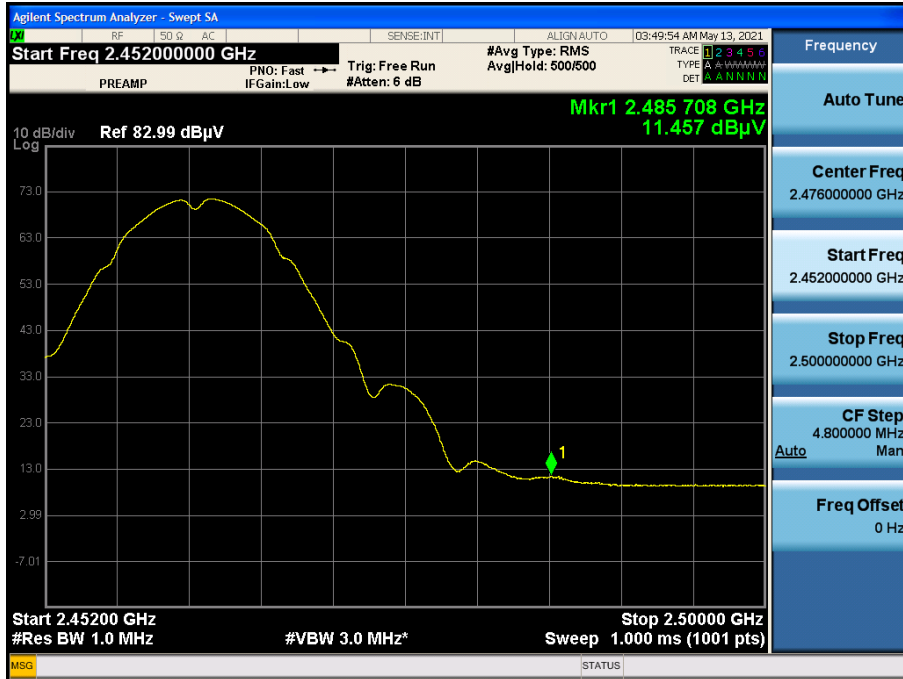
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+ C.L+ D.F [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	30.70	0.00	34.04	H	64.74	73.98	9.24	PK
2390.0	16.52	0.32	34.04	H	50.88	53.98	3.10	AV
2390.0	30.47	0.00	34.04	V	64.51	73.98	9.47	PK
2390.0	15.61	0.32	34.04	V	49.97	53.98	4.01	AV
# 2484	30.080	0.00	35.00	H	65.08	73.98	8.90	PK
# 2484	16.130	0.32	35.00	H	51.45	53.98	2.53	AV
2484.5~2500	15.608	0.32	35.00	H	50.93	53.98	3.05	AV
# 2485	29.450	0.00	35.00	H	64.45	73.98	9.53	PK
2485.5~2500	35.292	0.00	35.00	H	70.29	73.98	3.69	PK
# 2484	29.842	0.00	35.00	V	64.84	73.98	9.14	PK
# 2484	16.021	0.32	35.00	V	51.34	53.98	2.64	AV
2484.5~2500	15.425	0.32	35.00	V	50.75	53.98	3.23	AV
# 2485	29.125	0.00	35.00	V	64.13	73.98	9.86	PK
2485.5~2500	34.897	0.00	35.00	V	69.90	73.98	4.08	PK

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

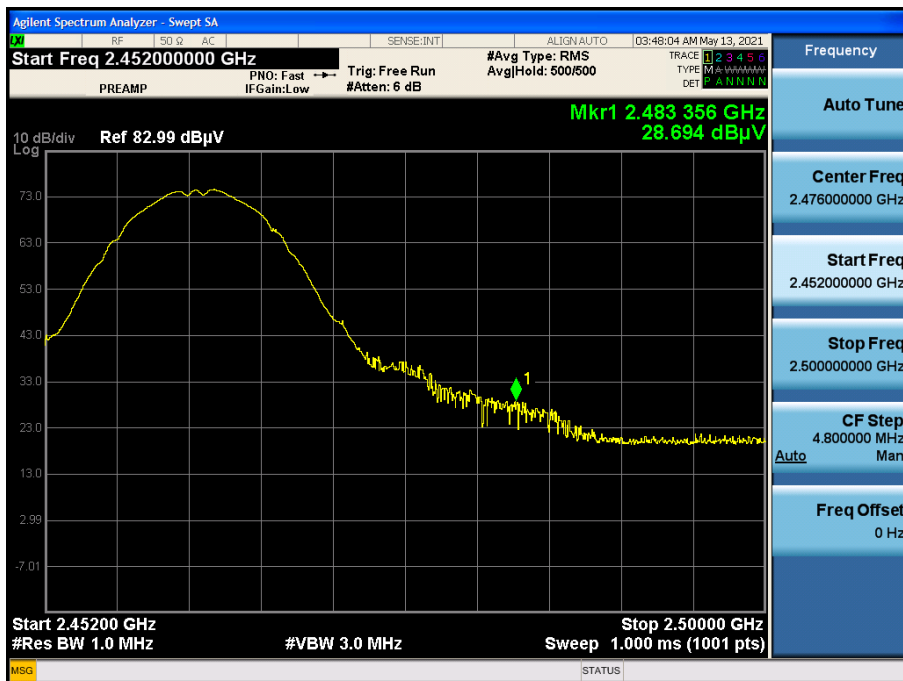
■ Test Plots

[Ant.1(SISO)] (Worst case : Z-H)

Radiated Restricted Band Edges plot – Average Reading (802.11b_1 Mbps Ch.11)

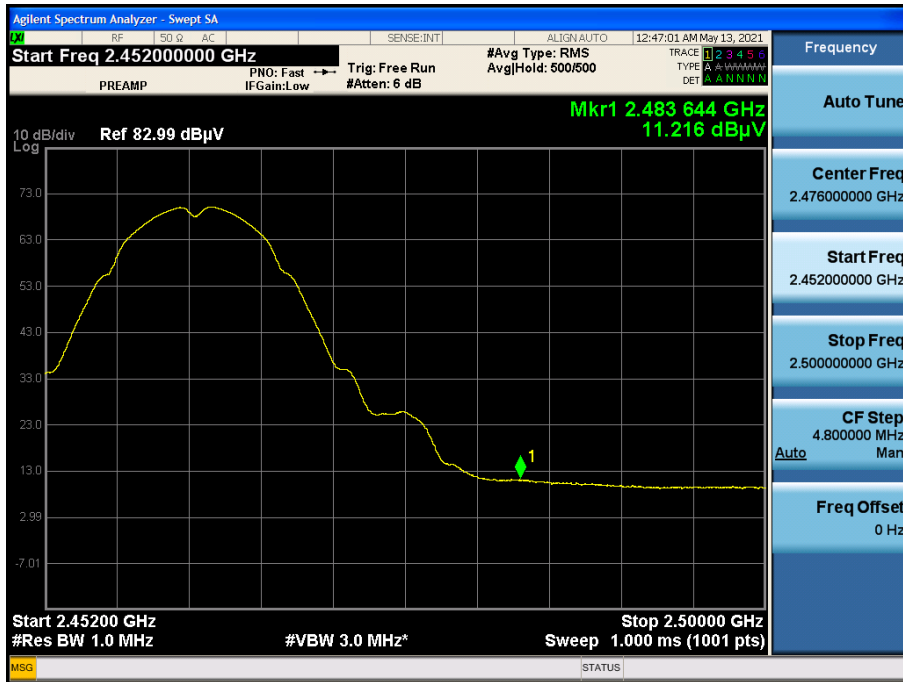


Radiated Restricted Band Edges plot – Peak Reading (802.11b_1 Mbps Ch.11)

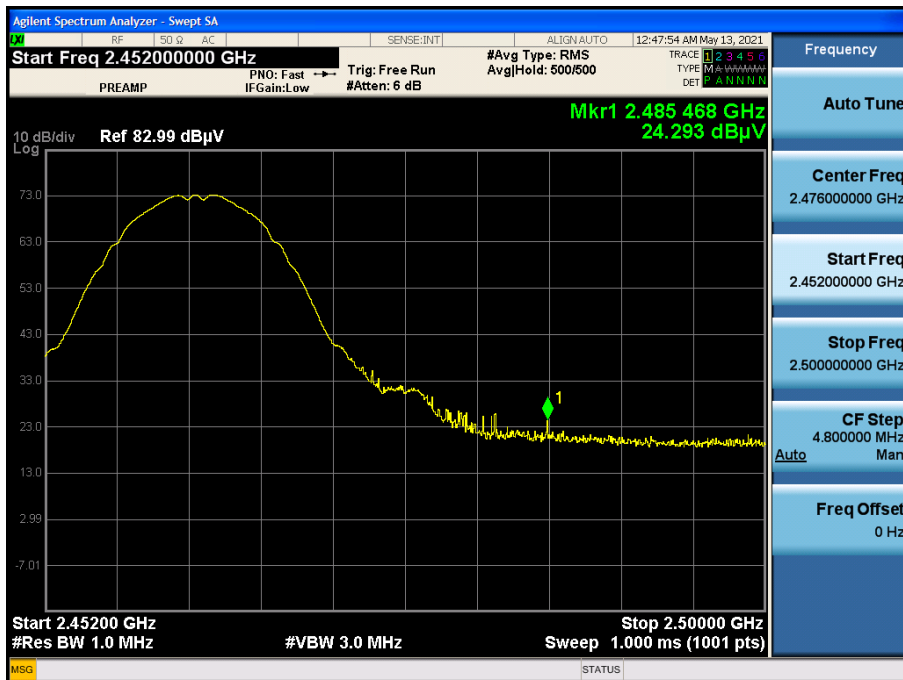


[Ant.2(SISO)] (Worst case : X-H)

Radiated Restricted Band Edges plot – Average Reading (802.11b_1 Mbps Ch.11)



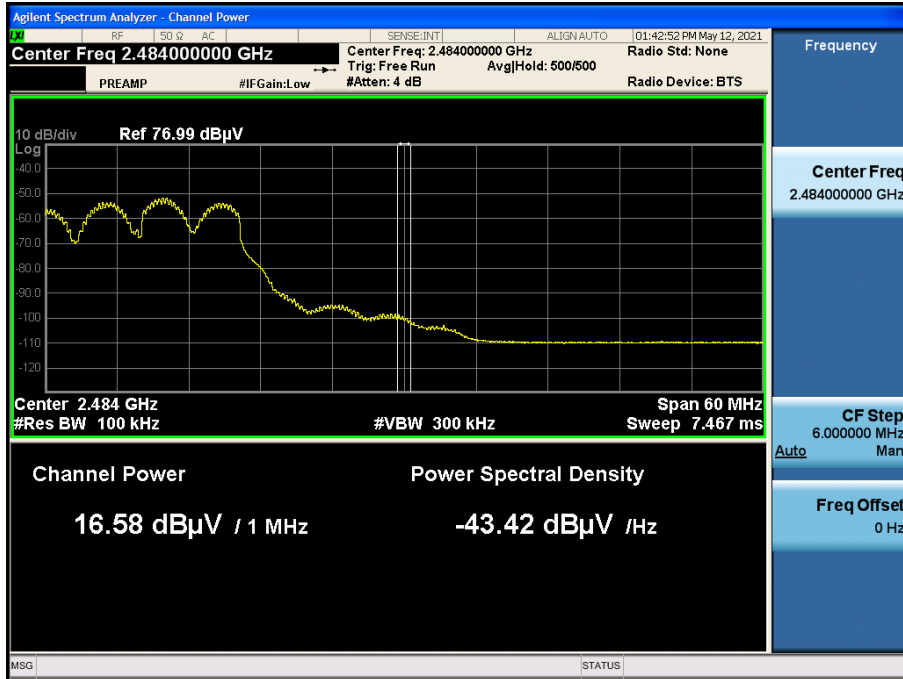
Radiated Restricted Band Edges plot – Peak Reading (802.11b_1 Mbps Ch.11)



[Ant.1&Ant.2_MIMO(CDD)] (Worst case : Z-V)

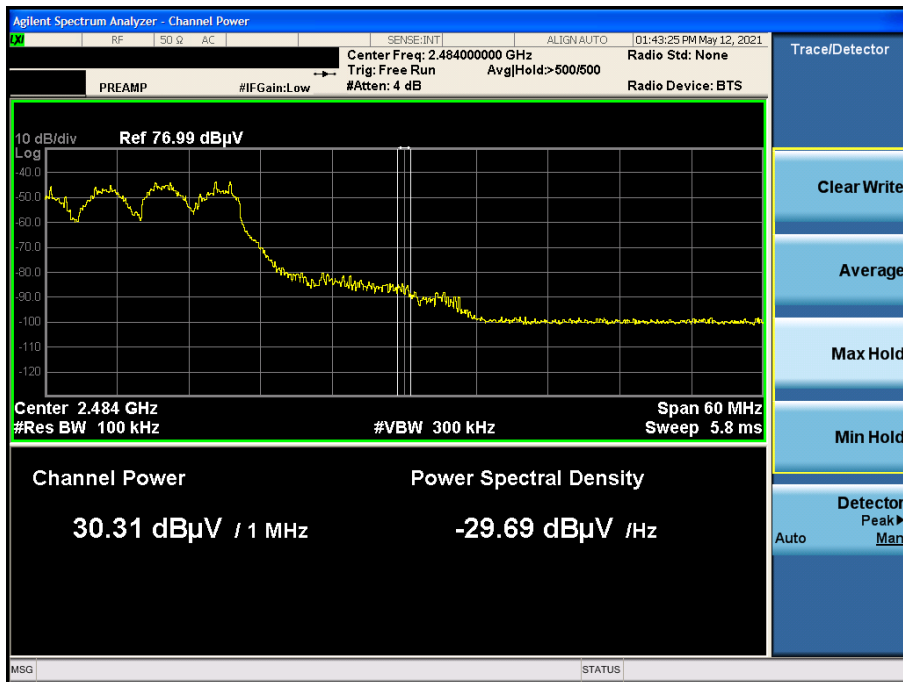
Radiated Restricted Band Edges plot – Average Reading (802.11g_6 Mbps Ch.11)

Integration method Used_2 484 MHz

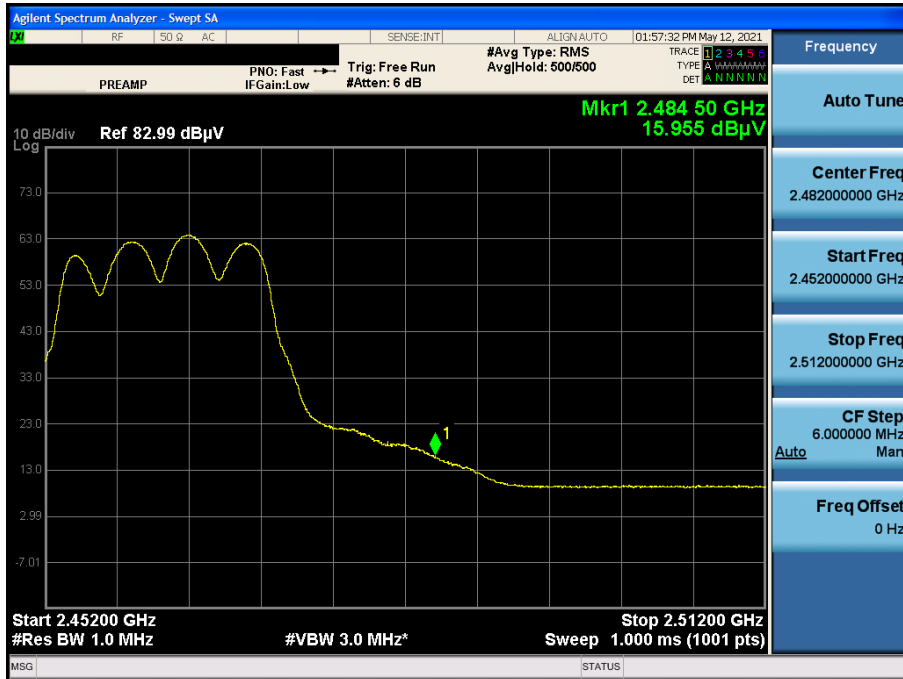


Radiated Restricted Band Edges plot – Peak Reading (802.11g_6 Mbps Ch.11)

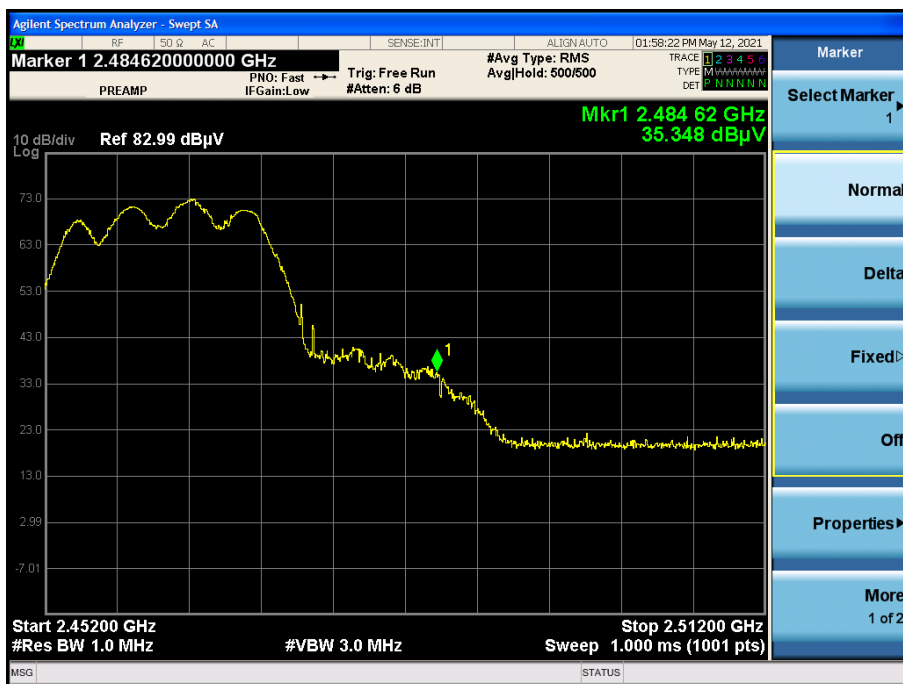
Integration method Used_2 484 MHz



Radiated Restricted Band Edges plot – Average Reading (802.11g_6 Mbps Ch.11)



Radiated Restricted Band Edges plot – Peak Reading (802.11g_6 Mbps Ch.11)



Note:

Plot of worst case are only reported.

9.8 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

2.4GHz WLAN L1

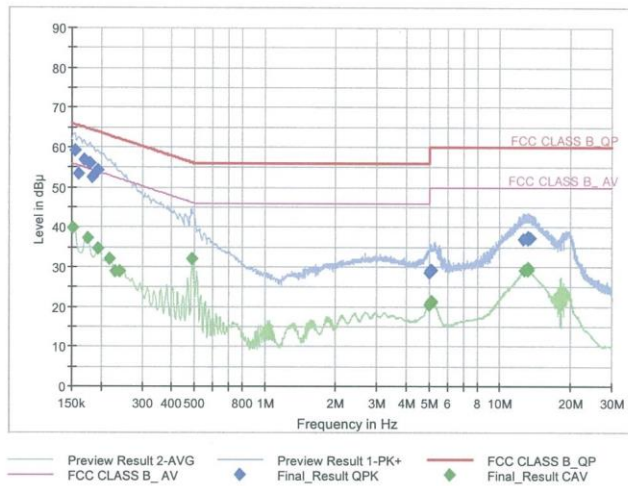
1 / 2

Test Report

Common Information

EUT : SM-G990B/DS
 Manufacturer : SAMSUNG
 Test Site: SHIELD ROOM
 Operating Conditions : 2.4GHz WLAN L1 (25W)
 Operator Name:
 Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	59.14	65.75	6.62	9.000	L1	OF	9.6
0.1613	53.37	65.40	12.03	9.000	L1	OF	9.6
0.1703	56.91	64.95	8.04	9.000	L1	OF	9.6
0.1793	55.99	64.52	8.53	9.000	L1	OF	9.6
0.1838	52.59	64.31	11.72	9.000	L1	OF	9.6
0.1950	54.34	63.82	9.48	9.000	L1	OF	9.6
5.0338	28.62	60.00	31.38	9.000	L1	OF	9.9
5.0585	29.14	60.00	30.86	9.000	L1	OF	9.9
5.0788	29.11	60.00	30.89	9.000	L1	OF	9.9
5.0833	29.02	60.00	30.98	9.000	L1	OF	9.9
5.1103	29.20	60.00	30.80	9.000	L1	OF	9.9
5.1350	29.20	60.00	30.80	9.000	L1	OF	9.9
12.6500	36.90	60.00	23.10	9.000	L1	OF	10.2
12.6770	37.05	60.00	22.95	9.000	L1	OF	10.2
13.1608	36.78	60.00	23.22	9.000	L1	OF	10.2
13.1878	37.59	60.00	22.41	9.000	L1	OF	10.2
13.2058	37.50	60.00	22.50	9.000	L1	OF	10.2
13.4465	37.16	60.00	22.84	9.000	L1	OF	10.2

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2.4GHz WLAN L1

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Final Result CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	39.70	55.88	16.18	9.000	L1	OFF	9.6
0.1748	37.25	54.73	17.48	9.000	L1	OFF	9.6
0.1950	34.69	53.82	19.13	9.000	L1	OFF	9.6
0.2175	31.96	52.91	20.95	9.000	L1	OFF	9.6
0.2288	28.92	52.50	23.57	9.000	L1	OFF	9.6
0.2400	28.77	52.10	23.33	9.000	L1	OFF	9.6
0.4898	32.12	46.17	14.05	9.000	L1	OFF	9.6
5.0000	20.57	46.00	25.43	9.000	L1	OFF	9.9
5.0855	20.92	50.00	29.08	9.000	L1	OFF	9.9
5.0900	20.98	50.00	29.02	9.000	L1	OFF	9.9
5.1125	20.99	50.00	29.01	9.000	L1	OFF	9.9
5.1418	21.33	50.00	28.67	9.000	L1	OFF	9.9
12.7018	29.10	50.00	20.90	9.000	L1	OFF	10.2
12.7243	29.06	50.00	20.94	9.000	L1	OFF	10.2
13.1878	29.65	50.00	20.35	9.000	L1	OFF	10.2
13.2080	29.09	50.00	20.91	9.000	L1	OFF	10.2
13.2305	29.36	50.00	20.64	9.000	L1	OFF	10.2
13.2643	29.29	50.00	20.71	9.000	L1	OFF	10.2

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Conducted Emissions (Line 2)

2.4GHz WLAN N

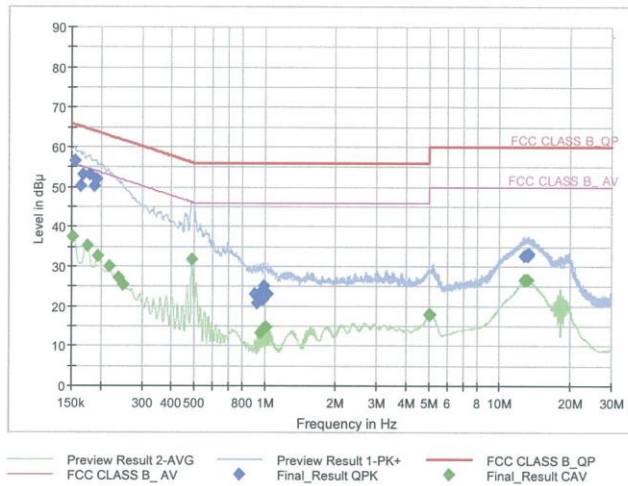
1 / 2

Test Report

Common Information

EUT : SM-G990B/DS
 Manufacturer : SAMSUNG
 Test Site: SHIELD ROOM
 Operating Conditions : 2.4GHz WLAN N (25W)
 Operator Name:
 Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	56.44	65.75	9.31	9.000	N	OFF	9.6
0.1635	50.18	65.28	15.10	9.000	N	OFF	9.6
0.1680	52.95	65.06	12.10	9.000	N	OFF	9.6
0.1793	53.00	64.52	11.52	9.000	N	OFF	9.6
0.1883	50.19	64.11	13.92	9.000	N	OFF	9.6
0.1928	51.96	63.92	11.96	9.000	N	OFF	9.6
0.9050	23.07	56.00	32.93	9.000	N	OFF	9.7
0.9230	20.78	56.00	35.22	9.000	N	OFF	9.7
0.9568	23.49	56.00	32.51	9.000	N	OFF	9.7
0.9838	21.76	56.00	34.24	9.000	N	OFF	9.7
0.9950	25.16	56.00	30.84	9.000	N	OFF	9.7
1.0265	22.93	56.00	33.07	9.000	N	OFF	9.7
12.7963	32.62	60.00	27.38	9.000	N	OFF	10.2
13.0843	32.94	60.00	27.06	9.000	N	OFF	10.3
13.1315	32.46	60.00	27.54	9.000	N	OFF	10.3
13.2125	32.59	60.00	27.41	9.000	N	OFF	10.3
13.2395	32.81	60.00	27.19	9.000	N	OFF	10.3
13.3250	33.07	60.00	26.93	9.000	N	OFF	10.3

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2.4GHz WLAN N

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Final Result CAV

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	37.61	55.88	18.26	9.000	N	OFF	9.6
0.1748	35.14	54.73	19.59	9.000	N	OFF	9.6
0.1950	32.61	53.82	21.21	9.000	N	OFF	9.6
0.2175	29.92	52.91	23.00	9.000	N	OFF	9.6
0.2378	27.05	52.17	25.12	9.000	N	OFF	9.6
0.2490	25.46	51.79	26.33	9.000	N	OFF	9.6
0.4898	31.82	46.17	14.35	9.000	N	OFF	9.6
0.9545	13.26	46.00	32.74	9.000	N	OFF	9.7
0.9973	14.42	46.00	31.58	9.000	N	OFF	9.7
1.0198	14.74	46.00	31.26	9.000	N	OFF	9.7
4.9955	17.80	46.00	28.20	9.000	N	OFF	9.9
5.0653	17.94	50.00	32.06	9.000	N	OFF	9.9
12.7378	26.44	50.00	23.56	9.000	N	OFF	10.2
12.7963	26.49	50.00	23.51	9.000	N	OFF	10.2
12.8188	26.52	50.00	23.48	9.000	N	OFF	10.2
13.0595	26.63	50.00	23.37	9.000	N	OFF	10.3
13.1900	26.48	50.00	23.52	9.000	N	OFF	10.3
13.2125	26.68	50.00	23.32	9.000	N	OFF	10.3

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9.9 CONFIRMATION OF GEO-LOCATION MECHANISM

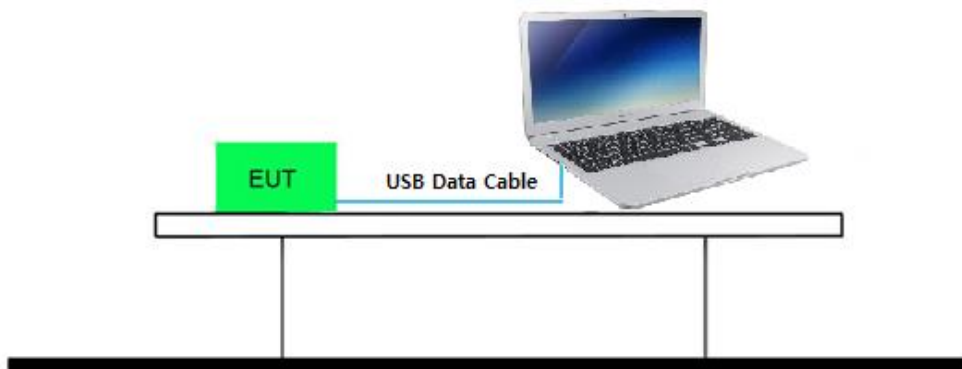
The device uses MCC information obtained from the public cellular carrier to determine that it is operating outside the U.S. and then enable channels 12 and 13 only if a non-US MCC that supports channel 12 and 13 is confirmed.

The device uses a geo-location mechanism based on the Country in order to only enable certain WLAN DTS bands when the device is not in the USA.

WLAN	Country code = US	Country code = KR(Korea)
CH 12	Did not connect	Connected
CH 13	Did not connect	Connected

The verification tests confirmed the operational of the geo-location mechanism.


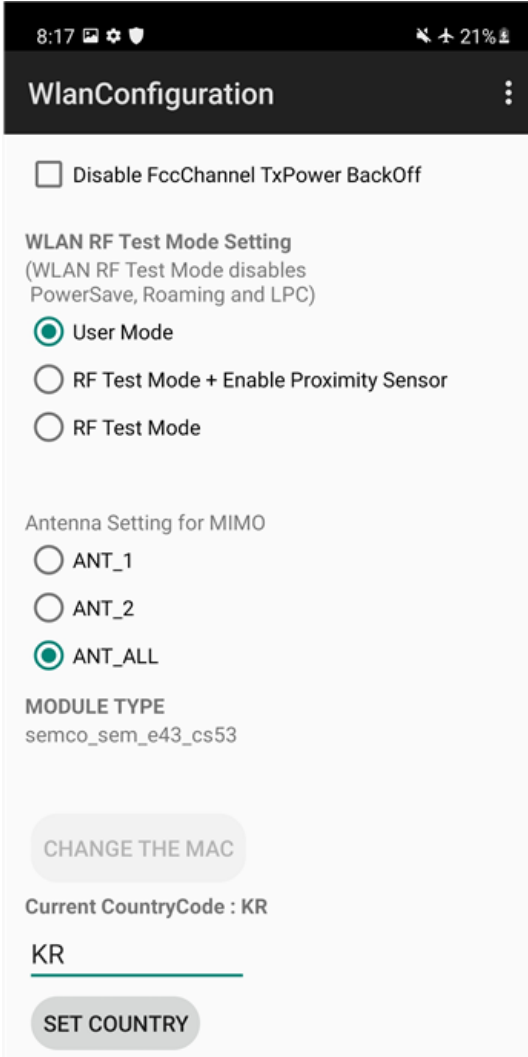
Test Setup



Test Procedure

In case of Country code	In case of airplane mode
1. Open Command Prompt. 2. At the Command Prompt, enter the command. - C:\adb>adb remount - C:\adb>adb shell - gts4lv:/ # wpa_cli driver country US // Setting the country. - gts4lv:/ # iw list // Channel list is obtain.	1. airplane mode on 2. Wifi on 3. Open Command Prompt. 4. At the Command Prompt, enter the command. - C:\adb>adb remount - C:\adb>adb shell - gts4lv:/ # iw list // support band in case of airplane mode

Setting the country for product

Country code = US	Country code = KR(Korea)
 <p>WlanConfiguration</p> <p><input type="checkbox"/> Disable FccChannel TxPower BackOff</p> <p>WLAN RF Test Mode Setting (WLAN RF Test Mode disables PowerSave, Roaming and LPC)</p> <p><input checked="" type="radio"/> User Mode</p> <p><input type="radio"/> RF Test Mode + Enable Proximity Sensor</p> <p><input type="radio"/> RF Test Mode</p> <p>Antenna Setting for MIMO</p> <p><input type="radio"/> ANT_1</p> <p><input type="radio"/> ANT_2</p> <p><input checked="" type="radio"/> ANT_ALL</p> <p>MODULE TYPE semco_sem_e43_cs53</p> <p>CHANGE THE MAC</p> <p>Current CountryCode : US</p> <p>US</p> <p>SET COUNTRY</p>	 <p>WlanConfiguration</p> <p><input type="checkbox"/> Disable FccChannel TxPower BackOff</p> <p>WLAN RF Test Mode Setting (WLAN RF Test Mode disables PowerSave, Roaming and LPC)</p> <p><input checked="" type="radio"/> User Mode</p> <p><input type="radio"/> RF Test Mode + Enable Proximity Sensor</p> <p><input type="radio"/> RF Test Mode</p> <p>Antenna Setting for MIMO</p> <p><input type="radio"/> ANT_1</p> <p><input type="radio"/> ANT_2</p> <p><input checked="" type="radio"/> ANT_ALL</p> <p>MODULE TYPE semco_sem_e43_cs53</p> <p>CHANGE THE MAC</p> <p>Current CountryCode : KR</p> <p>KR</p> <p>SET COUNTRY</p>
<pre>C:\wadb> C:\wadb> C:\wadb>adb remount remount succeeded C:\wadb>adb shell r9q:/ # wpa_cli driver country US wpa_cli driver country US Using interface 'wlan0' OK r9q:/ #</pre>	<pre>C:\wadb>adb remount remount succeeded C:\wadb>adb shell r9q:/ # wpa_cli driver country KR wpa_cli driver country KR Using interface 'wlan0' OK r9q:/ #</pre>

Did not connect Airplane mode	
Airplane on	
Frequencies:	
* 2412 MHz [1] (30.0 dBm)	
* 2417 MHz [2] (30.0 dBm)	
* 2422 MHz [3] (30.0 dBm)	
* 2427 MHz [4] (30.0 dBm)	
* 2432 MHz [5] (30.0 dBm)	
* 2437 MHz [6] (30.0 dBm)	
* 2442 MHz [7] (30.0 dBm)	
* 2447 MHz [8] (30.0 dBm)	
* 2452 MHz [9] (30.0 dBm)	
* 2457 MHz [10] (30.0 dBm)	
* 2462 MHz [11] (30.0 dBm)	
* 2467 MHz [12] (disabled)	
* 2472 MHz [13] (disabled)	
Airplane off	
Frequencies:	
* 2412 MHz [1] (30.0 dBm)	
* 2417 MHz [2] (30.0 dBm)	
* 2422 MHz [3] (30.0 dBm)	
* 2427 MHz [4] (30.0 dBm)	
* 2432 MHz [5] (30.0 dBm)	
* 2437 MHz [6] (30.0 dBm)	
* 2442 MHz [7] (30.0 dBm)	
* 2447 MHz [8] (30.0 dBm)	
* 2452 MHz [9] (30.0 dBm)	
* 2457 MHz [10] (30.0 dBm)	
* 2462 MHz [11] (30.0 dBm)	
* 2467 MHz [12] (30.0 dBm)	
* 2472 MHz [13] (30.0 dBm)	

Note : The frequency range is occupied band, not center frequency.

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
ESPAAC	SU-642 / Temperature Chamber	03/15/2021	Annual	0093008124
Agilent	N9030A / Signal Analyzer	01/11/2021	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/02/2021	Annual	101231
Agilent	N1911A / Power Meter	04/08/2021	Annual	MY45100523
Keysight	N1921A / Power Sensor	04/08/2021	Annual	MY57820067
Agilent	87300B / Directional Coupler	11/10/2020	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	05/20/2021	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	02/16/2021	Annual	MY50360067
Hewlett Packard	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	03/19/2020	Biennial	1513-333
Schwarzbeck	VULB 9168 / Hybrid Antenna	02/22/2021	Biennial	760
Schwarzbeck	BBHA 9120D / Horn Antenna	05/19/2020	Biennial	02299
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	01/11/2021	Annual	MY49431210
Wainwright Instruments	WRCJV12-4900-5100-5900-6100-50SS	06/24/2021	Annual	5
Wainwright Instruments	WRCJV12-4900-5100-5900-6100-50SS	06/24/2021	Annual	6
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	01/06/2021	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	02/08/2021	Annual	1
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	02/03/2021	Annual	8
Wainwright Instruments	WHKX8-6090-7000-18000-40SS/ High Pass Filter	02/03/2021	Annual	25
Api tech.	18B-03 / Attenuator (3 dB)	02/03/2021	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	02/03/2021	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	02/03/2021	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	02/03/2021	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	12/04/2020	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	03/23/2021	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-2106-FC026-P