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FCC DTS REPORT

Class II Permissive Change

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Date of Issue:
09 January 2020

Test Site/Location:
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

Report No.: HCT-RF-2001-FC007-R3

FCC ID:	**A3LSMG770F**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**
Model:	SM-G770F/DS
Additional Model:	SM-G770F
EUT Type:	Mobile Phone
Average Output Power:	Ant.1: 802.11b: 18.07 dBm / 802.11g: 17.60 dBm / 802.11n(HT20): 17.50 dBm Ant.2: 802.11b: 17.99 dBm / 802.11g: 17.47 dBm / 802.11n(HT20): 17.57 dBm Ant.1&2: 802.11g: 20.51 dBm / 802.11n(HT20): 20.50 dBm
Frequency Range:	2412 MHz - 2472 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 prepared by : Jeong Ho Kim
Engineer of Telecommunication testing center

Approved by : Jong Seok Lee
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2001-FC007	03 January 2020	- First Approval Report
HCT-RF-2001-FC007-R1	07 January 2020	- Revised the summary on page 26. - Added the test results of Ant2(802.11b ch1,2,3).
HCT-RF-2001-FC007-R2	08 January 2020	- Revised the summary on page 26.
HCT-RF-2001-FC007-R3	09 January 2020	- Additional Model name revised

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 KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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1. EUT DESCRIPTION

Model	SM-G770F/DS		
Additional Model	SM-G770F		
EUT Type	Mobile Phone		
Power Supply	DC 3.85 V		
Battery Information	Model: EB-BA907ABY L Type: Li-ion Battery		
Travel Adapter Information	Model : EP-TA845 Manufacture: SOLUM		
Data Cable Information	Model : EP-DN975BBE Manufacture: RF TECH		
Ear-jack Information	Model : GHSS028-W9 Manufacture: BUJEON		
Frequency Range	2412 MHz - 2472 MHz		
Max. RF Output Power	Peak Power (For information only)	Ant. 1 (SISO)	802.11b : 20.65 dBm 802.11g : 26.25 dBm 802.11n(HT20) : 26.28 dBm
		Ant.2 (SISO)	802.11b : 21.00 dBm 802.11g : 25.64 dBm 802.11n(HT20) : 25.63 dBm
		Ant.1&2 (MIMO)	802.11g : 28.94 dBm 802.11n(HT20) : 28.97 dBm
	Average Power	Ant. 1 (SISO)	802.11b: 18.07 dBm 802.11g: 17.60 dBm 802.11n(HT20): 17.50 dBm
		Ant.2 (SISO)	802.11b: 17.99 dBm 802.11g: 17.47 dBm 802.11n(HT20): 17.57 dBm
		Ant.1&2 (MIMO)	802.11g: 20.51 dBm 802.11n(HT20): 20.50 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n		
Number of Channels	13 Channels		
Antenna Specification	Antenna type: LDS Peak Gain Ant.1: -3.57 dBi / Ant.2: -6.42 dBi		
Date(s) of Tests	December 01, 2019 ~ January 06, 2020		

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	O	O	X	O
802.11n(HT20)	O	O	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 SISO channels to operate independent of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna.

Frequency	Supported
2.4 GHz Ant 1 + 5 GHz Ant 2	O
2.4 GHz Ant 2 + 5 GHz Ant 1	X
2.4 GHz Ant 1 + 5 GHz Ant 1	X
2.4 GHz Ant 2 + 5 GHz Ant 2	X

3. Directional Gain Calculation

According to KDB 662911 D01 Multiple Transmitter Output v02r01 F) 2) e) (iii)

Directional gain = $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS}) dBi

(N_{ANT} = 2, N_{SS} = 2, $G_{ANT\ MAX}$ is.the gain of the antenna having the highest gain)

Band	Ant Gain (dBi)		N_{ANT}/ N_{ss}	Directional Gain (= $G_{ANT\ MAX}$ + 10 log(N_{ANT}/N_{SS})) (dBi)
DTS	ANT1	-3.57	2 / 2	-1.85
	ANT2	-6.42		

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 purpse 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 3.75 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 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.

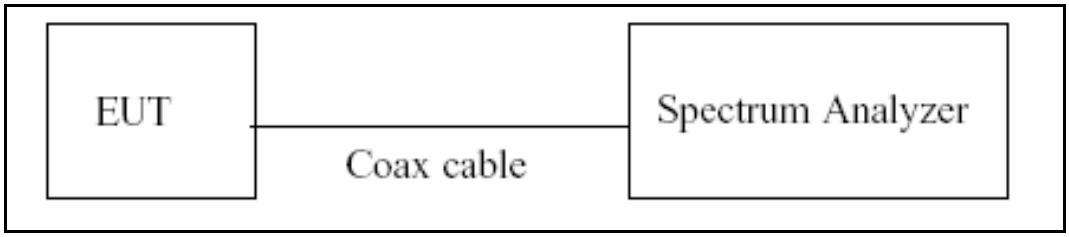
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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 availble 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 ≤ 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*.

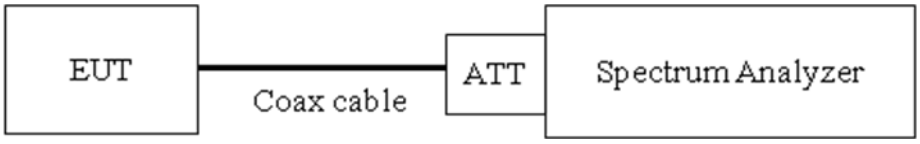
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

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 ≥ 3 x 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.

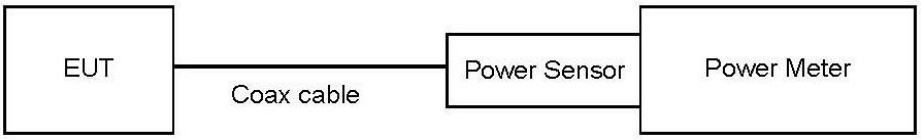
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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

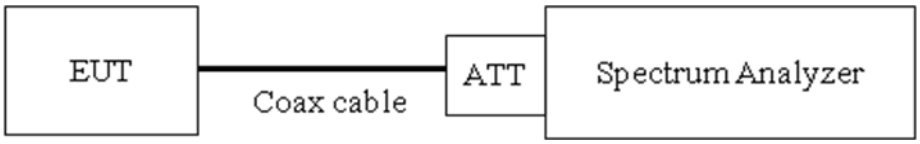
▪ Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

7.4. Power Spectral Density

Limit

The transmitter power density average over 1-second interval shall not be greater than 8dBm 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 kHz ≤ RBW ≤ 100 kHz.
4) VBW ≥ 3 x 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 ≥[2 ×span / RBW].
8) Employ trace averaging (rms) modeover 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.

Sample Calculation

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

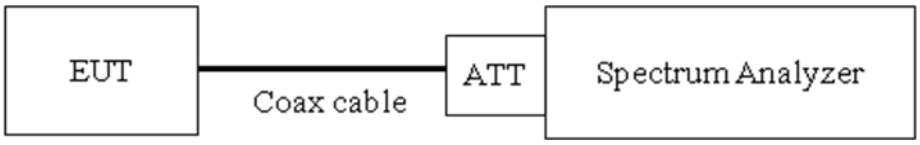
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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 30 dB 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 ≥ 3 x 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 ≥ 2 x 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	20.05
100	20.10
200	20.13
300	20.18
400	20.21
500	20.23
600	20.23
700	20.25
800	20.26
900	20.28
1000	20.29
2000	20.42
2400	20.47
2500	20.47
3000	20.52
4000	20.60
5000	20.68
6000	20.73
7000	20.81
8000	20.88
9000	20.94
10000	21.02
11000	21.05
12000	21.13
13000	21.23
14000	21.20
15000	21.25
16000	21.29
17000	21.33
18000	21.40
19000	21.44
20000	21.48
21000	21.65
22000	21.64
23000	21.67
24000	21.71
25000	21.75
26000	21.84

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

2. Factor = Attenuator loss + Cable loss

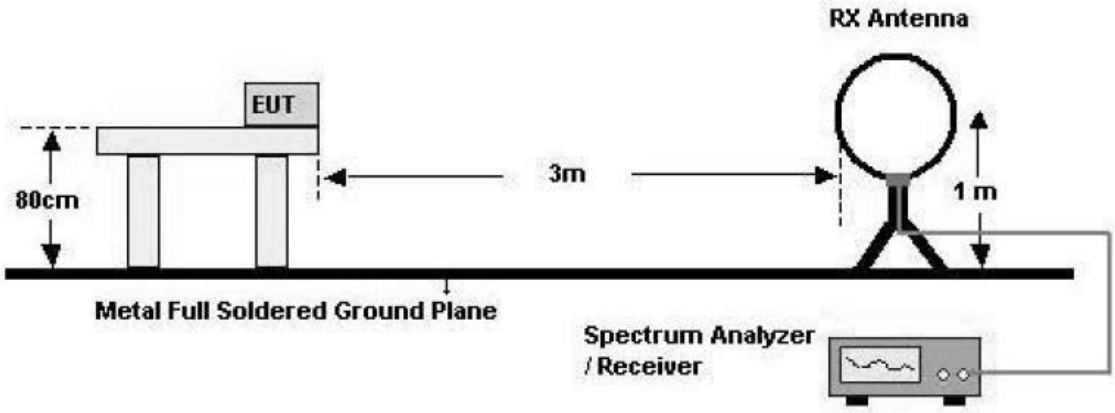
7.6. Radiated Test

Limit

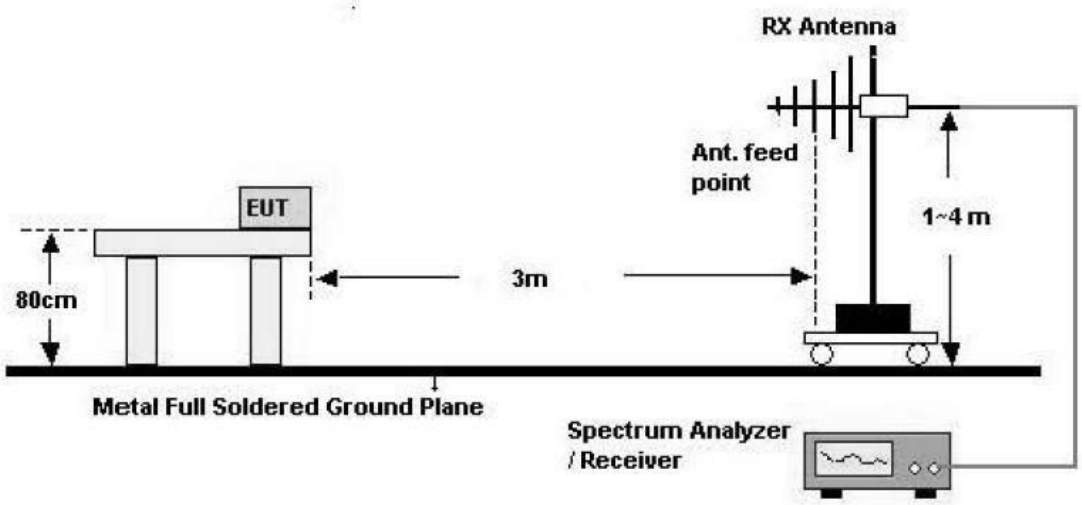
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

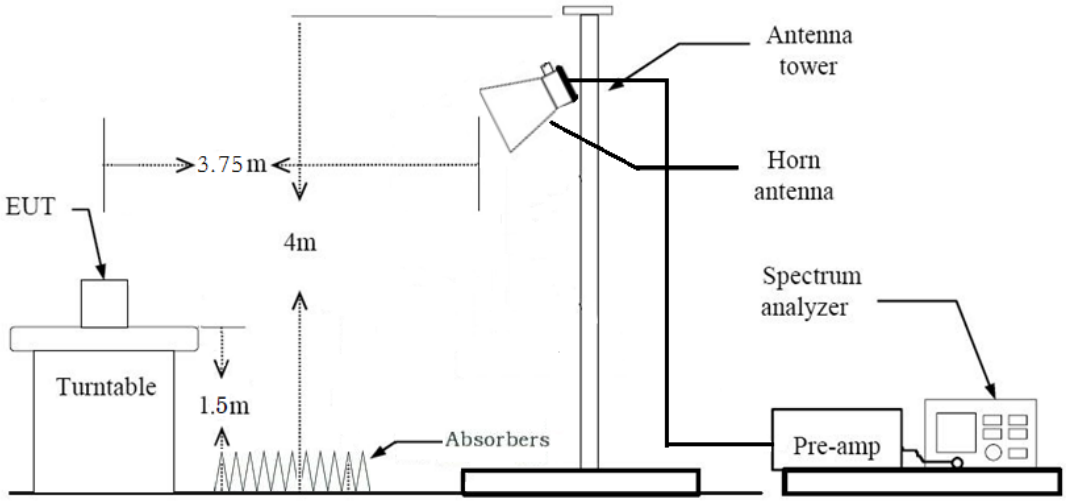
Below 30 MHz



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) = 40log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3 x RBW
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

KDB 414788 OFS and Chamber Correlation Justification

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

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

Test Procedure of Radiated spurious emissions(Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 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
6. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
7. 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 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
   ◆ Distance extrapolation factor = 20log (test distance / specific distance) (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting (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 ≥ 3 x RBW
   (2) Measurement Type(Average): Duty cycle ≥ 98%
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = RMS
      - Averaging type = power (*i.e.*, RMS)
      - RBW = 1 MHz
      - VBW ≥ 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 ±2％
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = RMS
      - Averaging type = power (*i.e.*, RMS)
      - RBW = 1 MHz
      - VBW ≥ 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.

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

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

- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Average): Duty cycle ≥ 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 ≥ 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 ±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 ≥ 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.

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

11. Total(Measurement Type : Peak)
= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – AMP Gain (A.G) +Attenuator(ATT)

Total(Measurement Type : Average, Duty cycle ≥ 98%)
= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – AMP Gain (A.G) +Attenuator(ATT)

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

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – AMP Gain (A.G) +Attenuator(ATT) + 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 : ANT1-Z / ANT2-X
   - Radiated Restricted Band Edge : ANT1-Y / ANT2-Z
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 : 1Mbps
   - 802.11g : 6Mbps
   - 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-G770F, SM-G770F/DS were tested and the worst case results are reported.

(Worst case : SM-G770F/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 : Y
3. The following tables show the worst case configurations determined during testing.

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	1, 6, 11	36, 100, 165
Data Rate	1 Mbps	6 Mbps
Mode	802.11b	802.11a

4. SM-G770F, SM-G770F/DS were tested and the worst case results are reported.

(Worst case : SM-G770F/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-G770F, SM-G770F/DS were tested and the worst case results are reported.

(Worst case : SM-G770F/DS)

Conducted test

1. The EUT was configured with data rate of highest power.
2. SM-G770F, SM-G770F/DS were tested and the worst case results are reported.

(Worst case : SM-G770F/DS)

8. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result	Status
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	Conducted	PASS	C Note2&6
Conducted Maximum Output Power	§15.247(b)(3)	< 1 Watt		PASS	C Note4&6
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS	C Note2&6
Band Edge (Out of Band Emissions)	§15.247(d)	Conducted > 30 dBc		PASS	C Note2&6
AC Power line Conducted Emissions	§15.207	cf. Section 7.7		PASS	C Note2&6
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS	C Note3&6
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 7.6		PASS	C Note3&6

Note:

1. C = Comply, NT = Not Tested, NA = Not Applicable, NC = Not Comply
2. C2PC model is electrically identical to the Original model.
   The Product Equality Declaration includes detailed information about the changes between the devices.
3. The data from that application has been verified through appropriate spot checks to demonstrate compliance for this device as shown in the test result of section 9.1.
4. Output power was verified to be within the expected tune up tolerances prior to performing the spot checks for radiated spurious emissions and band edge to confirm that the proposed changes to the digital circuitry had not adversely affected the previously reported values in the original filing.
5. Original model : SM-G770F/DS / C2PC model : SM-G770F/DS
6. 802.11b ch.1,2,3 Power reduction. this mode & channel radiated & conducted full test completed. and another test data refer to the original test Report No.: HCT-RF-1910-FC007

9. TEST RESULT

9.1 SPOT CHECKS

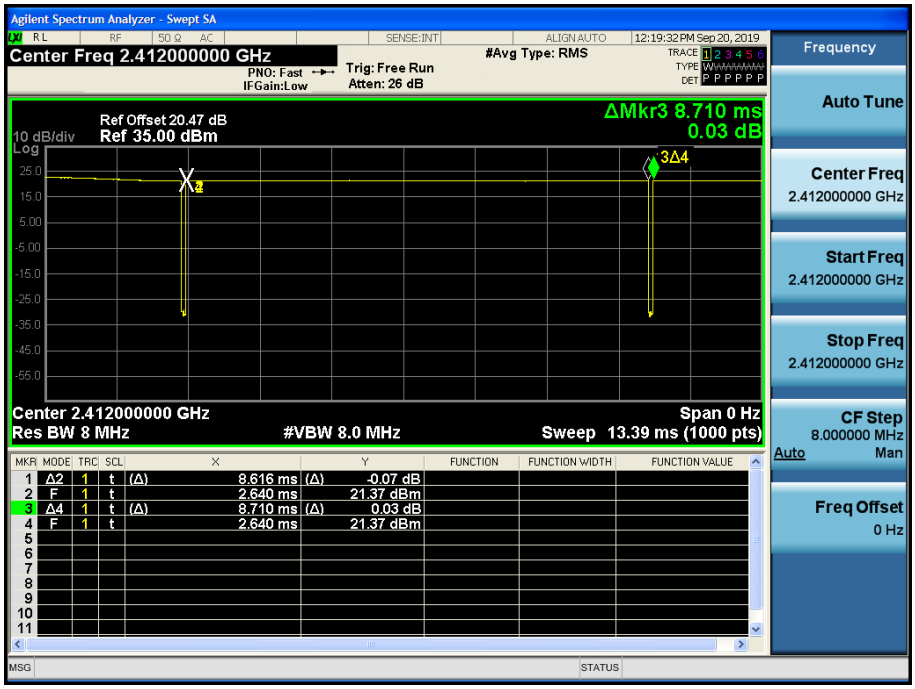
Test Item	Mod/ Channel	Measured Frequency (MHz)	SM-G770F/DS Original(dBuV/m)		SM-G770F/DS C2PC(dBuV/m)		Deviation (dB)	
			Peak	Average	Peak	Average	Peak	Average
Band Edge	802.11n MCS0 / Ch.11	2 483.5 ~ 2 500	62.21	51.66	60.50	50.11	-1.71	-1.55
RSE	802.11b 1 Mbps / Ch .1	4824.0	57.52	50.92	56.46	49.57	-1.06	-1.35
RSE (RSDB)	ANT1 802.11b 1 Mbps ch.1 & ANT2 802.11a 6 Mbps ch.36	4824.0	57.39	50.42	55.96	49.04	-1.43	-1.38

9.2 DUTY CYCLE

Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	8.616	8.710	0.989	0.047
	2	4.315	4.351	0.992	0.036
	5.5	1.629	1.659	0.982	0.079
	11	0.863	0.894	0.966	0.152

▣ Test Plots

Duty cycle plot (802.11b(1Mbps))



Note:

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

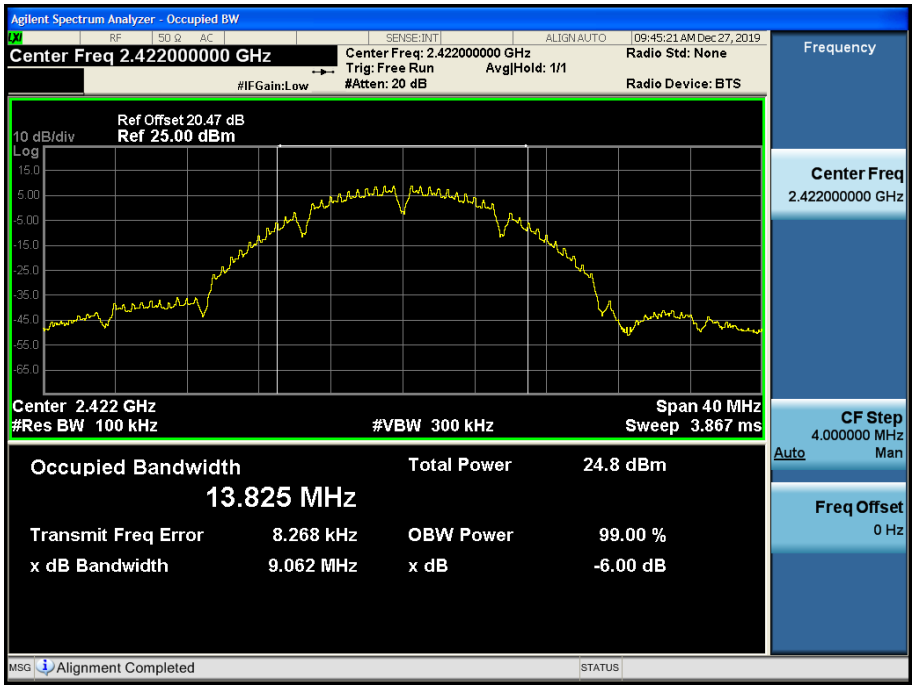
9.3 6dB BANDWIDTH

[ANT1]

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	9.051	0.5
2417	2	9.053	0.5
2422	3	9.062	0.5

▣ Test Plots

6dB Bandwidth plot (802.11b-CH 3)

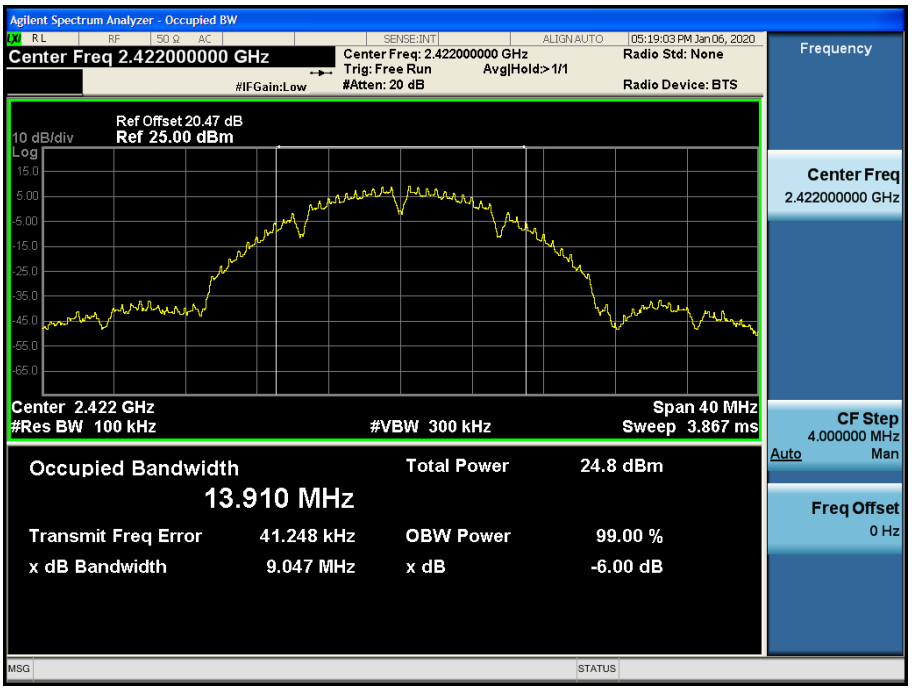


[ANT2]

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	9.064	0.5
2417	2	9.077	0.5
2422	3	9.047	0.5

▣ Test Plots

6dB Bandwidth plot (802.11b-CH 3)



Note:

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

9.4 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, 20.47 dB is offset for 2.4 GHz Band

[ANT1]

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	1	18.19	30	15
		2	18.35	30	
		5.5	18.37	30	
		11	18.33	30	
2417	2	1	19.02	30	16
		2	19.16	30	
		5.5	19.17	30	
		11	19.18	30	
2422	3	1	19.87	30	17
		2	20.31	30	
		5.5	20.23	30	
		11	20.18	30	

[ANT2]

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	1	18.18	30	15
		2	18.33	30	
		5.5	18.36	30	
		11	18.31	30	
2417	2	1	19.18	30	16
		2	19.37	30	
		5.5	19.35	30	
		11	19.36	30	
2422	3	1	19.98	30	17
		2	20.14	30	
		5.5	20.12	30	
		11	20.19	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, 20.47 dB is offset for 2.4 GHz Band.

[ANT1]

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	15.51	0.047	15.56	30	15
		2	15.74	0.036	15.78	30	
		5.5	15.72	0.079	15.80	30	
		11	15.66	0.152	15.81	30	
2417	2	1	16.28	0.047	16.33	30	16
		2	16.46	0.036	16.50	30	
		5.5	16.40	0.079	16.48	30	
		11	16.36	0.152	16.51	30	
2422	3	1	17.22	0.047	17.27	30	17
		2	17.35	0.036	17.39	30	
		5.5	17.30	0.079	17.38	30	
		11	17.25	0.152	17.40	30	

[ANT2]

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	15.58	0.047	15.63	30	15
		2	15.75	0.036	15.79	30	
		5.5	15.71	0.079	15.79	30	
		11	15.65	0.152	15.80	30	
2417	2	1	16.58	0.047	16.63	30	16
		2	16.77	0.036	16.81	30	
		5.5	16.73	0.079	16.81	30	
		11	16.67	0.152	16.82	30	
2422	3	1	17.38	0.047	17.43	30	17
		2	17.53	0.036	17.57	30	
		5.5	17.49	0.079	17.57	30	
		11	17.46	0.152	17.61	30	

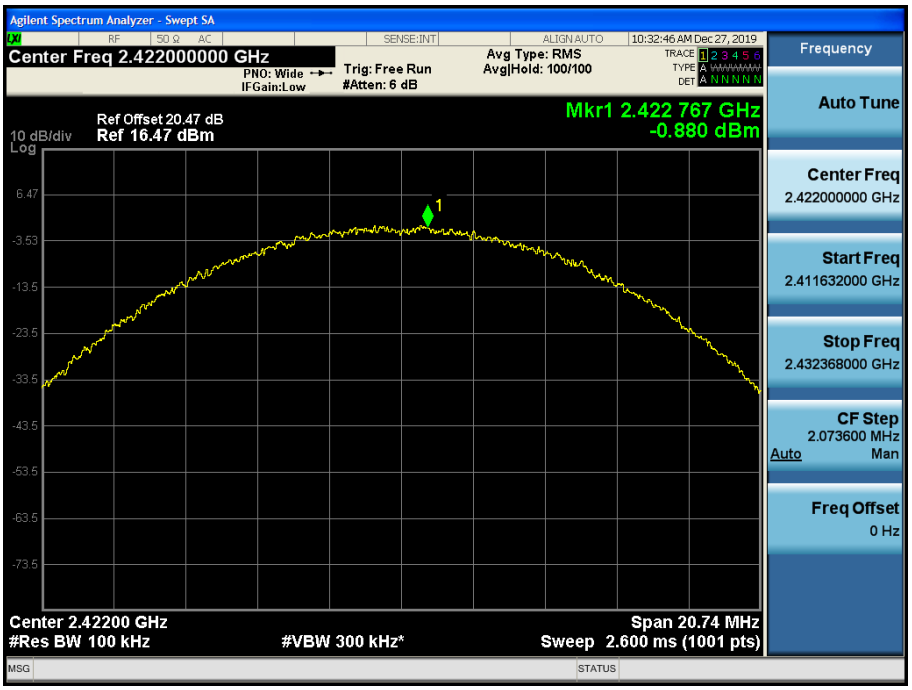
9.5 POWER SPECTRAL DENSITY

[ANT1]

Mode	Frequency (MHz)	Channel No.	Test Result			
			Measured PSD (dBm)	Duty Cycle Factor	Measured PSD(dBm) + Duty Cycle Factor	Limit (dBm)
802.11b	2412	1	-2.988	0.047	-2.941	8
	2417	2	-1.513	0.047	-1.466	8
	2422	3	-0.880	0.047	-0.833	8

▣ Test Plots

Power Spectral Density (802.11b-CH 3)

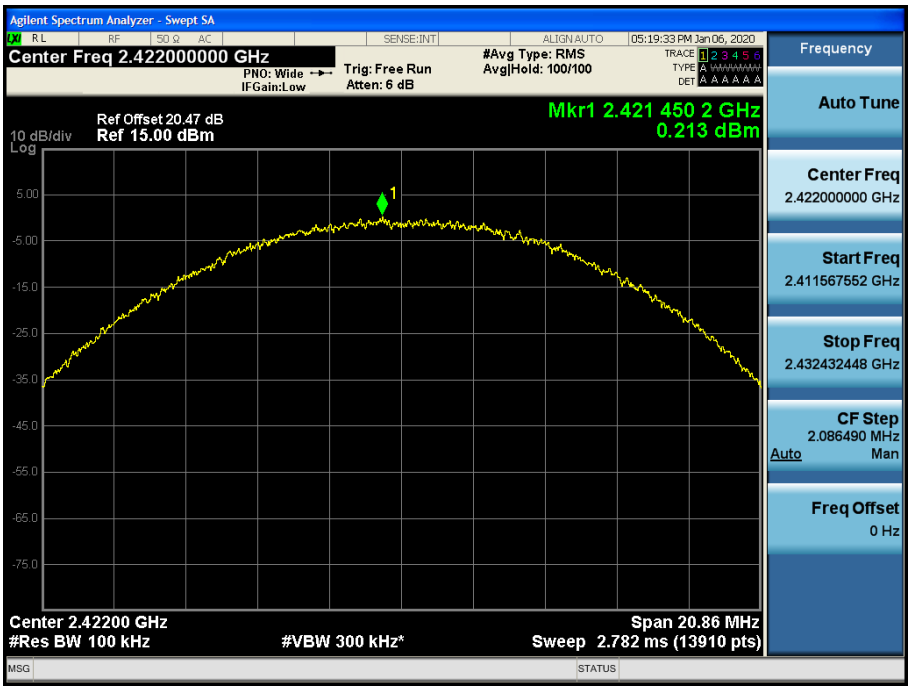


[ANT2]

Mode	Frequency (MHz)	Channel No.	Test Result			
			Measured PSD (dBm)	Duty Cycle Factor	Measured PSD(dBm) + Duty Cycle Factor	Limit (dBm)
802.11b	2412	1	-1.937	0.152	-1.785	8
	2417	2	-0.797	0.152	-0.645	8
	2422	3	0.213	0.152	0.365	8

▣ Test Plots

Power Spectral Density (802.11b-CH 3)



Note :

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

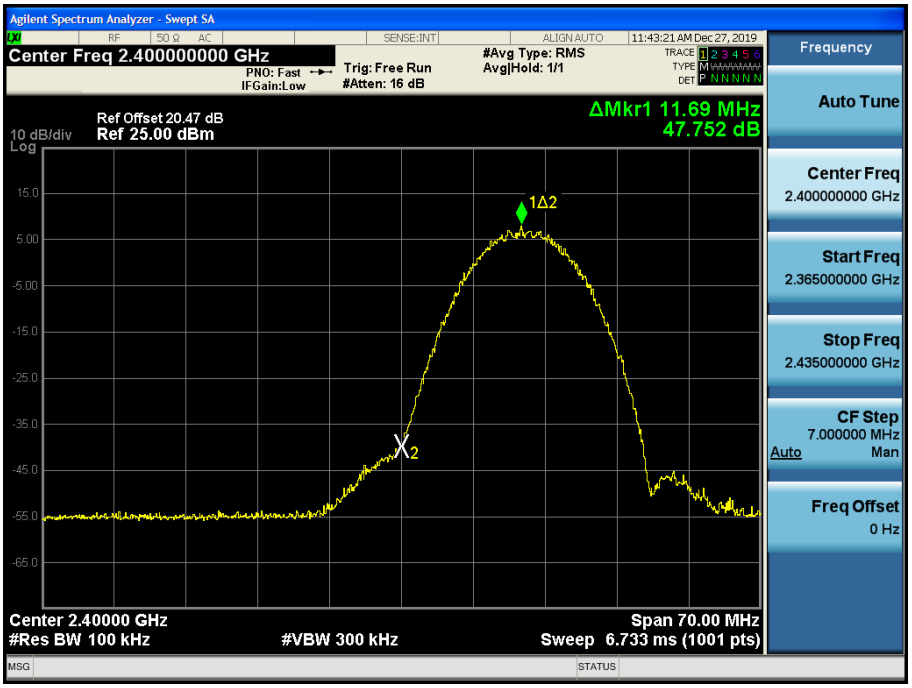
9.6 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

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.

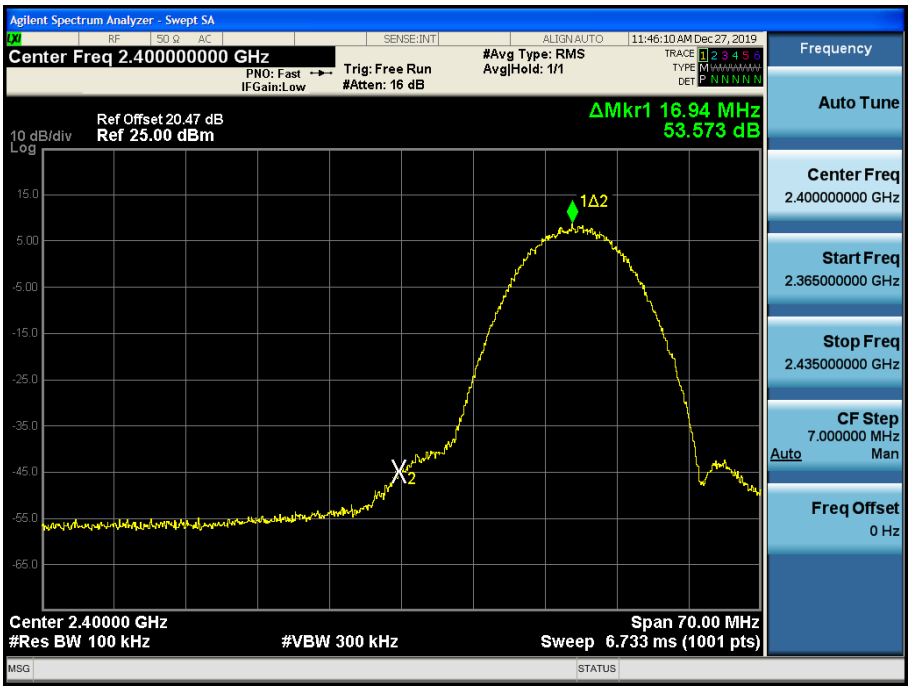
[ANT1]

▣ Test Plots(BandEdge)

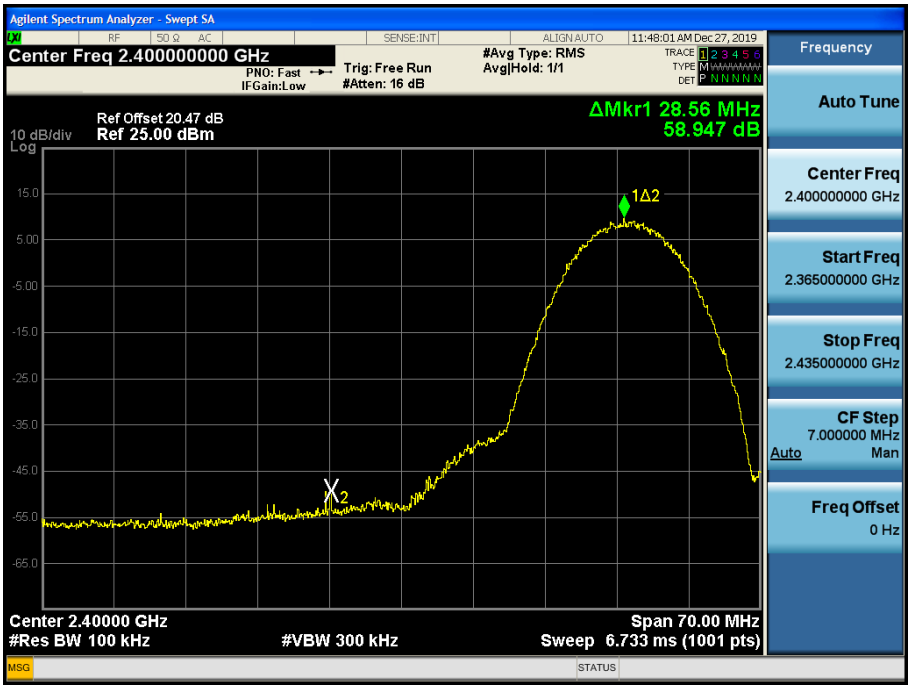
Band Edge (802.11b-CH1)



Band Edge (802.11b-CH2)



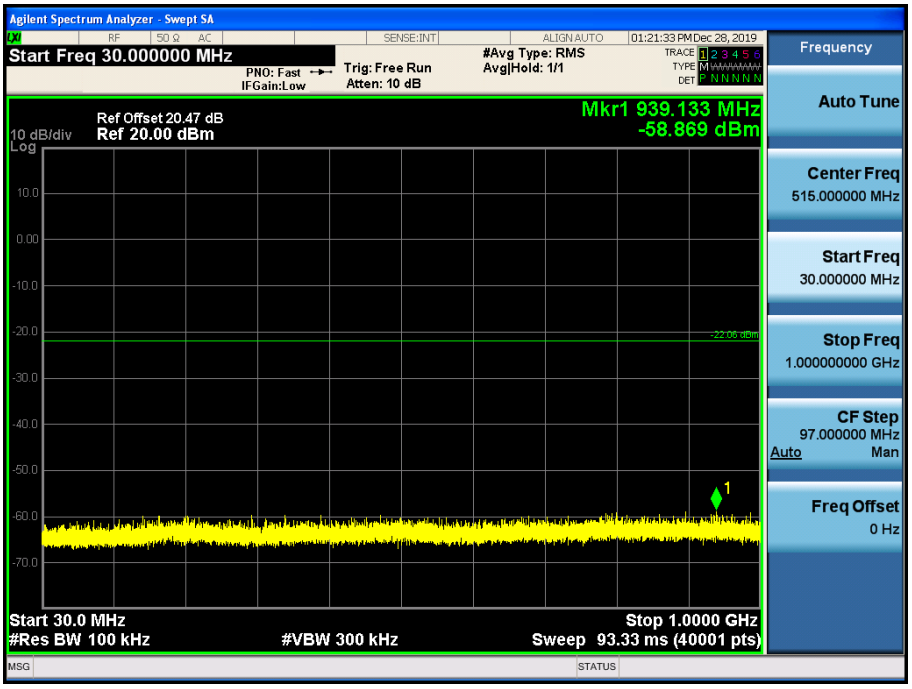
Band Edge (802.11b-CH3)



▣ Test Plots(Conducted Spurious Emission)

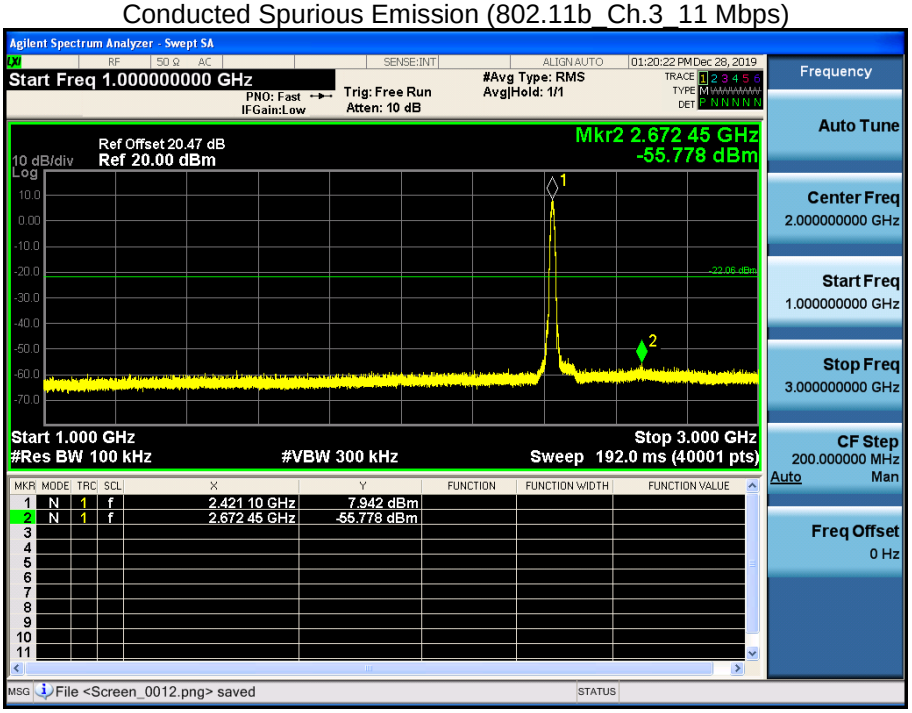
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



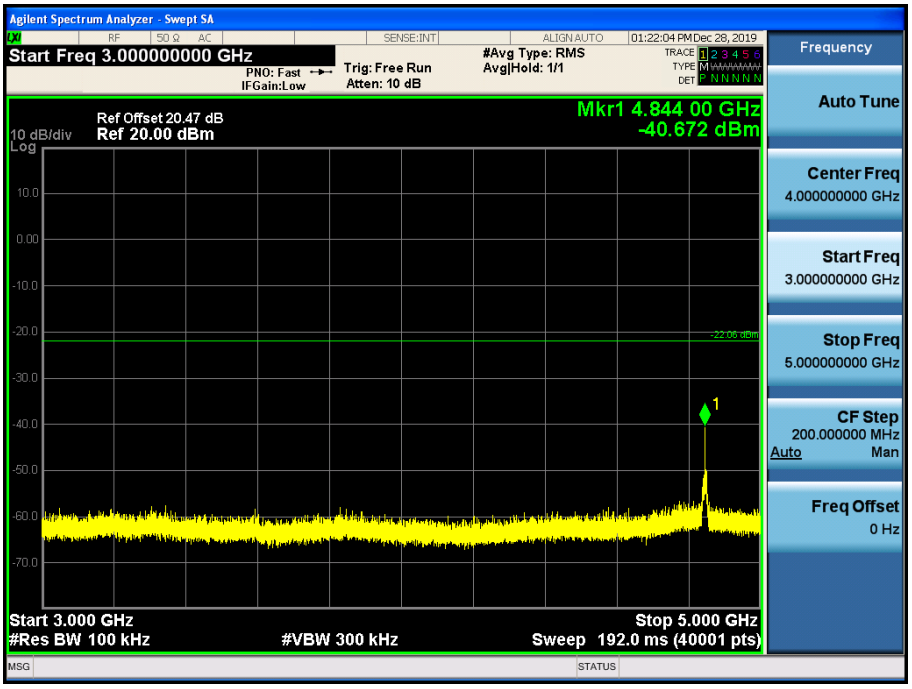
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



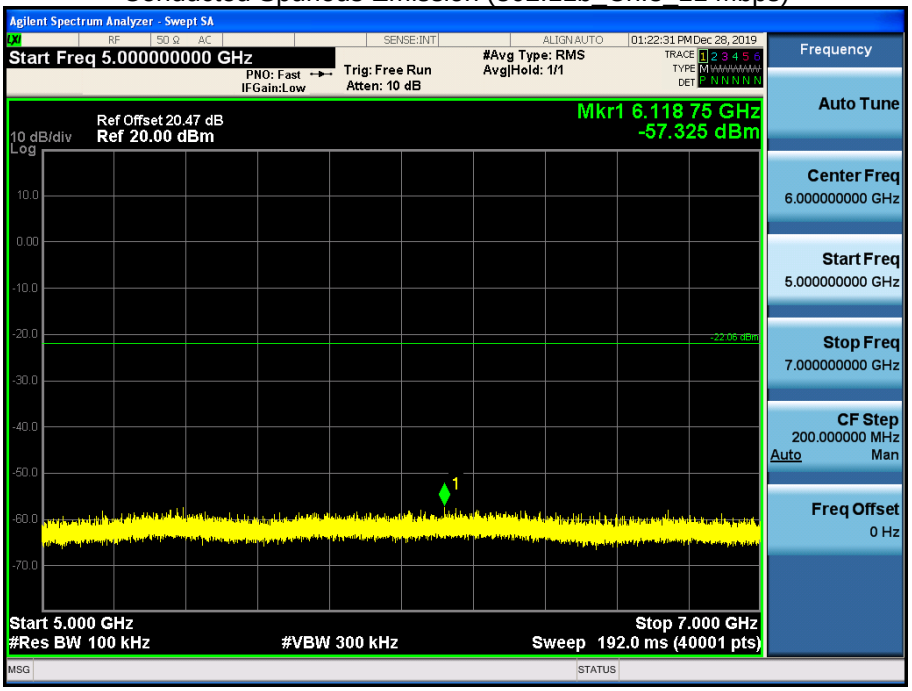
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



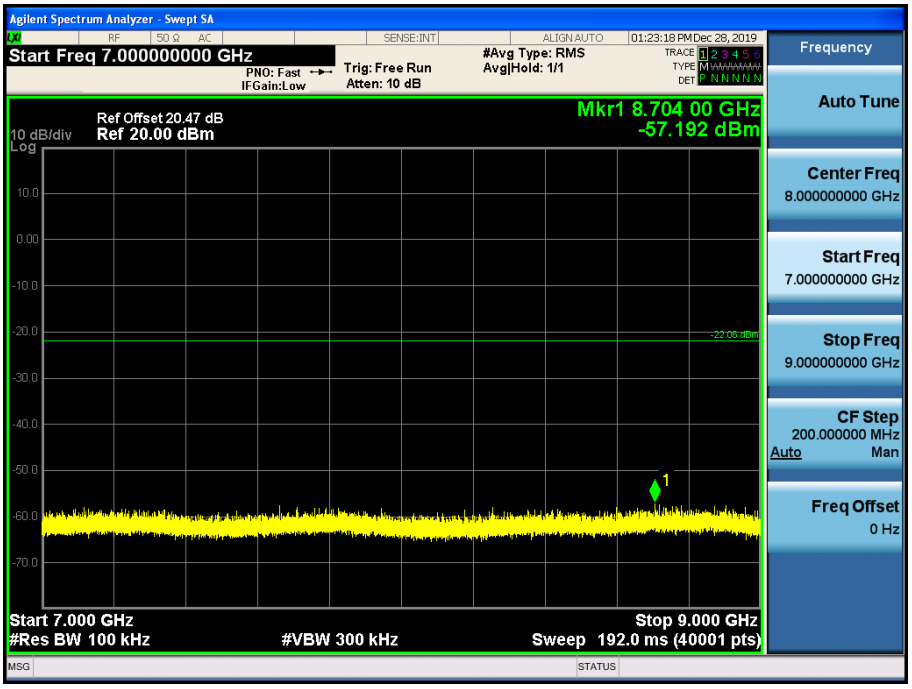
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



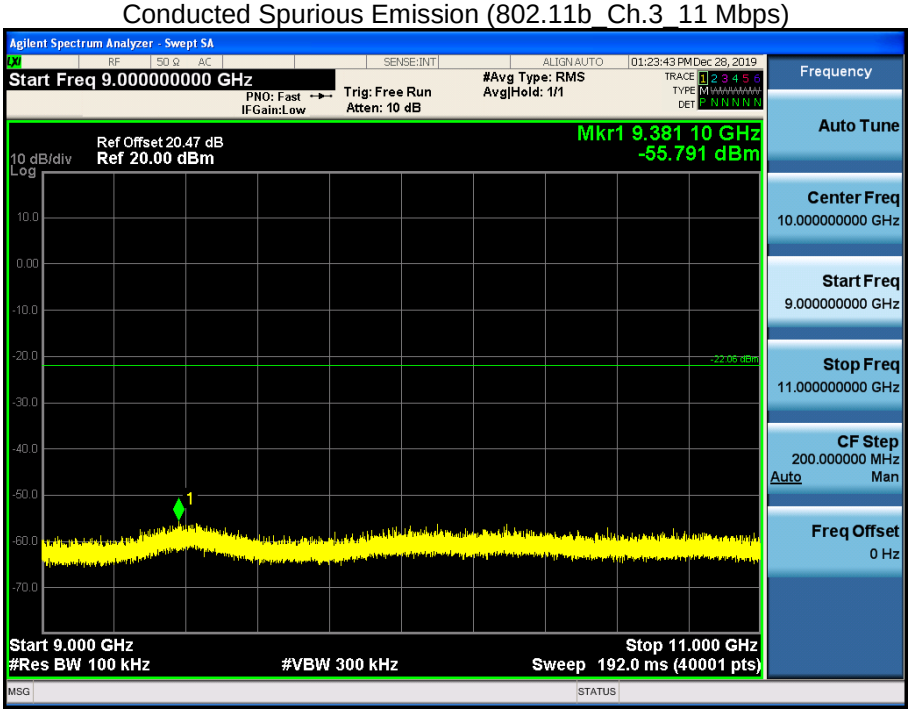
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



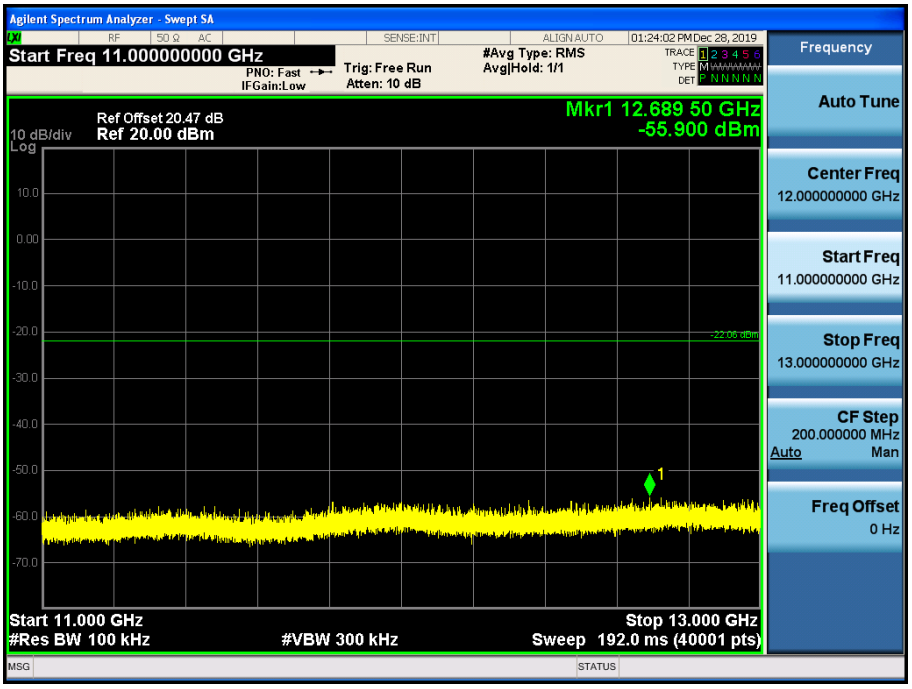
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



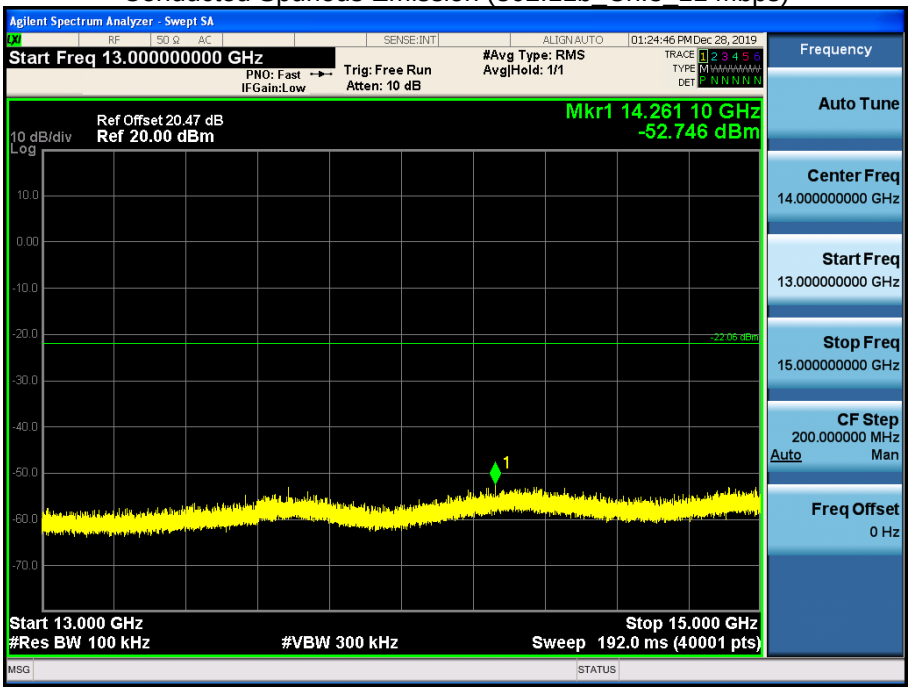
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



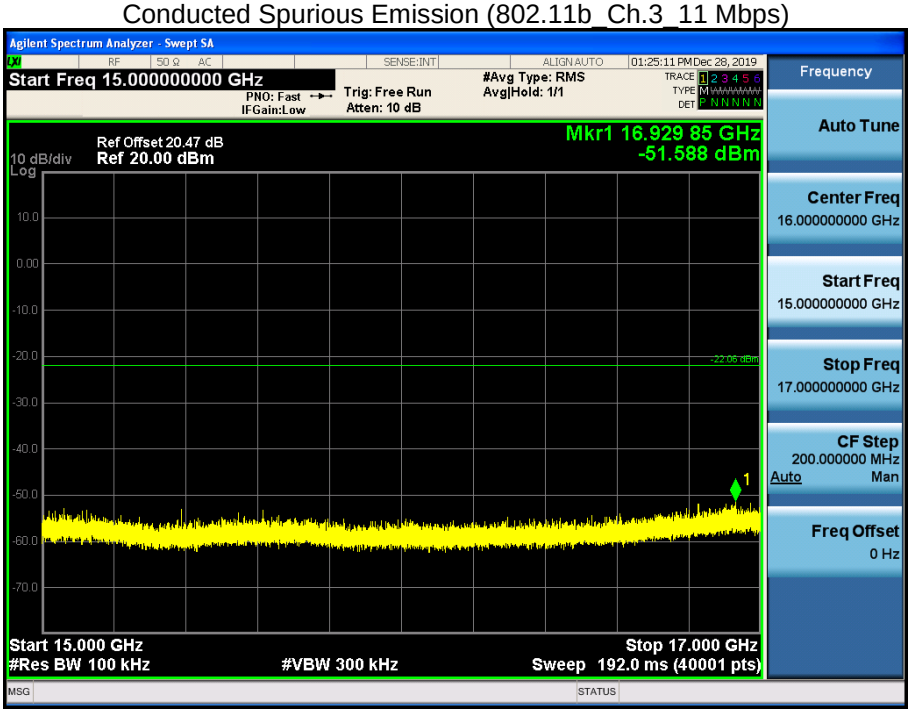
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



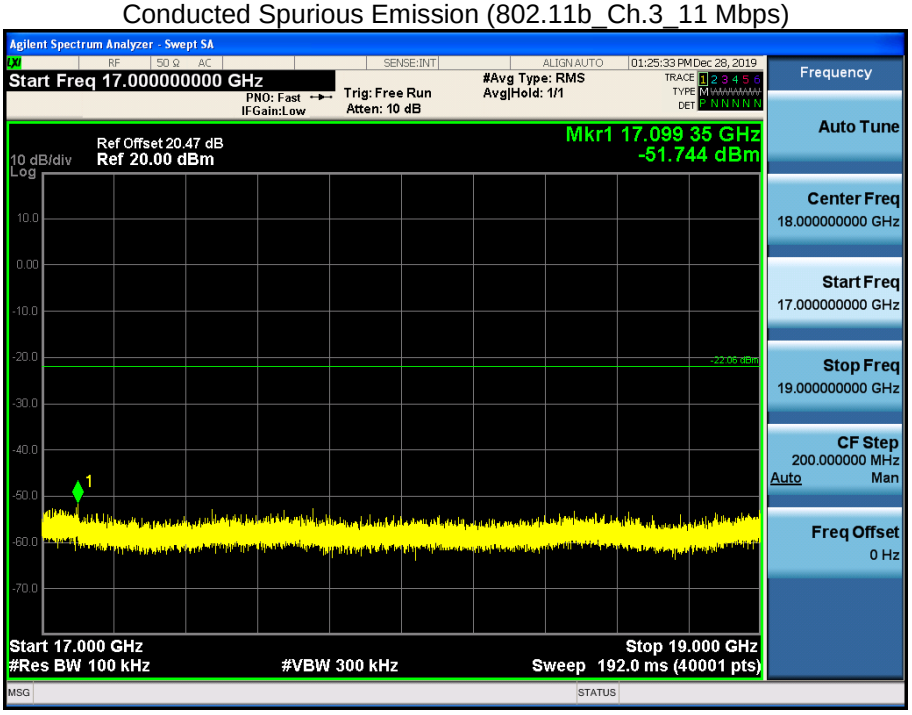
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



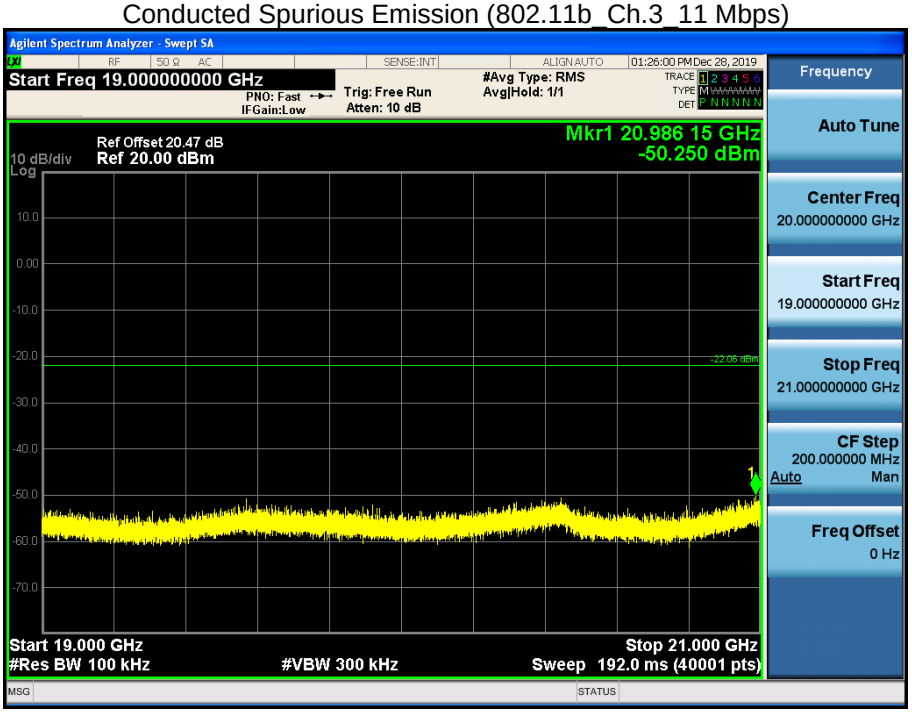
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



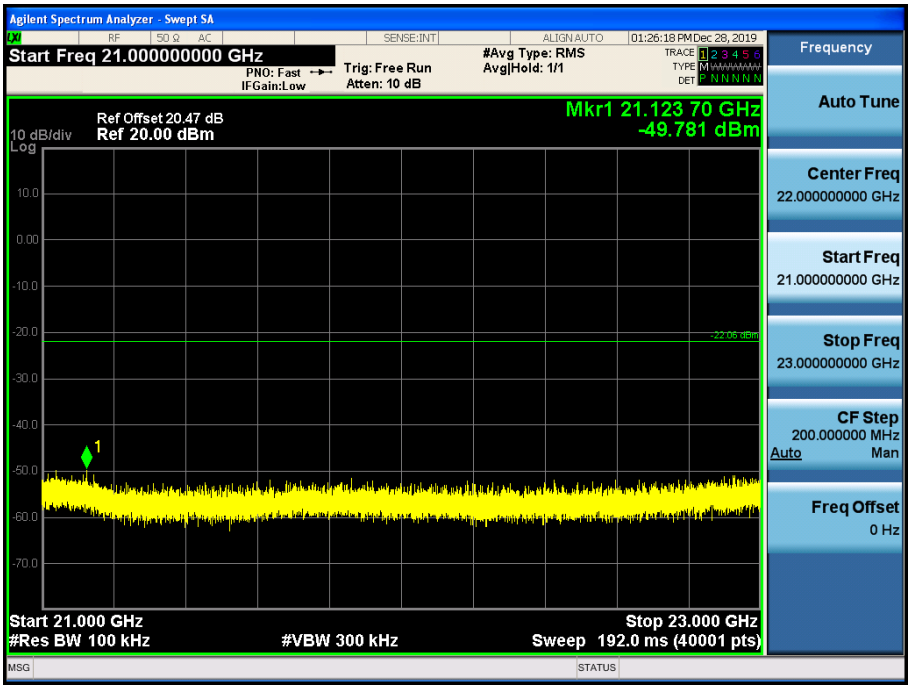
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



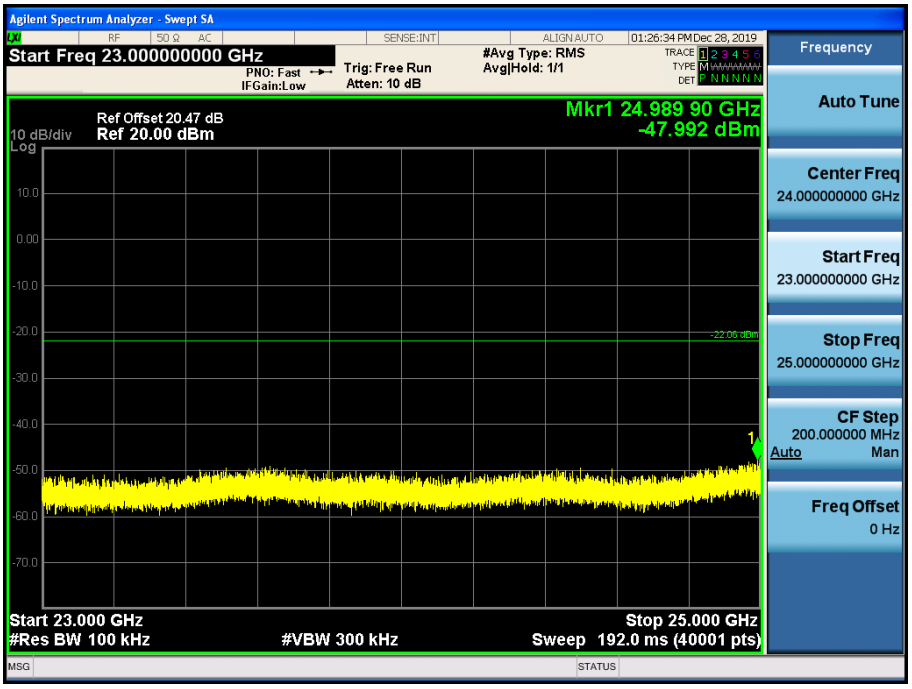
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



23 GHz ~ 25 GHz

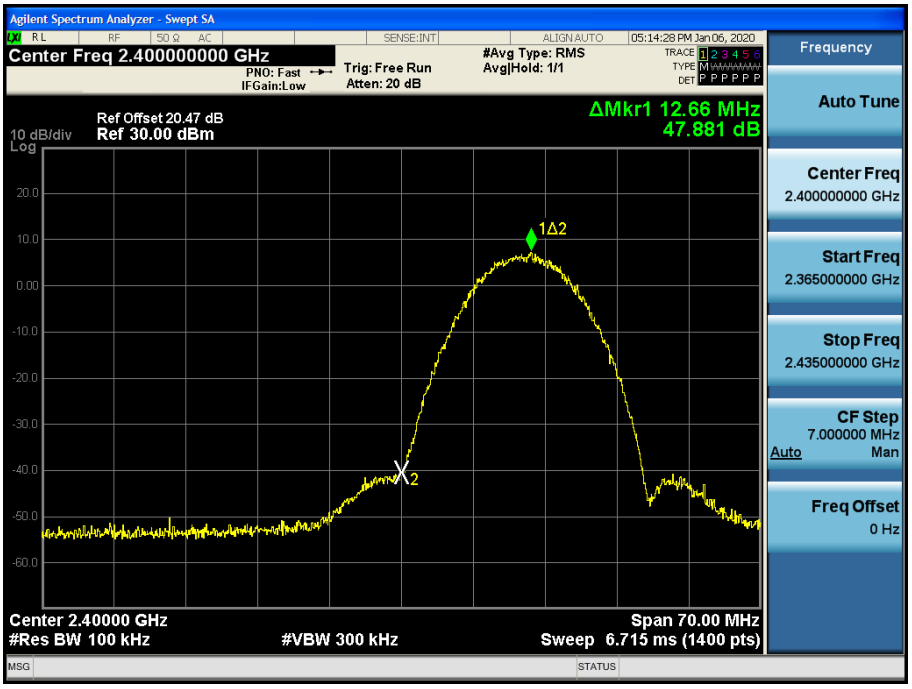
Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



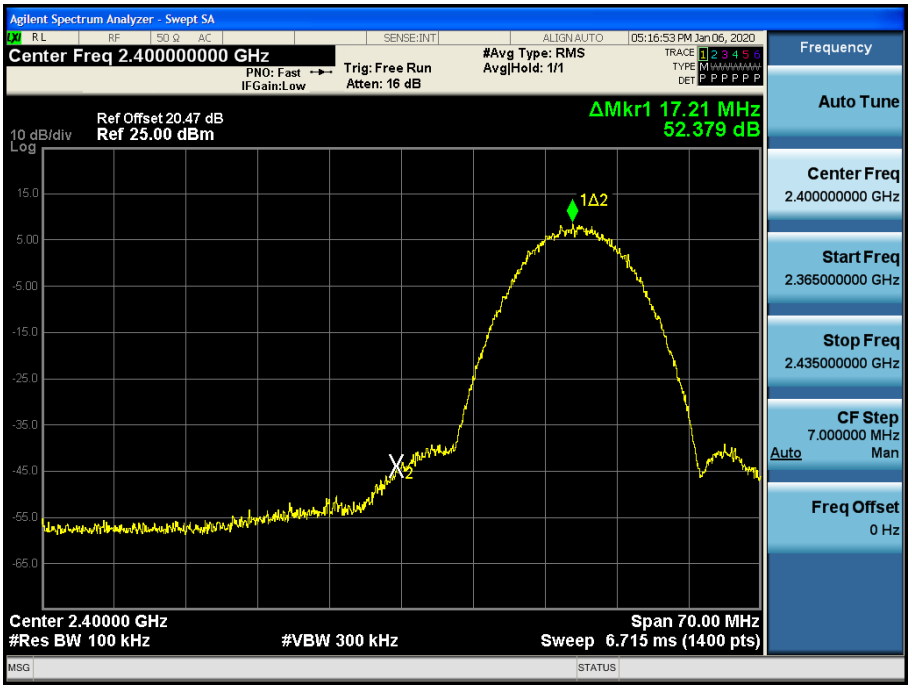
[ANT2]

▣ Test Plots(BandEdge)

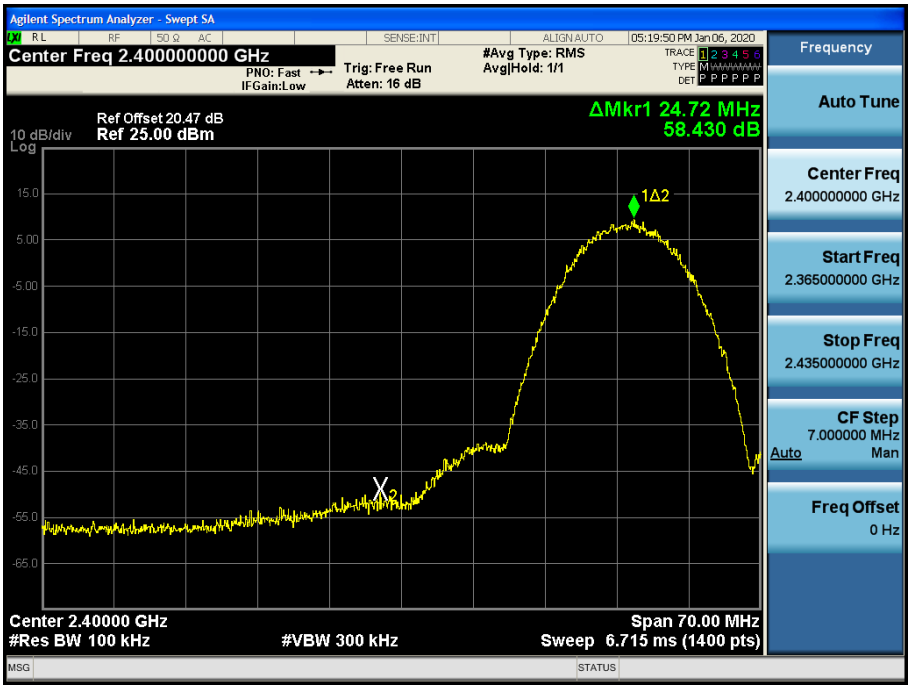
Band Edge (802.11b-CH1)



Band Edge (802.11b-CH2)



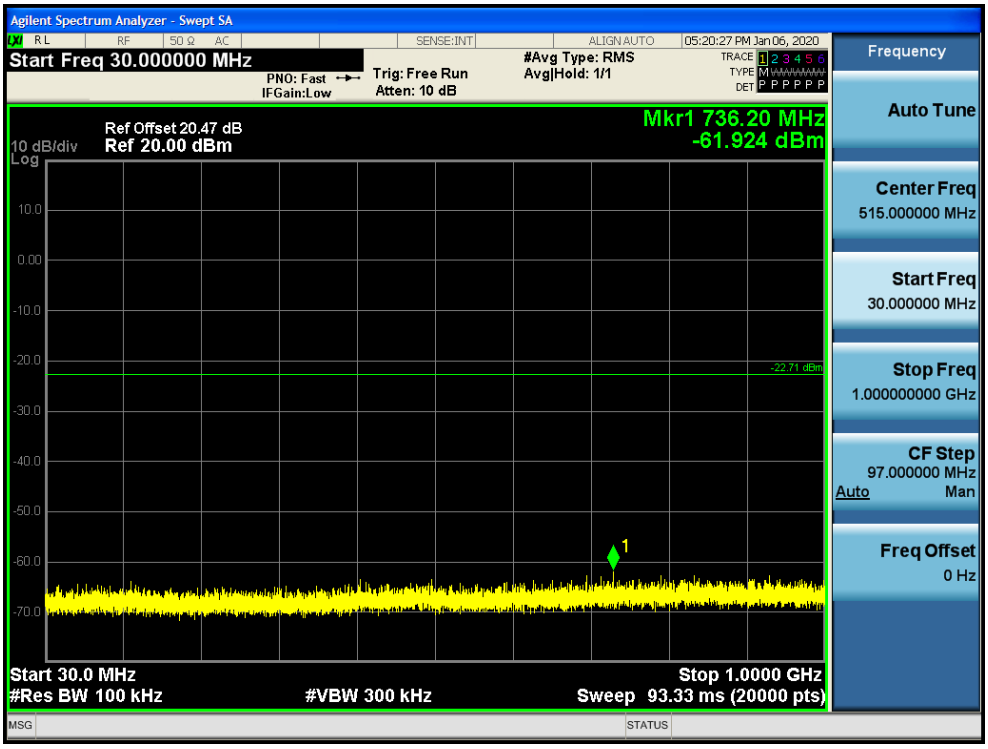
Band Edge (802.11b-CH3)



▣ Test Plots(Conducted Spurious Emission)

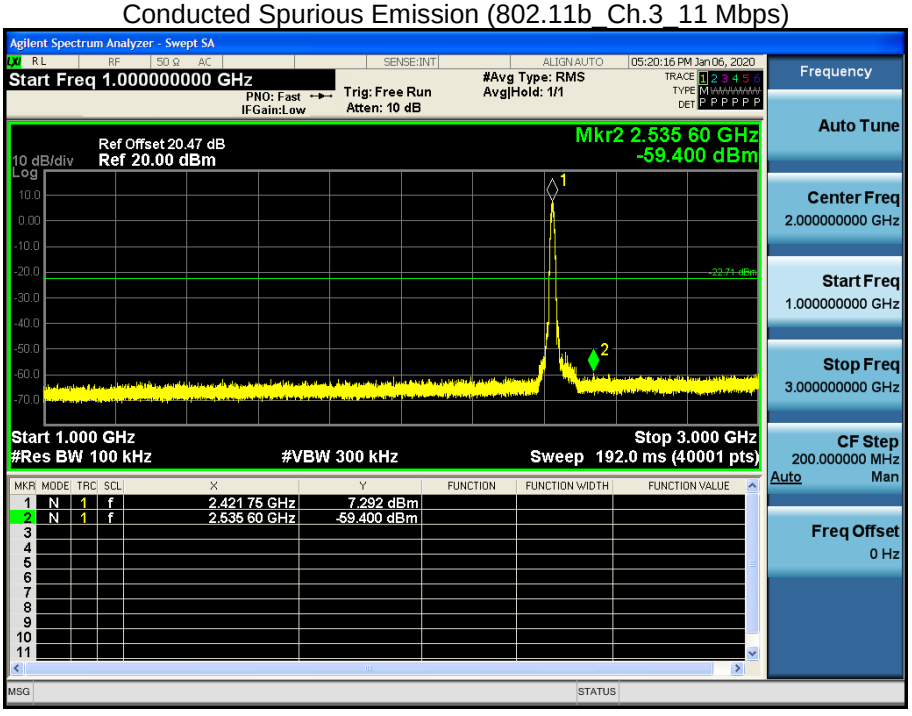
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



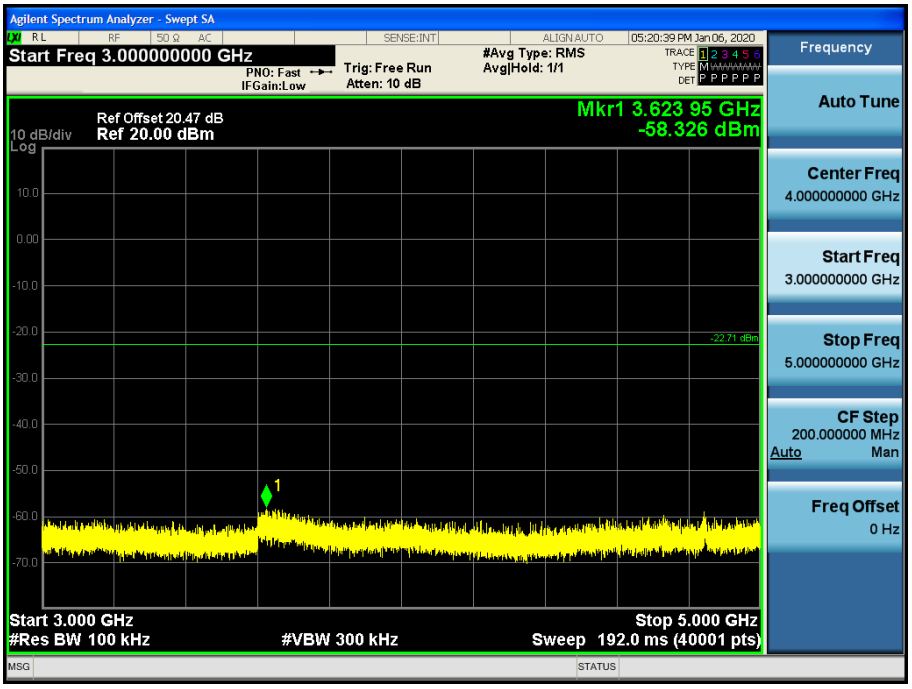
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



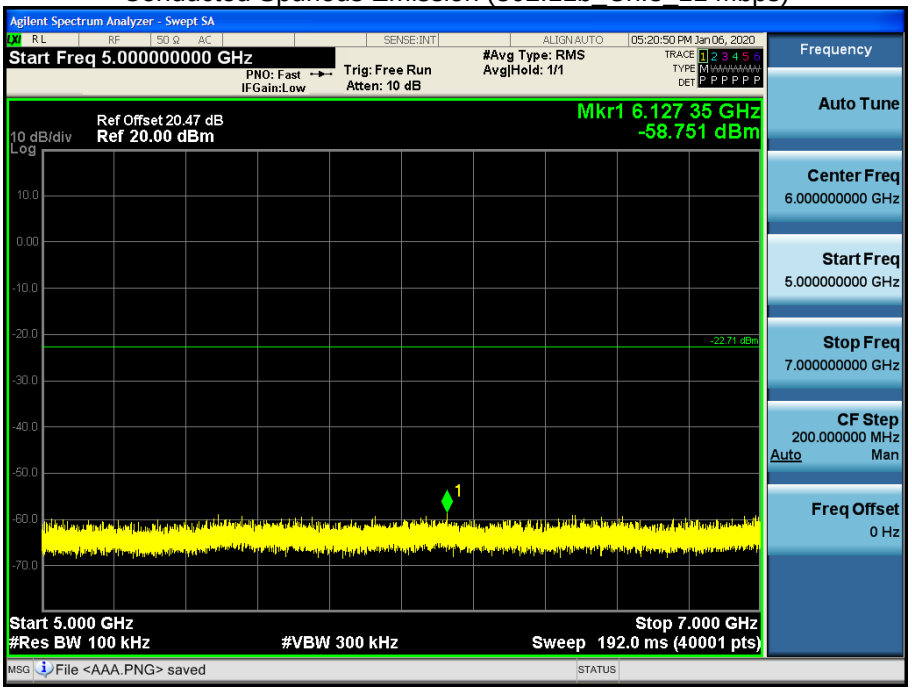
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



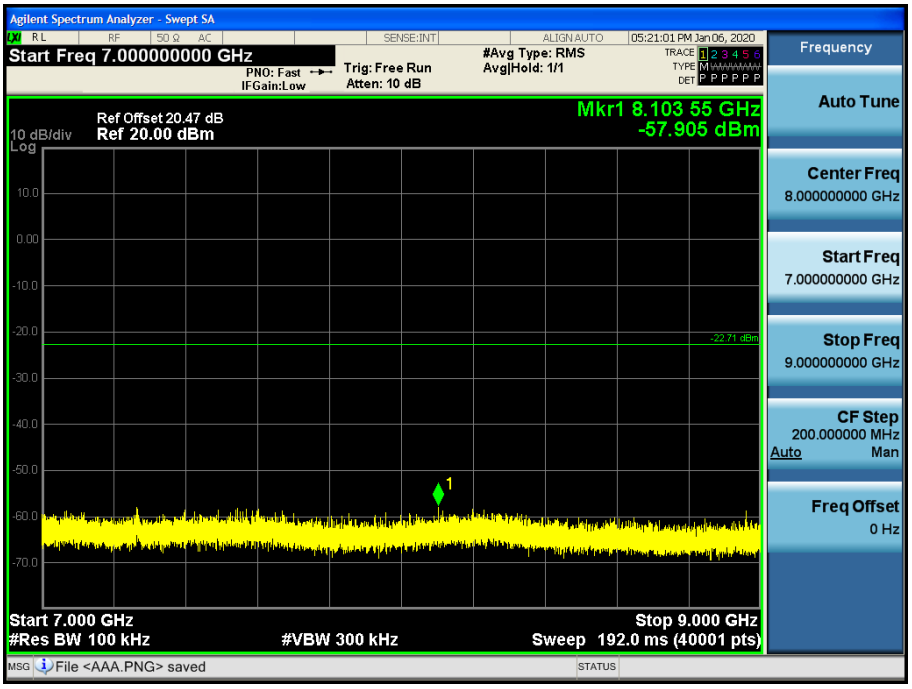
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



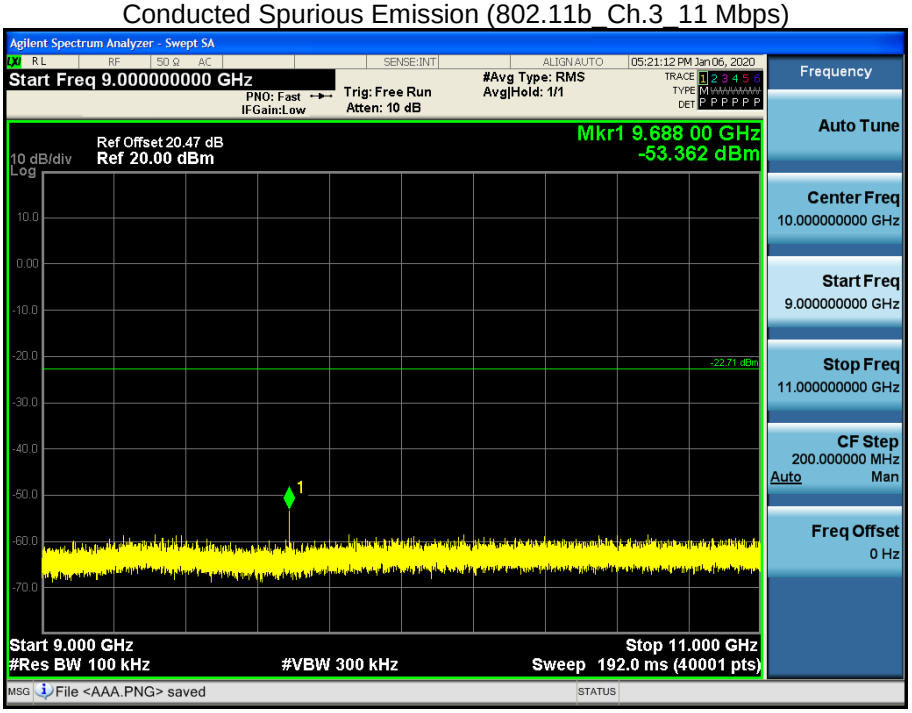
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



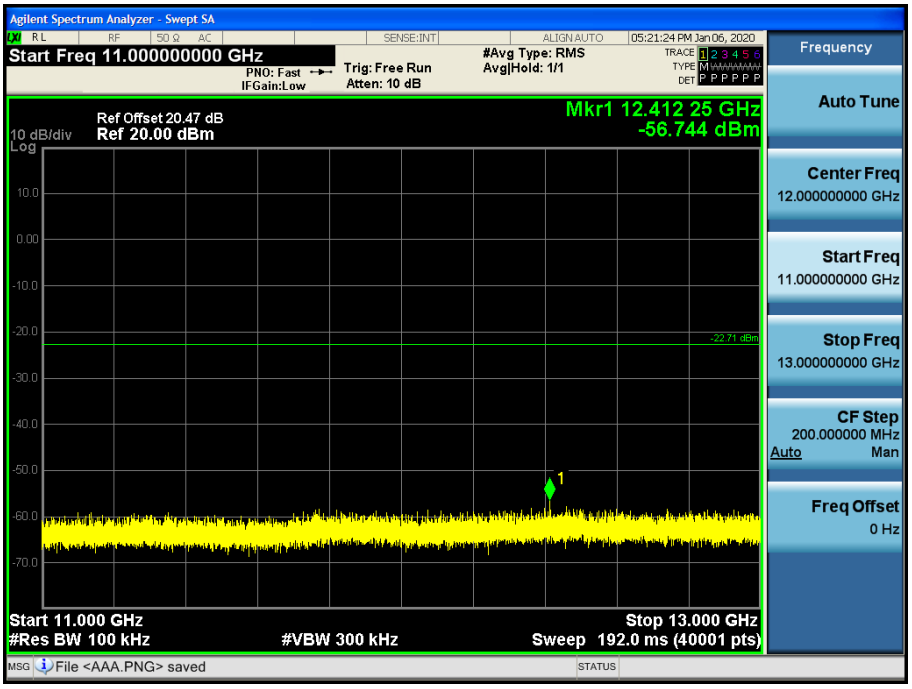
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



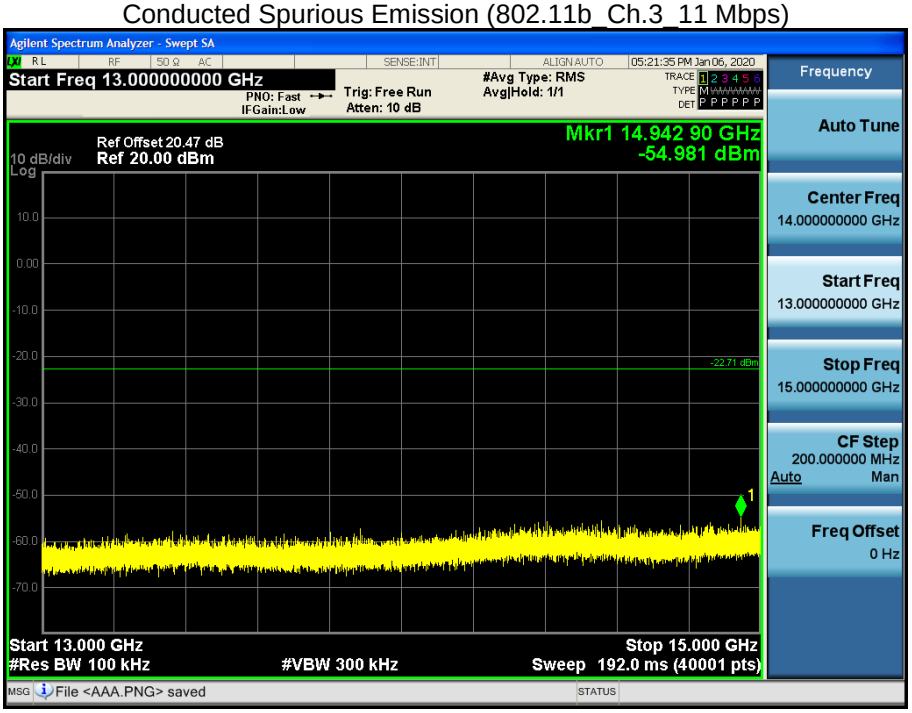
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



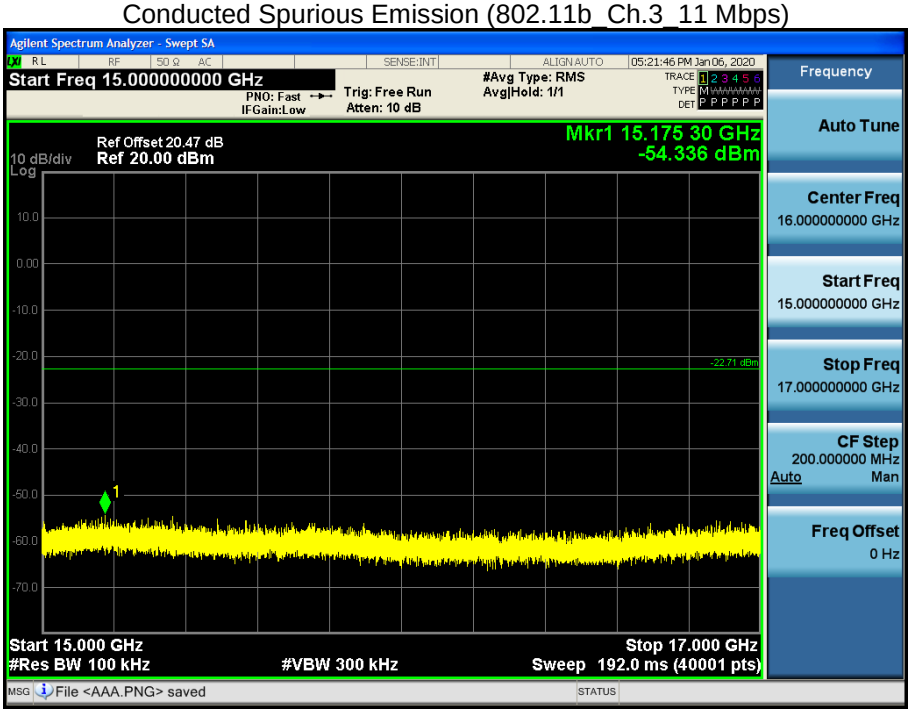
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



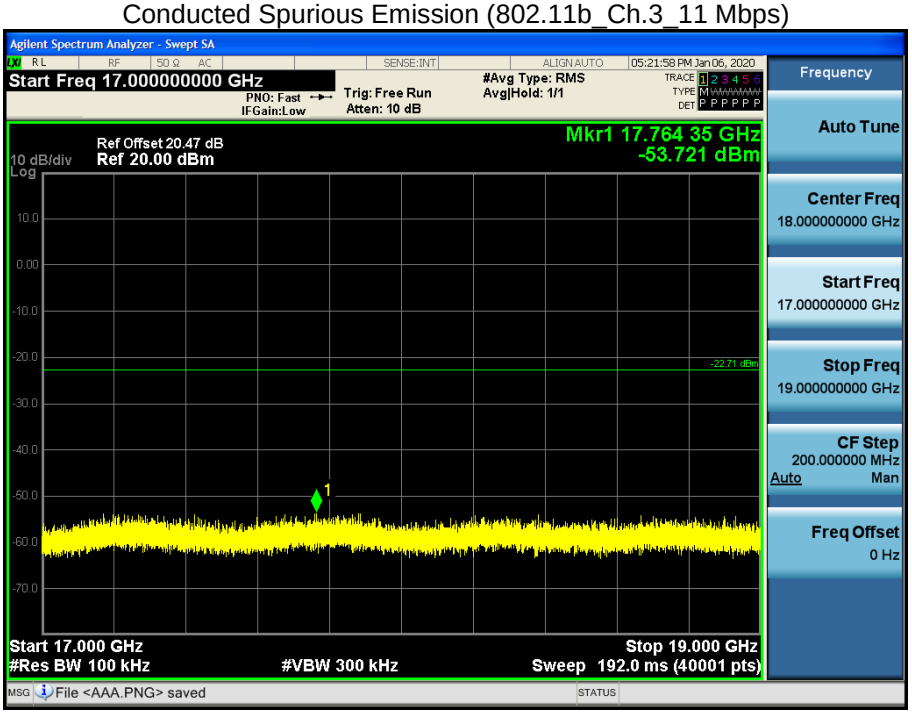
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



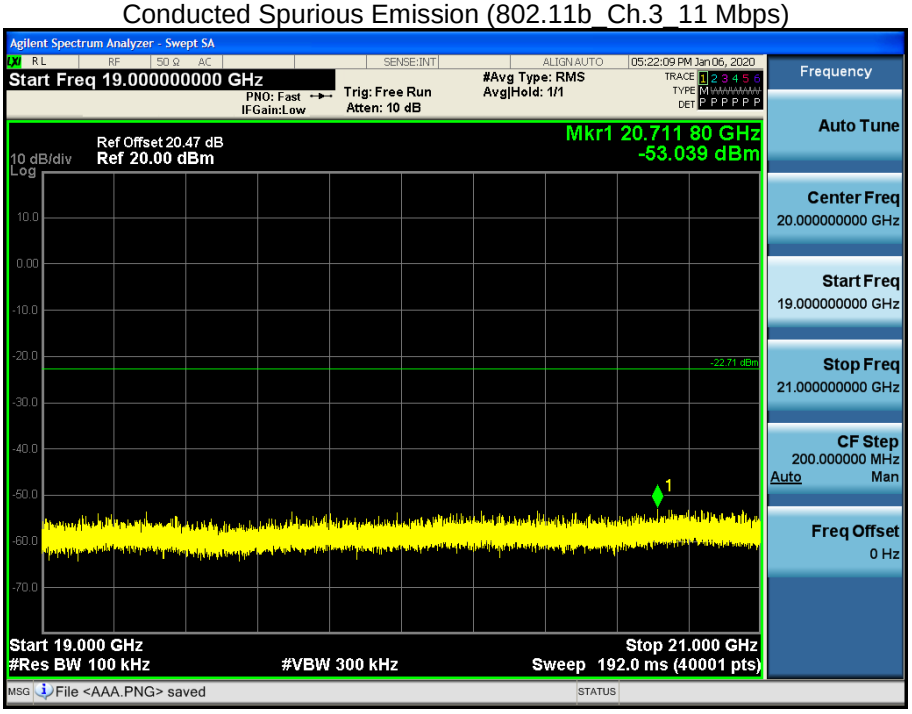
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



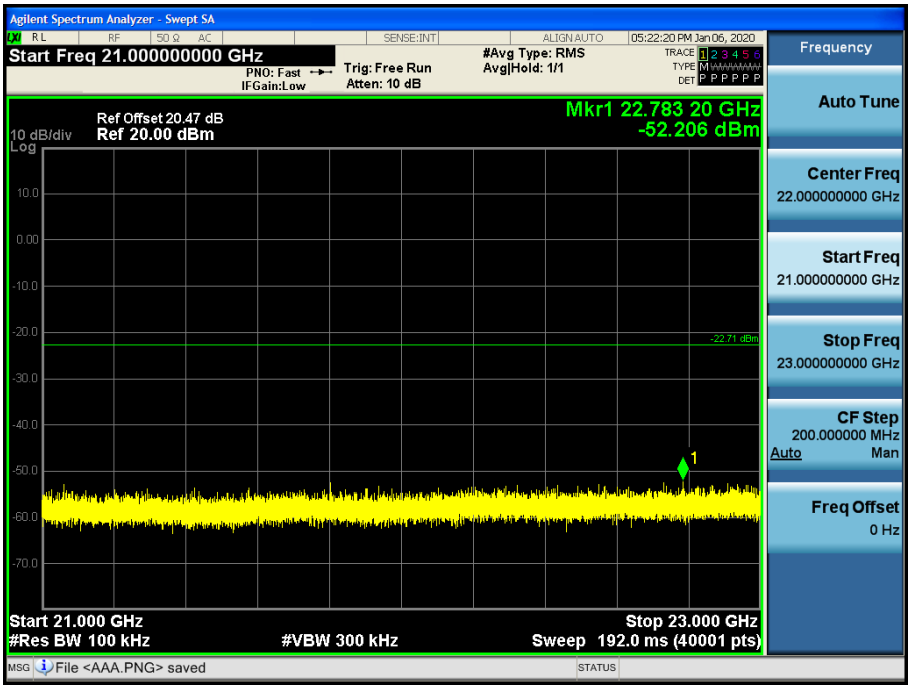
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



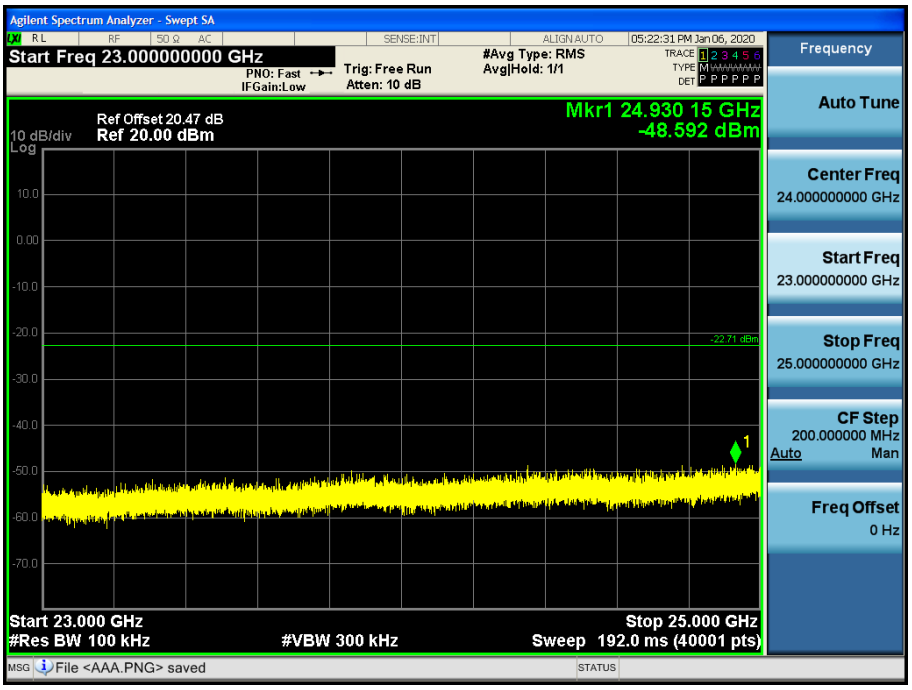
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11b_Ch.3_11 Mbps)



9.7 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

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

Note:

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

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.

[ANT1_SISO]

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	54.51	1.95	H	56.46	73.98	17.52	PK
4824	47.62	1.95	H	49.57	53.98	4.41	AV
7236	50.90	9.86	H	60.76	73.98	13.22	PK
7236	38.34	9.86	H	48.20	53.98	5.78	AV

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2417
Channel No.	02 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
4834	55.14	1.82	H	56.96	73.98	17.02	PK
4834	48.55	1.82	H	50.37	53.98	3.61	AV
7251	49.81	9.80	H	59.61	73.98	14.37	PK
7251	37.80	9.80	H	47.60	53.98	6.38	AV

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2422
Channel No.	03 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
4844	55.61	1.82	H	57.43	73.98	16.55	PK
4844	48.99	1.82	H	50.81	53.98	3.17	AV
7266	50.08	10.10	H	60.18	73.98	13.80	PK
7266	37.53	10.10	H	47.63	53.98	6.35	AV

[ANT2_SISO]

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	51.57	1.95	V	53.52	73.98	20.46	PK
4824	39.89	1.95	V	41.84	53.98	12.14	AV
7236	50.89	9.86	V	60.75	73.98	13.23	PK
7236	38.28	9.86	V	48.14	53.98	5.84	AV

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2417
Channel No.	02 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
4834	51.19	1.82	V	53.01	73.98	20.97	PK
4834	40.23	1.82	V	42.05	53.98	11.93	AV
7251	50.54	9.80	V	60.34	73.98	13.64	PK
7251	38.05	9.80	V	47.85	53.98	6.13	AV

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2422
Channel No.	03 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
4844	51.79	1.82	V	53.61	73.98	20.37	PK
4844	40.47	1.82	V	42.29	53.98	11.69	AV
7266	49.96	10.10	V	60.06	73.98	13.92	PK
7266	37.76	10.10	V	47.86	53.98	6.12	AV

[DBS Mode 2.4 GHz & 5GHz]

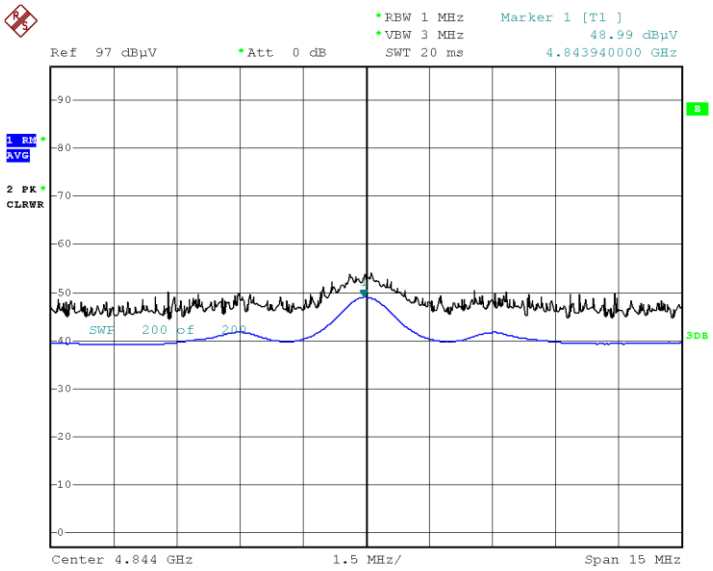
Operation Mode:	802.11b & 802.11a
Transfer Rate:	1 Mbps & 6 Mbps
Operating Frequency	2412 & 5825
Channel No.	01 Ch & 165 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	54.01	1.95	H	55.96	73.98	18.02	PK
4824	47.09	1.95	H	49.04	53.98	4.94	AV
7236	51.12	9.86	H	60.98	73.98	13.00	PK
7236	38.34	9.86	H	48.20	53.98	5.78	AV

[ANT1_SISO]

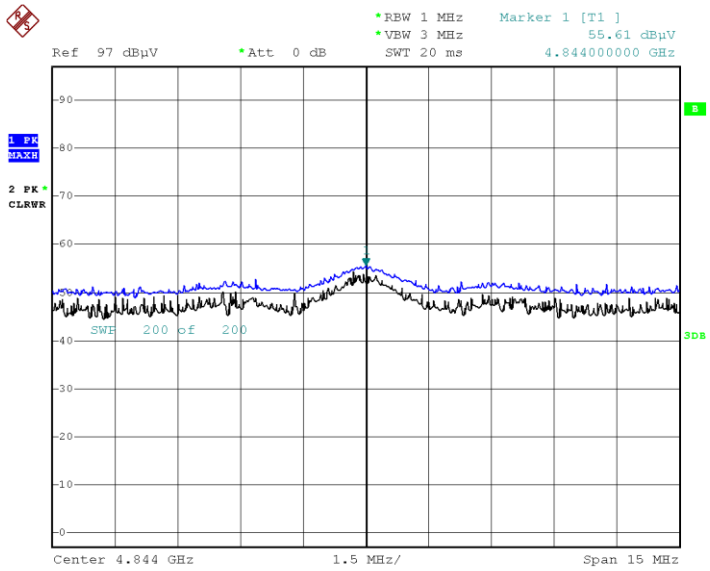
▣ Test Plots (Worst case : Y-H)

Radiated Spurious Emissions plot – Average Reading (802.11b_1Mbps, Ch.3 2nd Harmonic)



Date: 2.JAN.2020 10:26:39

Radiated Spurious Emissions plot – Peak Reading (802.11b_1Mbps, Ch.3 2nd Harmonic)

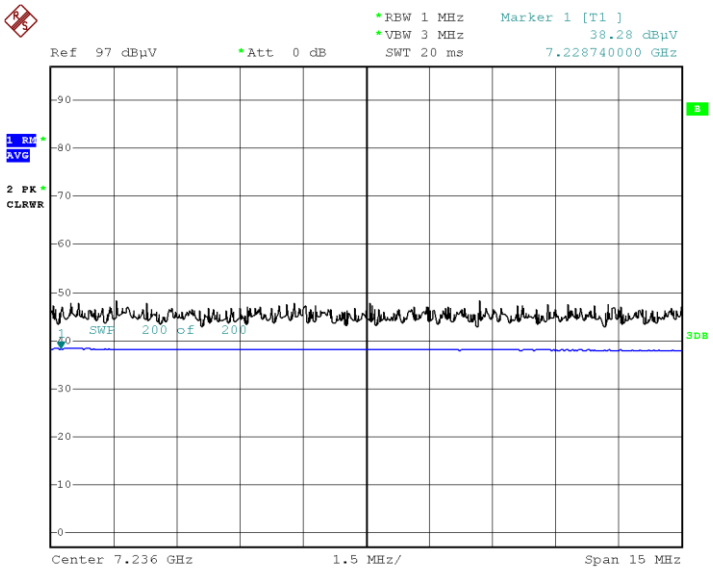


Date: 2.JAN.2020 10:28:18

[ANT2_SISO]

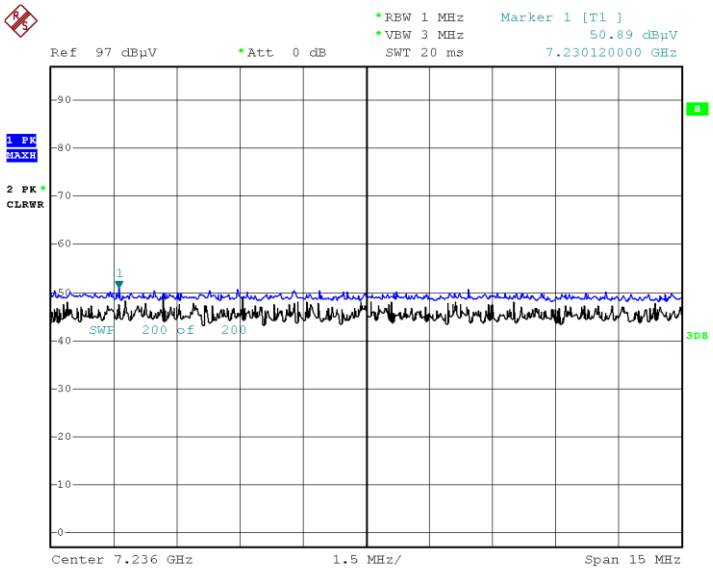
▣ Test Plots (Worst case : X-V)

Radiated Spurious Emissions plot – Average Reading (802.11b_1Mbps, Ch.1 3rd Harmonic)



Date: 5.JAN.2020 14:54:42

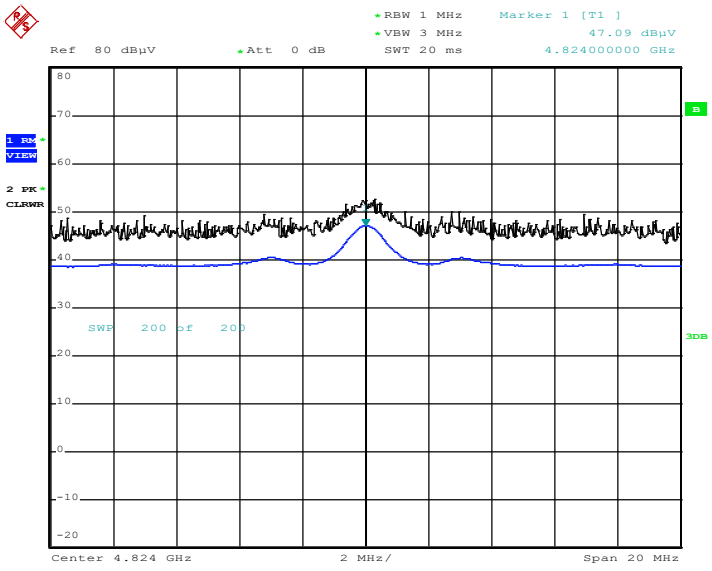
Radiated Spurious Emissions plot – Peak Reading (802.11b_1Mbps, Ch.1 3rd Harmonic)



Date: 5.JAN.2020 15:12:29

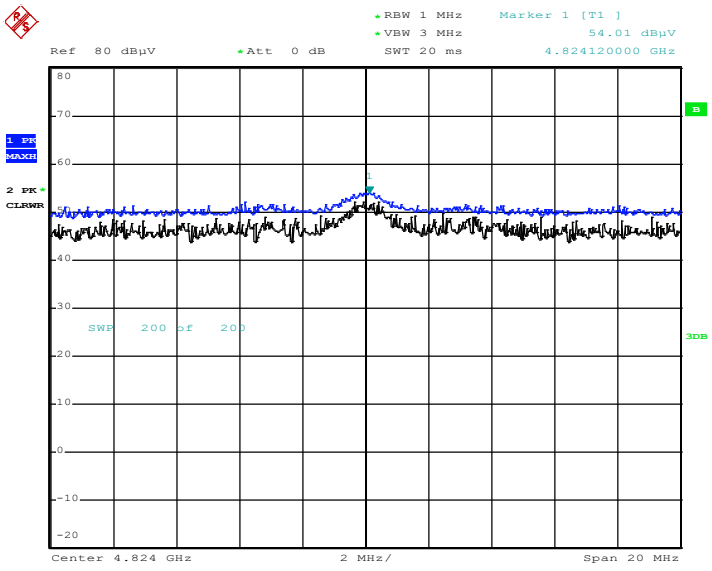
[DBS Mode 2.4 GHz & 5GHz_Y-H]

Radiated Spurious Emissions plot – Average Reading (802.11b & 802.11a_ 1 Mbps & 6 Mbps, 1 Ch & 165 Ch, 2nd Harmonic)



Date: 23.DEC.2019 16:00:41

Radiated Spurious Emissions plot – Peak Reading (802.11b & 802.11a_ 1 Mbps & 6 Mbps, 1 Ch & 165 Ch, 2nd Harmonic)



Date: 23.DEC.2019 15:19:34

Note:

Plot of worst case are only reported.

9.8 RADIATED RESTRICTED BAND EDGES

[ANT1_SISO]

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2412 MHz ,2417 MHz, 2422 MHz
Channel No.	1 Ch, 2 Ch, 3 Ch

Channel No	Frequency [MHz]	Reading [dBuV]	A.F.+C.L.+D.F. -A.G+ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
1	2390.0	54.40	0.85	H	55.25	73.98	18.73	PK
	2390.0	42.78	0.85	H	43.63	53.98	10.35	AV
	2390.0	53.81	0.85	V	54.66	73.98	19.32	PK
	2390.0	42.29	0.85	V	43.14	53.98	10.84	AV
2	2390.0	54.74	0.85	H	55.59	73.98	18.39	PK
	2390.0	42.70	0.85	H	43.55	53.98	10.43	AV
	2390.0	54.26	0.85	V	55.11	73.98	18.87	PK
	2390.0	42.12	0.85	V	42.97	53.98	11.01	AV
3	2390.0	54.04	0.85	H	54.89	73.98	19.09	PK
	2390.0	42.65	0.85	H	43.50	53.98	10.48	AV
	2390.0	53.77	0.85	V	54.62	73.98	19.36	PK
	2390.0	42.05	0.85	V	42.90	53.98	11.08	AV

[ANT2_SISO]

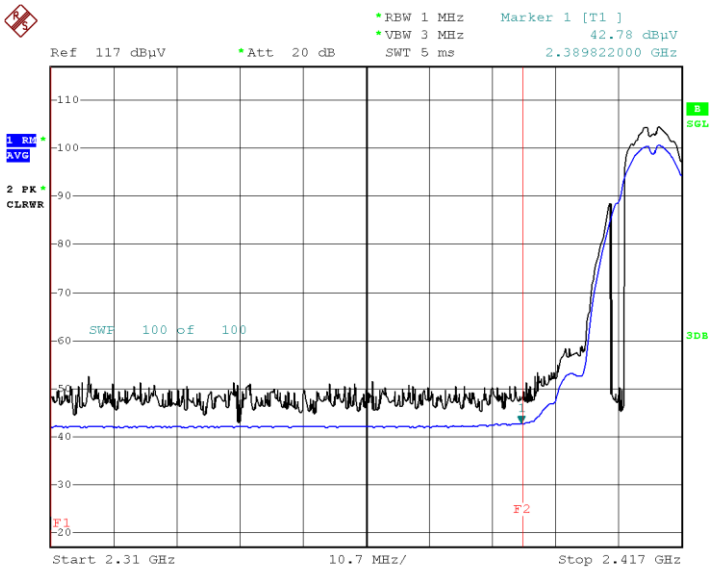
Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2412 MHz ,2417 MHz, 2422 MHz
Channel No.	1 Ch, 2 Ch, 3 Ch

Channel No	Frequency [MHz]	Reading [dBuV]	A.F.+C.L.+D.F. -A.G+ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
1	2390.0	55.10	0.85	H	55.95	73.98	18.03	PK
	2390.0	42.25	0.85	H	43.10	53.98	10.88	AV
	2390.0	54.68	0.85	V	55.53	73.98	18.45	PK
	2390.0	42.16	0.85	V	43.01	53.98	10.97	AV
2	2390.0	54.67	0.85	H	55.52	73.98	18.46	PK
	2390.0	42.24	0.85	H	43.09	53.98	10.89	AV
	2390.0	54.11	0.85	V	54.96	73.98	19.02	PK
	2390.0	42.11	0.85	V	42.96	53.98	11.02	AV
3	2390.0	54.88	0.85	H	55.73	73.98	18.25	PK
	2390.0	42.17	0.85	H	43.02	53.98	10.96	AV
	2390.0	54.51	0.85	V	55.36	73.98	18.62	PK
	2390.0	42.15	0.85	V	43.00	53.98	10.98	AV

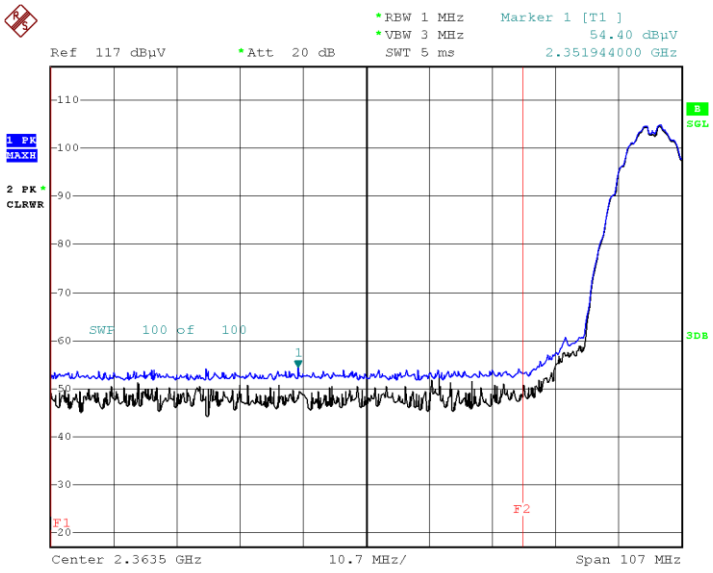
[ANT1_SISO]

▣ Test Plots (Worst case : X-H)

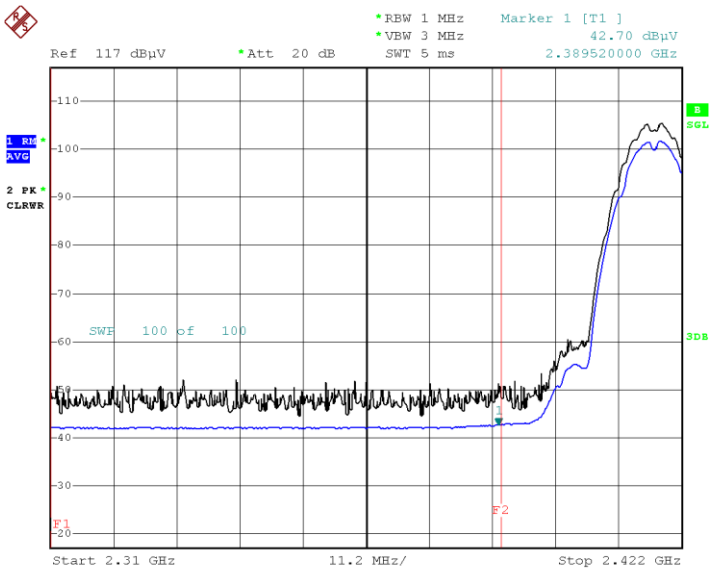
Radiated Restricted Band Edges plot – Average Reading (802.11b_1Mbps Ch.1)



Radiated Restricted Band Edges plot – Peak Reading (802.11b_1Mbps Ch.1)

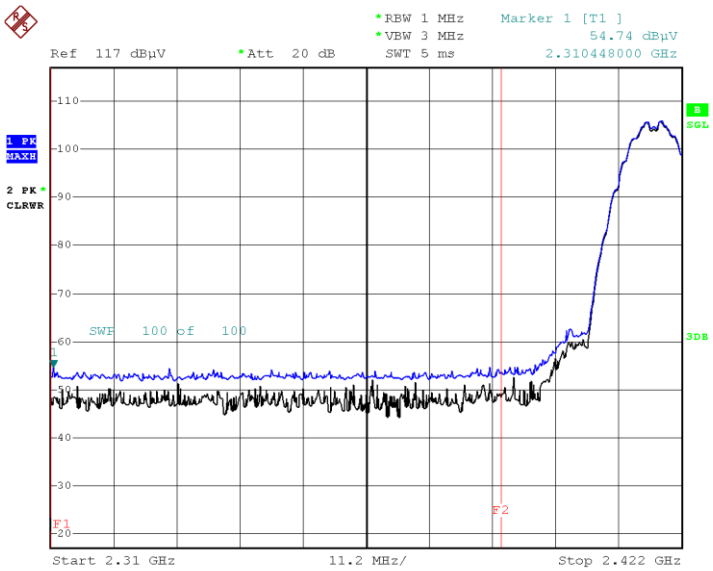


Radiated Restricted Band Edges plot – Average Reading (802.11b_1Mbps Ch.2)



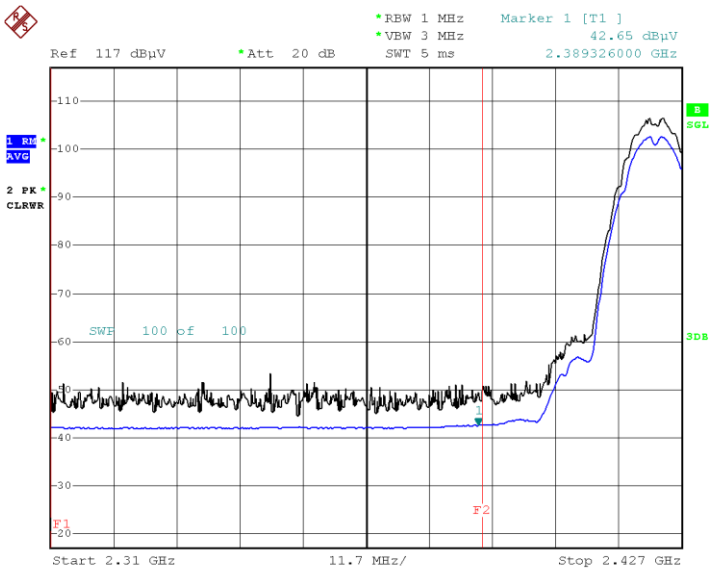
Date: 29.DEC.2019 10:40:46

Radiated Restricted Band Edges plot – Peak Reading (802.11b_1Mbps Ch.2)



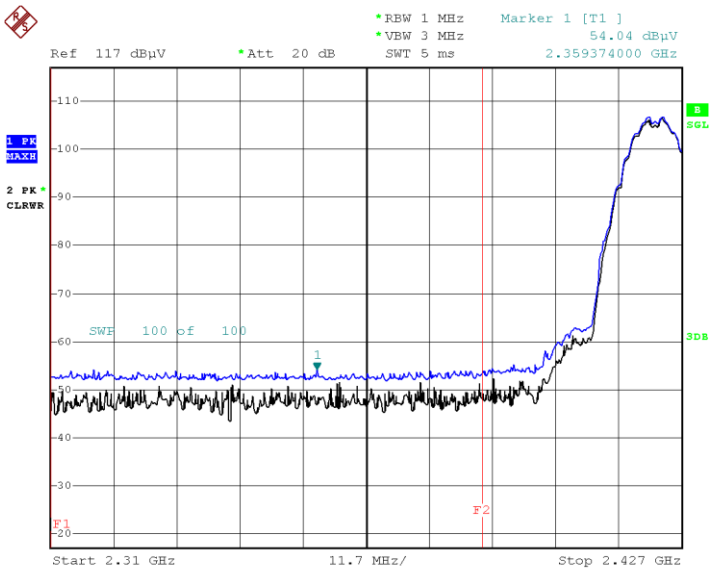
Date: 29.DEC.2019 10:41:48

Radiated Restricted Band Edges plot – Average Reading (802.11b_1Mbps Ch.3)



Date: 29.DEC.2019 10:44:26

Radiated Restricted Band Edges plot – Peak Reading (802.11b_1Mbps Ch.3)

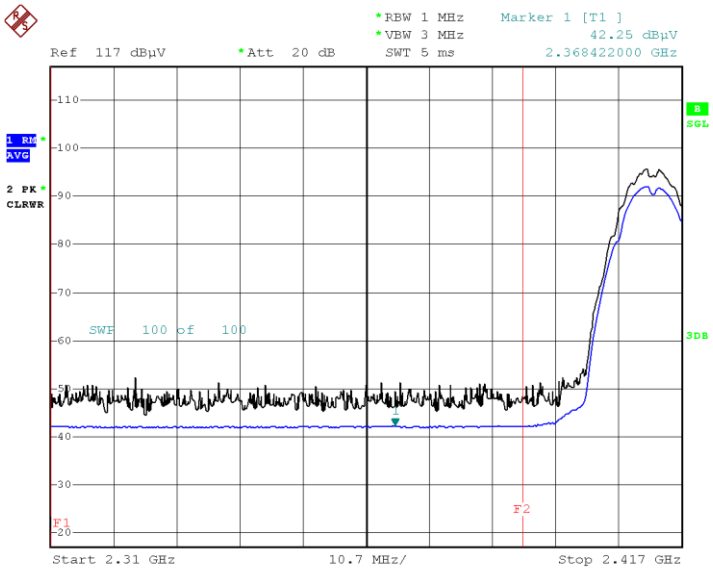


Date: 29.DEC.2019 10:45:30

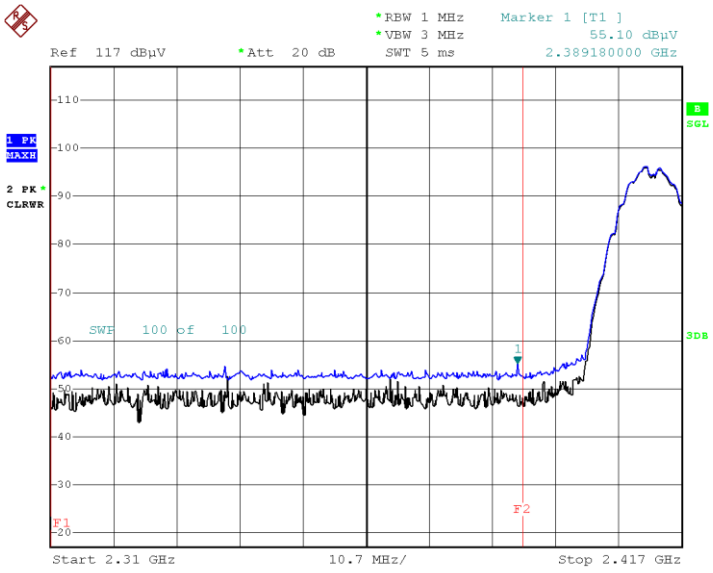
[ANT2_SISO]

▣ Test Plots (Worst case : Z-H)

Radiated Restricted Band Edges plot – Average Reading (802.11b_1Mbps Ch.1)



Radiated Restricted Band Edges plot – Peak Reading (802.11b_1Mbps Ch.1)



Note:

Plot of worst case are only reported.

10. LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/11/2019	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/18/2019	Annual	100584
ESPAC	SU-642 /Temperature Chamber	03/12/2019	Annual	0093008124
Agilent	N9020A / Signal Analyzer	05/23/2019	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	01/10/2019	Annual	MY49431210
Agilent	N1911A / Power Meter	04/10/2019	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/10/2019	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/11/2019	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	05/24/2019	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/18/2019	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	07/02/2019	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A
Rohde & Schwarz	CBT / Bluetooth Tester	05/16/2019	Annual	100422

Note:

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

Radiated Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	04/26/2019	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	08/31/2018	Biennial	00895
Schwarzbeck	VULB 9160 / Hybrid Antenna	08/09/2018	Annual	3368
Schwarzbeck	BBHA 9120D / Horn Antenna	06/28/2019	Biennial	1300
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	11/29/2019	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 40 GHz) / Spectrum Analyzer	07/16/2019	Annual	100843
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	12/26/2019	Annual	F6
Wainwright Instruments	WHFX7.0/18G-8SS / High Pass Filter	05/03/2019	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/19/2019	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	02/15/2019	Annual	1
Api tech.	18B-03 / Attenuator (3 dB)	06/04/2019	Annual	1
H+S	5910-N-50-010 / Attenuator(10 dB)	10/29/2019	Annual	801
CERNEX	CBLU1183540B-01 / Power Amplifier	12/20/2019	Annual	25540
CERNEX	CBL06185030 / Power Amplifier	03/26/2019	Annual	28550
CERNEX	CBL18265035 / Power Amplifier	01/03/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/18/2019	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/26/2019	Annual	3000C000276

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
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-2001-FC007-P