

# FCC DTS REPORT

## Certification

**Applicant Name:**  
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**Date of Issue:**  
December 06, 2018

**Test Site/Location:**  
HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

**Report No.:** HCT-RF-1811-FC034-R2

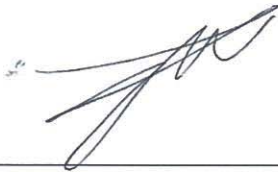
<b>FCC ID:</b>	<b>A3LSMA920N</b>
<b>APPLICANT:</b>	<b>SAMSUNG Electronics Co., Ltd.</b>

**Model:** SM-A920N  
**EUT Type:** Smart Phone  
**Max. Average Output Power:** 802.11b : 18.311 dBm  
802.11g : 19.076 dBm  
802.11n(HT20) : 18.847 dBm  
**Frequency Range:** 2412 MHz - 2462 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.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S. C.853(a)



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**Approved by : Jong Seok Lee**  
**Manager of Telecommunication testing center**

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## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1811-FC034	November 27, 2018	- First Approval Report
HCT-RF-1811-FC034-R1	December 03, 2018	- Revised the test procedure on page 10 - Added the test plot of duty cycle
HCT-RF-1811-FC034-R2	December 06, 2018	- Added the note on page 43

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# 1. EUT DESCRIPTION

## EUT DESCRIPTION

Model	SM-A920N		
EUT Type	Smart Phone		
Power Supply	DC 3.85 V		
Battery Information	Model: EB-BA920ABU Type: Li-ion battery		
Travel Adapter Information	Model: EP-TA20KWK Manufacture: SOLUM		
Frequency Range	2412 MHz - 2462 MHz		
Max. RF Output Power	<b>Peak Power</b>	Ant. 1 (SISO)	802.11b : 21.09 dBm 802.11g : 23.68 dBm 802.11n(HT20) : 24.61 dBm
		Ant.2 (SISO)	802.11b : 15.43 dBm 802.11g : 23.53 dBm 802.11n(HT20) : 23.77 dBm
		Ant.1&2 (MIMO)	802.11g : 26.615 dBm 802.11n(HT20) : 27.206 dBm
	<b>Average Power</b>	Ant. 1 (SISO)	802.11b : 18.311 dBm 802.11g : 16.377 dBm 802.11n(HT20) : 16.240 dBm
		Ant.2 (SISO)	802.11b : 12.706 dBm 802.11g : 15.732 dBm 802.11n(HT20) : 15.783 dBm
		Ant.1&2 (MIMO)	802.11g : 19.076 dBm 802.11n(HT20) : 18.847 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n		
Number of Channels	11 Channels		
Antenna Specification	Antenna type: FPCB Peak Gain : -7.11 dBi(Ant1), -7.36 dBi(Ant2)		
Date(s) of Tests	November 06, 2018 ~ November 26, 2018		

## 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.

The data for these configurations is contained in the UNII test report.

## 2. TEST METHODOLOGY

FCC KDB 558074 D01 15.247 Meas Guidance v05 dated August 24, 2018 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 3.75 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

### **Conducted Antenna Terminal**

See Section from 8.3.(KDB 558074 v05)

## 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."

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

\* The E.U.T Complies with the requirement of §15.203

## 6. MEASUREMENT UNCERTAINTY

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

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

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

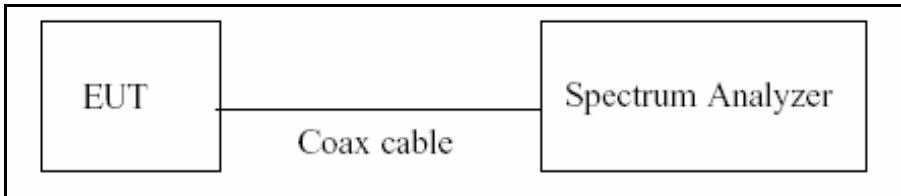
Parameter	Expanded Uncertainty ( $\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.71



## 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, 6.0)b) in KDB 558074 v05.

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  $> 50/T$ .

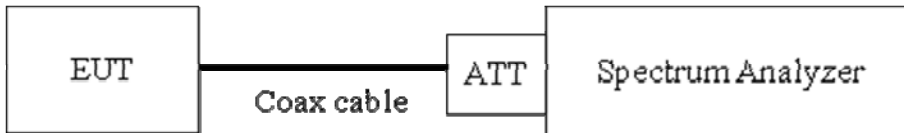
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ( $\geq$  RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep  $> 100$
6. Trace mode = Clear write
7. Measure  $T_{total}$  and  $T_{on}$
8. Calculate Duty Cycle =  $T_{on} / T_{total}$  and Duty Cycle Factor =  $10 \cdot \log(1/\text{Duty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

## 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 8.2 in KDB 558074 v05, Procedure 11.8.2 in ANSI 63.10-2013)

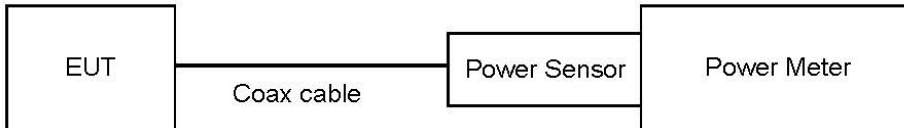
- 1) RBW = 100 kHz
- 2) VBW  $\geq 3 \times$  RBW
- 3) Detector = Peak
- 4) Trace mode = max hold
- 5) Sweep = auto couple
- 6) Allow the trace to stabilize
- 7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

### 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 8.3.1.3 in KDB 558074 v05, Procedure 11.9.1.3 in ANSI 63.10-2013)  
: Measure the peak power of the transmitter.
  
- Average Power (Procedure 8.3.2.3 in KDB 558074 v05, 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

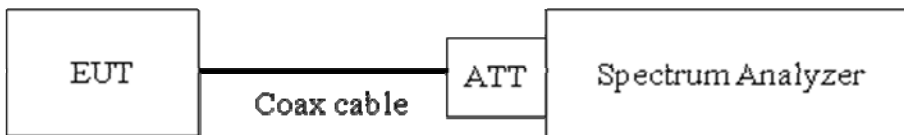
- Total Power (Peak) = Reading Value + ATT loss + Cable loss
- Total Power (Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

## 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 v05, Procedure 11.10.2 in ANSI 63.10-2013.

The spectrum analyzer is set to :

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Span = 1.5 times the DTS channel bandwidth.
- 3)  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- 4)  $\text{VBW} \geq 3 \times \text{RBW}$ .
- 5) Sweep = auto couple
- 6) Detector = peak
- 7) Trace Mode = max hold
- 8) Allow trace to fully stabilize.
- 9) 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

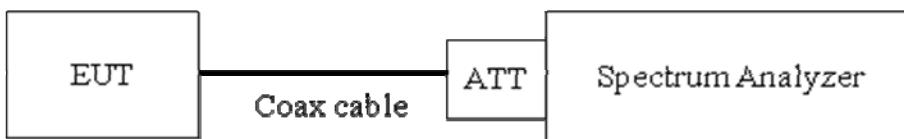
## 7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

### 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 8.5 in KDB 558074 v05, 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	11.4
100	9.93
200	10.29
300	10.23
400	10.33
500	10.35
600	10.42
700	10.45
800	10.45
900	10.44
1000	10.49
2000	10.74
2400*	10.75
2500*	10.77
3000	10.78
4000	10.99
5000	11.17
6000	11.16
7000	11.45
8000	11.42
9000	11.58
10000	11.66
11000	11.66
12000	11.78
13000	11.93
14000	12
15000	12.08
16000	12.14
17000	12.12
18000	12.18
19000	12.17
20000	12.24
21000	12.27
22000	12.41
23000	12.7
24000	12.44
25000	12.63
26000	12.12

Note : 1. '\*' is fundamental frequency range.  
 2. Factor = Attenuator loss + Cable loss

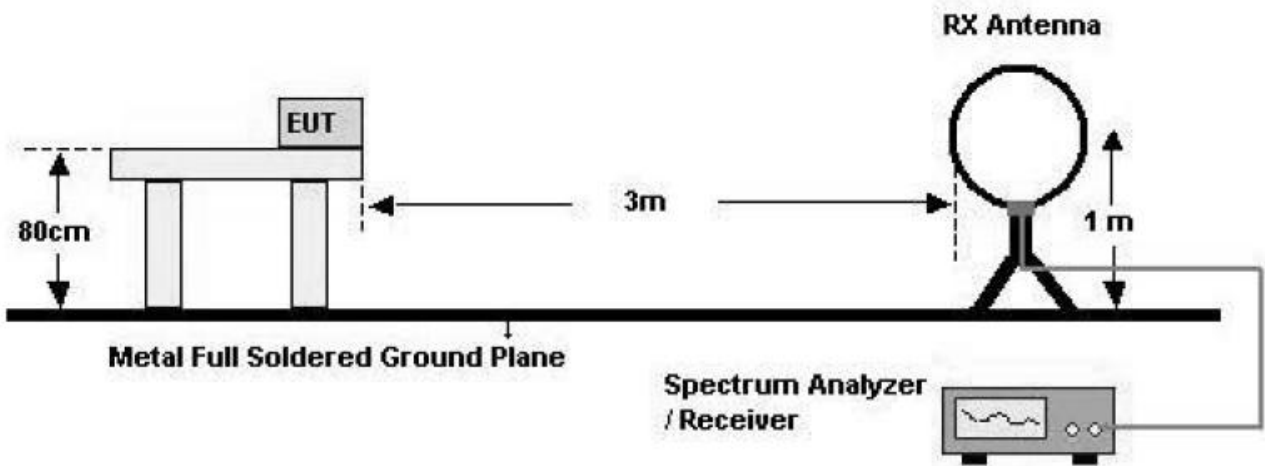
**7.6. Radiated Test**

Limit

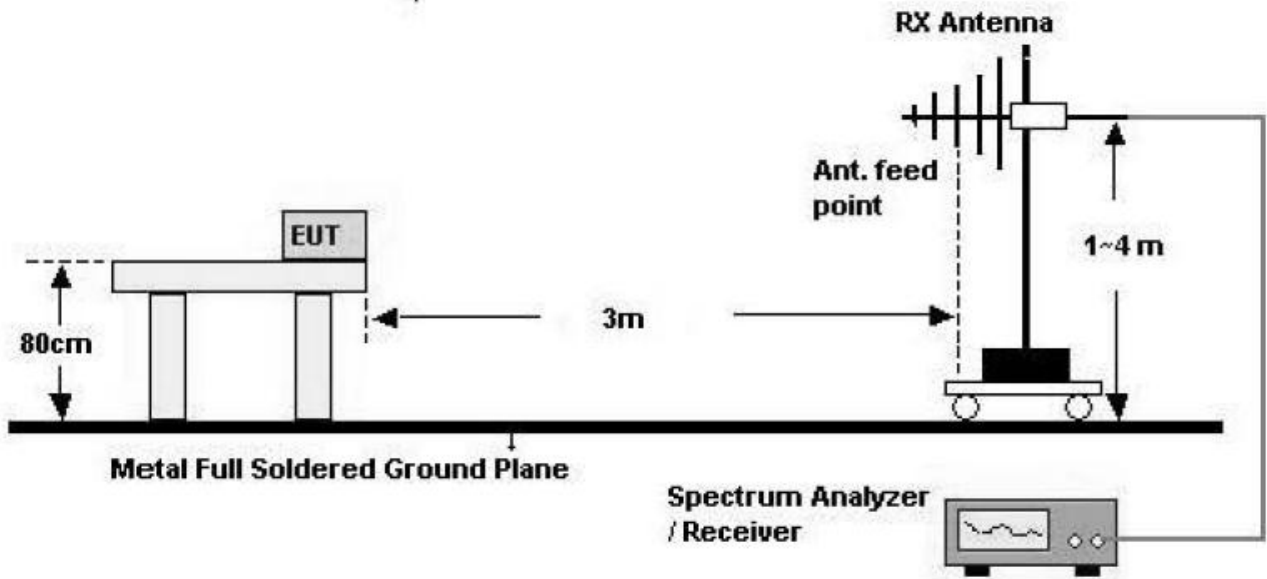
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

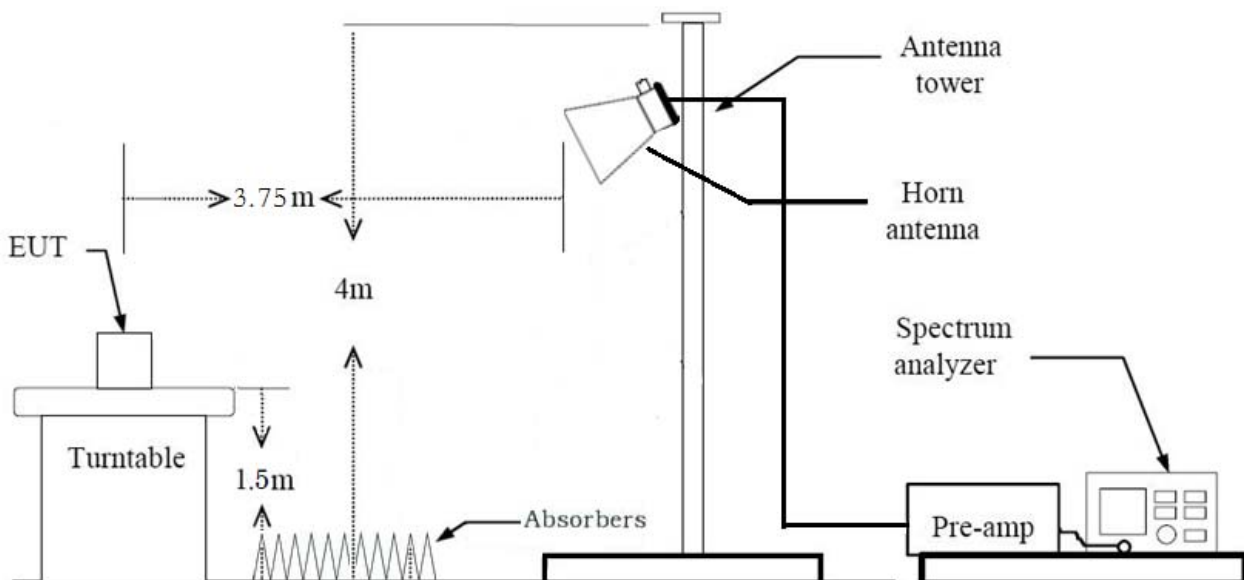
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz





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

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting (Method 8.6 in KDB 558074 v05, 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\*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\*RBW
    - Sweep time = auto.
    - Trace mode = average (at least 100 traces).

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

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \times$  RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

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  $\geq 98\%$ )

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

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

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

**Test Procedure of Radiated Restricted Band Edge**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq$  3\*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\*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  $\geq 3 \times$  RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

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)

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

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

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

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

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

**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*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

\*Decreases with the logarithm of the frequency.

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

**Test Configuration**

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

**Test Procedure**

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

**Sample Calculation**

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

## 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. All configurations of antenna were investigated and the worst case configuration results are reported.
  - Mode : Ant1(SISO), Ant2(SISO), Ant1+Ant2(SDM), Ant1+Ant2(CDD)
  - Worstcase : Ant1+Ant2(CDD)
3. EUT Axis
  - Radiated Spurious Emissions : X
  - Radiated Restricted Band Edge : X
4. Duty cycle factor applies only 802.11g/n(Duty cycle < 98%).
5. All datarate of operation were investigated and the worst case datarate results are reported
  - 802.11b : 1Mbps
  - 802.11g : 6Mbps
  - 802.11n : MCS0

### AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone+Earphone+Travel Adapter, Stand alone+Travel Adapter
  - Worstcase : Stand alone+Travel Adapter

### Conducted test

All datarate of operation were investigated and the worst case datarate results are reported

- 802.11b : 2Mbps
- 802.11g : 18Mbps
- 802.11n : MCS5

## 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 Peak Output Power	§15.247(b)(3)	< 1 Watt		N/A
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

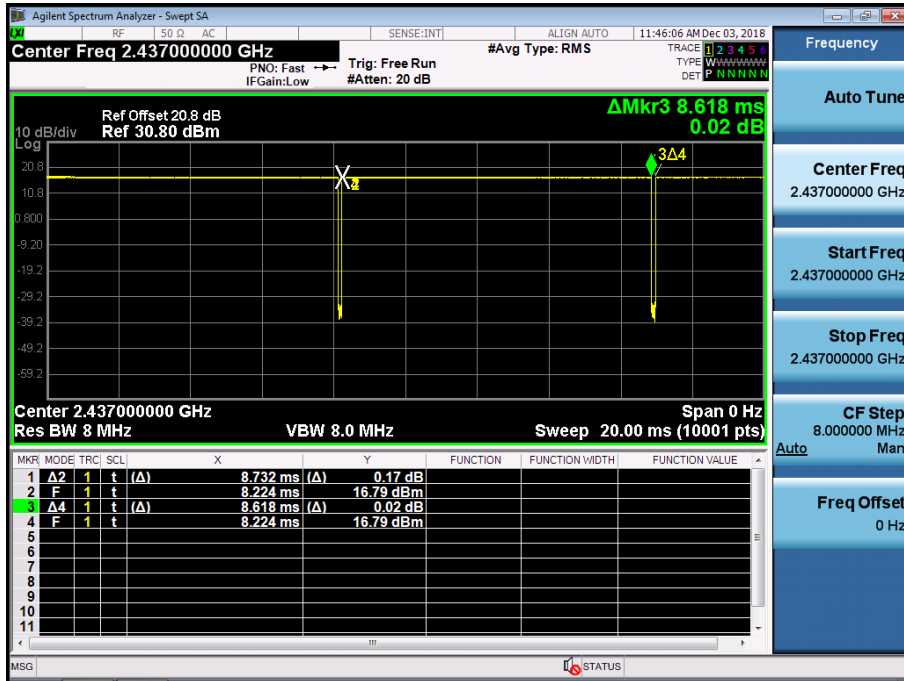
### 9.1 DUTY CYCLE

Mode	Data Rate (Mbps)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	0.987	0.057
	2	0.975	0.110
	5.5	0.942	0.259
	11	0.898	0.467
802.11g	6	0.931	0.311
	9	0.900	0.458
	12	0.876	0.575
	18	0.828	0.820
	24	0.788	1.035
	36	0.719	1.433
	48	0.666	1.765
	54	0.643	1.918
802.11n (HT20)	6.5 (MCS0)	0.926	0.334
	13 (MCS1)	0.868	0.615
	19.5 (MCS2)	0.822	0.851
	26 (MCS3)	0.781	1.073
	39 (MCS4)	0.717	1.445
	52 (MCS5)	0.667	1.759
	58.5 (MCS6)	0.647	1.891
	65 (MCS7)	0.626	2.034

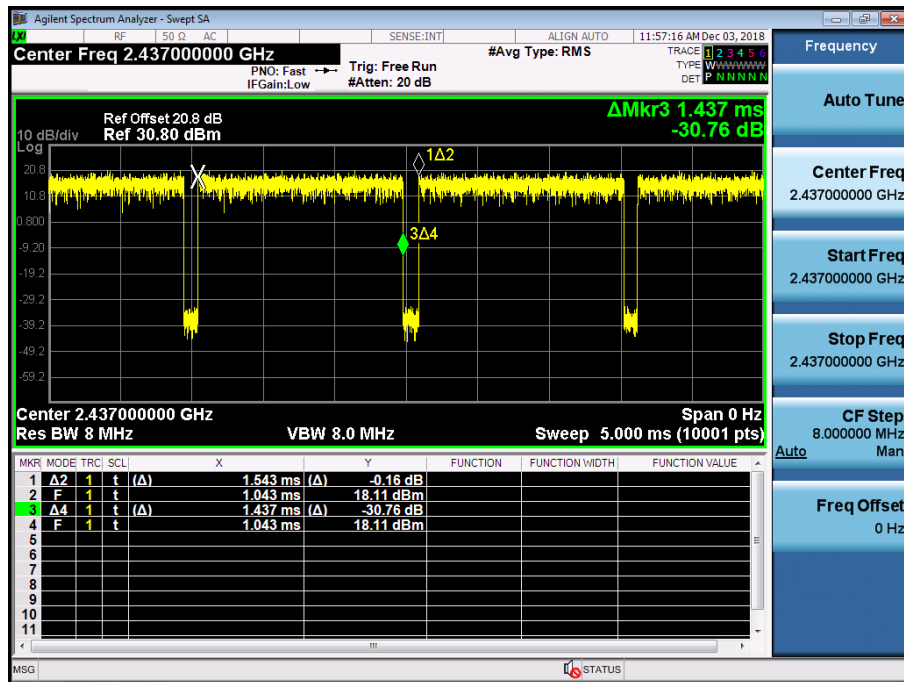


■ Test Plots

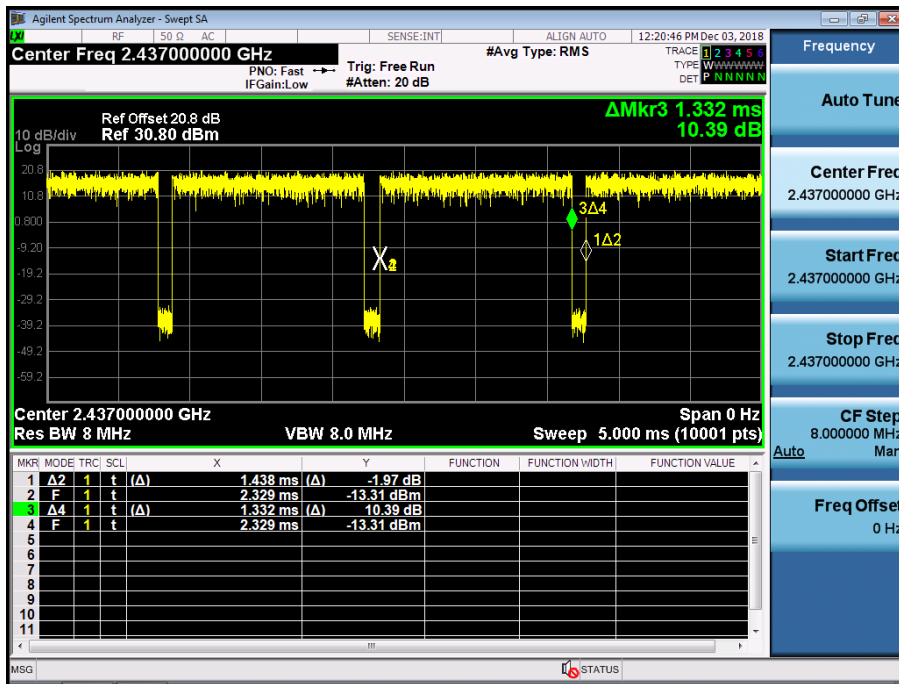
Duty cycle plot (802.11b(1Mbps))



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 datarate.

## 9.2 6dB BANDWIDTH

[Ant1]

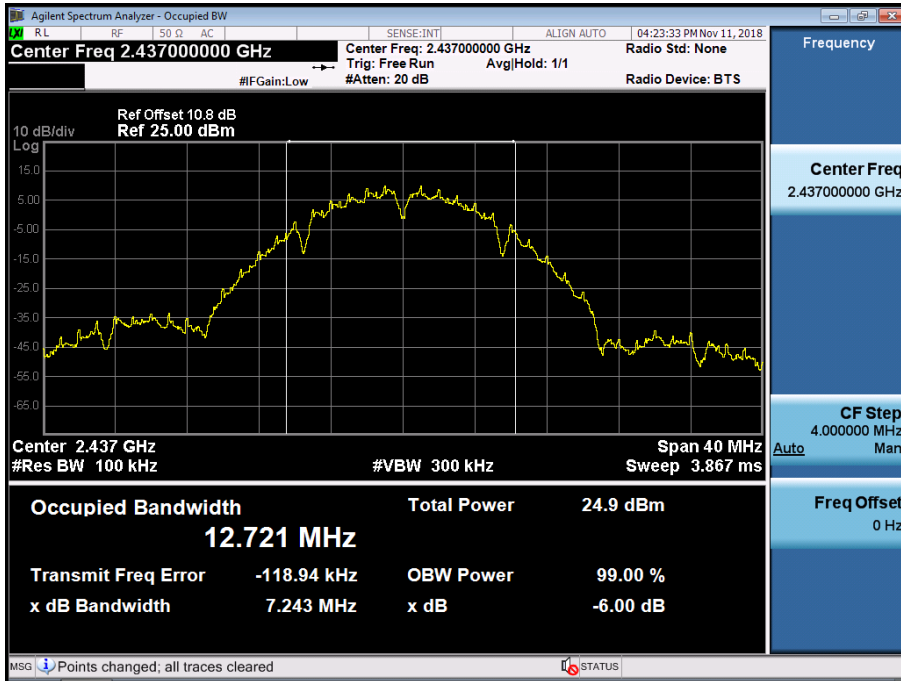
802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	8.059	0.5
2437	6	7.243	0.5
2462	11	8.057	0.5

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.40	0.5
2437	6	15.62	0.5
2462	11	15.18	0.5

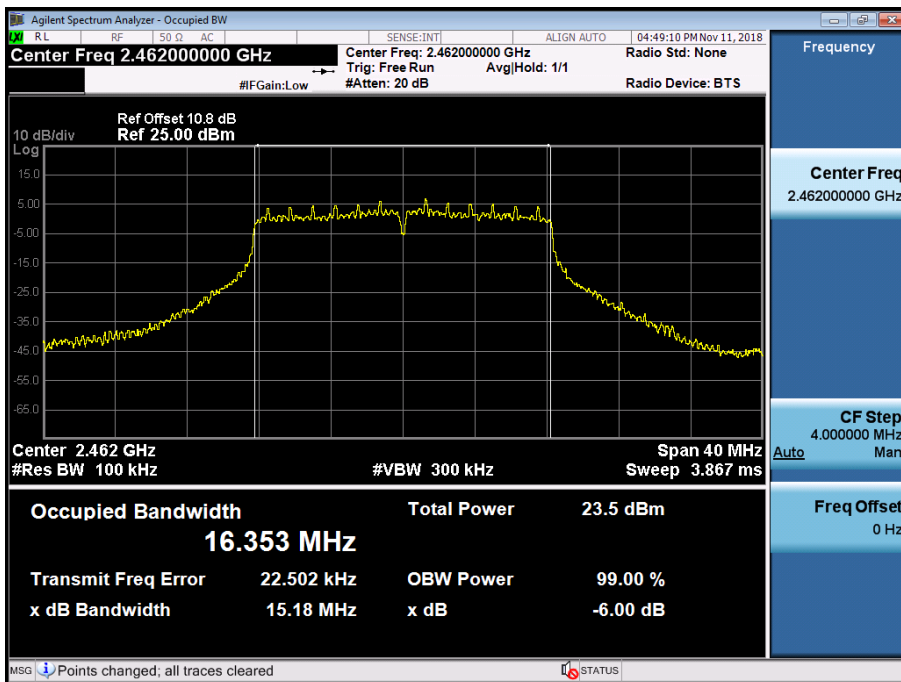
802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	17.72	0.5
2437	6	17.69	0.5
2462	11	17.68	0.5

■ Test Plots [Ant1]

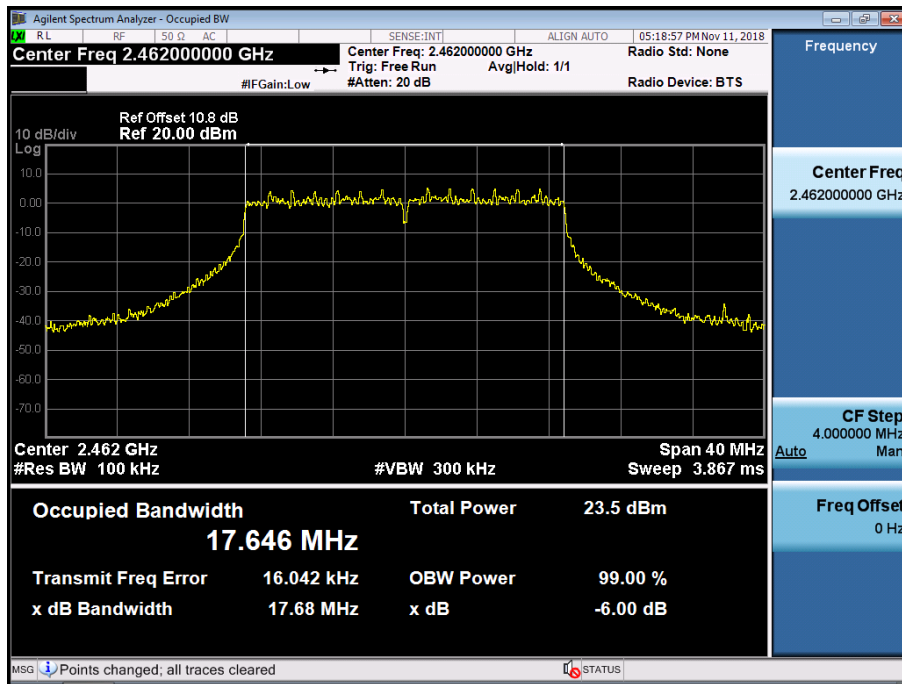
6dB Bandwidth plot (802.11b-CH 6)



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.

[Ant2]

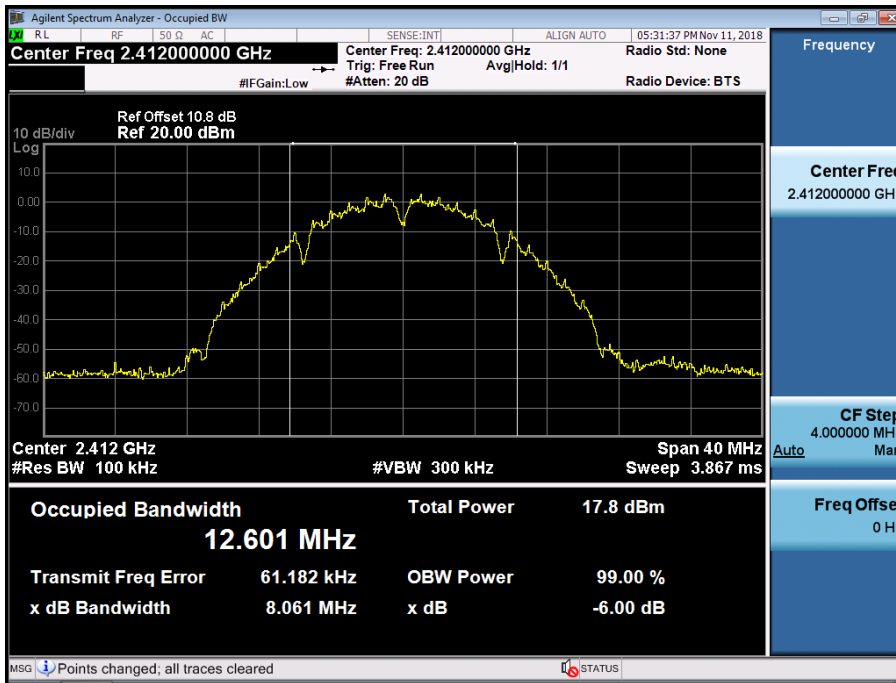
802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	8.061	0.5
2437	6	8.073	0.5
2462	11	8.066	0.5

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.42	0.5
2437	6	15.66	0.5
2462	11	15.44	0.5

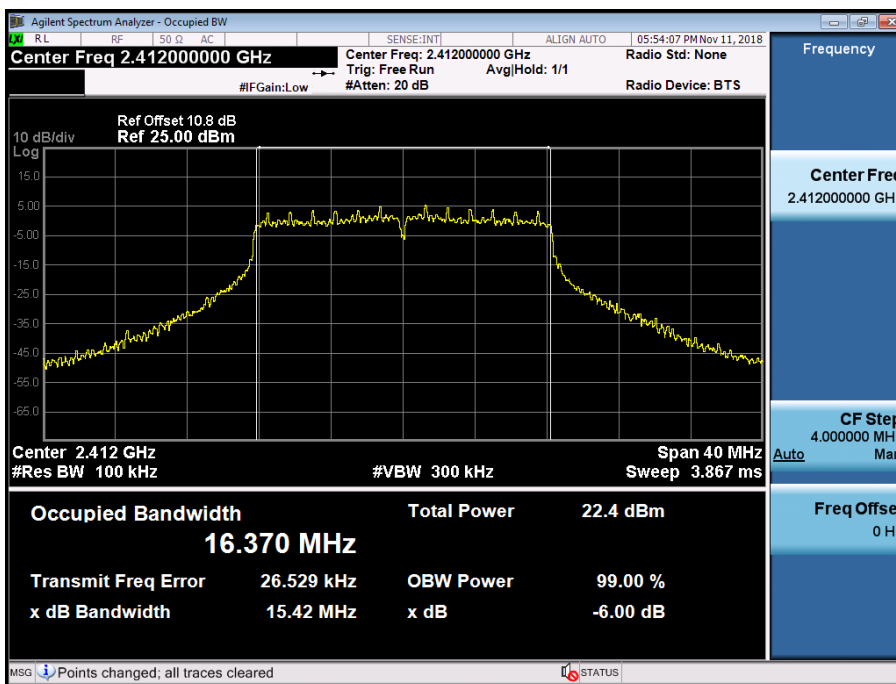
802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	17.71	0.5
2437	6	17.71	0.5
2462	11	17.75	0.5

■ Test Plots [Ant2]

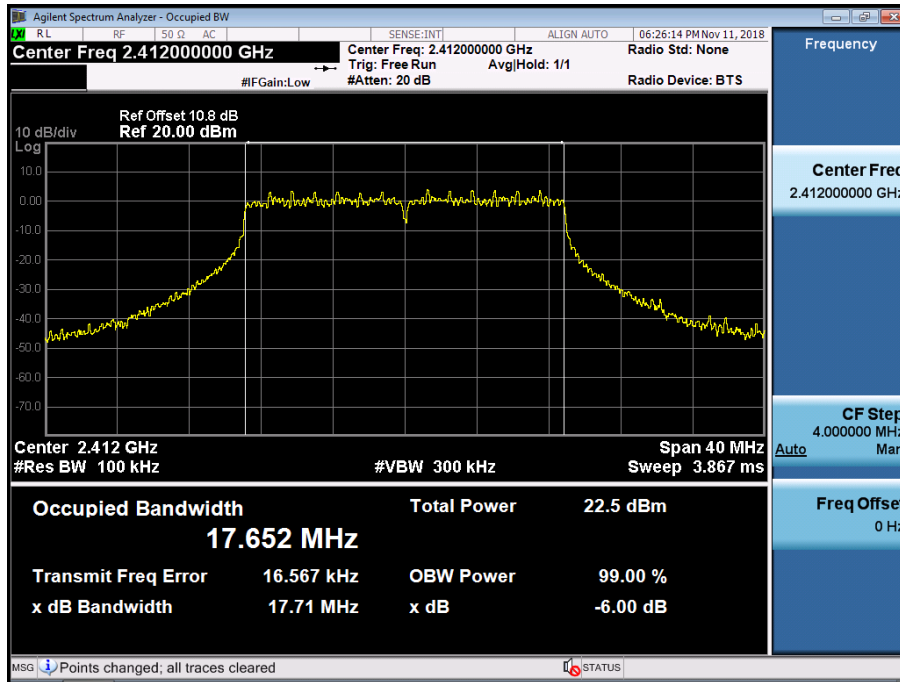
6dB Bandwidth plot (802.11b-CH 1)



6dB Bandwidth plot (802.11g-CH 1)



6dB Bandwidth plot (802.11n\_HT20-CH 1)



**Note:**

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



### 9.3 OUTPUT POWER

**Peak Power**

1. Power Meter offset = Attenuator loss + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.  
So, 10.8 dB is offset for 2.4 GHz Band.

802.11b Mode (Antenna1)		Power Level Setting	Measured Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.			
2412	1	13	16.75	30.00
2437	6	17	20.23	30.00
2462	11	16	21.09	30.00

802.11b Mode (Antenna2)		Power Level Setting	Measured Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.			
2412	1	10	13.29	30.000
2437	6	10	12.88	30.000
2462	11	12	15.43	30.000

802.11g Mode		Power Level Setting	Total Power [dBm]			Limit (dBm)
Frequency [MHz]	Channel No.		SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1+2)	
2412	1	15	23.41	22.66	26.060	30.00
2437	6	15	23.50	22.39	25.991	30.00
2462	11	15	23.68	23.53	26.615	30.00

802.11n Mode		Power Level Setting	Total Power [dBm]			Limit (dBm)
Frequency [MHz]	Channel No.		SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1+2)	
2412	1	15	23.55	22.84	26.219	30.00
2437	6	16	24.61	23.74	27.206	30.00
2462	11	15	23.71	23.77	26.749	30.00

**Average Power**

1. Power Meter offset = Attenuator loss + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.  
So, 10.7 dB is offset for 2.4 GHz Band.

802.11b Mode (Antenna1)		Power Level Setting	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
2412	1	13	0.110	13.829	30.00
2437	6	17	0.110	17.801	30.00
2462	11	16	0.110	18.311	30.00

802.11b Mode (Antenna2)		Power Level Setting	Duty Cycle Factor (dB)	Total Power [dBm]	Limit (dBm)
Frequency [MHz]	Channel No.				
2412	1	10	0.110	10.484	30.00
2437	6	10	0.110	10.271	30.00
2462	11	12	0.110	12.706	30.00

802.11g Mode		Power Level Setting	Duty Cycle Factor (dB)	Total Power [dBm]			Limit (dBm)
Frequency [MHz]	Channel No.			SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1+2)	
2412	1	15	0.820	16.220	15.051	18.685	30.00
2437	6	15	0.820	16.013	14.800	18.459	30.00
2462	11	15	0.820	16.377	15.732	19.076	30.00

802.11n Mode		Power Level Setting	Duty Cycle Factor (dB)	Total Power [dBm]			Limit (dBm)
Frequency [MHz]	Channel No.			SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1+2)	
2412	1	15	1.759	15.609	14.892	18.275	30.00
2437	6	16	1.759	16.240	15.230	18.774	30.00
2462	11	15	1.759	15.890	15.783	18.847	30.00

### 9.4 POWER SPECTRAL DENSITY

802.11b Mode (Antenna1)		PSD (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.		
2412	1	-2.444	8.00
2437	6	1.550	8.00
2462	11	-2.835	8.00

802.11b Mode (Antenna2)		PSD (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.		
2412	1	-5.629	8.00
2437	6	-6.242	8.00
2462	11	3.653	8.00

802.11g Mode		PSD [dBm]			Limit (dBm)
Frequency [MHz]	Channel No.	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1+2)	
2412	1	-9.900	-10.613	-7.232	8.00
2437	6	-10.558	-11.554	-8.017	8.00
2462	11	-10.040	-10.139	-7.079	8.00

802.11n Mode		Measured Power [dBm]			Limit (dBm)
Frequency [MHz]	Channel No.	SISO (Ant 1)	SISO (Ant 2)	MIMO (Ant 1+2)	
2412	1	-10.582	-11.582	-8.043	8.00
2437	6	-9.235	-9.965	-6.574	8.00
2462	11	-10.329	-10.200	-7.254	8.00

**Note :**

1. Spectrum reading values are not plot data.

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

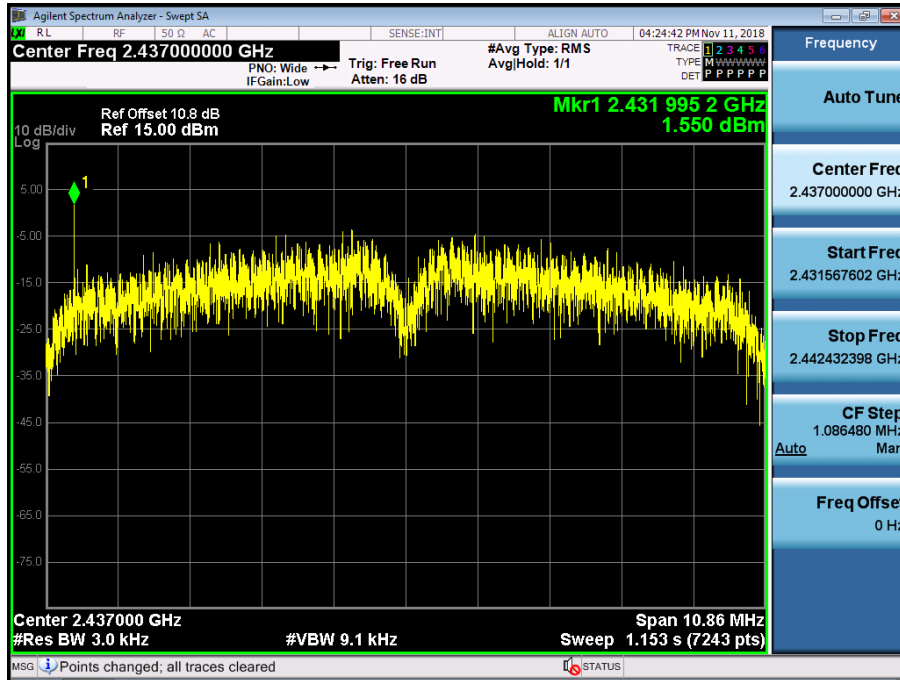
2. Spectrum offset = Attenuator loss + Cable loss

3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.

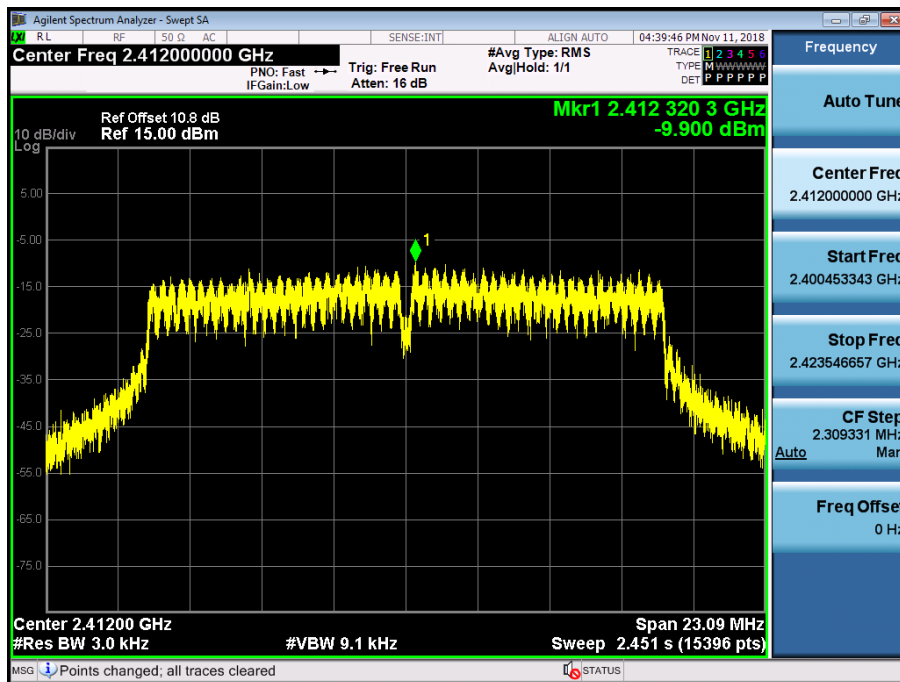
So, 10.8 dB is offset for 2.4 GHz Band.

■ Test Plots [Ant1]

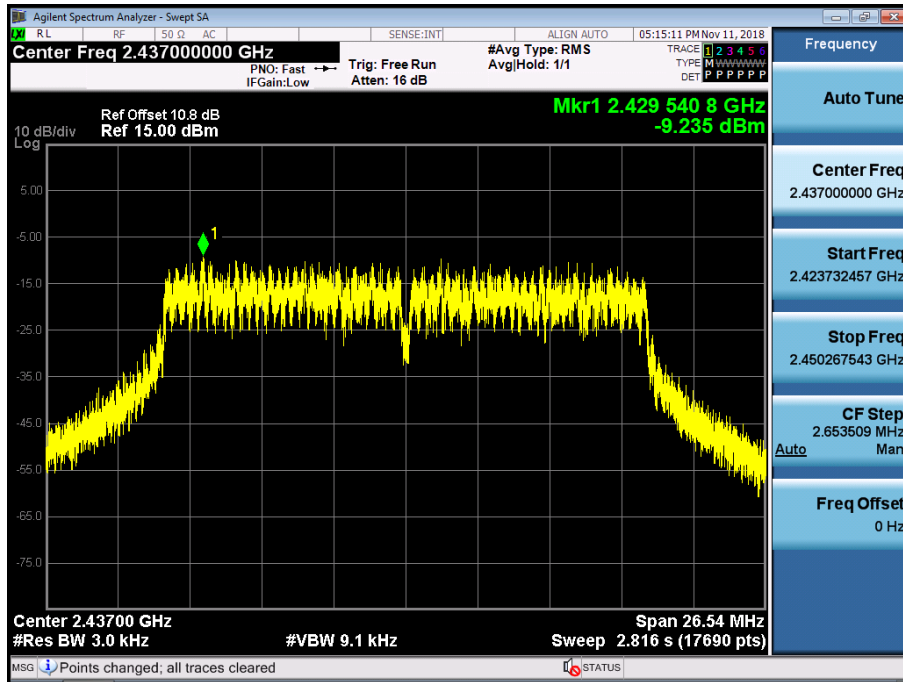
Power Spectral Density (802.11b-CH 6)



Power Spectral Density (802.11g-CH 1)



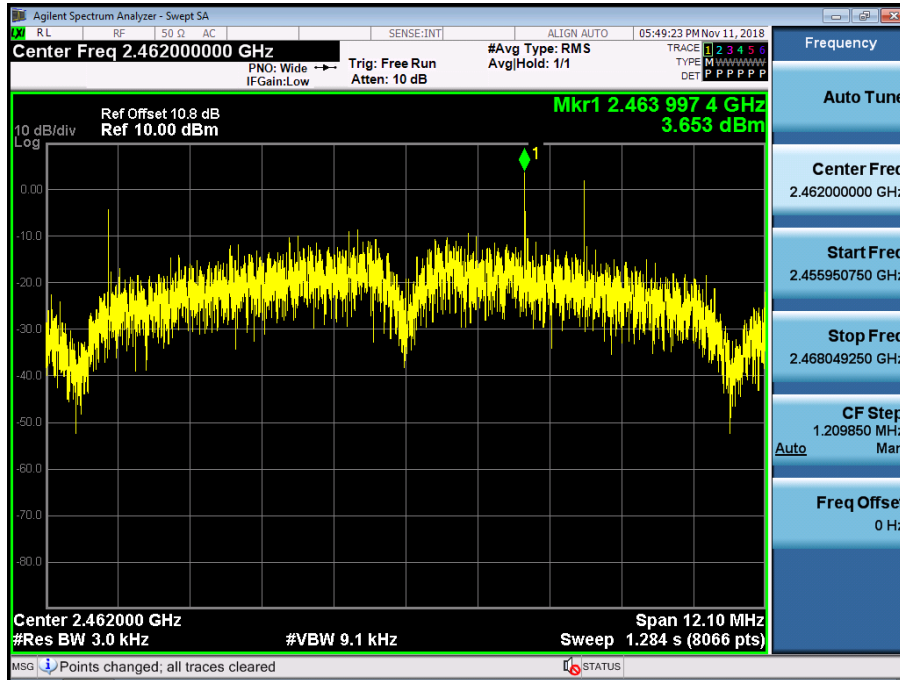
Power Spectral Density (802.11n\_HT20 -CH 6)



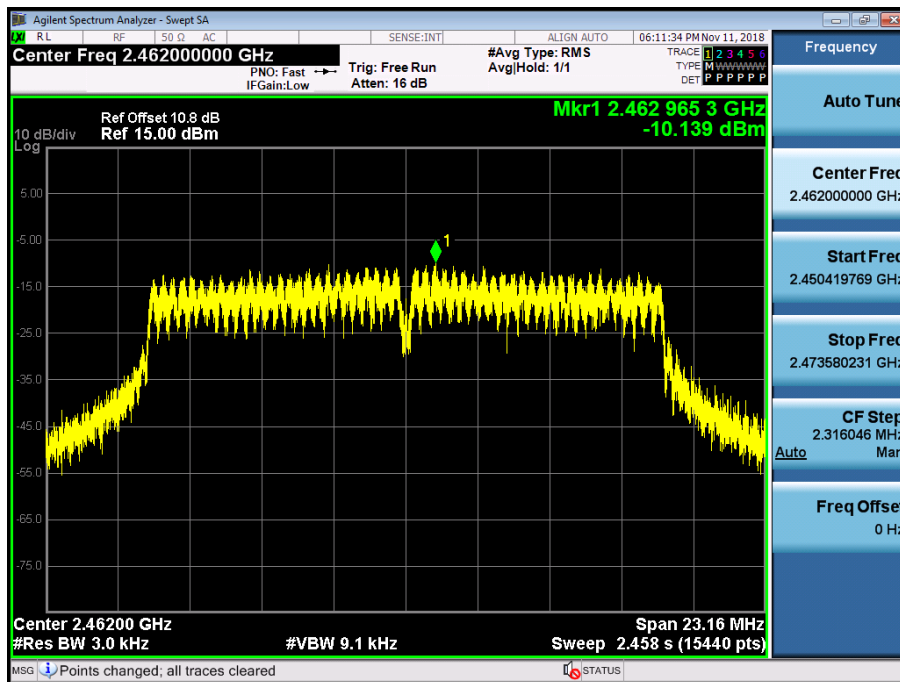


■ Test Plots [Ant2]

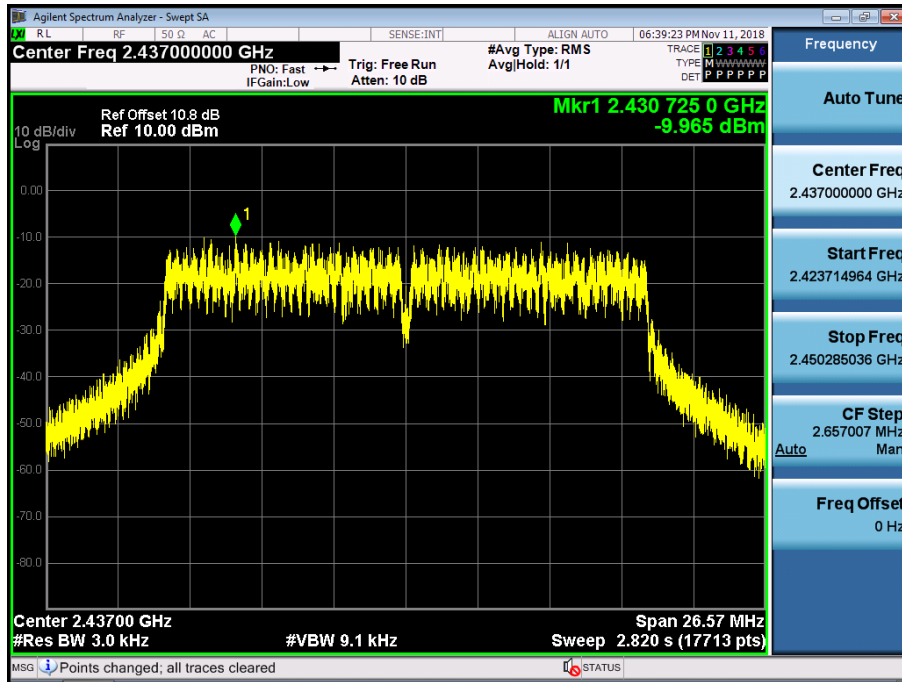
Power Spectral Density (802.11b-CH 11)



Power Spectral Density (802.11g-CH 11)



Power Spectral Density (802.11n\_HT20 -CH 6)



**Note :**

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

## **9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS**

**Note:**

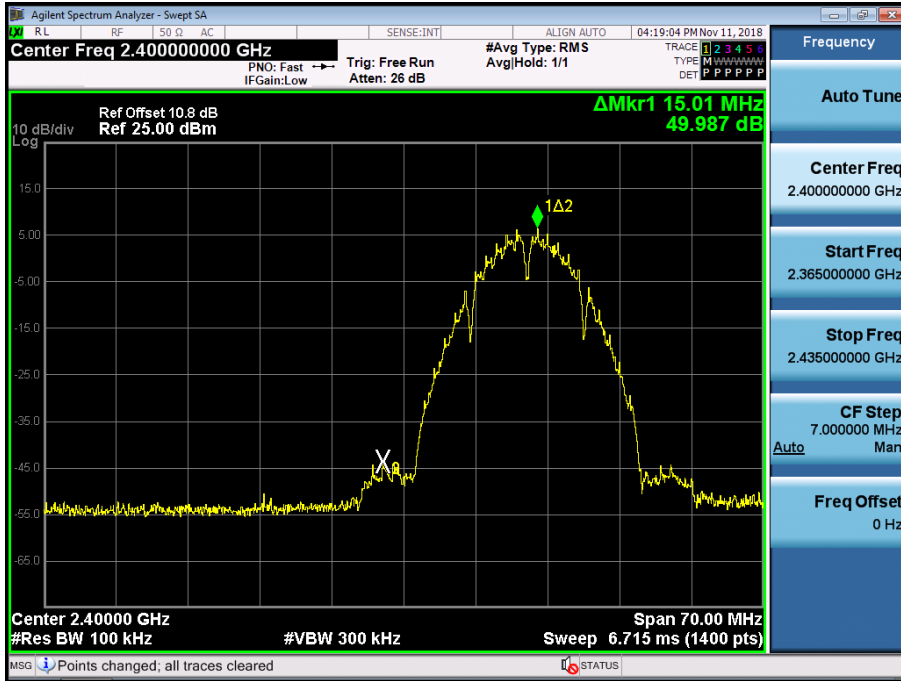
1; Test Result : please refer to the plot below.

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

2. Display line is placed at -20dBc but all emissions outside of the band meet the -30dBc limit.

■ Test Plots(BandEdge) [Ant1]

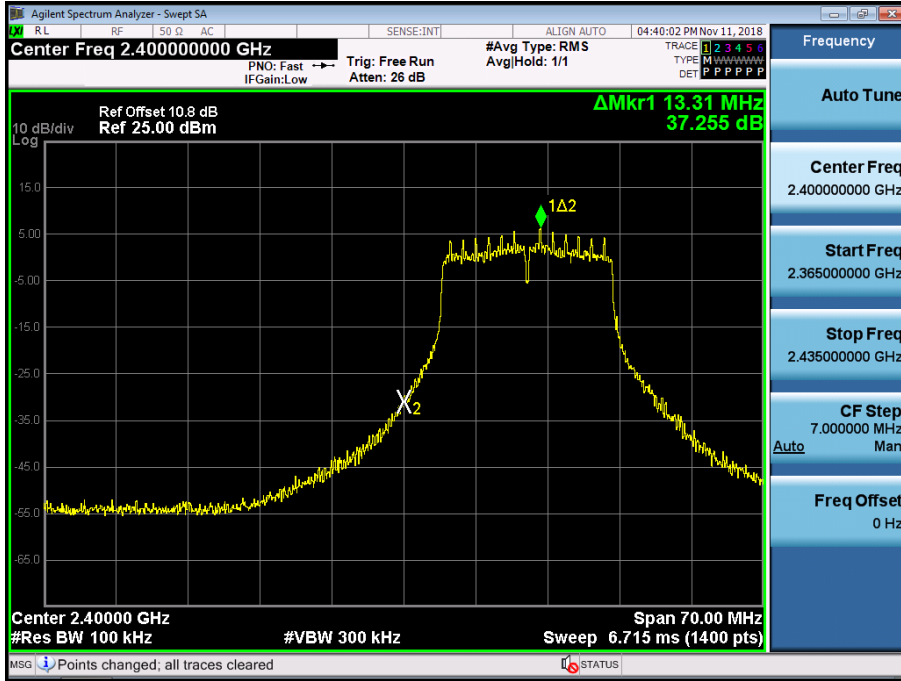
Band Edge (802.11b-CH1)



Band Edge (802.11b-CH11)



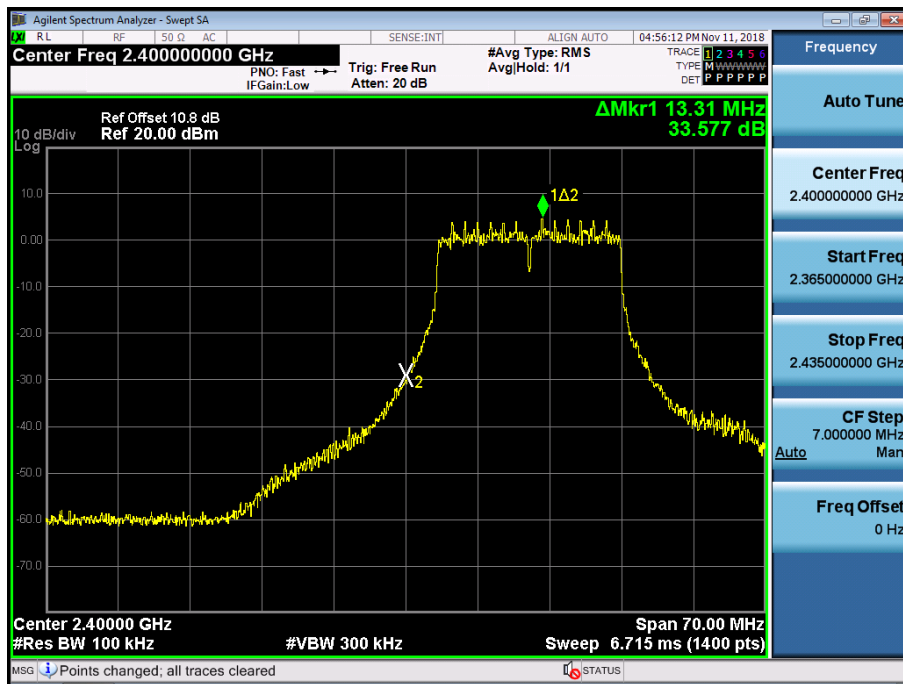
Band Edge (802.11g-CH1)



Band Edge (802.11g-CH11)



Band Edge (802.11n\_HT20-CH1)



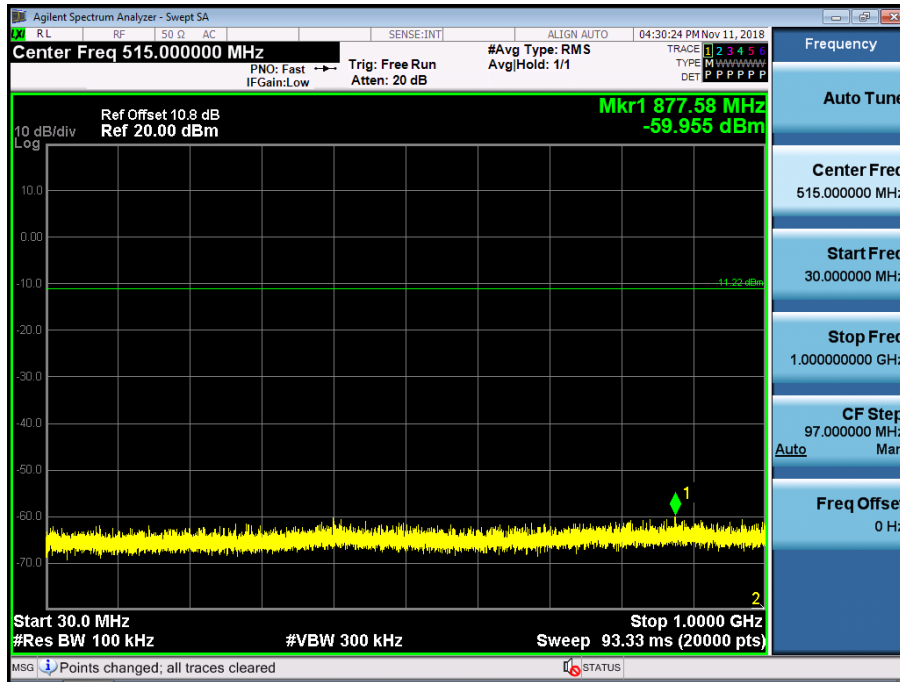
Band Edge (802.11n\_HT20-CH11)



■ Test Plots(Conducted Spurious Emission) [Ant1]

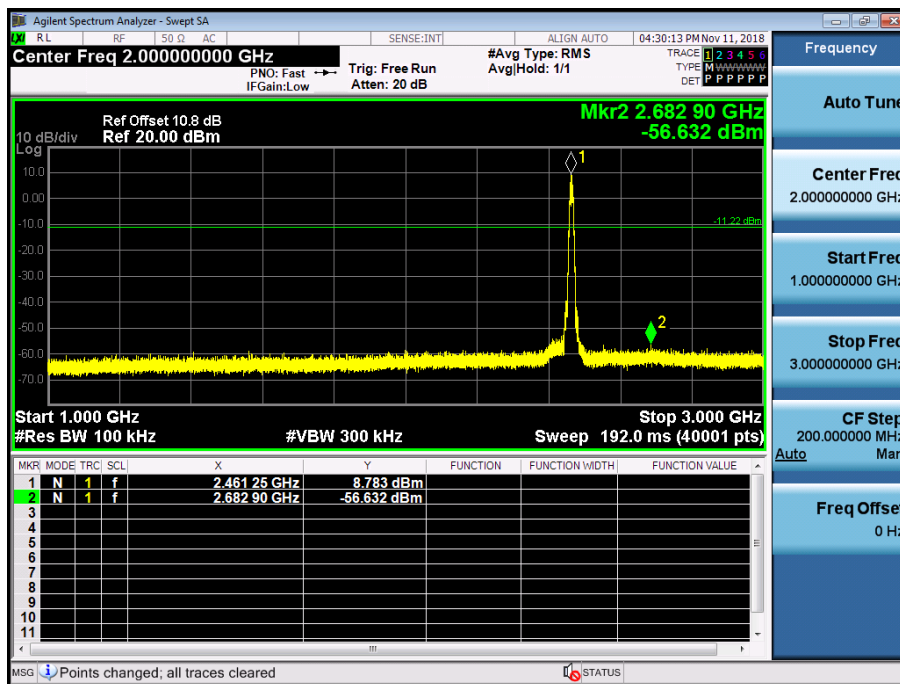
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



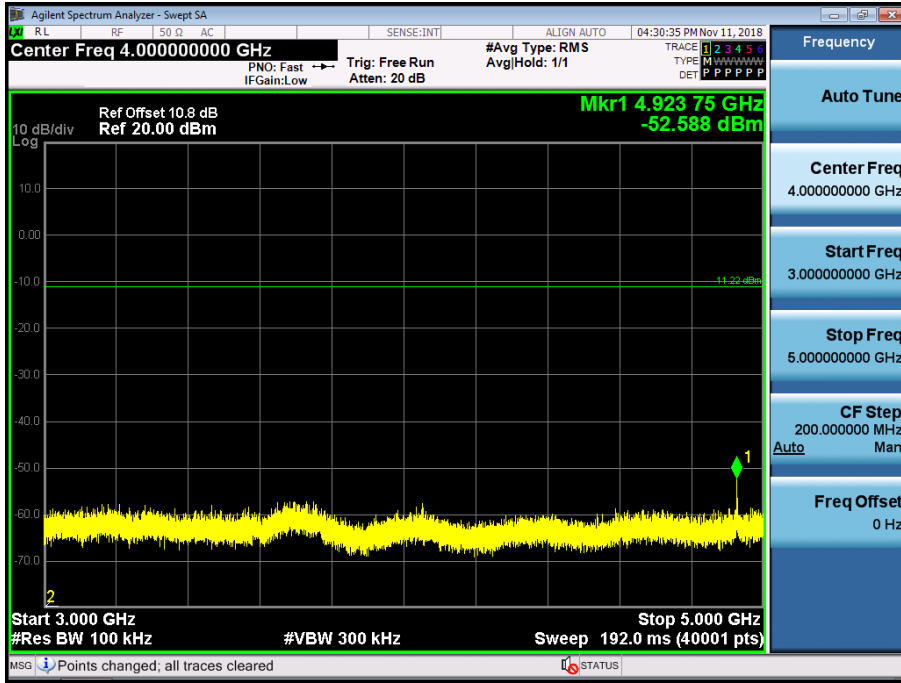
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



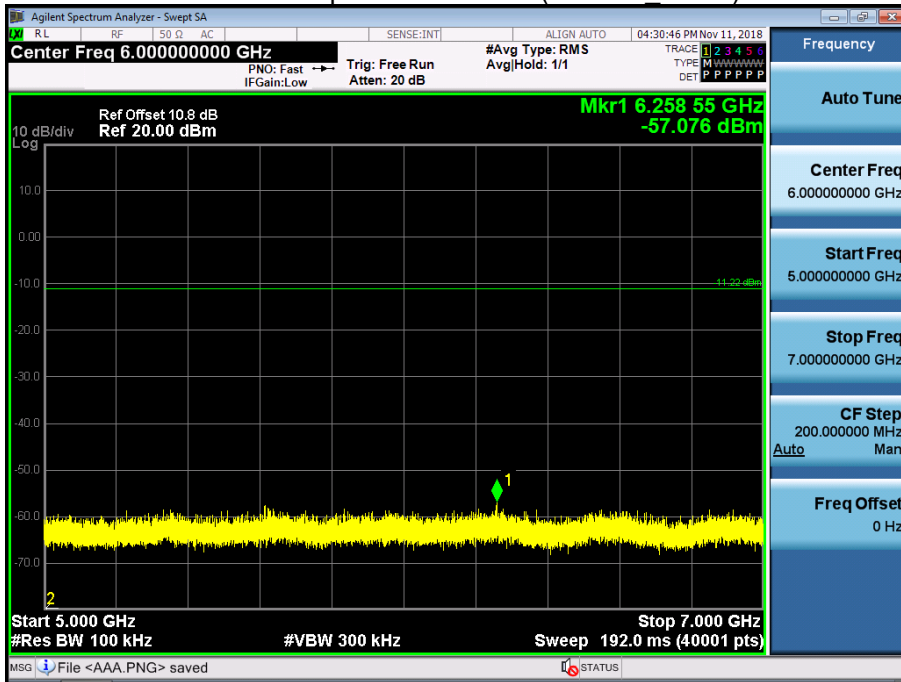
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



5 GHz ~ 7 GHz

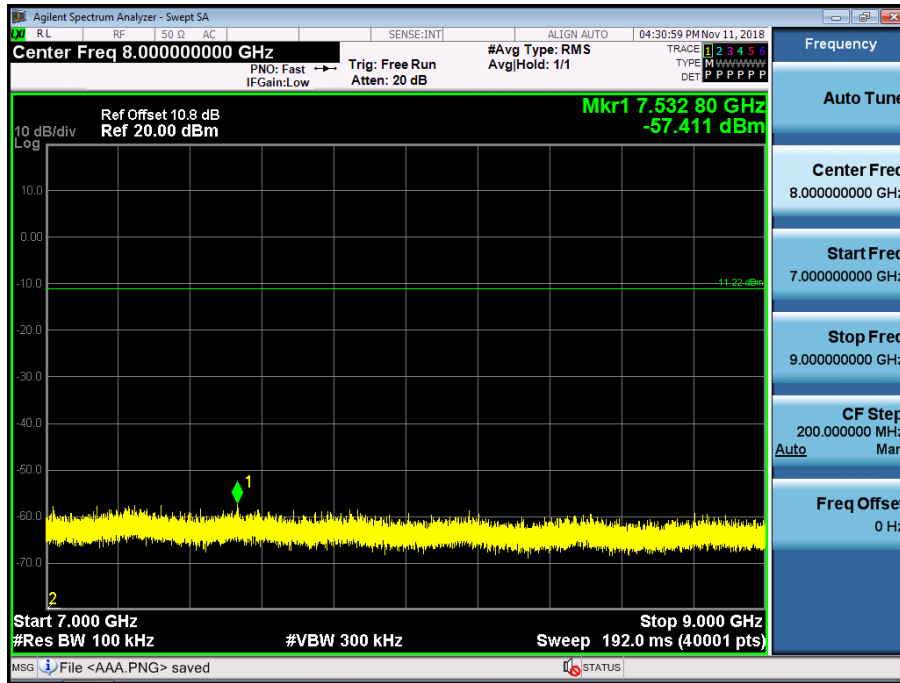
Conducted Spurious Emission (802.11b\_Ch.11)





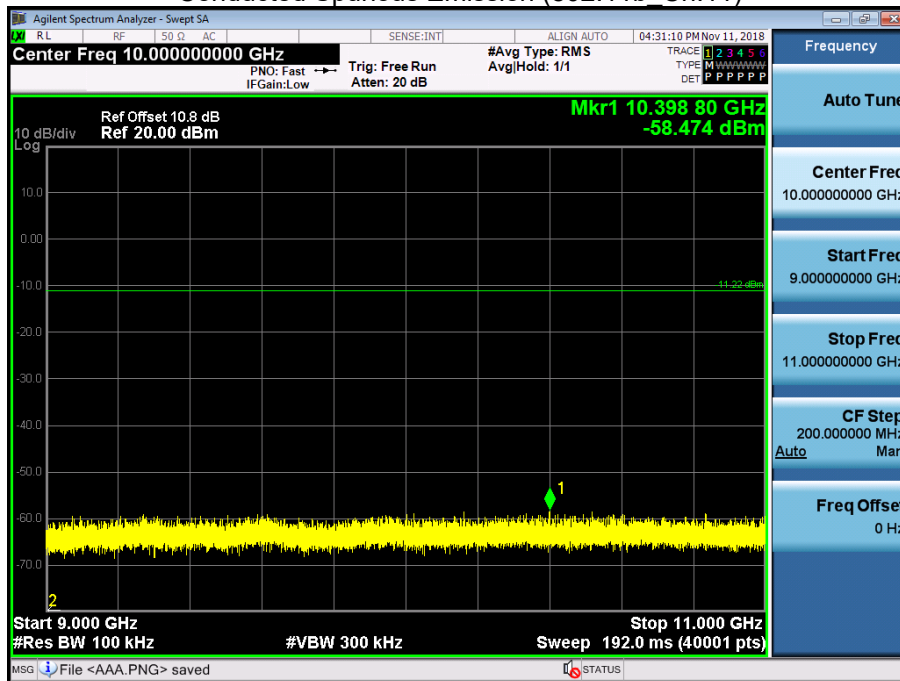
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



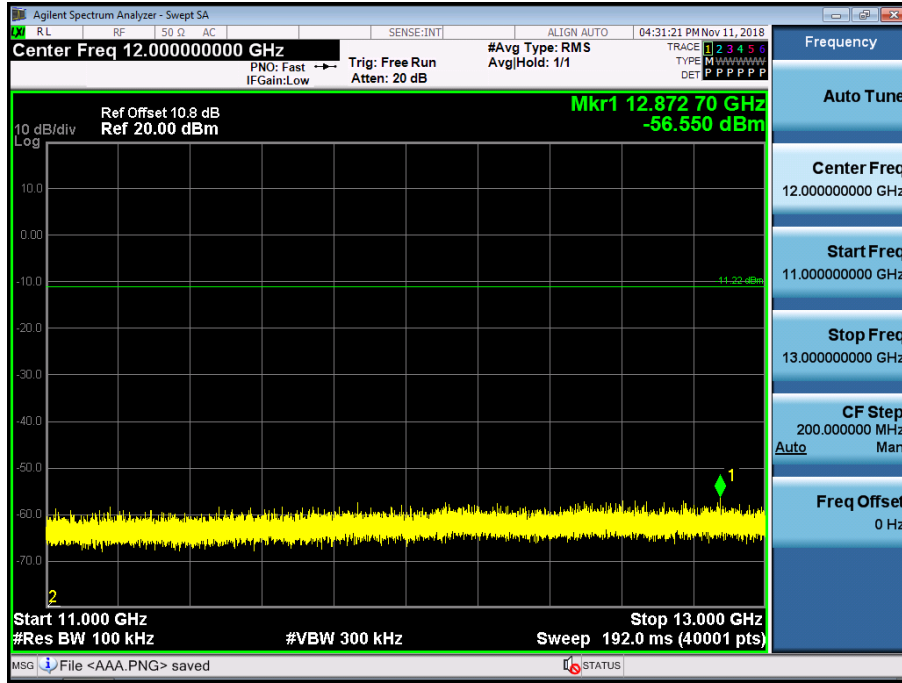
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



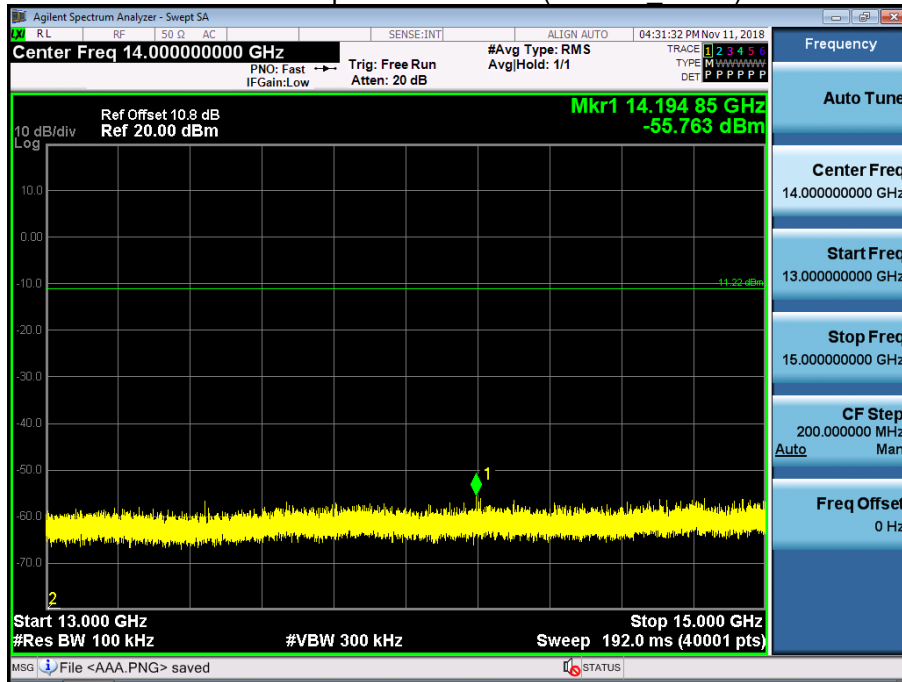
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



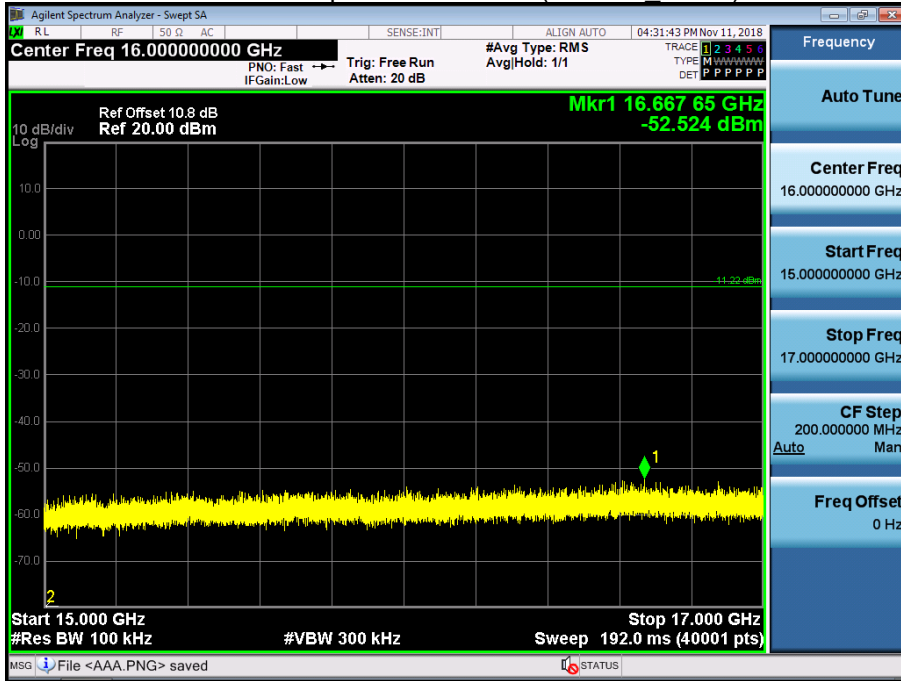
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



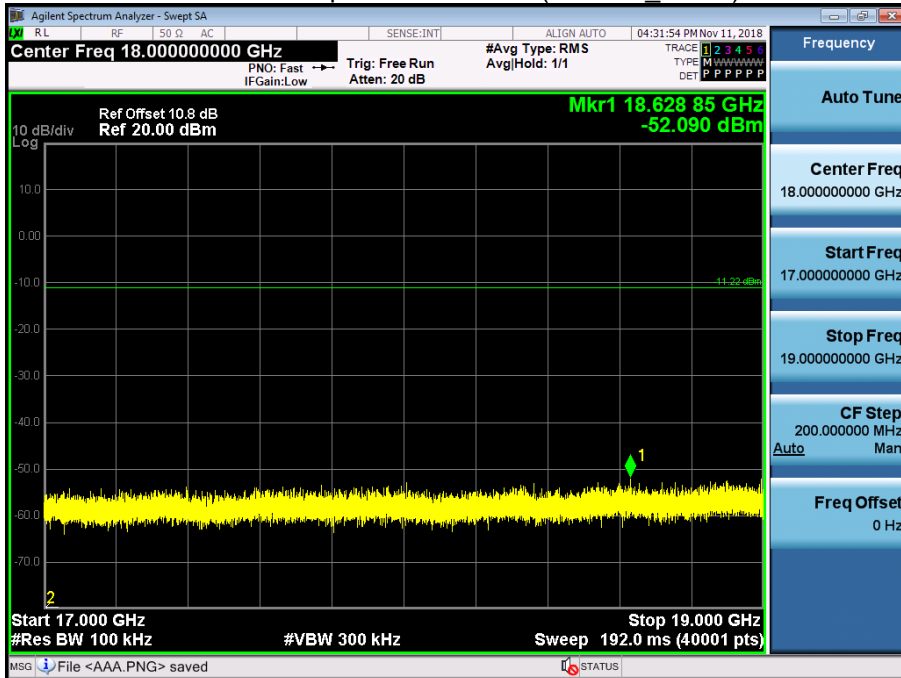
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b Ch.11)



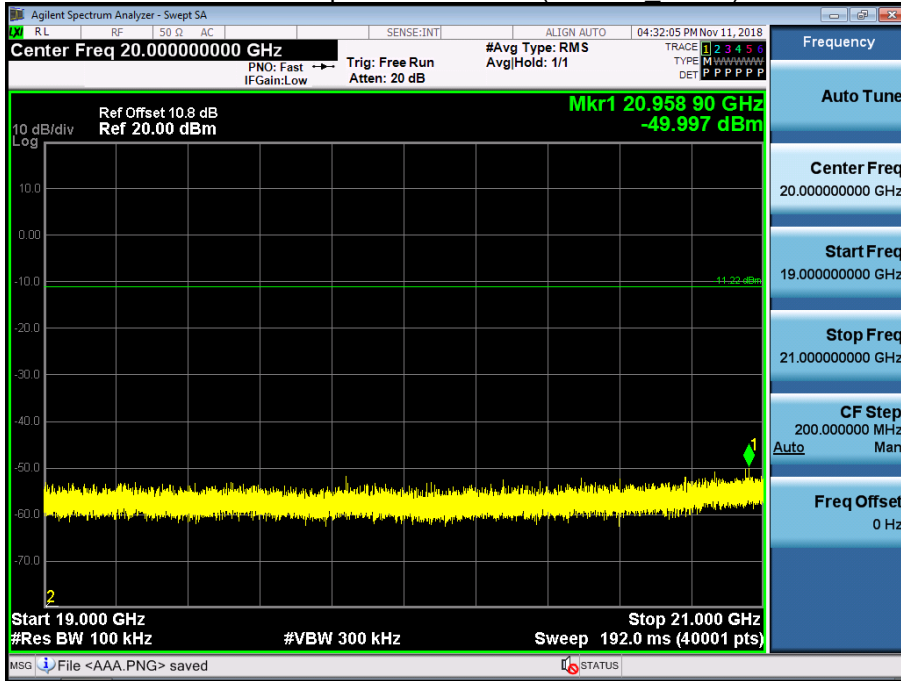
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b Ch.11)



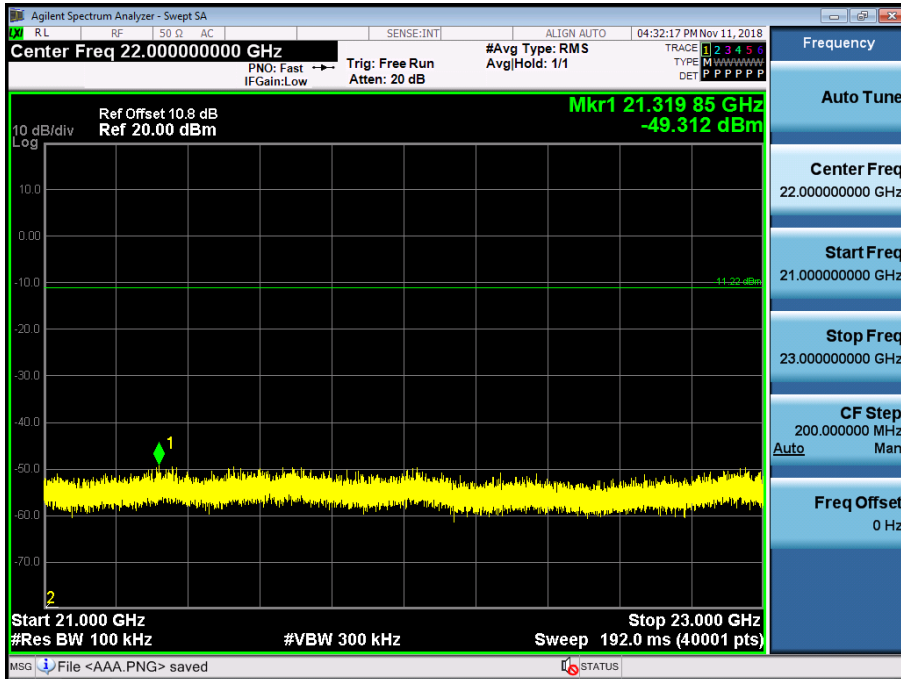
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b Ch.11)



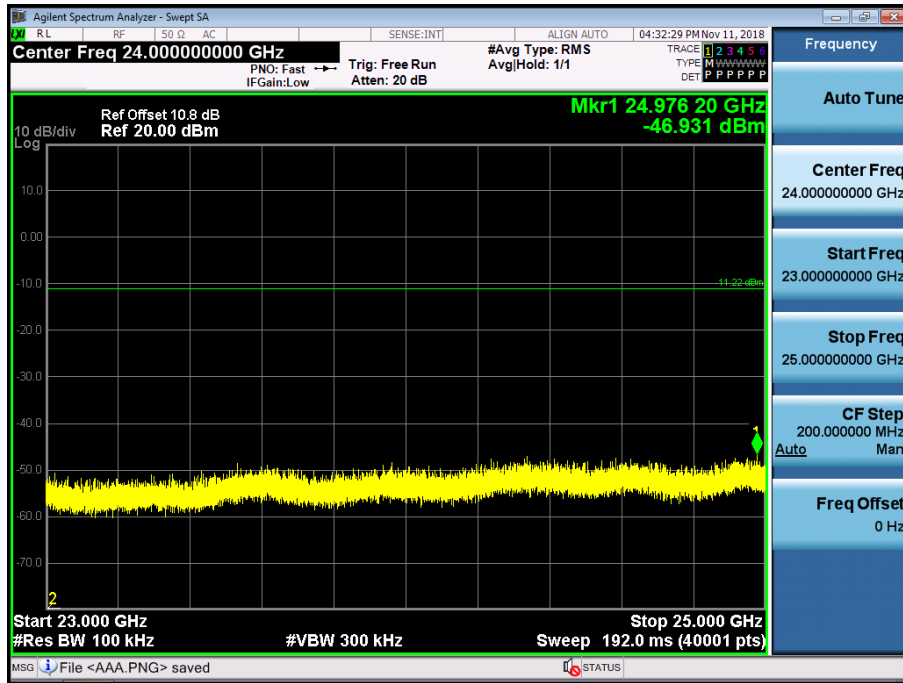
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



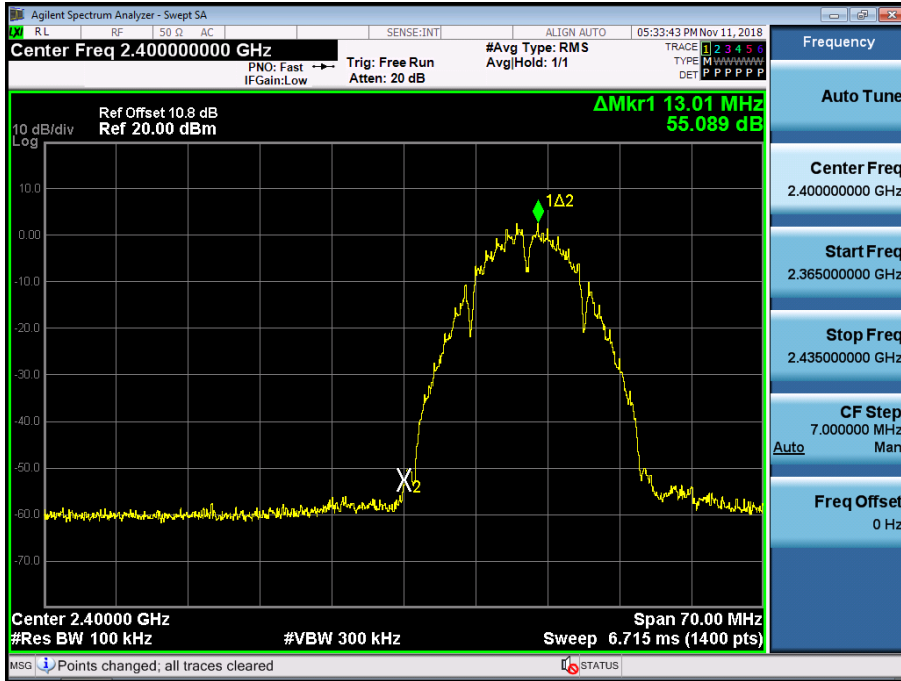
23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11b\_Ch.11)

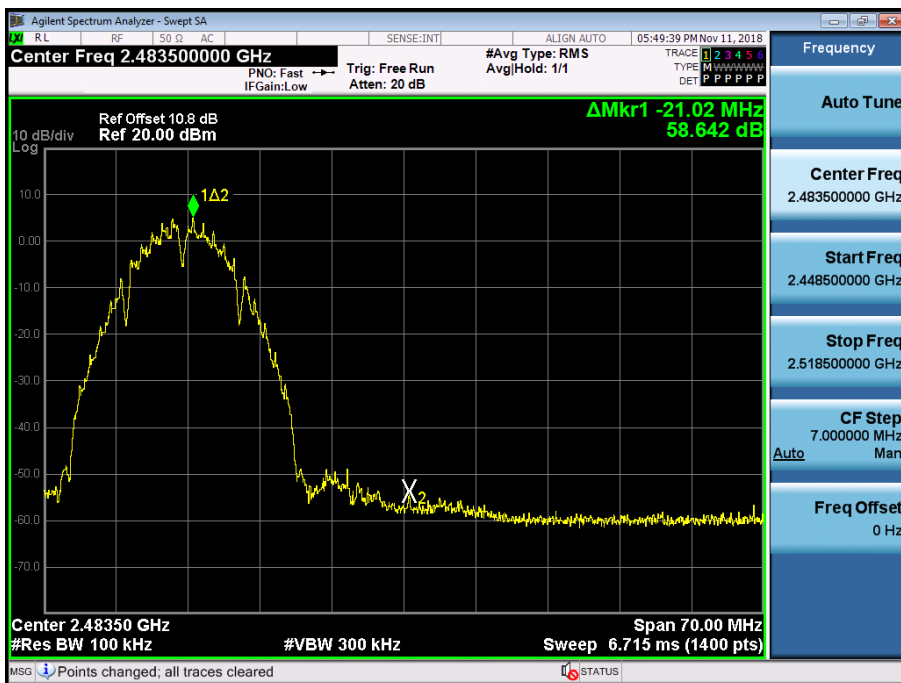


■ Test Plots(BandEdge) [Ant2]

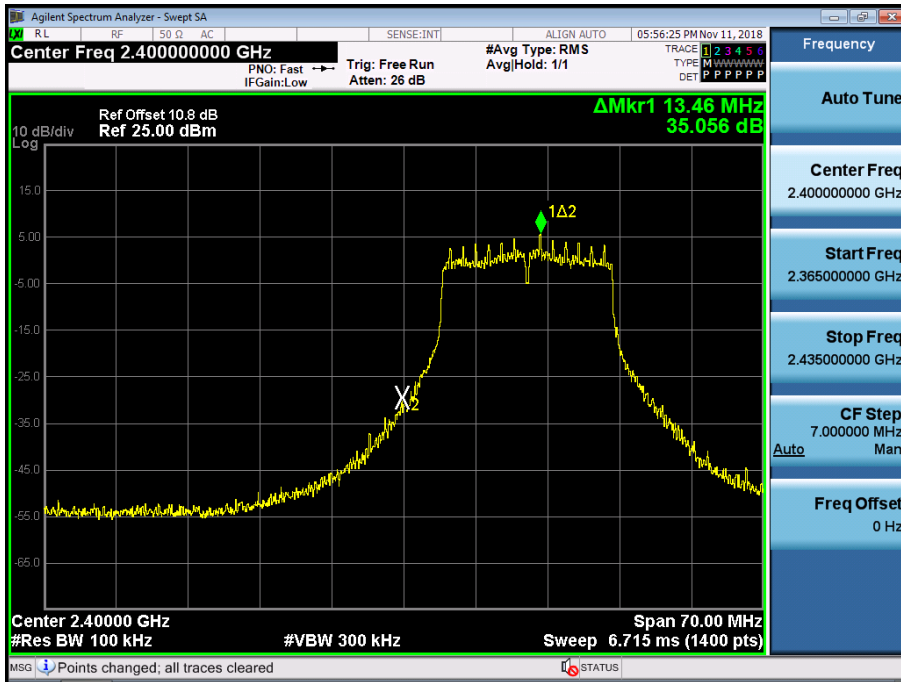
Band Edge (802.11b-CH1)



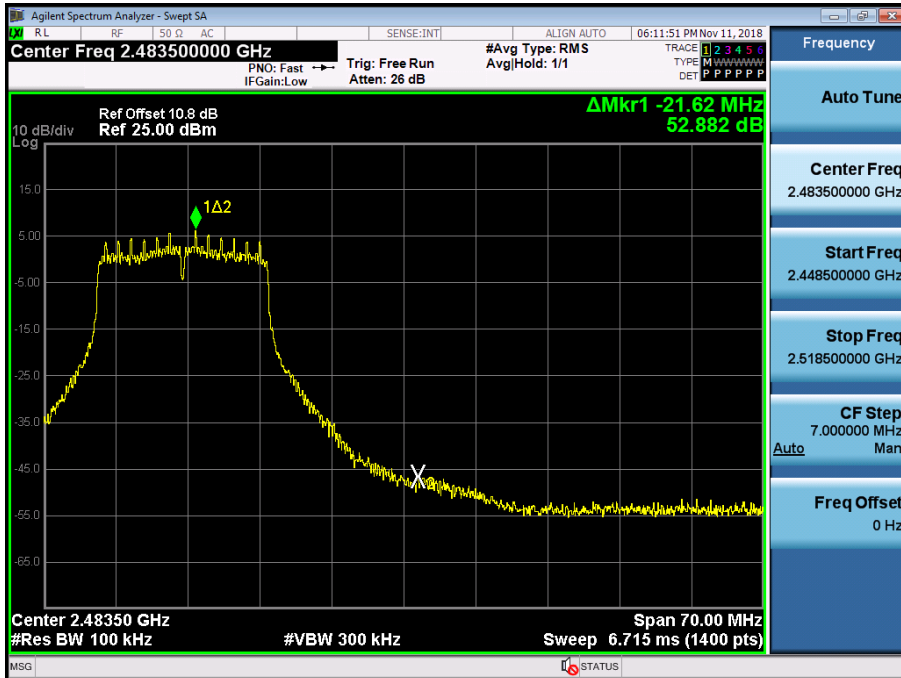
Band Edge (802.11b-CH11)



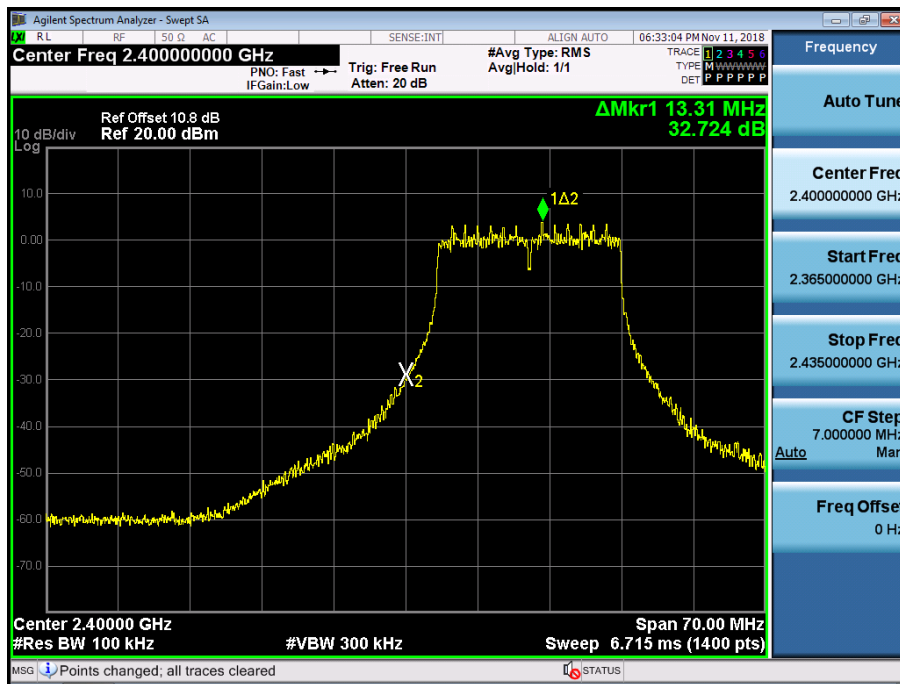
Band Edge (802.11g-CH1)



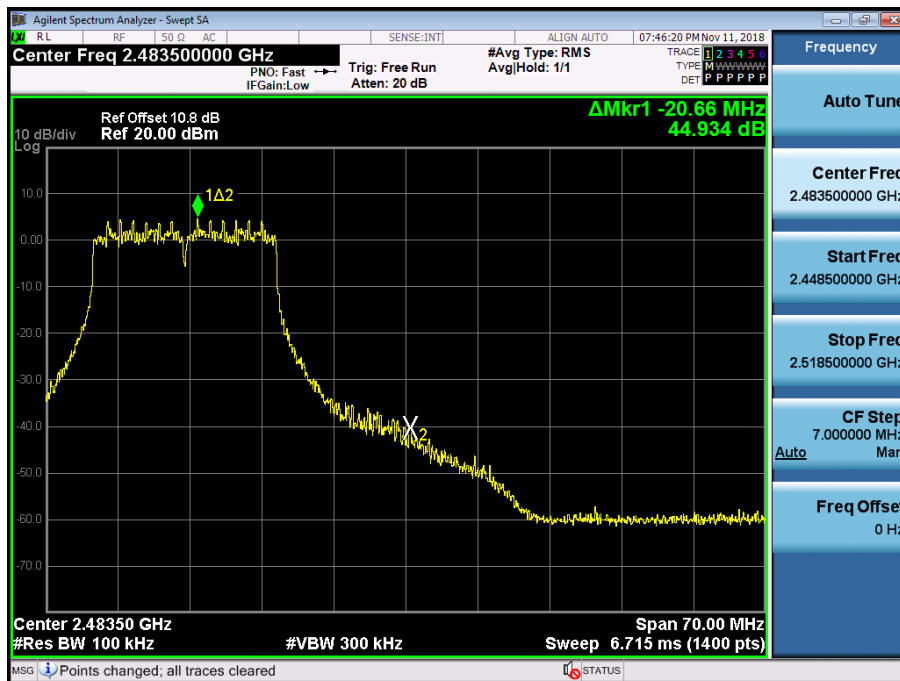
Band Edge (802.11g-CH11)



Band Edge (802.11n\_HT20-CH1)



Band Edge (802.11n\_HT20-CH11)

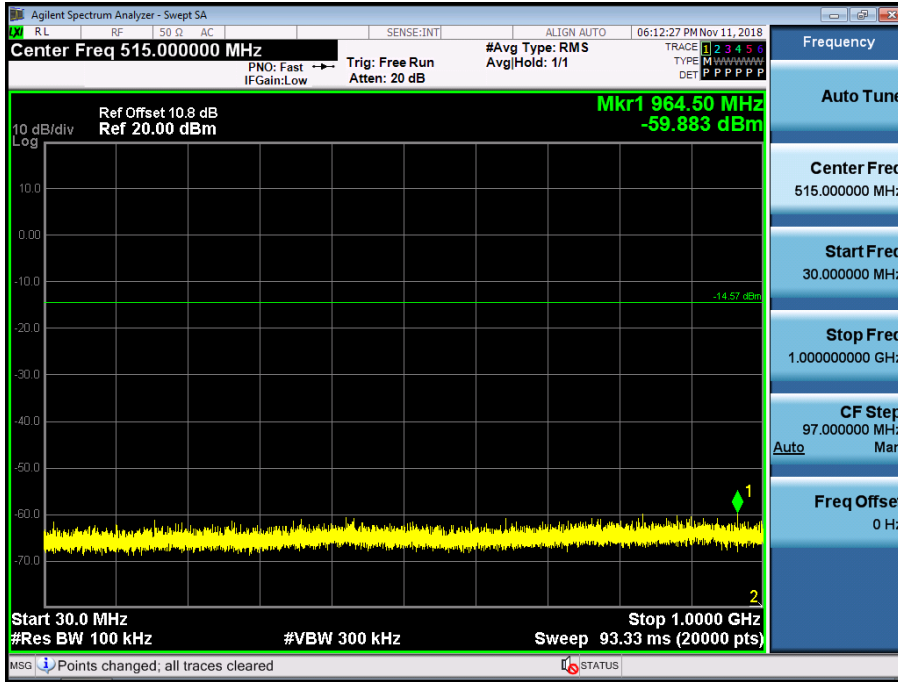




■ Test Plots(Conducted Spurious Emission) [Ant2]

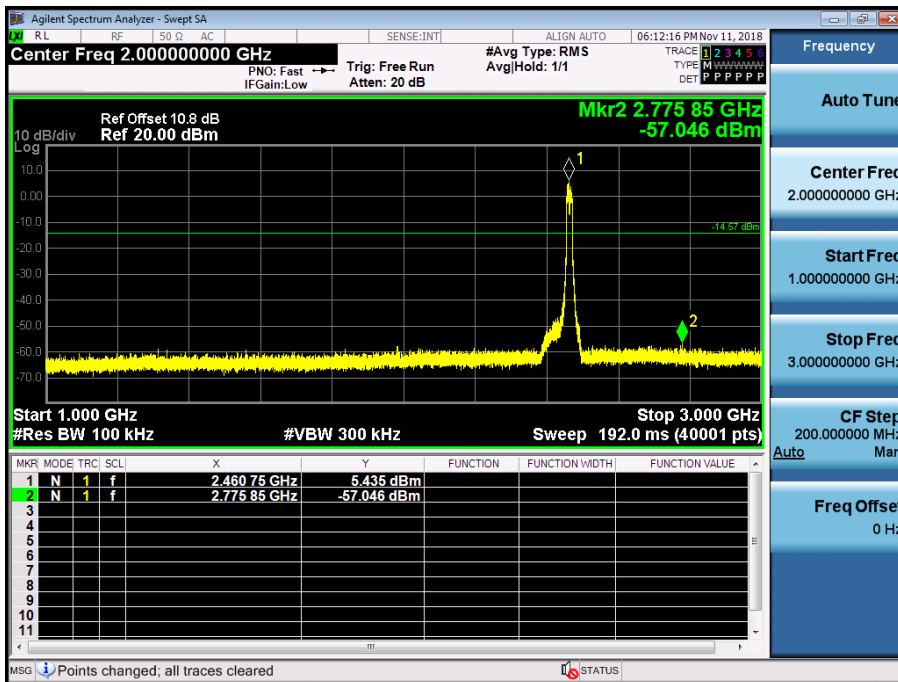
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11g\_Ch.11)



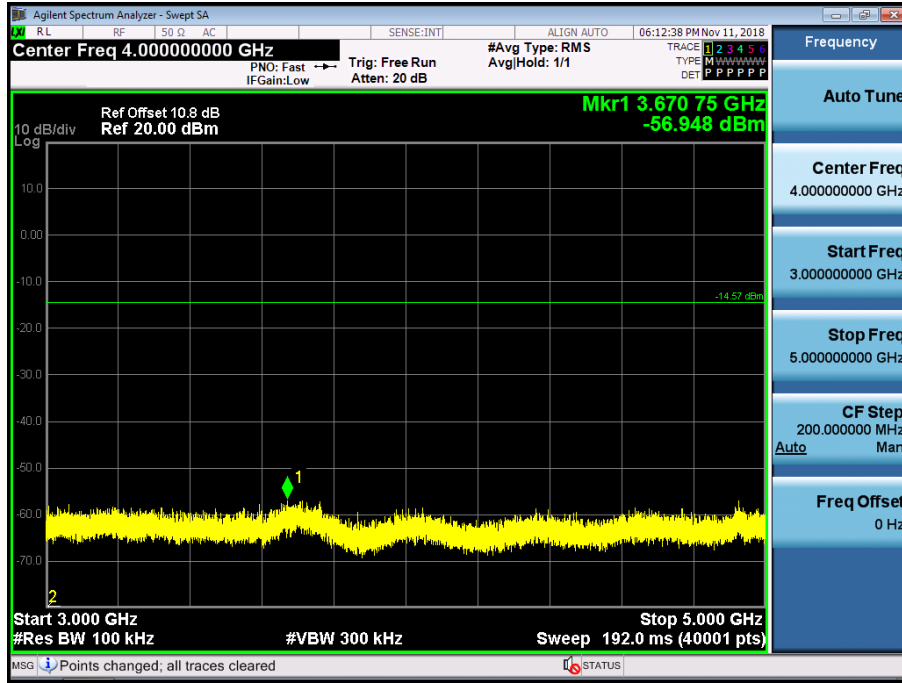
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11g\_Ch.11)



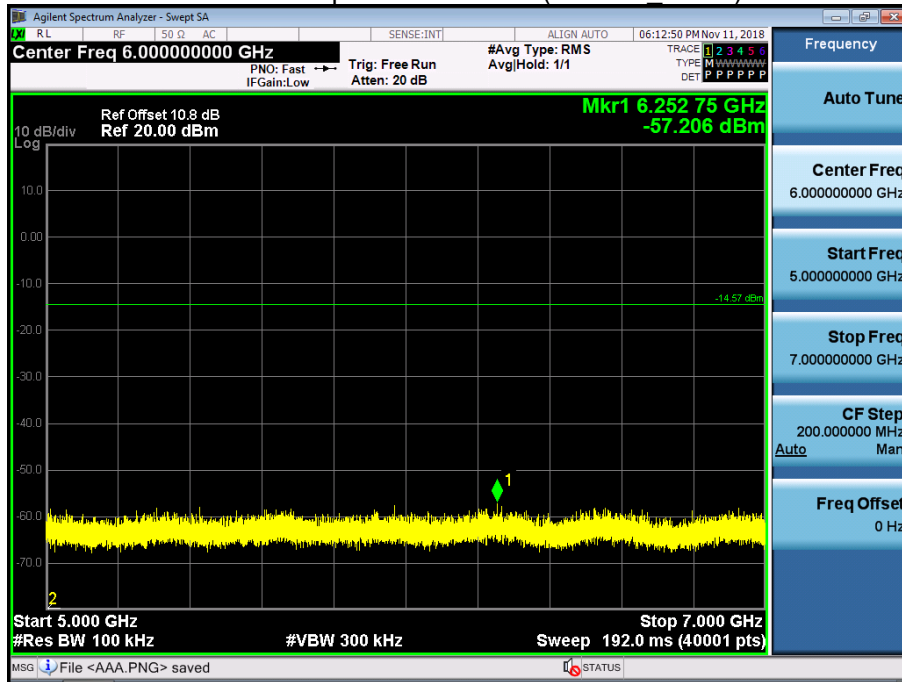
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



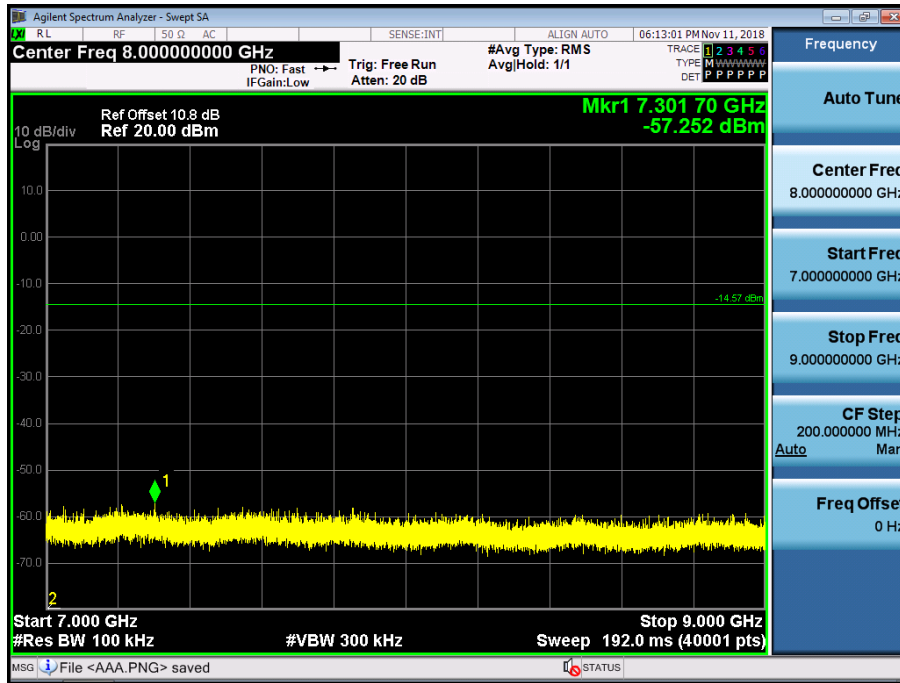
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



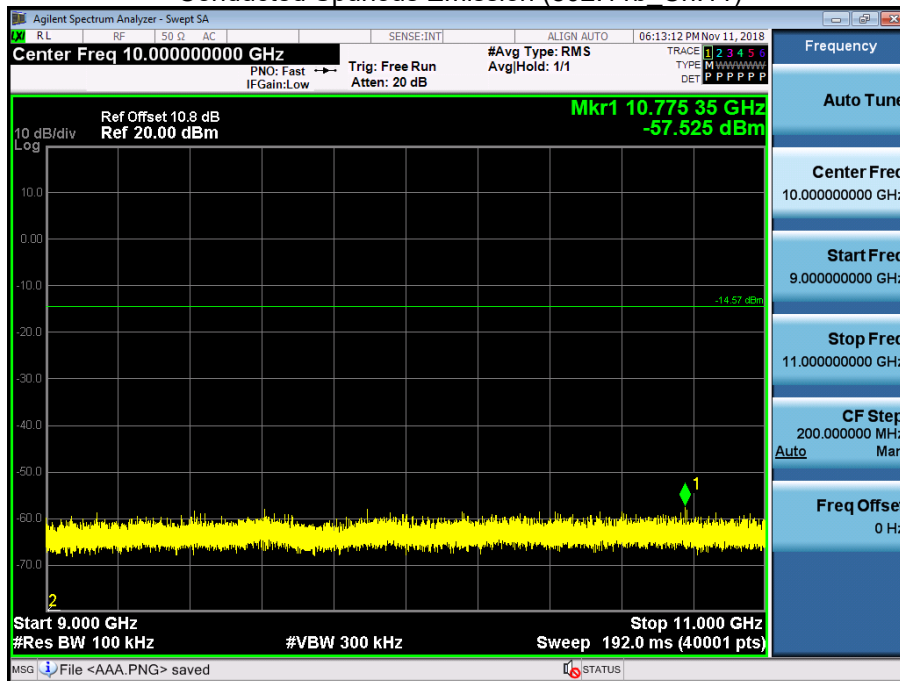
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



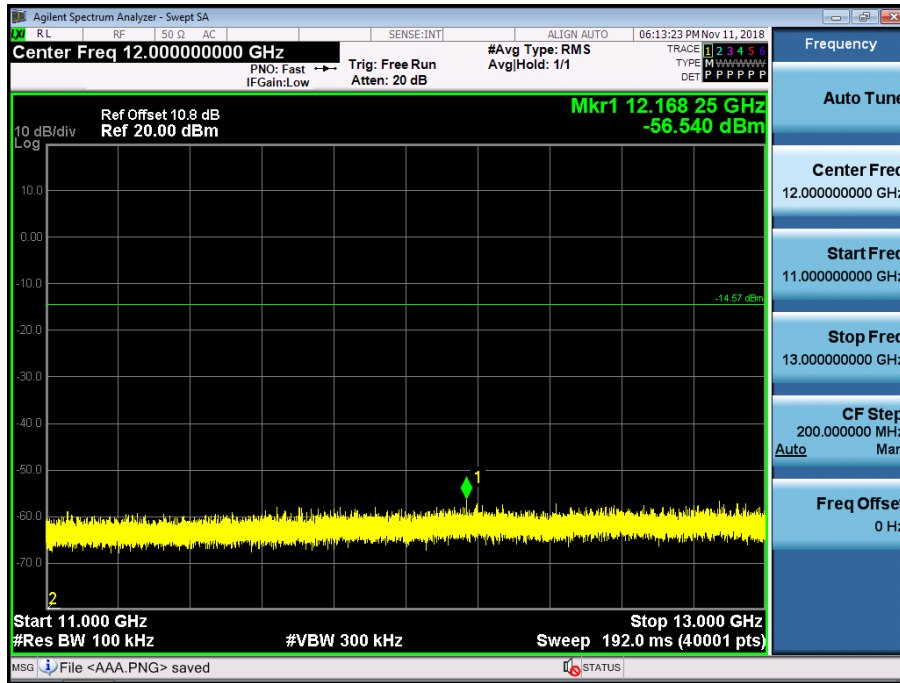
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



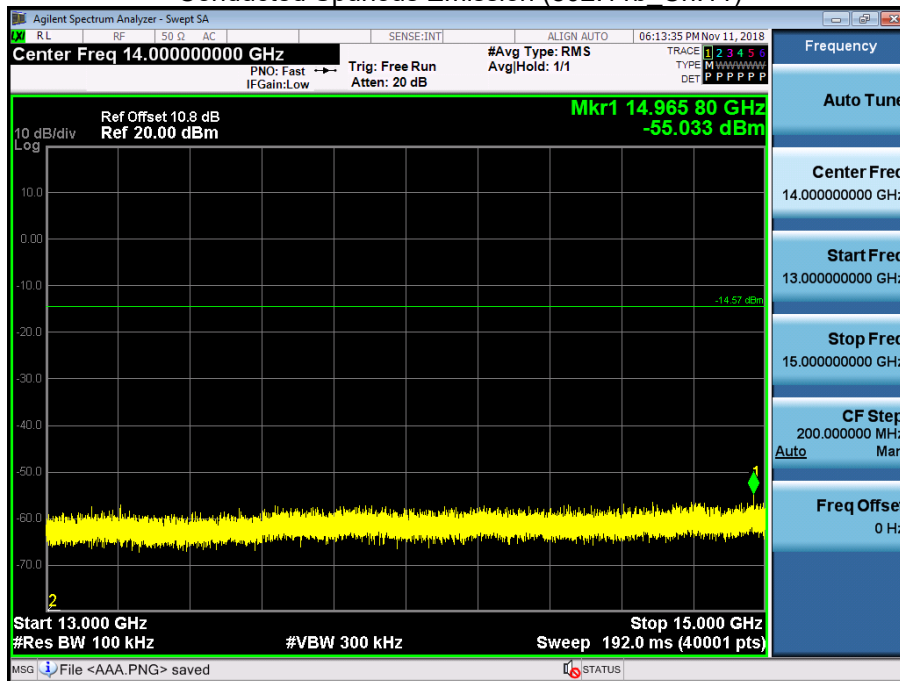
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



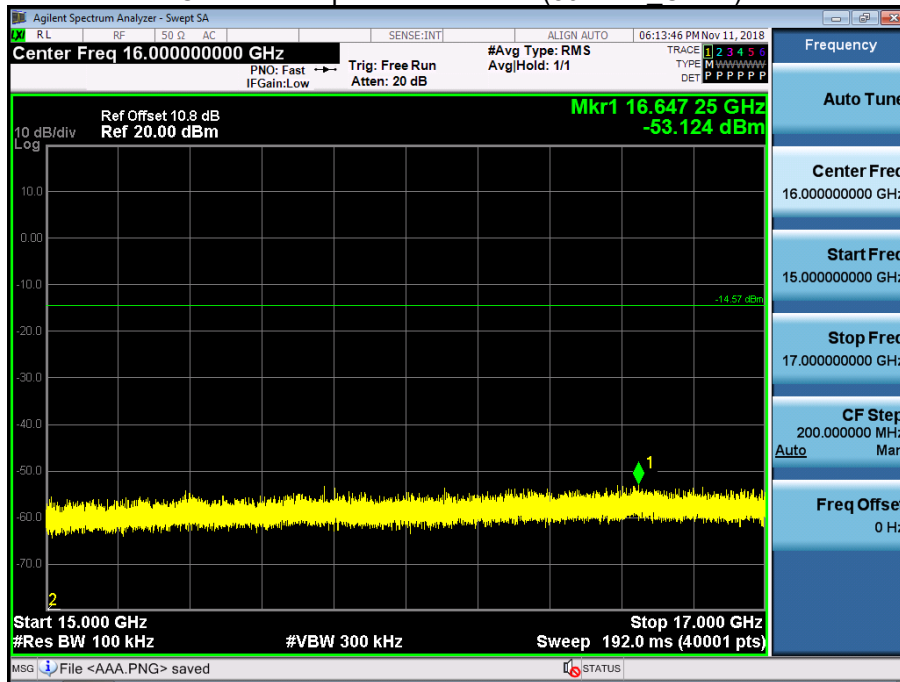
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b\_Ch.11)



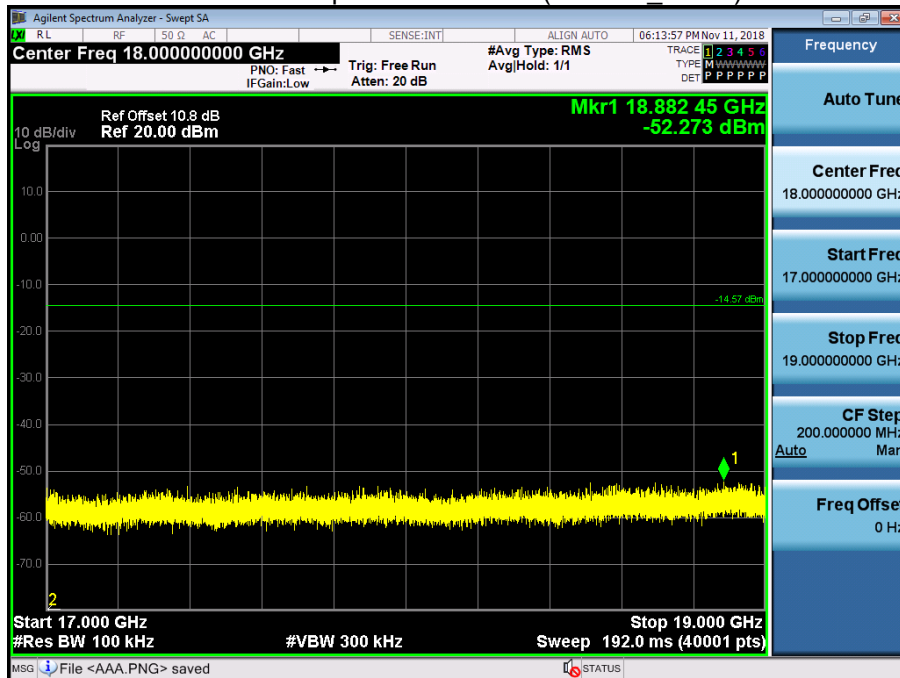
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b Ch.11)



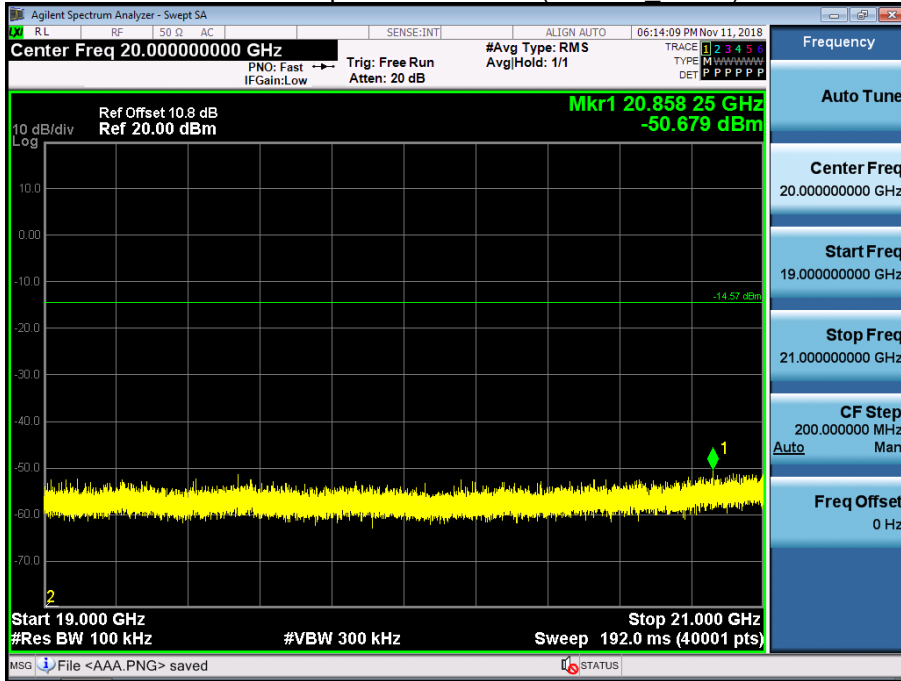
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b Ch.11)



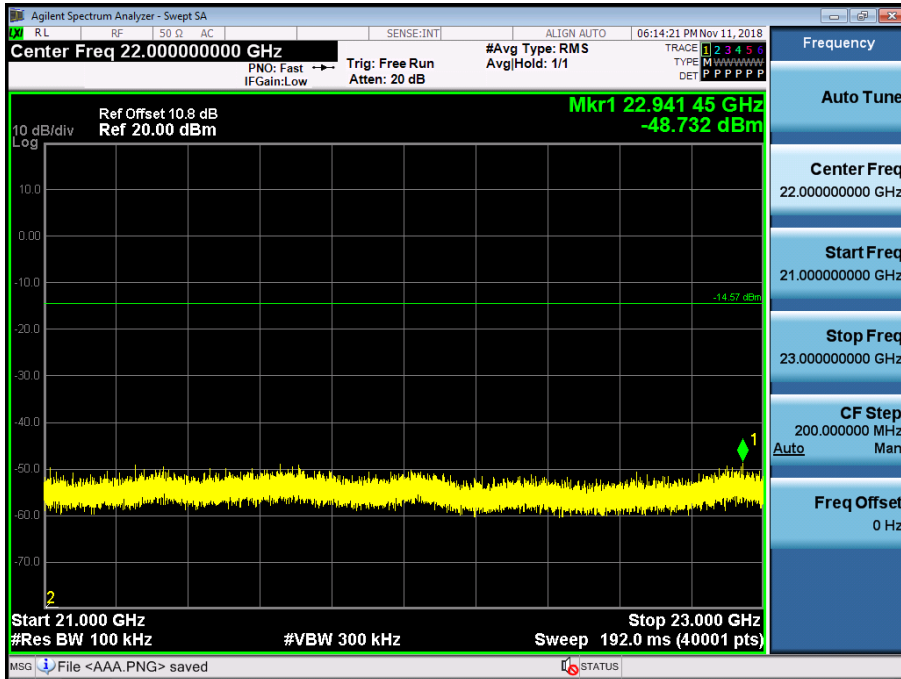
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b Ch.11)



21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b\_Ch.11)





## 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 =  $40 \cdot \log(\text{specific distance} / \text{test distance})$  (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor
4. The test results for below 30 MHz is correlated to an open site.  
The result on OATS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

### Frequency Range : Below 1 GHz

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

**Note:**

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



**Frequency Range : Above 1 GHz**

**[Ant1]**

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	52.61	1.45	V	54.06	73.98	19.92	PK
4824	46.94	1.45	V	48.39	53.98	5.59	AV
7236	44.89	11.43	V	56.32	73.98	17.66	PK
7236	33.05	11.43	V	44.48	53.98	9.50	AV
4824	54.15	1.45	H	55.60	73.98	18.38	PK
4824	48.40	1.45	H	49.85	53.98	4.13	AV
7236	45.66	11.43	H	57.09	73.98	16.89	PK
7236	33.40	11.43	H	44.83	53.98	9.15	AV

Operation Mode: 802.11b  
 Transfer Rate: 1 Mbps  
 Operating Frequency: 2437  
 Channel No. 06 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	52.11	1.66	V	53.77	73.98	20.21	PK
4874	47.94	1.66	V	49.60	53.98	4.38	AV
7311	46.58	10.10	V	56.68	73.98	17.30	PK
7311	36.53	10.10	V	46.63	53.98	7.35	AV
4874	53.83	1.66	H	55.49	73.98	18.49	PK
4874	48.30	1.66	H	49.96	53.98	4.02	AV
7311	47.60	10.10	H	57.70	73.98	16.28	PK
7311	37.10	10.10	H	47.20	53.98	6.78	AV

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	52.74	1.00	V	53.74	73.98	20.24	PK
4924	46.69	1.00	V	47.69	53.98	6.29	AV
7386	48.14	11.10	V	59.24	73.98	14.74	PK
7386	36.88	11.10	V	47.98	53.98	6.00	AV
4924	53.11	1.00	H	54.11	73.98	19.87	PK
4924	47.10	1.00	H	48.10	53.98	5.88	AV
7386	48.35	11.10	H	59.45	73.98	14.53	PK
7386	37.23	11.10	H	48.33	53.98	5.65	AV

**[Ant2]**

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	54.13	1.45	V	55.58	73.98	18.40	PK
4824	48.02	1.45	V	49.47	53.98	4.51	AV
7236	44.89	11.43	V	56.32	73.98	17.66	PK
7236	33.18	11.43	V	44.61	53.98	9.37	AV
4824	54.48	1.45	H	55.93	73.98	18.05	PK
4824	48.40	1.45	H	49.85	53.98	4.13	AV
7236	45.16	11.43	H	56.59	73.98	17.39	PK
7236	33.29	11.43	H	44.72	53.98	9.26	AV

Operation Mode: 802.11b  
 Transfer Rate: 1 Mbps  
 Operating Frequency: 2437  
 Channel No. 06 Ch

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	52.47	1.66	V	54.13	73.98	19.85	PK
4874	47.99	1.66	V	49.65	53.98	4.33	AV
7311	44.96	10.10	V	55.06	73.98	18.92	PK
7311	33.65	10.10	V	43.75	53.98	10.23	AV
4874	53.85	1.66	H	55.51	73.98	18.47	PK
4874	48.44	1.66	H	50.10	53.98	3.88	AV
7311	45.81	10.10	H	55.91	73.98	18.07	PK
7311	33.73	10.10	H	43.83	53.98	10.15	AV

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	53.37	1.00	V	54.37	73.98	19.61	PK
4924	48.85	1.00	V	49.85	53.98	4.13	AV
7386	44.69	11.10	V	55.79	73.98	18.19	PK
7386	33.42	11.10	V	44.52	53.98	9.46	AV
4924	54.45	1.00	H	55.45	73.98	18.53	PK
4924	49.09	1.00	H	50.09	53.98	3.89	AV
7386	45.27	11.10	H	56.37	73.98	17.61	PK
7386	33.53	11.10	H	44.63	53.98	9.35	AV

**[Ant1 + Ant2]**

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

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	51.34	0.00	1.45	V	52.79	73.98	21.19	PK
4824	39.10	0.31	1.45	V	40.86	53.98	13.12	AV
7236	46.08	0.00	11.43	V	57.51	73.98	16.47	PK
7236	33.80	0.31	11.43	V	45.54	53.98	8.44	AV
4824	52.58	0.00	1.45	H	54.03	73.98	19.95	PK
4824	40.54	0.31	1.45	H	42.30	53.98	11.68	AV
7236	48.63	0.00	11.43	H	60.06	73.98	13.92	PK
7236	34.91	0.31	11.43	H	46.65	53.98	7.33	AV

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

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	51.68	0.00	1.45	V	53.13	73.98	20.85	PK
4824	39.16	0.33	1.45	V	40.94	53.98	13.04	AV
7236	51.66	0.00	11.43	V	63.09	73.98	10.89	PK
7236	35.03	0.33	11.43	V	46.79	53.98	7.19	AV
4824	52.15	0.00	1.45	H	53.60	73.98	20.38	PK
4824	39.62	0.33	1.45	H	41.40	53.98	12.58	AV
7236	52.84	0.00	11.43	H	64.27	73.98	9.71	PK
7236	35.39	0.33	11.43	H	47.15	53.98	6.83	AV

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

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	50.62	0.00	1.66	V	52.28	73.98	21.70	PK
4874	38.45	0.31	1.66	V	40.42	53.98	13.56	AV
7311	47.22	0.00	10.10	V	57.32	73.98	16.66	PK
7311	34.18	0.31	10.10	V	44.59	53.98	9.39	AV
4874	51.37	0.00	1.66	H	53.03	73.98	20.95	PK
4874	38.75	0.31	1.66	H	40.72	53.98	13.26	AV
7311	47.56	0.00	10.10	H	57.66	73.98	16.32	PK
7311	34.33	0.31	10.10	H	44.74	53.98	9.24	AV

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

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	57.64	0.00	1.66	V	59.30	73.98	14.68	PK
4874	41.75	0.33	1.66	V	43.74	53.98	10.24	AV
7311	47.55	0.00	10.10	V	57.65	73.98	16.33	PK
7311	34.20	0.33	10.10	V	44.63	53.98	9.35	AV
4874	58.77	0.00	1.66	H	60.43	73.98	13.55	PK
4874	42.22	0.33	1.66	H	44.21	53.98	9.77	AV
7311	48.19	0.00	10.10	H	58.29	73.98	15.69	PK
7311	34.49	0.33	10.10	H	44.92	53.98	9.06	AV

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

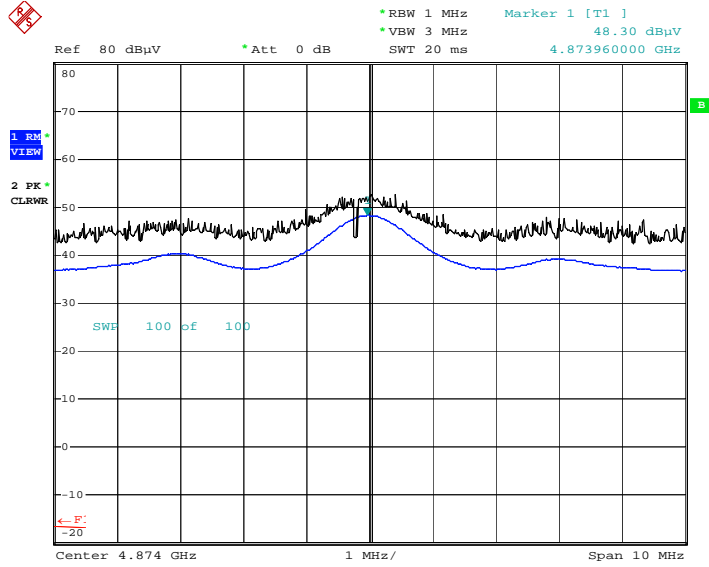
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	50.56	0.00	1.00	V	51.56	73.98	22.42	PK
4924	38.26	0.31	1.00	V	39.57	53.98	14.41	AV
7386	45.22	0.00	11.10	V	56.32	73.98	17.66	PK
7386	34.30	0.31	11.10	V	45.71	53.98	8.27	AV
4924	51.17	0.00	1.00	H	52.17	73.98	21.81	PK
4924	38.98	0.31	1.00	H	40.29	53.98	13.69	AV
7386	46.80	0.00	11.10	H	57.90	73.98	16.08	PK
7386	34.37	0.31	11.10	H	45.78	53.98	8.20	AV

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

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	51.34	0.00	1.00	V	52.34	73.98	21.64	PK
4924	38.64	0.33	1.00	V	39.97	53.98	14.01	AV
7386	46.61	0.00	11.10	V	57.71	73.98	16.27	PK
7386	33.81	0.33	11.10	V	45.24	53.98	8.74	AV
4924	52.89	0.00	1.00	H	53.89	73.98	20.09	PK
4924	39.03	0.33	1.00	H	40.36	53.98	13.62	AV
7386	46.80	0.00	11.10	H	57.90	73.98	16.08	PK
7386	33.88	0.33	11.10	H	45.31	53.98	8.67	AV

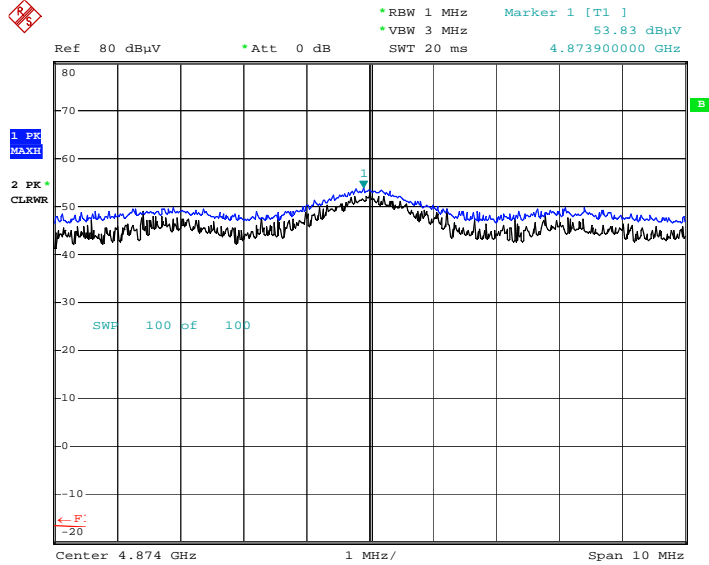
■ Test Plots[Ant1]

Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.6 2nd Harmonic, H)



Date: 12.NOV.2018 18:08:18

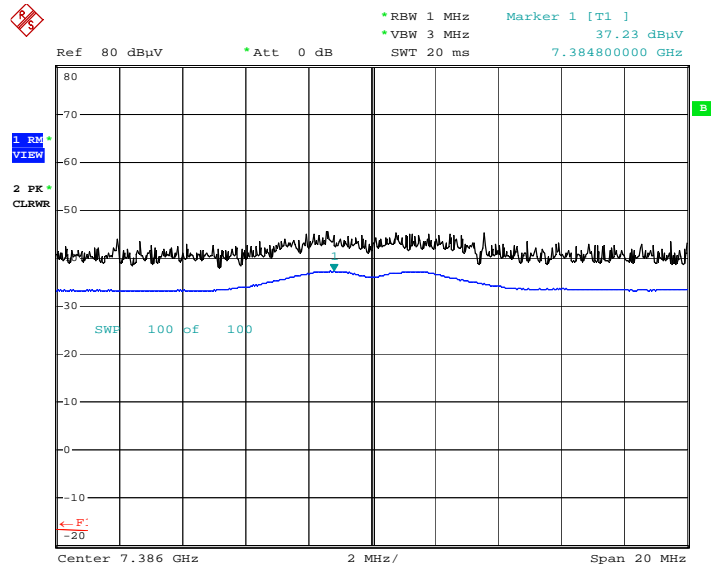
Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.6 2nd Harmonic, H)



Date: 12.NOV.2018 18:08:35

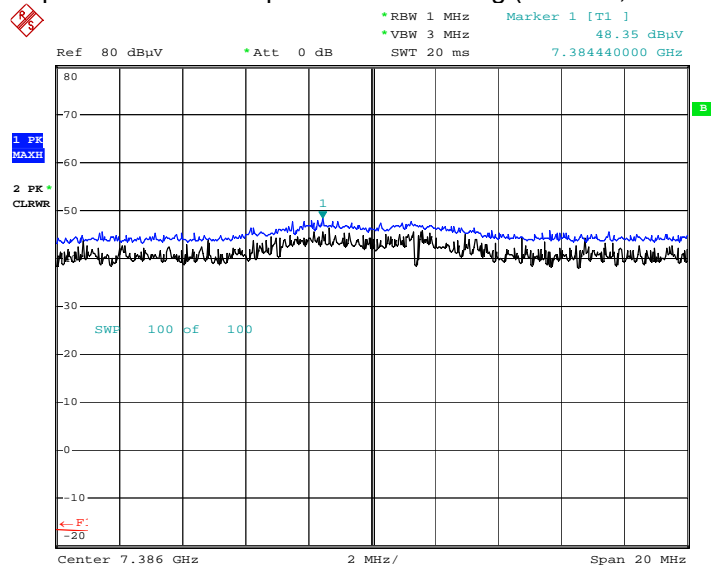


Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.11 3rd Harmonic, H)



Date: 12.NOV.2018 18:22:45

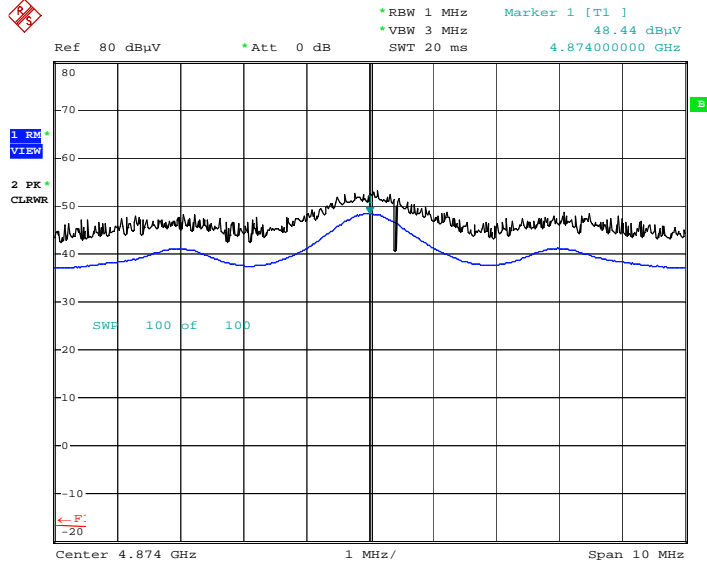
Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.11 3rd Harmonic, H)



Date: 12.NOV.2018 18:23:19

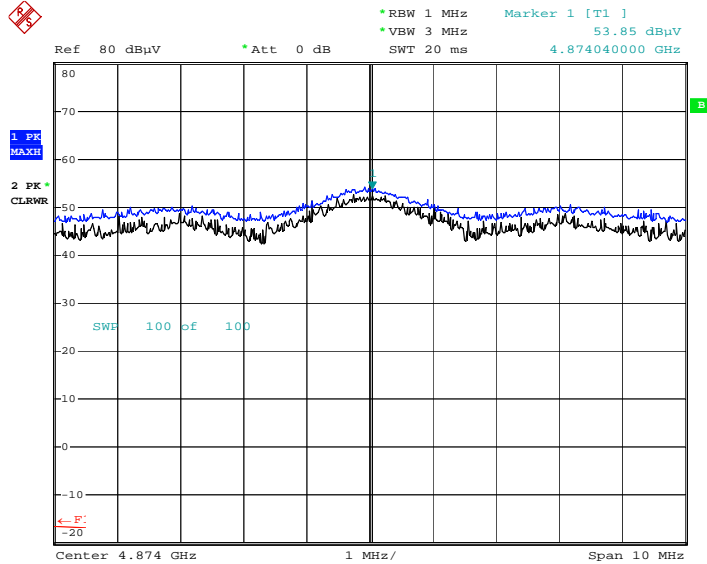
■ Test Plots[Ant2]

Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.6 2nd Harmonic, H)



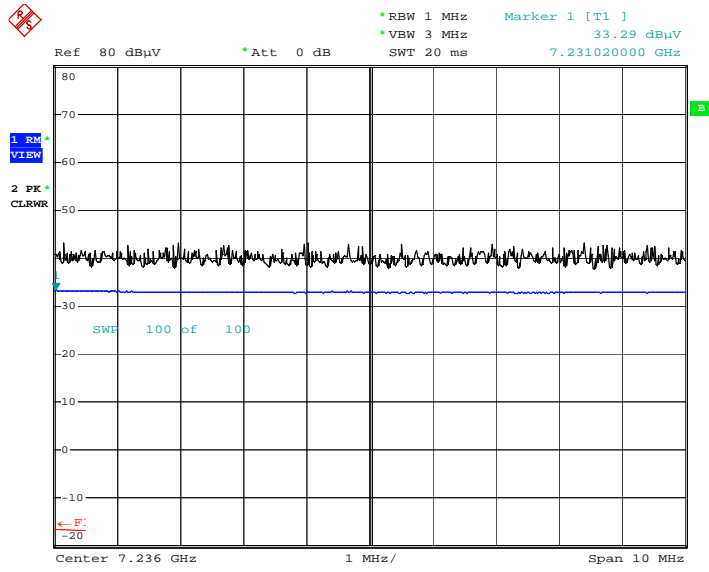
Date: 12.NOV.2018 18:52:14

Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.6 2nd Harmonic, H)



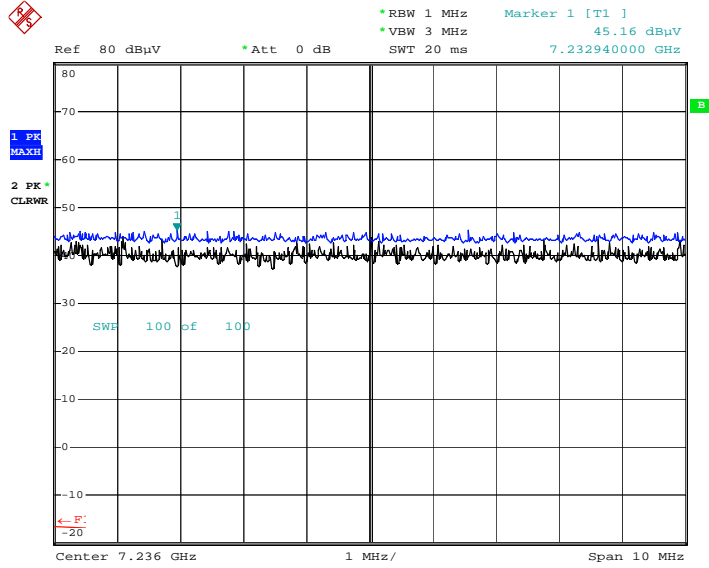
Date: 12.NOV.2018 18:52:57

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



Date: 12.NOV.2018 18:54:16

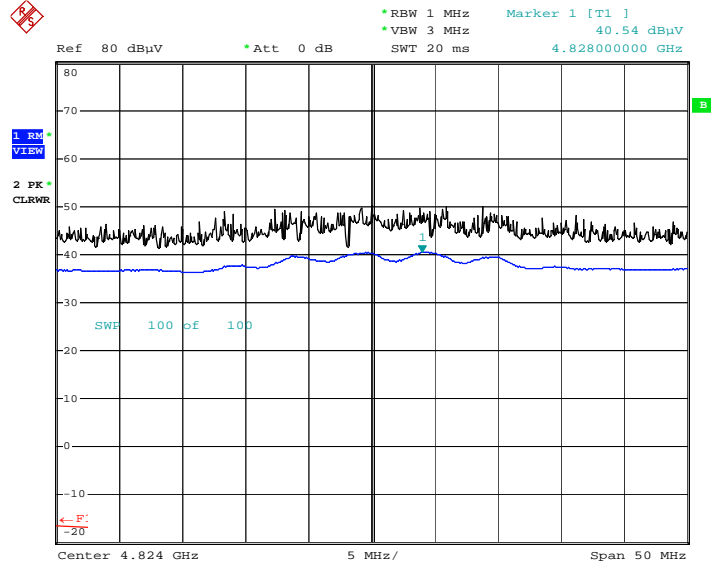
Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.1 3rd Harmonic, H) [Ant2]



Date: 12.NOV.2018 18:54:44

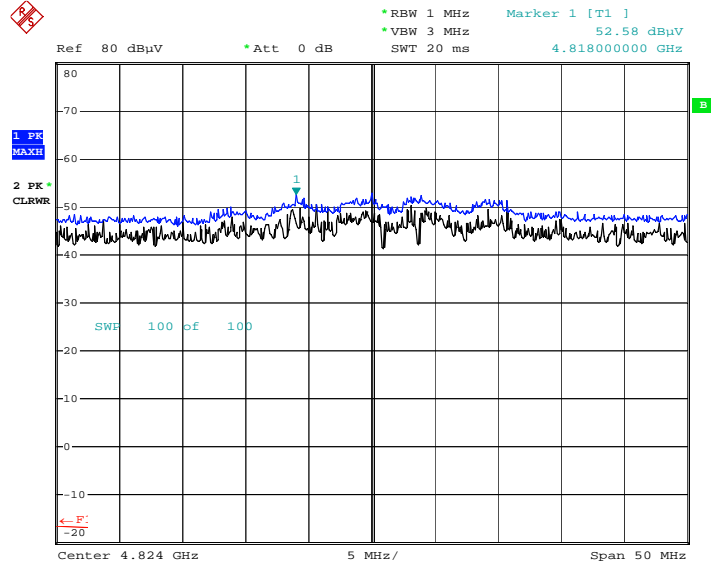
■ Test Plots[Ant1 + Ant2]

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



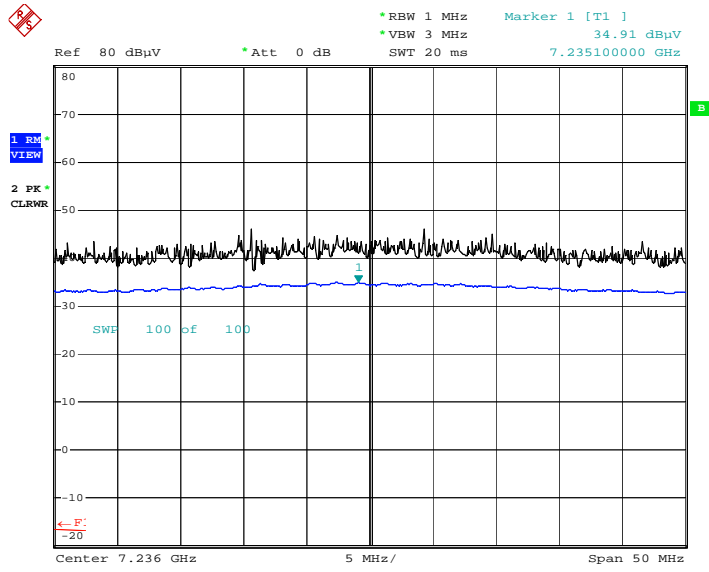
Date: 12.NOV.2018 17:56:02

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



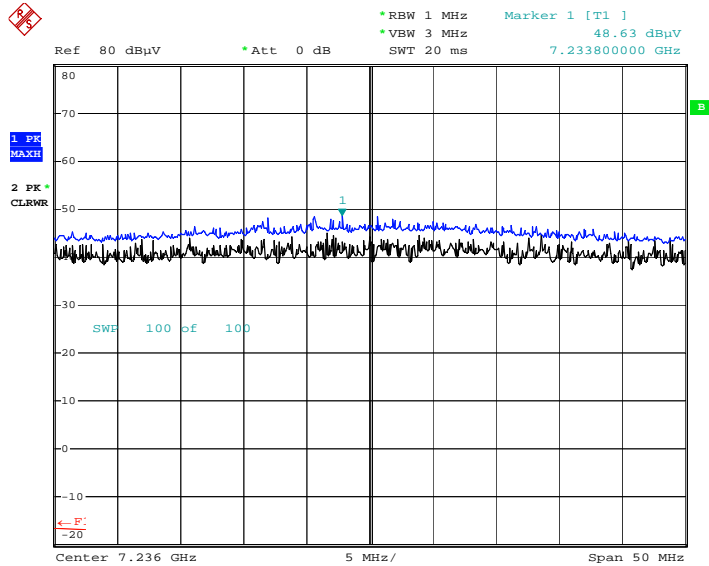
Date: 12.NOV.2018 17:56:40

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



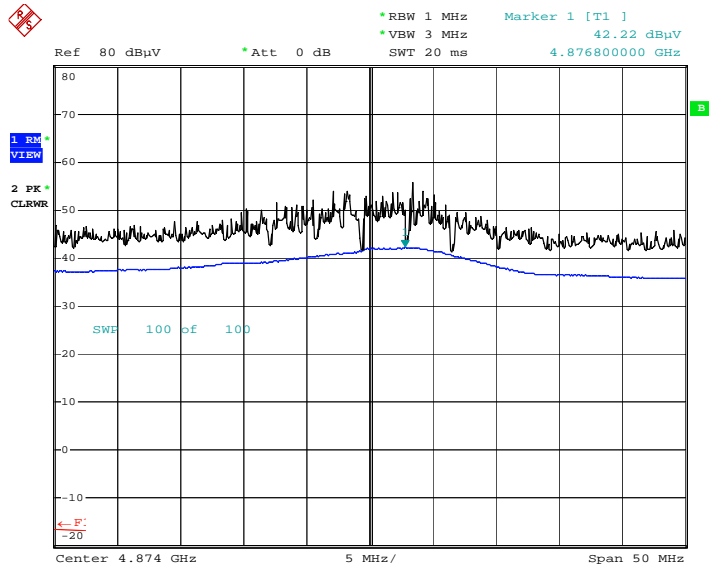
Date: 12.NOV.2018 17:57:50

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



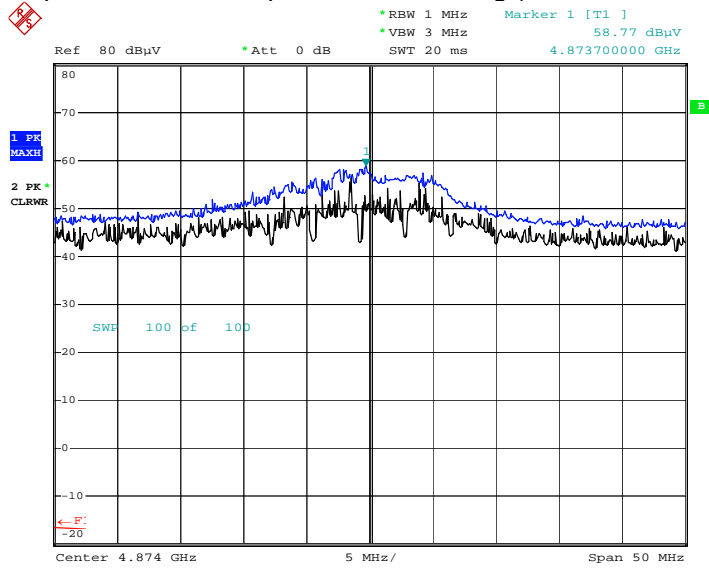
Date: 12.NOV.2018 17:58:27

Radiated Spurious Emissions plot – Average Reading (802.11n, Ch.6 2nd Harmonic, H)



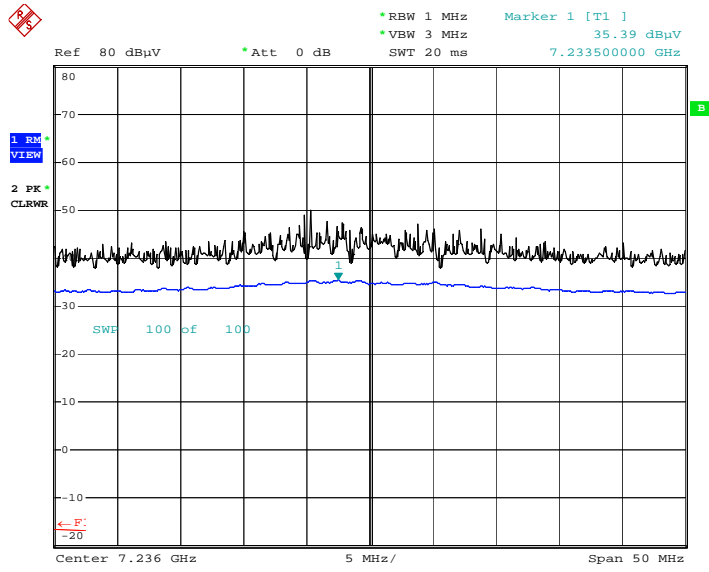
Date: 12.NOV.2018 19:27:10

Radiated Spurious Emissions plot – Peak Reading (802.11n, Ch.6 2nd Harmonic, H)



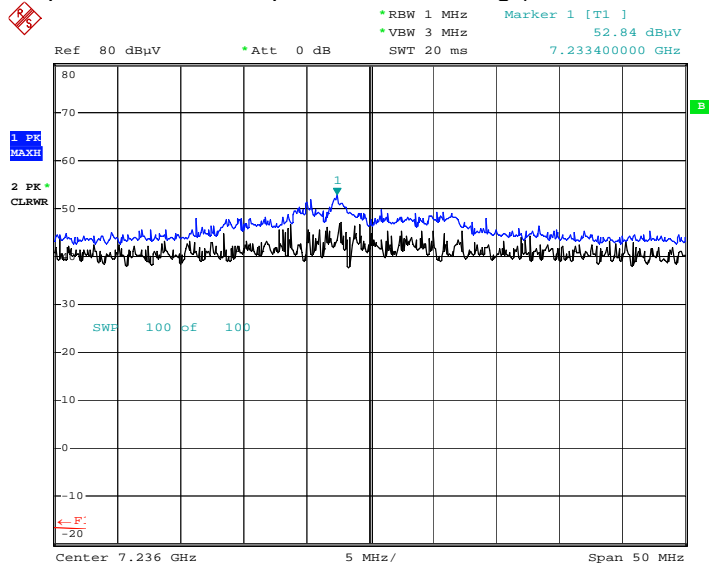
Date: 12.NOV.2018 19:27:48

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



Date: 12.NOV.2018 17:59:19

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



Date: 12.NOV.2018 17:59:43

**Note:**

Plot of worst case are only reported.

### 9.7 RADIATED RESTRICTED BAND EDGES

**[Ant1]**

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	52.14	1.14	H	53.28	73.98	20.70	PK
2390.0	39.75	1.14	H	40.89	53.98	13.09	AV
2390.0	50.58	1.14	V	51.72	73.98	22.26	PK
2390.0	39.50	1.14	V	40.64	53.98	13.34	AV
2483.5	54.00	0.78	H	54.78	73.98	19.20	PK
2483.5	39.50	0.78	H	40.28	53.98	13.70	AV
2483.5	53.58	0.78	V	54.36	73.98	19.62	PK
2483.5	39.32	0.78	V	40.10	53.98	13.88	AV

**[Ant2]**

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	54.35	1.14	H	55.49	73.98	18.49	PK
2390.0	39.61	1.14	H	40.75	53.98	13.23	AV
2390.0	52.62	1.14	V	1.14	73.98	72.84	PK
2390.0	35.63	1.14	V	1.14	53.98	52.84	AV
2483.5	56.70	0.78	H	57.48	73.98	16.50	PK
2483.5	39.57	0.78	H	40.35	53.98	13.63	AV
2483.5	54.62	0.78	V	0.78	73.98	73.20	PK
2483.5	37.66	0.78	V	0.78	53.98	53.20	AV



**[Ant1+Ant2]**

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

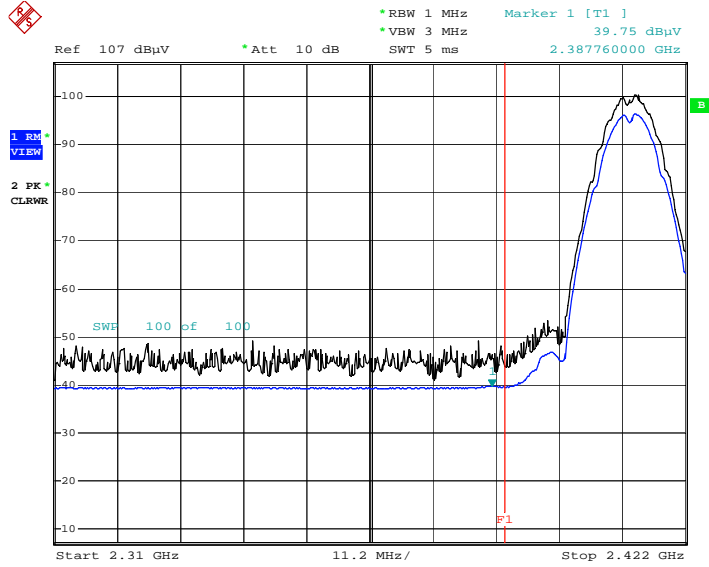
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+C.L.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	63.39	0.00	1.14	H	64.53	73.98	9.45	PK
2390.0	48.09	0.31	1.14	H	49.54	53.98	4.44	AV
2390.0	61.17	0.00	1.14	V	62.31	73.98	11.67	PK
2390.0	45.30	0.31	1.14	V	46.75	53.98	7.23	AV
2483.5	66.65	0.00	0.78	H	67.43	73.98	6.55	PK
2483.5	50.34	0.31	0.78	H	51.43	53.98	2.55	AV
2483.5	60.43	0.00	0.78	V	61.21	73.98	12.77	PK
2483.5	47.26	0.31	0.78	V	48.35	53.98	5.63	AV

Operation Mode: 802.11n (HT20)  
 Transfer MCS Index: 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	63.41	0.00	1.14	H	64.55	73.98	9.43	PK
2390.0	47.99	0.33	1.14	H	49.46	53.98	4.52	AV
2390.0	62.50	0.00	1.14	V	63.64	73.98	10.34	PK
2390.0	47.24	0.33	1.14	V	48.71	53.98	5.27	AV
2483.5	64.63	0.00	0.78	H	65.41	73.98	8.57	PK
2483.5	50.48	0.33	0.78	H	51.59	53.98	2.39	AV
2483.5	63.49	0.00	0.78	V	64.27	73.98	9.71	PK
2483.5	49.10	0.33	0.78	V	50.21	53.98	3.77	AV

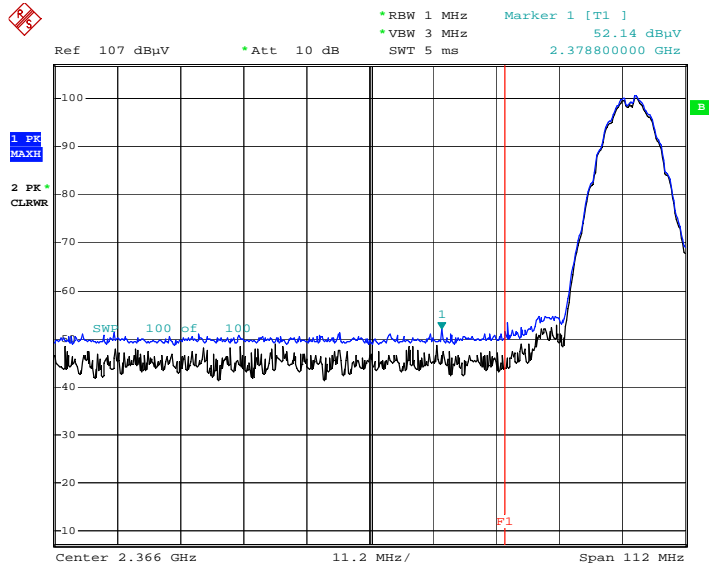
■ Test Plots[Ant1]

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



Date: 12.NOV.2018 20:04:41

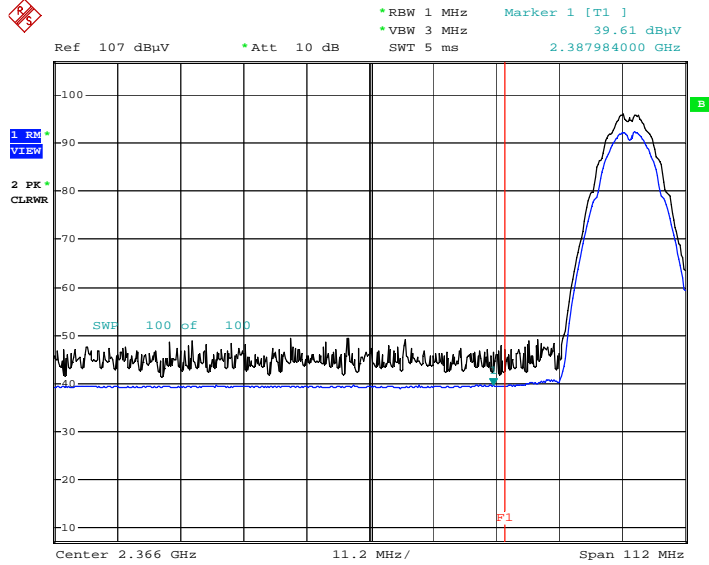
Radiated Restricted Band Edges plot – Peak Reading (802.11b Ch.1)



Date: 12.NOV.2018 20:24:41

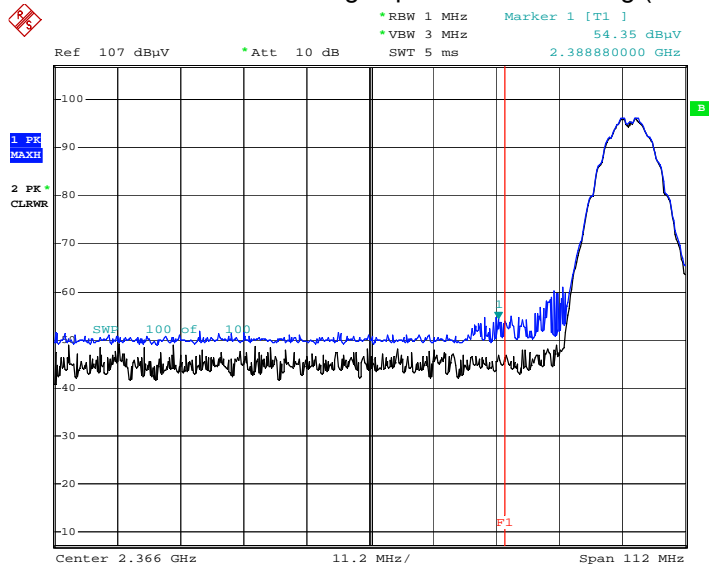
■ Test Plots[Ant2]

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



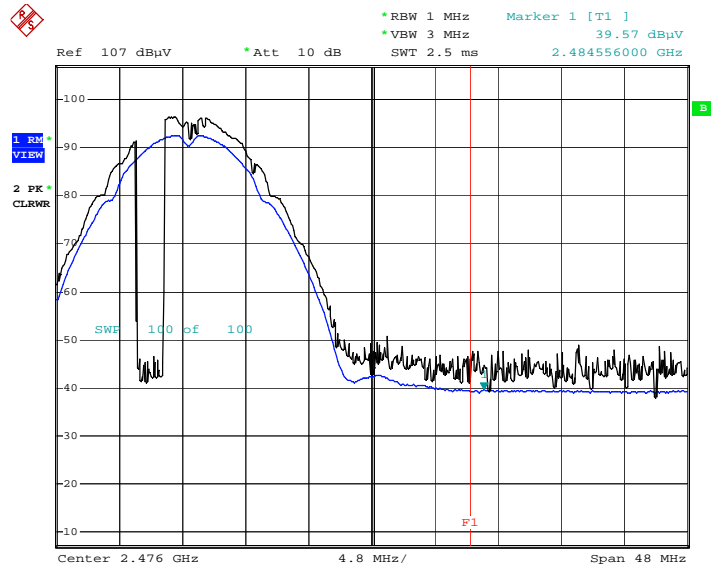
Date: 12.NOV.2018 20:20:59

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



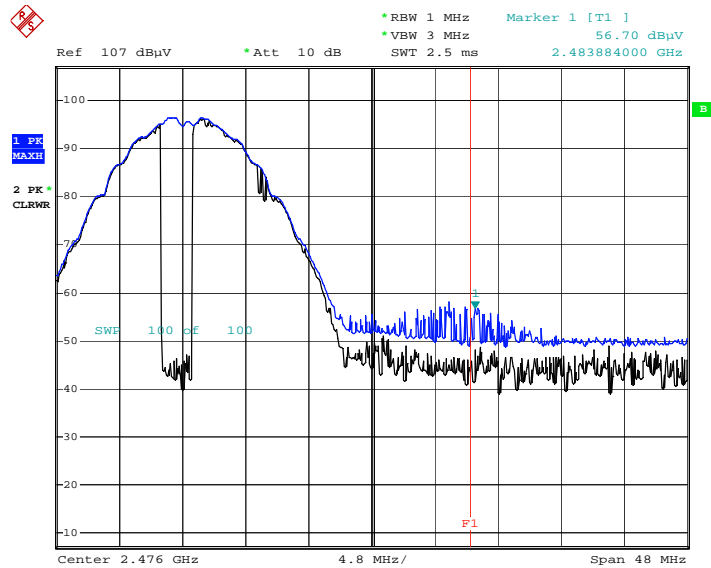
Date: 12.NOV.2018 20:21:52

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



Date: 12.NOV.2018 20:14:15

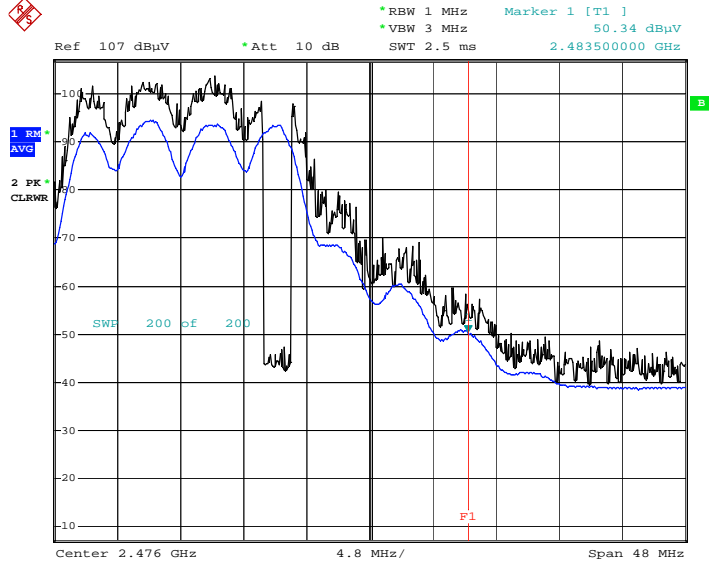
Radiated Restricted Band Edges plot – Peak Reading (802.11b Ch.11) [Ant2]



Date: 12.NOV.2018 20:15:22

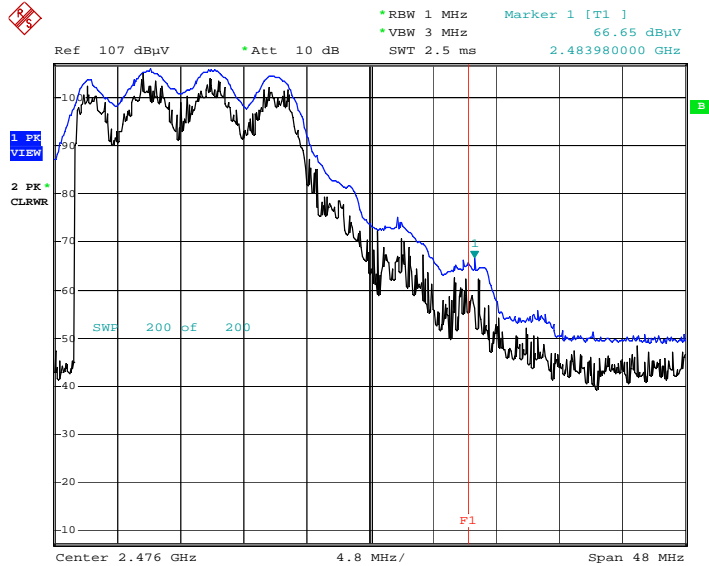
■ Test Plots[Ant1+Ant2]

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



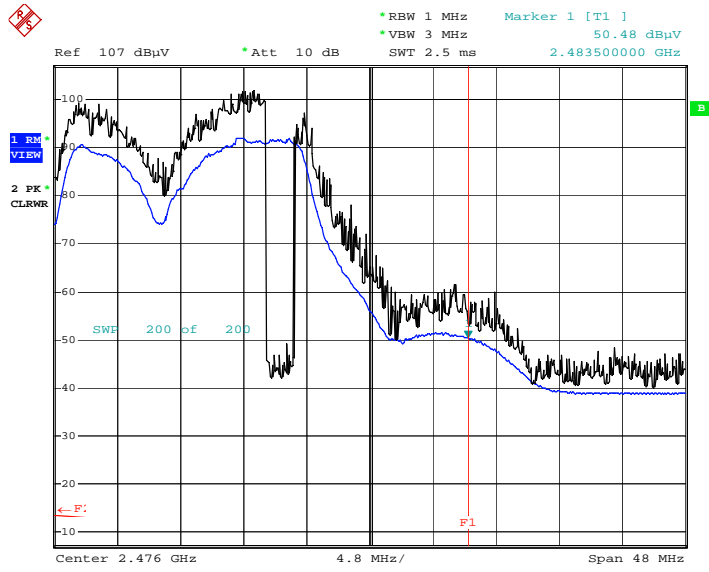
Date: 6.NOV.2018 18:21:36

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



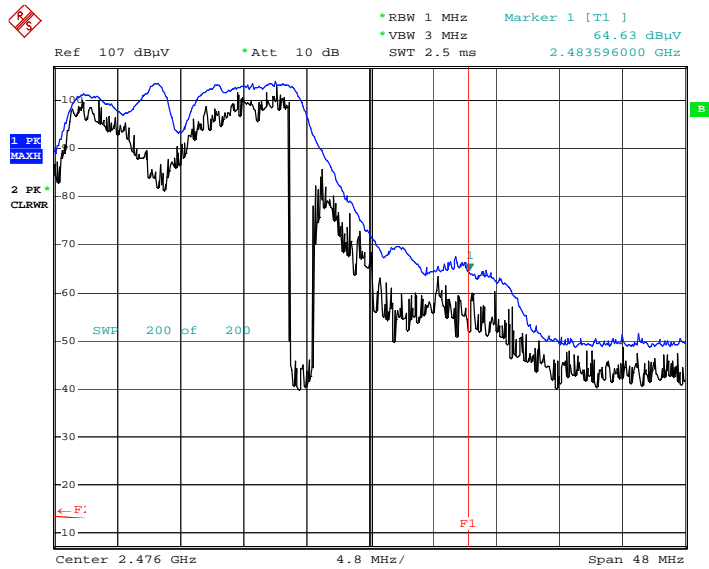
Date: 6.NOV.2018 18:20:33

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



Date: 6.NOV.2018 19:11:27

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



Date: 6.NOV.2018 19:12:24

**Note:**

Plot of worst case are only reported.

## 9.8 POWERLINE CONDUCTED EMISSIONS

### Conducted Emissions (Line 1)

EMI Auto Test(5)

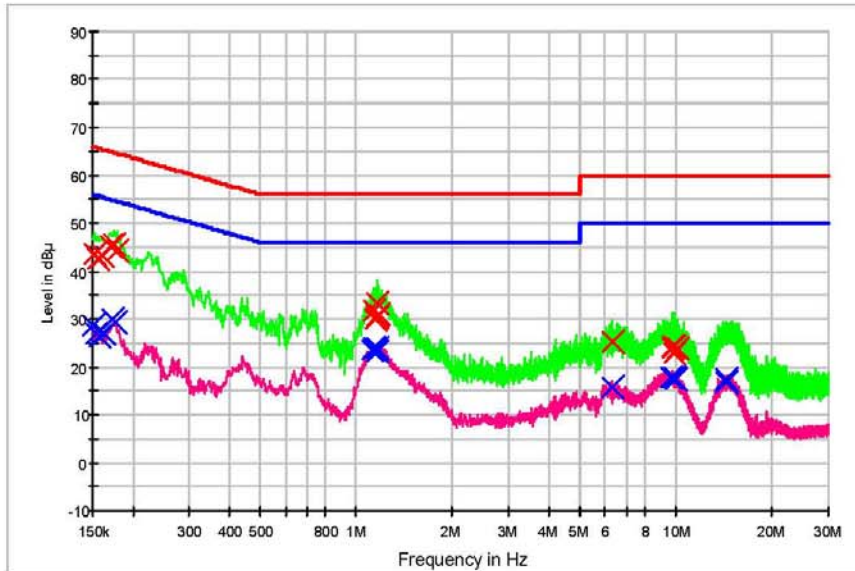
1 / 2

# HCT TEST Report

### Common Information

EUT: SM-A920N  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: WLAN 2.4G MODE

FCC CLASS B\_Exten Cable



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

### Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	43.6	9.000	Off	N	9.7	22.3	65.9
0.156000	42.6	9.000	Off	N	9.7	23.1	65.7
0.160000	43.1	9.000	Off	N	9.7	22.3	65.5
0.170000	45.1	9.000	Off	N	9.7	19.8	65.0
0.174000	45.6	9.000	Off	N	9.7	19.2	64.8
0.178000	44.2	9.000	Off	N	9.7	20.4	64.6
1.138000	31.8	9.000	Off	N	9.8	24.2	56.0
1.146000	29.9	9.000	Off	N	9.8	26.1	56.0
1.160000	30.4	9.000	Off	N	9.8	25.6	56.0
1.164000	33.2	9.000	Off	N	9.8	22.8	56.0
1.168000	30.6	9.000	Off	N	9.8	25.4	56.0
1.172000	31.0	9.000	Off	N	9.8	25.0	56.0
6.362000	25.4	9.000	Off	N	10.1	34.6	60.0
9.768000	24.1	9.000	Off	N	10.2	35.9	60.0
9.804000	24.1	9.000	Off	N	10.2	35.9	60.0
9.868000	24.3	9.000	Off	N	10.2	35.7	60.0
9.916000	22.8	9.000	Off	N	10.2	37.2	60.0
10.092000	24.0	9.000	Off	N	10.3	36.0	60.0

EMI Auto Test(5)

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**Final Result 2**

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	28.5	9.000	Off	N	9.7	27.5	56.0
0.154000	26.9	9.000	Off	N	9.7	28.9	55.8
0.158000	26.1	9.000	Off	N	9.7	29.4	55.6
0.162000	26.9	9.000	Off	N	9.7	28.5	55.4
0.172000	29.9	9.000	Off	N	9.7	25.0	54.9
0.176000	29.4	9.000	Off	N	9.7	25.3	54.7
1.122000	23.4	9.000	Off	N	9.8	22.6	46.0
1.138000	24.0	9.000	Off	N	9.8	22.0	46.0
1.156000	23.4	9.000	Off	N	9.8	22.6	46.0
1.160000	23.9	9.000	Off	N	9.8	22.1	46.0
1.164000	24.0	9.000	Off	N	9.8	22.0	46.0
1.168000	23.8	9.000	Off	N	9.8	22.2	46.0
6.360000	15.6	9.000	Off	N	10.1	34.4	50.0
9.606000	17.9	9.000	Off	N	10.2	32.1	50.0
9.868000	17.8	9.000	Off	N	10.2	32.2	50.0
9.950000	17.6	9.000	Off	N	10.2	32.4	50.0
14.290000	17.4	9.000	Off	N	10.4	32.6	50.0
14.416000	16.7	9.000	Off	N	10.5	33.3	50.0

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**Conducted Emissions (Line 2)**

EMI Auto Test(5)

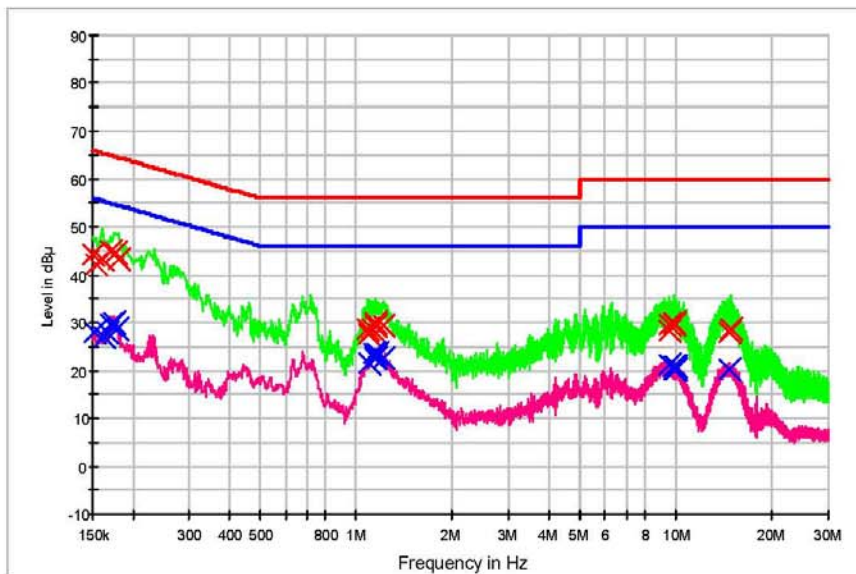
1 / 2

# HCT TEST Report

**Common Information**

EUT: SM-A920N  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: WLAN 2.4G MODE

FCC CLASS B\_Exten Cable



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

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	44.3	9.000	Off	L1	9.7	21.7	66.0
0.154000	42.4	9.000	Off	L1	9.7	23.4	65.8
0.160000	43.3	9.000	Off	L1	9.7	22.2	65.5
0.170000	44.8	9.000	Off	L1	9.7	20.1	65.0
0.176000	44.6	9.000	Off	L1	9.7	20.1	64.7
0.180000	43.1	9.000	Off	L1	9.7	21.4	64.5
1.088000	28.6	9.000	Off	L1	9.8	27.4	56.0
1.100000	27.6	9.000	Off	L1	9.8	28.4	56.0
1.120000	28.6	9.000	Off	L1	9.8	27.4	56.0
1.144000	29.9	9.000	Off	L1	9.8	26.1	56.0
1.154000	29.4	9.000	Off	L1	9.8	26.6	56.0
1.224000	29.3	9.000	Off	L1	9.8	26.7	56.0
9.504000	29.6	9.000	Off	L1	10.2	30.4	60.0
9.524000	28.4	9.000	Off	L1	10.2	31.6	60.0
9.886000	30.1	9.000	Off	L1	10.2	29.9	60.0
9.900000	29.8	9.000	Off	L1	10.2	30.2	60.0
14.742000	27.8	9.000	Off	L1	10.3	32.2	60.0
14.854000	28.5	9.000	Off	L1	10.3	31.5	60.0

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오후 6:31:21

EMI Auto Test(5)

2 / 2

**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	27.8	9.000	Off	L1	9.7	28.1	55.9
0.162000	26.8	9.000	Off	L1	9.7	28.5	55.4
0.166000	28.1	9.000	Off	L1	9.7	27.1	55.2
0.170000	29.7	9.000	Off	L1	9.7	25.3	55.0
0.174000	29.8	9.000	Off	L1	9.7	24.9	54.8
0.178000	28.7	9.000	Off	L1	9.7	25.8	54.6
1.100000	21.7	9.000	Off	L1	9.8	24.3	46.0
1.138000	23.5	9.000	Off	L1	9.8	22.5	46.0
1.144000	22.8	9.000	Off	L1	9.8	23.2	46.0
1.154000	22.7	9.000	Off	L1	9.8	23.3	46.0
1.162000	23.6	9.000	Off	L1	9.8	22.4	46.0
1.224000	22.5	9.000	Off	L1	9.8	23.5	46.0
9.504000	21.3	9.000	Off	L1	10.2	28.7	50.0
9.886000	20.8	9.000	Off	L1	10.2	29.2	50.0
9.900000	20.3	9.000	Off	L1	10.2	29.7	50.0
9.944000	20.3	9.000	Off	L1	10.2	29.7	50.0
9.952000	20.8	9.000	Off	L1	10.2	29.2	50.0
14.742000	20.3	9.000	Off	L1	10.3	29.7	50.0

2018-11-08

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## 9.9 CONFIRMATION OF GEO-LOCATION MECHANISM

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.

### Setting the channel for Access point

- SSID : ap\_2g\_ht20

- Ch.12 setting

```

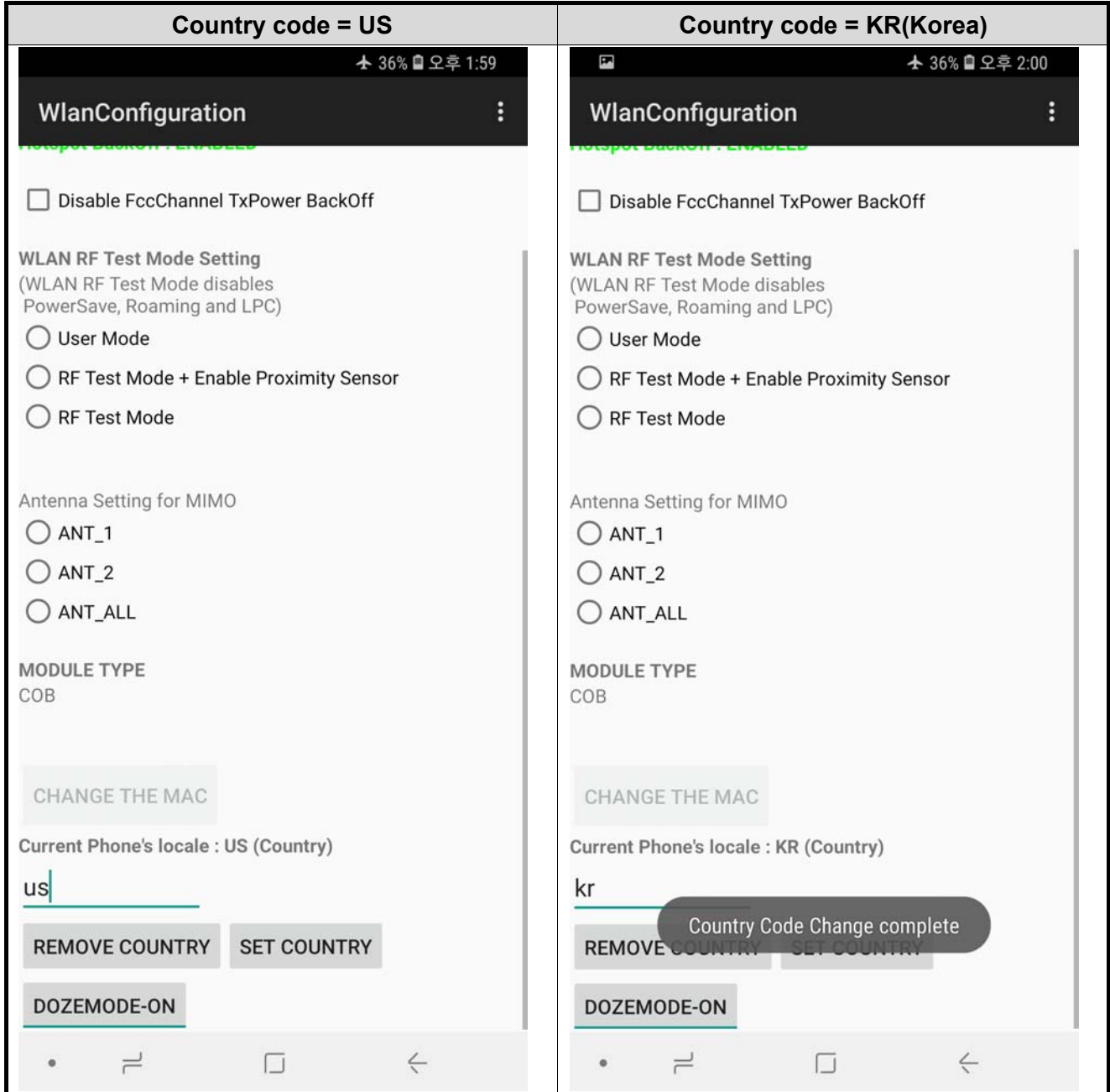
Debug:~> wl -i radio_1 down
Debug:~> wl -i radio_1 chanspec 12
Chanspec set to 0x100c
Debug:~> wl -i radio_1 up
  
```

- Ch.13 setting

```

Debug:~> wl -i radio_1 down
Debug:~> wl -i radio_1 chanspec 13
Chanspec set to 0x100d
Debug:~> wl -i radio_1 up
  
```

**Setting the country for product**



**Verification test**

<p style="text-align: center;"><b>Did not connect</b> (Country code = US)</p>	<p style="text-align: center;"><b>Connected</b> (Country code = KR)</p>
<p>36% 오후 2:00</p> <p>Wi-Fi Wi-Fi 다이렉트</p> <p>사용 중</p> <p>사용 가능한 네트워크</p> <p>Wi-Fi 네트워크 찾는 중...</p> <p>+ 네트워크 추가</p>	<p>35% 오후 2:01</p> <p>Wi-Fi Wi-Fi 다이렉트</p> <p>사용 중</p> <p>현재 네트워크</p> <p>ap_2g_ht20 인터넷 연결 확실치 않음</p> <p>+ 네트워크 추가</p>

## 10. LIST OF TEST EQUIPMENT

### Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/20/2017	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/27/2018	Annual	100033
ESPAC	SU-642 /Temperature Chamber	03/30/2018	Annual	0093008124
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY52090906
Agilent	N1911A / Power Meter	04/16/2018	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/16/2018	Annual	MY52260025
Hewlett Packard	11667B / Power Splitter	06/07/2018	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/26/2018	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	07/10/2018	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A
Rohde & Schwarz	CBT / Bluetooth Tester	05/17/2018	Annual	100422

### Note:

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

**Radiated Test**

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	04/19/2017	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/06/2017	Biennial	760
Schwarzbeck	VULB 9160 / TRILOG Antenna	08/09/2018	Biennial	9160-3368
Schwarzbeck	BBHA 9120D / Horn Antenna	05/02/2017	Biennial	9120D-937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	12/04/2017	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer	09/03/2018	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/28/2018	Annual	101068-SZ
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/07/2018	Annual	8
Wainwright Instruments	WHKX7.0/18G-8SS / High Pass Filter	05/09/2018	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/29/2018	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/03/2018	Annual	2
Api tech.	18B-03 / Attenuator (3 dB)	06/07/2018	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	07/17/2018	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	07/10/2018	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	07/10/2018	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	01/10/2018	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/29/2018	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/27/2018	Annual	3000C000276

**Note:**

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

## 11. ANNEX A\_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-1811-FC029-P
2	HCT-RF-1811-FC030-P
3	HCT-RF-1811-FC031-P
4	HCT-RF-1811-FC032-P
5	HCT-RF-1811-FC033-P
6	HCT-RF-1811-FC034-P
7	HCT-RF-1811-FC035-P