HCT CO.,LTD.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
TEL: +82-31-645-6300 **FAX: +82-31-645-6401**

FCC DTS REPORT

Certification

Applicant Name:
SmartWitness USA, LLC

Address:
1108 Lunt Avenue, Schaumburg, IL 60193 USA

Date of Issue:
September 27, 2018

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

Report No.: HCT-RF-1809-FC050

FCC ID:	**2AQ2S-CP2-NA**
APPLICANT:	**SmartWitness USA, LLC**

Model:	CP2-NA
Additional Model:	CP2, CP2-NA-L1, TX2000
EUT Type:	3G ENABLED VEHICLE RECORDER
Max. RF Output Power:	802.11b : 15.32 dBm 802.11g : 21.65 dBm 802.11n(HT20) : 20.36 dBm 802.11n(HT40) : 17.75 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)

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-1809-FC050	September 27, 2018	- First Approval Report

Table of Contents

1. EUT DESCRIPTION

Manufacturer Address	D-TEG Security Co.,Ltd. (Yatap-dong, 3F, Jungmin Bldg.), 53, Maehwa-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea.
Factory Address	DaWoo Telecom Co.,Ltd. 57, Gunpocheomdansaneop 2-ro, Gunpo-si, Gyeonggi-do, Republic of Korea.
Model	CP2-NA
Additional Model	CP2, CP2-NA-L1, TX2000
EUT Type	3G ENABLED VEHICLE RECORDER
Power Supply	DC 5.0 V / Power Adaptor : DC(input) 10~32V ➔ DC(output) 5V
Frequency Range	2412 MHz - 2462 MHz
Max. RF Output Power	**Peak Power** 802.11b : 15.32 dBm 802.11g : 21.65 dBm 802.11n(HT20) : 20.36 dBm 802.11n(HT40) : 17.75 dBm **Average Power** 802.11b : 13.10 dBm 802.11g : 11.56 dBm 802.11n(HT20) : 10.44 dBm 802.11n(HT40) : 9.25 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n
Number of Channels	11 Channels
Antenna Specification	Antenna type: Multilayer Chip Antenna Peak Gain : 3.50 dBi
Date(s) of Tests	August 8, 2018 ~ September 11, 2018

2. TEST METHODOLOGY

FCC KDB 558074 D01 15.247 Meas Guidance v05 dated August 24, 2018 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) 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 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.

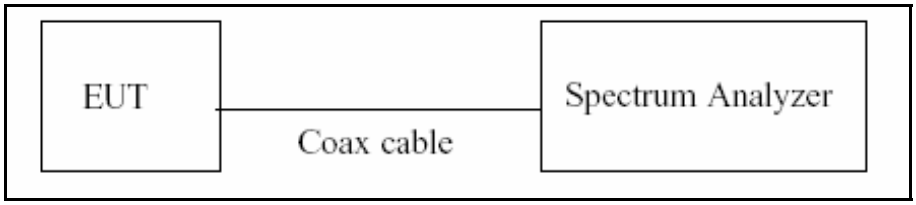
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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)	5.71

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 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*.

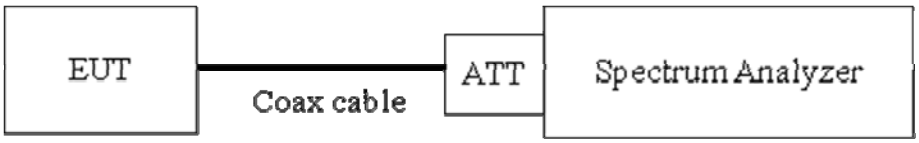
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10*log(1/Duty Cycle)

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 8.2 in KDB 558074 v05 , Procedure 11.8.1 in ANSI 63.10-2013)

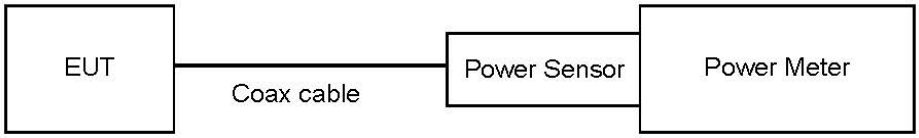
1) RBW = 100 kHz
2) VBW ≥ 3 x RBW
3) Detector = Peak
4) Trace mode = max hold
5) Sweep = auto couple
6) Allow the trace to stabilize
7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

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

▪ Conducted Output Power(Peak) = Reading Value + ATT loss + Cable loss

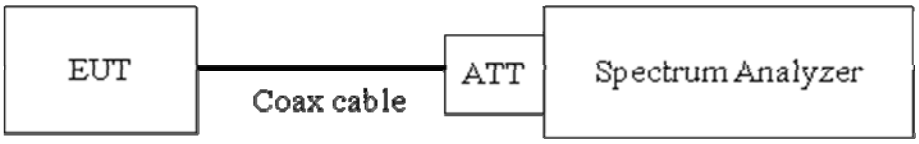
▪ Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

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 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) RBW = 3 kHz ≤ RBW ≤ 100 kHz.
4) VBW ≥ 3 x 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

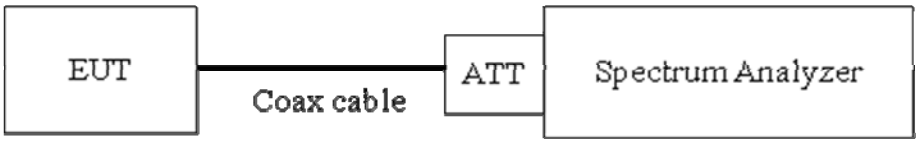
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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 > 20 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 ≥ 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*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	12.35
100	10.88
200	11.24
300	11.18
400	11.28
500	11.30
600	11.37
700	11.40
800	11.40
900	11.39
1000	11.44
2000	11.69
2400*	11.70
2500*	11.72
3000	11.73
4000	11.94
5000	12.12
6000	12.11
7000	12.40
8000	12.37
9000	12.53
10000	12.61
11000	12.61
12000	12.73
13000	12.88
14000	12.95
15000	13.03
16000	13.09
17000	13.07
18000	13.13
19000	13.12
20000	13.19
21000	13.22
22000	13.36
23000	13.65
24000	13.39
25000	13.58
26000	13.07

Note : 1. '*' is fundamental frequency range.

2. Factor = Attenuator loss + Cable loss

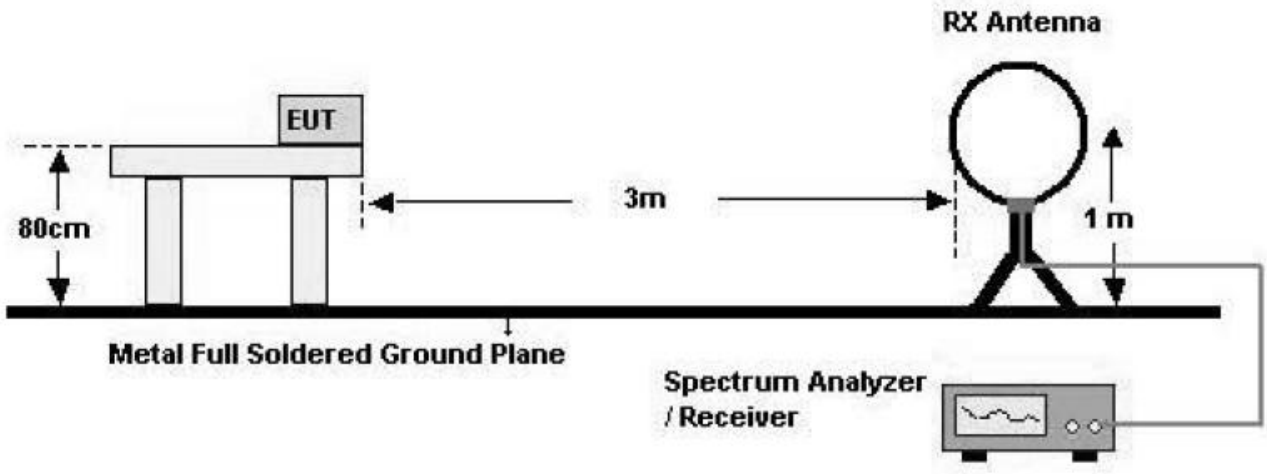
7.6. Radiated Test

Limit

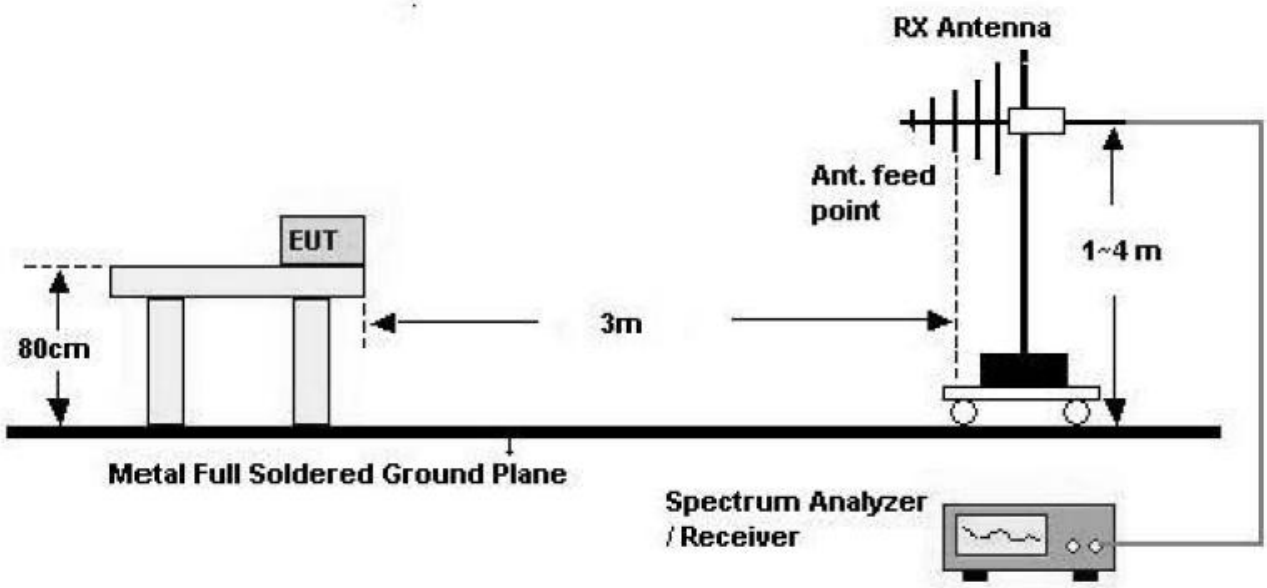
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

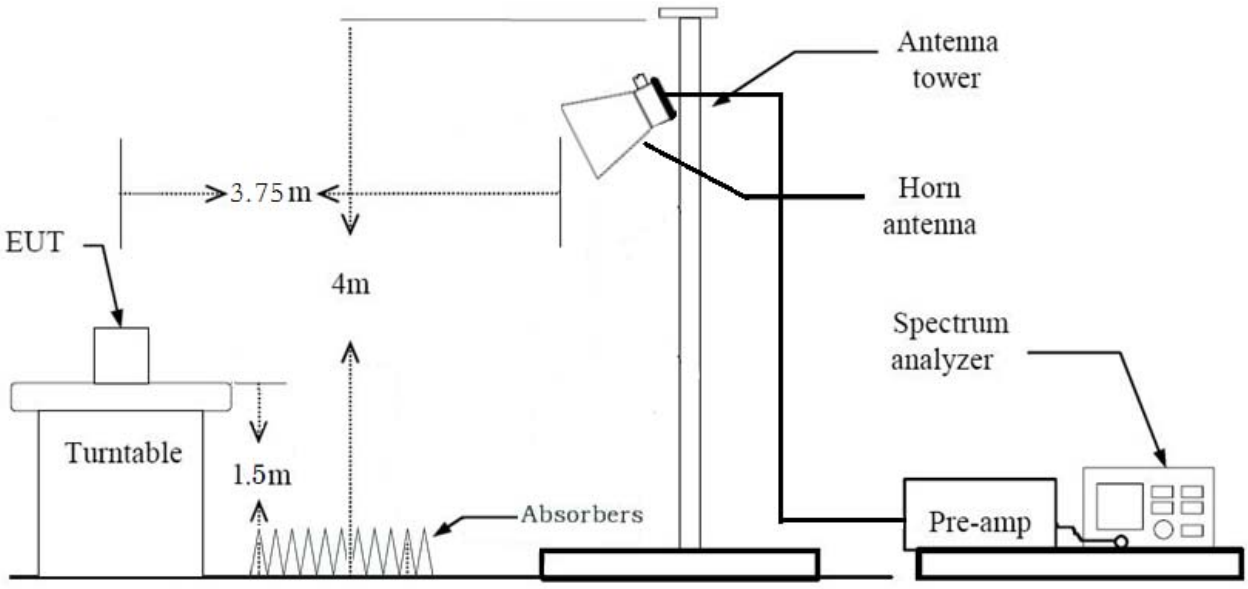
Below 30 MHz



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*log (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 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 ≥ 3*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*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*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 = 20*log (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*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*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*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

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.
5. The EUT is the device operating below 30 MHz.
   - For unterminated the Antenna, the AC line conducted tests are performed with the antenna connected
   - For terminated the Antenna, the AC line conducted tests are performed with a dummy load connected to the EUT antenna output terminal.

Sample Calculation

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

Note : We don’t perform powerline conducted emission test. Because this EUT is used with vehicle.

7.8. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
2. EUT Axis
   - Radiated Spurious Emissions : Stand alone: Y / With CAM: Z
   - Radiated Restricted Band Edge : 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
   - 802.11n_HT40 : MCS0

AC Power line Conducted Emissions

We don't perform powerline conducted emission test. Because this EUT is used with vehicle.

Conducted test

The EUT was configured with data rate of highest power.

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 > 20 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

Duty Cycle Factor

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
2.4 GHz Band 802.11b	1 Mbps	1.000	1.000	1.00000000	0.000
	2 Mbps	1.000	1.000	1.00000000	0.000
	5.5 Mbps	1.000	1.000	1.00000000	0.000
	11 Mbps	1.000	1.000	1.00000000	0.000
2.4 GHz Band 802.11g	6 Mbps	1.000	1.000	1.00000000	0.000
	9 Mbps	1.000	1.000	1.00000000	0.000
	12 Mbps	1.000	1.000	1.00000000	0.000
	18 Mbps	1.000	1.000	1.00000000	0.000
	24 Mbps	1.000	1.000	1.00000000	0.000
	36 Mbps	1.000	1.000	1.00000000	0.000
	48 Mbps	1.000	1.000	1.00000000	0.000
	54 Mbps	1.000	1.000	1.00000000	0.000
2.4 GHz Band 802.11n_20 MHz BW	MCS0_6.5 Mbps	1.000	1.000	1.00000000	0.000
	MCS1_13 Mbps	1.000	1.000	1.00000000	0.000
	MCS2_19.5 Mbps	1.000	1.000	1.00000000	0.000
	MCS3_26 Mbps	1.000	1.000	1.00000000	0.000
	MCS4_39 Mbps	1.000	1.000	1.00000000	0.000
	MCS5_52 Mbps	1.000	1.000	1.00000000	0.000
	MCS6_58.5 Mbps	1.000	1.000	1.00000000	0.000
	MCS7_65 Mbps	1.000	1.000	1.00000000	0.000
2.4 GHz & 802.11n_40 MHz BW	MCS0_13.5 Mbps	1.000	1.000	1.00000000	0.000
	MCS1_27 Mbps	1.000	1.000	1.00000000	0.000
	MCS2_40.5 Mbps	1.000	1.000	1.00000000	0.000
	MCS3_54 Mbps	1.000	1.000	1.00000000	0.000
	MCS4_81 Mbps	1.000	1.000	1.00000000	0.000
	MCS5_108 Mbps	1.000	1.000	1.00000000	0.000
	MCS6_121.5 Mbps	1.000	1.000	1.00000000	0.000
	MCS7_135 Mbps	1.000	1.000	1.00000000	0.000

Note : The EUT transmits continuously.

9.2 6dB BANDWIDTH

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	10.11	0.5
2437	6	10.11	0.5
2462	11	10.11	0.5

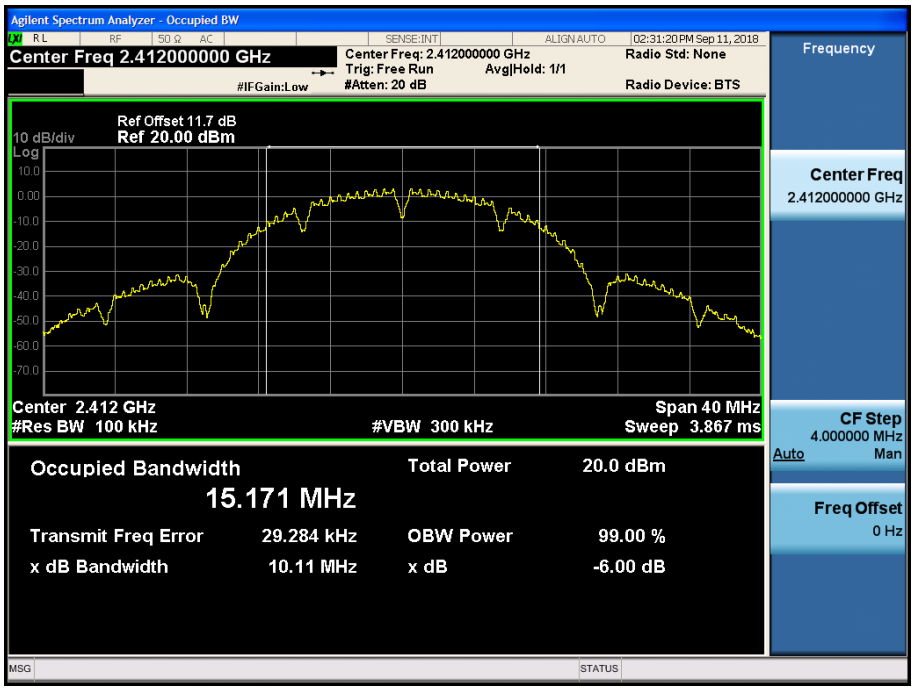
802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	16.17	0.5
2437	6	16.05	0.5
2462	11	16.07	0.5

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	17.31	0.5
2437	6	17.36	0.5
2462	11	17.40	0.5

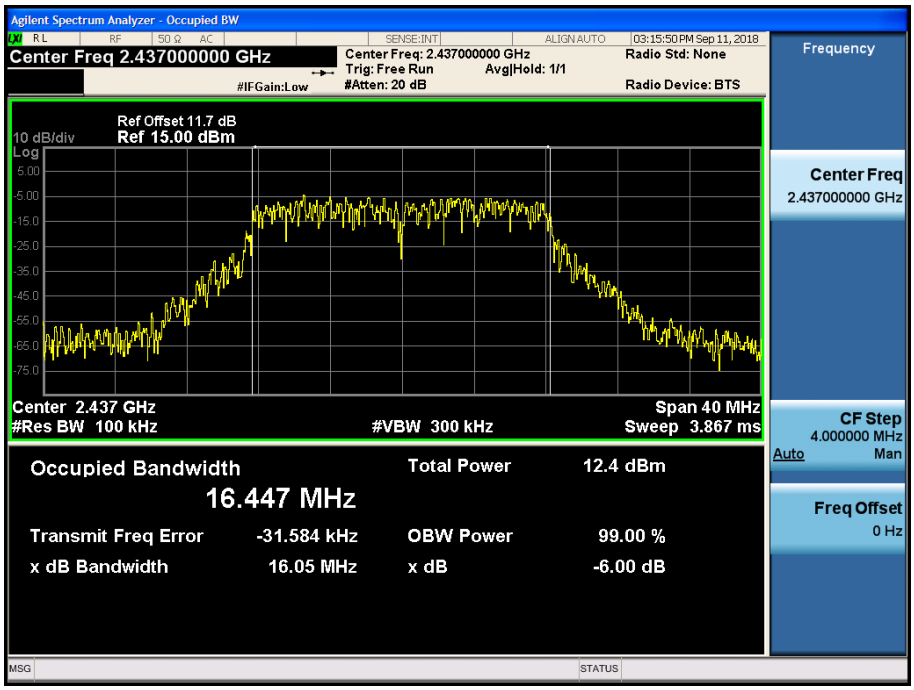
802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2422	3	36.49	0.5
2437	6	35.83	0.5
2452	9	35.61	0.5

▣ Test Plots

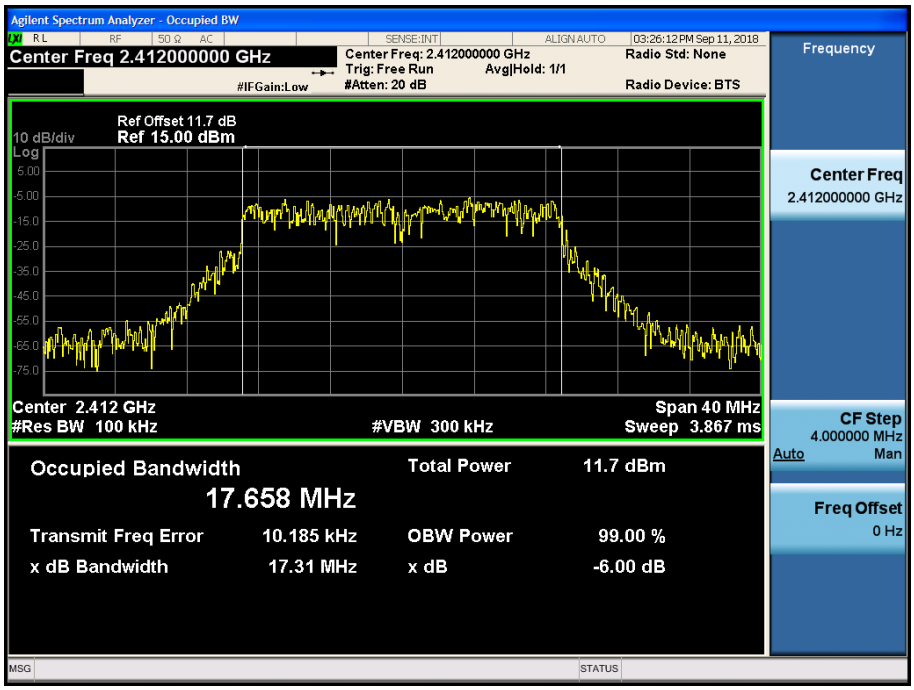
6dB Bandwidth plot (802.11b-CH 1)



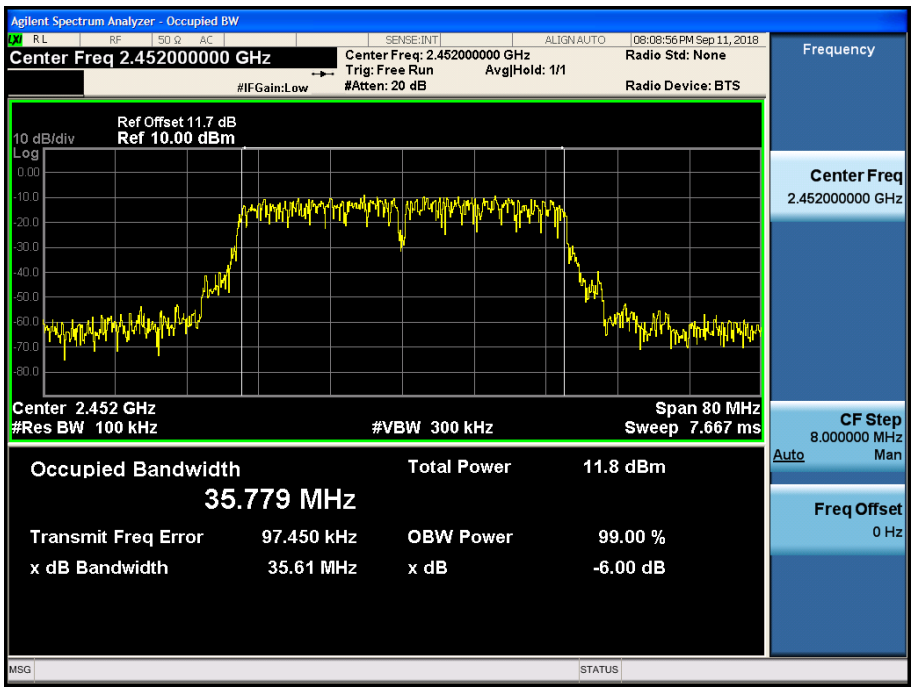
6dB Bandwidth plot (802.11g-CH 6)



6dB Bandwidth plot (802.11n_HT20-CH 1)



6dB Bandwidth plot (802.11n_HT40-CH 9)



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, 11.7 dB is offset for 2.4 GHz Band.

802.11b Mode		Data Rate [Mbps]	Measured Power[dBm]	Limit [dBm]
Frequency [MHz]	Channel No.			
2412	1	1	14.91	30
		2	15.06	30
		5.5	14.86	30
		11	14.89	30
2437	6	1	15.15	30
		2	15.09	30
		5.5	15.08	30
		11	15.04	30
2462	11	1	15.29	30
		2	15.28	30
		5.5	15.32	30
		11	15.30	30

802.11g Mode		Data Rate [Mbps]	Measured Power[dBm]	Limit [dBm]
Frequency[MHz]	Channel No.			
2412	1	6	20.71	30
		9	20.92	30
		12	20.28	30
		18	19.96	30
		24	21.27	30
		36	20.99	30
		48	20.20	30
		54	20.76	30
2437	6	6	20.83	30
		9	20.09	30
		12	21.11	30
		18	19.86	30
		24	21.16	30
		36	21.63	30
		48	20.01	30
		54	21.37	30
2462	11	6	21.05	30
		9	21.15	30
		12	21.65	30
		18	20.31	30
		24	21.62	30
		36	21.64	30
		48	20.01	30
		54	21.35	30

802.11n_HT20 Mode		MCS Index	Measured Power[dBm]	Limit [dBm]
Frequency[MHz]	Channel No.			
2412	1	0	19.37	30
		1	19.67	30
		2	19.27	30
		3	19.34	30
		4	18.79	30
		5	19.62	30
		6	19.99	30
		7	19.77	30
2437	6	0	18.59	30
		1	19.98	30
		2	19.88	30
		3	19.66	30
		4	19.01	30
		5	19.87	30
		6	19.46	30
		7	19.09	30
2462	11	0	18.87	30
		1	18.29	30
		2	20.04	30
		3	20.09	30
		4	20.21	30
		5	19.05	30
		6	20.36	30
		7	20.16	30

802.11n_HT40 Mode		MCS Index	Measured Power[dBm]	Limit [dBm]
Frequency[MHz]	Channel No.			
2422	3	0	15.67	30
		1	16.72	30
		2	15.81	30
		3	16.96	30
		4	16.94	30
		5	16.29	30
		6	16.31	30
		7	17.01	30
2437	6	0	15.89	30
		1	16.00	30
		2	16.59	30
		3	16.21	30
		4	17.25	30
		5	17.44	30
		6	16.48	30
		7	17.18	30
2452	9	0	16.08	30
		1	17.08	30
		2	17.17	30
		3	16.43	30
		4	17.28	30
		5	17.75	30
		6	16.63	30
		7	17.39	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, 11.7 dB is offset for 2.4 GHz Band.

802.11b Mode		Data Rate [Mbps]	Measured Power[dBm]	Duty Cycle Factor [dB]	Measured Power(dBm) + Duty Cycle Factor[dB]	Limit [dBm]
Frequency [MHz]	Channel No.					
2412	1	1	12.65	-	12.65	30
		2	12.54	-	12.54	30
		5.5	12.62	-	12.62	30
		11	12.61	-	12.61	30
2437	6	1	12.94	-	12.94	30
		2	12.80	-	12.80	30
		5.5	12.81	-	12.81	30
		11	12.84	-	12.84	30
2462	11	1	13.07	-	13.07	30
		2	13.02	-	13.02	30
		5.5	13.10	-	13.10	30
		11	13.04	-	13.04	30

802.11g Mode		Data Rate [Mbps]	Measured Power[dBm]	Duty Cycle Factor [dB]	Measured Power(dBm) + Duty Cycle Factor[dB]	Limit [dBm]
Frequency [MHz]	Channel No.					
2412	1	6	10.79	-	10.79	30
		9	10.98	-	10.98	30
		12	10.04	-	10.04	30
		18	11.02	-	11.02	30
		24	11.01	-	11.01	30
		36	10.53	-	10.53	30
		48	10.56	-	10.56	30
		54	10.55	-	10.55	30
2437	6	6	10.96	-	10.96	30
		9	10.42	-	10.42	30
		12	10.84	-	10.84	30
		18	10.97	-	10.97	30
		24	10.74	-	10.74	30
		36	11.19	-	11.19	30
		48	10.34	-	10.34	30
		54	11.24	-	11.24	30
2462	11	6	11.11	-	11.11	30
		9	11.56	-	11.56	30
		12	11.48	-	11.48	30
		18	10.30	-	10.30	30
		24	11.33	-	11.33	30
		36	11.29	-	11.29	30
		48	11.35	-	11.35	30
		54	11.24	-	11.24	30

802.11n_HT20 Mode		MCS Index	Measured Power[dBm]	Duty Cycle Factor [dB]	Measured Power(dBm) + Duty Cycle Factor[dB]	Limit [dBm]
Frequency [MHz]	Channel No.					
2412	1	0	9.81	-	9.81	30
		1	9.85	-	9.85	30
		2	8.97	-	8.97	30
		3	9.99	-	9.99	30
		4	8.96	-	8.96	30
		5	10.00	-	10.00	30
		6	8.86	-	8.86	30
		7	9.93	-	9.93	30
2437	6	0	9.03	-	9.03	30
		1	10.11	-	10.11	30
		2	9.24	-	9.24	30
		3	10.29	-	10.29	30
		4	9.29	-	9.29	30
		5	10.27	-	10.27	30
		6	8.27	-	8.27	30
		7	9.16	-	9.16	30
2462	11	0	9.34	-	9.34	30
		1	8.30	-	8.30	30
		2	9.47	-	9.47	30
		3	9.37	-	9.37	30
		4	10.44	-	10.44	30
		5	9.39	-	9.39	30
		6	9.41	-	9.41	30
		7	10.39	-	10.39	30

802.11n_HT40 Mode		MCS Index	Measured Power[dBm]	Duty Cycle Factor [dB]	Measured Power(dBm) + Duty Cycle Factor[dB]	Limit [dBm]
Frequency [MHz]	Channel No.					
2422	3	0	7.78	-	7.78	30
		1	8.91	-	8.91	30
		2	7.86	-	7.86	30
		3	8.85	-	8.85	30
		4	8.79	-	8.79	30
		5	7.76	-	7.76	30
		6	7.94	-	7.94	30
		7	8.78	-	8.78	30
2437	6	0	8.06	-	8.06	30
		1	8.05	-	8.05	30
		2	8.98	-	8.98	30
		3	8.03	-	8.03	30
		4	8.99	-	8.99	30
		5	9.01	-	9.01	30
		6	8.00	-	8.00	30
		7	8.99	-	8.99	30
2452	9	0	8.17	-	8.17	30
		1	9.25	-	9.25	30
		2	9.16	-	9.16	30
		3	8.13	-	8.13	30
		4	9.13	-	9.13	30
		5	9.21	-	9.21	30
		6	8.29	-	8.29	30
		7	9.14	-	9.14	30

9.4 POWER SPECTRAL DENSITY

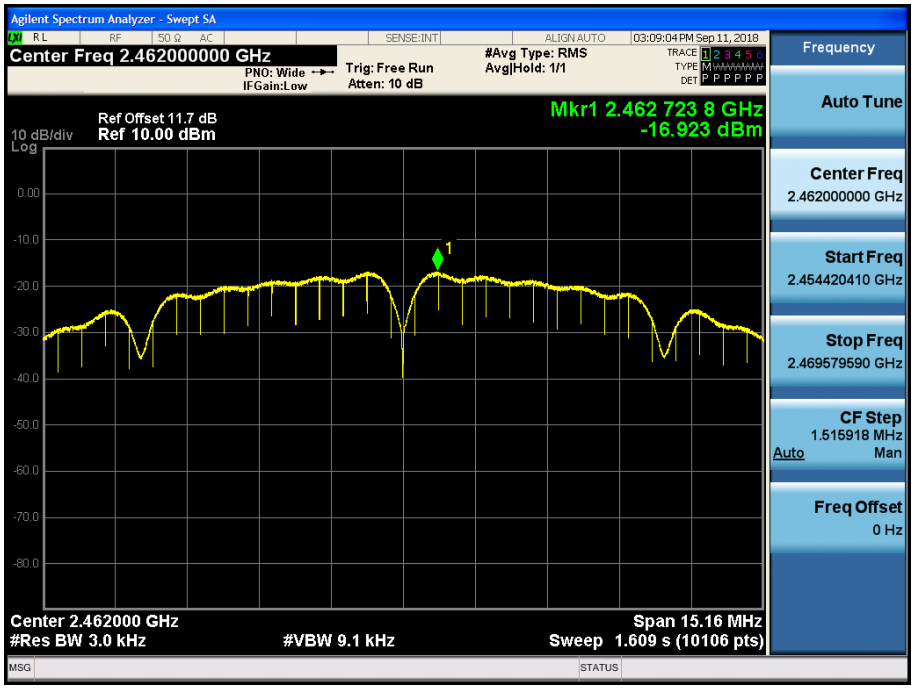
Mode	Frequency (MHz)	Channel No.	Test Result	
			PSD (dBm)	Limit (dBm)
802.11b	2412	1	-17.455	8
	2437	6	-17.088	8
	2462	11	-16.923	8
802.11g	2412	1	-17.061	8
	2437	6	-15.767	8
	2462	11	-15.346	8
802.11n (HT20)	2412	1	-16.512	8
	2437	6	-17.711	8
	2462	11	-16.050	8
802.11n (HT40)	2422	3	-20.134	8
	2437	6	-19.951	8
	2452	9	-20.662	8

Note :

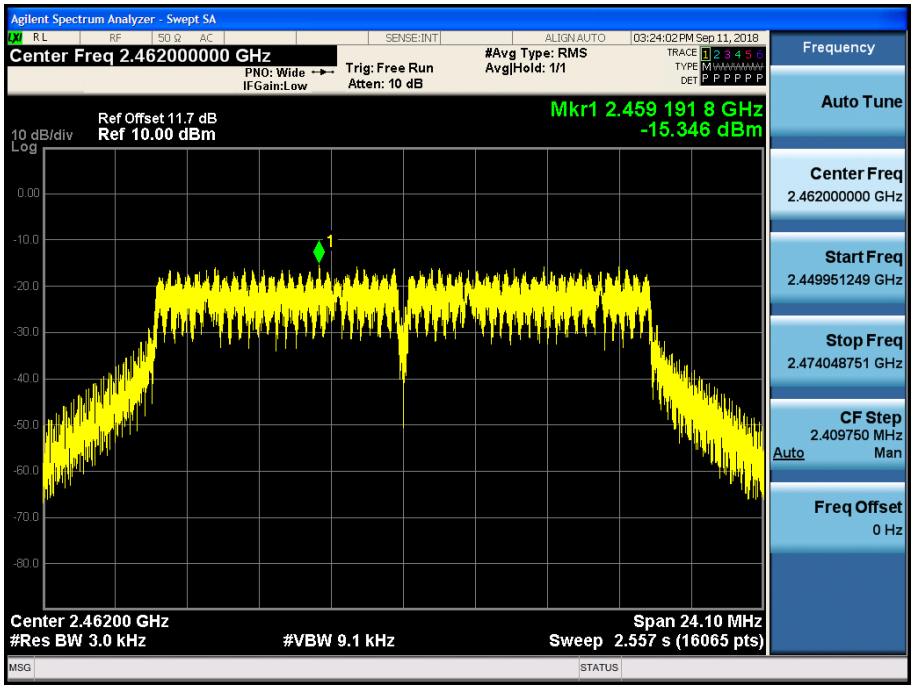
1. Spectrum reading values are not plot data.
   The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
   So, 11.7 dB is offset for 2.4 GHz Band.

▣ Test Plots

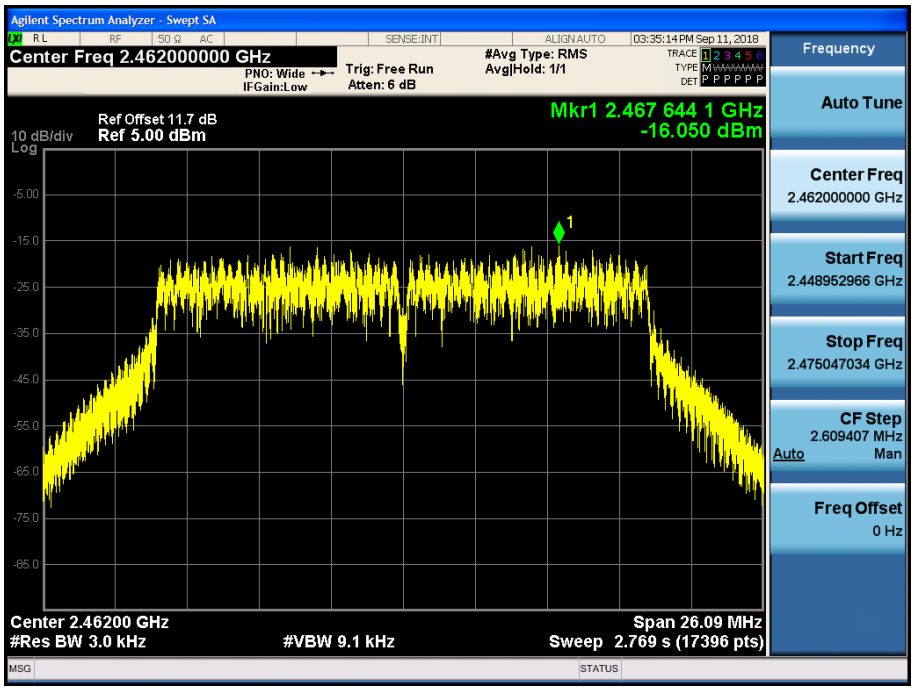
Power Spectral Density (802.11b-CH 11)



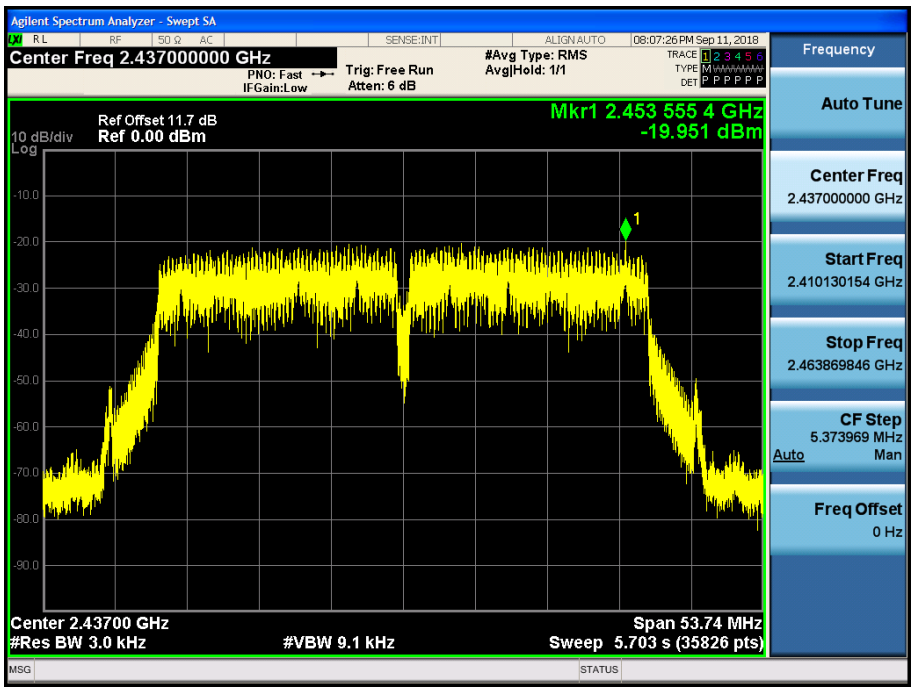
Power Spectral Density (802.11g-CH 11)



Power Spectral Density (802.11n_HT20 -CH 11)



Power Spectral Density (802.11n_HT40 -CH 6)



Note :

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

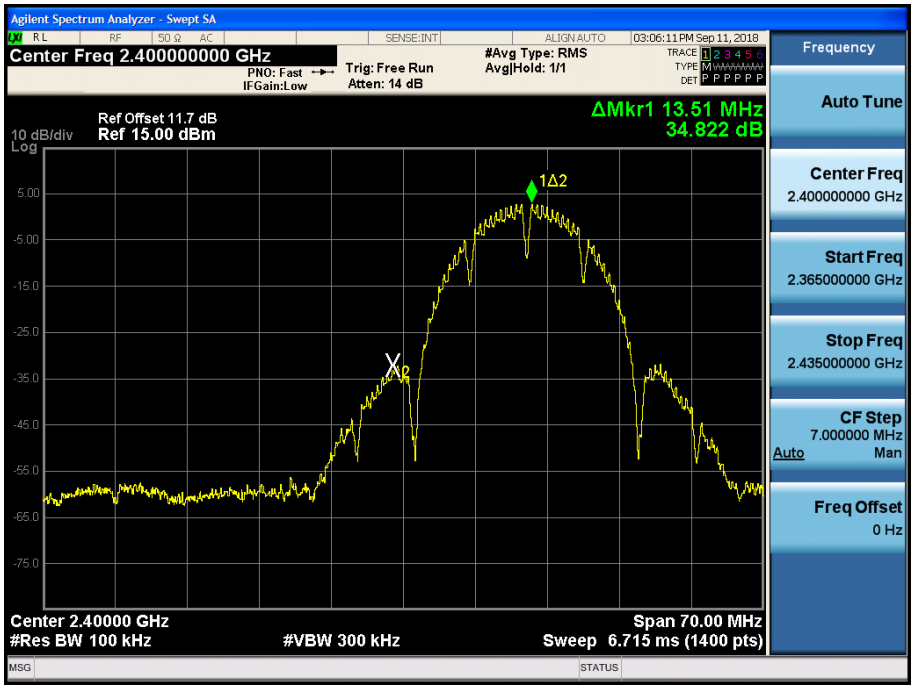
9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Result : please refer to the plot below.

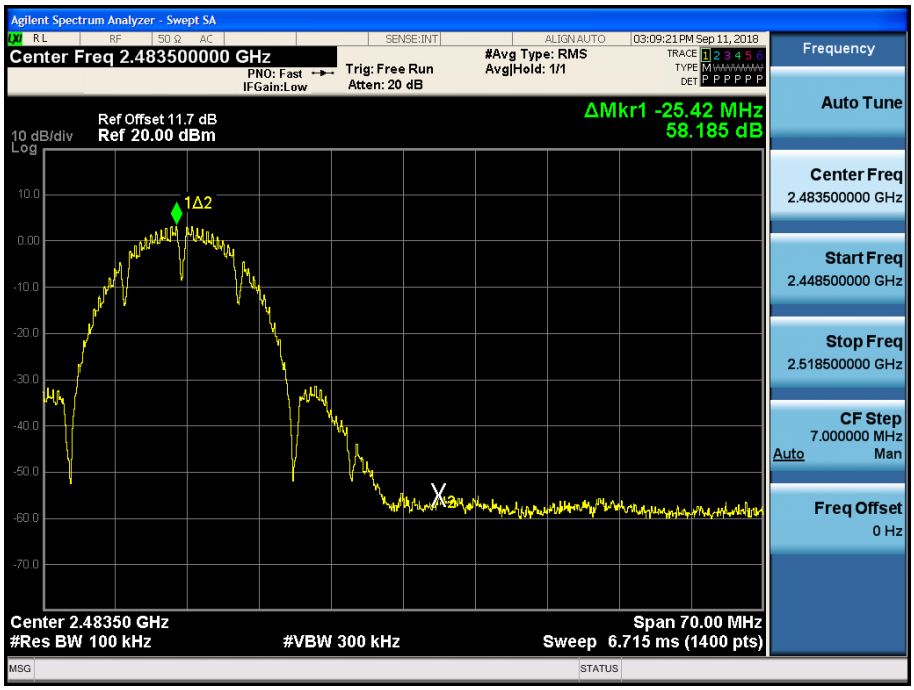
In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ Test Plots(BandEdge)

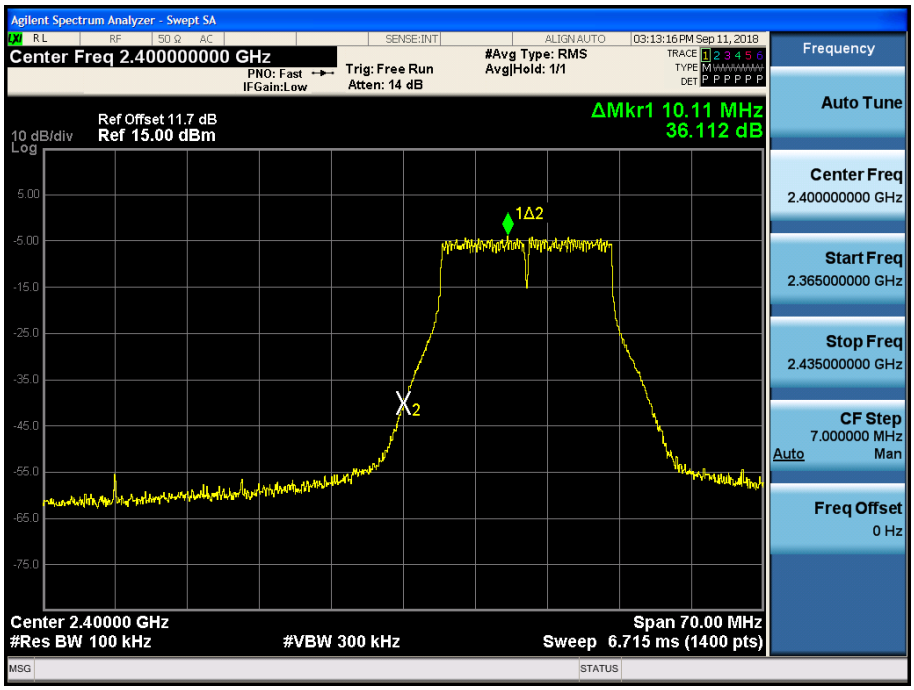
Band Edge (802.11b-CH1)



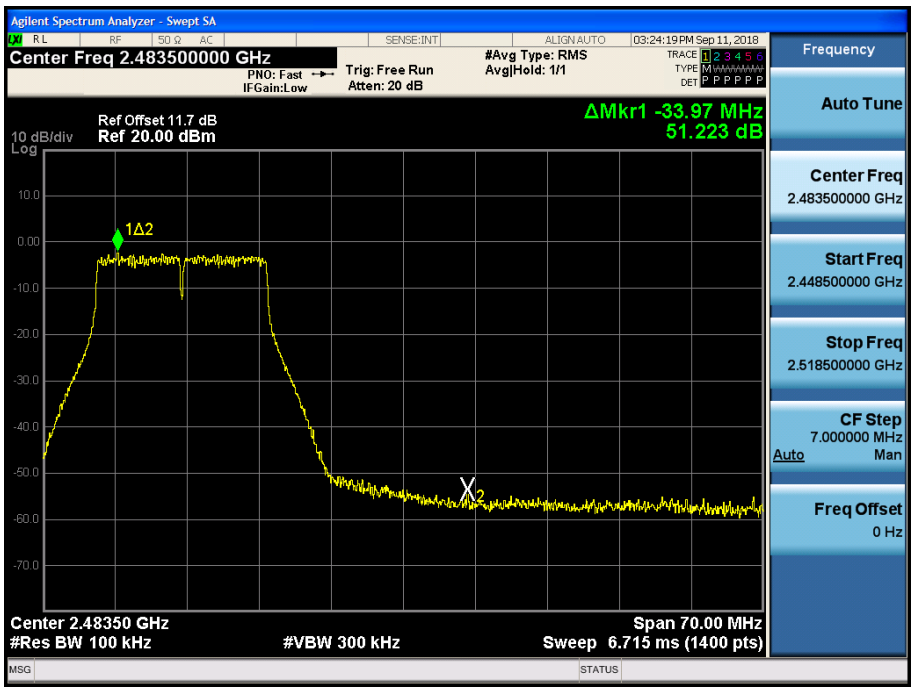
Band Edge (802.11b-CH11)



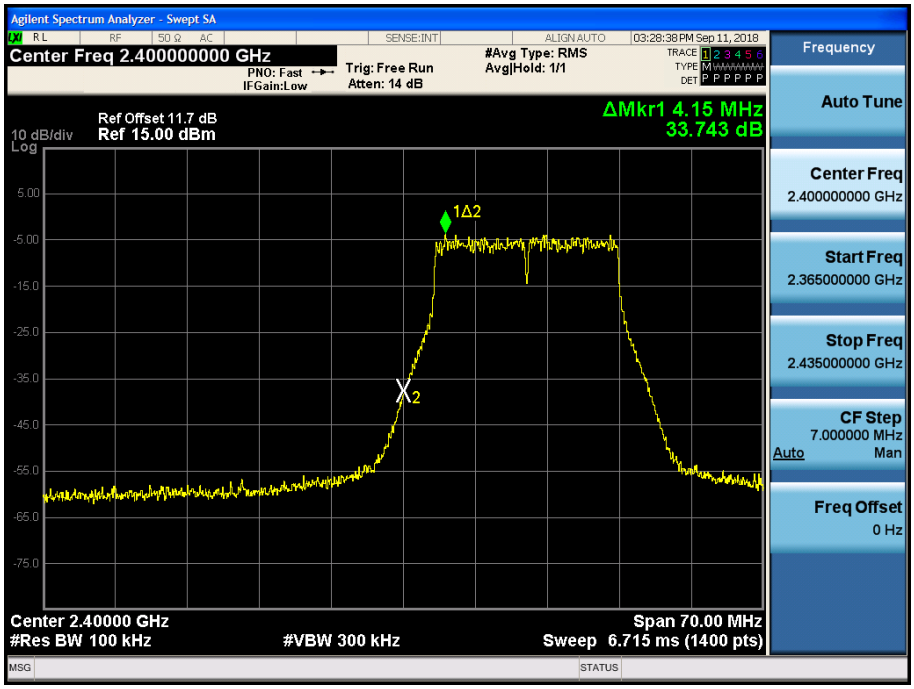
Band Edge (802.11g-CH1)



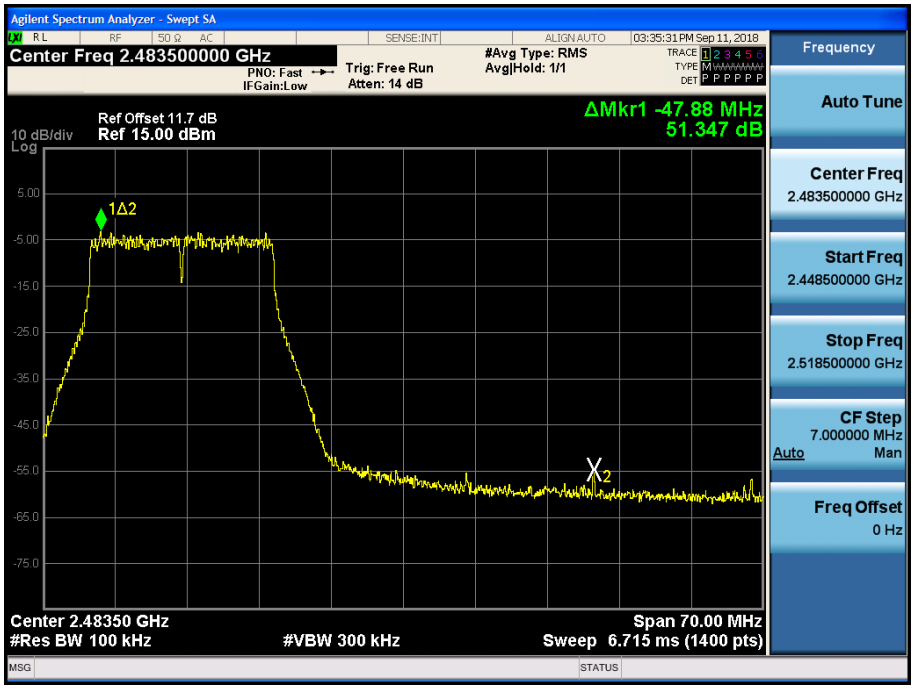
Band Edge (802.11g-CH11)



Band Edge (802.11n_HT20-CH1)



Band Edge (802.11n_HT20-CH11)



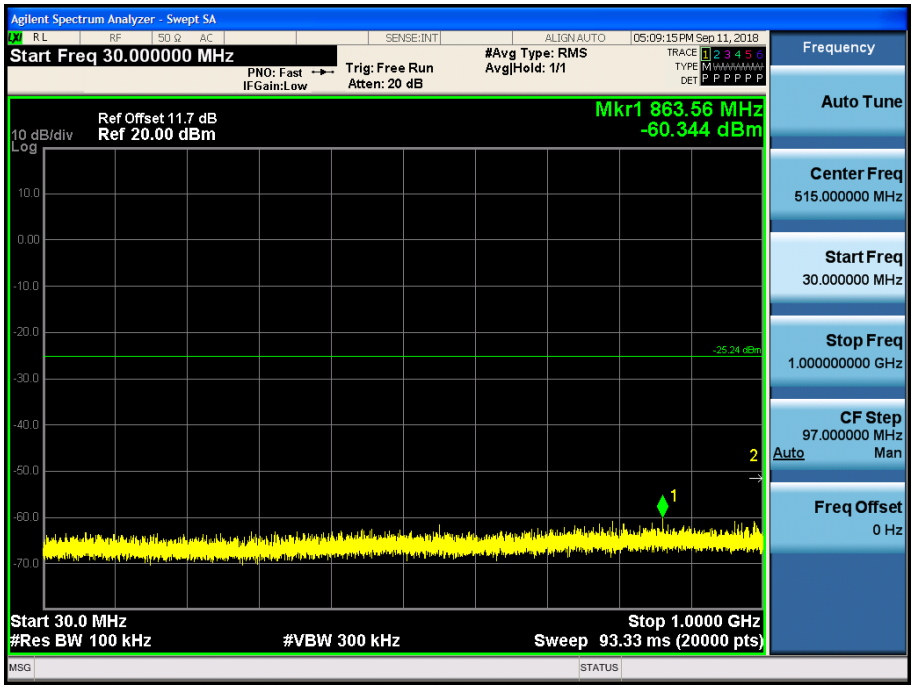
Band Edge (802.11n_HT40-C3)

Band Edge (802.11n_HT40-CH9)

▣ Test Plots(Conducted Spurious Emission)

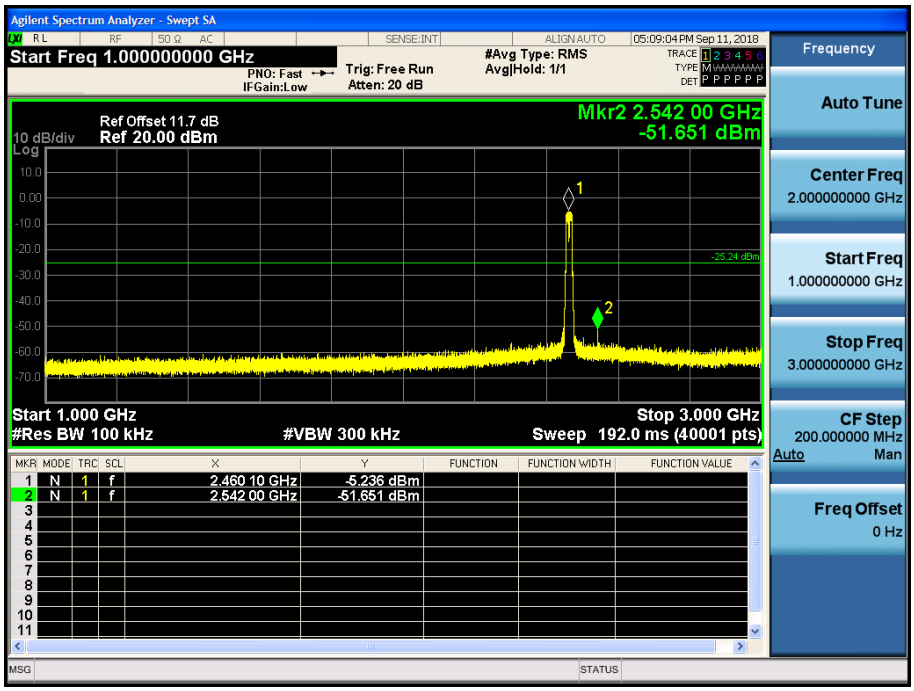
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



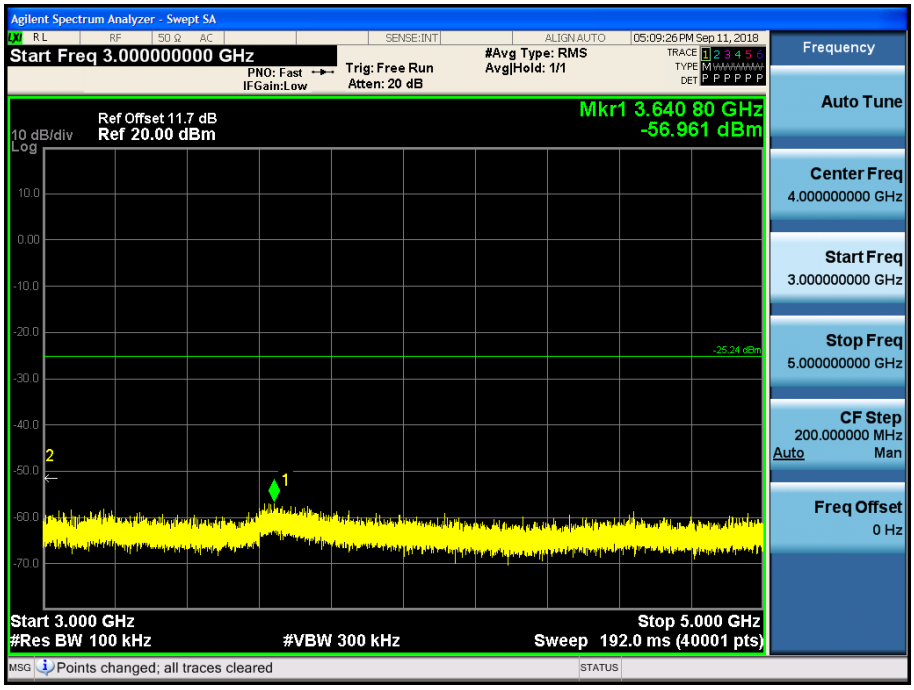
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



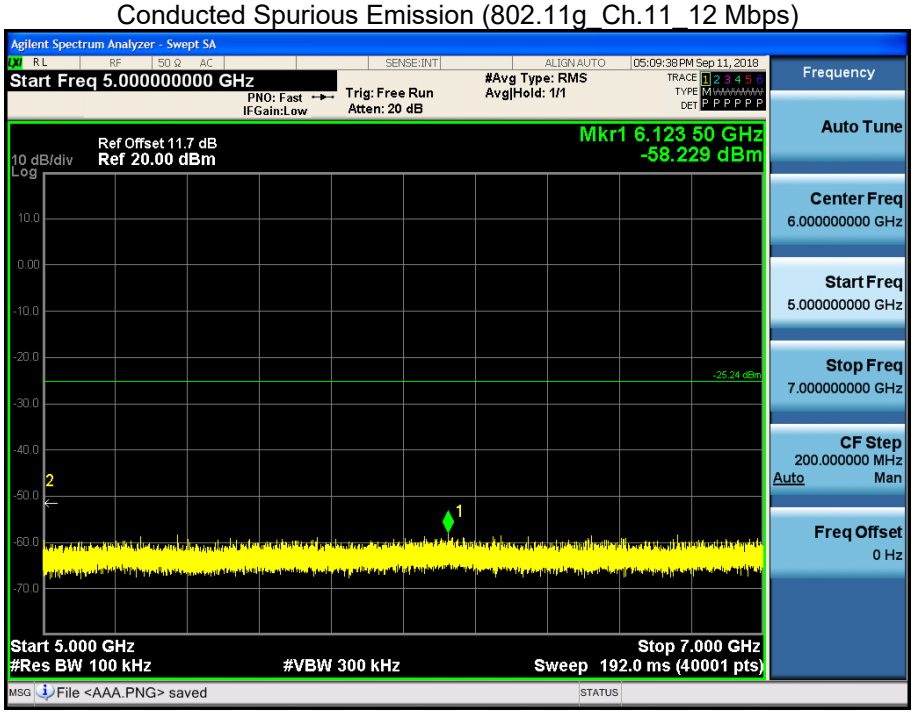
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



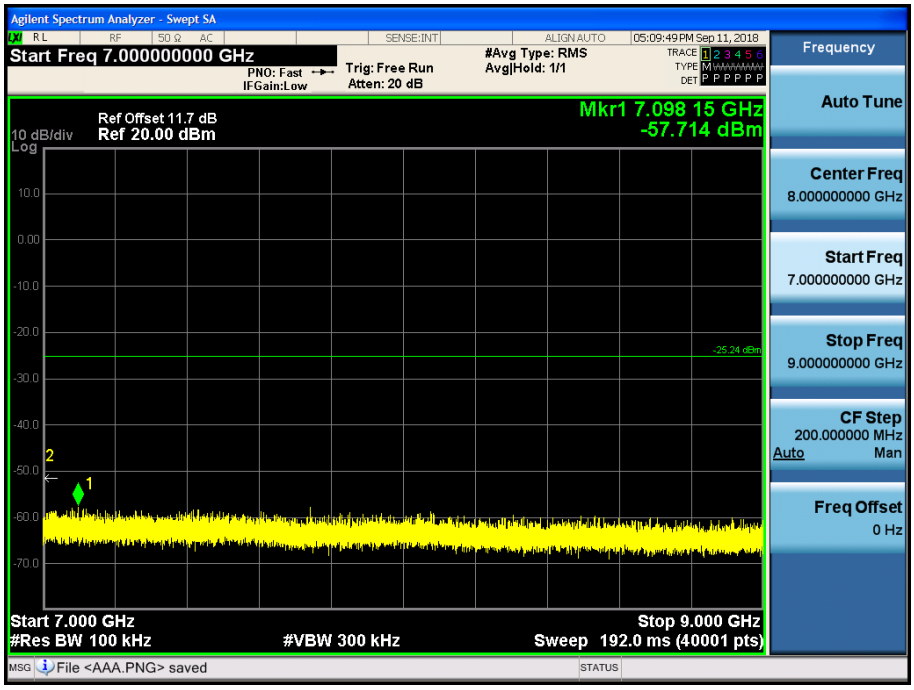
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



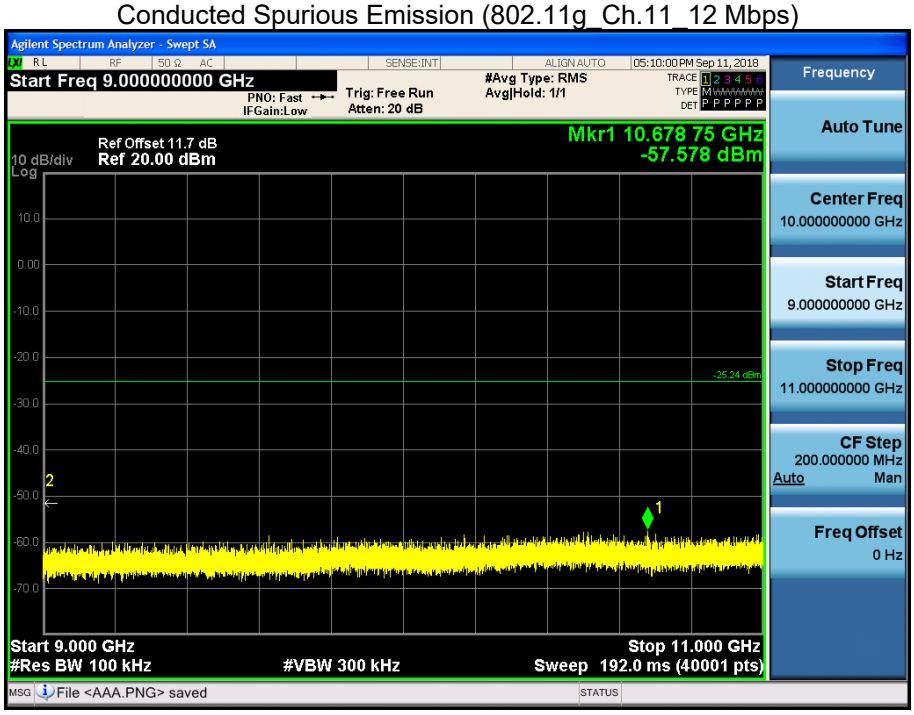
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



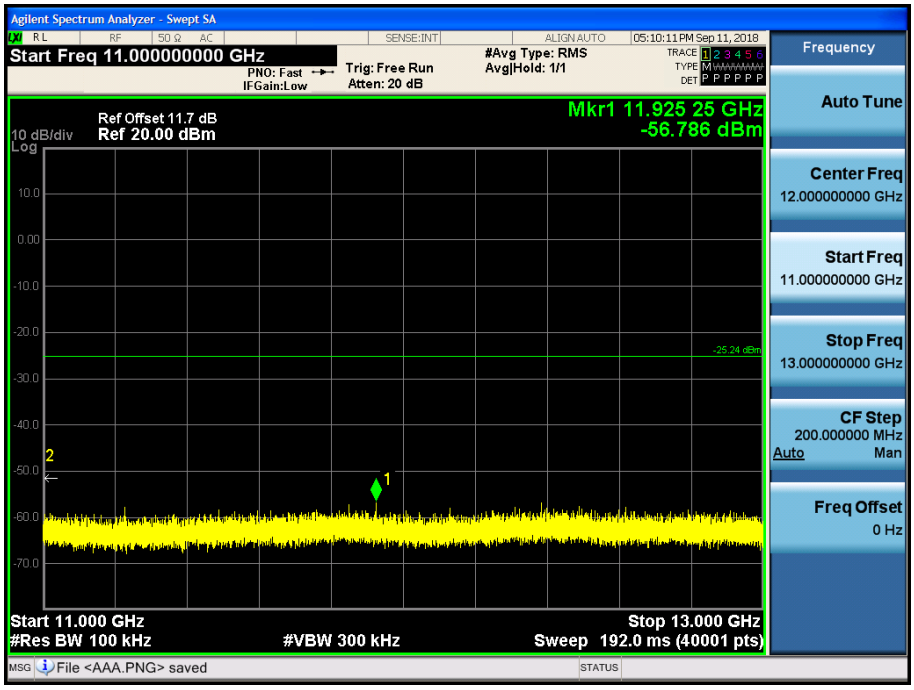
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



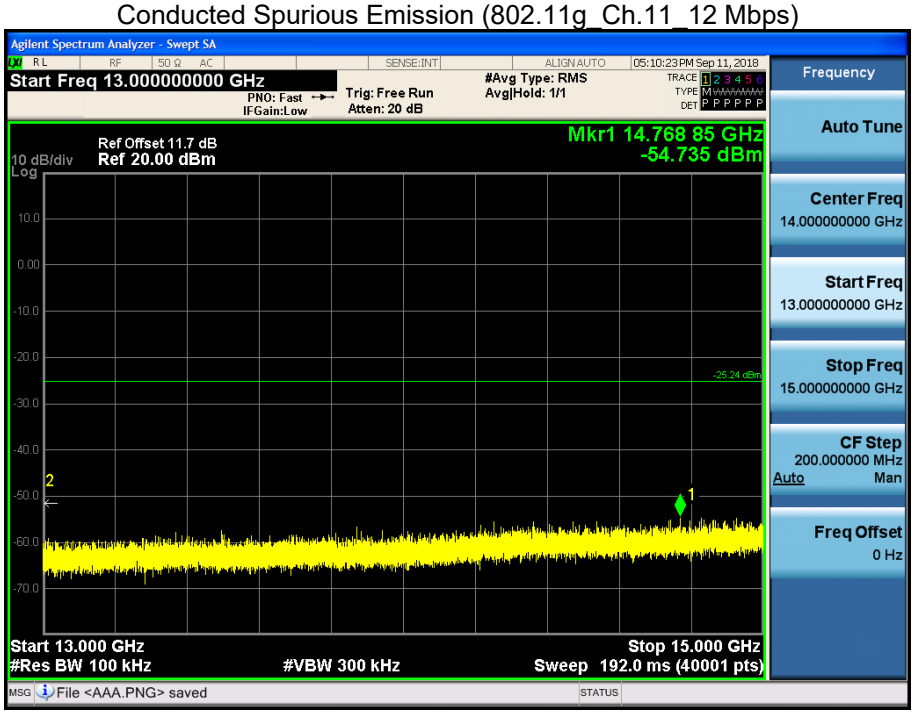
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



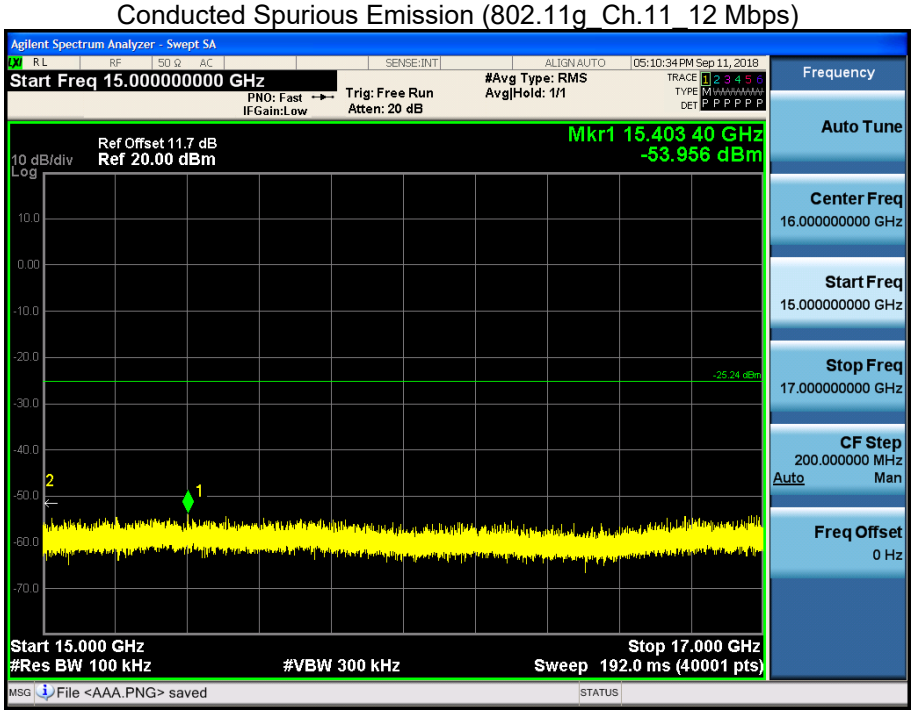
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



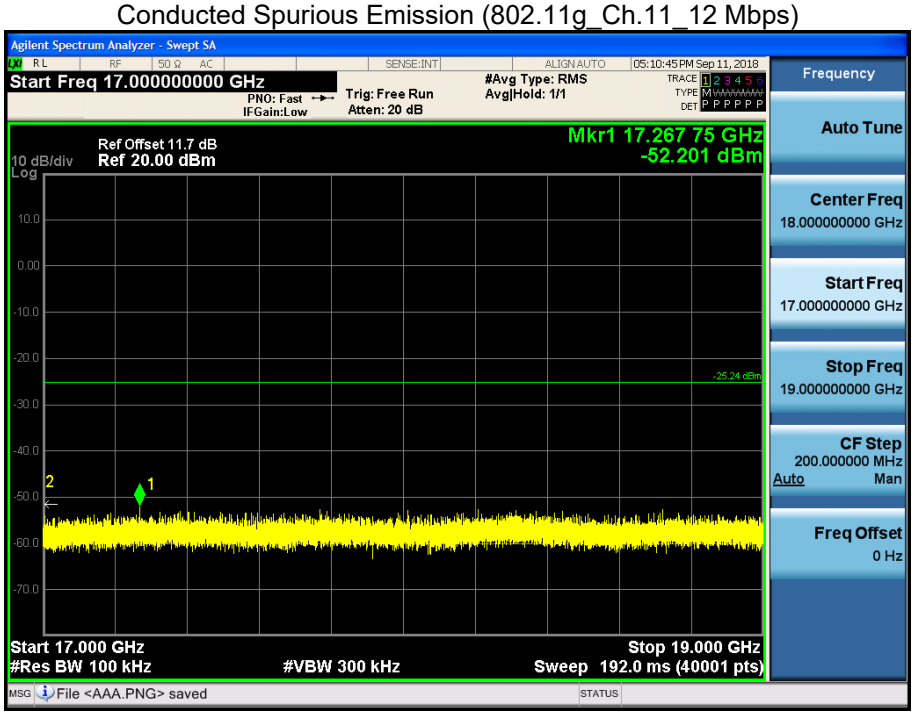
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



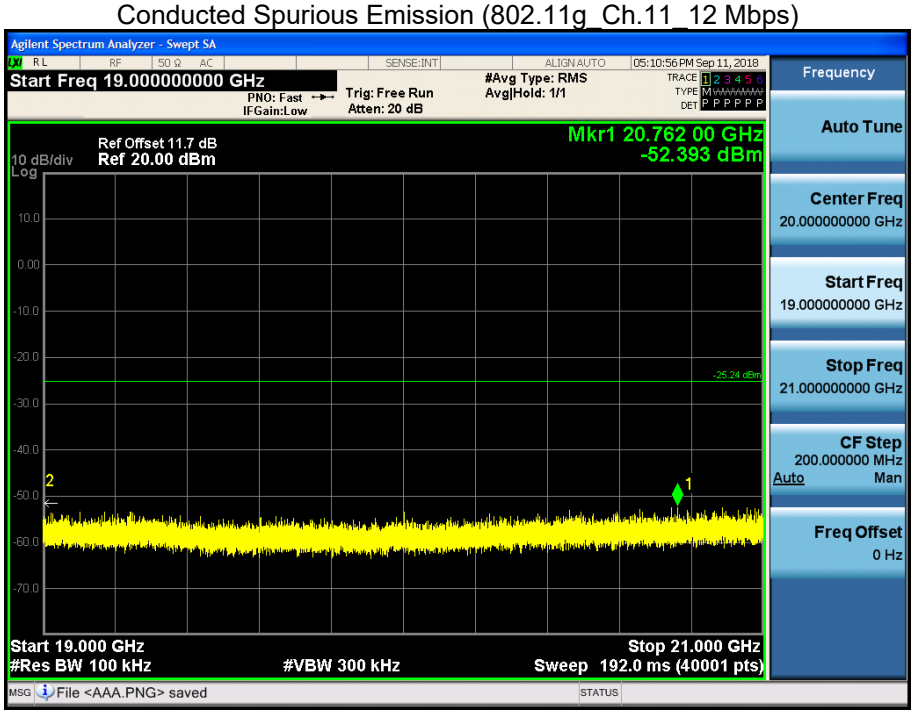
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



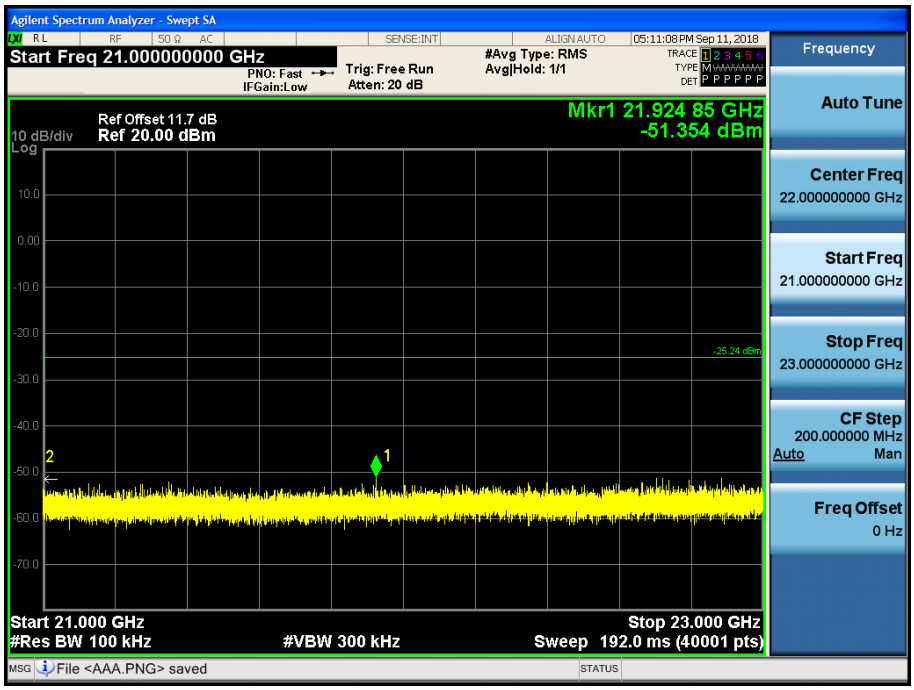
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



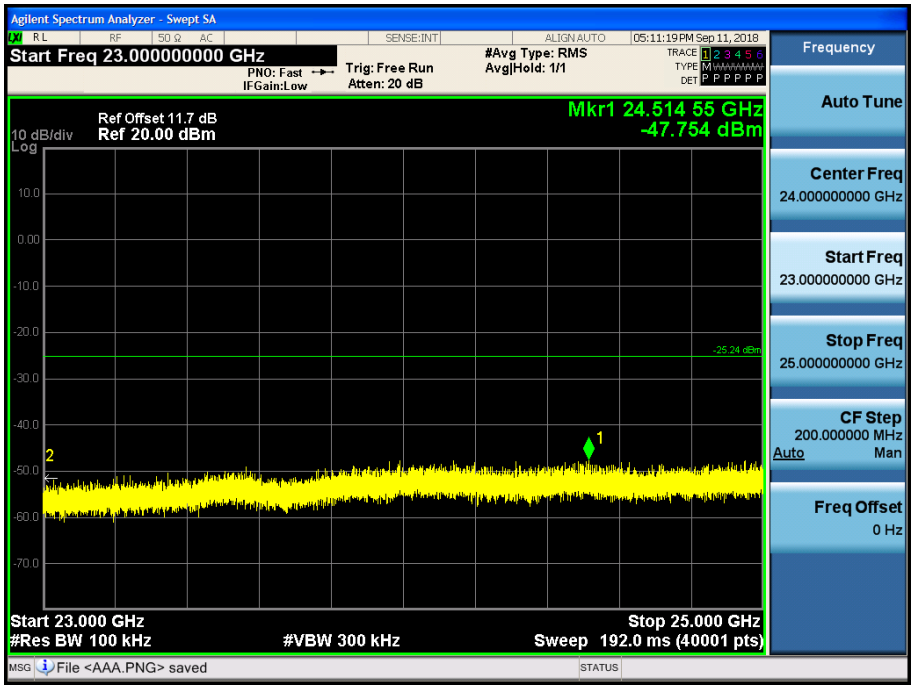
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11g_Ch.11_12 Mbps)



9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

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

Note:

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = 40*log (specific distance / 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

Stand alone:

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	51.78	2.24	V	54.02	73.98	19.96	PK
4824	39.17	2.24	V	41.41	53.98	12.57	AV
7236	50.22	9.70	V	59.92	73.98	14.06	PK
7236	38.01	9.70	V	47.71	53.98	6.27	AV
4824	52.31	2.24	H	54.55	73.98	19.43	PK
4824	39.26	2.24	H	41.50	53.98	12.48	AV
7236	51.22	9.70	H	60.92	73.98	13.06	PK
7236	38.33	9.70	H	48.03	53.98	5.95	AV

Operation Mode:	802.11g
Transfer Rate:	6 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	51.15	2.24	V	53.39	73.98	20.59	PK
4824	39.21	2.24	V	41.45	53.98	12.53	AV
7236	50.12	9.70	V	59.82	73.98	14.16	PK
7236	37.59	9.70	V	47.29	53.98	6.69	AV
4824	51.63	2.24	H	53.87	73.98	20.11	PK
4824	39.35	2.24	H	41.59	53.98	12.39	AV
7236	50.29	9.70	H	59.99	73.98	13.99	PK
7236	38.39	9.70	H	48.09	53.98	5.89	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
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	51.01	2.24	V	53.25	73.98	20.73	PK
4824	39.24	2.24	V	41.48	53.98	12.50	AV
7236	49.99	9.70	V	59.69	73.98	14.29	PK
7236	38.05	9.70	V	47.75	53.98	6.23	AV
4824	51.59	2.24	H	53.83	73.98	20.15	PK
4824	39.31	2.24	H	41.55	53.98	12.43	AV
7236	50.45	9.70	H	60.15	73.98	13.83	PK
7236	38.10	9.70	H	47.80	53.98	6.18	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
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	50.87	2.21	V	53.08	73.98	20.90	PK
4844	38.51	2.21	V	40.72	53.98	13.26	AV
7266	49.11	9.97	V	59.08	73.98	14.90	PK
7266	36.25	9.97	V	46.22	53.98	7.76	AV
4844	51.09	2.21	H	53.30	73.98	20.68	PK
4844	39.42	2.21	H	41.63	53.98	12.35	AV
7266	50.56	9.97	H	60.53	73.98	13.45	PK
7266	37.94	9.97	H	47.91	53.98	6.07	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	50.37	2.62	V	52.99	73.98	20.99	PK
4874	39.21	2.62	V	41.83	53.98	12.15	AV
7311	49.82	9.86	V	59.68	73.98	14.30	PK
7311	37.12	9.86	V	46.98	53.98	7.00	AV
4874	51.07	2.62	H	53.69	73.98	20.29	PK
4874	39.29	2.62	H	41.91	53.98	12.07	AV
7311	50.34	9.86	H	60.20	73.98	13.78	PK
7311	38.34	9.86	H	48.20	53.98	5.78	AV

Operation Mode:	802.11g
Transfer Rate:	6 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	50.21	2.62	V	52.83	73.98	21.15	PK
4874	38.11	2.62	V	40.73	53.98	13.25	AV
7311	50.05	9.86	V	59.91	73.98	14.07	PK
7311	37.25	9.86	V	47.11	53.98	6.87	AV
4874	50.66	2.62	H	53.28	73.98	20.70	PK
4874	39.19	2.62	H	41.81	53.98	12.17	AV
7311	50.09	9.86	H	59.95	73.98	14.03	PK
7311	38.27	9.86	H	48.13	53.98	5.85	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
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	50.32	2.62	V	52.94	73.98	21.04	PK
4874	39.11	2.62	V	41.73	53.98	12.25	AV
7311	49.75	9.86	V	59.61	73.98	14.37	PK
7311	38.22	9.86	V	48.08	53.98	5.90	AV
4874	50.76	2.62	H	53.38	73.98	20.60	PK
4874	39.26	2.62	H	41.88	53.98	12.10	AV
7311	50.33	9.86	H	60.19	73.98	13.79	PK
7311	38.27	9.86	H	48.13	53.98	5.85	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
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	50.47	2.62	V	53.09	73.98	20.89	PK
4874	38.57	2.62	V	41.19	53.98	12.79	AV
7311	50.05	9.86	V	59.91	73.98	14.07	PK
7311	36.51	9.86	V	46.37	53.98	7.61	AV
4874	50.79	2.62	H	53.41	73.98	20.57	PK
4874	39.21	2.62	H	41.83	53.98	12.15	AV
7311	50.46	9.86	H	60.32	73.98	13.66	PK
7311	38.29	9.86	H	48.15	53.98	5.83	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	49.22	2.69	V	51.91	73.98	22.07	PK
4924	37.54	2.69	V	40.23	53.98	13.75	AV
7386	48.58	10.21	V	58.79	73.98	15.19	PK
7386	36.86	10.21	V	47.07	53.98	6.91	AV
4924	50.78	2.69	H	53.47	73.98	20.51	PK
4924	38.51	2.69	H	41.20	53.98	12.78	AV
7386	49.02	10.21	H	59.23	73.98	14.75	PK
7386	37.57	10.21	H	47.78	53.98	6.20	AV

Operation Mode:	802.11g
Transfer Rate:	6 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	49.92	2.69	V	52.61	73.98	21.37	PK
4924	37.51	2.69	V	40.20	53.98	13.78	AV
7386	48.14	10.21	V	58.35	73.98	15.63	PK
7386	37.12	10.21	V	47.33	53.98	6.65	AV
4924	50.48	2.69	H	53.17	73.98	20.81	PK
4924	38.66	2.69	H	41.35	53.98	12.63	AV
7386	49.52	10.21	H	59.73	73.98	14.25	PK
7386	37.67	10.21	H	47.88	53.98	6.10	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
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	49.48	2.69	V	52.17	73.98	21.81	PK
4924	37.54	2.69	V	40.23	53.98	13.75	AV
7386	49.82	10.21	V	60.03	73.98	13.95	PK
7386	37.51	10.21	V	47.72	53.98	6.26	AV
4924	49.99	2.69	H	52.68	73.98	21.30	PK
4924	38.66	2.69	H	41.35	53.98	12.63	AV
7386	49.54	10.21	H	59.75	73.98	14.23	PK
7386	37.76	10.21	H	47.97	53.98	6.01	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
Operating Frequency	2452
Channel No.	9 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
4904	49.86	2.58	V	52.44	73.98	21.54	PK
4904	37.62	2.58	V	40.20	53.98	13.78	AV
7356	48.93	10.02	V	58.95	73.98	15.03	PK
7356	36.51	10.02	V	46.53	53.98	7.45	AV
4904	50.29	2.58	H	52.87	73.98	21.11	PK
4904	38.51	2.58	H	41.09	53.98	12.89	AV
7356	49.42	10.02	H	59.44	73.98	14.54	PK
7356	37.72	10.02	H	47.74	53.98	6.24	AV

With CAM:

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	50.43	2.24	V	52.67	73.98	21.31	PK
4824	39.29	2.24	V	41.53	53.98	12.45	AV
7236	50.36	9.70	V	60.06	73.98	13.92	PK
7236	38.32	9.70	V	48.02	53.98	5.96	AV
4824	50.71	2.24	H	52.95	73.98	21.03	PK
4824	39.33	2.24	H	41.57	53.98	12.41	AV
7236	49.70	9.70	H	59.40	73.98	14.58	PK
7236	38.40	9.70	H	48.10	53.98	5.88	AV

Operation Mode:	802.11g
Transfer Rate:	6 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	50.91	2.24	V	53.15	73.98	20.83	PK
4824	38.88	2.24	V	41.12	53.98	12.86	AV
7236	49.76	9.70	V	59.46	73.98	14.52	PK
7236	37.90	9.70	V	47.60	53.98	6.38	AV
4824	51.48	2.24	H	53.72	73.98	20.26	PK
4824	39.36	2.24	H	41.60	53.98	12.38	AV
7236	49.80	9.70	H	59.50	73.98	14.48	PK
7236	38.34	9.70	H	48.04	53.98	5.94	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
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	50.20	2.24	V	52.44	73.98	21.54	PK
4824	39.02	2.24	V	41.26	53.98	12.72	AV
7236	49.83	9.70	V	59.53	73.98	14.45	PK
7236	38.33	9.70	V	48.03	53.98	5.95	AV
4824	50.62	2.24	H	52.86	73.98	21.12	PK
4824	39.34	2.24	H	41.58	53.98	12.40	AV
7236	50.21	9.70	H	59.91	73.98	14.07	PK
7236	38.41	9.70	H	48.11	53.98	5.87	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
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	50.73	2.21	V	52.94	73.98	21.04	PK
4844	38.65	2.21	V	40.86	53.98	13.12	AV
7266	49.74	9.97	V	59.71	73.98	14.27	PK
7266	36.89	9.97	V	46.86	53.98	7.12	AV
4844	51.27	2.21	H	53.48	73.98	20.50	PK
4844	39.23	2.21	H	41.44	53.98	12.54	AV
7266	49.80	9.97	H	59.77	73.98	14.21	PK
7266	37.56	9.97	H	47.53	53.98	6.45	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	51.21	2.62	V	53.83	73.98	20.15	PK
4874	38.15	2.62	V	40.77	53.98	13.21	AV
7311	49.81	9.86	V	59.67	73.98	14.31	PK
7311	37.21	9.86	V	47.07	53.98	6.91	AV
4874	52.05	2.62	H	54.67	73.98	19.31	PK
4874	39.32	2.62	H	41.94	53.98	12.04	AV
7311	50.94	9.86	H	60.80	73.98	13.18	PK
7311	38.42	9.86	H	48.28	53.98	5.70	AV

Operation Mode:	802.11g
Transfer Rate:	6 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	50.55	2.62	V	53.17	73.98	20.81	PK
4874	37.26	2.62	V	39.88	53.98	14.10	AV
7311	49.70	9.86	V	59.56	73.98	14.42	PK
7311	38.33	9.86	V	48.19	53.98	5.79	AV
4874	50.98	2.62	H	53.60	73.98	20.38	PK
4874	38.35	2.62	H	40.97	53.98	13.01	AV
7311	50.17	9.86	H	60.03	73.98	13.95	PK
7311	38.37	9.86	H	48.23	53.98	5.75	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
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	50.50	2.62	V	53.12	73.98	20.86	PK
4874	37.51	2.62	V	40.13	53.98	13.85	AV
7311	49.77	9.86	V	59.63	73.98	14.35	PK
7311	38.30	9.86	V	48.16	53.98	5.82	AV
4874	50.74	2.62	H	53.36	73.98	20.62	PK
4874	38.41	2.62	H	41.03	53.98	12.95	AV
7311	50.13	9.86	H	59.99	73.98	13.99	PK
7311	38.39	9.86	H	48.25	53.98	5.73	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
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	50.40	2.62	V	53.02	73.98	20.96	PK
4874	38.96	2.62	V	41.58	53.98	12.40	AV
7311	49.96	9.86	V	59.82	73.98	14.16	PK
7311	37.99	9.86	V	47.85	53.98	6.13	AV
4874	50.93	2.62	H	53.55	73.98	20.43	PK
4874	39.11	2.62	H	41.73	53.98	12.25	AV
7311	51.41	9.86	H	61.27	73.98	12.71	PK
7311	38.39	9.86	H	48.25	53.98	5.73	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	49.69	2.69	V	52.38	73.98	21.60	PK
4924	38.43	2.69	V	41.12	53.98	12.86	AV
7386	48.68	10.21	V	58.89	73.98	15.09	PK
7386	37.26	10.21	V	47.47	53.98	6.51	AV
4924	50.30	2.69	H	52.99	73.98	20.99	PK
4924	38.52	2.69	H	41.21	53.98	12.77	AV
7386	49.62	10.21	H	59.83	73.98	14.15	PK
7386	37.53	10.21	H	47.74	53.98	6.24	AV

Operation Mode:	802.11g
Transfer Rate:	6 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	49.87	2.69	V	52.56	73.98	21.42	PK
4924	38.46	2.69	V	41.15	53.98	12.83	AV
7386	48.99	10.21	V	59.20	73.98	14.78	PK
7386	36.79	10.21	V	47.00	53.98	6.98	AV
4924	50.22	2.69	H	52.91	73.98	21.07	PK
4924	38.51	2.69	H	41.20	53.98	12.78	AV
7386	49.06	10.21	H	59.27	73.98	14.71	PK
7386	37.42	10.21	H	47.63	53.98	6.35	AV

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

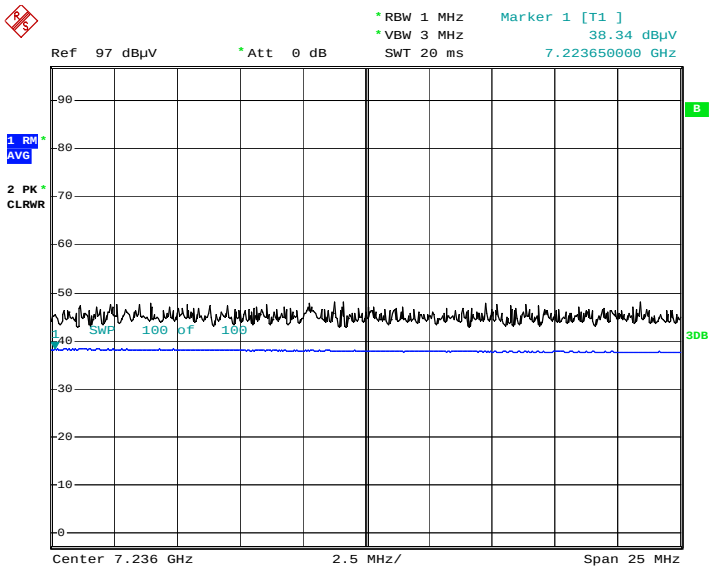
Frequency [MHz]	Reading [dBuV]	A.F.+C.L.-A.G+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	50.45	2.69	V	53.14	73.98	20.84	PK
4924	38.47	2.69	V	41.16	53.98	12.82	AV
7386	49.29	10.21	V	59.50	73.98	14.48	PK
7386	36.98	10.21	V	47.19	53.98	6.79	AV
4924	51.34	2.69	H	54.03	73.98	19.95	PK
4924	38.50	2.69	H	41.19	53.98	12.79	AV
7386	49.34	10.21	H	59.55	73.98	14.43	PK
7386	37.51	10.21	H	47.72	53.98	6.26	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
Operating Frequency	2452
Channel No.	9 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
4904	50.12	2.58	V	52.70	73.98	21.28	PK
4904	38.39	2.58	V	40.97	53.98	13.01	AV
7356	49.56	10.02	V	59.58	73.98	14.40	PK
7356	36.98	10.02	V	47.00	53.98	6.98	AV
4904	50.25	2.58	H	52.83	73.98	21.15	PK
4904	38.50	2.58	H	41.08	53.98	12.90	AV
7356	49.88	10.02	H	59.90	73.98	14.08	PK
7356	37.57	10.02	H	47.59	53.98	6.39	AV

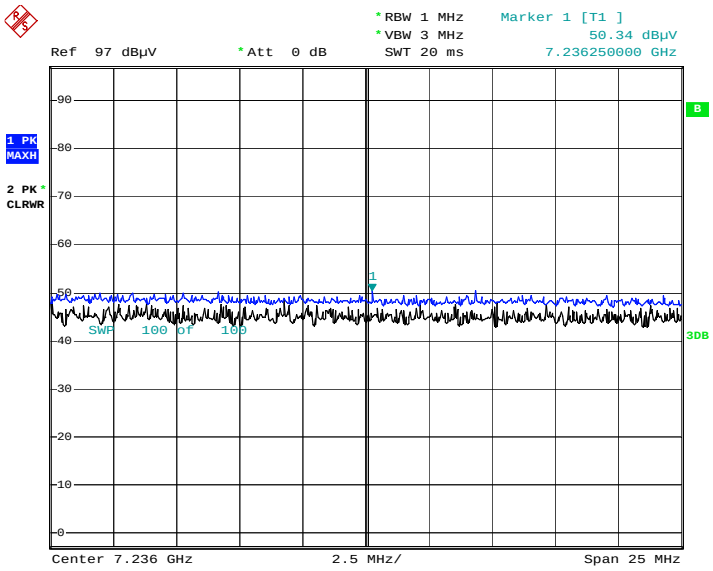
▣ Stand alone: Test Plots (Worst case : Y-H)

Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.6 3rd Harmonic)



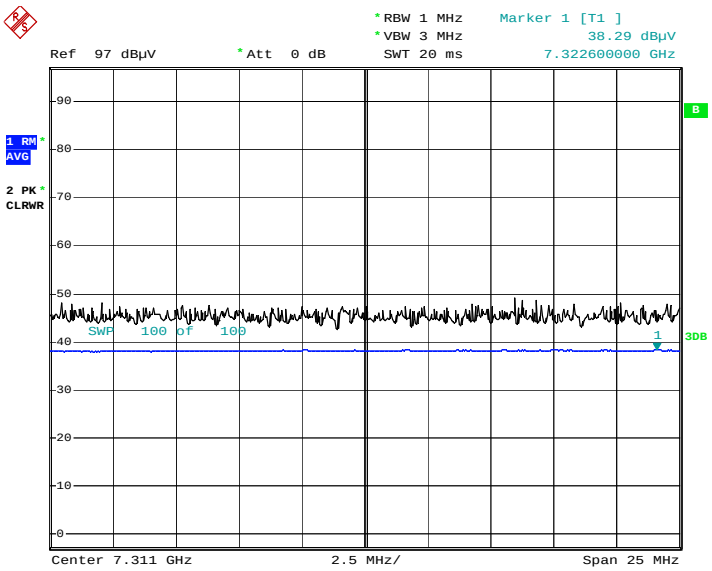
Date: 8.SEP.2018 15:52:51

Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.6 3rd Harmonic)



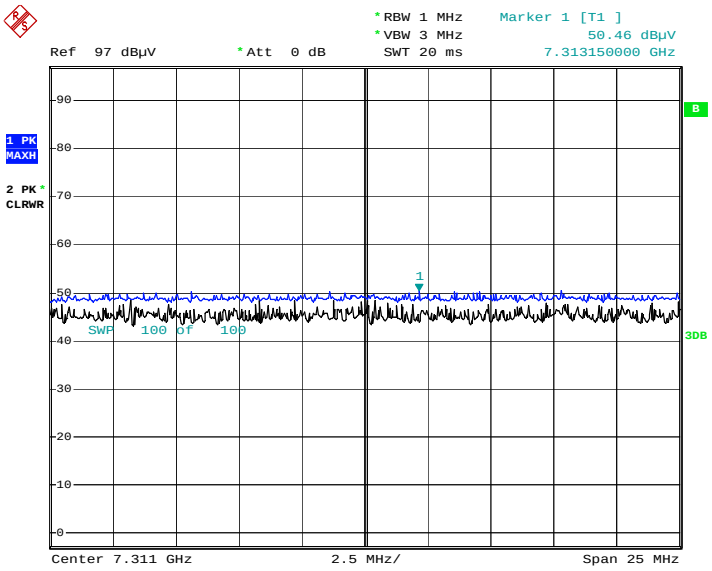
Date: 8.SEP.2018 15:53:52

Radiated Spurious Emissions plot – Average Reading (802.11n_(HT40, Ch.6 3rd Harmonic)



Date: 8.SEP.2018 15:11:03

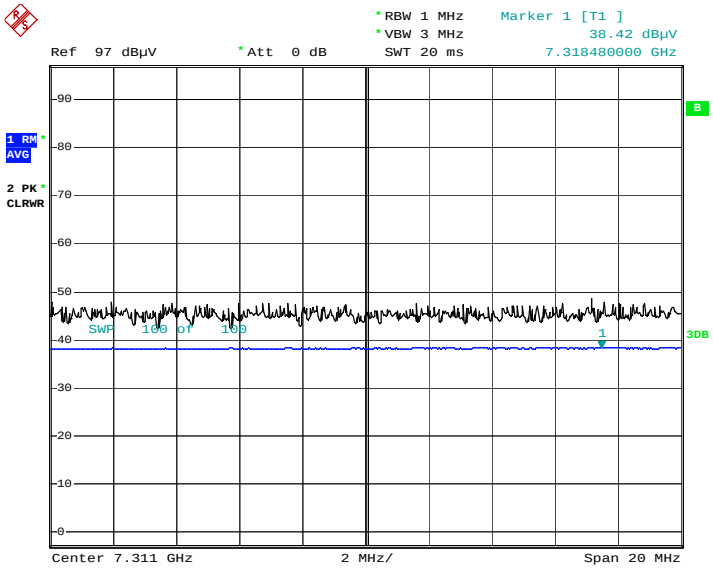
Radiated Spurious Emissions plot – Peak Reading (802.11n_HT40, Ch.6 3rd Harmonic)



Date: 8.SEP.2018 15:13:00

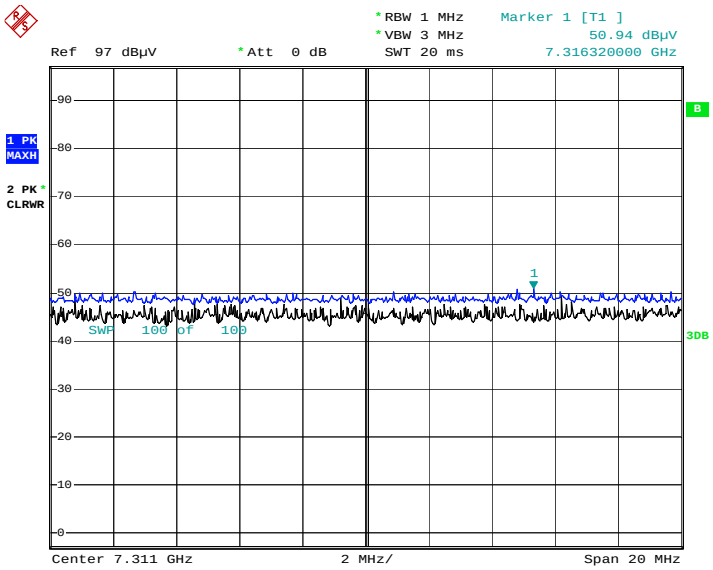
▣ With CAM: Test Plots (Worst case : Z-H)

Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.6 3rd Harmonic)



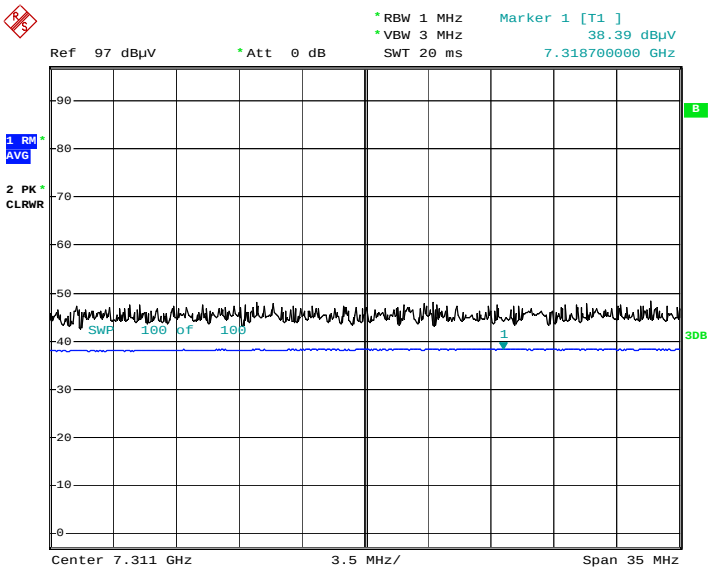
Date: 8.SEP.2018 17:43:53

Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.6 3rd Harmonic)



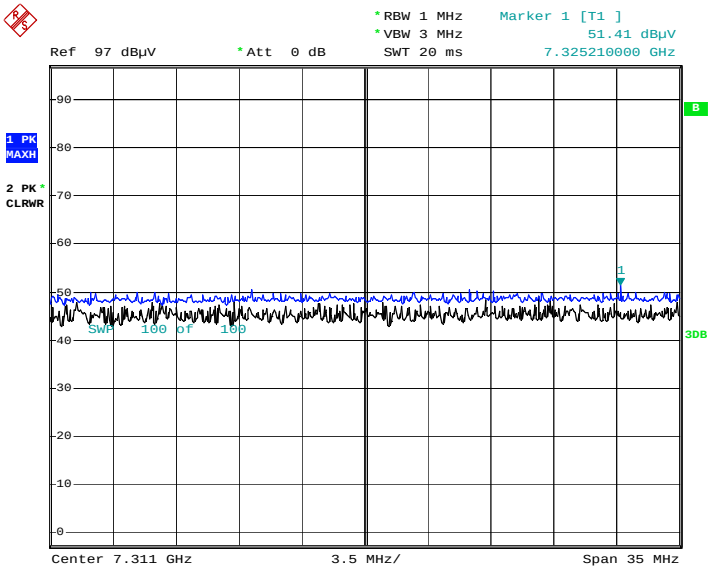
Date: 8.SEP.2018 17:46:03

Radiated Spurious Emissions plot – Average Reading (802.11n_HT40, Ch.6 3rd Harmonic)



Date: 8.SEP.2018 17:48:25

Radiated Spurious Emissions plot – Peak Reading (802.11n_HT40, Ch.6 3rd Harmonic)



Date: 8.SEP.2018 17:49:31

Note:

Plot of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

Stand alone:

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	51.85	1.12	H	52.97	73.98	21.01	PK
2390.0	41.84	1.12	H	42.96	53.98	11.02	AV
2390.0	53.51	1.12	V	54.63	73.98	19.35	PK
2390.0	42.02	1.12	V	43.14	53.98	10.84	AV
2483.5	52.41	1.38	H	53.79	73.98	20.19	PK
2483.5	41.24	1.38	H	42.62	53.98	11.36	AV
2483.5	53.59	1.38	V	54.97	73.98	19.01	PK
2483.5	41.73	1.38	V	43.11	53.98	10.87	AV

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	51.73	1.12	H	52.85	73.98	21.13	PK
2390.0	41.24	1.12	H	42.36	53.98	11.62	AV
2390.0	52.68	1.12	V	53.80	73.98	20.18	PK
2390.0	41.46	1.12	V	42.58	53.98	11.40	AV
2483.5	53.06	1.38	H	54.44	73.98	19.54	PK
2483.5	41.86	1.38	H	43.24	53.98	10.74	AV
2483.5	54.07	1.38	V	55.45	73.98	18.53	PK
2483.5	41.91	1.38	V	43.29	53.98	10.69	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]	A.F.+C.L.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	52.76	1.12	H	53.88	73.98	20.10	PK
2390.0	41.63	1.12	H	42.75	53.98	11.23	AV
2390.0	53.25	1.12	V	54.37	73.98	19.61	PK
2390.0	41.98	1.12	V	43.10	53.98	10.88	AV
2483.5	53.35	1.38	H	54.73	73.98	19.25	PK
2483.5	41.37	1.38	H	42.75	53.98	11.23	AV
2483.5	54.14	1.38	V	55.52	73.98	18.46	PK
2483.5	41.87	1.38	V	43.25	53.98	10.73	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
Operating Frequency	2422 MHz, 2452 MHz
Channel No.	03 Ch, 9 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	52.48	1.12	H	53.60	73.98	20.38	PK
2390.0	41.32	1.12	H	42.44	53.98	11.54	AV
2390.0	53.37	1.12	V	54.49	73.98	19.49	PK
2390.0	41.56	1.12	V	42.68	53.98	11.30	AV
2483.5	53.35	1.38	H	54.73	73.98	19.25	PK
2483.5	41.72	1.38	H	43.10	53.98	10.88	AV
2483.5	53.92	1.38	V	55.30	73.98	18.68	PK
2483.5	41.81	1.38	V	43.19	53.98	10.79	AV

With CAM:

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	51.89	1.12	H	53.01	73.98	20.97	PK
2390.0	41.78	1.12	H	42.90	53.98	11.08	AV
2390.0	53.02	1.12	V	54.14	73.98	19.84	PK
2390.0	41.96	1.12	V	43.08	53.98	10.90	AV
2483.5	51.63	1.38	H	53.01	73.98	20.97	PK
2483.5	41.76	1.38	H	43.14	53.98	10.84	AV
2483.5	52.81	1.38	V	54.19	73.98	19.79	PK
2483.5	41.82	1.38	V	43.20	53.98	10.78	AV

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

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	53.28	1.12	H	54.40	73.98	19.58	PK
2390.0	41.99	1.12	H	43.11	53.98	10.87	AV
2390.0	54.26	1.12	V	55.38	73.98	18.60	PK
2390.0	42.23	1.12	V	43.35	53.98	10.63	AV
2483.5	53.21	1.38	H	54.59	73.98	19.39	PK
2483.5	41.98	1.38	H	43.36	53.98	10.62	AV
2483.5	53.83	1.38	V	55.21	73.98	18.77	PK
2483.5	42.02	1.38	V	43.40	53.98	10.58	AV

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

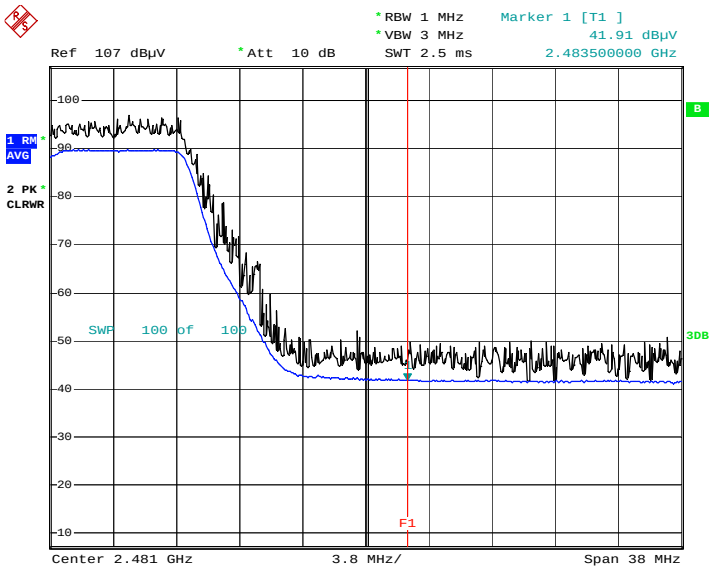
Frequency [MHz]	Reading [dBuV]	A.F.+C.L.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	52.26	1.12	H	53.38	73.98	20.60	PK
2390.0	41.79	1.12	H	42.91	53.98	11.07	AV
2390.0	53.87	1.12	V	54.99	73.98	18.99	PK
2390.0	42.06	1.12	V	43.18	53.98	10.80	AV
2483.5	52.37	1.38	H	53.75	73.98	20.23	PK
2483.5	41.98	1.38	H	43.36	53.98	10.62	AV
2483.5	53.21	1.38	V	54.59	73.98	19.39	PK
2483.5	42.06	1.38	V	43.44	53.98	10.54	AV

Operation Mode:	802.11n (HT40)
Transfer MCS Index:	0
Operating Frequency	2422 MHz, 2452 MHz
Channel No.	03 Ch, 9 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	52.54	1.12	H	53.66	73.98	20.32	PK
2390.0	41.83	1.12	H	42.95	53.98	11.03	AV
2390.0	52.58	1.12	V	53.70	73.98	20.28	PK
2390.0	41.97	1.12	V	43.09	53.98	10.89	AV
2483.5	52.78	1.38	H	54.16	73.98	19.82	PK
2483.5	41.55	1.38	H	42.93	53.98	11.05	AV
2483.5	53.28	1.38	V	54.66	73.98	19.32	PK
2483.5	42.36	1.38	V	43.74	53.98	10.24	AV

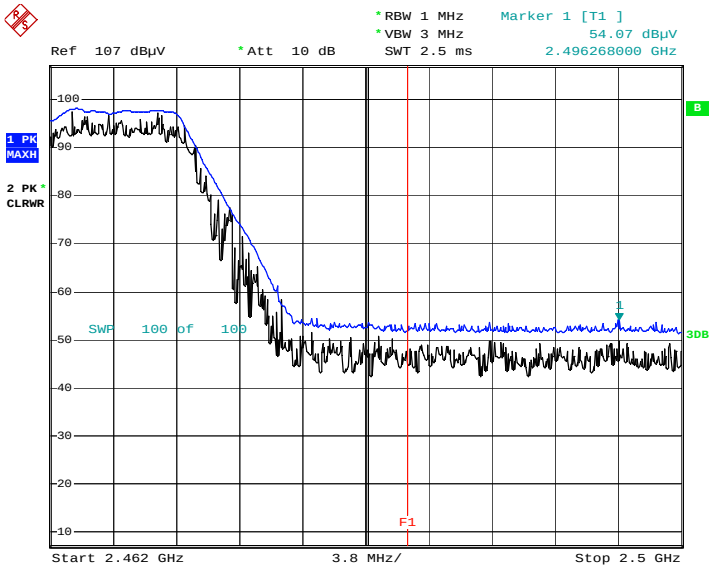
▣ Stand alone: Test Plots (Worst case : Z-V)

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



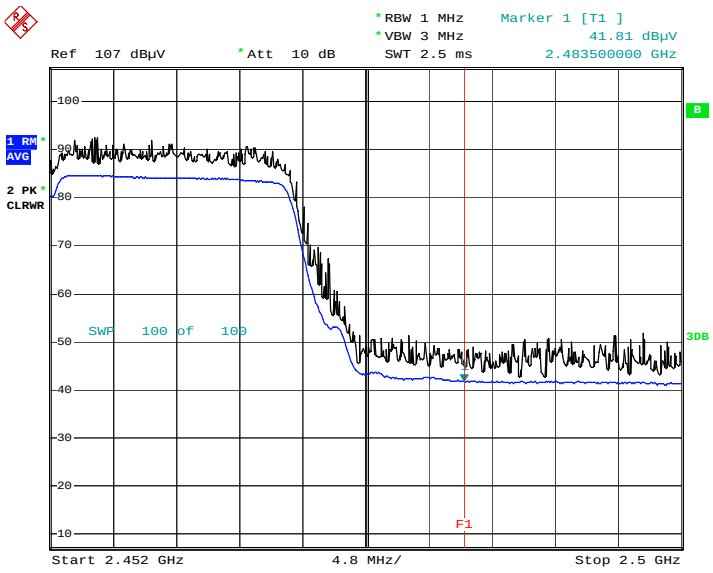
Date: 8.SEP.2018 11:08:28

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



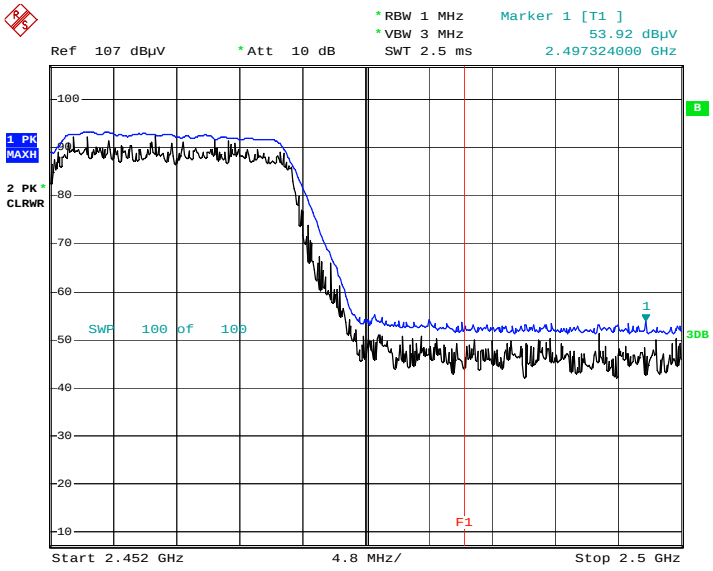
Date: 8.SEP.2018 11:12:58

Radiated Restricted Band Edges plot – Average Reading (802.11n (HT40) Ch.9)



Date: 8.SEP.2018 11:19:38

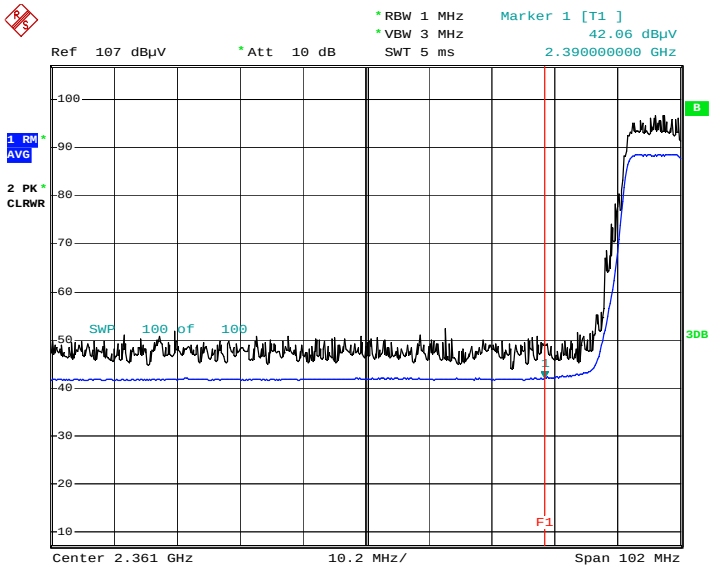
Radiated Restricted Band Edges plot – Peak Reading (802.11n (HT40) Ch.9)



Date: 8.SEP.2018 11:17:02

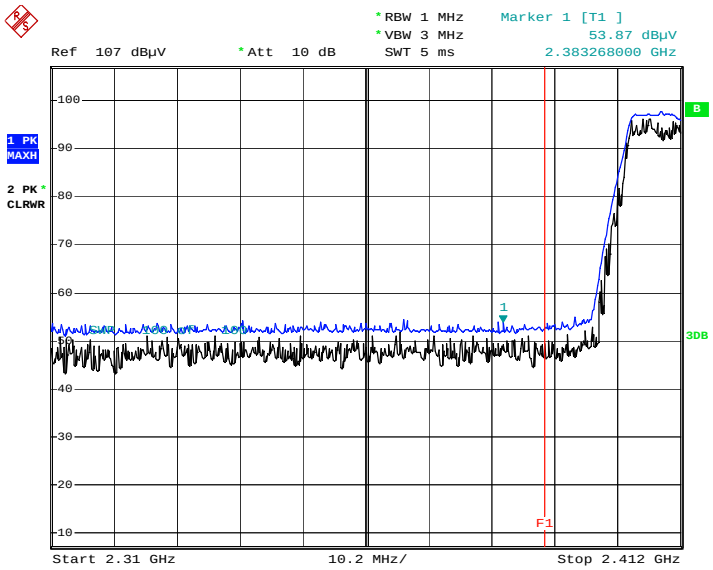
▣ With CAM: Test Plots (Worst case : Z-V)

Radiated Restricted Band Edges plot – Average Reading (802.11n_HT20 Ch.1)



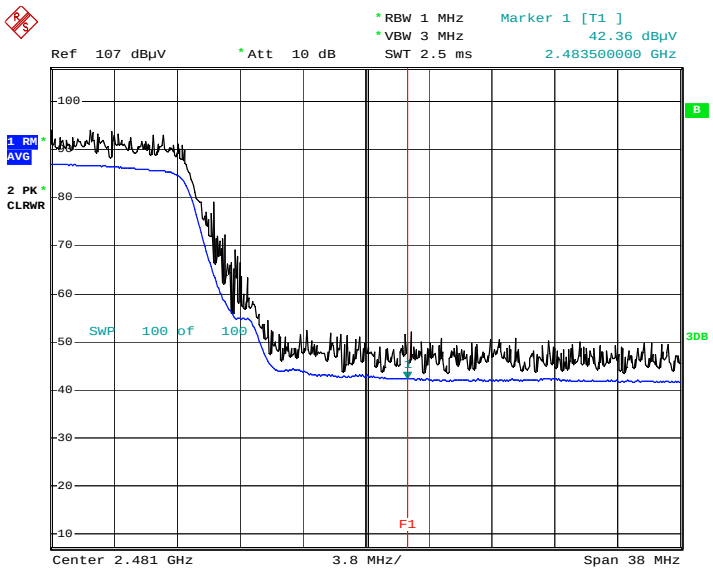
Date: 11.SEP.2018 09:01:49

Radiated Restricted Band Edges plot – Peak Reading (802.11n_HT20 Ch.1)



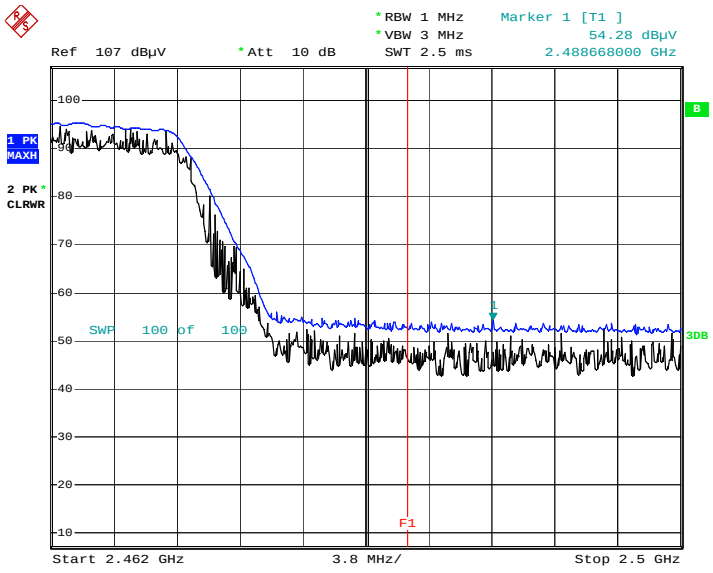
Date: 11.SEP.2018 09:03:30

Radiated Restricted Band Edges plot – Average Reading (802.11n_HT40 Ch.9)



Date: 8.SEP.2018 18:04:20

Radiated Restricted Band Edges plot – Peak Reading (802.11n_HT40 Ch.9)



Date: 8.SEP.2018 18:03:41

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	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	MY51110085
Agilent	N9030A / Signal Analyzer	11/22/2017	Annual	MY49431210
Agilent	N1911A / Power Meter	04/16/2018	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/16/2018	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/20/2017	Annual	3116A03621
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 9160 / Hybrid Antenna	08/09/2018	Biennial	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	09/27/2017	Annual	101068-SZ
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/07/2018	Annual	8
Wainwright Instruments	WHFX7.0/18G-8SS / High Pass Filter	05/09/2018	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/29/2018	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/03/2018	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

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-1809-FC050-P