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FCC DTS REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

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

Date of Issue:
May 08, 2019

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-1905-FC008

FCC ID:	**A3LSMV310**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model:	SM-V310
EUT Type:	AI Speaker
Average Output Power:	802.11b : 16.80 dBm 802.11g : 13.05 dBm 802.11n(HT20) : 12.86 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. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

Report prepared by : Jeong Ho Kim
Engineer of Telecommunication testing center

Approved by : Kwon Jeong
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1905-FC008	May 08, 2019	- First Approval Report

Table of Contents

1. EUT DESCRIPTION

Model	SM-V310
EUT Type	AI Speaker
Power Supply	DC 9.0 V
Data cable	Model : ECB-DU2EBE Manufacture: KSD
Travel Adapter Information	Model : EP-TA200 Manufacture: Dogyang E&P, SoluM, RFTECH, HAEM
Frequency Range	2412 MHz - 2472 MHz
Max. RF Output Power	**Peak Power (For information only)** 802.11b : 22.94 dBm 802.11g : 21.37 dBm 802.11n(HT20) : 20.93 dBm **Average Power** 802.11b : 16.80 dBm 802.11g : 13.05 dBm 802.11n(HT20) : 12.86 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n
Number of Channels	11 Channels
Antenna Specification	Antenna type: PIFA (Planar Inverted F Antenna) Peak Gain : 0.10 dBi
Date(s) of Tests	April 11, 2019~ May 07, 2019

2. TEST METHODOLOGY

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

EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpse of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

GENERAL TEST PROCEDURES

Conducted Emissions

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

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013)

DESCRIPTION OF TEST MODES

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

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,

Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

* 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.

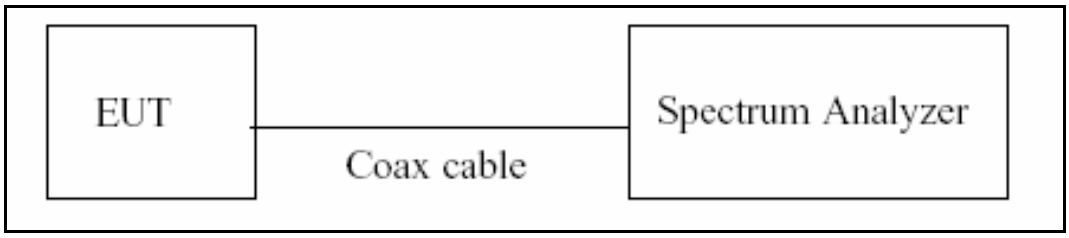
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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.

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*.

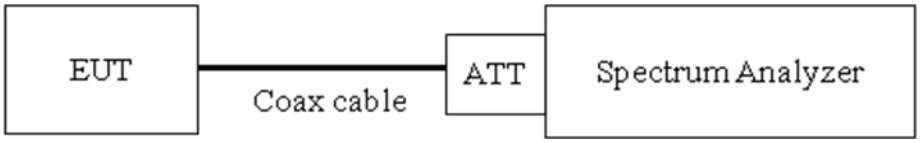
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10*log(1/Duty Cycle)

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 11.8.1 in ANSI 63.10-2013)

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

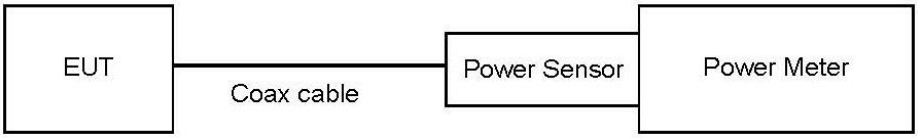
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

7.3. Output Power

Limit

The maximum permissible conducted output power is 1 Watt.

Test Configuration



Test Procedure

The transmitter output is connected to the Power Meter.

▪ Peak Power (Procedure 11.9.1.3 in ANSI 63.10-2013)

: Measure the peak power of the transmitter.

▪ Average Power (Procedure 11.9.2.3 in ANSI 63.10-2013)

1) Measure the duty cycle.
2) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Sample Calculation

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

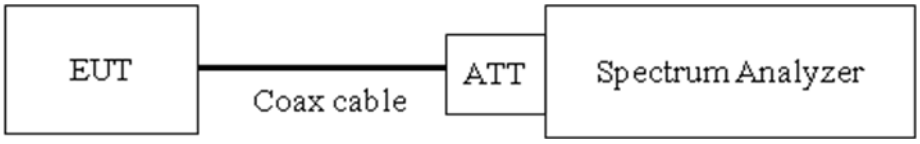
▪ Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

7.4. Power Spectral Density

Limit

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

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

1) Set analyzer center frequency to DTS channel center frequency.
2) Set span to at least 1.5 times the OBW.
3) RBW = 3 kHz ≤ RBW ≤ 100 kHz.
4) VBW ≥ 3 x RBW.
5) Sweep = auto couple
6) Detector = power averaging (rms) or sample detector (when rms not available).
7) Ensure that the number of measurement points in the sweep ≥[2 ×span / RBW].
8) Employ trace averaging (rms) modeover a minimum of 100 traces
9) Use the peak marker function to determine the maximum amplitude level.
10) Use the peak marker function to determine the maximum amplitude level within the RBW.
    If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Sample Calculation

▪ Power Spectral Density = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

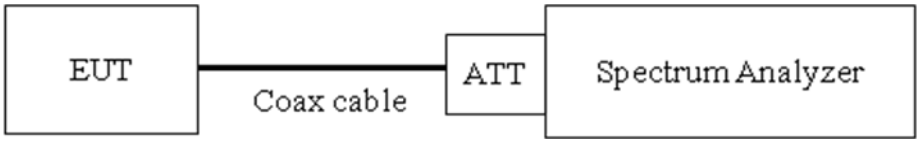
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

Limit

The maximum conducted (Average) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

[Conducted > 30 dBc]

Test Configuration



Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 11.11 in ANSI 63.10-2013)

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

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

Factors for frequency

Freq(MHz)	Factor(dB)
30	20.95
100	19.48
200	19.84
300	19.78
400	19.88
500	19.90
600	19.97
700	20.00
800	20.00
900	19.99
1000	20.04
2000	20.29
2400*	20.28
2500*	20.30
3000	20.33
4000	20.54
5000	20.48
6000	20.51
7000	21.00
8000	20.97
9000	21.13
10000	21.21
11000	21.21
12000	21.33
13000	21.48
14000	21.55
15000	21.63
16000	21.69
17000	21.67
18000	21.73
19000	21.72
20000	21.79
21000	21.82
22000	21.96
23000	22.25
24000	21.99
25000	22.18
26000	21.67

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

2. Factor = Attenuator loss + Cable loss

7.6. Radiated Test

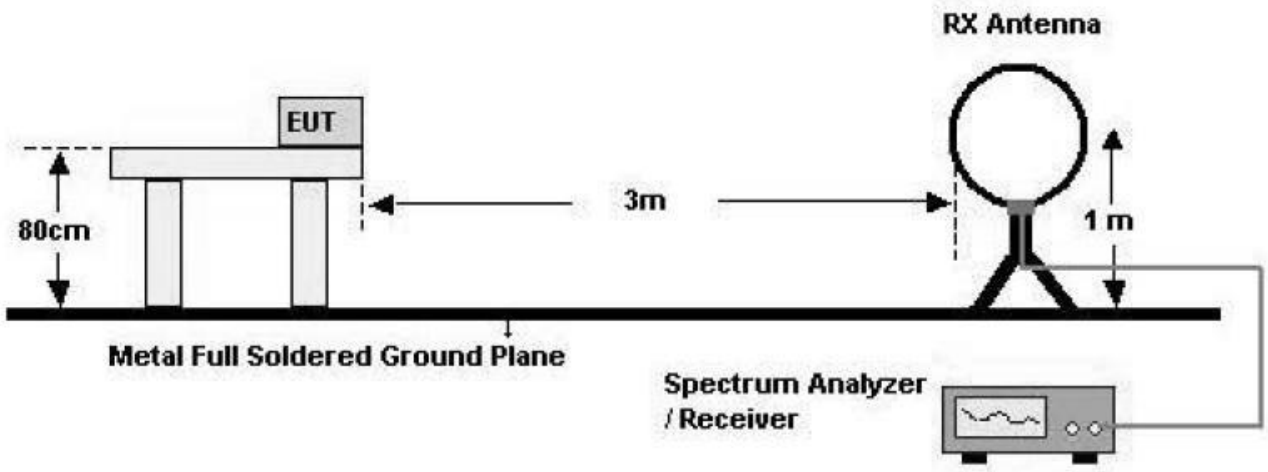
Limit

FCC

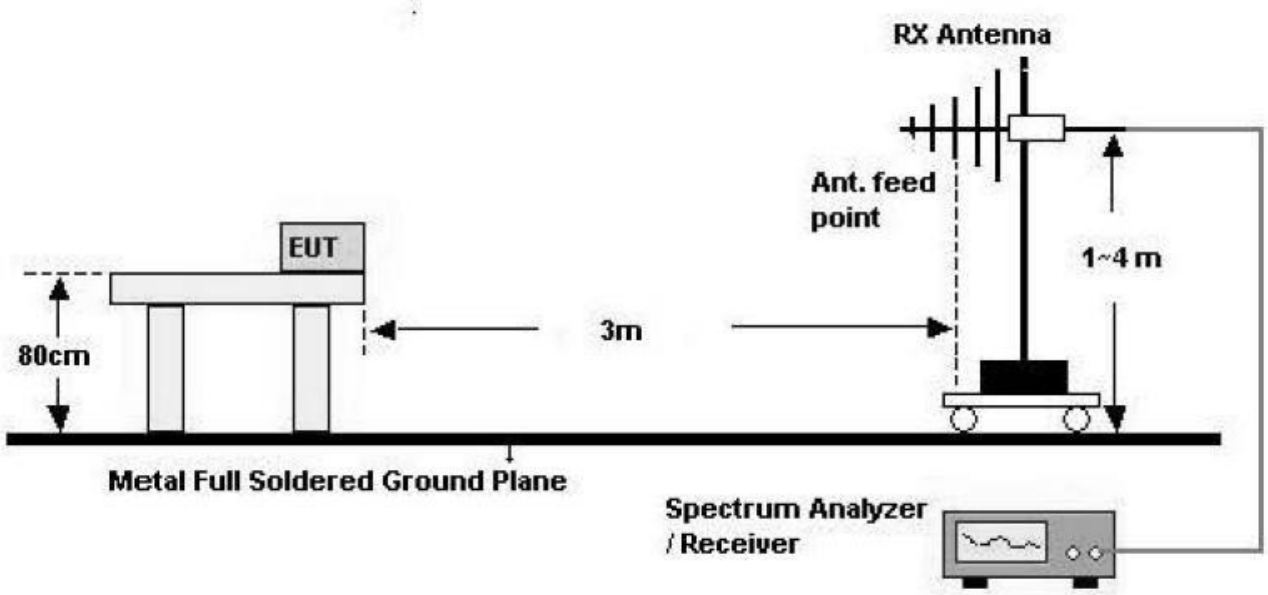
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30

Test Configuration

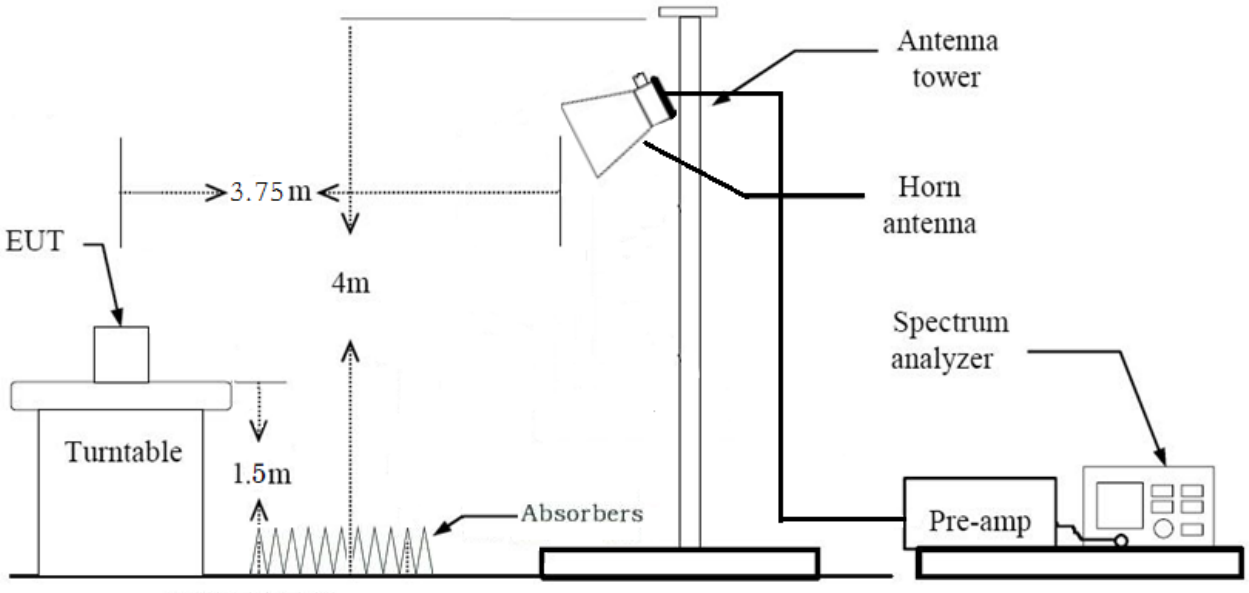
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = 40*log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40*log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3*RBW
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. The test results for below 30 MHz is correlated to an open site.
    The result on OFS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

Test Procedure of Radiated spurious emissions(Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
   (1) Measurement Type(Peak):
   - Measured Frequency Range : 30 MHz – 1 GHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 100 kHz
   - VBW ≥ 3*RBW

   (2) Measurement Type(Quasi-peak):
   - Measured Frequency Range : 30 MHz – 1 GHz
   - Detector = Quasi-Peak
   - RBW = 120 kHz

   *In general, (1) is used mainly
6. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

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 v05r01, 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.

Sample Calculation

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

7.8. Worst case configuration and mode

Radiated test

1. EUT Axis
   - Radiated Spurious Emissions : X
   - Radiated Restricted Band Edge : X
2. Duty cycle factor applies only 802.11g/n(Duty cycle < 98%).
3. 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 : MCS0

Conducted test

1. 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		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	§15.247(d)	Conducted > 30 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 7.7		PASS
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 7.6		PASS

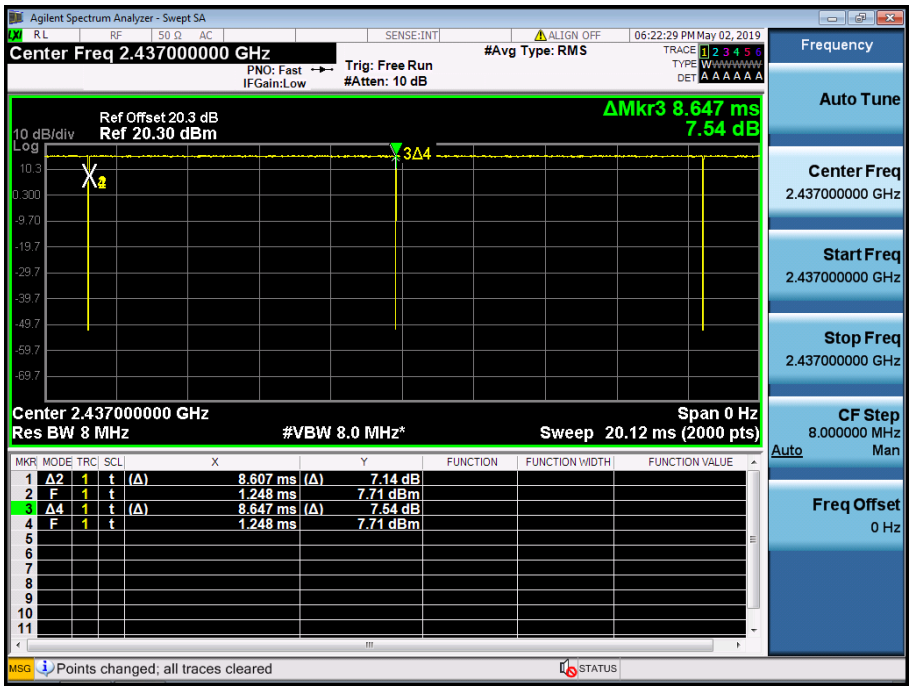
9. TEST RESULT

9.1 DUTY CYCLE

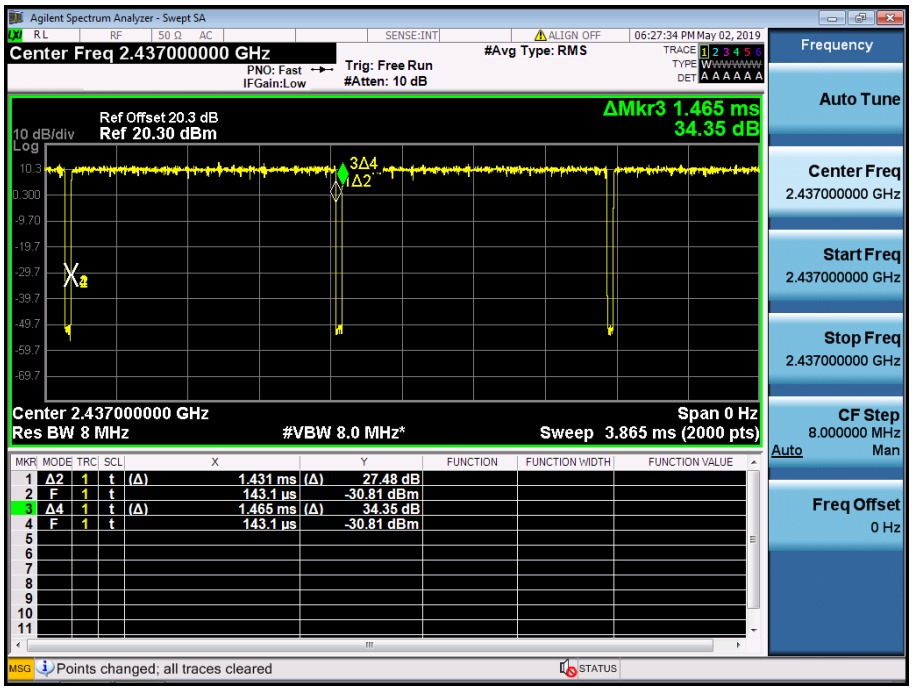
Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	8.607	8.647	0.995	0.020
	2	4.403	4.434	0.993	0.030
	5.5	1.722	1.753	0.982	0.077
	11	0.960	0.988	0.972	0.125
802.11g	6	1.431	1.465	0.976	0.104
	9	0.963	0.995	0.968	0.143
	12	0.727	0.761	0.957	0.193
	18	0.495	0.547	0.905	0.434
	24	0.375	0.428	0.876	0.576
	36	0.259	0.311	0.831	0.803
	48	0.196	0.251	0.781	1.074
	54	0.183	0.235	0.779	1.086
802.11n (HT20)	6.5 (MCS0)	1.340	1.373	0.976	0.106
	13 (MCS1)	0.690	0.723	0.954	0.203
	19.5 (MCS2)	0.474	0.507	0.935	0.292
	26 (MCS3)	0.367	0.399	0.919	0.368
	39 (MCS4)	0.259	0.311	0.831	0.803
	52 (MCS5)	0.203	0.256	0.793	1.007
	58.5 (MCS6)	0.186	0.240	0.772	1.124
	65 (MCS7)	0.170	0.223	0.761	1.187

▣ Test Plots

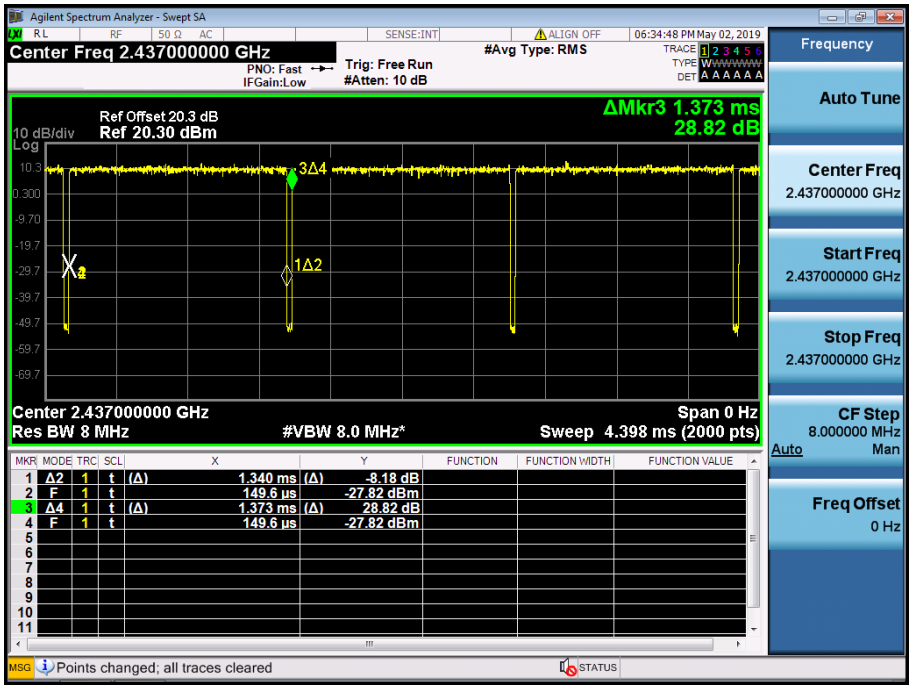
Duty cycle plot (802.11b(1Mbps))



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

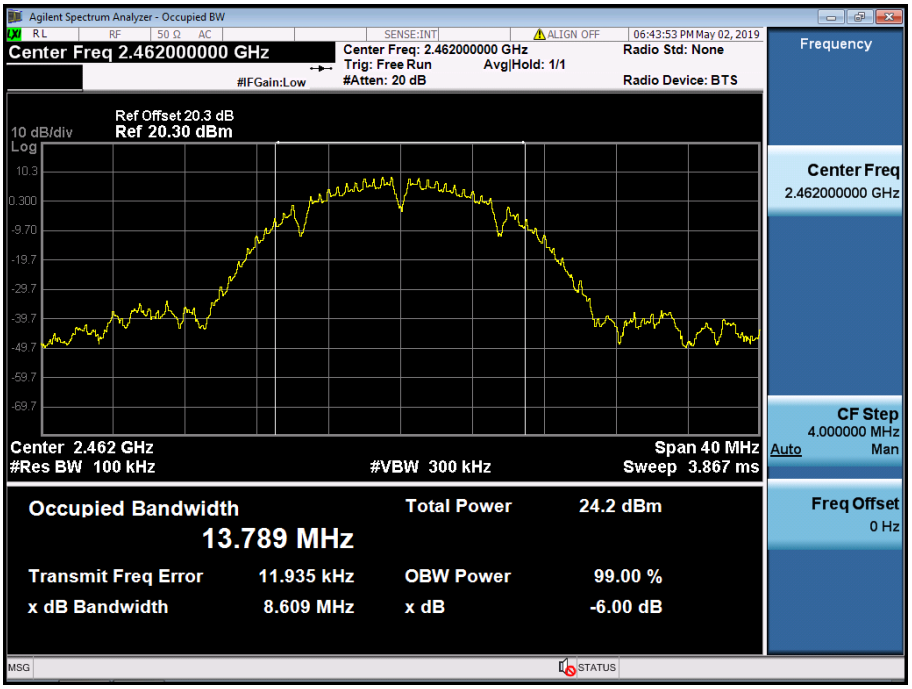
802.11b Mode		6dB Bandwidth [MHz]	Limit [MHz]
Frequency [MHz]	Channel No.		
2412	1	10.064	> 0.5
2437	6	9.582	> 0.5
2462	11	8.609	> 0.5

802.11g Mode		6dB Bandwidth [MHz]	Limit [MHz]
Frequency [MHz]	Channel No.		
2412	1	16.106	> 0.5
2437	6	15.687	> 0.5
2462	11	16.067	> 0.5

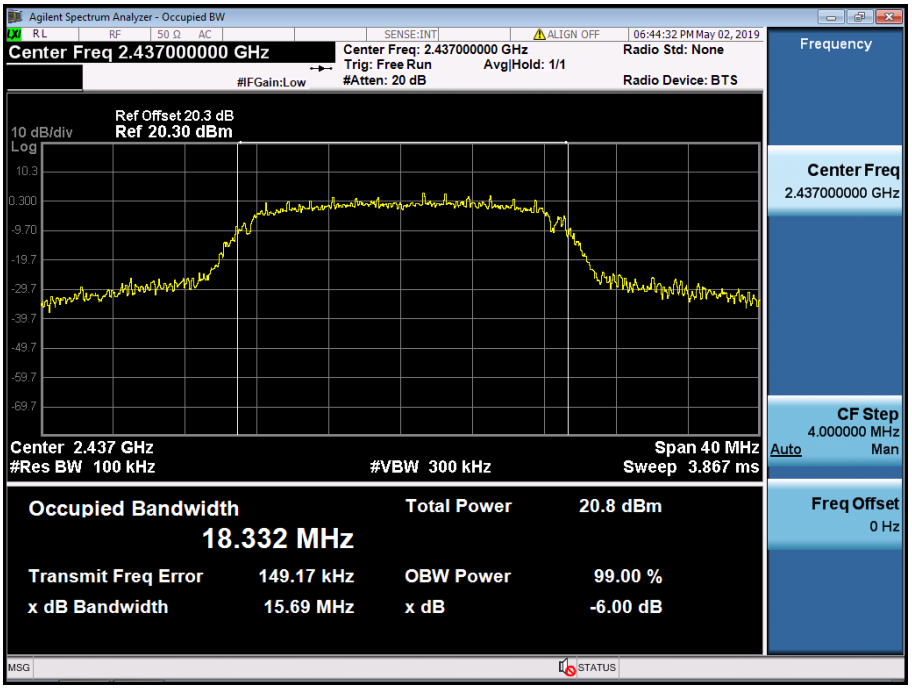
802.11n Mode		6dB Bandwidth [MHz]	Limit [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.120	> 0.5
2437	6	15.118	> 0.5
2462	11	15.166	> 0.5

▣ Test Plots

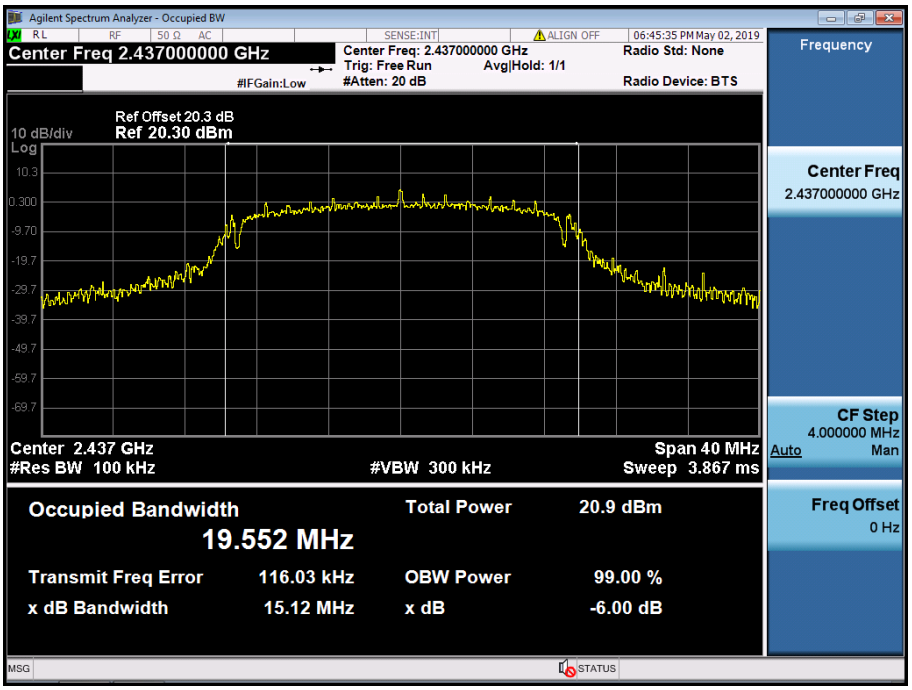
6dB Bandwidth plot (802.11b-CH 11)



6dB Bandwidth plot (802.11g-CH 6)



6dB Bandwidth plot (802.11n_HT20-CH 6)



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, 20.3 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	19.09	30
		2	19.83	30
		5.5	21.65	30
		11	22.94	30
2437	6	1	18.97	30
		2	19.79	30
		5.5	21.05	30
		11	22.45	30
2462	11	1	19.04	30
		2	19.28	30
		5.5	20.79	30
		11	22.39	30

802.11g Mode		Data Rate [Mbps]	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	6	20.90	30
		9	21.02	30
		12	20.86	30
		18	20.47	30
		24	21.22	30
		36	21.09	30
		48	19.93	30
		54	20.13	30
2437	6	6	21.02	30
		9	21.03	30
		12	21.02	30
		18	20.67	30
		24	21.37	30
		36	21.23	30
		48	19.44	30
		54	19.65	30
2462	11	6	20.21	30
		9	20.24	30
		12	19.71	30
		18	19.92	30
		24	20.65	30
		36	20.54	30
		48	19.16	30
		54	19.41	30

802.11n Mode		MCS Index	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	0	20.50	30
		1	20.06	30
		2	19.97	30
		3	20.46	30
		4	20.60	30
		5	18.31	30
		6	18.52	30
		7	18.46	30
2437	6	0	20.65	30
		1	20.39	30
		2	20.38	30
		3	20.84	30
		4	20.93	30
		5	18.20	30
		6	18.28	30
		7	18.03	30
2462	11	0	19.97	30
		1	19.78	30
		2	19.70	30
		3	20.23	30
		4	20.22	30
		5	17.82	30
		6	18.02	30
		7	17.90	30

Average Power

1. Power Meter offset = Attenuator loss + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
   So, 20.3 dB is offset for 2.4 GHz Band.

802.11b Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Result (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1 Mbps	16.45	0.020	16.47	30
		2 Mbps	16.40	0.030	16.43	30
		5.5 Mbps	16.60	0.077	16.68	30
		11 Mbps	16.48	0.125	16.61	30
2437	6	1 Mbps	16.40	0.020	16.42	30
		2 Mbps	16.33	0.030	16.36	30
		5.5 Mbps	16.72	0.077	16.80	30
		11 Mbps	16.57	0.125	16.69	30
2462	11	1 Mbps	16.56	0.020	16.58	30
		2 Mbps	16.53	0.030	16.56	30
		5.5 Mbps	16.66	0.077	16.73	30
		11 Mbps	16.59	0.125	16.72	30

802.11g Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Result (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6 Mbps	12.77	0.104	12.88	30
		9 Mbps	12.74	0.143	12.88	30
		12 Mbps	12.69	0.193	12.88	30
		18 Mbps	12.46	0.434	12.90	30
		24 Mbps	12.25	0.576	12.82	30
		36 Mbps	12.07	0.803	12.88	30
		48 Mbps	10.69	1.074	11.76	30
		54 Mbps	10.70	1.086	11.79	30
2437	6	6 Mbps	12.88	0.104	12.98	30
		9 Mbps	12.81	0.143	12.95	30
		12 Mbps	12.46	0.193	12.65	30
		18 Mbps	12.62	0.434	13.05	30
		24 Mbps	12.44	0.576	13.02	30
		36 Mbps	12.24	0.803	13.05	30
		48 Mbps	10.31	1.074	11.38	30
		54 Mbps	10.33	1.086	11.41	30
2462	11	6 Mbps	12.17	0.104	12.27	30
		9 Mbps	12.08	0.143	12.22	30
		12 Mbps	12.01	0.193	12.20	30
		18 Mbps	11.93	0.434	12.36	30
		24 Mbps	11.76	0.576	12.34	30
		36 Mbps	11.55	0.803	12.35	30
		48 Mbps	10.05	1.074	11.12	30
		54 Mbps	10.07	1.086	11.15	30

802.11n(HT20) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Result (dBm)	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	MCS0	12.31	0.106	12.42	30
		MCS1	12.14	0.203	12.35	30
		MCS2	11.98	0.292	12.27	30
		MCS3	11.89	0.368	12.26	30
		MCS4	11.76	0.803	12.57	30
		MCS5	9.35	1.007	10.36	30
		MCS6	9.29	1.124	10.41	30
		MCS7	9.28	1.187	10.47	30
2437	6	MCS0	12.51	0.106	12.62	30
		MCS1	12.44	0.203	12.64	30
		MCS2	12.33	0.292	12.62	30
		MCS3	12.23	0.368	12.60	30
		MCS4	12.06	0.803	12.86	30
		MCS5	9.09	1.007	10.10	30
		MCS6	9.01	1.124	10.14	30
		MCS7	8.91	1.187	10.10	30
2462	11	MCS0	11.97	0.106	12.07	30
		MCS1	11.88	0.203	12.08	30
		MCS2	11.79	0.292	12.08	30
		MCS3	11.70	0.368	12.07	30
		MCS4	11.52	0.803	12.32	30
		MCS5	9.16	1.007	10.17	30
		MCS6	9.07	1.124	10.19	30
		MCS7	8.99	1.187	10.18	30

9.4 POWER SPECTRAL DENSITY

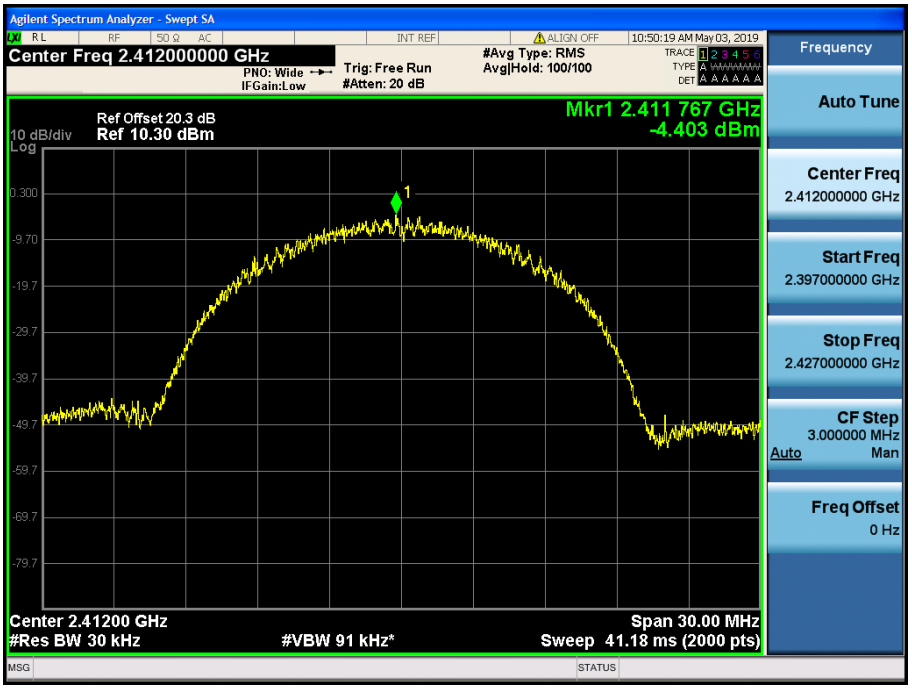
Mode	Frequency (MHz)	Channel No.	Test Result			
			Measured PSD (dBm)	Duty Cycle Factor	Measured PSD(dBm) + Duty Cycle Factor	Limit (dBm)
802.11b	2412	1	-4.403	0.077	-4.326	8
	2437	6	-5.181	0.077	-5.104	8
	2462	11	-4.522	0.077	-4.445	8
802.11g	2412	1	-11.769	0.434	-11.335	8
	2437	6	-11.254	0.434	-10.820	8
	2462	11	-11.704	0.434	-11.270	8
802.11n	2412	1	-12.035	0.803	-11.232	8
	2437	6	-11.713	0.803	-10.910	8
	2462	11	-11.980	0.803	-11.177	8

Note :

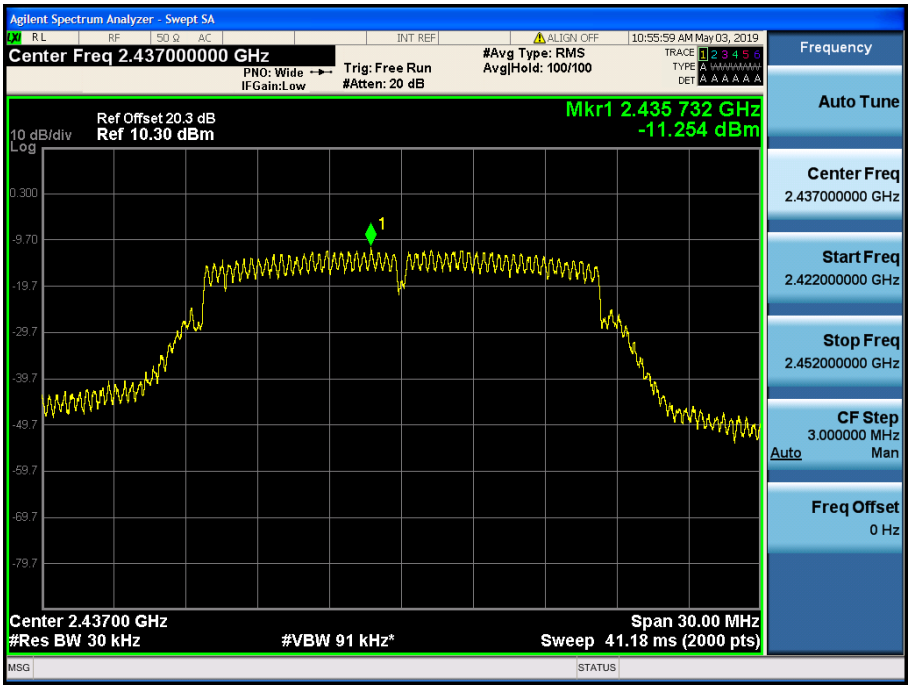
1. Spectrum reading values are not plot data.
   The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
   So, 20.3 dB is offset for 2.4 GHz Band.

▣ Test Plots

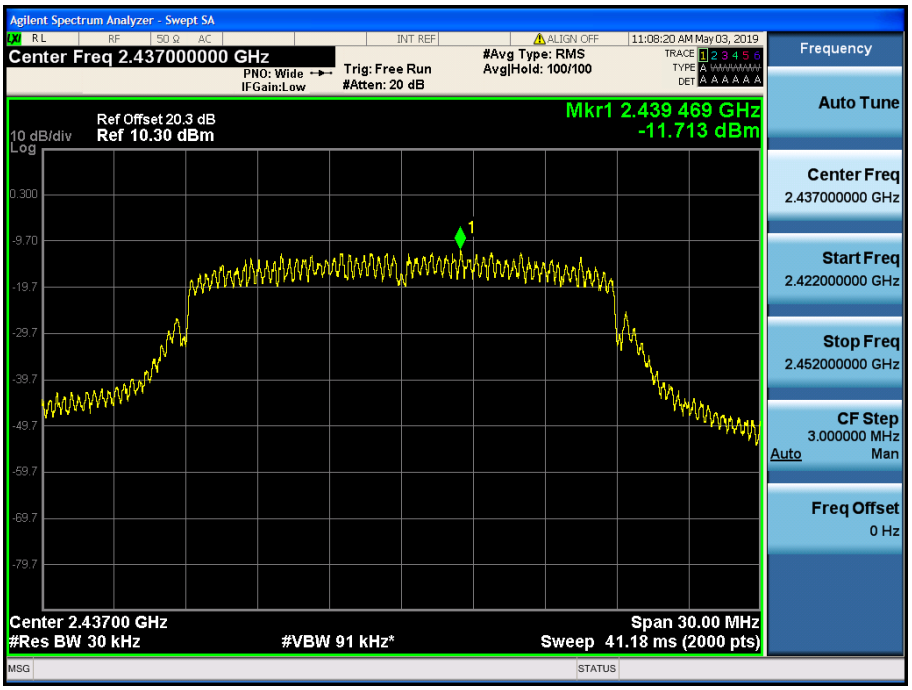
Power Spectral Density (802.11b-CH 1)



Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)



Note :

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

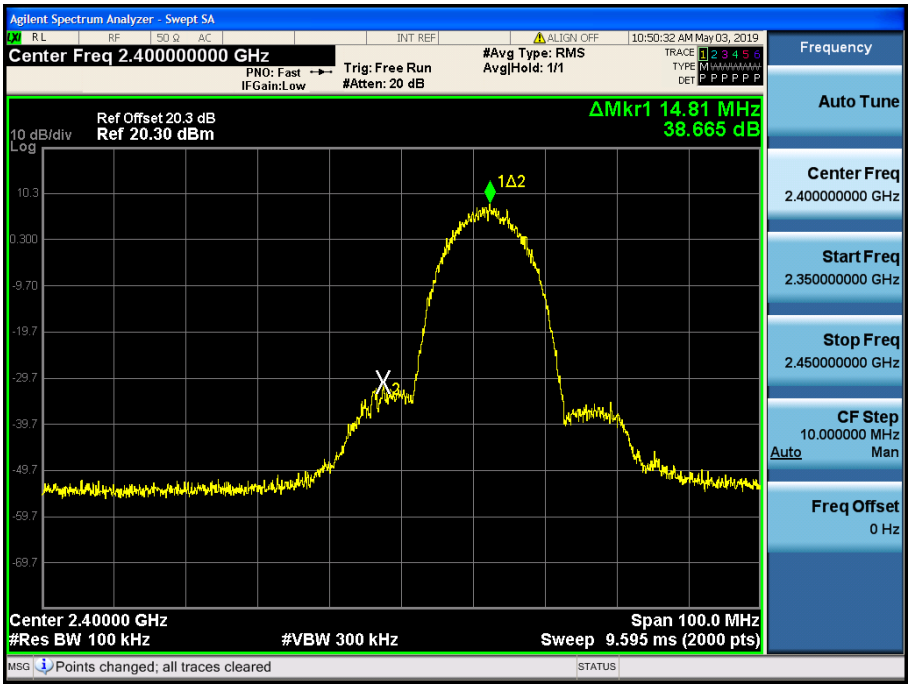
9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

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.

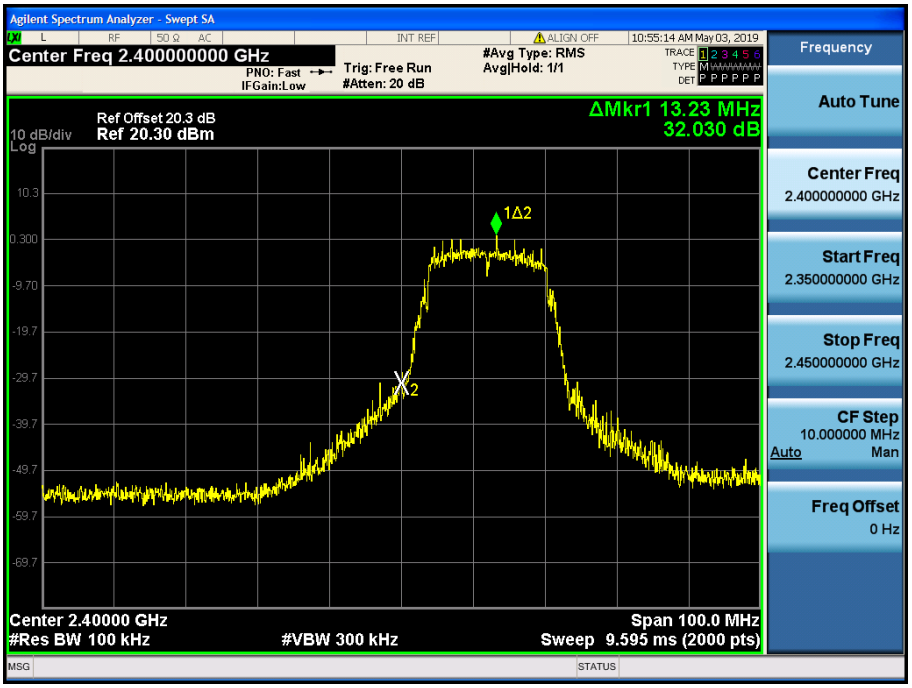
▣ Test Plots(BandEdge)

Band Edge (802.11b-CH1)



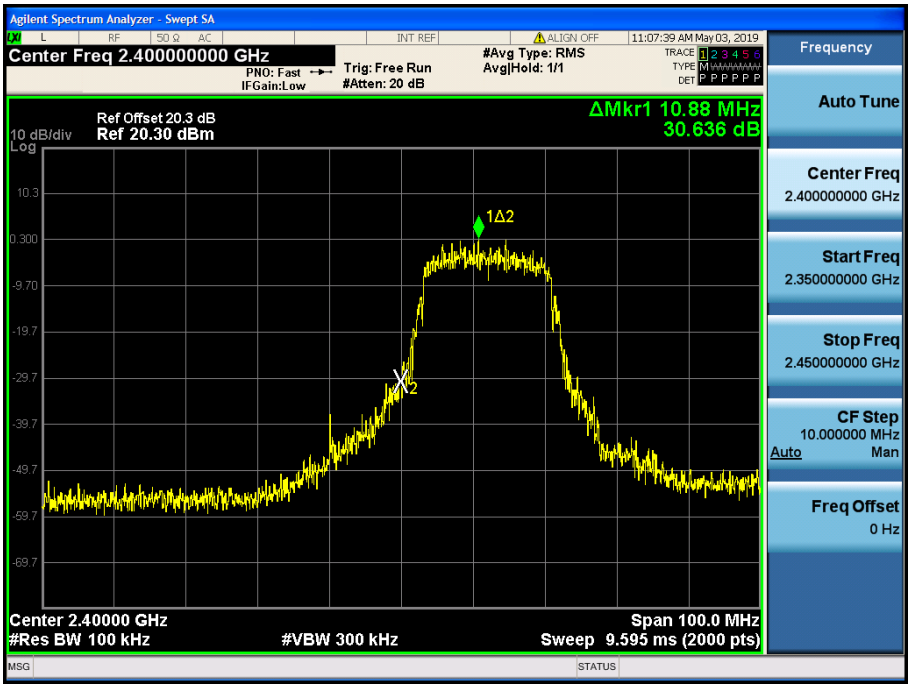
Band Edge (802.11b-CH11)

Band Edge (802.11g-CH1)



Band Edge (802.11g-CH11)

Band Edge (802.11n_HT20-CH1)

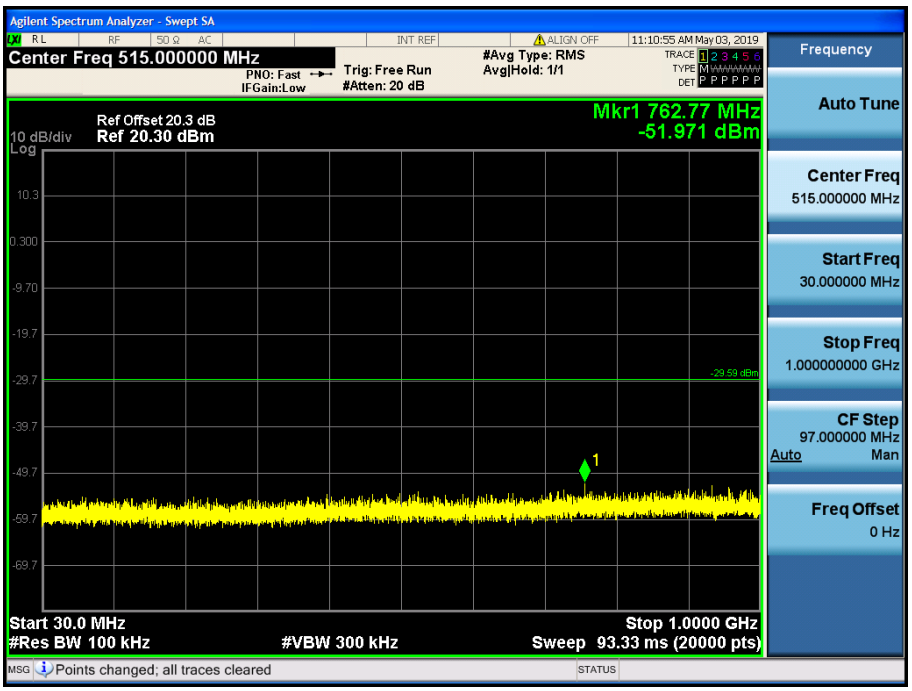


Band Edge (802.11n_HT20-CH11)

▣ Test Plots(Conducted Spurious Emission)

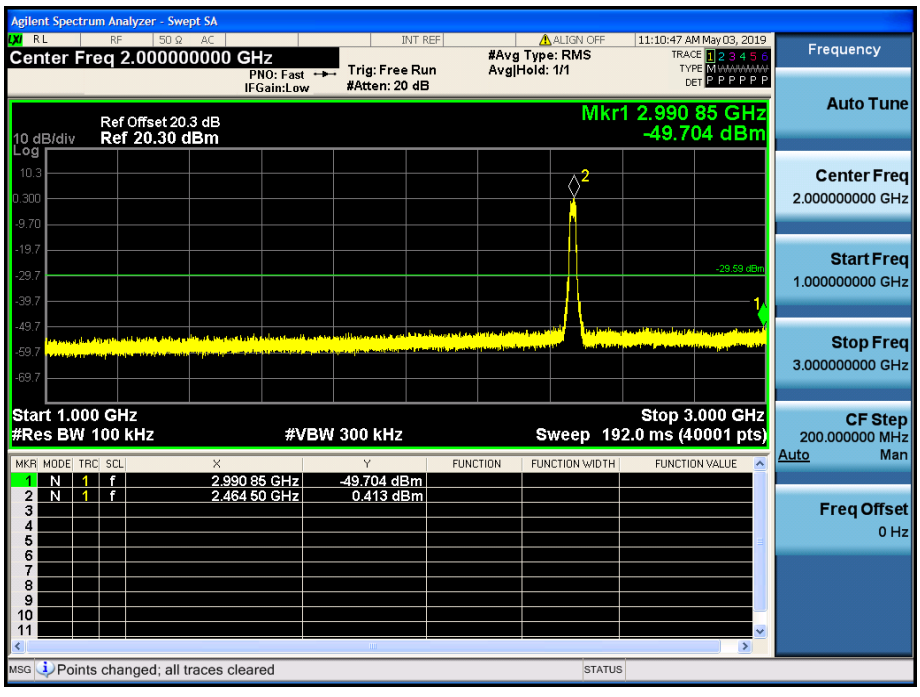
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



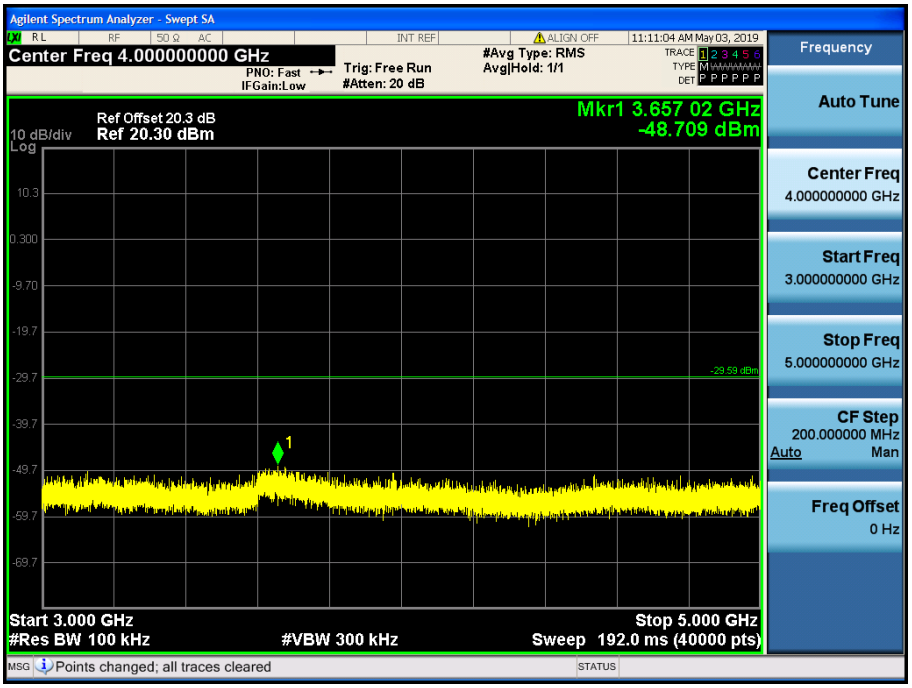
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



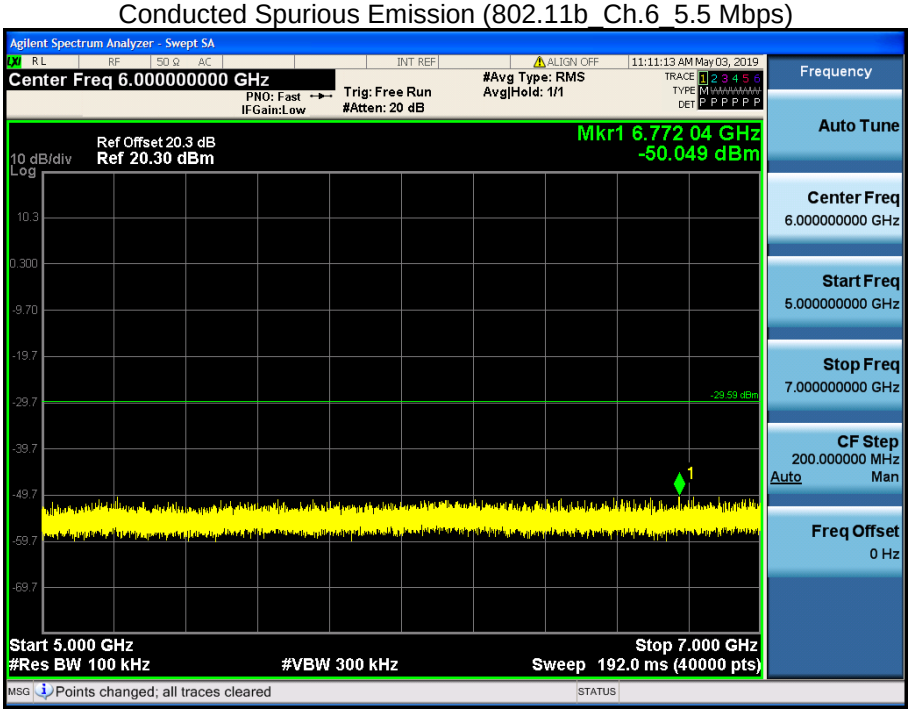
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



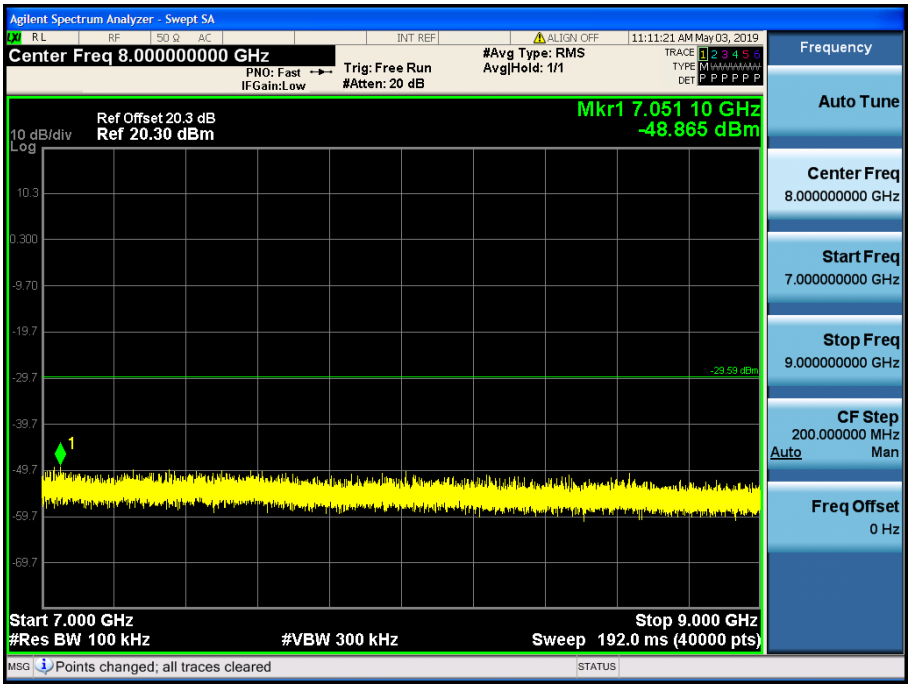
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



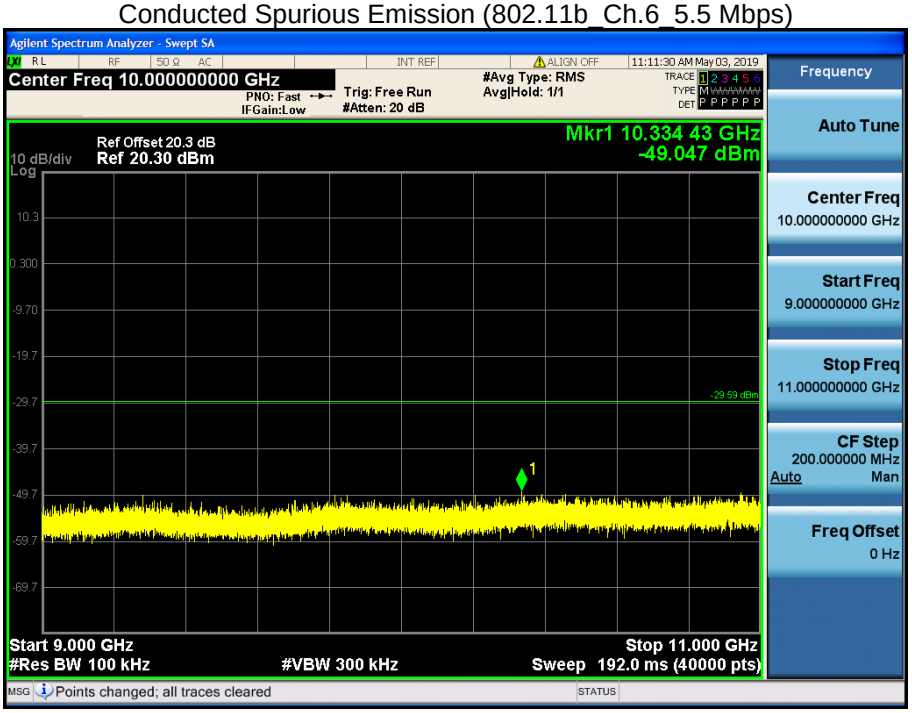
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



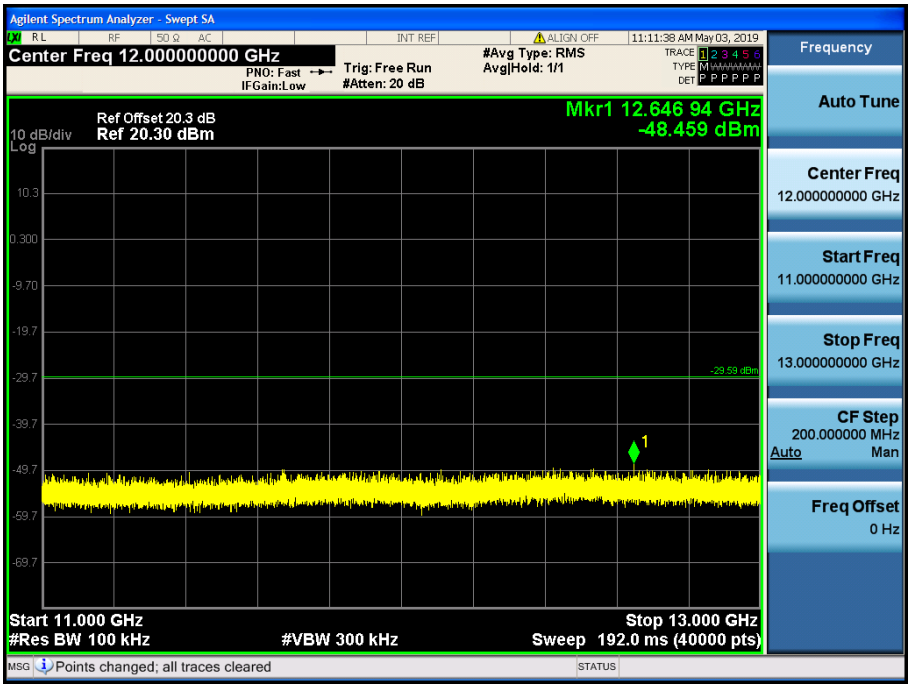
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



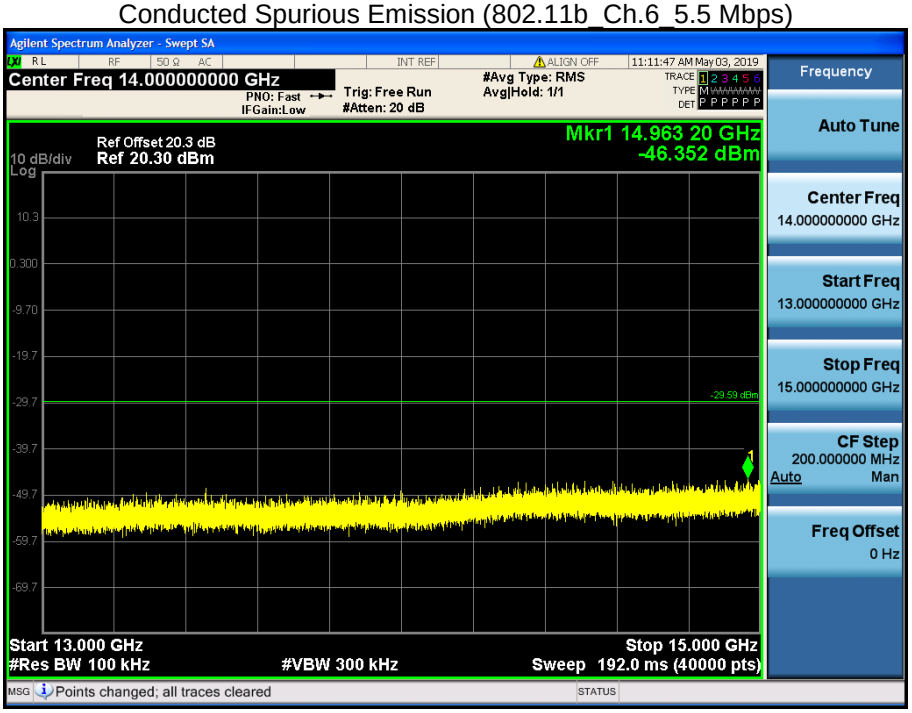
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



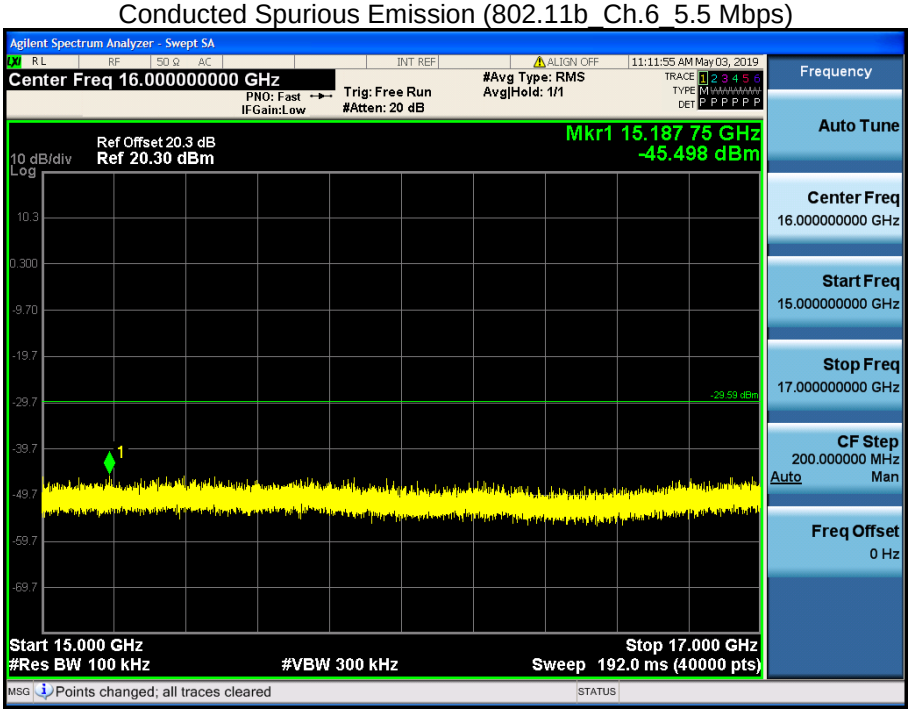
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



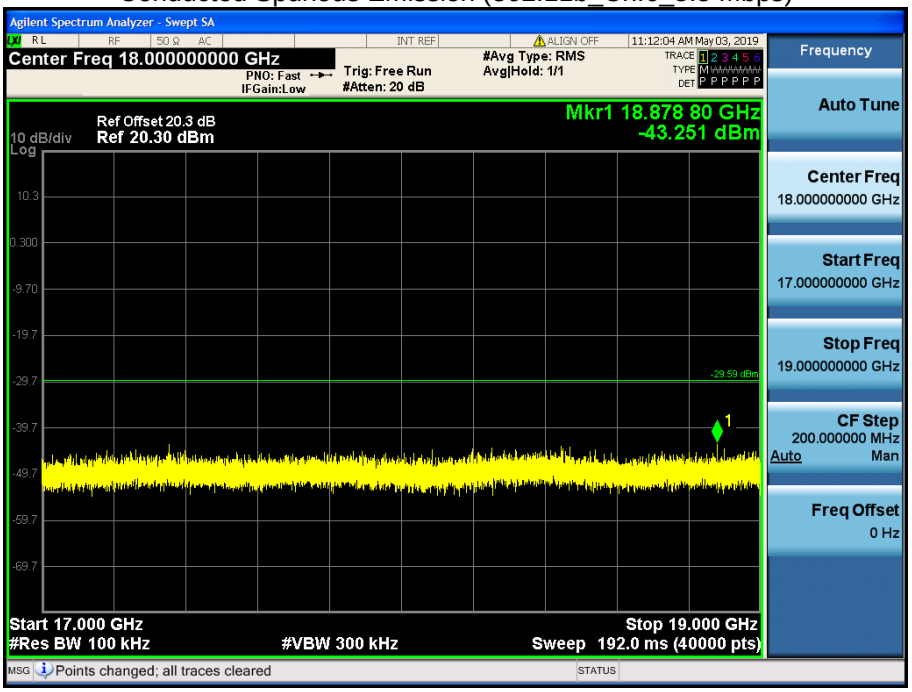
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



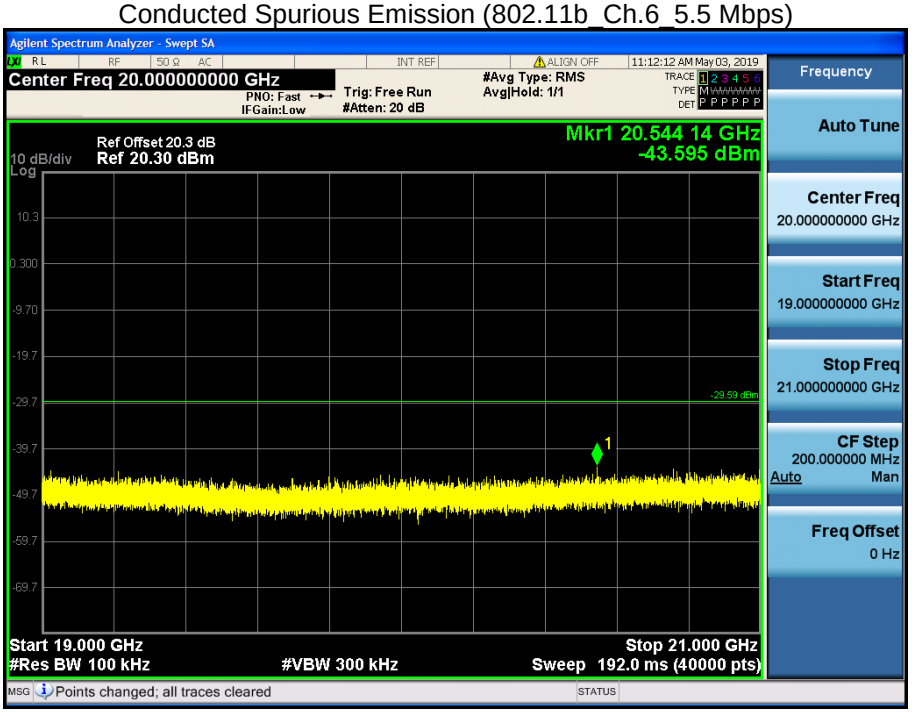
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



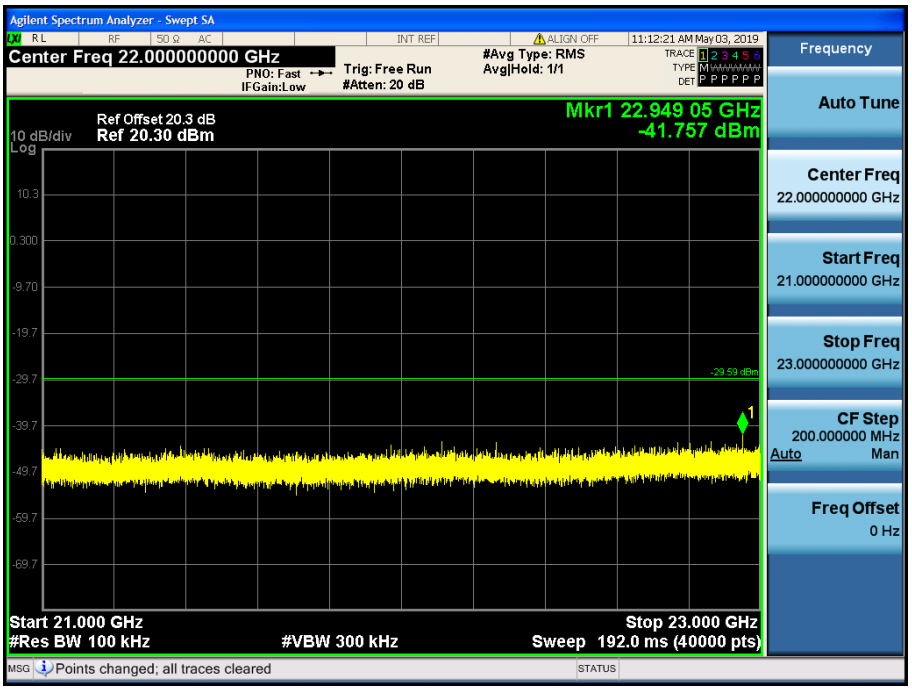
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



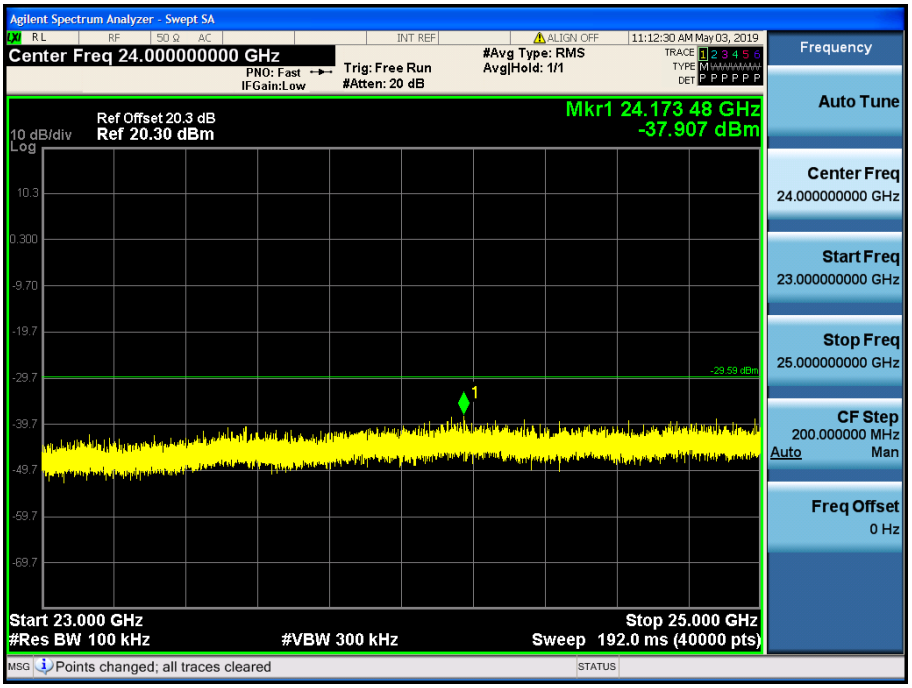
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11b_Ch.6_5.5 Mbps)



9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

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

Note:

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

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

Frequency [MHz]	Reading [dBuV]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	51.91	1.95	V	53.86	73.98	20.12	PK
4824	41.18	1.95	V	43.13	53.98	10.85	AV
7236	49.84	9.86	V	59.70	73.98	14.28	PK
7236	37.80	9.86	V	47.66	53.98	6.32	AV
4824	54.63	1.95	H	56.58	73.98	17.40	PK
4824	45.23	1.95	H	47.18	53.98	6.80	AV
7236	49.89	9.86	H	59.75	73.98	14.23	PK
7236	37.81	9.86	H	47.67	53.98	6.31	AV

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

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	49.99	0.00	1.95	V	51.94	73.98	22.04	PK
4824	38.48	0.10	1.95	V	40.53	53.98	13.45	AV
7236	49.69	0.00	9.86	V	59.55	73.98	14.43	PK
7236	37.75	0.10	9.86	V	47.71	53.98	6.27	AV
4824	50.34	0.00	1.95	H	52.29	73.98	21.69	PK
4824	38.49	0.10	1.95	H	40.54	53.98	13.44	AV
7236	49.82	0.00	9.86	H	59.68	73.98	14.30	PK
7236	37.77	0.10	9.86	H	47.73	53.98	6.25	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]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4824	50.14	0.00	1.95	V	52.09	73.98	21.89	PK
4824	38.50	0.11	1.95	V	40.56	53.98	13.42	AV
7236	49.72	0.00	9.86	V	59.58	73.98	14.40	PK
7236	37.77	0.11	9.86	V	47.74	53.98	6.24	AV
4824	50.37	0.00	1.95	H	52.32	73.98	21.66	PK
4824	38.52	0.11	1.95	H	40.58	53.98	13.40	AV
7236	49.78	0.00	9.86	H	59.64	73.98	14.34	PK
7236	37.75	0.11	9.86	H	47.72	53.98	6.26	AV

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

Frequency [MHz]	Reading [dBuV]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	51.52	2.33	V	53.85	73.98	20.13	PK
4874	41.34	2.33	V	43.67	53.98	10.31	AV
7311	49.15	10.14	V	59.29	73.98	14.69	PK
7311	37.47	10.14	V	47.61	53.98	6.37	AV
4874	53.67	2.33	H	56.00	73.98	17.98	PK
4874	44.52	2.33	H	46.85	53.98	7.13	AV
7311	49.29	10.14	H	59.43	73.98	14.55	PK
7311	37.51	10.14	H	47.65	53.98	6.33	AV

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

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	50.84	0.00	2.33	V	53.17	73.98	20.81	PK
4874	38.20	0.10	2.33	V	40.63	53.98	13.35	AV
7311	49.08	0.00	10.14	V	59.22	73.98	14.76	PK
7311	37.39	0.10	10.14	V	47.63	53.98	6.35	AV
4874	51.04	0.00	2.33	H	53.37	73.98	20.61	PK
4874	38.54	0.10	2.33	H	40.97	53.98	13.01	AV
7311	49.10	0.00	10.14	H	59.24	73.98	14.74	PK
7311	37.45	0.10	10.14	H	47.69	53.98	6.29	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]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4874	50.75	0.00	2.33	V	53.08	73.98	20.90	PK
4874	38.23	0.11	2.33	V	40.67	53.98	13.31	AV
7311	49.02	0.00	10.14	V	59.16	73.98	14.82	PK
7311	37.35	0.11	10.14	V	47.60	53.98	6.38	AV
4874	51.11	0.00	2.33	H	53.44	73.98	20.54	PK
4874	38.51	0.11	2.33	H	40.95	53.98	13.03	AV
7311	49.23	0.00	10.14	H	59.37	73.98	14.61	PK
7311	37.47	0.11	10.14	H	47.72	53.98	6.26	AV

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

Frequency [MHz]	Reading [dBuV]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	50.22	2.28	V	52.50	73.98	21.48	PK
4924	38.74	2.28	V	41.02	53.98	12.96	AV
7386	49.10	9.81	V	58.91	73.98	15.07	PK
7386	36.77	9.81	V	46.58	53.98	7.40	AV
4924	54.09	2.28	H	56.37	73.98	17.61	PK
4924	45.96	2.28	H	48.24	53.98	5.74	AV
7386	49.51	9.81	H	59.32	73.98	14.66	PK
7386	36.82	9.81	H	46.63	53.98	7.35	AV

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

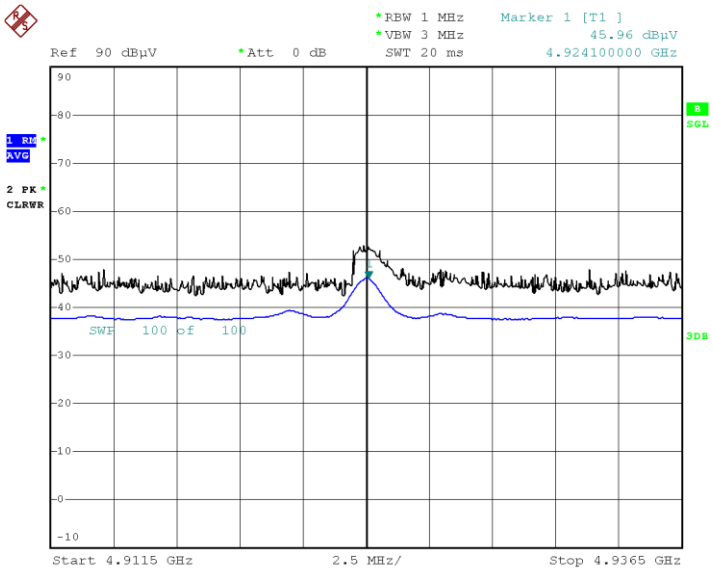
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	51.23	0.00	2.28	V	53.51	73.98	20.47	PK
4924	38.12	0.10	2.28	V	40.50	53.98	13.48	AV
7386	49.05	0.00	9.81	V	58.86	73.98	15.12	PK
7386	36.69	0.10	9.81	V	46.60	53.98	7.38	AV
4924	51.51	0.00	2.28	H	53.79	73.98	20.19	PK
4924	38.27	0.10	2.28	H	40.65	53.98	13.33	AV
7386	49.42	0.00	9.81	H	59.23	73.98	14.75	PK
7386	36.78	0.10	9.81	H	46.69	53.98	7.29	AV

Operation Mode:	802.11n (HT20)
Transfer Rate:	6.5 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4924	51.36	0.00	2.28	V	53.64	73.98	20.34	PK
4924	38.21	0.11	2.28	V	40.60	53.98	13.38	AV
7386	49.33	0.00	9.81	V	59.14	73.98	14.84	PK
7386	36.71	0.11	9.81	V	46.63	53.98	7.35	AV
4924	51.65	0.00	2.28	H	53.93	73.98	20.05	PK
4924	38.30	0.11	2.28	H	40.69	53.98	13.29	AV
7386	49.69	0.00	9.81	H	59.50	73.98	14.48	PK
7386	36.74	0.11	9.81	H	46.66	53.98	7.32	AV

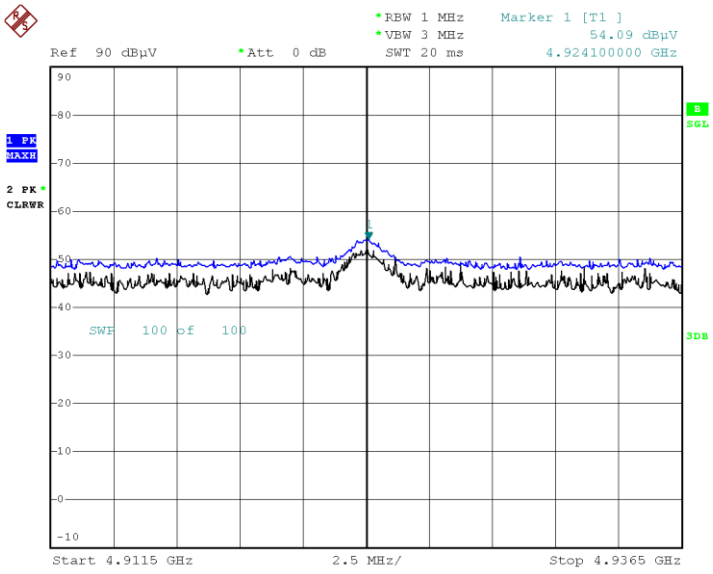
▣ Test Plots

Radiated Spurious Emissions plot – Average Reading (802.11b, Ch.11 2nd Harmonic)



Date: 5.APR.2019 23:21:39

Radiated Spurious Emissions plot – Peak Reading (802.11b, Ch.11 2nd Harmonic)



Date: 5.APR.2019 23:22:15

Note:

Plot of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

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

Frequency [MHz]	Reading [dBuV]	A.F.+CL + AMP + ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	57.04	0.85	H	57.89	73.98	16.09	PK
2390.0	44.94	0.85	H	45.79	53.98	8.19	AV
2390.0	53.27	0.85	V	54.12	73.98	19.86	PK
2390.0	43.31	0.85	V	44.16	53.98	9.82	AV
2483.5	56.09	1.13	H	57.22	73.98	16.76	PK
2483.5	47.30	1.13	H	48.43	53.98	5.55	AV
2483.5	53.20	1.13	V	54.33	73.98	19.65	PK
2483.5	41.94	1.13	V	43.07	53.98	10.91	AV

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

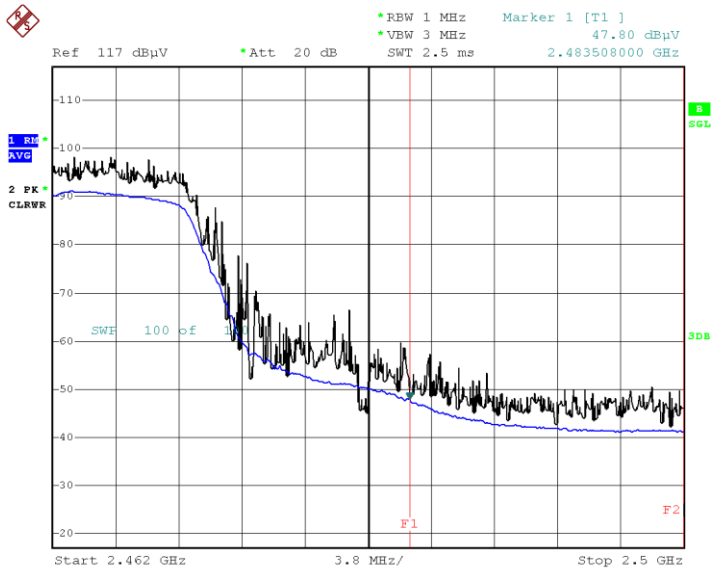
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+CL + AMP + ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	68.37	0.00	0.85	H	69.22	73.98	4.76	PK
2390.0	49.11	0.10	0.85	H	50.06	53.98	3.92	AV
2390.0	62.75	0.00	0.85	V	63.60	73.98	10.38	PK
2390.0	43.51	0.10	0.85	V	44.46	53.98	9.52	AV
2483.5	69.06	0.00	1.13	H	70.19	73.98	3.79	PK
2483.5	47.80	0.10	1.13	H	49.03	53.98	4.95	AV
2483.5	63.84	0.00	1.13	V	64.97	73.98	9.01	PK
2483.5	43.17	0.10	1.13	V	44.40	53.98	9.58	AV

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

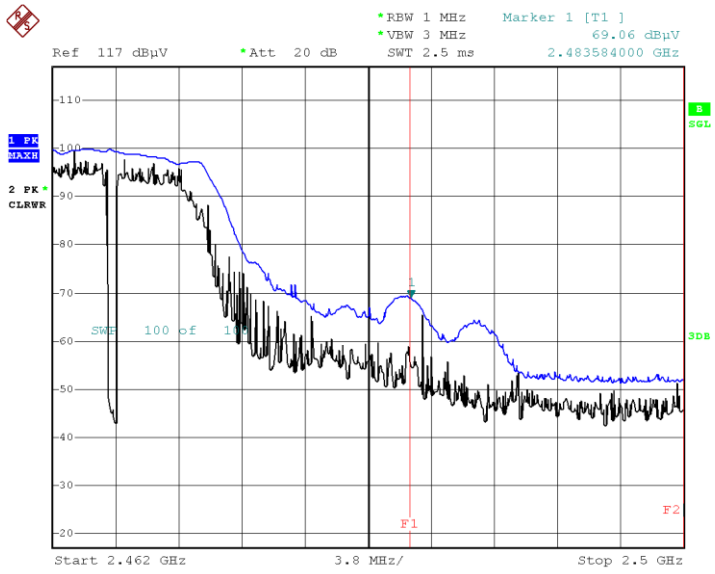
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F.+CL + AMP + ATT [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	68.07	0.00	0.85	H	68.92	73.98	5.06	PK
2390.0	49.00	0.11	0.85	H	49.96	53.98	4.02	AV
2390.0	62.91	0.00	0.85	V	63.76	73.98	10.22	PK
2390.0	43.86	0.11	0.85	V	44.82	53.98	9.16	AV
2483.5	67.55	0.00	1.13	H	68.68	73.98	5.30	PK
2483.5	48.77	0.11	1.13	H	50.01	53.98	3.97	AV
2483.5	57.24	0.00	1.13	V	58.37	73.98	15.61	PK
2483.5	45.26	0.11	1.13	V	46.50	53.98	7.48	AV

▣ Test Plots

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



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



Note:

Plot of worst case are only reported

9.8 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

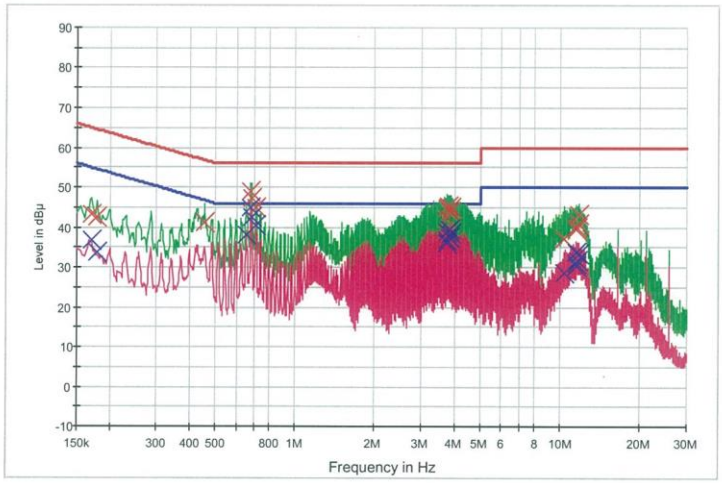
2.4G WLAN_L1 1 / 2

HCT TEST Report

Common Information

EUT:	SM-V310
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	2.4G_WLAN_L1

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.170000	43.3	9.000	Off	L1	9.7	21.7	65.0
0.178000	42.7	9.000	Off	L1	9.7	21.9	64.6
0.456000	41.1	9.000	Off	L1	9.8	15.6	56.8
0.682000	49.1	9.000	Off	L1	9.8	6.9	56.0
0.686000	47.2	9.000	Off	L1	9.8	8.8	56.0
0.712000	45.0	9.000	Off	L1	9.8	11.0	56.0
3.730000	44.9	9.000	Off	L1	10.0	11.1	56.0
3.734000	42.1	9.000	Off	L1	10.0	13.9	56.0
3.760000	44.9	9.000	Off	L1	10.0	11.1	56.0
3.788000	45.2	9.000	Off	L1	10.0	10.8	56.0
3.848000	44.0	9.000	Off	L1	10.0	12.0	56.0
3.876000	44.8	9.000	Off	L1	10.0	11.2	56.0
10.356000	37.2	9.000	Off	L1	10.2	22.8	60.0
11.546000	39.4	9.000	Off	L1	10.3	20.6	60.0
11.552000	39.6	9.000	Off	L1	10.3	20.4	60.0
11.610000	39.9	9.000	Off	L1	10.3	20.1	60.0
11.758000	43.1	9.000	Off	L1	10.3	16.9	60.0
11.764000	40.7	9.000	Off	L1	10.3	19.3	60.0

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2.4G WLAN_L1 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.170000	36.7	9.000	Off	L1	9.7	18.3	55.0
0.178000	33.7	9.000	Off	L1	9.7	20.9	54.6
0.656000	38.2	9.000	Off	L1	9.8	7.8	46.0
0.682000	44.8	9.000	Off	L1	9.8	1.2	46.0
0.686000	42.6	9.000	Off	L1	9.8	3.4	46.0
0.712000	40.5	9.000	Off	L1	9.8	5.5	46.0
3.730000	38.9	9.000	Off	L1	10.0	7.1	46.0
3.734000	36.8	9.000	Off	L1	10.0	9.2	46.0
3.762000	36.3	9.000	Off	L1	10.0	9.7	46.0
3.816000	39.6	9.000	Off	L1	10.0	6.4	46.0
3.848000	37.5	9.000	Off	L1	10.0	8.5	46.0
3.876000	38.6	9.000	Off	L1	10.0	7.4	46.0
10.356000	28.6	9.000	Off	L1	10.2	21.4	50.0
11.546000	30.2	9.000	Off	L1	10.3	19.8	50.0
11.552000	31.1	9.000	Off	L1	10.3	18.9	50.0
11.562000	33.7	9.000	Off	L1	10.3	16.3	50.0
11.610000	31.7	9.000	Off	L1	10.3	18.3	50.0
11.764000	33.3	9.000	Off	L1	10.3	16.7	50.0

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Conducted Emissions (Line 2)

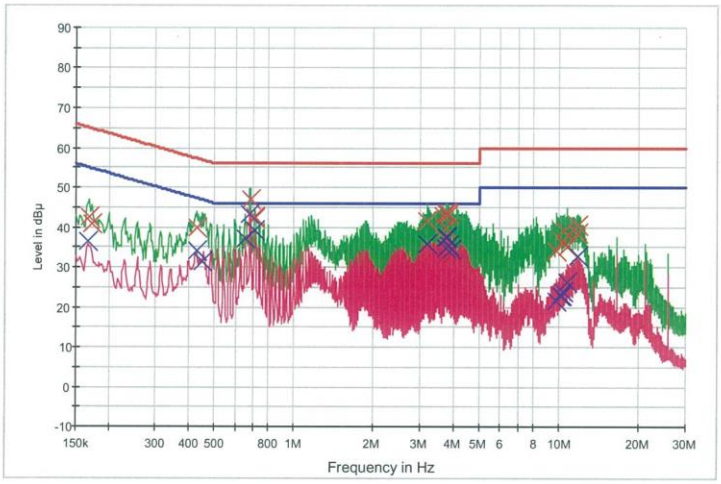
2.4G WLAN_N 1 / 2

HCT TEST Report

Common Information

EUT:	SM-V310
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	2.4G_WLAN_N

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.168000	42.6	9.000	Off	N	9.8	22.4	65.1
0.172000	40.9	9.000	Off	N	9.8	23.9	64.9
0.428000	39.8	9.000	Off	N	9.9	17.5	57.3
0.686000	46.8	9.000	Off	N	9.9	9.2	56.0
0.710000	42.0	9.000	Off	N	9.9	14.0	56.0
0.714000	42.5	9.000	Off	N	9.9	13.5	56.0
3.162000	41.4	9.000	Off	N	10.1	14.6	56.0
3.674000	42.9	9.000	Off	N	10.2	13.1	56.0
3.732000	43.4	9.000	Off	N	10.2	12.6	56.0
3.758000	39.9	9.000	Off	N	10.2	16.1	56.0
3.790000	43.7	9.000	Off	N	10.2	12.3	56.0
3.818000	43.3	9.000	Off	N	10.2	12.7	56.0
9.790000	34.2	9.000	Off	N	10.4	25.8	60.0
10.332000	36.4	9.000	Off	N	10.5	23.6	60.0
10.462000	39.1	9.000	Off	N	10.5	20.9	60.0
10.734000	35.0	9.000	Off	N	10.5	25.0	60.0
11.760000	40.4	9.000	Off	N	10.5	19.6	60.0
11.764000	38.5	9.000	Off	N	10.5	21.5	60.0

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2.4G WLAN_N 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.166000	36.3	9.000	Off	N	9.8	18.9	55.2
0.428000	34.1	9.000	Off	N	9.9	13.2	47.3
0.450000	31.4	9.000	Off	N	9.9	15.5	46.9
0.656000	37.0	9.000	Off	N	9.9	9.0	46.0
0.682000	43.3	9.000	Off	N	9.9	2.7	46.0
0.712000	39.2	9.000	Off	N	9.9	6.8	46.0
3.162000	35.8	9.000	Off	N	10.1	10.2	46.0
3.732000	37.4	9.000	Off	N	10.2	8.6	46.0
3.758000	34.9	9.000	Off	N	10.2	11.1	46.0
3.790000	37.5	9.000	Off	N	10.2	8.5	46.0
3.814000	35.5	9.000	Off	N	10.2	10.5	46.0
3.898000	34.4	9.000	Off	N	10.2	11.6	46.0
9.790000	21.4	9.000	Off	N	10.4	28.6	50.0
10.166000	22.8	9.000	Off	N	10.5	27.2	50.0
10.192000	22.7	9.000	Off	N	10.5	27.3	50.0
10.332000	24.0	9.000	Off	N	10.5	26.0	50.0
10.776000	26.3	9.000	Off	N	10.5	23.7	50.0
11.760000	32.6	9.000	Off	N	10.5	17.4	50.0

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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.

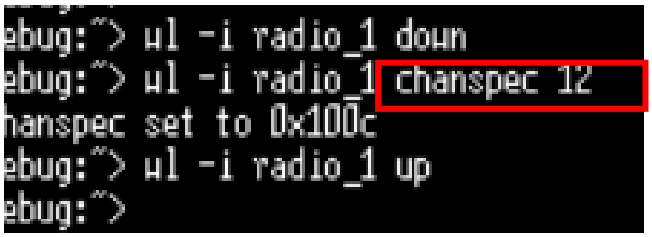
WLAN	Country code = US	Country code = KR(Korea)
CH 12	Did not connect	Connected
CH 13	Did not connect	Connected

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

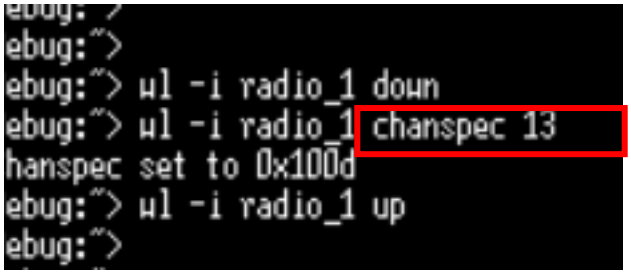
Setting the channel for Access point

- SSID : ap_2g_ht20

- Ch.12 setting

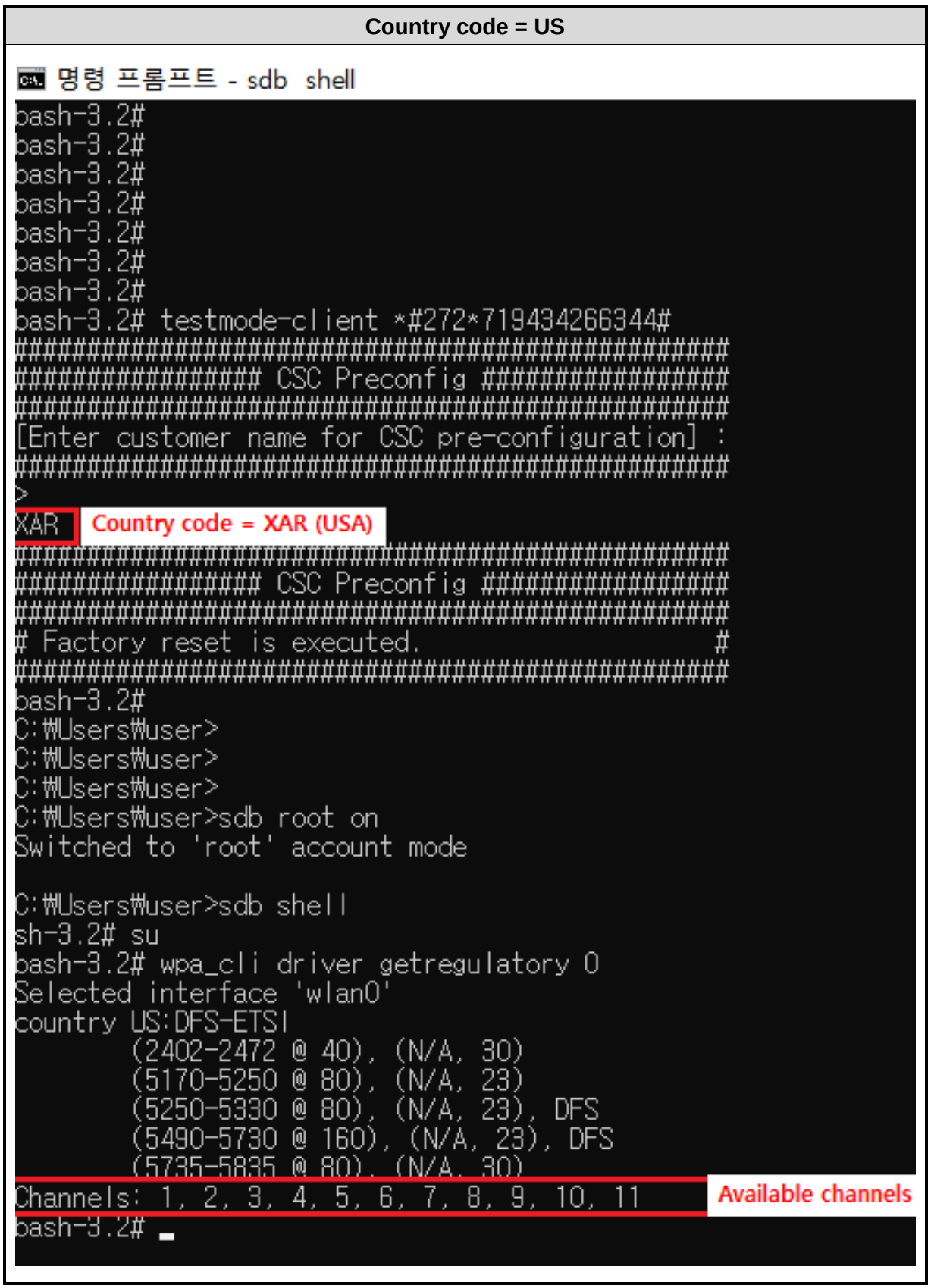


- Ch.13 setting

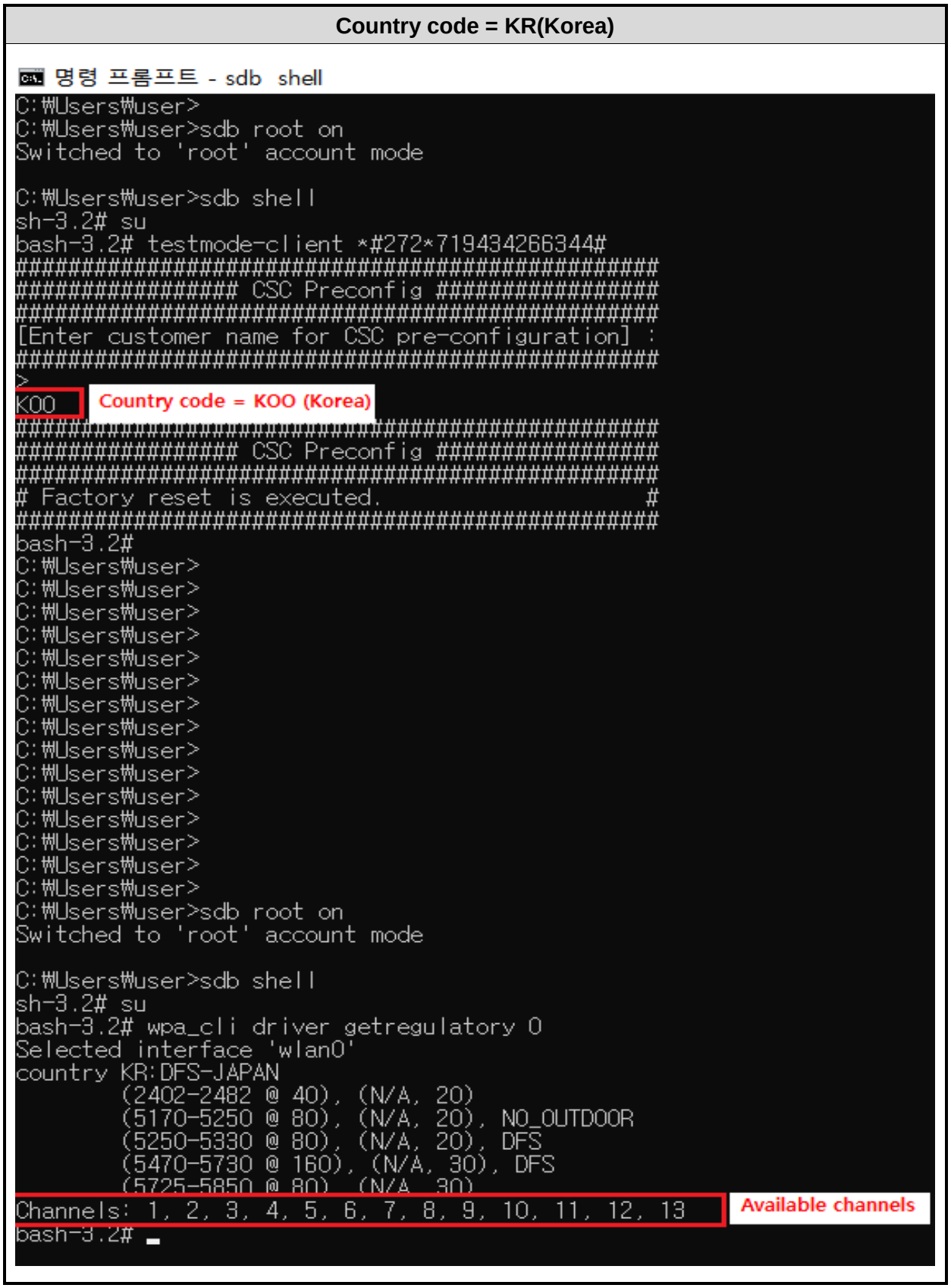


Setting the country for product

Country code = US



Country code = KR(Korea)



10. LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/12/2018	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/27/2018	Annual	100033
ESPAC	SU-642 /Temperature Chamber	03/12/2019	Annual	0093008124
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY52090906
Agilent	N9030A / Signal Analyzer	01/10/2019	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/26/2018	Annual	101231
Agilent	N1911A / Power Meter	04/10/2019	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/10/2019	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/20/2018	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

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	08/23/2018	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	03/22/2019	Biennial	760
Schwarzbeck	VULB 9168 / Hybrid Antenna	08/09/2018	Annual	3368
Schwarzbeck	BBHA 9120D / Horn Antenna	06/30/2017	Biennial	1300
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	12/04/2017	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 40 GHz) / Spectrum Analyzer	07/24/2018	Annual	100843
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	01/03/2019	Annual	F6
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	01/03/2019	Annual	2
Weinschel	2-3 / Attenuator (3 dB)	10/10/2018	Annual	BR0617
H+S	5910-N-50-010 / Attenuator(10 dB)	11/08/2018	Annual	NONE
CERNEX	CBLU1183540B-01 / Power Amplifier	12/21/2018	Annual	25540
CERNEX	CBL06185030 / Power Amplifier	03/26/2019	Annual	28550
CERNEX	CBL18265035 / Power Amplifier	01/03/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/29/2018	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/26/2019	Annual	3000C000276

Note:

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

11. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-1905-FC008-P