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TEST REPORT

FCC DTS Test for SM-T725

Certification

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-1906-FC011-R3

DATE OF ISSUE
June 24, 2019

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TEST REPORT

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Other Model
SM-T725N, SM-T727

Applicant	**SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Eut Type Model Name	Tablet SM-T725
FCC ID	A3LSMT725U
Average Output Power	802.11b : 19.888 dBm / 802.11g : 19.415 dBm / 802.11n(HT20) : 19.395 dBm
Modulation type	CCK/DSSS/OFDM
FCC Classification	Digital Transmission System(DTS)
FCC Rule Part(s)	Part 15.247

Tested by
Jeong Ho Kim (signature)

Technical Manager
Jong Seok Lee (signature)

HCT CO., LTD.
Soo Chan Lee
SooChan Lee / CEO

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	June 05, 2019	Initial Release
1	June 17, 2019	1. On Page 17 & 23 Revised 2. Test Plot and Result update. On Page 59&65 3. Page5, Update Test date
2	June 20, 2019	Revised the page number (59, 65 → 60, 66)
3	June 24, 2019	Revised the frequency range on page 5.

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

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.

CONTENTS

1. EUT DESCRIPTION

Model	SM-T725
Additional Model	SM-T725N, SM-T727
EUT Type	Tablet
Power Supply	DC 3.85 V
Battery Information	Model: EB-BT725ABU Type: Li-ion Battery
Travel Adapter Information	Model : EP-TA200 Manufacture: SOLUM
Keyboard Information	Model : EJ-FT720 Manufacture: SAMSUNG
Charging Doc Information	Model : EE-D3200 Manufacture: SAMSUNG
Frequency Range	2412 MHz - 2472 MHz
Max. RF Output Power	**Peak Power** (For information only) 802.11b : 22.68 dBm 802.11g : 26.72 dBm 802.11n(HT20) : 26.70 dBm **Average Power** 802.11b : 19.888 dBm 802.11g : 19.415 dBm 802.11n(HT20) : 19.395 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n
Number of Channels	13 Channels
Antenna Specification	Antenna type: Metal Peak Gain : -5.50 dBi
Date(s) of Tests	May 10, 2019~ June 17, 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.

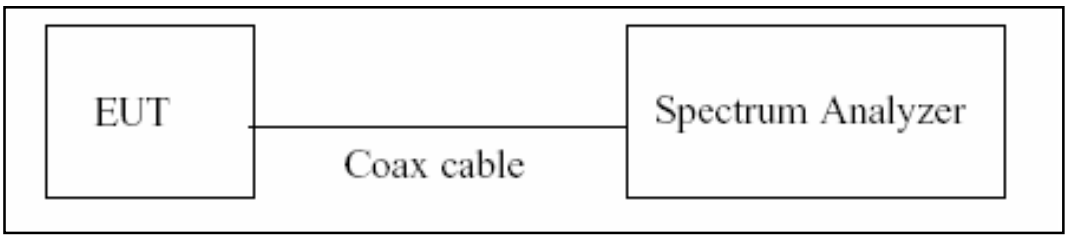
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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*.

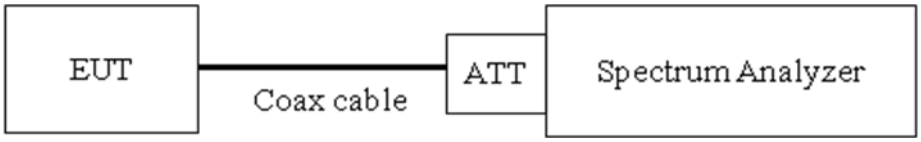
1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10*log(1/Duty Cycle)

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.

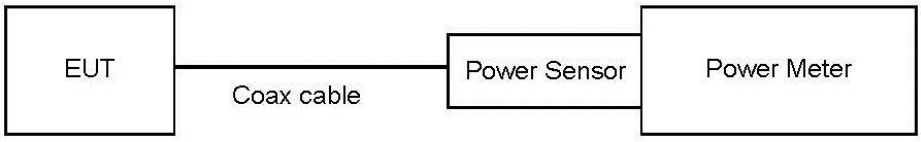
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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

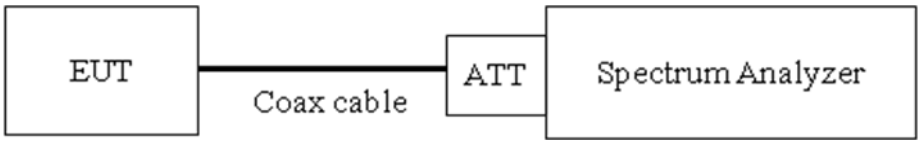
▪ Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

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 8.4 in KDB 558074 v05r02, Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

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

Sample Calculation

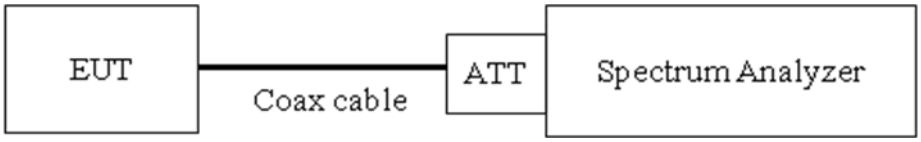
▪ Power Spectral Density = Reading Value + ATT loss + Cable loss

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

Limit

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

Test Configuration



Test Procedure

The transmitter output is connected to the spectrum analyzer.
(Procedure 11.11 in ANSI 63.10-2013)

1) RBW = 100 kHz
2) VBW ≥ 3 x RBW
3) Set span to encompass the spectrum to be examined
4) Detector = Peak
5) Trace Mode = max hold
6) Sweep time = auto couple
7) Ensure that the number of measurement points ≥ 2*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	20.30
100	20.28
200	20.24
300	20.14
400	20.14
500	20.14
600	20.17
700	20.22
800	20.29
900	20.36
1000	20.41
2000	20.41
2400*	20.38
2500*	20.39
3000	20.48
4000	20.53
5000	20.63
6000	20.70
7000	20.77
8000	20.79
9000	20.81
10000	20.82
11000	20.81
12000	20.91
13000	20.94
14000	21.07
15000	21.16
16000	21.25
17000	21.27
18000	21.32
19000	21.39
20000	21.45
21000	21.56
22000	21.65
23000	21.53
24000	21.63
25000	21.64
26000	21.69

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

2. Factor = Attenuator loss(20 dB) + Cable loss

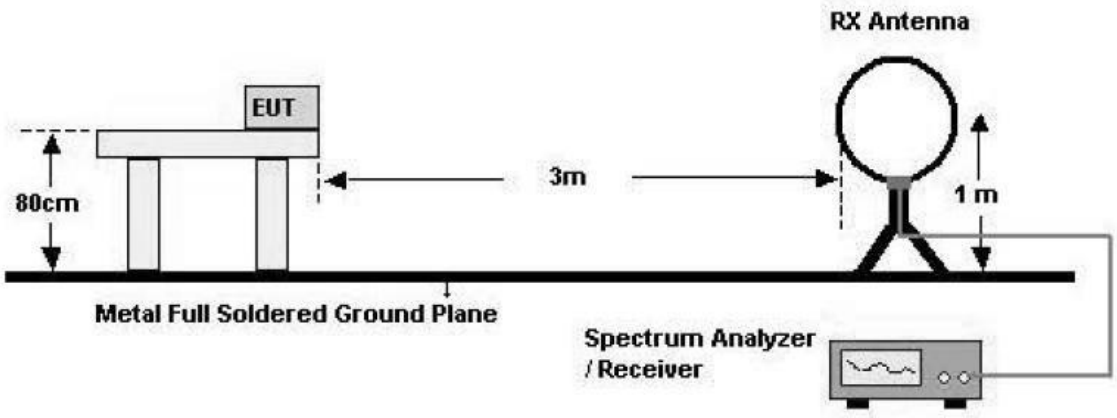
7.6. Radiated Test

Limit

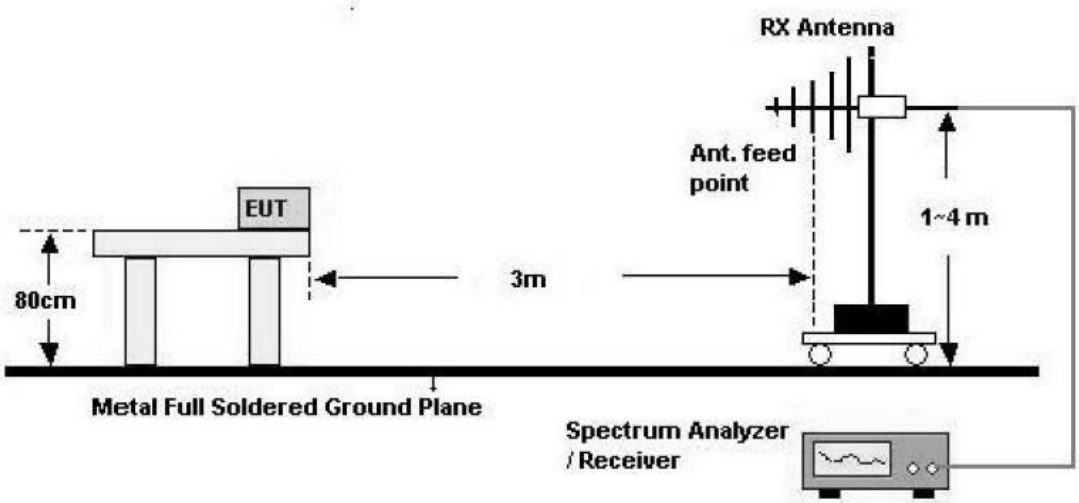
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

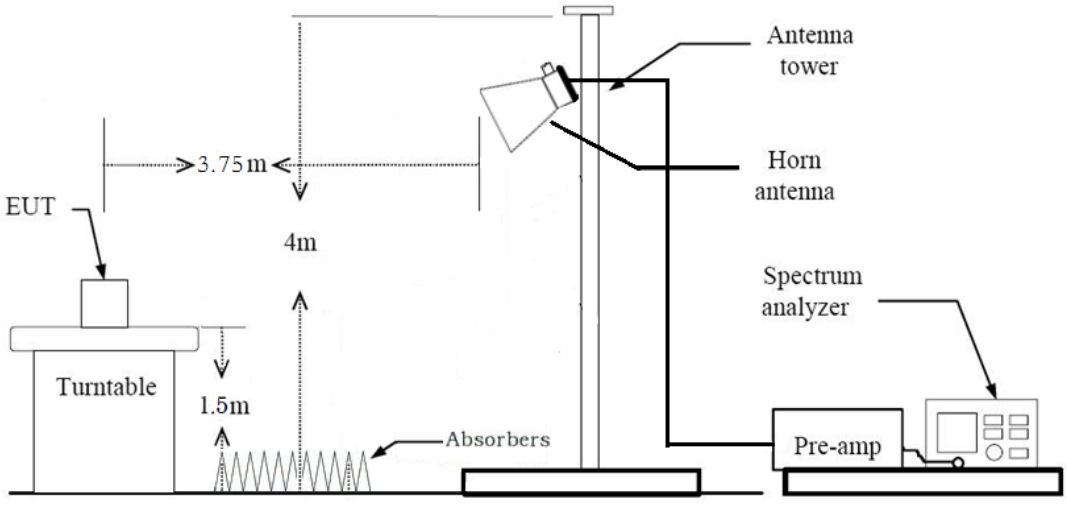
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = 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)

KDB 414788 OFS and Chamber Correlation Justification

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

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

Test Procedure of Radiated spurious emissions(Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3*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 v05r02, Procedure 11.12 in ANSI 63.10-2013)
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3*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) + Distance Factor(D.F) – AMP Gain (A.G) +Attenuator(ATT)

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

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – AMP Gain (A.G) +Attenuator(ATT)

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

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – AMP Gain (A.G) +Attenuator(ATT) + Duty Cycle Factor

7.7. AC Power line Conducted Emissions

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

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

Test Configuration

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

Test Procedure

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

Sample Calculation

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

7.8. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone, Stand alone + External accessories(Keyboard, Charging Doc, Earphone, etc)
   - Worstcase : Stand alone
2. EUT Axis
   - Radiated Spurious Emissions : Y
   - Radiated Restricted Band Edge : X
3. Duty cycle factor applies only 802.11g/n(Duty cycle < 98%).
4. All data rate of operation were investigated and the test results are worst case in lowest datarate of each mode.
   - 802.11b : 1Mbps
   - 802.11g : 6Mbps
   - 802.11n_HT20 : MCS0
5. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
   - Position : Horizontal, Vertical, Parallel to the ground plane
6. SM-T725, SM-T725N, SM-T727 were tested and the worst case results are reported.
   (Worst case : SM-T725)

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone + External accessories(Keyboard, Charging Doc, Earphone, etc)+Travel Adapter, Stand alone + Travel Adapter
   - Worstcase : Stand alone + Travel Adapter
2. SM-T725, SM-T725N, SM-T727 were tested and the worst case results are reported.
   (Worst case : SM-T725)

Conducted test

1. The EUT was configured with data rate of highest power.
2. SM-T725, SM-T725N, SM-T727 were tested and the worst case results are reported.
   (Worst case : SM-T725)

8. SUMMARY TEST OF RESULTS

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

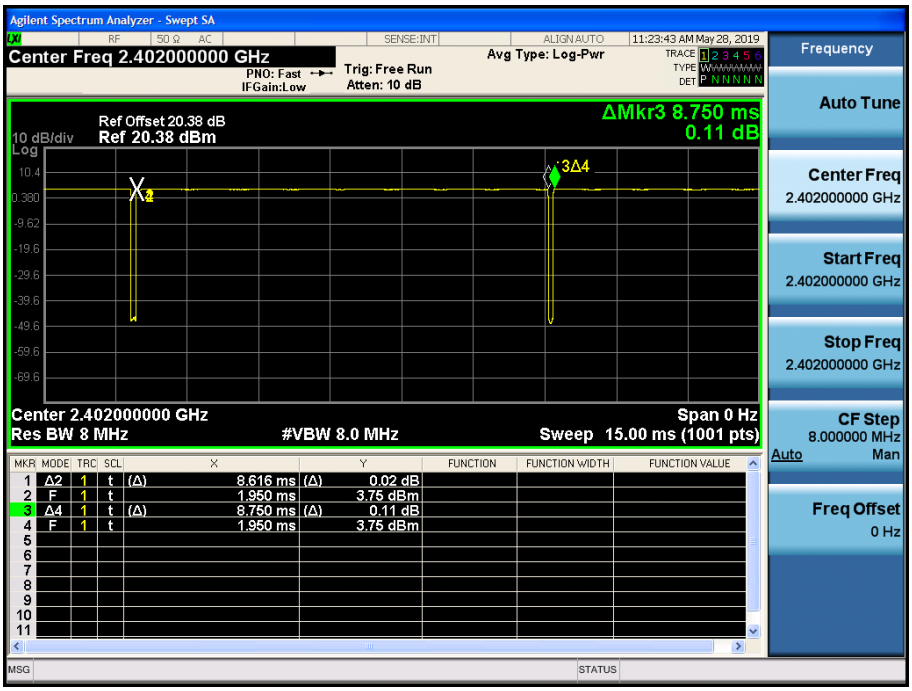
9. TEST RESULT

9.1 DUTY CYCLE

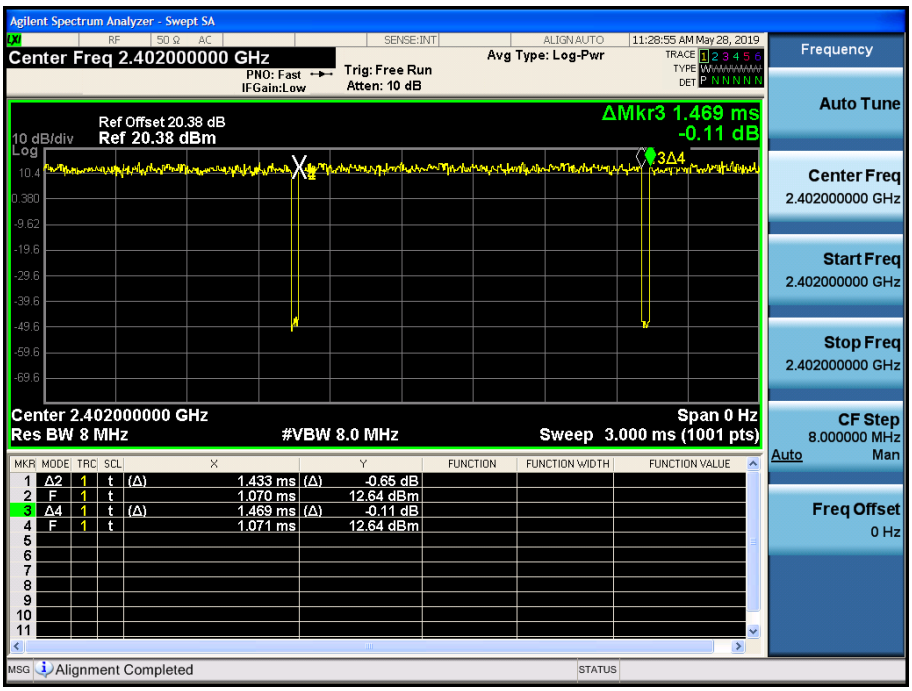
Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	8.616	8.750	0.985	0.067
	2	4.313	4.347	0.992	0.034
	5.5	1.630	1.661	0.981	0.084
	11	0.862	0.893	0.966	0.151
802.11g	6	1.433	1.469	0.975	0.108
	9	0.960	0.997	0.963	0.165
	12	0.727	0.764	0.951	0.217
	18	0.492	0.529	0.930	0.316
	24	0.377	0.413	0.912	0.402
	36	0.256	0.292	0.877	0.572
	48	0.200	0.236	0.847	0.720
	54	0.180	0.216	0.833	0.794
802.11n (HT20)	6.5 (MCS0)	1.340	1.376	0.974	0.116
	13 (MCS1)	0.688	0.725	0.949	0.229
	19.5 (MCS2)	0.472	0.509	0.928	0.325
	26 (MCS3)	0.364	0.401	0.908	0.420
	39 (MCS4)	0.256	0.292	0.877	0.572
	52 (MCS5)	0.200	0.236	0.847	0.722
	58.5 (MCS6)	0.184	0.220	0.837	0.773
	65 (MCS7)	0.168	0.204	0.824	0.840

▣ Test Plots

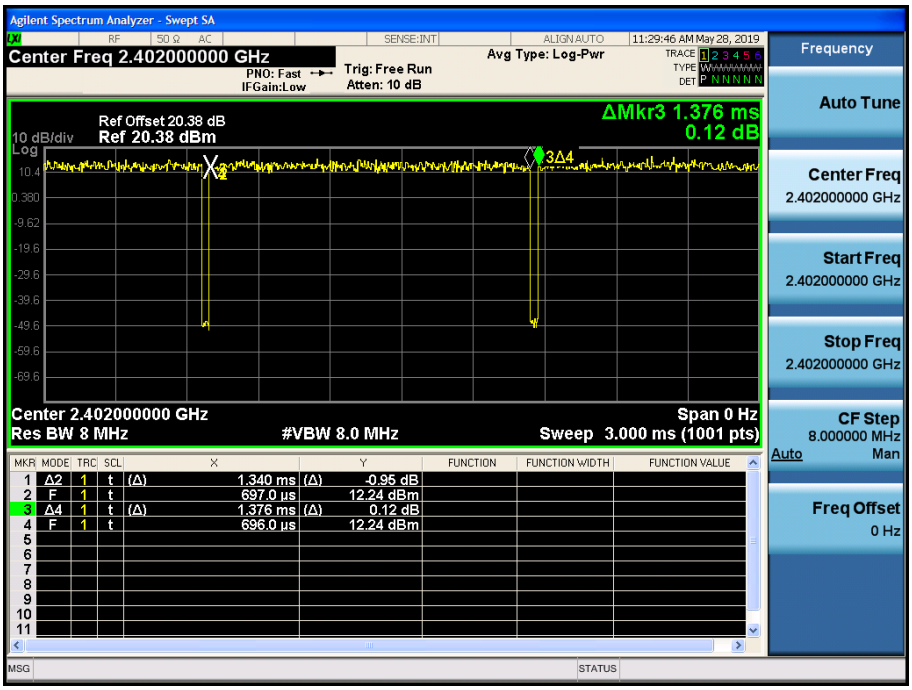
Duty cycle plot (802.11b(1Mbps))



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

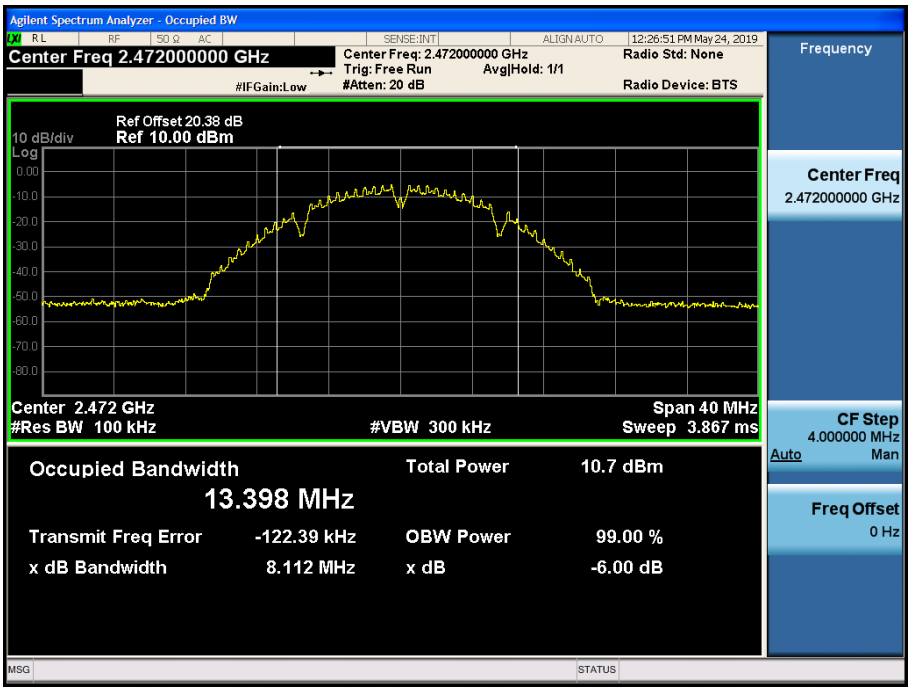
802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	9.084	0.5
2437	6	9.028	0.5
2462	11	8.605	0.5
2467	12	8.585	0.5
2472	13	8.112	0.5

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.35	0.5
2437	6	15.50	0.5
2462	11	15.19	0.5
2467	12	15.37	0.5
2472	13	15.17	0.5

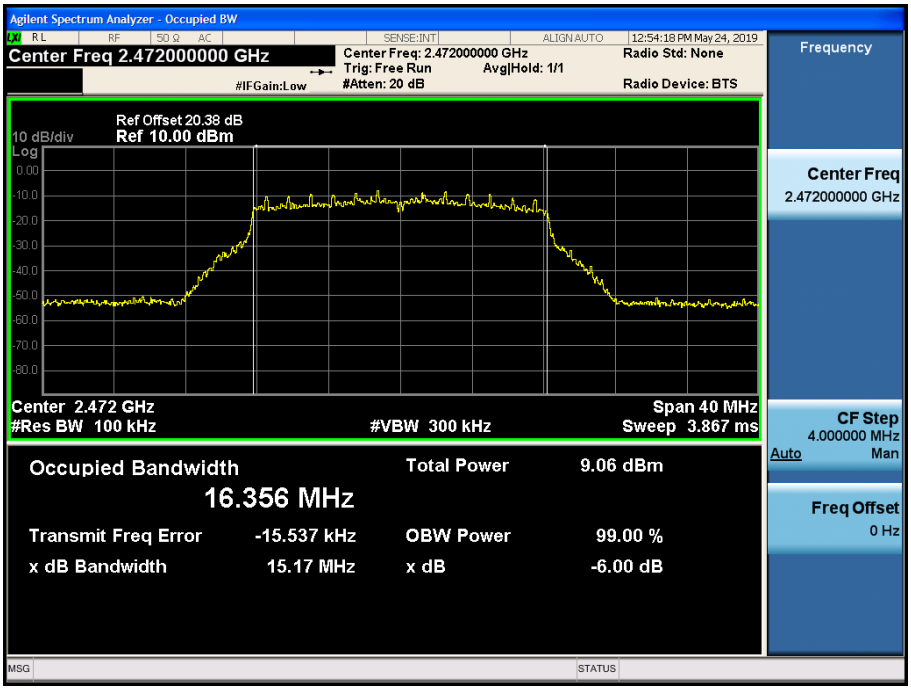
802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.19	0.5
2437	6	16.15	0.5
2462	11	15.48	0.5
2467	12	15.74	0.5
2472	13	15.15	0.5

▣ Test Plots

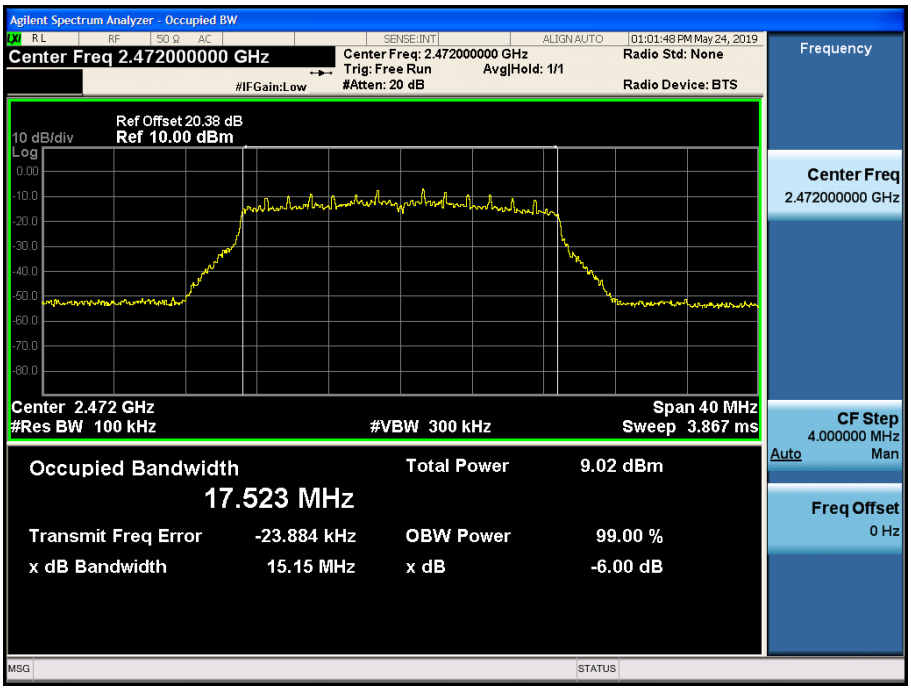
6dB Bandwidth plot (802.11b-CH 13)



6dB Bandwidth plot (802.11g-CH 13)



6dB Bandwidth plot (802.11n_HT20-CH 13)



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(20 dB) + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.

So, 20.38 dB is offset for 2.4 GHz Band

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	1	22.554	30	19
		2	22.658	30	
		5.5	22.597	30	
		11	22.633	30	
2437	6	1	22.448	30	
		2	22.644	30	
		5.5	22.635	30	
		11	22.676	30	
2462	11	1	22.184	30	
		2	22.300	30	
		5.5	22.267	30	
		11	22.314	30	
2467	12	1	12.660	30	8
		2	12.820	30	
		5.5	12.740	30	
		11	12.750	30	
2472	13	1	6.280	30	2
		2	6.770	30	
		5.5	6.870	30	
		11	6.660	30	

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	6	24.381	30	19
		9	24.534	30	
		12	24.349	30	
		18	25.620	30	
		24	25.360	30	
		36	26.595	30	
		48	26.699	30	
		54	26.627	30	
2437	6	6	24.337	30	
		9	24.397	30	
		12	24.303	30	
		18	25.545	30	
		24	25.268	30	
		36	26.559	30	
		48	26.718	30	
		54	26.588	30	
2462	11	6	24.032	30	
		9	24.006	30	
		12	23.967	30	
		18	25.040	30	
		24	24.742	30	
		36	26.157	30	
		48	26.209	30	
		54	26.075	30	
2467	12	6	14.130	30	8
		9	14.615	30	
		12	14.168	30	
		18	16.206	30	
		24	15.759	30	
		36	20.025	30	
		48	20.521	30	
		54	19.806	30	
2472	13	6	8.118	30	2
		9	8.040	30	
		12	7.738	30	
		18	10.179	30	
		24	9.860	30	
		36	13.531	30	
		48	14.311	30	
		54	13.593	30	

802.11n Mode		MCS Index	Measured Power(dBm)	Limit (dBm)	Power Level Setting
Frequency[MHz]	Channel No.				
2412	1	0	23.713	30	18
		1	23.671	30	
		2	25.156	30	
		3	24.720	30	
		4	26.536	30	
		5	26.356	30	
		6	26.522	30	
		7	26.462	30	
2437	6	0	24.335	30	19
		1	24.297	30	
		2	25.442	30	
		3	25.198	30	
		4	26.699	30	
		5	26.551	30	
		6	26.676	30	
		7	26.606	30	
2462	11	0	23.369	30	18
		1	23.291	30	
		2	24.614	30	
		3	24.228	30	
		4	26.092	30	
		5	25.861	30	
		6	26.042	30	
		7	25.919	30	
2467	12	0	14.070	30	8
		1	14.368	30	
		2	16.156	30	
		3	15.716	30	
		4	20.454	30	
		5	19.607	30	
		6	20.595	30	
		7	19.649	30	
2472	13	0	7.836	30	2
		1	7.812	30	
		2	9.915	30	
		3	9.885	30	
		4	13.516	30	
		5	13.466	30	
		6	14.452	30	
		7	13.251	30	

Average Power

1. Power Meter offset = Attenuator loss(20 dB) + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
   So, 20.38 dB is offset for 2.4 GHz Band.

802.11b Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	1	19.572	0.067	19.639	30	19
		2	19.854	0.034	19.888	30	
		5.5	19.714	0.084	19.798	30	
		11	19.663	0.151	19.815	30	
2437	6	1	19.566	0.067	19.633	30	
		2	19.798	0.034	19.832	30	
		5.5	19.713	0.084	19.797	30	
		11	19.671	0.151	19.823	30	
2462	11	1	19.257	0.067	19.324	30	
		2	19.441	0.034	19.475	30	
		5.5	19.343	0.084	19.427	30	
		11	19.332	0.151	19.484	30	
2467	12	1	8.940	0.067	9.007	30	8
		2	9.040	0.034	9.074	30	
		5.5	8.980	0.084	9.064	30	
		11	8.910	0.151	9.061	30	
2472	13	1	2.700	0.067	2.767	30	2
		2	2.930	0.034	2.964	30	
		5.5	2.870	0.084	2.954	30	
		11	2.790	0.151	2.941	30	

802.11g Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	6	18.535	0.108	18.643	30	19
		9	18.447	0.165	18.612	30	
		12	18.375	0.217	18.592	30	
		18	19.029	0.316	19.344	30	
		24	18.832	0.402	19.234	30	
		36	18.781	0.572	19.353	30	
		48	18.672	0.720	19.392	30	
		54	18.621	0.794	19.415	30	
2437	6	6	18.529	0.108	18.637	30	
		9	18.443	0.165	18.608	30	
		12	18.388	0.217	18.605	30	
		18	19.021	0.316	19.337	30	
		24	18.894	0.402	19.295	30	
		36	18.773	0.572	19.345	30	
		48	18.675	0.720	19.395	30	
		54	18.557	0.794	19.351	30	
2462	11	6	18.221	0.108	18.328	30	
		9	18.136	0.165	18.302	30	
		12	18.074	0.217	18.291	30	
		18	18.677	0.316	18.993	30	
		24	18.477	0.402	18.878	30	
		36	18.433	0.572	19.006	30	
		48	18.296	0.720	19.017	30	
		54	18.186	0.794	18.980	30	
2467	12	6	7.589	0.108	7.697	30	8
		9	7.595	0.165	7.760	30	
		12	7.326	0.217	7.543	30	
		18	8.253	0.316	8.568	30	
		24	8.047	0.402	8.449	30	
		36	8.090	0.572	8.662	30	
		48	8.050	0.720	8.771	30	
		54	8.142	0.794	8.936	30	
2472	13	6	1.445	0.108	1.553	30	2
		9	1.368	0.165	1.533	30	
		12	1.254	0.217	1.471	30	
		18	2.038	0.316	2.354	30	
		24	1.863	0.402	2.265	30	
		36	2.022	0.572	2.594	30	
		48	1.742	0.720	2.463	30	
		54	1.581	0.794	2.375	30	

802.11n Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)	Power Level Setting
Frequency [MHz]	Channel No.						
2412	1	0	17.367	0.116	17.483	30	18
		1	17.190	0.229	17.419	30	
		2	17.949	0.325	18.274	30	
		3	17.865	0.420	18.285	30	
		4	17.894	0.572	18.466	30	
		5	17.750	0.722	18.473	30	
		6	17.694	0.773	18.467	30	
		7	17.590	0.840	18.430	30	
2437	6	0	18.386	0.116	18.502	30	19
		1	18.213	0.229	18.443	30	
		2	18.921	0.325	19.246	30	
		3	18.809	0.420	19.229	30	
		4	18.805	0.572	19.377	30	
		5	18.660	0.722	19.383	30	
		6	18.622	0.773	19.395	30	
		7	18.518	0.840	19.358	30	
2462	11	0	17.166	0.116	17.282	30	18
		1	16.945	0.229	17.175	30	
		2	17.689	0.325	18.014	30	
		3	17.619	0.420	18.039	30	
		4	17.614	0.572	18.186	30	
		5	17.475	0.722	18.197	30	
		6	17.427	0.773	18.201	30	
		7	17.297	0.840	18.136	30	
2467	12	0	7.285	0.116	7.401	30	8
		1	7.144	0.229	7.373	30	
		2	7.990	0.325	8.315	30	
		3	8.014	0.420	8.434	30	
		4	8.178	0.572	8.750	30	
		5	8.083	0.722	8.805	30	
		6	8.077	0.773	8.850	30	
		7	7.955	0.840	8.795	30	
2472	13	0	1.164	0.116	1.280	30	2
		1	0.893	0.229	1.122	30	
		2	1.796	0.325	2.120	30	
		3	1.776	0.420	2.196	30	
		4	1.866	0.572	2.438	30	
		5	1.834	0.722	2.556	30	
		6	1.698	0.773	2.471	30	
		7	1.577	0.840	2.417	30	

9.4 POWER SPECTRAL DENSITY

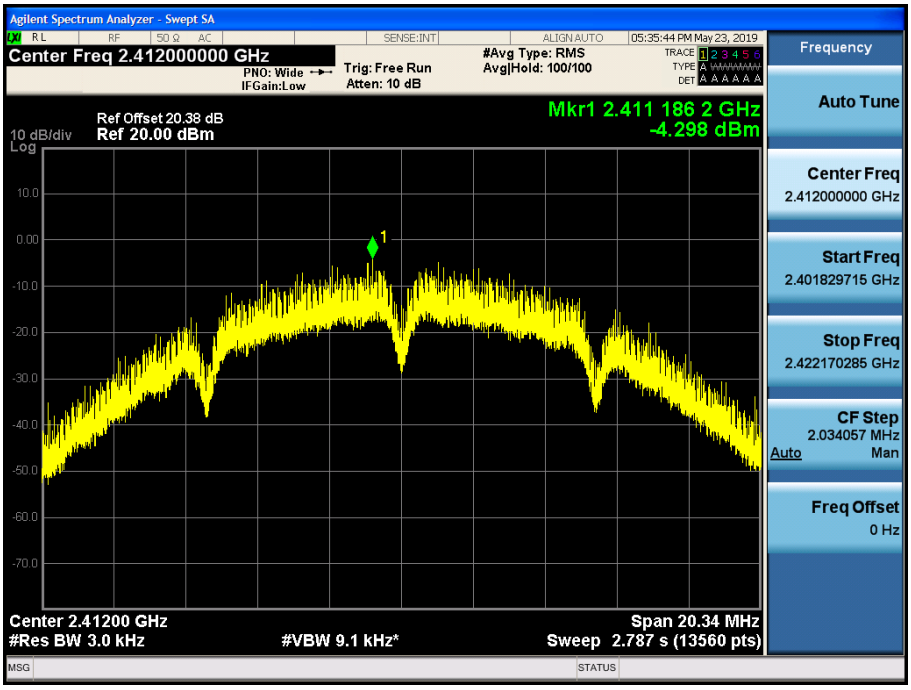
Mode	Frequency (MHz)	Channel No.	Test Result			
			Measured PSD (dBm)	Duty Cycle Factor	Measured PSD(dBm) + Duty Cycle Factor	Limit (dBm)
802.11b	2412	1	-4.298	0.034	-4.264	8
	2437	6	-4.779	0.034	-4.745	
	2462	11	-6.737	0.151	-6.586	
	2467	12	-15.597	0.034	-15.563	
	2472	13	-20.771	0.034	-20.737	
802.11g	2412	1	-11.685	0.794	-10.891	
	2437	6	-11.184	0.720	-10.464	
	2462	11	-11.599	0.720	-10.879	
	2467	12	-22.462	0.794	-21.668	
	2472	13	-21.973	0.572	-21.401	
802.11n	2412	1	-10.443	0.722	-9.721	
	2437	6	-10.254	0.773	-9.481	
	2462	11	-11.249	0.773	-10.476	
	2467	12	-21.365	0.773	-20.592	
	2472	13	-23.117	0.722	-22.395	

Note :

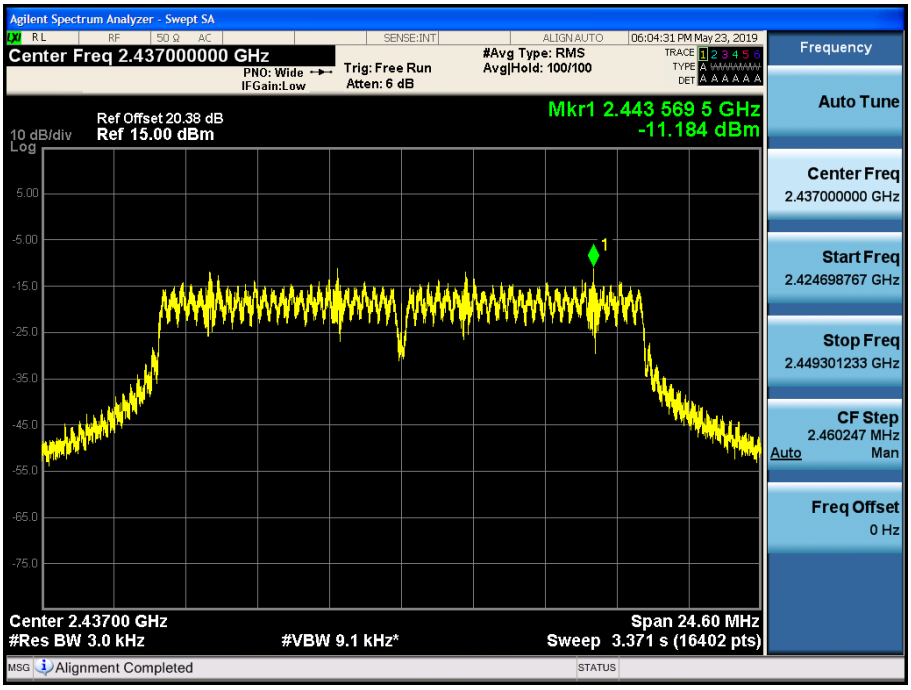
1. Spectrum reading values are not plot data.
   The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss(20 dB) + Cable loss
3. 20.38 dB is offset for 2.4 GHz Band.

▣ Test Plots

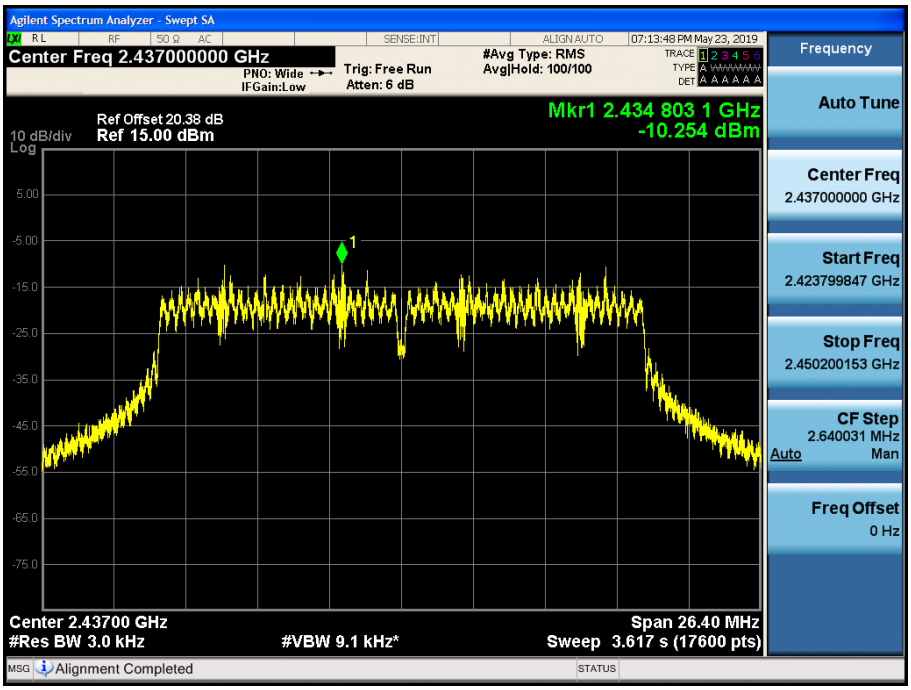
Power Spectral Density (802.11b-CH 1)



Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20 -CH 6)



Note :

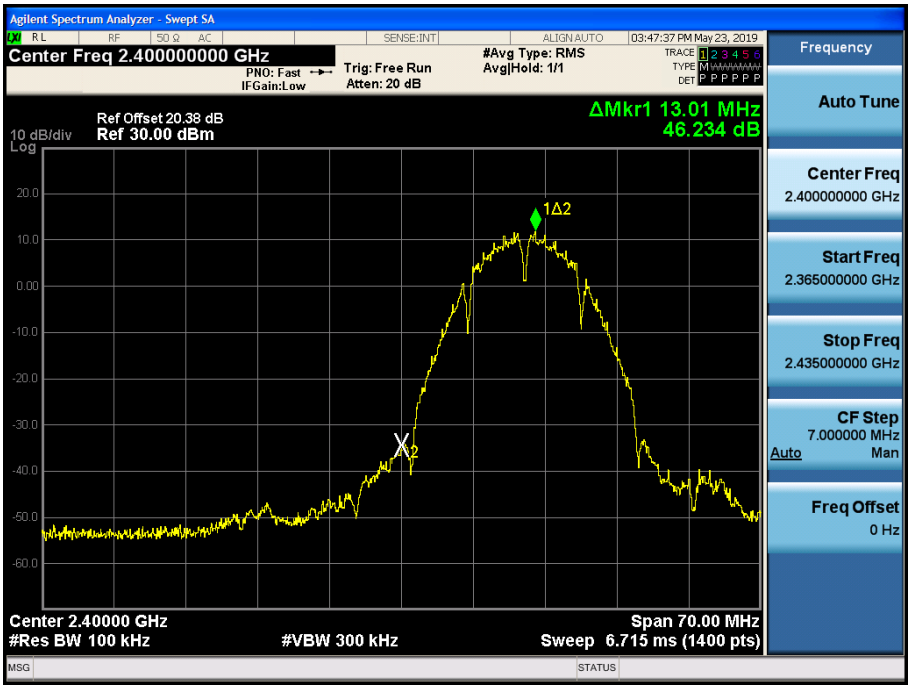
In order to simplify the report, attached plots were only the worstcase PSD channel.

9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

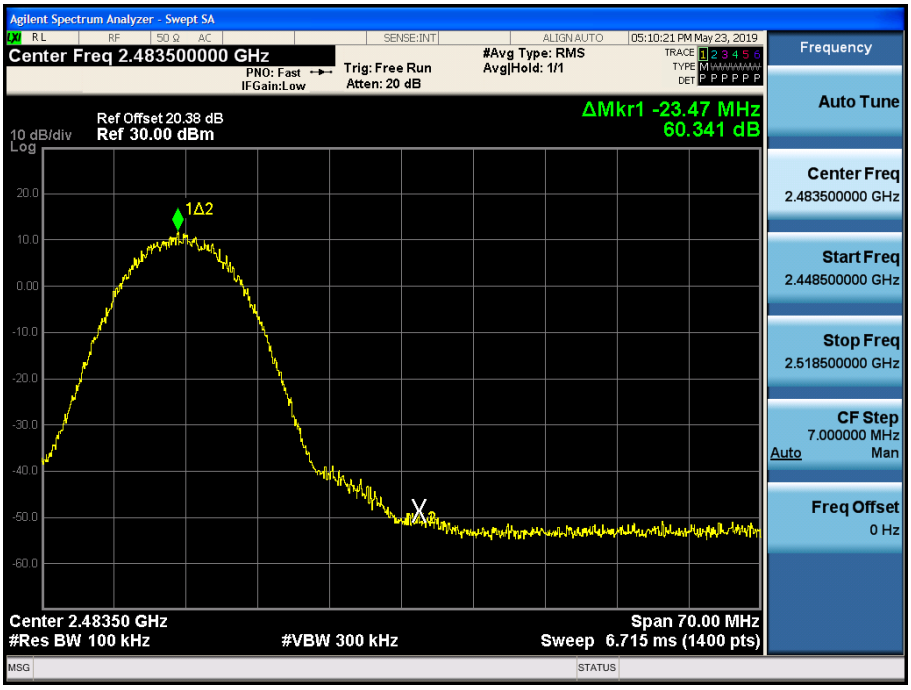
Test Result : please refer to the plot below.
In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ Test Plots(BandEdge)

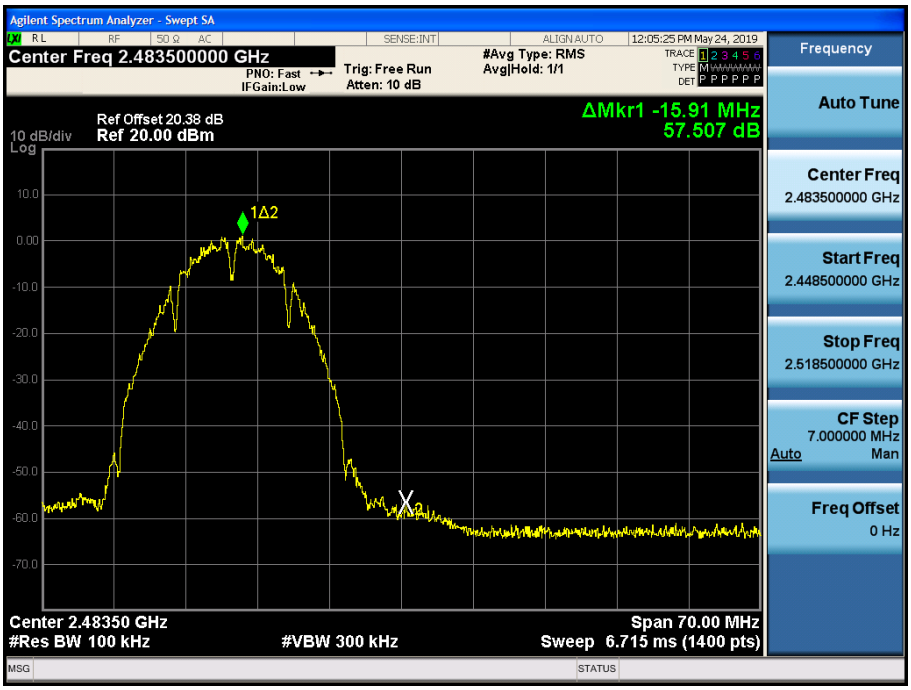
Band Edge (802.11b-CH1)



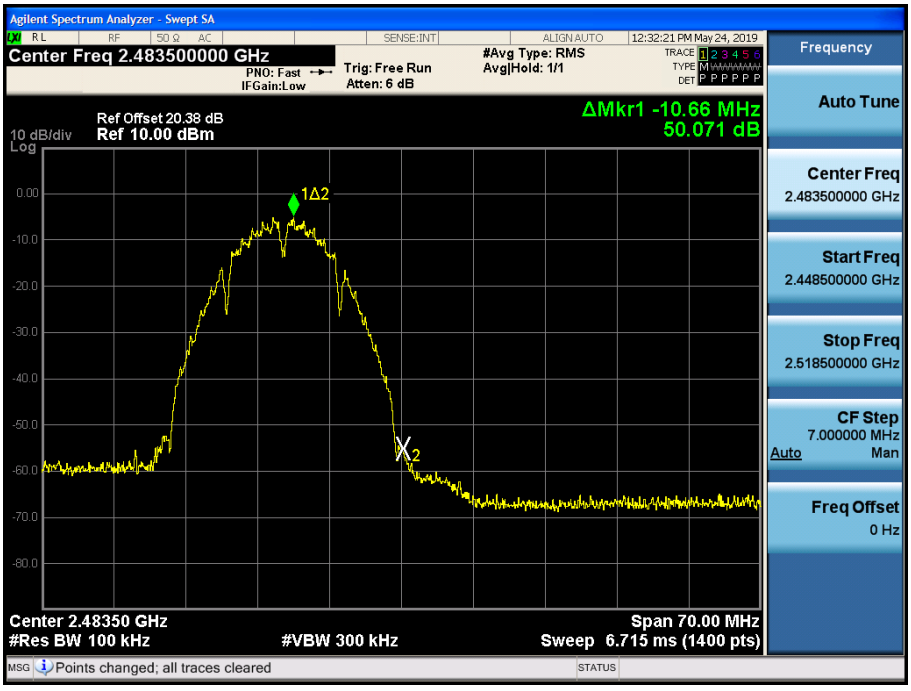
Band Edge (802.11b-CH11)



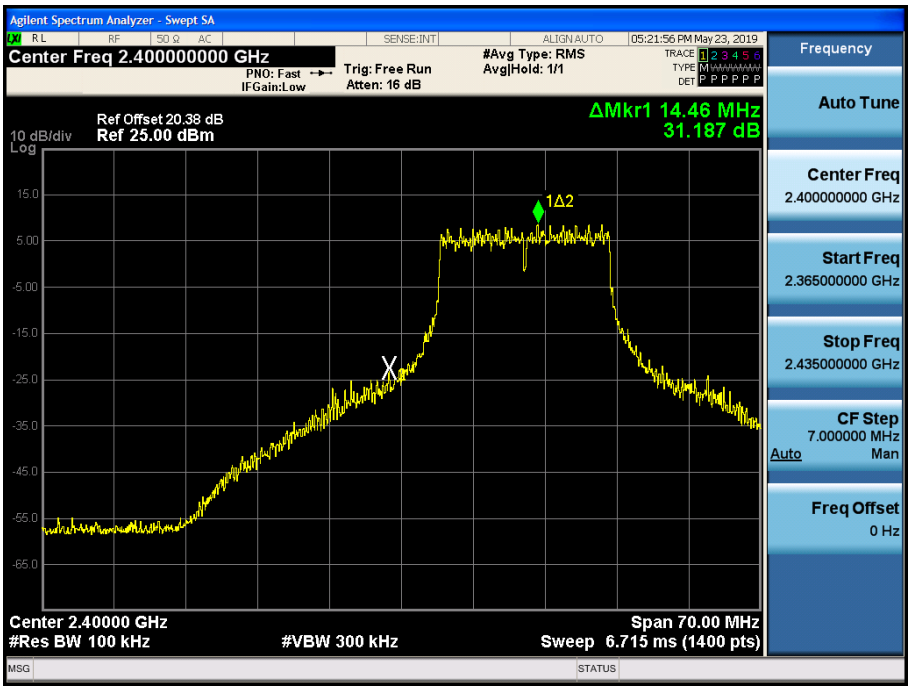
Band Edge (802.11b-CH12)



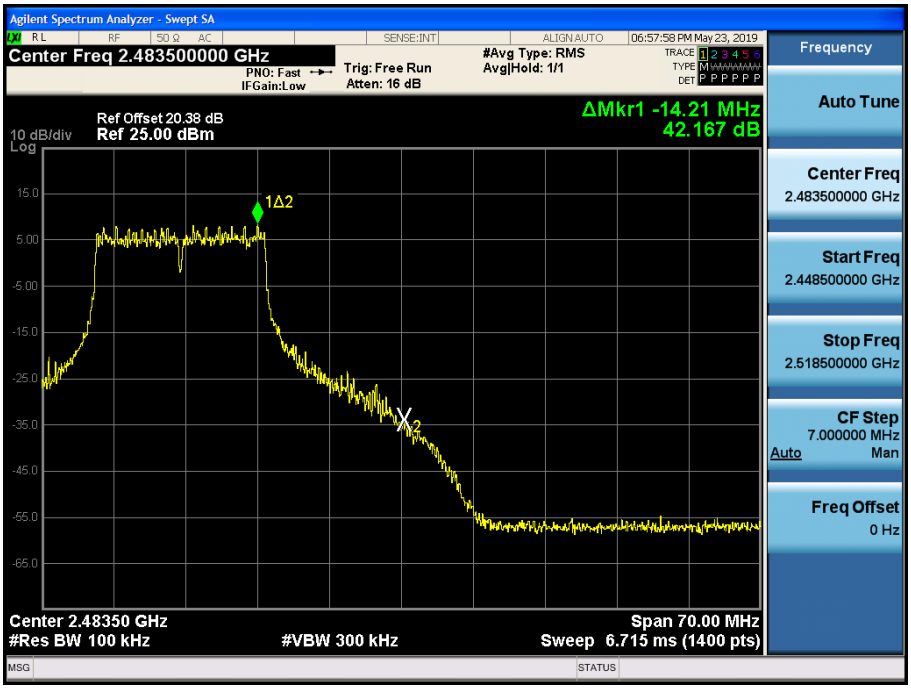
Band Edge (802.11b-CH13)



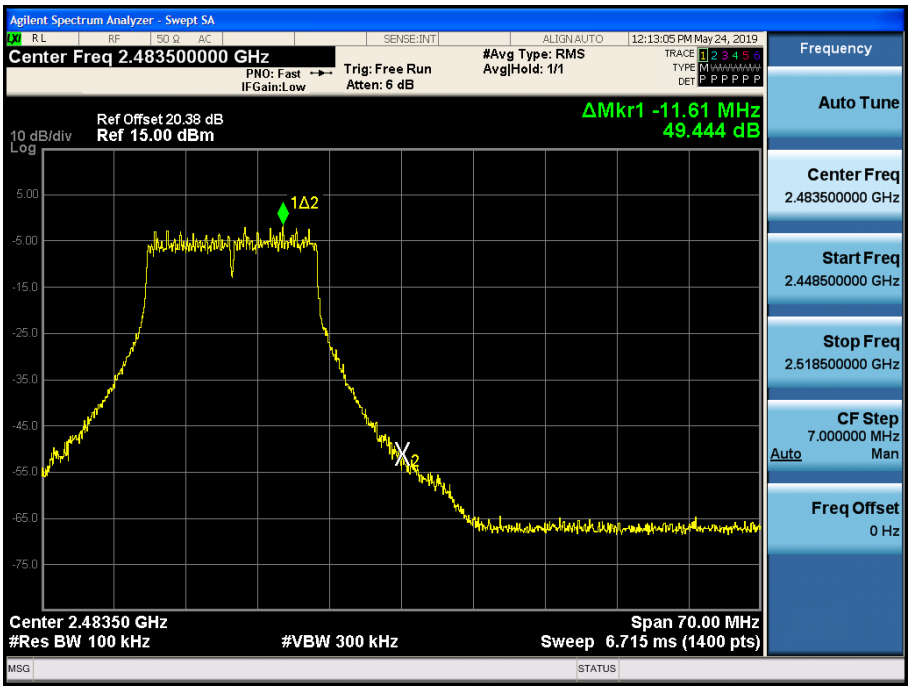
Band Edge (802.11g-CH1)



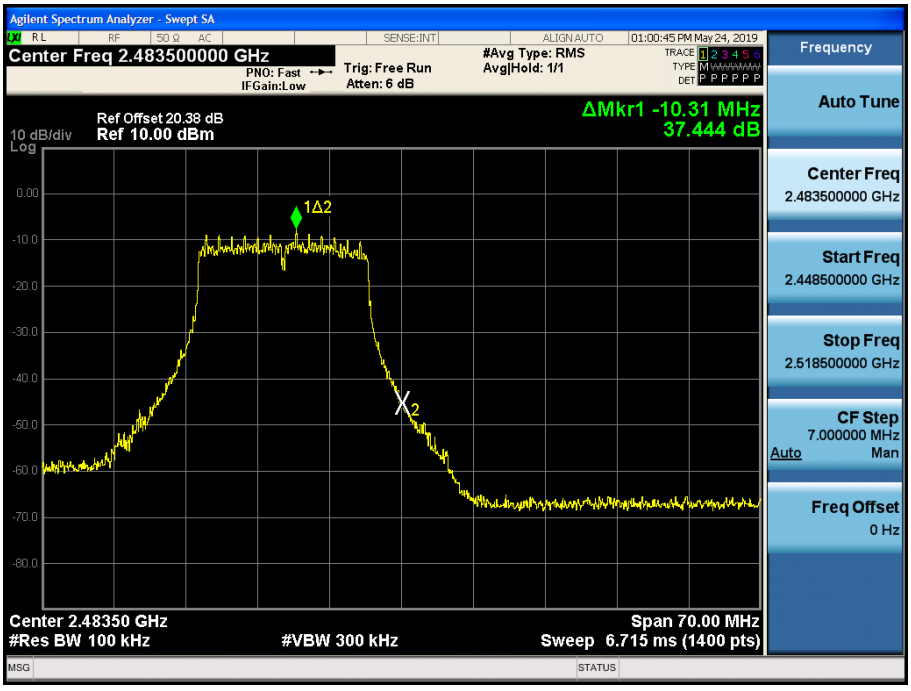
Band Edge (802.11g-CH11)



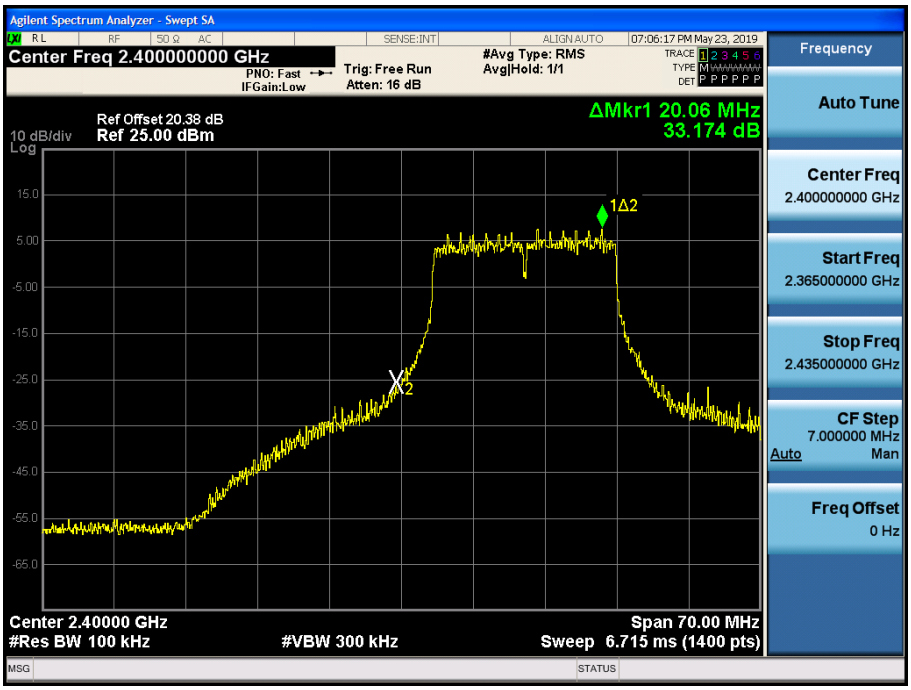
Band Edge (802.11g-CH12)



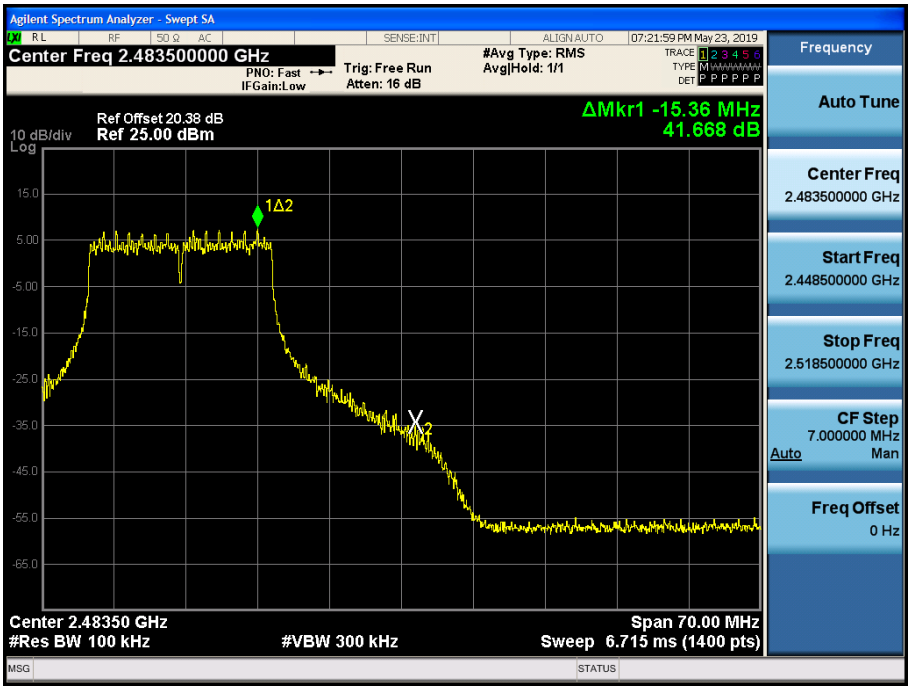
Band Edge (802.11g-CH13)



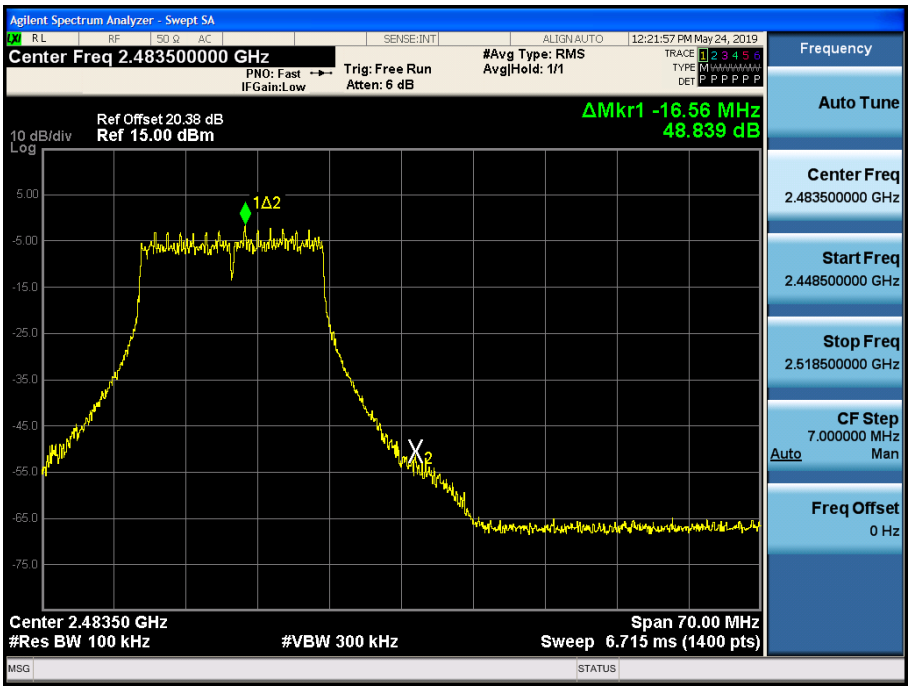
Band Edge (802.11n_HT20 -CH1)



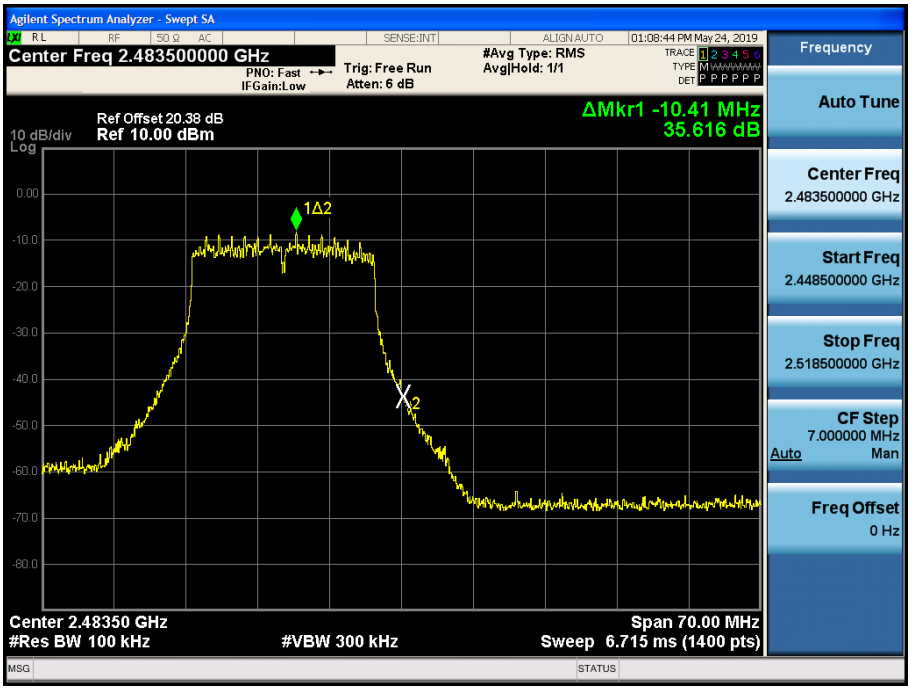
Band Edge (802.11n_HT20 -CH11)



Band Edge (802.11n_HT20 -CH12)



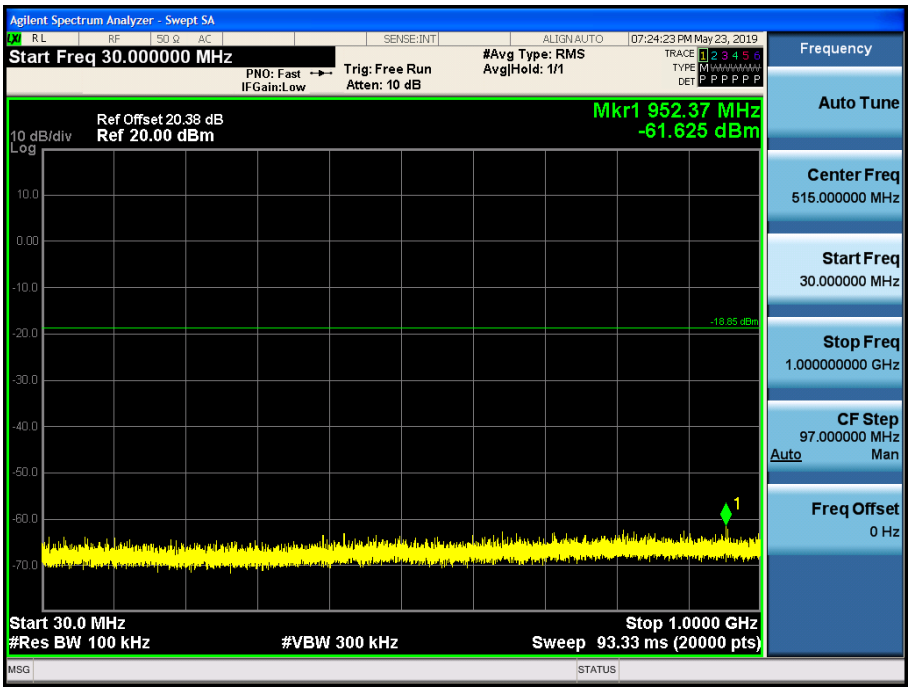
Band Edge (802.11n_HT20 -CH13)



▣ Test Plots(Conducted Spurious Emission)

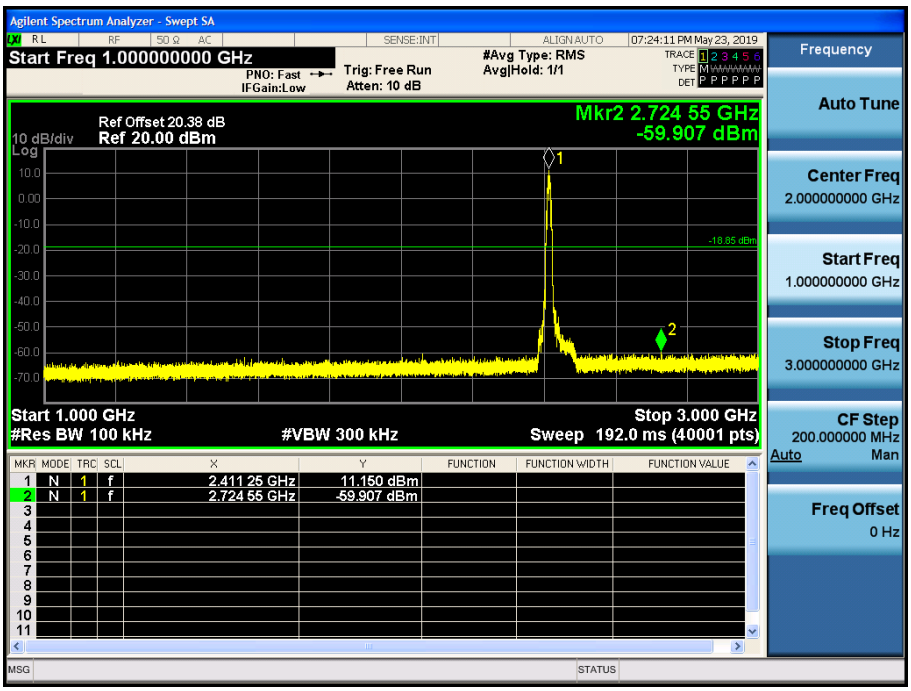
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



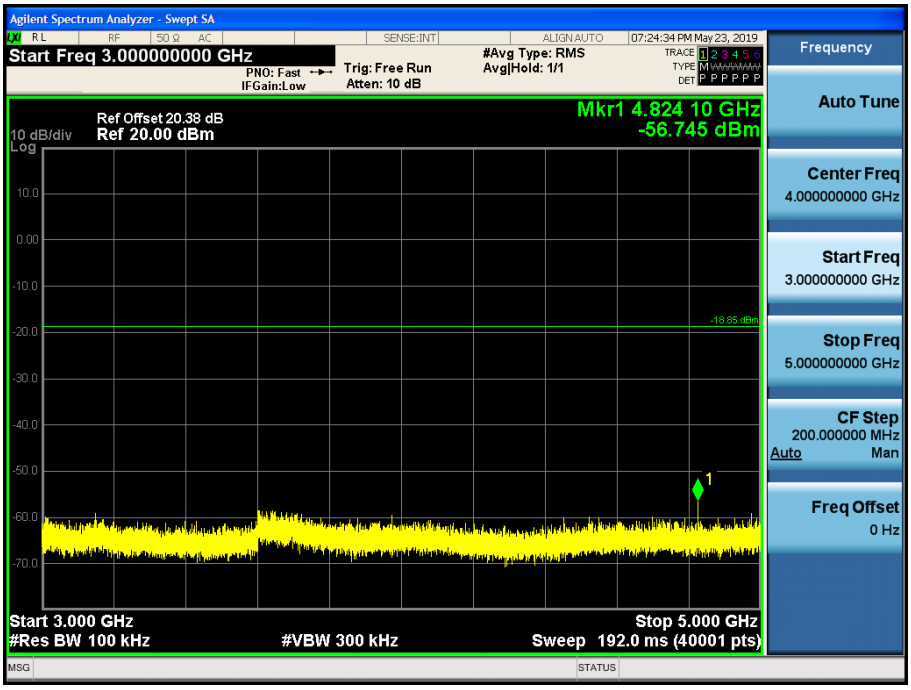
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



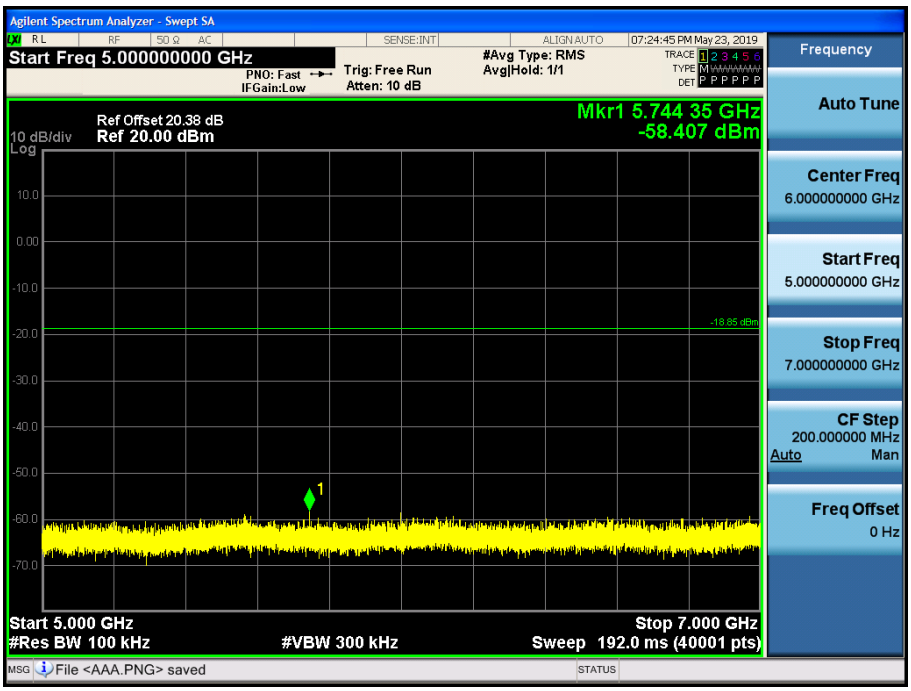
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



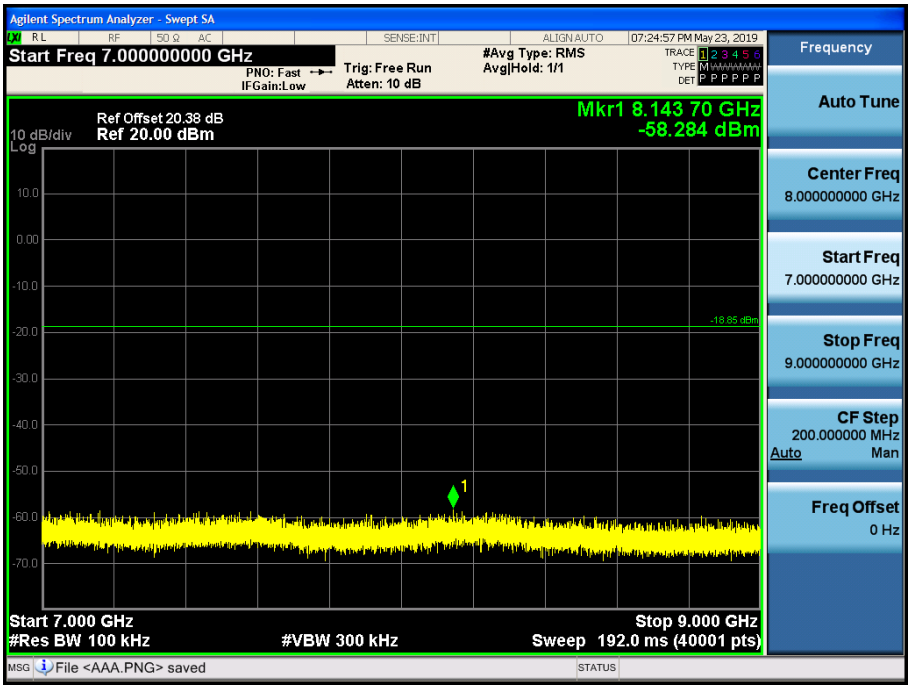
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



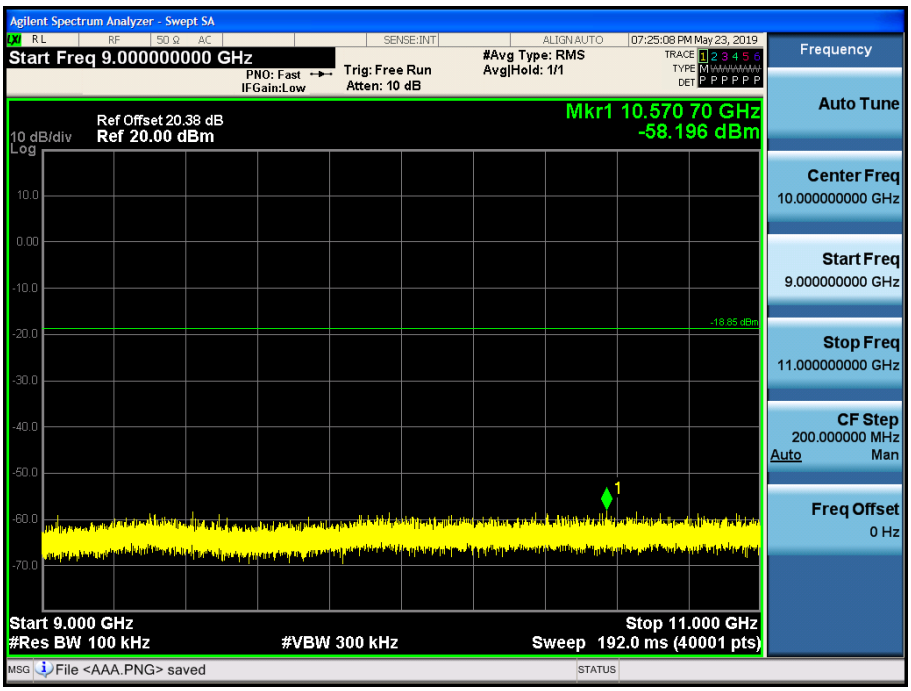
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



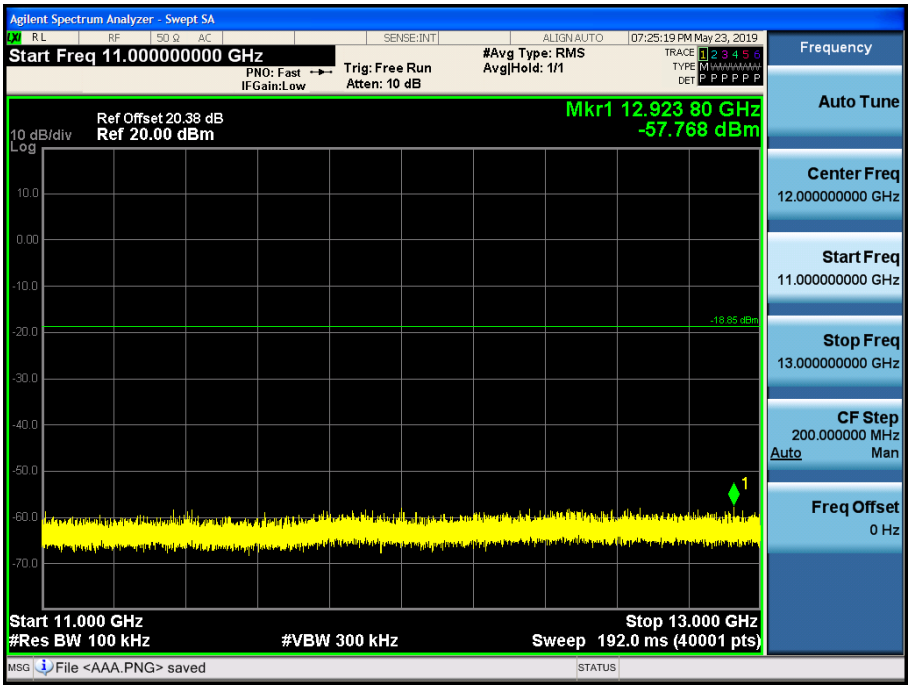
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



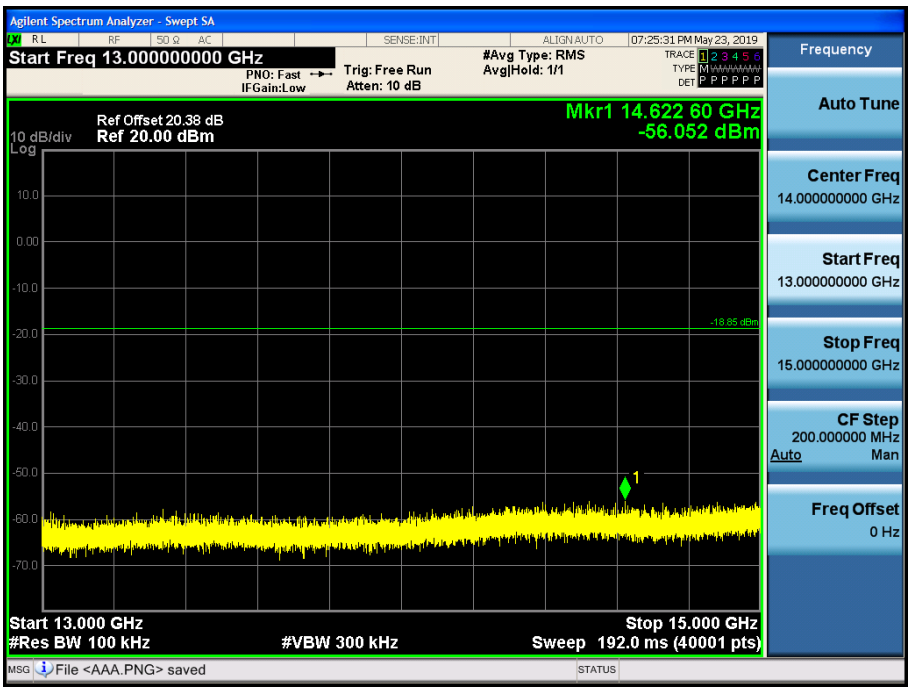
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



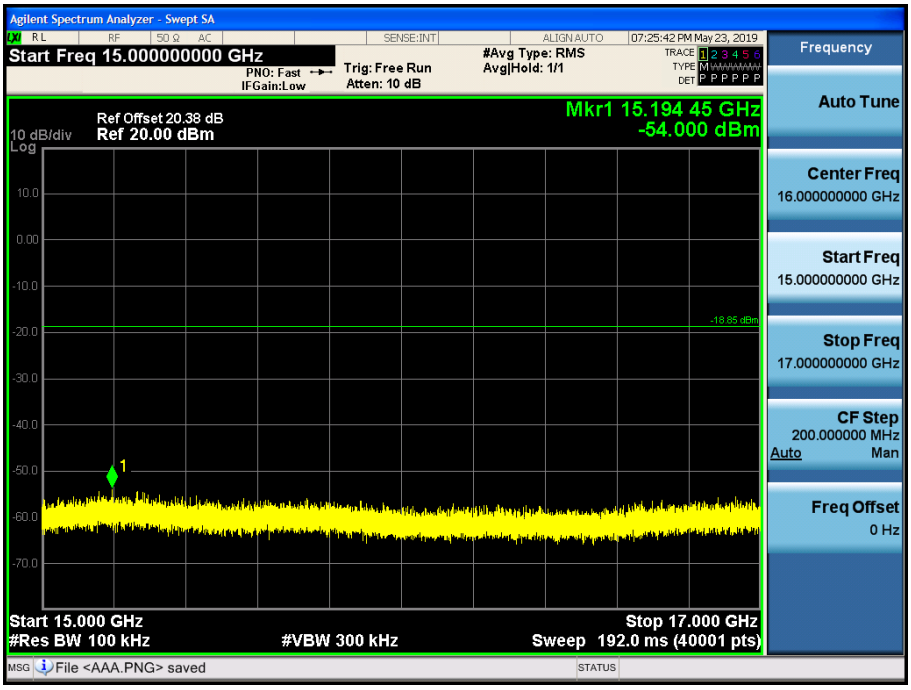
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)



17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11b_Ch.1_2 Mbps)