

EMC Test Report

Project Number: 4261199

Report Number: 4261199EMC02

Revision Level: 3

Client: Younes Medical

Equipment Under Test: Wireless Sleep Diagnostics

Model Name: Prodigy 2 System (HMU)

Model Number: Prodigy 2 (HMU)

FCC ID: 2AFGB100099

IC ID: 20415-100099

Applicable Standards: ANSI C63.10: 2013 (FCC Part 15 Subpart C, § 15.247)

RSS-247, Issue 2

RSS-GEN Issue 4

Report issued on: 24 January 2019

Test Result: Compliant

Tested by:

A handwritten signature in black ink, appearing to read 'Aaron Froehlich'.

Aaron Froehlich, EMC Test Engineer

Reviewed by:

A handwritten signature in blue ink, appearing to read 'David Schramm'.

David Schramm, Operations Manager

Remarks: This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.7	Compliant
Peak Output Power	15.247(b)(3)	RSS-247 S5.4 (4)	Compliant
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	Compliant
Conducted Spurious Emissions / Band Edge	15.247(d)	RSS-247 S5.5	Compliant
Field Strength of Spurious Radiation	15.247(d), 15.209	RSS-247 S5.5	Compliant
Emissions in Restricted Frequency Bands	15.205, 15.209	RSS-GEN S8.9, S8.10	Compliant
Antenna Requirement	15.203	RSS-GEN S6.8	Compliant ¹
AC Powerline Conducted Emissions	15.107, 15.207	RSS-GEN S8.8	N/A ²

- 1) Internal PCB trace antenna
- 2) DUT is batter powered.
- 3) Band Edge measurement satisfies RSS Gen S8.11 Frequency Stability Requirements.

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: Younes Medical Technologies
Address: Unit 5-55 Henlow Bay
City, State, Zip, Country: Winnipeg Manitoba, R3Y 1G4, Canada

2.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA
Type of lab: Testing Laboratory
Certificate Number: 3212.01

2.3 General Information of EUT

Type of Product: Wireless Sleep Monitor
Model Name: Prodigy 2 System (HMU)
Serial Number: HMU 9

Frequency Range: 2412-2472MHz
Data Modes: 802.11 b/g/n
Antenna: Integral – 1.9 dBi

Rated Voltage: 3.7 Vdc Battery
Test Voltage: 3.7 Vdc Battery

Sample Received Date: 3/21/2018
Dates of testing: 12 Jun 2018 - 2 Jul 2018, 4 Sep 2018, 9 – 16 Jan 2019

2.4 Operating Modes and Conditions

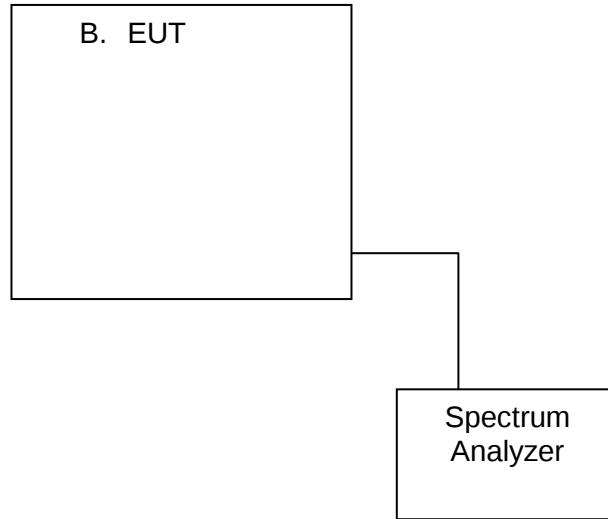
Continuous traffic was generated using test modes.

The following data rates / modes of operation were investigated for the “worst case” mode of operation in accordance with ANSI C63.10 Section 5.6:

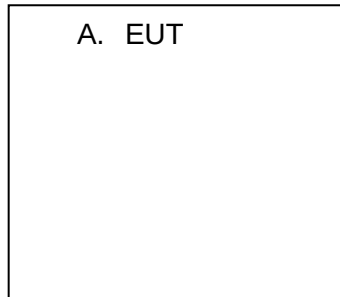
DSSS:
802.11b – 1, 2, 5, 11 Mbps
OFDM:
802.11g – 6, 9, 12, 18, 24, 36, 48, 54 Mbps
802.11n – MCS 0 through MCS 7

Determined Worst Case:
DSSS – 802.11b 1 Mbps
OFDM – 802.11g 6 Mbps
OFDM – 802.11n MCS 0

2.5 EUT Connection Block Diagram – Conducted Measurements



2.6 EUT Connection Block Diagram – Radiated Measurements



Inside Chamber

.....
Outside Chamber

2.7 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Younes Medical Technologies	HMU PCB	100099	NSN
B	Younes Medical Technologies	HMU PCB (Conducted)	100099	NSN

3 Bandwidth

3.1 Test Result

Test Description	Test Specification		Test Result
6 dB bandwidth	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.7	Compliant

3.2 Test Method

The procedures from ANSI C63.10: 2013 clause 11.8 and 558074 D01 DTS Meas Guidance v04 were used to determine the 6 dB bandwidth.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 21.8 °C
Relative Humidity: 38.7 %
Atmospheric Pressure: 98.0 kPa

3.4 Test Equipment

Test End Date: 9-Jan-2019

Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095591	25-Jul-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095585	25-Jul-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019

Note: The equipment calibration period is 1 year.

3.5 Test Data

802.11	Modulation Family	Data Rate	Ch	DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
b	DSSS	1 Mbps	1	2412	9.7	0.5	---	2406.95	2416.65	-0.5	PASS
			7	2442	9.7	0.5	---	2436.95	2446.65	-0.7	PASS
			13	2472	9.2	0.5	---	2466.95	2476.15	-1.7	PASS
g	OFDM	6 Mbps	1	2412	15.3	0.5	---	2404.35	2419.65	-16.9	PASS
			7	2442	15.2	0.5	---	2434.45	2449.65	-15.5	PASS
			13	2472	15.2	0.5	---	2464.45	2479.65	-16.6	PASS
n	OFDM	MCS 0	1	2412	15.4	0.5	---	2404.35	2419.75	-17.1	PASS
			7	2442	15.2	0.5	---	2434.45	2449.65	-16.5	PASS
			13	2472	15.2	0.5	---	2464.45	2479.65	-16.9	PASS

4 RF Output Power

4.1 Test Result

Test Description	Test Specification		Test Result
RF Output Power	15.247(b)(3)	RSS-247 S5.4 (4)	Compliant

4.2 Test Method

Fundamental RF power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.9 and KDB 558074 D01 Measurement Guidance v04.

Limit

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. For using antennas with greater than 6dBi of gain, the limit is reduced in dB by the amount the gain exceeds 6dBi (e.g. for a 7.4dBi antenna, the limit is reduced from 30dBm to 28.6dBm)

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 21.8 °C
Relative Humidity: 38.7 %
Atmospheric Pressure: 98.0 kPa

4.4 Test Equipment

Test End Date: 9-Jan-2019

Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095591	25-Jul-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095585	25-Jul-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
POWER METER (TS8997)	OSP-B157	ROHDE & SCHWARZ	15040	15-Dec-2019

Note: The equipment calibration period is 1 year.

4.5 Test Data

802.11	Modulation Family	Data Rate	Ch	DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated ERP (dBm)	DutyCycle (%)	Result
b	DSSS	1 Mbps	1	2412	3.2	30	5.1	64.007	PASS
			7	2442	2.3	30	4.2	67.273	PASS
			13	2472	2.7	30	4.6	63.31	PASS
g	OFDM	6 Mbps	1	2412	-8.1	30	-6.2	31.321	PASS
			7	2442	-6.7	30	-4.8	31.17	PASS
			13	2472	-7.8	30	-5.9	30.708	PASS
n	OFDM	MCS 0	1	2412	-8.5	30	-6.6	30.464	PASS
			7	2442	-8	30	-6.1	30.168	PASS
			13	2472	-8.2	30	-6.3	30.235	PASS

5 Power Spectral Density

5.1 Test Result

Test Description	Test Specification		Test Result
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	Compliant

5.2 Test Method

Power spectral density measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.10 and KDB 558074 D01 Measurement Guidance v04.

Limit

The limit is 8 dBm.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 21.8 °C
Relative Humidity: 38.7 %
Atmospheric Pressure: 98.0 kPa

5.4 Test Equipment

Test End Date: 9-Jan-2019

Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095591	25-Jul-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095585	25-Jul-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
POWER METER (TS8997)	OSP-B157	ROHDE & SCHWARZ	15040	15-Dec-2019

Note: The equipment calibration period is 1 year.

5.5 Test Data

802.11	Modulation Family	Data Rate	Ch	DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
b	DSSS	1 Mbps	1	2412	2412.825	-15.56	8	PASS
			7	2442	2441.275	-15.88	8	PASS
			13	2472	2471.275	-15.7	8	PASS
g	OFDM	6 Mbps	1	2412	2410.775	-30.043	8	PASS
			7	2442	2440.775	-28.837	8	PASS
			13	2472	2474.525	-29.909	8	PASS
n	OFDM	MCS 0	1	2412	2410.775	-29.9	8	PASS
			7	2442	2440.775	-29.306	8	PASS
			13	2472	2474.525	-30.283	8	PASS

6 Conducted Spurious Emissions / Band Edge

6.1 Test Result

Test Description	Test Specification		Test Result
Conducted Spurious Emissions	15.247(d)	RSS-247 S5.5	Compliant

6.2 Test Method

Spurious emissions in non-restricted frequency bands were recorded using the methods defined in ANSI C63.10: 2013 clause 11.11 and KDB 558074 D01 Measurement Guidance v04.

Lowest, middle, and highest channels were investigated.

Because the maximum conducted peak output power was used to determine compliance with the output power limits, the limit in any 100 kHz band outside of the authorized band is 20 dB below the maximum in-band peak level.

Per ANSI C63.10 Clause 5.6.2.2 b) – 802.11b 1 Mbps (DSSS) and 802.11g 6 Mbps (OFDM) were chosen as the “worst case” modes, within each modulation family, for Spurious Emissions tests.

6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.0 °C

Relative Humidity: 52.8 %

Atmospheric Pressure: 97.8 kPa

6.4 Test Equipment

Test End Date: 14-Jan-2019

Tester: ASF

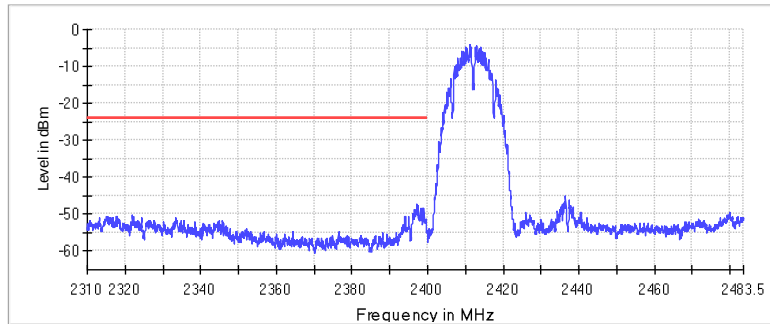
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095591	25-Jul-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095585	25-Jul-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
POWER METER (TS8997)	OSP-B157	ROHDE & SCHWARZ	15040	15-Dec-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
RF CABLE	SF102	HUBER & SUHNER	B079824	25-Jul-2019

Note: The equipment calibration period is 1 year.

6.5 Test Data – DTS Band Edge

6.5.1 802.11b 1 Mbps

Lower Band Edge

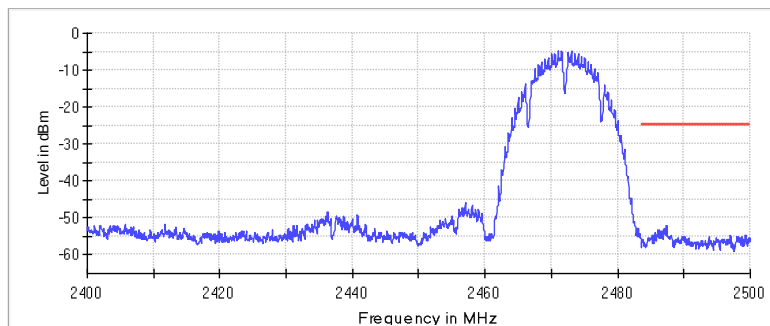


— Limit — Sum Level × Fail

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2397.025	-47.2	23.1	-24.1	PASS
2397.075	-47.3	23.2	-24.1	PASS
2397.525	-47.7	23.6	-24.1	PASS
2397.575	-47.9	23.8	-24.1	PASS
2398.025	-48.2	24.2	-24.1	PASS
2398.525	-48.4	24.3	-24.1	PASS
2399.025	-48.5	24.5	-24.1	PASS
2398.575	-48.6	24.5	-24.1	PASS
2396.525	-48.6	24.5	-24.1	PASS
2398.075	-48.6	24.5	-24.1	PASS
2397.475	-48.7	24.6	-24.1	PASS
2396.575	-48.7	24.6	-24.1	PASS
2399.075	-48.8	24.8	-24.1	PASS
2397.175	-49.4	25.3	-24.1	PASS
2397.225	-49.4	25.3	-24.1	PASS

Setting	Instrument Value	Target Value
Start Frequency	2.31000 GHz	2.31000 GHz
Stop Frequency	2.40000 GHz	2.40000 GHz
Span	90.000 MHz	90.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	113.672 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	18 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.27 dB	0.50 dB

Upper Band Edge:



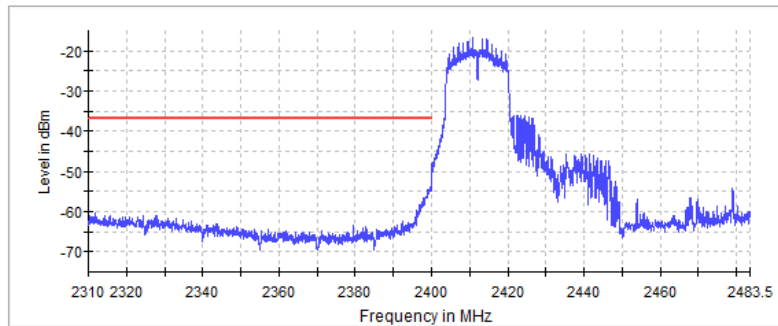
— Limit — Sum Level × Fail

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2487.325	-51.9	27.3	-24.7	PASS
2487.375	-52.2	27.6	-24.7	PASS
2486.975	-52.9	28.3	-24.7	PASS
2486.325	-53	28.3	-24.7	PASS
2486.925	-53	28.4	-24.7	PASS
2486.275	-53.1	28.5	-24.7	PASS
2486.125	-53.3	28.6	-24.7	PASS
2487.275	-53.4	28.7	-24.7	PASS
2487.225	-53.5	28.8	-24.7	PASS
2486.075	-53.5	28.9	-24.7	PASS
2486.525	-53.6	28.9	-24.7	PASS
2486.575	-53.6	28.9	-24.7	PASS
2487.025	-53.7	29.1	-24.7	PASS
2487.075	-53.8	29.2	-24.7	PASS
2486.025	-53.9	29.2	-24.7	PASS

Setting	Instrument Value	Target Value
Start Frequency	2.48350 GHz	2.48350 GHz
Stop Frequency	2.50000 GHz	2.50000 GHz
Span	16.500 MHz	16.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	330	~ 330
SweepTime	18.945 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	6 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.00 dB	0.50 dB

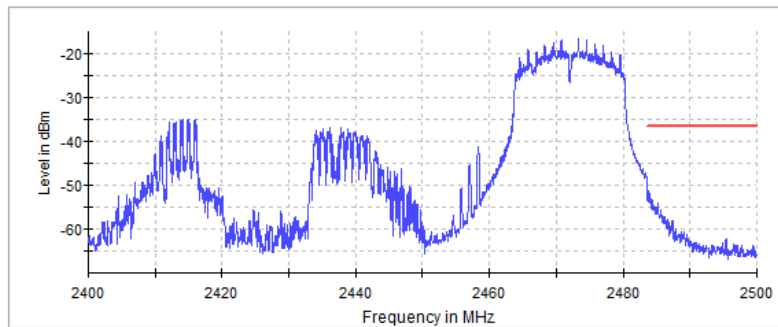
6.5.2 802.11g 6 Mbps

Lower Band Edge



Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result	Setting	Instrument Value	Target Value
2399.975	-52.9	16	-36.9	PASS	Start Frequency	2.31000 GHz	2.31000 GHz
2399.925	-53.1	16.2	-36.9	PASS	Stop Frequency	2.40000 GHz	2.40000 GHz
2399.725	-53.9	17.1	-36.9	PASS	Span	90.000 MHz	90.000 MHz
2399.675	-54	17.1	-36.9	PASS	RBW	100.000 kHz	<= 100.000 kHz
2399.875	-54	17.1	-36.9	PASS	VBW	300.000 kHz	>= 300.000 kHz
2399.775	-54.2	17.3	-36.9	PASS	SweepPoints	1800	~ 1800
2399.225	-54.4	17.5	-36.9	PASS	Sweeptime	113.672 μ s	AUTO
2399.275	-54.4	17.6	-36.9	PASS	Reference Level	-10.000 dBm	-10.000 dBm
2398.975	-54.6	17.8	-36.9	PASS	Attenuation	10.000 dB	AUTO
2398.175	-54.7	17.8	-36.9	PASS	Detector	MaxPeak	MaxPeak
2398.625	-54.7	17.8	-36.9	PASS	SweepCount	100	100
2398.475	-54.7	17.8	-36.9	PASS	Filter	3 dB	3 dB
2398.425	-54.8	17.9	-36.9	PASS	Trace Mode	Max Hold	Max Hold
2398.525	-54.8	18	-36.9	PASS	SweepType	FFT	AUTO
2398.575	-54.9	18	-36.9	PASS	Preamp	off	off
					Stablemode	Trace	Trace
					Stablevalue	0.50 dB	0.50 dB
					Run	18 / max. 150	max. 150
					Stable	3 / 3	3
					Max Stable Difference	0.27 dB	0.50 dB

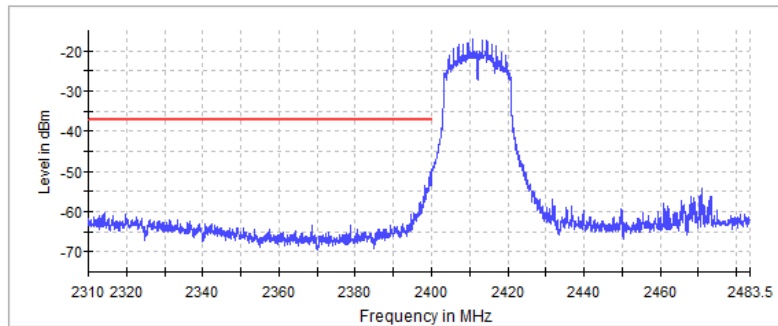
Upper Band Edge



Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result	Setting	Instrument Value	Target Value
2483.675	-50.5	13.8	-36.7	PASS	Start Frequency	2.48350 GHz	2.48350 GHz
2483.625	-51.1	14.4	-36.7	PASS	Stop Frequency	2.50000 GHz	2.50000 GHz
2483.725	-51.3	14.6	-36.7	PASS	Span	16.500 MHz	16.500 MHz
2483.925	-52	15.2	-36.7	PASS	RBW	100.000 kHz	<= 100.000 kHz
2483.975	-52.2	15.5	-36.7	PASS	VBW	300.000 kHz	>= 300.000 kHz
2483.875	-53	16.3	-36.7	PASS	SweepPoints	330	~ 330
2484.125	-53.2	16.5	-36.7	PASS	Sweeptime	18.945 μ s	AUTO
2483.525	-53.2	16.5	-36.7	PASS	Reference Level	-10.000 dBm	-10.000 dBm
2483.775	-53.2	16.5	-36.7	PASS	Attenuation	10.000 dB	AUTO
2483.575	-53.4	16.7	-36.7	PASS	Detector	MaxPeak	MaxPeak
2484.075	-53.4	16.7	-36.7	PASS	SweepCount	100	100
2484.425	-53.5	16.8	-36.7	PASS	Filter	3 dB	3 dB
2484.175	-53.5	16.8	-36.7	PASS	Trace Mode	Max Hold	Max Hold
2484.225	-53.7	16.9	-36.7	PASS	SweepType	FFT	AUTO
2483.825	-53.8	17.1	-36.7	PASS	Preamp	off	off
					Stablemode	Trace	Trace
					Stablevalue	0.50 dB	0.50 dB
					Run	6 / max. 150	max. 150
					Stable	3 / 3	3
					Max Stable Difference	0.00 dB	0.50 dB

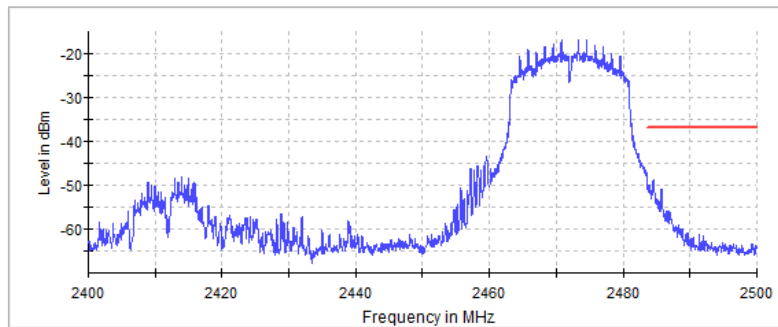
6.5.3 802.11n MCS 0

Lower Band Edge



Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result	Setting	Instrument Value	Target Value
2399.575	-50.2	13.1	-37.1	PASS	Start Frequency	2.31000 GHz	2.31000 GHz
2399.525	-50.2	13.1	-37.1	PASS	Stop Frequency	2.40000 GHz	2.40000 GHz
2399.475	-50.8	13.6	-37.1	PASS	Span	90.000 MHz	90.000 MHz
2399.625	-51	13.9	-37.1	PASS	RBW	100.000 kHz	<= 100.000 kHz
2399.675	-52	14.9	-37.1	PASS	VBW	300.000 kHz	>= 300.000 kHz
2399.425	-52.2	15	-37.1	PASS	SweepPoints	1800	~ 1800
2399.925	-52.7	15.6	-37.1	PASS	Sweeptime	113.672 μ s	AUTO
2399.875	-52.8	15.6	-37.1	PASS	Reference Level	-10.000 dBm	-10.000 dBm
2399.975	-52.9	15.7	-37.1	PASS	Attenuation	10.000 dB	AUTO
2399.725	-53.3	16.1	-37.1	PASS	Detector	MaxPeak	MaxPeak
2399.775	-53.4	16.2	-37.1	PASS	SweepCount	100	100
2399.825	-53.4	16.3	-37.1	PASS	Filter	3 dB	3 dB
2399.175	-53.5	16.4	-37.1	PASS	Trace Mode	Max Hold	Max Hold
2398.325	-53.6	16.5	-37.1	PASS	SweepType	FFT	AUTO
2398.275	-53.7	16.6	-37.1	PASS	Preamplifier	off	off
					Stablemode	Trace	Trace
					Stablevalue	0.50 dB	0.50 dB
					Run	18 / max. 150	max. 150
					Stable	3 / 3	3
					Max Stable Difference	0.27 dB	0.50 dB

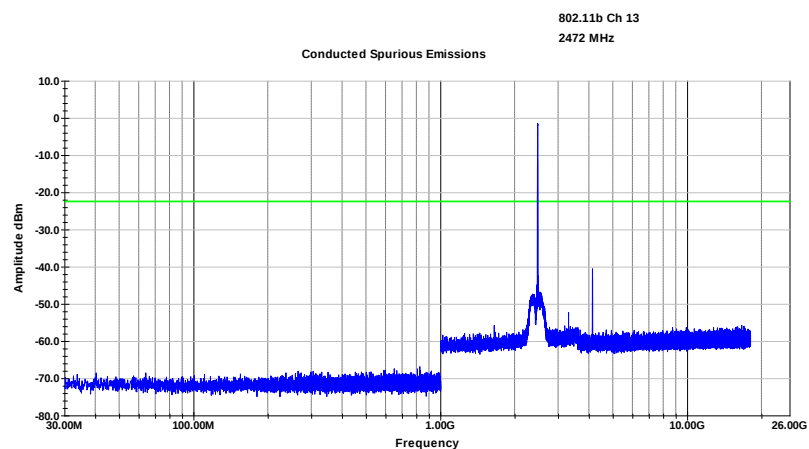
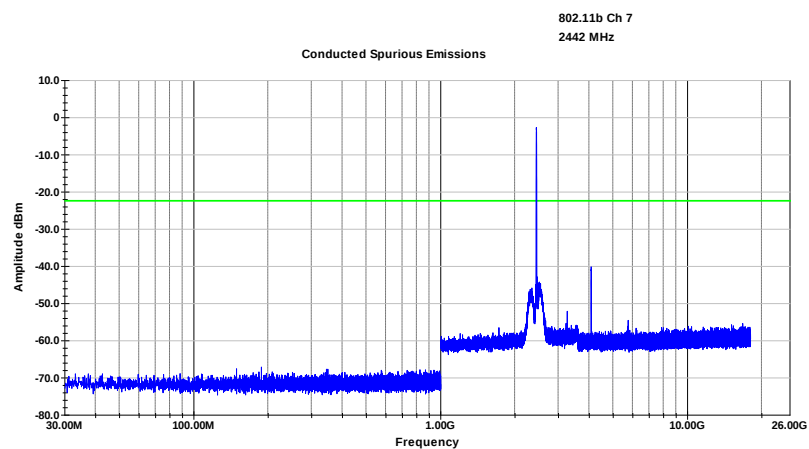
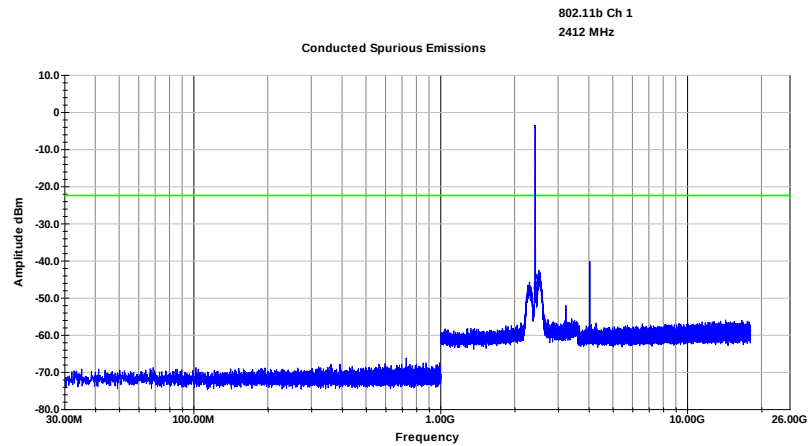
Upper Band Edge



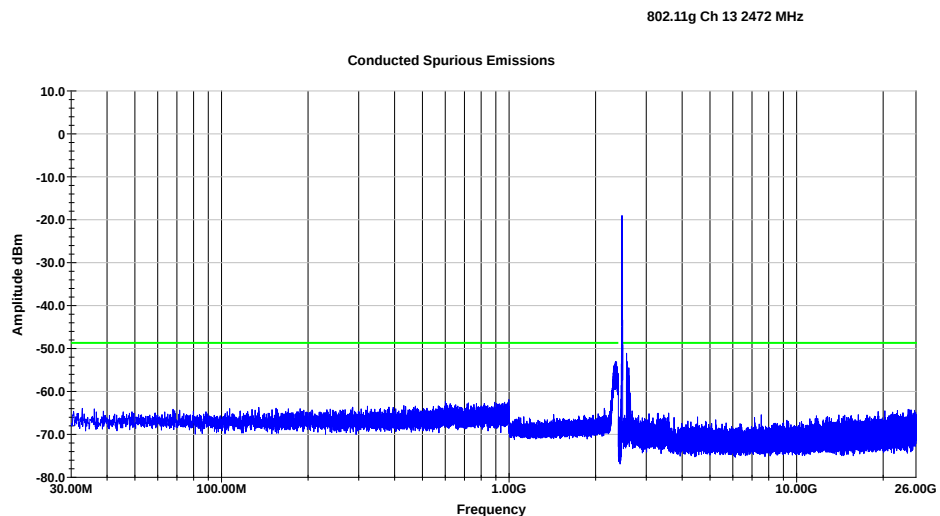
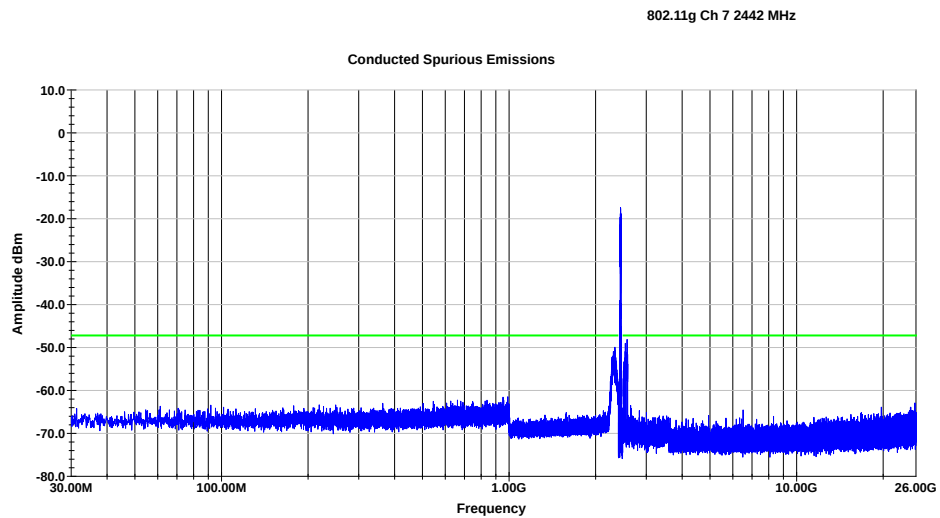
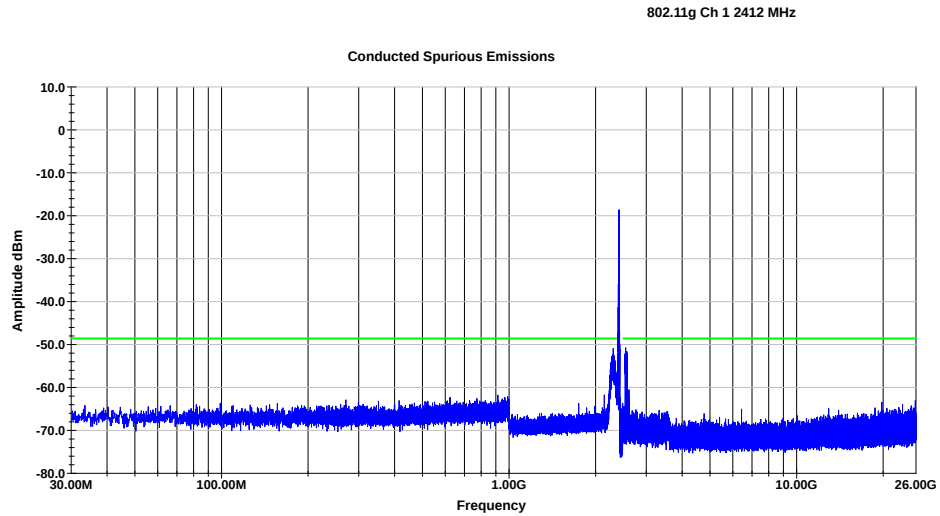
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result	Setting	Instrument Value	Target Value
2484.525	-48.6	11.7	-36.9	PASS	Start Frequency	2.48350 GHz	2.48350 GHz
2484.575	-48.6	11.7	-36.9	PASS	Stop Frequency	2.50000 GHz	2.50000 GHz
2484.475	-48.9	12	-36.9	PASS	Span	16.500 MHz	16.500 MHz
2483.525	-49.1	12.1	-36.9	PASS	RBW	100.000 kHz	<= 100.000 kHz
2484.625	-49.3	12.3	-36.9	PASS	VBW	300.000 kHz	>= 300.000 kHz
2483.575	-49.3	12.4	-36.9	PASS	SweepPoints	330	~ 330
2484.025	-49.9	13	-36.9	PASS	Sweeptime	18.945 μ s	AUTO
2484.425	-50	13	-36.9	PASS	Reference Level	-10.000 dBm	-10.000 dBm
2483.775	-50.1	13.1	-36.9	PASS	Attenuation	10.000 dB	AUTO
2484.075	-50.3	13.4	-36.9	PASS	Detector	MaxPeak	MaxPeak
2483.625	-50.4	13.4	-36.9	PASS	SweepCount	100	100
2483.725	-50.5	13.6	-36.9	PASS	Filter	3 dB	3 dB
2483.975	-50.5	13.6	-36.9	PASS	Trace Mode	Max Hold	Max Hold
2483.825	-50.6	13.6	-36.9	PASS	SweepType	FFT	AUTO
2483.675	-50.8	13.9	-36.9	PASS	Preamplifier	off	off
					Stablemode	Trace	Trace
					Stablevalue	0.50 dB	0.50 dB
					Run	6 / max. 150	max. 150
					Stable	3 / 3	3
					Max Stable Difference	0.00 dB	0.50 dB

6.6 Test Data – Conducted Spurious Emissions

6.6.1 802.11b 1 Mbps



6.6.2 802.11g 6 Mbps



7 Field Strength of Spurious Radiation

7.1 Test Result

Test Description	Test Specification		Test Result
Radiated Spurious Emissions	15.247 (d) and 15.209	RSS-247 S5.5	Compliant

7.2 Test Method

The measurement methods defined in ANSI C63.10: 2013 were used.

Lowest, middle, and highest channels were investigated with the device continuously transmitting on the corresponding channel

Per ANSI C63.10 Clause 5.6.2.2 b) – 802.11b 1 Mbps (DSSS) and 802.11g 6 Mbps (OFDM) were chosen as the “worst case” modes, within each modulation family, for Spurious Emissions tests.

802.11b 1 Mbps was tested using the Radiated Methods of Clause 11.12.1

802.11g 6 Mbps was tested using the cabinet/case emissions and conducted methods of Clause 11.12.2

Test distance:

9k to 30 MHz – Near field prescan to determine if there were any emissions.

30 to 1000 MHz - The EUT to measurement antenna distance was 3 meters

1 to 18 GHz - The EUT to measurement antenna distance was 1 meter(s)

18 to 26 GHz - The EUT to measurement antenna distance was 1 meter(s)

Limits within restricted bands of operation:

Frequency	Limits ⁽¹⁾		Peak Limits dBuV/m
	Microvolts/m	dBuV/m ⁽⁴⁾	
30 - 88 MHz	100	40 ⁽²⁾	--
88 - 216 MHz	150	43.5 ⁽²⁾	--
216 - 960 MHz	200	46 ⁽²⁾	--
960 - 1000 MHz	500	54 ⁽²⁾	--
1 - 40 GHz	500	54 ⁽³⁾	74

(1) These limits are applicable to emissions outside of the intentional transmit frequency band.

(2) Quasi-peak limit

(3) Average limit

(4) At 1 m test distance the above limits are increased by 10 dB

7.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.4 °C

Relative Humidity: 24.5 %

Atmospheric Pressure: 98.4 kPa

7.4 Test Equipment

Test End Date: 16-Jan-2019

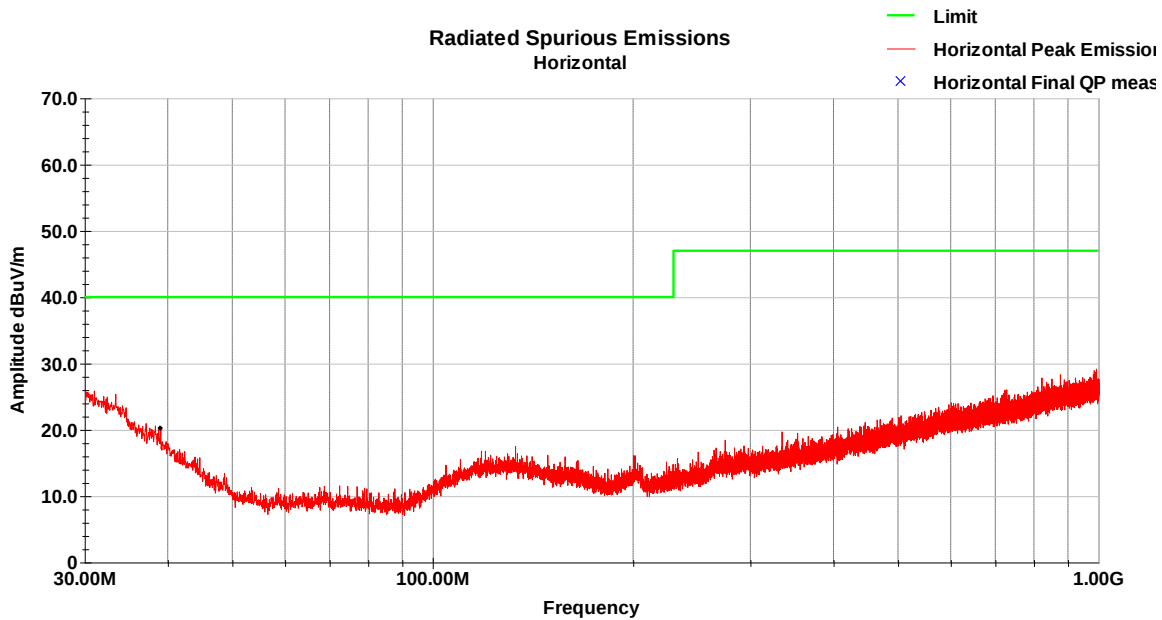
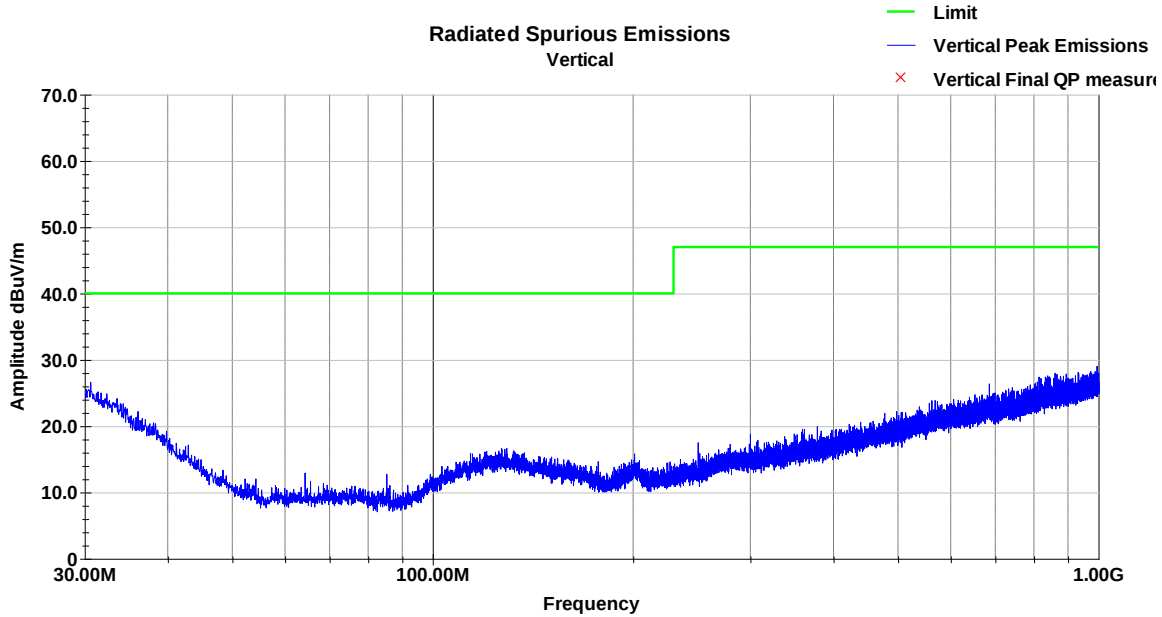
Tester: ASF

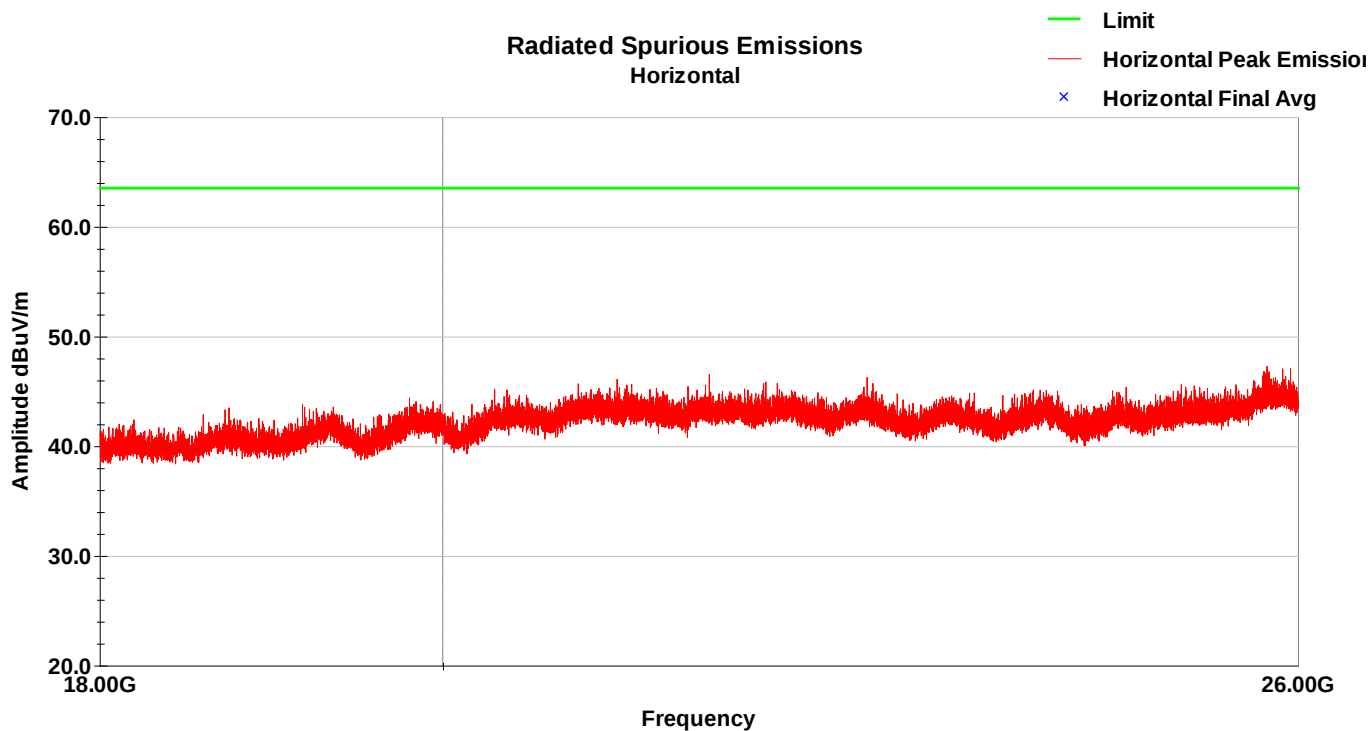
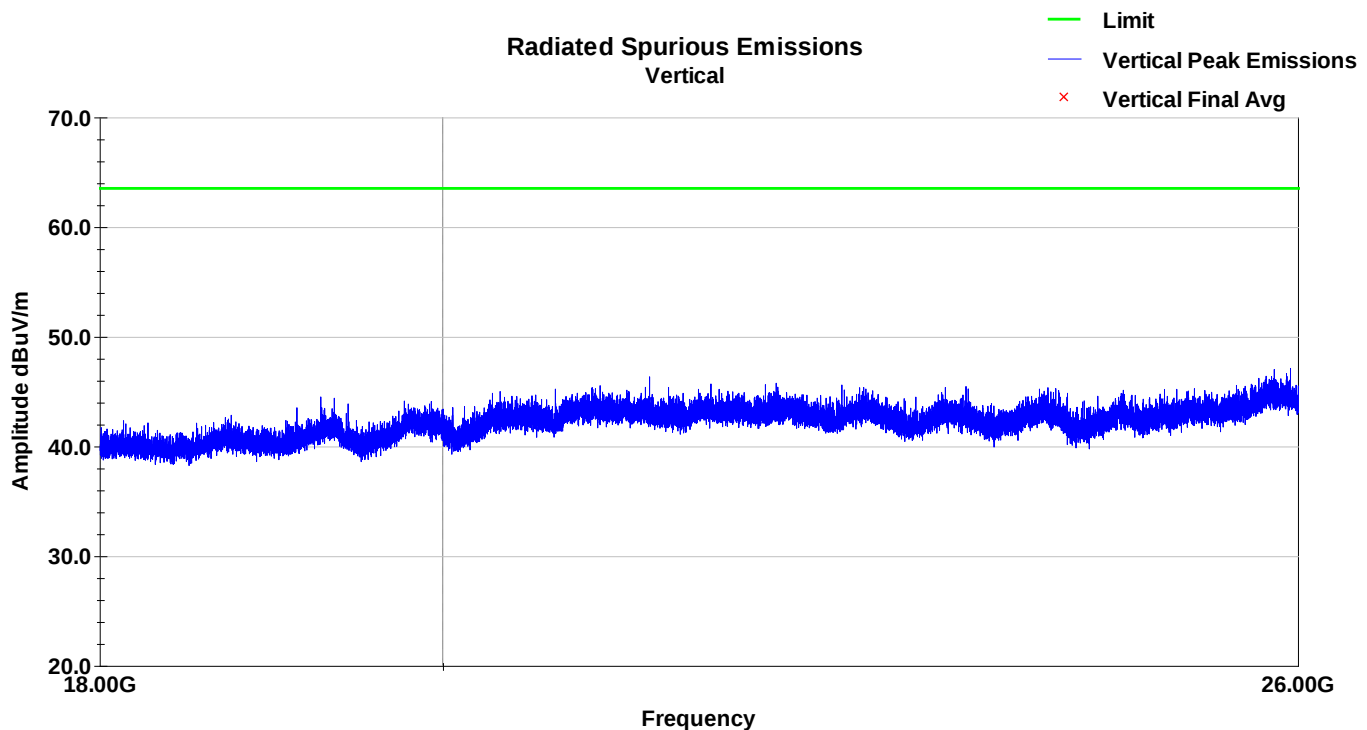
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079690	11-Dec-2019
RF CABLE	SF106	HUBER & SUHNER	B079716	23-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079713	24-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079659	23-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	27-Jul-2019
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	17-Aug-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
ANTENNA, HORN (SMALL)	LB-180400-20-C-KF	A-INFO	15007	30-Mar-2019
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	27-Jul-2019
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	100364	2-Oct-2018
ANTENNA, DRG HORN (SMALL)	3116B	ETS LINDGREN	B079695	9-Aug-2019
FILTER, HIGH PASS (>2800MHZ)	HPM50111	MICRO-TRONICS	B085747	26-Jul-2019
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079699	2-Jul-2019
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	6-Mar-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019

Note: The equipment calibration period is 1 year.

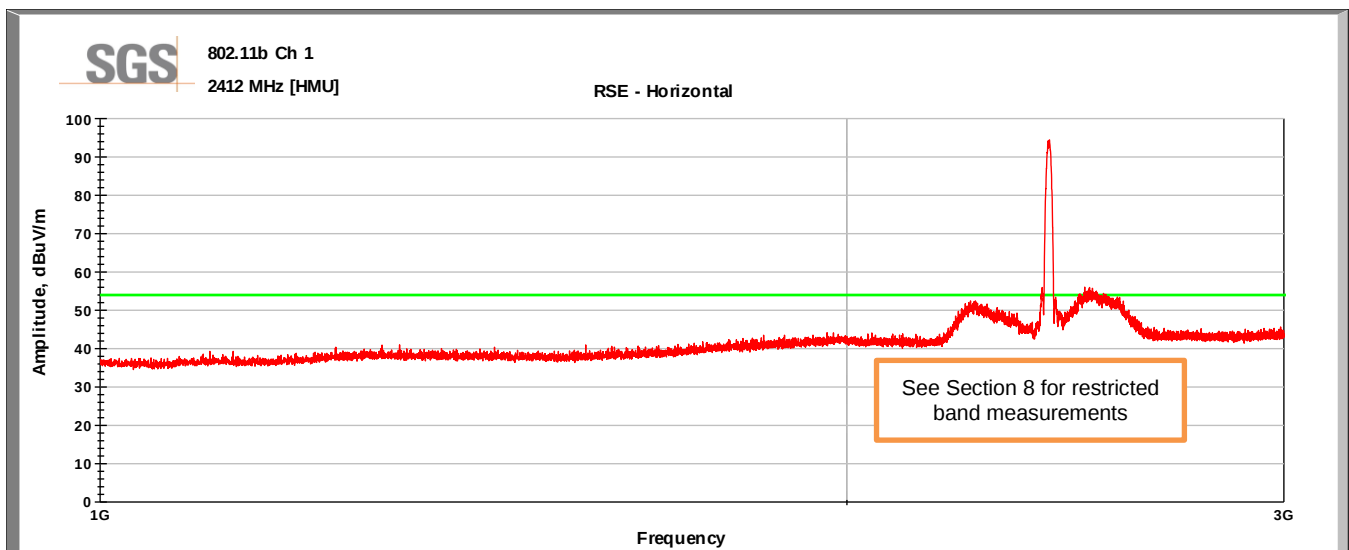
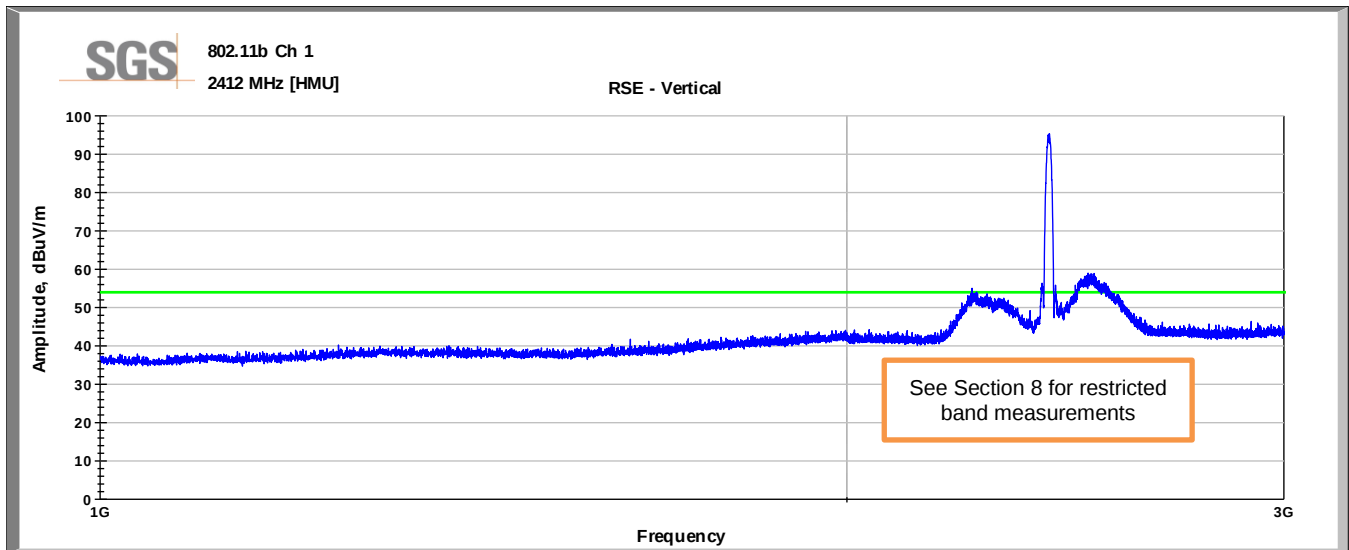
7.5 Test Data – 802.11b 1 Mbps [Antenna Radiation]

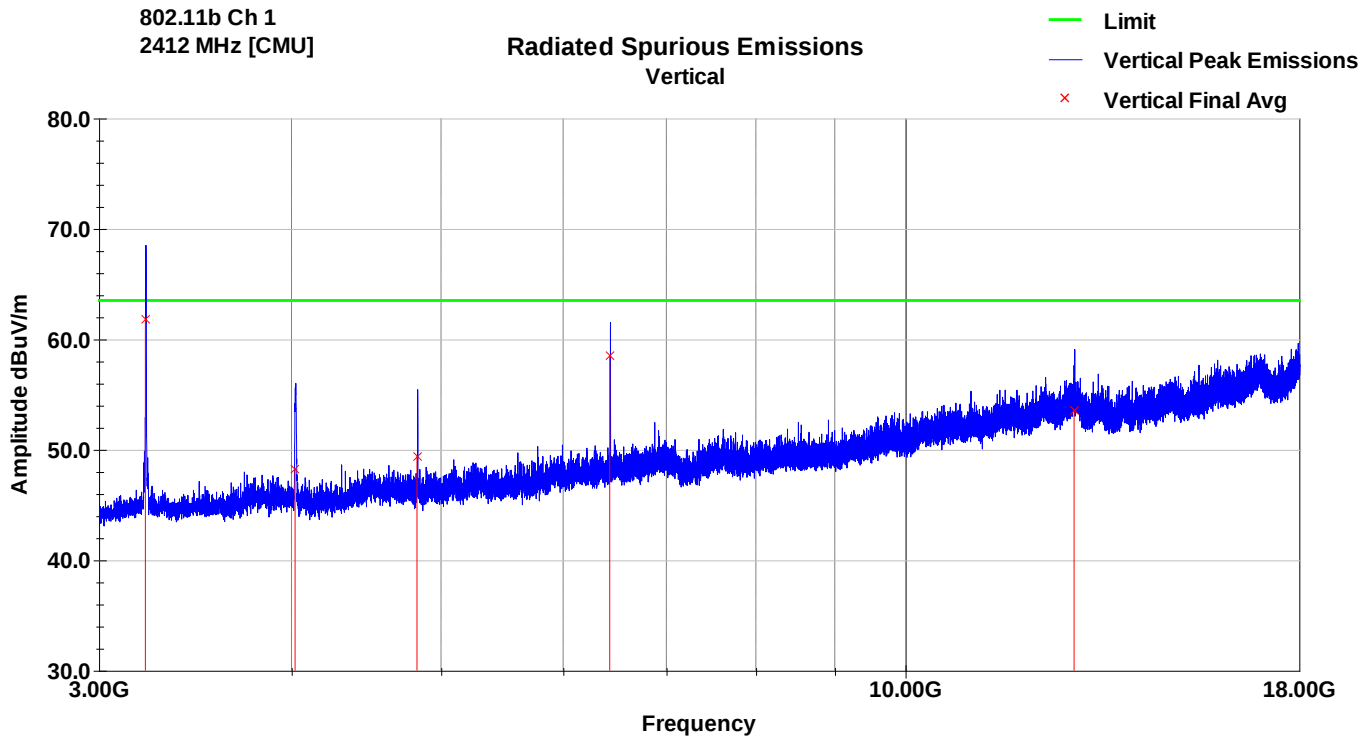
No emissions were detected in the range 9kHz to 30MHz.
Below 1 GHz and above 18 GHz no significant emissions detected regardless of channel



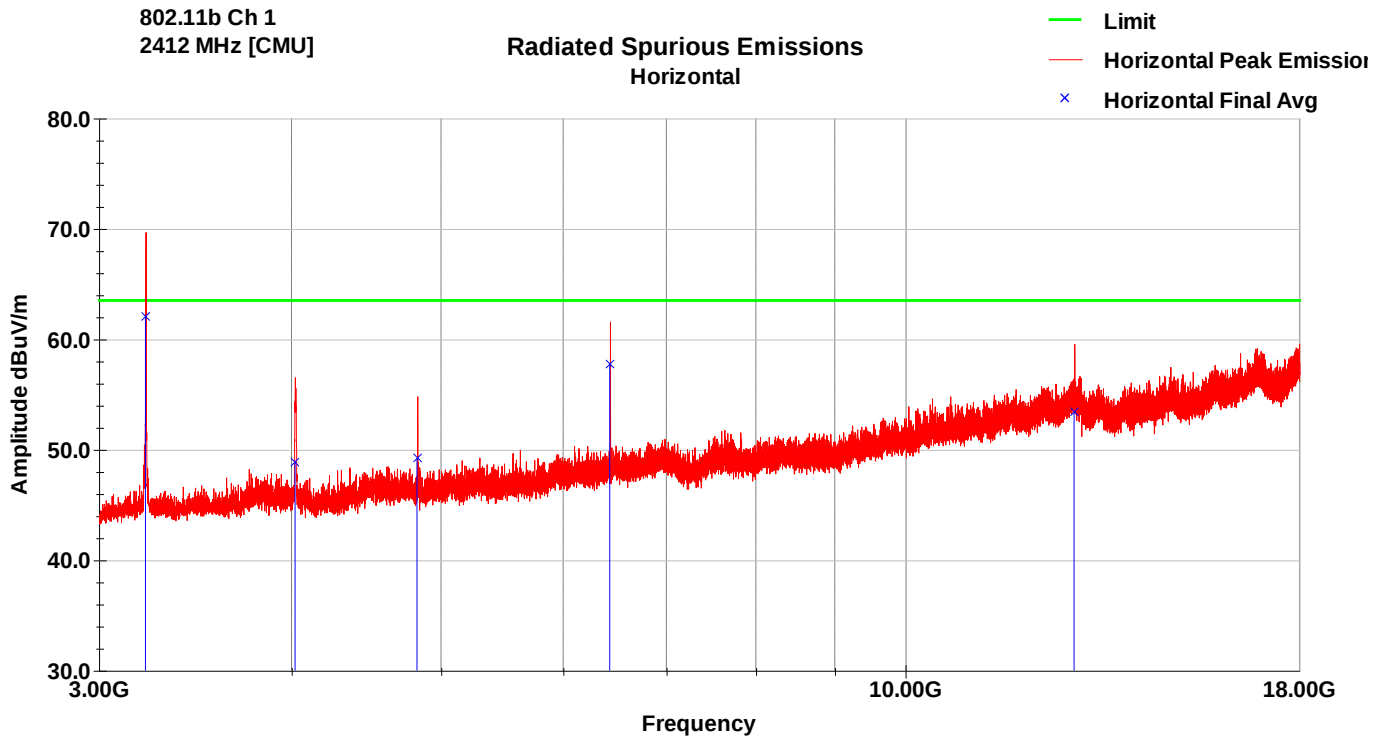


7.5.1 Channel 1



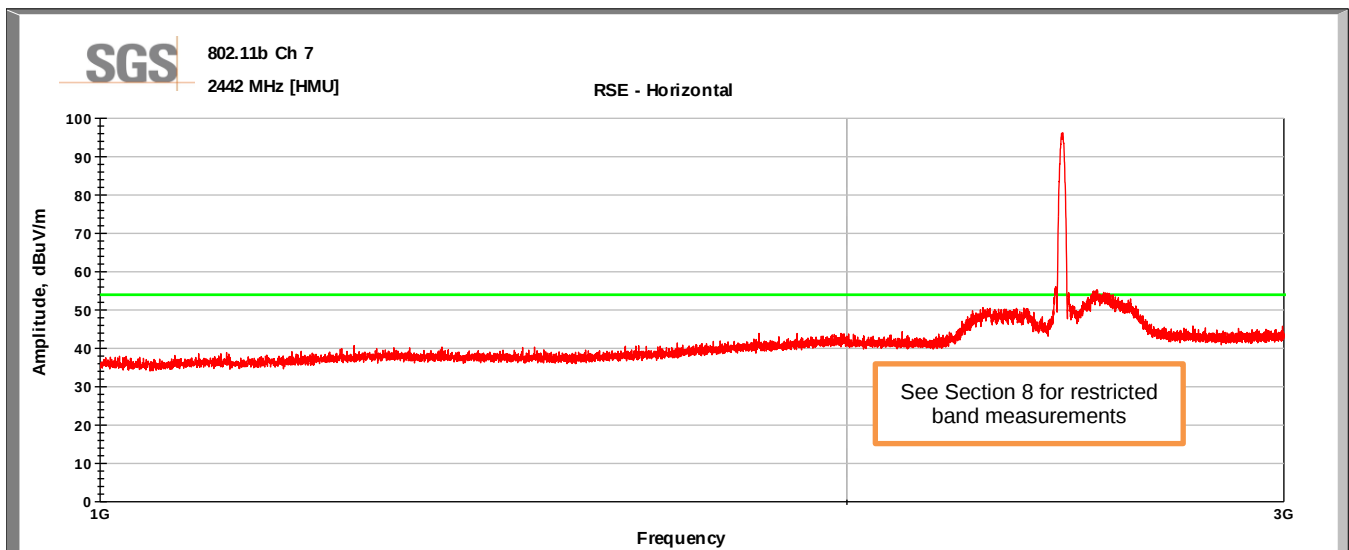
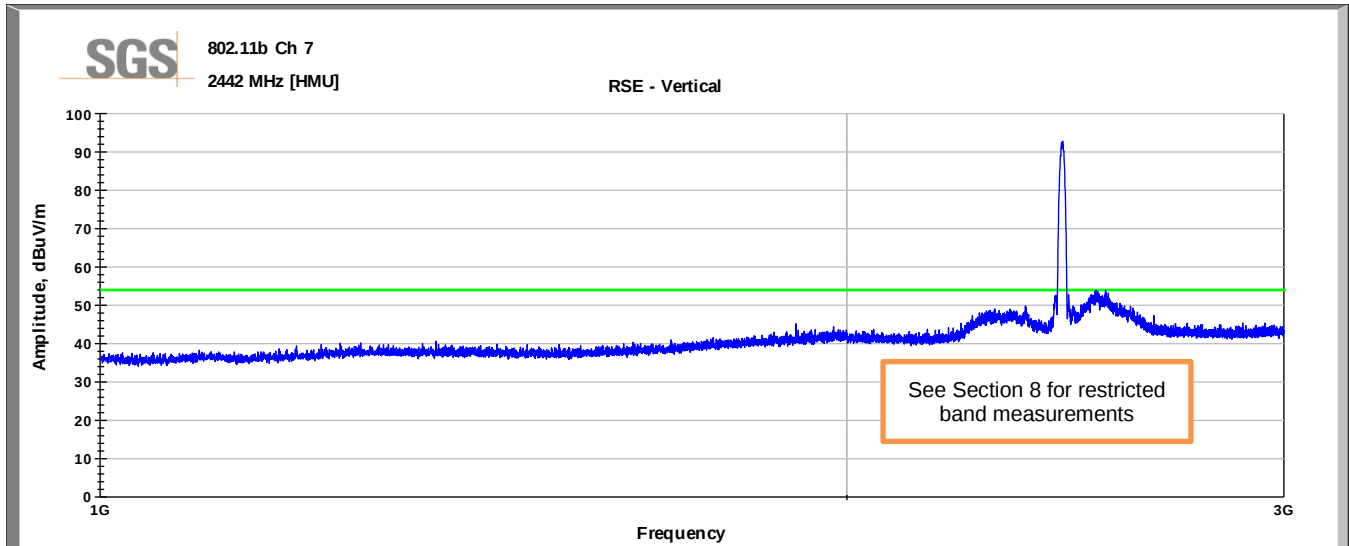


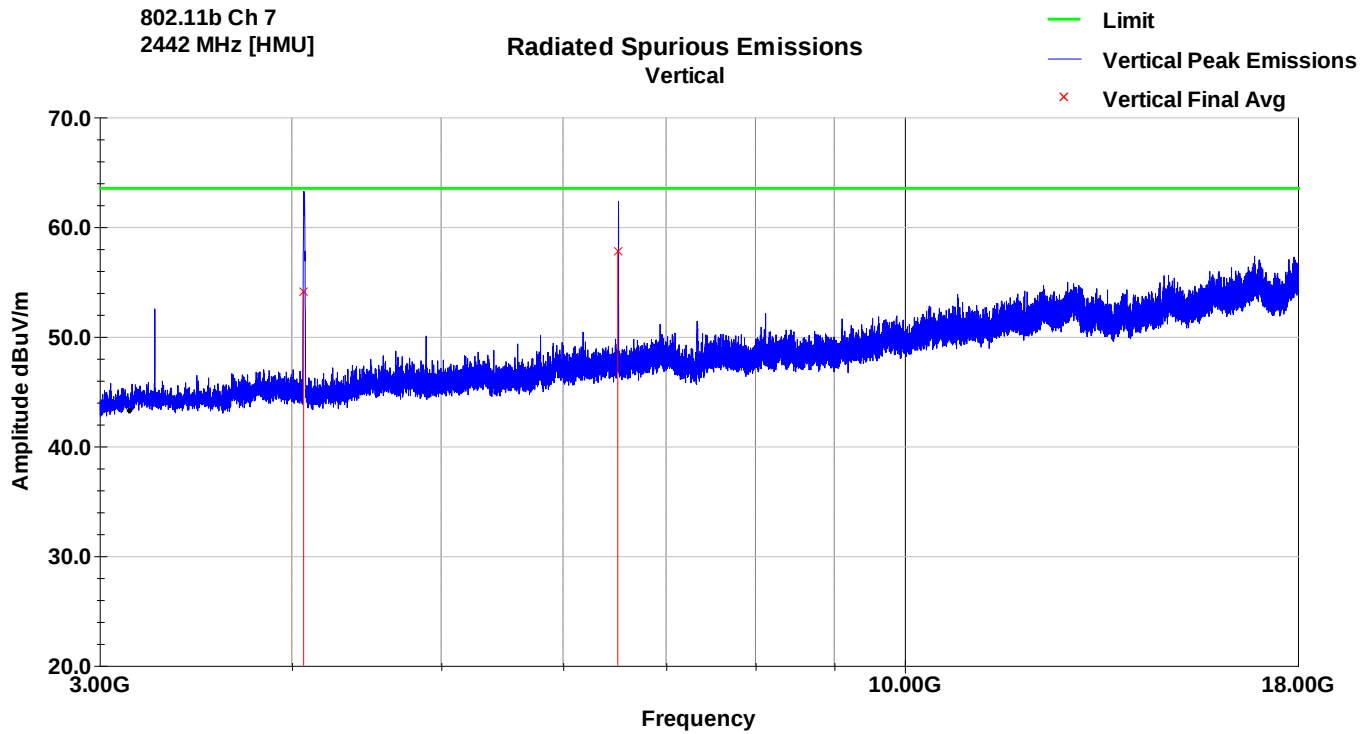
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
3215.80	58.5	V	176.0	186.0	33.8	2.9	33.4	61.8	63.5	-1.7
4021.42	44.3	V	190.0	182.0	34.1	3.3	33.4	48.3	63.5	-15.2
4823.94	44.7	V	160.0	165.0	34.6	3.6	33.5	49.4	63.5	-14.1
6432.30	51.6	V	323.0	188.0	36.1	4.2	33.4	58.5	63.5	-5.0
12864.44	41.1	V	243.0	168.0	39.6	6.2	33.3	53.6	63.5	-9.9
Avg Value = Level + AF + CL - Amp										
Margin = Avg Value - Limit										



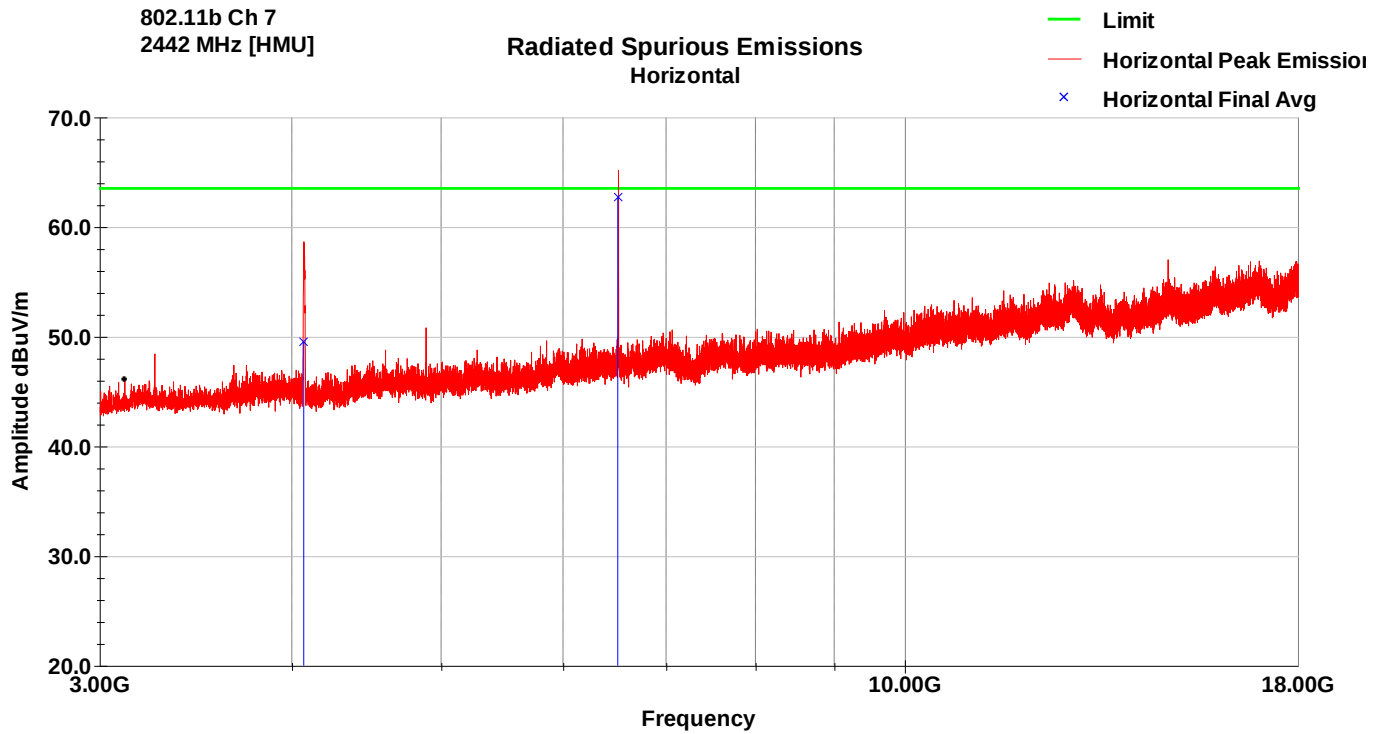
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
3216.16	58.8	H	174.0	191.0	33.8	2.9	33.4	62.1	63.5	-1.4
4021.06	44.9	H	178.0	205.0	34.1	3.3	33.4	48.9	63.5	-14.6
4823.94	44.5	H	174.0	175.0	34.6	3.6	33.5	49.2	63.5	-14.3
6432.06	50.8	H	311.0	189.0	36.1	4.2	33.4	57.7	63.5	-5.8
12864.20	40.9	H	257.0	173.0	39.6	6.2	33.3	53.4	63.5	-10.1
Avg Value = Level + AF + CL - Amp										
Margin = Avg Value - Limit										

7.5.2 Channel 7



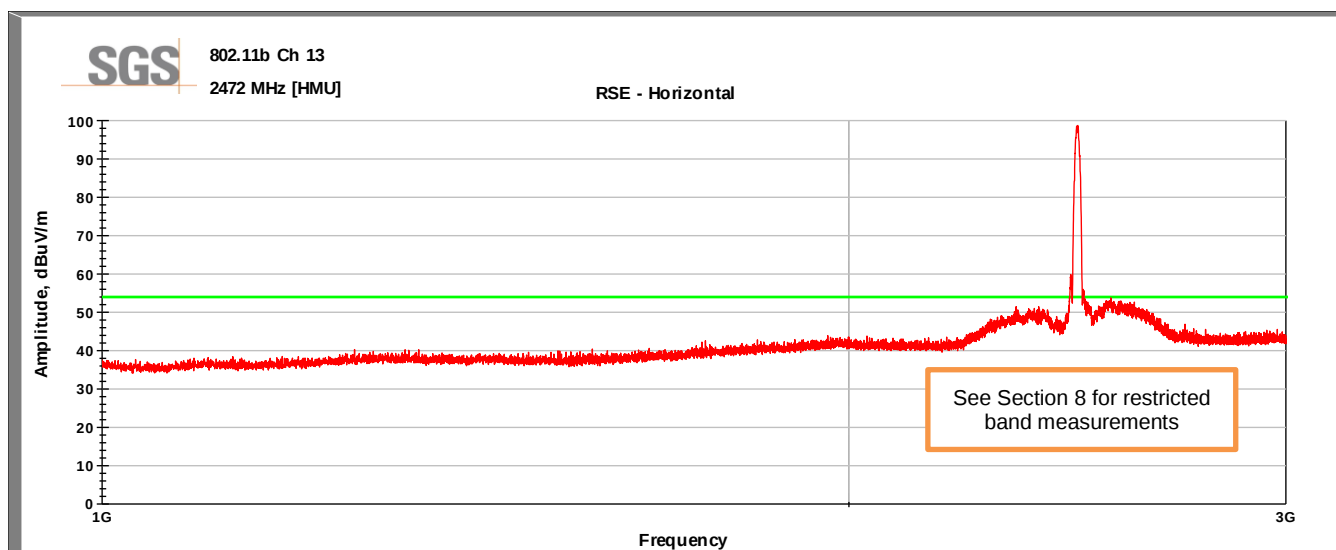
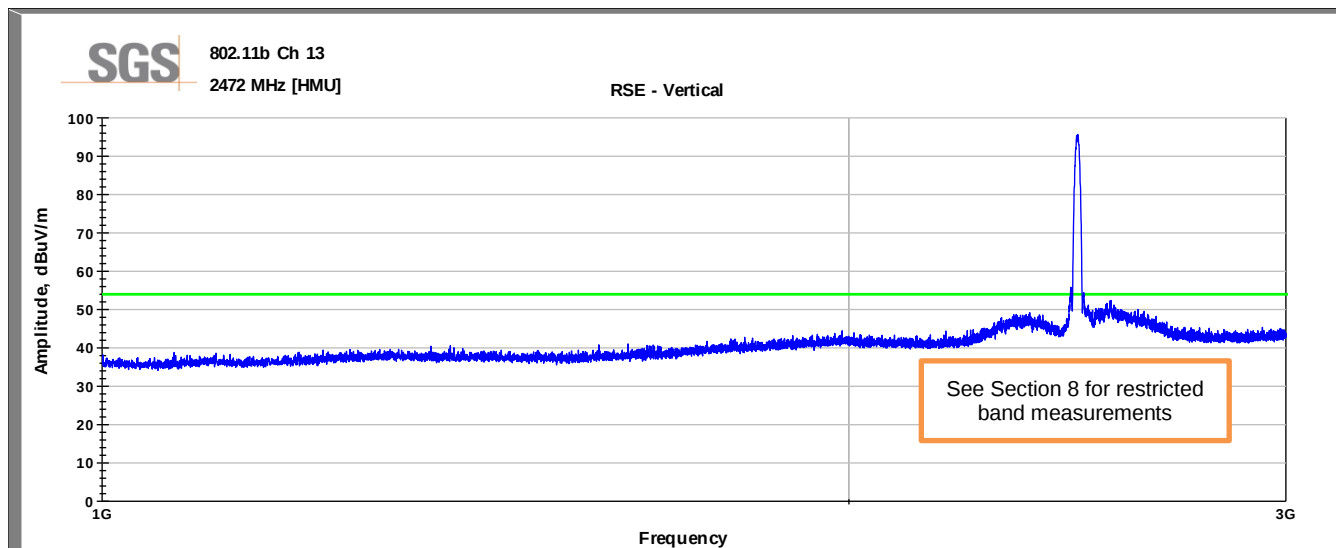


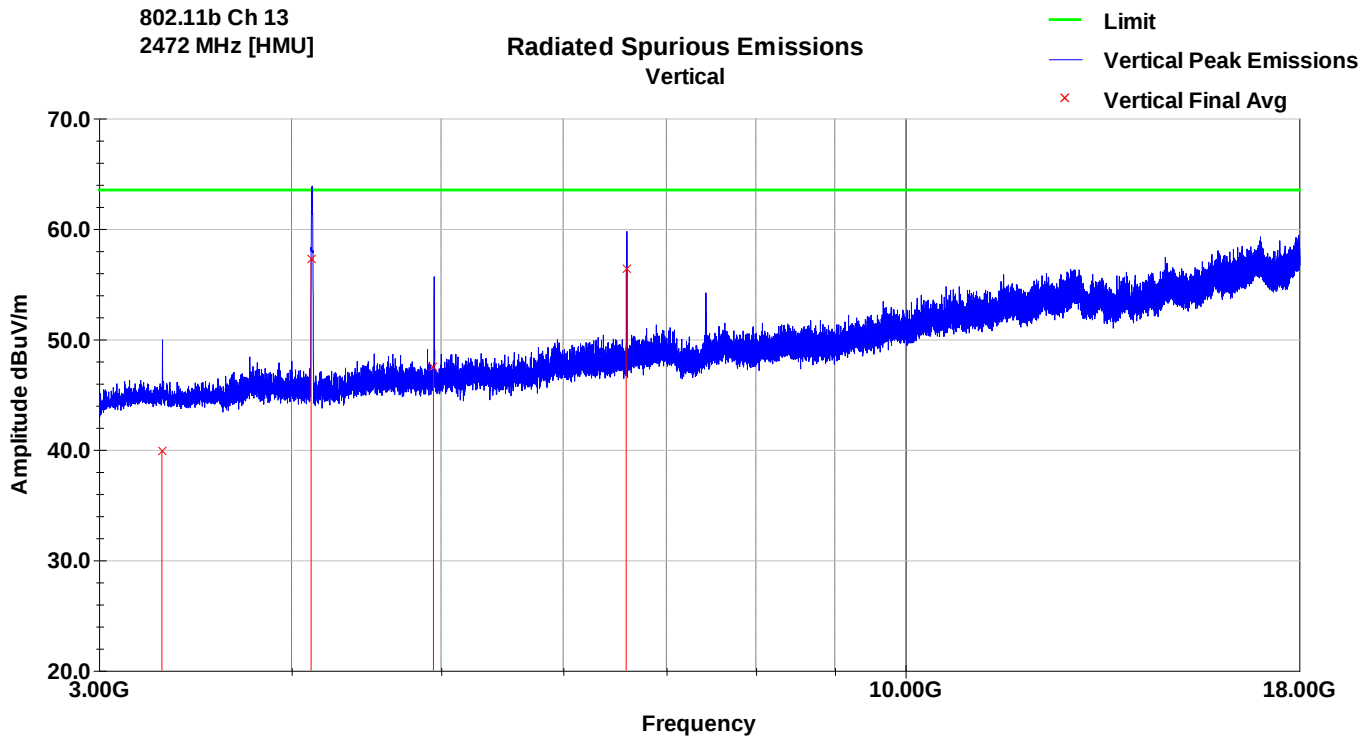
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
4071.00	50.8	V	289.0	187.0	34.1	2.6	33.4	54.1	63.5	-9.4
6512.10	51.7	V	197.0	196.0	36.1	3.4	33.4	57.7	63.5	-5.8
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



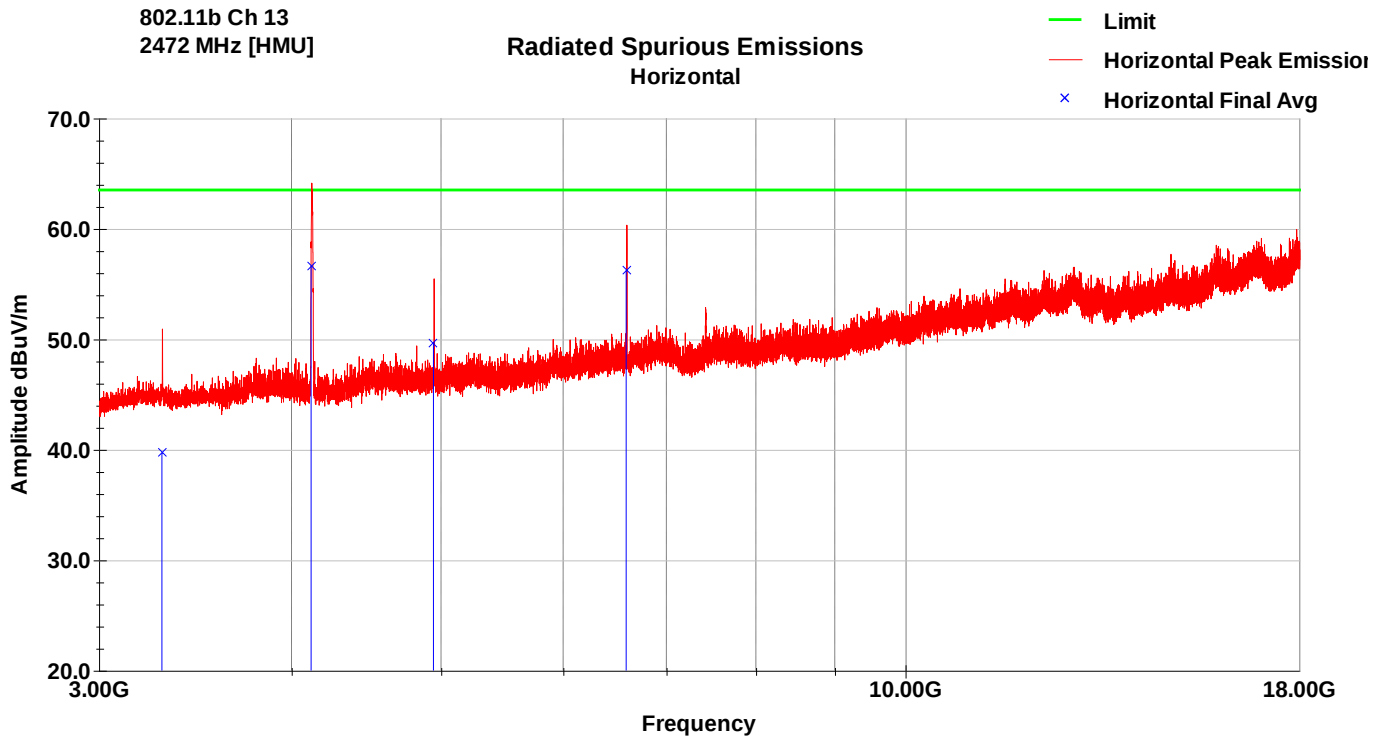
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
4071.80	46.3	H	347.0	182.0	34.1	2.6	33.4	49.5	63.5	-14.0
6512.00	56.6	H	173.0	150.0	36.1	3.4	33.4	62.7	63.5	-0.8
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

7.5.3 Channel 13





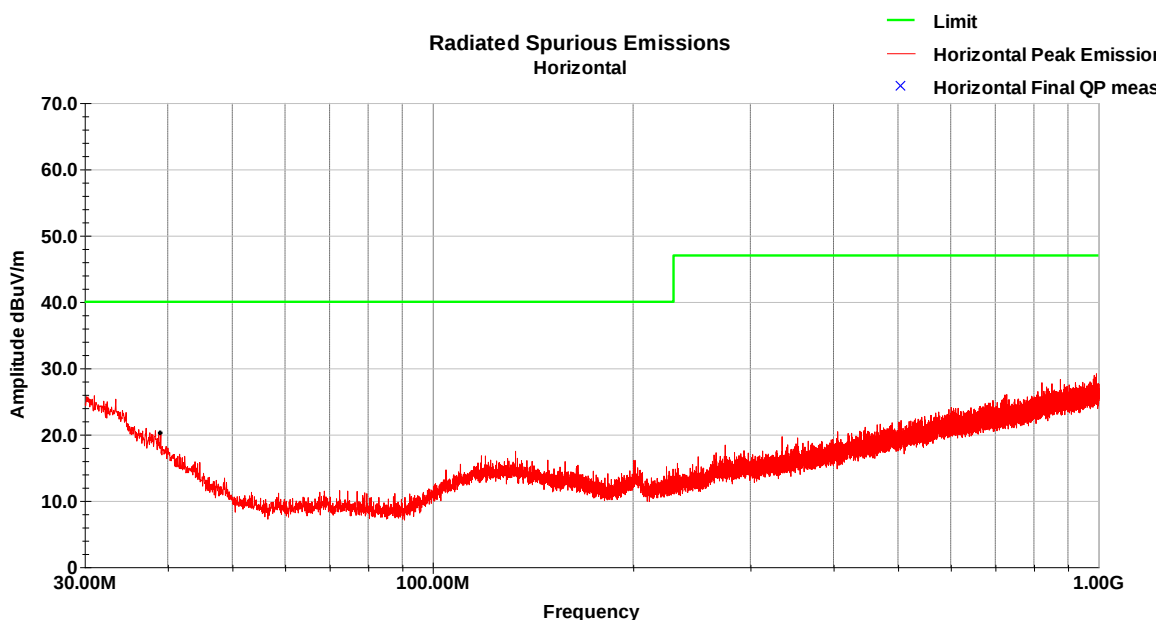
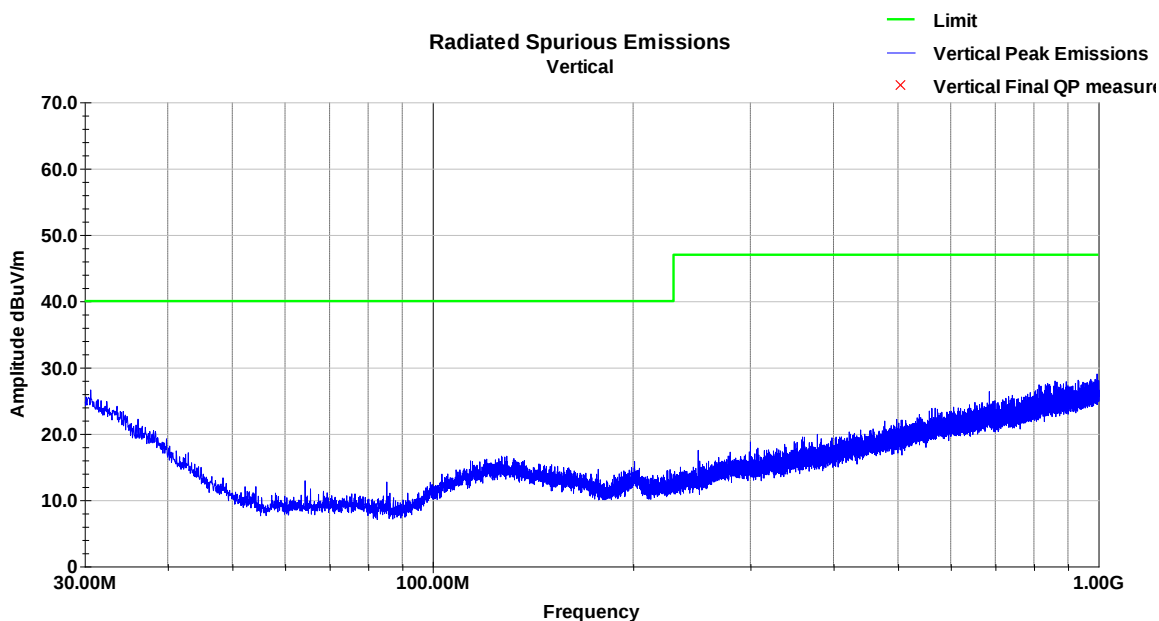
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
3296.28	36.7	V	199.0	140.0	33.7	2.9	33.4	39.8	63.5	-23.7
4119.02	53.3	V	177.0	141.0	34.0	3.3	33.4	57.2	63.5	-6.3
4943.92	42.5	V	224.0	199.0	34.7	3.6	33.4	47.4	63.5	-16.1
6592.06	49.3	V	347.0	171.0	36.1	4.3	33.4	56.3	63.5	-7.2
12864.20	40.9	H	257.0	173.0	39.6	6.2	33.3	53.4	63.5	-10.1
Avg Value = Level + AF + CL - Amp										
Margin = Avg Value - Limit										

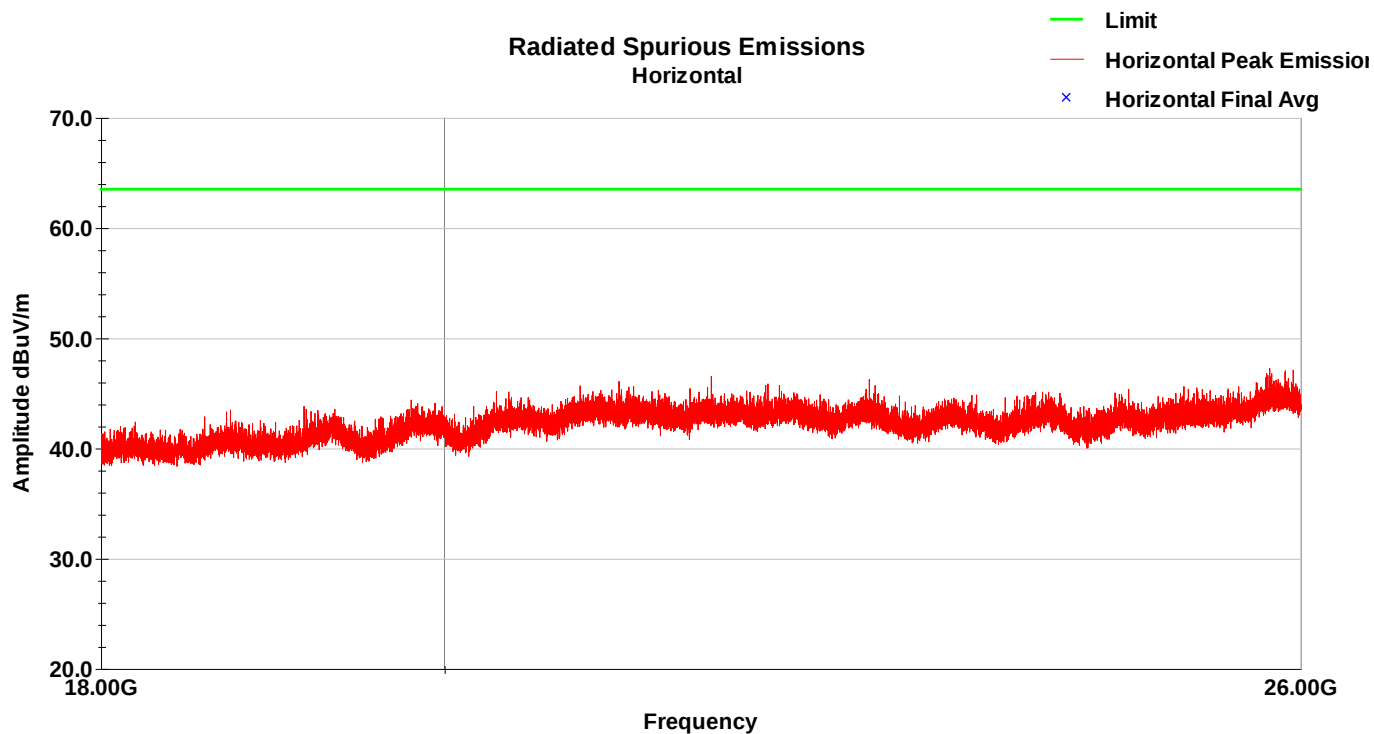
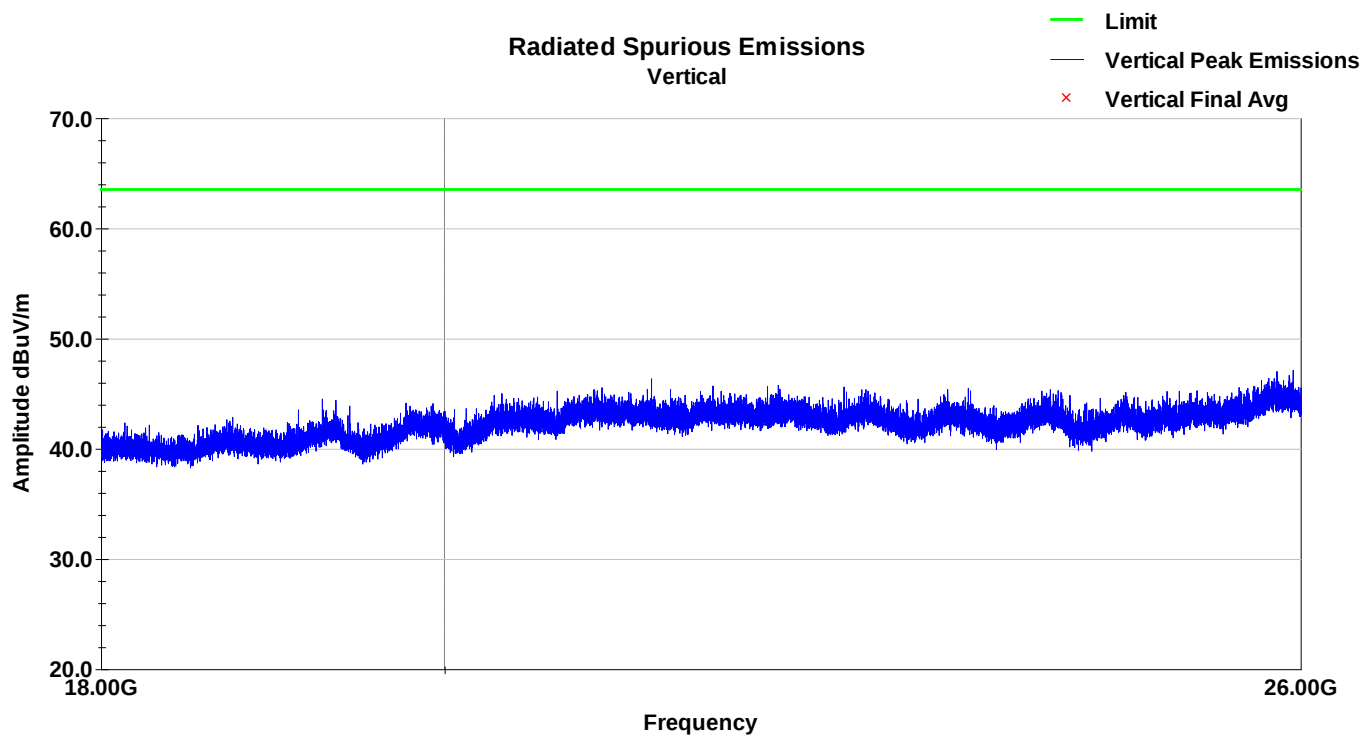


Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
3296.52	36.5	H	202.0	117.0	33.7	2.9	33.4	39.7	63.5	-23.8
4118.66	52.7	H	178.0	136.0	34.0	3.3	33.4	56.7	63.5	-6.8
4944.16	44.8	H	224.0	175.0	34.7	3.6	33.4	49.7	63.5	-13.8
6592.06	49.2	H	349.0	170.0	36.1	4.3	33.4	56.3	63.5	-7.2
12864.20	40.9	H	257.0	173.0	39.6	6.2	33.3	53.4	63.5	-10.1
Avg Value = Level + AF + CL - Amp										
Margin = Avg Value - Limit										

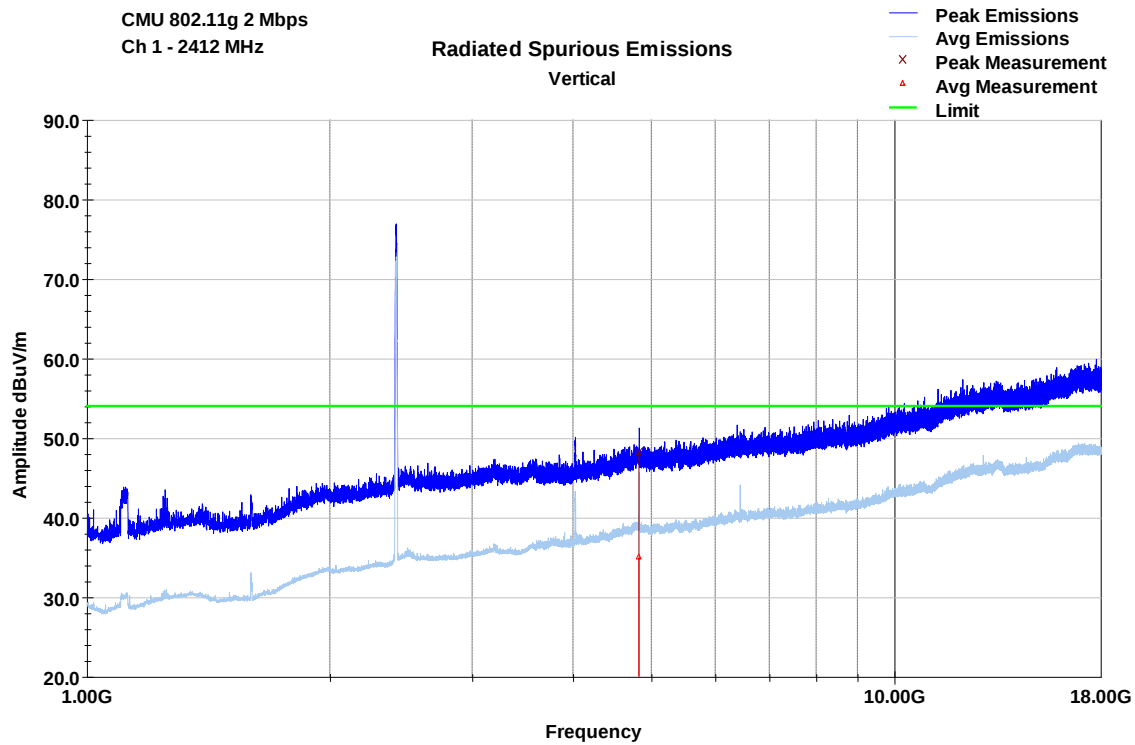
7.6 Test Data – 802.11g 6 Mbps [Cabinet Radiation]

No emissions were detected in the range 9kHz to 30MHz.
Below 1 GHz and above 18 GHz no significant emissions detected regardless of channel



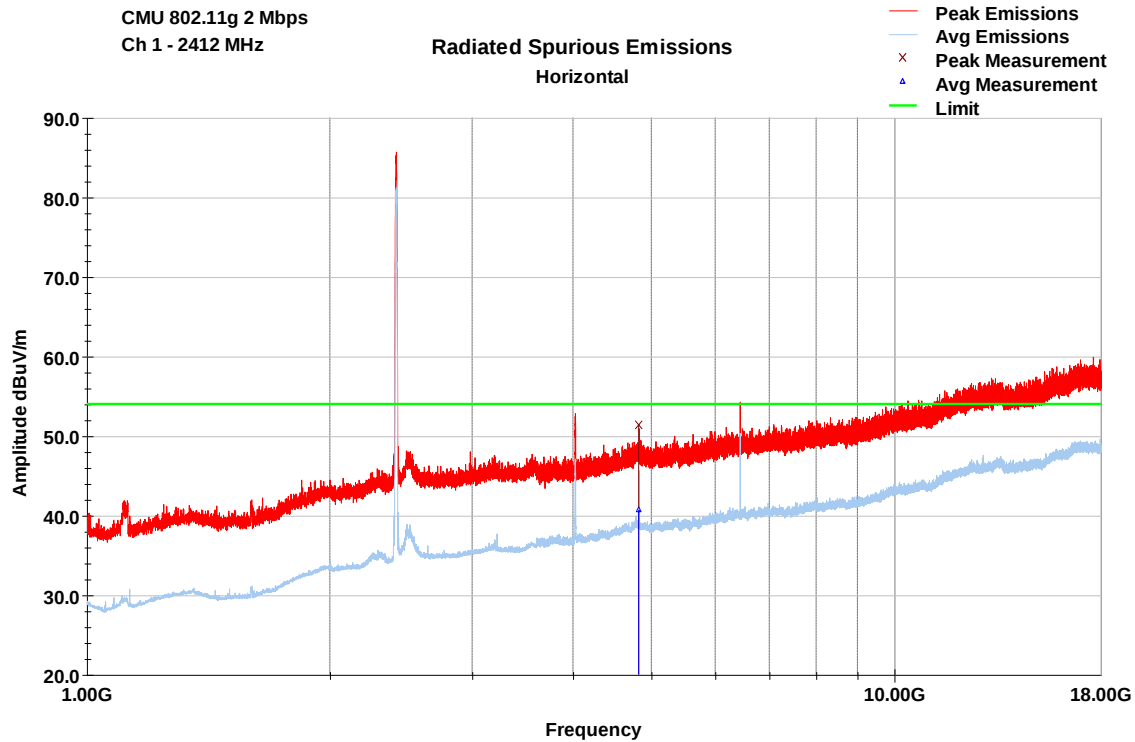


7.6.1 Channel 1



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4828.36	43.6	V	88.0	175.0	34.6	3.5	33.5	48.3	74.0	-25.7
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

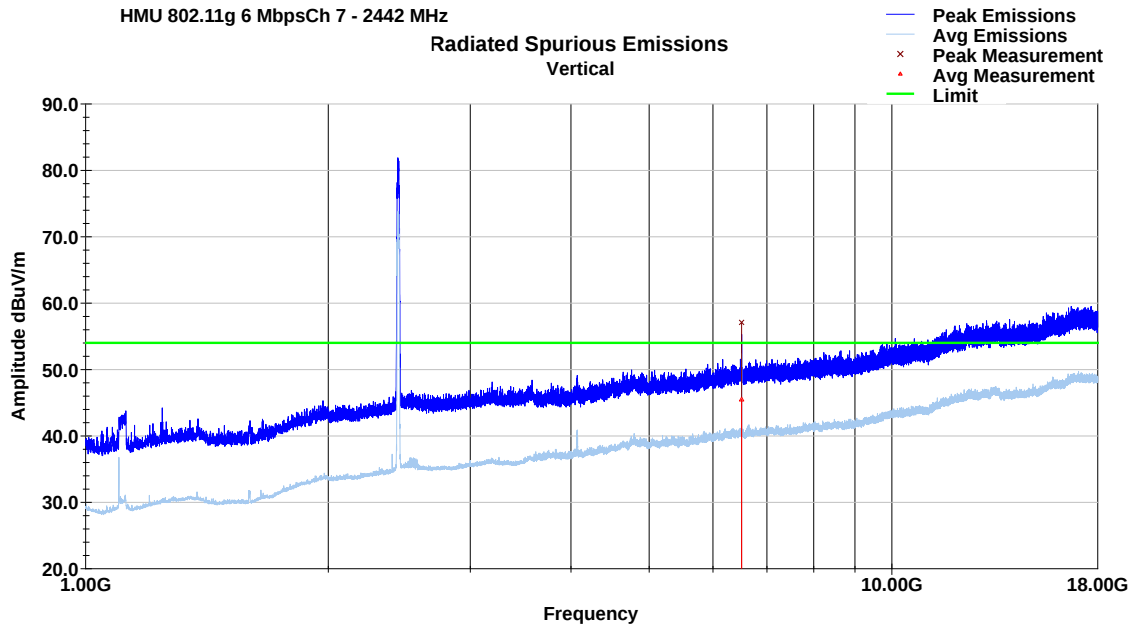
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
4828.36	30.5	V	88.0	175.0	34.6	3.5	33.5	35.1	54.0	-18.9
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4824.40	46.8	H	190.0	135.0	34.7	3.5	33.5	51.4	74.0	-22.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

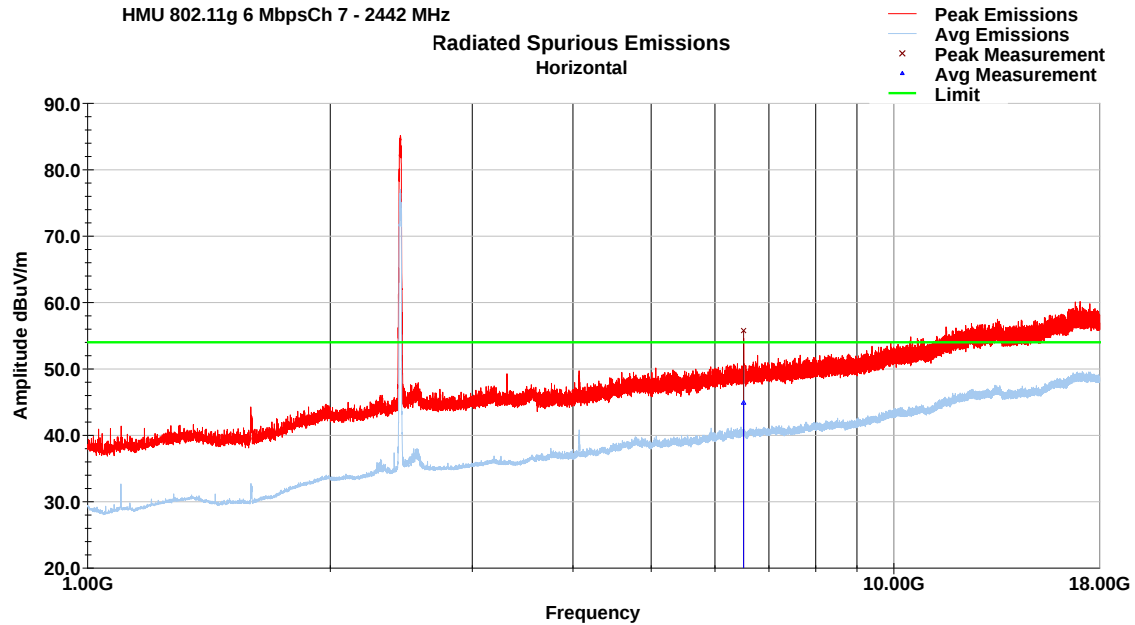
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit dBuV/m	Margin (dB)
4824.40	36.1	H	190.0	135.0	34.7	3.5	33.5	40.7	54.0	-13.3
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

7.6.2 Channel 7



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
6511.93	50.8	V	60.0	100.0	35.6	4.1	33.4	57.1	74.0	-16.9
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

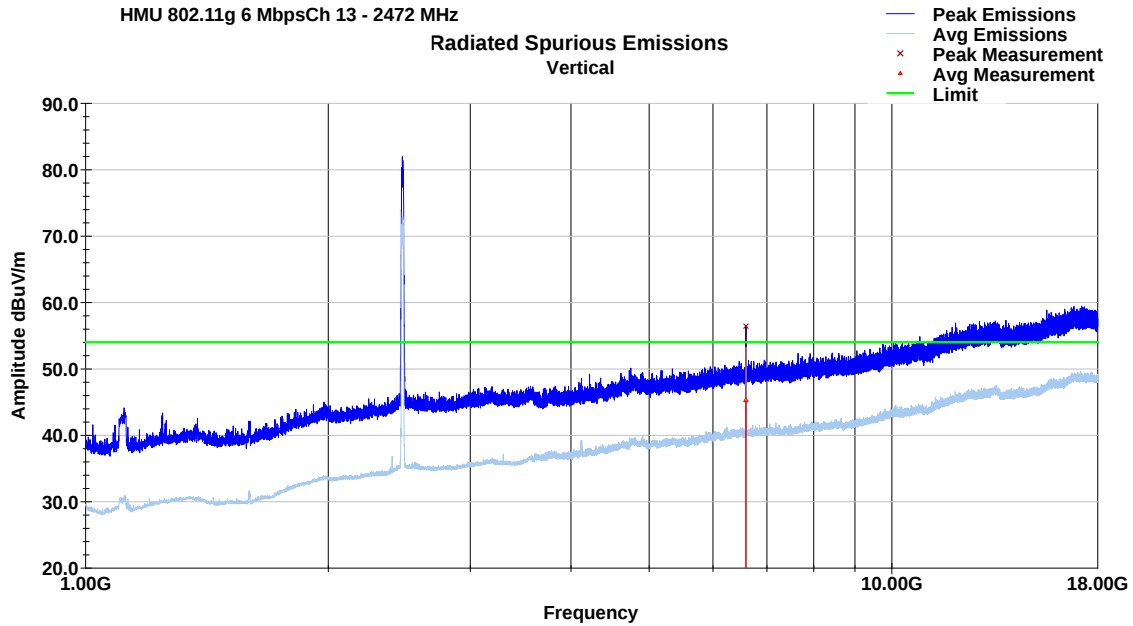
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
6511.93	39.2	V	60.0	100.0	35.6	4.1	33.4	45.5	54.0	-8.5
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
6512.23	49.5	H	159.0	106.0	35.6	4.1	33.4	55.8	74.0	-18.2
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

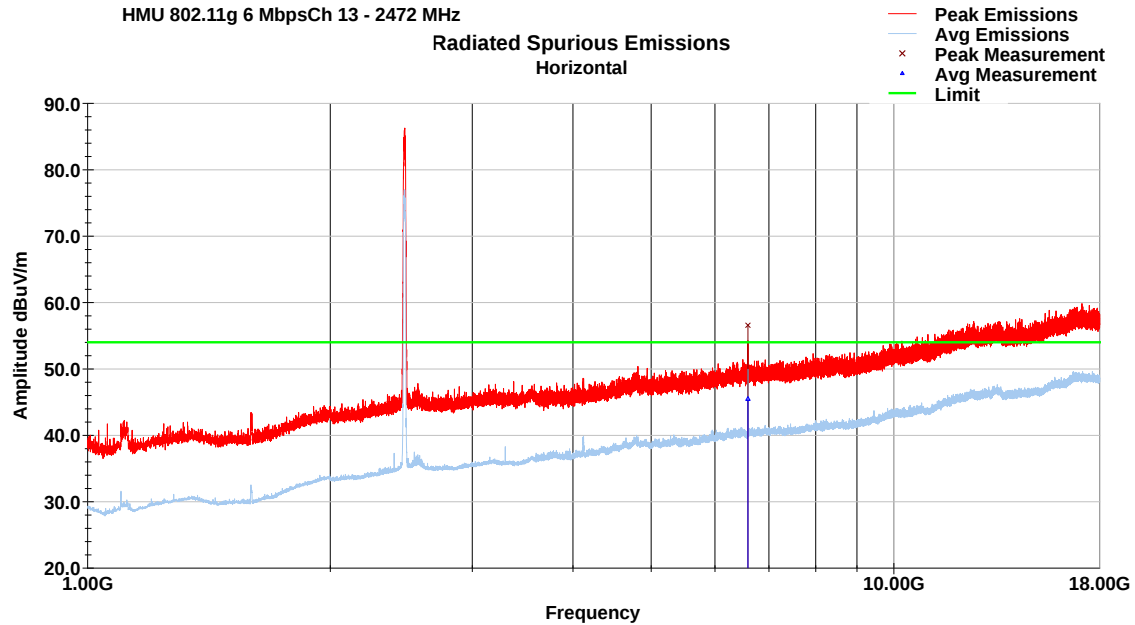
Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit dBuV/m	Margin (dB)
6512.23	38.6	H	159.0	106.0	35.6	4.1	33.4	44.9	54.0	-9.1
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

7.6.3 Channel 13



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
6592.31	50.1	V	56.0	100.0	35.6	4.1	33.4	56.4	74.0	-17.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit dBuV/m	Margin (dB)
6592.31	39.0	V	56.0	100.0	35.6	4.1	33.4	45.3	54.0	-8.7
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
6592.11	50.2	H	56.0	101.0	35.6	4.1	33.4	56.6	74.0	-17.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit dBuV/m	Margin (dB)
6592.11	39.2	H	56.0	101.0	35.6	4.1	33.4	45.5	54.0	-8.5
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

8 Emissions in Restricted Frequency Bands

8.1 Test Result

Test Description	Test Specification		Test Result
Restricted Band Emissions	15.205 / 15.209	RSS-GEN S8.9 / 8.10	Compliant

8.2 Test Method

Field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz for each modulation. Measurements were made using the conducted methods defined in ANSI C63.10, Section 11.12.2.

Offset Calculations:

Offset calculations so that conducted measurements on the spectrum analyzer in dBμV represent field strength measurements in dBμV/m.

CL = Cable Loss, DCCF = Duty Cycle Correction Factor, AG = Antenna Gain (minimum 2)

Offset = $-20\log(D) + 104.8 - 107 + CL + DCCF + AG$

Offset_{3m} = $-11.7 + CL + DCCF + AG$

802.11	Rate	DCCF	CL	AG	Offset
b	1 Mbps	1.99	11	2	3.29
g	6 Mbps	5.13	11	2	6.43
n	MCS0	5.20	11	2	6.50

8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.3 °C

Relative Humidity: 29.1 %

Atmospheric Pressure: 984 kPa

8.4 Test Equipment

Band Edge:

Test End Date: 11-Jan-2019

Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095591	25-Jul-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095585	25-Jul-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019

Note: The equipment calibration period is 1 year.

Conducted Spurious Emissions in Restricted Bands:

Test End Date: 14-Jan-2019

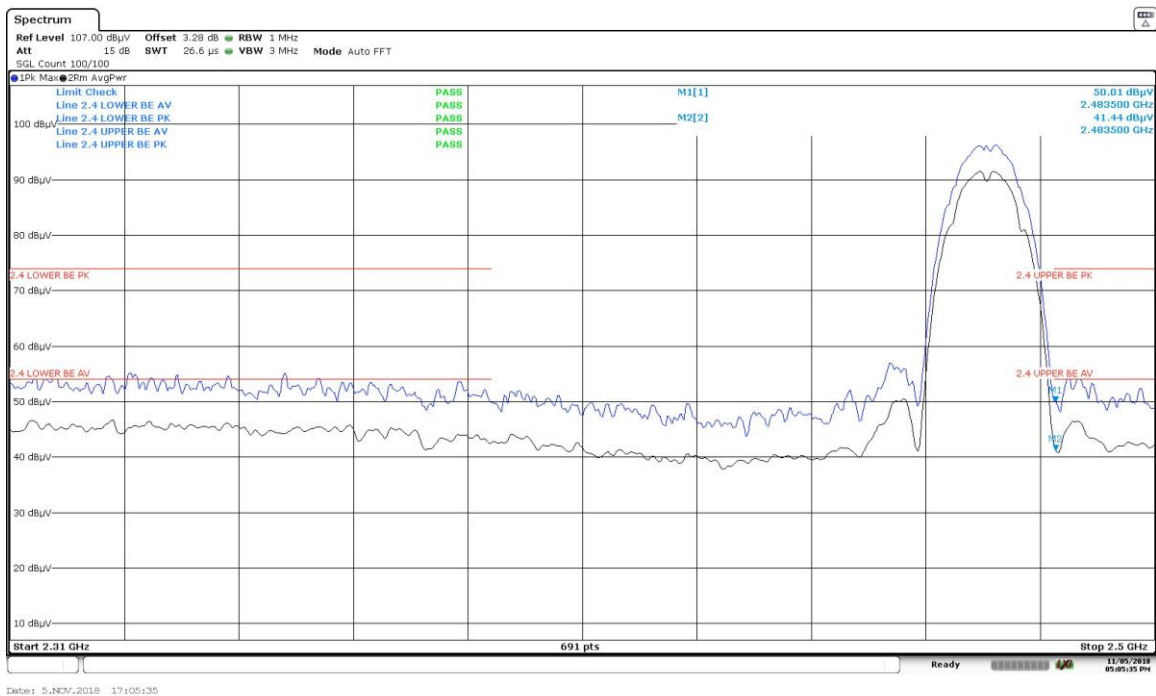
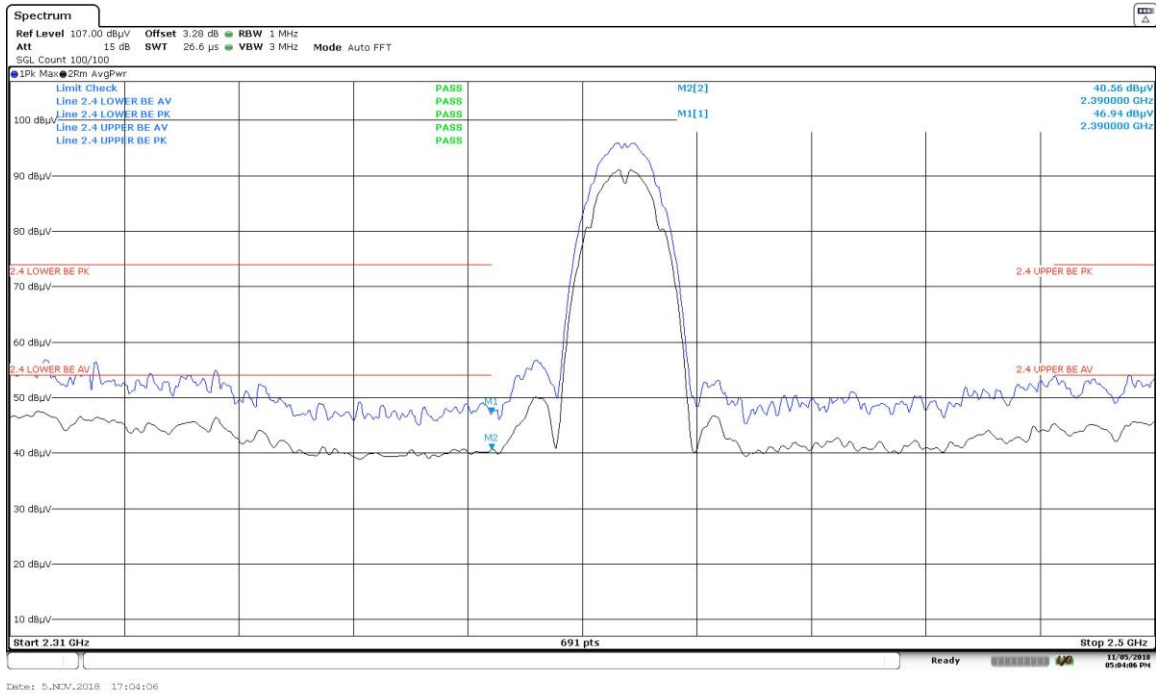
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095591	25-Jul-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095585	25-Jul-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
RF CABLE	SF102	HUBER & SUHNER	B079824	25-Jul-2019

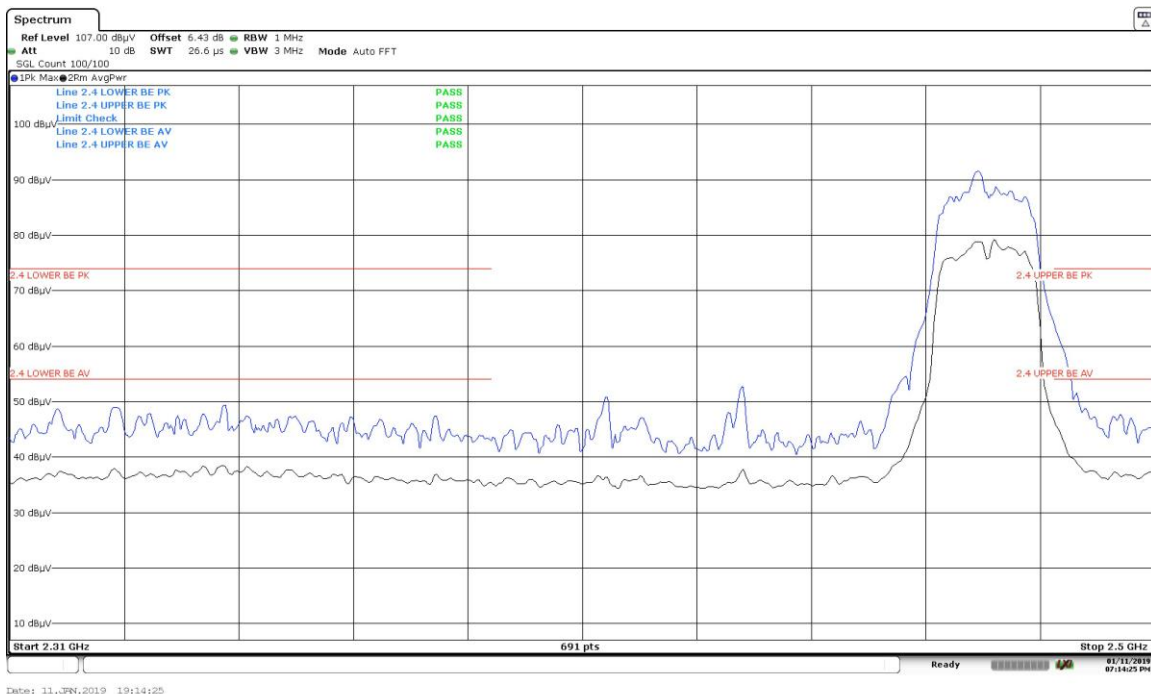
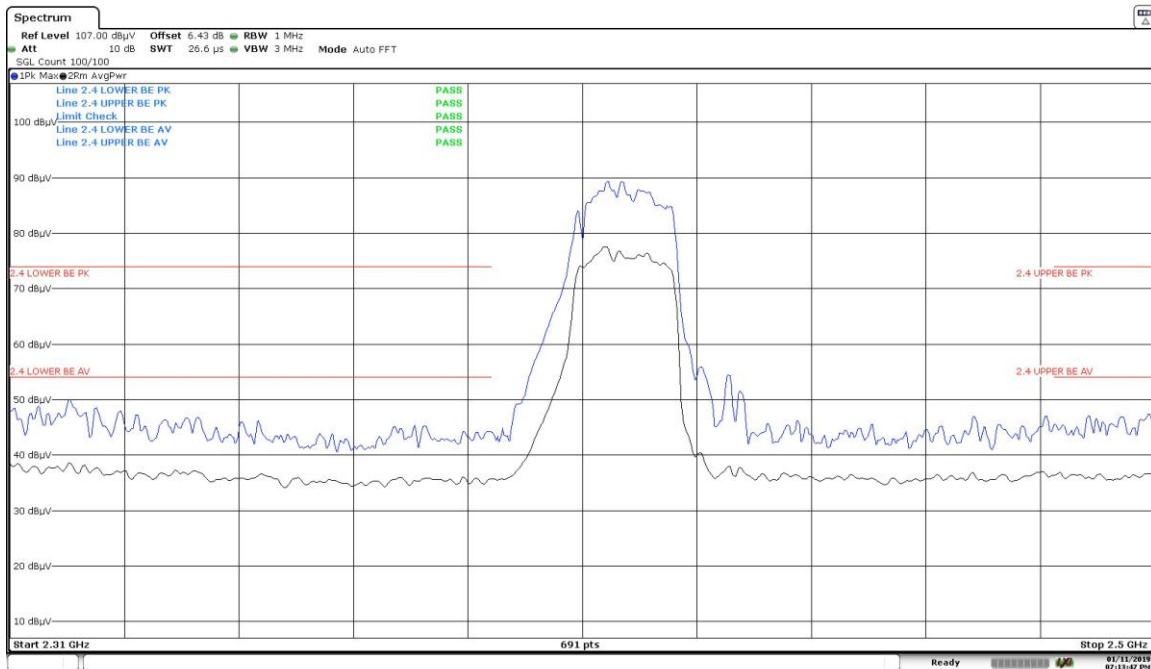
Note: The equipment calibration period is 1 year.

8.5 Test Data – Restricted Band Edge

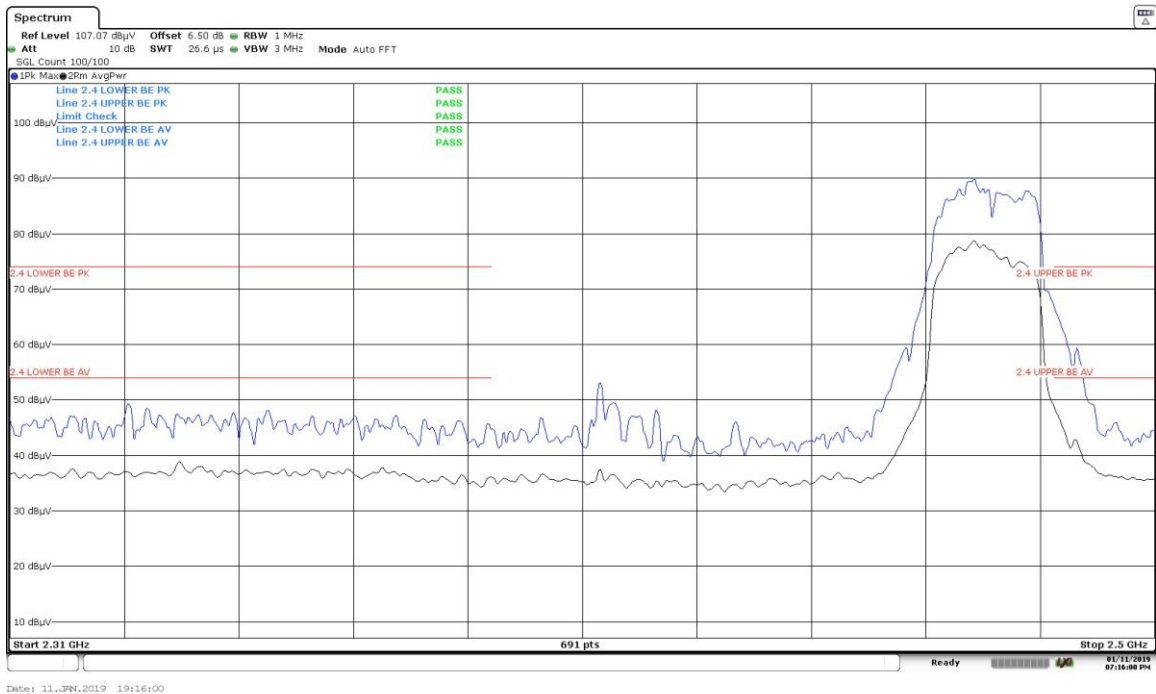
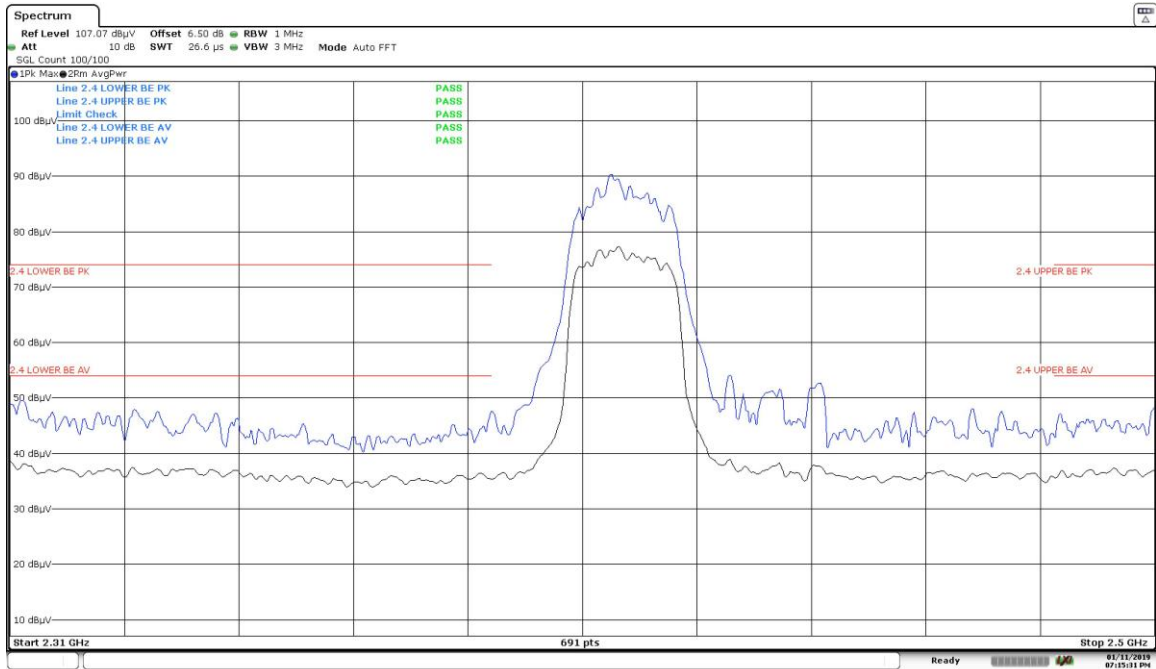
8.5.1 802.11b 1 Mbps



8.5.2 802.11g 6 Mbps



8.5.3 802.11n MCS 0

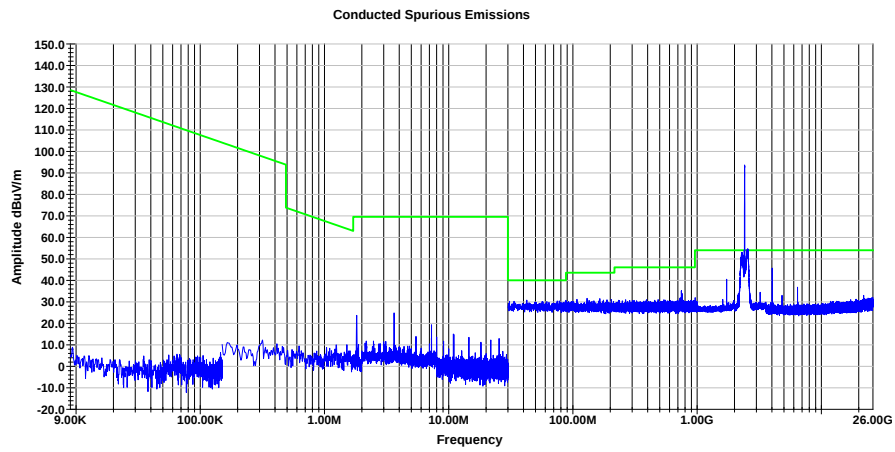


8.6 Test Data - Conducted Emissions in Restricted Bands

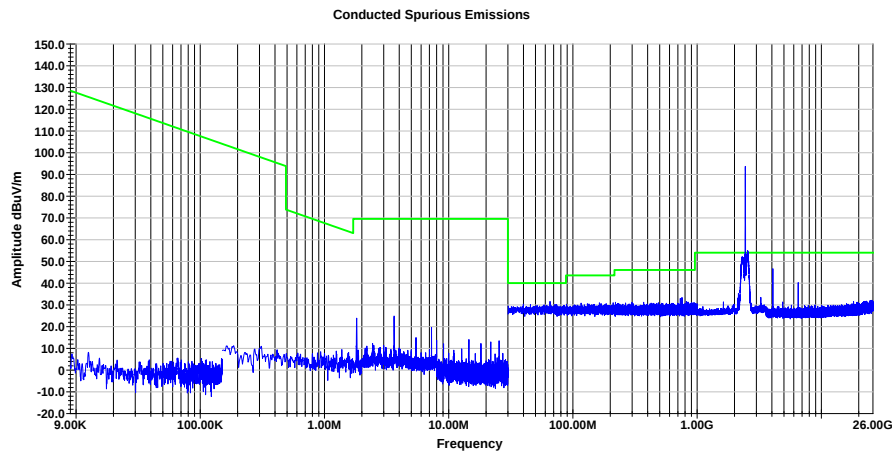
HMU Restricted Band Measurements								
DUT Data Rate	DUT Ch	DUT Freq MHz	Freq GHz	Pk Value dBuV/m	Ant Gain dBi	Final Value dBuV/m	Avg Limit dBuV/m	Margin dB
1 Mbps	1	2412	4.021	46.40	1.9	48.30	54	-5.70
1 Mbps	1	2412	4.824	34.17	1.9	36.07	54	-17.93
1 Mbps	1	2412	6.432	37.37	1.9	39.27	54	-14.73
1 Mbps	7	2442	4.071	46.69	1.9	48.59	54	-5.41
1 Mbps	7	2442	6.512	40.85	1.9	42.75	54	-11.25
1 Mbps	13	2472	4.122	43.70	1.9	45.60	54	-8.40
1 Mbps	13	2472	6.592	40.44	1.9	42.34	54	-11.66
6 Mbps	1	2412	6.433	45.51	1.9	47.41	54	-6.59
6 Mbps	7	2442	6.512	47.05	1.9	48.95	54	-5.05
6 Mbps	13	2472	6.592	46.47	1.9	48.37	54	-5.63

8.6.1 802.11b

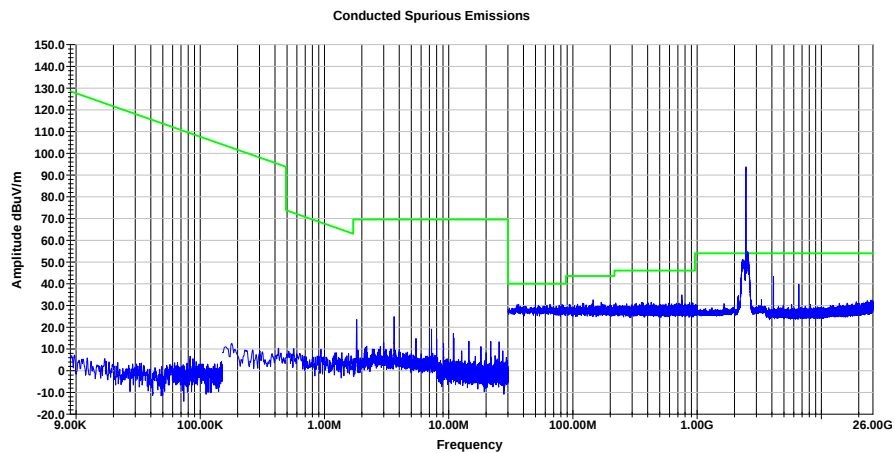
802.11b Ch 1 2412 MHz



802.11b Ch 7 2442 MHz

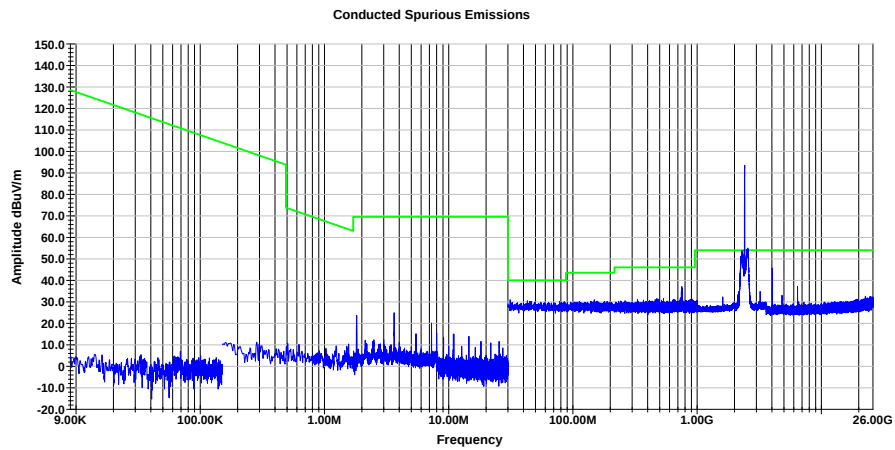


802.11b Ch 13 2472 MHz

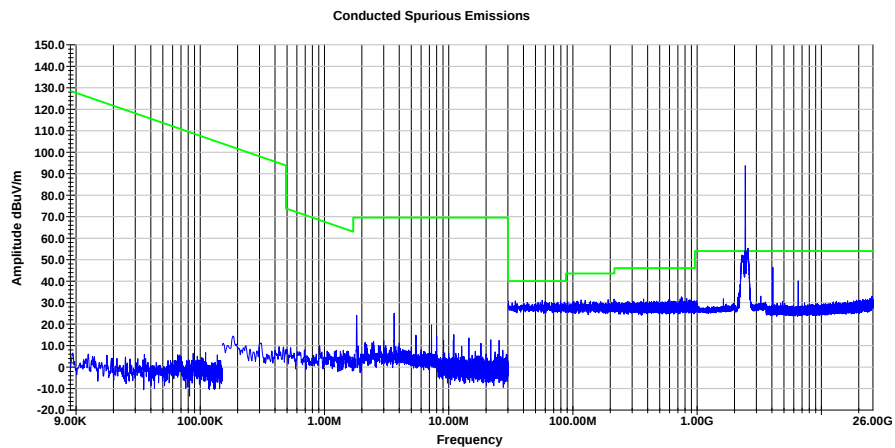


8.6.2 802.11g

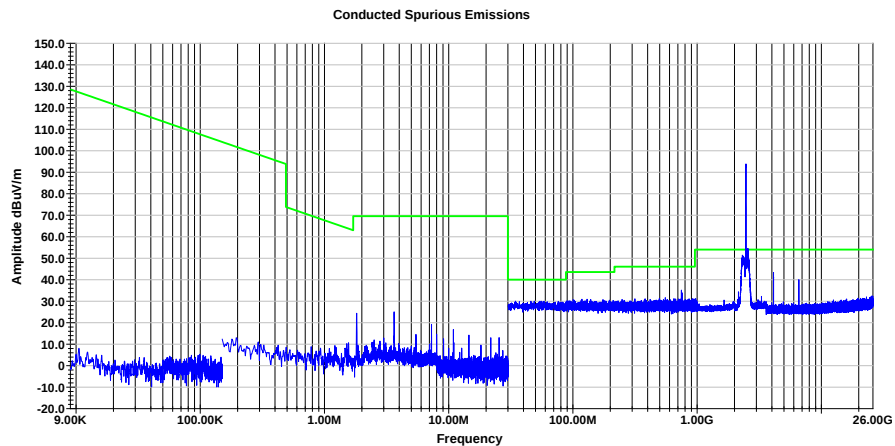
802.11b Ch 1 2412 MHz



802.11b Ch 7 2442 MHz



802.11b Ch 13 2472 MHz



9 Measurement Uncertainty

The measurement uncertainty figures are be calculated in accordance with TR 100 028-1 [2] and correspond to an expansion factor (coverage factor) $k = 2$ (which provide confidence levels of 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Parameter	Expanded Uncertainty for Normal k factor equal to 2	
	Required	Laboratory Actual
Radio Frequency	$\pm 1 \times 10^{-5}$	$\pm 9.8 \times 10^{-8}$
total RF power, conducted	± 1.5 dB	± 1.2 dB
RF power density, conducted	± 3 dB	± 0.7 dB
spurious emissions, conducted	± 3 dB	± 2.1 dB
all emissions, radiated	± 6 dB	± 4.8 dB
temperature	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
humidity	± 5 %	$\pm 3.5\%$
DC and low frequency voltages	± 3 %	$\pm 0.4\%$

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	
1	CMU data moved to report 4261199EMC08, Power, PSD, Restricted-Band Band-Edge, DTS Band Edge testing repeated	8 November 2018
2	Added "Worst Case" investigation to section 2. Added OFDM data to all sections.	24 January 2019
3	Added Band Edge RSS Gen S8.11 Frequency Stability Requirements. Also, added Section 9 Measurement Uncertainty.	15 February 2019