

RF Test Report

Project Number: 5003430**Offer Number:** SUW-202109001717**Report Number:** 5003430EMC01**Revision Level:** 2**Client:** UTEC, Inc.**Equipment Under Test:** Chiller Controller Display**Model Name:** PIC6.1 CONTROLLER**Model Numbers:** CEPL131258-01-R & CEPL131260-01-R**Contains FCC ID:** 2AK6N-WG233**Contains IC:** 703A-WG233**Applicable Standards:** FCC Part 15 Subpart C, § 15.247

RSS-247, Issue 2, February 2017

RSS-GEN, Issue 5, February 2021, Amendment 2

ANSI C63.10: 2013

Report issued on: 01 September 2023**Test Result:** Compliant

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

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Prepared by:

A handwritten signature in blue ink, appearing to read 'Martin Taylor', is written over a horizontal line.

Martin Taylor, Project Engineer

Reviewed by:

A handwritten signature in black ink, appearing to read 'Brandon E. Osborn', is written over a horizontal line.

Brandon Osborn, Project Engineer

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Table of Contents

1	SUMMARY OF TEST RESULTS	3
1.1	MODIFICATIONS REQUIRED FOR COMPLIANCE	3
2	GENERAL INFORMATION.....	4
2.1	CLIENT INFORMATION	4
2.2	TEST LABORATORY	4
2.3	GENERAL INFORMATION OF EUT	4
2.4	OPERATING MODES AND CONDITIONS	4
2.5	EUT CONNECTION BLOCK DIAGRAM.....	5
2.6	SYSTEM CONFIGURATIONS.....	5
2.7	CABLE LIST	5
3	FIELD STRENGTH OF SPURIOUS RADIATION.....	6
3.1	TEST RESULT.....	6
3.2	TEST METHOD.....	6
3.3	TEST SITE	6
3.4	TEST EQUIPMENT	7
3.5	TEST DATA – 7-INCH DISPLAY – 802.11B.....	8
3.6	TEST DATA – 7-INCH DISPLAY – 802.11G.....	16
3.7	TEST DATA – 7-INCH DISPLAY – 802.11N.....	23
3.8	TEST DATA – 10-INCH DISPLAY – 802.11B.....	30
3.9	TEST DATA – 10-INCH DISPLAY – 802.11G.....	39
3.10	TEST DATA – 10-INCH DISPLAY – 802.11N.....	46
4	AC POWERLINE CONDUCTED EMISSIONS.....	53
4.1	TEST RESULT.....	53
4.2	TEST METHOD.....	53
4.3	TEST SITE	53
4.4	TEST EQUIPMENT	53
4.5	TEST DATA.....	54
5	MEASUREMENT UNCERTAINTY.....	58
6	REVISION HISTORY	59

1 Summary of Test Results

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

Notes: (1) Not Required. A certified WLAN module is being used, so only Radiated Spurious Emissions and AC Powerline Conducted Emissions testing was performed.

(2) Two antennas are externally connected to the EUT via coaxial cables with standard SMA connectors, but after professional installation, the antenna connectors are not accessible to the end user since the EUT is installed inside an electrical control box with only the display screen exposed.

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Company Name: UTEC, Inc.
Address: 111 E. Wayne Street, Suite 800
City, State, Zip, Country: Fort Wayne, IN 46802, USA

2.2 Test Laboratory

Company 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
ISED CAB Identifier: US0186
FCC Designation Number: US1126

2.3 General Information of EUT

Type of Product: Chiller Controller Display
Model Name: PIC6.1 CONTROLLER
Model Numbers: CEPL131258-01-R (7-inch Display)
CEPL131260-01-R (10-inch Display)
Serial Numbers: 3422M095587 (7-inch Display)
3322M185726 (10-inch Display)
Board Part Number: CEBD431259-05-R (same PCB in both 7-inch and 10-inch Displays)
Contains FCC ID: 2AK6N-WG233
Contains IC: 703A-WG233

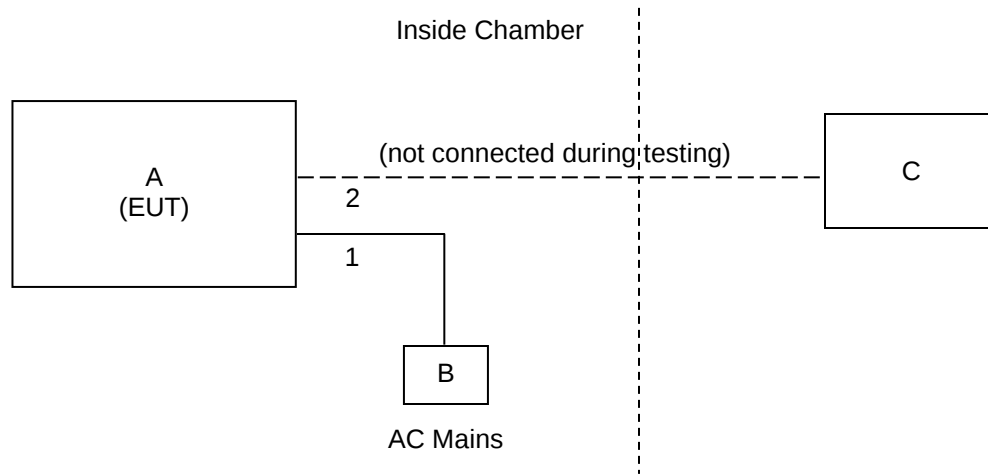
Frequency Ranges: 2412 – 2462 MHz
5180 – 5240 MHz (U-NII-1 Band)
5745 – 5825 MHz (U-NII-3 Band)
Data Modes: WLAN IEEE 802.11b/g/n (2.4GHz)
WLAN IEEE 802.11a/n/ac (5GHz)
Antennas: Two external antennas: MST-24/58BC-7 (7dBi)
Rated Voltage: 24Vac
Test Voltage: 24Vac

Sample Received Date: 23 November 2022
Dates of testing: 03-11 January, 23 March, 07 April and 17 August 2023

2.4 Operating Modes and Conditions

The EUT was powered by a 120-to-24Vac step-down transformer provided by the client. Test mode commands were issued to turn on the WLAN transmit signals at maximum power. A power setting of 44 was used and the worst-case data rates were tested for each data mode based on the original test report for the certified module. Low, middle and high WLAN channels were tested for the 2.4GHz band.

2.5 EUT Connection Block Diagram



2.6 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	UTEC, Inc.	Chiller Controller Display	CEPL131258-01-R CEPL131260-01-R	3422M095587 (7" Display) 3322M185726 (10" Display)
B	ELK Products, Inc.	AC/AC Transformer	ELK-TRG2440	6215812440
C	Lenovo	ThinkPad (Laptop)	20FX-S07P00	PF-0LWSDU

2.7 Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	AC Power	EUT	Transformer	2.25	No	No
2	Ethernet	EUT	Laptop	N/A	No	No

3 Field Strength of Spurious Radiation

3.1 Test Result

Test Description	Test Specification		Test Result
Radiated Spurious Emissions	15.247(d), 15.205, 15.209	RSS-247	Compliant

3.2 Test Method

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

The lowest, middle and highest channels were tested for 2.4GHz WLAN. IEEE 802.11b, g and n(HT20) modes were tested using the worst-case data rates for each mode based on the original certified WLAN module test reports. The n(HT40) mode was not tested since those signals have lower power spectral density than the narrower n(HT20) signals.

The EUT was tested in 3 orientations (orthogonal axes) and the worst-case results were reported.

Test distance:

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

1 to 18 GHz - The EUT to measurement antenna distance was 3 meters

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

Limits within restricted bands of operation:

Frequency	Limits ⁽¹⁾		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
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

3.3 Test Site

3m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions	30-1000MHz	1-18GHz	18-26GHz
Temperature:	20.9-23.3 °C	20.7-23.2 °C	23.6 °C
Relative Humidity:	38.8-48.1 %	29.0-36.8 %	50.1 %
Atmospheric Pressure:	97.7-98.3 kPa	97.8-98.7 kPa	97.6 kPa

3.4 Test Equipment

30-1000MHz

Test End Date: 4-Jan-2023

Tester: PL, ZH

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	26-May-2022	26-May-2024
ROTARY NM TO NF CONNECTOR	18-2120-0	DIAMOND ANTENNA AND MICROWAVE CORP	22008	16-Mar-2022	16-Mar-2023
N to N RF Cable	NC12-N1N1-276	MEGAPHASE	22001	10-Jan-2022	10-Jan-2023
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20117	17-Feb-2022	17-Feb-2023
RF CABLE NM TO NM, 0.01-18GHZ	90-195-079	TELEDYNE STORM MICROWAVE	20123	14-Feb-2022	14-Feb-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20132	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	ZKL-2+	MINI-CIRCUITS	B079800	14-Sep-2022	14-Sep-2023
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	8-Sep-2022	8-Sep-2023

Tile profile: RSE 30-1000 MHz T7 dated 18 Mar 2022

1-18GHz

Test End Date: 9-Jan-2023

Tester: LM

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	15-Aug-2022	15-Aug-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20118	16-Mar-2022	16-Mar-2023
RF CABLE NM TO NM, 0.01-18GHZ	90-195-118	TELEDYNE STORM MICROWAVE	20126	14-Feb-2022	14-Feb-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20132	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	3-Oct-2022	3-Oct-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22032	24-Nov-2022	24-Nov-2023
FILTER, HIGH PASS, >2800MHZ	HPM50111	MICRO-TRONICS	22017	16-Jun-2022	16-Jun-2023

Test End Date: 10-Jan-2023

Tester: PL

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	15-Aug-2022	15-Aug-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20118	16-Mar-2022	16-Mar-2023
RF CABLE NM TO NM, 0.01-18GHZ	90-195-118	TELEDYNE STORM MICROWAVE	20126	14-Feb-2022	14-Feb-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20132	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	3-Oct-2022	3-Oct-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22032	24-Nov-2022	24-Nov-2023
FILTER, HIGH PASS, >2800MHZ	HPM50111	MICRO-TRONICS	22017	16-Jun-2022	16-Jun-2023

Test End Date: 11-Jan-2023

Tester: PL

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	15-Aug-2022	15-Aug-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20118	16-Mar-2022	16-Mar-2023
RF CABLE NM TO NM, 0.01-18GHZ	90-195-118	TELEDYNE STORM MICROWAVE	20126	14-Feb-2022	14-Feb-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20132	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	3-Oct-2022	3-Oct-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22032	24-Nov-2022	24-Nov-2023
FILTER, HIGH PASS, >2800MHZ	HPM50111	MICRO-TRONICS	22017	16-Jun-2022	16-Jun-2023

Tile profile: RSE 1-18 GHz T7 dated 12 Feb 2021

18-26GHz

Test End Date: 17-Aug-2023

Tester: LM

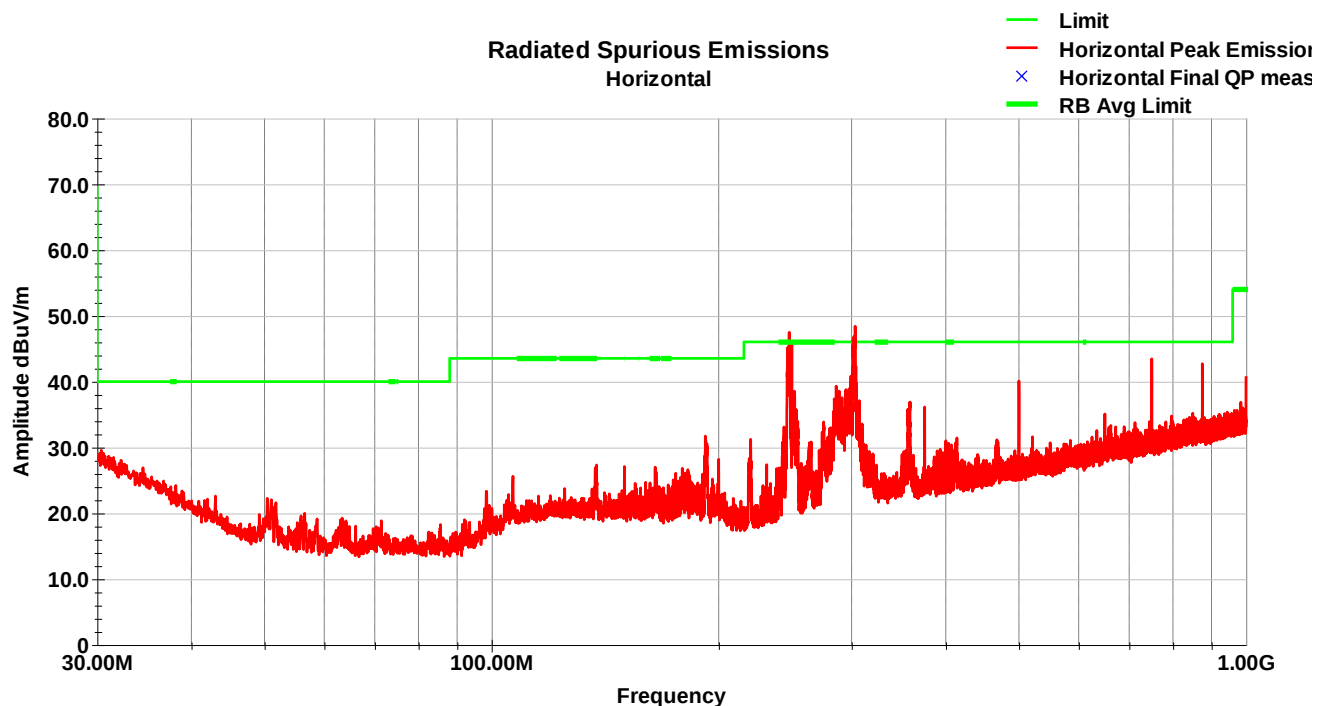
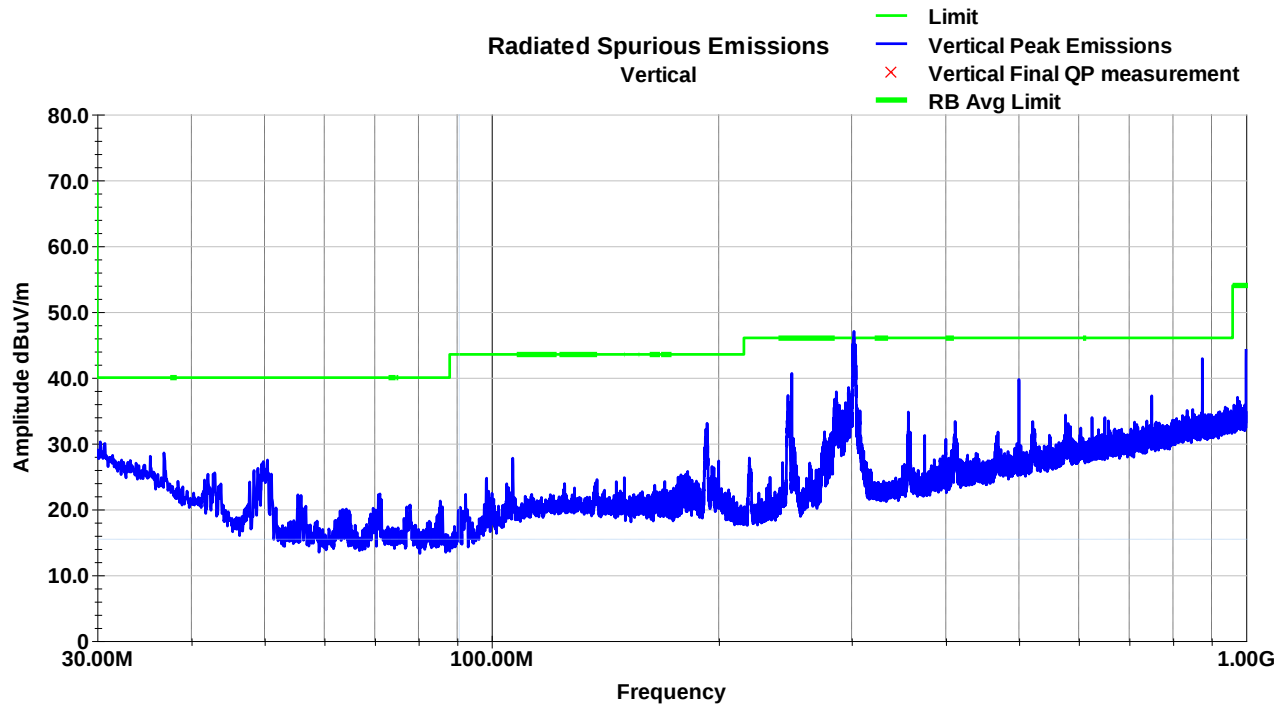
Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, HORN (SMALL)	LB-180400-20-C-KF	A-INFO	15007	18-Apr-2022	18-Apr-2024
SMA to SMA RF Cable	NC12-K1K1-138	MEGAPHASE	22002	9-Feb-2023	9-Feb-2024
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-020	TELEDYNE STORM MICROWAVE	20105	1-May-2023	29-Apr-2024
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	13-Oct-2022	13-Oct-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22032	24-Nov-2022	24-Nov-2023

Tile profile: RSE 18-40 GHz T7 dated 12 Feb 2021

3.5 Test Data – 7-inch Display – 802.11b

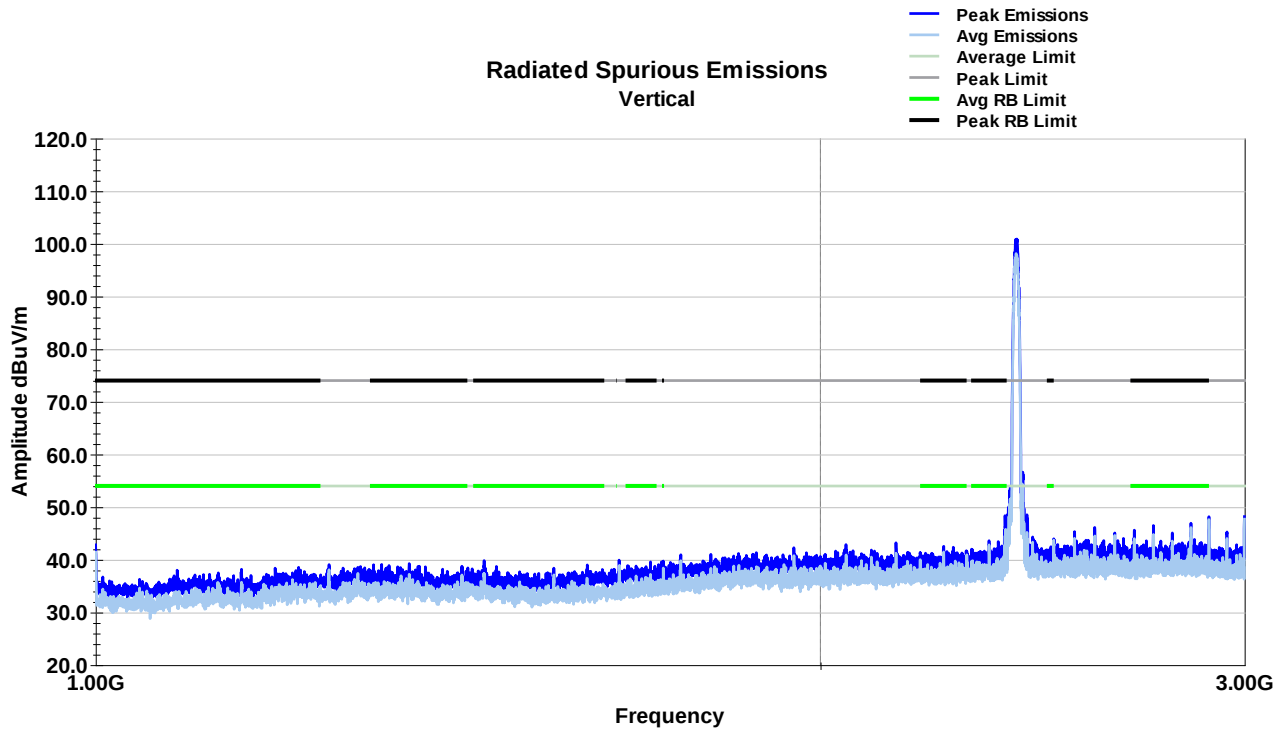
3.5.1 30-1000 MHz

Emissions were confirmed to be non-radio emissions. All channels had similar plots (worst case shown).

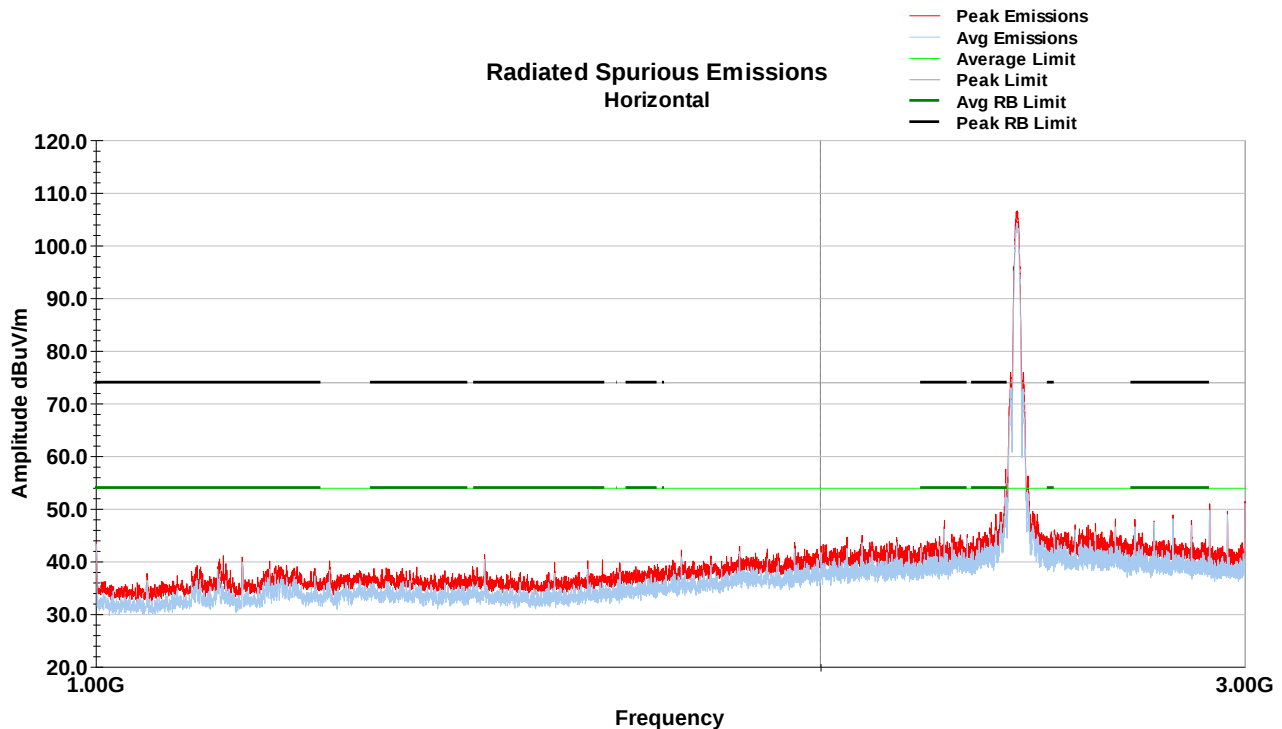


3.5.2 1-18 GHz

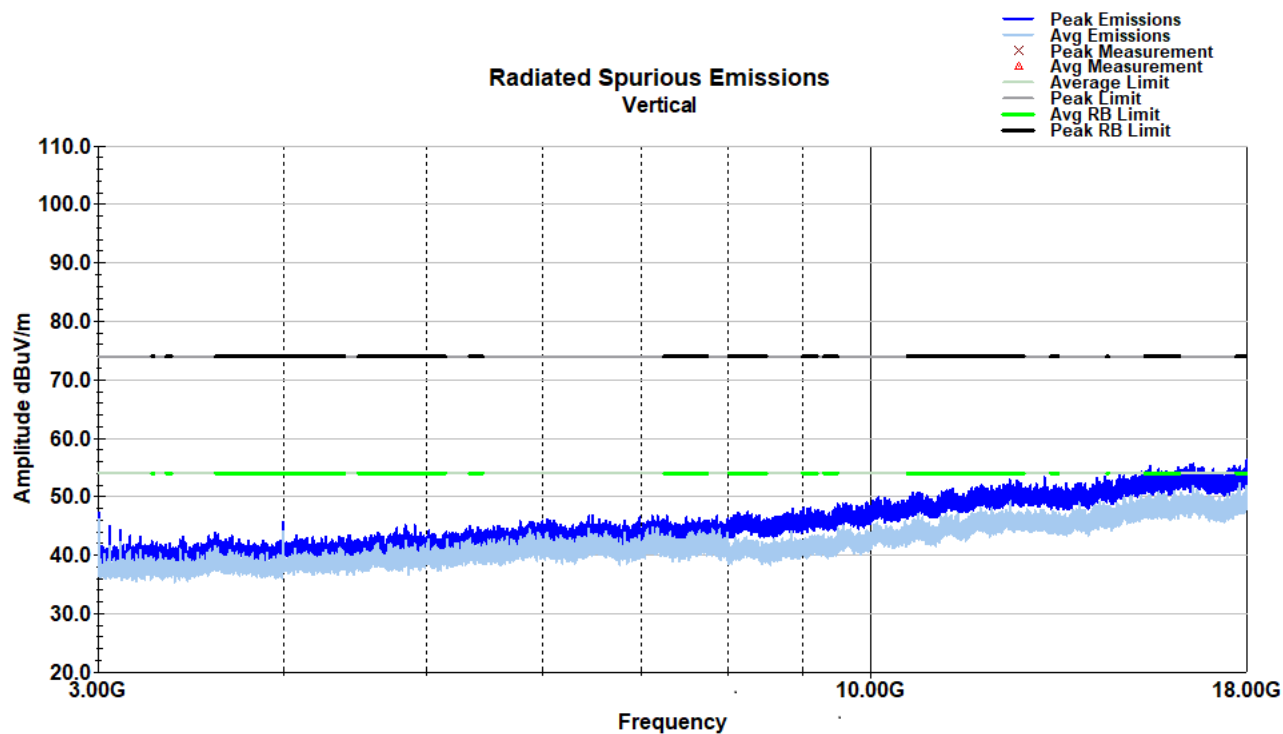
Vertical Plot – 1-3GHz – Low Channel



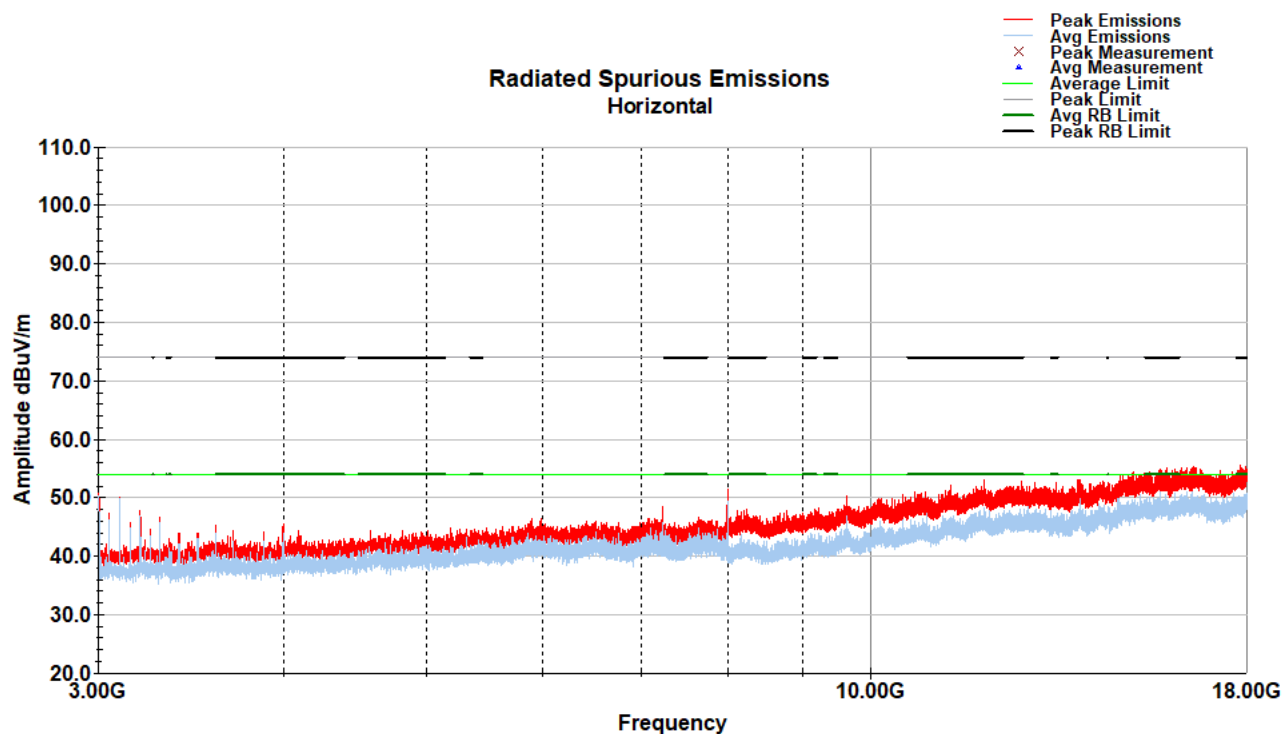
Horizontal Plot – 1-3GHz – Low Channel



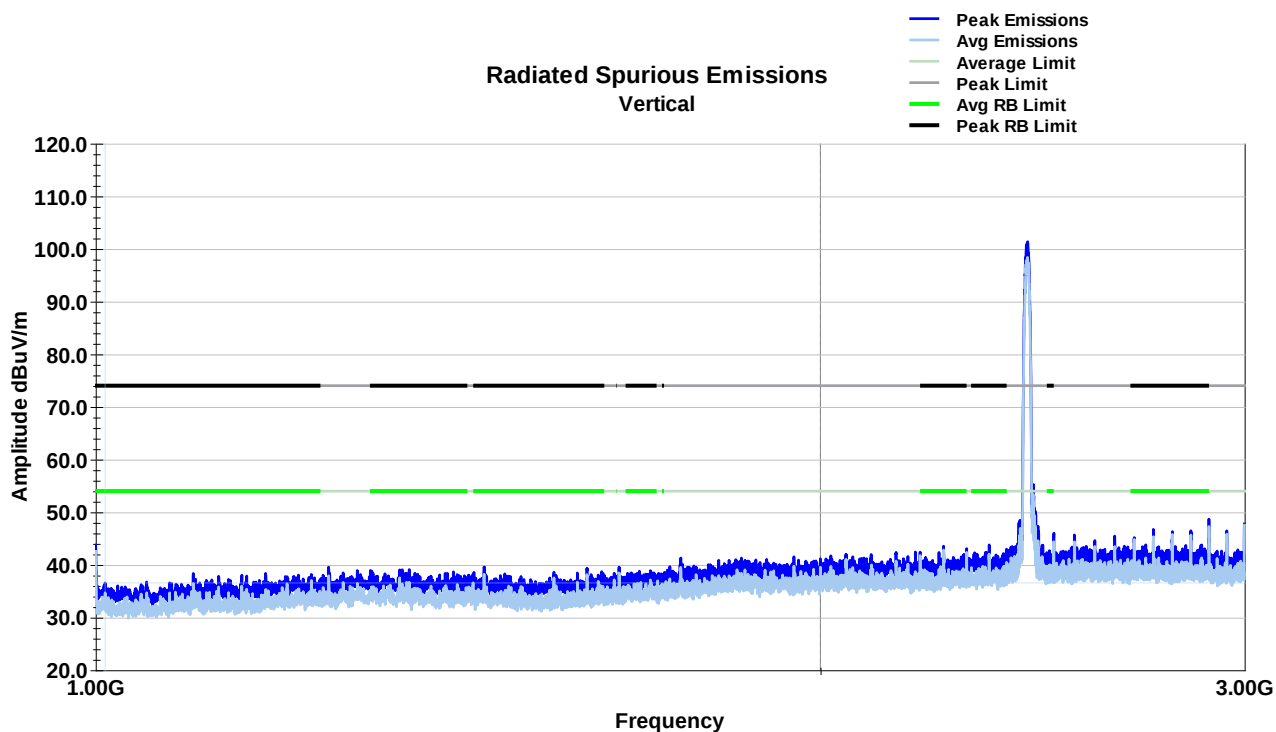
Vertical Plot – 3-18GHz – Low Channel



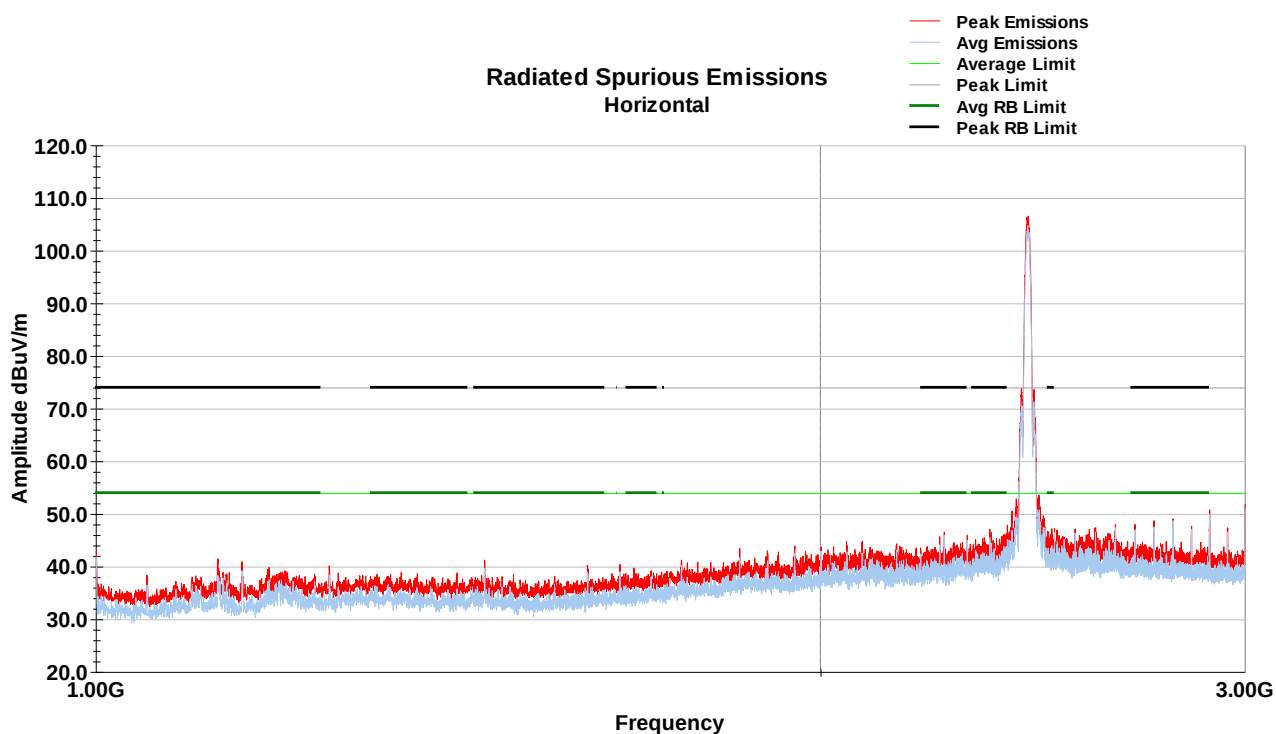
Horizontal Plot – 3-18GHz – Low Channel



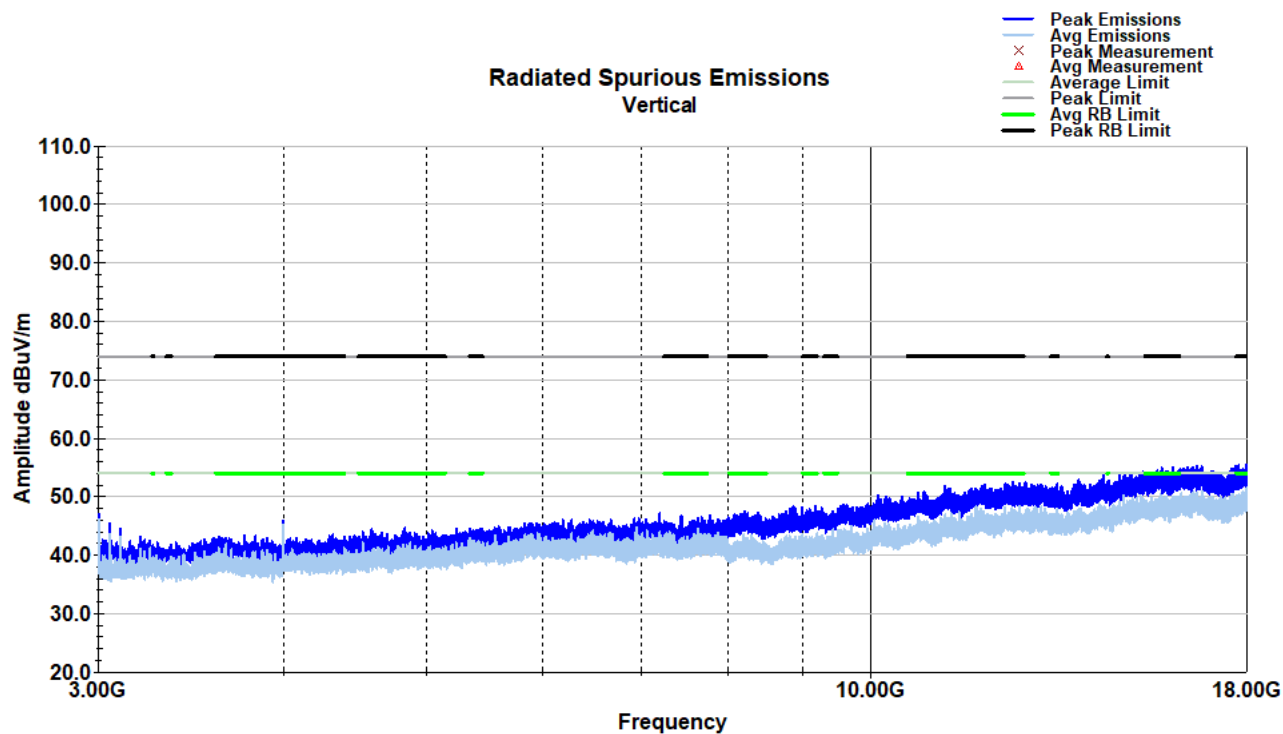
Vertical Plot – 1-3GHz – Mid Channel



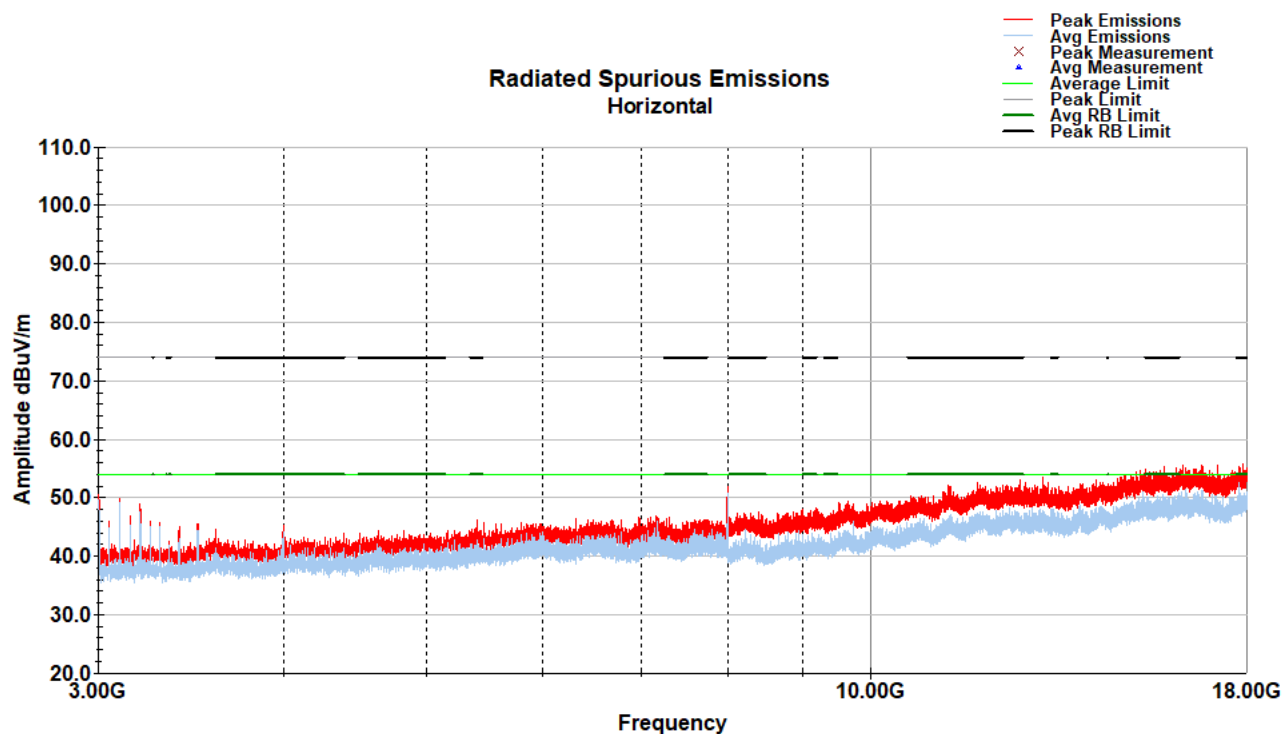
Horizontal Plot – 1-3GHz – Mid Channel



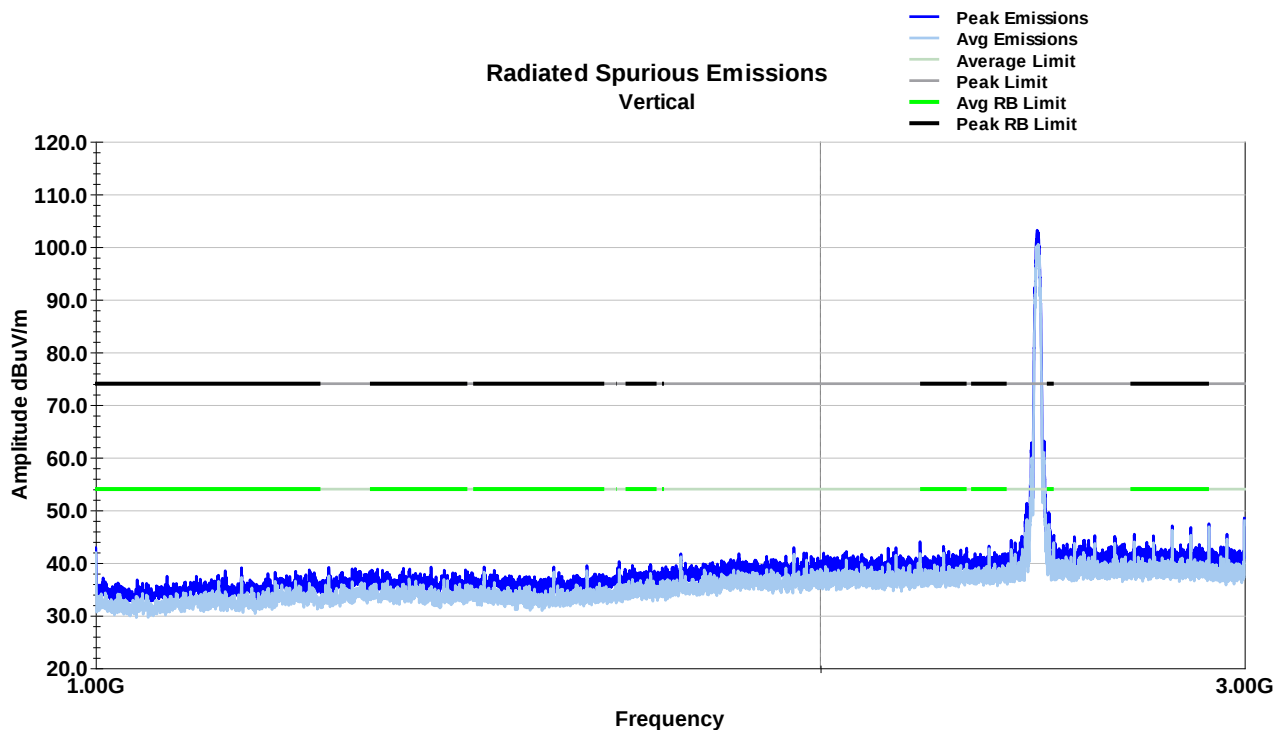
Vertical Plot – 3-18GHz – Mid Channel



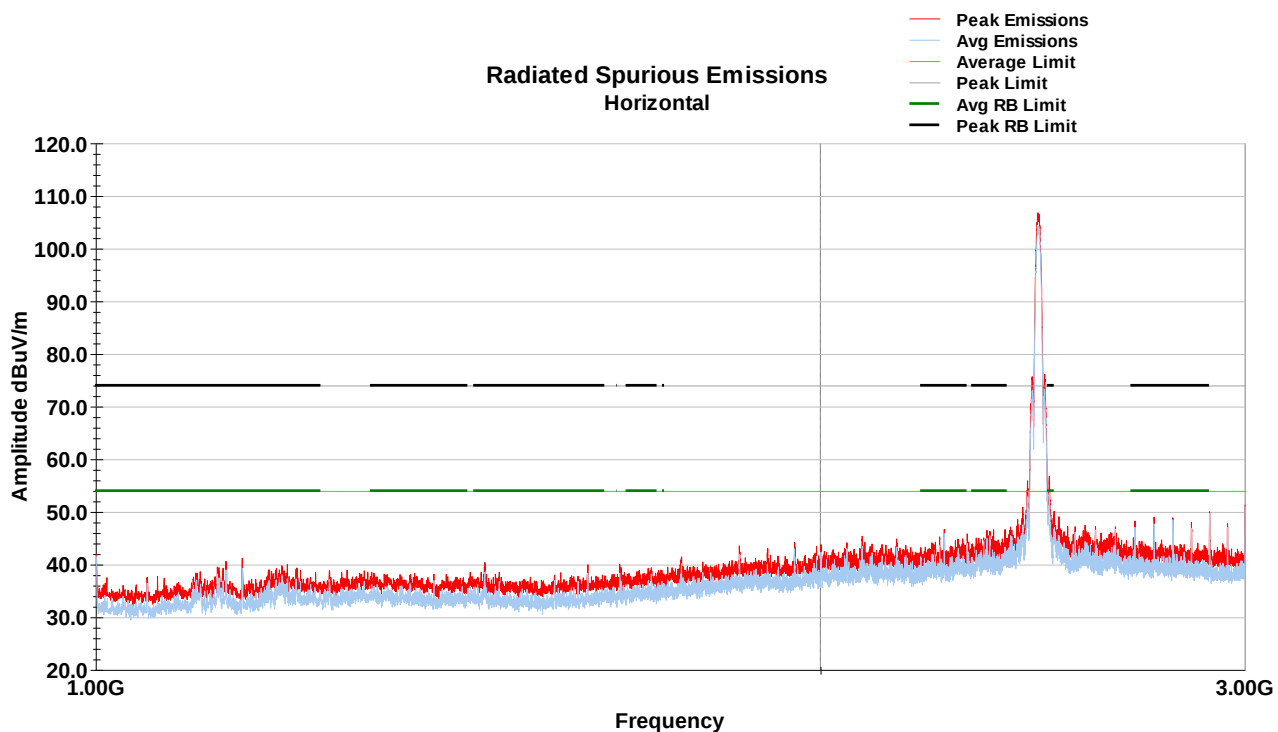
Horizontal Plot – 3-18GHz – Mid Channel



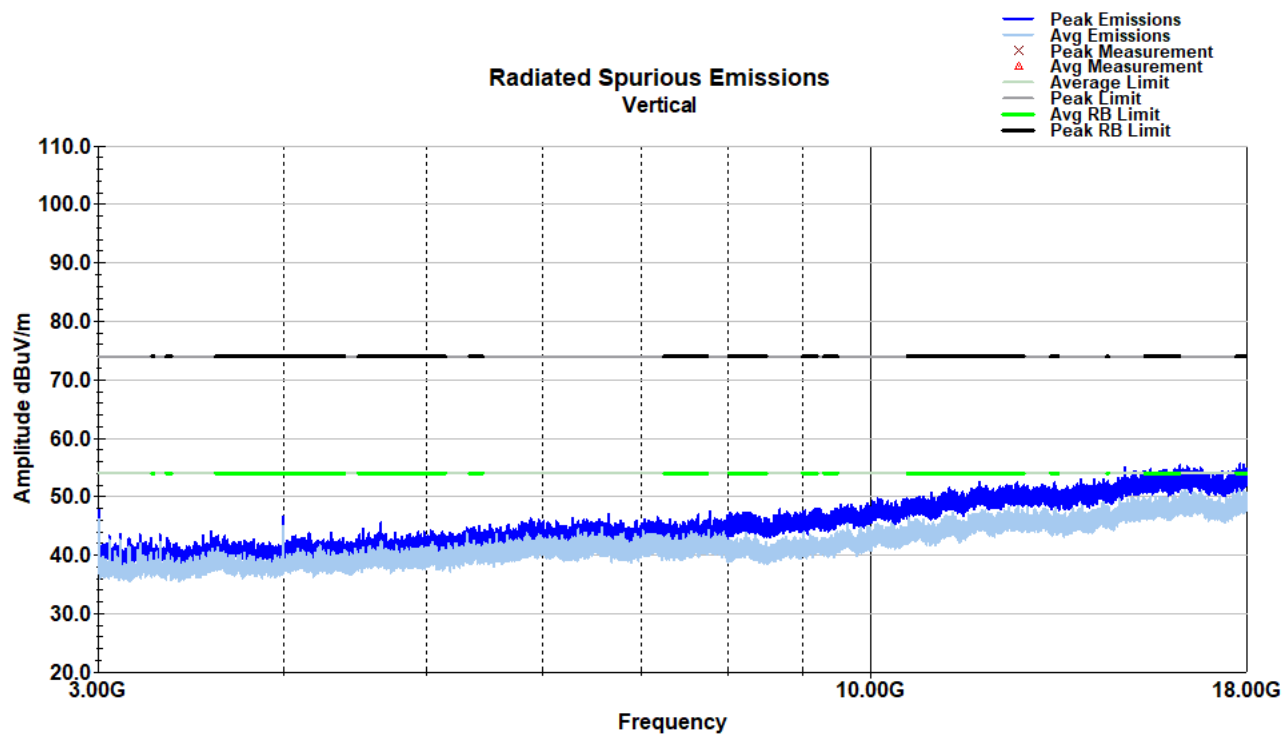
Vertical Plot – 1-3GHz – High Channel



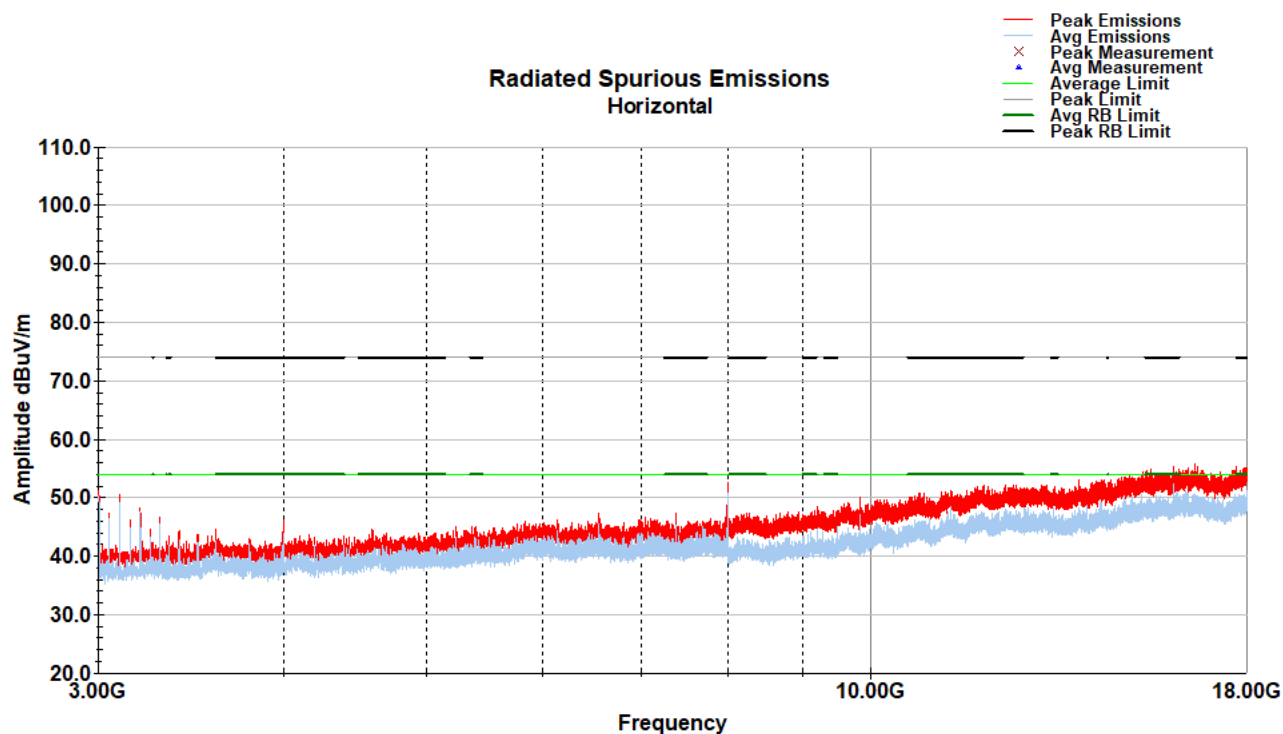
Horizontal Plot – 1-3GHz – High Channel



Vertical Plot – 3-18GHz – High Channel

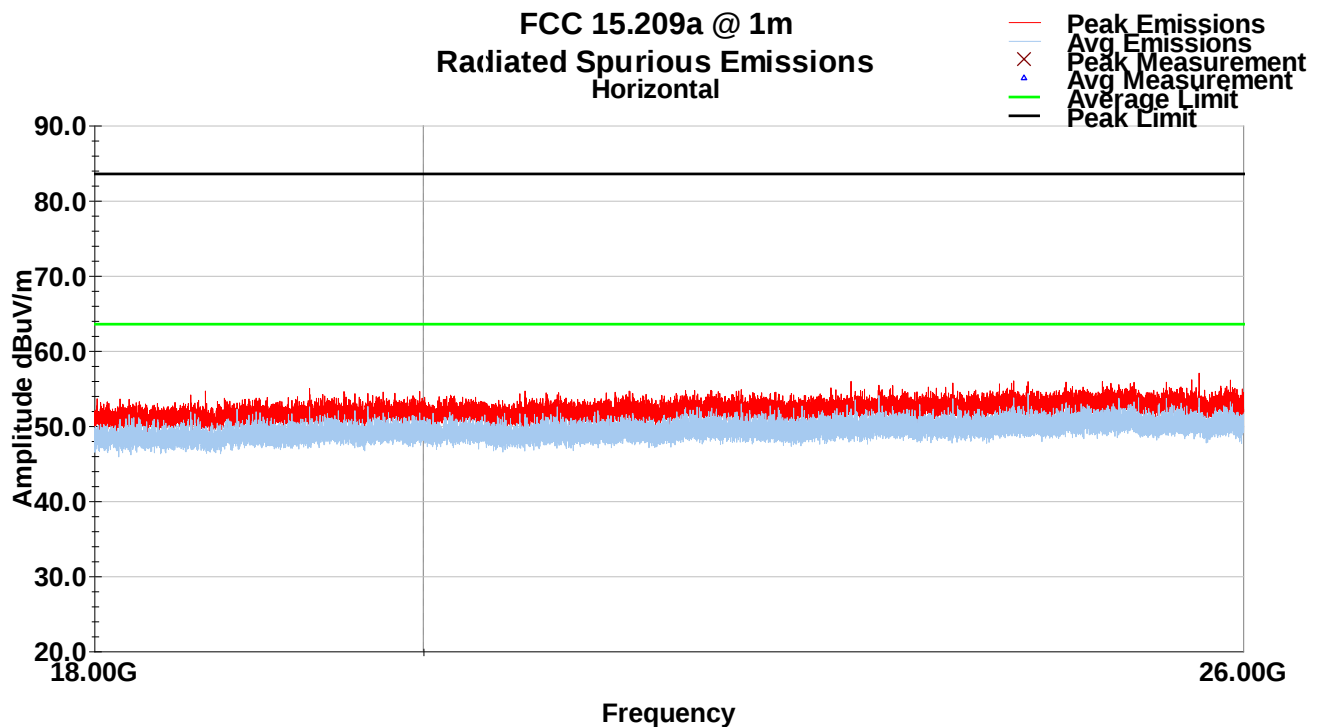
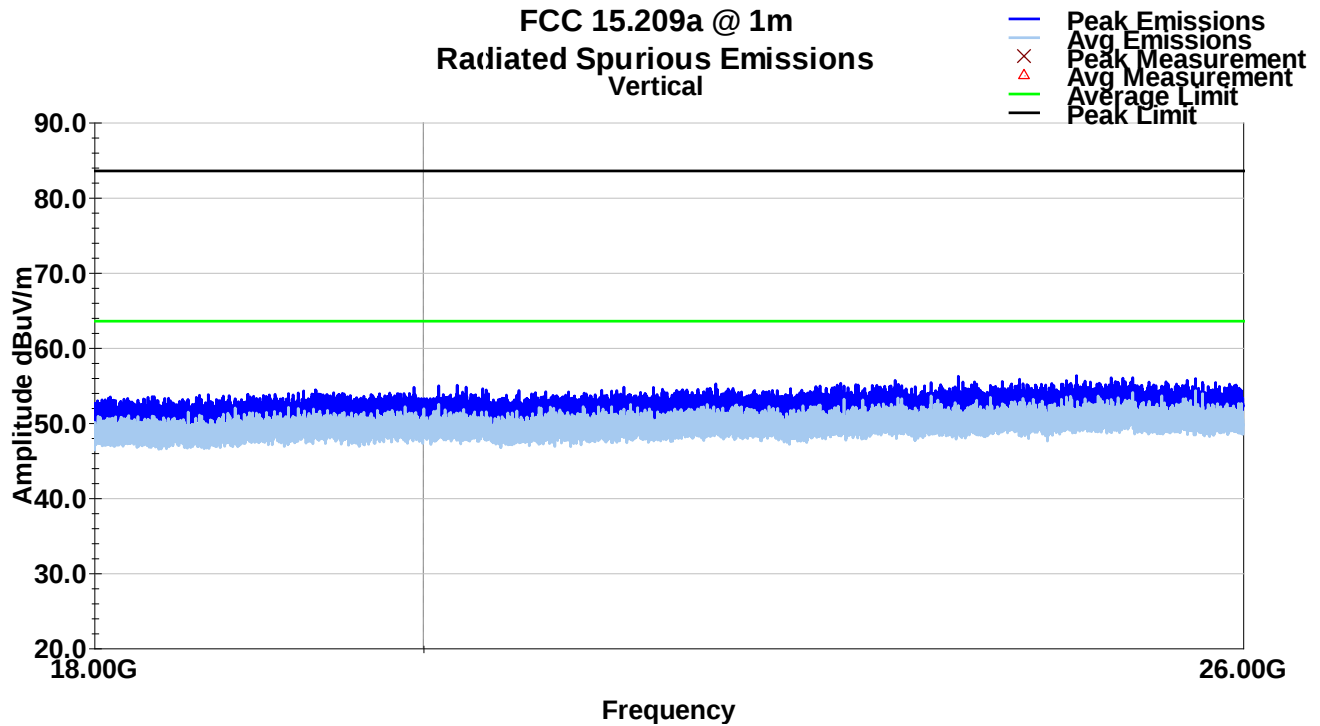


Horizontal Plot – 3-18GHz – High Channel



3.5.3 18-26 GHz

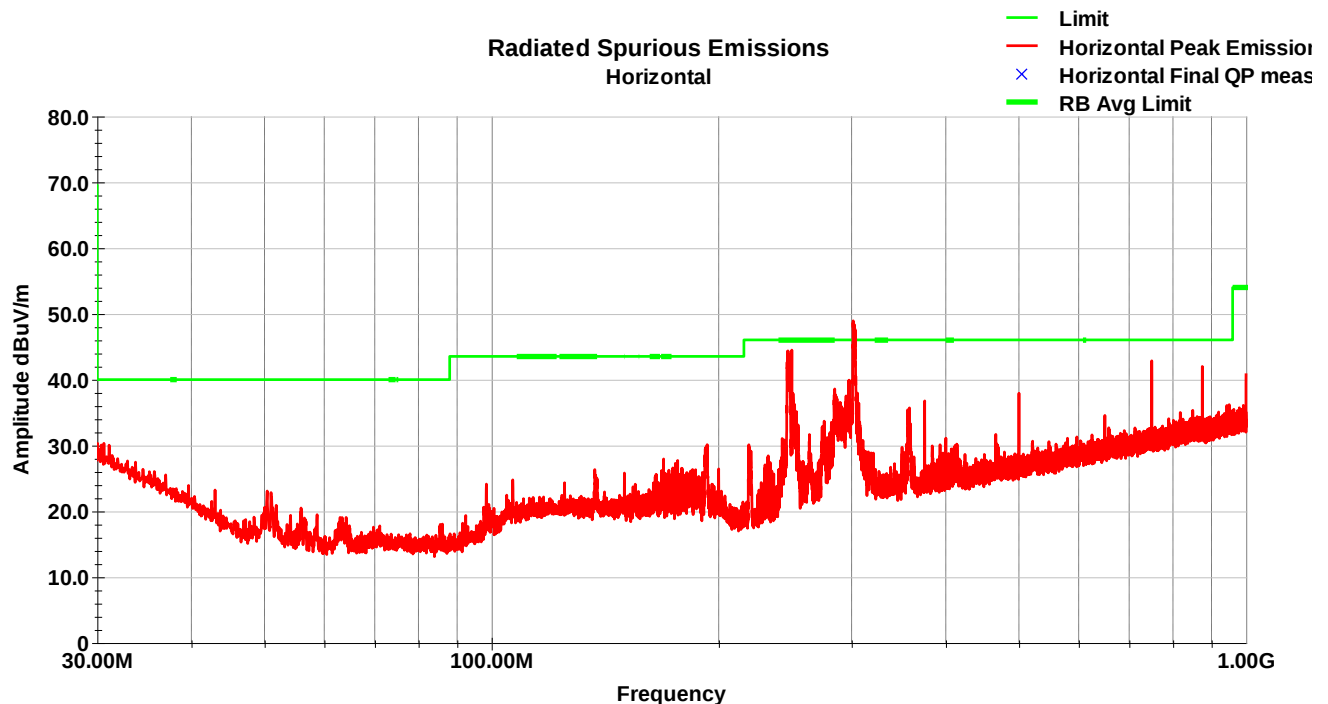
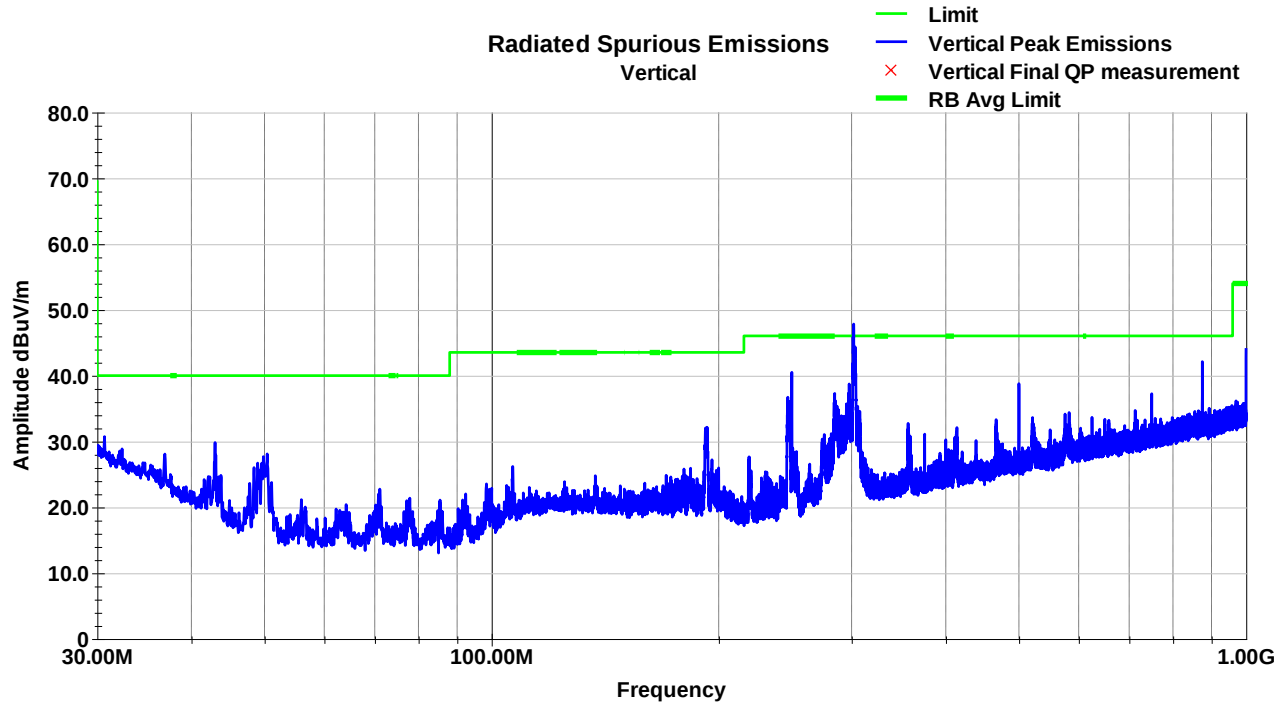
All channels and data modes had similar plots in the 18-26GHz frequency range.



3.6 Test Data – 7-inch Display – 802.11g

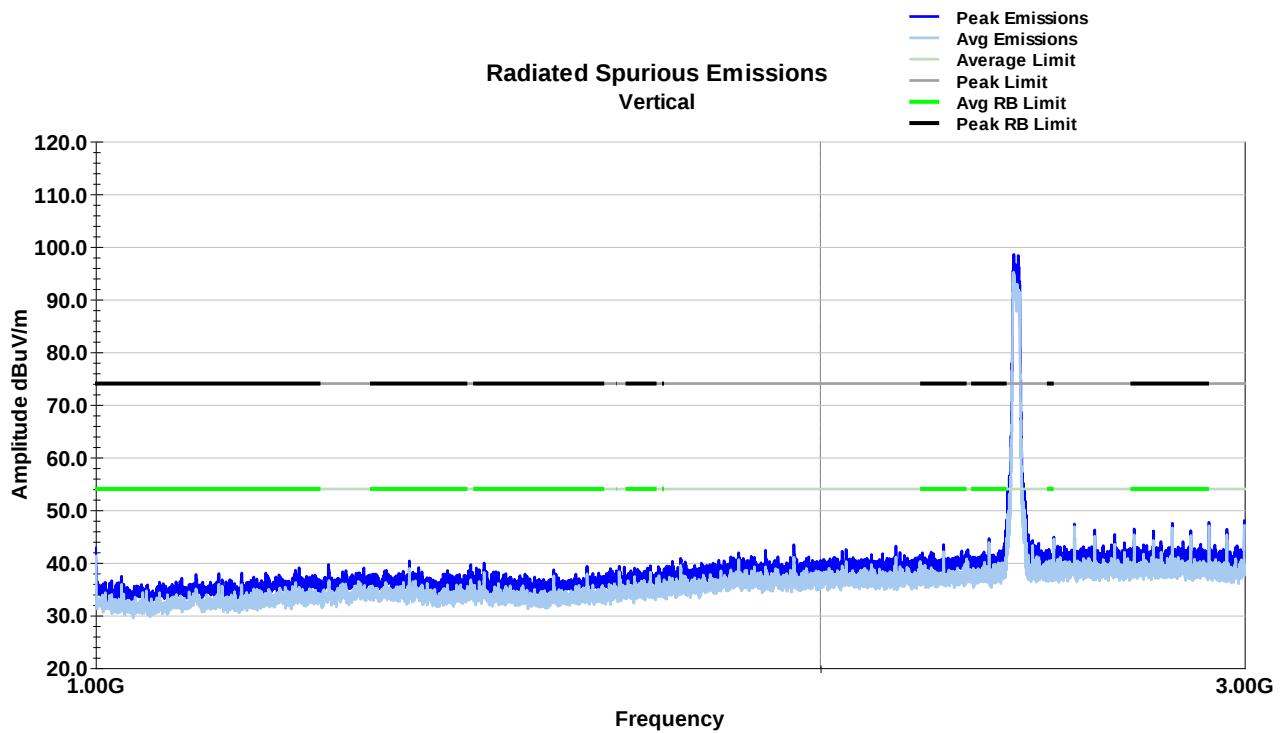
3.6.1 30-1000 MHz

Emissions were confirmed to be non-radio emissions. All channels had similar plots (worst case shown).

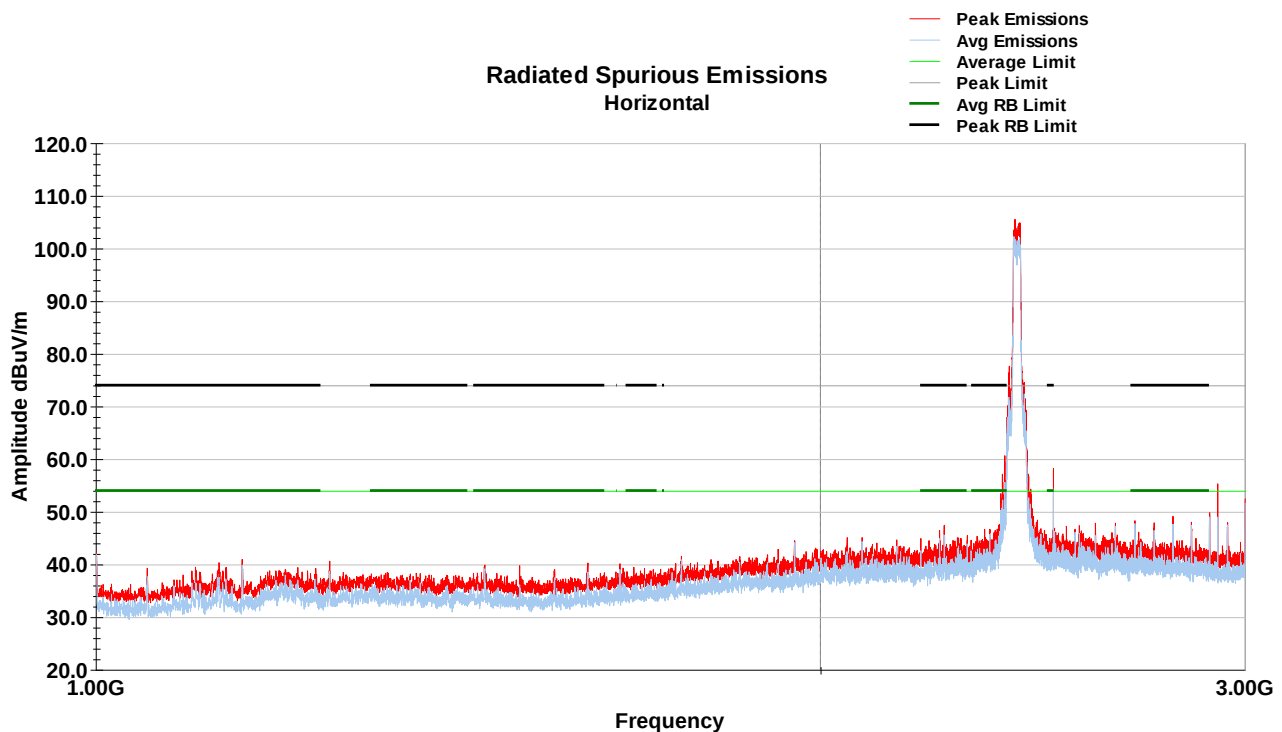


3.6.2 1-18 GHz

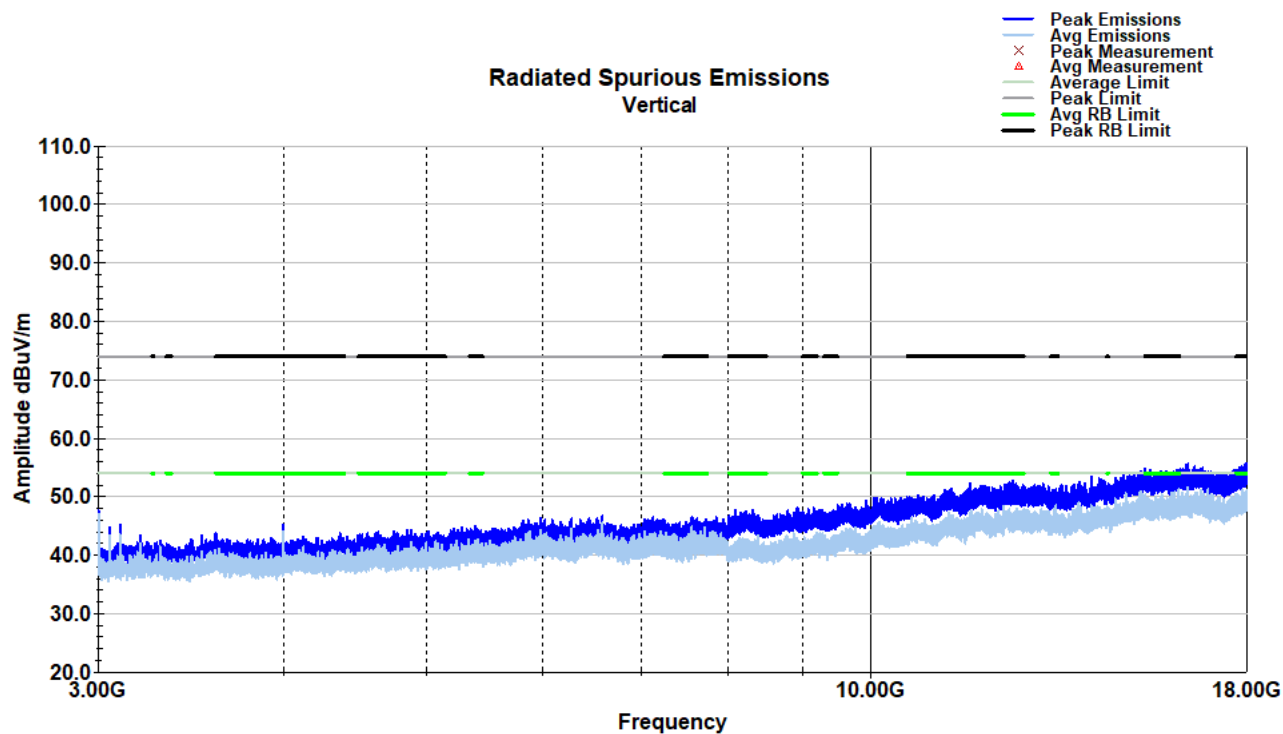
Vertical Plot – 1-3GHz – Low Channel



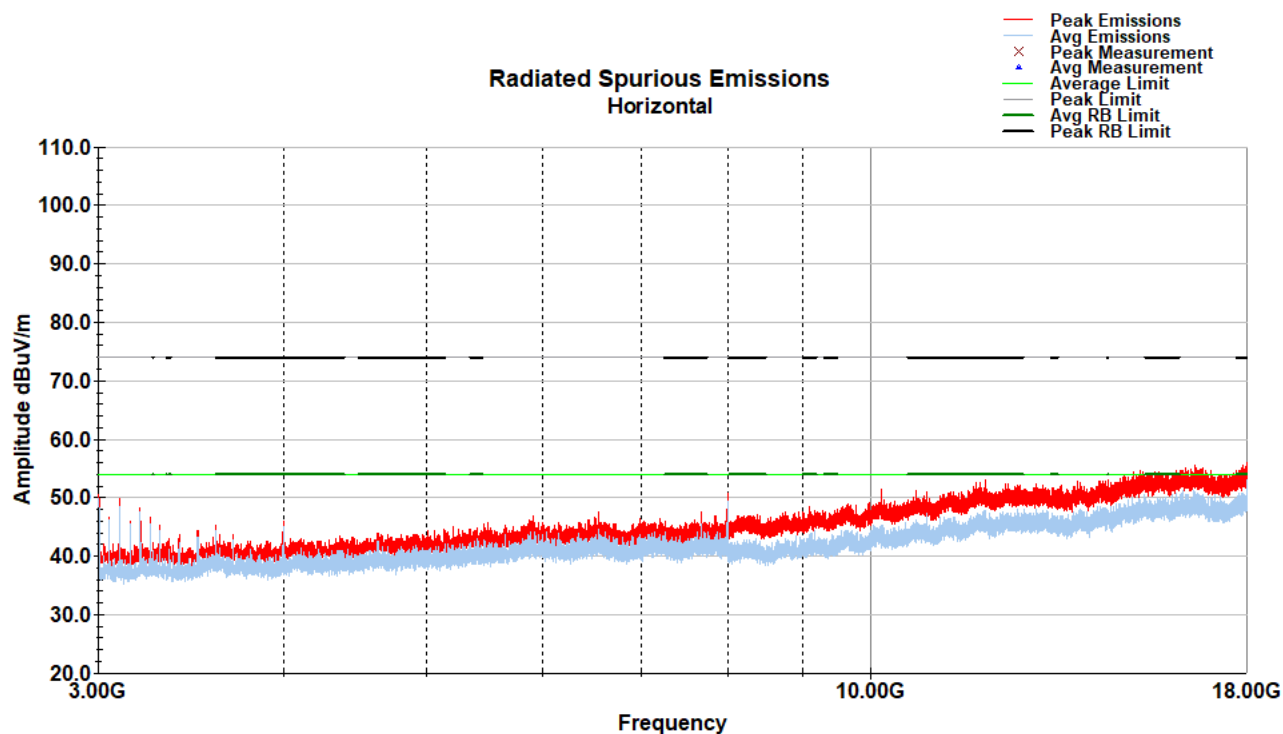
Horizontal Plot – 1-3GHz – Low Channel



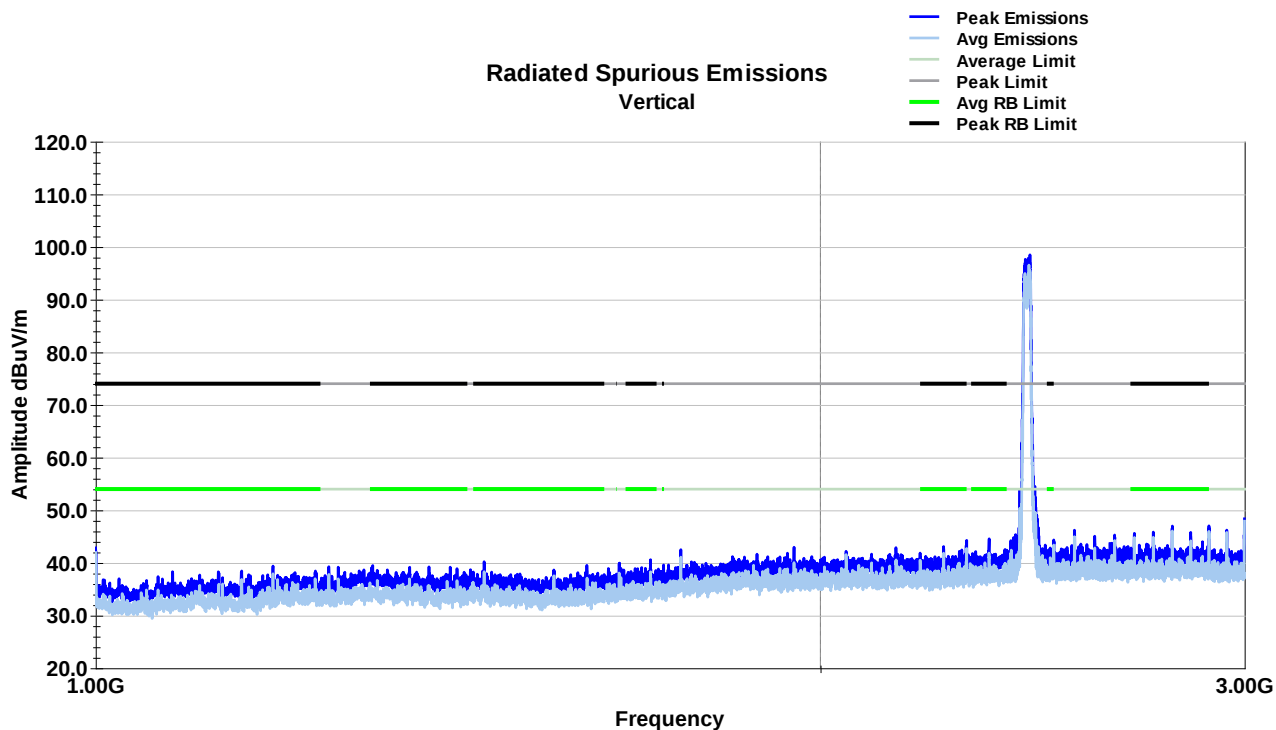
Vertical Plot – 3-18GHz – Low Channel



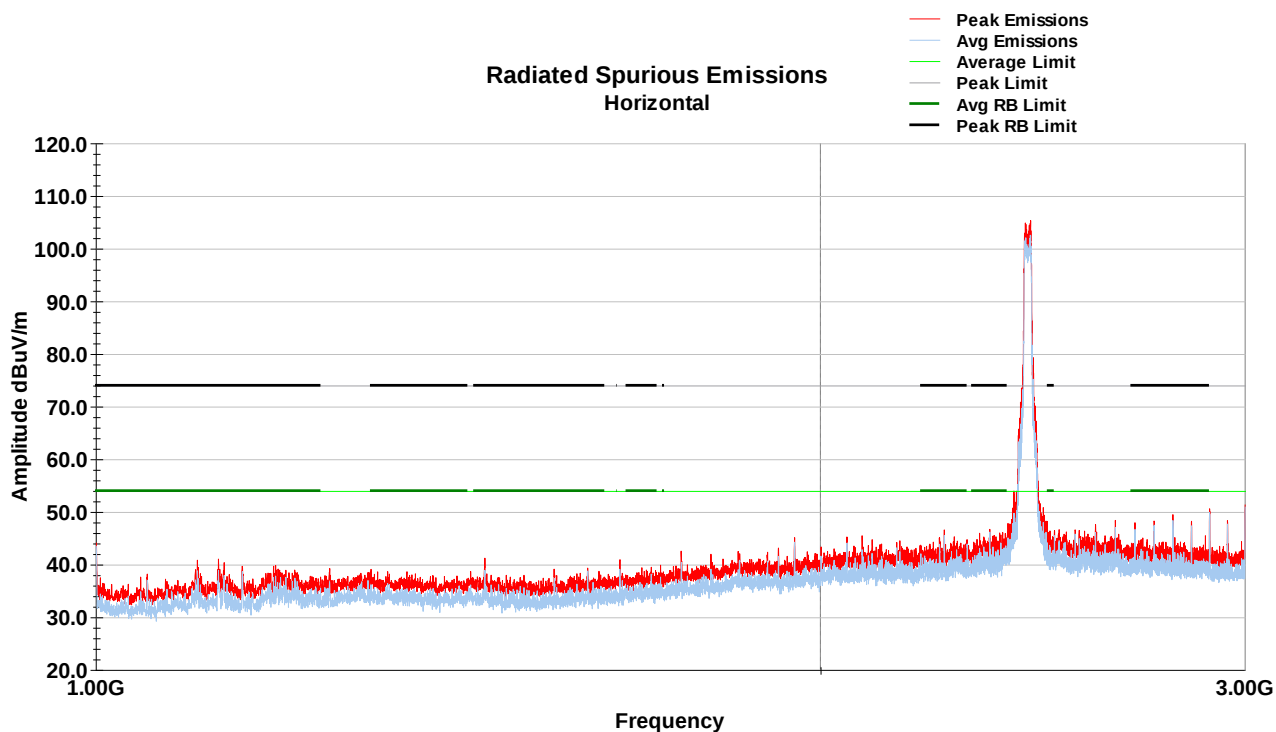
Horizontal Plot – 3-18GHz – Low Channel



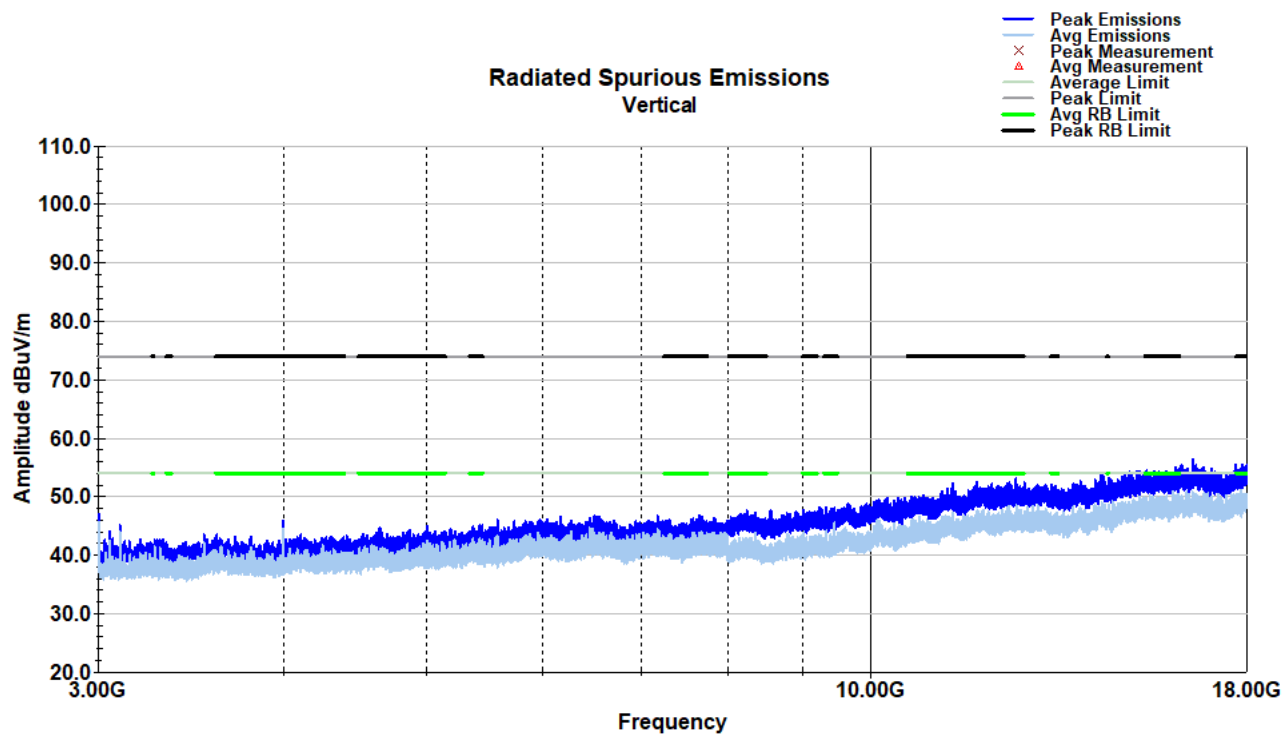
Vertical Plot – 1-3GHz – Mid Channel



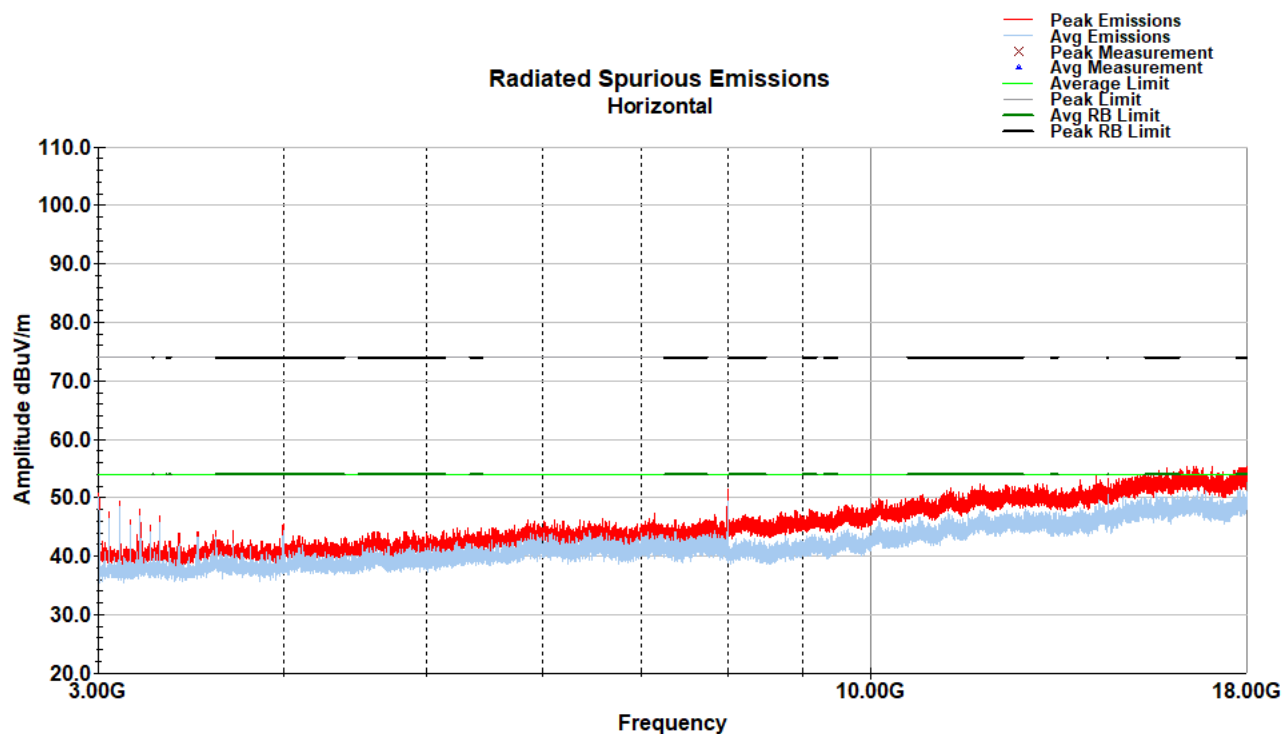
Horizontal Plot – 1-3GHz – Mid Channel



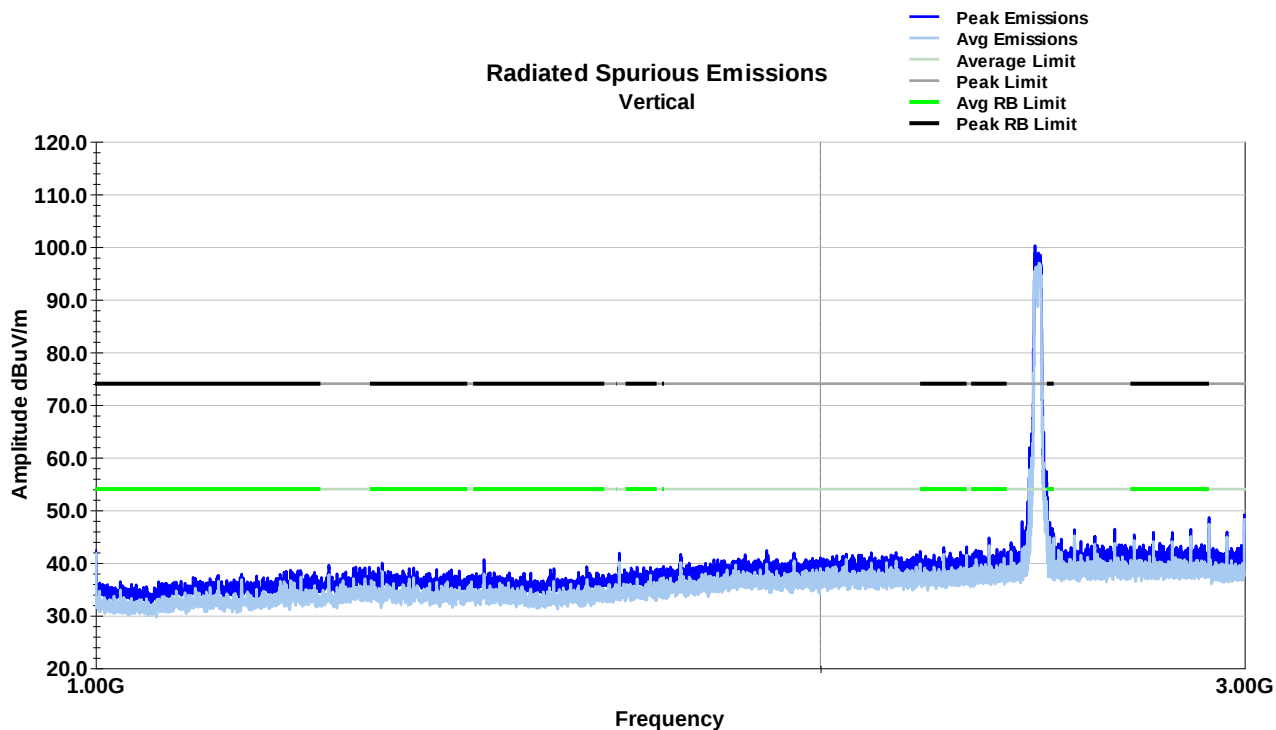
Vertical Plot – 3-18GHz – Mid Channel



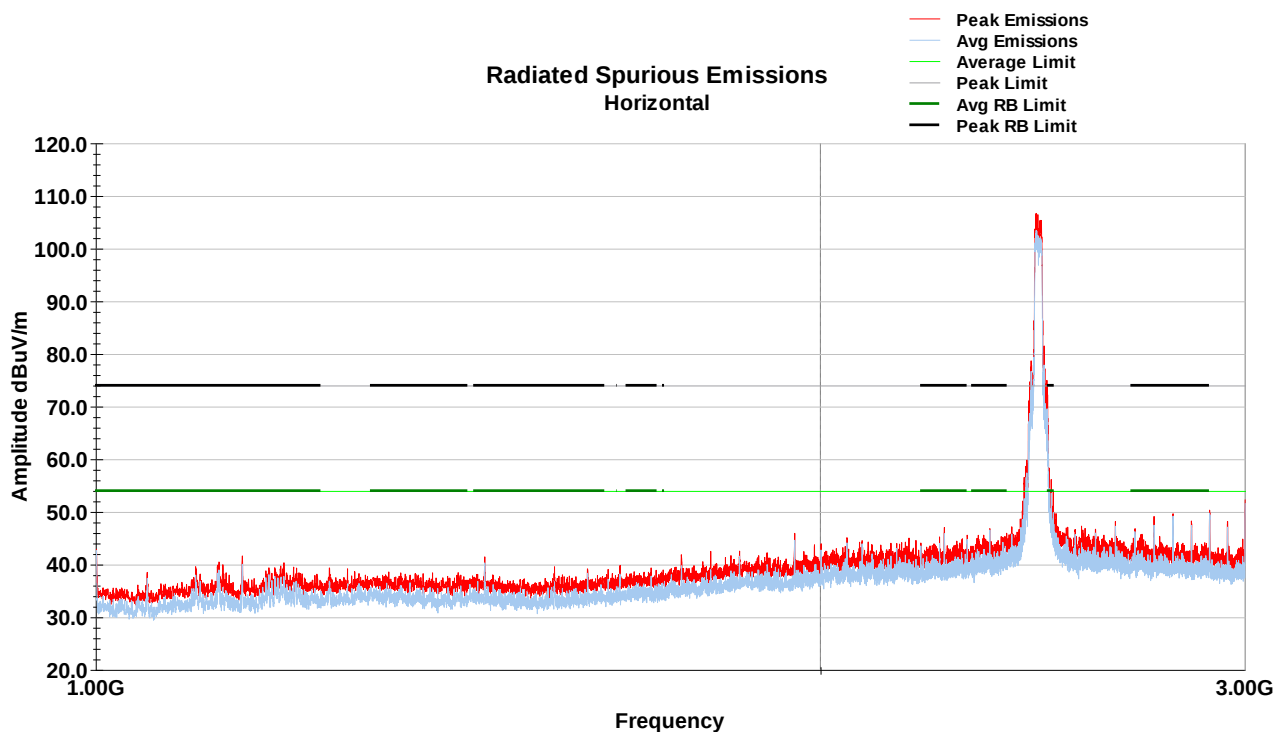
Horizontal Plot – 3-18GHz – Mid Channel



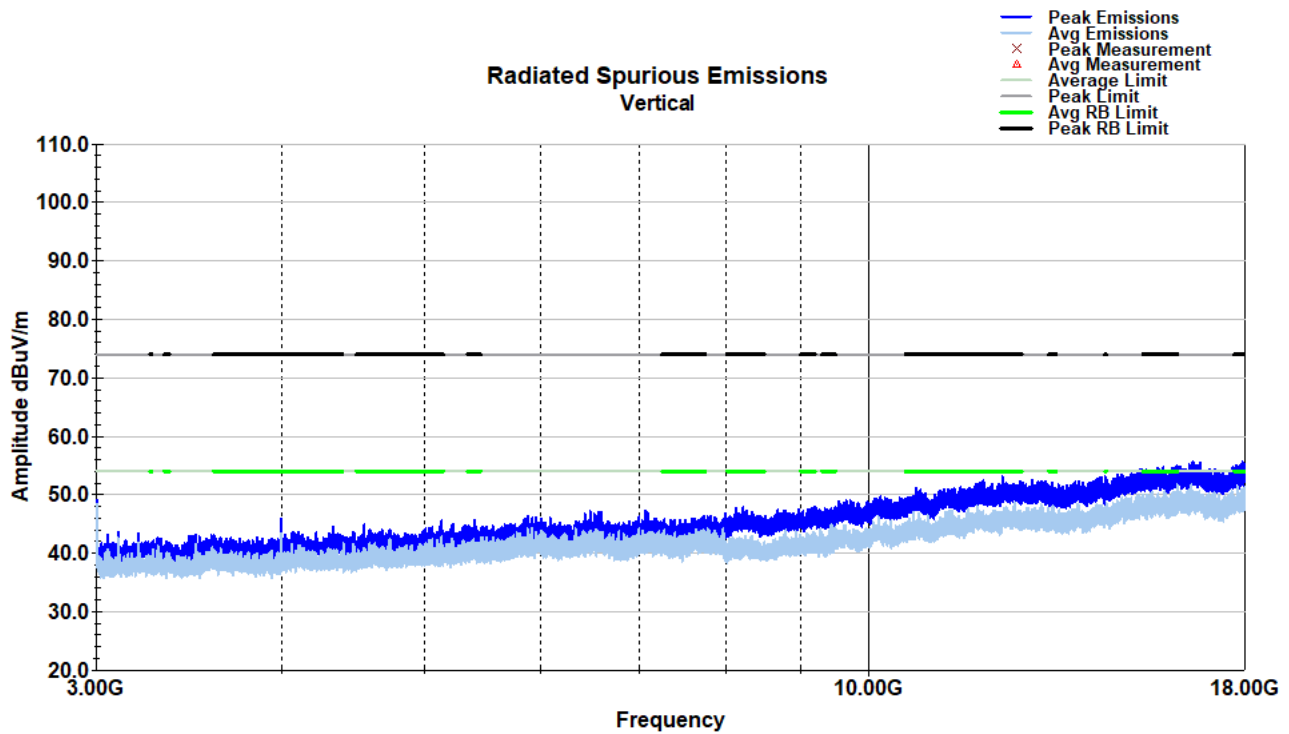
Vertical Plot – 1-3GHz – High Channel



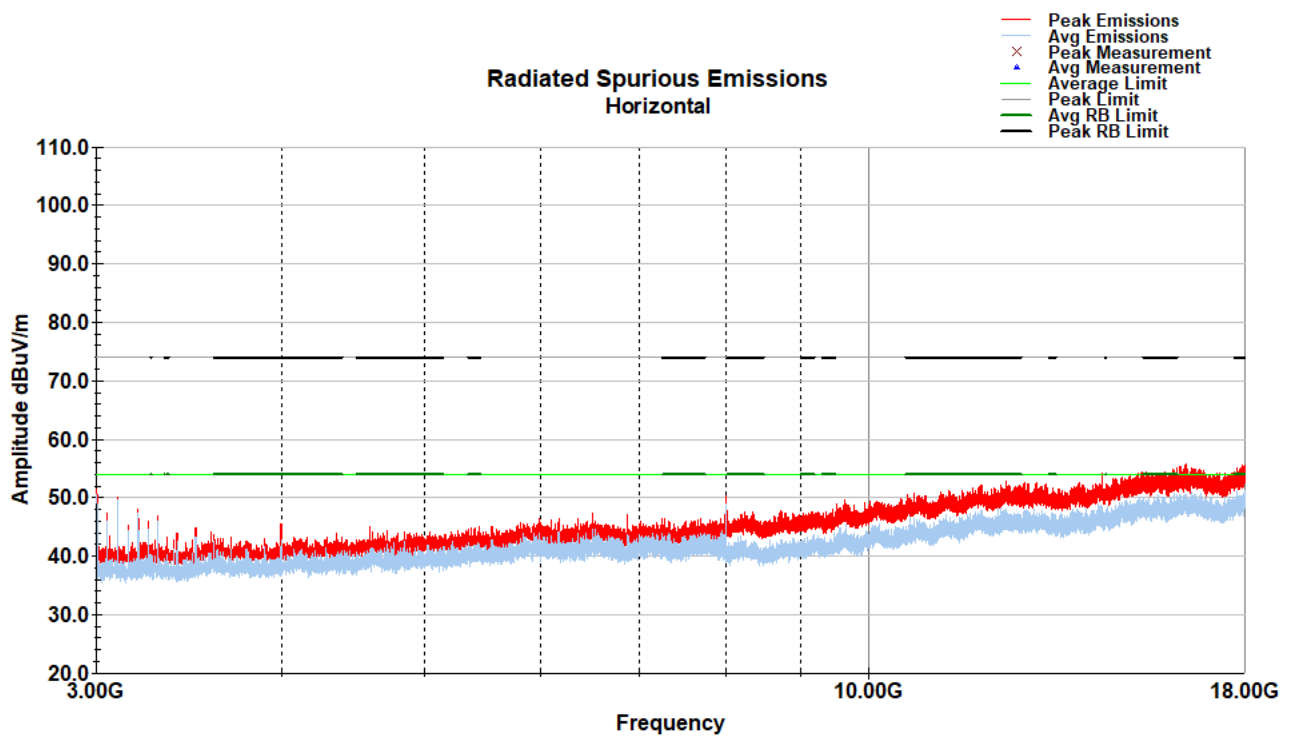
Horizontal Plot – 1-3GHz – High Channel



Vertical Plot – 3-18GHz – High Channel



Horizontal Plot – 3-18GHz – High Channel

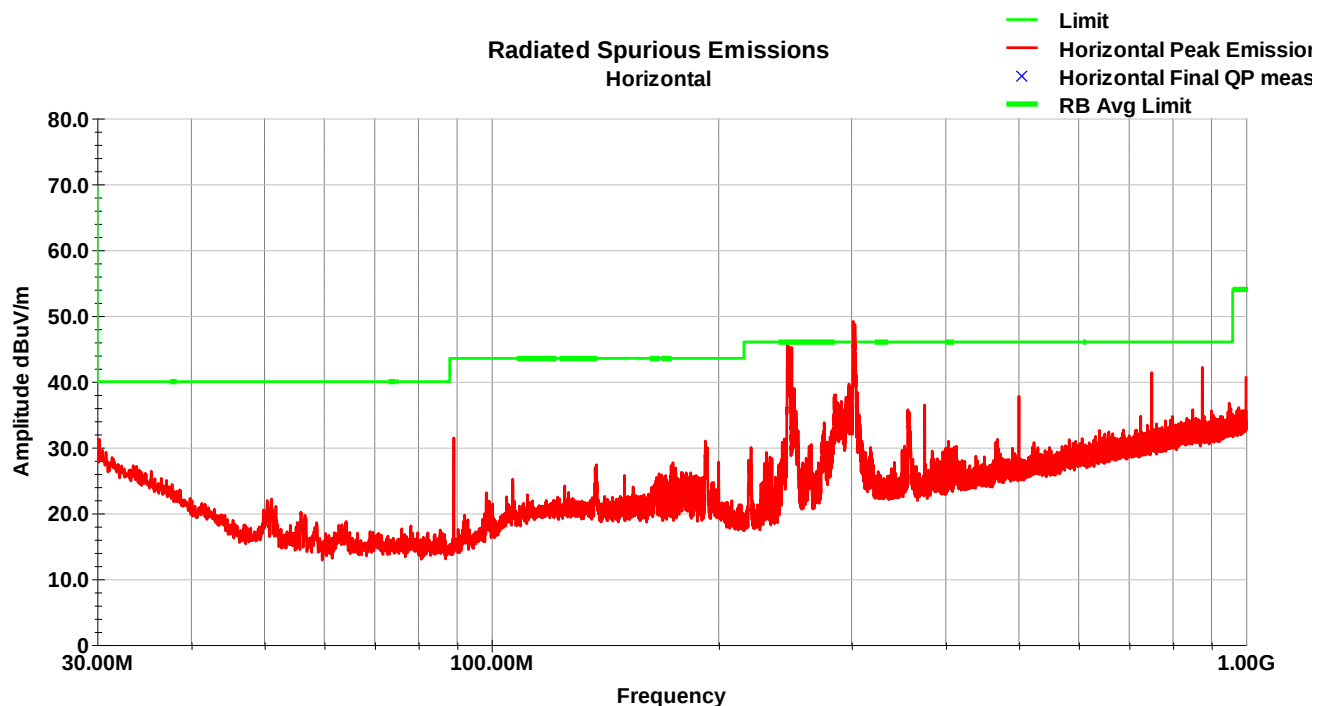
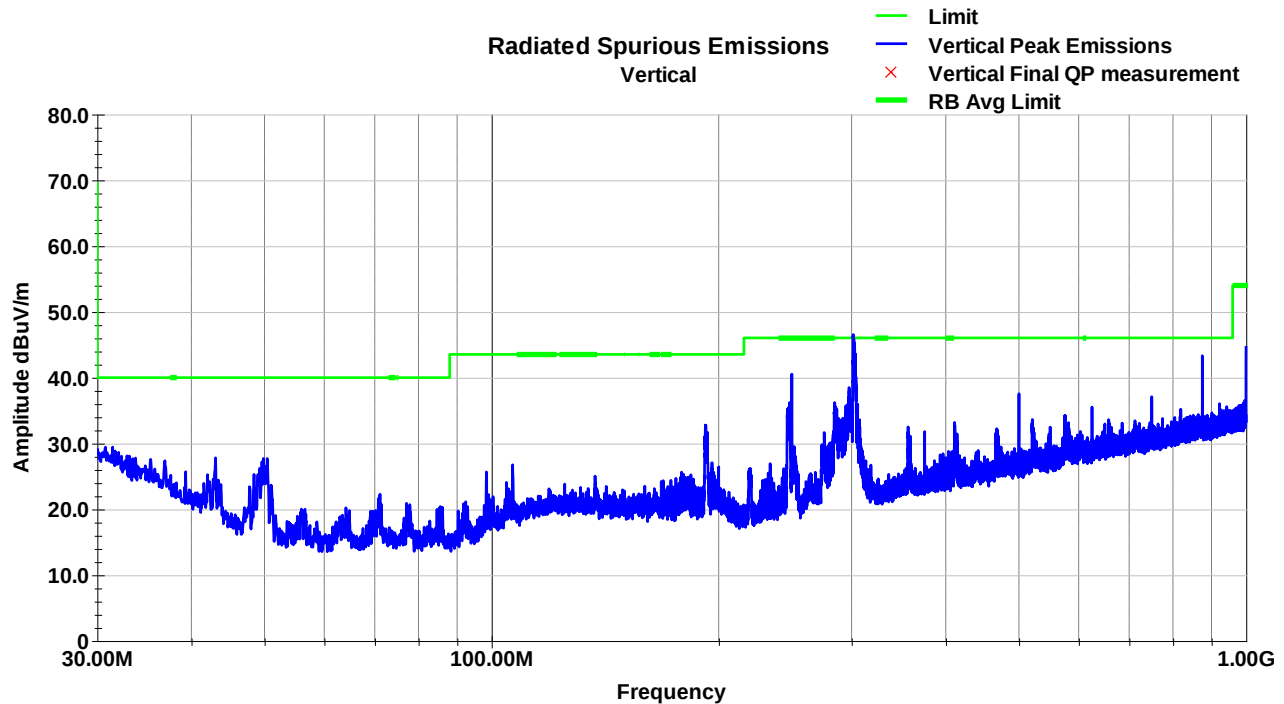


Emissions in the 18-26GHz frequency range were similar to those shown in section 3.5.3 above.

3.7 Test Data – 7-inch Display – 802.11n

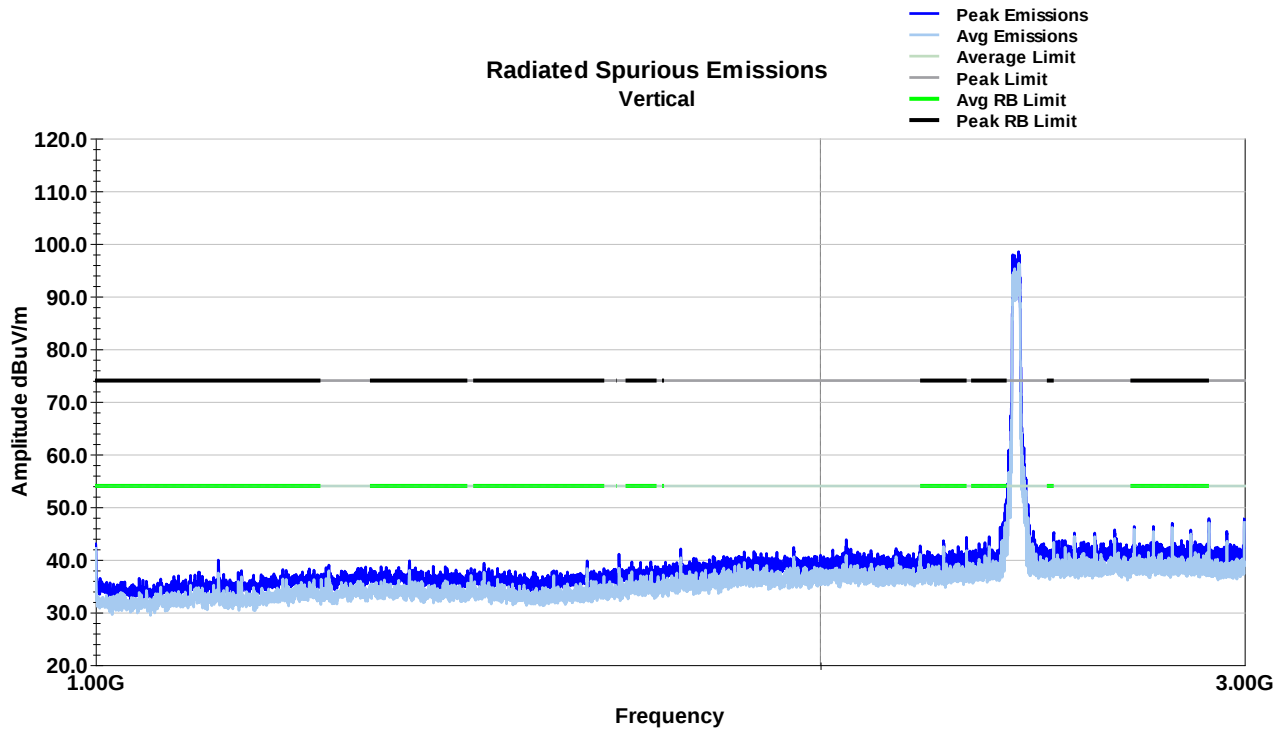
3.7.1 30-1000 MHz

Emissions were confirmed to be non-radio emissions. All channels had similar plots (worst case shown).

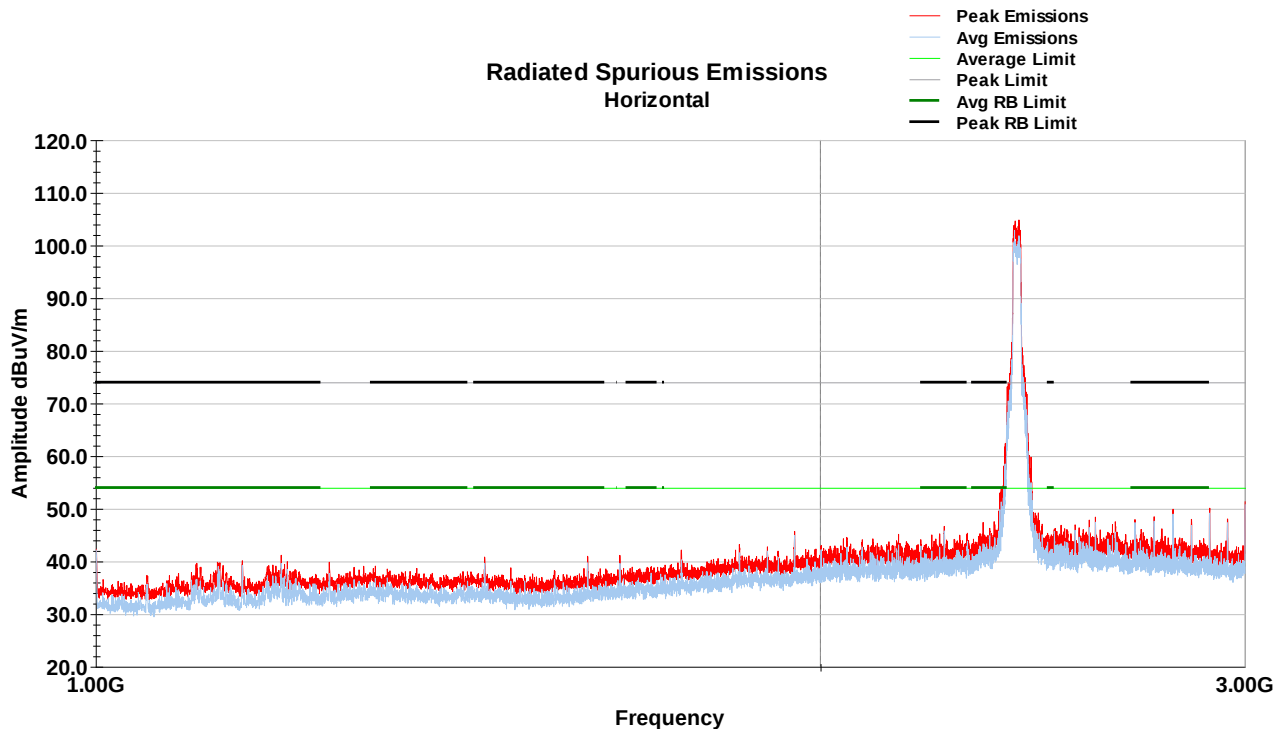


3.7.2 1-18 GHz

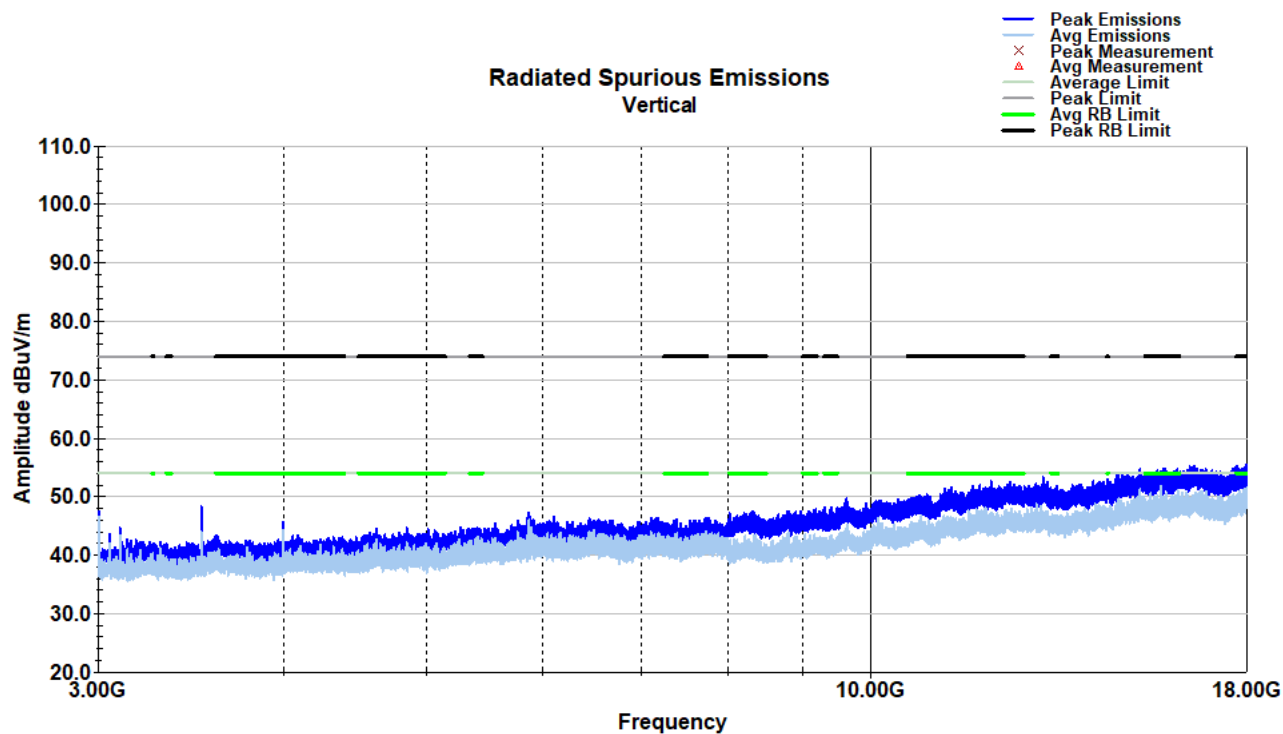
Vertical Plot – 1-3GHz – Low Channel



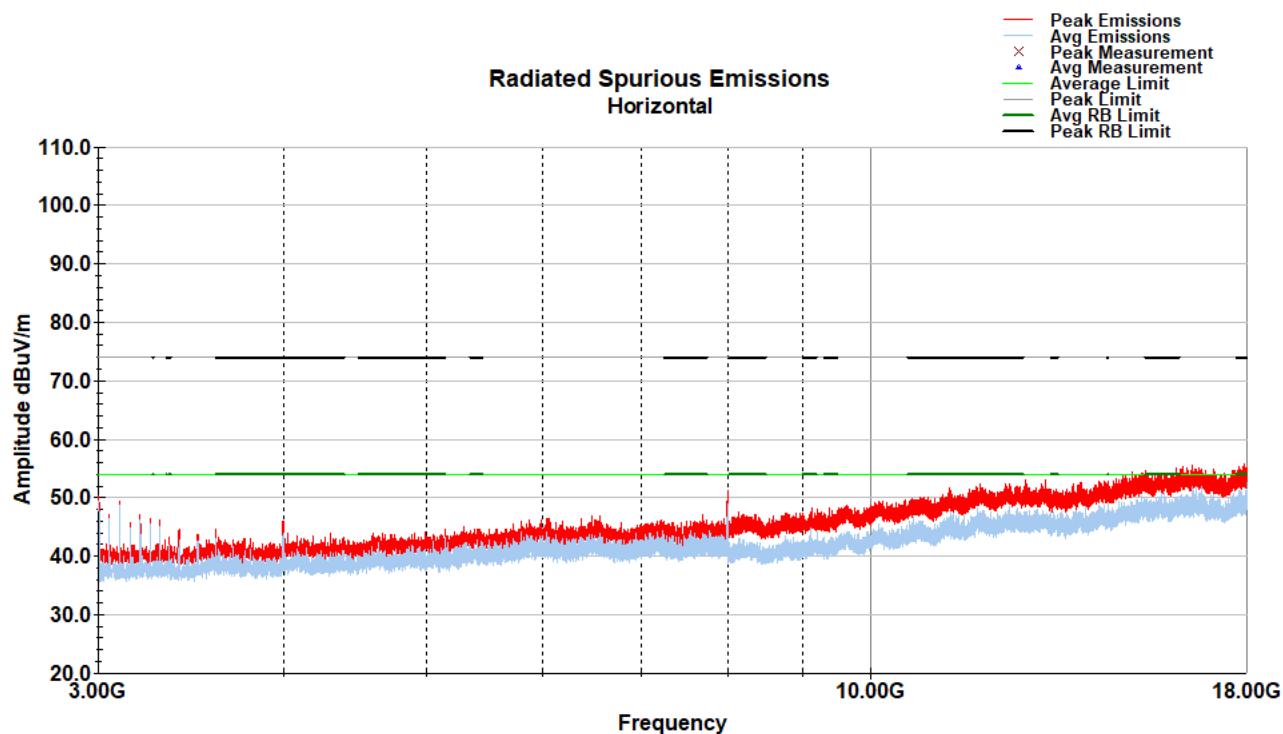
Horizontal Plot – 1-3GHz – Low Channel



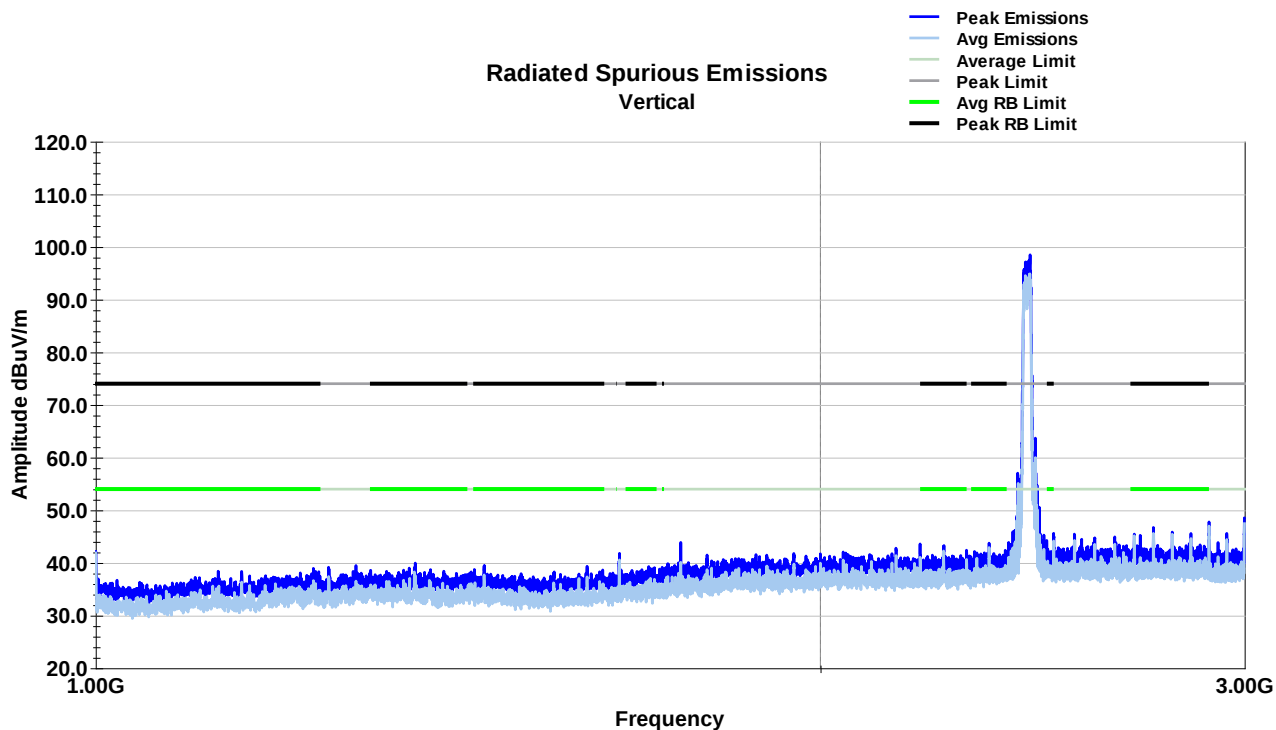
Vertical Plot – 3-18GHz – Low Channel



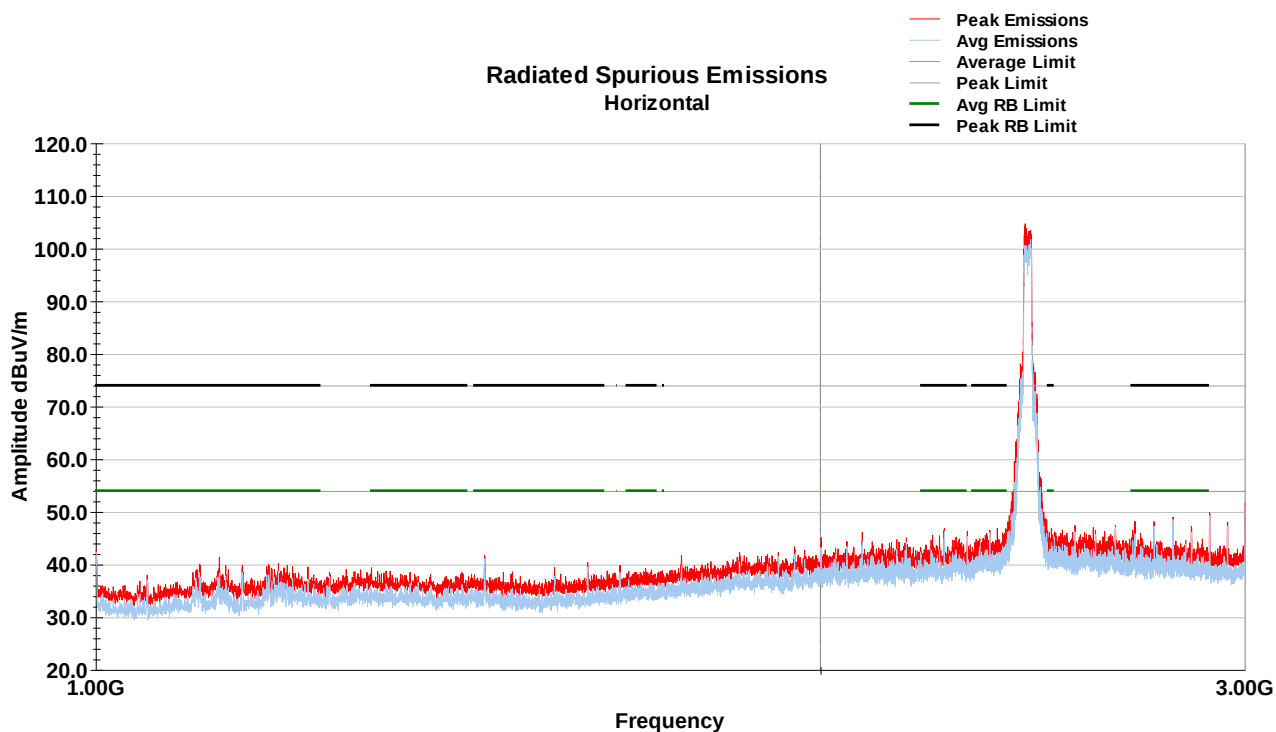
Horizontal Plot – 3-18GHz – Low Channel



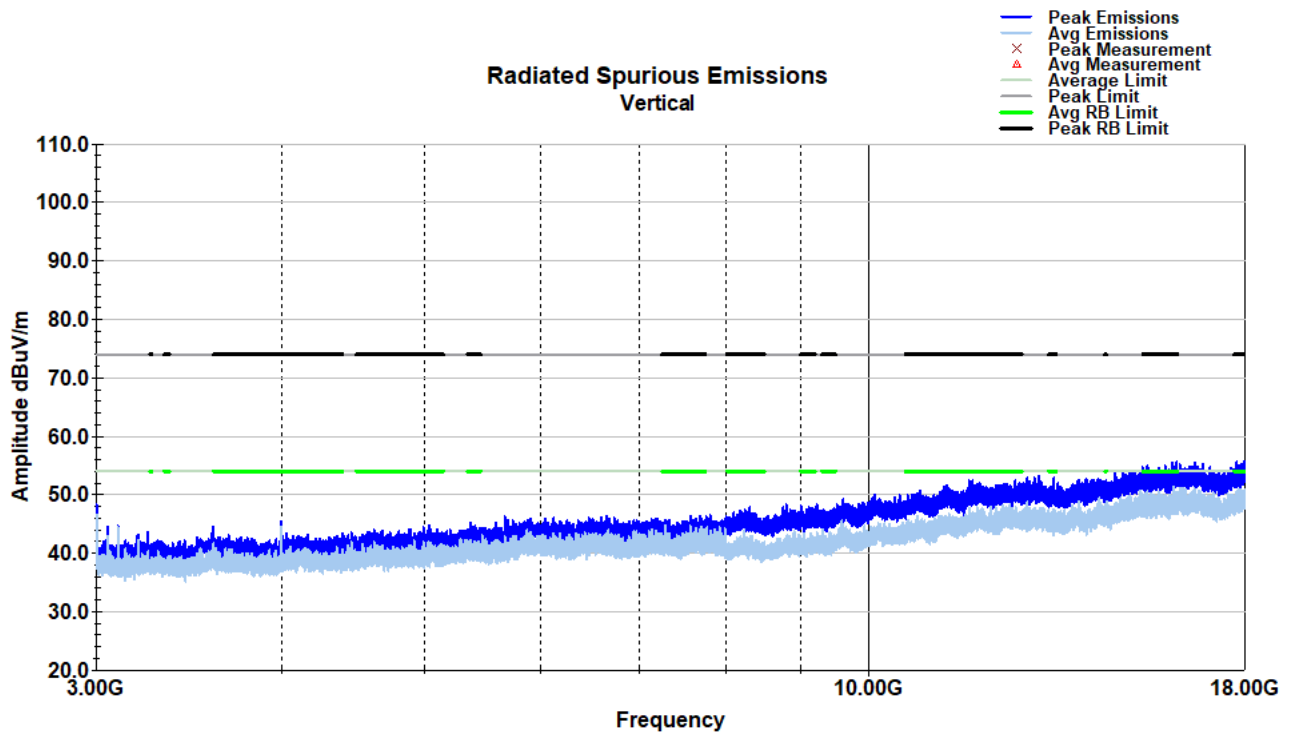
Vertical Plot – 1-3GHz – Mid Channel



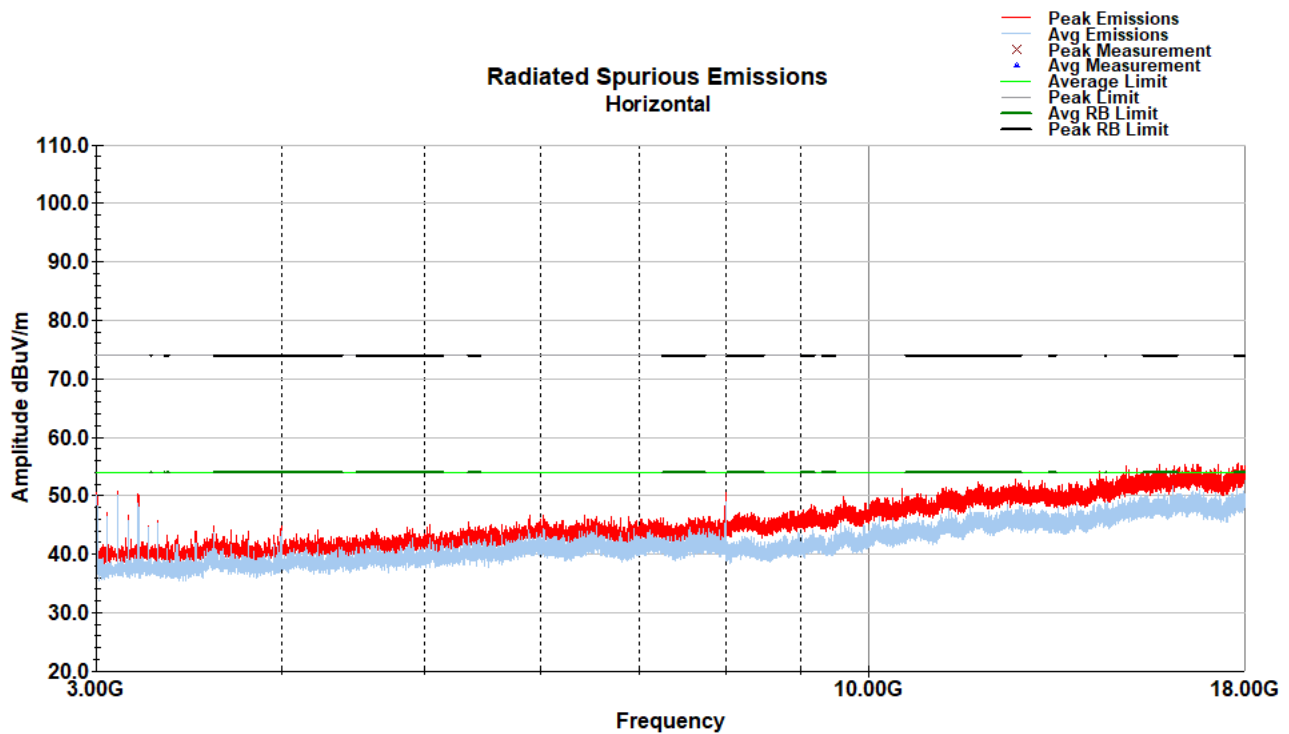
Horizontal Plot – 1-3GHz – Mid Channel



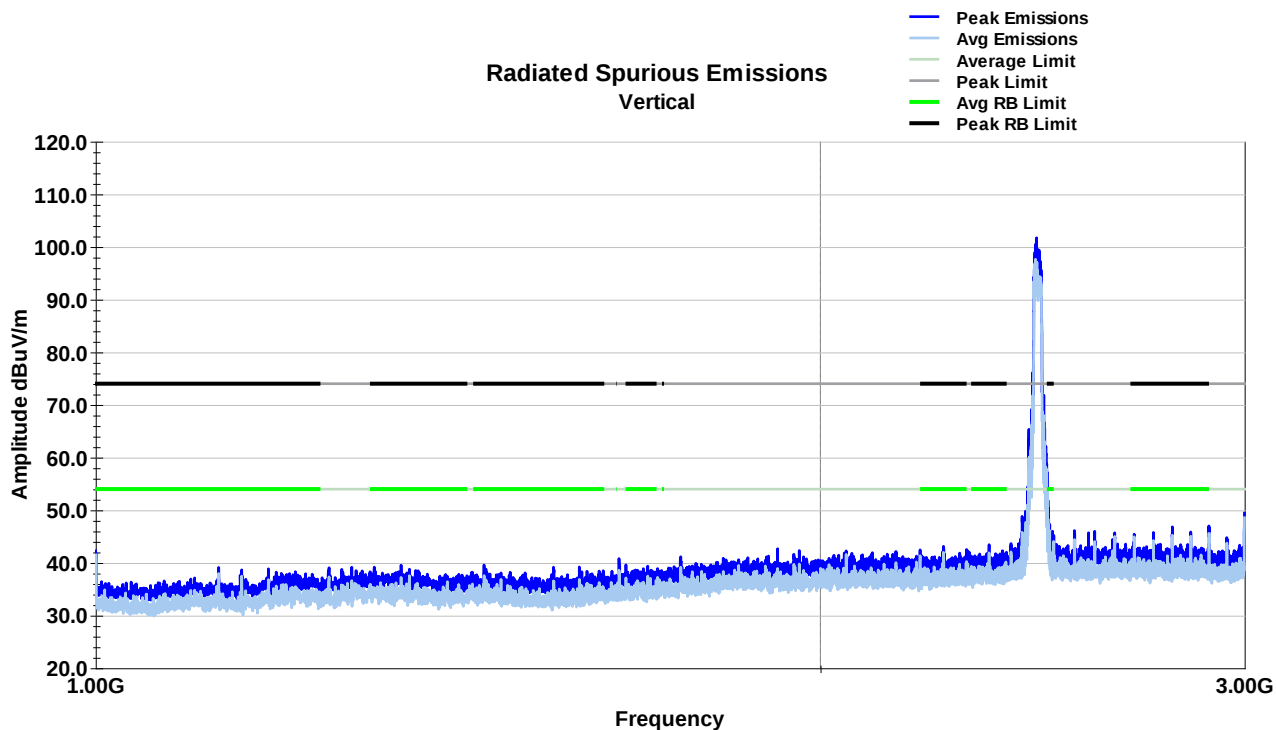
Vertical Plot – 3-18GHz – Mid Channel



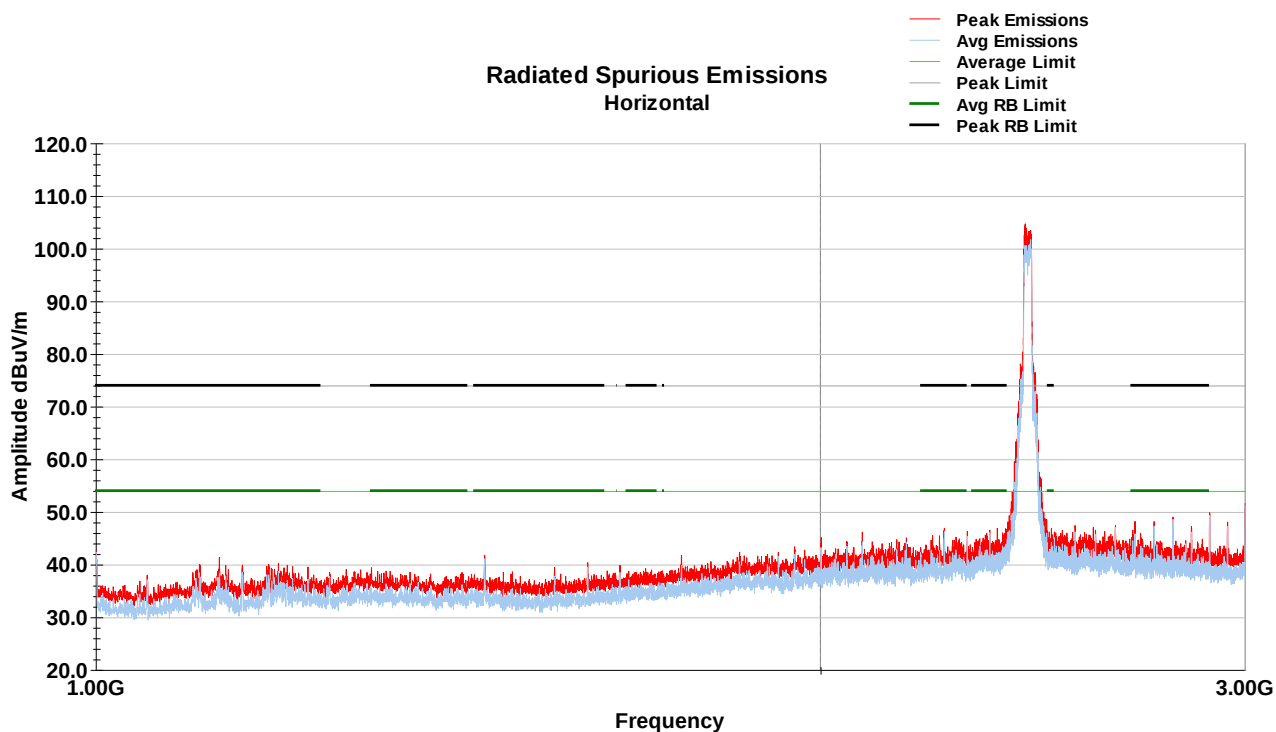
Horizontal Plot – 3-18GHz – Mid Channel



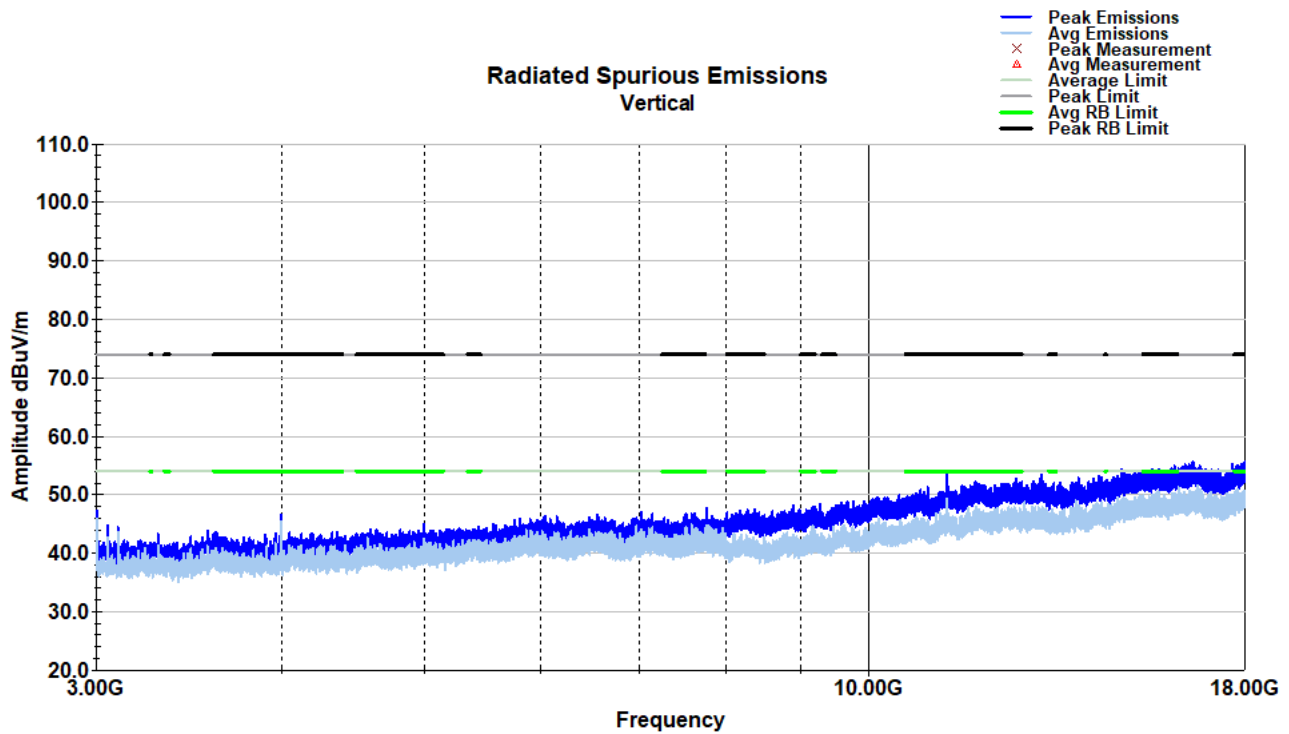
Vertical Plot – 1-3GHz – High Channel



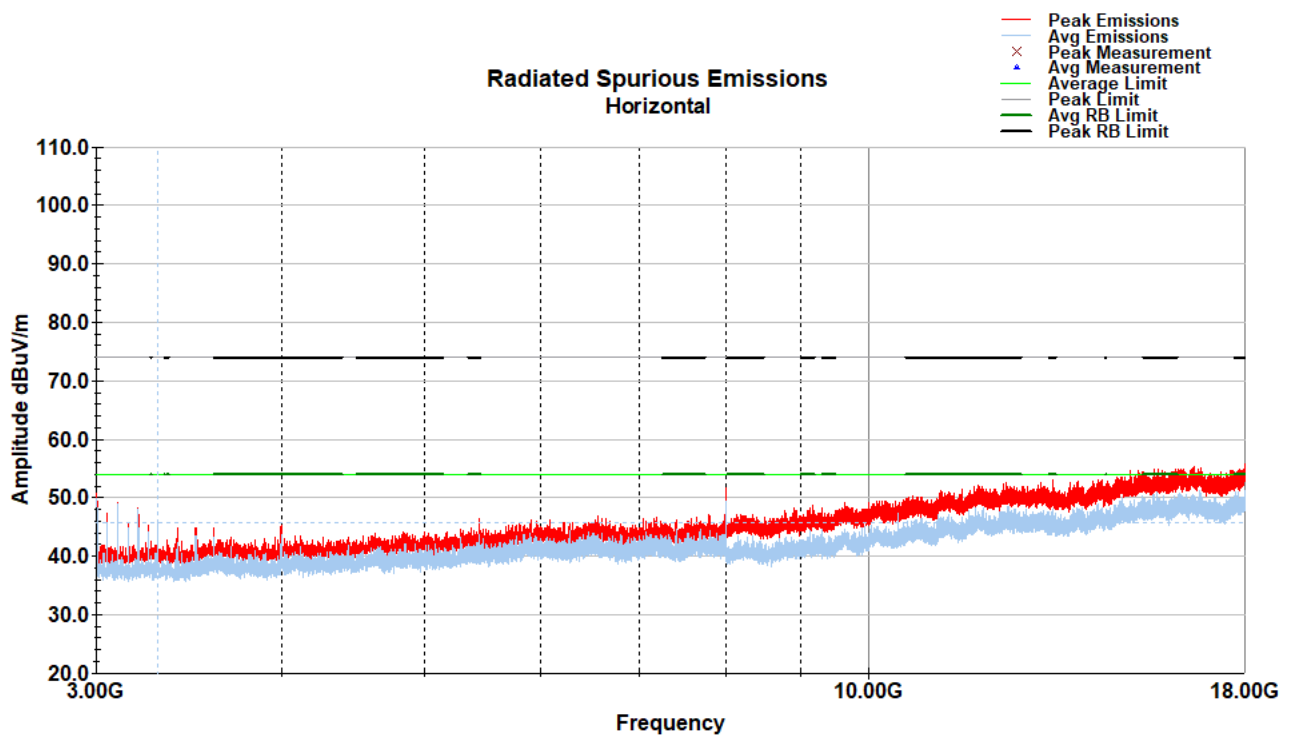
Horizontal Plot – 1-3GHz – High Channel



Vertical Plot – 3-18GHz – High Channel



Horizontal Plot – 3-18GHz – High Channel



Emissions in the 18-26GHz frequency range were similar to those shown in section 3.5.3 above.