RF Test Report

Project Number:	**5003430**	**Offer Number:**	**SUW-202109001717**
Report Number:	**5003430EMC02**	**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 E, § 15.407**
	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
Report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Prepared by: Martin Taylor, Project Engineer

Reviewed by: Brandon Osborn, Project Engineer

Remarks: This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com//en/Terms-and-Conditions.aspx. And for electronic format documents, subject to Terms and Conditions for Electronic Documents at http://www.sgs.com/en/Terms-and-Conditions/terms-e-document.aspx.

Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful, and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for a maximum of 30 days only.

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 – U-NII BAND 1 – 802.11A 8
3.6 TEST DATA: 7-INCH DISPLAY – U-NII BAND 1 – 802.11N 19
3.7 TEST DATA: 7-INCH DISPLAY – U-NII BAND 1 – 802.11AC 29
3.8 TEST DATA: 7-INCH DISPLAY – U-NII BAND 3 – 802.11A 39
3.9 TEST DATA: 7-INCH DISPLAY – U-NII BAND 3 – 802.11N 49
3.10 TEST DATA: 7-INCH DISPLAY – U-NII BAND 3 – 802.11AC 59
3.11 TEST DATA: 10-INCH DISPLAY – U-NII BAND 1 – 802.11A 69
3.12 TEST DATA: 10-INCH DISPLAY – U-NII BAND 1 – 802.11N 80
3.13 TEST DATA: 10-INCH DISPLAY – U-NII BAND 1 – 802.11AC 90
3.14 TEST DATA: 10-INCH DISPLAY – U-NII BAND 3 – 802.11A 100
3.15 TEST DATA: 10-INCH DISPLAY – U-NII BAND 3 – 802.11N 110
3.16 TEST DATA: 10-INCH DISPLAY – U-NII BAND 3 – 802.11AC 120

4 AC POWERLINE CONDUCTED EMISSIONS 130

4.1 TEST RESULT 130
4.2 TEST METHOD 130
4.3 TEST SITE 130
4.4 TEST EQUIPMENT 130
4.5 TEST DATA 131

5 MEASUREMENT UNCERTAINTY 135

6 REVISION HISTORY 136

1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.407(e)	RSS-247 S6.2 RSS-GEN S6.7	N/R [1]
Output Power	15.407(a)	RSS-247 S6.2	N/R [1]
Power Spectral Density	15.407(a)	RSS-247 S6.2	N/R [1]
Conducted Spurious Emissions / Band Edge	15.407(b)	RSS-247 S6.2	N/R [1]
Field Strength of Spurious Radiation (Restricted Bands)	15.407(b) 15.205, 15.209	RSS-247 S6.2 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

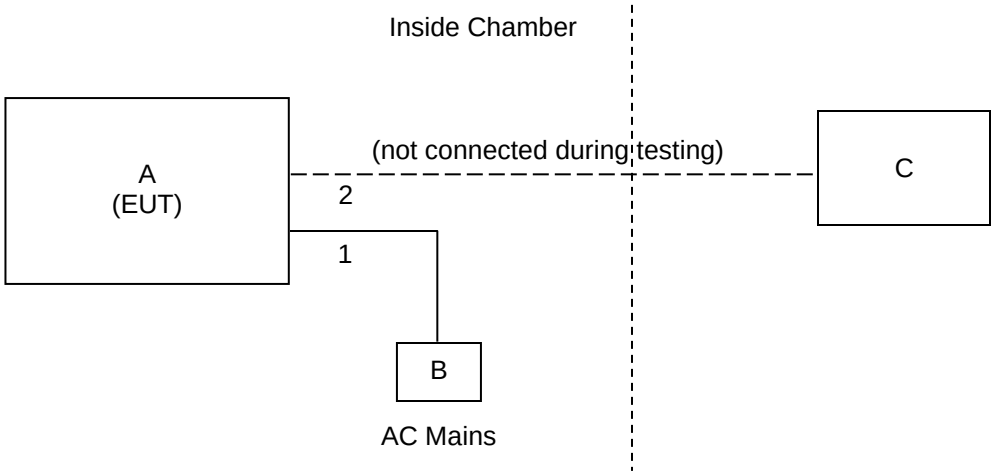
2.3 *General Information of EUT*

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) (USA only) 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 5GHz U-NII-1 and U-NII-3 bands. Note that the U-NII-1 band is not used in Canada.

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	15.407(b) – 5GHz U-NII	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 5GHz U-NII Bands 1 and 3. IEEE 802.11a, n(HT20) and ac(VHT20) modes were tested using the worst-case data rates for each mode based on the original certified WLAN module test reports. The wider bandwidth modes (40MHz and 80MHz) were not tested since those signals have lower power spectral density than the narrower 20MHz BW 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 40 GHz - The EUT to measurement antenna distance was 1 meter

Limit for spurious emissions from FCC §15.407(b) for U-NII Bands 1 & 3 for >1GHz: -27 dBm/MHz e.i.r.p.

Limits for 30-1000MHz and within restricted bands of operation >1GHz (at 3m distance):

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

Converting the >1GHz avg field strength limit of 54dBuV/m at 3m to e.i.r.p. gives a value of -41.2dBm.

3.3 *Test Site*

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

Environmental Conditions	30-1000MHz	1-18GHz	18-40GHz
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 dated 12 Feb 2021

18-40GHz

Test End Date: 17-Aug-2023 Tester: LM

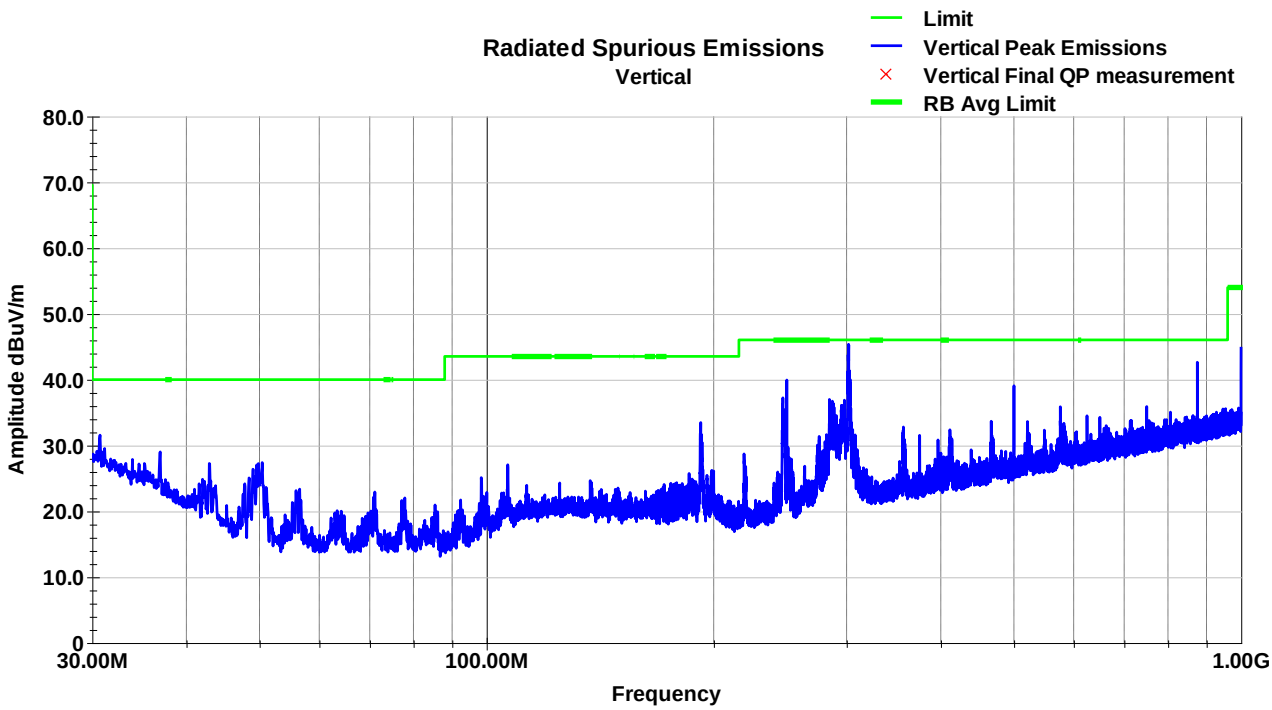
Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, HORN (SMALL)	LB-180400-20-C-KF	A-INFO	15007	18-Apr-2022	18-Apr-2024
SMA to SMA RF Cable	NC12-K1K1-138	MEGAPHASE	22002	9-Feb-2023	9-Feb-2024
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-020	TELEDYNE STORM MICROWAVE	20105	1-May-2023	29-Apr-2024
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

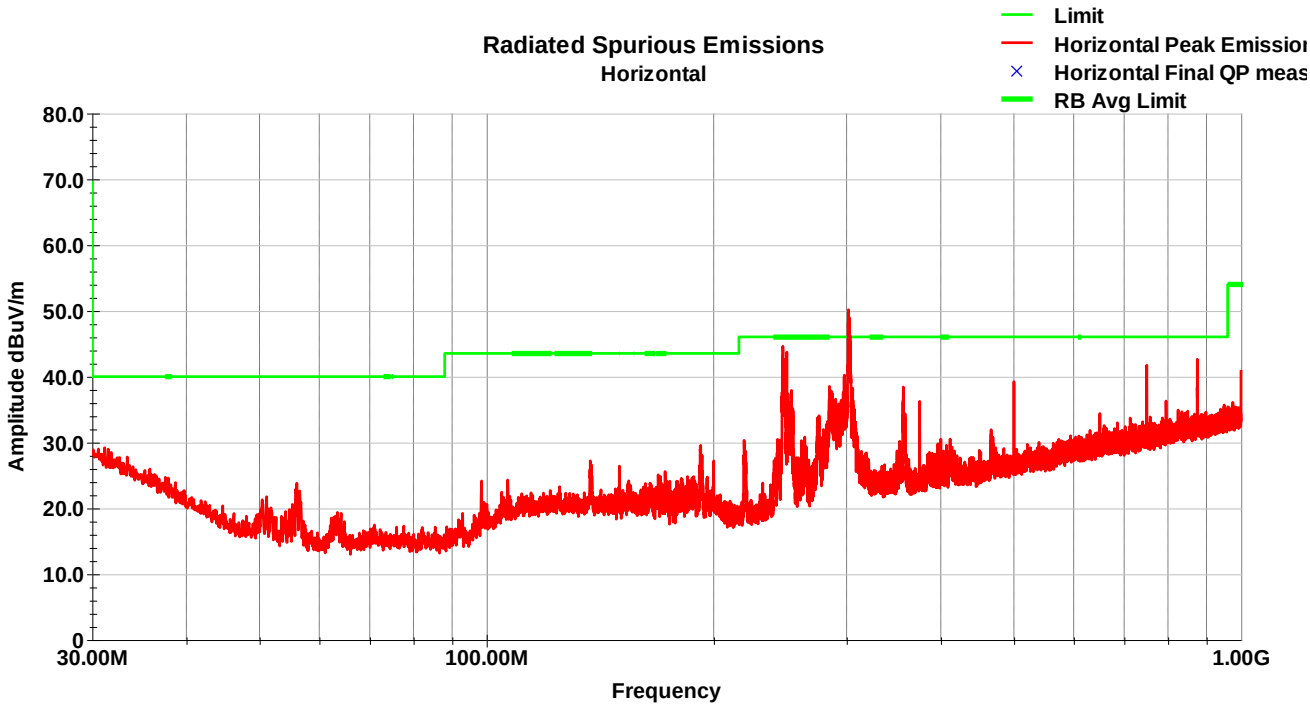
Tile profile: RSE 18-40 GHz T7 dated 12 Feb 2021

3.5 *Test Data: 7-inch Display – U-NII Band 1 – 802.11a*

3.5.1 30-1000 MHz

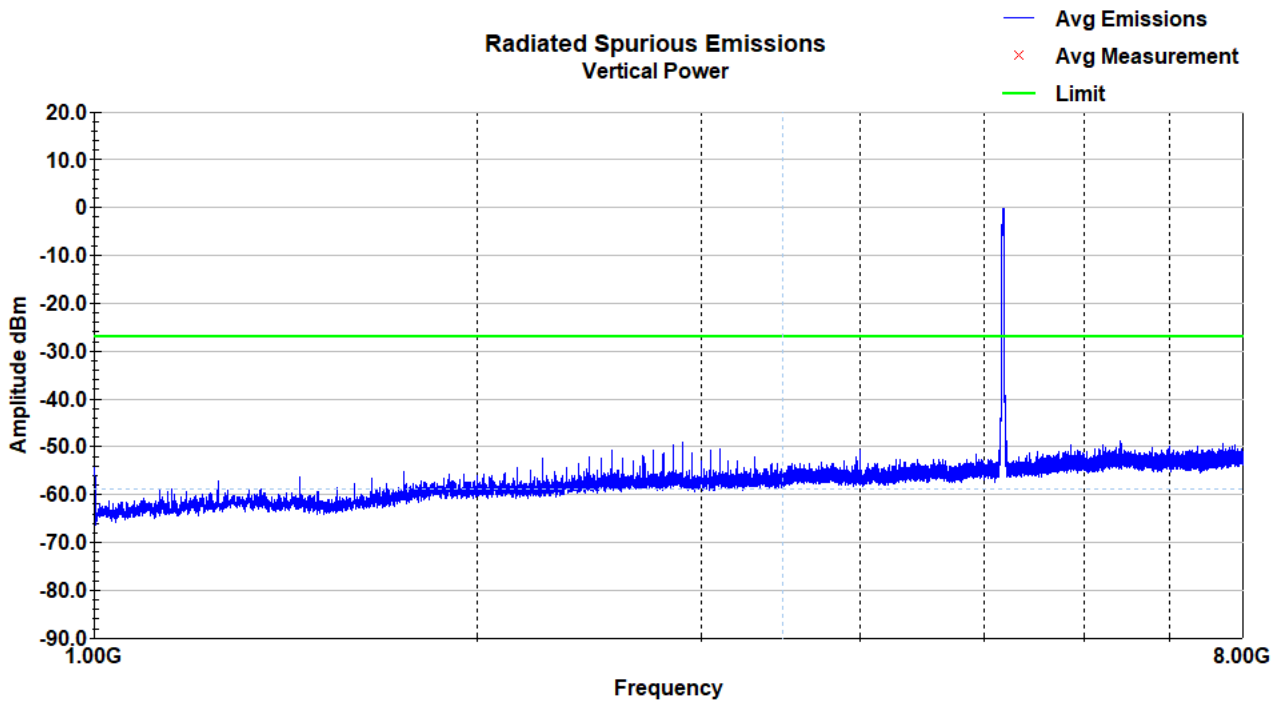
Emissions were confirmed to be non-radio emissions. All channels had similar plots (worst case shown).





3.5.2 1-18 GHz

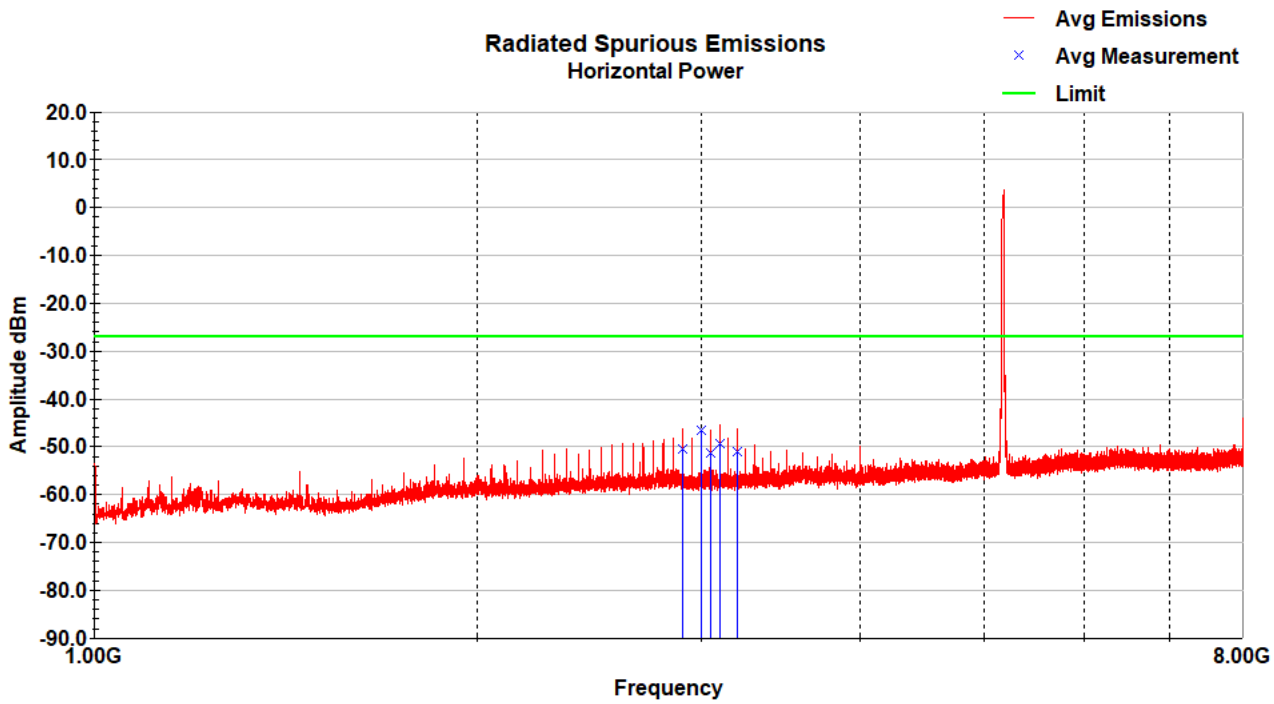
Vertical Plot – 1-8GHz – Low Channel



Vertical Data – 1-8GHz – Low Channel

No emissions within 20dB of limit

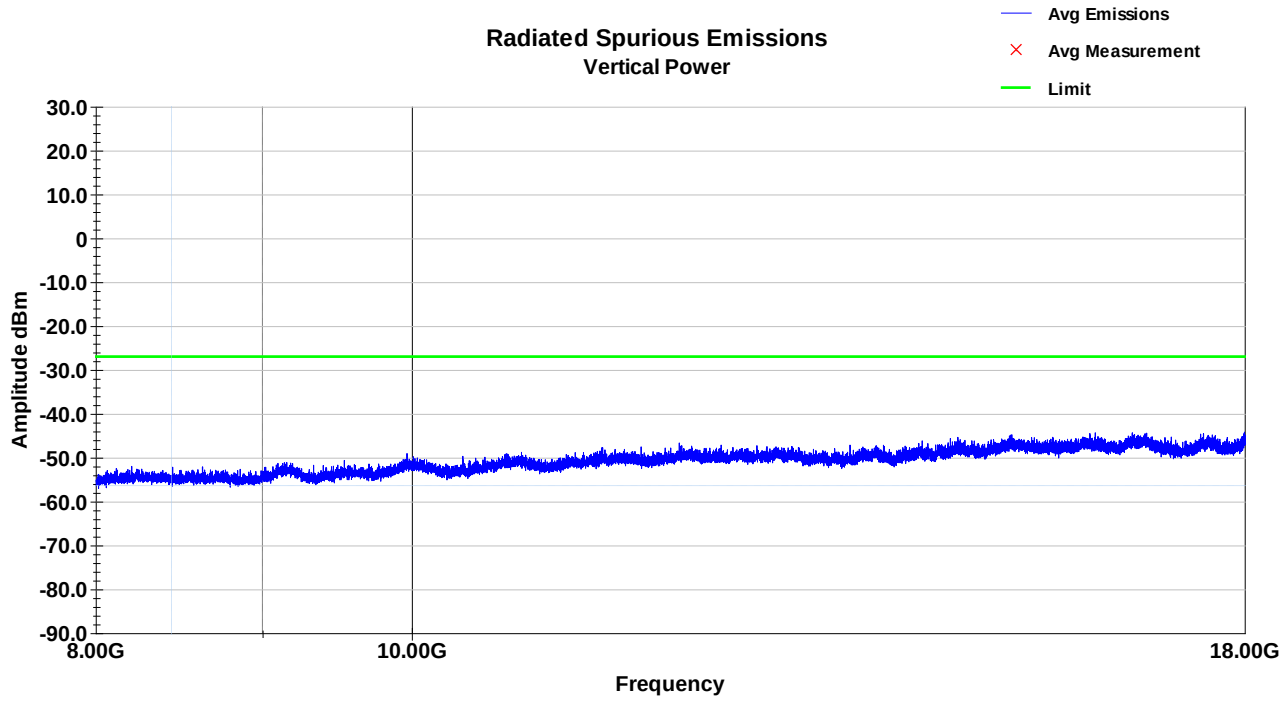
Horizontal Plot – 1-8GHz – Low Channel



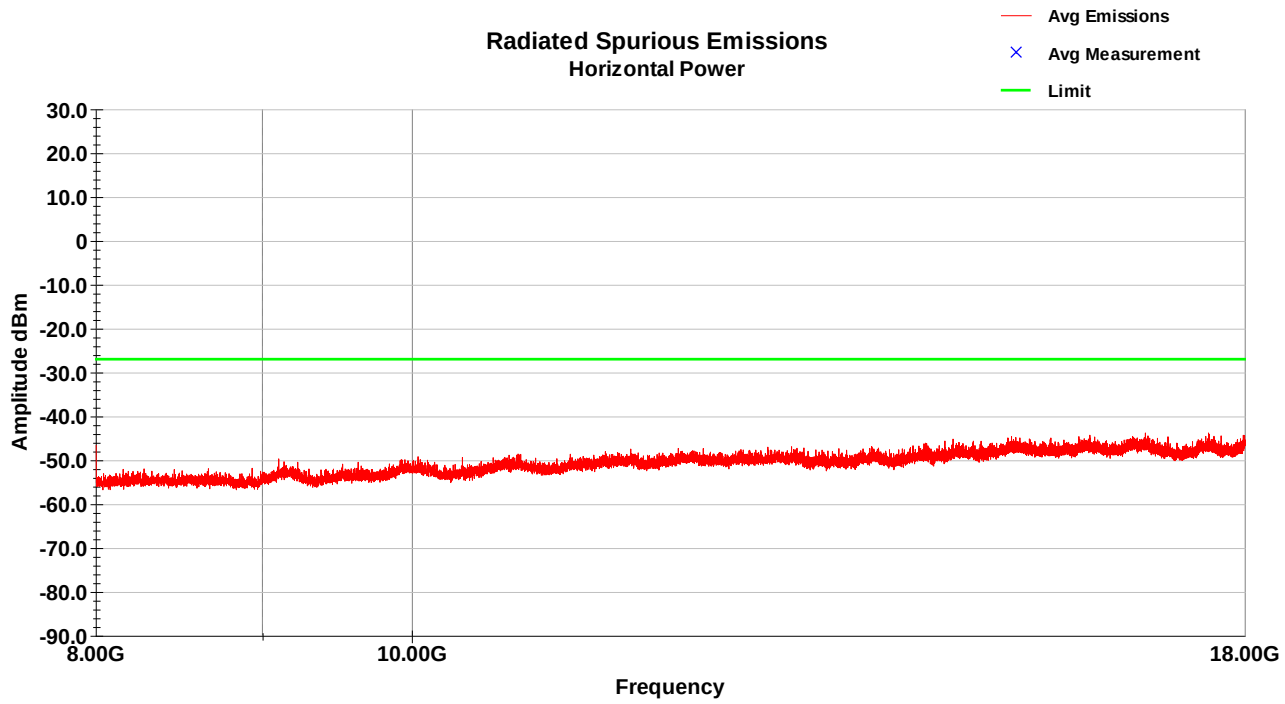
Horizontal Data – 1-8GHz – Low Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.95	-43.5	H	255.0	210.0	32.3	2.7	42.0	-50.5	-27.0	-23.5
3000.05	-39.9	H	248.0	194.0	32.4	2.8	42.0	-46.6	-27.0	-19.6
3049.98	-44.9	H	252.0	156.0	32.7	2.8	42.0	-51.3	-27.0	-24.3
3100.16	-43.1	H	226.0	128.0	32.8	2.8	41.9	-49.4	-27.0	-22.4
3199.92	-44.7	H	252.0	109.0	32.8	2.9	41.8	-50.9	-27.0	-23.9
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

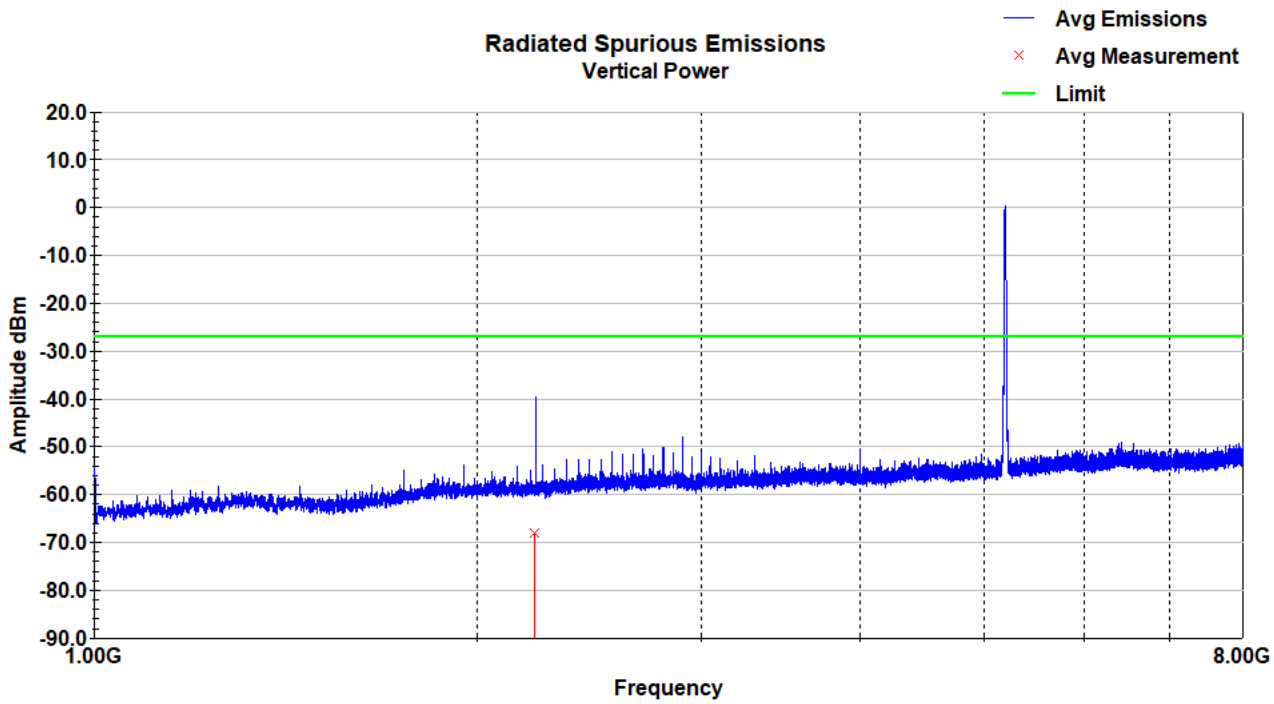
Vertical Plot – 8-18GHz – Low Channel



Horizontal Plot – 8-18GHz – Low Channel



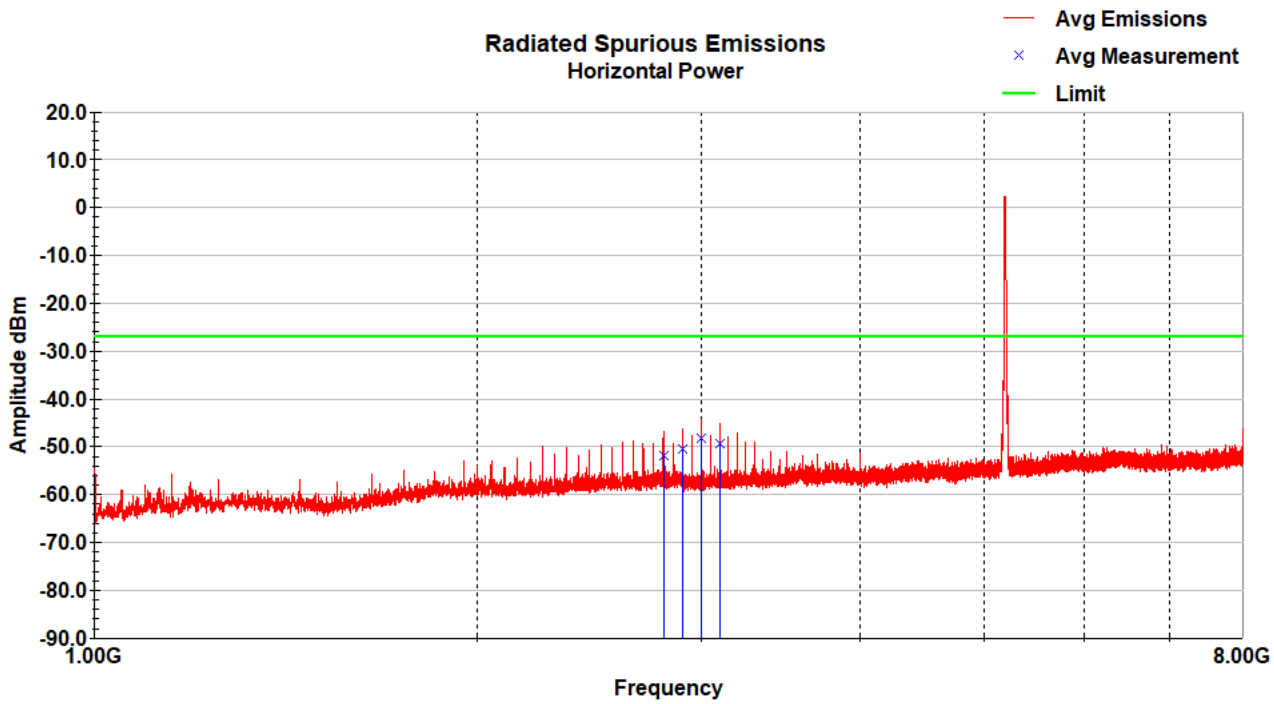
Vertical Plot – 1-8GHz – Mid Channel



Vertical Data – 1-8GHz – Mid Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2219.58	-59.5	V	286.0	118.0	31.5	2.4	42.3	-67.9	-27.0	-40.9
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

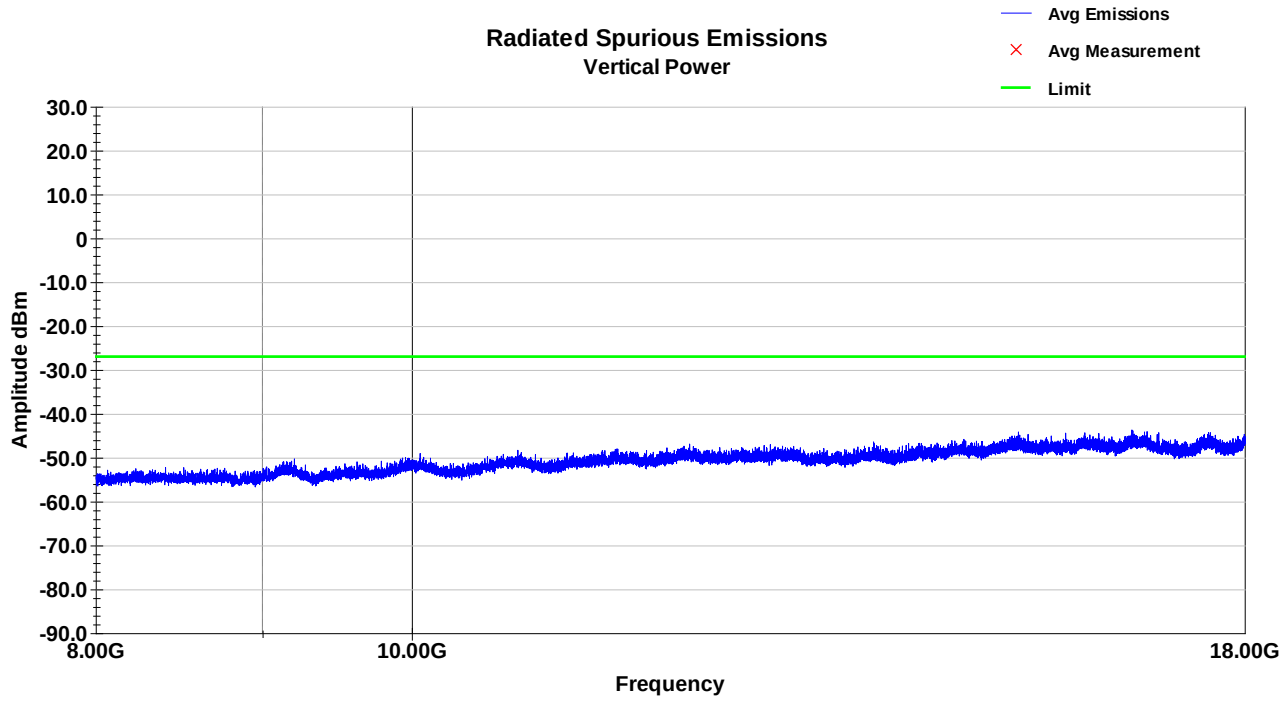
Horizontal Plot – 1-8GHz – Mid Channel



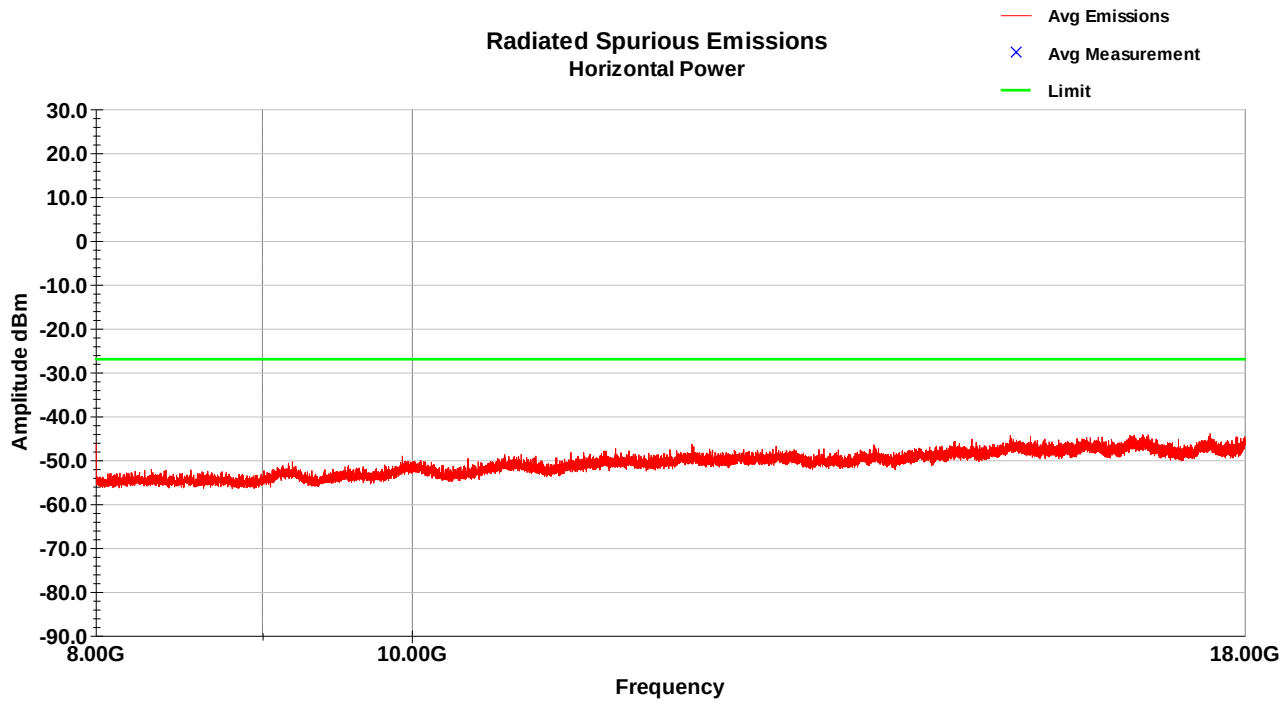
Horizontal Data – 1-8GHz – Mid Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2799.92	-44.7	H	228.0	126.0	32.5	2.7	42.2	-51.7	-27.0	-24.7
2899.92	-43.3	H	227.0	135.0	32.3	2.7	42.0	-50.3	-27.0	-23.3
3000.16	-41.5	H	248.0	126.0	32.4	2.8	42.0	-48.3	-27.0	-21.3
3100.16	-43.0	H	225.0	117.0	32.8	2.8	41.9	-49.3	-27.0	-22.3
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

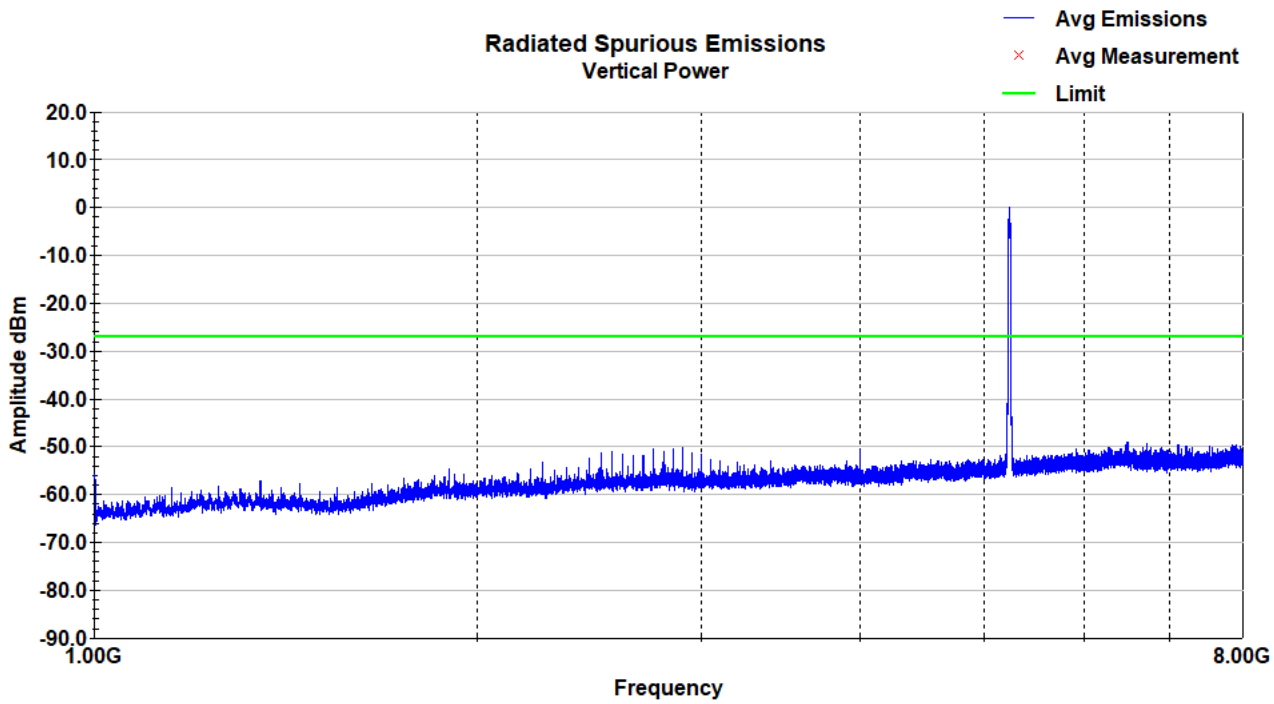
Vertical Plot – 8-18GHz – Mid Channel



Horizontal Plot – 8-18GHz – Mid Channel



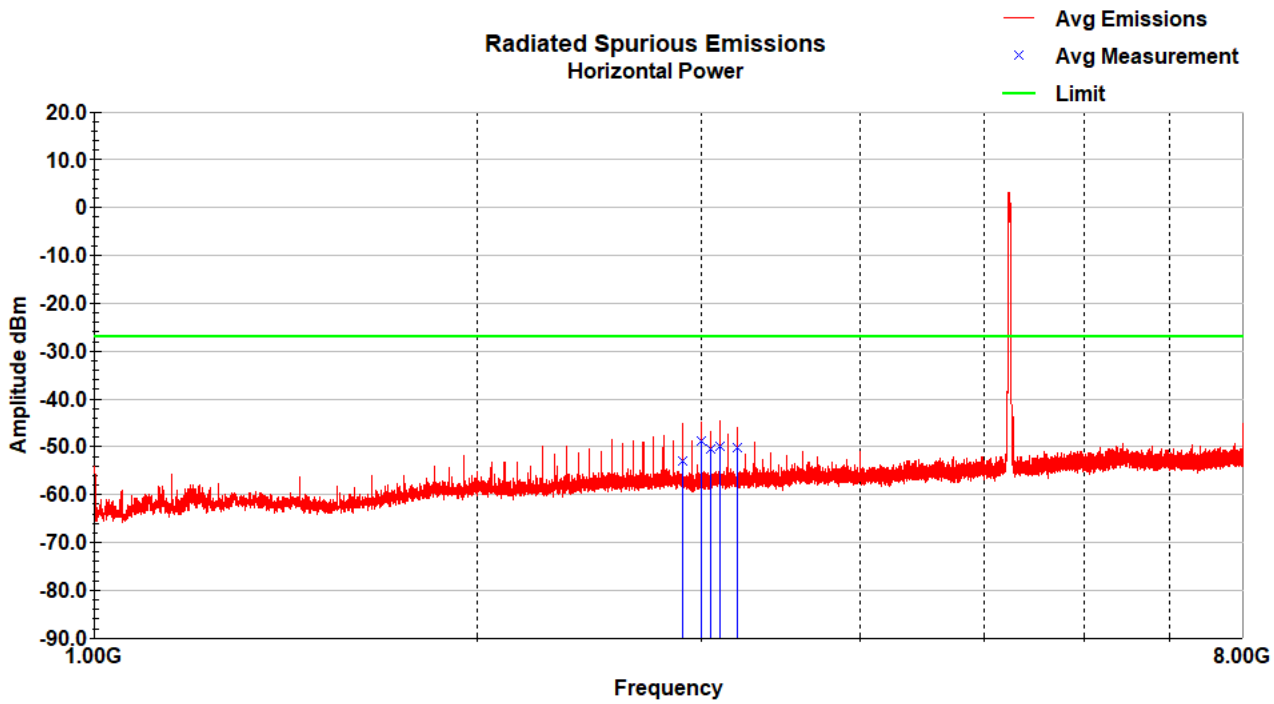
Vertical Plot – 1-8GHz – High Channel



Vertical Data – 1-8GHz – High Channel

No emissions within 20dB of limit

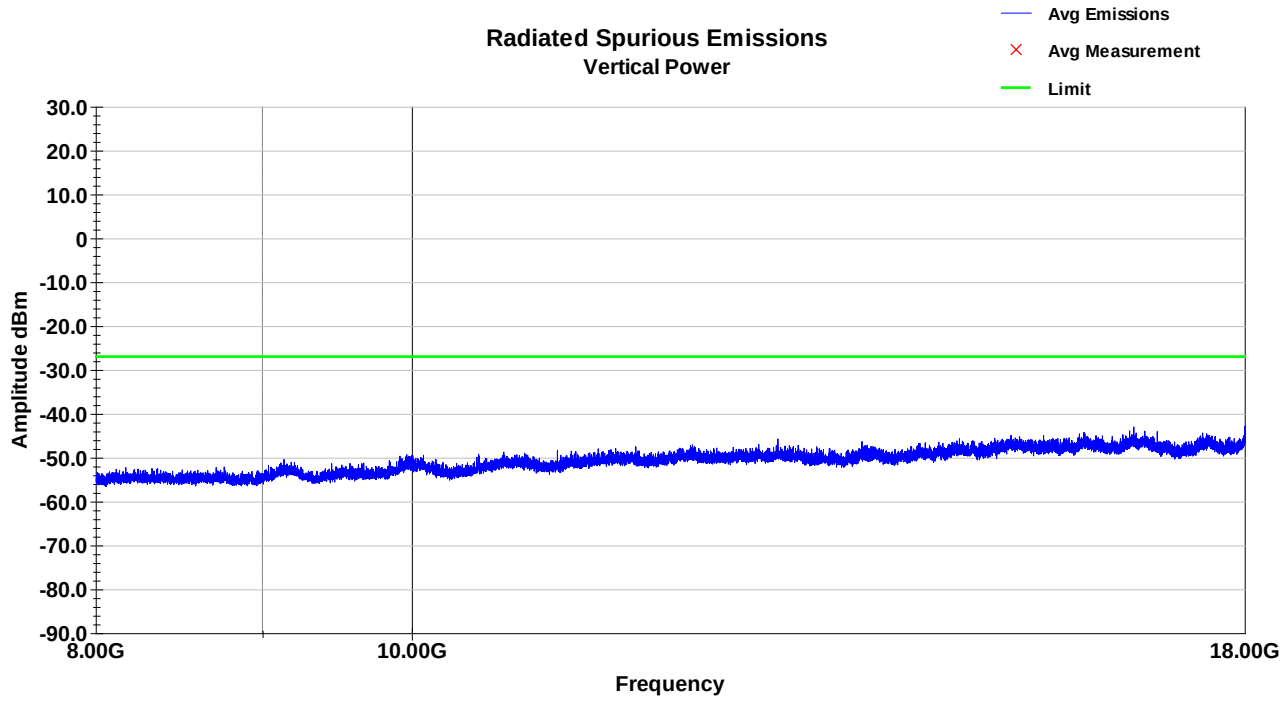
Horizontal Plot – 1-8GHz – High Channel



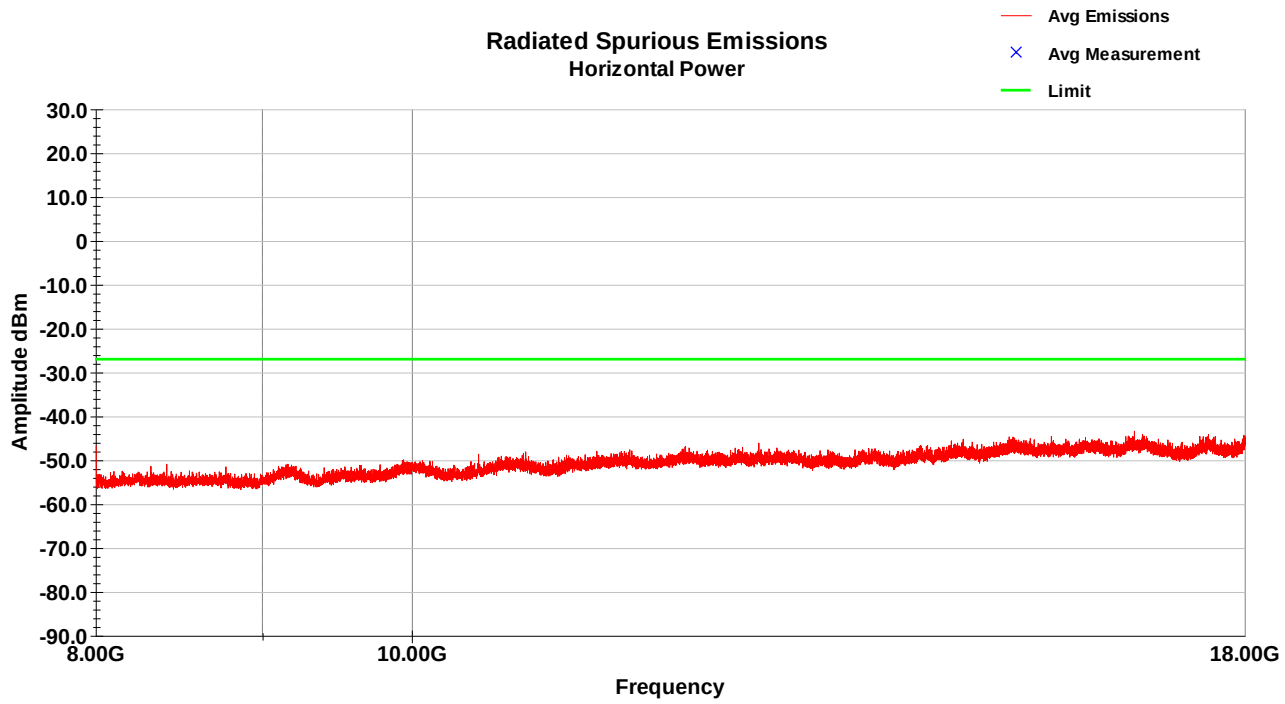
Horizontal Data – 1-8GHz – High Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.95	-45.9	H	258.0	106.0	32.3	2.7	42.0	-52.9	-27.0	-25.9
3000.08	-42.0	H	236.0	120.0	32.4	2.8	42.0	-48.8	-27.0	-21.8
3049.99	-44.2	H	221.0	117.0	32.7	2.8	42.0	-50.6	-27.0	-23.6
3099.80	-43.6	H	236.0	134.0	32.8	2.8	41.9	-49.9	-27.0	-22.9
3200.16	-44.1	H	238.0	109.0	32.8	2.9	41.8	-50.2	-27.0	-23.2
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

Vertical Plot – 8-18GHz – High Channel



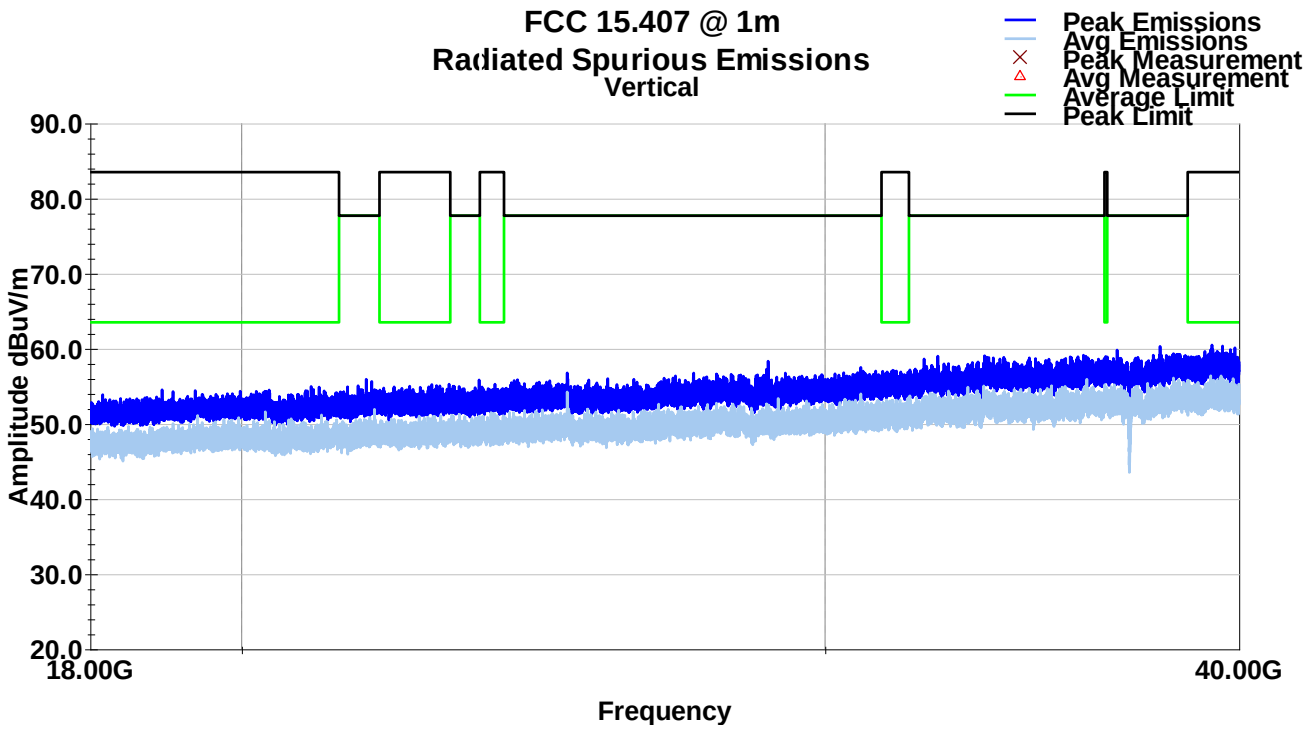
Horizontal Plot – 8-18GHz – High Channel

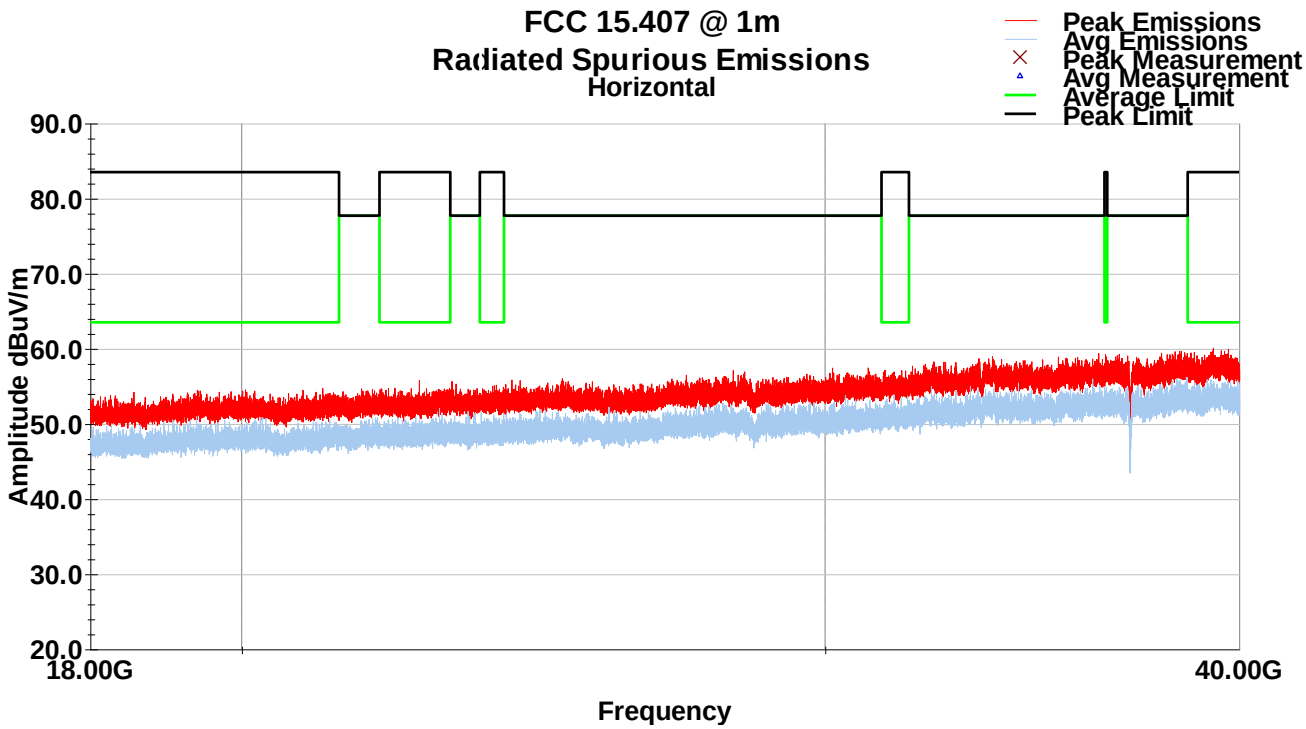


The worst-case final data in this section of -46.6dBm is below the restricted band limit of -41.2dBm.

3.5.3 18-40 GHz

All channels and data modes had similar plots in the 18-40GHz frequency range.

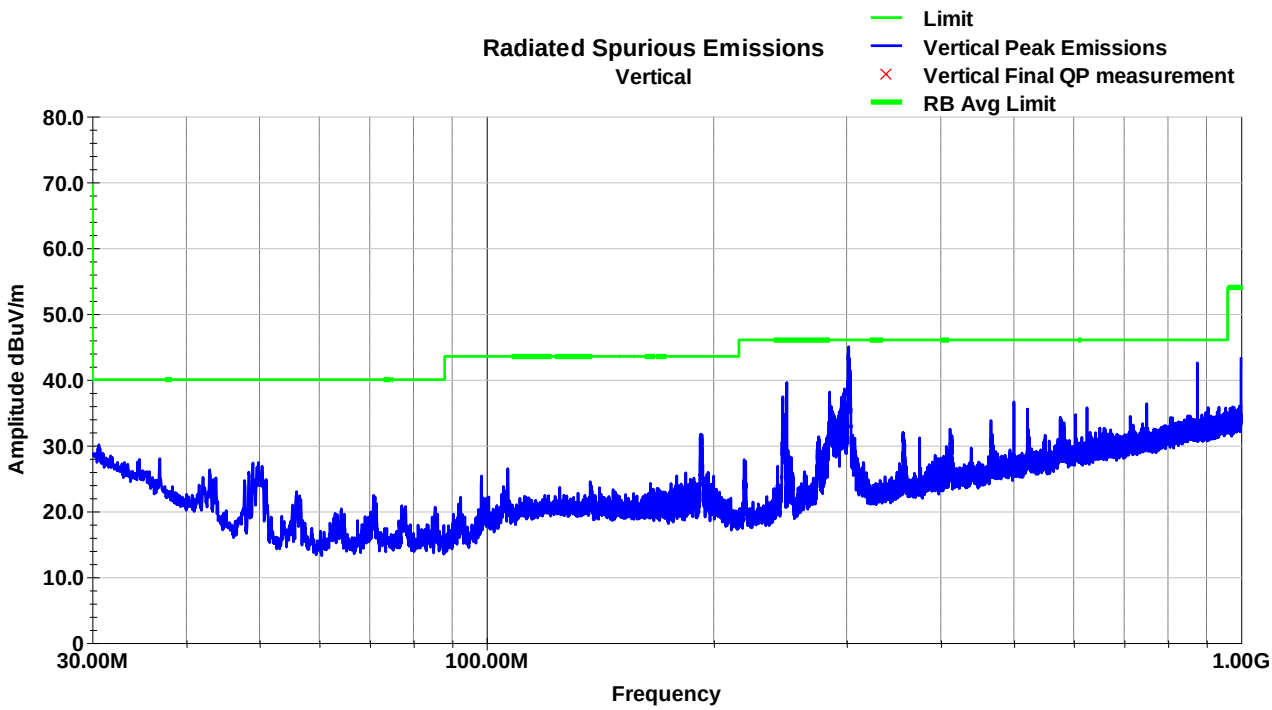


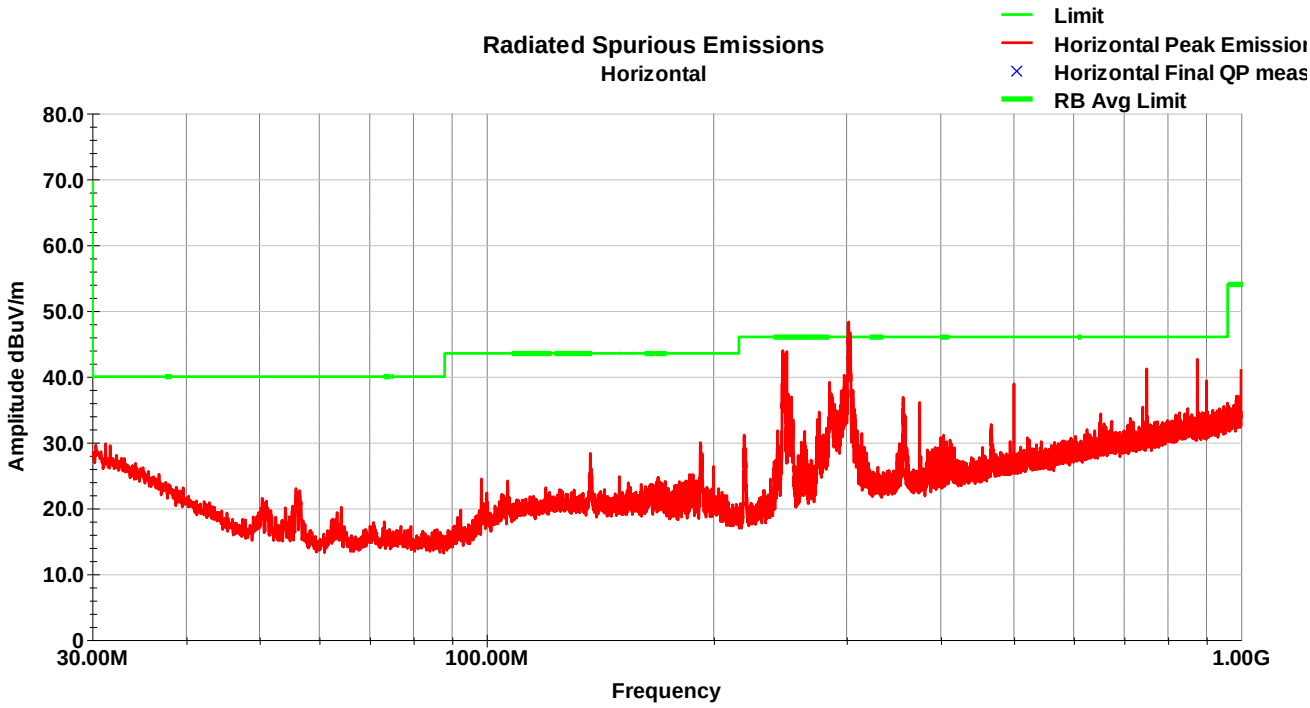


3.6 *Test Data: 7-inch Display – U-NII Band 1 – 802.11n*

3.6.1 30-1000 MHz

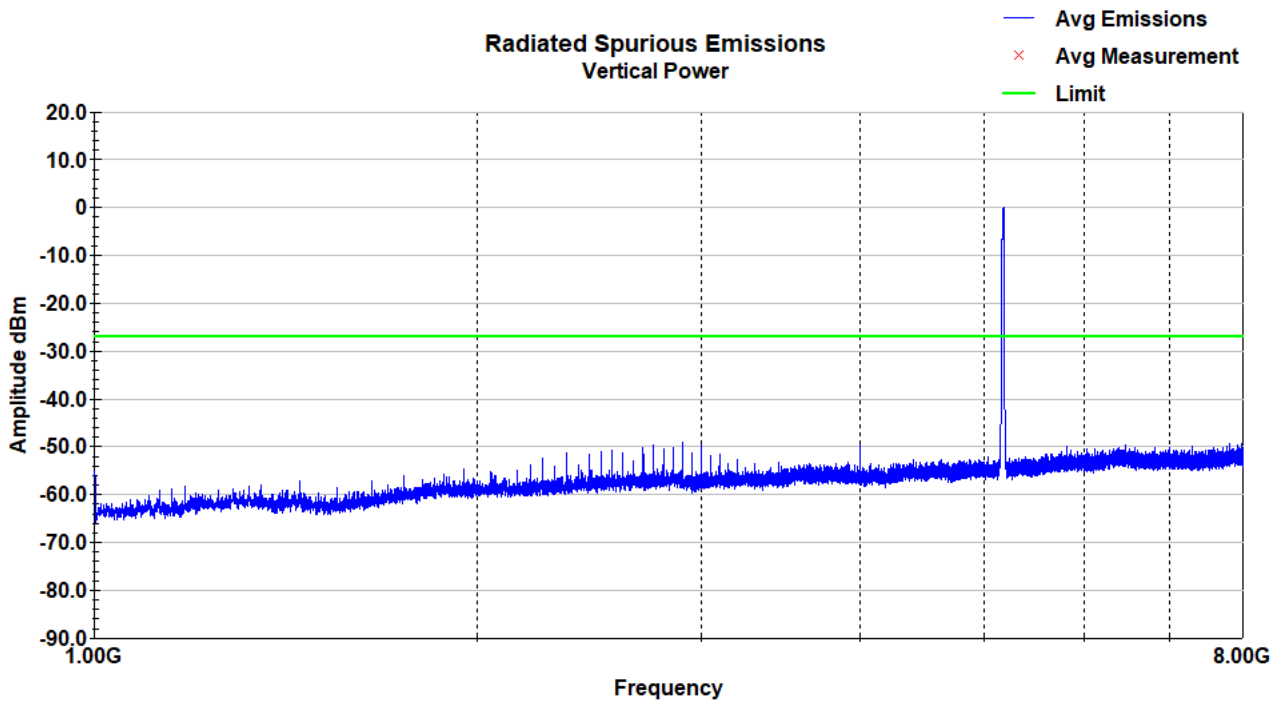
Emissions were confirmed to be non-radio emissions. All channels had similar plots (worst case shown).





3.6.2 1-18 GHz

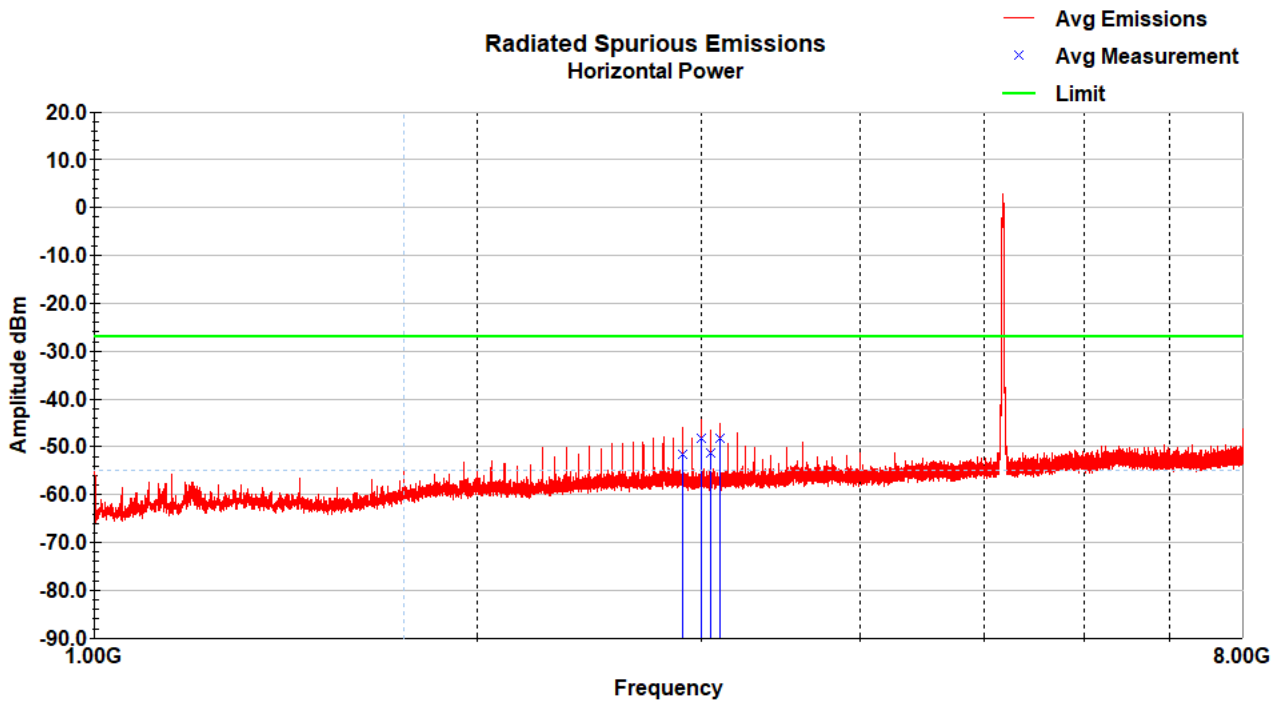
Vertical Plot – 1-8GHz – Low Channel



Vertical Data – 1-8GHz – Low Channel

No emissions within 20dB of limit

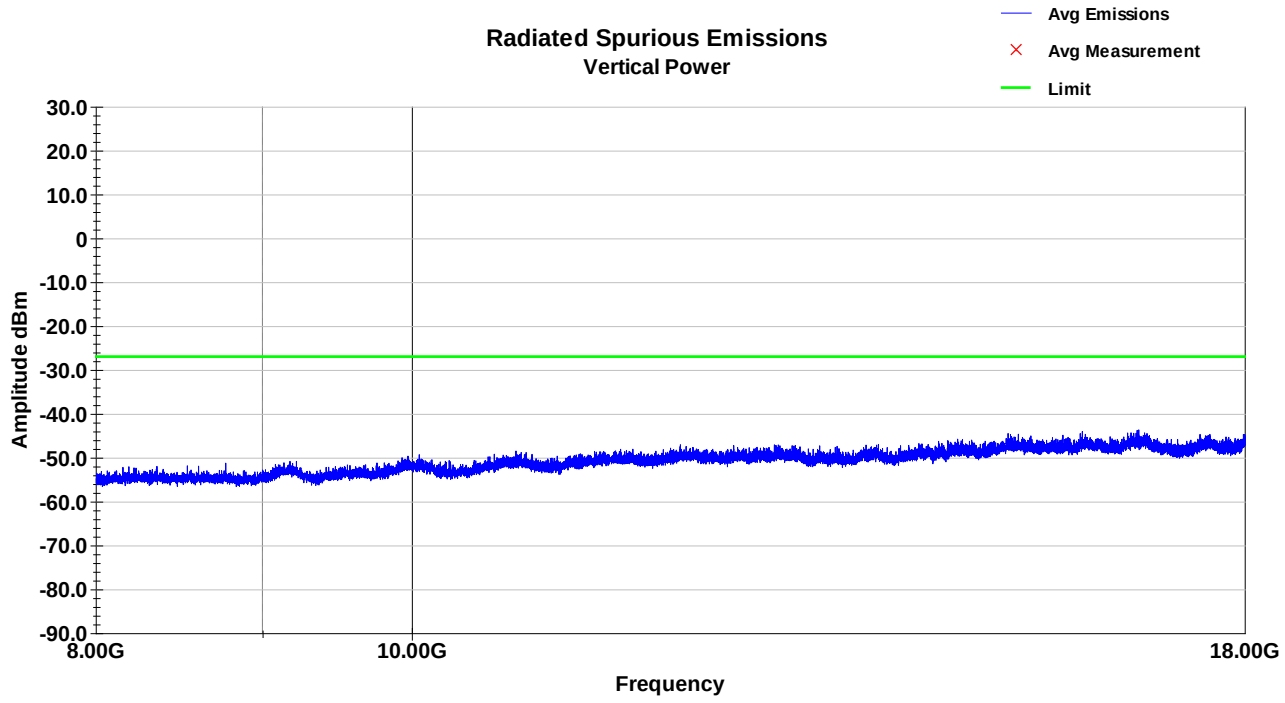
Horizontal Plot – 1-8GHz – Low Channel



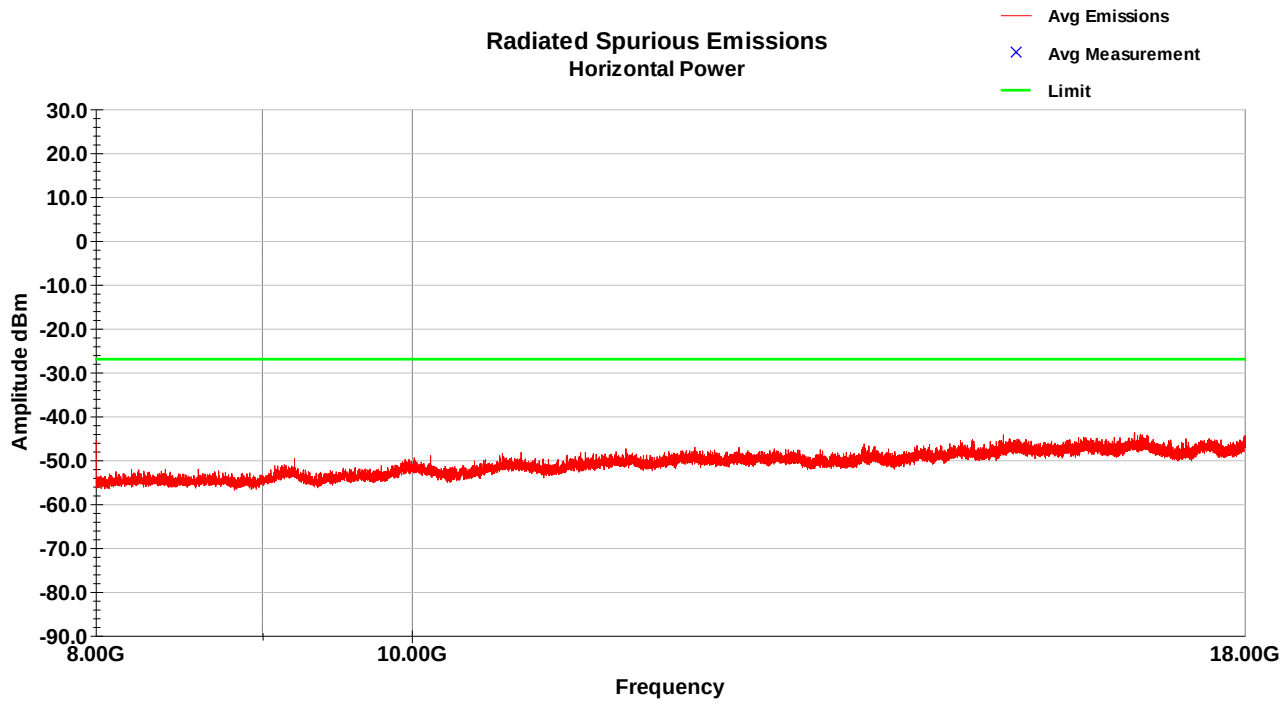
Horizontal Data – 1-8GHz – Low Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.95	-44.7	H	260.0	138.0	32.3	2.7	42.0	-51.7	-27.0	-24.7
3000.06	-41.6	H	241.0	120.0	32.4	2.8	42.0	-48.3	-27.0	-21.3
3050.23	-44.8	H	231.0	110.0	32.7	2.8	42.0	-51.2	-27.0	-24.2
3099.92	-41.9	H	253.0	165.0	32.8	2.8	41.9	-48.2	-27.0	-21.2
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

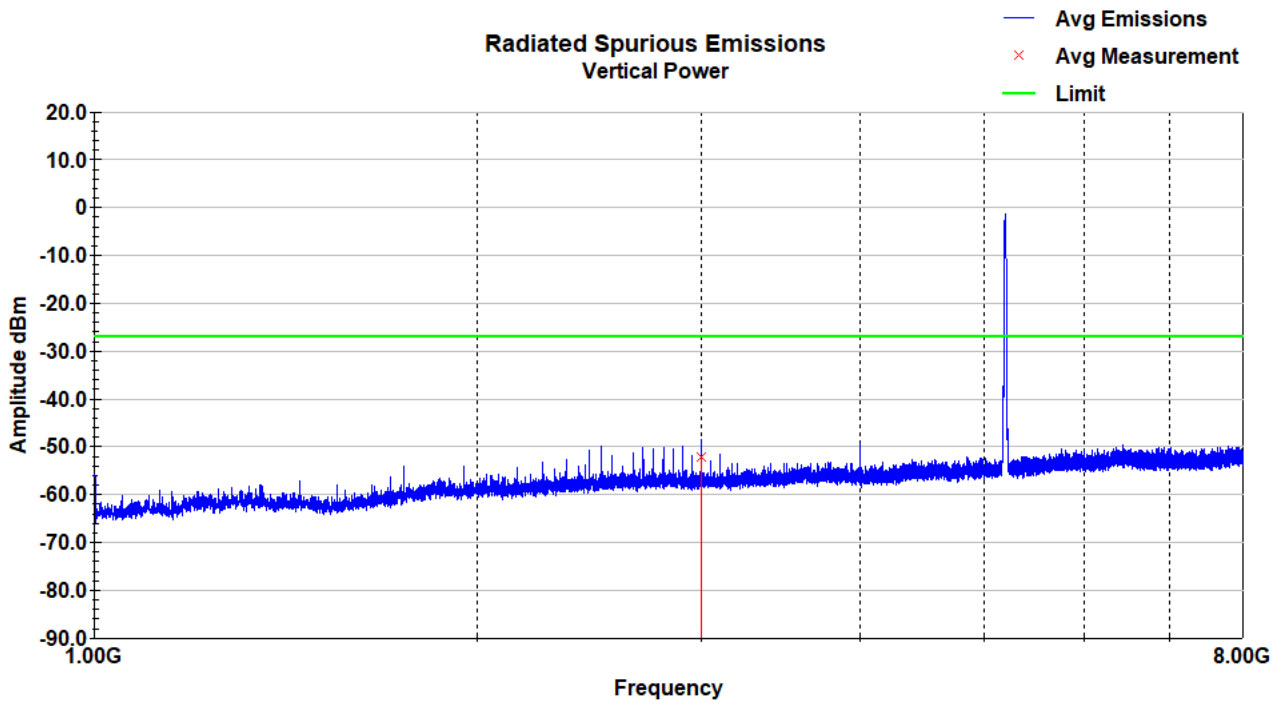
Vertical Plot – 8-18GHz – Low Channel



Horizontal Plot – 8-18GHz – Low Channel



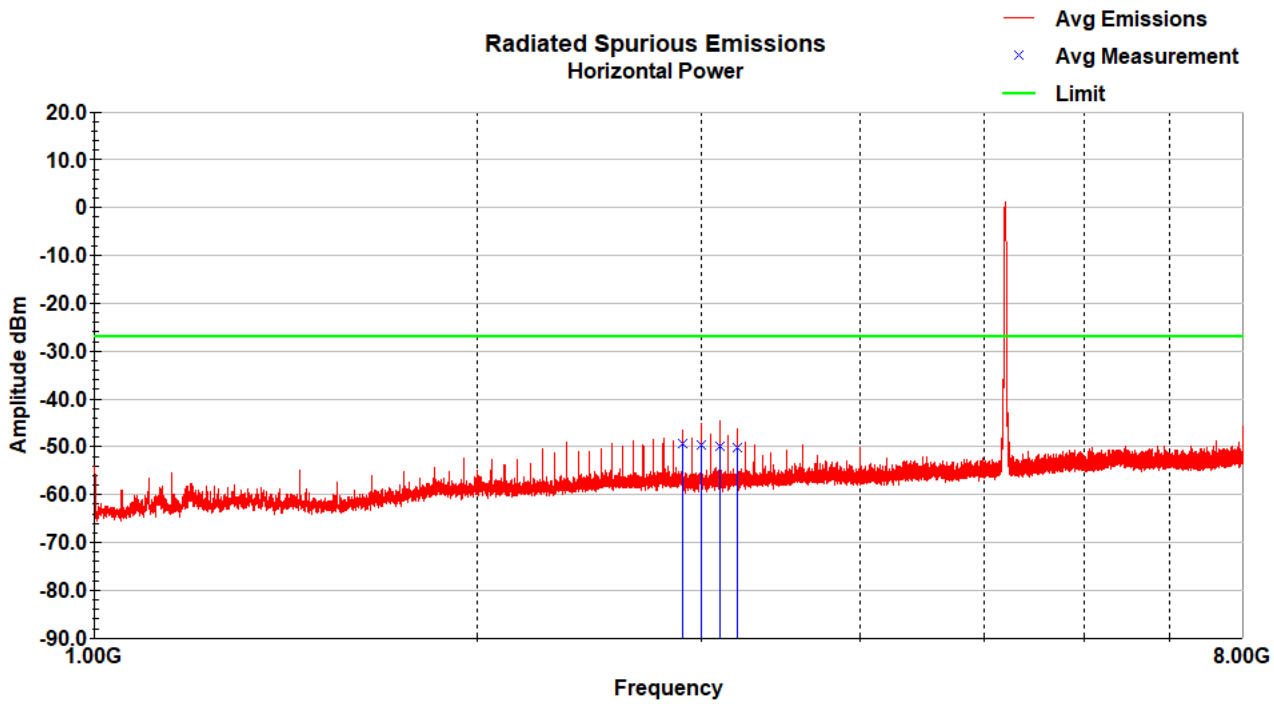
Vertical Plot – 1-8GHz – Mid Channel



Vertical Data – 1-8GHz – Mid Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
3000.04	-45.2	V	163.0	230.0	32.4	2.8	42.0	-52.0	-27.0	-25.0
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

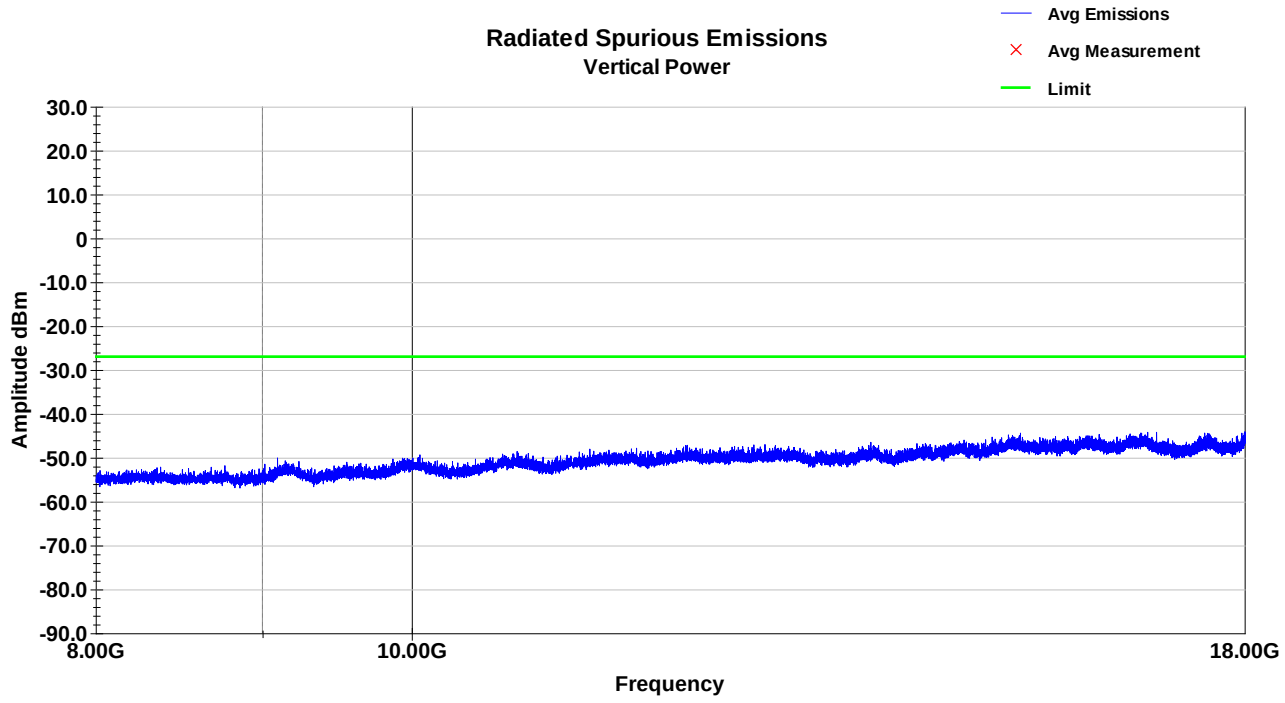
Horizontal Plot – 1-8GHz – Mid Channel



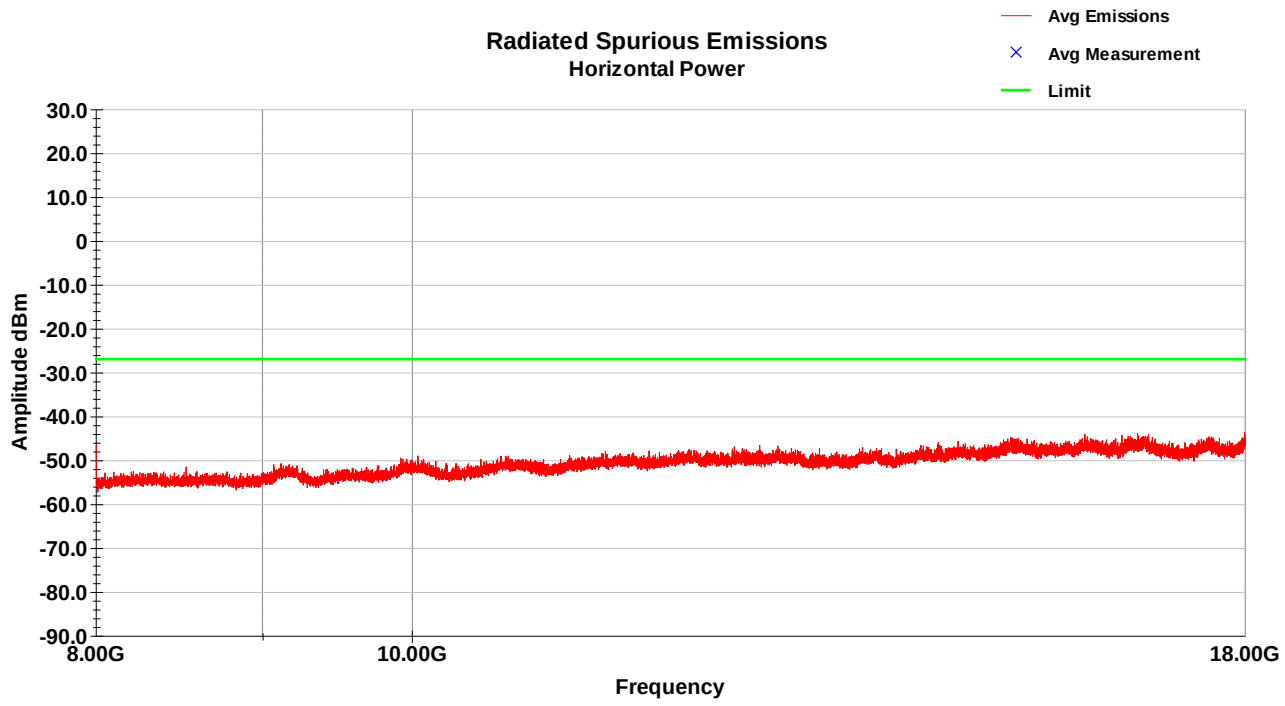
Horizontal Data – 1-8GHz – Mid Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2900.07	-42.4	H	258.0	181.0	32.3	2.7	42.0	-49.3	-27.0	-22.3
3000.05	-42.9	H	135.0	246.0	32.4	2.8	42.0	-49.7	-27.0	-22.7
3100.04	-43.5	H	235.0	145.0	32.8	2.8	41.9	-49.8	-27.0	-22.8
3200.04	-44.0	H	251.0	139.0	32.8	2.9	41.8	-50.1	-27.0	-23.1
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

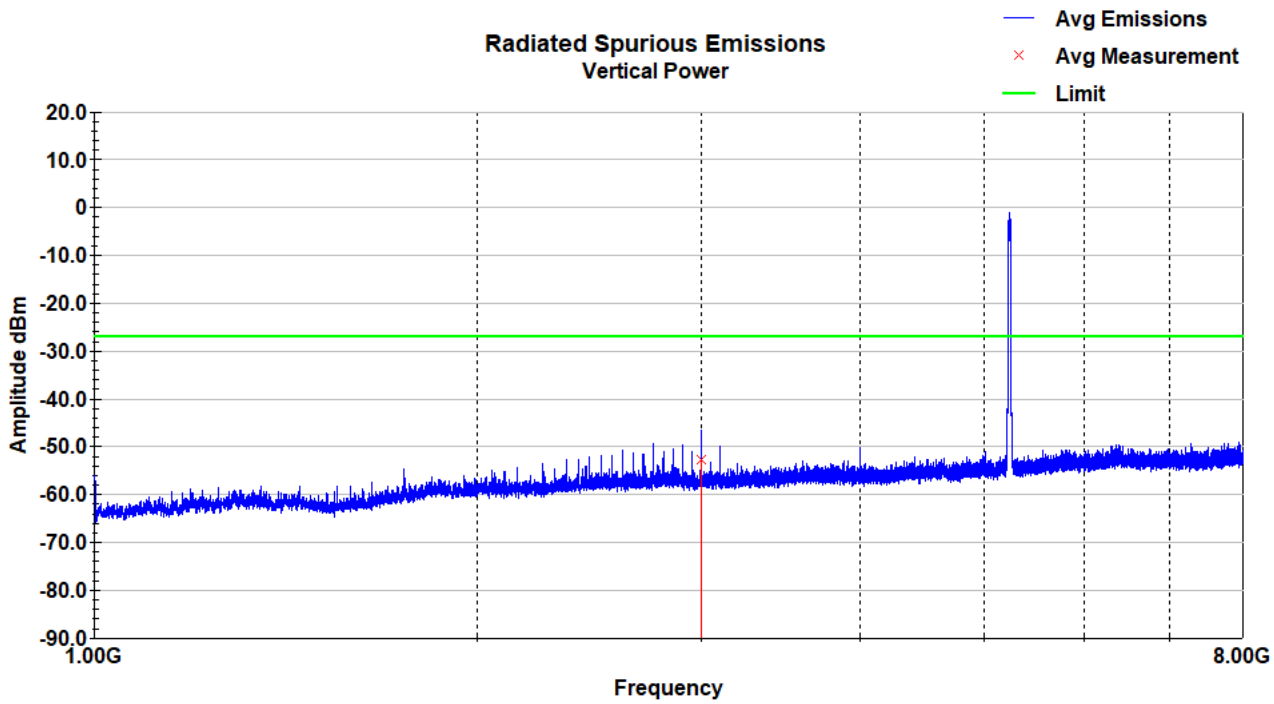
Vertical Plot – 8-18GHz – Mid Channel



Horizontal Plot – 8-18GHz – Mid Channel



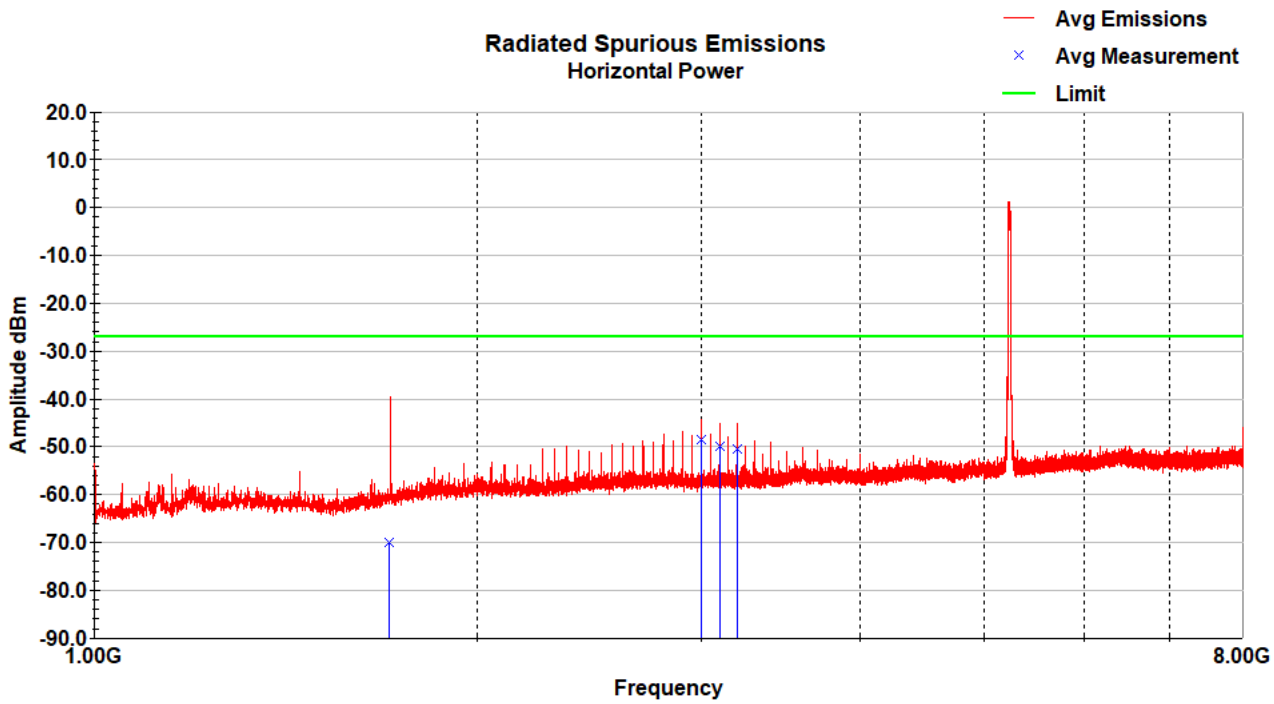
Vertical Plot – 1-8GHz – High Channel



Vertical Data – 1-8GHz – High Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2999.93	-46.0	V	161.0	239.0	32.4	2.8	42.0	-52.8	-27.0	-25.8
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

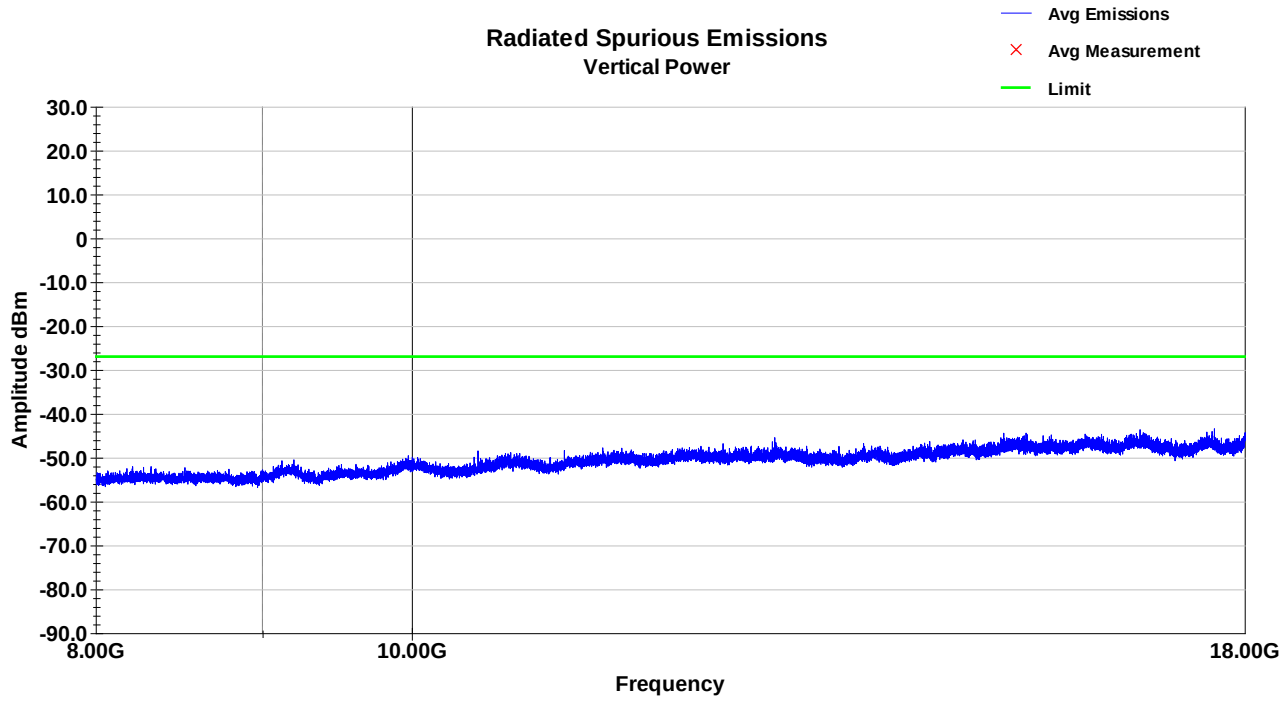
Horizontal Plot – 1-8GHz – High Channel



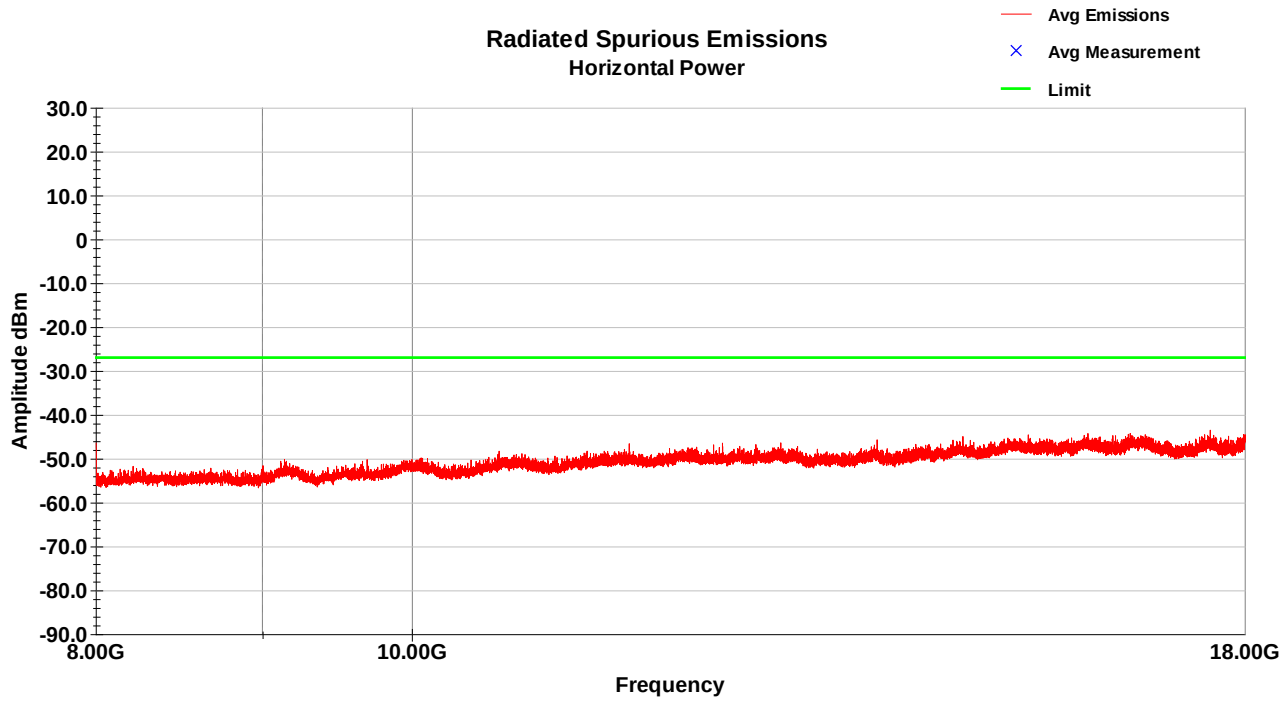
Horizontal Data – 1-8GHz – High Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1704.52	-59.1	H	28.0	116.0	29.6	2.1	42.5	-70.0	-27.0	-43.0
2999.94	-41.7	H	241.0	112.0	32.4	2.8	42.0	-48.4	-27.0	-21.4
3100.03	-43.7	H	260.0	111.0	32.8	2.8	41.9	-50.0	-27.0	-23.0
3200.14	-44.2	H	252.0	120.0	32.8	2.9	41.8	-50.4	-27.0	-23.4
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

Vertical Plot – 8-18GHz – High Channel



Horizontal Plot – 8-18GHz – High Channel

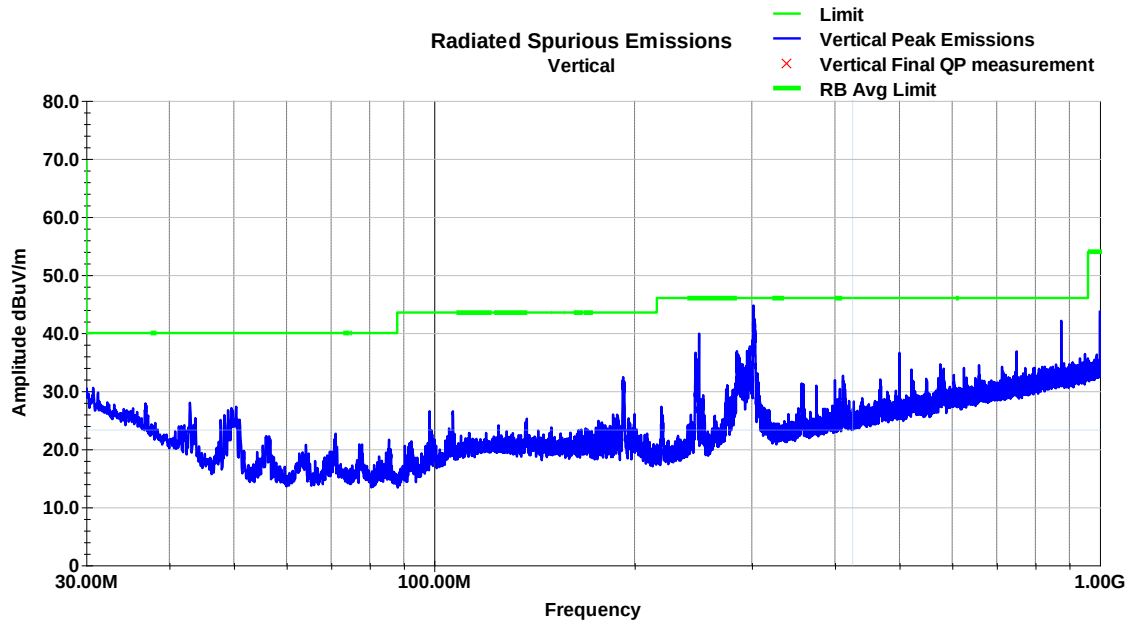


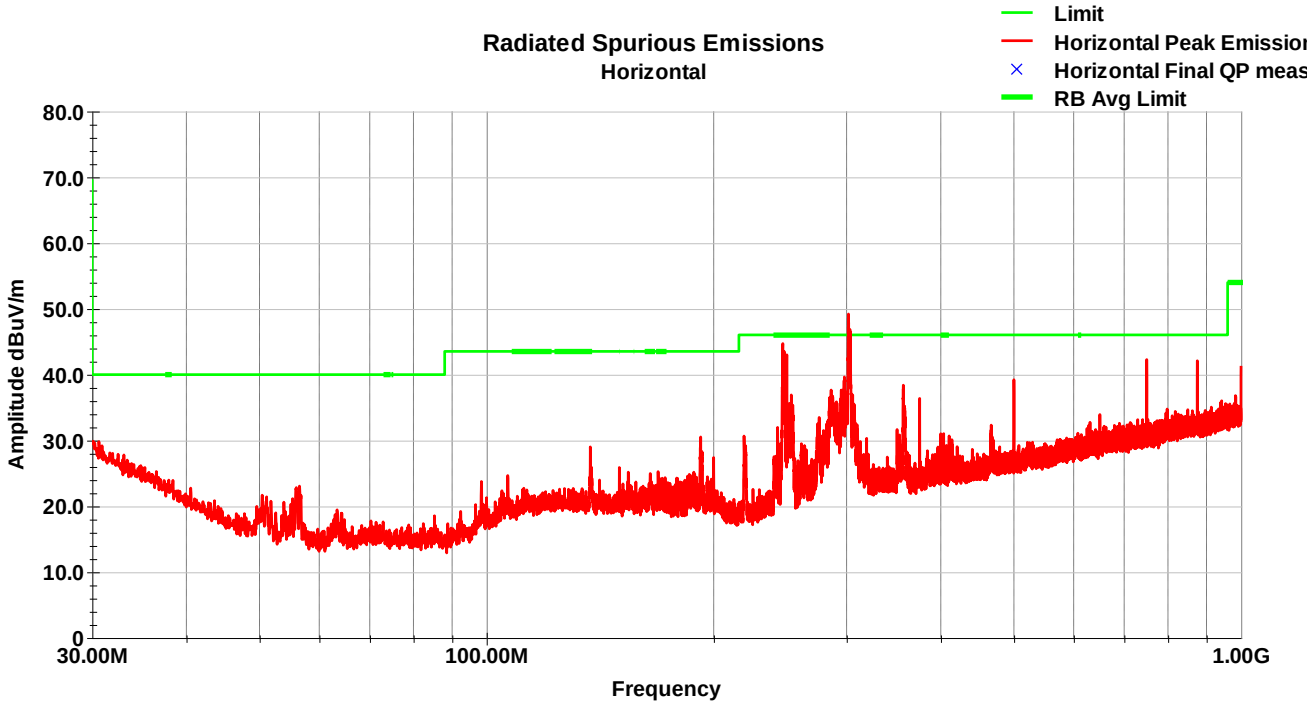
The worst-case final data in this section of -48.2dBm is below the restricted band limit of -41.2dBm. Emissions in the 18-40GHz frequency range were similar to those shown in section 3.5.3 above.

3.7 *Test Data: 7-inch Display – U-NII Band 1 – 802.11ac*

3.7.1 30-1000 MHz

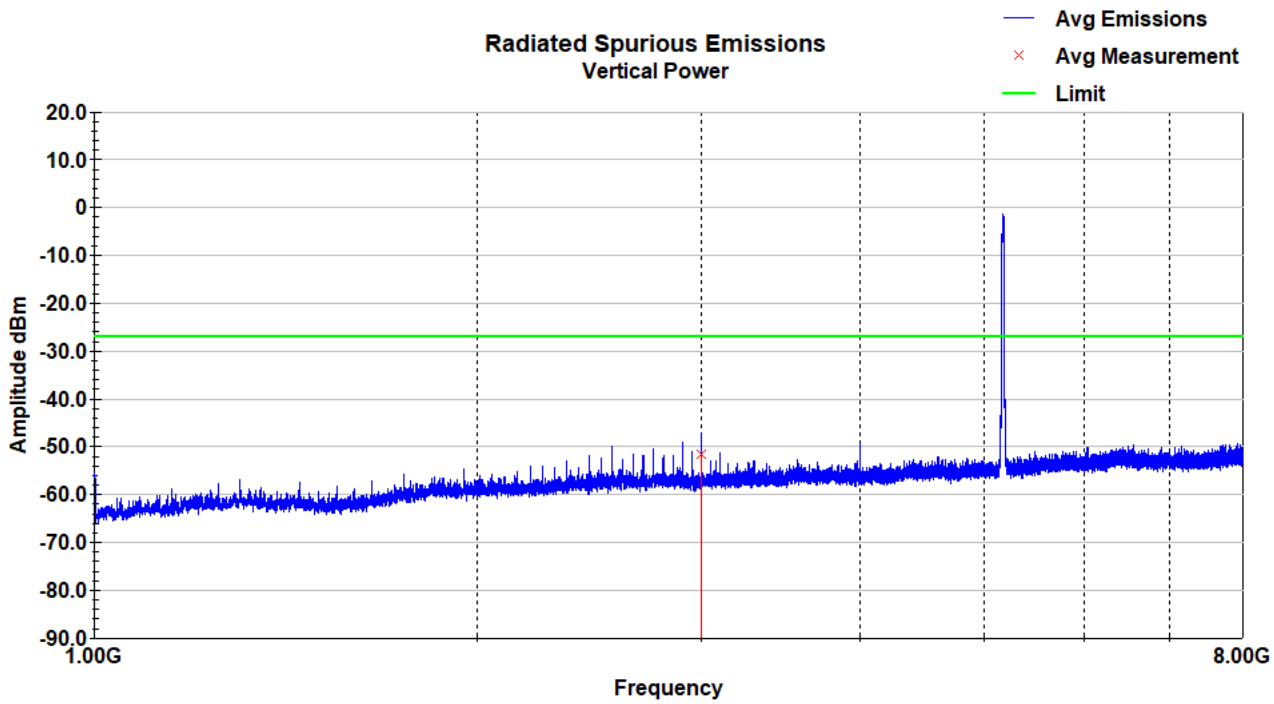
Emissions were confirmed to be non-radio emissions. All channels had similar plots (worst case shown).





3.7.2 1-18 GHz

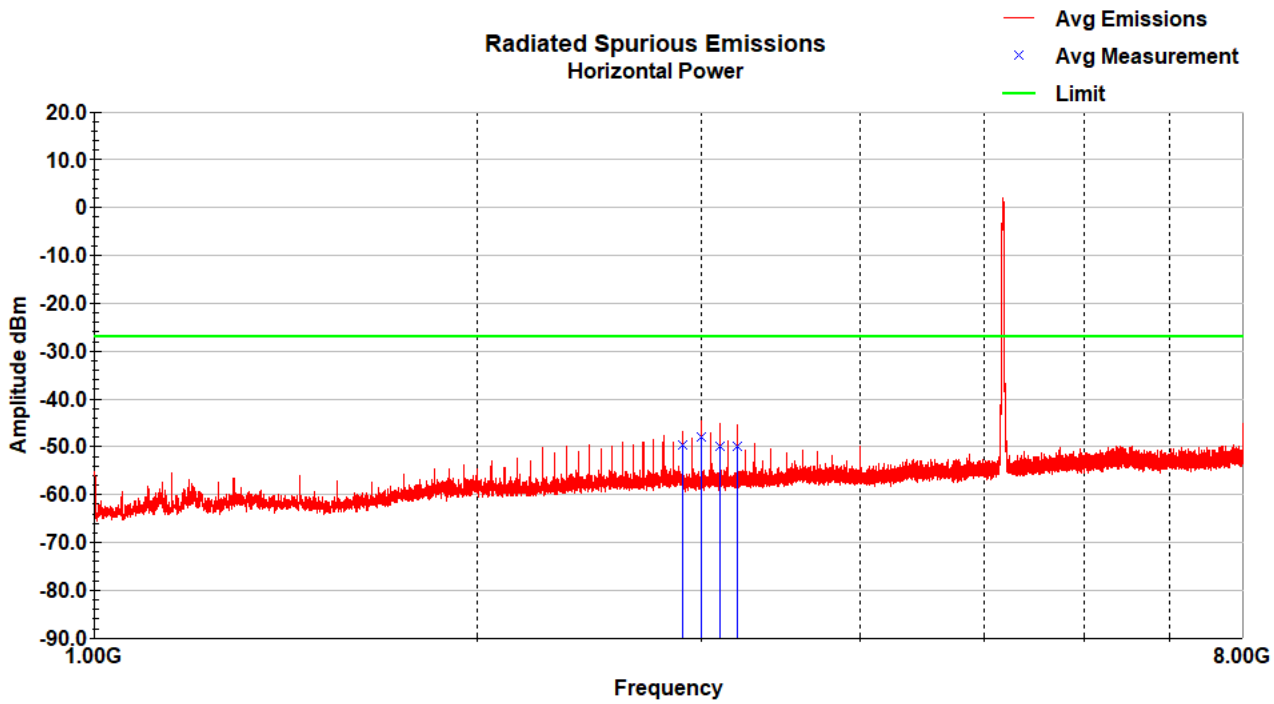
Vertical Plot – 1-8GHz – Low Channel



Vertical Data – 1-8GHz – Low Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
3000.05	-44.9	V	167.0	250.0	32.4	2.8	42.0	-51.7	-27.0	-24.7
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

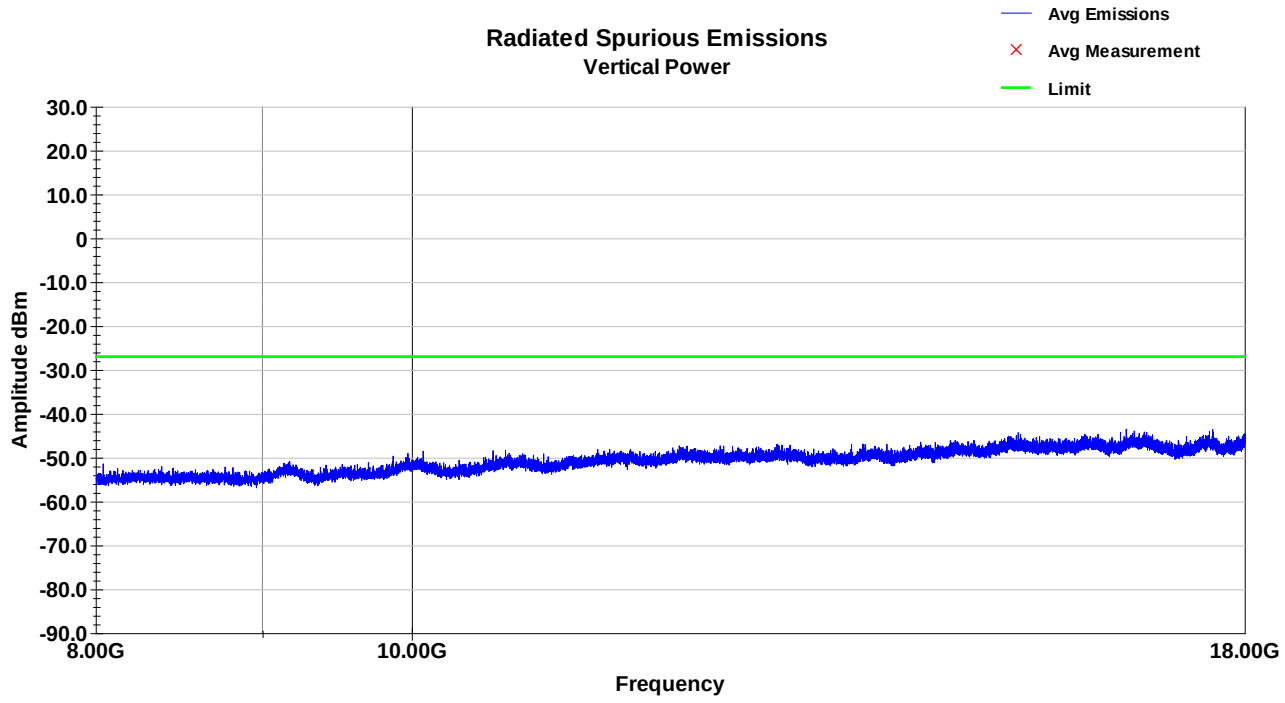
Horizontal Plot – 1-8GHz – Low Channel



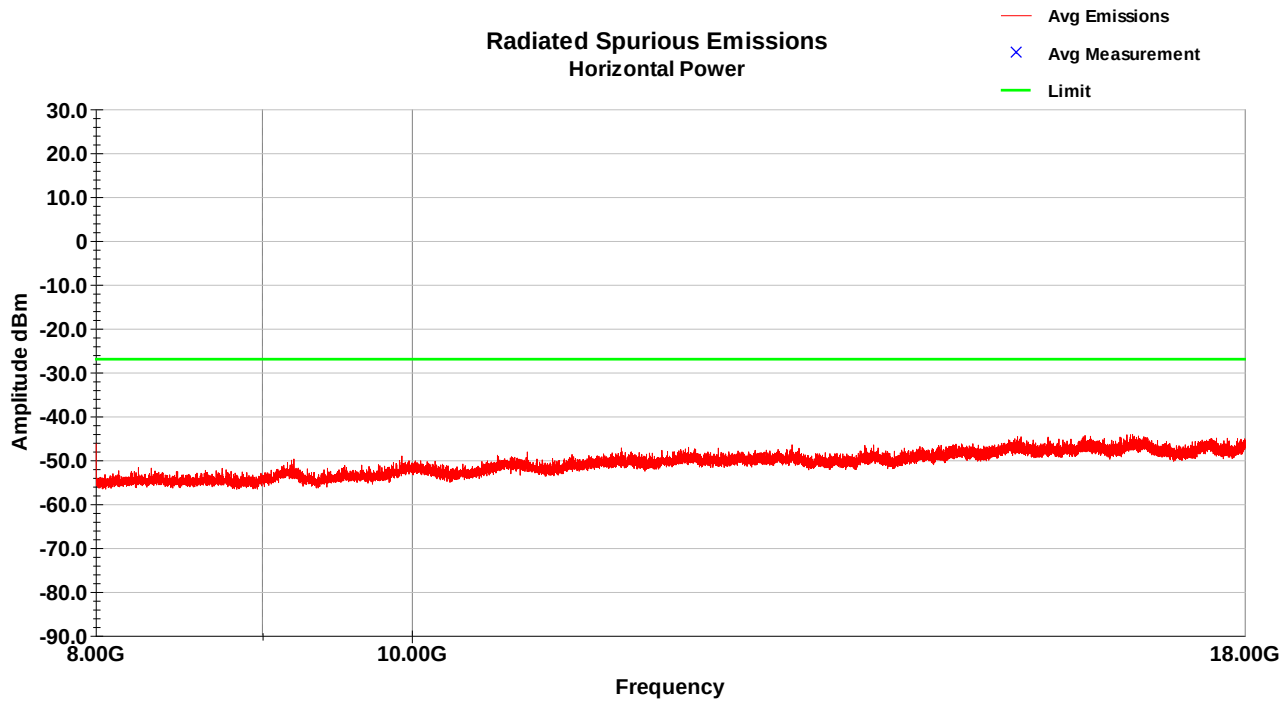
Horizontal Data – 1-8GHz – Low Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.96	-42.6	H	262.0	185.0	32.3	2.7	42.0	-49.6	-27.0	-22.6
2999.94	-41.2	H	228.0	109.0	32.4	2.8	42.0	-48.0	-27.0	-21.0
3100.28	-43.6	H	233.0	118.0	32.8	2.8	41.9	-49.9	-27.0	-22.9
3199.92	-43.7	H	232.0	110.0	32.8	2.9	41.8	-49.9	-27.0	-22.9
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

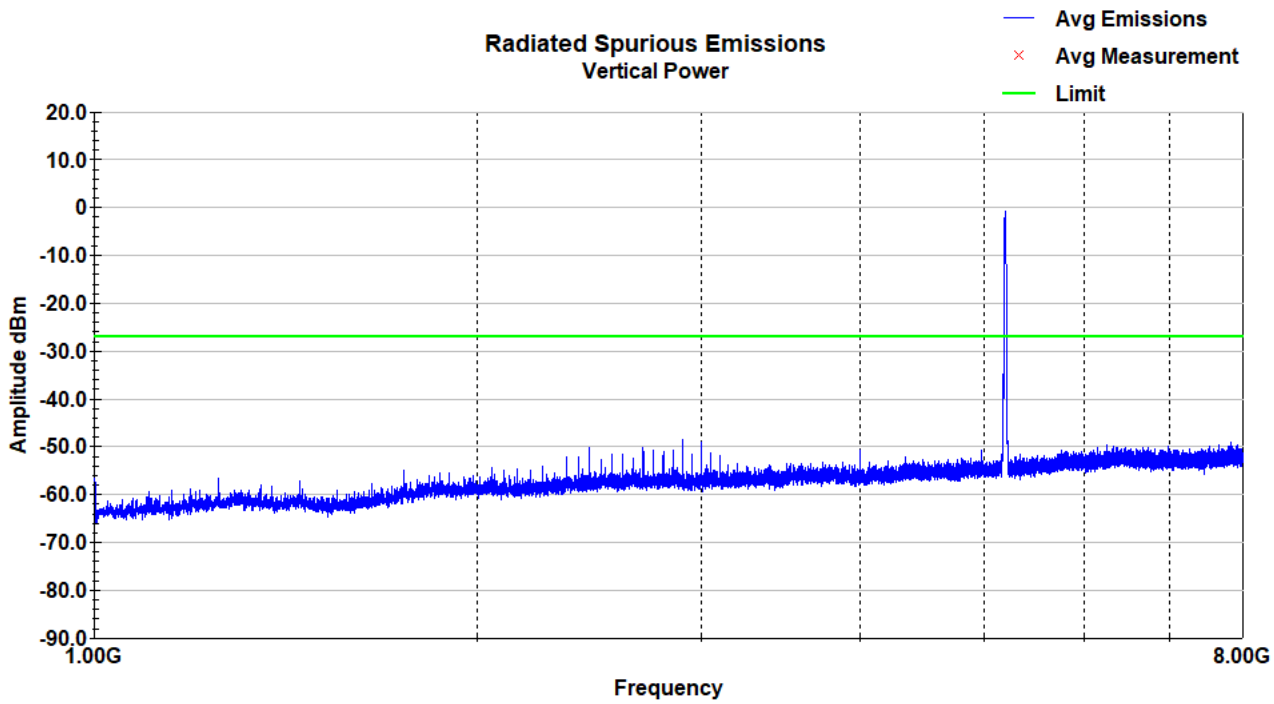
Vertical Plot – 8-18GHz – Low Channel



Horizontal Plot – 8-18GHz – Low Channel



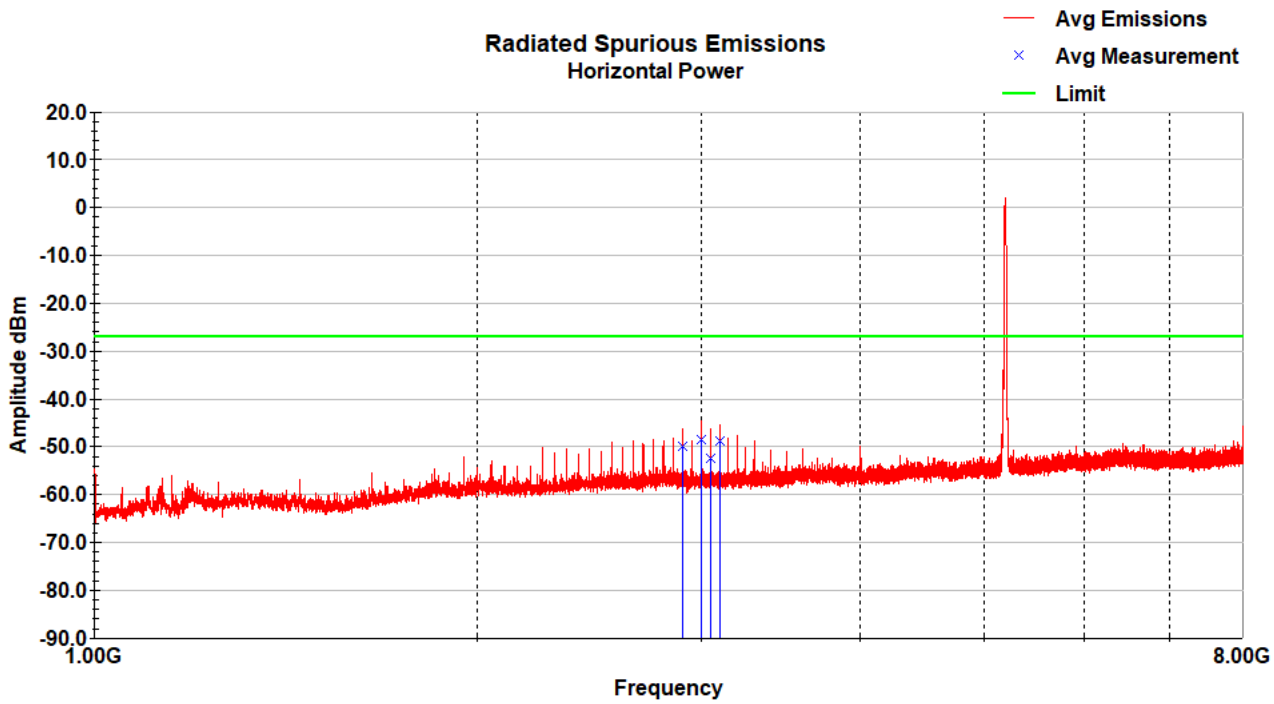
Vertical Plot – 1-8GHz – Mid Channel



Vertical Data – 1-8GHz – Mid Channel

No emissions within 20dB of limit

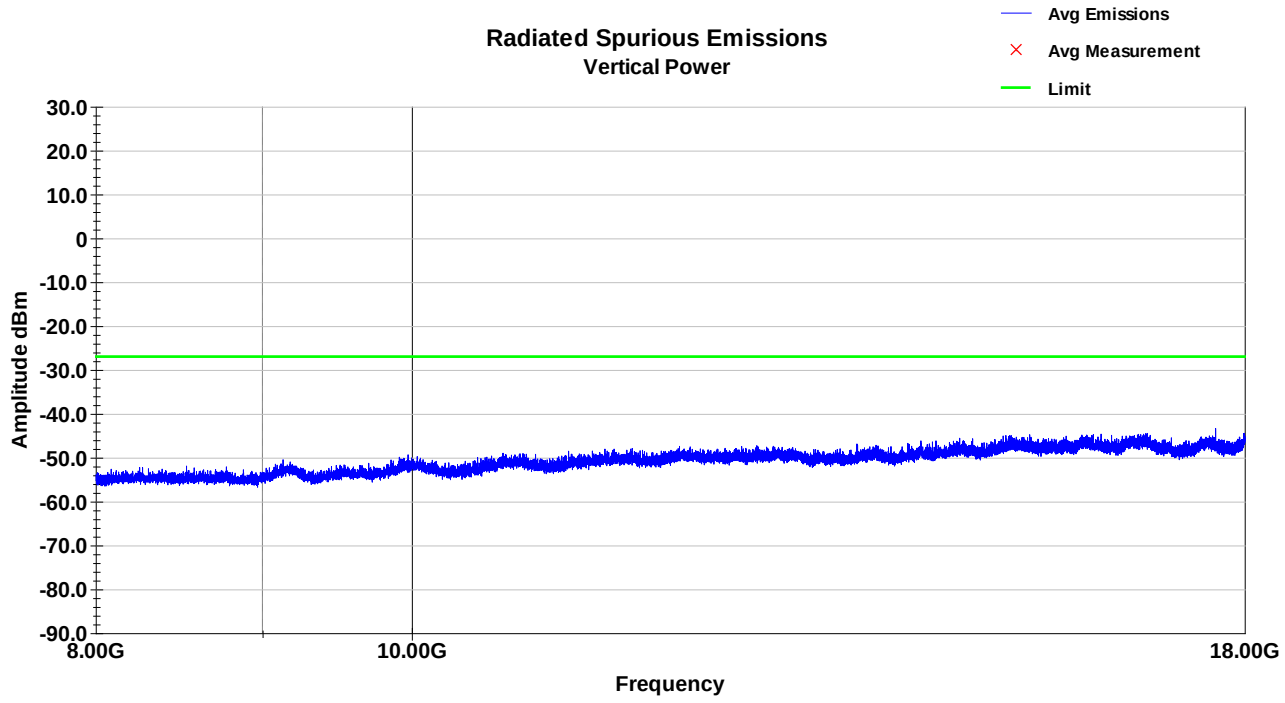
Horizontal Plot – 1-8GHz – Mid Channel



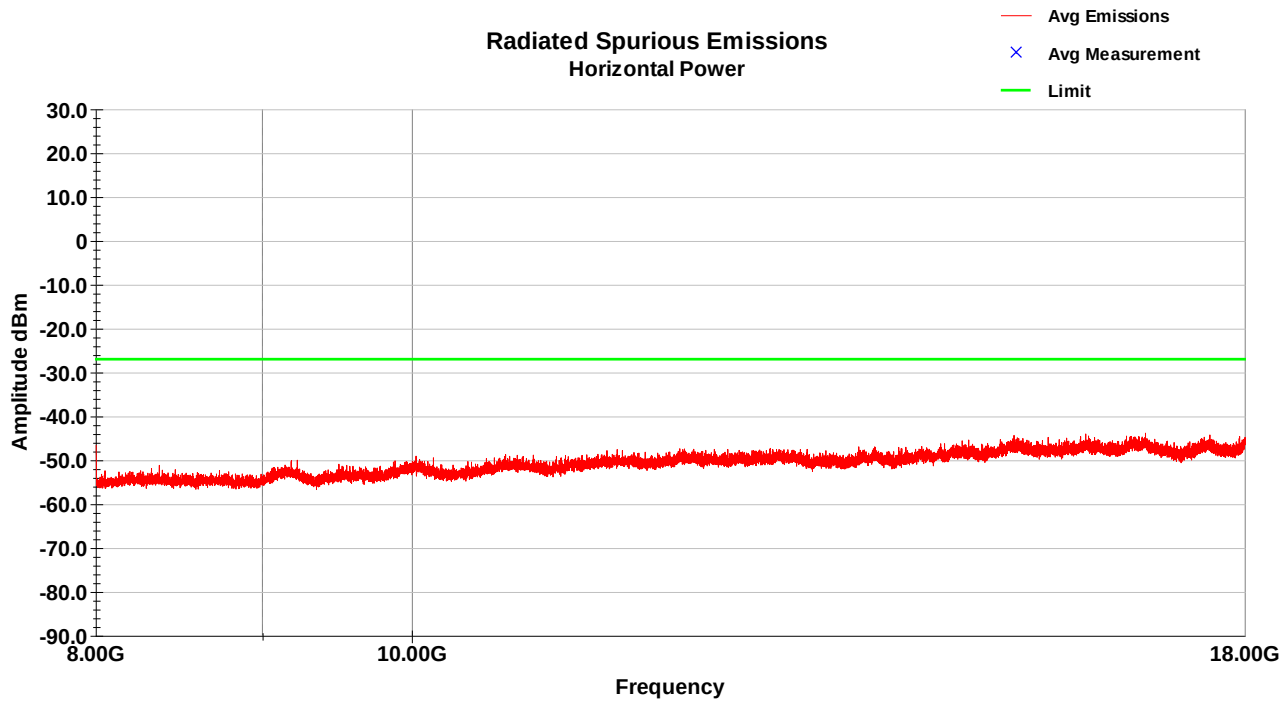
Horizontal Data – 1-8GHz – Mid Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.96	-42.9	H	229.0	117.0	32.3	2.7	42.0	-49.9	-27.0	-22.9
2999.94	-41.7	H	249.0	107.0	32.4	2.8	42.0	-48.4	-27.0	-21.4
3049.99	-45.9	H	235.0	167.0	32.7	2.8	42.0	-52.3	-27.0	-25.3
3100.04	-42.3	H	246.0	167.0	32.8	2.8	41.9	-48.7	-27.0	-21.7
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

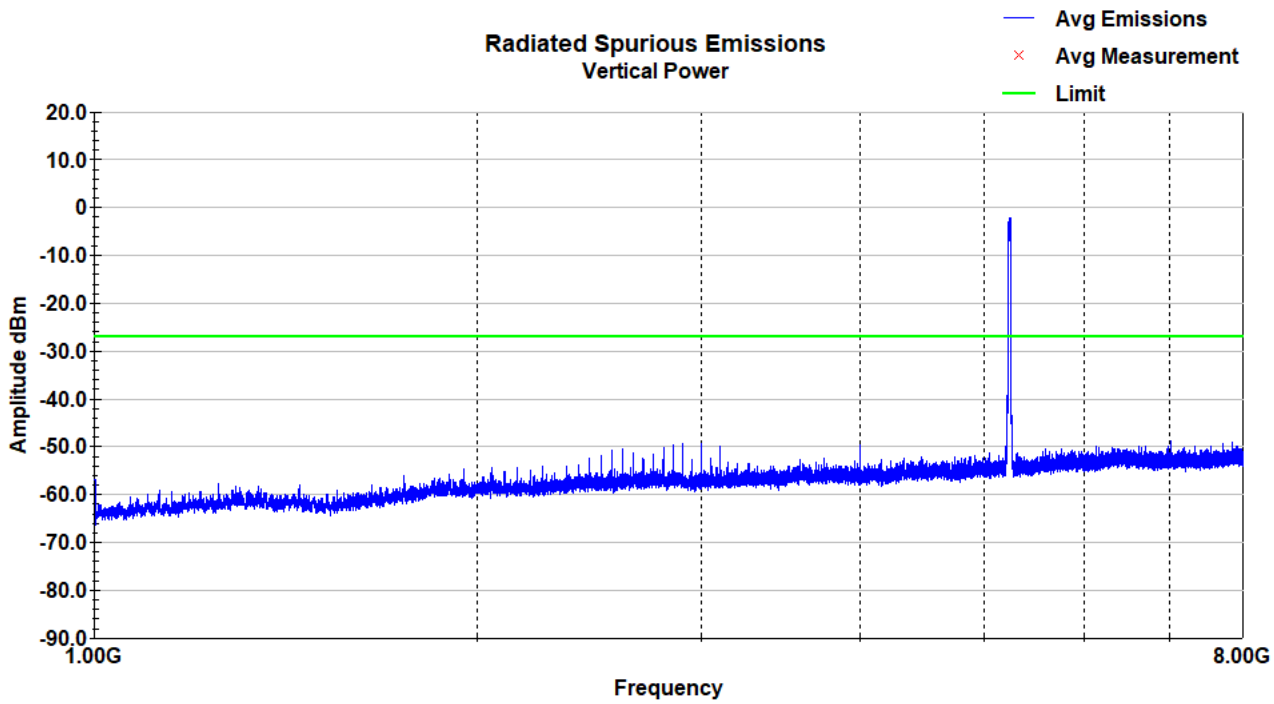
Vertical Plot – 8-18GHz – Mid Channel



Horizontal Plot – 8-18GHz – Mid Channel



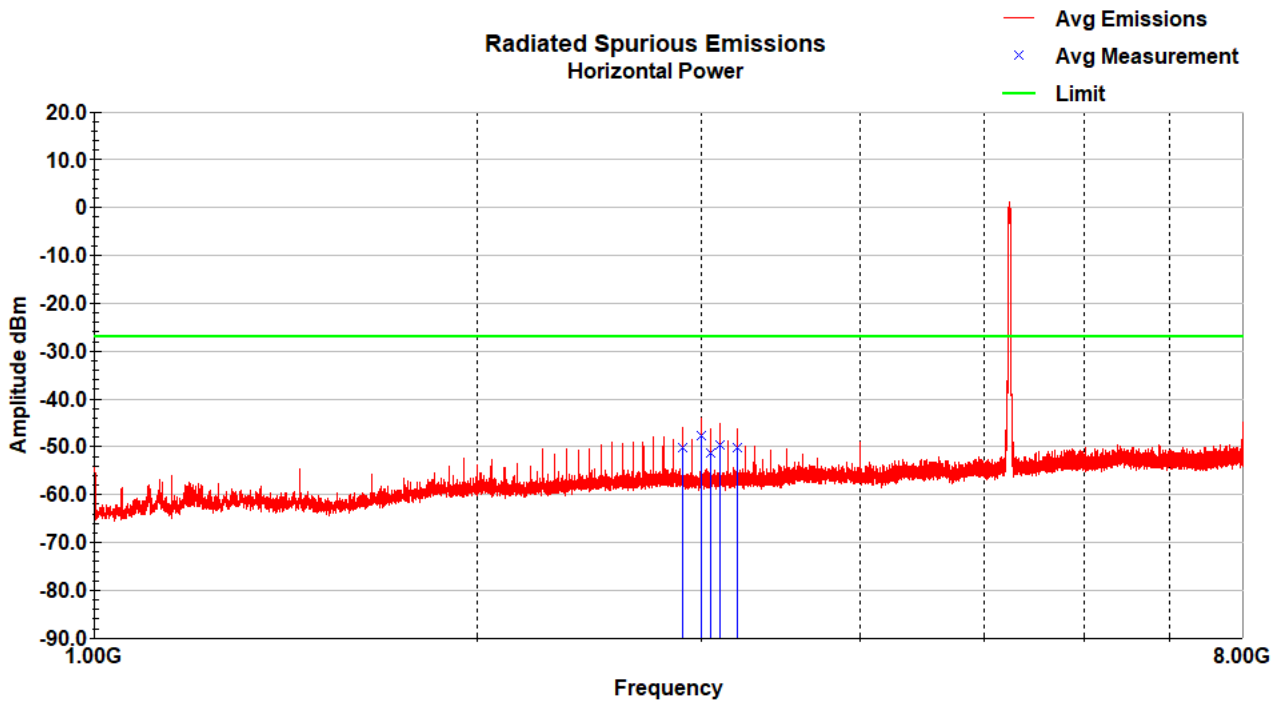
Vertical Plot – 1-8GHz – High Channel



Vertical Data – 1-8GHz – High Channel

No emissions within 20dB of limit

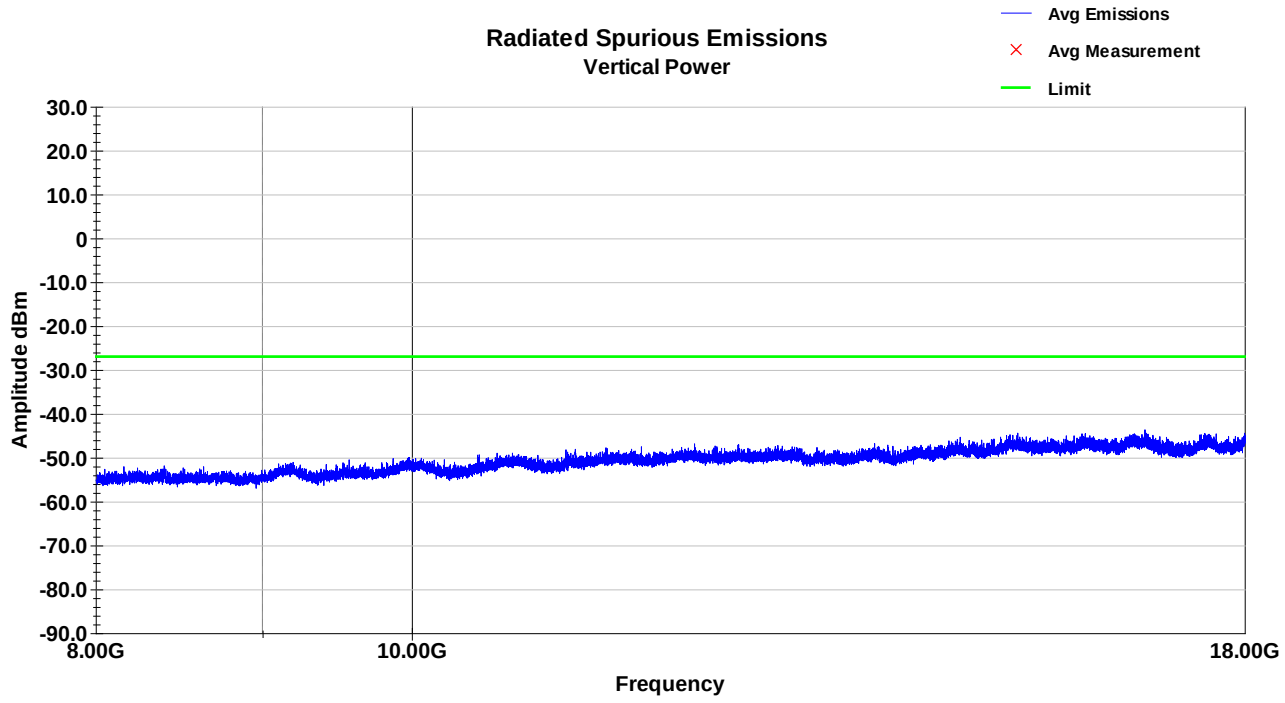
Horizontal Plot – 1-8GHz – High Channel



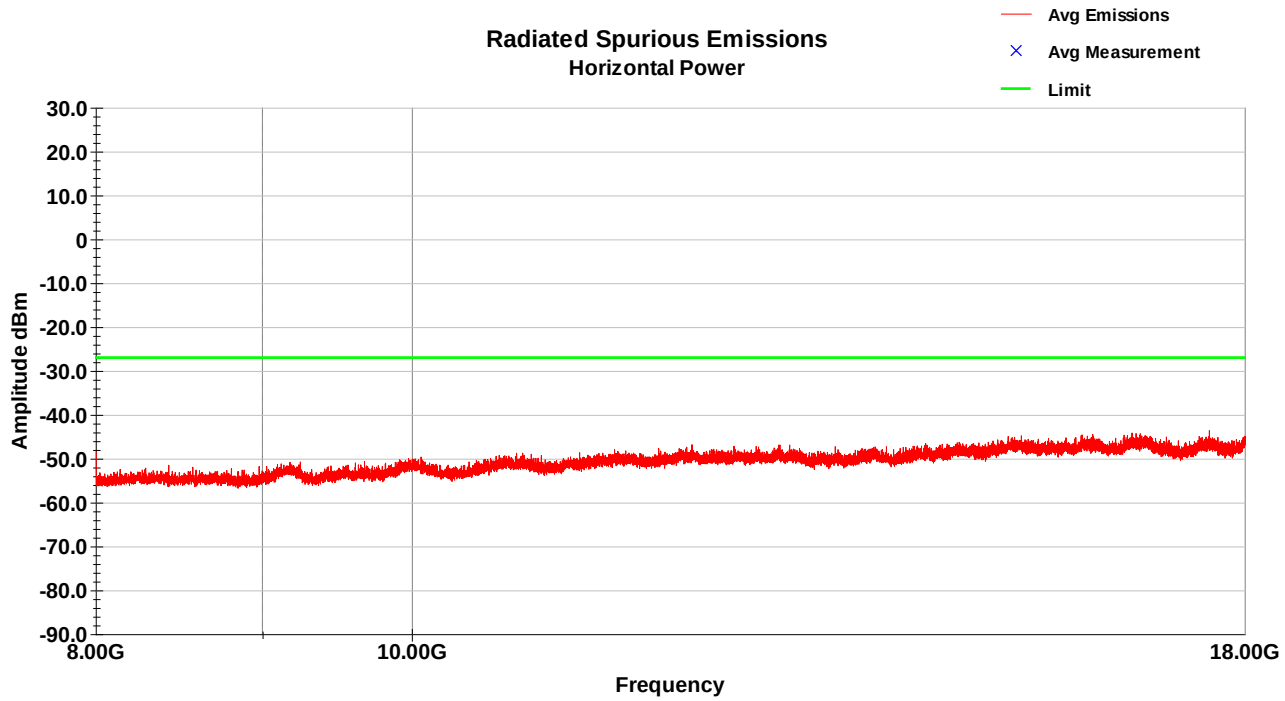
Horizontal Data – 1-8GHz – High Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.95	-43.2	H	251.0	175.0	32.3	2.7	42.0	-50.2	-27.0	-23.2
3000.04	-40.9	H	246.0	174.0	32.4	2.8	42.0	-47.7	-27.0	-20.7
3049.87	-44.8	H	238.0	131.0	32.7	2.8	42.0	-51.2	-27.0	-24.2
3099.91	-43.4	H	243.0	131.0	32.8	2.8	41.9	-49.7	-27.0	-22.7
3200.14	-44.1	H	236.0	100.0	32.8	2.9	41.8	-50.3	-27.0	-23.3
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

Vertical Plot – 8-18GHz – High Channel



Horizontal Plot – 8-18GHz – High Channel

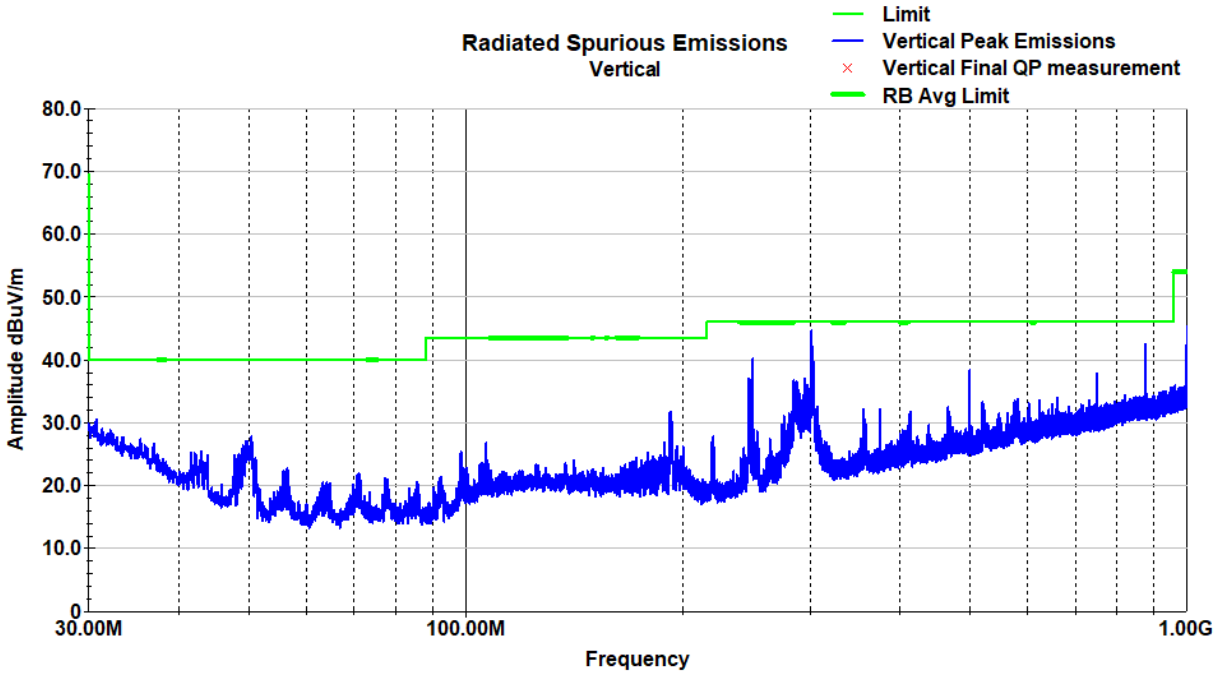


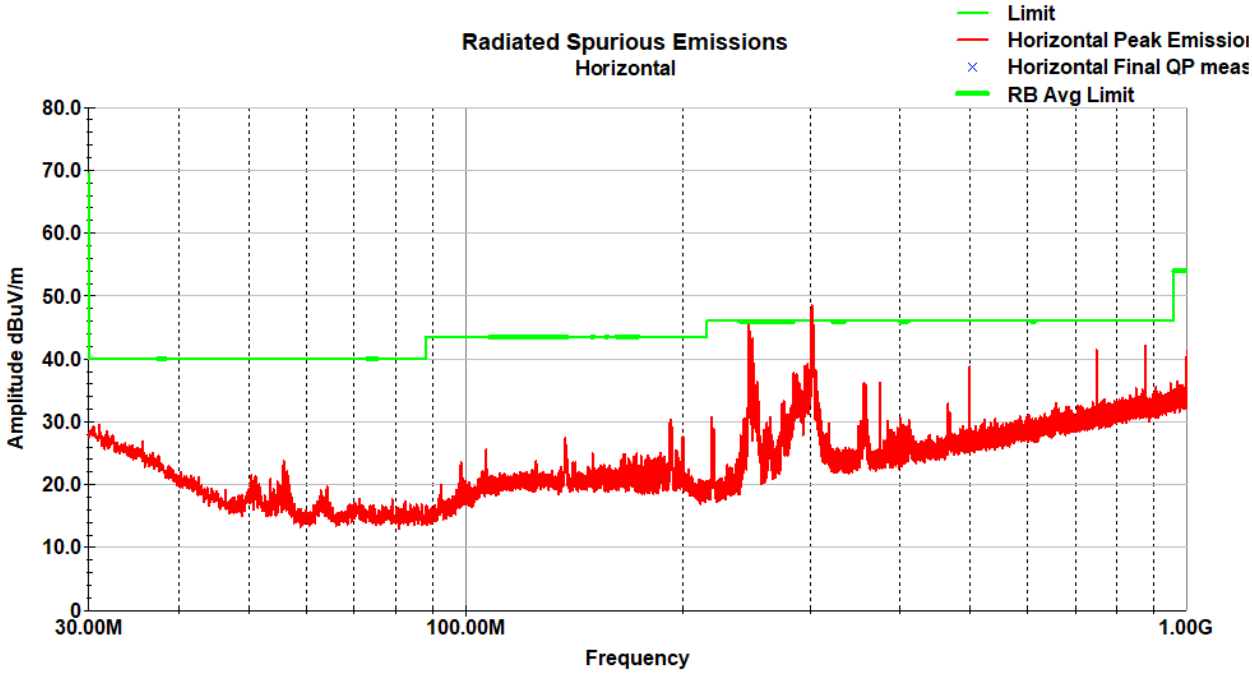
The worst-case final data in this section of -47.7dBm is below the restricted band limit of -41.2dBm. Emissions in the 18-40GHz frequency range were similar to those shown in section 3.5.3 above.

3.8 *Test Data: 7-inch Display – U-NII Band 3 – 802.11a*

3.8.1 30-1000 MHz

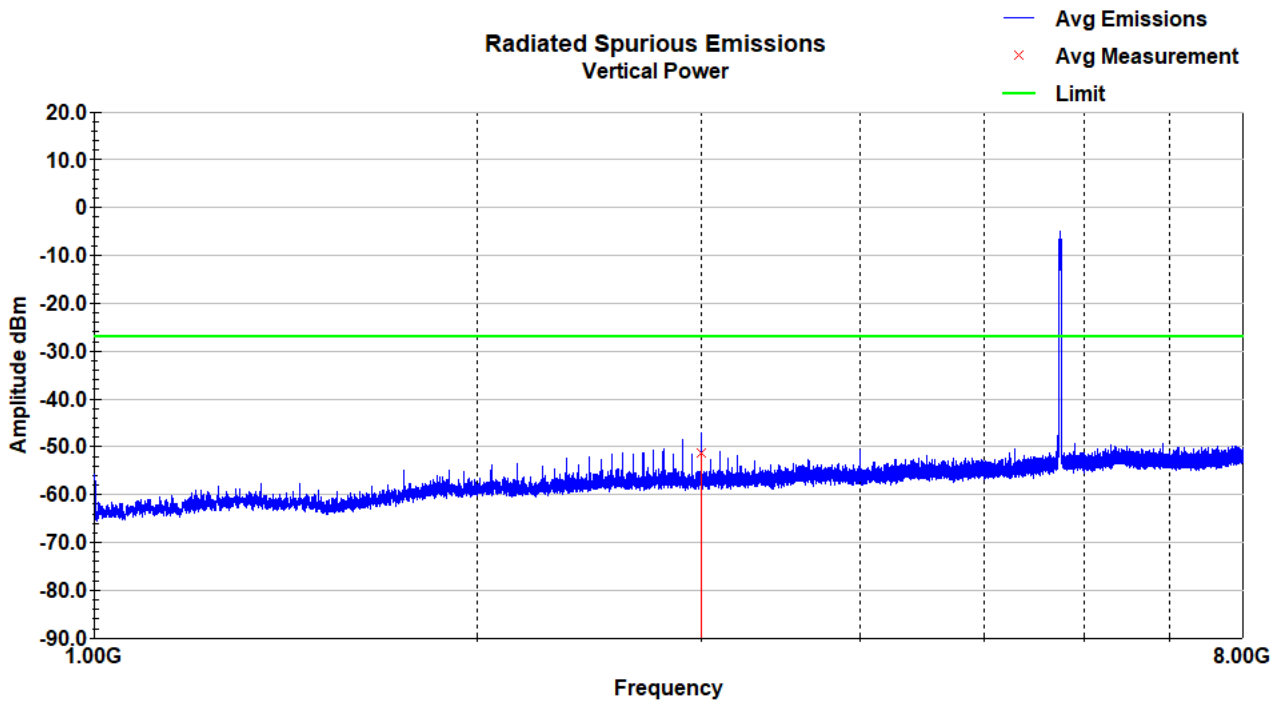
Emissions were confirmed to be non-radio emissions. All channels had similar plots (worst case shown).





3.8.2 1-18 GHz

Vertical Plot – 1-8GHz – Low Channel

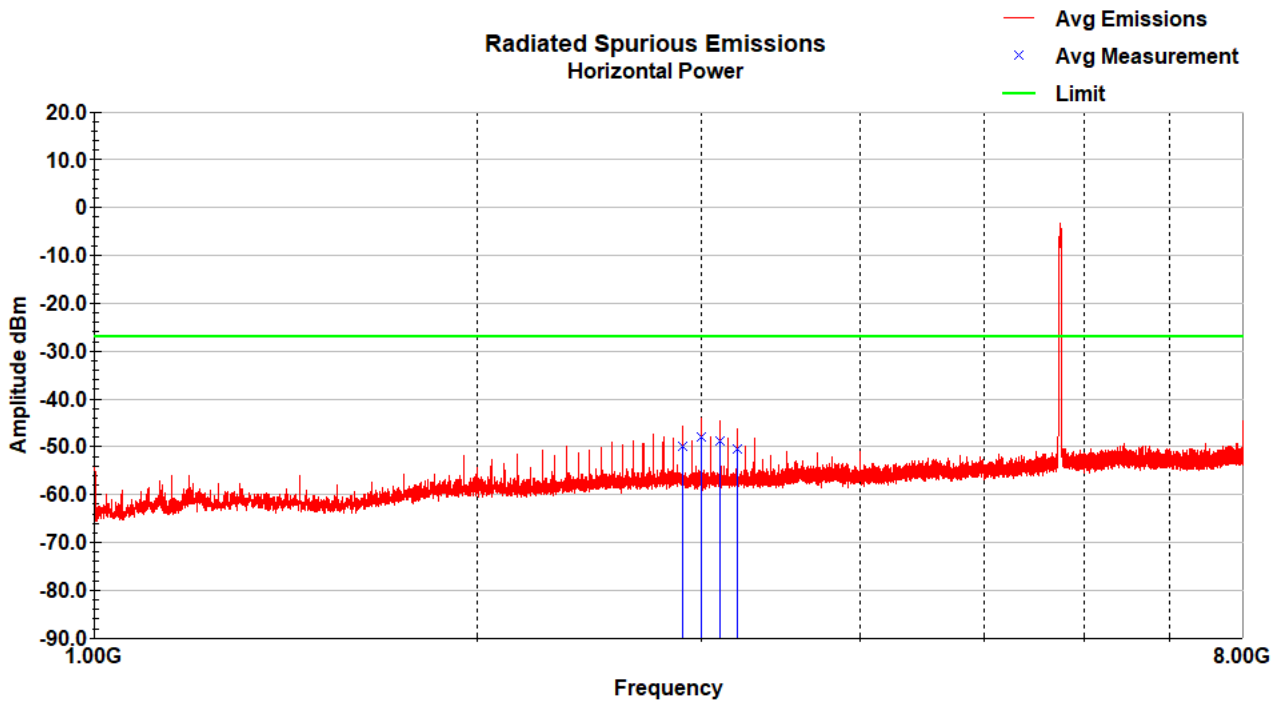


Vertical Data – 1-8GHz – Low Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
3000.07	-44.6	V	168.0	225.0	32.4	2.8	42.0	-51.3	-27.0	-24.3
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

No emissions within 20dB of limit

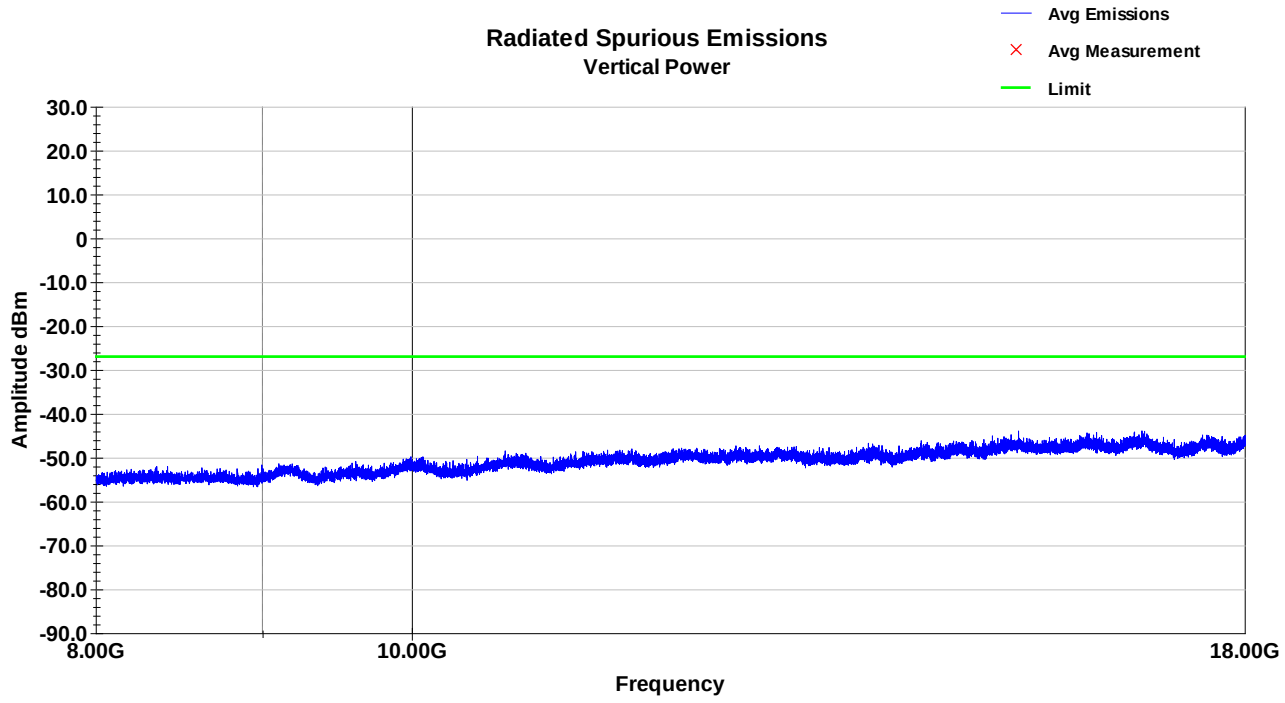
Horizontal Plot – 1-8GHz – Low Channel



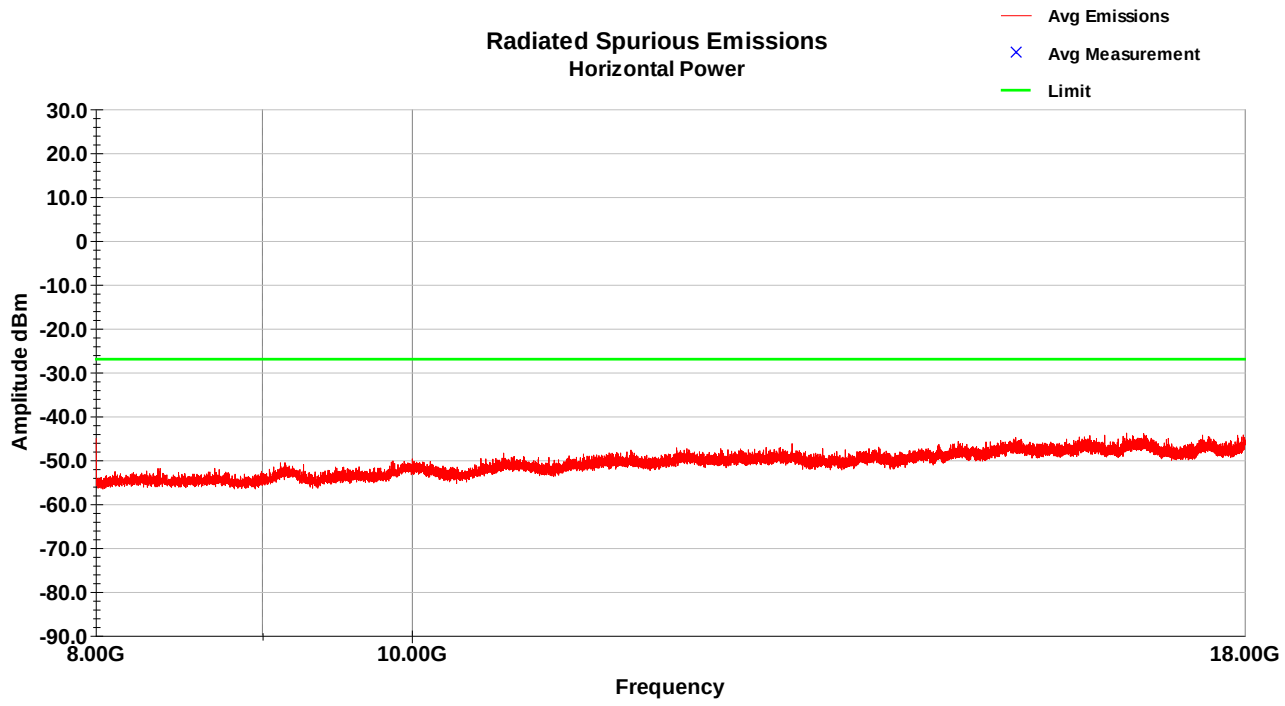
Horizontal Data – 1-8GHz – Low Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.95	-42.9	H	257.0	174.0	32.3	2.7	42.0	-49.9	-27.0	-22.9
3000.17	-41.3	H	242.0	166.0	32.4	2.8	42.0	-48.1	-27.0	-21.1
3099.92	-42.6	H	236.0	125.0	32.8	2.8	41.9	-48.9	-27.0	-21.9
3200.04	-44.1	H	242.0	100.0	32.8	2.9	41.8	-50.3	-27.0	-23.3
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

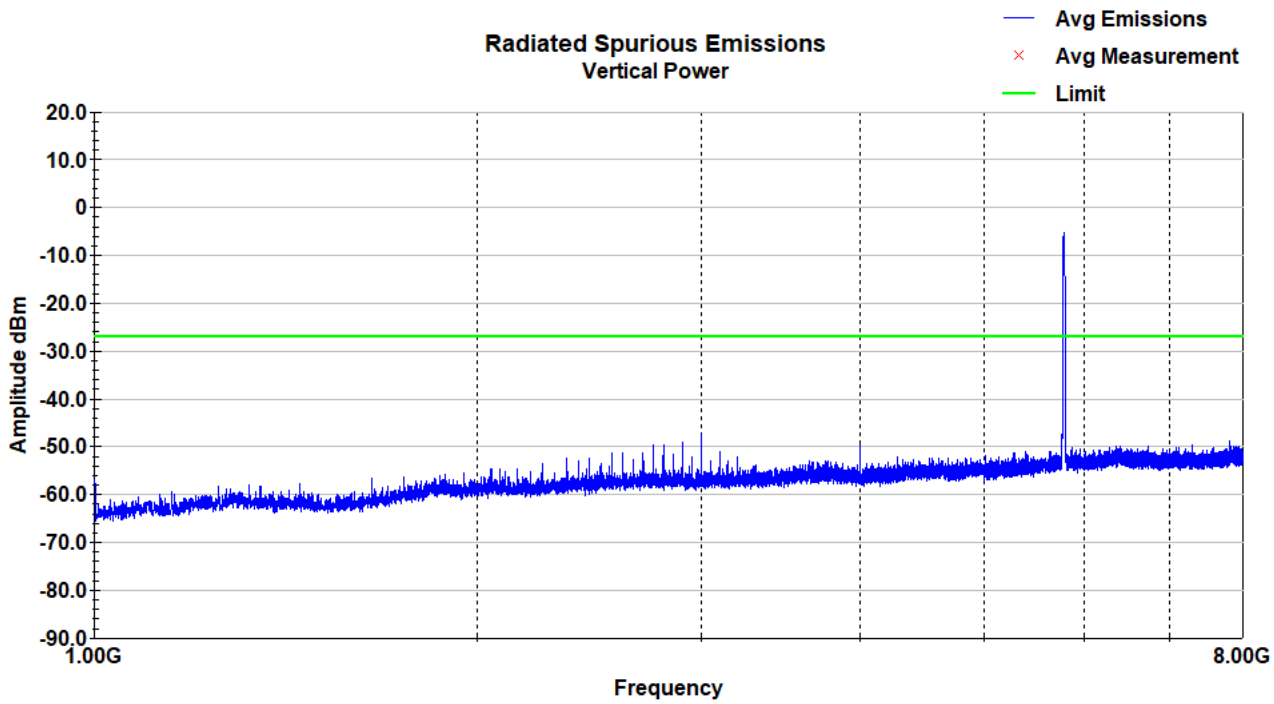
Vertical Plot – 8-18GHz – Low Channel



Horizontal Plot – 8-18GHz – Low Channel



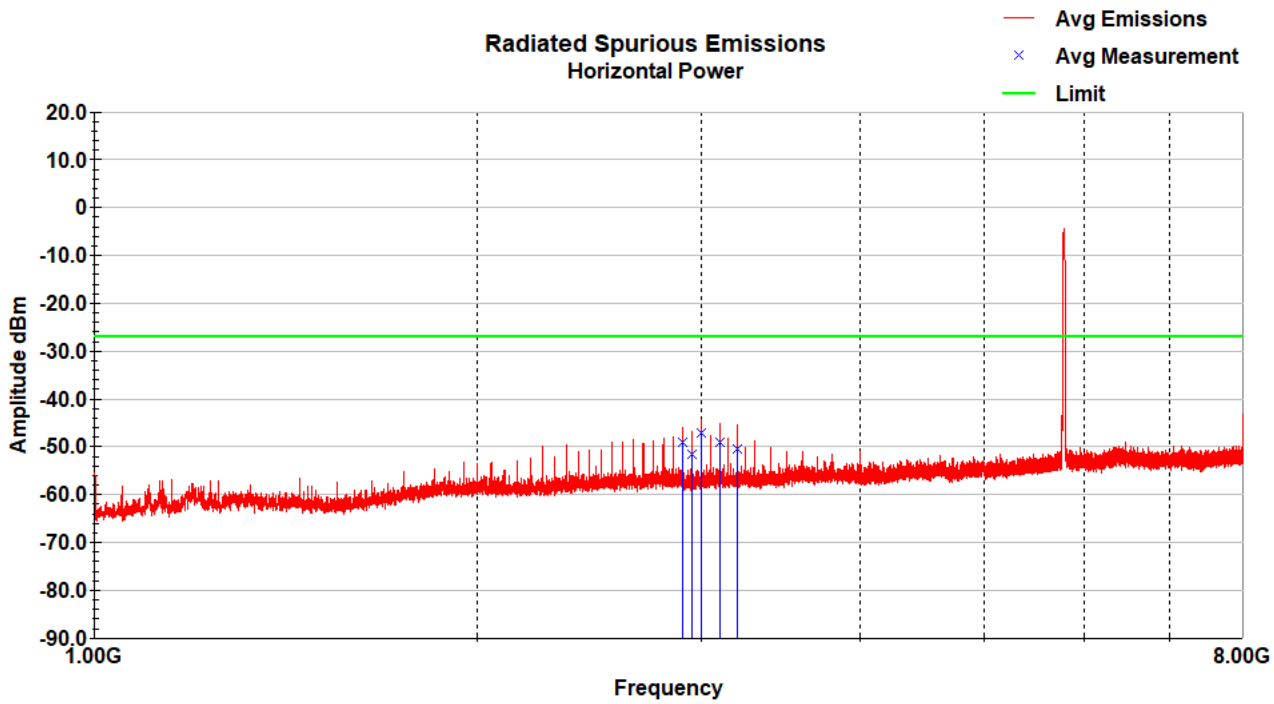
Vertical Plot – 1-8GHz – Mid Channel



Vertical Data – 1-8GHz – Mid Channel

No emissions within 20dB of limit

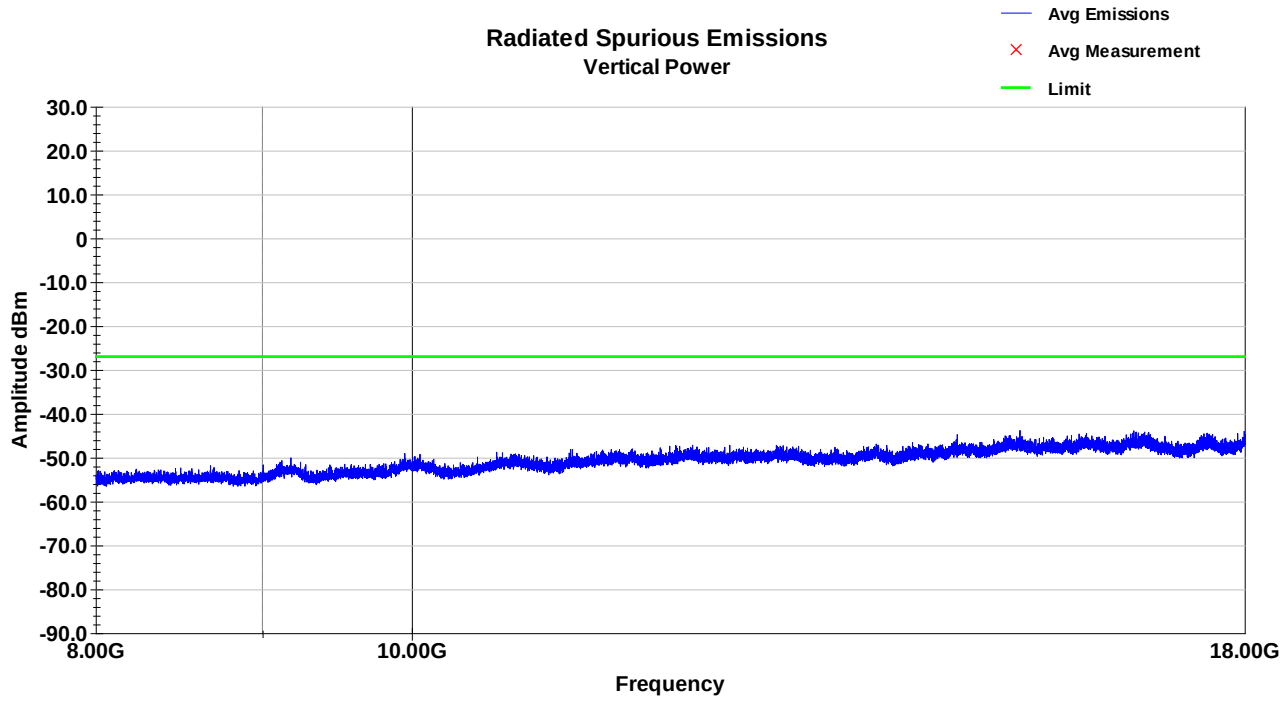
Horizontal Plot – 1-8GHz – Mid Channel



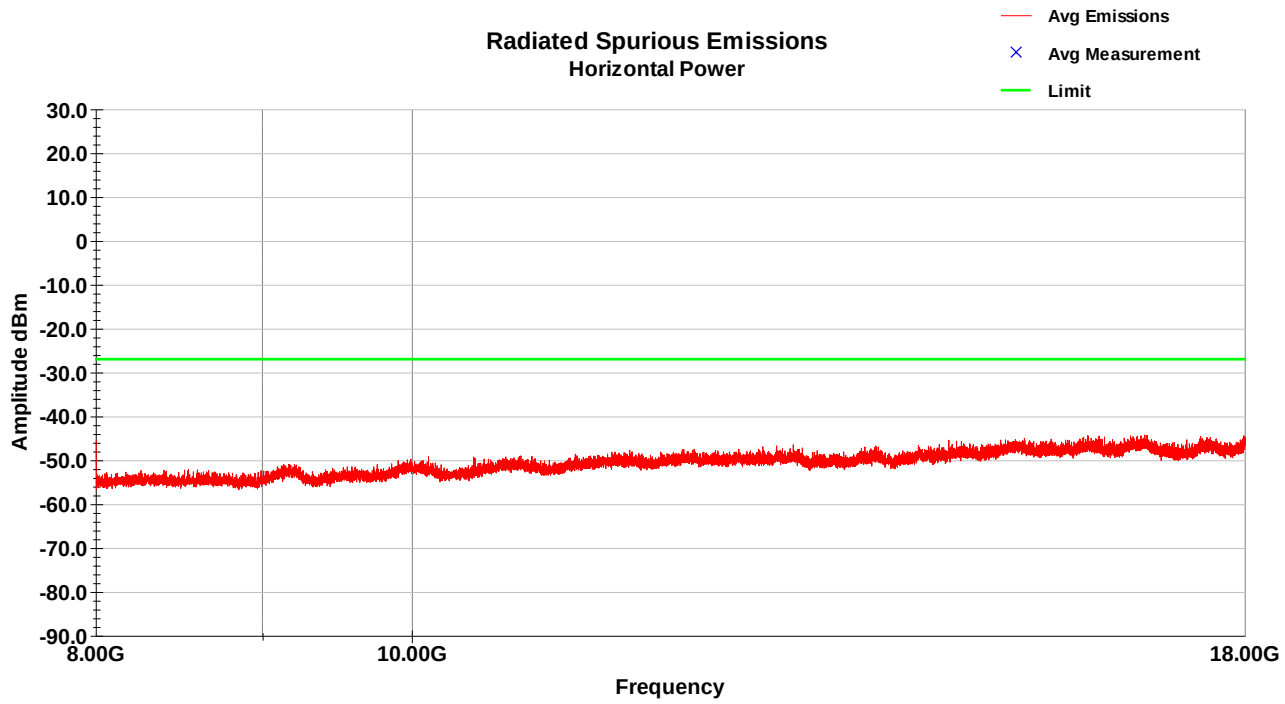
Horizontal Data – 1-8GHz – Mid Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.95	-42.1	H	256.0	184.0	32.3	2.7	42.0	-49.1	-27.0	-22.1
2949.89	-44.5	H	242.0	165.0	32.0	2.8	41.9	-51.6	-27.0	-24.6
2999.80	-40.5	H	245.0	192.0	32.4	2.8	42.0	-47.2	-27.0	-20.2
3100.27	-42.8	H	257.0	166.0	32.8	2.8	41.9	-49.1	-27.0	-22.1
3199.90	-44.4	H	237.0	124.0	32.8	2.9	41.8	-50.6	-27.0	-23.6
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

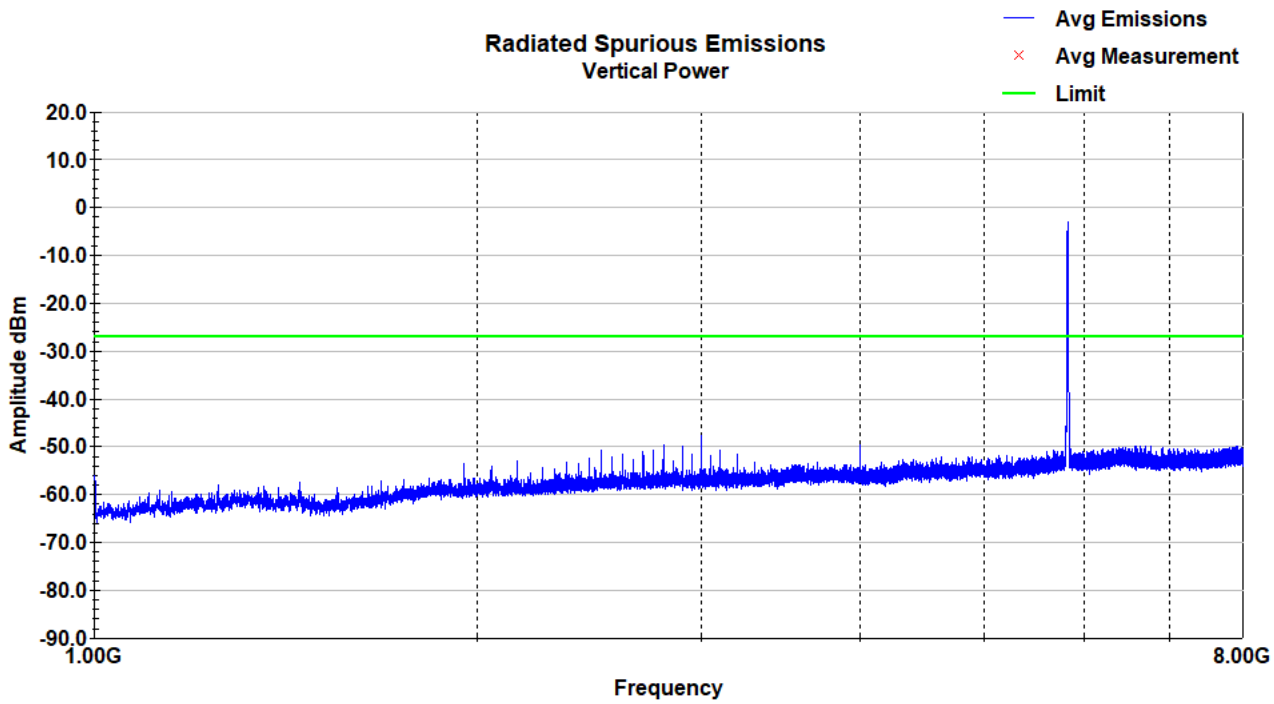
Vertical Plot – 8-18GHz – Mid Channel



Horizontal Plot – 8-18GHz – Mid Channel



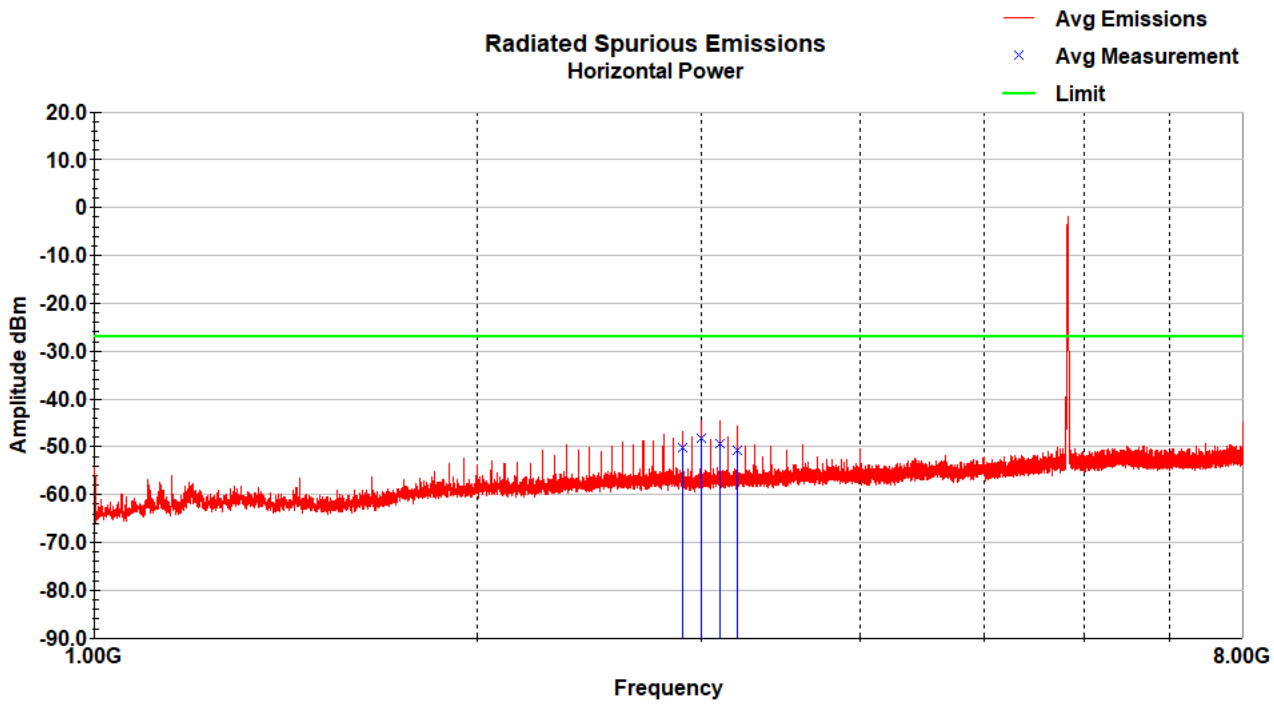
Vertical Plot – 1-8GHz – High Channel



Vertical Data – 1-8GHz – High Channel

No emissions within 20dB of limit

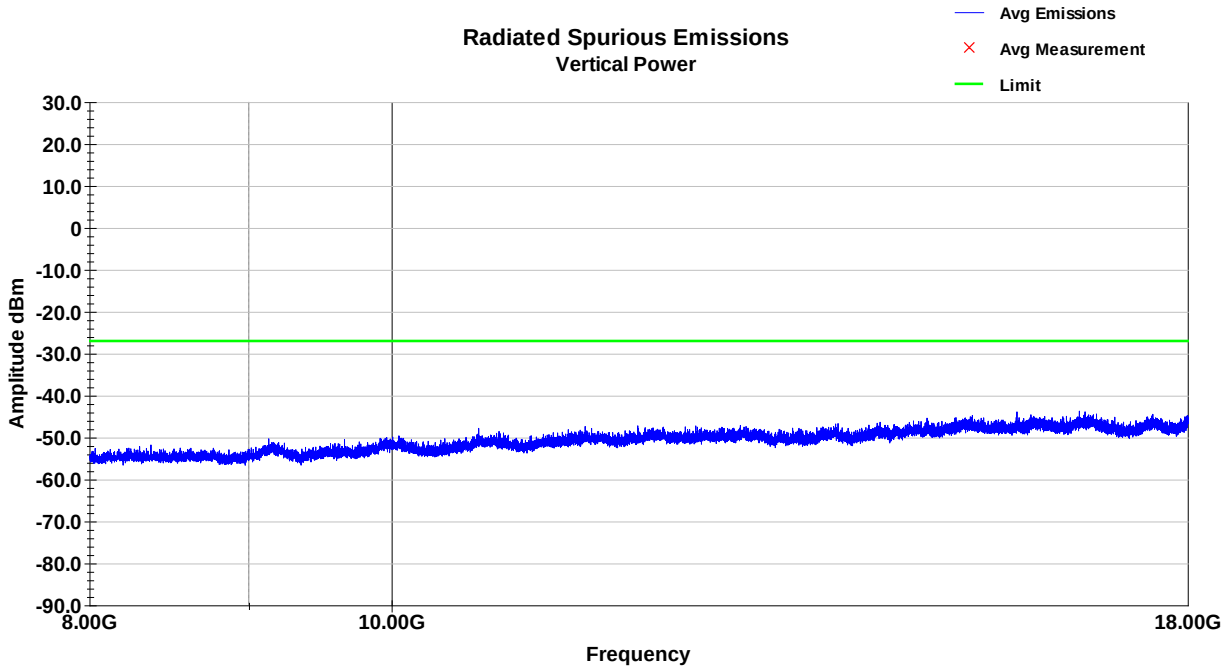
Horizontal Plot – 1-8GHz – High Channel



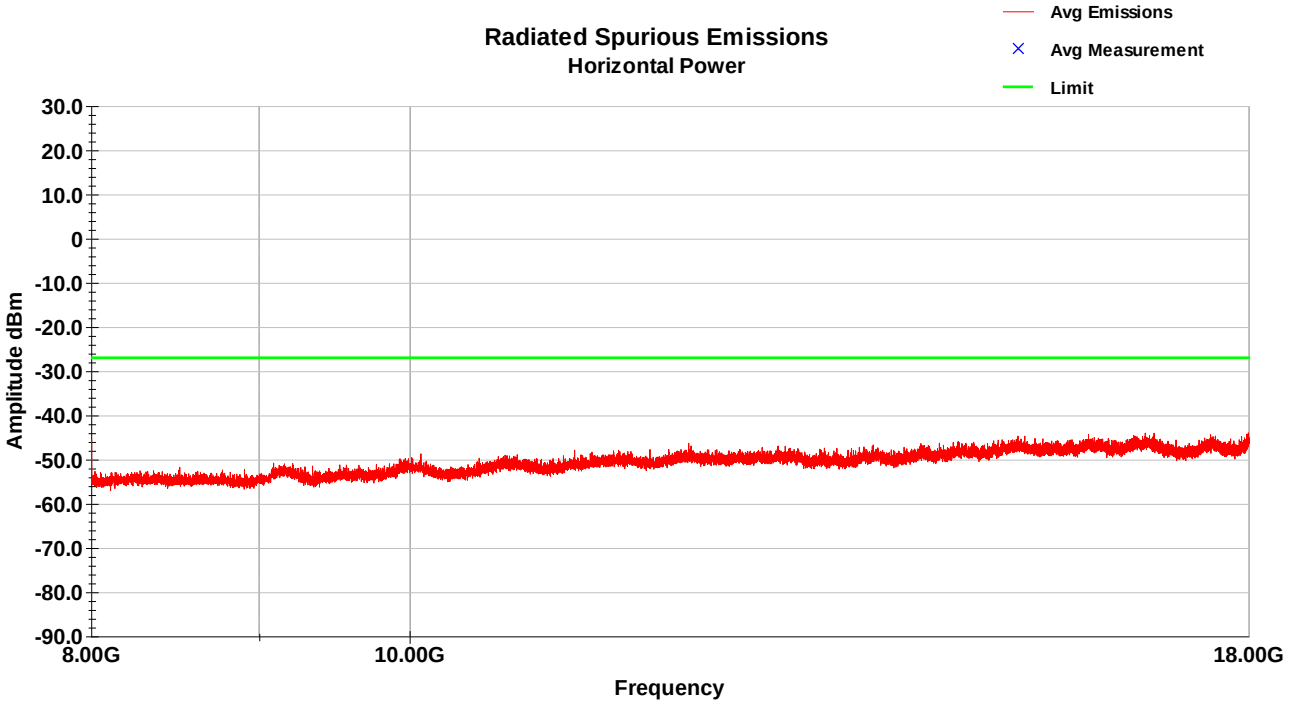
Horizontal Data – 1-8GHz – High Channel

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
2899.95	-43.3	H	228.0	134.0	32.3	2.7	42.0	-50.3	-27.0	-23.3
3000.04	-41.5	H	246.0	135.0	32.4	2.8	42.0	-48.3	-27.0	-21.3
3100.03	-43.0	H	251.0	146.0	32.8	2.8	41.9	-49.3	-27.0	-22.3
3200.02	-44.5	H	230.0	134.0	32.8	2.9	41.8	-50.7	-27.0	-23.7
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

Vertical Plot – 8-18GHz – High Channel



Horizontal Plot – 8-18GHz – High Channel



The worst-case final data in this section of -47.2dBm is below the restricted band limit of -41.2dBm. Emissions in the 18-40GHz frequency range were similar to those shown in section 3.5.3 above.