

RF Test Report

Project Number: 4942239**Proposal:** SUW-202112002041**Report Number:** 4942239EMC05**Revision Level:** 1**Client:** Risk Band LLC**Equipment Under Test:** LTE Module in Wearable Emergency Device**Module Model Number:** TOBY-R200**Host Model Name:** ARIES**Host Model Number:** RBD30060**Module FCC ID:** 2AHZ7-R20082B00**Module IC:** 21986-R20082B00**Host FCC ID:** 2AHZ7-300602022**Host IC:** 21986-300602022**Test Standard:** ANSI C63.26:2015**FCC Rule Parts:** Part 2, Part 22(H), Part 24(E), Part 27**ISED Specifications:** RSS-130 Issue 2; RSS-132 Issue 3; RSS-133 Issue 6
RSS-139 Issue 4; RSS-GEN Issue 5**Report issued on:** 25 January 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.

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1 Summary of Test Results

Reference Sections		Test Description	Test Condition	Test Result
FCC	ISED			
2.1046	RSS-GEN (6.12)	Conducted Output Power	Conducted	N/S ¹
24.232(d) 27.50(d)(5)	RSS-130 (4.6.1) RSS-132 (5.4) RSS-133 (6.4) RSS-139 (5.5)	Peak-to-Average Ratio		N/S ¹
2.1049 22.917(b) 24.238(b) 27.53(h)(3)	RSS-GEN (6.7) RSS-133 (2.3)	Occupied / Emission Bandwidth		N/S ¹
2.1051 22.917(a) 24.238(a) 27.53(g)/(h)	RSS-130 (4.7) RSS-132 (5.5) RSS-133 (6.5) RSS-139 (5.6)	Band Edge / Conducted Spurious Emissions		N/S ¹
22.913(a)(5) 24.232(c) 27.50(c)(10) 27.50(d)(4)	RSS-130 (4.6.3) RSS-132 (5.4) RSS-133 (6.4) RSS-139 (5.5)	Effective Radiated Power / Effective Isotropic Radiated Power	Radiated	N/S ¹
2.1053 22.917(a) 24.238(a) 27.53(g)/(h)	RSS-GEN (6.13) RSS-130 (4.7) RSS-132 (5.5) RSS-133 (6.5) RSS-139 (5.6)	Radiated Spurious Emissions		Compliant
2.1055 22.355 24.235 27.54	RSS-GEN (6.11) RSS-130 (4.5) RSS-132 (5.3) RSS-133 (6.3) RSS-139 (5.4)	Frequency Stability		N/S ¹

Note:

- 1) Not in the scope of evaluation. The EUT is a certified cellular module. Only radiated spurious emissions was performed with the module installed in the new host per FCC KDB 996369 D04 Module Integration Guide v02.

1.1 Modifications Required to Compliance

None

2 General Information

2.1 Client Information

Name: Risk Band LLC
Address: 1000 Johnnie Dobbs Blvd., Suite 103-312
City, State, Zip, Country: Mount Pleasant, SC, 29464, USA

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
Designation Number: US1126
CAB Identifier: US0186

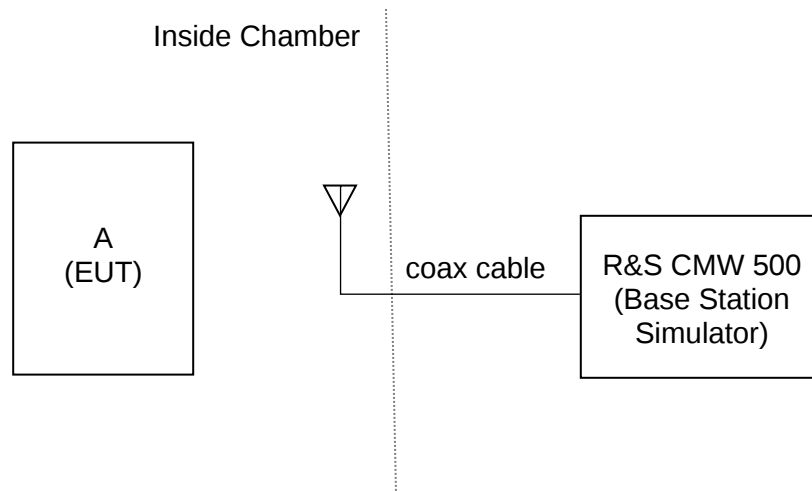
2.3 General Information of EUT

Equipment Under Test: LTE Module in Wearable Emergency Device
Module Model Number: TOBY-R200
Host Model Name: ARIES
Host Model Number: RBD30060
Serial Number: 221003-00004
IMEI Number: 359947100951077
Frequencies of Operation: 1850 – 1910 MHz (LTE Band 2)
1710 – 1755 MHz (LTE Band 4)
824 – 849 MHz (LTE Band 5)
699 – 716 MHz (LTE Band 12)
Radio Technology: LTE Cat 1
Channel Bandwidth tested: 1.4 MHz
Modulation tested: QPSK
RB allocation: 1 RBs allocated, RB start = 0
Antenna Type/Gain: SMT, Ethertronics P822601, 698-2200MHz, 2.6 to 4.4dBi
Rated Voltage: 3.7 VDC
Test Voltage: 3.7 VDC
Sample Received Date: 26 July 2022
Dates of testing: 28-31 October 2022

2.4 Operating Modes and Conditions

The EUT was tested with normal operating firmware, but with a Rohde & Schwarz test SIM installed. Once powered on by USB and AT commands were sent, the cellular modem connected with the R&S Wideband Radio Communication Tester (CMW500). The CMW500 was used to control the EUT to operate with maximum transmit (uplink) power in LTE Bands 2 and 12. Low, middle and high channels were tested in each band using a cell bandwidth of 1.4MHz with 1 Resource Block.

2.5 EUT Connection Block Diagram



2.6 System Configurations

Device Reference	Manufacturer	Description	Model Number	Serial Number
A	Risk Band LLC	Wearable Emergency Device containing LTE Module (EUT)	RBD30060	221003-00004

3 Radiated Spurious Emissions

3.1 Test Result

Test Description	Specification	Test Result
Transmitter Spurious Emissions	ANSI C63.26:2015	Compliant

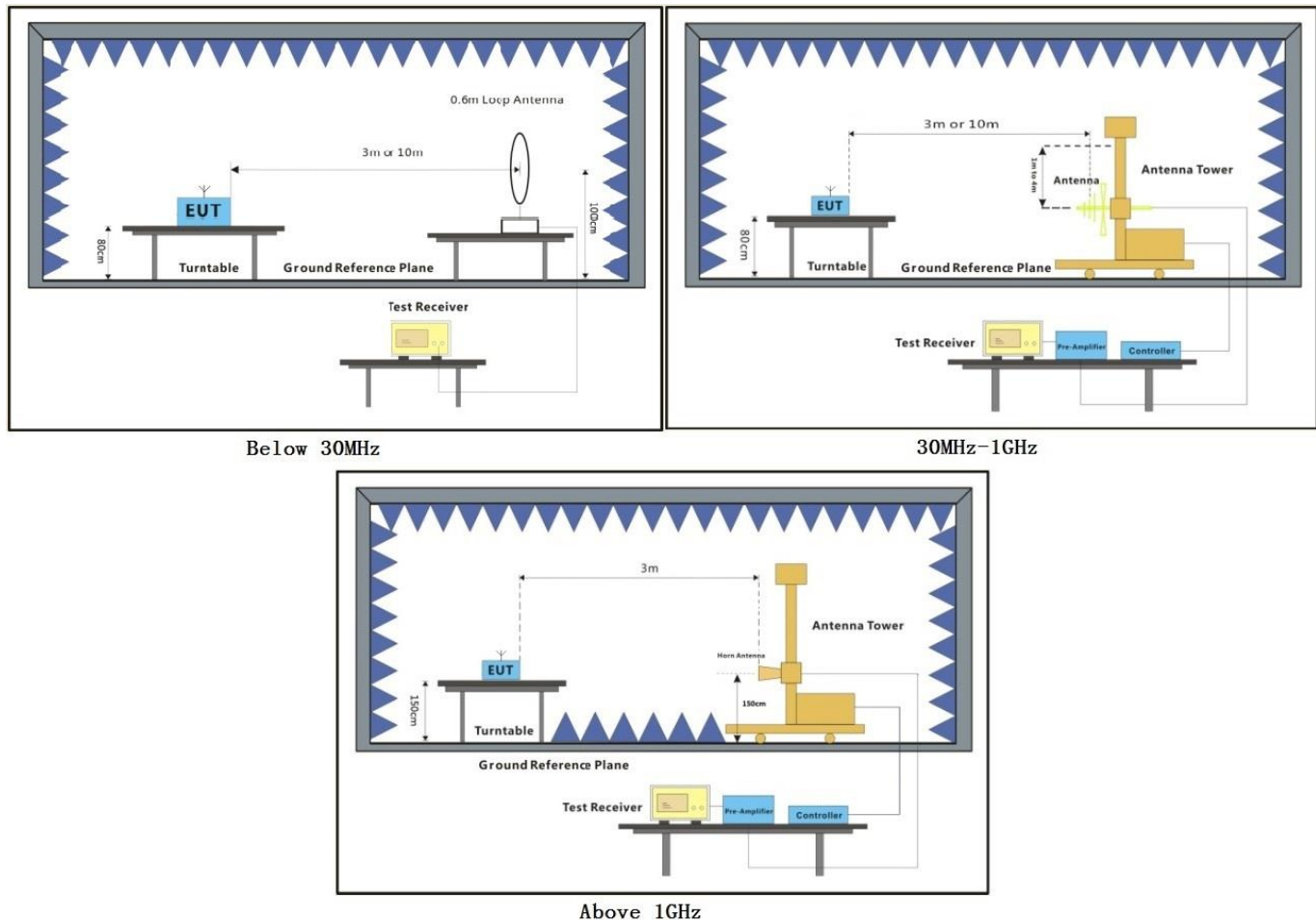
3.2 Test Method

The levels of the carrier and the various conducted spurious and harmonics frequencies are measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester.

The measurements were performed at the lowest, middle, and highest channels of the lowest and highest frequency bands (Bands 2 and 12).

3.3 Test Setup Diagrams



3.4 Test Site

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

Environmental Conditions	28-Oct-2022	31-Oct-2022
Temperature:	21.82 °C	21.01°C
Relative Humidity:	40.2 %	51.1 %
Atmospheric Pressure:	97.9 kPa	97.7 kPa

3.5 Test Equipment

30-1000MHz

Test End Date: 28-Oct-2022

Tester: PL

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	26-May-2022	26-May-2024
RF CABLE NM TO NM, 0.01-18GHZ	90-195-079	TELEDYNE STORM MICROWAVE	20124	14-Feb-2022	14-Feb-2023
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20117	17-Feb-2022	17-Feb-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-	90-076-020	TELEDYNE STORM MICROWAVE	20131	16-Mar-2022	16-Mar-2023
N to N RF Cable	NC12-N1N1-276	MEGAPHASE	22001	10-Jan-2022	10-Jan-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22027	13-Sep-2022	13-Sep-2023
LOW NOISE AMPLIFIER	ZKL-2+	MINI-CIRCUITS	B079800	14-Sep-2022	14-Sep-2023

>1GHz

Test End Date: 31-Oct-2022

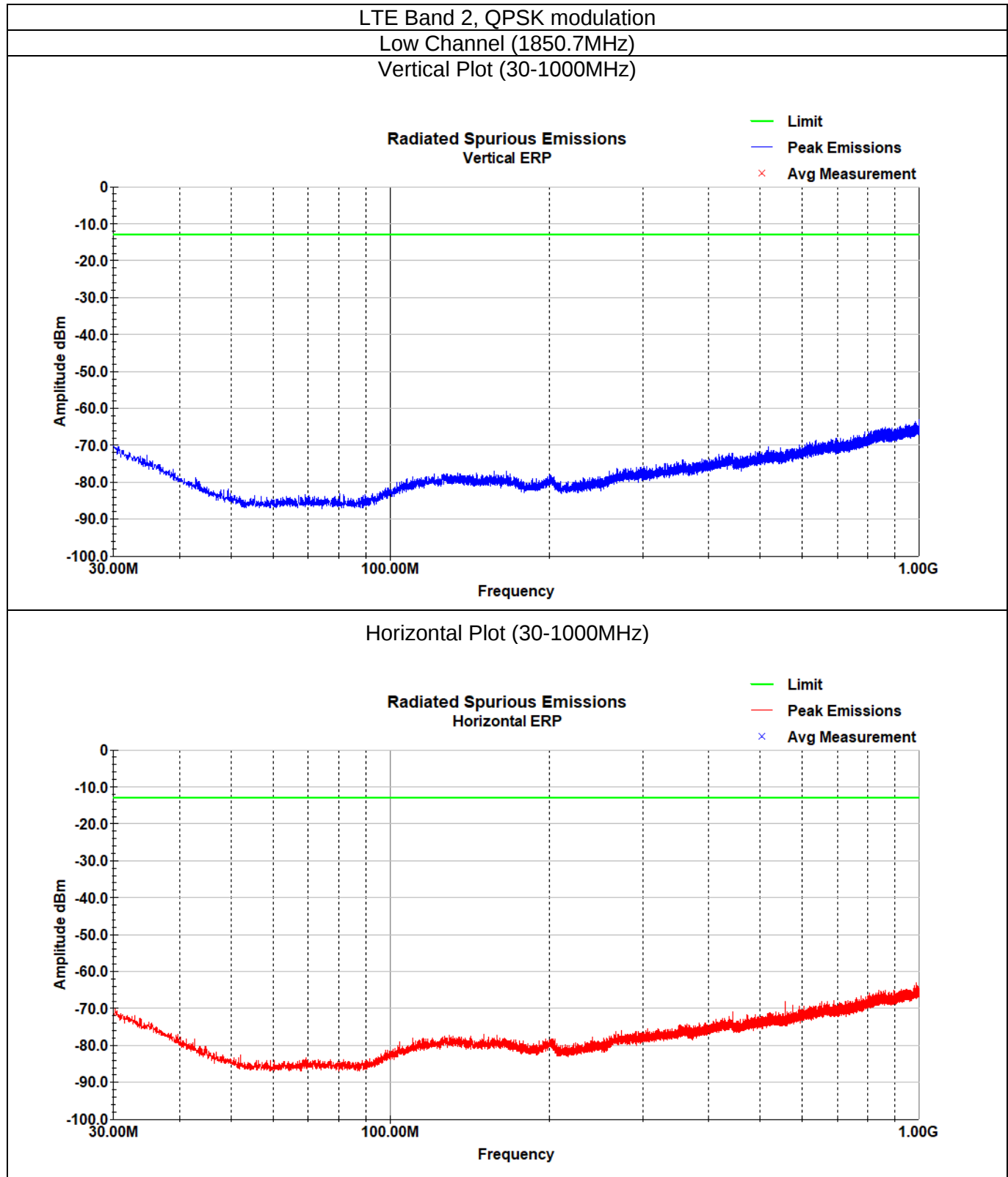
Tester: PL

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	104PE	HUBER & SUHNER	B079793	25-Aug-2022	25-Aug-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22027	13-Sep-2022	13-Sep-2023
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	3-Oct-2022	3-Oct-2023
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	8-Sep-2022	8-Sep-2023
FILTER, HIGH PASS, >2800MHZ	HPM50110	MICRO-TRONICS	B079792	11-Jul-2022	11-Jul-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-	90-076-020	TELEDYNE STORM MICROWAVE	20131	16-Mar-2022	16-Mar-2023
FILTER, HIGH PASS, >1000MHZ	HPM50108	MICRO-TRONICS	B079802	5-Jul-2022	5-Jul-2023

Note: Refer to equipment list for calibration intervals.

3.6 Test Data

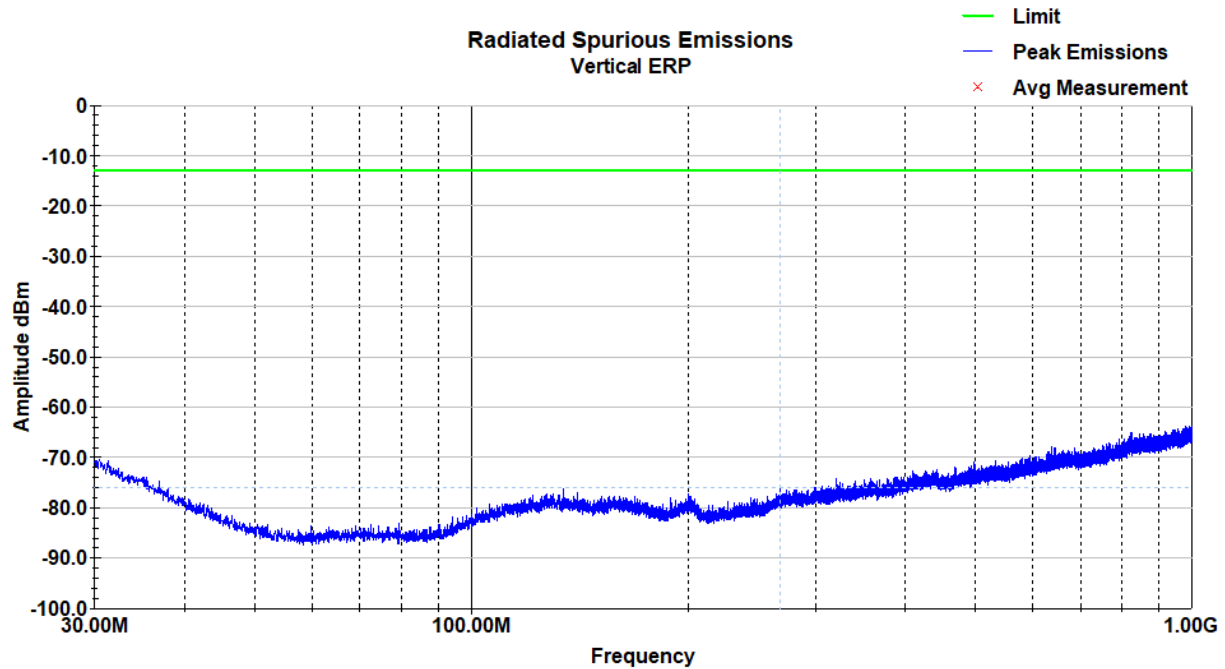
3.6.1 30-1000MHz



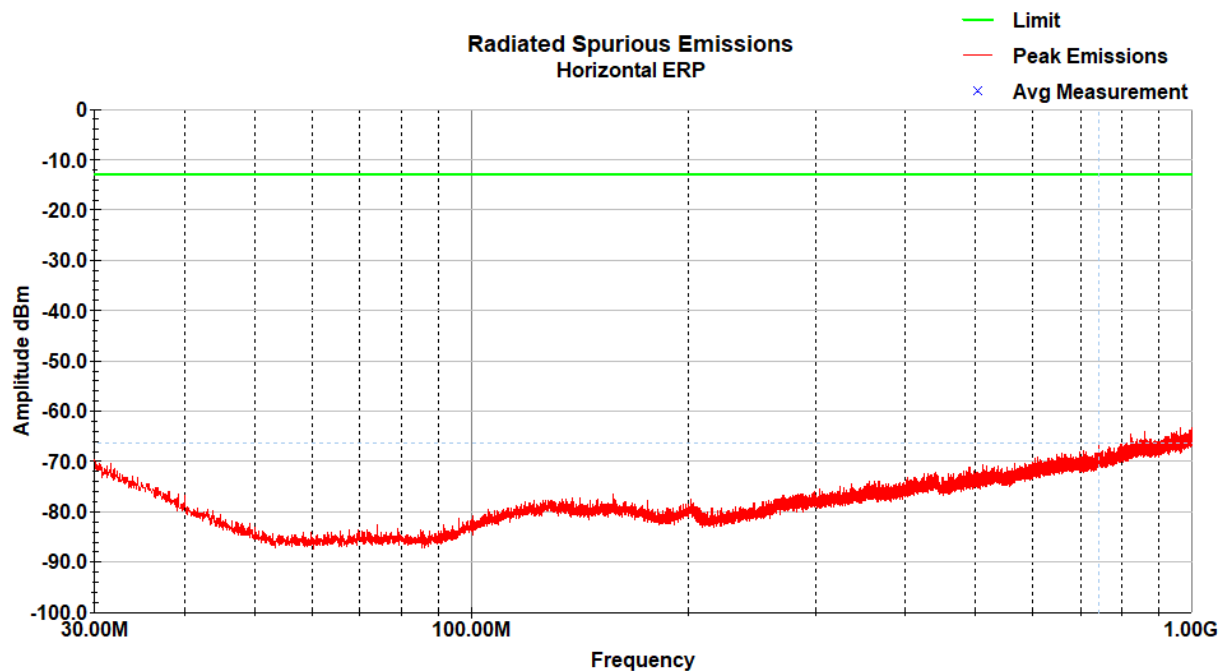
LTE Band 2, QPSK modulation

Mid Channel (1880MHz)

Vertical Plot (30-1000MHz)



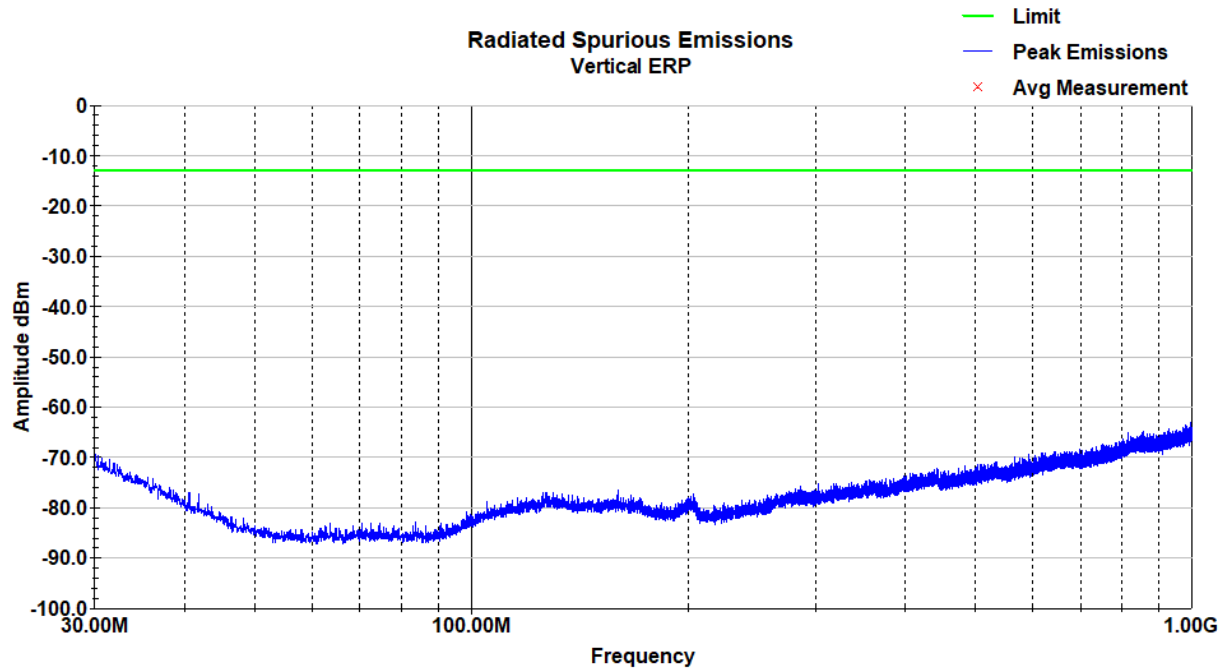
Horizontal Plot (30-1000MHz)



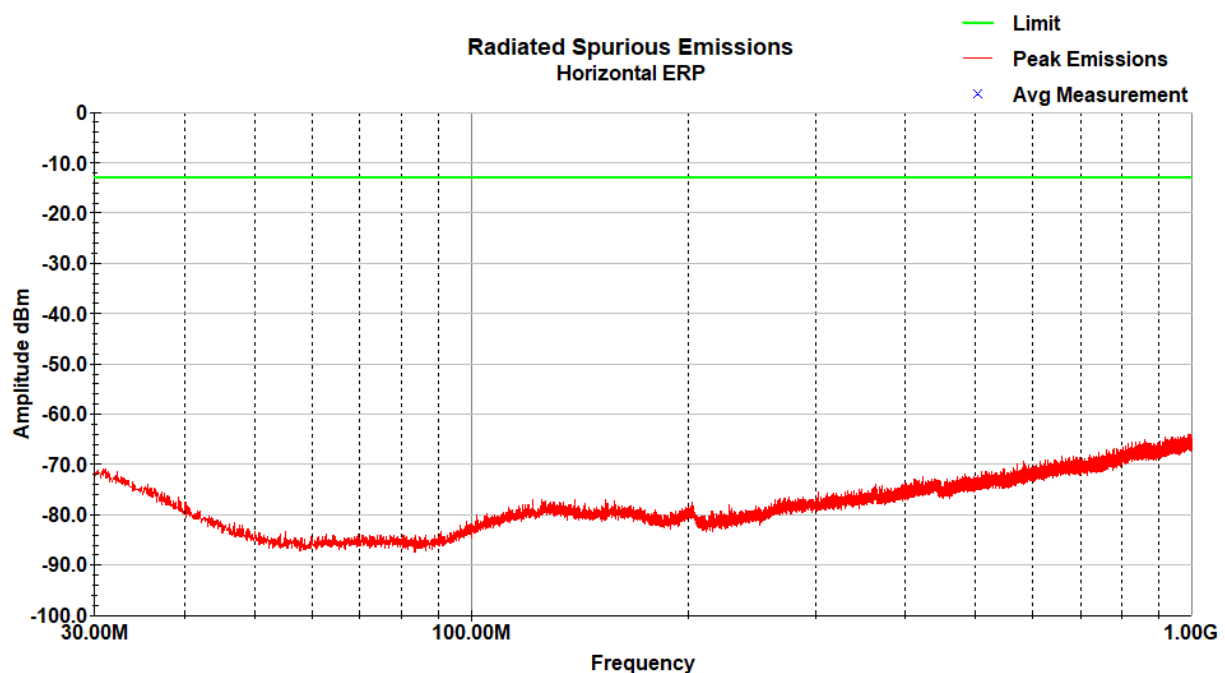
LTE Band 2, QPSK modulation

High Channel (1909.3MHz)

Vertical Plot (30-1000MHz)



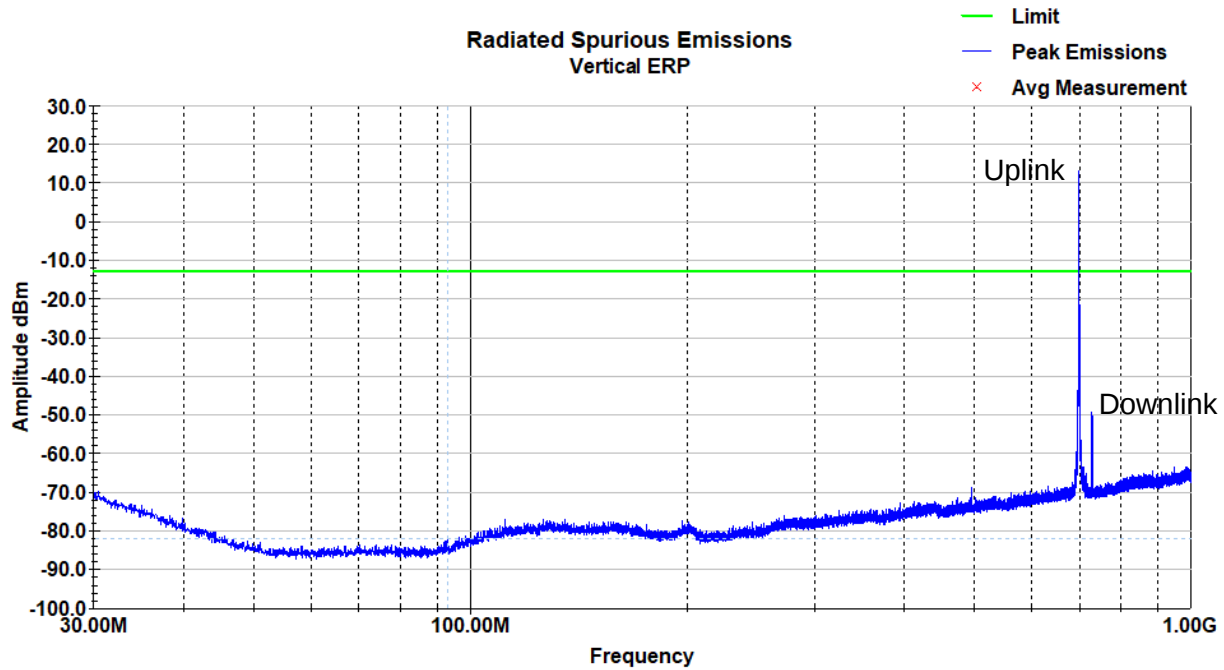
Horizontal Plot (30-1000MHz)



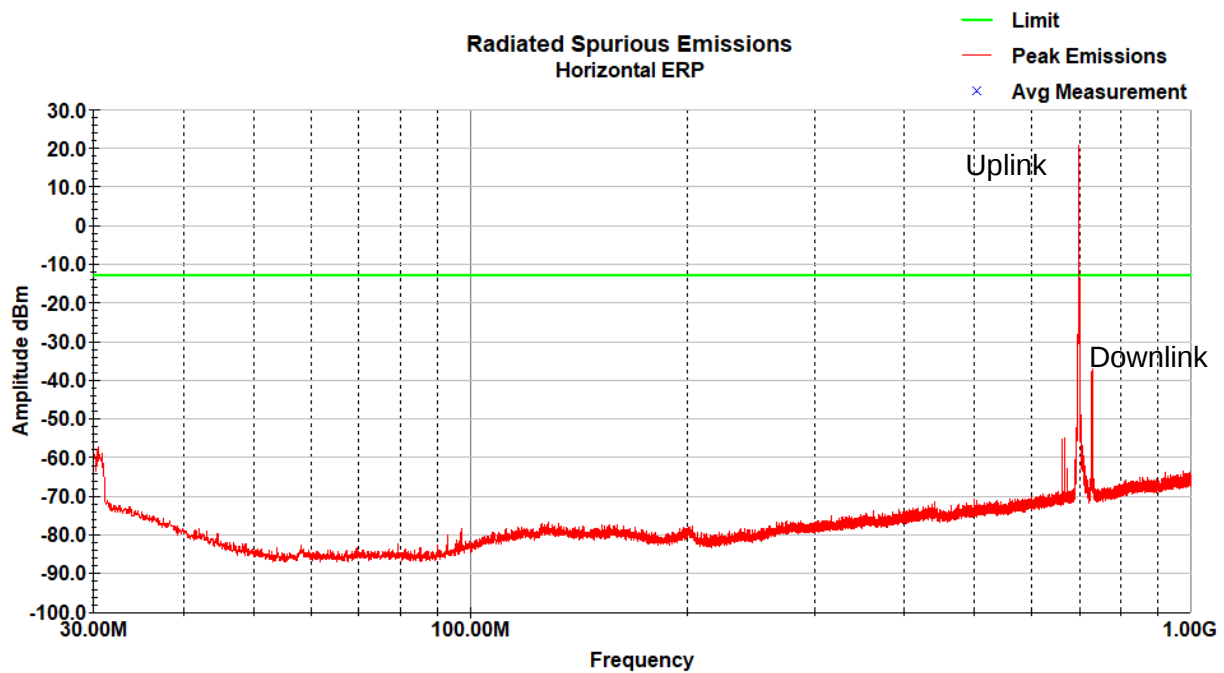
LTE Band 12, QPSK modulation

Low channel (699.7MHz)

Vertical Plot (30-1000MHz)



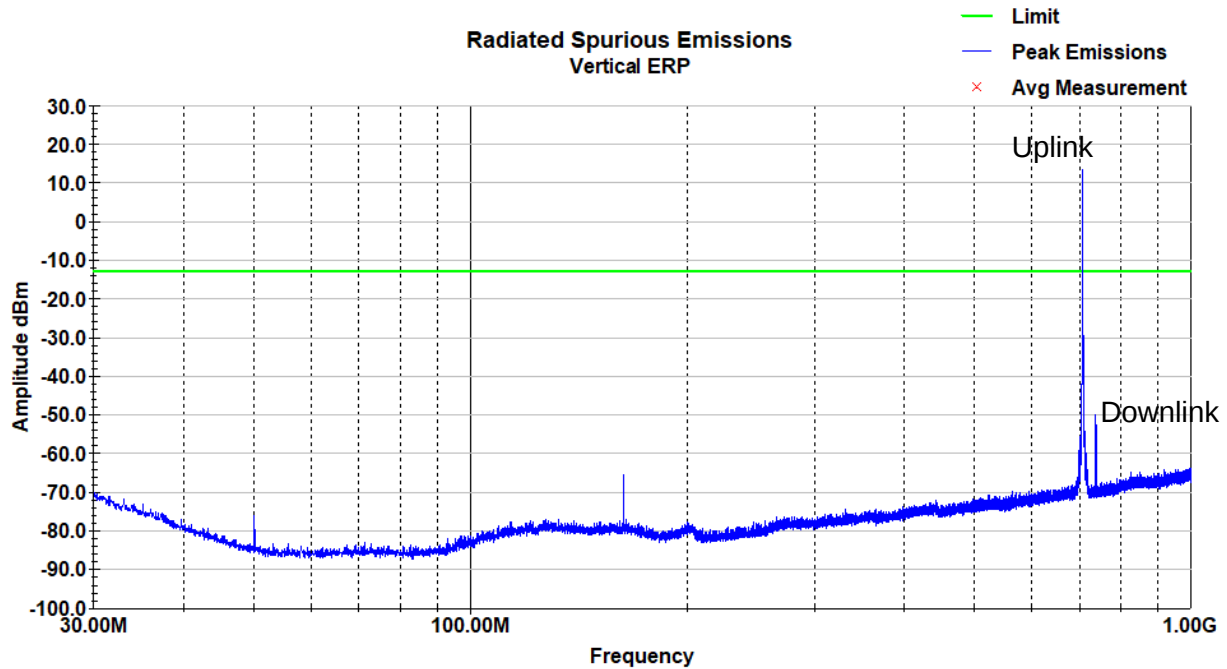
Horizontal Plot (30-1000MHz)



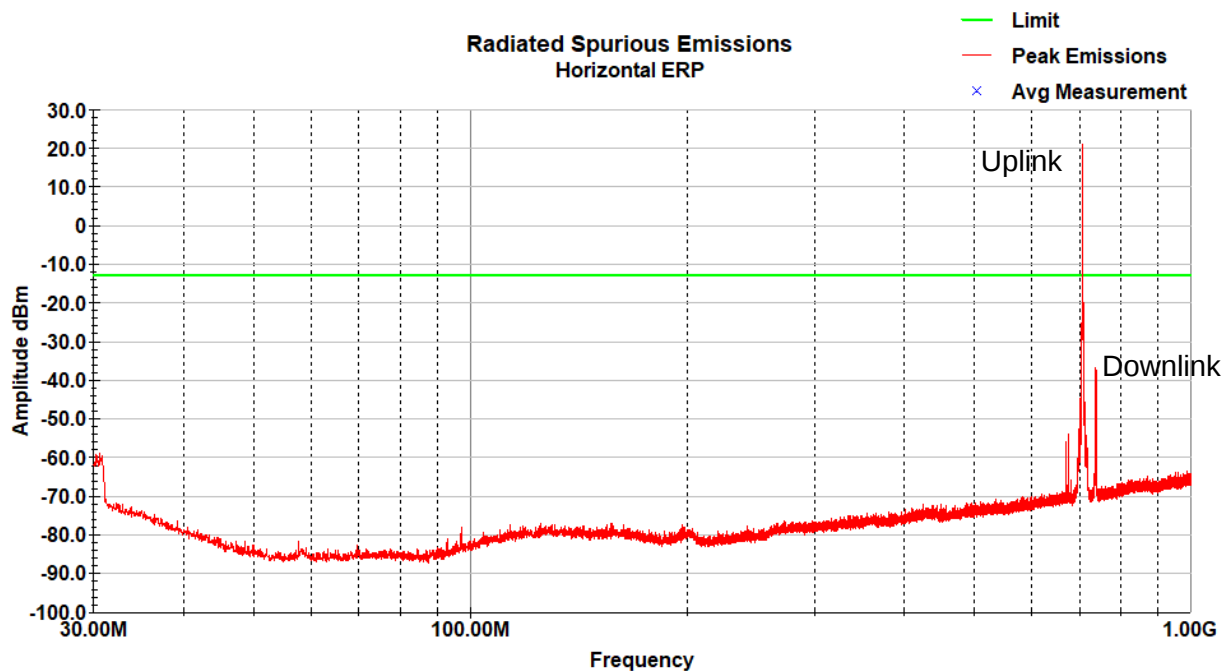
LTE Band 12, QPSK modulation

Mid channel (707.5MHz)

Vertical Plot (30-1000MHz)



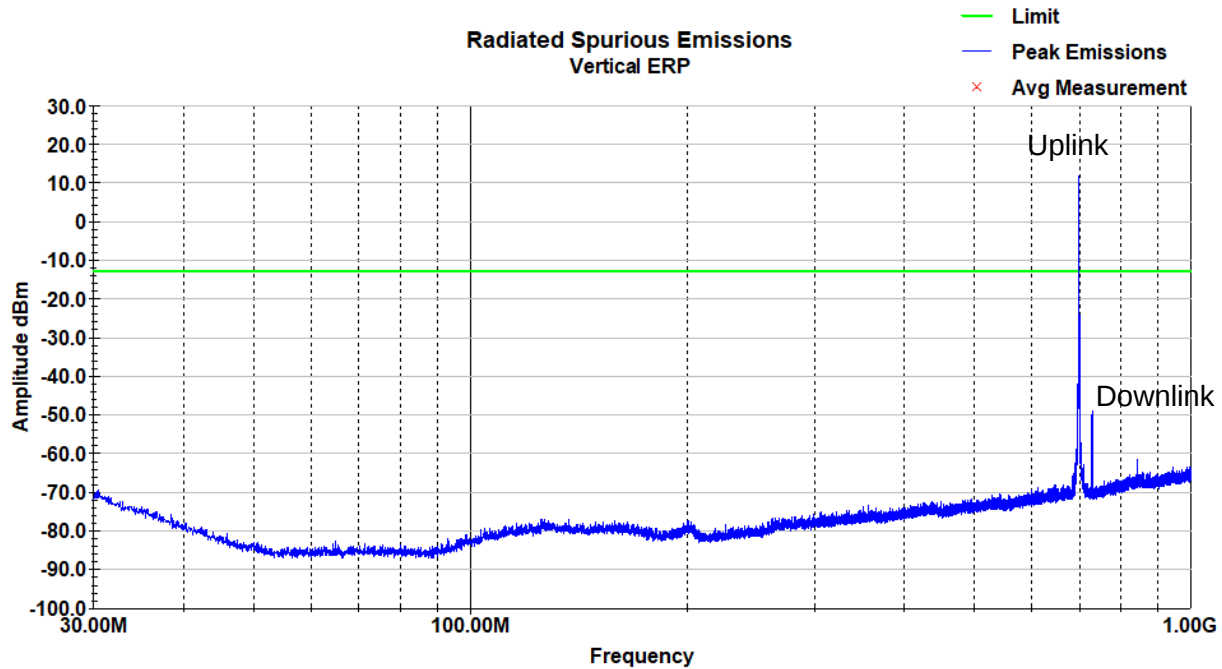
Horizontal Plot (30-1000MHz)



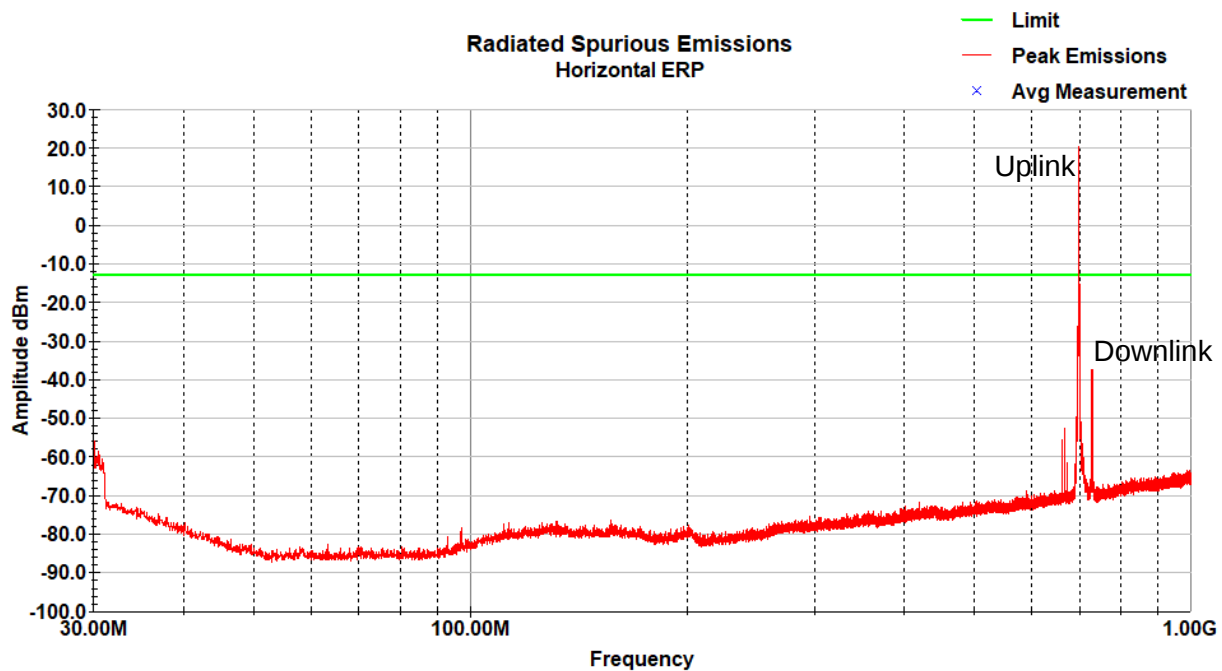
LTE Band 12, QPSK modulation

High channel (715.3MHz)

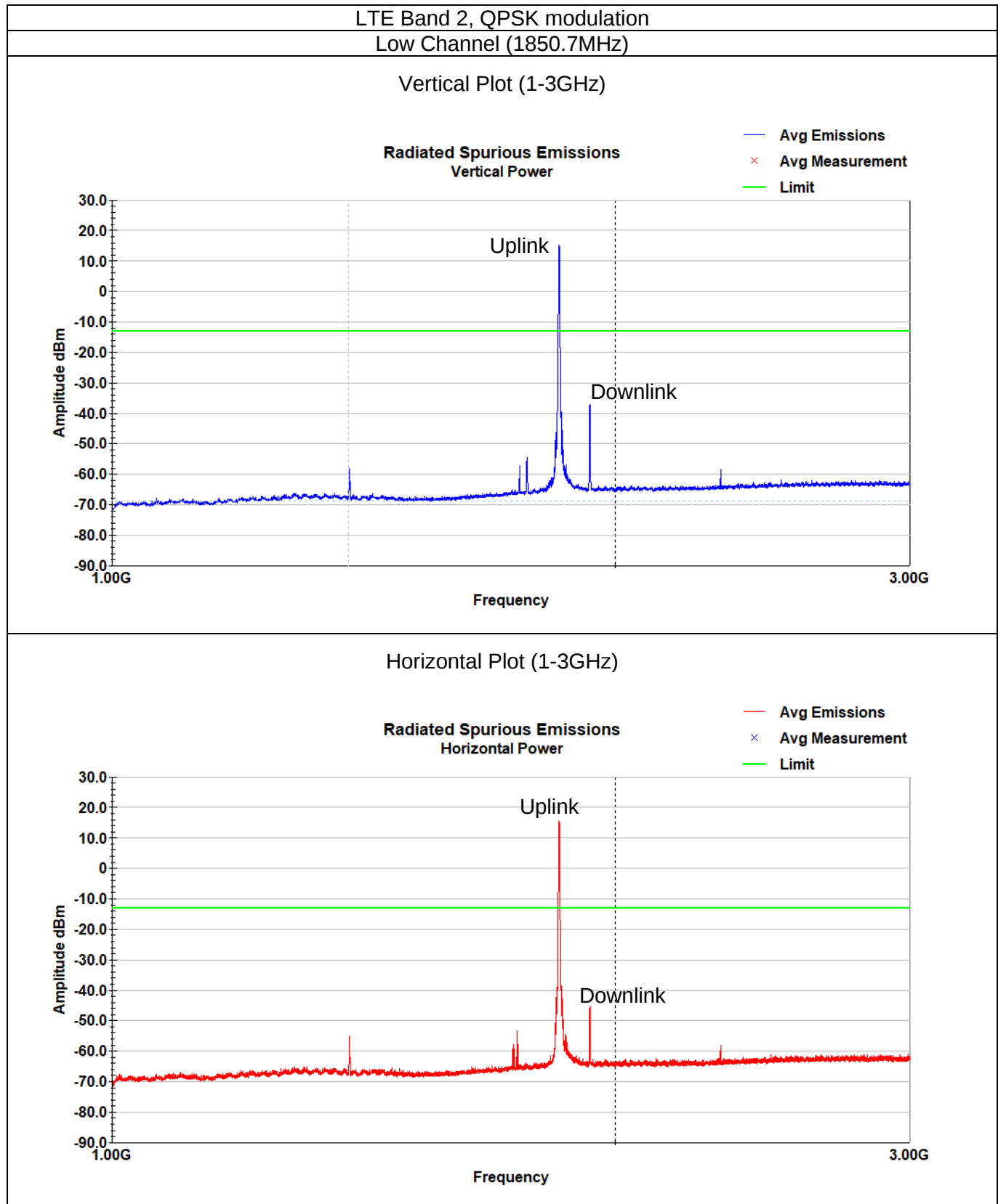
Vertical Plot (30-1000MHz)



Horizontal Plot (30-1000MHz)



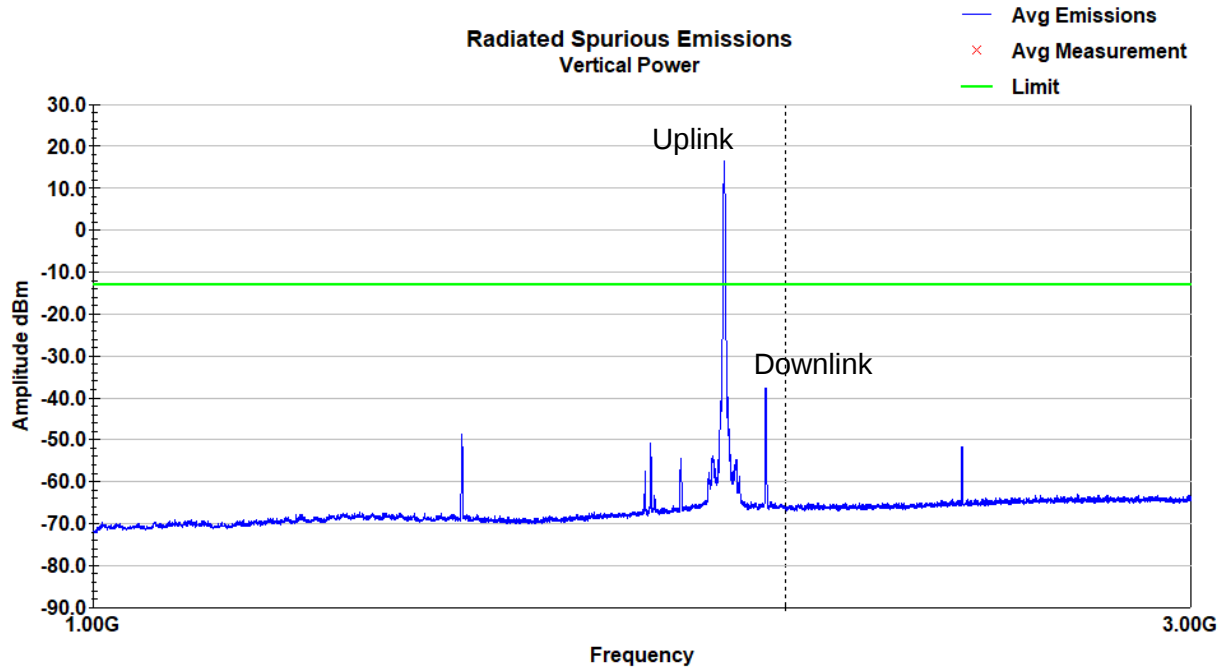
3.6.2 Above 1GHz



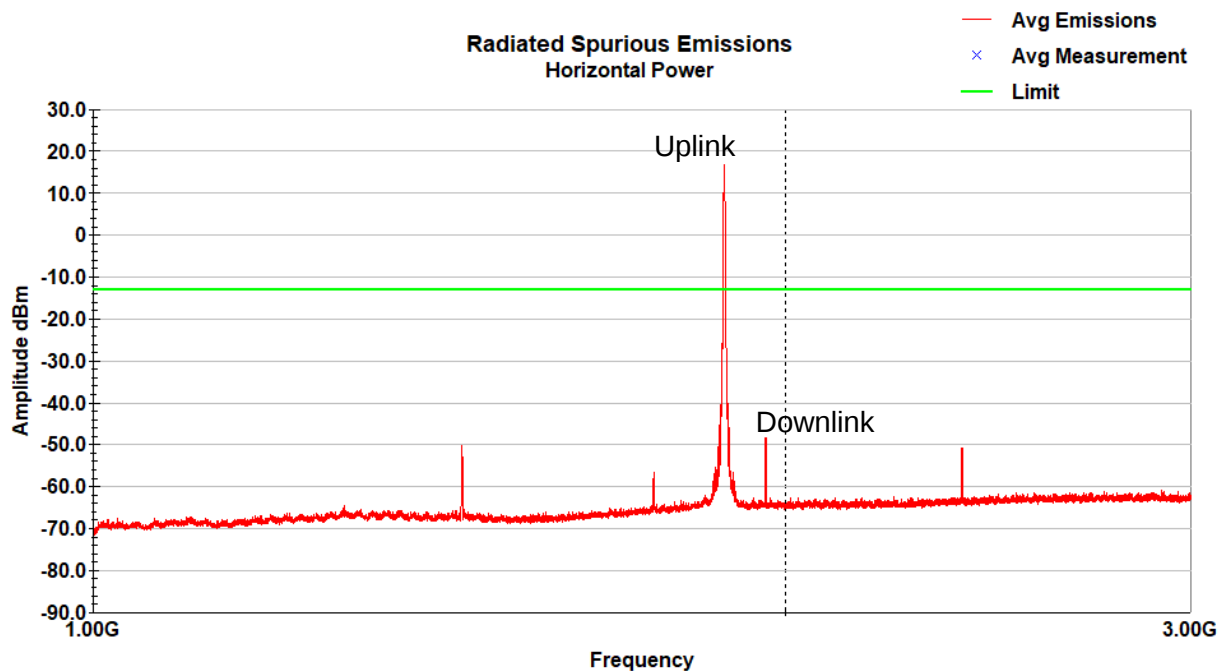
LTE Band 2, QPSK modulation

Mid Channel (1880MHz)

Vertical Plot (1-3GHz)



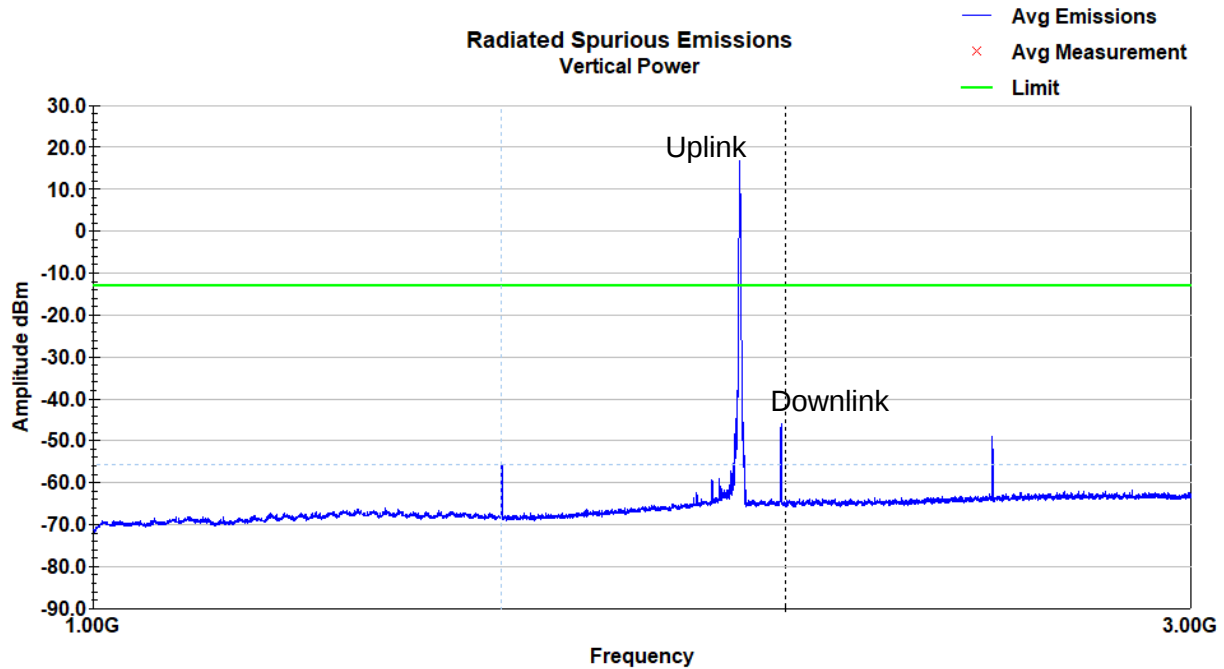
Horizontal Plot (1-3GHz)



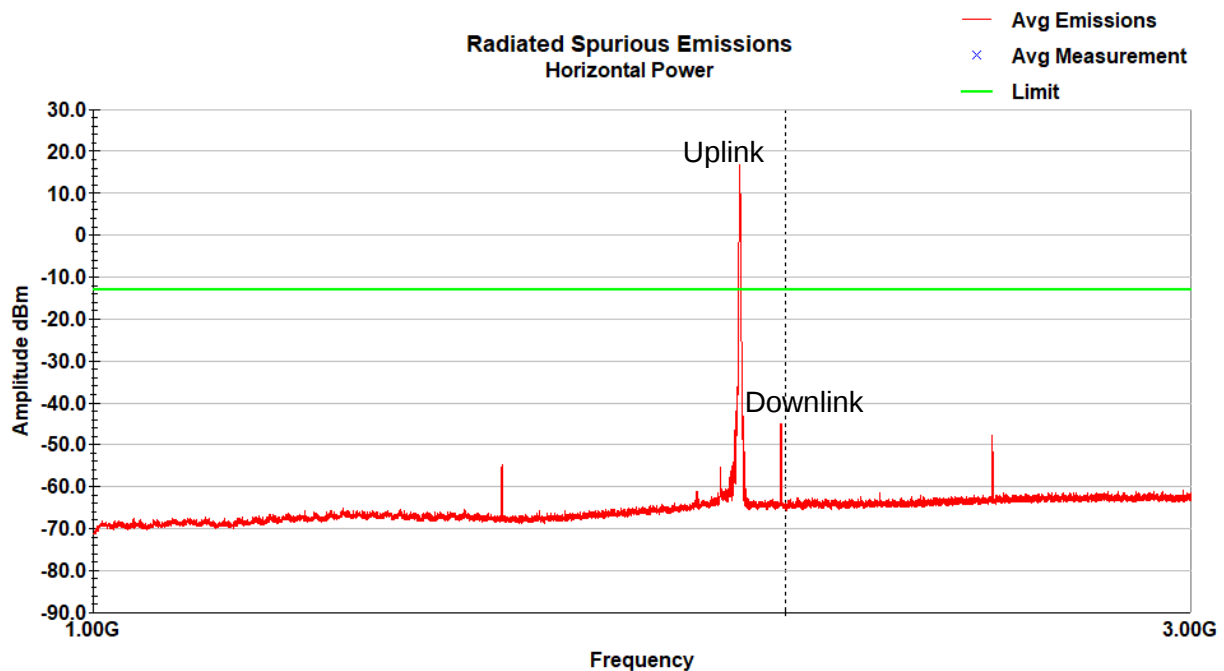
LTE Band 2, QPSK modulation

High Channel (1909.3MHz)

Vertical Plot (1-3GHz)



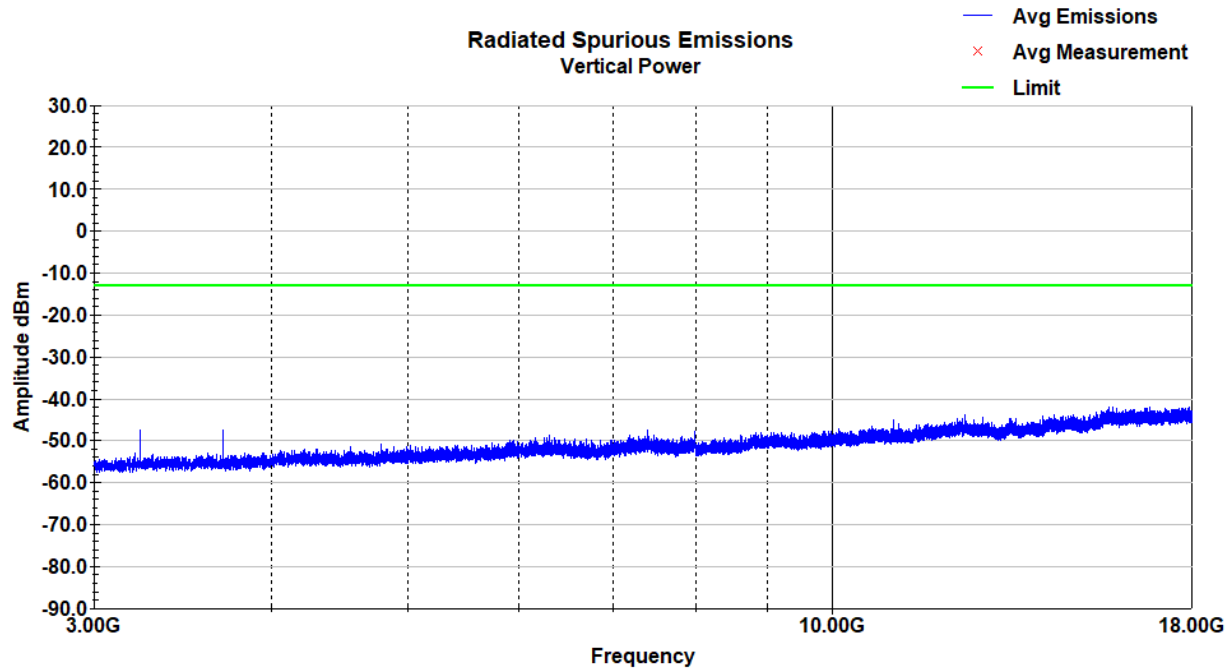
Horizontal Plot (1-3GHz)



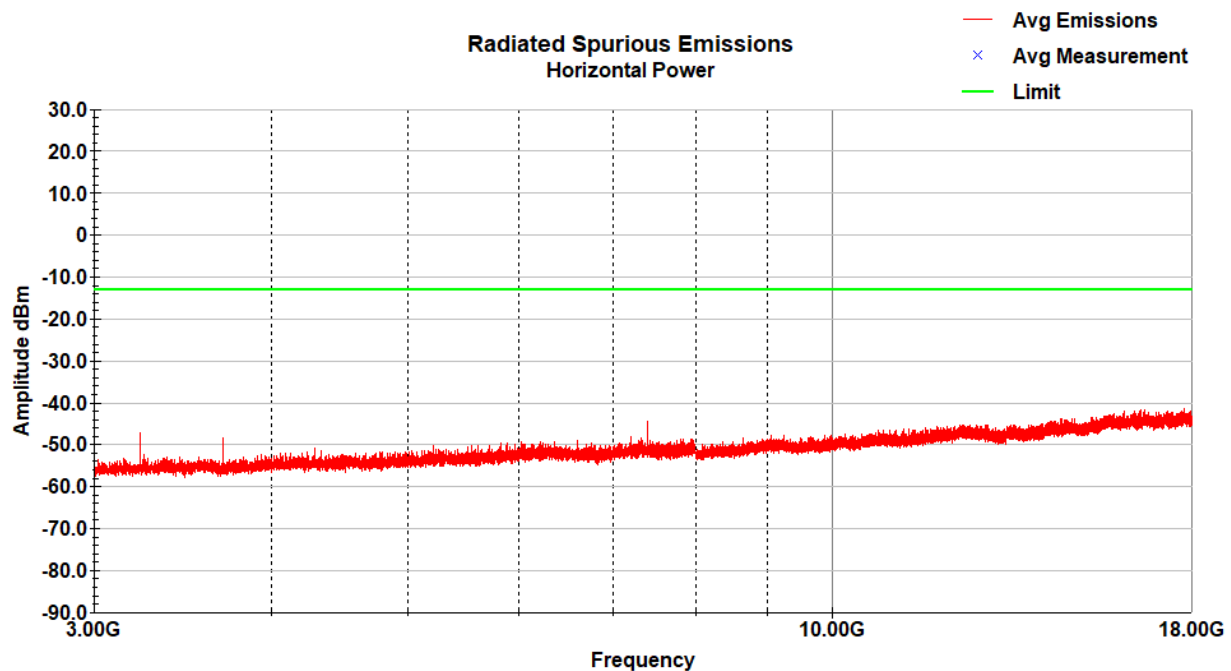
LTE Band 2, QPSK modulation

Low Channel (1850.7MHz)

Vertical Plot (3-18GHz)



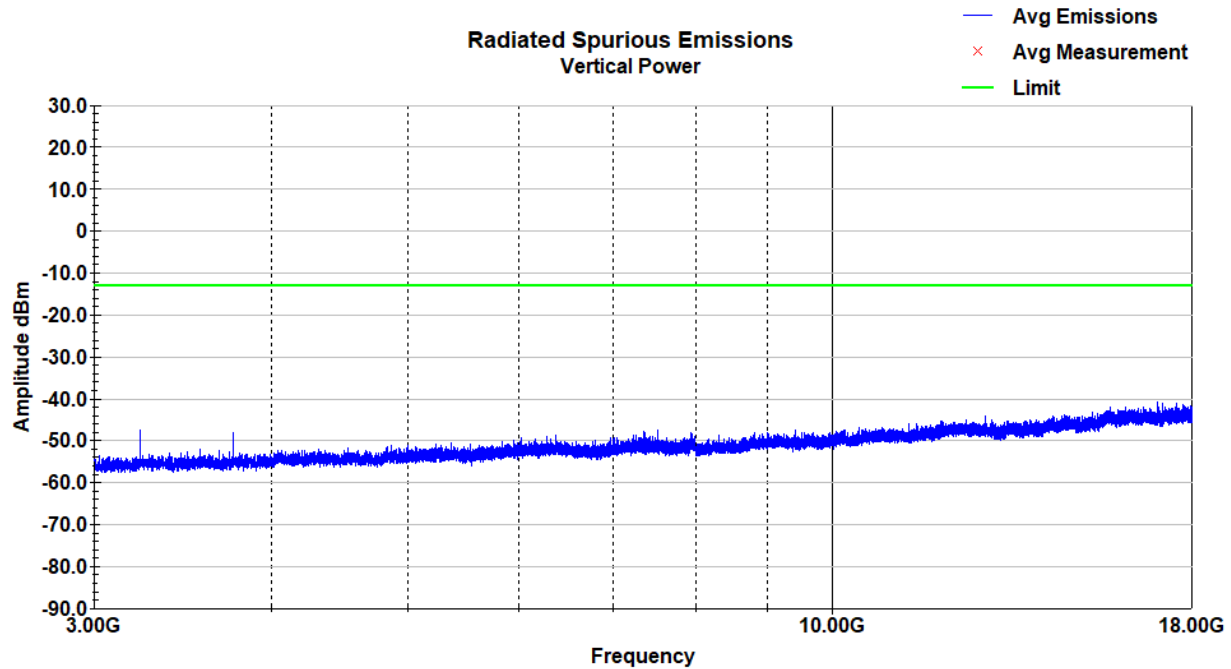
Horizontal Plot (3-18GHz)



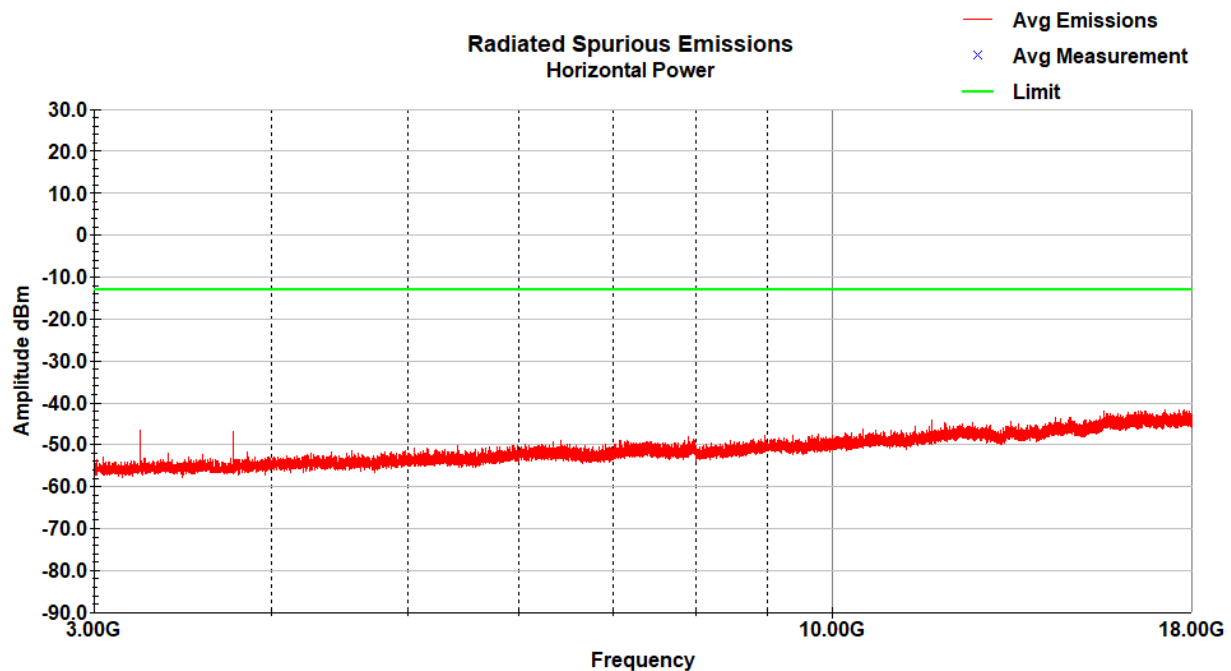
LTE Band 2, QPSK modulation

Mid Channel (1880MHz)

Vertical Plot (3-18GHz)



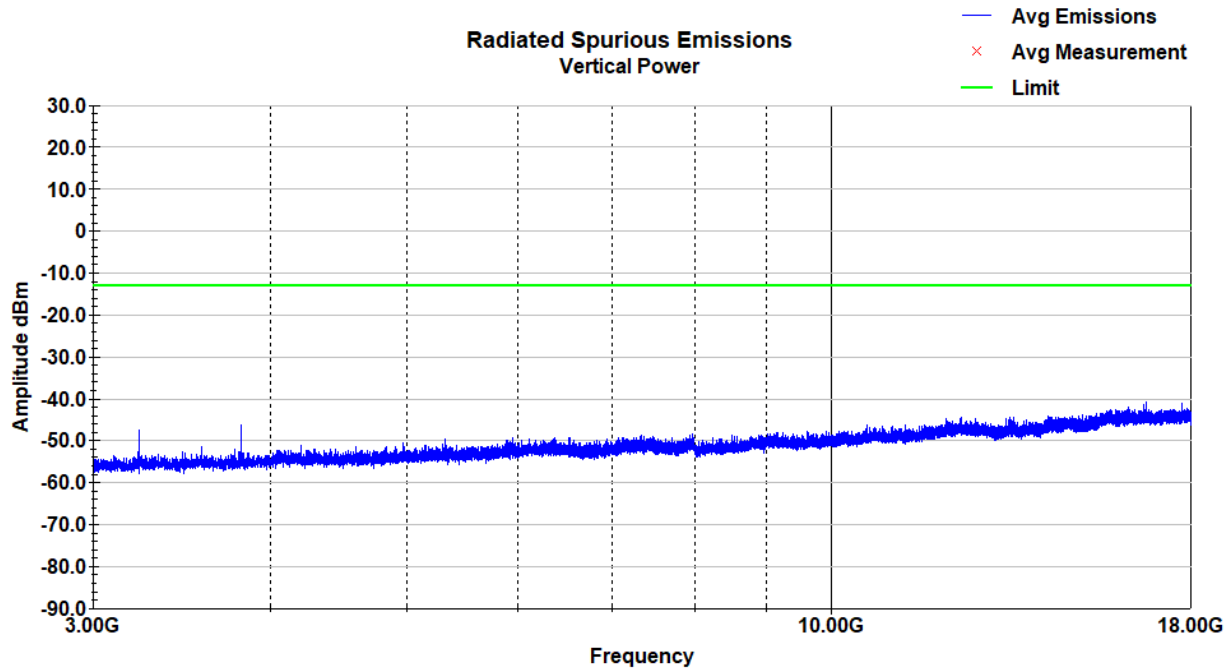
Horizontal Plot (3-18GHz)



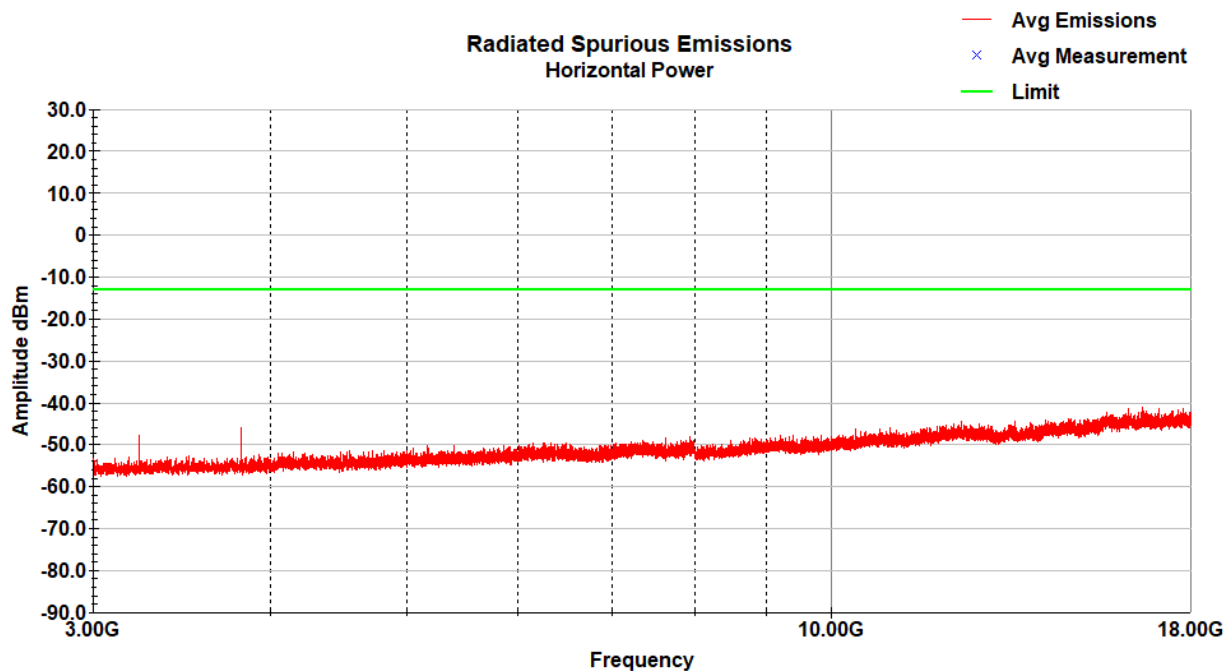
LTE Band 2, QPSK modulation

High Channel (1909.3MHz)

Vertical Plot (3-18GHz)



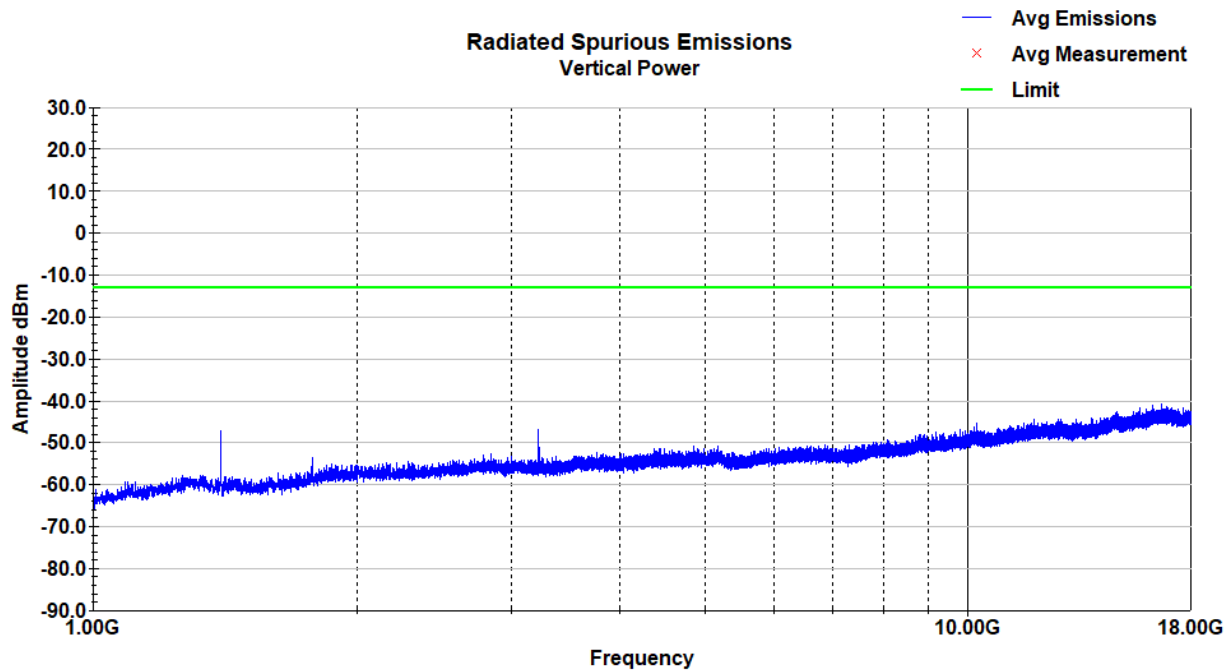
Horizontal Plot (3-18GHz)



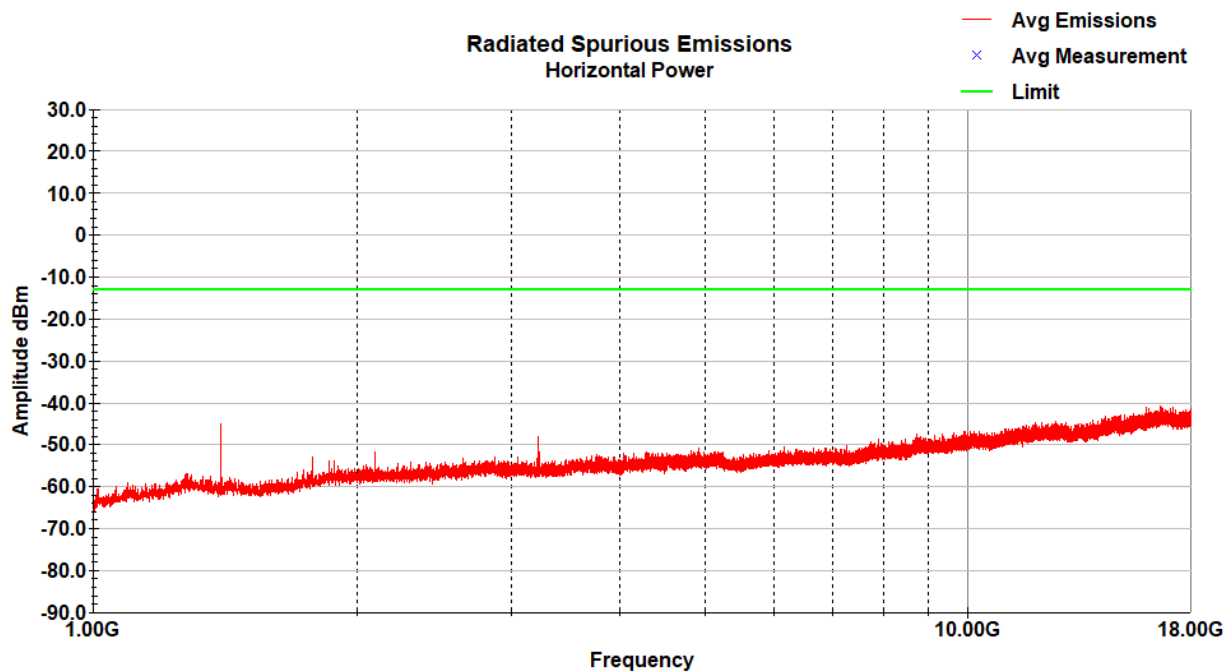
LTE Band 12, QPSK modulation

Low Channel (699.7 MHz)

Vertical Plot (1-8GHz)



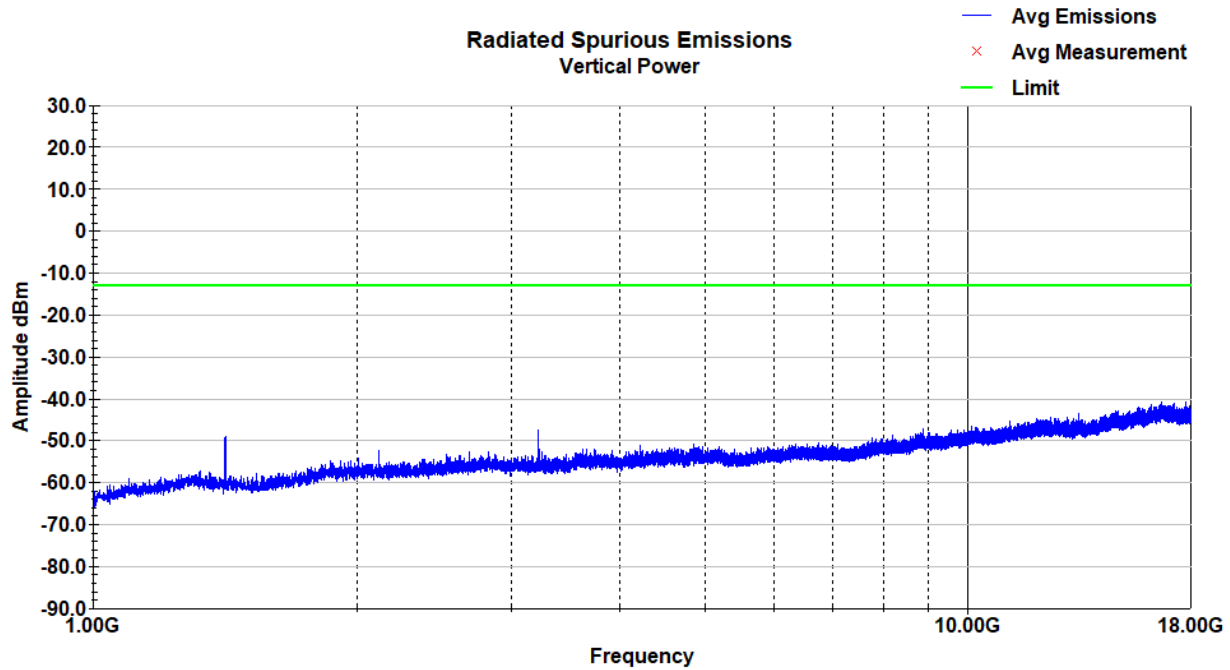
Horizontal Plot (1-8GHz)



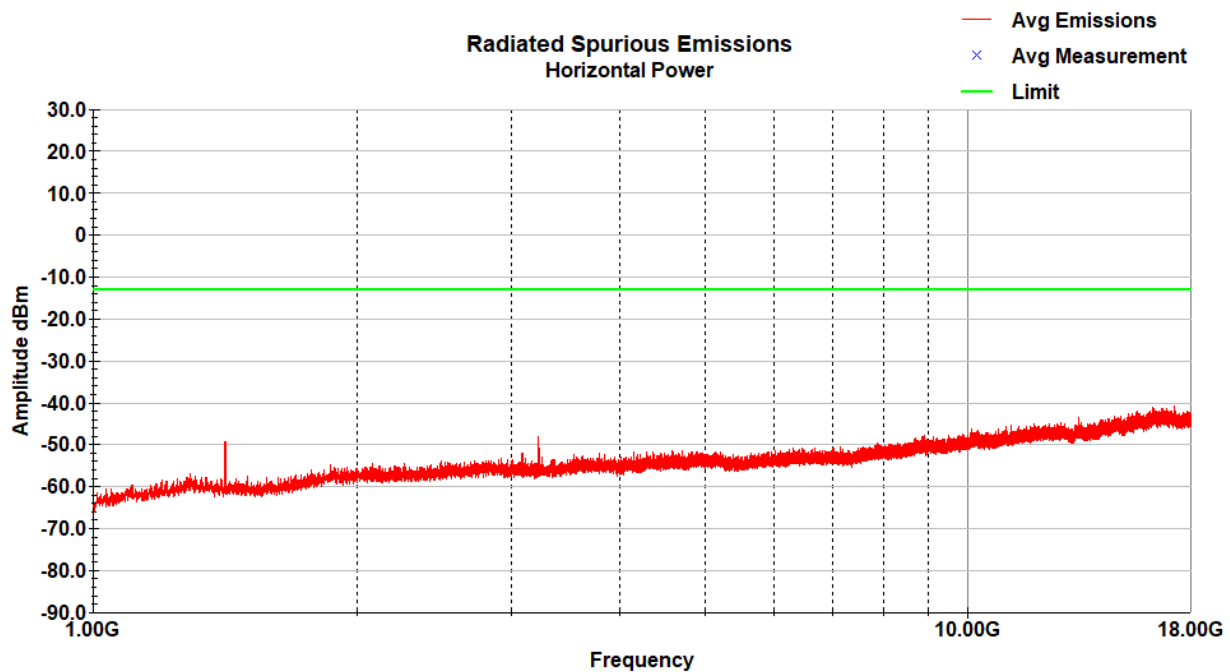
LTE Band 12, QPSK modulation

Mid Channel (707.5 MHz)

Vertical Plot (1-8GHz)



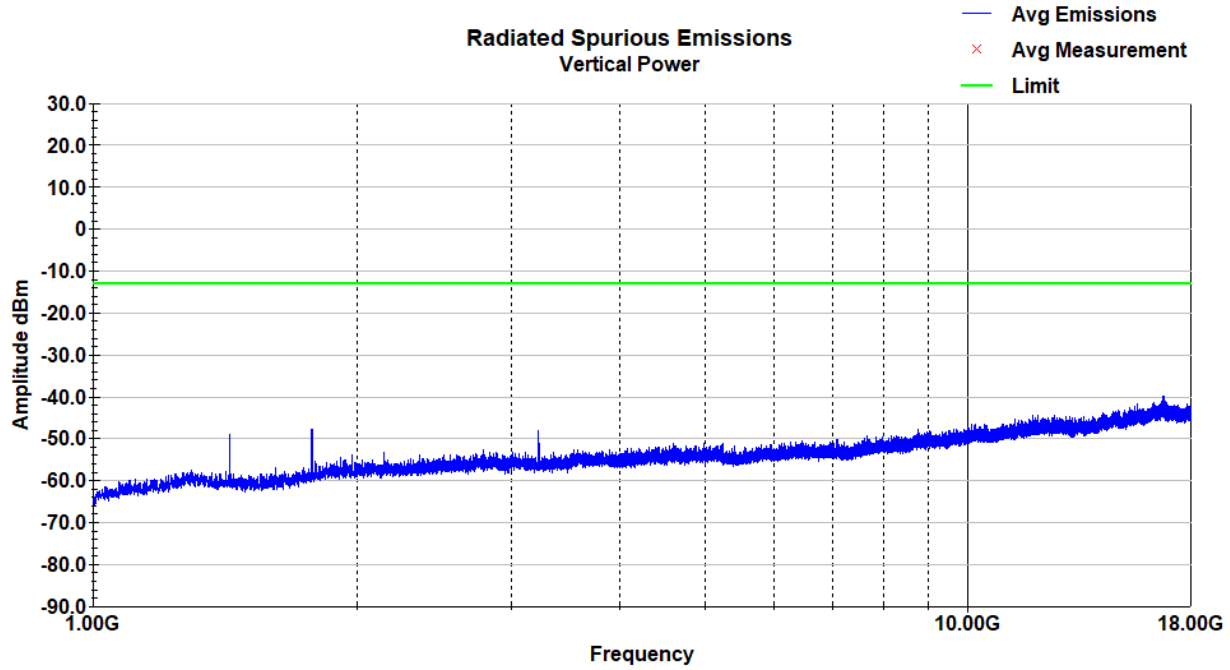
Horizontal Plot Mid (1-8GHz)



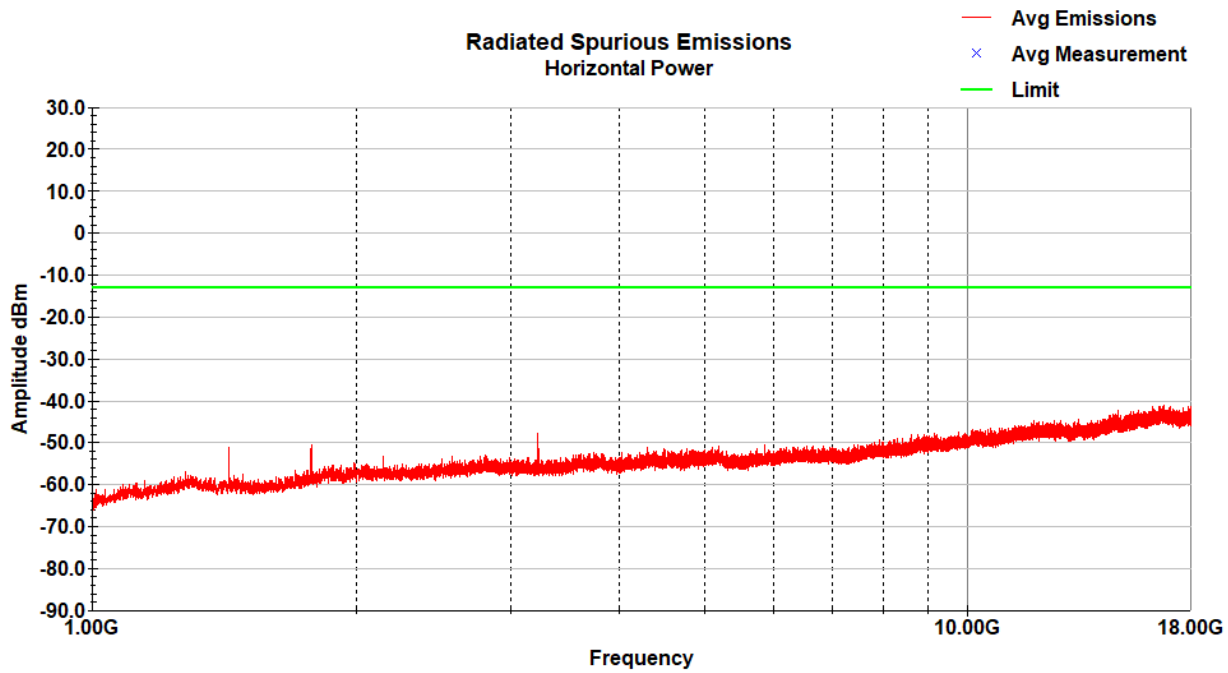
LTE Band 12, QPSK modulation

High Channel (715.3 MHz)

Vertical Plot (1-8GHz)



Horizontal Plot (1-8GHz)



Regardless of channel or band, no spurious emissions associated with the radio were within 20dB of the limit.

4 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 %	± 3.5 %
DC and low frequency voltages	± 3 %	± 0.4 %

5 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	12 January 2023
1	- Clarified that EUT is LTE Module on title page and in section 2.3 - Added Measurement Uncertainty (new section 4)	25 January 2023