EMC Test Report

Project Number:	**4643717**	**Quotation Number:**	**02062020NG-1.3**
Report Number:	**4643717EMC01**	**Revision Level:**	**2**
Client:	**Track Group Inc.**		

Equipment Under Test:	**GPS Ankle Bracelet**
Model Number:	**OTD 4.1**
FCC ID:	**TPO-OTD41**
IC:	**6512A-OTD41**
FCC Rule Parts:	**Part 2, Part 22(H), Part 24(E), Part 27**
Industry Canada:	**RSS-GEN, Issue 5, Amendment 1, March 2019**
	RSS-130, Issue 2, February 2019
	RSS-132, Issue 3, January 2013
	RSS-133, Issue 6, Amendment 1, January 2018
	RSS-139, Issue 3, July 2015
Applicable Standards:	**ANSI C63.26: 2015**

Report issued on:	**19 October 2020**
Test Result:	**Compliant**

Tested by: Martin Taylor, Project Engineer

Reviewed by: Jeremy Pickens, RF Lab 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.

Table of Contents

1 Summary of Test Results

Reference Sections		Test Description	Test Condition	Test Result
FCC	IC			
2.1046	RSS-GEN (6.12)	Conducted Output Power	Conducted	(see Note 1)
24.232(d) 27.50(d)(5)	RSS-130 (4.6.1) RSS-132 (5.4) RSS-133 (6.4) RSS-139 (6.5)	Peak-to-Average Ratio		(see Note 1)
2.1049 22.917(b) 24.238(b) 27.53(h)(3)	RSS-GEN (6.7) RSS-133 (2.3)	Occupied Bandwidth Emission Bandwidth		(see Note 1)
2.1051 22.917 24.238 27.53(c) 27.53(g) 27.53(h)	RSS-130 (4.7) RSS-132 (5.5) RSS-133 (6.5) RSS-139 (6.6)	Band Edge / Conducted Spurious Emissions		(see Note 1)
22.913(a)(5) 27.50(b)(9) 27.50(c)(9)	RSS-130 (4.6.3)	Effective Radiated Power	Radiated	(see Note 1)
24.232(c) 27.50(d)(4)	RSS-132 (5.4) RSS-133 (6.4) RSS-139 (6.5)	Effective Isotropic Radiated Power		(see Note 1)
2.1053 22.917 24.238 27.53(c) 27.53(g) 27.53(h)	RSS-GEN (6.13) RSS-130 (4.7) RSS-132 (5.5) RSS-133 (6.5) RSS-139 (6.6)	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 (6.4)	Frequency Stability	Conducted	(see Note 1)

Note 1: Test results for this test are contained in Test Report Number 1506FR21-01 for LTE and in Test Report Number 1506FR22-01 for WCDMA. Also note that LTE Band 17 is a subset of Band 12 and is not used in this product application, which is why Band 17 data is not included in this report.

1.1 *Modifications Required to Compliance*

None

2 General Information

2.1 *Client Information*

Name:	Track Group Inc.
Address:	200 East 5th Ave. Suite 100
City, State, Zip, Country:	Naperville, IL 60563 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

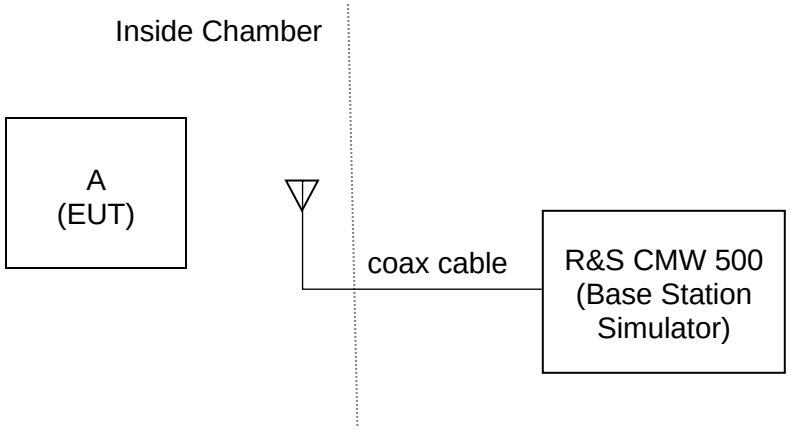
2.3 *General Information of EUT*

Product Marketing Name:	ReliAlert XC4
Model Number (HVIN):	OTD 4.1
Firmware Version (FVIN):	4465
Host Marketing Name:	NA
Serial Number:	P0020008
IMEI Number:	355285089996399
FCC ID:	TPO-OTD41
IC:	6512A-OTD41
Tx Frequency Range:	1850 – 1910 MHz (LTE Band 2) 1710 – 1755 MHz (LTE Band 4) 824 – 849 MHz (LTE Band 5) 699 – 716 MHz (LTE Band 12) 777 – 787 MHz (LTE Band 13)
Radio Technology:	LTE Cat 1 and WCDMA
Channel Bandwidth tested:	5 MHz (Bands 5, 12, 13); 10 MHz (LTE Band 2); 15 MHz (LTE Band 4)
LTE RB allocation:	1 RB allocated, RB start = 0
FCC Classification:	PCS Licensed Transmitter (PCB)
Rated Voltage:	3.6 Vdc Rechargeable Lithium-Ion Battery Pack
Test Voltage:	3.6 Vdc Rechargeable Lithium-Ion Battery Pack
Sample Received Date:	13 July 2020
Dates of testing:	16-28 July 2020

2.4 *Operating Modes and Conditions*

A Rohde & Schwarz test SIM was installed in the EUT. The EUT was powered by a fully charged battery pack and was turned on by holding down the call button for a few seconds until the Power Up audio tone played. After this the modem established a cellular connection with a Rohde & Schwarz CMW 500 Wideband Radio Communication Tester. The CMW 500 was used to control the radio in the EUT to operate with maximum transmit (uplink) power in LTE Bands 2, 4, 5, 12 & 13 and WCDMA Bands 2 & 5. Low, middle and high channels were tested in each band. For LTE a cell bandwidth of 5MHz was used for Bands 5, 12 and 13, a bandwidth of 10MHz was used for Band 2 and a bandwidth of 15MHz was used for Band 4, all using 1 Resource Block with an RB start position of 0. These were found to be the highest power channel configurations based on power measurements covering all configurations.

2.5 *EUT Connection Block Diagram*



2.6 *System Configurations*

Device Reference	Manufacturer	Description	Model Number	Serial Number
A	Track Group Inc.	GPS Ankle Bracelet (EUT)	OTD 4.1	P0020008

3 Radiated Spurious Emissions

3.1 *Test Result*

Test Description	Basic Standards		Test Result
Radiated Spurious Emissions	FCC 2.1053 FCC 22.917(a) FCC 24.238(a) FCC 27.53(c) FCC 27.53(f) FCC 27.53(g) FCC 27.53(h)	RSS-GEN (6.13) RSS-130 (4.7) RSS-132 (5.5) RSS-133 (6.5) RSS-139 (6.6)	Compliant

3.2 *Test Method*

The radiated power emanating from the EUT of the band edge (out-of-band) and spurious band emissions are measured by means of a calibrated spectrum analyzer. The spectrum is investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. The power of any emissions outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) measured in watts by at least 43 + 10 log (P) dB.

The EUT was tested in all 3 orthogonal axes and the worst-case data is reported.

The measurement was oriented in both vertical and horizontal polarizations.

A radio link was established between the EUT and a 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 low, middle and high channels of each band tested.

3.3 *Test Site*

Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions	30-1000 MHz	1-18 GHz	18-20 GHz
Enclosure:	3m chamber	3m chamber	3m chamber
Temperature:	22.5 °C	22.4 °C	22.6 °C
Relative Humidity:	48.4 %	49.9 %	49.0 %
Atmospheric Pressure:	97.66 kPa	97.32 kPa	97.44 kPa

3.4 *Test Equipment*

30-1000 MHz

Test End Date: 24-Jul-2020 Tester: CO, PV

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	30-Oct-2020
RF Cable Nm to Nm, 0.01-18GHz	90-195-354	TELEDYNE STORM MICROWAVE	20120	2-Mar-2021
RF Cable Nm to Nf, 0.01-18GHz	90-213-118	TELEDYNE STORM MICROWAVE	20117	2-Mar-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-118	TELEDYNE STORM MICROWAVE	20125	2-Mar-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	3-Dec-2020
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	5-Sep-2020
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2021
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B085757	9-Nov-2020

1-18 GHz

Test End Date: 24-Jul-2020 Tester: CO, PV

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079691	10-Aug-2020
RF Cable Nm to Nm, 0.01-18GHz	90-195-354	TELEDYNE STORM MICROWAVE	20120	2-Mar-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	3-Dec-2020
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	5-Sep-2020
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2021
FILTER, BAND REJECT, 1880MHz	BRC50720	MICRO-TRONICS	B079784	9-Sep-2020
FILTER, BAND REJECT, 1750MHz	BRC50719	MICRO-TRONICS	B079785	9-Sep-2020
FILTER, HIGH PASS, >2800MHz	HPM50111	MICRO-TRONICS	B085747	7-Sep-2020
FILTER, HIGH PASS, >1000MHz	HPM50108	MICRO-TRONICS	B079802	7-Sep-2020
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B085757	9-Nov-2020

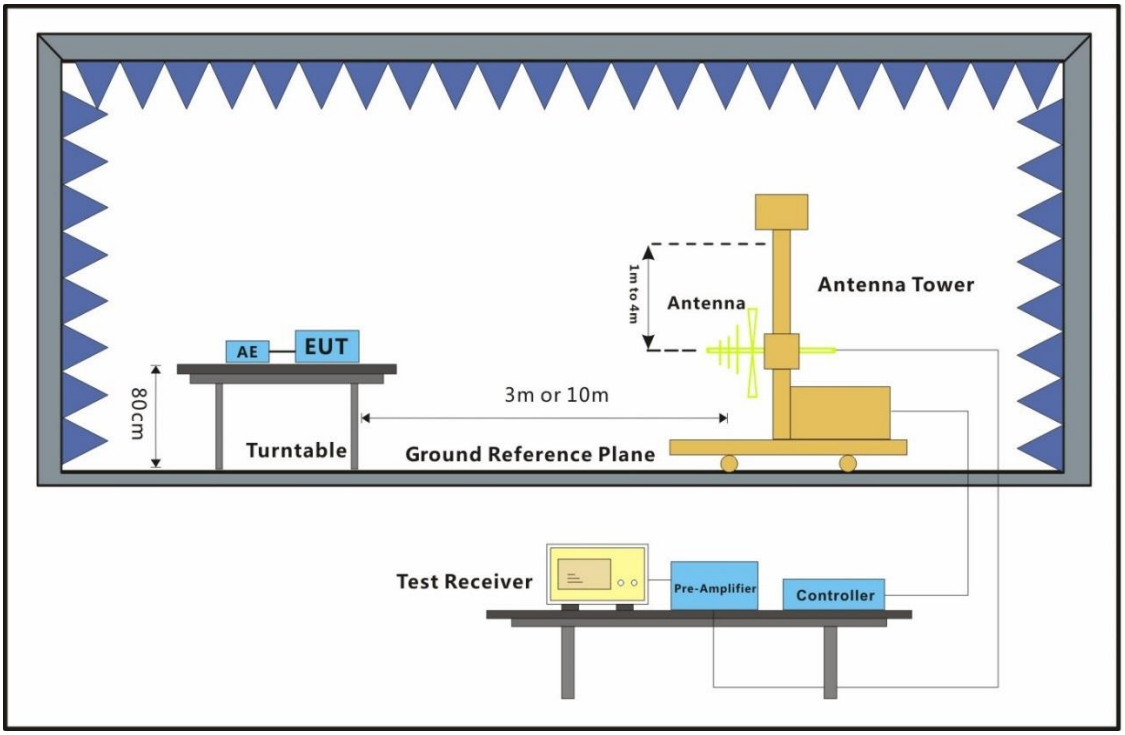
18-20GHz

Test End Date: 22-Jul-2020 Tester: CO, PV

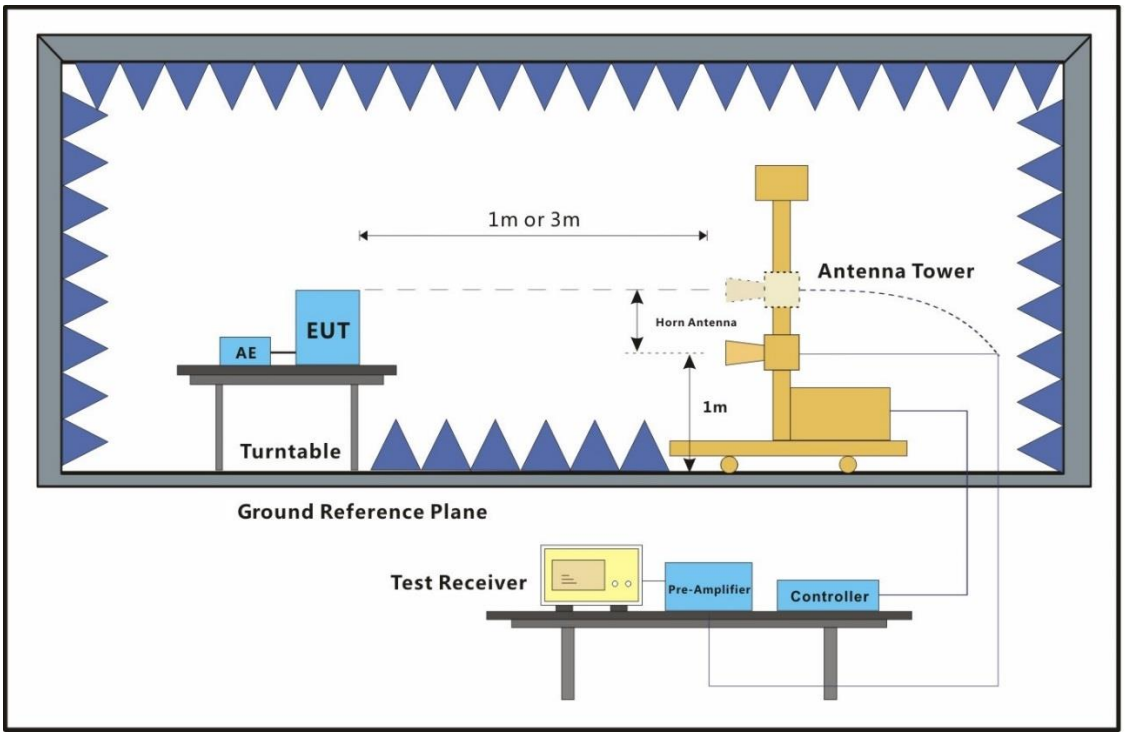
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, HORN (SMALL)	LB-180400-20-C-KF	A-INFO	15007	6-Apr-2022
2.92mm male to2.92mm male RF Cable	HULL140A-29P-29P-60	HASCO COMPONENTS	18033	30-Mar-2021
RF Cable SMA	HULL150A-29P-29P-36	HASCO COMPONENTS	19101	30-Mar-2021
RF CABLE SMA	HULL150A-29P-29P-36	HASCO COMPONENTS	19102	30-Mar-2021
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	7-Oct-2020
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2021
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B085757	9-Nov-2020

- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- The CMW 500 is on a 2-year calibration cycle.

3.5 *Test Setup Block Diagram*



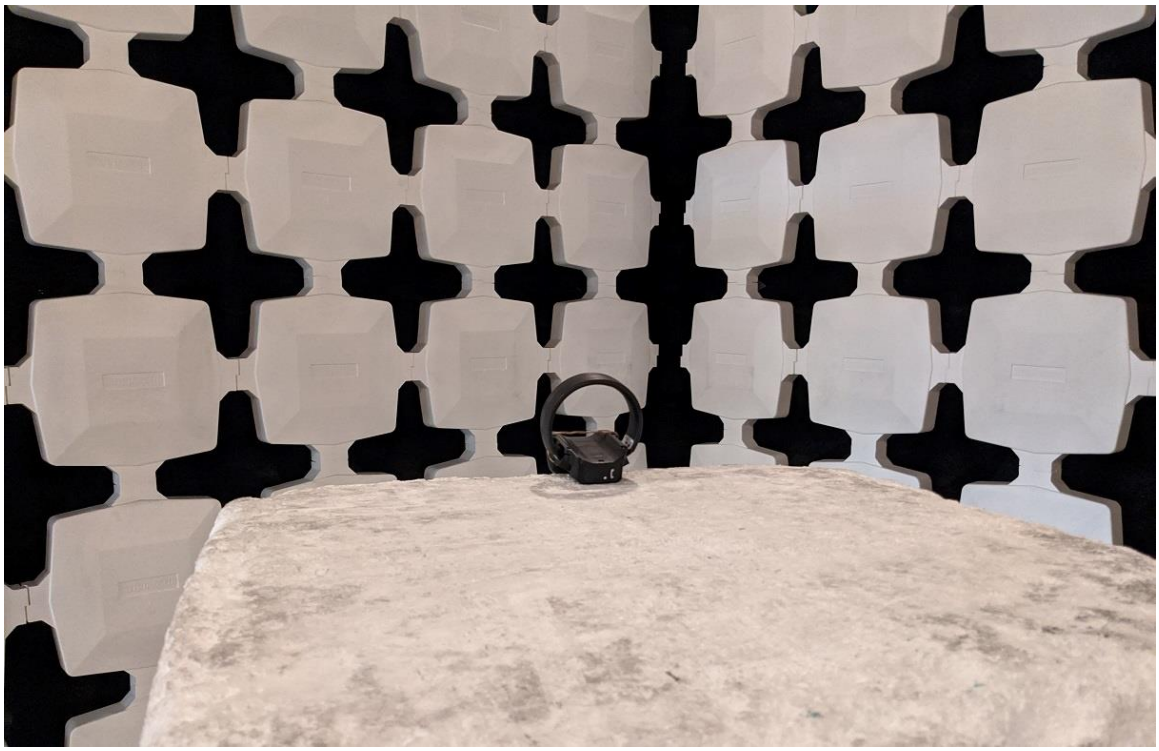
30MHz – 1GHz



Above 1GHz

3.6 *Test Setup Photographs*

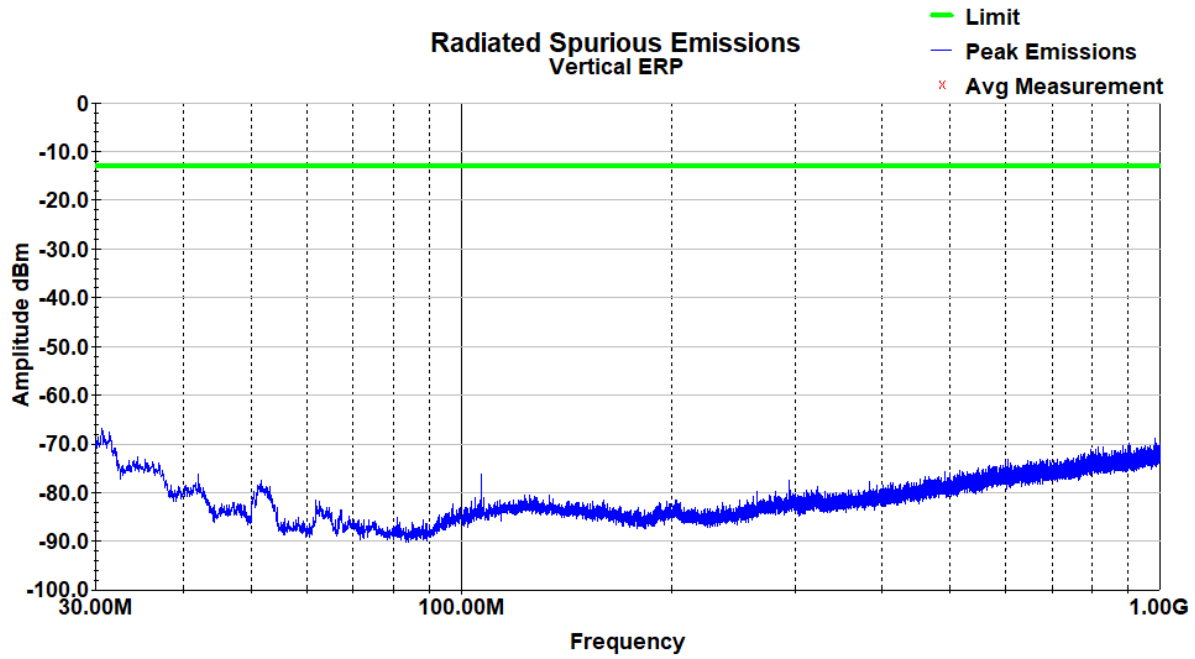
Under 1GHz



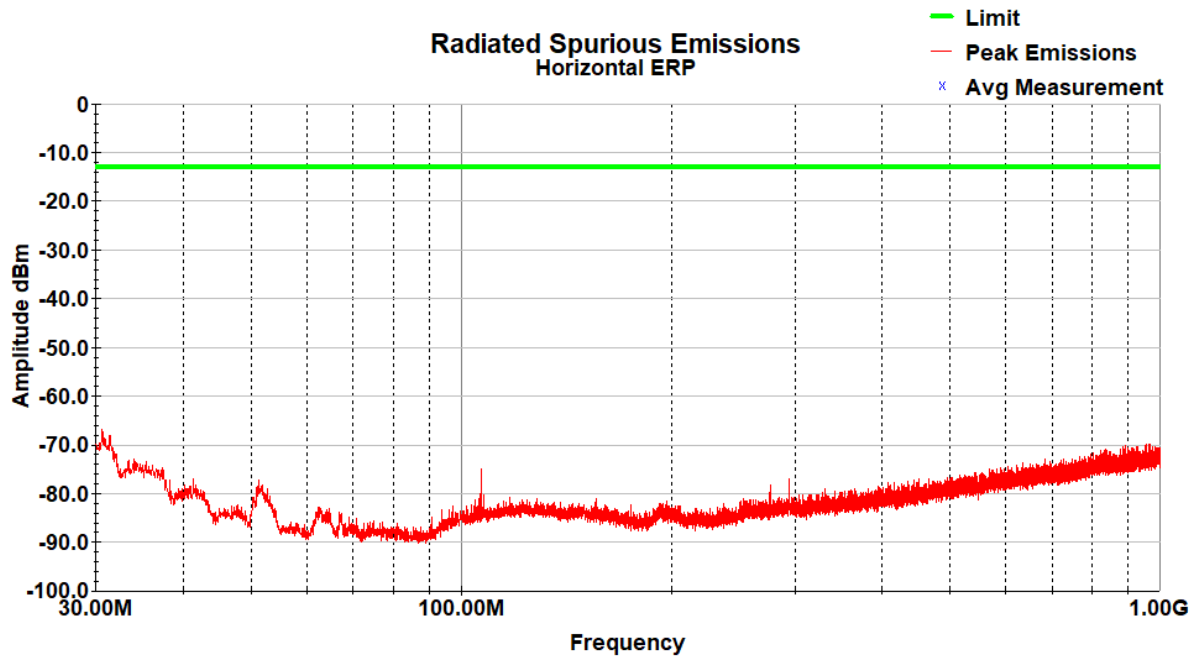
Over 1GHz

3.7 *Test Data 30-1000MHz*

LTE Band 2, QPSK modulation, 10MHz Bandwidth
Low Channel (1855MHz)
Vertical Plot (30-1000MHz)



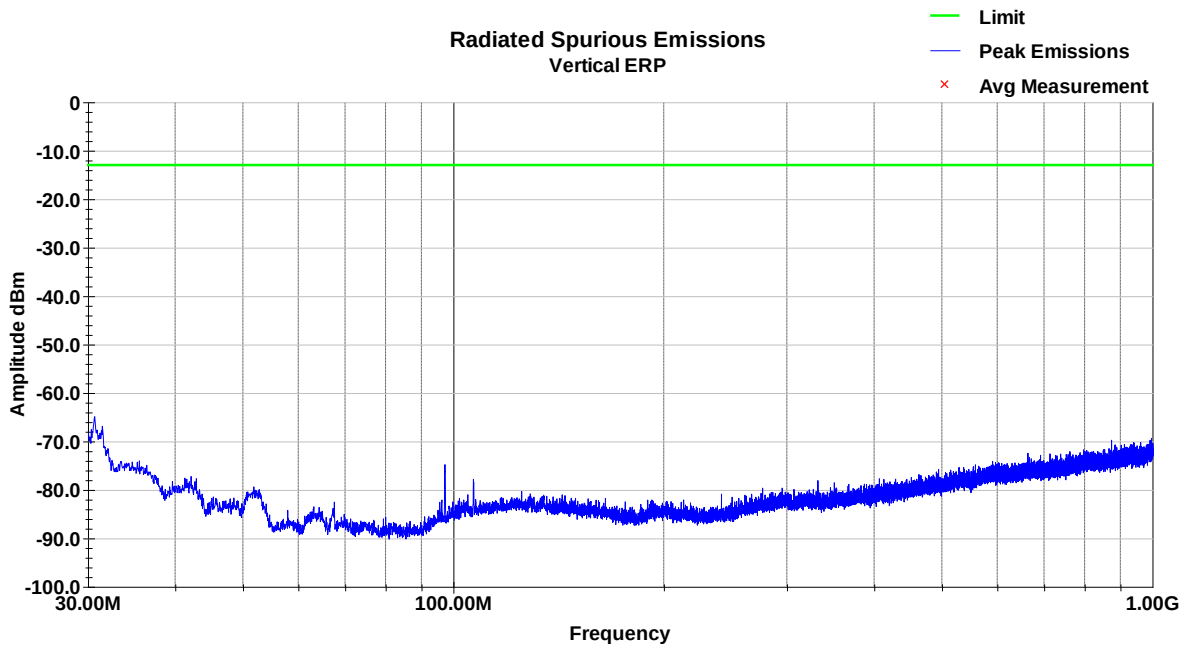
Horizontal Plot (30-1000MHz)



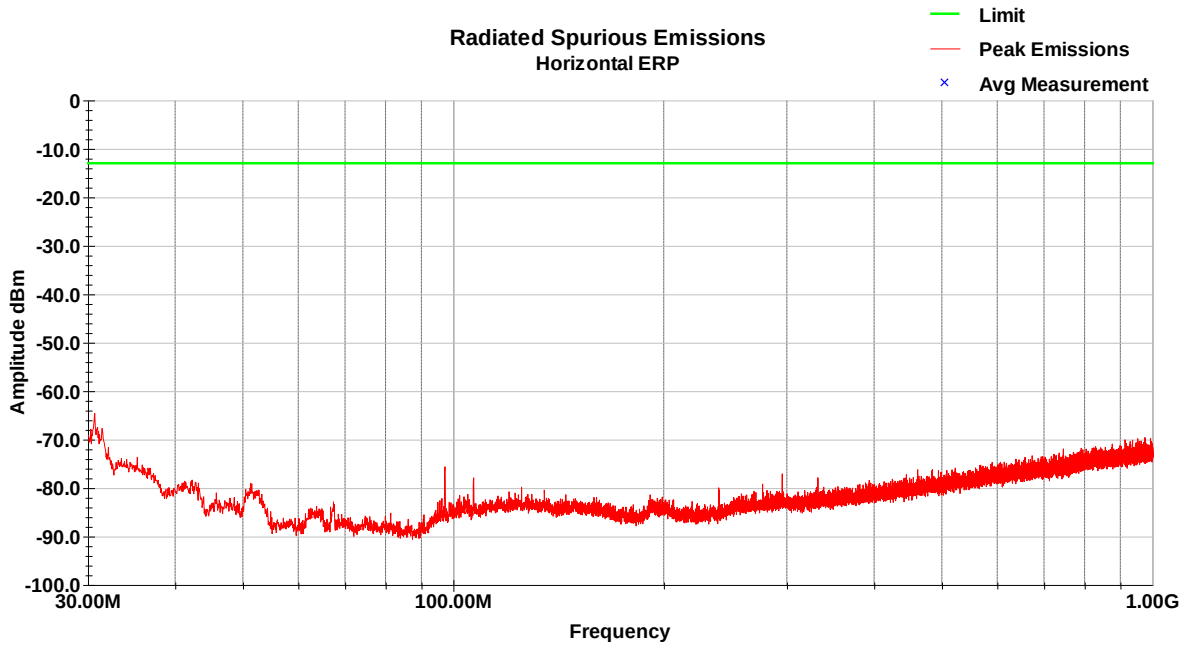
LTE Band 2, QPSK modulation, 10MHz Bandwidth

Mid Channel (1880MHz)

Vertical Plot (30-1000MHz)



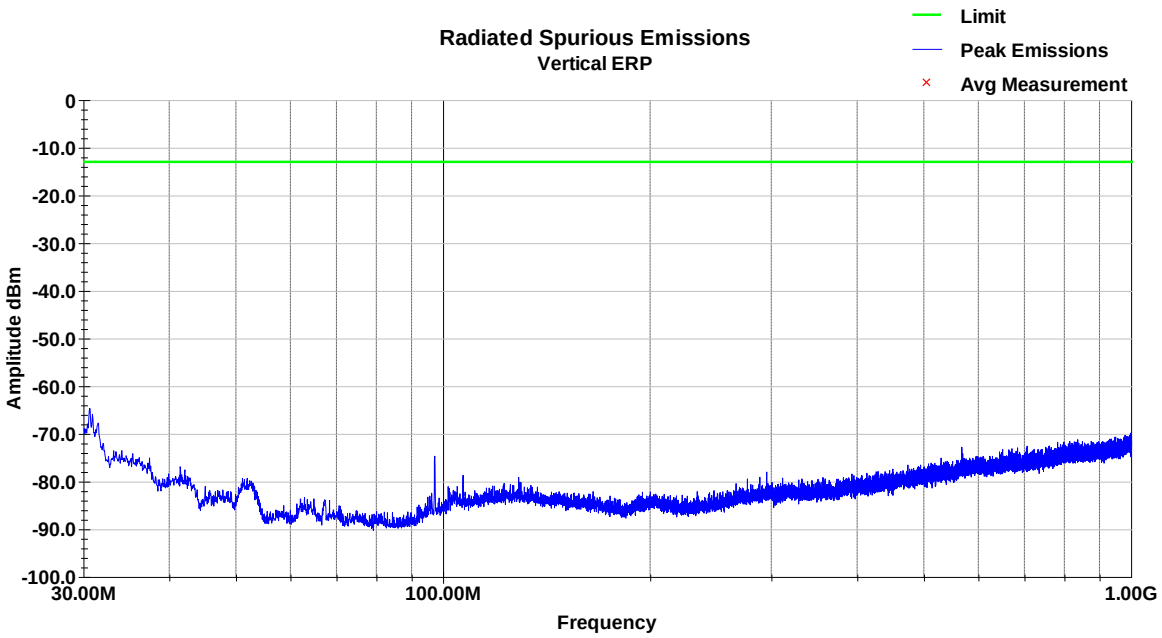
Horizontal Plot (30-1000MHz)



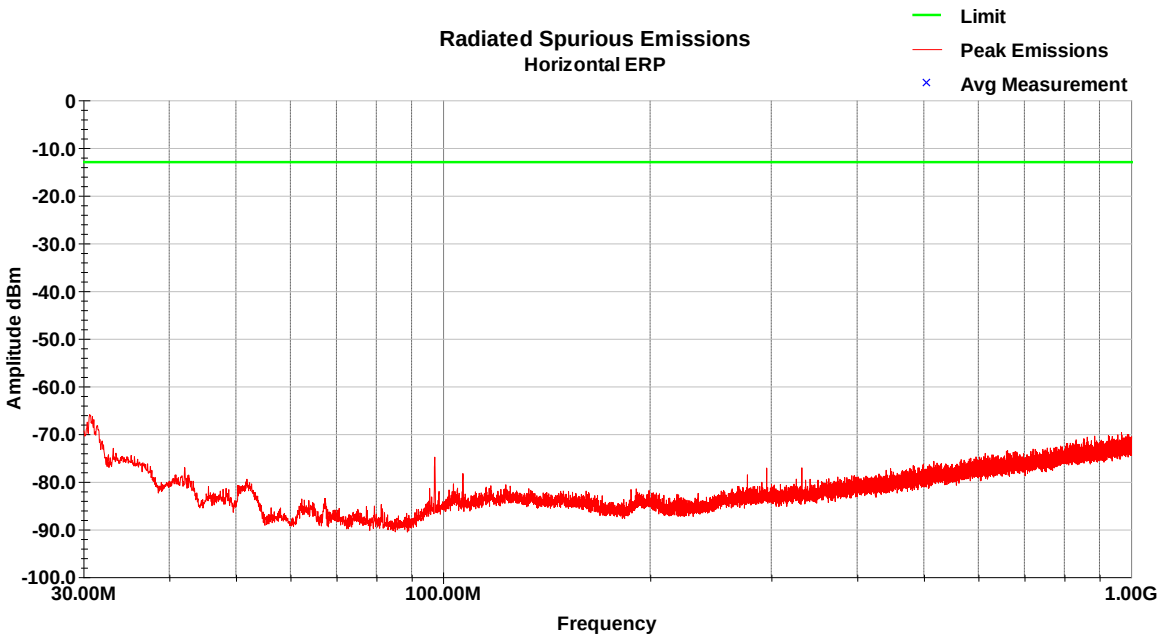
LTE Band 2, QPSK modulation, 10MHz Bandwidth

High Channel (1905MHz)

Vertical Plot (30-1000MHz)



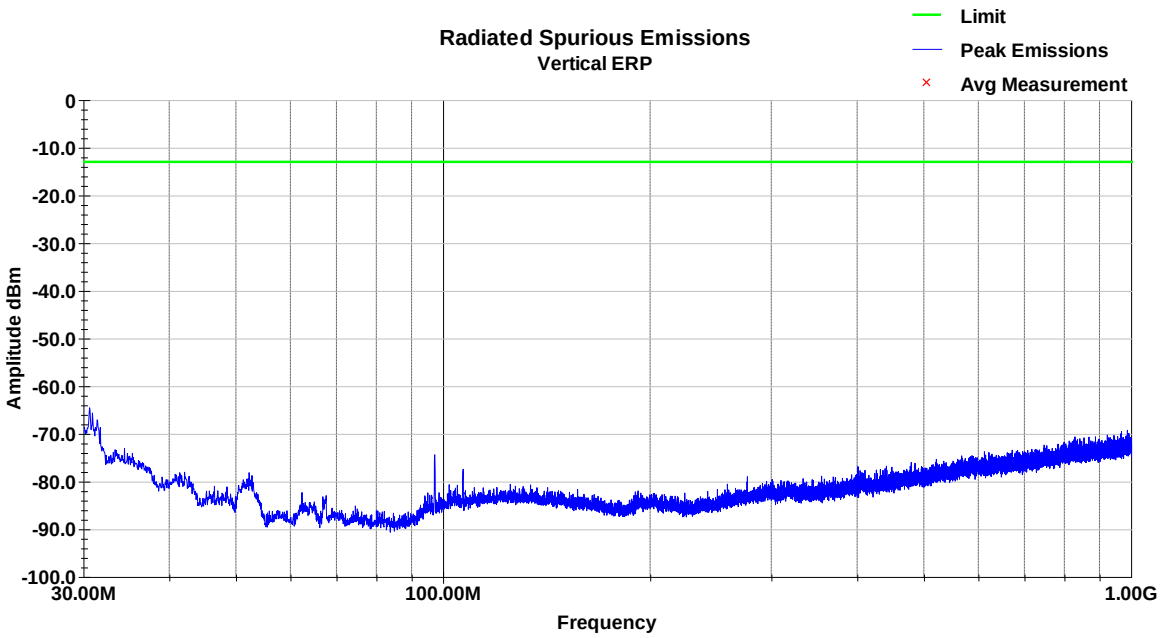
Horizontal Plot (30-1000MHz)



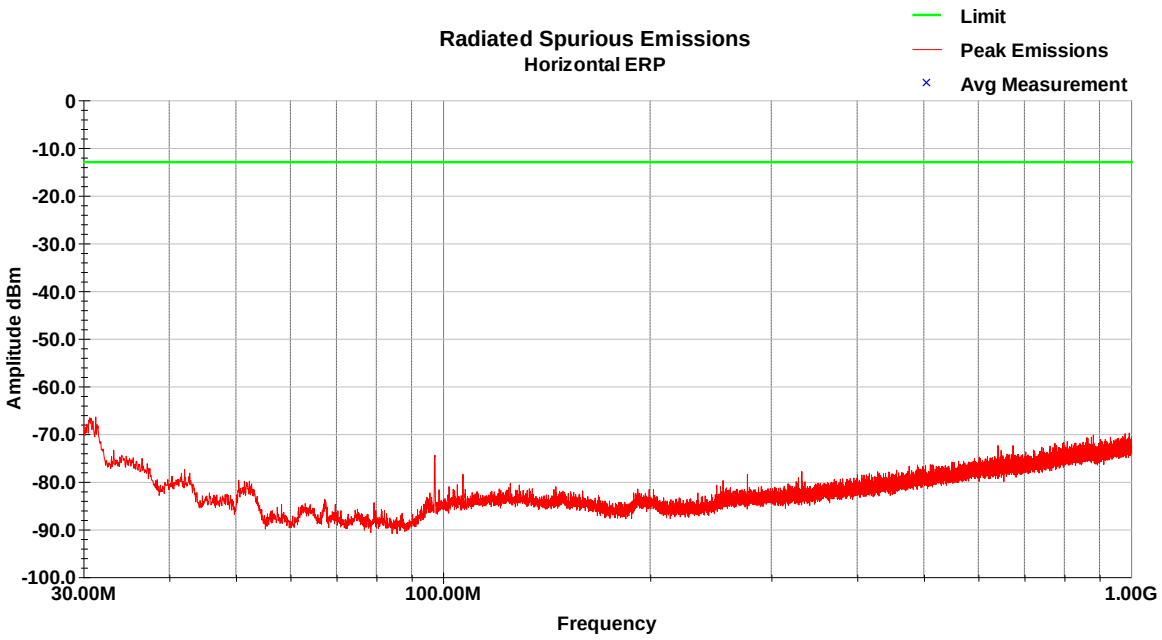
LTE Band 4, QPSK modulation, 15MHz Bandwidth

Low channel (1717.5MHz)

Vertical Plot (30-1000MHz)



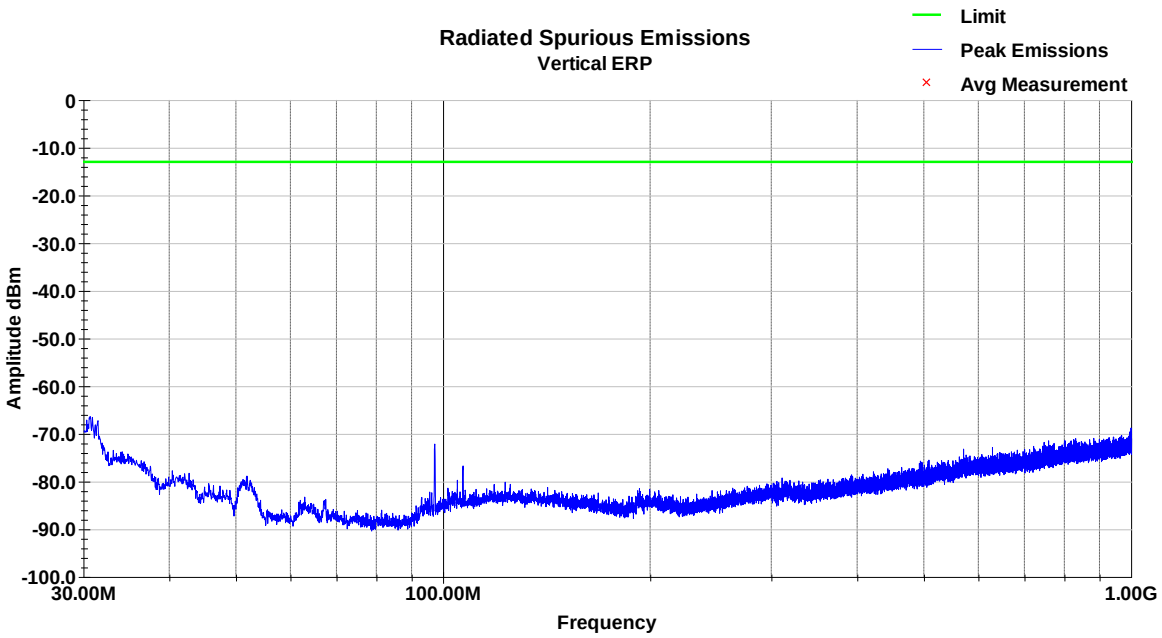
Horizontal Plot (30-1000MHz)



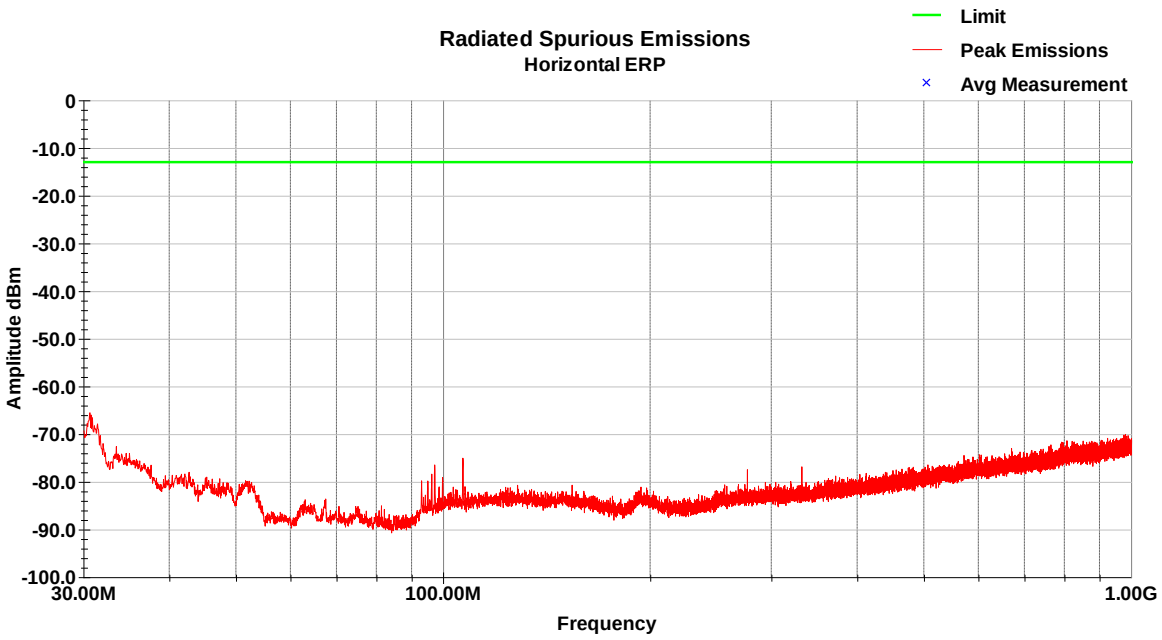
LTE Band 4, QPSK modulation, 15MHz Bandwidth

Mid channel (1732.5MHz)

Vertical Plot (30-1000MHz)



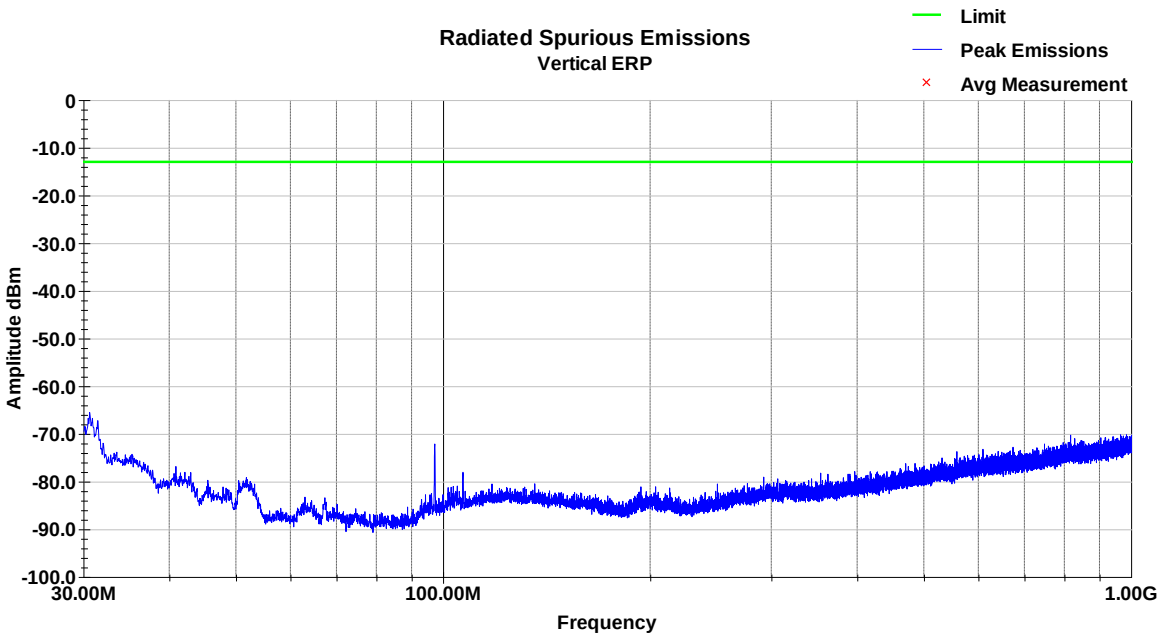
Horizontal Plot (30-1000MHz)



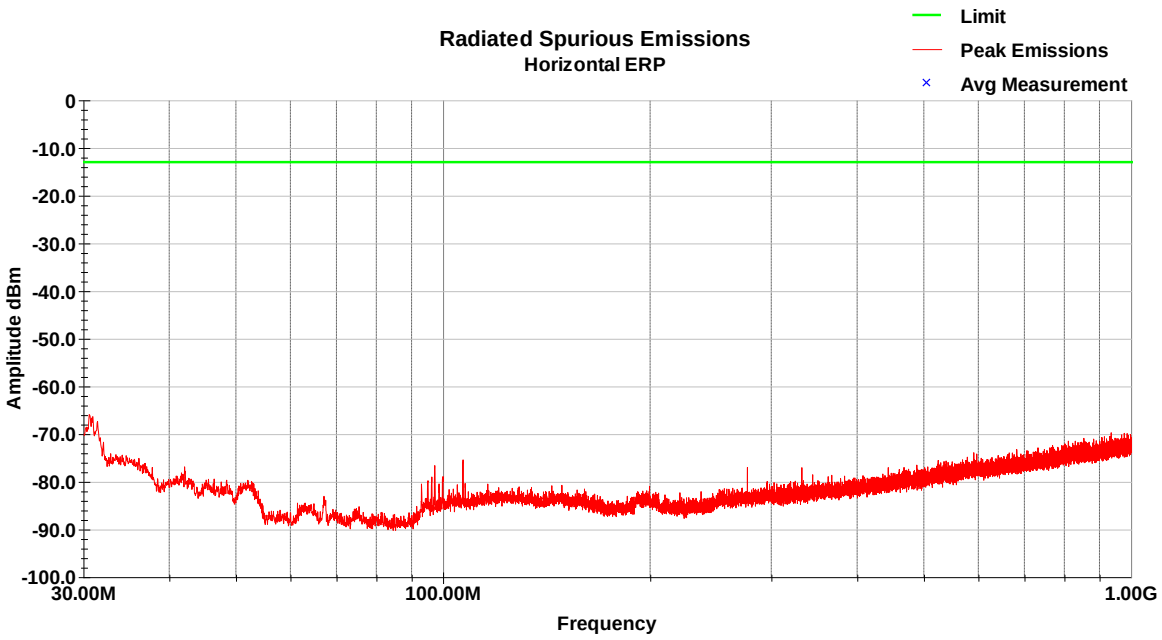
LTE Band 4, QPSK modulation, 15MHz Bandwidth

High channel (1747.5MHz)

Vertical Plot (30-1000MHz)



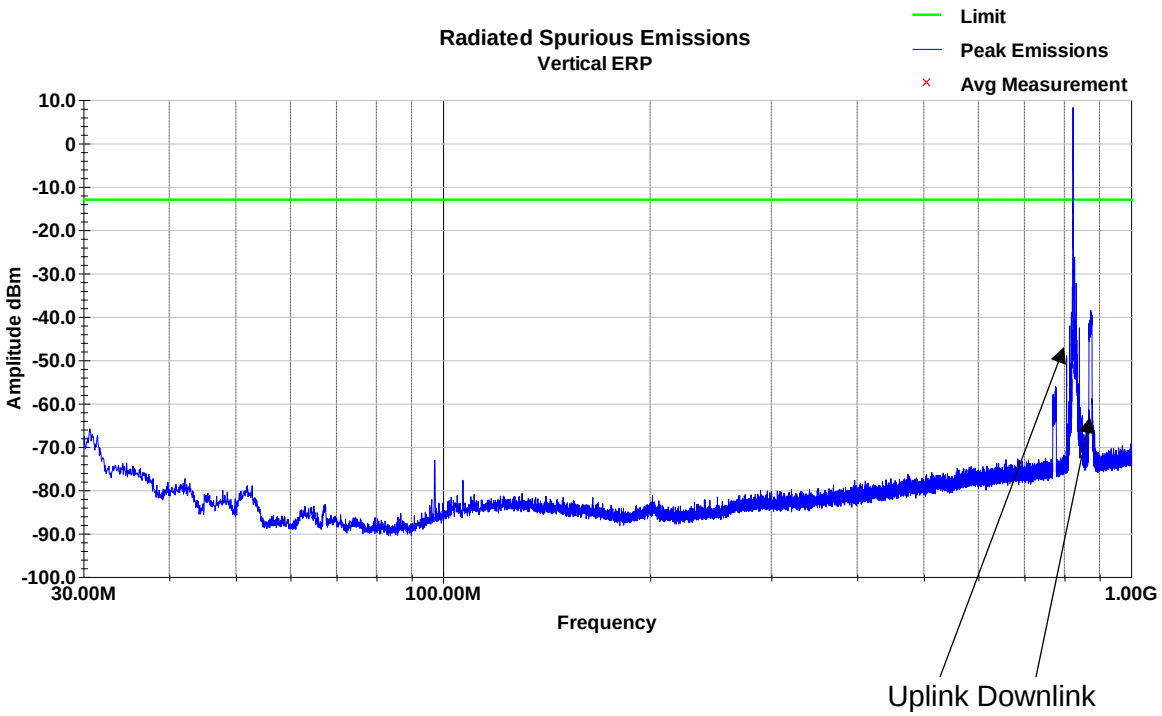
Horizontal Plot (30-1000MHz)



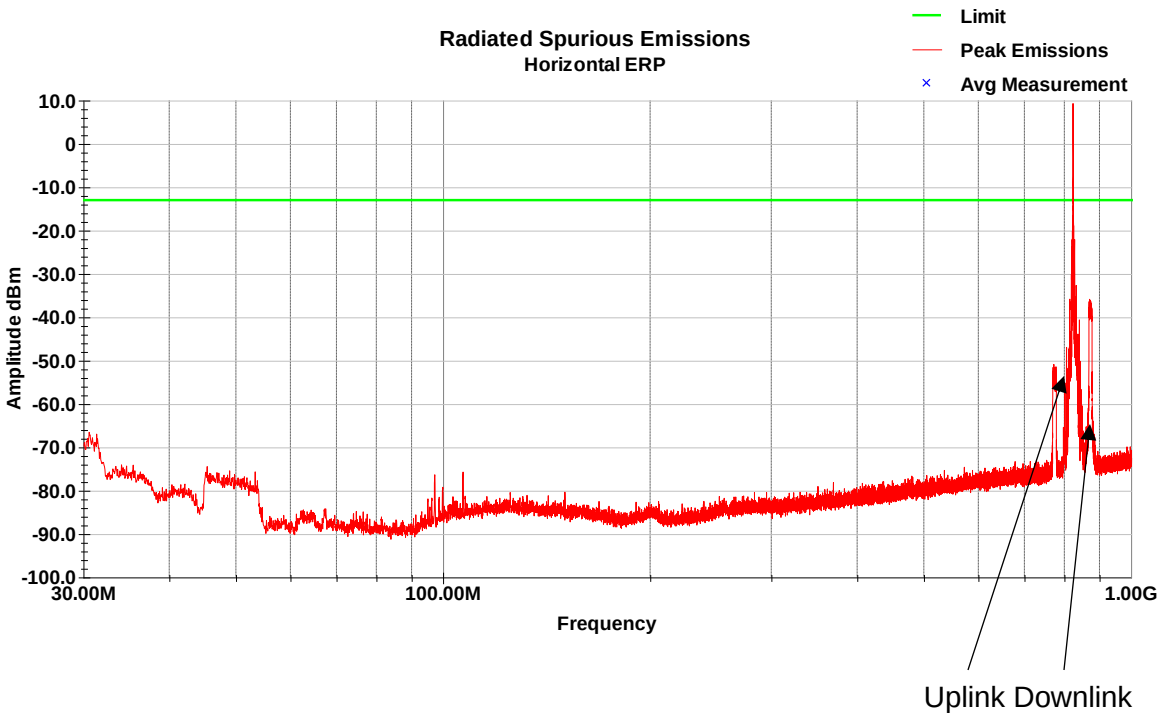
LTE Band 5, QPSK modulation, 5MHz

Low channel (826.5MHz)

Vertical Plot (30-1000MHz)



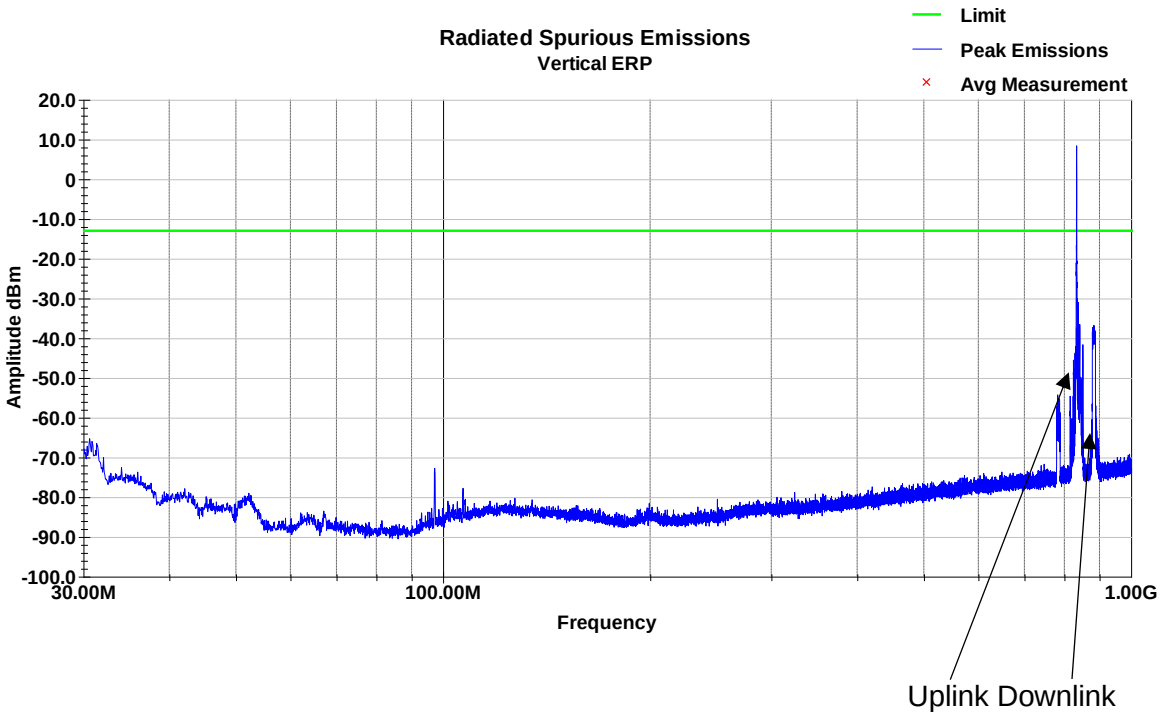
Horizontal Plot (30-1000MHz)



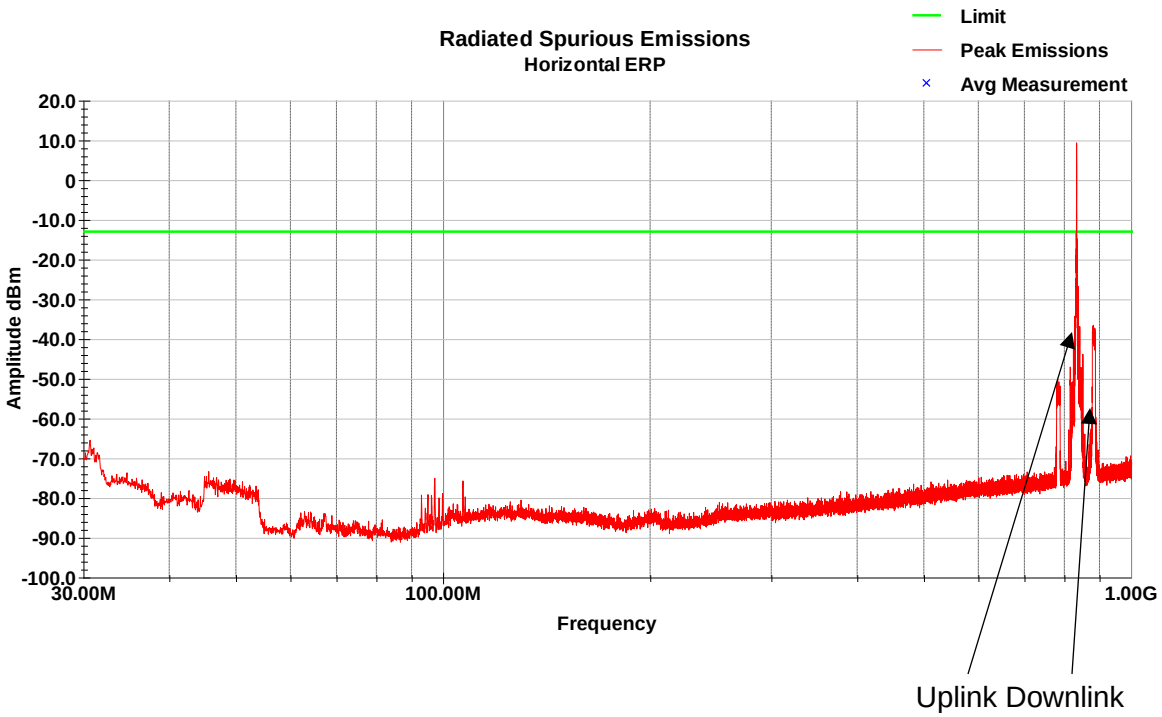
LTE Band 5, QPSK modulation, 5MHz

Mid channel (836.5MHz)

Vertical Plot (30-1000MHz)



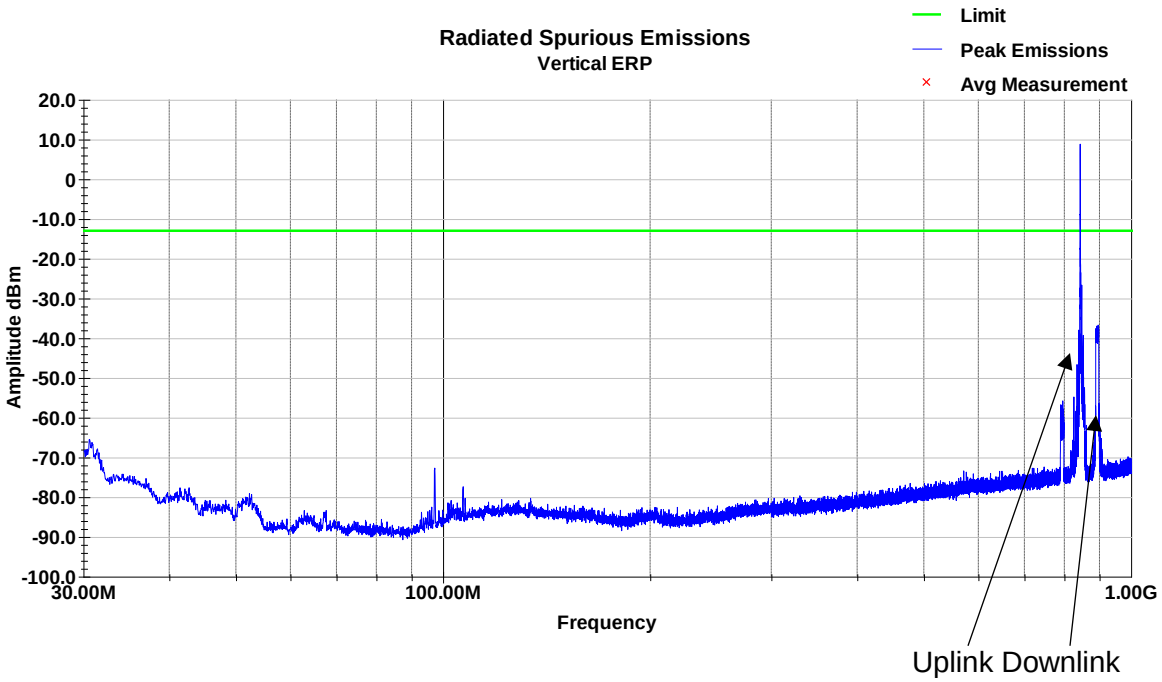
Horizontal Plot (30-1000MHz)



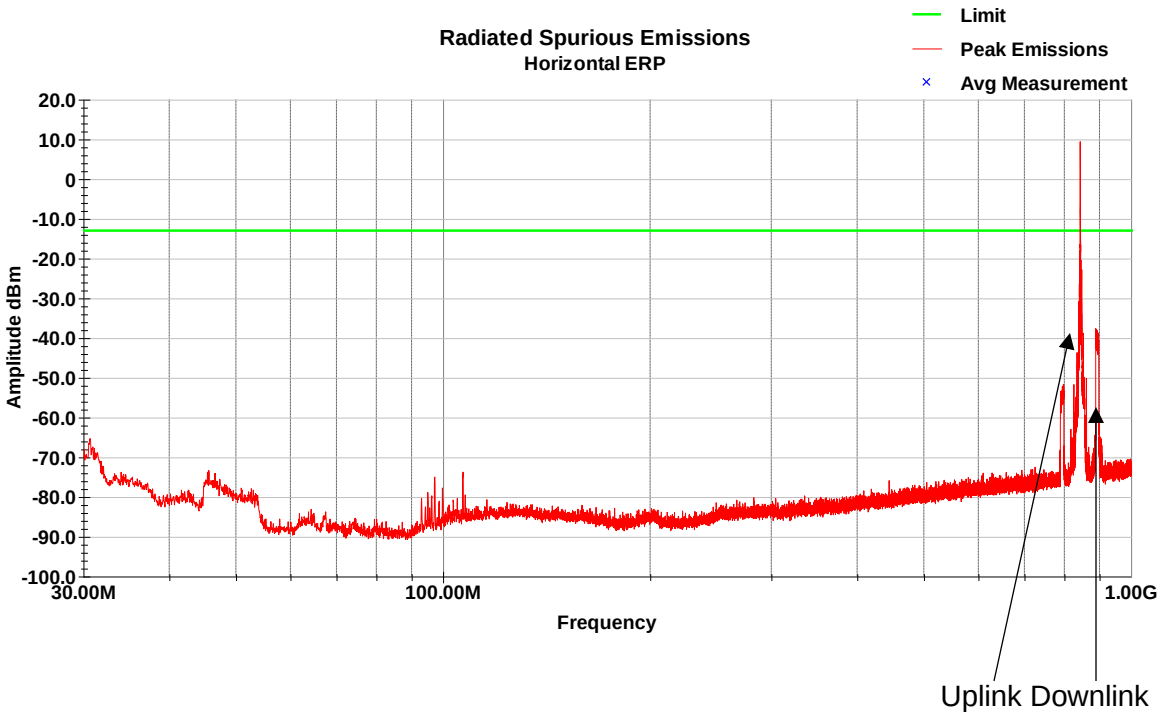
LTE Band 5, QPSK modulation, 5MHz

High channel (846.5MHz)

Vertical Plot (30-1000MHz)



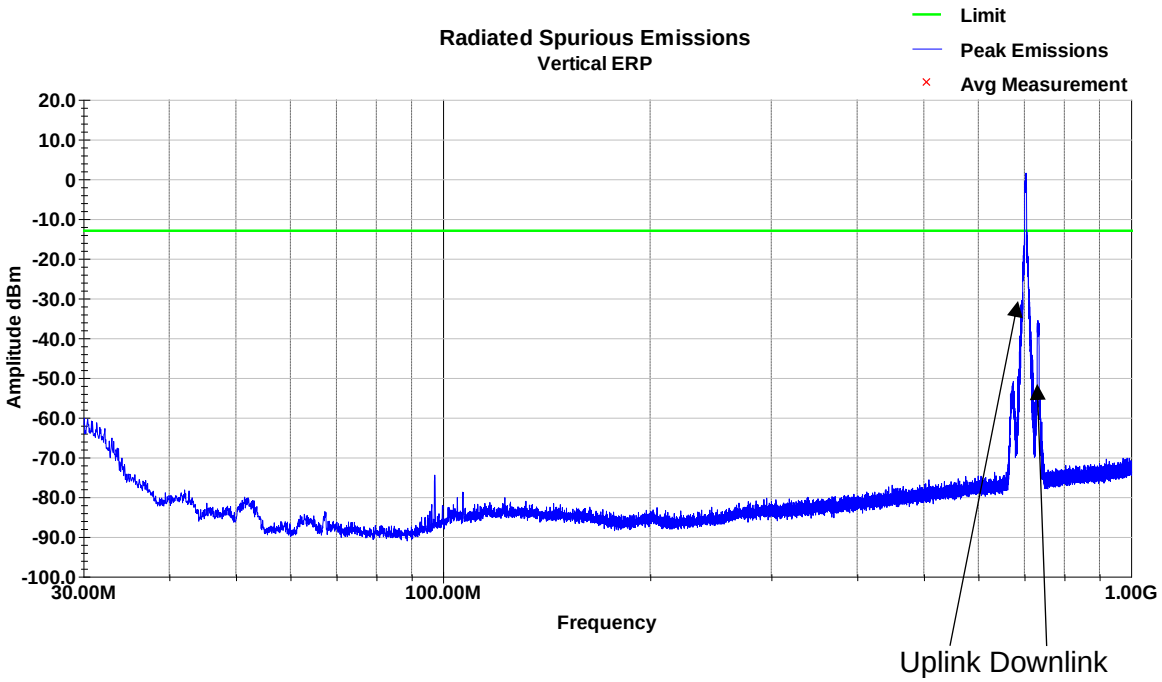
Horizontal Plot (30-1000MHz)



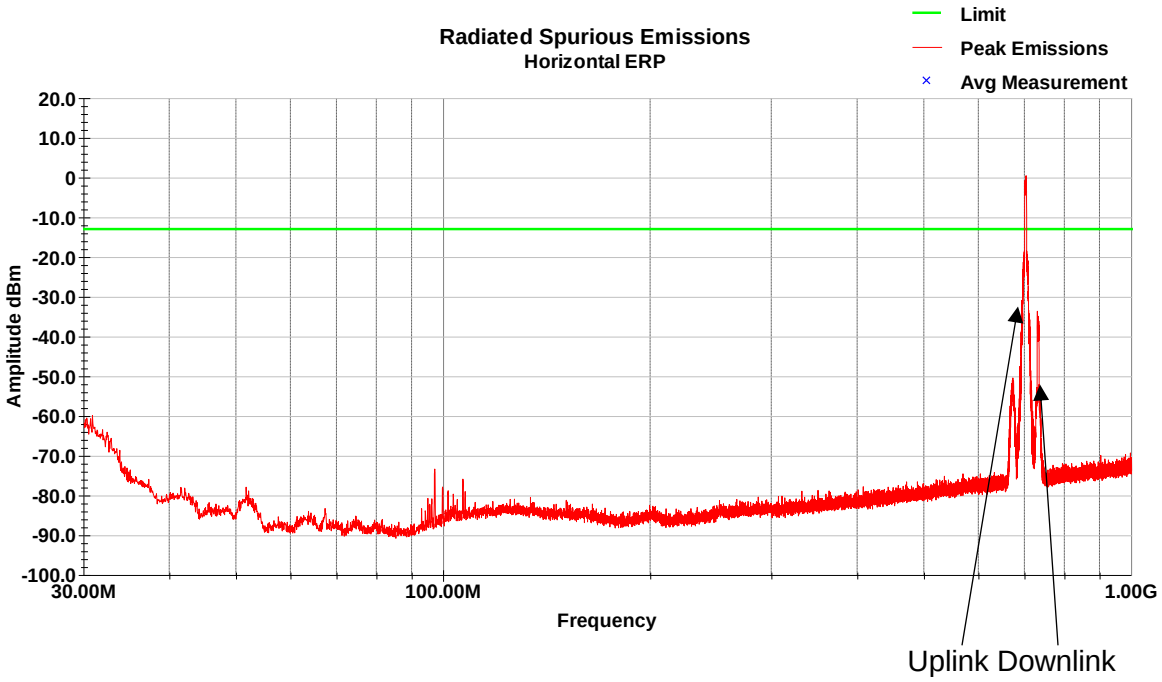
LTE Band 12, QPSK modulation, 5MHz

Low channel (701.5MHz)

Vertical Plot (30-1000MHz)



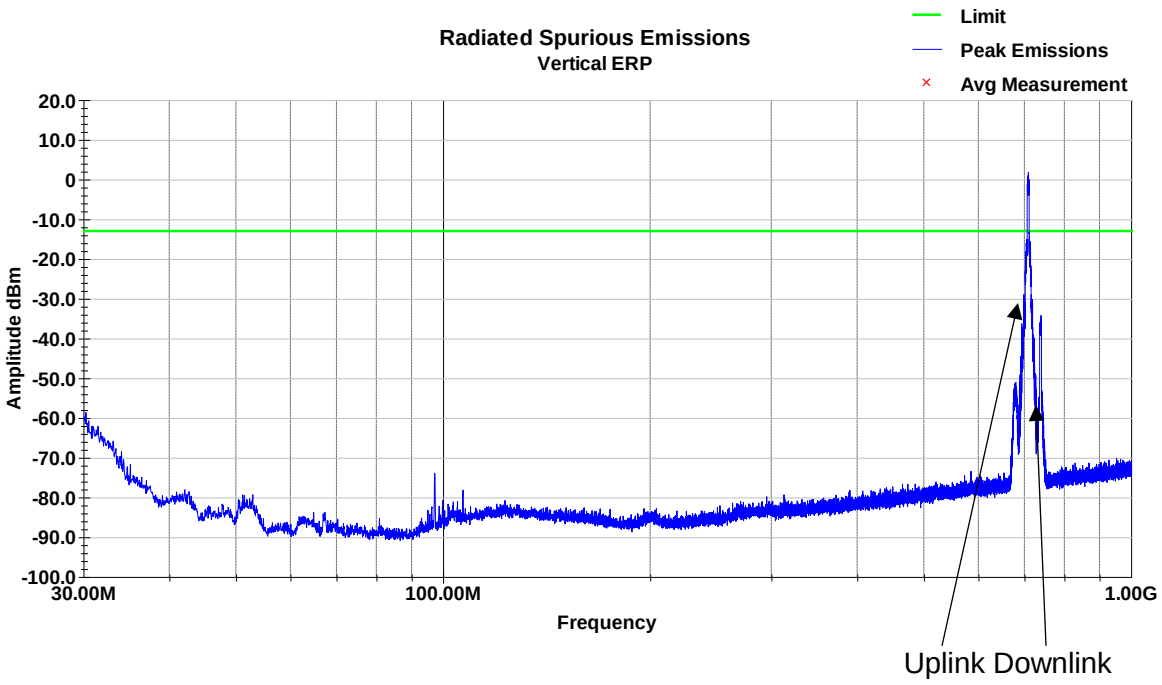
Horizontal Plot (30-1000MHz)



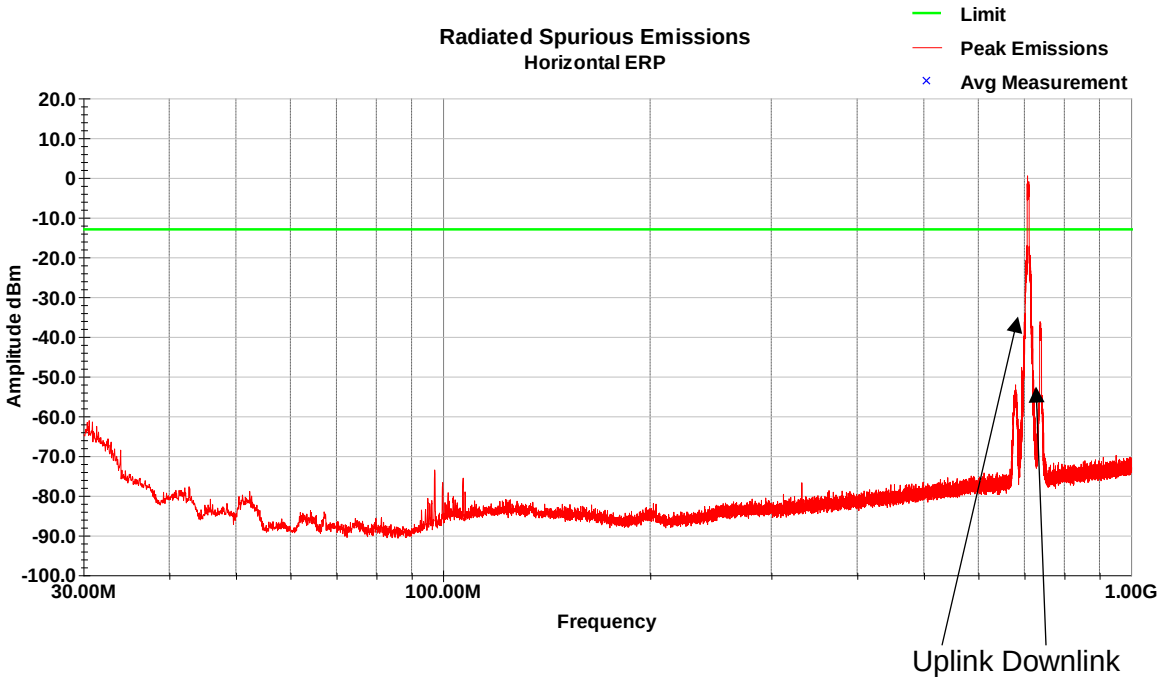
LTE Band 12, QPSK modulation, 5MHz

Mid channel (707.5MHz)

Vertical Plot (30-1000MHz)



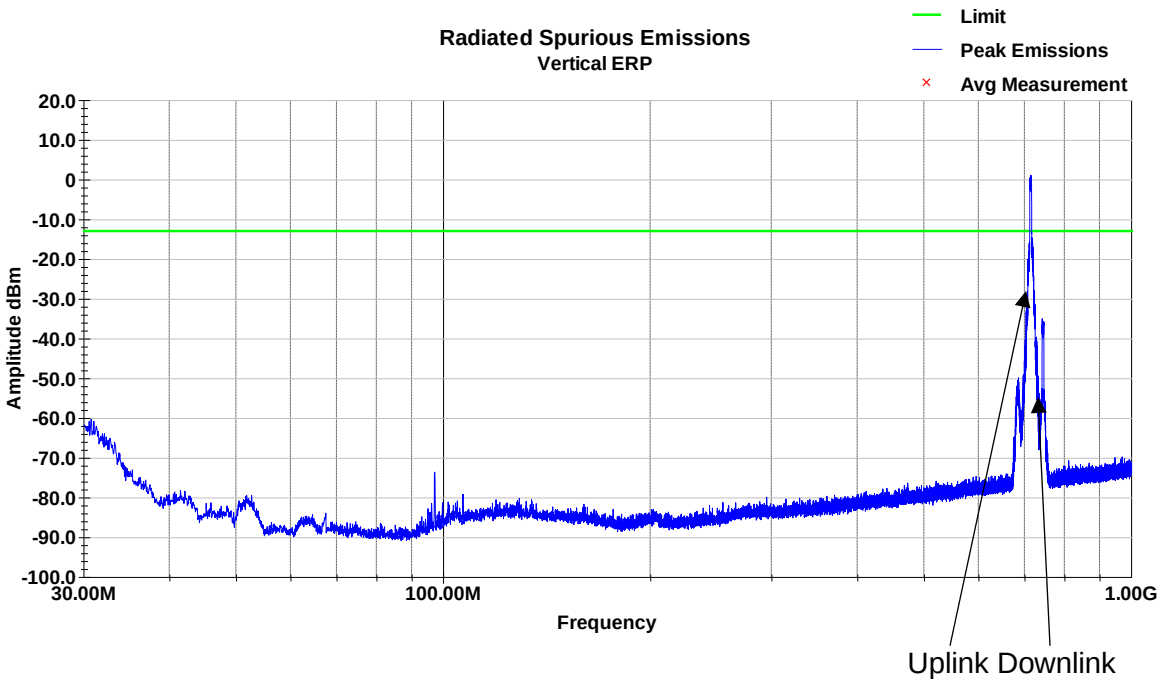
Horizontal Plot (30-1000MHz)



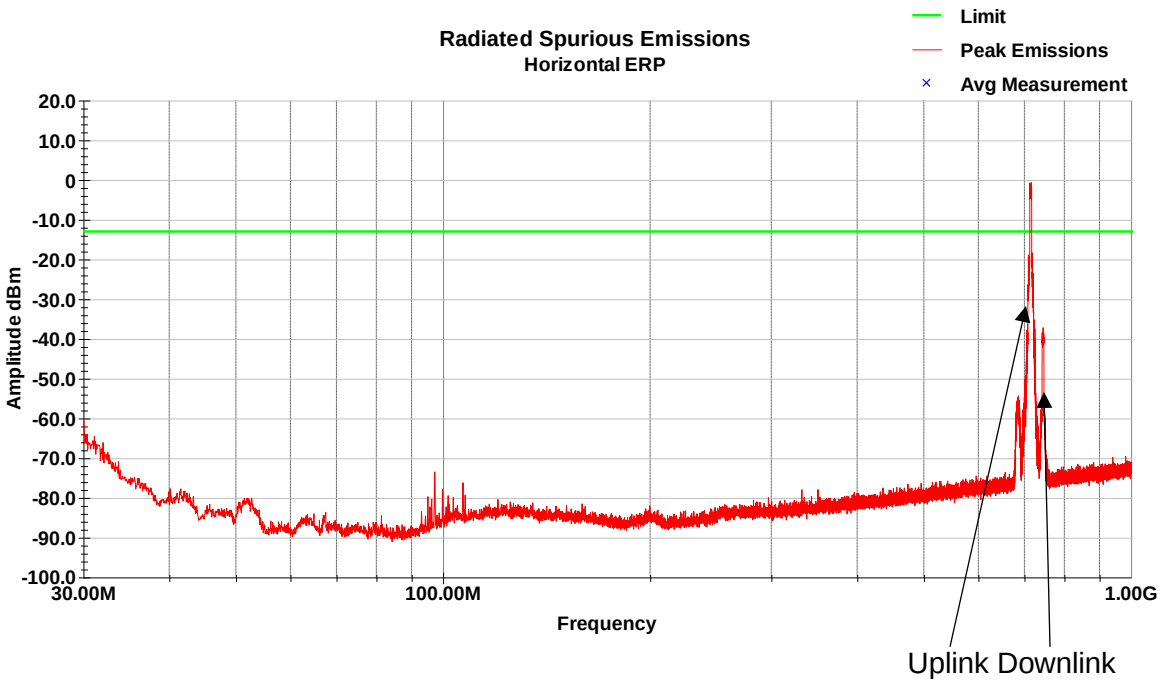
LTE Band 12, QPSK modulation, 5MHz

High channel (713.5MHz)

Vertical Plot (30-1000MHz)



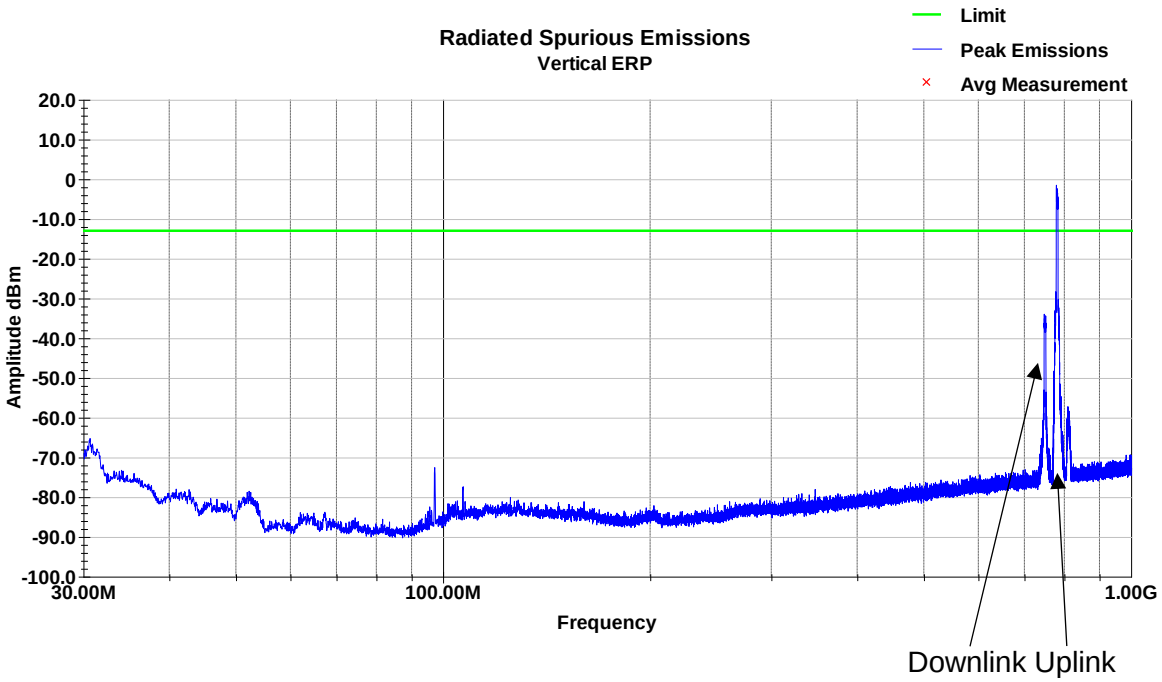
Horizontal Plot (30-1000MHz)



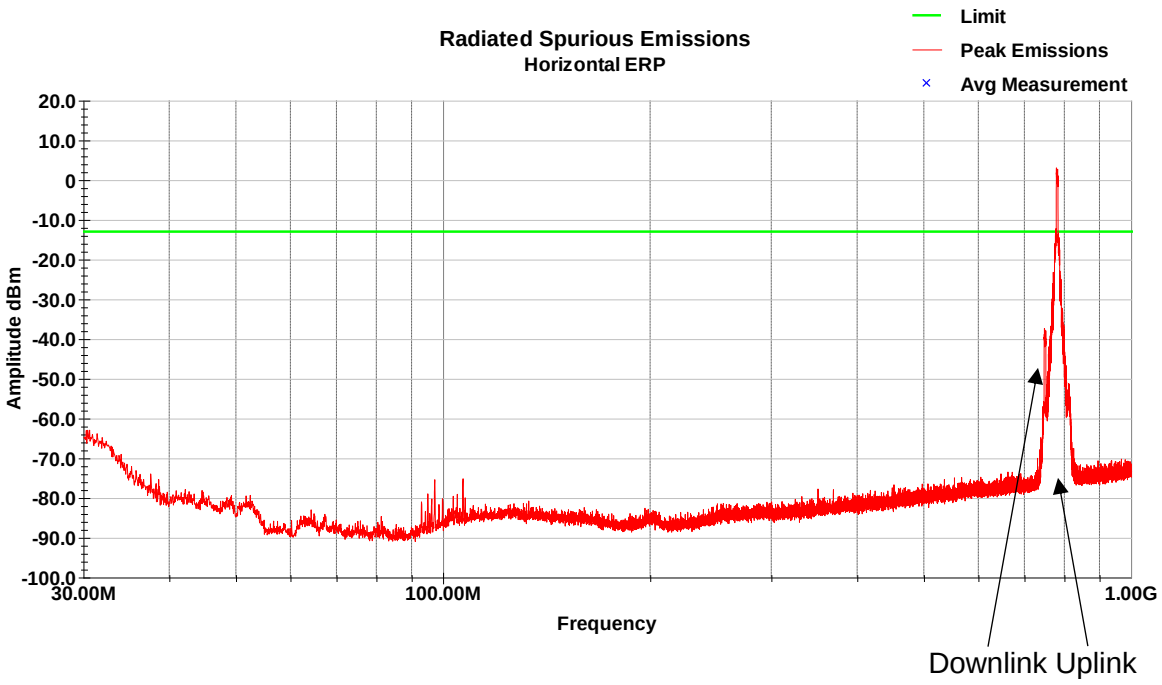
LTE Band 13, QPSK modulation, 5MHz

Low channel (779.5MHz)

Vertical Plot (30-1000MHz)



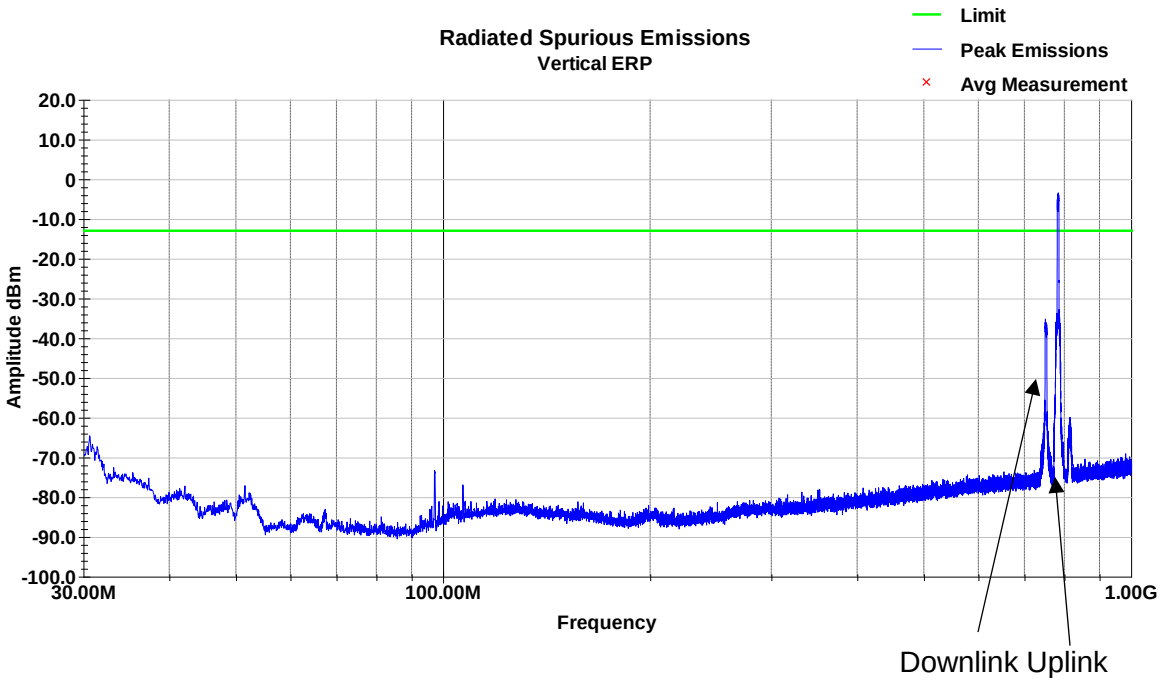
Horizontal Plot (30-1000MHz)



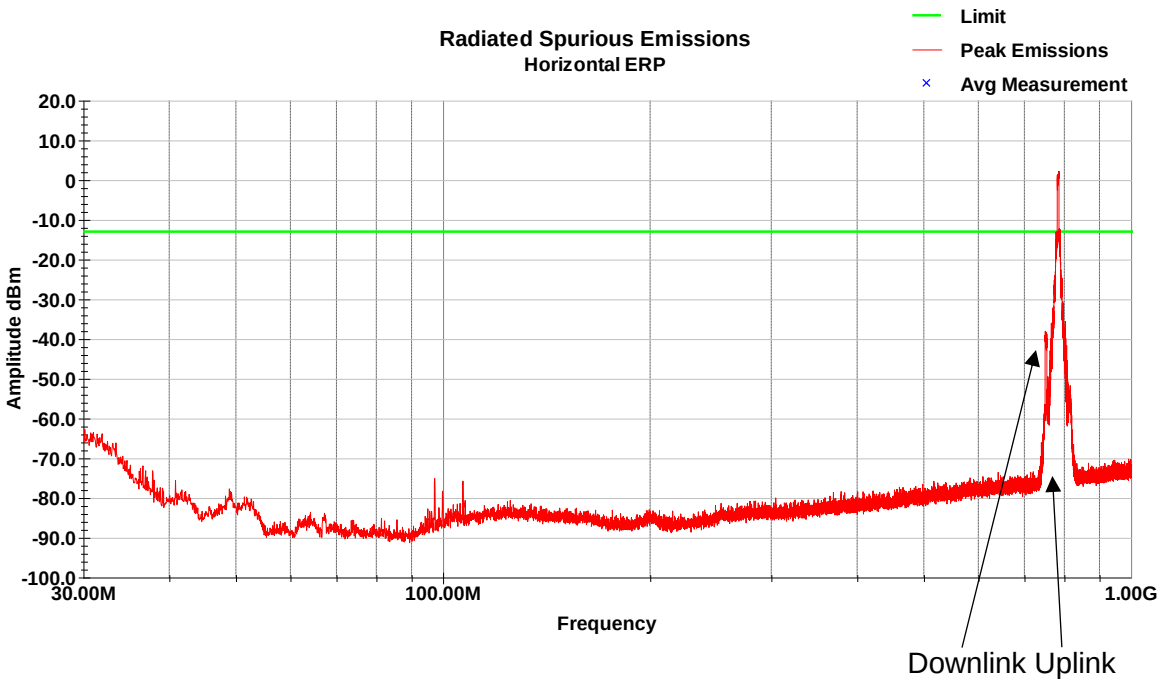
LTE Band 13, QPSK modulation, 5MHz

Mid channel (782MHz)

Vertical Plot (30-1000MHz)



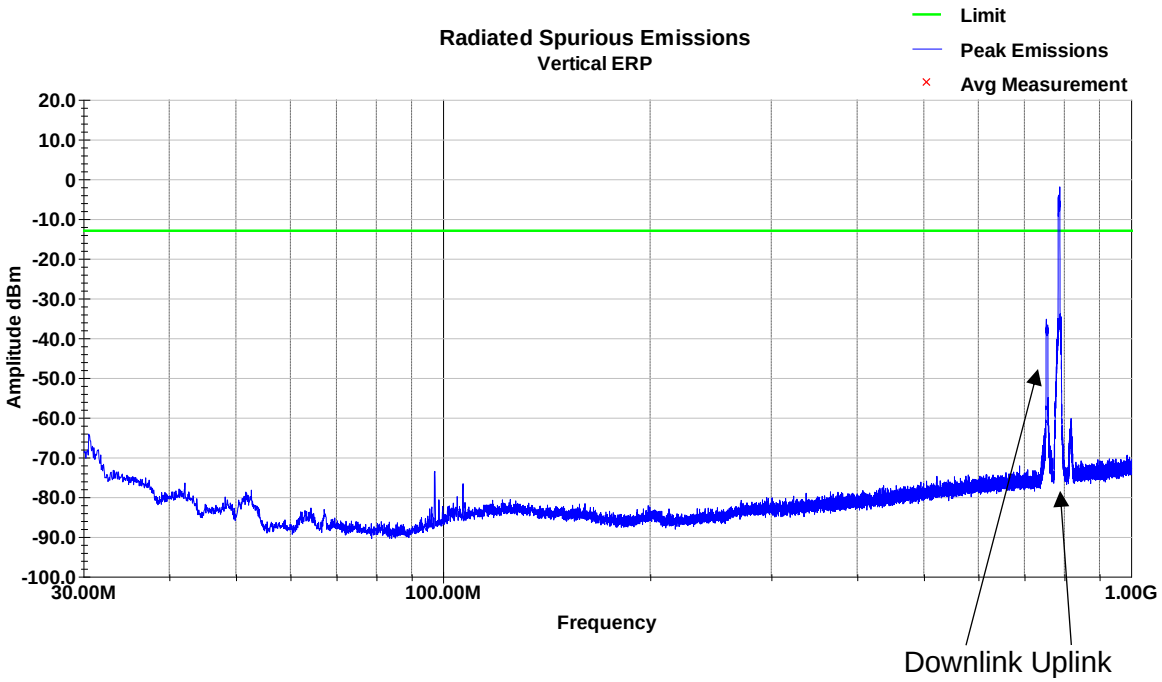
Horizontal Plot (30-1000MHz)



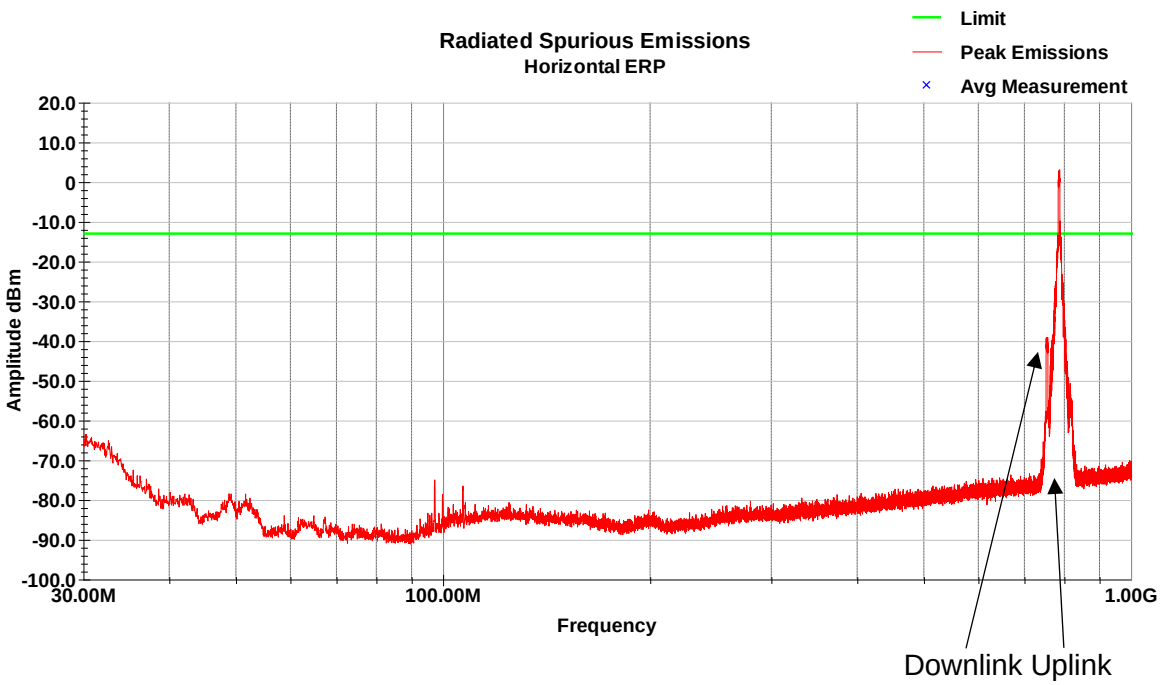
LTE Band 13, QPSK modulation, 5MHz

High channel (784.5MHz)

Vertical Plot (30-1000MHz)



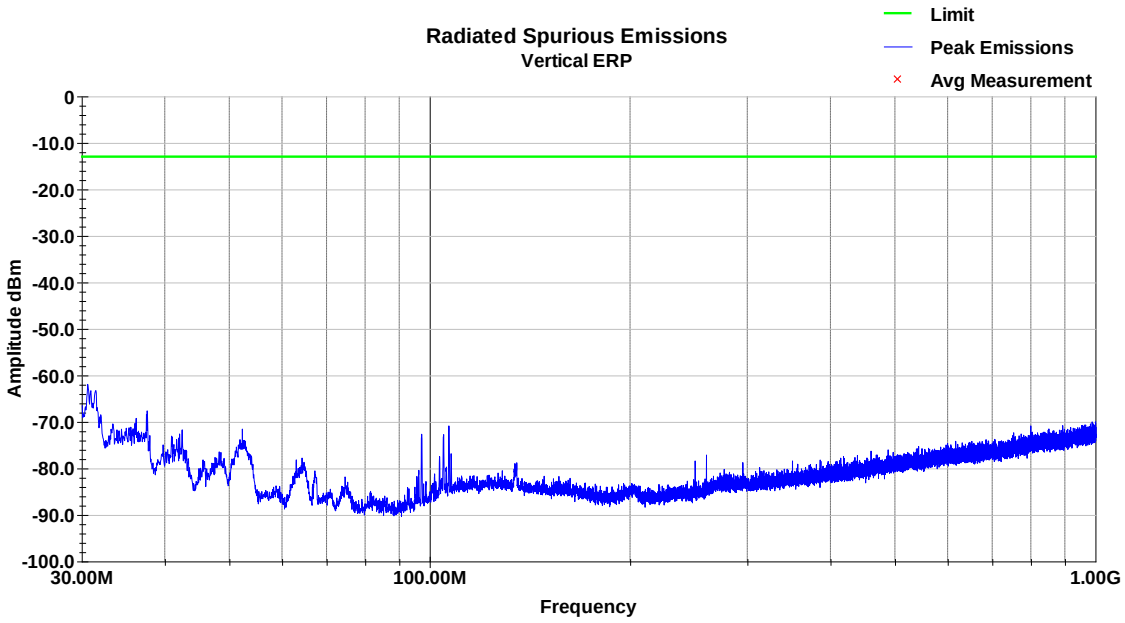
Horizontal Plot (30-1000MHz)



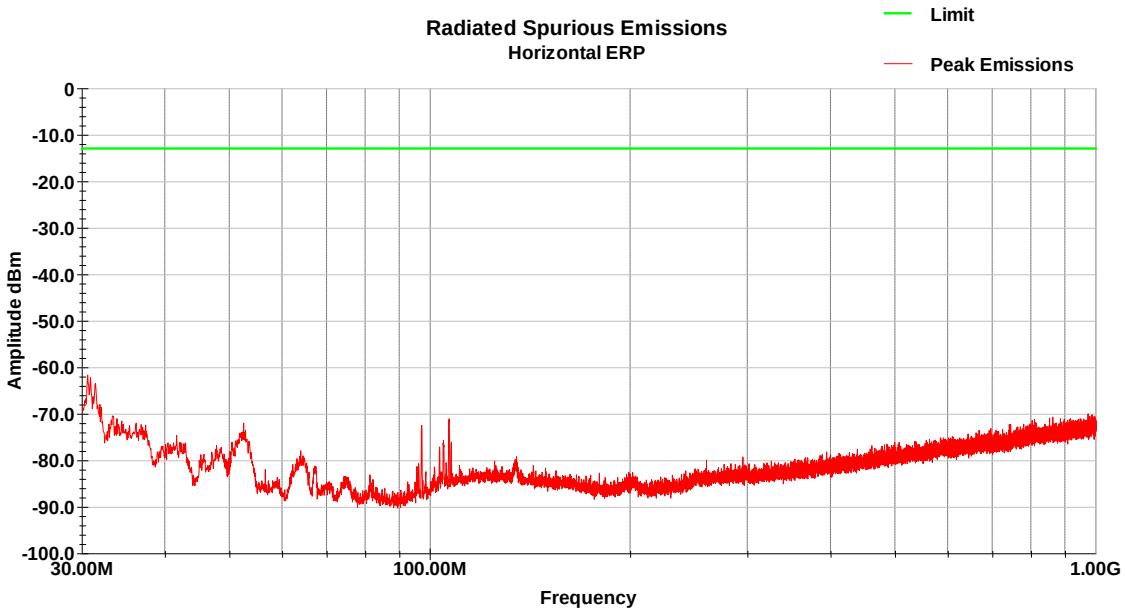
WCDMA Band 2, QPSK modulation

Low channel (1852.4MHz)

Vertical Plot (30-1000MHz)



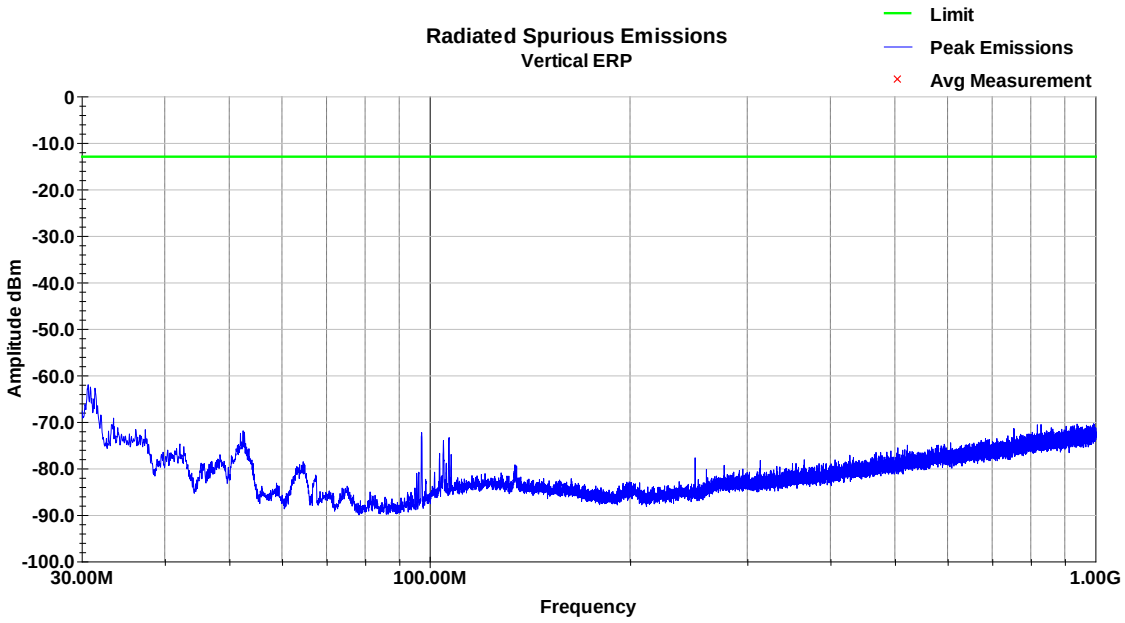
Horizontal Plot (30-1000MHz)



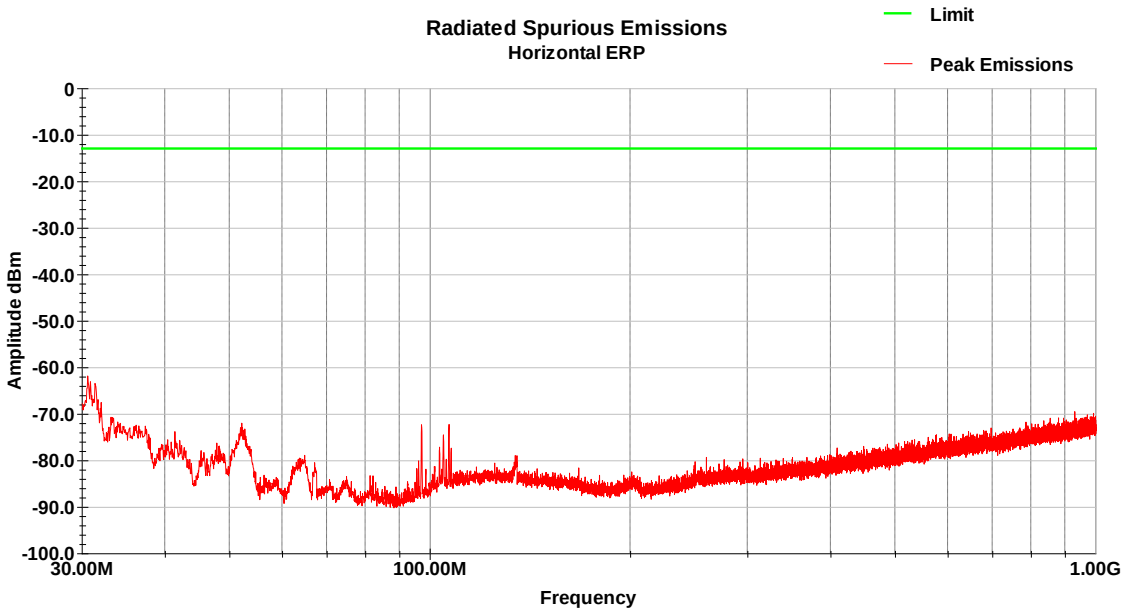
WCDMA Band 2, QPSK modulation

Mid channel (1880MHz)

Vertical Plot (30-1000MHz)



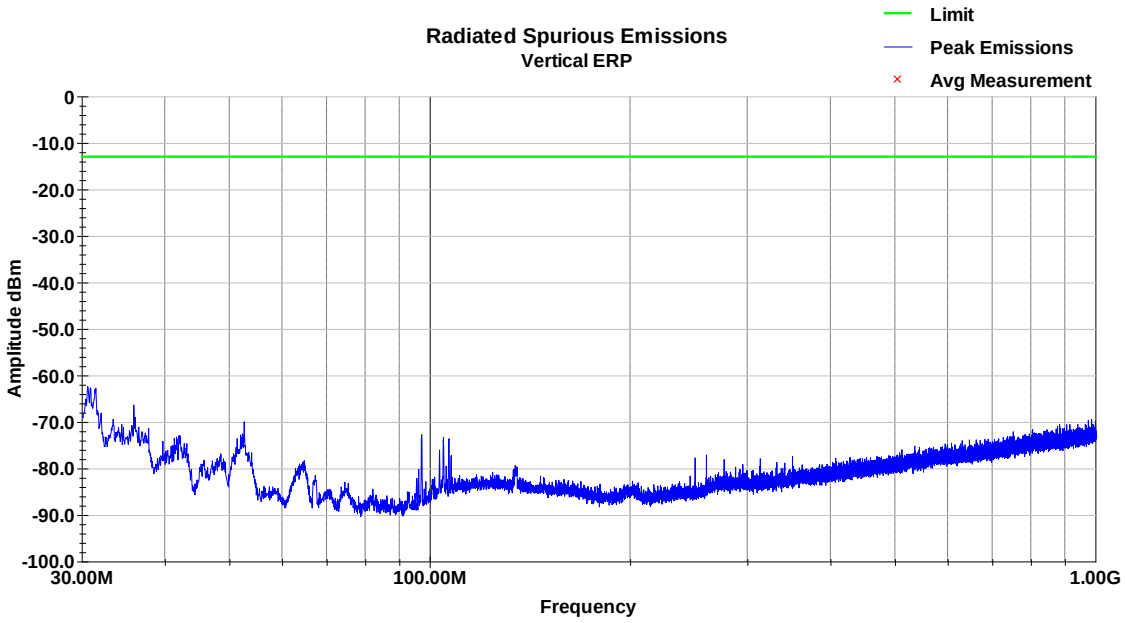
Horizontal Plot (30-1000MHz)



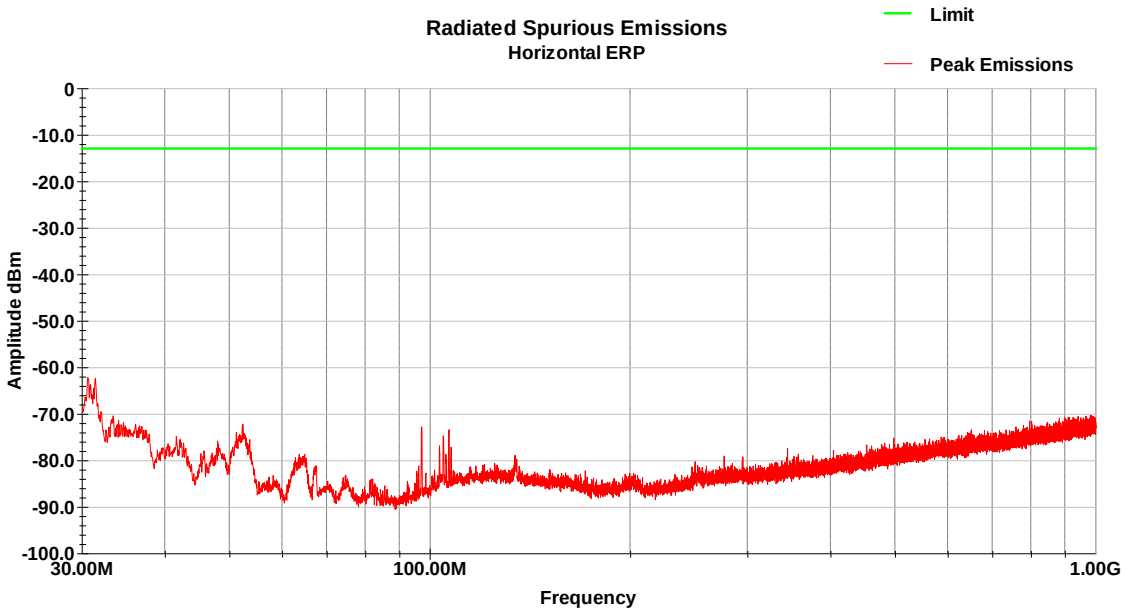
WCDMA Band 2, QPSK modulation

High channel (1907.6MHz)

Vertical Plot (30-1000MHz)



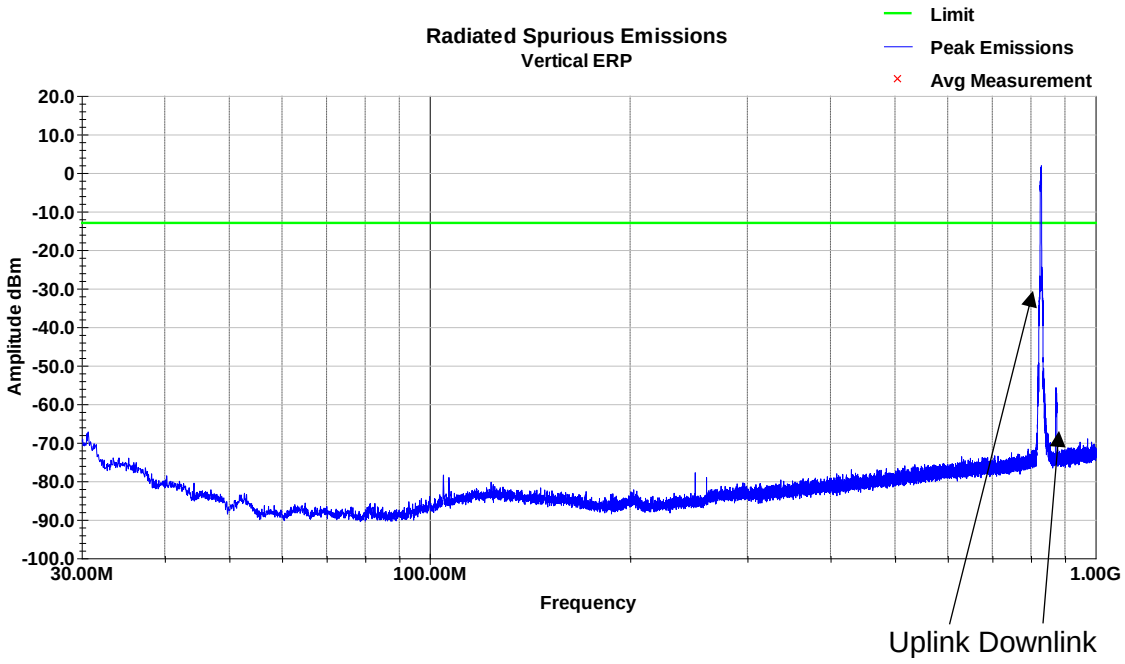
Horizontal Plot (30-1000MHz)



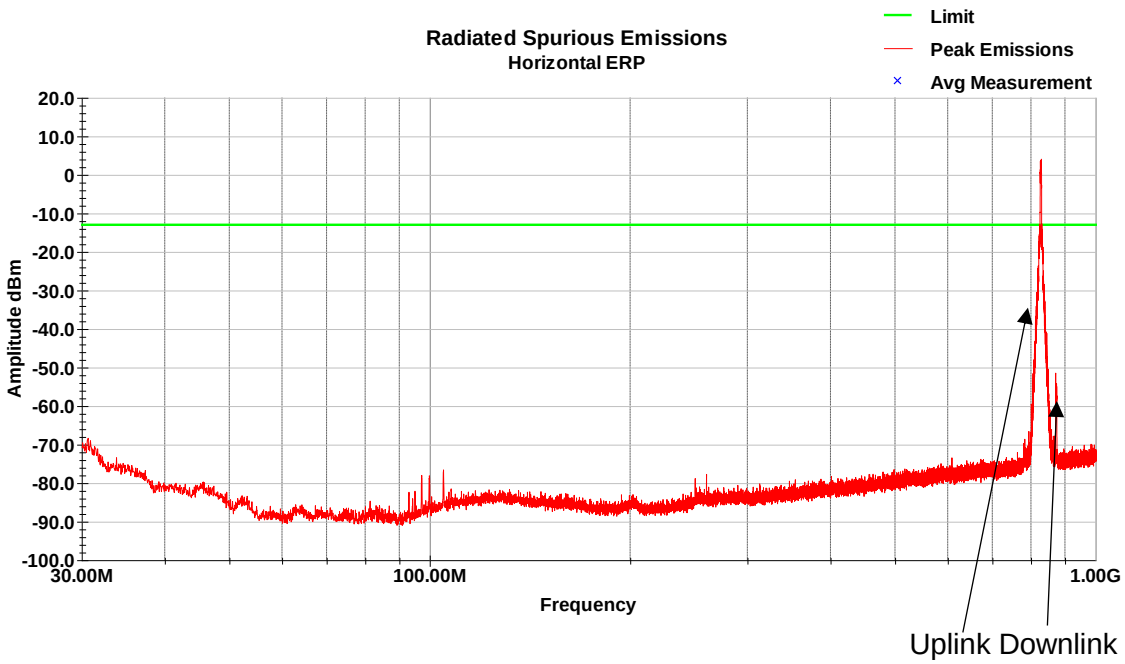
WCDMA Band 5, QPSK modulation

Low channel (826.4MHz)

Vertical Plot (30-1000MHz)



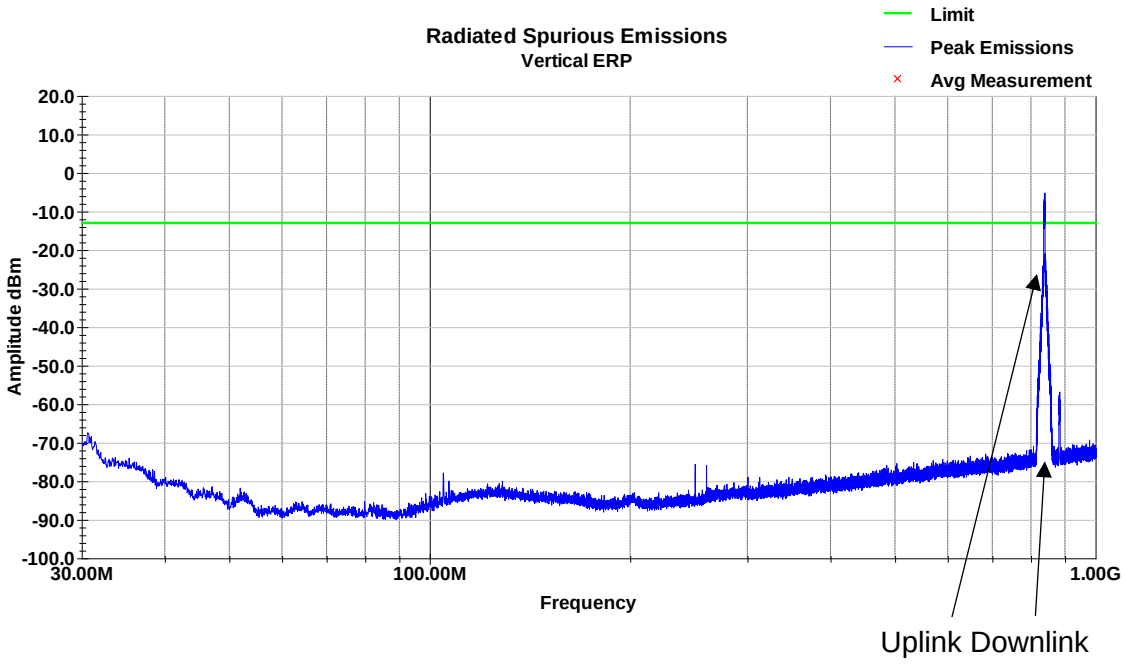
Horizontal Plot (30-1000MHz)



WCDMA Band 5, QPSK modulation

Mid channel (836.4MHz)

Vertical Plot (30-1000MHz)



Horizontal Plot (30-1000MHz)