7 Radiated Spurious Emissions

7.1 *Test Result*

Test Description	Specification		Test Result
	FCC	ISED	
Transmitter Spurious Emissions	2.1053 22.917(a) / (b) 24.238(a) / (b) 27.53(h)	RSS-GEN (6.13) RSS-132 (5.5) RSS-133 (6.5.1) RSS-139 (5.6)	Compliant

7.2 *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.

The EUT was set to transmit at maximum power.

7.3 *Test Site*

10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions	30-1000MHz	Above 1GHz
Temperature:	20.2 °C	22 °C
Relative Humidity:	54.1 %	51.1 %
Atmospheric Pressure:	98.13 kPa	98.24 kPa

7.4 *Test Equipment*

30-1000MHz

Test End Date: 14-Sep-2022 Tester: AB

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079690	19-Apr-2022	19-Apr-2024
N to N RF Cable	NC12-N1N1-276	MEGAPHASE	22000	10-Jan-2022	10-Jan-2023
RF CABLE	SF106	HUBER & SUHNER	B079713	25-Aug-2022	25-Aug-2023
RF CABLE NM TO NM, 0.01-18GHZ	90-195-079	TELEDYNE STORM MICROWAVE	20124	14-Feb-2022	14-Feb-2023
RF CABLE	104PE	HUBER & SUHNER	B079793	25-Aug-2022	25-Aug-2023
LOW NOISE AMPLIFIER	ZKL-2+	MINI-CIRCUITS	B079817	25-Aug-2022	25-Aug-2023
ROTARY NM TO NF CONNECTOR	18-2120-0	DIAMOND ANTENNA AND MICROWAVE CORP	22008	16-Mar-2022	16-Mar-2023
EMI TEST RECEIVER	ESW26	ROHDE & SCHWARZ	103066	6-Apr-2022	6-Apr-2023

Above 1GHz

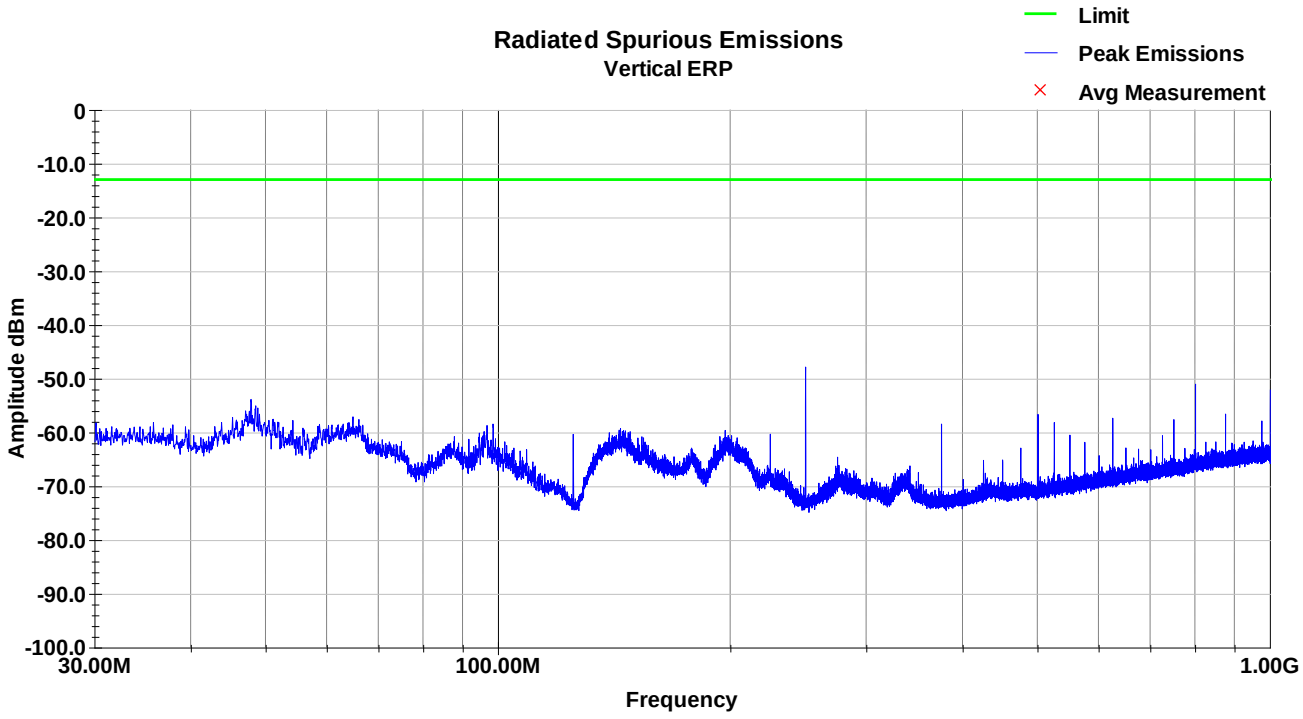
Test End Date: 16-Sep-2022 Tester: ZH

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079699	29-Jul-2022	29-Jul-2024
RF CABLE NM TO NM, 0.01-18GHZ	90-195-157	TELEDYNE STORM MICROWAVE	20121	14-Feb-2022	14-Feb-2023
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	25-Aug-2022	25-Aug-2023
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	7-Oct-2021	7-Oct-2022
EMI TEST RECEIVER	ESW26	ROHDE & SCHWARZ	103066	6-Apr-2022	6-Apr-2023
FILTER, HIGH PASS, >1000MHZ	HPM50108	MICRO-TRONICS	B079802	5-Jul-2022	5-Jul-2023
FILTER, HIGH PASS, >2800MHZ	HPM50111	MICRO-TRONICS	22017	16-Jun-2022	16-Jun-2023

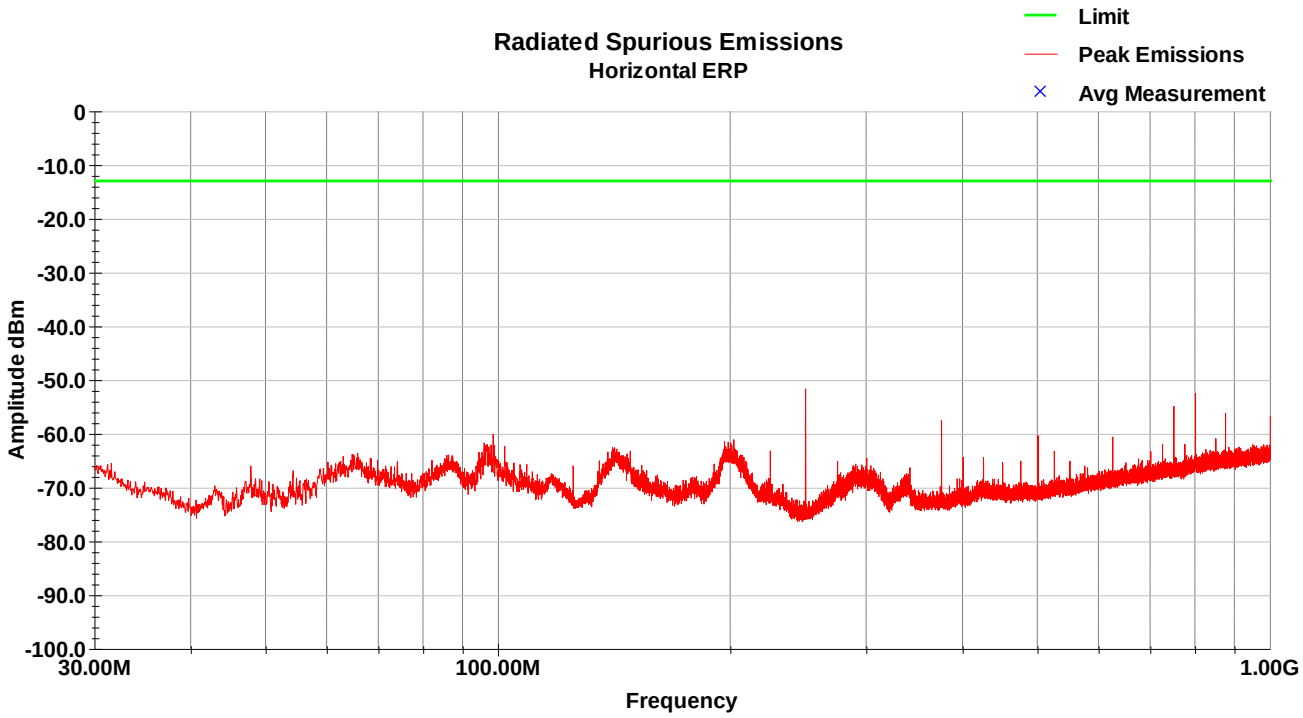
Software:
“RSE 30-1000 MHz T7 220318” TILE! profile dated 18 March 2022
“RSE 1-18 GHz T7 210212” TILE! profile dated 02 February 2021

7.5 *Test Data – LTE Band 2*

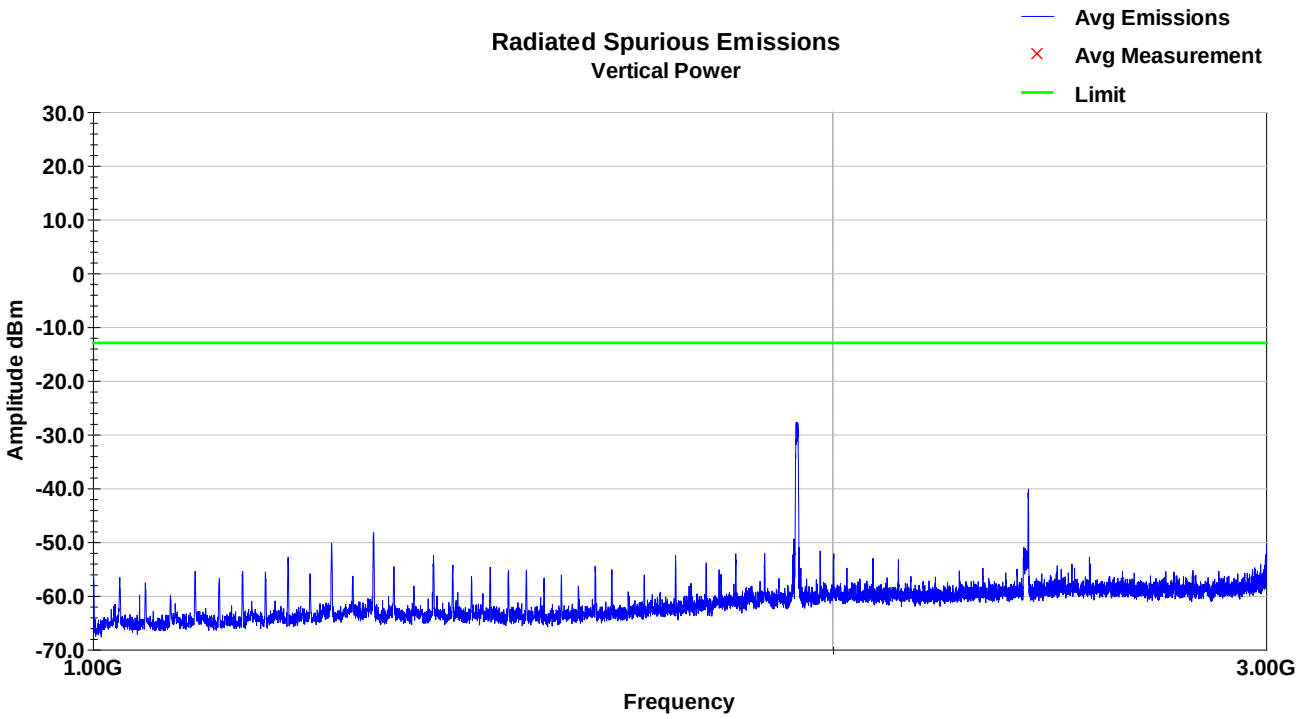
LTE Band 2 – LCH – 30-1000MHz – Vertical



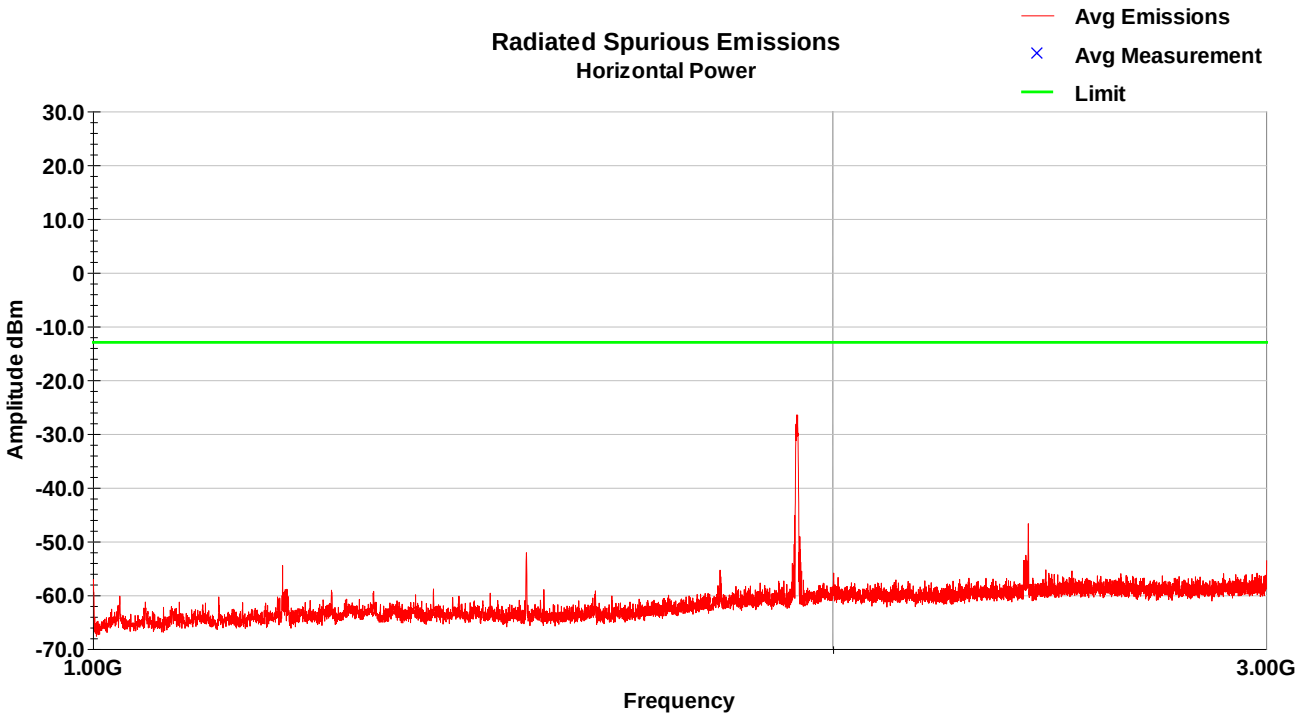
LTE Band 2 – LCH – 30-1000MHz – Horizontal



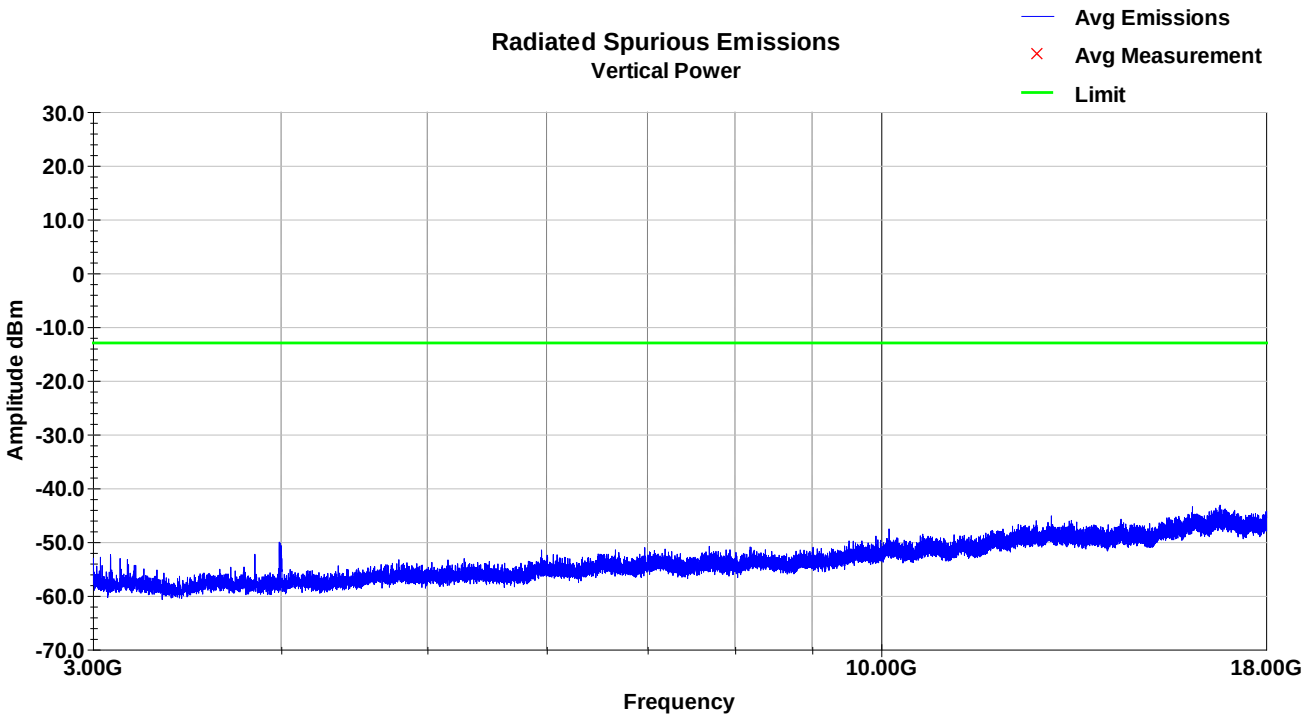
LTE Band 2 – LCH – 1-3GHz – Vertical



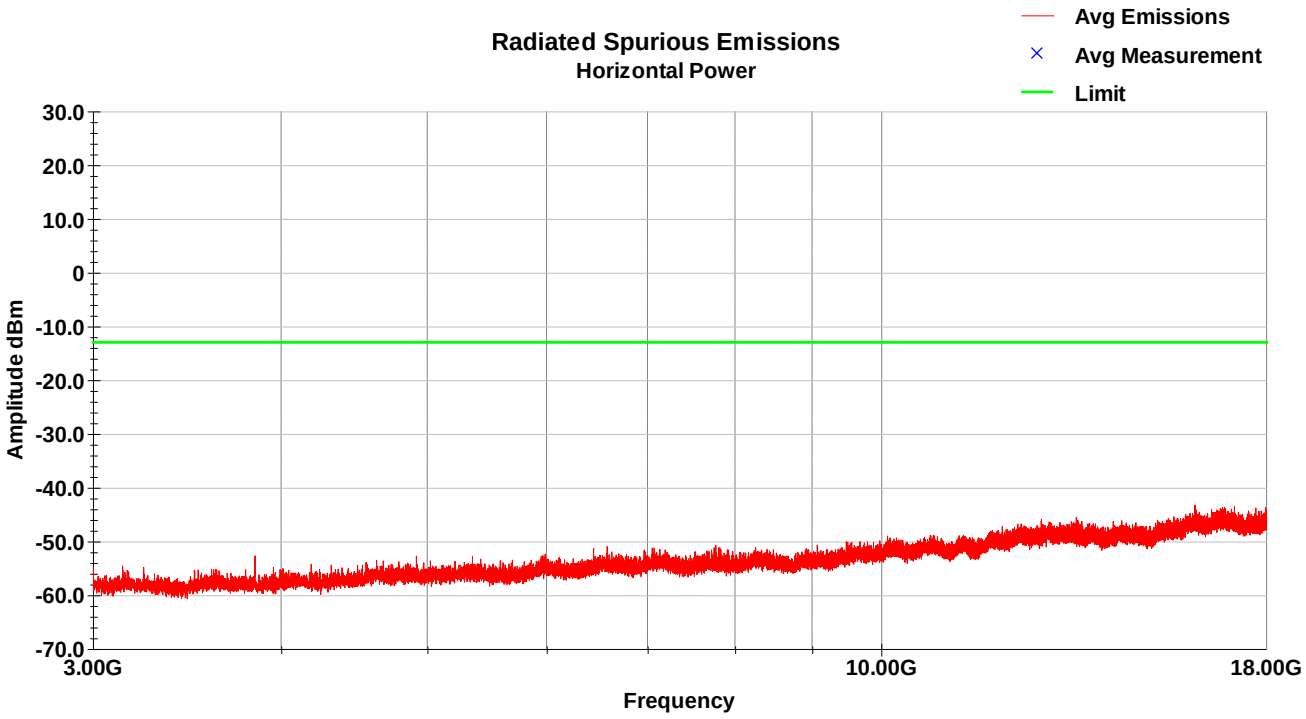
LTE Band 2 – LCH – 1-3GHz – Horizontal



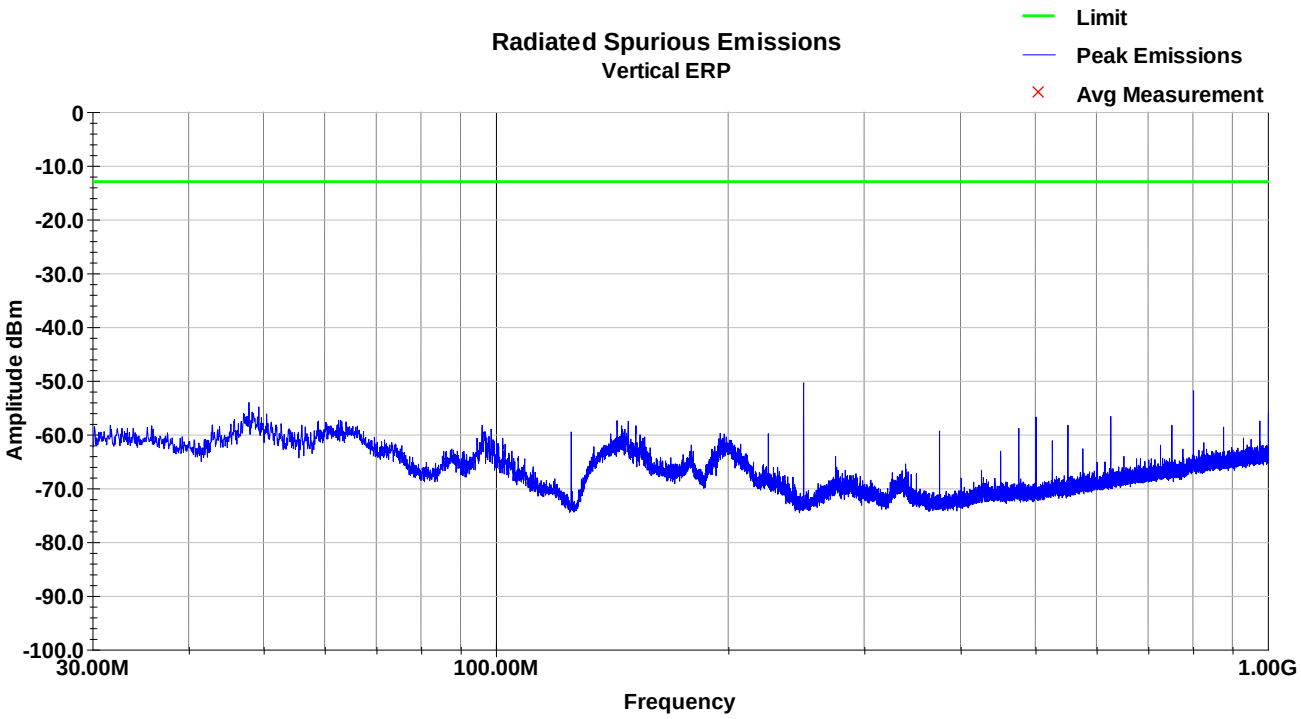
LTE Band 2 – LCH – 3-18GHz – Vertical



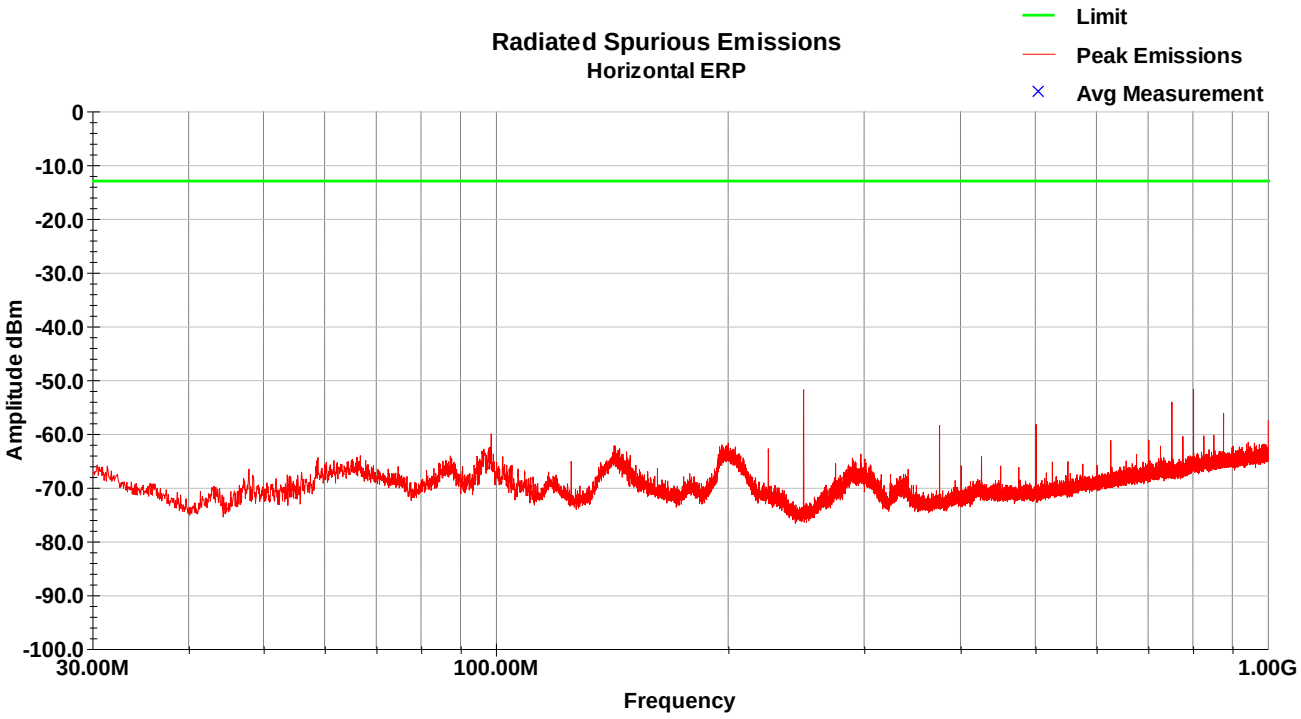
LTE Band 2 – LCH – 3-18GHz – Horizontal



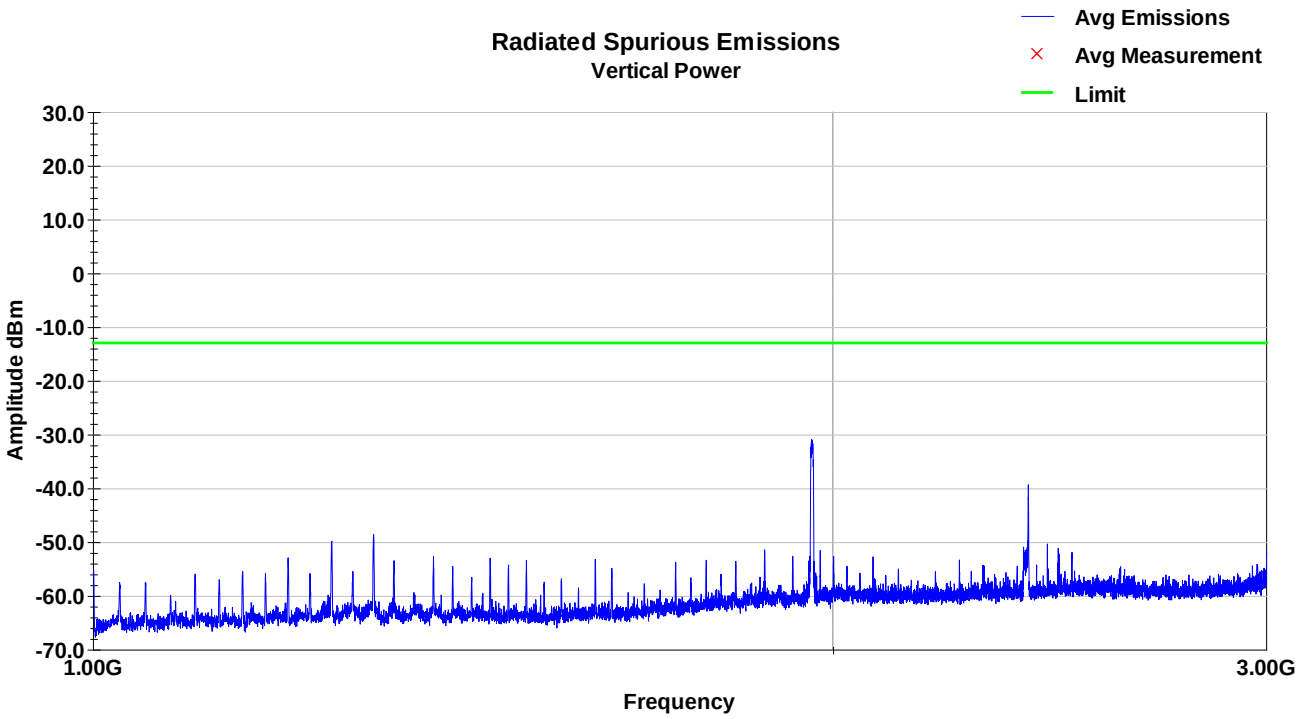
LTE Band 2 – MCH – 30-1000MHz – Vertical



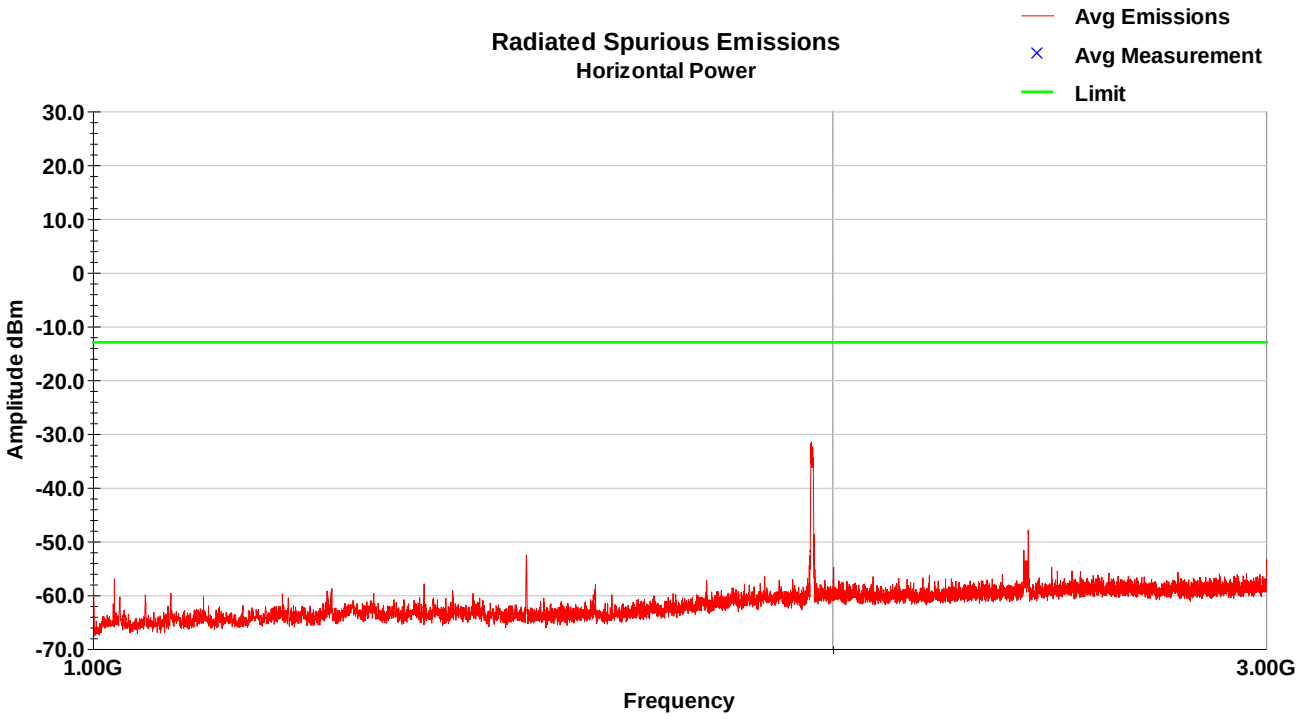
LTE Band 2 – MCH – 30-1000MHz – Horizontal



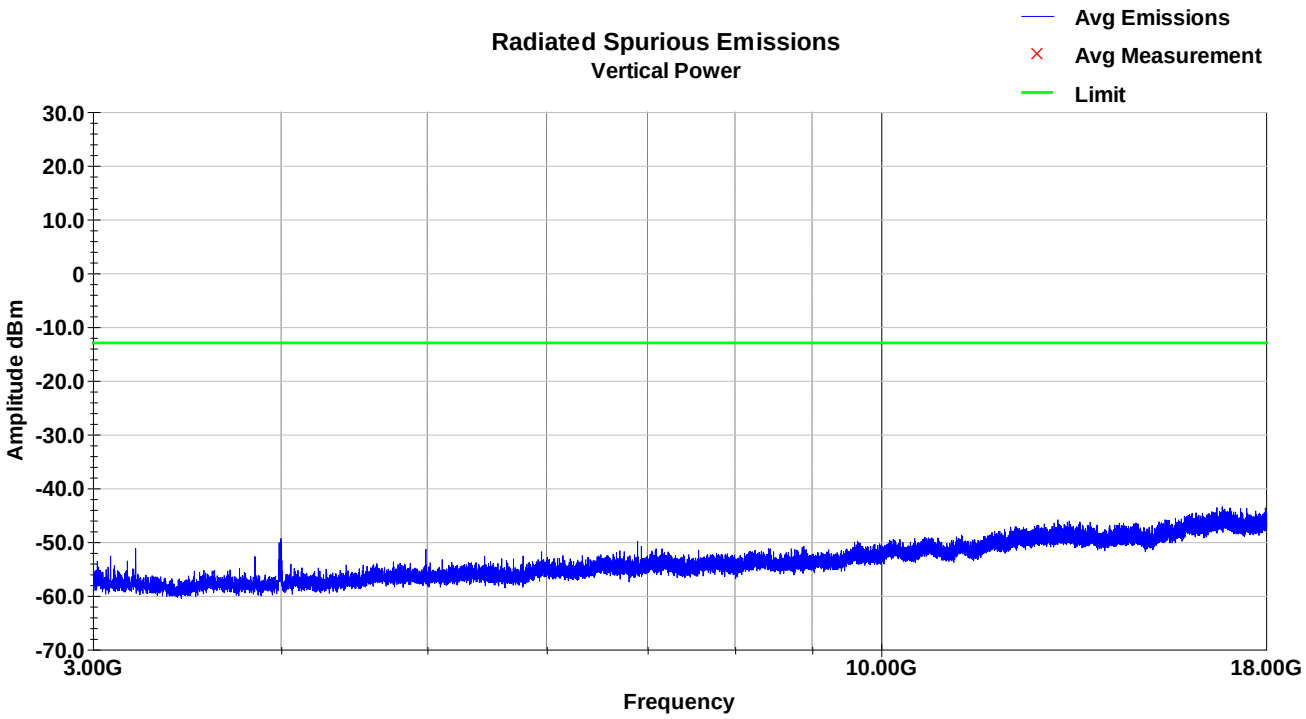
LTE Band 2 – MCH – 1-3GHz – Vertical



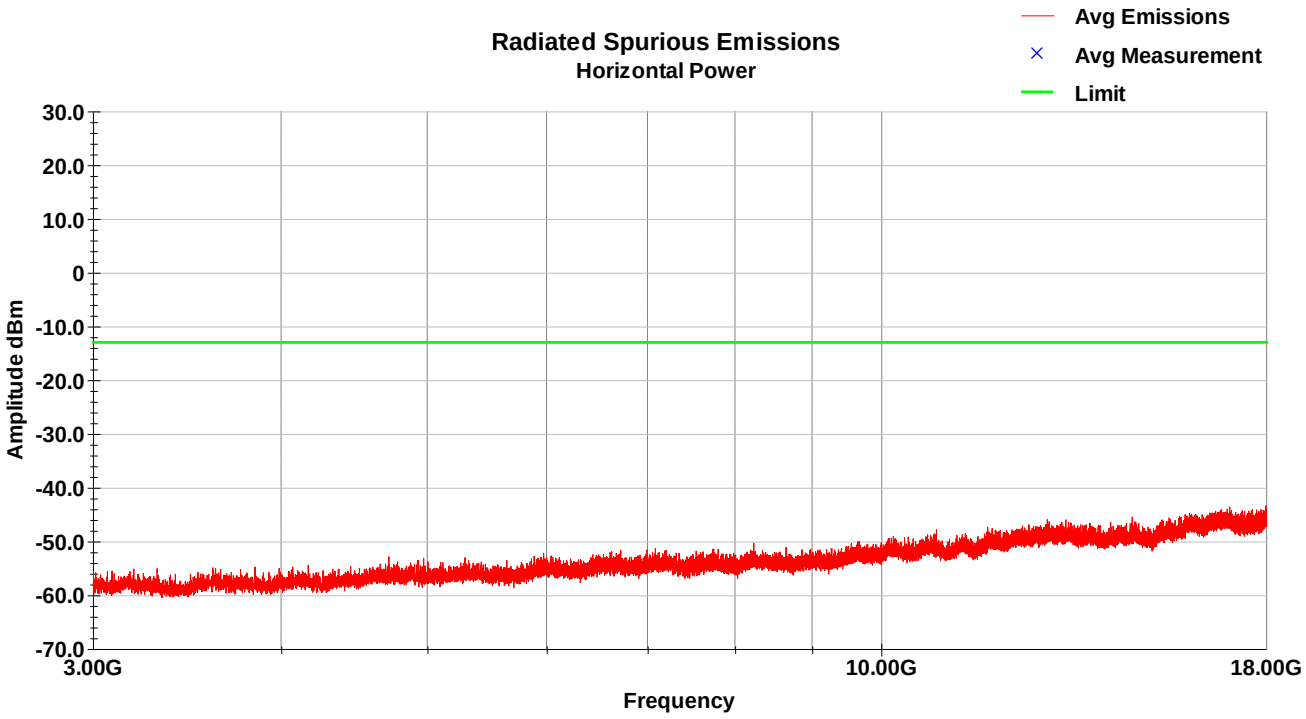
LTE Band 2 – MCH – 1-3GHz – Horizontal



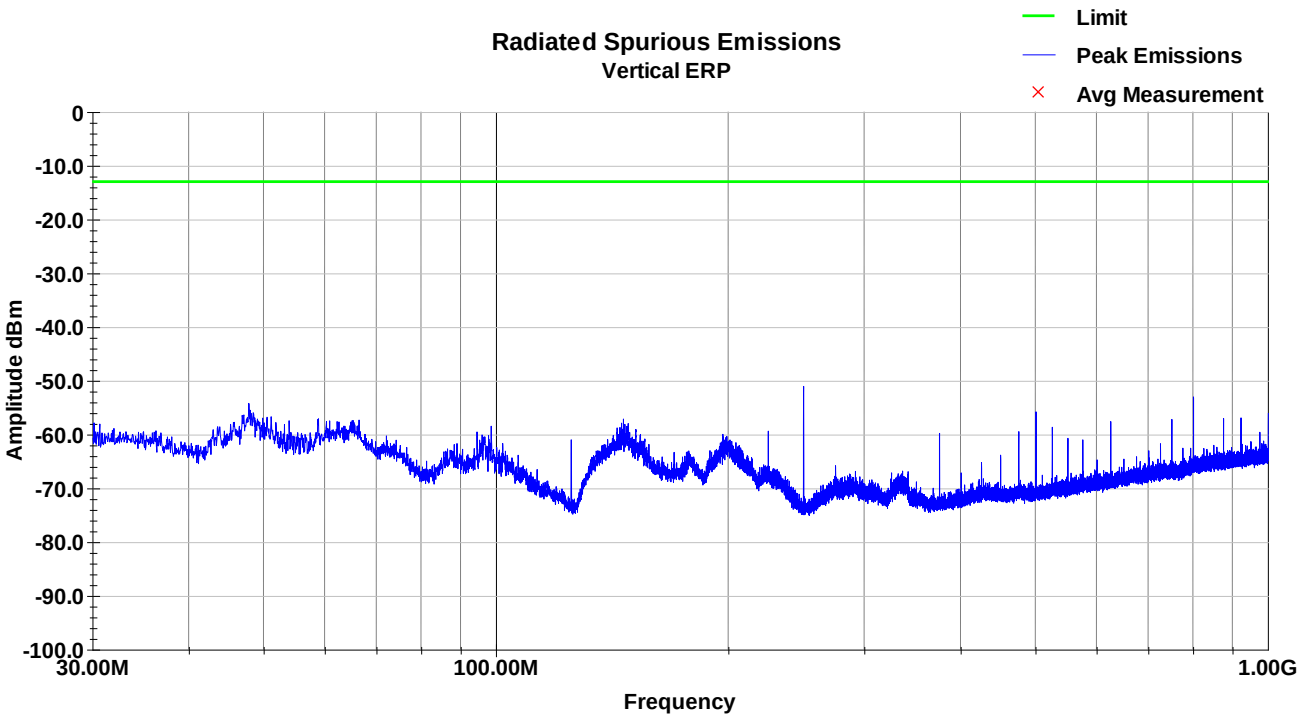
LTE Band 2 – MCH – 3-18GHz – Vertical



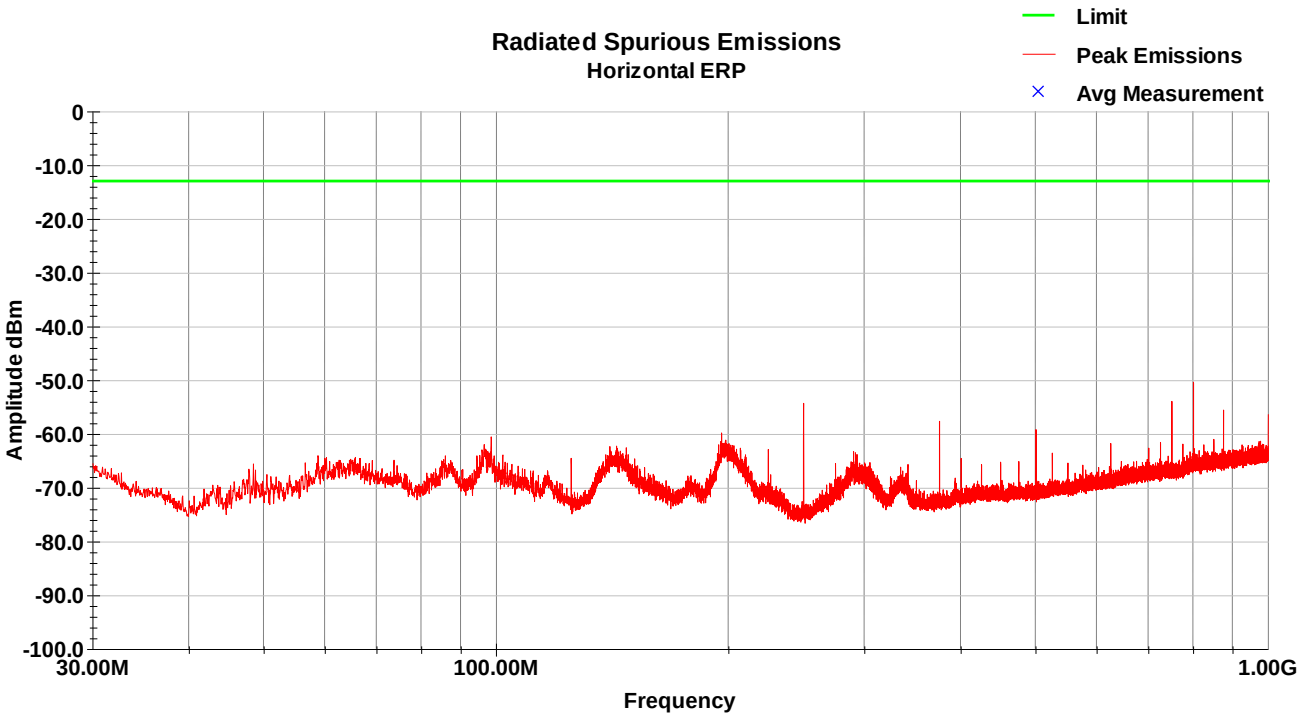
LTE Band 2 – MCH – 3-18GHz – Horizontal



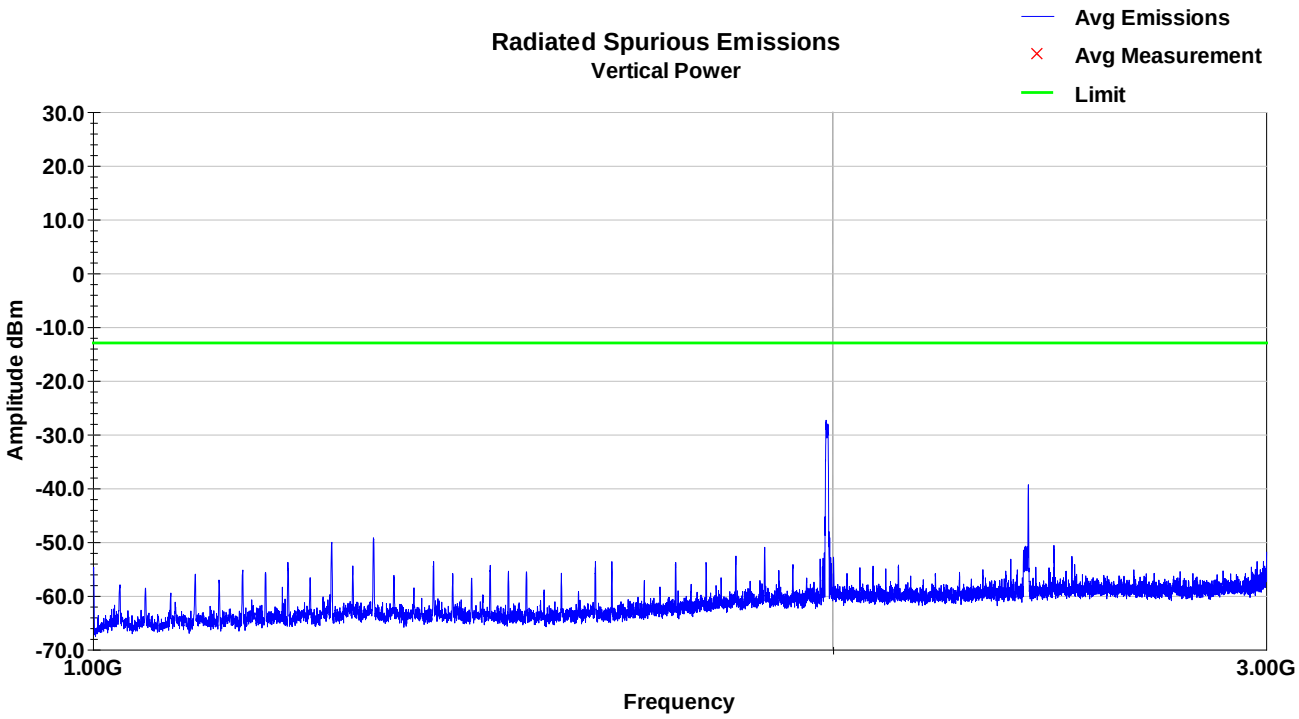
LTE Band 2 – HCH – 30-1000MHz – Vertical



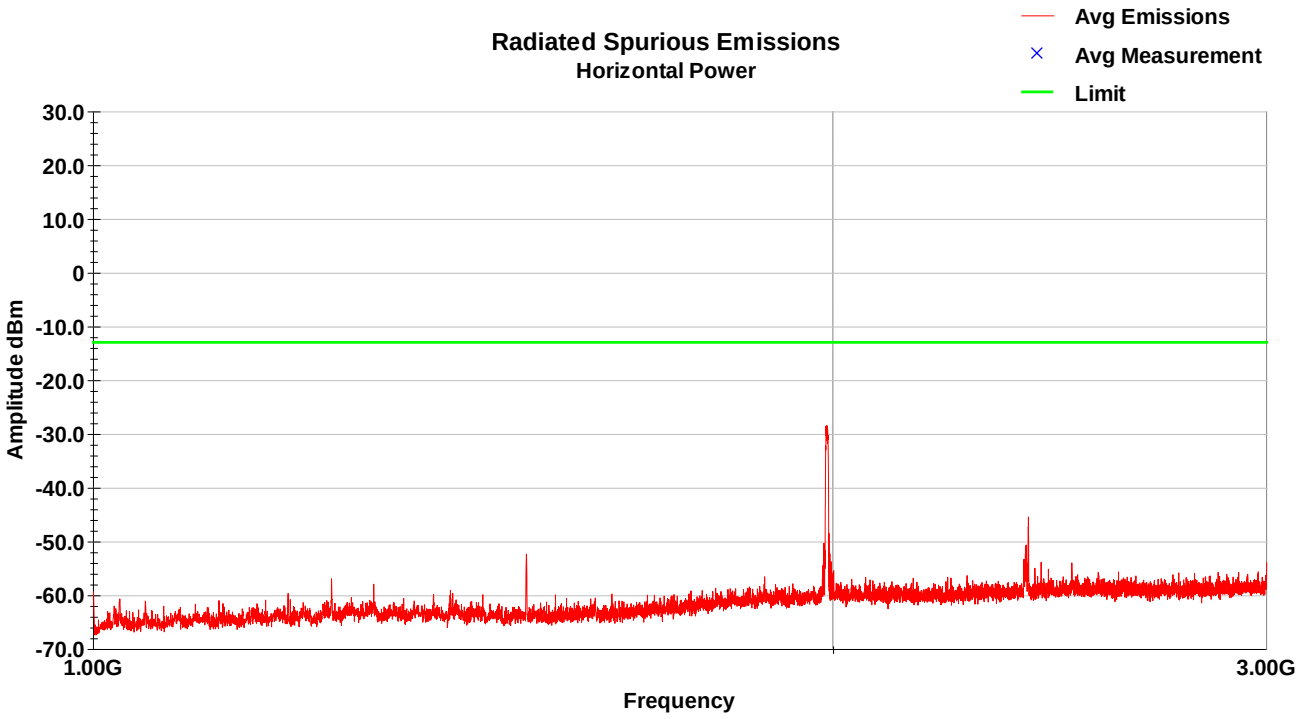
LTE Band 2 – HCH – 30-1000MHz – Horizontal



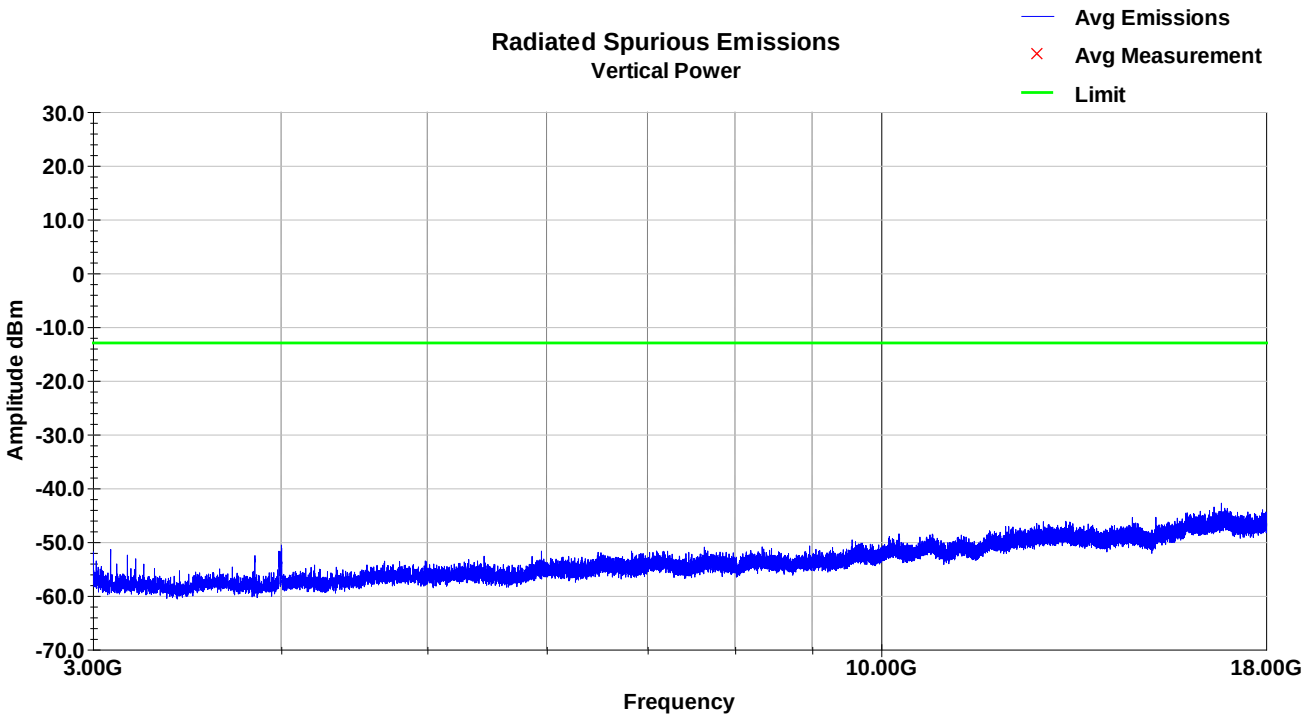
LTE Band 2 – HCH – 1-3GHz – Vertical



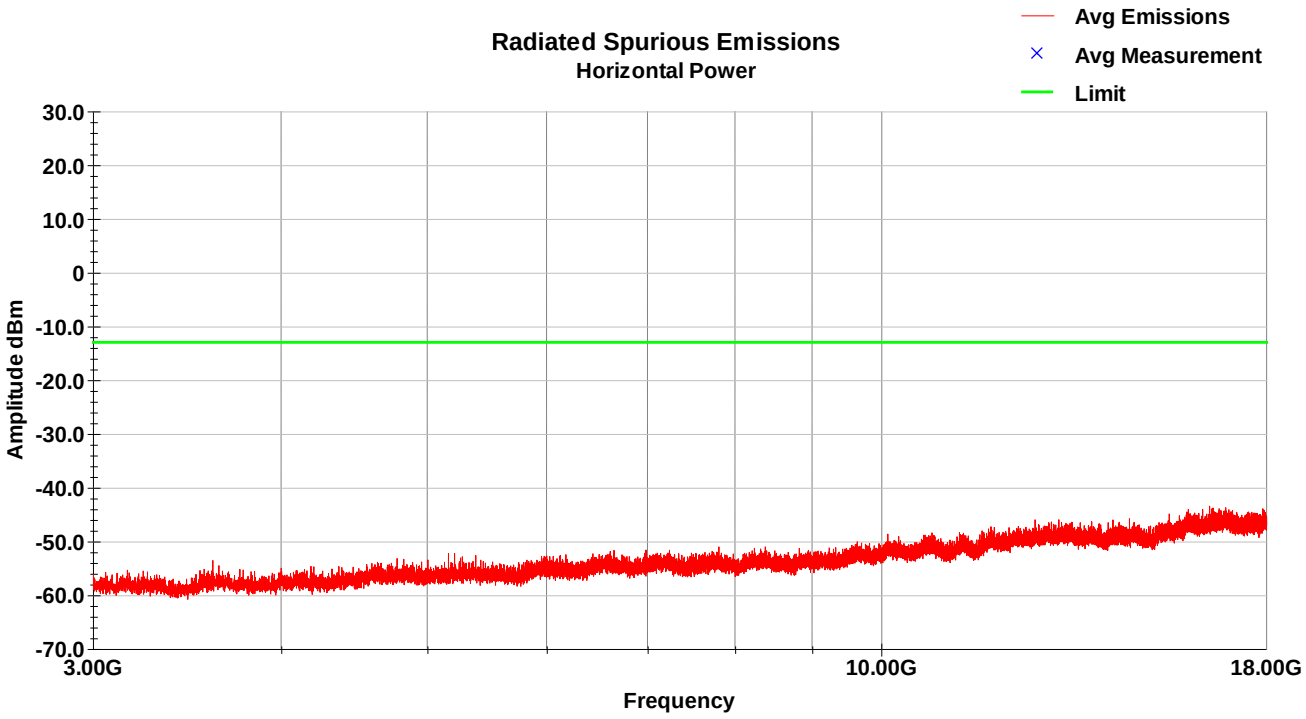
LTE Band 2 – HCH – 1-3GHz – Horizontal



LTE Band 2 – HCH – 3-18GHz – Vertical

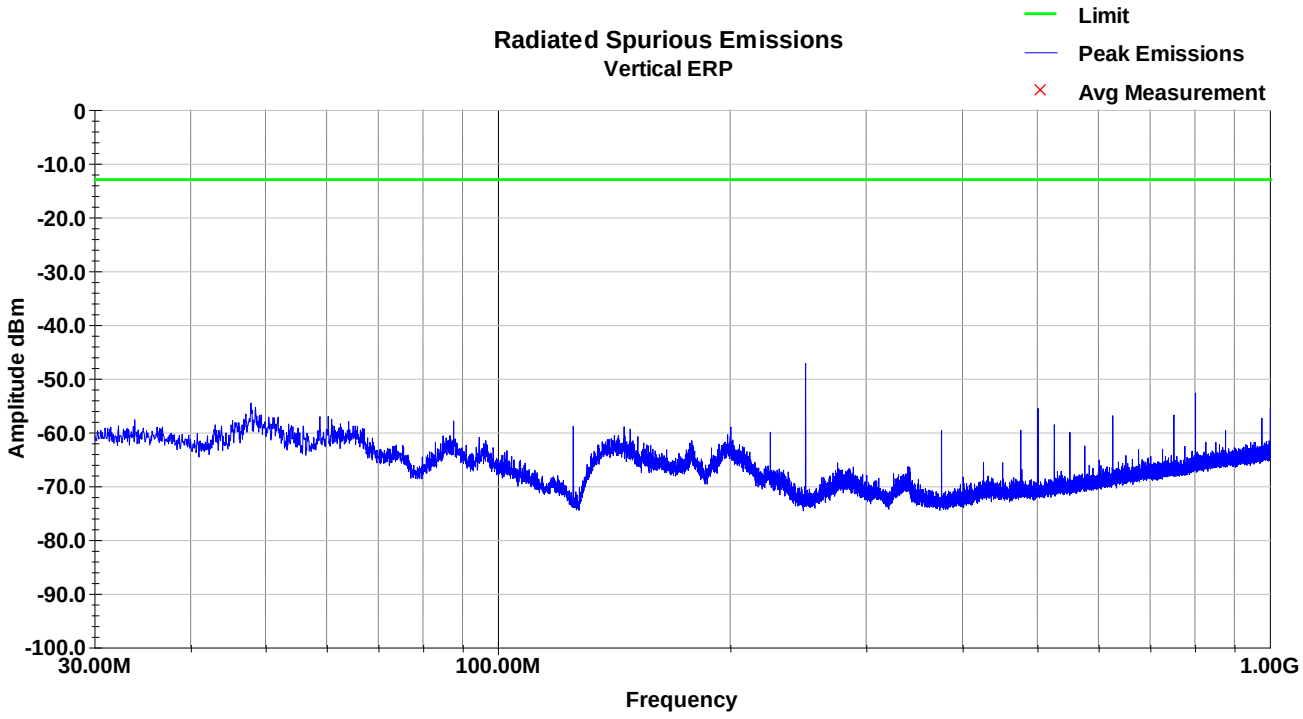


LTE Band 2 – HCH – 3-18GHz – Horizontal

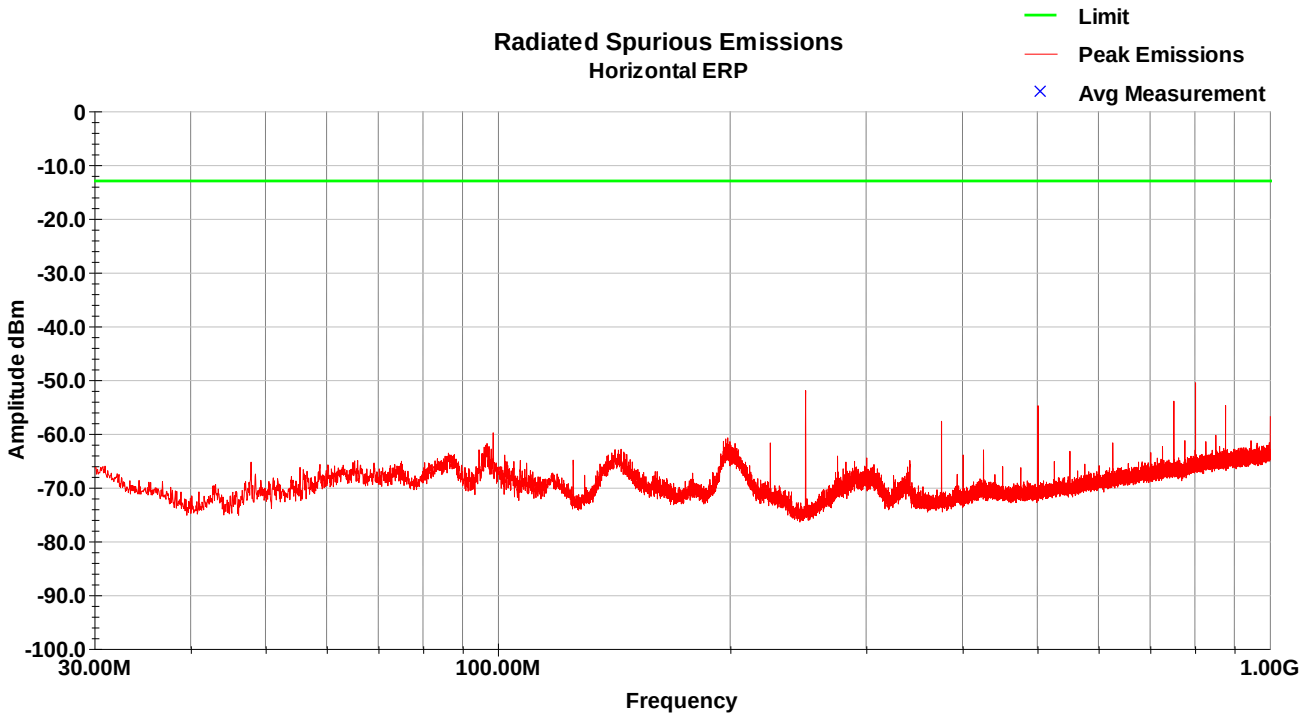


7.6 *Test Data – LTE Band 4*

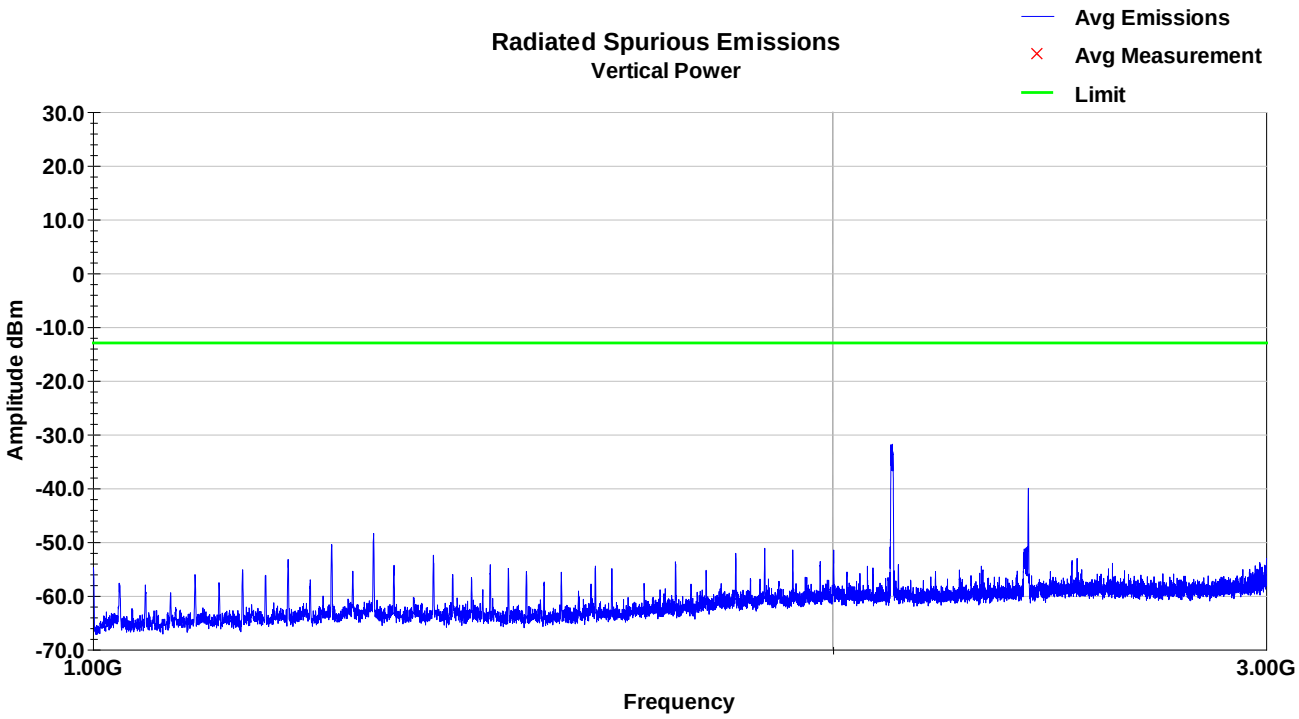
LTE Band 4 – LCH – 30-1000MHz – Vertical



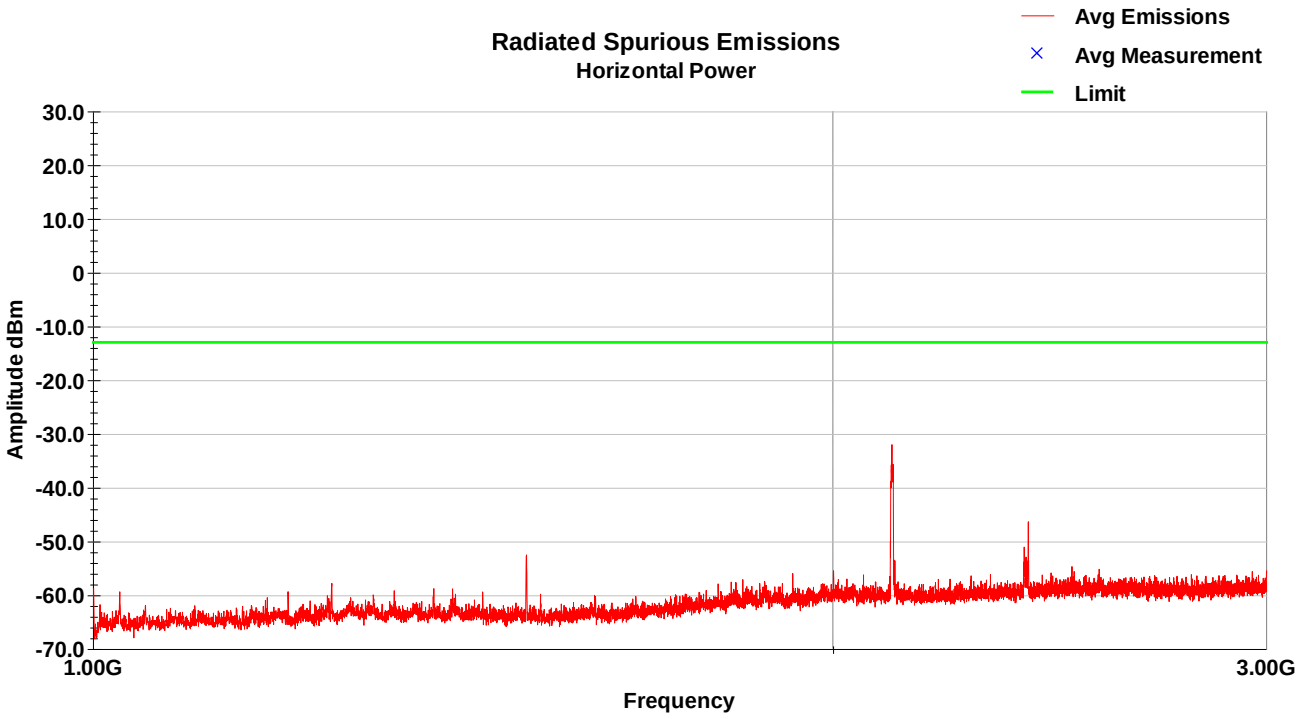
LTE Band 4 – LCH – 30-1000MHz – Horizontal



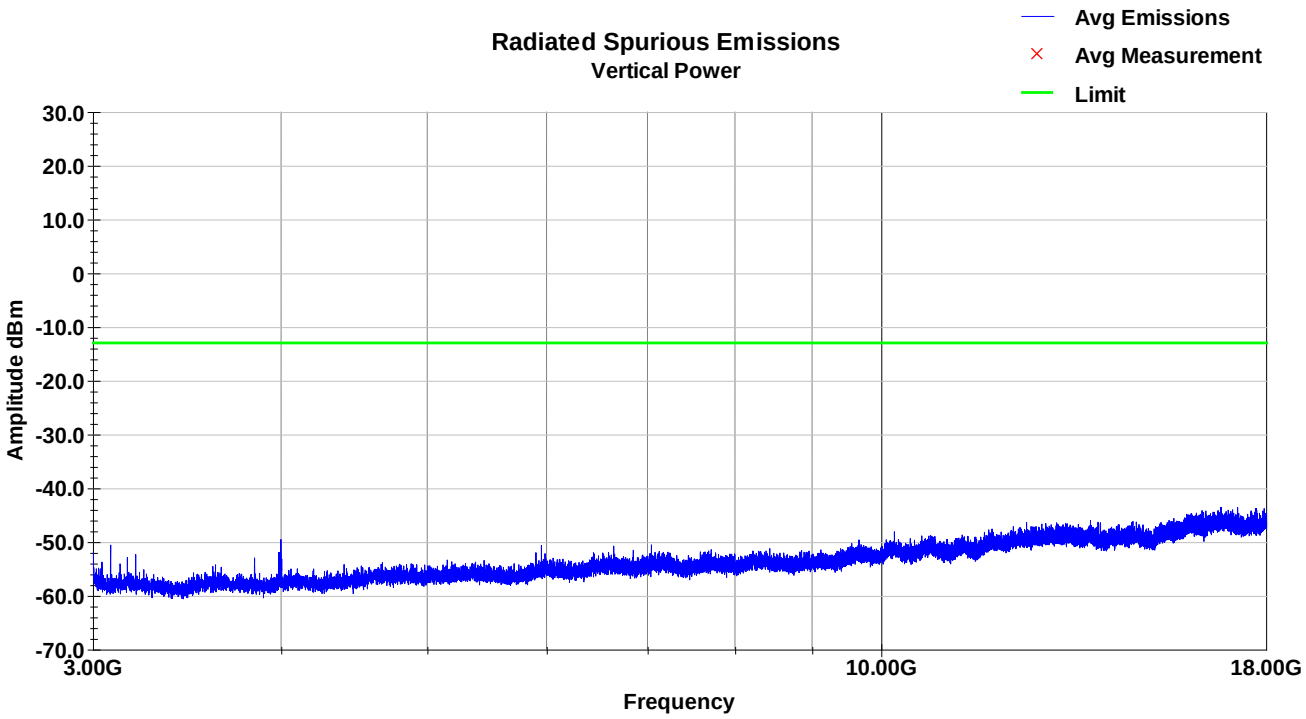
LTE Band 4 – LCH – 1-3GHz – Vertical



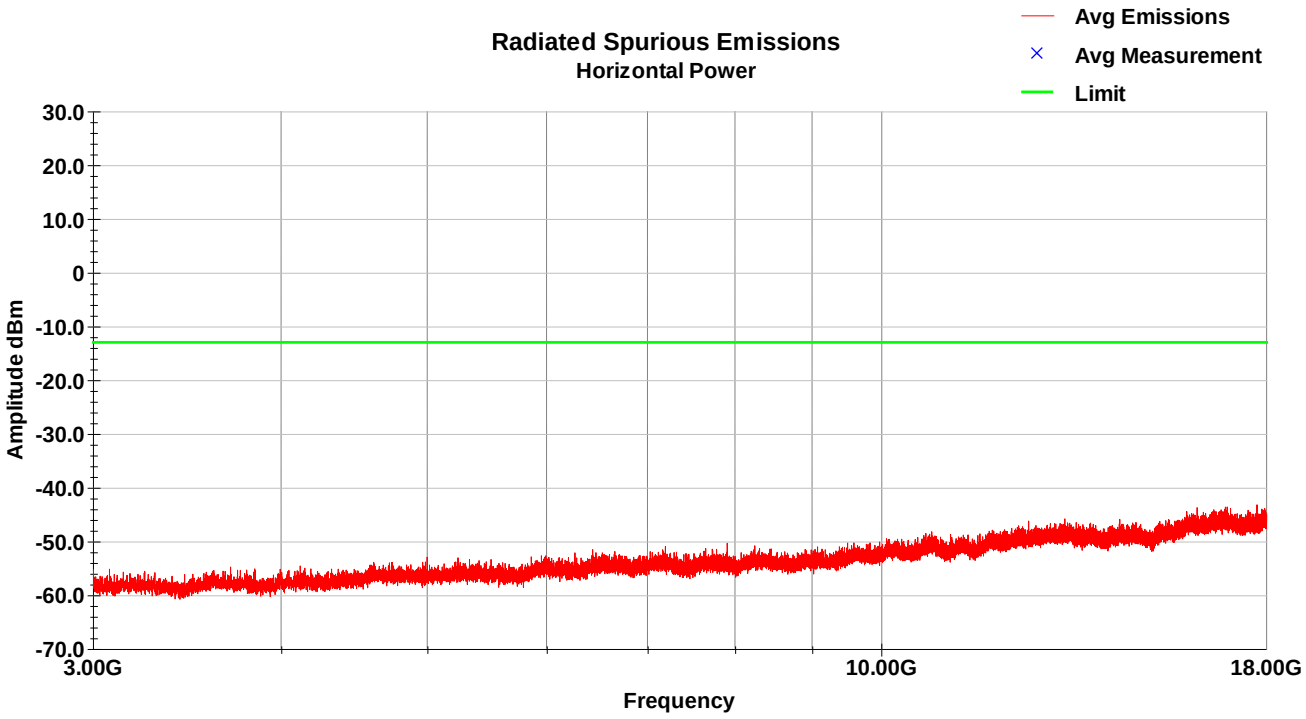
LTE Band 4 – LCH – 1-3GHz – Horizontal



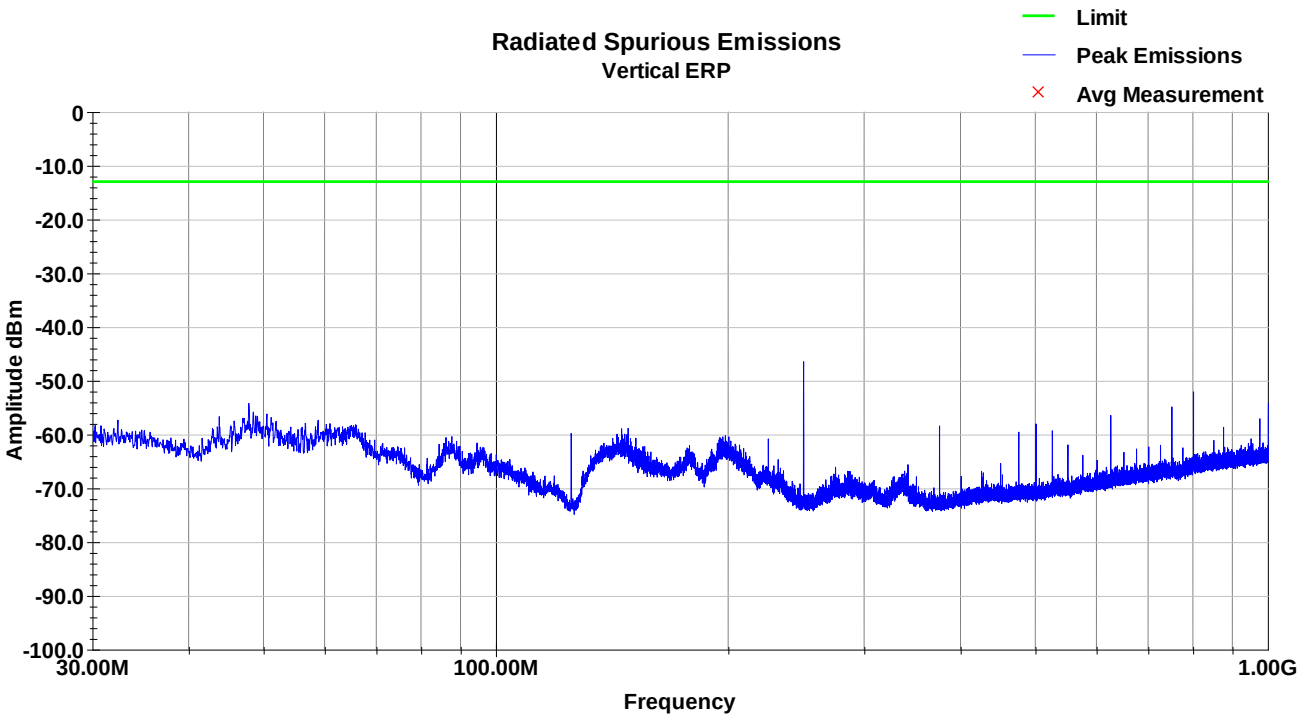
LTE Band 4 – LCH – 3-18GHz – Vertical



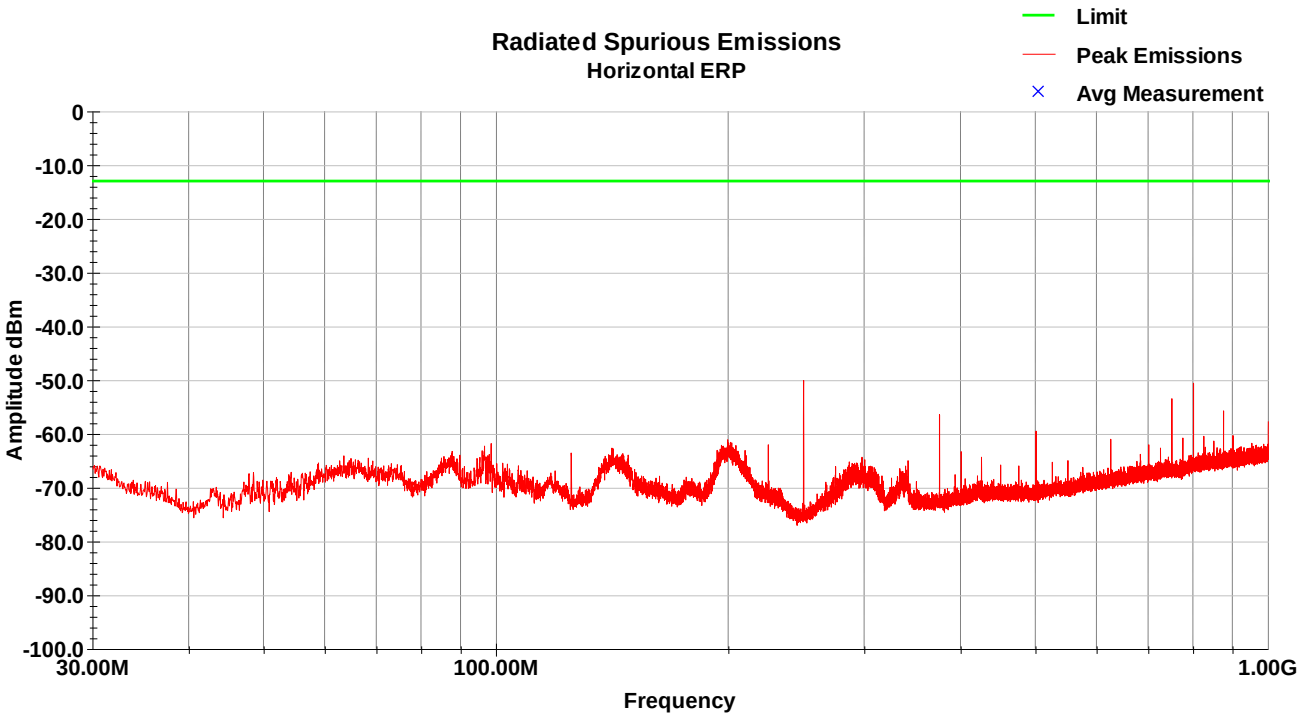
LTE Band 4 – LCH – 3-18GHz – Horizontal



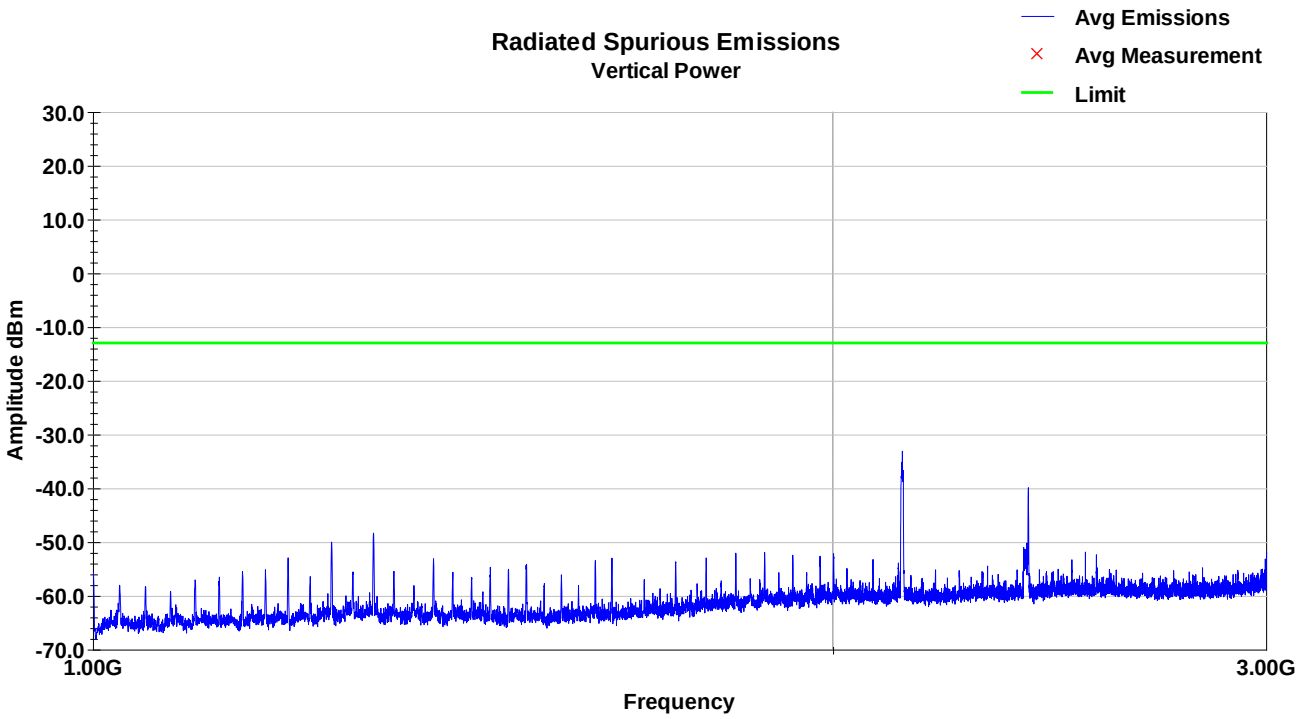
LTE Band 4 – MCH – 30-1000MHz – Vertical



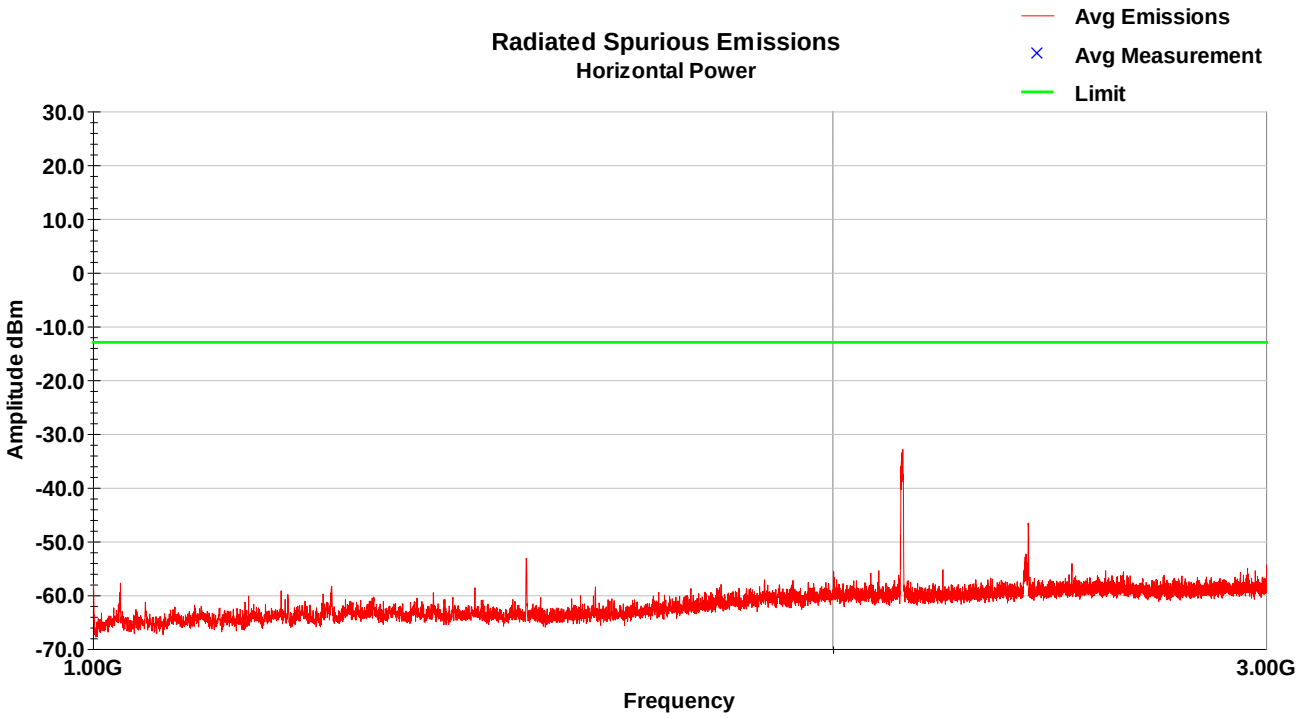
LTE Band 4 – MCH – 30-1000MHz – Horizontal



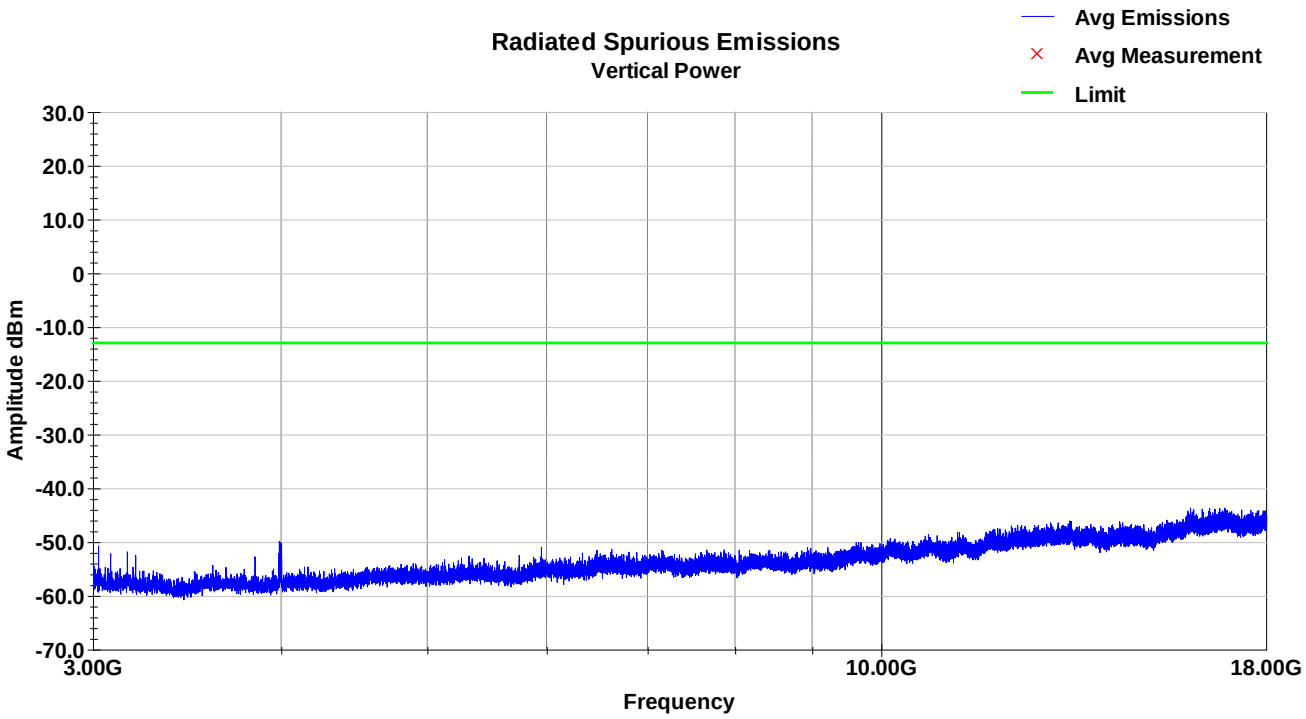
LTE Band 4 – MCH – 1-3GHz – Vertical



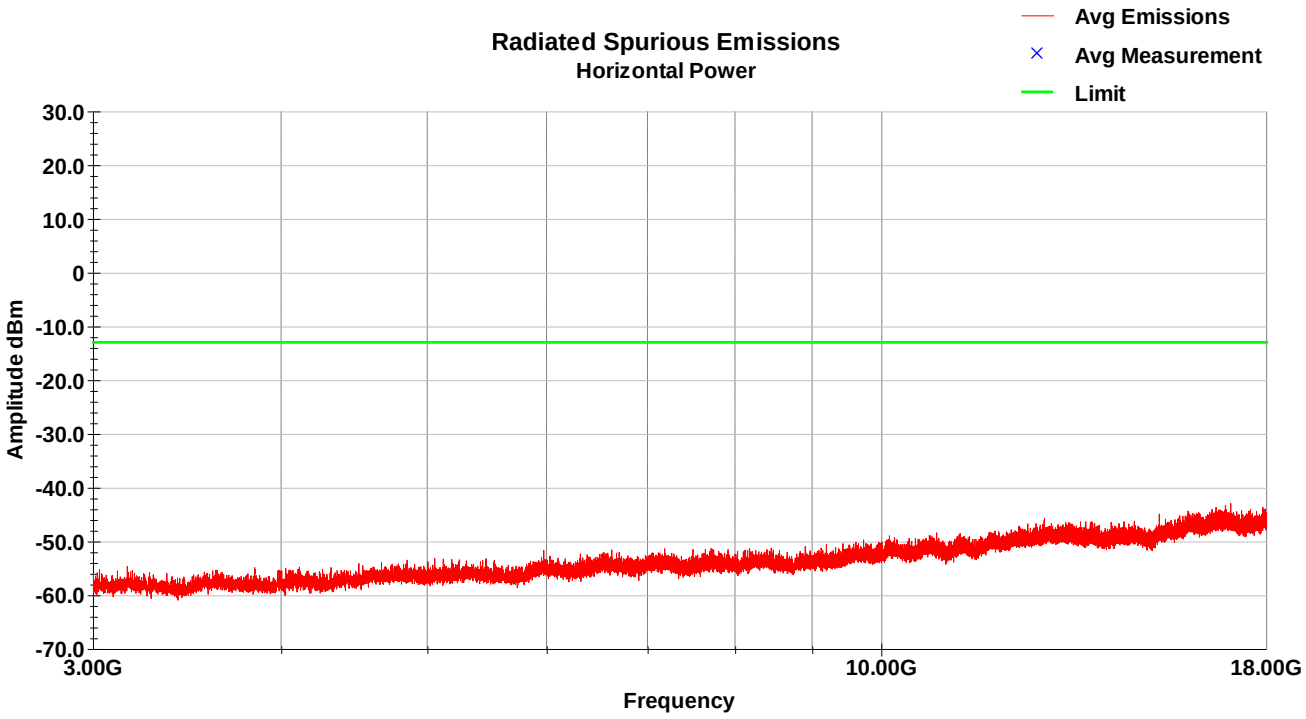
LTE Band 4 – MCH – 1-3GHz – Horizontal



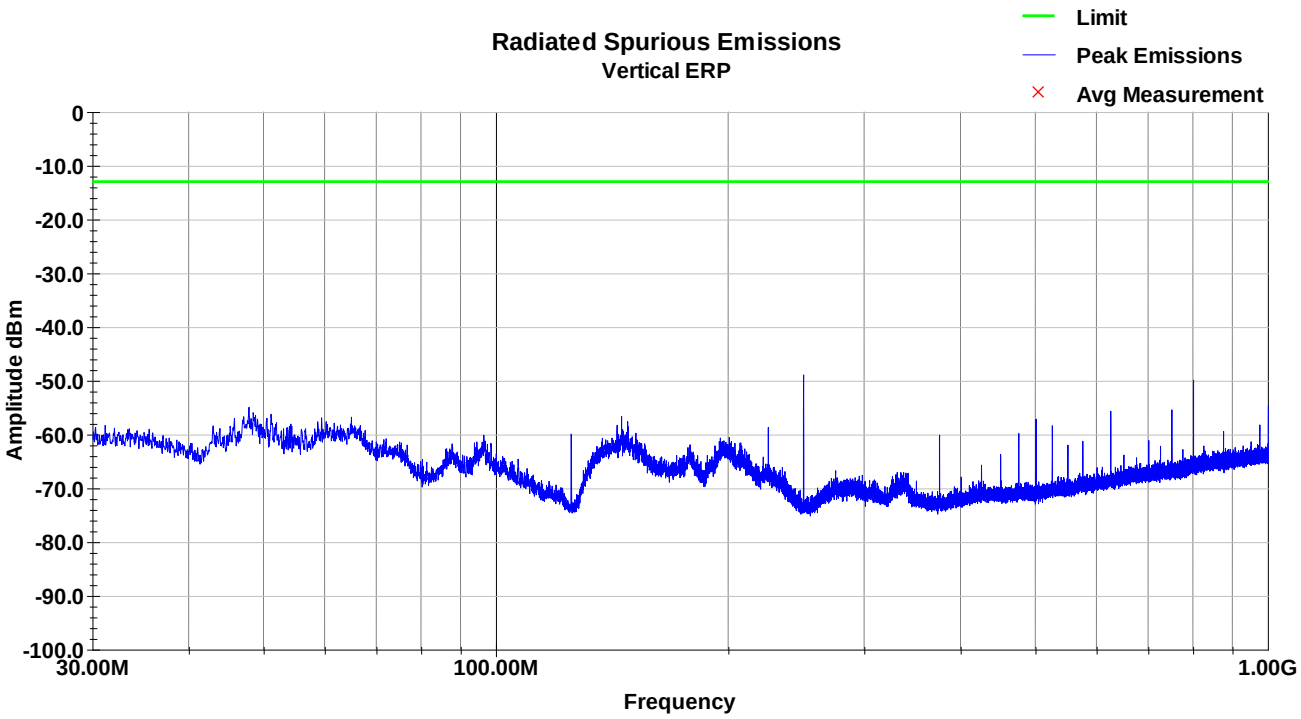
LTE Band 4 – MCH – 3-18GHz – Vertical



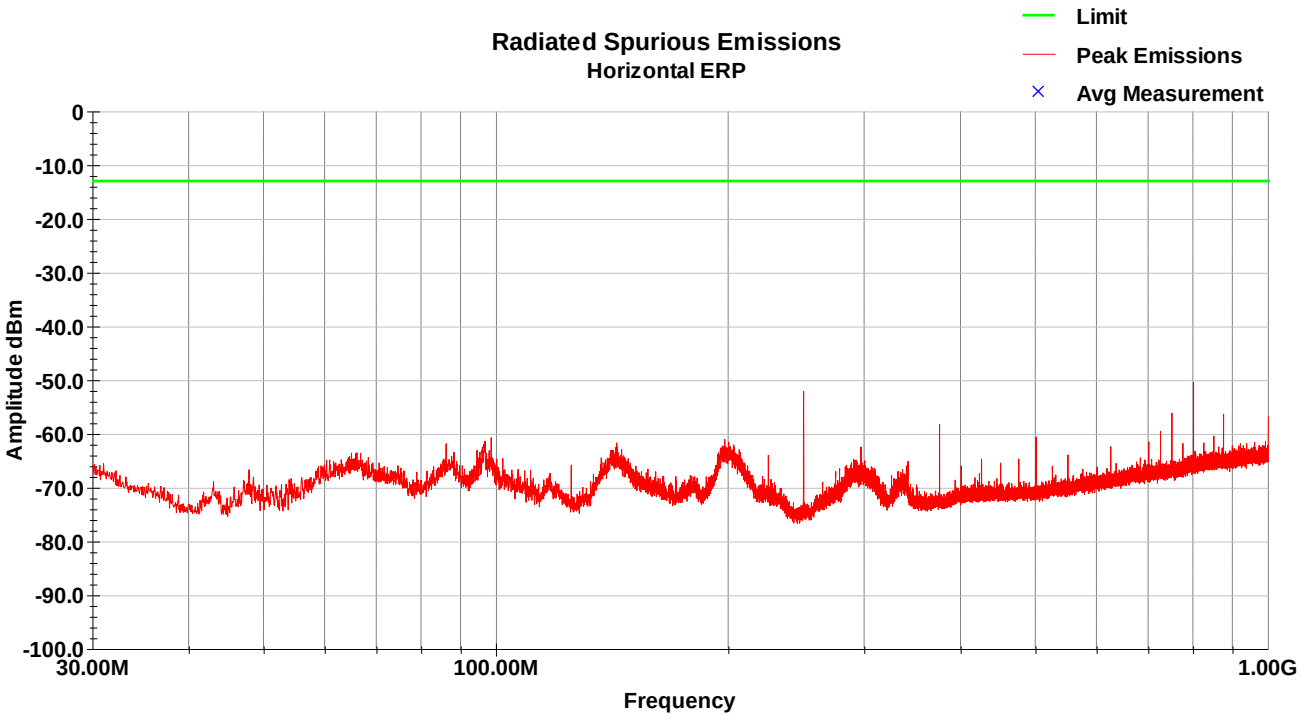
LTE Band 4 – MCH – 3-18GHz – Horizontal



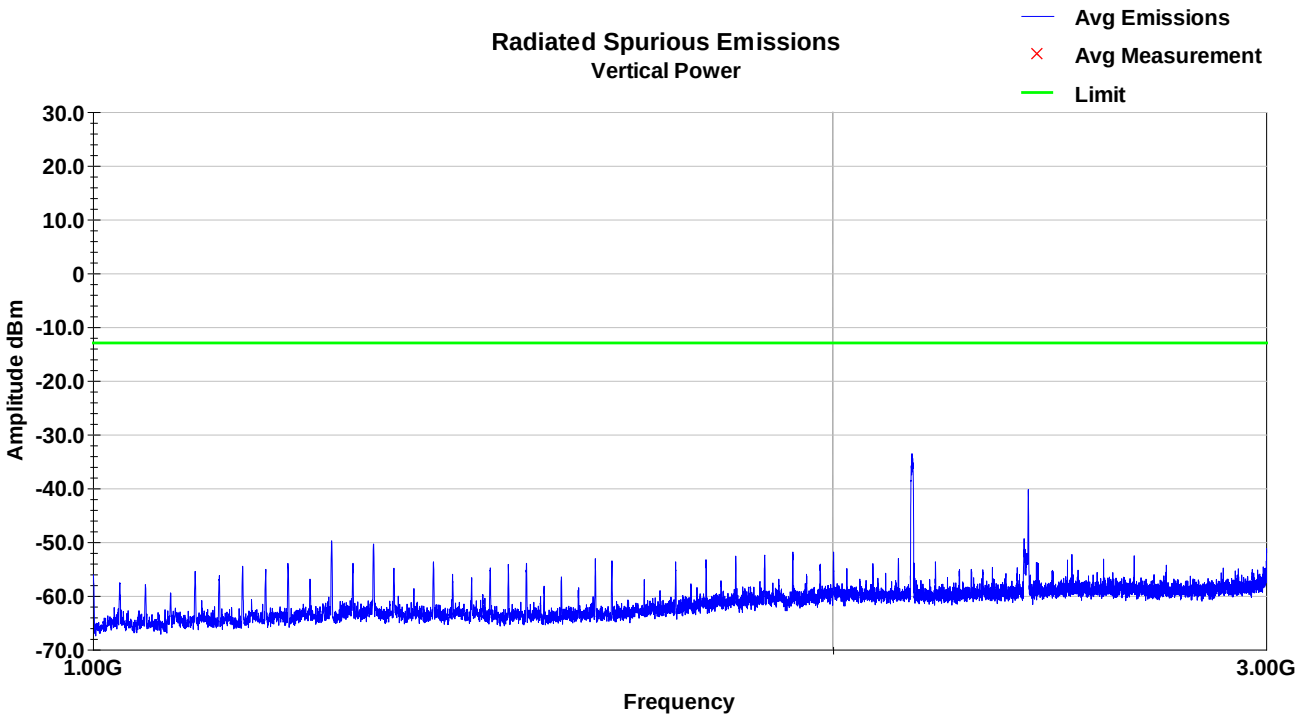
LTE Band 4 – HCH – 30-1000MHz – Vertical



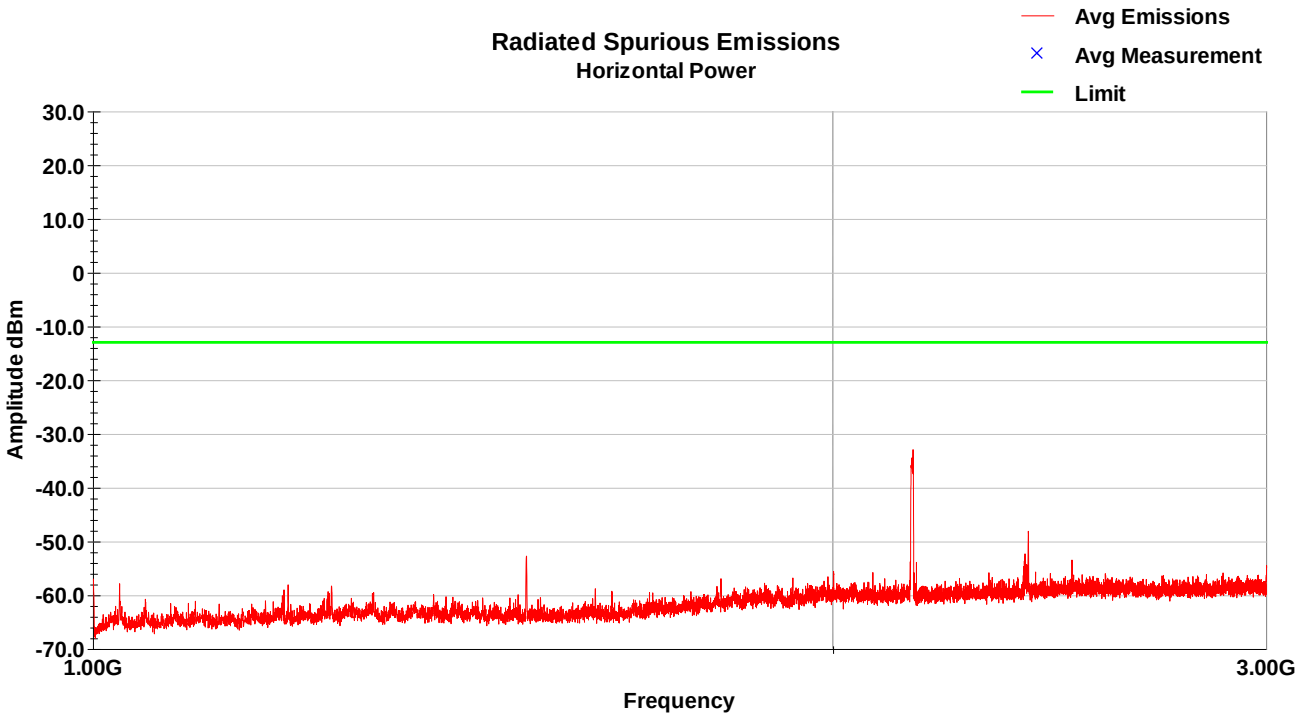
LTE Band 4 – HCH – 30-1000MHz – Horizontal



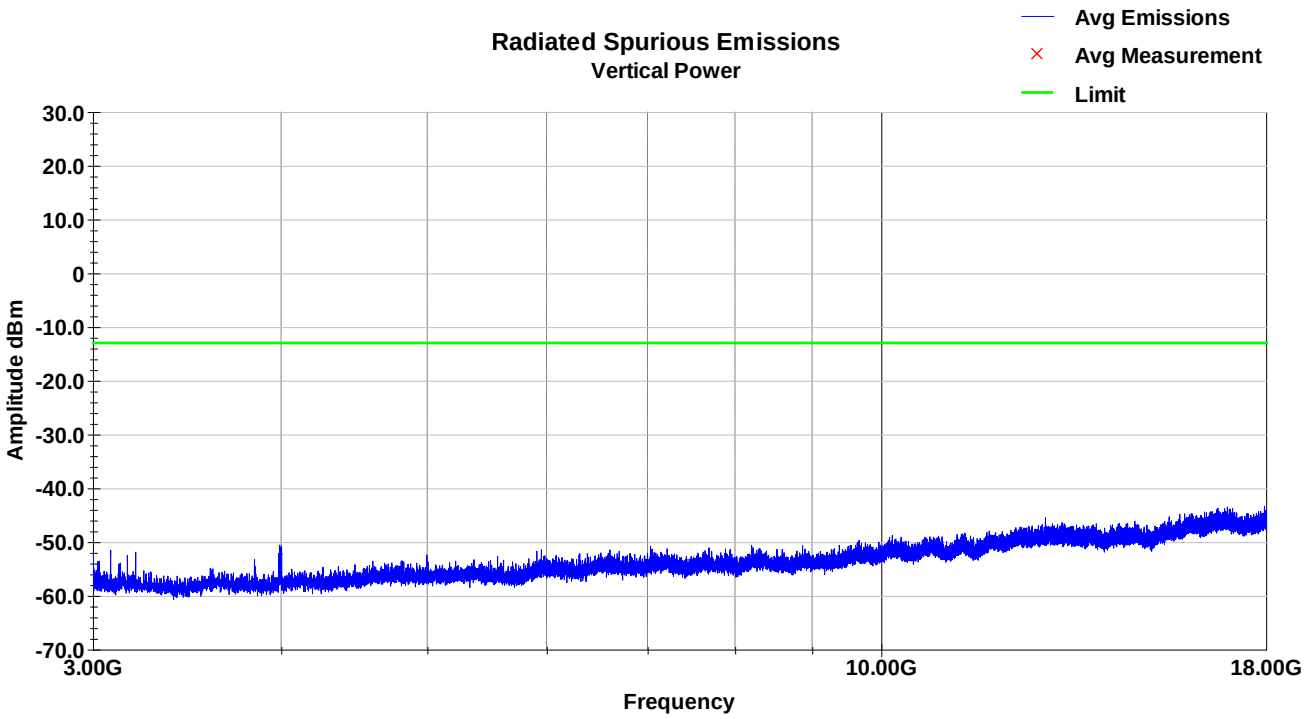
LTE Band 4 – HCH – 1-3GHz – Vertical



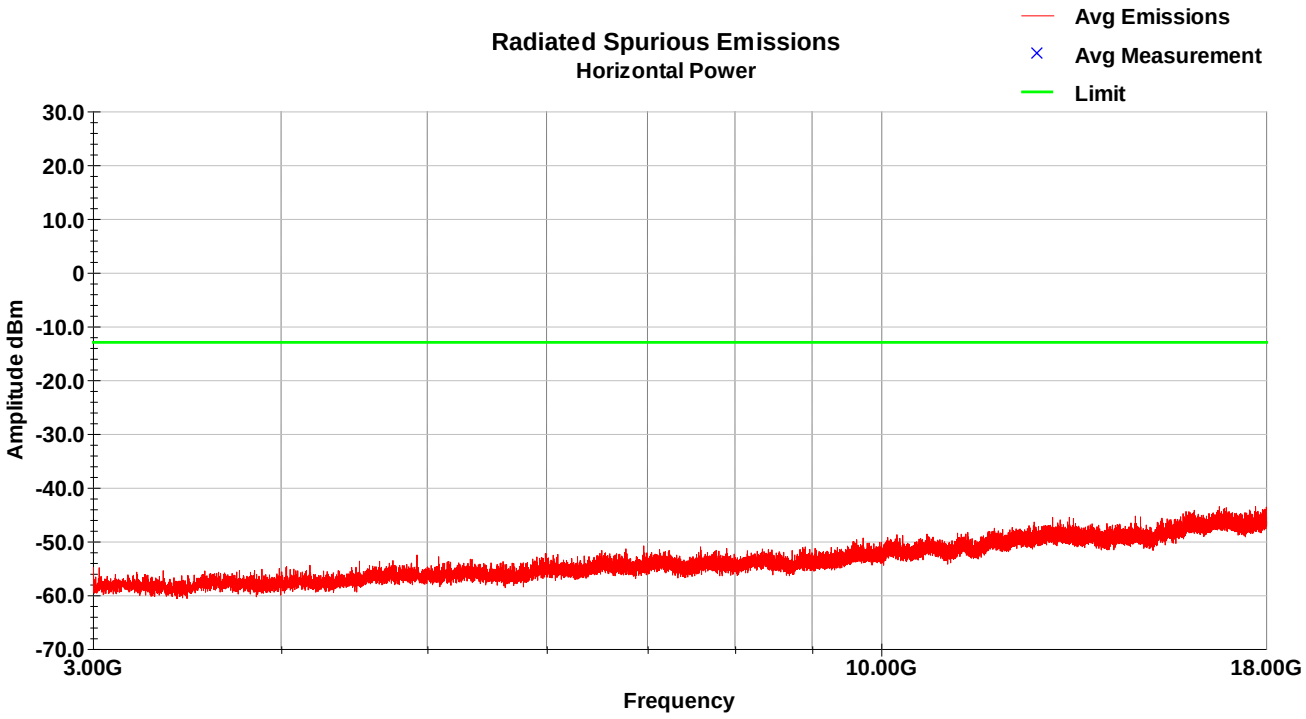
LTE Band 4 – HCH – 1-3GHz – Horizontal



LTE Band 4 – HCH – 3-18GHz – Vertical

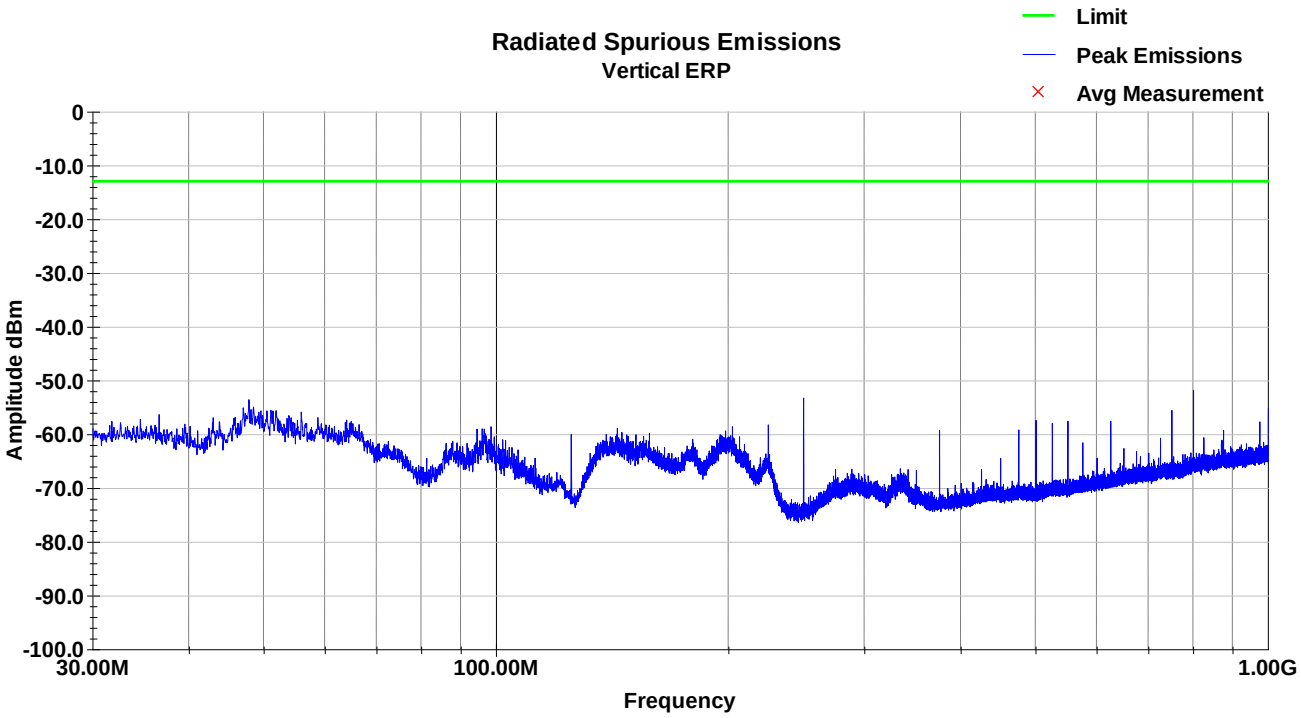


LTE Band 4 – HCH – 3-18GHz – Horizontal

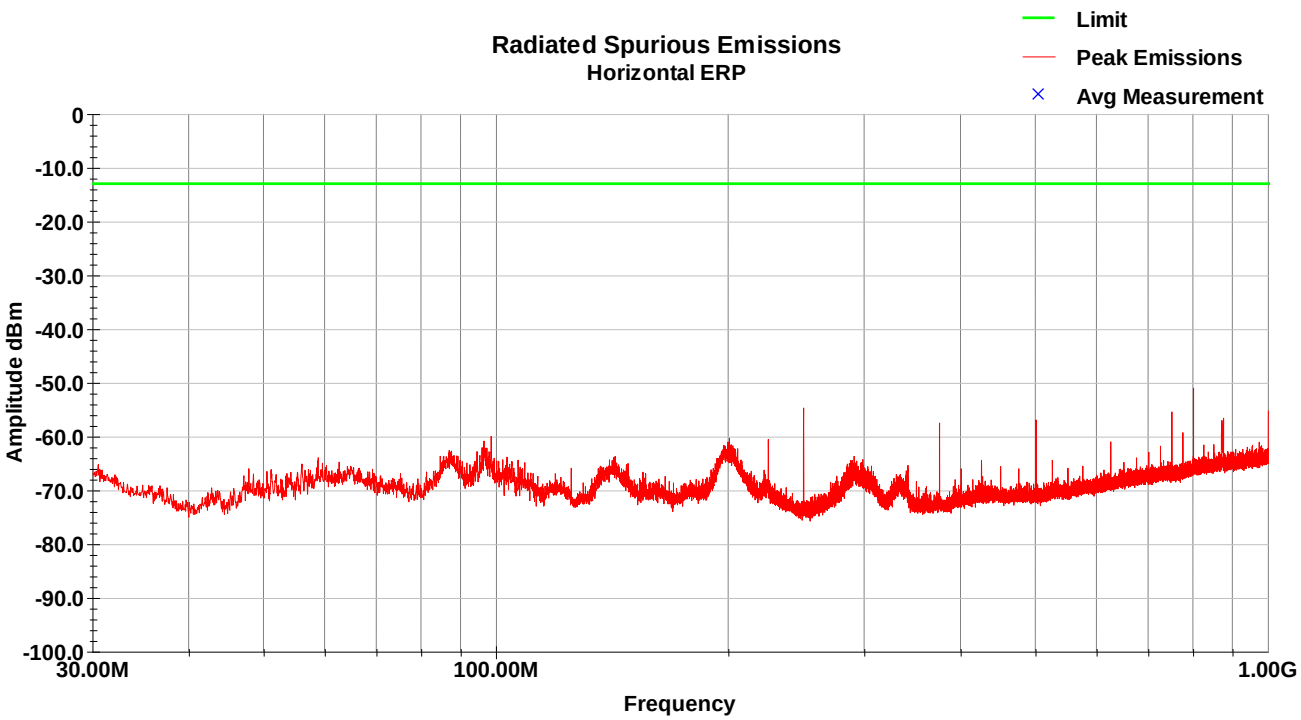


7.7 *Test Data – LTE Band 5*

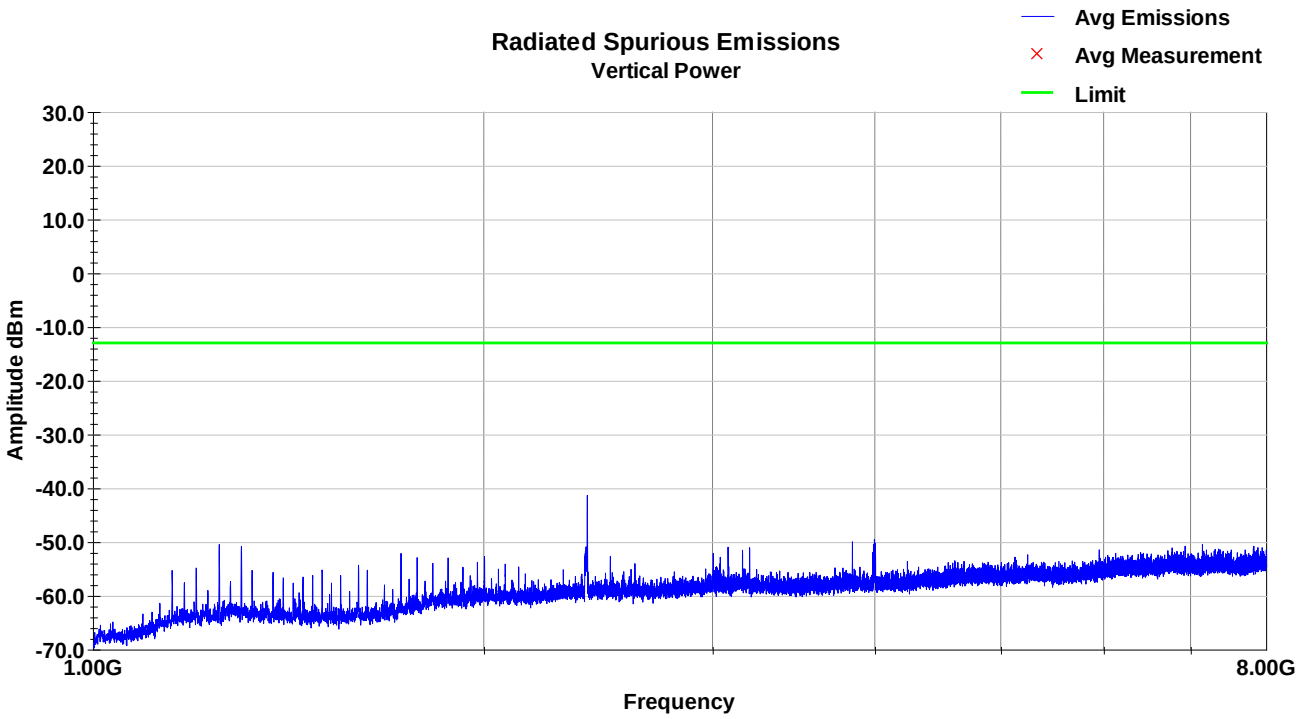
LTE Band 5 – LCH – 30-1000MHz – Vertical



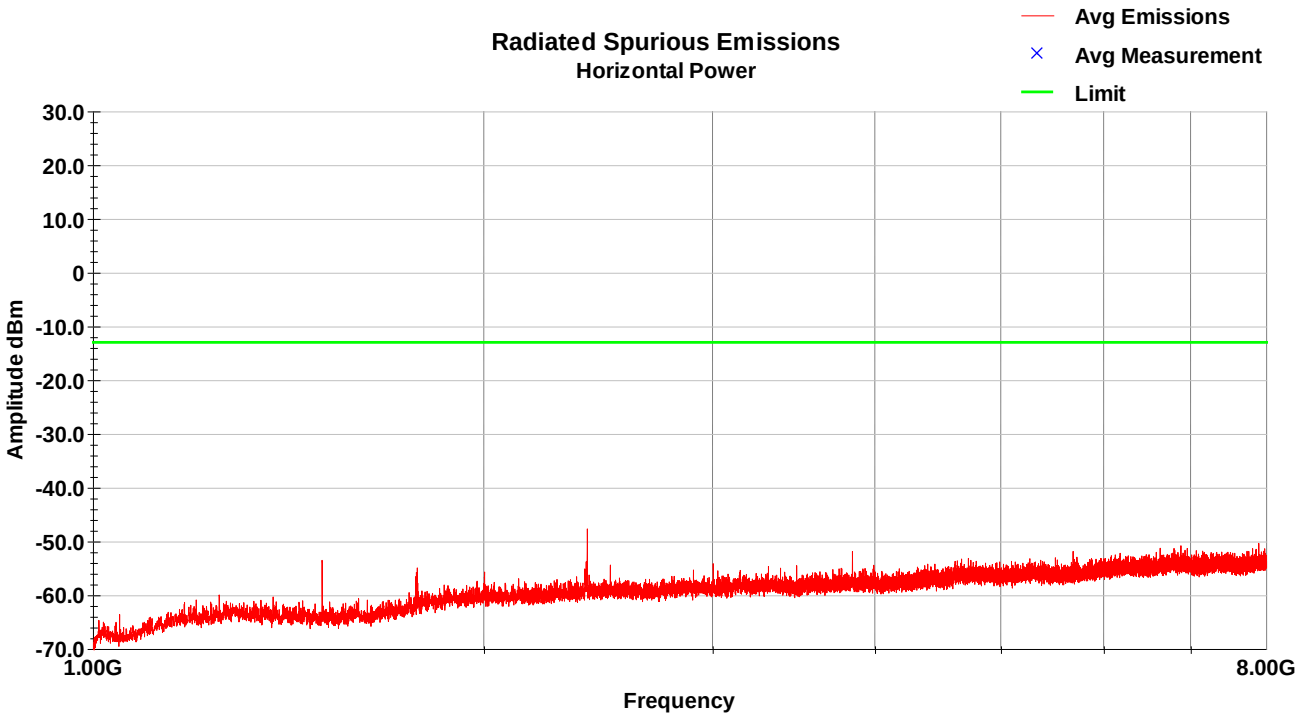
LTE Band 5 – LCH – 30-1000MHz – Horizontal



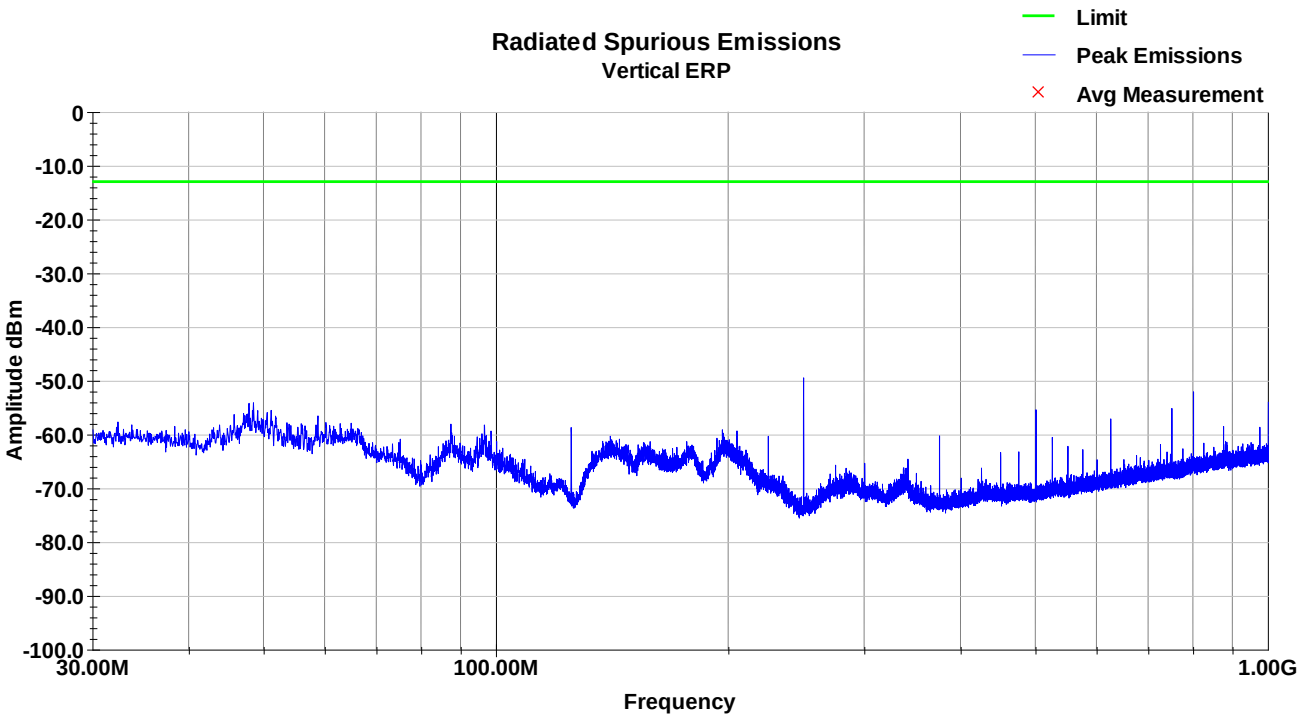
LTE Band 5 – LCH – 1-8GHz – Vertical



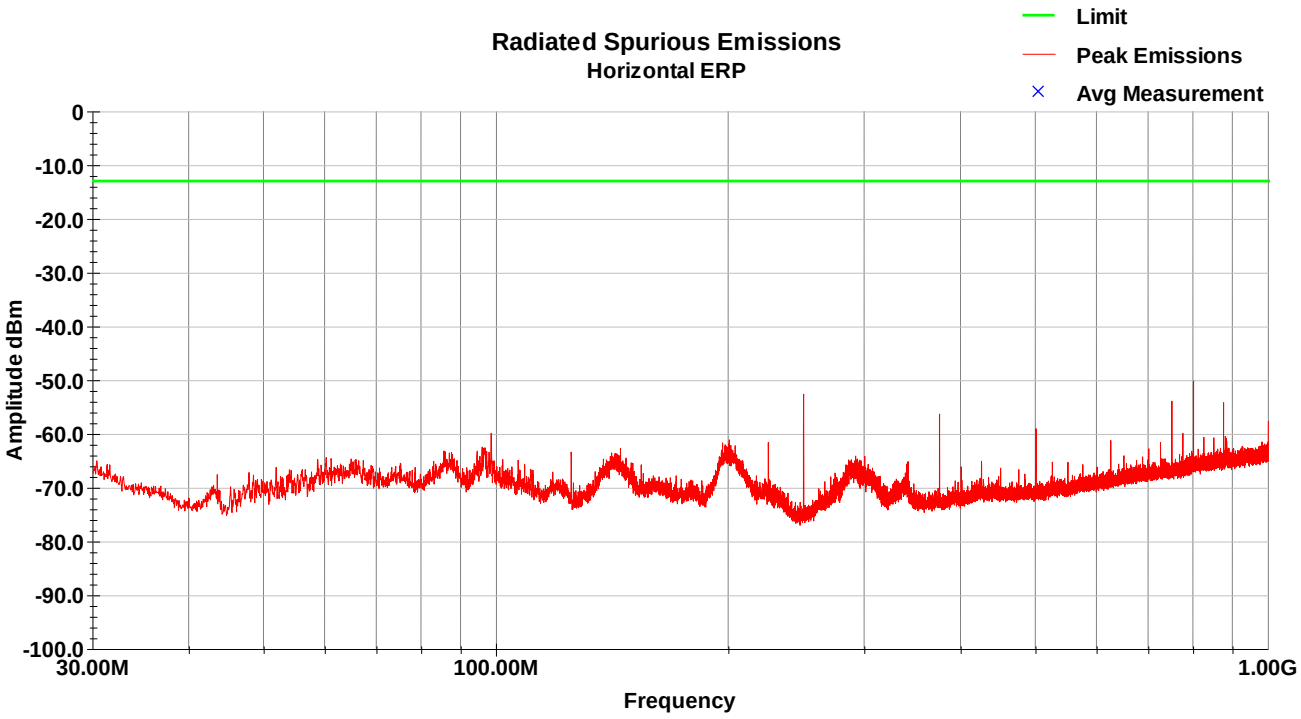
LTE Band 5 – LCH – 1-8GHz – Horizontal



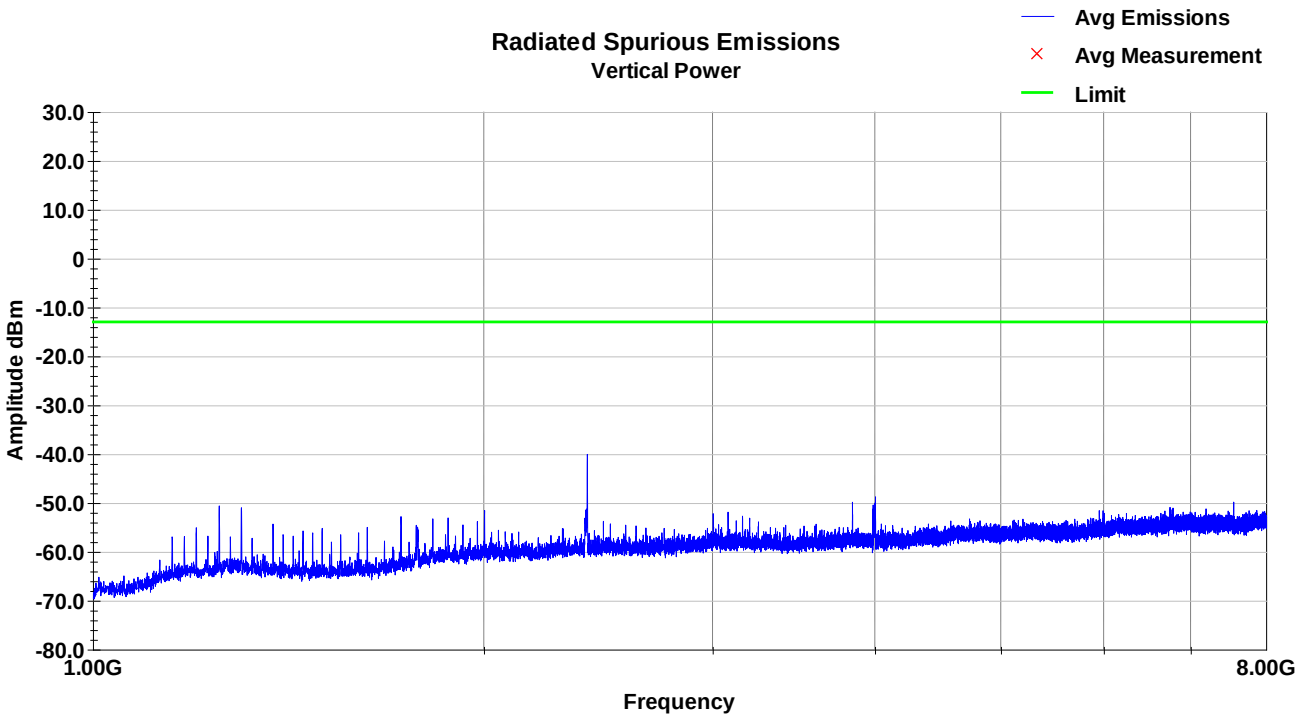
LTE Band 5 – MCH – 30-1000MHz – Vertical



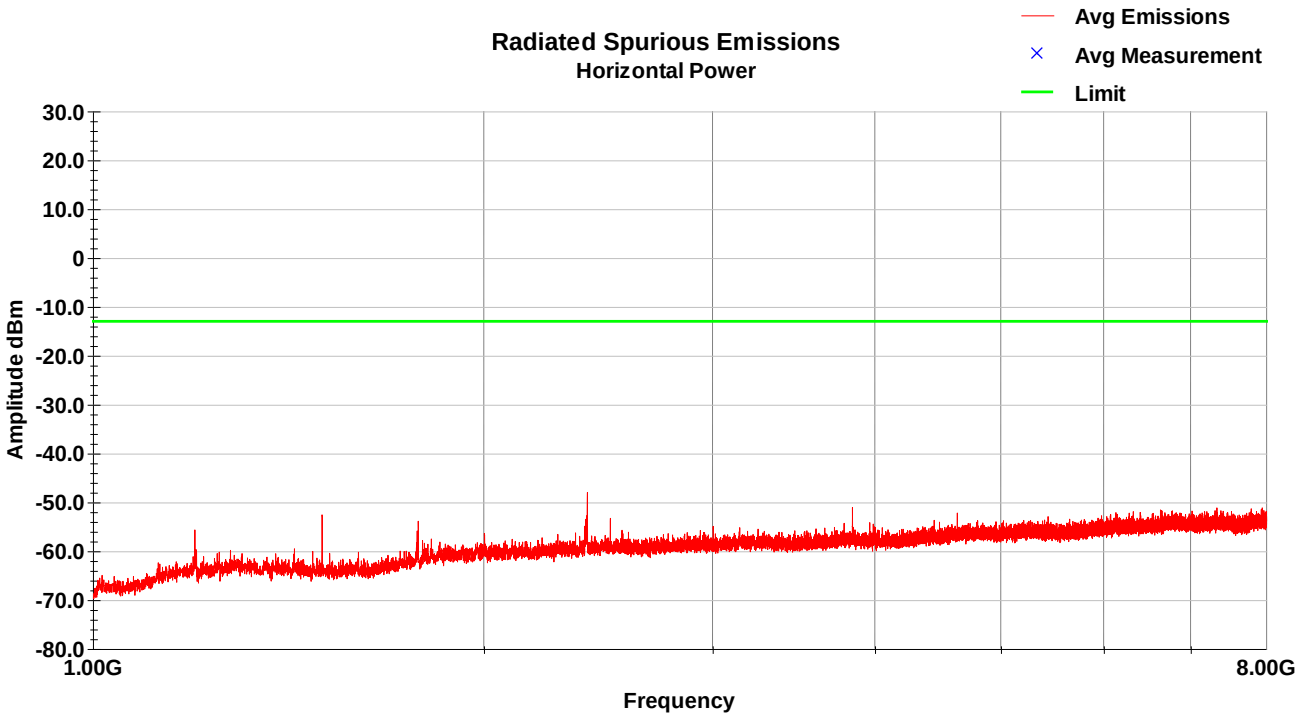
LTE Band 5 – MCH – 30-1000MHz – Horizontal



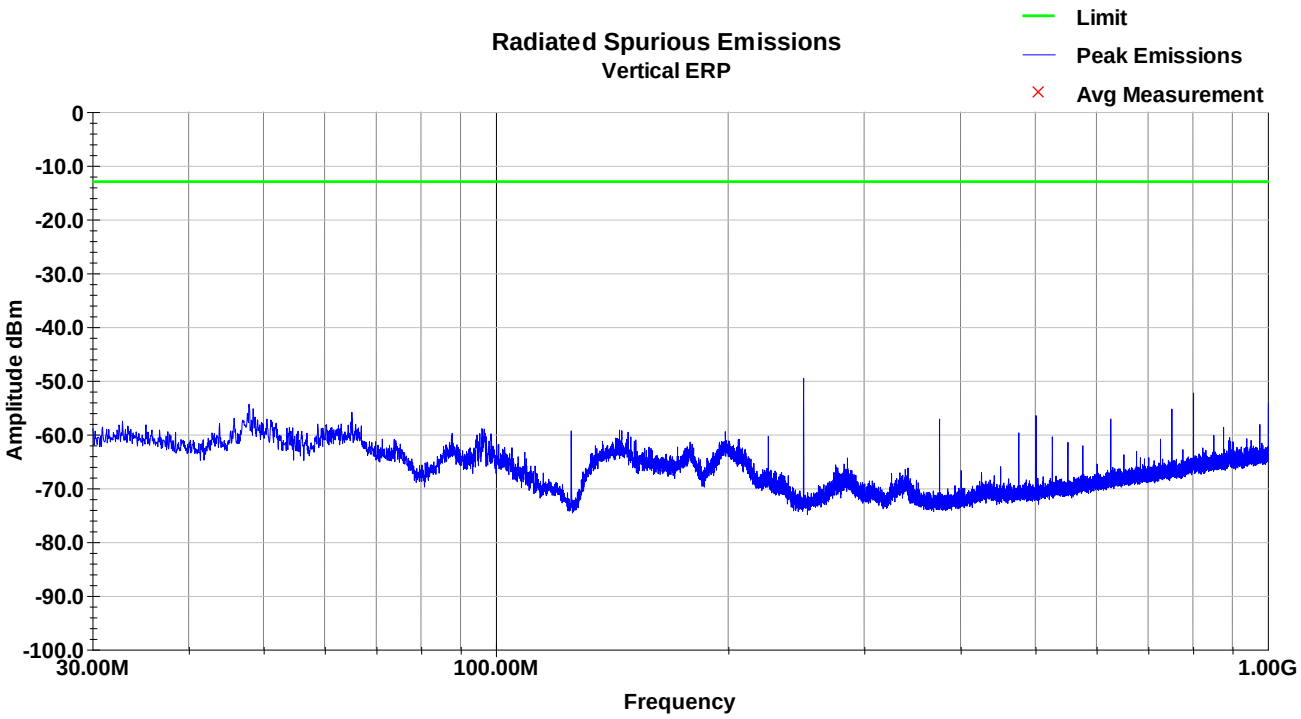
LTE Band 5 – MCH – 1-8GHz – Vertical



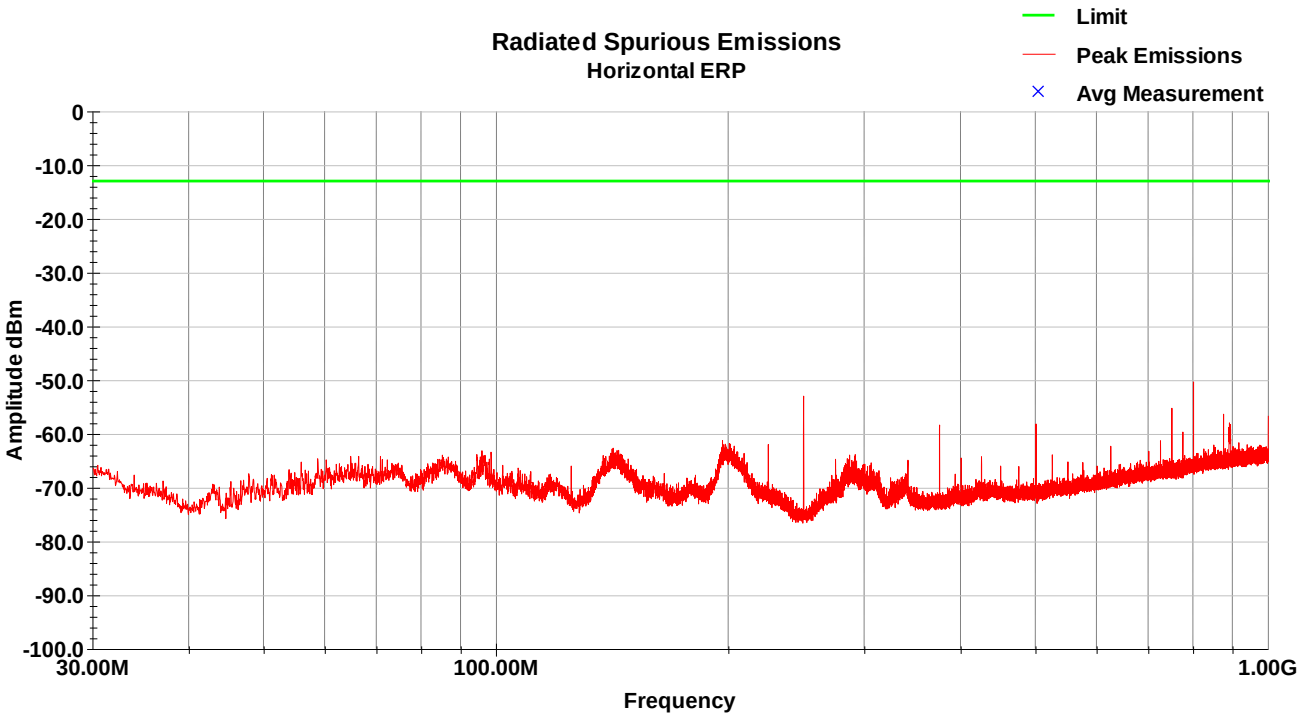
LTE Band 5 – MCH – 1-8GHz – Horizontal



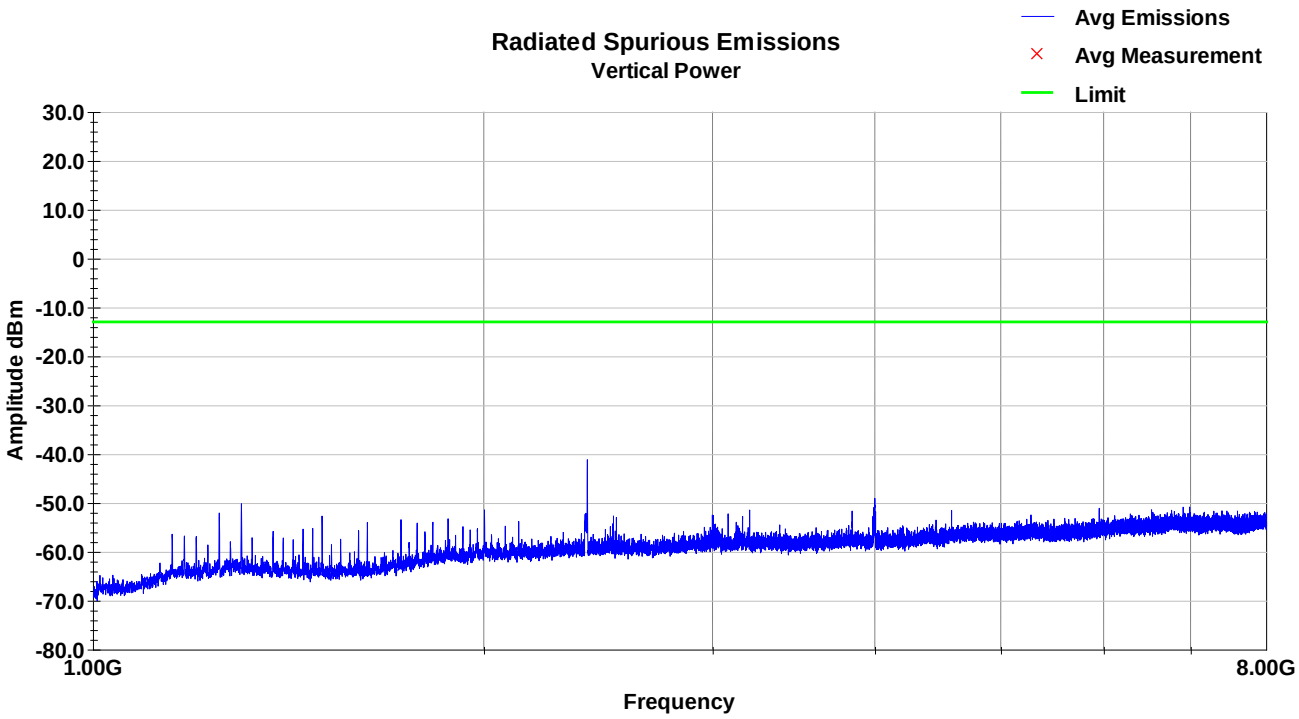
LTE Band 5 – HCH – 30-1000MHz – Vertical



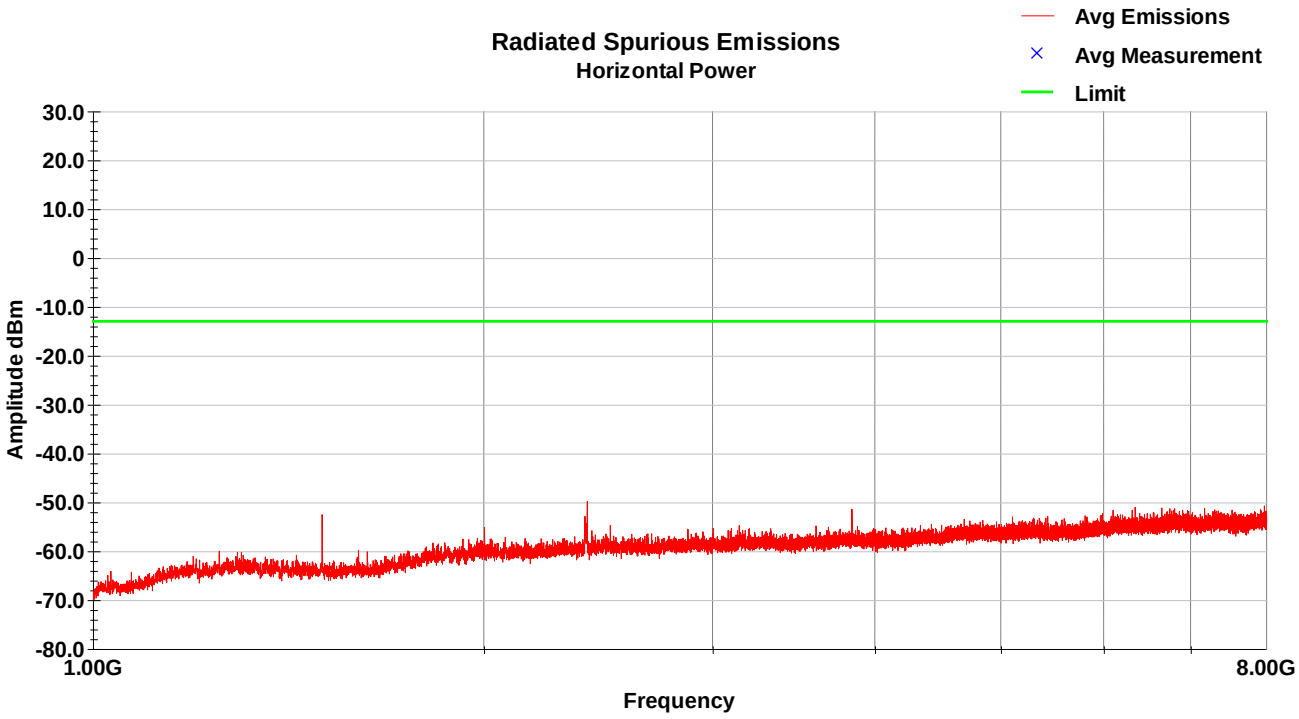
LTE Band 5 – HCH – 30-1000MHz – Horizontal



LTE Band 5 – HCH – 1-8GHz – Vertical



LTE Band 5 – HCH – 1-8GHz – Horizontal



8 Frequency Stability

8.1 *Test Result*

Test Description	Specification		Test Result
	FCC	ISED	
Frequency Stability	2.1055 22.355 24.235 27.54	RSS-GEN (6.11) RSS-132 (5.3) RSS-133 (6.3) RSS-139 (5.4)	Compliant

8.2 *Test Method*

The EUT was placed inside the Environmental Chamber and was left inside chamber to stabilize to set temperature for minimum of thirty minutes before any measurements were made. The EUT was tested at the middle channels of LTE Bands 2, 4, and 5.

8.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

8.4 *Test Equipment*

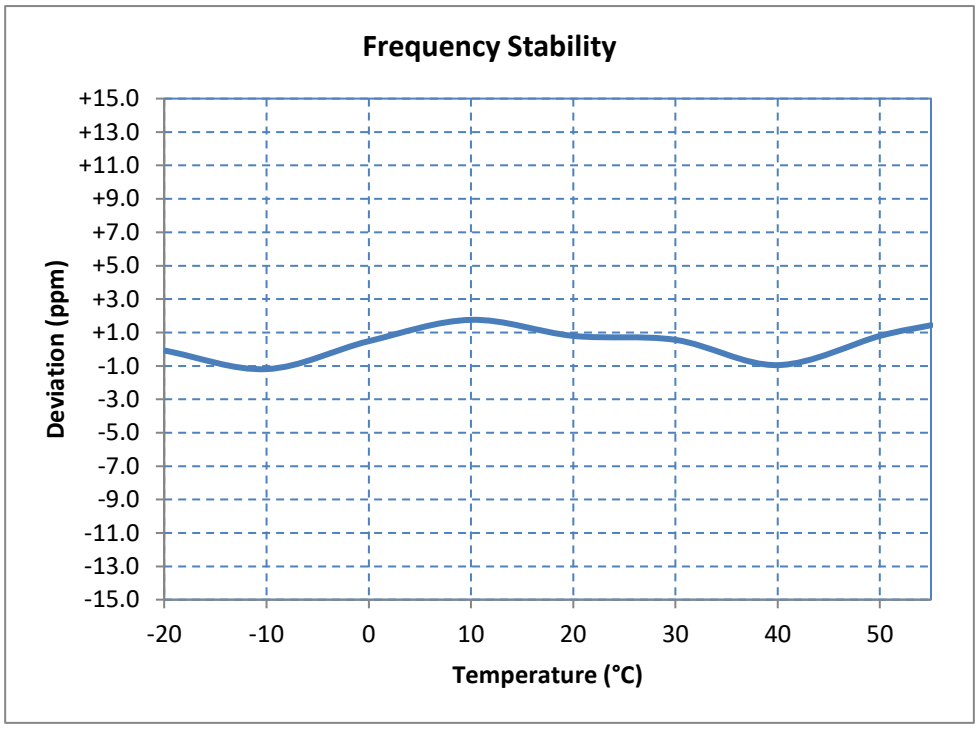
Test End Date: 29-Sep-2022 Tester: AB

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ENVIRONMENTAL TEST CHAMBER	S-8200	THERMOTRON	B079727	22-Nov-2021	22-Nov-2022
RF CABLE, SMA TO N	LL142	CENTRICRF	19011	16-Mar-2022	16-Mar-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023

8.5 *Test Data*

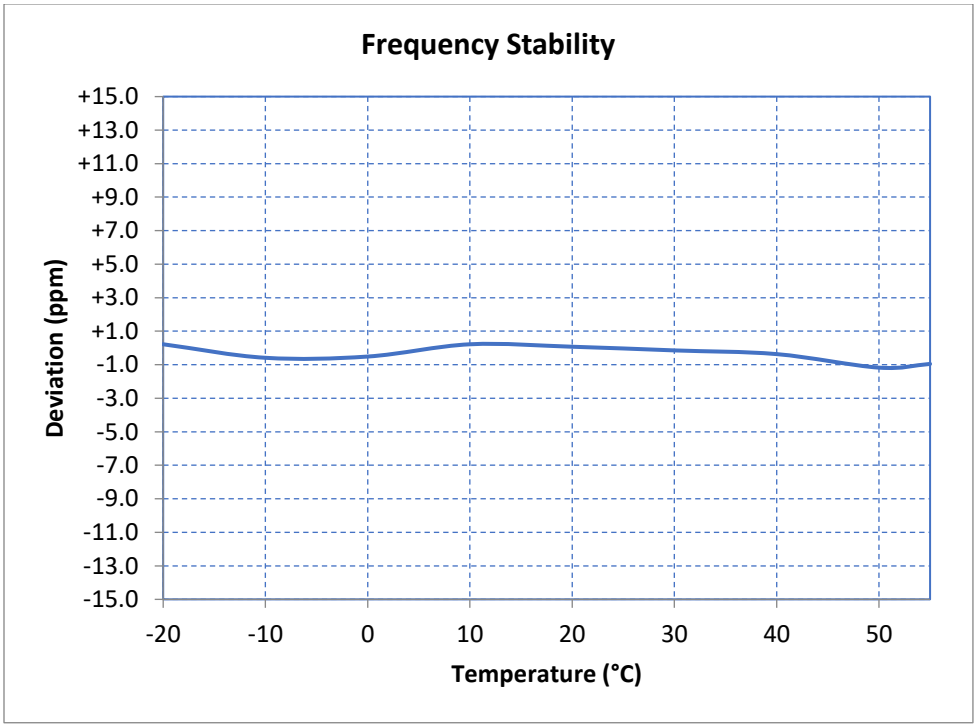
LTE Band 2, Middle Channel

Voltage %	Power Vac	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	120.00	+20 (Ref)	1,960,000,000	+0	+0.00	+0.000000
100%	120.00	-20	1,959,999,840	-160	-0.08	-0.000008
100%	120.00	-10	1,959,997,660	-2340	-1.19	-0.000119
100%	120.00	0	1,960,000,940	+940	+0.48	+0.000048
100%	120.00	+10	1,960,003,440	+3440	+1.76	+0.000176
100%	120.00	+20	1,960,001,560	+1560	+0.80	+0.000080
100%	120.00	+30	1,960,001,090	+1090	+0.56	+0.000056
100%	120.00	+40	1,959,998,130	-1870	-0.95	-0.000095
100%	120.00	+50	1,960,001,560	+1560	+0.80	+0.000080
100%	120.00	+55	1,960,002,810	+2810	+1.43	+0.000143
115%	138.00	+20	1,960,002,810	+2810	+1.43	+0.000143
85%	102.00	+20	1,959,996,250	-3750	-1.91	-0.000191



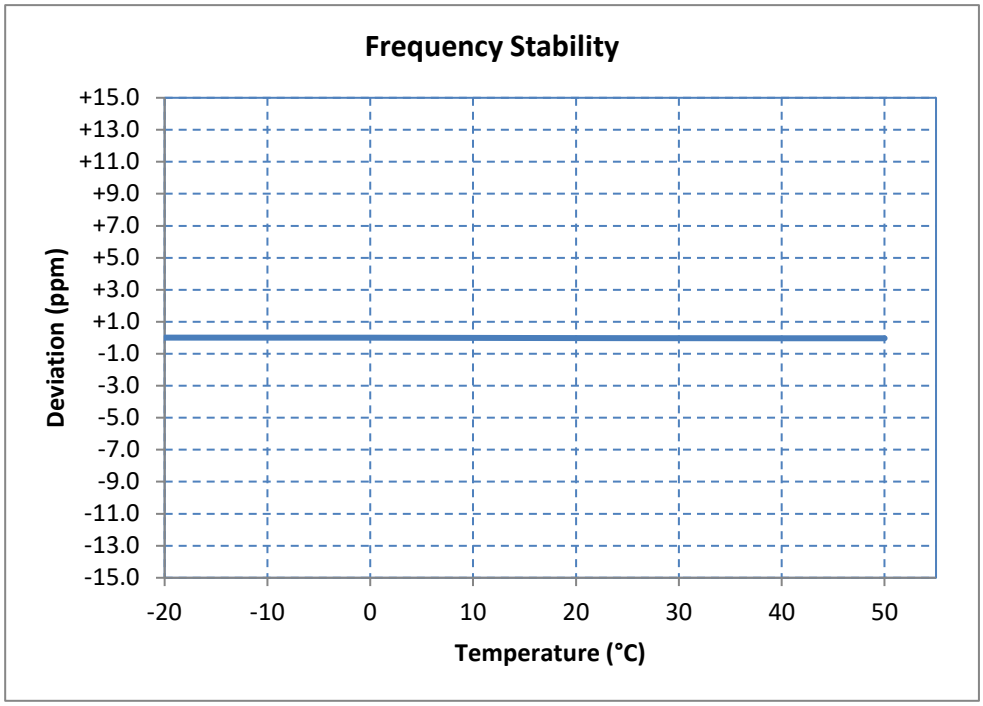
LTE Band 4, Middle Channel

Voltage %	Power Vac	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	120.00	+20 (Ref)	2,132,500,780	+0	+0.00	+0.000000
100%	120.00	-20	2,132,500,470	-310	-0.15	-0.000015
100%	120.00	-10	2,132,498,750	-2030	-0.95	-0.000095
100%	120.00	0	2,132,498,910	-1870	-0.88	-0.000088
100%	120.00	+10	2,132,500,470	-310	-0.15	-0.000015
100%	120.00	+20	2,132,500,160	-620	-0.29	-0.000029
100%	120.00	+30	2,132,499,690	-1090	-0.51	-0.000051
100%	120.00	+40	2,132,499,220	-1560	-0.73	-0.000073
100%	120.00	+50	2,132,497,500	-3280	-1.54	-0.000154
100%	120.00	+55	2,132,497,970	-2810	-1.32	-0.000132
115%	138.00	+20	2,132,498,130	-2650	-1.24	-0.000124
85%	102.00	+20	2,132,501,090	+310	+0.15	+0.000015



LTE Band 5, Middle Channel

Voltage %	Power Vac	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	120.00	+20 (Ref)	881,499,921	+0	+0.00	+0.000000
100%	120.00	-20	881,499,924	+3	+0.00	+0.000000
100%	120.00	-10	881,499,923	+2	+0.00	+0.000000
100%	120.00	0	881,499,922	+1	+0.00	+0.000000
100%	120.00	+10	881,499,913	-8	-0.01	-0.000001
100%	120.00	+20	881,499,906	-15	-0.02	-0.000002
100%	120.00	+30	881,499,902	-19	-0.02	-0.000002
100%	120.00	+40	881,499,899	-22	-0.02	-0.000002
100%	120.00	+50	881,499,899	-22	-0.02	-0.000002
100%	100.00	+55	881,499,904	-17	-0.02	-0.000002
115%	138.00	+20	881,499,944	+23	+0.03	+0.000003
85%	102.00	+20	881,499,945	+24	+0.03	+0.000003



9 Measurement Uncertainty

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

	Expanded Uncertainty for Normal k factor equal to 2	
Parameter	Required	Laboratory Actual
Radio Frequency	±1 x 10-5	±9.8 x 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	±1°C	±0.5°C
humidity	±5 %	±3.5%
DC and low frequency voltages	±3 %	±0.4%

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	12 January 2023
1	- Added FCC ID on title page. - Corrected section numbering.	13 February 2023