EMC Test Report

Project Number: 4323476

Report Number: 4323476EMC02 **Revision Level:** 0

Client: Continental Automotive Systems, Inc.

Equipment Under Test: Wireless Modem Module

Model: BL28NA-003

FCC ID: LHJ-BL28NA003

IC ID: 2807E-BL28NA003

FCC Rule Parts: Part 2, Part 22(H), Part 24(E), Part 27

Industry Canada: RSS-GEN, Issue 5

RSS-132, Issue 3

RSS-133 Issue 6

RSS-139, Issue 3

Report issued on: 04 September 2018

Test Result: Compliant

Tested by: Martin Taylor, Project Engineer

Reviewed by: David Schramm, Operations 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	Reported
24.232(d) 27.50(d)(5)	RSS-132 (5.4) RSS-133 (6.4) RSS-139 (6.5)	Peak-to-Average Ratio		Pass
2.1049 22.917(b) 24.238(b) 27.53(h)(3)	RSS-GEN (6.7) RSS-133 (2.3)	Occupied Bandwidth		Reported
2.1051 22.917(a) 24.238(a) 27.53(h)	RSS-132 (5.5) RSS-133 (6.5.1) RSS-139 (6.6)	Band Edge / Conducted Spurious Emissions		Pass
22.913(a)(5)	--	Effective Radiated Power	Radiated	Pass
24.232(c) 27.50(d)(4)	RSS-132 (5.4) RSS-133 (6.4) RSS-139 (6.5)	Effective Isotropic Radiated Power		Pass
2.1053 22.917(a) 24.238(a) 27.53(h)	RSS-GEN (6.13) RSS-132 (5.5) RSS-133 (6.5.1) RSS-139 (6.6)	Radiated Spurious Emissions		Pass
2.1055 24.235 27.54	RSS-GEN (6.11) RSS-132 (5.3) RSS-133 (6.3) RSS-139 (6.4)	Frequency Stability	Conducted	Pass

1.1 *Modifications Required to Compliance*

None

2 General Information

2.1 *Client Information*

Name:	Continental Automotive Systems, Inc.
Address:	21440 West Lake Cook Road
City, State, Zip, Country:	Deer Park, IL 60010, 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

2.3 *General Information of EUT*

Type of Product:	Wireless Modem Module
Model Number:	BL28NA-003
Serial Number:	ADN180505317640
FCC ID:	LHJ-BL28NA003
IC ID:	2807E-BL28NA003
IMEI Number:	004401810317640
Rated Voltage:	10.2 – 13.8 Vdc
Test Voltage:	12 Vdc, 10.2 Vdc, 13.8 Vdc
Tx Frequency Range:	826.4 – 846.6 MHz (WCDMA Band V) 1712.4 – 1752.6 (WCDMA Band IV) 1852.4 – 1907.6 MHz (WCDMA Band II)
FCC Classification:	PCS Licensed Transmitter PCB
Type:	Pre-Production
Sample Received Date:	13 June 2018
Dates of testing:	13 July – 14 August 2018

2.4 *Operating Modes and Conditions*

The EUT was exercised by connecting a CMW 500 Radio Communication Tester to the device. The CMW was used to control signaling and channel during testing.

3 RF Output Power

3.1 *Test Result*

Test Description	Basic Standards	Test Result
RF Output Power	FCC 2.1046 RSS-GEN (6.12)	Reported

3.2 *Test Method*

The EUT was directly connected to a Radio Communication Tester (CMW 500) and a radio link was established. The output power of the EUT was set to maximum value by using the maximum power setting on the CMW. The output power was measured using the CMW internal measurement functions.

3.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	23.7 °C
Relative Humidity:	52.8 %
Atmospheric Pressure:	97.8 kPa

3.4 *Test Equipment*

Test End Date: 18-Jul-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF CABLE	141	HUBER & SUHNER	B095588	25-Jul-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- Based on manufacturer's specifications, the CMW 500 is on a 2-year calibration cycle.

3.5 *Test Data*

HSUPA

Band	UpLink Channel	UL Frequency (MHz)	Subtest	Measured Power (dBm)	Cable Loss (dB)	Conducted Power (dBm)
Band 2	9262	1852.4	Subtest1	20.87	0.53	21.40
Band 2	9400	1880	Subtest1	21.44	0.54	21.98
Band 2	9538	1907.6	Subtest1	21.49	0.54	22.03
Band 2	9262	1852.4	Subtest2	20.43	0.53	20.96
Band 2	9400	1880	Subtest2	20.70	0.54	21.24
Band 2	9538	1907.6	Subtest2	20.16	0.54	20.70
Band 2	9262	1852.4	Subtest3	20.09	0.53	20.62
Band 2	9400	1880	Subtest3	20.14	0.54	20.68
Band 2	9538	1907.6	Subtest3	19.72	0.54	20.26
Band 2	9262	1852.4	Subtest4	20.75	0.53	21.28
Band 2	9400	1880	Subtest4	21.14	0.54	21.68
Band 2	9538	1907.6	Subtest4	21.11	0.54	21.65
Band 2	9262	1852.4	Subtest5	21.08	0.53	21.61
Band 2	9400	1880	Subtest5	21.50	0.54	22.04
Band 2	9538	1907.6	Subtest5	21.35	0.54	21.89
Band 4	1313	1712.6	Subtest1	21.48	0.51	21.99
Band 4	1450	1740	Subtest1	21.27	0.52	21.79
Band 4	1512	1752.4	Subtest1	20.86	0.52	21.38
Band 4	1313	1712.6	Subtest2	20.86	0.51	21.37
Band 4	1450	1740	Subtest2	20.04	0.52	20.56
Band 4	1512	1752.4	Subtest2	20.47	0.52	20.99
Band 4	1313	1712.6	Subtest3	20.64	0.51	21.15
Band 4	1450	1740	Subtest3	20.49	0.52	21.01
Band 4	1512	1752.4	Subtest3	20.16	0.52	20.68
Band 4	1313	1712.6	Subtest4	21.29	0.51	21.80
Band 4	1450	1740	Subtest4	21.04	0.52	21.56
Band 4	1512	1752.4	Subtest4	20.78	0.52	21.30
Band 4	1313	1712.6	Subtest5	21.54	0.51	22.05
Band 4	1450	1740	Subtest5	21.31	0.52	21.83
Band 4	1512	1752.4	Subtest5	21.28	0.52	21.80
Band 5	4132	826.4	Subtest1	22.26	0.35	22.61
Band 5	4175	835	Subtest1	21.33	0.35	21.68
Band 5	4233	846.6	Subtest1	21.68	0.35	22.03
Band 5	4132	826.4	Subtest2	20.75	0.35	21.10
Band 5	4175	835	Subtest2	21.03	0.35	21.38
Band 5	4233	846.6	Subtest2	20.51	0.35	20.86
Band 5	4132	826.4	Subtest3	21.08	0.35	21.43
Band 5	4175	835	Subtest3	20.51	0.35	20.86
Band 5	4233	846.6	Subtest3	20.66	0.35	21.01
Band 5	4132	826.4	Subtest4	21.17	0.35	21.52
Band 5	4175	835	Subtest4	21.11	0.35	21.46
Band 5	4233	846.6	Subtest4	20.68	0.35	21.03
Band 5	4132	826.4	Subtest5	22.15	0.35	22.50
Band 5	4175	835	Subtest5	22.03	0.35	22.38
Band 5	4233	846.6	Subtest5	21.59	0.35	21.94

HSDPA QPSK

Band	UpLink Channel	UL Frequency (MHz)	Modulation	Subtest	Measured Power (dBm)	Cable Loss (dB)	Conducted Power (dBm)
Band 2	9262	1852.4	QPSK	Subtest1	21.31	0.53	21.84
Band 2	9400	1880	QPSK	Subtest1	21.57	0.54	22.11
Band 2	9538	1907.6	QPSK	Subtest1	21.50	0.54	22.04
Band 2	9262	1852.4	QPSK	Subtest2	21.11	0.53	21.64
Band 2	9400	1880	QPSK	Subtest2	21.47	0.54	22.01
Band 2	9538	1907.6	QPSK	Subtest2	21.50	0.54	22.04
Band 2	9262	1852.4	QPSK	Subtest3	20.75	0.53	21.28
Band 2	9400	1880	QPSK	Subtest3	20.94	0.54	21.48
Band 2	9538	1907.6	QPSK	Subtest3	20.88	0.54	21.42
Band 2	9262	1852.4	QPSK	Subtest4	20.75	0.53	21.28
Band 2	9400	1880	QPSK	Subtest4	20.93	0.54	21.47
Band 2	9538	1907.6	QPSK	Subtest4	20.68	0.54	21.22
Band 4	1313	1712.6	QPSK	Subtest1	21.76	0.51	22.27
Band 4	1450	1740	QPSK	Subtest1	21.36	0.52	21.88
Band 4	1512	1752.4	QPSK	Subtest1	21.64	0.52	22.16
Band 4	1313	1712.6	QPSK	Subtest2	21.76	0.51	22.27
Band 4	1450	1740	QPSK	Subtest2	21.39	0.52	21.91
Band 4	1512	1752.4	QPSK	Subtest2	21.58	0.52	22.10
Band 4	1313	1712.6	QPSK	Subtest3	21.27	0.51	21.78
Band 4	1450	1740	QPSK	Subtest3	21.01	0.52	21.53
Band 4	1512	1752.4	QPSK	Subtest3	21.12	0.52	21.64
Band 4	1313	1712.6	QPSK	Subtest4	21.18	0.51	21.69
Band 4	1450	1740	QPSK	Subtest4	21.02	0.52	21.54
Band 4	1512	1752.4	QPSK	Subtest4	21.12	0.52	21.64
Band 5	4132	826.4	QPSK	Subtest1	22.13	0.35	22.48
Band 5	4175	835	QPSK	Subtest1	21.97	0.35	22.32
Band 5	4233	846.6	QPSK	Subtest1	21.69	0.35	22.04
Band 5	4132	826.4	QPSK	Subtest2	22.09	0.35	22.44
Band 5	4175	835	QPSK	Subtest2	22.05	0.35	22.40
Band 5	4233	846.6	QPSK	Subtest2	21.69	0.35	22.04
Band 5	4132	826.4	QPSK	Subtest3	21.60	0.35	21.95
Band 5	4175	835	QPSK	Subtest3	21.44	0.35	21.79
Band 5	4233	846.6	QPSK	Subtest3	21.19	0.35	21.54
Band 5	4132	826.4	QPSK	Subtest4	21.67	0.35	22.02
Band 5	4175	835	QPSK	Subtest4	21.43	0.35	21.78
Band 5	4233	846.6	QPSK	Subtest4	21.18	0.35	21.53

HSDPA 16-QAM

Band	UpLink Channel	UL Frequency (MHz)	Modulation	Subtest	Measured Power (dBm)	Cable Loss (dB)	Conducted Power (dBm)
Band 2	9262	1852.4	16-QAM	Subtest1	21.28	0.53	21.81
Band 2	9400	1880	16-QAM	Subtest1	21.65	0.54	22.19
Band 2	9538	1907.6	16-QAM	Subtest1	21.59	0.54	22.13
Band 2	9262	1852.4	16-QAM	Subtest2	21.24	0.53	21.77
Band 2	9400	1880	16-QAM	Subtest2	21.47	0.54	22.01
Band 2	9538	1907.6	16-QAM	Subtest2	21.60	0.54	22.14
Band 2	9262	1852.4	16-QAM	Subtest3	20.74	0.53	21.27
Band 2	9400	1880	16-QAM	Subtest3	21.02	0.54	21.56
Band 2	9538	1907.6	16-QAM	Subtest3	20.87	0.54	21.41
Band 2	9262	1852.4	16-QAM	Subtest4	20.73	0.53	21.26
Band 2	9400	1880	16-QAM	Subtest4	21.02	0.54	21.56
Band 2	9538	1907.6	16-QAM	Subtest4	20.86	0.54	21.40
Band 4	1313	1712.6	16-QAM	Subtest1	21.74	0.51	22.25
Band 4	1450	1740	16-QAM	Subtest1	21.44	0.52	21.96
Band 4	1512	1752.4	16-QAM	Subtest1	21.62	0.52	22.14
Band 4	1313	1712.6	16-QAM	Subtest2	21.74	0.51	22.25
Band 4	1450	1740	16-QAM	Subtest2	21.38	0.52	21.90
Band 4	1512	1752.4	16-QAM	Subtest2	21.56	0.52	22.08
Band 4	1313	1712.6	16-QAM	Subtest3	21.26	0.51	21.77
Band 4	1450	1740	16-QAM	Subtest3	21.00	0.52	21.52
Band 4	1512	1752.4	16-QAM	Subtest3	21.10	0.52	21.62
Band 4	1313	1712.6	16-QAM	Subtest4	21.16	0.51	21.67
Band 4	1450	1740	16-QAM	Subtest4	21.00	0.52	21.52
Band 4	1512	1752.4	16-QAM	Subtest4	21.11	0.52	21.63
Band 5	4132	826.4	16-QAM	Subtest1	22.12	0.35	22.47
Band 5	4175	835	16-QAM	Subtest1	22.04	0.35	22.39
Band 5	4233	846.6	16-QAM	Subtest1	21.68	0.35	22.03
Band 5	4132	826.4	16-QAM	Subtest2	22.19	0.35	22.54
Band 5	4175	835	16-QAM	Subtest2	22.03	0.35	22.38
Band 5	4233	846.6	16-QAM	Subtest2	21.68	0.35	22.03
Band 5	4132	826.4	16-QAM	Subtest3	21.69	0.35	22.04
Band 5	4175	835	16-QAM	Subtest3	21.53	0.35	21.88
Band 5	4233	846.6	16-QAM	Subtest3	21.19	0.35	21.54
Band 5	4132	826.4	16-QAM	Subtest4	21.65	0.35	22.00
Band 5	4175	835	16-QAM	Subtest4	21.53	0.35	21.88
Band 5	4233	846.6	16-QAM	Subtest4	21.17	0.35	21.52

Overall highest power levels:
Band II Max: 22.19dBm (0.166W)
Band IV Max: 22.27dBm (0.169W)
Band V Max: 22.61dBm (0.182W)

4 Peak to Average Ratio

4.1 *Test Result*

Test Description	Basic Standards	Test Result
Peak to Average Ratio	FCC 24.232(d) FCC 27.50(d)(5) RSS-132 (5.4) RSS-133 (6.4) RSS-139 (6.5)	Pass

4.2 *Test Method*

KDB document 971168 D01 Power Meas License Digital Systems v03r01 was used to determine the peak-to-average power ratio. Clause 5.7.2 references ANSI C63.26-2015 Subclause 5.2.3.4 which defines the measurement method using the CCDF function of the spectrum analyzer. Measurements were recorded on the middle channel of each band at the highest power.

4.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	22.7 °C
Relative Humidity:	49.1 %
Atmospheric Pressure:	98.1 kPa

4.4 *Test Equipment*

Test End Date: 13-Jul-2018 Tester: MT

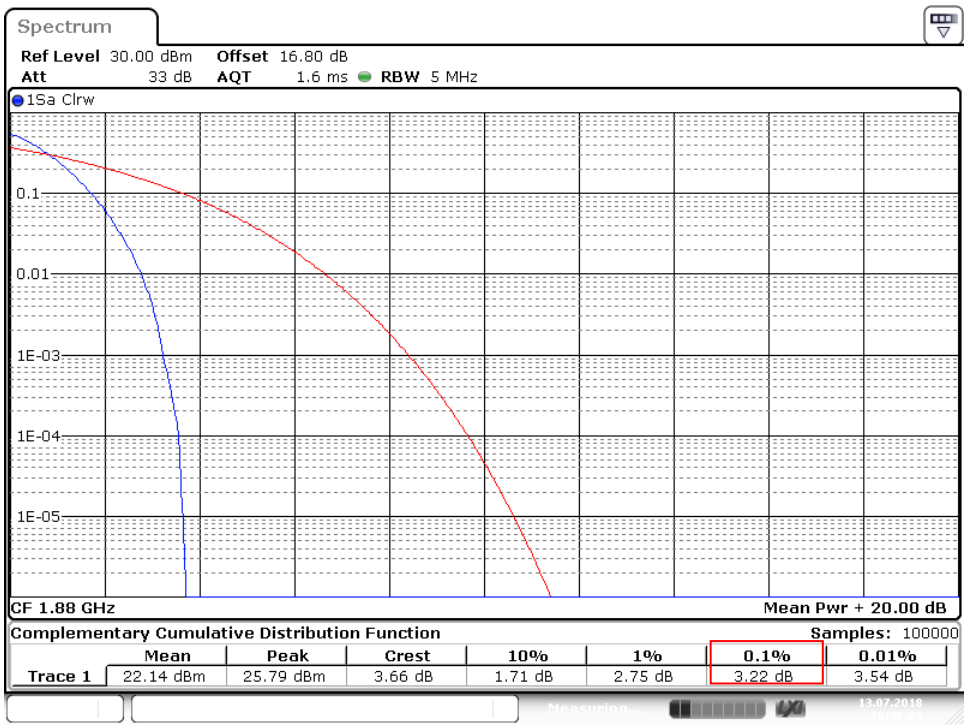
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	1608522I	24-Jul-2018
RF CABLE	1134	GORE	B094785	25-Jul-2019
RF CABLE	141	HUBER & SUHNER	B095588	25-Jul-2019
ATTENUATOR, 10DB	BW-S10W2	MINI-CIRCUITS	15032	CNR
POWER SPLITTER	ZFRSC-183-S+	MINI-CIRCUITS	B101743	25-Jul-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- Based on manufacturer's specifications, the CMW 500 is on a 2-year calibration cycle.

4.5 *Test Data*

The requirement is that the peak-to-average ratio shall not exceed 13 dB for more than 0.1% of the time.

WCDMA Band II



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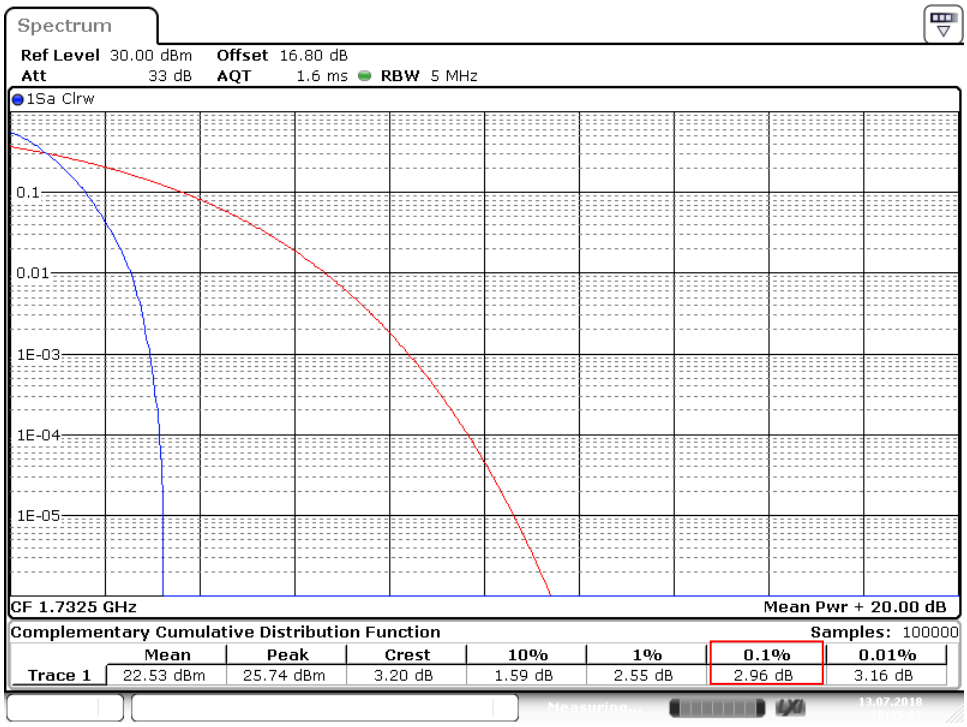
Band IV



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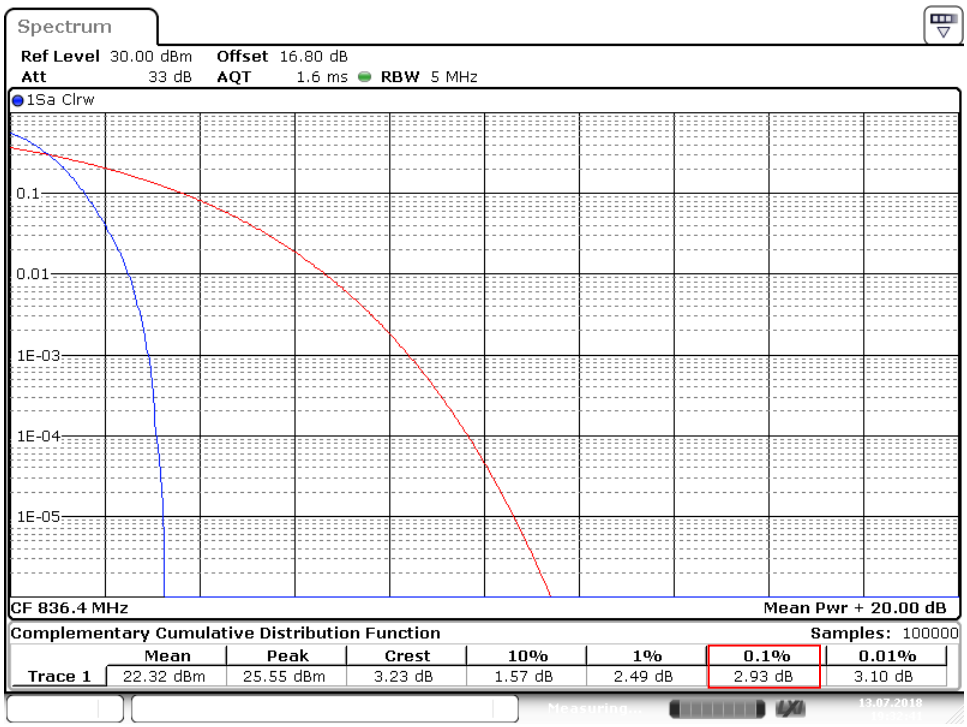
Band V



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5 Occupied Bandwidth

5.1 *Test Result*

Test Description	Basic Standards	Test Result
Occupied Bandwidth	FCC 2.1049 FCC 22.917(b) FCC 24.238(b) FCC 27.53(h)(3) RSS-GEN (6.7) RSS-133 (2.3)	Reported

5.2 *Test Method*

The occupied bandwidth is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of a given emission.

The span of the analyzer was set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth was set to between 1% and 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth. Video averaging is not permitted. The 99% occupied bandwidth was measured using the spectrum analyzer's occupied bandwidth measurement function.

A radio link was established between the EUT and the 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 occupied bandwidth measurement was conducted at the middle channel of each band.

5.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	22.7 °C
Relative Humidity:	49.1 %
Atmospheric Pressure:	98.1 kPa

5.4 *Test Equipment*

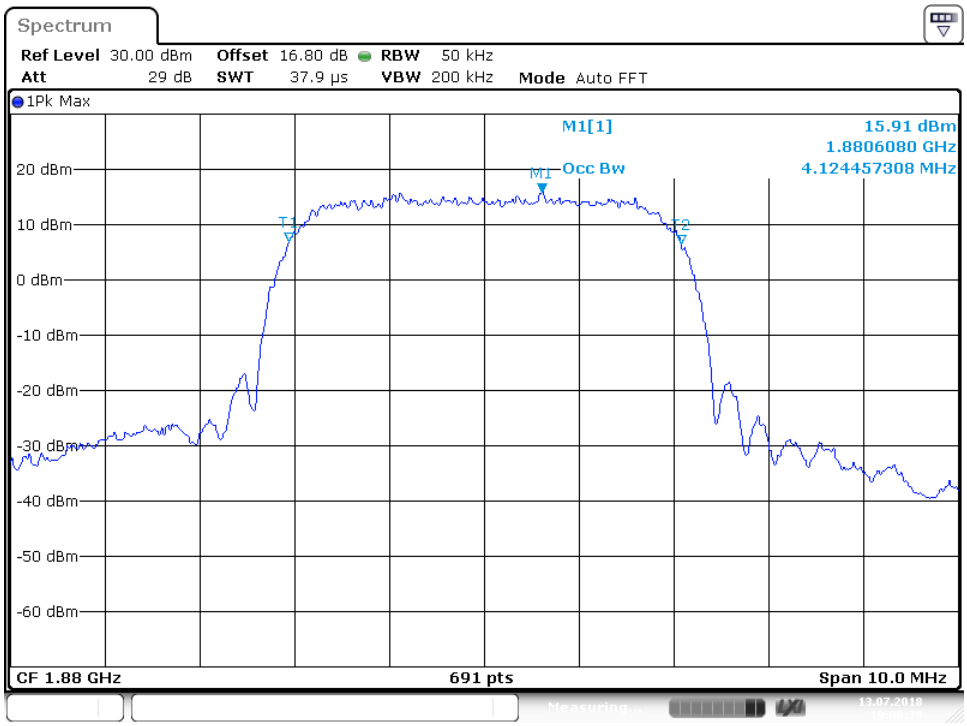
Test End Date: 13-Jul-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	1608522I	24-Jul-2018
RF CABLE	1134	GORE	B094785	25-Jul-2019
RF CABLE	141	HUBER & SUHNER	B095588	25-Jul-2019
ATTENUATOR, 10DB	BW-S10W2	MINI-CIRCUITS	15032	CNR
POWER SPLITTER	ZFRSC-183-S+	MINI-CIRCUITS	B101743	25-Jul-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- Based on manufacturer's specifications, the CMW 500 is on a 2-year calibration cycle.

5.5 *Test Data*

WCDMA – Band II Channel 9400 - 99% Bandwidth



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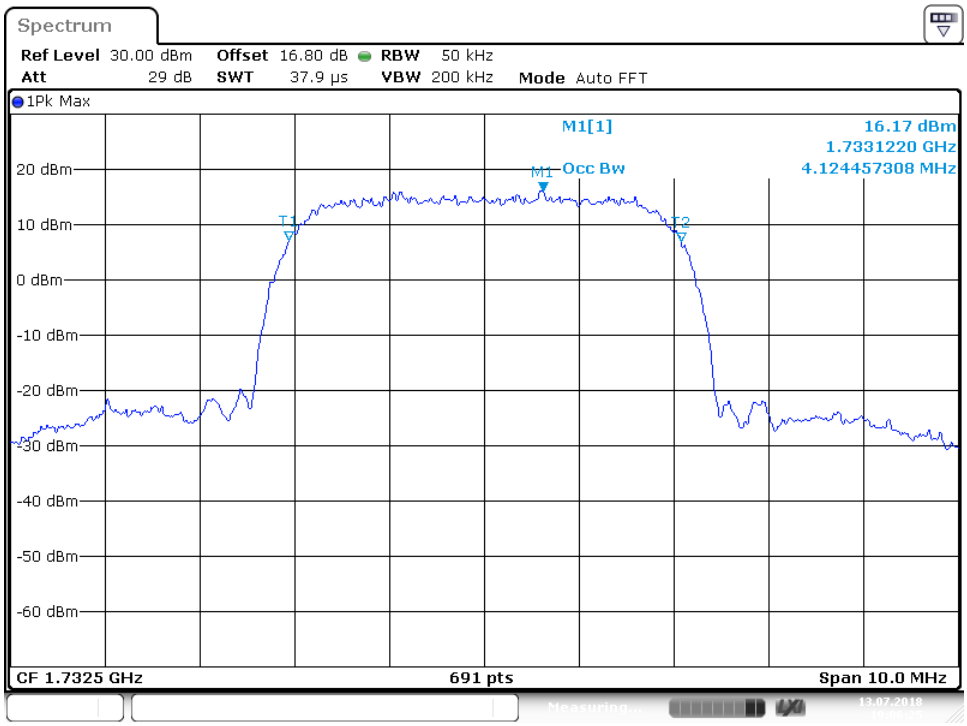
WCDMA – Band IV Channel 1762 - 99% Bandwidth



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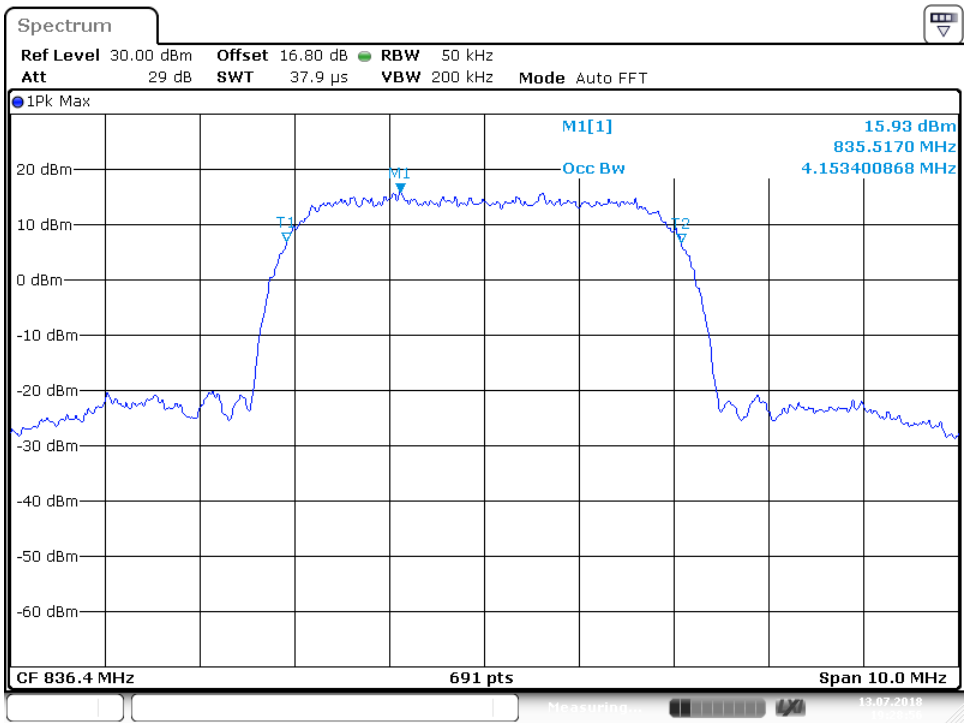
WCDMA – Band V Channel 4182 - 99% Bandwidth



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6 Band Edge and Conducted Spurious Emissions

6.1 *Test Result*

Test Description	Basic Standards	Test Result
Conducted Spurious Emissions and Band Edge	FCC 2.1051 FCC 22.917(a) FCC 24.238(a) FCC 27.53(h) RSS-132 (5.5) RSS-133 (6.5.1) RSS-139 (6.6)	Pass

6.2 *Test Method*

The conducted power at the EUT antenna port 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.

6.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	23.2 – 23.6 °C
Relative Humidity:	52.5 – 52.8 %
Atmospheric Pressure:	97.4 – 97.8 kPa

6.4 *Test Equipment*

Test End Date: 23-Jul-2018 Tester: MT

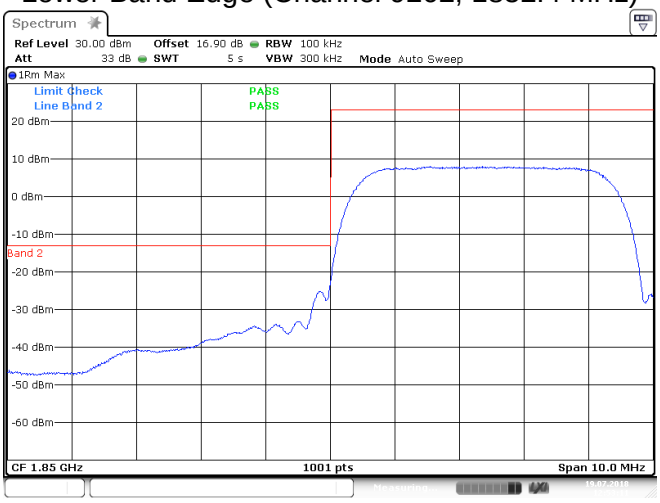
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	1608522I	24-Jul-2018
RF CABLE	1134	GORE	B094785	25-Jul-2019
RF CABLE	141	HUBER & SUHNER	B095588	25-Jul-2019
ATTENUATOR, 10DB	BW-S10W2	MINI-CIRCUITS	15032	CNR
POWER SPLITTER	ZFRSC-183-S+	MINI-CIRCUITS	B101743	25-Jul-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- Based on manufacturer's specifications, the CMW 500 is on a 2-year calibration cycle.

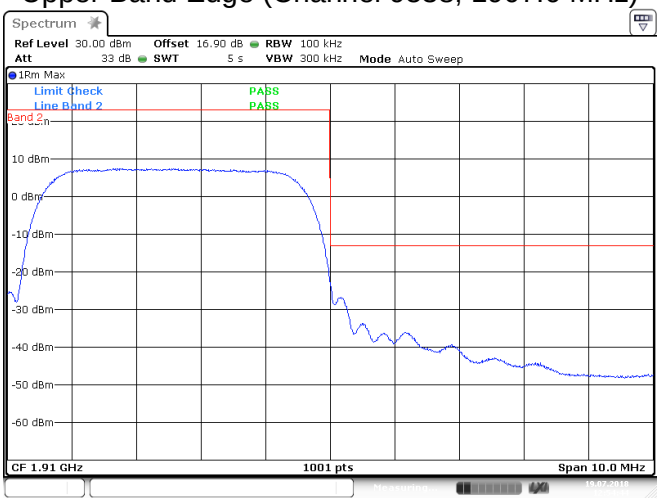
6.5 *Test Data*

WCDMA, Band II

Lower Band Edge (Channel 9262, 1852.4 MHz)

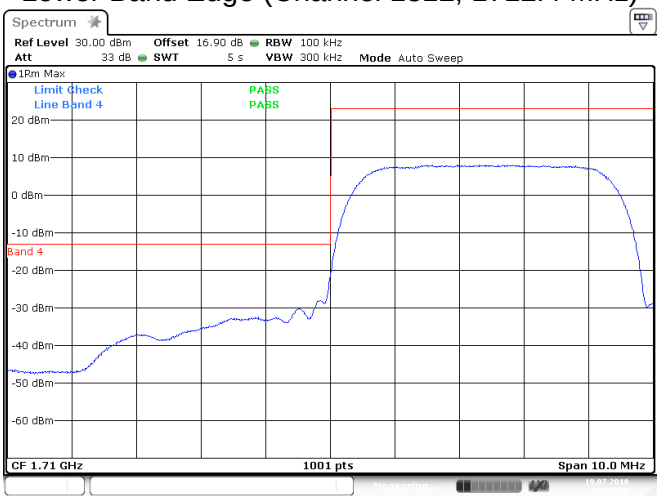


Upper Band Edge (Channel 9538, 1907.6 MHz)



WCDMA, Band IV

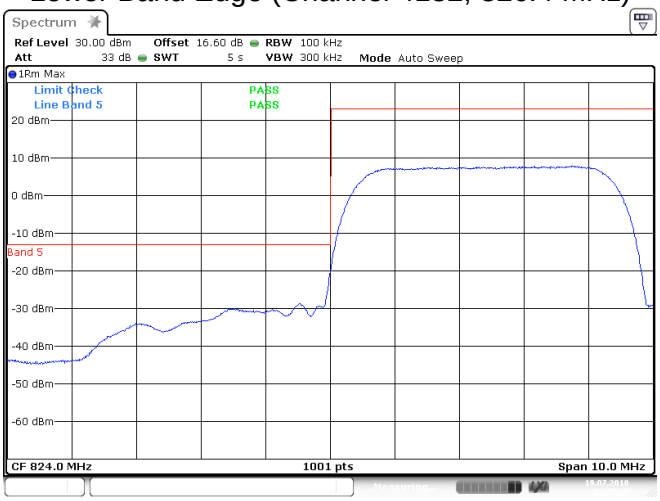
Lower Band Edge (Channel 1312, 1712.4 MHz)



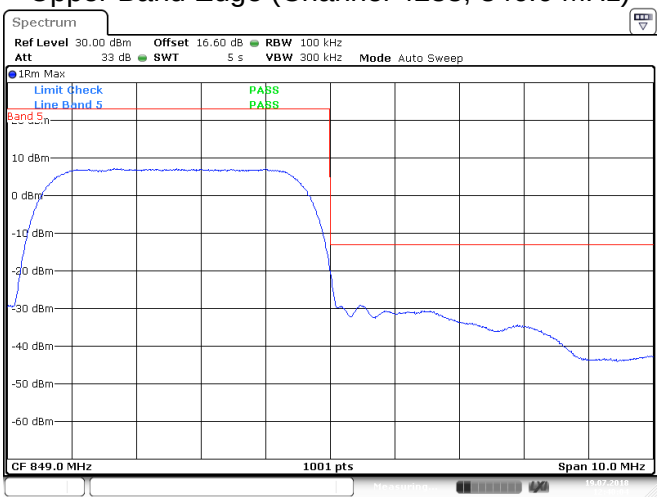
Upper Band Edge (Channel 1513, 1752.6 MHz)

WCDMA, Band V

Lower Band Edge (Channel 4132, 826.4 MHz)

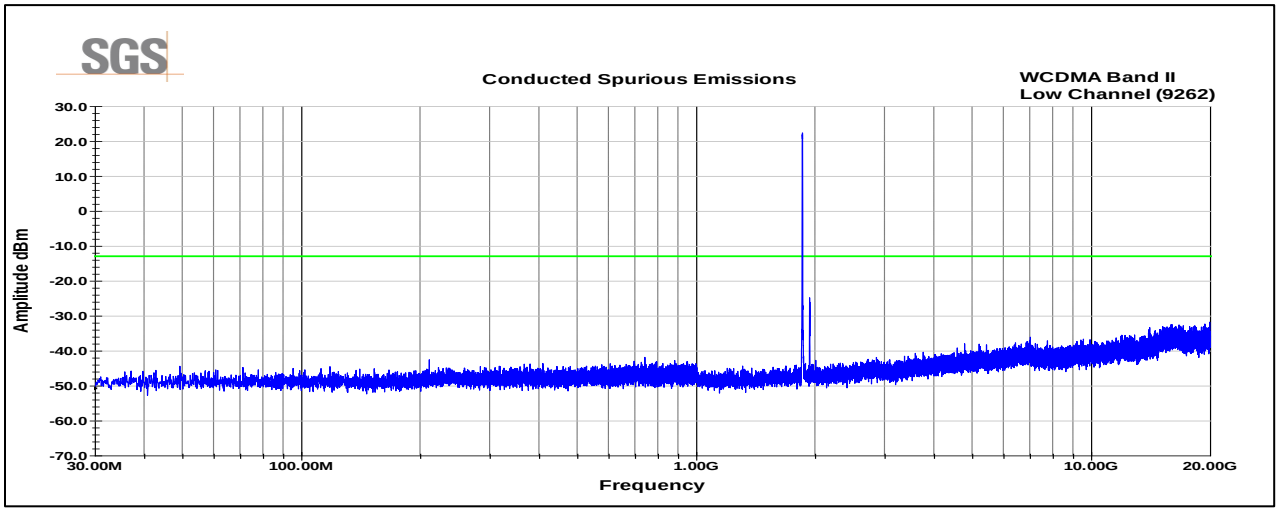


Upper Band Edge (Channel 4233, 846.6 MHz)

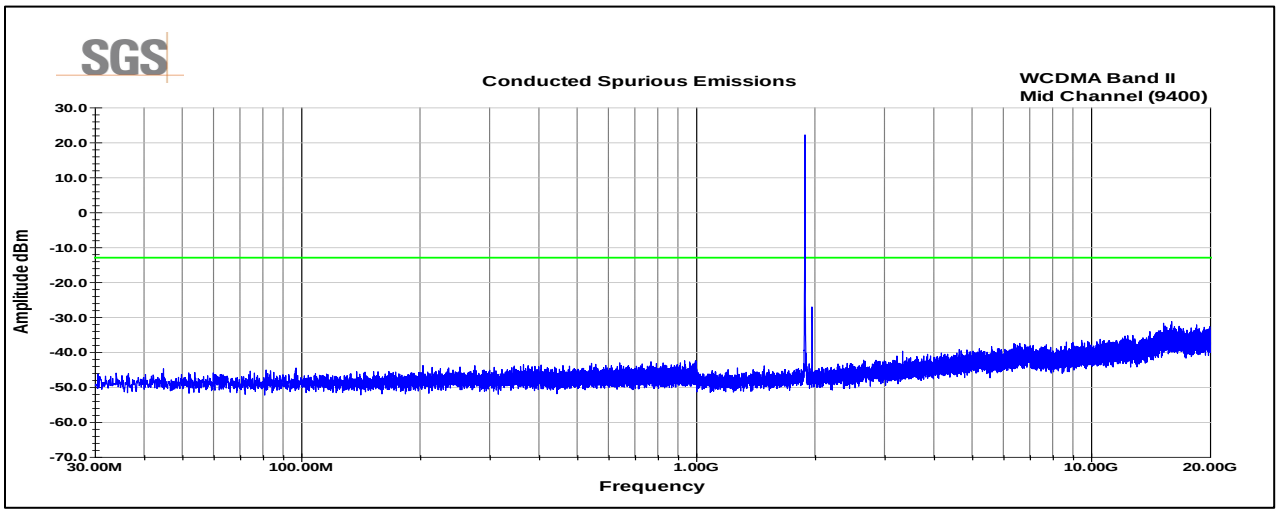


6.6 *Conducted Spurious Emissions Plot*

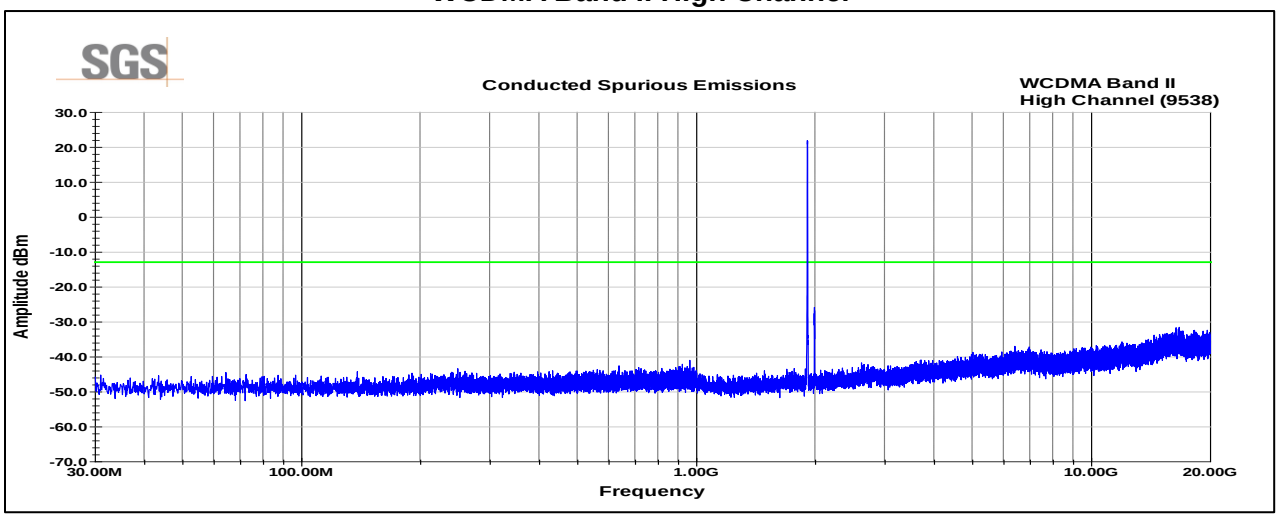
WCDMA Band II Low Channel



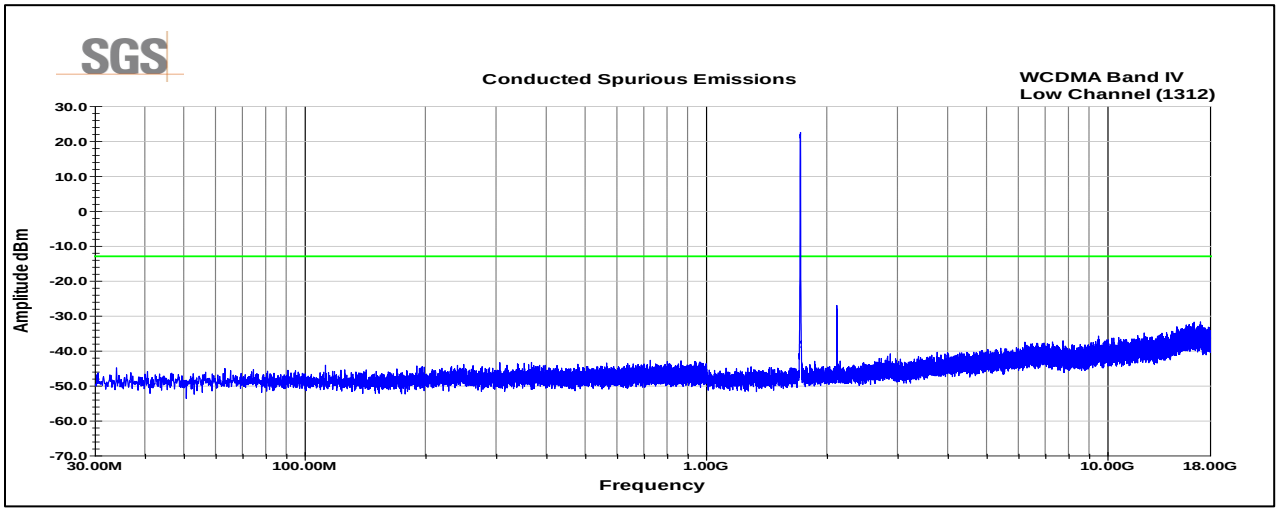
WCDMA Band II Mid Channel



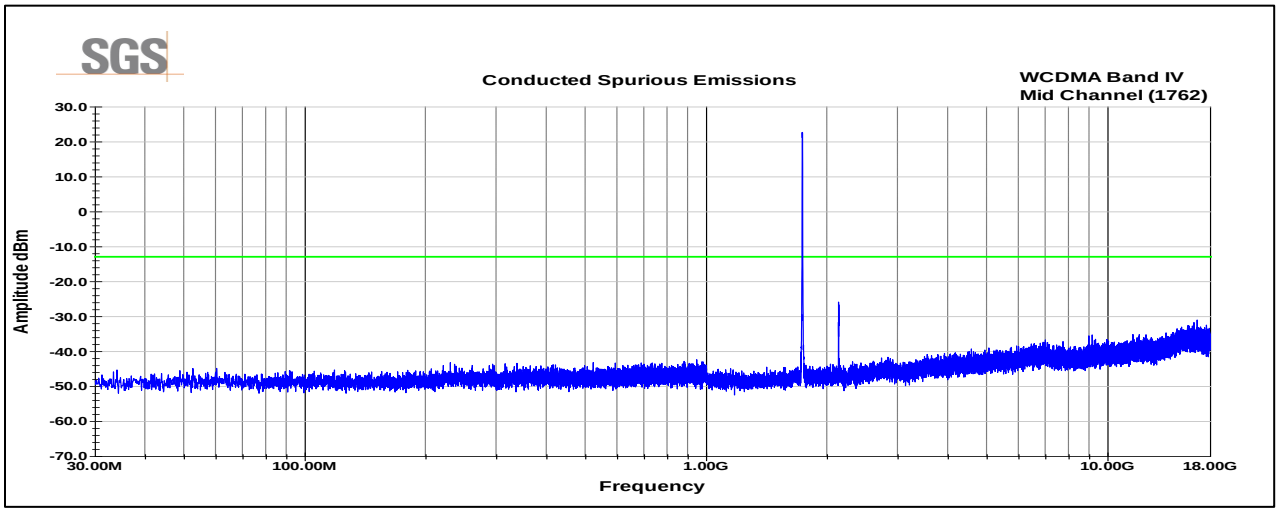
WCDMA Band II High Channel



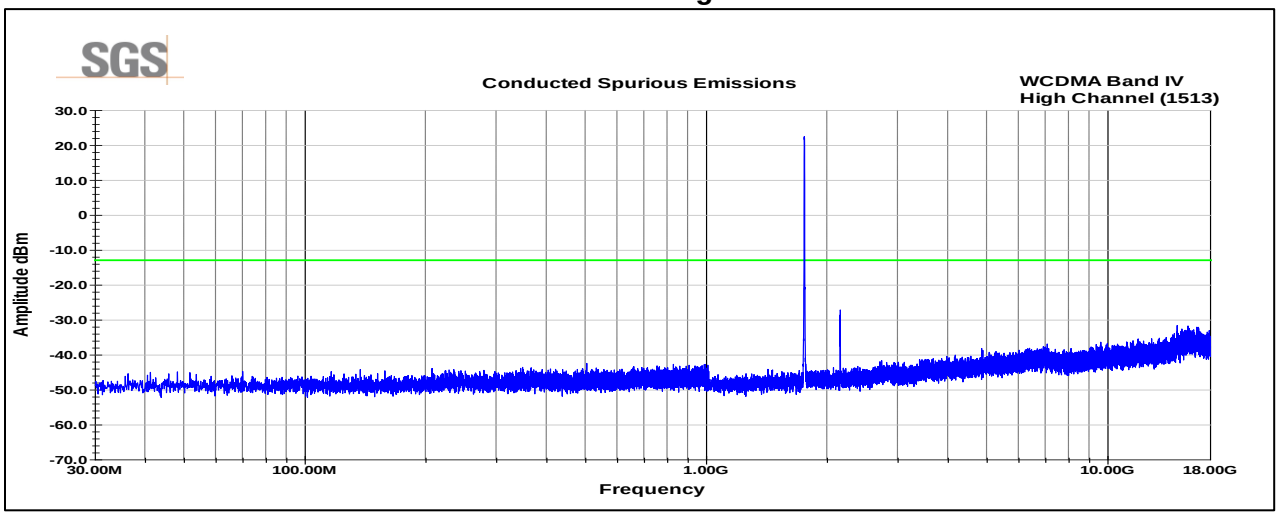
WCDMA Band IV Low Channel



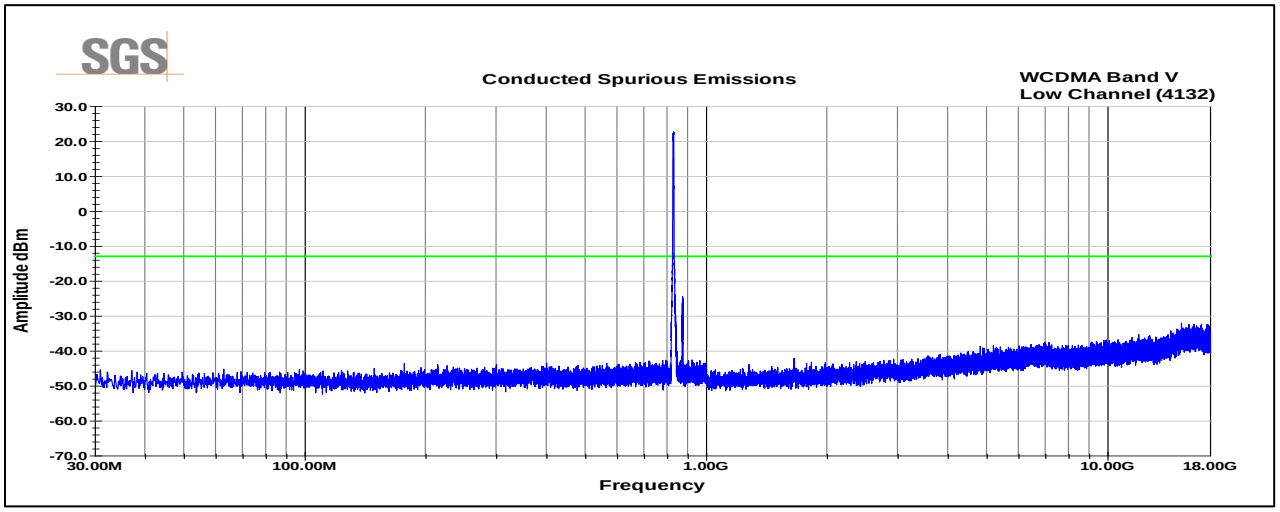
WCDMA Band IV Mid Channel



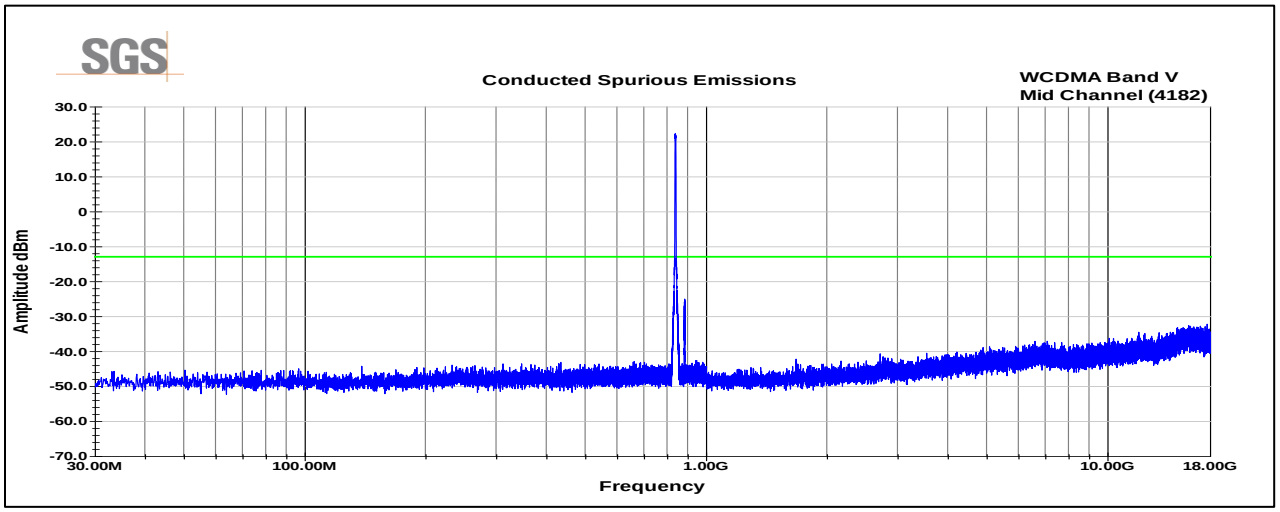
WCDMA Band IV High Channel



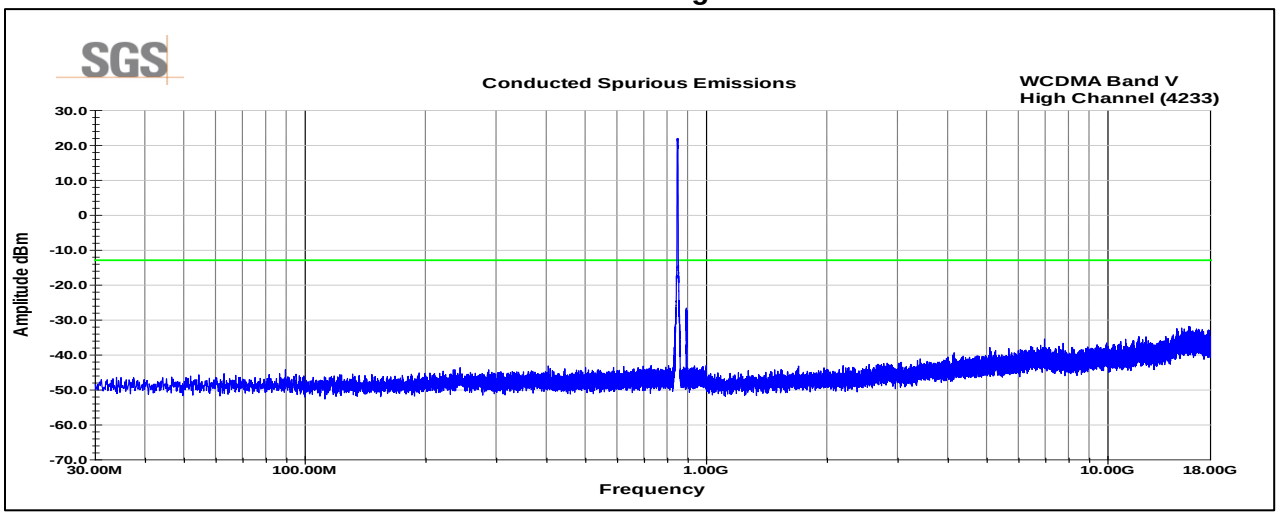
WCDMA Band V Low Channel



WCDMA Band V Mid Channel



WCDMA Band V High Channel



7 Effective Radiated Power

7.1 *Test Result*

Test Description	Basic Standards	Test Result
Effective Radiated Power	FCC 22.913(a)(5)	Pass
Effective Isotropic Radiated Power	FCC 24.232(c) FCC 27.50(d)(4) RSS-132 (5.4) RSS-133 (6.4) RSS-139 (6.5)	Pass

7.2 *Test Method*

Because the device is provided with a coaxial port but no antenna, ERP/EIRP measurements were taken by measuring the conducted output power and defining the maximum gain antenna that may be used while maintaining compliance with the applicable limits.

7.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

7.4 *Test Equipment*

None

7.5 *Test Data*

Band of Operation		Conducted Power w/tolerance	Antenna Gain	Cable Loss	Average EIRP		FCC EIRP Limit	% of Limit	Verdict
Type	MHz	dBm			dBm	W	W		
WCDMA Band II	1850-1910	25.0	5.0	0.0	30.0	1.000	2.0	50%	Pass
WCDMA Band IV	1710-1755	25.0	5.0	0.0	30.0	1.000	1.0	100%	Pass
WCDMA Band V	824-849	25.0	1.0	0.0	26.0	0.398	7.0	6%	Pass

Band of Operation		Conducted Power w/tolerance	Antenna Gain	Cable Loss	Average EIRP		ISED EIRP Limit	% of Limit	Verdict
Type	MHz	dBm			dBm	mW	W		
WCDMA Band II	1850-1910	25.0	5.0	0.0	30.0	1.000	2.0	50%	Pass
WCDMA Band IV	1710-1755	25.0	5.0	0.0	30.0	1.000	1.0	100%	Pass
WCDMA Band V	824-849	25.0	1.0	0.0	26.0	0.398	11.5	3%	Pass

Note: Antenna gain was determined from maximum gain while still meeting the ERP/EIRP limits and the RF exposure requirements at 20cm.

8 Radiated Spurious Emissions

8.1 *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(h) ANSI/TIA-603-D-2010	RSS-GEN (6.13) RSS-132 (5.5) RSS-133 (6.5.1) RSS-139 (6.6)	Pass

8.2 *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 manipulated through each of its three orthogonal axes with the measurement oriented in both vertical and horizontal polarizations.

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 low, middle and high channels.

8.3 *Test Site*

SGS 3m Chamber, Suwanee, GA (validated to ANS C63.4: 2009 below and above 1GHz)

Environmental Conditions

Temperature:	23.6 – 24.1 °C
Relative Humidity:	53.5 – 54.7 %
Atmospheric Pressure:	97.9 – 98.2 kPa

8.4 *Test Equipment*

30-1000MHz

Test End Date: 26-Jul-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	16-Oct-2018
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	23-Jul-2019
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	24-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079659	23-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	6-Mar-2019
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	1206247	28-Feb-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

1-18GHz

Test End Date: 10-Aug-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079699	2-Jul-2019
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	23-Jul-2019
RF CABLE	104PE	HUBER & SUHNER	B079793	24-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	27-Jul-2019
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	1206247	28-Feb-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

18-20GHz

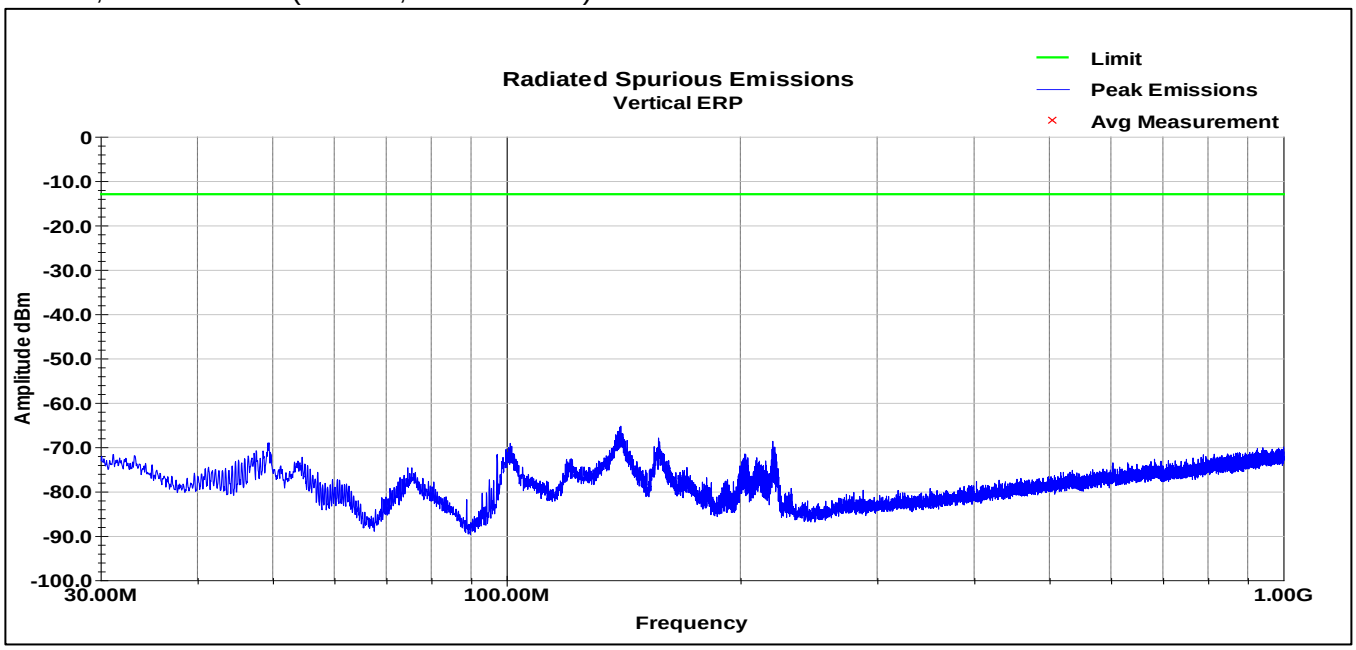
Test End Date: 7-Aug-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, HORN (SMALL)	LB-180400-20-C-KF	A-INFO	15007	30-Mar-2019
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2019
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	27-Jul-2019
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	1206247	28-Feb-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

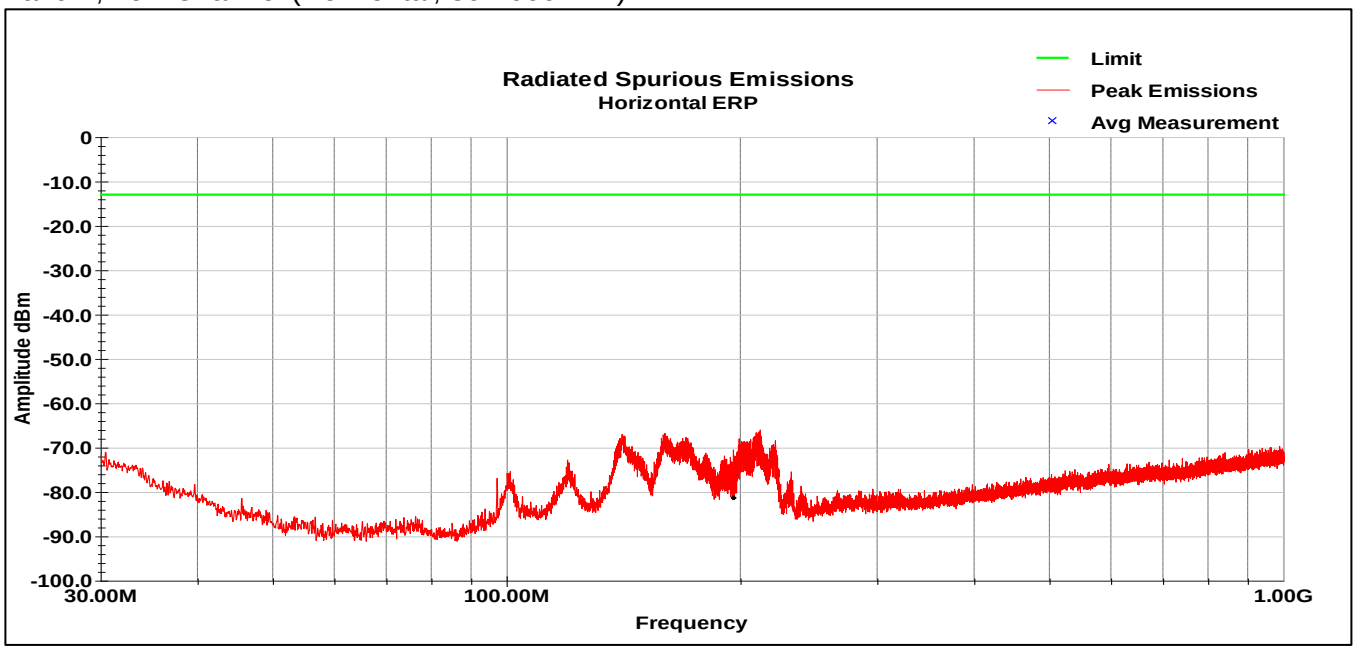
- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- Based on manufacturer's specifications, the CMW 500 is on a 2-year calibration cycle.

8.5 *Test Data*

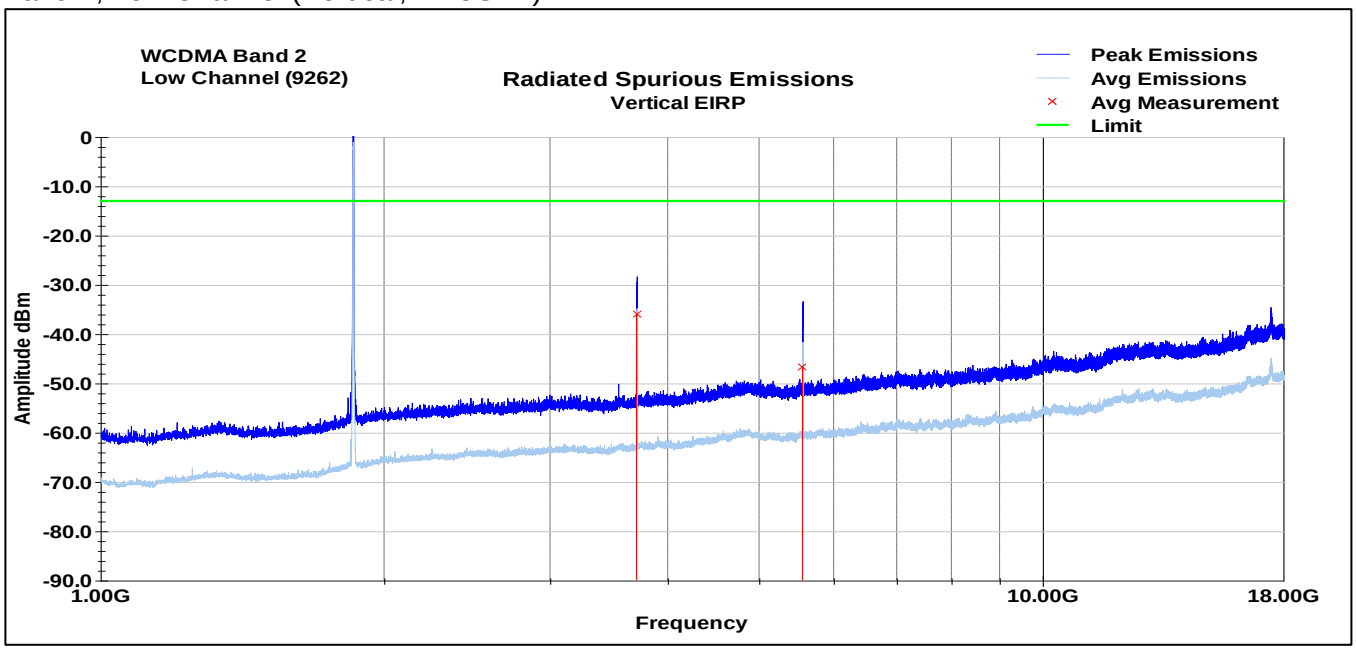
Band II, Low Channel (Vertical, 30-1000MHz)



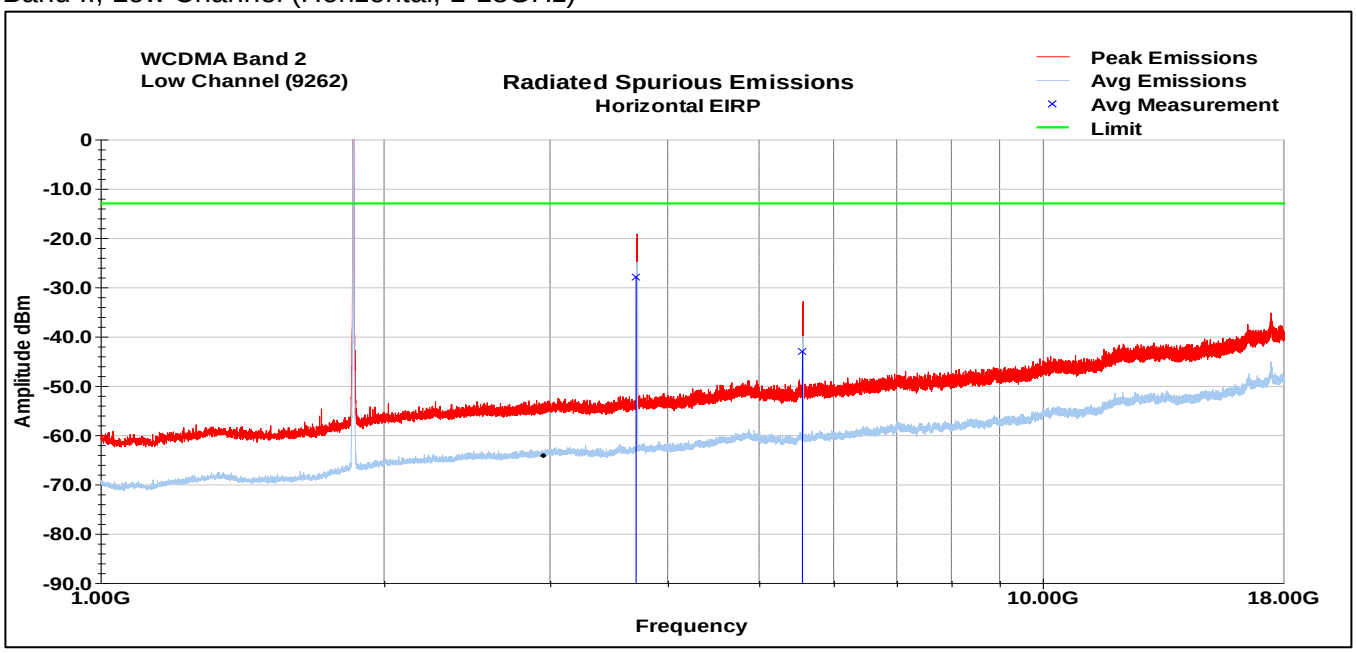
Band II, Low Channel (Horizontal, 30-1000MHz)



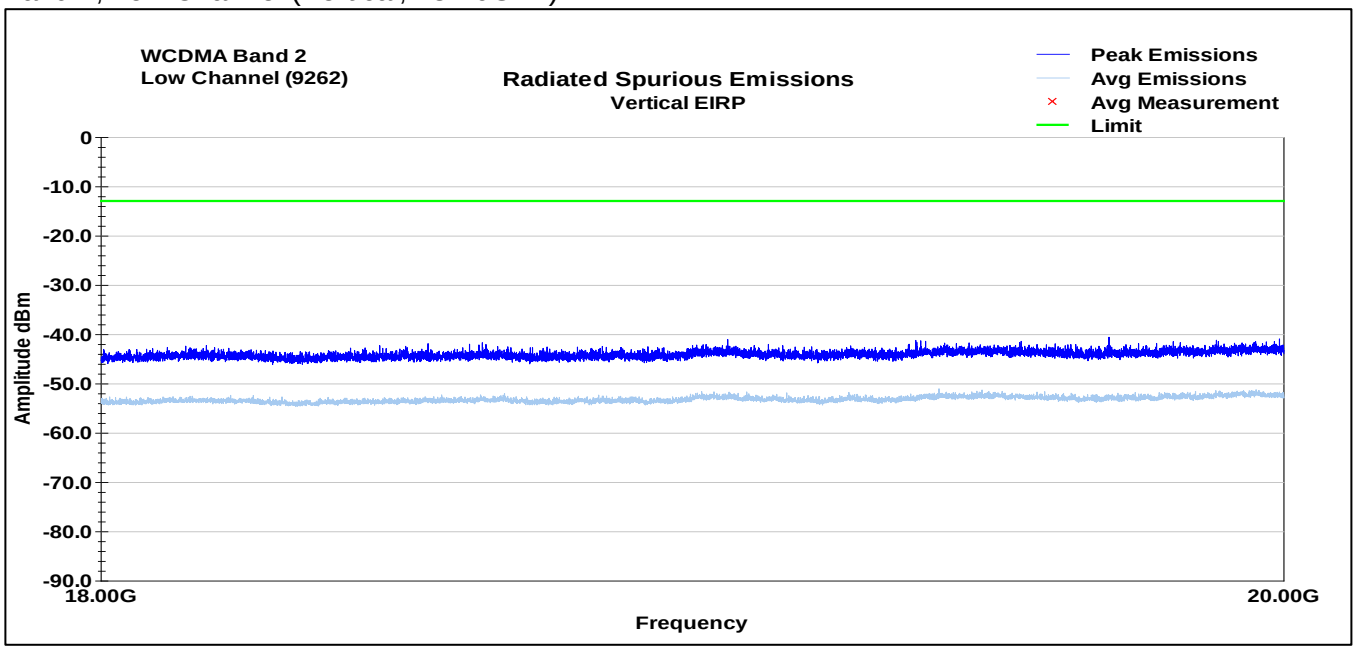
Band II, Low Channel (Vertical, 1-18GHz)



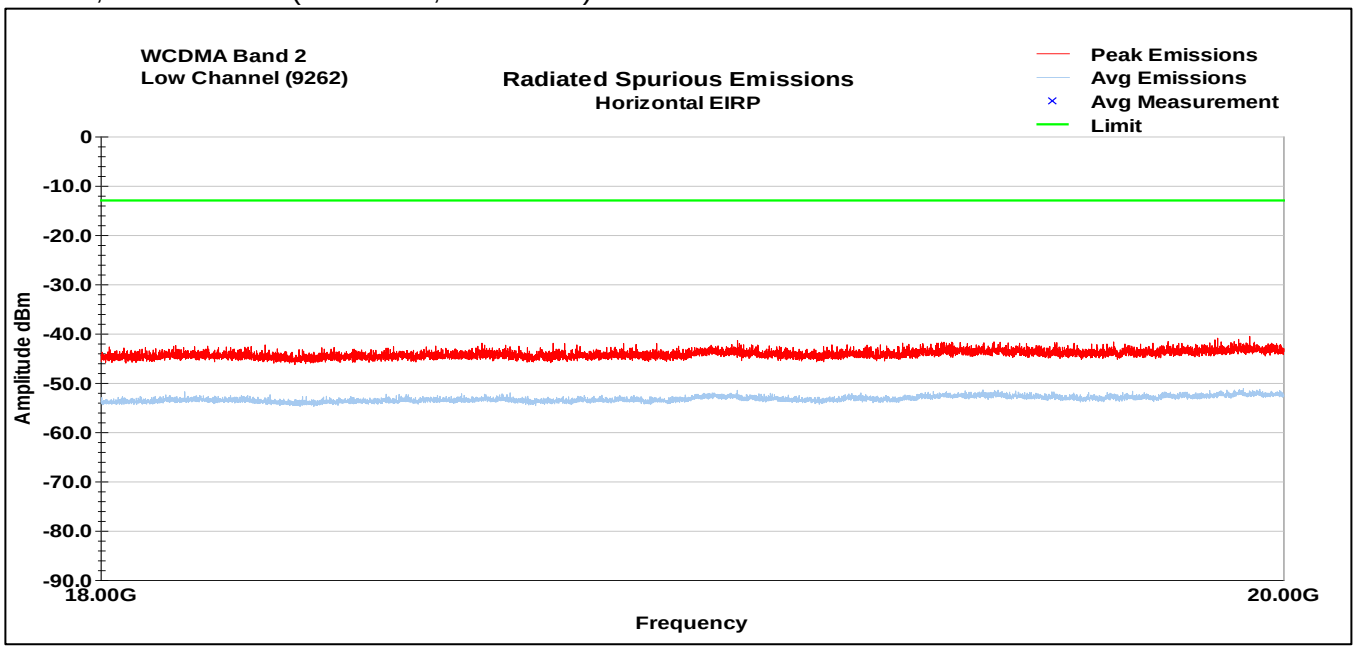
Band II, Low Channel (Horizontal, 1-18GHz)



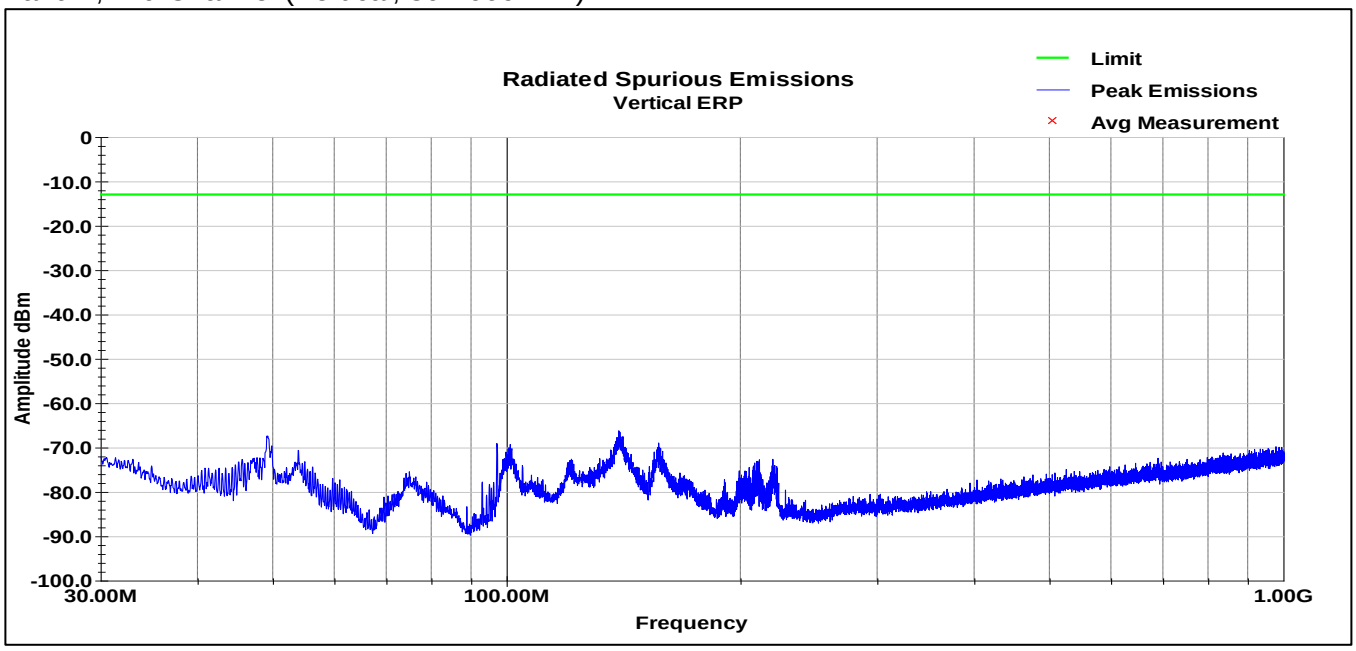
Band II, Low Channel (Vertical, 18-20GHz)



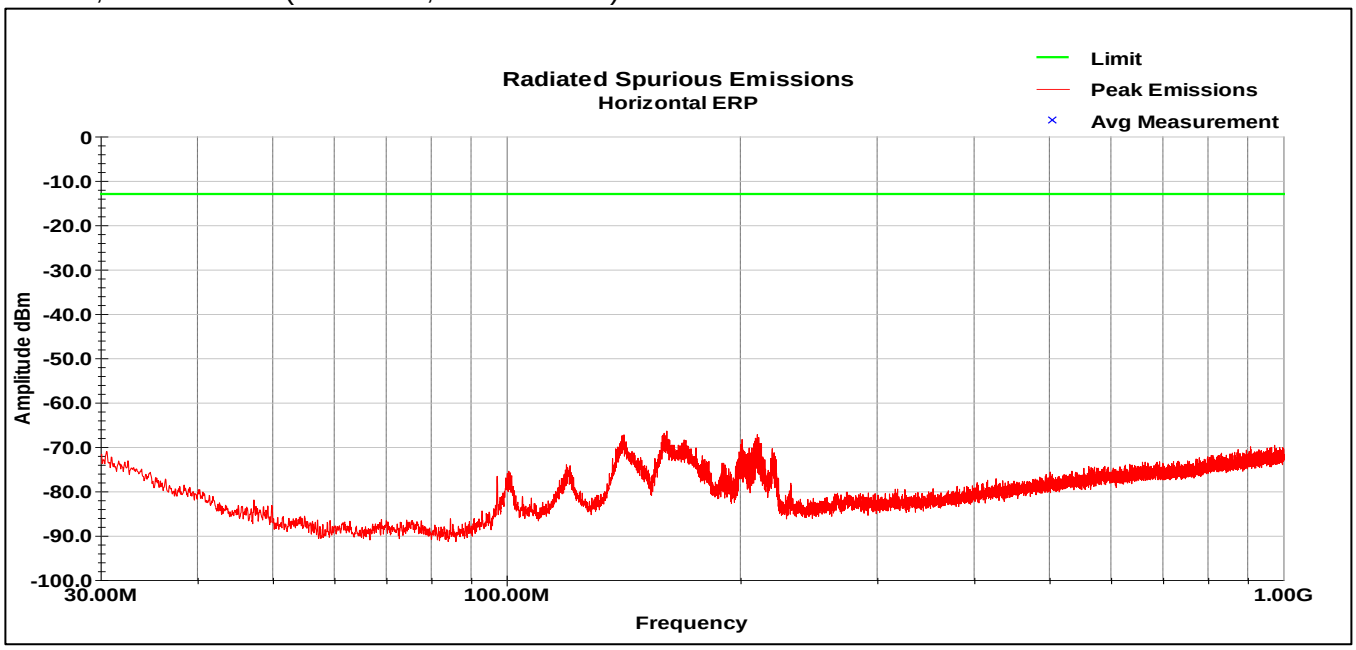
Band II, Low Channel (Horizontal, 18-20GHz)



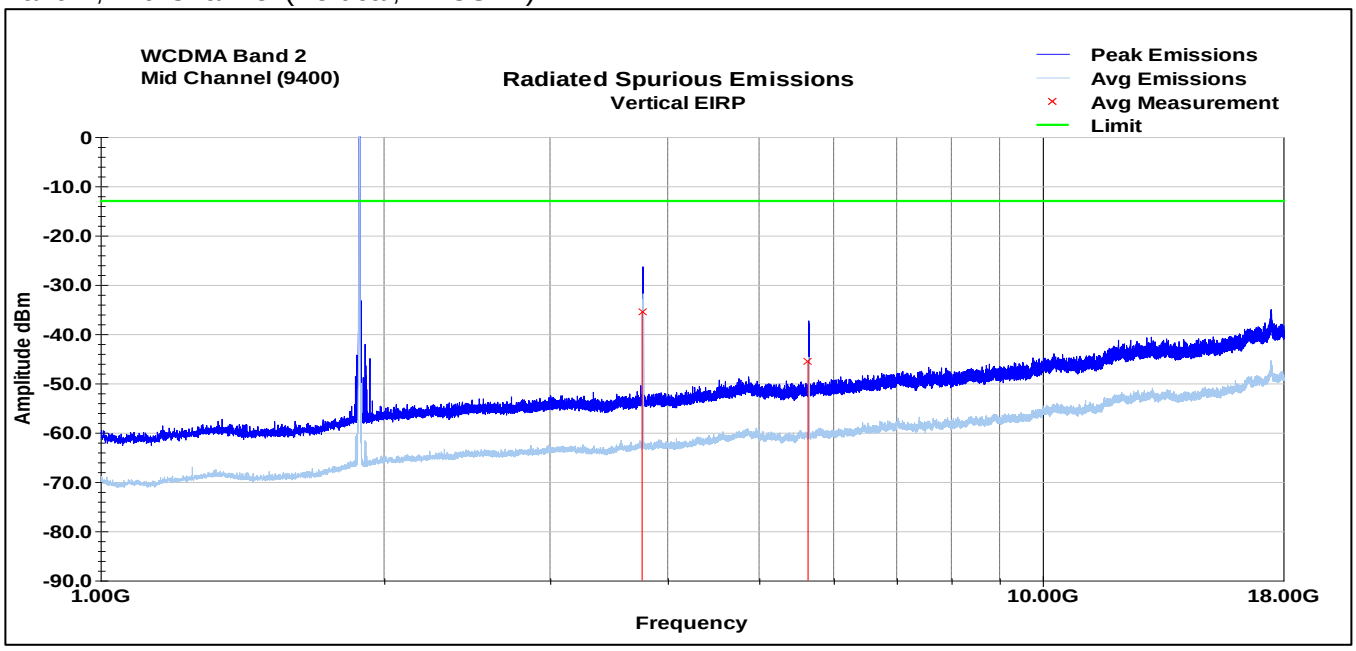
Band II, Mid Channel (Vertical, 30-1000MHz)



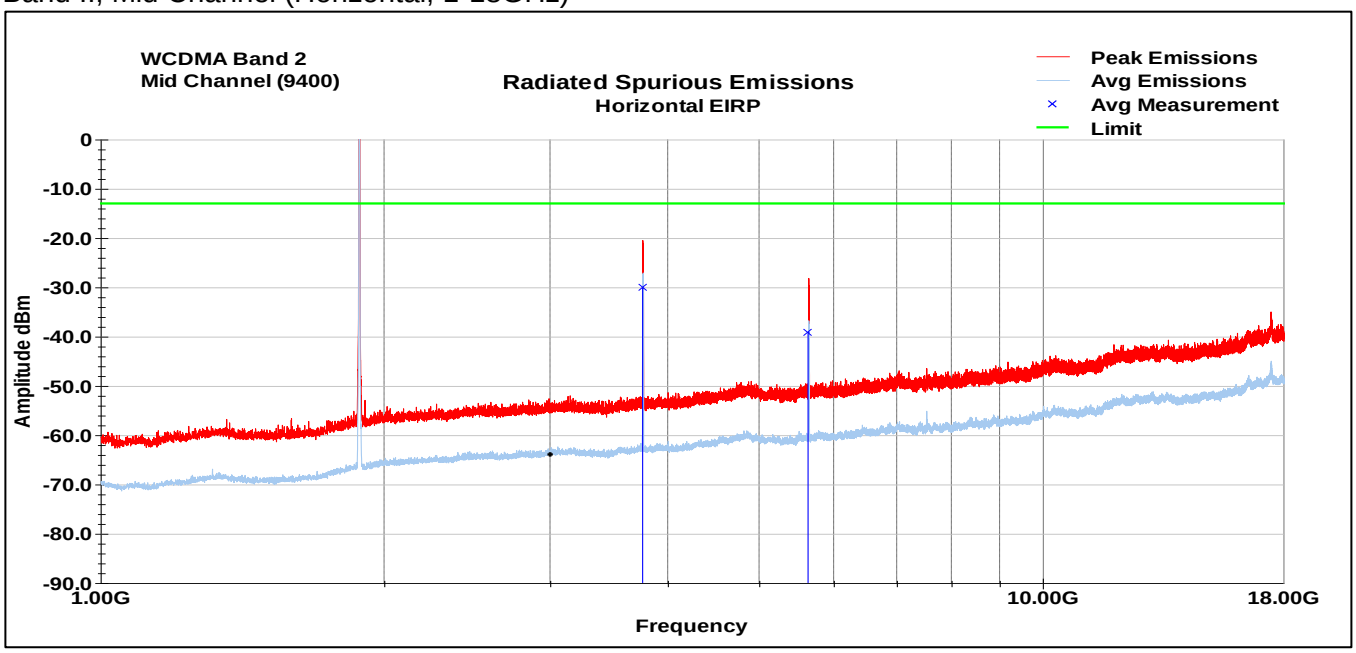
Band II, Mid Channel (Horizontal, 30-1000MHz)



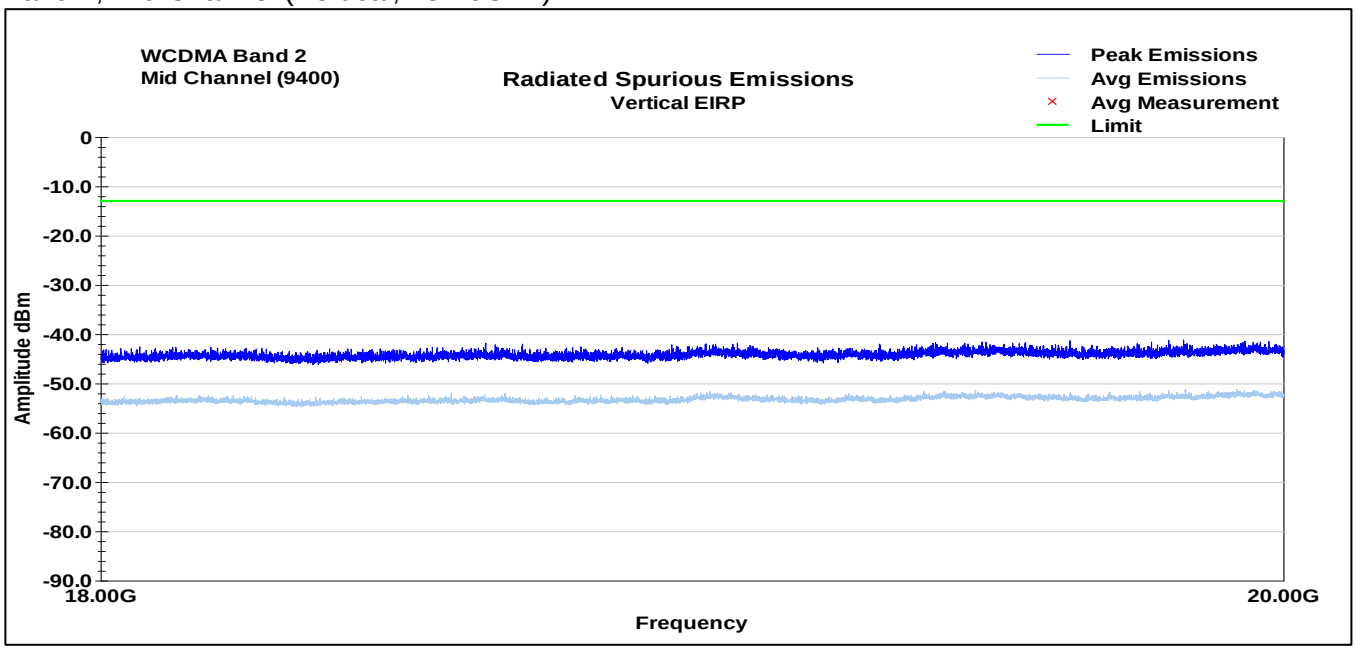
Band II, Mid Channel (Vertical, 1-18GHz)



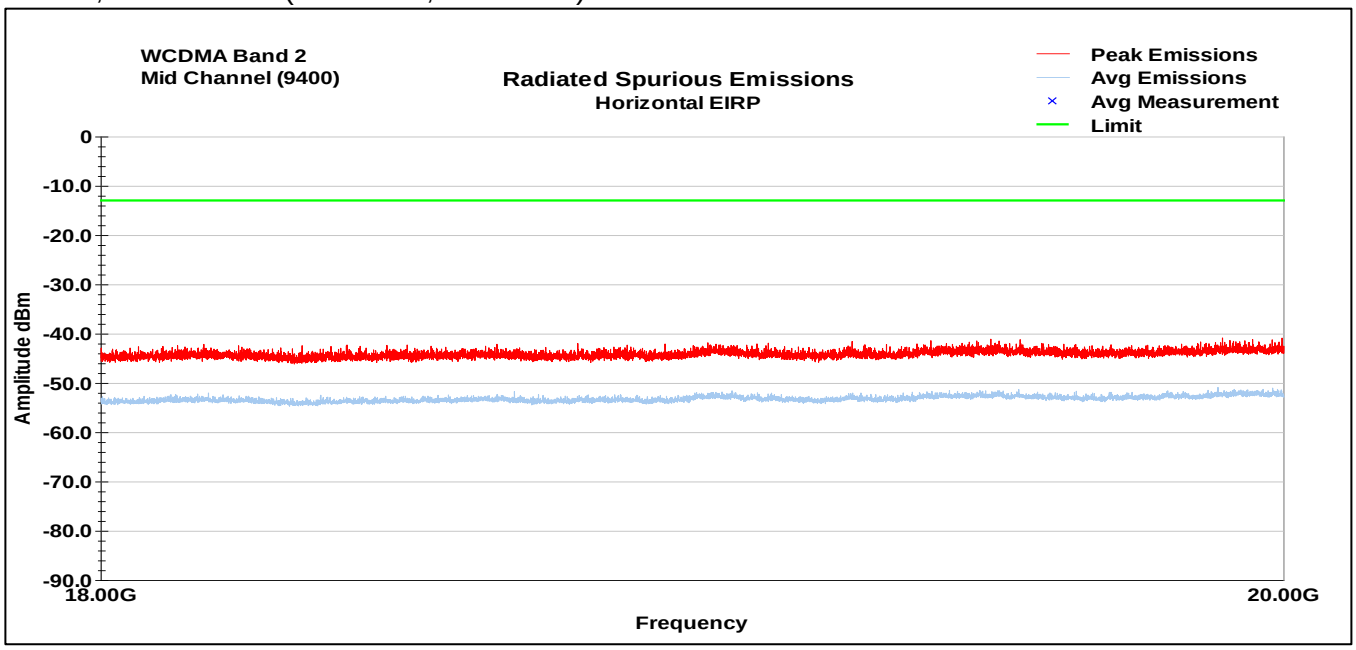
Band II, Mid Channel (Horizontal, 1-18GHz)



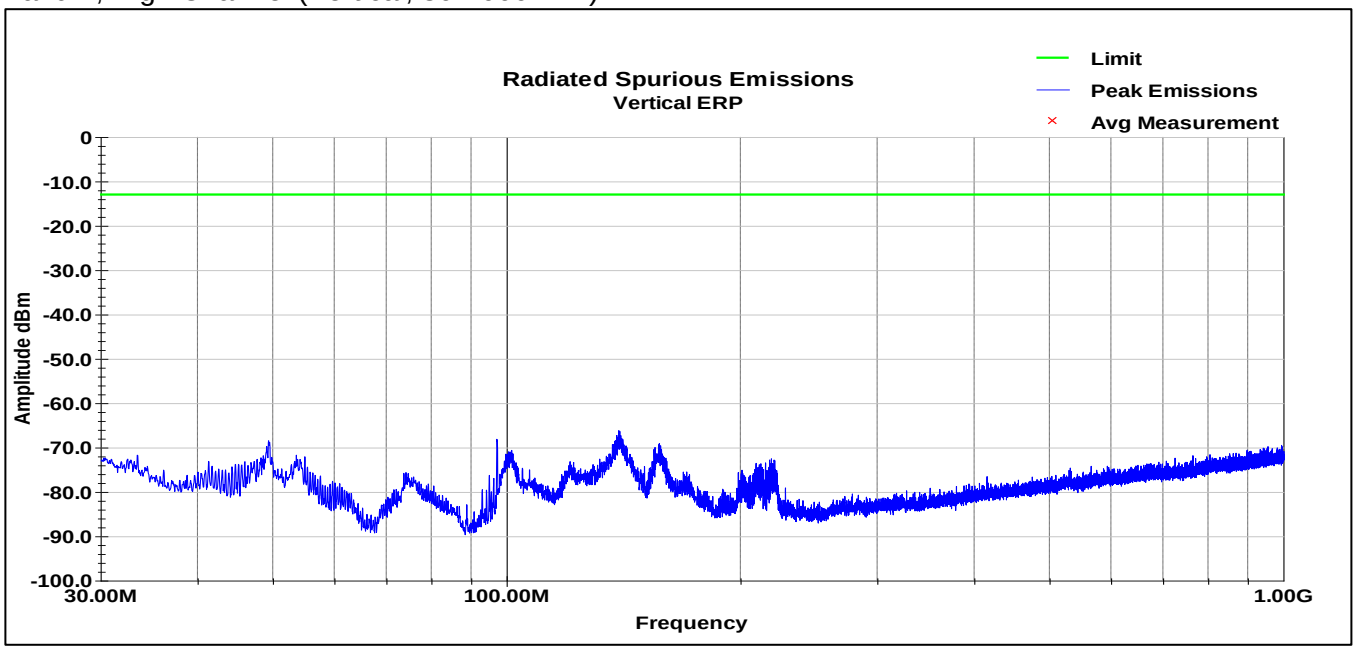
Band II, Mid Channel (Vertical, 18-20GHz)



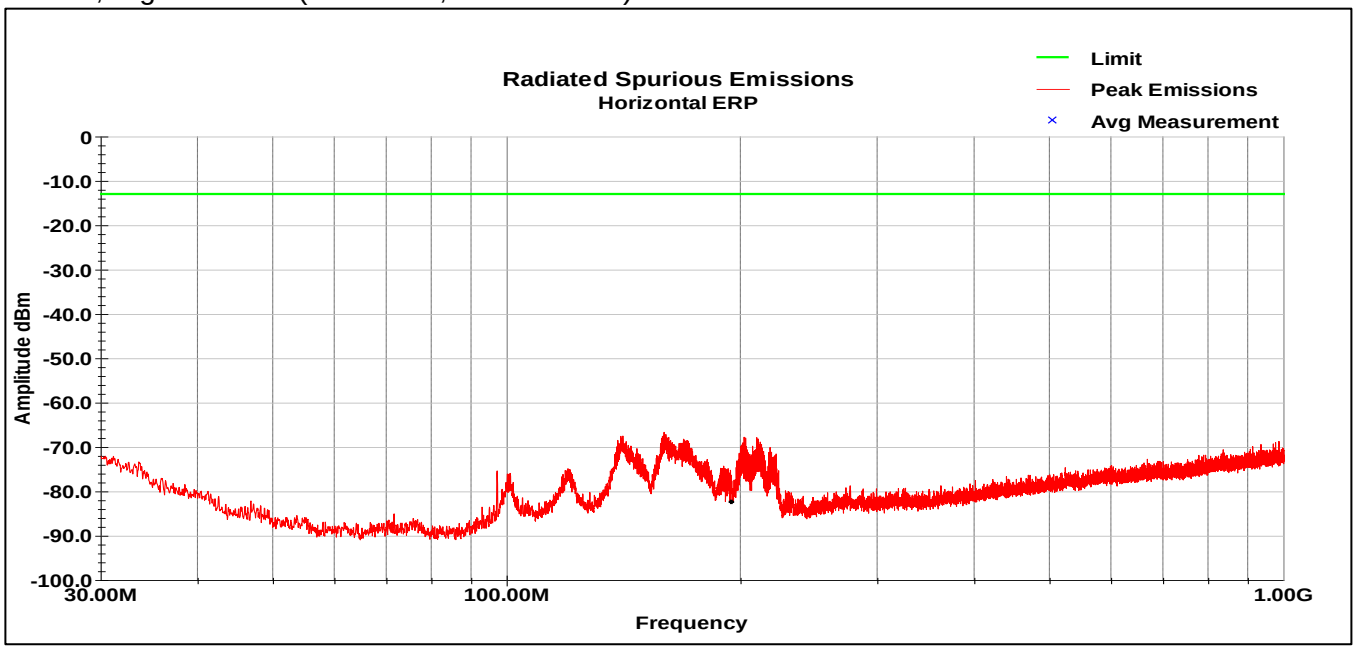
Band II, Mid Channel (Horizontal, 18-20GHz)



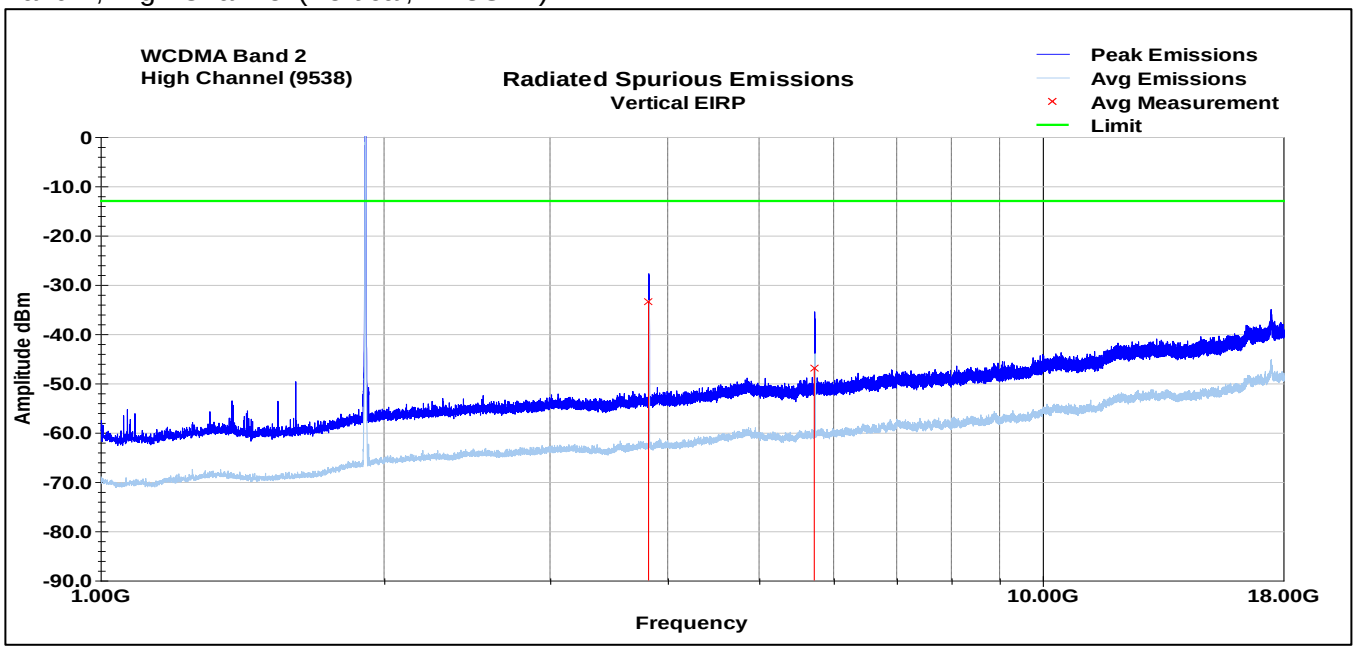
Band II, High Channel (Vertical, 30-1000MHz)



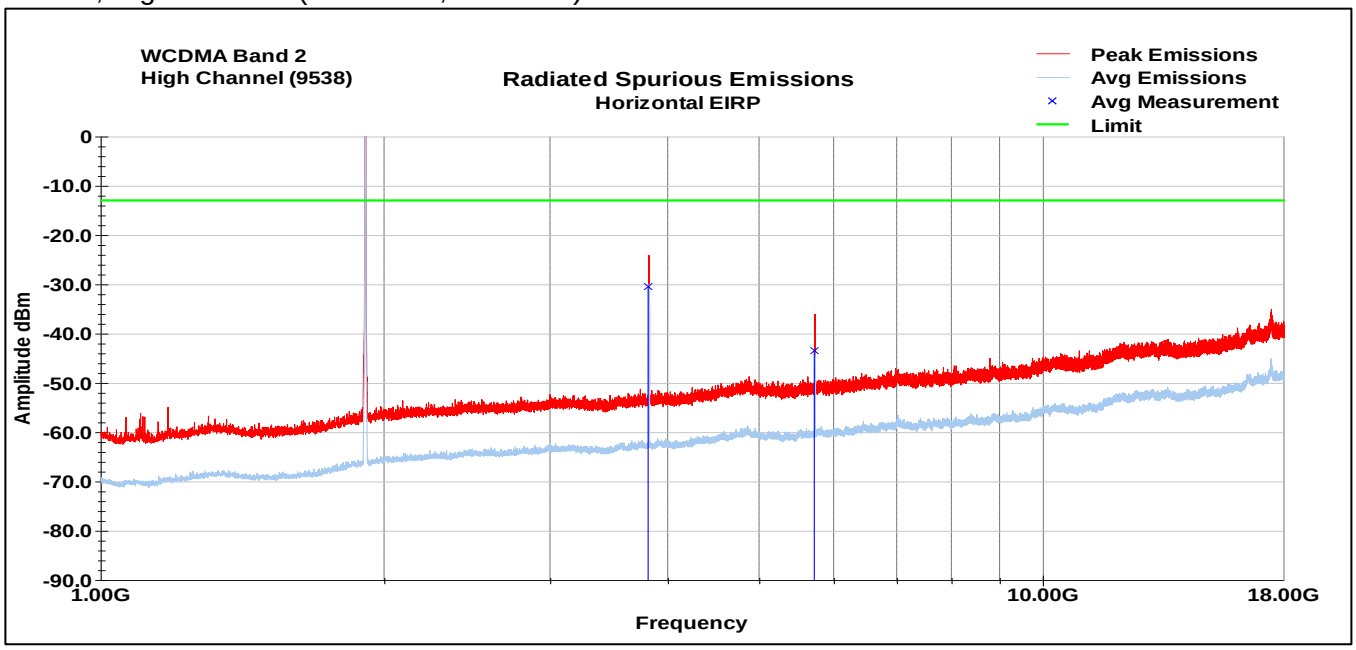
Band II, High Channel (Horizontal, 30-1000MHz)



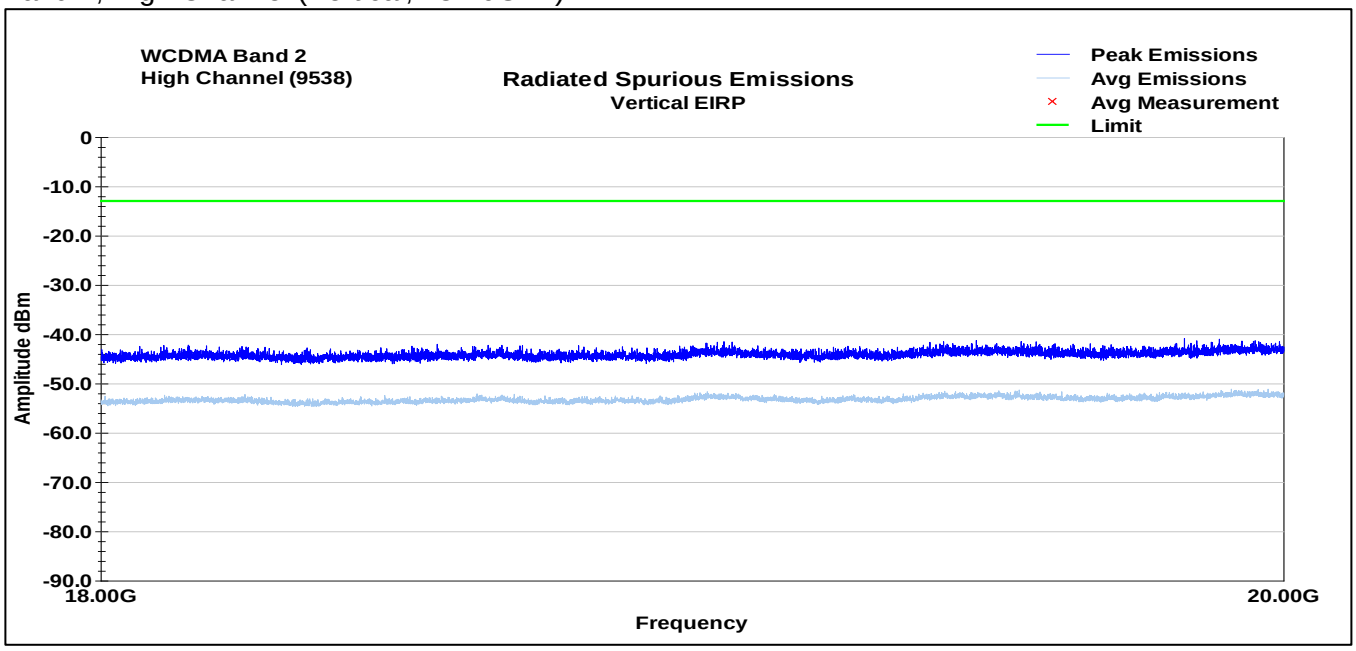
Band II, High Channel (Vertical, 1-18GHz)



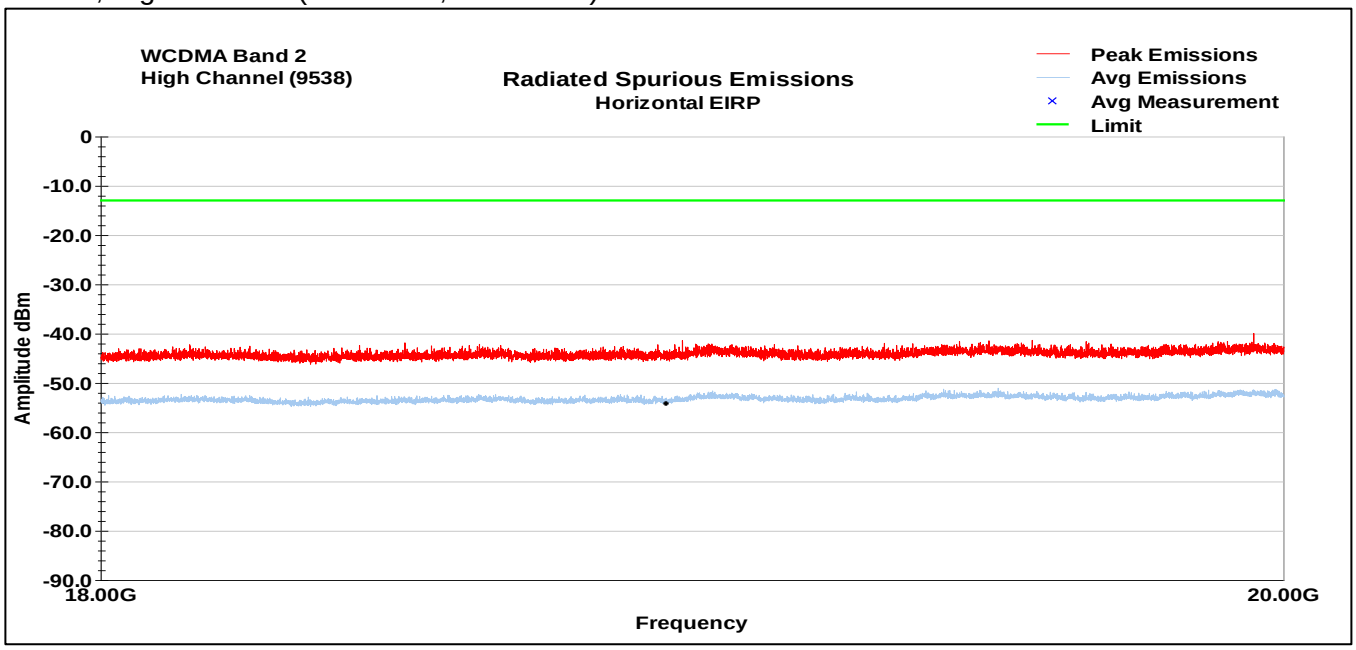
Band II, High Channel (Horizontal, 1-18GHz)



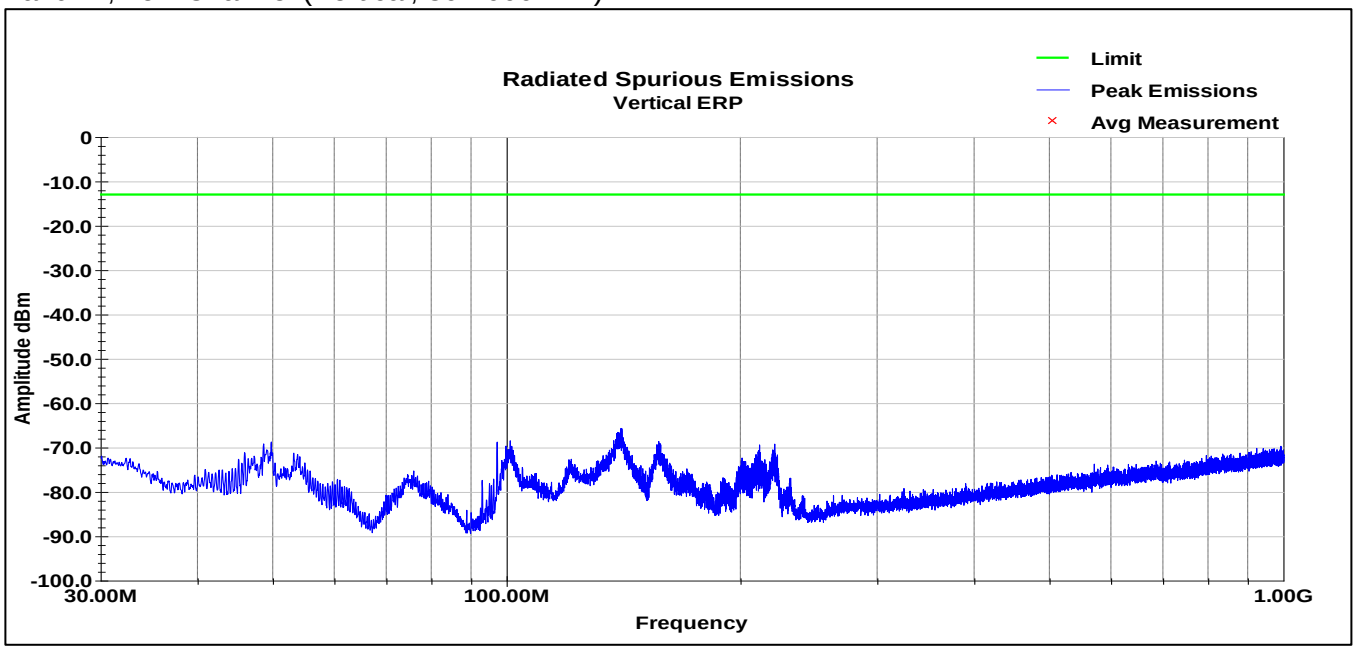
Band II, High Channel (Vertical, 18-20GHz)



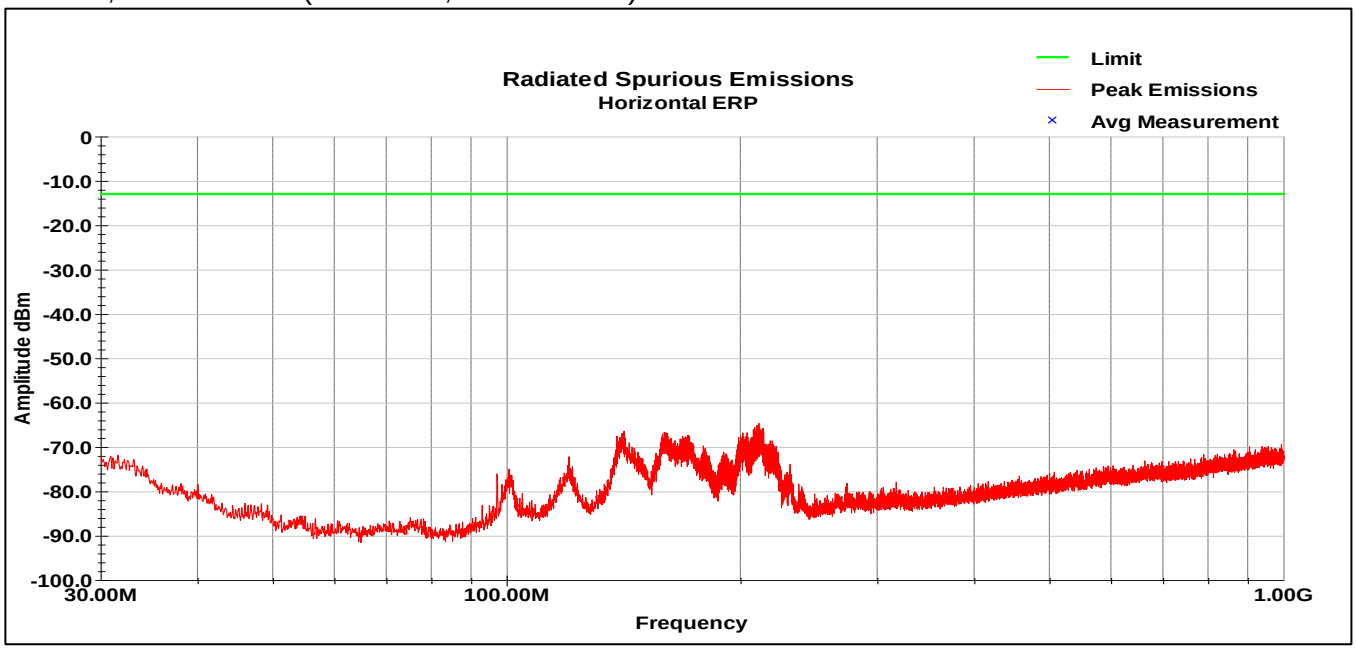
Band II, High Channel (Horizontal, 18-20GHz)



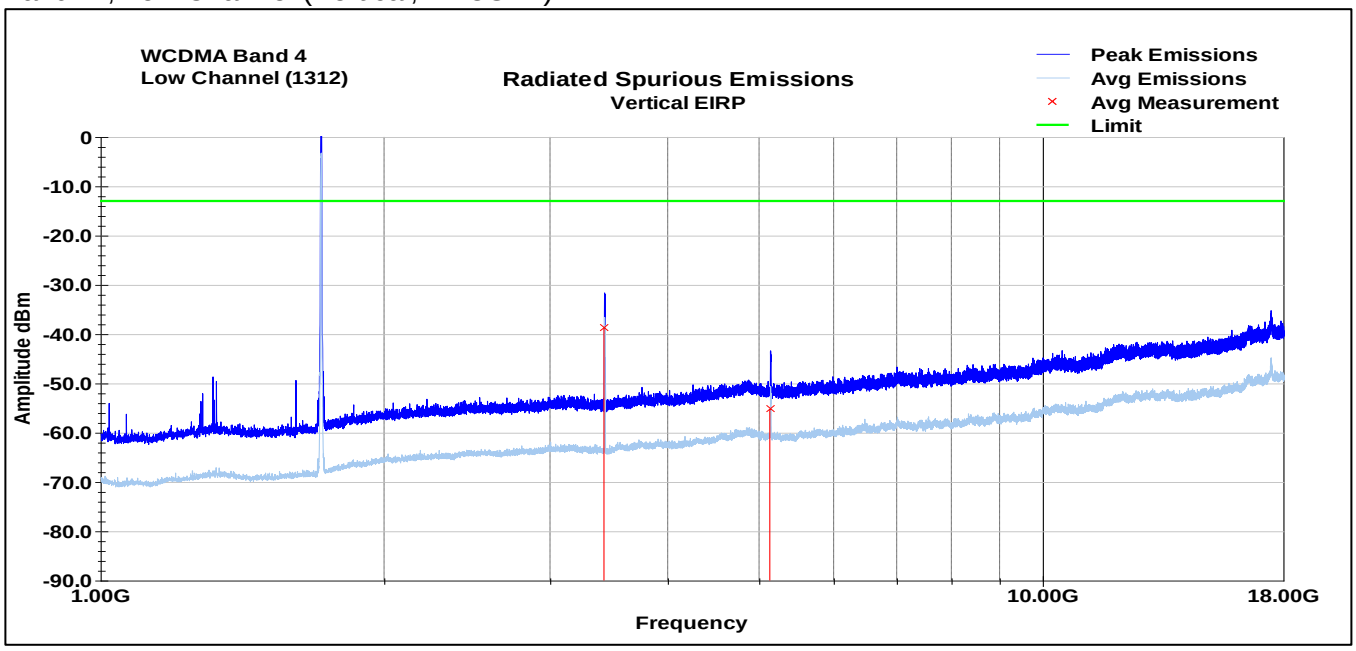
Band IV, Low Channel (Vertical, 30-1000MHz)



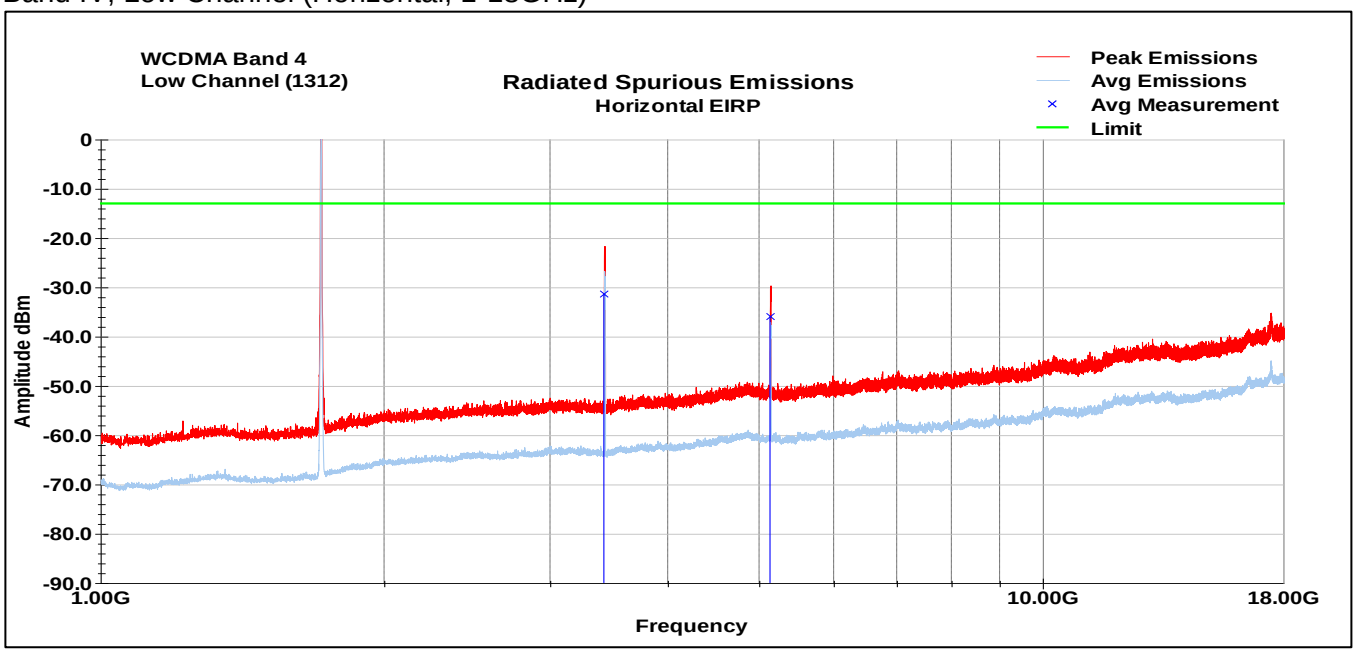
Band IV, Low Channel (Horizontal, 30-1000MHz)



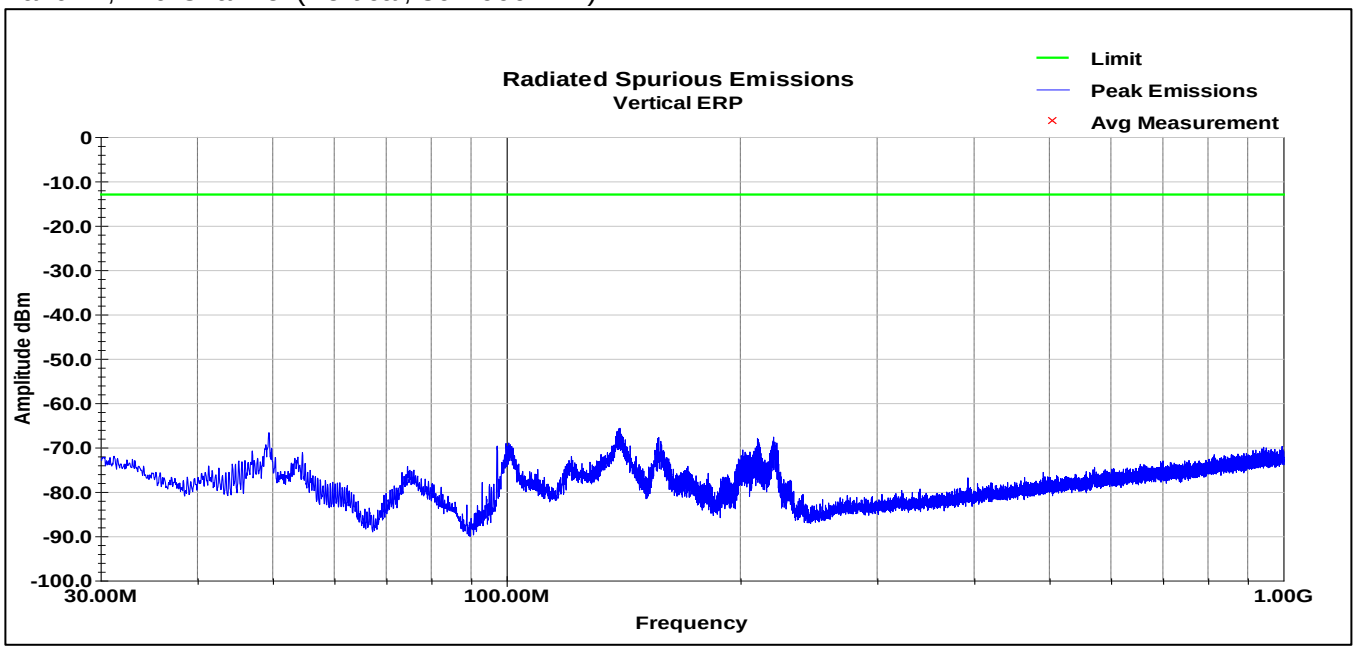
Band IV, Low Channel (Vertical, 1-18GHz)



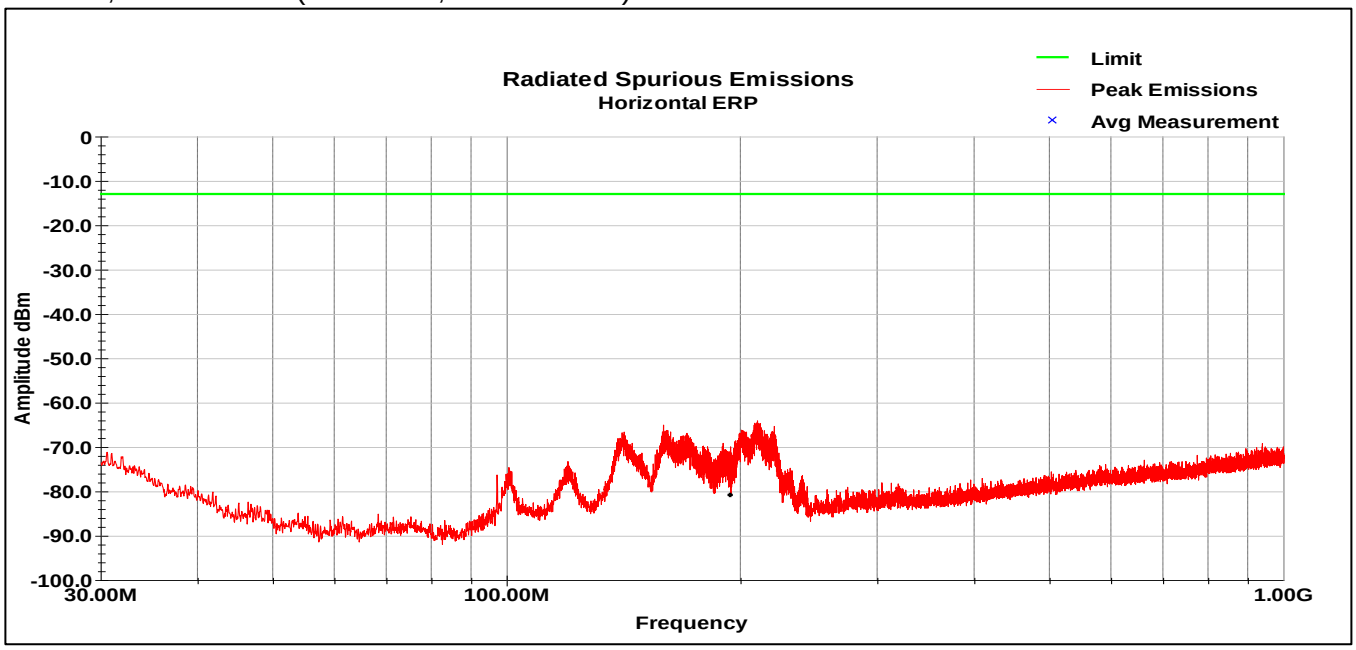
Band IV, Low Channel (Horizontal, 1-18GHz)



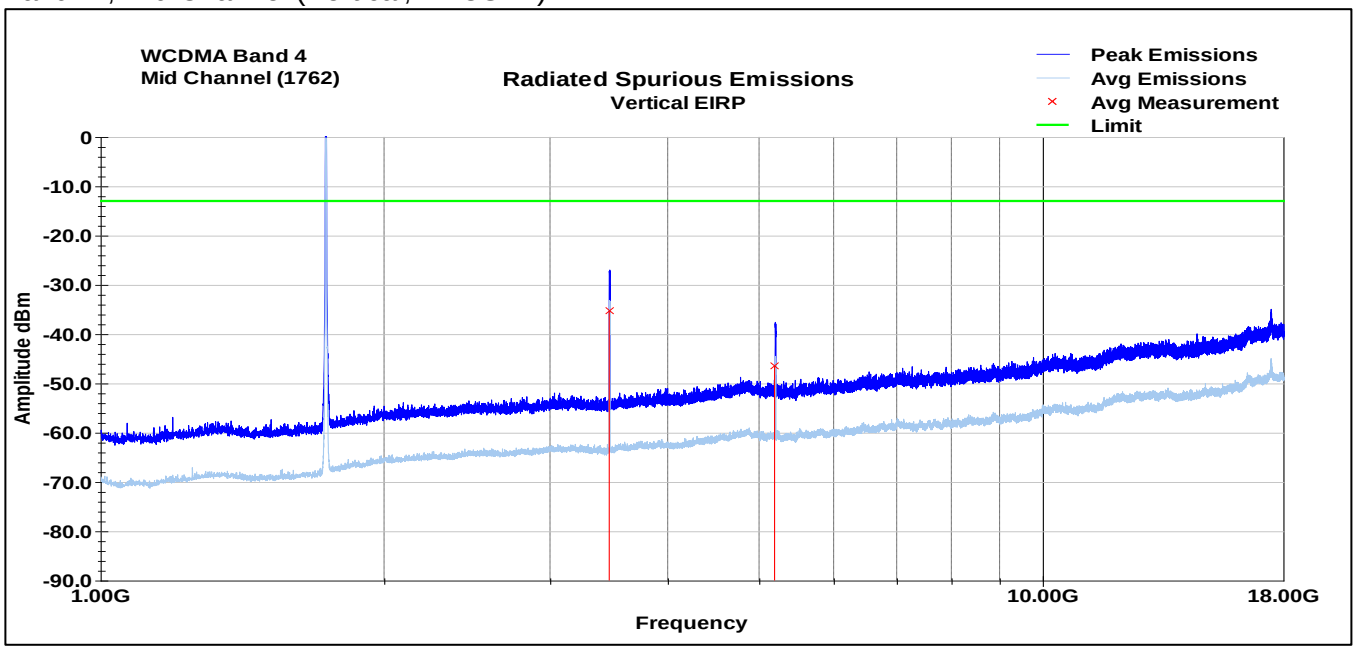
Band IV, Mid Channel (Vertical, 30-1000MHz)



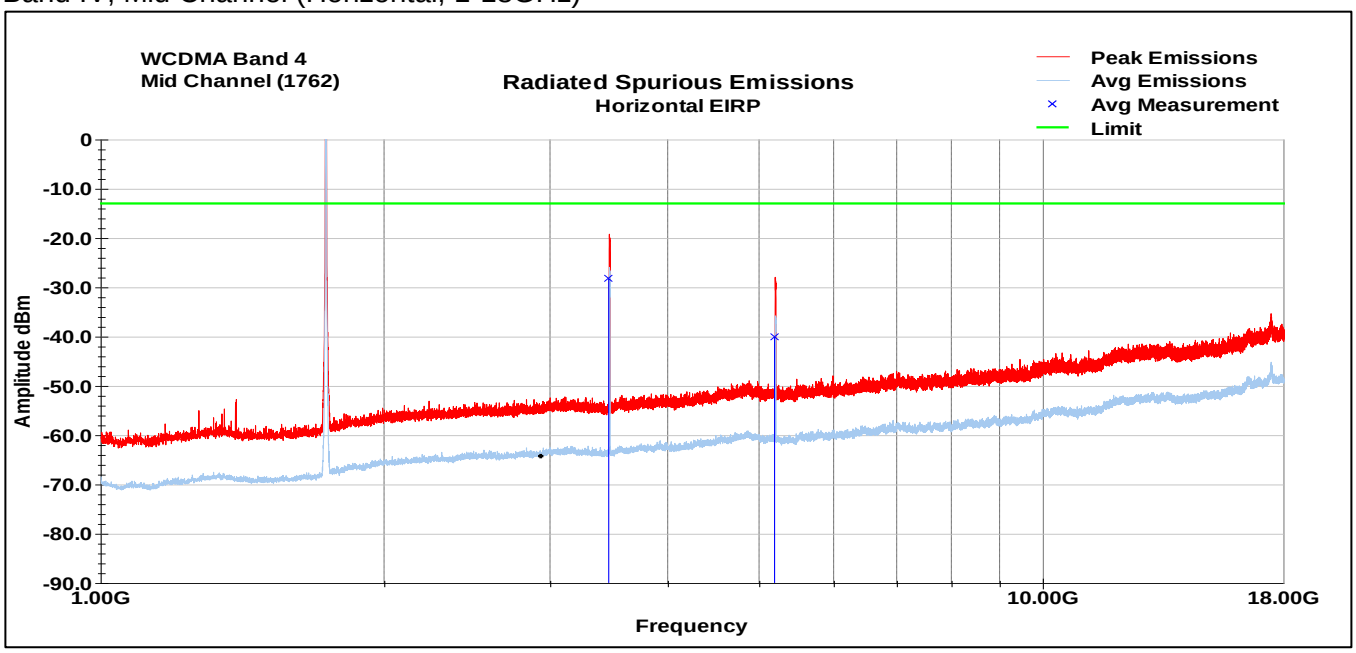
Band IV, Mid Channel (Horizontal, 30-1000MHz)



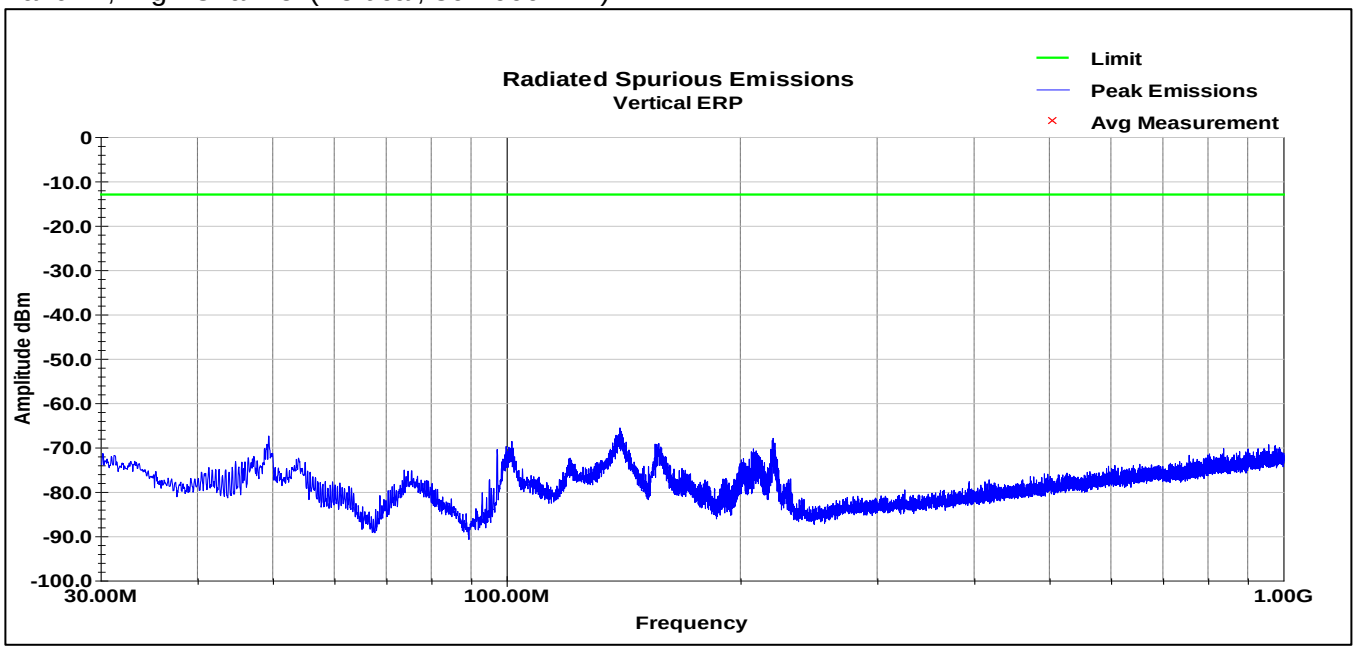
Band IV, Mid Channel (Vertical, 1-18GHz)



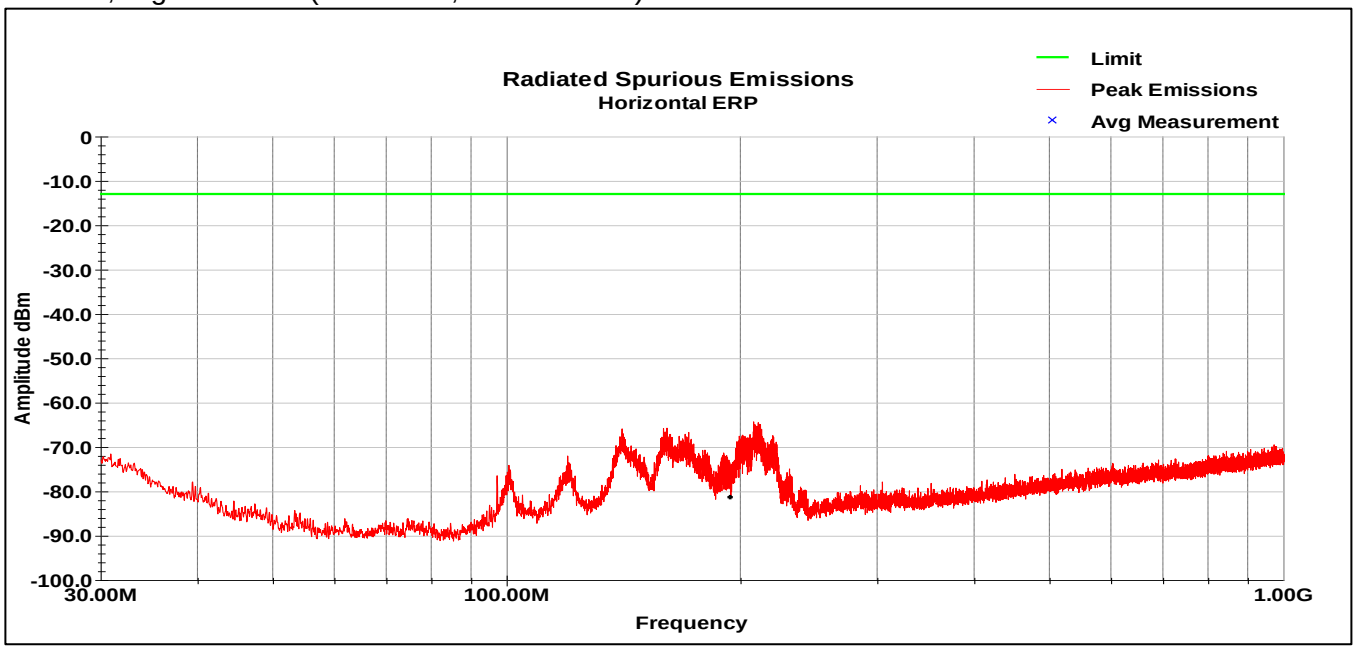
Band IV, Mid Channel (Horizontal, 1-18GHz)



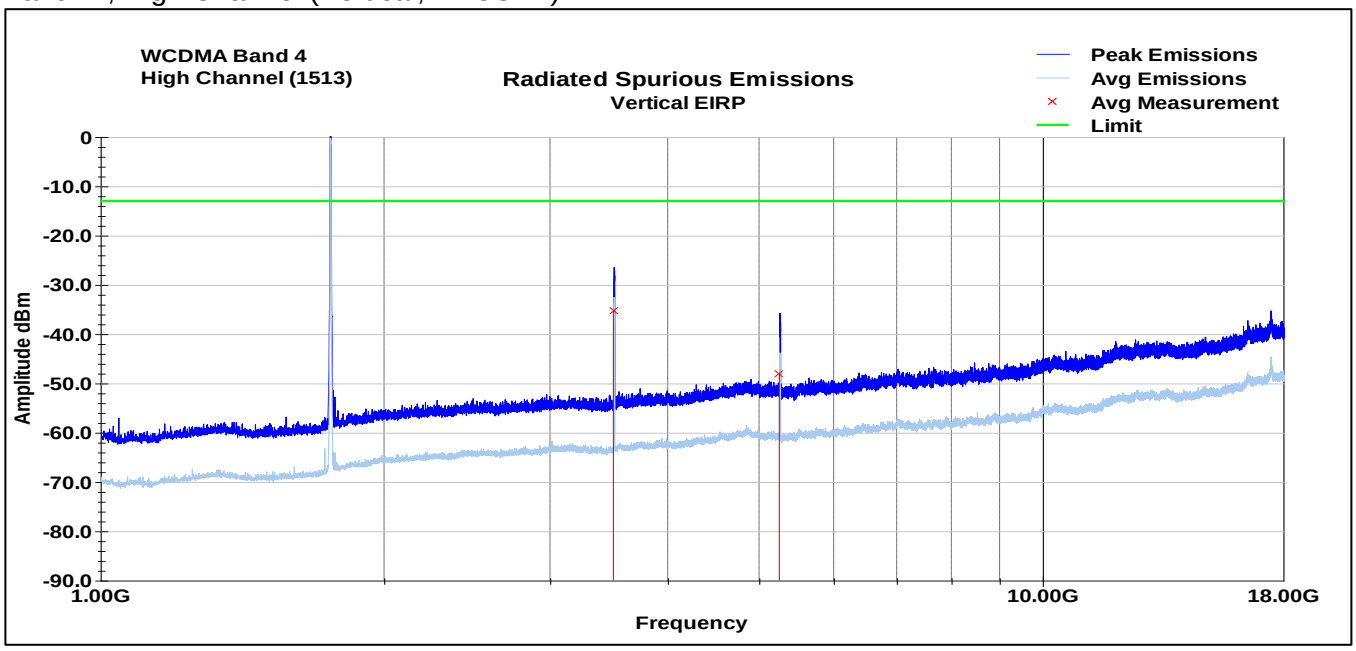
Band IV, High Channel (Vertical, 30-1000MHz)



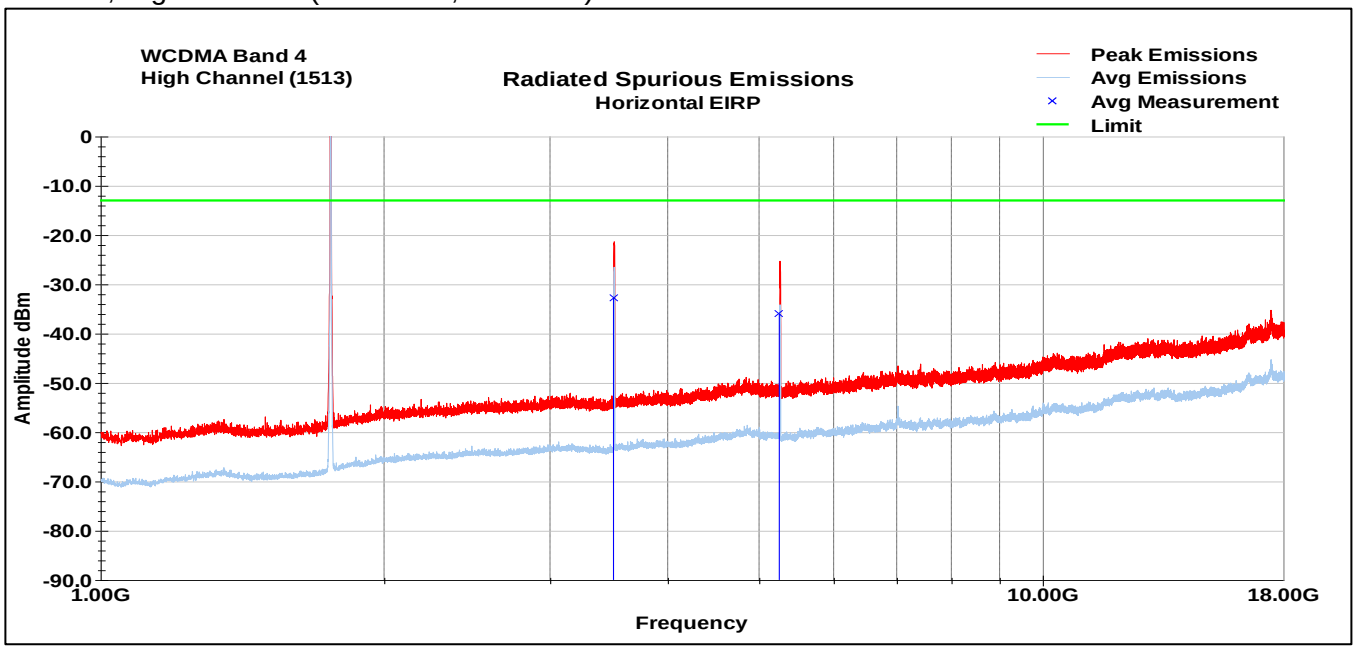
Band IV, High Channel (Horizontal, 30-1000MHz)



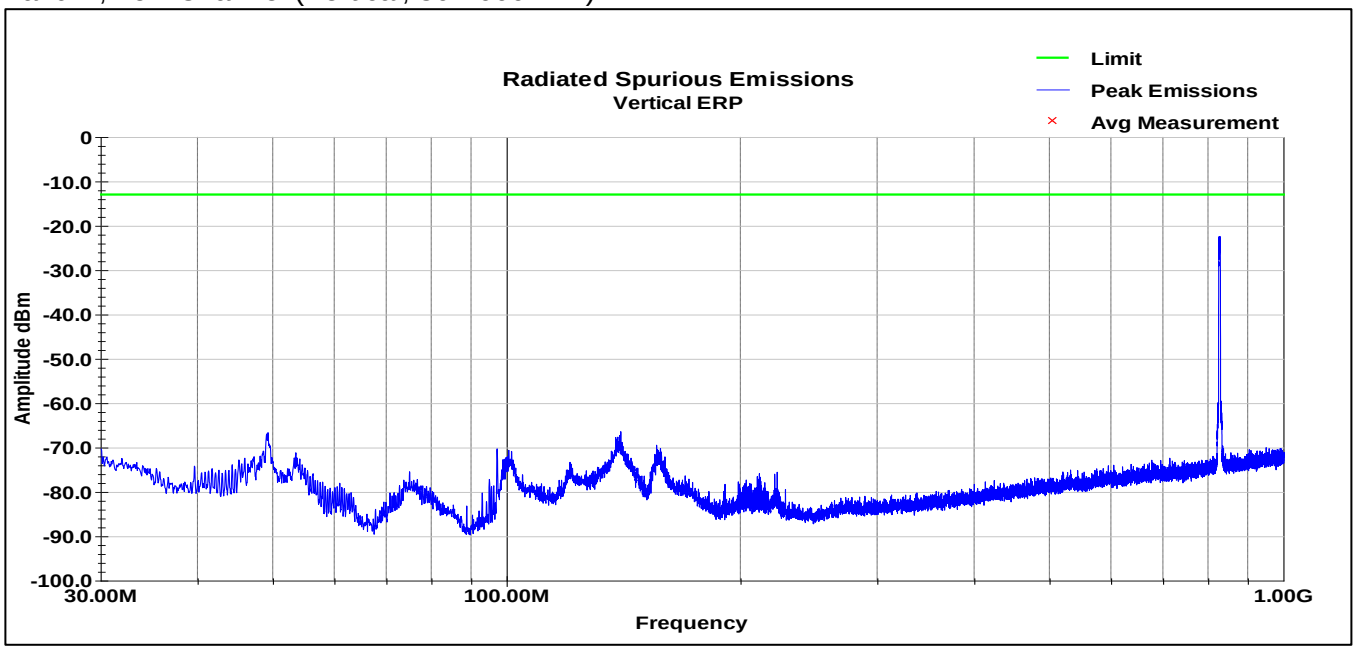
Band IV, High Channel (Vertical, 1-18GHz)



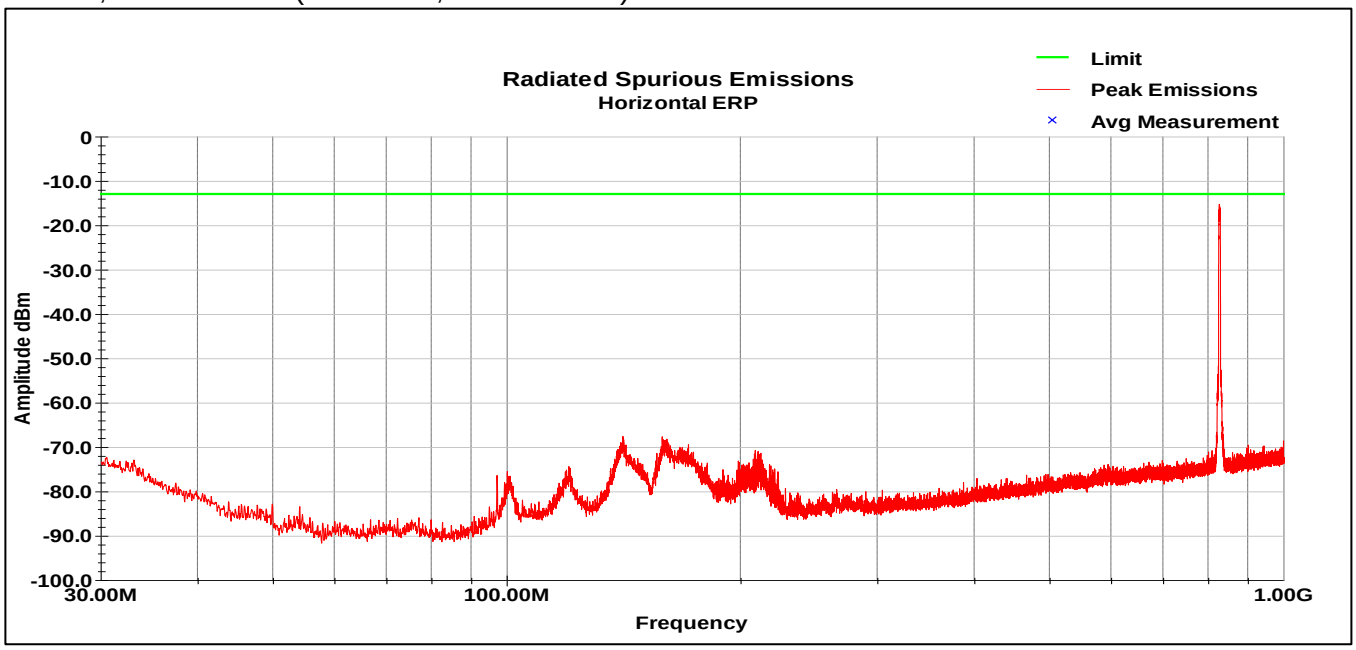
Band IV, High Channel (Horizontal, 1-18GHz)



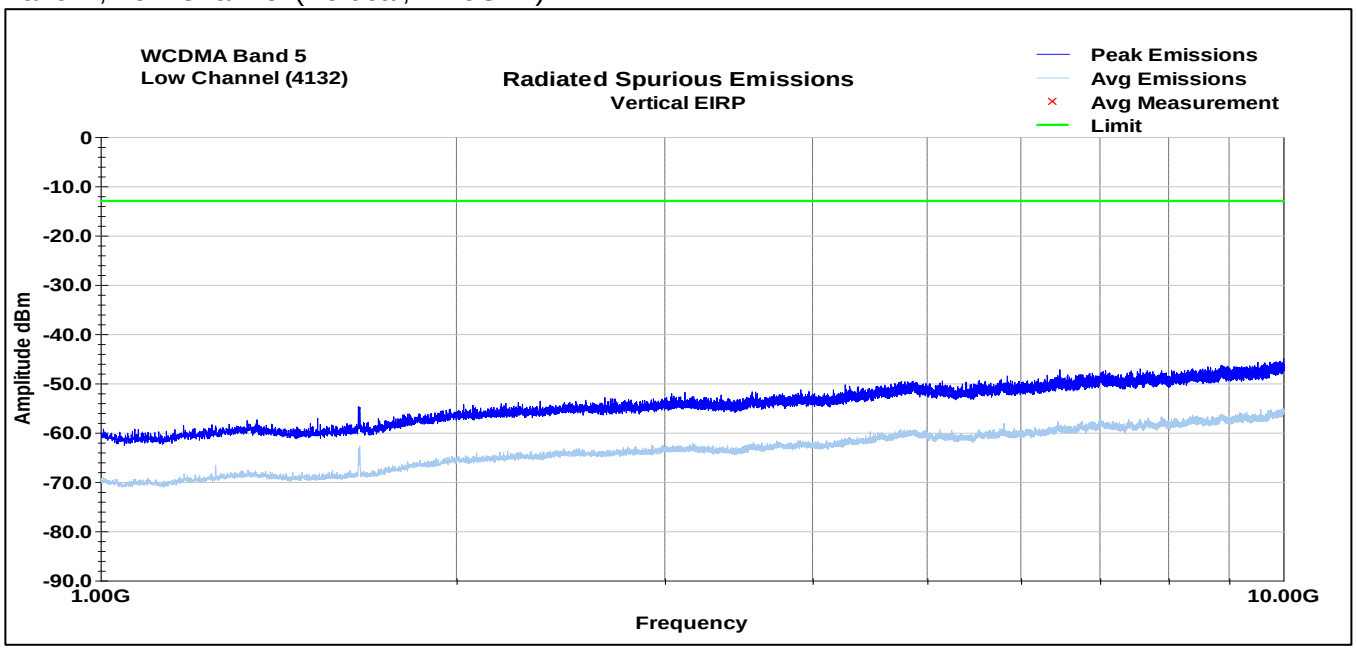
Band V, Low Channel (Vertical, 30-1000MHz)



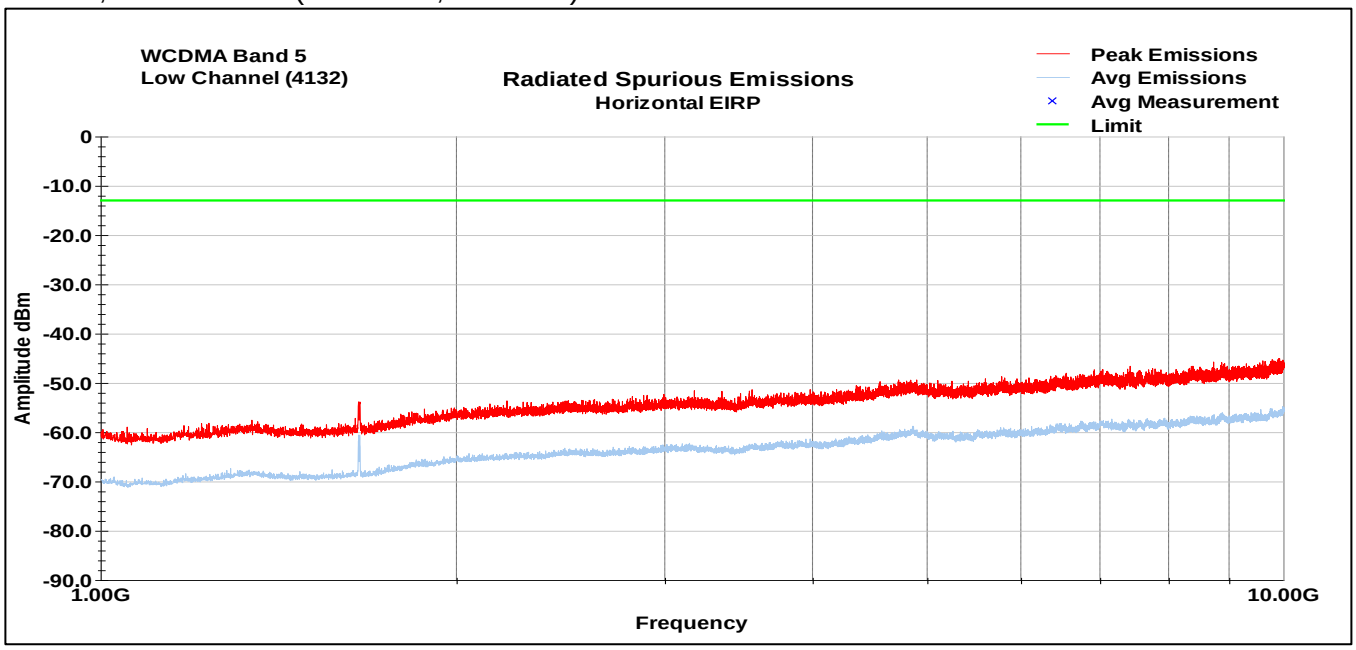
Band V, Low Channel (Horizontal, 30-1000MHz)



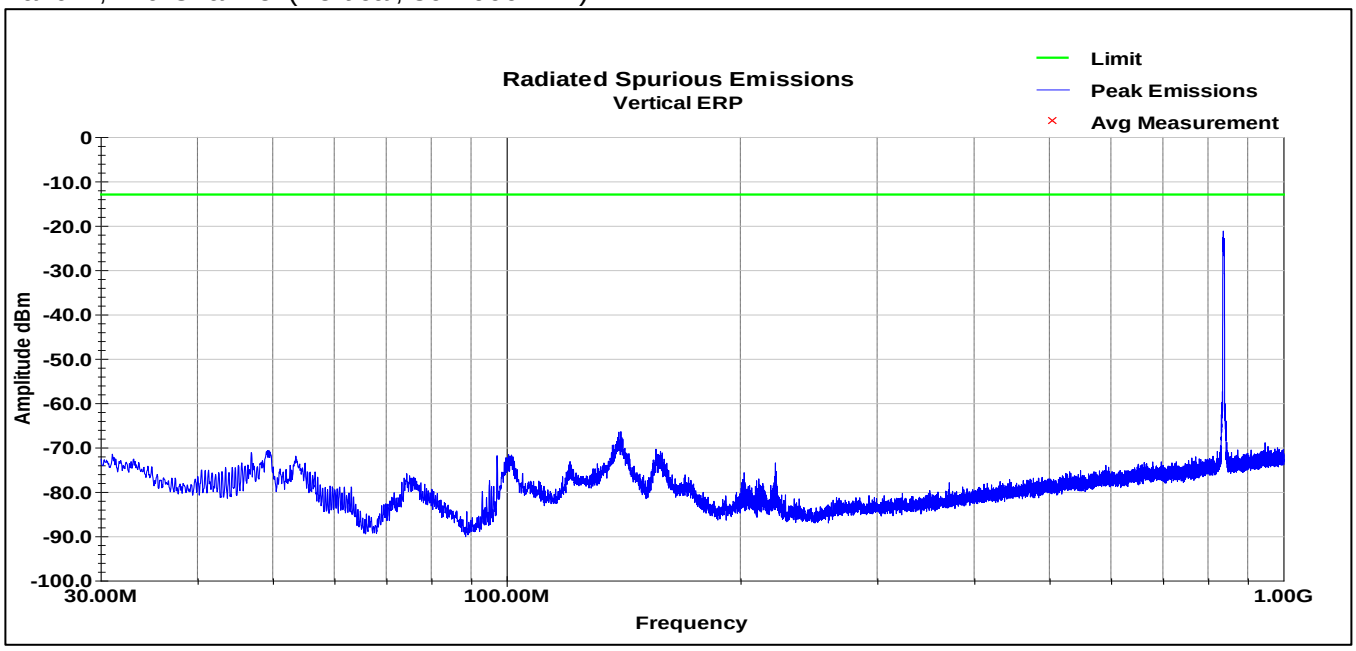
Band V, Low Channel (Vertical, 1-10GHz)



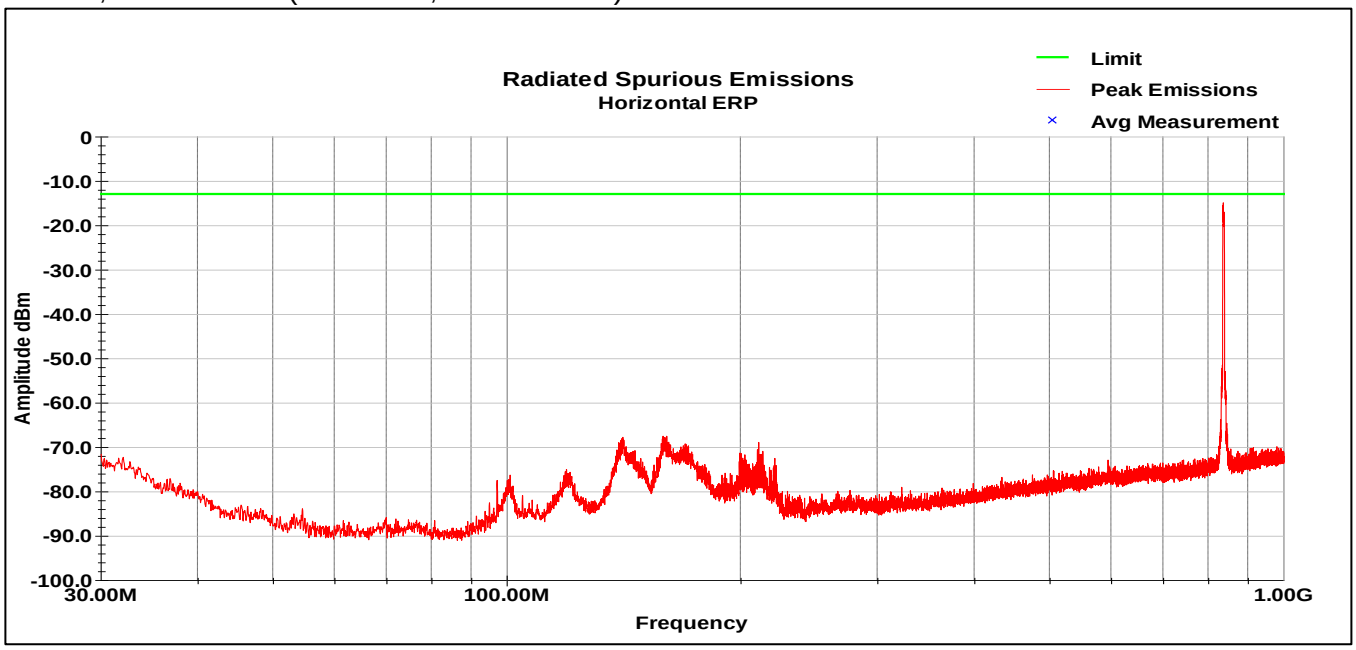
Band V, Low Channel (Horizontal, 1-10GHz)



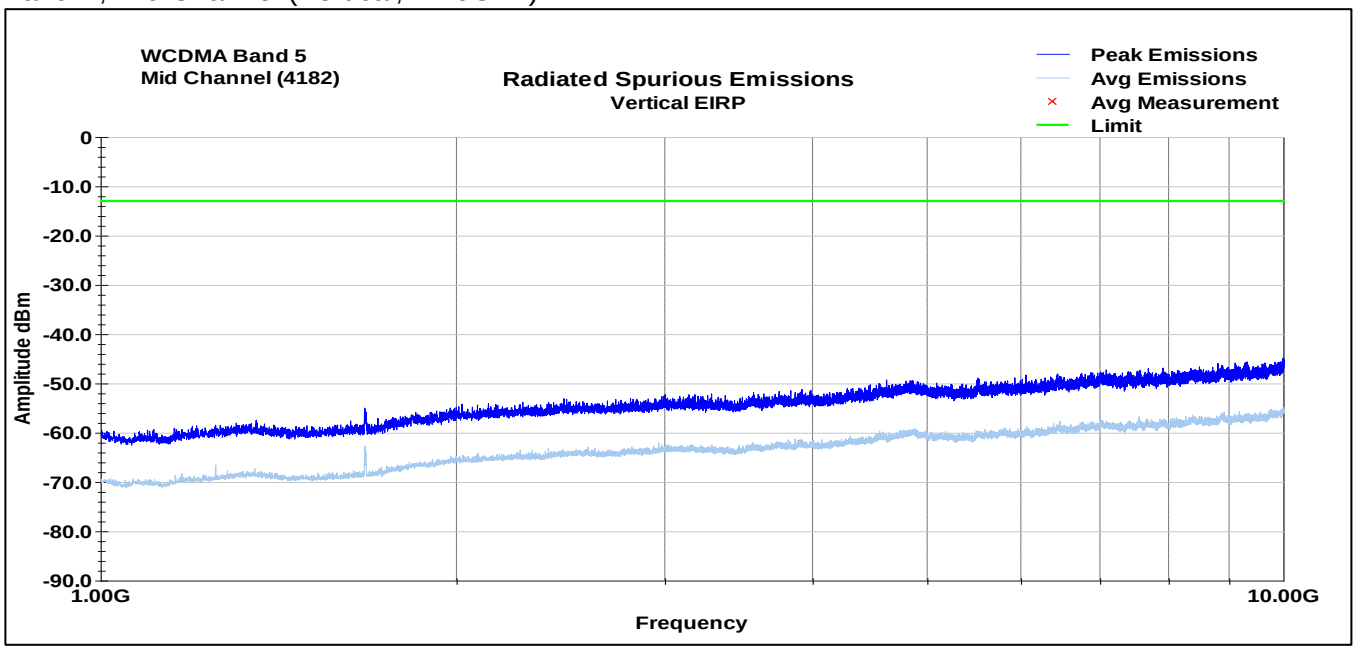
Band V, Mid Channel (Vertical, 30-1000MHz)



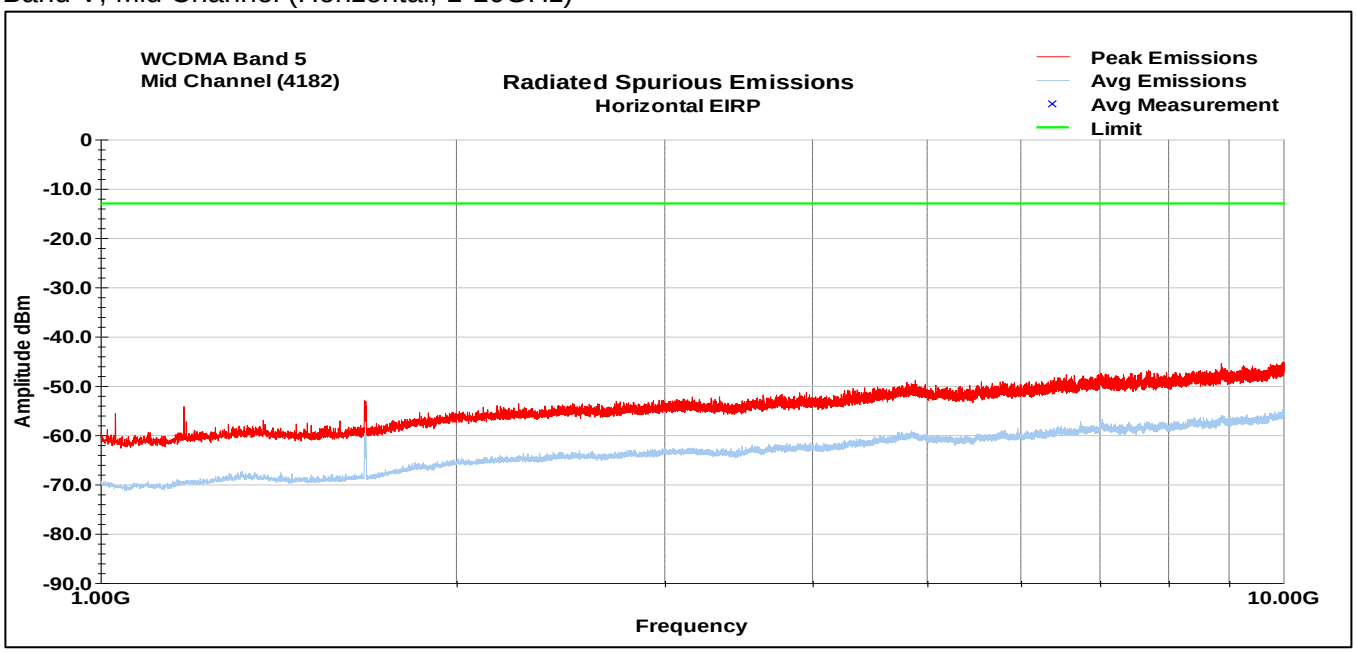
Band V, Mid Channel (Horizontal, 30-1000MHz)



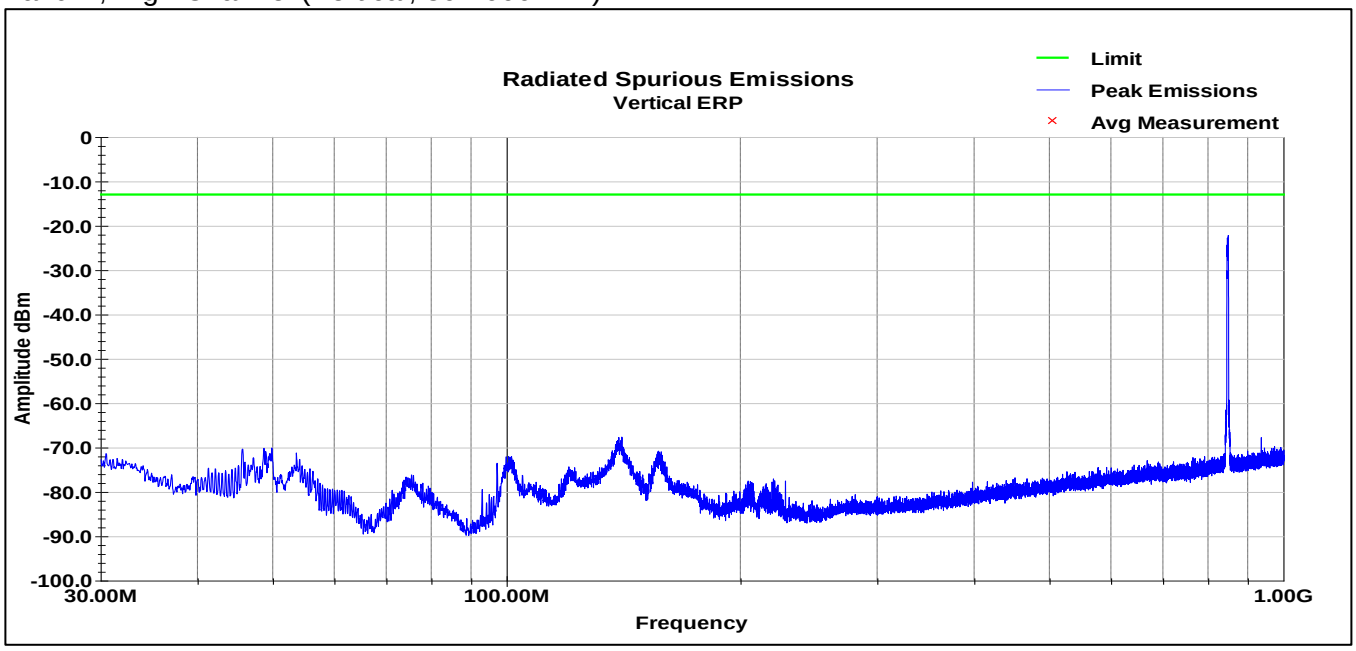
Band V, Mid Channel (Vertical, 1-10GHz)



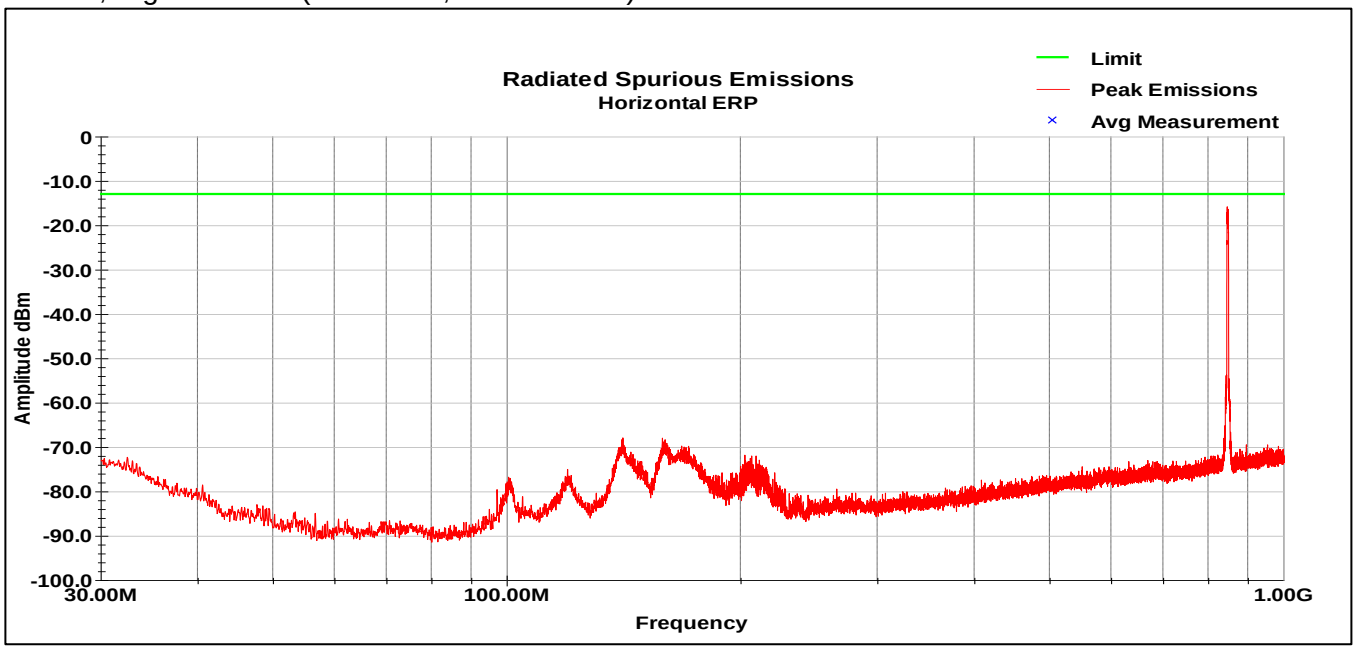
Band V, Mid Channel (Horizontal, 1-10GHz)



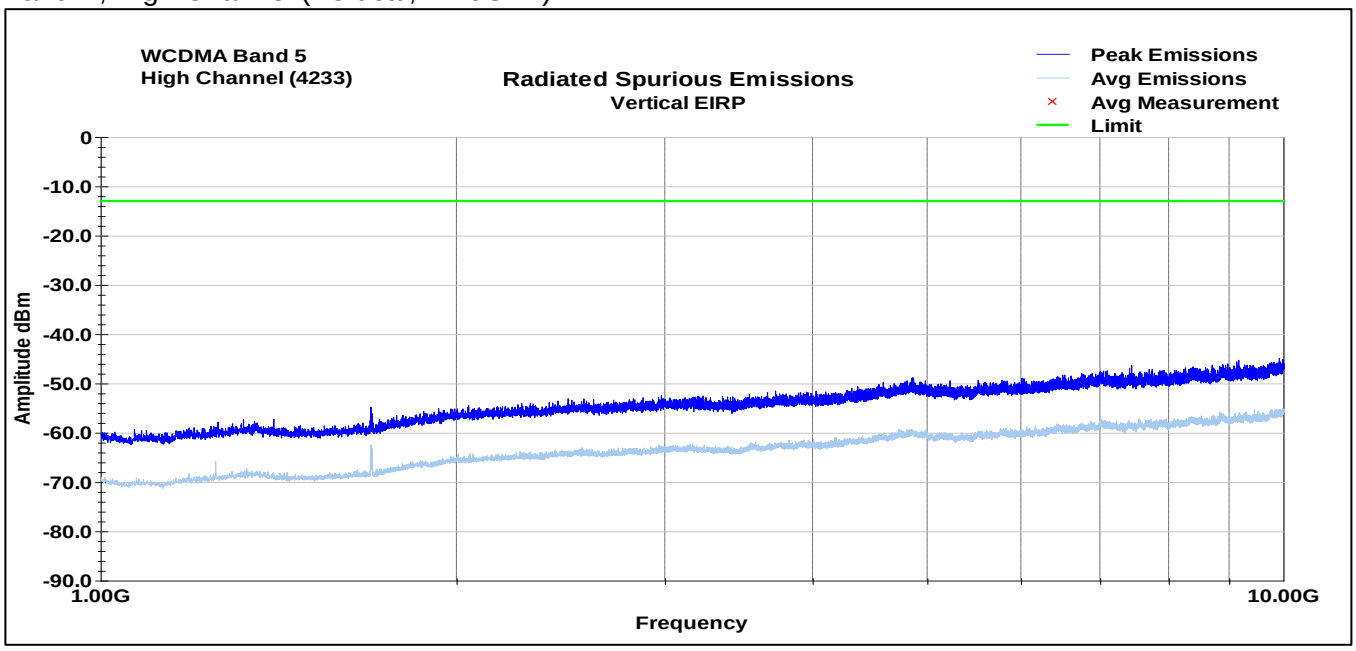
Band V, High Channel (Vertical, 30-1000MHz)



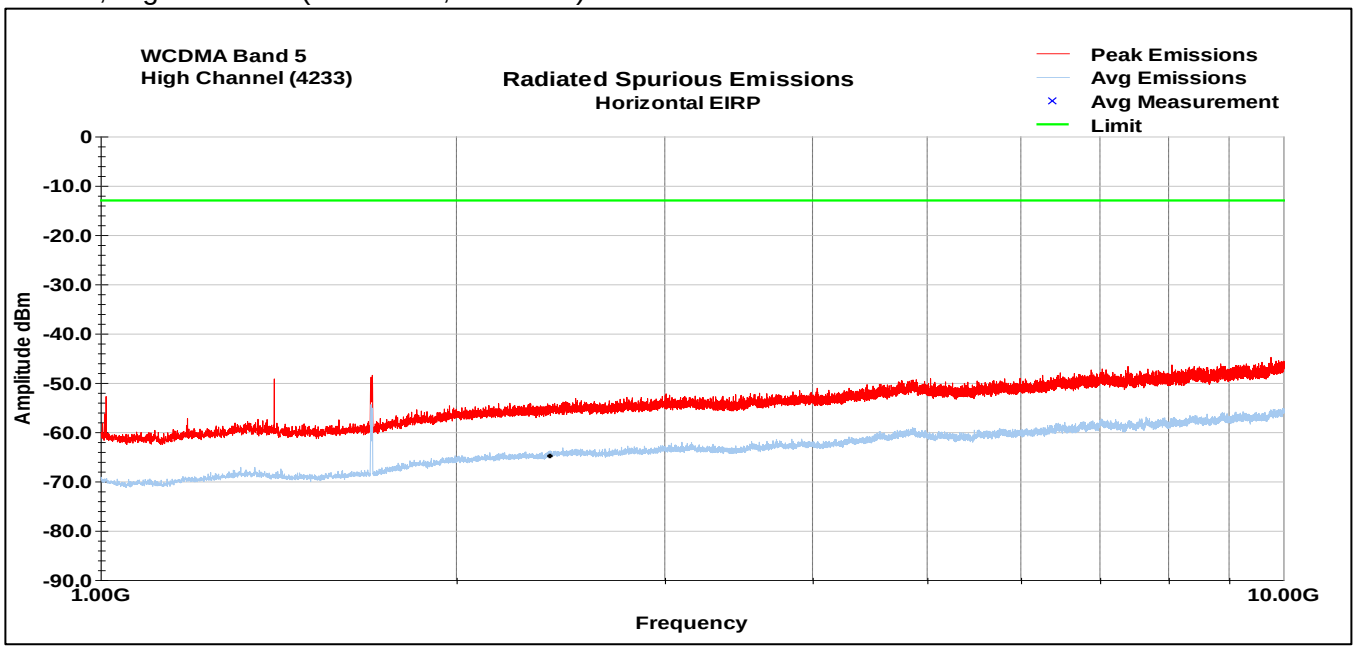
Band V, High Channel (Horizontal, 30-1000MHz)



Band V, High Channel (Vertical, 1-10GHz)



Band V, High Channel (Horizontal, 1-10GHz)



9 Frequency Stability

9.1 *Test Result*

Test Description	Basic Standards	Test Result
Frequency Stability	FCC 2.1055 FCC 24.235 FCC 27.54 RSS-GEN (6.11) RSS-132 (5.3) RSS-133 (6.3) RSS-139 (6.4)	Pass

9.2 *Test Method*

The EUT was placed inside the Environmental Chamber and was allowed to stabilize to set temperature for a minimum of thirty minutes before any measurements were made. The EUT antenna port was connected to the CMW 500 and the frequency was measured using the CMW internal measurement functions. The EUT was tested at the middle channel of each band.

9.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

9.4 *Test Equipment*

Test End Date: 14-Aug-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020
ENVIRONMENTAL TEST CHAMBER	T2RC	TENNEY ENVIRONMENTAL	B094877	CNR
MULTIMETER	87V	FLUKE	B079677	27-Jul-2019

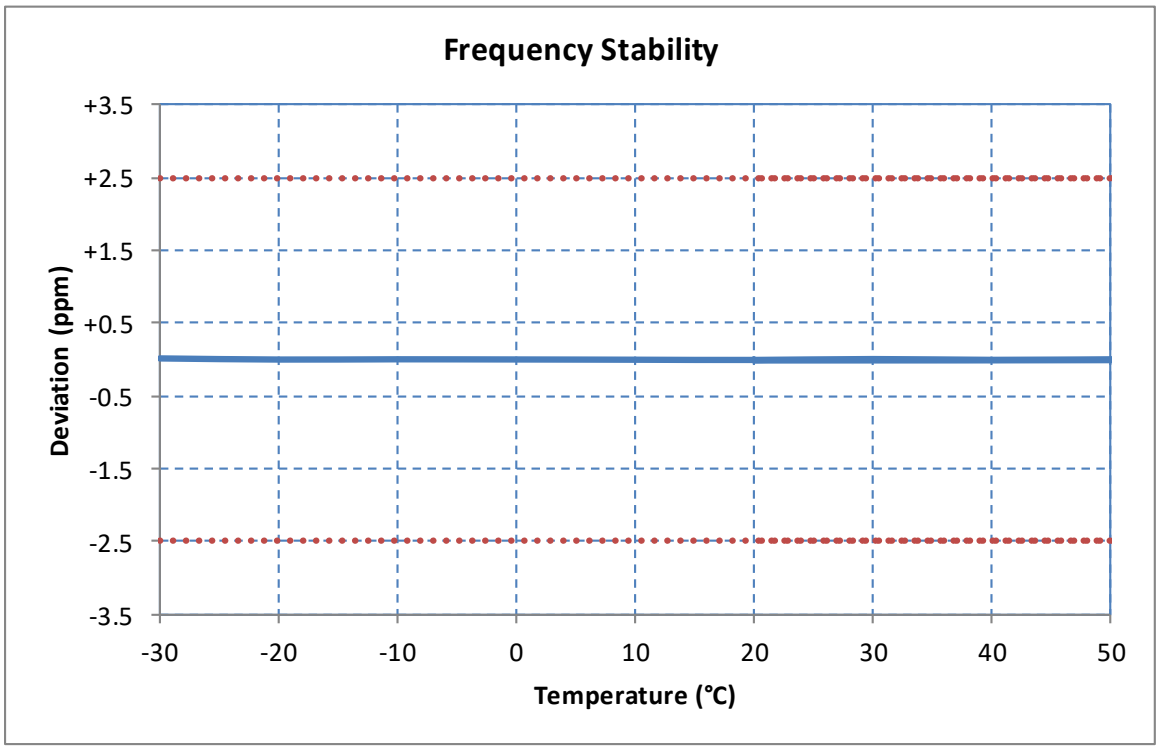
- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- Based on manufacturer's specifications, the CMW 500 is on a 2-year calibration cycle.

9.5 *Test Data*

The carrier frequency shall not depart from the reference frequency by more than ±2.5 ppm.

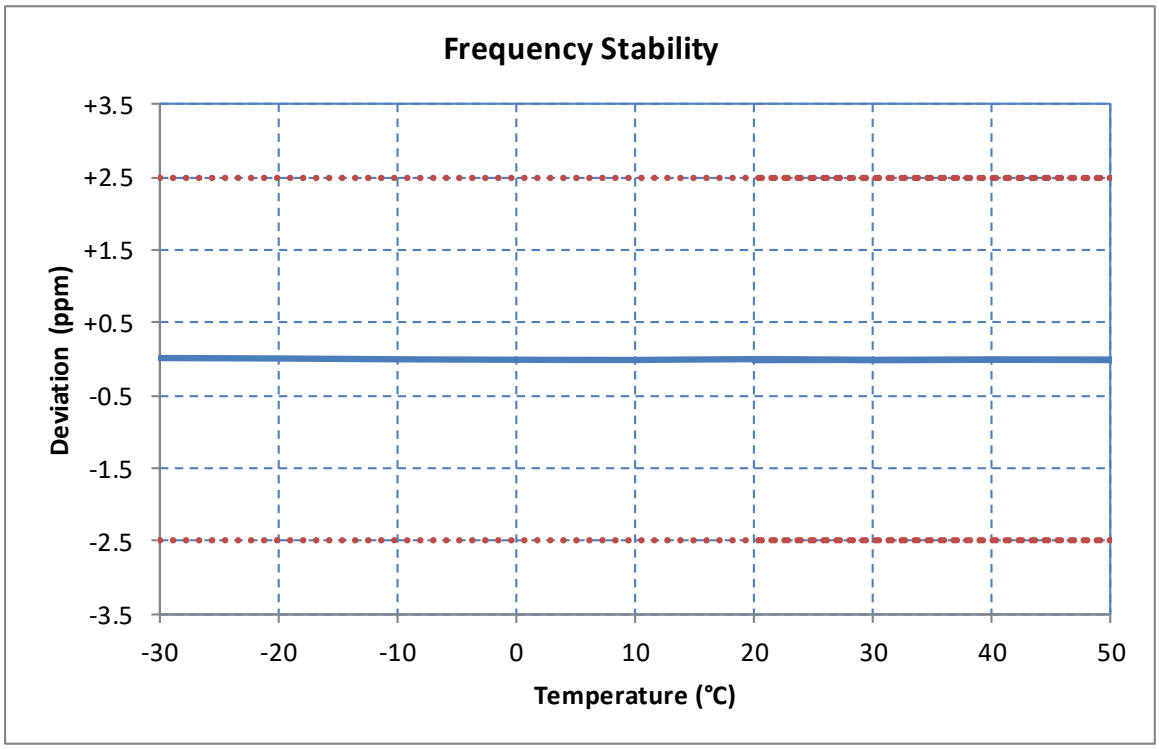
WCDMA Band II, Channel 9400 (1880MHz)

Voltage %	Power V_{DC}	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	12.00	+20 (Ref)	1,879,999,999	-1	-0.00	-0.000000
100%	12.00	-30	1,880,000,001	+1	+0.00	+0.000000
100%	12.00	-20	1,879,999,999	-1	-0.00	-0.000000
100%	12.00	-10	1,880,000,000	-0	-0.00	-0.000000
100%	12.00	0	1,879,999,999	-1	-0.00	-0.000000
100%	12.00	+10	1,879,999,999	-1	-0.00	-0.000000
100%	12.00	+20	1,879,999,999	-1	-0.00	-0.000000
100%	12.00	+30	1,880,000,000	-0	-0.00	-0.000000
100%	12.00	+40	1,879,999,999	-1	-0.00	-0.000000
100%	12.00	+50	1,880,000,000	-1	-0.00	-0.000000
100%	12.00	+55	1,879,999,999	-1	-0.00	-0.000000
115%	13.80	+20	1,879,999,998	-2	-0.00	-0.000000
85%	10.20	+20	1,879,999,999	-1	-0.00	-0.000000



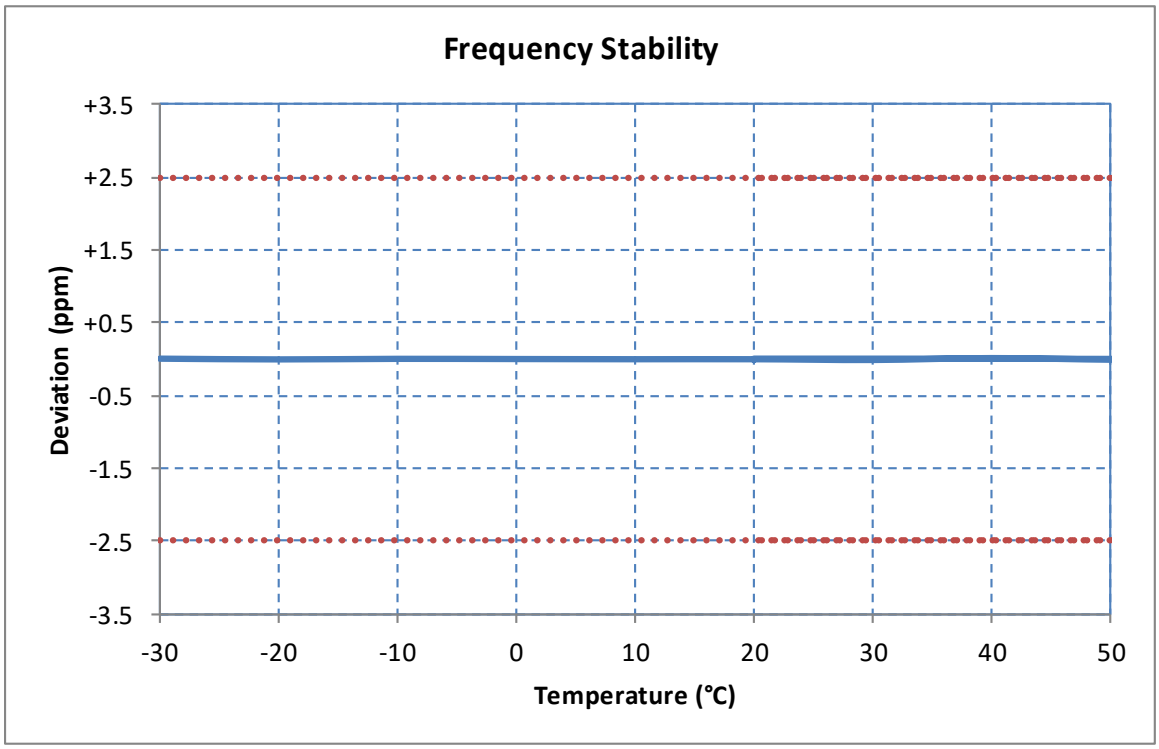
WCDMA Band IV, Channel 1762 (1732.5MHz)

Voltage %	Power V_{DC}	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	12.00	+20 (Ref)	1,732,500,001	+1	+0.00	+0.000000
100%	12.00	-30	1,732,500,002	+2	+0.00	+0.000000
100%	12.00	-20	1,732,500,002	+2	+0.00	+0.000000
100%	12.00	-10	1,732,500,001	+1	+0.00	+0.000000
100%	12.00	0	1,732,500,001	+1	+0.00	+0.000000
100%	12.00	+10	1,732,500,000	+0	+0.00	+0.000000
100%	12.00	+20	1,732,500,001	+1	+0.00	+0.000000
100%	12.00	+30	1,732,500,000	+0	+0.00	+0.000000
100%	12.00	+40	1,732,500,001	+1	+0.00	+0.000000
100%	12.00	+50	1,732,500,000	+0	+0.00	+0.000000
100%	12.00	+55	1,732,500,001	+1	+0.00	+0.000000
115%	13.80	+20	1,732,500,000	+0	+0.00	+0.000000
85%	10.20	+20	1,732,500,001	+1	+0.00	+0.000000



WCDMA Band V, Channel 4182 (836.4MHz)

Voltage %	Power V_{DC}	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	12.00	+20 (Ref)	836,400,000	-0	-0.00	-0.000000
100%	12.00	-30	836,400,000	+0	+0.00	+0.000000
100%	12.00	-20	836,400,000	-0	-0.00	-0.000000
100%	12.00	-10	836,400,000	+0	+0.00	+0.000000
100%	12.00	0	836,400,000	-0	-0.00	-0.000000
100%	12.00	+10	836,400,000	-0	-0.00	-0.000000
100%	12.00	+20	836,400,000	-0	-0.00	-0.000000
100%	12.00	+30	836,399,999	-1	-0.00	-0.000000
100%	12.00	+40	836,400,000	+0	+0.00	+0.000000
100%	12.00	+50	836,400,000	-0	-0.00	-0.000000
100%	12.00	+55	836,400,000	-0	-0.00	-0.000000
115%	13.80	+20	836,400,000	+0	+0.00	+0.000000
85%	10.20	+20	836,399,999	-1	-0.00	-0.000000



10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	04 September 2018