

RF Test Report

Class 2 Permissive Change

Project Number: 4297829

Report Number: 4297829EMC03 **Revision Level:** 1

Client: Continental Automotive Systems, Inc.

Equipment Under Test: Wireless Modem Module

Model: BL28NA-001

FCC ID: LHJ-BL28NA001

IC ID: 2807E-BL28NA001

FCC Rule Parts: Part 2, Part 24(E)

Industry Canada: RSS-GEN, Issue 5

RSS-133, Issue 6

Report issued on: 17 October 2018

Test Result: Compliant

Tested by:


Shawn McGuinness, EMC Engineering Leader
for Jacky Li, Senior 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.

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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
2.1051 24.238(a)	RSS-133 (6.5.1)	Band Edge / Conducted Spurious Emissions		Pass
2.1053 24.238(a)	RSS-GEN (6.13) RSS-133 (6.5.1)	Radiated Spurious Emissions	Radiated	Pass

2 Modifications Required to Compliance

None

3 General Information

3.1 Client Information

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

3.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

3.3 General Information of EUT

Type of Product: Wireless Modem Module
Model Number: BL28NA-001
Serial Number: ADN171020001760, ADN171020000184
IMEI Number: 014831000001760, 014831000000184
FCC ID: LHJ-BL28NA001
IC ID: 2807E-BL28NA001

Rated Voltage: 10.2 - 13.8 Vdc
Test Voltage: 12 Vdc

Tx Frequency Range: 824.2 – 848.8 MHz (GSM850)
1850.2 – 1909.8 MHz (GSM1900)

Tested bands for C2PC: 1850.2 – 1909.8 MHz (GSM1900)

FCC Classification: PCS Licensed Transmitter PCB
Type: Pre-Production

Sample Received Date: 17 April 2018, 05 June 2018
Dates of testing: 21 May to 29 June and 15-17 October 2018

3.4 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.

4 RF Output Power

4.1 Test Result

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

4.2 Test Method

A radio link was established between EUT and Radio Communication Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester. The CMW500 was used to measure the output power.

The measurements were conducted at the low, middle, and high channel.

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.3 °C
 Relative Humidity: 53.0 %
 Atmospheric Pressure: 98.3 kPa

4.4 Test Equipment

Test End Date: 15-Oct-2018

Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF CABLE (TS8997)	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.

4.5 Test Data

GSM1900 Max: 29.12 dBm (0.817 W)

Band	Uplink Channel	UL Frequency (MHz)	Mode	Modulation	Slots	Measured Power (dBm)	Cable Loss (dB)	Conducted Power (dBm)
1900	512	1850.2	GPRS	GMSK	1	27.95	0.53	28.48
1900	512	1850.2	GPRS	GMSK	2	27.79	0.53	28.32
1900	512	1850.2	GPRS	GMSK	3	27.61	0.53	28.14
1900	512	1850.2	GPRS	GMSK	4	27.39	0.53	27.92
1900	661	1880	GPRS	GMSK	1	28.45	0.54	28.99
1900	661	1880	GPRS	GMSK	2	28.27	0.54	28.81
1900	661	1880	GPRS	GMSK	3	28.07	0.54	28.61
1900	661	1880	GPRS	GMSK	4	27.84	0.54	28.38
1900	810	1909.8	GPRS	GMSK	1	28.58	0.54	29.12
1900	810	1909.8	GPRS	GMSK	2	28.42	0.54	28.96
1900	810	1909.8	GPRS	GMSK	3	28.23	0.54	28.77
1900	810	1909.8	GPRS	GMSK	4	27.98	0.54	28.52
1900	512	1850.2	EGPRS	8-PSK	1	24.27	0.53	24.80
1900	512	1850.2	EGPRS	8-PSK	2	24.13	0.53	24.66
1900	512	1850.2	EGPRS	8-PSK	3	23.92	0.53	24.45
1900	512	1850.2	EGPRS	8-PSK	4	23.68	0.53	24.21
1900	661	1880	EGPRS	8-PSK	1	24.50	0.54	25.04
1900	661	1880	EGPRS	8-PSK	2	24.29	0.54	24.83
1900	661	1880	EGPRS	8-PSK	3	24.14	0.54	24.68
1900	661	1880	EGPRS	8-PSK	4	23.85	0.54	24.39
1900	810	1909.8	EGPRS	8-PSK	1	24.67	0.54	25.21
1900	810	1909.8	EGPRS	8-PSK	2	24.48	0.54	25.02
1900	810	1909.8	EGPRS	8-PSK	3	24.29	0.54	24.83
1900	810	1909.8	EGPRS	8-PSK	4	24.05	0.54	24.59

5 Band Edge and Conducted Spurious Emissions

5.1 Test Result

Test Description	Basic Standards	Test Result
Band Edge and Conducted Spurious Emissions	FCC 2.1051 FCC 24.238(a) RSS-133 (6.5.1)	Pass

5.2 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.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions	Band Edge	Conducted Spurious Emissions
Temperature:	23.7 °C	23.4 °C
Relative Humidity:	50.3 %	50.5 %
Atmospheric Pressure:	98.5 kPa	98.2 kPa

5.4 Test Equipment

Band Edge Tests

Test End Date: 17-Oct-2018

Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
RF CABLE	1134	GORE	B094785	25-Jul-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	25-Jul-2019
ATTENUATOR, 10DB	BW-S10W2	MINI-CIRCUITS	15032	CNR
POWER SPLITTER	ZFRSC-183-S+	MINI-CIRCUITS	B101741	25-Jul-2019
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	25-Jan-2020

Conducted Spurious Emissions Tests

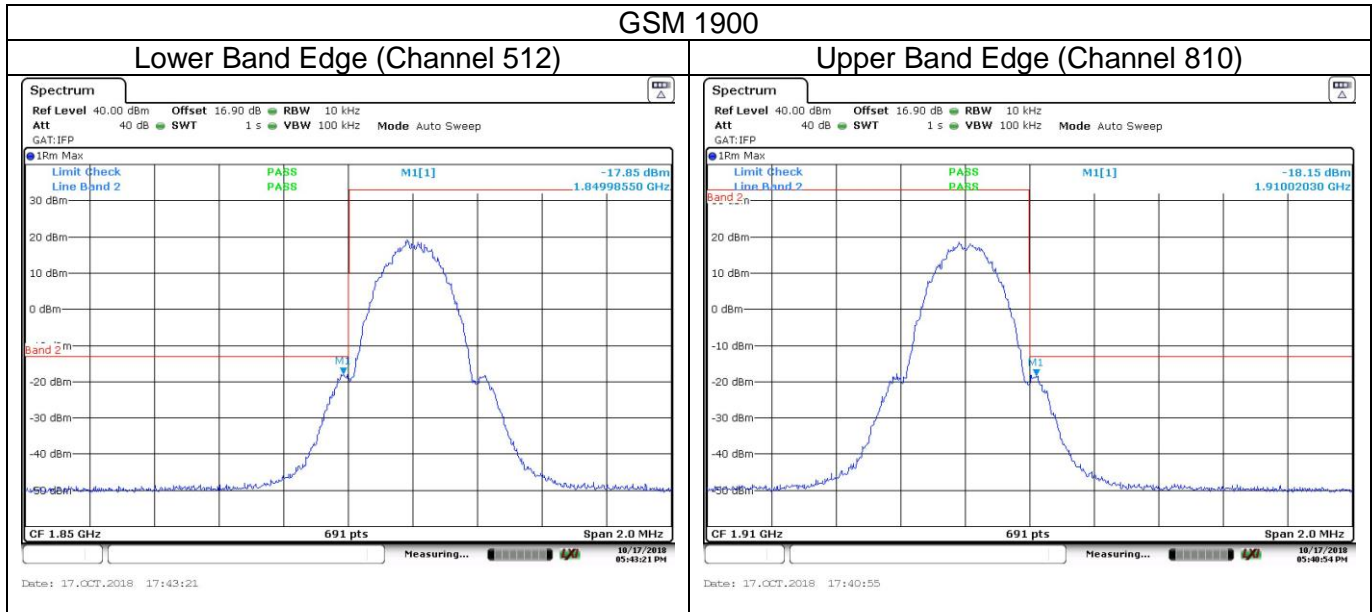
Test End Date: 24-May-2018

Tester: JL

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	13628	2-Oct-2018
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	20-Jan-2020

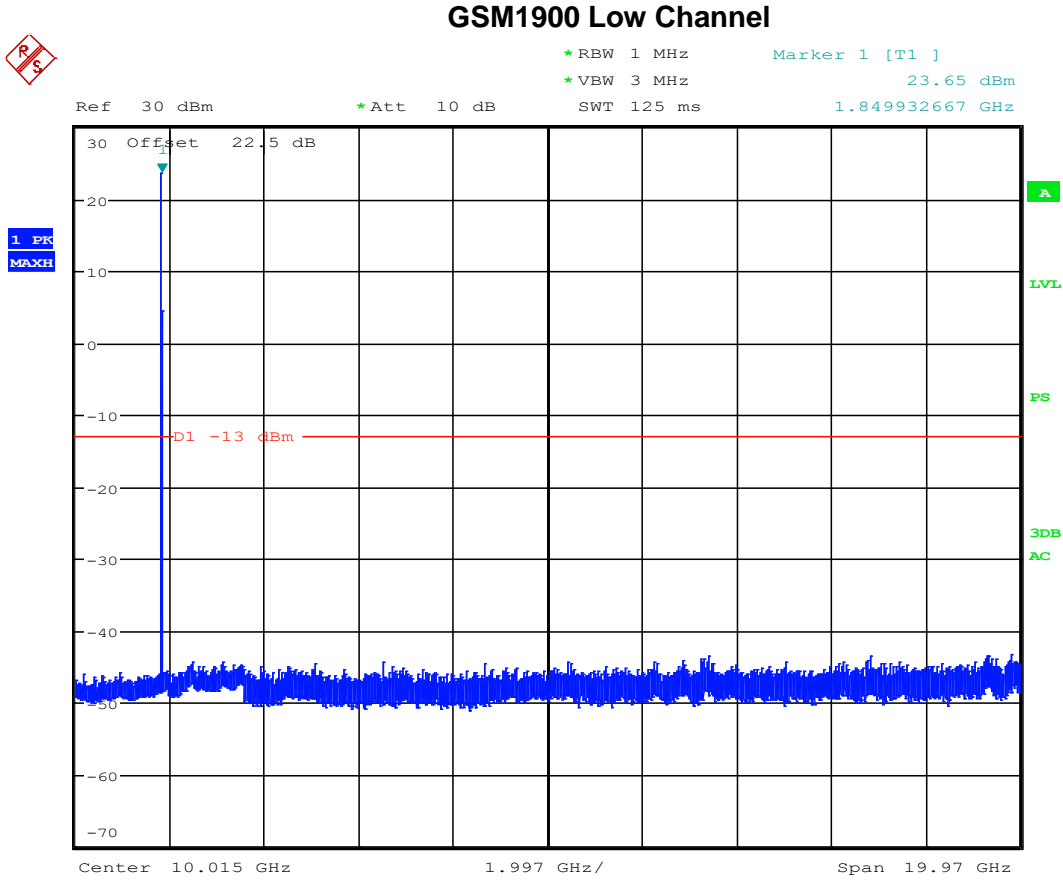
- Unless otherwise noted, equipment is on a 1-year calibration cycle.
- Based on manufacturer's specifications, the CMW 500 is on a 2-year calibration cycle.

5.5 Test Data - Band Edge



5.6 Test Data - Conducted Spurious Emissions

There were no emissions within 20 dB of the limit from 9kHz to 1 GHz.

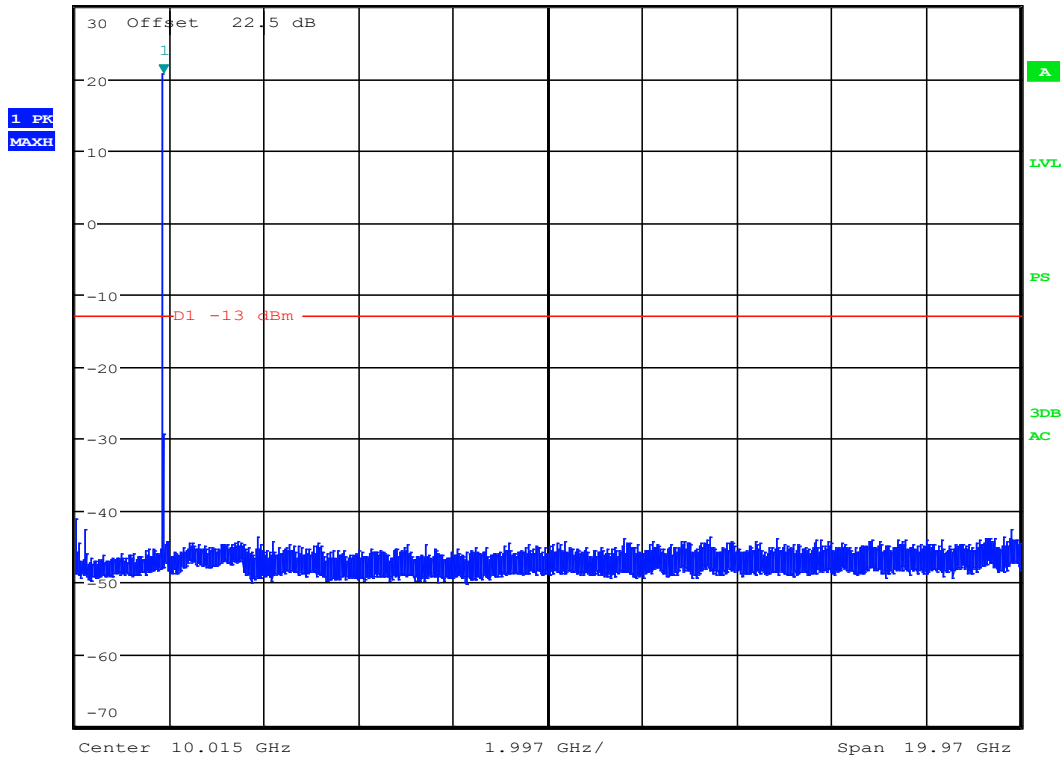


Date: 24.MAY.2018 09:33:25

GSM1900 Mid Channel



*RBW 1 MHz Marker 1 [T1]
 *VBW 3 MHz 20.58 dBm
 Ref 30 dBm *Att 10 dB SWT 125 ms 1.879887667 GHz

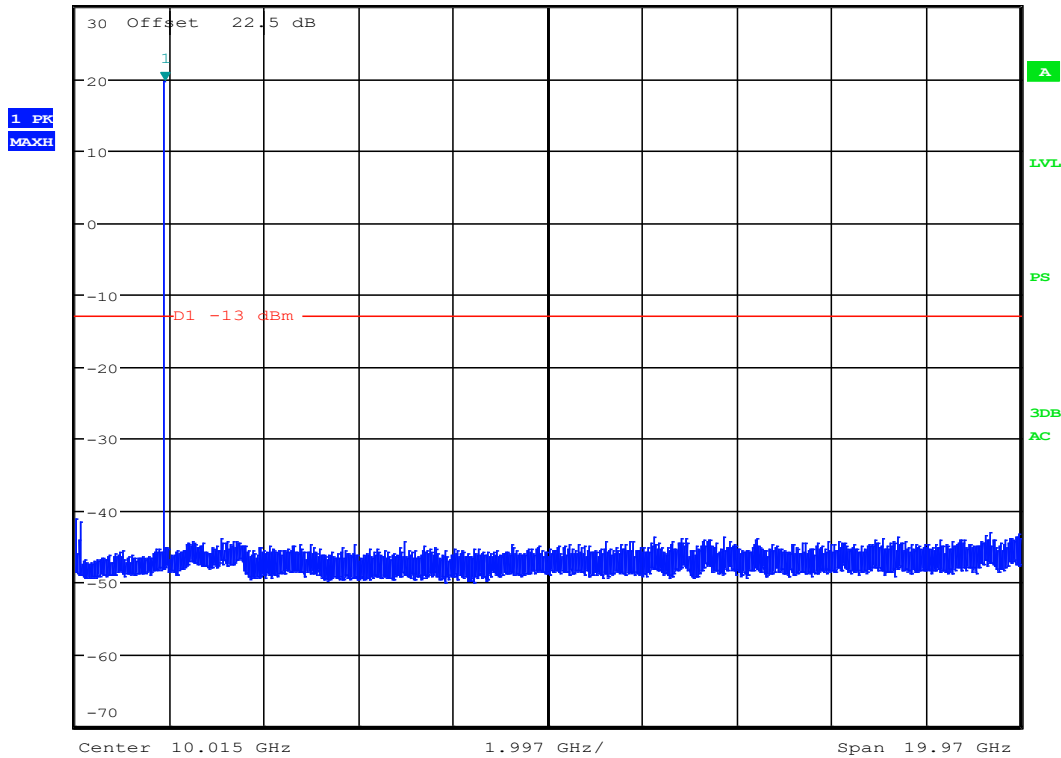


Date: 24.MAY.2018 09:23:58

GSM1900 High Channel



*RBW 1 MHz Marker 1 [T1]
 *VBW 3 MHz 19.70 dBm
 Ref 30 dBm *Att 10 dB SWT 125 ms 1.909842667 GHz



Date: 24.MAY.2018 09:22:29

6 Radiated Spurious Emissions

6.1 Test Result

Test Description	Basic Standards		Test Result
Radiated Spurious Emissions	FCC 2.1053 FCC 24.238(a)	RSS-GEN (6.13) RSS-133 (6.5.1)	Pass

6.2 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.

6.3 Test Site

SGS 10m Chamber, Suwanee, GA (validated to ANS C63.4: 2009 below and above 1GHz)

Environmental Conditions

Temperature: 24.0 °C
 Relative Humidity: 52.7 %
 Atmospheric Pressure: 97.68 kPa

6.4 Test Equipment

Test End Date: 20-Jun-2018

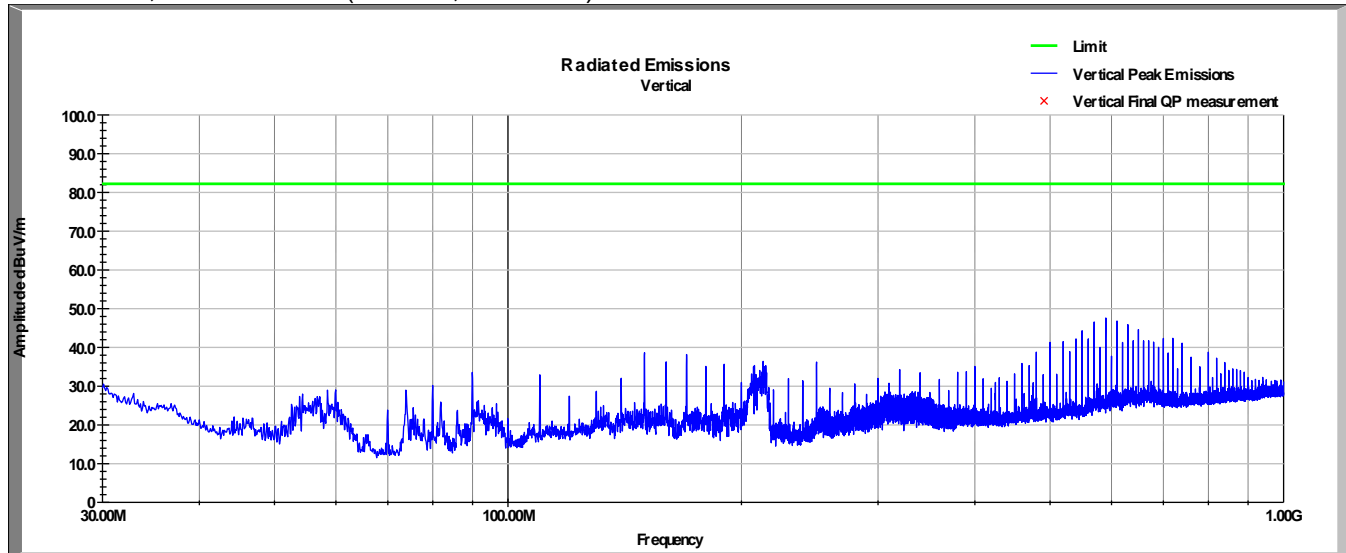
Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079690	29-Nov-2018
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2018
ANTENNA, DRG HORN (SMALL)	3116B	ETS LINDGREN	B079695	27-Jul-2018
RF CABLE	SF106	HUBER & SUHNER	B079716	24-Jul-2018
RF CABLE	SF106	HUBER & SUHNER	B079713	24-Jul-2018
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	28-Jul-2018
Attenuator, 6dB 5W	BW-N6W5+	MINI-CIRCUITS	18005	28-Feb-2019
RF CABLE	SF102	HUBER & SUHNER	B079824	26-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018
RF CABLE	UC-N-MM-275	MAURY MICROWAVE	17015	25-Jul-2018
RF CABLE	104PE	HUBER & SUHNER	B079793	24-Jul-2018
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	6-Mar-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	13628	2-Oct-2018

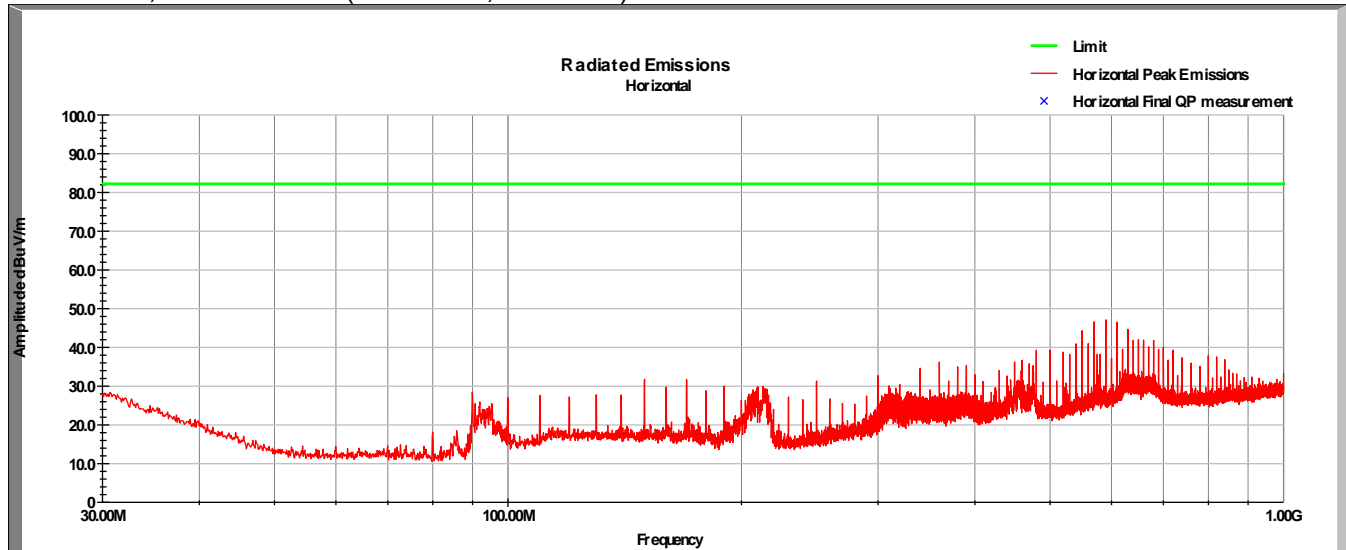
- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 3 year calibration cycle.

6.5 Test Data

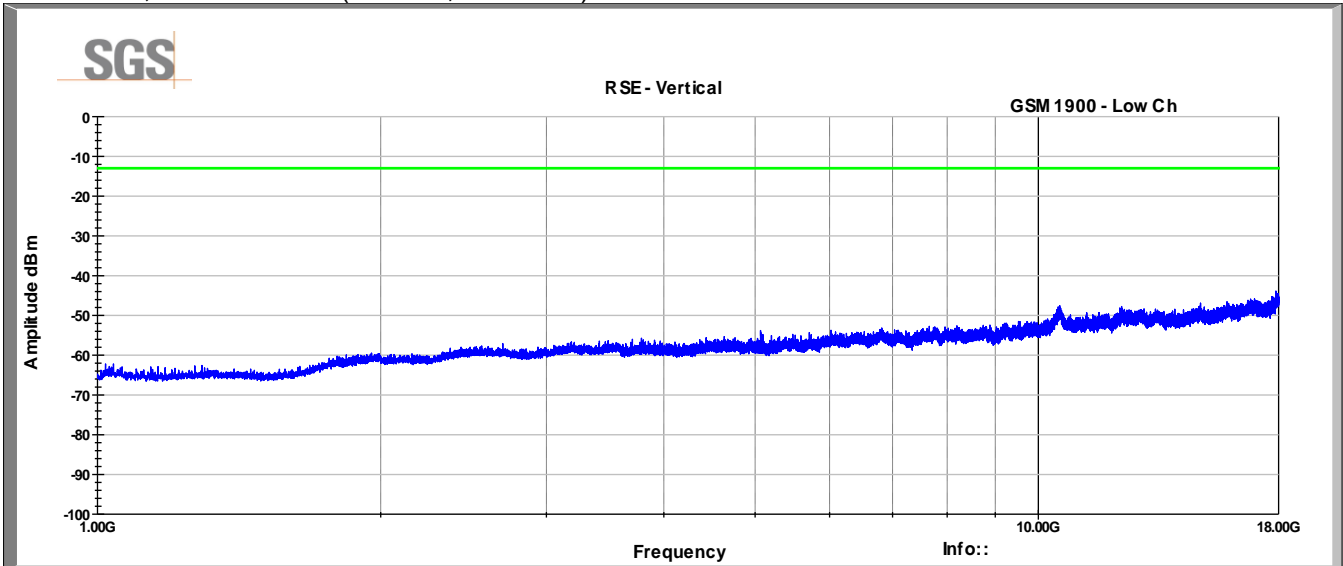
GSM 1900, Low Channel (Vertical, 30-1GHz)



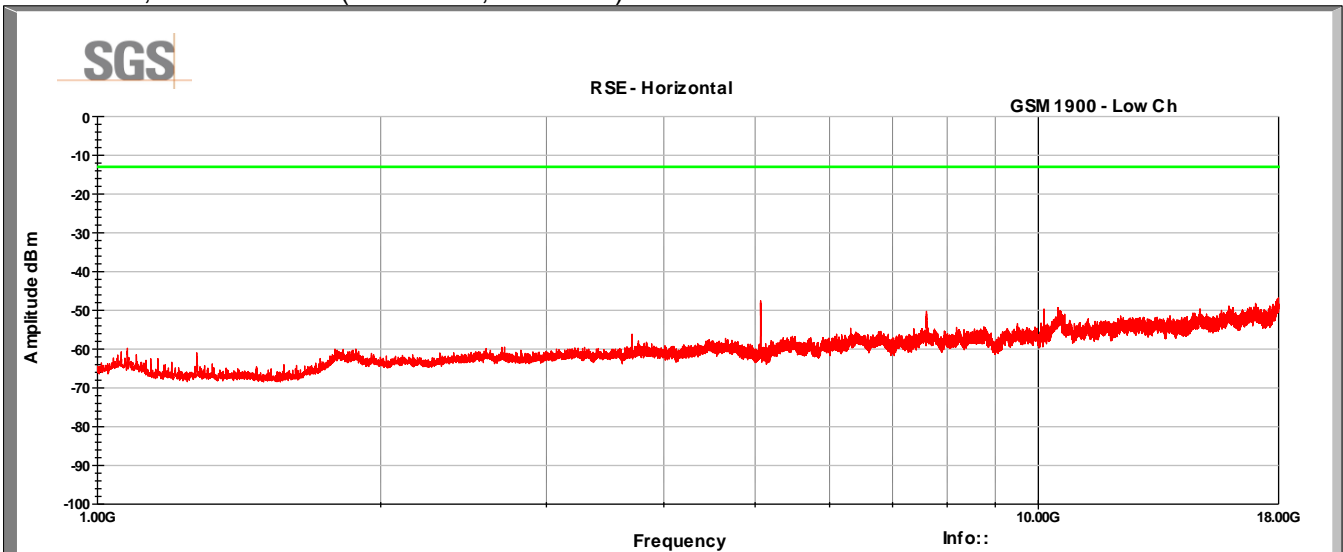
GSM 1900, Low Channel (Horizontal, 30-1GHz)



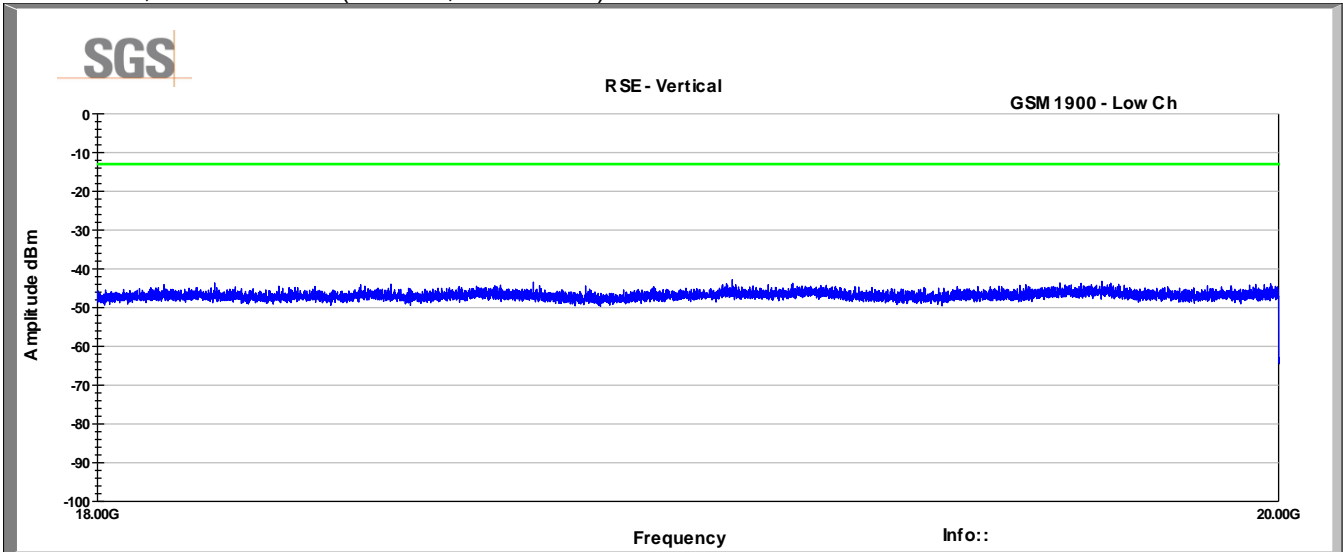
GSM 1900, Low Channel (Vertical, 1-18GHz)



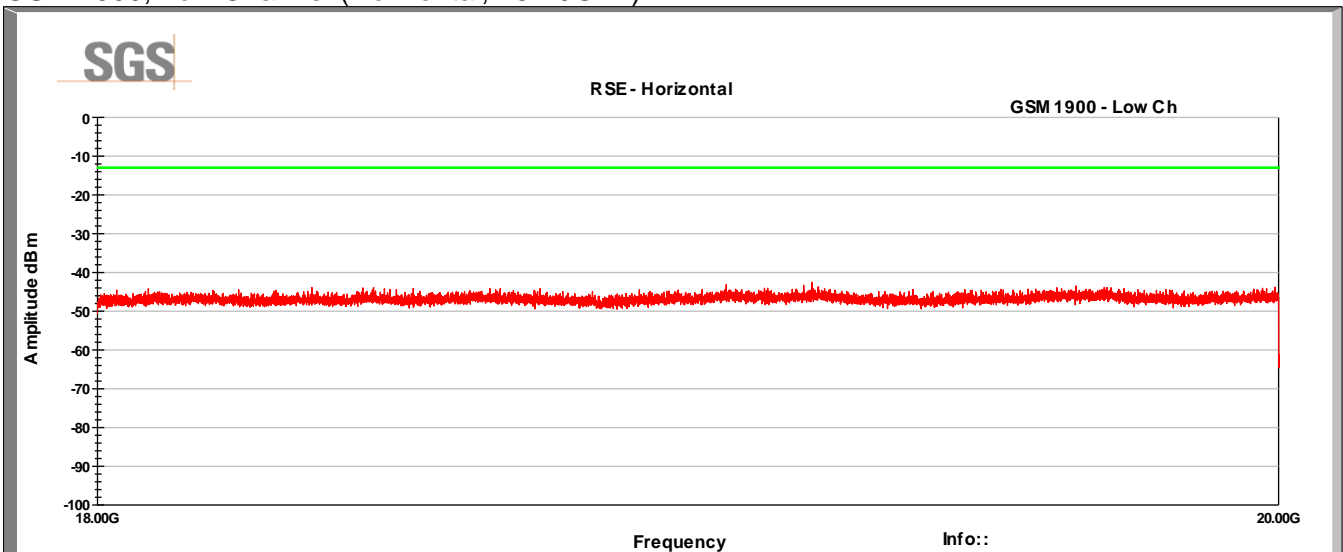
GSM 1900, Low Channel (Horizontal, 1-18GHz)



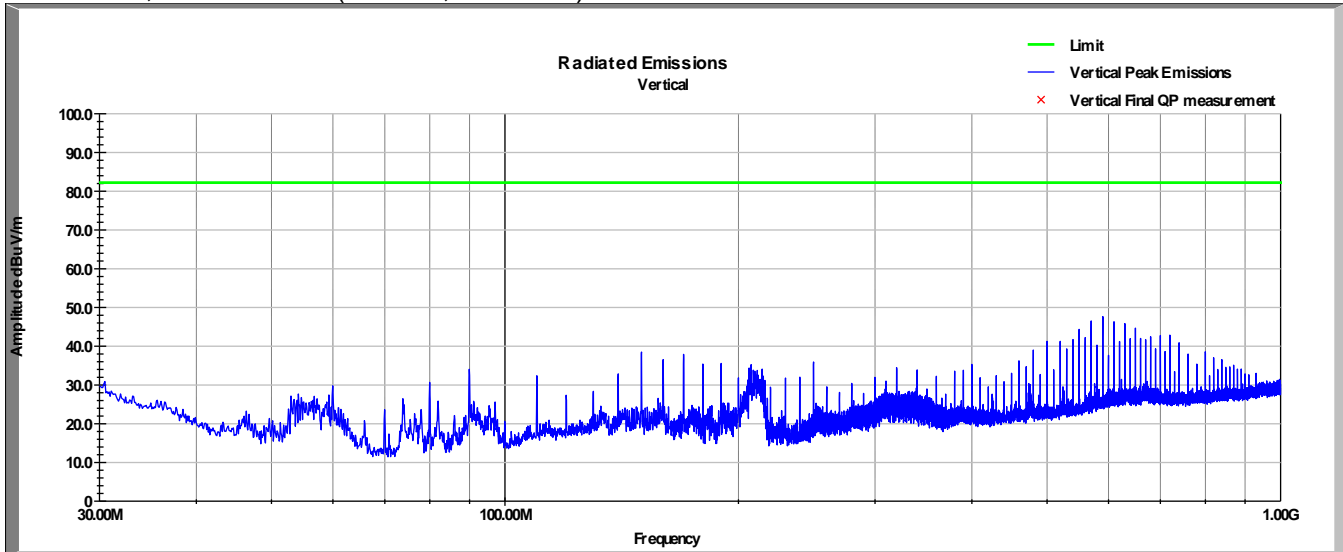
GSM 1900, Low Channel (Vertical, 18-20GHz)



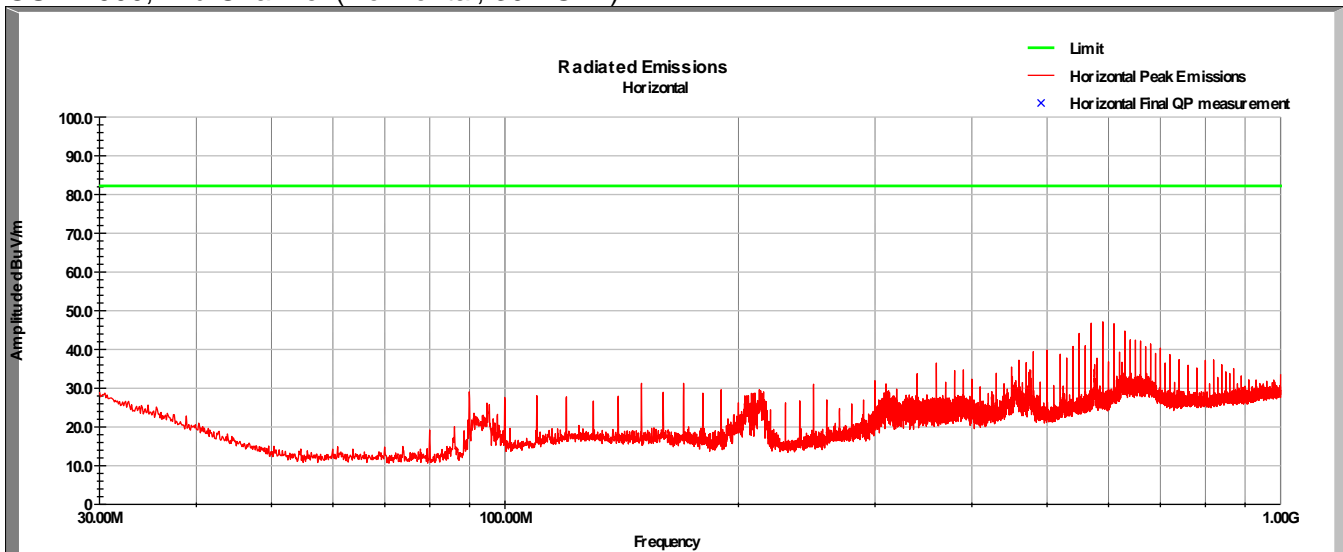
GSM 1900, Low Channel (Horizontal, 18-20GHz)



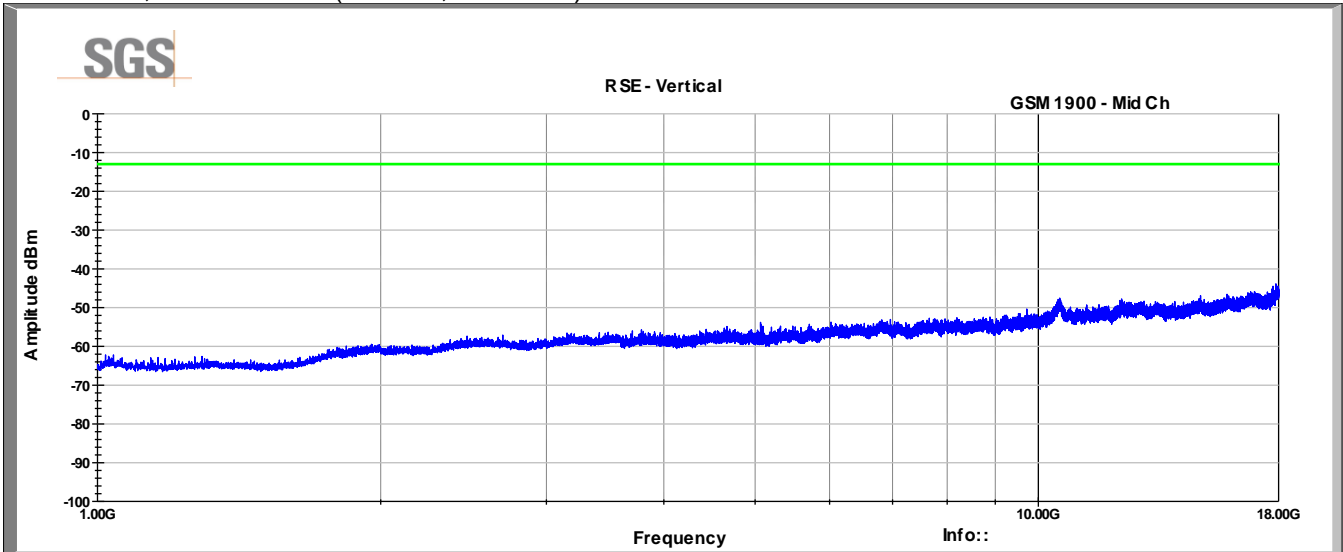
GSM 1900, Mid Channel (Vertical, 30-1GHz)



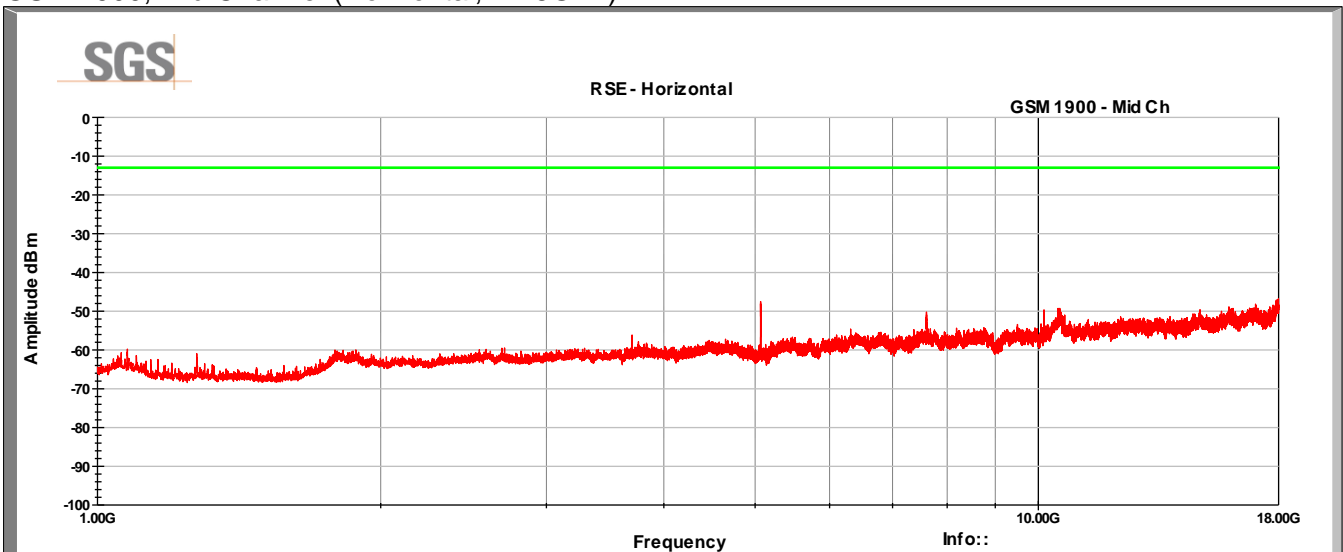
GSM 1900, Mid Channel (Horizontal, 30-1GHz)



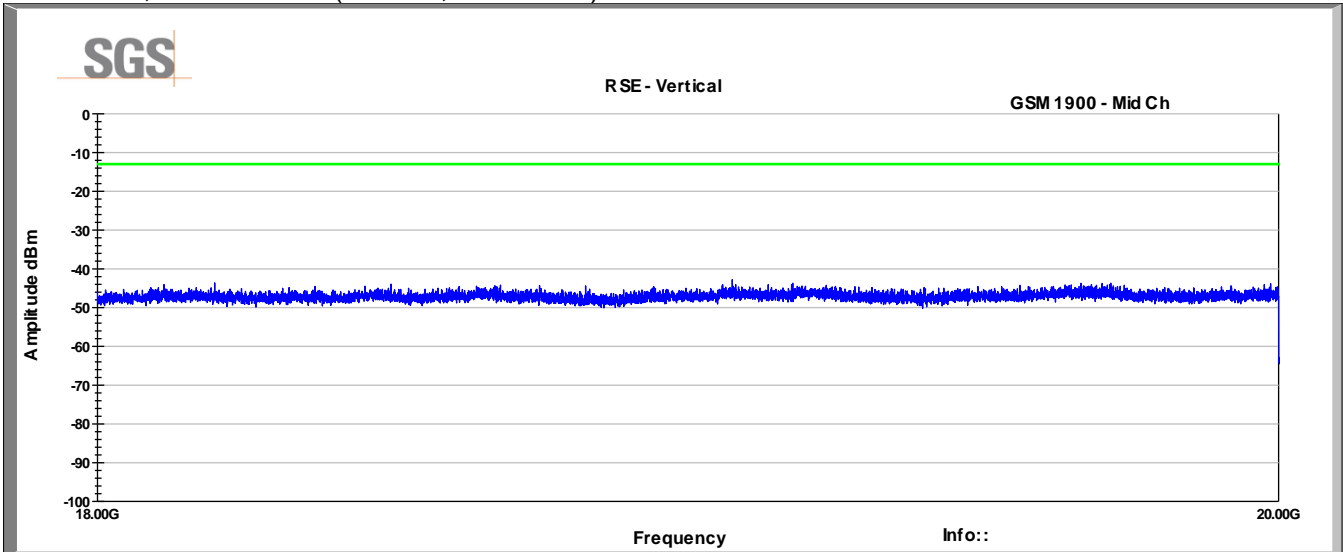
GSM 1900, Mid Channel (Vertical, 1-18GHz)



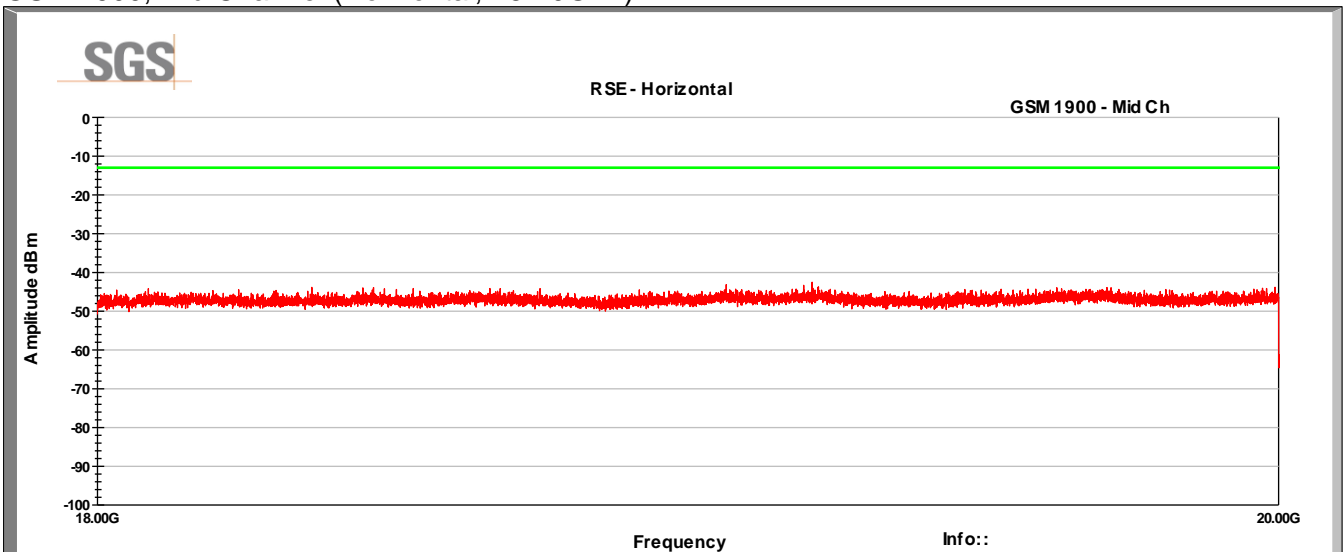
GSM 1900, Mid Channel (Horizontal, 1-18GHz)



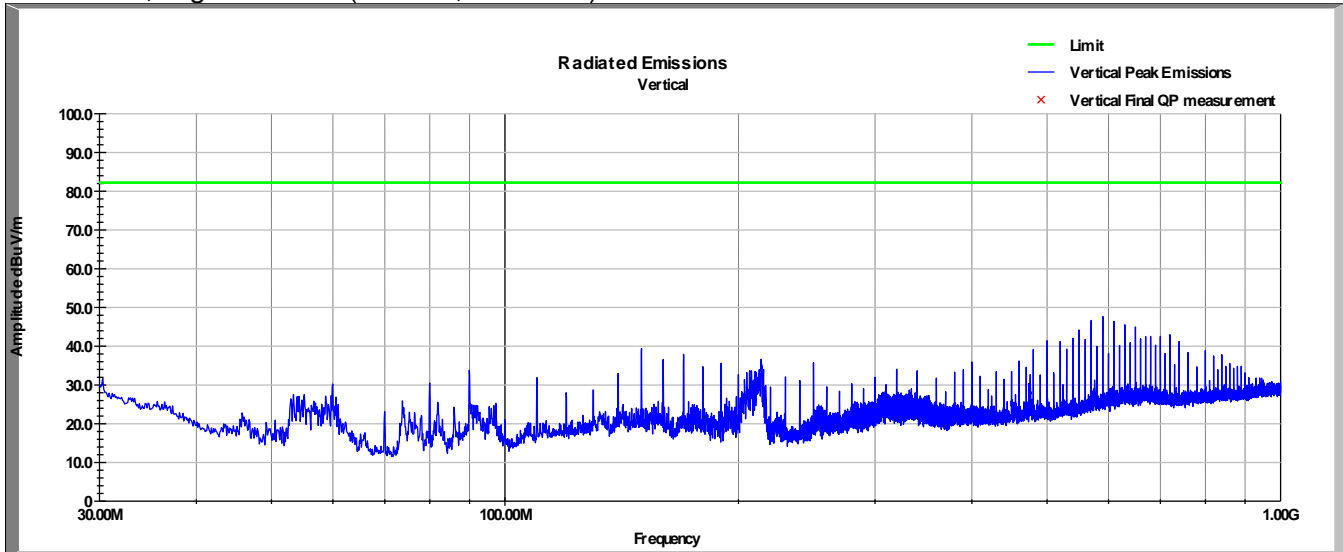
GSM 1900, Mid Channel (Vertical, 18-20GHz)



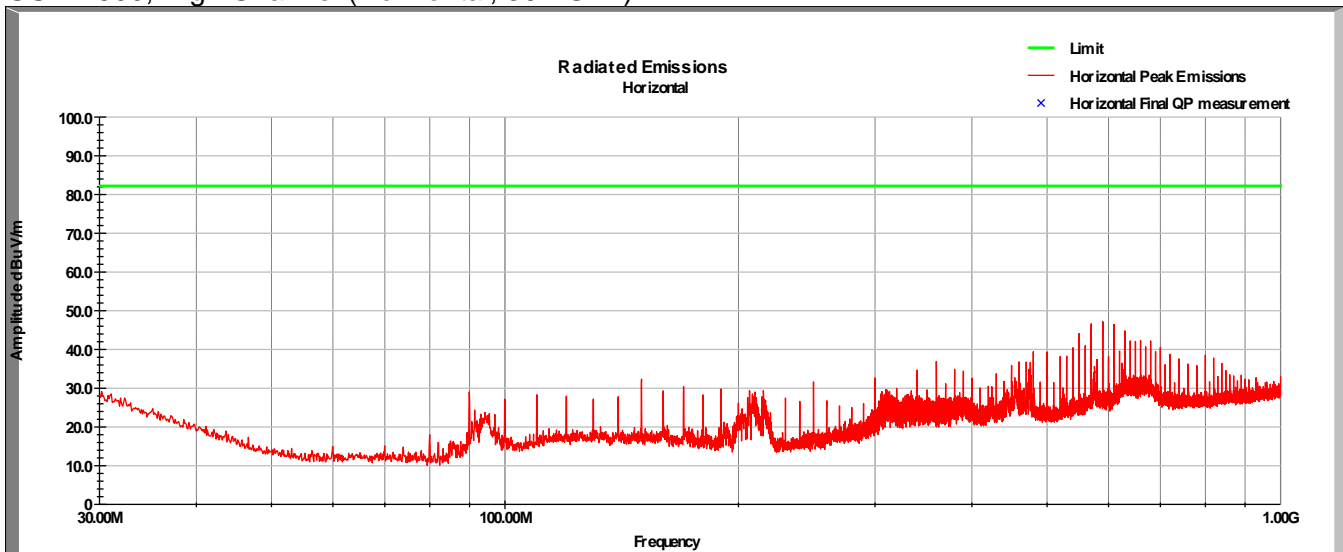
GSM 1900, Mid Channel (Horizontal, 18-20GHz)



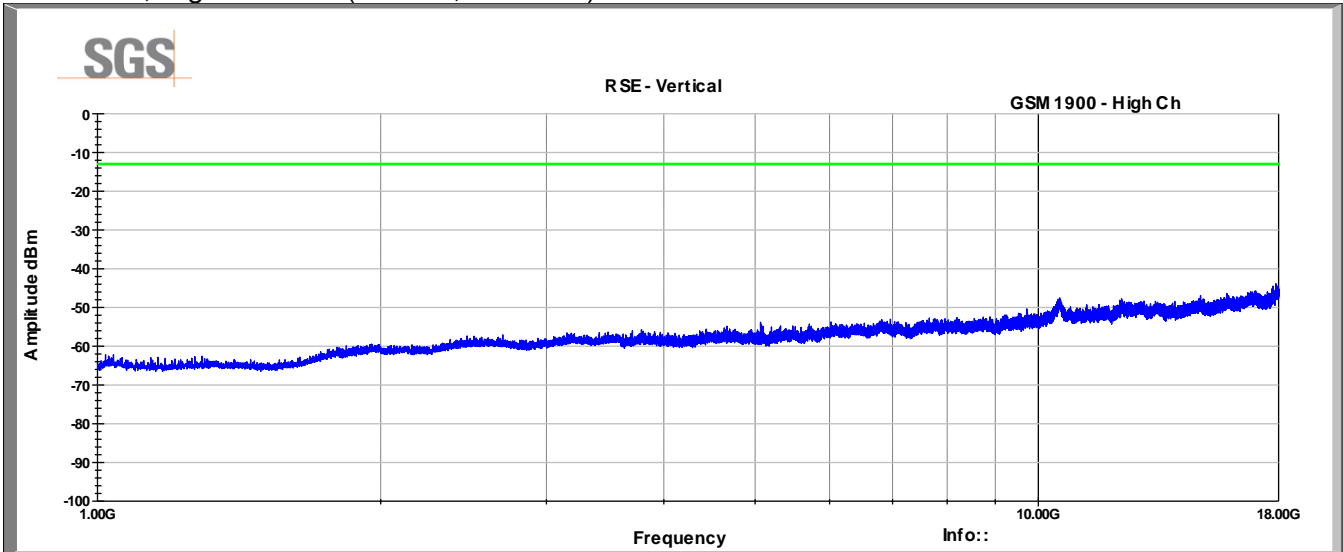
GSM 1900, High Channel (Vertical, 30-1GHz)



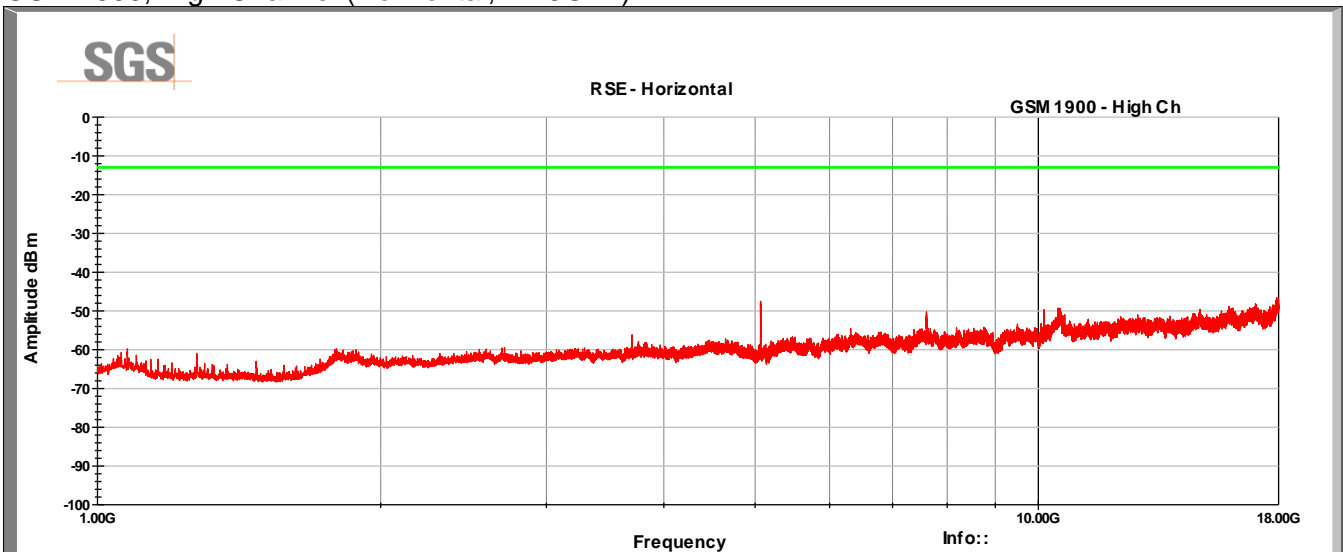
GSM 1900, High Channel (Horizontal, 30-1GHz)



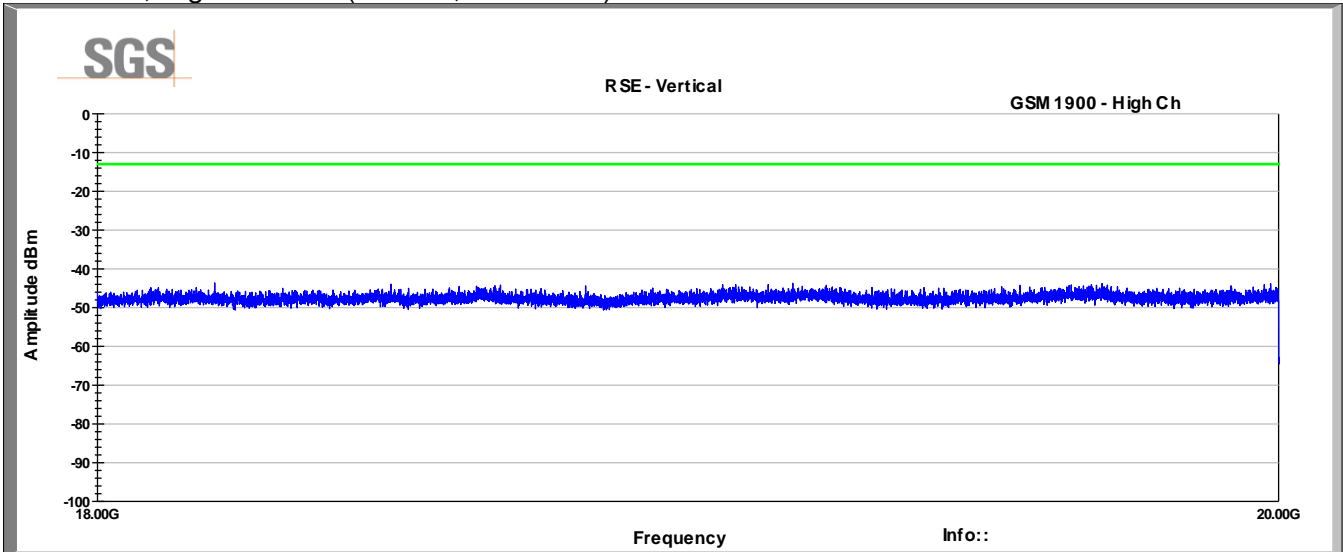
GSM 1900, High Channel (Vertical, 1-18GHz)



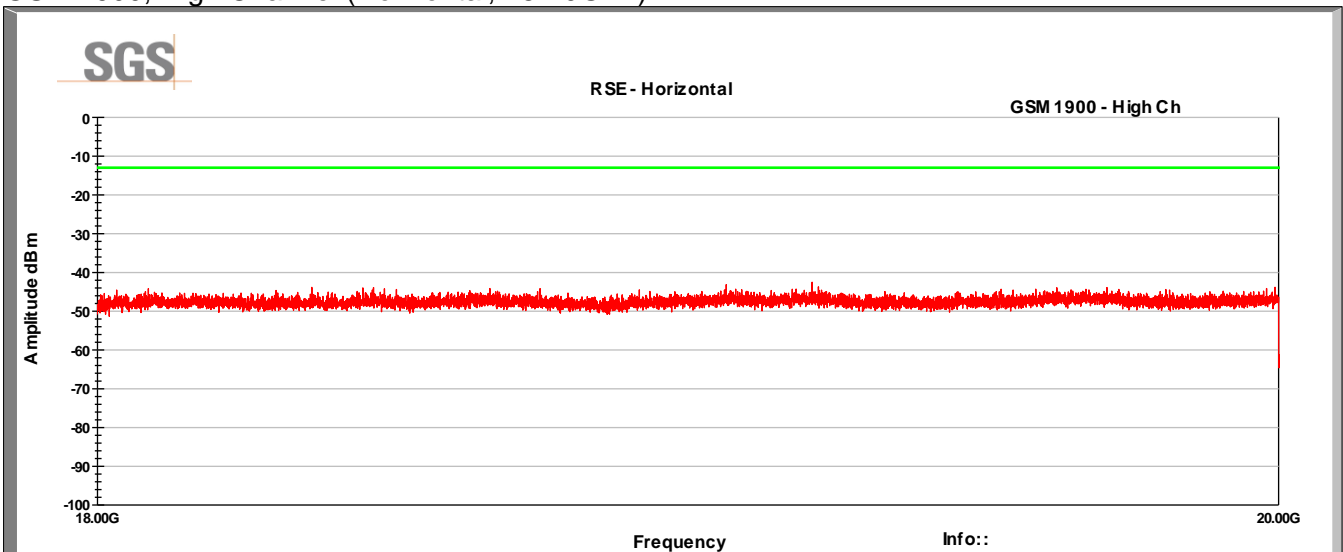
GSM 1900, High Channel (Horizontal, 1-18GHz)



GSM 1900, High Channel (Vertical, 18-20GHz)



GSM 1900, High Channel (Horizontal, 18-20GHz)



7 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	29 June 2018
1	<ul style="list-style-type: none"> - Added detailed RF Output Power data - Added Band Edge plots - Other minor additions, corrections and cleanup 	17 October 2018