

RF Test Report

Project Number: 4975321**Proposal:** SUW-202108001433**Report Number:** 4975321EMC19**Revision Level:** 1**Client:** Deere & Company**Equipment Under Test:** JDLINK™ M Modem - 4G**Model Number:** MA4M**FCC ID:** OV5-MA4M**IC ID:** 11137A-MA4M**Applicable Standards:** ANSI C63.26:2014

Part 2, Part 22(H), Part 24(E)

RSS-132 Issue 3

RSS-133 Issue 6

RSS-GEN, Issue 5

Report issued on: 24 February 2023**Test Result:** Compliant

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Prepared by:

A handwritten signature in blue ink that reads 'Andrew Bluhm'.

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Martin Taylor, Sr RF/EMC Project Engineer

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1 Summary of Test Results

Reference Sections		Test Description	Test Limit	Test Condition	Test Result
FCC	IC				
2.1046	RSS-GEN (6.12)	Conducted Output Power	N/A	Conducted	Compliant
24.232(d)	RSS-132 (5.4) RSS-133 (6.4)	Peak-to-Average Ratio	<13 dB		Compliant
2.1049 22.917(b) 24.238(b)	RSS-GEN (6.7) RSS-133 (2.3)	Occupied Bandwidth	N/A		Reported
2.1051 22.917(a) 24.238(a)	RSS-132 (5.5) RSS-133 (6.5.1)	Band Edge / Conducted Spurious Emissions	$< 43 + 10\log_{10}(P_{\text{Watts}})$ at band edge and for all out of band emissions		Compliant
22.913(a)(5)	--	Effective Radiated Power	< 7 Watts max ERP	Radiated	Compliant
--	RSS-132 (5.4)	Equivalent Isotropically Radiated Power	< 11.5 Watts max EIRP		Compliant
24.232(c)	RSS-133 (6.4) SRSP-510 (5.1.2)		< 2 Watts max EIRP		Compliant
2.1053 22.917(a) 24.238(a)	RSS-GEN (6.13) RSS-132 (5.5) RSS-133 (6.5.1)	Radiated Spurious Emissions	$< 43 + 10\log_{10}(P_{\text{Watts}})$ at band edge and for all out of band emissions		Compliant
2.1055 22.355 24.235	RSS-GEN (6.11) RSS-132 (5.3) RSS-133 (6.3)	Frequency Stability	<2.5 ppm		Compliant

1.1 Modifications Required to Compliance

None

2 General Information

2.1 Client Information

Name: Deere & Company dba John Deere Intelligent Solutions
Address: 9505 Northpark Drive
City, State, Zip, Country: Urbandale, IA 50131 USA

2.2 Test Laboratory

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

Accrediting Body: A2LA
Type of lab: Testing Laboratory
Certificate Number: 3212.01
Designation Number: US1126
CAB Identifier: US0186

2.3 General Information of EUT

Product Description: JDLINK™ M Modem - 4G
Model Number: MA4M
Serial Number: PCMA4MA101508 (Conducted); PCMA4MA101503 (Radiated)

Modes of Operation: GSM 850 / 1900

Antenna Type: Internal – GSM 850 (0dBi); GSM 1900 (3.2dBi)
IMEI: 351072640039065

Sample Received Date: 22 October 2022
Dates of testing: 01 November – 01 December 2022

2.4 Description of Test Modes

The EUT was tested under normal operating conditions. A Rhode & Schwarz test SIM was installed in the unit with a base station simulator directly connect to the cellular port for conducted measurements, and over the air for radiated measurements. The base station simulator was set to control the EUT to output maximum power and operate in GSM Bands 850 and 1900. Using the base station simulator, the device was configured for maximum uplink transmit power.

3 RF Output Power

3.1 Test Result

Test Description	Requirements	Test Result
RF Output Power	FCC Part 2.1046 RSS-GEN (6.12)	Reported

3.2 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.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.8 °C

Relative Humidity: 41.1 %

Atmospheric Pressure: 97.8 kPa

3.4 Test Equipment

Test End Date: 28-Nov-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	13-Jan-2021	13-Jan-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20109	16-Mar-2022	16-Mar-2023
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
POWER SPLITTER	ZFRSC-123-S+	MINI-CIRCUITS	B101739	13-Jul-2022	13-Jul-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-020	TELEDYNE STORM MICROWAVE	20105	16-Mar-2022	16-Mar-2023
EXA SIGNAL ANALYZER	N9010B	KEYSIGHT	1245605	17-Nov-2022	17-Nov-2023
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

Software Profile:

TESTPass Version: 1.0.0, build: 2020.11.15.01

3.5 Test Data

Band	Uplink Channel	UL Freq (MHz)	Mode	Slots	Conducted Power (dBm)
850	128	824.2	1	GPRS	33.03
850	128	824.2	2	GPRS	30.7
850	128	824.2	3	GPRS	29.14
850	128	824.2	4	GPRS	27.79
850	190	836.6	1	GPRS	32.88
850	190	836.6	2	GPRS	30.84
850	190	836.6	3	GPRS	29.21
850	190	836.6	4	GPRS	27.85
850	251	848.8	1	GPRS	32.98
850	251	848.8	2	GPRS	30.94
850	251	848.8	3	GPRS	28.96
850	251	848.8	4	GPRS	27.72
850	128	824.2	1	EGPRS	33.01
850	128	824.2	2	EGPRS	31.04
850	128	824.2	3	EGPRS	29.17
850	128	824.2	4	EGPRS	27.83
850	190	836.6	1	EGPRS	32.94
850	190	836.6	2	EGPRS	30.88
850	190	836.6	3	EGPRS	29.25
850	190	836.6	4	EGPRS	27.9
850	251	848.8	1	EGPRS	32.73
850	251	848.8	2	EGPRS	30.94
850	251	848.8	3	EGPRS	29.01
850	251	848.8	4	EGPRS	27.75
1900	512	1850.2	1	GPRS	29.5
1900	512	1850.2	2	GPRS	27.2
1900	512	1850.2	3	GPRS	25.71
1900	512	1850.2	4	GPRS	24.46
1900	661	1880	1	GPRS	29.72
1900	661	1880	2	GPRS	27.6
1900	661	1880	3	GPRS	25.92
1900	661	1880	4	GPRS	24.75
1900	810	1909.8	1	GPRS	29.64
1900	810	1909.8	2	GPRS	27.57
1900	810	1909.8	3	GPRS	25.95
1900	810	1909.8	4	GPRS	24.76
1900	512	1850.2	1	EGPRS	29.52
1900	512	1850.2	2	EGPRS	27.26
1900	512	1850.2	3	EGPRS	25.67
1900	512	1850.2	4	EGPRS	24.52
1900	661	1880	1	EGPRS	29.76
1900	661	1880	2	EGPRS	27.55
1900	661	1880	3	EGPRS	25.92
1900	661	1880	4	EGPRS	24.63
1900	810	1909.8	1	EGPRS	29.73
1900	810	1909.8	2	EGPRS	27.58
1900	810	1909.8	3	EGPRS	25.86
1900	810	1909.8	4	EGPRS	24.58

GSM850 Max: 33.03dBm (2.01W)

GSM1900 Max: 29.76dBm (0.946W)

4 Peak to Average Ratio

4.1 Test Result

Test Description	Requirements	Test Result
Peak to Average Ratio	FCC 24.232(d) RSS-132 (5.4) RSS-133 (6.4)	Compliant

4.2 Test Method

KDB document 971168 D01 Power Meas License Digital Systems v03r01 was used to determine peak-to-average ratio. For the measurements, Clause 5.7.1 was used which defined the measurement method using the CCDF function of the spectrum analyzer. Measurements were recorded at the mid channels at the highest power.

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.8 °C

Relative Humidity: 41.1 %

Atmospheric Pressure: 97.8 kPa

4.4 Test Equipment

Test End Date: 28-Nov-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	13-Jan-2021	13-Jan-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20109	16-Mar-2022	16-Mar-2023
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
POWER SPLITTER	ZFRSC-123-S+	MINI-CIRCUITS	B101739	13-Jul-2022	13-Jul-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-020	TELEDYNE STORM MICROWAVE	20105	16-Mar-2022	16-Mar-2023
EXA SIGNAL ANALYZER	N9010B	KEYSIGHT	1245605	17-Nov-2022	17-Nov-2023
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

Software Profile:

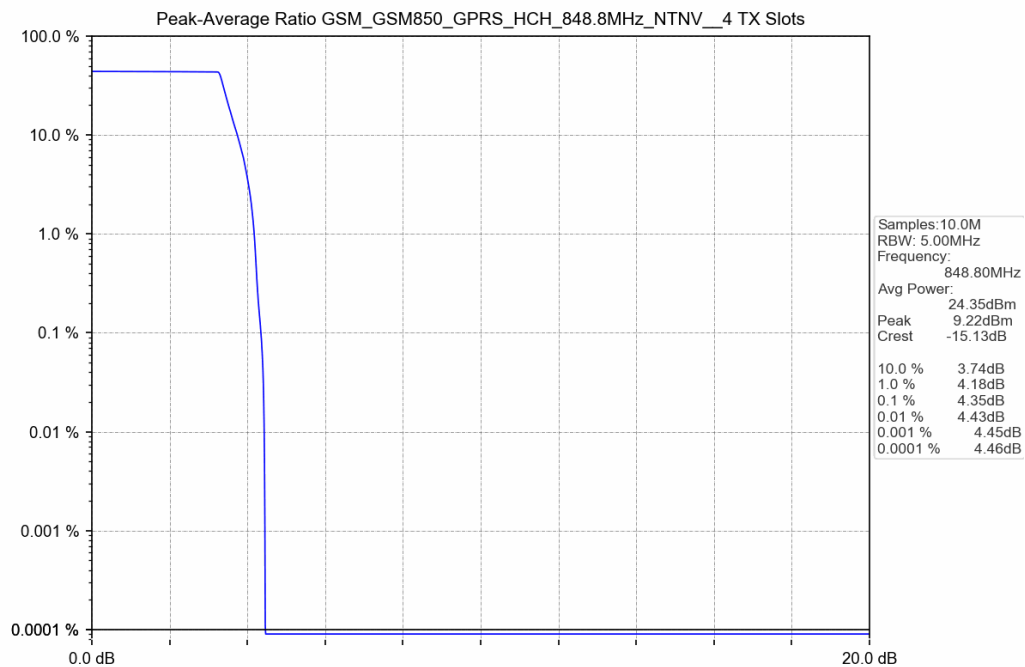
TESTPass Version: 1.0.0, build: 2020.11.15.01

4.5 Test Data

Test Band: GSM850					
Test Mode	Test result (dB)			Limit (dB)	Verdict
	LCH	MCH	HCH		
EGPRS	4.24	4.33	4.28	13	PASS
GPRS	4.34	4.32	4.35	13	PASS

Test Band: PCS1900					
Test Mode	Test result (dB)			Limit (dB)	Verdict
	LCH	MCH	HCH		
EGPRS	4.08	4.22	4.28	13	PASS
GPRS	4.14	4.21	4.23	13	PASS

Representative Plot taken from data measured



2022-11-23 22:49

5 Occupied Bandwidth

5.1 Test Result

Test Description	Requirements	Test Result
Occupied Bandwidth	FCC Part 2.1049 FCC Part 22.917(b) FCC Part 24.238(b) RSS-GEN (6.7) RSS-133 (2.3)	Reported

5.2 Test Method

KDB document 971168 D01 Power Meas License Digital Systems v03r01, Clause 4 was used to determine the occupied measurement.

The 99% measurement function of the spectrum analyzer was used.

The measurement was conducted at the low, middle and high channel of each band.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.8 °C

Relative Humidity: 41.1 %

Atmospheric Pressure: 97.8 kPa

5.4 Test Equipment

Test End Date: 28-Nov-2022

Tester: AB

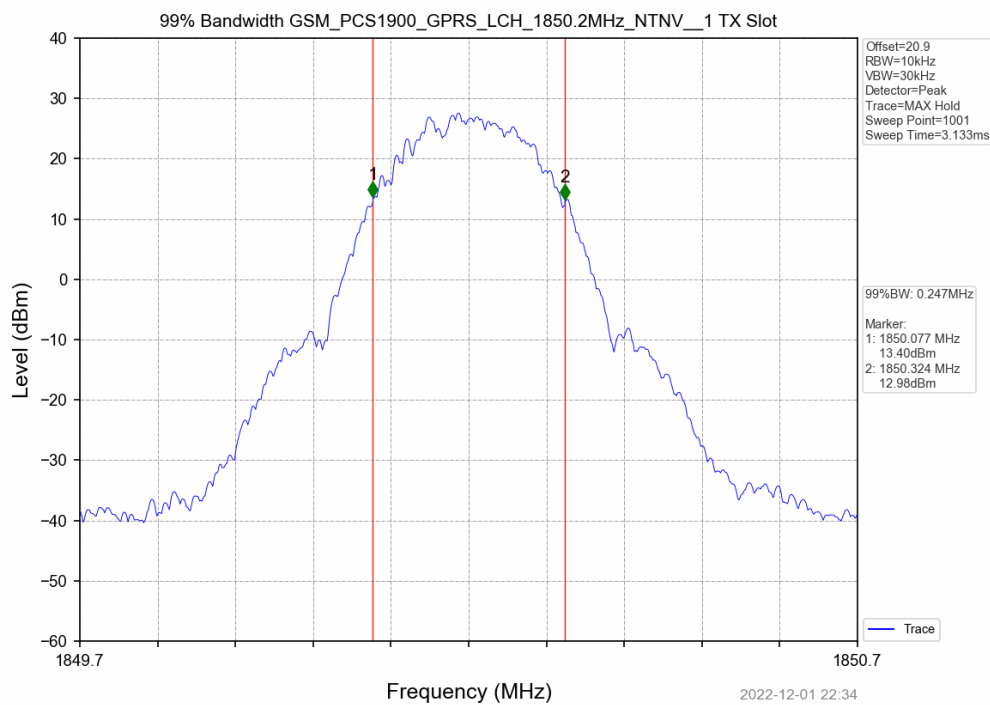
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	13-Jan-2021	13-Jan-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20109	16-Mar-2022	16-Mar-2023
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
POWER SPLITTER	ZFRSC-123-S+	MINI-CIRCUITS	B101739	13-Jul-2022	13-Jul-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-020	TELEDYNE STORM MICROWAVE	20105	16-Mar-2022	16-Mar-2023
EXA SIGNAL ANALYZER	N9010B	KEYSIGHT	1245605	17-Nov-2022	17-Nov-2023

5.5 Test Data

Test Band: GSM850					
Test Mode	99% Occupied Bandwidth (MHz)			Limit	Verdict
	LCH	MCH	HCH		
EGPRS	0.242	0.245	0.244	N/A	PASS
GPRS	0.247	0.243	0.242	N/A	PASS

Test Band: PCS1900					
Test Mode	99% Occupied Bandwidth (MHz)			Limit	Verdict
	LCH	MCH	HCH		
EGPRS	0.243	0.247	0.244	N/A	PASS
GPRS	0.247	0.241	0.243	N/A	PASS

Representative Plot taken from data measured



6 Band Edge and Conducted Spurious Emissions

6.1 Test Result

Test Description	Requirements	Test Result
Conducted spurious emissions and Band Edge	2.1051 22.917(a) 24.238(a) RSS-132 (5.5) RSS-133 (6.5.1)	Compliant

6.2 Test Method

KDB document 971168 D01 Power Meas License Digital Systems v03r01, Clause 6 was used to measure spurious emissions at the antenna terminals.

6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.8 °C

Relative Humidity: 41.1 %

Atmospheric Pressure: 97.8 kPa

6.4 Test Equipment

Test End Date: 28-Nov-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	13-Jan-2021	13-Jan-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20109	16-Mar-2022	16-Mar-2023
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
POWER SPLITTER	ZFRSC-123-S+	MINI-CIRCUITS	B101739	13-Jul-2022	13-Jul-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-020	TELEDYNE STORM MICROWAVE	20105	16-Mar-2022	16-Mar-2023
EXA SIGNAL ANALYZER	N9010B	KEYSIGHT	1245605	17-Nov-2022	17-Nov-2023
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

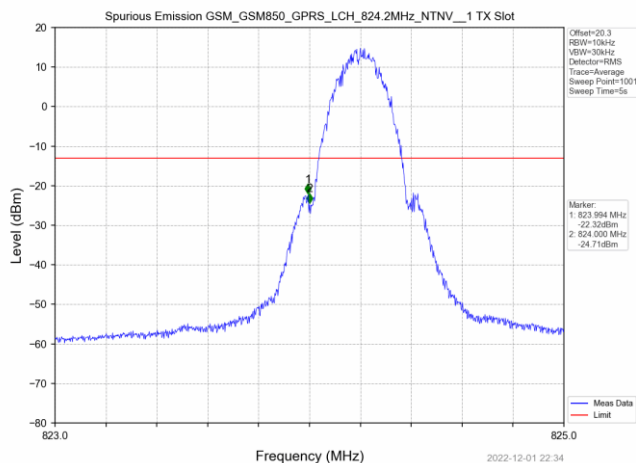
Software Profile:

TESTPass Version: 1.0.0, build: 2020.11.15.01

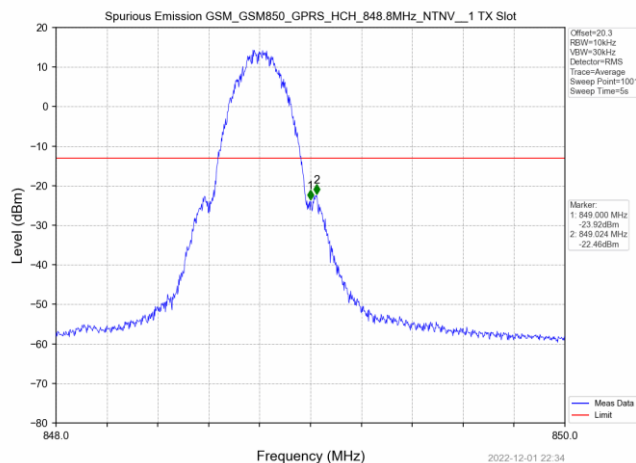
6.5 Test Data – Band Edge

GSM 850 - GPRS

Lower Band Edge (Channel 128, 824.2 MHz)

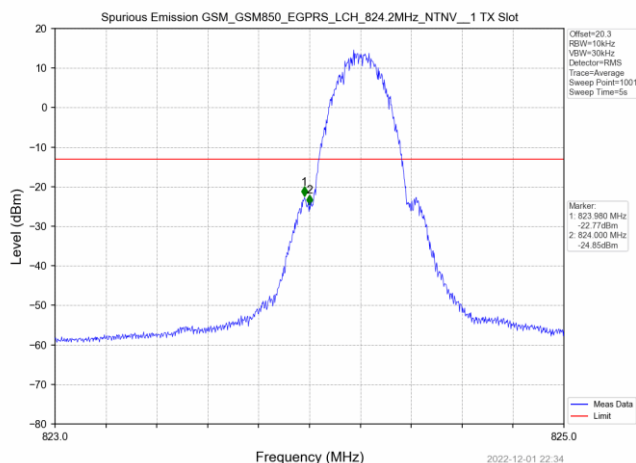


Upper Band Edge (Channel 251, 848.8 MHz)

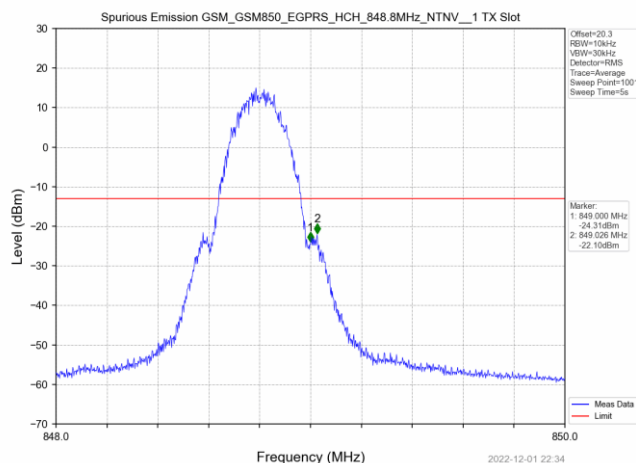


GSM 850 - EGPRS

Lower Band Edge (Channel 128, 824.2 MHz)

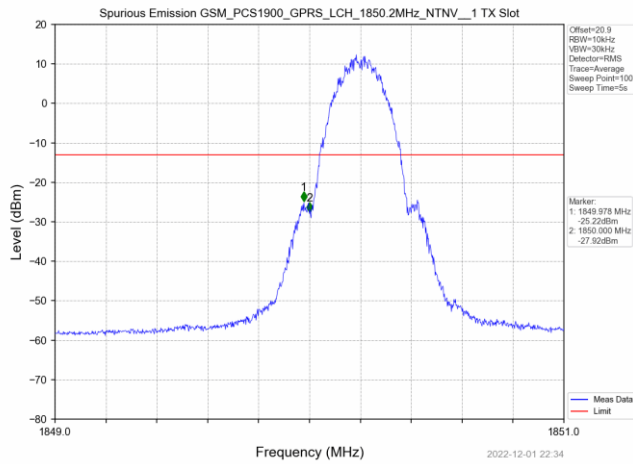


Upper Band Edge (Channel 251, 848.8 MHz)

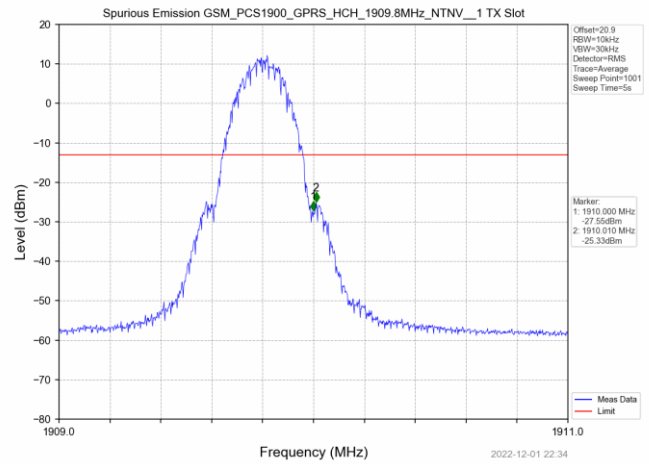


GSM1900 – GPRS

Lower Band Edge (Channel 512, 1850.2 MHz)

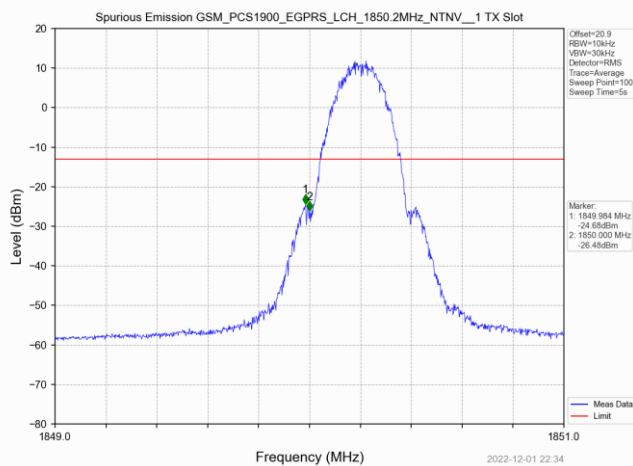


Upper Band Edge (Channel 810, 1909.8 MHz)

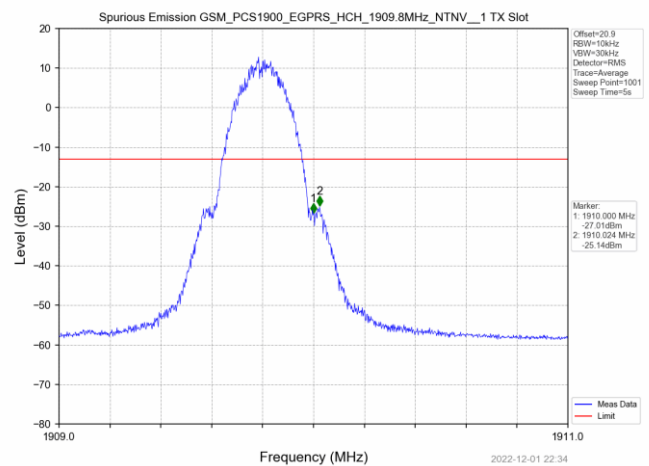


GSM1900 - EGPRS

Lower Band Edge (Channel 512, 1850.2 MHz)

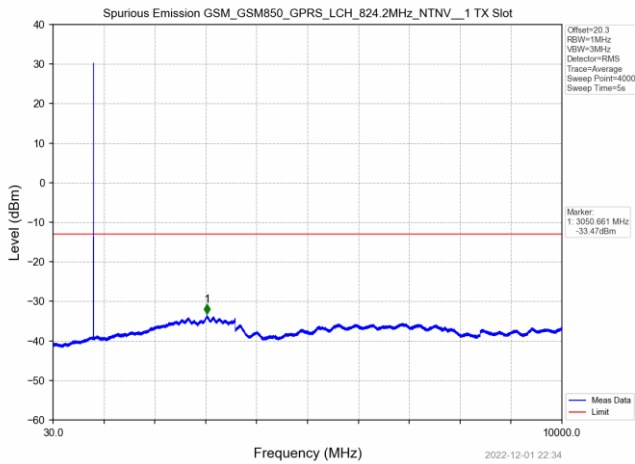


Upper Band Edge (Channel 810, 1909.8 MHz)

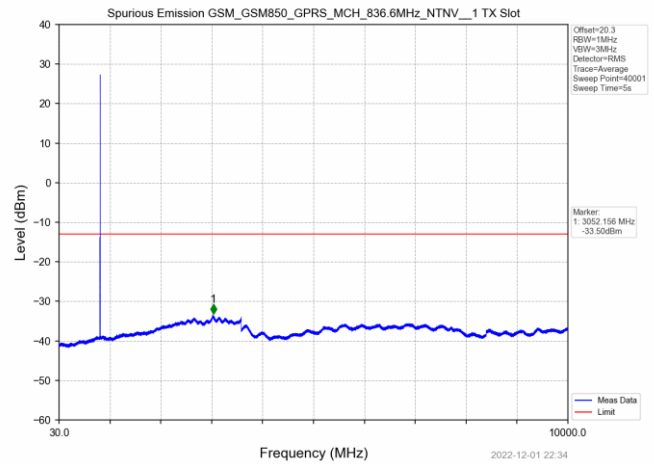


6.6 Test Data - Conducted Spurious Emissions

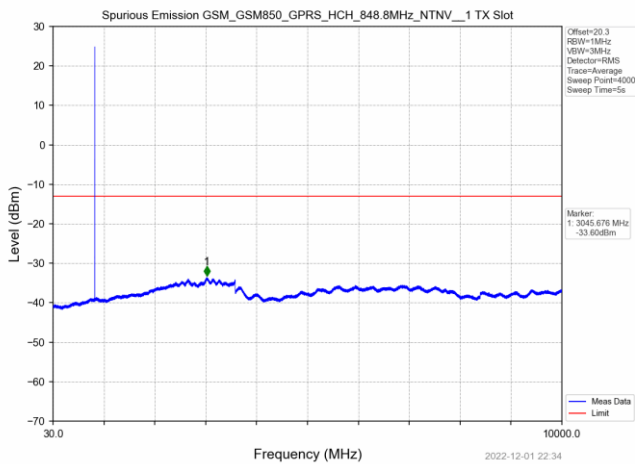
GSM 850 GPRS Channel 128



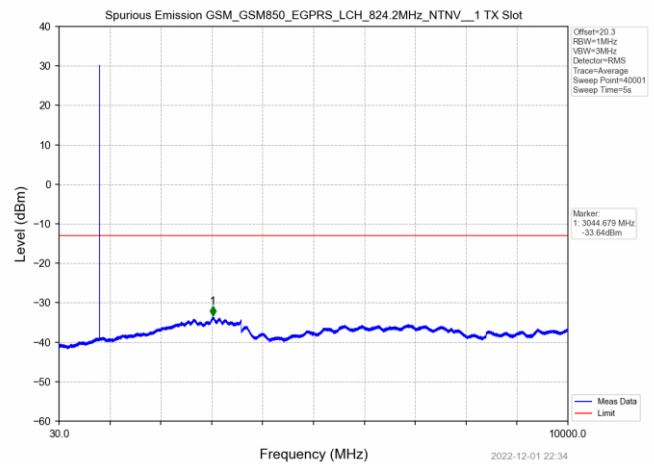
GSM 850 GPRS Channel 190



GSM 850 GPRS Channel 251

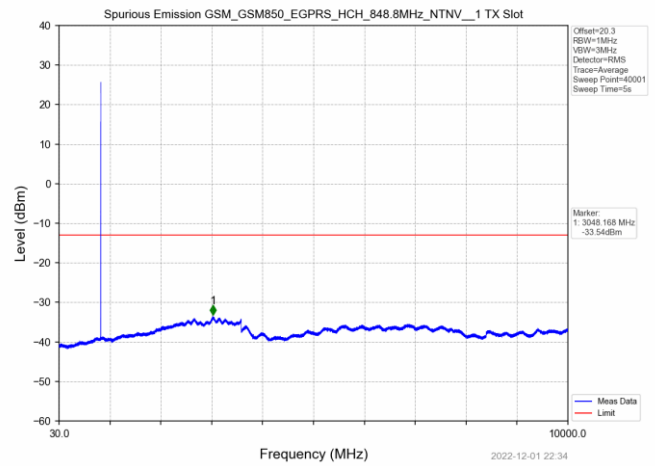
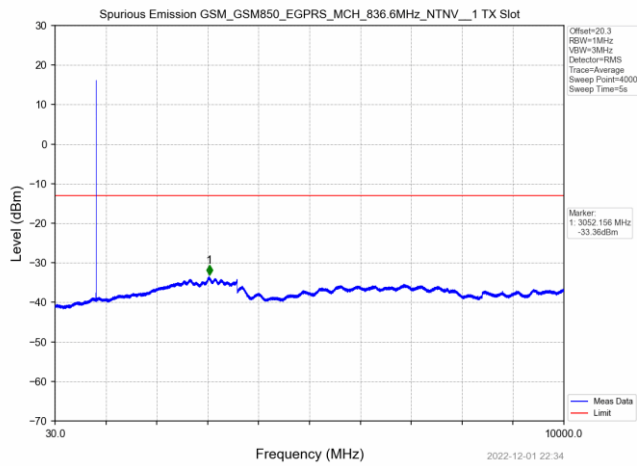


GSM 850 EGPRS Channel 128

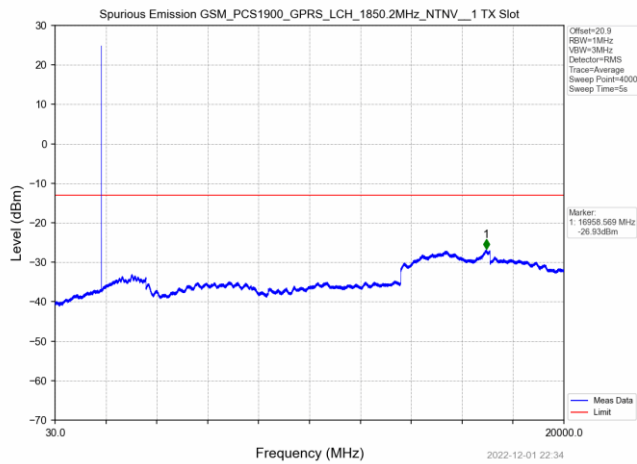


GSM 850 EGPRS Channel 190

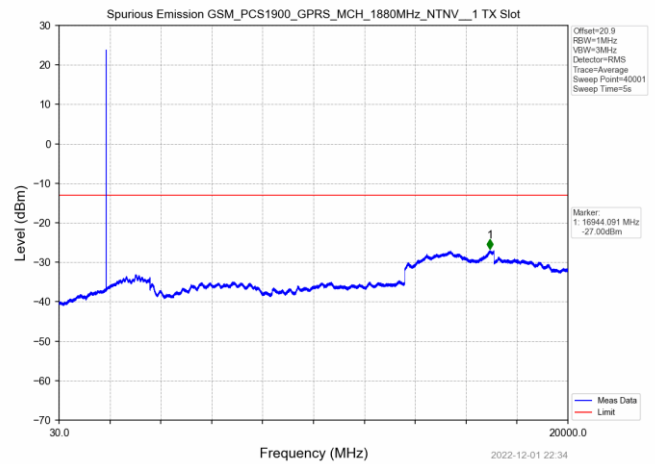
GSM 850 EGPRS Channel 251



GSM 1900 GPRS Channel 512

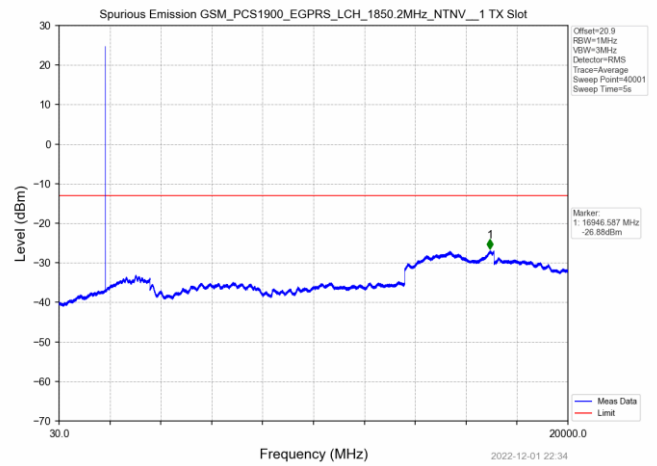
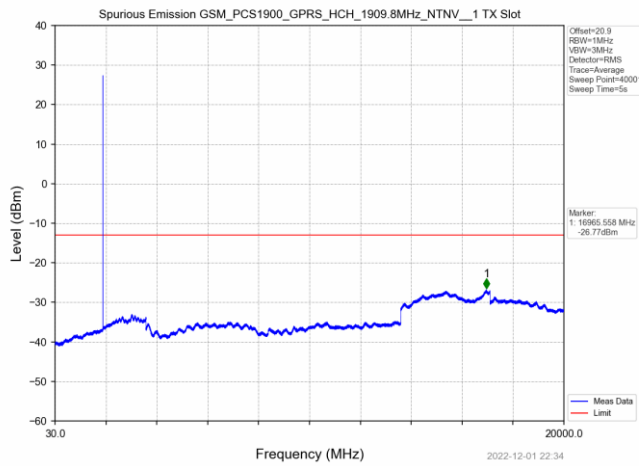


GSM 1900 GPRS Channel 661

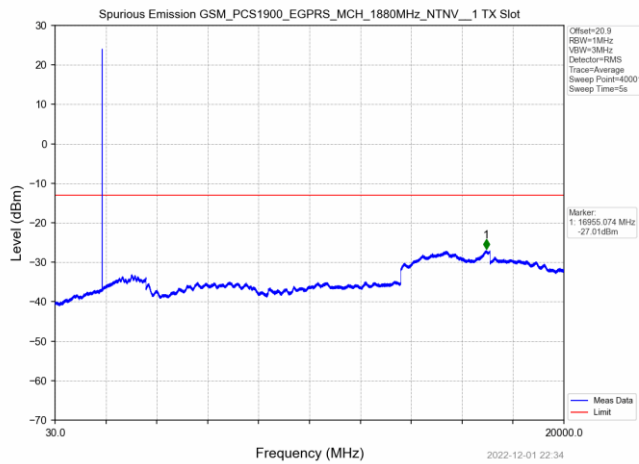


GSM 1900 GPRS Channel 810

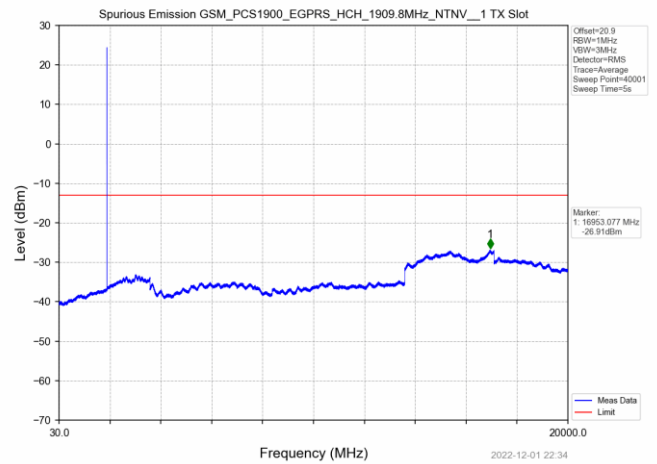
GSM 1900 EGPRS Channel 512



GSM 1900 EGPRS Channel 661



GSM 1900 EGPRS Channel 810



7 Effective Radiated Power

7.1 Test Result

Test Description	Requirements	Test Result
Effective Radiated Power	FCC Part 22.913(a)(5)	Compliant
Effective Isotropic Radiated Power	24.232(c) RSS-132 (5.4) RSS-133 (6.4)	Compliant

7.2 Test Method

For ERP/EIRP calculations, the highest antenna gain was used for each band.

7.3 Test Site

SGS EMC Laboratory, Suwanee, GA

7.4 Test Equipment

None

7.5 Test Data

Band	Max Power	Antenna Gain dBd/dBi	ERP/EIRP (dBm)	ERP/EIRP		Result	
				Limit, dBm			
				FCC	IC	FCC	IC
GSM850 / 824.2	33.03	-2.15	30.88	38.45	38.45	PASS	PASS
GSM850 / 836.6	32.94	-2.15	30.79	38.45	38.45	PASS	PASS
GSM850 / 848.8	32.98	-2.15	30.83	38.45	38.45	PASS	PASS
GSM1900 / 1850.2	29.52	3.2	32.72	33.01	33.01	PASS	PASS
GSM1900 / 1880	29.76	3.2	32.96	33.01	33.01	PASS	PASS
GSM1900 / 1909.8	29.73	3.2	32.93	33.01	33.01	PASS	PASS

8 Radiated Spurious Emissions

8.1 Test Result

Test Description	Specifications		Test Result
Radiated Spurious Emissions	FCC Part 2.1053 FCC Part 22.917(a) FCC Part 24.238(a) ANSI/TIA-603-C-2004	RSS-GEN (6.13) RSS-132 (5.5) RSS-133 (6.5)	Compliant

8.2 Test Method

The levels of the carrier and the various conducted spurious and harmonics frequencies are measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. Compliance is based on the use of a spectrum analyzer employing a resolution bandwidth of 1 MHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of a least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emissions bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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 via over the air connection. 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 conducted at the low, middle, and high channels in BC0/BC1 in the worst-case operating mode.

8.3 Test Site

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

Environmental Conditions	30-1000MHz	Above 1GHz
Temperature:	21.2 °C	21.6 °C
Relative Humidity:	50.3 %	57.1 %
Atmospheric Pressure:	98.3 kPa	98.51 kPa

8.4 Test Equipment

30-1000MHz:

Test End Date: 1-Nov-2022

Test End Date: 2-Nov-2022

Tester: EW, ZH

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	26-May-2022	26-May-2024
N to N RF Cable	NC12-N1N1-276	MEGAPHASE	22001	10-Jan-2022	10-Jan-2023
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20117	17-Feb-2022	17-Feb-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
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	8-Sep-2022	8-Sep-2023
SOFTWARE	TILE 7	ETS LINDGREN	N/A	CNR	CNR

Above 1GHz:

Test End Date: 7-Nov-2022

Test End Date: 8-Nov-2022

Tester: PL, ZH

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	15-Aug-2022	15-Aug-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20118	16-Mar-2022	16-Mar-2023
RF CABLE NM TO NM, 0.01-18GHZ	90-195-118	TELEDYNE STORM MICROWAVE	20126	14-Feb-2022	14-Feb-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20131	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	13-Jul-2022	13-Jul-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22027	13-Sep-2022	13-Sep-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	TILE 7	ETS LINDGREN	N/A	CNR	CNR

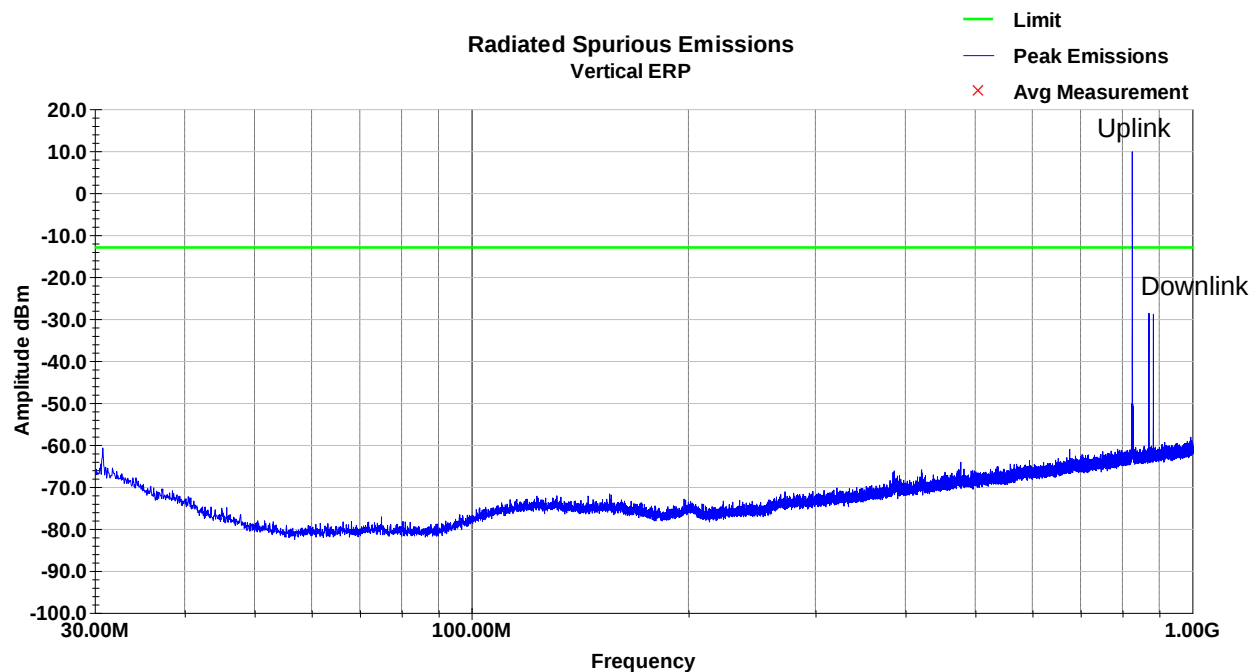
Software Profile:

“RSE 30-1000 MHz T7 220212” TILE! profile dated 12 February 2022

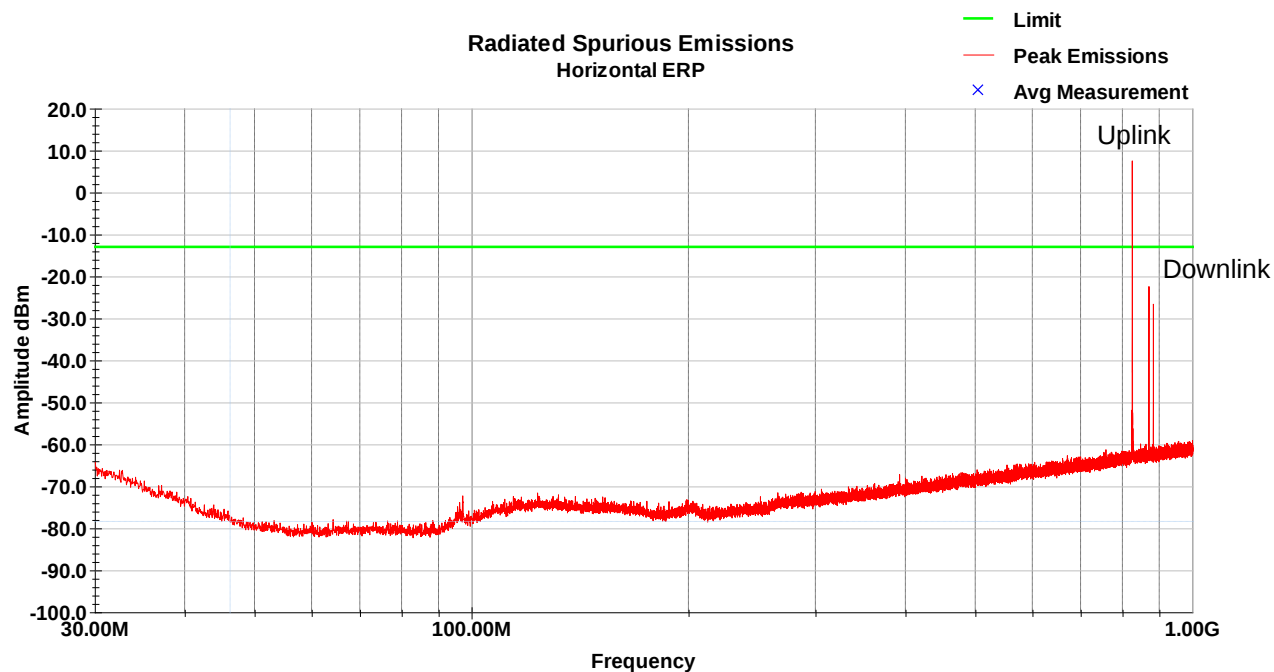
“RSE 1-18 GHz T7 210212” TILE! profile dated 12 February 2021

8.5 Test Data – GSM 850

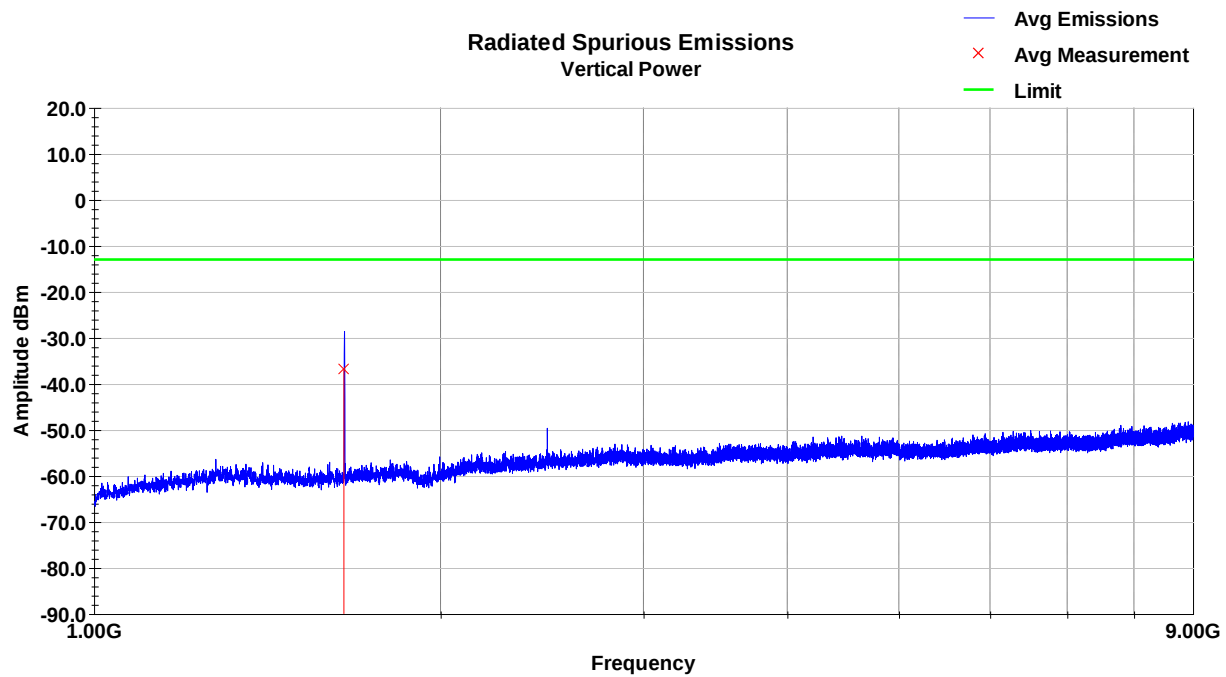
GSM 850 – LCH – 30-1000MHz – Vertical



GSM 850 – LCH – 30-1000MHz – Horizontal



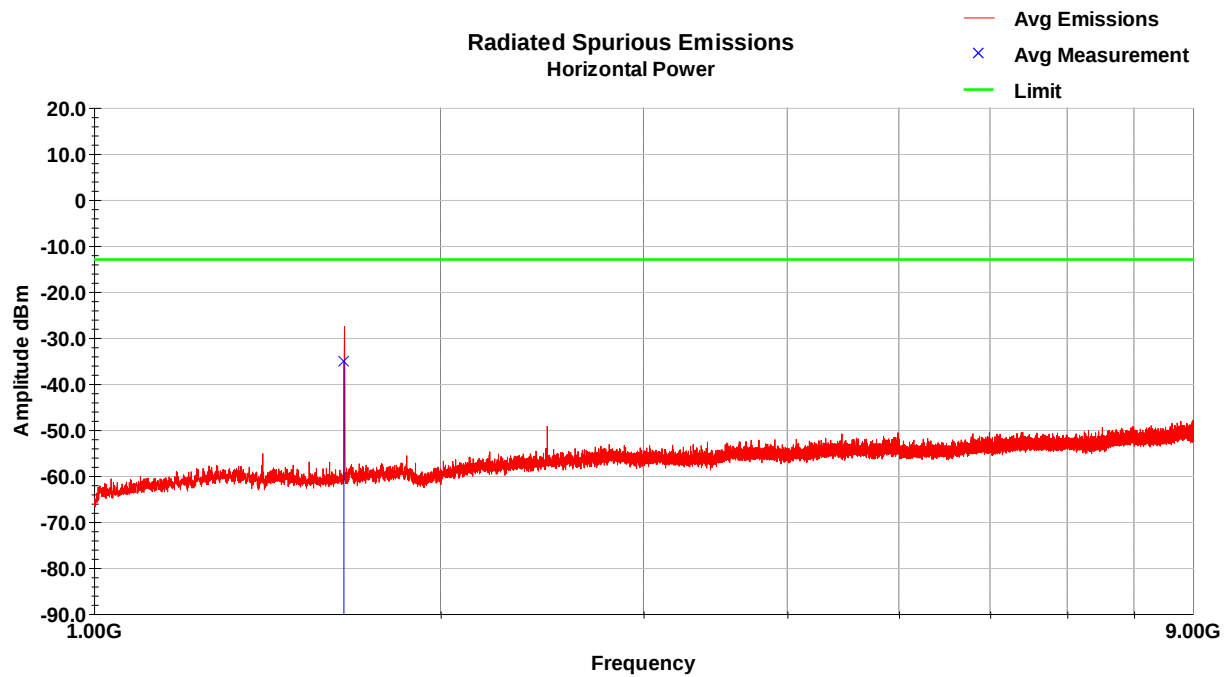
GSM 850 – LCH – 1-9GHz – Vertical



GSM 850 – LCH – 1-9GHz – Vertical – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1648.32	-34.3	V	138.0	160.0	28.9	2.0	33.4	-36.8	-13.0	-23.8
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

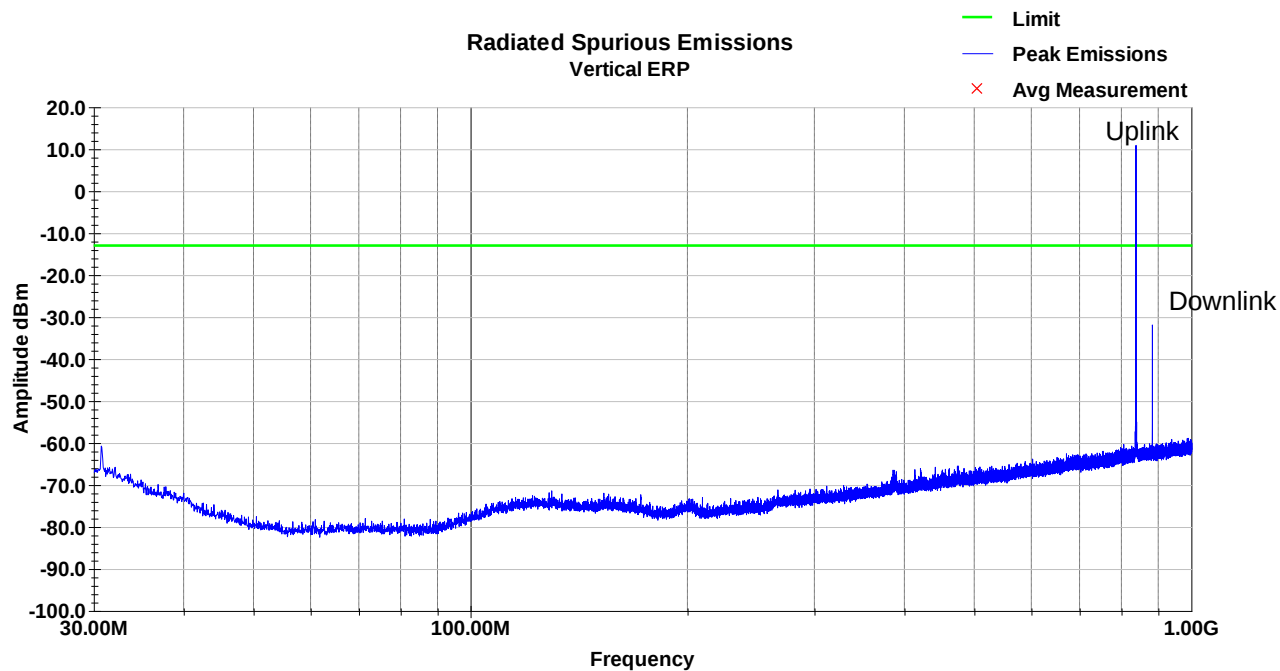
GSM 850 – LCH – 1-9GHz – Horizontal



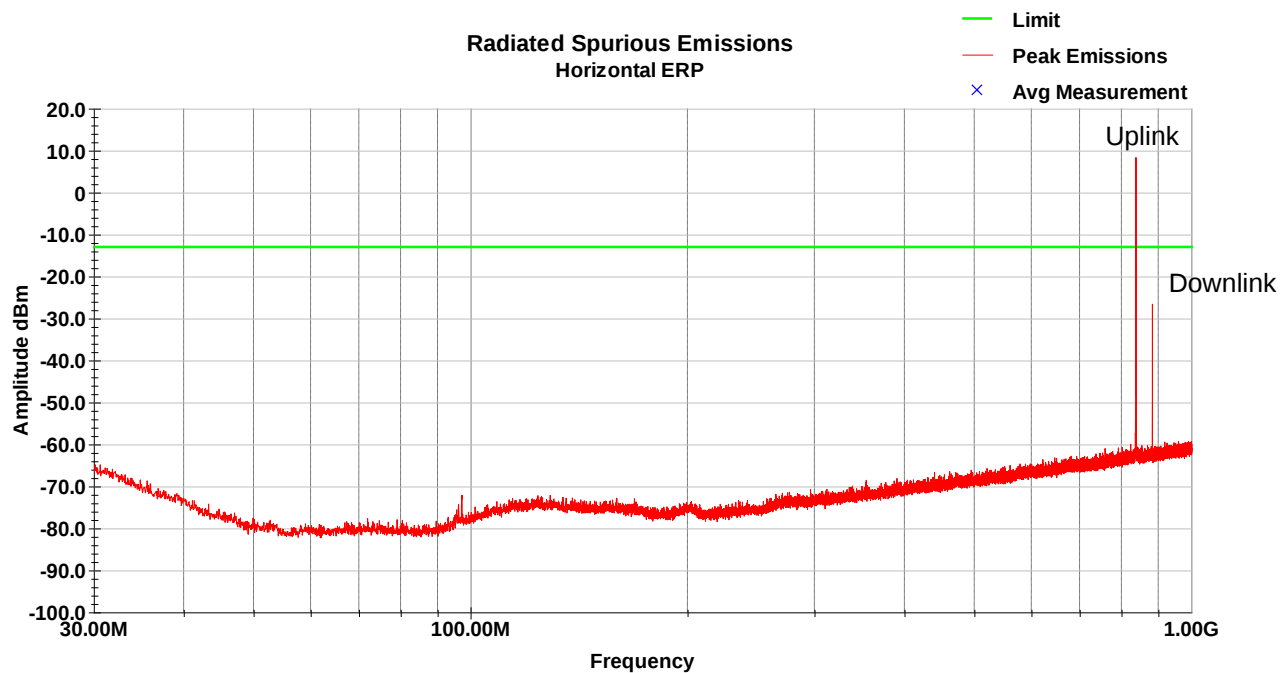
GSM 850 – LCH – 1-9GHz – Horizontal – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1648.32	-32.7	H	307.0	100.0	28.9	2.0	33.4	-35.2	-13.0	-22.2
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

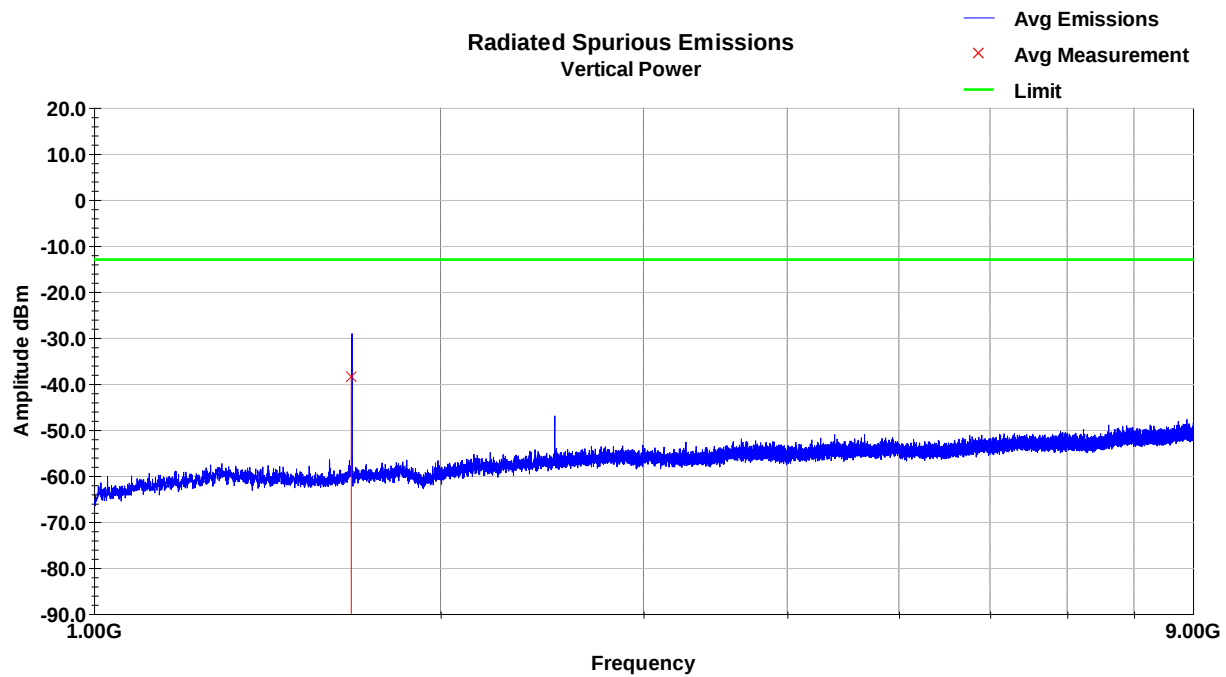
GSM 850 – MCH – 30-1000MHz – Vertical



GSM 850 – MCH – 30-1000MHz – Horizontal



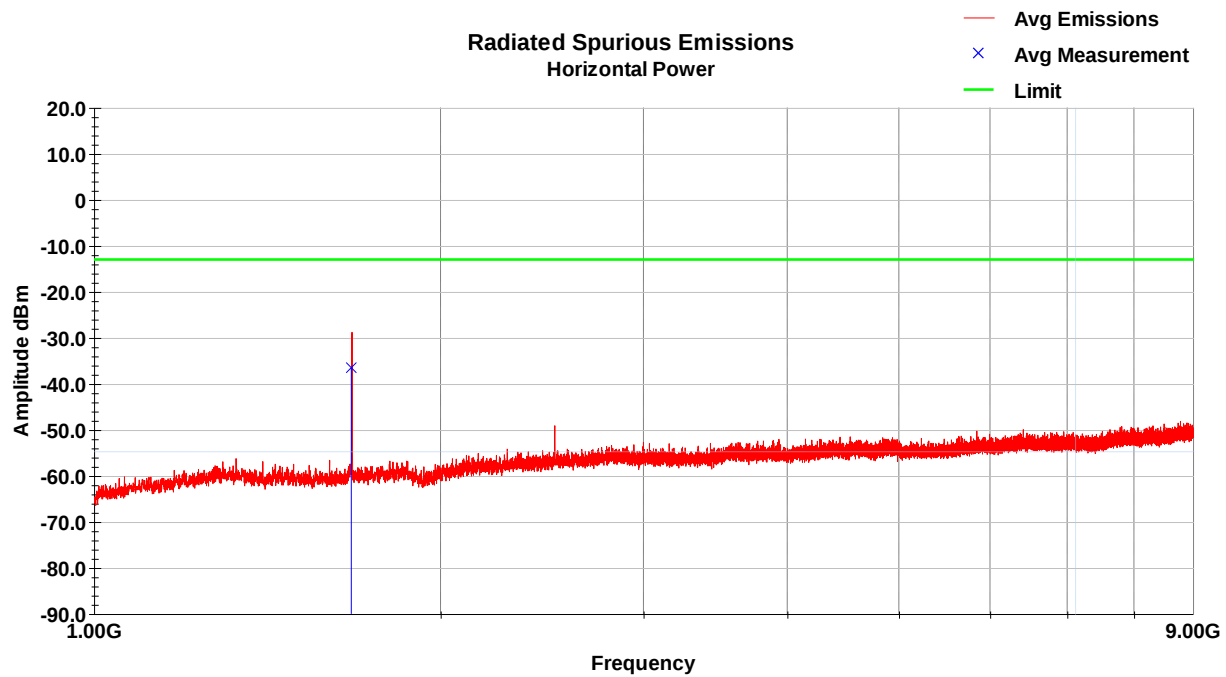
GSM 850 – MCH – 1-9GHz – Vertical



GSM 850 – MCH – 1-9GHz – Vertical – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1672.88	-36.4	V	141.0	122.0	29.2	2.0	33.4	-38.5	-13.0	-25.5
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

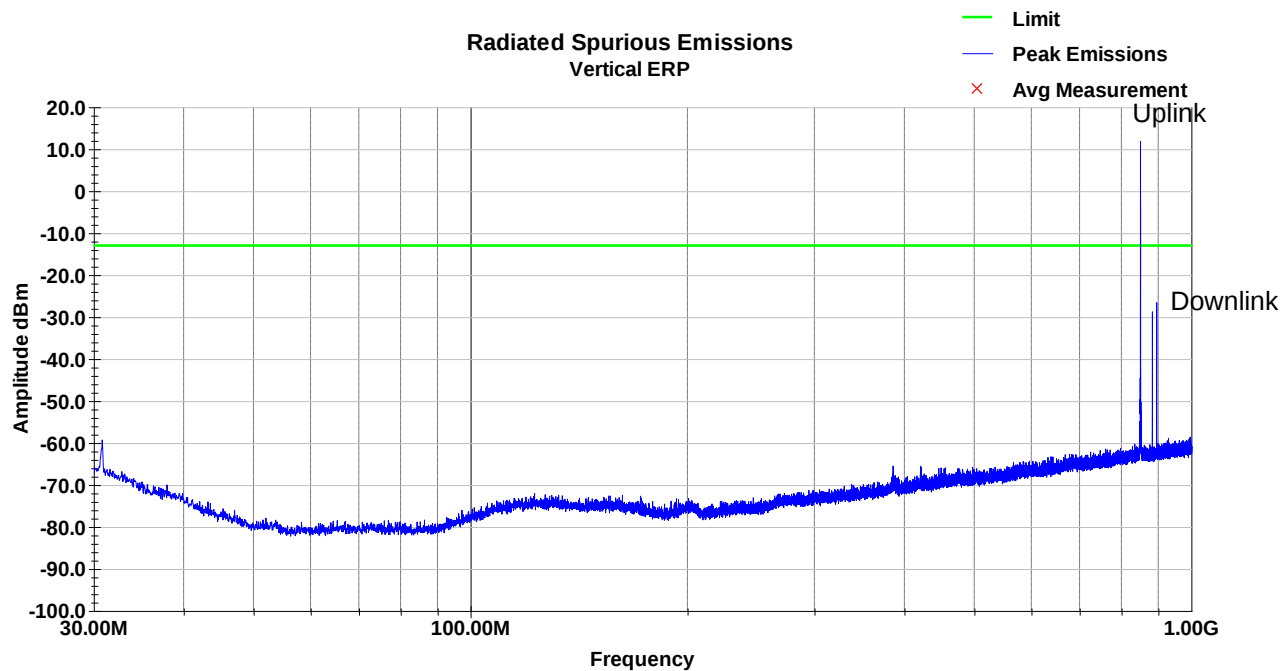
GSM 850 – MCH – 1-9GHz – Horizontal



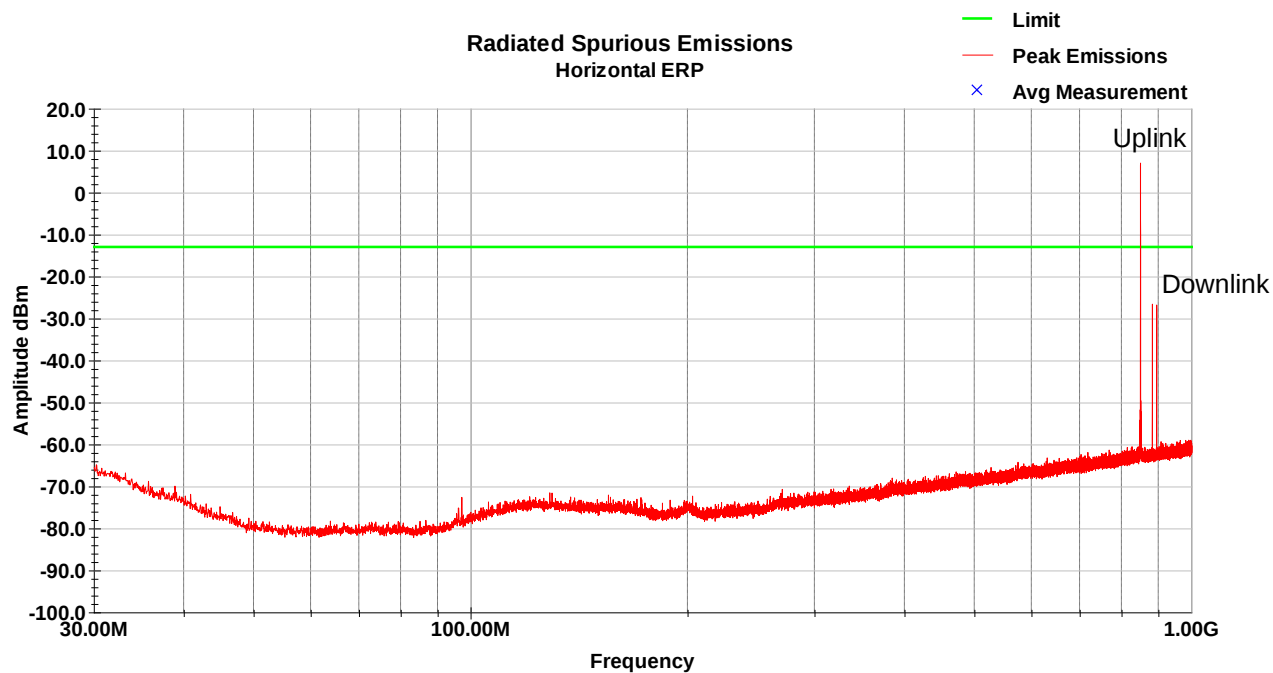
GSM 850 – MCH – 1-9GHz – Horizontal – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1673.00	-34.3	H	105.0	100.0	29.2	2.0	33.4	-36.4	-13.0	-23.4
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

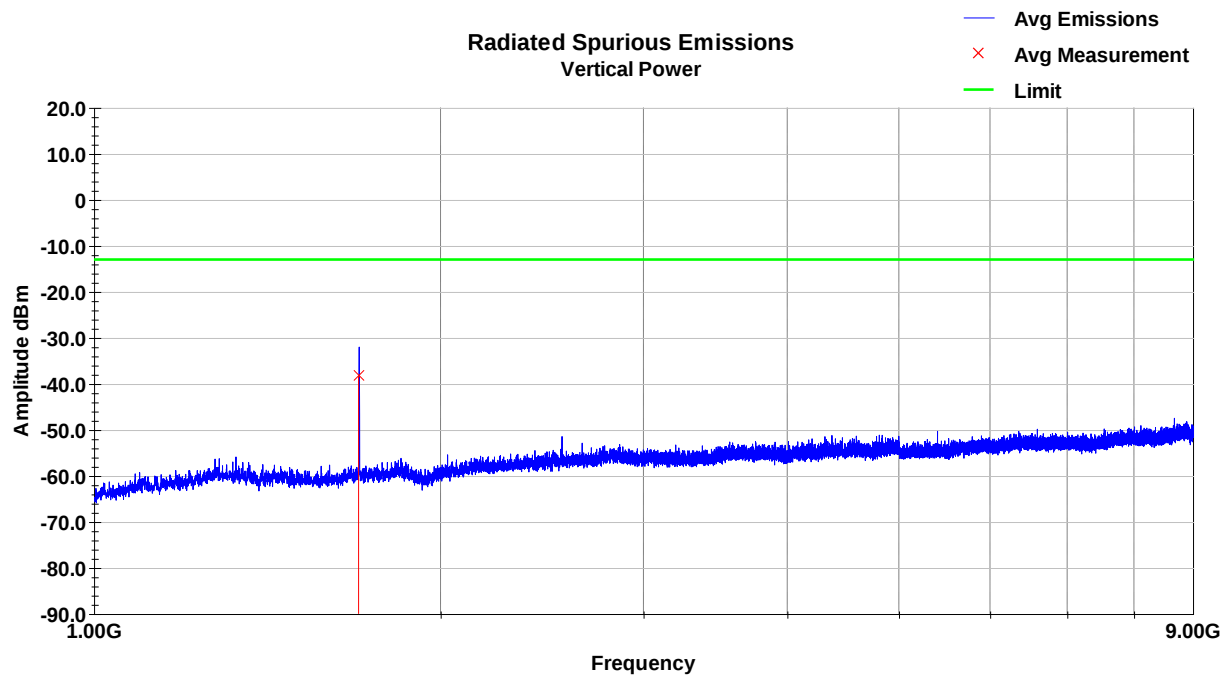
GSM 850 – HCH – 30-1000MHz – Vertical



GSM 850 – HCH – 30-1000MHz – Horizontal



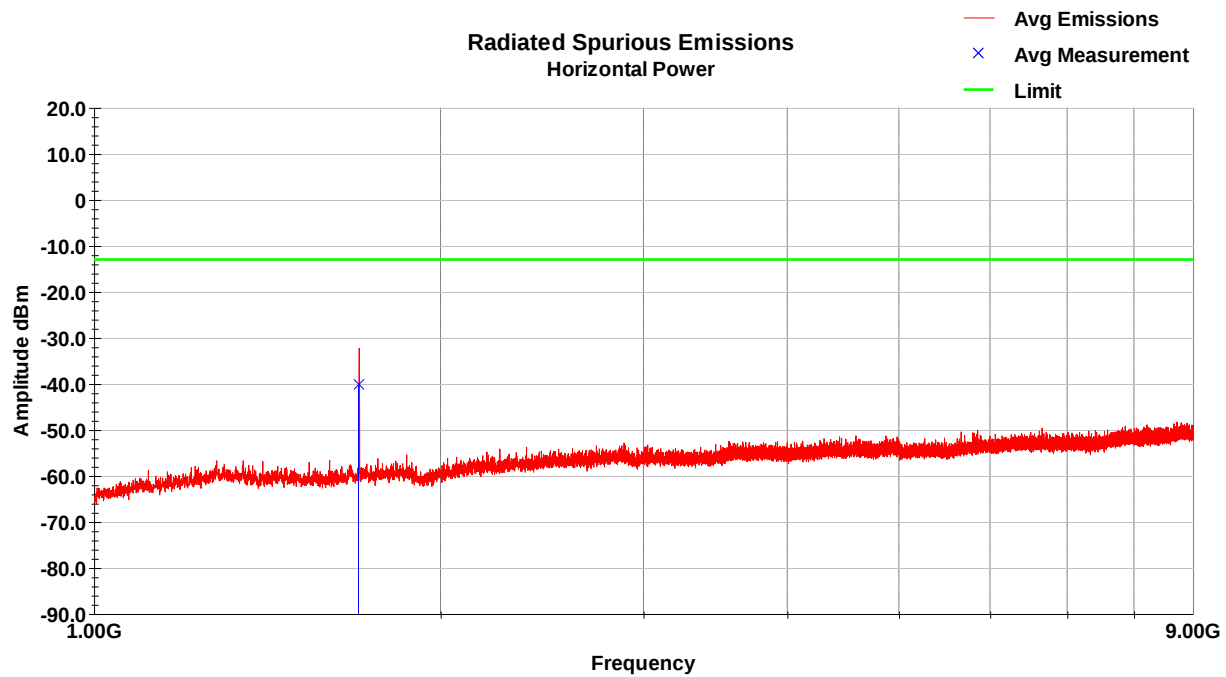
GSM 850 – HCH – 1-9GHz – Vertical



GSM 850 – HCH – 1-9GHz – Vertical – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1697.64	-36.4	V	135.0	140.0	29.5	2.0	33.4	-38.3	-13.0	-25.3
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

GSM 850 – HCH – 1-9GHz – Horizontal

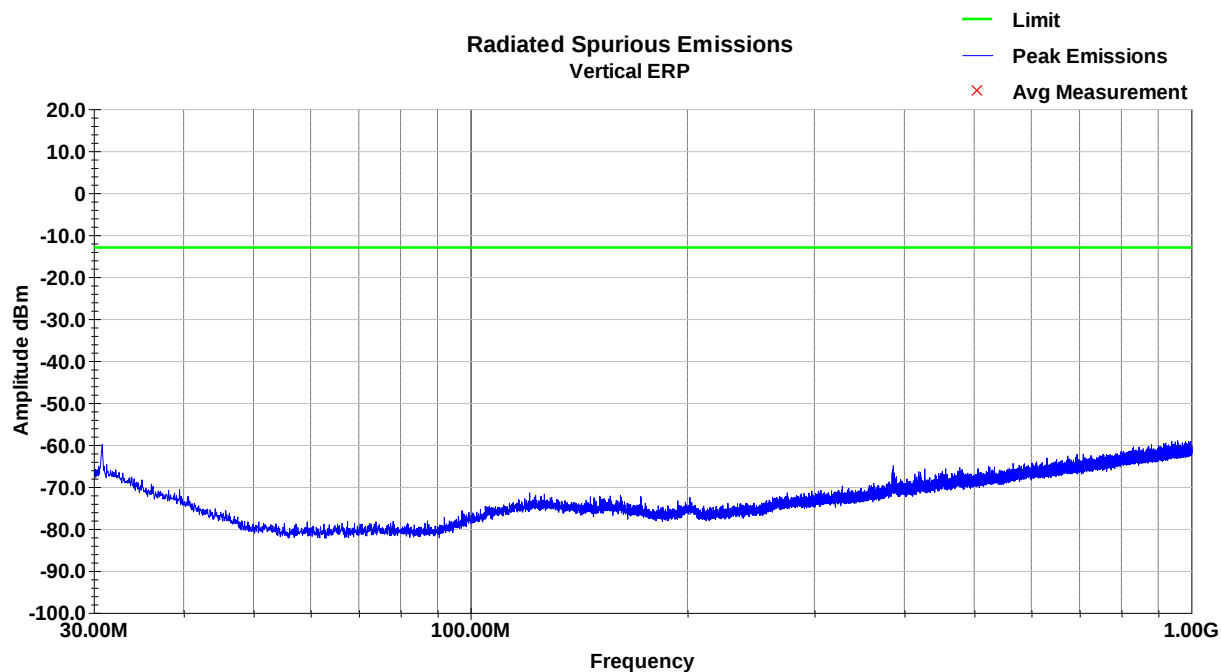


GSM 850 – HCH – 1-9GHz – Horizontal – Tabular Data

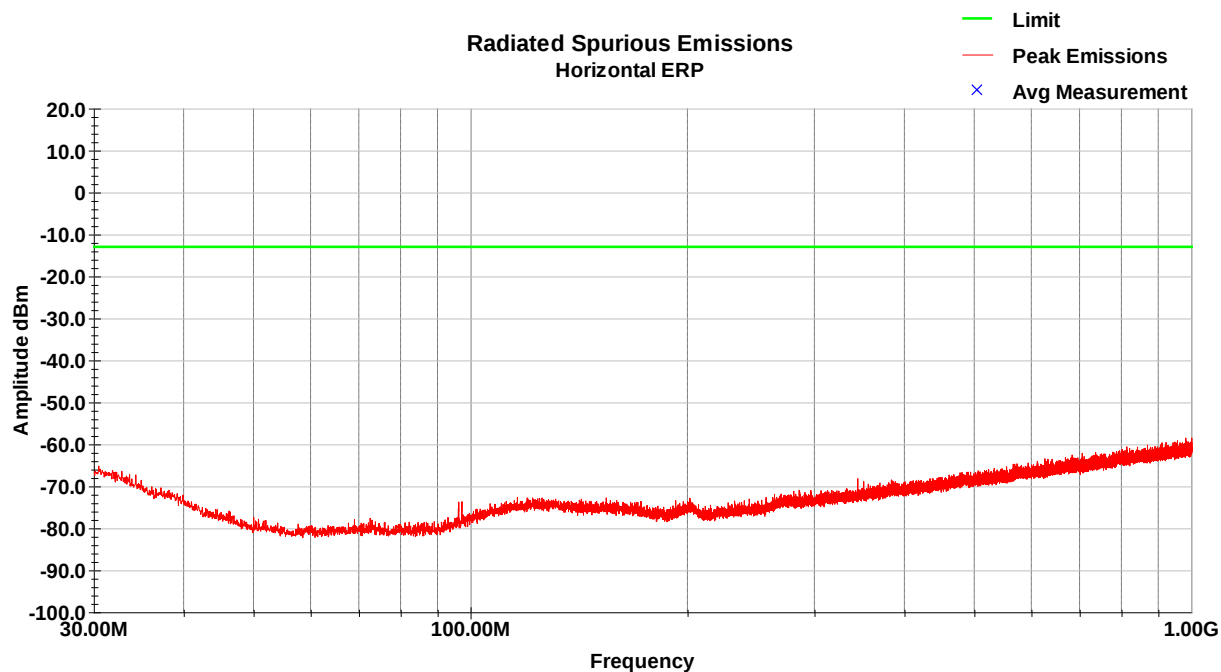
Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1697.32	-38.3	H	102.0	110.0	29.5	2.0	33.4	-40.2	-13.0	-27.2
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

8.6 Test Data – GSM 1900

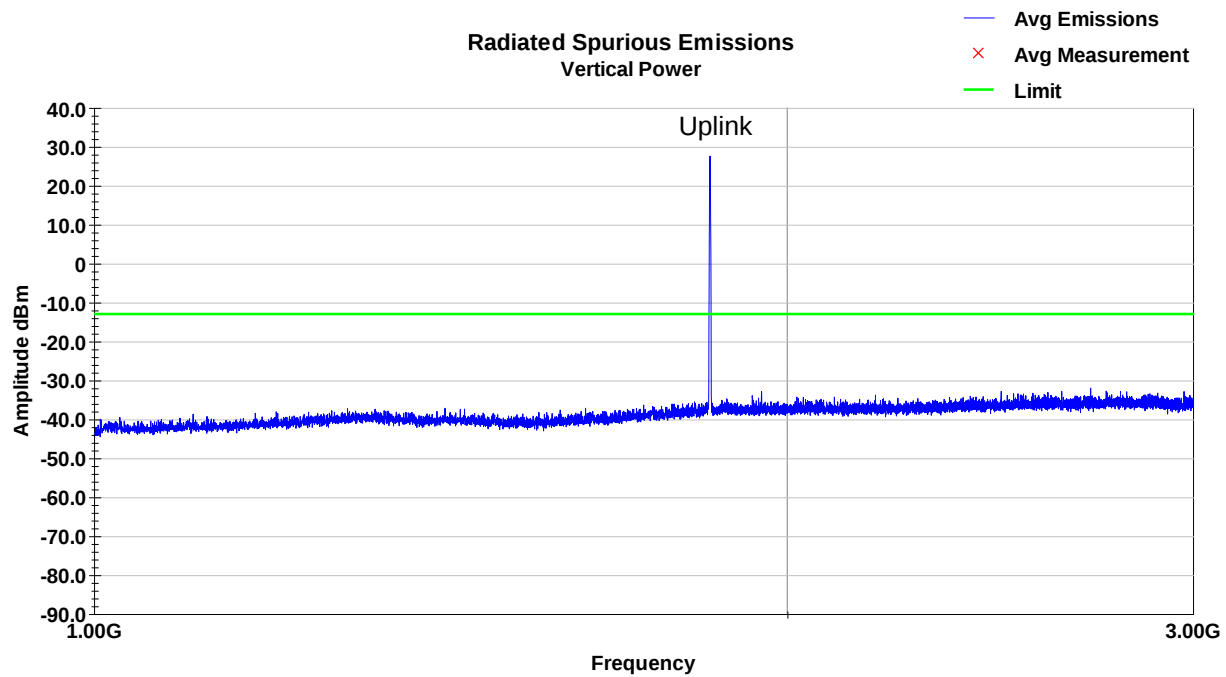
GSM 1900 – LCH – 30-1000MHz – Vertical



GSM 1900 – LCH – 30-1000MHz – Horizontal

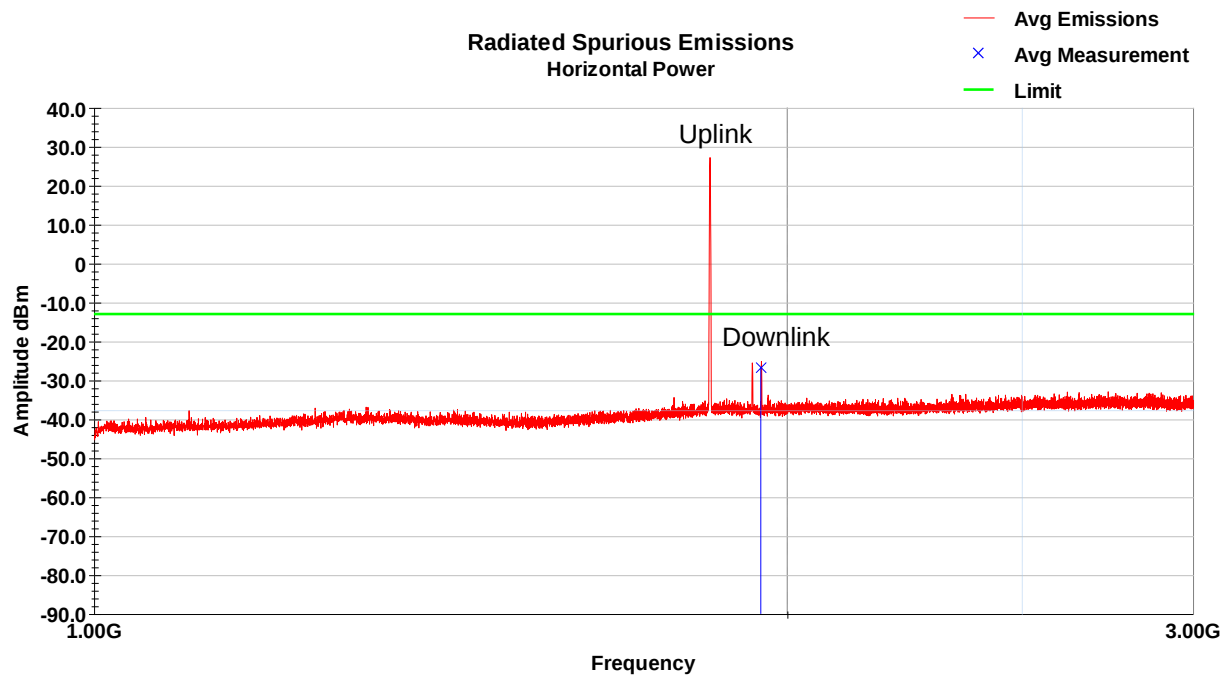


GSM 1900 – LCH – 1-3GHz – Vertical



*No emissions aside from the fundamental were within 20dB from the limit

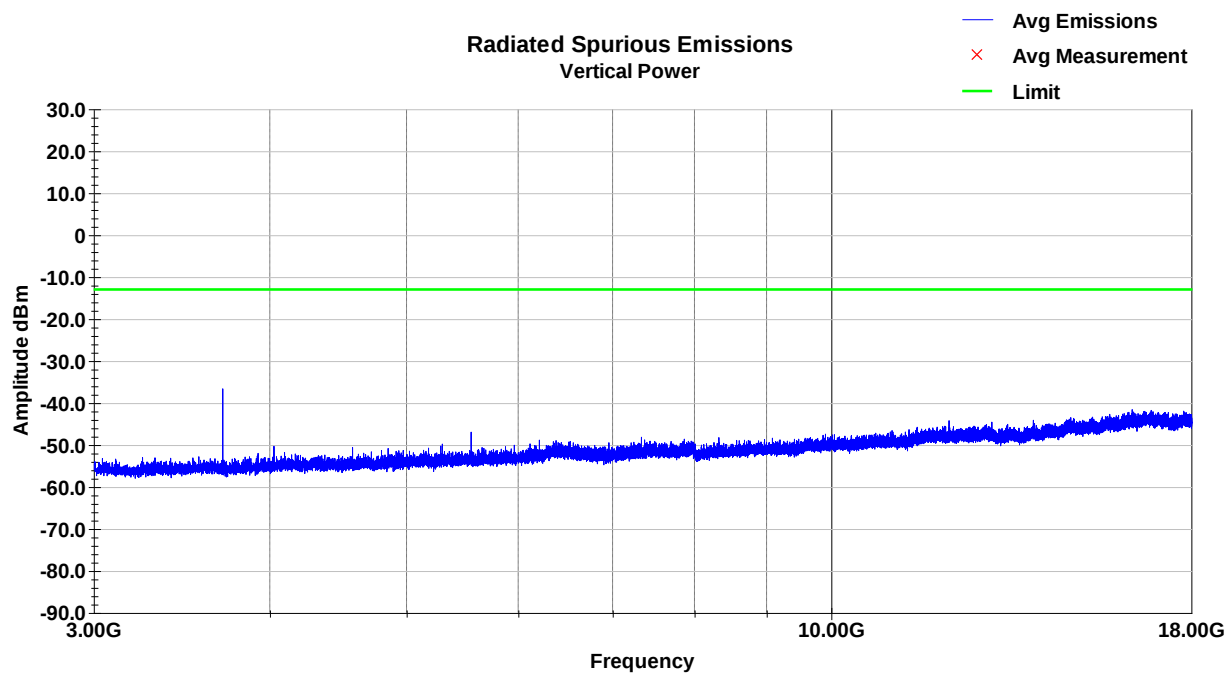
GSM 1900 – LCH – 1-3GHz – Horizontal



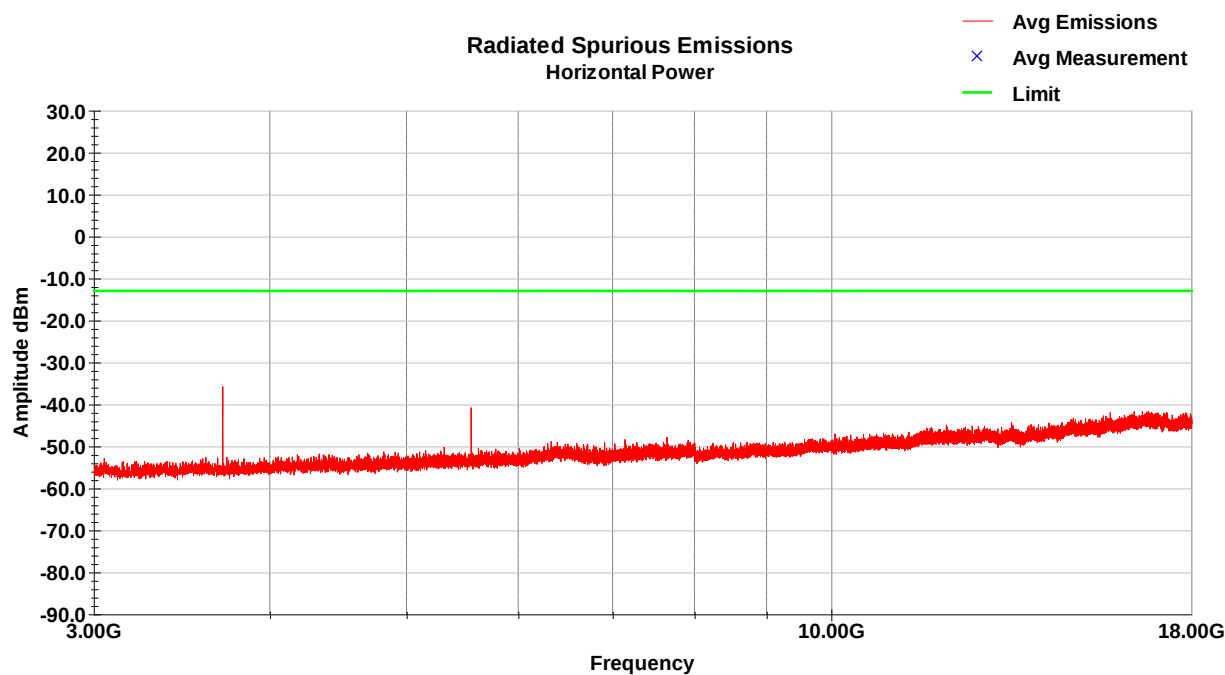
GSM 1900 – LCH – 1-3GHz – Horizontal – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1947.84	-46.7	H	273.0	244.0	31.2	22.3	33.4	-26.6	-13.0	-13.6
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

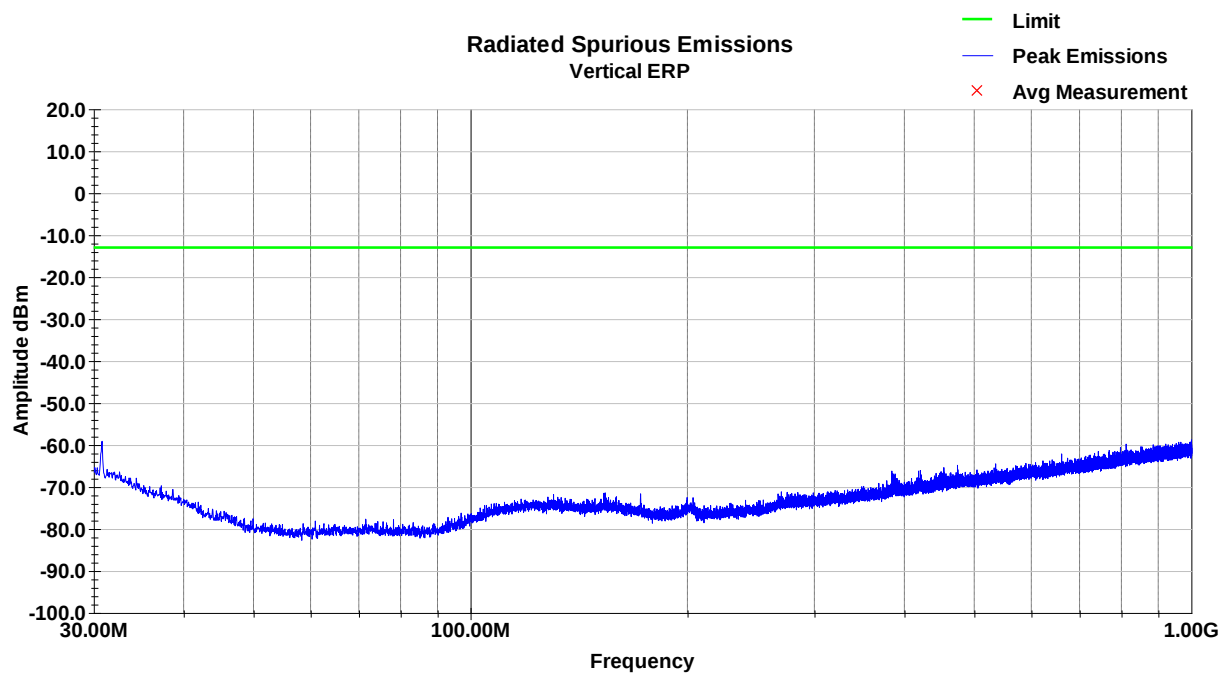
GSM 1900 – LCH – 3-18GHz – Vertical



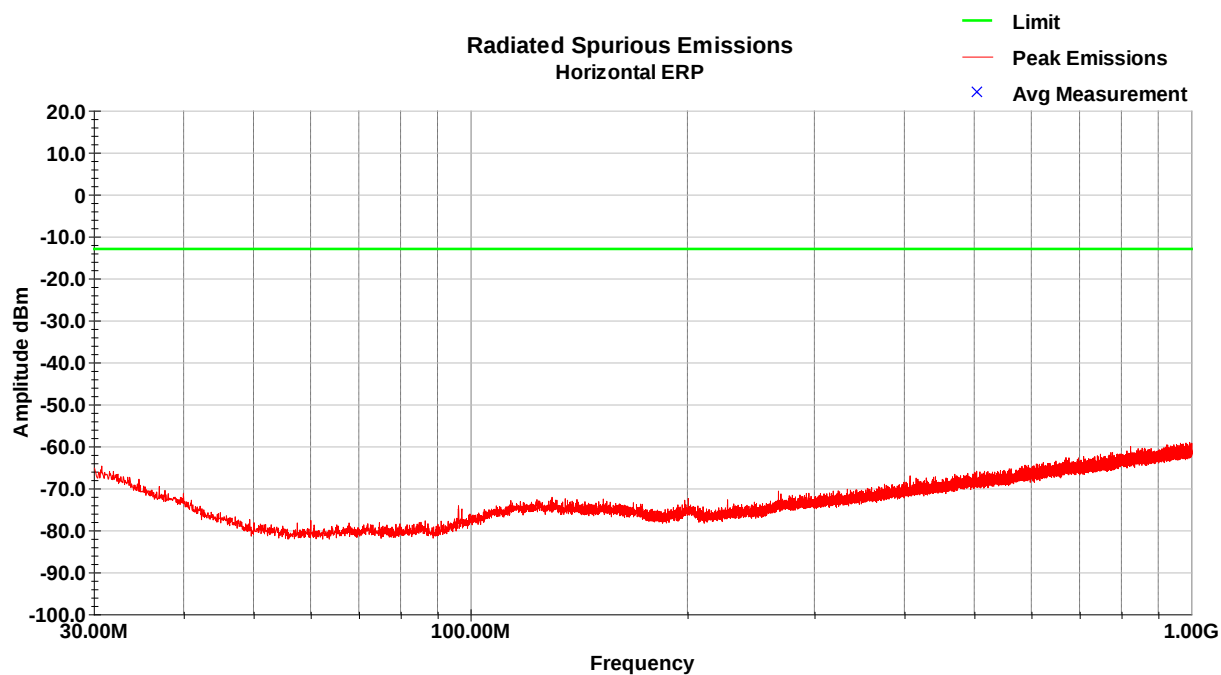
GSM 1900 – LCH – 3-18GHz – Horizontal



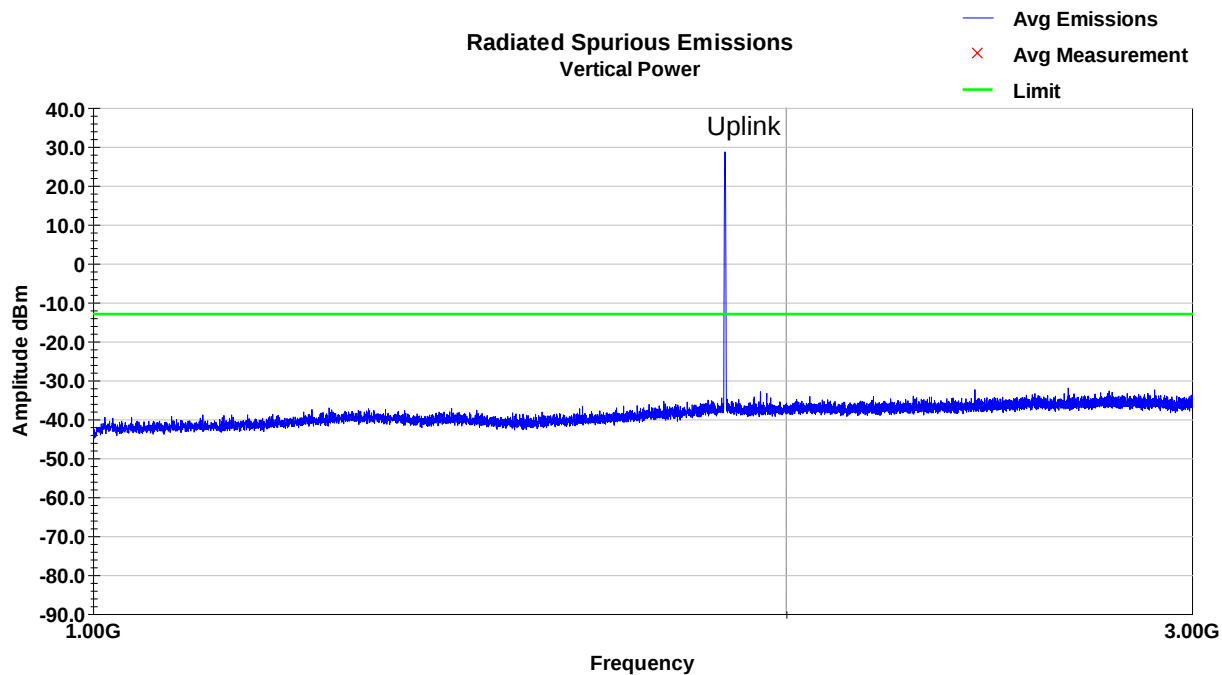
GSM 1900 – MCH – 30-1000MHz – Vertical



GSM 1900 – MCH – 30-1000MHz – Horizontal

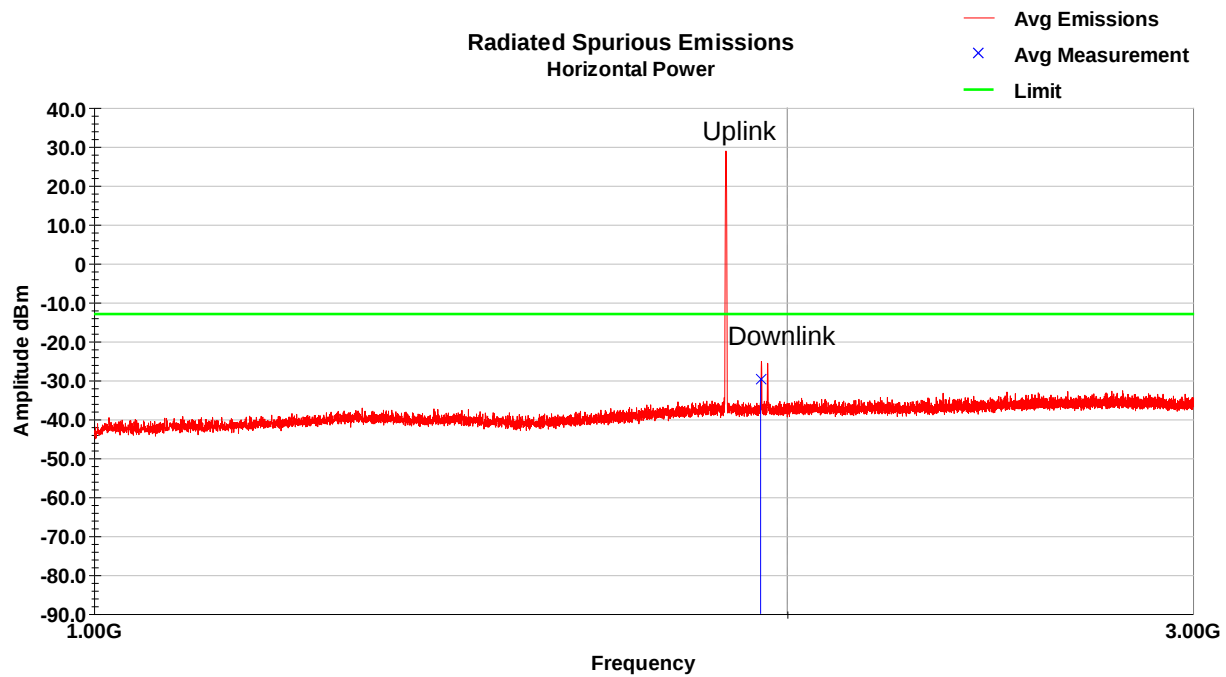


GSM 1900 – MCH – 1-3GHz – Vertical



*No emissions aside from the fundamental were within 20dB from the limit

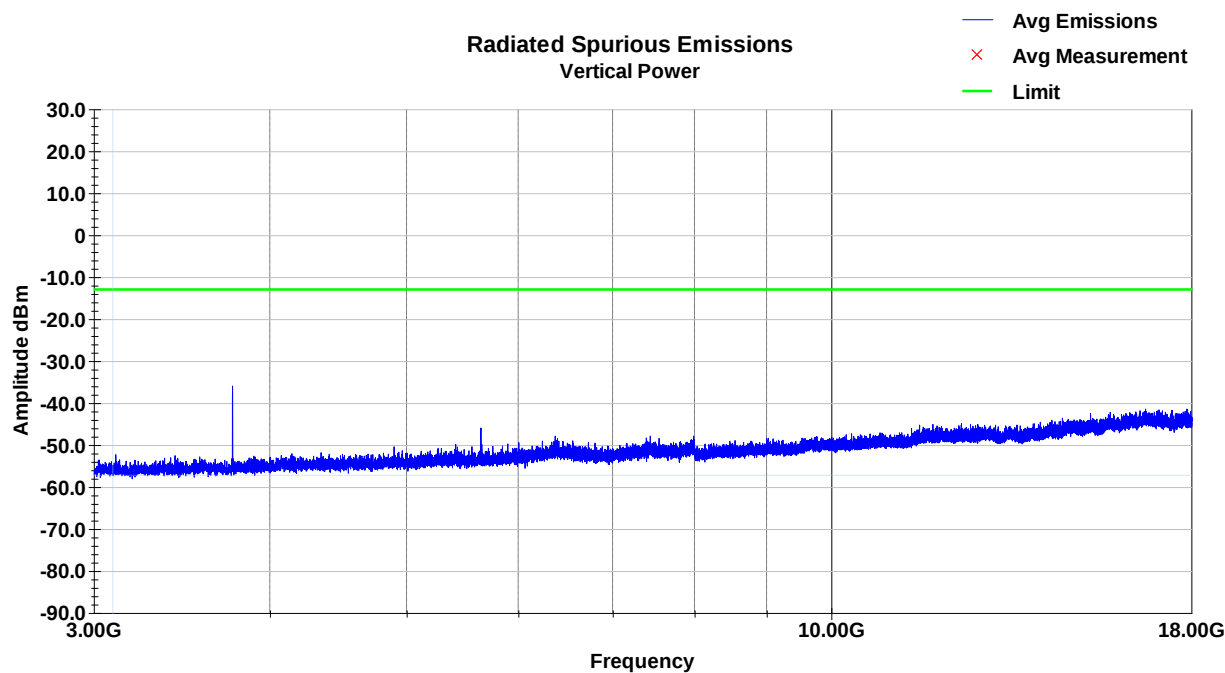
GSM 1900 – MCH – 1-3GHz – Horizontal



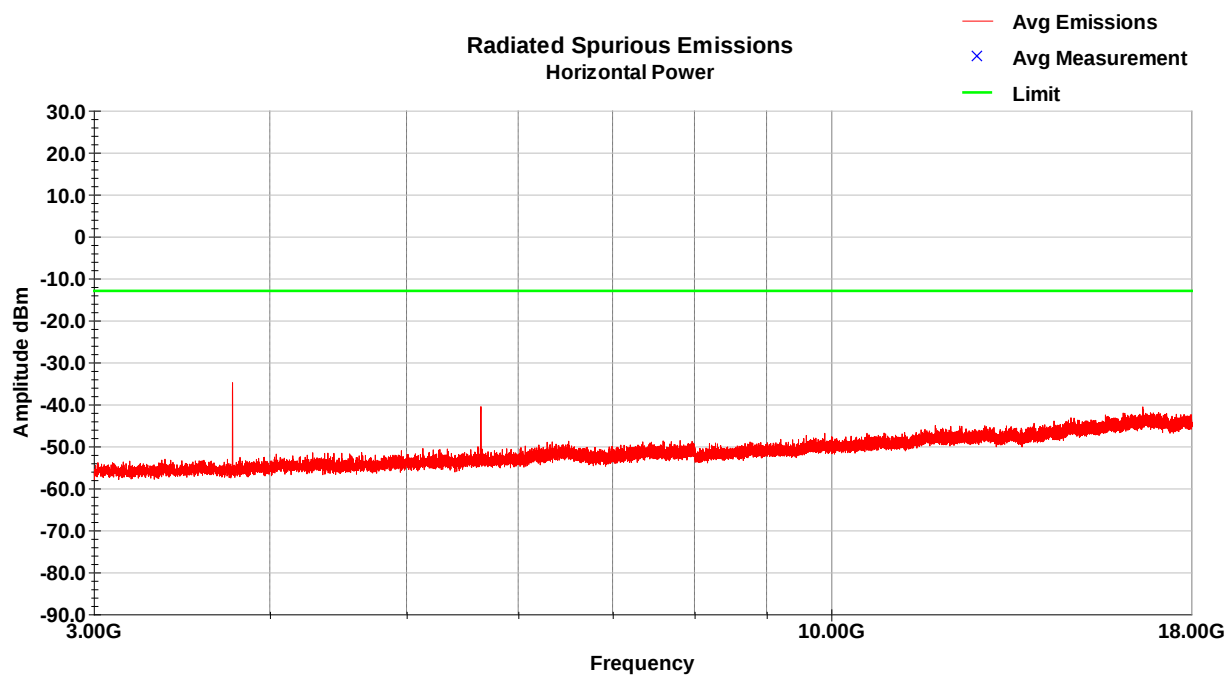
GSM 1900 – MCH – 1-3GHz – Horizontal – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1947.48	-49.9	H	180.0	114.0	31.2	22.3	33.4	-29.8	-13.0	-16.8
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

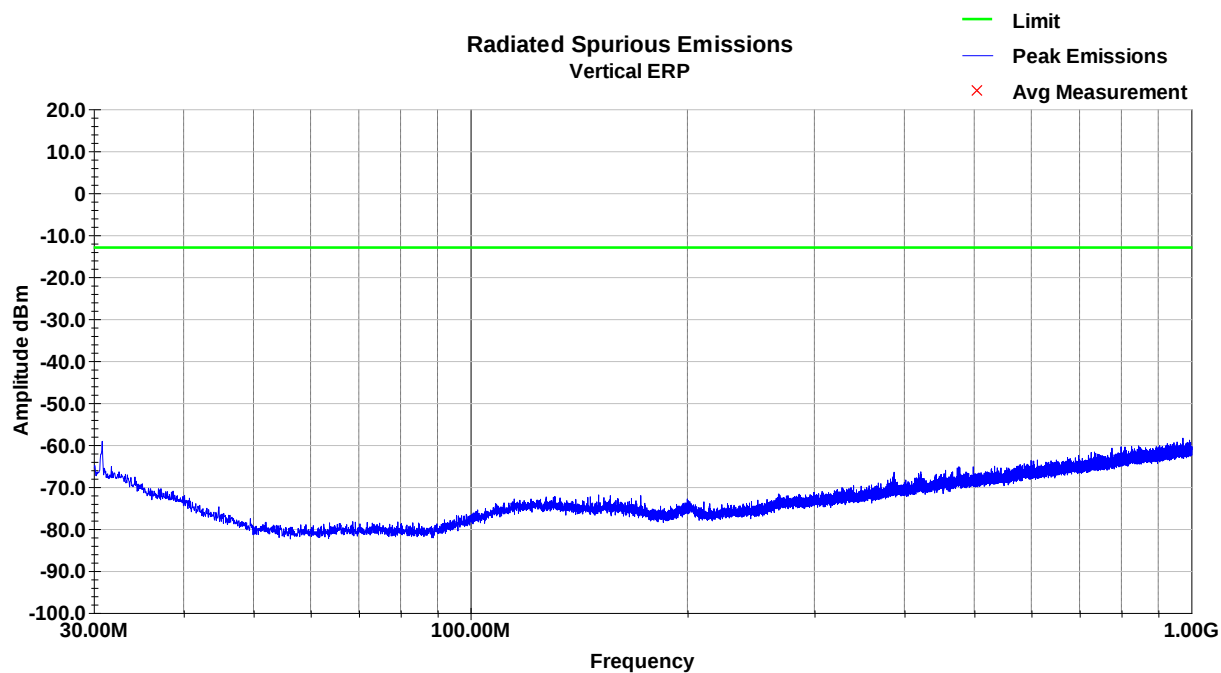
GSM 1900 – MCH – 3-18GHz – Vertical



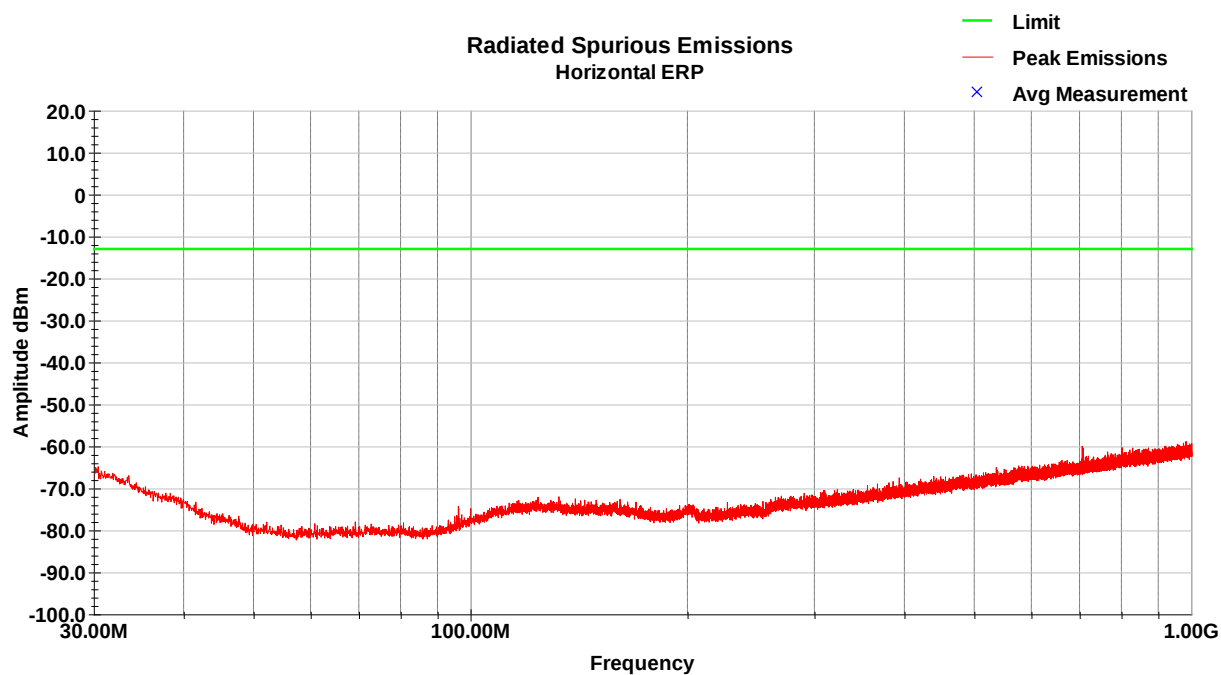
GSM 1900 – MCH – 3-18GHz – Horizontal



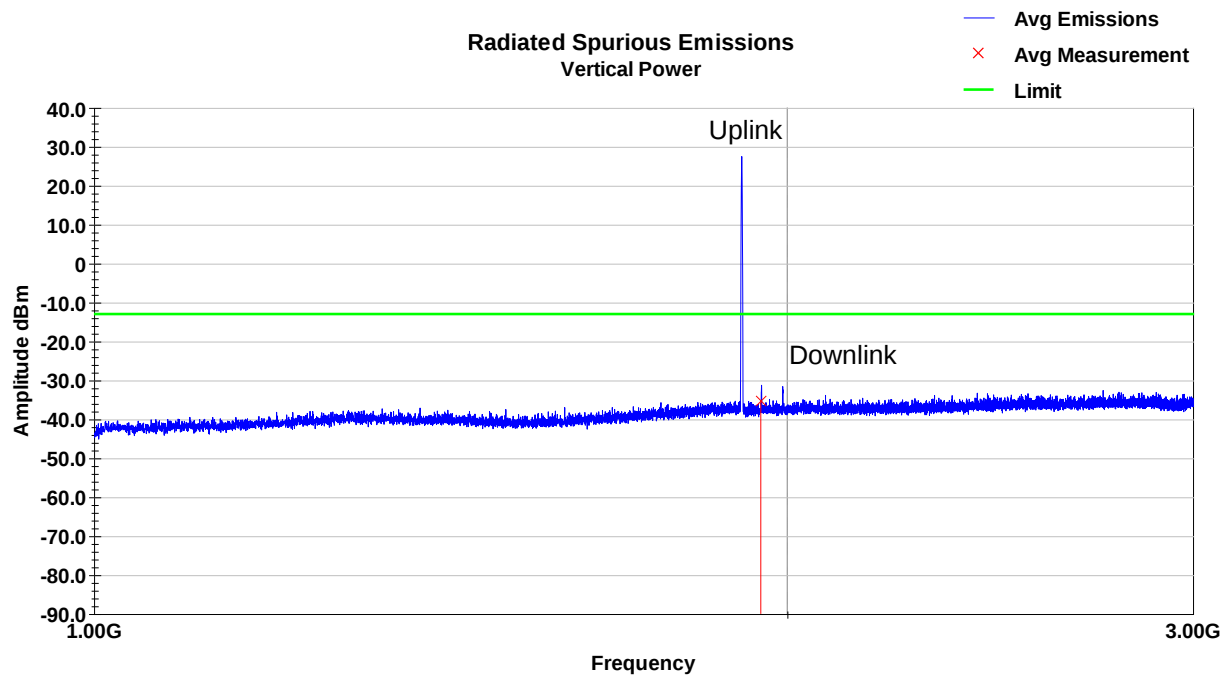
GSM 1900 – HCH – 30-1000MHz – Vertical



GSM 1900 – HCH – 30-1000MHz – Horizontal



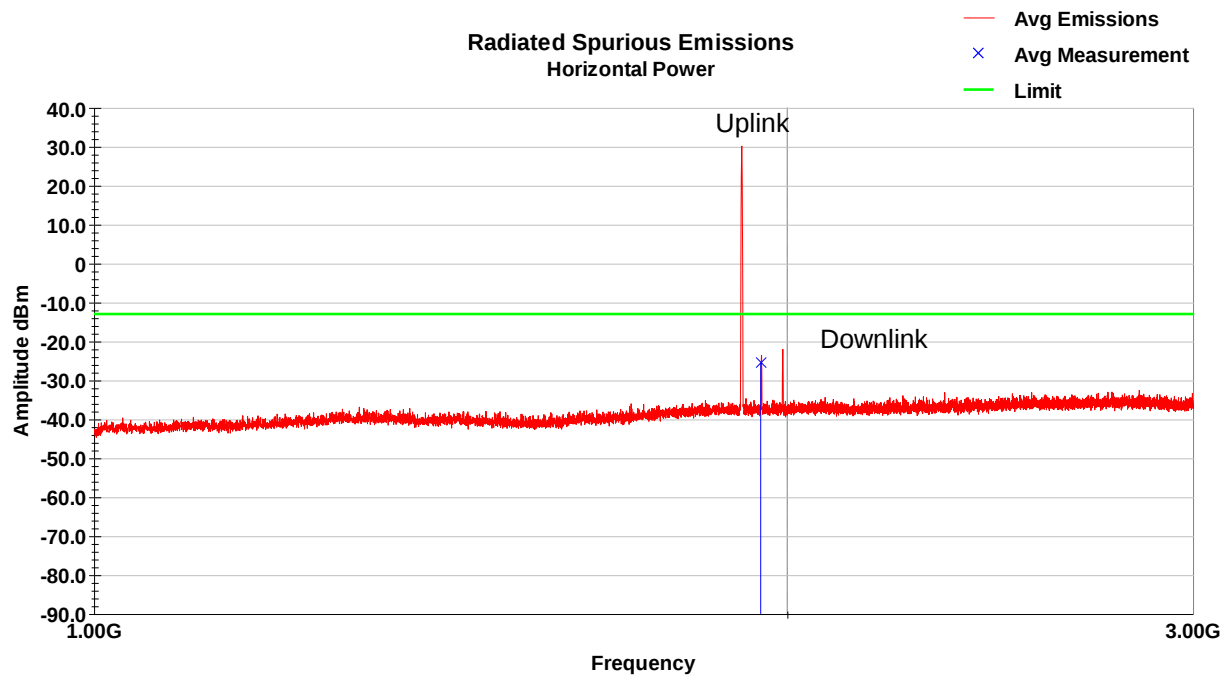
GSM 1900 – HCH – 1-3GHz – Vertical



GSM 1900 – HCH – 1-3GHz – Vertical – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1947.80	-55.4	V	58.0	100.0	31.2	22.3	33.4	-35.4	-13.0	-22.4
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

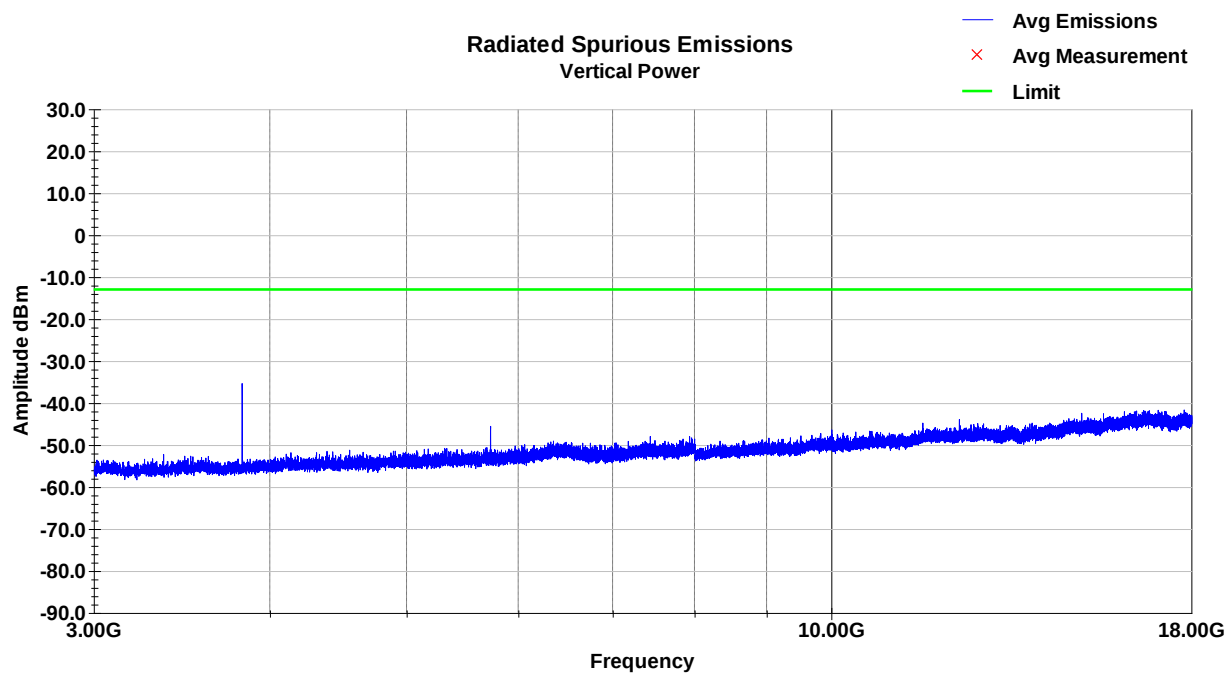
GSM 1900 – HCH – 1-3GHz – Horizontal



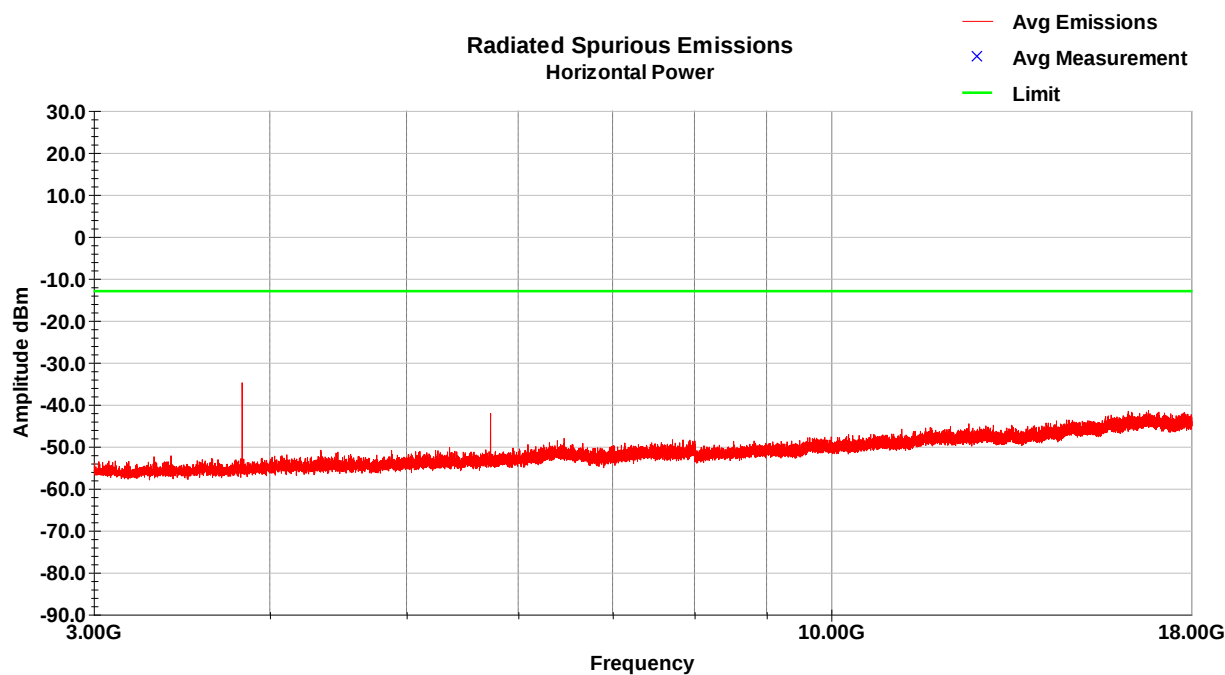
GSM 1900 – HCH – 1-3GHz – Horizontal – Tabular Data

Frequency MHz	Raw Avg dBm	Polarity V/H	Azimuth degrees	Height cm	AF dB/m	Loss dB	Amp dB	Avg Value dBm	Limit dBm	Margin dB
1947.68	-45.5	H	271.0	158.0	31.2	22.3	33.4	-25.5	-13.0	-12.5
Avg Value = Raw Avg + AF + Loss - Amp										
Margin = Avg Value - Limit										

GSM 1900 – HCH – 3-18GHz – Vertical



GSM 1900 – HCH – 3-18GHz – Horizontal



9 Frequency Stability

9.1 Test Result

Test Description	Requirements	Test Result
Frequency Stability	FCC Part 2.1055 FCC Part 22.355 FCC Part 24.235 RSS-GEN (6.11) RSS-132 (5.3) RSS-133 (6.3)	Compliant

9.2 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 BC0 channel 190 and BC1 channel 661.

9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

9.4 Test Equipment

Test End Date: 1-Dec-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
RF CABLE, SMA TO N	LL142	CENTRICRF	19011	16-Mar-2022	16-Mar-2023
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B094874	13-Jan-2021	13-Jan-2023
ENVIRONMENTAL CHAMBER	S 1.20	Thermotron	SAF-ENV-08	22-Nov-2022	22-Nov-2023
MULTIMETER	87V	FLUKE	B079677	16-Aug-2022	16-Aug-2023
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

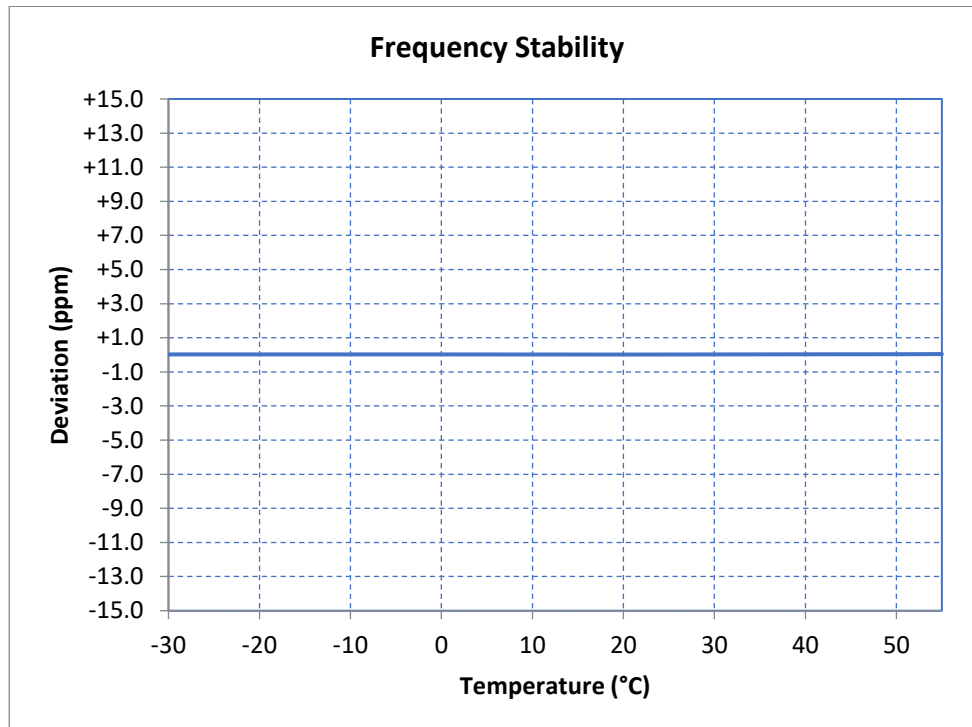
Software Profile:

TESTPass Version: 1.0.0, build: 2020.11.15.01

9.5 Test Data

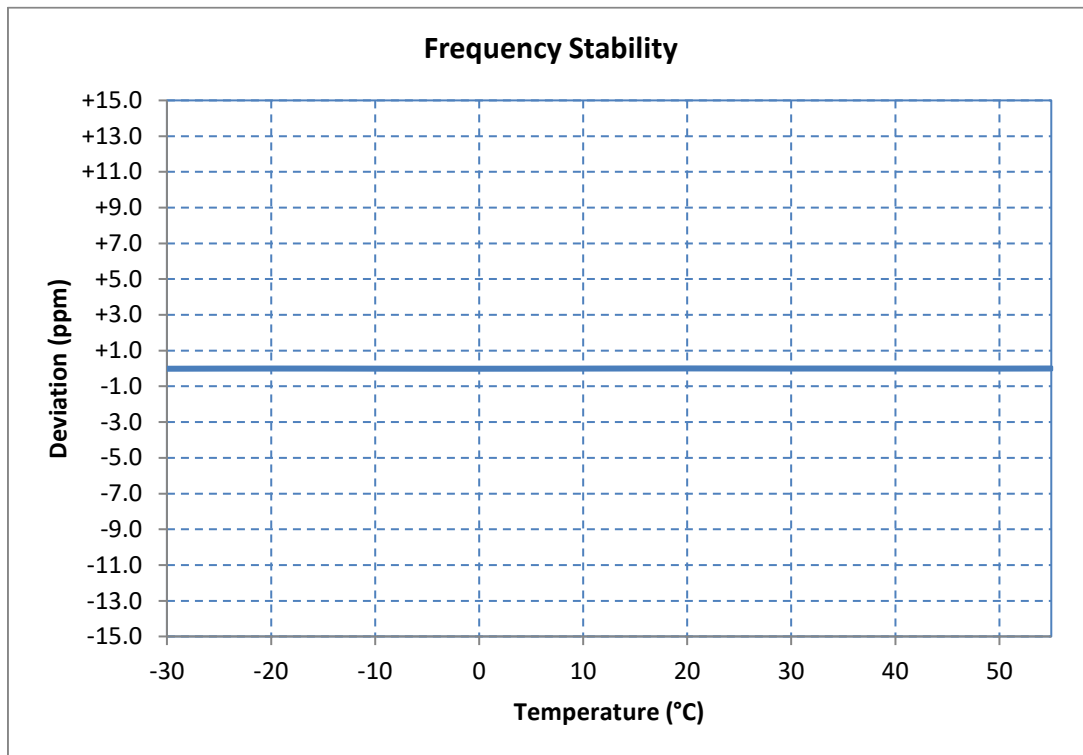
GSM 850, Channel 190 (836.6MHz)

Voltage %	Power V _{DC}	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	12.00	+20 (Ref)	836,600,014	+14	+0.02	+0.000002
100%	12.00	-30	836,600,021	+21	+0.03	+0.000003
100%	12.00	-20	836,600,022	+22	+0.03	+0.000003
100%	12.00	-10	836,600,021	+21	+0.03	+0.000003
100%	12.00	0	836,600,021	+21	+0.03	+0.000003
100%	12.00	+10	836,600,017	+17	+0.02	+0.000002
100%	12.00	+20	836,600,015	+15	+0.02	+0.000002
100%	12.00	+30	836,600,020	+20	+0.02	+0.000002
100%	12.00	+40	836,600,027	+27	+0.03	+0.000003
100%	12.00	+50	836,600,030	+30	+0.04	+0.000004
100%	12.00	+55	836,600,038	+38	+0.05	+0.000005
115%	13.80	+20	836,600,018	+18	+0.02	+0.000002
85%	10.20	+20	836,600,019	+19	+0.02	+0.000002



GSM 1900, Channel 661 (1880MHz)

Voltage %	Power V _{DC}	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	12.00	+20 (Ref)	1,880,000,012	+12	+0.01	+0.000001
100%	12.00	-30	1,880,000,010	+10	+0.01	+0.000001
100%	12.00	-20	1,880,000,014	+14	+0.01	+0.000001
100%	12.00	-10	1,880,000,012	+12	+0.01	+0.000001
100%	12.00	0	1,880,000,010	+10	+0.01	+0.000001
100%	12.00	+10	1,880,000,013	+13	+0.01	+0.000001
100%	12.00	+20	1,880,000,016	+16	+0.01	+0.000001
100%	12.00	+30	1,880,000,014	+14	+0.01	+0.000001
100%	12.00	+40	1,880,000,014	+14	+0.01	+0.000001
100%	12.00	+50	1,880,000,013	+13	+0.01	+0.000001
100%	12.00	+55	1,880,000,015	+15	+0.01	+0.000001
115%	13.80	+20	1,880,000,017	+17	+0.01	+0.000001
85%	10.20	+20	1,880,000,015	+15	+0.01	+0.000001



10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	08 December 2022
1	- Corrected test dates in section 2.3 - Corrected test voltages in section 9.5 - Corrected company address in section 2.1 - Updated equipment list to add software and TSTPass system - Updated Frequency Stability Test Data for GSM 1900	24 February 2023