TEST REPORT

Report Number: 3042052-43-04-0
Project Number: 3042052
September 16, 2003

Evaluation of the
Dual Band GSM Cellular Phone
Model Number: PhoneCell SX5
FCC ID: MTFGSMUSDUAL
to

FCC Part 15
FCC Part 22 Subpart H
FCC Part 24 Subpart E

For

Telular Corporation

Test Performed by:	Test Authorized by:
Intertek	Telular Corporation
731 Enterprise Dr.	580 Old Willets Path
Lexington, KY 40510	Hauppauge, NY 11788

Prepared by: _____ Date: 9/29/2003
Brian Tucker, Project Engineer

Reviewed by: _____ Date: 9/29/2003
David J. Schramm, Team Leader - EMC

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Executive Summary

Testing performed for: Telular Corporation

Equipment Under Test: PhoneCell SX5, Dual Band GSM Cellular Phone

FCC RULE	IC RULE	DESCRIPTION OF TEST	RESULT	PAGE
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§22.913, §24.232	RSS-128 §7.1 RSS-133 §6.2	ERP, EIRP	Passed	12
§2.1049 §22.917(b)(d)	RSS-128 §7.4	Emission Limitation, Occupied Bandwidth	Passed	13
§2.1051 §22.917(e) §22.917(f) §24.238(a)	RSS-128 §7.4 RSS-133 §6.3	Out of Band Emissions at Antenna Terminals Mobile Emissions In Base Frequency Range	Passed	20
§2.1053	RSS-128 §7.4 RSS-133 §6.3	Field Strength of Spurious Radiation	Passed	27
§15.107, §15.207	IC ES-003	Power Line Conducted Emissions	Passed	44
§2.1055, §22.355, §24.235	RSS-128 §9 RSS-133 §7	Frequency Stability vs. Temperature	Passed	49
§2.1055, §22.355, §24.235	RSS-128 §9 RSS-133 §7	Frequency Stability vs. Voltage	Passed	52
§2.1091, §2.1093	RSS-128 §21, RSS-133 §8	Specific Absorption Rate	--	See Note [1]
§15.109	IC ES-003 RSS-128 §9, RSS-133 §9	Receiver Spurious Emission	Passed	33

[1] The Specific Absorption Rate is addressed in a separate document.

1 JOB DESCRIPTION

1.1 Client information

The Dual Band GSM Cellular Phone has been tested at the request of

Company:	Telular Corporation 580 Old Willets Path Hauppauge, NY 11788
Name of contact:	Matthew McKiernan
Telephone:	(631) 232-6070
Fax:	(631) 232 6082

1.2 Test plan reference:

Tests were performed to the following standards:

- FCC Part 15
- FCC Part 22 Subpart H rules for an intentional radiator
- FCC Part 24 Subpart E rules for an intentional radiator

The test procedures described in this test report and ANSI C63.4: 1992 were employed.

1.3 Equipment Under Test (EUT)

Product	Dual Band GSM Cellular Phone	
EUT Model Number	PhoneCell SX5	
EUT Serial Number	010143.00.002000.0	
Whether quantity (>1) production is planned	Quantity production is planned.	
Cellular Phone standards	GSM800 and GSM1900	
Type(s) of Emission	260KGXW	
RF Output Power	See Section 3.3	
Frequency Range	824 – 849	GSM800
	1850 – 1910	GSM1900
Antenna	Removable antenna with TNC type connector	
Detachable Antenna?	Yes	

EUT receive date: July 1, 2003

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: July 1, 2003

Test completion date: August 7, 2003

The test results in this report pertain only to the item tested.

Table 1: Details of Equipment Under Test

Description	Model Number	Serial Number
Dual Band GSM Cellular Phone	PhoneCell SX5D	010143.00.002000.0
AC/DC Power Supply	TMG-0716	0716020939

The EUT is comprised of two separate devices. Internally the two devices are identical. They function as Cellular PCS transceivers. However, externally, both in appearance and functionally, the two devices differ. The Phonecell SX5D appears as a standard telephone handset. The Phonecell SX5T uses the same circuitry, however does not utilize all of the functions on the circuit board.

1.3.1 System Support Equipment

There was no support equipment required to operate the EUT other than the base station simulator, which is listed as test equipment.

1.3.2 Cables associated with EUT

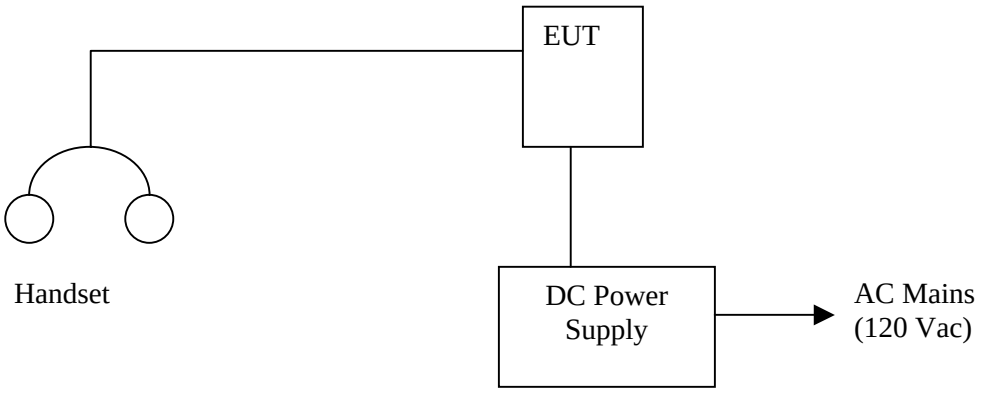
Table 1-2 contains the details of the cables associated with the EUT.

Table 1-2: Interconnecting cables between modules of EUT

Cables					
Description	**Length**	**Shielding**	**Ferrites**	**Connection**	
				From	**To**
AC Power Supply Cable	2 m	No	No	AC Mains	EUT

1.3.3 System Block Diagram

The diagram shown below details the interconnection of the EUT and its accessories during FCC Part 15 testing. For specific layout, refer to the test configuration photograph in the relevant section of this report.



1.3.4 Justification

The EUT was operated in the stand-alone configuration.

1.3.5 Mode(s) of operation

The EUT was powered from 120V AC, supplied by the AC mains of the test facility, for all testing. Battery power is for back-up purposes only. The EUT was set to the GSM800, or GSM1900 mode during testing.

1.4 Modifications required for compliance

No modifications were implemented by Intertek Testing Services.

1.5 Related Submittal(s) Grants

None

2 TEST FACILITY

The Intertek test site is located at 721 Enterprise Dr., Lexington, KY. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

3 CONDUCTED RF POWER

FCC §2.1046

3.1 Test Procedure

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

Tests were performed at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitters.

3.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Base Station Simulator	Rhode & Schwarz	CMU 200	837198/089
Temperature Chamber	Thermotron	SM-8C	32692

3.3 Test Results

Table 3-1 Conducted RF Power

EUT Mode	Frequency MHz	Channel	Measured Power dBm		
			+60°C	+20°C	-30°C
GSM800	824.2	128	32.1	32.1	31.6
	836.4	189	32.0	32.2	31.7
	848.8	251	31.7	31.9	31.5
GSM1900	1850.2	512	29.5	29.2	28.7
	1880.0	661	29.6	29.4	28.9
	1909.80	810	29.5	29.5	29.1

4 RADIATED RF POWER

FCC §22.913: The effective radiated power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

FCC §24.232: The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

4.1 Test Procedure

The EUT was placed on a non-conductive turntable with the earpiece attached. The earpiece was extended vertically above the EUT using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3m with a test antenna and EMI receiver.

During the measurement of the EUT, the receiver resolution bandwidth was set to 3 MHz and the average bandwidth was set to 10 kHz. These settings matched the power readings of a power meter with a thermocouple power sensor. The highest emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The receiver reading was recorded and the field strength (E in dBμV/m) was calculated.

ERP in frequency band 824-849 MHz, and EIRP in frequency band 1851.25-1910 MHz were measured using a substitution method. The EUT was replaced by half-wave dipole (824-849 MHz) or horn antenna (1851.25-1910 MHz) connected to a signal generator, which was set to approximately -10 dBm. The spectrum analyzer reading was recorded and ERP/EIRP was calculated as follows:

$$ERP = E_1 - E_2 + V_g$$
$$EIRP = E_1 - E_2 + V_g + G$$

where,

E_1 is the receiver reading in dBμV/m when measuring the field strength of the EUT
E_2 is the receiver reading in dBμV/m when measured field strength from the generator
V_g is the generator output in dBm
G is the gain of the transmitting antenna in dBi.

4.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Signal Generator	HP	83620B	3844A01327
Horn Antenna	ETS	3115	6556
Receive Antenna	ETS	3142B	1674
EMI Receiver	Rhode & Schwarz	ESI26	100016

4.3 Test Results

Table 4-1 Radiated RF Power

EUT Mode	Measurement Method	Frequency MHz	Channel	Measured Power dBm
GSM800	ERP	824.2	128	31.2
	ERP	936.4	189	31.7
	ERP	848.8	251	32.4
GSM1900	EIRP	1850.2	512	27.6
	EIRP	1880.0	661	27.6
	EIRP	1909.80	810	28.0

5 EMISSION LIMITATIONS, OCCUPIED BANDWIDTH

CFR 47 §2.1049

5.1 Test Procedure

The 99% Bandwidth function of the EMI Receiver was used to measure the bandwidth.

5.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Base Station Simulator	Rhode & Schwarz	CMU-200	837198/089
Directional Coupler	Amplifier Research	DC7144	22729
Spectrum Analyzer	Rhode & Schwarz	FSP3	100712/003

5.3 Test Results

Table 5-1: Occupied bandwidth measurements for GSM modes

Mode	Channel	Resolution Bandwidth	Video Bandwidth	Sweep time	Measured Bandwidth KHz
GSM800	128	3 kHz	3 kHz	500 ms	252.0
GSM800	189	3 kHz	3 kHz	500 ms	242.0
GSM800	251	3 kHz	3 kHz	500 ms	254.0
GSM1900	512	3 kHz	3 kHz	500 ms	250.0
GSM1900	661	3 kHz	3 kHz	500 ms	242.0
GSM1900	810	3 kHz	3 kHz	500 ms	260.0

Figure 5-1: Occupied Bandwidth – GSM800 Channel 128

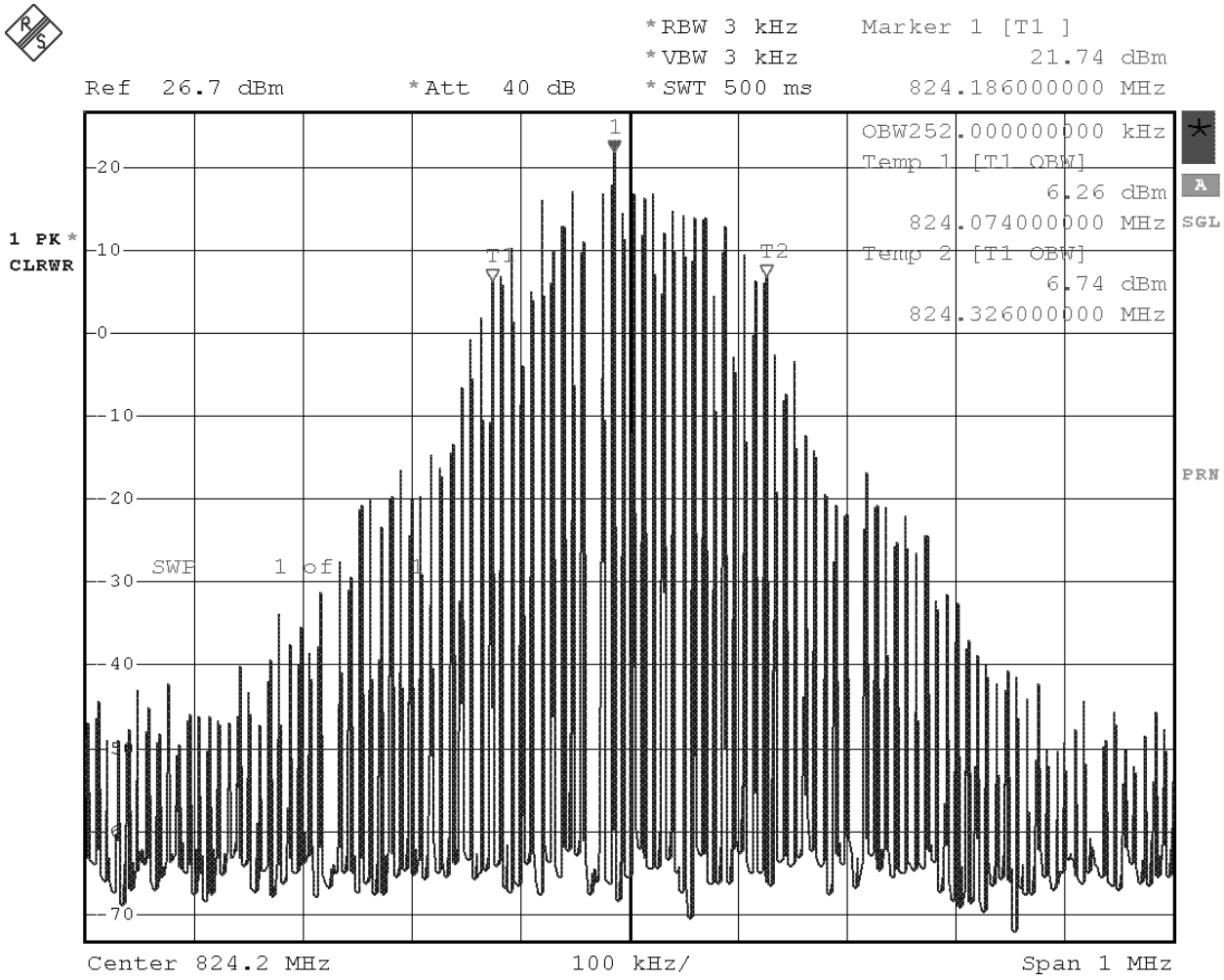


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Figure 5-2: Occupied Bandwidth – GSM800 Channel 189

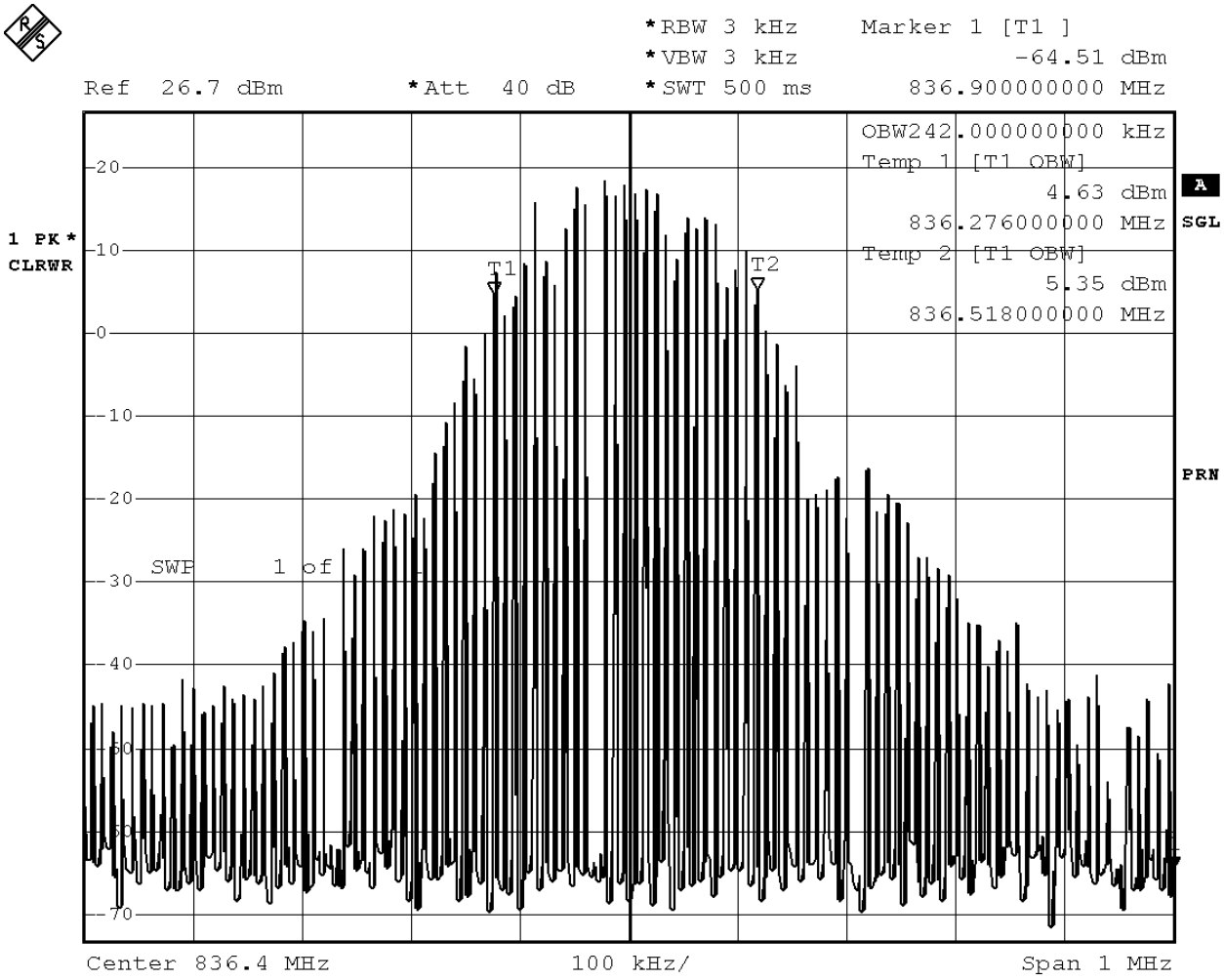

Figure 5-3: Occupied Bandwidth – GSM800 Channel 251

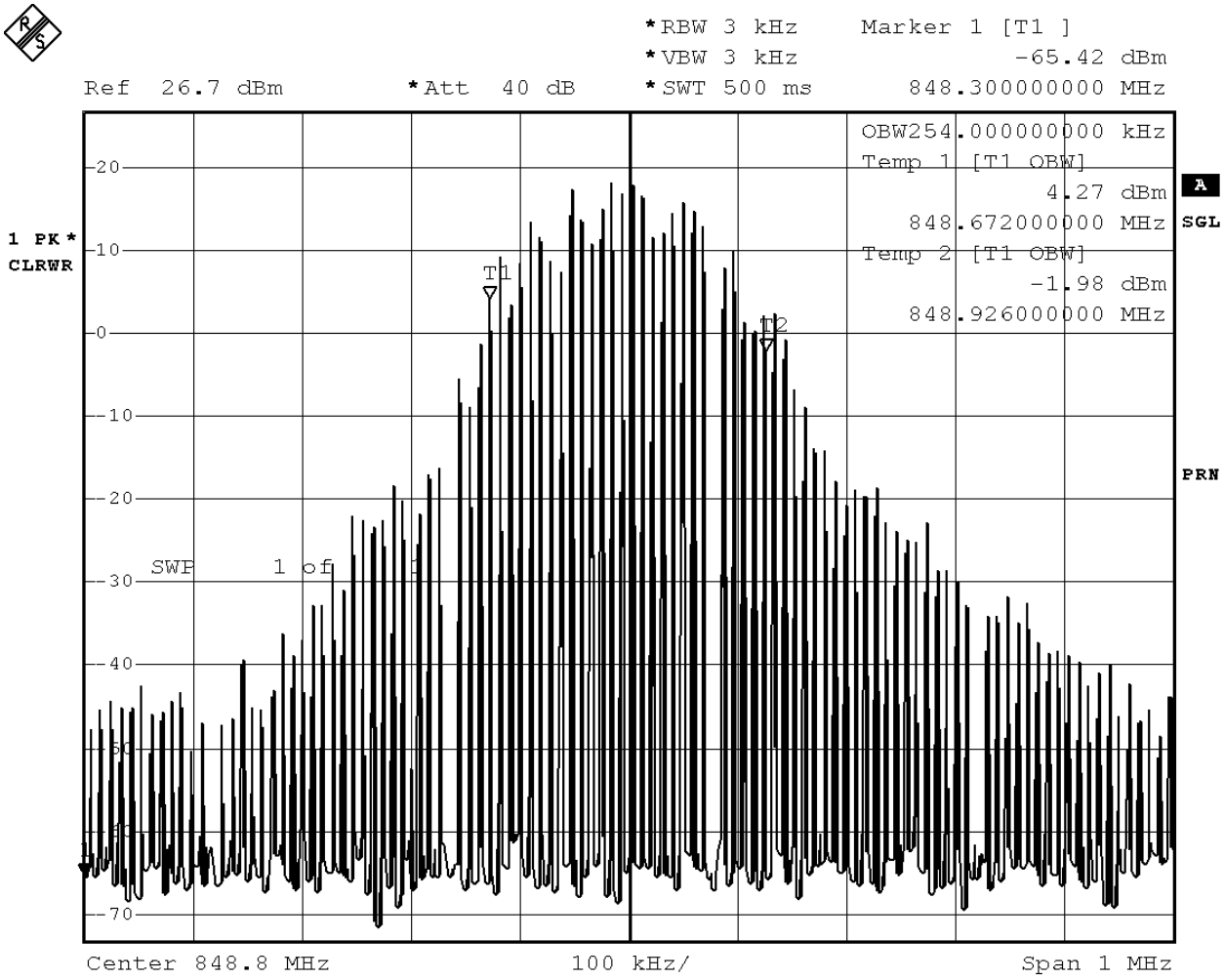

Figure 5-4: Occupied Bandwidth – GSM1900 Channel 512

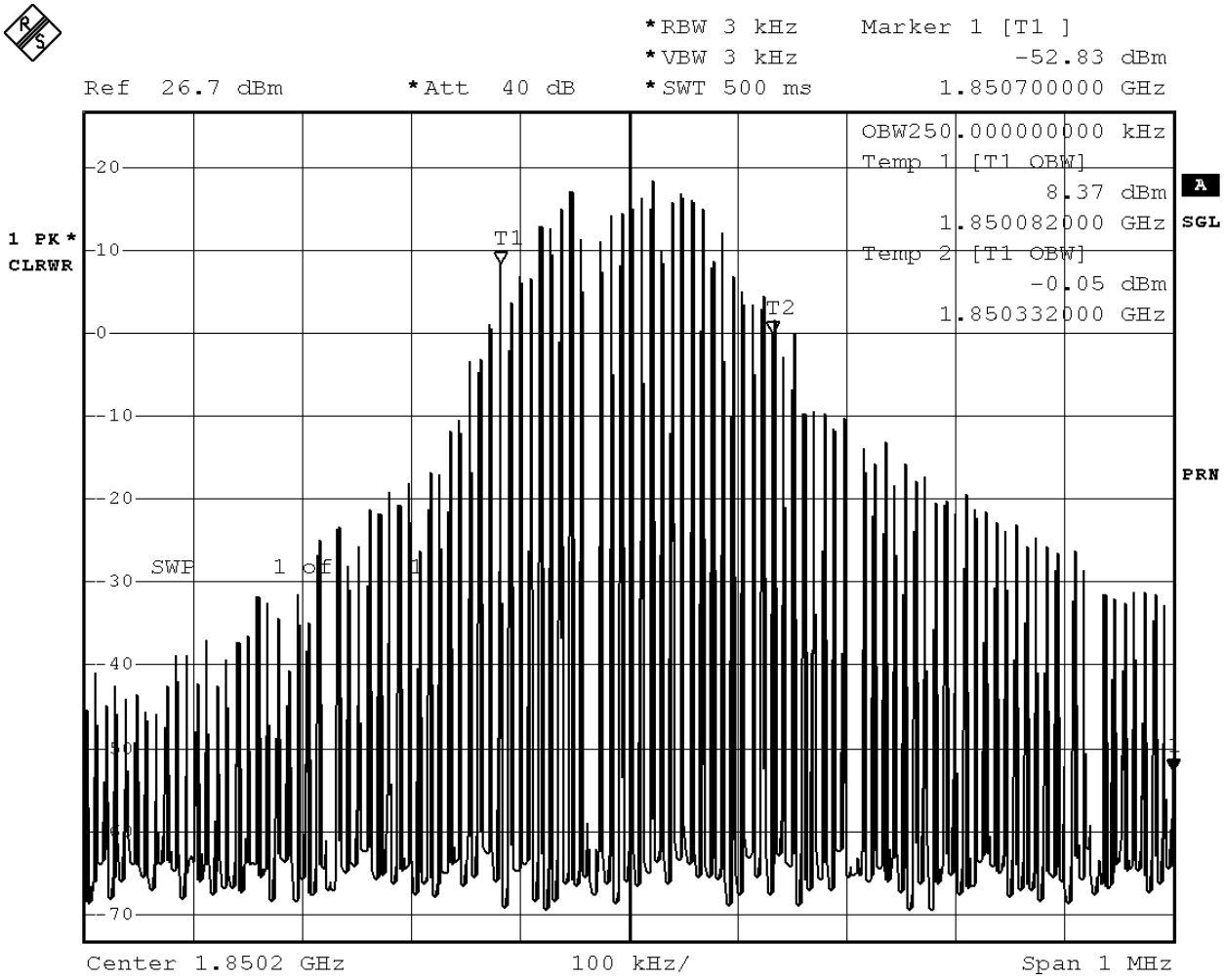

Figure 5-5: Occupied Bandwidth – GSM1900 Channel 661

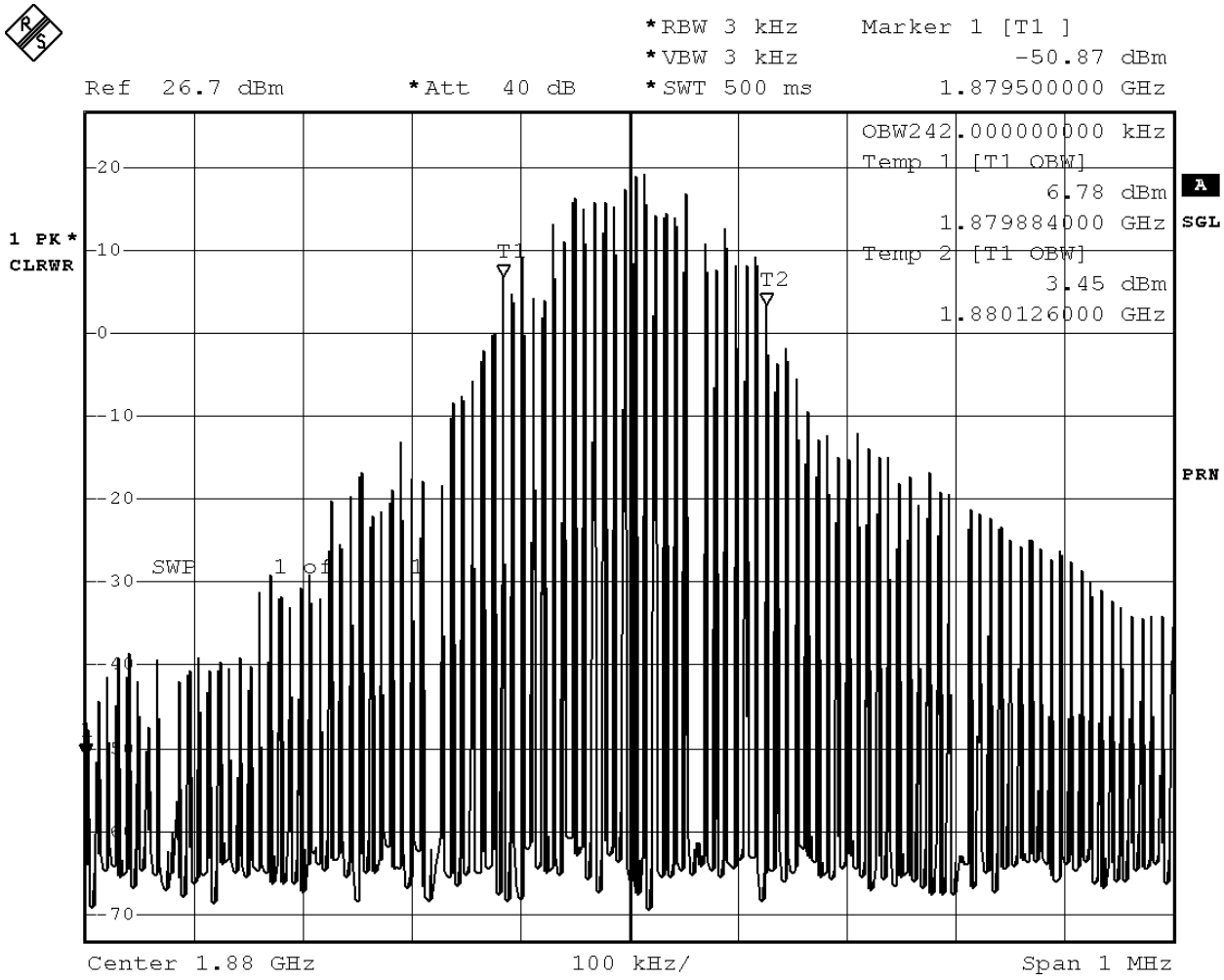

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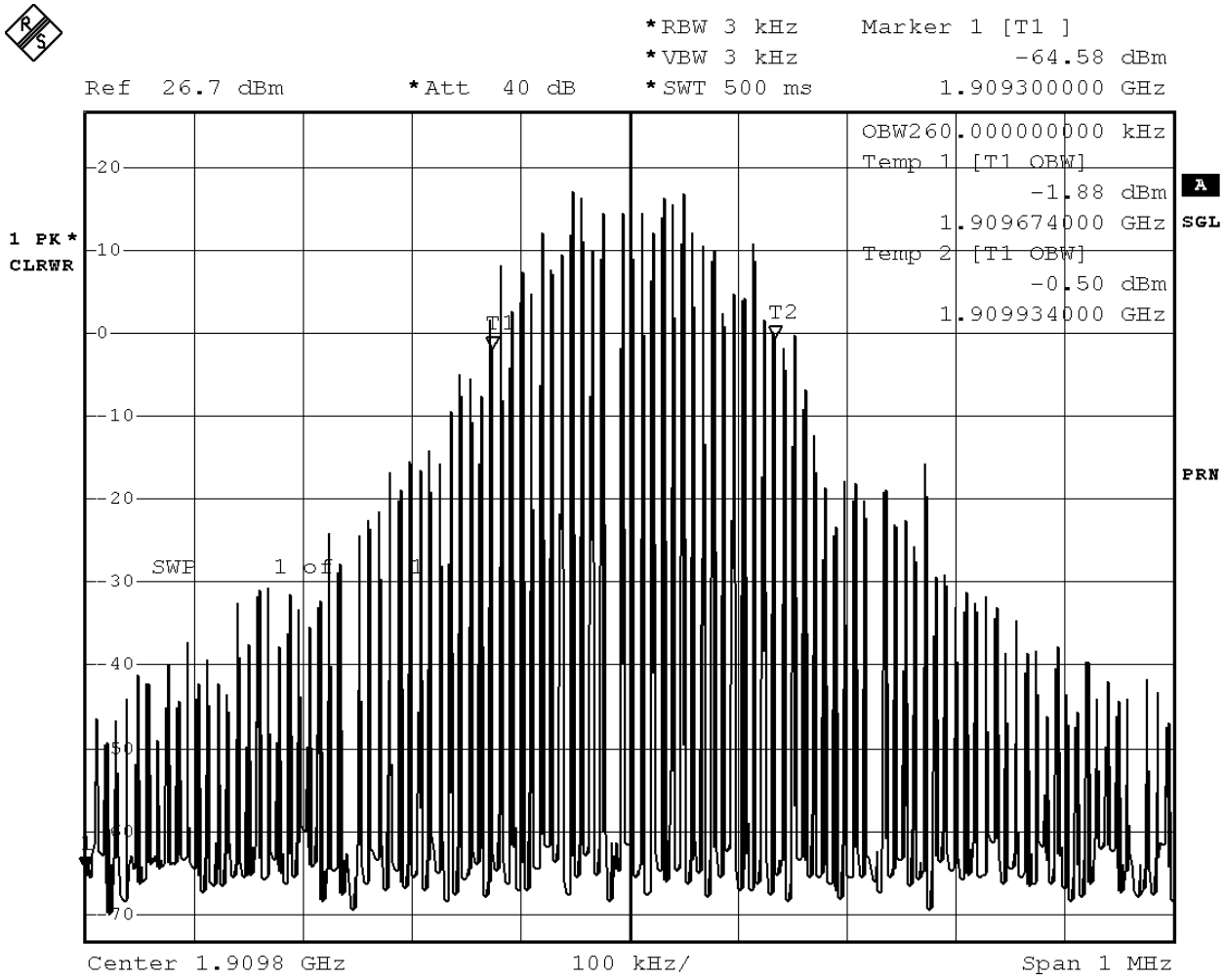
Figure 5-6: Occupied Bandwidth – GSM1900 Channel 810



6 OUT OF BAND EMISSION AT ANTENNA TERMINALS

FCC §2.1047, FCC §22.905, FCC §22.917, FCC §24.238(a)

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

6.1 Test Procedure

Measurement instrumentation was set to 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 at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The transceiver was set to its maximum power level. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

6.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	HP	8566B	3026A20179
Spectrum Analyzer	Rhode & Schwarz	FSP3	100712/003
Base Station Simulator	Rhode & Schwarz	CMU-200	837198/089
Directional Coupler	Amplifier Research	DC7144	22729

6.3 Test Results

Table 6-1: Summary of test result locations

Location	Mode (Band)	Channel	Description
Figure 6-1	GSM800	128	Conducted spurious emissions, 30MHz to 10 GHz
Figure 6-2	GSM800	189	Conducted spurious emissions, 30MHz to 10 GHz
Figure 6-3	GSM800	251	Conducted spurious emissions, 30MHz to 10 GHz
Figure 6-4	GSM1900	512	Conducted spurious emissions, 30MHz to 20 GHz
Figure 6-5	GSM1900	661	Conducted spurious emissions, 30MHz to 20 GHz
Figure 6-6	GSM1900	810	Conducted spurious emissions, 30MHz to 20 GHz
Figure 6-7	GSM800	128	Emissions within 1 MHz of band edge
Figure 6-8	GSM800	251	Emissions within 1 MHz of band edge
Figure 6-9	GSM1900	512	Emissions within 1 MHz of band edge
Figure 6-10	GSM1900	810	Emissions within 1 MHz of band edge

Table 6-2: Summary of test results for Conducted Spurious Emissions

Mode (Band)	Channel	Bandwidths RBW / VBW	Frequency (GHz)	Measured Emissions (dBm)
GSM800	128	1 MHz / 1 MHz	2.472	-20.95
GSM800	189	1 MHz / 1 MHz	2.509	-20.34

Figure 6-1: Out of band emissions at antenna terminals – GSM800 Channel 128

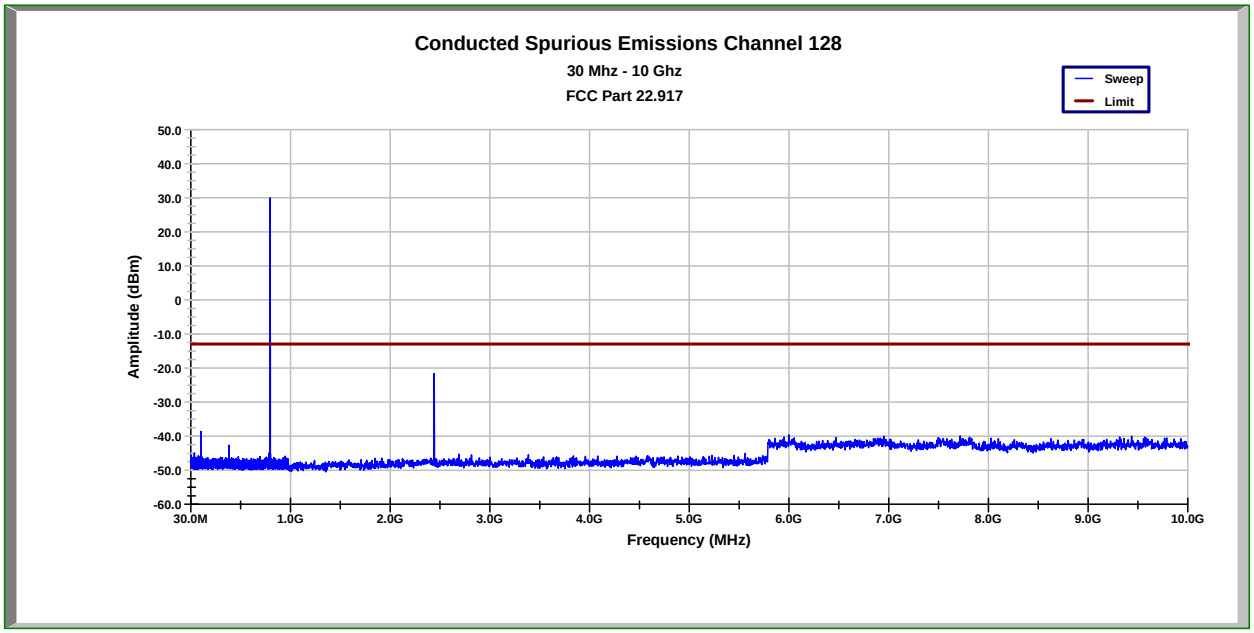


Figure 6-2: Out of band emissions at antenna terminals – GSM800 Channel 189

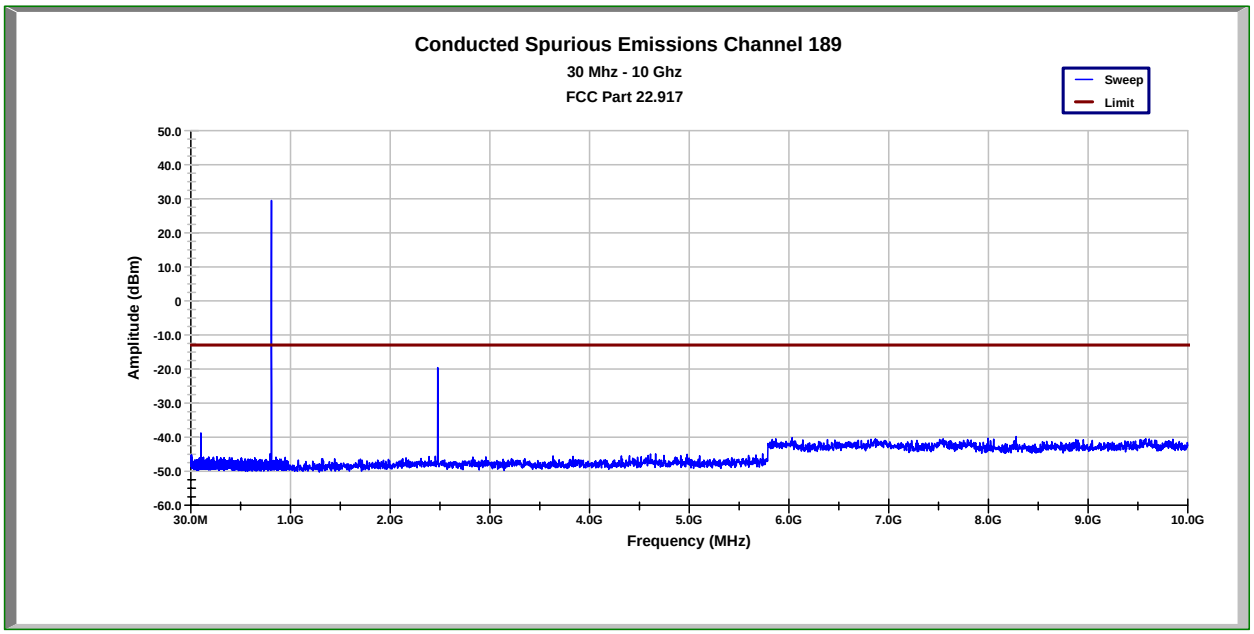


Figure 6-3: Out of band emissions at antenna terminals – GSM800 Channel 251

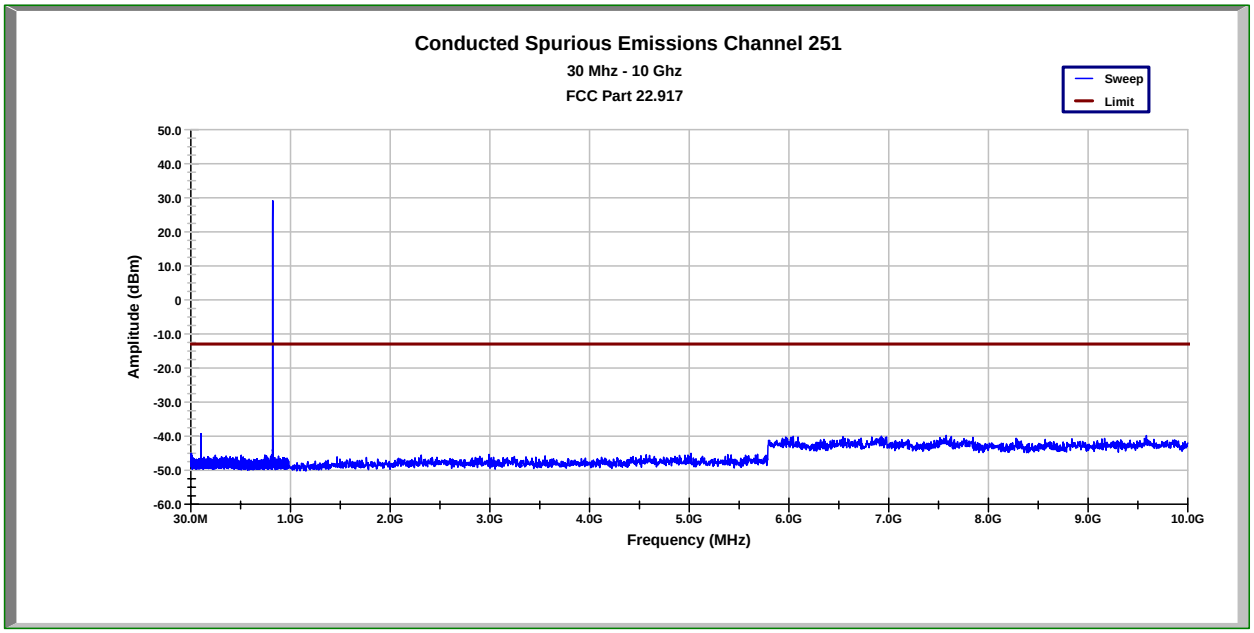


Figure 6-4: Out of band emissions at antenna terminals – GSM1900 Channel 512

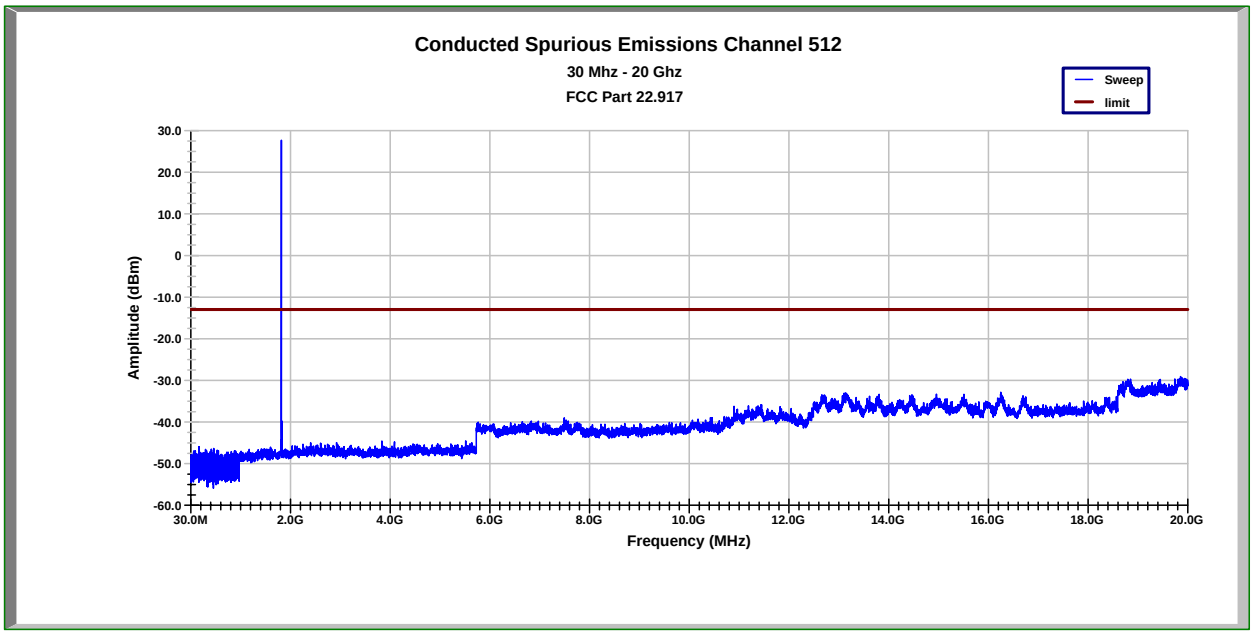


Figure 6-5: Out of band emissions at antenna terminals – GSM800 Channel 661

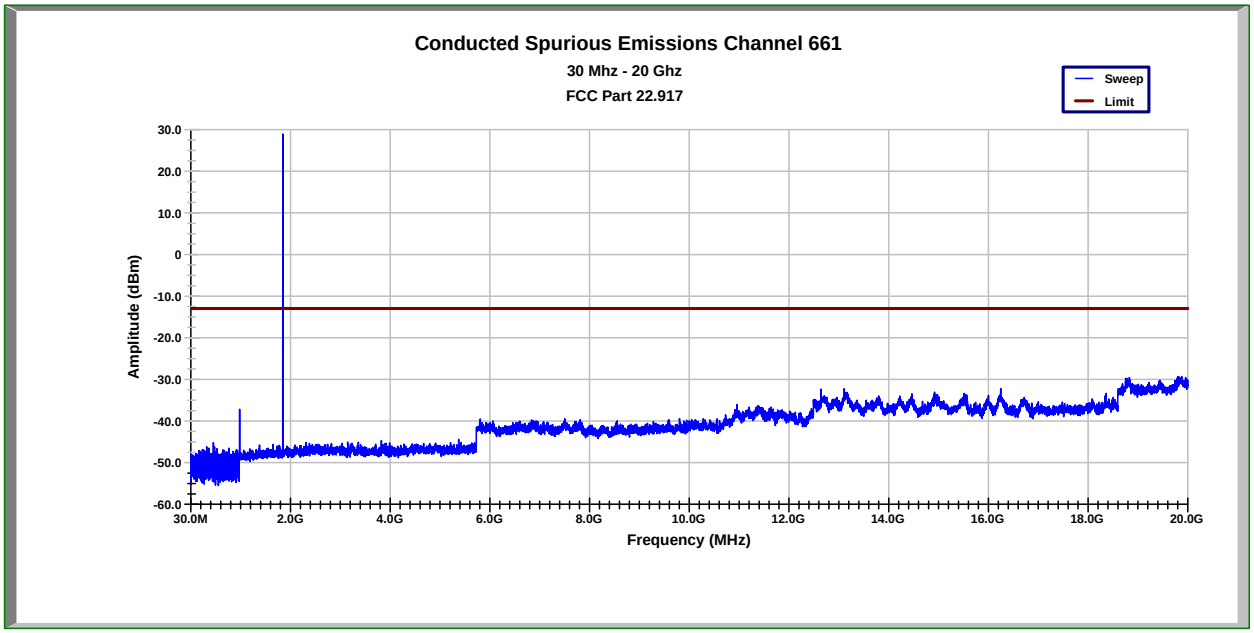


Figure 6-6: Out of band emissions at antenna terminals – GSM1900 Channel 810

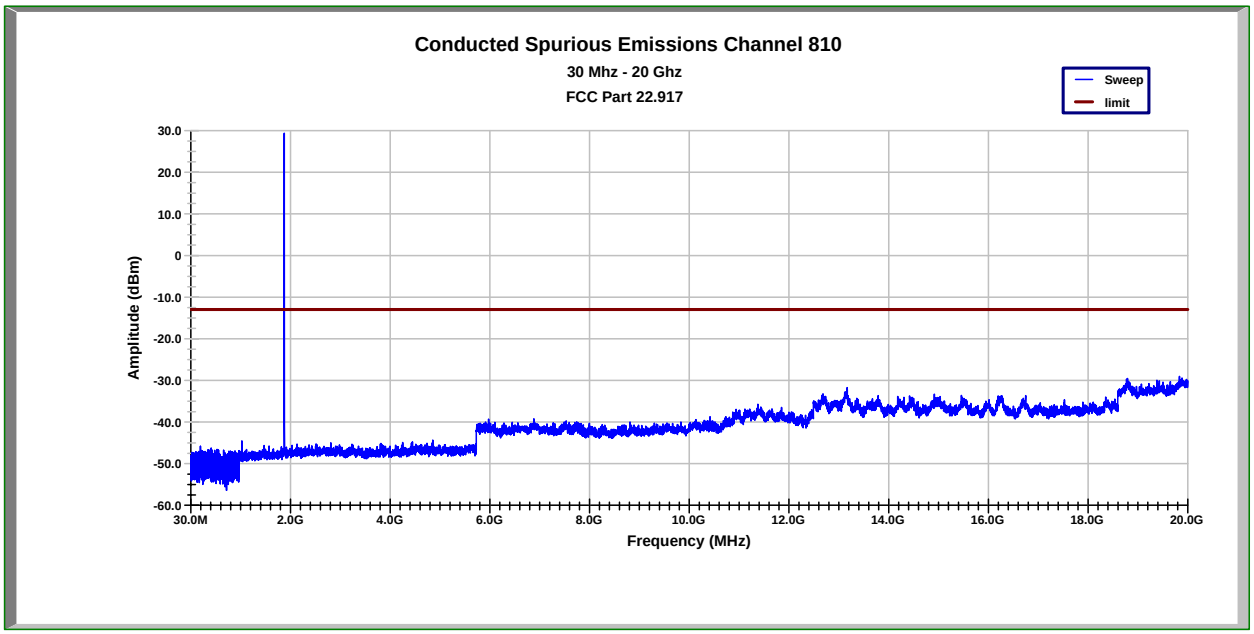


Figure 6-7: Emissions within 1 MHz of band edge, GSM 800 Channel 128

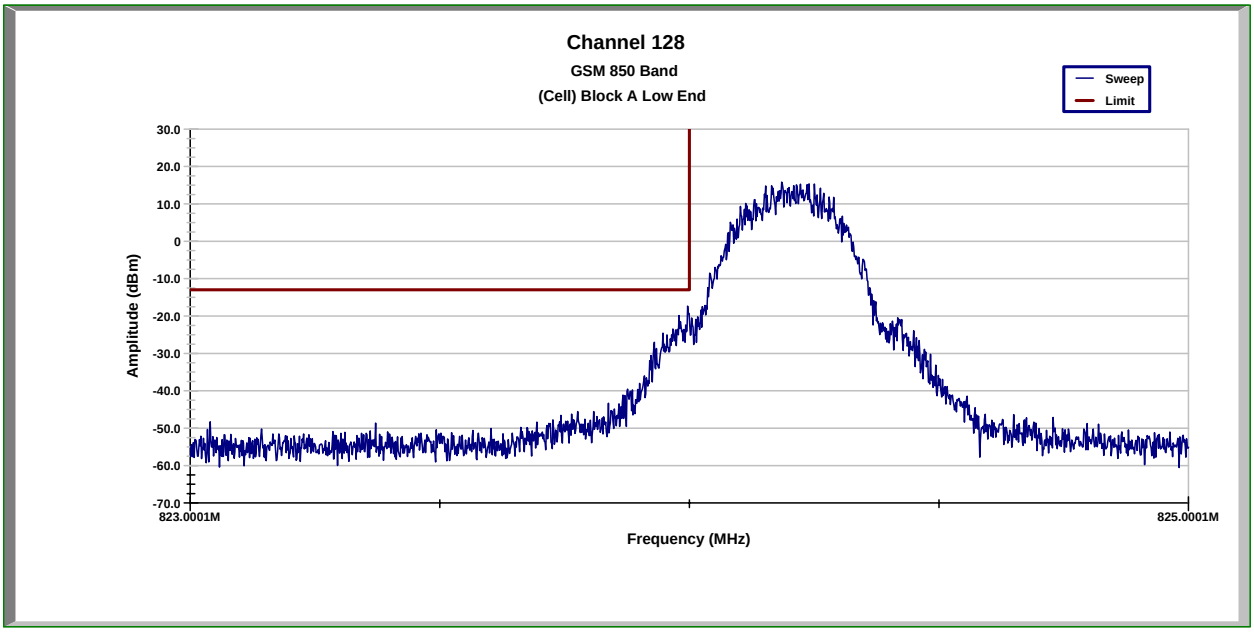


Figure 6-8: Emissions within 1 MHz of band edge, GSM 800 Channel 251

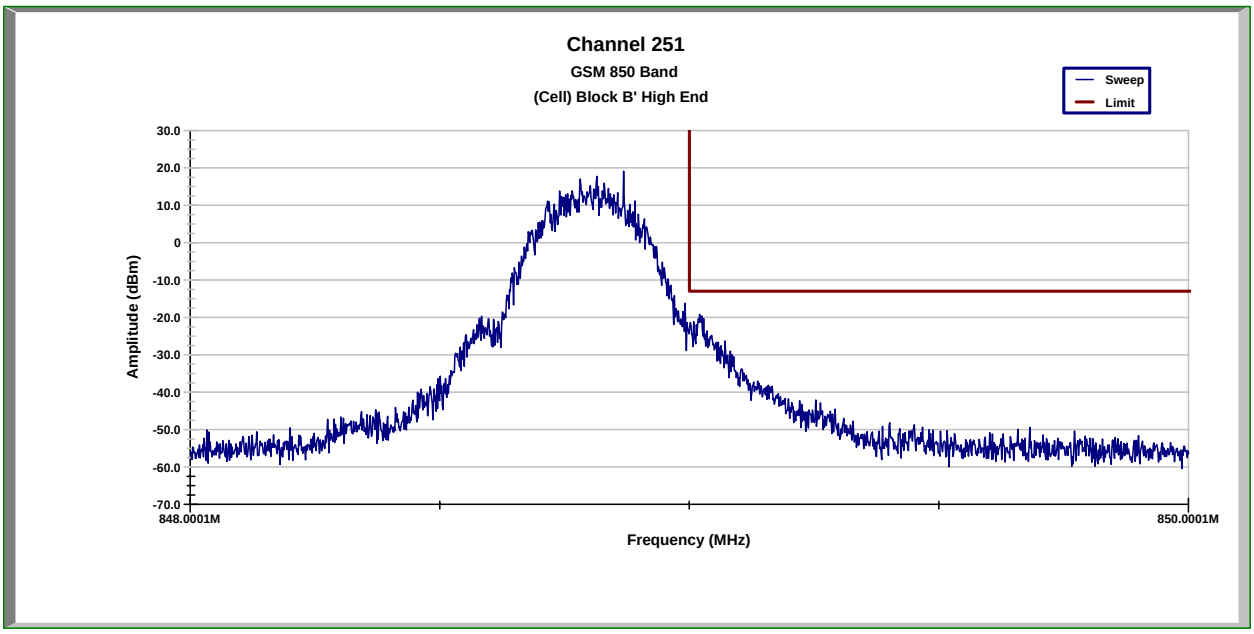


Figure 6-9: Emissions within 1 MHz of band edge, GSM 1900 Channel 512

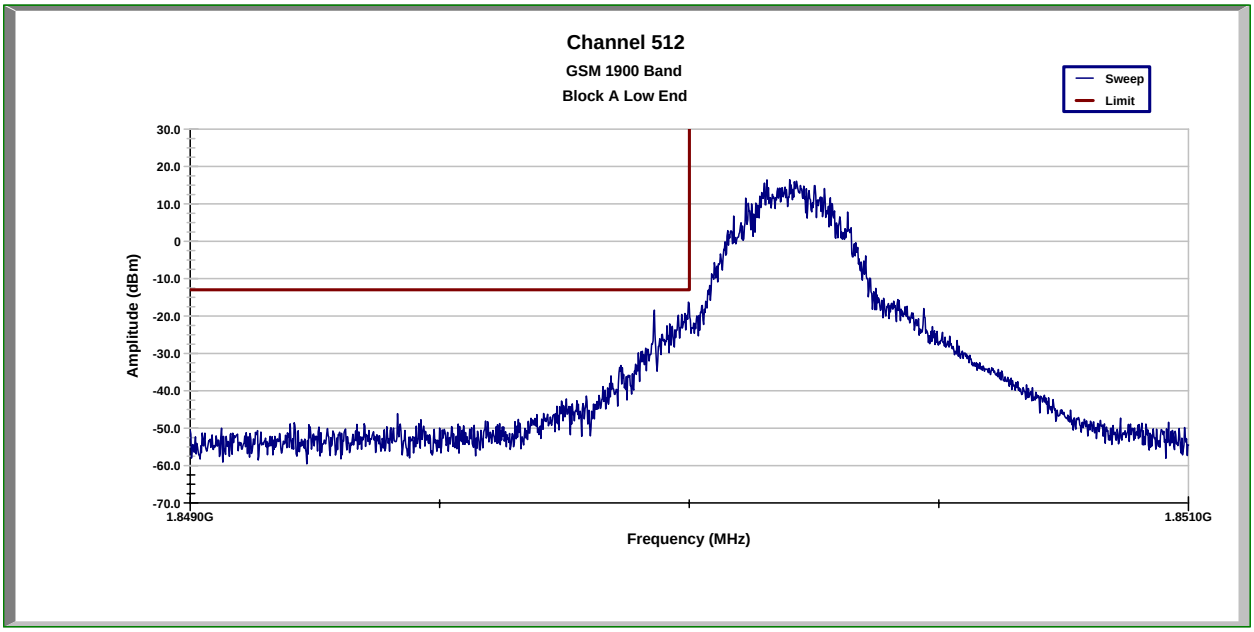
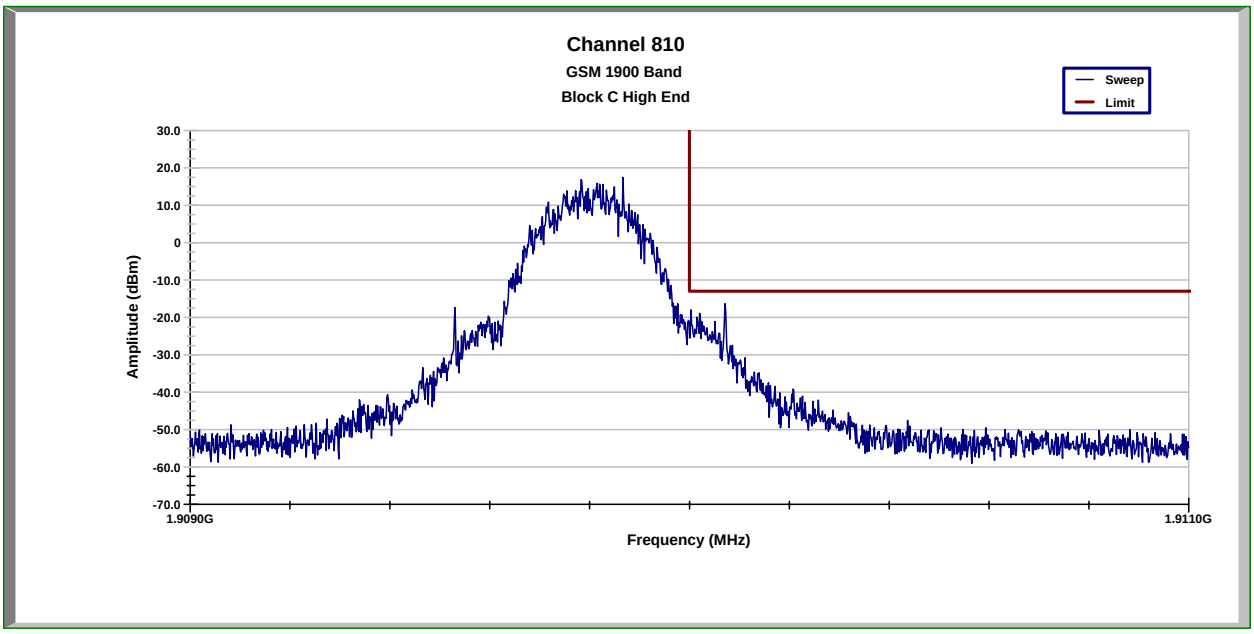


Figure 6-10: Emissions within 1 MHz of band edge, GSM 1900 Channel 810



7 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §2.1053

7.1 Test Procedure

The EUT was placed on a non-conductive turntable with the earpiece attached. The earpiece was extended vertically above the EUT using a non-conductive support. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle, and high channels). Once spurious emissions were identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and at the spurious emissions frequency.

7.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Base Station Simulator	Rhode & Schwarz	CMU-200	837198/089
Signal Generator	Hewlett Packard	ESG3000A	US37040988
Horn Antenna	ETS	3115	6556
Receive Antenna	ETS	3142B	1674
EMI Receiver	Rhode & Schwarz	ESI26	100016

7.3 Test Results

Table 7-1: Tabular Test Results for Field Strength of Spurious Radiation, GSM 800

Phone Orientation	Antenna Polarity	Freq (GHz)	Channel	EUT (dBm)	Sub Ant (dBm)	Sig Gen (dBm)	Path Loss (dB)	Ant Gain (dBi)	Radiated Power (dBm)
Tabletop	V	1.673	189	-72.3	-41.9	-14.8	27.1	7.2	-38.0
Tabletop	V	2.509	189	-65.0	-48.0	-15.3	32.7	8.8	-23.5
Tabletop	V	1.699	251	-77.0	-42.4	-14.9	27.5	7.2	-42.3
Tabletop	V	2.546	251	-61.6	-48.9	-15.1	33.8	8.8	-19.0

Figure 7-1: Measured Field Strength of Spurious Radiation GSM 800, Channel 128

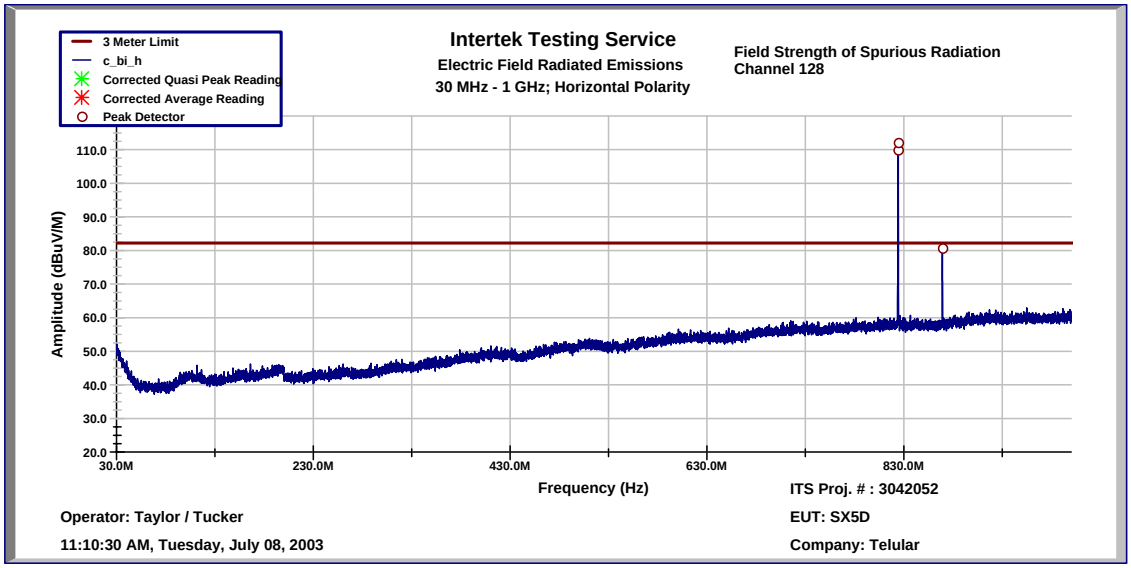


Figure 7-2: Measured Field Strength of Spurious Radiation GSM 800, Channel 128

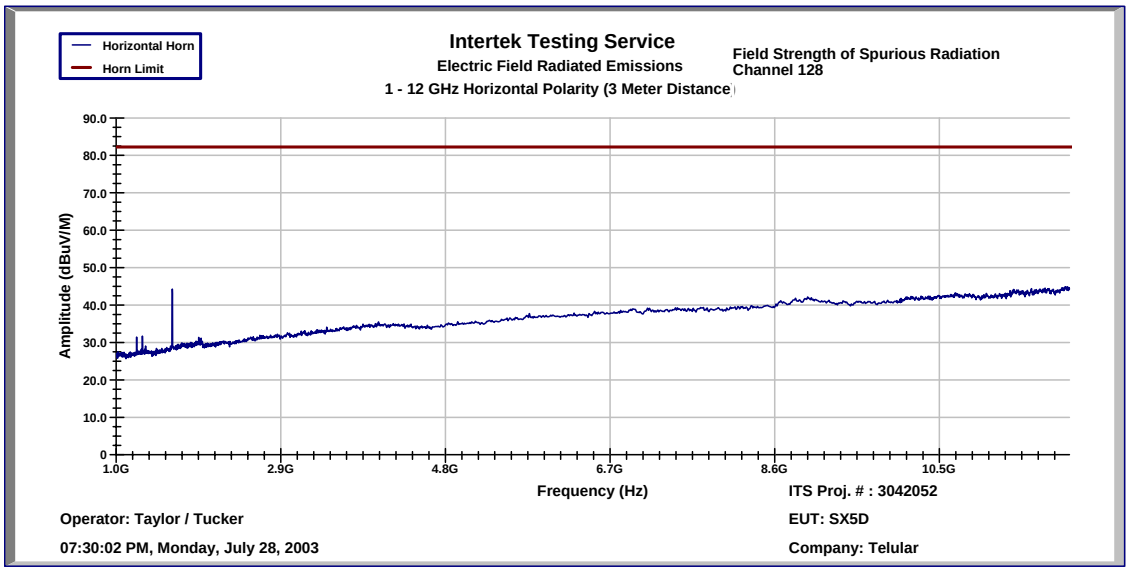


Figure 7-3: Measured Field Strength of Spurious Radiation GSM 800, Channel 128

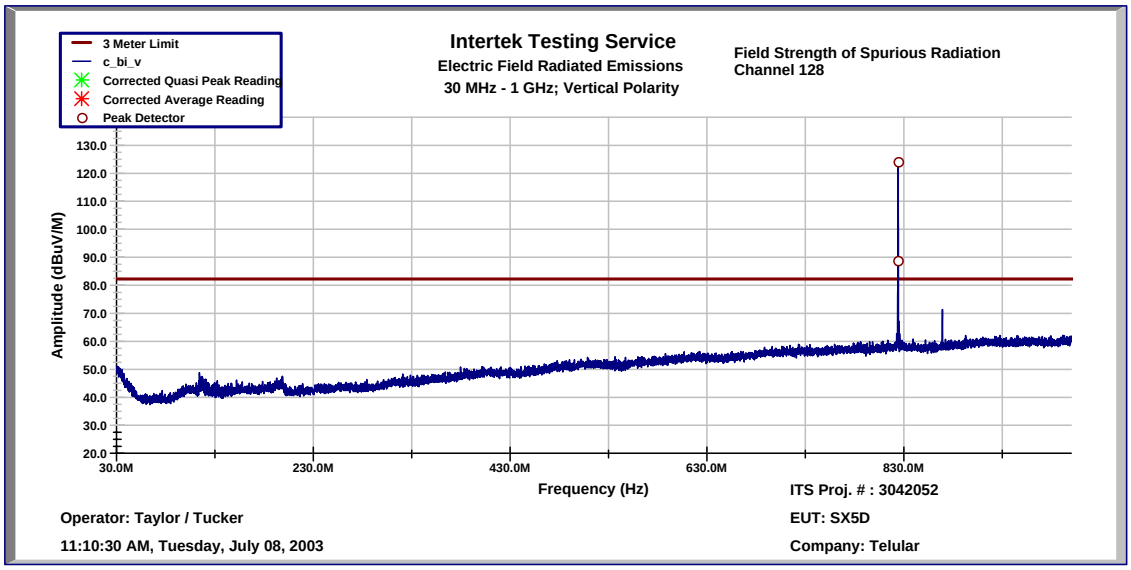


Figure 7-4: Measured Field Strength of Spurious Radiation GSM 800, Channel 128

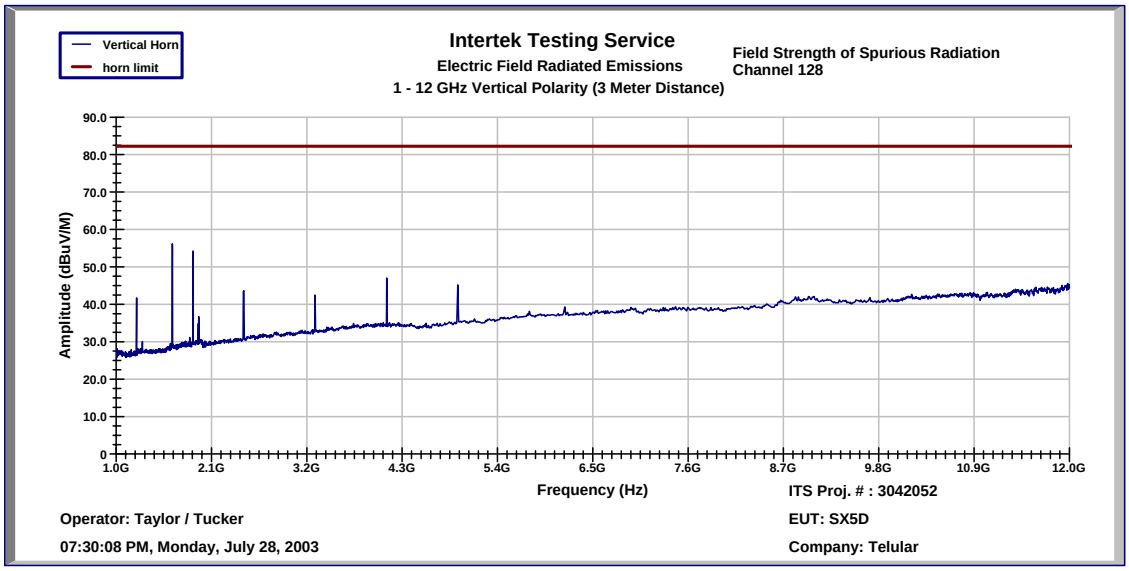


Figure 7-5: Measured Field Strength of Spurious Radiation GSM 800, Channel 189

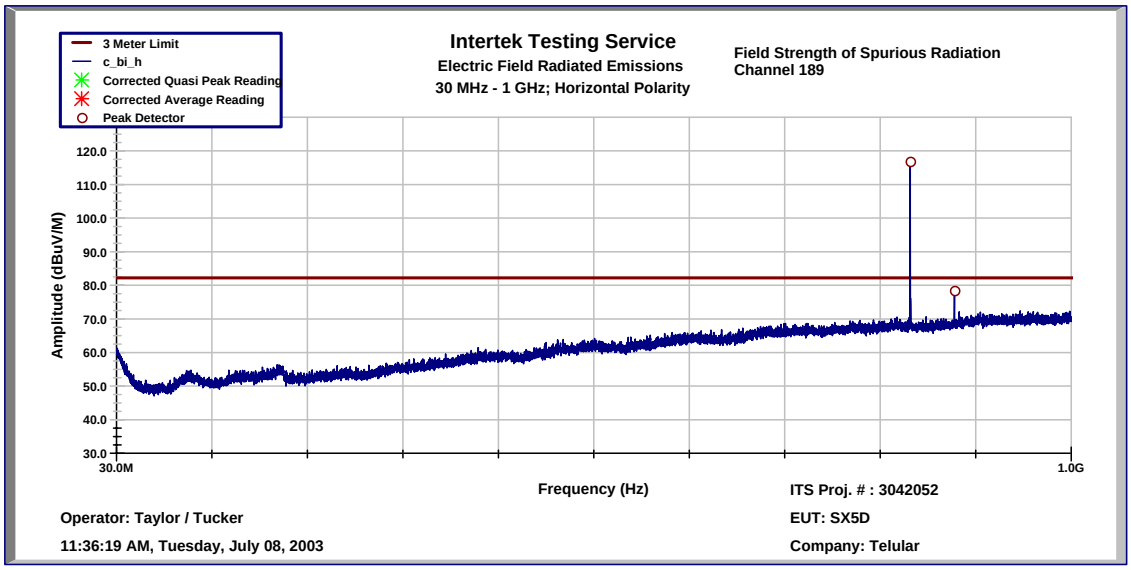


Figure 7-6: Measured Field Strength of Spurious Radiation GSM 800, Channel 189

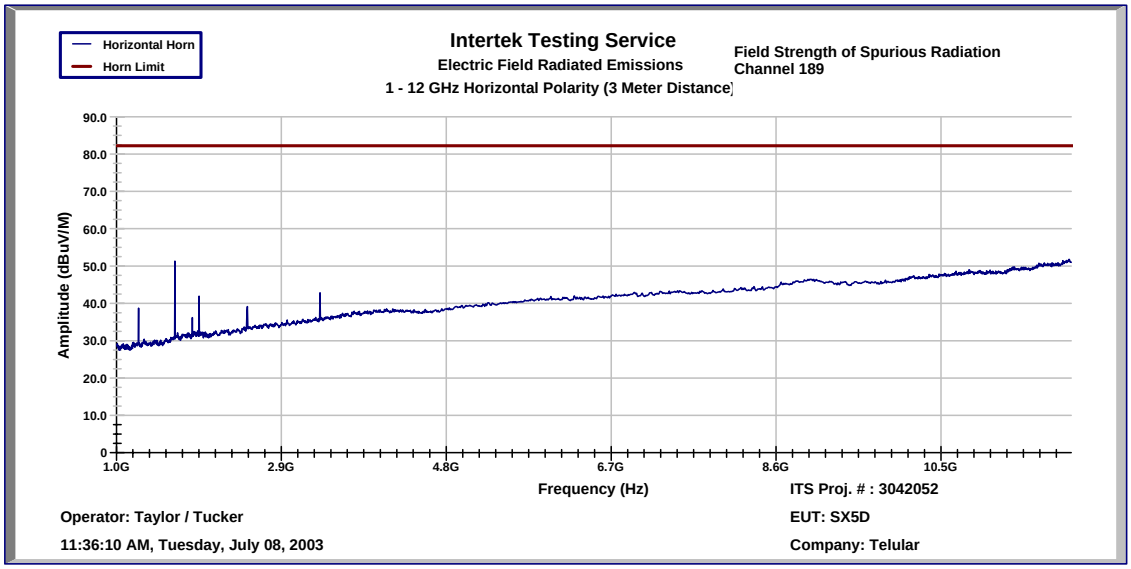


Figure 7-7: Measured Field Strength of Spurious Radiation GSM 800, Channel 189

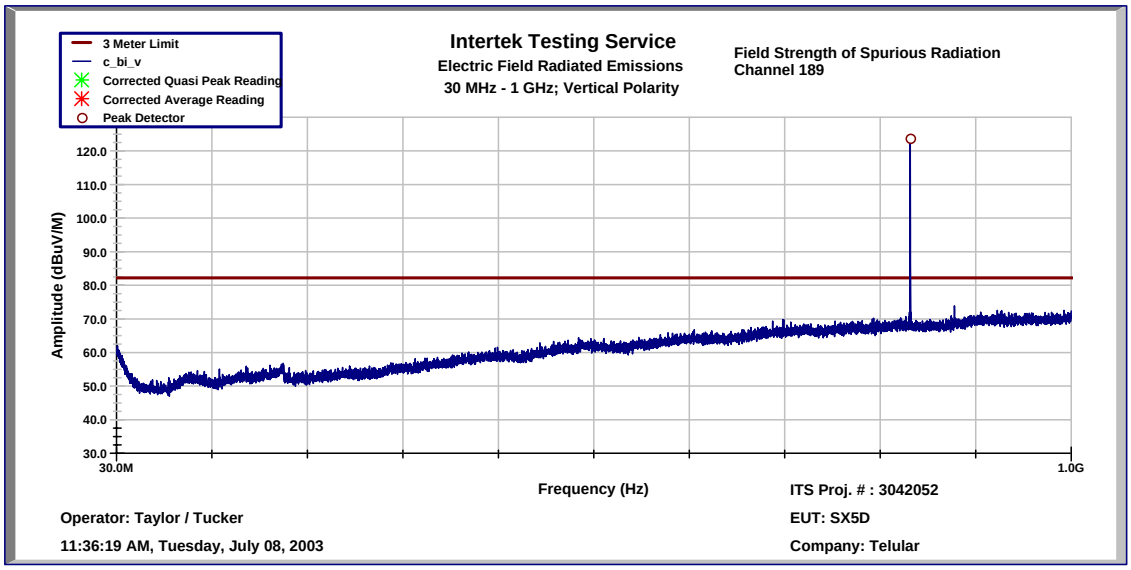


Figure 7-8: Measured Field Strength of Spurious Radiation GSM 800, Channel 189

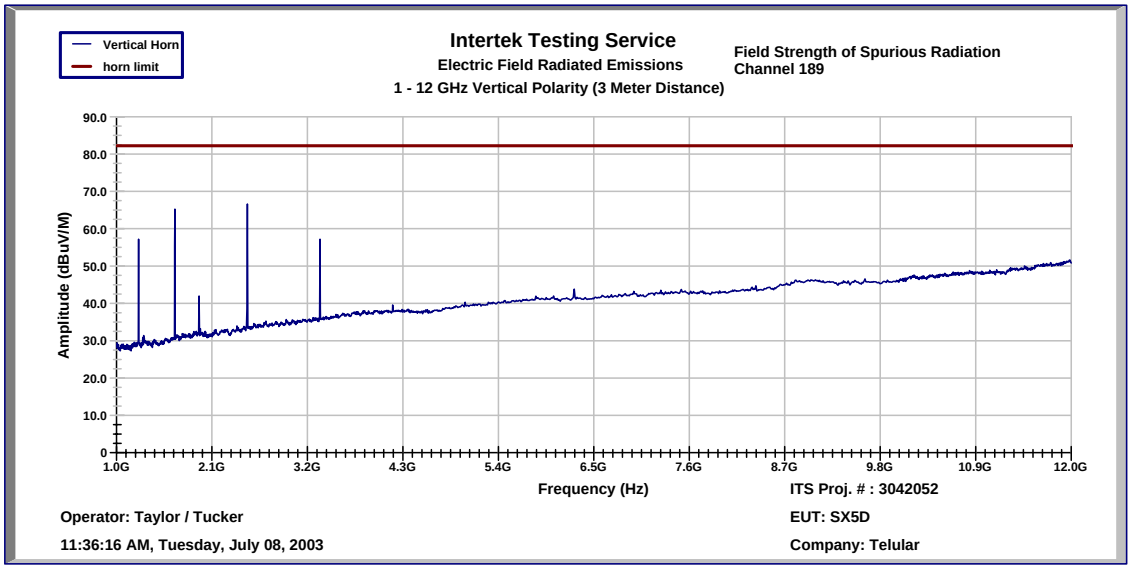


Figure 7-9: Measured Field Strength of Spurious Radiation GSM 800, Channel 251

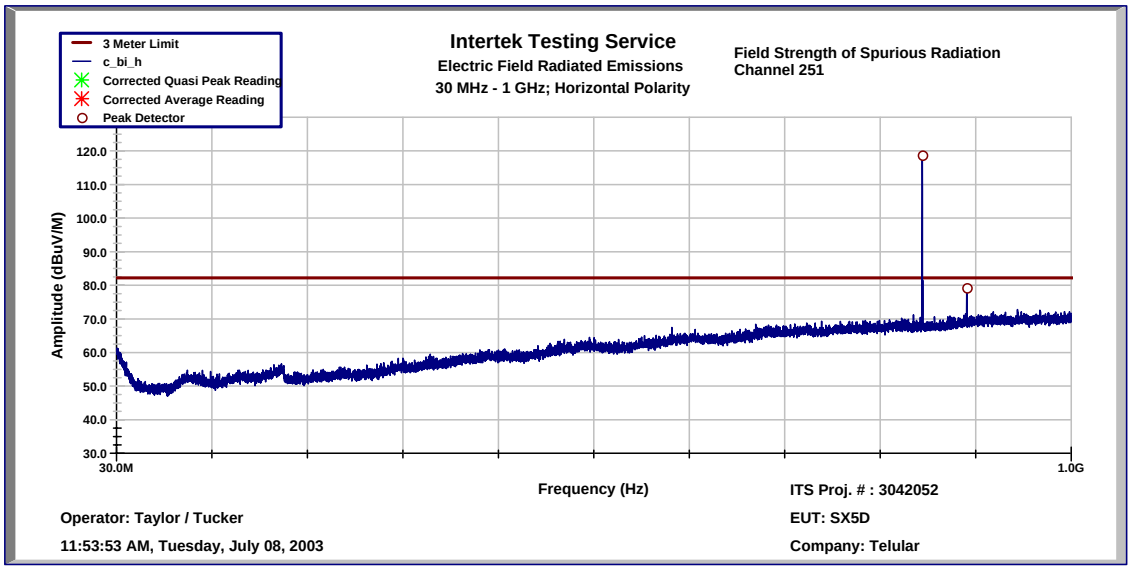


Figure 7-10: Measured Field Strength of Spurious Radiation GSM 800, Channel 251

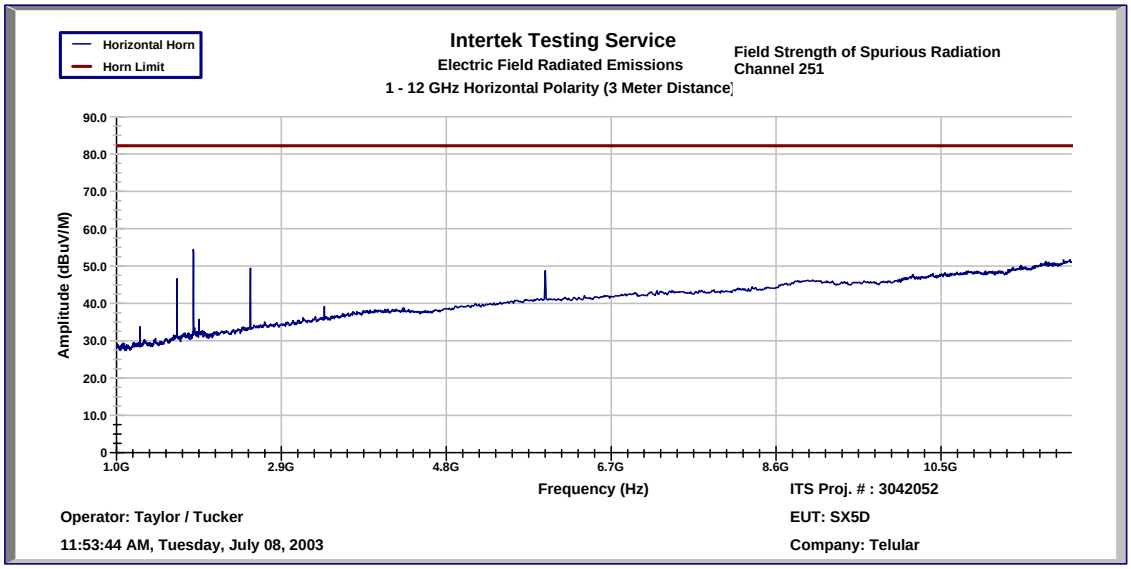


Figure 7-11: Measured Field Strength of Spurious Radiation GSM 800, Channel 251

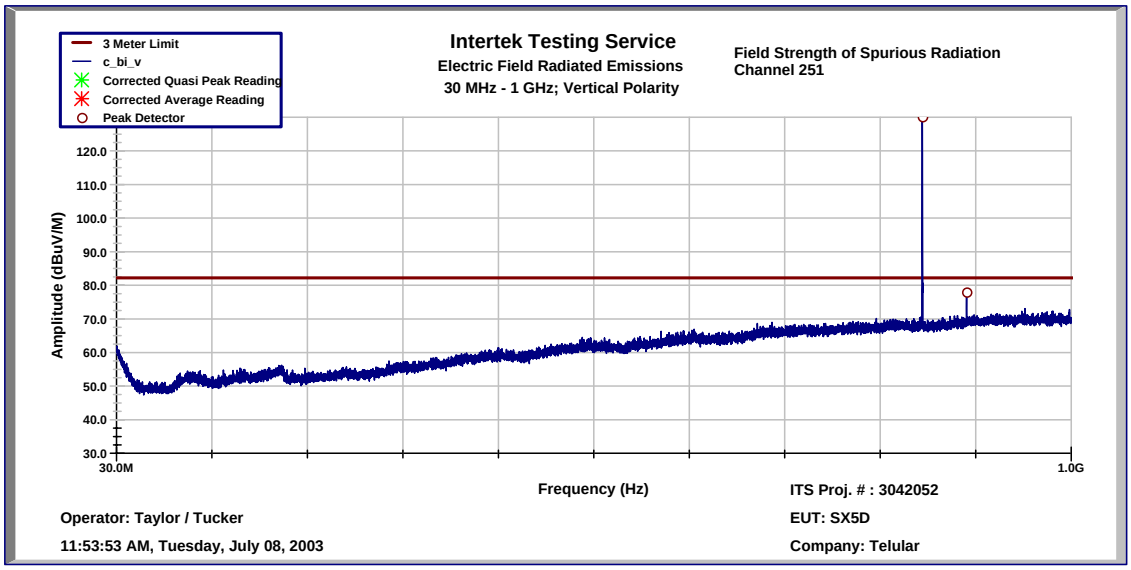


Figure 7-12: Measured Field Strength of Spurious Radiation GSM 800, Channel 251

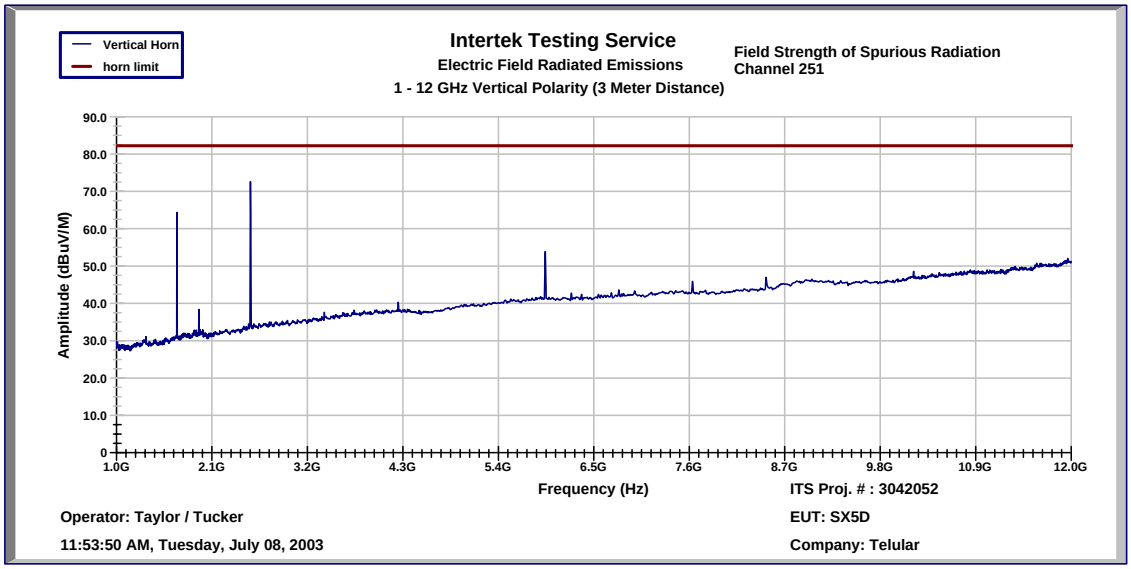


Figure 7-13: Measured Field Strength of Spurious Radiation GSM 1900, Channel 512

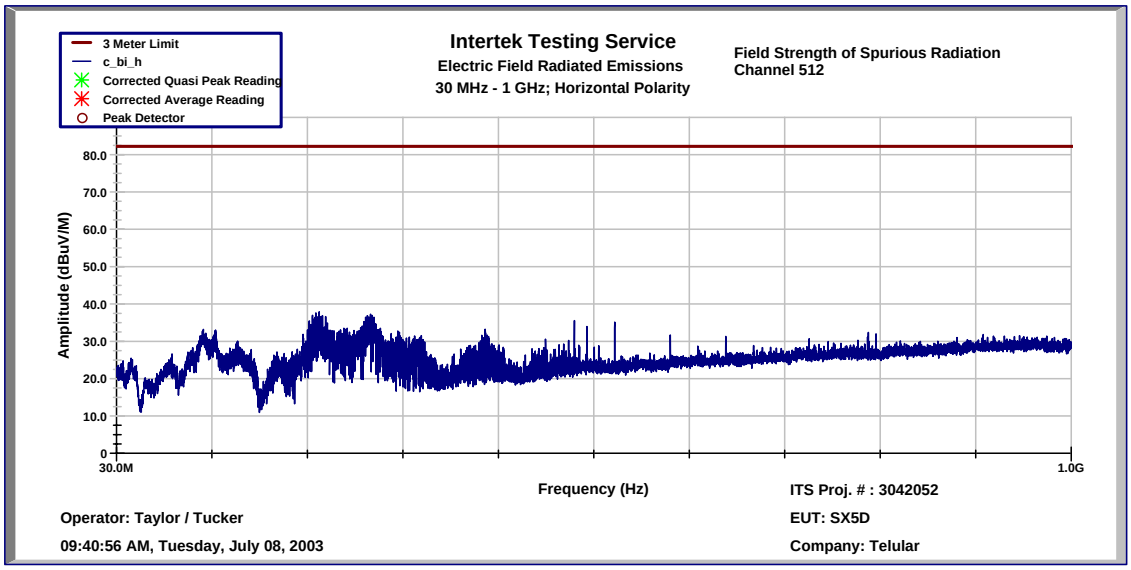


Figure 7-14: Measured Field Strength of Spurious Radiation GSM 1900, Channel 512

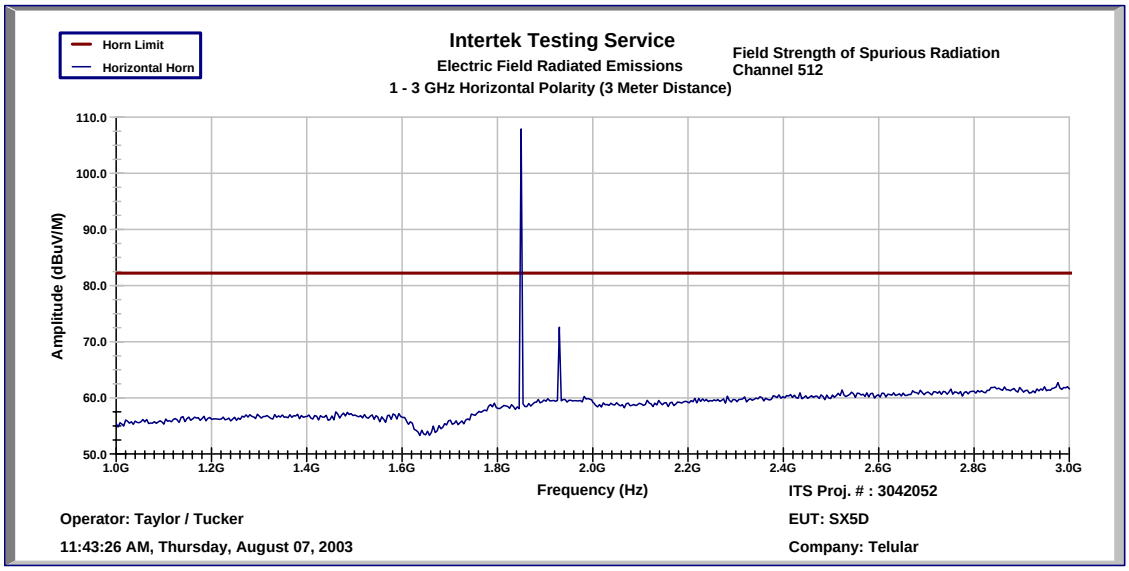


Figure 7-15: Measured Field Strength of Spurious Radiation GSM 1900, Channel 512

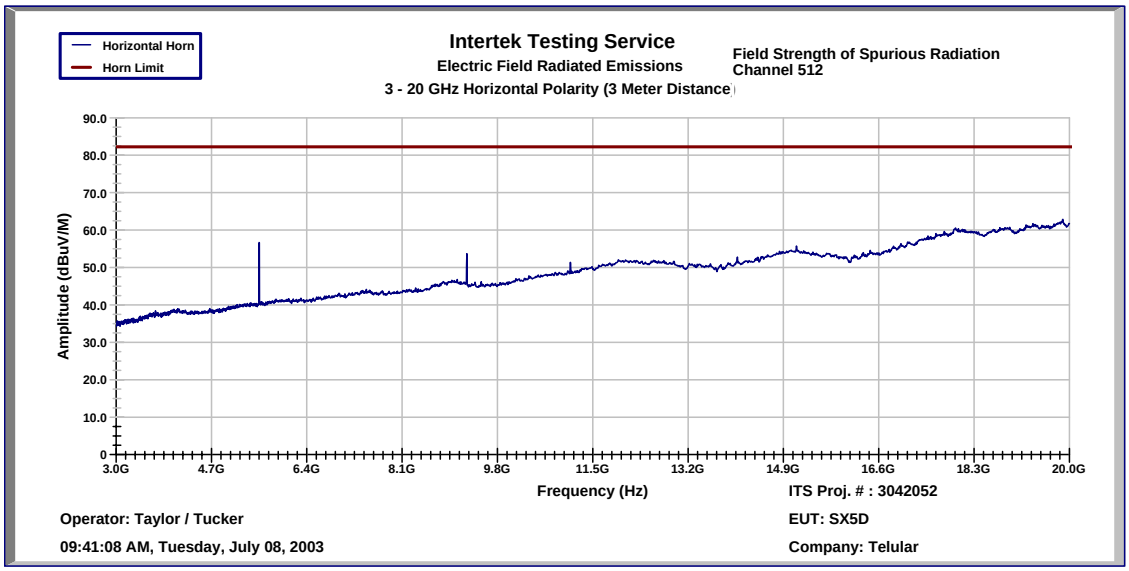


Figure 7-16: Measured Field Strength of Spurious Radiation GSM 1900, Channel 512

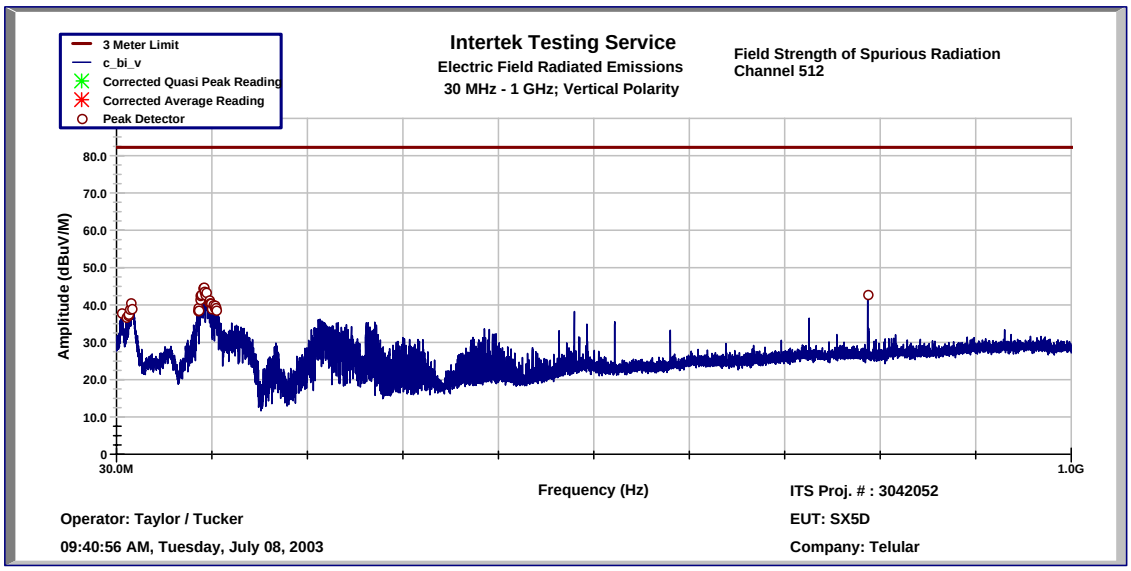


Figure 7-17: Measured Field Strength of Spurious Radiation GSM 1900, Channel 512

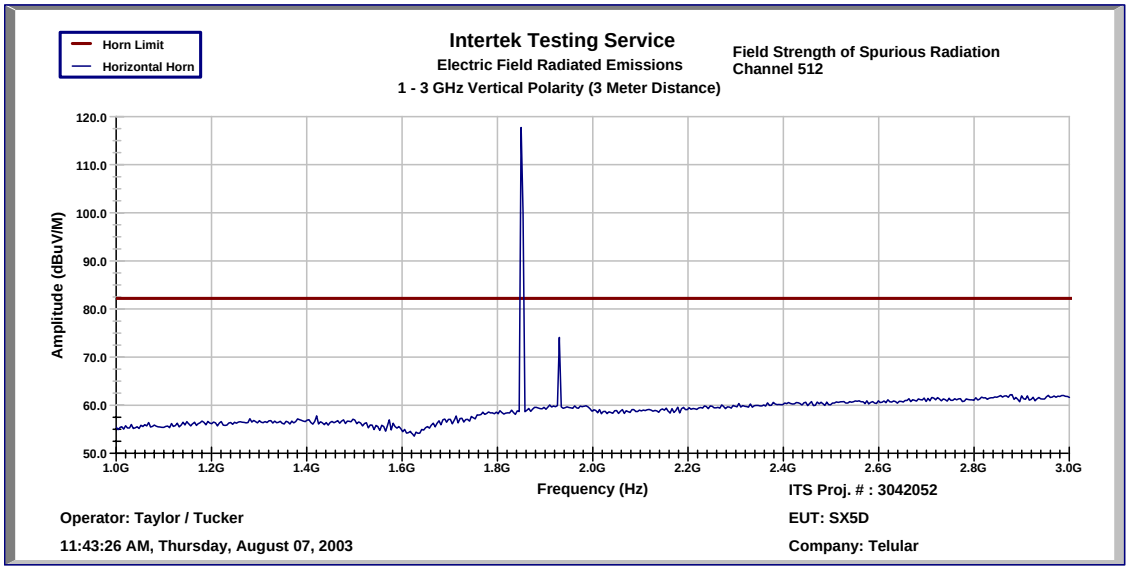


Figure 7-18: Measured Field Strength of Spurious Radiation GSM 1900, Channel 512

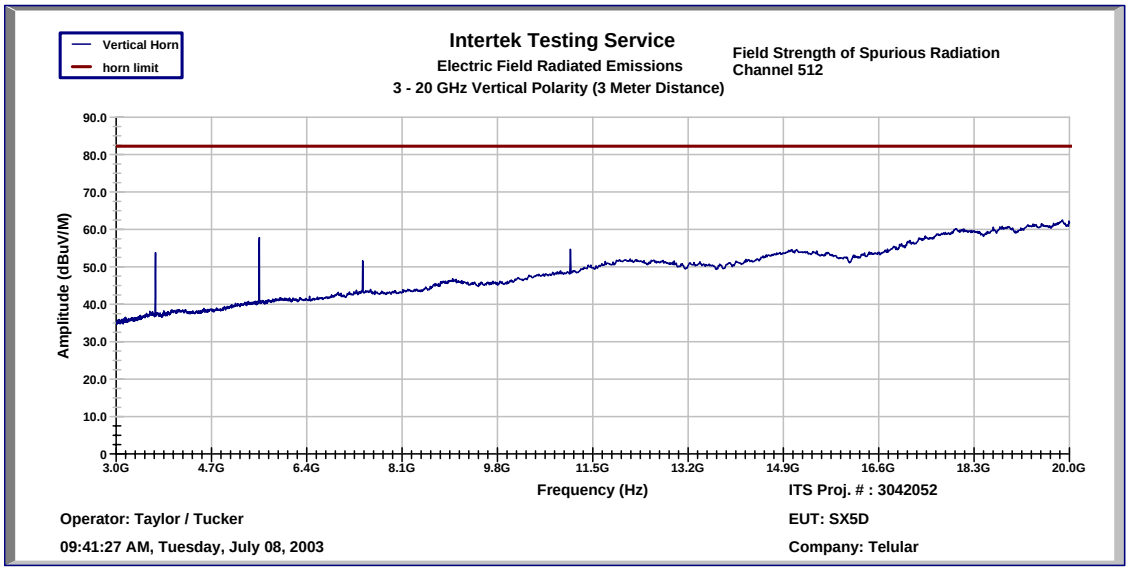


Figure 7-19: Measured Field Strength of Spurious Radiation GSM 1900, Channel 661

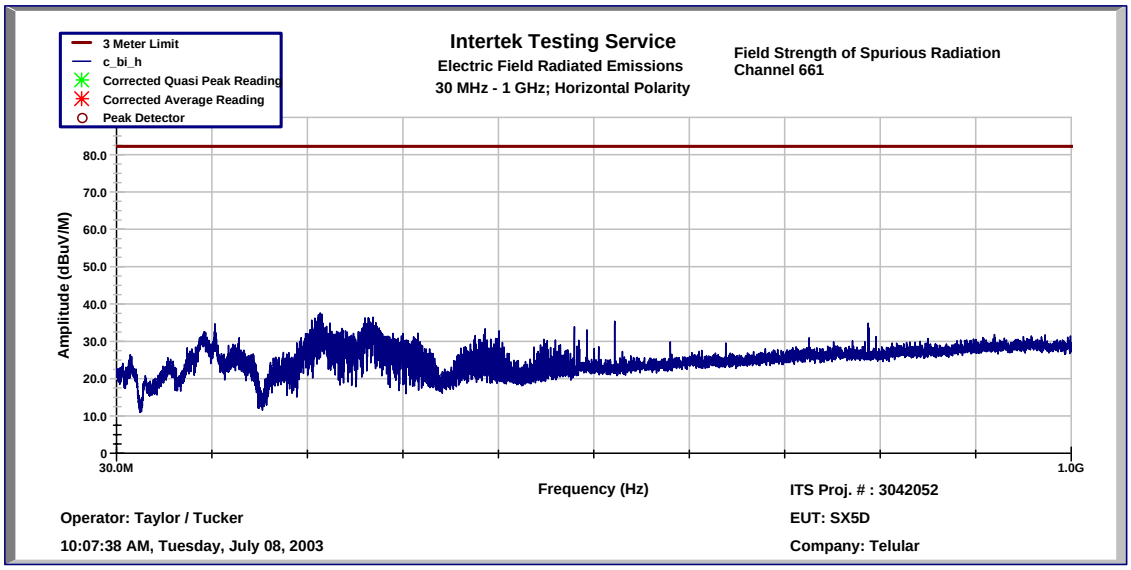


Figure 7-20: Measured Field Strength of Spurious Radiation GSM 1900, Channel 661

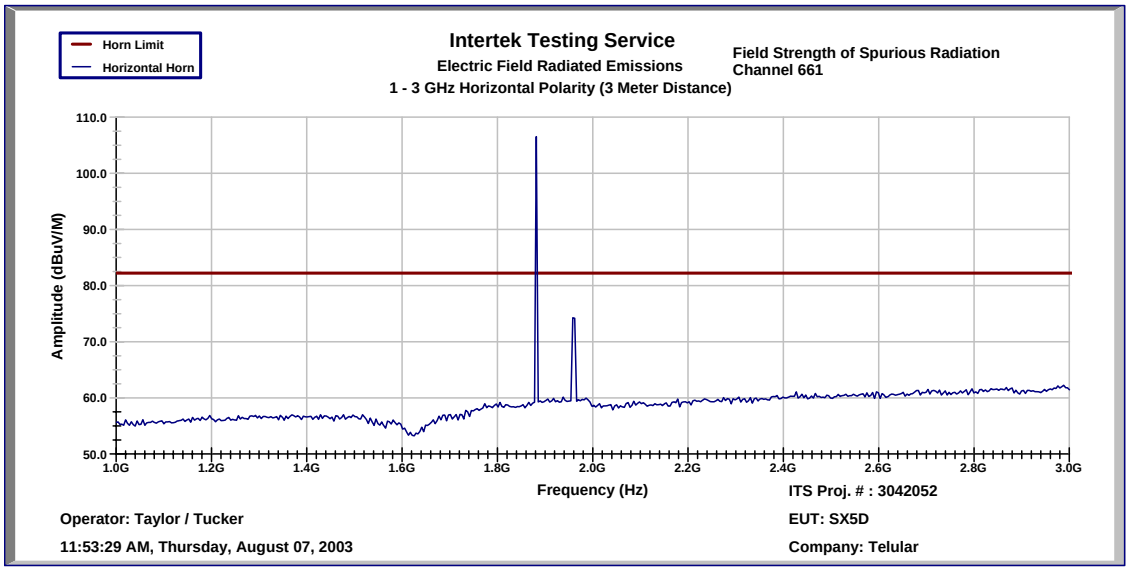


Figure 7-21: Measured Field Strength of Spurious Radiation GSM 1900, Channel 661

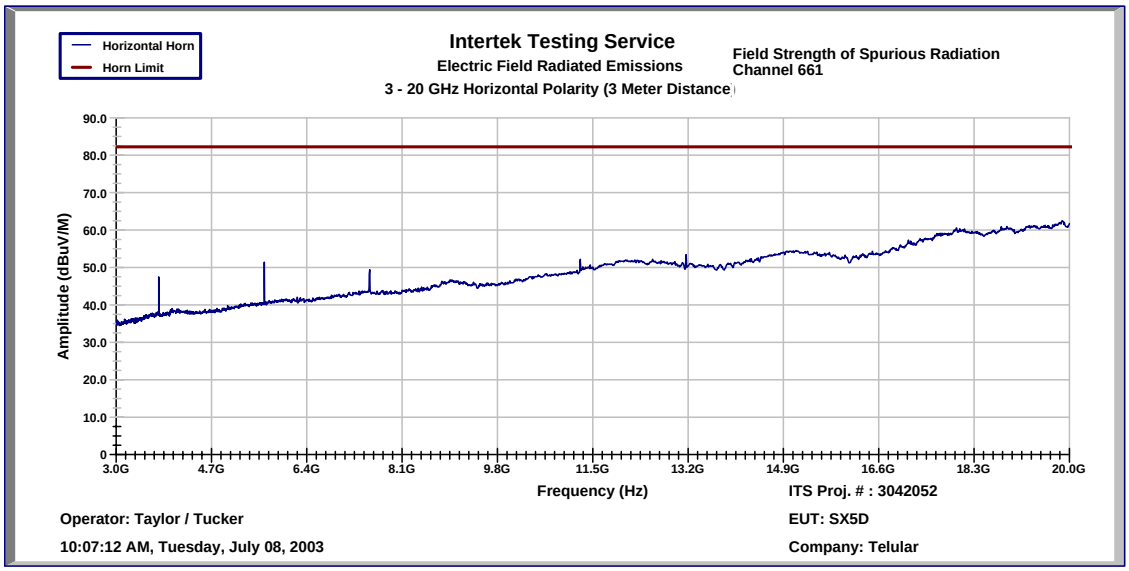


Figure 7-22: Measured Field Strength of Spurious Radiation GSM 1900, Channel 661

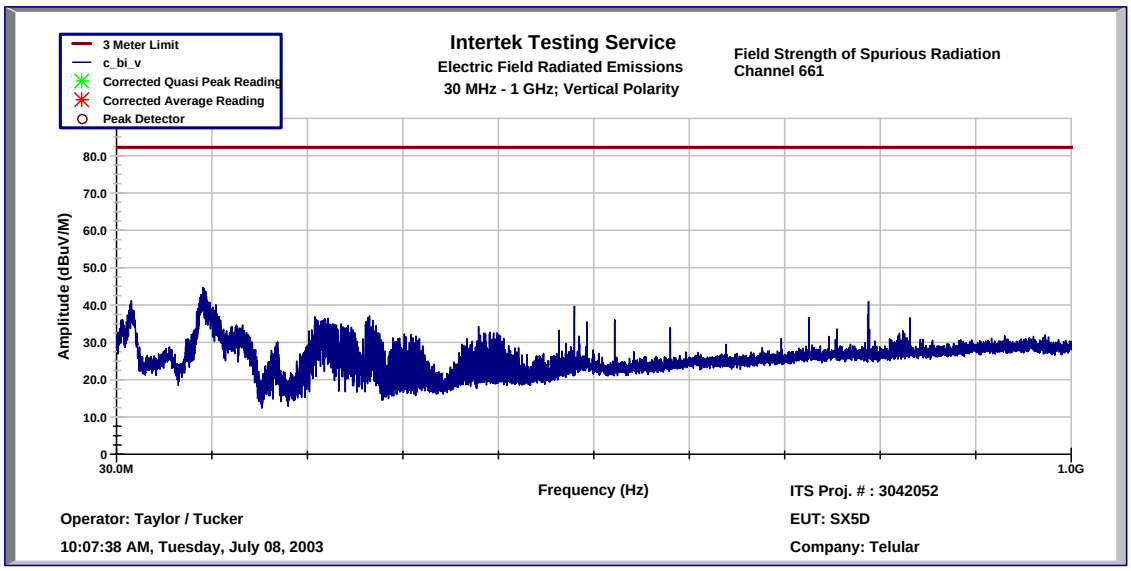


Figure 7-23: Measured Field Strength of Spurious Radiation GSM 1900, Channel 661

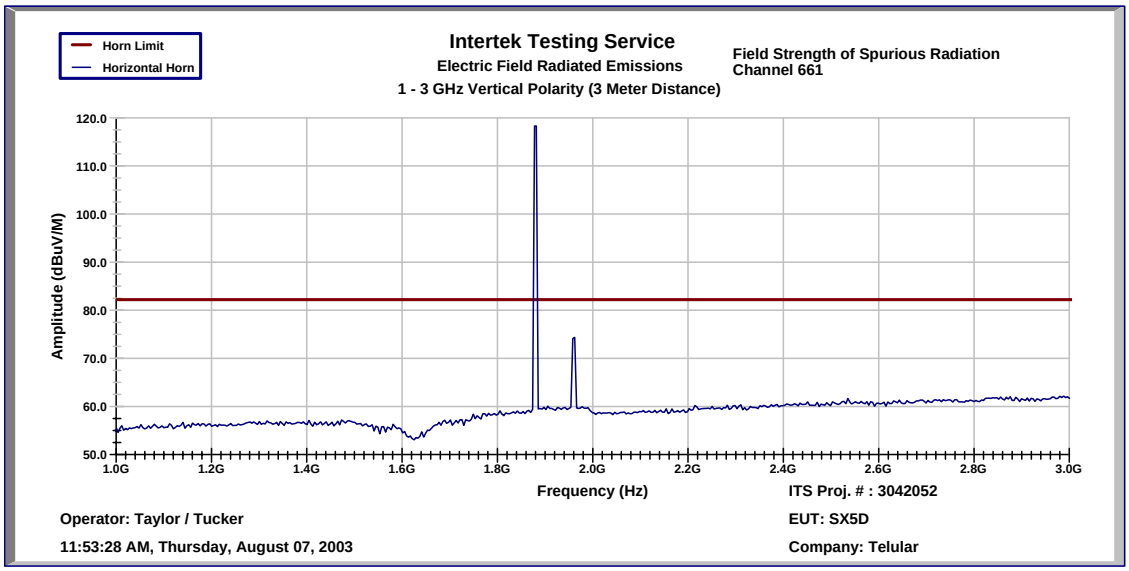


Figure 7-24: Measured Field Strength of Spurious Radiation GSM 1900, Channel 661

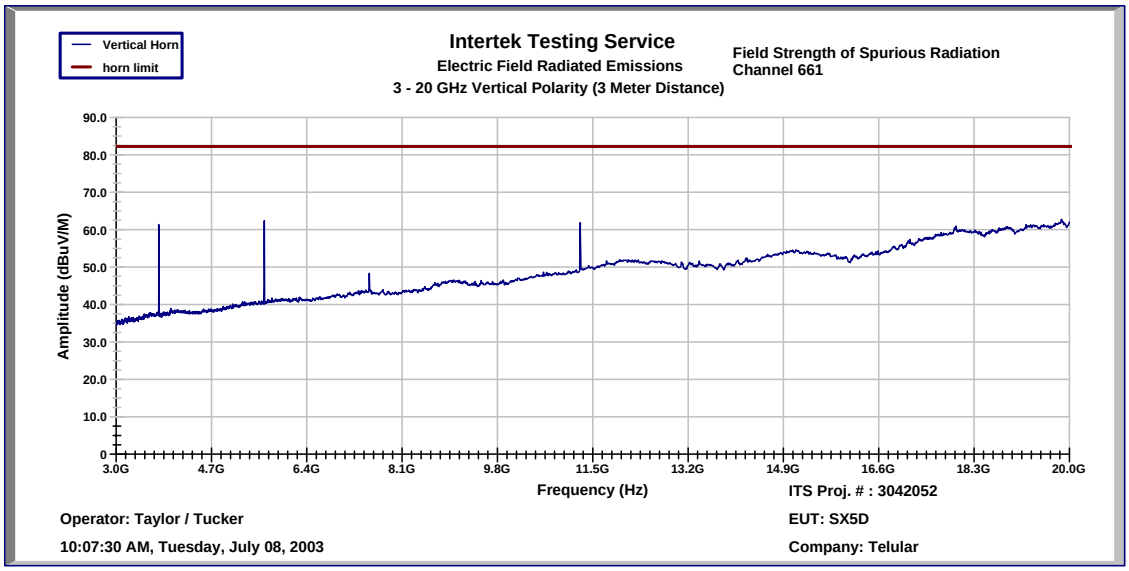


Figure 7-25: Measured Field Strength of Spurious Radiation GSM 1900, Channel 810

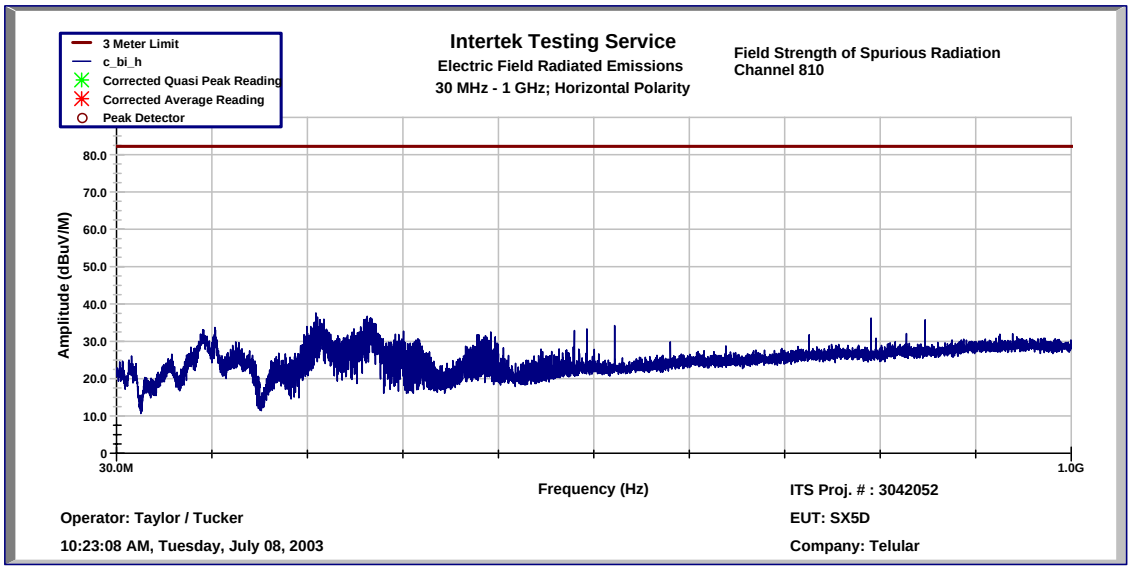


Figure 7-26: Measured Field Strength of Spurious Radiation GSM 1900, Channel 810

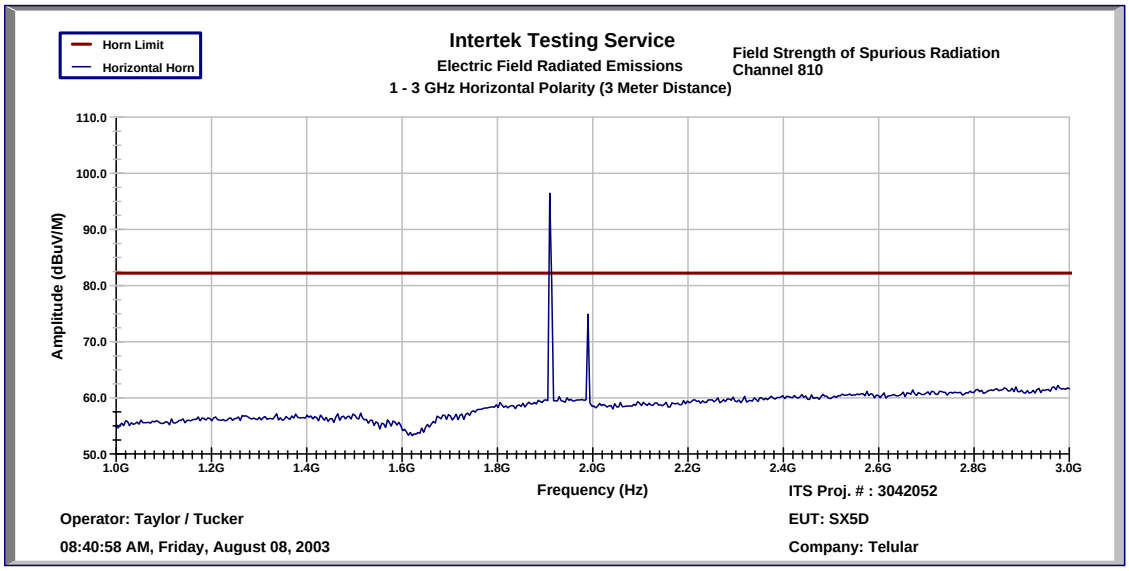


Figure 7-27: Measured Field Strength of Spurious Radiation GSM 1900, Channel 810

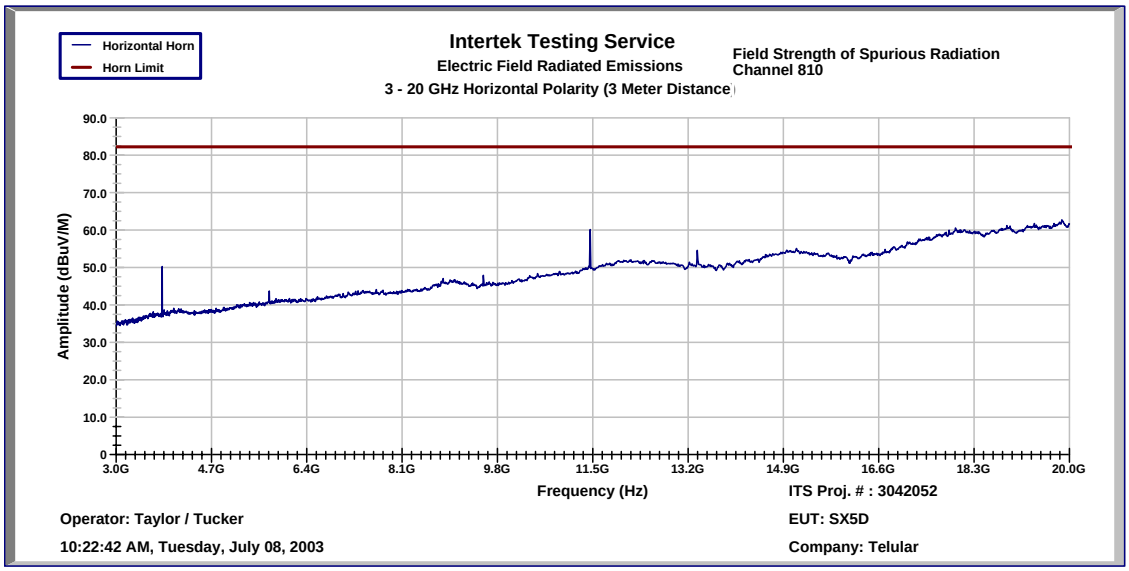


Figure 7-28: Measured Field Strength of Spurious Radiation GSM 1900, Channel 810

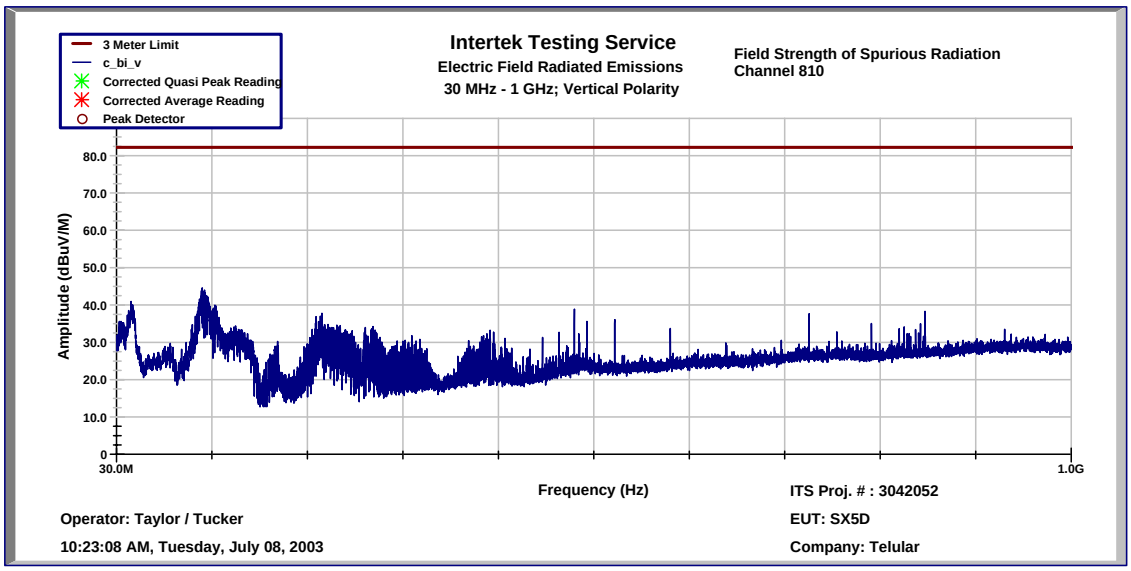


Figure 7-29: Measured Field Strength of Spurious Radiation GSM 1900, Channel 810

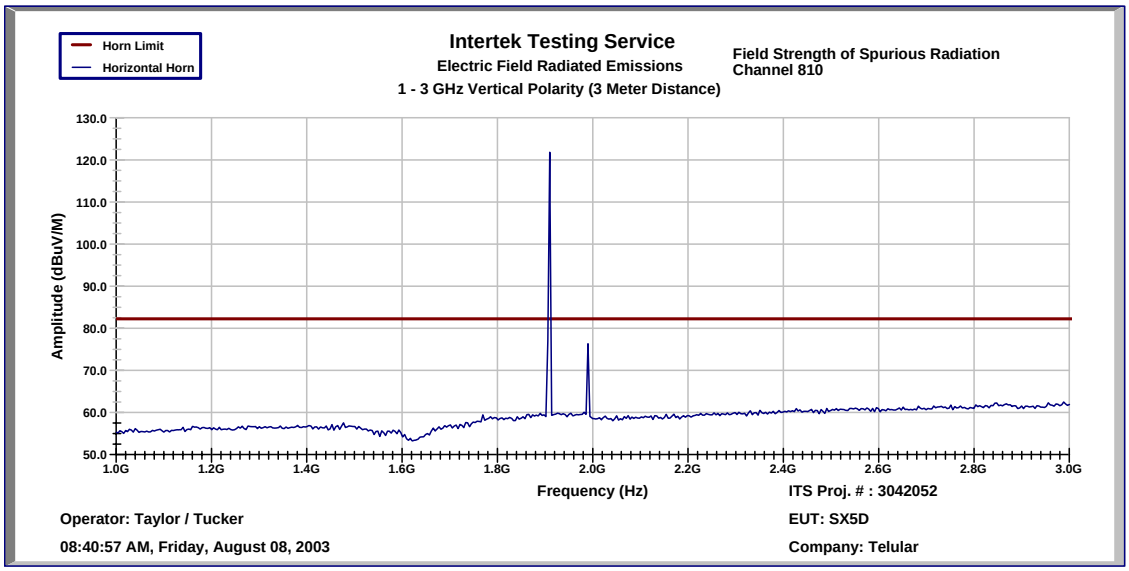
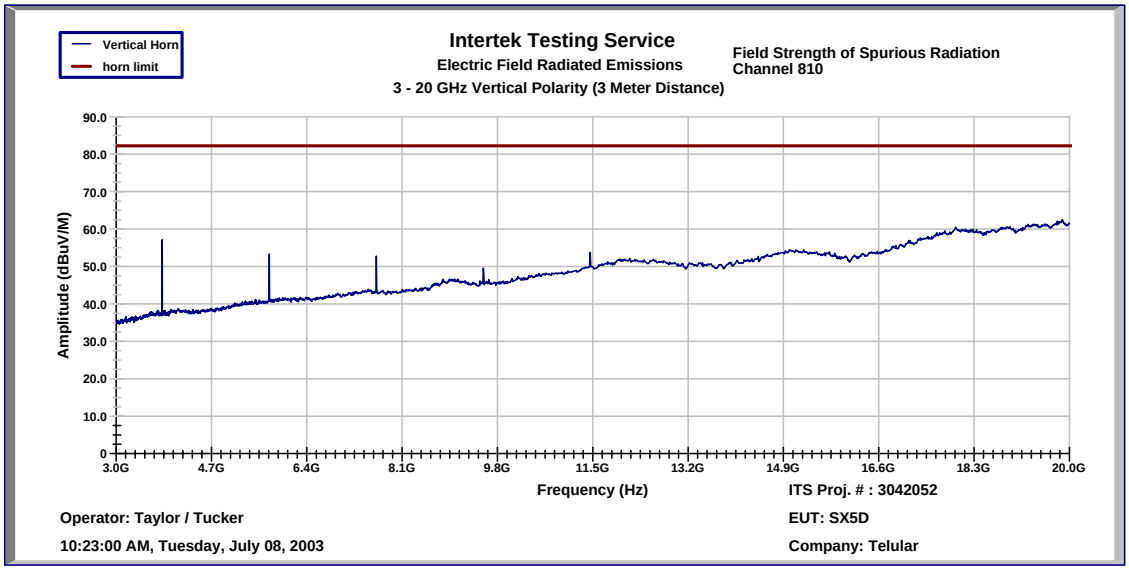


Figure 7-30: Measured Field Strength of Spurious Radiation GSM 1900, Channel 810



8 POWER LINE CONDUCTED EMISSIONS

FCC §15.107, FCC §15.207

8.1 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4: 1992.

8.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Base Station Simulator	Rhode & Schwarz	CMU-200	837198/089
EMI Receiver	Rhode & Schwarz	ESI26	100016
LISN	FCC	FCC-LISN-50-50-2M	01026

8.3 Test Results

Figure 8-1: FCC §15.107 and §15.207 power line conducted emissions (peak), L1

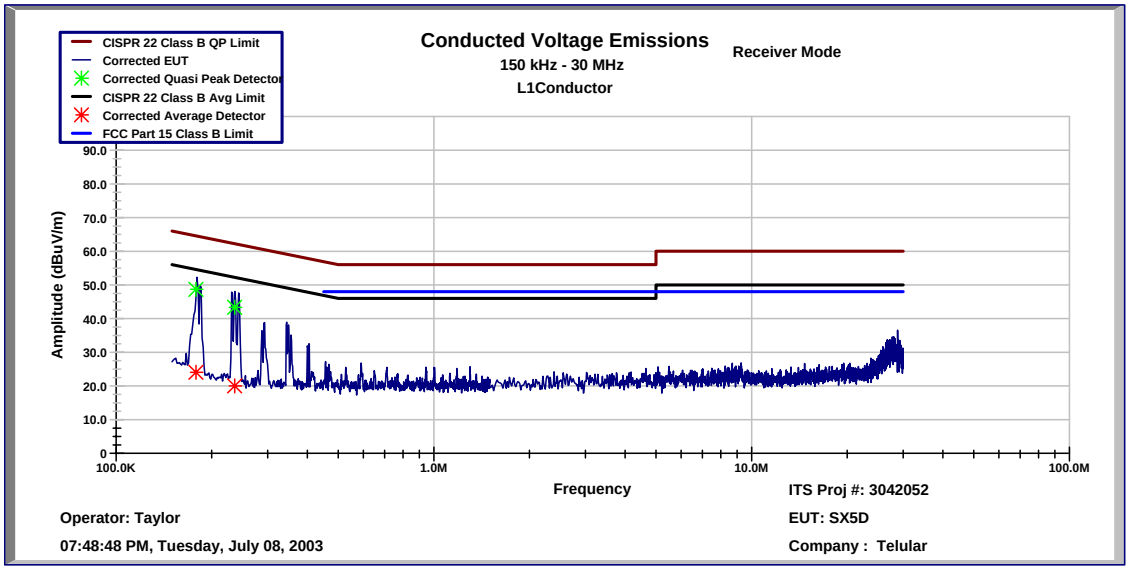


Figure 8-2: FCC §15.107 and §15.207 power line conducted emissions (peak), L2

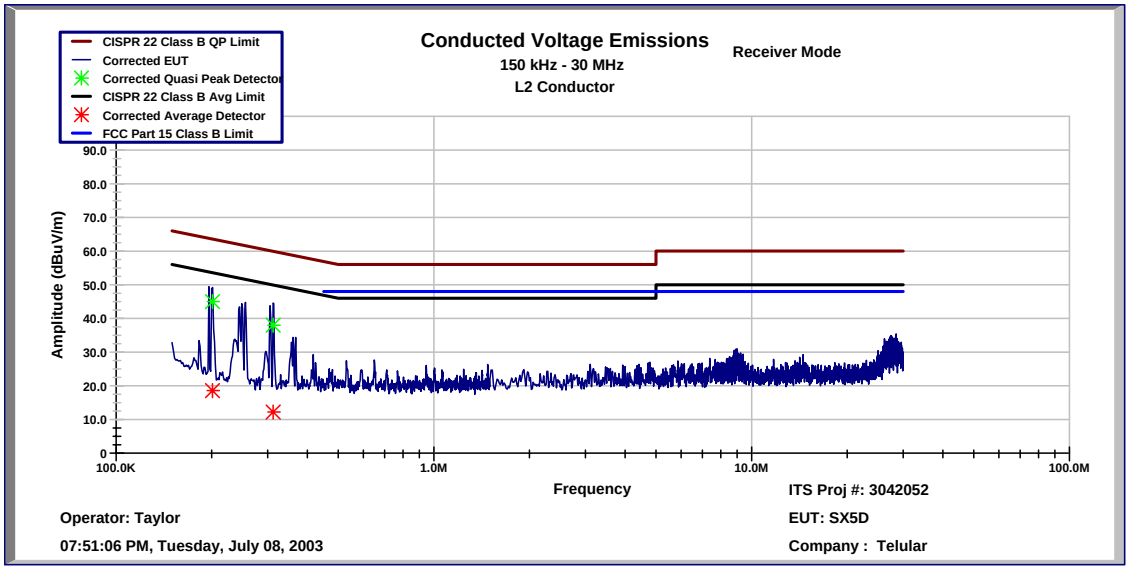


Figure 8-3: FCC §15.107 and §15.207 power line conducted emissions (peak), L2

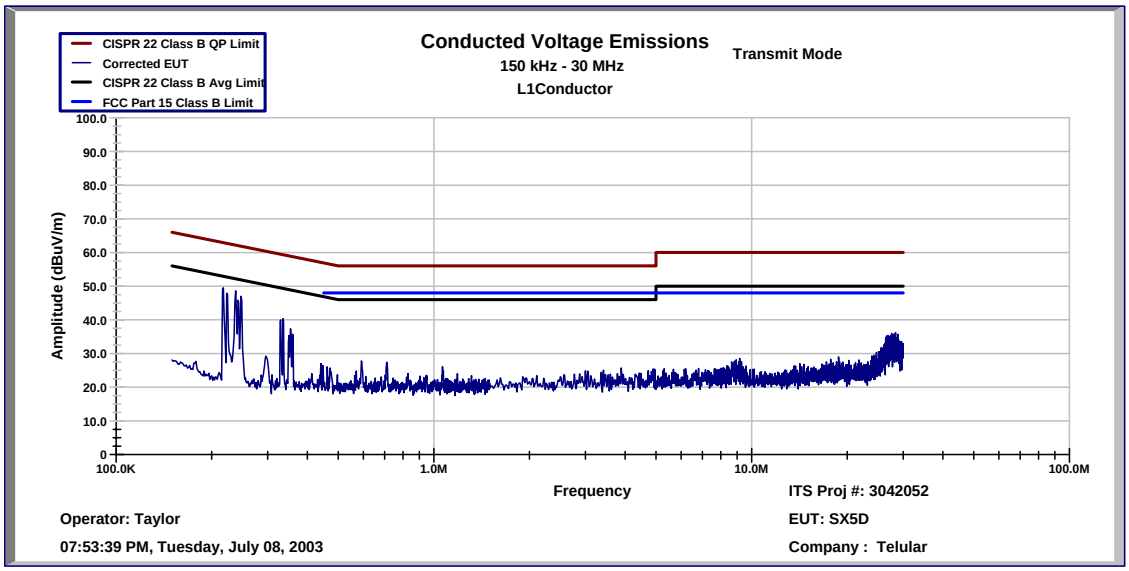
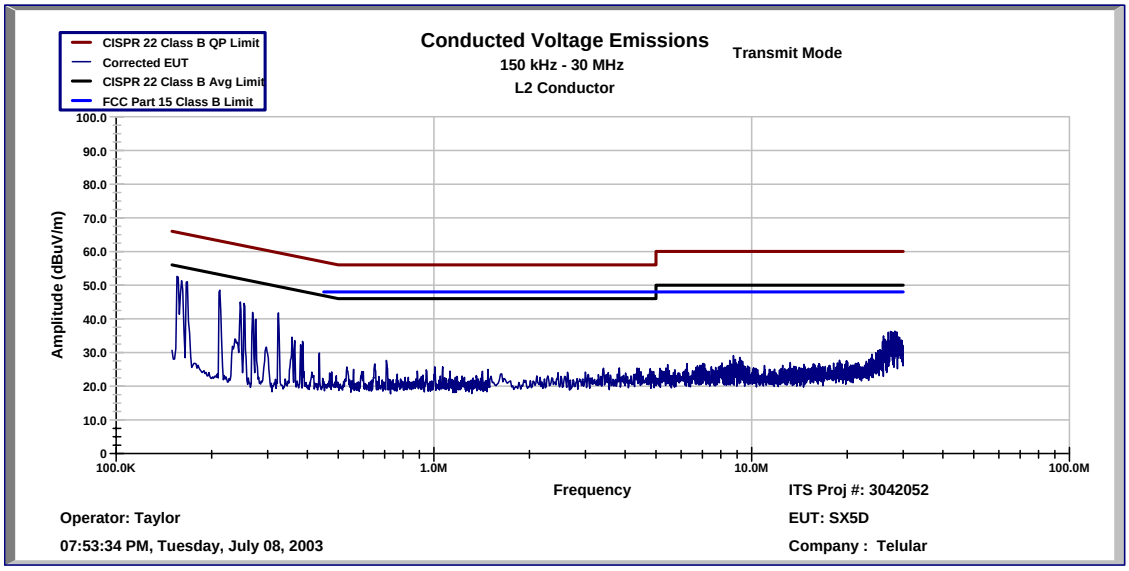


Figure 8-4: FCC §15.107 and §15.207 power line conducted emissions (peak), L2



8.4 Test Configuration Photograph

Figure 8-5 and Figure 8-6 show the testing configurations used.

Figure 8-5: Configuration photograph, AC mains conducted emission, front view

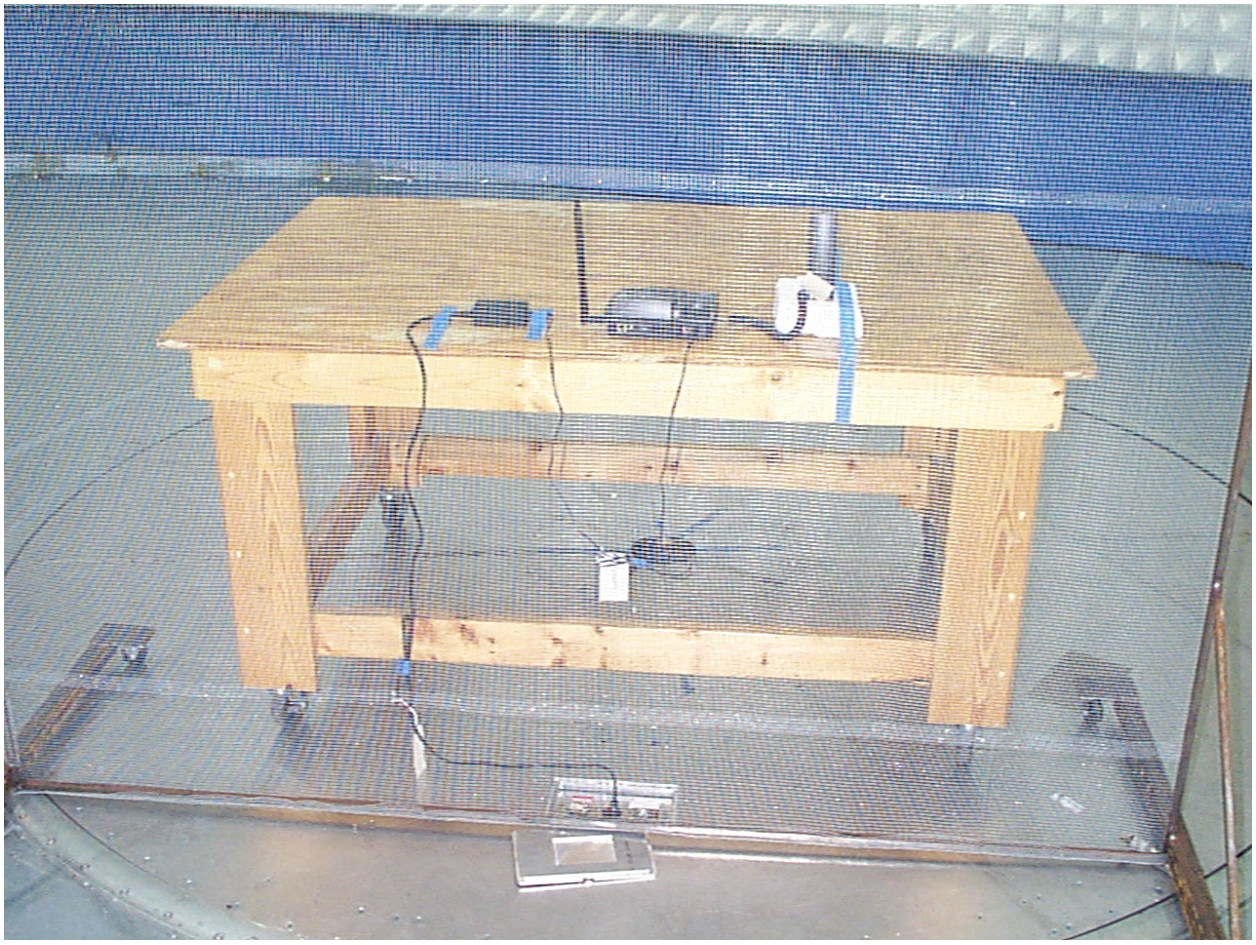


Figure 8-6: Configuration photograph, AC mains conducted emission, rear view

9 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §22.355, FCC §24.235

Frequency tolerance: 2.5ppm

9.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. The DC leads, RF output cable, and external PTT cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 30 minutes, the external switch was activated, and the frequency output was recorded from the counter.

9.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Base Station Simulator	Rhode & Schwarz	CMU-200	837198/089
Temperature Chamber	Thermotron	SM-8C	32692

9.3 Test Results

Table 9-1: GSM800 Channel 189, Frequency stability vs. Temperature

Tx Frequency: 836.400 MHz
Tolerance: +/- 2091 Hz

Temperature	Maximum Frequency Deviation
(°C)	(Hz)
60	47
50	50
40	60
30	58
20	15
10	73
0	50
-10	49
-20	114
-30	79

Table 9-2: GSM1900 Channel 661, Frequency stability vs. Temperature

Tx Frequency: 1880 MHz
Tolerance: +/-4700 Hz

Temperature	Maximum Frequency Deviation
(°C)	(Hz)
60	-40
50	31
40	71
30	61
20	120
10	75
0	171
-10	68
-20	211
-30	114

10 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355

Frequency tolerance: 2.5ppm

10.1 Test Procedure

The voltage was set to 115% of the nominal value and was then decreased to 85% of the nominal value. The nominal value was 120 Vac, 60 Hz. The output frequency was recorded for each voltage.

10.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Base Station Simulator	Rhode & Schwarz	CMU-200	837198/089
AC Power Supply	Elgar	501SL	149

10.3 Test Results

Table 10-1: GSM 800 Channel 189, Frequency stability vs. input voltage

Tx Frequency: 836.40 MHz
Tolerance: +/- 2091 Hz

Supply (AC) 60 Hz	Maximum Frequency Deviation
Volts	(Hz)
132.25	80
97.75	97

Table 10-2: GSM 1900 Channel 661, Frequency stability vs. input voltage

Tx Frequency: 1880.00 MHz
Tolerance: +/-4700 Hz

Supply (AC) 60 Hz	Maximum Frequency Deviation
Volts	(Hz)
132.25	50
97.75	22

11 RECEIVER SPURIOUS EMISSIONS

11.1 Test Limits

Table 11-1 Radiated Emission Limit for FCC §15.109

Radiated Emission Limits at 3 meters	
Frequency (MHz)	Quasi-Peak limits, dB (μV/m)
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 and up	54.0

11.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number
Dipole Antenna	Motorola	-	VA1L-008
Horn Antenna	ETS	3115	6556
Receive Antenna	ETS	3142B	1674
EMI Receiver	Rhode & Schwarz	ESI26	100016

11.3 Test Procedure

Measurements are made over the frequency range of 30 MHz to five times the highest frequency operating within the device. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole. From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz, average measurements were performed.

Measurements of the radiated field are made with the antenna located at a distance of 3 meters from the EUT. If the field-strength measurements at 3m cannot be made because of high ambient noise level or for other reasons, measurements may be made at a closer distance, for example 1m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4: 1992.

11.4 Test Results

Figure 11-1 FCC §15.109, RSS-129, and RSS-133 Receiver Spurious Emissions Horizontal

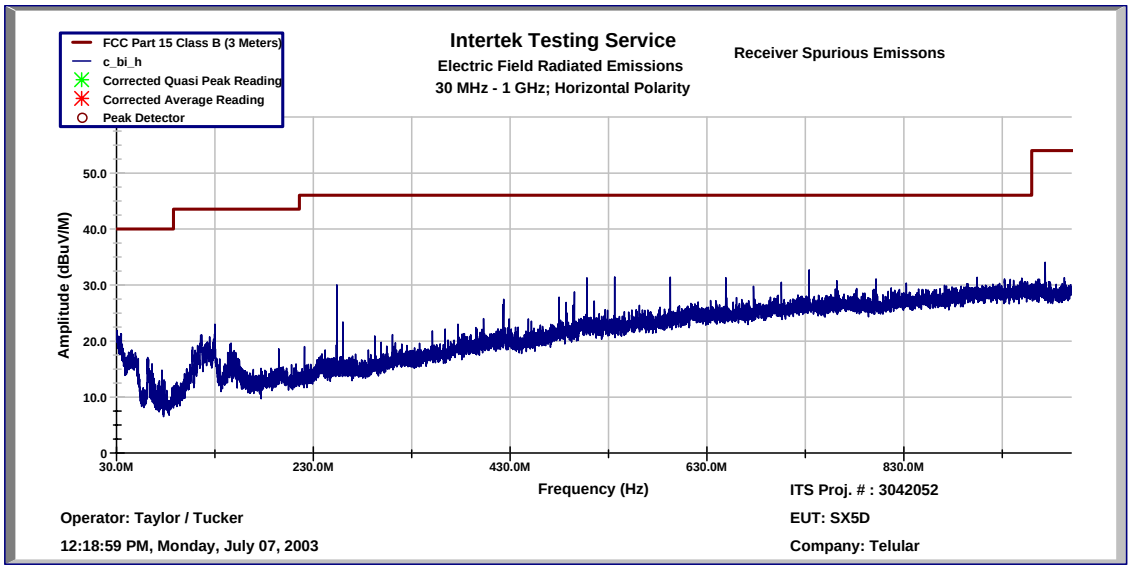


Figure 11-1 FCC §15.109, RSS-129, and RSS-133 Receiver Spurious Emissions Horizontal

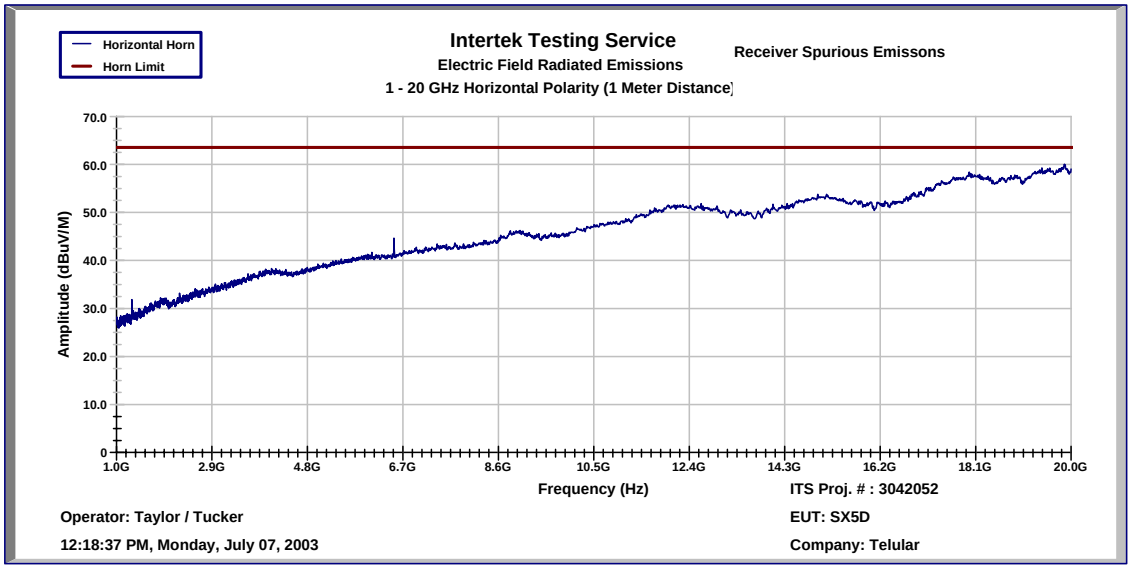


Figure 11-1 FCC §15.109, RSS-129, and RSS-133 Receiver Spurious Emissions Vertical

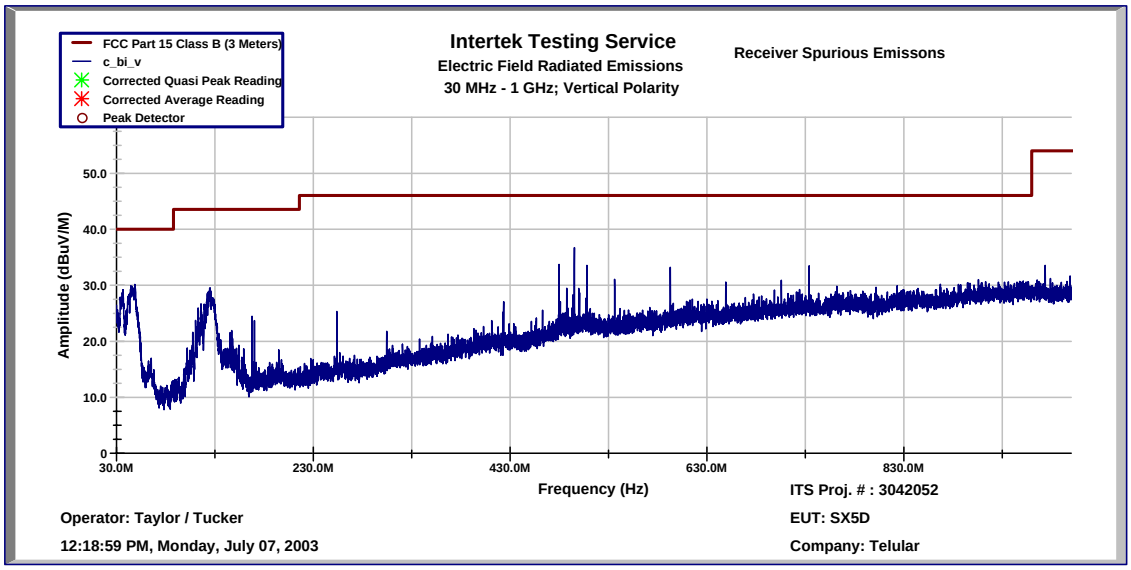
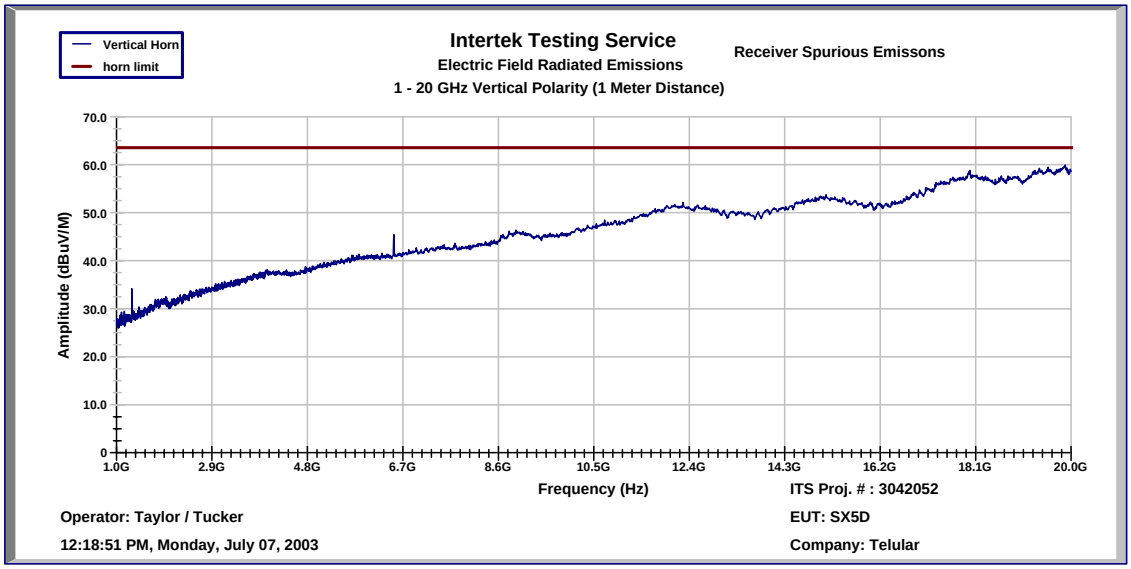


Figure 11-1 FCC §15.109, RSS-129, and RSS-133 Receiver Spurious Emissions Vertical



11.5 Test Configuration Photograph

Figure 11-1 and Figure 11-2 show the testing configurations used.

Figure 11-1: Configuration photograph, radiated emission, front view

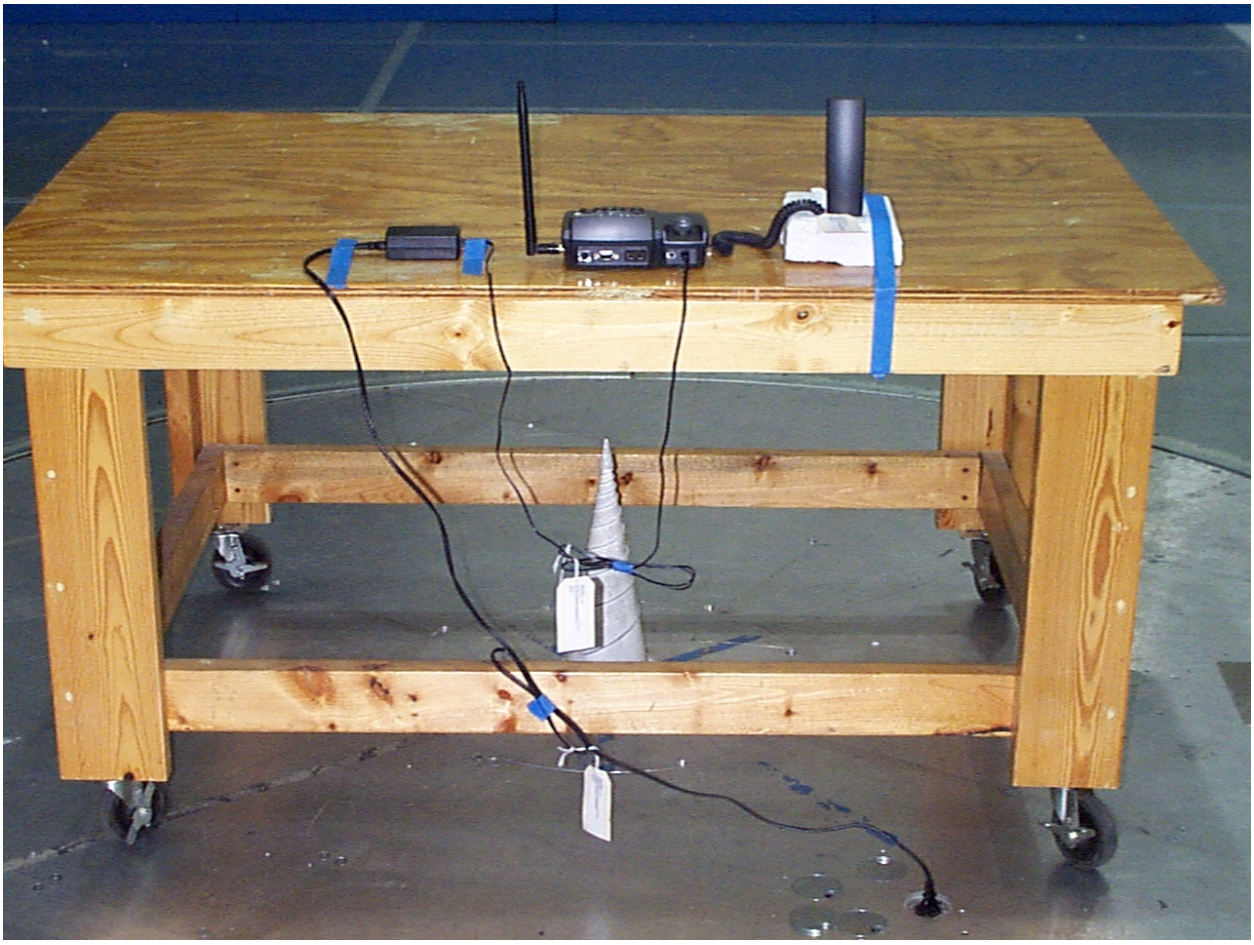


Figure 11-2: Configuration photograph, radiated emission, rear view