MOTOROLA

PERSONAL COMMUNICATIONS SECTOR

PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

EMC TEST REPORT

Test Report Number – 8942-1

Report Date – November 21, 2002

The test results contained herein relate only to the model(s) identified. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Engineer, I hereby declare that the equipment tested as specified in this report conforms to the requirements indicated.

Signature  Name: Kirby Munroe

Title: Compliance Engineer Date : 11/21/02

A2LA Certificate Number: 1846-01

ACCREDITED

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Test Report Details

Tests Performed By:	Motorola Personal Communications Sector Product Safety and Compliance Group 1500 Gateway Boulevard Boynton Beach, FL 33426 PH (561) 739-2179 Fax (561) 739-2131 FCC Registration Number: 100000 Industry Canada Number: IC3908
Tests Requested By:	Motorola Inc. Personal Communications Sector 3301 Quantum Boulevard Boynton Beach, FL 33426
Product Type:	Cellular Phone
Signaling Capability:	GSM 850, GSM 1900
Model Number:	SUG2835AA
Serial Numbers:	003
Received Date:	11/15/2002
Testing Start Date:	11/15/2002
Testing Complete Date:	11/21/2002

Applicable Standards

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

__X__ Part 15 Subpart B – Unintentional Radiators
__X__ Part 22 Subpart H - Public Mobile Services
__X__ Part 24 - Personal Communications Services
_____ Part 90 - Private Land Mobile Radio Service

Applicable Standards: ANSI 63.4 2000, RSS-132, RSS-133

Summary of Testing

Test #	Test Name	Pass/Fail
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	NA
3	Occupied Bandwidth	Pass
4	Spurious Emissions at Antenna Terminal	Pass
5	Field Strength of Spurious Emissions	Pass
6	Frequency Stability	Pass
7	Field Strength of Spurious Emissions from Unintentional Radiators	Pass

Test #	Test Name	Margin with respect to the Limit
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	NA
3	Occupied Bandwidth	NA
4	Spurious Emissions at Antenna Terminal	15.6 dB
5	Field Strength of Spurious Emissions	12.4 dB
6	Frequency Stability	28.06 Hz
7	Field Strength of Spurious Emissions from Unintentional Radiators	> 20dB

The margin with respect to the limit is the minimum margin for all modes and bands. ( ) indicates the margin at which the product exceeds the limit.

General and Special Conditions

The EUT was tested using a fully charged battery when applicable. Where a battery could not be used due to the need for a controlled variation of input voltage, an external power supply was utilized.

All testing was done in an indoor controlled environment with an average temperature of 22º C and relative humidity of 50%.

Equipment and Cable Configurations

The EUT was tested in a stand-alone configuration that is representative of typical use. Multiple housings (5) were evaluated for radiated emissions and the worst case housing data is shown in this report.

Measuring Equipment and Calibration Information

Manufacturer Name	Item Name Description	Item Version/ Model #	Serial Number	CALIBRATION DUE DATE
Rohde & Schwarz	EMI Test Receiver	ESI26	838386/010	6/28/2003
Rohde & Schwarz	EMI Test Receiver	ESI26	838786/010	2/26/2003
Hewlett Packard	EMC Analyzer	E7405	US40240219	3/27/2003
Hewlett Packard	RF Amplifier	8347A	3307A02001	12/20/2002
Hewlett Packard	Pre-Amplifier	8449B	3008A01343	12/20/2002
Agilent	Mobile Test Set	8960	GB42360906	9/10/2003
A.H. Systems Inc.	DRG Horn Antenna	SAS-200/571	265	8/28/2003
ETS	DRG Horn Antenna	3115	6222	9/30/2003
ETS	Log-Periodic Antenna	3148	1188	12/6/2002
ETS	Log-Periodic Antenna	3148	1189	1/2/2003
ETS	Biconical Antenna	3110B	3369	12/15/2002
Compliance Design	Biconical Antenna	B100	385	7/16/2003
Compliance Design	Biconical Antenna	B200	312	7/22/2003
Compliance Design	Biconical Antenna	B300	321	7/22/2003
Attenuator	Weinschel	AS-6	6675	10/9/2003
Attenuator	Weinschel	AS-6	6677	10/11/2003
Hewlett Packard	Signal Generator	83623B	3844A01195	1/16/2003
Thermotron	Environmental Chamber	S-4	31580	12/20/2002
Gigatronics	Power meter	8651A	8650561	1/28/2003
Gigatronics	Power meter	8651A	8650508	7/10/2003

All equipment is on a one-year calibration cycle.

Measurement Procedures and Data

RF POWER OUTPUT

Measurement Procedure

The RF output port of the equipment under test is directly coupled to the input of the 8650 series Gigatronics power meter through a specialized RF connector. The power meter is set for Burst Average Power mode (BAP). The power output is measured for all channels.

CFR Part 2.1046

Measurement Results

* Data supplied by SAR Lab

GSM 850

Frequency (MHz)	Power (dBm)
824.2	30.01
836.6	30.05
848.8	29.99

GSM 1900

Frequency (MHz)	Power (dBm)
1850.2	30.10
1880.0	30.07
1909.8	30.07

RADIATED POWER (ERP)

Measurement Procedure

The phone was tested in Harvard Chamber 1, which is a 16' cubical anechoic chamber with a 2-axis positioner system that permits taking complete spherical scans of the AUT's radiation patterns. For all tests, the phone was supported in a free-space type environment, vertically oriented in the chamber. Tests were done for GSM 850 three frequencies (824.2, 836.4, and 848.8) and GSM 1900 three frequencies (1850.2, 1880.0 and 1909.8 MHz) with antenna stubby.

GSM measurements were made with the phone placed into test mode. The phone was configured to transmit in full data rate mode. Radiated power was measured at every 15 degree step using a Gigatronics 8542C power meter in "Burst Avg" mode. The radiated power results follows, as EIRP in dBm. To get ERP (effective radiated power referenced to a half-wave dipole), subtract 2.1 dB from these numbers.

GSM 850:
824.2 MHz 29.59 dBm
836.4 MHz 29.78 dBm
848.8 MHz 29.66 dBm.

GSM 1900:
1850.2 MHz: 32.92 dBm
1880.0 MHz: 32.77 dBm
1909.8 MHz: 31.54 dBm

For all measurements, calibration was performed via gain substitution with a half-wave dipole.

GSM 850 mode: Max EIRP is 29.78 dBm (**max ERP is 27.68 dBm**)
PCS 1900 mode: **Max EIRP is 32.92 dBm** (max ERP is 30.82 dBm)

OCCUPIED BANDWIDTH

CFR Part 2.1049, 22.917, 24.238

Measurement Procedure

The RF output port of the equipment under test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. The amplitude of the spectrum analyzer is corrected for the attenuator and any other applicable losses. The analyzer is set for Peak Detector and each trace is set for Max Hold. A fully charged battery was used for the supply voltage.

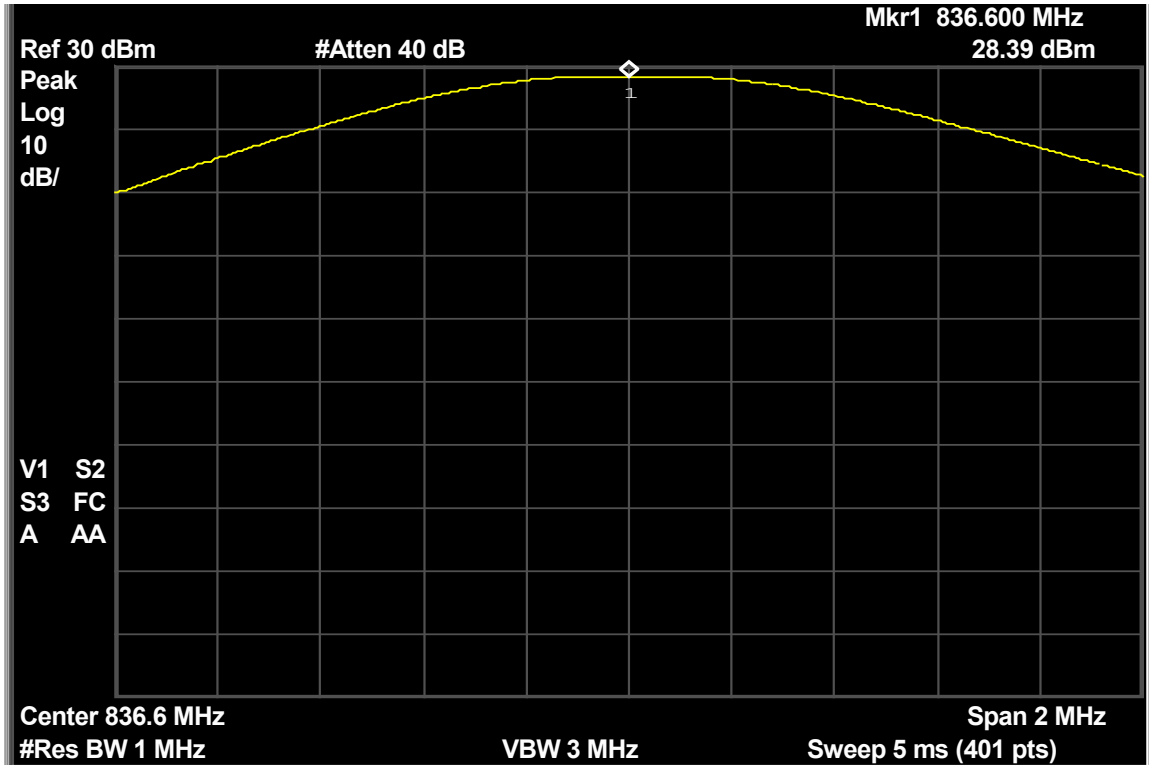
The middle channel within the designated frequency block was measured. For digital modulation, the lower and upper band edge plots are displayed.

Measurement Results

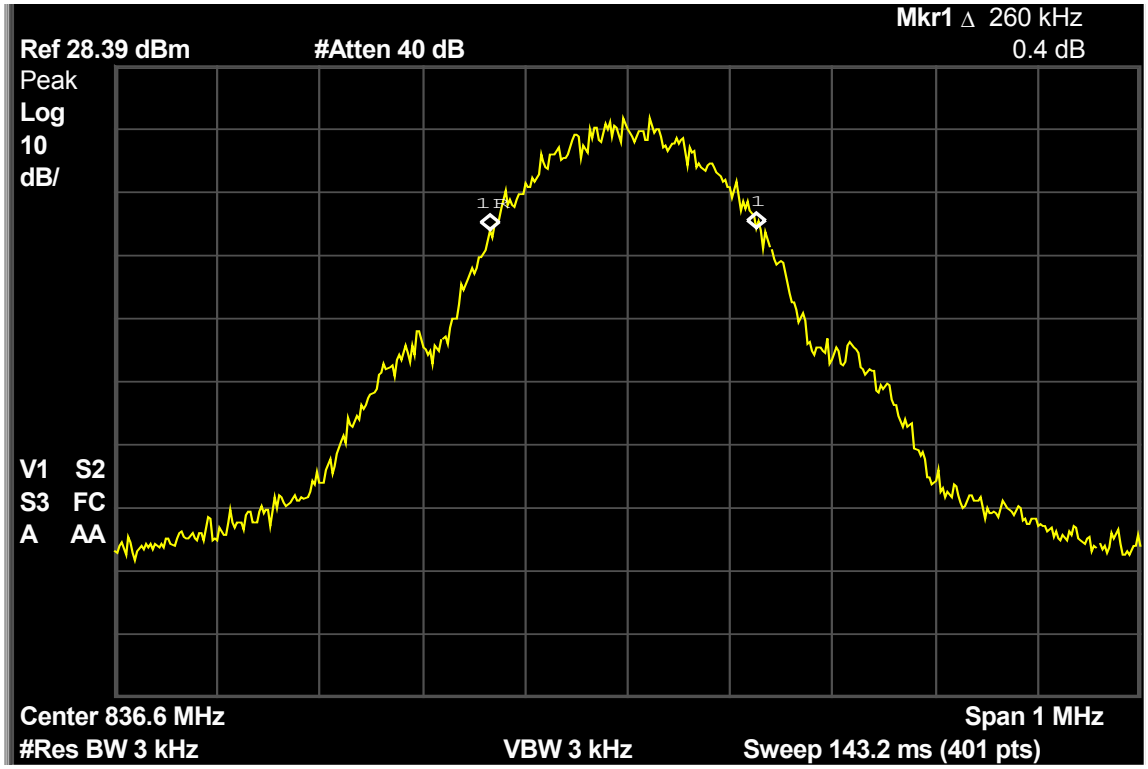
Attached

Measurement Results – GSM 850

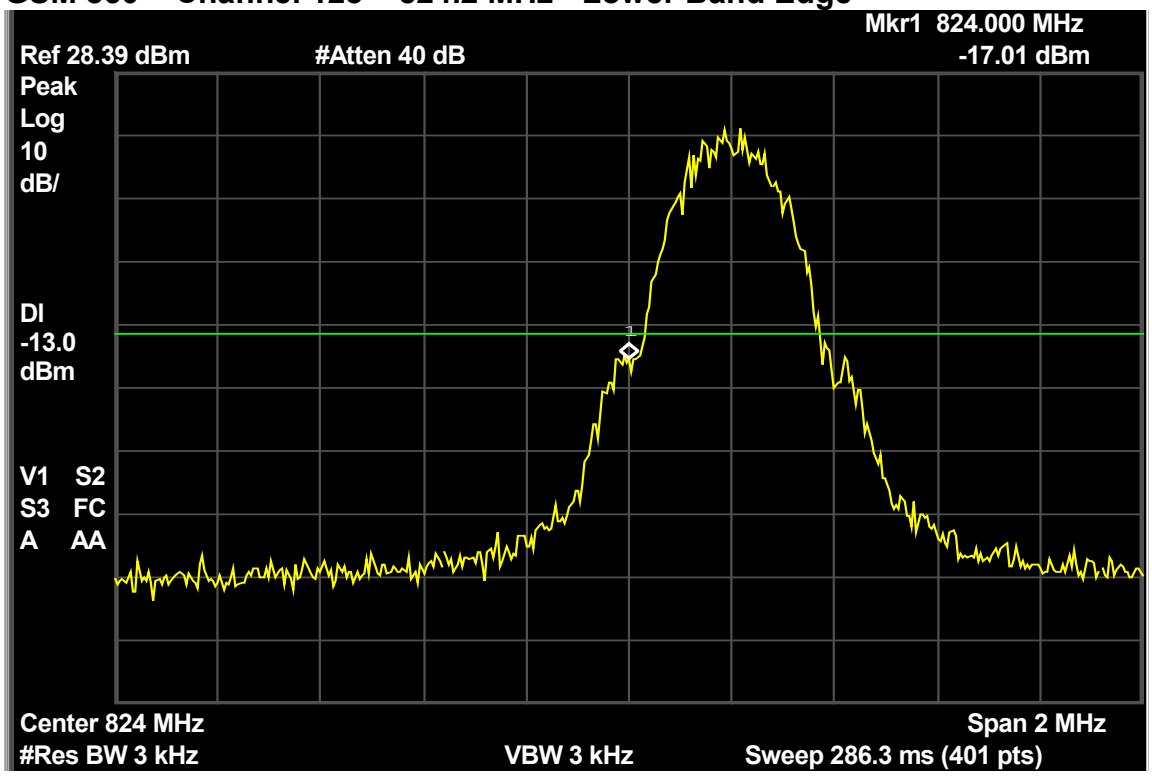
GSM 850 – Channel 190 – 836.6 MHz - Reference Plot



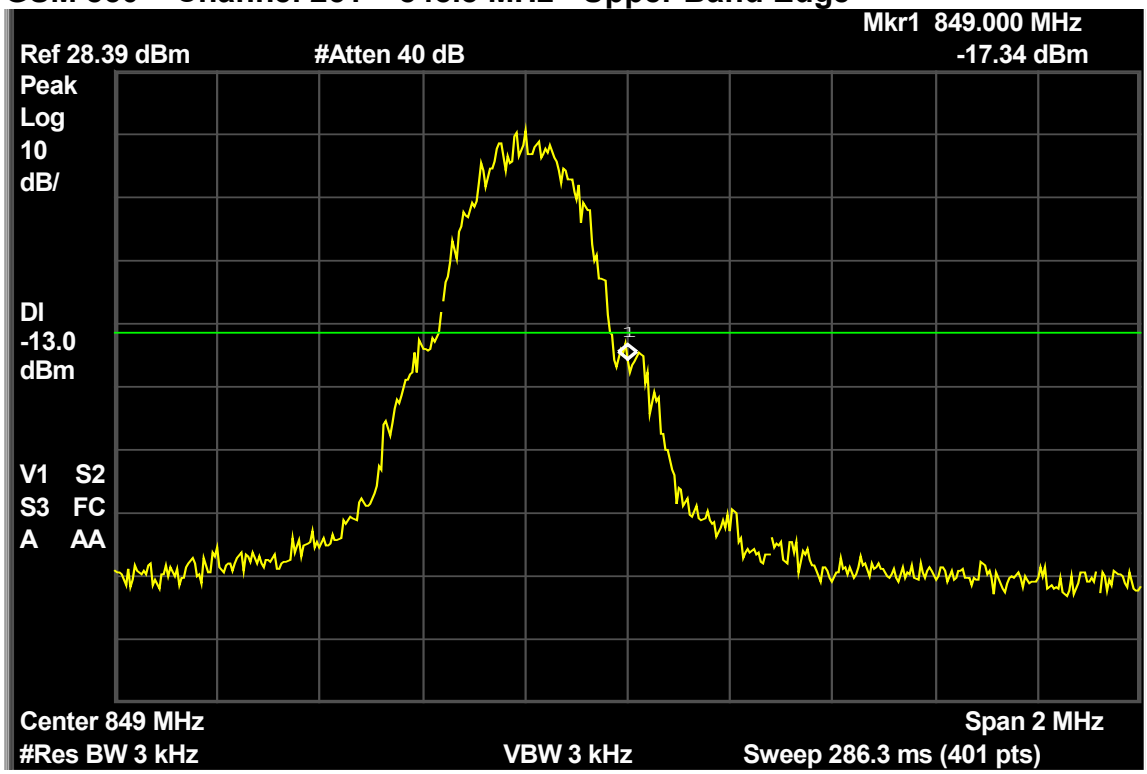
GSM 850 – Channel 190 - 836.6 MHz



GSM 850 – Channel 128 – 824.2 MHz - Lower Band Edge

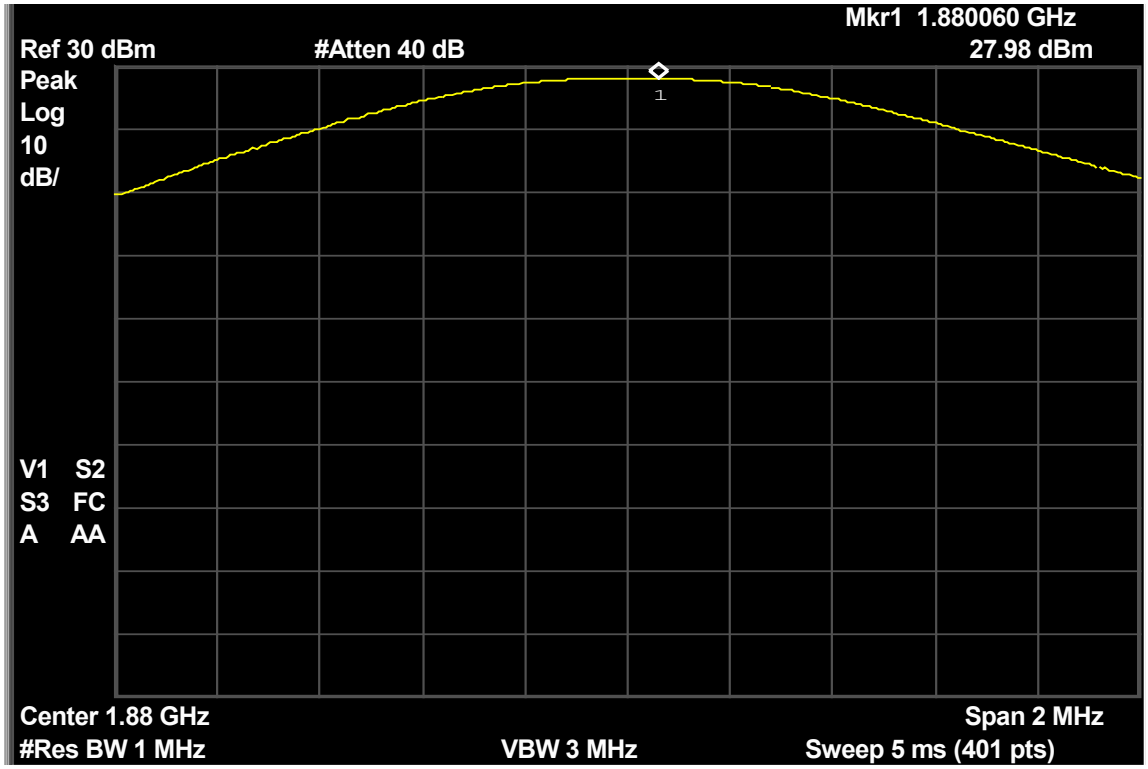


GSM 850 – Channel 251 – 848.8 MHz - Upper Band Edge

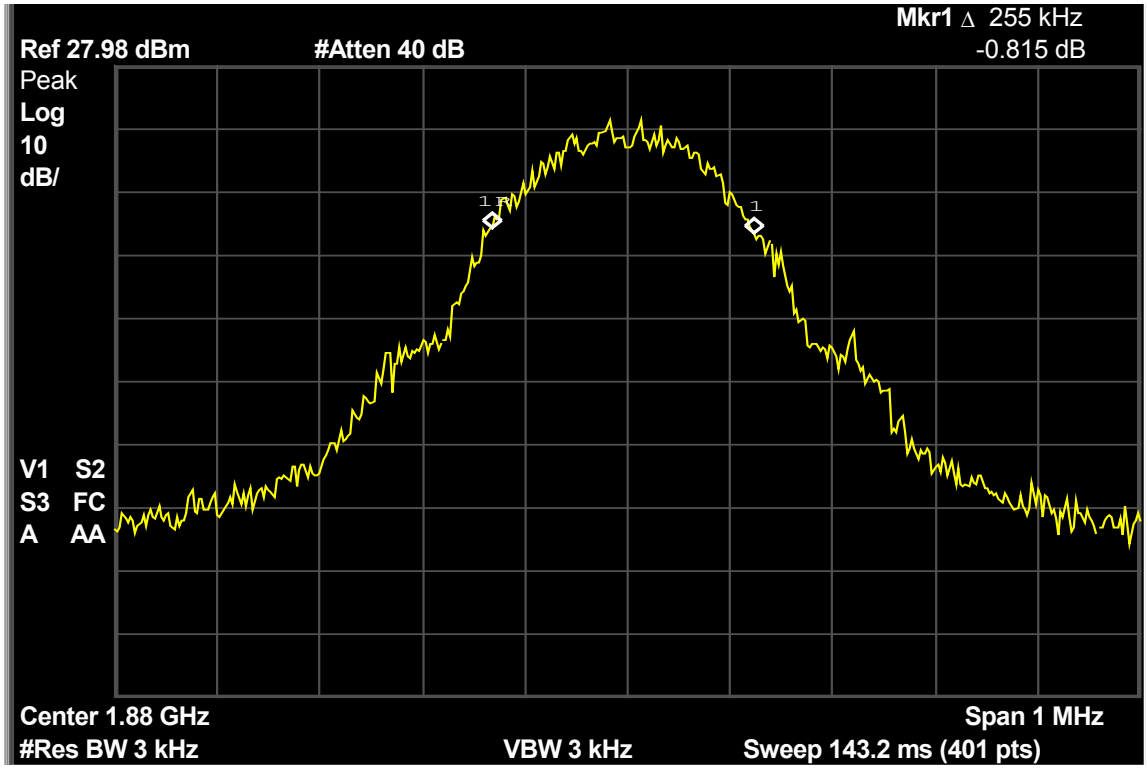


Measurement Results – GSM 1900

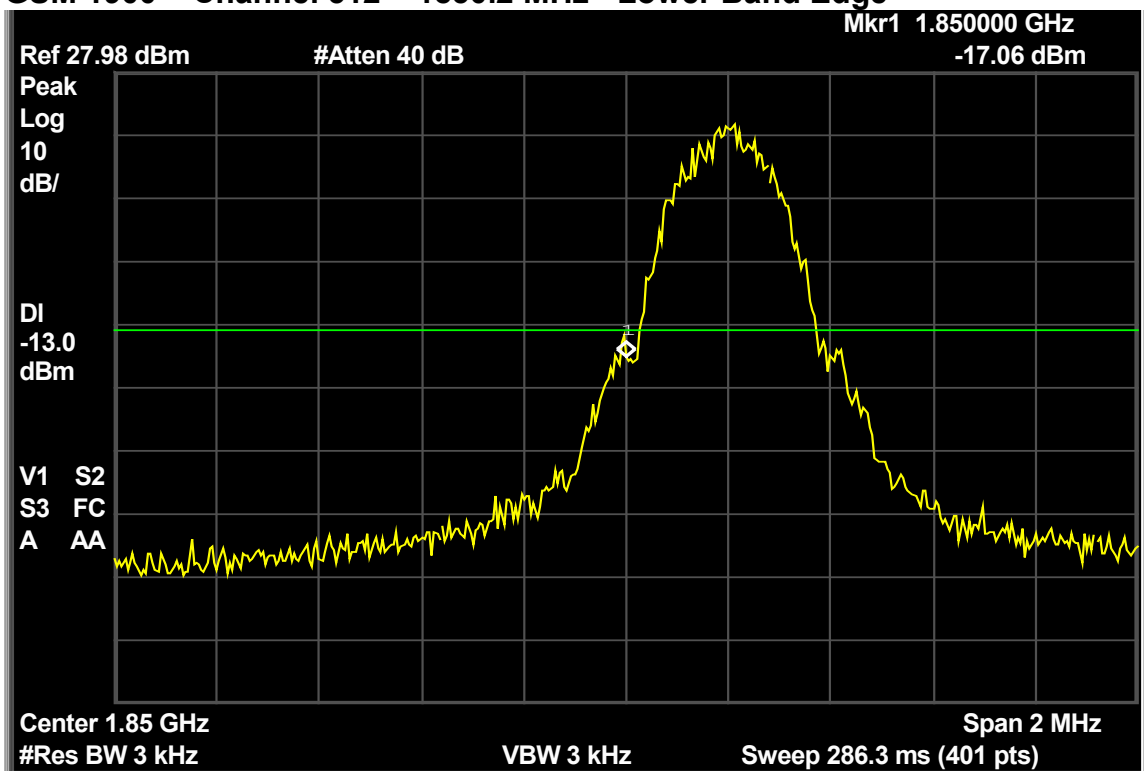
GSM 1900 – Channel 661 – 1880.0 MHz - Reference Plot



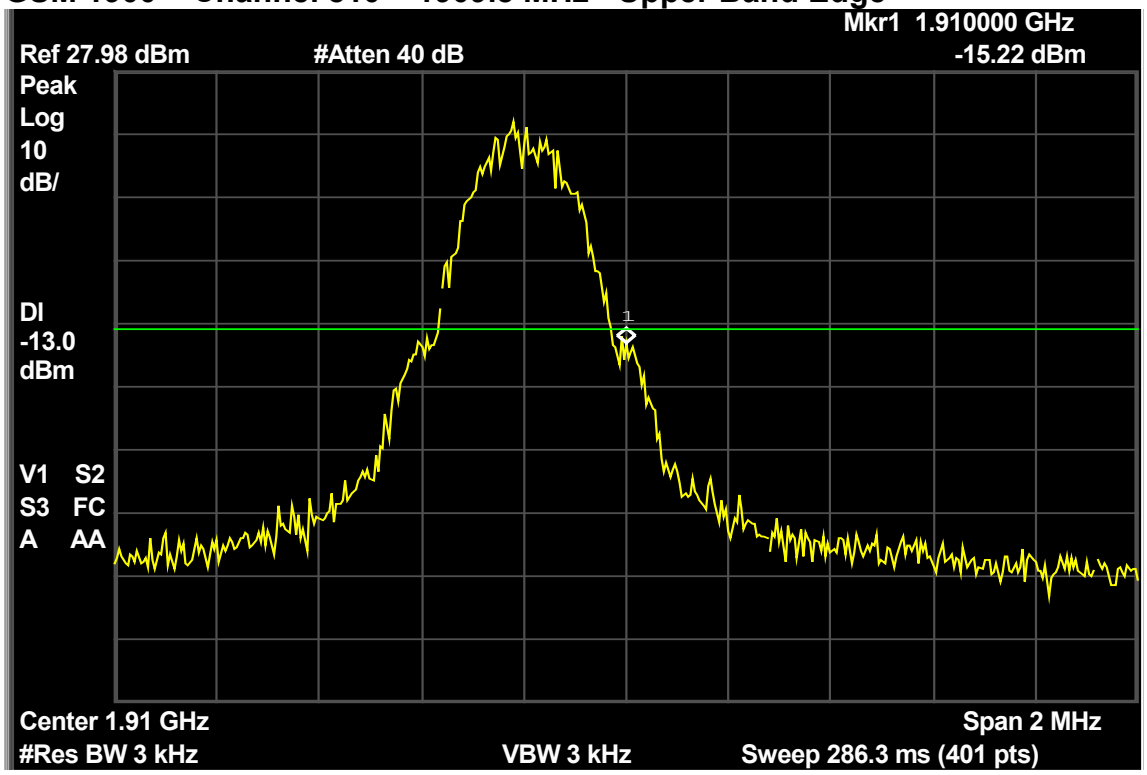
GSM 1900 – Channel 661 - 1880.0 MHz



GSM 1900 – Channel 512 – 1850.2 MHz - Lower Band Edge



GSM 1900 – Channel 810 – 1909.8 MHz - Upper Band Edge



SPURIOUS EMISSIONS AT ANTENNA TERMINALS

CFR Part 2.1051, 22.917, 24.238

Measurement Procedure

The RF output port of the Equipment Under Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage.

The spectrum was investigated from the lowest frequency signal generated, without going below 9 kHz, up to at least the tenth harmonic of the fundamental or 40 GHz, whichever is lower.

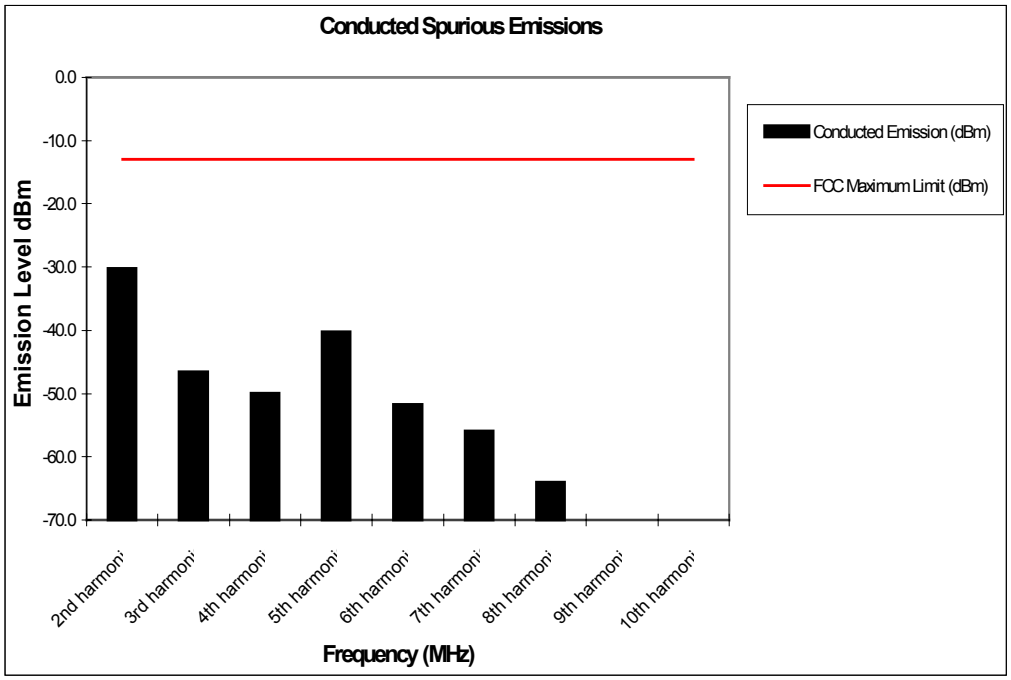
Measurements were made at the low, middle, and high channels within the frequency band. Measurements were also made within the base station frequency range (869-894 MHz) for cellular at low, middle and high channels with only worst case submitted.

Measurement Results

Attached

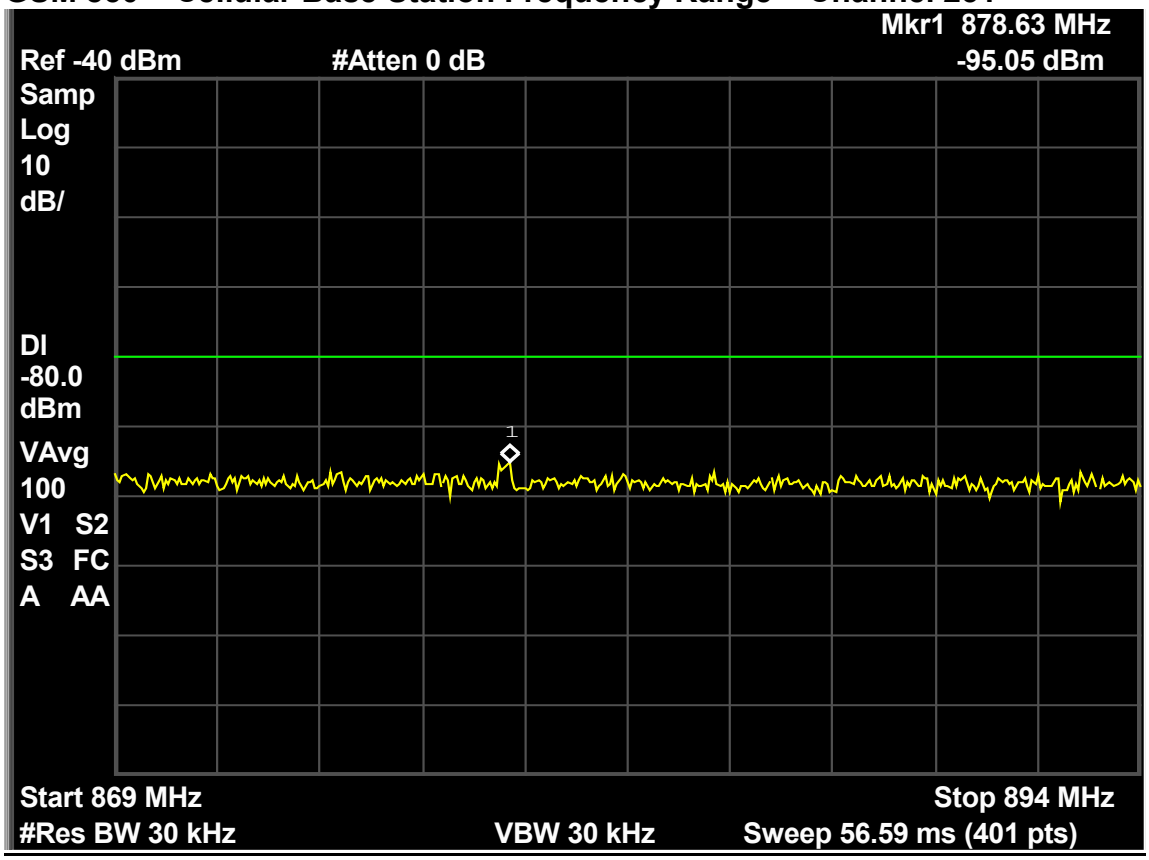
Measurement Results
Modulation: GSM 850

Harmonic of Fundamental	FCC Maximum Limit (dBm)	Conducted Emission (dBm)
2nd harmonic	-13	-30.2
3rd harmonic	-13	-46.6
4th harmonic	-13	-50.0
5th harmonic	-13	-40.3
6th harmonic	-13	-51.7
7th harmonic	-13	-56.0
8th harmonic	-13	-64.0
9th harmonic	-13	*
10th harmonic	-13	*



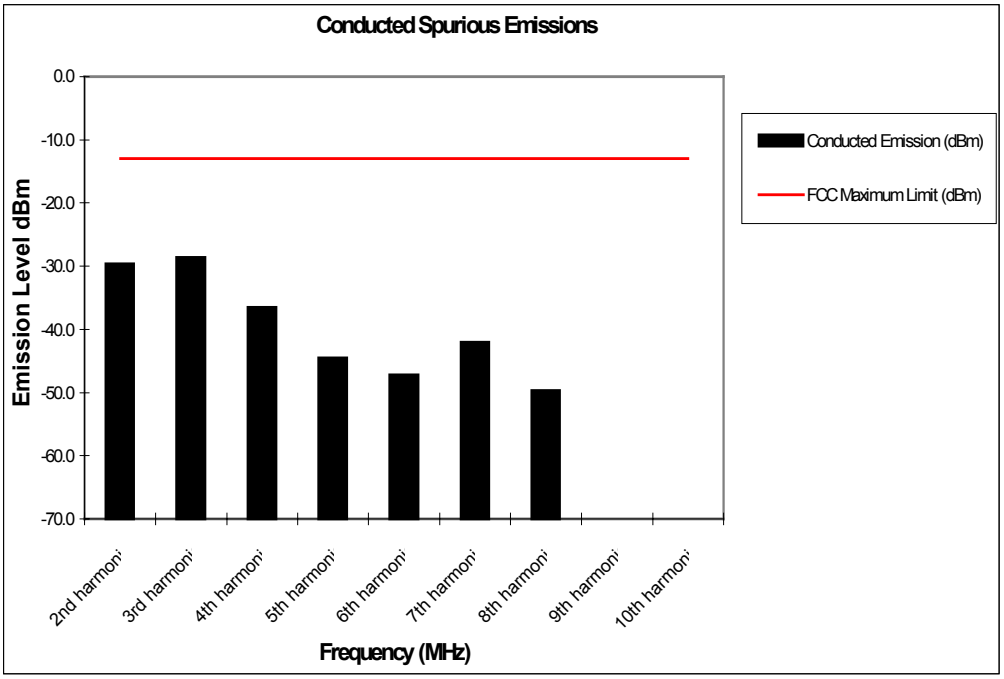
Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid and high channels at maximum power.
3. The Spectrum was investigated from 9 kHz to the tenth harmonic of the fundamental.

GSM 850 – Cellular Base Station Frequency Range – Channel 251



Measurement Results
Modulation: GSM 1900

Harmonic of Fundamental	FCC Maximum Limit (dBm)	Conducted Emission (dBm)
2nd harmonic	-13	-29.7
3rd harmonic	-13	-28.6
4th harmonic	-13	-36.5
5th harmonic	-13	-44.5
6th harmonic	-13	-47.2
7th harmonic	-13	-42.1
8th harmonic	-13	-49.7
9th harmonic	-13	*
10th harmonic	-13	*



Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum was investigated from 9 kHz to the tenth harmonic of the fundamental.

FIELD STRENGTH OF SPURIOUS EMISSIONS

CFR Part 2.1053, 22.917, 24.238

Measurement Procedure

The equipment under test is placed inside the semi-anechoic chamber on a wooden table at the turntable center. For each spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum reading on the spectrum analyzer. This is repeated for both horizontal and vertical polarizations of the receive antenna.

The equipment under test is then replaced with a substitution antenna fed by a signal generator. With the signal generator tuned to a particular spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters to obtain a maximum reading at the spectrum analyzer. The output of the signal generator is then adjusted until a reading identical to that obtained with the actual transmitter is achieved.

The power in dBm of each spurious emission is calculated by correcting the signal generator level for cable loss and gain of the substitution antenna referenced to a dipole. A fully charged battery was used for the supply voltage.

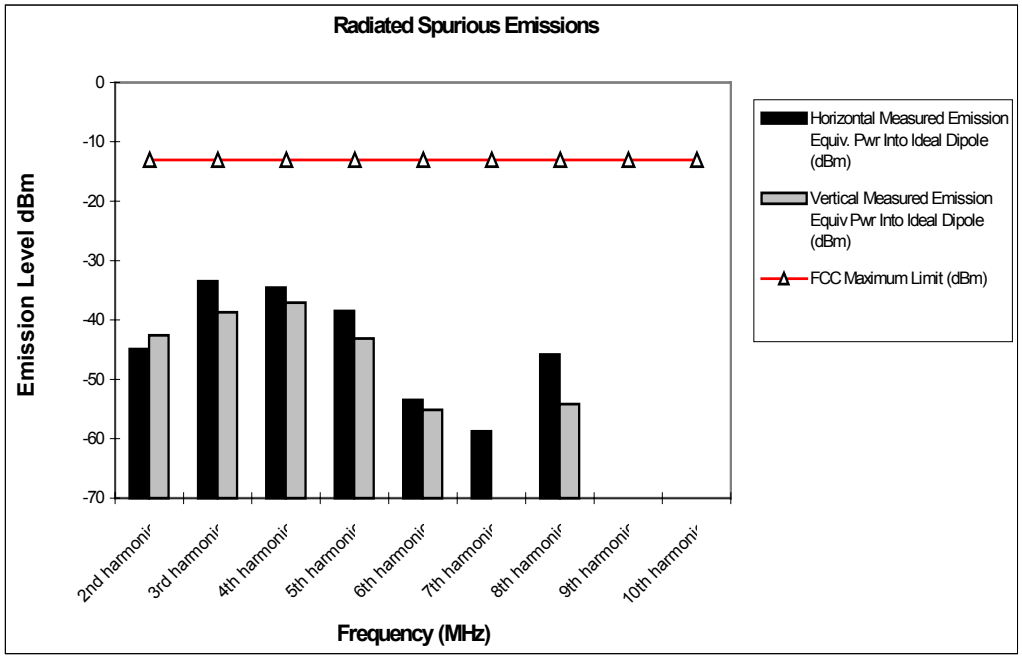
Photographs of the radiated test set-up including substitution are enclosed in Appendix A.

Measurement Results

Attached

Measurement Results
Modulation: GSM 850

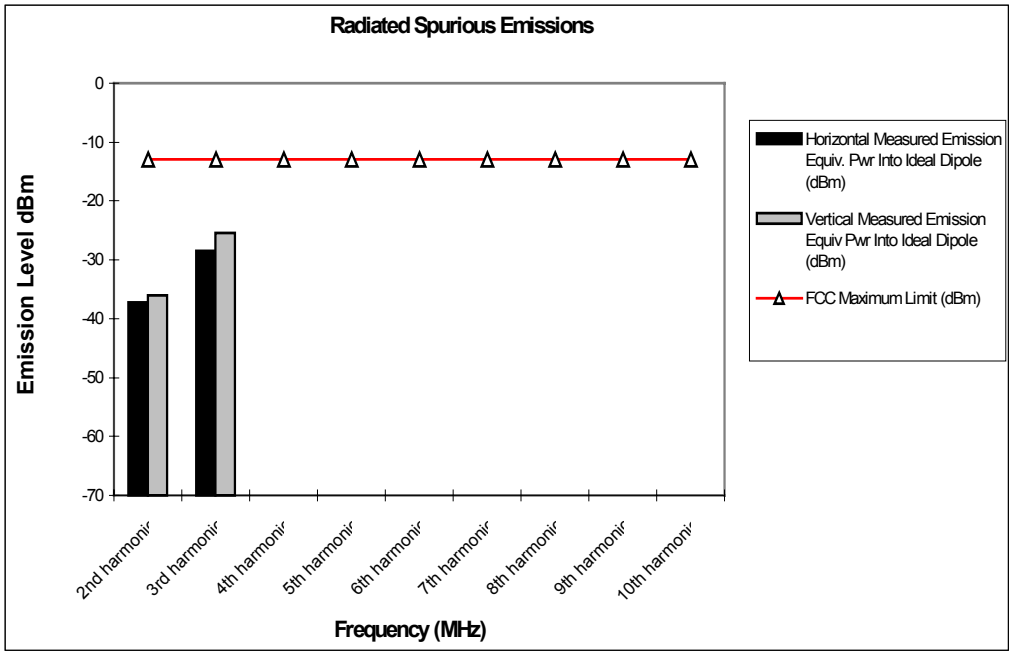
Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	-44.9	-42.6
3rd harmonic	-13	-33.5	-38.8
4th harmonic	-13	-34.6	-37.1
5th harmonic	-13	-38.5	-43.2
6th harmonic	-13	-53.5	-55.1
7th harmonic	-13	-58.7	*
8th harmonic	-13	-45.8	-54.1
9th harmonic	-13	*	*
10th harmonic	-13	*	*



Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid and high channels at maximum power.
3. The Spectrum was investigated from 30 MHz to the tenth harmonic of the fundamental.

Measurement Results
Modulation: GSM 1900

Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	-37.2	-36.1
3rd harmonic	-13	-28.5	-25.4
4th harmonic	-13	*	*
5th harmonic	-13	*	*
6th harmonic	-13	*	*
7th harmonic	-13	*	*
8th harmonic	-13	*	*
9th harmonic	-13	*	*
10th harmonic	-13	*	*



Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum was investigated from 30 MHz to the tenth harmonic of the fundamental.

FREQUENCY STABILITY

CFR Part 2.1055, 22.355, 24.235

Measurement Procedure

The equipment under test is placed in an environmental chamber. The antenna port of the Equipment Under Test is directly coupled to the input of the measurement equipment through a specialized RF connector. A power supply is attached as the primary voltage supply.

Frequency measurements are made at the extremes of the temperature range -30º C to +60º C and at intervals of 10º C with the primary supply voltage set to the nominal battery operating voltage. A period of time sufficient to stabilize all components of the equipment is allowed at each frequency measurement. The maximum variation of frequency is measured.

At room temperature, the primary supply voltage is reduced to the battery operating endpoint of the equipment under test. The maximum variation of frequency is measured.

Measurement Results

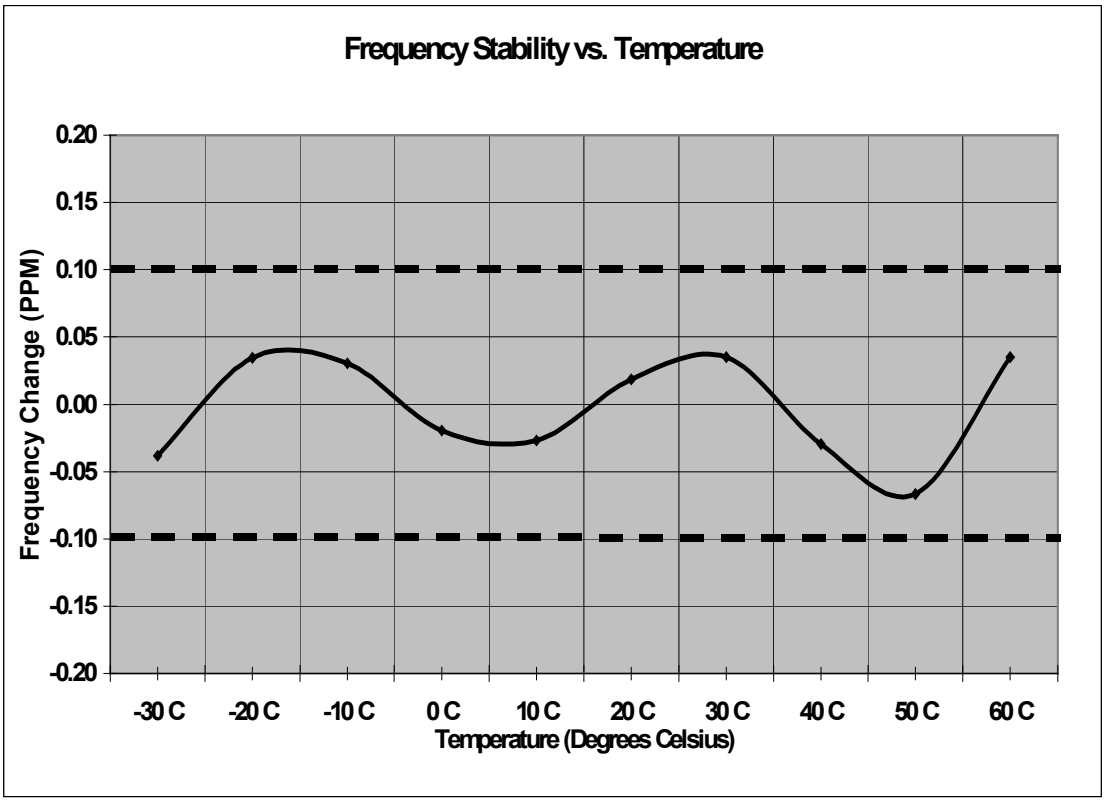
Attached

Measurement Results
Modulation: GSM 850

Frequency Stability

Mode:	GSM 850	**Operating Frequency:**	836.6 MHz
Channel:	190	**Deviation Limit (PPM):**	0.1ppm

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-32.00**	**-0.038**	100%	3.55
-20 C	**28.80**	**0.034**	100%	3.55
-10 C	**25.50**	**0.030**	100%	3.55
0 C	**-16.25**	**-0.019**	100%	3.55
10 C	**-22.30**	**-0.027**	100%	3.55
20 C	**15.40**	**0.018**	100%	3.55
30 C	**29.20**	**0.035**	100%	3.55
40 C	**-24.60**	**-0.029**	100%	3.55
50 C	**-55.60**	**-0.066**	100%	3.55
60 C	**29.40**	**0.035**	100%	3.55
20 C	**-18.80**	**-0.022**	Battery Endpoint	3.35

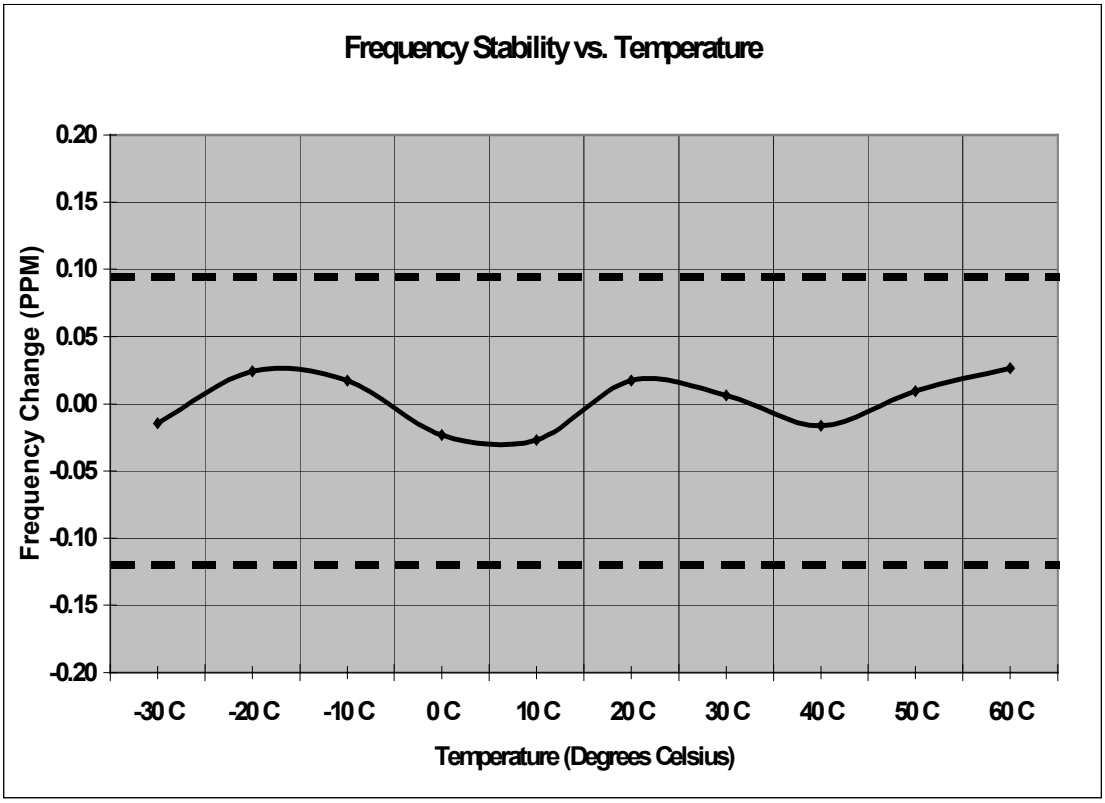


Measurement Results
Modulation: GSM 1900

Frequency Stability

Mode:	GSM 1900	**Operating Frequency:**	1880.0 MHz
Channel:	661	**Deviation Limit (PPM):**	0.1ppm

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-27.12**	**-0.014**	100%	3.55
-20 C	**45.60**	**0.024**	100%	3.55
-10 C	**32.10**	**0.017**	100%	3.55
0 C	**-43.60**	**-0.023**	100%	3.55
10 C	**-50.40**	**-0.027**	100%	3.55
20 C	**32.60**	**0.017**	100%	3.55
30 C	**11.40**	**0.006**	100%	3.55
40 C	**-30.60**	**-0.016**	100%	3.55
50 C	**17.40**	**0.009**	100%	3.55
60 C	**49.80**	**0.026**	100%	3.55
20 C	**43.20**	**0.023**	Battery Endpoint	3.35



FIELD STRENGTH OF EMISSIONS FROM UNINTENTIONAL RADIATORS

CFR Part 15.109

Measurement Procedure

The equipment under test is placed inside the semi-anechoic chamber on a wooden table at the turntable center. For each radiated emission, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum peak reading on the spectrum analyzer. The radiated emissions are then measured using an EMI receiver employing a CISPR quasi-peak detector function below 1000 MHz and an average detector function above 1000 MHz. This is repeated for both horizontal and vertical polarizations of the receive antenna. A fully charged battery was used for the supply voltage.

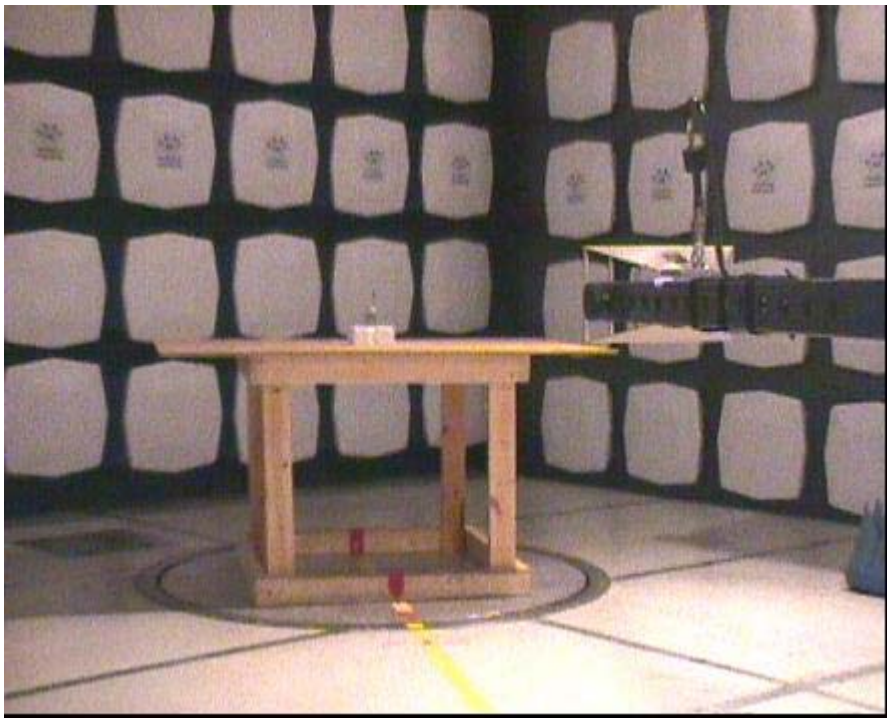
The field strength of each radiated emission is calculated by correcting the EMI receiver level for cable loss, amplifier gain, and antenna correction factors.

Field Strength (dBuV/m) = EMI Receiver Level (dBuV) + Cable Loss (dB) - Amplifier Gain (dB) + Antenna Correction Factor (1/m)

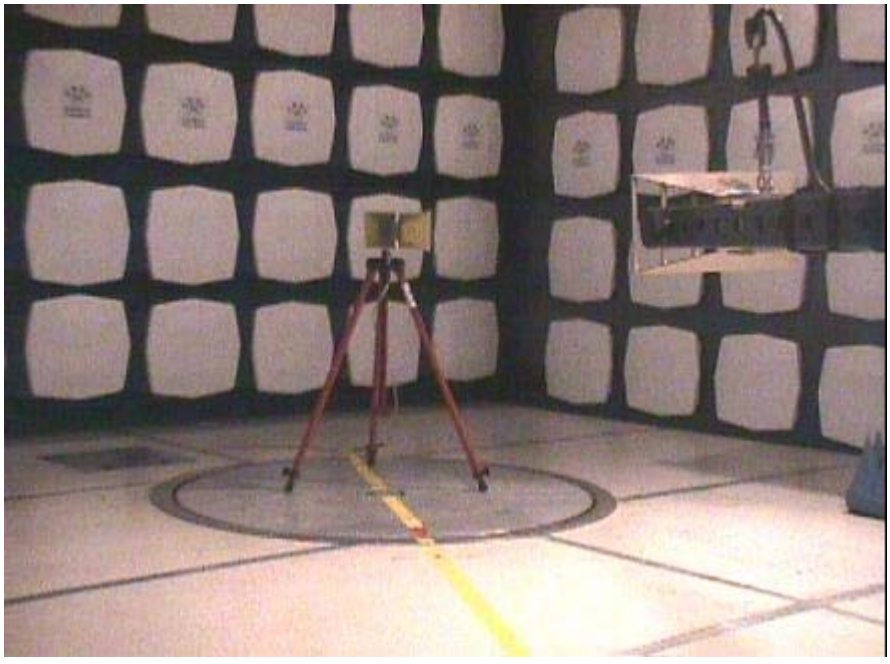
Measurement Results

The magnitude of all spurious emissions in GSM 850 and GSM 1900 modes were attenuated below the noise floor of the measurement equipment and therefore not reported.

Appendix A – Radiated Emissions Test Setup Photos



A.1 Radiated Emissions Measurement



A.2 Substitution Measurement

End of Test Report