PERSONAL COMMUNICATIONS SECTOR

PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

EMC TEST REPORT

Test Report Number – 10361-1

Report Date – April 14, 2003

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: Mark Kien

Title: Electrical Engineer Date : 04/14/03

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Test Report Details

Field Strength Tests Performed By:	Underwriters Laboratory Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 PH (847) 272-8800 Fax (847) 272-8129 FCC Registration Number: 91044 Industry Canada Number: IC2180
All Other Tests Performed By:	Motorola Personal Communications Sector Product Safety and Compliance Group 600 North US Hwy 45 Libertyville, IL 60048 PH (847) 523-3642 Fax (847) 523-8274 FCC Registration Number: 100000 Industry Canada Number: IC3908
Tests Requested By:	Motorola Inc. Personal Communications Sector 600 North US Hwy 45 Libertyville, IL 60048
Product Type:	Data Module
Signaling Capability:	GSM 850, GSM 1900
Model Number:	G20
Serial Numbers:	PGE00070, PGE00022, PGE00033 PGE00032
Received Date:	3/31/2003
Testing Start Date:	3/31/2003
Testing Complete Date:	4/9/2003

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: TIA EIA 98-C, ANSI 63.4 2000, RSS-132, RSS-133

Summary of Testing

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

Test #	Test Name	Margin with respect to the Limit
1	RF Power Output	NA
2	Occupied Bandwidth	See Plots
3	Spurious Emissions at Antenna Terminal	16.7 dB
4	Field Strength of Spurious Emissions	13.4 dB
5	Frequency Stability	62.2 Hz
6	Field Strength of Spurious Emissions from Unintentional Radiators	4.4 dB

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 with a development interface used to simulate the user interface to the EUT. This configuration is representative of typical use.

Measuring Equipment and Calibration Information

Manufacturer Name	Item Name Description	Model #	Serial Number	Calibration Due Date
Agilent	EMC Analyzer	E7405A	US53944019	11/6/03
Hewlett Packard	QP Adapter	85650A	2811A01069	1/15/04
Hewlett Packard	S/A Display	8566B	2542A12974	1/15/04
Hewlett Packard	S/A	8566B	2637A03376	1/15/04
Hewlett Packard	RF Preselector	85685A	2810A00692	1/15/04
Rohde & Schwarz	S/A	FSEK20	DE2525315	1/14/04
EMCO	Horn Antenna 1-18GHz	3115	8812-3032	5/23/03
EMCO	Horn Antenna 1-18GHz	3115	2638	7/20/03
EMCO	Horn Antenna 18-26.5GHz	3160-09	9904-1165	N/A*
Chase	Bi-Con Antenna 30-300MHz	VBA6106A	1246	6/18/03
Chase	Log-Periodic Antenna	UPA6108	1120	6/20/03
Weinschel	Attenuator Kit – 10, 6 dB	AS6	6675	10/9/03
Thermotron	Environmental Chamber	S-4	31580	12/19/03
Hewlett Packard	System DC Power Supply	66311B	US38447252	10/18/03
Agilent	Wireless Communication Test Set	8960 Series 10	GB42360906	9/10/03
Giga-tronics	Universal Power Meter	8651A	8650508	7/2/2003
Giga-tronics	Power Sensor	80701A	1834031	7/2/2003

* Per ANSI C63.5-1998 (Revision of ANSI C63.5-1988) pg. 6, under 5.1 General "It is unnecessary to calibrate standard gain horn antennas for use above 1GHz; rather, they are used as gain standards to calibrate other antennas (see 12.3.1 of IEEE Std 149-1979)."

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 Modulated Average Power (MAP) mode. The power output is measured for all channels.

CFR Part 2.1046

Measurement Results

* Data supplied by SAR Lab

GSM 800

Frequency (MHz)	Power (dBm)
824.20	27.99
836.60	27.77
848.80	27.93

GSM 1900

Frequency (MHz)	Power (dBm)
1850.20	28.35
1880.00	28.37
1909.80	29.07

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.

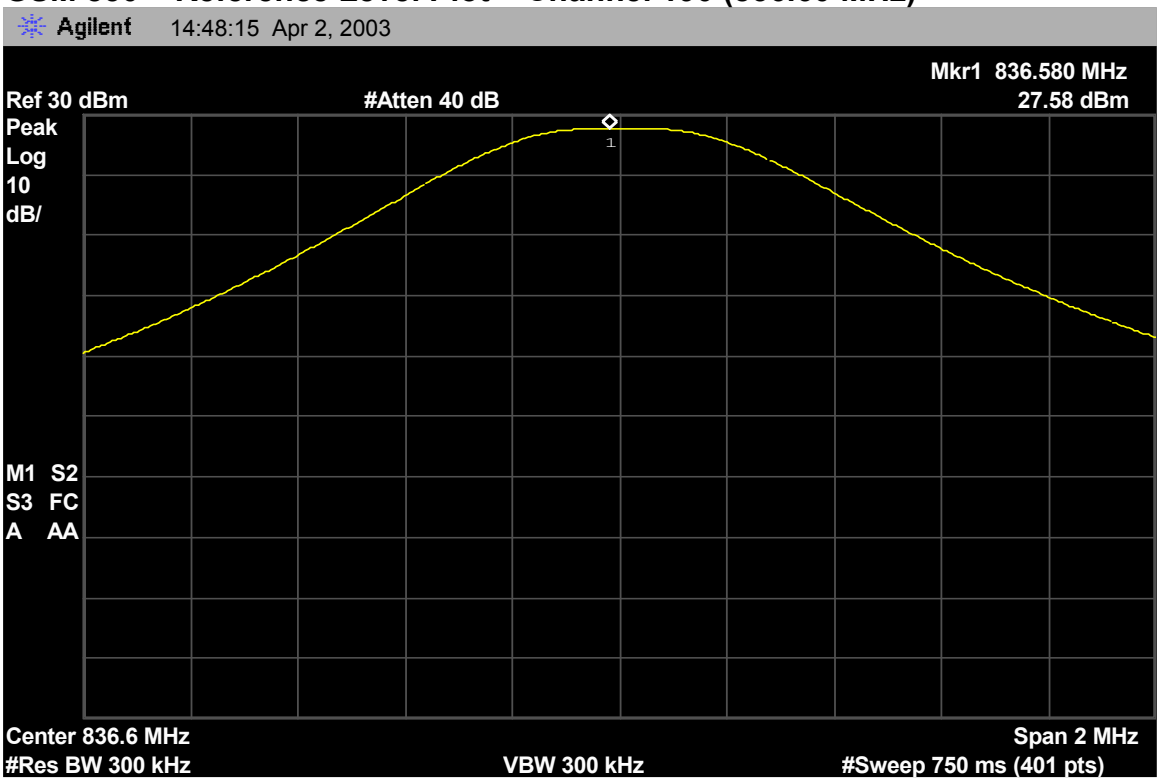
The middle channel within the designated frequency block was measured. For digital modulation, the lower and upper band edge plots are displayed.

Measurement Results

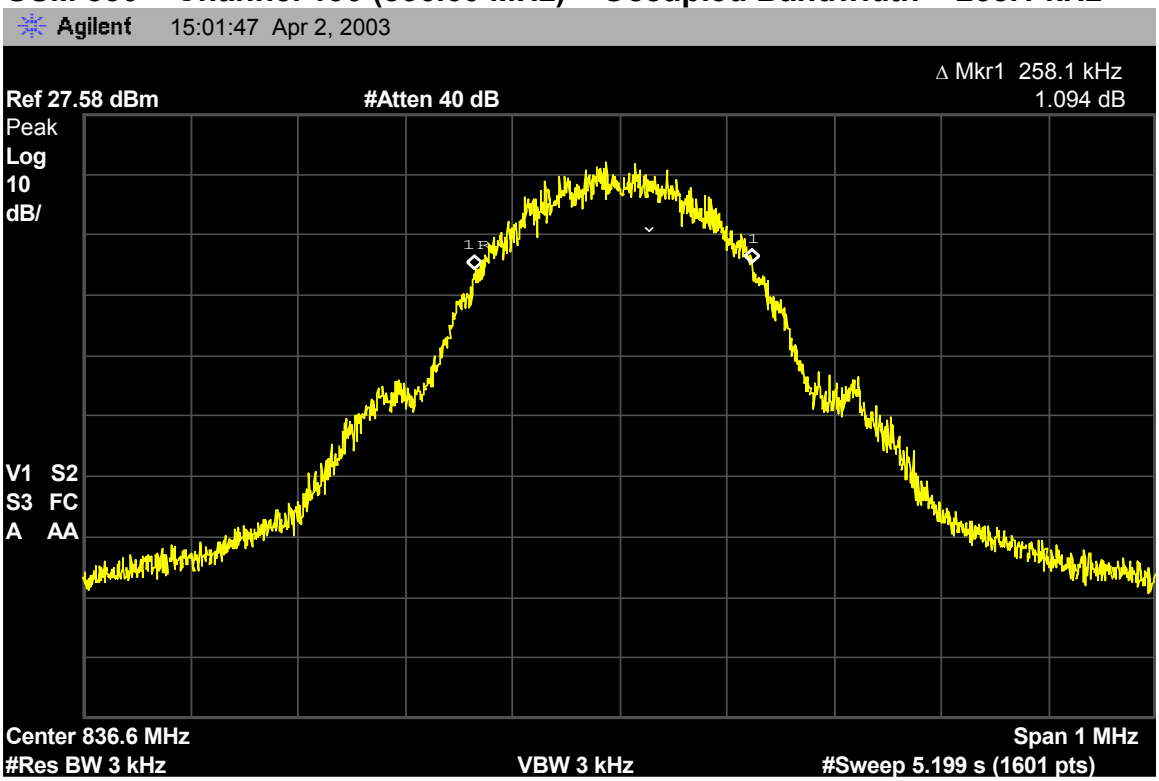
Attached

Measurement Results – GSM 850

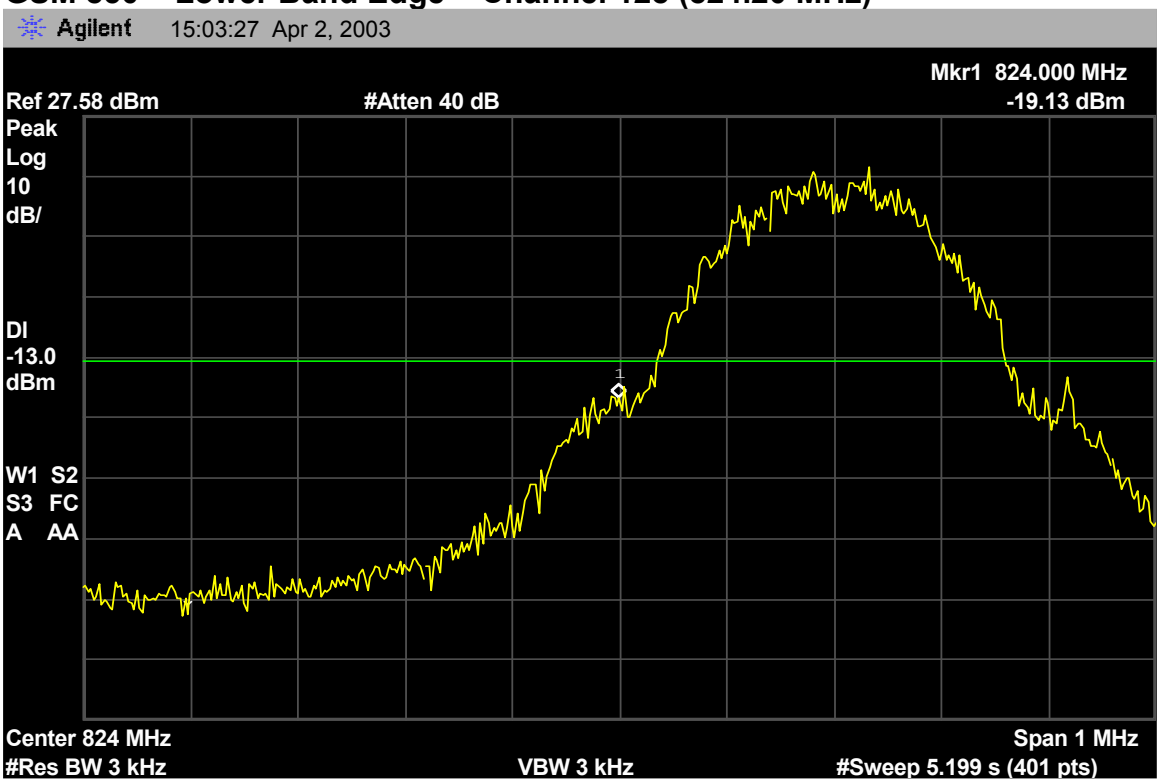
GSM 850 – Reference Level Plot – Channel 190 (836.60 MHz)



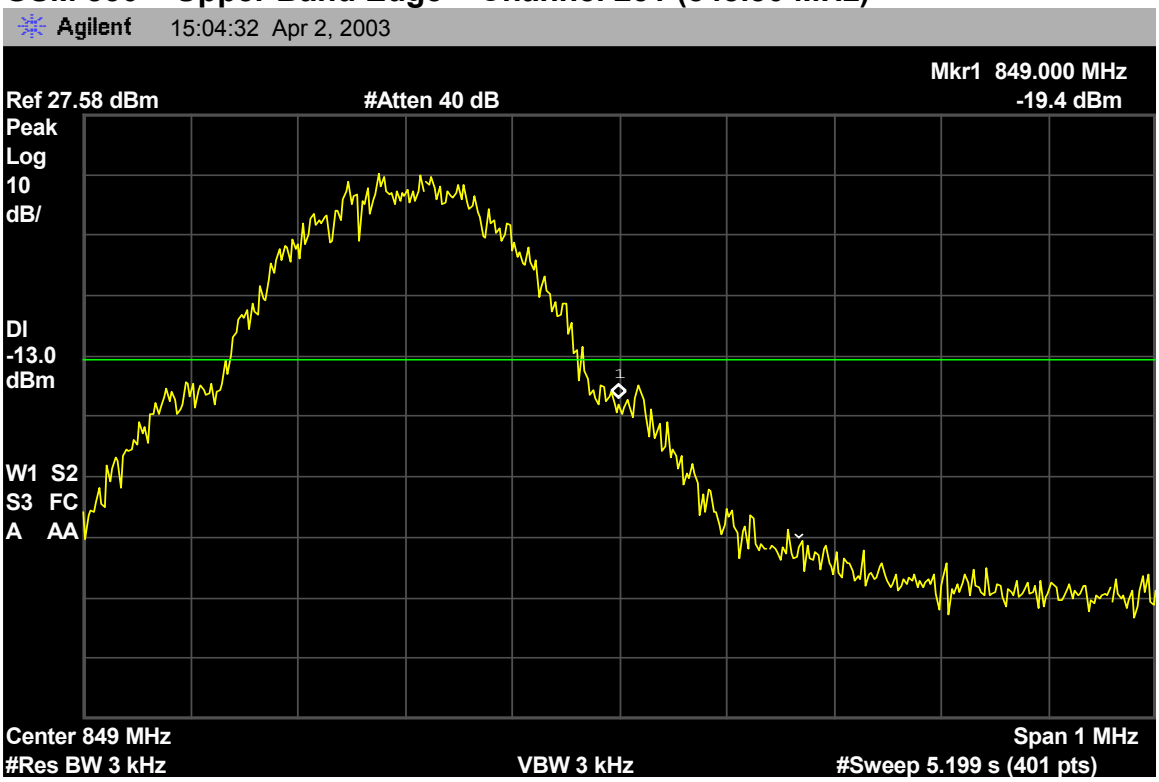
GSM 850 – Channel 190 (836.60 MHz) – Occupied Bandwidth = 258.1 kHz



GSM 850 – Lower Band Edge – Channel 128 (824.20 MHz)

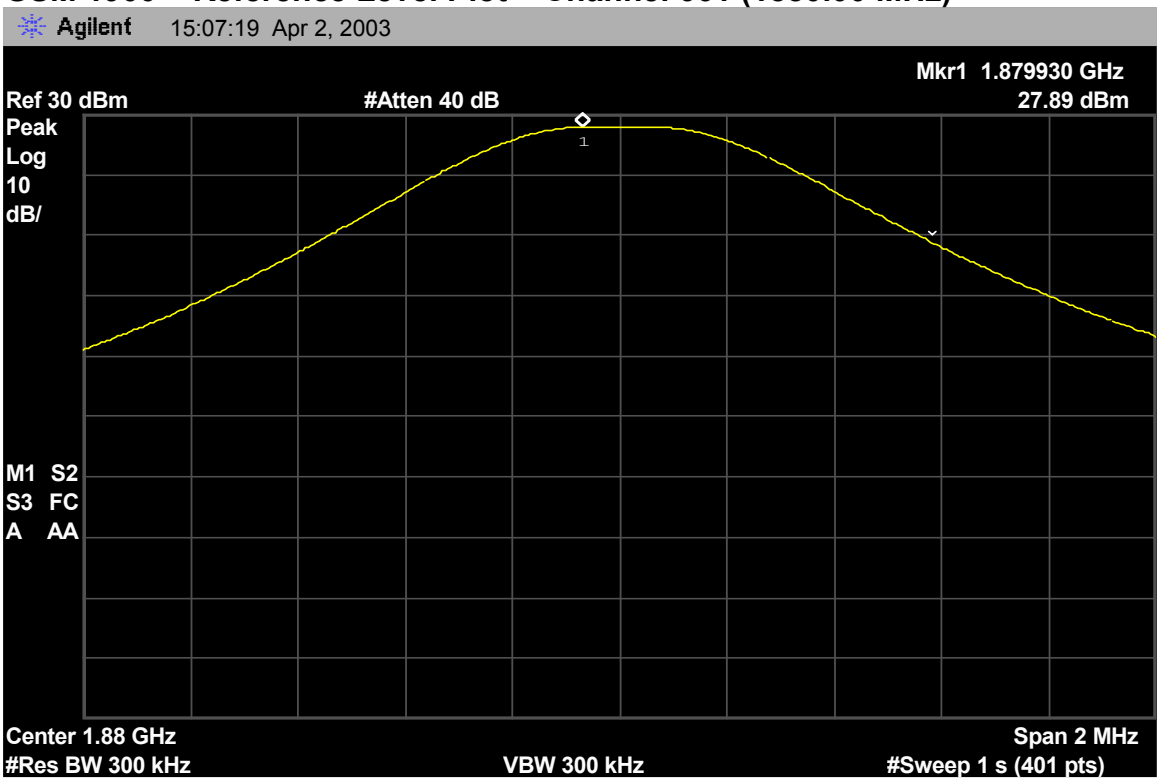


GSM 850 – Upper Band Edge – Channel 251 (848.80 MHz)

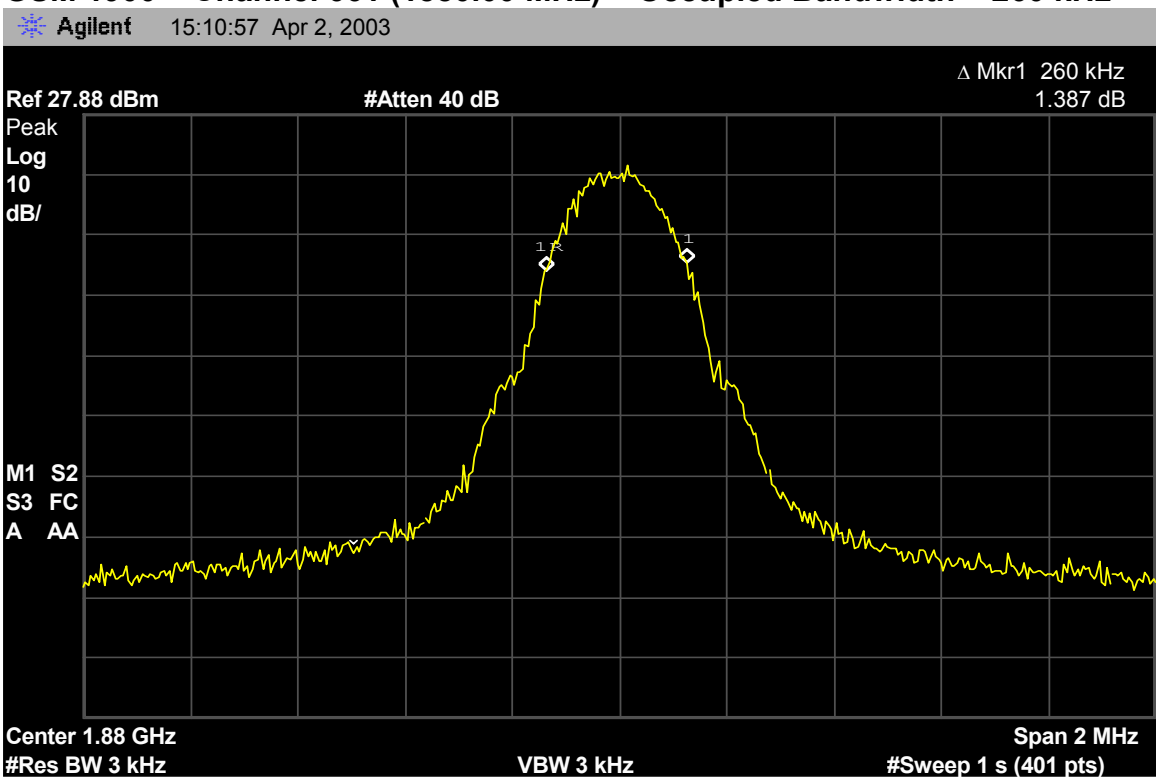


Measurement Results – TDMA 1900

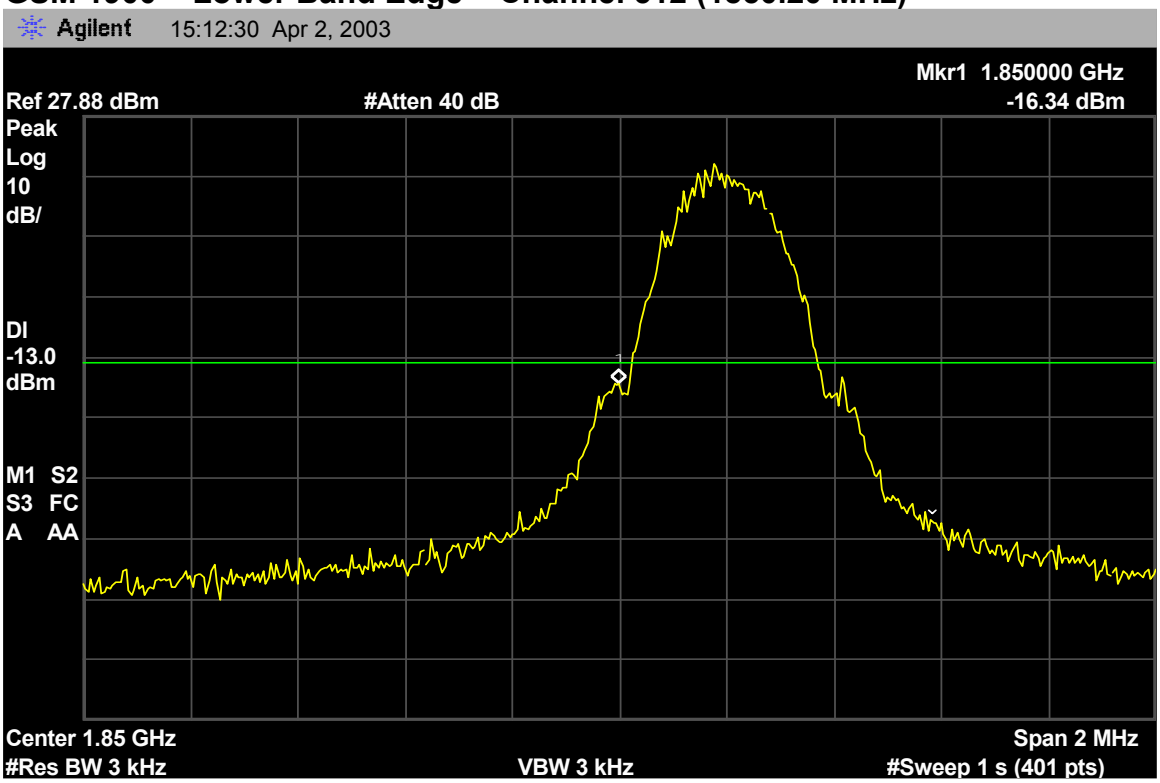
GSM 1900 – Reference Level Plot – Channel 661 (1880.00 MHz)



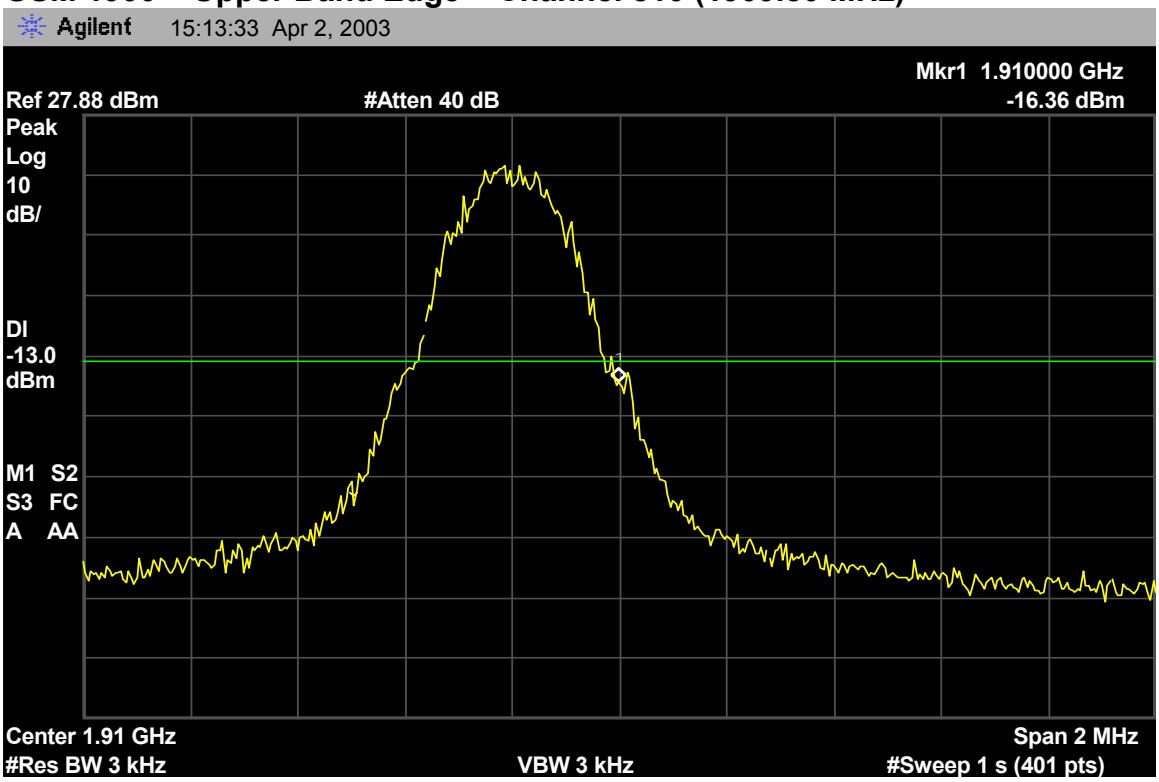
GSM 1900 – Channel 661 (1880.00 MHz) – Occupied Bandwidth = 260 kHz



GSM 1900 – Lower Band Edge – Channel 512 (1850.20 MHz)



GSM 1900 – Upper Band Edge – Channel 810 (1909.80 MHz)



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.

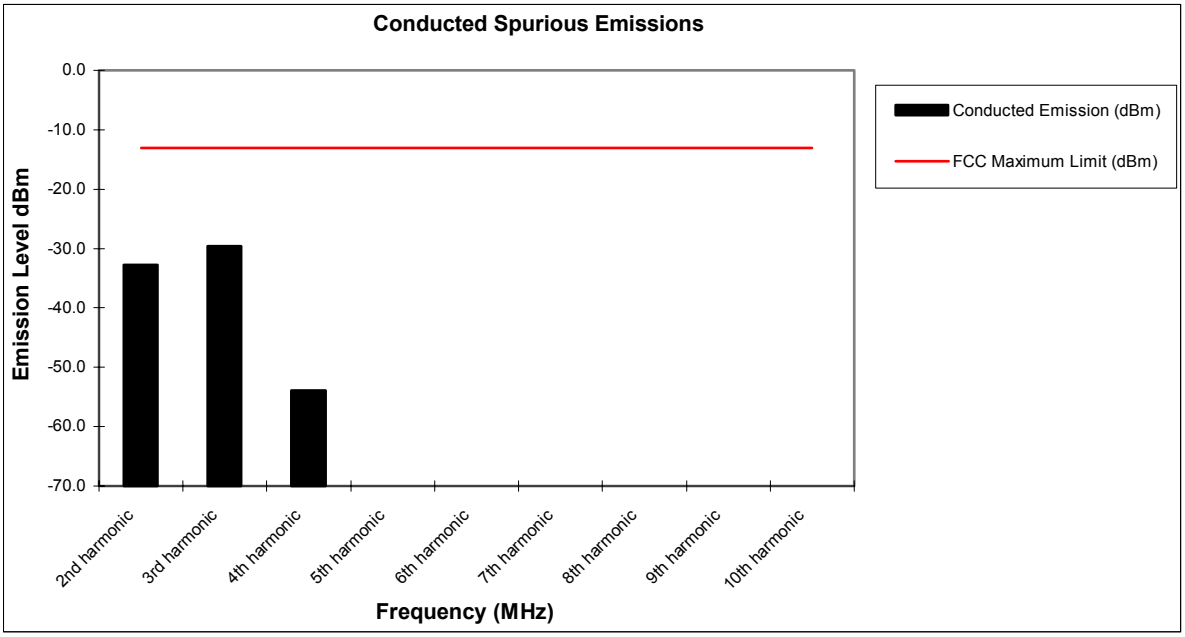
Measurements were made with the phone tuned to low, middle and high frequency within the valid mobile transmit frequency band. The worst case emissions of all three frequency configurations can be found below. Measurements for Spurious emission levels were also measured in the cellular base station frequency range (869-894 MHz).

Measurement Results

Attached

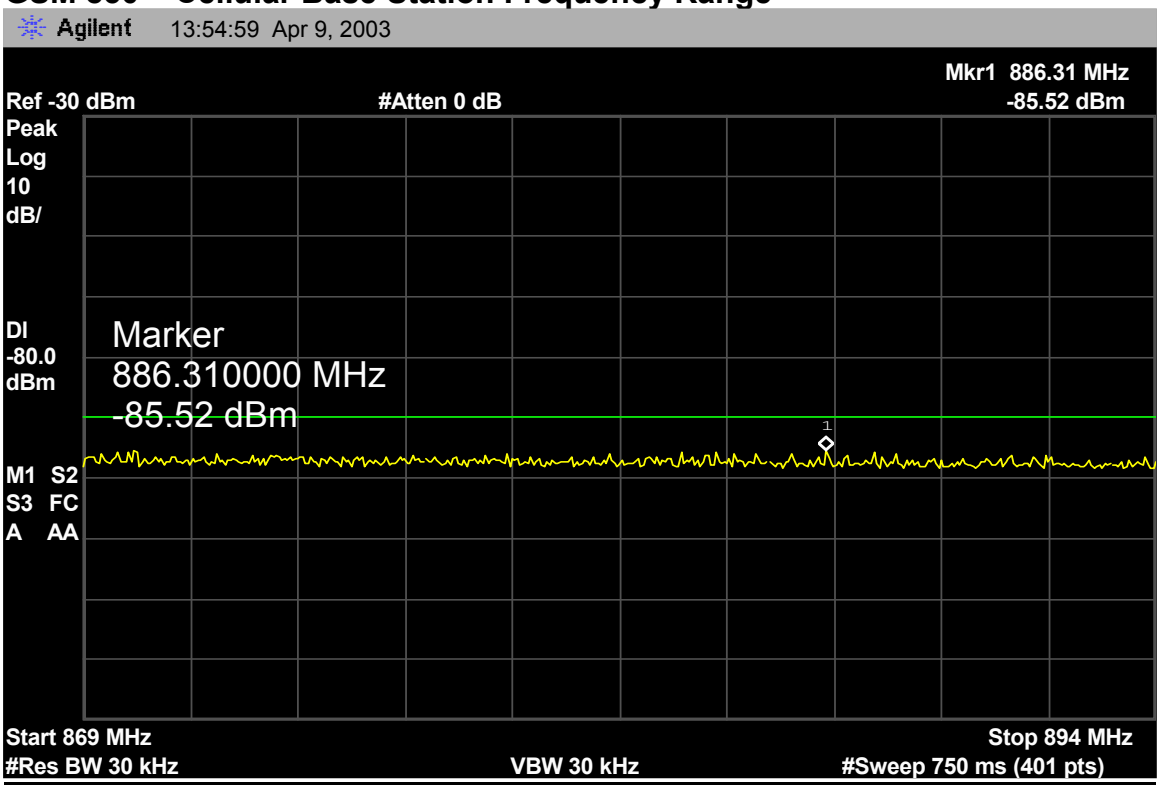
Measurement Results
Modulation: GSM 850

Harmonic of Fundamental	FCC Maximum Limit (dBm)	Conducted Emission (dBm)
2nd harmonic	-13	-32.7
3rd harmonic	-13	-29.7
4th harmonic	-13	-54.0
5th harmonic	-13	*
6th harmonic	-13	*
7th harmonic	-13	*
8th harmonic	-13	*
9th harmonic	-13	*
10th harmonic	-13	*



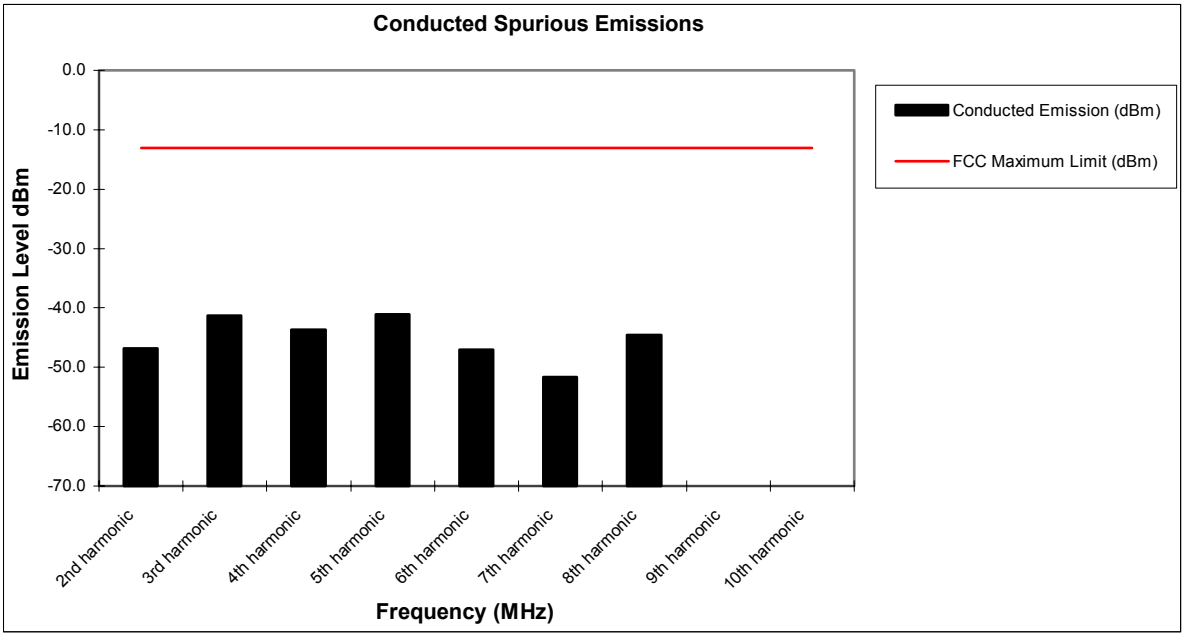
Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum was investigated from 9 kHz to the tenth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

GSM 850 – Cellular Base Station Frequency Range



Measurement Results
Modulation: GSM 1900

Harmonic of Fundamental	FCC Maximum Limit (dBm)	Conducted Emission (dBm)
2nd harmonic	-13	-46.9
3rd harmonic	-13	-41.3
4th harmonic	-13	-43.7
5th harmonic	-13	-41.1
6th harmonic	-13	-47.0
7th harmonic	-13	-51.6
8th harmonic	-13	-44.6
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.

After all the spurious emissions were investigated and reported, 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.

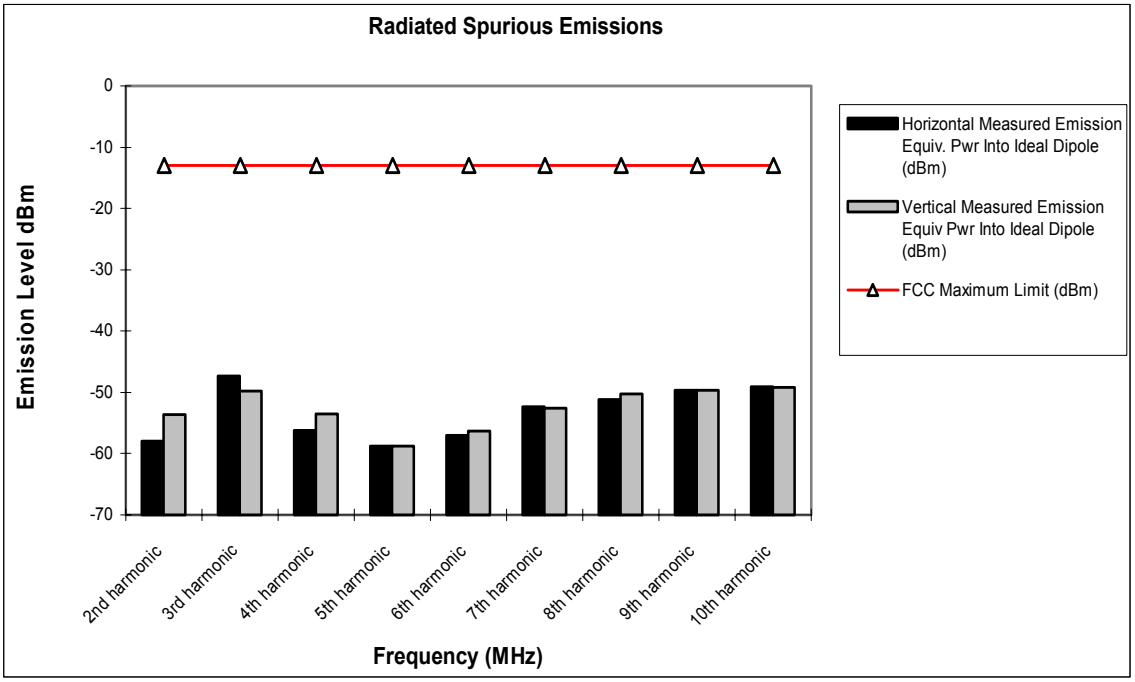
The power in dBm of each spurious emission is calculated by correcting the signal generator level for cable loss and gain of the substitution antenna referenced to a dipole. A fully charged battery was used for the supply voltage.

Measurement Results

Attached

Measurement Results
Modulation: GSM 850

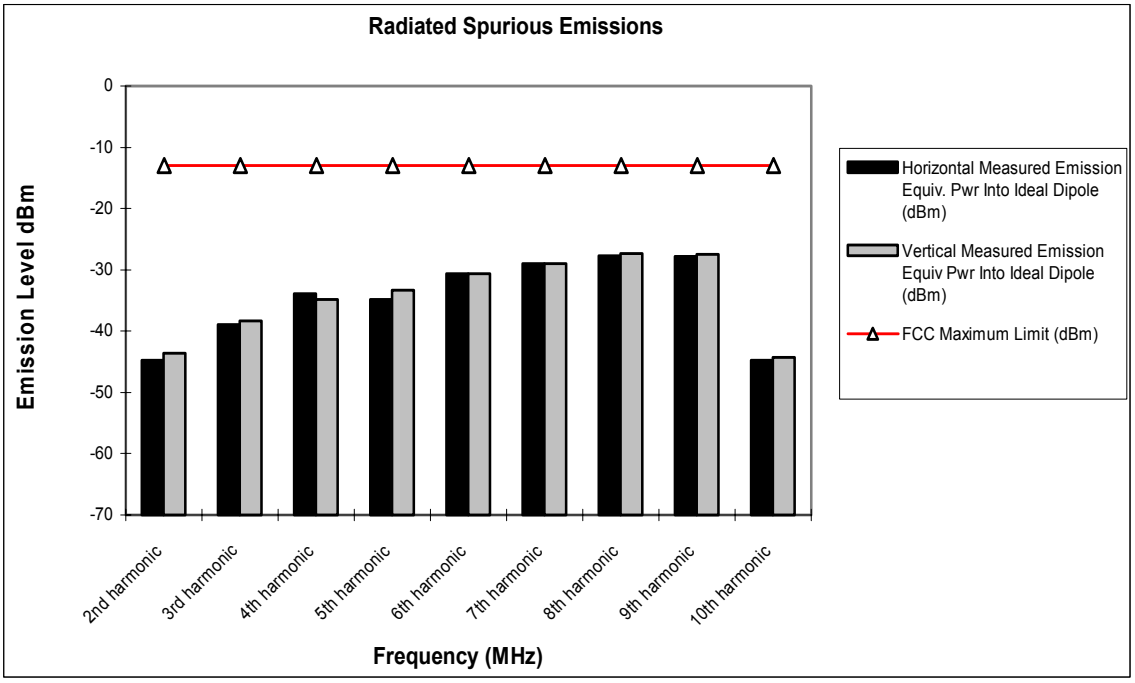
Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	-58.0	-53.6
3rd harmonic	-13	-47.3	-49.8
4th harmonic	-13	-56.2	-53.5
5th harmonic	-13	-58.8	-58.8
6th harmonic	-13	-57.0	-56.3
7th harmonic	-13	-52.4	-52.6
8th harmonic	-13	-51.2	-50.2
9th harmonic	-13	-49.7	-49.6
10th harmonic	-13	-49.1	-49.2



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 lov 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	-44.8	-43.6
3rd harmonic	-13	-38.9	-38.4
4th harmonic	-13	-33.9	-34.8
5th harmonic	-13	-34.8	-33.3
6th harmonic	-13	-30.6	-30.6
7th harmonic	-13	-29.0	-29.0
8th harmonic	-13	-27.7	-27.4
9th harmonic	-13	-27.8	-27.5
10th harmonic	-13	-44.7	-44.3



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 lov 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

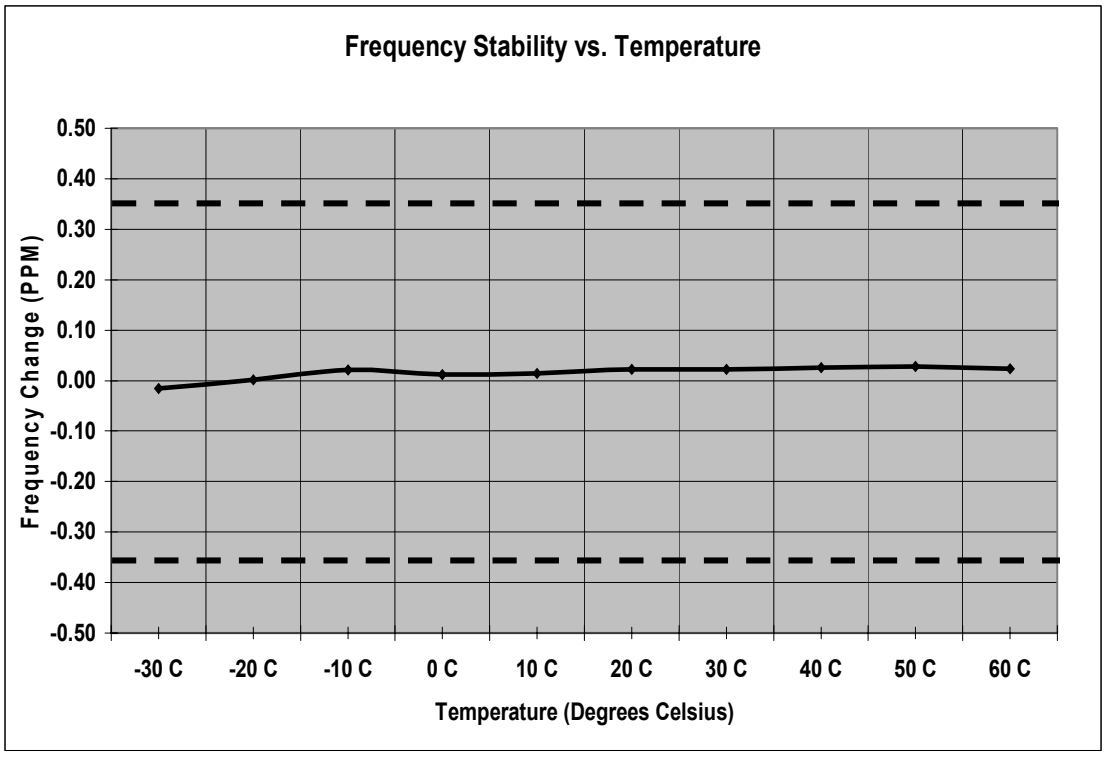
Attached

Measurement Results
Modulation: GSM 850

Frequency Stability

Mode: GSM 850 **Operating Frequency:** 836.6 MHz
Channel: 190 **Deviation Limit (PPM):** 0.359ppm (+/-300 Hz)

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-12.92**	**-0.015**	100%	3.60
-20 C	**1.06**	**0.001**	100%	3.60
-10 C	**17.74**	**0.021**	100%	3.60
0 C	**10.34**	**0.012**	100%	3.60
10 C	**11.60**	**0.014**	100%	3.60
20 C	**18.75**	**0.022**	100%	3.60
30 C	**18.50**	**0.022**	100%	3.60
40 C	**21.60**	**0.026**	100%	3.60
50 C	**23.41**	**0.028**	100%	3.60
60 C	**19.70**	**0.024**	100%	3.60
20 C	**24.24**	**0.029**	85%	3.00

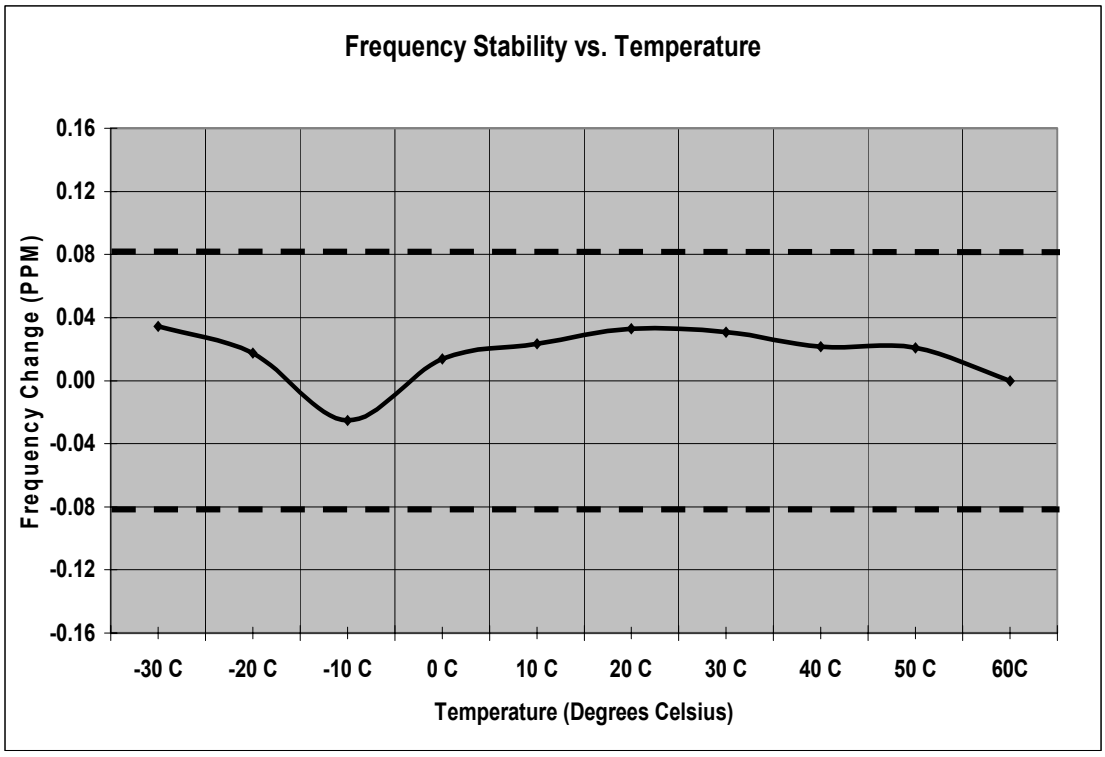


Measurement Results
Modulation: GSM 1900

Frequency Stability

Mode: GSM 1900 **Operating Frequency:** 1880 MHz
Channel: 661 **Deviation Limit (PPM):** 0.1ppm

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	**64.76**	**0.034**	100%	3.60
-20 C	**32.91**	**0.018**	100%	3.60
-10 C	**-47.21**	**-0.025**	100%	3.60
0 C	**26.28**	**0.014**	100%	3.60
10 C	**43.86**	**0.023**	100%	3.60
20 C	**62.20**	**0.033**	100%	3.60
30 C	**57.70**	**0.031**	100%	3.60
40 C	**40.51**	**0.022**	100%	3.60
50 C	**38.83**	**0.021**	100%	3.60
60C	**49.62**	**0.000**	100%	3.60
20 C	**37.00**	**0.020**	85%	3.00



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.

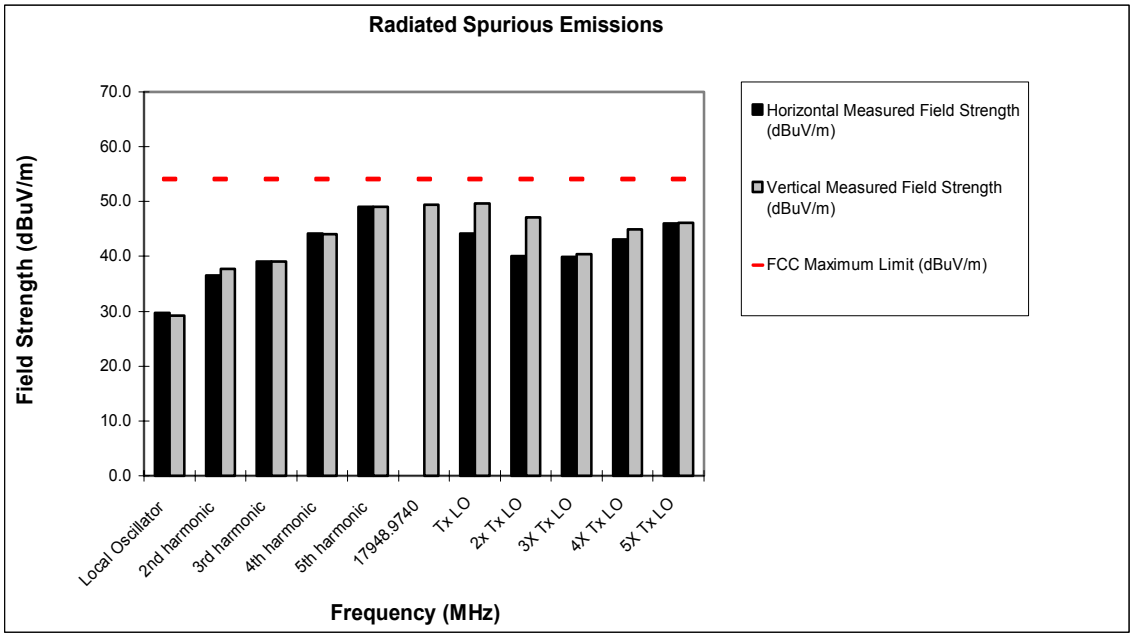
Field Strength (dBuV/m) = EMI Receiver Level (dBuV) + Cable Loss (dB) - Amplifier Gain (dB) + Antenna Correction Factor (1/m)

Measurement Results

Attached

Measurement Results
Modulation: GSM 850

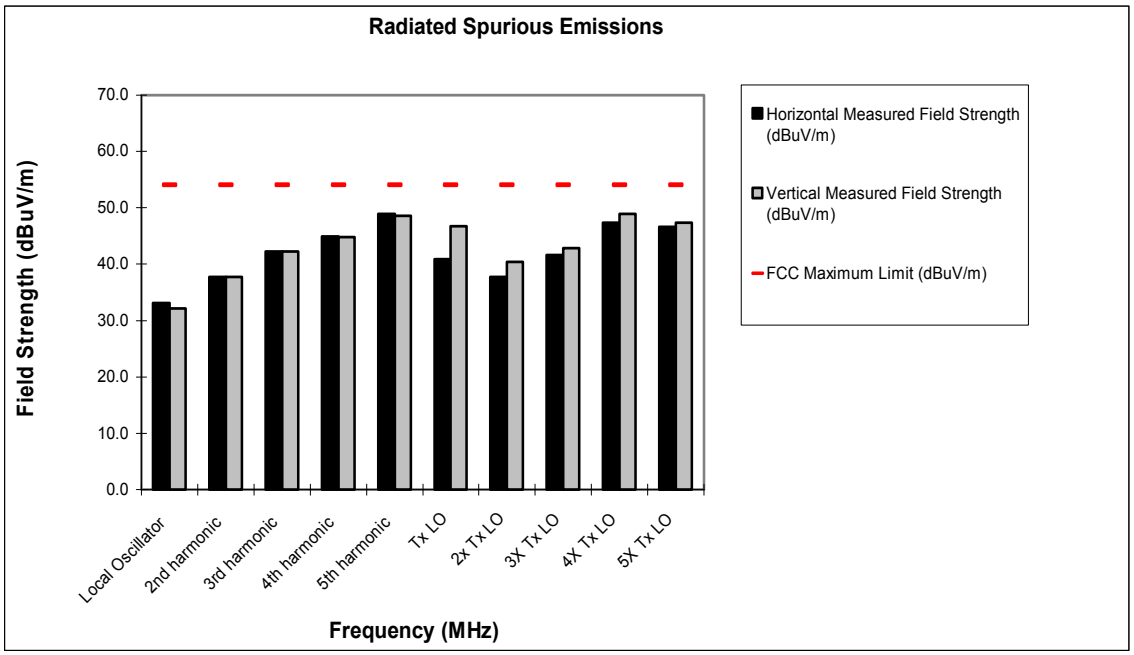
Frequency (MHz)	FCC Maximum Limit (dBuV/m)	Horizontal Measured Field Strength (dBuV/m)	Vertical Measured Field Strength (dBuV/m)
Local Oscillator	54	29.7	29.2
2nd harmonic	54	36.5	37.8
3rd harmonic	54	39.1	39.1
4th harmonic	54	44.2	44.1
5th harmonic	54	49.1	49.1
17948.9740	54	*	49.4
Tx LO	54	44.2	49.6
2x Tx LO	54	40.0	47.1
3X Tx LO	54	40.0	40.4
4X Tx LO	54	43.2	44.9
5X Tx LO	54	46.0	46.2



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 frequency for the lo and high channels.

Measurement Results
Modulation: GSM 1900

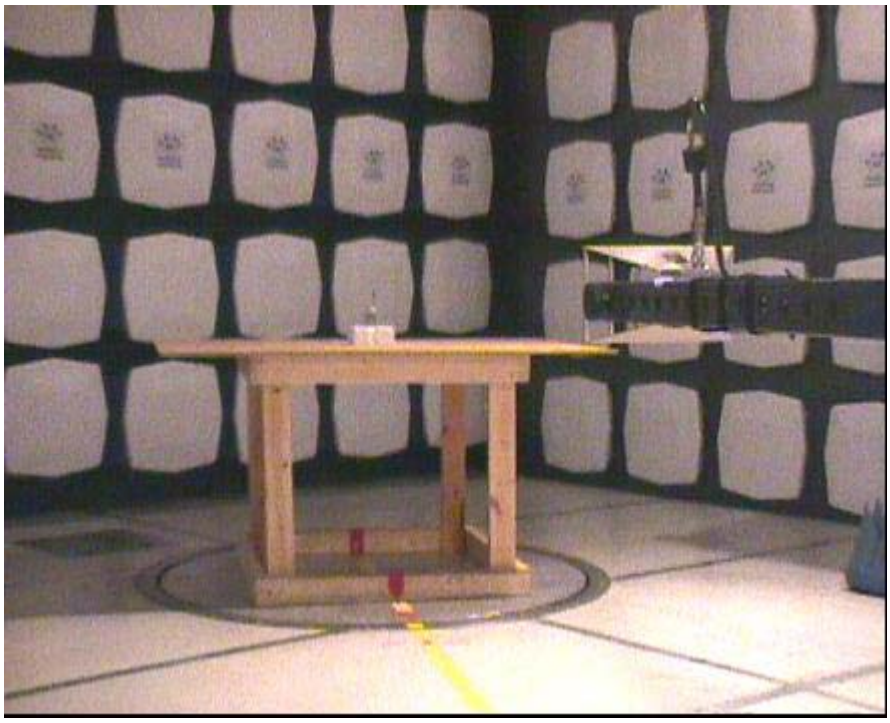
Frequency (MHz)	FCC Maximum Limit (dBuV/m)	Horizontal Measured Field Strength (dBuV/m)	Vertical Measured Field Strength (dBuV/m)
Local Oscillator	54	33.1	32.2
2nd harmonic	54	37.8	37.7
3rd harmonic	54	42.2	42.3
4th harmonic	54	45.0	44.9
5th harmonic	54	49.0	48.6
Tx LO	54	40.9	46.7
2x Tx LO	54	37.7	40.4
3X Tx LO	54	41.6	42.9
4X Tx LO	54	47.3	48.9
5X Tx LO	54	46.7	47.4



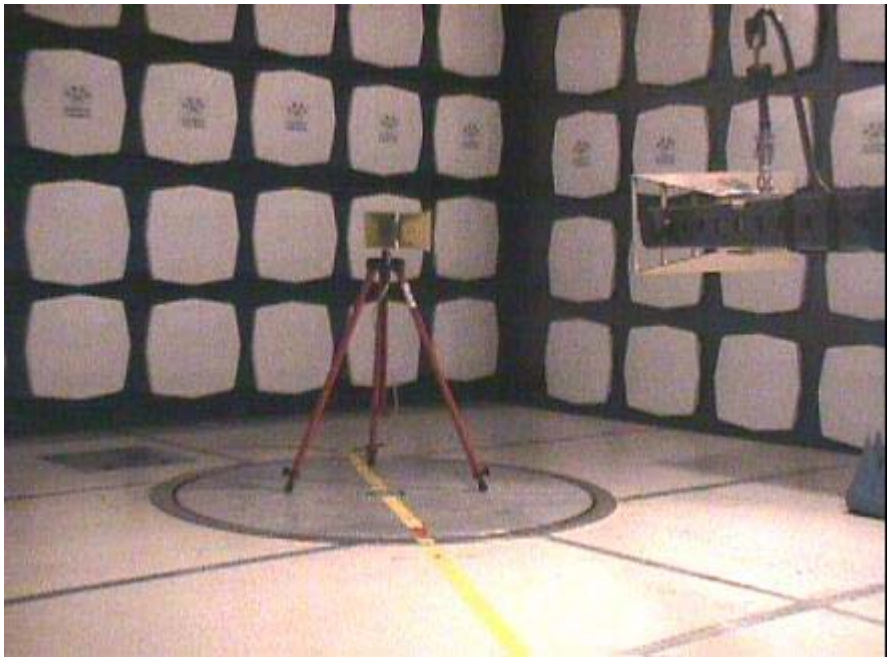
Notes:
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. Each emission reported reflects the highest absolute level at the specific frequency for the lo and high channels.

Appendix A – Radiated Emissions Test Setup Photos

Note: Photos are representative of the test house setup used.



A.1 Radiated Emissions Measurement



A.2 Substitution Measurement

End of Test Report