



MOTOROLA

PERSONAL COMMUNICATIONS SECTOR

**PRODUCT SAFETY AND COMPLIANCE
EMC LABORATORY**

EMC TEST REPORT

Test Report Number – 8543-1

Report Date – October 4, 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 : 10/4/2002

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Table of Contents

<u>Description</u>	<u>Page</u>
Test Report Details	3
Applicable Standards	3
Summary of Testing	4
General and Special Conditions	4
Equipment and Cable Configurations	4
Measuring Equipment and Calibration Information	5
Measurement Procedures and Data	
RF Power Output	6
Radiated Power (ERP)	7
Spurious Emissions at Antenna Terminals	8
GSM 850 Tabular and Graphical Data	9
GSM 850 Cellular Base Station Frequency Range Plot	10
GSM 1900 Tabular and Graphical Data	11
Field Strength of Spurious Emissions	12
GSM 850 Tabular and Graphical Data	13
GSM 1900 Tabular and Graphical Data	14
Appendix A - Radiated Emissions Test Setup Photos	
Figure A.1 – Radiated Emissions Measurement	15
Figure A.2 – Substitution Measurement	15

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
 1500 Gateway Boulevard
 Boynton Beach, FL 33426

Product Type: Cellular Phone

Signaling Capability: GSM 850, GSM 1900

Model Number: SUG2491AA

Serial Numbers: T7Z0023

Received Date: 9/26/2002

Testing Start Date: 10/1/2002

Testing Complete Date: 10/2/2002

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:

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

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

Summary of Testing

Test #	Test Name	Pass/Fail
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	NA
3	Spurious Emissions at Antenna Terminal	Pass
4	Field Strength of Spurious Emissions	Pass

Test #	Test Name	Margin with respect to the Limit
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	NA
3	Spurious Emissions at Antenna Terminal	23.4 dB
4	Field Strength of Spurious Emissions	29.3 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 22° 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.

Measuring Equipment and Calibration Information

Manufacturer	Item	Item Version/	Serial	CALIBRATION
Name	Name	Model #	Number	DUE DATE
	Description			
Rohde & Schwarz	EMI Test Receiver	ESI26	838386/010	2/26/2003
Hewlett Packard	EMC Analyzer	E7405	US3944019	10/11/2002
Hewlett Packard	RF Amplifier	8347A	3307A02001	12/20/2002
Hewlett Packard	Pre-Amplifier	8449B	3008A01343	12/20/2002
A.H. Systems Inc.	DRG Horn Antenna	SAS-200/571	265	8/28/2003
A.H. Systems Inc.	DRG Horn Antenna	SAS-200/571	365	11/14/2002
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
ETS	Biconical Antenna	3110B	3370	10/16/2002
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	10/10/2002
Attenuator	Weinschel	AS-6	6677	11/10/2002
Rohde & Schwarz	Mobile Test Set	CMD80	DE29008	10/18/2002
Hewlett Packard	Signal Generator	83623B	3844A01195	1/16/2003
Thermotron	Environmental Chamber	S-4	31580	12/20/2002

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	29.37
836.4	29.43
848.8	29.32

GSM 1900

Frequency (MHz)	Power (dBm)
1850.2	29.36
1880.0	29.42
1909.8	29.38

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	29.07 dBm
836.4 MHz	29.45 dBm
848.8 MHz	29.71 dBm.

GSM 1900:

1850.2 MHz:	30.91 dBm
1880.0 MHz:	31.62 dBm
1909.8 MHz:	31.37 dBm

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

GSM 850 mode: Max EIRP is 29.71 dBm (**max ERP is 27.61 dBm**)

PCS 1900 mode: **Max EIRP is 31.62 dBm** (max ERP is 29.52 dBm)

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.

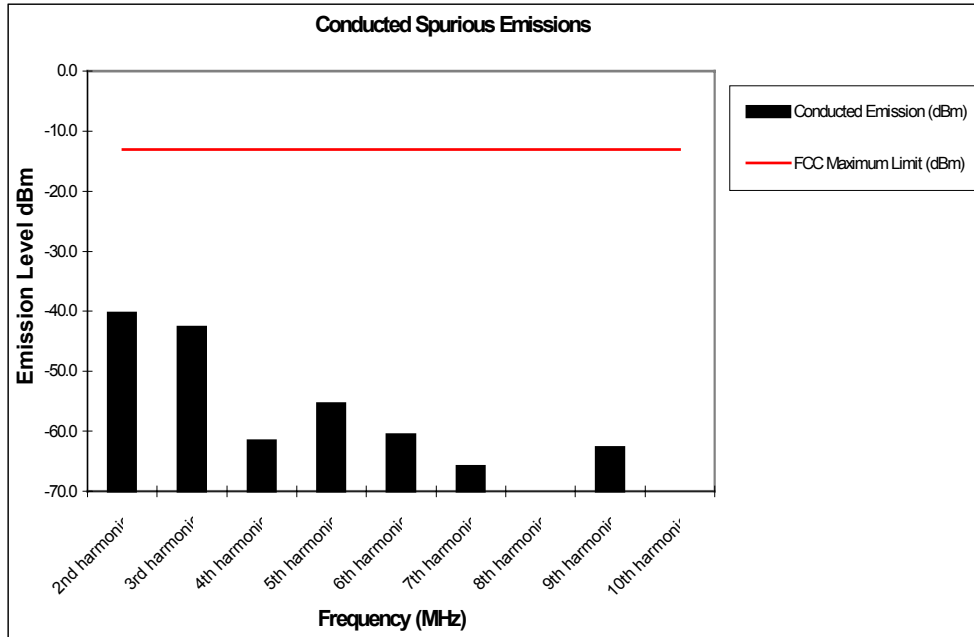
Measurements were made at the low, middle, and high channels within the frequency band and within the base station frequency range (869-894 MHz) for cellular.

Measurement Results

Attached

Measurement Results
Modulation: GSM 850

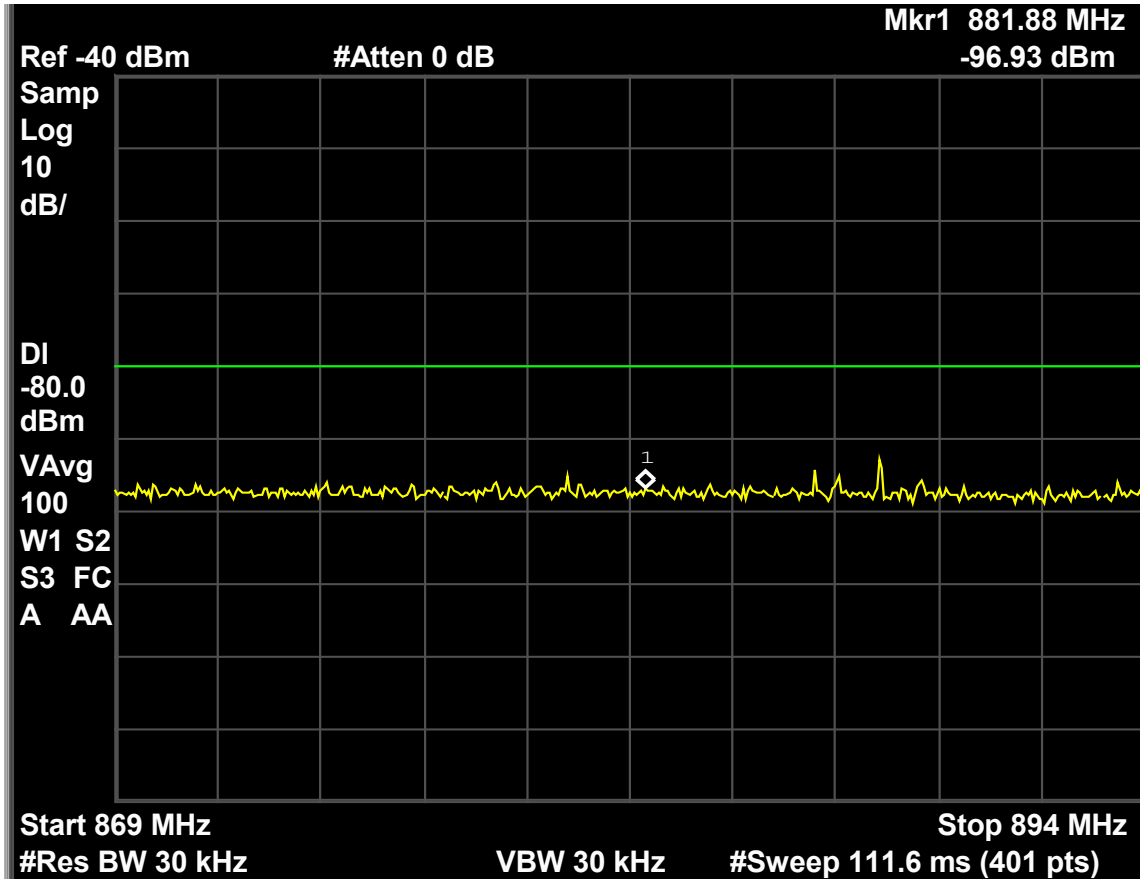
Harmonic of Fundamental	FCC Maximum Limit (dBm)	Conducted Emission (dBm)
2nd harmonic	-13	-40.3
3rd harmonic	-13	-42.6
4th harmonic	-13	-61.6
5th harmonic	-13	-55.4
6th harmonic	-13	-60.5
7th harmonic	-13	-65.8
8th harmonic	-13	-71.4
9th harmonic	-13	-62.7
10th harmonic	-13	*



Notes:

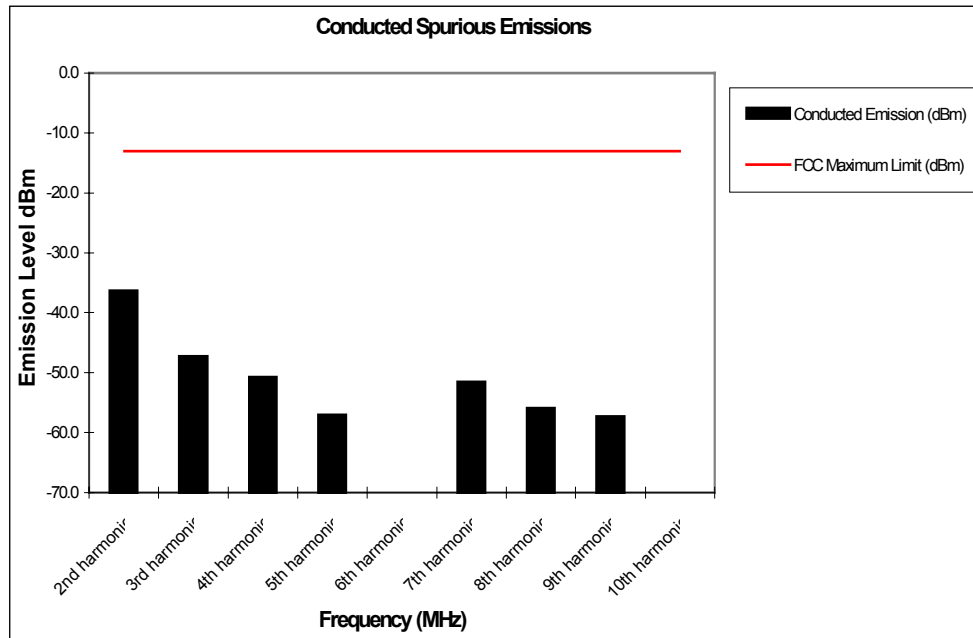
1. * Indicates the spurious emission could not be detected due to noise limitations or ambients.
2. Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
3. The Spectrum was investigated from 9 kHz to the tenth harmonic 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	-36.4
3rd harmonic	-13	-47.3
4th harmonic	-13	-50.7
5th harmonic	-13	-57.0
6th harmonic	-13	*
7th harmonic	-13	-51.5
8th harmonic	-13	-56.0
9th harmonic	-13	-57.3
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.

Measurements were made at the middle channel within the frequency band.

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

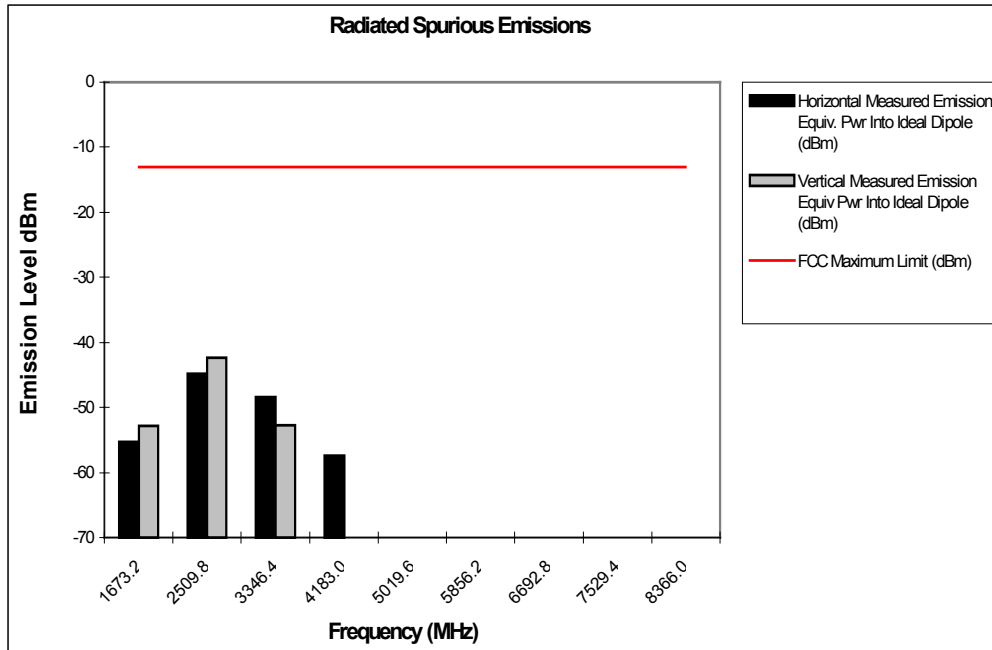
Measurement Results

Attached

Measurement Results

Modulation: GSM 850 – Channel 190 836.6 MHz

Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)
1673.2	-13	-55.3	-52.8
2509.8	-13	-44.8	-42.4
3346.4	-13	-48.4	-52.7
4183.0	-13	-57.4	*
5019.6	-13	*	*
5856.2	-13	*	*
6692.8	-13	*	*
7529.4	-13	*	*
8366.0	-13	*	*



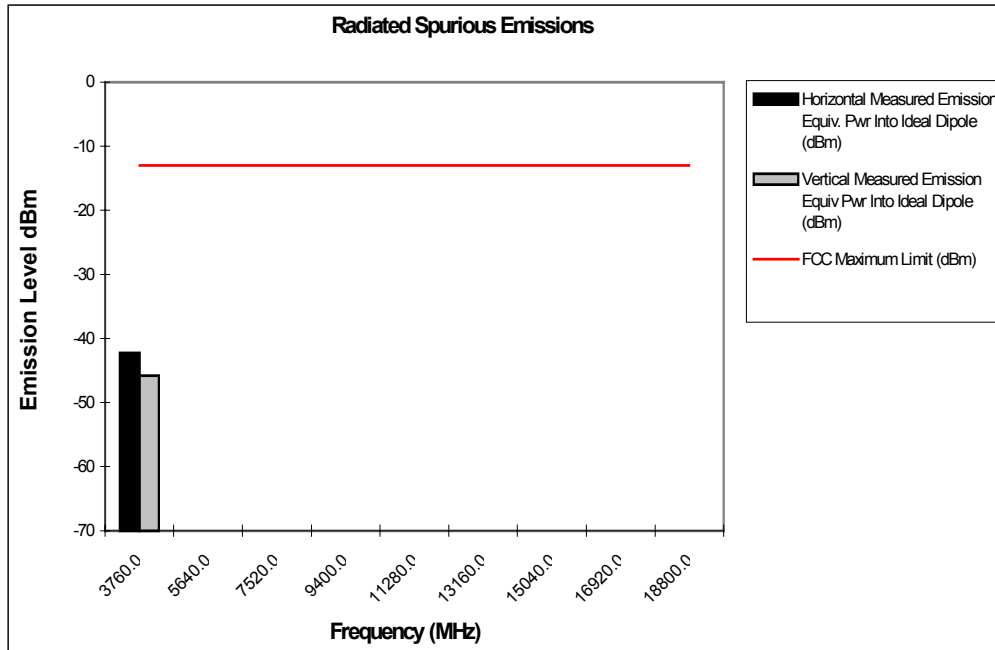
Notes:

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 each harmonic at maximum power.
3. The Spectrum was investigated from 30 MHz to the tenth harmonic of the fundamental.

Measurement Results

Modulation: GSM 1900 – Channel 661 – 1880.0 MHz

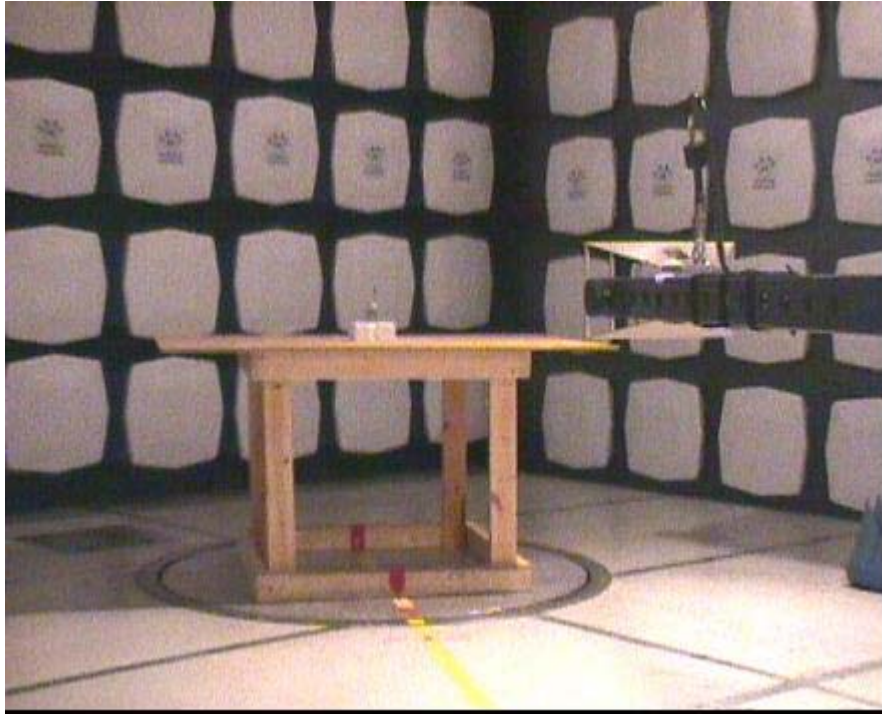
Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)
3760.0	-13	-42.3	-45.8
5640.0	-13	*	*
7520.0	-13	*	*
9400.0	-13	*	*
11280.0	-13	*	*
13160.0	-13	*	*
15040.0	-13	*	*
16920.0	-13	*	*
18800.0	-13	*	*



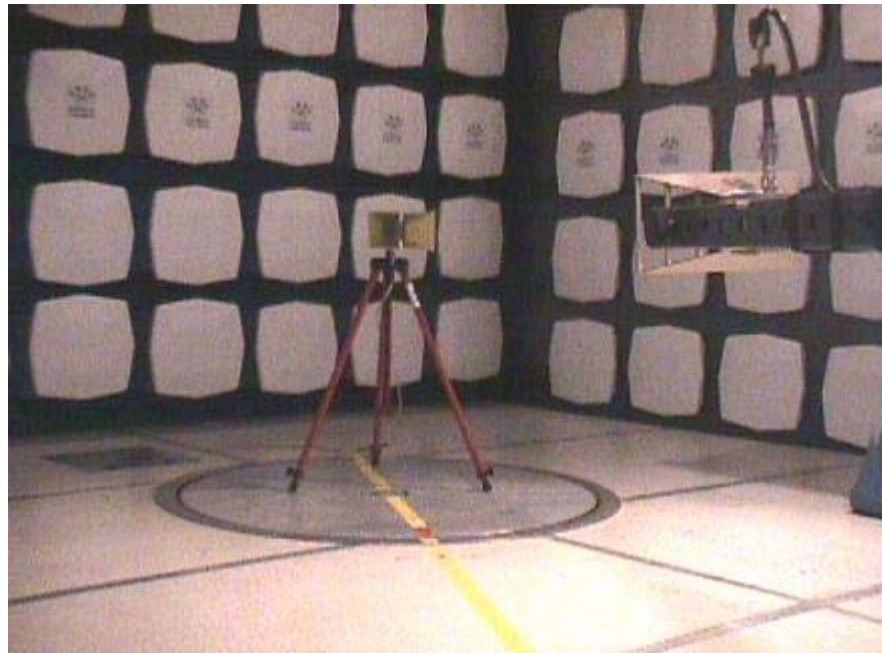
Notes:

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 each harmonic at maximum power.
3. The Spectrum was investigated from 30 MHz to the tenth harmonic of the fundamental.

Appendix A – Radiated Emissions Test Setup Photos



A.1 Radiated Emissions Measurement



A.2 Substitution Measurement

End of Test Report