MOTOROLA

PERSONAL COMMUNICATIONS SECTOR

PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

EMC TEST REPORT

Test Report Number – 6244-1

Report Date – February 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 : __2/21/2002____

A2LA Certificate Number: 1846-01

A2LA ACCREDITED

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
Tests Requested By:	Motorola Inc. Personal Communications Sector 1111 Durham South Plainfield, NJ 07080
Product Type:	Cellular Phone
Signaling Capability:	Analog, TDMA 800, TDMA 1900
Model Number:	SUG1848AA
Serial Numbers:	HEX5260011A, HEX526000E0, HEX52600107
Received Date:	February 15, 2002
Testing Start Date:	February 15, 2002
Testing Complete Date:	February 20, 2002
Measurement of Uncertainty:	+/- 3.8 dB

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 137-A, ANSI 63.4 2000

Summary of Testing

Test #	Test Name	Comply	Does Not Comply
1	RF Power Output	NA	
2	ERP (Effective Radiated Power)	NA	
3	Modulation Characteristics	X	
4	Occupied Bandwidth	X	
5	Spurious Emissions at Antenna Terminal	X	
6	Field Strength of Spurious Emissions	X	
7	Frequency Stability	X	
8	Field Strength of Spurious Emissions from Unintentional Radiators	X	

Test #	Test Name	Margin with respect to the Limit
1	RF Power Output	NA
2	Modulation Characteristics	NA
3	ERP (Effective Radiated Power)	NA
4	Occupied Bandwidth	NA
5	Spurious Emissions at Antenna Terminal	> 20dB
6	Field Strength of Spurious Emissions	18 dB 1900 TDMA
7	Frequency Stability	22 Hz 1900 TDMA
8	Field Strength of Spurious Emissions from Unintentional Radiators	6.7 dB 1900 TDMA

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.

Measuring Equipment and Calibration Information

Manufacturer Name	Item Name Description	Item Version/ Model #	Serial Number	CALIBRATION DUE DATE
Rohde & Schwarz	EMI Test Receiver	ESI26	100001	3/13/2002
Rohde & Schwarz	EMI Test Receiver	ESI26	838386/010	2/28/2002
Hewlett Packard	RF Amplifier	8347A	3307A01225	7/30/2002
Hewlett Packard	Pre-Amplifier	8449B	3008A00535	7/2/2002
ETS	DRG Horn Antenna	3115	6222	9/23/2002
A.H. Systems Inc.	DRG Horn Antenna	SAS-200/571	265	8/21/2002
A.H. Systems Inc.	DRG Horn Antenna	SAS-200/571	365	11/14/2002
ETS	Log-Periodic Antenna	3148	1188	12/6/2002
ETS	Biconical Antenna	3110B	3370	10/16/2002
Compliance Design	Biconical Antenna	B100	385	7/31/2002
Compliance Design	Biconical Antenna	B200	312	9/15/2002
Compliance Design	Biconical Antenna	B300	321	7/30/2002
Attenuator	Weinschel	AS-6	6675	10/10/2002
Attenuator	Weinschel	AS-6	6677	11/10/2002
Rohde & Schwarz	Mobile Test Set	CMD 80	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 a HPE4406A Vector Signal Analyzer through a 10dB passive attenuator, adaptor (if needed), and specialized RF connector. The peak power output is measured for all channels.

CFR Part 2.1046

Measurement Results

* Data supplied by SAR Lab

ANALOG

Frequency (MHz)	Power (dBm)
824.04	25.52
836.52	25.67
848.97	25.62

TDMA 800

Frequency (MHz)	Power (dBm)
824.04	27.58
836.52	27.62
848.97	27.58

TDMA 1900

Frequency (MHz)	Power (dBm)
1850.04	27.01
1879.98	27.07
1909.92	26.98

RADIATED (ERP)

Measurement Procedure

The phone was tested in 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 AMPS 800 frequency (824.04) (836.52Mhz)and (848.97) PCS 1900 frequency(1850.04) (1879.98) and (1909.92) and AMPS Analog frequency(824.04) (836.52 MHz) and (848.97) with antenna stubby
TDMA measurements were made with the phone placed in a call using the HP 8920 mobile station test set. The phone was weakly coupled to the test set and configured to transmit in full data rate mode. Radiated power was measured at every 15 degree step from theta=0 to 165 degrees and phi=0 to 360 degrees. The radiated power was measured using a Gigatronics 8542C power meter in "Burst Avg" mode. From these measurements, the software calculates the angle at which maximum radiated power occurs for each case, and the radiated power at this angle was extracted from the data. The max radiated power results for the IHDT56CA1 follows, as EIRP in dBm. To get ERP (effective radiated power referenced to a half-wave dipole), subtract 2.1 dB from these numbers.

Measurement Results

AMPS 800 TDMA:

824.04 Mhz:	24.12	dBm
836.52 MHz:	24.61	dBm
848.97 Mhz:	**25.09**	**dBm**

PCS 1900 TDMA:

1850.04 Mhz	28.16	dBm
1879.98 Mhz	**29.04**	**dBm**
1909.92 Mhz	28.15	dBm

AMPS 800 Analog :

824.04 Mhz	23.55	dBm
836.52 Mhz	22.62	dBm
848.97 Mhz	**23.93**	**dBm**

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

Max EIRP is 23.93 dBm in AMPS 800 mode (max ERP is **21.83** dBm)
Max EIRP is **25.09** dBm in TDMA 800 mode
Max EIRP is **29.04** dBm in PCS 1900 mode

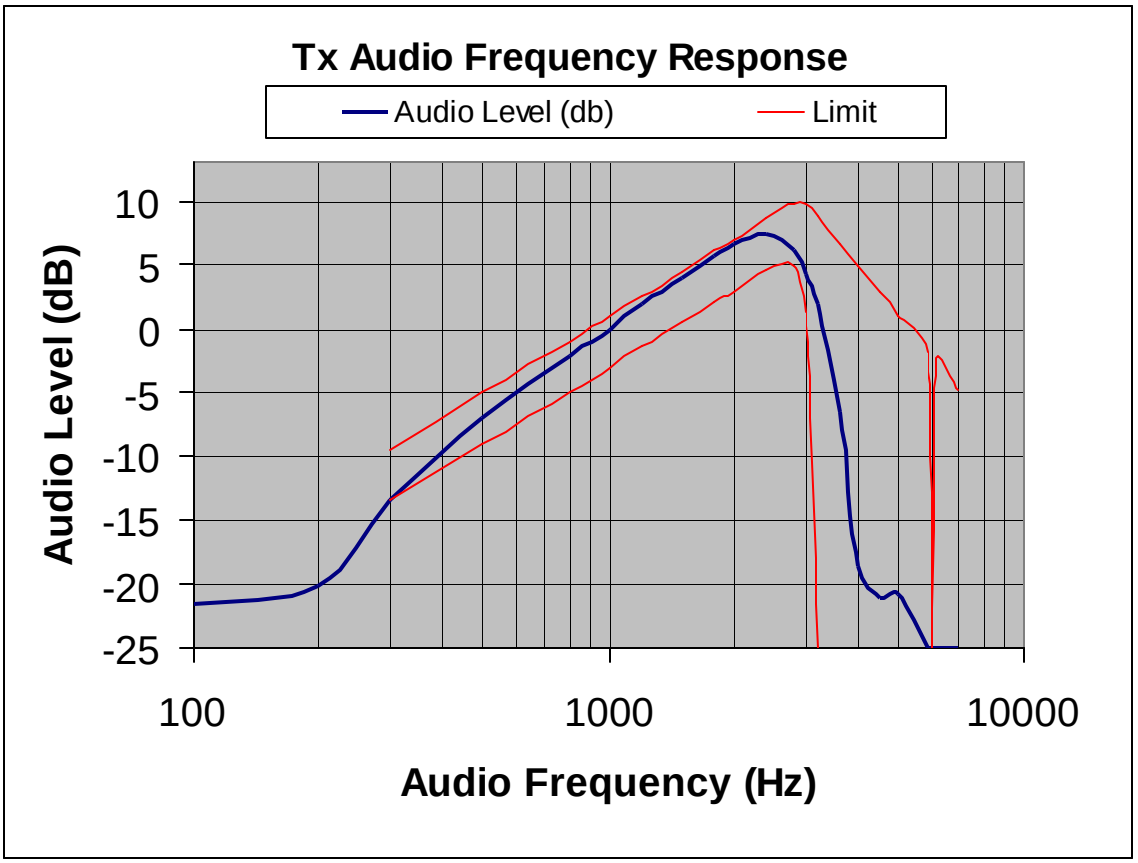
MODULATION CHARACTERISTICS

CFR Part 2.1047, 22.915

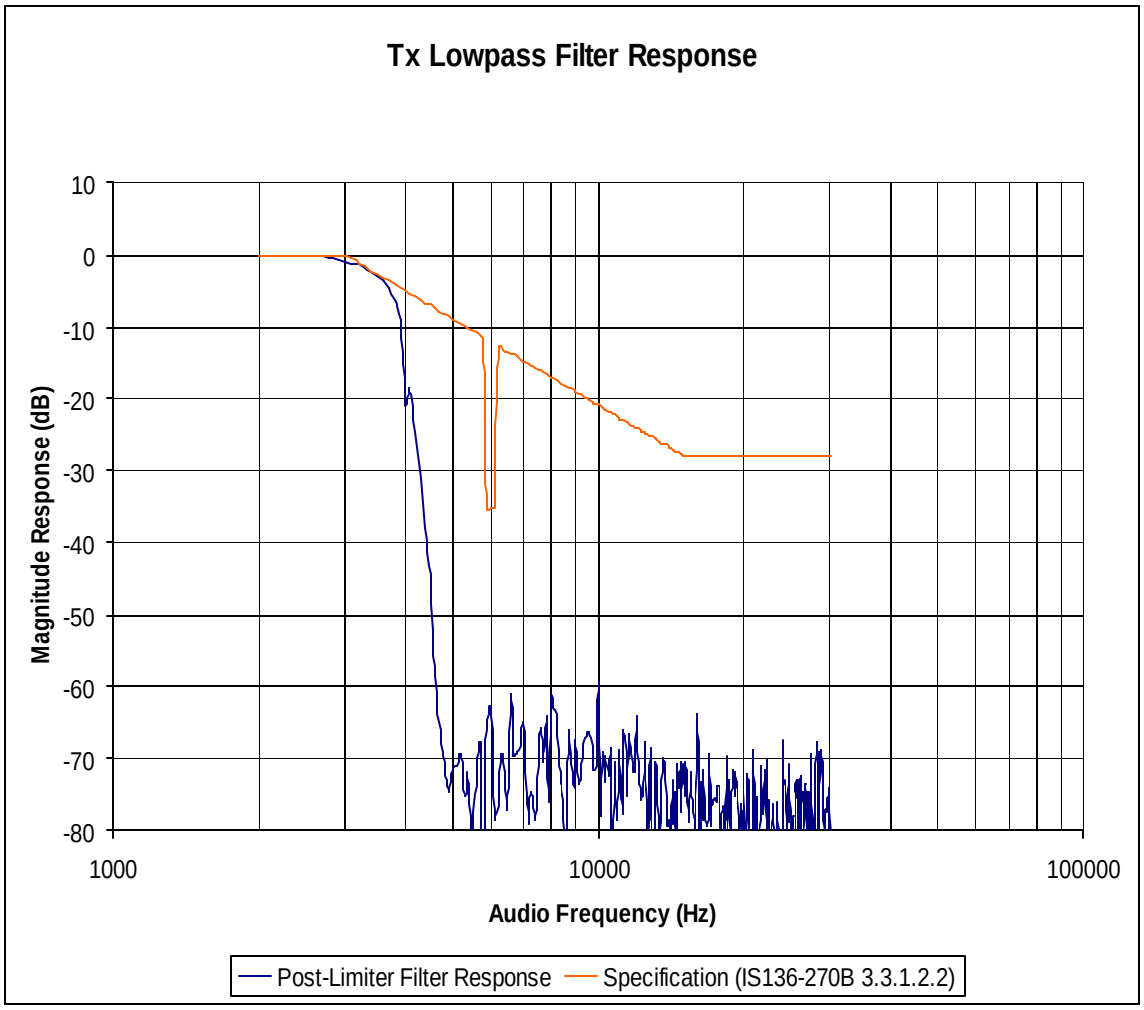
Measurement Results

* Data supplied by product group

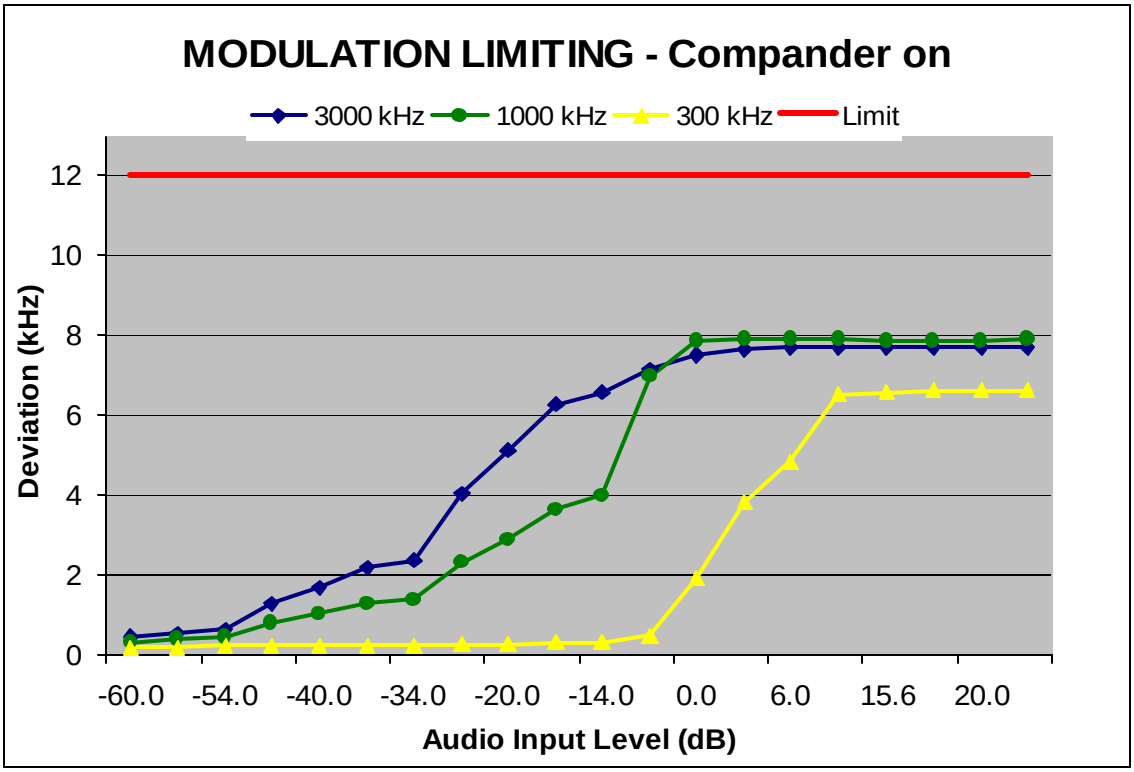
Transmit Audio Frequency Response

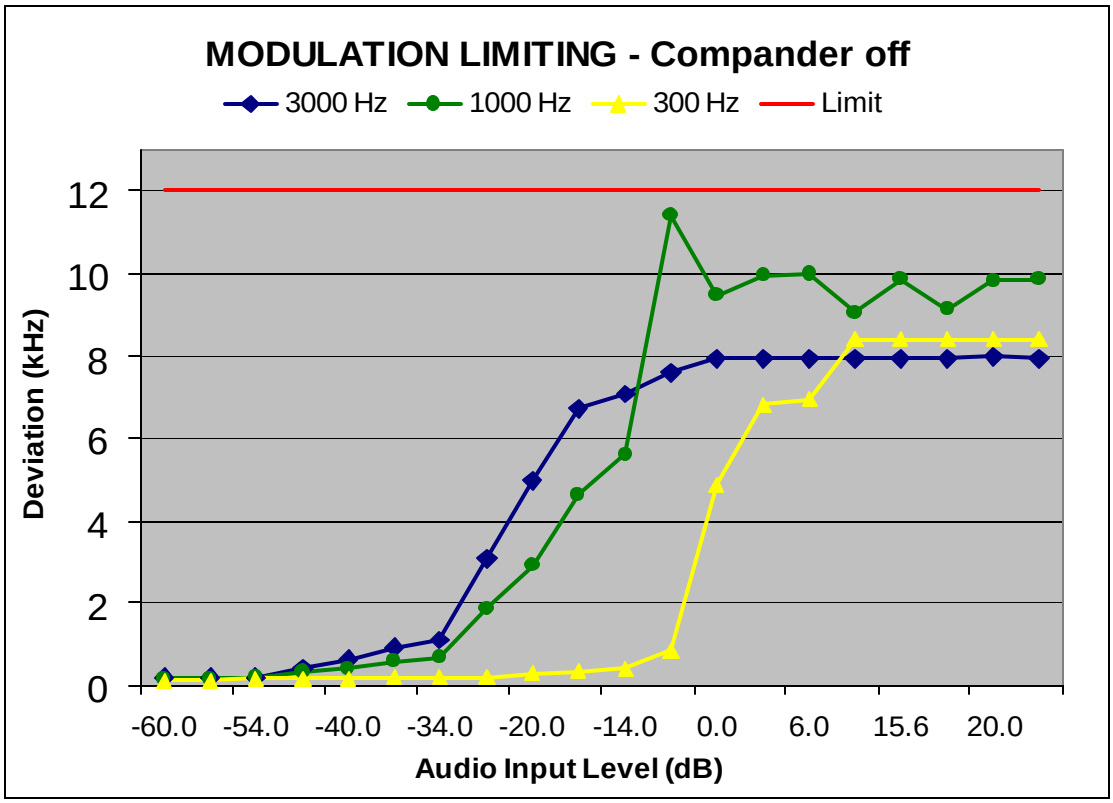


Post Limiter Low-Pass Filter Response



Modulation Limiting vs. Modulation Input Voltage





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. A fully charged battery was used for the supply voltage.

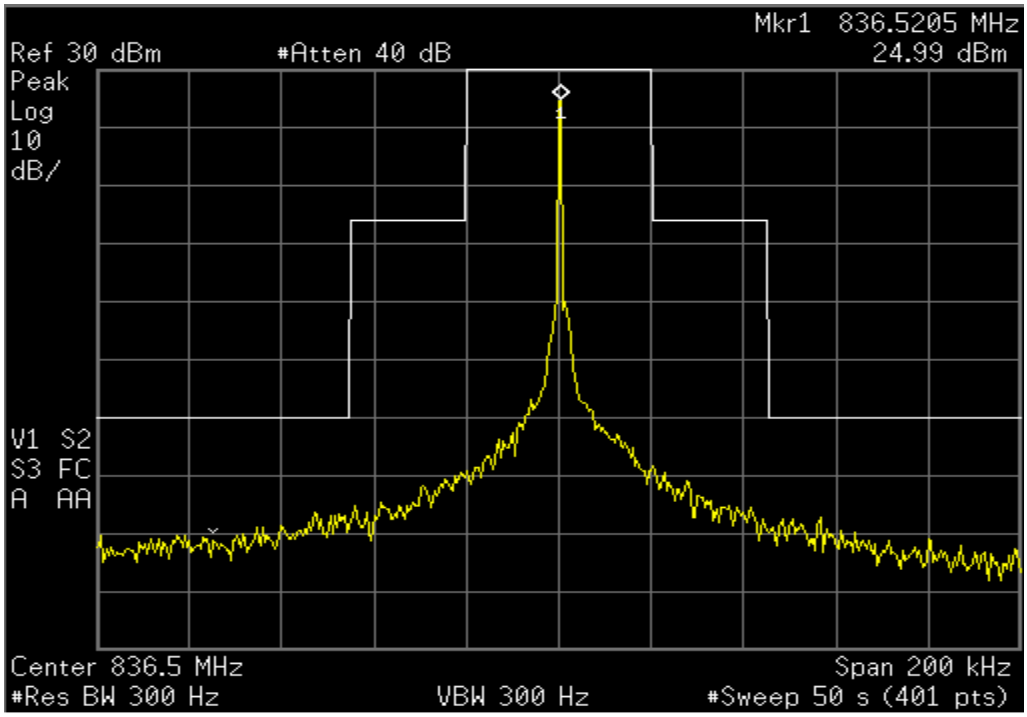
The middle channel within the designated frequency block was measured. For PCS, the lower and upper band edge plots are displayed.

Measurement Results

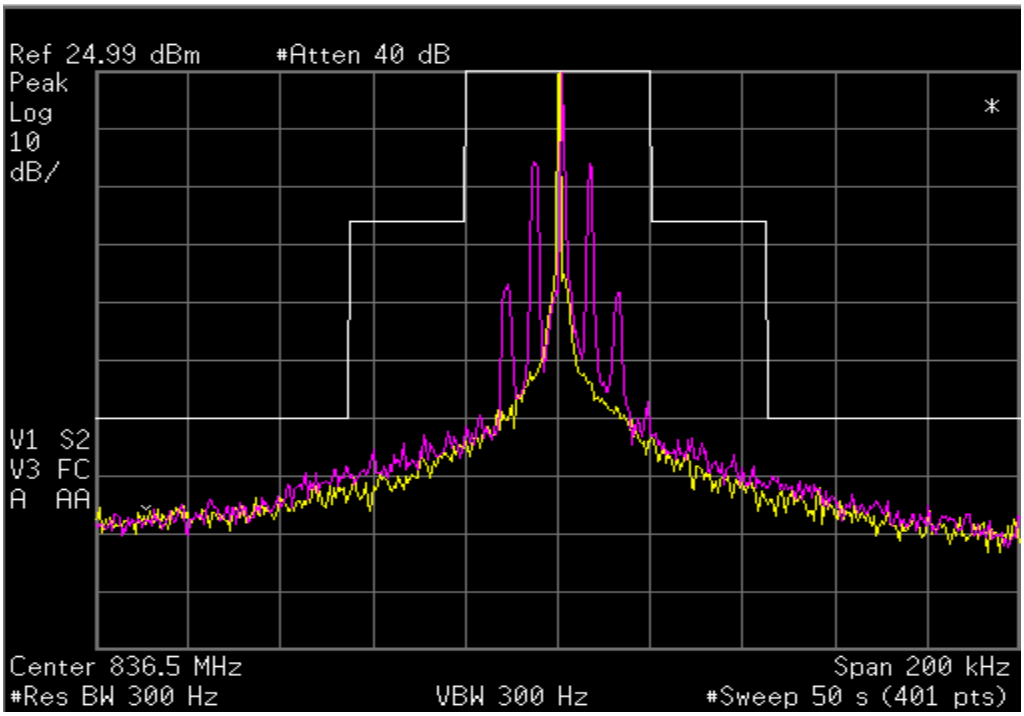
Attached

Measurement Results - ANALOG

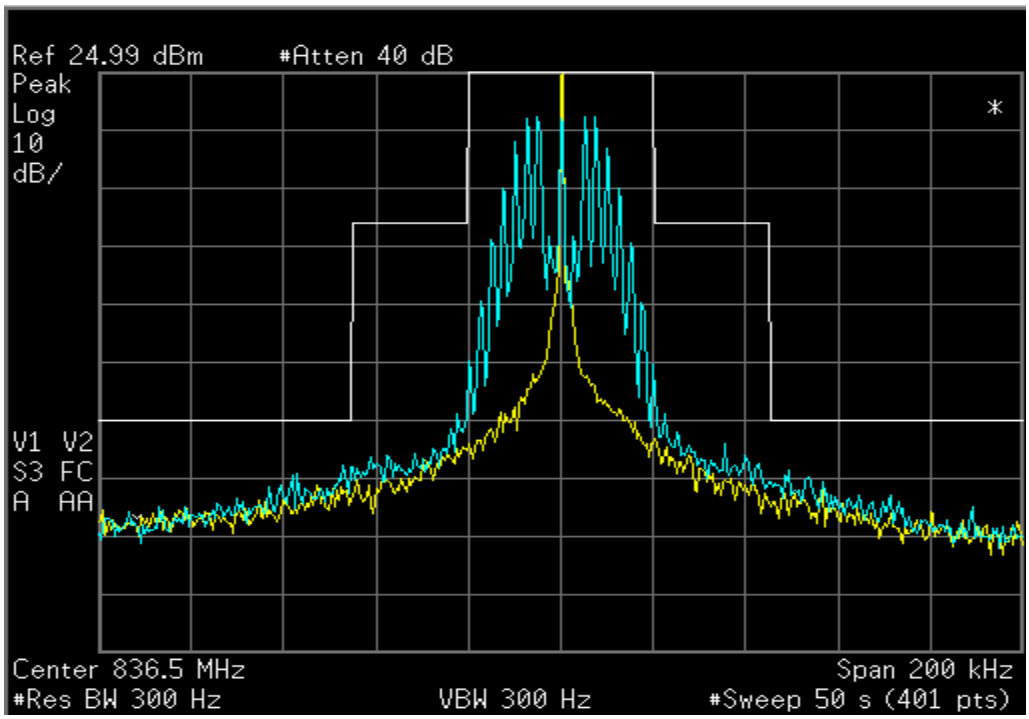
AMPS - Unmodulated Carrier



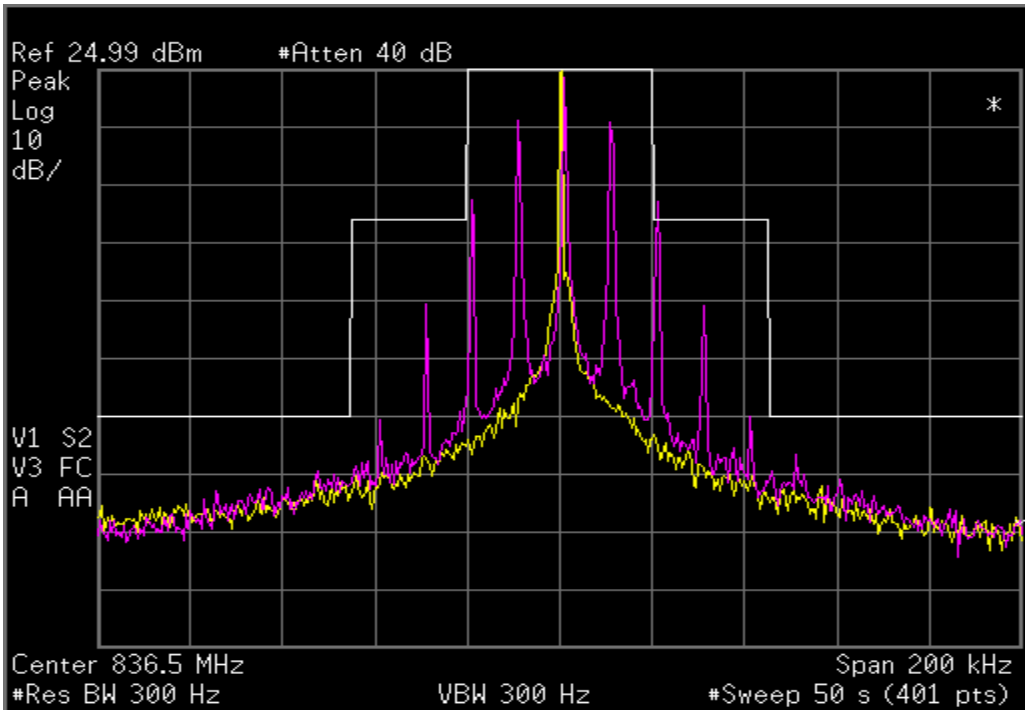
AMPS - Supervisory Audio Tone



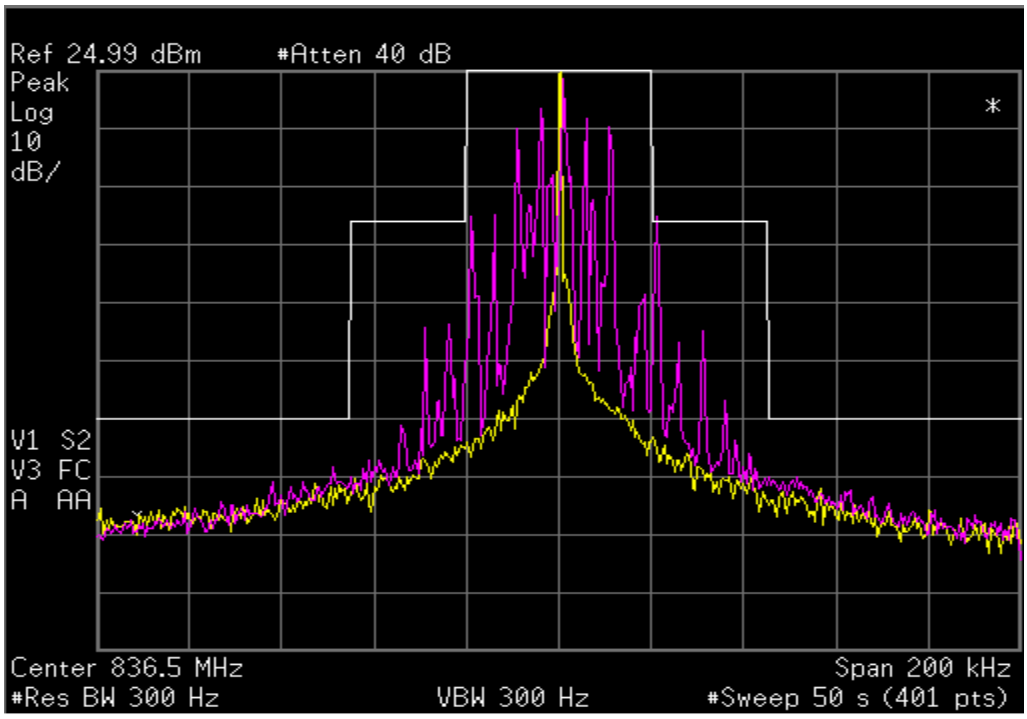
AMPS - Voice



AMPS – Signaling Tone

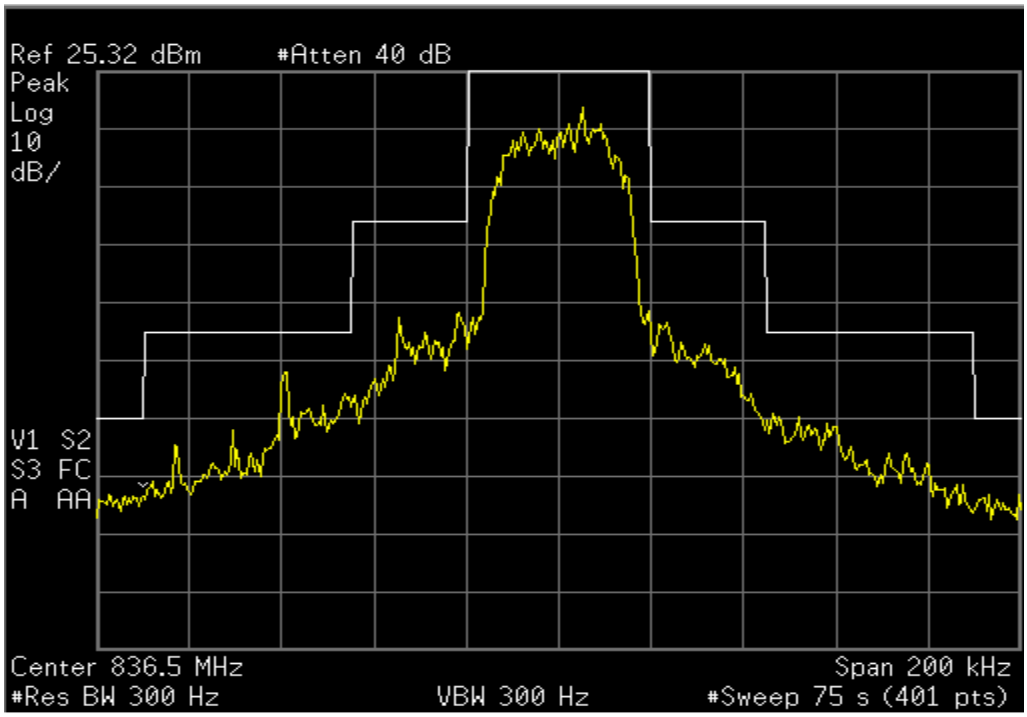


AMPS – 10kb/s Wideband Data

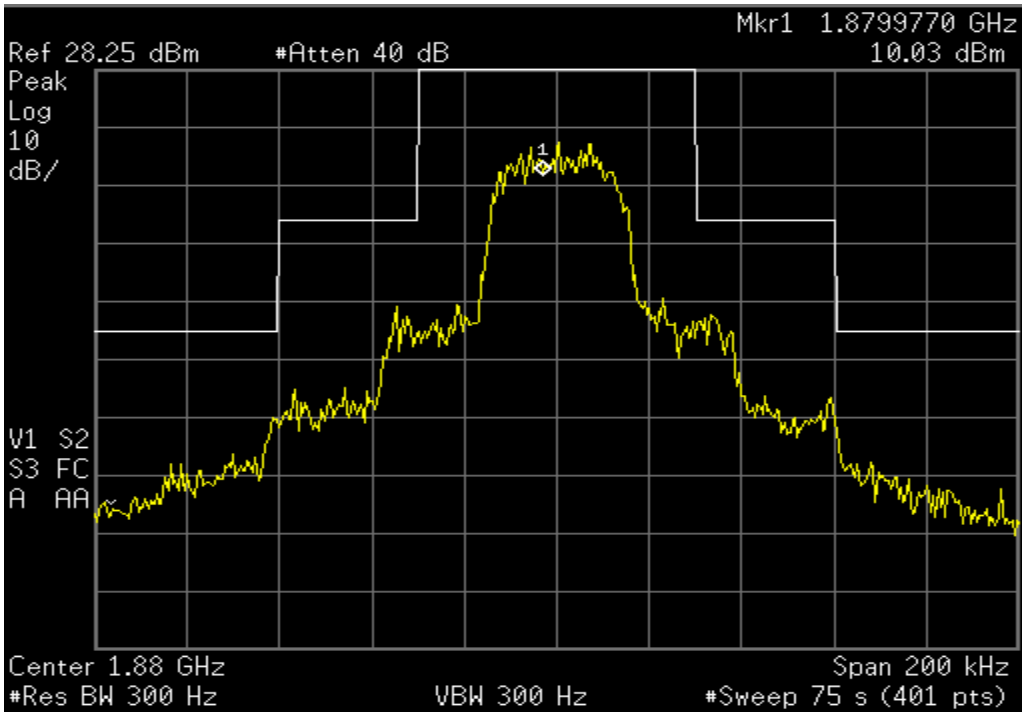


Measurement Results - DIGITAL

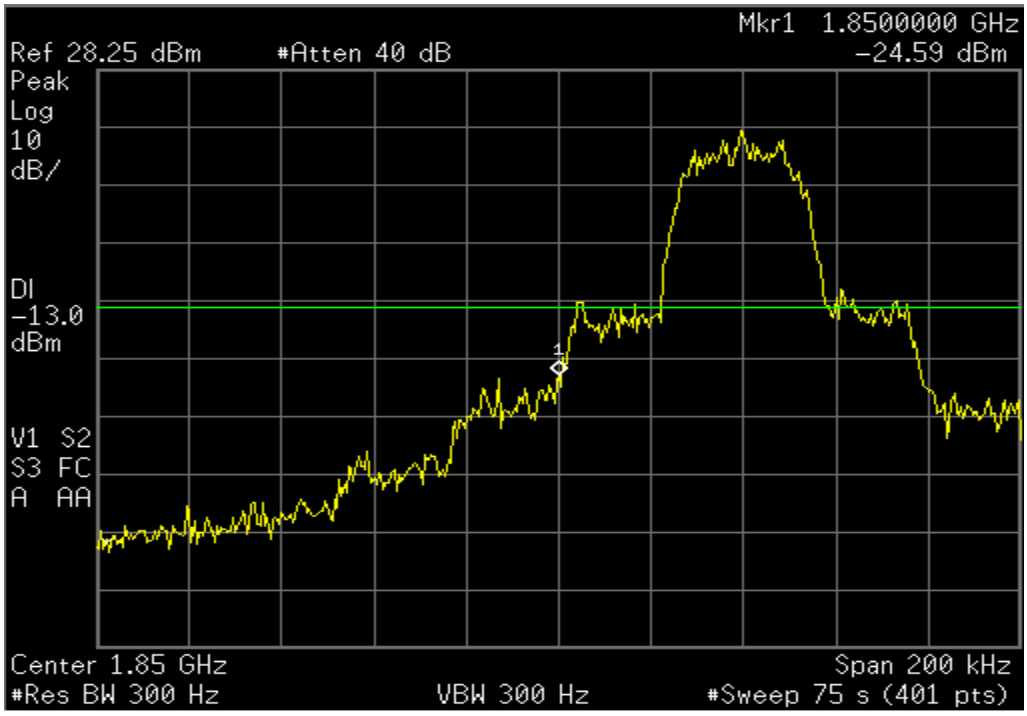
TDMA 800



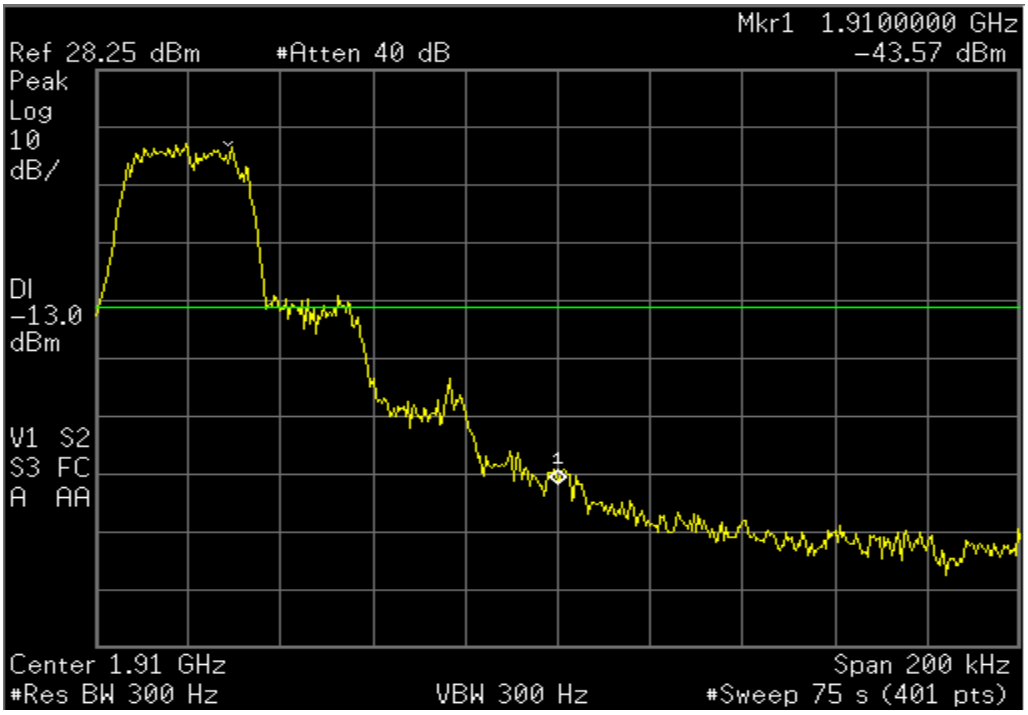
TDMA 1900



TDMA 1900 – Lower Band Edge



TDMA 1900 – 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.

Measurement Results

The magnitude of all spurious emissions were attenuated more than 20 dB below the permissible value of –13dBm and therefore not specified.

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.

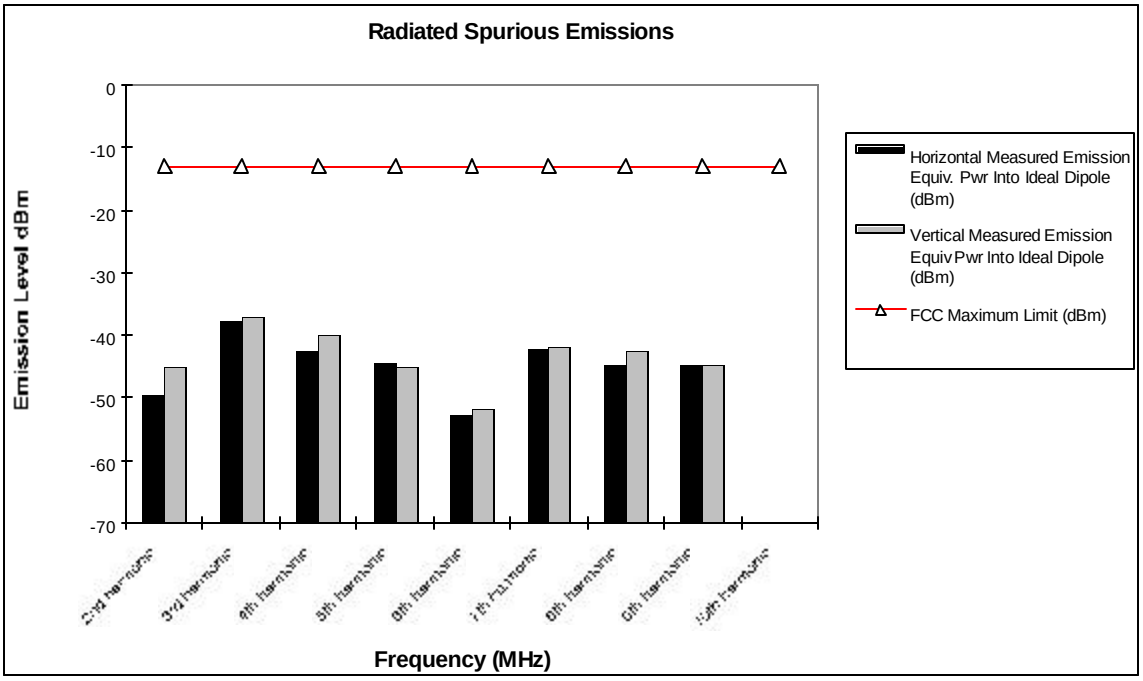
The power in dBm of each spurious emission is calculated by correcting the signal generator level for cable loss and gain of the substitution antenna referenced to a dipole. A fully charged battery was used for the supply voltage.

Measurement Results

Attached

Measurement Results
Modulation: ANALOG

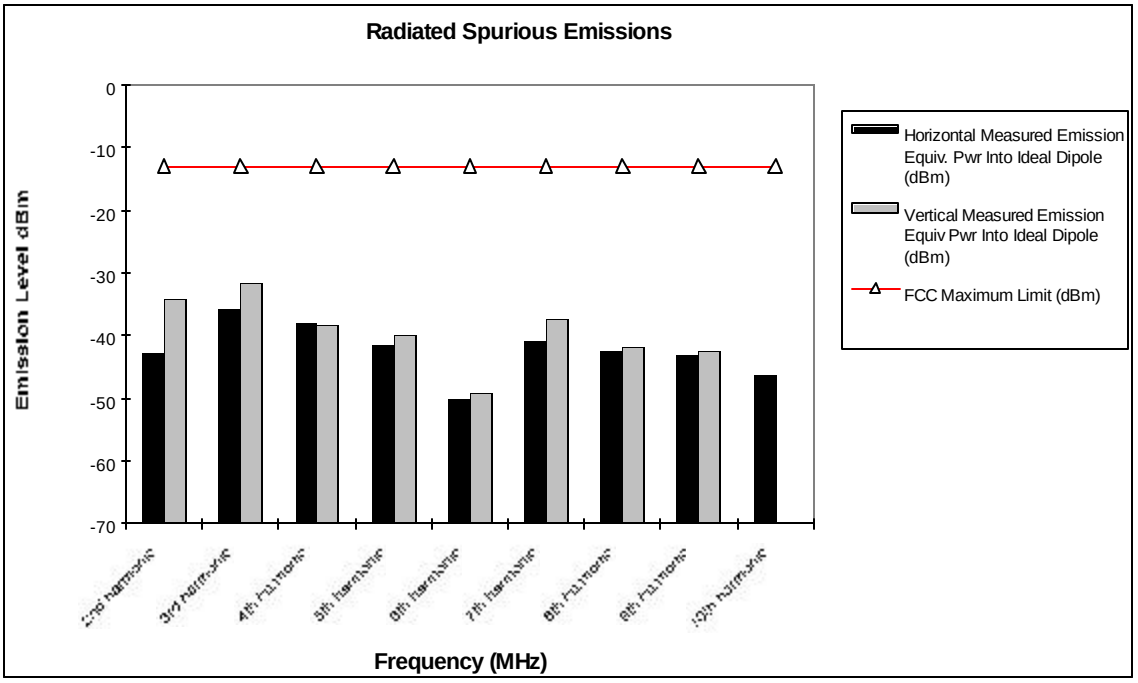
Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	-49.7	-45.1
3rd harmonic	-13	-37.7	-36.9
4th harmonic	-13	-42.3	-40.0
5th harmonic	-13	-44.3	-45.1
6th harmonic	-13	-52.7	-51.9
7th harmonic	-13	-42.2	-41.7
8th harmonic	-13	-44.8	-42.4
9th harmonic	-13	-44.8	-44.6
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: TDMA 800

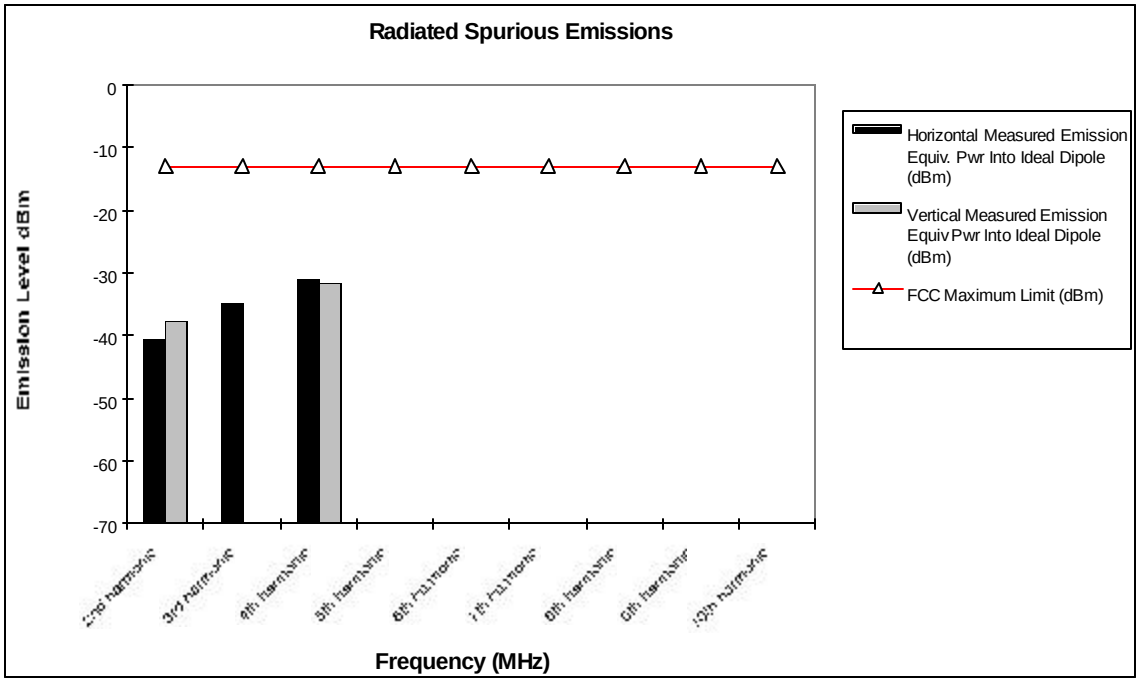
Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	-42.7	-34.2
3rd harmonic	-13	-35.7	-31.7
4th harmonic	-13	-37.9	-38.2
5th harmonic	-13	-41.5	-40.0
6th harmonic	-13	-50.0	-49.1
7th harmonic	-13	-40.9	-37.1
8th harmonic	-13	-42.4	-41.8
9th harmonic	-13	-43.0	-42.3
10th harmonic	-13	-46.4	*



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 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: TDMA 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	-40.6	-37.6
3rd harmonic	-13	-34.8	*
4th harmonic	-13	-31.0	-31.7
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. A battery eliminator was used for the input supply voltage.

Measurement Results

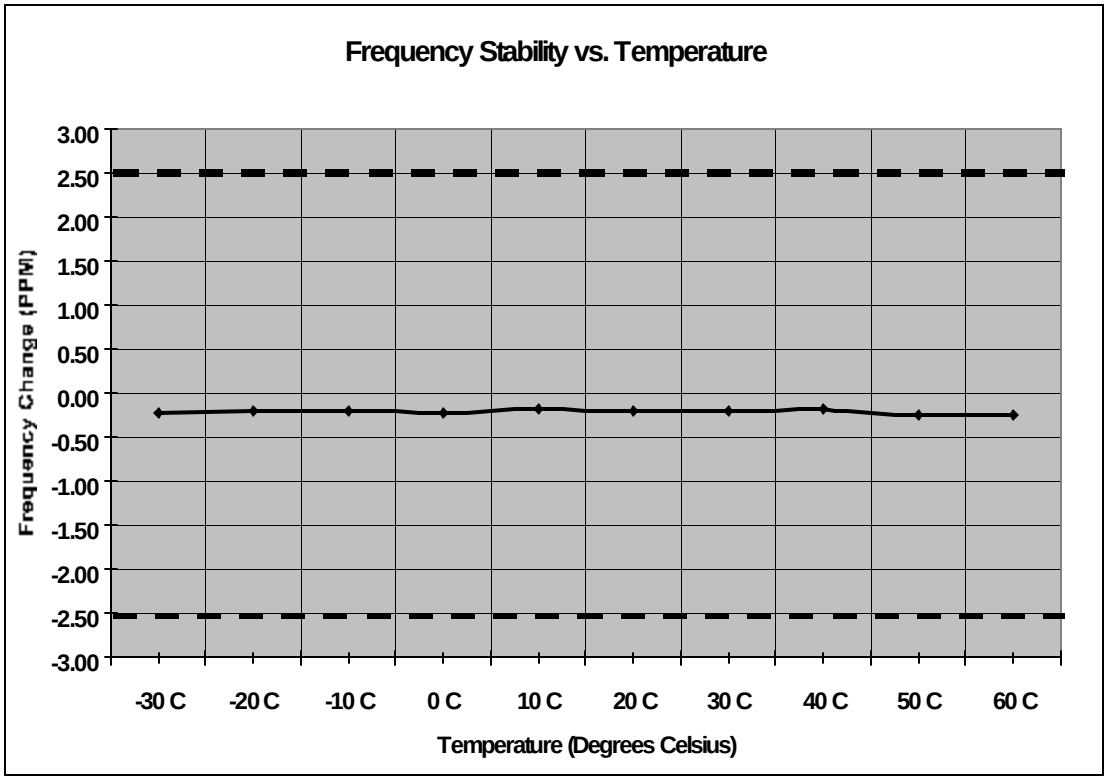
Attached

Measurement Results
Modulation: ANALOG

Frequency Stability

Mode:	Analog	**Operating Frequency:**	836.52 MHz
Channel:	384	**Deviation Limit (PPM):**	2.5ppm
Date:	2/20/2002	**Submission #:**	6244-1
		S/N:	526000 E0

Temperature	Frequency Error	Frequency Error	Voltage	Power
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-186.00**	**-0.222**	100%	3.80
-20 C	**-173.00**	**-0.207**	100%	3.80
-10 C	**-158.00**	**-0.189**	100%	3.80
0 C	**-180.00**	**-0.215**	100%	3.80
10 C	**-147.00**	**-0.176**	100%	3.80
20 C	**-169.00**	**-0.202**	100%	3.80
30 C	**-173.00**	**-0.207**	100%	3.80
40 C	**-154.00**	**-0.184**	100%	3.80
50 C	**-207.00**	**-0.247**	100%	3.80
60 C	**-195.00**	**-0.233**	100%	3.80
20 C	**-178.00**	**-0.213**	Battery Endpoint	3.40

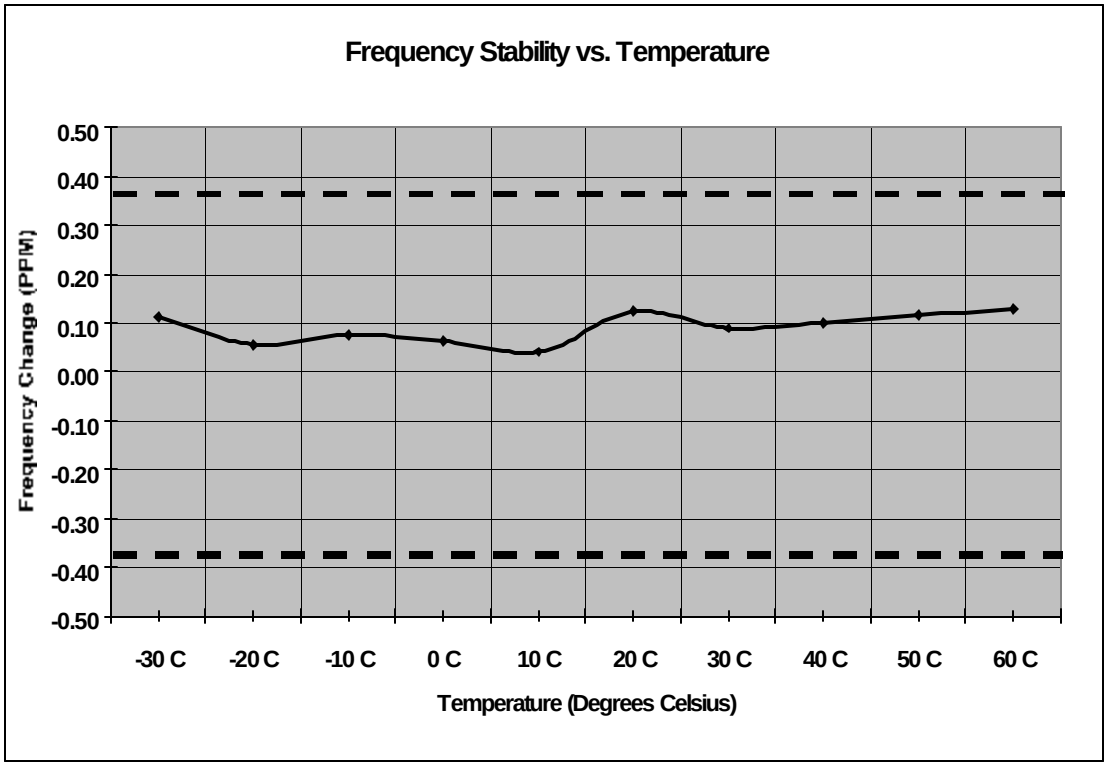


Measurement Results
Modulation: TDMA 800

Frequency Stability

Mode:	TDMA 800	**Operating Frequency:**	836.52 MHz
Channel:	384	**Deviation Limit (PPM):**	0.359ppm (+/-300 Hz)
Date:	2/20/2002	**Submission #:**	6244-1
		S/N:	526000 E0

Temperature C	Frequency Error HZ	Frequency Error (PPM)	Voltage (%)	Power (VDC)
-30 C	**94.00**	**0.112**	100%	3.80
-20 C	**47.00**	**0.056**	100%	3.80
-10 C	**63.00**	**0.075**	100%	3.80
0 C	**53.00**	**0.063**	100%	3.80
10 C	**34.00**	**0.041**	100%	3.80
20 C	**103.00**	**0.123**	100%	3.80
30 C	**75.00**	**0.090**	100%	3.80
40 C	**84.00**	**0.100**	100%	3.80
50 C	**97.00**	**0.116**	100%	3.80
60 C	**106.00**	**0.127**	100%	3.80
20 C	**-97.00**	**-0.116**	Battery Endpoint	3.40

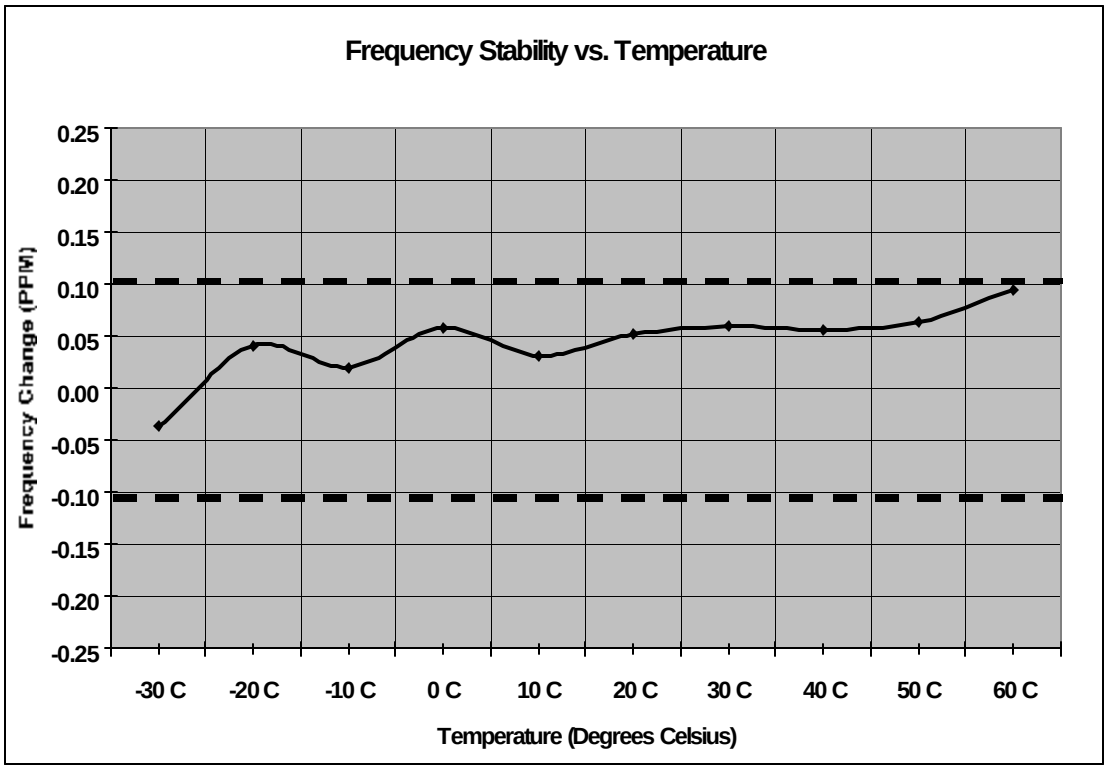


Measurement Results
Modulation: TDMA 1900

Frequency Stability

Mode:	TDMA 1900	**Operating Frequency:**	1879.98 MHz
Channel:	1000	**Deviation Limit (PPM):**	0.106ppm (+/-200Hz)
Date:	2/20/2002	**Submission #:**	6244-1
		S/N:	526000 E0

Temperature	Frequency Error	Frequency Error	Voltage	Power
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-68.00**	**-0.036**	100%	3.80
-20 C	**77.00**	**0.041**	100%	3.80
-10 C	**38.00**	**0.020**	100%	3.80
0 C	**109.00**	**0.058**	100%	3.80
10 C	**59.00**	**0.031**	100%	3.80
20 C	**98.00**	**0.052**	100%	3.80
30 C	**112.00**	**0.060**	100%	3.80
40 C	**106.00**	**0.056**	100%	3.80
50 C	**119.00**	**0.063**	100%	3.80
60 C	**178.00**	**0.095**	100%	3.80
20 C	**103.00**	**0.055**	Battery Endpoint	3.40



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)

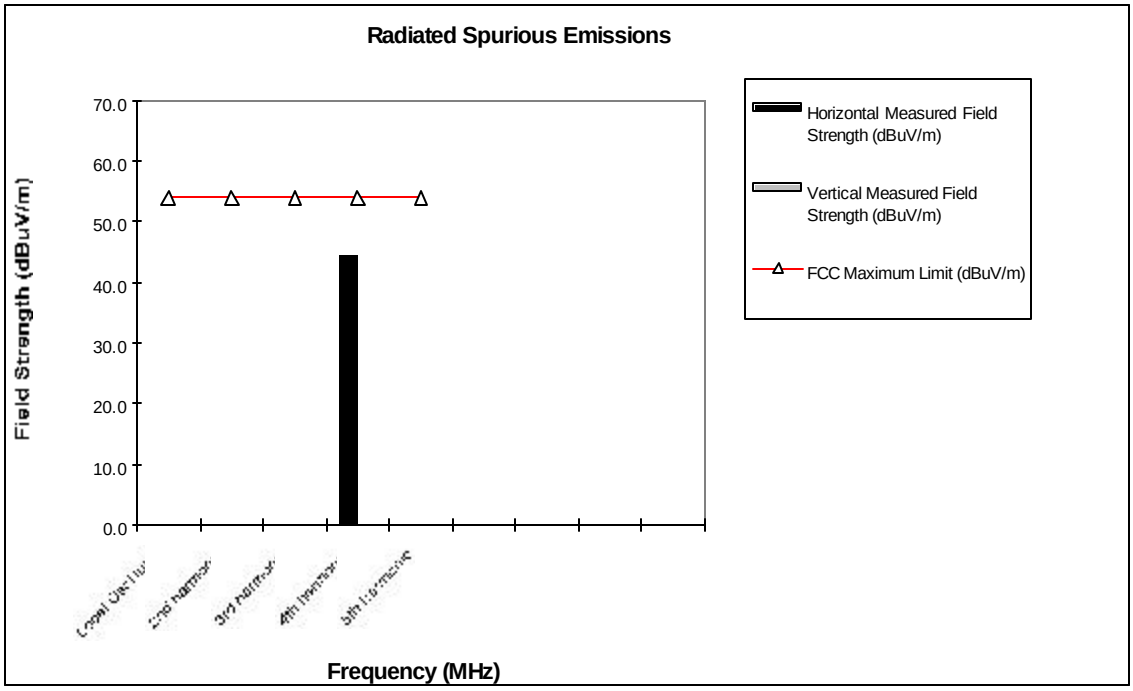
The equipment under test was evaluated on the low, middle, and high channels within each band for each mode of operation.

Measurement Results

Attached

Measurement Results
ANALOG Mode

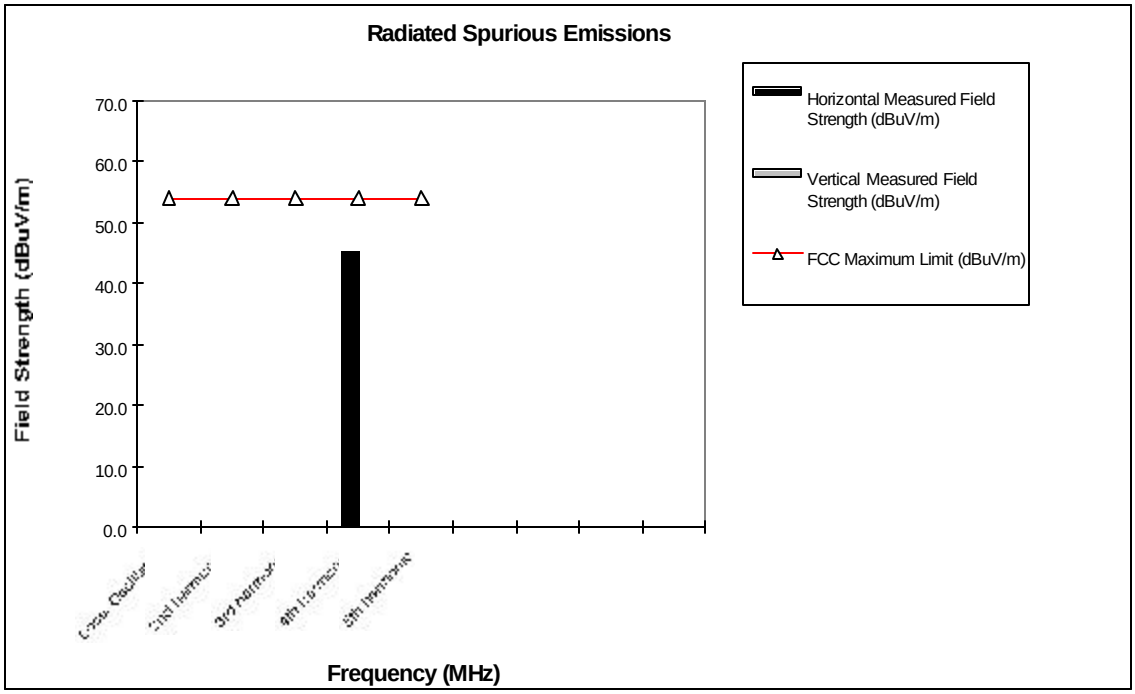
Frequency (MHz)	FCC Maximum Limit (dBuV/m)	Horizontal Measured Field Strength (dBuV/m)	Vertical Measured Field Strength (dBuV/m)
Local Oscillator	54	*	*
2nd harmonic	54	*	*
3rd harmonic	54	*	*
4th harmonic	54	44.7	*
5th harmonic	54	*	*



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 low, mid, and high channels.

Measurement Results
TDMA 800 Mode

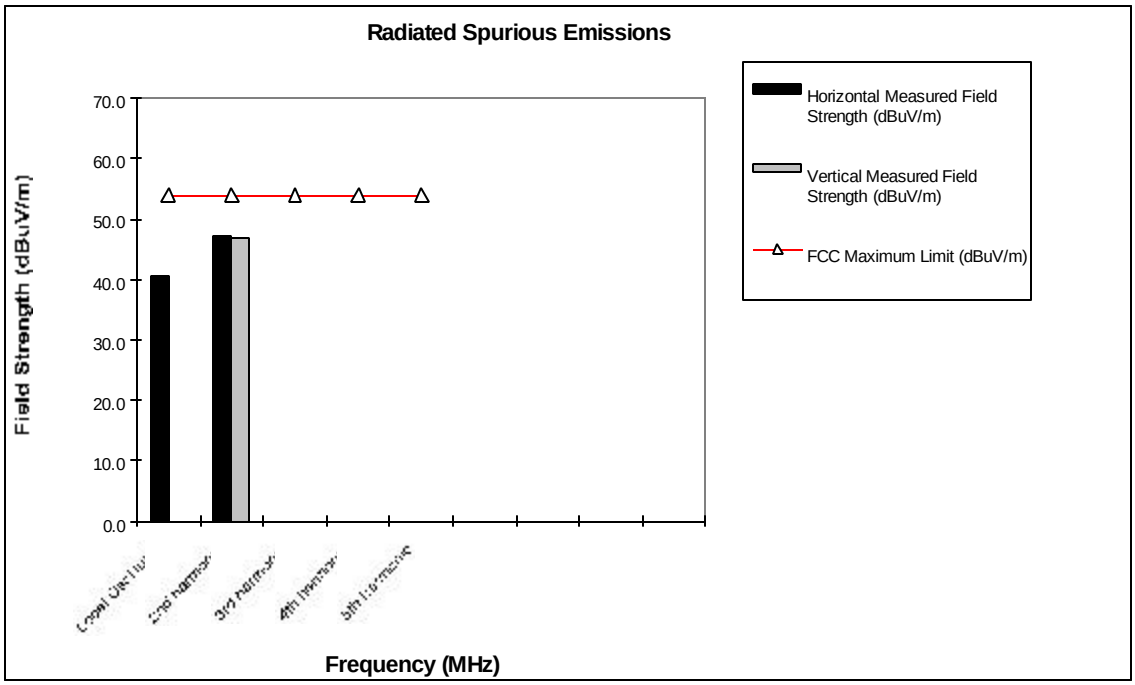
Frequency (MHz)	FCC Maximum Limit (dBuV/m)	Horizontal Measured Field Strength (dBuV/m)	Vertical Measured Field Strength (dBuV/m)
Local Oscillator	54	*	*
2nd harmonic	54	*	*
3rd harmonic	54	*	*
4th harmonic	54	45.3	*
5th harmonic	54	*	*



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 low, mid, and high channels.

Measurement Results
TDMA 1900 Mode

Frequency (MHz)	FCC Maximum Limit (dBuV/m)	Horizontal Measured Field Strength (dBuV/m)	Vertical Measured Field Strength (dBuV/m)
Local Oscillator	54	40.5	*
2nd harmonic	54	47.3	46.9
3rd harmonic	54	*	*
4th harmonic	54	*	*
5th harmonic	54	*	*



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 low, mid, and high channels.

End of Test Report