MOTOROLA

PERSONAL COMMUNICATIONS SECTOR

PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

EMC TEST REPORT

Test Report Number – 6917-1

Report Date – June 7, 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 : 6/7/2002

THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY A2LA OR ANY AGENCY OF THE U.S. GOVERNMENT.

A2LA Certificate Number: 1846-01

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 FCC Registration Number: 100000 Industry Canada Number: IC3908
Tests Requested By:	Motorola Inc. Motorola Personal Communications Sector 1500 Gateway Boulevard Boynton Beach, FL 33426
Product Type:	Cellular Phone
Signaling Capability:	Analog, TDMA 800, TDMA 1900
Model Number:	C331
Serial Numbers:	00A, 014, 5281E6BC
Received Date:	April 18, 2002
Testing Start Date:	April 19, 2002
Testing Complete Date:	June 7, 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: TIA EIA 137-A, ANSI 63.4 2000, RSS-118, RSS-128, RSS-133

Summary of Testing

Test #	Test Name	Pass/Fail
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	NA
3	Modulation Characteristics	Pass
4	Occupied Bandwidth	Pass
5	Spurious Emissions at Antenna Terminal	Pass
6	Field Strength of Spurious Emissions	Pass
7	Frequency Stability	Pass
8	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	Modulation Characteristics	NA
4	Occupied Bandwidth	NA
5	Spurious Emissions at Antenna Terminal	>20 dB
6	Field Strength of Spurious Emissions	15.0 dB
7	Frequency Stability	19 Hz
8	Field Strength of Spurious Emissions from Unintentional Radiators	9.2 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 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	838386/010	2/26/03
Hewlett Packard	EMC Analyzer	E7405	US3944019	10/11/02
Hewlett Packard	RF Amplifier	8347A	3307A01225	7/30/02
Hewlett Packard	Pre-Amplifier	8449B	3008A00535	7/2/02
ETS	DRG Horn Antenna	3115	6222	9/23/02
A.H. Systems Inc.	DRG Horn Antenna	SAS-200/571	265	8/21/02
A.H. Systems Inc.	DRG Horn Antenna	SAS-200/571	365	11/14/02
ETS	Log-Periodic Antenna	3148	1188	12/6/02
ETS	Log-Periodic Antenna	3148	1189	1/2/03
ETS	Biconical Antenna	3110B	3369	12/15/02
ETS	Biconical Antenna	3110B	3370	10/16/02
Compliance Design	Biconical Antenna	B100	385	7/31/02
Compliance Design	Biconical Antenna	B200	312	9/15/02
Compliance Design	Biconical Antenna	B300	321	7/30/02
Attenuator	Weinschel	AS-6	6675	10/10/02
Attenuator	Weinschel	AS-6	6677	11/10/02
Rohde & Schwarz	Mobile Test Set	CMD 80	DE29008	10/18/02
Hewlett Packard	Signal Generator	83623B	3844A01195	1/16/03
Thermotron	Environmental Chamber	S-4	31580	12/20/02

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

ANALOG

Frequency (MHz)	Power (dBm)
824.04	26.25
836.52	26.37
848.97	26.23

TDMA 800

Frequency (MHz)	Power (dBm)
824.04	27.00
836.52	27.13
848.97	27.16

TDMA 1900

Frequency (MHz)	Power (dBm)
1850.04	25.92
1878.98	26.00
1909.92	25.98

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 Analog three frequencies (824.04, 836.52, and 848.97), TDMA 800 three frequencies (824.04, 836.52, and 848.97 MHz), and TDMA 1900 three frequencies (1850.04, 1879.98, and 1909.92 Mhz) with antenna stubby.

TDMA measurements were made with the phone placed in a call using the HP8920B 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 IHDT56CF1 follows, as EIRP in dBm. To get ERP (effective radiated power referenced to a half-wave dipole), subtract 2.1 dB from these numbers.

Analog 800:
824.04 MHz: 24.04 dBm
836.52 MHz: 23.98 dBm
848.97 MHz: 24.70 dBm

TDMA 800:
824.04 MHz: 26.53 dBm
836.52 MHz: 27.01 dBm
848.97 MHz: 27.41 dBm

TDMA 1900:
1850.04 MHz: 29.13 dBm
1879.98 MHz: 30.09 dBm
1909.92 MHz 29.32 dBm

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

Max EIRP in Analog 800 is 24.70 dBm mode **(max ERP is 22.60 dBm)**
Max EIRP in TDMA 800 is 27.41 dBm mode **(max ERP is 25.31 dBm)**
Max EIRP in TDMA 1900 is 30.09 dBm mode (max ERP is 27.99 dBm)

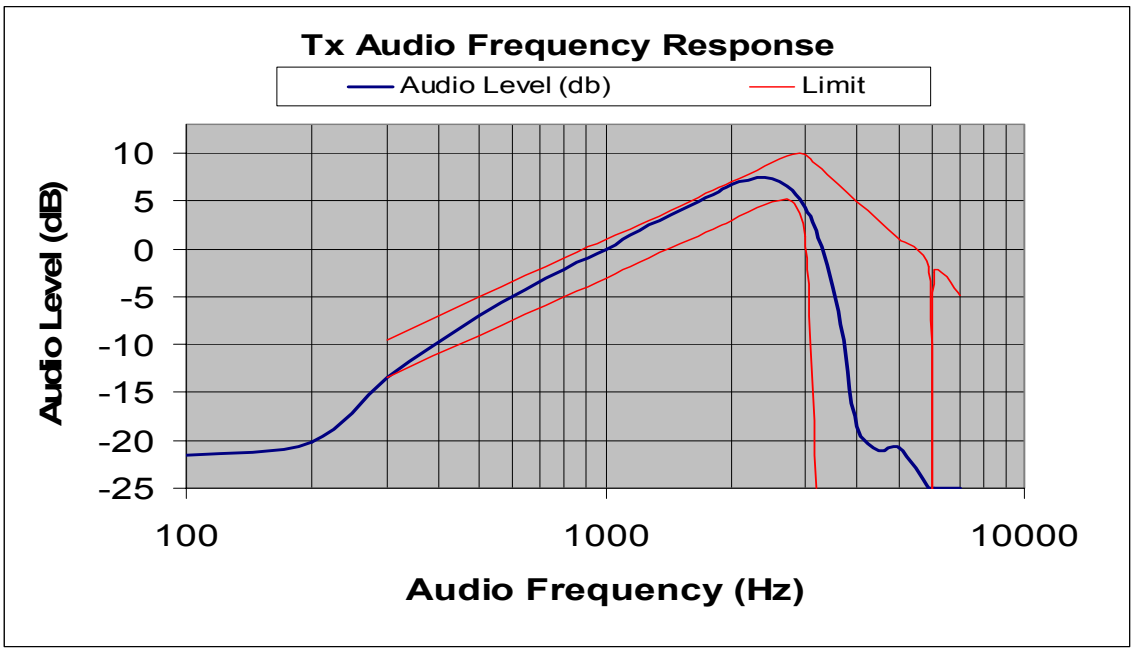
MODULATION CHARACTERISTICS

CFR Part 2.1047, 22.915

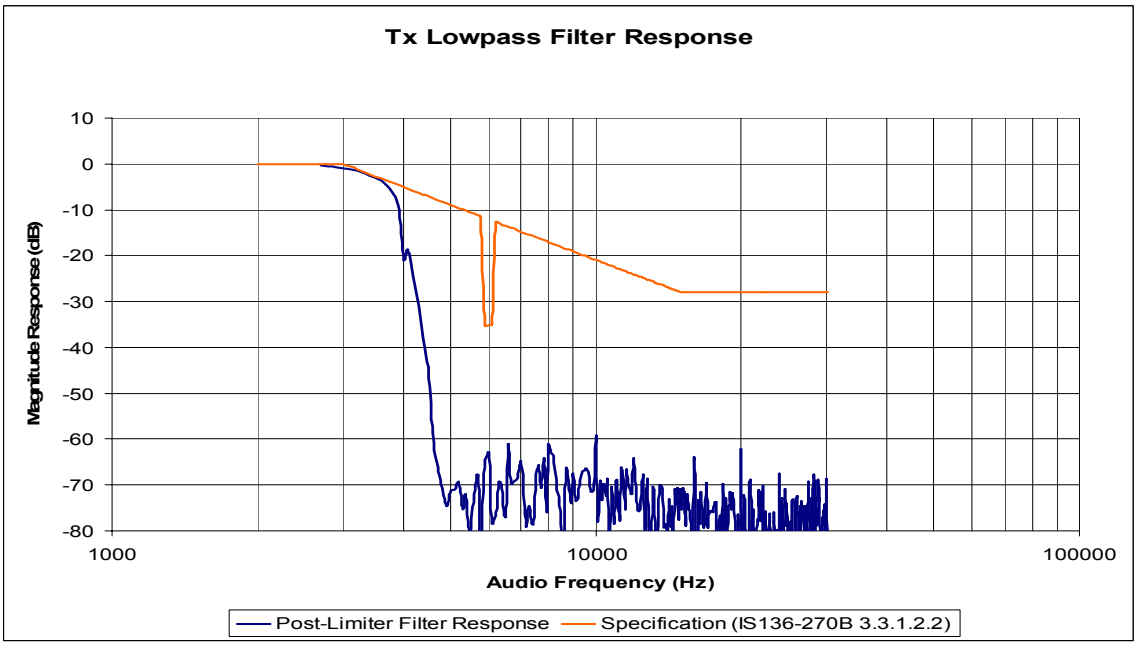
Measurement Results

* Data supplied by product group

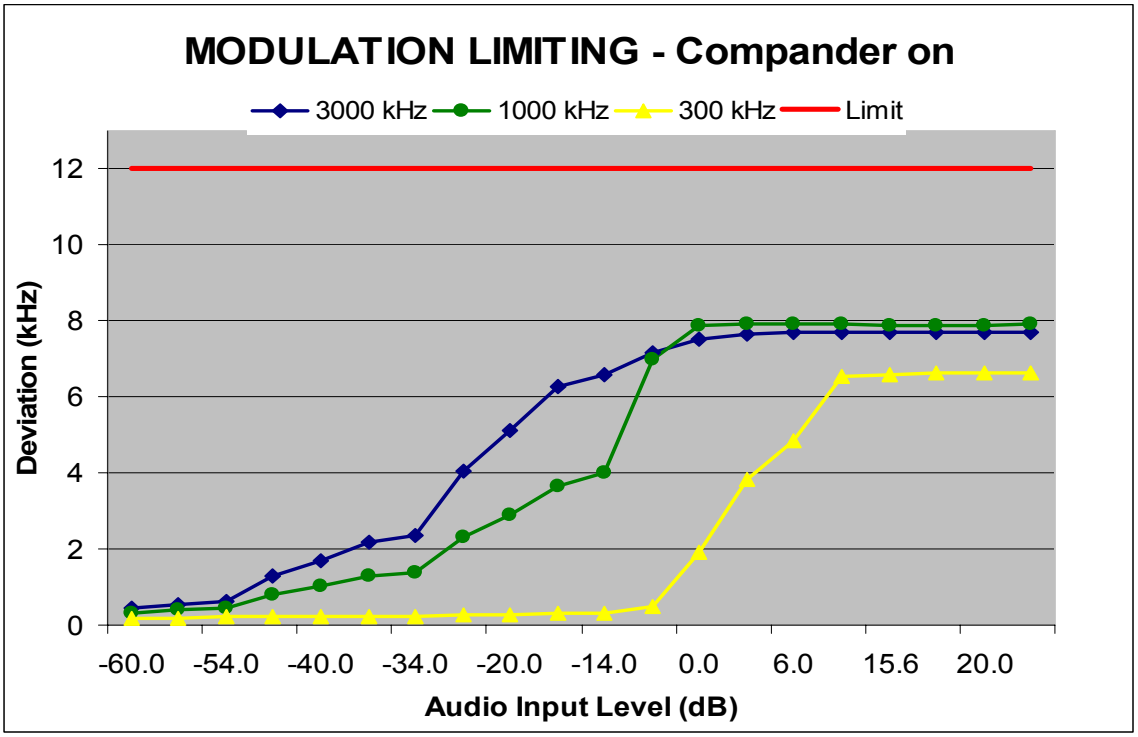
Transmit Audio Frequency Response

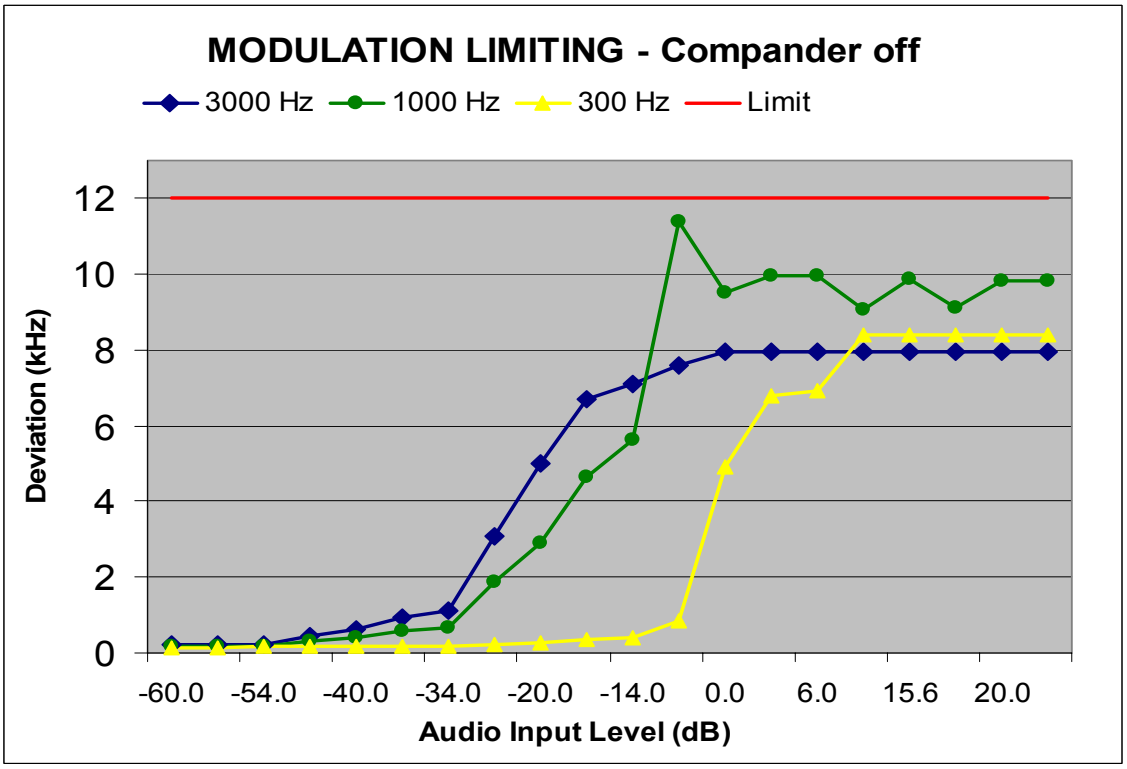


Tx Lowpass Filter Response



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.

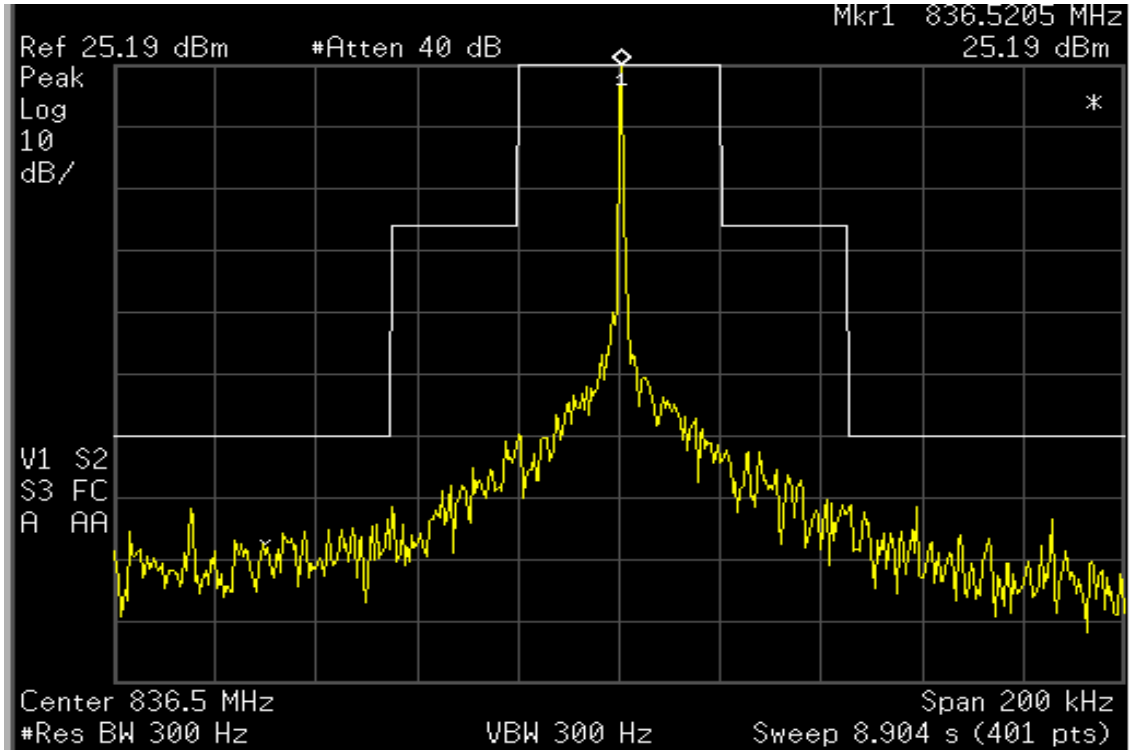
The middle channel within the designated frequency block was measured. For digital modulation, the lower and upper band edge plots are displayed.

Measurement Results

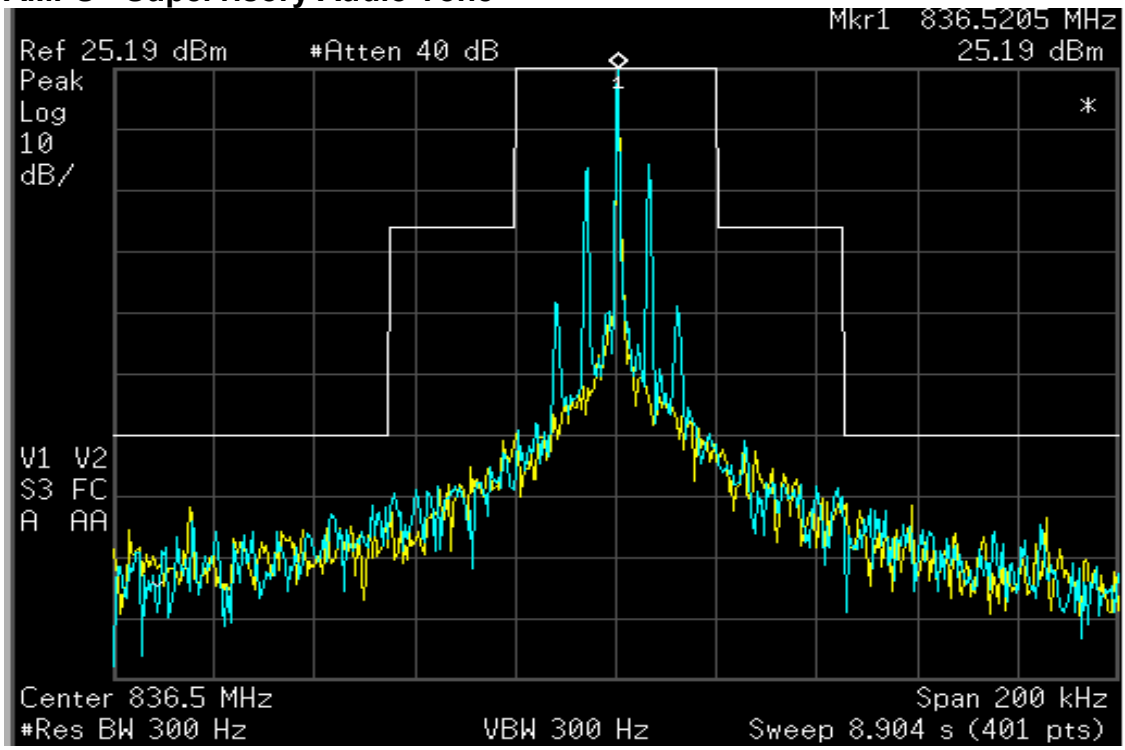
Attached

Measurement Results – AMPS

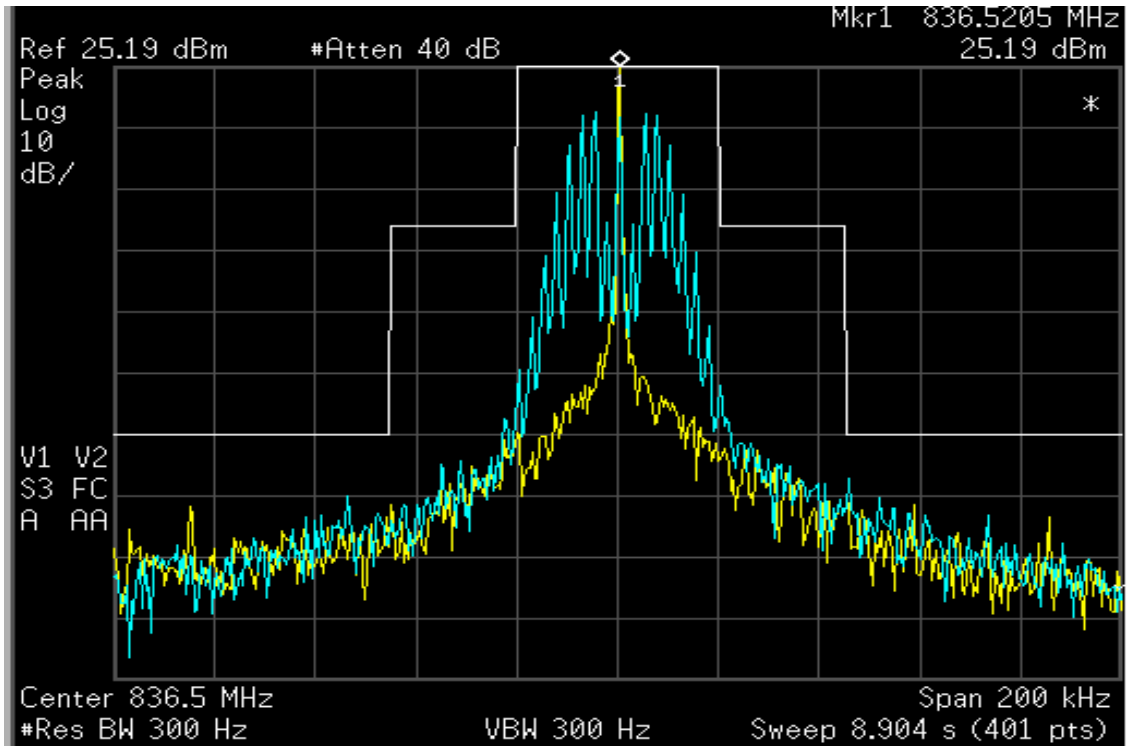
AMPS - Unmodulated Carrier



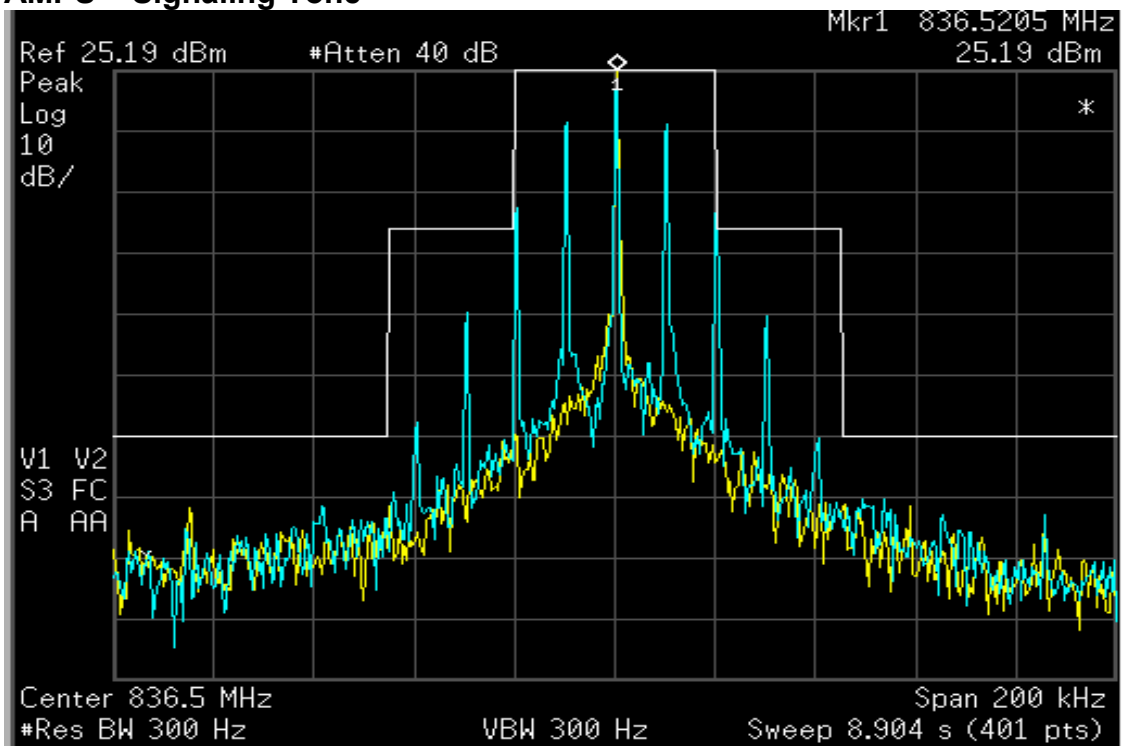
AMPS - Supervisory Audio Tone



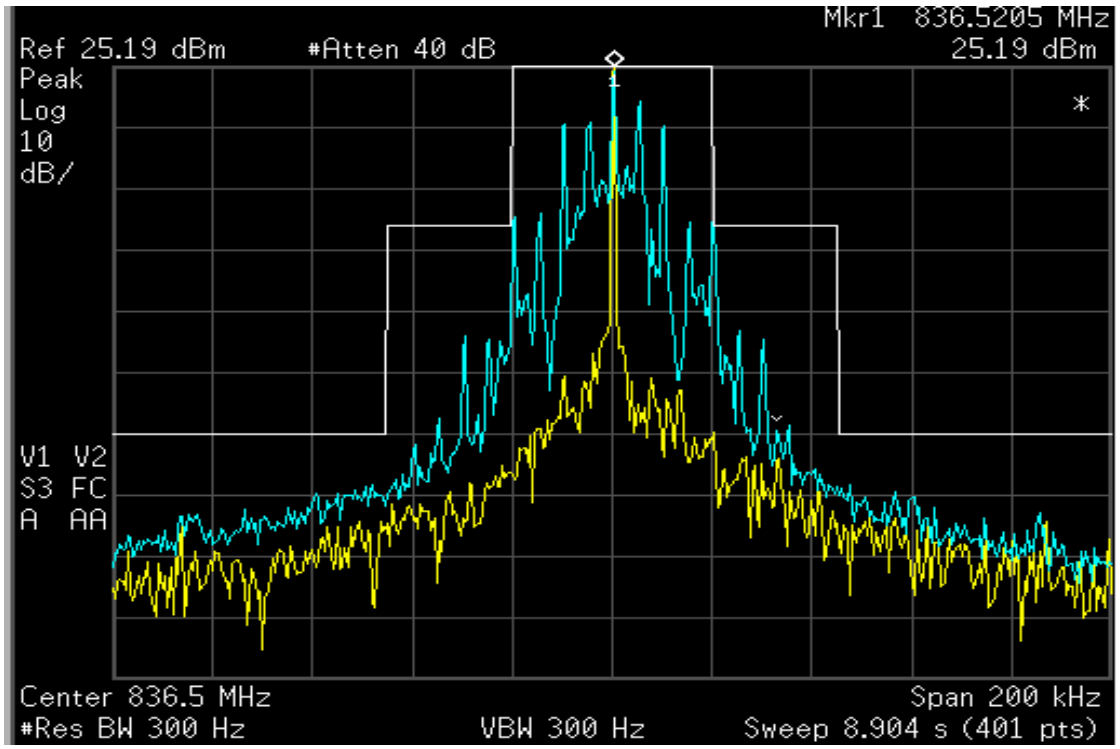
AMPS - Voice



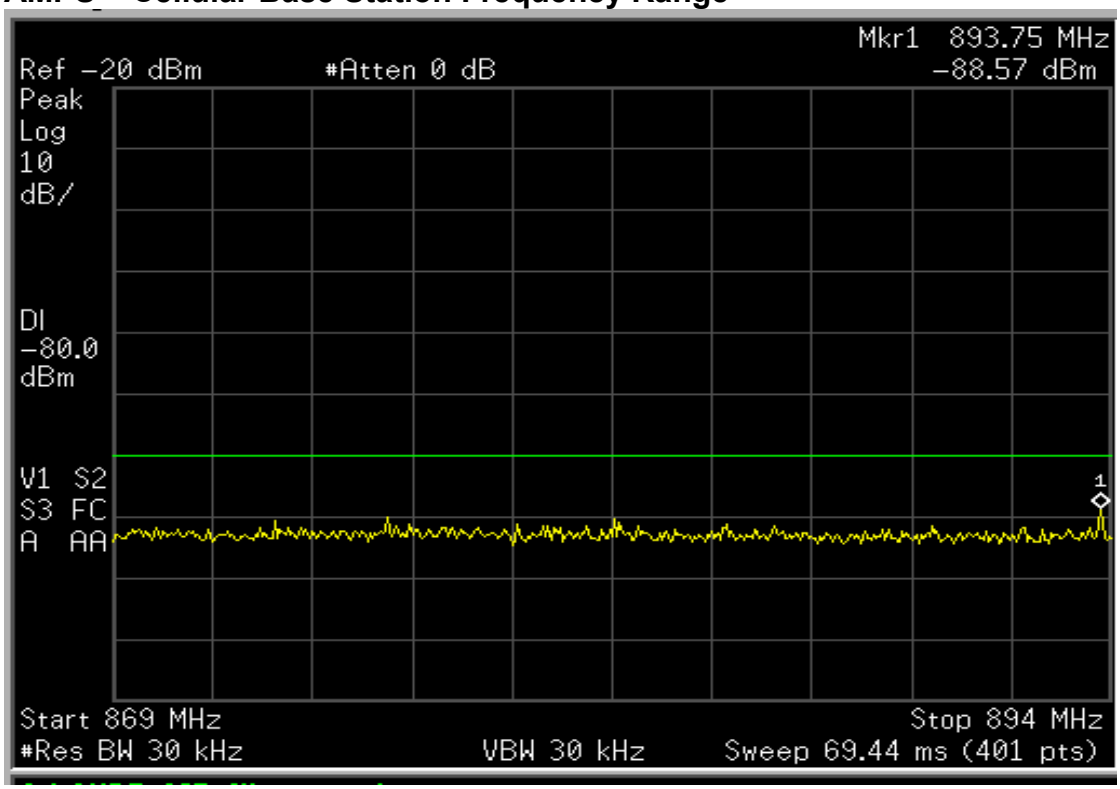
AMPS – Signaling Tone



AMPS – 10kb/s Wideband Data

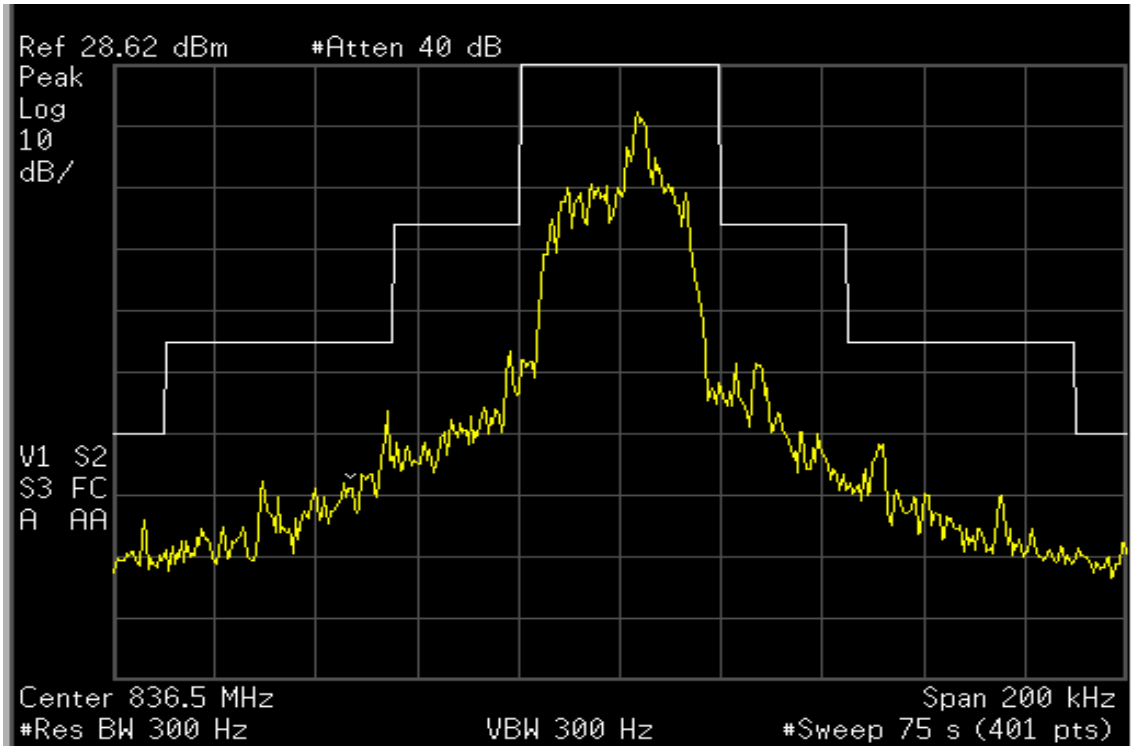


AMPS – Cellular Base Station Frequency Range

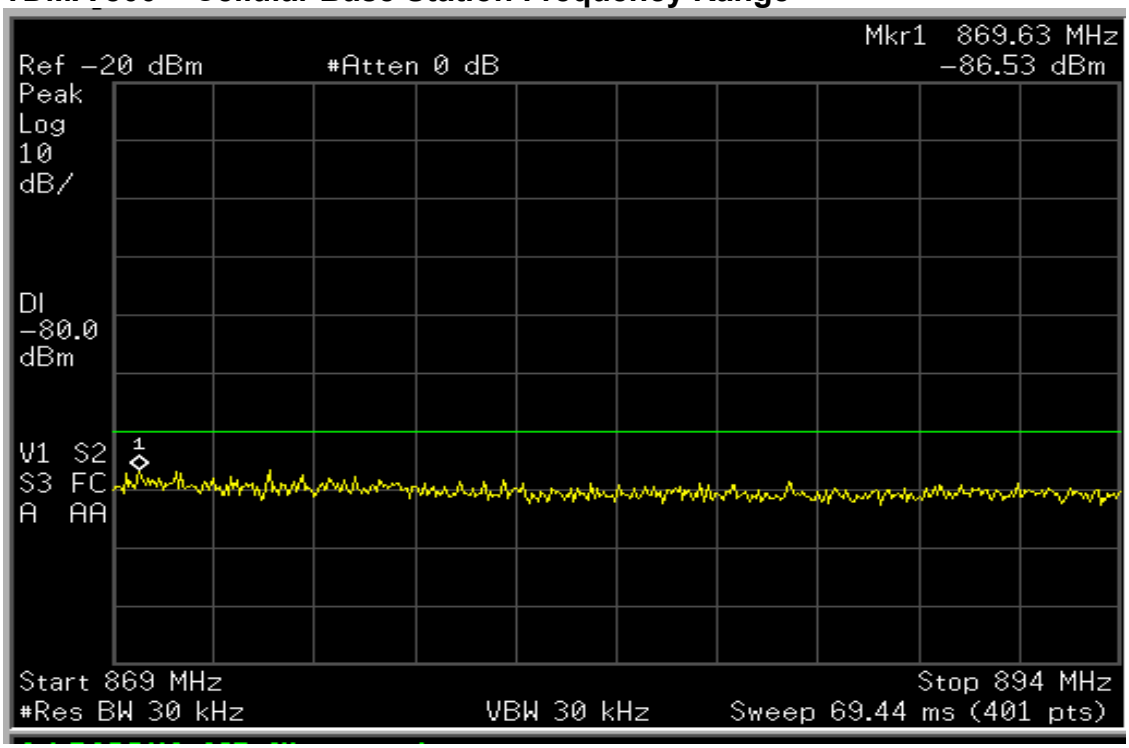


Measurement Results – TDMA 800

TDMA 800

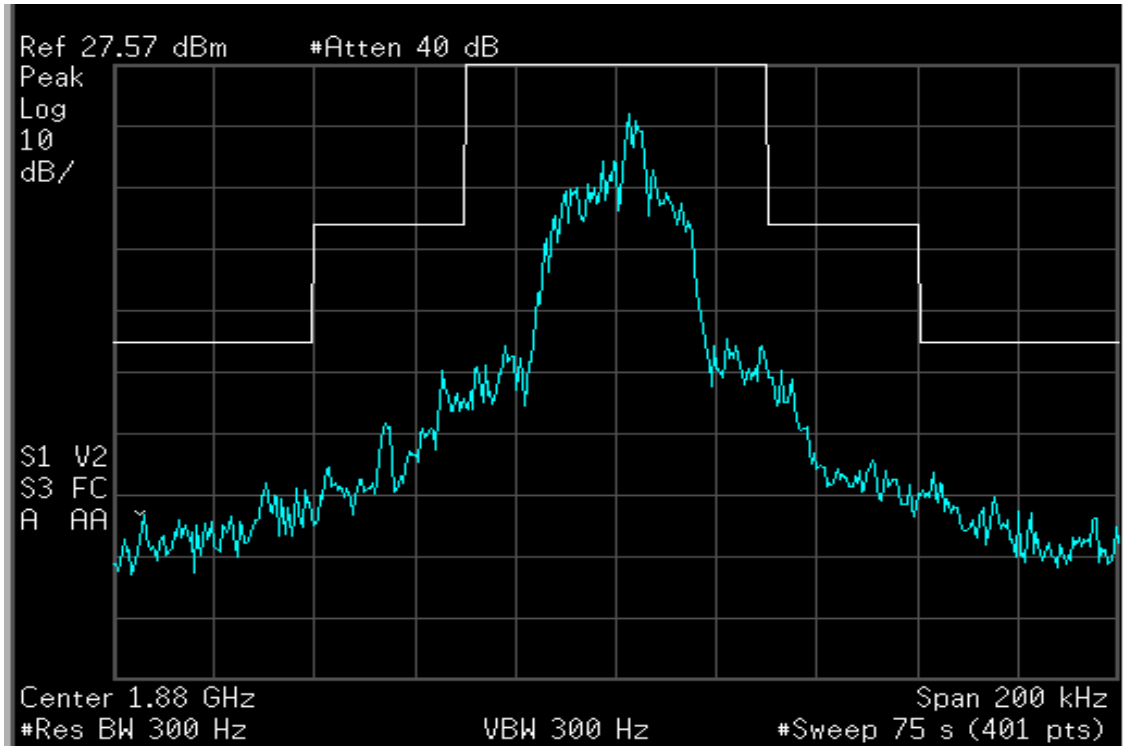


TDMA 800 – Cellular Base Station Frequency Range



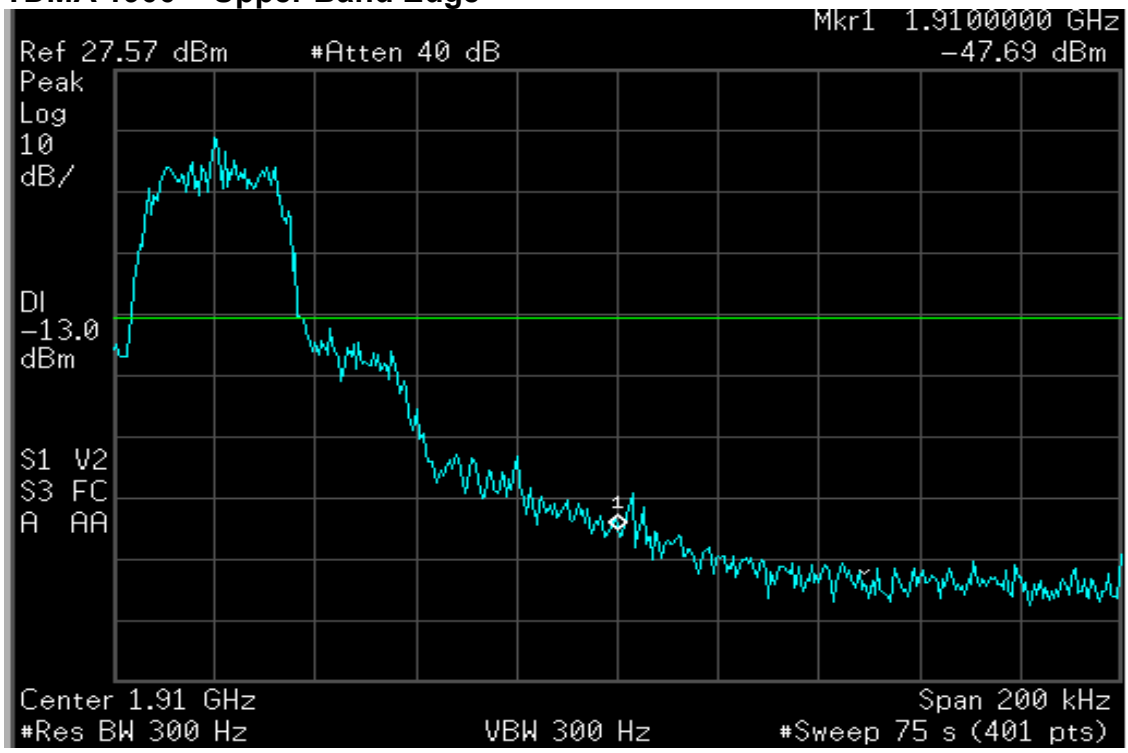
Measurement Results – TDMA 1900

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 20 dB below the permissible value and therefore not reported.

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.

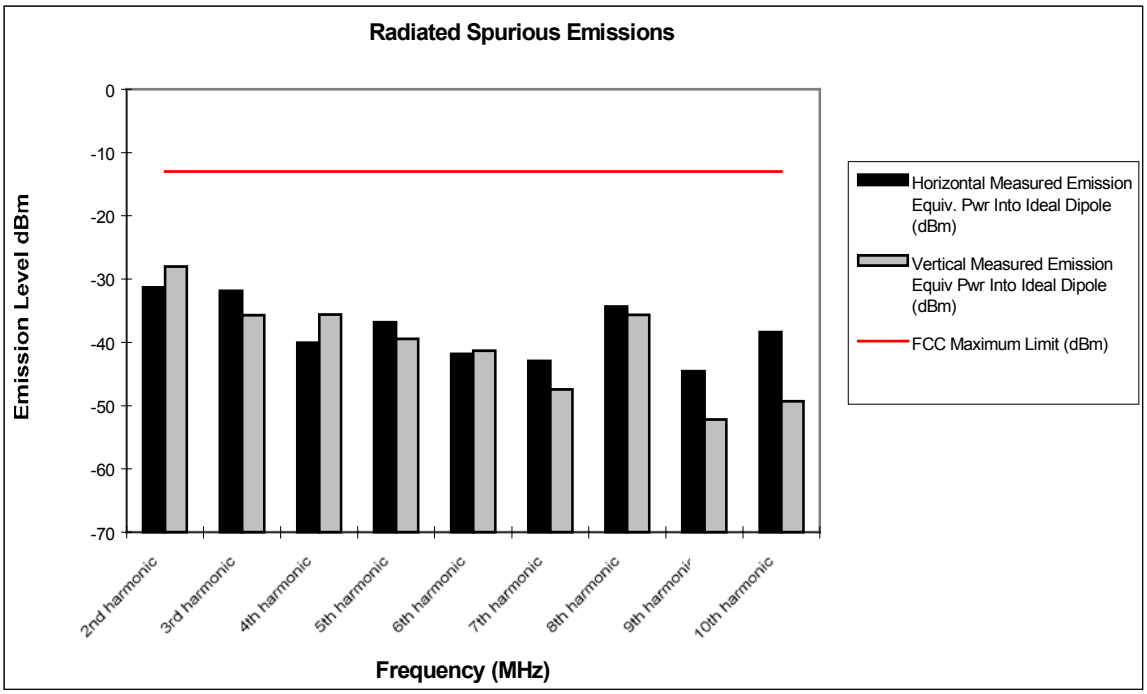
The power in dBm of each spurious emission is calculated by correcting the signal generator level for cable loss and gain of the substitution antenna referenced to a dipole. A fully charged battery was used for the supply voltage.

Measurement Results

Attached

Measurement Results
Modulation: ANALOG

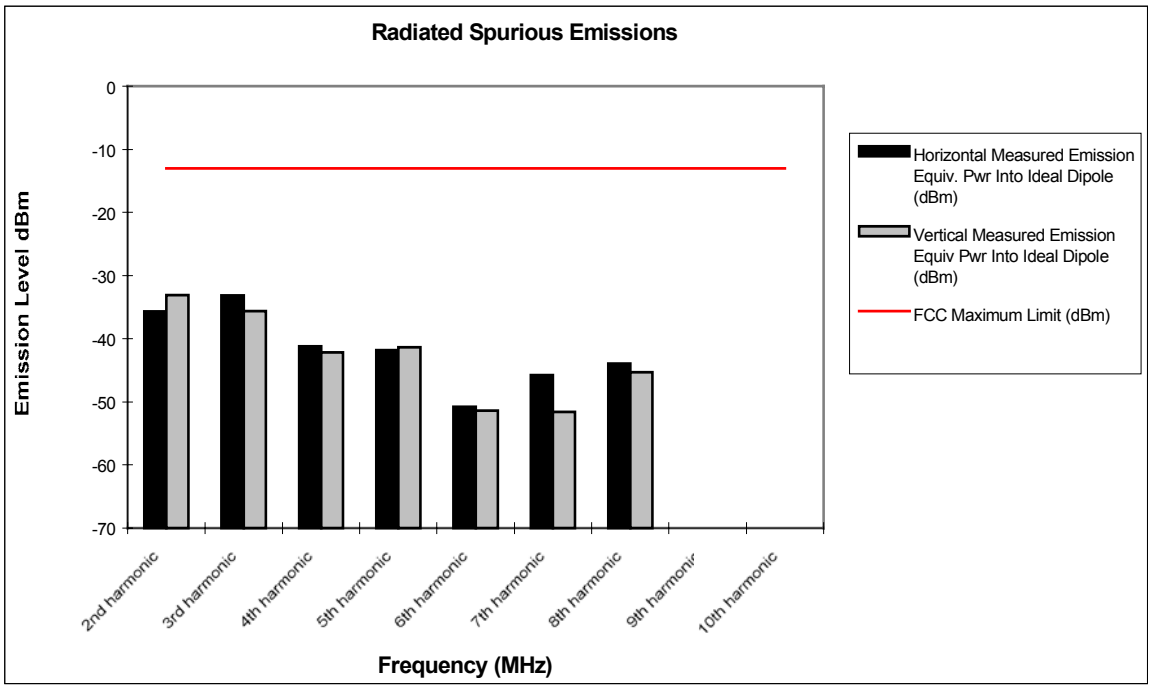
Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	-31.3	-28.0
3rd harmonic	-13	-31.8	-35.7
4th harmonic	-13	-40.0	-35.6
5th harmonic	-13	-36.8	-39.4
6th harmonic	-13	-41.8	-41.3
7th harmonic	-13	-42.9	-47.5
8th harmonic	-13	-34.3	-35.6
9th harmonic	-13	-44.5	-52.2
10th harmonic	-13	-38.4	-49.3



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 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

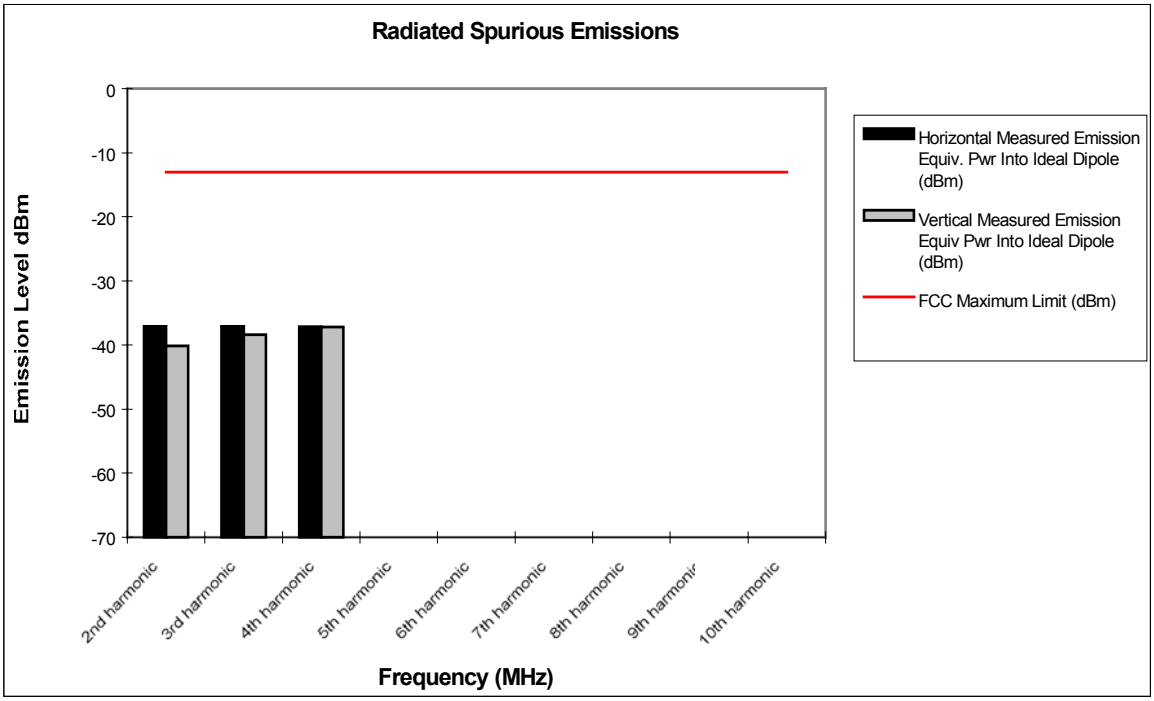
Frequency (MHz)	FCC Maximum Limit (dBm)	Horizontal Measured Emission Equiv. Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into Ideal Dipole (dBm)
2nd harmonic	-13	-35.7	-33.1
3rd harmonic	-13	-33.1	-35.7
4th harmonic	-13	-41.2	-42.2
5th harmonic	-13	-41.8	-41.4
6th harmonic	-13	-50.8	-51.4
7th harmonic	-13	-45.8	-51.6
8th harmonic	-13	-44.0	-45.3
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: 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	-37.1	-40.1
3rd harmonic	-13	-37.1	-38.4
4th harmonic	-13	-37.2	-37.2
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

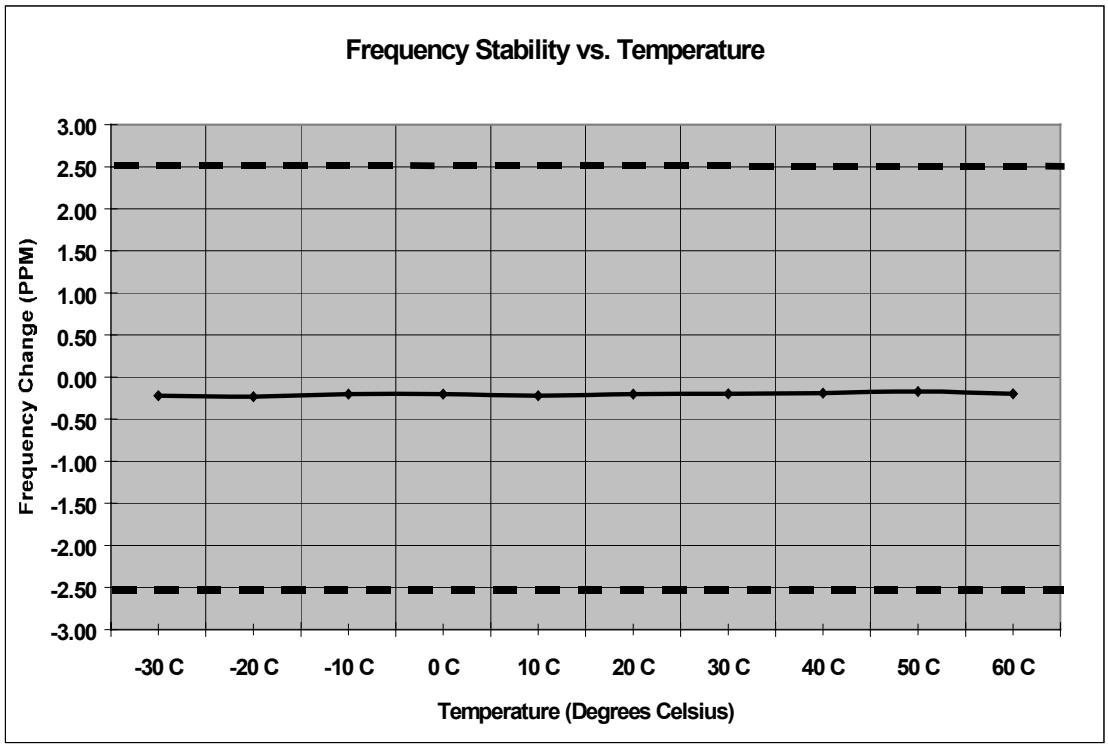
Attached

Measurement Results
Modulation: ANALOG

Frequency Stability

Mode:	Analog	**Operating Frequency:**	836.52 MHz
Channel:	384	**Deviation Limit (PPM):**	2.5ppm
Date:	March 20 02		

Temperature	Frequency Error	Frequency Error	Voltage	Power
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-186.00**	**-0.222**	100%	3.60
-20 C	**-194.00**	**-0.232**	100%	3.60
-10 C	**-171.00**	**-0.204**	100%	3.60
0 C	**-169.00**	**-0.202**	100%	3.60
10 C	**-187.00**	**-0.224**	100%	3.60
20 C	**-170.00**	**-0.203**	100%	3.60
30 C	**-168.00**	**-0.201**	100%	3.60
40 C	**-158.00**	**-0.189**	100%	3.60
50 C	**-143.00**	**-0.171**	100%	3.60
60 C	**-168.00**	**-0.201**	100%	3.60
20 C	**-133.00**	**-0.159**	Battery Endpoint	3.30



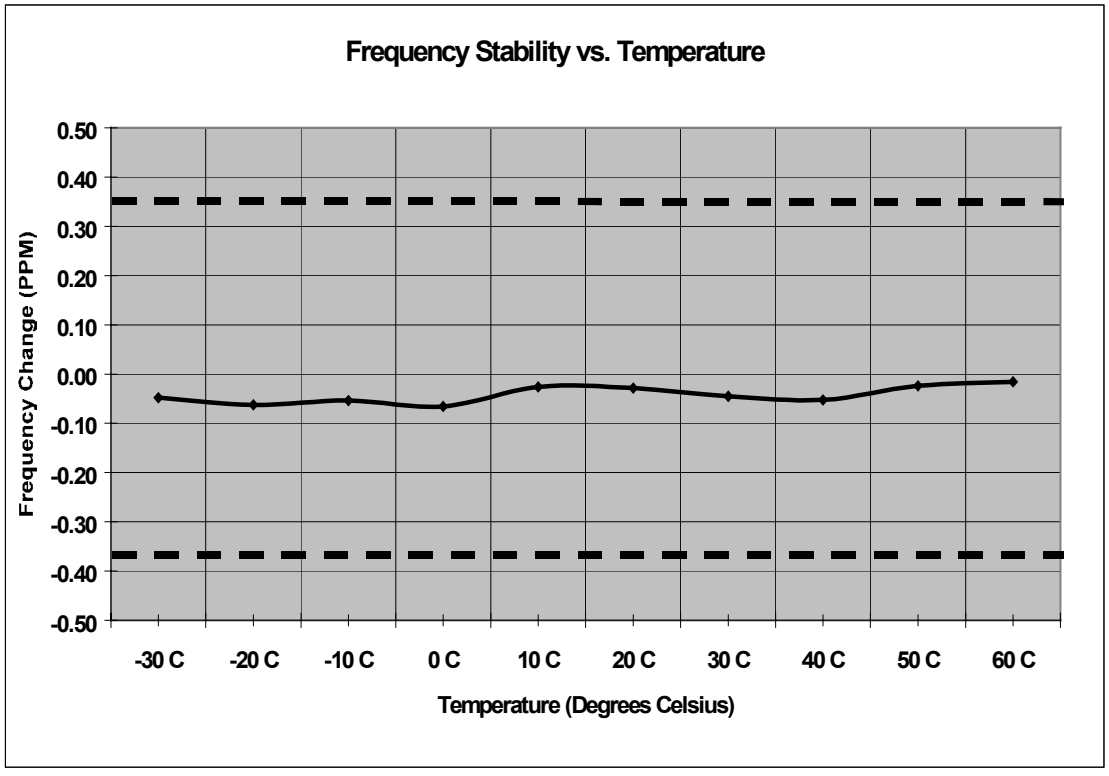
Measurement Results

Modulation: TDMA 800

Frequency Stability

Mode:	TDMA 800	**Operating Frequency:**	836.52 MHz
Channel:	384	**Deviation Limit (PPM):**	0.359ppm (+/-300 Hz)
Date:	March 20 02		

Temperature	Frequency Error	Frequency Error	Voltage	Power
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-40.00**	**-0.048**	100%	3.60
-20 C	**-52.00**	**-0.062**	100%	3.60
-10 C	**-45.00**	**-0.054**	100%	3.60
0 C	**-55.00**	**-0.066**	100%	3.60
10 C	**-22.00**	**-0.026**	100%	3.60
20 C	**-24.00**	**-0.029**	100%	3.60
30 C	**-38.00**	**-0.045**	100%	3.60
40 C	**-44.00**	**-0.053**	100%	3.60
50 C	**-20.00**	**-0.024**	100%	3.60
60 C	**-13.00**	**-0.016**	100%	3.60
20 C	**-76.00**	**-0.091**	Battery Endpoint	3.30

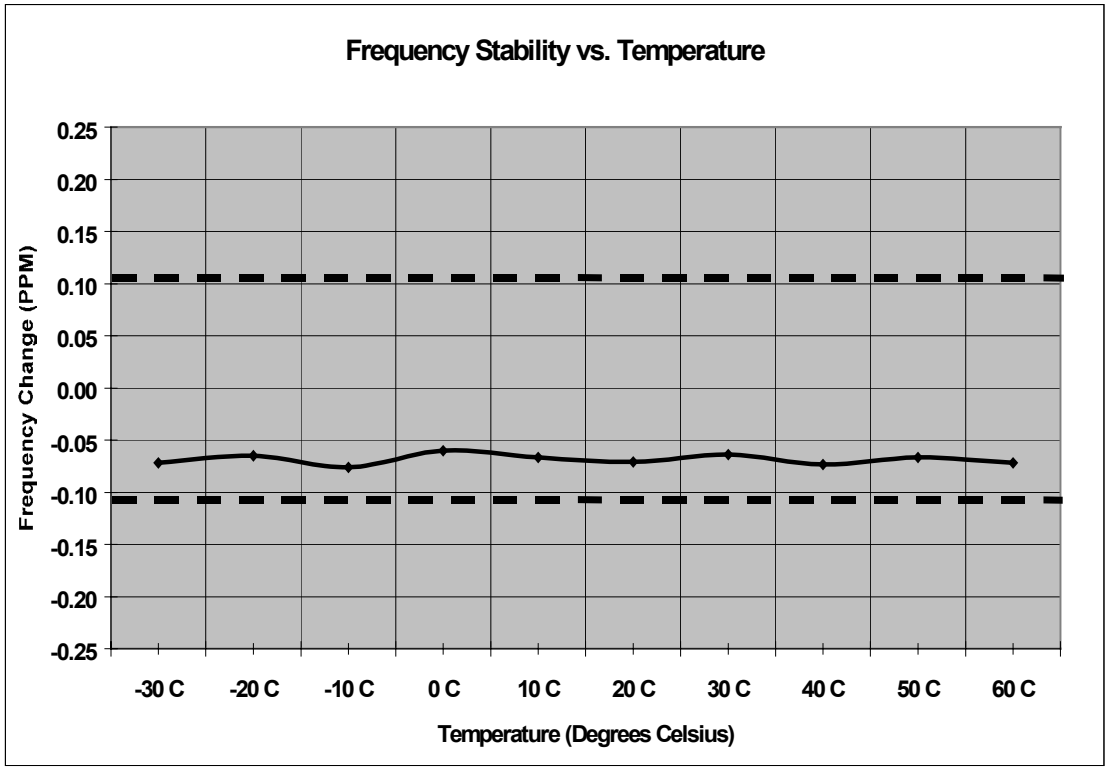


Measurement Results
Modulation: TDMA 1900

Frequency Stability

Mode: TDMA 1900 **Operating Frequency:** 1879.98 MHz
Channel: 1000 **Deviation Limit (PPM):** 0.106ppm (+/-200Hz)
Date: March 20 02

Temperature	Frequency Error	Frequency Error	Voltage	Power
C	HZ	(PPM)	(%)	(VDC)
-30 C	**-135.00**	**-0.072**	100%	3.60
-20 C	**-122.00**	**-0.065**	100%	3.60
-10 C	**-143.00**	**-0.076**	100%	3.60
0 C	**-113.00**	**-0.060**	100%	3.60
10 C	**-125.00**	**-0.066**	100%	3.60
20 C	**-133.00**	**-0.071**	100%	3.60
30 C	**-120.00**	**-0.064**	100%	3.60
40 C	**-138.00**	**-0.073**	100%	3.60
50 C	**-125.00**	**-0.066**	100%	3.60
60 C	**-135.00**	**-0.072**	100%	3.60
20 C	**-181.00**	**-0.096**	Battery Endpoint	3.30



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.

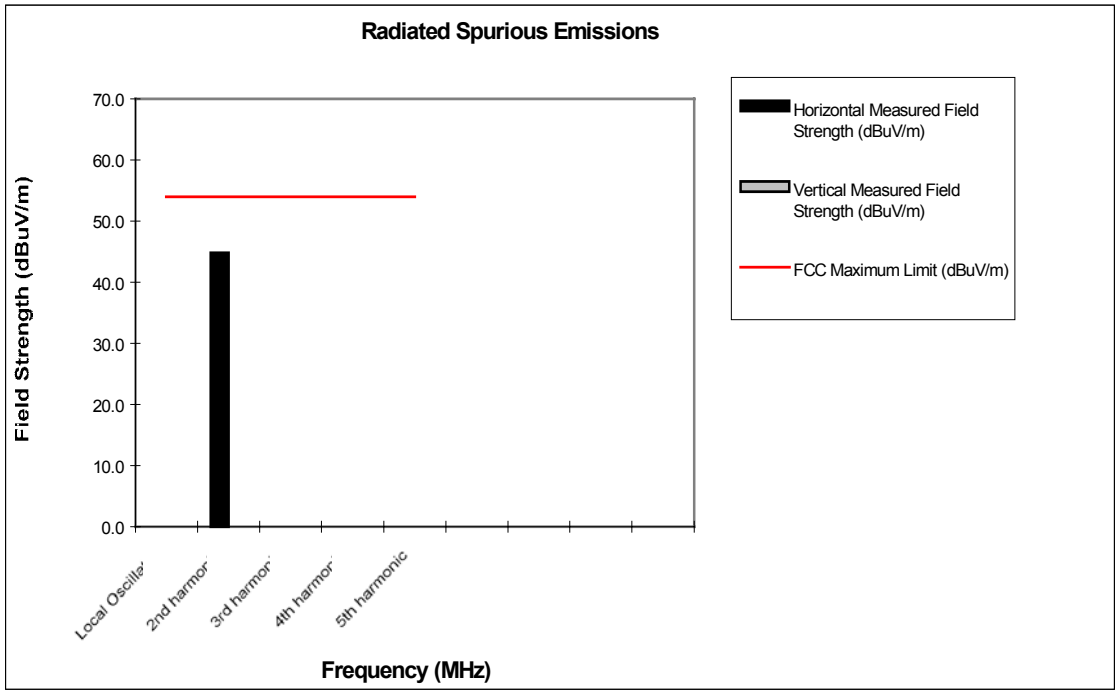
Field Strength (dBuV/m) = EMI Receiver Level (dBuV) + Cable Loss (dB) - Amplifier Gain (dB) + Antenna Correction Factor (1/m)

Measurement Results

The magnitude of all spurious emissions in AMPS and TDMA 800 modes were attenuated below the noise floor of the measurement equipment and therefore not reported. TDMA 1900 data is attached.

Measurement Results
Modulation: TDMA 1900

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	44.8	*
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