



**MOBILE DEVICES BUSINESS  
PRODUCT SAFETY AND COMPLIANCE  
EMC LABORATORY**

**EMC TEST REPORT**

**Test Report Number** – 23156-1

**Report Date** – July 14, 2009

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: Thanigaiselvan Palaniswami

Title: EMC Engineer

Date: July 10, 2009

This report must not be reproduced, except in full, without written approval from this laboratory.

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

A2LA Certificate Number: 2518-02

**Test Report Details**..... 3

**Applicable Standards**..... 3

**Summary of Testing**..... 4

**Equipment and Cable Configurations** ..... 5

**Measurement Procedures and Data** ..... 6

**RF POWER OUTPUT**..... 6

**RADIATED POWER (EIRP AND ERP)** ..... 7

**OCCUPIED BANDWIDTH**..... 8

**SPURIOUS EMISSIONS AT ANTENNA TERMINALS**..... 15

**FIELD STRENGTH OF SPURIOUS EMISSIONS** ..... 18

**FREQUENCY STABILITY**..... 21

**Test Report Details**

Tests Performed By: Motorola Mobile Devices business (MDb)  
 Product Safety and Compliance Group  
 600 North US Hwy 45  
 Libertyville, IL 60048  
 PH (847) 523-6167 Fax (847) 523-4538  
 Motorola MDb FRN: 0004321311  
 FCC Registration Number: 316588  
 Industry Canada Number: 109O-1

Tests Requested By: Motorola Inc.  
 Mobile Devices Business  
 600 North US Hwy 45  
 Libertyville, IL 60048

Product Type: Cellular Phone

Signaling Capability: CDMA 800 & 1900, CDMA EVDO Release 0 - 800 & 1900, Bluetooth

FCC ID: IHDP56KB1

Serial Numbers: 2CA1CBE, 2CA215C

Testing Complete Date: July 10, 2009

**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 2
- X   Part 22 Subpart H - Public Mobile Services
- X   Part 24 Subpart E – Personal Communications Services

Applicable Standards: ANSI 63.4 2003, ANSI/TIA-603-C-2004

**Summary of Testing**

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

Test #	Test Name	Margin with respect to the Limit
1	RF Power Output	NA
2	ERP (Effective Radiated Power)	See results
3	EIRP (Effective Isotropic Radiated Power)	See results
4	Occupied Bandwidth	See Plots
5	Spurious Emissions at Antenna Terminal	See results
6	Field Strength of Spurious Emissions	See results
7	Frequency Stability	See results

The margin with respect to the limit is the minimum margin for all modes and bands.

**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. The temperature and the relative humidity were maintained within the ANSI C63.4 2003 Standard requirements during the entire duration of testing.

**Equipment and Cable Configurations**

The EUT was tested in a stand-alone configuration that is representative of typical use.

<b>Manufacturer</b>	<b>Equipment Type</b>	<b>Model No.</b>	<b>Serial Number</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Receiver	ESIB40	100226	1/30/10
Rohde Schwarz	Receiver	ESI26	838786/010	5/01/10
Hewlett Packard	EMC Analyzer	E7405	US40440219	4/24/10
Agilent	Spectrum Analyzer	N9020A	US46470586	12/10/09
Hewlett Packard	Signal Generator	83623B	3844A00935	4/24/11
A.H. Systems	DRG Horn Antenna	SAS 200/571	365	12/23/09
A.H. Systems	DRG Horn Antenna	SAS 200/571	265	04/29/10
ETS	Log-Periodic Antenna	3148	1188	7/30/09
ETS	Biconical Antenna	3110B	3370	7/29/09
Attenuator	Weinschel	AS-6	6675	NCR
Attenuator	Weinschel	AS-6	6677	NCR
Thermotron	Environmental Chamber	S-4	31580	1/28/10
Agilent	Power Meter	E4416A	GB41293262	11/01/09
Agilent	Power Sensor	E9323A	MY44420845	12/13/09
Agilent	Microwave Preamplifier	8449B	3008A01442	2/25/10
ETS	LISN	3810/2NM	00062907	12/10/09
ETS	LISN	3810/2NM	00062912	12/10/09

All test equipment was within their calibration date during the time of testing. When equipment went out of calibration during testing it was replaced using a similar piece of calibrated equipment. All these equipments are listed in the equipment list.

Note that the Agilent power meter, power sensor and the preamplifier are on a two-year calibration cycle. All other equipments are 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 an Agilent power meter through a 20dB passive attenuator, adaptor (if needed), and specialized RF connector.

Conducted Power was measured according to the “SAR Measurement Procedure for 3G Devices” released on October, 2007.

**Measurement Results**

Conducted power (dBm) for CDMA modes						
	Channel	RC1		RC3		RC3 (FCH + SCH)
		SO2	SO55	SO2	SO55	
CDMA 800	1013	24.89	24.87	24.75	24.94	Per Motorola designs, the maximum power, when in a mode that allows supplemental channels, will always be less than the RC3/RC1 maximum conducted power limit.
	384	24.91	24.86	24.78	24.87	
	777	24.85	24.79	24.71	24.80	
CDMA 1900	25	25.03	25.01	24.94	24.97	
	600	24.94	24.94	24.84	24.90	
	1175	25.14	25.15	25.04	24.99	

Conducted power (dBm) for EVDO modes					
	Channel	Rev 0		Rev A	
		FTAP 307.2k	RTAP 153.6k	Subtype 2 FETAP	Subtype 2 RETAP
CDMA 800	1013	24.69	24.93		
	384	24.69	24.96		
	777	24.58	24.85		
CDMA 1900	25	25.28	25.04		
	600	25.32	25.01		
	1175	25.62	25.20		

Based on the power measurements 800 band testing was done in RC3/SO55 CDMA 1x mode and 1900 band testing was performed in EVDO Rev 0 FTAP mode.

**RADIATED POWER (EIRP AND ERP)**

**Measurement Procedure**

The phone was tested in a 16’ anechoic chamber with a 2-axis position system that permits taking complete spherical scans of the EUT’s radiation patterns. For all tests, the phone was supported in a free space type environment, vertically oriented in the chamber.

All measurements were made with the phone placed in a call using a 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 each 15 degree step. The radiated power was measured using Spectrum Analyzers using a peak detector for all bands. 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. To get ERP (effective radiated power referenced to a half-wave dipole), subtract 2.1 dB from these numbers.

**Measurement Results**

<b>Band</b>	<b>EIRP dBm</b>	<b>ERP dBm</b>
CDMA 800	26.98	<b>24.88</b>
CDMA 1900	<b>29.04</b>	26.94

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

**OCCUPIED BANDWIDTH**

**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

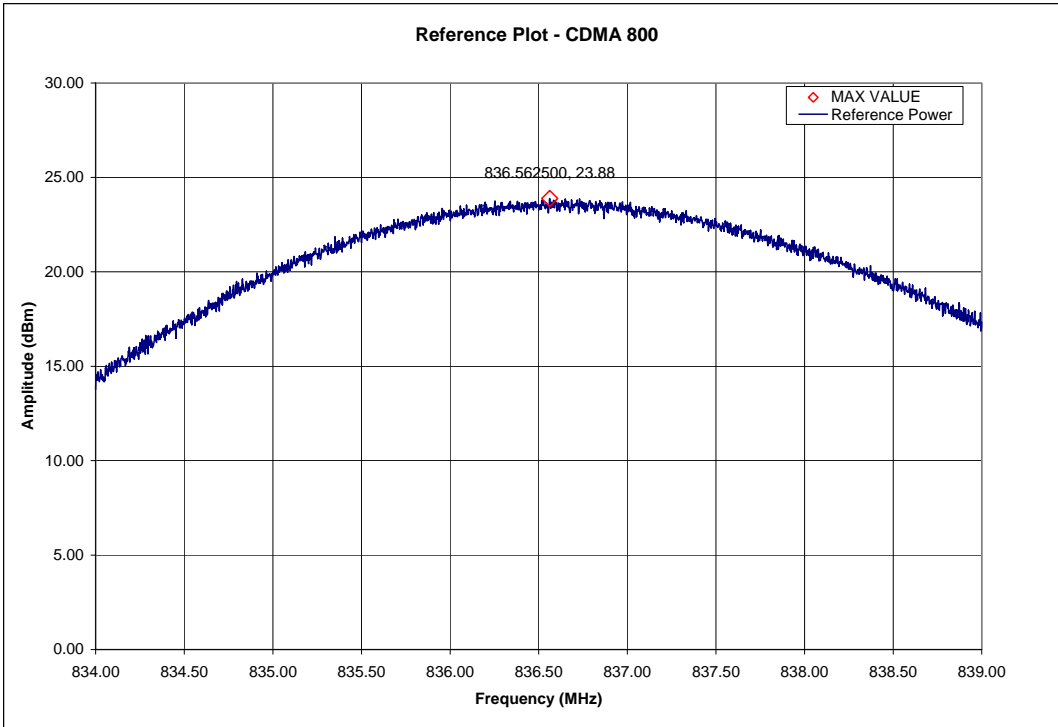
Plot	Equipment Settings					
	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Sweep Points (#)	Trace Mode	Detector	Samples (≥ #)
Reference Plot - CDMA 800	3000	Auto	2001	Max Hold	Peak	100
OCBW - CDMA 800	30	Auto	1601	Max Hold	Peak	100
Lower Band Edge - CDMA 800	1	Auto	2004	Max Hold	Peak	30
Upper Band Edge - CDMA 800	1	Auto	2004	Max Hold	Peak	30

Notes: 1) When the video bandwidth is set to Auto the video bandwidth self adjusts for <sup>3</sup> the resolution bandwidth.

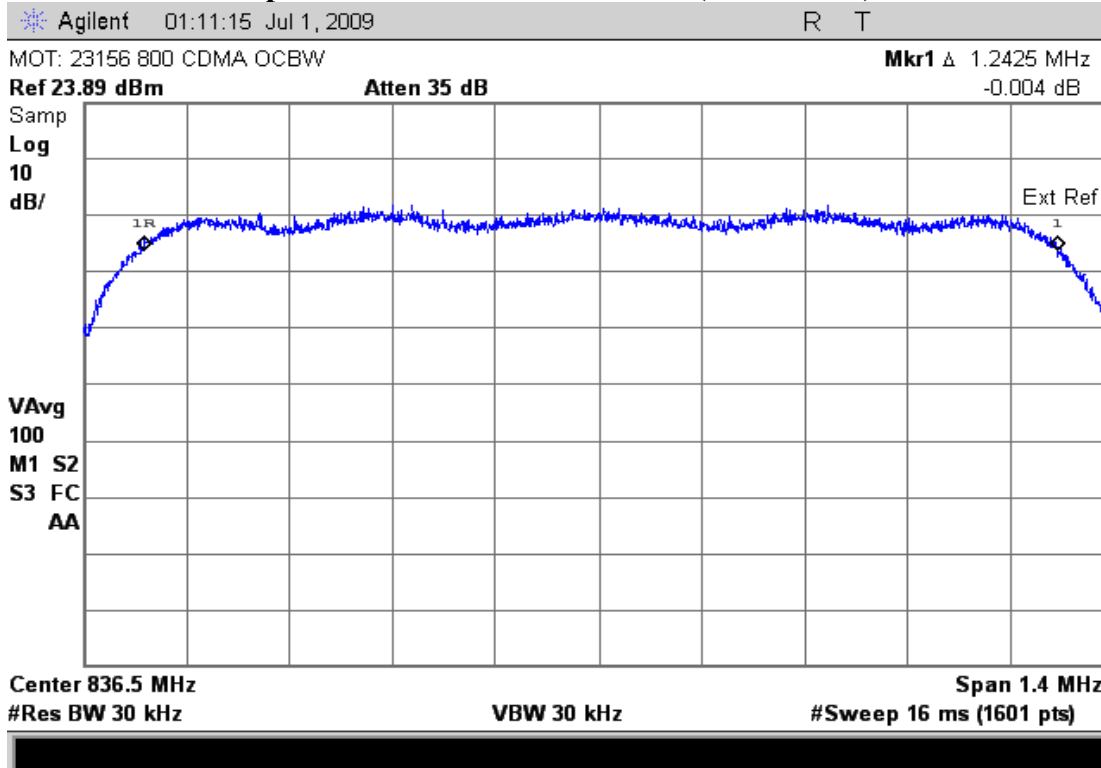
2) The plotted data shown for the band edge measurements is representative of data taken with a true 13 kHz resolution bandwidth filter. The raw data was taken using a 1 kHz resolution bandwidth and was integrated to produce a response representative of data taken using a true 13 kHz resolution bandwidth filter.

**Measurement Results – CDMA 800**

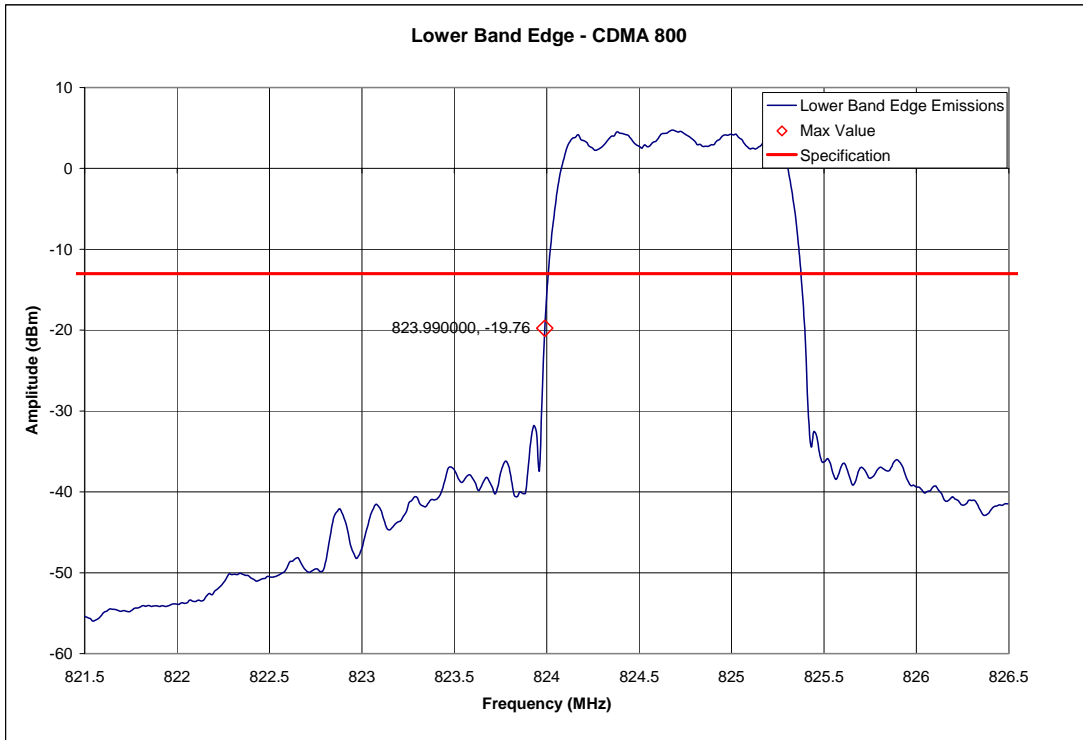
**CDMA 800 – Reference Level Plot – Channel 384 (836.52 MHz)**



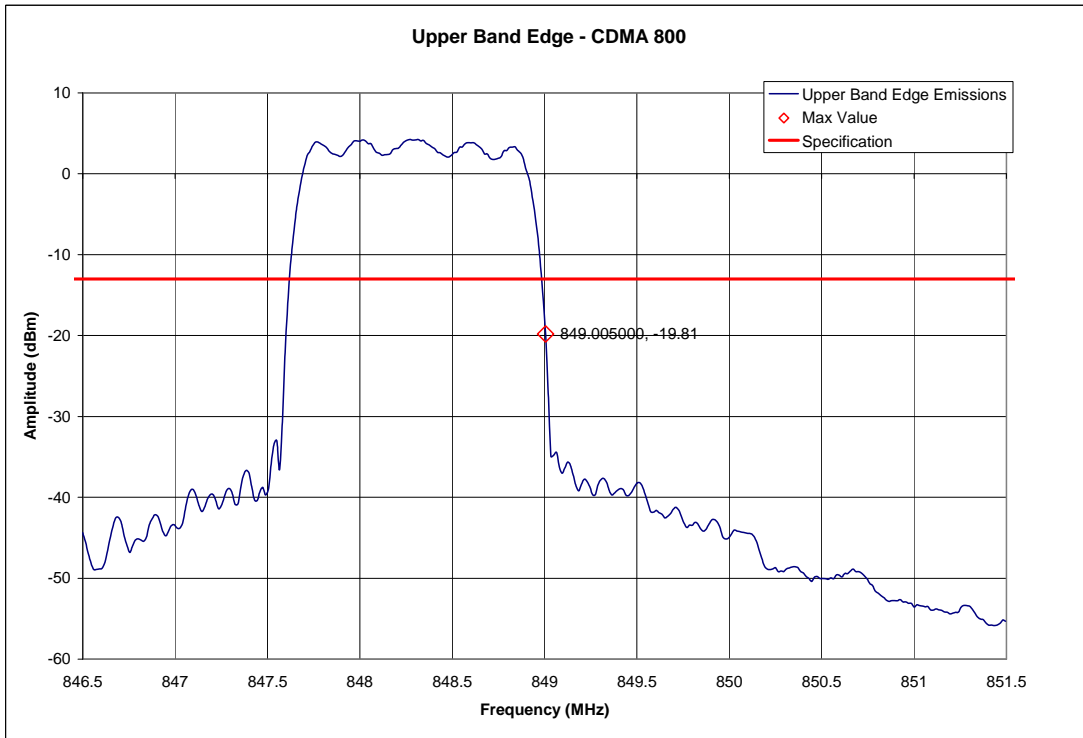
**CDMA 800 – Occupied Bandwidth – Channel 384 (836.52MHz)**

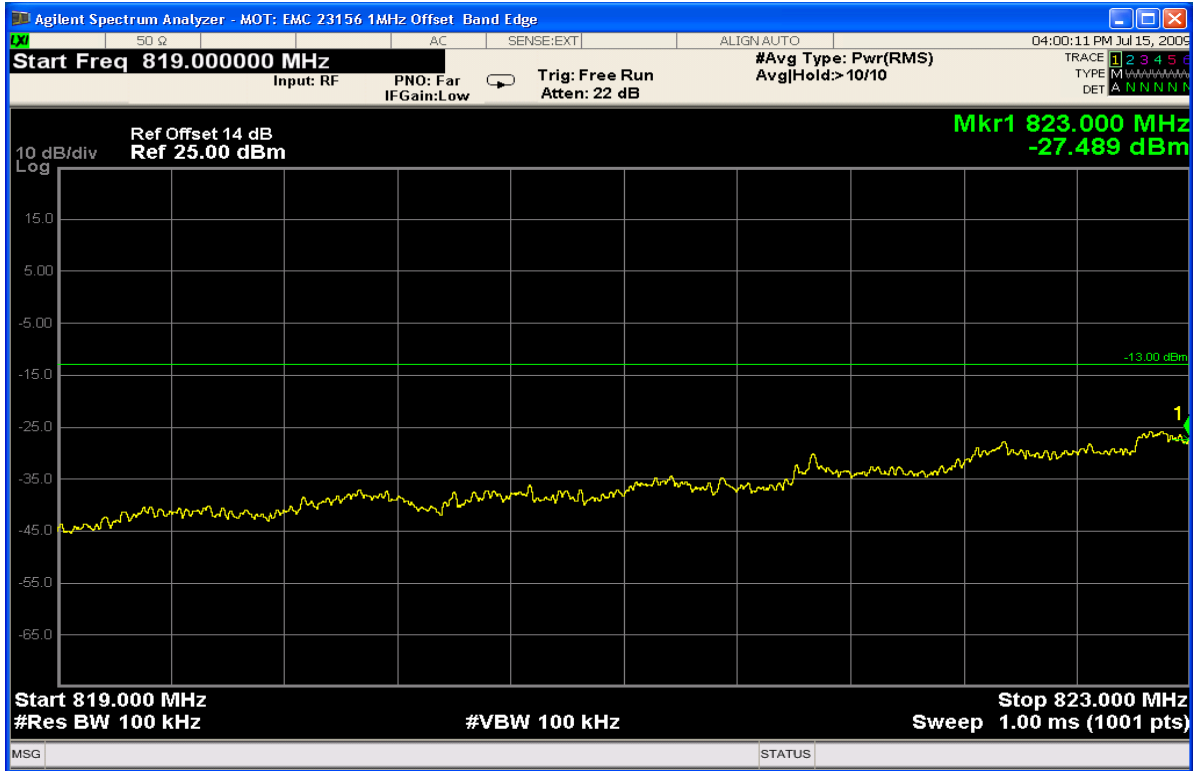


**CDMA 800 – Lower Band Edge – Channel 1013 (824.70 MHz)**

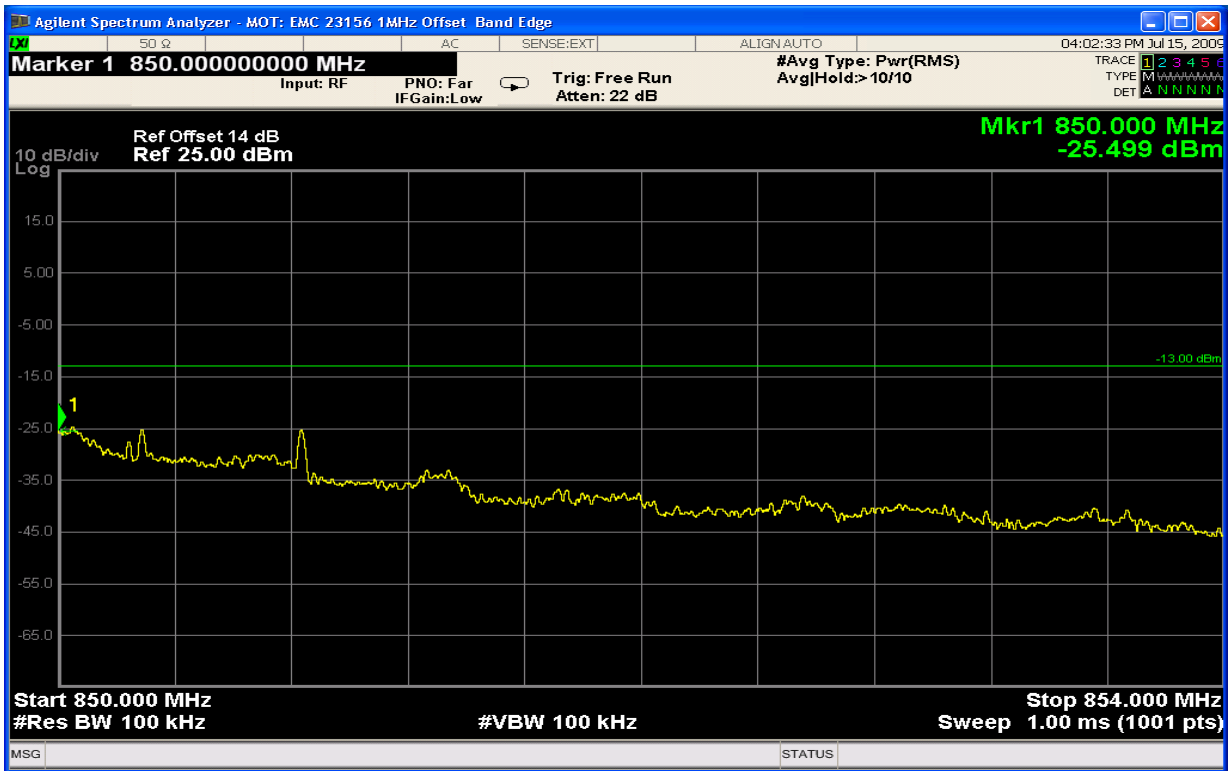


**CDMA 800 – Upper Band Edge – Channel 777 (848.31 MHz)**





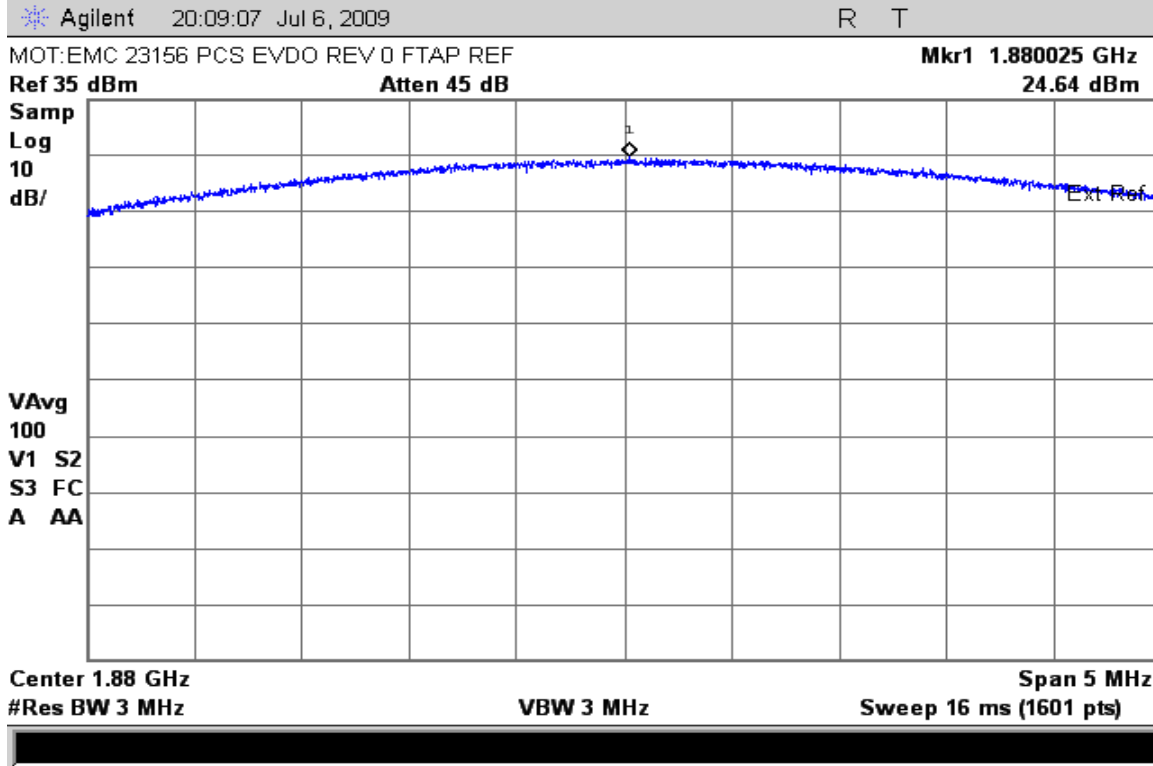
Channel 1013 - Lower Band Edge



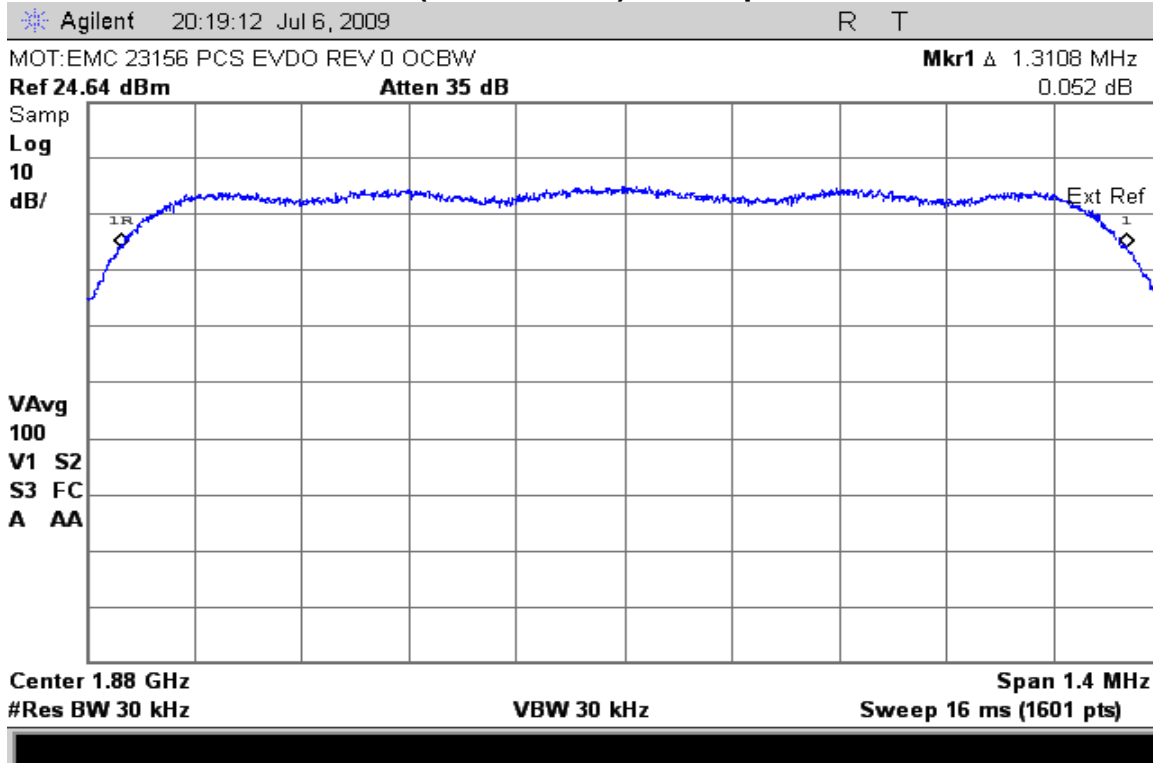
Channel 777 - Upper Band Edge

**Measurement Results – CDMA 1900**

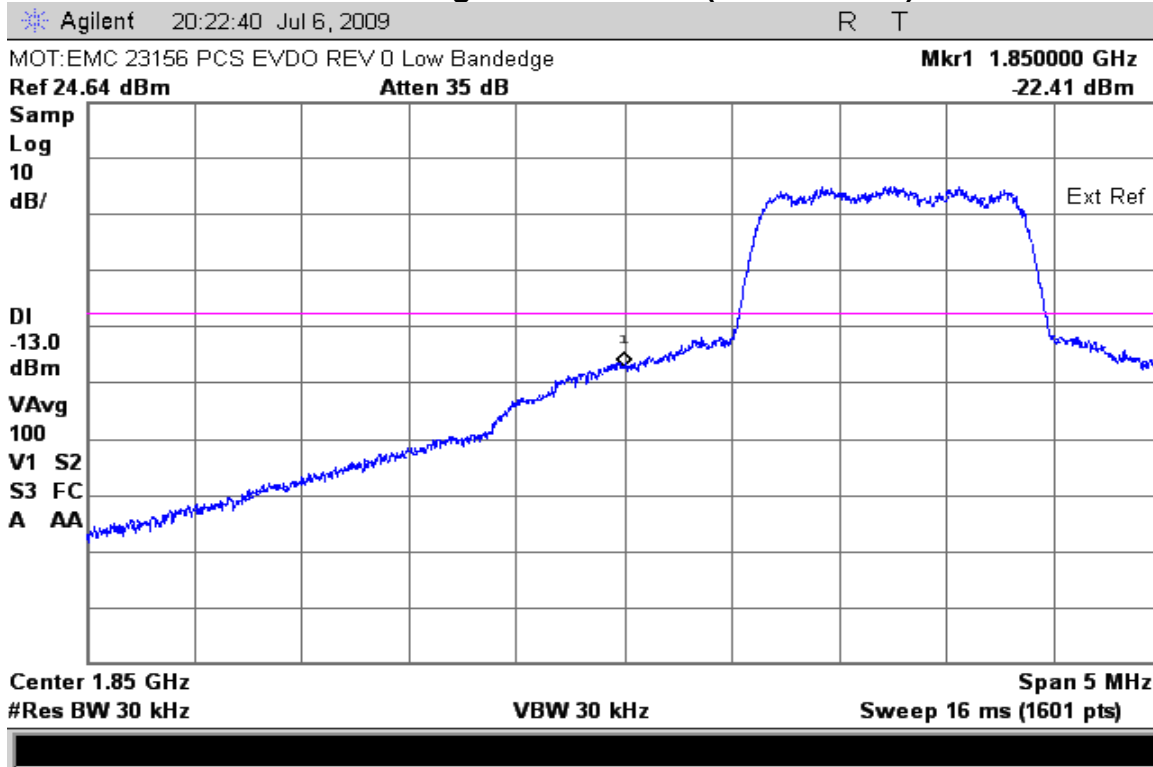
**CDMA 1900 – Reference Level Plot – Channel 600 (1880.00 MHz)**



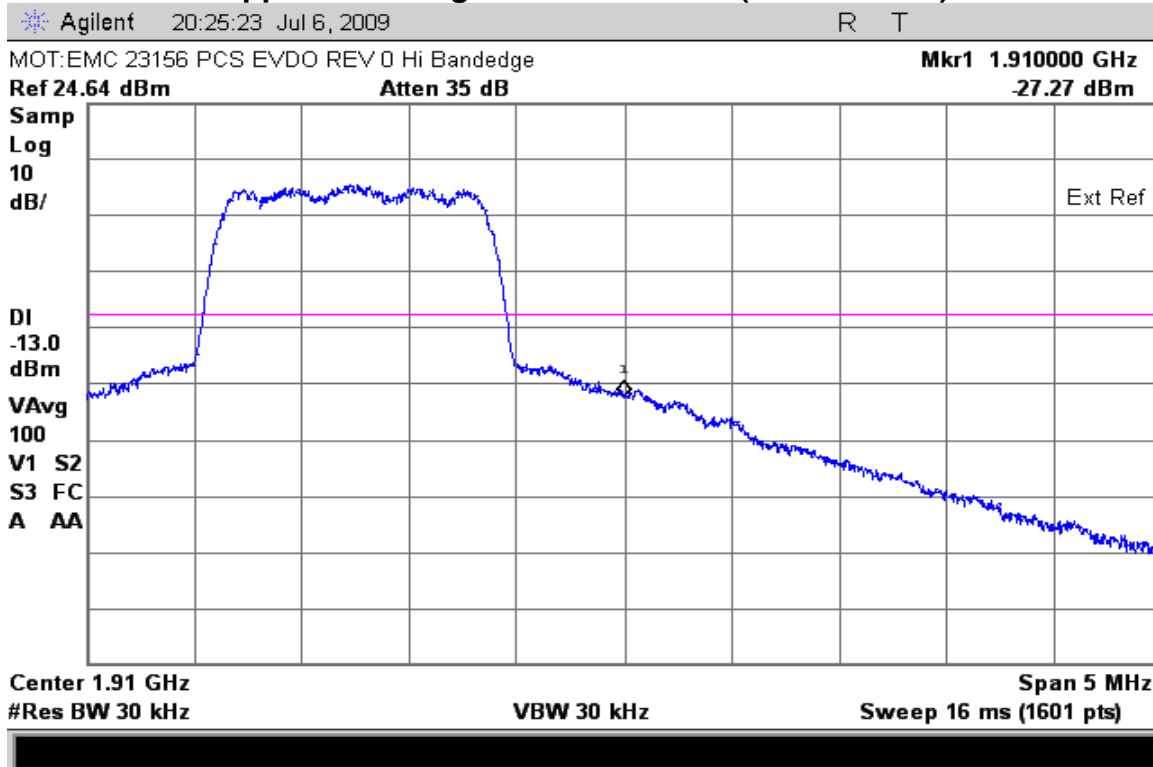
**CDMA 1900 – Channel 600 (1880.00 MHz) – Occupied Bandwidth**

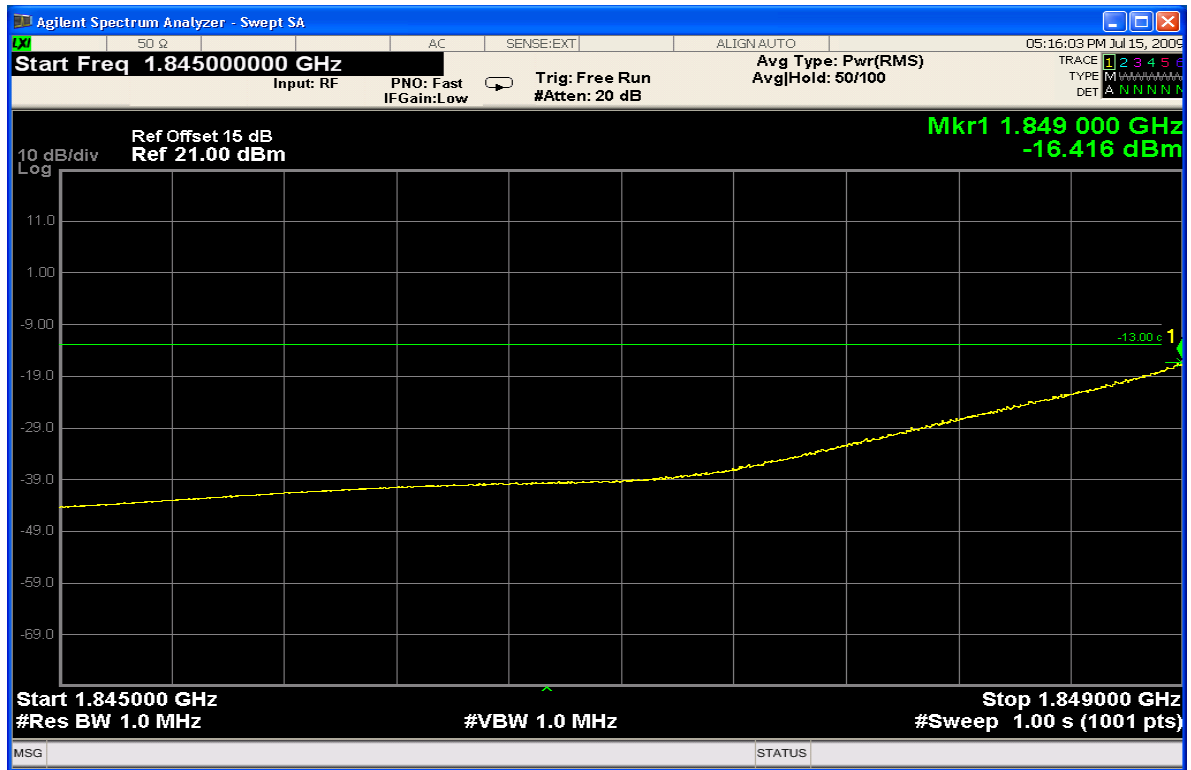


### CDMA 1900 – Lower Band Edge – Channel 25 (1851.25 MHz)

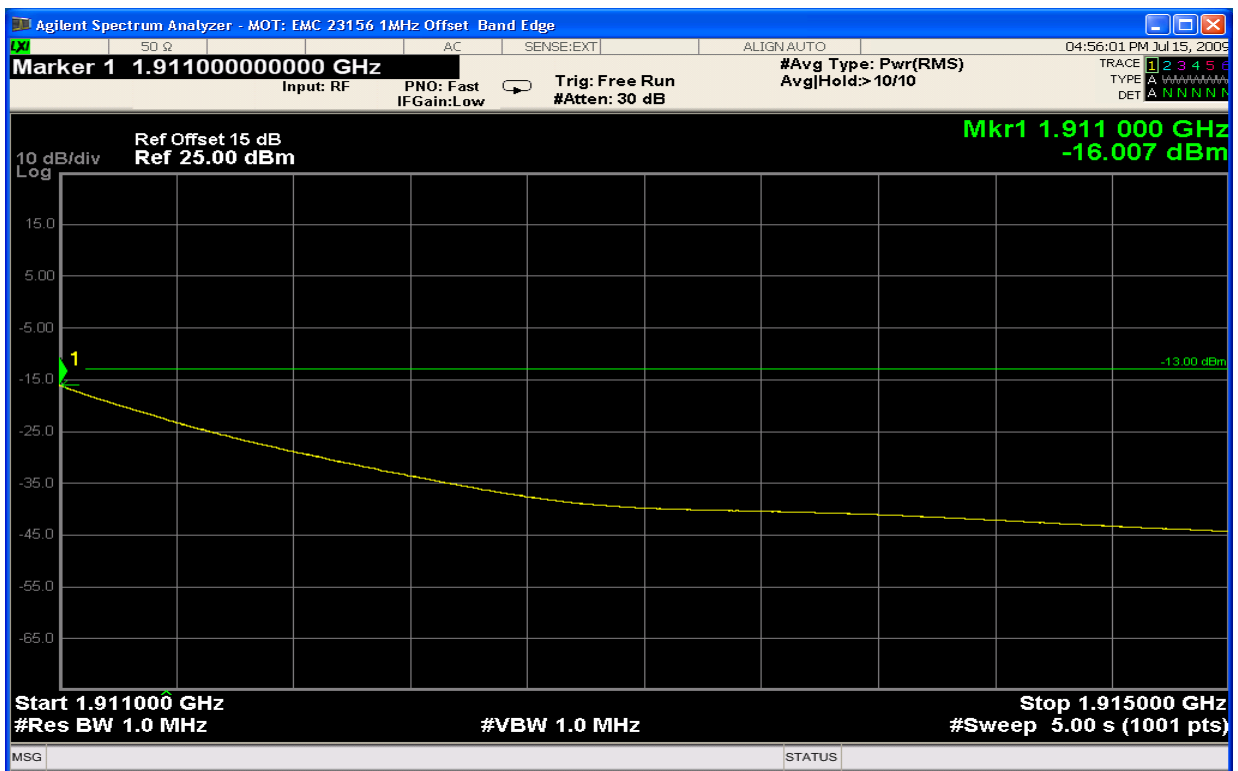


### CDMA 1900 – Upper Band Edge – Channel 1175 (1908.75 MHz)





Channel 25 Lower Band Edge



Channel 1175 Upper Band Edge

**SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

**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.

The spectrum analyzer settings were as follows:

Unit	dBm
Divisions	10 dB
Detector	Peak Detector
Resolution Bandwidth	1 MHz
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

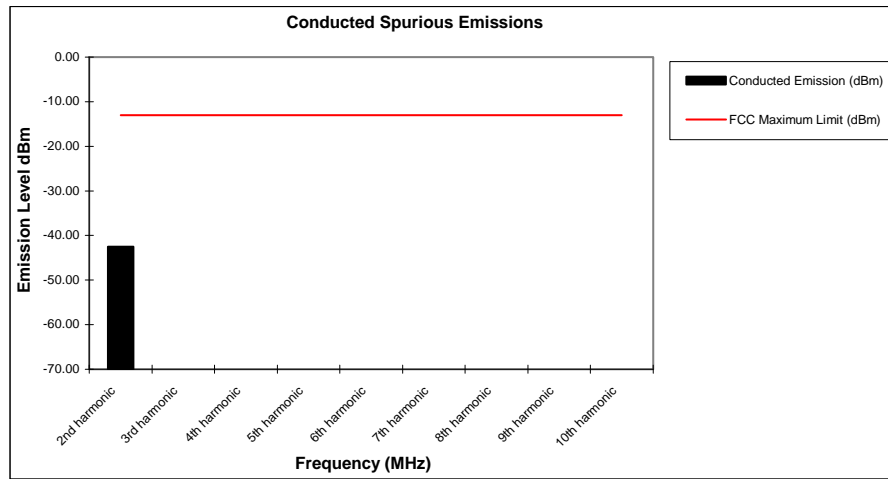
**Measurement Results**

Attached

**Measurement Results – CDMA 800**

**Conducted Spurious and Harmonic Emissions**

Harmonic of Fundamental	FCC Maximum Limit (dBm)	Conducted Emission (dBm)
2nd harmonic	-13	-42.53
3rd harmonic	-13	*
4th harmonic	-13	*
5th harmonic	-13	*
6th harmonic	-13	*
7th harmonic	-13	*
8th harmonic	-13	*
9th harmonic	-13	*
10th harmonic	-13	*



Notes:

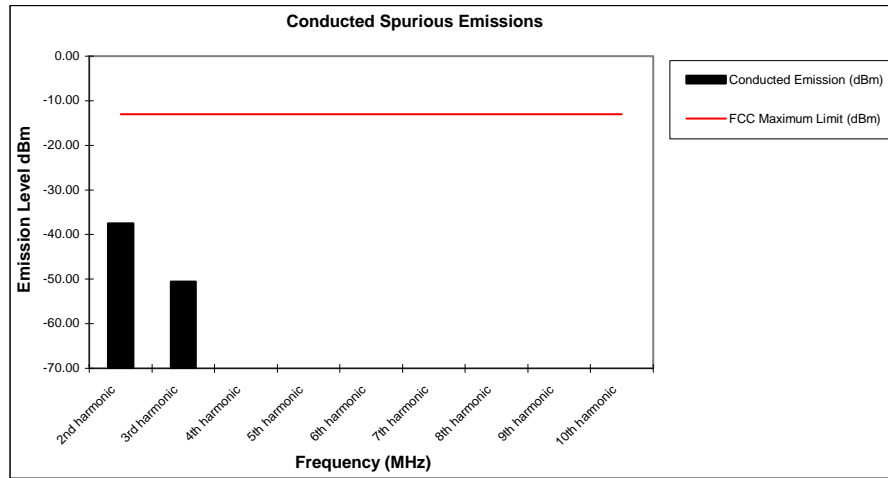
- \* Indicates the spurious emission could not be detected due to noise limitations or ambients.
- Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
- The Spectrum was investigated from 9 kHz to the tenth harmonic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

The margin with respect to the limit is the minimum margin for all modes and bands.

**Measurement Results – CDMA 1900**

**Conducted Spurious and Harmonic Emissions**

Harmonic of Fundamental	FCC Maximum Limit (dBm)	Conducted Emission (dBm)
2nd harmonic	-13	-37.45
3rd harmonic	-13	-50.57
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 9 kHz to the tenth harmonic of the fundamental.

The margin with respect to the limit is the minimum margin for all modes and bands.

**FIELD STRENGTH OF SPURIOUS EMISSIONS**

**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.

The settings of the receiver were as follows:

Units	dBm
Divisions	5 dB
Detector	Peak Detector
Resolution Bandwidth	1 MHz
Video Bandwidth (AVG)	Auto
Sweep Time	Auto

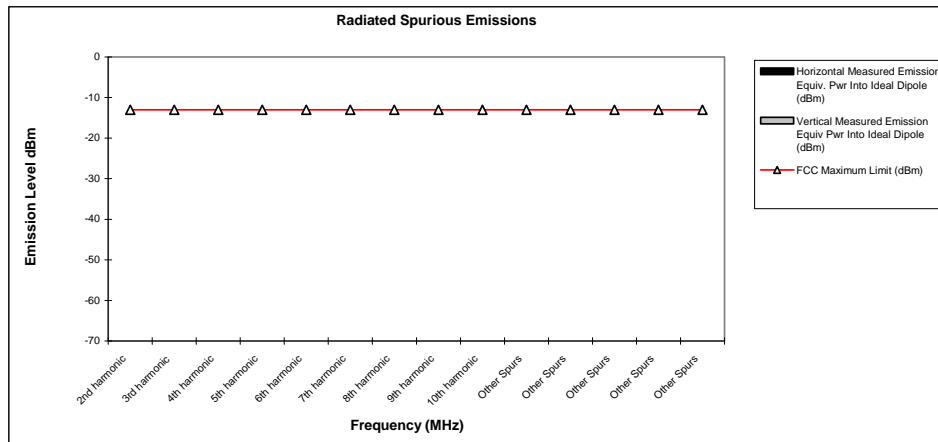
Measurement Results

Attached

**Measurement Results – CDMA 800**

**Radiated Spurious and Harmonic Emissions**

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	*	*
3rd harmonic	-13	*	*
4th harmonic	-13	*	*
5th harmonic	-13	*	*
6th harmonic	-13	*	*
7th harmonic	-13	*	*
8th harmonic	-13	*	*
9th harmonic	-13	*	*
10th harmonic	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*



Notes:

- \* Indicates the spurious emission could not be detected due to noise limitations or ambients or the emissions are lower than -33 dBm.
- Each emission reported reflects the highest absolute level at the specific harmonic for the low, mid, and high channels at maximum power.
- The Spectrum was investigated from 30 MHz to the tenth harmonic of the fundamental.

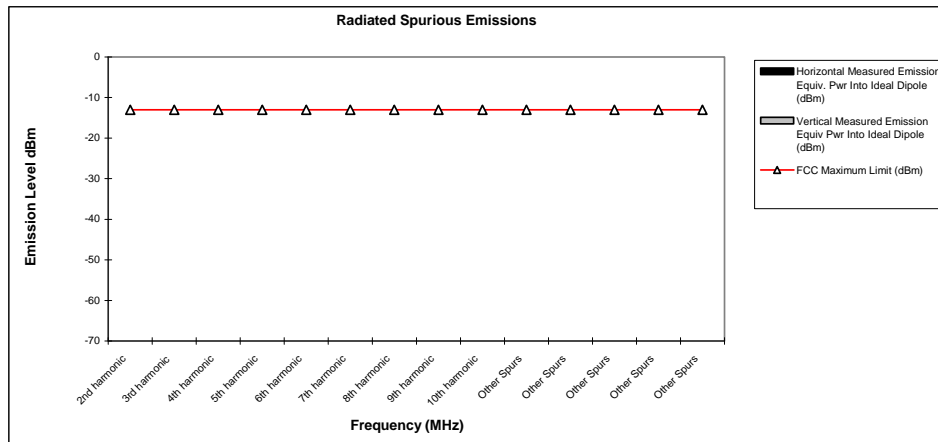
Emissions below -33 dBm are not shown.

The margin with respect to the limit is the minimum margin for all modes and bands.

**Measurement Results – CDMA 1900**

**Radiated Spurious and Harmonic Emissions**

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	*	*
3rd harmonic	-13	*	*
4th harmonic	-13	*	*
5th harmonic	-13	*	*
6th harmonic	-13	*	*
7th harmonic	-13	*	*
8th harmonic	-13	*	*
9th harmonic	-13	*	*
10th harmonic	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*
Other Spurs	-13	*	*



Notes:

1. \* Indicates the spurious emission could not be detected due to noise limitations or ambients or the emissions are lower than -33 dBm.
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.

Emissions below -33 dBm are not shown.

The margin with respect to the limit is the minimum margin for all modes and bands.

**FREQUENCY STABILITY****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  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  and at intervals of  $10^{\circ}\text{C}$  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**

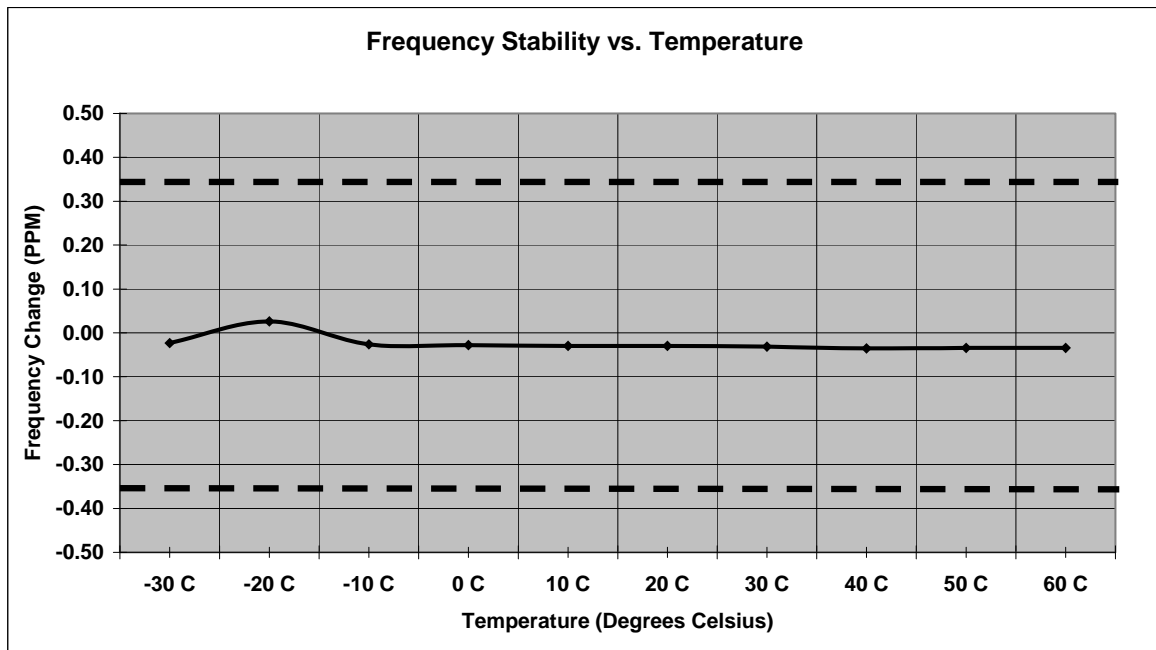
Attached

**Measurement Results – CDMA 800**

## Frequency Stability

**Mode:** CDMA 800      **Operating Frequency:** 836.52 MHz  
**Channel:** 384      **Deviation Limit (PPM):** 0.359ppm (+/-300 Hz)

Temperature C	Frequency Error HZ	Frequency Error (PPM)	Voltage (%)	Voltage (VDC)
-30 C	-19.39	-0.023	100%	3.80
-20 C	21.77	0.026	100%	3.80
-10 C	-22.07	-0.026	100%	3.80
0 C	-23.22	-0.028	100%	3.80
10 C	-24.54	-0.029	100%	3.80
20 C	-24.69	-0.030	100%	3.80
30 C	-26.01	-0.031	100%	3.80
40 C	-29.63	-0.035	100%	3.80
50 C	-28.75	-0.034	100%	3.80
60 C	-28.56	-0.034	100%	3.80
20 C	-25.22	-0.030	Battery Endpoint	3.40

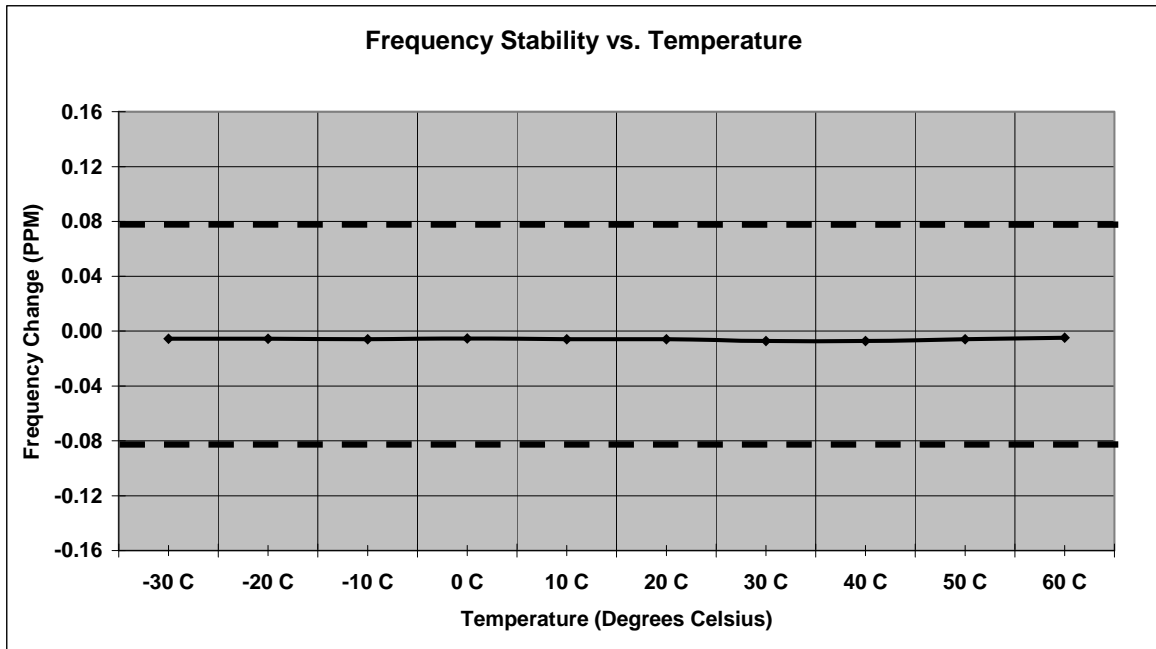


**Measurement Results – CDMA 1900**

## Frequency Stability

**Mode:** EVDO REV-0 1900      **Operating Frequency:** 1880.0 MHz  
**Channel:** 600                      **Deviation Limit (PPM):** 0.08ppm (+/-150Hz)

Temperature	Frequency Error	Frequency Error	Voltage	Voltage
C	HZ	(PPM)	(%)	(VDC)
-30 C	-10.44	-0.006	100%	3.80
-20 C	-10.51	-0.006	100%	3.80
-10 C	-11.15	-0.006	100%	3.80
0 C	-10.21	-0.005	100%	3.80
10 C	-11.27	-0.006	100%	3.80
20 C	-11.34	-0.006	100%	3.80
30 C	-13.58	-0.007	100%	3.80
40 C	-13.61	-0.007	100%	3.80
50 C	-11.09	-0.006	100%	3.80
60 C	-9.11	-0.005	100%	3.80
20 C	-12.86	-0.007	Battery Endpoint	3.40



**End of Test Report**