



Flom Test Labs
EMI, EMC, RF Testing Experts Since 1963

Transmitter Certification

of

Model: CDMA Phone – ic502
FCC ID: AZ489FT7019

to

Federal Communications Commission

Rule Part(s) 24E

Date of report: April 27, 2006
Revised June 28, 2006

On the Behalf of the Applicant:

Motorola Inc.

At the Request of:

P.O. NP2470186

Motorola Inc.
2501 S. Price Road
Chandler, AZ 85248-2899

Attention of:

Richard Altenhofen

Supervised by:

David E. Lee, FCC/IC Compliance Manager

The Applicant has been cautioned as to the following:

15.21 Information to the User.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) Special Accessories.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

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Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

- a) **Test Report**
- b) Laboratory: M. Flom Associates, Inc.
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044) Chandler, AZ 85225
- c) Report Number: d0640008
- d) Client: Motorola Inc.
2501 S. Price Road
Chandler, AZ 85248-2899
- e) Identification: CDMA Phone – ic502
FCC ID: AZ489FT7019
Serial # B5, CP, 9X, 8Z
EUT Description: PCS Phone
- f) EUT Condition: Not required unless specified in individual tests.
- g) Report Date: April 27, 2006
EUT Received: April 11, 2006
- h, j, k): As indicated in individual tests.
- i) Sampling method: No sampling procedure used.
- l) Uncertainty: In accordance with MFA internal quality manual.
- m) Supervised by: 
David E. Lee, FCC/IC Compliance Manager
- n) Results: The results presented in this report relate only to the item tested.
- o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

Sub-part
2.1033(c)(14):

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

- 21 – Domestic Public Fixed Radio Services
- 22 – Public Mobile Services
- 22 Subpart H - Cellular Radiotelephone Service
- 22.901(d) - Alternative technologies and auxiliary services
- 23 – International Fixed Public Radiocommunication services
- 24 – Personal Communications Services
- 74 Subpart H - Low Power Auxiliary Stations
- 80 – Stations in the Maritime Services
- 80 Subpart E - General Technical Standards
- 80 Subpart F - Equipment Authorization for Compulsory Ships
- 80 Subpart K - Private Coast Stations and Marine Utility Stations
- 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
- 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
- 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
- 80 Subpart V - Emergency Position Indicating Radio Beacons (EPIRB'S)
- 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
- 80 Subpart X - Voluntary Radio Installations
- 87 – Aviation Services
- 90 – Private Land Mobile Radio Services
- 94 – Private Operational-Fixed Microwave Service
- 95 Subpart A - General Mobile Radio Service (GMRS)
- 95 Subpart C - Radio Control (R/C) Radio Service
- 95 Subpart D - Citizens Band (CB) Radio Service
- 95 Subpart E - Family Radio Service
- 95 Subpart F - Interactive Video and Data Service (IVDS)
- 97 - Amateur Radio Service
- 101 – Fixed Microwave Services

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-2003, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst-case measurements.

For PCS Equipment:

Pursuant to Section 24.51(d), the EUT complies with IEEE C95.1-1991, "IEEE Standards for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz."

The EUT uses digital modulation, as such, measurements of the modulation characteristics are not applicable. The applicant has provided a description of the modulation particular to the EUT.

Pursuant to Section 24.238(c), the EUT was tested at it's lowest and highest possible tuned frequencies.

 <p style="text-align: center;">THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION</p> <p style="text-align: center;">ACCREDITED LABORATORY</p> <p style="text-align: center;">A2LA has accredited</p> <p style="text-align: center;">M. FLOM ASSOCIATES, INC. Chandler, AZ</p> <p style="text-align: center;">for technical competence in the field of</p> <p style="text-align: center;">Electrical Testing</p> <p style="font-size: small;">The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025-1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing.</p> <p style="font-size: x-small;">Presented this 16th day of June 2004</p> <div style="display: flex; justify-content: space-around; align-items: center;">  <div style="font-size: x-small;"> <p><i>[Signature]</i> President For the Accreditation Council Certificate Number 2152-01 Valid to August 31, 2009</p> </div> </div> <p style="font-size: x-small; text-align: center;">For lists or types of tests to which the accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.</p>	<p>A2LA</p> <hr/> <p>"A2LA has accredited M. Flom Associates, Inc. Chandler, AZ for technical competence in the field of Electrical Testing. The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 – 1999 'General Requirements for the Competence of Testing and Calibration Laboratories' and any additional program requirements in the identified field of testing."</p> <hr/> <p>Certificate Number: 2152-01</p>
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List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
 Volume II, Part 2 and to 24E

Sub-part 2.1033

(c)(1): **Name and Address of Applicant:**

Motorola Inc.
 2501 S. Price Road
 Chandler, AZ 85248-2899

Manufacturer:

Motorola Inc.

(c)(2): **FCC ID:** AZ489FT7019

Model Number: CDMA Phone – ic502

(c)(3): **Instruction Manual(s):**

Please see attached exhibits

(c)(4): **Type of Emission:** 1M25F9W

(c)(5): **Frequency Range, MHz:** 1851.25 – 1908.75

(c)(6): **Power Rating, Watts:** 0.628
 _____ Switchable X Variable _____ N/A

FCC Grant Note: Note 1 below

©(7): **Maximum Power Rating, Watts:** 2.000

DUT Results: Passes X Fails _____

Note 1. This report will be submitted with others in the final application. The required Grant Notes are unknown this test house.

Subpart 2.1033 (continued)

(c)(8): Voltages & currents in all elements in final RF stage, including final transistor or solid-state device:

Collector Current, A	=	per manual
Collector Voltage, Vdc	=	per manual
Supply Voltage, Vdc	=	3.6

(c)(9): **Tune-Up Procedure:**

Please see attached exhibits

(c)(10): **Circuit Diagram/Circuit Description:**

Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

Please see attached exhibits

(c)(11): **Label Information:**

Please see attached exhibits

(c)(12): **Photographs:**

Please see attached exhibits

(c)(13): **Digital Modulation Description:**

Attached Exhibits
 N/A

(c)(14): **Test and Measurement Data:**

Follows

Name of Test: Carrier Output Power (Conducted)

Specification: 47 CFR 2.1046(a)

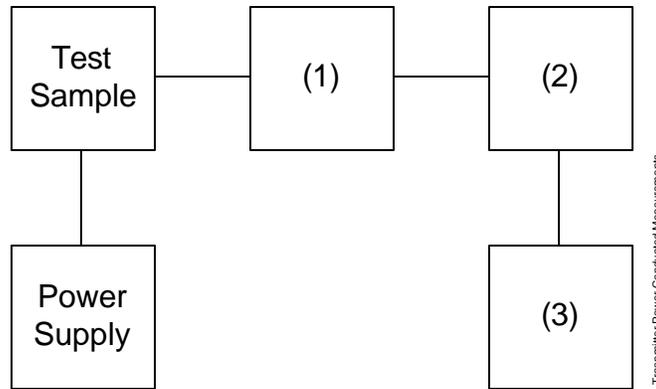
Guide: ANSI/TIA/EIA-603-B (2004)

Measurement Procedure

A) The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the modulated output power was measured by means of an RF Power Meter.

B) Measurement accuracy is $\pm 3\%$.

Transmitter Test Set-Up: RF Power Output



	Asset	Description	s/n	Cycle	Last Cal
(1)	Coaxial Attenuator				
X	i00231/2	PASTERNAK PE7021-30 (30 dB)	231 or 232	NCR	
	i00122/3	NARDA 766 (10 dB)	7802 or 7802A	NCR	
(2)	Power Meters				
X	i00048	HP 8566B Spectrum Analyzer	2511A01467	12 mo.	Sep-05
(3)	Frequency Counter				
X	i00048	HP 8566B Spectrum Analyzer	2511A01467	12 mo.	Sep-05

Name of Test: Carrier Output Power (Conducted)

Measurement Results

Ambient Temperature = 23°C ± 3°C

Nominal, MHz	Channel	dBm	RF Power, Watts
PCS CDMA Mode:			
1851.25	025	24.1	0.257
1880.00	600	24.0	0.251
1908.75	1175	24.0	0.251

Performed by: David McPherson, FCC/IC Compliance Engineer

Name of Test: EIRP Carrier Power (Radiated)

Specification: TIA/EIA-603-B (2004) Substitution Method

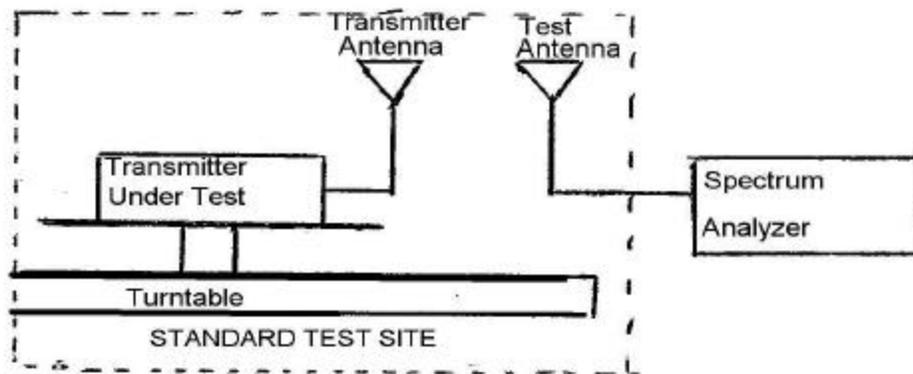
Measurement Procedure

Definition

The average radiated power of a licensed device is the equivalent power required to produce at a distant point the same average received power as produced by the licensed device.

Method of Measurement:

- A) Connect the equipment as illustrated. Place the transmitter to be tested on the turntable in the standard test site.



- B) Raise and lower the test antenna from 1m to 6 m with the transmitter facing the antenna and record the highest received signal in dB as LVL.
- C) Repeat step B) for seven additional readings at 45° interval positions of the turntable.
- D) Replace the transmitter under test with a half-wave or horn vertically polarized antenna. The center of the antenna should be at the same location as the transmitter under test. Connect the antenna to a signal generator with a known output power and record the path loss in dB or LOSS.
- E) Calculate the average radiated output power from the readings in step C) and D) by the following:

$$\text{average radiated power} = 10 \log_{10} \left(\frac{10(LVL - LOSS)}{10} \right) \text{ (dBm)}$$

Name of Test: EIRP Carrier Power (Radiated)

Test Equipment

Asset	Description	s/n	Cycle	Last Cal
Transducer				
i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-04
X i00089	April 2001 200MHz-1GHz	001500	24 mo.	Sep-04
X i00103	EMCO 3115 1GHz-18GHz	9208-3925	24 mo.	Sep-04
Amplifier				
X i00028	HP 8449A	2749A00121	12 mo.	May-05
Spectrum Analyzer				
X i00029	HP 8563E	3213A00104	12 mo.	Jan-06
X i00033	HP 85462A	3625A00357	12 mo.	Sep-05
Substitution Generator				
X i00286	SMT 03, R&S, Signal Generator	826211/005	12 mo.	Jul-05
Substitution Antenna				
X i00091	APREL 3115 1GHz-18GHz	001469	24 mo.	Sep-04

Measurement Results

CDMA1900

Frequency Tuned, MHz	Measured, dBm	Sub Gen, dBm	Sub Meter dBm	Path Loss, dB	Cable CF, dB	Ant, dBi	EIRP, dBm	EIRP, Watts
1851.250000	8.10	10	-12.20	22.20	2.78	5.1	28.0	0.628
1880.000000	6.86	10	-13.60	23.60	2.82	5.3	28.0	0.628
1908.750000	6.30	10	-14.10	24.10	2.87	5.5	27.8	0.598



Performed by:

David E. Lee, FCC/IC Compliance Manager

Name of Test: Unwanted Emissions (Transmitter Conducted)

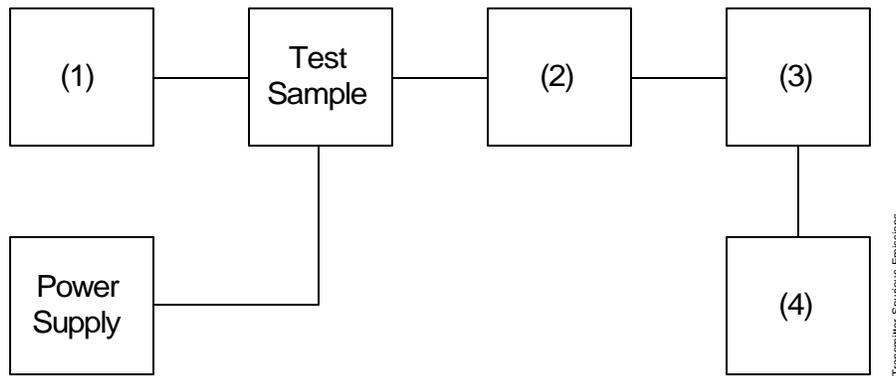
Specification: 47 CFR 2.1051: Unwanted (spurious) Emissions
2.1049(c), 24.238(b): Occupied Bandwidth
24: Emissions at Band Edges

Guide: ANSI/TIA/EIA-603-B (2004)

Measurement Procedure

- A) The emissions were measured for the worst case as follows:
 - 1). within a band of frequencies defined by the carrier frequency plus and minus one channel.
 - 2). from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40 GHz, whichever is lower.
- B) The magnitude of spurious emissions that are attenuated more than 20 dB below the permissible value need not be specified.

Transmitter Test Set-Up: Spurious Emission



Asset	Description	s/n		
(1) Audio Oscillator/Generator (Not Required)				
(2) Coaxial Attenuator				
X	i00231/2	PASTERNAK PE7021-30 (30 dB)	231 or 232	NCR
	i0012/3	NARDA 766 (10 dB)	7802 or 7802A	NCR
(3) Filters; Notch, HP, LP, BP (Not Required)				
(4) Spectrum Analyzer				
X	i00048	HP 8566B Spectrum Analyzer	2511A01467	12 mo. Sep-05
X	i00029	HP 8563E Spectrum Analyzer	3213A00104	12 mo. Jan-06

Name of Test: Unwanted Emissions (Transmitter Conducted)

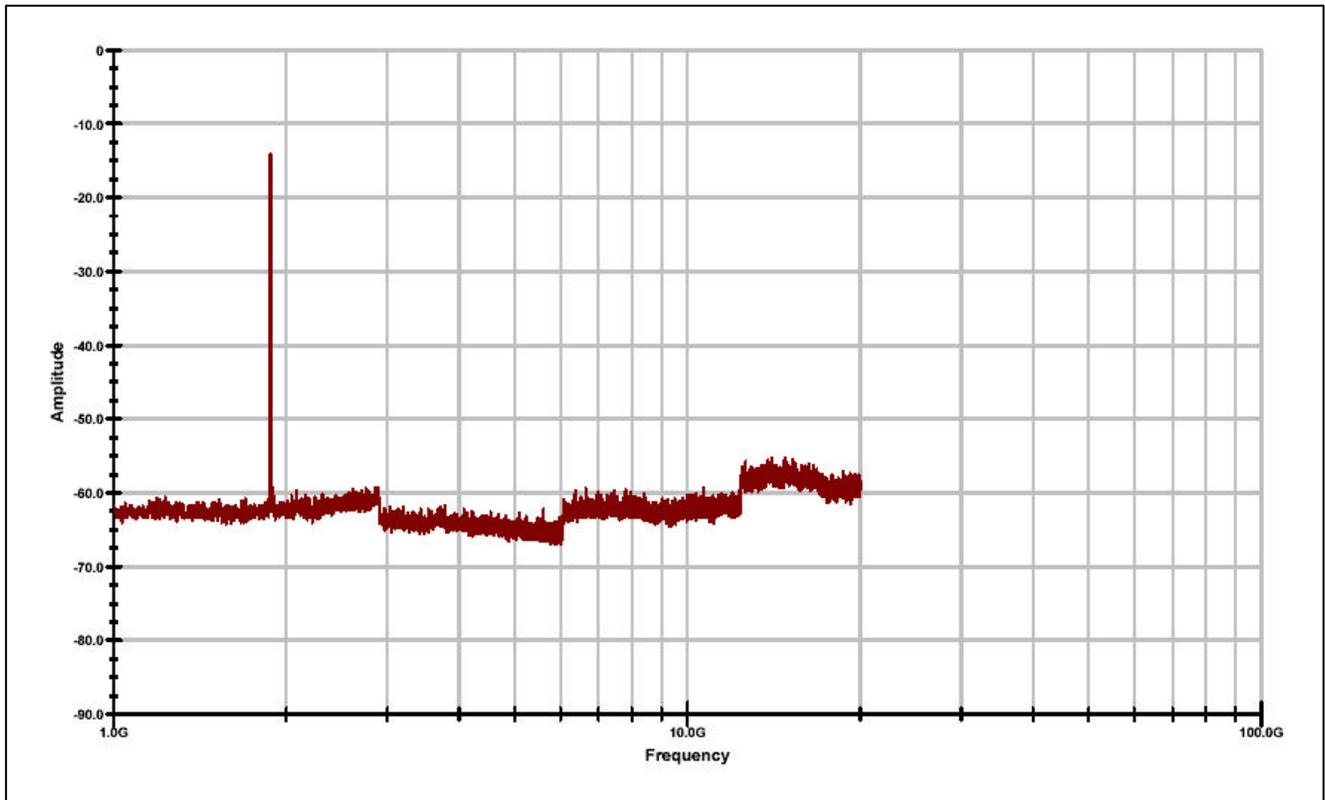
Measurement Results
(Worst Case)

Summary:

Frequency of carrier, MHz	=	1851.25, 1880.00, 1908.75
Spectrum Searched, GHz	=	0 to 10 x F _C
Maximum Response, Hz	=	N/A
All Other Emissions	=	= 20 dB Below Limit

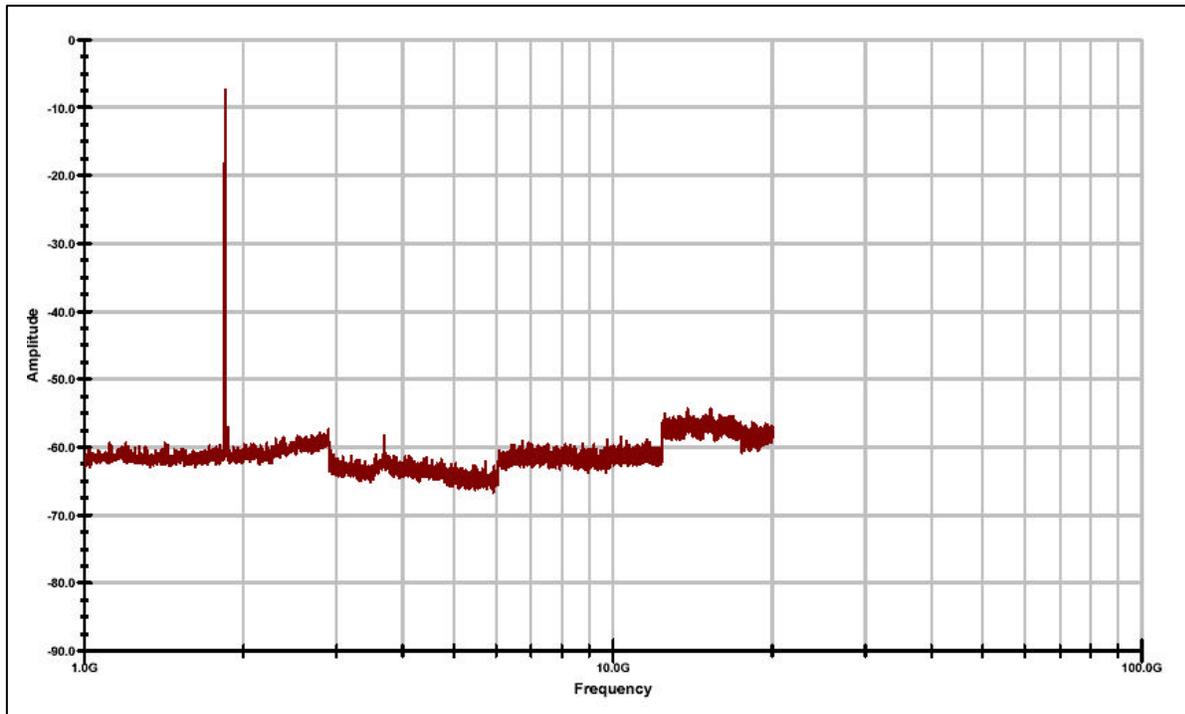
Tabulated Results follow:

Measurement Results

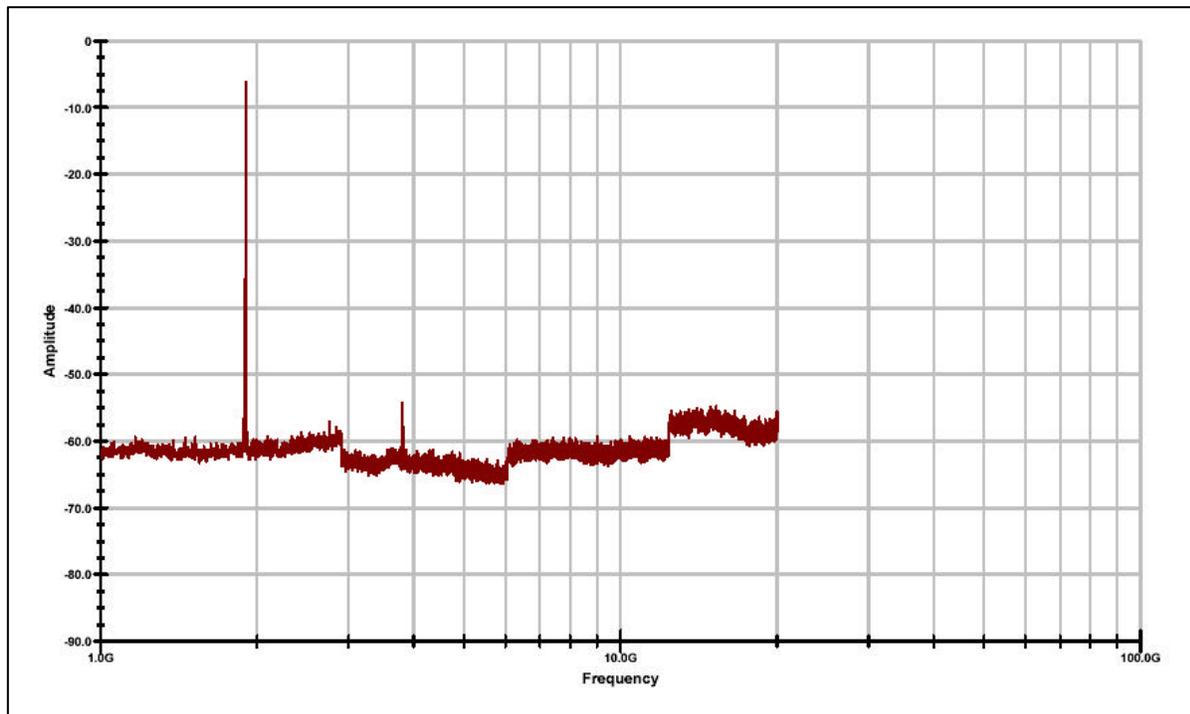


Mid Channel

Name of Test: Unwanted Emissions (Transmitter Conducted)



Low Channel



High Channel

Name of Test: Field Strength of Spurious Radiation

Specification: 47 CFR 2.1053(a)

Guide: ANSI/TIA/EIA-603-B (2004)

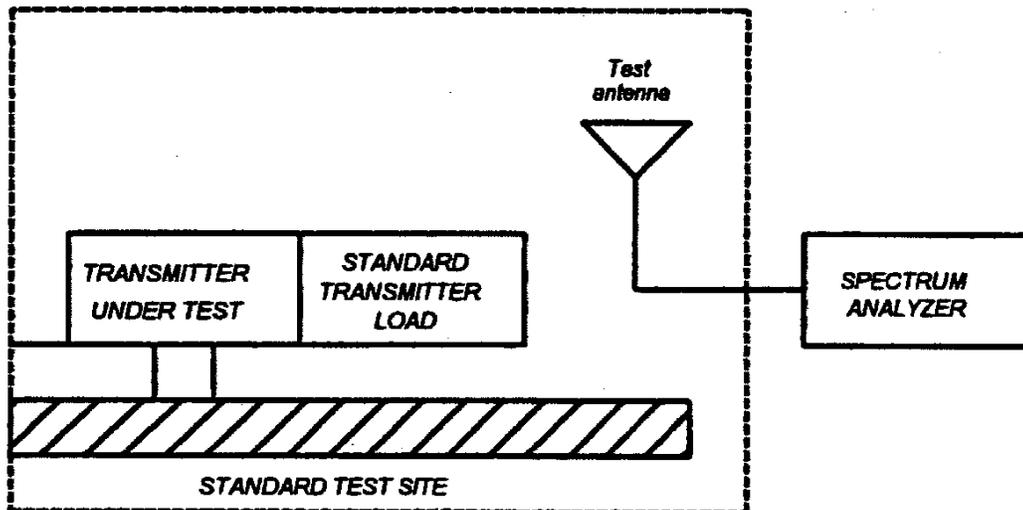
Measurement Procedure

Definition:

Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

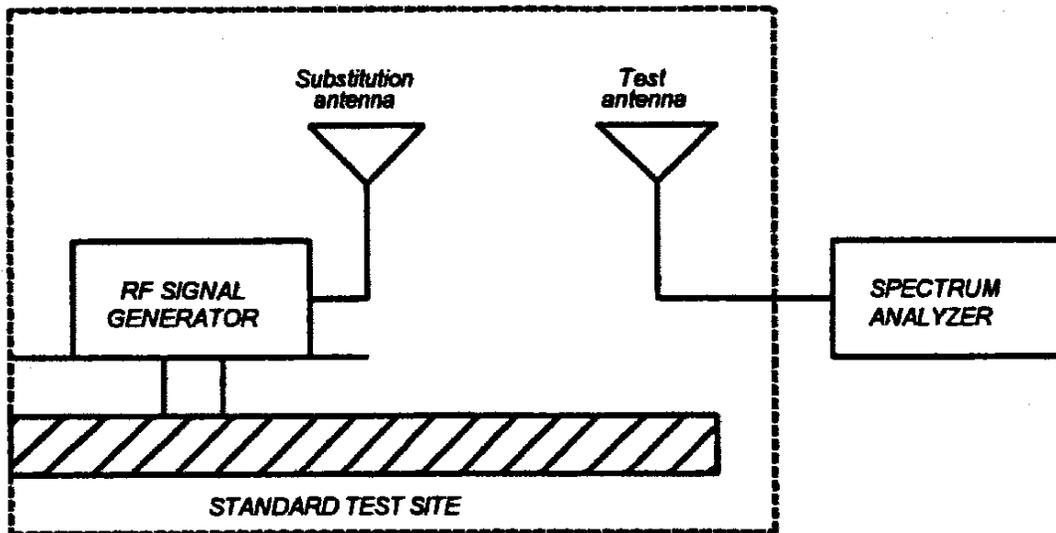
Method of Measurement:

- A) Connect the equipment as illustrated
- B) Adjust the spectrum analyzer for the following settings:
 - 1) Resolution Bandwidth 100 kHz (<1 GHz), 1 MHz (> 1GHz).
 - 2) Video Bandwidth = 3 times Resolution Bandwidth, or 30 kHz (22.917)
 - 3) Sweep Speed ≤ 2000 Hz/second
- C) Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load that is placed on the turntable. The RF cable to this load should be of minimum length.



Name of Test: Field Strength of Spurious Radiation (Cont.)

- D) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to \pm the test bandwidth (see section 1.3.4.4).
- E) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
- F) Repeat step E) for each spurious frequency with the test antenna polarized vertically.



- G) Reconnect the equipment as illustrated.
- H) Keep the spectrum analyzer adjusted as in step B).
- I) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

Name of Test: Field Strength of Spurious Radiation (Cont.)

- J) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
- K) Repeat step J) with both antennas vertically polarized for each spurious frequency.
- L) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps J) and K) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.
- M) The levels recorded in step L) are absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions dB =

$$10\log_{10}(\text{TX power in watts}/0.001) - \text{the levels in step I)}$$

NOTE: It is permissible that other antennas provided can be referenced to a dipole.

Test Equipment

Asset	Description	s/n	Cycle	Last Cal
Transducer				
i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-04
X i00089	Aprel 2001 200MHz-1GHz	001500	24 mo.	Sep-04
X i00103	EMCO 3115 1GHz-18GHz	9208-3925	24 mo.	Sep-04
Amplifier				
X i00028	HP 8449A	2749A00121	12 mo.	May-05
Spectrum Analyzer				
X i00029	HP 8563E	3213A00104	12 mo.	Jan-06
X i00033	HP 85462A	3625A00357	12 mo.	Sep-05
Substitution Generator				
X i00286	SMT 03, R&S, Signal Generator	826211/005	12 mo.	Jul-05
Substitution Antenna				
X i00091	APREL 3115 1GHz-18GHz	001469	24 mo.	Sep-04

Name of Test: Field Strength of Spurious Radiation

Measurement Results

g0640020: 2006-Apr-27 Thu 09:30:00

STATE: 2:High Power

Ambient Temperature: 28°C ± 3°C

Frequency Tuned, MHz	Frequency Emission, MHz	EIRP, dBm		Limit, dBm	EIRP, dBc
1851.250000	5593.050000	-62.00	P	-13.00	-90.00
1880.000000	5640.035000	-62.70	P	-13.00	-90.70
1908.750000	5726.250000	-65.40	P	-13.00	-93.20
1851.250000	9256.241667	-47.00	P	-13.00	-75.00
1908.750000	9543.750000	-47.30	P	-13.00	-75.10
1851.250000	12958.791667	-41.60	P	-13.00	-69.60
1880.000000	13160.083333	-41.90	P	-13.00	-69.90
1851.250000	14810.041667	-49.00	P	-13.00	-77.00
1880.000000	15040.083333	-46.90	P	-13.00	-74.90
1908.750000	15270.000000	-49.80	P	-13.00	-77.60
1851.250000	16661.250000	-47.90	P	-13.00	-75.90
1880.000000	16920.000000	-47.40	P	-13.00	-75.40
1908.750000	17178.750000	-47.40	P	-13.00	-75.20

P= Peak

All other emissions were greater than 20dB below the limit.



Performed by:

David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth)

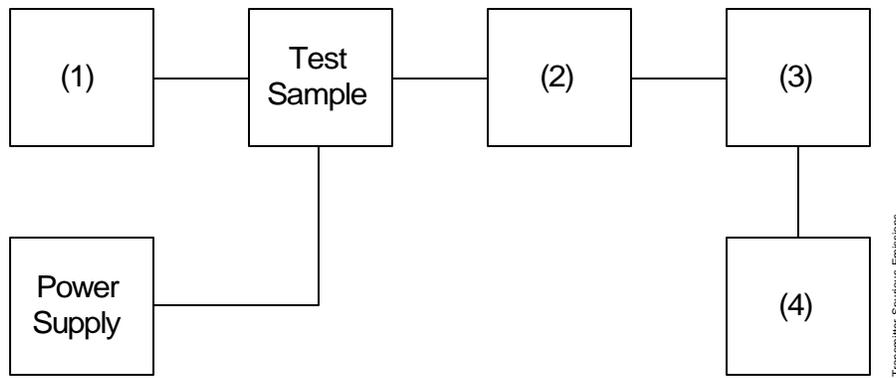
Specification: 47 CFR 2.1049(c)(1)

Guide: ANSI/TIA/EIA-603-B (2004)

Measurement Procedure

- A) The EUT and test equipment were set up as shown below
- B) For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for $\pm 2.5/\pm 1.25$ kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.
- C) For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
- D) The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

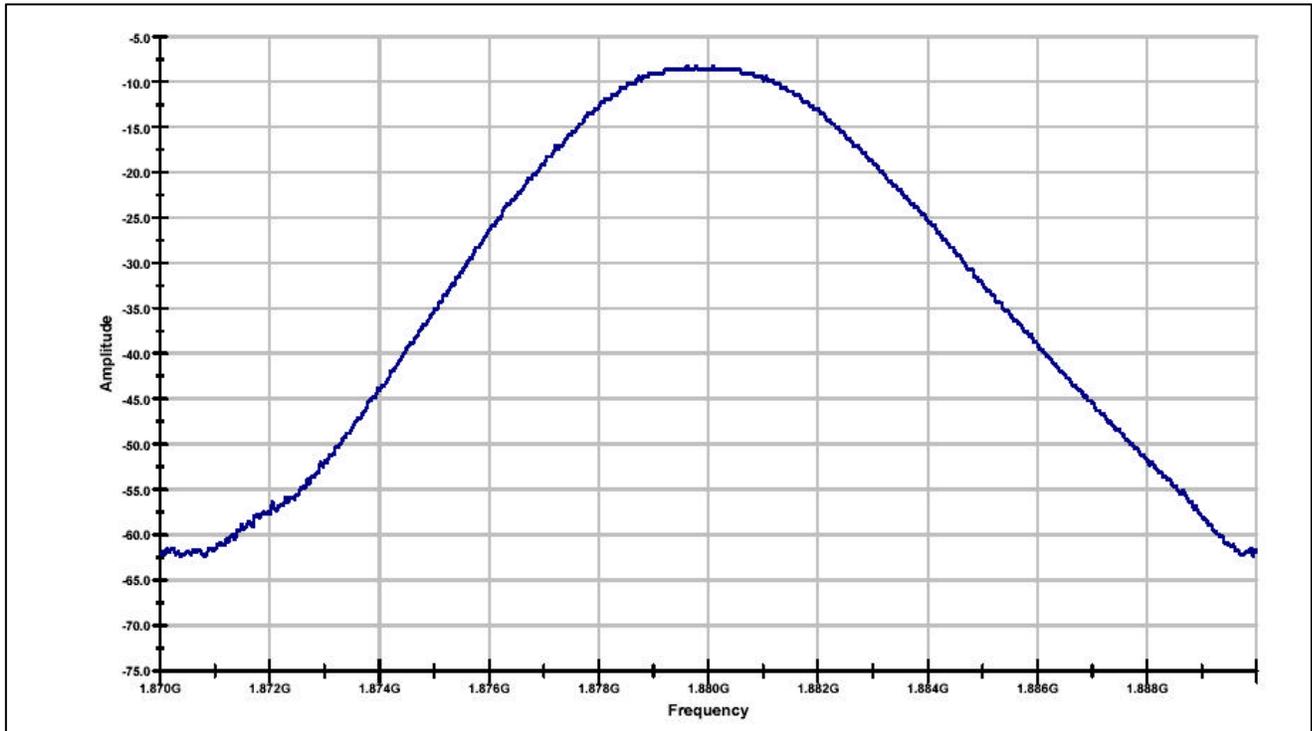
Transmitter Test Set-Up: Occupied Bandwidth



Asset	Description	s/n	Cycle	Last Cal
(1) Audio Oscillator/Generator (Not required)				
X	i00231/2	PASTERNAK PE7021-30 (30 dB)	231 or 232	NCR
	i00123	NARDA 766 (10 dB)	7802A	NCR
(3) Interface				
X	i00021	HP 8954A Transceiver Interface	2146A00159	NCR
(4) Spectrum Analyzer				
X	i00048	HP 8566B Spectrum Analyzer	2511A01467	12 mo. Sep-05
	i00029	HP 8563E Spectrum Analyzer	3213A00104	12 mo. Jan-06

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results



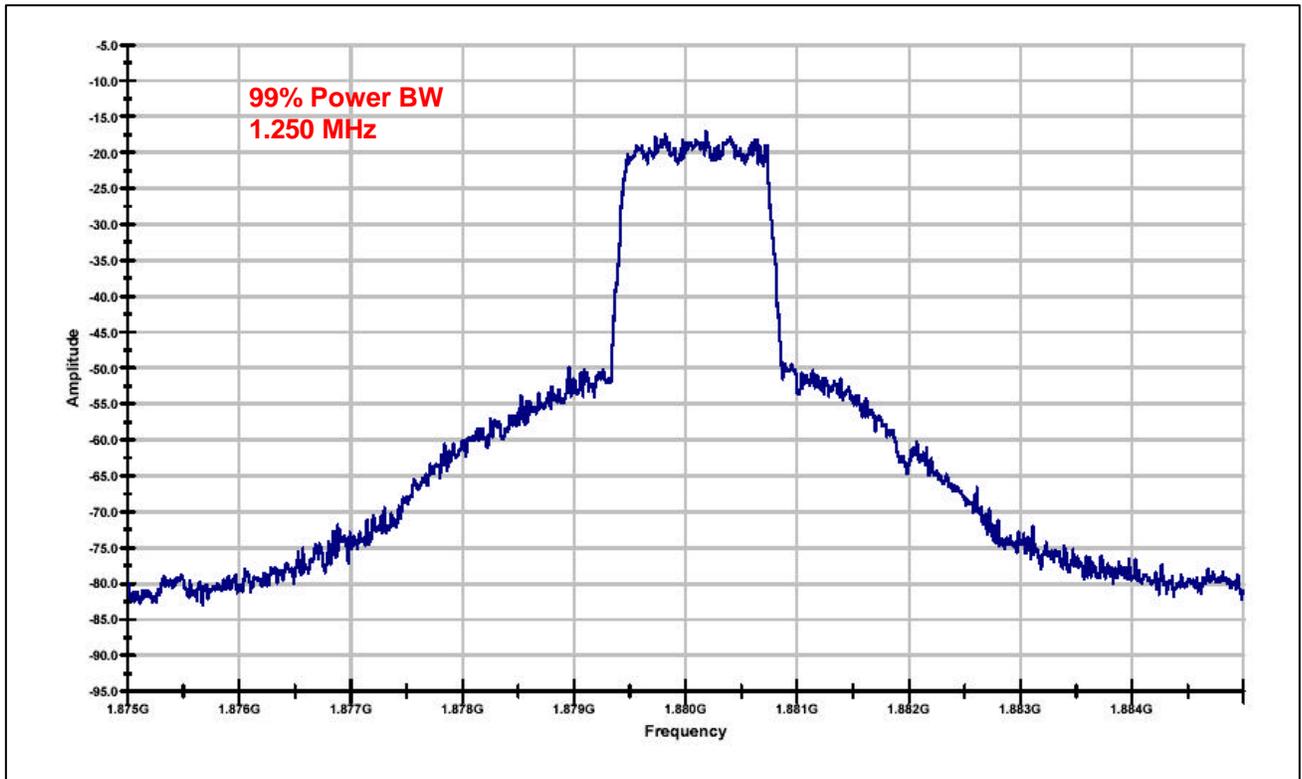
Mid Channel Peak Power, RBW=3MHz
In-Line Attenuation = 32dB, Corrected Peak Power = 24dBm

Performed by:

David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results



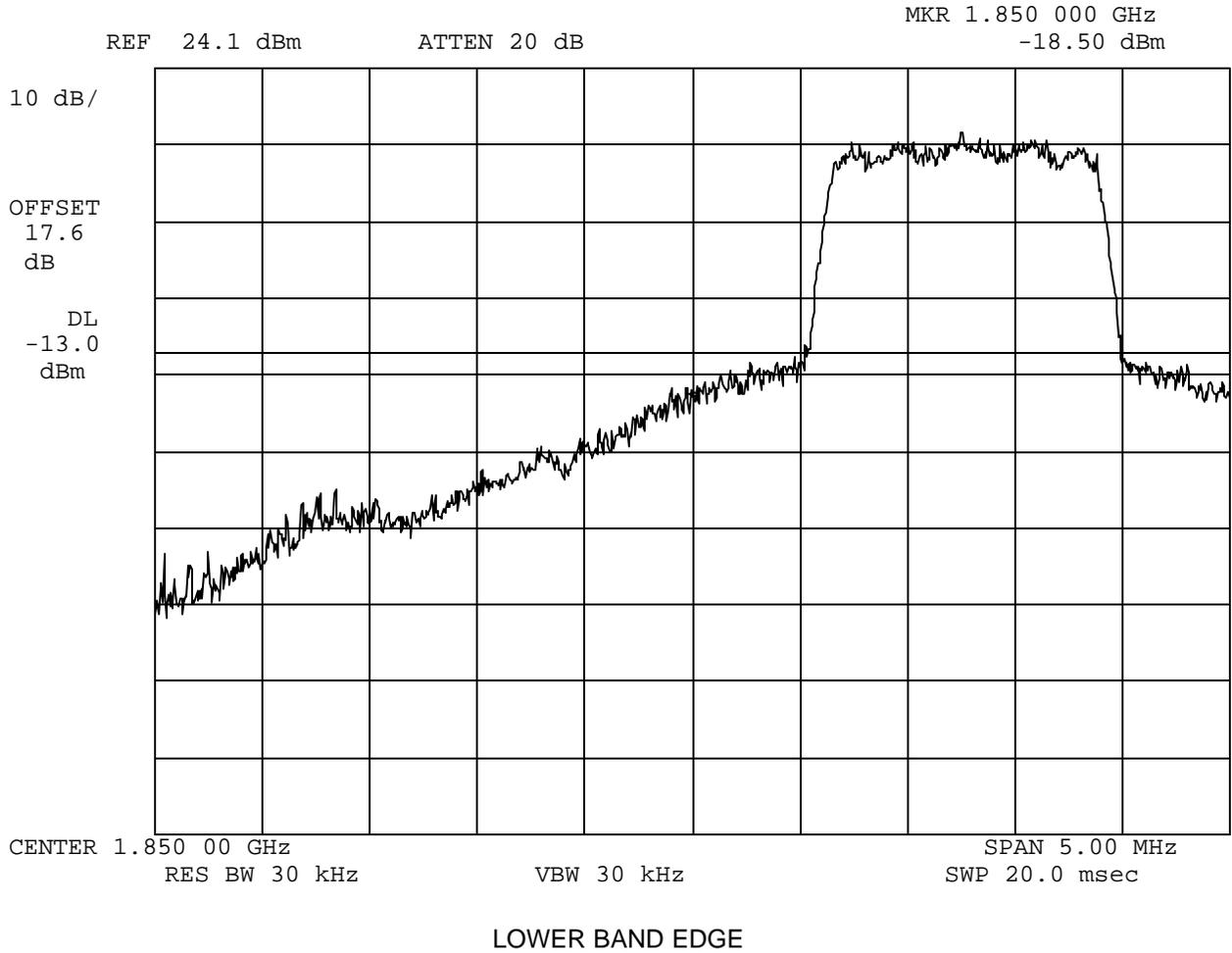
Mid Channel, CDMA
99% Power Bandwidth = 1.25MHz

Performed by:

David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

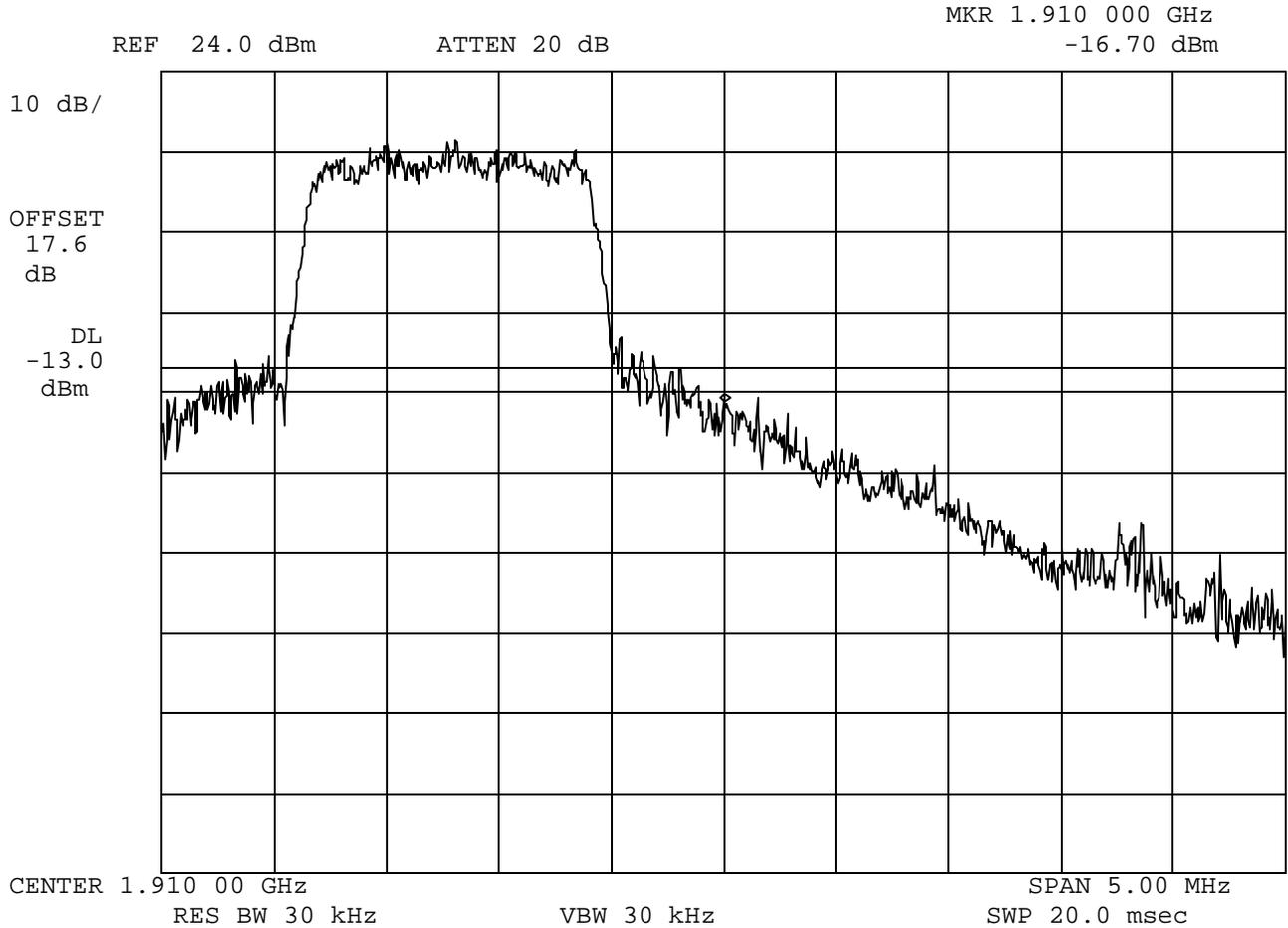


Performed by:

David McPherson, FCC/IC Compliance Engineer

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results



Upper Band Edge

Performed by:

David McPherson, FCC/IC Compliance Engineer

Name of Test: Necessary Bandwidth and Emission Bandwidth

Specification: 47 CFR 2.202(g)

Modulation = CDMA

Necessary Bandwidth (Measured) = 1.25 MHz

Emission Designator = 1M25F9W



Performed by:

David E. Lee, FCC/IC Compliance Manager

END OF TEST REPORT

**Testimonial
and
Statement of Certification**

This is to Certify:

1. **That** the application was prepared either by, or under the direct supervision of, the undersigned.
2. **That** the technical data supplied with the application was taken under my direction and supervision.
3. **That** the data was obtained on representative units, randomly selected.
4. **That**, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.



Certifying Engineer:

David E. Lee, FCC/IC Compliance Manager