



M. Flom Associates, Inc.

International Compliance Testing Laboratory

3356 N. San Marcos Place, Suite 107
Chandler, AZ 85225

toll-free: (866) 311-3268
fax: (480) 926-3598

<http://www.mflom.com>
info@mflom.com

Transmitter Certification (Receiver Verified)

of

Model: Mini-Card
FCC ID: PKRNVWEV620

to

Federal Communications Commission

Rule Part(s) 22H, 24E, Modular Approval and Confidentiality

Date Of Report: June 27, 2005

On the Behalf of the Applicant:

Novatel Wireless Inc.

At the Request of:

P.O. NWS21012

Novatel Wireless Inc.
9255 Towne Centre Dr., Suite 225
San Diego, CA 92121-3030

Attention of:

John Ross
858-812-0614; FAX: -2888
Email: jross@novatelwireless.com

Supervised By:

Michael Findley, Laboratory Manager

The Applicant has been cautioned as to the following:

15.21 Information to 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.

Table of Contents

Rule	Description	Page
	Test Report	1
2.1033(c)	General Information Required	2
2.1033(c)(14)	Rule Summary	5
	General Information	6
	Standard Test Conditions and Engineering Practices	7
2.1046(a)	Carrier Output Power (Conducted)	8
2.1046(a)	Carrier Output Power (Radiated)	10
2.1049(c)(1), 22	Emission Masks (Occupied Bandwidth)	13
2.1053(a)	Field Strength of Spurious Radiation	23
2.1055(a)&(b)	Frequency Stability (Temperature & Voltage Variation)	28
2.202(g)	Necessary Bandwidth and Emission Bandwidth	31
15.109	Receiver Spurious Emissions (Radiated)	33

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: d0560044
- d) Client: Novatel Wireless Inc.
9255 Towne Centre Dr., Suite 225
San Diego, CA 92121-3030
- e) Identification: Mini-Card
FCC ID: PKRNVWEV620
Description: CDMA Cell-PCS Module
- f) EUT Condition: Not required unless specified in individual tests.
- g) Report Date: June 27, 2005
EUT Received: June 23, 2005
- 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:
- 
 Michael Findley, Laboratory 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.

Accessories used during testing:

Type	Quantity	Manufacturer	Model	Serial No.	FCC ID
Test Jig	1	Novatel (Special)	EV620 Jig	NSN	NONE
Antenna	1	Antenna Specialists	ASPRDM1994	NSN	NONE
Ground Plane	1	Novatel (Special)	17" Diameter	NSN	NONE

List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
Volume II, Part 2 and to 22H, 24E, Modular Approval and Confidentiality

Sub-Part 2.1033

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

Novatel Wireless Inc.
9255 Towne Centre Dr., Suite 225
San Diego, CA 92121-3030

Manufacturer:

Novatel Wireless Inc.
9255 Towne Centre Dr., Suite 225
San Diego, CA 92121-3030

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

PKRNVWEV620

Model Number:

Mini-Card EV620 (Module)

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

Please See Attached Exhibits

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

1M25F9W

(c)(5): **FREQUENCY RANGE, MHz:**

824.70 to 848.30
1851.25 to 1908.75

(c)(6): **Power Rating, Watts:**

Switchable Variable N/A

0.282

FCC Grant Note:

Modular Approval with antennas up to 5dBi

(c)(7): **Maximum Power Rating, Watts:**

2.0

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	=	0.450 (max)
Collector Voltage, Vdc	=	3.3
Supply Voltage, Vdc	=	3.3

(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



A2LA

"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."

Certificate Number: **2152-01**



NIST

I am pleased to inform you that your laboratory has been validated by the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Your laboratory is now formally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA between the American Institute in Taiwan (AIT) and the Taipei Economic and Cultural Representative Office (TECRO) in the United States, covering equipment subject to Electro-Magnetic Compatibility (EMC) requirements. The names of all validated and nominated laboratories will be posted on the NIST website at <http://ts.nist.gov/mra> under the 'Asia' category."

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 Radiobeacons (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

General Information

1. Prior to testing, the deviation for audio modulation and each of the respective SAT + ST tones were set as close as possible to the required limit.
2. Except for audio modulation, which was applied externally, Wideband Data SAT, ST and all other tones and operational modes were provided by a test control unit incorporating appropriate software. Worst case repetition rate for Wideband Data was 10 kb/s.
3. Spurious radiation was measured at three (3) meters.
4. The two cellular frequency bands are available to the user automatically. Please refer to the manual contained in the documentation.
5. The normal modes of modulation are:
 - (a) Voice
 - (b) Wideband Data
 - (c) SAT
 - (d) ST
 - (e) SAT + Voice
 - (f) SAT + DTMF
 - (g) CDMA
 - (h) TDMA
 - (i) NAMPS Voice
 - (j) NAMPS DSAT
 - (k) NAMPS ST
 - (l) NAMPS Voice + DSAT

Standard Test Conditions and Engineering Practices

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

In accordance with ANSI C63.4-1992/2000, section 6.1.9, 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.

Part 2.948:

(a)(b) **Description Of Measurement Facilities:**
File: 31040/SIT

A description of the measurement facilities was filed with the Commission and was found to be in compliance with the requirements of Section 2.948, by letter dated March 5, 2003. All pertinent changes will be reported to the Commission by up-date of A2LA Accreditation.

Name of Test: Carrier Output Power (Conducted)
Specification: 47 CFR 2.1046(a)
Test Equipment: As per attached page

Measurement Procedure

1. The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an R. F. Power Meter.
2. Measurement accuracy is $\pm 3\%$.

Measurement Results

Nominal, MHz	Channel	dBm	RF Power, Watts
Cellular CDMA Mode:			
825.3	991	24.5	0.282
836.4	380	24.5	0.282
847.7	799	24.5	0.282
PCS CDMA Mode:			
1851.25	025	24.5	0.282
1880.00	600	24.5	0.282
1908.75	1175	24.5	0.282

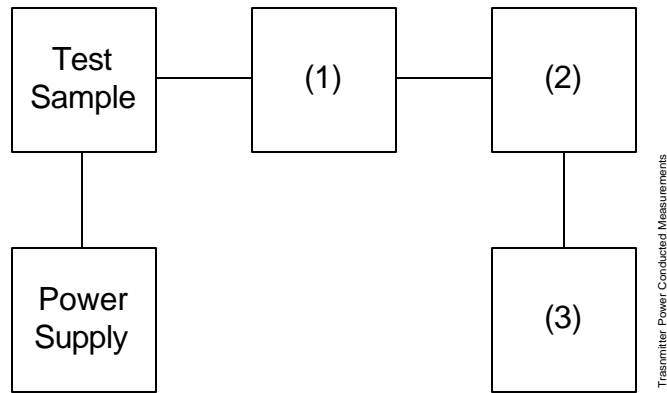


Performed By:

David E. Lee, Test Engineer

Transmitter Power Conducted Measurements

Test 1: RF Power Output
Test 2: Frequency Stability



Asset	Description (as applicable)	s/n		
(1)	Coaxial Attenuator			
X	N/A	Splitter + Attenuator	Client Supplied	
X	i00231	Pasternack 30dB	231A	NCR
(2)	Power Meters			
X	i00228	HP E4418B	GB39512470	12 mo May-05
(3)	Base Station Simulator (GUI)			
X	N/A	DELL Inspireon Laptop	Client Supplied	

Name of Test: R. F. Power Output (Radiated)
Specification: 47 CFR 2.1046(a)
Test Equipment: As per attached page

Measurement Procedure (Radiated)

- The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading was calculated from the equation $P_t = ((E \times R)^2 / 49.2)$ watts, where $R = 3m$.
- Measurement accuracy is ± 1.5 dB.

Measurement Results

g0560269: 2005-Jun-24 Fri 05:51:00
 State: 2:High Power
 CDMA Cellular:

Frequency Tuned, MHz	Frequency Emission, MHz	Meter, dBuV/m	CF, dB	Calc, dBm	Path Loss, dB (Sub)	EUT - Ant Loss, dB	ERP, dBm	ERP, Watts (Max)
824.730000	824.730000	102.62	25.36	30.6	-2.4	1.2	29.4	
836.500000	836.500000	101.06	25.48	29.2	-1.7	1.2	29.7	0.93
848.300000	848.300000	103.29	25.61	31.5	-3.2	1.2	29.5	

g0560270: 2005-Jun-24 Fri 06:18:00
 State: 2:High Power
 CDMA PCS:

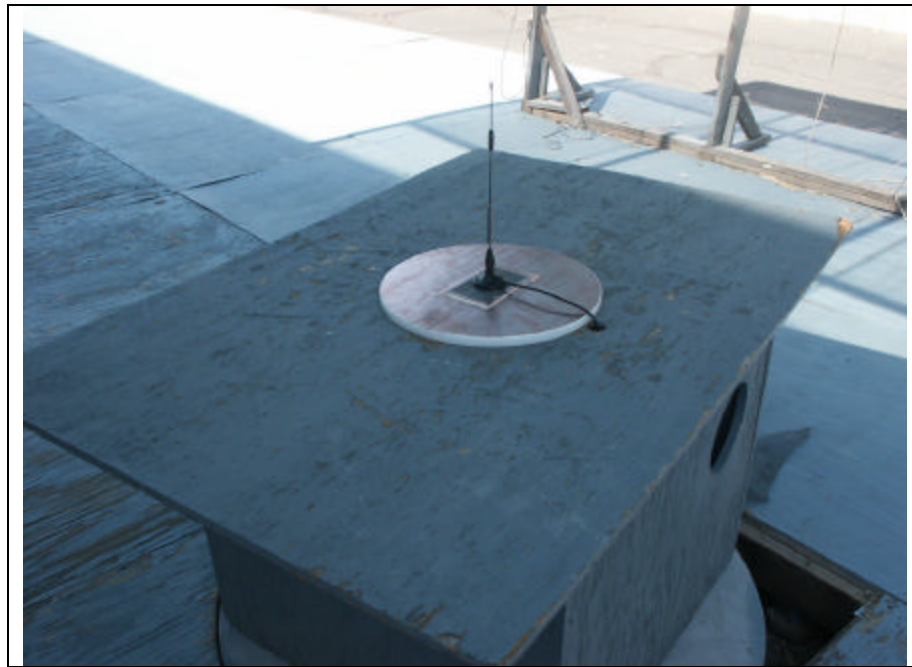
Frequency Tuned, MHz	Frequency Emission, MHz	Meter, dBuV/m	CF, dB	Calc, dBm	Path Loss, dB (Sub)	EUT - Ant Loss, dB	EIRP, dBm	EIRP, Watts (Max)
1851.300000	1851.300000	90.60	31.23	26.6	-0.2	1.8	28.6	
1880.000000	1880.000000	90.76	31.27	26.8	+0.1	1.8	28.5	0.72
1908.700000	1908.700000	87.41	31.33	23.5	+3.0	1.8	28.3	

CDMA Mode:

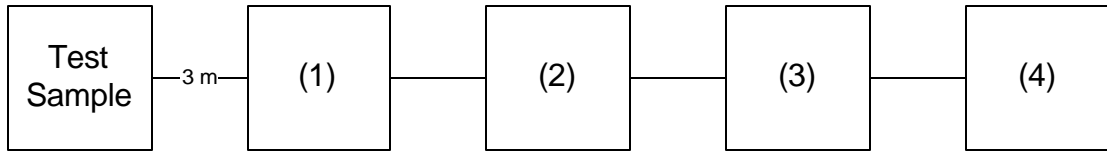
The emission bandwidth exceeds the measurement bandwidth of the test receiver.

Test Setup:

Radiated Emissions



Transmitter Radiated Measurements



Transmitter Radiated Measurements

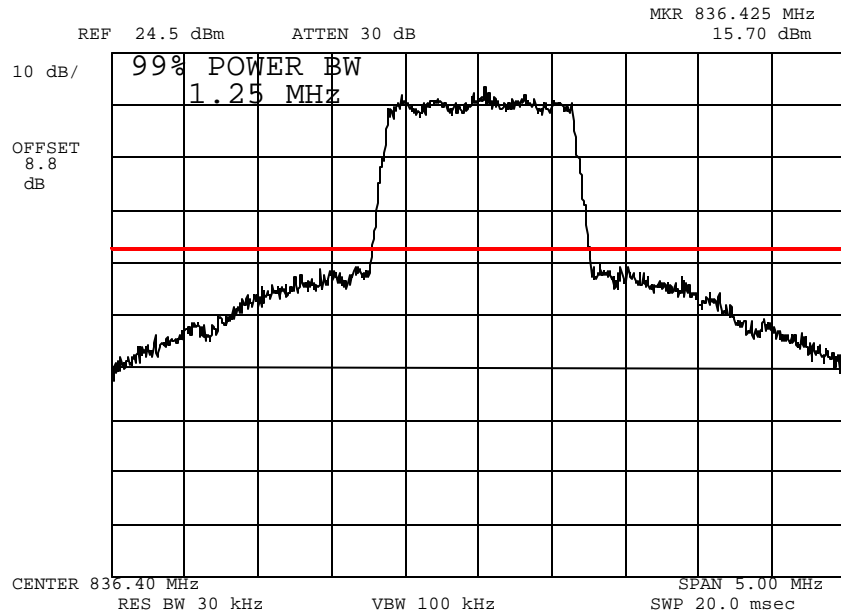
Asset	Description (as applicable)	s/n			
(1) Transducer					
X	i00091	Emco 3115	001469	24 mo	Jan-04
X	i00089	AprEl Log Periodic	001500	24 mo	Sep-03
(2) High Pass Filter					
-	As Required				
(3) Preamp					
X	i00028	HP 8449 (+30 dB)	2749A00121	12 mo	May-05
(4) Spectrum Analyzer					
	i00048	HP 8566B	2511A01467	12 mo	Aug-04
X	i00029	HP 8563E	3213A00104	12 mo	May-05

Name of Test: Emission Masks (Occupied Bandwidth)
Specification: 47 CFR 2.1049(c)(1), 22
Test Equipment: As per previous page

Measurement Procedure

1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.
2. For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for ± 2.5 kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.
3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.
5. Measurement Results: Attached

Name of Test: Emission Masks (Occupied Bandwidth)
 g0560267: 2005-Jun-23 Thu 15:11:00
 State: 2:High Power



Power:
Modulation:

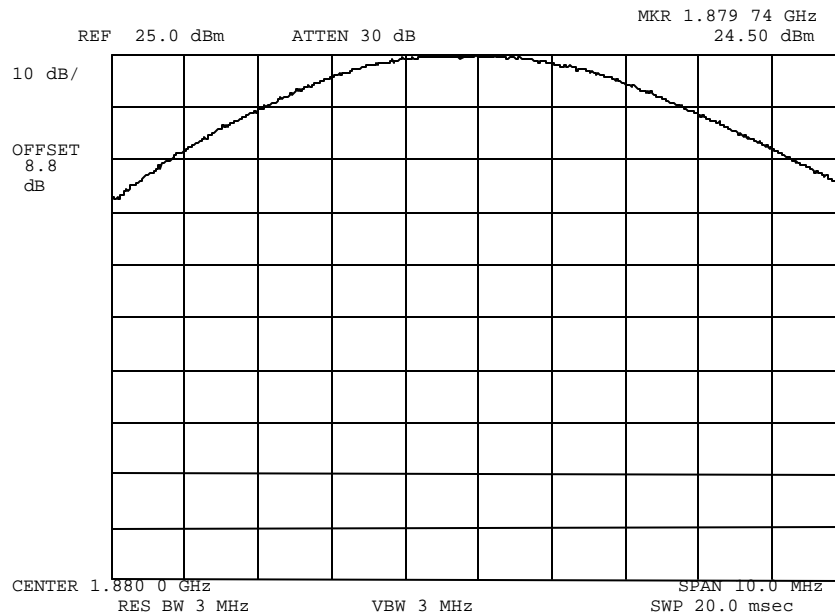
HIGH
99% POWER BANDWIDTH (CELLULAR)



Performed By:

David E. Lee, Test Engineer

Name of Test: Emission Masks (Occupied Bandwidth)
 g0560256: 2005-Jun-23 Thu 12:42:00
 State: 2:High Power



Power:
 Modulation:

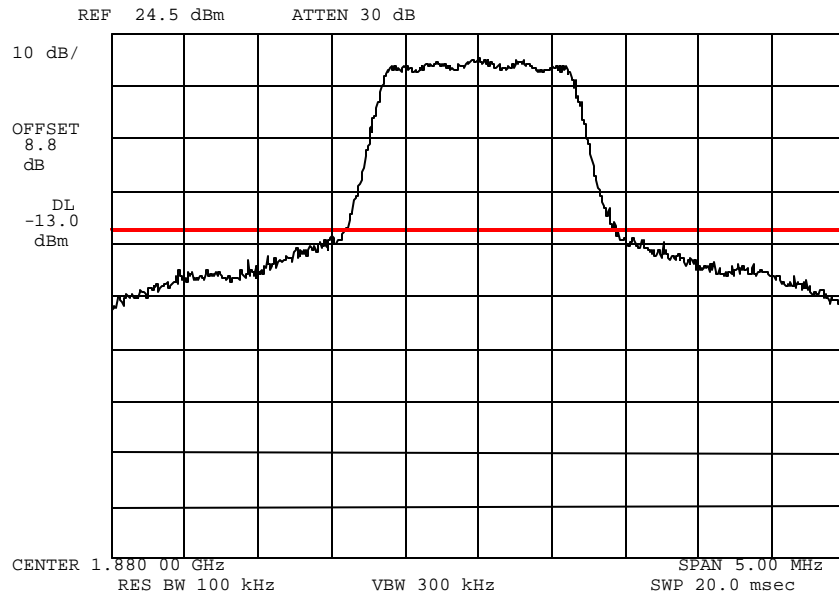
HIGH
 PCS REFERENCE



Performed By:

David E. Lee, Test Engineer

Name of Test: Emission Masks (Occupied Bandwidth)
 g0560257: 2005-Jun-23 Thu 12:44:00
 State: 2:High Power



Power:
 Modulation:

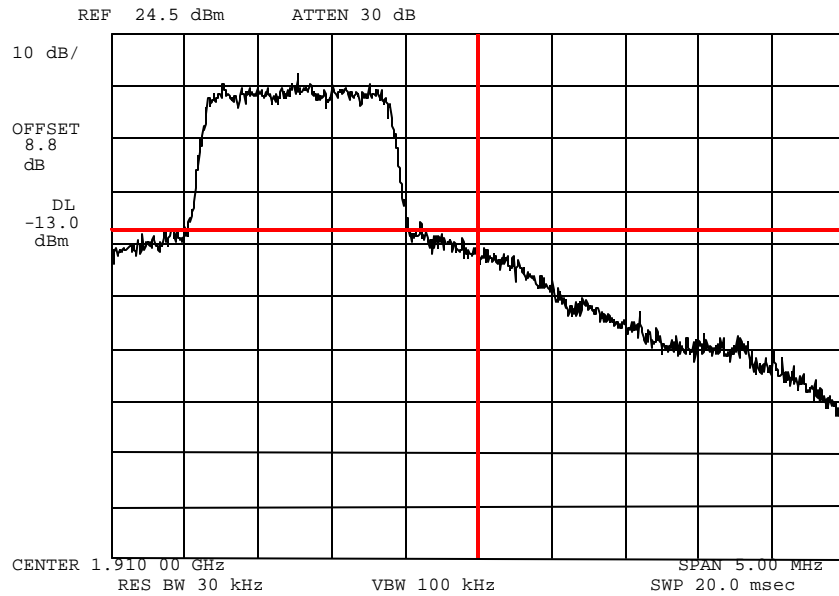
HIGH
 PCS MID CHANNEL



Performed By:

David E. Lee, Test Engineer

Name of Test: Emission Masks (Occupied Bandwidth)
 g0560260: 2005-Jun-23 Thu 12:49:00
 State: 2:High Power



Power:
 Modulation:

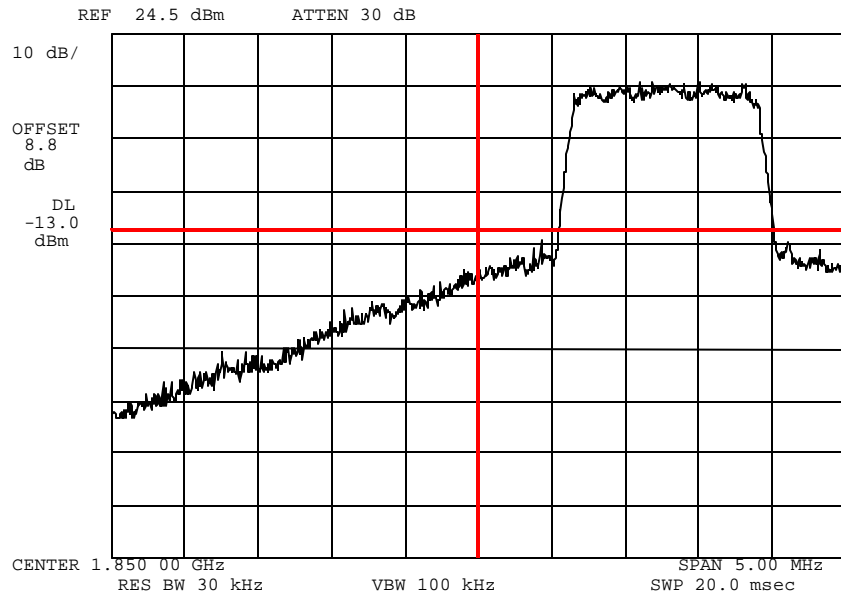
HIGH
 PCS UPPER BAND EDGE



Performed By:

David E. Lee, Test Engineer

Name of Test: Emission Masks (Occupied Bandwidth)
 g0560261: 2005-Jun-23 Thu 12:53:00
 State: 2:High Power



Power:
 Modulation:

HIGH
 PCS LOWER BAND EDGE



Performed By:

David E. Lee, Test Engineer

Name of Test: Field Strength of Spurious Radiation

Specification: 47 CFR 2.1053(a)

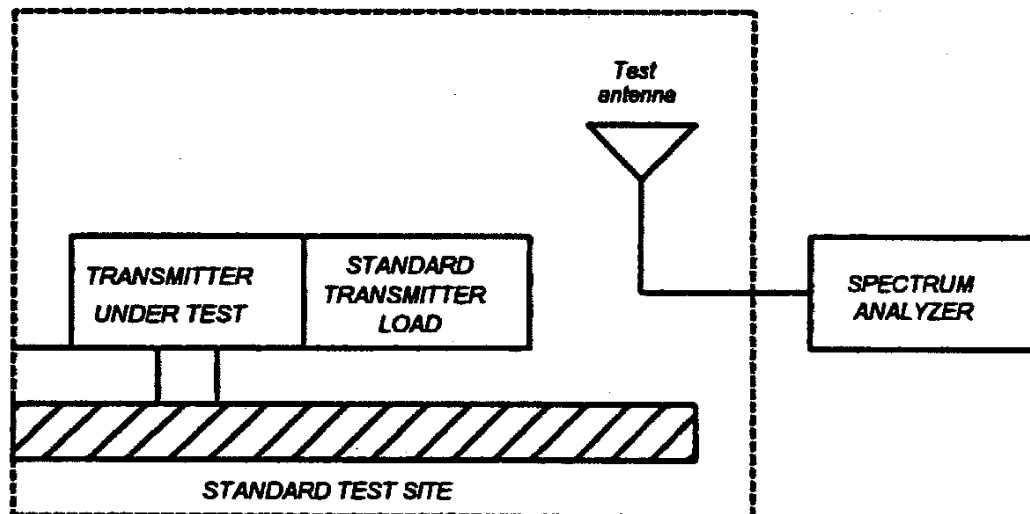
Guide: ANSI/TIA/EIA-603-1992/2001, Paragraph 1.2.12 and Table 16, 47 CFR 22.917

Measurement Procedure

1.2.12.1 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.

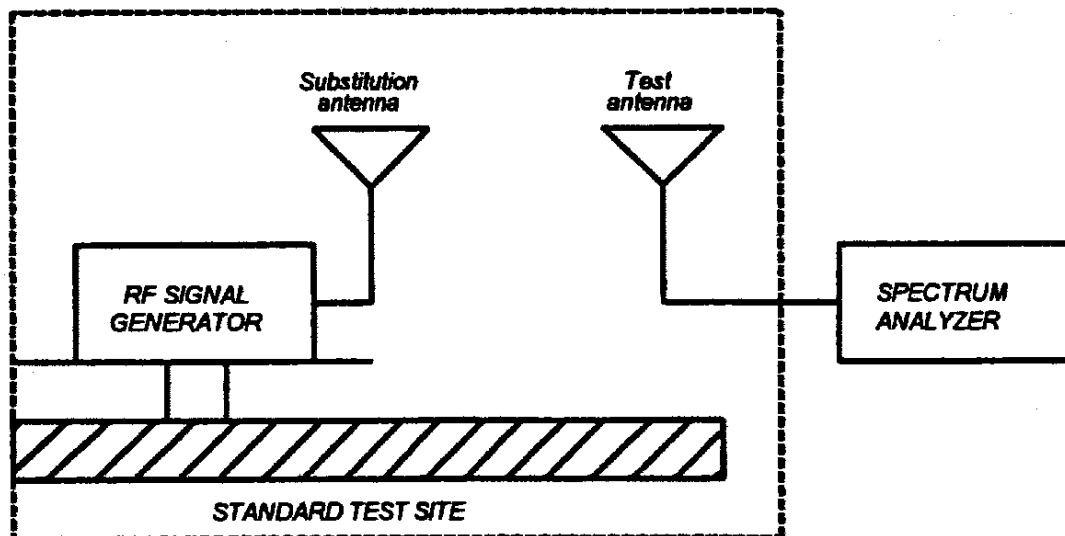
1.2.12.2 Method of Measurement

- 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
 - 4) Detector Mode = Mean or Average Power
- C) Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load which 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 =
 $10 \log_{10}(\text{TX power in watts}/0.001) - \text{the levels in step l)}$

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

Test Equipment:

Asset (as applicable)	Description	s/n	Cycle	Last Cal
Transducer				
i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-03
i00065	EMCO 3301-B Active Monopole	2635	24 mo.	Sep-03
i00089	Apriel 2001 200MHz-1GHz	001500	24 mo.	Sep-03
i00103	EMCO 3115 1GHz-18GHz	9208-3925	24 mo.	Jan-04
Amplifier				
i00028	HP 8449A	2749A00121	12 mo.	Mar-05
Spectrum Analyzer				
i00029	HP 8563E	3213A00104	12 mo.	May-05
i00033	HP 85462A	3625A00357	12 mo.	Oct-04
i00048	HP 8566B	2511AD1467	12 mo.	Aug-04

Name of Test: Field Strength of Spurious Radiation (Cellular)
g0560262: 2005-Jun-23 Thu 13:02:00
State: 2:High Power

Frequency Tuned, MHz	Frequency Emission, MHz	Meter, dBuV	CF, dB	ERP, dBm	Margin, dB
824.700000	1649.400000	93.50	-27.40	-31.3	-16.1
836.000000	1673.000000	93.00	-27.36	-31.7	-16.6
848.300000	1696.683333	92.50	-27.36	-32.2	-17.1
824.700000	2474.100000	90.33	-26.52	-33.6	-18.4
836.000000	2509.500000	88.50	-25.99	-34.9	-19.7
848.300000	2544.983333	90.33	-26.52	-33.6	-18.4
824.700000	3298.800000	80.67	-26.44	-43.1	-28.0
836.000000	3346.000000	74.17	-26.40	-49.6	-34.4
848.300000	3393.283333	87.33	-26.36	-36.4	-21.2
824.700000	4123.500000	80.17	-25.83	-43.0	-27.9
836.000000	4182.500000	78.50	-25.79	-44.7	-29.5
848.300000	4241.583333	81.00	-25.75	-42.1	-27.0
824.700000	4948.200000	66.00	-25.33	-56.7	-41.5
836.000000	5019.000000	70.50	-25.29	-52.2	-37.0
848.300000	5089.883333	72.33	-25.25	-50.3	-35.1
824.700000	5772.900000	68.83	-24.91	-53.5	-38.3
836.000000	5855.500000	61.50	-24.87	-60.7	-45.6
848.300000	5938.183333	65.17	-24.83	-57.0	-41.9
824.700000	6597.600000	62.17	-24.54	-59.7	-44.6
836.000000	6692.000000	64.00	-24.50	-57.9	-42.7
848.300000	6786.483333	58.00	-24.46	-63.8	-48.7
824.700000	7422.383333	61.00	-24.22	-60.6	-45.4
836.000000	7528.500000	60.67	-24.18	-60.9	-45.7
848.300000	7634.783333	62.83	-24.14	-58.7	-43.5
824.700000	8247.083333	54.83	-23.93	-66.5	-51.3
836.000000	8365.000000	54.83	-23.89	-66.4	-51.3
848.300000	8483.083333	45.67	-23.85	-75.6	-60.4



Performed By:

David E. Lee, Test Engineer

Name of Test: Field Strength of Spurious Radiation (PCS)
g0560265: 2005-Jun-23 Thu 13:45:00
State: 2:High Power

Frequency Tuned, MHz	Frequency Emission, MHz	Meter, dBuV	CF, dB	EIRP, dBm	Margin, dB
1851.300000	3702.666667	87.67	-26.12	-35.8	-20.7
1880.000000	3760.000000	88.17	-26.08	-35.3	-20.1
1908.700000	3817.683333	89.33	-26.04	-34.1	-18.9
1851.300000	5553.916667	93.83	-25.01	-28.6	-13.4
1880.000000	5640.000000	92.50	-24.97	-29.8	-14.7
1908.700000	5726.433333	95.00	-24.93	-27.3	-12.1
1851.300000	7405.080000	89.83	-24.22	-31.8	-16.6
1880.000000	7520.083333	89.67	-24.18	-31.9	-16.7
1851.300000	9256.330000	89.00	-23.61	-32.0	-16.8
1880.000000	9400.083333	88.17	-23.57	-32.8	-17.6
1908.700000	9543.830000	90.83	-23.53	-30.1	-14.9
1851.300000	11107.580000	77.33	-23.08	-43.1	-28.0
1880.000000	11280.083333	76.33	-23.04	-44.1	-28.9
1908.700000	11452.580000	76.00	-22.99	-44.4	-29.2
1851.300000	12958.830000	79.17	-22.62	-40.8	-25.7
1880.000000	13160.083333	80.17	-22.57	-39.8	-24.6
1908.700000	13361.330000	78.83	-22.53	-41.1	-25.9
1851.300000	14810.193333	78.83	-22.22	-40.8	-25.6
1880.000000	15040.166667	79.17	-22.17	-40.4	-25.2
1908.700000	15270.080000	74.33	-22.13	-45.2	-30.0
1851.300000	16661.443333	73.17	-21.87	-46.1	-30.9
1880.000000	16920.166667	71.50	-21.82	-47.7	-32.5
1908.700000	17178.830000	73.00	-21.77	-46.1	-31.0
1851.300000	18512.683333	71.17	-21.55	-47.8	-32.6
1880.000000	18800.166667	71.50	-21.50	-47.4	-32.2
1908.700000	19087.580000	66.00	-21.46	-52.8	-37.7



Performed By:

David E. Lee, Test Engineer

Name of Test: Frequency Stability (Temperature & Voltage Variation)
Specification: 47 CFR 2.1055(a)&(b)
Test Conditions: As Indicated
Test Equipment: As per previous page

Measurement Temperature

1. The EUT and test equipment were set up as shown on the following page.
2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
4. The temperature tests were performed for the worst case.

Measurement Voltage

1. The EUT was placed in a temperature chamber at $25\pm 5^{\circ}\text{C}$ and connected as for "Frequency Stability - Temperature Variation" test.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.
5. Measurement Results: Attached

Name of Test: Frequency Stability (Temperature & Voltage Variation)

The Transmitter Oscillator in a Cellular CDMA system is locked to the received down link signal for increased accuracy. In normal operation the device will not transmit unless there is a valid received channel.

Data supplied by Applicant

NAME OF TEST : Frequency Stability (Temperature Variation)

Operating Frequency :	836520000	Hz
Channel :	384	
Reference Voltage :	3.3	Vdc
Deviation Limit :	+/- 0.00025/2.5	%/ppm

Voltage	Power	Temp	Frequency	Deviation	Offset
(%)	(Vdc)	(C)	(Hz)	(%)	(Hz)
100%	3.3	25(Ref)	836,520,002.50	0.0000000	2.5
100%		-20	836,520,008.00	0.0000055	8
100%		-10	836,520,010.00	0.0000075	10
100%		0	836,520,007.80	0.0000053	7.8
100%		10	836,520,005.10	0.0000026	5.1
100%		25	836,519,995.90	-0.0000066	-4.1
100%		30	836,519,993.50	-0.0000090	-6.5
100%		40	836,520,006.00	0.0000035	6
100%		50	836,520,004.00	0.0000015	4
100%		60	836,519,994.30	-0.0000082	-5.7
90%		3.0	25	836,520,004.00	0.0000015
110%	3.6	25	836,520,005.50	0.0000030	5.5



Attested By:

David E. Lee, Test Engineer

Name of Test: Frequency Stability (Temperature & Voltage Variation)

The Transmitter Oscillator in a PCS CDMA system is locked to the received down link signal for increased accuracy. In normal operation the device will not transmit unless there is a valid received channel.

Data supplied by Applicant

NAME OF TEST : Frequency Stability (Temperature Variation)

Operating Frequency :	188000000	Hz
Channel	600	
Reference Voltage :	3.3	Vdc
Deviation Limit :	+/- 0.00025/2.5	%/ppm

Voltage (%)	Power (Vdc)	Temp (C)	Frequency (Hz)	Deviation (%)	
100%	3.3	25(Ref)	188,000,000.00	0.0000000	-9
100%		-20	188,000,004.00	0.0000040	4
100%		-10	188,000,004.90	0.0000049	4.9
100%		0	188,000,004.60	0.0000046	4.6
100%		10	187,999,992.60	-0.0000074	-7.4
100%		25	187,999,993.10	-0.0000069	-6.9
100%		30	188,000,007.00	0.0000070	7
100%		40	188,000,004.60	0.0000046	4.6
100%		50	188,000,006.50	0.0000065	6.5
100%		60	187,999,991.90	-0.0000081	-8.1
90%		3.0	25	188,000,010.00	0.0000100
110%	3.6	25	188,000,008.00	0.0000080	8



Attested By:

David E. Lee, Test Engineer

Name of Test: Necessary Bandwidth and Emission Bandwidth

Specification: 47 CFR 2.202(g)

Modulation = F9W

Necessary Bandwidth:

Necessary Bandwidth (B_N) = 1.25MHz
(measured at the 99% power bandwidth)

Expository Statement for Receiver
(Cellular Receiver only - PCS Receiver above 960MHz)

1. Number of Bands = 1
2. Number of Channels = All Cellular Channels
3. Tuning Range, MHz = 869.73 to 893.31
4. Oscillator Range, MHz = 1739.540 to 1786.70
5. I.F., MHz = 0
6. Block Diagram = Attached
7. For cellular receiver only, the radio transceiver meets the requirements of FCC Bulletin OET 53 ("Cellular System Mobile Stations-Land-System Compatibility Specification."). See attached affidavit.

15.203: Antenna Requirement:

- The antenna is permanently attached to the EUT
- The antenna uses a unique coupling
- The EUT must be professionally installed
- The antenna requirement does not apply

Performed By:



David E. Lee, Test Engineer

Name of Test: Receiver Spurious Emissions (Radiated)

Specification:

15.109: Radiated Interference Limits
15.33: Frequency Range of Radiated Measurements
80.217: Suppression of Interference Aboard Ships

Guide: See measurement procedure below

Test Conditions: Standard Temperature & Humidity

Test Equipment: As per attached page

Search Antennas:

25 MHz - 300 MHz: Emco 3109 Biconical
200 MHz - 1 GHz: Aprel 2001 Log Periodic
1 GHz - 18 GHz: Emco 3115 Horn
10 GHz - 40 GHz: Emco 3116 Horn with HP11970A Mixer

Measurement Procedure

1. At first, bench tests were performed to locate the spurious emissions at the antenna terminals.
2. In the field, tests were conducted over the range shown, The test sample was set up on a wooden turntable above ground, and at a distance of three meters from the antenna connected to the Spectrum Analyzer.
3. In order to obtain the maximum response at each frequency, the turntable was rotated, and the search antenna was raised and lowered. The EUT was also adjusted for maximum response. Tests were conducted in Horizontal & Vertical polarization modes.

4. The field strength was calculated from:

$$E \mu V/m @ 3 m = \text{Log}_{10}^{-1} \left(\frac{\text{dB}\mu V + A.F. + C.L.}{20} \right)$$

5. Measurement Results: Attached for "Worst Case" conditions.

Name of Test: Receiver Spurious Emissions (Radiated)

Measurement Details

Site Reference = 31040/SIT
 Spectrum Searched = 0 to 10 x F_R
 Worst Case = V
 Limits = 15.109(a) (Attached)
 All Other Emissions = 20 dB or More Below Limit

Tests were conducted with:

- a. All controls and switches operated.
- b. Half-wave dipole antenna or manufacturer/applicant supplied antenna.

Sample Calculation:

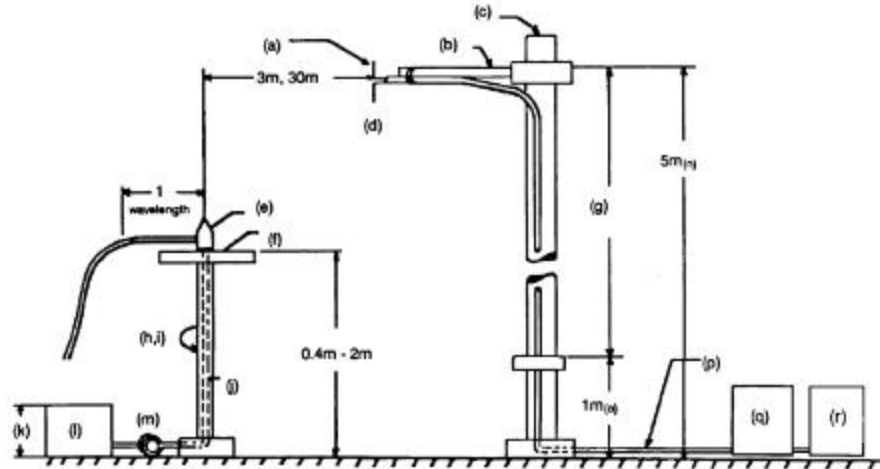
$$\begin{aligned} \text{Emission Frequency, MHz} &= 1739.460000 \\ \text{Level} &= \text{Log}_{10}^{-1} \left(\frac{-0.44 + 30.98}{20} \right) \\ \text{Level, } \mu\text{V/m @ 3m} &= 33.65 \end{aligned}$$

Measurement Results = Attached

Note: Worst Case of Scan and Non-Scan Modes Reported.

Name of Test: Receiver Spurious Emissions (Radiated)

Radiated Test Setup



NOTES:

- (a) Search Antenna - Rotatable on boom
- (b) Non-metallic boom
- (c) Non-metallic mast
- (d) Adjustable horizontally
- (e) Equipment Under Test
- (f) Turntable
- (g) Boom adjustable in height.
- (h) External control cables routed horizontally at least one wavelength.
- (i) Rotatable
- (j) Cables routed through hollow turntable center
- (k) 30 cm or less
- (l) External power source
- (m) 10 cm diameter coil of excess cable
- (n) 25 cm (V), 1 m-7 m (V, H)
- (o) 25 cm from bottom end of 'V', 1m normally
- (p) Calibrated Cable at least 10m in length
- (q) Amplifier (optional)
- (r) Spectrum Analyzer

Asset (as applicable)	Description	s/n	Cycle	Last Cal
Transducer				
i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-03
i00089	Apr1 2001 200MHz-1GHz	001500	24 mo.	Sep-03
i00103	EMCO 3115 1GHz-18GHz	9208-3925	24 mo.	Jan-04
Amplifier				
i00028	HP 8449A	2749A00121	12 mo.	Mar-05
Spectrum Analyzer				
i00029	HP 8563E	3213A00104	12 mo.	Mar-05
i00033	HP 85462A	3625A00357	12 mo.	Aug-04

Test Setup:

Radiated Emissions



Results: Receiver Spurious Emissions (Radiated)

Rule 15.109(a) Limits:

Frequency, MHz	Field Strength $\mu\text{V/m}$	Distance, m
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

g0560266: 2005-Jun-23 Thu 14:05:00
State: 0:General

Frequency Tuned, MHz	Frequency Emission, MHz	Level, dBuV	@ m	C.F., dB	$\mu\text{V/m}$	@ m
869.730000	1739.540000	53.67	3	-27.34	20.73	3
881.520000	1763.220000	55.50	3	-27.32	25.64	3
893.310000	1786.700000	55.67	3	-27.31	26.18	3
869.730000	2609.270000	56.67	3	-26.55	32.06	3
893.310000	2680.010000	54.17	3	-26.58	23.96	3
869.730000	3479.000000	52.83	3	-26.29	21.23	3
881.520000	3526.360000	55.33	3	-26.26	28.41	3
893.310000	3573.320000	53.33	3	-26.22	22.67	3
869.730000	4348.730000	53.00	3	-25.68	23.23	3
893.310000	4466.630000	52.83	3	-25.61	22.96	3
869.730000	5218.460000	52.67	3	-25.18	23.69	3
881.520000	5289.500000	52.33	3	-25.15	22.86	3
893.310000	5359.940000	51.67	3	-25.11	21.28	3
869.730000	6088.190000	52.67	3	-24.76	24.86	3
893.310000	6253.250000	54.17	3	-24.69	29.79	3
869.730000	6957.920000	55.33	3	-24.39	35.24	3
881.520000	7052.640000	54.67	3	-24.36	32.77	3
893.310000	7146.560000	54.67	3	-24.32	32.92	3
869.730000	7827.650000	55.33	3	-24.07	36.56	3
893.310000	8039.870000	56.50	3	-24.00	42.17	3
881.520000	8815.780000	53.17	3	-23.74	29.61	3
893.310000	8933.180000	56.50	3	-23.71	43.60	3

All other emissions in the required measurement range were more than 20 dB below the required limits.



Performed By:

David E. Lee, Test Engineer

END OF TEST REPORT

**Testimonial
and
Statement of Certification**

This is to certify that:

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:



Michael Findley, Laboratory Manager