MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372

Electromagnetic Compatibility Criteria
Test Report

For the

SOMA Networks
SOMAport Subscriber Terminal (Model: CPE-300-200)

Tested under

The FCC Verification Rules
Contained in Title 47 of the CFR, Part 24, Subpart E
for Broadband PCS Devices

MET Report: EMCS15478-FCC24

August 23, 2004

Prepared For:

SOMA Networks
185 Berry St, Suite 4600
San Francisco, CA 94107

Prepared By:
MET Laboratories, Inc.
33439 Western Ave.
Union City, California 94587

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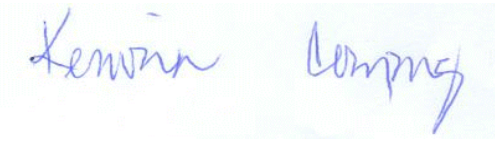
Alvin Ilarina, Manager
Electromagnetic Compatibility Lab

Cheryl Anicete
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is / is not capable of operation in accordance with the requirements of Part 24, Subpart E of the FCC Rules under normal use and maintenance.



Kerwinn Corpuz
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	August 23, 2004	Initial Issue.

Table of Contents

All references to section numbers are taken directly from the standard/specification used. Only sections requiring testing or evaluation are included.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci **B**els
dBm	**D**eci-**B**els relative to one **m**illi **w**att
dBμV	**D**eci-**B**els above one **micro V**olt
dBμV/m	**D**eci-**B**els above one **micro V**olt **per m**eter
DC	**D**irect **C**urrent
DCF	**D**istance **C**orrection **F**actor
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
H	Magnetic Field
GHz	**G**iga **H**ert**z**
Hz	**H**ert**z**
ICES	**I**nterference-**C**ausing **E**quipment **S**tandard
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo **V**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**H**ertz
μH	**micro H**enry
μF	**micro F**arad
μs	**micro s**econds
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare

1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 24, Subpart E. All tests were conducted using measurement procedure ANSI C63.4: 2003, ANSI TIA/EIA-603-A-2001.

Type of Submission/ Rule Part:	Certification / Part 24 Subpart E
EUT:	SOMAport Subscriber Terminal (model: CPE-300-200)
FCC ID:	POZCPEPCS004886C
Equipment Code:	PCB
Type of Emissions:	4M69F9W
RF Power Output:	Conducted Output Power in Peak: 29.86 dBm (0.9683 watt)
Frequency Range (MHz):	1850 – 1910
Frequency Stability:	+/- 850 Hz

Title 47 of the CFR, Part 24, Subpart E, Reference and Test Description	Conformance			Comments
	Yes	No	N/A	
	Yes - Equipment complies with the Requirement *No - Equipment does not comply with the Requirement* *N/A - Not applicable to the equipment under tests*			
24.232(b); 2.1046 RF Power Output	✓			Measured emissions below applicable limits.
2.1047(a) Modulation Characteristics			✓	EUT is non-voice, data only.
24.238(b); 2.1049 Occupied Bandwidth	✓			Measured emissions below applicable limits.
24.238(a); 2.1051 Spurious Emissions at Antenna Terminals	✓			Measured emissions below applicable limits.
24.238(a); 2.1053 Radiated Spurious Emissions	✓			Measured emissions below applicable limits.
24.235; 2.1055(a)(1) Frequency Stability over Temperature Variations	✓			Measured emissions below applicable limits.
24.235; 2.1055(d)(1) Frequency Stability over Voltage Variations	✓			Measured emissions below applicable limits.
1.1307(b)(2); 1.1310 RF Exposure Requirements	✓			Measured emissions below applicable limits.

2. Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by SOMA Networks to perform testing on the SOMAport Subscriber Terminal (Model: CPE-300-200), under SOMA Networks purchase order number 403785.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the SOMA Networks, SOMAport Subscriber Terminal (Model: CPE-300-200).

An EMC evaluation to determine compliance of the SOMA Networks, SOMAport Subscriber Terminal (Model: CPE-300-200) with the requirements of Part 24, Subpart E, was conducted. (All references are to the most current version of Title 47 of the Code of Federal Regulations in effect). In accordance with §2.1033, the following data is presented in support of the Certification of the SOMAport Subscriber Terminal (Model: CPE-300-200). SOMA Networks should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been **permanently** discontinued.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	SOMAport Subscriber Terminal (Model: CPE-300-200)
Model(s) Covered:	N/A
EUT Specifications:	Primary Power: 110 – 240 Vac (to 12 Vdc)
	Secondary Power: N/A
	Highest Clock Frequency: 1.9325 GHz
Evaluated by:	Kerwinn Corpuz
Date(s):	August 23, 2004

2.2. Test Site

All testing was performed at MET Laboratories, Inc., 4855 Patrick Henry Drive, Building 6, Santa Clara, California 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories. In accordance with §2.948(d), MET Laboratories has been accredited by the National Voluntary Laboratory Accreditation Program (Lab Code: 100273-0).

2.3. Description of Test Sample

The SOMAport, Equipment Under Test (EUT) for the remainder of this document, is a wireless terminal that is designed to provide wireless network access in a residence as well as two phone line.

2.4. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Rev. #
A	Wireless Router (Digital board/ RF Module)	CPE 300-200	N/A (999351B-200/ 999353C-200)	0004310114 (040423000G/ 04030001S)	N/A

Table 1. Equipment Configuration

2.5. Support Equipment

SOMA Networks supplied support equipment necessary for the operation and testing of the SOMAport Subscriber Terminal (Model: CPE-300-200). All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
B	Laptop	IBM	TYPE 2644	N/A
C	Power Meter	Anritsu	ML 2488A (1S2430)	N/A
D	Spectrum Analyzer	HP	8564E (1S2293)	N/A
E	AC-DC Power Supply	SOMA Network	UP04821120B	N/A
F	AC-DC Power Supply	IBM	02K6557	N/A
G	Coupler	Krytar	101020020(1S2034)	N/A
H	WCDMA Sensor	Anritsu	MA 2491A (1S2432)	N/A
I	Environmental Chamber	Tenney Engineering	Tenney Six(1S2229)	N/A
J	Variac	Staco	3PN2210 (1S2060)	N/A

Table 2. Support Equipment

* - The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

2.6. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded ?	Termination Box ID & Port ID
1	A, 10/100 Ethernet	RJ45,10/100 Ethernet Cable	1	2	No	B, Ethernet port
2	A, Antenna Port	SMA coax	1	0.3	Yes	G-1, Kytar Coupler
3	A, DC Power Input	16 AWG cable	1	2	No	E , AC-DC Power Supply

Table 3. Ports and Cabling Information

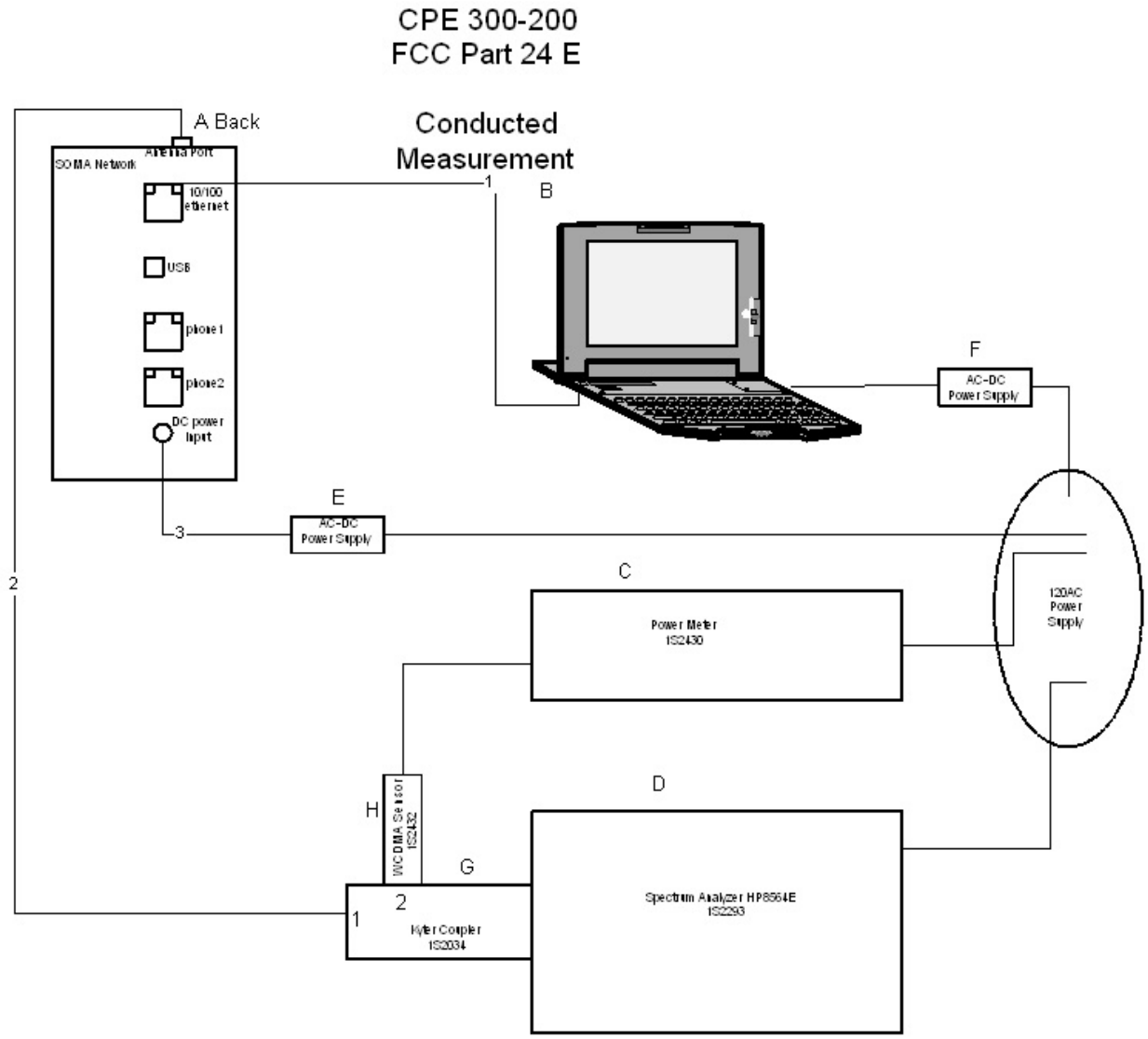


Figure 1. Block Diagram of Test Configuration (Conducted Measurement)

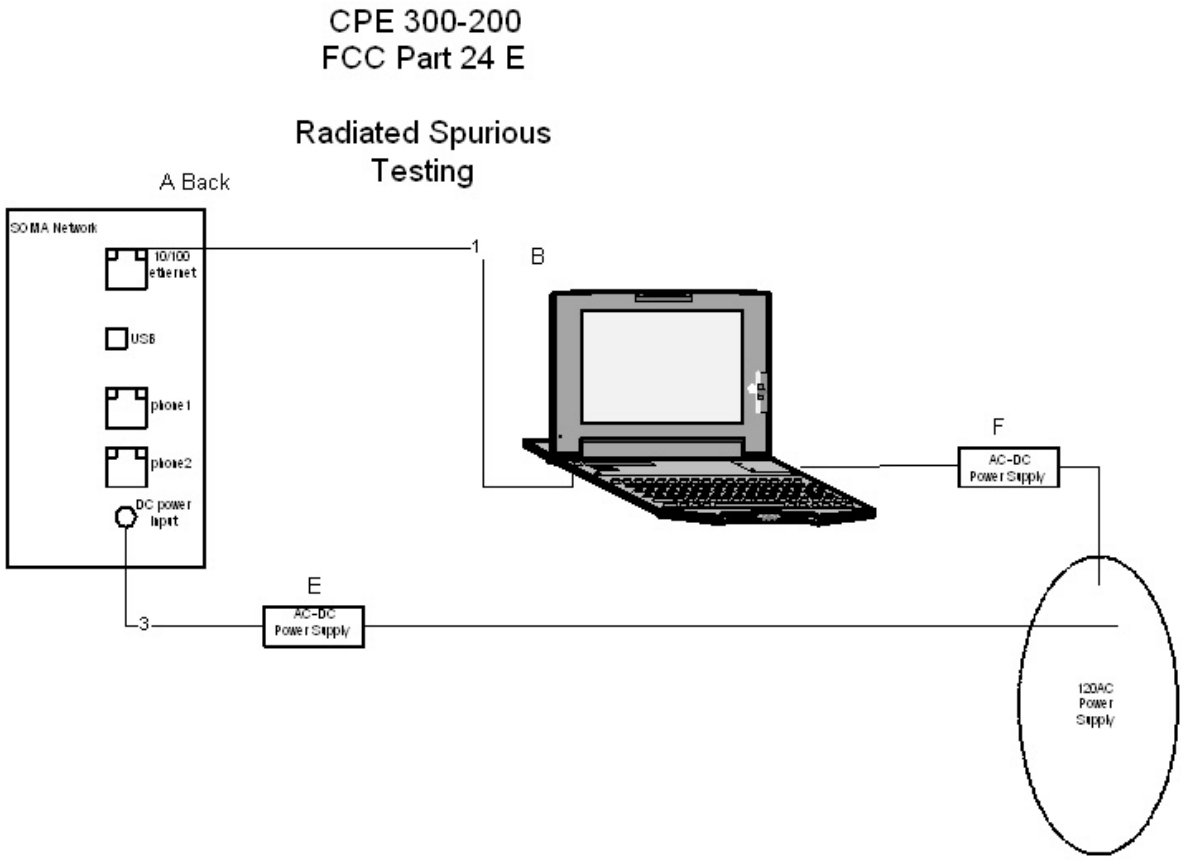


Figure 2. Block Diagram of Test Configuration (Radiated Spurious)

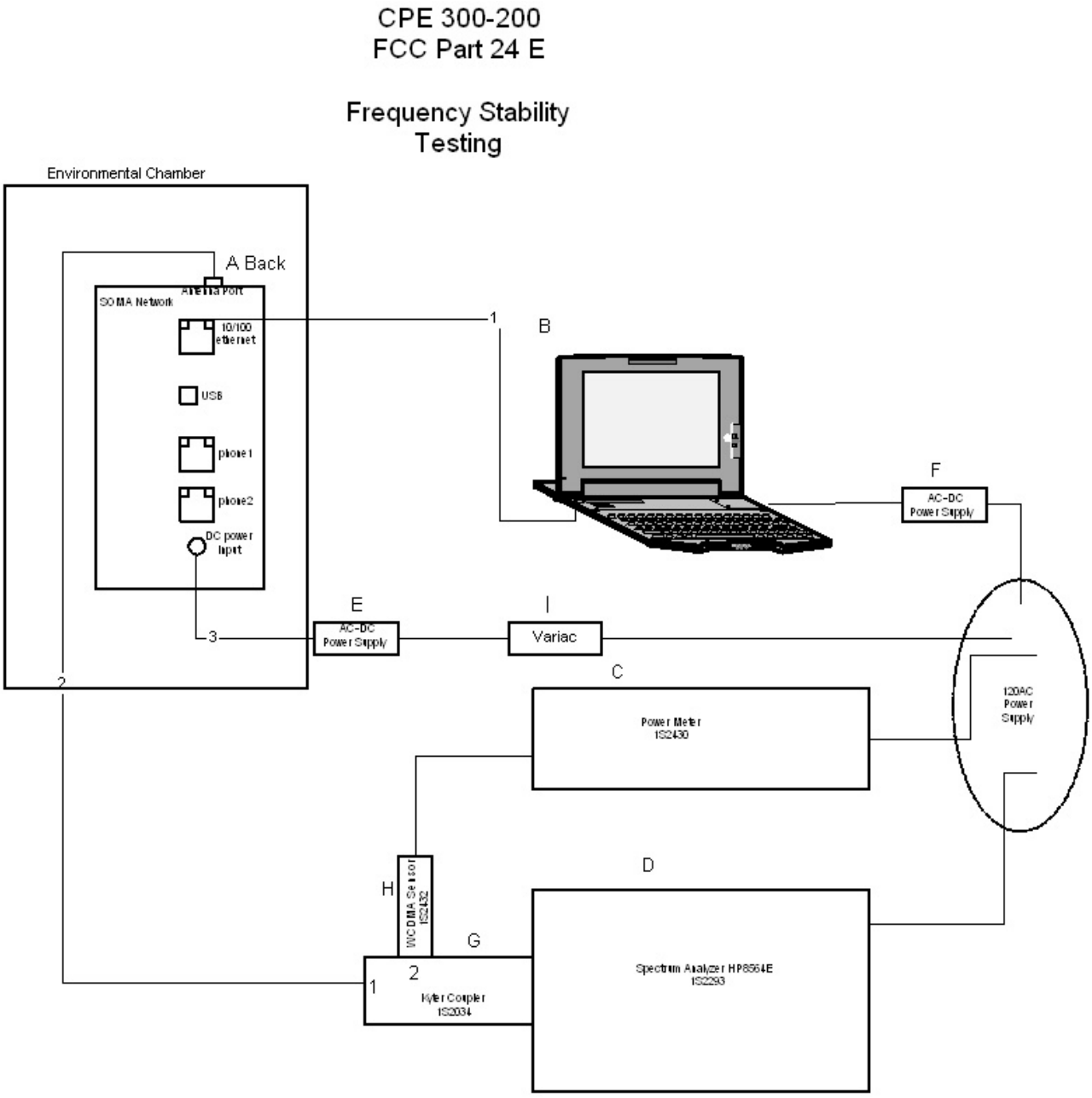


Figure 3. Block Diagram of Test Configuration (Frequency Stability)

2.7. Mode of Operation

SOMAport is normally placed close to a computer connected via Ethernet or USB. It provides wireless access from a nearby base station.

2.8. Method of Monitoring EUT Operation

SOMAport has two tri-color LED to display network connection and other status.

2.9. Modifications

2.9.1. Modifications to EUT

No modifications were made to the EUT.

2.9.2. Modifications to Test Standard

No modifications were made to the test standard.

2.10. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to SOMA Networks upon completion of testing.

3. Electromagnetic Compatibility RF Power Output Requirements

3.1. Peak Power Output and RF Exposure

Test Requirement(s): **§2.1046 and §24.232(b)**

RF Exposure Requirements - §1.1307(b)(2); 1.1310:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Test Procedures: As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected through a Directional Coupler, a EMI Receiver or Spectrum Analyzer to monitor the frequency, and a Power Meter to measure the Peak power. A 20.6 dB was set to Reference level Offset of the Power Meter. The EUT was set to transmit in the lowest of the operating frequency range. The EUT power was adjusted enough to produce maximum output power as specified in the owner's manual. The output power was then recorded with peak and average reading. This process was repeatedly done with the middle and highest channels.

For EIRP Radiated Emissions at Fundamental Test Results and Procedure, refer to Section 7.1 Radiated Emissions (Substitution Method).

Test Results: Equipment complies with 47CFR 2.1046 and 24.232(b). The EUT does not exceed 33 dBm (2 watt) at the carrier frequency.

All RF Power output measurements were direct connection to RF output Terminal of EUT from a Power Meter.

Channel	Frequency (MHz)	Average (dBm)	Peak (dBm)	EUT antenna gain (dBi)	EUT EIRP (dBm)	Limit (EIRP) 2 Watt (dBm)	Margin (dBm)
1	1852.5	26.65	29.86	3	32.86	33	-0.14
6	1877.5	26.49	29.74	3	32.74	33	-0.26
12	1907.5	26.93	29.58	3	32.58	33	-0.42

MPE Calculation:

MPE Limit Calculation: EUT's operating frequencies @ 1850 – 1910 MHz; Peak Power Output = 29.86 dBm
therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2$$

where, S = Power Density (**10 W/m^2**)
P = Power Input to antenna (0.9683 Watts)
G = Antenna Gain (3 dBi)
R = distance to the center of radiation of the antenna (20 cm or 0.2 m)

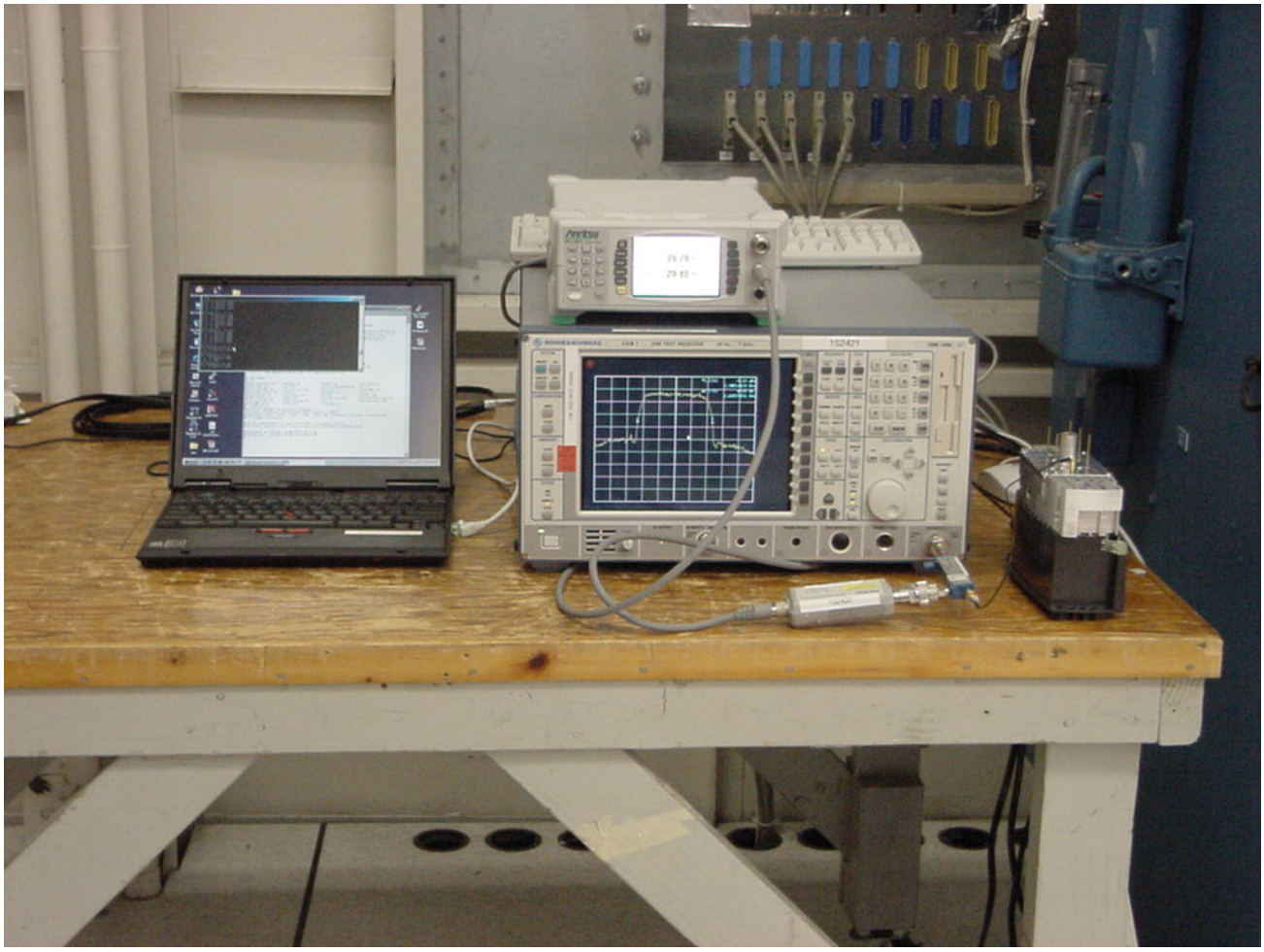
$$S = 0.9683W*3dBi / 4*3.14*(0.2m)^2 = 2.9048W / 0.5024m^2 = 5.7819\ W/m^2$$

EUT comply with 20cm distance exposure.

Test Engineer(s): Kerwinn Corpuz

Test Date(s): 8/17/04

Peak Power Output and RF Exposure



Photograph 1. RF Power Output Test Setup

4. Electromagnetic Compatibility Modulation Characteristics Requirements

4.1. Modulation Characteristics

Test Requirement(s): **§2.1047**

Test Procedures: As required by 47 CFR 2.1047, *Modulation Characteristics measurements* were made at the RF output terminals.

Test Results: EUT is not required for this test.
The EUT contain no analog voice circuitry.

5. Electromagnetic Compatibility Occupied Bandwidth Requirements

5.1. Occupied Bandwidth

Test Requirement(s): **§2.1049 and §24.238 (b)**

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made at the RF output terminals using a Directional Coupler through an EMI Receiver and Power Meter monitoring the power output level.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected through a Directional Coupler, a EMI Receiver, and a Power Meter to monitor the output power level. The measured highest Average Power was set relative to zero dB reference. A 1.3 dB was set to Reference level Offset of the EMI Receiver and set the RBW = VBW = 50 kHz, a 1% of emission bandwidth. The EUT was set to transmit in the lowest of the operating frequency range. The EUT power was adjusted at the maximum output power level. The max hold button from the EMI Receiver was activated capturing the modulated envelope of the EUT then plotted the graph. This process was repeatedly done with the middle and highest channel.

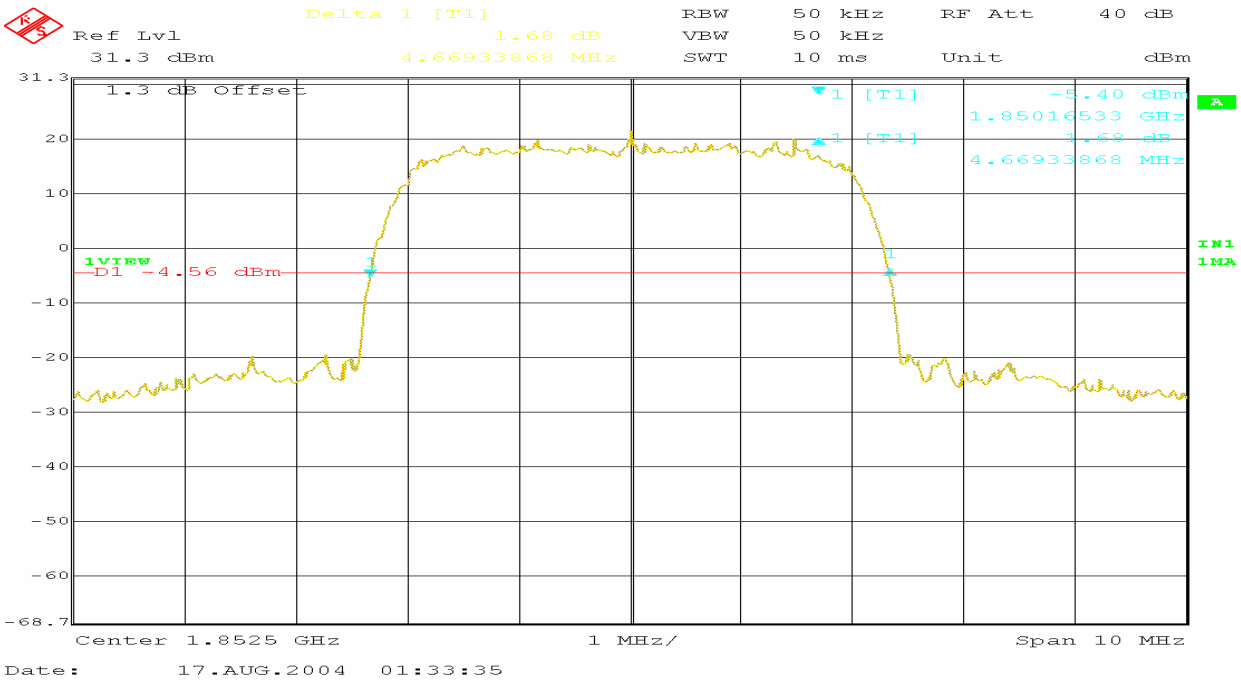
Test Results: Equipment complies with Section 2.1049 and 24.238(b). The EUT meets the 5 MHz W-CDMA occupied bandwidth.

The following pages show measurements of Occupied Bandwidth plots which is recorded below:

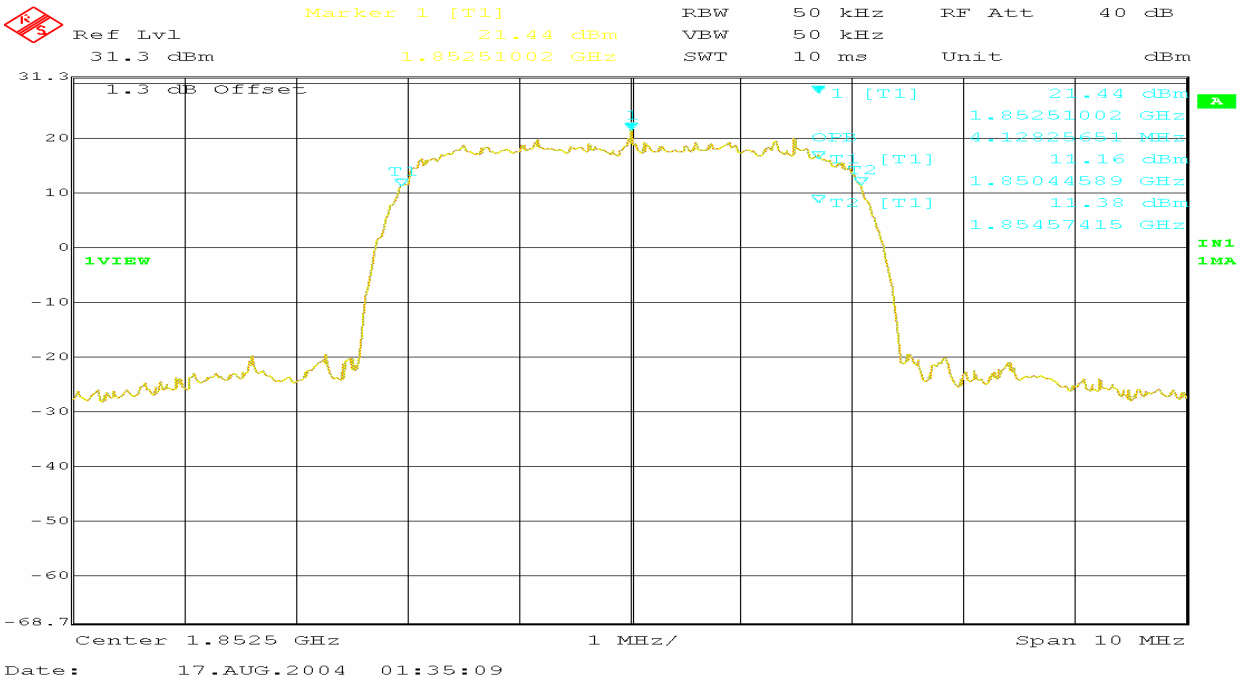
Occupied Bandwidth Description			
Plot #	**Frequency (MHz)**	**Comments**	**Measured Occupied BW (MHz)**
1	1852.5	Low channel 26 dB bandwidth	4.6693
2	1852.5	Low channel 99 percent bandwidth	4.1283
3	1877.5	Middle channel 26 dB bandwidth	4.6693
4	1877.5	Middle channel 99 percent bandwidth	4.1483
5	1907.5	High channel 26 dB bandwidth	4.6894
6	1907.5	High channel 99 percent bandwidth	4.1283

Test Engineer(s): Kerwinn Corpuz

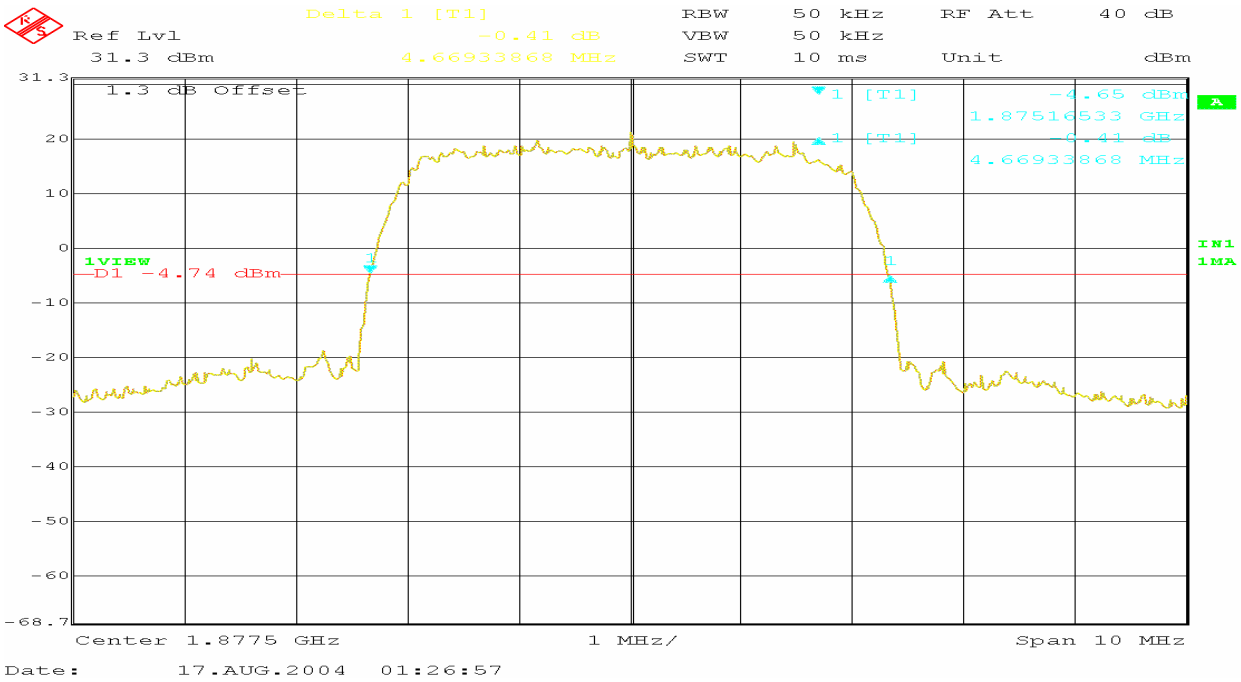
Test Date(s): 7/17/04



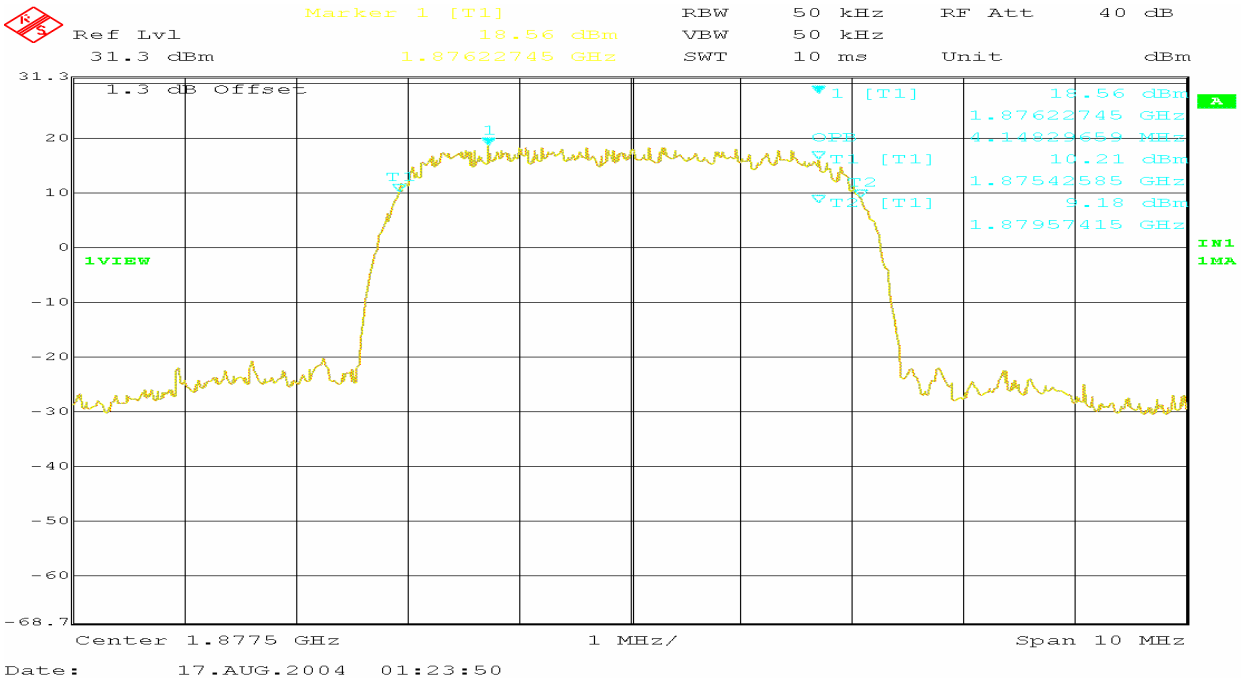
Plot 1. Low channel 26 dB bandwidth



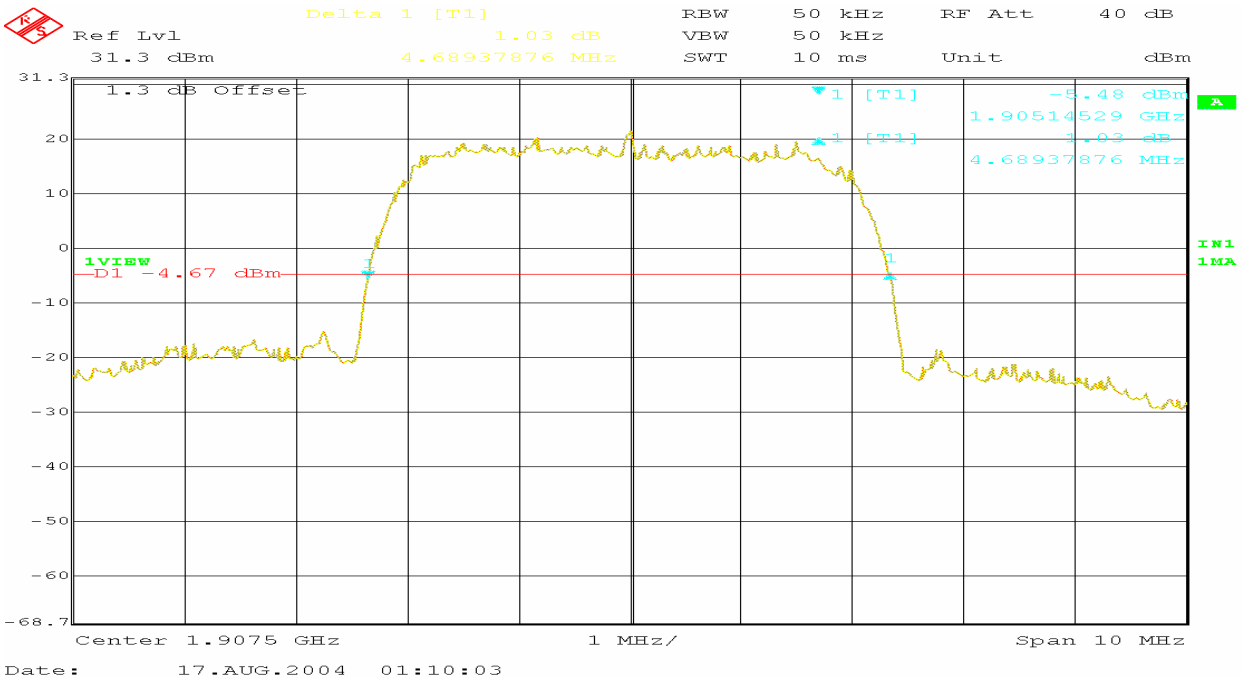
Plot 2. Low channel 99% bandwidth



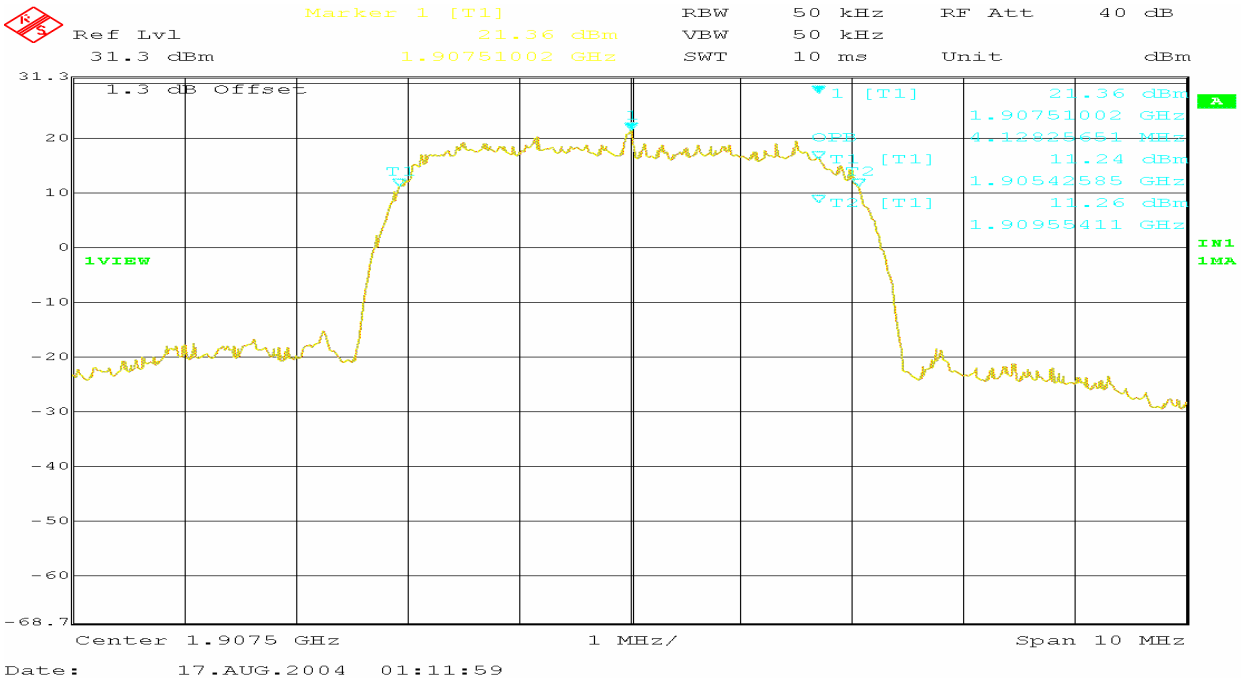
Plot 3. Middle channel 26 dB bandwidth



Plot 4. Middle channel 99% bandwidth

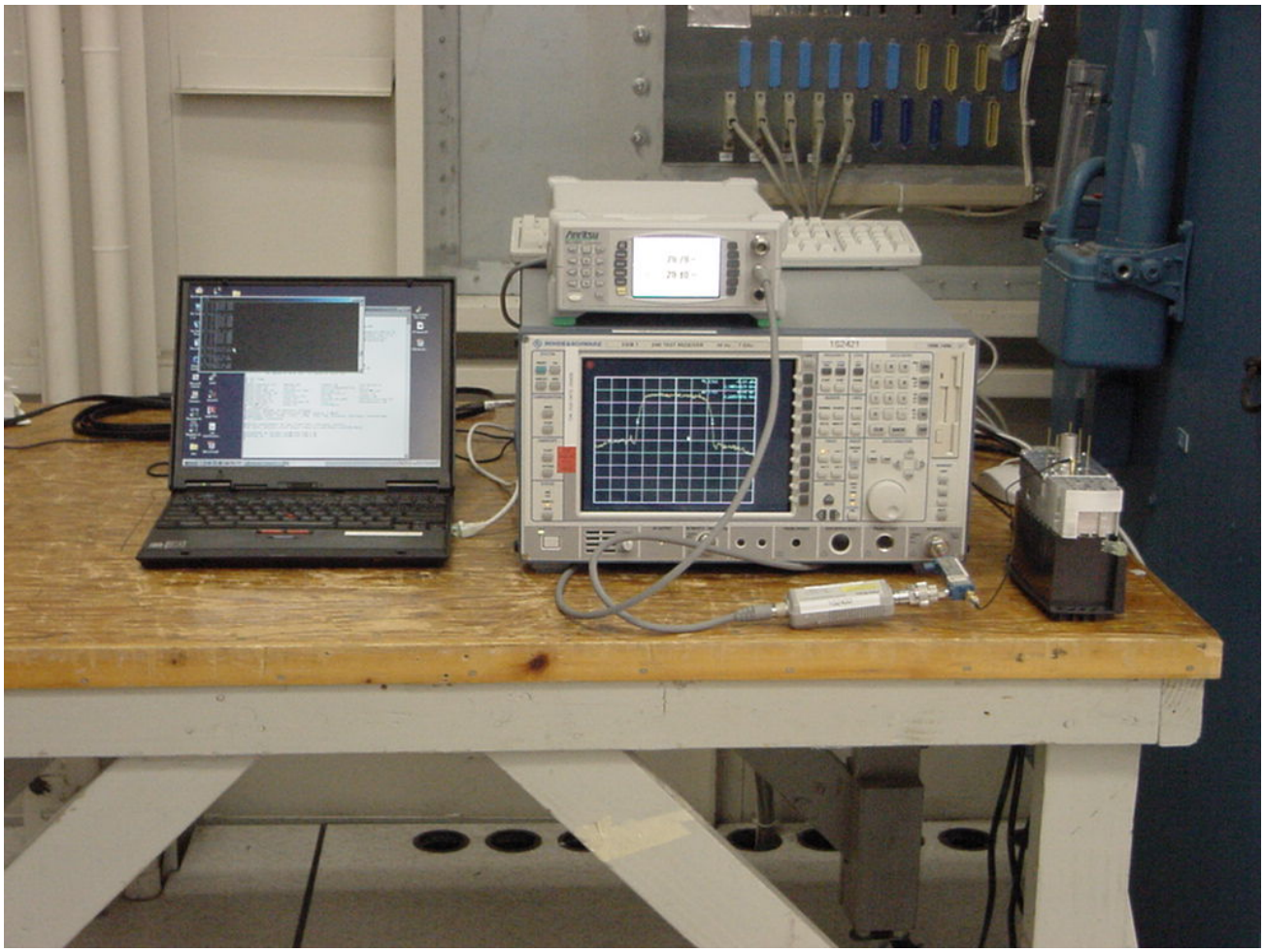


Plot 5. High channel 26 dB bandwidth



Plot 6. High channel 99% bandwidth

Occupied Bandwidth Test Setup



Photograph 2. Occupied Bandwidth Test Setup

6. Electromagnetic Compatibility Spurious Emissions at Antenna Terminal Requirements

6.1. Spurious Emissions at Antenna Terminals

Test Requirement(s): **§2.1051 and §24.238(a)**

Test Procedures: As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Directional Coupler through a EMI Receiver or Spectrum Analyzer and Power Meter.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected through a Directional Coupler, a EMI Receiver, and a Power Meter to monitor the output power level. A 1.3 dB was set to Reference level Offset of the Spectrum Analyzer and set the RBW = VBW = 1 MHz. The Spectrum Analyzer was set to sweep 30 MHz to the 10^{th} harmonic of the fundamental. The Display Line of the Spectrum Analyzer was set to -13 dBm as the limit line. The EUT was set to transmit in the lowest of the operating frequency range. The EUT power was adjusted at the maximum output power level and after at least 10 sweeps, plotted the graph. This process was repeatedly done to middle and highest channel.

The Radiated Spurious Emissions *Limit* is obtained by the following:

Measured maximum Output Power of EUT: 0.9683 Watts (Peak)

Spur limit = Po - (43 + 10logPo); Po = 0.9683 watts or 29.86 dBm

29.86dBm - (43 + 10log 0.9683) = 29.86 dBm - (42.86dB) = -13 dBm

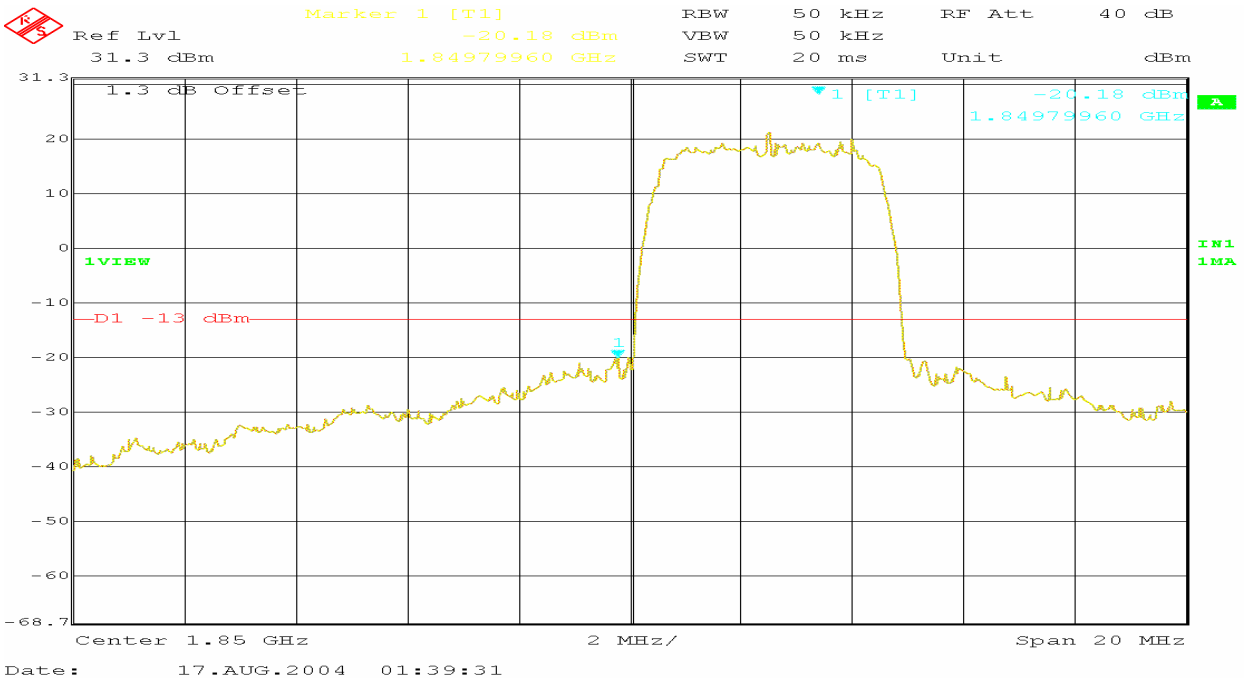
Test Results: Equipment complies with Section 2.1051 and 24.238(a). The following pages show measurements of Spurious Emission plots which is recorded below:

Spurious Emissions at Antenna Port Description		
Plot #	**EUT Center Frequency (MHz)**	**Comment**
7	1852.5	Bandedge for 1850 MHz at the lowest channel measuring -7.18 dB below the limit.
8	1907.5	Bandedge for 1910 MHz at the highest channel measuring -6.08 dB below the limit.
9	1852.5	(Low channel) Frequency swept: 30M – 10 GHz
10	1852.5	(Low channel) Frequency swept: 10 – 20 GHz
11	1877.5	(Middle channel) Frequency swept: 30M – 10 GHz
12	1877.5	(Middle channel) Frequency swept: 10 – 20 GHz
13	1907.5	(High channel) Frequency swept: 30M – 10 GHz
14	1907.5	(High channel) Frequency swept: 10 – 20 GHz

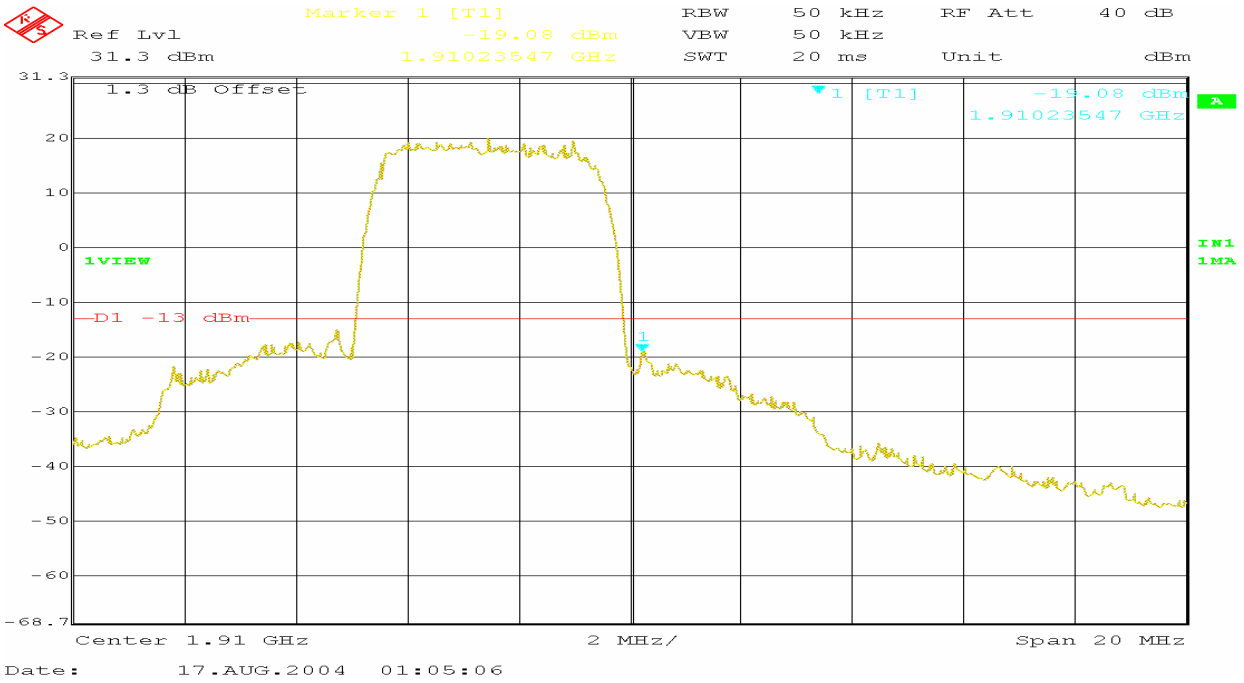
The following plots are included to illustrate compliance with the required rule parts.

Test Engineer(s): Kerwinn Corpuz

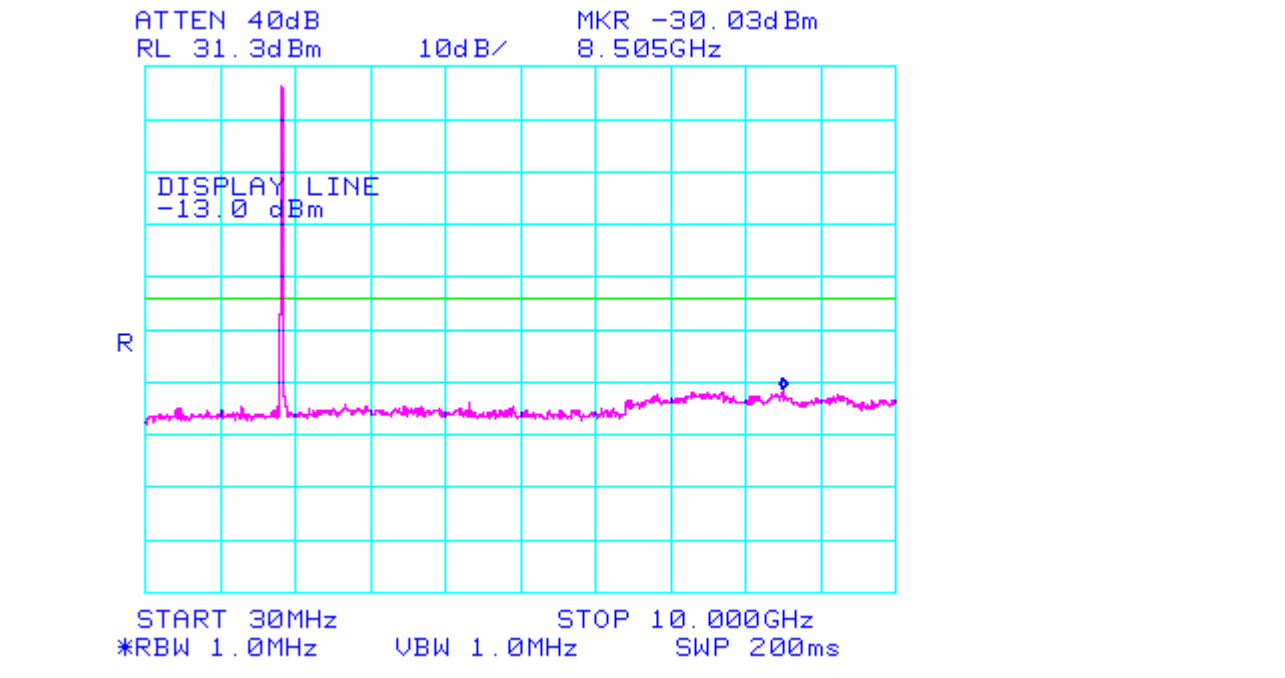
Test Date(s): 7/19/04



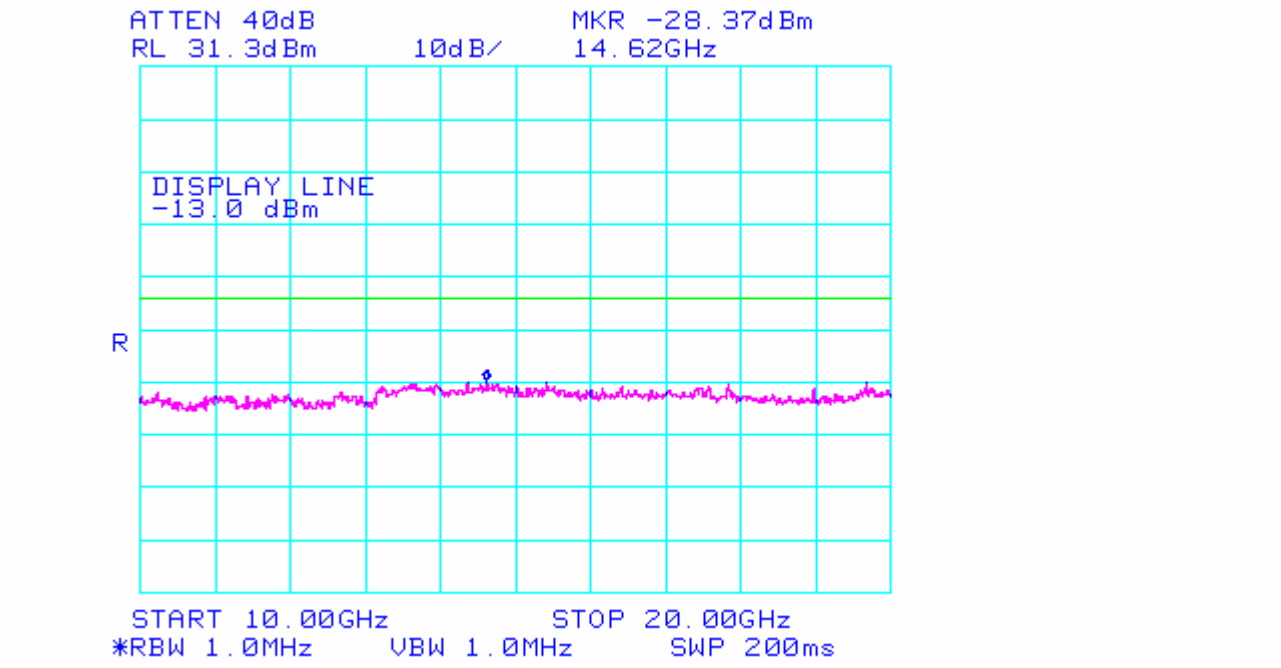
Plot 7. Bandedge Emissions at the Lowest channel



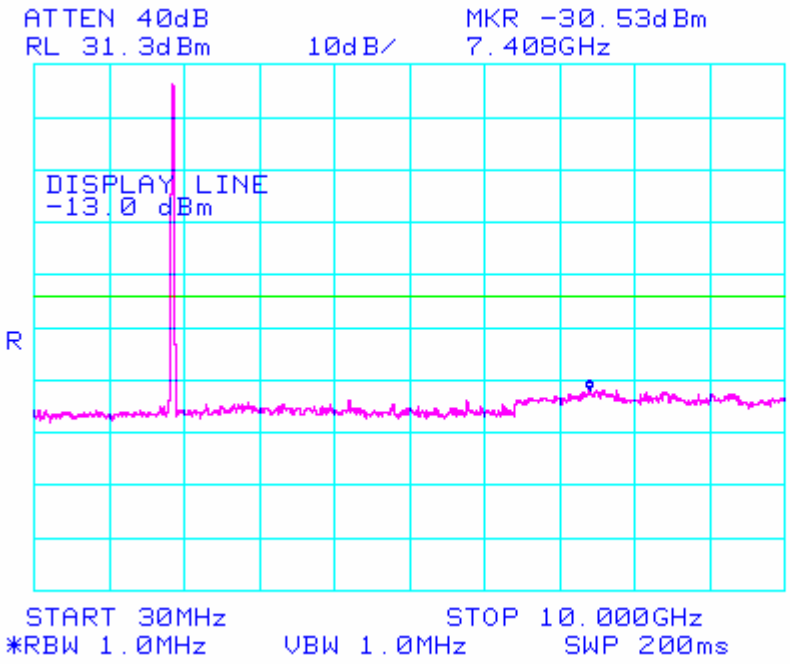
Plot 8. Bandedge Emissions at the Highest channel



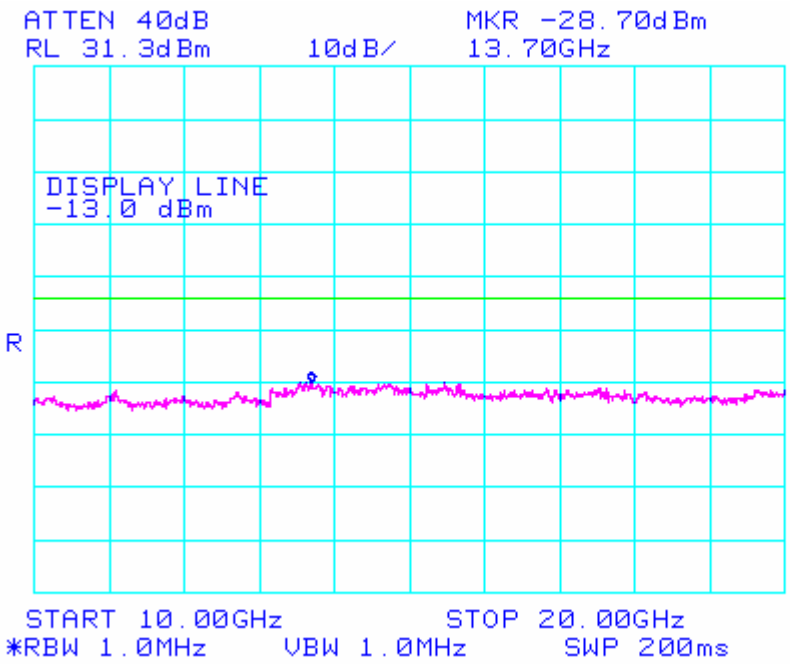
Plot 9. Spurious Emission 30 M – 10 GHz at low channel



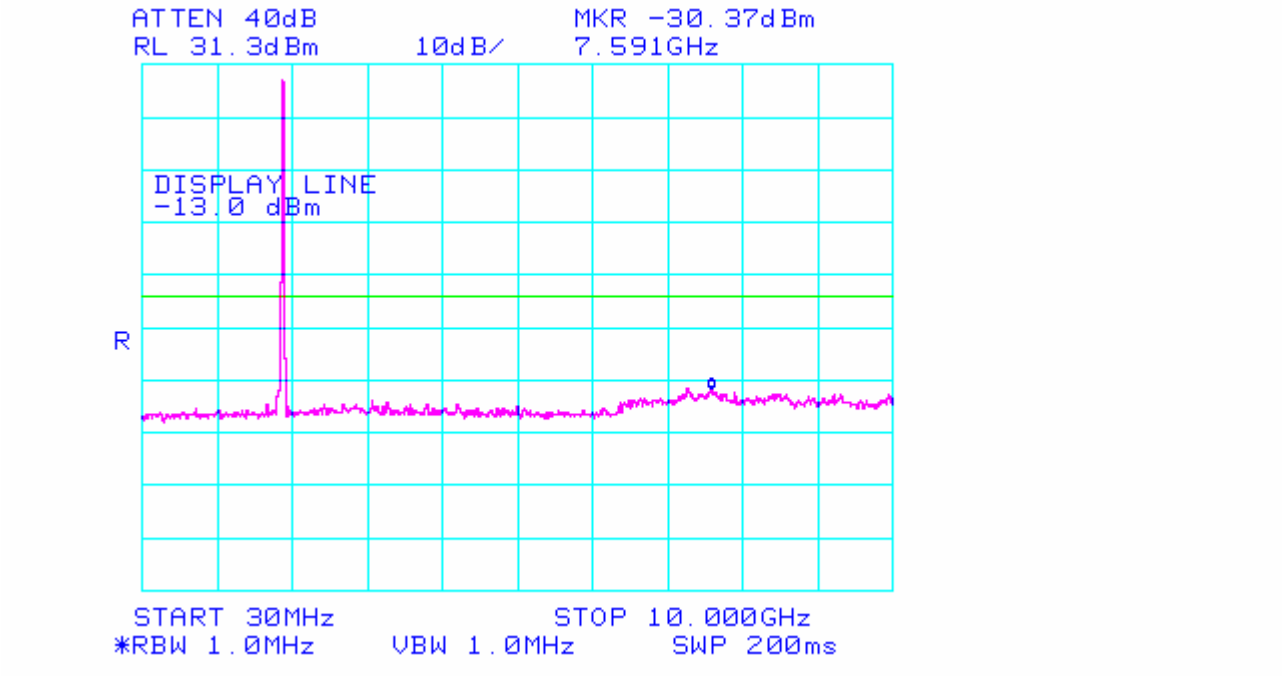
Plot 10. Spurious Emission 10 – 20 GHz at low channel



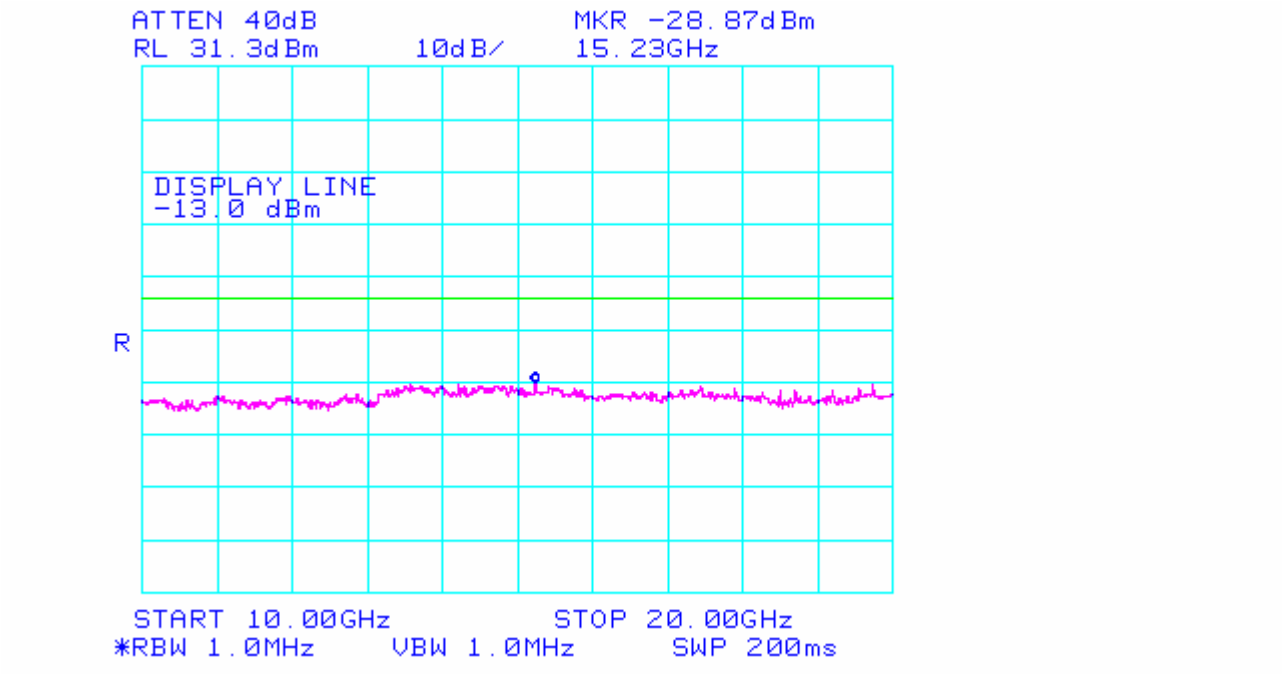
Plot 11. Spurious Emission 30 M – 10 GHz at mid channel



Plot 12. Spurious Emission 10 – 20 GHz at mid channel

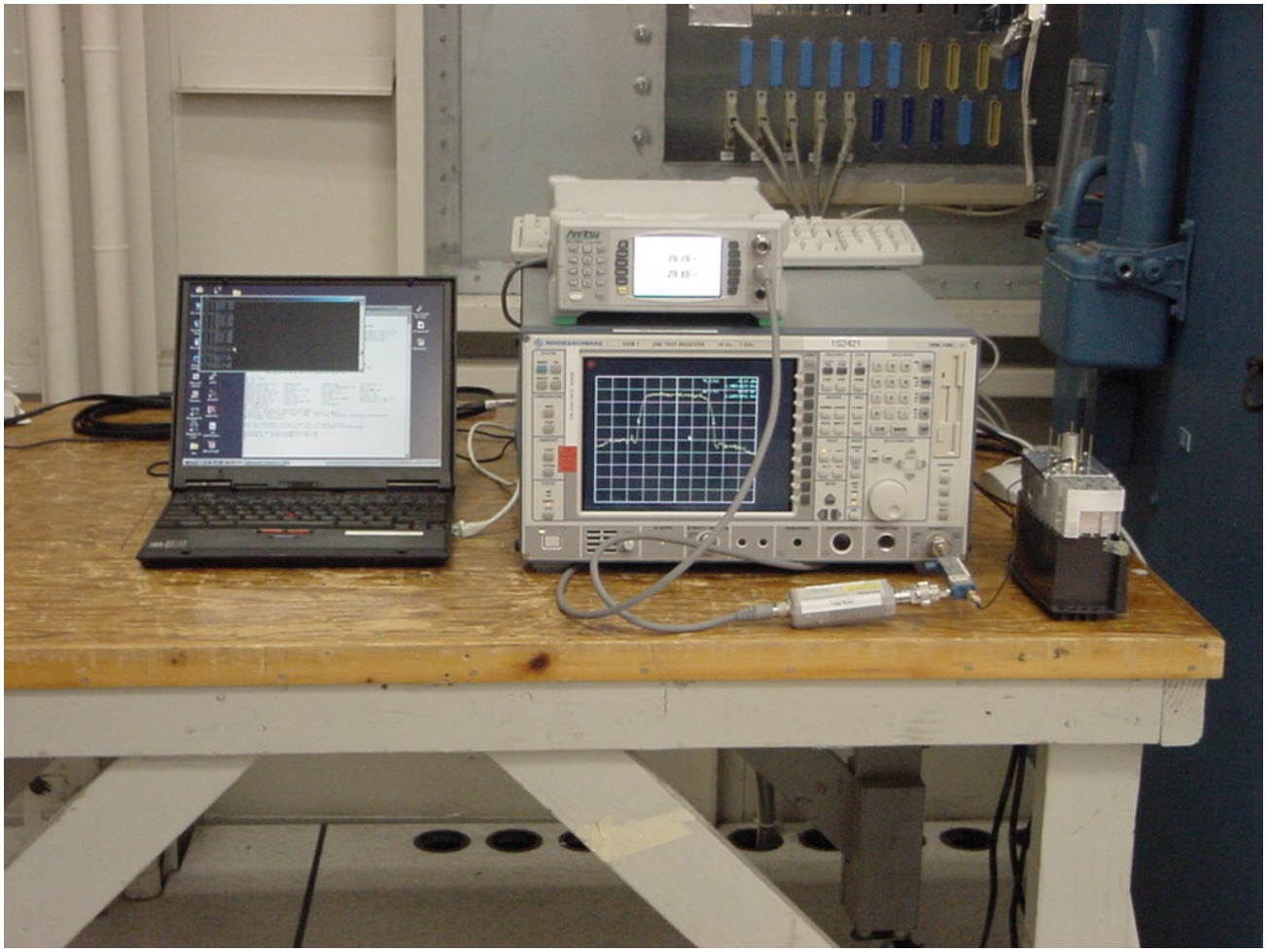


Plot 13. Spurious Emission 30 M – 10 GHz at high channel



Plot 14. Spurious Emission 10 – 20 GHz at high channel

Spurious Emissions at Antenna Terminals Test Setup



Photograph 3. Spurious Emissions at Antenna Terminals Test Setup

7. Electromagnetic Compatibility Radiated Emissions Requirements

7.1. Radiated Emissions (Substitution Method)

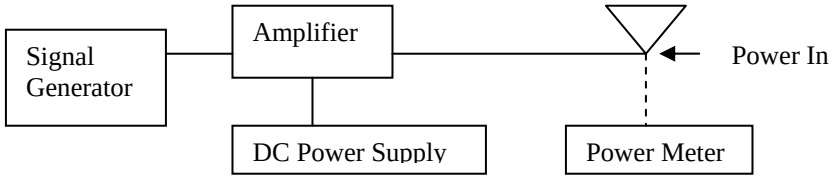
Test Requirement(s): **§2.1053 and §24.238(a)**

Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). The distance between the EUT and the test antenna is 3 meter – 1 meter. The EUT was set to transmit in the lowest of the operating frequency range. The EUT Peak output power was measured before radiated emissions were swept. To capture the full power spurious emissions, maximized each frequency by rotating the turntable to 360° and varying the test antenna from 1 to 4 meter height. Once the maximized emission is found, recorded the reading in a tabular format. These steps were repeated with horizontal polarization and for middle and highest channel.

Once all emissions are collected and recorded, replaced the EUT with a substitution antenna connected to a 1.5 meter 2.92 mm(K) cable and a signal generator. All test setup on the receiving side should be the same as it was when measuring the emissions of the EUT. Repeat all steps above except that the emissions will be compared with the signal generator's amplitude. Record reading in a tabular format.

Note: For fundamental power measurement, the EIRP was measured with Power Meter after all the steps above were made as shown below.



The Radiated Spurious Emissions *Limit* is obtained by the following:

Measured maximum Output Power of EUT: 0.9683 Watts (Peak)
Spur limit = Po - (43 + 10logPo); Po = 0.9683 watts or 29.86 dBm
29.86dBm - (43 + 10log 0.9683) = 29.86 dBm - (42.86dB) = -13 dBm

Test Results: Equipment complies with Section 2.1053 and 24.238(a). The following pages show measurements of emissions data sheet which is recorded in the following pages:

Test Engineer(s): Kerwinn Corpuz

Test Date(s): 07/19/2004

Radiated Emissions (Substitution Method) Test Results at Fundamental

Frequency	Polarization	Spectrum Analyzer	Power In	Tx Ant. Gain	EIRP	Limit	Margin
(MHz)	(V/H)	(dBuV/m)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)
1852.5	V	96.33	23.37	8.71	32.08	33	-0.92
1852.5	H	95.33	22.4	8.71	31.11	33	-1.89
1877.5	V	96.3	23.5	8.73	32.23	33	-0.77
1877.5	H	94.84	22	8.73	30.73	33	-2.27
1907.5	V	96.2	23.7	8.74	32.44	33	-0.56
1907.5	H	95	22	8.74	30.74	33	-2.26

NOTE: Power In was measured at the Transmit antenna port with Power Meter.
EIRP = Power In + Gain (dBi)
Margin = EIRP - Limit

Radiated Emissions (Substitution Method) Test Results for Spurious

For 1852.5 MHz, Low Channel

Frequency (MHz)	Polarization V/H or SNF	Spectrum Analyzer (dBuV/m)	Signal Generator (dBm)	Cable Loss (dB)	Tx Ant. Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
3705.0	SNF	-	-	-	-	-	-	-
5557.5	V	51.5	-52	1.89	10.8	-43.09	-13	-30.09
5557.5	H	48	-55	1.89	10.8	-46.09	-13	-33.09
7410.0	SNF	-	-	-	-	-	-	-
9262.5	SNF	-	-	-	-	-	-	-
11115.0	SNF	-	-	-	-	-	-	-
12967.5	SNF	-	-	-	-	-	-	-
14820.0	SNF	-	-	-	-	-	-	-
16672.5	SNF	-	-	-	-	-	-	-
18525.0	SNF	-	-	-	-	-	-	-

For 1877.5 MHz, Mid Channel

Frequency (MHz)	Polarization V/H or SNF	Spectrum Analyzer (dBuV/m)	Signal Generator (dBm)	Cable Loss (dB)	Tx Ant. Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
3755.0	SNF	-	-	-	-	-	-	-
5632.5	SNF	-	-	-	-	-	-	-
7510.0	SNF	-	-	-	-	-	-	-
9387.5	SNF	-	-	-	-	-	-	-
11265.0	V	48.5	-47	3.06	12.3	-37.76	-13	-24.76
11265.0	SNF for H	-	-	-	-	-	-	-
13142.5	SNF	-	-	-	-	-	-	-
15020.0	SNF	-	-	-	-	-	-	-
16897.5	SNF	-	-	-	-	-	-	-
18775.0	SNF	-	-	-	-	-	-	-

Notes:
SNF = Spectrum Analyzer Noise Floor (worse case vertical); H=horizontal and V=vertical
EIRP = SG reading - CL + Gain (dBi)
Margin = EIRP - Limit

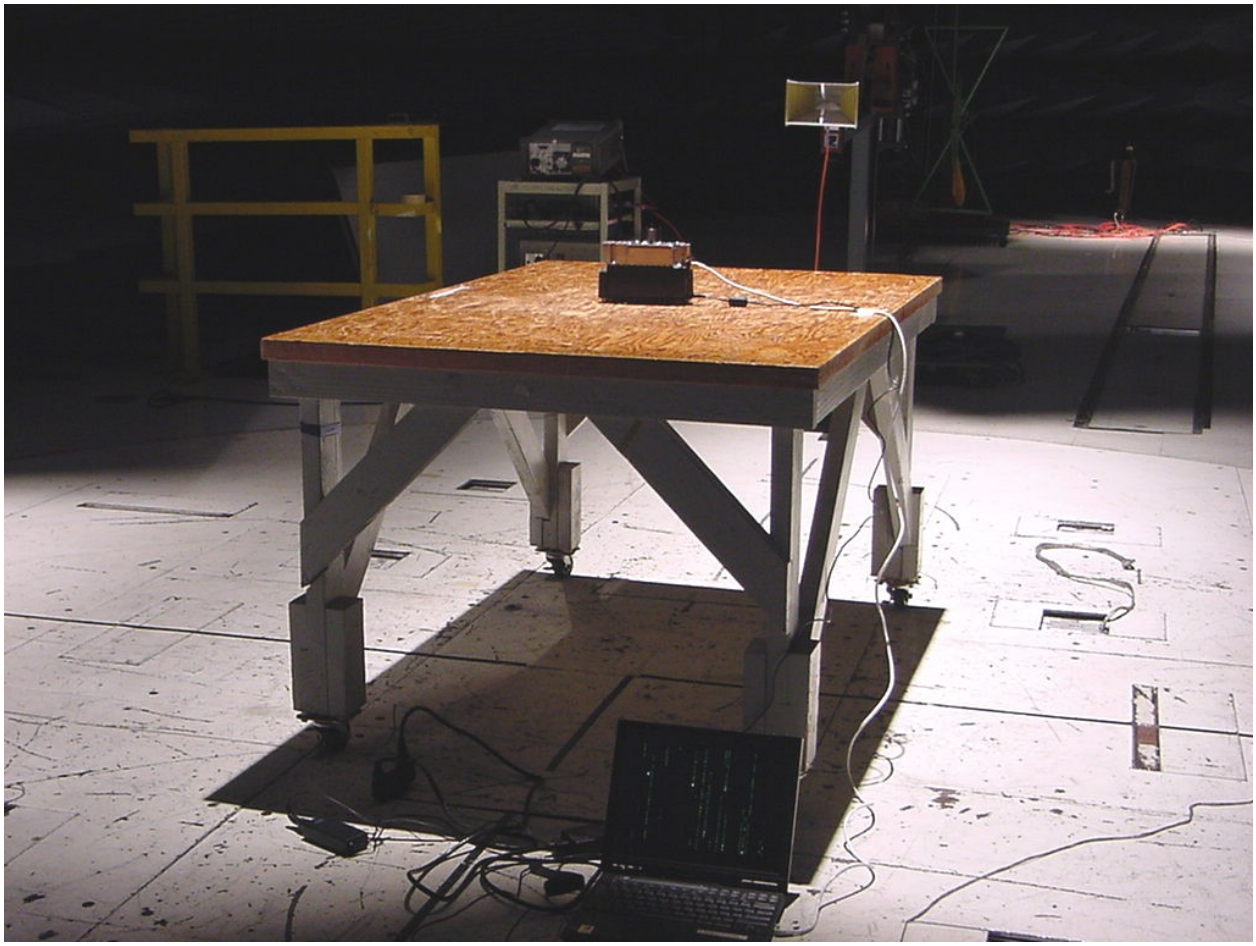
Radiated Emissions (Substitution Method) Test Results for Spurious

For 1907.5 MHz, High Channel

Frequency (MHz)	Polarization V/H or SNF	Spectrum Analyzer (dBuV/m)	Signal Generator (dBm)	Cable Loss (dB)	Tx Ant. Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
3815.0	SNF	-	-	-	-	-	-	-
5722.5	SNF	-	-	-	-	-	-	-
7630.0	SNF	-	-	-	-	-	-	-
9537.5	SNF	-	-	-	-	-	-	-
11445.0	V	50.5	-44	3.12	12	-35.12	-13	-22.12
11445.0	SNF for H	-	-	-	-	-	-	-
13352.5	SNF	-	-	-	-	-	-	-
15260.0	SNF	-	-	-	-	-	-	-
17167.5	SNF	-	-	-	-	-	-	-
19075.0	SNF	-	-	-	-	-	-	-

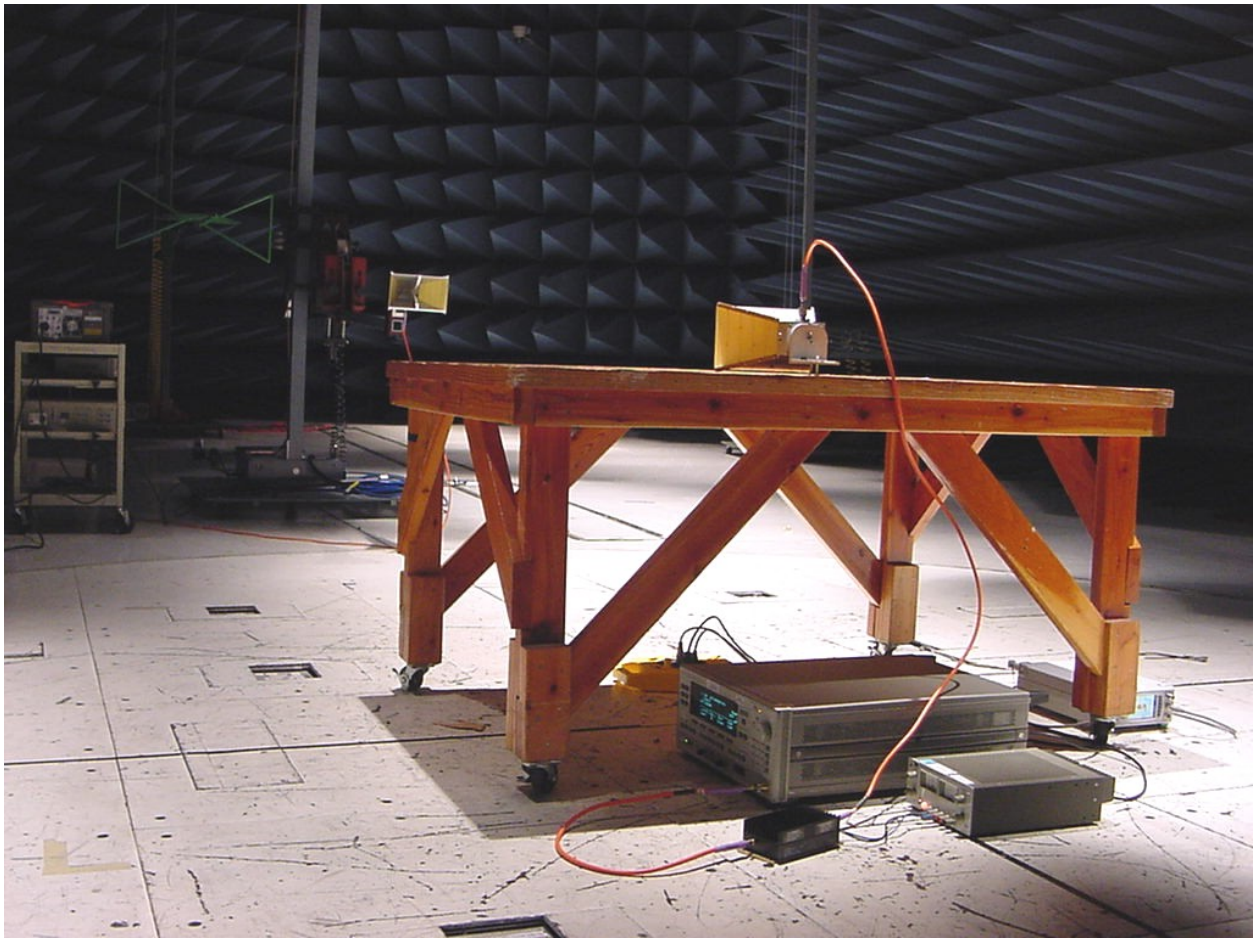
Notes:
SNF = Spectrum Analyzer Noise Floor (worse case vertical); H=horizontal and V=vertical
EIRP = SG reading - CL + Gain (dBi)
Margin = EIRP - Limit

Radiated Emissions Spurious Test Setup



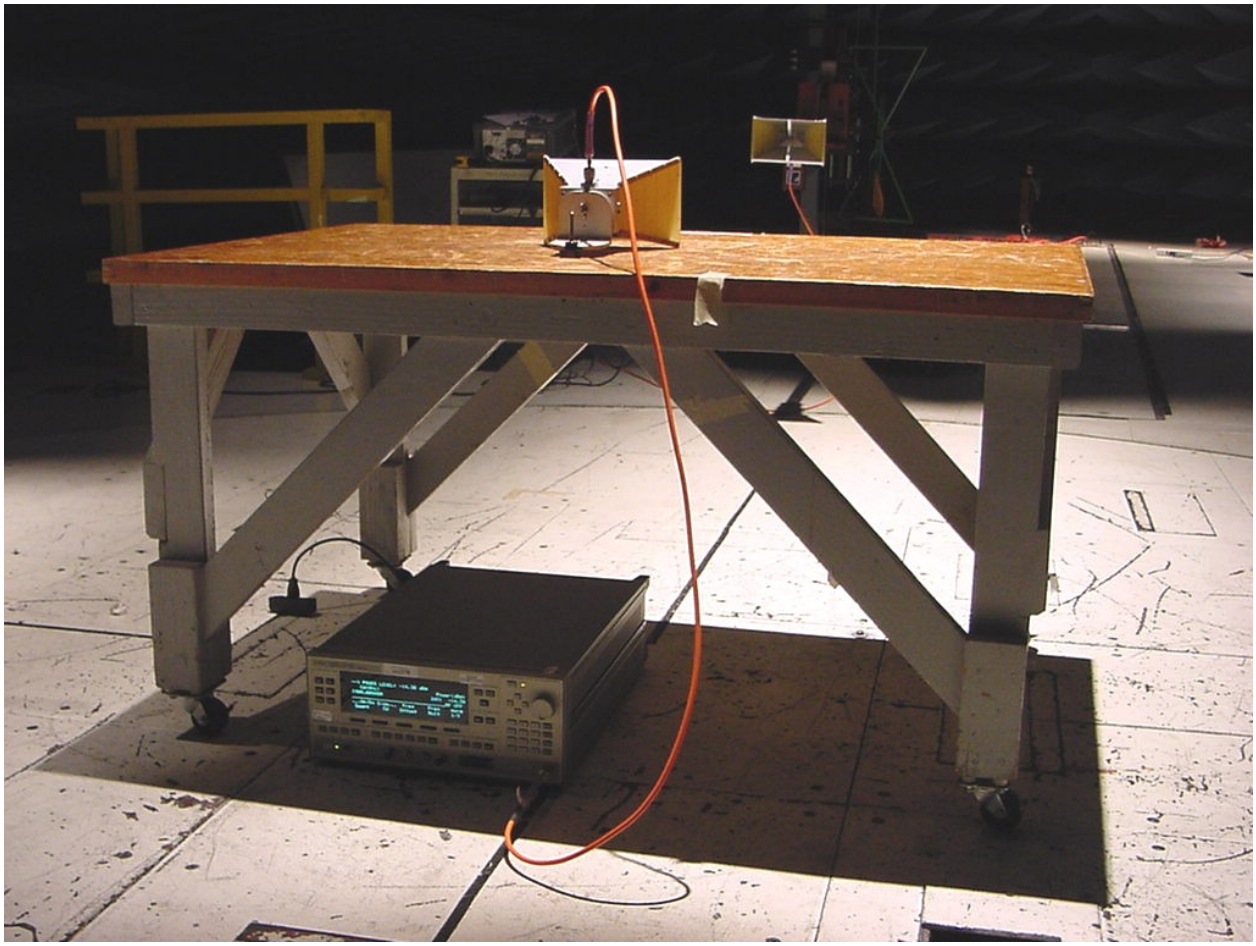
Photograph 4. Radiated Emission Spurious Test Setup

Radiated Emissions (Substitution Method) Test Setup



Photograph 5. Radiated Emission (Substitution Method for Fundamental) Test Setup

Radiated Emissions (Substitution Method) Test Setup



Photograph 6. Radiated Emission (Substitution Method for Spurious) Test Setup

8. Electromagnetic Compatibility Frequency Stability Requirements

8.1. Frequency Stability

Test Requirement(s): **§2.1055 and §24.235**

Test Procedures: As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

The EUT was placed in the Temperature Chamber and support equipments are outside the chamber on a table. Set RBW = VBW = 100 Hz to Spectrum Analyzer. BW was set to 100 Hz to show the frequency values in hertz from the Spectrum Analyzer. The EUT was set to a CW signal and to transmit in the low channel of the operating frequency range. Before setting the CW signal, adjusted enough to produce maximum output power as specified in the owner's manual. Frequency drift was investigated for every 10°C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30° to 50°C.

Voltage supplied to EUT is 120 Vac. Reference temperature was done at 20°C.

Limit calculation: Channel 1 center frequency is set to 1852.5 MHz (modulated) and 26 dB BW measured 4.7 MHz (50% is 2.35 MHz). Therefore, frequency drift can not be greater than 150 kHz at lower and upper band.

Test Results: Equipment complies with Section 2.1053 and 24.235; EUT does not exceed the 150 kHz calculated limit. The following pages show measurements of frequency drift data sheet which is recorded below:

Test Engineer(s): Kerwinn Corpuz

Test Date(s): 08/10/2004

Frequency Stability Test Results

Reference Freq.: 1.852740867 GHz (Low Channel) at 20°C

Temperature (Celsius)	Measured Freq (MHz)	Drift (Hz)
50	1.852741042	175
40	1.852740983	116
30	1.852740925	58
20	Reference	
10	1.852740917	50
0	1.852740958	91
-10	1.852741283	416
-20	1.852741717	850
-30	1.852741200	333

Table 4. Temperature Vs. Frequency Test Results

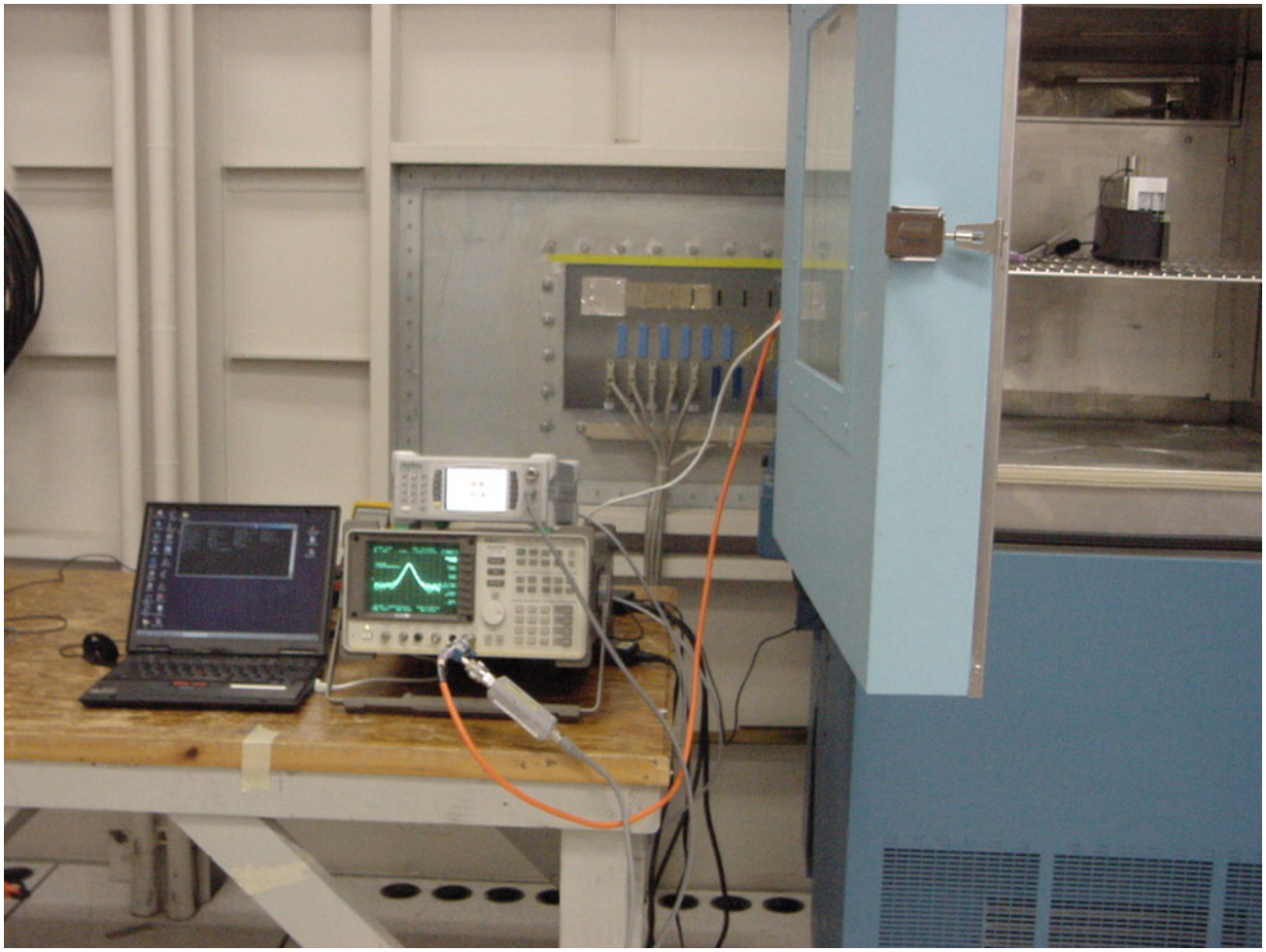
Note: According to Manual spec., tested EUT at maximum output power from 0 degrees celsius to 40 degrees celsius. Outside the temperature parameter, reduced output power to 20 dBm.

Reference: 120 Vac at 20°Celsius **Freq.** = 1.852740917 GHz at 29.86 dBm (Peak)

Measured Voltage(dc) +/-15% of nominal	Measured Freq (GHz)	Drift (Hz)
138	1.852740917	0
102	1.852740892	-25

Table 5. Frequency Vs. Voltage

Frequency Stability Test Setup



Photograph 7. Frequency Stability Test Setup

9. Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

Test Name: RF Power Output					**Test Date(s): 8/17/04**
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2430	WCDMA Sensor	Anritsu Company	ML2488A	05/24/2004	05/24/2005
1S2432	WCDMA Power Monitor Sensor	Anritsu Company	MA2491A	01/14/2004	01/14/2005
1S2293	Analyzer, Spectrum, 9 kHz – 40 GHz	Hewlett Packard	8564E	09/09/2003	09/09/2004
1S2421	EMI Test Receiver	Rhode & Schwarz	ES1B 7	02/04/2004	02/04/2005
N/A	20 dB Attenuator	Hewlett Packard	8491A	See Note	
1S2034	Coupler, Directional 1-20 GHz	KRYTAR	101020020	See Note	
Client	Laptop	IBM	Type 2644	N/A	
Test Name: Occupied Bandwidth, Band-Edge Channel Power & Spurious at Antenna					**Test Date(s): 7/17/04**
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2430	WCDMA Sensor	Anritsu Company	ML2488A	05/24/2004	05/24/2005
1S2432	WCDMA Power Monitor Sensor	Anritsu Company	MA2491A	01/14/2004	01/14/2005
1S2293	Analyzer, Spectrum 9 kHz-40GHz	Hewlett Packard	8564E	09/09/2003	09/09/2004
1S2421	EMI Test Receiver	Rhode & Schwarz	ES1B 7	02/04/2004	02/04/2005
N/A	20 dB Attenuator	Hewlett Packard	8491A	See Note	
1S2041	Coupler, Bi Directional Coaxial	NARDA	N/A	See Note	
1S2034	Coupler, Directional 1-20 GHz	KRYTAR	101020020	See Note	
Client	Laptop	IBM	Type 2644	N/A	
Test Name: Radiation Emission (Substitution Method)					**Test Date(s): 08/17/2004**
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2263	Chamber, 10 Meter	Rantec	N2-14	07/25/2003	07/25/2004
1S2293	Analyzer, Spectrum 9 kHz-40GHz	Hewlett Packard	8564E	09/09/2003	09/09/2004
1S2278	Generator, Swept Signal	Hewlett Packard	83650B	06/04/2004	06/04/2005
1U7	Antenna, Horn	EMCO	3115	02/17/2004	02/17/2005
1S2198	Antenna, Horn	EMCO	3115	06/22/2004	06/22/2005
1S2202	Antenna, Horn, 1 Meter	EMCO	3116	03/23/2004	03/23/2005
1S2203	Antenna, Horn	EMCO	3116	See Note	
1S2121	Pre-Amplifier	Hewlett Packard	8449B	10/08/2003	10/08/2004
N/A	4 GHz High Pass Filter	Micro-Tronics	HPM13147	See Note	
1S2432	Power Sensor	Anritsu	MA2491A	01/14/2004	01/14/2005
N/A	Power Meter	Anritsu	ML2488A	05/24/2004	05/24/2005
1S2001	Amplifier	Mini Circuits	ZHL-4240W-SMA	See Note	
N/A	15 Vdc Power Supply	Hewlett Packard	6236B	See Note	
N/A	10 dB Attenuator	MCL	BW-S10W2	See Note	

Test Name: Frequency Stability					Test Date(s): 8/18/04
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
N/A	Laptop	IBM	Type 2644	Not Applicable	
1S2293	Analyzer, Spectrum 9 kHz-40GHz	Hewlett Packard	8564E	09/09/2003	09/09/2004
1S2430	WCDMA Sensor	Anritsu Company	ML2488A	05/24/2004	05/24/2005
1S2432	WCDMA Power Monitor Sensor	Anritsu Company	MA2491A	01/14/2004	01/14/2005
1S2034	Coupler, Directional 1-20 GHz	KRYTAR	101020020	See Note	
1S2066	Transformer, Variable	STACO	3PN2210	See Note	
1S2100	Multimeter, Digital	Fluke	77	09/26/2003	09/26/2004

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

10. Certification Label & User's Manual Information

10.1. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart E — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer,* be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant, whichever is applicable.

§ 2.902 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

10.2. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 24, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional 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.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.
– Increase the separation between the equipment and receiver.
– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
– Consult the dealer or an experienced radio/TV technician for help.

