



**FCC CFR47 PART 15 SUBPART F  
CERTIFICATION TEST REPORT**

**FOR**

**UWB REFERENCE DESIGN MODULE**

**MODEL NUMBER: WINDEO**

**FCC ID: D87-WINDEO**

**REPORT NUMBER: 08U11804-1**

**ISSUE DATE: JULY 25, 2008**

*PREPARED FOR*  
**SIGMA DESIGNS**  
**1778 MC CARTHY BLVD**  
**MILPITAS, CA 95054**

*PREPARED BY*  
**COMPLIANCE CERTIFICATION SERVICES**  
**47173 BENICIA STREET**  
**FREMONT, CA 94538, U.S.A.**  
**TEL: (510) 771-1000**  
**FAX: (510) 661-0888**



**NVLAP LAB CODE 200065-0**

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	7/25/2008	Initial Issue	M. Heckrotte

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS</b> .....	<b>4</b>
<b>2. TEST METHODOLOGY</b> .....	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION</b> .....	<b>5</b>
<b>4. CALIBRATION AND UNCERTAINTY</b> .....	<b>5</b>
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i> .....	5
4.2. <i>MEASUREMENT UNCERTAINTY</i> .....	5
<b>5. EQUIPMENT UNDER TEST</b> .....	<b>6</b>
5.1. <i>DESCRIPTION OF EUT</i> .....	6
5.2. <i>OPERATING FREQUENCY RANGE</i> .....	6
5.3. <i>MAXIMUM OUTPUT POWER</i> .....	6
5.4. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i> .....	6
5.5. <i>SOFTWARE AND FIRMWARE</i> .....	6
5.6. <i>OPERATING MODE</i> .....	6
5.7. <i>WORST-CASE CONFIGURATION</i> .....	7
5.8. <i>DESCRIPTION OF TEST SETUP</i> .....	7
<b>6. TEST AND MEASUREMENT EQUIPMENT</b> .....	<b>9</b>
<b>7. LIMITS AND RESULTS</b> .....	<b>10</b>
7.1. <i>UWB BANDWIDTH, CENTER FREQUENCY, AND FRACTIONAL BANDWIDTH</i> .....	10
7.2. <i>PEAK POWER</i> .....	17
7.3. <i>RADIATED EMISSIONS ABOVE 960 MHz</i> .....	19
7.3.1. <i>F MAX</i> .....	20
7.3.2. <i>LOW CHANNEL EMISSIONS</i> .....	21
7.3.3. <i>MID CHANNEL EMISSIONS</i> .....	43
7.3.4. <i>HIGH CHANNEL EMISSIONS</i> .....	65
7.4. <i>RADIATED EMISSIONS BELOW 960 MHz</i> .....	87
7.4.1. <i>LOW CHANNEL EMISSIONS</i> .....	87
7.4.2. <i>MID CHANNEL EMISSIONS</i> .....	91
7.4.3. <i>HIGH CHANNEL EMISSIONS</i> .....	95
7.5. <i>AC POWER LINE CONDUCTED EMISSIONS</i> .....	99
<b>8. SETUP PHOTOS</b> .....	<b>102</b>

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SIGMA DESIGNS  
1778 McCARTHY BLVD  
MILPITAS, CA 95054

**EUT DESCRIPTION:** UWB REFERENCE DESIGN MODULE

**MODEL:** WINDEO

**SERIAL NUMBER:** PE706

**DATE TESTED:** JUNE 12 TO JULY 24, 2008

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart F	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



---

MICHAEL HECKROTTE  
DIRECTOR OF ENGINEERING  
COMPLIANCE CERTIFICATION SERVICES

---

THANH NGUYEN  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a UWB module in a Mini PCI card form factor intended for hand-held use.

### 5.2. OPERATING FREQUENCY RANGE

The UWB radio operates over a nominal frequency range of 3100 to 4800 MHz. The measured UWB bandwidths of all three channels lie within this range.

### 5.3. MAXIMUM OUTPUT POWER

The UWB transmitter has a maximum radiated output power as follows:

RMS Output Power (dBm/MHz EIRP)	RMS Output Power (uW/MHz EIRP)
-42.16	0.061

### 5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT utilizes a PCB Omnidirectional antenna, with a maximum gain of 0 dBi over the 3100 to 4800 MHz frequency range of the UWB radio. The antenna is integral to end products.

### 5.5. SOFTWARE AND FIRMWARE

The software, driver, firmware, and tools package installed in the EUT during testing was WINDEO\_TELEC 4488-0001.

### 5.6. OPERATING MODE

The EUT was tested in its non-hopping mode.

## 5.7. WORST-CASE CONFIGURATION

### CONFIGURATIONS TESTED

Preliminary tests were performed on both unshielded and shielded versions of the radio module. Final test results documented in this report are representative of the performance of the shielded version.

### MANUFACTURER'S ATTESTATION THAT ONLY SHIELDED VERSIONS OF THE RADIO MODULE WILL BE PLACED ON THE MARKET

This statement is in a separate document.

## 5.8. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	Inspiron 640	DMG532-70166-67H-0	DoC
AC/DC Adapter	Dell	PA -1600-06D	71615-492-09B9	N/A

### I/O CABLES

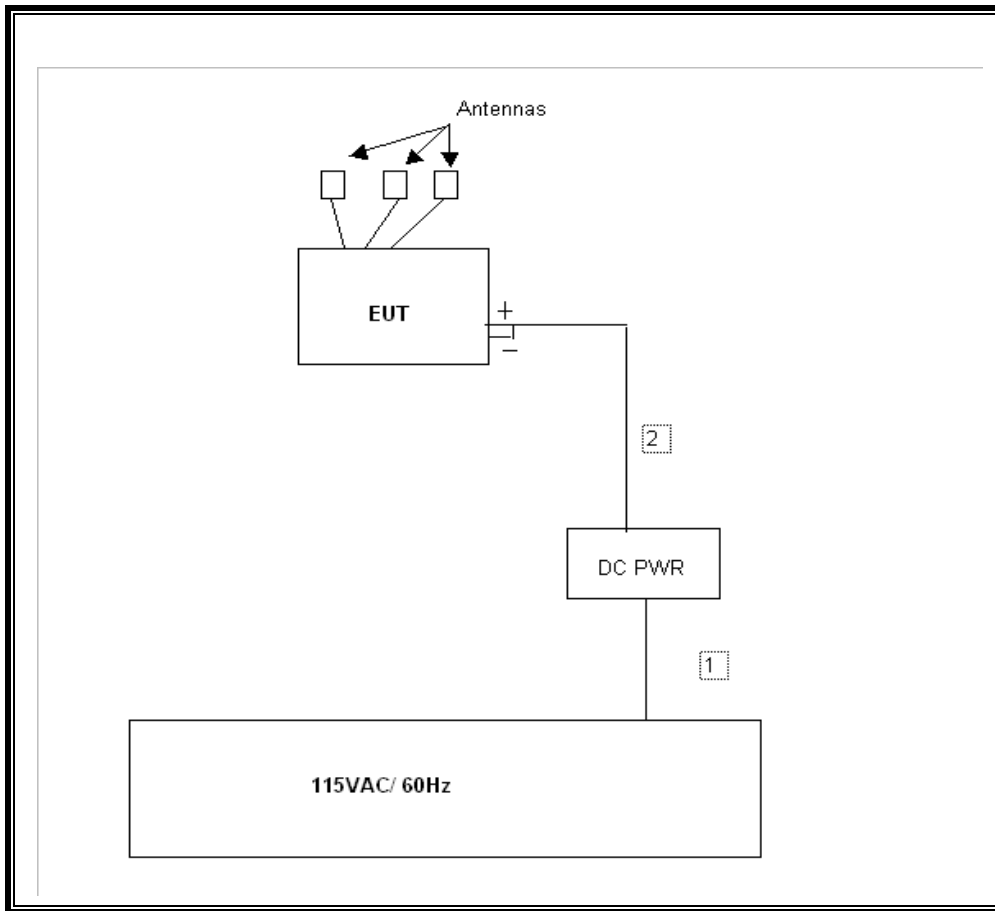
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	1.5m	HP DC PWR supply
2	DC	1	DC clip	Un-shielded	1.5m	N/A

The HEWLETT PACKARD DC power supply E3610, Serial Number KR24104150 was used to input 5VDC to the EUT.

### TEST SETUP

The EUT is connected to a control computer by serial port. Test software exercised the radio card. During the tests the support laptop was removed out of the EMI chamber.

**SETUP DIAGRAM FOR TESTS**





## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A0022704	9/28/2008
Antenna, Microwave Horn	ARA	AT4002A	322899	12/20/2007
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/15/2008
Antenna, Horn 18 ~ 26 GHz	ARA	SWH-28	1007	9/26/2008
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	4/11/2008
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	5/9/2008
Preamplifier, 1 ~ 2 GHz	Miteq	AFS3-01000200	1199462	8/14/2008
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00931	8/14/2008
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	8/14/2008
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	6/12/2008
RF Filter Section	Agilent / HP	85420E	3705A00256	6/12/2008
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42510266	10/26/2008
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	9/15/2008
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	9/15/2008
EMI Test Receiver	R & S	ESHS 20	827129/006	1/27/2008

## 7. LIMITS AND RESULTS

### 7.1. UWB BANDWIDTH, CENTER FREQUENCY, AND FRACTIONAL BANDWIDTH

#### DEFINITIONS AND LIMITS

§15.503 Definitions.

(a) UWB Bandwidth. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated  $f_H$  and the lower boundary is designated  $f_L$ . The frequency at which the highest radiated emission occurs is designated  $f_M$ .

(b) Center frequency. The center frequency,  $f_C$ , equals  $(f_H + f_L)/2$ .

(c) Fractional bandwidth. The fractional bandwidth equals  $2(f_H - f_L)/(f_H + f_L)$ .

(d) Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

§15.519 (b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

#### TEST PROCEDURE

Radiated measurements are made using the procedures described above. The detection mode is set to peak detection, the sweep time is AUTO, and the Max Hold trace function is utilized. The frequency range from 3.1 to 10.6 GHz is measured, and corrected from raw values to Peak EIRP.

The frequency at which the maximum EIRP is measured is designated as  $f_M$ . A major graticule line of the plot is adjusted to exactly equal the peak EIRP at  $f_M$ . The spectral envelope at the major graticule line that is 10 dB below the reference graticule is examined to determine the frequency band bounded by the points that are 10 dB below the highest radiated emission. The upper boundary is designated  $f_H$  and the lower boundary is designated  $f_L$ .

The center frequency,  $f_C$ , is calculated as  $(f_H + f_L)/2$ .

The antenna polarization that yields the highest EIRP at  $f_M$  is used to calculate the above parameters.

Calculations are made independently for each of the three channels.

**LOW CHANNEL RESULTS (VERTICAL POLARIZATION)**

<b>f Max (GHz)</b>	<b>Reference EIRP at f Max (dBm)</b>	<b>10 dB down from Reference EIRP (dBm)</b>
3.520	-28.0	-38.0

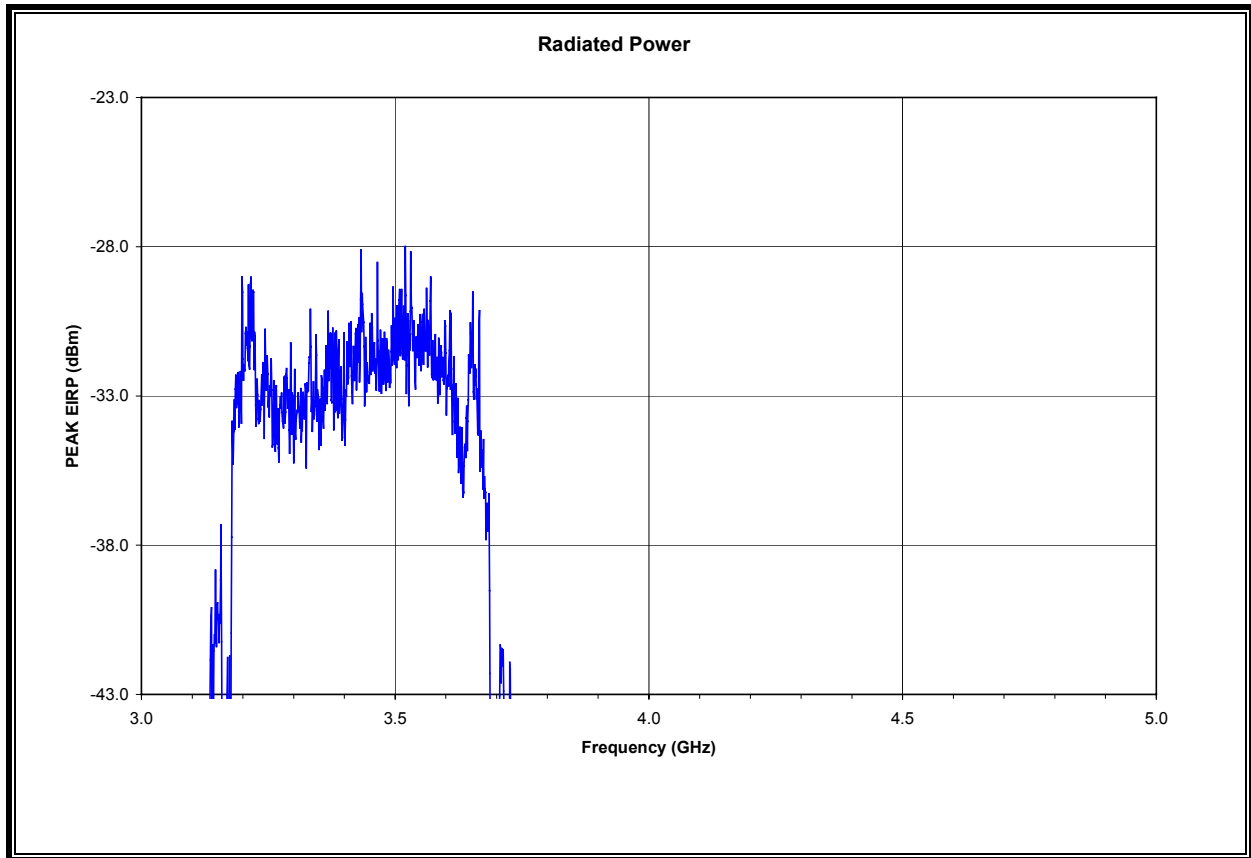
<b>f Low (GHz)</b>	<b>Minimum f Low (GHz)</b>
3.157	3.1

<b>f High (GHz)</b>	<b>Maximum f High (GHz)</b>
3.686	10.6

<b>f Center (GHz)</b>
3.422

<b>UWB BW (GHz)</b>	<b>Minimum UWB BW (GHz)</b>
0.529	0.500

**PLOT OF PEAK EIRP WITH REFERENCE GRATICULE ADJUSTED FOR LOW CHANNEL F MAX**



**MID CHANNEL RESULTS (VERTICAL POLARIZATION)**

<b>f Max (GHz)</b>	<b>Reference EIRP at f Max (dBm)</b>	<b>10 dB down from Reference EIRP (dBm)</b>
4.059	-28.2	-38.2

<b>f Low (GHz)</b>	<b>Minimum f Low (GHz)</b>
3.713	3.1

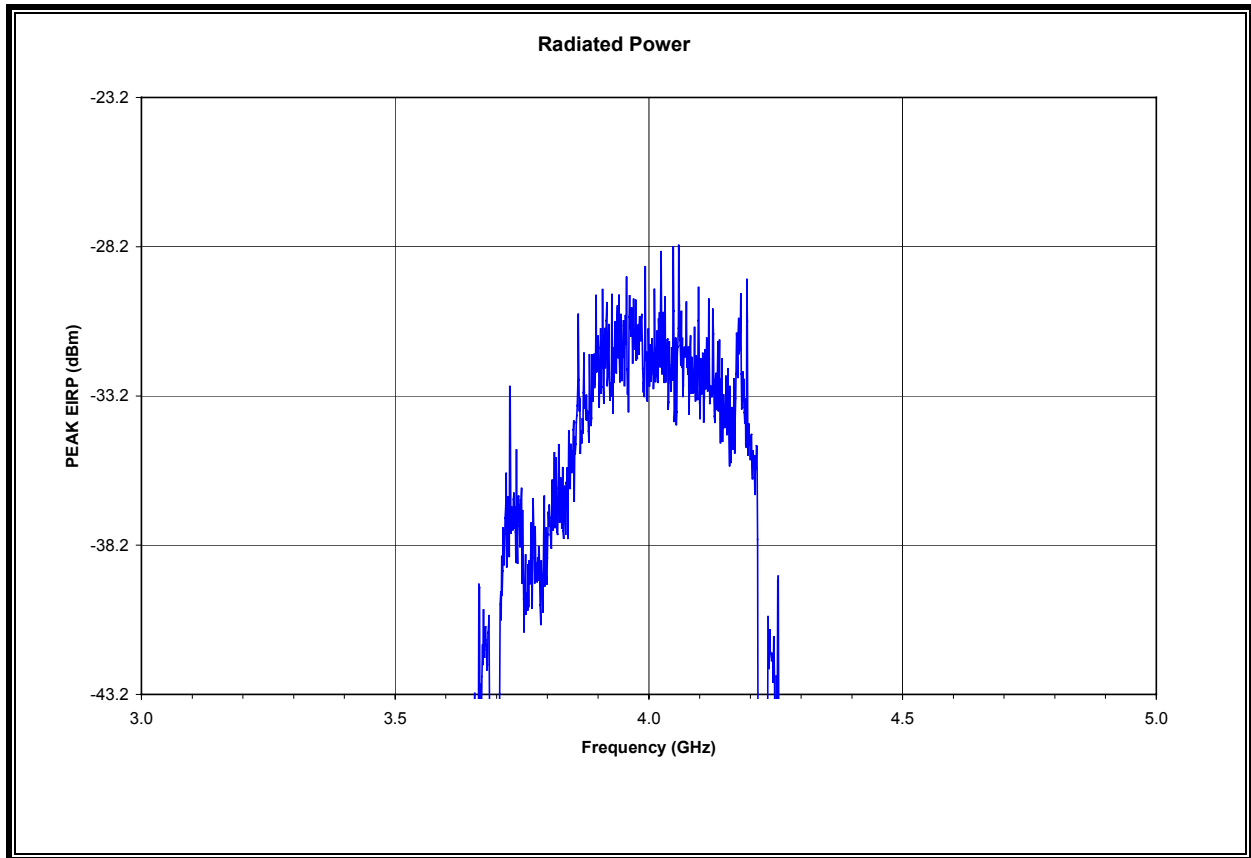
<b>f High (GHz)</b>	<b>Maximum f High (GHz)</b>
4.214	10.6

<b>f Center (GHz)</b>
3.964

<b>UWB BW (GHz)</b>	<b>Minimum UWB BW (GHz)</b>
0.501	0.500

<b>Fractional BW</b>	<b>Minimum Fractional BW</b>
0.126	0.20

**PLOT OF PEAK EIRP WITH REFERENCE GRATICULE ADJUSTED FOR MID CHANNEL F MAX**



**HIGH CHANNEL RESULTS (VERTICAL POLARIZATION)**

<b>f Max (GHz)</b>	<b>Reference EIRP at f Max (dBm)</b>	<b>10 dB down from Reference EIRP (dBm)</b>
4.255	32.4	22.4

<b>f Low (GHz)</b>	<b>Minimum f Low (GHz)</b>
4.193	3.1

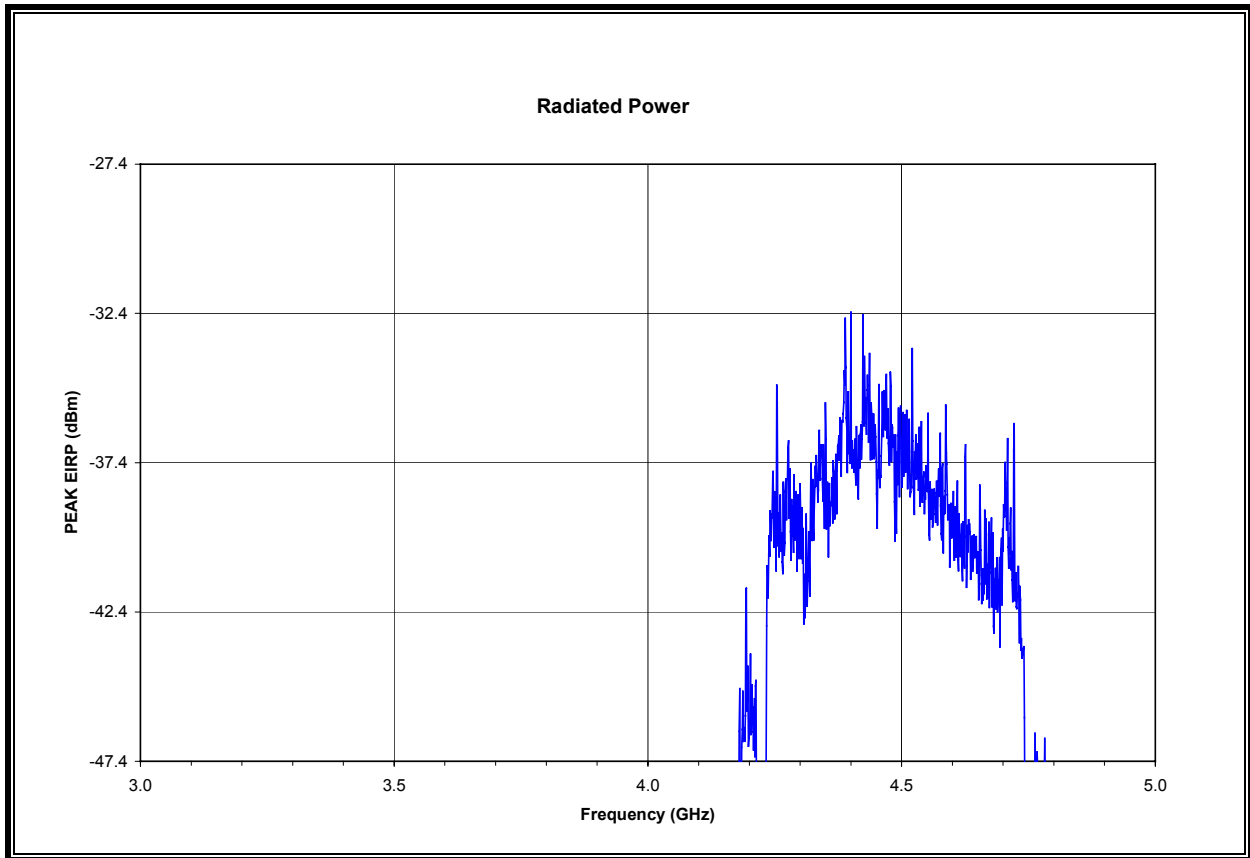
<b>f High (GHz)</b>	<b>Maximum f High (GHz)</b>
4.727	10.6

<b>f Center (GHz)</b>
4.460

<b>UWB BW (GHz)</b>	<b>Minimum UWB BW (GHz)</b>
0.534	0.500

<b>Fractional BW</b>	<b>Minimum Fractional BW</b>
0.120	0.20

**PLOT OF PEAK EIRP WITH REFERENCE GRATICULE ADJUSTED FOR HIGH CHANNEL F MAX**





## 7.2. PEAK POWER

### LIMIT

§15.519 (e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs,  $f_M$ . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

§15.521 (g) When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs,  $f_M$ . If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be  $20 \log(\text{RBW}/50)$  dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using  $E(\text{dBuV/m}) = P(\text{dBm EIRP}) + 95.2$ . If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

§15.521 (e) The frequency at which the highest radiated emission occurs,  $f_M$ , must be contained within the UWB bandwidth.

### TEST PROCEDURE

Radiated measurements are made using the procedures described above.

The spectrum analyzer center frequency is set to  $f_M$ . The frequency span is set to 50 MHz. The RBW and VBW are both set to 8 MHz. The detector function is set to peak.

The test procedure and the calibration of the test setup are both identical to that for which a 1 or 3 MHz RBW is specified. The instrumentation is an Agilent PSA series spectrum analyzer, model E4446A, which includes a standard RBW of 8 MHz.

**RESULTS**

RBW =	8	Limit =	-15.92	Distance =	1.0
-------	---	---------	--------	------------	-----

Low Channel					
f Max (GHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable (dB)	Preamp (dB)	Distance Factor (dB)
3.52	79.42	31.12	11.31	-35.00	-9.54
	Field Strength at 3 meters (dBuV/m)	EIRP Conversion Factor	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
	77.31	-95.20	-17.89	-15.92	-1.97

Mid Channel					
f Max (GHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable (dB)	Preamp (dB)	Distance Factor (dB)
4.059	77.78	32.26	11.58	-34.56	-9.54
	Field Strength at 3 meters (dBuV/m)	EIRP Conversion Factor	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
	77.51	-95.20	-17.69	-15.92	-1.77

High Channel					
f Max (GHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable (dB)	Preamp (dB)	Distance Factor (dB)
4.4	69.25	32.61	11.82	-34.71	-9.54
	Field Strength at 3 meters (dBuV/m)	EIRP Conversion Factor	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
	69.42	-95.20	-25.78	-15.92	-9.86

### 7.3. RADIATED EMISSIONS ABOVE 960 MHz

#### LIMITS

§15.519 (c) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	- 75.3
1610–1990	- 63.3
1990–3100	- 61.3
3100–10600	- 41.3
Above 10600	- 61.3

§15.519 (d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	- 85.3
1559–1610	- 85.3

§15.521 (d) Within the tables in §§15.509, 15.511, 15.513, 15.515, 15.517, and 15.519, the tighter emission limit applies at the band edges. Radiated emission levels above 960 MHz are based on RMS average measurements over a 1 MHz resolution bandwidth. The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time.

§15.521 (e) The frequency at which the highest radiated emission occurs,  $f_M$ , must be contained within the UWB bandwidth.

#### TEST PROCEDURE

Radiated measurements are made using the procedures described above. The number of points on the horizontal axis of the spectrum analyzer is set to (frequency span in MHz + 1) and the sweep time is set to (frequency span in MHz) milliseconds, the RBW is set to 1 MHz and the detector function is set to RMS average.

For the requirements of §15.519 (d), an RBW of 10 kHz is utilized.

### 7.3.1. F MAX

#### RESULTS

The highest radiated emission at  $f_M$  is as follows:

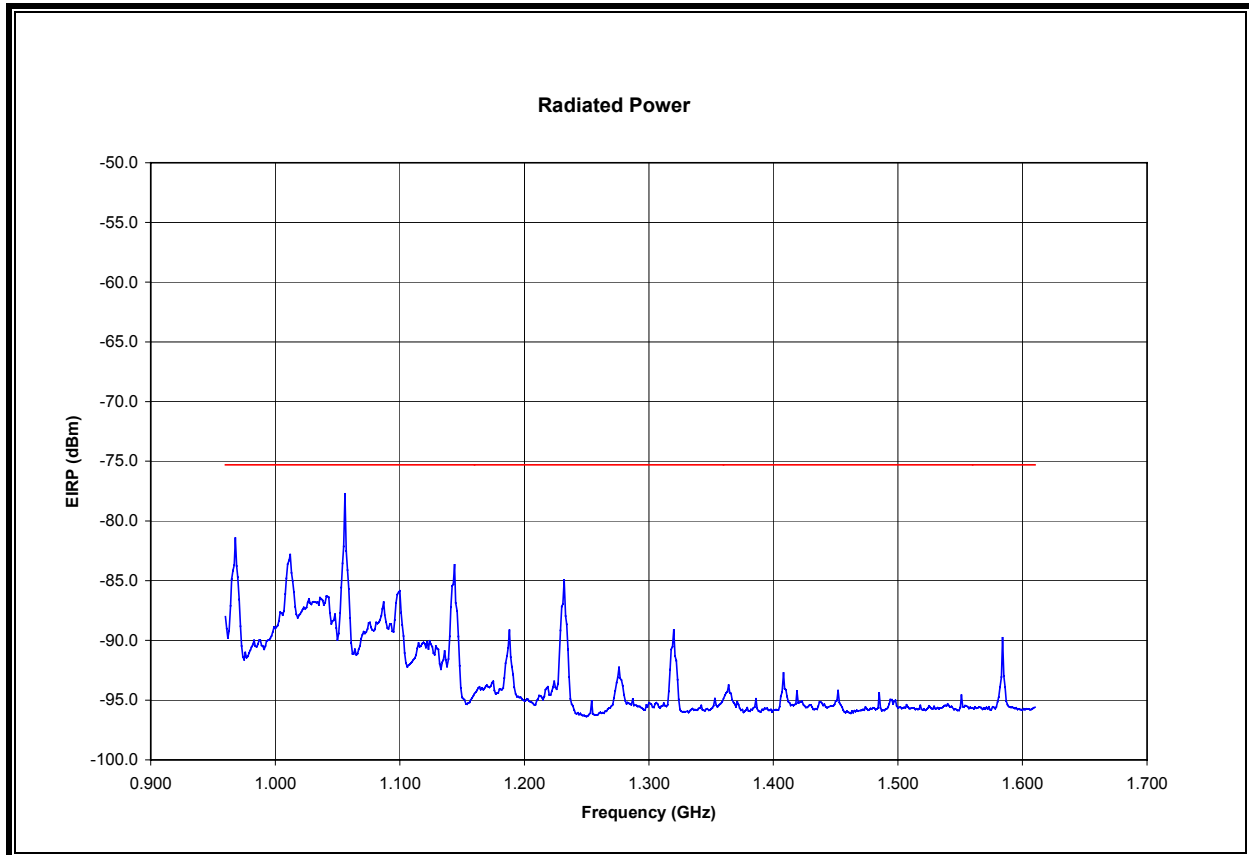
Polarization =	Vertical	Distance =	1.0
----------------	----------	------------	-----

f Max (GHz)	Reading (dBuV)	Antenna Factor (dB/m)	Cable (dB)	Preamp (dB)	Distance Factor (dB)
3.993	53.41	32.18	11.54	-34.55	-9.54

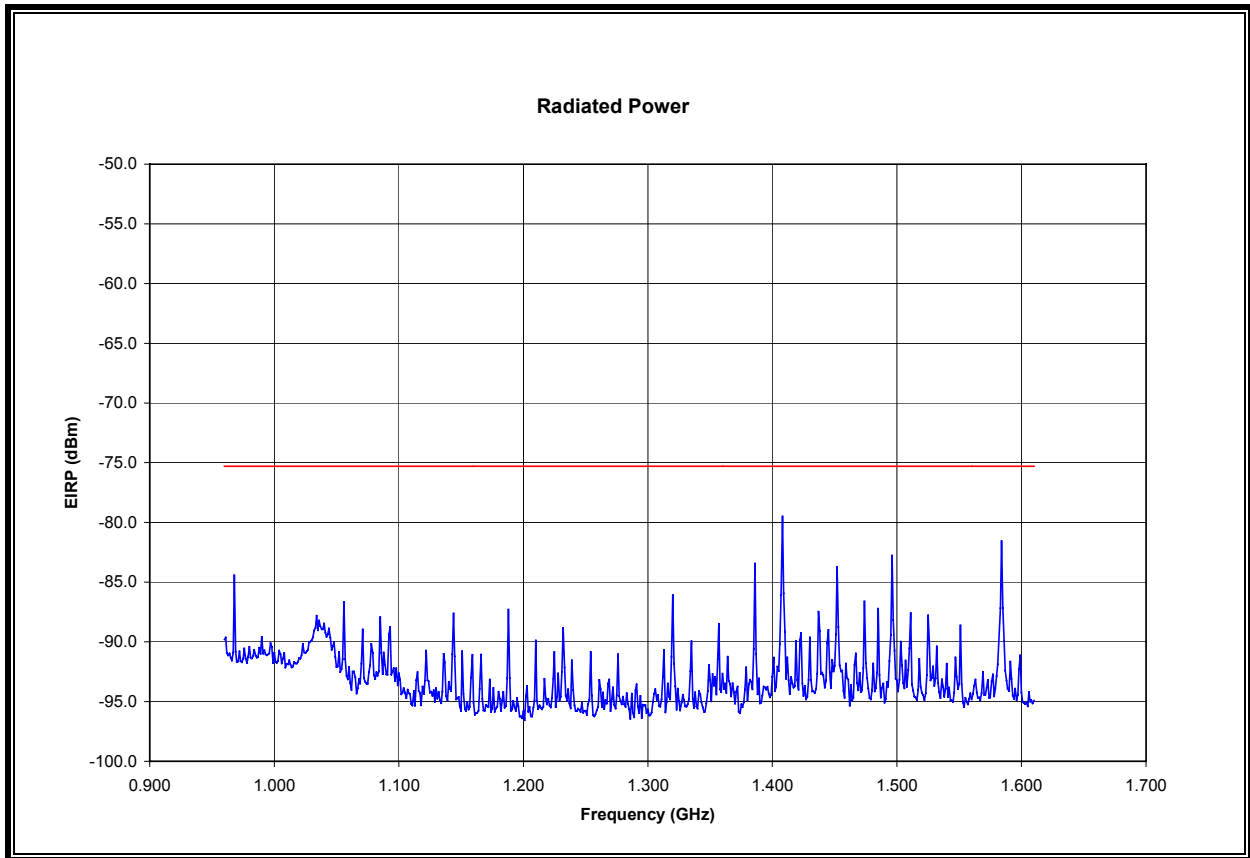
Field Strength at 3 meters (dBuV/m)	EIRP Conversion Factor	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
53.04	-95.20	-42.16	-41.30	-0.86

### 7.3.2. LOW CHANNEL EMISSIONS

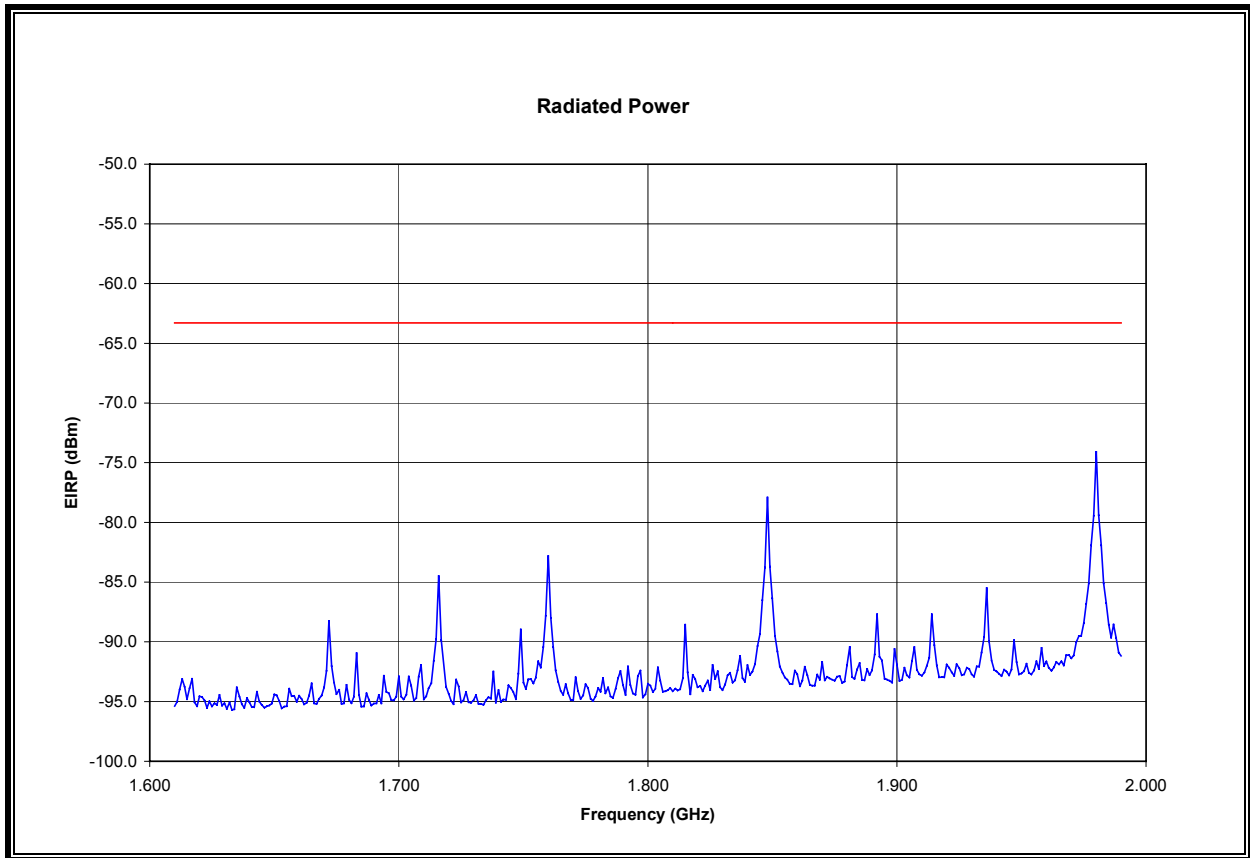
#### EIRP 0.960 TO 1.610 GHz, 1 MHz BW, HORIZONTAL



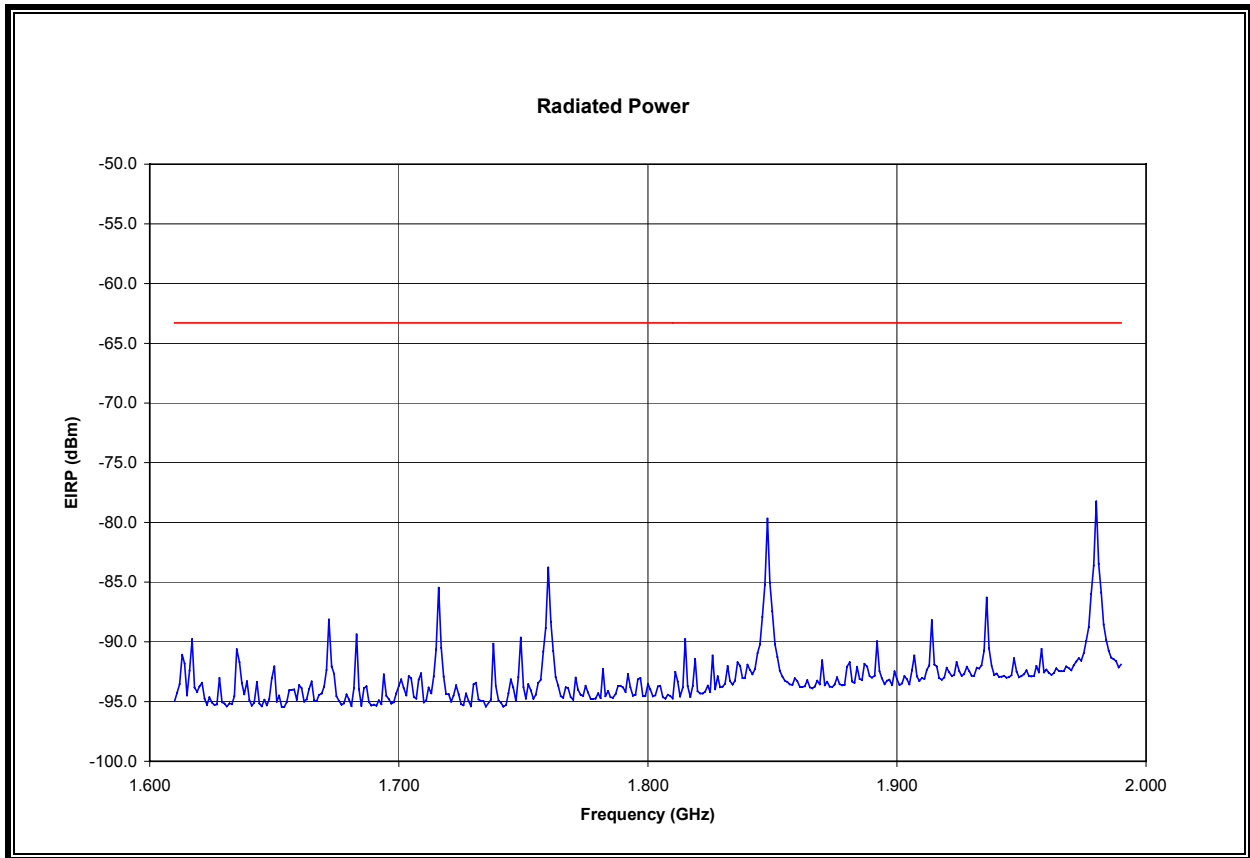
**EIRP 0.960 TO 1.610 GHz, 1 MHz BW, VERTICAL**



**EIRP 1.610 TO 1.990 GHz, 1 MHz BW, HORIZONTAL**

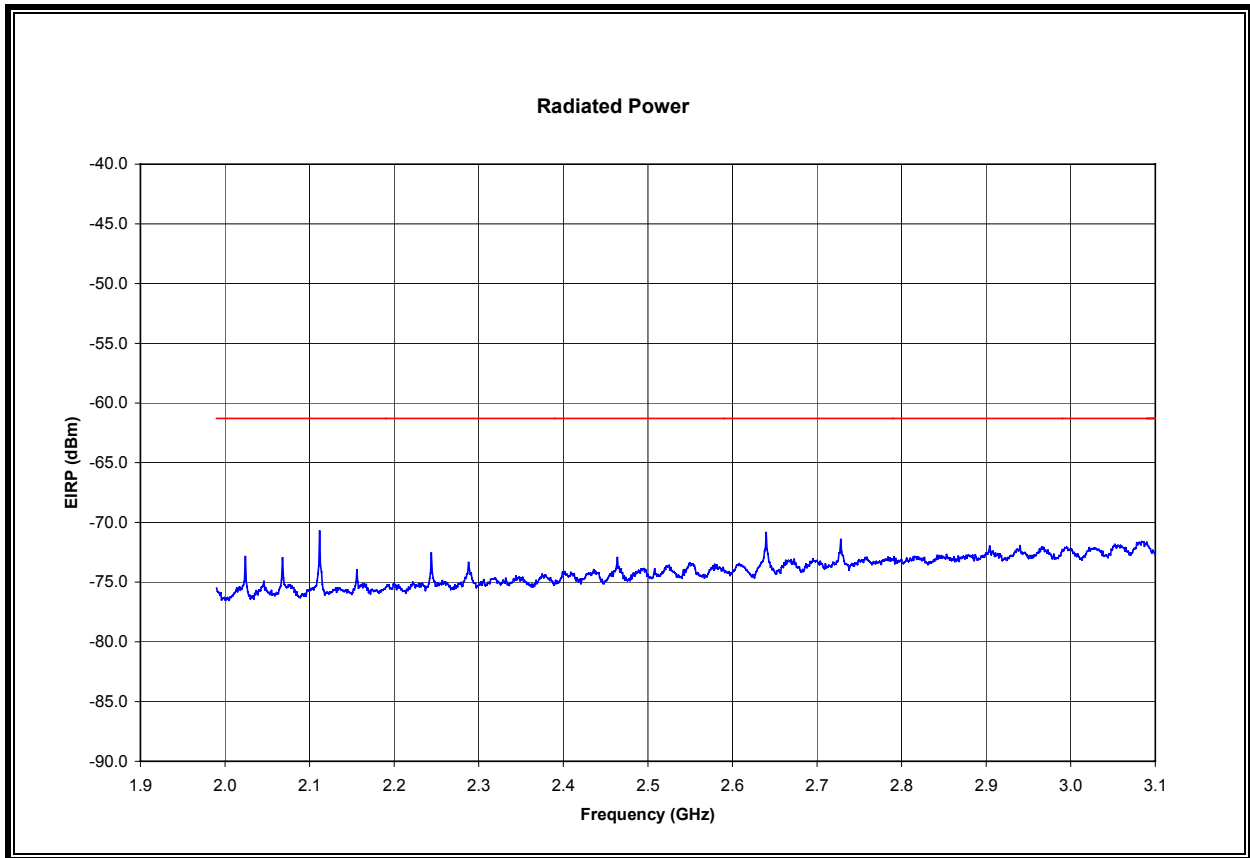


**EIRP 1.610 TO 1.990 GHz, 1 MHz BW, VERTICAL**

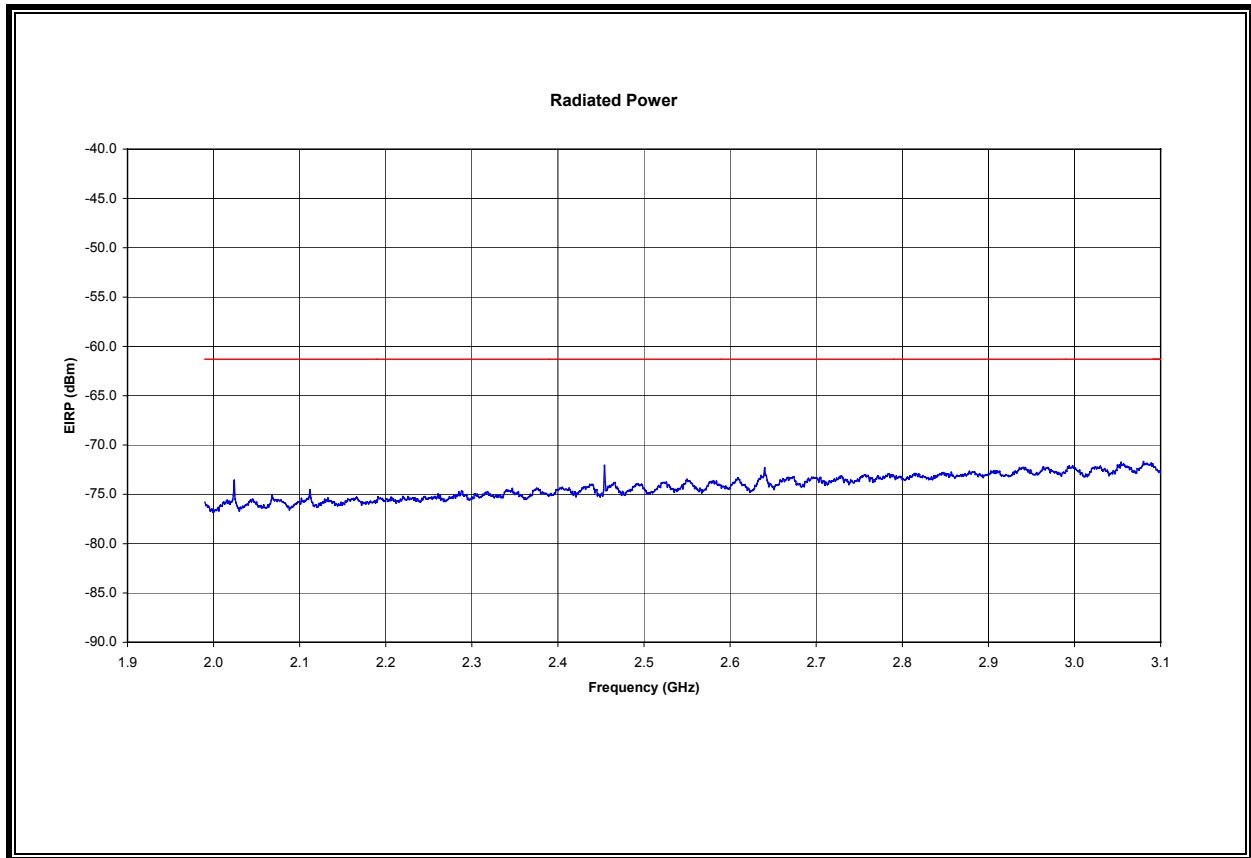




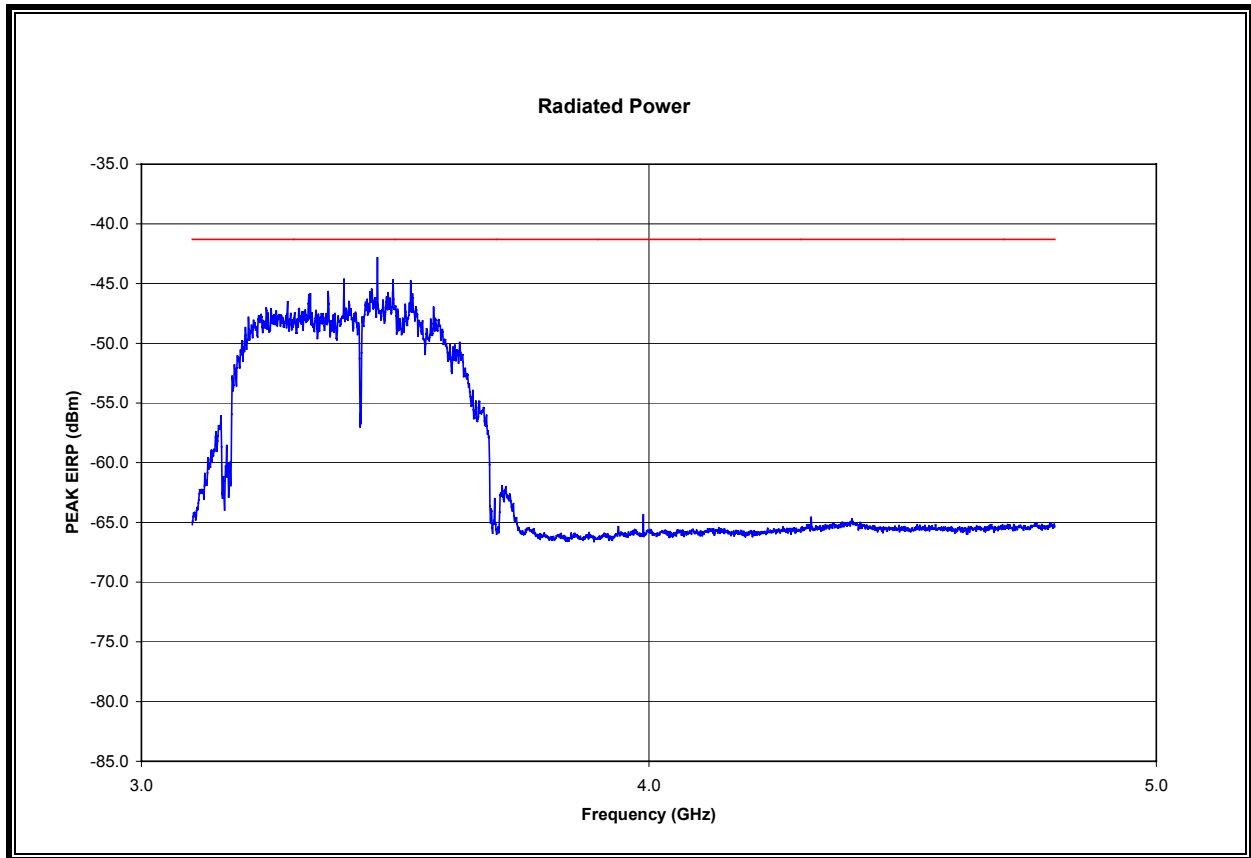
**EIRP 1.990 TO 3.100 GHz, 1 MHz BW, HORIZONTAL**



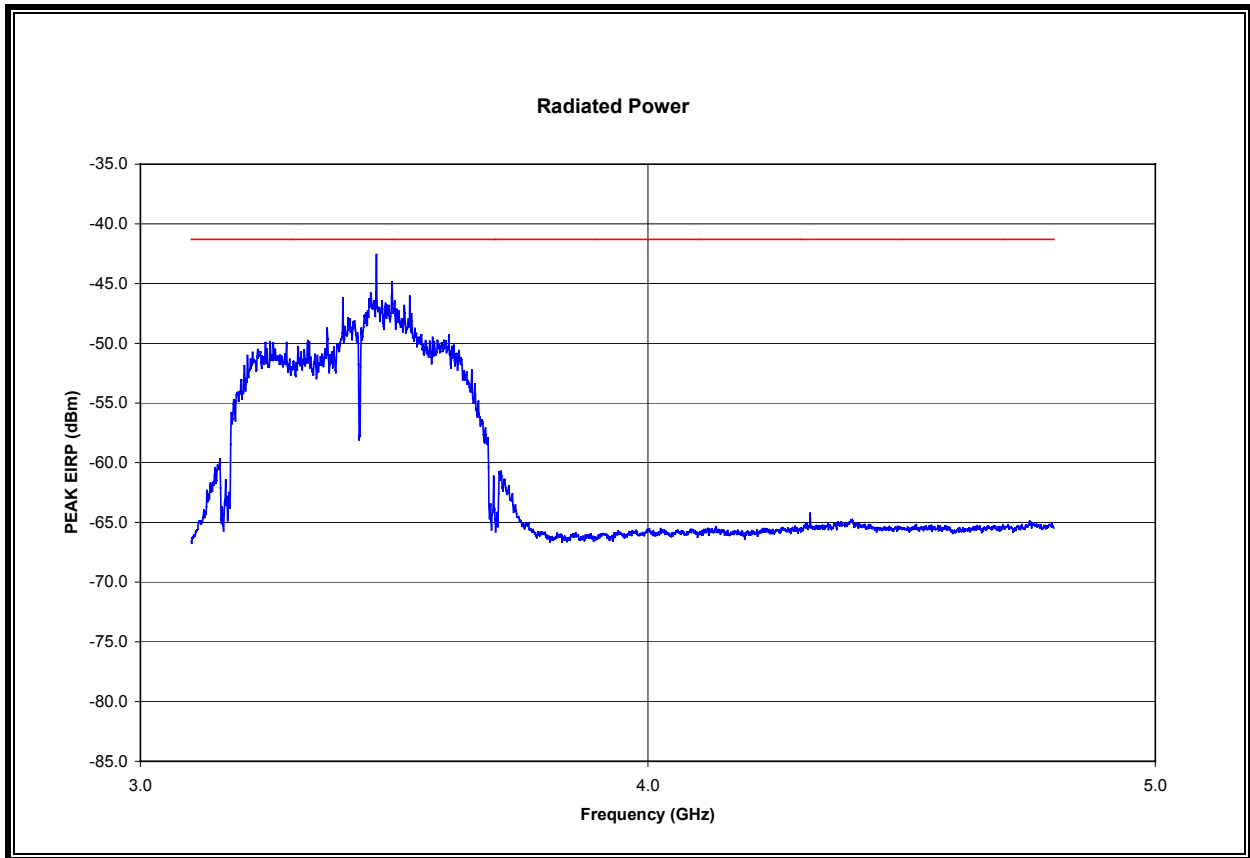
**EIRP 1.990 TO 3.100 GHz, 1 MHz BW, VERTICAL**



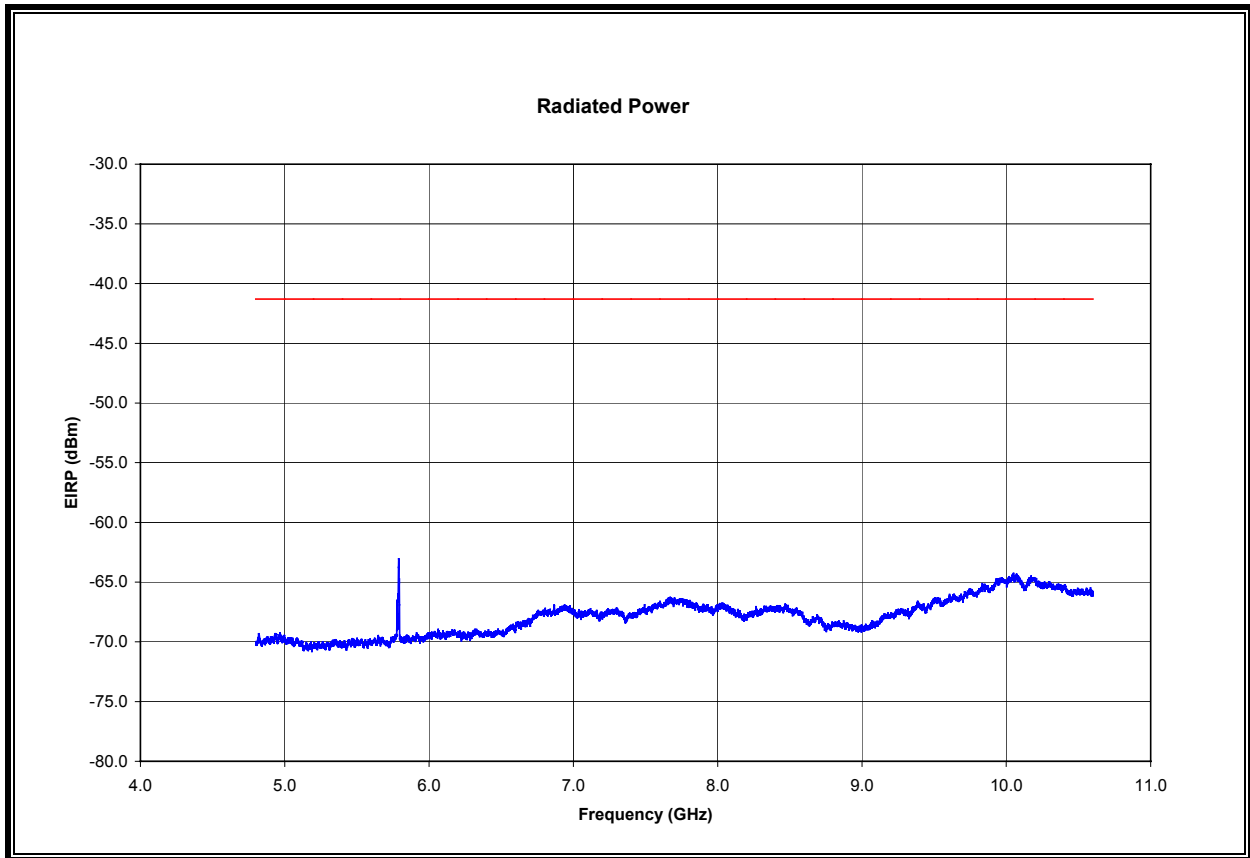
**EIRP 3.1 TO 4.8 GHz, 1 MHz BW, HORIZONTAL**



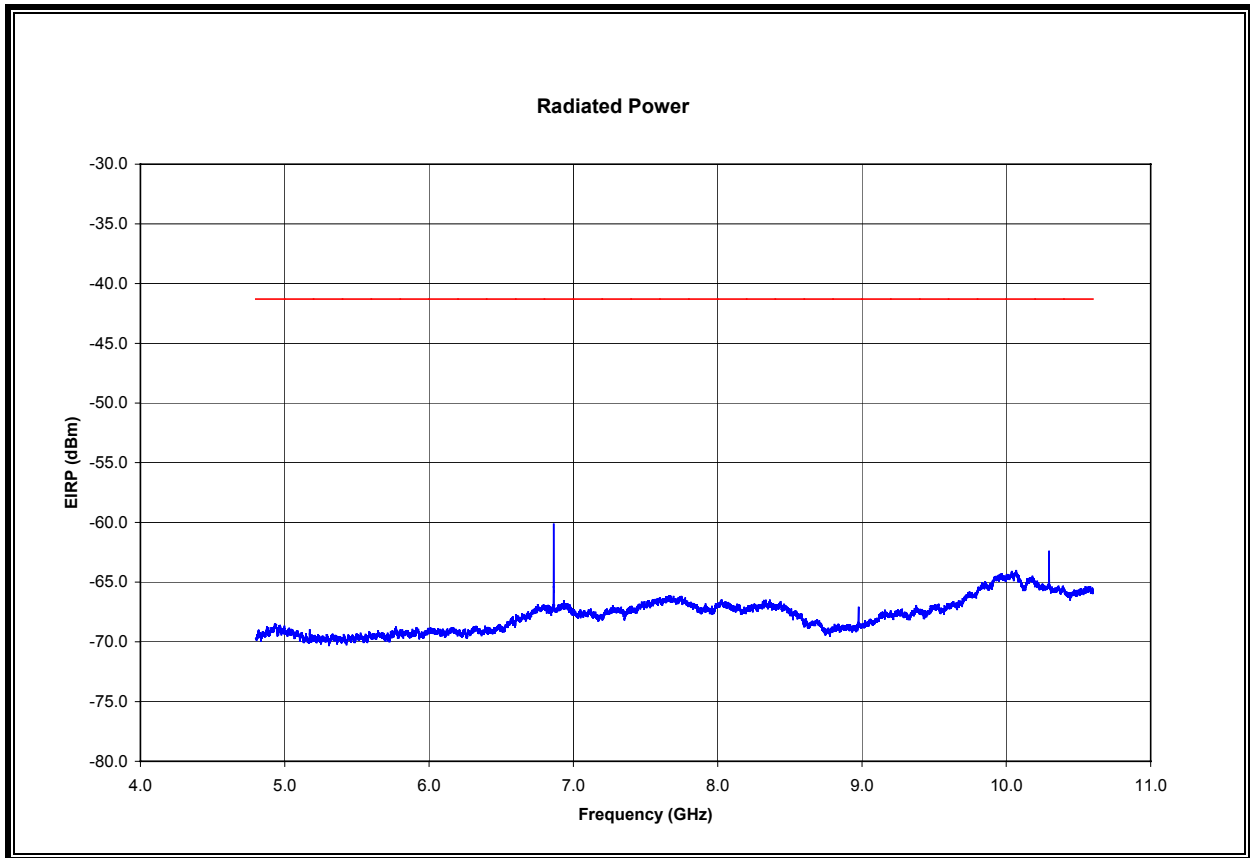
**EIRP 3.1 TO 4.8 GHz, 1 MHz BW, VERTICAL**



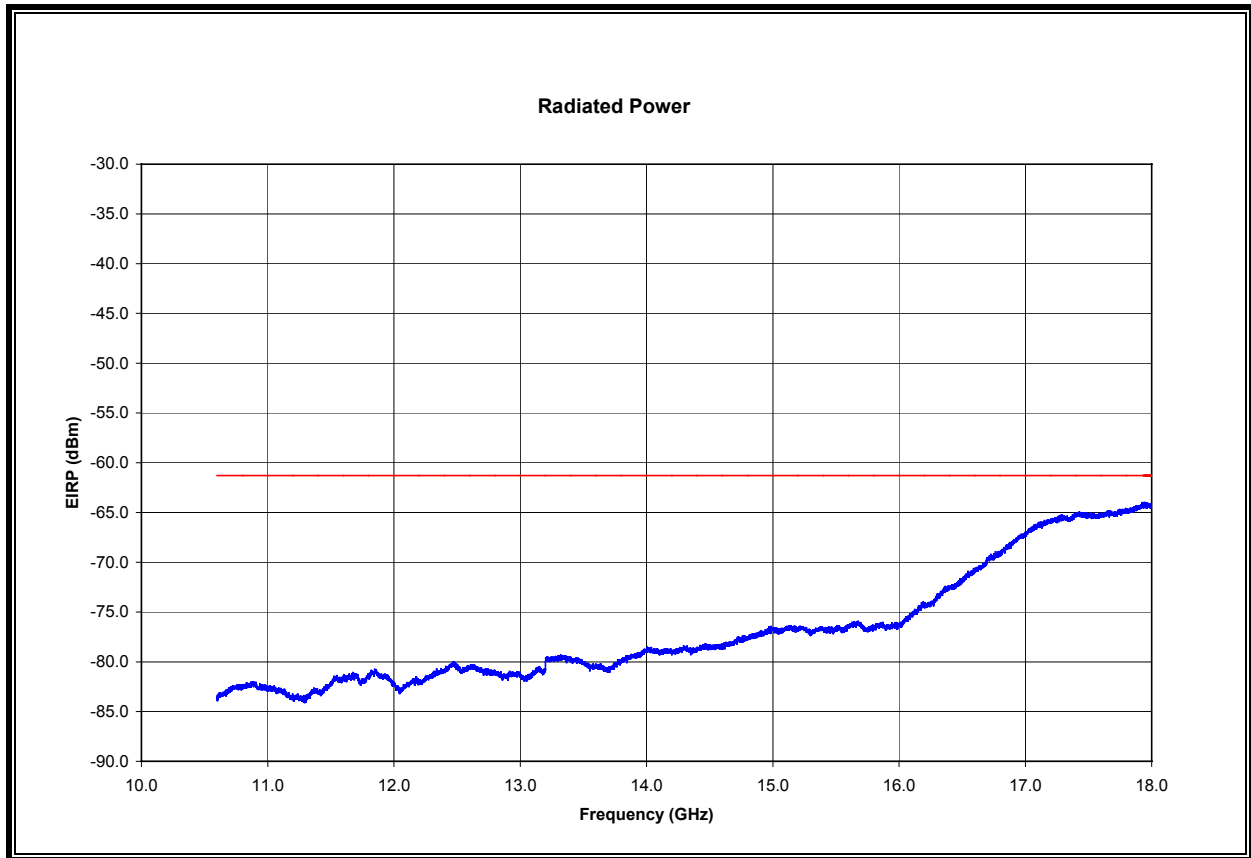
**EIRP 4.8 TO 10.6 GHz, 1 MHz BW, HORIZONTAL**



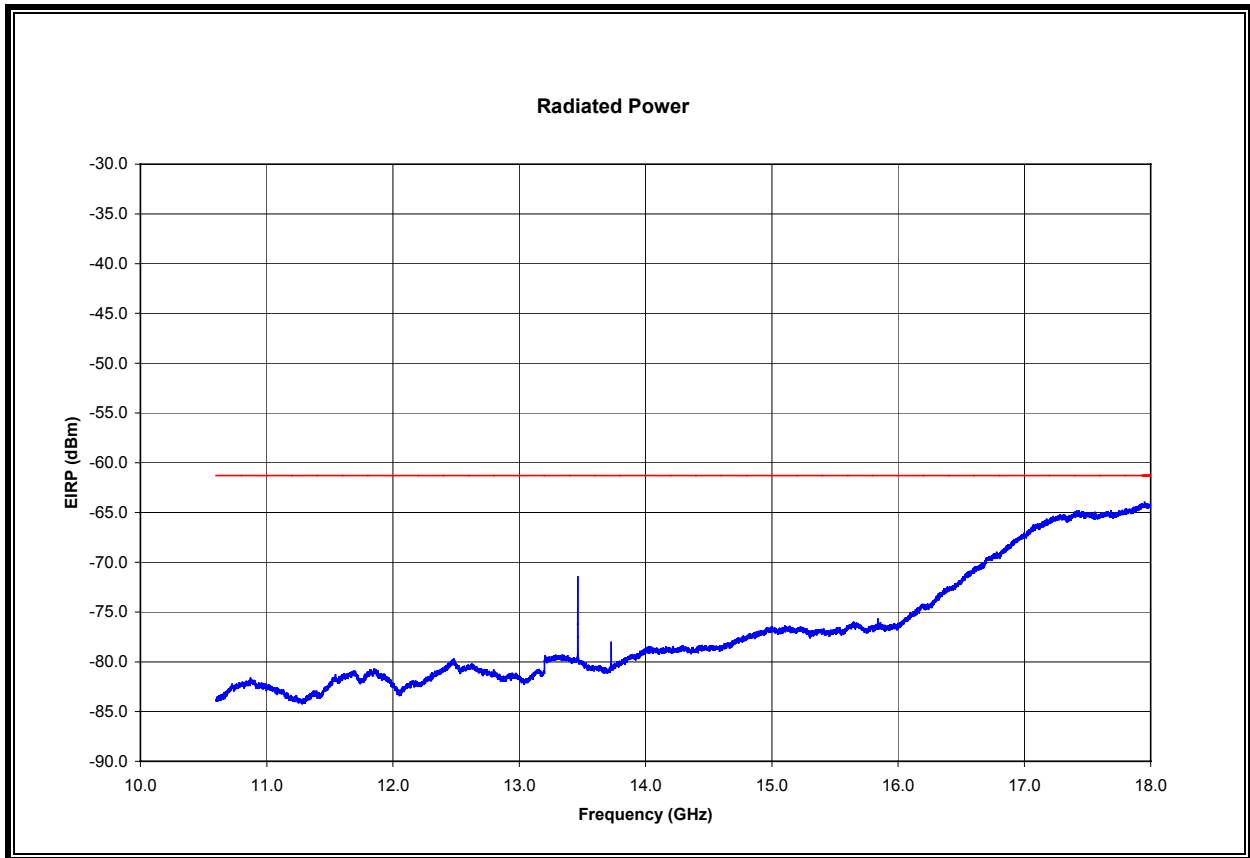
**EIRP 4.8 TO 10.6 GHz, 1 MHz BW, VERTICAL**



**EIRP 10.6 TO 18 GHz, 1 MHz BW, HORIZONTAL**

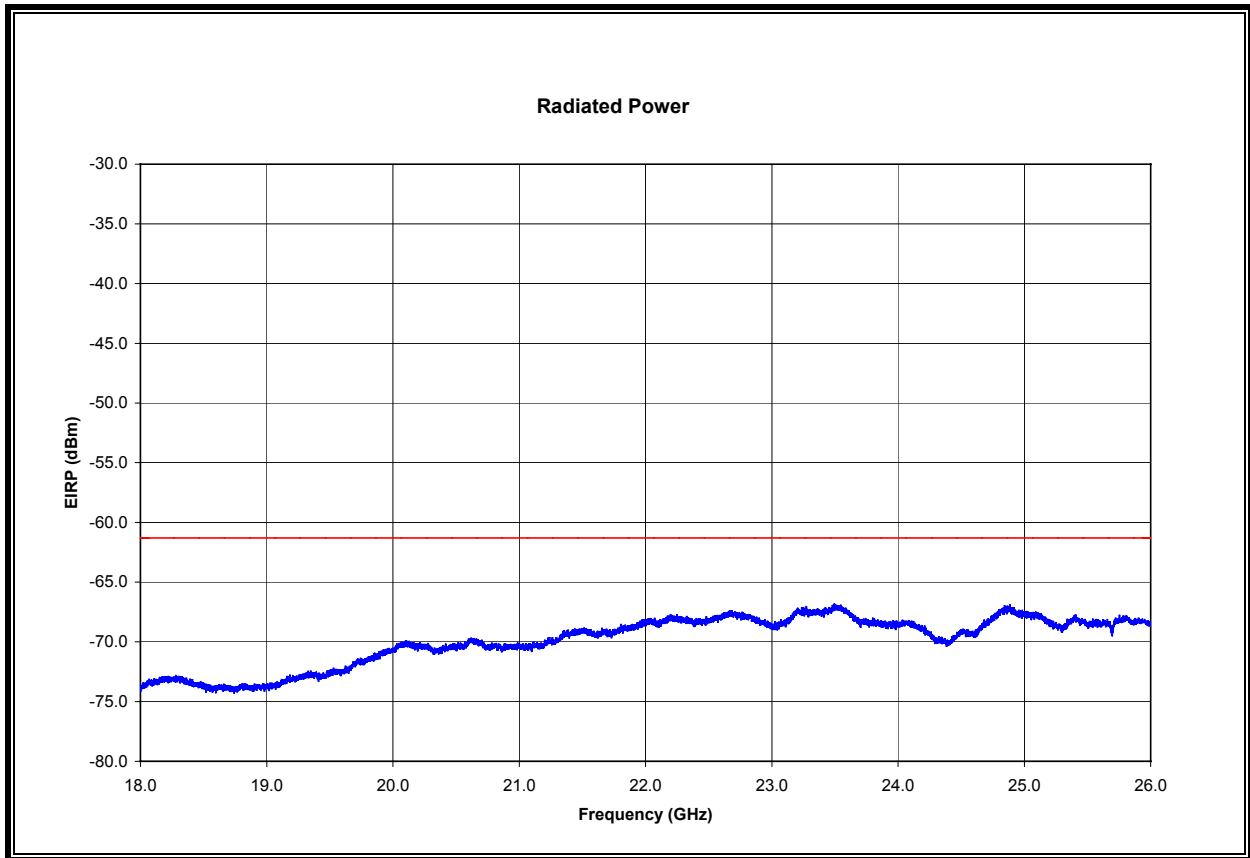


**EIRP 10.6 TO 18 GHz, 1 MHz BW, VERTICAL**

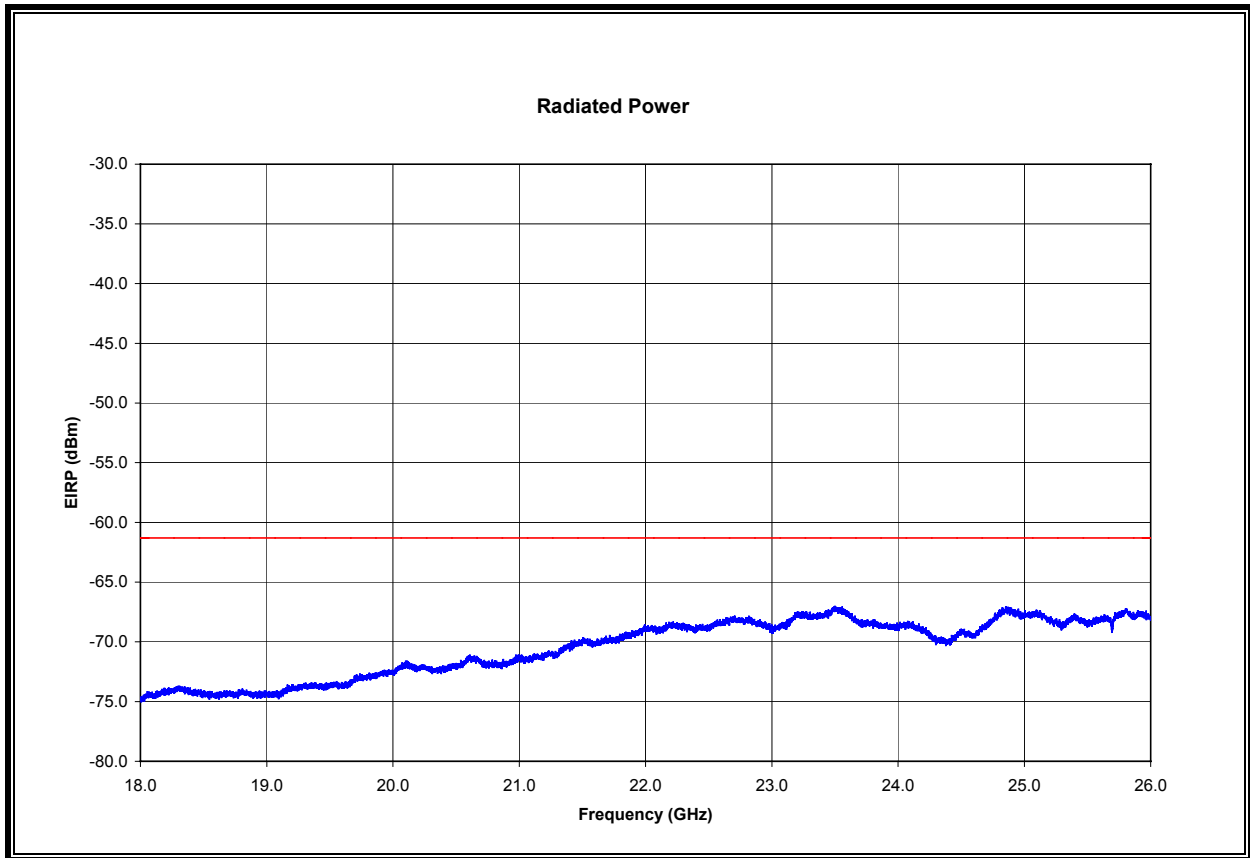




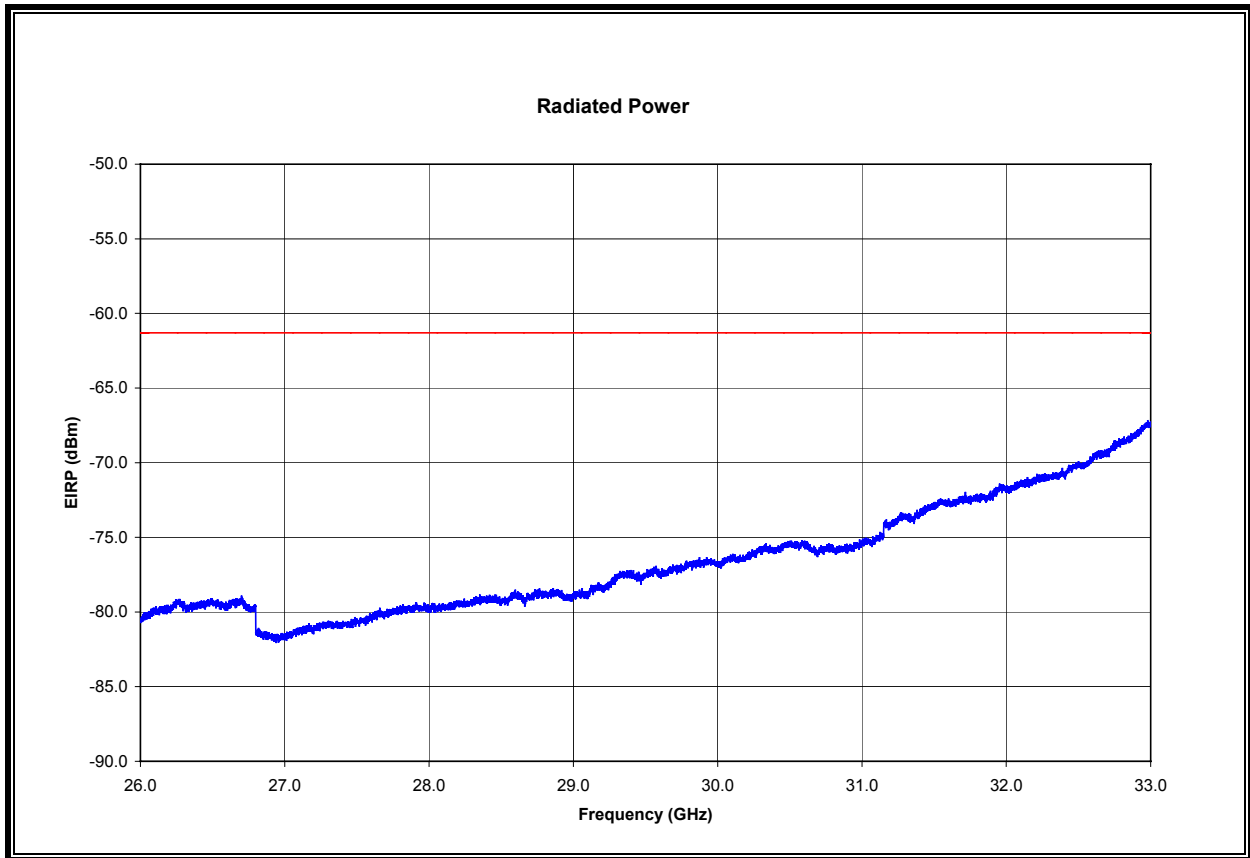
**EIRP 18 TO 26 GHz, 1 MHz BW, HORIZONTAL**



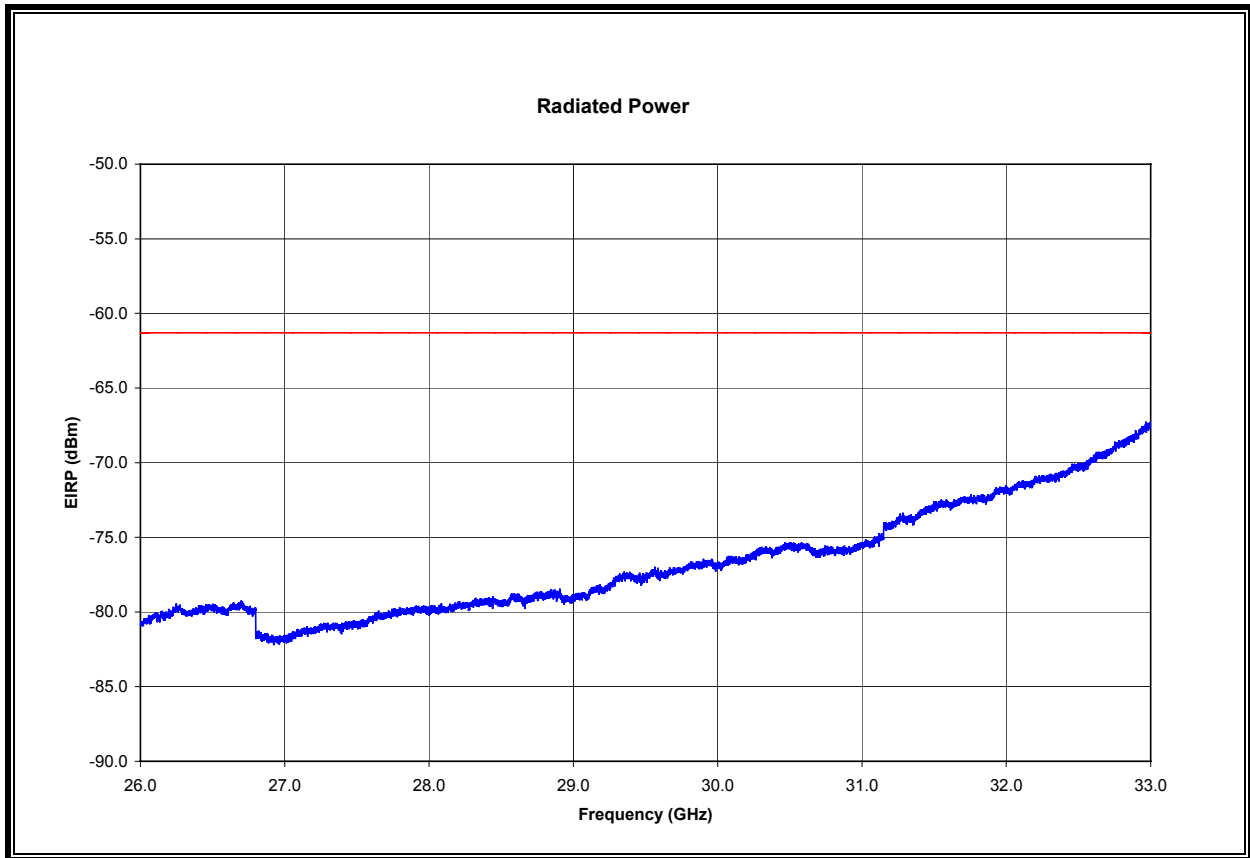
**EIRP 18 TO 26 GHz, 1 MHz BW, VERTICAL**



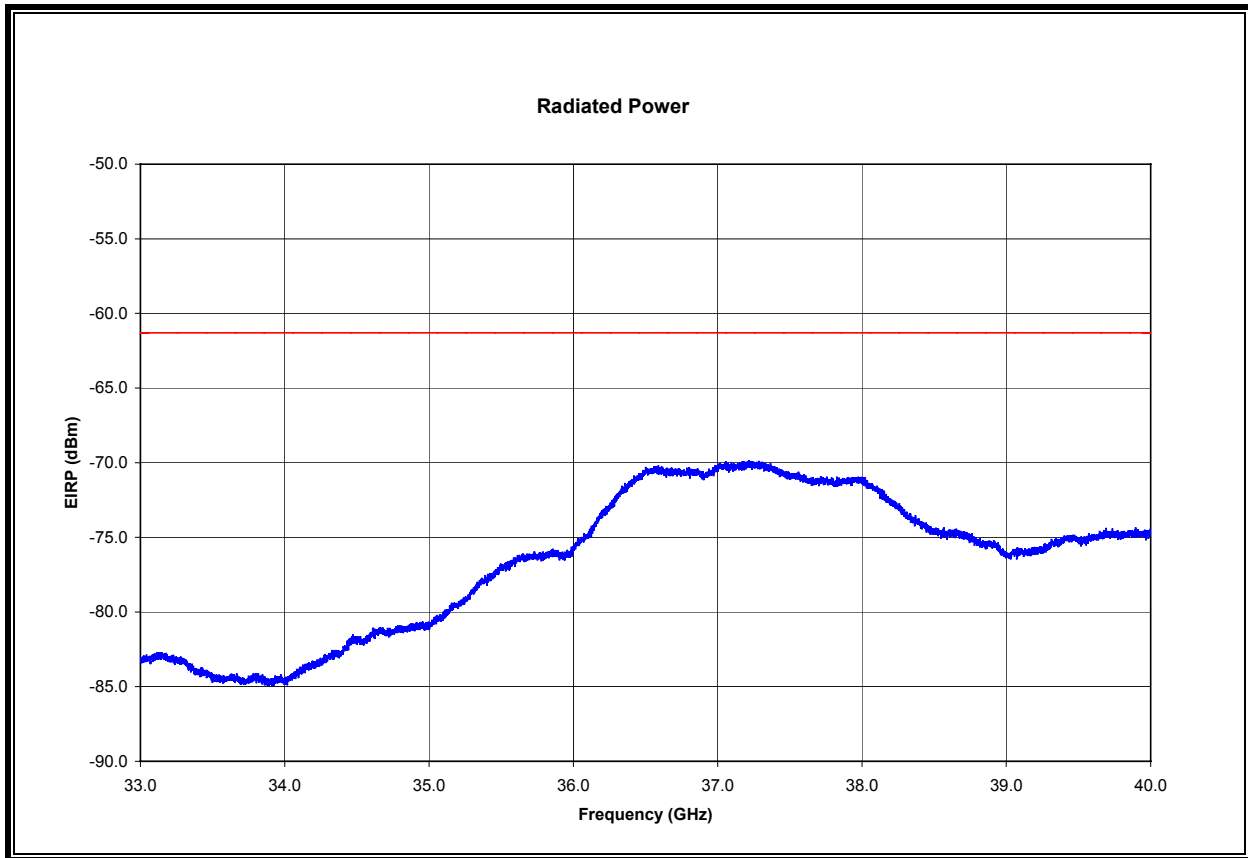
**EIRP 26 TO 33 GHz, 1 MHz BW, HORIZONTAL**



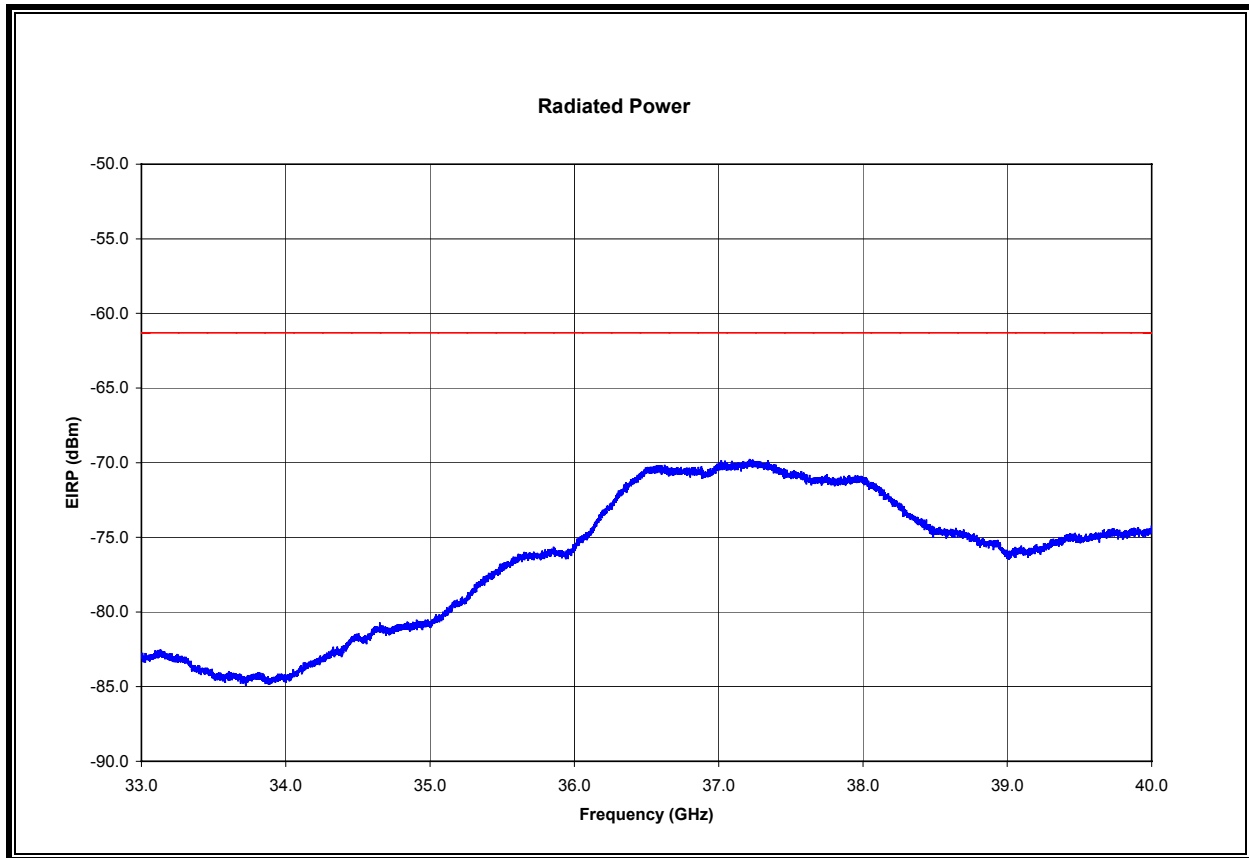
**EIRP 26 TO 33 GHz, 1 MHz BW, VERTICAL**



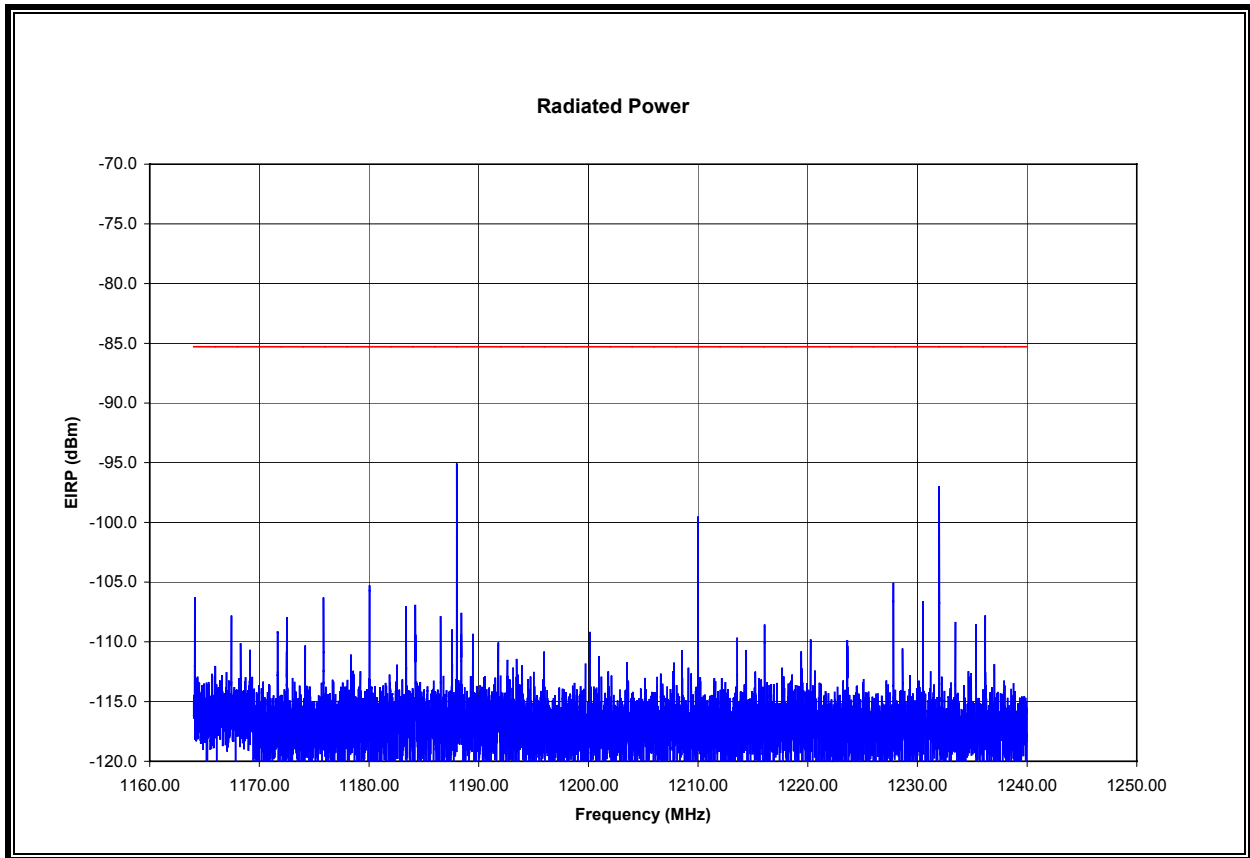
**EIRP 33 TO 40 GHz, 1 MHz BW, HORIZONTAL**



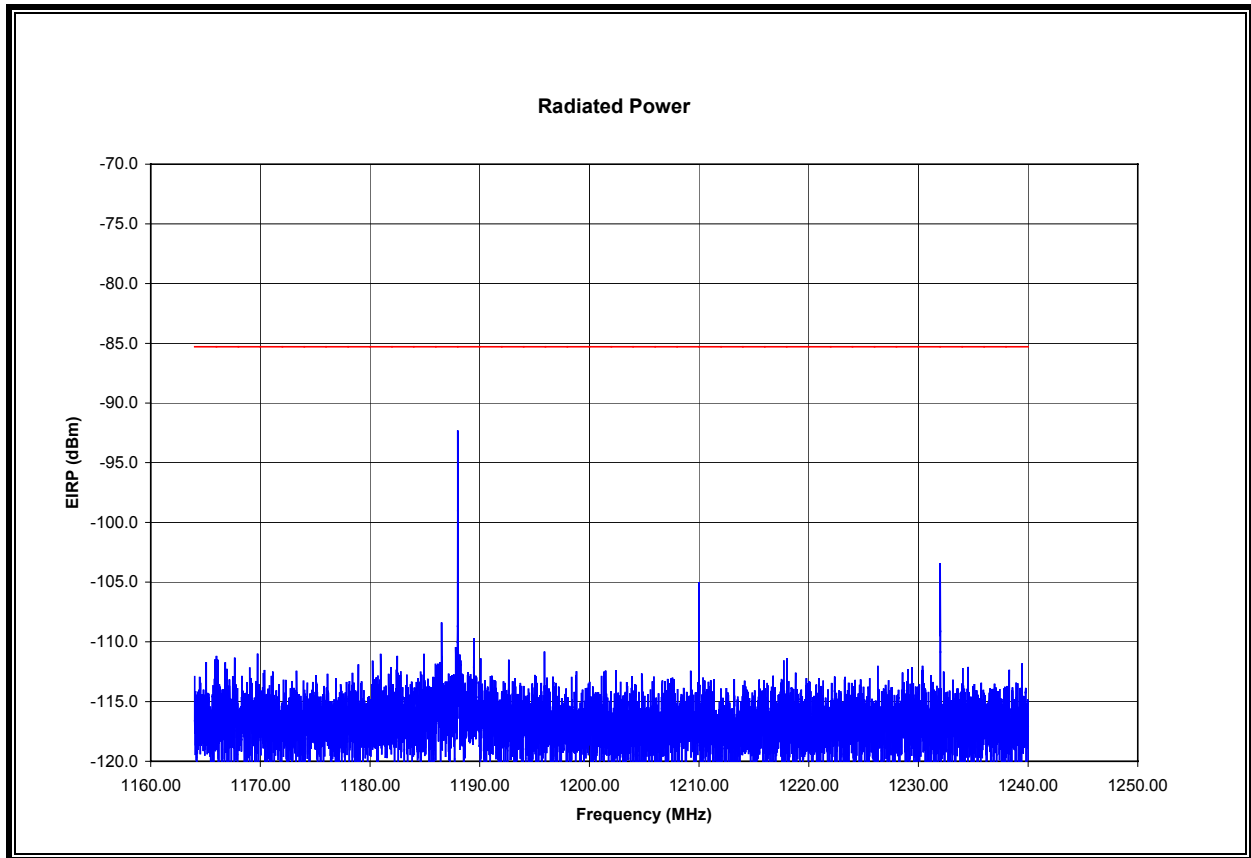
**EIRP 33 TO 40 GHz, 1 MHz BW, VERTICAL**



**EIRP 1.164 TO 1.240 GHz, 1 kHz BW, HORIZONTAL**

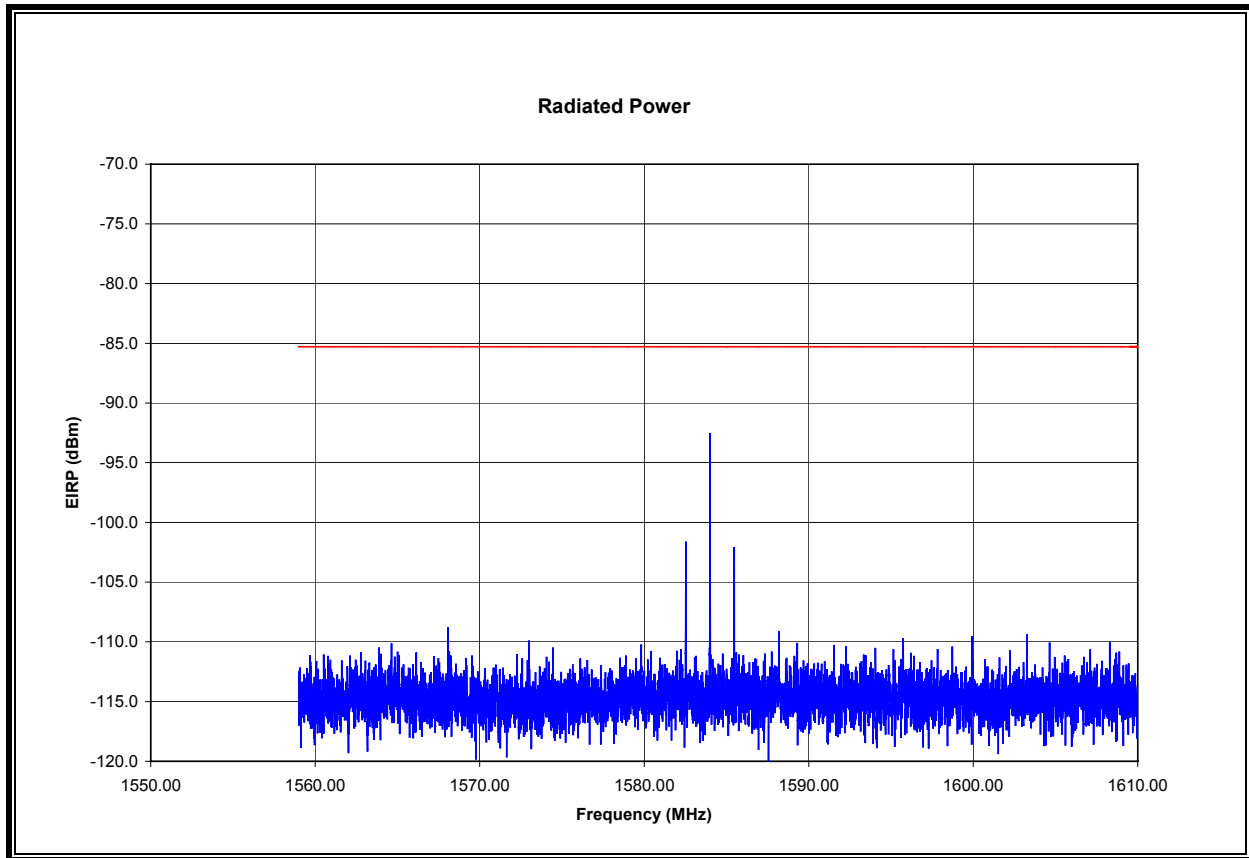


**EIRP 1.164 TO 1.240 GHz, 1 kHz BW, VERTICAL**

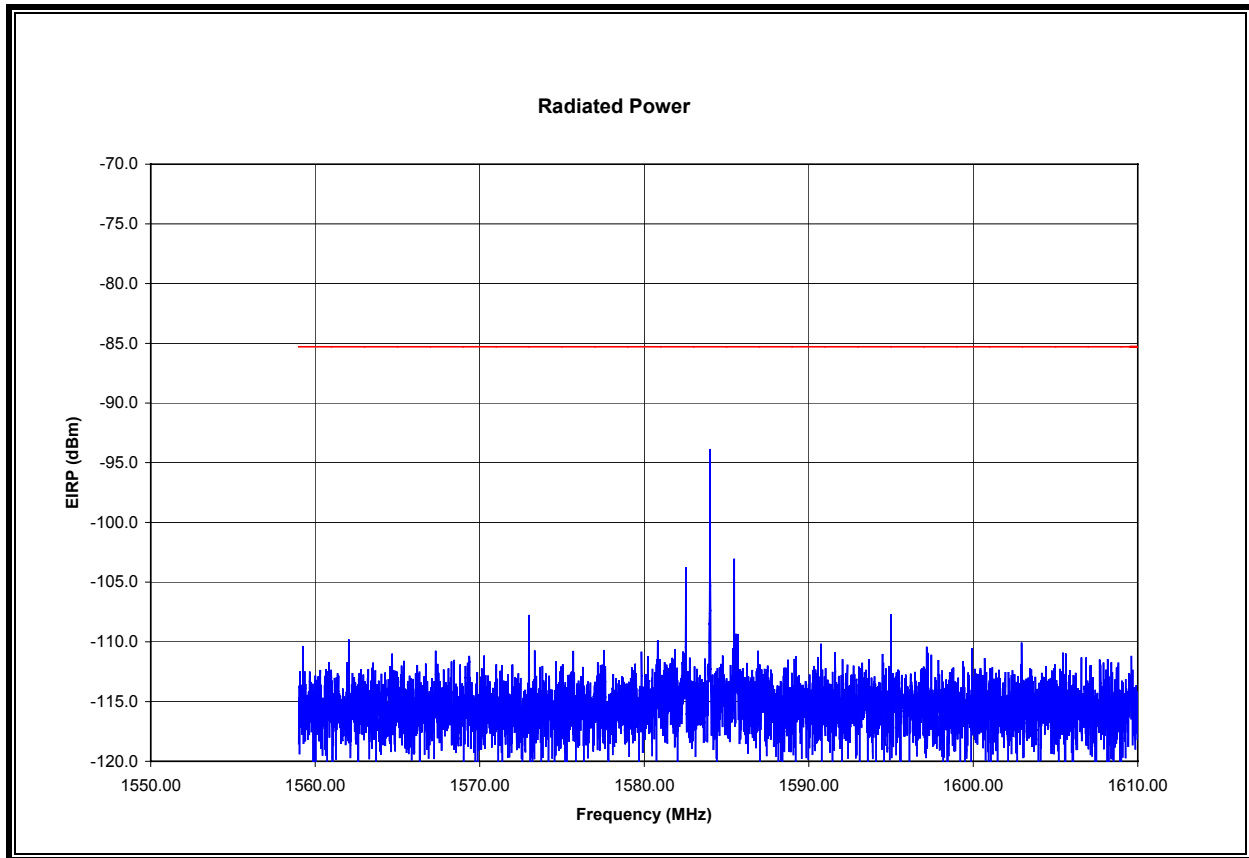




**EIRP 1.559 TO 1.610 GHz, 1 kHz BW, HORIZONTAL**

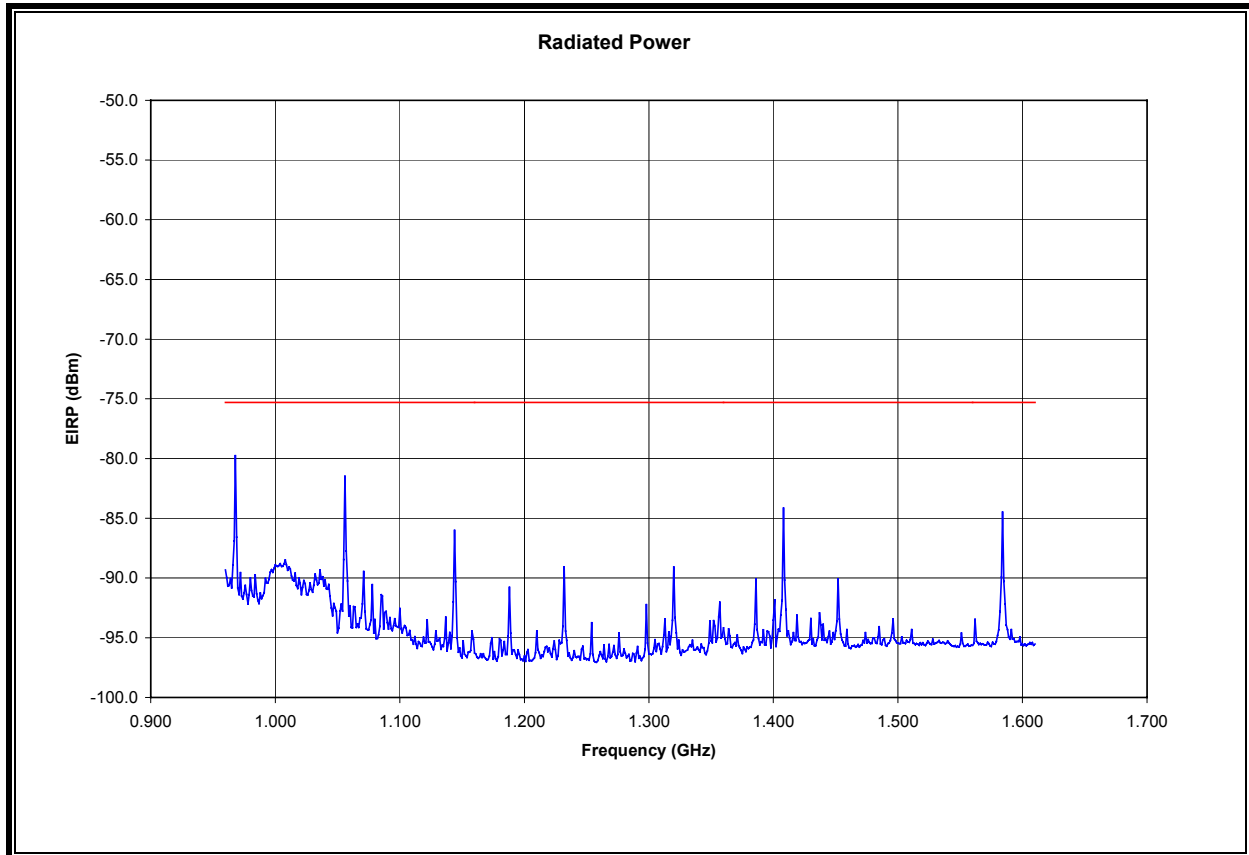


**EIRP 1.559 TO 1.610 GHz, 1 kHz BW, VERTICAL**

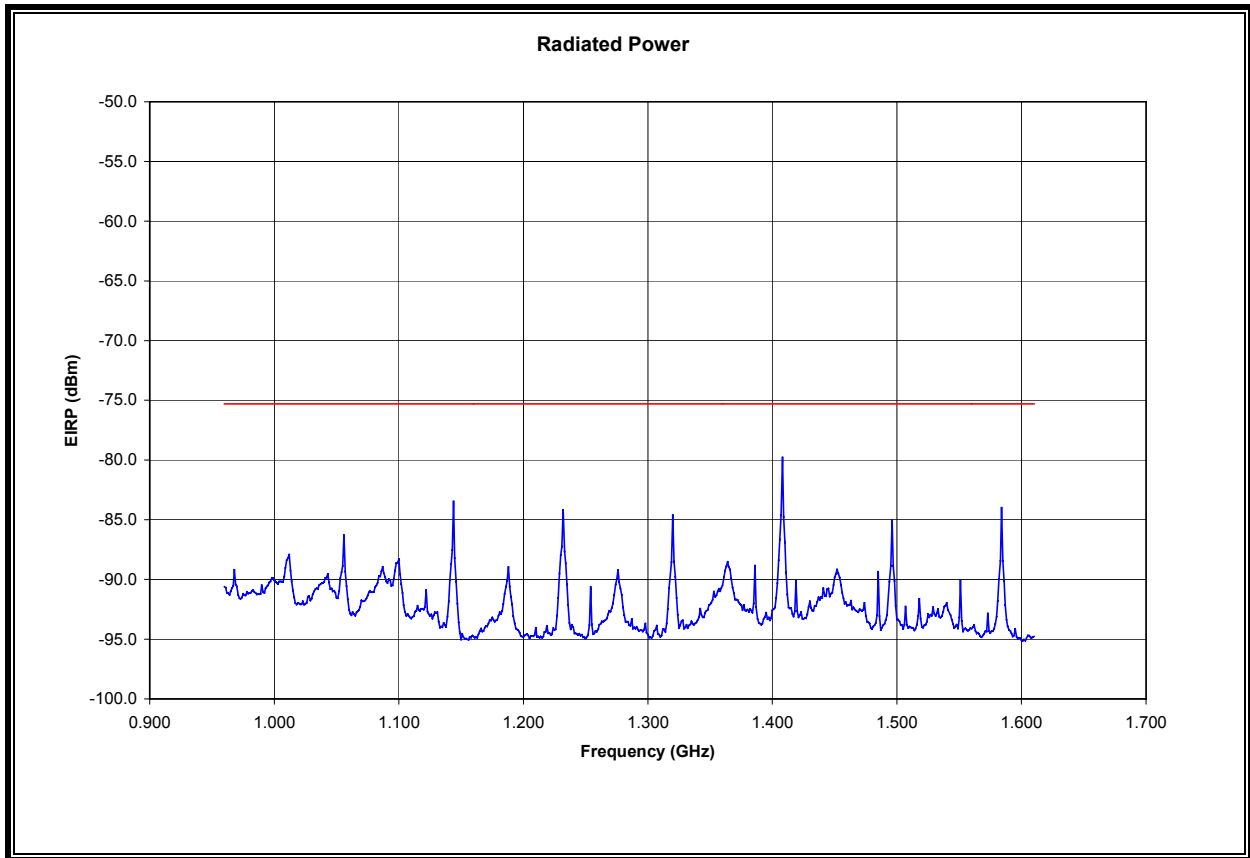


### 7.3.3. MID CHANNEL EMISSIONS

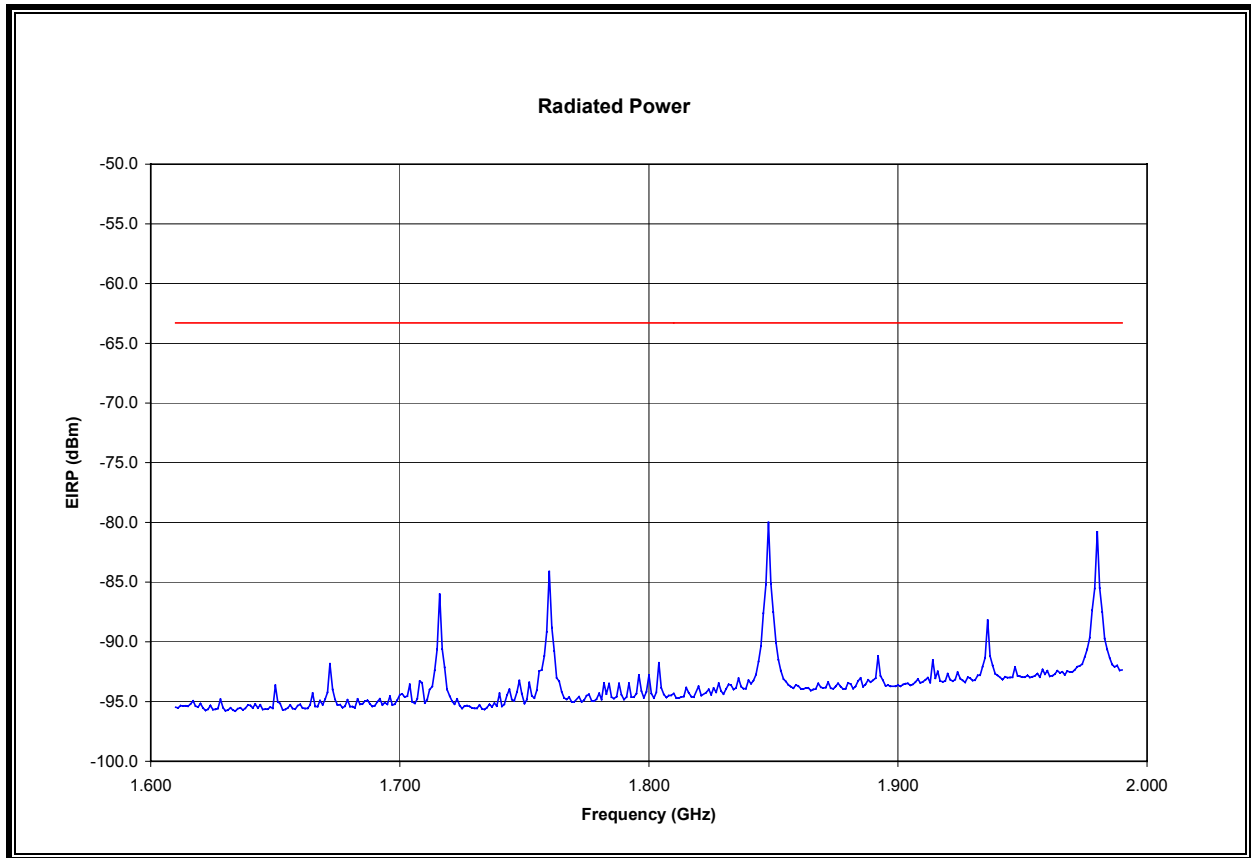
#### EIRP 0.960 TO 1.610 GHz, 1 MHz BW, HORIZONTAL



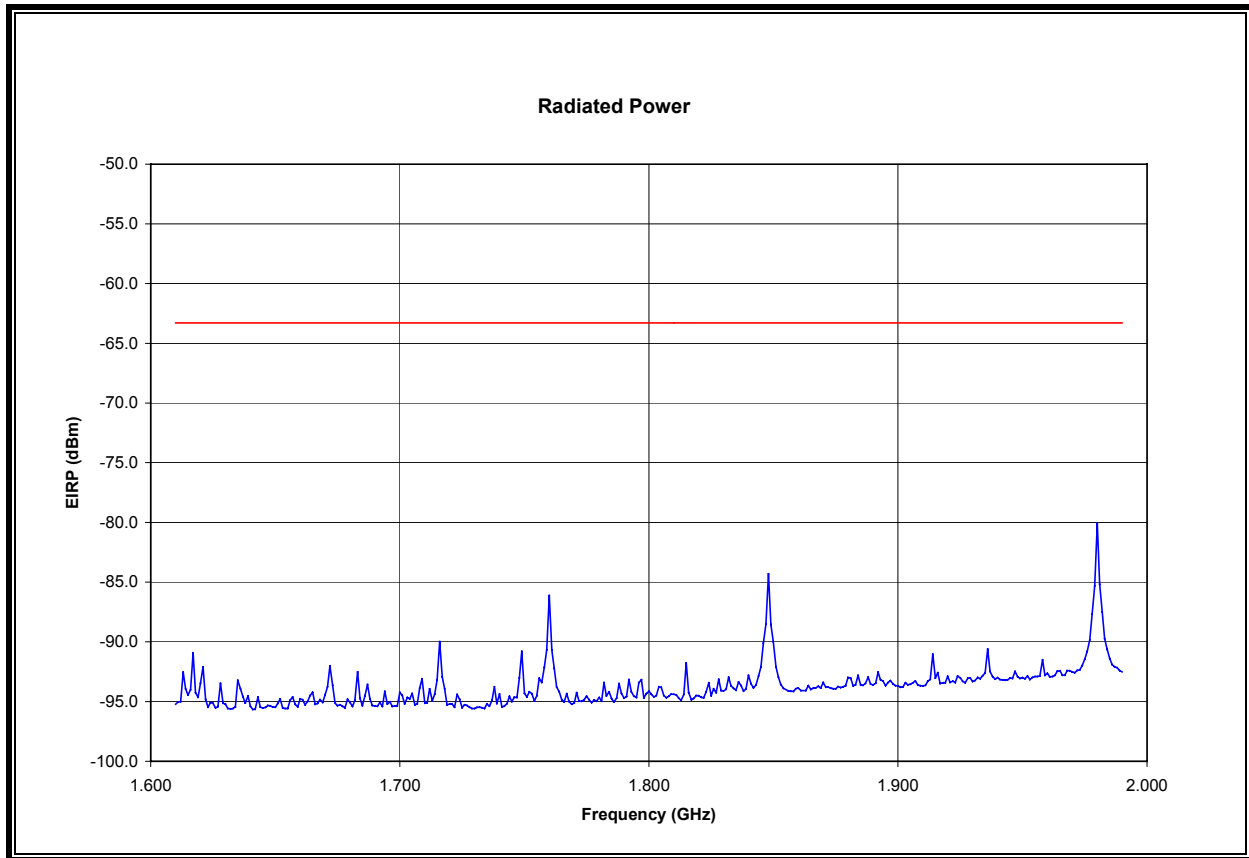
**EIRP 0.960 TO 1.610 GHz, 1 MHz BW, VERTICAL**



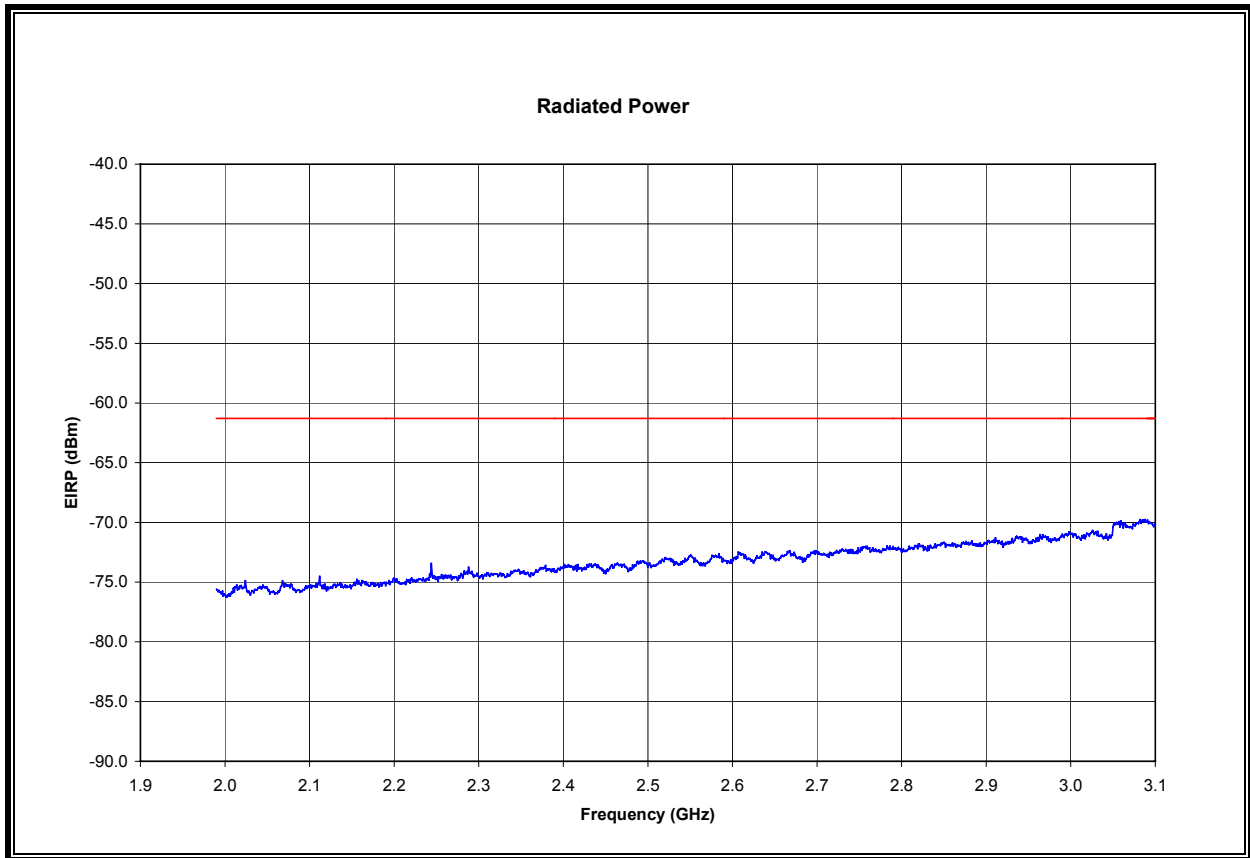
**EIRP 1.610 TO 1.990 GHz, 1 MHz BW, HORIZONTAL**



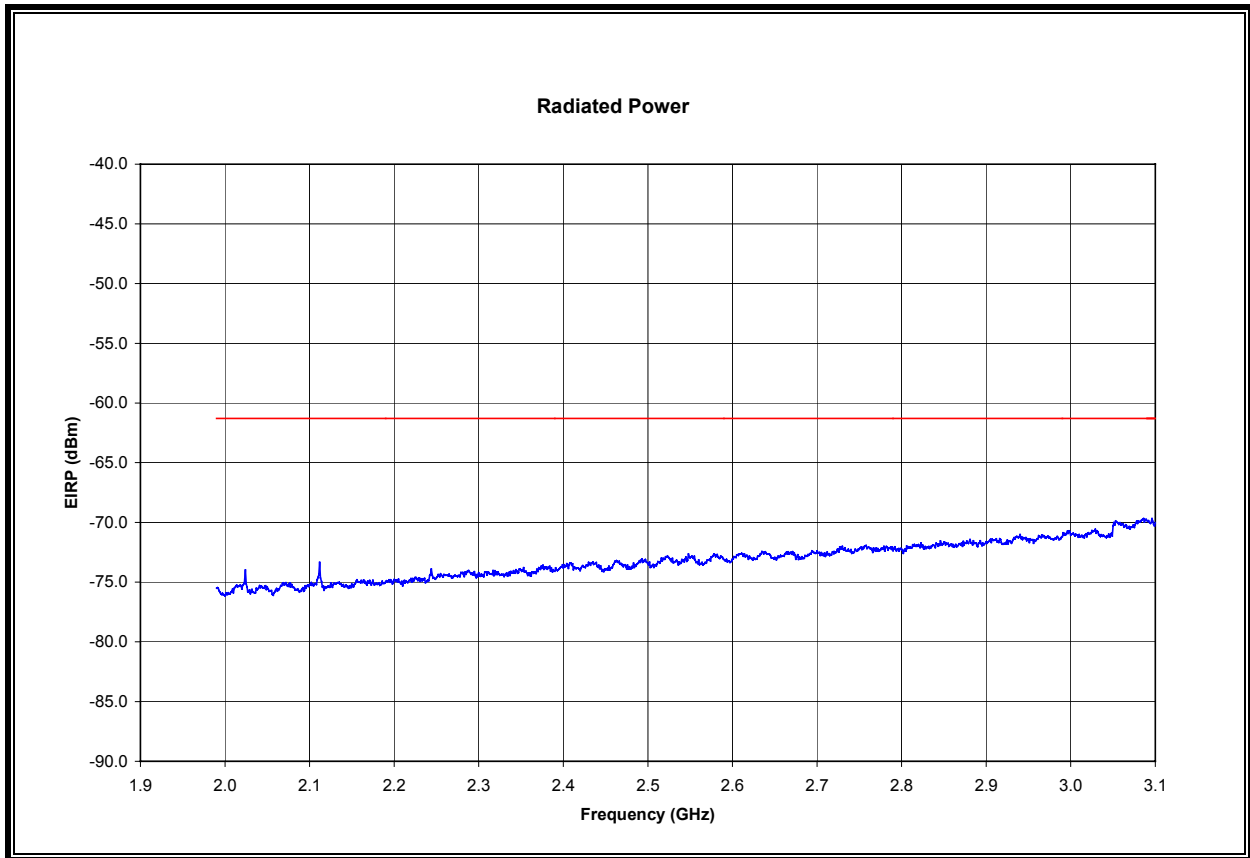
**EIRP 1.610 TO 1.990 GHz, 1 MHz BW, VERTICAL**



**EIRP 1.990 TO 3.100 GHz, 1 MHz BW, HORIZONTAL**

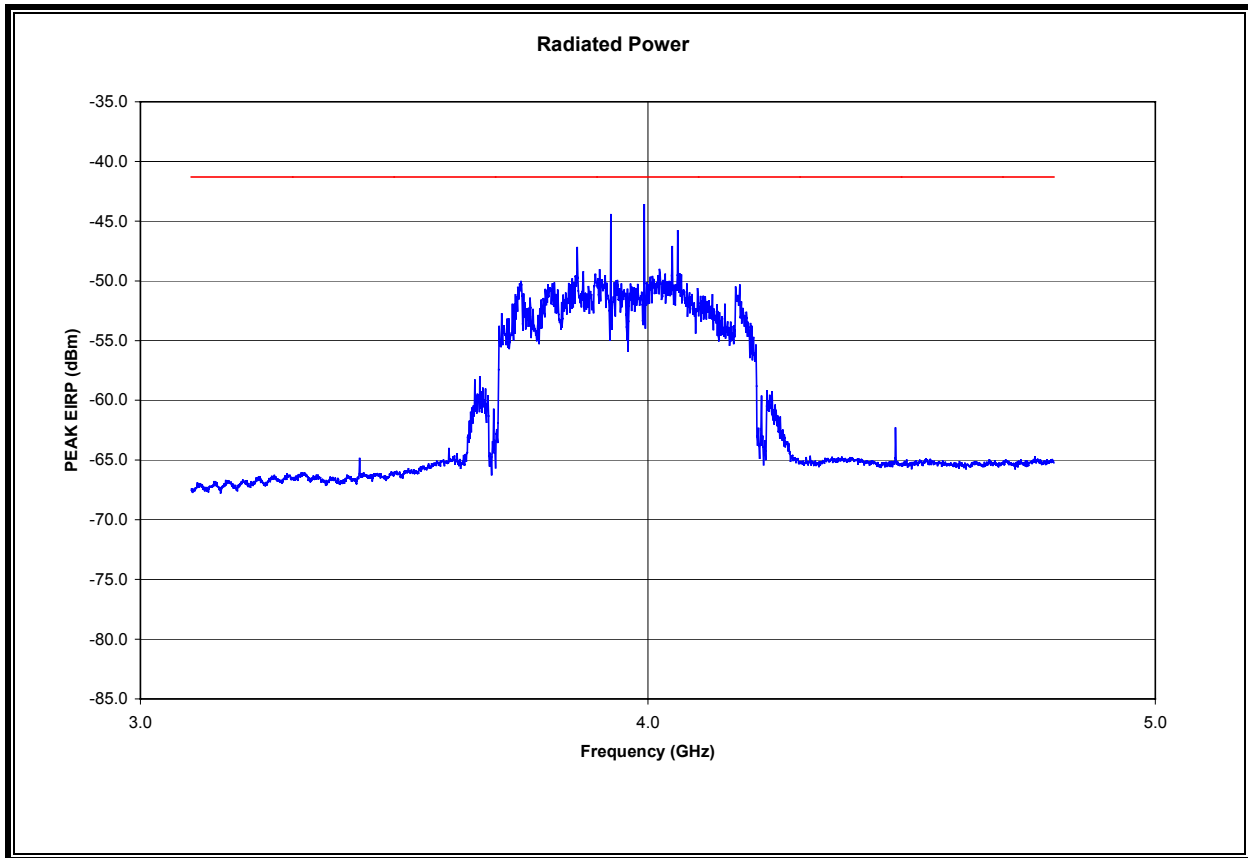


**EIRP 1.990 TO 3.100 GHz, 1 MHz BW, VERTICAL**

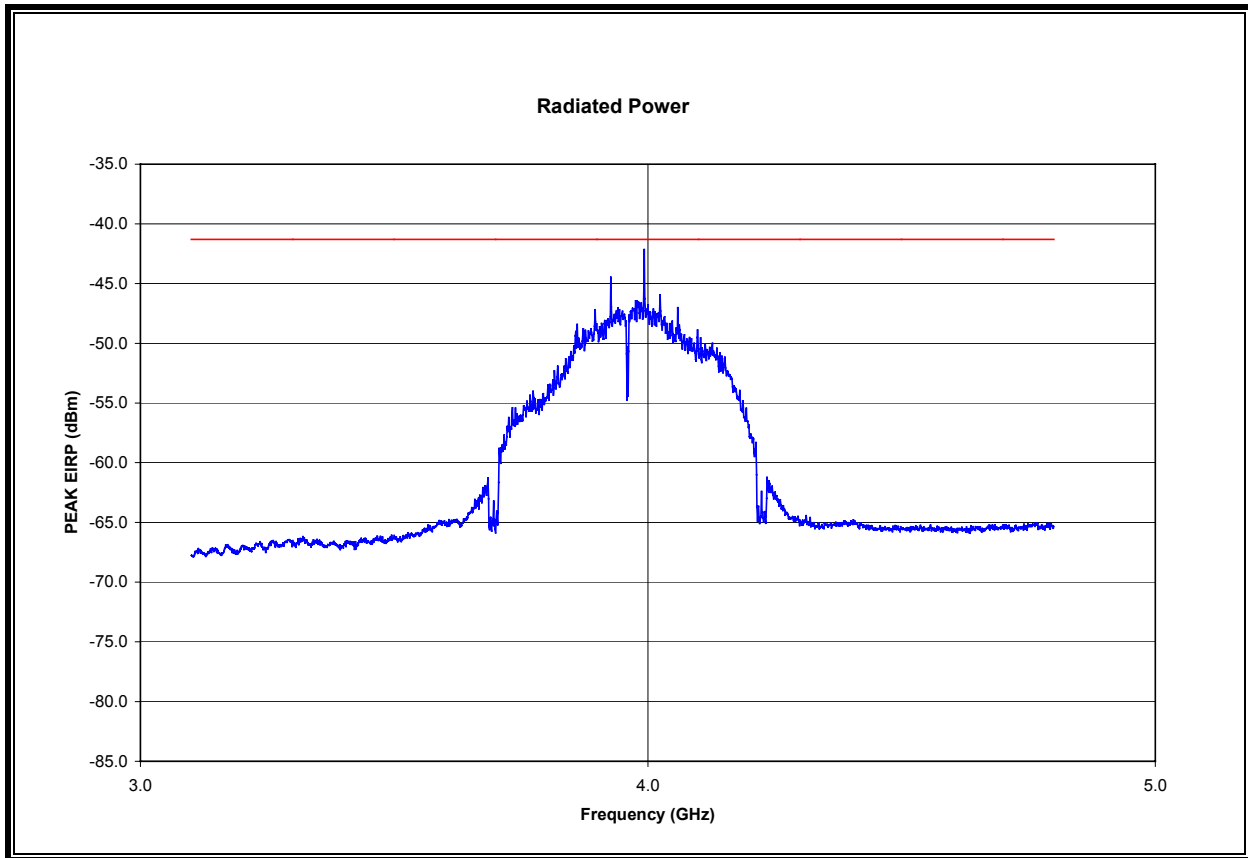




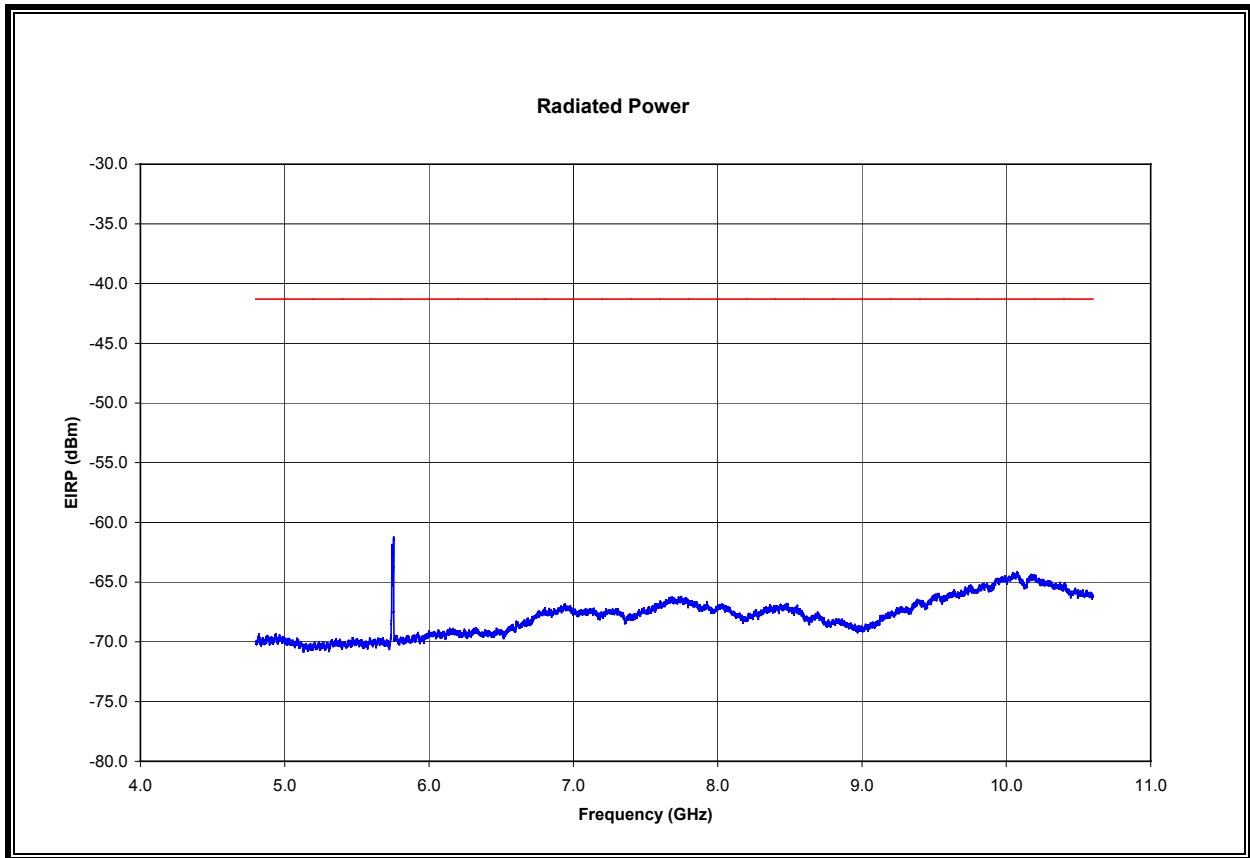
**EIRP 3.1 TO 4.8 GHz, 1 MHz BW, HORIZONTAL**



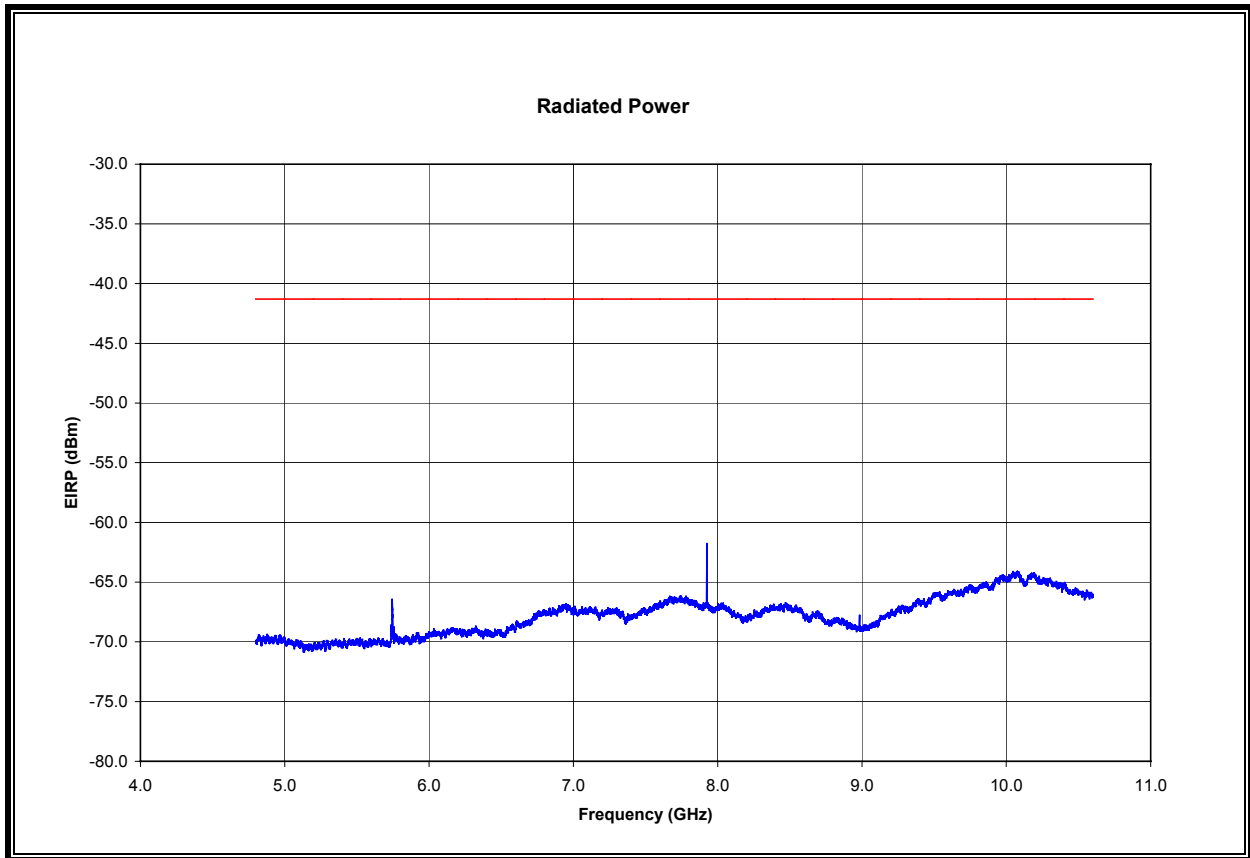
**EIRP 3.1 TO 4.8 GHz, 1 MHz BW, VERTICAL**



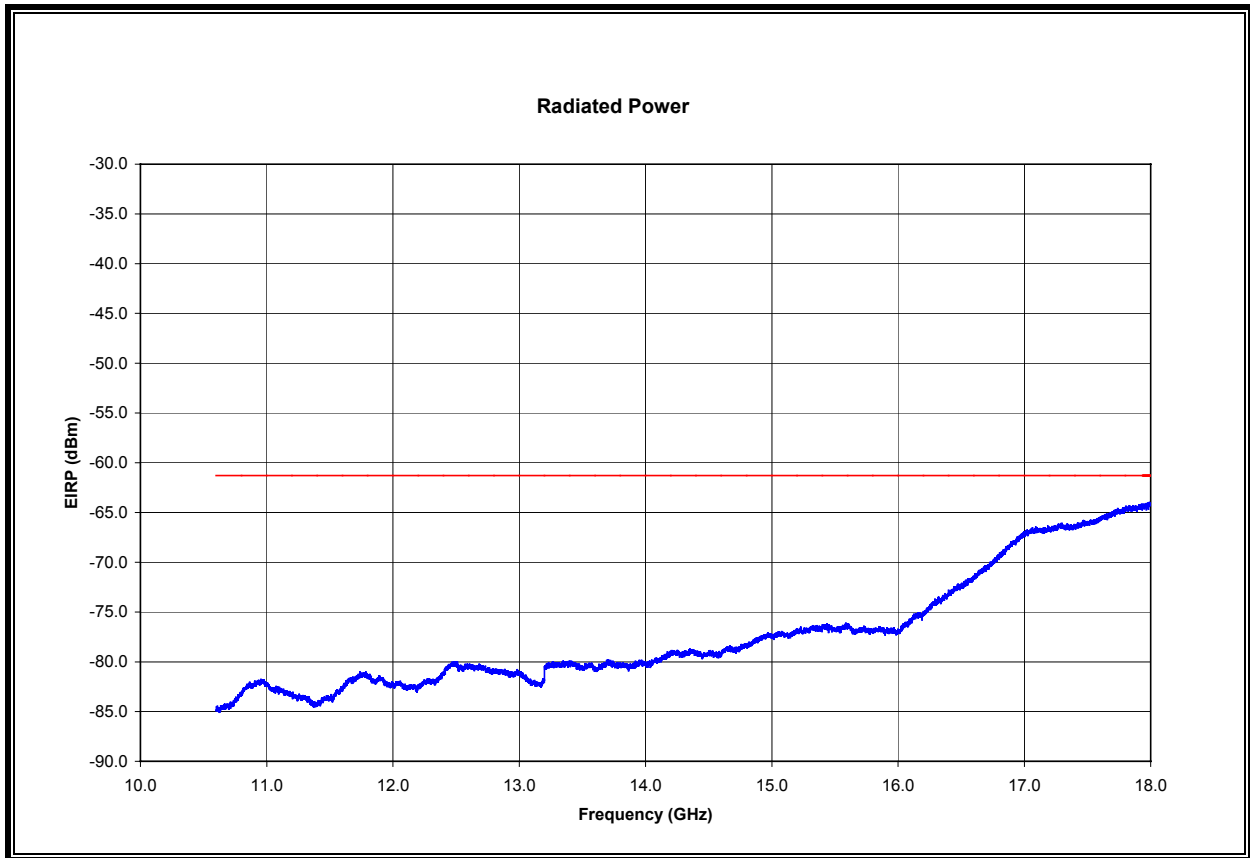
**EIRP 4.8 TO 10.6 GHz, 1 MHz BW, HORIZONTAL**



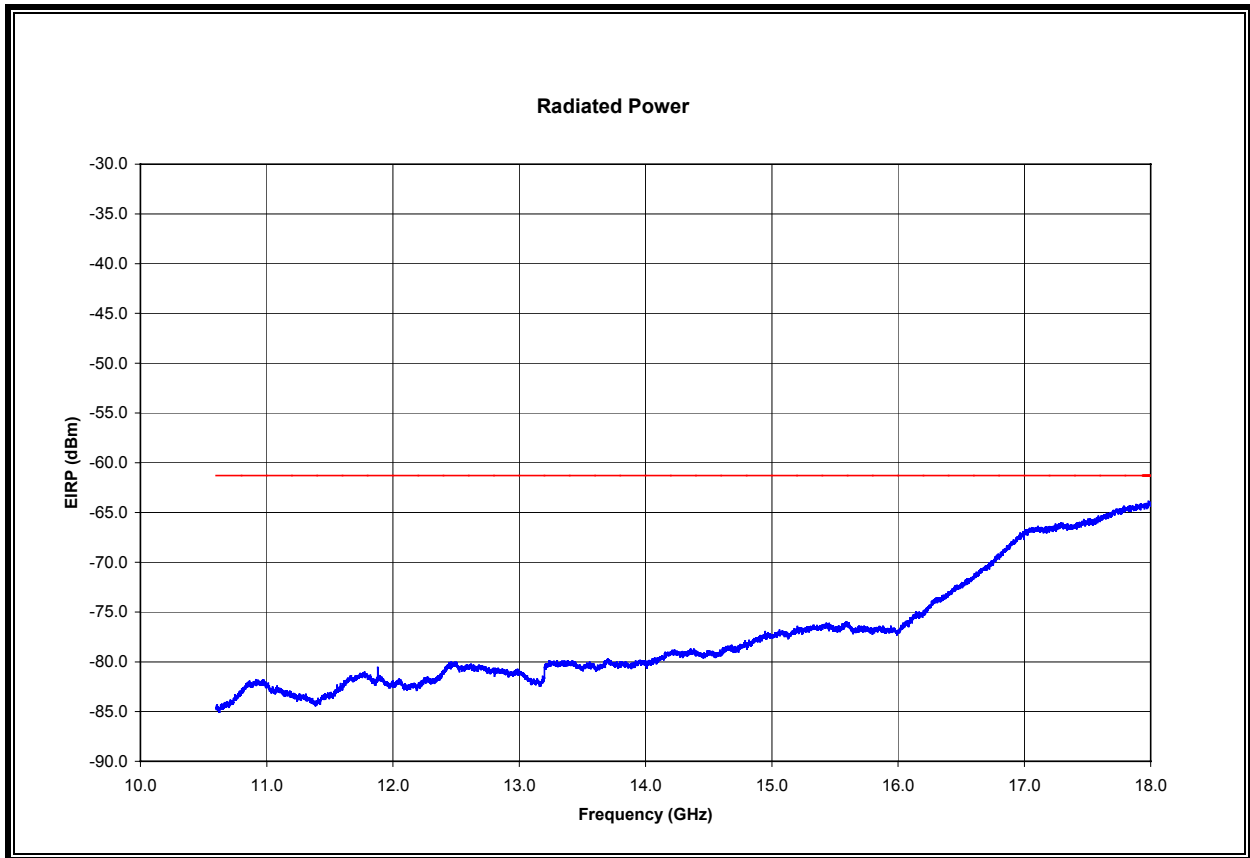
**EIRP 4.8 TO 10.6 GHz, 1 MHz BW, VERTICAL**



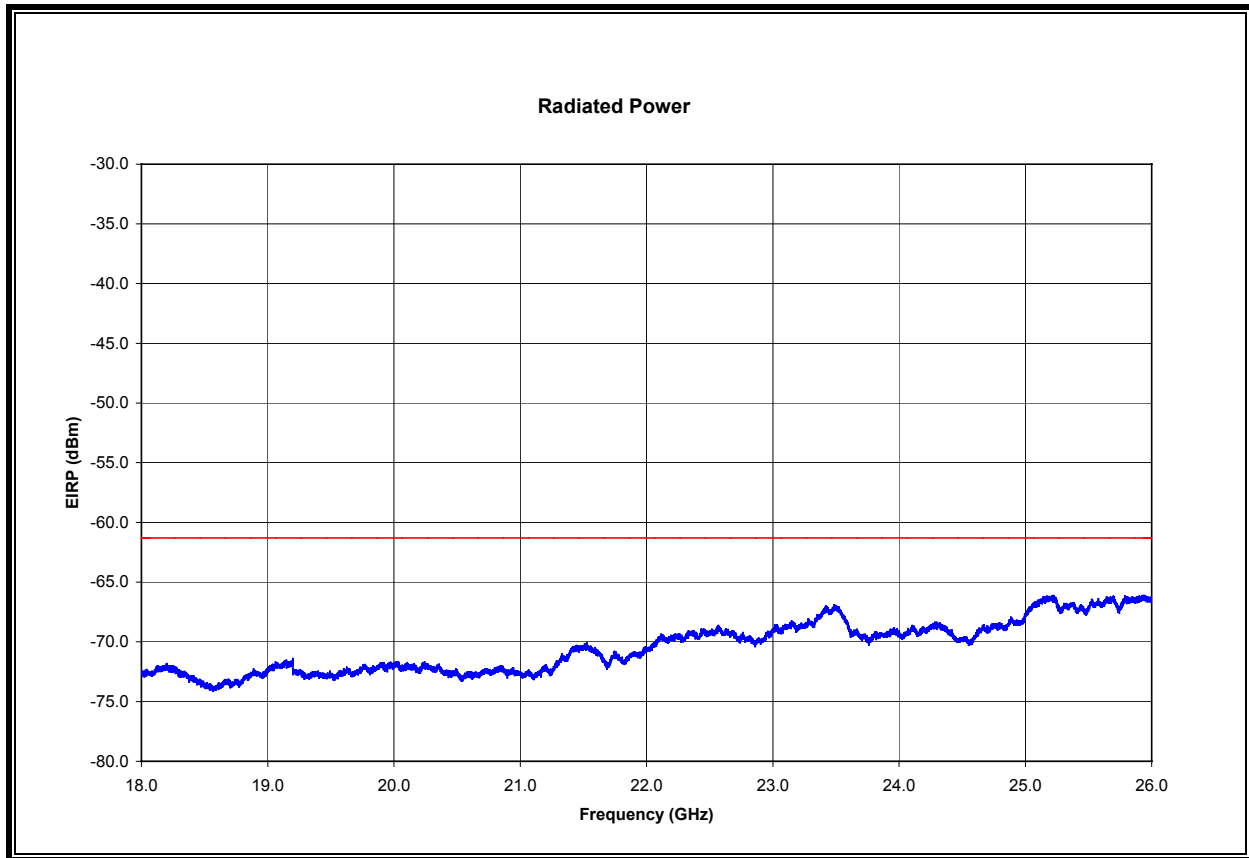
**EIRP 10.6 TO 18 GHz, 1 MHz BW, HORIZONTAL**



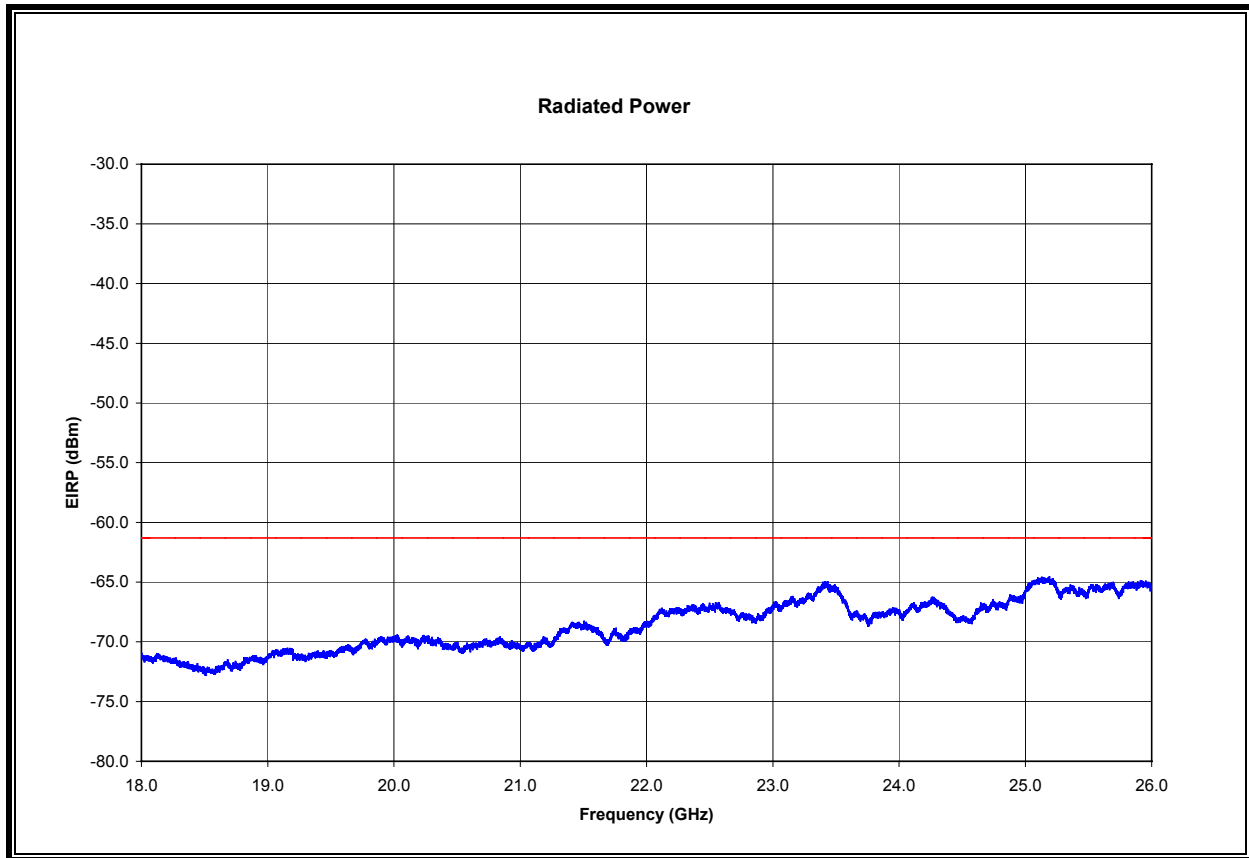
**EIRP 10.6 TO 18 GHz, 1 MHz BW, VERTICAL**



**EIRP 18 TO 26 GHz, 1 MHz BW, HORIZONTAL**

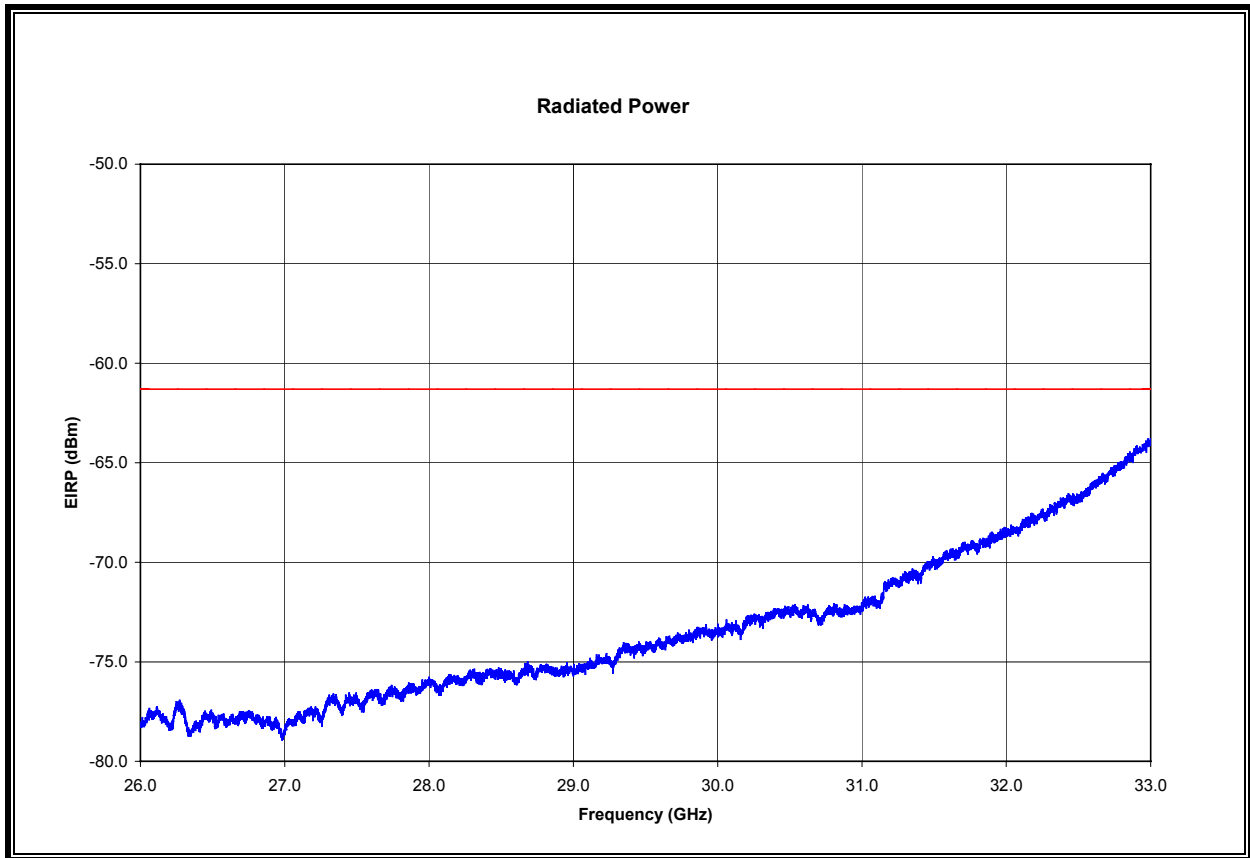


**EIRP 18 TO 26 GHz, 1 MHz BW, VERTICAL**

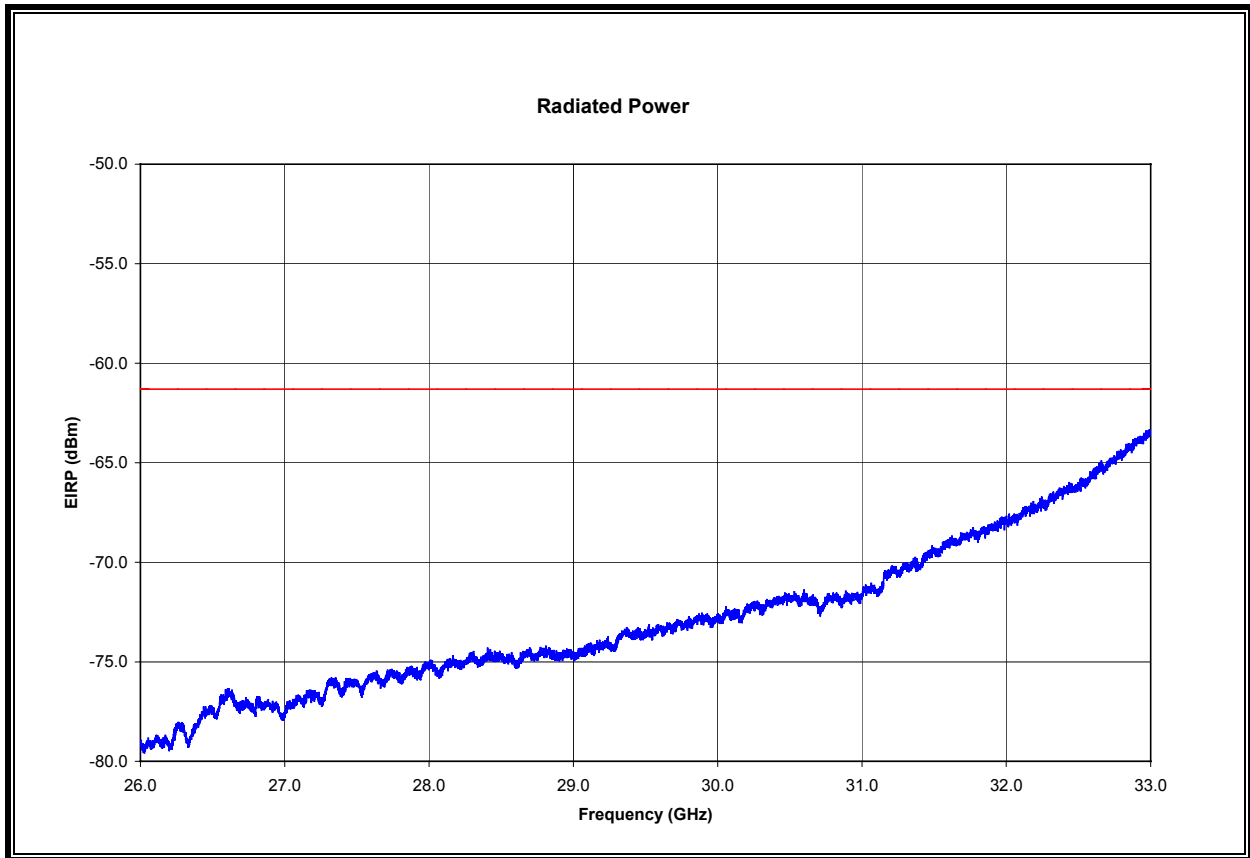




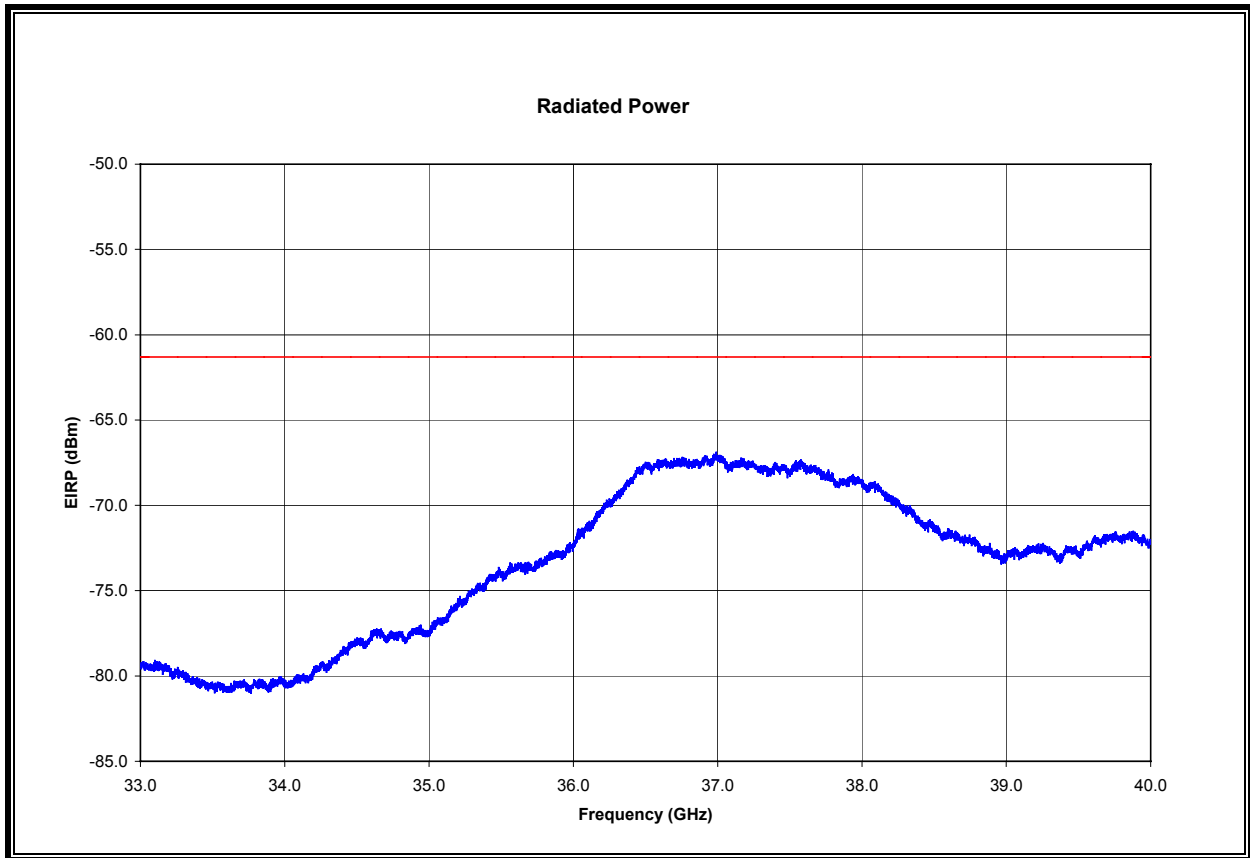
**EIRP 26 TO 33 GHz, 1 MHz BW, HORIZONTAL**



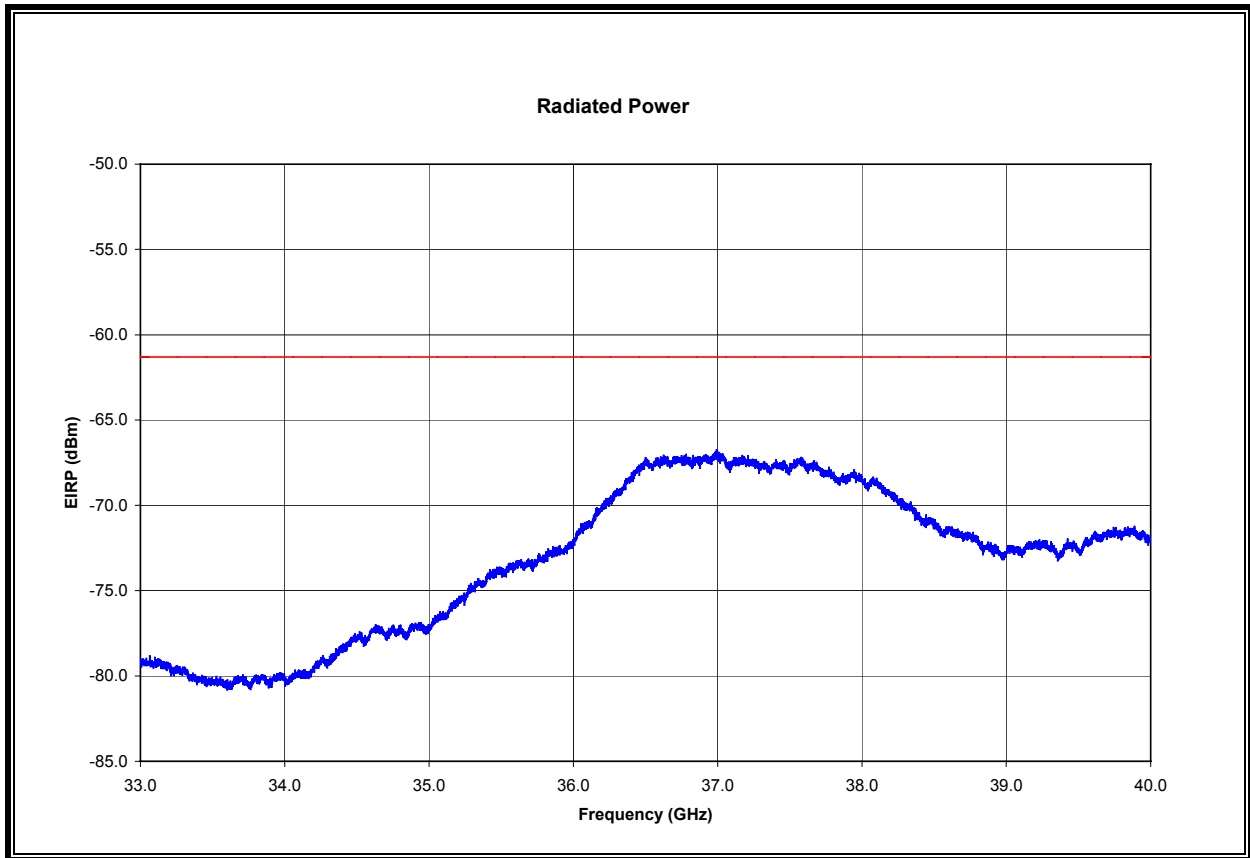
**EIRP 26 TO 33 GHz, 1 MHz BW, VERTICAL**



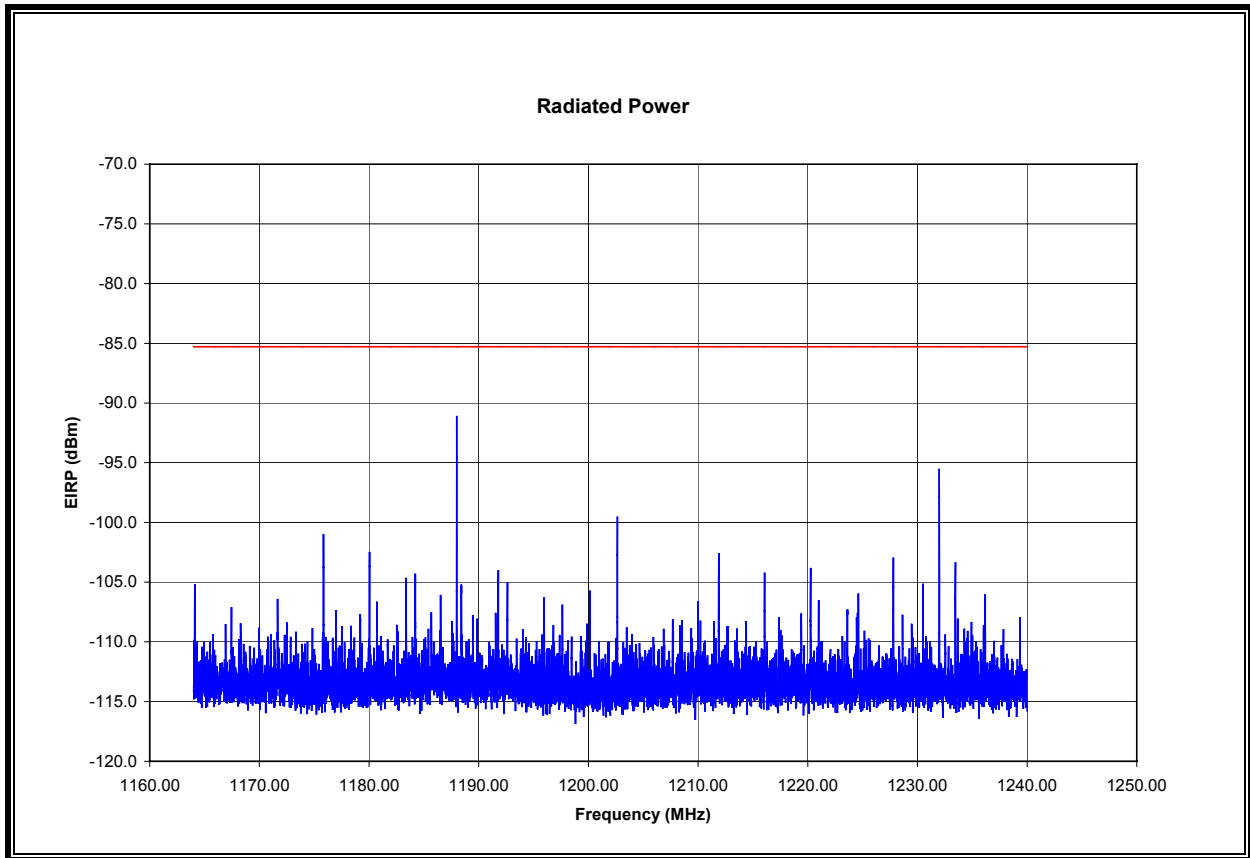
**EIRP 33 TO 40 GHz, 1 MHz BW, HORIZONTAL**



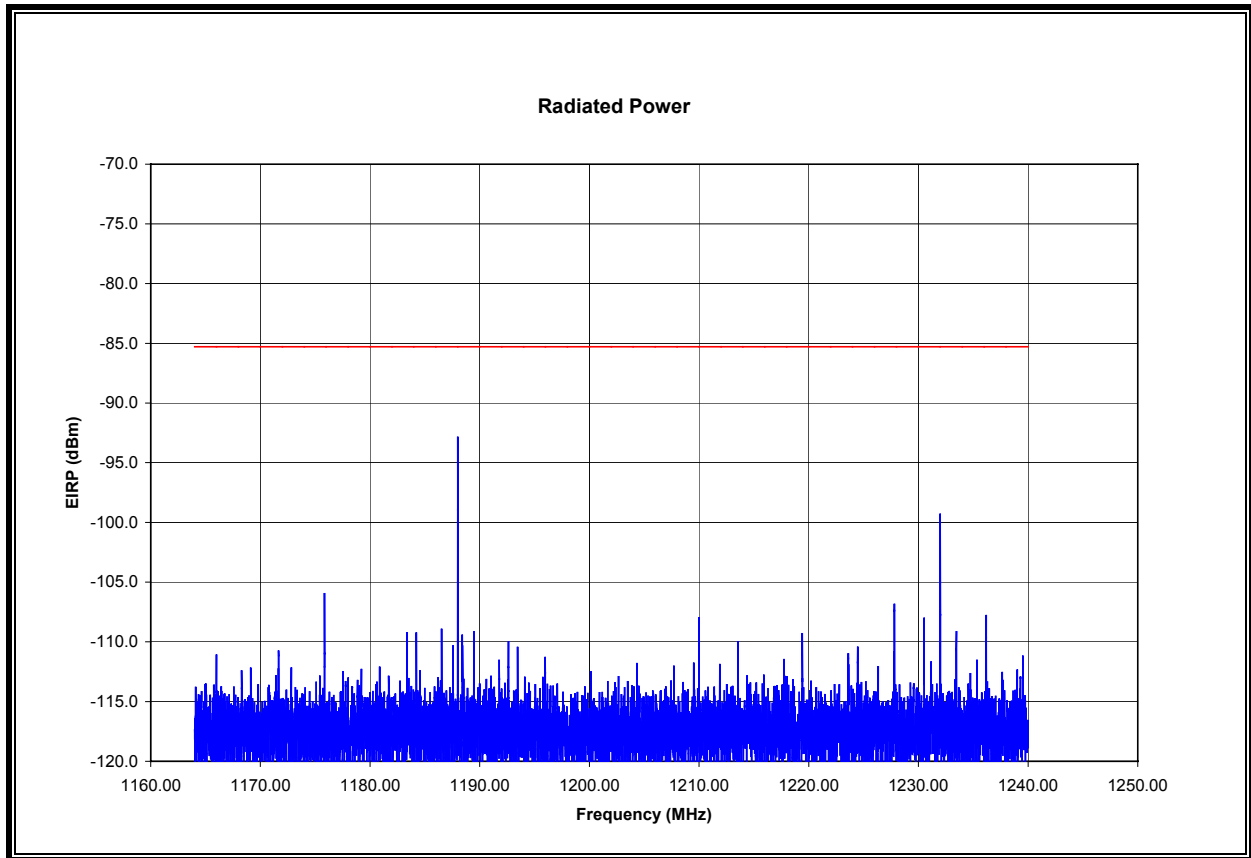
**EIRP 33 TO 40 GHz, 1 MHz BW, VERTICAL**



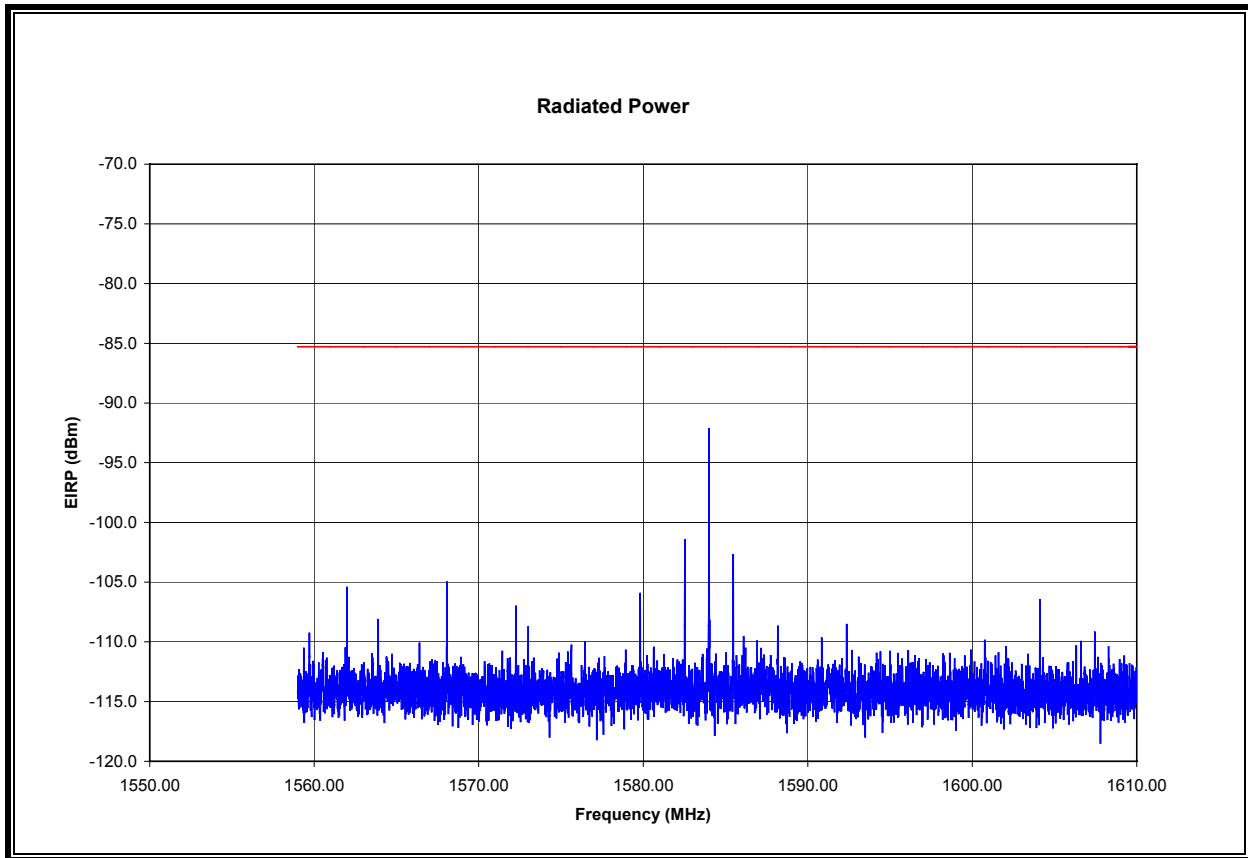
**EIRP 1.164 TO 1.240 GHz, 1 kHz BW, HORIZONTAL**



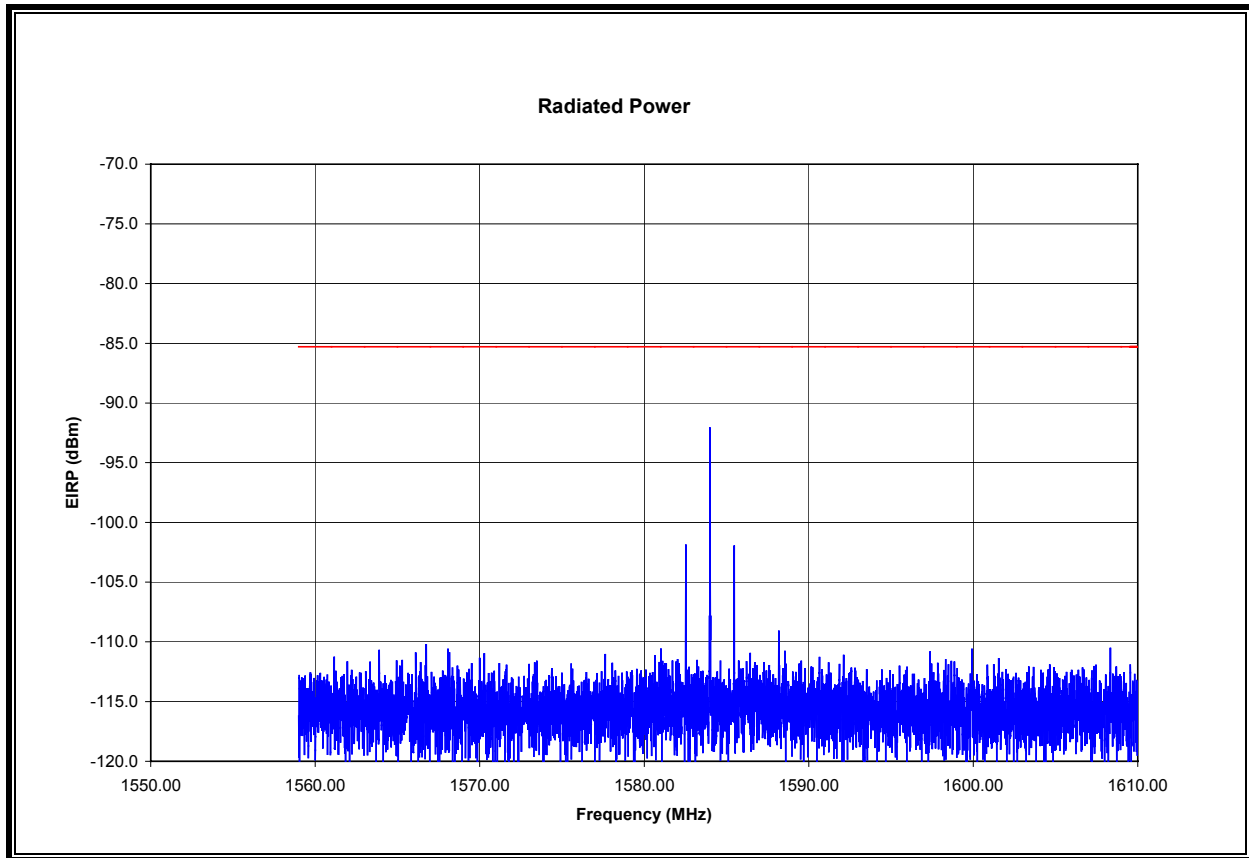
**EIRP 1.164 TO 1.240 GHz, 1 kHz BW, VERTICAL**



**EIRP 1.559 TO 1.610 GHz, 1 kHz BW, HORIZONTAL**



**EIRP 1.559 TO 1.610 GHz, 1 kHz BW, VERTICAL**

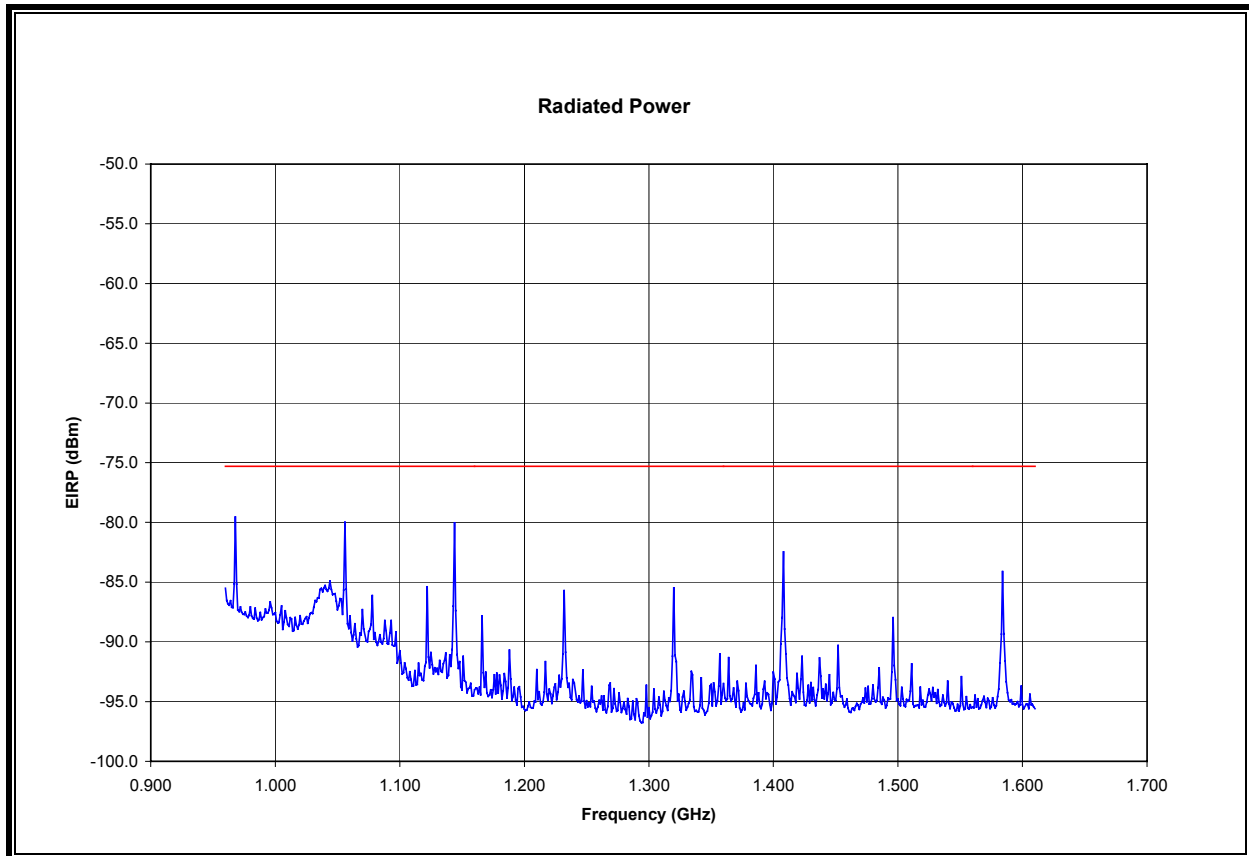




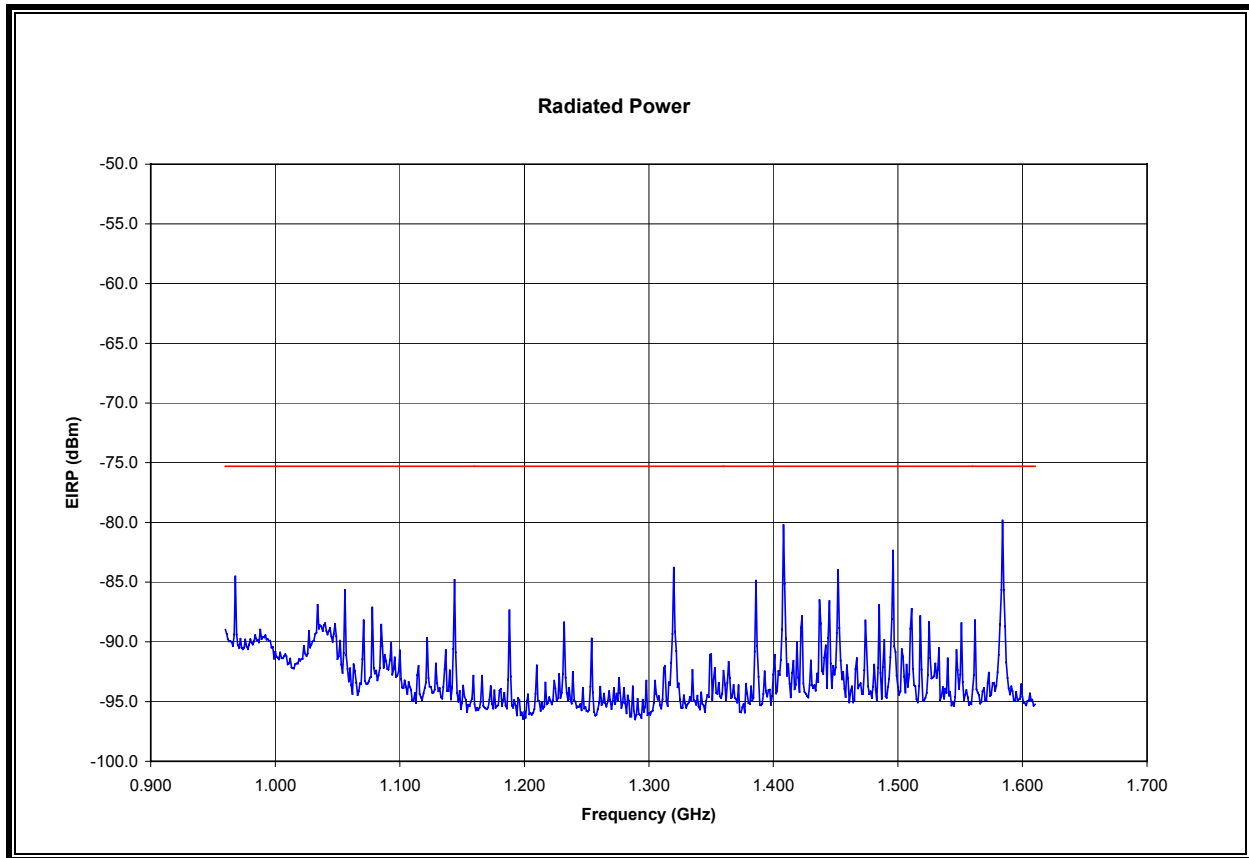
### 7.3.4. HIGH CHANNEL EMISSIONS

#### RESULTS

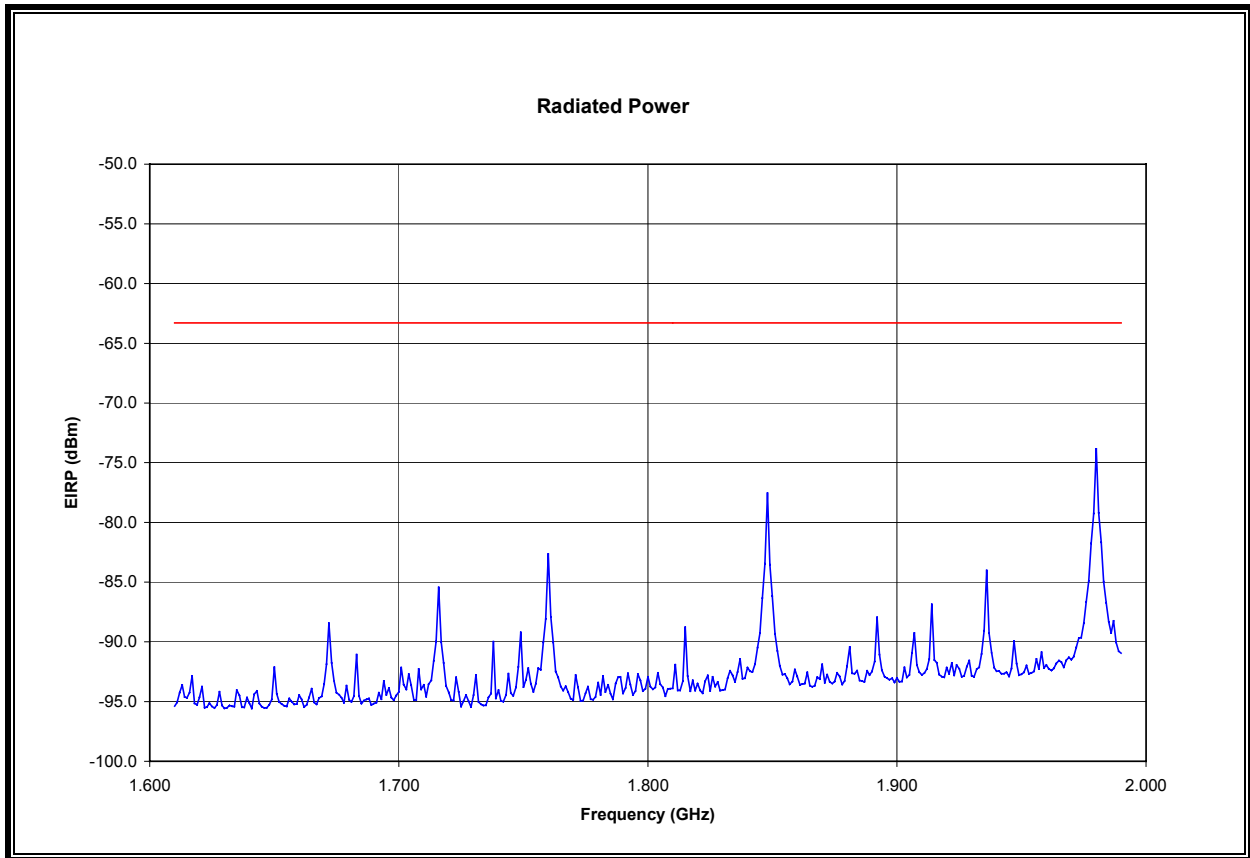
#### EIRP 0.960 TO 1.610 GHz, 1 MHz BW, HORIZONTAL



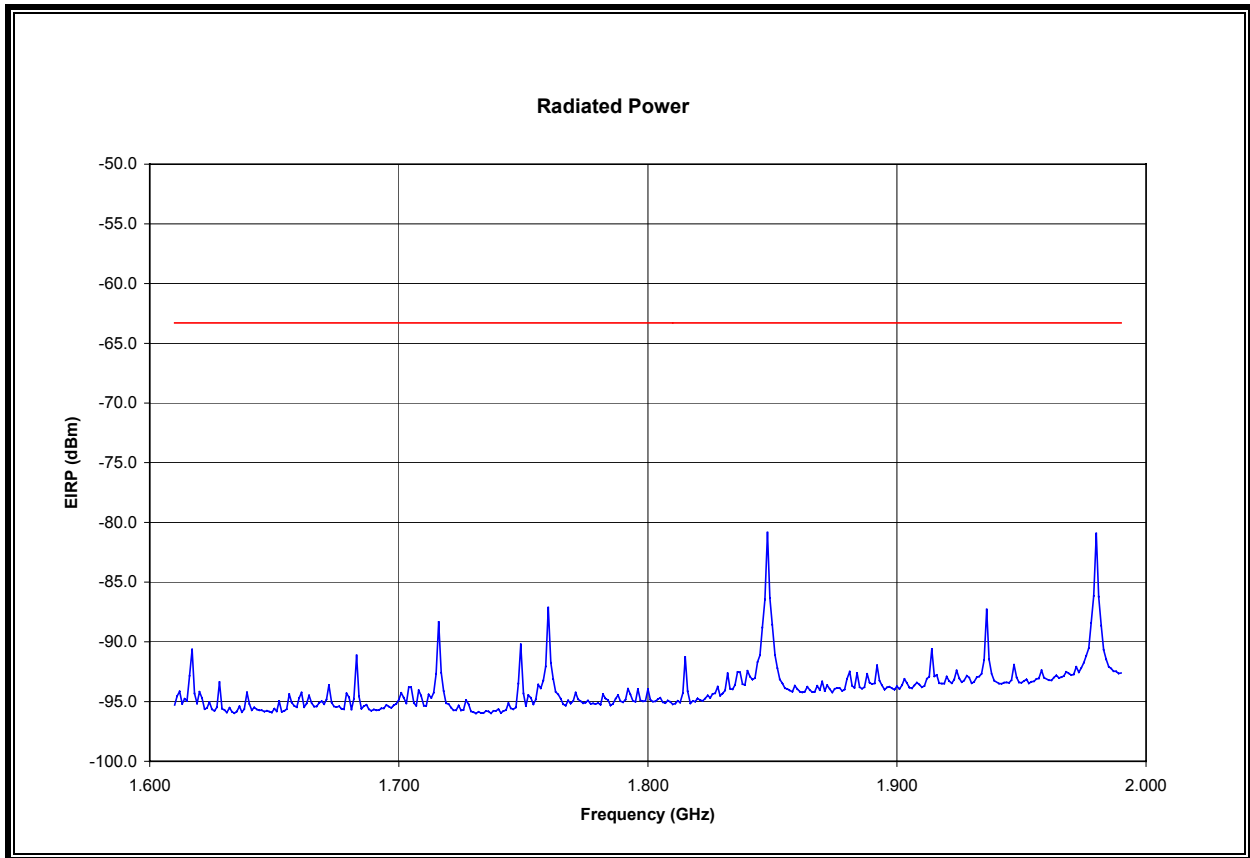
**EIRP 0.960 TO 1.610 GHz, 1 MHz BW, VERTICAL**



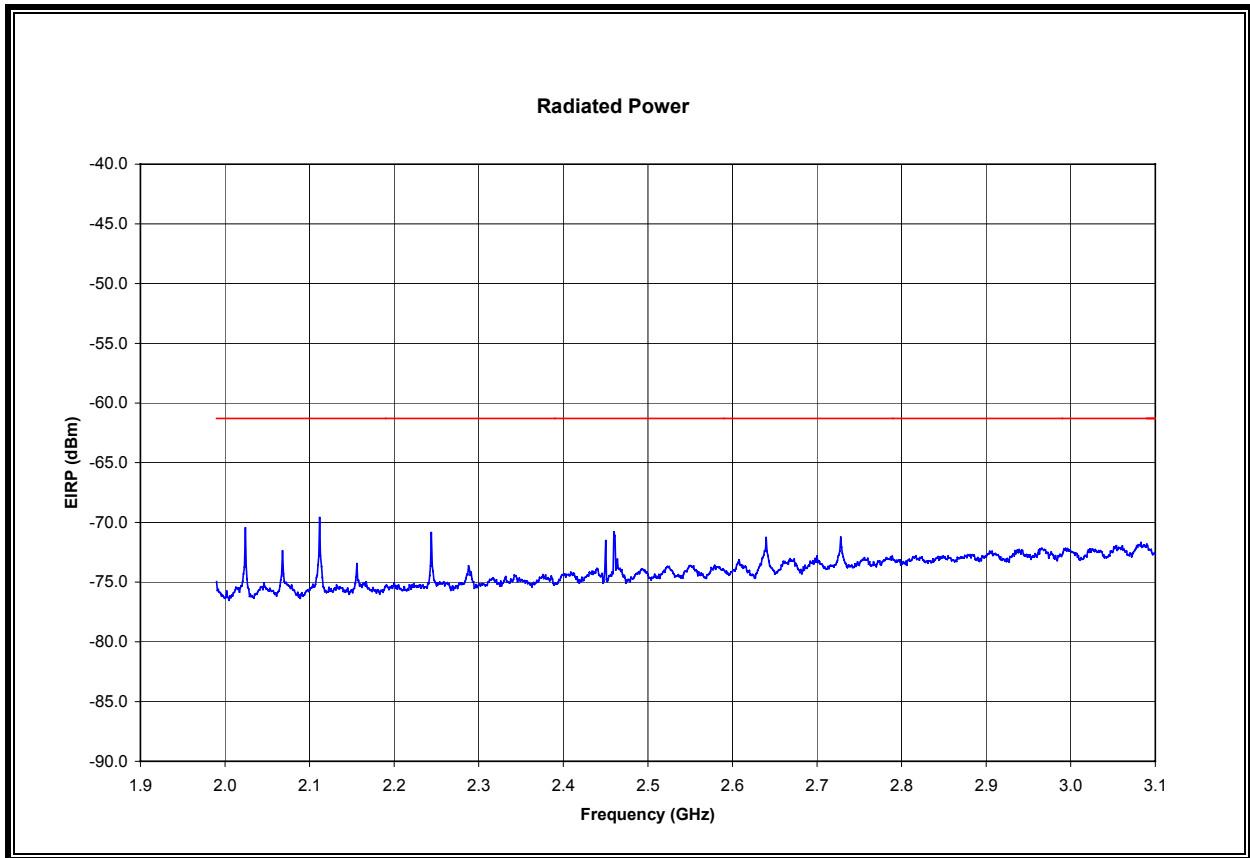
**EIRP 1.610 TO 1.990 GHz, 1 MHz BW, HORIZONTAL**



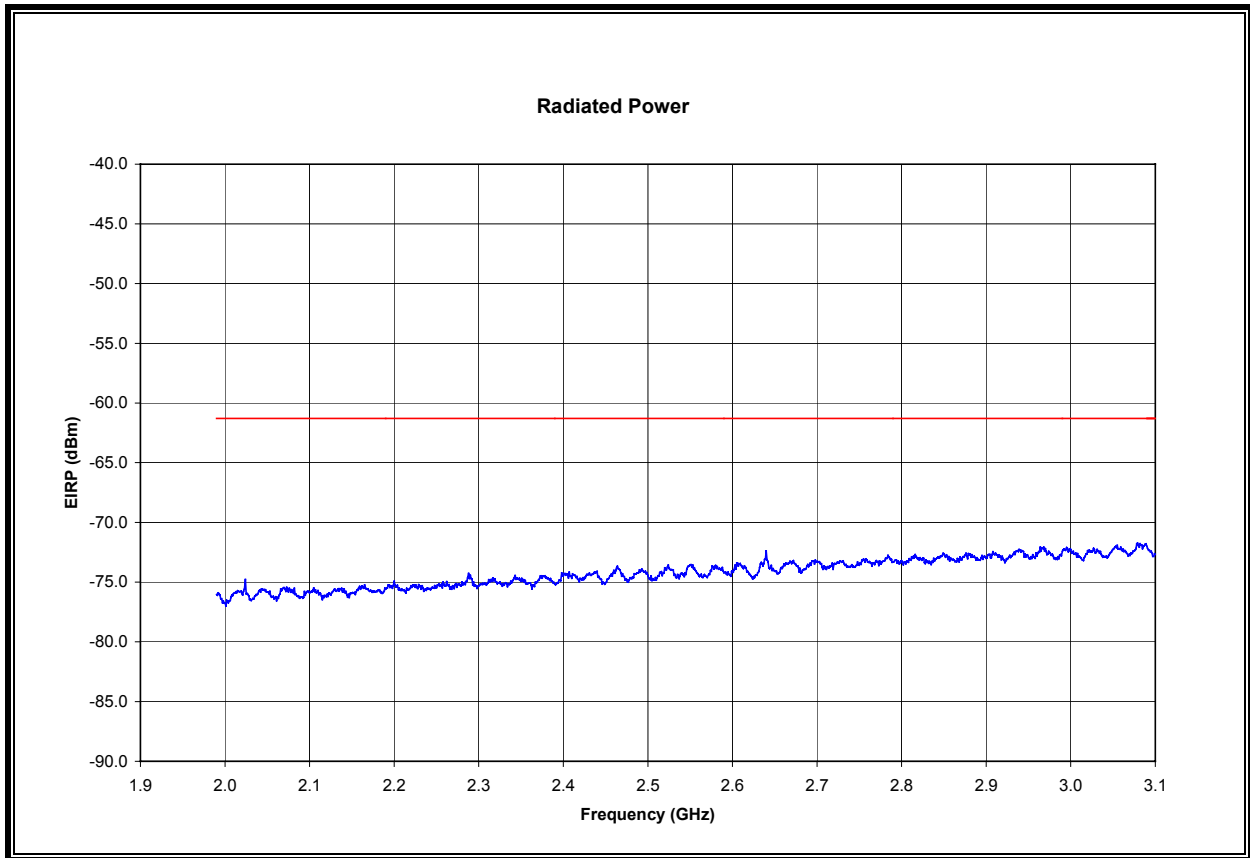
**EIRP 1.610 TO 1.990 GHz, 1 MHz BW, VERTICAL**



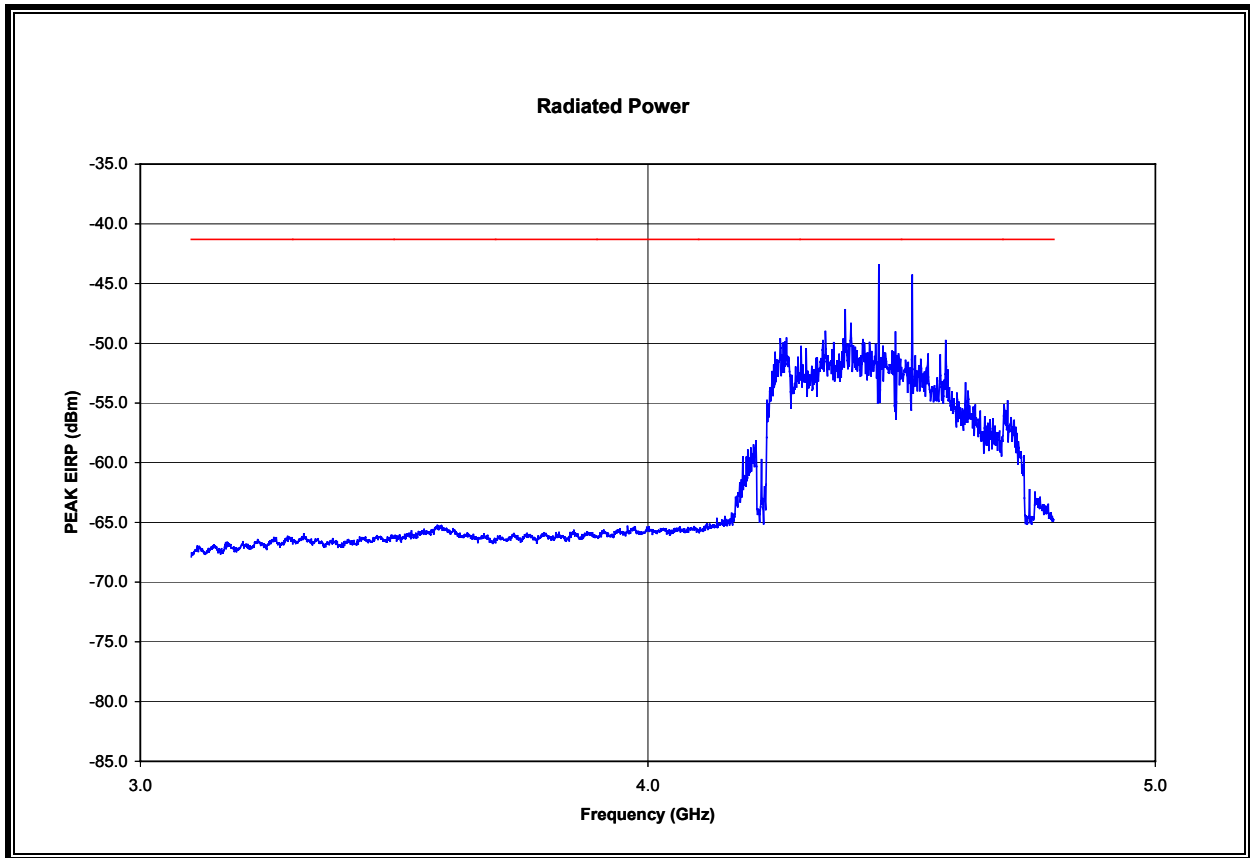
**EIRP 1.990 TO 3.100 GHz, 1 MHz BW, HORIZONTAL**



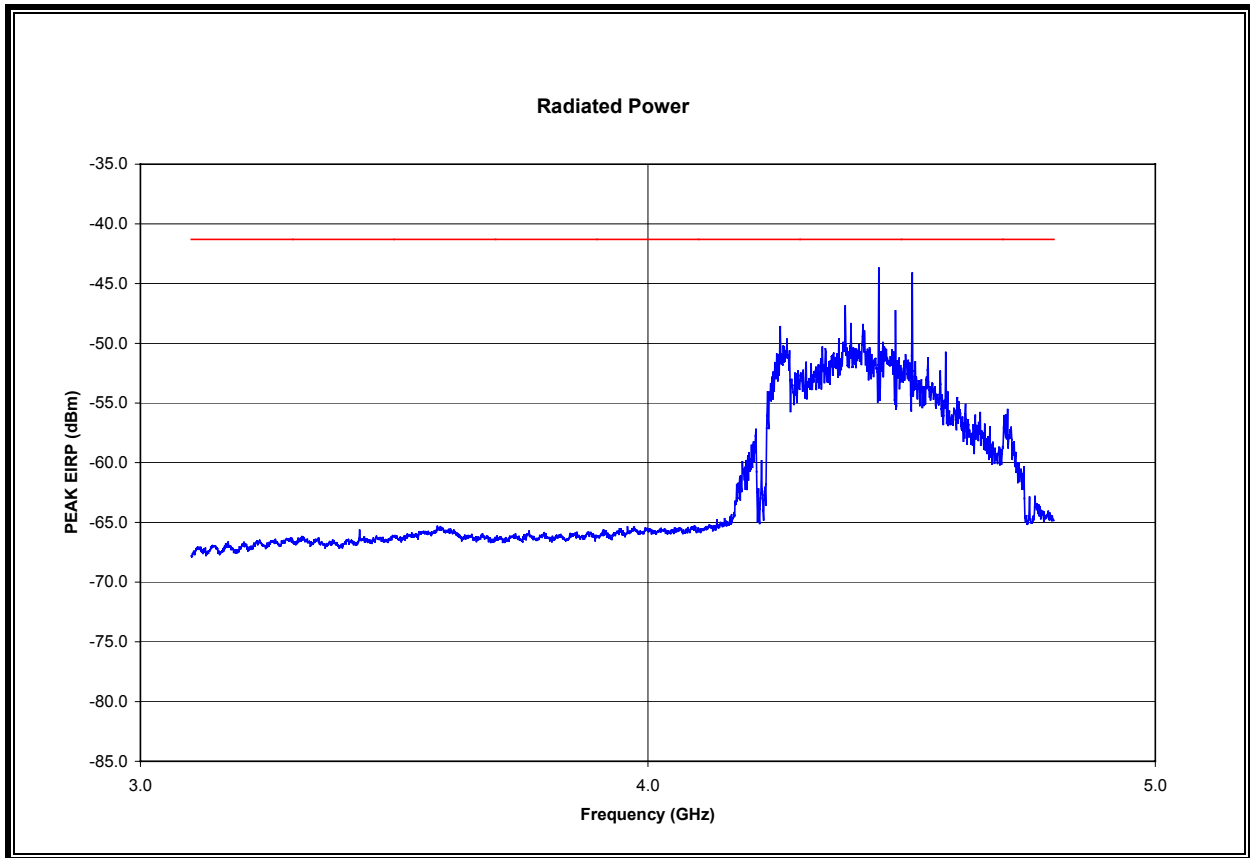
**EIRP 1.990 TO 3.100 GHz, 1 MHz BW, VERTICAL**



**EIRP 3.1 TO 4.8 GHz, 1 MHz BW, HORIZONTAL**

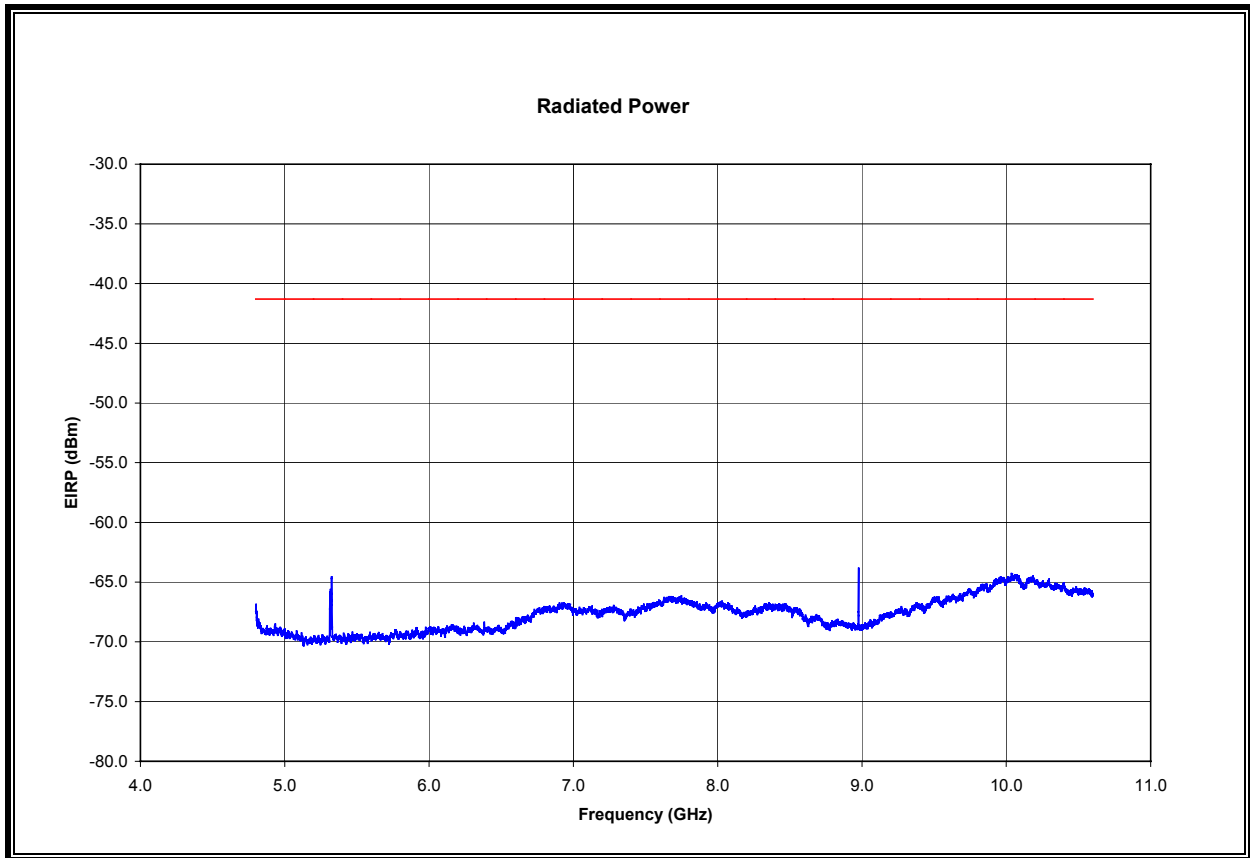


**EIRP 3.1 TO 4.8 GHz, 1 MHz BW, VERTICAL**

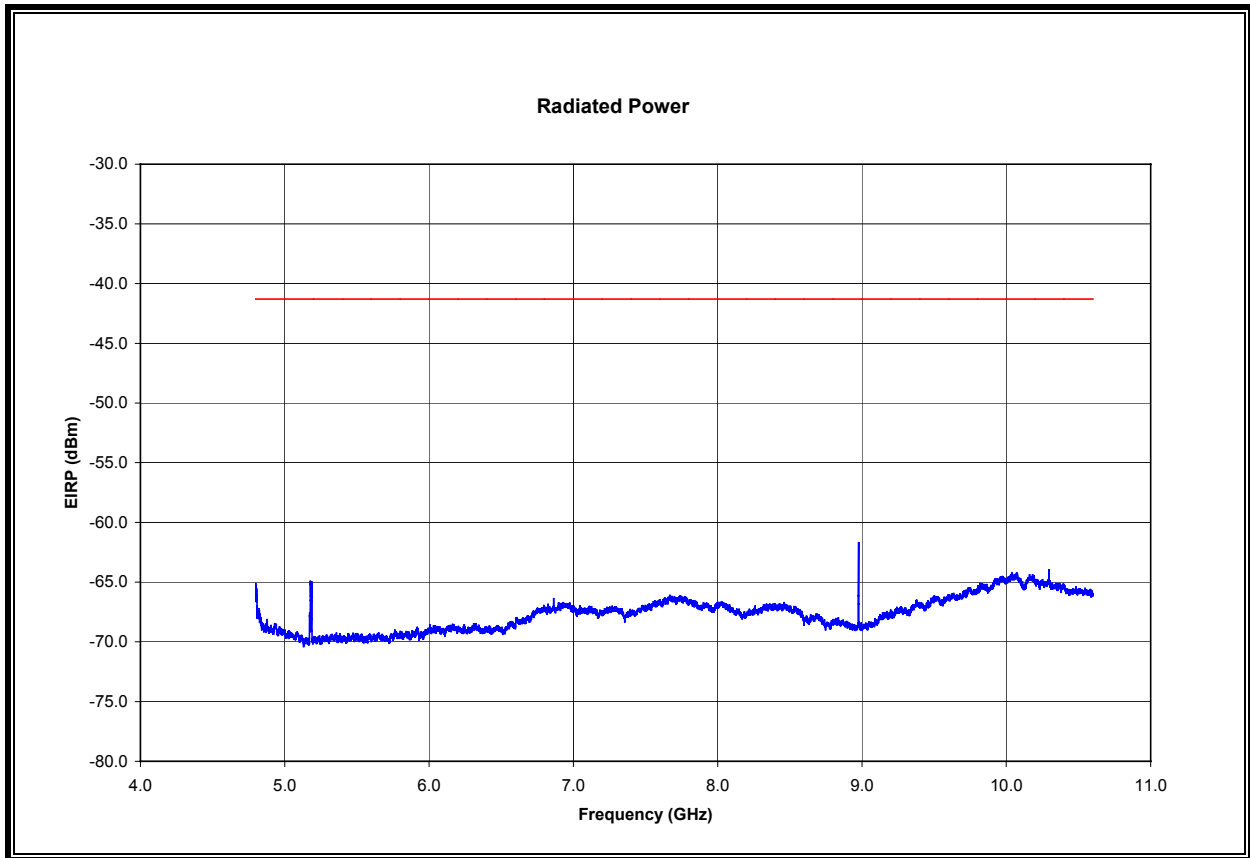




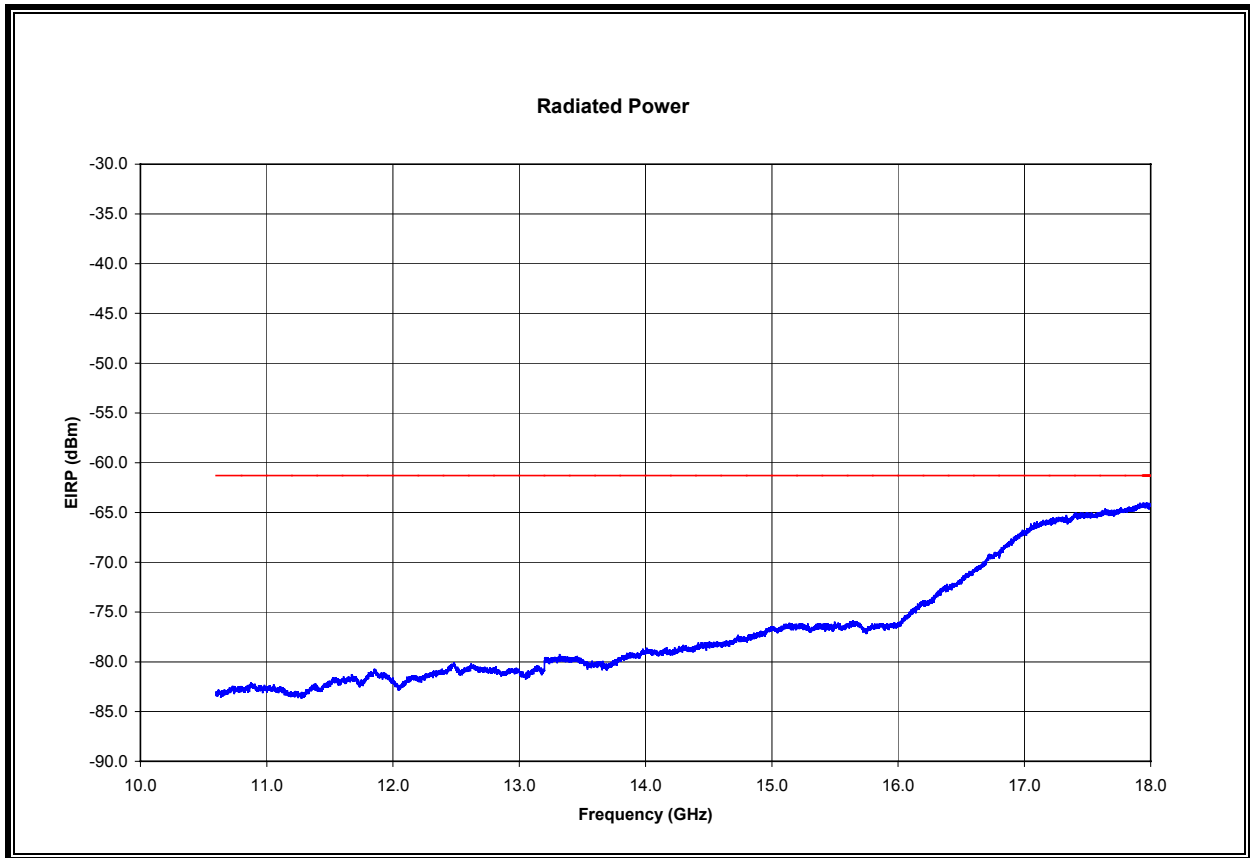
**EIRP 4.8 TO 10.6 GHz, 1 MHz BW, HORIZONTAL**



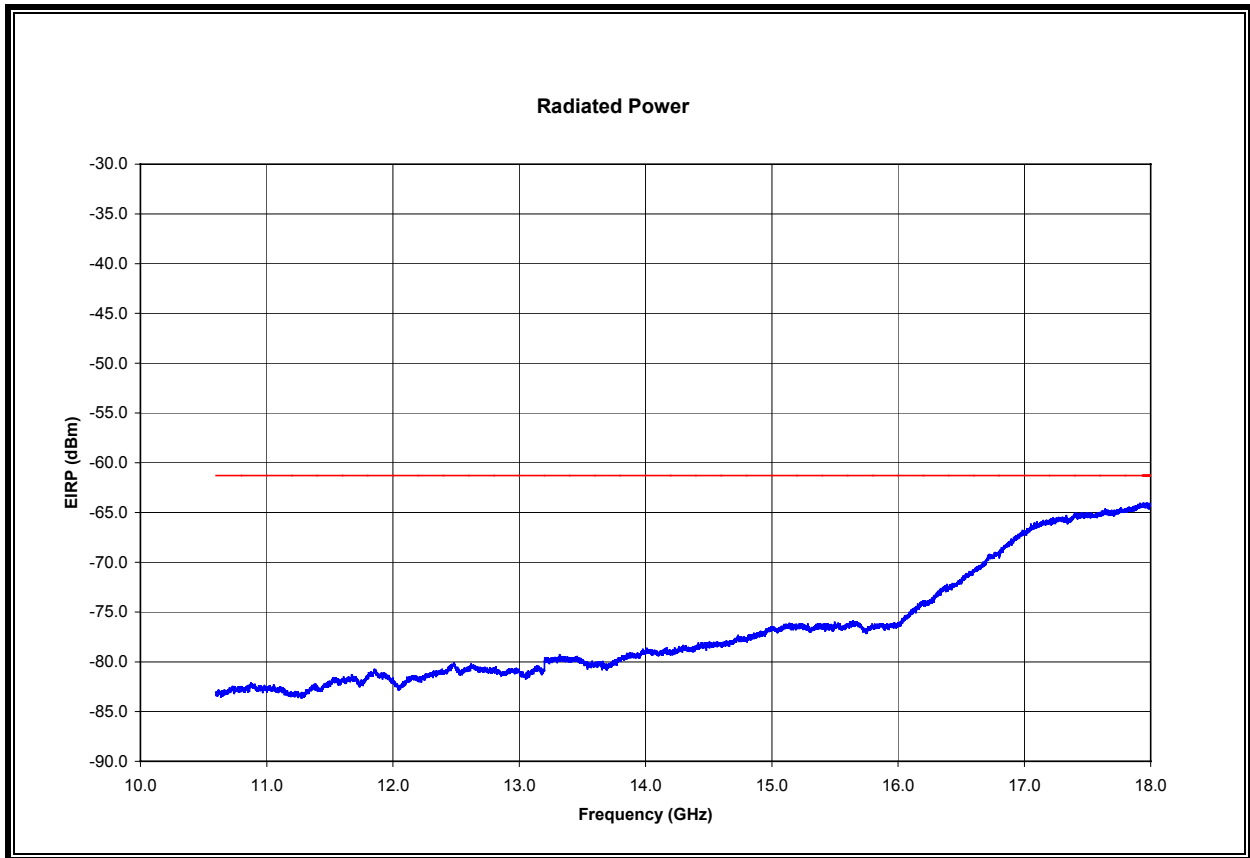
**EIRP 4.8 TO 10.6 GHz, 1 MHz BW, VERTICAL**



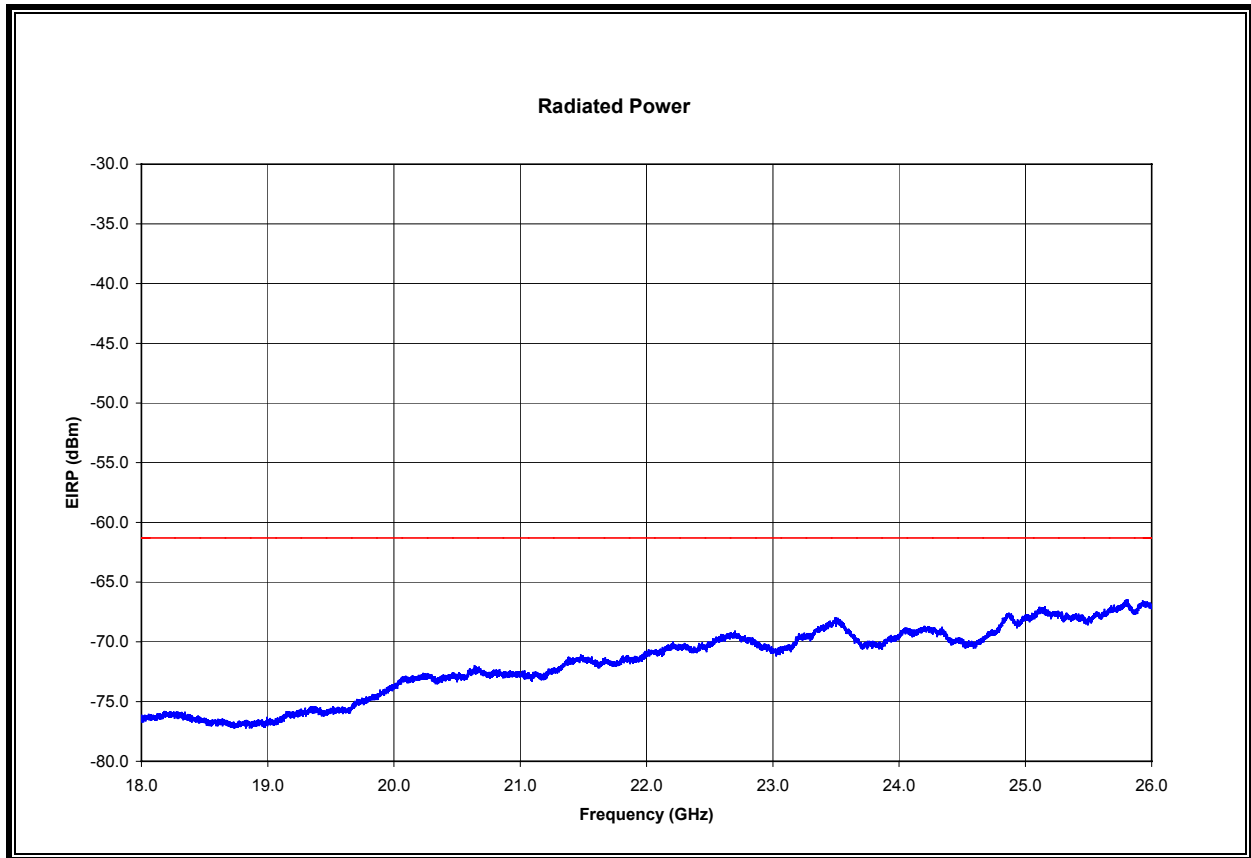
**EIRP 10.6 TO 18 GHz, 1 MHz BW, HORIZONTAL**



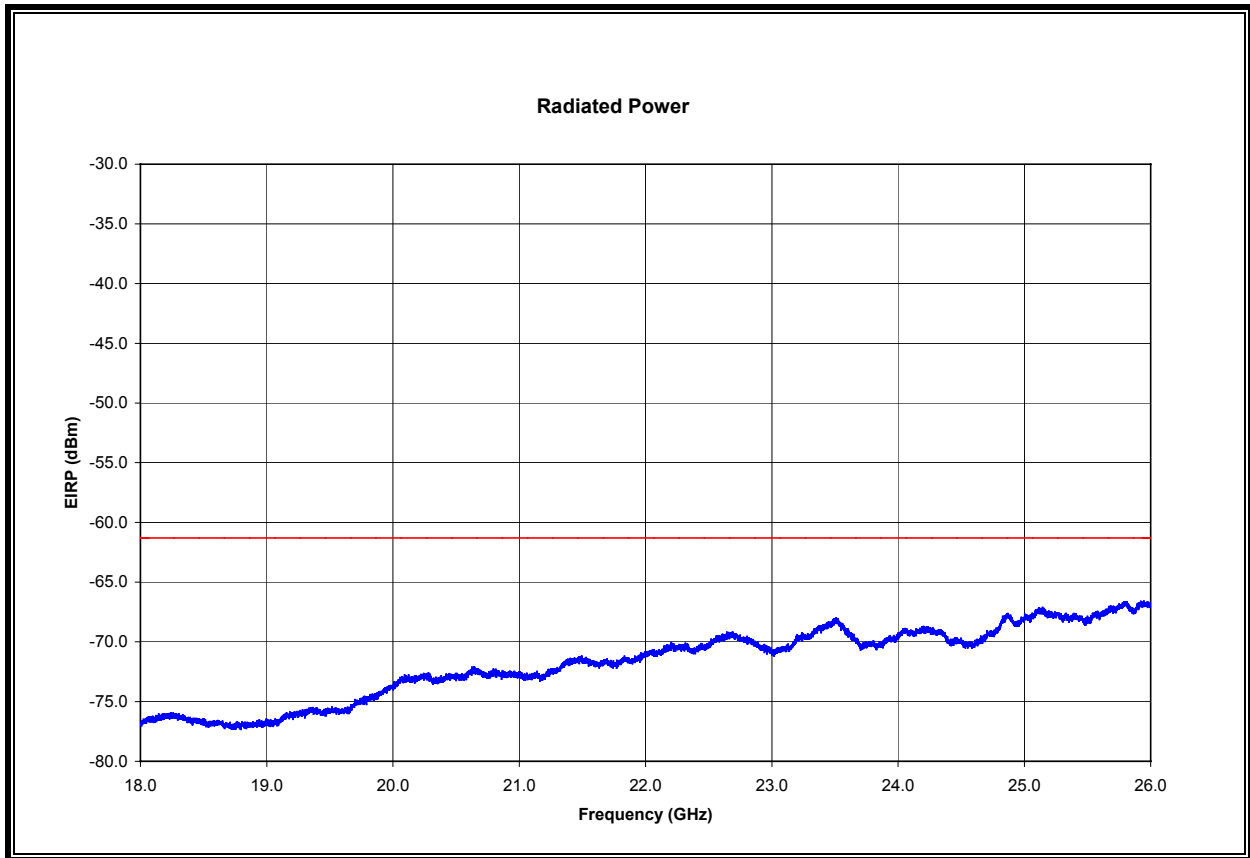
**EIRP 10.6 TO 18 GHz, 1 MHz BW, VERTICAL**



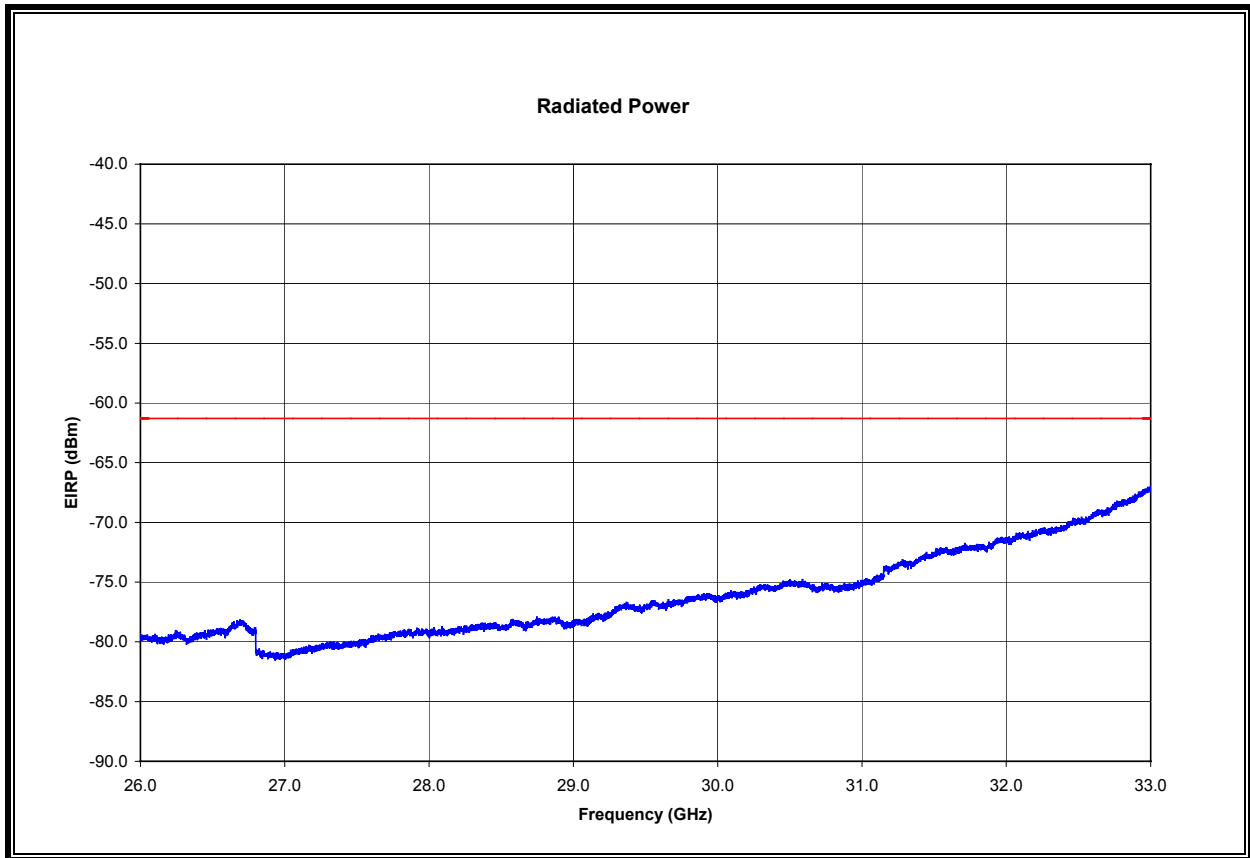
**EIRP 18 TO 26 GHz, 1 MHz BW, HORIZONTAL**



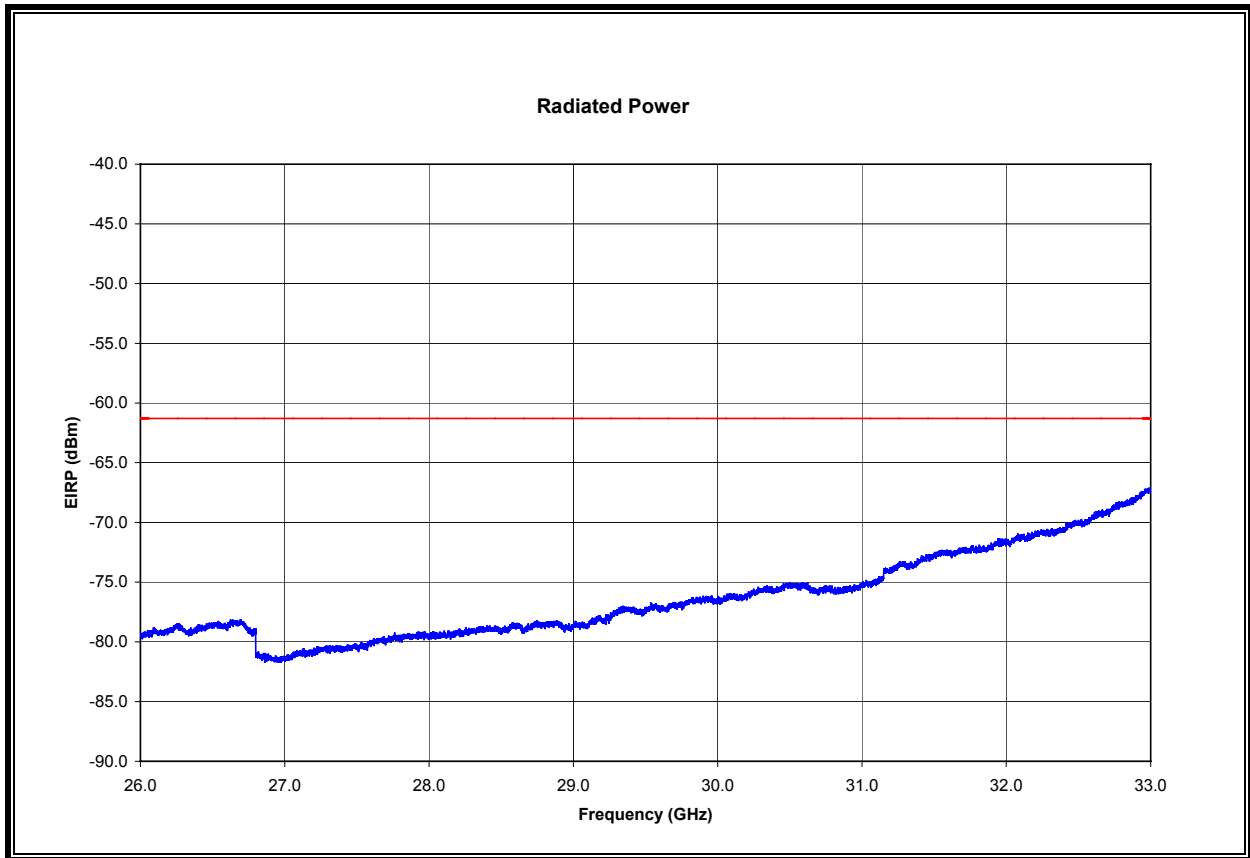
**EIRP 18 TO 26 GHz, 1 MHz BW, VERTICAL**



**EIRP 26 TO 33 GHz, 1 MHz BW, HORIZONTAL**

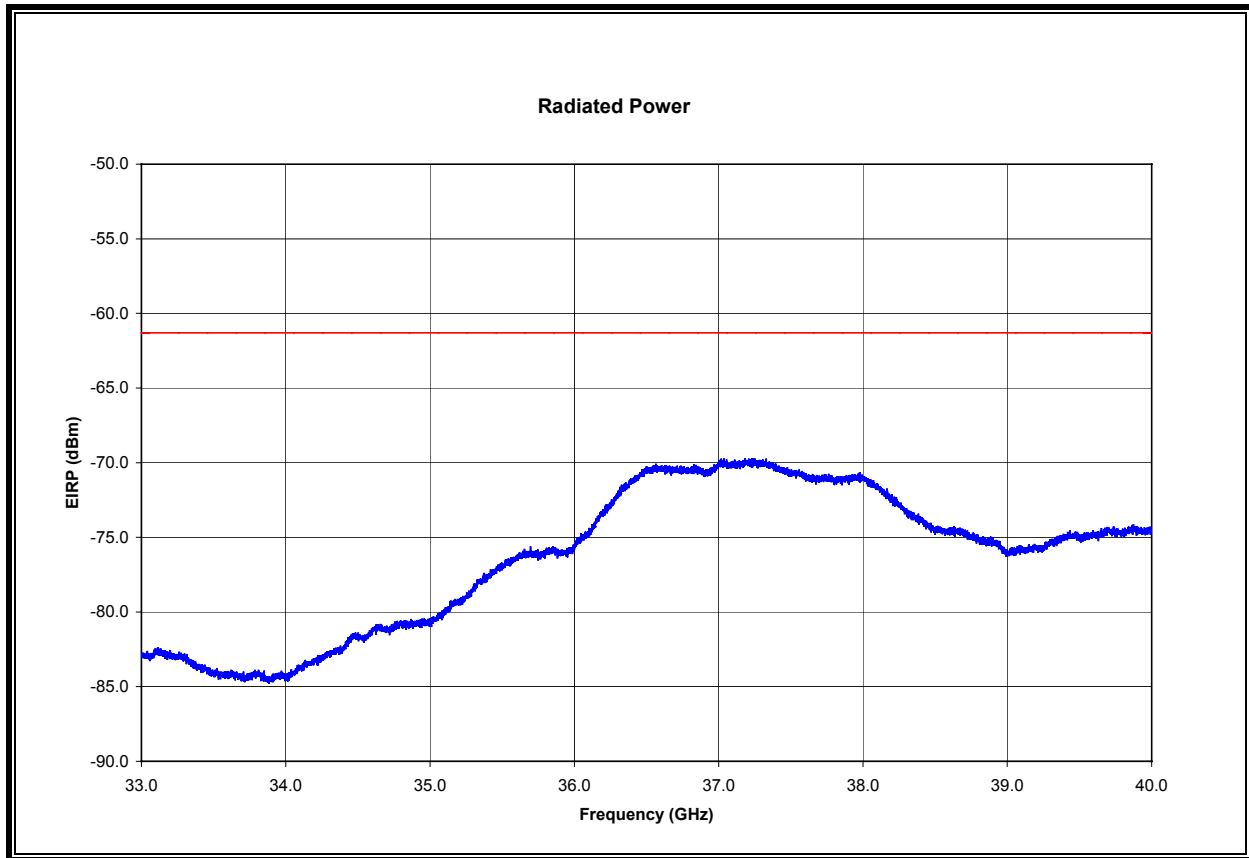


**EIRP 26 TO 33 GHz, 1 MHz BW, VERTICAL**

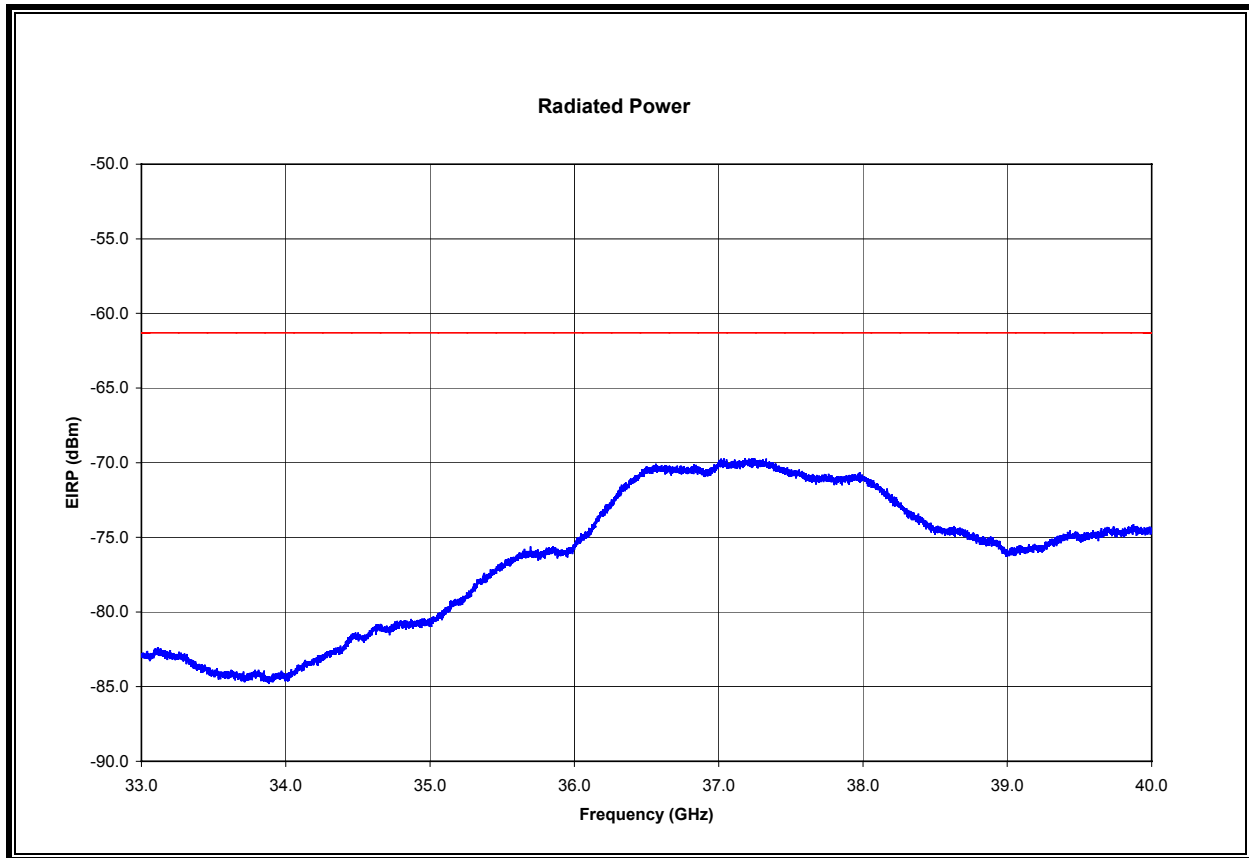




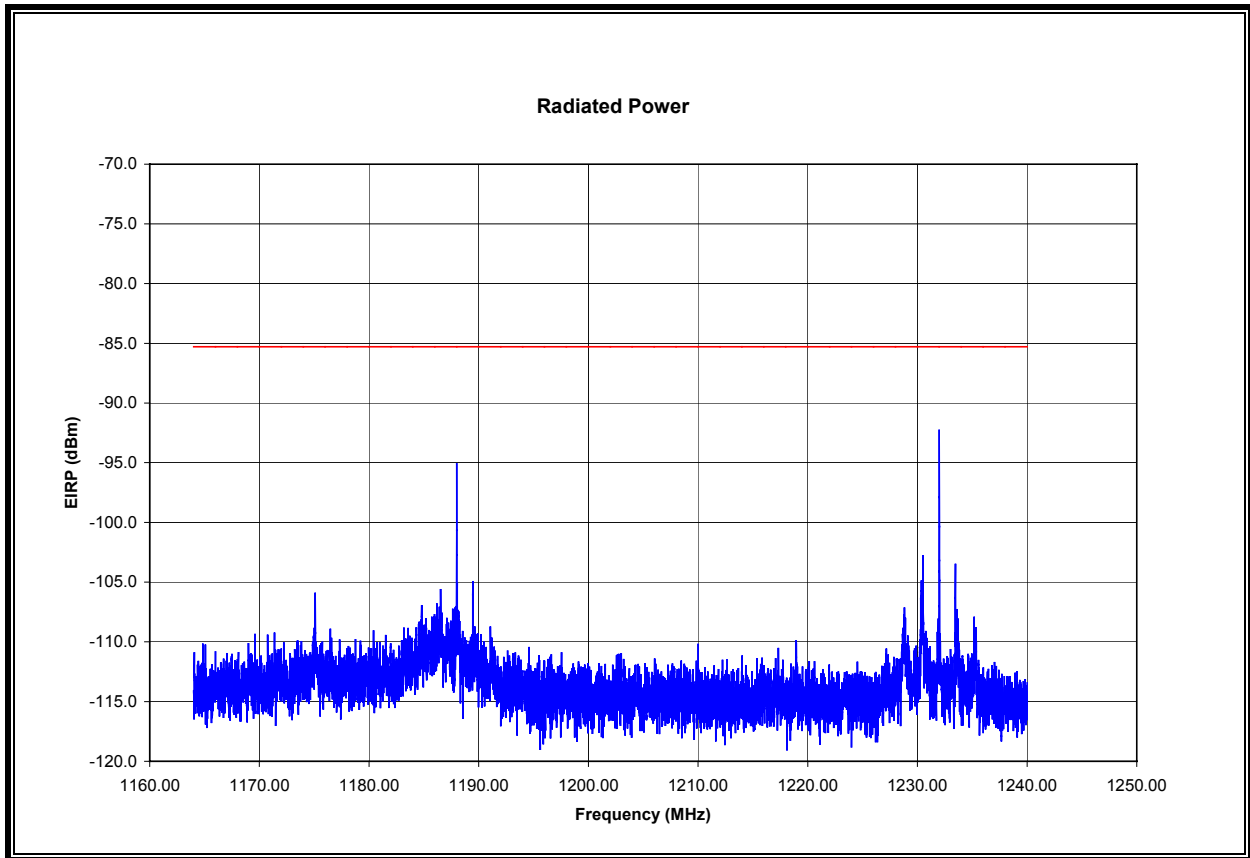
**EIRP 33 TO 40 GHz, 1 MHz BW, HORIZONTAL**



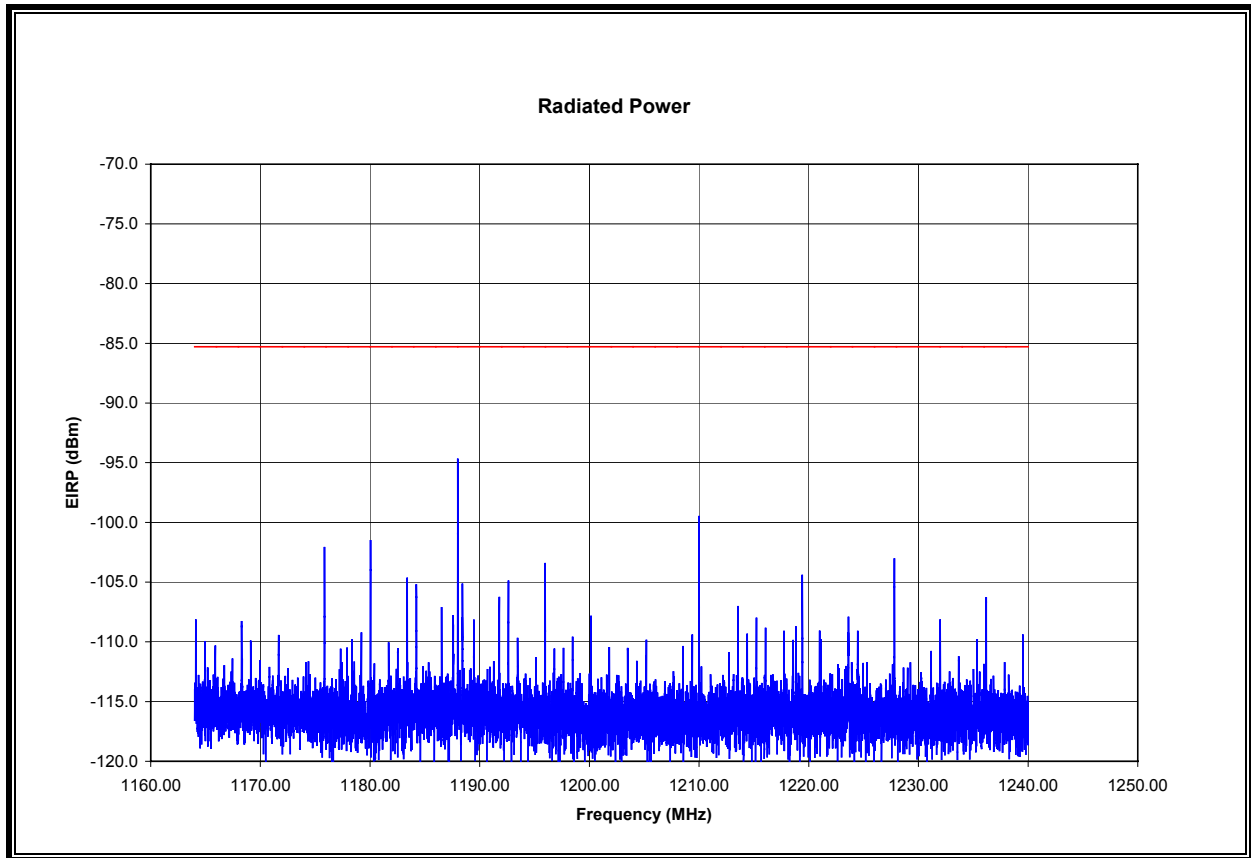
**EIRP 33 TO 40 GHz, 1 MHz BW, VERTICAL**



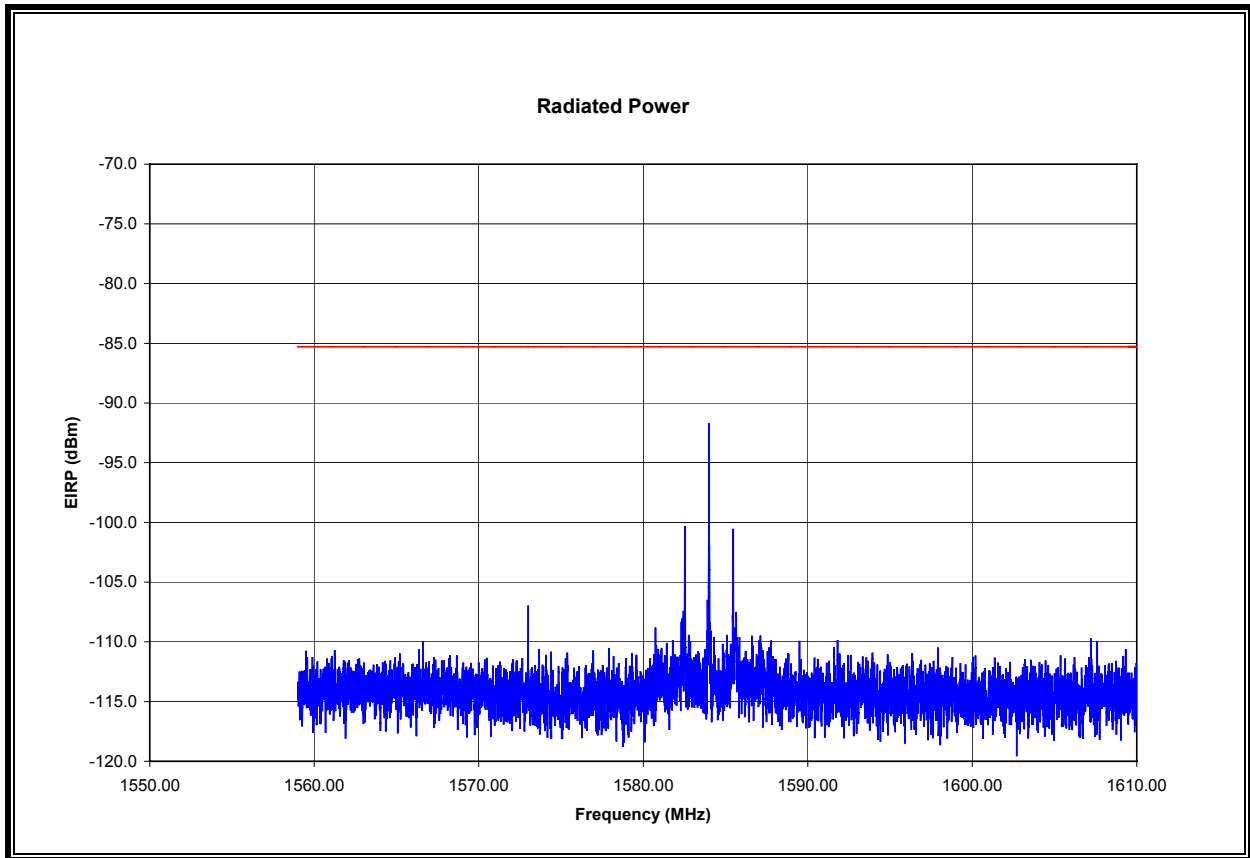
**EIRP 1.164 TO 1.240 GHz, 1 kHz BW, HORIZONTAL**



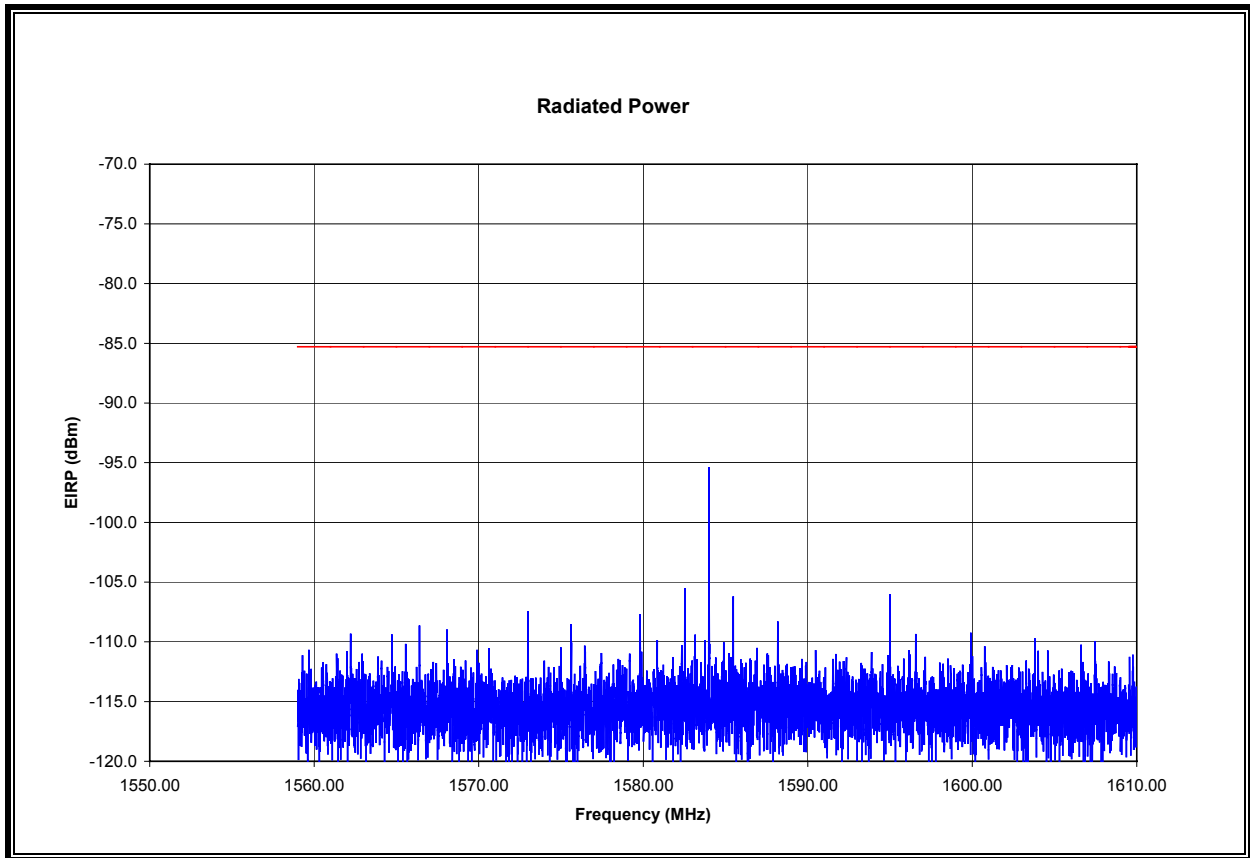
**EIRP 1.164 TO 1.240 GHz, 1 kHz BW, VERTICAL**



**EIRP 1.559 TO 1.610 GHz, 1 kHz BW, HORIZONTAL**



**EIRP 1.559 TO 1.610 GHz, 1 kHz BW, VERTICAL**

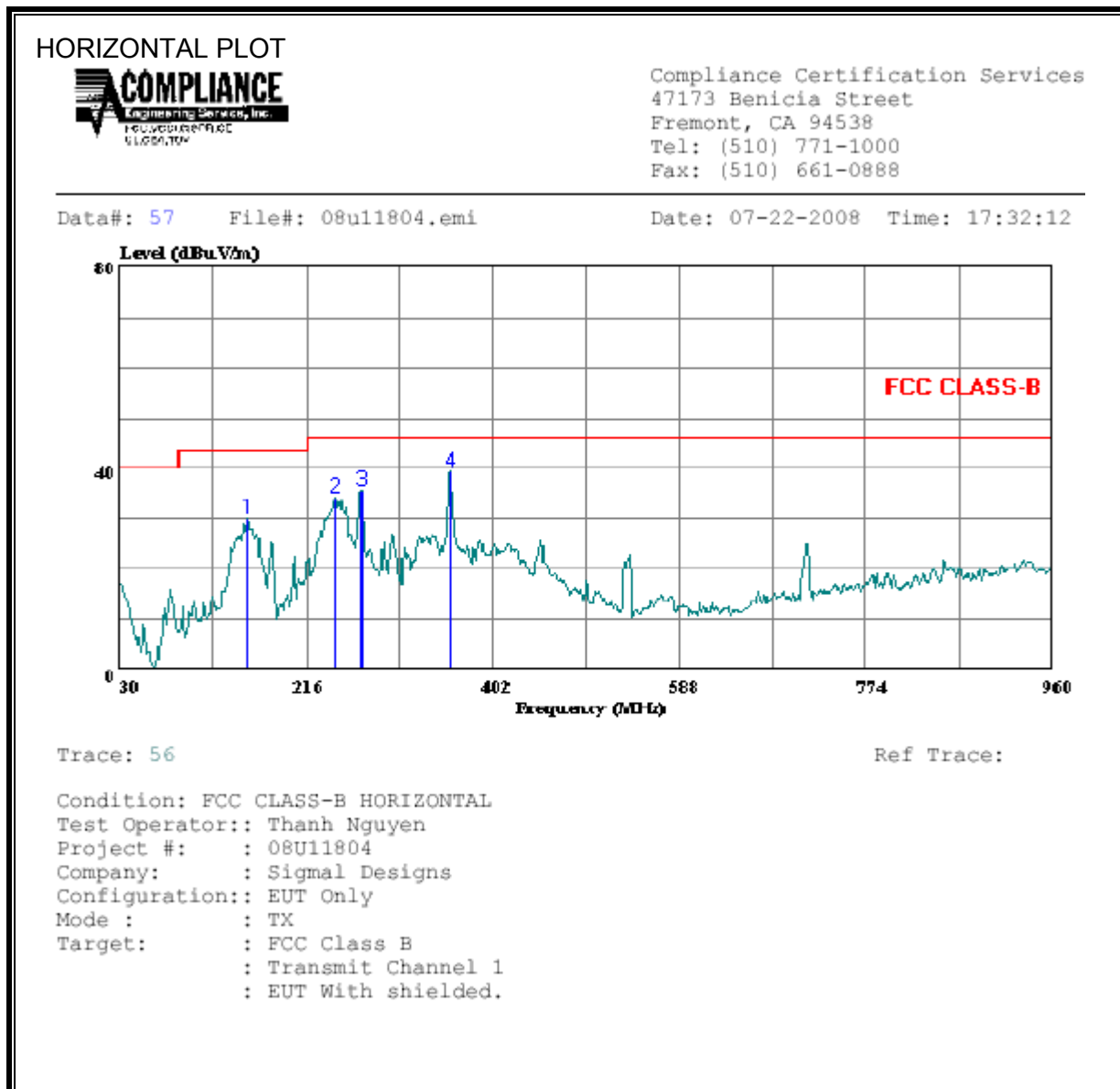


## 7.4. RADIATED EMISSIONS BELOW 960 MHz

§15.519 (c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209.

### 7.4.1. LOW CHANNEL EMISSIONS

#### SPURIOUS EMISSIONS 30 TO 960 MHz (HORIZONTAL)

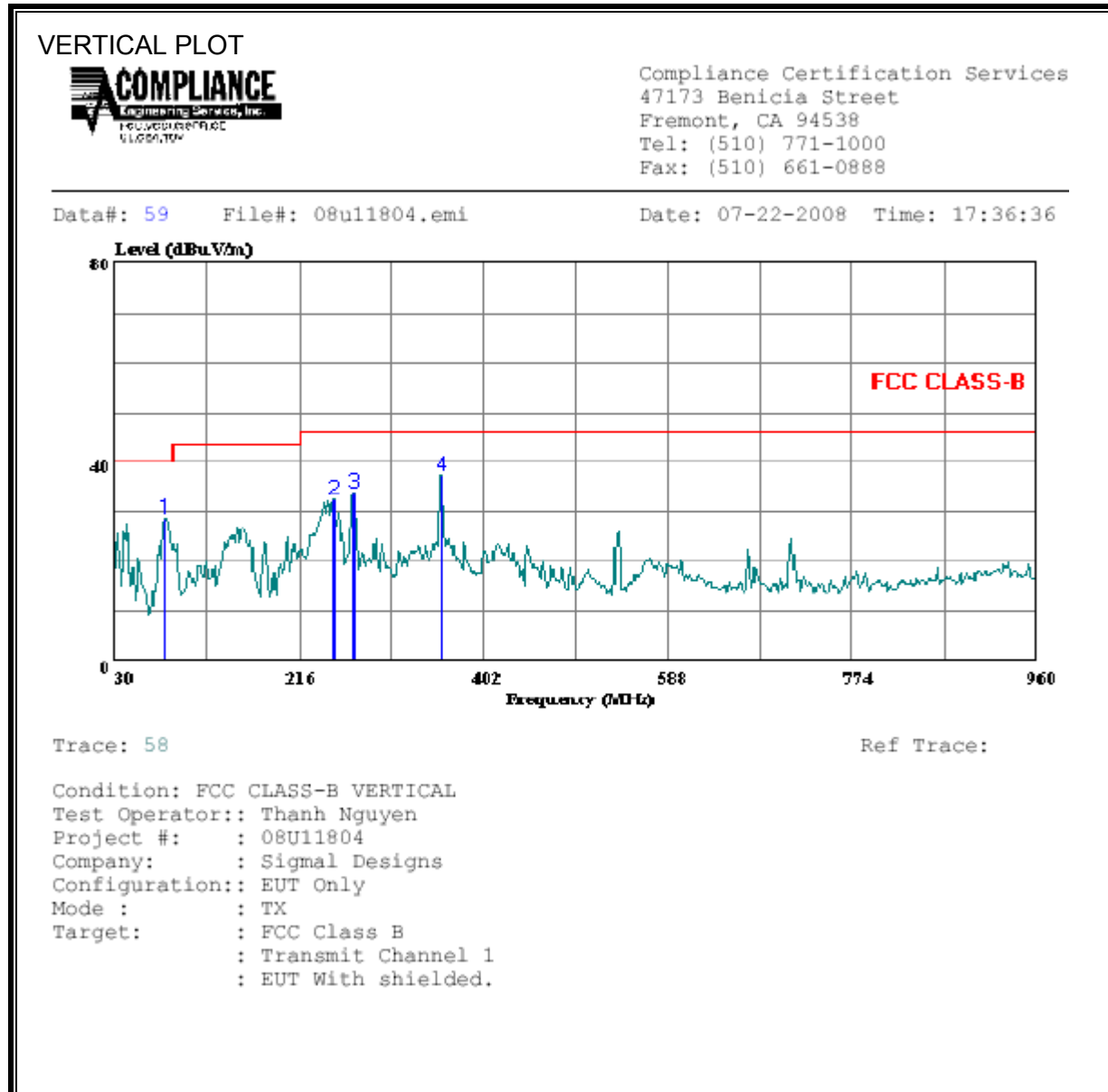


HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	157.410	47.62	-17.63	29.99	43.50	-13.51	Peak
2	245.760	52.31	-17.96	34.35	46.00	-11.65	Peak
3	270.870	52.62	-17.01	35.61	46.00	-10.39	Peak
4	359.220	54.00	-14.45	39.55	46.00	-6.45	Peak



**SPURIOUS EMISSIONS 30 TO 960 MHz (VERTICAL)**

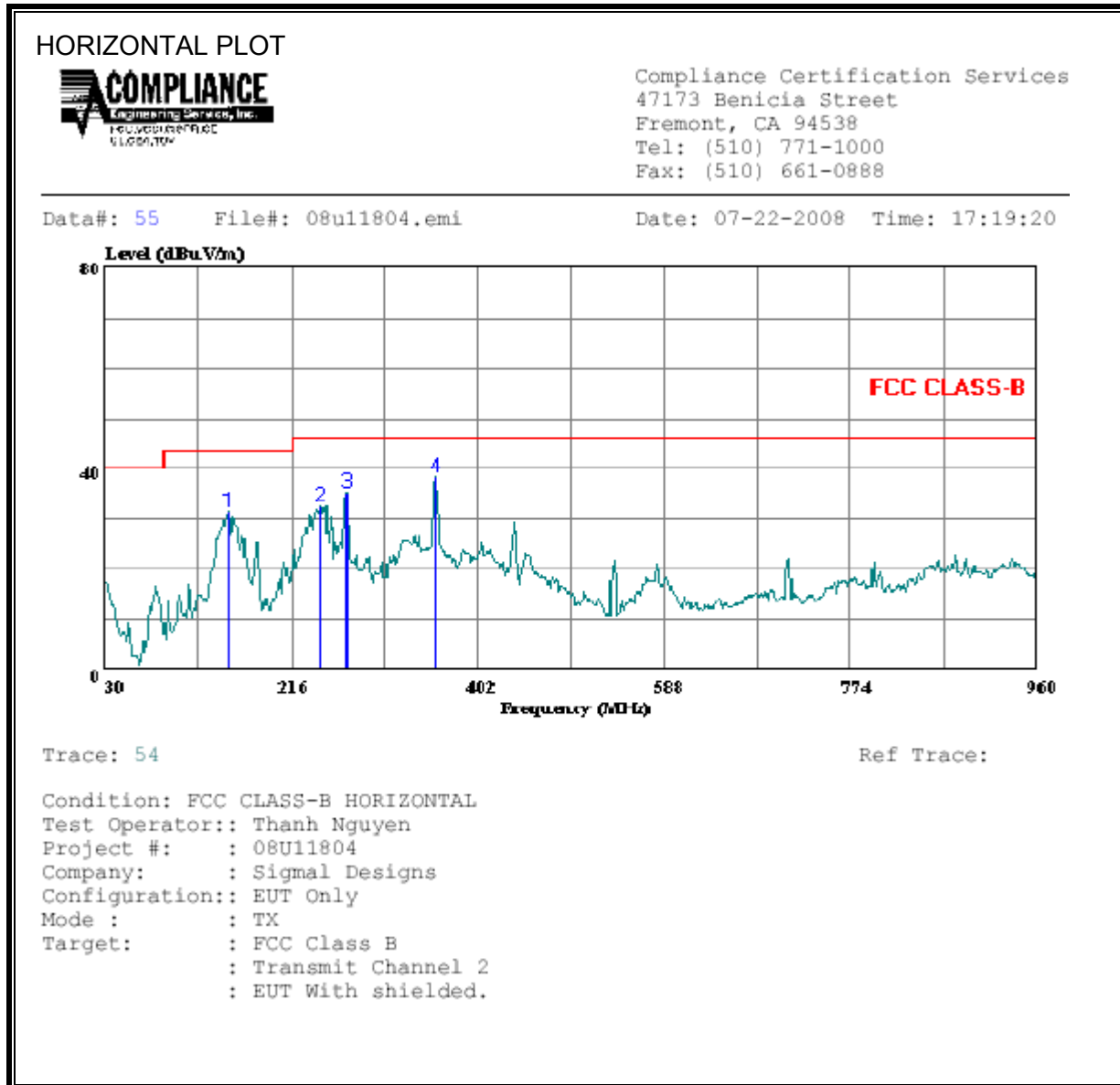


VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	80.220	51.70	-22.82	28.88	40.00	-11.12	Peak
2	250.410	50.23	-17.64	32.59	46.00	-13.41	Peak
3	270.870	50.87	-17.01	33.86	46.00	-12.14	Peak
4	359.220	51.76	-14.45	37.31	46.00	-8.69	Peak

### 7.4.2. MID CHANNEL EMISSIONS

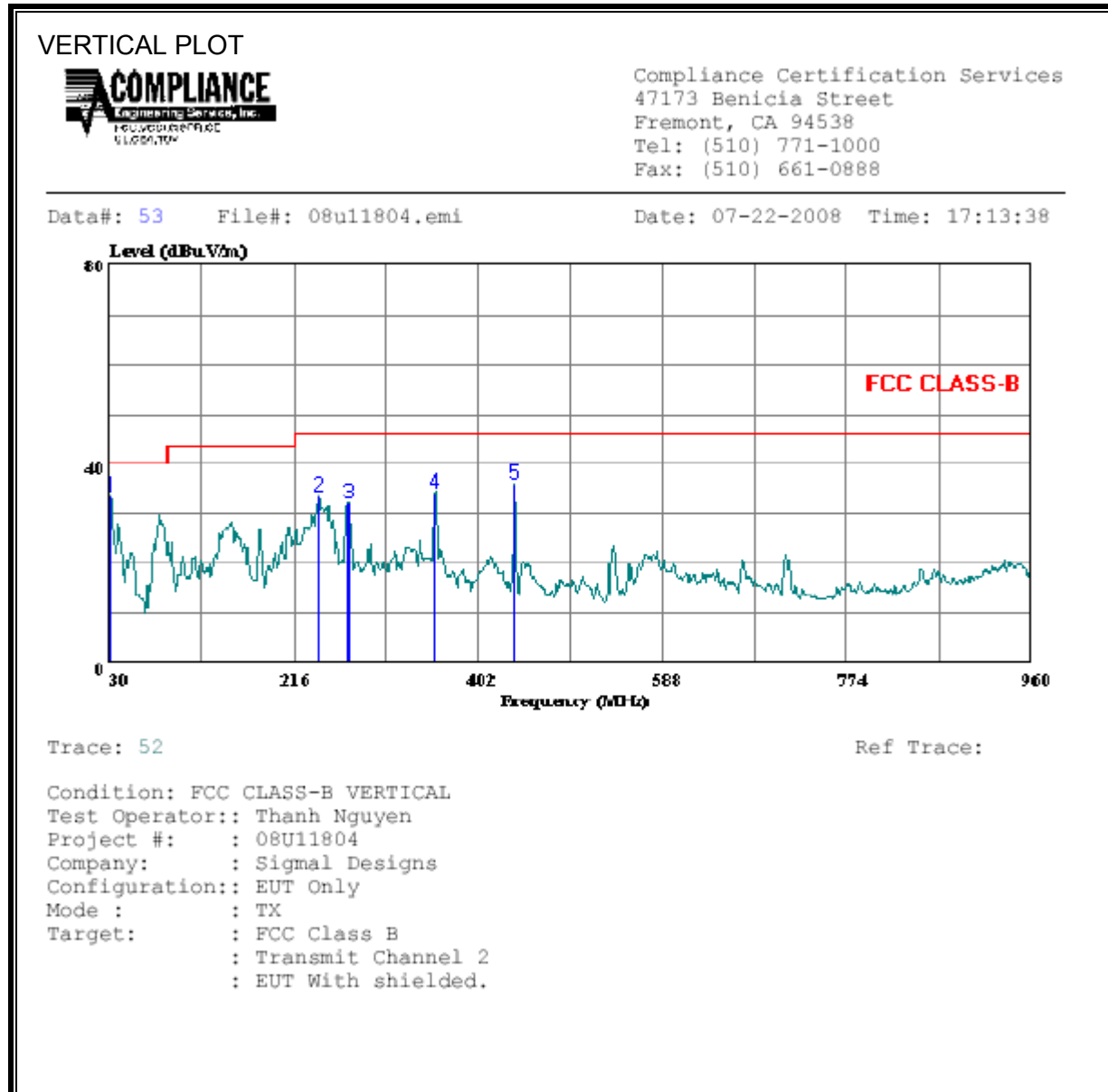
#### SPURIOUS EMISSIONS 30 TO 960 MHz (HORIZONTAL)



HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	152.760	48.93	-17.46	31.47	43.50	-12.03	Peak
2	245.760	50.62	-17.96	32.66	46.00	-13.34	Peak
3	270.870	52.41	-17.01	35.40	46.00	-10.60	Peak
4	359.220	52.73	-14.45	38.28	46.00	-7.72	Peak

**SPURIOUS EMISSIONS 30 TO 960 MHz (VERTICAL)**

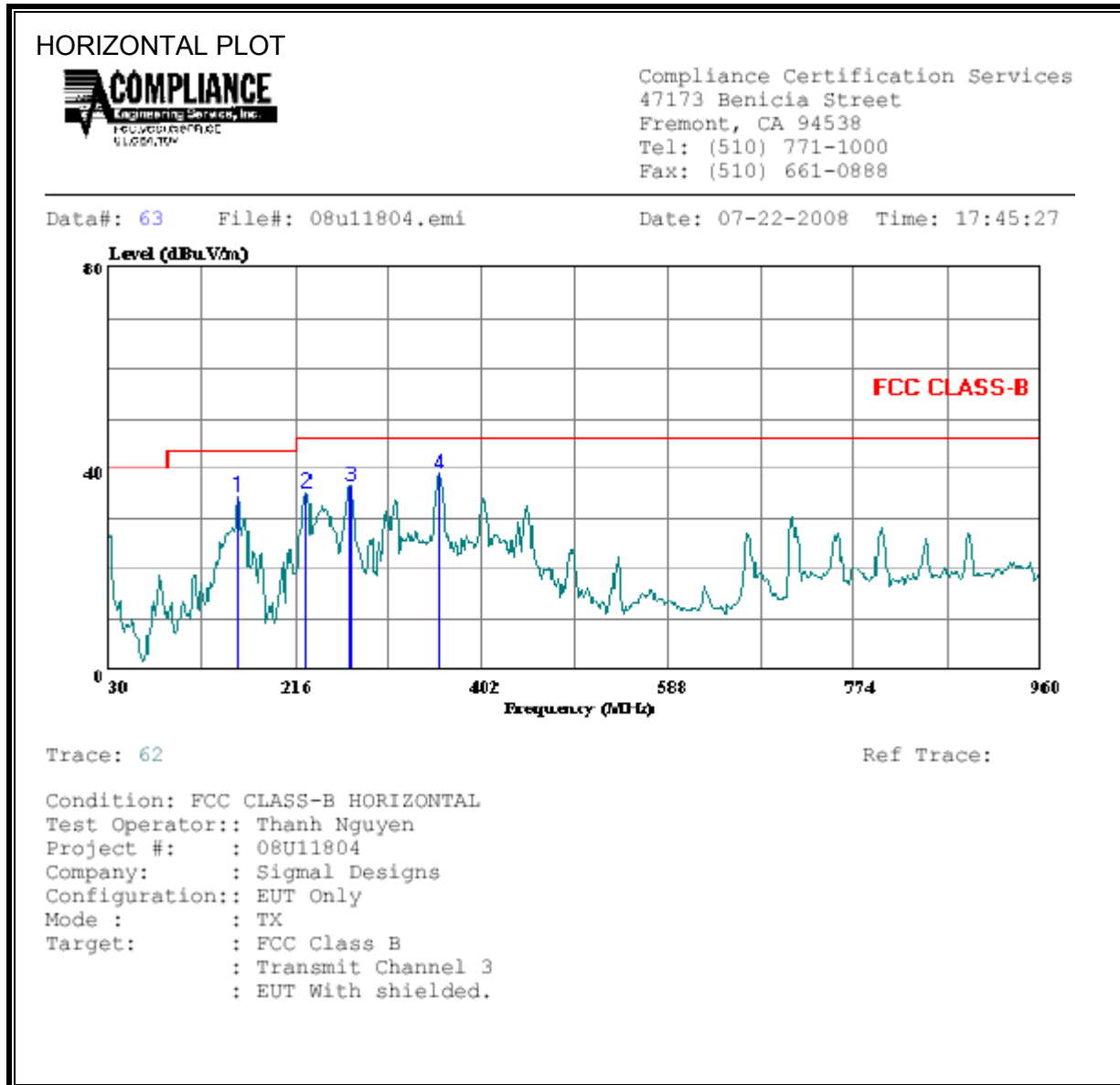


VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	42.82	-9.13	33.69	40.00	-6.31	Peak
2	241.110	51.60	-18.08	33.52	46.00	-12.48	Peak
3	270.870	49.14	-17.01	32.13	46.00	-13.87	Peak
4	358.290	48.71	-14.33	34.37	46.00	-11.63	Peak
5	438.270	48.50	-12.58	35.92	46.00	-10.08	Peak

### 7.4.3. HIGH CHANNEL EMISSIONS

#### SPURIOUS EMISSIONS 30 TO 960 MHz (HORIZONTAL)

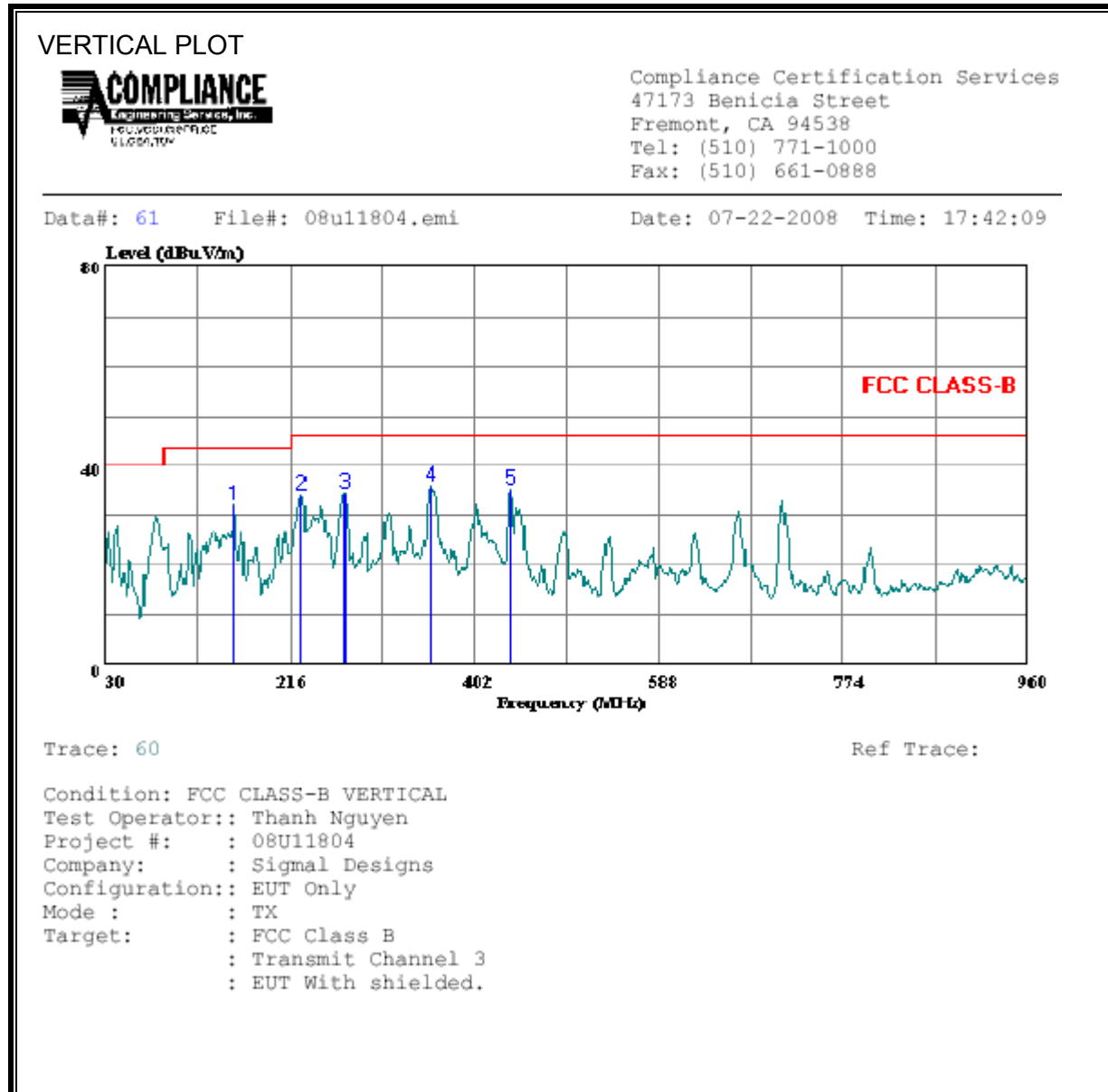


HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	159.270	52.15	-17.68	34.47	43.50	-9.03	Peak
2	227.160	53.73	-18.52	35.21	46.00	-10.79	Peak
3	270.870	53.77	-17.01	36.76	46.00	-9.24	Peak
4	359.220	53.49	-14.45	39.04	46.00	-6.96	Peak



**SPURIOUS EMISSIONS 30 TO 960 MHz (VERTICAL)**



VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	159.270	50.00	-17.68	32.32	43.50	-11.18	Peak
2	227.160	52.89	-18.52	34.37	46.00	-11.63	Peak
3	270.870	51.67	-17.01	34.66	46.00	-11.34	Peak
4	357.360	50.41	-14.28	36.13	46.00	-9.87	Peak
5	438.270	48.02	-12.58	35.44	46.00	-10.56	Peak

## 7.5. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

#### 6 WORST EMISSIONS

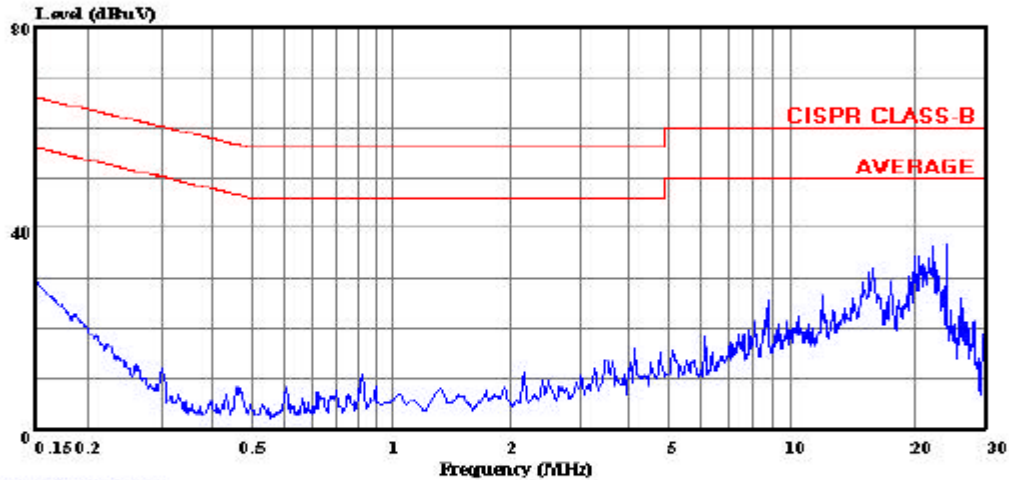
CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq. (MHz)	Reading			Closs (dB)	Limit QP	EN B		Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)			AV	QP (dB)	AV (dB)		
16.05	31.87	--	--	0.00	60.00	50.00	-28.13	-18.13	L1	
22.30	36.47	--	--	0.00	60.00	50.00	-23.53	-13.53	L1	
24.01	36.55	--	--	0.00	60.00	50.00	-23.45	-13.45	L1	
16.05	33.36	--	--	0.00	60.00	50.00	-26.64	-16.64	L2	
24.01	36.75	--	--	0.00	60.00	50.00	-23.25	-13.25	L2	
	--	--	--	0.00	--	--	--	--	L2	
6 Worst Data										

**LINE 1 RESULTS**



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 7 File#: 08U11804 LC.EMI Date: 06-12-2008 Time: 16:36:52



(Line Conduction)

Trace:

Ref Trace:

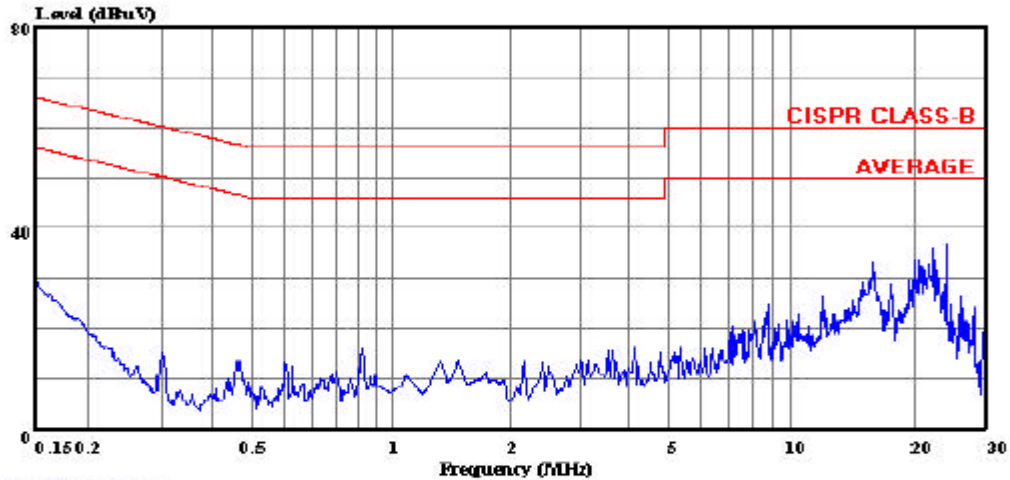
Condition: CISPR CLASS-B  
Test Operator:: Thanh Nguyen  
Project #: : 08U11804  
Company: : Sigma Designs  
Configuration:: EUT with HP DC power supply  
Mode: : TX worst case  
Target: : FCC Class B  
Voltage: : 115VAC/60Hz  
: L1: Peak (Blue)

**LINE 2 RESULTS**



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 14 File#: 08U11804 LC.EMI Date: 06-12-2008 Time: 16:48:08



(Line Conduction)

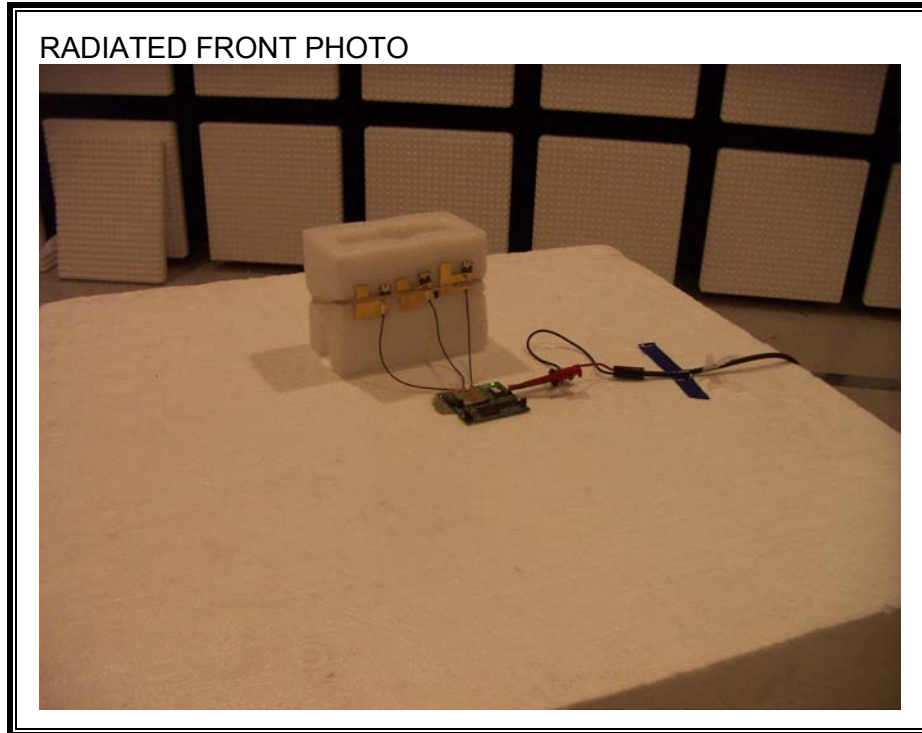
Trace:

Ref Trace:

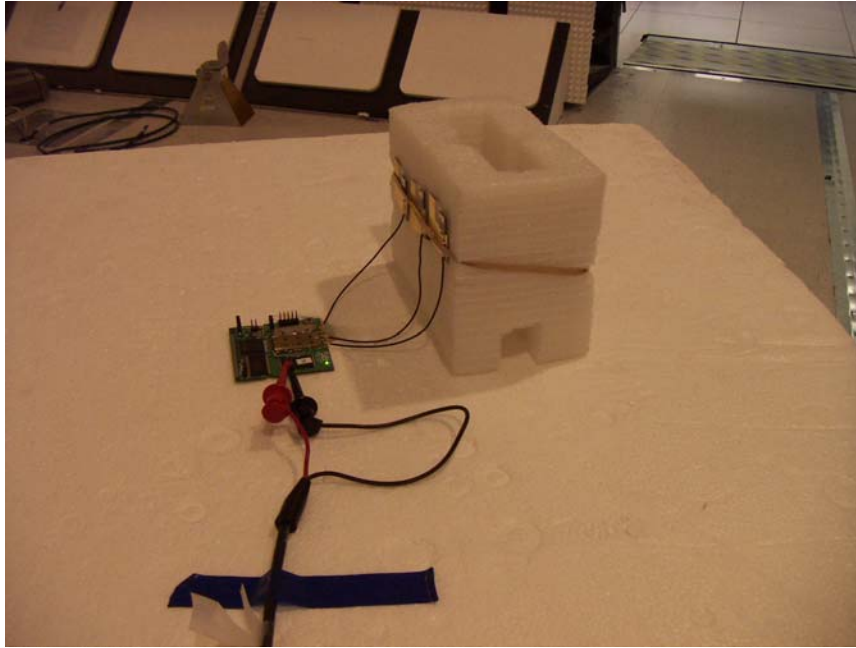
Condition: CISPR CLASS-B  
Test Operator:: Thanh Nguyen  
Project #: : 08U11804  
Company: : Sigma Designs  
Configuration:: BUT with HP DC power supply  
Mode: : TX worst case  
Target: : FCC Class B  
Voltage: : 115VAC/60Hz  
: L2: Peak (Blue)

## 8. SETUP PHOTOS

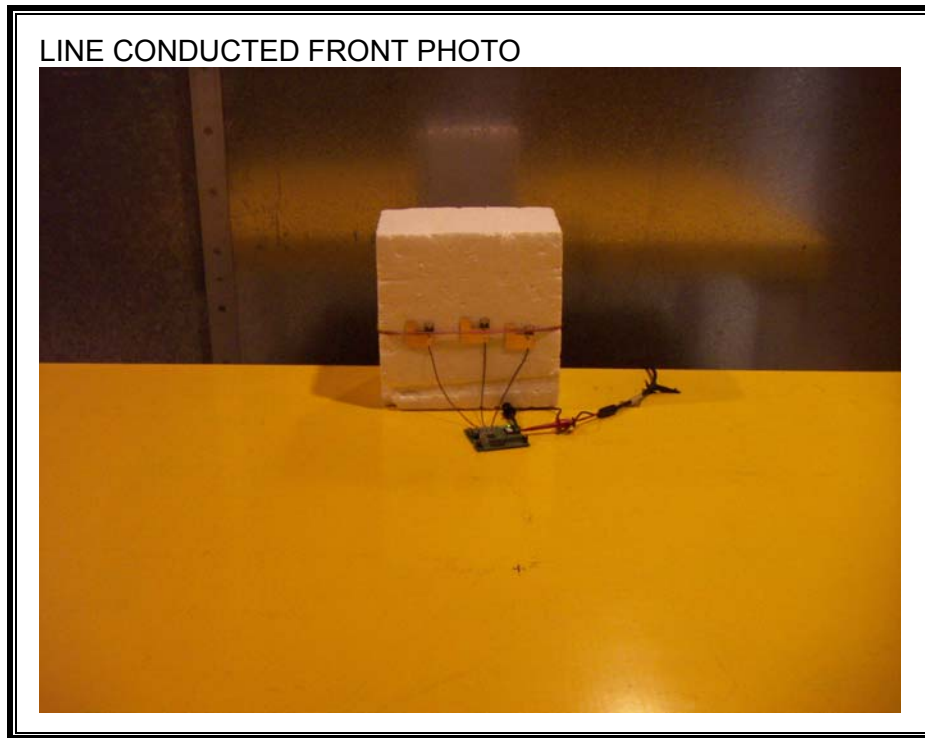
### RADIATED RF MEASUREMENT SETUP



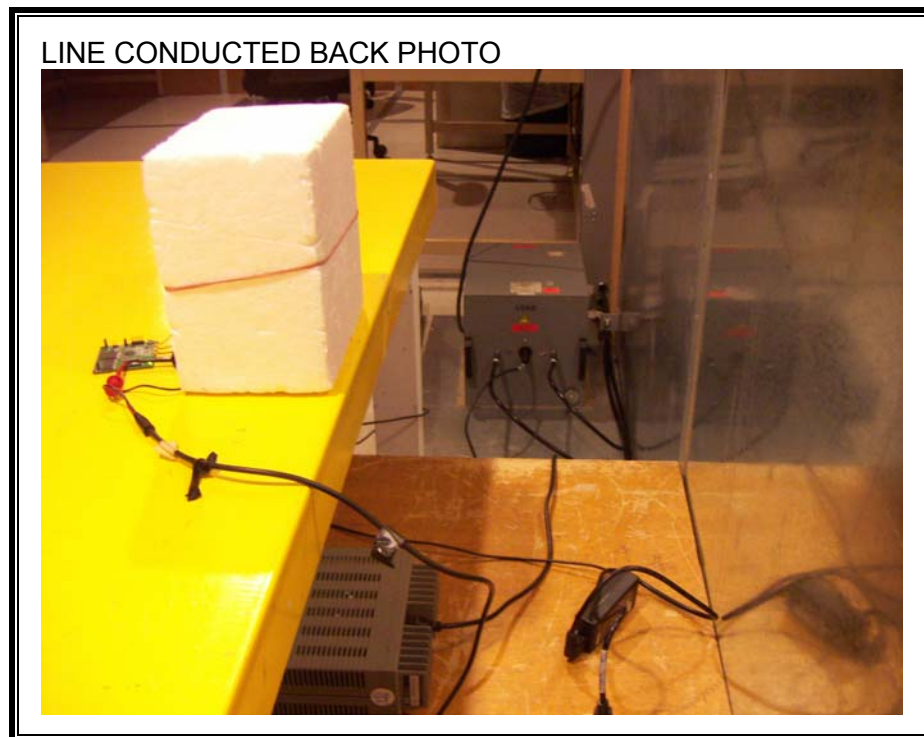
RADIATED BACK PHOTO



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**







**END OF REPORT**