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**Measured Radio Frequency Emissions
From**

**Hyperlink/Proxim Extended Range Radio System
Model MP2401**

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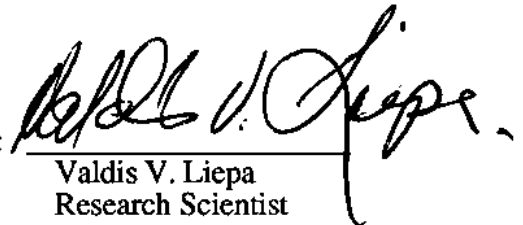
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Summary

Tests for compliance with FCC Regulations subject to Part 15 were performed on HyperLink spread spectrum RF Extended Range LAN System. The DUT is subject to FCC Rules and Regulations as a transmitter, a receiver, and as a digital device. This link uses an already certified spread spectrum Proxim radio, but adds high gain antennas, amplifiers and cables. Here we report on measurements as required by 15.247 for combinations of antennas and amplifiers. We also report on measurements of conducted emissions for a two power supplies for the amplifiers.

In testing performed May 14 through 25, 2001, of the twelve combination tested, the radiated emissions in restricted bands were met by 1.1 dB (see p. 20). The amplifier power supply conducted emissions, Class A, were met by 8 dB. The second power supply conducted emissions, Class B, were met by 4 dB (see p. 24).

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1. Introduction

HyperLink/Proxim Extended Range Radio, Model MP2401, was tested for compliance with FCC Regulations, Part 15, adopted under Docket 87-389, April 18, 1989. The tests were performed at the University of Michigan Radiation Laboratory Willow Run Test Range following the procedures described in ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The attenuation characteristics of the Open Site facility are on file with FCC Laboratory, Columbia, Maryland. (FCC file 31040/SIT)

2. Test Procedure and Equipment Used

The test equipment commonly used in our facility is listed in Table 2.1 below. The second column identifies the specific equipment used in these tests. The HP 8593E spectrum analyzer is used for primary amplitude and frequency reference.

Table 2.1. Test Equipment.

Test Instrument	Equipment Used	Manufacturer/Model	Cal. Date/By
Spectrum Analyzer (9kHz-22GHz)	X	Hewlett-Packard 8593A SN: 3107A01358	December 2000/UM
Spectrum Analyzer (9kHz-26GHz)	X	Hewlett-Packard 8593E SN: 3107A01131	December 2000/HP
Spectrum Analyzer (0.1-1500 MHz)		Hewlett-Packard 182T/8558B SN: 1529A01114/543592	December 2000/UM
Preamplifier (5-1000MHz)	X	Watkins-Johnson A11 -1 plus A25-1S	December 2000/UM
Preamplifier (5-4000 MHz)	X	Avantek	Oct. 1999/ U of M Rad Lab
Power Meter w/ Thermistor		Hewlett-Packard 432A Hewlett-Packard 478A	Dec. 2000/U of M Rad Lab
Peak Power Meter w/ Sensor		Pacific Instruments 1018B	Dec. 2000/U of M Rad Lab
Broadband Bicone (20-200 MHz)	X	University of Michigan	June 1999/U of M Rad Lab
Broadband Bicone (200-1000 MHz)	X	University of Michigan	June 1999/U of M Rad Lab
Dipole Antenna Set (25-1000 MHz)	X	University of Michigan	June 2000/UM
Dipole Antenna Set (30-1000 MHz)		EMCO 3121C	June 2000/UM
S-Band Std. Gain Horn	X	S/A, Model SGH-2.6	Manufacturer, NRL design
C-Band Std. Gain Horn	X	University of Michigan	Manufacturer, NRL design
XN-Band Std. Gain Horn	X	University of Michigan	Manufacturer, NRL design
X-Band Std. Gain Horn	X	S/A, Model 12-8.2	Manufacturer, NRL design
Ku-Band Std. Gain Horn	X	University of Michigan	Manufacturer, NRL design
K-Band Std. Gain Horn	X	University of Michigan	Manufacturer, NRL design
Ridge-horn Antenna (0.5-5 GHz)		University of Michigan	February 1991/U of M Rad Lab
LISN Box		University of Michigan	Dec. 2000/U of M Rad Lab
Signal Generator (0.1-2060 MHz)	X	Hewlett-Packard 8657B	January 2000/U of M Rad Lab
Printer	X	Hewlett-Packard 2225A	August 1989/HP

3. Configuration and Identification of Device Under Test

The DUT is a spread spectrum RF wireless link operating in 2400 - 2483.5 MHz band. The system tested consisted of a laptop computer, Proxim radio, (choice of) power feed/ lightning protector, 50-foot coax cable, (choice of) amplifier, (choice of) band-pass filter, and (choice of) an antenna. Figure 3.1 shows the block diagram of the basic system.

The system has been designed to operate up to 11 channels from 2417 to 2457 MHz; however, depending on the choice of components used (amplifier, filter, antenna) to meet the link s/n requirements, channels are restricted to meet the FCC/IC emission limits.

The DUT was designed and manufactured by Hyperlink Technologies Inc., 1200 Clint Moore Rd., Suite 14, Boca Raton, FL 33687. It is identified as:

HyperLink/Proxim Extended Range Radio System
Model: MP2401
SN: Proto8
FCC ID: MYF-IMK-STMP-10-1

There were a total of 12 combinations, varying in amplifier, filter, and/or antenna used. All 12 were tested.

With components evaluated:

Proxim (Radio), Stratum MP Model 2000	SN: 200205-05000212 FCC ID: IMK-STMP-10-1 CAN: 1856391181A
Power Supply for Stratum Radio Proxim, PN: 4050.0013, Model DSA-0151A-06A	
Laptop, Compaq Presario Model: Series 2940	SN: V745BQD22994 FCC Reg: CNTTAI-24639-TT-E
Amplifier, HyperLink Model: HA2401-AGC100 Model: HA2401-AGC250	SN: 100-051501 SN: 250-051501
Power Supply, HyperLink, for amplifier Model: ACSM-26 Model: DSA-0151A-12	FCC: Class A (verify) FCC: Class B (verify)
Power Injector/ Lightning Arrestor HyperLink	SN: none
Lightning Arrestor HyperLink, PN: HGLN-03	SN: none
andpass Filter, Hyperlink, 4-pole Model: FLT-2437-20-4	
andpass Filter, Hyperlink, 5-pole Model: FLT-2442-60-5	

Cables

Antenna cable, 50 feet
WBC400, with N-connectors

Pigtail cable, between radio and
lightning arrestor, approx. 12 in. RG-58 , HyperLink

Antennas

Antenna, Omni, V-pol

Model: HG 2408U, 8.0 dBi

Antenna, Omni, V-pol

Model: HG 2410U, 10.0 dBi

Antenna, Patch, V/H-pol

Model: HG 2414P, 14.0 dBi

Antenna, Yaggi, V/H-pol

Model: HG 2415Y, 14.0 dBi

Antenna, Omni, V-pol

Model: HG 2415U, 15.0 dBi

Antenna, Reflector, V/H-pol

Model: HG 2424G, 24.0 dBi

3.1 EMI Relevant Modifications

During the course of testing, amplifier (if need), filter (if need), and antenna were selected, and then the available channels for the particular configuration were reduced (if needed) to meet the band-edge and harmonic emission limits.

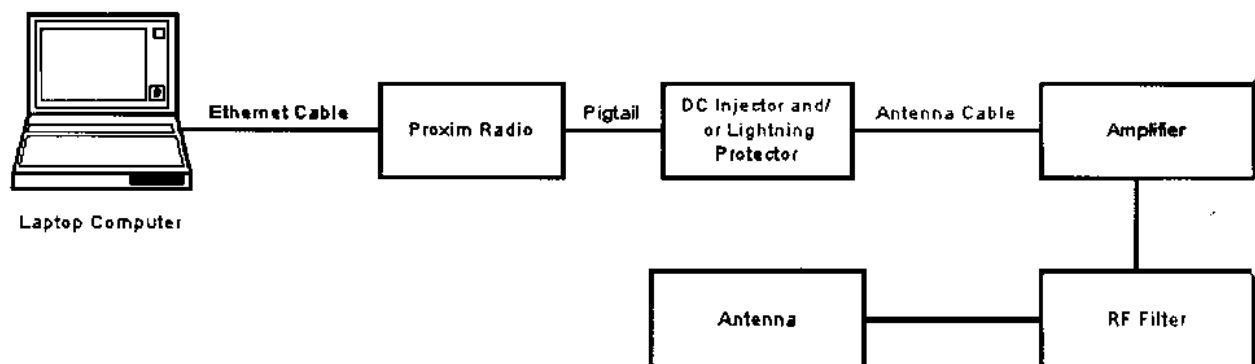


Figure 3.1. Basic block diagram of the system.

4. Emission Limits

4.1 Radiated Emission Limits

Since the DUT is a spread spectrum device (15.247, 2.4 GHz), the radiated emissions are subject to emissions in restricted bands only (15.205). The applicable frequencies, through ten harmonics, are given below in Table 4.1. Emission limits from digital circuitry are specified in Table 4.2.

Table 4.1. Radiated Emission Limits (Ref: 15.205) — Transmitter.

Frequency (MHz)	Fundamental Ave. E _{lim} (3m)		Spurious* Ave. E _{lim} (3m)	
	(μ V/m)	dB (μ V/m)	(μ V/m)	dB (μ V/m)
2400-2483.5	---		---	
2383.5-2500 4500-5250 7250-7750	Restricted Bands		500	54.0
14470-14500 17700-21400 22010-23120 23600-24000	Restricted Bands		500	54.0

* Measure up to tenth harmonic; 1 MHz res. BW, 100 Hz video BW (for average detection)

Table 4.2 Radiated Emission Limits (15.109) — Digital device.

Frequency (MHz)	Class A ds = 10 m		Class B ds = 3 m	
	(μ V/m)	dB (μ V/m)	(μ V/m)	dB (μ V/m)
30-88	90	39.0	100	40.0
88-216	150	43.5	150	43.5
219-960	210	46.4	200	46.0
960-	300	49.5	500	54.0

120 kHz BW up to 1 GHz, 1 MHz BW above 1 GHz

4.2 Conductive Emission Limits

Table 4.3. Conducted Emission Limits (15.107).

Frequency (MHz)	Class A $d_s = 10$ m		Class B $d_s = 3$ m	
	μV	dB μV	μV	dB μV
0.45-1.705	1000	60.0	250	48.0
1.705-30.0	3000	69.6	250	48.0

Note: Quasi-Peak readings apply here (9 kHz BW)

Class A limits apply to the first DUT supply, and Class B limits apply to the second DUT supply.

5. Radiated Emission Tests and Results

5.1 Anechonic Chamber Measurements

In our chamber there is a set-up similar to that of an outdoor 3-meter site, with a turntable, an antenna mast, and a ground plane. Instrumentation includes spectrum analyzers and other equipment as needed. For these tests the receiver (horn) antennas were placed on a Styrofoam block, at about 1.2 m height, and the DUT on a turntable, at 3 meter distance, then moved to 1 m distance, if needed.

Standard gain horn antennas were used for the measurements. Up to 12 GHz the horns were connected to a spectrum analyzer via RG-214 coaxial cable, and above 12 GHz a pre-amp was added. The cables and the pre-amplifier used were specially calibrated for these tests using a network analyzer.

The DUT antenna was rotated in all possible ways and the maximum emission recorded. A photograph in Appendix (last page of the report) shows the measurement set-up.

5.2 Outdoor Measurements

None made

5.3 Computations and Results

To convert the dBm measured on the spectrum analyzer to dB($\mu V/m$), we use expression

$$E_3(\text{dB}\mu V/m) = 107 + P_R + K_A - K_G + K_E$$

where P_R = power recorded on spectrum analyzer, dB, measured at 3m
 K_A = antenna factor, dB/m
 K_G = pre-amplifier gain, including cable loss, dB
 K_E = pulse operation correction factor, dB

When presenting the data, at each frequency the dominant measured emissions under all of the possible situations are given. Computations and results are given in Tables 5.1 through 5.12. There we see that in the worst case the DUT meets the limit by 1.1 dB at 2483.5 MHz in Table 5.10.

Note, that besides the emission measurements, each table contains (a) the frequency range of operation (in upper section of the table) and (b) the max. RF exposure power density.

5.4 Duty Factor for Normal Operation

When the radio is operating in the normal mode, in the worst case, the on-time is 78.24 ms over 100 ms. Thus the duty factor is

$$K_e = 78.24\text{ms}/100\text{ms} = 0.7824 = -2.1\text{dB}.$$

(Ref. Stratum Test Report, pp. 23, 24.)

6. Other Measurements and Computations

6.1 Peak-to-Average Ratio (15.35(b))

For the measurements presented here for emissions in restricted bands, the DUT was programmed to transmit continuous, and such was verified with spectrum analyzer set to zero-span mode. See Figure 6.1. The average measurements were made using 1 MHz RBW and 100 Hz VBW (sometimes to 300 Hz -- it goes faster). The peak measurements, were made using 1 MHz RBW and 1 MHz VBW.

Typically the difference between peak and average was 12 to 13 dB, and never exceeded the 20 dB limit.

6.2 Potential Health Hazard EM Radiation Level

The maximum radiation level from the unit was determined by using an open-end waveguide probe feeding directly into a spectrum analyzer. In case the 1 mW/cm² limit is exceeded, the maximum distance from the DUT is determined by measurement at a distance where the field density is 1 mW/cm².

An open-end waveguide probe is as basic as a standard gain horn. Their characteristics have been extensively studied and experimentally verified. (Yaghjian, IEEE/APS pp. 378-384, April, 1984.) For the S-band (WR-284) waveguide at 2445 MHz, for an open-end waveguide the Gain is 5.7 dBi and this equates to $A_{eq} = 44.25 \text{ cm}^2$, giving

$$p(\text{mW}/\text{cm}^2) = 0.026 * P(\text{mW})$$

where $P(\text{mW})$ is power measured.

For the subject DUT, we probed each of the 12 configurations in the near field including the surface of the antenna. In every case the maximum power density was found at the feed of the antenna. Table 6.1 below summarizes the results.

Table 6.1. Measured EM Radiation Exposure Levels.

System	P(mW)	Max. Level (mW/cm ²)	Limit (mW/cm ²)
08U	1.0	0.030	1.0
08UA	3.2	0.080	1.0
10U	0.3	0.010	1.0
10UA	0.7	0.020	1.0
14P	0.5	0.010	1.0
14PA	0.5	0.010	1.0
15U	0.2	0.004	1.0
15UA	6.9	0.180	1.0
15Y	0.4	0.010	1.0
15YA	0.7	0.020	1.0
24G	0.5	0.013	1.0
24GA	5.6	0.146	1.0

6.3 Peak and Average Output Power (15.247(b))

For this measurement, the DUT was set in a test mode for continuous data transmission. A peak (diode detector) power meter and a bolometer type (average) microwave power meter was connected where the antenna attaches to the system. The power was measured for cases of (a) without amplifier, (b) with 100 mW amplifier, and (c) 250 mW amplifier. A 50 foot coax cable and a power injector (or arrestor) was used in each case. Since the DUT transmits in continuous mode, there is no adjustment needed to the readings. See Figure 6.1. Table 6.2, below, presents the results. The Limit is 30dBm.

Table 6.2. Peak and Average Output Power (Antenna Conducted)

Freq (MHz)	Avg. P(dBm)	Peak P(dBm)	Comment
2417	5.2	8.5	(No AMP)
2437	5.4	8.5	
2457	5.3	5.0	
2417	17.6	19.3	(100 mW AMP)
2437	17.5	19.3	
2457	16.8	18.2	
2417	19.0	23.6	(250 mW AMP)
2437	18.6	23.9	
2457	17.0	23.5	

6.4 Power Line Conducted Emissions (15.270)

The RF amplifier is powered through the RF cable, which in turn, is powered from a switching power supply via a Power Injector. Conducted emissions were measured using LISN in the standard set-up. Two supplies were tested: (1) ASCM-26 (see Table 6.3) and DSA-0151A-12 (see Table 6.4). Photograph of the set-up is in the Appendix.

The radio and the laptop conducted emissions were not measured; the laptop is already compliant and for the radio conducted data see the Statum MP test report.

6.5 Bandwidth (15.247(a)(2))

For this test, the DUT was put in a test mode for continuous data transmission. The spectrum analyzer was connected where the antenna attaches to the system. The analyzer was set for RBW=VBW=100 kHz, SPAN= 100 MHz. Configured was the "worst case" system, i.e., with 50 foot cable, high power amp (250 mW), no filter, and measured for lowest, mid, and highest channels that would be used in the system. Plots are shown in Figure 6.2.

<u>Frequency</u>	<u>6 dB Bandwidth</u>
2.417 GHz	14.25 MHz
2.436 GHz	11.88 MHz
2.457 GHz	15.63 MHz

6.6 RF Antenna Conducted Spurious Emissions (15.247(c))

For this test, the DUT was put in a test mode for continuous data transmission. The spectrum analyzer was connected where the antenna attaches to the system. The analyzer was set for RBW=VBW=100 kHz, the frequency was swept from 0 to 25 GHz. Configured was the "worst case" system, i.e., with 50 foot cable, high power amp (250 mW), no filter, and measured for lowest, mid, and highest channels that would be used in the system. See Figures 6.3(a) through (c). In the plots, only the fundamental is seen, the rest is noise. In all cases, the noise is at least 35 dB below the carrier. (Limit -20.0 dB below carrier).

The Figure 6.4 shows the band-edge scans at lower and upper edges.

6.7 Power Spectral Density and Line Spacing (15.247(d))

For this measurement, the DUT was put in a test mode for continuous data transmission. The spectrum analyzer was connected where the antenna attaches to the system. Configured was the "worst case" system, i.e., with 50 foot cable, high power amp (250 mW), no filter, and measured for lowest, mid, and highest channels that would be used in the system. The spectrum was first scanned for the maximum spectrum peaks and then at these peaks the sweep was repeated with RBW=3 kHz, VBW=100 kHz, SPAN=300 kHz, and SWEEP TIME=100s. See Figures 6.4(a) through (c). The maximum readings obtained are:

<u>Frequency</u>	<u>Analyzer Reading</u>	<u>Line Spacing</u>
2.41865 GHz	-4.55 dBm (Limit 8.0 dBm)	4.5 kHz
2.43868 GHz	-4.31 dBm (Limit 8.0 dBm)	4.5 kHz
2.41865 GHz	-6.54 dBm (Limit 8.0 dBm)	5.3 kHz

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Table 5.1 Highest Emissions Measured

Radiated Emissions										HyperLink/Proxim; 08U	
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2417.0										Low channel
3	2437.0										Mid channel
4	2457.0										High channel
5											
6	2390.0	HornS	H/V	-78.3	-66.1	21.5	- 0.6	48.7	54.0	5.3	Low
7	2390.0	HornS	H/V	-79.4	-67.2	21.5	- 0.6	47.6	54.0	6.4	Mid, noise
8	2390.0	HornS	H/V	-79.4	-67.2	21.5	- 0.6	47.6	54.0	6.4	High, noise
9	2483.5	HornS	H/V	-79.3	-69.3	21.5	- 0.6	47.7	54.0	6.3	Low, noise
10	2483.5	HornS	H/V	-79.3	-67.3	21.5	- 0.6	47.7	54.0	6.3	Mid, noise
11	2483.5	HornS	H/V	-79.2	-66.9	21.5	- 0.6	47.8	54.0	6.2	High, noise
12	4834.0	HornC	H/V	-88.5	-75.3	25.5	- 0.7	42.6	54.0	11.4	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-88.6	-75.6	25.5	- 0.7	42.5	54.0	11.5	1.0 m, Noise for Ave and Peak
14	4914.0	HornC	H/V	-88.5	-76.2	25.5	- 0.7	42.6	54.0	11.4	1.0 m, Noise for Ave and Peak
15	7251.0	HornXN	H/V	-80.6	-68.4	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.5	-67.9	25.5	- 0.8	50.7	54.0	3.3	1.0 m, Noise for Ave and Peak
17	7371.0	HornXN	H/V	-80.9	-68.1	25.5	- 0.8	50.3	54.0	3.7	1.0 m, Noise for Ave and Peak
18	12085.0	HornX	H/V	-72.7	-59.6	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.6	-59.8	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
20	12285.0	HornX	H/V	-72.7	-60.4	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
21	14502.0	HornKu	H/V	-76.9	-64.3	25.5	17.3	36.2	54.0	17.8	1.0 m, Noise for Ave and Peak
22	19336.0	HornK	H/V	-73.4	-63.3	32.3	32.0	31.8	54.0	22.2	1.0 m, Noise for Ave and Peak
23	19496.0	HornK	H/V	-73.8	-63.2	32.3	32.0	31.4	54.0	22.6	1.0 m, Noise for Ave and Peak
24	19656.0	HornK	H/V	-70.9	-60.6	32.3	32.0	34.3	54.0	19.7	1.0 m, Noise for Ave and Peak
25	22113.0	HornK	H/V	-67.9	-56.4	32.3	32.0	37.3	54.0	16.7	1.0 m, Noise for Ave and Peak
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		0.0	1.0			0.03	1.0		15.9	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	Arrest	50 ft	N/A	N/A	08U		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

Meas. 05/14/10; U of Mich

Table 5.2 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 08UA
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2417.0										Low channel
3	2437.0										Mid channel
4	2457.0										High channel
5											
6	2390.0	HornS	H/V	-79.3	-67.1	21.5	- 0.6	47.7	54.0	6.3	Low, noise
7	2390.0	HornS	H/V	-79.5	-67.2	21.5	- 0.6	47.5	54.0	6.5	Mid, noise
8	2390.0	HornS	H/V	-79.4	-67.1	21.5	- 0.6	47.6	54.0	6.4	High, noise
9	2483.5	HornS	H/V	-77.7	-69.3	21.5	- 0.6	49.3	54.0	4.7	Low
10	2483.5	HornS	H/V	-79.4	-67.2	21.5	- 0.6	47.6	54.0	6.4	Mid, noise
11	2483.5	HornS	H/V	-79.1	-66.9	21.5	- 0.6	47.9	54.0	6.1	High, noise
12	4834.0	HornC	H/V	-87.9	-75.7	25.5	- 0.7	43.2	54.0	10.8	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-88.4	-76.2	25.5	- 0.7	42.7	54.0	11.3	1.0 m, Noise for Ave and Peak
14	4914.0	HornC	H/V	-88.7	-75.5	25.5	- 0.7	42.4	54.0	11.6	1.0 m, Noise for Ave and Peak
15	7251.0	HornXN	H/V	-81.0	-67.9	25.5	- 0.8	50.2	54.0	3.8	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.7	-67.8	25.5	- 0.8	50.5	54.0	3.5	1.0 m, Noise for Ave and Peak
17	7371.0	HornXN	H/V	-80.7	-68.3	25.5	- 0.8	50.5	54.0	3.5	1.0 m, Noise for Ave and Peak
18	12085.0	HornX	H/V	-72.4	-60.0	25.5	34.0	24.0	54.0	30.0	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.6	-60.2	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
20	12285.0	HornX	H/V	-72.7	-60.6	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
21	14502.0	HornKu	H/V	-77.0	-64.2	25.5	17.3	36.1	54.0	17.9	1.0 m, Noise for Ave and Peak
22	19336.0	HornK	H/V	-73.6	-61.3	32.3	32.0	31.6	54.0	22.4	1.0 m, Noise for Ave and Peak
23	19496.0	HornK	H/V	-73.6	-63.3	32.3	32.0	31.6	54.0	22.4	1.0 m, Noise for Ave and Peak
24	19656.0	HornK	H/V	-71.0	-59.6	32.3	32.0	34.2	54.0	19.8	1.0 m, Noise for Ave and Peak
25	22113.0	HornK	H/V	-67.8	-56.5	32.3	32.0	37.4	54.0	16.6	1.0 m, Noise for Ave and Peak
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		5.0	3.2			0.08	1.0		10.9	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	yes	50 ft	100.0	N/A	08U		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

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Table 5.3 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 10U
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2417.0										Low channel
3	2437.0										Mid channel
4	2457.0										High channel
5											
6	2390.0	HornS	H/V	-76.9	-64.9	21.5	- 0.6	50.1	54.0	3.9	Low
7	2390.0	HornS	H/V	-79.5	-67.3	21.5	- 0.6	47.5	54.0	6.5	Mid, noise
8	2390.0	HornS	H/V	-79.2	-67.1	21.5	- 0.6	47.8	54.0	6.2	High, noise
9	2483.5	HornS	H/V	-79.2	-66.9	21.5	- 0.6	47.8	54.0	6.2	Low, noise
10	2483.5	HornS	H/V	-79.3	-67.2	21.5	- 0.6	47.7	54.0	6.3	Mid, noise
11	2483.5	HornS	H/V	-79.2	-67.5	21.5	- 0.6	47.8	54.0	6.2	High, noise
12	4834.0	HornC	H/V	-88.6	-75.8	25.5	- 0.7	42.5	54.0	11.5	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-88.5	-77.3	25.5	- 0.7	42.6	54.0	11.4	1.0 m, Noise for Ave and Peak
14	4914.0	HornC	H/V	-88.7	-76.9	25.5	- 0.7	42.4	54.0	11.6	1.0 m, Noise for Ave and Peak
15	7251.0	HornXN	H/V	-80.6	-67.8	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.6	-68.1	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
17	7371.0	HornXN	H/V	-80.8	-68.3	25.5	- 0.8	50.4	54.0	3.6	1.0 m, Noise for Ave and Peak
18	12085.0	HornX	H/V	-72.6	-61.1	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.5	-60.0	25.5	34.0	23.9	54.0	30.1	1.0 m, Noise for Ave and Peak
20	12285.0	HornX	H/V	-72.6	-60.8	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
21	14502.0	HornKu	H/V	-77.0	-63.9	25.5	17.3	36.1	54.0	17.9	1.0 m, Noise for Ave and Peak
22	19336.0	HornK	H/V	-73.4	-62.3	32.3	32.0	31.8	54.0	22.2	1.0 m, Noise for Ave and Peak
23	19496.0	HornK	H/V	-73.4	-62.7	32.3	32.0	31.8	54.0	22.2	1.0 m, Noise for Ave and Peak
24	19656.0	HornK	H/V	-72.4	-59.8	32.3	32.0	32.8	54.0	21.2	1.0 m, Noise for Ave and Peak
25	22113.0	HornK	H/V	-68.0	-56.6	32.3	32.0	37.2	54.0	16.8	1.0 m, Noise for Ave and Peak
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		- 5.0	0.3			0.01	1.0		20.9	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant					
34	ACSM-26	Arrest	50 ft	N/A	N/A	10U		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
35								* Peak: measured with 1 MHz RBW and 3 MHz VBW			
36								** Includes -2.1 dB Duty Factor			
37											
38											

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Table 5.4 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 10UA
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2425.0										Low channel
3	2437.0										Mid channel
4	2449.0										High channel
5											
6	2390.0	HornS	H/V	-79.1	-67.5	21.5	- 0.6	47.9	54.0	6.1	Low, noise
7	2390.0	HornS	H/V	-79.3	-68.0	21.5	- 0.6	47.7	54.0	6.3	Mid, noise
8	2390.0	HornS	H/V	-79.1	-67.8	21.5	- 0.6	47.9	54.0	6.1	High, noise
9	2483.5	HornS	H/V	-79.1	-67.0	21.5	- 0.6	47.9	54.0	6.1	Low, noise
10	2483.5	HornS	H/V	-79.2	-67.3	21.5	- 0.6	47.8	54.0	6.2	Mid, noise
11	2483.5	HornS	H/V	-79.1	-67.5	21.5	- 0.6	47.9	54.0	6.1	High, noise
12	4850.0	HornC	H/V	-88.6	-76.8	25.5	- 0.7	42.5	54.0	11.5	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-88.4	-77.1	25.5	- 0.7	42.7	54.0	11.3	1.0 m, Noise for Ave and Peak
14	4898.0	HornC	H/V	-88.4	-76.2	25.5	- 0.7	42.7	54.0	11.3	1.0 m, Noise for Ave and Peak
15	7275.0	HornXN	H/V	-80.7	-68.2	25.5	- 0.8	50.5	54.0	3.5	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.7	-67.9	25.5	- 0.8	50.5	54.0	3.5	1.0 m, Noise for Ave and Peak
17	7347.0	HornXN	H/V	-80.6	-68.1	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
18	12125.0	HornX	H/V	-72.4	-60.4	25.5	34.0	24.0	54.0	30.0	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.5	-60.0	25.5	34.0	23.9	54.0	30.1	1.0 m, Noise for Ave and Peak
20	12245.0	HornX	H/V	-72.6	-60.4	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
21	19400.0	HornK	H/V	-73.7	-62.9	32.3	32.0	31.5	54.0	22.5	1.0 m, Noise for Ave and Peak
22	19496.0	HornK	H/V	-73.7	-62.5	32.3	32.0	31.5	54.0	22.5	1.0 m, Noise for Ave and Peak
23	19592.0	HornK	H/V	-71.3	-57.1	32.3	32.0	33.9	54.0	20.1	1.0 m, Noise for Ave and Peak
24	22041.0	HornK	H/V	-68.0	-57.5	32.3	32.0	37.2	54.0	16.8	1.0 m, Noise for Ave and Peak
25											
26											
27	Health Hazard:		Pr	Pr			Pr	Limit		dB	
28			dBm	mW			mW/cm2	mW/cm2		Bellow	
29	2437 MHz		- 1.5	0.7			0.02	1.0		17.4	
30											
31	Configuration:										
32	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
33	ACSM-26	yes	50 ft	100	N/A	10U		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
34								** Includes -2.1 dB Duty Factor			
35											
36											
37											
38											

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Table 5.5 Highest Emissions Measured

Radiated Emissions										HyperLink/Proxim; 14P	
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2417.0										Low channel
3	2437.0										Mid channel
4	2457.0										High channel
5											
6	2390.0	HornS	H/V	-75.7	-63.5	21.5	- 0.6	51.3	54.0	2.7	Low
7	2390.0	HornS	H/V	-79.4	-67.1	21.5	- 0.6	47.6	54.0	6.4	Mid, noise
8	2390.0	HornS	H/V	-79.3	-67.2	21.5	- 0.6	47.7	54.0	6.3	High, noise
9	2483.5	HornS	H/V	-79.2	-67.3	21.5	- 0.6	47.8	54.0	6.2	Low, noise
10	2483.5	HornS	H/V	-79.2	-67.3	21.5	- 0.6	47.8	54.0	6.2	Mid, noise
11	2483.5	HornS	H/V	-78.9	-67.0	21.5	- 0.6	48.1	54.0	5.9	High, noise
12	4834.0	HornC	H/V	-88.6	-75.3	25.5	- 0.7	42.5	54.0	11.5	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-88.5	-75.9	25.5	- 0.7	42.6	54.0	11.4	1.0 m, Noise for Ave and Peak
14	4914.0	HornC	H/V	-88.5	-75.4	25.5	- 0.7	42.6	54.0	11.4	1.0 m, Noise for Ave and Peak
15	7251.0	HornXN	H/V	-88.5	-67.5	25.5	- 0.8	42.7	54.0	11.3	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.7	-67.8	25.5	- 0.8	50.5	54.0	3.5	1.0 m, Noise for Ave and Peak
17	7371.0	HornXN	H/V	-80.8	-68.2	25.5	- 0.8	50.4	54.0	3.6	1.0 m, Noise for Ave and Peak
18	12085.0	HornX	H/V	-72.5	-59.9	25.5	34.0	23.9	54.0	30.1	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.6	-61.8	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
20	12285.0	HornX	H/V	-72.3	-60.0	25.5	34.0	24.1	54.0	29.9	1.0 m, Noise for Ave and Peak
21	14502.0	HornKu	H/V	-72.0	-63.8	25.5	17.3	41.1	54.0	12.9	1.0 m, Noise for Ave and Peak
22	19336.0	HornK	H/V	-73.4	-65.3	32.3	32.0	31.8	54.0	22.2	1.0 m, Noise for Ave and Peak
23	19496.0	HornK	H/V	-73.7	-62.1	32.3	32.0	31.5	54.0	22.5	1.0 m, Noise for Ave and Peak
24	19656.0	HornK	H/V	-71.1	-66.1	32.3	32.0	34.1	54.0	19.9	1.0 m, Noise for Ave and Peak
25	22113.0	HornK	H/V	-67.9	-56.1	32.3	32.0	37.3	54.0	16.7	1.0 m, Noise for Ave and Peak
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		- 3.1	0.5			0.01	1.0		19.0	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	Arrest	50 ft	N/A	N/A	14P		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

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Table 5.6 Highest Emissions Measured

Radiated Emissions										HyperLink/Proxim; 14PA	
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2425.0										Low channel
3	2437.0										Mid channel
4	2449.0										High channel
5											
6	2390.0	HornS	H/V	-77.6	-65.5	21.5	- 0.6	49.4	54.0	4.6	Low
7	2390.0	HornS	H/V	-78.6	-66.1	21.5	- 0.6	48.4	54.0	5.6	Mid, noise
8	2390.0	HornS	H/V	-79.4	-66.8	21.5	- 0.6	47.6	54.0	6.4	High, noise
9	2483.5	HornS	H/V	-79.1	-66.9	21.5	- 0.6	47.9	54.0	6.1	Low, noise
10	2483.5	HornS	H/V	-78.9	-65.8	21.5	- 0.6	48.1	54.0	5.9	Mid, noise
11	2483.5	HornS	H/V	-79.1	-66.0	21.5	- 0.6	47.9	54.0	6.1	High, noise
12	4850.0	HornC	H/V	-88.7	-76.1	25.5	- 0.7	42.4	54.0	11.6	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-88.2	-75.4	25.5	- 0.7	42.9	54.0	11.1	1.0 m, Noise for Ave and Peak
14	4898.0	HornC	H/V	-87.9	-75.2	25.5	- 0.7	43.2	54.0	10.8	1.0 m, Noise for Ave and Peak
15	7275.0	HornXN	H/V	-80.7	-68.1	25.5	- 0.8	50.5	54.0	3.5	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.6	-68.5	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
17	7347.0	HornXN	H/V	-80.8	-68.3	25.5	- 0.8	50.4	54.0	3.6	1.0 m, Noise for Ave and Peak
18	12125.0	HornX	H/V	-72.7	-60.9	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.6	-60.7	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
20	12245.0	HornX	H/V	-72.6	-59.9	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
21	19400.0	HornK	H/V	-73.5	-61.1	32.3	32.0	31.7	54.0	22.3	1.0 m, Noise for Ave and Peak
22	19496.0	HornK	H/V	-73.7	-62.7	32.3	32.0	31.5	54.0	22.5	1.0 m, Noise for Ave and Peak
23	19592.0	HornK	H/V	-71.6	-58.7	32.3	32.0	33.6	54.0	20.4	1.0 m, Noise for Ave and Peak
24	22041.0	HornK	H/V	-67.8	-57.0	32.3	32.0	37.4	54.0	16.6	1.0 m, Noise for Ave and Peak
25											
26											
27	Health Hazard:		Pr	Pr			Pr	Limit		dB	
28			dBm	mW			mW/cm2	mW/cm2		Bellow	
29	2437 MHz		- 3.1	0.5			0.01	1.0		19.0	
30											
31	Configuration:										
32	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
33	ACSM-26	Yes	50 ft	100	N/A	14P		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
34								** Includes -2.1 dB Duty Factor			
35											
36											
37											
38											

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Table 5.7 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 15U
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2417.0										Low channel
3	2437.0										Mid channel
4	2457.0										High channel
5											
6	2390.0	HornS	H/V	-78.6	-65.2	21.5	- 0.6	48.4	54.0	5.6	Low
7	2390.0	HornS	H/V	-86.9	-74.5	21.5	- 0.6	40.1	54.0	13.9	Mid, noise
8	2390.0	HornS	H/V	-86.7	-74.3	21.5	- 0.6	40.3	54.0	13.7	High, noise
9	2483.5	HornS	H/V	-86.8	-74.5	21.5	- 0.6	40.2	54.0	13.8	Low, noise
10	2483.5	HornS	H/V	-86.7	-74.4	21.5	- 0.6	40.3	54.0	13.7	Mid, noise
11	2483.5	HornS	H/V	-86.5	-74.3	21.5	- 0.6	40.5	54.0	13.5	High, noise
12	4834.0	HornC	H/V	-88.6	-75.5	25.5	- 0.7	42.5	54.0	11.5	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-88.5	-77.5	25.5	- 0.7	42.6	54.0	11.4	1.0 m, Noise for Ave and Peak
14	4914.0	HornC	H/V	-88.6	-76.3	25.5	- 0.7	42.5	54.0	11.5	1.0 m, Noise for Ave and Peak
15	7251.0	HornXN	H/V	-80.6	-67.8	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.6	-68.6	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
17	7371.0	HornXN	H/V	-80.9	-68.4	25.5	- 0.8	50.3	54.0	3.7	1.0 m, Noise for Ave and Peak
18	12085.0	HornX	H/V	-72.6	-60.2	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.7	-61.7	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
20	12285.0	HornX	H/V	-73.1	-60.4	25.5	34.0	23.3	54.0	30.7	1.0 m, Noise for Ave and Peak
21	14502.0	HornKu	H/V	-76.9	-64.1	25.5	17.3	36.2	54.0	17.8	1.0 m, Noise for Ave and Peak
22	19336.0	HornK	H/V	-73.3	-61.9	32.3	32.0	31.9	54.0	22.1	1.0 m, Noise for Ave and Peak
23	19496.0	HornK	H/V	-73.7	-62.5	32.3	32.0	31.5	54.0	22.5	1.0 m, Noise for Ave and Peak
24	19656.0	HornK	H/V	-71.2	-60.5	32.3	32.0	34.0	54.0	20.0	1.0 m, Noise for Ave and Peak
25	22113.0	HornK	H/V	-67.7	-56.2	32.3	32.0	37.5	54.0	16.5	1.0 m, Noise for Ave and Peak
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		- 8.0	0.2			0.004	1.0		23.9	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	Arrest	50 ft	100.0	N/A	15U		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

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Table 5.8 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 15UA
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2											
3	2437.0										Mid channel only
4											
5											
6											
7	2390.0	HornS	H/V	-74.3	-61.1	21.5	- 0.6	52.7	54.0	1.3	Mid
8											
9											
10	2483.5	HornS	H/V	-78.6	-66.4	21.5	- 0.6	48.4	54.0	5.6	Mid, noise
11											
12											
13	4874.0	HornC	H/V	-88.7	-76.8	25.5	- 0.7	42.4	54.0	11.6	1.0 m, Noise for Ave and Peak
14											
15											
16	7311.0	HornXN	H/V	-80.9	-67.8	25.5	- 0.8	50.3	54.0	3.7	1.0 m, Noise for Ave and Peak
17											
18											
19	12185.0	HornX	H/V	-72.7	-60.1	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
20											
21											
22	19336.0	HornK	H/V	-73.7	-62.2	32.3	32.0	31.5	54.0	22.5	1.0 m, Noise for Ave and Peak
23											
24											
25											
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		8.4	6.9			0.180	1.0		7.5	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	yes	50 ft	100.0	N/A	15U		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

Meas. 05/14/10; U of Mich

Table 5.9 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 15Y
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2417.0										Low channel
3	2437.0										Mid channel
4	2457.0										High channel
5											
6	2390.0	HornS	H/V	-78.6	-67.5	21.5	- 0.6	48.4	54.0	5.6	Low
7	2390.0	HornS	H/V	-79.9	-68.0	21.5	- 0.6	47.1	54.0	6.9	Mid, noise
8	2390.0	HornS	H/V	-79.5	-69.5	21.5	- 0.6	47.5	54.0	6.5	High, noise
9	2483.5	HornS	H/V	-79.3	-69.3	21.5	- 0.6	47.7	54.0	6.3	Low, noise
10	2483.5	HornS	H/V	-79.2	-69.3	21.5	- 0.6	47.8	54.0	6.2	Mid, noise
11	2483.5	HornS	H/V	-79.3	-69.5	21.5	- 0.6	47.7	54.0	6.3	High, noise
12	4834.0	HornC	H/V	-78.6	-67.3	25.5	- 0.7	52.5	54.0	1.5	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-78.6	-66.9	25.5	- 0.7	52.5	54.0	1.5	1.0 m, Noise for Ave and Peak
14	4914.0	HornC	H/V	-78.4	-66.8	25.5	- 0.7	52.7	54.0	1.3	1.0 m, Noise for Ave and Peak
15	7251.0	HornXN	H/V	-80.5	-68.1	25.5	- 0.8	50.7	54.0	3.3	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.6	-67.9	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
17	7371.0	HornXN	H/V	-80.9	-67.9	25.5	- 0.8	50.3	54.0	3.7	1.0 m, Noise for Ave and Peak
18	12085.0	HornX	H/V	-72.6	-60.8	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.7	-60.2	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
20	12285.0	HornX	H/V	-72.7	-60.3	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
21	14502.0	HornKu	H/V	-76.9	-64.3	25.5	17.3	36.2	54.0	17.8	1.0 m, Noise for Ave and Peak
22	19336.0	HornK	H/V	-73.1	-62.0	32.3	32.0	32.1	54.0	21.9	1.0 m, Noise for Ave and Peak
23	19496.0	HornK	H/V	-73.5	-63.3	32.3	32.0	31.7	54.0	22.3	1.0 m, Noise for Ave and Peak
24	19656.0	HornK	H/V	-73.1	-60.3	32.3	32.0	32.1	54.0	21.9	1.0 m, Noise for Ave and Peak
25	22113.0	HornK	H/V	-67.9	-57.1	32.3	32.0	37.3	54.0	16.7	1.0 m, Noise for Ave and Peak
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		- 4.0	0.4			0.01	1.0		19.9	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	Arrest	50 ft	N/A	N/A	15Y		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

Meas. 05/14/10; U of Mich

Table 5.10 Highest Emissions Measured

Radiated Emissions										HyperLink/Proxim; 15YA	
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2	2425.0										Low channel
3	2437.0										Mid channel
4	2449.0										High channel
5											
6	2390.0	HornS	H/V	-77.0	-67.5	21.5	- 0.6	50.0	54.0	4.0	Low
7	2390.0	HornS	H/V	-79.4	-68.0	21.5	- 0.6	47.6	54.0	6.4	Mid, noise
8	2390.0	HornS	H/V	-79.4	-69.5	21.5	- 0.6	47.6	54.0	6.4	High, noise
9	2483.5	HornS	H/V	-79.1	-69.3	21.5	- 0.6	47.9	54.0	6.1	Low, noise
10	2483.5	HornS	H/V	-79.3	-69.3	21.5	- 0.6	47.7	54.0	6.3	Mid, noise
11	2483.5	HornS	H/V	-79.2	-69.5	21.5	- 0.6	47.8	54.0	6.2	High, noise
12	4850.0	HornC	H/V	-79.0	-65.7	25.5	- 0.7	52.1	54.0	1.9	1.0 m, Noise for Ave and Peak
13	4874.0	HornC	H/V	-78.6	-67.1	25.5	- 0.7	52.5	54.0	1.5	1.0 m, Noise for Ave and Peak
14	4898.0	HornC	H/V	-78.4	-66.2	25.5	- 0.7	52.7	54.0	1.3	1.0 m, Noise for Ave and Peak
15	7275.0	HornXN	H/V	-80.5	-67.4	25.5	- 0.8	50.7	54.0	3.3	1.0 m, Noise for Ave and Peak
16	7311.0	HornXN	H/V	-80.6	-67.8	25.5	- 0.8	50.6	54.0	3.4	1.0 m, Noise for Ave and Peak
17	7347.0	HornXN	H/V	-78.3	-68.3	25.5	- 0.8	52.9	54.0	1.1	1.0 m, Noise for Ave and Peak
18	12125.0	HornX	H/V	-72.7	-60.9	25.5	34.0	23.7	54.0	30.3	1.0 m, Noise for Ave and Peak
19	12185.0	HornX	H/V	-72.8	-60.5	25.5	34.0	23.6	54.0	30.4	1.0 m, Noise for Ave and Peak
20	12245.0	HornX	H/V	-72.6	-59.9	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
21	19400.0	HornK	H/V	-73.3	-61.6	32.3	32.0	31.9	54.0	22.1	1.0 m, Noise for Ave and Peak
22	19496.0	HornK	H/V	-73.3	-62.7	32.3	32.0	31.9	54.0	22.1	1.0 m, Noise for Ave and Peak
23	19592.0	HornK	H/V	-71.4	-59.5	32.3	32.0	33.8	54.0	20.2	1.0 m, Noise for Ave and Peak
24	22041.0	HornK	H/V	-67.9	-56.8	32.3	32.0	37.3	54.0	16.7	1.0 m, Noise for Ave and Peak
25											
26											
27	Health Hazard:		Pr	Pr			Pr	Limit		dB	
28			dBm	mW			mW/cm2	mW/cm2		Bellow	
29	2437 MHz		- 1.8	0.7			0.02	1.0		17.7	
30											
31	Configuration:										
32	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
33	ACSM-26	yes	50 ft	250	gray	15Y		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
34								** Includes -2.1 dB Duty Factor			
35											
36											
37											
38											

Meas. 05/14/10; U of Mich

Table 5.11 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 24G
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2											
3	2437.0										Mid channel only
4											
5											
6											
7	2390.0	HornS	H/V	-79.9	-67.1	21.5	- 0.6	47.1	54.0	6.9	Mid, noise
8											
9											
10	2483.5	HornS	H/V	-78.5	-67.3	21.5	- 0.6	48.5	54.0	5.5	Mid, noise
11											
12											
13	4874.0	HornC	H/V	-78.7	-68.2	25.5	- 0.7	52.4	54.0	1.6	1.0 m, Noise for Ave and Peak
14											
15											
16	7311.0	HornXN	H/V	-80.5	-67.9	25.5	- 0.8	50.7	54.0	3.3	1.0 m, Noise for Ave and Peak
17											
18											
19	12185.0	HornX	H/V	-72.5	-60.6	25.5	34.0	23.9	54.0	30.1	1.0 m, Noise for Ave and Peak
20											
21											
22	19336.0	HornK	H/V	-73.4	-61.3	32.3	32.0	31.8	54.0	22.2	1.0 m, Noise for Ave and Peak
23											
24											
25											
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		- 3.0	0.5			0.013	1.0		18.9	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	yes	50 ft	N/A	N/A	24G		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

Meas. 05/14/01; U of Mich

Table 5.12 Highest Emissions Measured

Radiated Emissions											HyperLink/Proxim; 24GA
#	Freq. MHz	Ant. Used	Ant. Pol.	Ave dBm	Peak dBm	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1											
2											
3	2437.0										Mid channel only
4											
5											
6											
7	2390.0	HornS	H/V	-79.3	-67.1	21.5	- 0.6	47.7	54.0	6.3	Mid, noise
8											
9											
10	2483.5	HornS	H/V	-79.2	-67.3	21.5	- 0.6	47.8	54.0	6.2	Mid, noise
11											
12											
13	4874.0	HornC	H/V	-78.6	-67.6	25.5	- 0.7	52.5	54.0	1.5	1.0 m, Noise for Ave and Peak
14											
15											
16	7311.0	HornXN	H/V	-80.8	-68.5	25.5	- 0.8	50.4	54.0	3.6	1.0 m, Noise for Ave and Peak
17											
18											
19	12185.0	HornX	H/V	-72.6	-60.4	25.5	34.0	23.8	54.0	30.2	1.0 m, Noise for Ave and Peak
20											
21											
22	19336.0	HornK	H/V	-73.3	-62.4	32.3	32.0	31.9	54.0	22.1	1.0 m, Noise for Ave and Peak
23											
24											
25											
26											
27											
28	Health Hazard:		Pr	Pr			Pr	Limit		dB	
29			dBm	mW			mW/cm2	mW/cm2		Below	
30	2437 MHz		7.5	5.6			0.146	1.0		8.4	
31											
32	Configuration:										
33	Pwr supp	Pwr feed	Coax	Amp	Filt	Ant		* Ave: measured with 1 MHz RBW and 100 Hz VBW			
34	ACSM-26	Arrest	50 ft	250.0	Black	24G		* Peak: measured with 1 MHz RBW and 3 MHz VBW			
35								** Includes -2.1 dB Duty Factor			
36											
37											
38											

Meas. 05/14/10; U of Mich

Table 6.3 Highest Conducted Emissions Measured

ACSM-26; FCC A

#	Freq. MHz	Line Side	Peak Det., dBμV		Pass dB*	QP Det., dBμV		Pass dB	Ave. Det., dBμV		Pass dB	Comments
			Vtest	Vlim*		Vtest	Vlim		Vtest	Vlim		
1	0.450	Lo	48.0	60.0	12.0		60.0					
2	0.770	Lo	46.0	60.0	14.0		60.0					
3	0.910	Lo	45.0	60.0	15.0		60.0					
4	1.20	Lo	45.0	60.0	15.0		60.0					
5	1.72	Lo	49.0	69.6	20.6		69.6					
6	1.96	Lo	52.0	69.6	17.6		69.6					
7	2.63	Lo	60.1	69.6	9.5		69.6					
8	8.10	Lo	43.0	69.6	26.6		69.6					
9	22.50	Lo	46.0	69.6	23.6		69.6					
10	23.90	Lo	42.0	69.6	27.6		69.6					
11	29.90	Lo	28.0	69.6	41.6		69.6					
12												
13												
14	0.500	Hi	52.0	60.0	8.0		60.0					*worst case
15	0.750	Hi	51.0	60.0	9.0		60.0					
16	1.400	Hi	50.0	60.0	10.0		60.0					
17	1.80	Hi	52.0	69.6	17.6		69.6					
18	2.63	Hi	58.5	69.6	11.1		69.6					
19	8.00	Hi	44.0	69.6	25.6		69.6					
20	22.10	Hi	46.0	69.6	23.6		69.6					
21	24.00	Hi	42.0	69.6	27.6		69.6					
22	29.80	Hi	39.0	69.6	30.6		69.6					
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

*QP limit

Meas. 05/15/2001; U of Mich.

Since $V_{peak} \geq V_{qp}$, the V_{qplim} is met.

Table 6.4 Highest Conducted Emissions Measured

DSA-0151A-12; FCC B

#	Freq. MHz	Line Side	Peak Det., dBμV		Pass dB*	QP Det., dBμV		Pass dB	Ave. Det., dBμV		Pass dB	Comments
			Vtest	Vlim*		Vtest	Vlim		Vtest	Vlim		
1	0.490	Lo	36.0	48.0	12.0		48.0					
2	0.920	Lo	37.0	48.0	11.0		48.0					
3	1.20	Lo	37.0	48.0	11.0		48.0					
4	1.92	Lo	32.0	48.0	16.0		48.0					
5	3.00	Lo	38.0	48.0	10.0		48.0					
6	3.90	Lo	39.0	48.0	9.0		48.0					
7	16.5	Lo	32.0	48.0	16.0		48.0					
8	24.0	Lo	32.0	48.0	16.0		48.0					
9	30.0	Lo	27.0	48.0	21.0		48.0					
10							48.0					
11							48.0					
12	0.500	Hi	33.0	48.0	15.0		48.0					
13	0.850	Hi	33.0	48.0	15.0		48.0					
14	1.230	Hi	36.0	48.0	12.0		48.0					
15	1.49	Hi	35.0	48.0	13.0		48.0					
16	1.78	Hi	34.0	48.0	14.0		48.0					
17	4.20	Hi	44.0	48.0	4.0		48.0					*worst case
18	9.80	Hi	30.0	48.0	18.0		48.0					
19	16.10	Hi	31.0	48.0	17.0		48.0					
20	23.30	Hi	30.0	48.0	18.0		48.0					
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

*QP limit

Meas. 5/15/2001; U of Mich.

Since $V_{peak} \geq V_{qp}$, the V_{qplim} is met.

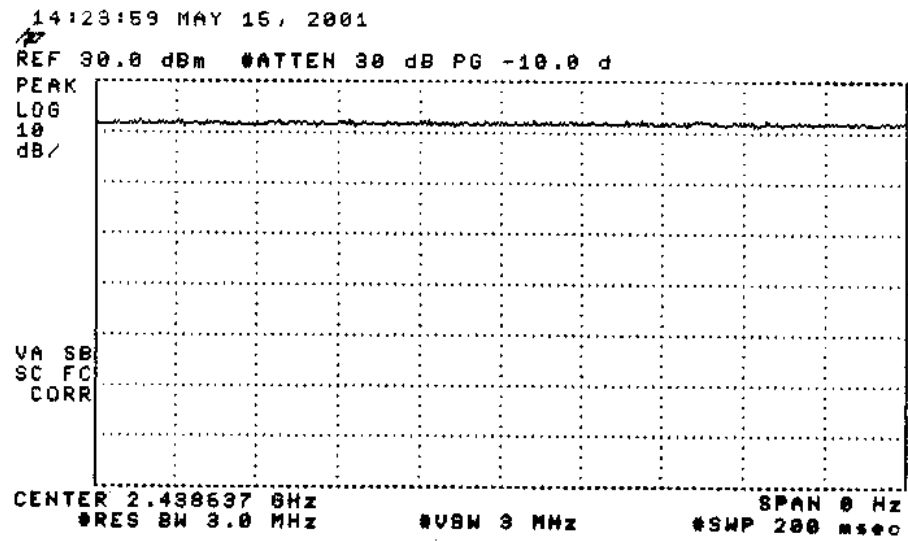


Figure 6.1 Measurement of duty factor for modified CW operation.

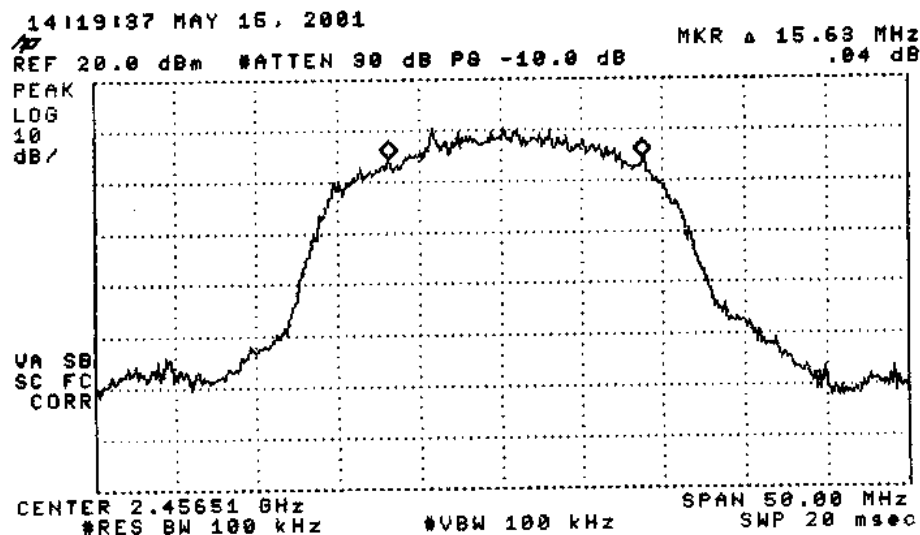
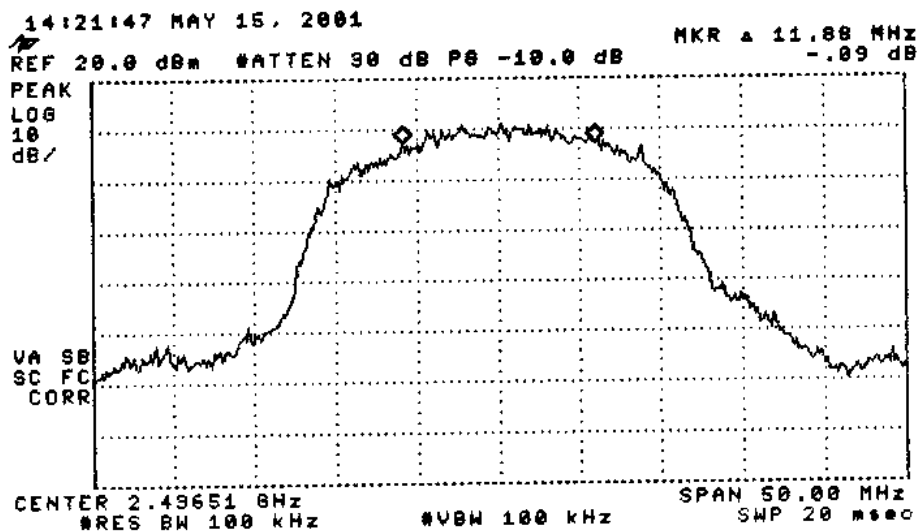
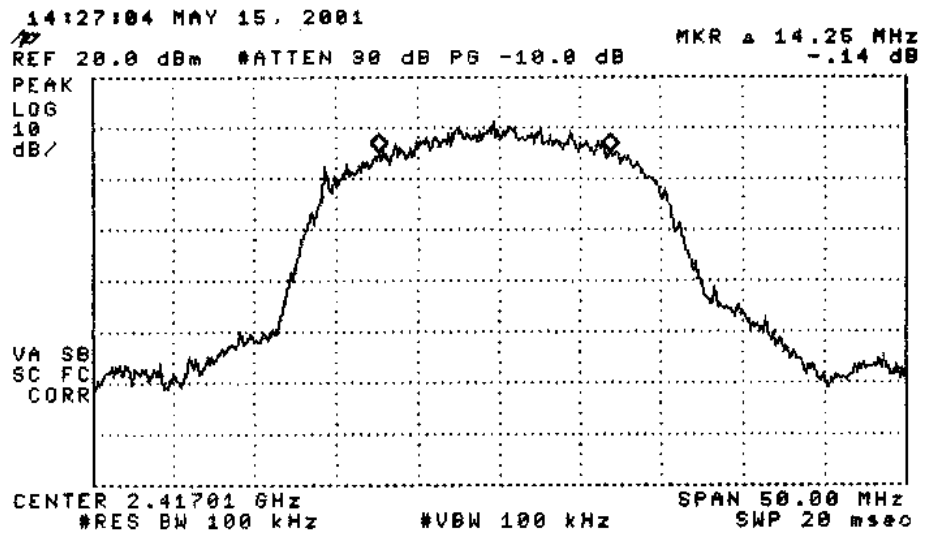


Figure 6.2. 6 dB-point bandwidth measurements; low, mid, and high channels.

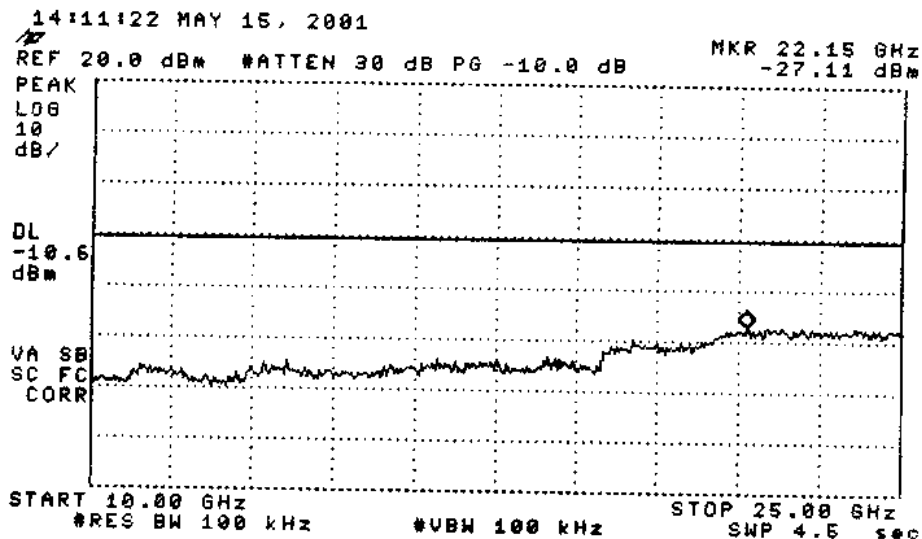
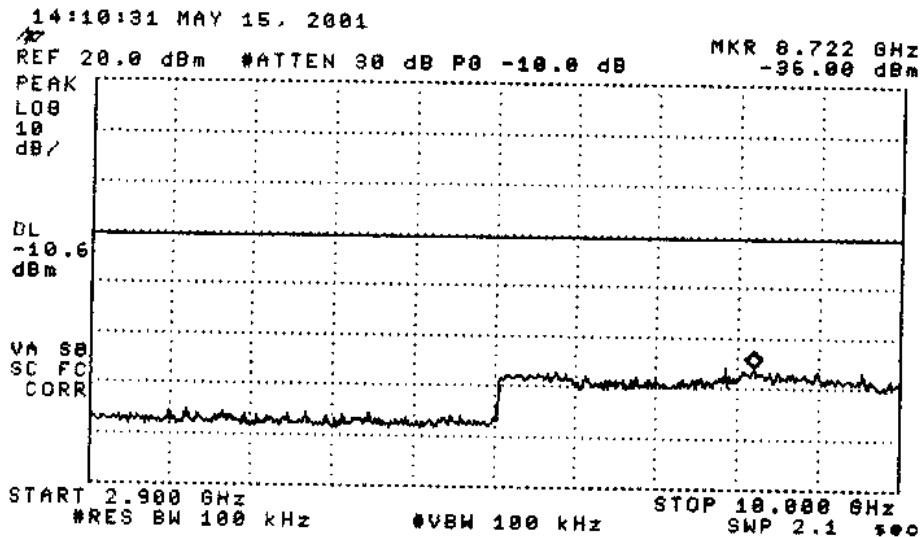
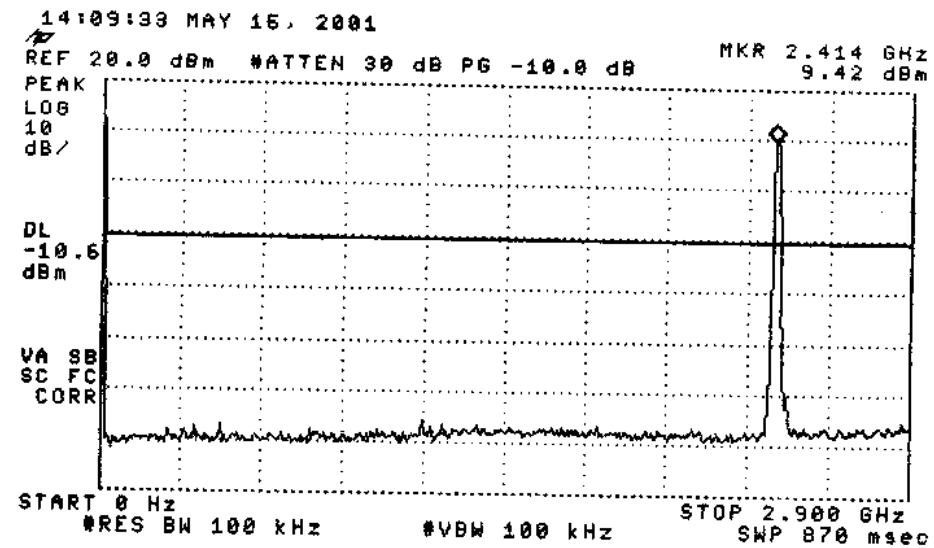


Figure 6.3(a).
Antenna conducted
spurious emissions,
low channel.

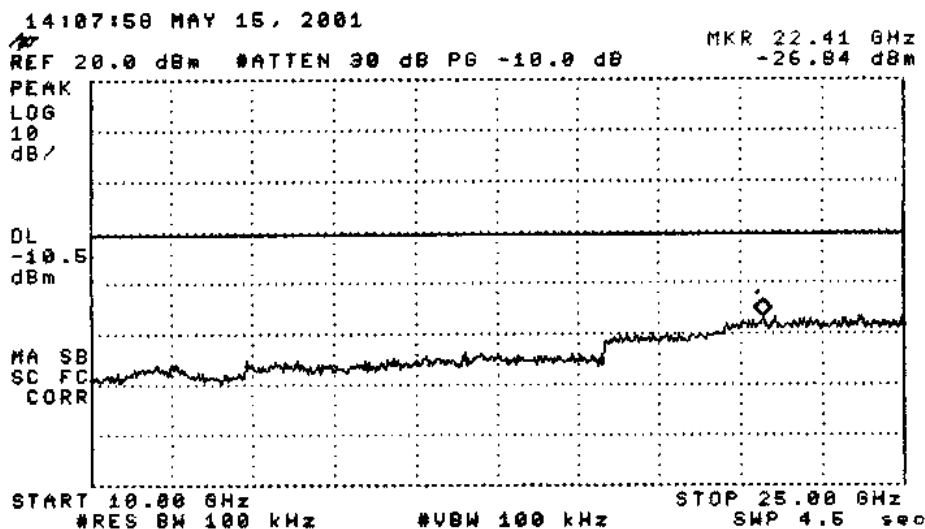
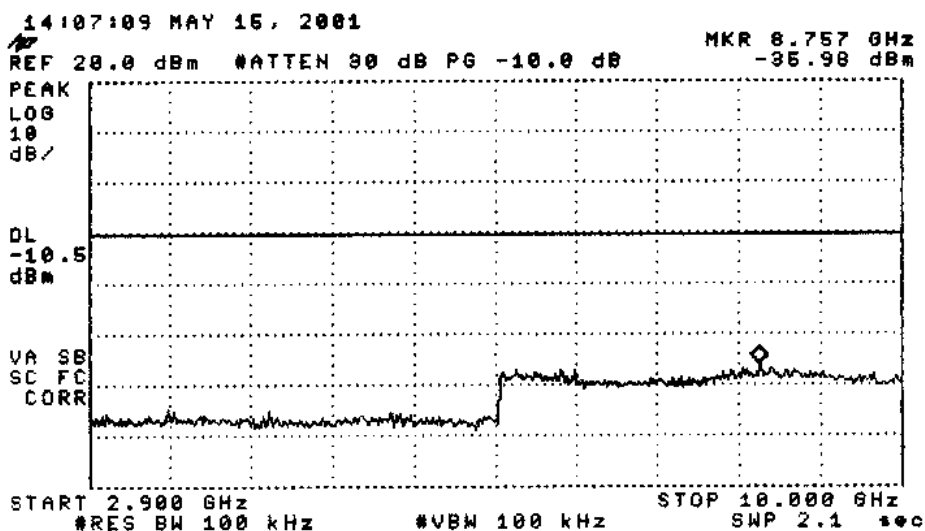
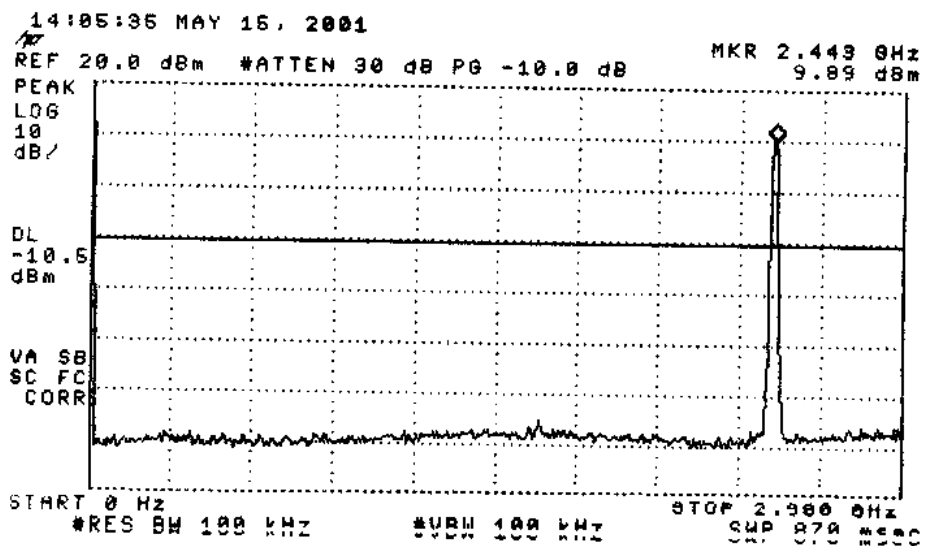


Figure 6.3(b).
Antenna conducted
spurious emissions,
mid channel.

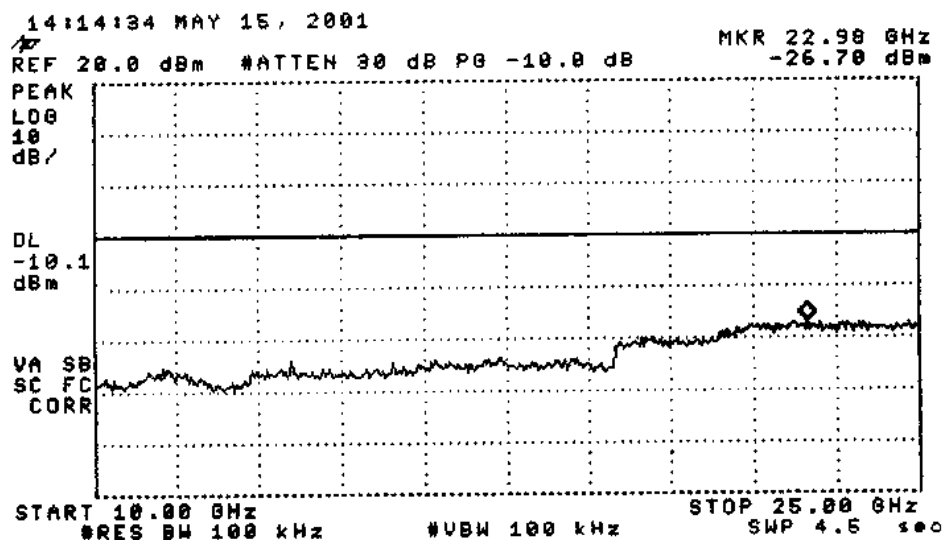
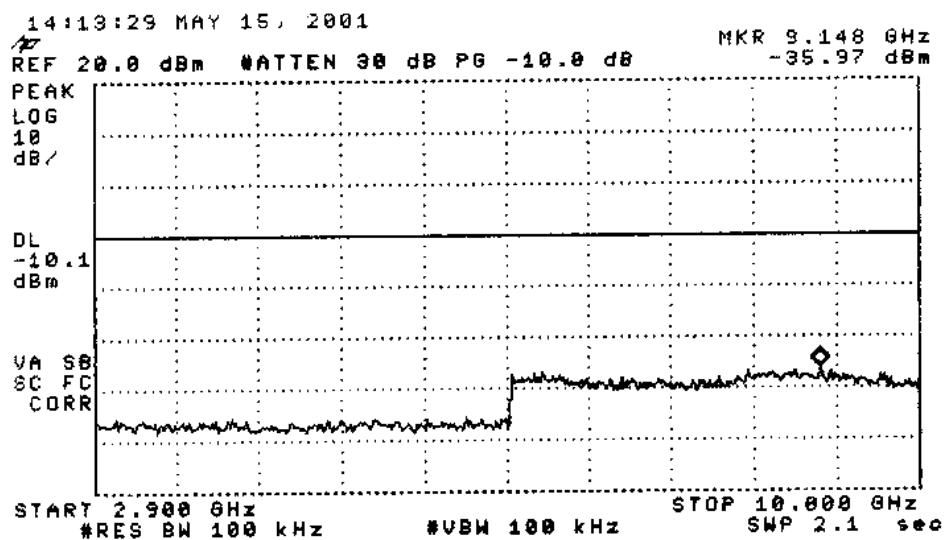
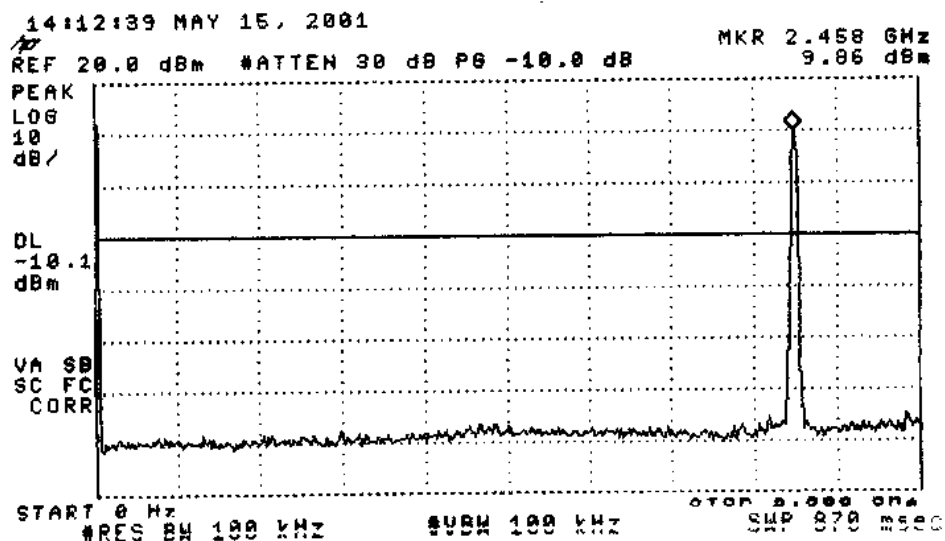


Figure 6.3(c).
Antenna conducted
spurious emissions,
high channel.

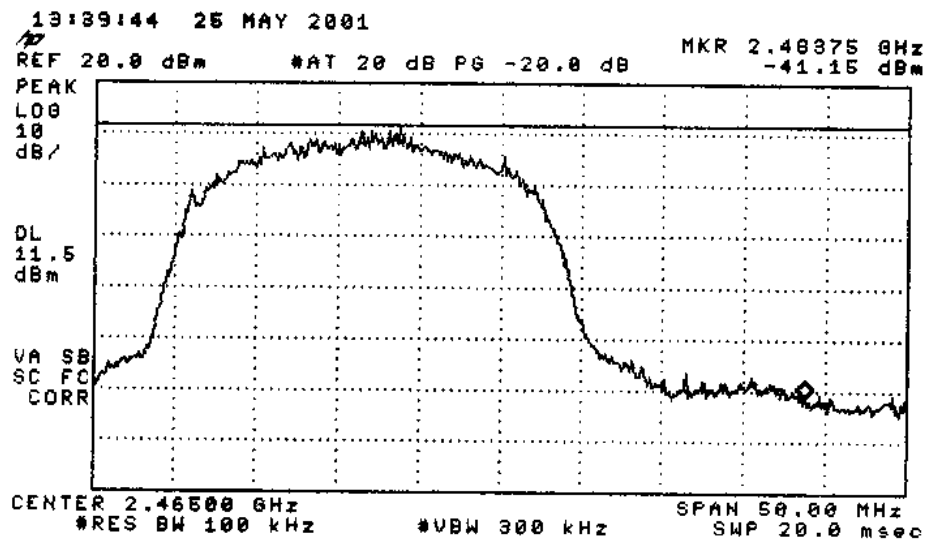
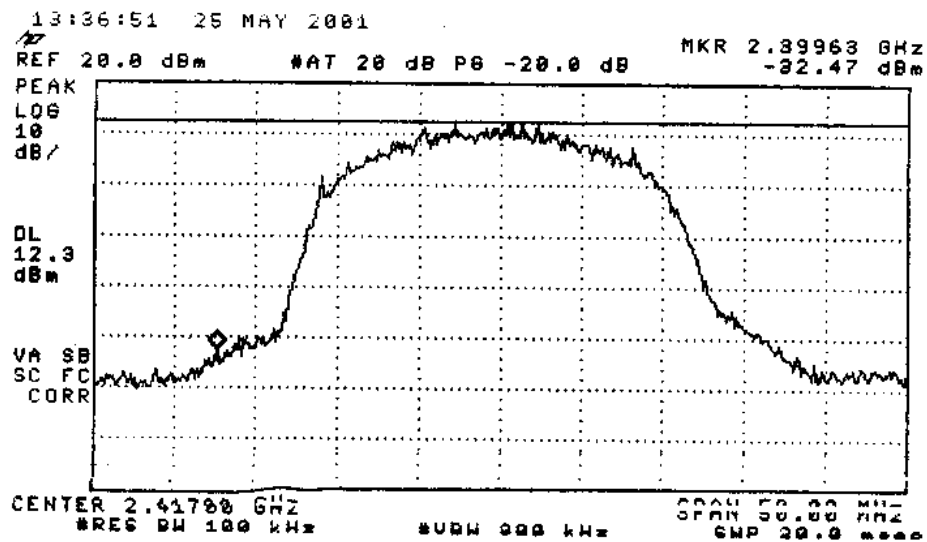


Figure 6.4. Band-edge behavior at bottom and top of the band.

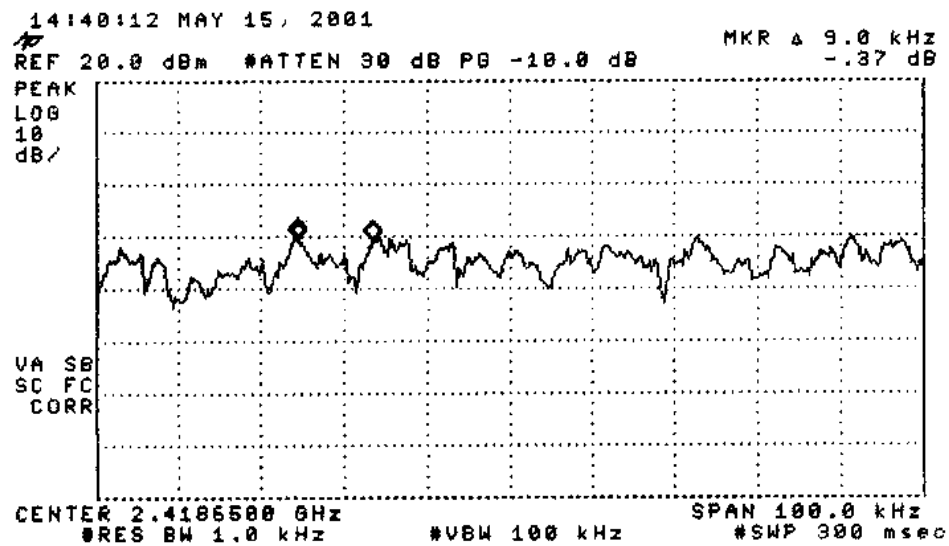
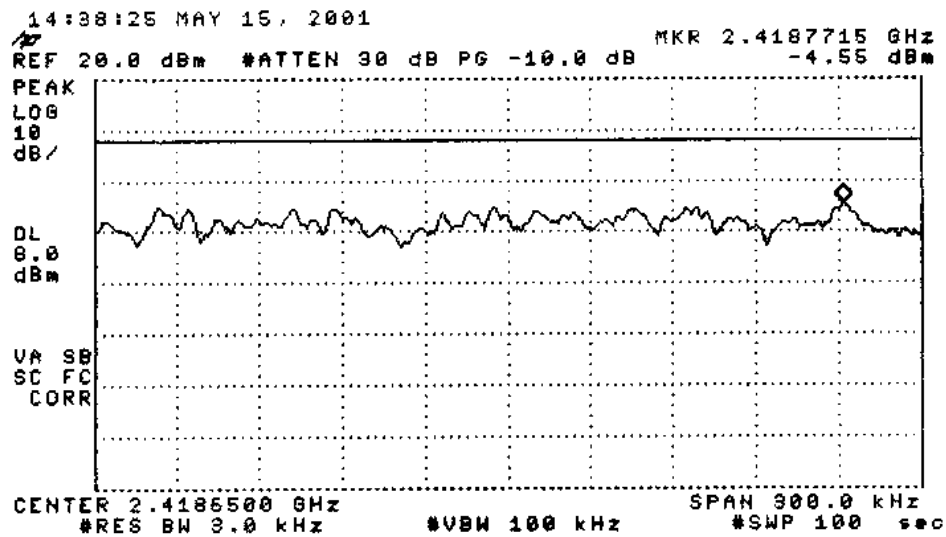
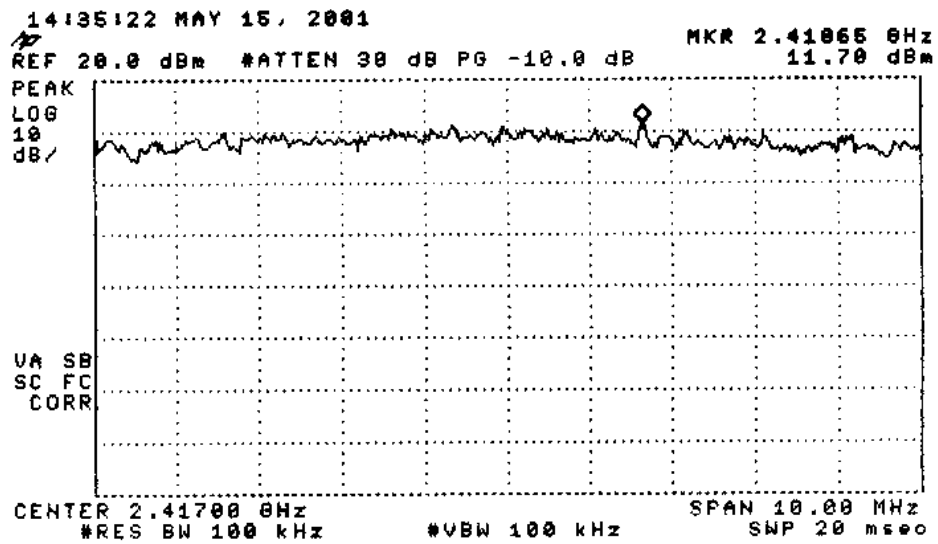


Figure 6.5(a). Spectral Density (low channel);
(top) Spectrum Scan, (mid) Spectral Density, (bottom) Line Spacing.

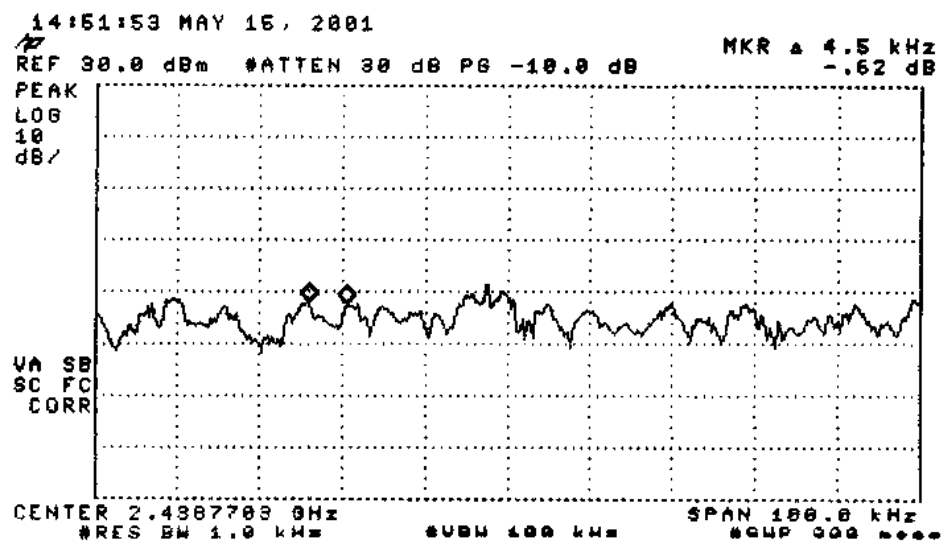
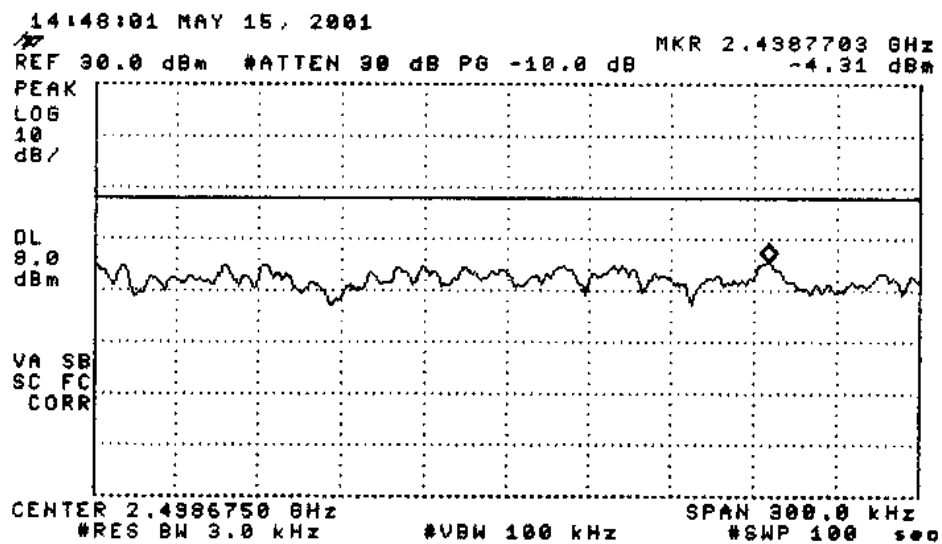
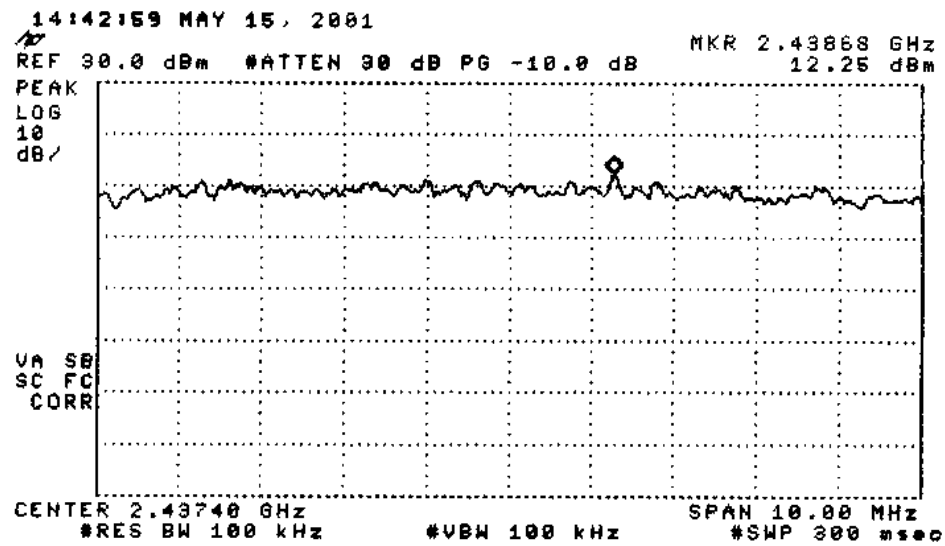


Figure 6.5(b). Spectral Density (mid channel);
(top) Spectrum Scan, (mid) Spectral Density, (bottom) Line Spacing.

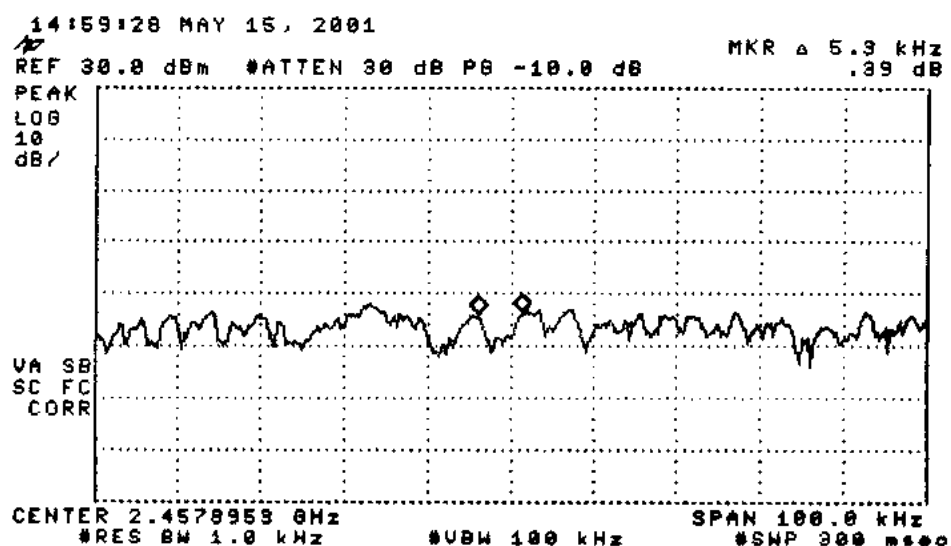
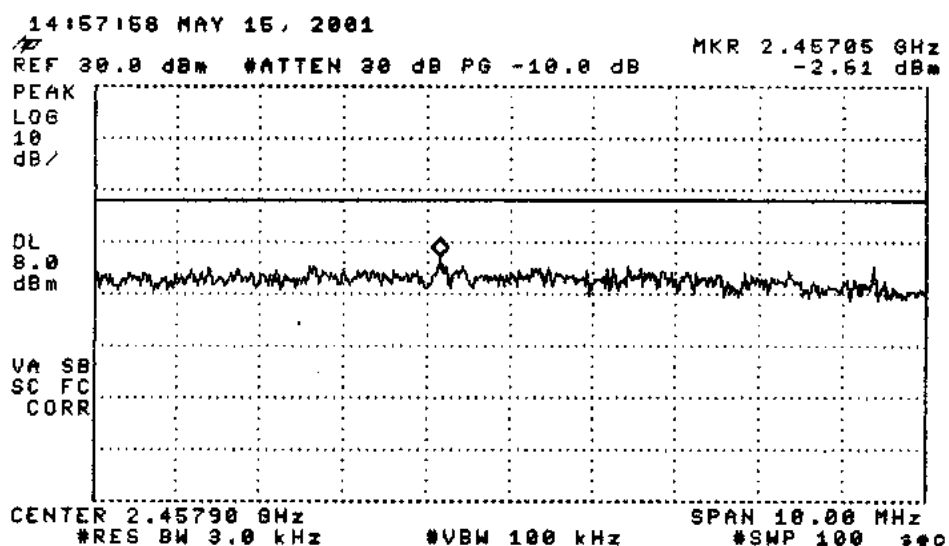
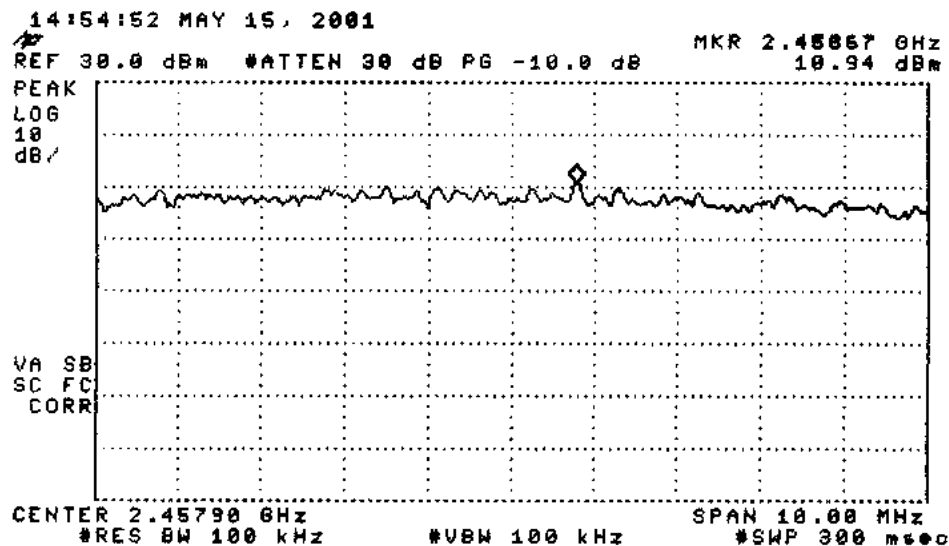


Figure 6.5(c). Spectral Density (high channel);
(top) Spectrum Scan, (mid) Spectral Density, (bottom) Line Spacing.