EXHIBIT 2: REPORT OF MEASUREMENTS [2.1033(b)(6)]

Summary of Results:

Summary with 2.2dBi short antenna

1. This test series evaluated the Equipment Under Test, LM3100, to FCC Part 15, SubPart C. The evaluation of spurious emissions and line conducted was done using the EN55022 Class B standard as allowed under 15.107(e) and 15.109(g). Above 1GHz, the evaluation of spurious and intentional emissions followed the provisions of 15.247.
2. The LM3100 was tested with a standard 2.2dBi antenna and with two alternate antennas; the 16dBi Patch Antenna and 12dBi OMNI Antenna. (Refer to Exhibits 4 and 5.)
3. The system tested is compliant to the requirement of CFR 47, FCC Part 15, SubPart C for Frequency Hopping Spread Spectrum, 2.4GHz, Intentional Radiators.
3. The equipment under test was received on November 19, 1998 and this test series commenced on November 19, 1998.
4. The line conducted emission level nearest the EN55022 Class B limit occurred at 221KHz with the Quasi-Peak detector. The signal was measured to be 48.78dBuV, which is 14dB below the limit when measuring phase to ground. The highest Quasi-Peak emission observed in the range 450KHz to 30MHz occurred at 6.7MHz. This signal was measured to be 67.7uV, which is 11.4dB below the FCC Class B limit of 250uV.
5. The radiated level of spurious emissions nearest the EN55022 Class B limit, with the EUT in 'Receive Mode', occurred at 199.9MHz vertically polarized. This signal was measured to be 27.1dBuV/m which is 2.9dB below the EN55022 30dBuV/m limit. Above 1GHz the emission nearest the FCC limit of 500uV occurred at 2052MHz. This signal was measured to be 248.3uV/m which is 6.1dB below the 500uV limit.
6. Band Edge, Restricted Band: The radiated emission level nearest occurred at 2.4835GHz vertically polarized. This signal was measured to be 177.8uV/m which is 9dB below the 500uV/m limit.
7. Transmitter harmonics: The radiated emission level nearest the limit, that was not in the system noise floor, occurred at 7.350Ghz. The signal was measured to be 298.5uV/m which is 4.5dB below the 500uV/m limit.

8 The transmitter maximum power was measured at 2.402GHGz, 2.450GHz, and 2.480GHz. The highest level observed measured to be 17.8dBm which is 12.2dB below the 15.247(b1) limit of 30dBm.

Summary of Results with optional 16dBi and 12dBi antennas

16dBi Patch antenna

1. Band Edge, Restricted Band: The radiated emission level nearest occurred at 2.388GHz vertically polarized. This signal was measured to be 113.5uV/m which is 12.9dB below the 500uV/m limit.
2. Transmitter harmonics: The radiated emission level nearest the limit, that was not in the measurement equipment noise floor, occurred at 7.440Ghz. The signal was measured to be 239.9uV/m which is 6.4dB below the 500uV/m limit.
3. The transmitter maximum power was measured at 2.402GHGz, 2.450GHz, and 2.480GHz. The highest level observed measured to be 17.8dBm which is 2.2dB below the 15.247(b3) limit of 20dBm. [This limit is derated due to the 16dBi antenna used with the transmitter].

12dBi Omni antenna

1. Band Edge, Restricted Band: The radiated emission level nearest occurred at 2.488GHz vertically polarized. This signal was measured to be 70uV/m which is 17.1dB below the 500uV/m limit.
2. Transmitter harmonics: The radiated emission level nearest the limit, that was not in the measurement equipment noise floor, occurred at 7.206Ghz. The signal was measured to be 216.3uV/m which is 7.3dB below the 500uV/m limit.
3. The transmitter maximum power was measured at 2.402GHGz, 2.450GHz, and 2.480GHz. The highest level observed measured to be 17.8dBm which is 6.2dB below the 15.247(b3) limit of 24dBm. [This limit is derated due to the 12dBi antenna used with the transmitter].

Changes made to achieve compliance

1. NONE

Requirements of Frequency Hopping systems [15.247(a1,a1ii)]

Manufacturer's Statements

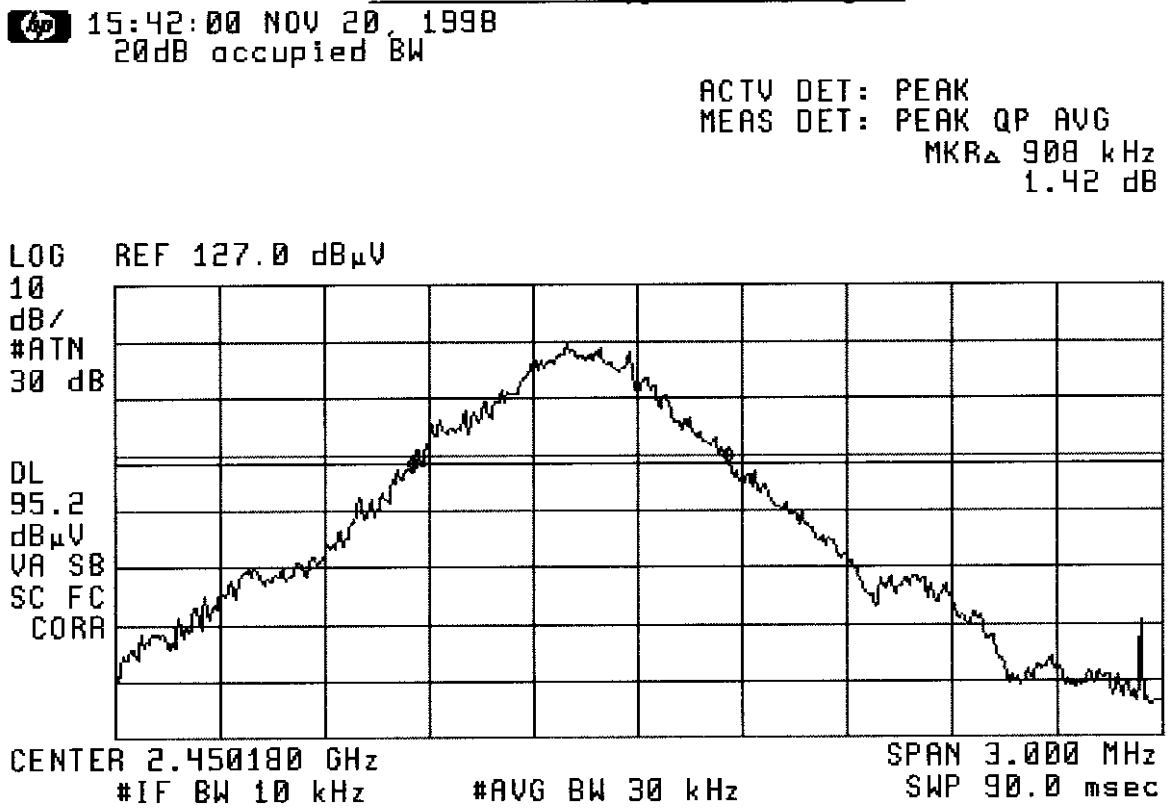
"The LM3100 frequency hopping transceiver adheres to the requirement of transmissions in a truly psuedorandom manner by ensuring that the message traffic operates over a continuous hopping pattern. The sequence does not "reset" after a message transaction; rather, it continues in the hop pattern through any waiting time for the next transaction. In this manner, the participants in the wireless LAN synchronize with each other and follow the continual hop pattern selected at initialization regardless of the network traffic. Any beacon messages which are broadcast to all participants also appear in uniform distribution throughout all channels."

"The LM3100 adheres to the IEEE 802.11 standard in that it uses the North American Base Hopping Sequence and the Hop Sequence Calculation Algorithm specified in IEEE P802.11 standard for Wireless LAN. The LM3100 hopping sequences use 79 frequencies."

"Each channel frequency is used equally by the transmitter."

The 20dB bandwidth of a hopping channel is measured to be 908KHz. This is less than the maximum allowed bandwidth of 1MHz. [15.247(a1ii)]

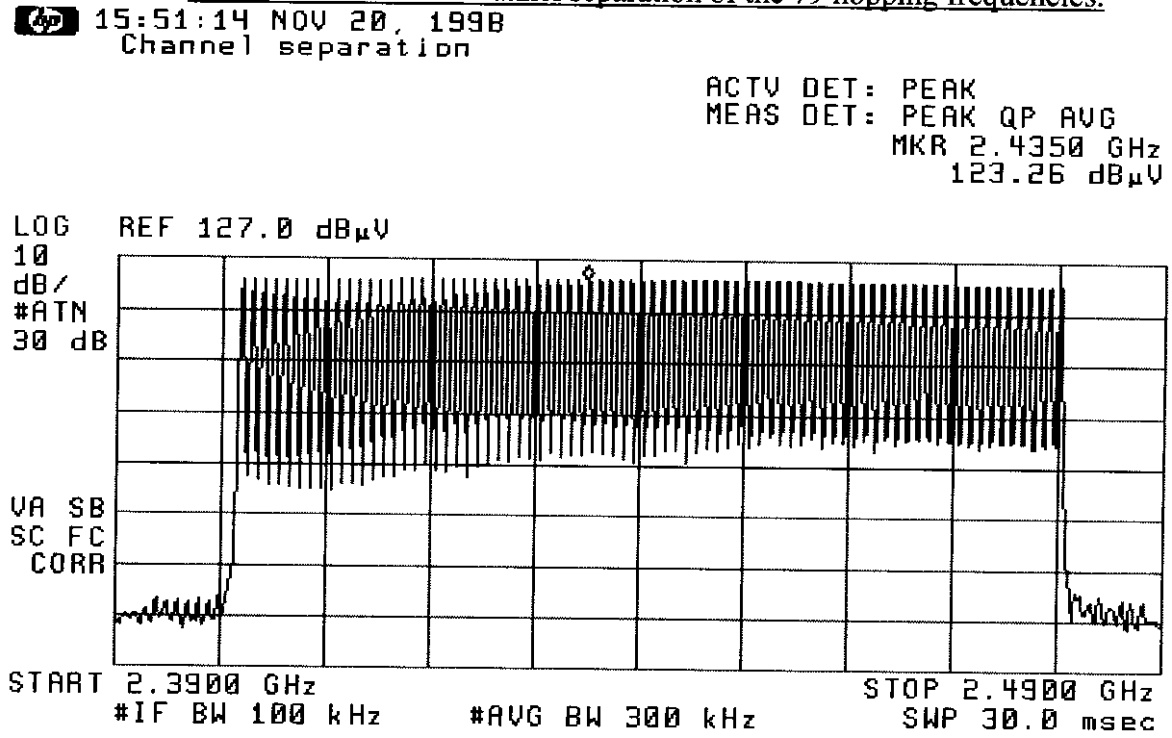
This chart shows a typical channel signal.



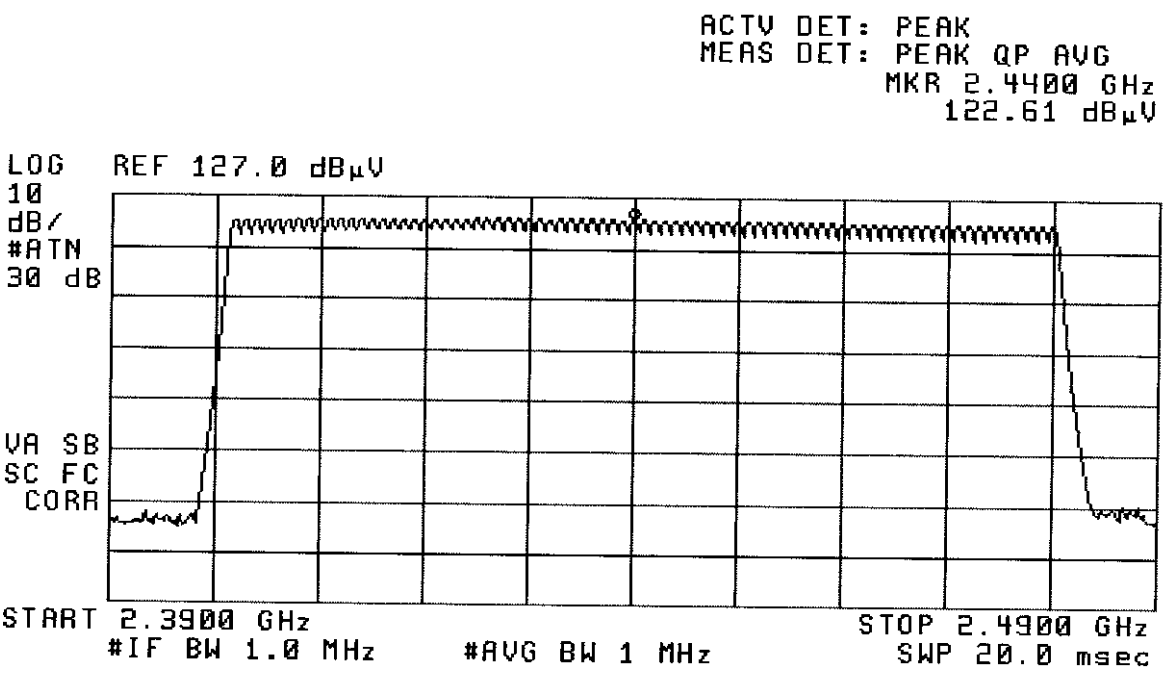
Channel Separation

The LM3100 tunes from 2402MHz to 2480MHz in 79 frequencies. The channel separation is 987KHz. This is greater than the minimum required separation of 908KHz. [15.247(a1)]

This chart shows the channel separation of the 79 hopping frequencies.



This chart shows the Occupied Band of the LM3100.



Standards Applied to Test: [2.1033(b)(6)]

ANSI C63.4 - 1992, Appendix I
CFR47 FCC Part 2, Part 15, SubPart C, 15.247

Test Methodology: [2.947(a), 2.1033(b)(6)]

For the testing, the placement of the EUT and the support equipment was selected to represent a configuration which would operate the equipment within the setup constraints of ANSI C63.4.

Line Conducted testing, performed in a shielded enclosure, and radiated testing, performed at a 3 and 10 meter open field test site, were both completed according to the procedures outlined in the standards.

The cables of the EUT were manipulated to produced the highest signal level relative to the limit.

The pictures in this report, showing test setups, indicate the position of the equipment and cabling that produced the maximum signal level.

A laptop computer hosted the transmitter LM3100.

Line Conducted

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm from the ground floor and 40cm from the vertical conducting plane in the prescribed setup per ANSI C63.4, Figure 9(a). This table is housed in a shielded enclosure to prevent the detection of unwanted ambients.

The mains power is nominally 115Vac, 60Hz.

The host unit was connected to the LISN being monitored by the EMI Receiver.

The principle settings of the EMI Receiver for line conducted testing include:
Bandwidth = 9KHz
Detector Function: scanning and signal search = Peak Detection Mode
measurements = Quasi Peak Detection

Radiated

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm from the open field site ground plane in the prescribed setup per ANSI C63.4, Figure 9(c).

The table sits upon a remote controlled turntable. The receiving antenna, located at the appropriate standards distance of 3 or 10 meters from the table center, is also remote controlled.

During the evaluation the transmitter was on continuously.

Preliminary tests were done at the 3 meter open field test site. The final tests are done at the appropriate standards distance of 3 or 10 meters. The "Biconical/Log Periodic" broadband antenna connected to an EMI Receiver, meeting CISPR 16, is used throughout the testing.

The turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions. Both Vertical and Horizontal RF profiles were evaluated.

The principle settings of the EMI Receiver for radiated testing include:

Bandwidth:	120KHz for frequencies less than 1GHz.
	1 MHz for frequencies greater than 1GHz.
Detector Function:	scanning and signal search = Peak Mode
	measurements = Quasi Peak Mode for frequencies less than 1Ghz.
	Average mode for frequencies greater than 1GHz.

The resultant Field Strength (FS) is a summation in decibels (dB) of the Indicated Receiver Level (RF), the Antenna Correction Factor (AF), and the Cable Loss Factor (CF). If a PreAmplifier (PA) is used, its gain (dB) is subtracted from the above sum.

Formula 1: $FS(dBuV/m) = RF(dBuV) + AF(dB/m) + CF(dB) - PA(dB)$

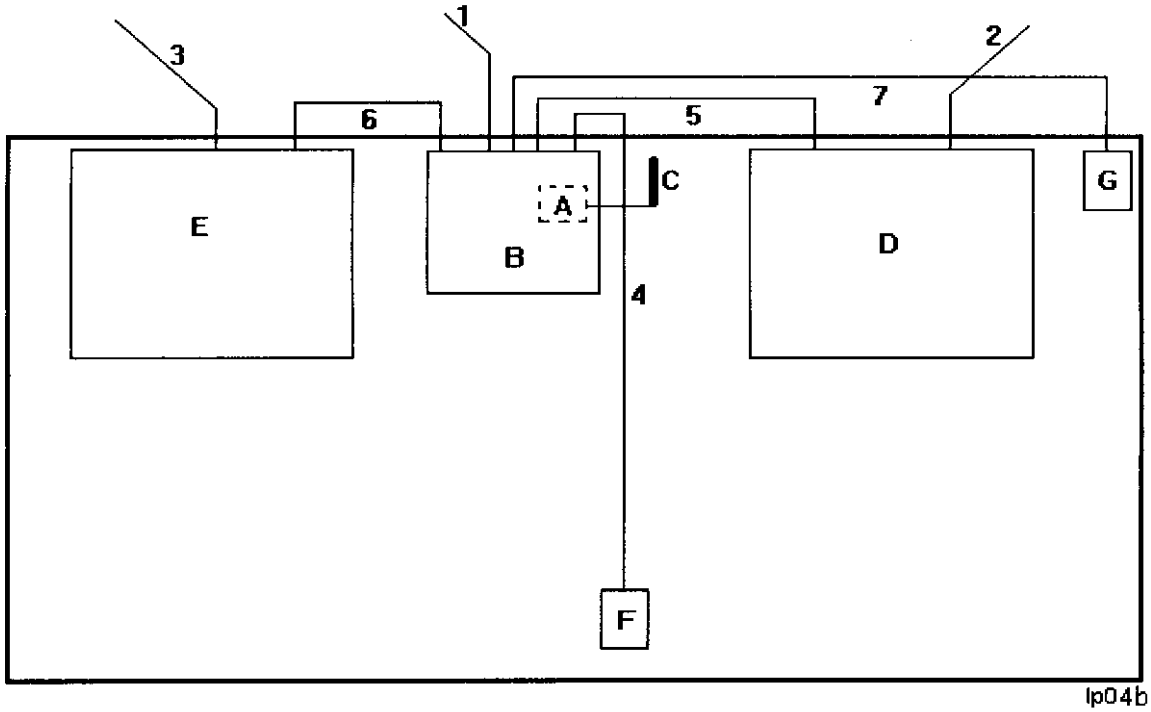
To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: $FS(uV/m) = AntiLog[(FS(dBuV/m))/20]$

Configuration Tested: [2.1033(b)(8)]

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] 2.4GHz FHSS transceiver	[Aironet] LM3100	--	FCC ID: LOZ102037
B	Host Computer 486DX4 100MHz	[Hewlett Packard] Omnibook 4000C	TW50902541	FCC ID:B944000XY1
	Laptop Power Supply	[HP] F1072A	T5005165	1meter DC cable, Shielded.
C	2.4GHz Antenna	--	--	--
D	Monitor	[ZDS] ZCM-1492-1	1190062ROD	FCC ID: ATO9OCZCM1492
E	Parallel Printer	[Lexmark] Optra Lxi	11-L9695	FCC ID: IYL4049-16
F	PS/2 Mouse	[MicroSoft] 2.0	640018	FCC ID: C3KAZB1
G	Serial Digital Camera	[Olympus] D-300L	16002530	FCC ID: AFAD-200L
1	DC line cord	--	--	1.5meters, Unshielded
2	Monitor line cord	--	--	2 meters, Unshielded
3	Printer line cord	--	--	1.5 meters, Unshielded
4	Mouse I/O cable	--	--	2 meters, Shielded. Permanently connected to mouse.
5	Video I/O cable	--	--	1.5 meters, Shielded. One ferrite core molded into jacket. Permanently connected to monitor. Bundled during testing.
6	Parallel I/O cable	--	--	2 meters, Shielded. Bundled during testing.
7	Serial I/O cable	--	--	1.5 meters, Shielded w. ferrite cores at both ends.



BASIC EUT SETUP
(Legend designation is on previous page)

Setup Pictures

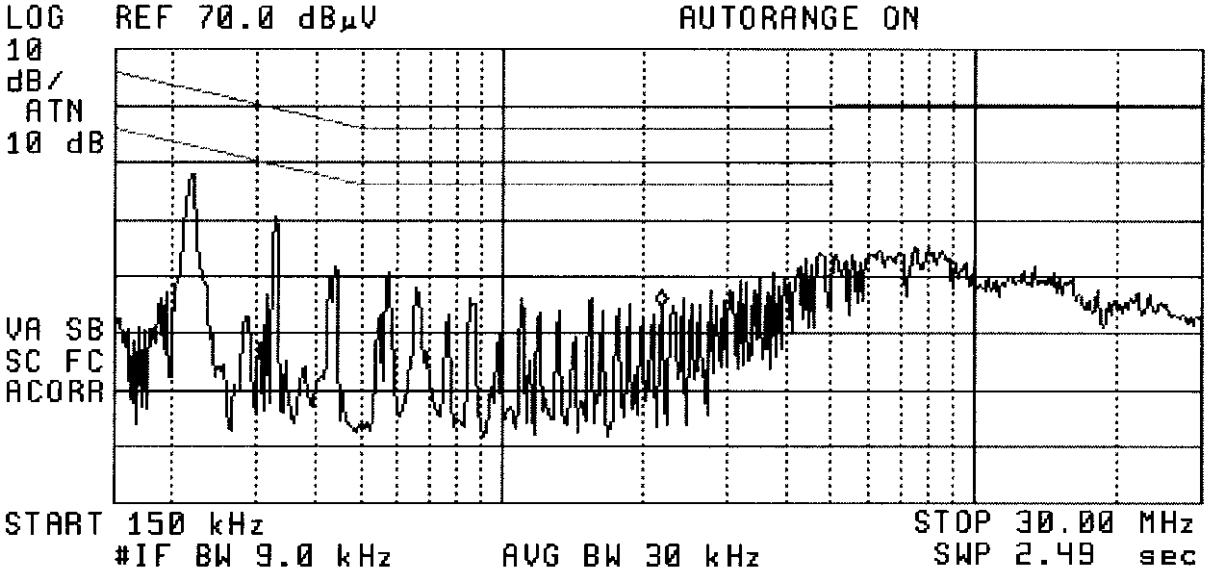
Test Data [2.1033(b)(6)]

Line Conducted 15.207(a)

NEUTRAL to Ground Measurement. 120Vac, 60Hz

Plot of Peak Values

Class B

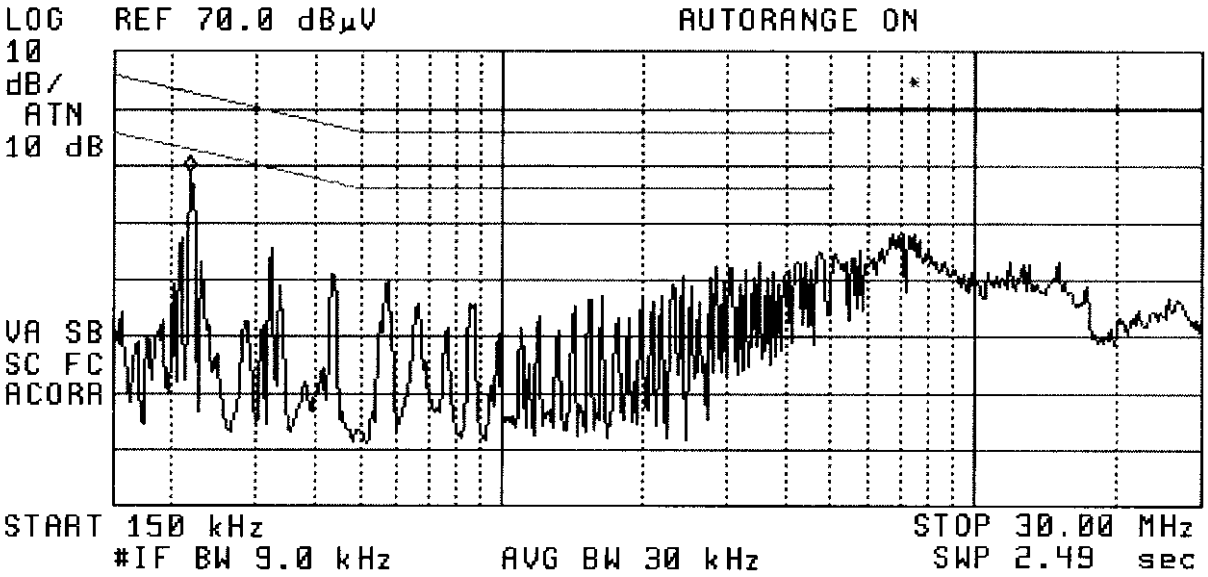


Tabulated Quasi-Peak Measurement.

Frequency	dBuV Reading		dBuV EN55022 B Limit		dB Margin	
MHz	QP	Avg	QP	Avg	QP	Avg
0.221	48.59	33.64	62.79	52.79	-14.20	-19.15
0.332	40.87	26.56	59.40	49.40	-18.53	-22.84
0.442	35.48	23.08	57.02	47.02	-21.54	-23.94
0.578	30.38	30.31	56.00	46.00	-25.62	-15.69
0.663	29.79	22.30	56.00	46.00	-26.21	-23.70
0.867	25.84	25.72	56.00	46.00	-30.16	-20.28
4.681	23.32	20.74	56.00	46.00	-32.68	-25.26
6.736	36.61	33.17	60.00	50.00	-23.39	-16.83
7.180	36.76	32.78	60.00	50.00	-23.24	-17.22

Measurements by: Ted Chaffee

PHASE to Ground Measurement. 120Vac, 60Hz
Plot of Peak Values
Class B



Tabulated Quasi-Peak Measurement.

Frequency	dBuV Reading		dBuV EN55022 B Limit		dB Margin	
MHz	QP	Avg	QP	Avg	QP	Avg
0.221	48.78	33.78	62.80	52.80	-14.02	-19.02
0.331	40.74	26.00	59.42	49.42	-18.68	-23.42
0.332	40.85	26.13	59.41	49.41	-18.56	-23.28
0.577	30.22	30.11	56.00	46.00	-25.78	-15.89
0.866	25.78	25.66	56.00	46.00	-30.22	-20.34
2.983	31.98	29.38	56.00	46.00	-24.02	-16.62
3.646	32.82	29.95	56.00	46.00	-23.18	-16.05
4.748	34.41	31.59	56.00	46.00	-21.59	-14.41
6.737	36.45	33.49	60.00	50.00	-23.55	-16.51
15.131	31.73	26.75	60.00	50.00	-28.27	-23.25

Measurements by: Fred Chaffee

Transmitter Maximum Peak Output Power: [15.247(b)(1), (b)(3)(i)]

MEASUREMENT PROCEDURE:

1. The EUT was setup to operate in for an 1MBit data rate.
2. The EMC Receiver was connected directly to the transmitter output.
3. The EMC Receiver was setup using IF BW = 1MHz, Avg BW = 300Hz.

With Standard 2.2dBi short antenna: Limit = 1Watt = 30dBm

Tuned Frequency MHz	Measurement dBm	Cable Factor dB	Total Power Level dBm	15.247(b)(3)(i) Limit dBm
2402	15.79	1.59	17.38	30
2450	16.18	1.59	17.77	30
2480	15.52	1.60	17.12	30

Measurements by: Fred Choffee

Out of Band Emissions: [15.205(a),(b),(c), 15.209(a), 15.247(c)]

Restricted Bands: [15.205]

The following frequency bands are restricted. Only spurious emissions are permitted at levels limited by 15.209:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.25
0.490-0.510	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

LIMIT @ 3meter: [15.209(a)]

30-88MHz 100uV/m 40dBuV/m
88-216MHz 150uV/m 43.5dBuV/m
216-960MHz 200uV/m 46dBuV/m
above 960MHz 500uV/m 54dBuV/m

Radiated Field Strength Measurements: [15.33(b), 15.109(a), 15.209(a)]

MEASUREMENT PROCEDURE:

1. The EUT was setup to operate as the receiver.
2. The EUT system was set upon the wooden turntable 80cm above the ground plane at a distance of 3 meters from the receiving antenna.
3. At each suspect frequency, the EUT system was rotated and the search antenna raised and lowered to obtain the maximum signal level.
4. A scan of 30MHz through 5GHz was made.
5. Both Horizontal and Vertical polarization modes were evaluated.
6. The Field Strength E(uV/m) is calculated using the formula:
   $E(uV/m) = LOG_{10}^{-1}((dBuV/m + Ant.Factor(dB) + Coax\ Loss(dB) - PreAmp(dB))/20)$
7. Note: A PreAmp was used only above 1000MHz. Its gain is 30dB.

Tabulated Measurements

Quasi-Peak for frequencies less than 1GHz. Average for frequencies greater than 1 GHz.
Data to 1GHz was measured at a distance of 10meters. EN55022 standard.
Above 1GHz measurements were made at a distance of 3meters.

Frequency MHz	Measurement Quasi-Peak dBuV/m	Polarity	Cable +Antenna Factor dB	Total Field Strength dBuV/m	Total Field Strength uV/m	EN55022 Limit dBuV/m
124.9	12.4	H	10.19	22.6	13.5	30
144.7	9.9	H	11.34	21.2	11.5	30
155.6	5.7	H	12.29	18.0	7.9	30
160.0	0.8	V	12.67	13.5	4.7	30
168.0	13.5	H	12.88	26.4	20.9	30
192.1	10.3	V	13.48	23.8	15.5	30
199.9	13.4	V	13.68	27.1	22.6	30
208.0	10.7	H	14.09	24.8	17.4	30
240.0	11.0	H	15.65	26.7	21.6	37
299.8	11.1	H	18.30	29.4	29.5	37
324.8	13.7	H	19.40	33.1	45.2	37
358.1	6.3	V	21.18	27.5	23.7	37
399.7	3.7	V	22.31	26.0	20.0	37
433.1	1.1	V	22.78	23.9	15.7	37
576.0	5.9	H	26.84	32.7	43.2	37
608.0	4.9	H	27.64	32.5	42.2	37
640.0	1.8	H	28.35	30.1	32.0	37

TX tuned to 2402MHz. LO=2052MHz.

Frequency MHz	Measurement Average dBuV/m	Polarity	Cable +Antenna Factor dB	Total Field Strength dBuV/m	Total Field Strength uV/m	FCC Limit uV/m
2052	15.3	V	32.6	47.9	248.3	500
2052	13.3	H	32.6	45.9	197.2	500
4104	-3.6 (floor noise)	V&H	44.8	< 41.2	< 114.8	500

TX tuned to 2450MHz. LO=2100MHz.

Frequency MHz	Measurement Average dBuV/m	Polarity	Cable +Antenna Factor dB	Total Field Strength dBuV/m	Total Field Strength uV/m	FCC Limit uV/m
2100	13.8	V	32.9	46.7	216.3	500
2100	11.3	H	32.9	44.2	162.2	500
4200	-4 (floor noise)	V&H	45.4	< 41.4	< 117.5	500

TX tuned to 2480MHz. LO=2130MHz.

Frequency MHz	Measurement Average dBuV/m	Polarity	Cable +Antenna Factor dB	Total Field Strength dBuV/m	Total Field Strength uV/m	FCC Limit uV/m
2130	11.3	V	33.1	44.4	166.0	500
2130	10.2	H	33.1	43.3	146.2	500
4260	-4 (floor noise)	V&H	45.8	< 41.8	< 123.0	500

All other emissions in the range 30MHz - 5GHz were greater than 20dB below the limits.

Measurements by: Ted Chaffee

Emissions at Band Edges [15.205(a,b), 15.209, 15.247(c)]

MEASUREMENT PROCEDURE:

1. The EUT was adjusted to operate at 2402MHz to evaluate the lower band edge
2. The EUT was adjusted to operate at 2480MHz to evaluate the upper band edge

Charted Waveforms at Band Edges. [Waveform charts begin at page 32.]

3. The waveforms displayed were recorded in chart format for both the high side and low side of band edges and are viewable on the following pages.
5. The EMI Receiver settings for charting the waveform display are:
   a) IF Bandwidth = 100KHz, Avg Bandwidth = 300KHz, and
   b) IF Bandwidth = 1MHz, Avg Bandwidth = 10Hz.

Measurement of Radiated Emissions. [Tabulated data is on pages 31.]

6. The EUT system was set upon the wooden turntable 80cm above the ground plane at a distance of 3 meters from the receiving antenna.
7. The transmit frequency emission level was maximized by rotating the turntable and raising and lowering the search antenna.
8. Data was recorded with the EUT at 1MBit/Sec.
9. The EMI Receiver settings at IF Bandwidth=1MHz, Avg Bandwidth=10Hz. The test procedure deviated when evaluating the upper band edge. It was observed that the peak reading using the 1MHz Bandwidth exceeded the 20dB increase in the limit. Therefore, part 24.238(b) was invoked which allows a reduction in the IF Bandwidth setting. An IF Bandwidth of 100KHz was used in measuring the upper band edge emissions.
10. Both Horizontal and Vertical polarization modes were evaluated.
11. The Field Strength E(uV/m) is calculated using the formula:
    $E(uV/m) = LOG_{10}^{-1}((dBuV/m + Ant.Factor(dB) + Coax\ Loss(dB)$.

1MBit/Sec operation.
Tabulated Measurements for the lower band edge.

Frequency	Measurement dBuV/m		Polarity	Cable + Antenna Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Avg Limit
GHz	Peak	Average		dB	Peak	Average	Average	uV/m
2.380	8.2	-2.9	V	34.6	42.8	31.7	38.4	500
2.382	10.0	-2.6	V	34.6	44.6	32.0	39.8	500
2.384	9.2	-2.5	V	34.6	43.8	32.1	40.3	500
2.386	9.9	-2.0	V	34.6	44.5	32.6	42.6	500
2.388	11.1	-2.1	V	34.6	45.7	32.5	42.2	500
2.390	9.8	-2.0	V	34.6	44.4	32.6	42.6	500
2.380	8.8	-3.3	H	34.6	43.4	31.3	36.7	500
2.382	8.6	-3.0	H	34.6	43.2	31.6	38.0	500
2.384	9.5	-2.9	H	34.6	44.1	31.7	38.4	500
2.386	10.2	-2.5	H	34.6	44.8	32.1	40.3	500
2.388	9.9	-2.5	H	34.6	44.5	32.1	40.3	500
2.390	11.1	-2.7	H	34.6	44.4	31.9	39.4	500

1MBit/Sec operation.
Tabulated Measurements for the upper band edge. BW=100KHz

Frequency	Measurement dBuV/m		Polarity	Cable + Antenna Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Avg Limit
GHz	Peak	Average		dB	Peak	Average	Average	uV/m
2.4835	25.5	9.8	V	35.2	60.7	45.0	177.8	500
2.485	21.7	9.3	V	35.2	56.9	44.5	167.9	500
2.488	21.3	9.2	V	35.2	56.5	44.4	166.0	500
2.491	21.7	9.2	V	35.2	56.9	44.4	166.0	500
2.494	21.3	9.1	V	35.3	56.6	44.4	166.0	500
2.497	21.2	9.1	V	35.3	56.5	44.4	166.0	500
2.500	22.1	9.2	V	35.3	57.4	44.5	167.9	500
2.4835	26.2	9.8	H	35.2	61.4	44.5	167.9	500
2.485	32.1	9.8	H	35.2	67.3	44.5	167.9	500
2.488	22.1	9.2	H	35.2	57.3	44.4	166.0	500
2.491	21.2	9.1	H	35.2	56.4	44.3	164.0	500
2.494	22.4	9.1	H	35.3	57.7	44.4	166.0	500
2.497	22.2	9.1	H	35.3	57.5	44.4	166.0	500
2.500	22.4	9.1	H	35.3	57.7	44.4	166.0	500

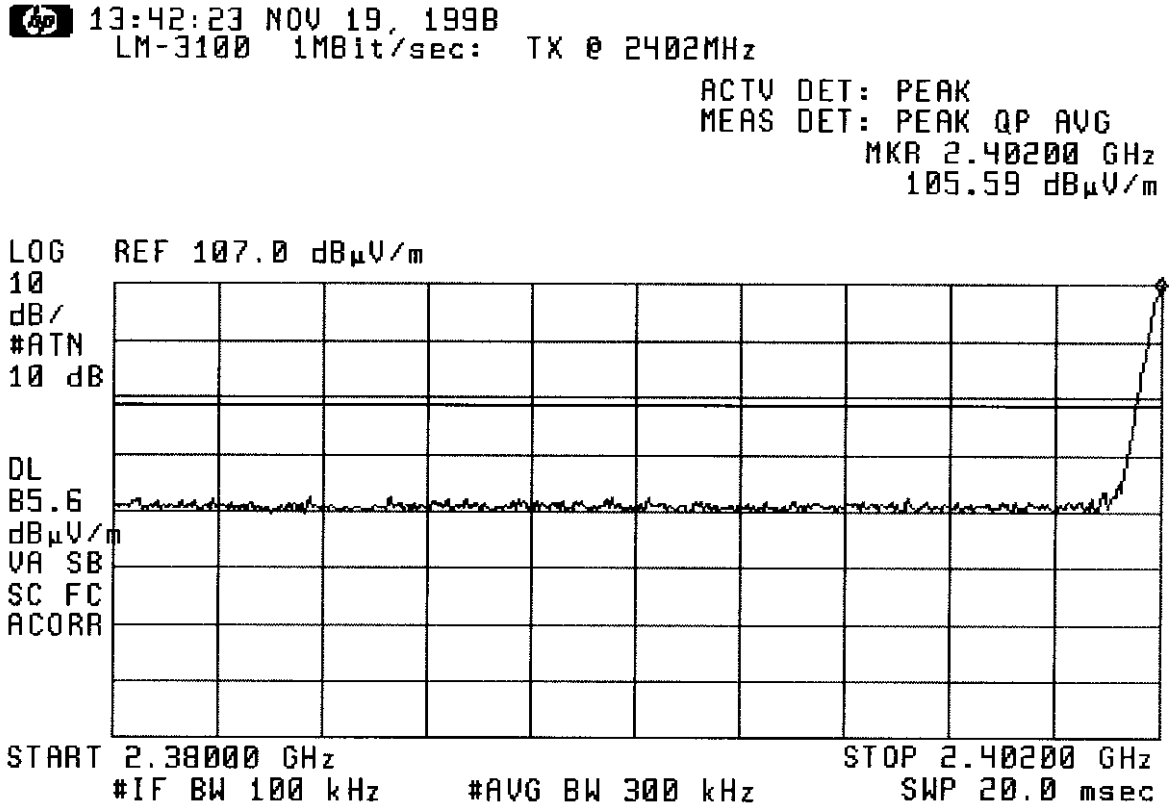
Measurements by: Ted Cheffee

The following pages show, in chart format, the emission profiles of the band edges with the system operating at 1MBit/Sec.

IF Bandwidth = 100KHz; Video Bandwidth = 300KHz

IF Bandwidth = 1.0MHz; Video Bandwidth = 10Hz

VERTICALLY POLARIZED



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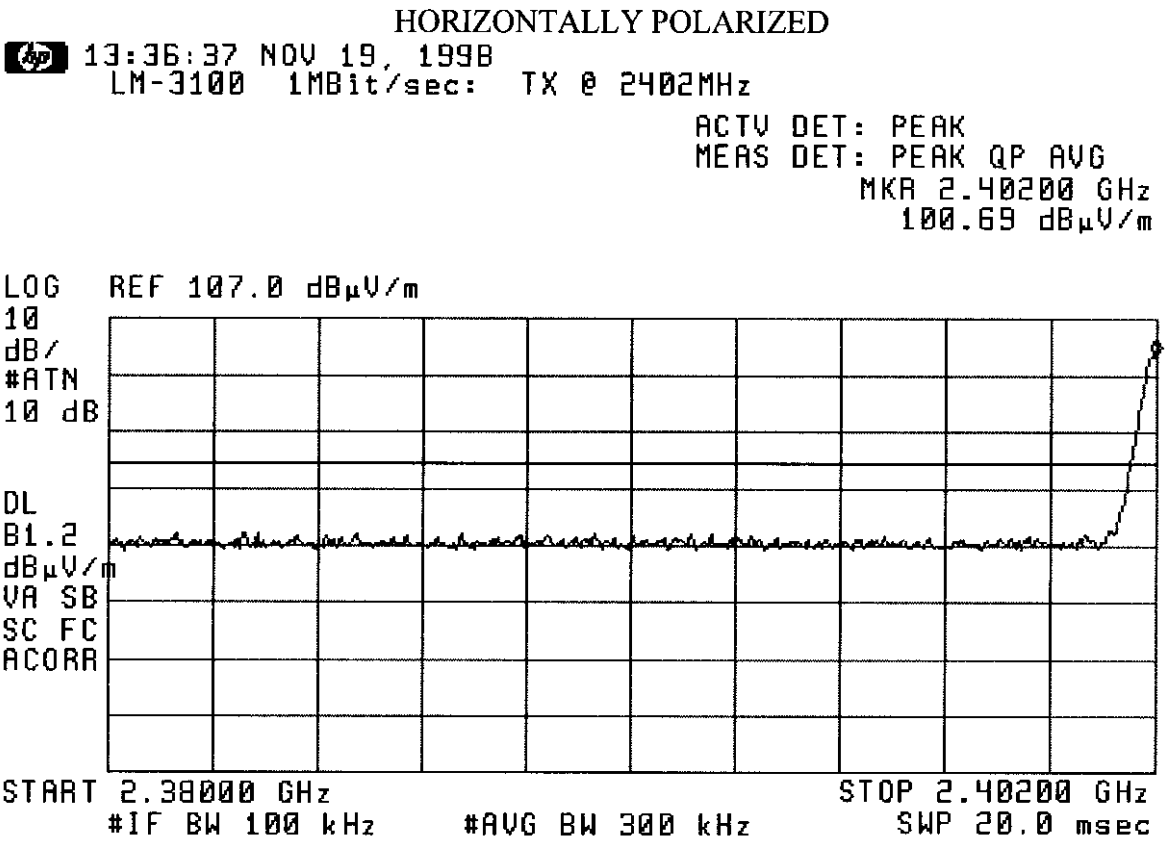

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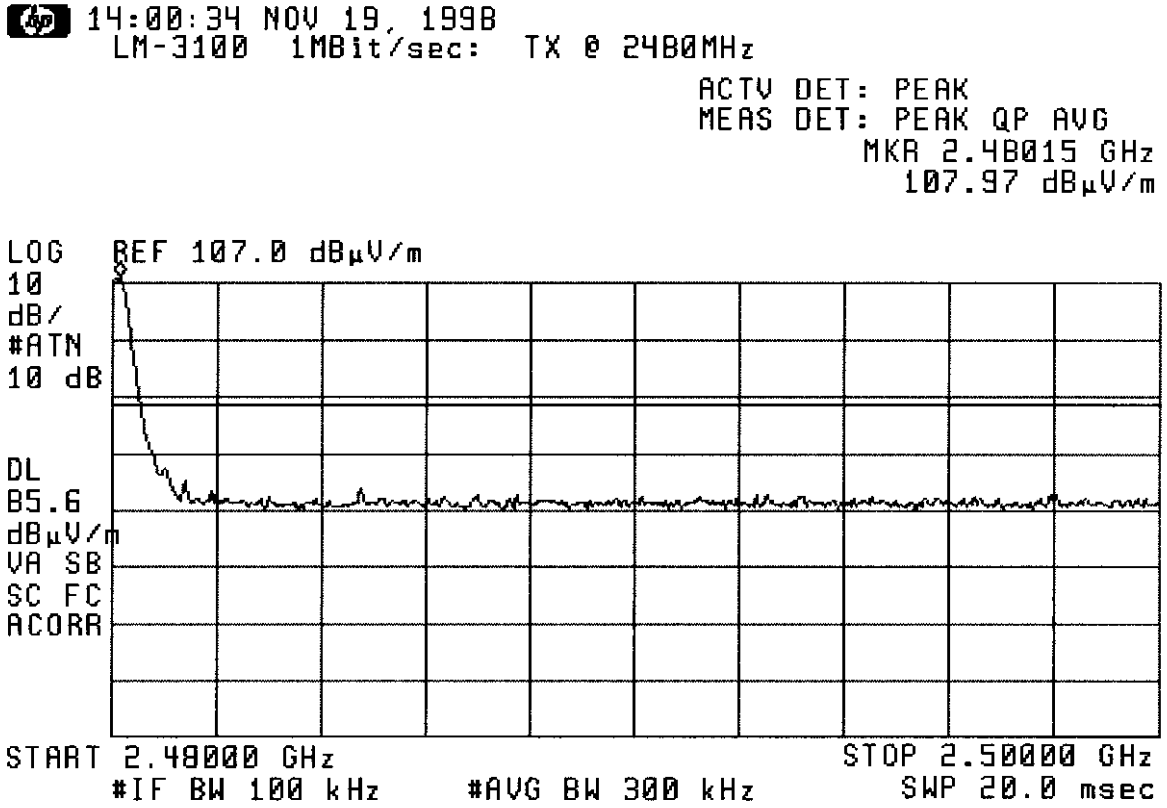

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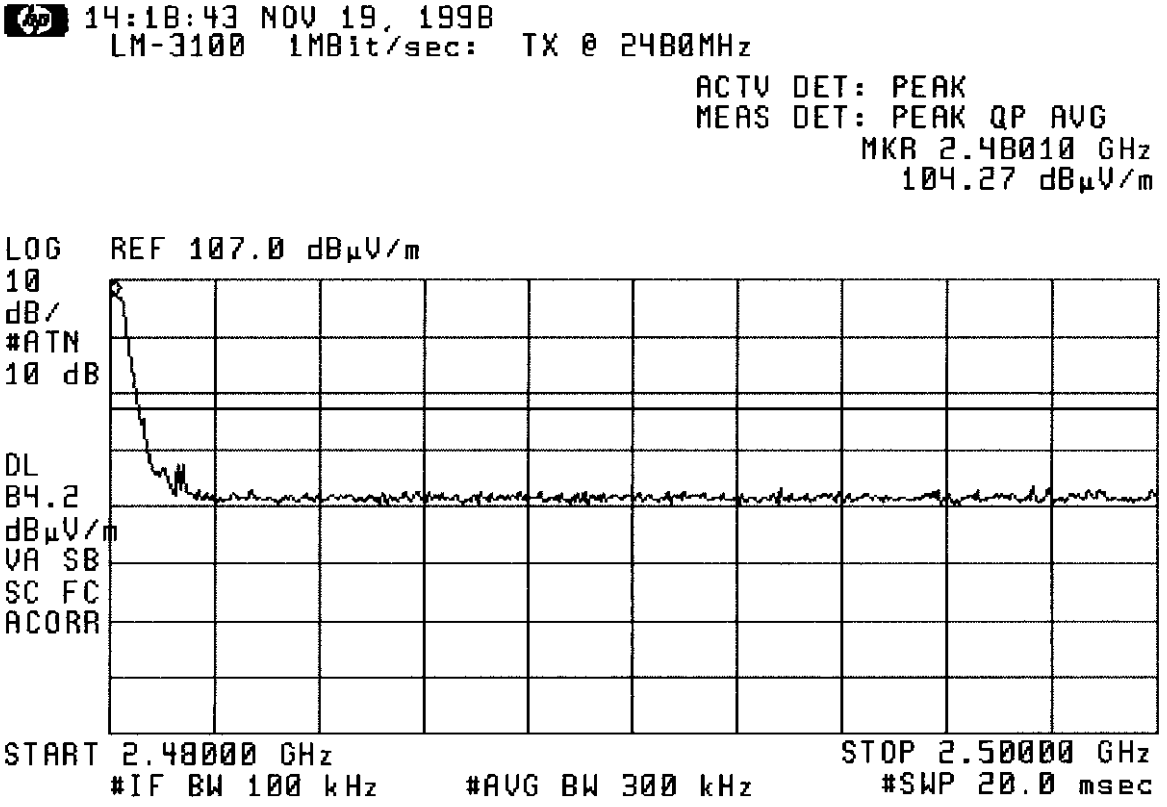

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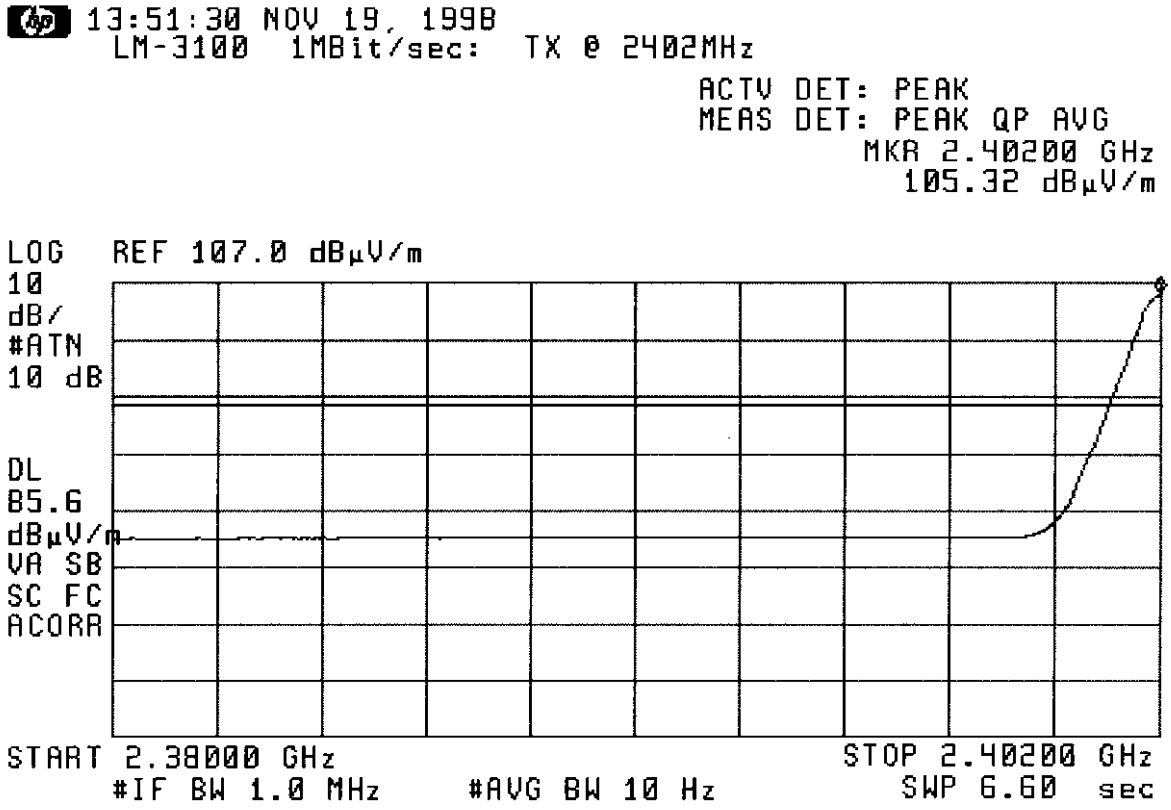

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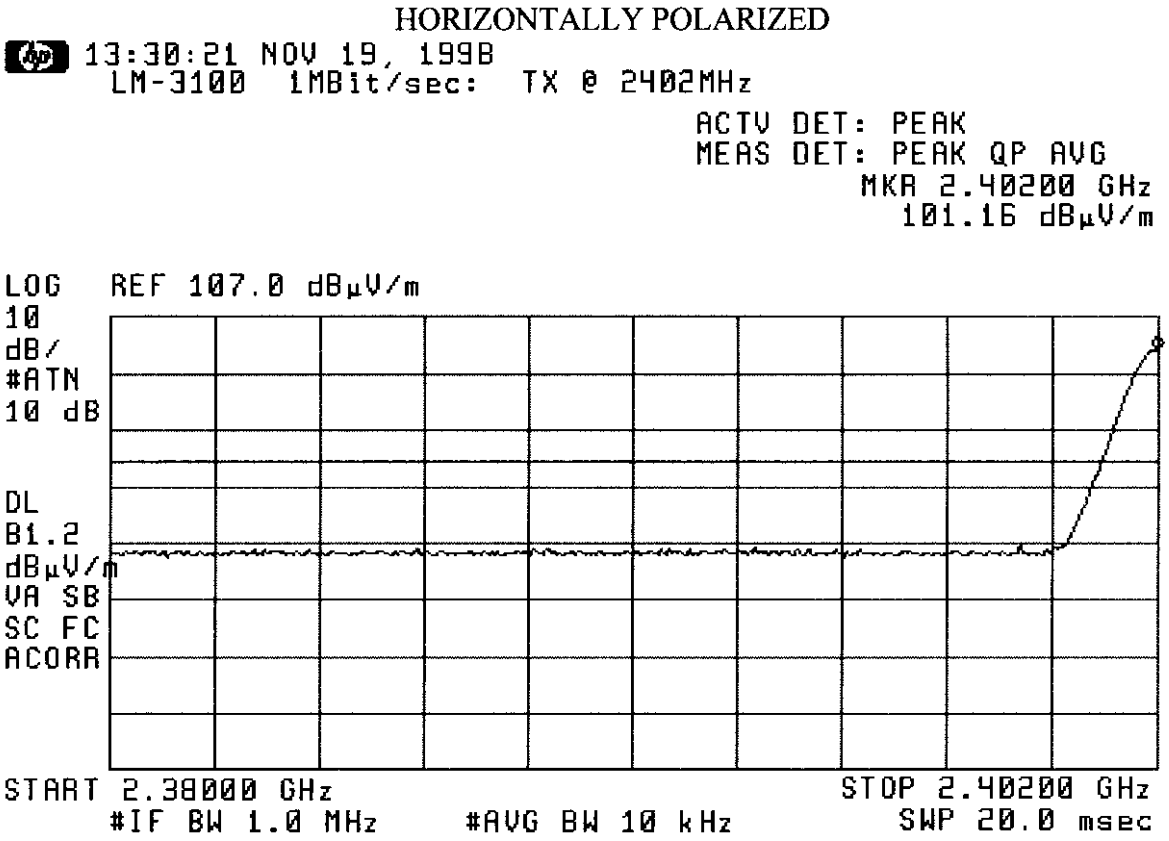

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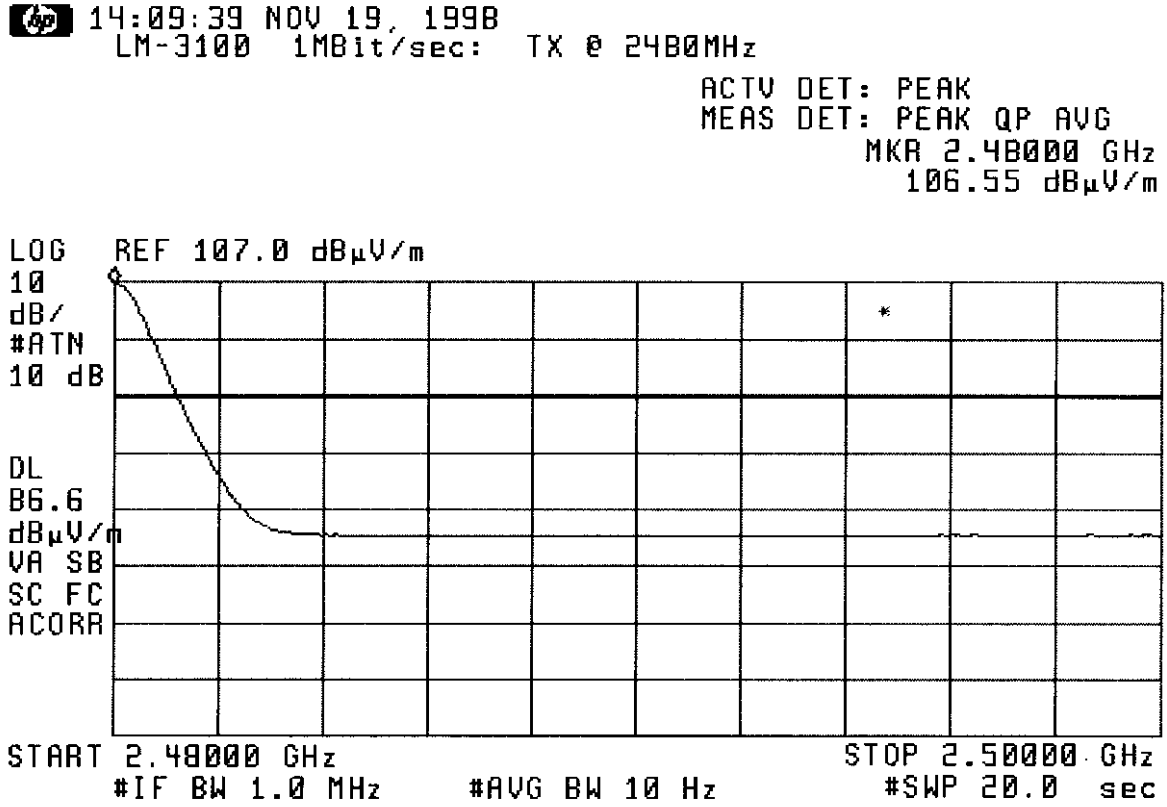

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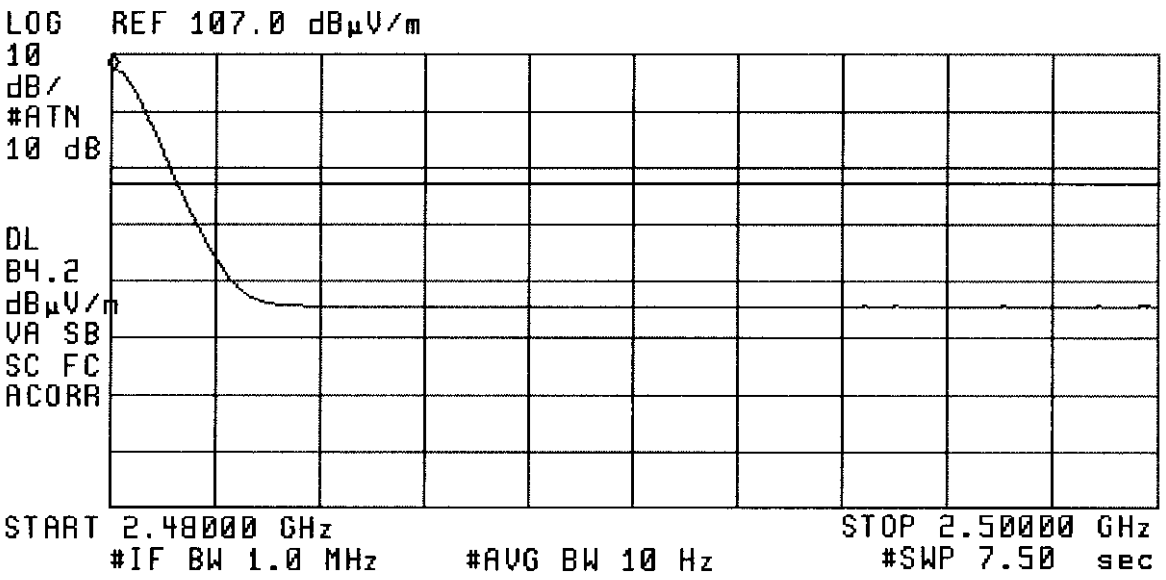


Transmitter Harmonic Emissions [15.205(a), 15.209(a),(f)]

MEASUREMENT PROCEDURE:

1. The EUT was adjusted to operate at its low, mid, and high range. These frequencies are, respectively, 2402MHz, 2450MHz, and 2480MHz.
2. The EUT system was set upon the wooden turntable 80cm above the ground plane at a distance of 3 meters from the receiving antenna.
3. The EUT was setup to operate in for an 1MBit data rate
4. The EMC Receiver was setup using IF BW = 1MHz, Avg BW = 10Hz.
5. The transmit harmonic emission level was maximized by rotating the turntable and raising and lowering the search antenna.
6. Both Horizontal and Vertical polarization modes were evaluated. Vertical is worst case.
7. The Field Strength E(uV/m) is calculated using the formula:
   $E(uV/m) = LOG_{10}^{-1}(dBuV/m)/20)$
8. The indicated levels of the HP8593EM Spectrum Analyzer include a 30dB factor for the PreAmp. The total field strength has been adjusted to include the attenuation factor of the coax, the correction factor of the horn antenna, and the difference in true PreAmp gain from 30dB at the specific frequencies of interest.

Tuned Frequency	Measured Frequency	Pol	Indicated Level dBuV/m		Antenna + Coax - PreAmp Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Limit
GHz	GHz		Peak	Avg	dB	Peak	Avg	Avg	uV/m
2.402	4.804	V	27.4	12.1	31.1	58.5	43.2	144.5	500
	7.206	V	13.5	7.4	35.8	49.3	43.2	144.5	500
	*9.608	V		13.8	41.6		<55.4	<589*	500
	**12.010	V		13.9	45.3		<59.2	<912**	500
2.450	4.900	V	18.6	15.9	31.4	50.0	47.3	231.7	500
	7.350	V	17.6	13.2	36.3	53.9	49.5	298.5	500
	*9.800	V	18.3	13.7	41.7	<60.0	<55.4	<589*	500
	**12.250	V	20.1	14.2	45.4	<65.5	<59.6	<955**	500
2.480	4.960	V	20.2	16.5	31.7	51.9	48.2	257.0	500
	7.440	V	16.9	12.8	36.6	53.5	49.4	295.1	500
	*9.920	V	16.2	13.5	41.9	<58.1	<55.4	<589*	500
	**12.400	V	18.2	14.1	45.5	<63.7	<59.6	<955**	500

* NOTE: This signal level is in the system floor noise. The recorded measurements include the affects of the system floor noise.

** NOTE: At frequencies above 9.7GHz no EUT emissions were observed. All emissions at these frequencies are less than the floor noise of the measurement system.

Measurements by: Ted Chaffee

EXHIBIT 3: MEASUREMENT FACILITIES & EQUIPMENT [2.948]

Test Site:

The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 M-152, Dowagiac, Michigan 49047. This test facility has been fully described in a report filed with the FCC, dated November 5, 1996, and accepted by the FCC in a letter dated January 15, 1997, (31040/SIT 1300F2).

Environment

The test was performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 22deg.C., the relative humidity 60%. The power supplying the system under test was a nominal 120VAC at 60Hz.

Measurement Equipment Used:

Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	19-Jun-98	12 month
RF Receiver Section	HP-85462A	3625A00342	19-Jun-98	12 month
EMCO BiconiLog Antenna	3142	1077	26-Aug-98	12 months
Solar LISN	8012-50-R-24-BNC	962138	25-Aug-98	12 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	17-Nov-98	12 months
(3-M) Double shielded 50ohm Coax	RG58/U	9807-12	30-Jul-98	6 months
(10-M) Double shielded 50ohm Coax	RG58/U	960720	04-Aug-98	6 months
from Aironet Wireless Communications, Inc.				
HP Spectrum Analyzer	8593EM	3536A00115	13-Sep-97	12 months
HP 1-26GHz RF PreAmplifier	8449B	3008A00911	13-Sep-97	12 months
ElectroMechanics Double Ridge Horn	3115	4363	10-Dec-97	12 months
6 ft.GORE 145 50ohm coax	145		23-Nov-98	12 months

AHD Site Approval

FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road
Columbia, MD 21046
Telephone: 301-725-1585 (ext-218)
Facsimile: 301-344-2050

January 15, 1997

IN REPLY REFER TO
31040/SIT
1300F2

AHD EMC Laboratory
92723 M-152
Dowagiac, MI 49047

Attention: Ted Chaffee

Re: Measurement facility located at Sister Lakes
(3 and 10 meter site)

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 or 18 of the Commission's Rules. Our list will also indicate that the facility complies with the radiated and AC line conducted test site criteria in ANSI C63.4-1992. Please note that this filing must be updated for any changes made to the facility, and at least every three years the data on file must be certified as current.

Per your request, the above mentioned facility has been also added to our list of those who perform these measurement services for the public on a fee basis. This list is published periodically and is also available on the Laboratory's Public Access Link as described in the enclosed Public Notice.

Sincerely,

Thomas W. Phillips
Electronics Engineer
Customer Service Branch

Enclosure:
PAL PN

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

AHD
DOWAGIAC, MI

is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. Accreditation is awarded for specific services, listed on the Scope of Accreditation for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS
FCC

June 30, 1999
Effective through

For the National Institute of Standards and Technology

NVLAP Lab Code: 200129-0

NVLAP-01C (11-95)

EXHIBIT 4: 16dBi PATCH ANTENNA MEASUREMENTS:

Description of Antenna

The 16dBi antenna tested with the LM3100 system is:

Type of Device:	16dBi gain patch antenna
Manufacturer:	Conifer II, Wireless Telecommunication Technology
Model:	Model QD-2402
Device working frequency:	2.4 - 2.5GHz
Fabrication Technology:	Stamped Aluminum housed in ABS plastic.
Package:	RTNC PLUG Conn., White paint.
Tolerance:	3dB beam width = 27deg.
Polarization:	Dual polarity, vswr =< 1.5:1
Front to Back Ratio:	> 40dB

The following two pages contain a copy of the manufacturer's specification print for the Model QD2402 antenna.

Wireless ANTENNAS

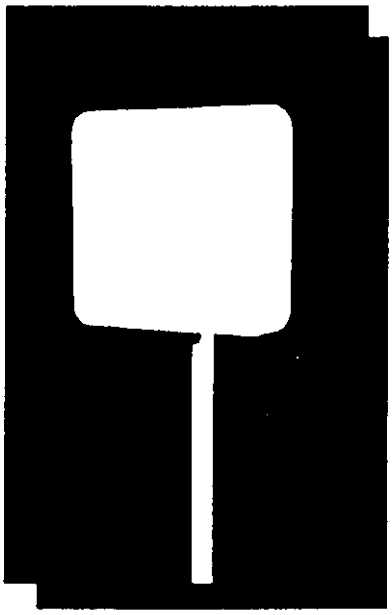
For World-Wide Applications

WLAN/ISM

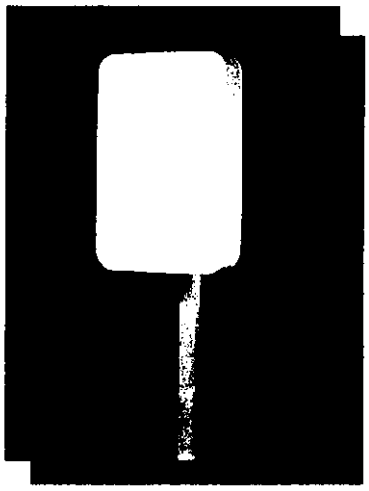
2.4 - 2.5 GHz*

New Microceptor® Series

Model QD-24XX
16dBi Typical Gain



Model DL-24XX
13dBi Typical Gain



MODELS

DL-2400
- 13dBi Typical Gain
- Standard Mast Mount

DL-2402
- 13dBi Typical Gain
- Elevation Mast Mount

QD-2400
- 16dBi Typical Gain
- Standard Mast Mount

QD-2402
- 16dBi Typical Gain
- Elevation Mast Mount

DL-2410
- 11dBi Typical Gain
- Standard Mast Mount
- 75° 3 db Beam Width

DL-2420
- 11dBi Typical Gain
- Elevation Mast Mount
- 75° 3 dB Beam Width

FEATURES

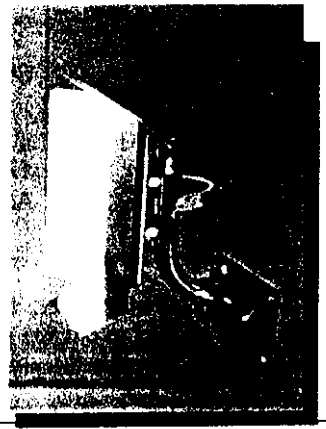
- Excellent Cross Pole Patterns
- Quick Mount "U" Bracket
- Tilt Mast Mount Option
- Broad Beam Width Option
- Light Weight But Durable
- Low Wind Loading
- Five Year Warranty

BENEFITS

- Superior Performance
- Easy To Install
- Optimize Signal Level
- Wide Area Coverage
- Saves On Shipping Costs
- Minimal Hardware Per Installation
- Guaranteed Reliability

Optional Micro-Mount™
Model UM-1000

The universal Micro-Mount makes antenna installation a snap! Mount it to a wall, a vent, roof, and even most rain gutters. Also available is the EX-1000 extension tube that adds another 10" of pipe to the end of the Microceptor Mount.



CONIFER II®
WIRELESS TELECOMMUNICATION TECHNOLOGY

1400 N Roosevelt, Burlington, IA 52601 (616) 424-7014
Phone 800-843-5419 (U.S.), 319-752-3601 (Int'l)
Fax 319-753-5508, email <conifer@conifercorp.com>

URS ISO 9001
APPENDIX

*Contact Conifer's Sales Department for other frequencies such as PCS, ENG, WLL, WCS.

MICROCEPTOR®* ANTENNAS
MODELS QD AND DL

SPECIFICATIONS**	DL-2400 *or* DL-2402	QD-2400 *or* QD-2402	DL-2420 *or* DL-2410
Input Frequency***	2400 - 2500 GHz	2400 - 2500 GHz	2400 - 2500 GHz
Gain (Typical)	13 dBi	16 dBi	11 dBi
3 dB Beam Width E Plane	27°	27°	27°
H Plane	45°	27°	75°
Front to Back Ratio (Typical)	>40 dB	>40 dB	>25 dB
Cross Pole	>25 dB	>30 dB	>25 dB
VSWR	1.4:1	1.5:1	1.4:1
Impedance	50 OHMS	50 OHMS	50 OHMS
Wind Loading			
@100 MPH	25.0 lbs.	25.0 lbs.	25.0 lbs.
@140 MPH	49.4 lbs.	49.4 lbs.	49.4 lbs.
Polarity	Dual	Dual	Dual
Input Power	50 Watts	50 Watts	50 Watts
Connector "N" Type	Female	Female	Female
Right Angle Male Adaptor	Option	Option	Option
Size			
Inches	7.5 x 11	10.75 x 11	7.5 x 11
Millimeters	.30 x .43	.42 x .43	.30 x .43
Weight			
Pound	1.4	2.0	1.4
Kilograms	.64	.91	.64
Reflector Material	Stamped Aluminum	Stamped Aluminum	Stamped Aluminum
Backplate Bracket Material	Zinc-plated Steel	Zinc-plated Steel	Zinc-plated Steel
Housing Material	High Impact ABS Plastic	High Impact ABS Plastic	High Impact ABS Plastic
Radome	Standard	Standard	Standard
Standard Mount			
DL-2400, QD-2400, DL-2410	1 - 2 inch O.D. Pipe	1 - 2 inch O.D. Pipe	1 - 2 inch O.D. Pipe
Elevation Mast Mount			
DL-2402, QD-2402, DL-2420	1 - 2 inch O.D. Pipe 60° in 10° increments or less	1 - 2 inch O.D. Pipe 60° in 10° increments or less	1 - 2 inch O.D. Pipe 60° in 10° increments or less
Micro-Mount *(Optional Mounting)*			
Material	Stainless Steel/Aluminum	Stainless Steel/Aluminum	Stainless Steel/Aluminum
EX-1000 Extension Tube			
Size	12 Inches	12 Inches	12 Inches
Material	Aluminum	Aluminum	Aluminum

*One or more Patents may apply: 5,229,782 • 5,523,768 • 5,402,138 • 5,394,115 • Patents Pending
**Specifications subject to change without notice.
***Consult factory for other frequencies including ENG and PCS.

MANUFACTURED IN BURLINGTON, IOWA

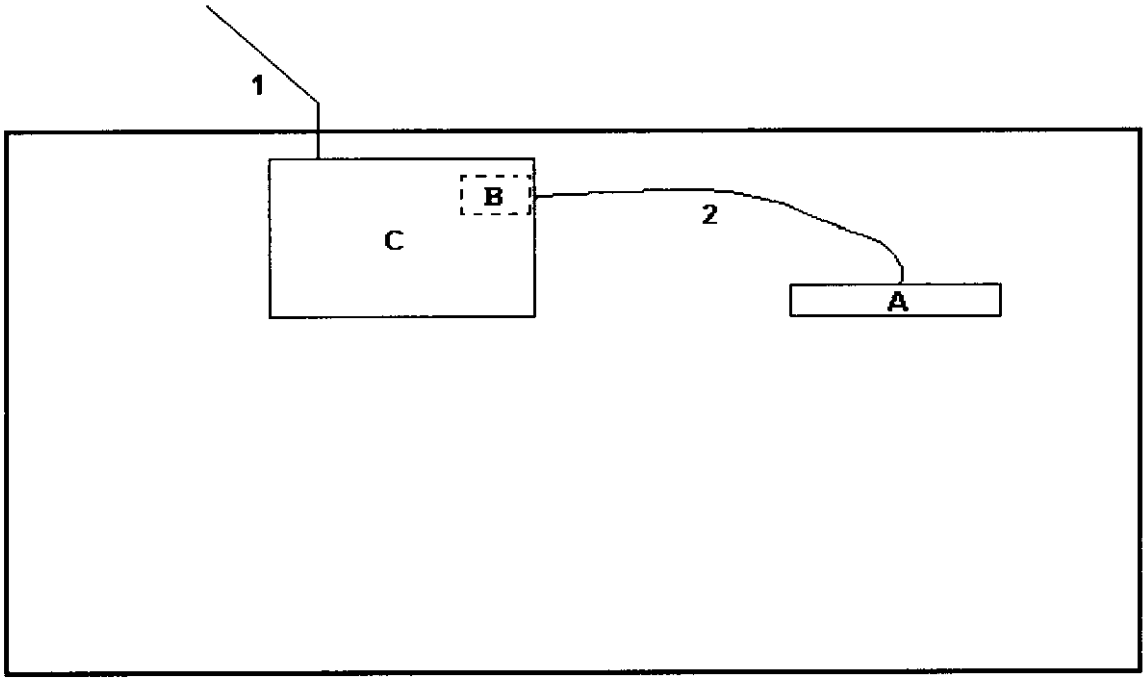
APPENDIX

Report of Measurements

Configuration Tested: [2.1033(b)(8)]

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	16dBi antenna	[Conifer] QD2402	--	--
B	2.4GHz FHSS transceiver	[Aironet] LM3100	--	FCC ID: LOZ102037
C	Host Computer 486DX4 100MHz	[Hewlett Packard] Omnibook 4000C	TW50902541	FCC ID:B944000XY1
1	DC line cord	--	--	1.5meters, Unshielded
2	Coax to antenna	--	--	.5 meters,



setup_1i

BASIC EUT SETUP
(Legend designation is above)

Setup Pictures

Test Data [2.1033(b)(6)]

Transmitter Maximum Peak Output Power: [15.247(b)(1), (b)(3)(i)]

MEASUREMENT PROCEDURE:

1. The EUT was setup to operate in for an 1MBit data rate.
2. The EMC Receiver was connected directly to the transmitter output.
3. The EMC Receiver was setup using IF BW = 1MHz, Avg BW = 300Hz.

Calculation justification: [15.247(b3)]

The maximum allowable power of 1 Watt is derated by 1dB for every 1dB that the directional gain of the antenna exceeds 6dBi.

The Model QD2402 Patch Antenna has a rated gain of 16dBi.

Thus the maximum allowable power is derated by (16dBi - 6dB) = 10dB.

Given that 1Watt = 1000mWatts: 1000mW is 10*LOG(1000) = 30dBm

Therefore, the maximum allowable power is:

30dBm - 10dBm = 20dBm. [or antilog(20/10) = 100mW].

Tuned Frequency MHz	Measurement dBm		Cable Factor dB	Total Power Level dBm	15.247(b)(3) Limit dBm
2402	15.79		1.59	17.38	20
2450	16.18		1.59	17.77	20
2480	15.52		1.60	17.12	20

Measurements by: Ted Chaffee

Out of Band Emissions: [15.205(a),(b),(c), 15.209(a), 15.247(c)]

Emissions at Band Edges [15.205(a), 15.209, 15.247(c)]

MEASUREMENT PROCEDURE:

1. The EUT was adjusted to operate at 2402MHz to evaluate the lower band edge
2. The EUT was adjusted to operate at 2480MHz to evaluate the upper band edge

Charted Waveforms at Band Edges. [Waveform charts begin at page 50.]

3. The waveforms displayed were recorded in chart format for both the high side and low side of band edges and are viewable on the following pages.
5. The EMI Receiver settings for charting the waveform display are:
   a) IF Bandwidth = 100KHz, Avg Bandwidth = 300KHz, and
   b) IF Bandwidth = 1MHz, Avg Bandwidth = 10Hz.

Measurement of Radiated Emissions. [Tabulated data is on pages 49.]

6. The EUT system was set upon the wooden turntable 80cm above the ground plane at a distance of 3 meters from the receiving antenna.
7. The transmit frequency emission level was maximized by rotating the turntable and raising and lowering the search antenna.
8. Data was recorded with the EUT at 1MBit/Sec.
9. The EMI Receiver settings at IF Bandwidth=1MHz, Avg Bandwidth=10Hz. The test IF bandwidth deviated from 1MHz when evaluating the upper band edge. It was observed that the peak reading using the 1MHz Bandwidth exceeded the 20dB increase in the limit. Therefore, part 24.238(b) was invoked which allows a reduction in the IF Bandwidth setting. An IF Bandwidth of 30KHz was used in measuring the upper band edge emissions.
10. Both Horizontal and Vertical polarization modes were evaluated.
11. The Field Strength E(uV/m) is calculated using the formula:
    $E(uV/m) = LOG_{10}^{-1}((dBuV/m + Ant.Factor(dB) + Coax\ Loss(dB).$

Preliminary measurements indicated that worst case polarization is vertical. The data presented in these tables are for vertical polarization only.

1MBit/Sec operation.
Tabulated Measurements for the lower band edge.

Frequency	Measurement dBuV/m		Polarity	Cable + Antenna Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Avg Limit
GHz	Peak	Average		dB	Peak	Average	Average	uV/m
2.380	17.7	5.0	V	34.6	52.3	39.6	95.5	500
2.382	18.9	5.4	V	34.6	53.5	40.0	100.0	500
2.384	18.8	5.5	V	34.6	53.4	40.1	101.2	500
2.386	19.0	6.0	V	34.6	53.6	40.6	107.2	500
2.388	19.9	6.5	V	34.6	54.5	41.1	113.5	500
2.390	19.9	5.9	V	34.6	54.5	40.5	105.9	500

1MBit/Sec operation.
Tabulated Measurements for the upper band edge. BW=30KHz

Frequency	Measurement dBuV/m		Polarity	Cable + Antenna Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Avg Limit
GHz	Peak	Average		dB	Peak	Average	Average	uV/m
2.4835	13.1	-4.2	V	35.2	48.3	31.0	35.5	500
2.485	10.3	-6.8	V	35.2	45.5	28.4	26.3	500
2.488	17.4	-2.8	V	35.2	52.6	38.0	79.4	500
2.491	13.3	0.5	V	35.2	48.5	35.7	61.0	500
2.494	13.7	-0.2	V	35.3	49.0	35.1	56.9	500
2.497	12.5	-0.9	V	35.3	47.8	34.4	52.5	500
2.500	11.5	-1.9	V	35.3	46.8	33.4	46.8	500

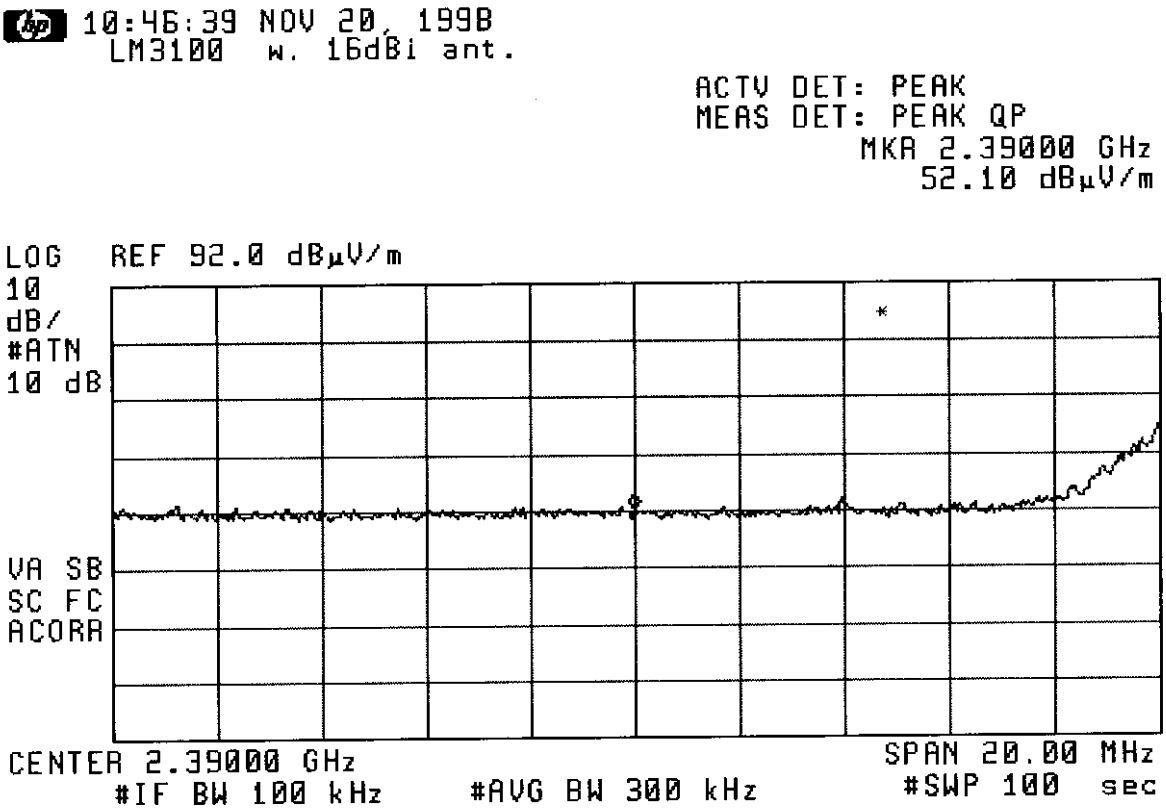
Measurements by: Ted Chaffee

The following pages show, in chart format, the emission profiles of the band edges with the system operating at 1MBit/Sec.

IF Bandwidth = 100KHz; Video Bandwidth = 300KHz

IF Bandwidth = 1.0MHz; Video Bandwidth = 10Hz

VERTICALLY POLARIZED



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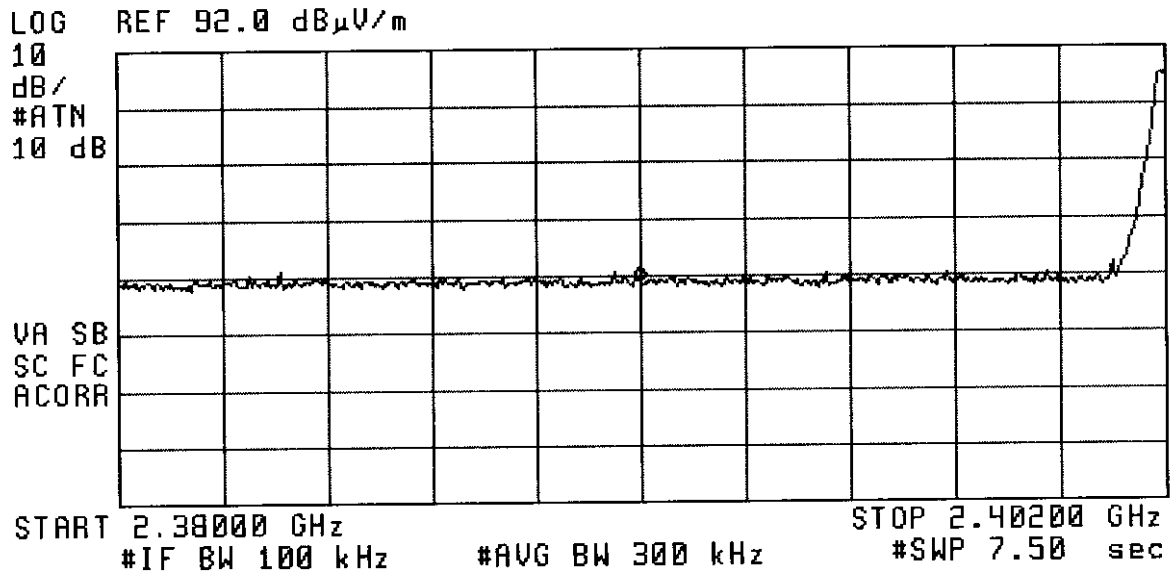

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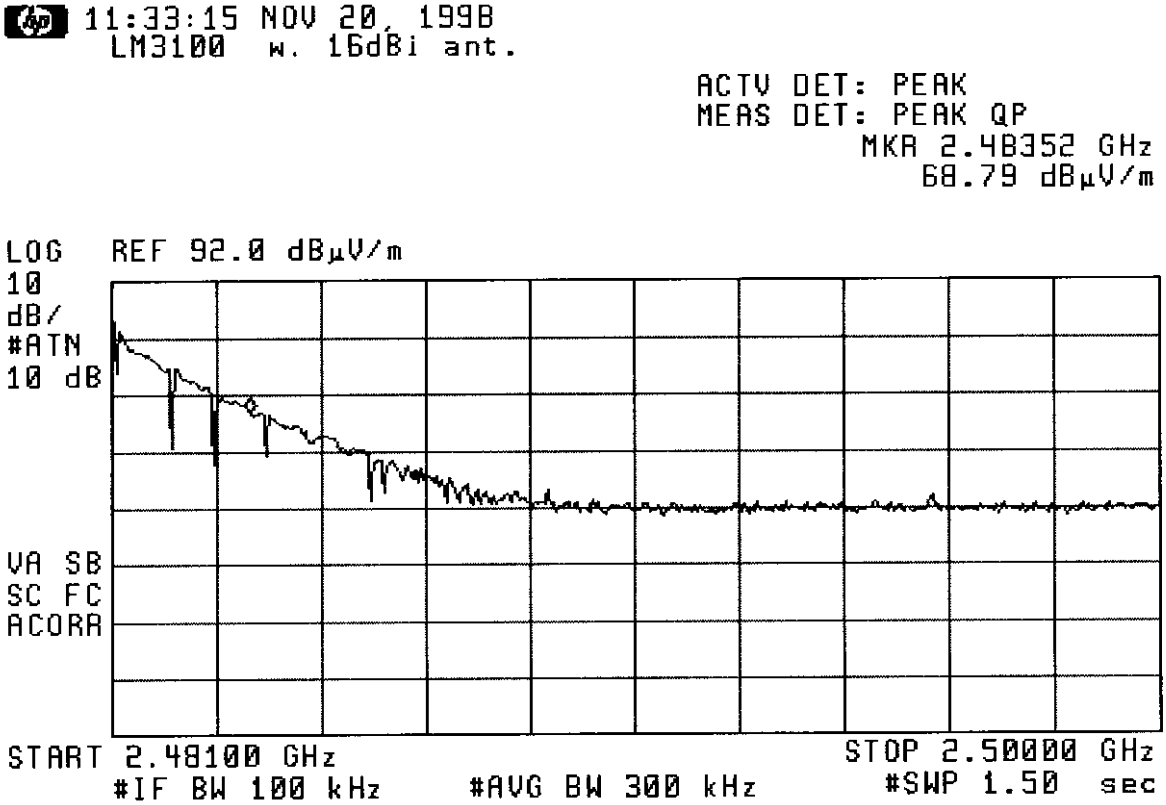

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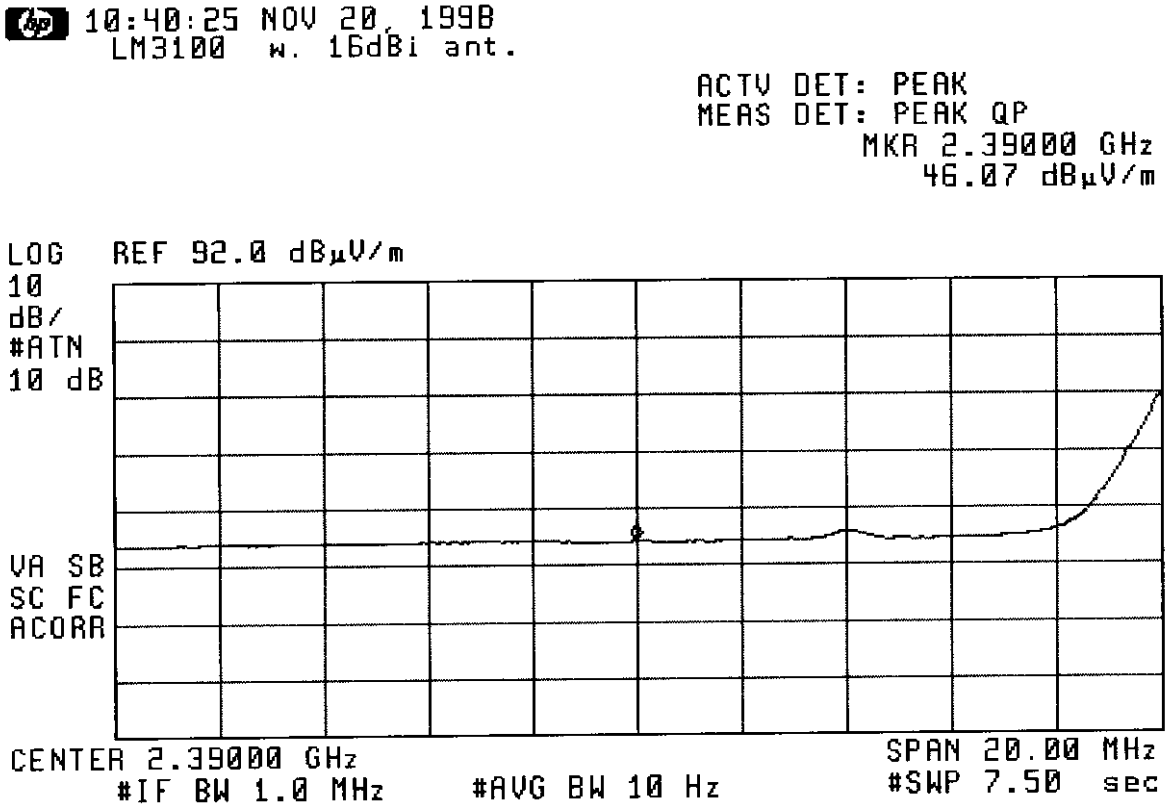

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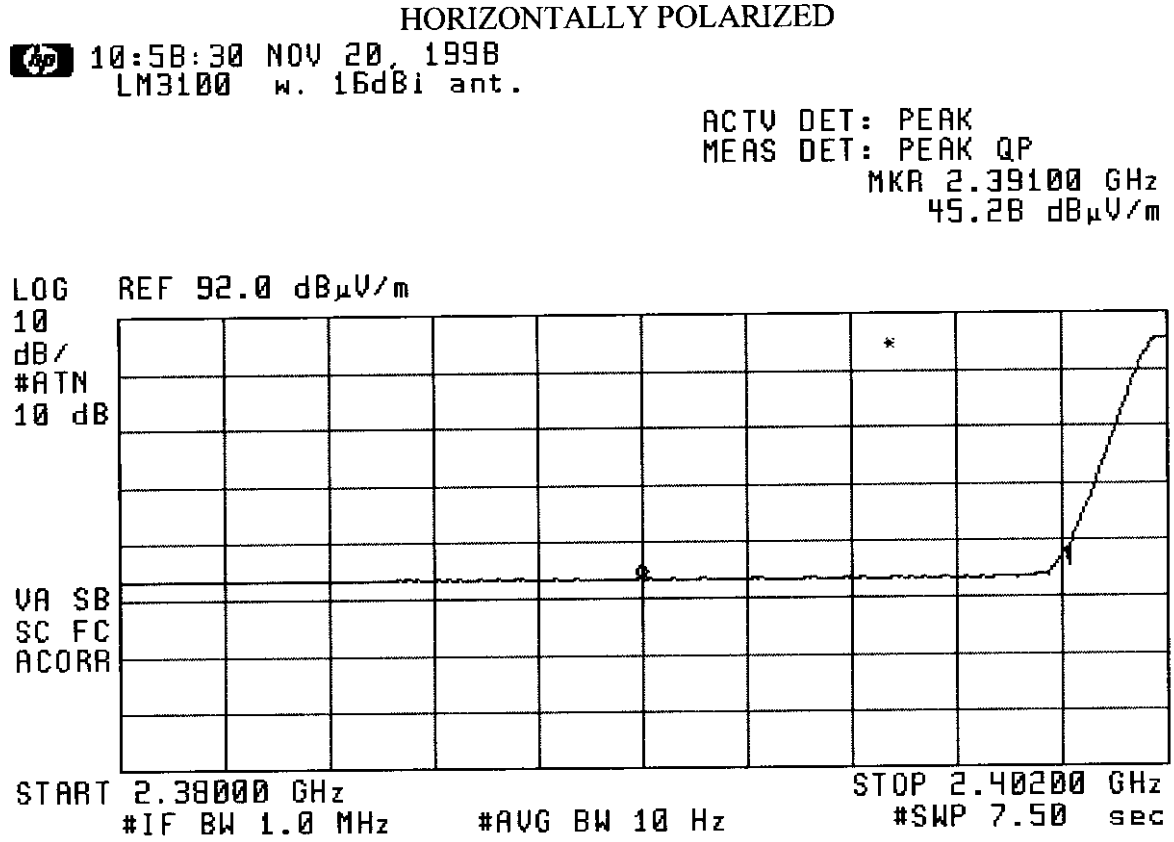

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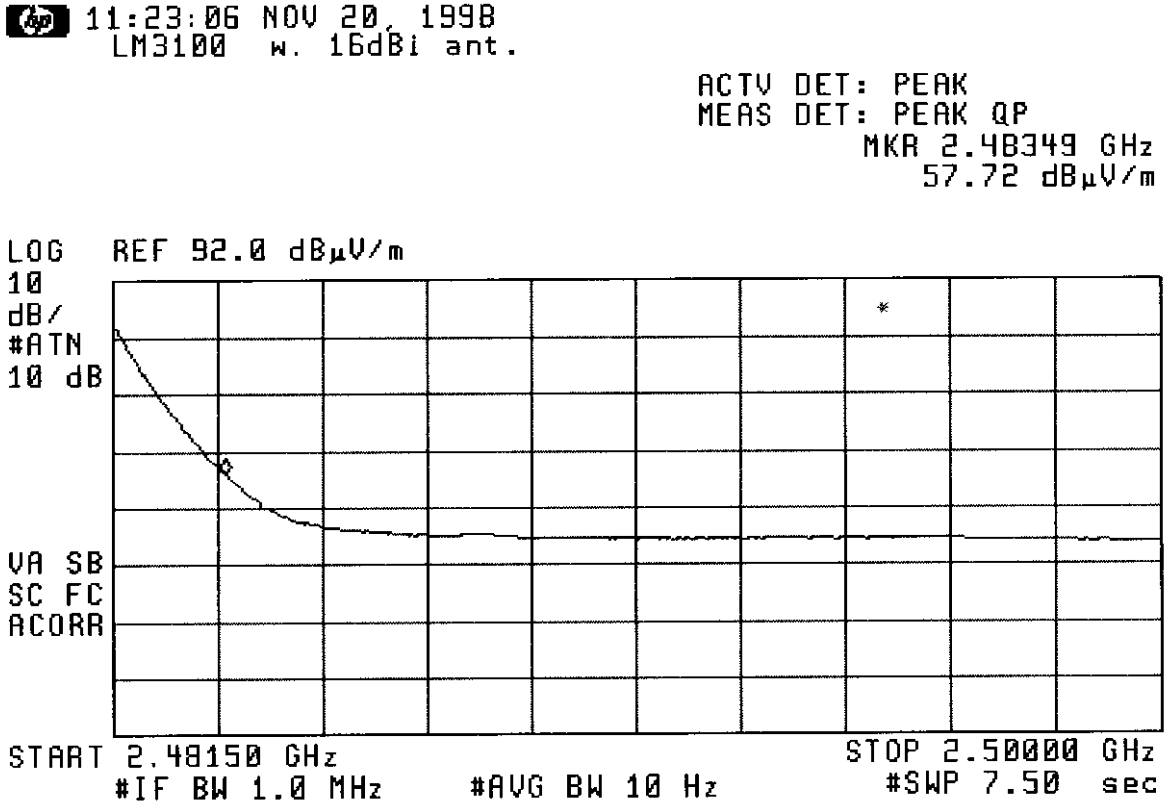

Transmitter Harmonic Emissions [15.205(a), 15.209(a),(f)]

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6. Both Horizontal and Vertical polarization modes were evaluated. Vertical is worst case.
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   $E(uV/m) = LOG_{10}^{-1}(dBuV/m)/20)$
8. The indicated levels of the HP8593EM Spectrum Analyzer include a 30dB factor for the PreAmp. The total field strength has been adjusted to include the attenuation factor of the coax, the correction factor of the horn antenna, and the difference in true PreAmp gain from 30dB at the specific frequencies of interest.

Tuned Frequency	Measured Frequency	Pol	Indicated Level dBuV/m		Antenna + Coax - PreAmp Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Limit
	GHz		Peak	Avg	dB	Peak	Avg	Avg	uV/m
2.402	4.804	V	16.5	13.2	31.1	47.6	44.3	164.0	500
	7.206	V	16.3	9.3	35.8	52.1	45.1	179.9	500
	*9.608	V	18.5	13.5	41.6	<60.1	<55.1	<569*	500
	**12.010	V	14.8	13.2	45.3	<60.1	<58.5	<841**	500
2.450	4.900	V	14.7	9.7	31.4	46.1	41.1	113.5	500
	7.350	V	16.5	9.7	36.3	52.8	46.0	199.5	500
	*9.800	V	14.8	13.6	41.7	<56.5	<55.3	<582*	500
	**12.250	V	15.5	13.3	45.4	<60.9	<58.7	<861**	500
2.480	4.960	V	15.2	12.1	31.7	46.9	43.8	154.9	500
	7.440	V	15.9	11.0	36.6	52.5	47.6	239.9	500
	*9.920	V	16.9	13.5	41.9	<58.8	<55.4	<589*	500
	**12.400	V	16.9	13.9	45.5	<62.4	<59.4	<933**	500

* NOTE: This signal level is in the system floor noise. The recorded measurements include the affects of the system floor noise.

** NOTE: At frequencies above 9.7GHz no EUT emissions were observed. All emissions at these frequencies are less than the floor noise of the measurement system.

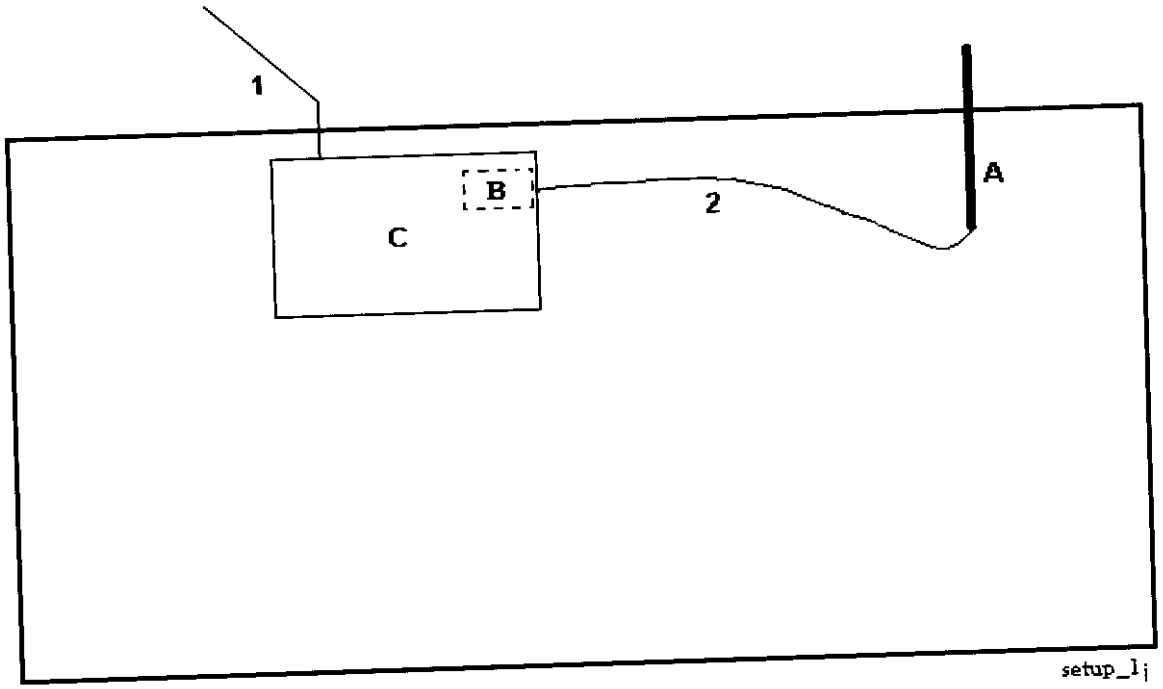
Measurements by: Ted Chaffee

Report of Measurements

Configuration Tested: [2.1033(b)(8)]

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	12dBi antenna OMNI-Directional	--	--	--
B	2.4GHz FHSS transceiver	[Aironet] LM3100	--	FCC ID: LOZ102037
C	Host Computer 486DX4 100MHz	[Hewlett Packard] Omnibook 4000C	TW50902541	FCC ID:B944000XY1
1	DC line cord	--	--	1.5meters, Unshielded
2	Coax to antenna	--	--	1.0 meters,



BASIC EUT SETUP
(Legend designation is above)

Setup Pictures

Setup Block Diagram this page
Radiated Setup page 58

Test Data [2.1033(B)(6)

Transmitter Maximum Peak Output Power: 15.247(b)(1), (b)(3)(i)

MEASUREMENT PROCEDURE:

1. The EUT was setup to operate in for an 1MBit data rate.
2. The EMC Receiver was connected directly to the transmitter output.
3. The EMC Receiver was setup using IF BW = 1MHz, Avg BW = 300Hz.

Calculation justification: [15.247(b3)]

The maximum allowable power of 1 Watt is derated by 1dB for every 1dB that the directional gain of the antenna exceeds 6dBi.

The OMNI Antenna has a rated gain of 12dBi.

Thus the maximum allowable power is derated by (12dBi - 6dB) = 6dB.

Given that 1Watt = 1000mWatts: 1000mW is 10*LOG(1000) = 30dBm

Therefore, the maximum allowable power is:

30dBm - 6dBm = 24dBm. [or antilog(24/10) = 251mW].

Tuned Frequency MHz	Measurement dBm		Cable Factor dB	Total Power Level dBm	15.247(b)(3) Limit dBm
2402	15.79		1.59	17.38	24
2450	16.18		1.59	17.77	24
2480	15.52		1.60	17.12	24

Measurements by: Ted Chaffee

Out of Band Emissions: [15.205(a),(b),(c), 15.209(a), 15.247(c)]

Emissions at Band Edges [15.205(a), 15.209, 15.247(c)]

MEASUREMENT PROCEDURE:

1. The EUT was adjusted to operate at 2402MHz to evaluate the lower band edge
2. The EUT was adjusted to operate at 2480MHz to evaluate the upper band edge

Charted Waveforms at Band Edges. [Waveform charts begin at page 62.]

3. The waveforms displayed were recorded in chart format for both the high side and low side of band edges and are viewable on the following pages.
5. The EMI Receiver settings for charting the waveform display are:
   a) IF Bandwidth = 100KHz, Avg Bandwidth = 300KHz, and
   b) IF Bandwidth = 1MHz, Avg Bandwidth = 10Hz.

Measurement of Radiated Emissions. [Tabulated data is on pages 61.]

6. The EUT system was set upon the wooden turntable 80cm above the ground plane at a distance of 3 meters from the receiving antenna.
7. The transmit frequency emission level was maximized by rotating the turntable and raising and lowering the search antenna.
8. Data was recorded with the EUT at 1MBit/Sec.
9. The EMI Receiver settings at IF Bandwidth=1MHz, Avg Bandwidth=10Hz. The test IF bandwidth deviated from 1MHz when evaluating the upper band edge. It was observed that the peak reading at 2.4835GHz using the 1MHz Bandwidth exceeded the 20dB increase in the limit. Therefore, part 24.238(b) was invoked which allows a reduction in the IF Bandwidth setting. An IF Bandwidth of 30KHz was used in measuring 2.4835GHz and 2.485GHz.
10. Both Horizontal and Vertical polarization modes were evaluated.
11. The Field Strength E(uV/m) is calculated using the formula:
    $E(uV/m) = LOG_{10}^{-1}((dBuV/m + Ant.Factor(dB) + Coax\ Loss(dB)$.

1MBit/Sec operation.
Tabulated Measurements for the lower band edge.

Frequency	Measurement dBuV/m		Polarity	Cable + Antenna Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Avg Limit
GHz	Peak	Average		dB	Peak	Average	Average	uV/m
2.380	2.3	1.8	V	34.6	36.9	36.4	66.1	500
2.382	2.4	1.8	V	34.6	37.0	36.4	66.1	500
2.384	2.4	1.8	V	34.6	37.0	36.4	66.1	500
2.386	2.5	1.9	V	34.6	37.1	36.5	66.8	500
2.388	2.4	1.9	V	34.6	37.0	36.5	66.8	500
2.390	2.3	1.9	V	34.6	36.9	36.5	66.8	500
2.380	12.5	1.8	H	34.6	47.1	36.4	66.1	500
2.382	12.9	1.8	H	34.6	47.5	36.4	66.1	500
2.384	12.3	1.8	H	34.6	46.9	36.4	66.1	500
2.386	13.0	1.8	H	34.6	47.6	36.4	66.1	500
2.388	13.2	1.9	H	34.6	47.8	36.5	66.8	500
2.390	13.1	1.9	H	34.6	47.7	36.5	66.8	500

1MBit/Sec operation.
Tabulated Measurements for the upper band edge.
BW=30KHz when measuring 2.4835,2.485GHz

Frequency	Measurement dBuV/m		Polarity	Cable + Antenna Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Avg Limit
GHz	Peak	Average		dB	Peak	Average	Average	uV/m
2.4835	10.9	-9.1	V	35.2	46.1	26.1	20.2	500
2.485	4.4	-10.3	V	35.2	39.6	24.9	17.6	500
2.488	12.5	1.7	V	35.2	47.7	36.9	70.0	500
2.491	12.5	1.4	V	35.2	47.7	36.6	67.6	500
2.494	12.6	1.2	V	35.3	47.9	36.5	66.8	500
2.497	12.5	1.2	V	35.3	47.8	36.5	66.8	500
2.500	12.6	1.3	V	35.3	47.9	36.6	67.6	500
2.4835	3.7	-11.3	H	35.2	38.9	23.9	15.7	500
2.485	6.4	-6.5	H	35.2	41.6	28.7	27.2	500
2.488	12.3	1.0	H	35.2	47.5	36.2	64.6	500
2.491	12.1	0.9	H	35.2	47.3	36.1	63.8	500
2.494	12.9	0.9	H	35.3	48.2	36.2	64.6	500
2.497	12.3	0.8	H	35.3	47.6	36.1	63.8	500
2.500	12.3	0.9	H	35.3	47.6	36.2	64.6	500

Measurements by: Fred Chaffee

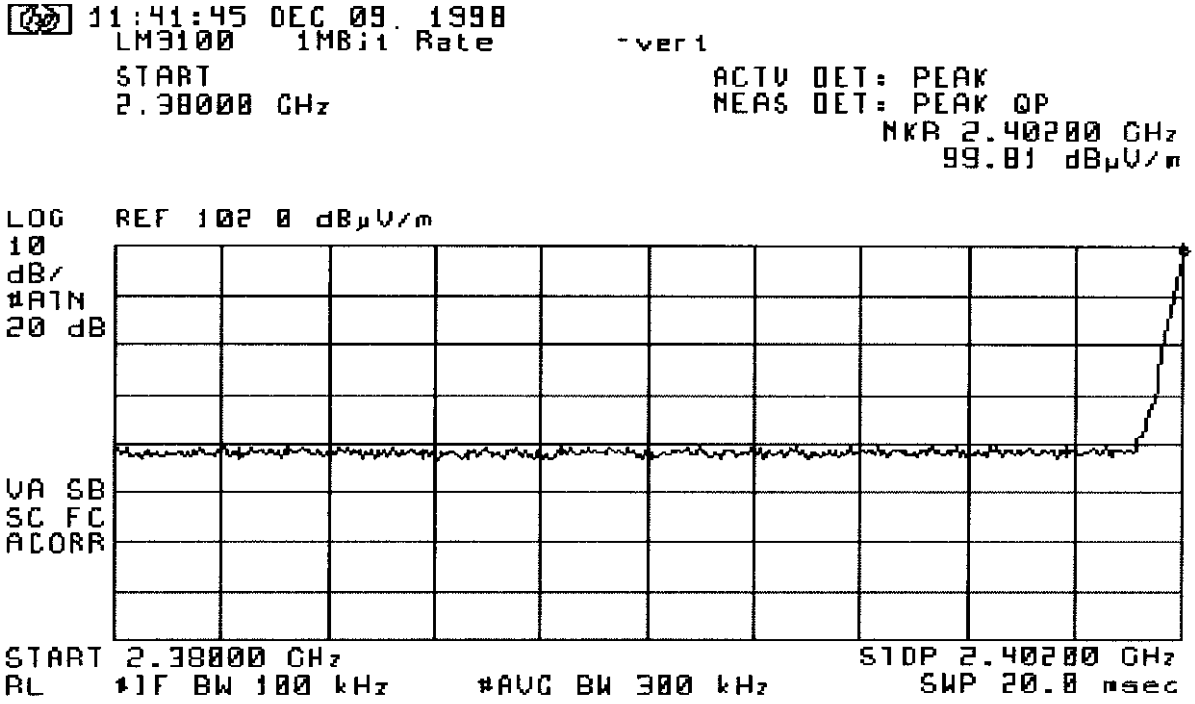
APPENDIX

The following pages show, in chart format, the emission profiles of the band edges with the system operating at 1MBit/Sec.

IF Bandwidth = 100KHz; Video Bandwidth = 300KHz

IF Bandwidth = 1.0MHz; Video Bandwidth = 10Hz

VERTICALLY POLARIZED



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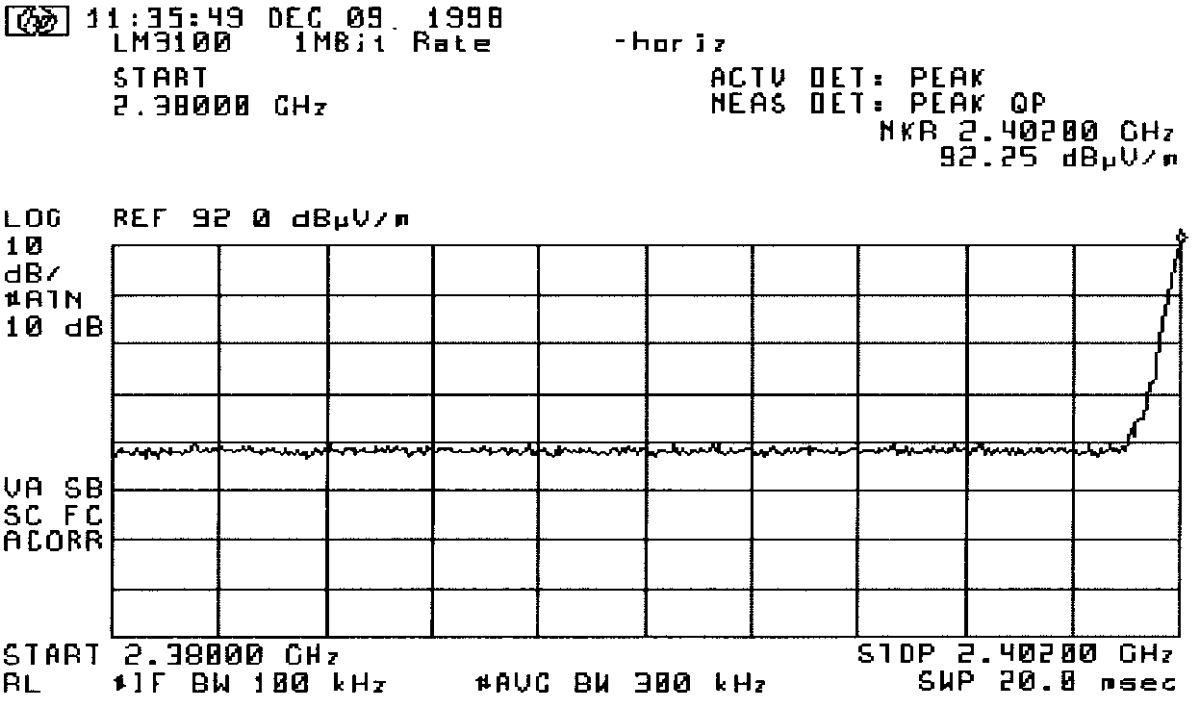

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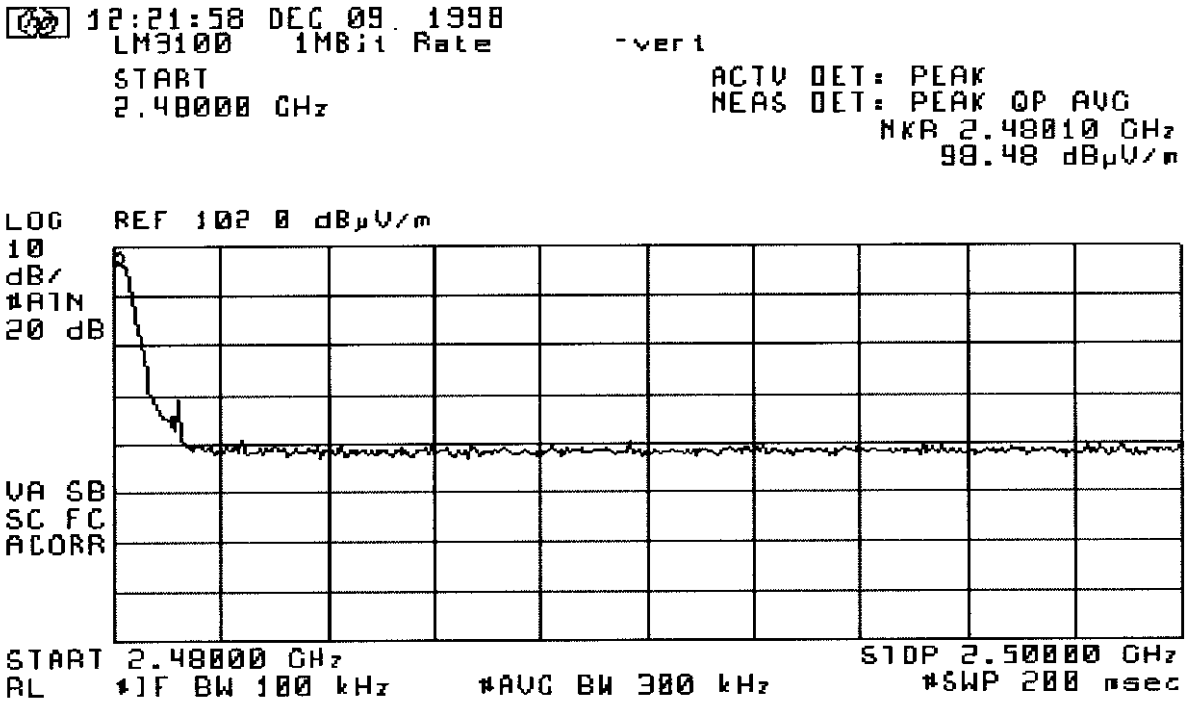

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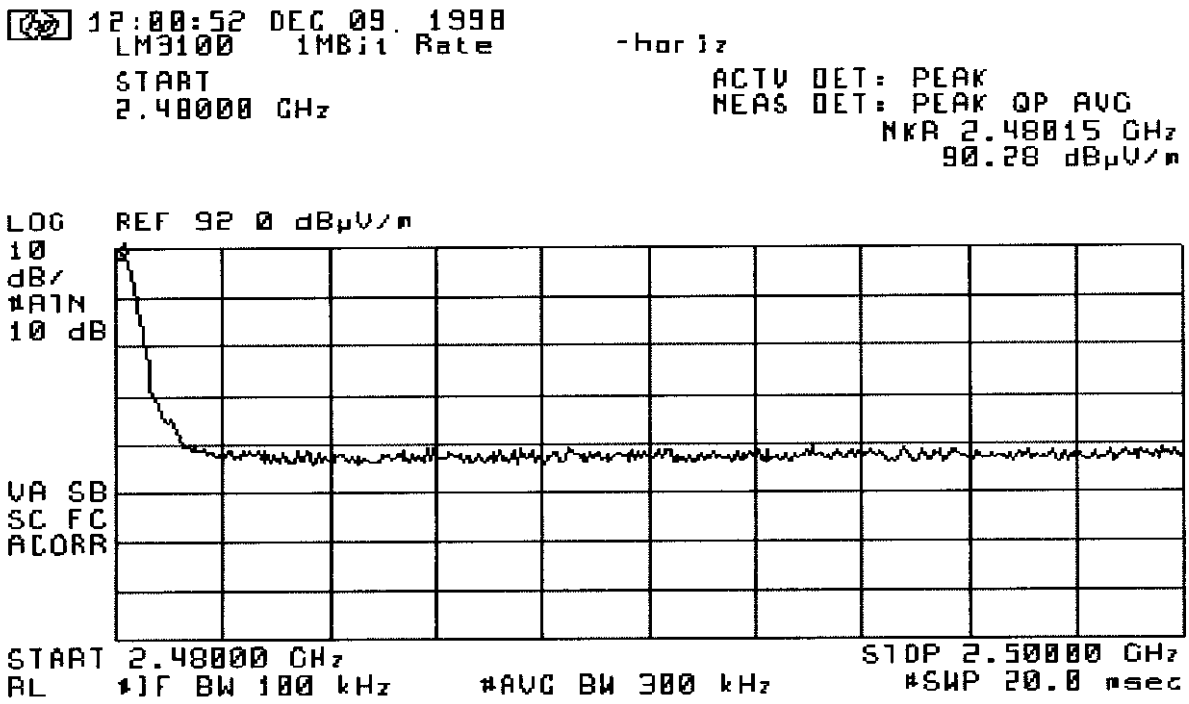

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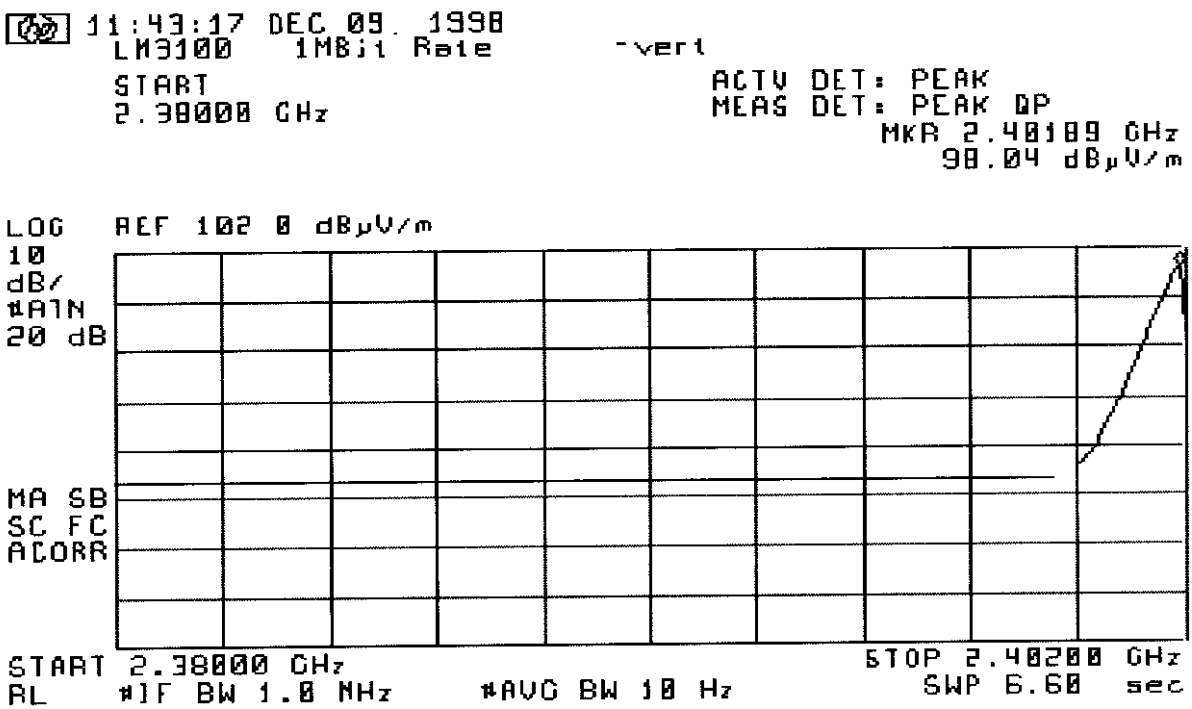

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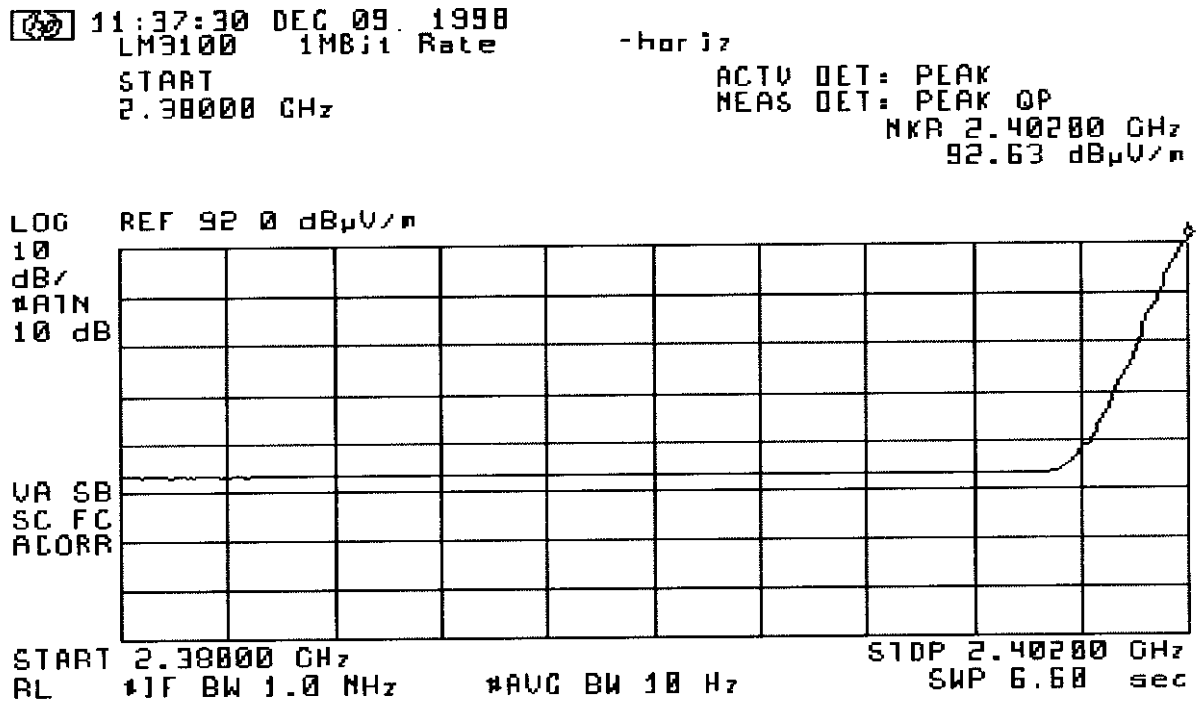

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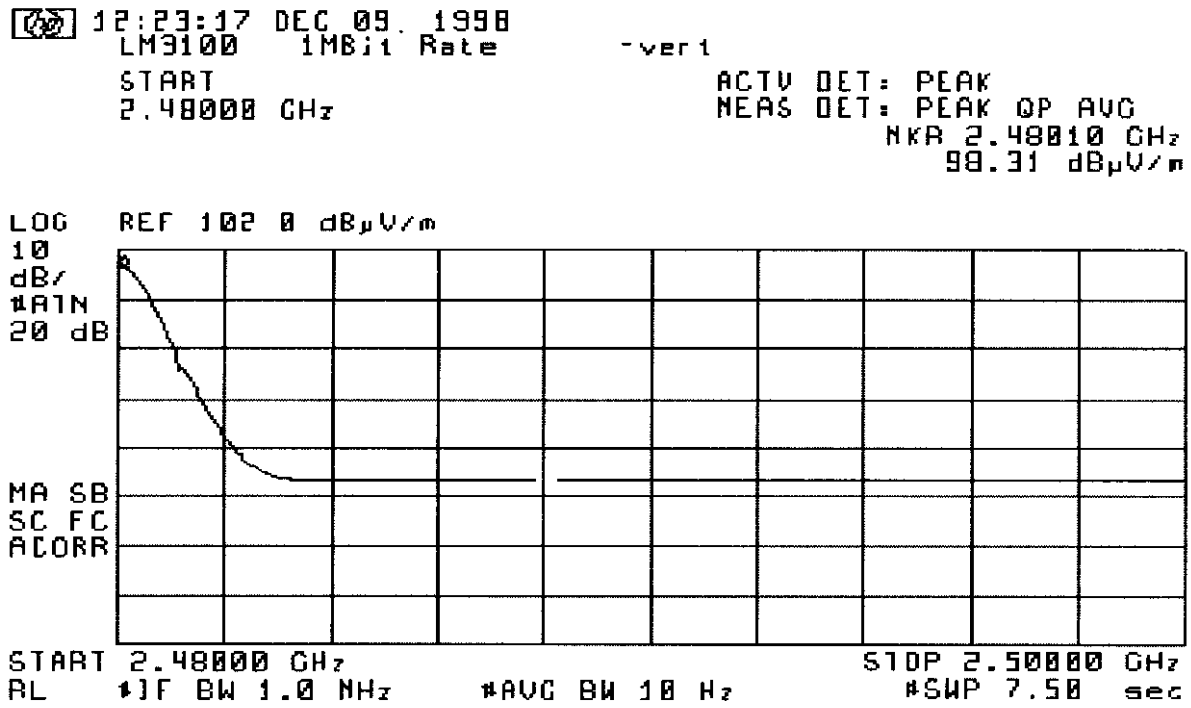

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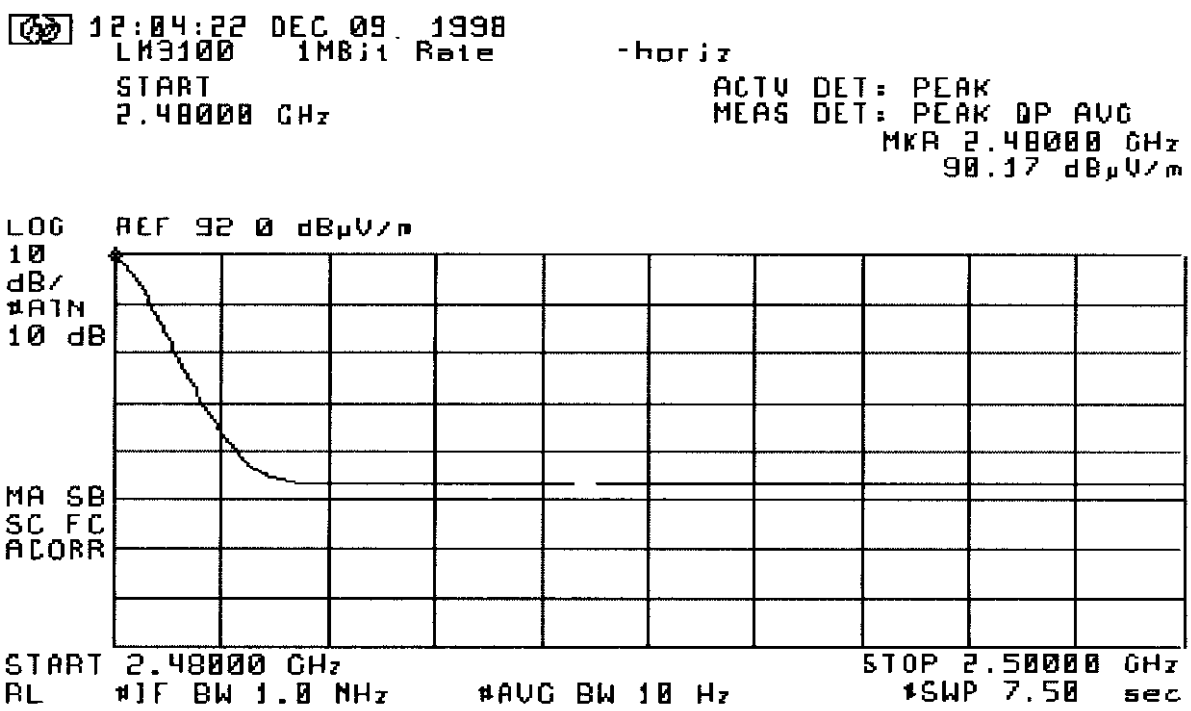

Transmitter Harmonic Emissions [15.205(a), 15.209(a),(f)]

MEASUREMENT PROCEDURE:

1. The EUT was adjusted to operate at its low, mid, and high range. These frequencies are, respectively, 2402MHz, 2450MHz, and 2480MHz.
2. The EUT system was set upon the wooden turntable 80cm above the ground plane at a distance of 3 meters from the receiving antenna.
3. The EUT was setup to operate in for an 1MBit data rate
4. The EMC Receiver was setup using IF BW = 1MHz, Avg BW = 10Hz.
5. The transmit harmonic emission level was maximized by rotating the turntable and raising and lowering the search antenna.
6. Both Horizontal and Vertical polarization modes were evaluated. Vertical is worst case.
7. The Field Strength E(uV/m) is calculated using the formula:
   $E(uV/m) = LOG_{10}^{-1}(dBuV/m)/20)$
8. The indicated levels of the HP8593EM Spectrum Analyzer include a 30dB factor for the PreAmp. The total field strength has been adjusted to include the attenuation factor of the coax, the correction factor of the horn antenna, and the difference in true PreAmp gain from 30dB at the specific frequencies of interest.

Tuned Frequency	Measured Frequency	Pol	Indicated Level dBuV/m		Antenna + Coax - PreAmp Factor	Total Field Strength dBuV/m		Total Field Strength uV/m	FCC Limit
GHz	GHz		Peak	Avg	dB	Peak	Avg	Avg	uV/m
2.402	4.804	V	25.1	12.2	31.1	56.2	43.3	146.2	500
	7.206	V	18.5	10.9	35.8	54.3	46.7	216.3	500
	*9.608	V	18.1	9.3	41.6	<59.7	<50.9	<351*	500
	**12.010	V	24.2	17.6	45.3	<69.5	<62.9	<1396**	500
2.450	4.900	V	16.9	10.9	31.4	48.3	42.3	130.3	500
	7.350	V	13.2	9.5	36.3	49.5	45.8	195.0	500
	*9.800	V	12.6	9.4	41.7	<54.3	<51.1	<359*	500
	**12.250	V	17.1	16.9	45.4	<62.5	<62.3	<1303**	500
2.480	4.960	V	14.2	9.1	31.7	45.9	40.8	109.6	500
	7.440	V	12.7	8.6	36.6	49.3	45.2	182.0	500
	*9.920	V	13.2	7.8	41.9	<55.1	<49.7	<305*	500
	**12.400	V	16.9	16.1	45.5	<62.4	<61.6	<1202**	500

* NOTE: This signal level is in the system floor noise. The recorded measurements include the affects of the system floor noise.

** NOTE: At frequencies above 9.7GHz no EUT emissions were observed. All emissions at these frequencies are less than the floor noise of the measurement system.

Measurements by: Ted Chaffee

EXHIBIT 6: STATEMENT FOR RF EXPOSURE LIMITS [15.247(b)(4)]

Engineering Analysis of

Transceiver Model LM3100

FCC ID: LOZ102037

To

Federal Communications Commission

Part 1.1310 Radio Frequency Exposure Limits

&

OET 65 Supplement C

12/14/98

David A. Case NCE
Sr. EMC Engineer
Aironet Wireless Communications
3875 Embassy Parkway
Akron, OH 44333
330-664-7396

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I Equipment Under Test

FCC ID:	LOZ102037
Model:	LM3100
Type:	PCMCIA Wireless LAN Adapter
Max Power	0.068 Watts
Duty Cycle	0.5

Max Radio Power for antenna combination

For 16dBi Patch 0.068 Watts

II MPE Distances

Antenna	TX Power	EIRP	MPE Distance
16.0 dBi Patch	+18dBm	+34dBm / 2.5W	14.1 cm
12.0 dBi Omni	+18dBm	+30dBm / 0.99W	8.9 cm
2.2 dBi Dipole	+18dBm	+20.2dBm/ 0.1 W	2.8 cm

Ref: Reference Data for Engineers 8th edition p32-7

$$\sqrt{\frac{EIRP}{4\pi\ 10}} =$$

Page 2 LOZ102037

III Maximum Permissible Exposure

Ref: FCC Rules, CFR 47 1.1310

FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	E Field Strength (V/m)	M Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	E Field Strength (V/m)	M Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

The uncontrolled environment represents the most restrictive limits.

IV. Summary

In an uncontrolled environment, the maximum permissible exposure from a radio device operating at 2.4 Ghz is 1mW/cm2 average over a 30 minute period.

Based on the calculated power density, the high gain antenna must be mounted at a minimum distance of 15 cm from the user. The following warning statement will be placed in the user manuals to caution the user on correct and safe use of this antenna.

For High Gain wall mount or mast mount antennas

These high gain antennas are designed to be professionally installed and should be located away from the user by a minimum of 15 cm. Please contact your professional installer, VAR, or antenna manufacturer for proper installation requirements

---

Since the analysis is favorable in the Uncontrolled Environment, it is unnecessary to analyze the device to the less restrictive limits of the Controlled Environment or Partial Body Exposure.

EXHIBIT 7: LM3100 SCHEMATICS

ATTACHMENT

EXHIBIT 8: USER'S GUIDE AND TECHNICAL REFERENCE MANUAL

ATTACHMENT