Date: 09-17-98

FCC ID: N7R-CM-AER
Exhibit: Test Report
Number of Pages: 27
WLI Project: 981525

TELECOMMUNICATION DIVISION

CODE OF FEDERAL REGULATION

PART 15 –INTENTIONAL RADIATORS

SUBPART "C" – Paragraph 15.247

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTERS

Operating in the Frequency Band 2402-2478 MHz

MEASUREMENT/TECHNICAL REPORT
ON

Product Name: MiniNet 2.4 Connection Manager

Model: AIR I/O CM

Applicant: Telxon Corporation
8302 New Trails Drive
The Woodlands, TX 77381-4246

Tested by Request of: Telxon Corporation

Test & Measurements Performed By:
Wayne Langston Incorporated
P.O. Box 1377; League City, TX 77574-1377
Tel: 281-337-6785; Fax: 281-337-7217
Email: langstoninc@msn.com

Test Results:
The test results for this sample provided show that the EUT is [x], is not [] in compliance with the requirements of the CFR, Subpart C, Paragraph 15.247, Direct Sequence Spread Spectrum Transmitters operating in the Frequency Band 2402-2478 MHz. I certify that I am the technically qualified person responsible for preparation of the technical information contained in this application, and that it is complete and accurate to the best of my knowledge

Tested By: Wayne Langston Date: 09-17-98

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Section 1 General Information

Applicant:	TELXON CORPORATION 8302 New Trails Drive The Woodlands, TX 77381-4246
Manufacturer:	TELXON CORPORATION 6333 Rothway Street Houston, TX 77040-5040 Phone: 713-307-2500 1-800-800-8020

1.1 Description of Equipment Under Test

Product Name:	MiniNet 2.4 Connection Manager
Serial number:	Pre-production
Type of Equipment:	Frequency Hopping Spread Spectrum Transmitters
Operating Frequency:	2402-2478 MHz
Number of Hopping Frequency Channels: 77	
Separation between Hopping Frequency Channels: 1 MHz	
Channel 20 dB BW:	682 kHz
Channel Occupancy time in 30 sec. Period:	382 mS
Power Rating:	2.0 mili-Watts max. EIRP
Emission Designation:	682K0F1D
Duty Cycle:	50 %
Osc. Frequency (IES)	24 MHz (CPU), 2402 MHz (Radio low), 2477 MHz (Radio high)
Input Supply:	15 V DC 2.7 A 100-240 50-60 Hz 1 A
Antenna:	TNC
FCC ID:	-CM-AER

Interface Ports:	RS232, Com 1
	RS232, Com 2

Overview of the Connection Manager 4

The Telxon Connection Manager is designed primarily for use in small stores with less than 12,000 square feet. It acts as a communication link between the store's host computer and one or more Portable Tele Transaction Computers (PTCs). The Connection Manager can send data to and receive data from the host and the PTCs.

The Connection Manager is wired to the host computer via an RS-232 serial cable or can be connected to an Ethernet network on which the host is connected. The Connection Manager establishes wireless communication links with PTCs used throughout the store. The PTCs, which can consist of any combination of up to eight PTC-821 DOS and/or PTC-860LE units, and the Connection Manager communicate with each other via their internal MiniNet 2.4 radio modules.

Light-emitting diodes (LEDs) on the Connection Manager's front panel indicate the status of power input, error conditions, and communication connections.

Processor

The Connection Manager's 66-MHz AMD Elan SC400 processor is fully IBM PC compatible. It provides exceptional processing speed and is designed for low power consumption.

Operating system

The Connection Manager uses the MS-DOS 6.22 operating system (ROM version).

1.2 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system are described on the test manifest sheets.

1.3 Related Submittal(s)/Grants

BC5-24-LP

1.4 Test Methodology

This product was tested per the FCC CFR Rules and Regulations, pursuant to Part 15. Both Terminal Interference and Radiated Disturbance testing for determining FCC Part 15 Subpart C – Paragraph 15.247, Frequency Hopping Spread Spectrum Transmitters operating in the Frequency Band 2402-2478 MHz compliance were performed according to the procedures in ANSI 63.4 – Methods of Measurement of Radio-Noise Emissions from low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

1.5 Test Facility

This facility performs EMI measurements, which support verification of compliance with CENELEC International Standards. It has filed a "Description of the Measurement Facility" and is on file with the FCC Laboratory Division in Colombia, Maryland. The FCC approved the site for the purpose of providing test results for submission with equipment authorization applications under the Commissions Equipment Authorization Program.

The instrumentation used to perform the test conforms to ANSI C63.2, CISPR 16, and FCC requirements for detector function and bandwidth. All equipment was calibrated and traceable to NIST. Calibration period is 1 year. Wayne Langston, Inc. has received NVLAP Accreditation, Certificate No. 200021-0.

1.6 Test Samples:

A representative test sample was tested under the test procedure and requirements of the CFR. The Equipment Under Test (EUT) was tested and shown to be in compliance with the applicable technical standards if no unauthorized change is made in the equipment and if the equipment is properly maintained and operated. Compliance with these standards shall not be construed to be a finding with respect to matters not encompassed by the Commission's rules.

1.7 Test Results (Worst Case Scenario)

The results from this testing and verification apply only to the sample that was tested and any identical production lot. The findings do not make any suggestions about how the product is to be used, nor does Wayne Langston Incorporated make any recommendations. regarding the product's usage.

Summary of Test Results and General Statement of Certification

FCC Paragraph	Test Requirements	Compliance Yes/No
15.247 (a)(I) & 15.247(a)(I)(II)	Hopping Channel Frequency Characteristics	Yes
15.247(b)(2) & 1.1310	Peak Output Power and RF Exposure Limit	Yes
15.247(c)	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(c), 15.209 & 15.205	Transmitter Radiated Emissions	Yes
15.107	AC Power Conducted Emissions	Yes
1.1310	RF Safety Requirements/SAR	Yes

Telxon AIR I/O CM has been tested and found to comply with FCC Part 15, Subpart B, Class A Digital Devices. The associated Radio Receiver operating in 2402-2478 MHz is exempted from FCC authorization.

1.8 Modifications

Modifications: None

1.9 Justification

No deviation, in both configuration and operation manners, different from normal operation were required. Only FCC test software to facilitate single channel operation during bandwidth measurements was used.

1.10 EUT Operating Condition

The transmitter was specially set operated at lowest, middle and highest frequencies for testing.

1.11 Special Accessories

No special accessories were required.

Section 2 Product Labeling

As required by the CFR 47, pursuant to clause 15.19(a)(3), the EUT shall bear the following statement in a conspicuous location on the device:

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

2.1 Information to the User

As required by the CFR 47, pursuant to clause 15.105(a), the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note:

This equipment has been tested and found to comply with the limits for a Class A Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection

against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

As required by the CFR 47, pursuant to clause 15.21, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note:

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Section 3 Test System Measurements

Section 3.1 MEASUREMENT OF TERMINAL INTERFERENCE VOLTAGE

3.1.1 Terminal Interference Voltage Measurement Data

See Appendix A for test configuration and test results.

Section 3.2 MEASUREMENT OF RADIATED INTERFERENCE FIELD STRENGTH

3.2.1 Radiated Interference Field Strength Measurement Data

Refer to Appendix A for test configuration and test results.

Section 4 Measurement Uncertainty

Normal distribution was assigned to uncertainties derived from multiple contributions. The standard uncertainty of a contribution to uncertainty with assumed normal distribution is found by dividing the

uncertainty by the coverage factor k, appropriate to the stated level of confidence. Strictly speaking

for a level of confidence of 95%, k = 1.96, we used k = 2. Rectangular distribution means that there is equal probability of the true value lying anywhere between the prescribed limits. A rectangular distribution was assigned where a manufacturer's specification limits are used as the uncertainty.

4.1 Radiated Emissions

Measurement of vertically polarized radiated field strength over the frequency range 30 MHz to 1 GHz on an open area test site at 3m and 10m includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Antenna factor calibration	Normal (k=2)	±1.0
Cable loss calibration	Normal (k=2)	±0.2
Receiver specification	Rectangular	±1.0
Antenna directivity	Rectangular	±0.1
Antenna factor variation with height	Rectangular	±2.0
Antenna factor frequency interpolation	Rectangular	±0.1
Measurement distance variation	Rectangular	±0.2
Site Imperfections	Rectangular	±1.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(Y) = \pm\sqrt{\left(\frac{1.0}{2}\right)^2+\left(\frac{0.2}{2}\right)^2+\frac{1.0^2+0.1^2+2.0^2+0.2^2+1.5^2}{3}} = \pm 1.6\ \text{dB}$$

It is probable that $u_c(y) / s(q_k)>3$, where $s(q_k)$ is estimated standard deviation from a sample of n

readings

$$s(q_k) = \sqrt{\frac{1}{(n-1)} \sum_{k-1}^{n} (q_k - \bar{q})^2}$$

unless the repeatability of the EUT is particularly poor, and a coverage factor of k = 2 will ensure that the level of confidence will be approximately 95%, therefore:

$$U = 2\, u_c(y) = 2 \times \pm 1.6 \text{ dB} = \pm 3.2 \text{ dB}$$

Notes:

1.1 Uncertainties for the antenna and cable were estimated, based on a normal probability distribution with k = 2.

1.2 The receiver uncertainty was obtained from the manufacturer's specification for which a rectangular distribution was assumed.

1.3 The antenna factor uncertainty does not take account of antenna directivity.

1.4 The antenna factor varies with height and since the height was not always the same in use as when the antenna was calibrated an additional uncertainty is added.

1.5 The uncertainty in the measurement distance is relatively small but have some effect on the received signal strength. The increase in measurement distance as the antenna height is increased is an inevitable consequence of the test method and is therefore not considered to be a contribution to uncertainty.

1.6 Site imperfections are difficult to quantify but may include the following contributions:

- unwanted reflections from adjacent objects.
- ground plane imperfections: reflection coefficient, flatness and edge effects.
- losses or reflections from "transparent" cabins for the EUT or site coverings.
- earth currents in antenna cables (mainly effects biconical antennas).

The specified limits for the difference between measured site attenuation and the theoretical value (±4

dB) were not included in total since the measurement of site attenuation includes uncertainty

contributions already allowed for in this budget, such as antenna factor.

4.2 Conducted Emissions

Measurement of conducted emissions over the frequency range 9 kHz to 30 MHz includes following

uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Receiver specification	Rectangular	±1.5
LISN coupling specification	Rectangular	±1.5
Cable and input attenuator calibration	Normal (k=2)	±0.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(Y) = \pm\sqrt{\frac{1.5^2 + 1.5^2}{3} + \left(\frac{0.5}{2}\right)^2} = \pm 1.2 \text{ dB}$$

As with radiated field strength uncertainty, it is probable that $u_c(y) / s(q_k) > 3$ and a coverage factor

of k=2 will suffice, therefore:

$$U = 2\, u_c(y) = 2 \times \pm 1.2 \text{ dB} = \pm 2.4 \text{ dB}$$

Section 5 GENERAL MEASUREMENT CONDITIONS

5.1 Ambient Emanations

Noted and complies.

Ambient Noise Floor: 20.0 dB.

5.2 Test Configuration

The ANSI 63.4 test configuration was used to measure Terminal Interference Voltages and Radiated

Interference Field Strengths after maximizing the cables.

5.3 Firmware

The firmware is manufacturer provided.

5.4 Exercise Software.

The software used is manufacturer provided.

5.5 Ground Plane

Noted.

Test Unit is Table-top. (Floor-standing, table-top or portable)**.**

5.6 Power Input

Rechargeable battery

5.7 Climate Condition

Standard Temperature and Humidity

Ambient Temperature: 26° C

Relative Humidity 60 %

Section 6. METHOD OF MEASUREMENT OF TERMINAL INTERFERENCE VOLTAGE

Section 6.1 METHOD OF MEASUREMENT OF RADIATED DISTURBANCES FIELD STRENGTH

Refer to ANSI 63.4-1992, paragraph 8 for detailed radiated emissions measurement procedures.

Applies to harmonics/spurious that fall in the restricted bands listed in section 15.205, the maximum permitted average field strength is listed in Section 15.209. a pre-amp and high pass filter are used for this measurement.

For measurement below 1 GHz, set RBW = 100 kHz, VBW ≥ 100 kHz, sweep = Auto

For measurement above 1 GHz, set RBW = 1 MHz (Peak) & VBW = 10 Hz (Average).

If the emission is pulsed, modified the unit for continuous operation, then use the settings above for

measurements, then correct the reading by subtracting the peak-average correction factor derived from the appropriate duty cycle calculation. Refer to Section 15.35(b) and (c).

6.1.1 Aerial

Noted and complies.

6.1.2 Aerial-to-Test Unit Distance

Noted and complies.

Distance from Aerial to Test Unit: 3 meters**:** (3, 10, 30)

6.1.3 Aerial-to-Ground Distance

Noted and complies.

6.1.4 Aerial-to-Test Unit Azimuth and Polarization

Noted and complies.

Test Unit is Rotated (fixed or rotated) during testing.

6.1.5 Ground Planes

Noted and complies.

Ground Plane Mesh Size; 7.0 mm

6.1.6 Measurement in the Presence of High Ambient Signals

Noted and complies.

7.0 Test Data

7.1 Hopping Channel Carrier Frequency Characteristics @ FCC CFR 47, Paragraph 15.247(a)(I) & 15.247(a)(I)(II)

FCC Requirements:

@ FCC CFR 47, Paragraph 15.247(a)(1) – Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping

channel, which ever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

@FCC CFR 47, Paragraph 15.247(a)(I)(II) – Frequency hopping systems operating in the 2402 – 2478 MHz and 5725 – 5850 MHz bands shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

Climate Condition:

Standard Temperature and Humidity:

Ambient: 26° C

Relative Humidity: 60 %

Power Input:

Rechargeable Battery

Test Equipment:

Refer to Appendix A for list of test equipment

Method of Measurements:

The measurements under this section will be performed at 3 meter distance.

Measurement Data:

Test Description	FCC Specification	Measured Values	Comments
Channel Hopping Frequency Separation	Minimum of 25 kHz or 20 dB BW which ever is greater	1 MHz	Pass
Channel Frequency hopping method	See Note (1)	Please refer to the technical description	Nil.
Number Hopping Frequencies	75 MINIMUM	77	Pass
20 dB BW of the Hopping Channel	1 Mhz minimum	682 kHz	Pass, Refer to Figure(s): 1, 2, and 3
Average Time of Occupancy	0.4 seconds maximum within 30 seconds period	0.372 seconds within 30 seconds period	Pass, Refer to Figure 4

Note (1): The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

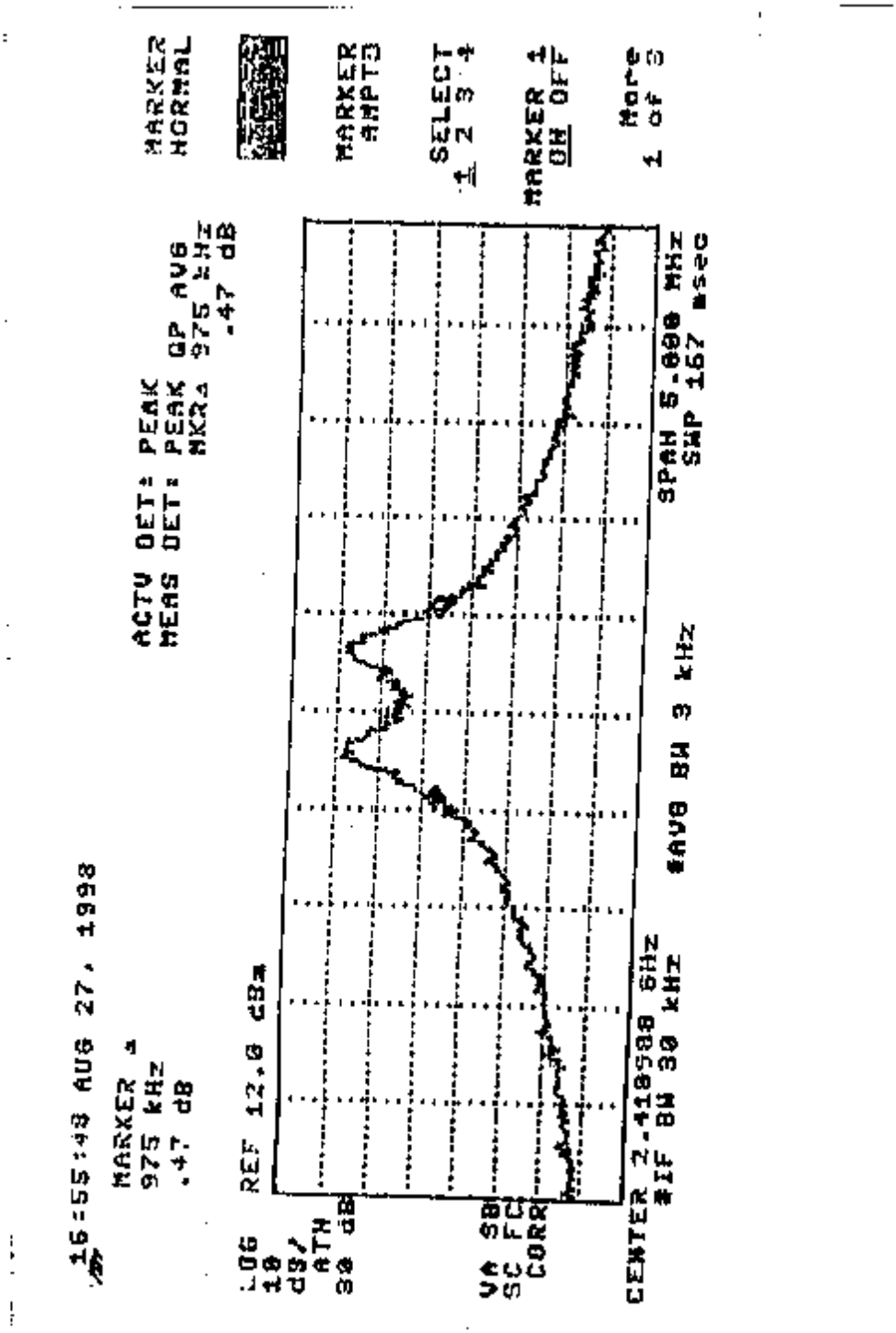

MARKER
NORMAL
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 3
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ 975 kHz
-47 dB
16:55:48 AUG 27, 1998
MARKER 1
975 kHz
-47 dB
LOG
10
dB/
ATN
30 dB
REF 12.8 dBm
VA SB
SC FC
CORR
CENTER 2.418588 GHz
#IF BW 30 kHz
#AVG BW 3 kHz
SPAN 5.000 MHz
SWP 167 msec

Figure 1

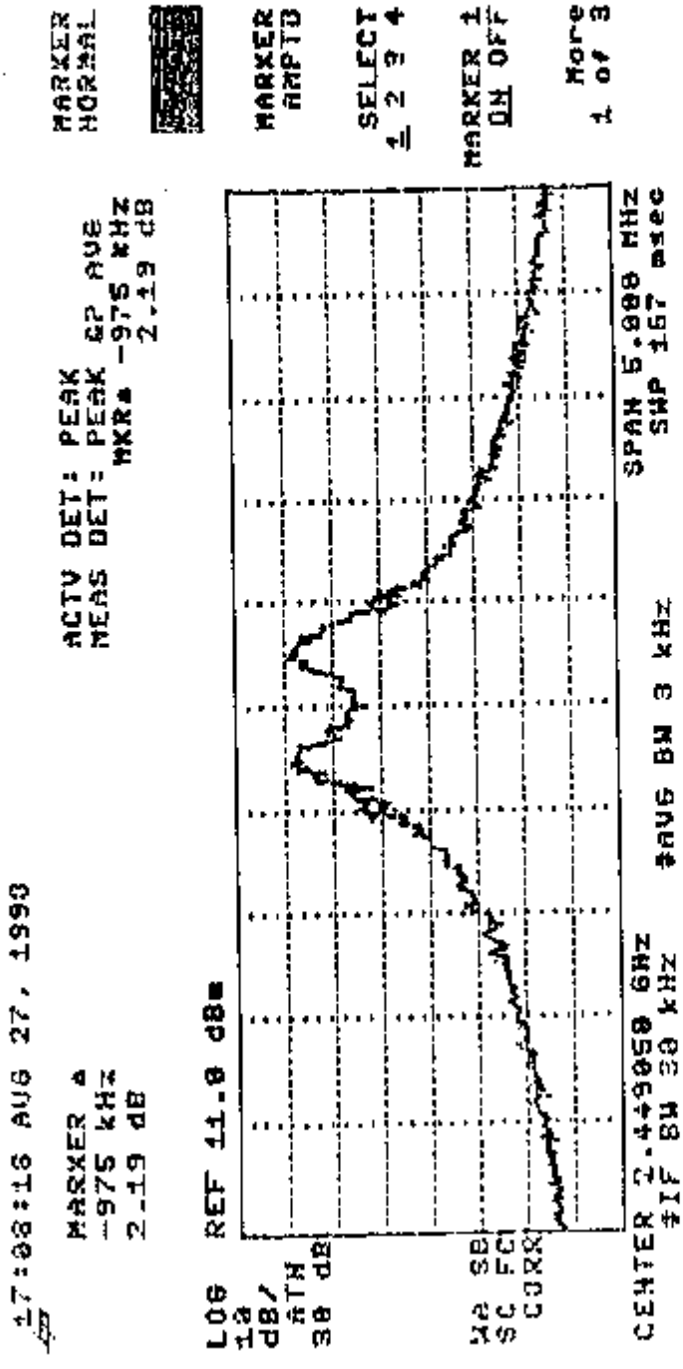

17:08:16 AUG 27, 1993
MARKER 4
-975 kHz
2.19 dB
ACTV DET: PEAK
MEAS DET: PEAK &2 AVG
MKR4 -975 kHz
2.19 dB
MARKER
NORMAL
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 3
LOG
10
dB/
ATN
30 dB
REF 11.0 dBm
#2 SB
SC FCI
CORR
CENTER 2.449050 GHz
#IF BW 30 kHz
#AVG BW 3 kHz
SPAN 5.000 MHz
SWP 157 msec

Figure 2

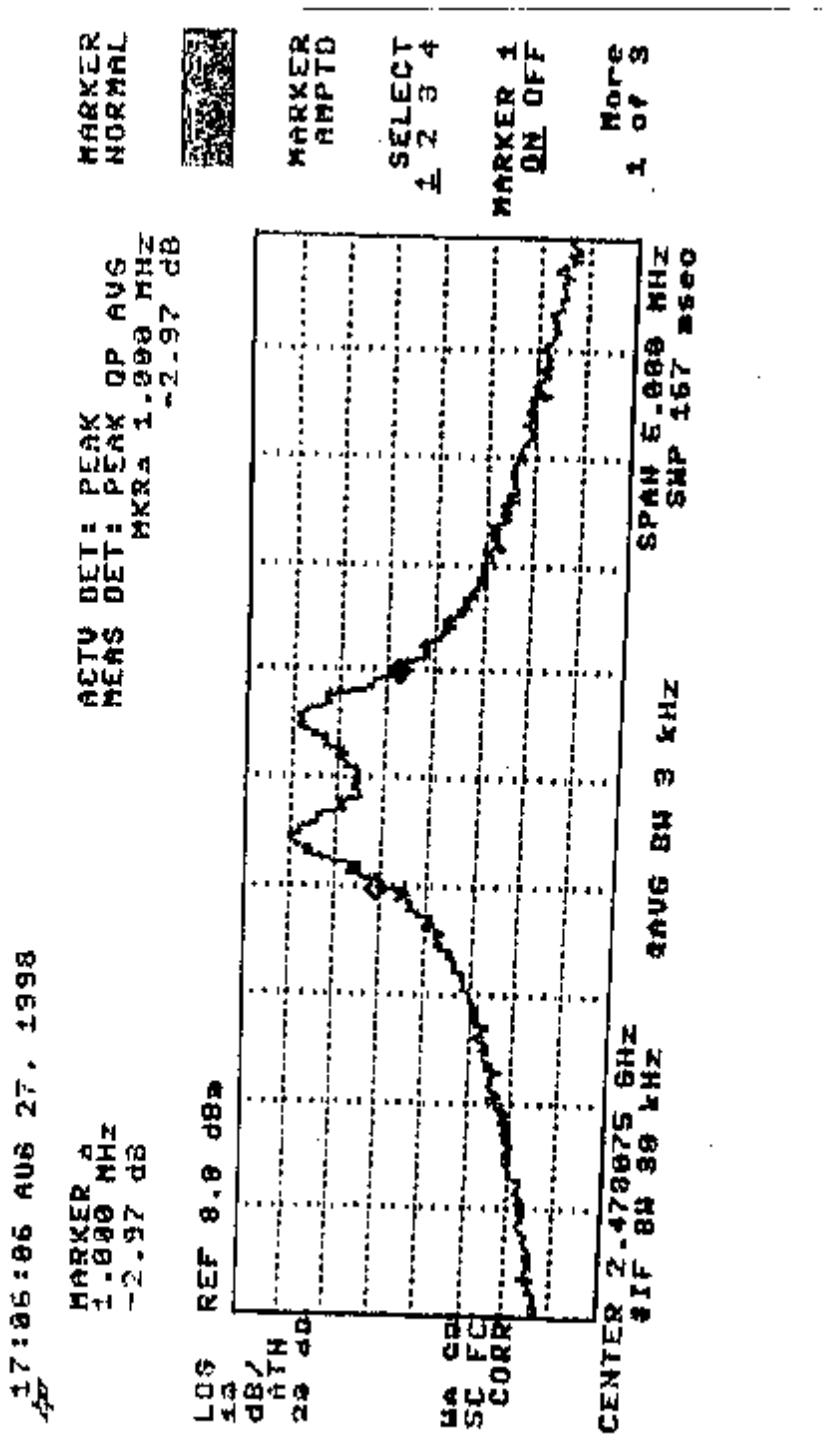

17:05:06 AUG 27, 1998
MARKER 1
1.000 MHz
-2.97 dB
REF 8.0 dBm
LOG
10
dB/
ATTN
20 dB
#IF BW 30 kHz
CENTER 2.478875 GHz
#VBW 3 kHz
SPAN 5.000 MHz
SWP 167 msec
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR1 1.000 MHz
-2.97 dB
MARKER
NORMAL
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 3

Figure 3

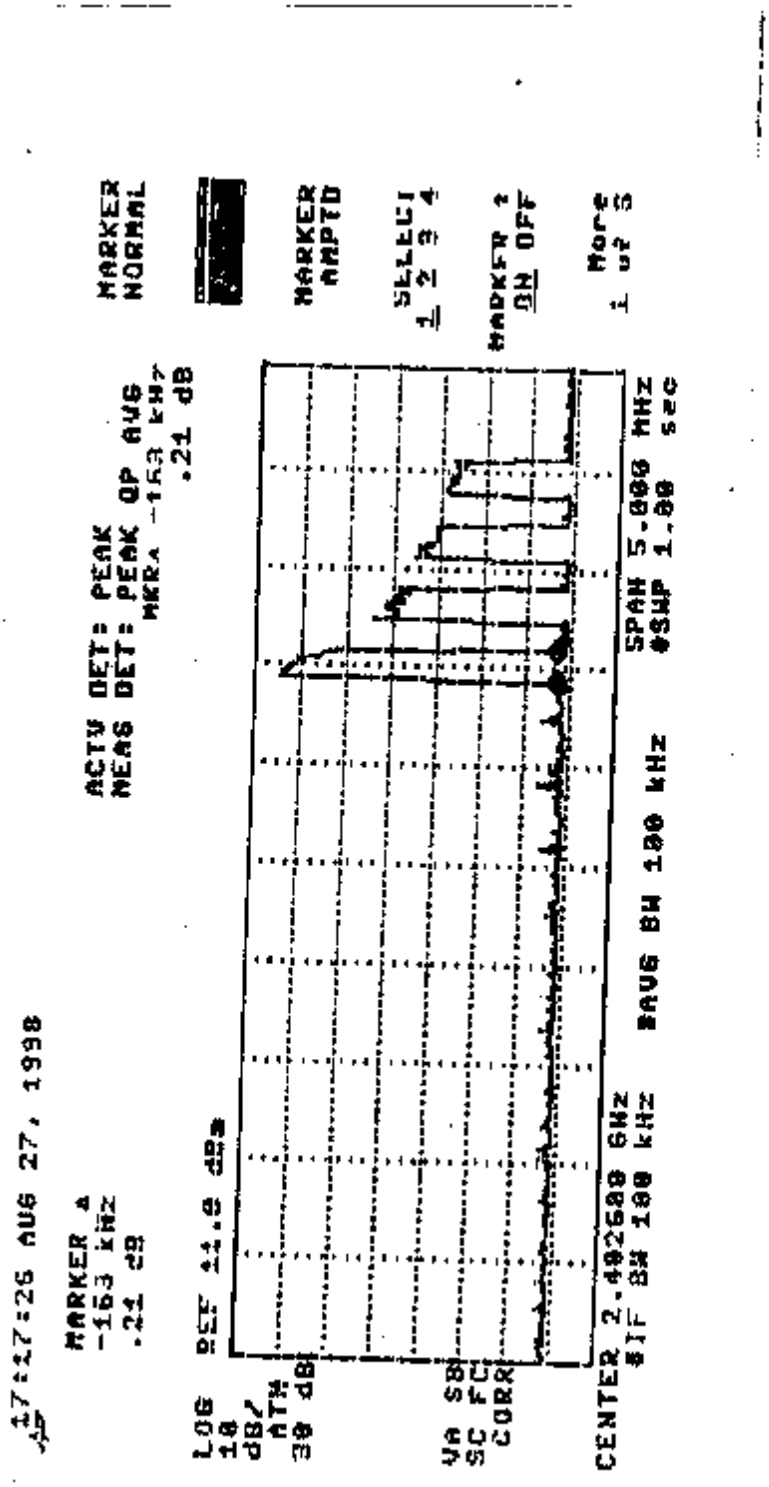

17:17:26 AUG 27, 1998
MARKER 1
-163 kHz
.21 dB
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR1 -163 kHz
.21 dB
MARKER NORMAL
MARKER AMPTD
SELECT 1 2 3 4
MARKER 1 ON OFF
More 1 of 3
LOG 10 dB/ ATN 30 dB
REF 44.8 dBµ
VA SB SC FC CORR
CENTER 2.492500 GHz
#IF BW 100 kHz
#AVG BW 100 kHz
SPAN 5.000 MHz
#SWP 1.00 sec

Figure 4

7.2 Measurement at Maximum Peak Output Power @ FCC 15.247 (B) and RF Exposure Limit @ FCC 1.1310

FCC Requirements:

7.2.1 FCC 15.247(b): Maximum peak output power of the transmitter shall not exceed 1 Watt. If the antenna of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

7.2.2 FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (V/m)	Power Density (mW/cm^2	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
300-1500			F/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
300-1500			F/1500	6
1500-100,000			1.0	30

F = Frequency in MHz
• = Plane wave equivalent power density

Climate Condition:

Standard Temperature and Humidity:

Ambient temperature: 26°

Relative humidity: 62 %

Power Input:

Rechargeable battery.

Measurement Data:

EIRP PEAK POWER MEAUSREMENT

Antenna Gain G= 1.4 dBi or 1.38 numeric

Transmitter Channel Output	Fundamental Frequency (MHz)	Measured EIRP Power (mWatts)	Power Limit (Watts)
1	2403	1.0	1.0
39	2441	2.0	1.0
79	2479	1.1	1.0

RF EXPOSURE DISTANCE: $r = (PG/IIP_d)^{1/2}$

Where: r distance where the power density equals to 1 mW/cm^2
P: EIRP power in mW
Pd: Power density limit $1mW/ cm^2$

Transmitter Channel Output	Fundamental Frequency (MHz)	Meausred EIRP Power (mWatts)	Minimum Allowable Distance ® from Skin (Centimeter)
1	2403	1.0	0.1
39	2441	2.0	0.6
79	2479	1.1	0.2

Note: Since the ERIP power is too small and the calculated distance at the power density of $1mW/cm^2$ is less than the distance from the antenna to the plastic housing, the SAR tests and RF Safety requirements are not required.

7.3 Transmitter Radiated Emissions @ 3 meters, FCC CFR 47, Paragraph 15.247(c), 15.209 & 15.205

FCC Requirements

In any 100 kHz bandwidth outside the operating frequency band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in @ 15.209 (a), which lesser attenuation.

All other emissions inside restricted bands specified in @ 15.205 (a) shall not exceed the general radiated emission limits specified in @ 15.209(a).

7.3.1 @ 15.237 – Operation in the Bands

The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in @ 15.35 for limiting peak emissions apply.

7.3.2 @15.205(a) – Restricted Frequency Bands

MHz	MHz	GHz
0.090-0110	1300-1427	9.3-9.5
0.49-0.51	1435-1626.5	10.6-12.7
2.1735-2.1905	1660-1710	13.25-13.4
8.362-8.366	1718.8-1722.2	14.47-14.5
13.36-13.41	2200-2300	14.35-16.2
25.5-25.67	2310-2390	17.7-21.4
37.5-38.25	2483.5-2500	22.01-23.12
73-75.4	2655-2900	23.6-24.0
108-121-94	3260-3267	312.2-31.8
123.138	3332-3339	36.43-36.5
149.9-150.05	3345.8-3358	Above 38.6
156.7-156.9	3600-4400	
162.0125-167.17	4500-5250	
167.72-173.2	5350-5460	
240-285	7250-7750	
322-335.4	8025-8500	
399.9-410	9000-9200	
608-674		
960-1240		

7.3.3 FCC CFR 47, Part 15 Subpart C Paragraph 15.209(a)

Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength Limits (Microvolts/m)	Distance (Meters)
0.009-04.90	2,400/F (kHz)	300
0.490-1.705	24,000/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

7.3.4 Measurement per FCC CFR 47, Paragraph 2.997 – Frequency Spectrum to be Investigated.

The spectrum was investigated from the lowest radio frequency generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency. Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

7.3.5 Measurement per FCC CFR 47, Paragraph 2.993 – Field Strength Spurious Emissions

a). Measurements was made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single side band, independent side band, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.989(c) as appropriate. For equipment operating on frequencies below 1 GHz, an Open Field Test is normally required, with the measuring instrument antenna located in the far field at all test frequencies. In the event it is either impractical or impossible to make open field measurements, measurement will be accepted

of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

b). Measurements specified in paragraph (a) of this section shall be made for the following equipment:

1). Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.

2). All equipment operating on frequencies higher than 25 MHz

3). All equipment where the antenna is an integral part of, and attached directly to the transmitter.

4). Other types of equipment as required, when deemed necessary by the commission.

See Figure 5, 6, and 7.

Measurement Data

Freq. (MHz)	Corrected Level Peak	Average (dB)	H_a (m) Hor./Ver.q	Limit per § 15.247(c)	Limit per § 15.209	Margin
Carrier: Low						
2402	96.3	90.4	H	N/A	N/A	
2402	96.9	90.9	V	N/A	N/A	
4804	50.0	34.8	V	76.3	54	19.2
4804	49.9	32.2	H	76.3	54	21.8
7206	48.0	31.1	H	76.3	54	22.9
7206	50.3	37.3	V	76.3	54	16.7

Figure 5

Freq. (MHz)	Corrected Level Peak	Average (dB)	H_a (m) Hor./Ver.q	Limit per § 15.247(c)	Limit per § 15.209	Margin
Carrier: Middle						
2440	98.3	93.2	V	N/A		
2440	94.9	90.1	H	N/A		
4880	49.9	41.3	H	78.3	54	12.7
4880	51.8	42.1	V	78.3	54	11.9
7320	49.3	41.4	V	78.3	54	12.6
7320	47.3	38.9	H	78.3	54	15.1

Figure 6

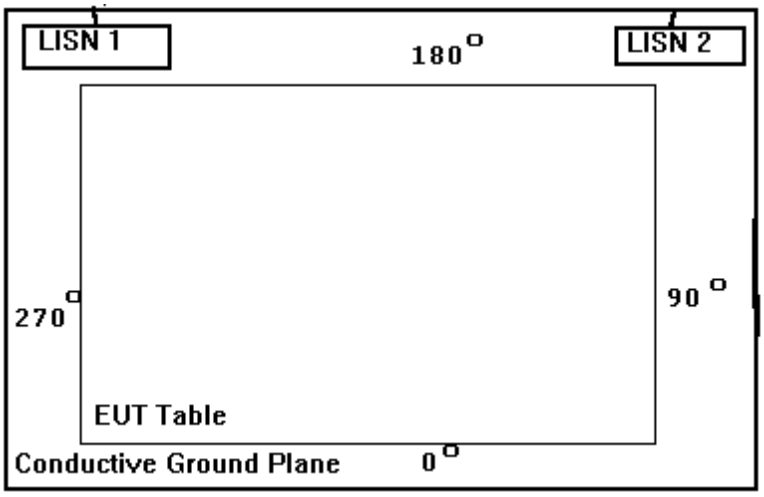
Freq. (MHz)	Corrected Level Peak	Average (dB)	H_a (m) Hor./Ver.q	Limit per § 15.247(c)	Limit per § 15.209	Margin
Carrier: High						
2478	96.3	90.3	V	N/A		
2478	96.1	90.1	H	N/A		
4956	53.8	41.5	H	76.3	54	12.5
4956	52.1	96.1	V	76.3	54	7.9
7434	52.1	43.1	V	76.3	54	10.9
7434	50.1	41.2	H	76.3	54	12.8

Figure 7

Freq. (MHz)	Level (dB)	A_f/C_L (dB)	H_A(M) Hor/Ver	Rotation °	Results (dB)	Comments
33.1	20.8	15.7	1.0V	180	36.5	
44.0	12.4	14.0	1.5	45	26.4	
48.0	18.0	13.3	1.5	45	31.3	
50.0	14.6	13.3	1.2	180	27.9	
54.0	11.2	13.3	1.0	190	24.5	
60.0	18.7	12.0	2.0	190	30.7	
61.2	19.0	12.0	2.0	180	31.0	
64.0	20.5	12.0	2.5	170	37.5	
68.0	19.3	12.0	1.5	180	31.3	
72.0	20.0	10.3	1.0	180	30.3	
80.0	21.3	10.0	1.0	90	31.3	
120.0	18.0	18.3	1.0	45	36.3	
144.0	14.1	18.6	1.0	95	32.7	
146.8	17.3	18.6	1.5	88	35.9	
146.8-300		No Signal Found				
60.0	11.4	12.0	1.0	90	23.4	
61.2	20.5	12.0	1.5	180	32.5	
120.0	13.6	18.3	1.5	180	31.9	
144.0	11.9	18.6	2.5	90	30.5	

Section 8 TEST SITE GROUND PLANES

8.1 Conducted Interference Voltage measurement Ground Plane



8.2 Radiated Disturbance Field Strength Ground Plane

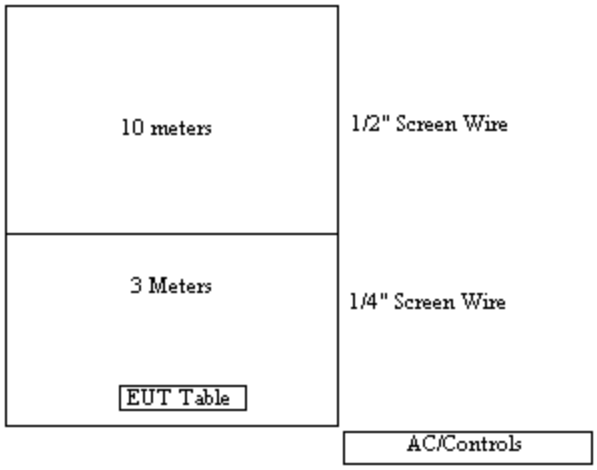


Figure 8.2 Radiated Disturbance Field Strength Ground Plane

APPENDIX A - TERMINAL INTERFERENCE

TEST CONFIGURATION AND TEST RESULTS

TEST MANIFEST PAGE

TEST: Check One: Test Type: Check One End Results: Check One

FCC (Part 15) [x]	Radiated [ ]	Pass [x]
EN550 22/Cispr 22 [ ]	Conducted [x]	Fails [ ]
Immunity: IEC 801- [ ]	Both [ ]	
Other (please define):		

EUT Model #/Name: AIR I/O CM Name: MiniNet 2.4 Connection Manager
EUT Description: Frequency Hopping Spread Spectrum Transmitter

EUT Support Equipment:	Serial #	Model #	FCC ID #
Telxon AP500E	003405387	(Osc. Freq. 33 MHz) CPU	

Software: Client provided (if any)
EUT Classification: Class "A" [x]; Class "B" [ ]
EUT Test Justification: FCC CFR Part 15, Subpart "[C]

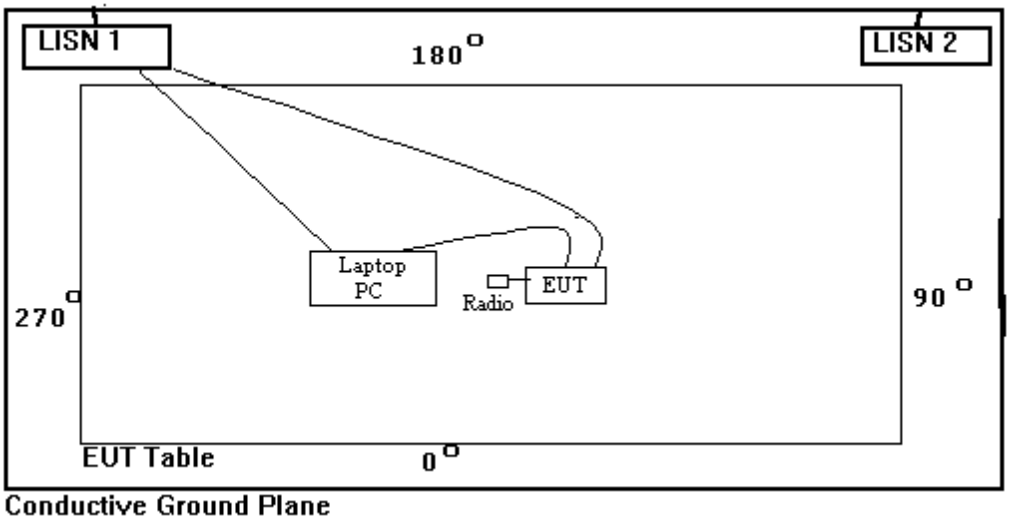
Test Equipment/Model #	Serial #	Cal. Date
[ ] AH Systems/SAS-200/S12	303	Traceable to NIST
[ ] Compliance Design/Lisn		Traceable to NIST
[ ] Rhode & Schwarz	879691/09	Daily
[x] Hewlett Packard 8591E	3501A03599	Traceable to NIST
[ ] Hewlett Packard 8640B	1532A03642	Traceable to NIST
[ ] Roberts Tuned Dipoles Std.	N/A	Per ANSI Ref. Std.
[x] Rhode & Schwarz	HL023	Traceable to NIST
[ ] Rhode & Schwarz/ESH3	872318/03	Traceable to NIST
[ ] Polard/ESH3-Z2	N/A	Traceable to NIST
[ ] Polard/HFH2-Z2	N/A	Traceable to NIST
[ ] Electro-Metrics/ESA-100	307	Traceable to NIST
[x] Electro-Metrics Biconical	BIA 3432	Traceable to NIST
[ ] TEM Chamber/None	none	Per IEC 801-3
[ ] Mini-Circuits Power Amp/None	100102	Traceable to NIST
[ ] Mini-Circuits/AFL-1000LN	10093	Traceable to NIST
[ ] Mini-Circuits/CAT-3(3dB,500Ohm Pad)	None	Traceable to NIST
[ ] HP Oscilloscope/54600A	3134A04619	Traceable to NIST
[ ] Mini-Circuits 50 dB Pad/NTRM 50	10018	None Required
[ ] Schaffner NSG433		Traceable to NIST
[ ] Schaffner NSG1046		Traceable to NIST

Miscellaneous Support Equipment

Equipment/Model	Serial	FCC ID
[ ] Dell 320 SLi PC	1Y10Y	EZK320SLi
[ ] Epson LX 800 Printer	011216166	BKM5VEP70RA
[ ] IBM Thinkpad	None	AN02618M481

2402 MHz (Radio low), 2477 MHz (Radio high), I/O Cable: RS232, Power Supply Cable (A0740V 1150)

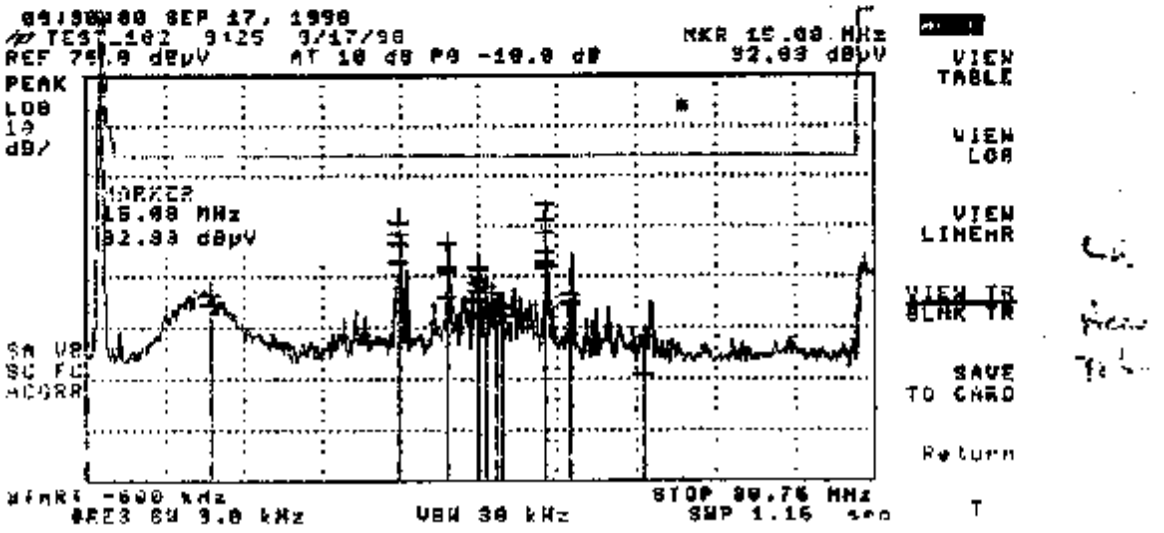
TEST CONFIGURATION



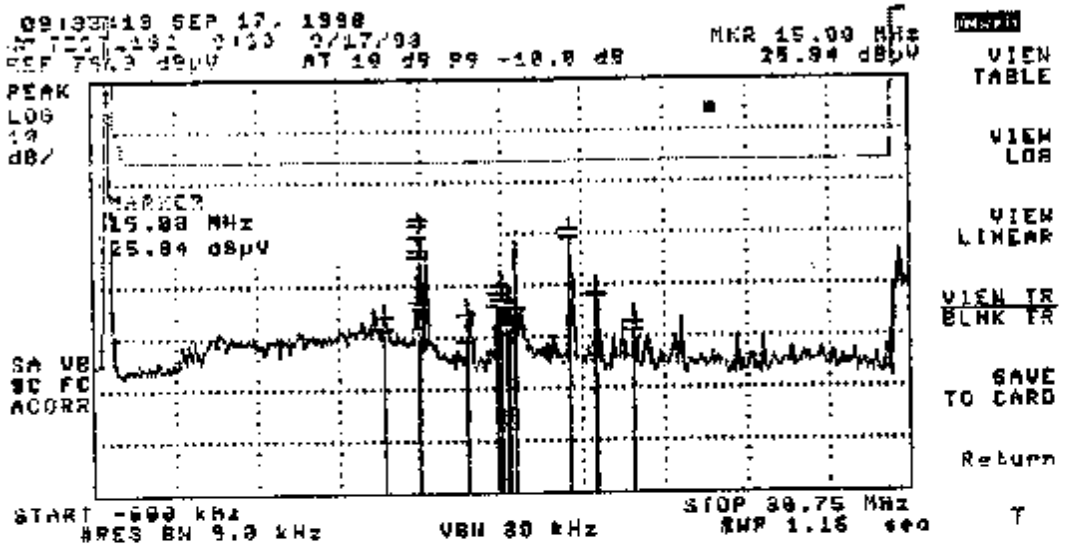
#	FREQUENCY (MHz)	PEAK (LIM)	QP (LIM) (dBµV)	AVG (LIM)
1	11.876	49.6 -10.4	46.9 -23.1	38.9 -21.1
2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]
4	10.748	33.2 -25.9	32.2 -27.8	28.7 -29.3
5	[illegible]	[illegible]	[illegible]	[illegible]
6	19.198	29.9 -28.1	27.5 -22.5	24.6 -25.4
7	15.196	40.4 -19.6	37.5 -22.5	29.0 -27.0
8	[illegible]	[illegible]	[illegible]	[illegible]
9	15.789	32.9 -27.1	30.6 -29.4	27.0 -29.0
10	4.371	35.0 -25.0	52.5 -27.5	50.5 -29.5
11	[illegible]	[illegible]	[illegible]	[illegible]
12	15.352	35.9 -24.7	34.2 -25.9	28.9 -31.1
13	[illegible]	[illegible]	[illegible]	[illegible]
14	15.099	32.3 -27.7	30.0 -30.0	28.3 -31.7
15	17.761	44.9 -15.1	47.3 -12.7	38.9 -21.1
16	[illegible]	[illegible]	[illegible]	[illegible]
17	17.751	51.2 -8.8	50.5 -9.5	45.0 -15.0
18	18.545	44.7 -15.3	42.5 -17.5	36.9 -23.1

MARGIN SET TO 30.0 DB BELOW LIMIT LINE
TEST-102 9:25 9/17/98

VIEW TABLE
VIEW LOG
VIEW LINEHR
VIEW TRACE
SAVE TO CARD
Return



VIEW TABLE
VIEW LOG
VIEW LINEHR
VIEW TR
BLNK TR
SAVE TO CARD
Return



#	FREQUENCY (MHz)	PEAK (LIN)		QP (LIM)		AVG (LIM)	
		(dBuV)					
1	11.975	58.9	-10.9	48.9	-11.1	45.1	-14.9
2	11.974	47.7	-12.4	41.6	-18.4	32.8	-27.2
3	17.759	48.6	-11.4	46.8	-13.2	45.3	-14.7
4	15.590	44.3	-15.7	31.7	-28.3	31.7	-28.3
5	14.312	36.2	-23.8	34.8	-25.7	32.1	-27.9
6	15.349	35.8	-24.2	32.9	-25.7	30.1	-29.9
7	16.748	37.7	-22.3	34.4	-25.6	30.9	-29.1
8	16.184	38.7	-21.3	36.9	-24.0	38.1	-25.9
9	11.975	48.3	-11.8	47.7	-12.3	42.7	-17.3
10	10.520	32.3	-27.7	30.8	-30.8	27.8	-32.2
11	13.759	33.7	-26.3	30.4	-29.5	25.4	-34.6
12	15.950	35.4	-24.6	32.8	-27.2	29.5	-30.5
13	20.178	31.3	-23.1	28.8	-31.2	27.2	-32.8

MKR
VIEW TABLE
VIEW LOG
VIEW LINEAR
VIEW TRACE
SAVE TO CARD
Return

MKRBIN SET TO 30.0 DB BELOW LIMIT LINE
TEST_102 9:30 9/17/98

FCC Draft Label

Proposed FCC Label and sketch of proposed Label Placement

SCHEMATICS

The attached are schematics for the above product.

USER'S MANUAL

Attached a copies of the following:

Users manual