MEASUREMENT AND TEST REPORT
ON THE STATSIGNAL
MODEL 1000 TRANSCEIVER/RF REPEATER

Southwest Research Institute
P.O. Drawer 28510
San Antonio, TX 78228-0510

Southwest Research Institute Project 10.03811.01.001
Report Number EMCR 01/022

Prepared for:

The Jamesport Group
1401 Capital Avenue
Plano, Texas 75074

April 2001

Prepared by:

D. A. Carmony

ISO/IEC GUIDE 25
EN 45001

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The results of this test report apply only to the specific samples tested. If the manufacturer extends the test results to apply to other samples of the same model, or from the same lot or batch, the manufacturer should ensure the additional samples are manufactured using identical electrical and mechanical components.

Reviewed by:

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Electromagnetic Compatibility Research Section
Communications Engineering Department

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1.0 GENERAL INFORMATION

1.1 Product Description

The StatSignal Model 1000 Transceiver/RF Repeater is an AC powered unit that is used to re-transmit emergency messages from a Personal Security Device. These messages notify a remote, manned position of the occurrence of an emergency event. The Model 1000 operates at 916.5 MHz under FCC Part 15, Subpart C, "Intentional Radiator," Sections 15.209 and 15.249. A detailed description of the Model 1000 is presented in Attachment 1.

1.2 Related Grants

The Model 1000 was tested in a stand-alone configuration. The Model 1000 can communicate with a StatSignal Personal Security Device (FCC ID: PK9M1000A). The StatSignal Personal Security Device operates at 916.5 MHz.

1.3 Tested System Details

The Model 1000 is powered by 220 VAC. The Model 1000 can receive and transmit a 2400 bps, on-off keyed modulated signal at 916.5 MHz when powered up. The antenna is mounted on the outside of the Model 1000 case and provides both transmission and reception.

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4-1992, and the limits prescribed in CFR 47, FCC 15.207, 15.249, and 15.209. Radiated testing was performed inside a semi-anechoic chamber at an antenna to EUT distance of 3 meters for all frequencies.

1.5 Test Facility

Southwest Research Institute (SwRI) operates an Open Area Test Site (OATS) and the Radiated/Conducted Measurement Facility, 6220 Culebra Road, San Antonio, Texas. Details concerning the test site and measurement facility are found in a letter from SwRI to the FCC dated 23 May 2000, which is on file with the FCC Laboratory Division in Columbia, Maryland. On June 2, 2000, the FCC approved the sites for the purpose of providing test results for submission with equipment authorization applications under the Commission's Equipment Authorization Program.

Since the Model 1000 transmit frequency was 916.5 MHz, a 3-meter semi-anechoic chamber was used to make the radiated emissions measurements. Conducted emissions measurements were performed in a shielded enclosure.

2.0 PRODUCT LABELING

2.1 FCC ID Label

The FCC ID label is shown in the drawing in Attachment 3.

2.2 Location of Identifier on EUT

The FCC ID label will be located to the right of, and adjacent to, the AC power entry, and centered on the power cord.

2.3 Supplemental Information to be in the Model 1000 Installation Instructions

In addition to reiteration of required information as on intentional radiator, in keeping with sections 15.21 and 15.105 of the FCC rules, the Installations Instructions supplied with the Model 1000 will also include the following admonitions:

"This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the Model 1000 off, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Consult StatSIGNAL or an experienced radio/TC technician for help."

3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

The StatSignal Model 1000 was tested for radiated emissions with broadband dipole antennas (30 MHz to 1000 MHz) and the EMCO 3115 Dual Ridge Guide Horn antenna (1 GHz to 10 GHz). Tests were performed in both the vertical and horizontal polarizations for the fundamental emission, the harmonics of the fundamental emission, and spurious emissions. The fundamental emission was also measured using a log periodic dipole antenna.

Automated radiated signature scans from 30 MHz to 1000 MHz and the manual measurement of the fundamental frequency were made at 3 meters in a shielded semi anechoic chamber. Manual radiated emission scans from 1 GHz to 10 GHz were also made at 3 meters in the shielded semi anechoic chamber.

Conducted frequency scans were made on the Model 1000 220 VAC power line from 450 kHz to 30 MHz.

3.2 EUT Exercise

The Model 1000 was configured to emit its transmit signal continuously. Operability of the unit was confirmed by spectral analysis of the 916.5 MHz transmit signal using a receiving system.

3.3 Special Accessories

No special accessories were used.

3.4 Equipment Modification

No modifications were made to the Model 1000 during testing.

3.5 Configuration of Tested System

Refer to Section 5 for photographs of the Model 1000 tested.

4.0 BLOCK DIAGRAM OF THE MODEL 1000

A block diagram of the StatSignal Model 1000 is in the technical documentation attached to this report (Attachment 1).

5.0 CONDUCTED AND RADIATED MEASUREMENT PHOTOS

Photographs of the Model 1000 taken during conducted and radiated emissions testing are located in Appendix D.

6.0 CONDUCTED EMISSION DATA

6.1 Conducted Measurement Data

The StatSignal Model 1000 was tested for conducted emissions. The initial step in collecting conducted data was to perform a spectrum analyzer peak scan of the measurement range to determine worst case. A computer-controlled spectrum analyzer was used to produce a peak measurement data plot. Quasi-peak measurements were made on signals that were close to or above the paragraph 15.207 limit.

The peak scans revealed no emissions conducted onto the AC power line within 20 dB of the limit. Appendix A contains the conducted emission measurement plots.

6.2 Conducted Test Instrumentation

The test instrumentation used to make conducted measurements is given in Appendix C.

7.0 RADIATED EMISSION DATA

The data below are the corrected highest level radiated emission measurements taken from the radiated data sheets. The data sheets are located in Appendix B.

7.1 Radiated Measurement Data

Automated frequency scans for spurious and harmonic emissions were made of the spectrum from 30.0 MHz to 1000.0 MHz at 3 meters. Manual measurements were made of the fundamental frequency of 916.5 MHz at 3 meters. Additionally, the spectrum from 1 GHz to 10 GHz was investigated for harmonics and spurious emissions at 3 meter. The 2nd harmonic at 1834 MHz was evident. Harmonics higher than the second were not seen. Plots of the automated frequency scans, the manual measurement of the fundamental carrier frequency and the investigation of the spectrum from 1 to 10 GHz are presented in Appendix B.

The frequency stability of the Model 1000 transmit signal was verified by varying the AC input voltage between 85% and 115% of the nominal 220 VAC. Measurements were made at power turn-on, and at 2, 5, and 10 minutes after turn-on. The frequency deviation of the transmitted carrier was found to be 30 kHz over the 10-minute time interval.

The measurement level of the fundamental is shown in Table 7.1.

TABLE 7.1
MEASUREMENTS OF FUNDAMENTAL FREQUENCY

Judgment: EUT Passed By 12.8 dB		
Frequency (MHz)	**Corrected Level[1] dB(µV/m)**	**Limit 3 Meters dB(µV/m)**
916.48	81.2	94.0

[1] All readings are peak manual measurements made with a spectrum analyzer.

The measurement level of the 2nd harmonic of the transmit signal is shown in Table 7.2.

TABLE 7.2
MEASUREMENTS OF SPURIOUS EMISSIONS ABOVE 30 MHz

Judgment: EUT Passed By 0.6 dB		
Frequency (MHz)	**Corrected Level [1] dB(µV/m)**	**Limit dB(V/m)**
1834.0	53.4	54

[1] All readings are peak manual measurements made with a spectrum analyzer.

7.2 Test Instrumentation for Radiated Measurements

Scans were made in an RF semi-anechoic chamber 28' long x 16' wide x 16' high with its interior lined on the ceiling and four walls with pyramidal absorber material up to four feet in length. Measurements were made with a spectrum analyzer. The list of test instrumentation used to perform the testing is shown in Appendix C.

7.3 Field Strength Calculation

The field strength was calculated by adding the antenna factor and cable factor, and subtracting the amplifier gain (when used) from the measured reading. The basic equation with a sample calculation is:

FS = AA + AF + CF + AG

Where	FS	=	Field Strength
	AA	=	Analyzer Peak Amplitude
	AF	=	Antenna Factor
	CF+AG	=	Cable Attenuation + Amplifier Gain

For example, reducing the measured value of the fundamental frequency of 916.5 MHz, from the enclosed spectrum analyzer plot on page 22, yields:

+57.7 dBμV
+20.0 dB (3/m) (AF)
+ 3.5 dB (CF/AG factor)
81.2 dBμV/m = FS

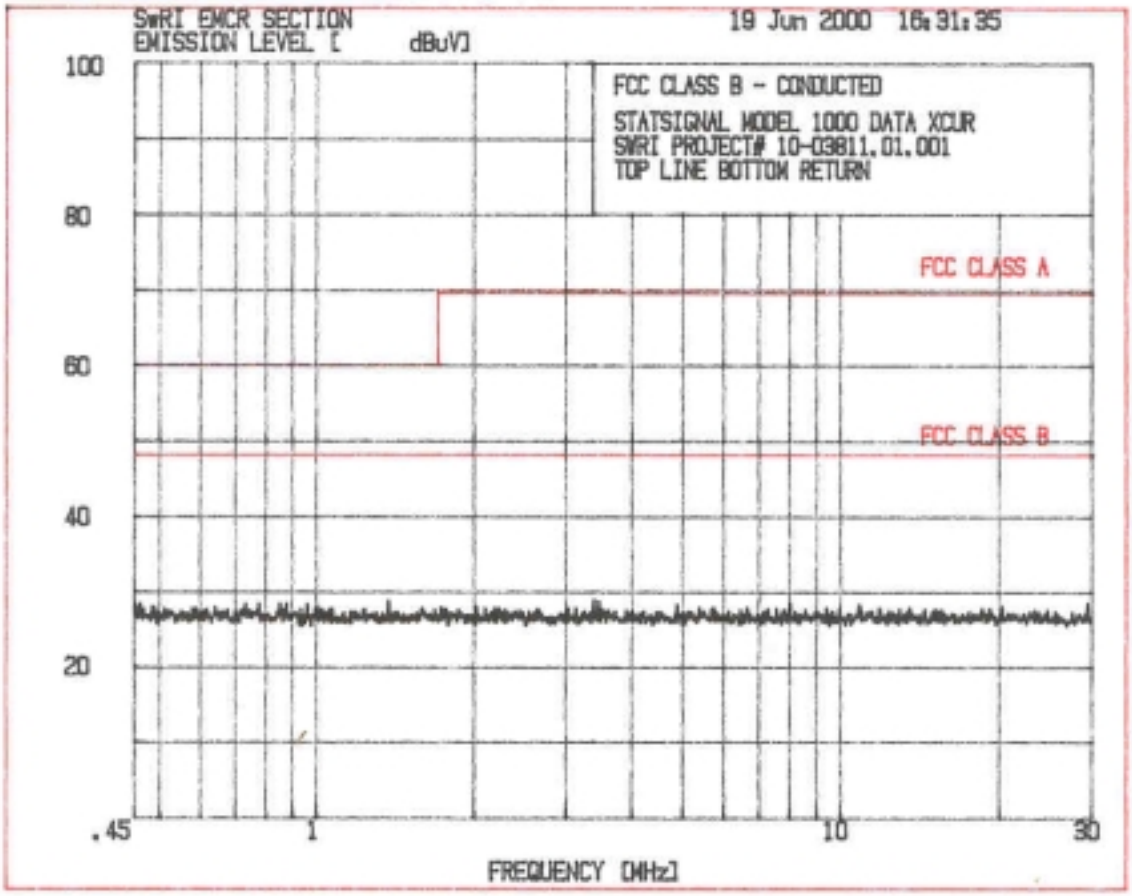
To convert dBμV/m to its corresponding level in μV/m: antilog[(81.2 dBμV/m)/20] = 11481.5 μV/m

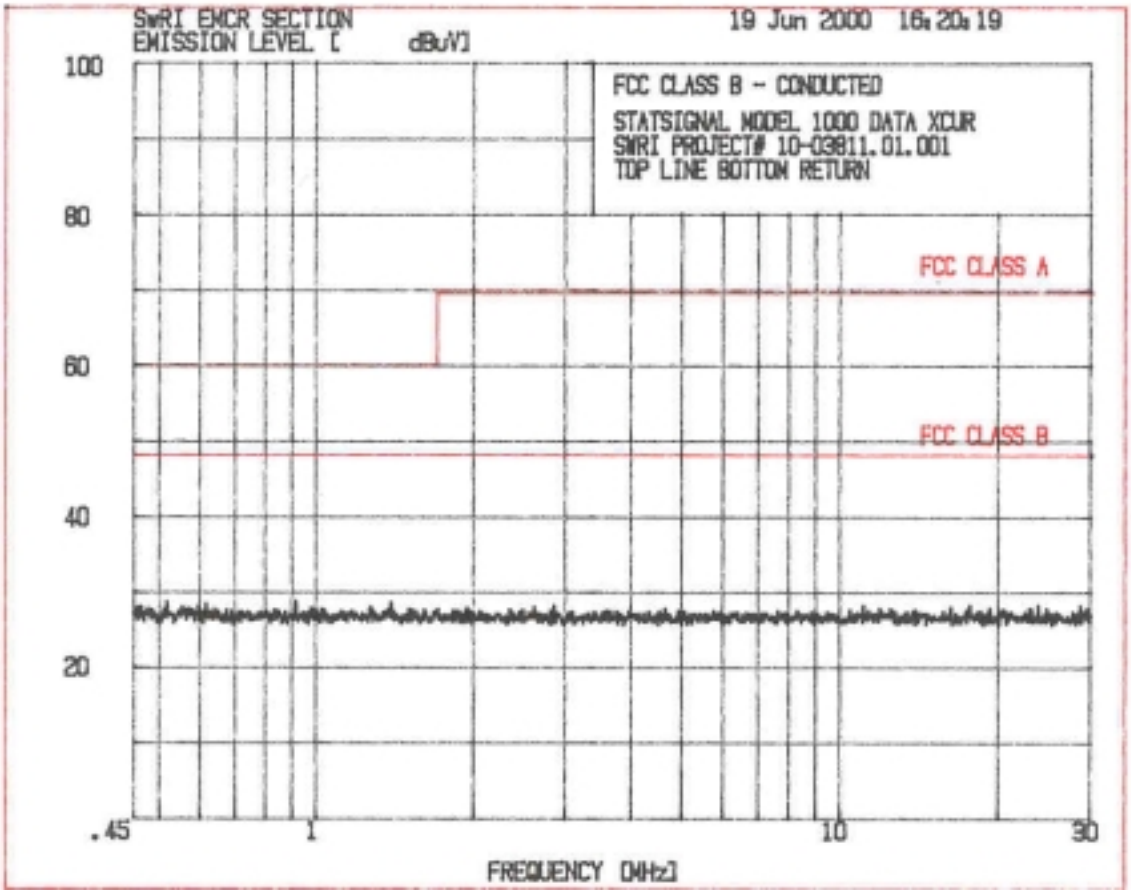
8.0 PHOTOS OF TESTED EUT

The photos of the EUT are provided in Appendix E.

APPENDIX A

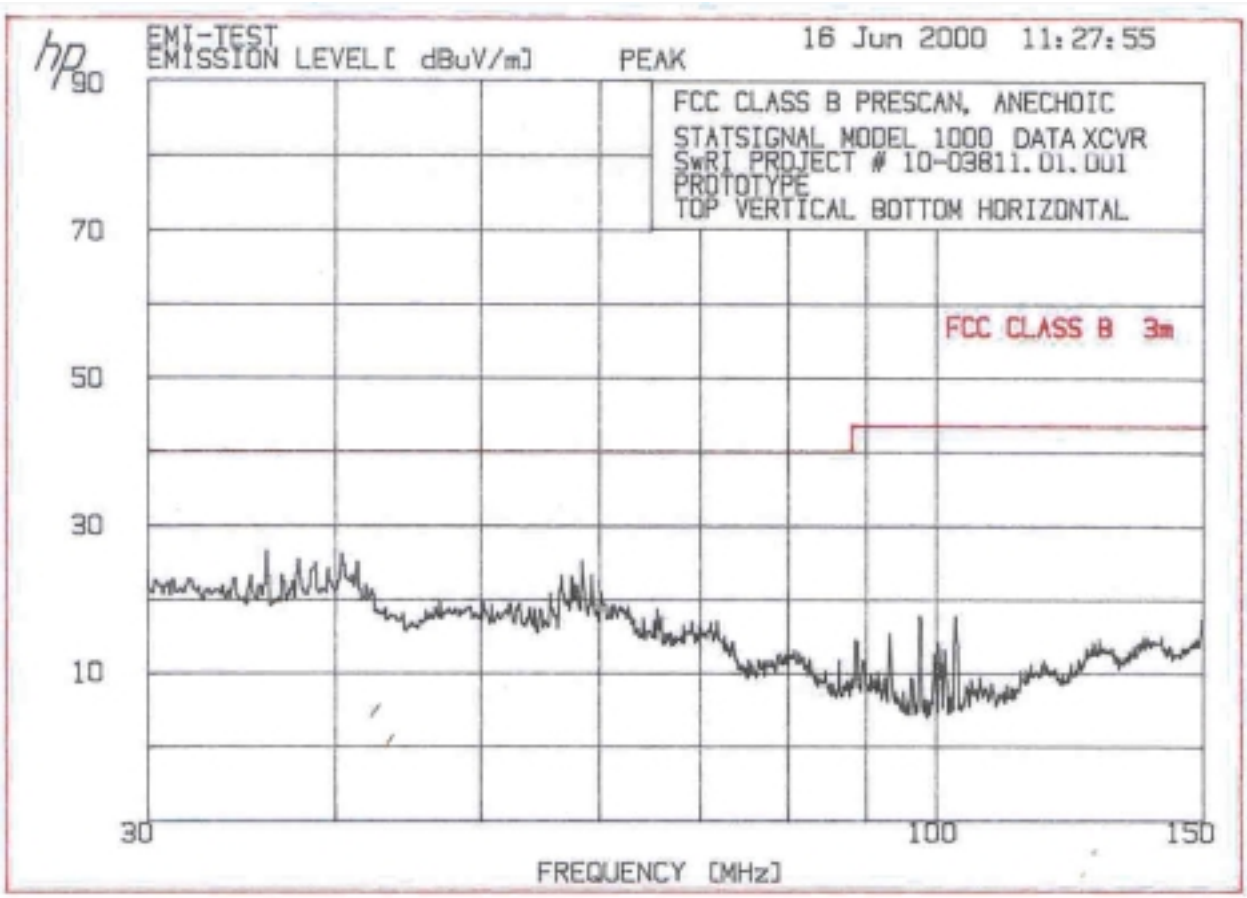
CONDUCTED MEASUREMENTS PLOTS

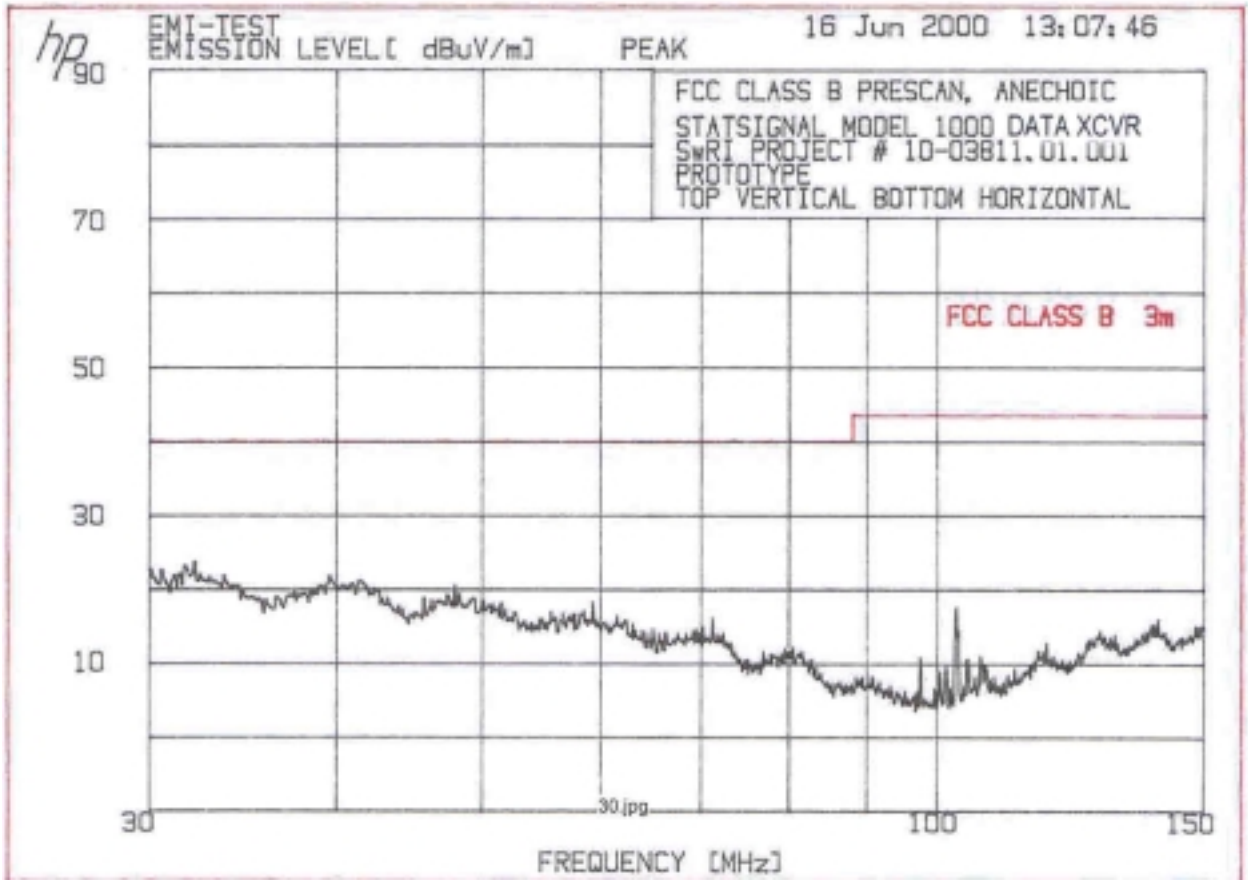

SwRI EMCR SECTION
EMISSION LEVEL [dBuV]
19 Jun 2000 16:31:35
FCC CLASS B - CONDUCTED
STATSIGNAL MODEL 1000 DATA XCUR
SWRI PROJECT# 10-03811.01.001
TOP LINE BOTTOM RETURN
FCC CLASS A
FCC CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

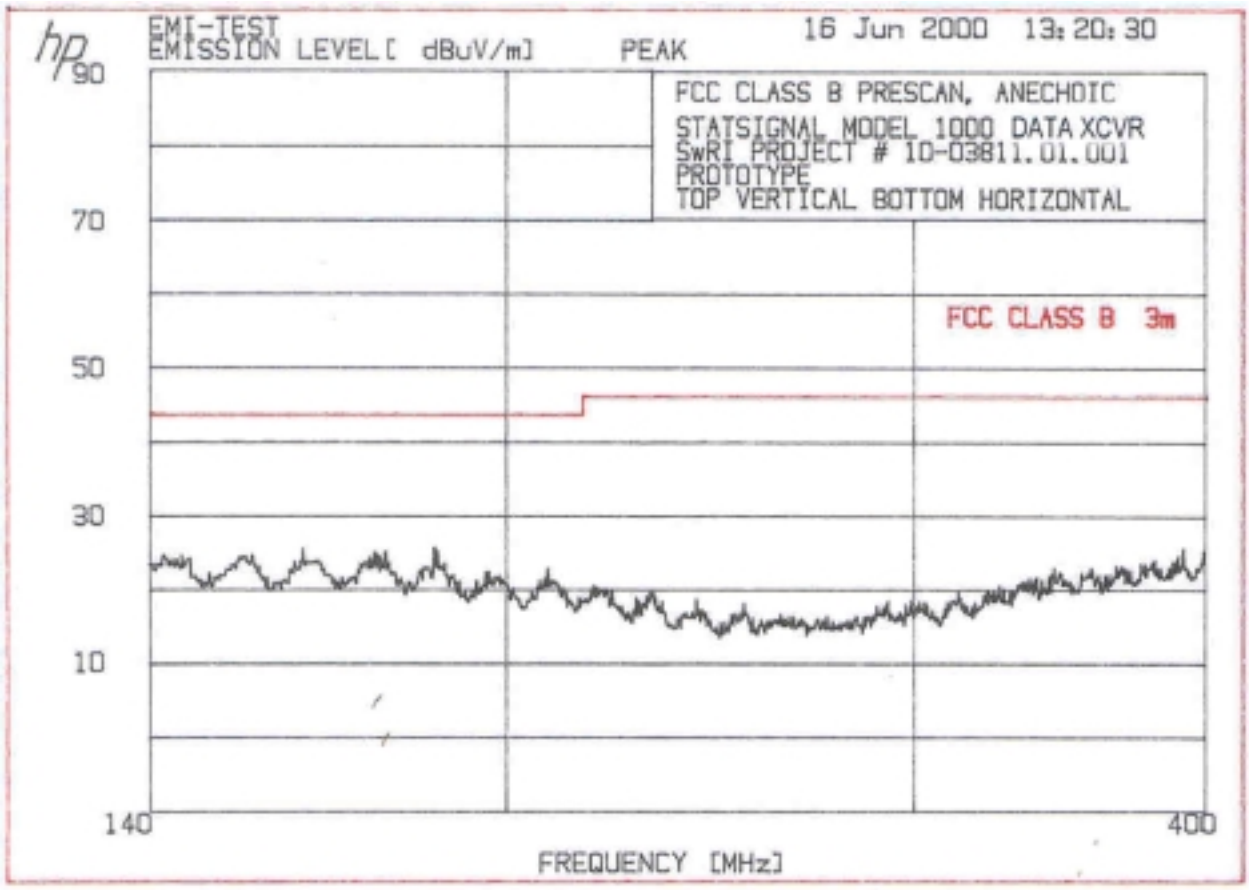

SwRI EMCR SECTION
EMISSION LEVEL [dBuV]
19 Jun 2000 16:20:19
FCC CLASS B - CONDUCTED
STATSIGNAL MODEL 1000 DATA XCUR
SWRI PROJECT# 10-03811.01.001
TOP LINE BOTTOM RETURN
FCC CLASS A
FCC CLASS B
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

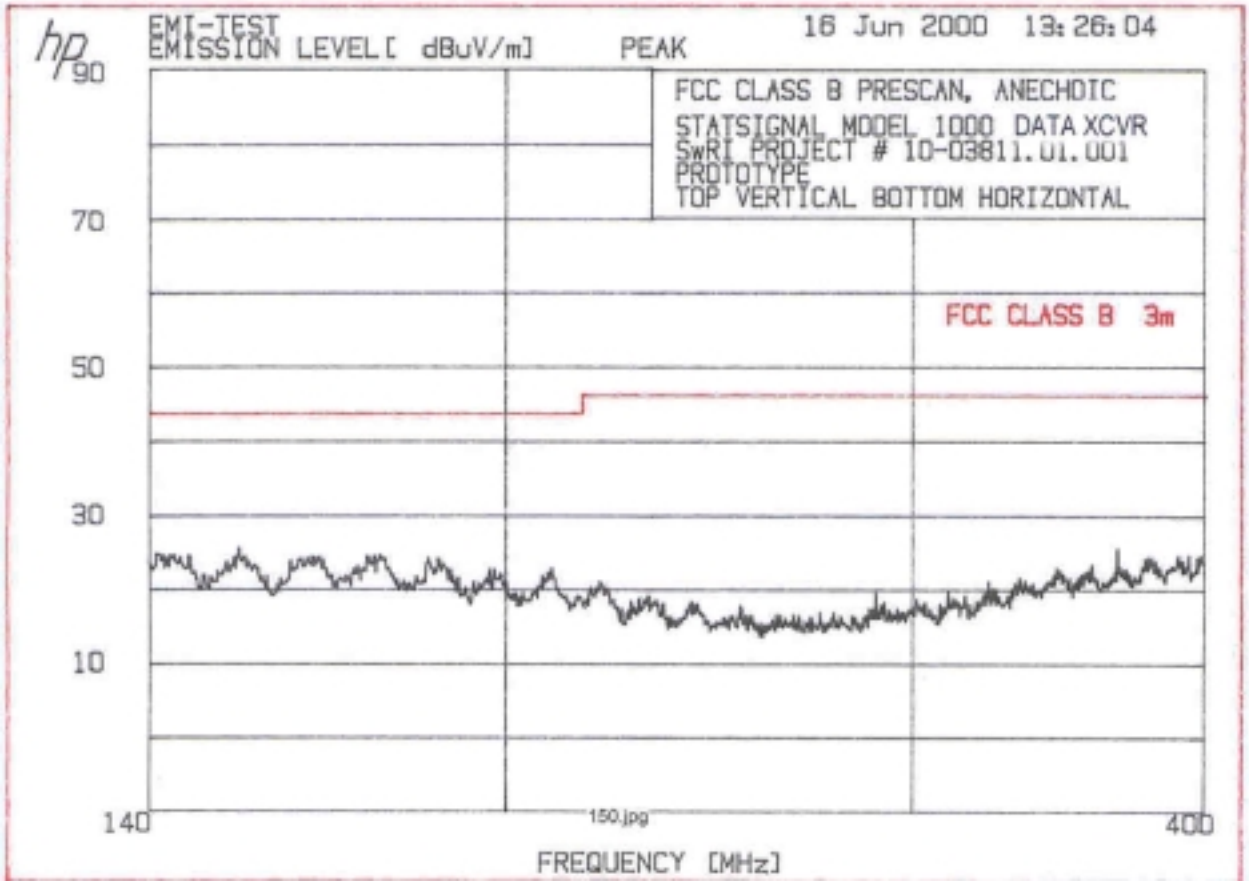
APPENDIX B

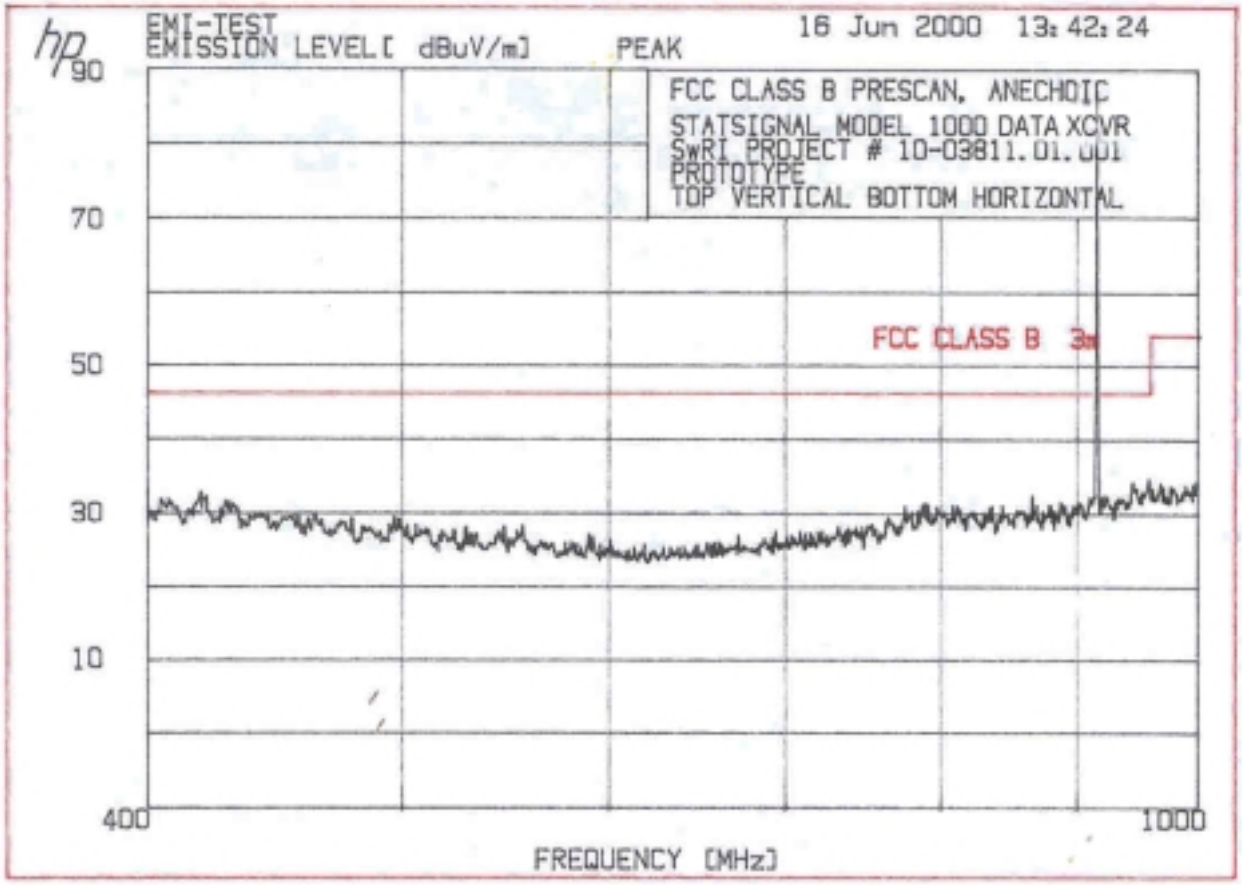
RADIATED MEASUREMENTS PLOTS

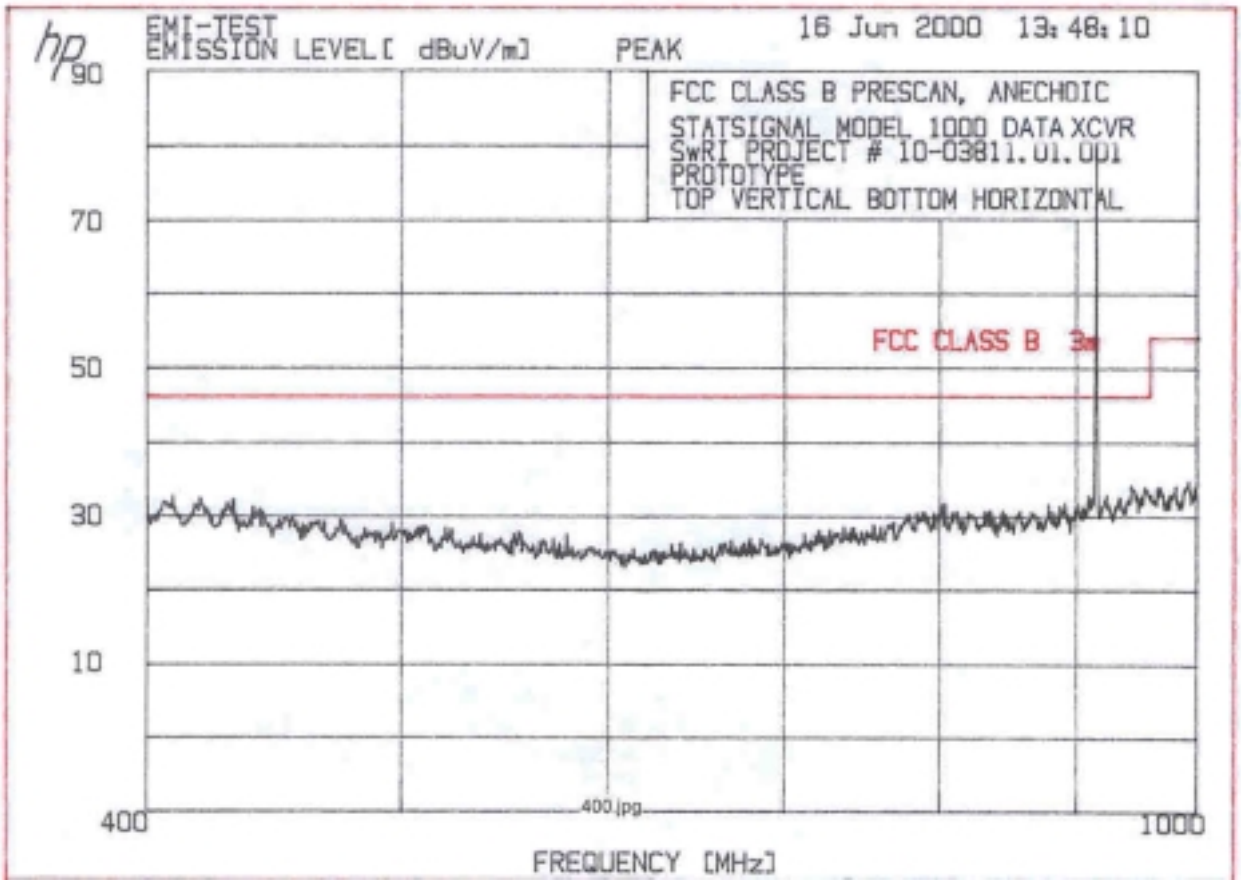

EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
16 Jun 2000 11:27:55
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 DATA XCVR
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
30
100
150
FREQUENCY [MHz]

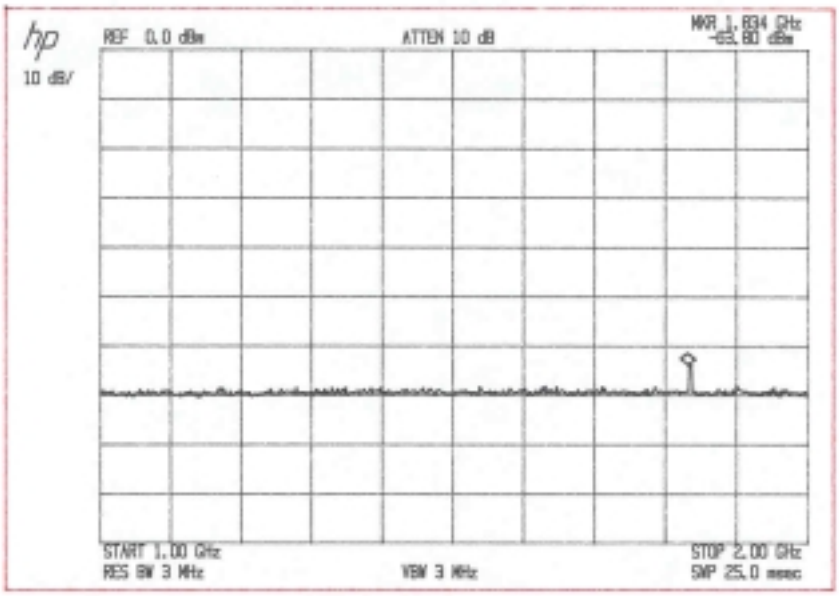

EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
16 Jun 2000 13:07:46
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 DATA XCVR
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
30.jpg
30
100
150
FREQUENCY [MHz]


EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
16 Jun 2000 13:20:30
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 DATA XCVR
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
140
400
FREQUENCY [MHz]


EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
16 Jun 2000 13:26:04
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 DATA XCVR
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
140
150.jpg
400
FREQUENCY [MHz]

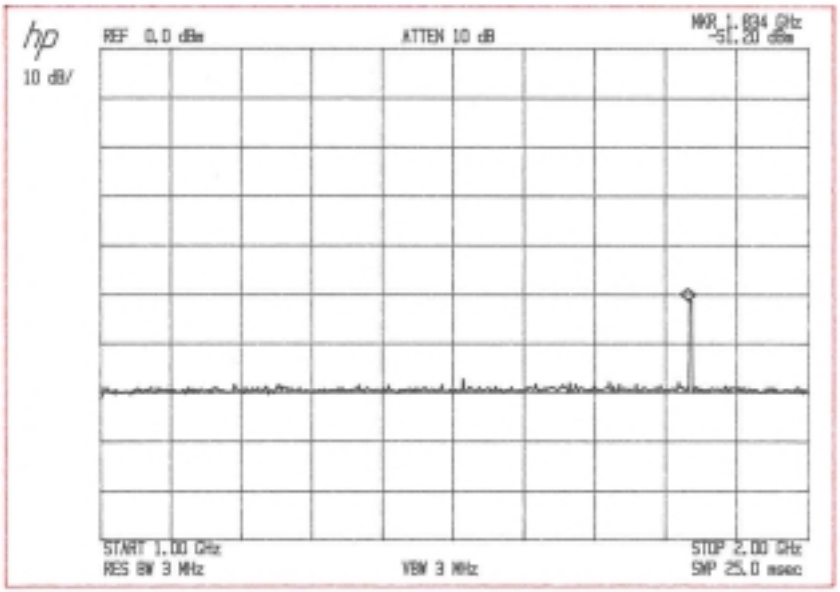

EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
16 Jun 2000 13:42:24
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 DATA XCVR
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
400
1000
FREQUENCY [MHz]


EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
16 Jun 2000 13:48:10
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 DATA XCVR
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
400
400.jpg
1000
FREQUENCY [MHz]



19 June 00 10-03811.01.001
08:41

Horizontal Orientation, 3 meters
Table rotated 360° max hold

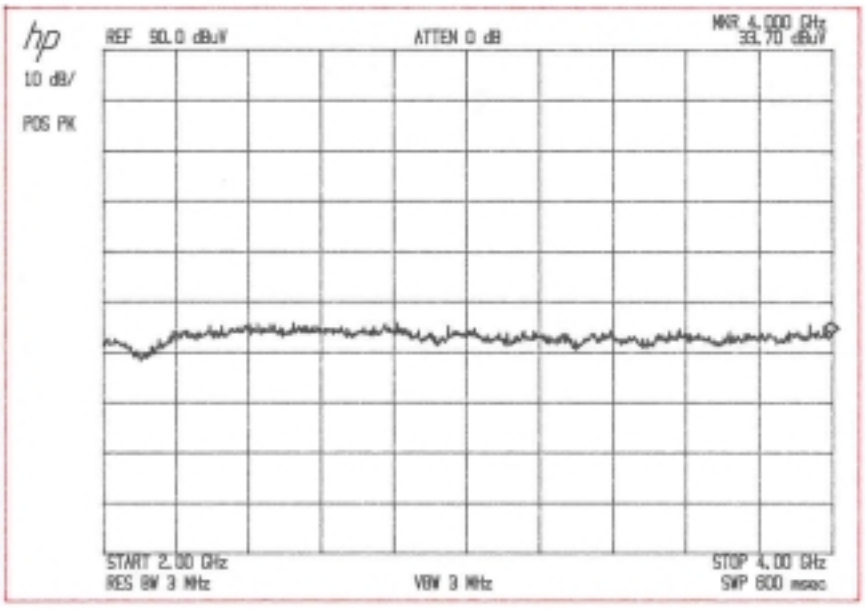


19 June 00 10-03811.01.001
08:55

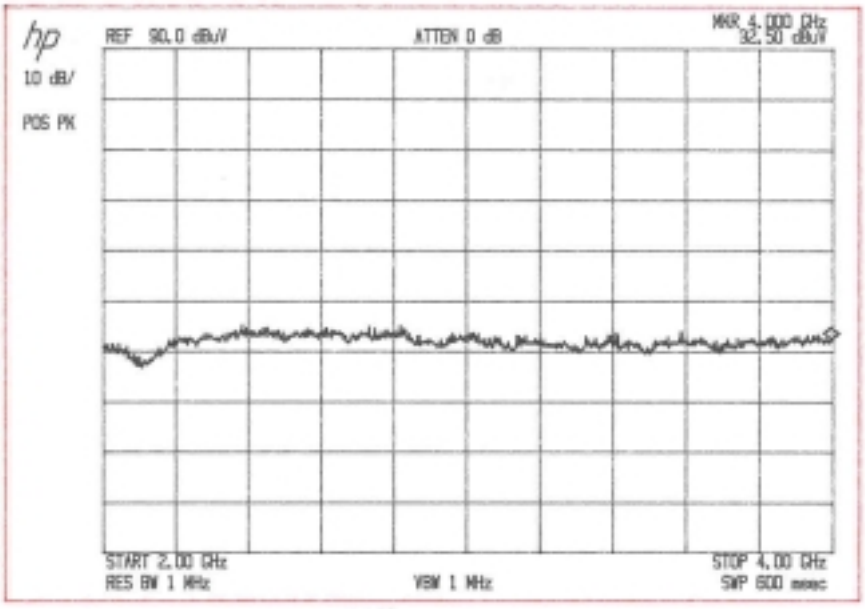
Vertical Orientation 3 meters
Table rotated 360° on Max Hold

-51.2 dBm to dBμV
-51.2
+107.0
+55.8 dBμV
+27.1 AF
-29.5 dB gain reduction
53.4 dBμV Total

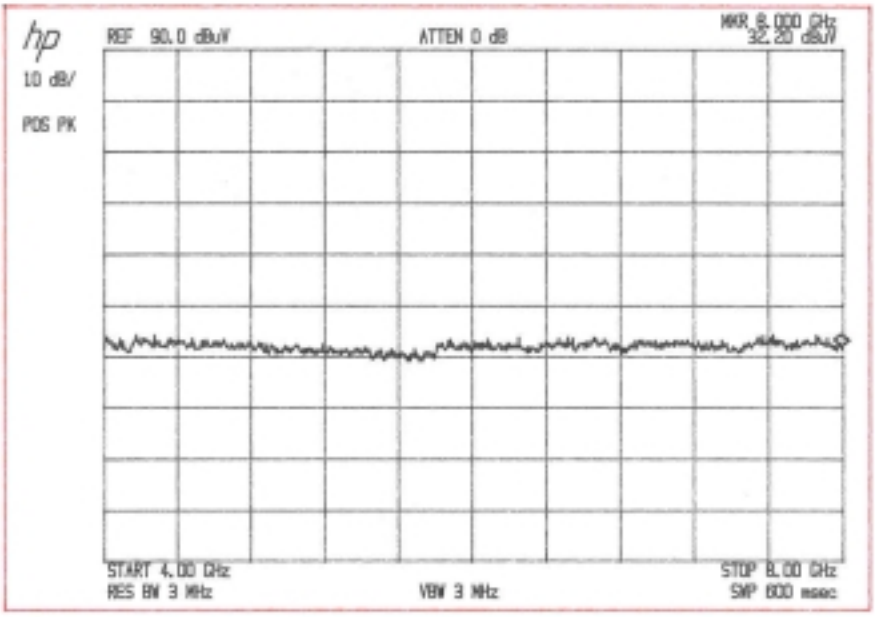
amp Gain = 27.1
cable
Amp -29.5



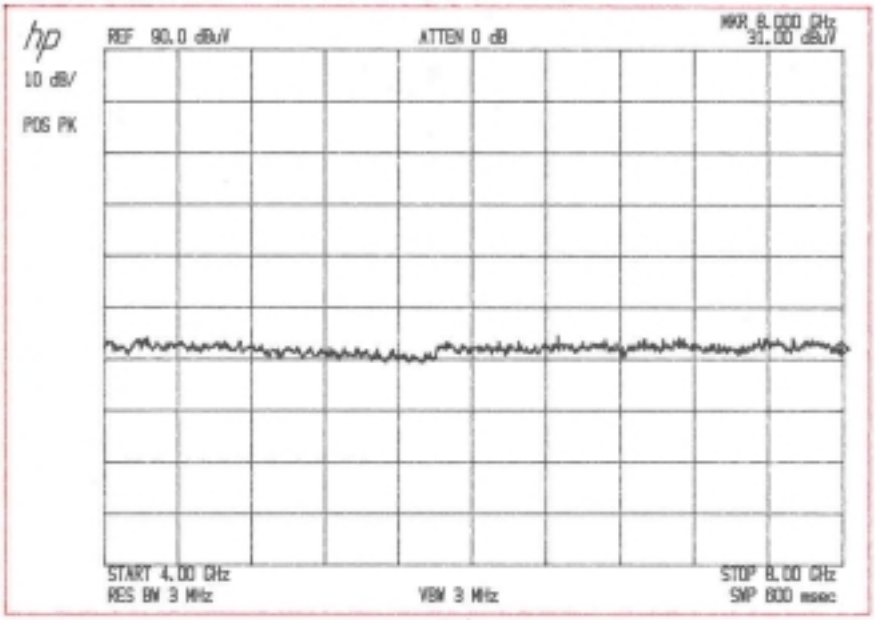
19 June 00 10-03811.01-001
08:49
Horizontal orientation, 3 meters
Table rotated 360° max held



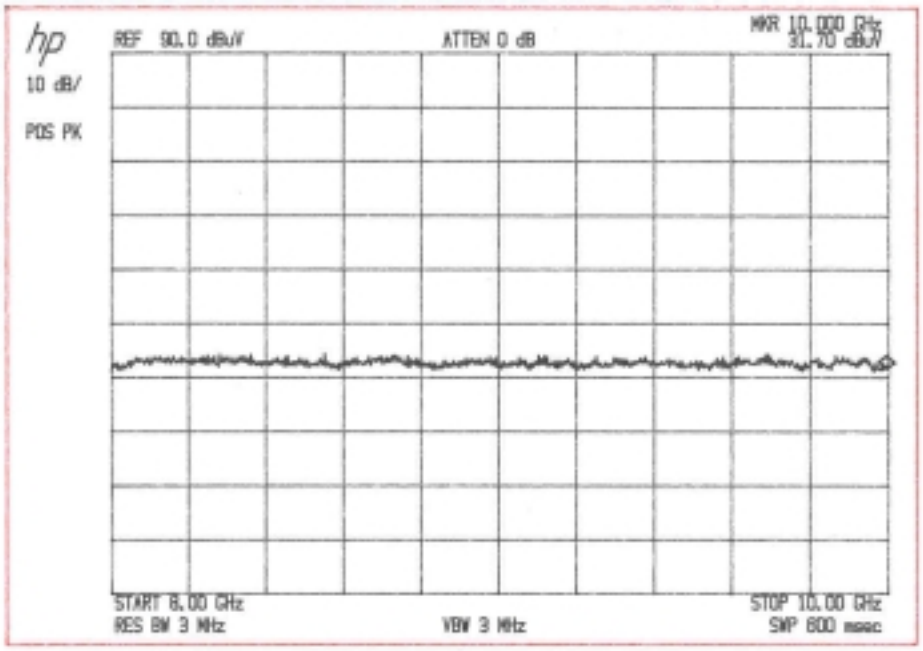
19 June 10-03811.01-001
08:58
Vertical orientation, 3 meters
Table rotated 360° max held



19 June 00 10-03811.01.001
09:17
Horizontal orientation
Table rotated 360° Max Hold



19 June 00 10-03811.01.001
09:04
Vertical orientation, 3 meters
Table rotated 360° max hold

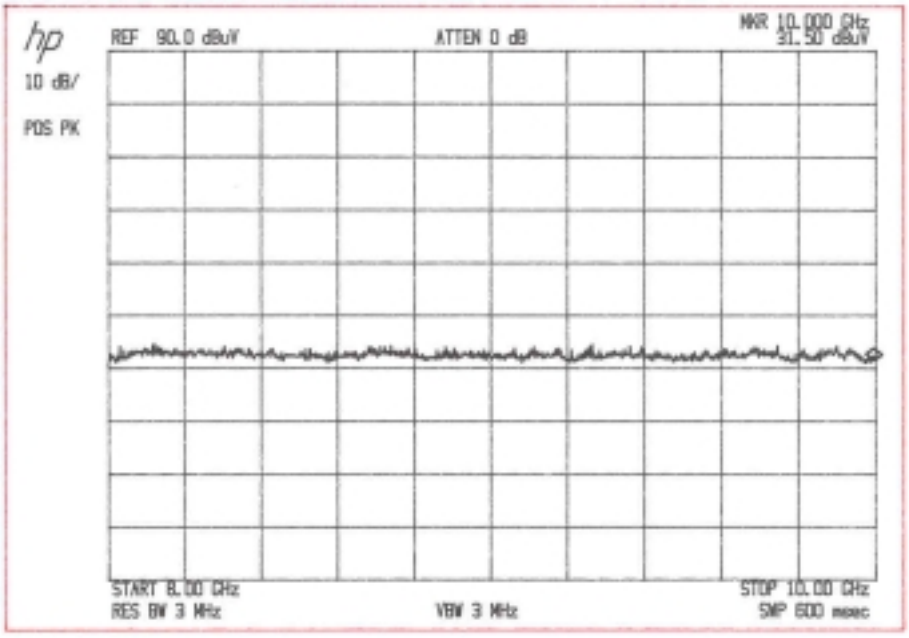


19 June 00 10-03811.01.001

09:25

Horizontal orientation

Table rotated 360° max hold

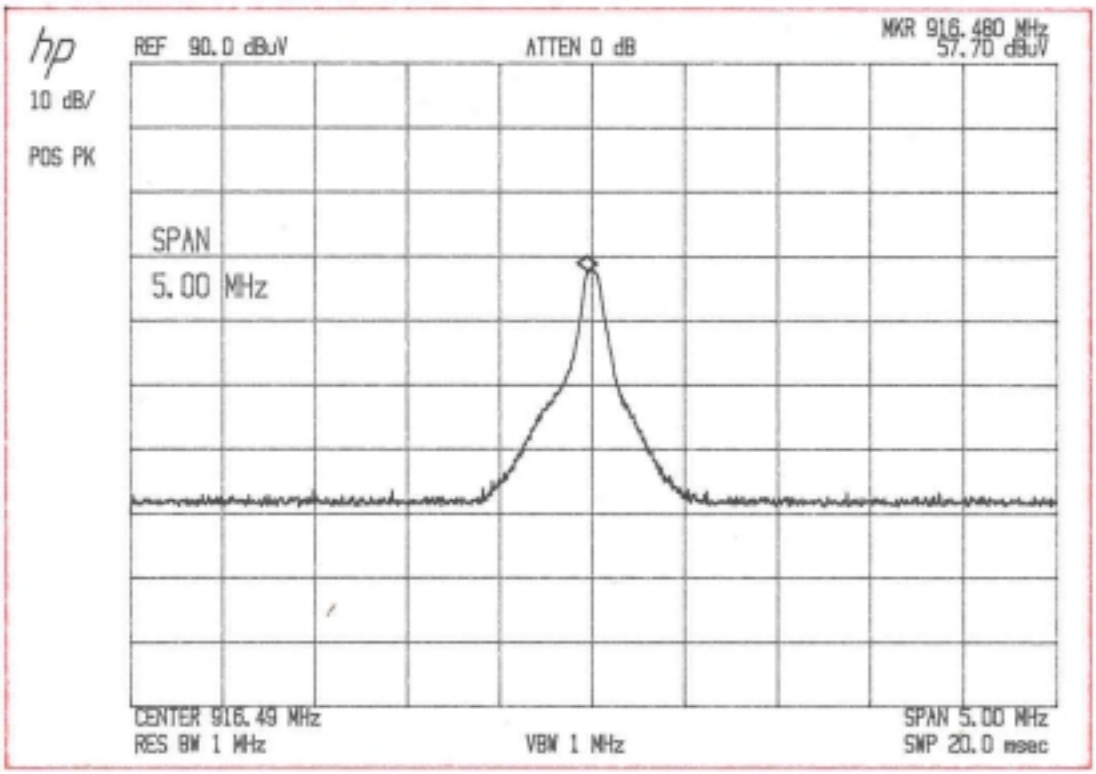


19 June 00 10-03811.01.001

09:29

Vertical orientation

Table rotated 360° max hold



16 June 00
10.03811.01.001
14:53
C. Hale

Carrier Measurement

Level =	57.7 dBuV
Cable loss =	3.5 dB
Antenna Factor =	20.0 dB

Corrected Level = 81.2 dBuV/m (Vertical Polarization)

APPENDIX C

TEST INSTRUMENTATION

TEST INSTRUMENTATION

Manufacturer	Description	Model No.	Serial No.	Cal Due
Conducted Emissions				
Rhode & Schwarz	LISN	ESH2-Z5	872461/021	26 Apr 01
SwRI	3 dB Transient Suppressor	---	---	---
Hewlett Packard	Spectrum Analyzer	8568B	2152A03081	13 Oct 00
Hewlett Packard	Quasi Peak Adapter	85650A	2043A00254	01 Aug 00
Radiated Emissions				
Hewlett Packard	Spectrum Analyzer	8566B	2152A03129	14 Sept 00
Hewlett Packard	Spectrum Analyzer	8566B	2209A01333	14 Sept 00
Hewlett Packard	Quasi Peak Adapter	85650A	2043A00213	13 Oct 00
COMPAQ	Computer/Controller	PROLINEA 4/66	A426HKD28803	NCR
SwRI	RF Pre-Amplifier	UTC 100221-1	9112SN15	Checked
Hewlett Packard	Plotter	7470A	2517A19008	NCR
EMCO	Antenna 30 MHz-150 MHz	DB2	148	Checked
EMCO	Antenna 140 MHz – 400 MHz	DB3	148	Checked
EMCO	Antenna 400 MHz - 1000 MHz	DB4	1097	Checked
ARA	Log Periodic Antenna (200 - 1000 MHz)	LPD 2010	152	29 Mar 01
SwRI	RF Pre-Amplifier (0.5 GHz - 18 GHz)	JCA018-505	101	Verified
EMCO	Antenna (1 GHz – 18 GHz)	3115	2043	30 Mar 01

APPENDIX D

TEST SETUP PHOTOS

Radiated Emissions Test Setup	Pic00037.jpg
Radiated Emissions Test Setup	Pic00038.jpg
Conducted Emissions Test Setup	Pic00031.jpg
Conducted Emissions Test Setup	Pic00033.jpg

APPENDIX E

PHOTOS OF TESTED EUT

Model 1000, Overall View	Pic00011.jpg
Model 1000, Case Open	Pic00015.jpg
Model 1000, PCB Assembly	Pic00017.jpg
Model 1000, Printed Circuit Board, Component Side	Pic00001.jpg
Model 1000, Printed Circuit Board, Circuit Side	Pic00010.jpg