MEASUREMENT AND TEST REPORT ON THE STATSIGNAL PERSONAL SECURITY DEVICE (FOB)

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

Southwest Research Institute Project 10.03811.01.001
Report Number EMCR 00/052

Prepared for:

The Jamesport Group
1401 Capital Avenue
Plano, Texas 75074

July 2000

Prepared by:

D. A. Carmony

ISO/IEC GUIDE 25
EN 45001

MEASUREMENT AND TEST REPORT
ON THE STATSIGNAL
PERSONAL SECURITY DEVICE (FOB)

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78228-0510

Project 10.03811.01.001
Report Number EMCR 00/052

Prepared for:

The Jamesport Group
1401 Capital Avenue
Plano, Texas 75074

Prepared by:
David A. Carmony

July 2000

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:

Ismael Martinez, Jr.
Sr. Engineering Technologist
Electromagnetic Compatibility Research Section
Communications Engineering Department

Approved by:

James J. Polonis
Manager
Electromagnetic Compatibility Research Section
Communications Engineering Department

TABLE OF CONTENTS

Page

LIST OF TABLES

1.0 GENERAL INFORMATION

1.1 Product Description

The StatSignal Personal Security Device (FOB) is a portable, handheld, battery powered unit that is used to transmit an emergency message that notifies a remote, manned position of the occurrence of an emergency event. The FOB transmits directly to a Site Controller that will, in turn, automatically contact the manned host position via the Internet. The FOB can also communicate to a Repeater, or series of Repeaters, which will also automatically contact the manned host position via the Internet. The FOB operates at 916.5 MHz under FCC Part 15, Subpart C, "Intentional Radiator," Sections 15.209 and 15.249. A detailed description of the FOB is presented in Attachment 1.

1.2 Related Grants

The FOB was tested in a stand-alone configuration. The FOB can communicate with a StatSignal Model 1000 Repeater (FCC ID: PK9R001), or a StatSignal Site Controller. The StatSignal Model 1000 Repeater operates at 916.5 MHz. The StatSignal Site Controller is an unitentional radiator which meets Part 15, Section 15.107 and 15.109 Class B requirements.

1.3 Tested System Details

The FOB is powered by two internal lithium 3-volt batteries. The FOB transmits a 2400 bps, on-off keyed modulated signal at 916.5 MHz whenever a pushbutton on the FOB is depressed. The antenna is internally mounted on the FOB printed circuit board and provides both transmission and reception.

1.4 Radiated Test Methodology

Radiated emissions testing was performed according to the procedures in ANSI C63.4-1992 and the limits prescribed in CFR 47, FCC Part 15, Subpart C, Sections 15.249 and 15.209, inside a semi-anechoic chamber. Radiated testing was performed 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 FOB transmit frequency was 916.5 MHz, a 3-meter semi-anechoic chamber was used to make the radiated emissions measurements. No conducted emissions measurements were required since the FOB is a battery operated device.

2.0 PRODUCT LABELING

2.1 FCC ID Label

The FOB is too small to include the complete wording. The following FCC ID will be attached to the plastic housing of the production FOB (as shown in Attachment 3 of this report):

FCC ID: PK9M1000A

The full FCC wording will be printed in the User Instructions distributed with the FOB to the user as described below (as shown in Attachment 3 of this report):

FCC ID: PK9M1000A

This device complies with Part 15 of the FCC Rules. Operation 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.

2.2 Location of Identifier on EUT

The location of the FCC ID Label is shown in Attachment 3 of this report.

3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

The StatSignal Model 1000 FOB 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 18 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 not made. The FOB operates using two internal lithium batteries and does not attach to commercially generated power.

3.2 EUT Exercise

The FOB was configured to emit its transmit signal continuously. Operability of the unit was confirmed by spectral analysis of the FOB's transmit signal using a SwRI receiving system.

3.3 Special Accessories

No special accessories were used.

3.4 Equipment Modification

No modifications were made to the FOB during testing.

3.5 Configuration of Tested System

Refer to Section 5 for photographs of the FOB tested.

4.0 BLOCK DIAGRAM OF THE TRANSCEIVER

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

5.0 RADIATED MEASUREMENT PHOTOS

Photographs of the FOB taken during radiated emissions testing are located in Appendix B.

6.0 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 A.

6.1 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 1835 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 A.

The frequency stability of the FOB transmit signal was also verified. The FOB frequency stability was tested with new internal lithium batteries installed. 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 4.2 kHz over the 10 minute time interval.

The measurement level of the fundamental is shown in Table 6.1.

TABLE 6.1
MEASUREMENTS OF FUNDAMENTAL FREQUENCY

Judgment: EUT Passed By 20.0 dB		
Frequency (MHz)	**Corrected Level[1] dB(μV/m)**	**Limit 3 Meters dB(μV/m)**
916.61	74.0	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 6.2.

TABLE 6.2
MEASUREMENTS OF SPURIOUS EMISSIONS ABOVE 30 MHz

Judgment: EUT Passed By 9.6 dB		
Frequency (MHz)	**Corrected Level [1] dB(μV/m)**	**Limit dB(V/m)**
1835.0	44.4	54

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

6.2 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 Table 6.3.

TABLE 6.3
RADIATED TEST INSTRUMENTATION

Manufacturer	Description	Model No.	Serial No.	Cal Due
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
Hewlett Packard	Printer	2225A	2432A09797	NCR

6.3 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 second harmonic frequency of 1835.0 MHz, vertical polarization, from the enclosed spectrum analyzer plot, yields:

+46.8dBµV
+27.1dB(3/m) (AF)
-29.5 dB (CF/AG factor)
44.4 dBµV/m = FS

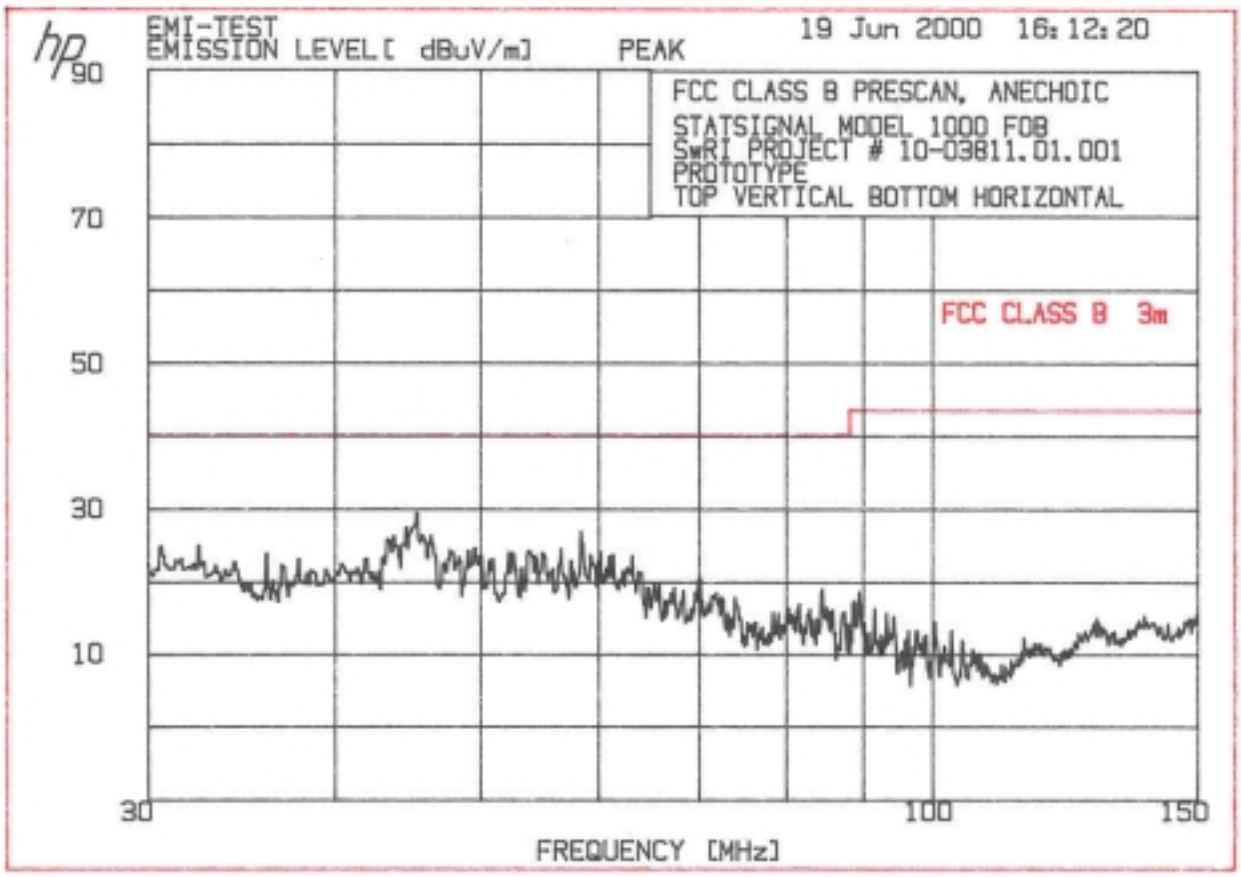
To convert dBµV/m to its corresponding level in µV/m: antilog[(44.4 dBµV/m)/20] = 165.9 µV/m

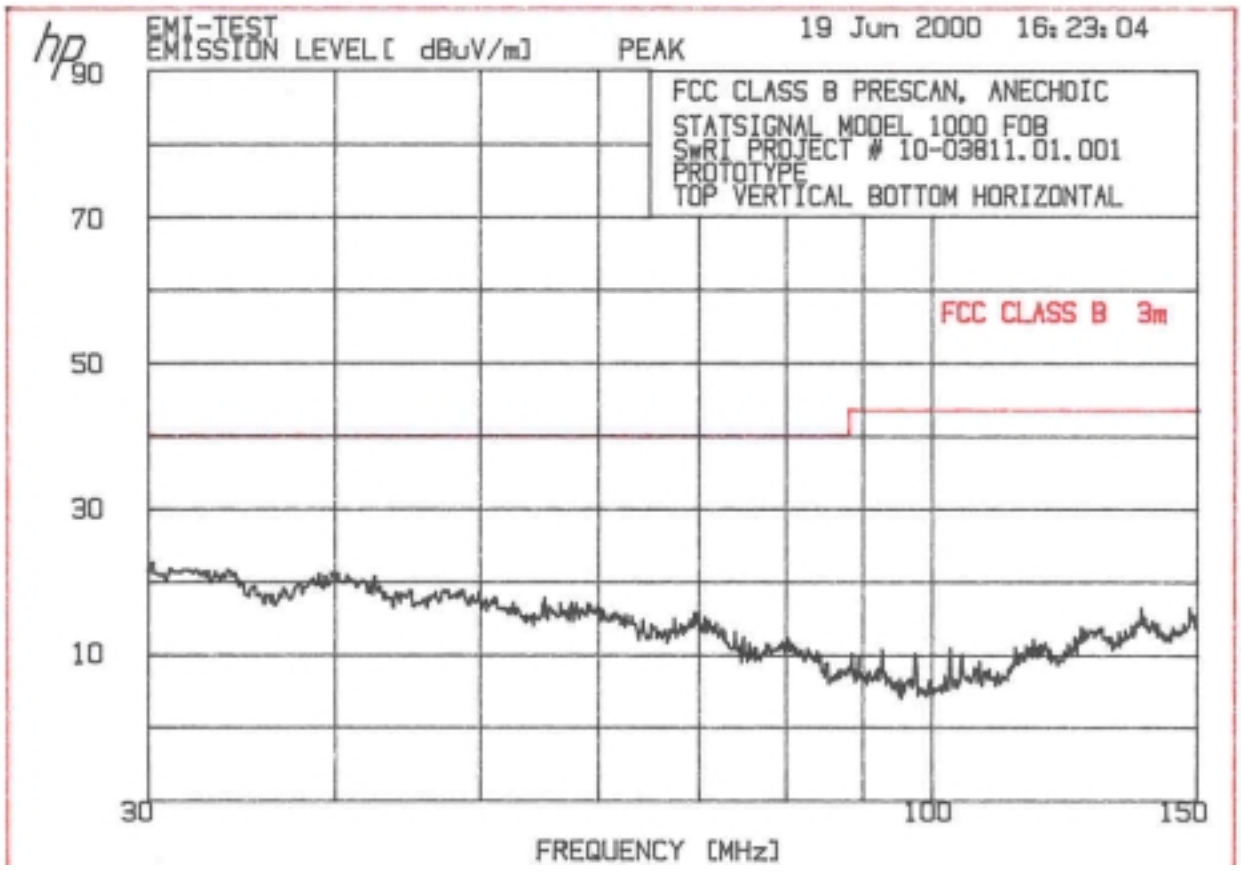
7.0 PHOTOS OF TESTED EUT

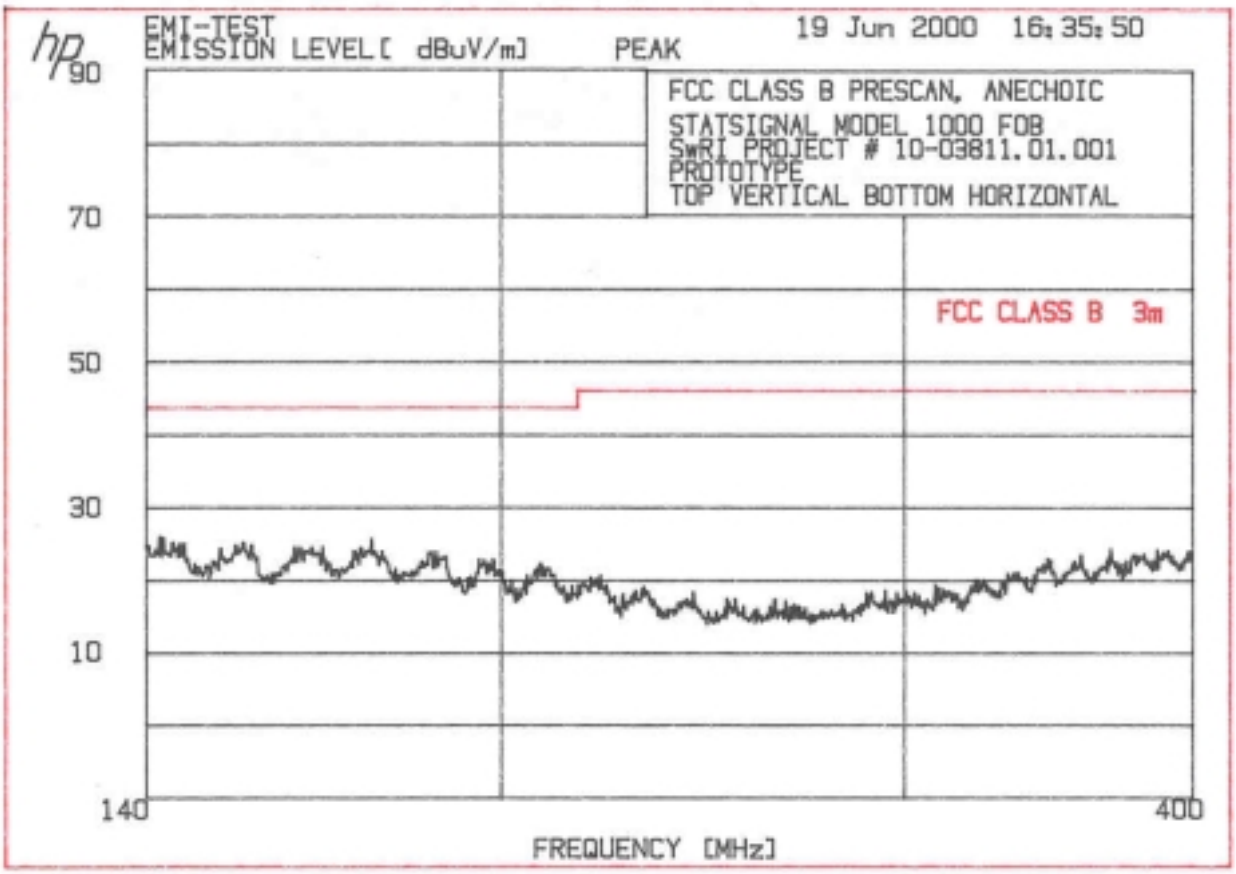
The photos of the EUT are provided in Appendix C.

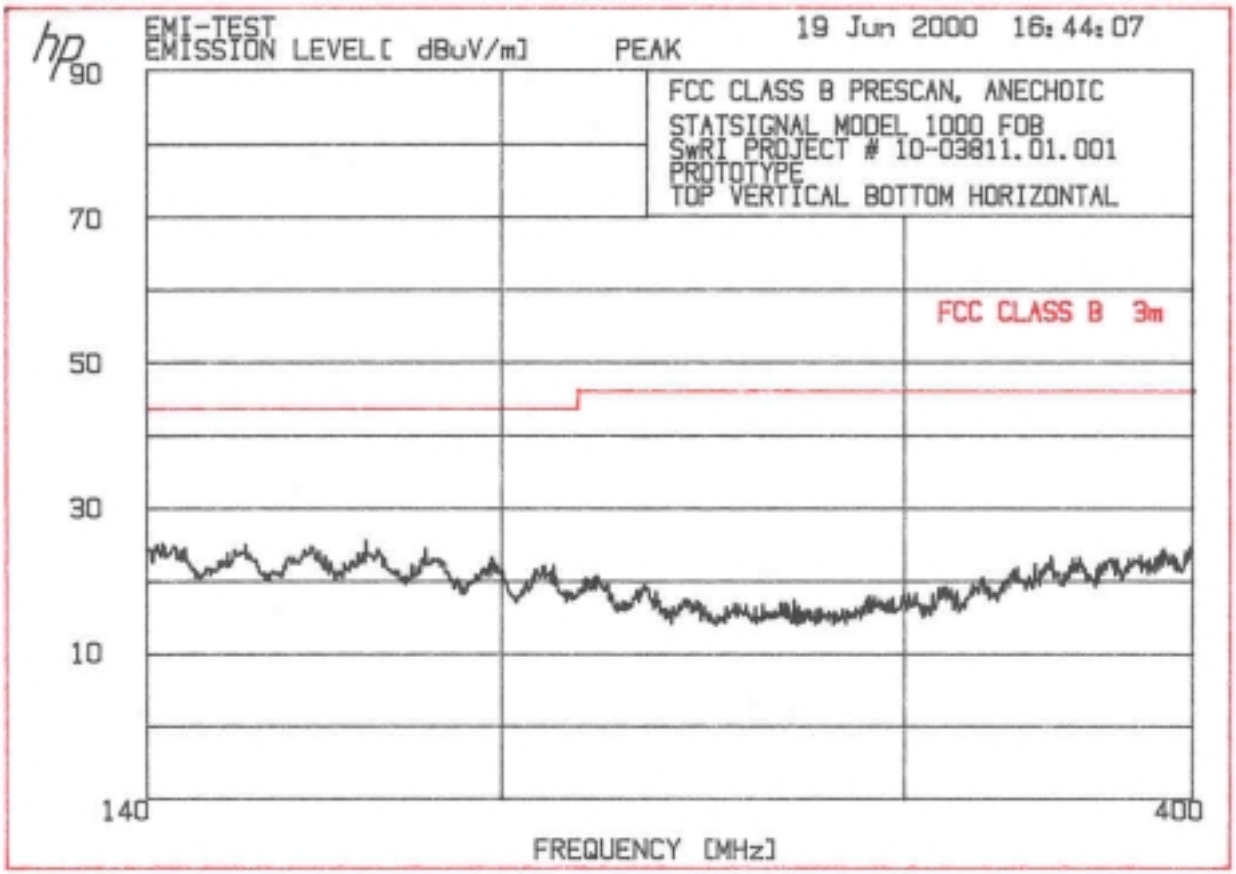
APPENDIX A

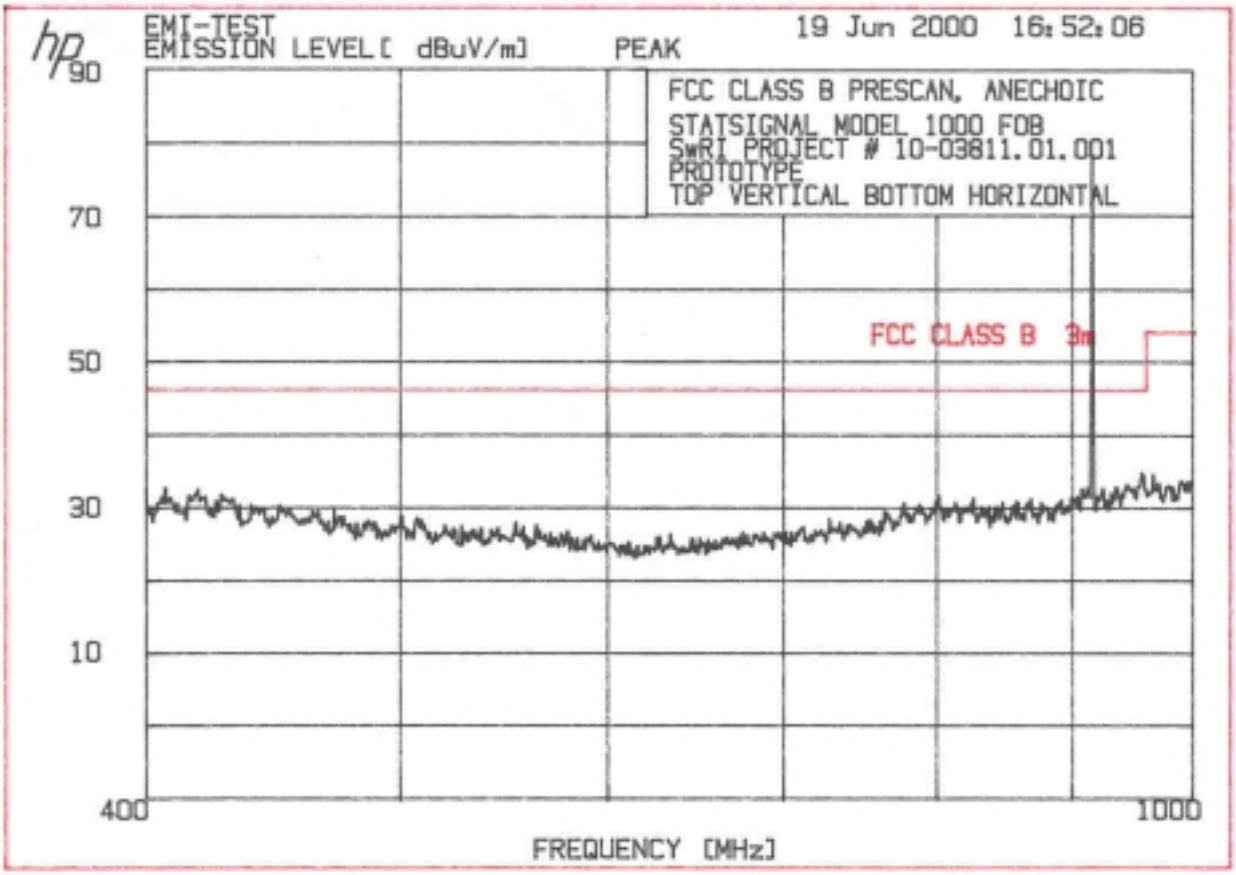
RADIATED SIGNATURE MEASUREMENTS PLOTS

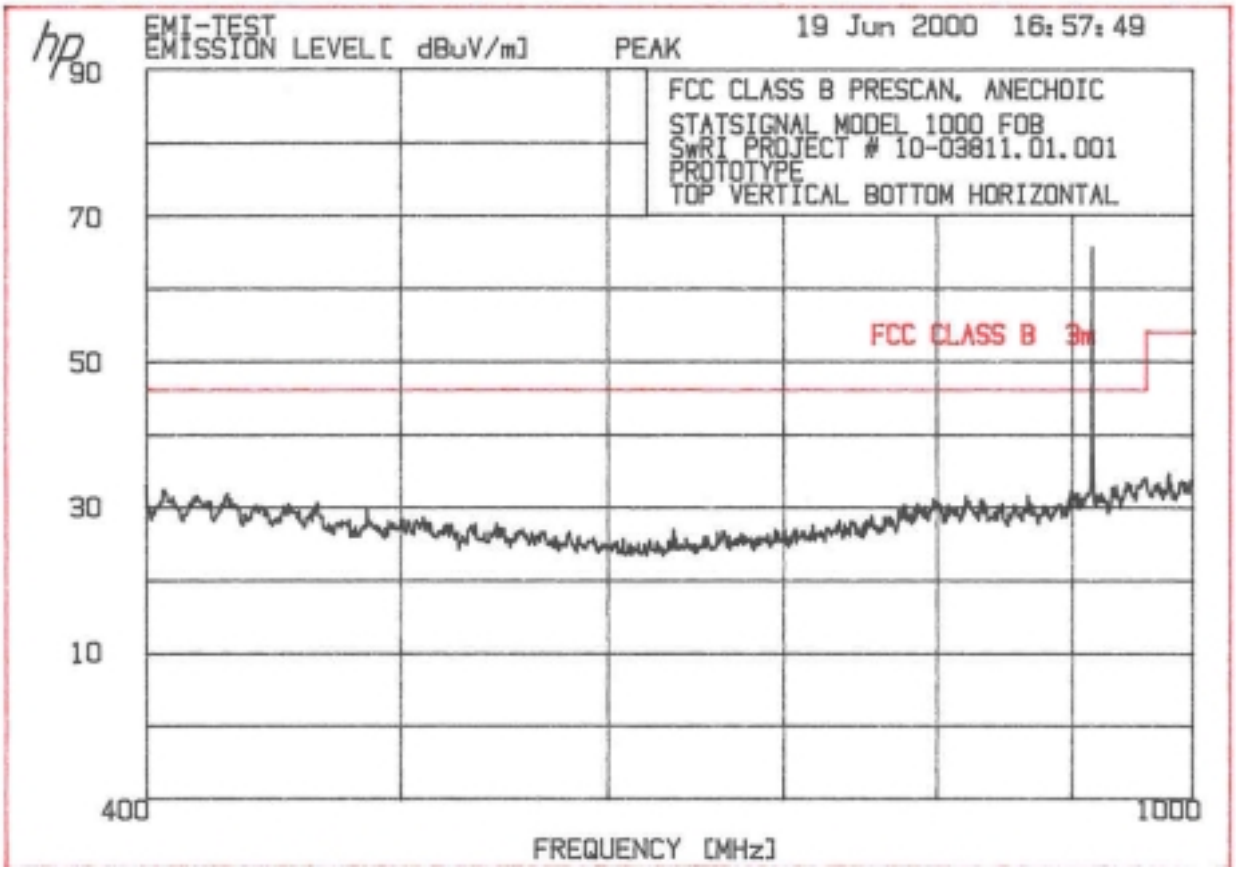

EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
19 Jun 2000 16:12:20
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 FOB
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
30
100
150
FREQUENCY [MHz]

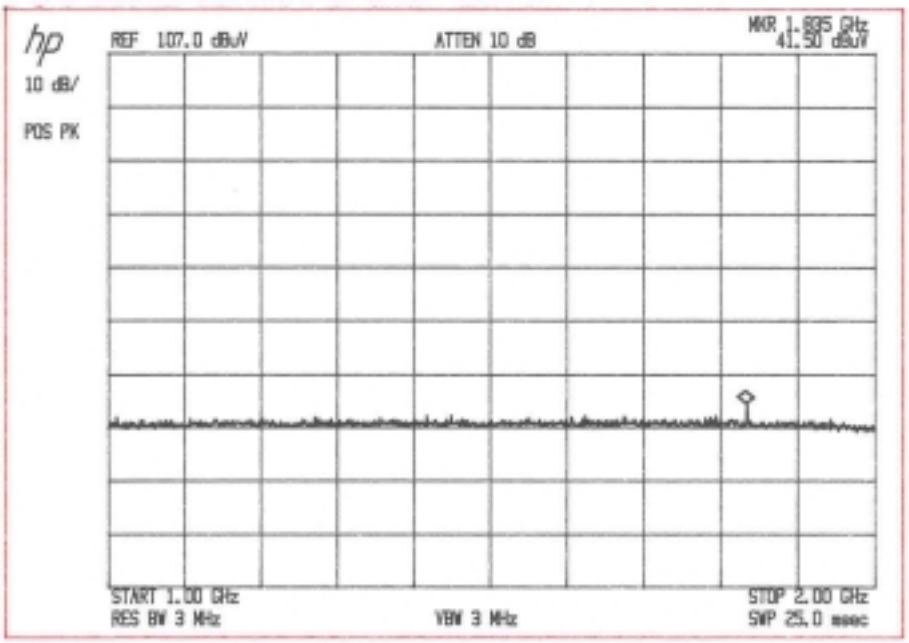

EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
19 Jun 2000 16:23:04
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 FOB
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
30
100
150
FREQUENCY [MHz]


EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
19 Jun 2000 16:35:50
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 FOB
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
140
400
FREQUENCY [MHz]

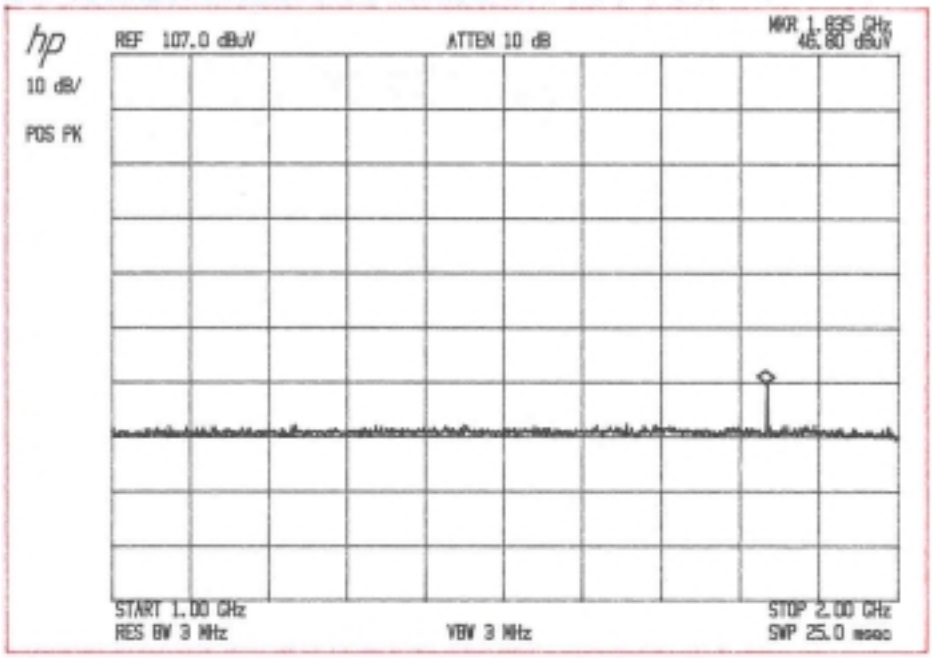

EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
19 Jun 2000 16:44:07
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 FOB
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
140
400
FREQUENCY [MHz]


EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
19 Jun 2000 16:52:06
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 FOB
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
400
1000
FREQUENCY [MHz]

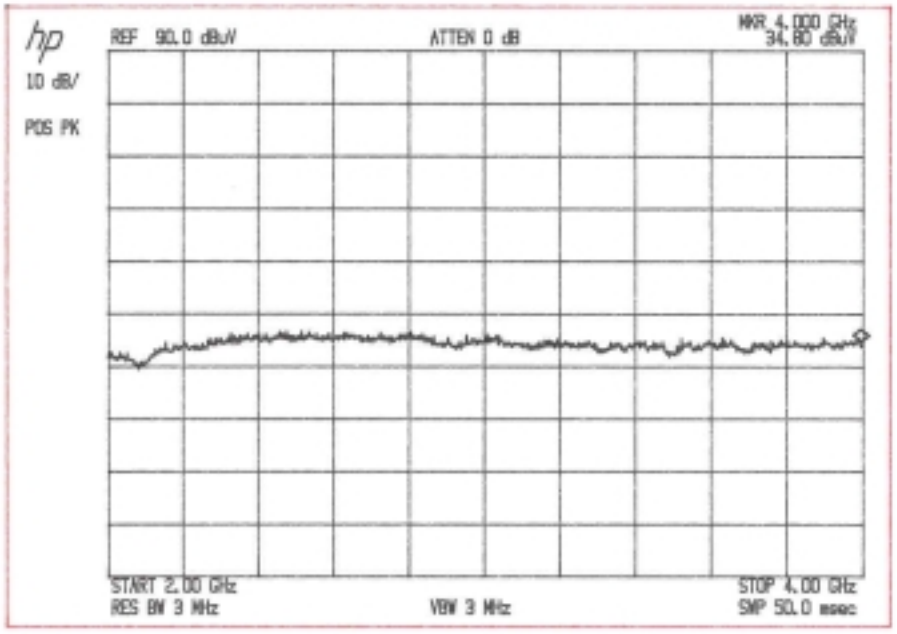

EMI-TEST
EMISSION LEVEL[dBuV/m]
PEAK
19 Jun 2000 16:57:49
FCC CLASS B PRESCAN, ANECHOIC
STATSIGNAL MODEL 1000 FOB
SwRI PROJECT # 10-03811.01.001
PROTOTYPE
TOP VERTICAL BOTTOM HORIZONTAL
FCC CLASS B 3m
90
70
50
30
10
400
1000
FREQUENCY [MHz]



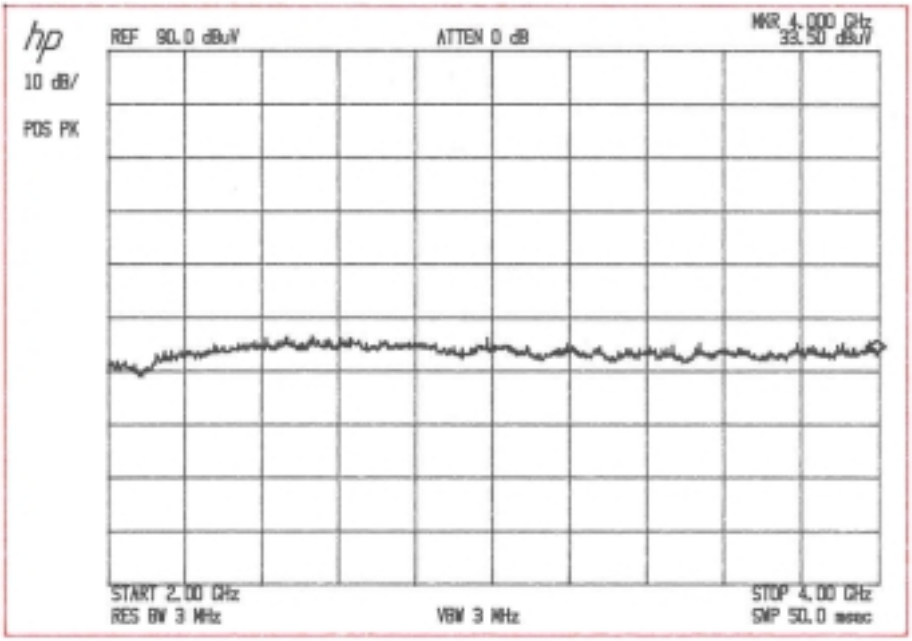
20 June 00
10:13
Horizontal Orientation
Table Rotated 360° Max Hold



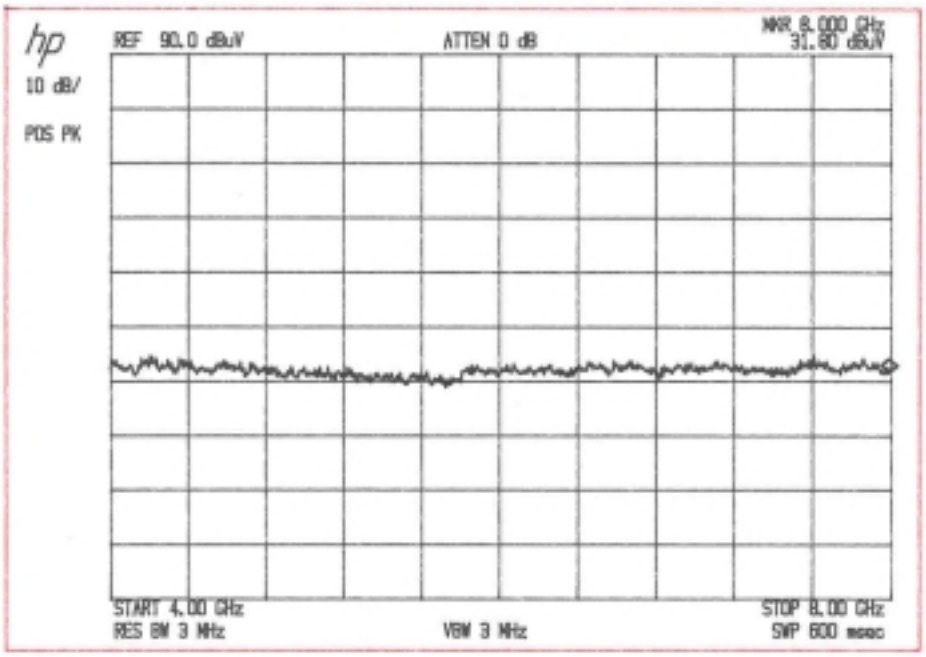
20 June 00
10:09
Vertical Orientation
Table Rotated 360° max hold.



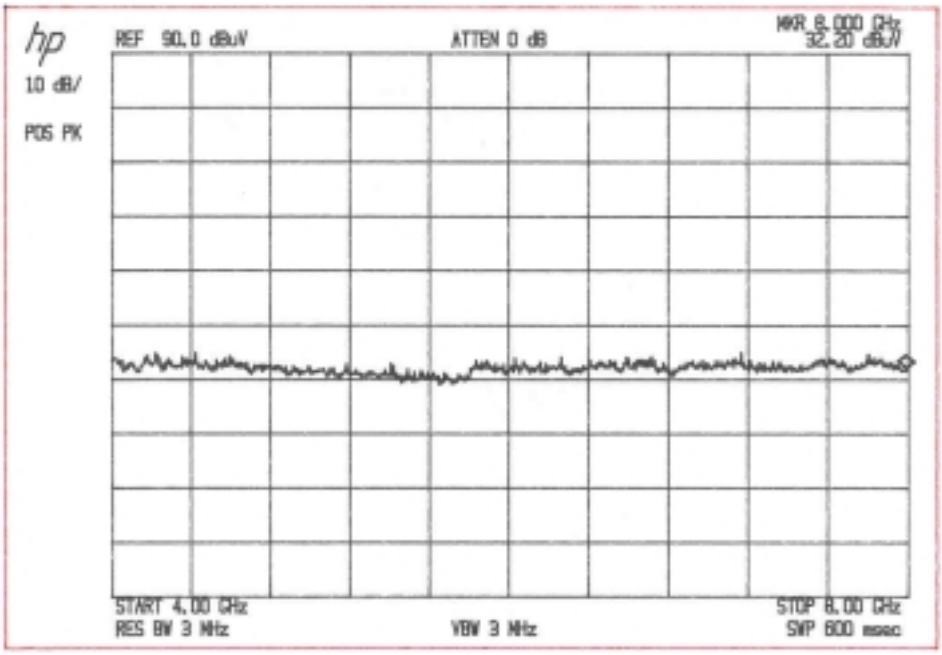
20 June 00
10:21
Horizontal Orientation
Table Rotated 360° MAX Hold



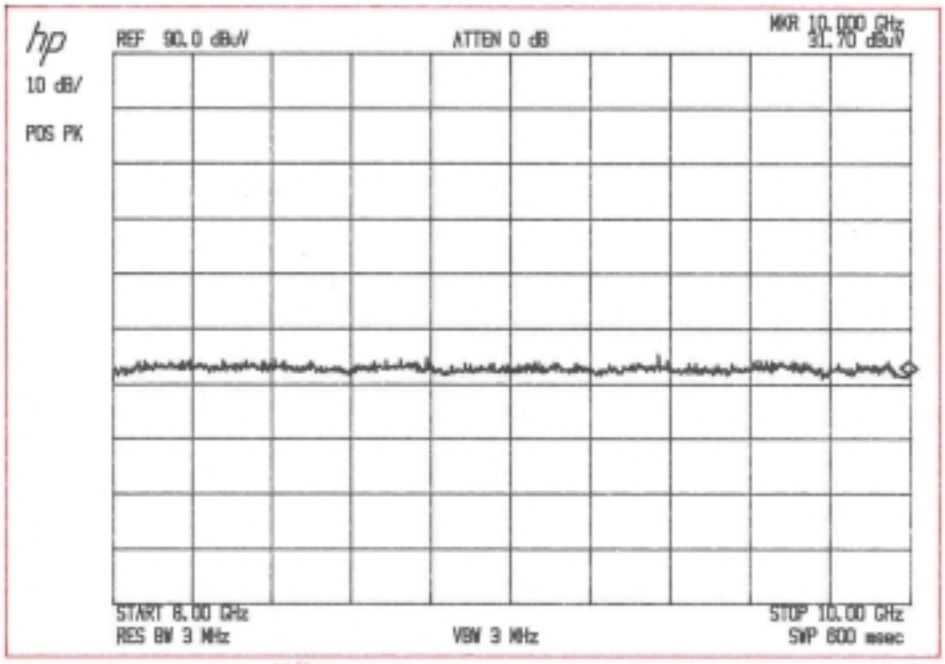
20 June 00
10:24
Vertical Orientation
Table rotated 360° max Hold



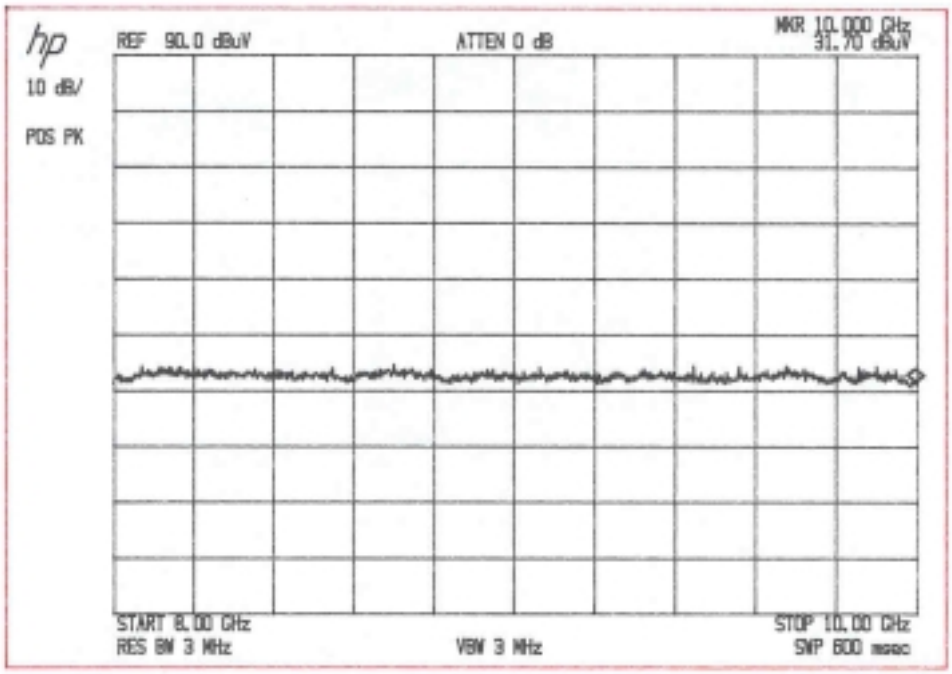
20 June 00 10:40
Horizontal Orientation
Table rotated 360° Max Hold



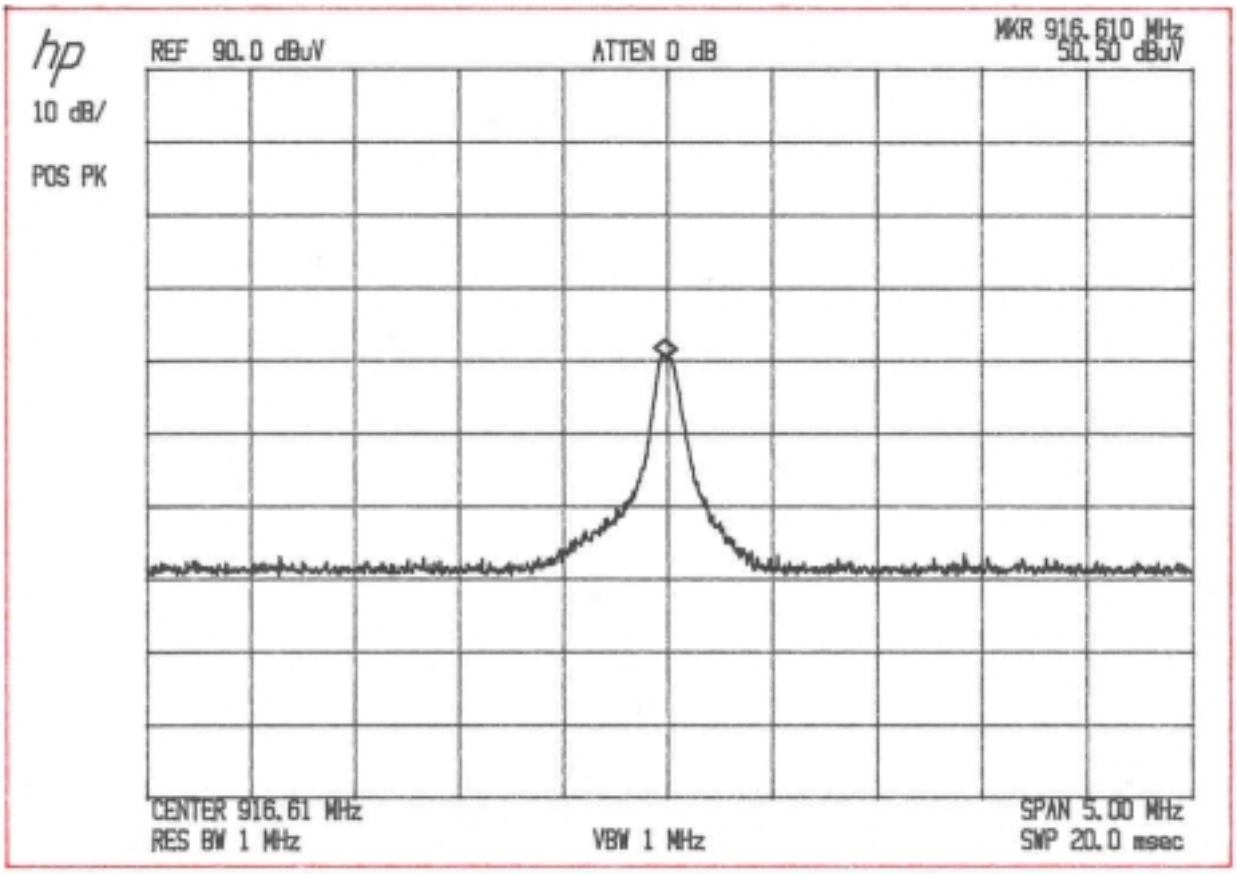
20 June 00
10:37
Vertical Orientation
Table Rotated 360° Max Hold



20 Jun 00 10:56
Horizontal Orientation
Table Rotated 360° Max Hold



20 Jun 00
10:61
Vertical Orientation
Table Rotated 360° Max Hold



20 June 00
09:52
10-03811.01.001

Carrier Measurement
Level = 50.5 dBμV
Δf(3m) = 20.0 dB
cable loss = 3.5 dB
Corrected Level = 74.0 dBμV

Vertical Ant Pol

Vertical Ant with EUT Vert On Table was worse case.

APPENDIX B

TEST SETUP PHOTOS

Radiated Emissions Test Setup	Pic00020.jpg
Radiated Emissions Test Setup Close-up (FOB Held in Position by Tape)	Pic00019.jpg
Radiated Emissions Test Setup	Pic00018.jpg

APPENDIX C

PHOTOS OF TESTED EUT

FOB, Front Side Showing Keypad	Pic00028.jpg
FOB, Back Side	Pic00029.jpg
FOB, Case Open, Showing Printed Circuit Board, Component Side, and Batteries	Pic00026.jpg
FOB, Printed Circuit Board, Circuit Side	Pic00024.jpg