

FCC CLASS II PERMISSIVE CHANGE TEST REPORT

for

Schlumberger Industries, Inc.
1600 Alabama Highway 229
Tallasse, AL 36078

FCC ID: F9CTALSRFW1

May 25, 2001

WLL PROJECT #: 6418X

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1.0 Introduction

This report has been prepared on behalf of Schlumberger Industries, Inc. to support the attached Class II Permissive Change. The test and application are submitted for an Intentional Radiator under Section 15.247 of the FCC Rules and Regulations. The Equipment Under Test was a Schlumberger Industries, Inc. Frequency Hopping Spread Spectrum Transmitter, Models: PIT MIU and SURF™ MIU.

All measurements herein were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and field Strength Instrumentation. Calibration checks are made periodically to verify proper performance of the measuring instrumentation.

All measurements were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The results of this test report relate only to the item tested. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government. The measurement uncertainty of the data contained herein is ± 2.3 dB. Refer to Appendix A for Statement of Measurement Uncertainty.

1.1 Summary

The Schlumberger Industries, Inc. Frequency Hopping Spread Spectrum Transmitter complies with the limits for an Intentional Radiator under Section 15.247.

2.0 Description of Equipment Under Test (EUT)

The Schlumberger Industries, Inc. Frequency Hopping Spread Spectrum Transmitter, Models: PIT MIU and SURF™ MIU are Meter Interface Units that are compact electronic devices used to collect meter data from an encoder register and transmit the data for collection by the meter reader. Both units are identical in operation except that the SURF unit is mounted on a flat surface and contains an integral antenna while the PIT unit contains a unique external antenna used when mounting the unit in a PIT. The EUT is a 900 MHz frequency hopping spread spectrum transmitter that collects meter readings from the encoder register on an hourly basis and transmits the information every four seconds. The unit is powered via an internal 3.6V lithium battery. The frequency range of operation is 911.08147 to 919.07686 MHz and the EUT utilizes 50 channels.

The purpose of the Class II Permissive change is to support the change in the manufacturer of the PLL to a Fujitsu. This change is made to support Schlumberger's approval of a second source vendor for the PLL. No other changes have been made to the unit.

2.1 On-board Oscillators

The Schlumberger Industries, Inc. R900 Frequency Hopping Spread Spectrum Transmitter contains the following oscillators:

32.768 MHz, 5.111808 MHz

3.0 Test Configuration

To complete the test configuration required by the FCC, the R900 Frequency Hopping Spread Spectrum Transmitter was tested with the transmitter being set to transmit at the lowest, highest and mid frequency of its operating range.

3.1 Testing Algorithm

The transmitter was powered on and setup to continuously transmit. The hopping was stopped for the spurious emissions testing. The high, low and middle channels were tested. Worst-case emissions are recorded in the data tables.

3.2 Conducted Emissions Testing

Conducted emissions testing was not performed, as the unit is battery powered.

3.3 Radiated Emissions Testing

The EUT was placed on an 80 cm high 1 x 1.5 meters non-conductive motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Biconical, log periodic, and horn broadband antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-1992. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak, peak or average as appropriate. The measurement bandwidth on the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth.

3.3.1 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are grouped into a composite antenna factor (AFc) and are supplied in the AFc column of Tables 1 and 2. The AFc in dB/m is algebraically added to the Spectrum Analyzer Voltage in dBμV to obtain the Radiated Electric Field in dBμV/m. This level is then compared with the FCC limit.

Example:

Spectrum Analyzer Voltage:	VdBμV
Composite Antenna Factor:	AFcdB/m
Electric Field:	EdBμV/m = VdBμV + AFcdB/m
To convert to linear units:	EμV/m = antilog (EdBμV/m/20)

Data is recorded in Table 1 (Pit Mount) and Table 2 (Wall Mount).

Table 1: FCC Part 15.247(c) 3M Radiated Emissions Data

CLIENT: Schlumberger
 MODEL NO: PIT MIU
 TYPE/PART: 15.247 Class 2 Permissive Change
 DATE: 03.26.01
 BY: Chad M. Beattie
 JOB #: 6418x
 CONFIGURATION: Tx Frequency: 910.910 MHz Channel: Low

**Channel 1
Restricted Band Data**

Frequency	Polarity	Azimuth	Antenna	SA Level	AFC	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Average) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2732.73	V	135.00	1.0	52.40	-4.9	47.5	238.2	500.0	-6.4	
2732.73	H	135.00	1.0	51.47	-4.9	46.6	214.0	500.0	-7.4	
3643.64	V	135.00	1.0	54.10	-3.7	50.4	332.1	500.0	-3.6	
3643.64	H	225.00	1.0	48.50	-3.7	44.8	174.3	500.0	-9.2	
4554.55	V	225.00	1.0	50.30	-2.8	47.5	238.4	500.0	-6.4	
4554.55	H	135.00	1.0	46.80	-2.8	44.0	159.3	500.0	-9.9	
7287.28	V	135.00	1.0	38.40	2.2	40.6	107.2	500.0	-13.4	
7287.28	H	180.00	1.0	34.20	2.2	36.4	66.1	500.0	-17.6	
8198.19	V	135.00	1.0	42.10	2.2	44.3	164.1	500.0	-9.7	
8198.19	H	180.00	1.0	41.00	2.2	43.2	144.5	500.0	-10.8	
9109.10	V	0.00	1.0	40.30	2.3	42.6	135.5	500.0	-11.3	Ambient
9109.10	H	0.00	1.0	35.00	2.3	37.3	73.6	500.0	-16.6	Ambient

Peak Measurements Above 1GHz

Frequency	Polarity	Azimuth	Antenna	SA Level	AFC	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2732.73	V	135.00	1.0	60.30	-4.9	55.4	591.4	5000.0	-18.5	
2732.73	H	135.00	1.0	61.50	-4.9	56.6	679.0	5000.0	-17.3	
3643.64	V	135.00	1.0	58.30	-3.7	54.6	538.6	5000.0	-19.4	
3643.64	H	225.00	1.0	55.30	-3.7	51.6	381.3	5000.0	-22.4	
4554.55	V	225.00	1.0	54.90	-2.8	52.1	404.8	5000.0	-21.8	
4554.55	H	135.00	1.0	52.60	-2.8	49.8	310.7	5000.0	-24.1	
7287.28	V	135.00	1.0	46.80	2.2	49.0	281.8	5000.0	-25.0	
7287.28	H	180.00	1.0	41.20	2.2	43.4	147.9	5000.0	-30.6	
8198.19	V	135.00	1.0	47.20	2.2	49.4	295.1	5000.0	-24.6	
8198.19	H	180.00	1.0	46.20	2.2	48.4	263.0	5000.0	-25.6	
9109.10	V	0.00	1.0	43.00	2.3	45.3	184.9	5000.0	-28.6	Ambient
9109.10	H	0.00	1.0	41.70	2.3	44.0	159.2	5000.0	-29.9	Ambient

Table 1 (cont'd): FCC Part 15.247(c) 3M Radiated Emissions Data

CLIENT: Schlumberger
 MODEL NO: PIT MIU
 TYPE/PART: 15.247 Class 2 Permissive Change
 DATE: 03.26.01
 BY: Chad M. Beattie
 JOB #: 6418x
 CONFIGURATION: Tx Frequency: 915.16 MHz Channel: Mid

**Channel 2
Restricted Band Data**

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Average) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2745.55	V	315.00	1.0	50.9	-4.8	46.1	200.8	500.0	-7.9	
2745.55	H	135.00	1.0	53.1	-4.8	48.3	258.7	500.0	-5.7	
3660.61	V	135.00	1.0	54.0	-3.7	50.3	329.0	500.0	-3.6	
3660.61	H	225.00	1.0	49.6	-3.7	45.9	198.2	500.0	-8.0	
4575.58	V	225.00	1.0	51.5	-2.7	48.8	274.3	500.0	-5.2	
4575.58	H	180.00	1.0	48.2	-2.7	45.5	187.6	500.0	-8.5	
7321.21	V	180.00	1.0	40.2	2.2	42.4	131.8	500.0	-11.6	
7321.21	H	180.00	1.0	38.9	2.2	41.1	113.5	500.0	-12.9	
8236.36	V	135.00	1.0	42.9	2.2	45.1	179.9	500.0	-8.9	
8236.36	H	135.00	1.0	38.5	2.2	40.7	108.4	500.0	-13.3	
9151.51	V	0.00	1.0	37.2	2.4	39.6	95.4	500.0	-14.4	Ambient
9151.51	H	0.00	1.0	36.7	2.4	39.1	90.1	500.0	-14.9	Ambient

Peak Measurements Above 1GHz

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2745.55	V	315.00	1.0	58.4	-4.8	53.6	476.3	5000.0	-20.4	
2745.55	H	135.00	1.0	60.2	-4.8	55.4	585.9	5000.0	-18.6	
3660.61	V	135.00	1.0	57.4	-3.7	53.7	486.6	5000.0	-20.2	
3660.61	H	225.00	1.0	60.0	-3.7	56.3	656.4	5000.0	-17.6	
4575.58	V	225.00	1.0	55.3	-2.7	52.6	424.8	5000.0	-21.4	
4575.58	H	180.00	1.0	54.8	-2.7	52.1	401.1	5000.0	-21.9	
7321.21	V	180.00	1.0	48.1	2.2	50.3	327.3	5000.0	-23.7	
7321.21	H	180.00	1.0	47.9	2.2	50.1	319.9	5000.0	-23.9	
8236.36	V	135.00	1.0	46.2	2.2	48.4	263.0	5000.0	-25.6	
8236.36	H	135.00	1.0	41.9	2.2	44.1	160.3	5000.0	-29.9	ambient
9151.51	V	0.00	1.0	40.0	2.4	42.4	131.7	5000.0	-31.6	ambient
9151.51	H	0.00	1.0	38.7	2.4	41.1	113.4	5000.0	-32.9	ambient

Table 1 (cont'd): FCC Part 15.247(c) 3M Radiated Emissions Data

CLIENT: Schlumberger
 MODEL NO: PIT MIU
 TYPE/PART: 15.247 Class 2 Permissive Change
 DATE: April 05, 2001
 BY: John Lam
 JOB #: 6418x
 CONFIGURATION: Tx Frequency: 919.2 MHz Channel: High

**Channel 3
Restricted Band Data**

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Average) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2757.45	H	270.00	1.0	51.1	-4.8	46.3	206.7	500.0	-7.7	
2757.90	V	135.00	1.0	51.3	-4.8	46.5	211.0	500.0	-7.5	
3676.65	V	90.00	1.0	53.3	-3.6	49.6	303.1	500.0	-4.3	
3676.80	H	45.00	1.0	45.5	-3.6	41.9	123.9	500.0	-12.1	
4596.26	H	90.00	1.0	45.9	-2.7	43.1	143.6	500.0	-10.8	
4596.26	V	90.00	1.0	45.4	-2.7	42.7	136.8	500.0	-11.3	
7353.00	H	0.00	1.0	33.6	2.2	35.8	61.7	500.0	-18.2	
7353.60	V	90.00	1.0	41.2	2.2	43.4	147.9	500.0	-10.6	
8272.90	V	90.00	1.0	36.5	2.2	38.7	86.1	500.0	-15.3	
8272.70	H	0.00	1.0	33.8	2.2	36.0	63.1	500.0	-18.0	
9191.95	H	0.00	1.0	35.8	2.4	38.2	81.7	500.0	-15.7	Ambient
9192.00	V	0.00	1.0	35.0	2.4	37.4	74.5	500.0	-16.5	Ambient

Peak Measurements Above 1GHz

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2757.45	H	270.00	1.0	58.4	-4.8	53.6	477.3	5000.0	-20.4	
2757.90	V	135.00	1.0	56.7	-4.8	51.9	392.5	5000.0	-22.1	
3676.65	V	90.00	1.0	61.3	-3.6	57.7	764.0	5000.0	-16.3	
3676.80	H	45.00	1.0	55.6	-3.6	52.0	396.4	5000.0	-22.0	
4596.26	H	90.00	1.0	48.3	-2.7	45.6	190.2	5000.0	-28.4	
4596.26	V	90.00	1.0	51.3	-2.7	48.6	268.6	5000.0	-25.4	
7353.00	H	0.00	1.0	38.7	2.2	40.9	110.9	5000.0	-33.1	
7353.60	V	90.00	1.0	47.9	2.2	50.1	319.9	5000.0	-23.9	
8272.90	V	90.00	1.0	44.7	2.2	46.9	221.3	5000.0	-27.1	
8272.70	H	0.00	1.0	42.1	2.2	44.3	164.1	5000.0	-29.7	
9191.95	H	0.00	1.0	41.1	2.4	43.5	150.4	5000.0	-30.4	ambient
9192.00	V	0.00	1.0	40.9	2.4	43.3	146.9	5000.0	-30.6	ambient

Table 2: FCC Part 15.247(c) 3M Radiated Emissions Data

CLIENT: Schlumberger
 MODEL NO: SURF MIU (Wall Mount)
 TYPE/PART: 15.247 Class 2 Permissive Change
 DATE: April 27, 2001
 BY: John Lam
 JOB #: 6418x
 CONFIGURATION: Tx Frequency: 910.9 MHz Channel: Low

**Channel 1
Restricted Band Data**

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Average) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2732.70	V	90.00	1.0	47.8	-4.9	42.9	140.2	500.0	-11.0	
2732.70	H	180.00	1.0	42.0	-4.9	37.1	71.9	500.0	-16.8	
3643.60	V	112.50	1.0	43.2	-3.7	39.5	94.7	500.0	-14.5	
3643.60	H	112.50	1.0	42.7	-3.7	39.0	89.4	500.0	-15.0	
4554.50	H	180.00	1.0	42.5	-2.8	39.7	97.1	500.0	-14.2	
4554.50	V	45.00	1.0	44.0	-2.8	41.2	115.4	500.0	-12.7	Ambient
7287.20	V	0.00	1.0	33.8	2.2	36.0	63.1	500.0	-18.0	Ambient
7287.20	H	0.00	1.0	34.0	2.2	36.2	64.6	500.0	-17.8	Ambient
8198.10	V	0.00	1.0	34.7	2.2	36.9	70.0	500.0	-17.1	Ambient
8198.10	H	0.00	1.0	34.5	2.2	36.7	68.4	500.0	-17.3	Ambient
9109.00	V	0.00	1.0	33.2	2.3	35.5	59.8	500.0	-18.4	Ambient
9109.00	H	0.00	1.0	33.3	2.3	35.6	60.5	500.0	-18.3	Ambient

Peak Measurements Above 1GHz

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2732.70	V	90.00	1.0	60.1	-4.9	55.2	578.0	5000.0	-18.7	
2732.70	H	180.00	1.0	53.3	-4.9	48.4	264.2	5000.0	-25.5	
3643.60	V	112.50	1.0	53.5	-3.7	49.8	309.9	5000.0	-24.2	
3643.60	H	112.50	1.0	52.2	-3.7	48.5	266.8	5000.0	-25.5	
4554.50	H	180.00	1.0	47.6	-2.8	44.8	174.7	5000.0	-29.1	
4554.50	V	45.00	1.0	53.0	-2.8	50.2	325.3	5000.0	-23.7	Ambient
7287.20	V	0.00	1.0	40.8	2.2	43.0	141.3	5000.0	-31.0	Ambient
7287.20	H	0.00	1.0	42.1	2.2	44.3	164.1	5000.0	-29.7	Ambient
8198.10	V	0.00	1.0	43.0	2.2	45.2	182.0	5000.0	-28.8	Ambient
8198.10	H	0.00	1.0	40.9	2.2	43.1	142.9	5000.0	-30.9	Ambient
9109.00	V	0.00	1.0	39.8	2.3	42.1	127.9	5000.0	-31.8	Ambient
9109.00	H	0.00	1.0	40.0	2.3	42.3	130.9	5000.0	-31.6	Ambient

Table 2 (cont'd): FCC Part 15.247(c) 3M Radiated Emissions Data

CLIENT: Schlumberger
 MODEL NO: SURF MIU (Wall Mount)
 TYPE/PART: 15.247 Class 2 Permissive Change
 DATE: April 26, 2001
 BY: John Lam
 JOB #: 6418x
 CONFIGURATION: Tx Frequency: 915.1 MHz Channel: Mid

**Channel 2
Restricted Band Data**

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Average) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2745.30	V	270.00	1.0	48.3	-4.8	43.4	148.0	500.0	-10.6	
2745.30	H	112.50	1.0	44.7	-4.8	39.9	98.4	500.0	-14.1	
3660.40	V	112.50	1.0	43.5	-3.7	39.9	98.3	500.0	-14.1	
3660.40	H	247.50	1.0	41.6	-3.7	37.9	78.6	500.0	-16.1	
4575.50	V	112.50	1.0	42.8	-2.7	40.1	100.7	500.0	-13.9	
4575.50	H	90.00	1.0	44.0	-2.7	41.3	115.7	500.0	-12.7	
7320.80	V	0.00	1.0	34.0	2.2	36.2	64.6	500.0	-17.8	Ambient
7320.80	H	0.00	1.0	34.7	2.2	36.9	70.0	500.0	-17.1	Ambient
8235.90	V	0.00	1.0	34.5	2.2	36.7	68.4	500.0	-17.3	Ambient
8235.90	H	0.00	1.0	33.8	2.2	36.0	63.1	500.0	-18.0	Ambient
9151.00	V	0.00	1.0	33.4	2.4	35.8	61.6	500.0	-18.2	Ambient
9151.00	H	0.00	1.0	34.0	2.4	36.4	66.0	500.0	-17.6	Ambient

Peak Measurements Above 1GHz

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2745.30	V	270.00	1.0	53.4	-4.8	48.6	267.8	5000.0	-25.4	
2745.30	H	112.50	1.0	55.6	-4.8	50.8	345.0	5000.0	-23.2	
3660.40	V	112.50	1.0	52.2	-3.7	48.5	267.4	5000.0	-25.4	
3660.40	H	247.50	1.0	45.9	-3.7	42.2	129.5	5000.0	-31.7	
4575.50	V	112.50	1.0	49.8	-2.7	47.1	225.5	5000.0	-26.9	
4575.50	H	90.00	1.0	50.4	-2.7	47.7	241.7	5000.0	-26.3	
7320.80	V	0.00	1.0	40.6	2.2	42.8	138.0	5000.0	-31.2	Ambient
7320.80	H	0.00	1.0	40.9	2.2	43.1	142.9	5000.0	-30.9	Ambient
8235.90	V	0.00	1.0	39.8	2.2	42.0	125.9	5000.0	-32.0	Ambient
8235.90	H	0.00	1.0	41.6	2.2	43.8	154.9	5000.0	-30.2	Ambient
9151.00	V	0.00	1.0	40.6	2.4	43.0	141.1	5000.0	-31.0	Ambient
9151.00	H	0.00	1.0	41.0	2.4	43.4	147.8	5000.0	-30.6	Ambient

Table 2 (cont'd): FCC Part 15.247(c) 3M Radiated Emissions Data

CLIENT: Schlumberger
 MODEL NO: SURF MIU (Wall Mount)
 TYPE/PART: 15.247 Class 2 Permissive Change
 DATE: April 24, 2001
 BY: John Lam
 JOB #: 6418x
 CONFIGURATION: Tx Frequency: 919.2 MHz Channel: High

**Channel 3
Restricted Band Data**

Frequency	Polarity	Azimuth	Antenna Height	SA Level (Average)	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	m	dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2757.45	H	180.00	1.0	43.3	-4.8	38.5	83.9	500.0	-15.5	
2757.60	V	90.00	1.0	49.8	-4.8	45.0	177.3	500.0	-9.0	
3676.65	V	247.50	1.0	44.3	-3.6	40.7	107.9	500.0	-13.3	
3676.80	H	180.00	1.0	40.6	-3.6	37.0	70.5	500.0	-17.0	
4596.00	H	112.50	1.0	42.2	-2.7	39.5	94.2	500.0	-14.5	
4596.26	V	180.00	1.0	44.1	-2.7	41.4	117.3	500.0	-12.6	
7353.61	V	0.00	1.0	32.9	2.2	35.1	56.9	500.0	-18.9	Ambient
7353.61	H	0.00	1.0	33.4	2.2	35.6	60.3	500.0	-18.4	Ambient
8272.70	V	0.00	1.0	33.6	2.2	35.8	61.7	500.0	-18.2	Ambient
8272.70	H	0.00	1.0	34.0	2.2	36.2	64.6	500.0	-17.8	Ambient
9191.95	V	0.00	1.0	33.4	2.4	35.8	62.0	500.0	-18.1	Ambient
9191.95	H	0.00	1.0	34.1	2.4	36.5	67.2	500.0	-17.4	Ambient

Peak Measurements Above 1GHz

Frequency	Polarity	Azimuth	Antenna Height	SA Level (Peak)	AFc	E-Field	E-Field	Limit	Margin	
MHz	H/V	Degree	m	dBuV	dB/m	dBuV/m	uV/m	uV/m	dB	
2757.45	H	180.00	1.0	53.1	-4.8	48.3	259.3	5000.0	-25.7	
2757.60	V	90.00	1.0	61.4	-4.8	56.6	674.2	5000.0	-17.4	
3676.65	V	247.50	1.0	55.4	-3.6	51.8	387.3	5000.0	-22.2	
3676.80	H	180.00	1.0	47.8	-3.6	44.2	161.5	5000.0	-29.8	
4596.00	H	112.50	1.0	53.0	-2.7	50.3	326.7	5000.0	-23.7	
4596.26	V	180.00	1.0	55.3	-2.7	52.6	425.7	5000.0	-21.4	
7353.61	V	0.00	1.0	41.8	2.2	44.0	158.5	5000.0	-30.0	Ambient
7353.61	H	0.00	1.0	43.2	2.2	45.4	186.2	5000.0	-28.6	Ambient
8272.70	V	0.00	1.0	42.7	2.2	44.9	175.8	5000.0	-29.1	Ambient
8272.70	H	0.00	1.0	40.7	2.2	42.9	139.6	5000.0	-31.1	Ambient
9191.95	V	0.00	1.0	41.3	2.4	43.7	153.9	5000.0	-30.2	Ambient
9191.95	H	0.00	1.0	40.8	2.4	43.2	145.3	5000.0	-30.7	Ambient

3.4 RF Antenna Conducted Spurious Emissions Testing

Since the impedance of the antenna terminal could not be matched by using a piece of a coax, the conducted test could not be performed and therefore the alternate radiated test method was used. The EUT was setup as per Section 3.3 of this report, except the spectrum analyzer resolution bandwidth was set to 100 kHz and the video

bandwidth was set to 1 MHz. The amplitude of the EUT carrier was measured to determine the emissions limit (20dB below the carrier frequency amplitude). All of the emissions outside the allocated frequency band of 902 MHz to 928 MHz were scanned up to the 10th harmonic. At each frequency, an external attenuator or filter was used to confirm that the signal was not overloading the spectrum analyzer input.

Data is recorded in Table 3 (PIT Mount) and Table 4 (Wall Mount).

**Table 3: FCC RF Radiated Spurious Emissions Data
Alternate Method to Confirm Compliance with Section 15.247(c)**

CLIENT: Schlumberger
MODEL NO: PIT MIU
TYPE/PART: 15.247 Class 2 Permissive Change
DATE: 03.26.01
BY: Chad M. Beattie
JOB #: 6418x

Channel 1

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB
910.91	V	225.00	1.3	58.10	28.2	86.3	20770.6	2077.1	N/A
910.91	H	270.00	1.3	55.40	28.2	83.6	15221.2	2077.1	N/A
1821.82	V	135.00	1.0	65.50	-7.1	58.4	834.7	2077.1	-7.9
1821.82	H	135.00	1.0	66.70	-7.1	59.6	958.4	2077.1	-6.7
2732.73	V	135.00	1.0	58.70	-4.9	53.8	491.9	2077.1	-12.5
2732.73	H	135.00	1.0	59.40	-4.9	54.5	533.2	2077.1	-11.8
3643.64	V	135.00	1.0	57.60	-3.7	53.9	496.9	2077.1	-12.4
3643.64	H	225.00	1.0	53.80	-3.7	50.1	320.8	2077.1	-16.2
4554.55	V	225.00	1.0	52.90	-2.8	50.1	321.6	2077.1	-16.2
4554.55	H	135.00	1.0	50.40	-2.8	47.6	241.1	2077.1	-18.7
5465.46	V	180.00	1.0	41.70	-2.0	39.7	96.6	2077.1	-26.7
5465.46	H	135.00	1.0	39.60	-2.0	37.6	75.8	2077.1	-28.8
6376.37	V	135.00	1.0	43.90	-0.1	43.8	155.1	2077.1	-22.5
6376.37	H	180.00	1.0	42.70	-0.1	42.6	135.1	2077.1	-23.7
7287.28	V	135.00	1.0	44.00	2.2	46.2	204.2	2077.1	-20.1
7287.28	H	180.00	1.0	37.30	2.2	39.5	94.4	2077.1	-26.8
8198.19	V	135.00	1.0	45.70	2.2	47.9	248.3	2077.1	-18.4
8198.19	H	180.00	1.0	44.30	2.2	46.5	211.3	2077.1	-19.8
9109.10	V	0.00	1.0	41.20	2.3	43.5	150.3	2077.1	-22.8
9109.10	H	0.00	1.0	38.60	2.3	40.9	111.4	2077.1	-25.4

**Table 3 Cont'd.: FCC RF Radiated Spurious Emissions Data
Alternate Method to Confirm Compliance with Section 15.247(c)**

CLIENT: Schlumberger
MODEL NO: PIT MIU
TYPE/PART: 15.247 Class 2 Permissive Change
DATE: 03.26.01
BY: Chad M. Beattie
JOB #: 6418x

Channel 2

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB
915.15	V	225.00	1.3	61.8	28.3	90.1	32060.3	3206.0	N/A
915.15	H	225.00	1.3	57.4	28.3	85.7	19318.3	3206.0	N/A
1830.30	V	135.00	1.0	65.2	-7.0	58.2	810.5	3206.0	-11.9
1830.30	H	135.00	1.0	67.3	-7.0	60.3	1032.2	3206.0	-9.8
2745.55	V	315.00	1.0	56.9	-4.8	52.1	400.7	3206.0	-18.1
2745.55	H	135.00	1.0	57.8	-4.8	53.0	444.5	3206.0	-17.2
3660.61	V	135.00	1.0	56.4	-3.7	52.7	433.7	3206.0	-17.4
3660.61	H	225.00	1.0	57.6	-3.7	53.9	498.0	3206.0	-16.2
4575.58	V	225.00	1.0	53.7	-2.7	51.0	353.4	3206.0	-19.2
4575.58	H	180.00	1.0	52.6	-2.7	49.9	311.3	3206.0	-20.3
5490.91	V	135.00	1.0	45.2	-2.0	43.2	144.8	3206.0	-26.9
5490.91	H	135.00	1.0	40.4	-2.0	38.4	83.3	3206.0	-31.7
6406.06	V	135.00	1.0	46.2	0.0	46.2	204.8	3206.0	-23.9
6406.06	H	180.00	1.0	42.6	0.0	42.6	135.3	3206.0	-27.5
7321.21	V	180.00	1.0	45.8	2.2	48.0	251.2	3206.0	-22.1
7321.21	H	180.00	1.0	44.4	2.2	46.6	213.8	3206.0	-23.5
8236.36	V	135.00	1.0	43.9	2.2	46.1	201.8	3206.0	-24.0
8236.36	H	135.00	1.0	38.5	2.2	40.7	108.4	3206.0	-29.4
9151.51	V	0.00	1.0	37.2	2.4	39.6	95.4	3206.0	-30.5
9151.51	H	0.00	1.0	36.7	2.4	39.1	90.1	3206.0	-31.0

**Table 3 Cont'd.: FCC RF Radiated Spurious Emissions Data
Alternate Method to Confirm Compliance with Section 15.247(c)**

CLIENT: Schlumberger
MODEL NO: PIT MIU
TYPE/PART: 15.247 Class 2 Permissive Change
DATE: April 05, 2001
BY: John Lam
JOB #: 6418x

Channel 3

Frequency	Polarity	Azimuth	Antenna Height	SA Level (PEAK)	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	m	dBuV	dB/m	dBuV/m	uV/m	uV/m	dB
919.20	V	0.00	1.0	59.0	28.4	87.4	23405.3	2656.6	N/A
919.22	H	180.00	1.0	60.1	28.4	88.5	26566.0	2656.6	N/A
1838.40	H	270.00	1.0	61.0	-7.0	54.0	502.2	2656.6	-14.5
1838.60	V	157.50	1.0	63.0	-7.0	56.0	628.7	2656.6	-12.5
2757.45	H	270.00	1.0	55.7	-4.8	50.9	350.1	2656.6	-17.6
2757.90	V	135.00	1.0	55.4	-4.8	50.6	337.9	2656.6	-17.9
3676.65	V	90.00	1.0	57.7	-3.6	54.1	505.4	2656.6	-14.4
3676.80	H	45.00	1.0	52.7	-3.6	49.1	284.8	2656.6	-19.4
4596.26	H	90.00	1.0	47.0	-2.7	44.3	163.7	2656.6	-24.2
4596.26	V	90.00	1.0	49.0	-2.7	46.3	206.1	2656.6	-22.2
5515.20	H	0.00	1.0	43.0	-2.0	41.0	112.7	2656.6	-27.5
5515.20	V	0.00	1.0	44.0	-2.0	42.0	126.4	2656.6	-26.5
6434.41	V	45.00	1.0	43.7	0.1	43.8	155.5	2656.6	-24.7
6434.41	H	0.00	1.0	40.0	0.1	40.1	101.6	2656.6	-28.4
7353.00	H	0.00	1.0	36.0	2.2	38.2	81.3	2656.6	-30.3
7353.60	V	90.00	1.0	46.7	2.2	48.9	278.6	2656.6	-19.6
8272.90	V	90.00	1.0	42.0	2.2	44.2	162.2	2656.6	-24.3
8272.70	H	0.00	1.0	40.0	2.2	42.2	128.8	2656.6	-26.3
9191.95	H	0.00	1.0	38.0	2.4	40.4	105.2	2656.6	-28.0
9192.00	V	0.00	1.0	38.0	2.4	40.4	105.2	2656.6	-28.0

**Table 4: FCC RF Radiated Spurious Emissions Data
Alternate Method to Confirm Compliance with Section 15.247(c)**

CLIENT: Schlumberger
MODEL NO: SURF MIU (Wall Mount)
TYPE/PART: 15.247 Class 2 Permissive Change
DATE: 04.27.01
BY: John Lam
JOB #: 6418x

Channel 1

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB
910.90	V	90.00	1.0	61.5	28.2	89.7	30721.4	3527.3	18.8
910.90	H	180.00	1.0	62.7	28.2	90.9	35272.8	3527.3	20.0
1821.80	V	180.00	1.0	61.5	-7.1	54.4	526.7	3527.3	-16.5
1821.80	H	180.00	1.0	67.5	-7.1	60.4	1050.9	3527.3	-10.5
2732.70	V	90.00	1.0	57.9	-4.9	53.0	448.6	3527.3	-17.9
2732.70	H	180.00	1.0	50.3	-4.9	45.4	187.0	3527.3	-25.5
3643.60	V	112.50	1.0	51.0	-3.7	47.3	232.4	3527.3	-23.6
3643.60	H	112.50	1.0	49.8	-3.7	46.1	202.4	3527.3	-24.8
4554.50	V	45.00	1.0	45.6	-2.8	42.8	138.8	3527.3	-28.1
4554.50	H	180.00	1.0	49.7	-2.8	46.9	222.5	3527.3	-24.0
5465.40	V	112.50	1.0	39.8	-2.0	37.8	77.6	3527.3	-33.2
5465.40	H	112.50	1.0	39.5	-2.0	37.5	75.0	3527.3	-33.5
6376.19	V	45.00	1.0	39.0	-0.1	38.9	88.2	3527.3	-32.0
6376.19	H	90.00	1.0	38.5	-0.1	38.4	83.3	3527.3	-32.5
7287.20	V	0.00	1.0	38.6	2.2	40.8	109.6	3527.3	-30.1
7287.20	H	0.00	1.0	39.0	2.2	41.2	114.8	3527.3	-29.7
8198.10	V	0.00	1.0	40.7	2.2	42.9	139.6	3527.3	-28.0
8198.10	H	0.00	1.0	39.5	2.2	41.7	121.6	3527.3	-29.2
9109.00	V	0.00	1.0	37.2	2.3	39.5	94.8	3527.3	-31.4
9109.00	H	0.00	1.0	37.0	2.3	39.3	92.7	3527.3	-31.6

**Table 4 Cont'd.: FCC RF Radiated Spurious Emissions Data
Alternate Method to Confirm Compliance with Section 15.247(c)**

CLIENT: Schlumberger
 MODEL NO: SURF MIU (Wall Mount)
 TYPE/PART: 15.247 Class 2 Permissive Change
 DATE: 04.26.01
 BY: John Lam
 JOB #: 6418x

Channel 2

Frequency	Polarity	Azimuth	Antenna	SA Level	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	Height m	(Peak) dBuV	dB/m	dBuV/m	uV/m	uV/m	dB
915.10	V	0.00	1.0	62.4	28.3	90.7	34350.0	4035.8	N/A
915.10	H	180.00	1.0	63.8	28.3	92.1	40357.7	4035.8	N/A
1830.20	V	180.00	1.0	60.0	-7.0	53.0	445.9	4035.8	-19.1
1830.20	H	180.00	1.0	69.8	-7.0	62.8	1376.4	4035.8	-9.3
2745.30	V	270.00	1.0	49.0	-4.8	44.2	161.4	4035.8	-28.0
2745.30	H	112.50	1.0	52.9	-4.8	48.1	254.0	4035.8	-24.0
3660.40	V	112.50	1.0	48.1	-3.7	44.4	166.4	4035.8	-27.7
3660.40	H	247.50	1.0	43.5	-3.7	39.8	98.2	4035.8	-32.3
4575.50	V	112.50	1.0	47.1	-2.7	44.4	165.9	4035.8	-27.7
4575.50	H	90.00	1.0	48.4	-2.7	45.7	191.7	4035.8	-26.5
5490.60	V	0.00	1.0	40.5	-2.0	38.5	84.3	4035.8	-33.6
5490.60	H	0.00	1.0	38.9	-2.0	36.9	70.1	4035.8	-35.2
6405.70	V	0.00	1.0	39.0	0.0	39.0	89.4	4035.8	-33.1
6405.70	H	0.00	1.0	38.6	0.0	38.6	85.4	4035.8	-33.5
7320.80	V	0.00	1.0	38.4	2.2	40.6	107.2	4035.8	-31.5
7320.80	H	0.00	1.0	40.2	2.2	42.4	131.2	4035.8	-29.8
8235.90	V	0.00	1.0	37.0	2.2	39.2	91.2	4035.8	-32.9
8235.90	H	0.00	1.0	40.9	2.2	43.1	142.2	4035.8	-29.1
9151.00	V	0.00	1.0	38.2	2.4	40.6	107.0	4035.8	-31.5
9151.00	H	0.00	1.0	39.2	2.4	41.6	120.1	4035.8	-30.5

**Table 4 Cont'd.: FCC RF Radiated Spurious Emissions Data
Alternate Method to Confirm Compliance with Section 15.247(c)**

CLIENT: Schlumberger
MODEL NO: SURF MIU (Wall Mount)
TYPE/PART: 15.247 Class 2 Permissive Change
DATE: April 24, 2001
BY: John Lam
JOB #: 6418x

Channel 3

Frequency	Polarity	Azimuth	Antenna Height	SA Level (PEAK)	AFc	E-Field	E-Field	Limit	Margin
MHz	H/V	Degree	m	dBuV	dB/m	dBuV/m	uV/m	uV/m	dB
919.20	V	180.00	1.0	63.2	28.4	91.6	37959.0	4162.2	N/A
919.22	H	270.00	1.0	64.0	28.4	92.4	41622.4	4162.2	N/A
1838.40	H	180.00	1.0	70.1	-7.0	63.1	1431.8	4162.2	-9.3
1838.60	V	180.00	1.0	59.0	-7.0	52.0	399.0	4162.2	-20.4
2757.45	H	180.00	1.0	49.5	-4.8	44.7	171.3	4162.2	-27.7
2757.60	V	112.50	1.0	58.0	-4.8	53.2	455.8	4162.2	-19.2
3676.65	V	247.50	1.0	52.3	-3.6	48.7	272.0	4162.2	-23.7
3676.80	H	180.00	1.0	45.8	-3.6	42.2	128.7	4162.2	-30.2
4596.00	H	112.50	1.0	50.7	-2.7	48.0	249.8	4162.2	-24.4
4596.26	V	180.00	1.0	52.2	-2.7	49.5	296.9	4162.2	-22.9
5515.20	H	112.50	1.0	39.8	-2.0	37.8	77.9	4162.2	-34.6
5515.20	V	0.00	1.0	39.5	-2.0	37.5	75.3	4162.2	-34.9
6434.40	H	0.00	1.0	39.4	0.1	39.5	94.8	4162.2	-32.9
6434.40	V	0.00	1.0	39.1	0.1	39.2	91.6	4162.2	-33.2
7353.61	V	0.00	1.0	39.0	2.2	41.2	114.8	4162.2	-31.2
7353.61	H	0.00	1.0	40.0	2.2	42.2	128.8	4162.2	-30.2
8272.70	V	0.00	1.0	38.9	2.2	41.1	113.5	4162.2	-31.3
8272.70	H	0.00	1.0	38.5	2.2	40.7	108.4	4162.2	-31.7
9191.95	V	0.00	1.0	38.6	2.4	41.0	112.8	4162.2	-31.3
9191.95	H	0.00	1.0	38.4	2.4	40.8	110.2	4162.2	-31.5

3.5 Carrier Bandwidth Testing

Since the impedance of the antenna terminal could not be matched by using a piece of a coax, this test could not be performed as a conducted test and the alternate radiated test method was used. The EUT was placed close to the receive antenna and the spectrum analyzer resolution bandwidth was set to 9 kHz and the video bandwidth was set to 30 kHz. The highest peak of the carrier was centered on the display of the spectrum analyzer display. The 20dB bandwidth of the modulated carrier was measured and compared to the FCC limit.

Spectrum analyzer plots of the bandwidths are located in Exhibit 1. The measured 20dB bandwidth for each unit is as follows:

PIT MIU:

Low Channel: 111kHz
Mid Channel: 122kHz
High Channel: 103kHz

SURF MIU (Wall Mount)

Low Channel: 285kHz
Mid Channel: 280kHz
High Channel: 270kHz

Table 5

System Under Test

FCC ID: F9CTALSRFW1

EUT: Schlumberger Industries, Inc. PIT and SURF Meter Interface Unit; M/N's: PIT MIU and SURF MIU; S/N: N/A; FCC ID: F9CTALSRFW1

Table 6
Interface Cables Used

Non-shielded, 20 gauge wires (one meter long) were attached to the encoder terminals during testing.

Table 7
Measurement Equipment Used

The following equipment is used to perform measurements:

Hewlett-Packard Spectrum Analyzer: HP 8568B

Hewlett-Packard Quasi-Peak Adapter: HP 85650A

Hewlett-Packard Preselector: HP 85685A

Hewlett-Packard Spectrum Analyzer: HP 8564E

Hewlett-Packard Pre-Amplifier: HP 8449A

Antenna Research Associates, Inc. Biconical Log Periodic Antenna: LPB-2520A (Site 2)

Antenna Research Associates, Inc. Horn Antenna: DRG-118/A

Solar 50 Ω /50 μ H Line Impedance Stabilization Network: 8012-50-R-24-BNC

Solar 50 Ω /50 μ H Line Impedance Stabilization Network: 8028-50-TS-24-BNC

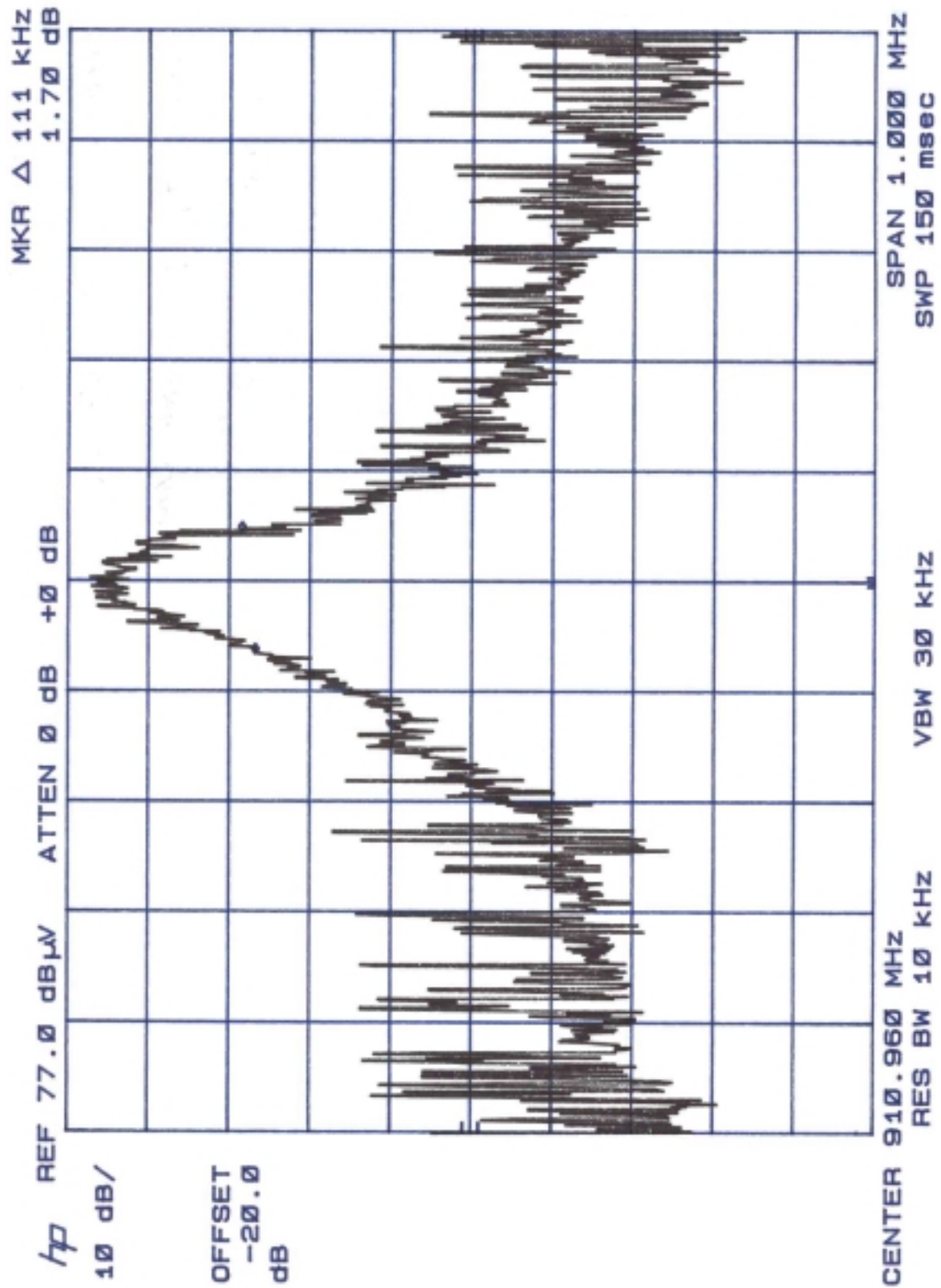
AH Systems, Inc. Portable Antenna Mast: AMS-4 (Site 2)

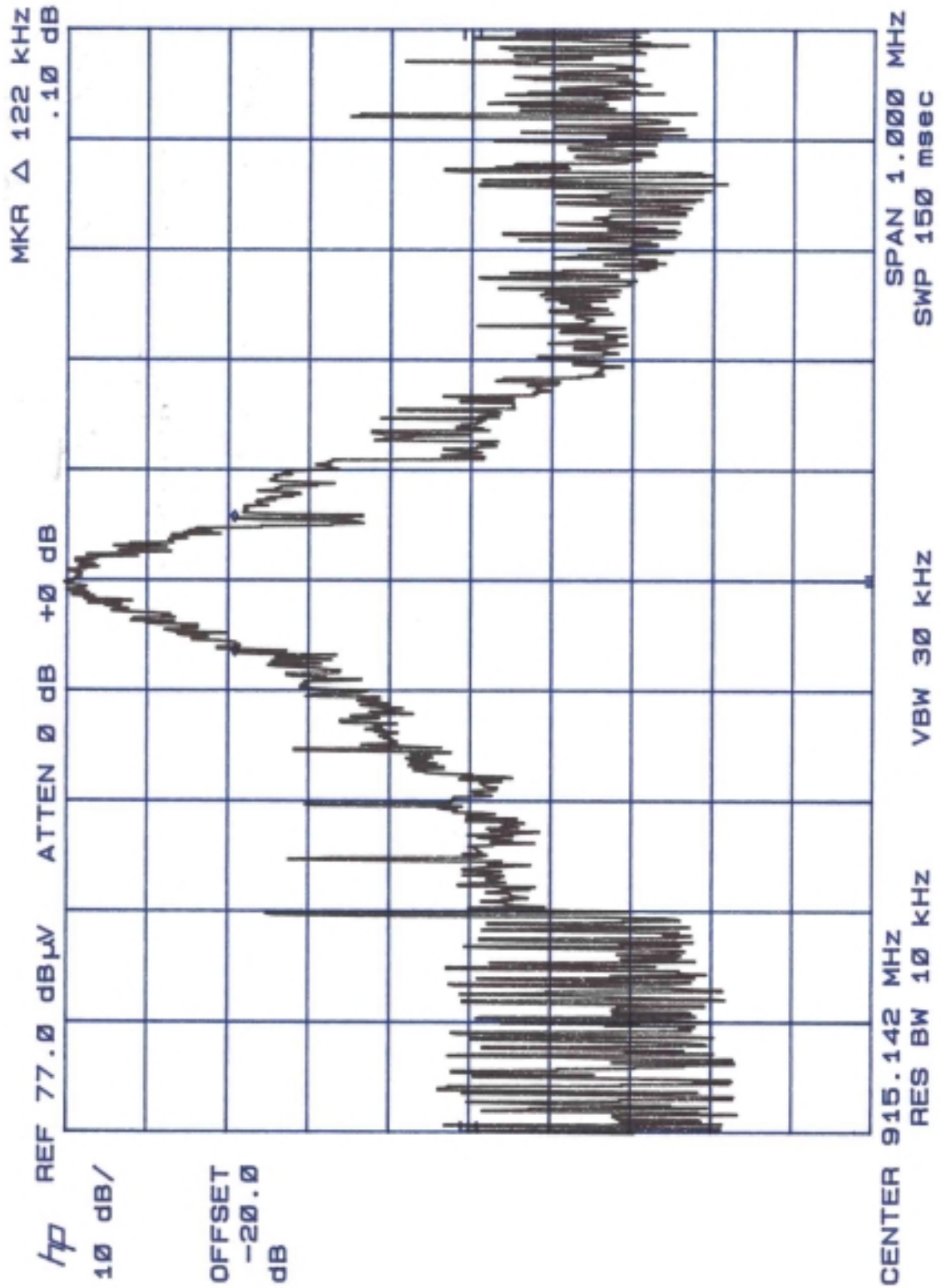
AH Systems, Inc. Motorized Turntable (Site 2)

RG-214 semi-rigid coaxial cable

RG-223 double-shielded coaxial cable

Exhibit 1. Carrier Bandwidth Plots, Pit Mount





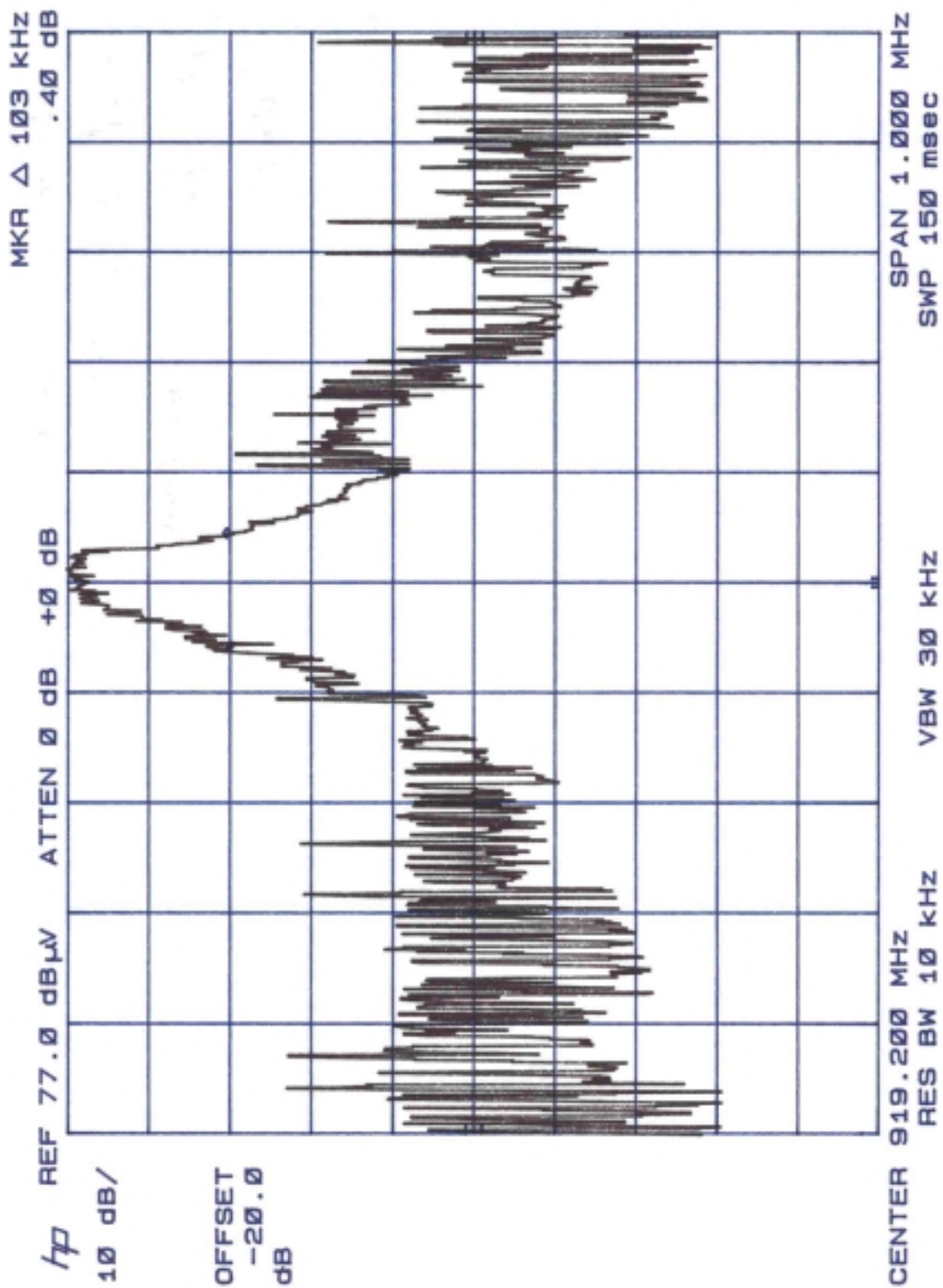
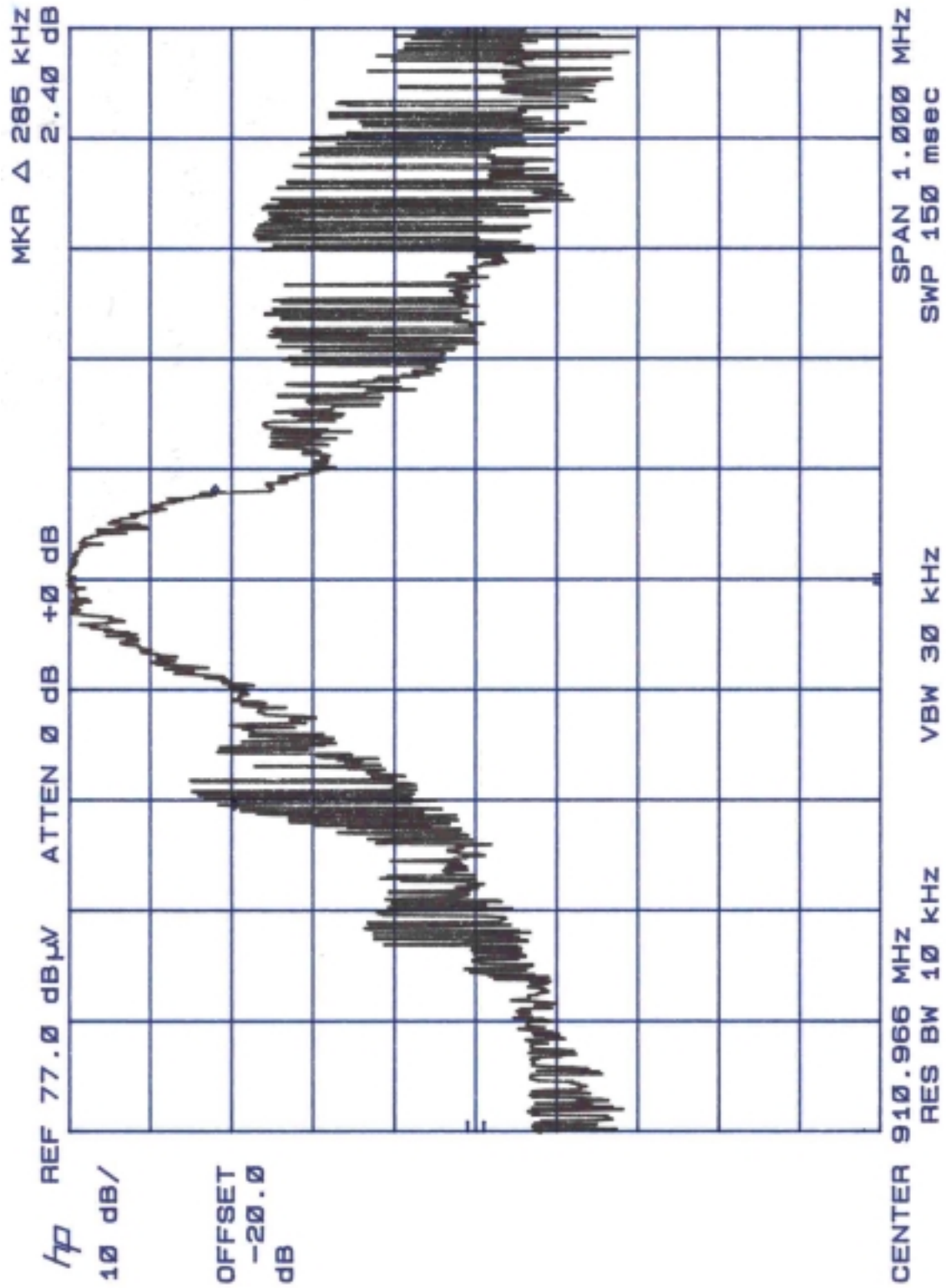
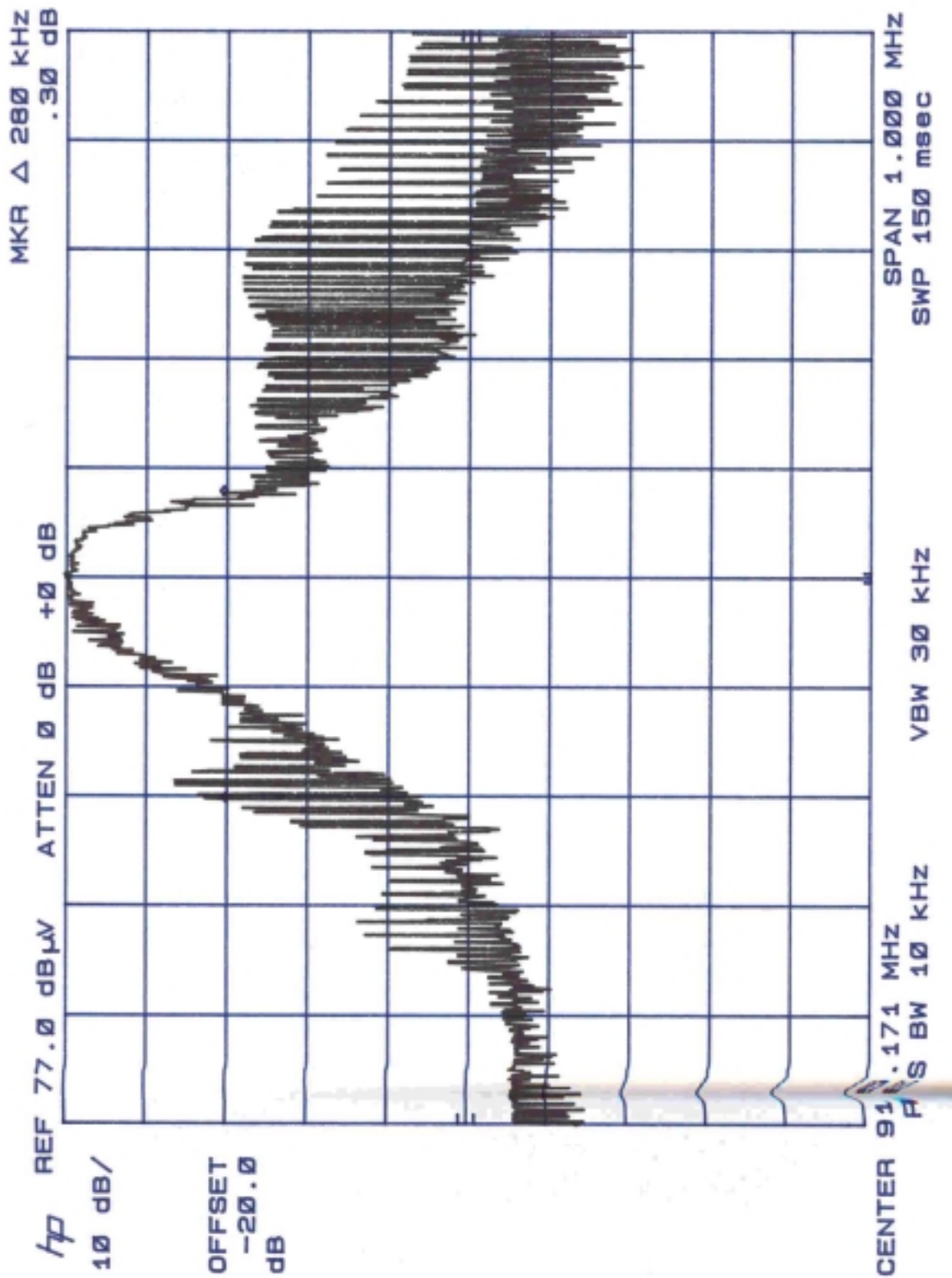
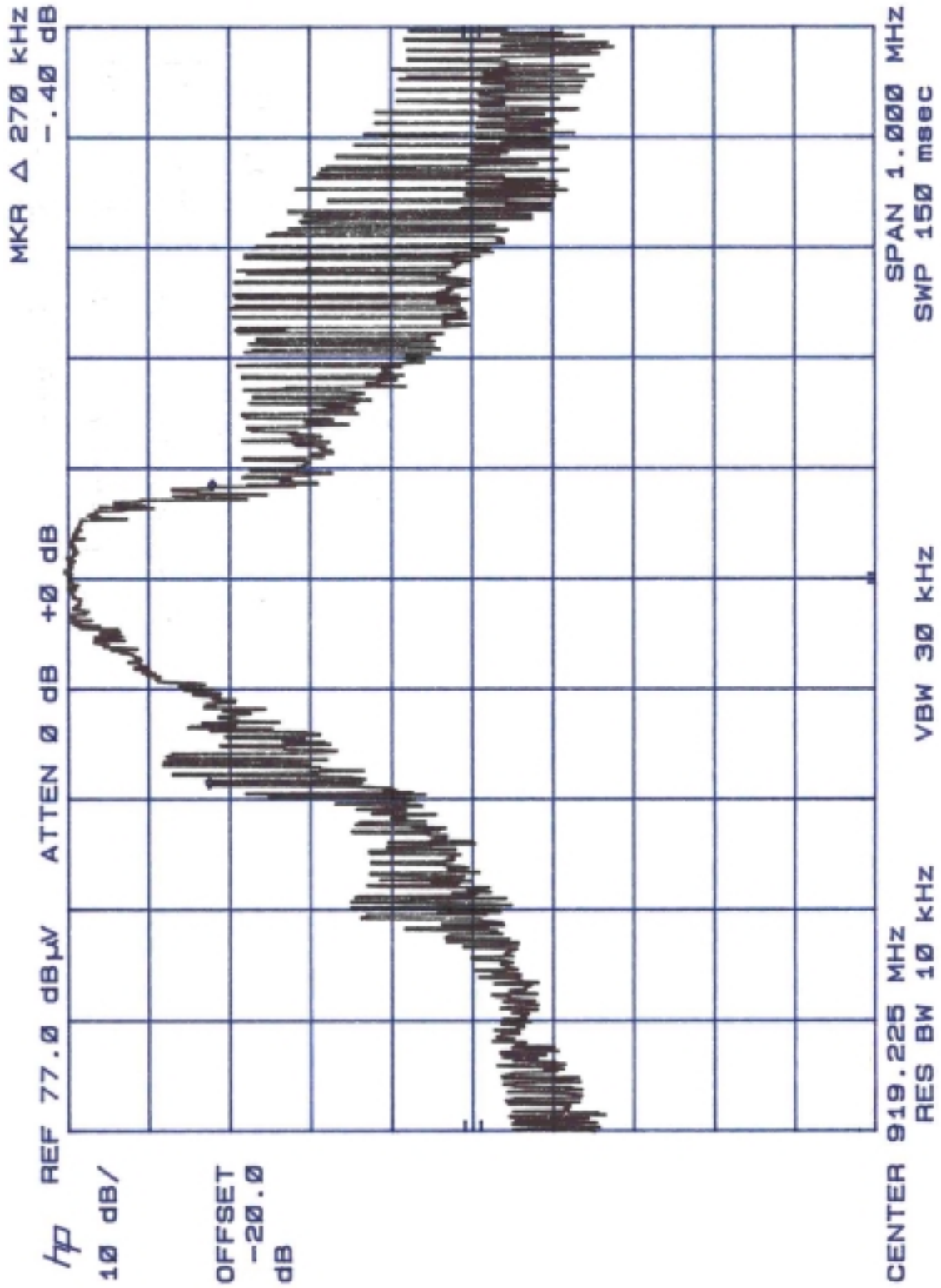


Exhibit 1 (cont'd): Carrier Bandwidth Plots Wall Mount







Appendix A

Statement of Measurement Uncertainty

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± 2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB