FCC CLASS II PERMISSIVE CHANGE TEST REPORT

for

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

FCC ID: F9CTALSRFW1

June 17, 1999

WLL PROJECT #: 5108X

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APPENDICES

Appendix A. **Statement of Measurement Uncertainty**

WASHINGTON LABORATORIES, LTD.
7560 Lindbergh Drive • Gaithersburg, Maryland 20879 • (301) 417-0220 • Fax (301) 417-9069 • (800) 839-1649
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STATEMENT OF QUALIFICATIONS

for

Gregory M. Snyder

Washington Laboratories, Ltd.

I hold a Bachelor of Science in Electronics Engineering Technology and have over ten years of EMI testing experience. I am qualified to perform EMC testing to the methods described in this test report. The measurements taken within this report are accurate within my ability to perform the tests and within the tolerance of the measuring instrumentation.

By: [signature]
Gregory M. Snyder
Chief EMC Engineer

Date: June 17, 1999

FCC CLASS II PERMISSIVE CHANGE TEST REPORT

for

Schlumberger Industries, Inc.

FCC ID: F9CTALSRFW1

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, Model: PIT 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, Model: PIT MIU is a Pit Meter Interface Unit that is a compact electronic device that collects meter reading data from an encoder register and transmits the data for collection by the meter reader. . 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 PIT MIU is the same as the Schlumberger Industries, Inc., Model: SURF^{TM} MIU except that it is mounted in a cement pit at ground level and contains a different antenna which mounts on the pit cover at ground level. The antenna is removable but contains a unique connector. Refer to Exhibit 2 for e-mail attachment referencing to conversation concerning this Class II Permissive Change request.

2.1 On-board Oscillators

The Schlumberger Industries, Inc. 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 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 Table 1. 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.

Table 1

FCC Part 15.247(c) 3 M Radiated Emissions Data

CLIENT: Schlumberger Industries, Inc.
FCC ID: F9CTALSRFW1
MODEL: PIT MIU
DATE: 6/2/99
BY: Greg Snyder
JOB #: 5108X

Channel 1

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (AVG) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
2732.80	V	225.00	1.0	43.4	-2.2	41.2	115.2	500.0	-12.7
2732.80	H	90.00	1.0	43.6	-2.2	41.4	117.9	500.0	-12.5
3643.83	V	90.00	1.0	42.0	-1.6	40.4	104.7	500.0	-13.6
3643.83	H	135.00	1.0	40.8	-1.6	39.2	91.2	500.0	-14.8
4554.68	V	180.00	1.0	41.8	-0.4	41.4	118.0	500.0	-12.5
4554.68	H	112.50	1.0	39.8	-0.4	39.4	93.8	500.0	-14.5
5465.68	V	90.00	1.0	38.5	1.4	39.9	98.7	500.0	-14.1
5465.68	H	90.00	1.0	36.2	1.4	37.6	75.7	500.0	-16.4

Peak Measurements Above 1 GHz

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (PEAK) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
1821.87	V	90.00	1.0	66.2	-5.1	61.1	1140.7	5000.0	-12.8
1821.87	H	135.00	1.0	61.0	-5.1	55.9	626.8	5000.0	-18.0
2732.80	V	225.00	1.0	56.4	-2.2	54.2	514.7	5000.0	-19.7
2732.80	H	90.00	1.0	56.3	-2.2	54.1	508.8	5000.0	-19.8
3643.83	V	90.00	1.0	54.6	-1.6	53.0	446.7	5000.0	-21.0
3643.83	H	135.00	1.0	50.2	-1.6	48.6	269.2	5000.0	-25.4
4554.68	V	180.00	1.0	52.7	-0.4	52.3	414.0	5000.0	-21.6
4554.68	H	112.50	1.0	50.2	-0.4	49.8	310.5	5000.0	-24.1
5465.68	V	90.00	1.0	50.8	1.4	52.2	406.6	5000.0	-21.8
5465.68	H	90.00	1.0	46.8	1.4	48.2	256.5	5000.0	-25.8

Table 1 Cont'd.

FCC Part 15.247 (c) 3 M Radiated Emissions Data

CLIENT: Schlumberger Industries, Inc.
FCC ID: F9CTALSRFW1
MODEL: PIT MIU
DATE: 6/2/99
BY: Greg Snyder
JOB #: 5108X

Channel 2

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (AVG) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
2745.47	H	135.00	1.0	44.5	-2.1	42.4	131.2	500.0	-11.6
2745.47	V	180.00	1.0	43.5	-2.1	41.4	116.9	500.0	-12.6
3660.56	H	180.00	1.0	38.8	-1.6	37.2	72.4	500.0	-16.8
3660.56	V	135.00	1.0	43.5	-1.6	41.9	124.5	500.0	-12.1
4575.67	H	135.00	1.0	40.7	-0.3	40.4	104.5	500.0	-13.6
4575.67	V	135.00	1.0	41.5	-0.3	41.2	114.6	500.0	-12.8
8236.20	V	135.00	1.0	37.7	7.0	44.7	170.9	500.0	-9.3

Peak Measurements Above 1 GHz

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (PEAK) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
1830.30	H	135.00	1.0	65.4	-5.0	60.4	1046.4	5000.0	-13.6
1830.30	V	90.00	1.0	65.8	-5.0	60.8	1095.8	5000.0	-13.2
2745.47	H	135.00	1.0	57.8	-2.1	55.7	606.6	5000.0	-18.3
2745.47	V	180.00	1.0	55.6	-2.1	53.5	470.8	5000.0	-20.5
3660.56	H	180.00	1.0	51.2	-1.6	49.6	302.0	5000.0	-24.4
3660.56	V	135.00	1.0	56.4	-1.6	54.8	549.5	5000.0	-19.2
4575.67	H	135.00	1.0	52.3	-0.3	52.0	398.8	5000.0	-22.0
4575.67	V	135.00	1.0	52.7	-0.3	52.4	416.1	5000.0	-21.6
5490.80	H	315.00	1.0	48.6	1.4	50.0	317.2	5000.0	-24.0
5490.80	V	90.00	1.0	50.6	1.4	52.0	399.3	5000.0	-22.0
6406.01	V	180.00	1.0	47.6	4.1	51.7	385.5	5000.0	-22.3
8236.25	V	135.00	1.0	49.3	7.0	56.3	649.6	5000.0	-17.7

Table 1 Cont'd.

FCC Part 15.247(c) 3 M Radiated Emissions Data

CLIENT: Schlumberger Industries, Inc.
FCC ID: F9CTALSRFW1
MODEL: PIT MIU
DATE: 6/2/99
BY: Greg Snyder
JOB #: 5108X

Channel 3

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (AVG) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
2757.60	V	315.00	1.0	43.7	-2.1	41.6	120.0	500.0	-12.4
2757.60	H	135.00	1.0	43.4	-2.1	41.3	115.9	500.0	-12.7
3676.76	V	180.00	1.0	40.9	-1.6	39.3	92.3	500.0	-14.7
3676.76	H	180.00	1.0	36.8	-1.6	35.2	57.5	500.0	-18.8
4596.06	V	225.00	1.0	41.5	-0.3	41.2	115.2	500.0	-12.8
4596.06	H	135.00	1.0	37.6	-0.3	37.3	73.5	500.0	-16.7

Peak Measurements Above 1 GHz

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (PEAK) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
1838.58	V	90.00	1.0	63.8	-5.0	58.8	875.4	5000.0	-15.1
1838.58	H	90.00	1.0	60.6	-5.0	55.6	605.6	5000.0	-18.3
2757.60	V	315.00	1.0	56.5	-2.1	54.4	523.8	5000.0	-19.6
2757.60	H	135.00	1.0	56.4	-2.1	54.3	517.8	5000.0	-19.7
3676.76	V	180.00	1.0	54.5	-1.6	52.9	441.6	5000.0	-21.1
3676.76	H	180.00	1.0	48.5	-1.6	46.9	221.3	5000.0	-27.1
4596.06	V	225.00	1.0	53.2	-0.3	52.9	443.0	5000.0	-21.1
4596.06	H	135.00	1.0	44.8	-0.3	44.5	168.4	5000.0	-29.5
5515.06	V	135.00	1.0	49.6	1.5	51.1	357.6	5000.0	-22.9
5515.06	H	180.00	1.0	48.5	1.5	50.0	315.1	5000.0	-24.0
6434.20	V	180.00	1.0	46.8	4.2	51.0	356.5	5000.0	-22.9

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 10^{th} 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 2.

Table 2

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

CLIENT: Schlumberger Industries, Inc.
FCC ID: F9CTALSRFW1
MODEL: PIT MIU
DATE: 6/2/99
BY: Greg Snyder
JOB #: 5108X

Channel 1

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (Peak) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
910.96	H	270.00	1.0	54.0	28.2	82.2	12956.6	N/A	N/A
910.96	V	315.00	1.0	56.2	28.2	84.4	16691.3	N/A	N/A
1821.87	V	90.00	1.0	65.8	-5.1	60.7	1089.3	1669.1	-3.7
1821.87	H	135.00	1.0	61.2	-5.1	56.1	641.4	1669.1	-8.3
2732.80	V	225.00	1.0	54.0	-2.2	51.8	390.4	1669.1	-12.6
2732.80	H	90.00	1.0	54.8	-2.2	52.6	428.1	1669.1	-11.8
3643.83	V	90.00	1.0	52.0	-1.6	50.4	331.1	1669.1	-14.0
3643.83	H	135.00	1.0	45.8	-1.6	44.2	162.2	1669.1	-20.2
4554.68	V	180.00	1.0	49.6	-0.4	49.2	289.8	1669.1	-15.2
4554.68	H	112.50	1.0	49.5	-0.4	49.1	286.4	1669.1	-15.3
5465.68	V	90.00	1.0	47.5	1.4	48.9	278.1	1669.1	-15.6
5465.68	H	90.00	1.0	40.8	1.4	42.2	128.6	1669.1	-22.3

Table 2 Cont'd.

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

CLIENT:	Schlumberger Industries, Inc.
FCC ID:	F9CTALSRFW1
MODEL:	PIT MIU
DATE:	6/2/99
BY:	Greg Snyder
JOB #:	5108X

Channel 2

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (QP) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
915.15	V	0.00	1.0	55.1	28.3	83.4	14824.1	N/A	N/A
915.15	H	0.00	1.0	53.2	28.3	81.5	11911.5	N/A	N/A
1830.30	H	135.00	1.0	64.0	-5.0	59.0	890.7	1482.4	-4.4
1830.30	V	90.00	1.0	65.2	-5.0	60.2	1022.6	1482.4	-3.2
2745.47	H	135.00	1.0	56.5	-2.1	54.4	522.2	1482.4	-9.1
2745.47	V	180.00	1.0	53.8	-2.1	51.7	382.7	1482.4	-11.8
3660.56	H	180.00	1.0	48.0	-1.6	46.4	208.9	1482.4	-17.0
3660.56	V	135.00	1.0	54.6	-1.6	53.0	445.7	1482.4	-10.4
4575.67	H	135.00	1.0	49.5	-0.3	49.2	287.9	1482.4	-14.2
4575.67	V	135.00	1.0	50.8	-0.3	50.5	334.4	1482.4	-12.9
5490.80	H	315.00	1.0	43.2	1.4	44.6	170.3	1482.4	-18.8
5490.80	V	90.00	1.0	47.2	1.4	48.6	270.0	1482.4	-14.8
6406.01	V	180.00	1.0	43.0	4.1	47.1	227.0	1482.4	-16.3
8236.20	V	135.00	1.0	45.0	7.0	52.0	396.0	1482.4	-11.5

Table 2 Cont'd.

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

CLIENT:	Schlumberger Industries, Inc.
FCC ID:	F9CTALSRFW1
MODEL:	PIT MIU
DATE:	6/2/99
BY:	Greg Snyder
JOB #:	5108X

Channel 3

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (PEAK) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
1838.58	V	90.00	1.0	63.8	-5.0	58.8	875.4	5000.0	-15.1
1838.58	H	90.00	1.0	60.6	-5.0	55.6	605.6	5000.0	-18.3
2757.60	V	315.00	1.0	56.5	-2.1	54.4	523.8	5000.0	-19.6
2757.60	H	135.00	1.0	56.4	-2.1	54.3	517.8	5000.0	-19.7
3676.76	V	180.00	1.0	54.5	-1.6	52.9	441.6	5000.0	-21.1
3676.76	H	180.00	1.0	48.5	-1.6	46.9	221.3	5000.0	-27.1
4596.06	V	225.00	1.0	53.2	-0.3	52.9	443.0	5000.0	-21.1
4596.06	H	135.00	1.0	44.8	-0.3	44.5	168.4	5000.0	-29.5
5515.06	V	135.00	1.0	49.6	1.5	51.1	357.6	5000.0	-22.9
5515.06	H	180.00	1.0	48.5	1.5	50.0	315.1	5000.0	-24.0
6434.20	V	180.00	1.0	46.8	4.2	51.0	356.5	5000.0	-22.9

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 10 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 2. The measured 20dB bandwidth was 118.5 kHz for the Low Channel, 108 kHz for the Mid Channel, and 125.5 kHz for the High Channel.

3.6 Power Output 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 3 MHz (maximum) and the video bandwidth was set to 3 MHz (maximum). The amplitude of the EUT carrier was measured and the following formula was used to calculate the output power:

$$P = (Ed)^2/30G$$

P = Power in Watts
E = Maximum field strength in V/m
d = Measurement distance in meters
G = Numeric gain of transmitting antenna.

For this EUT G = 1 and the measurement distance was 3 meters. Therefore;

Channel 1 Power = $(0.0907*3)^2/(30*1)$ = 0.131mW

Channel 2 Power = $(0.018*3)^2/(30*1)$ = 0.0097mW

Channel 3 Power = $(0.018*3)^2/(30*1)$ = 0.095mW

3.7 Radio Frequency Radiation Exposure

Based on the above data, the worst case RF output power of the unit occurs at the Low Channel, 910.96 MHz. According to Section 1.1310 of the FCC rules, the uncontrolled RF exposure limit for this frequency range is 0.607mW/cm^2. The gain of the antenna is 0 dBi. To comply with the exposure limits for this section, humans must not be too close to the transmit antenna. The following formula was used to calculate the minimum distances:

$S = (PG)/(4\pi R^2)$

Where,
S = Power Density
P = Output Power at the Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

For this device, the calculation is as follows:
S = FCC Limit = 0.607mW/cm^2
P = Output Power = 0.131 mW
G = Worst Case Gain = 0 dBi = INVLOG(0/10) = 1

Therefore the minimum distance is 0.13 cm. This minimum distance requirement is maintained via the enclosure of the device as well as the device is not located near where people are likely to be.

Table 2

System Under Test

FCC ID: F9CTALSRFW1

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

Table 3

Interface Cables Used

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

Table 4

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 µH Line Impedance Stabilization Network: 8012-50-R-24-BNC

Solar 50 Ω/50 µH 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)

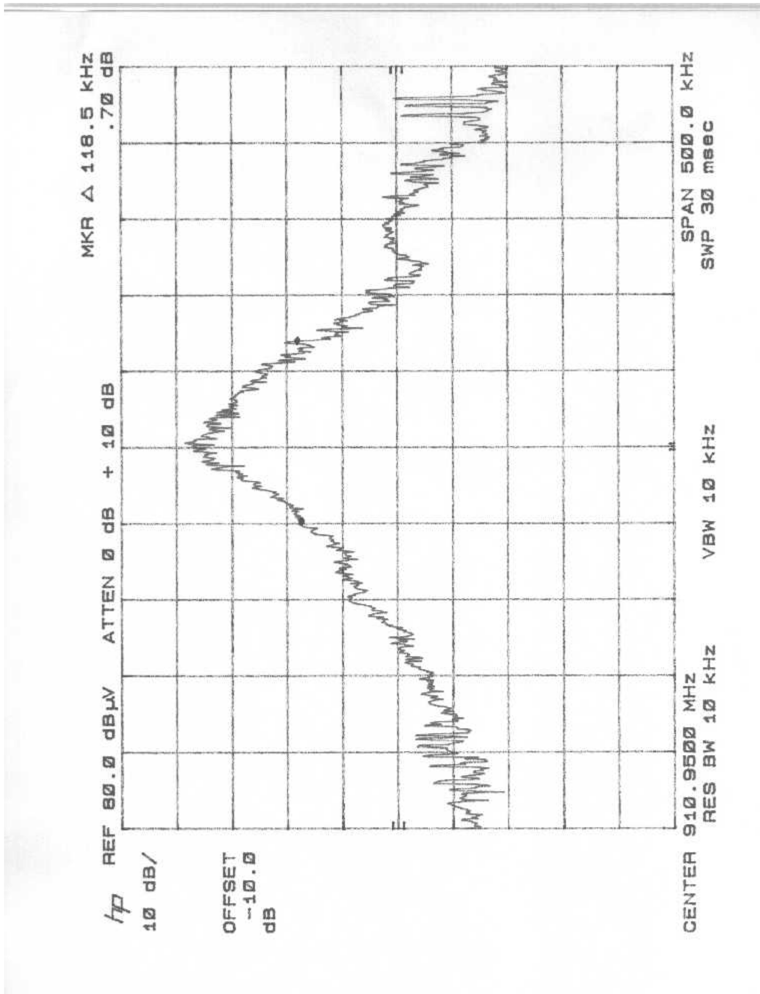
RG-214 semi-rigid coaxial cable

RG-223 double-shielded coaxial cable

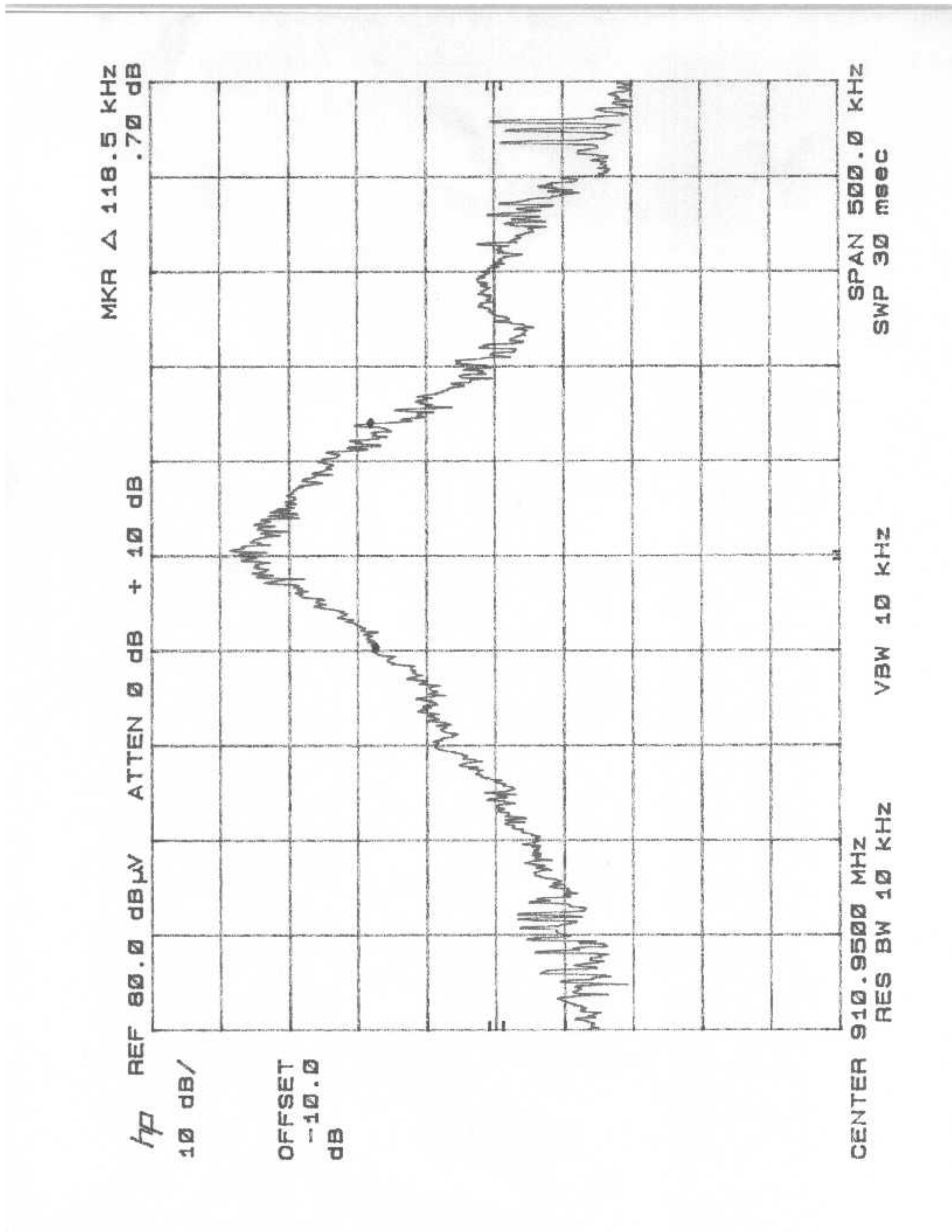
EXHIBIT 1

OCCUPIED BANDWIDTH PLOTS

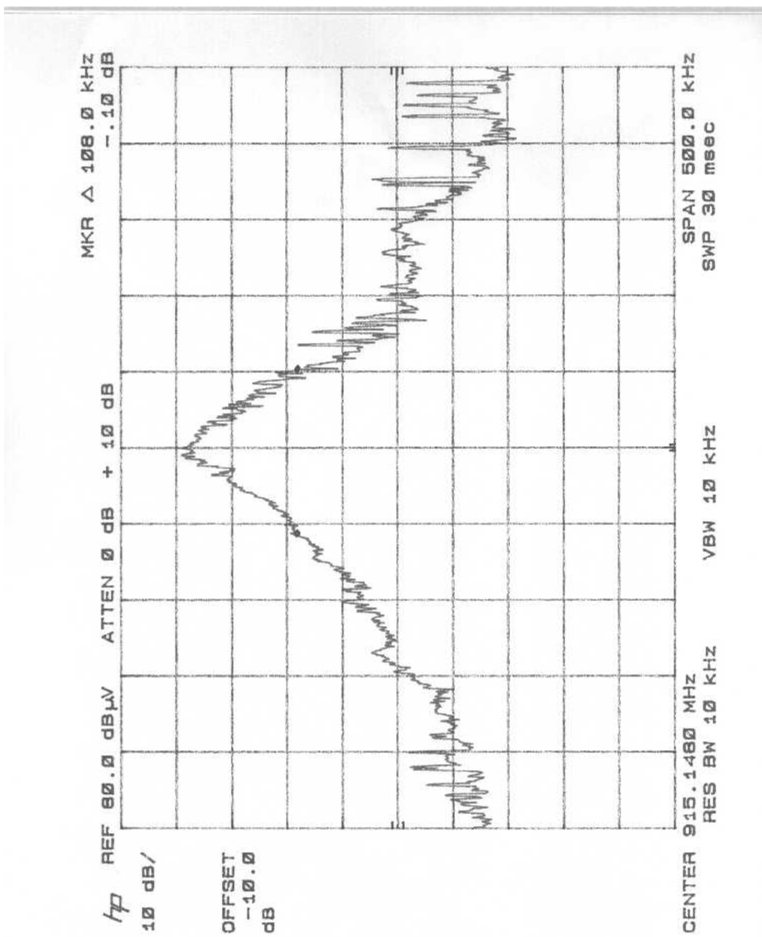
Low Channel

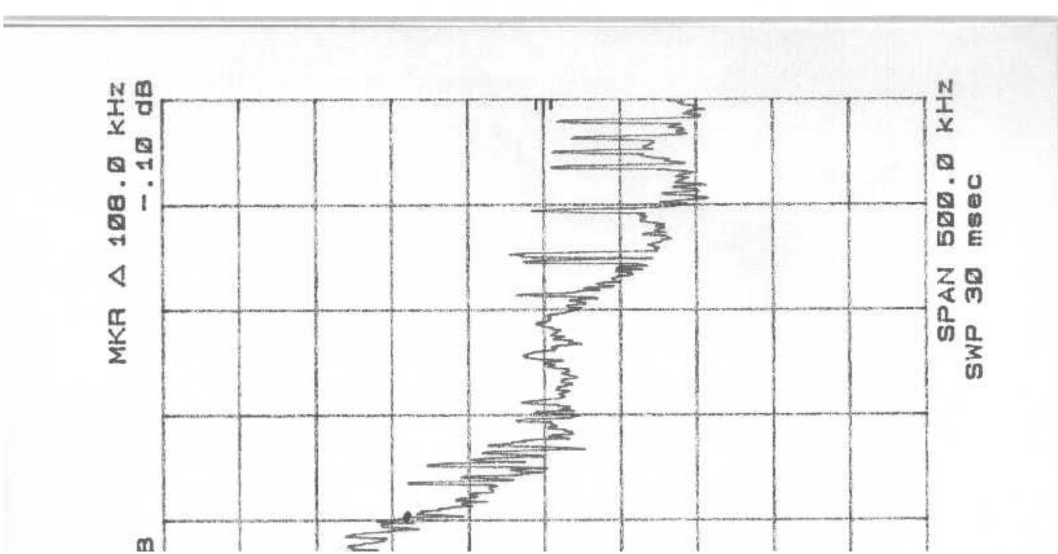


REF 80.0 dBμV
ATTEN 0 dB + 10 dB
MKR Δ 118.5 kHz
.70 dB
10 dB/
OFFSET
-10.0
dB
CENTER 910.9500 MHz
RES BW 10 kHz
VBW 10 kHz
SPAN 500.0 kHz
SWP 30 msec

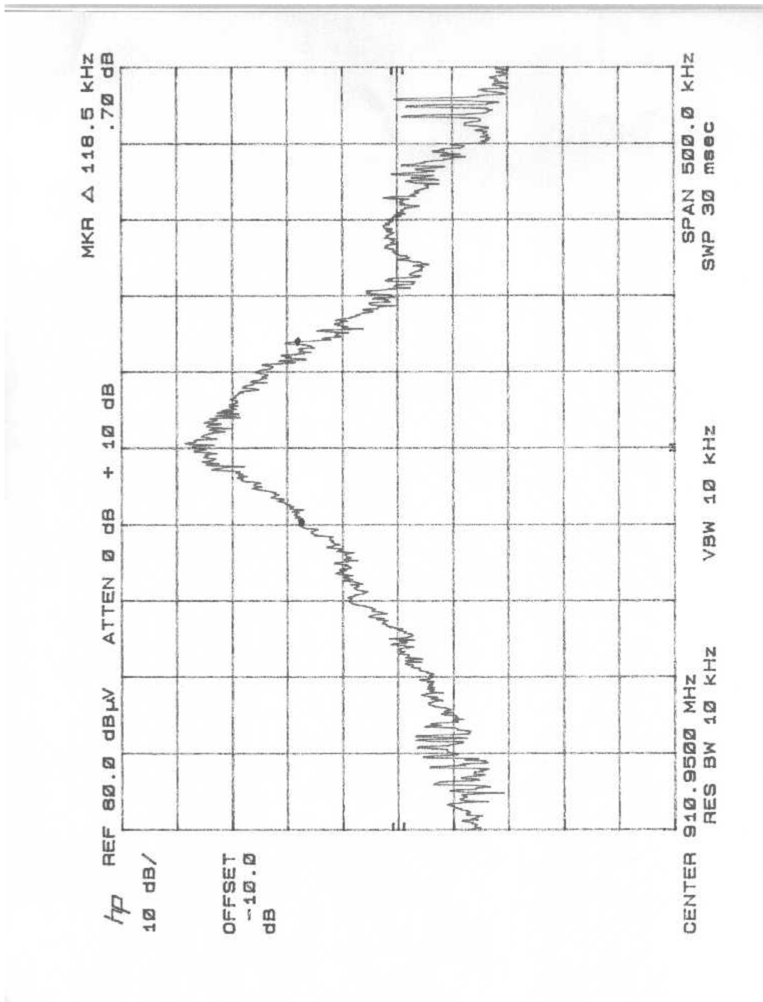

hp
REF 80.0 dBµV
ATTEN 0 dB + 10 dB
MKR Δ 118.5 kHz
.70 dB
10 dB/
OFFSET
-10.0
dB
CENTER 910.9500 MHz
RES BW 10 kHz
VBW 10 kHz
SPAN 500.0 kHz
SWP 30 msec

Mid Channel

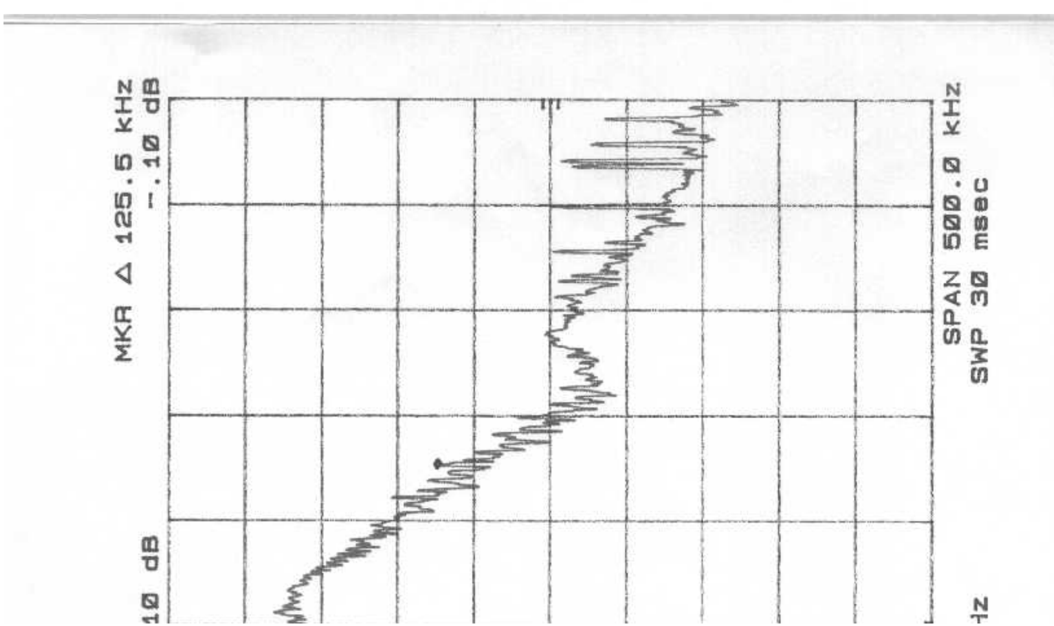

REF 80.0 dBμV
ATTEN 0 dB + 10 dB
MKR Δ 108.0 kHz
-.10 dB
10 dB/
OFFSET
-10.0
dB
CENTER 915.1480 MHz
RES BW 10 kHz
VBW 10 kHz
SPAN 500.0 kHz
SWP 30 msec


MKR Δ 108.0 kHz
-.10 dB
SPAN 500.0 kHz
SWP 30 msec

High Channel



MKR Δ 118.5 kHz
.70 dB
REF 80.0 dBµV
ATTEN 0 dB + 10 dB
10 dB/
OFFSET
-10.0
dB
CENTER 910.9500 MHz
RES BW 10 kHz
VBW 10 kHz
SPAN 500.0 kHz
SWP 30 msec



MKR Δ 125.5 kHz
-.10 dB
10 dB
SPAN 500.0 kHz
SWP 30 msec

EXHIBIT 2

Copy of E-Mail Referencing This Class II Permissive Change

Greg Snider,
This e-mail needs to be included in the Class II permissive
change filing. I talked to Greg Czumak and he said to include this e-mail ands a note that I had talked to him about this filing.

Jim Brennan

>X-Sender: mhill@pop.elliottlabs.com
>X-Mailer: QUALCOMM Windows Eudora Pro Version 3.0.5 (32)
>Date: Fri, 30 Apr 1999 09:02:53 -0700
>To: jbrennan@tallassee.rms.slb.com
>From: Mark Hill <mhill@elliottlabs.com>
>Subject: Antenna Change Question -Reply
>
>>Delivered-To: mhill@elliottlabs.com
>>X-Mailer: Novell GroupWise 4.1
>>Date: Fri, 30 Apr 1999 09:50:34 -0400
>>From: Rich Fabina <RFABINA@fcc.gov>
>>To: mhill@elliottlabs.com
>>Subject: Antenna Change Question -Reply
>>
>>Mark,
>>
>>The changes described below may be made using a Class II permissive
>>change filing. A new grant of equipment authorization does not have to
>>be filed for these changes.
>>
>>Please include a copy of this reply with the Class II permissive change
>>filing.
>>
>>I trust that this has answered this inquiry.
>>
>>Rich Fabina
>>
>>>>> Mark Hill <mhill@elliottlabs.com> 04/28/99 06:31pm >>>
>>Richard,
>>
>>We have a client that has made a change to their product (FCC ID:
>>F9CTALWCNMIU1) and we would like to know whether they can submit
>>as a
>>permissive change or is a full application needed.
>>
>>The original product is a 902-928 MHz spread spectrum radio. It uses an
>>antenna soldered to the transmitter printed wiring board, and the entire
>>assembly is enclosed in a plastic box. The unit is use as a wireless
>>water
>>meter. The granted meter was designed to be wall mounted.
>>
>>The new product uses the same radio. They have replaced the original
>>antenna with an external antenna. The new antenna is connected to the
>>printed wiring board with a small, approx. 6-8 in cable. The end at the

>>pwb is soldered directly to the same transmitter board, the other is a
>>SMA
>>connector that is attached to the external antenna. The SMA connector
>>is
>>potted in place at the factory, so that it can't be removed. This new
>>version is would be installed in a cement pit, located at ground level.
>>The antenna would be at ground level, while the rest of the system
>>would be
>>sitting in the pit.
>>
>>So, overall the changes include:
>>1) Different antenna type
>>2) External antenna vs. integral antenna
>>3) Mounting location, wall mount vs. pit mount
>>
>>Please let us know whether we should proceed with a full applications
>>or
>>submit a permissive change.
>>
>>Thanks,
>>
>>Mark
>>
>>
>>
>><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><>
>><>Mark Hill 408.245.7800 x258 <>
>><>Elliott Laboratories Inc. 408.245.3499 FAX <>
>><>Staff EMC Engineer 408.616.2403 Direct
>> <>
>><>Documentation Group Leader <>
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>>
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Schlumberger Resource Management Services, Inc.
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Fax (334) 283-7293

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