FCC CERTIFICATION TEST REPORT

for

Prism Systems, Inc.
200 Virginia Street
Mobile, AL 36603

FCC ID: OTC-PD0001

February 5, 2000

WLL PROJECT #: 5580X

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1.0 Introduction

This report has been prepared on behalf of Prism Systems, Inc. to support the attached Application for Equipment Authorization. The test and application are submitted for a Field Disturbance Sensor under Part 15.245 of the FCC Rules and Regulations. The Equipment Under Test was the Prism Systems, Inc. Field Disturbance Sensor Transmitter.

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 are 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.

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

1.1 Summary

The Prism Systems, Inc. Field Disturbance Sensor complies with the limits for a Field Disturbance Sensor under Part 15.245 of the FCC Rules and Regulations.

2.0 Description of Equipment Under Test (EUT)

The Prism Systems, Inc. RF transmitter (EUT) is a field disturbance sensor to serve as a component of a packaged goods inspection system used on a high speed assembly line. The unit operates at the X-band frequency of 10.525GHz. The EUT consists of two parts, an oscillator (Gunn Diode) and a detector (Schottky Diode). Both the oscillator and the detector are mechanically rugged and built into WR-90 wavequide housings.

2.1 On-board Oscillators

The Prism Systems, Inc. Field Disturbance Sensor contains a 10.525GHz Gunn Oscillator.

3.0 Test Configuration

To complete the test configuration required by the FCC, the transmitter was powered on and continuously transmitting to the receiver which was placed at approximately 10" away. All testing was performed at the rated power of 8.5 VDC.

I/O Ports	I/O Cables
DC Power	Non-shielded, ≈1m, DC Power Supply to Transmitter and Receiver

3.1 Testing Algorithm

The transmitter was turned on and constantly transmitting. Worst case emissions are recorded in the data tables.

3.2 Conducted Emissions Testing

Conducted emissions testing was not performed as the unit is DC 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 emissions testing at 3 meter distance. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. For emission scans below 1GHz, biconical and log periodic 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. For emissions above 1GHz, broadband horn antennas were used. 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. For emissions above 1 GHz, the measurement bandwidth on the spectrum analyzer system was set to at least 1 MHz, with all post-detector filtering no less than 10 times the measurement bandwidth. Testing was performed up to five times the fundamental frequency (to 53 GHz).

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)

Emissions data is recorded in Table 1. All emissions detected were harmonics of the fundamental. No other spurious emissions were detected including at the band edges. Measurements of emissions above 40GHz were made a distance of 1 meter as no emissions were detected at the 3meter distance. For this reason, the limit above 40GHz was interpolated to 1 meter.

Table 1

FCC 15.245 3M Radiated Emissions Data – Site 1

CLIENT: Prism Systems, Inc.
FCC ID: OTC-PD0001
DATE: 12/17/99
BY: Herb Meadows
JOB #: 5580X

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Ht m	SA Level (Peak) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB	
				Peak						
10533.00	H	0.0	1	79.0	9.0	88.0	25155.5	250000	-19.9	
10533.00	V	0.0	1	92.3	9.0	101.3	116314.4	250000	-6.6	
				Average						
21065.10	H	0.0	1	24.8	40.1	64.9	1757.9	25000	-23.1	
21065.10	V	0.0	1	26.3	40.1	66.4	2089.3	25000	-21.6	
31598.00	H	0.0	1	36.7	43.8	80.5	10592.5	25000	-7.5	
31598.00	V	0.0	1	26.8	43.8	70.6	3388.4	25000	-17.4	Ambient
42130.00	H	0.0	1	34.3	40.0	74.3	5188.0	79433	-23.7	
42130.00	V	0.0	1	43.7	40.0	83.7	15310.9	79433	-14.3	
52663.00	H	0.0	1	42.5	41.0	83.5	14962.4	79433	-14.5	
52663.00	V	0.0	1	35.0	41.0	76.0	6309.6	79433	-22.0	
				Peak						
21065.10	H	0.0	1	35.7	40.1	75.8	6166.0	250000	-32.2	
21065.10	V	0.0	1	37.0	40.1	77.1	7161.4	250000	-30.9	
31598.00	H	0.0	1	43.5	43.8	87.3	23173.9	250000	-20.7	
31598.00	V	0.0	1	39.5	43.8	83.3	14621.8	250000	-24.7	Ambient
42130.00	H	0.0	1	42.5	40.0	82.5	13335.2	794330	-35.5	
42130.00	V	0.0	1	48.0	40.0	88.0	25118.9	794330	-30.0	
52663.00	H	0.0	1	46.3	41.0	87.3	23173.9	794330	-30.7	
52663.00	V	0.0	1	36.8	41.0	77.8	7762.5	794330	-40.2	

Table 2

System Under Test

FCC ID: OTC-PD0001

EUT:	Prism Systems, Inc. Field Disturbance Sensor ; M/N: N/A; S/N: N/A FCC ID: OTC-PD0001
Power Supply:	Prism 8.5Vdc Power Supply; M/N: N/A; S/N: N/A

Table 3

Interface Cables Used

The EUT was powered via a non-shielded DC power cord.

Table 4

Measurement Equipment Used

The following equipment is used to perform measurements:

Hewlett-Packard Spectrum Analyzer: HP8564E
Hewlett-Packard Spectrum Analyzer: HP8568B
Hewlett-Packard Spectrum Analyzer: HP8593A
Hewlett-Packard Quasi-Peak Adapter: HP85650A
Hewlett-Packard Preselector: HP85685A
Hewlett-Packard Preamplifier: HP8449B
Antenna Research Associates, Inc. Biconical Log Periodic Antenna: LPB-2520 (Site 1)
Antenna Research Associates, Inc. Horn Antenna: DRG-118/A
Narda Horn Antenna: 637
Narda Horn Antenna: 638
Millitech Horn Antenna: SGH-19-RP000
Hewlett-Packard Harmonic Mixer: HP1197U
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
Washington Laboratories Portable Antenna Mast (Site 1)
Washington Laboratories Motorized Turntable (Site 1)
RG-214 semi-rigid coaxial cable
RG-223 double-shielded coaxial cable

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.