EXHIBIT 1

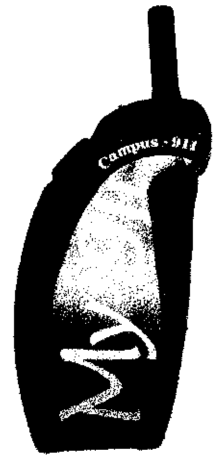
LambdaMetrics, Inc, Test Report

LM04178A

LambdaMetrics, Inc.
PO Box 1029
Cedar Park, TX. 78630-1029
Voice and Fax (512) 219-8218
e-mail:benbibb@lambdametrics.com

TEST RECORD, FCC PART 15,
PERSONAL ALARM
SPREAD SPECTRUM TRANSCIEVER
Operating on: 902 - 928 MHz
> Certification <
TEST REPORT No. LM04178A

Client P/O No. 29944A-001, L/M Proposal 01308A



1/2 actual size

FREQUENCY HOPPING TRANSCIEVER

Grantee: ProNet, Inc.

Model: PAD-1000

Grantee Code: NBI

LAB CODE 200122-0

NOTICE: (1) This report must not be used to claim product endorsement by **NVLAP**, the **FCC** or any other Agency.

(2) **ProNet, Inc.** is authorized to reproduce this copyrighted report only if it is reproduced and distributed in its entirety.

(3) The significance of this report is dependent on the representative character of the test samples submitted for evaluation. The manufacturer must continuously implement the changes shown herein to attain and maintain the required degree of compliance.

Measurements Made For:	**Equipment Tested:**
Mr. Robert Palmer, Senior ME **ProNet, Inc.** 6340 LBJ Freeway Dallas, TX, USA 75240 Tel: (972) 687-2189 Fax: (972) 774-0640	MFG: **ProNet, Inc.** 6340 LBJ Freeway Dallas, TX, USA 75240 Model: **PAD1000** Frequency hopping, spread spectrum, personal alarm transceiver.

REPORT APPROVED 17 April, 1998 BY:

Ben Bibb, NARTE EMC-001970-NE,
President, **LambdaMetrics, Inc.**

TEST SPECIFICATION and CERTIFICATION
ProNet, Inc. Personal Alarm Device, PAD

Tested For: Conformance to 47 CFR 15 Subpart C, Intentional Radiators

Device(s) Tested: Model: **PAD1000** (FCC ID: NBI-PAD1000) frequency hopping spread spectrum transceiver.

Manufacturer:
ProNet, Inc.
6340 LBJ Freeway
Dallas, TX, USA 75240
Tel: (972) 687-2189 Fax: (972) 774-0640

Use of Test: File with the Federal Communication Commission (FCC) for CERTIFICATION, for use as a continuing conformity guide for production control.

Test Requester: Mr. Robert H. Palmer, Senior Mechanical Engineer, **ProNet, Inc.**

Specifications:
(a.) 47 CFR Parts 2. and 15.
(b.) CISPR 22 : 1993-12 Limits and Methods of Measurement of Radio Disturbance Characteristics of ITE
(c.) ANSI C63.4-1992 Methods of Measurement of Radio Noise Emissions, 9 KHz to 40 GHz
(d.) CISPR 16-1 : 1993-08 Specifications for Radio Disturbance and Immunity Measuring Apparatus and Methods
(a.) **LambdaMetrics™** Proposal 01308A
(f.) **LambdaMetrics™** Test Procedure FCC15V-2, 1996
(g.) **LambdaMetrics™** Test Procedure FCCIR-2, 1996

Test Conducted at: **LambdaMetrics™** Test Facility
Cedar Park, TX. (512) 219-8218

Test Date(s): 06 April, 1998 through 16 April, 1998

Test Result: Measurements documented herein indicate the **ProNet, INC.**, MODEL: **PAD1000** personal alarm device is in compliance with 47 CFR **15.31, 15.203, 15.205, 15.209, 15.231**, pertaining to measurement standards, antenna requirements, restricted bands, general emission limits, and in-band emission limits as applicable to the product. This product is eligible for **Certification** by the FCC.

MEASUREMENT CERTIFICATION

The undersigned hereby certify that this report reflects the actual test conditions and equipment used, and that the conditions and results obtained during this test are accurately documented herein. Further, the Test Engineer certifies that, within the last year, the measurement receiver, amplifier(s), cable(s), attenuator(s), signal source(s), and antenna(s) have been calibrated and are traceable to NIST within the stated transfer tolerances. An Audited Quality Manual and procedures are in use.

Report Written By: Patricia Bibb — Date Signed: 17 April, 1998

Test Engineer: Ben Bibb, NARTE EMC-001970-NE — Date Signed: 17 Apr 1998 — 17 April, 1998

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF EXHIBITS

 PO Box 1029 Cedar Park, Texas 78630-1029, USA (512) 219-8218

1. INTRODUCTION, TEST RECORD

1.1 Scope

This report documents tests showing technical conformity with the FCC rules in 47 CFR 15 for intentional radiators. It details the results of the transceiver emission testing performed from 06 April, 1998 through 16 April, 1998 on the MODEL: **PAD1000**, frequency hopping, spread spectrum, presonal alarm device manufactured by **ProNet, Inc.** of Dallas Texas. The **PAD1000**, also called The Campus-Trac™ will be called Equipment Under Test (**EUT**) in this report.

1.2 Purpose

Testing has been performed to document compliance with **47 CFR §15.247** and other relevant rules. The primary 902 to 928 MHz radiated, spurious, and harmonic emissions from the **EUT's** transmitter and receiver have been measured. System timing and power levels have been verified to be in compliance with the manufacturer's technical description. Radiated emissions from the **EUT** have been evaluated from 9 KHz through 10 GHz with particular interest in any emissions falling in certain restricted bands identified in **§15.205**. Spectrum analyzer plots, oscilloscope plots, and other technical measurement documentation is included in this report which will demonstrate conformity with the required emission limitations. This report shows that the **EUT** is qualified for FCC **CERTIFICATION.** These test results are also baseline data for continued product assessment to control emission conformity of future production units.

1.3 Summary

The **EUT** was found to conform to the current FCC emission regulations when modified as described below. The test samples, which were provided by ProNet, Inc. appear to be from a production run. The antenna arrangement clearly complies with **§15.203** in that the antenna is a built in item, which cannot be removed, modified, or replaced. The **EUT** is a battery operated, unlicensed, + 18 dBm into a - 4 dBi antenna, intermittent control transceiver. This frequency hopping transceiver is used to activate a personal alarm system at a remote security office. The **EUT** is clearly consumer equipment. The **EUT** is to be **CERTIFIED** by the FCC under Part 15. A complete technical description with photographs showing electrical and mechanical construction, and emission test data are included in this report. Table 1.1 summarizes the emission test results.

902 to 928 MHz Band F/H Spread Spectrum Transceiver

47 CFR 15.205, 15.209, and 15.247 Radiated Emissions, General 0.009 MHz to 10 GHz	
Results	**Modifications**
Transmitter and Receiver **PASS** requirements of the above Emission Limitations.	NONE

Table 1-1: Test Results, General

2. TEST ENVIRONMENT

2.1 Test Sample Description

The **EUT** is a battery powered personal alarm transceiver, which communicates to a security office using frequency hopping spread spectrum data in the 902 MHz to 928 MHz band. The **EUT** electronic assembly consists of two UL 94V-0 printed circuit boards containing the RF and digital circuits. The boards are packaged with associated battery and tamper proof antenna in a shielded plastic enclosure. Actuating the **PAD1000** requires the user to depress two buttons. After actuation, the unit can not be turned off by the user. For convenience, the two units supplied for evaluation were configured with a tiny switch in series with the battery to stop operation of the internal circuits. The electronic design of the **EUT** is very well implemented with good power bypassing, and RF energy management. Mechanical photographs are provided herein.

The Campus-Trac™ system divides the 902 to 928 MHz band into 1,040 25 KHz channels. A 112 channel (2.8 MHz) guard-band is provided at the low end of the band, which means that the first hopping channel is 904.8 MHz. The highest channel hopped to is 914.750 MHz, the high end of the band (915 to 928 MHz) is not used. The *Campus-Trac™ Band Plan* is presented in tabular form in **Exhibit A.** The lowest and highest frequency units were evaluated for this report, Set A (S/N 107) starts on 904.800 MHz and hops in 50 randomly picked 0.200 MHz steps to 914.600 MHz, with a dwell time of about 75 milliseconds per channel. Set D (S/N 101) starts on 904.950 MHz and hops in 50 randomly picked 0.200 MHz steps to 914.750 MHz.

2.2 Test configuration Description

A modification consisting of a simple switch in series with the battery was required to configure the unit for compliance testing. The battery life while transmitting is about 8 hours. The two buttons were depressed and the required parameters were measured. The battery voltage was checked periodically during testing to assure that the batteries were delivering full voltage. A radiated emission pre-scan was conducted in the 65 m^3 mode stirred chamber to determine possible emissions which might pose a compliance problem. Final radiated emission measurements were made on the 3 meter OATS with the **EUT** positioned statically 80 cm above the ground plane. Radiated emission testing was also performed while the **EUT** was normally carried by a person. Investigation of the higher frequency harmonics was carried out at a distance of five meters and translated to 3 meters by adding $(20 * \log_{10}(5/3))$ to the 5 meter reading. Photographs of the emission test configurations are provided herein. Table 2.1 lists the components making up this test suite.

EQUIPMENT TYPE	MANUFACTURER	MODEL NO.	SERIAL NO.	AGENCY ID
* **F/H-SS Alarm**	ProNet, Inc.	PAD-1000	106 (A)	NBI-PAD1000
do	ProNet, Inc.	PAD-1000	101 (D)	NBI-PAD1000

* =EUT

Table 2-1: Components Tested

2.2.1 1.5 Meter Mode-Stirred Shielded Chamber

Radiated emission pre-scans, conducted emissions testing, and immunity testing are performed in a 4 meter by 5 meter (68 m^3) wood frame building, in which the floor, walls, and ceiling are covered with galvanized steel, bonded and grounded, to shield from outside ambient RF signals. This chamber is slightly larger than the small NIST M/S chamber and operates within the technical confines of NBS TN 1092. Radiated emission and susceptance measurements are normally made on the diagonal at distances of 1.5 to 2 meters. This chamber is equipped with a large rotating mode-stirrer, which is easily stowed for line-conducted measurements. Stirring efficiency data is on file for this chamber. An 80 cm clearance is maintained between all edges of an EUT and the chamber walls, except that a 40 cm clearance is maintained to the back wall for normal power line conducted measurements. LISNs are permanently bonded to the ground plane for line-conducted tests. Line power to this test facility is isolated and back-filtered.

2.2.2 TEM Cell

The 1.2 meter, **EMCO Model 5104** TEM Cell is used for field probe and sensor calibration from DC through 350 MHz. This cell can be absorber loaded for use at higher frequencies.

2.2.3 Test Equipment and Antennas

Table 2.2 contains a complete list of the test equipment routinely used for compliance testing. Each item applicable to and used for the tests documented herein are checked ✓. The remaining items were available but were not used for this test record. The measurement items affecting the accuracy of a test record are maintained in accordance with the provisions of ISO Guide 25 sub. 8 and section 8 of the **LambdaMetrics, Inc.** Quality Manual dated 07 October, 1996, last revised 1 January, 1998. The last NVLAP physical audit was 24 April, 1997. E-field measurements over the 30 to 1,000 MHz range are traceable to balanced dipoles. Broadband antennas are calibrated yearly using the IEEE three-antenna method on two different test ranges. Broadband horn antennas are calibrated using the IEEE three-antenna method on the L/M test range. Radiated power measurements above 0.5 V/m are traceable to the EMR-20C, which is verified by power applied to the TEM cell below 300 MHz and Wandel and the Goltermann (German) standards to 3 GHz. Coaxial power measurements are traceable to NIST via one of two digital power meters. GPIB controlled statistical sampling is used to reduce errors in antenna calibration and power measurement. Each digital power meter and associated sensor is calibrated on a yearly basis with one or the other being calibrated each six month interval.

2.3 Calibration

In this report, dBuV/m and dBu are the same and taken as dB above one microvolt per meter, a unit of field measurement.

Each of the three broadband antennas used was calibrated at r = 3 meters and h = 1 to 4 meters, on a different site, using the IEEE three antenna method, within the last 12 months. The standard dipoles were calibrated within the last 12 months by an independent laboratory. Resonant dipoles are used to finalize radiated emissions, which are within 3 dB of the limit.

Cable quality is monitored by regular calibration of all cables used to report emissions. Calibrated 5 dB attenuators, specified for the frequency of use, are used at the antenna terminal to provide a consistent impedance match. Pre-amplifiers are regularly tested for impedance and response, and documented over the frequency of use. Filters, isolators, and power splitters receive the same careful attention to performance documentation.

Sometimes it is necessary to decrease the specified radiated measurement distance to differentiate between **EUT** emissions and nearby signals or measure a very weak signal. When required, the published emission limit is translated to a new measurement distance by the equation:

$$\text{New limit (dBuV/m)} = \text{Limit (dBuV/m)} + 20 \log (d^{limit}/d^{measure})$$

EXAMPLE: The published limit, measured at 10 meters, for the frequency range of 30 to 230 MHz is 40 dBu. Then for 3 meters, 40 + (20 log (10/3)) = **50.46 dBu.**

Reported emission measurements are always made at distances greater than $(\lambda/2*\pi)$.

2.4 Measurement Uncertainty

The nominal measurement uncertainty for OATS measurements is the combination of spectrum analyzer, cables, attenuators, preamplifier, and antenna factors (±1.5, ±0.3, ±0.4, ±0.6, ±1.2 dB) and is 2.07 dB plus a 1.5 dB margin for mismatch, drift, and other minor terms.

For this test, direct comparison of a calibrated power meter and the measured signal was made with a precision power splitter. This technique reduces the measurement uncertainty to 2 dB or less. The primary uncertainty term is the antenna factor. Uncertainty relating to instrumentation error and drift is virtually eliminated.

The major uncertainty term for the radiated emission **pre-scan** is in the M/S chamber, which for this size and type **EUT**, has been statistically within ±4dB. During the pre-scan it was clearly determined that all harmonics from the internal clocks were well below the emission limits. For the general emissions on the **OATS**, the **EUT** must be 2 dB, plus any desired margin, under the stated limit to assure consistent passing measurements. To guarantee radiated emissions are under the limit, for this and other identical transceivers, it is suggested that this **EUT** should test 5 dB below the limit. (2 dB to cover our uncertainty plus a 3 dB manufacturing margin. (With some statistical justification, for this small **EUT**, the manufacturing margin might be reduced.)

This laboratory certifies the correctness of test results reported herein and does not require any margins. Measurement uncertainty is a real term and present in ALL measurements. While careful DOX and implementation can reduce errors to acceptable values, measurement uncertainty is a given.

2.5 Measurement Uncertainty Details

For the spurious emission and harmonic field strength measurements, a substitution method of calibration was used. The 6 dB attenuator and coax was removed from the measurement antenna at the OATS and looped back into the laboratory where an established reference signal from a power split signal generator was applied. The second port of the HP splitter was attached to a HP 8481D and HP 436A power meter. This provides a calibration U_c of 0.4 dB. The calibration signal was usually at 50 dBuV, traceable to the HP 436A and 8481D with no range changes, (direct substitution). Combining terms for this type of measurement yields an RSS U of 1 dB most of which is antenna uncertainty. A coverage of 3 could be applied, to obtain 95% confidence, for a final radiated emission measurement Uc of 3 dB. For this field strength test, the distance error was always such that measurements were made at less than 3.0 meters and always carefully maximized. Maximization was done using peak detection.

It was shown that when either of the transmitter units were held normally, each one would consistently provide 6 to 10 dB below the reported spurious emissions. Our tests optimized emissions by holding position, polarization and elevation. See photograph for details of **EUT** support on the OATS.

2.6 Order of Testing

The HAND CARRIED, and BATTERY POWERED transceiver, was evaluated for harmonic emissions in the M/S chamber from 30 MHz through 10 GHz, then moved to the 3 meter OATS for final emission testing over the 9 KHz to 10 GHz band.

Two transceiver samples were evaluated and documented. The higher order harmonics were measured at r = 5 meter on the OATS.

The transmitter samples were then placed on a 2 cm Styrofoam™ block inside an environmental chamber for temperature effect evaluation. The battery supply voltage was verified to be at new battery values for measurement of frequency and power versus temperature. Each sample was warmed or cooled to the desired temperature then quickly placed next to the near-field sensor and activated for power and frequency measurement using a calibrated reference method.

The outside ambient temperature was 75° +/- 5° Fahrenheit and the relative humidity was about 65% during the OATS test period.

The items ✓[ed] were used to obtain the data for this test record.

✓	Equipment Description	Model #	Serial #	Last Cal
✓	OATS, 3 meter	L/M OATS-3	N/A	04 Jun 97
	OATS, 10 meter	L/M OATS-10	N/A	04 Jun 97
✓	Chamber, Test, 1.5 mtr, M/S	1.5MSTC	11223A	04 Jun 97
	Clamp, Current, 0.01 to 100 MHz	91550-2	206	21 Jun 97
✓	Chamber, Environmental	Delta MK5750	5166	03 Apr 98
	LISN, 50 Ohm, 50 uHy, 4 Amp	C63492-3-4A	071592B	02 Sep 97
	LISN, 50 Ohm, 50 uHy, 8 Amp	C63492-3-8A	810-00278	02 Sep 97
	Filter, High Pass, 10 KHz	HPF3	060192	02 Sep 97
✓	Antenna, Rod, 41", 0.01 30 MHz	EMCO RVR-25	010A	02 Sep 97
✓	Antenna, Biconical, 30-200 MHz	CDI B-100	298	11 Sep 97
✓	Antenna, Log periodic, EMCO, 200-1000 MHz	3146	2766	11 Sep 97
	Antenna, Dipole Kit, EMCO, 30-1000 MHz	3121C	539	09 Sep 97
	Antenna, E-Field, 0.1-300 MHz	EFG-1	03	09 Sep 97
✓	Antenna, Dual Ridge Guide, 1-18 GHz	LMI-18-N2 "A"	110	19 Sep 97
	Antenna, Standard Horn, 18-26 GHz, 25 dB	42-7025	078	11 Nov 97
	Antenna, Standard Horn, 26-40 GHz, 25 dB	28-7025	0141	18 Sep 97
	Antenna, Standard Horn, 40 - 60 GHz, 25 dB	19-7025	035	11 Nov 97
	Antenna, Standard Horn, 75 - 110 GHz, 25 dB	10-7025	1107	11 Nov 97
	Antenna, Standard Horn, M'tech, 90 - 140 GHz	SGH-08-RP000 8344	012	20 Oct 97
	Mon, Field, W&G 100 KHz to 3 GHz	EMR-20C	B-0074	08 Dec 97
	Mon, Field, W&G 5 Hz to 30 KHz	EFA-1	B-0057	09 Dec 97
✓	Receiver, EMI, 9 KHz to 1 GHz	EMC-25 MK-III	351	02 Aug 96
✓	Spectrum Analyzer, 100 Hz - 8.4 GHz	ATEST R3465	35060162	18 Dec 97
✓	Spectrum Analyzer, TEK, 22 GHz	492BP	B010153	21 Nov 97
	Spectrum Analyzer, 5 Hz to 50 KHz	HP 3580A-02	A06305	07 Oct 97
	Spectrum Analyzer, QP detector, 9 KHz-1.8G	TEK 2712-12	B011218	05 Jan 98
	Mixer, HP, 11517A, 12 - 40 GHz, w/accys.	11517A	2325A00175	19 Sep 97
	Mixer, HP, 26 - 40 GHz, w/accys.	11974A	1315A00105	18 Sep 97
	Mixer, PMP, 60 - 90 GHz	FM	073	20 Oct 97
	Mixer, PMP, 90 140 GHz	FM	068	20 Oct 97
✓	Counter, Frequency, EIP, 110 GHz	548A-590	01783	16 Dec 97
✓	Oscillator, Disciplined (2)	2010B	01724	12 Mar 98
✓	Receiver, WWVB, 60 KHz	8163	0725	09 Mar 98
✓	Power Meter, 0.1 to 60 GHz (2)	436A	1719A01744	05 May 97
✓	Power Sensor, -70 to -20 dBm, 0.01 to 18 GHz (2)	8481D	3643A15709	23 May 97
✓	Power Splitter, Resistive, DC to 18 GHz	121667A	12011	05 May 97
	Wave Analyzer, 5HZ to 50 KHz	HP 3581A	A03063	08 Oct 97
✓	Preselector, 9 KHz-1800 MHz	TEK 2706	B010106	07 Mar 97
✓	Preamplifier, 100 KHz - 1300 MHz (3)	HP 8447D	A01897	07 Mar 97
✓	Preamplifier, 100 MHz - 20 GHz	MITEQ 0.1-20 GHz	LM021195A	05 Apr 98
✓	Attenuator, 50 Ohm, HP, 6 dB, (2)	8491B	-	17 Nov 97
	Attenuator, Kit, HP, Reference	11582A	-	15 Nov 97
	Attenuator, 50 Ohm, 50 dB, 4 GHz	WIE-10350N	521	26 Nov 96
✓	Filter, HPF, 1.5 GHz, SMA	SMT 41241	306A	05 Apr 98
✓	Filter, HPF, 3.0 GHz, N	u-Phase H3000N	153	05 Apr 98
	Coupler, Directional, 1-4 GHz	Narda 3022-20	70741	15 Dec 97
	Coupler, Directional, 2-4 GHz	Narda 3003-30	1639	15 Dec, 97
	Coupler, Directional, 4-8 GHz	Narda 22014-30	06	15 Dec, 97
	Coupler, Directional, 8-12 GHz	Narda 22046-20	21	15 Dec 97
	Coupler, Directional, 2-18 GHz	Krytar 1818 16dB	2597	15 Dec 97
	Directional Coupler / Wattmeter	44AP	26067P	26 Nov 96
	Generator, Signal, HP, 10 MHz 40 GHz	8350B	1435A00817	16 Dec 97
✓	Generator, Signal, HP, 2 - 26.5 GHz	8673B	1546A00308	15 Dec 97
	Generator, Signal, HP, 0.99 GHz	8656A	2341A05572	03 Sep 97
✓	Generator, Signal, HP 2.6 GHz	8660D	2741A0209	11 Nov 97
	Oscilloscope, Tektronix, 100 MHz	THS720P	B010609	22 Oct 97
✓	Oscilloscope, Tektronix, 1 GHz / 5 GHz	TDS680B	B030137	08 Aug 97

Table 2-2: Test Equipment List

3. TEST PROCEDURES AND RESULTS

3.1 Emission Testing

3.1.1 Test Description

ANSI C63.4-1992, *Methods of Measurement of Radio Noise Emissions, 9 KHz to 40 GHz,* **CISPR 16-1 : 1993-08**, *Specifications For Radio Disturbance and Immunity Measuring Apparatus and Methods,* and **CISPR Publications 22 : 1993-12**, *Limits and methods of measurement of radio interference of information technology equipment,* were the guiding documents for equipment, test set-ups, and procedures used during these tests. Radiated emissions from 9 KHz to 10 GHz were measured.

3.1.2 Test Configuration, Radiated

The radiated emission pre-scan for each sample transceiver was conducted on the diagonal centerline of the M/S chamber, 1 meter from all chamber walls. For final radiated emissions testing on the OATS, each transceiver was placed in the center of the non-conductive test table 80 cm above the turntable and ground plane.

A human operator also held the transceiver at a fixed distance from the measurement antenna simulating actual operation of the transceiver. This measurement method attenuated in-band and harmonic signals 3 to 20 dB below those reported herein. The maximum emission obtained in either antenna polarity without the human holding the **EUT** is reported. During testing, the **EUT**'s batteries were frequently checked to insure maximum emissions.

3.1.3 Test Procedure, Radiated

General emission measurements were made using procedures and equipment outlined in ANSI C63.4-1992, and CISPR 22 to determine compliance with **47 CFR 15.205** and **15.209.** Signal detection below 1,000 MHz was quasi-peak. Emissions measured above 1,000 MHz were peak detected in a 100 KHz RBW and in a 1 MHz RBW and converted to average values. Emissions in-band (902 - 928 MHz) were measured as outlined in ANSI C63.4-1992 using peak and average detection IAW **47 CFR 15.35(b)**. Peak detected plots are presented here for clarity.

Harmonic emission measurements above 1 GHz were conducted on the OATS with the ridge-guide horn antenna, microwave cable, appropriate filter, and pre-amplifier using procedures outlined in ANSI C63.4 for intentional radiators. Height and azimuth scans were performed to obtain maximum emissions on all measurements. Each harmonic of the transmitter and LO was investigated through 9,280 GHz (10th harmonic of 928 MHz) with particular emphasis placed on measuring the energy transmitted in the restricted bands listed in **47 CFR 15.205.**

For demonstrating compliance with **15.205** which provides an average detected limit, first each harmonic band was evaluated in the peak detected mode in both 100 KHz and 1 MHz RBW. Then the average power function of the ADVANTEST R3265A was adjusted as follows: Option 76 ON, (measurement of average power density ON), RBW = 3 MHz, VBW = 3 MHz, Sweep Width = 10 MHz, Measurement Window Width = 1 MHz, Sweep Time = 1 sec, and average time set to 130 sec. (The cycle time of the PR code is 13 seconds.) The same results were obtained with M/W width = 100 KHz and window sweep = 0.1 second. The window was placed in the center and to each side of center and the average run. The average detected power on each harmonic measured 25 dB or more below the peak power.

Since the FCC rules are not clear on the measurement procedure for **47 CFR 15.205** compliance of FH/SS transmitters, a peak to average conversion factor of 22.4 dB is used in this report. The derivation of this factor is shown below.

3.1.4 Test Results, Radiated Emissions

The **EUTs** measured acceptably below the limits currently established in **47 CFR 15** for intentional radiators when measured IAW the procedures of **47 CFR 15.** In-band emissions (902 - 928 MHz) from the transmitters were measured at 7 cm and 70 cm in the laboratory to determine the general characteristics of the hopping scheme and RF timing. This near field data also provides an indication of spectrum shape and possible LO emissions. Oscilloscope plots and spectrum analyzer plots of this data are included herein.

At 3.0 meters, the highest signal level **radiated** from either of the transmitters was at 910 MHz, 111 dBuV/m (Peak) VERTICAL. This emission is 20 dB below the maximum emissions (125 dBuV/m at 3 m) allowed by **47 CFR 15.247.** The highest harmonic emission was the third, in a restricted band, at 68.1 dBuV/m (Peak) VERTICAL and HORIZONTAL, 8.3 dB below the limits prescribed by **15.209** and **15.205.** All significant OATS measured radiated emissions are presented in the table below. Signals between 9 KHz and 900 MHz were more than 20 dB below the limits of **15.209** and **15.205.**

As evaluated, this system has adequate design, shielding, and RF decoupling characteristics to meet the emission limits established by the FCC for intentional radiators. The **EUTs** that were tested are identified in the enclosed photographs. Each **EUT** provided the same emission levels. Compliance may be attained as indicated in this report with the specified product design and configuration that is described herein. Any changes to the design or implementation must be evaluated for any possible impact on the emission characteristics of the product. See **47 CFR 15.21.**

Radiated Emissions Measurements at 3 meters

FCC §15.205 Restricted Bands of Operation shown in bold type

Operating Range			Measured, peak, 1 MHz	Correction Factors				Three meters Calculated Average Emission (pk-22.4 dB)		15.205 Limit
Harmonic	from 902 MHz	to 928 MHz	Raw. @ 3 m	G	AF	CL	CF	Cor'd FS 3m	FS, dBuV/m in 1 MHz	Margin
2nd	1804	1856	34.2 dBu	30.7	26.5	1.09	27.6	61.8 dBuV/m	39.4 dBuV/m	14.6
3rd	**2706**	**2784**	36.3 dBu	29.8	30.4	1.38	**31.8**	68.1 dBuV/m	45.7 dBuV/m	**8.3**
4th	**3608**	**3712**	22.4 dBu	29.8	31.7	1.65	**33.4**	55.8 dBuV/m	33.4 dBuV/m	**20.6**
5th	**4510**	**4640**	25.5 dBu	30.3	33.6	2.04	**35.6**	61.2 dBuV/m	38.8 dBuV/m	**15.2**
6th	**5412**	**5568**	22.7 dBu	30.5	34.5	2.47	**37.0**	59.7 dBuV/m	37.3 dBuV/m	**16.7**
7th	6314	6496	26.0 dBu	* 28.4	34.9	3.10	38.0	64.0 dBuV/m	41.6 dBuV/m	12.4
8th	# **7216**	**7424**	24.6 dBu	* 31.0	36.3	3.80	**40.1**	64.7 dBuV/m	42.3 dBuV/m	**11.7**
9th	# **8118**	**8352**	21.9 dBu	* 30.7	37.3	4.59	**41.9**	63.8 dBuV/m	41.4 dBuV/m	**12.6**
10th	# **9020**	**9280**	12.2 dBu	* 30.0	37.9	5.70	**43.6**	55.8 dBuV/m	33.4 dBuV/m	**20.6**
11th	# 9922	10208		* 30.5	38.5	6.78				

Amplifiers:	Cable:	Antenna(s)	Receiver(s)
Miteq P58658	3.4 m Gore	LM DRG 1-18 (#A)	Advantest R3265A
* Miteq 2-20AMPO-30			# Tek 492-BP

Table 3-1: 3 meter OATS Radiated Emissions Data, PAD Transmitter
Bold entries are emissions in §15.205 restricted bands.

NOTE: Measurements have been made using peak detection in a 1 MHz resolution bandwidth using max hold. Measurements were made over a long enough period to allow the hop set (13,000 ms) to repeat several times. Usually each measurement was integrated five minutes or more. Peak to average conversion was accomplished by applying the following formula to the measured peak value.

$$10 * \log10 (75 \text{ ms} / 13,000 \text{ ms}) = -22.4 \text{ dB}$$

4. CONCLUSIONS

The **ProNet, Inc. Model PAD-1000, Security Locator Transmitter,** consisting of a low power unlicensed Part 15 transceiver using frequency hopping spread spectrum is compliant with the requirements of 47 CFR 15 Subpart C based on the results contained in this report.

It is the responsibility of the manufacturer under US law to submit this test report along with FCC Form 731 and await a Grant of Equipment Authorization from the FCC. Equipment meeting the technical requirements and requiring FCC approval, but not approved by the FCC may not be marketed until such FCC approval is granted. It is also the manufacturer's responsibility to ensure the continued compliance of future production units with the essential protection requirements.

4.1 Labeling Requirements

A notice to the purchaser of the **PAD-1000** must be placed within the products documentation indicating that each item has been CERTIFIED TO COMPLY with the current Federal Communications Commission rules, Part 15 Subpart C and explaining the conditions of allowed operation. The transmitter must display the appropriate FCC ID code as shown, on the right side, in Table 2.1 of this test report. This requirement is outlined in **47 CFR 15.19(3)**. Additional information on identification requirements for certified equipment may be found in **2.925.**

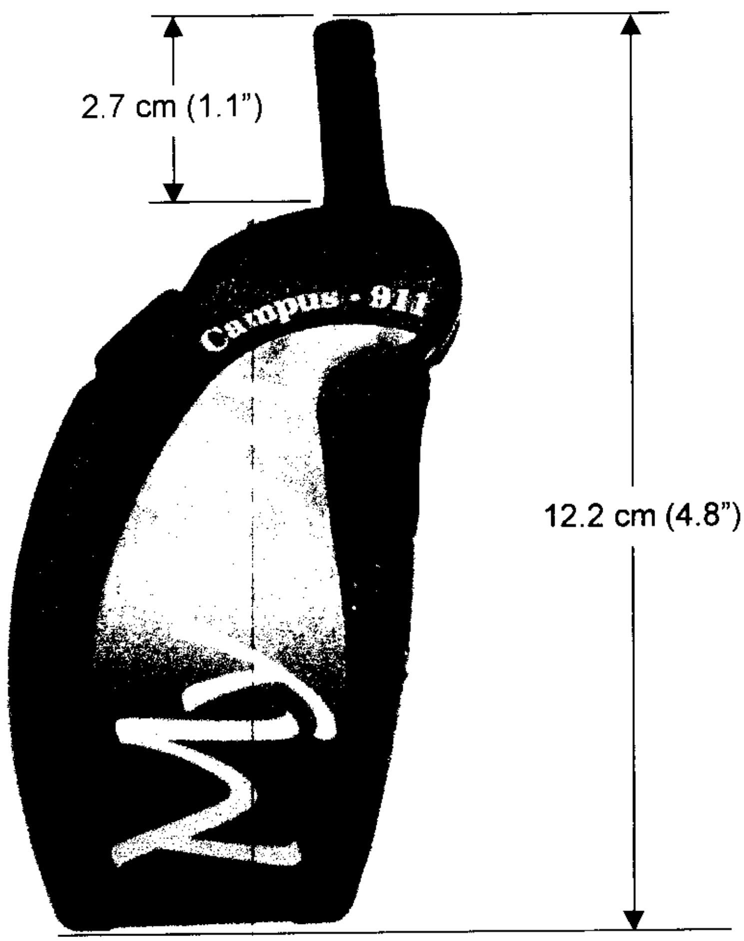


Photo 1: Actual SizeView, Pad-1000

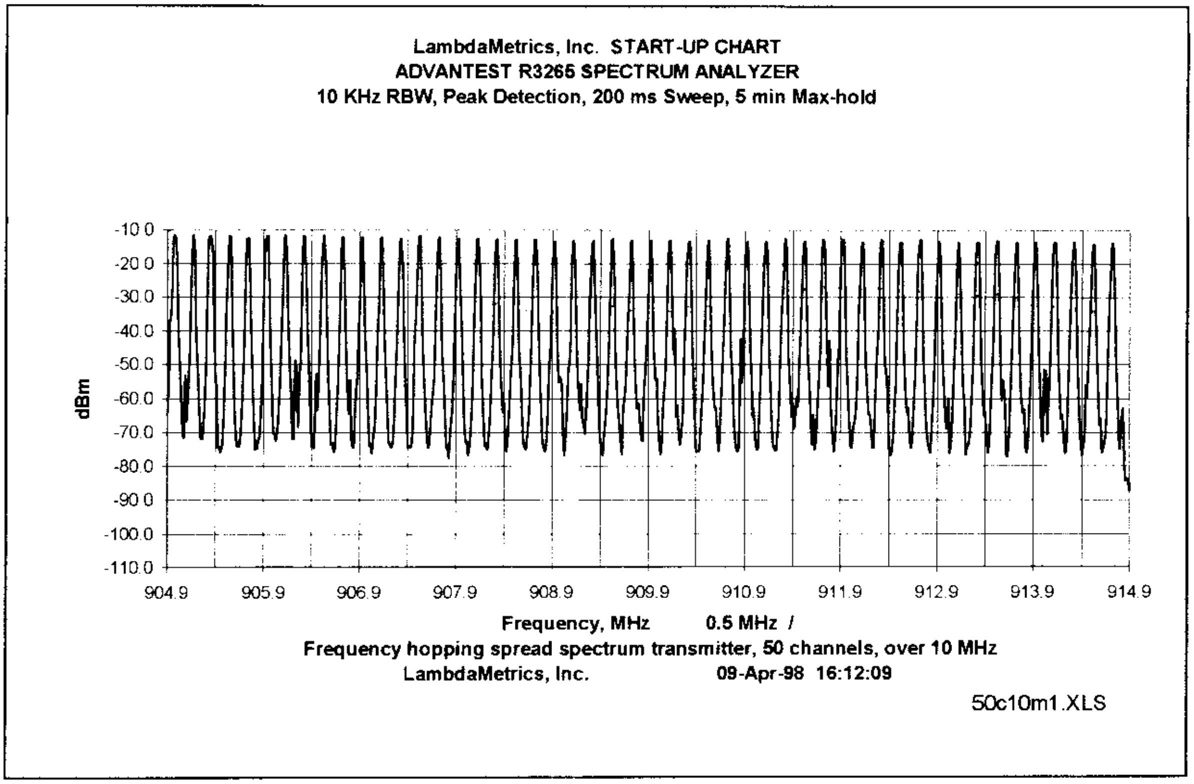


Figure 1: Hop Band of "D Set", 904.950 to 914.75 MHz

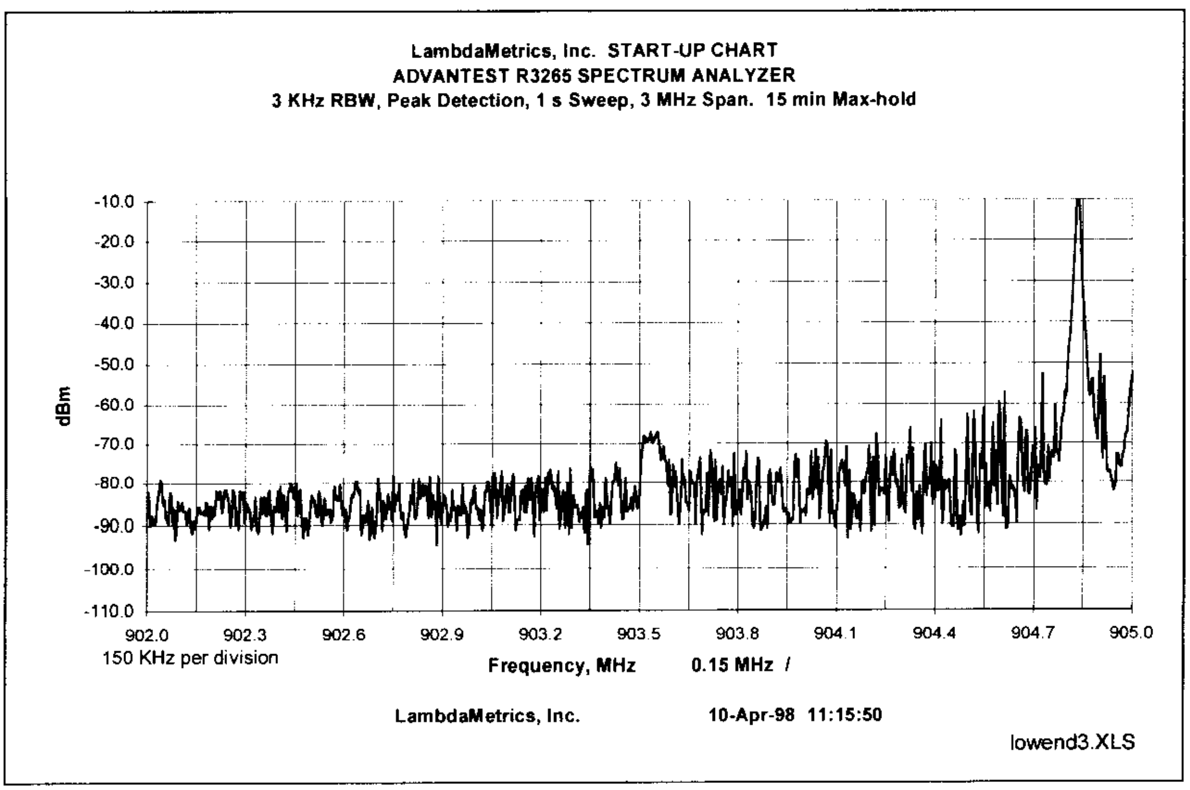


Figure 2: Low Frequency Spectrum, "A Set"
Lowest hop is "A1", 904.8 MHz. Note integration time.

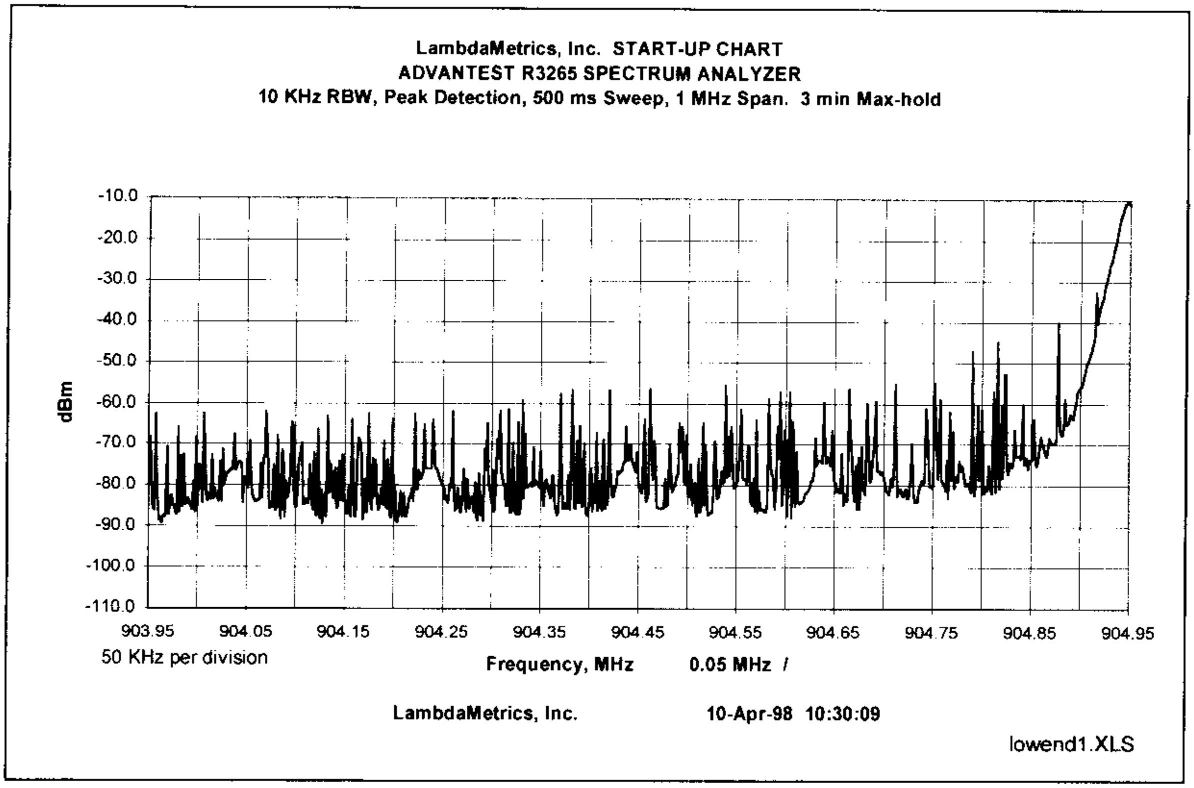


Figure 3:: Low Frequency Spectrum, "D Set"
Lowest hop is "D1", 904.950 MHz. Increased RBW to show sideband energy.

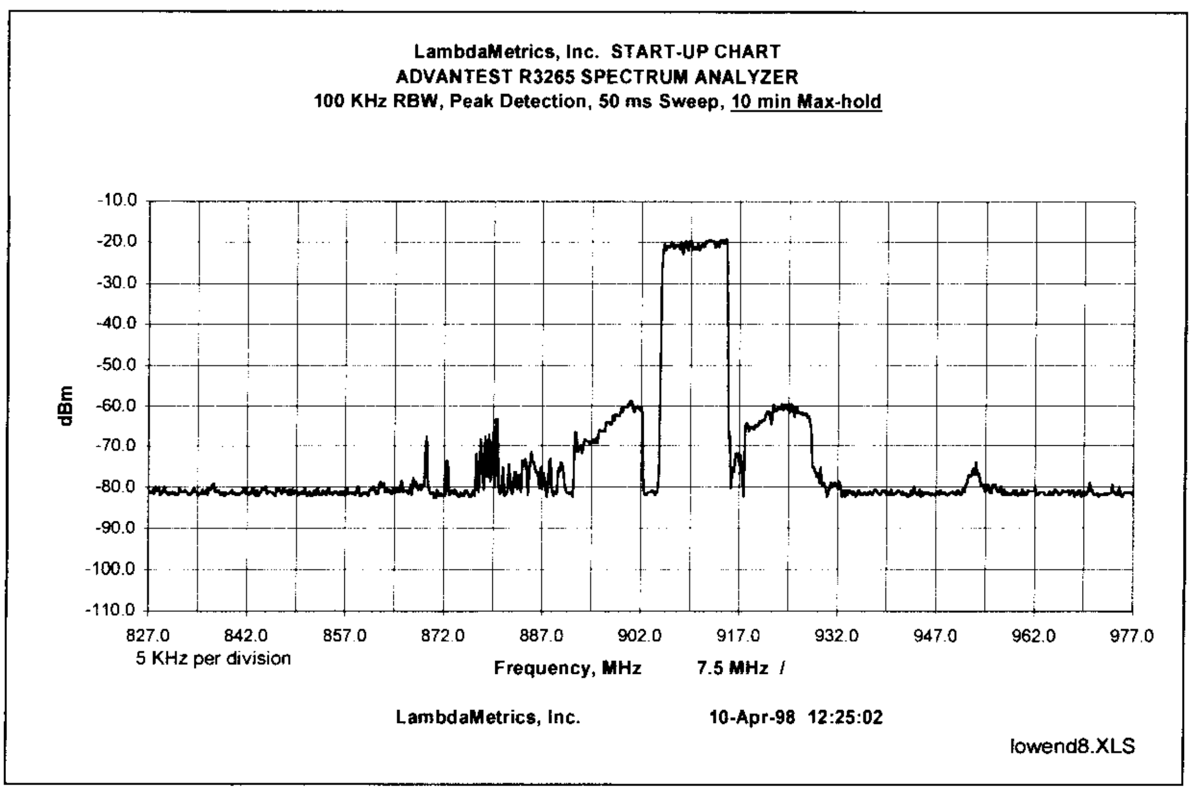


Figure 4: Low Frequency End, Long Integration "A Set"

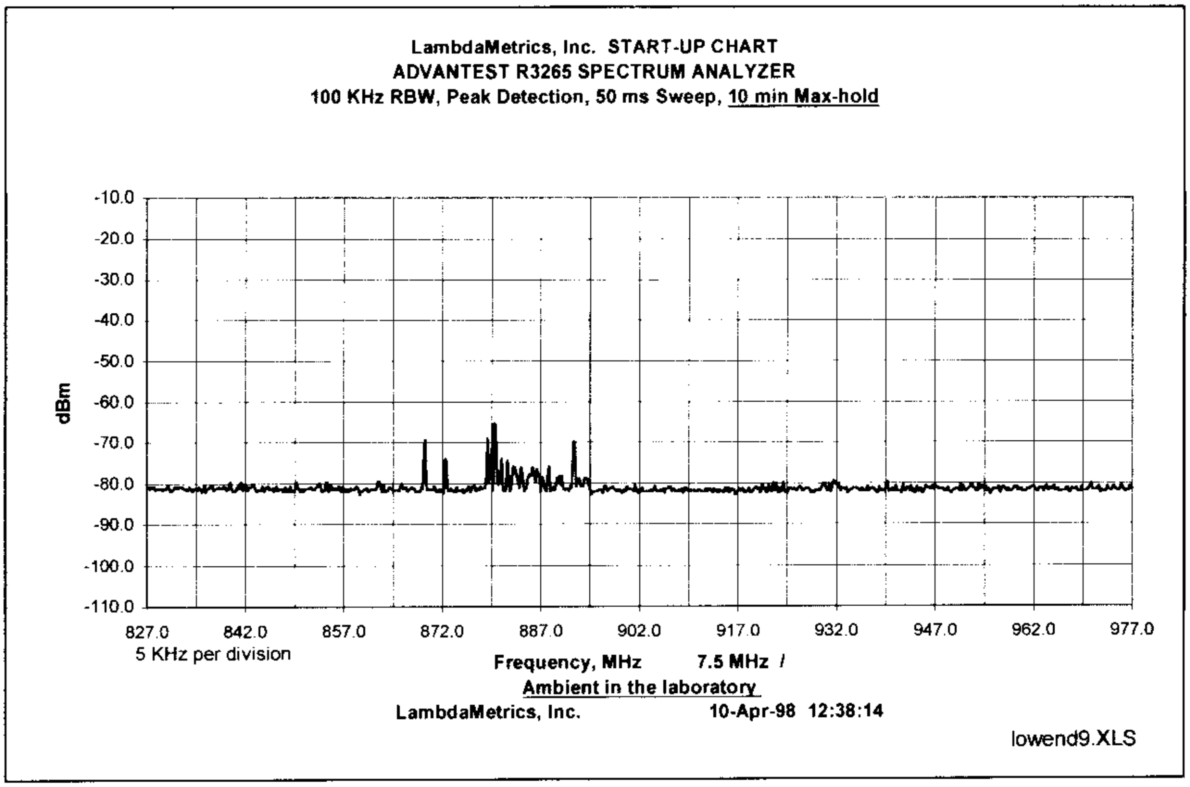


Figure 5: Laboratory Ambient
On workbench when Figure 4 was taken.

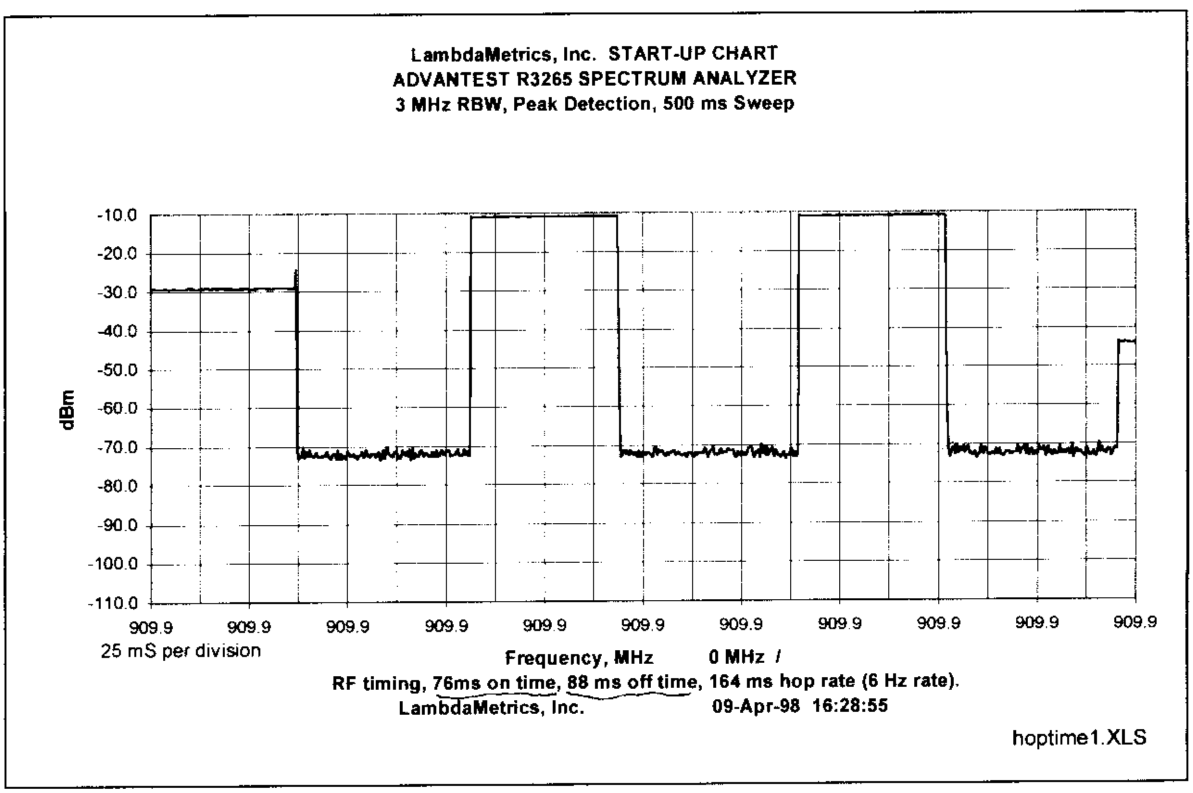


Figure 6: Spectrum Analyzer Measurement of Hop time

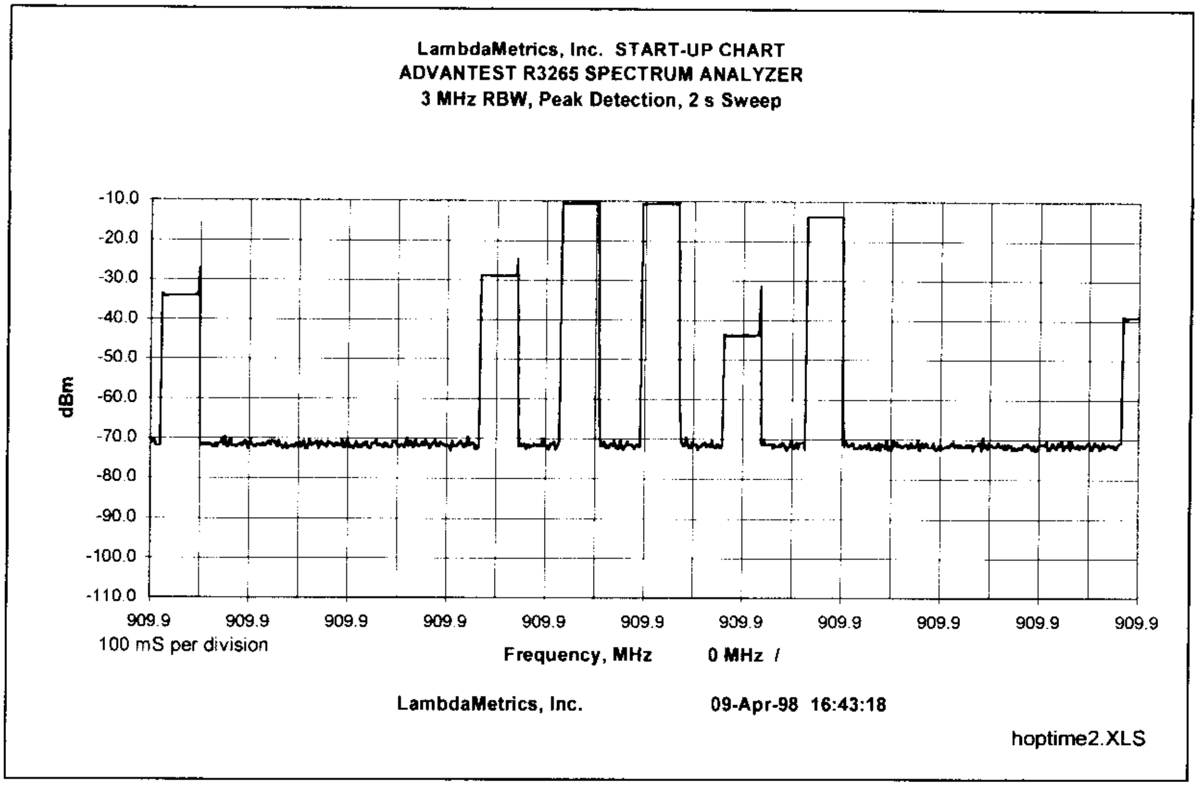


Figure 7: Spectrum Analyzer Measurement of Hop Set and Off Time

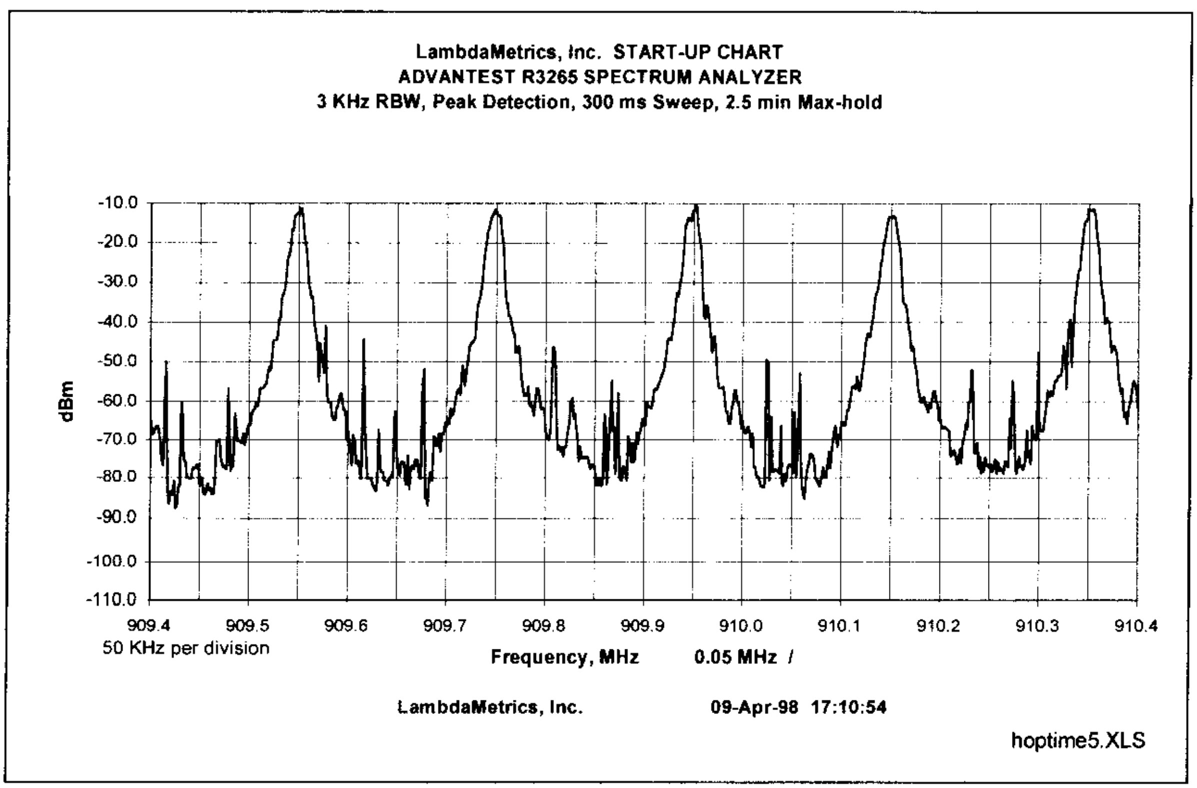


Figure 8: 3 KHz Resolution Bandwidth View, Hop Set

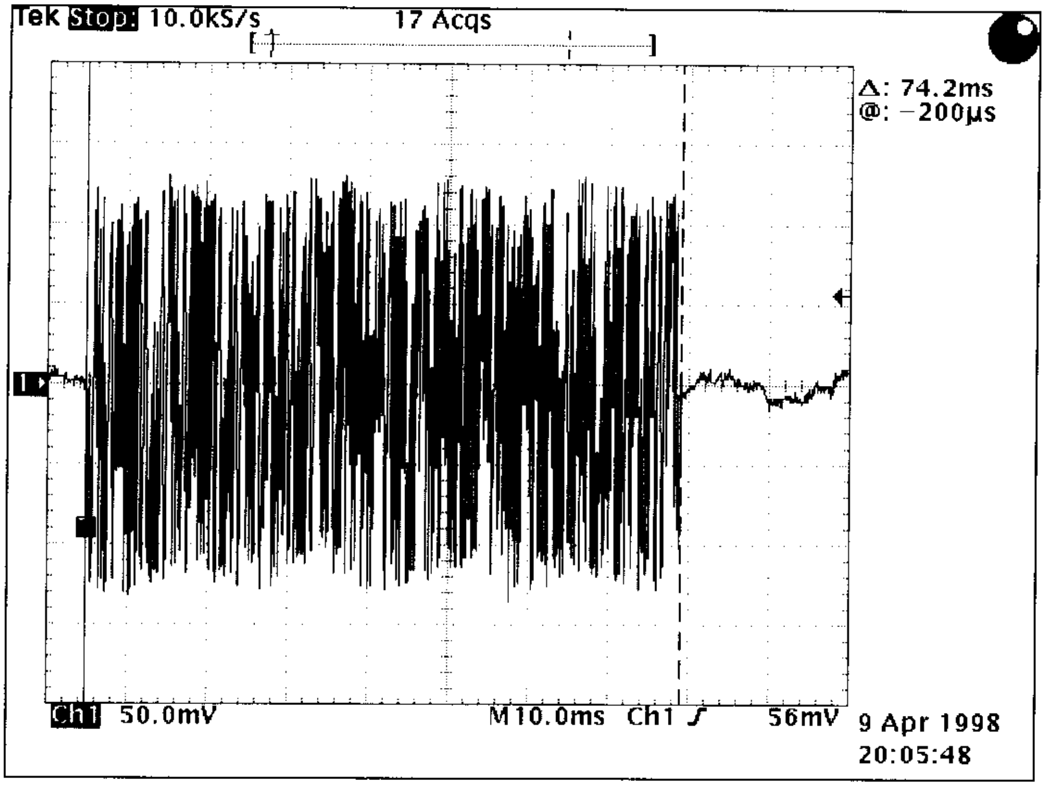


Figure 9: TDS 680B Measured, Single Channel RF Timing

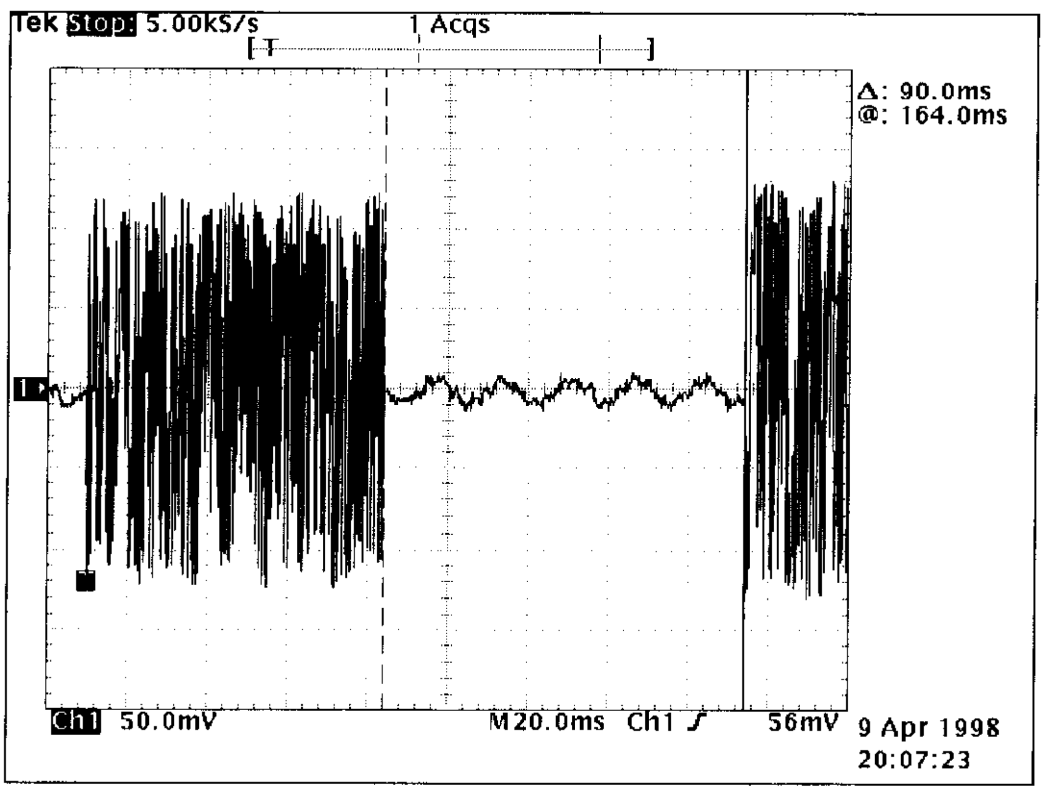


Figure 10: TDS 680B Measured, Inter Hop RF Timing

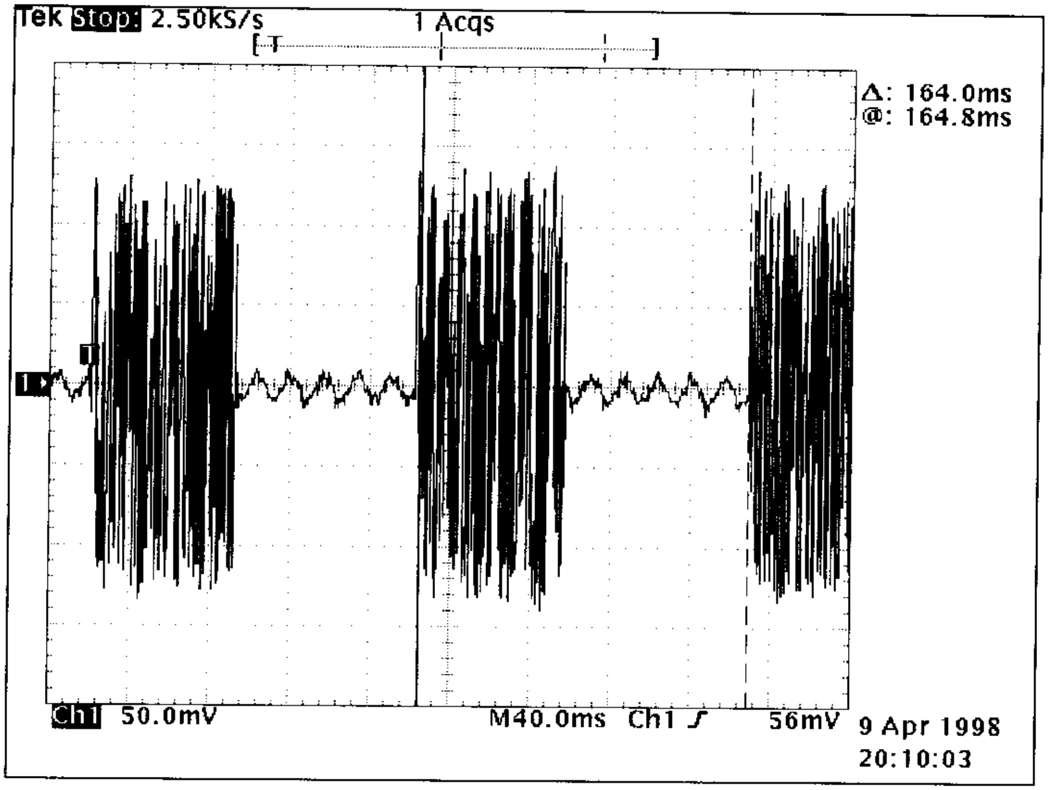


Figure 11: TDS 680B Measured, Hop RF Timing

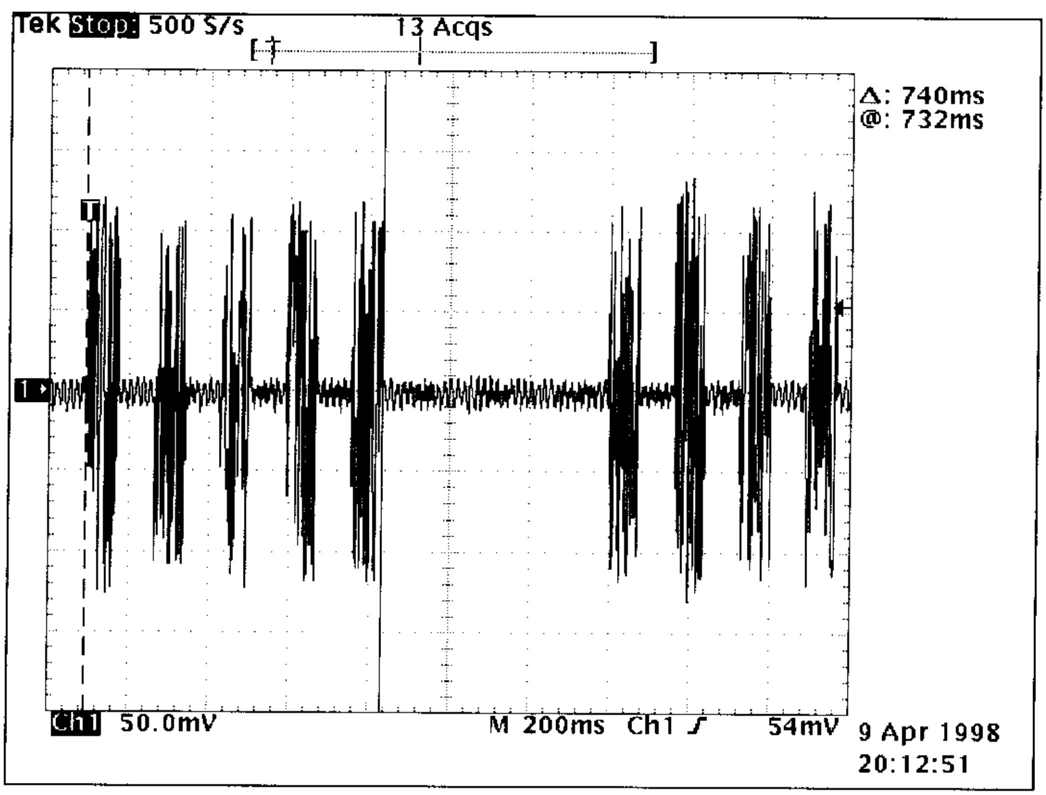


Figure 12: TDS 680B Measured, Five Frequency Hop Set Timing

EXHIBIT 1a

Peak to Average Conversion Discussion

Peak to Average Conversion Discussion

This document discusses a possible calculation method for peak measured radiated emission values to be converted to average values for comparison the limits of §15.205. 902 to 928 MHz Frequency Hopped Spread Spectrum Radios, specifically the **ProNet, Inc. PAD** and PROX generate harmonics in the frequencies above 1,000 MHz and FCC Rules require the comparison of those radiated harmonics to the average limits of §15.205.

Here is an additional way that you might apply §15.35 (b) to the **ProNet, Inc. PAD** to determine the conversion from the OATS measured peak emissions to reported average emissions.

For a frequency hopper operating over 10 MHz with fifty 25 kHz channels spaced 200 kHz apart, the total radiated energy would be spread equally among the fifty channels over the 10 MHz. The third and fifth harmonics would appear above 1000 MHz and would fall under Section 15.35.

Any radiated energy at the third harmonic would be spread over a 30 MHz span. The channel would be 75 kHz wide and separated by 600 kHz. It would then follow that the energy in any 1 MHz span at the third harmonic range, you could cover two channels (i.e. at 600 kHz spacing you could fit two channels inside a 1 MHz span). Thus the radiated energy in any 1 MHz span is 1/25 of the total energy in this 30 MHz span. This equates to 13.98 dB or as we say in EMC 14 dB.

Any radiated energy at the fifth harmonic would be spread over a 50 MHz span. The channel would be 125 kHz wide and separated by 1000 kHz. It would then follow that the energy in any 1 MHz span at the fifth harmonic range, you could cover one channel (i.e. at 1000 kHz spacing you could fit only one channel inside a 1 MHz span). Thus the radiated energy in any 1 MHz span is 1/50 of the total energy in this 50 MHz span. This equates to 17 dB.

Additionally, the hopper would have a transmission duty cycle of 41% on for 380 ms (5*76) and off for 920 ms ((560+(4*490)). This equates to 3.9 dB or 4 dB as we say.

Therefore the 3rd harmonic is 14 dB + 4 dB = 18 dB and the 5th harmonic is 17 dB + 4 dB = 21 dB down.

Further, laboratory evaluations using the ADVANTEST R3265A <u>measured</u> <u>average</u> power in a 1 MHz bandwidth support the above conclusions within 3 dB of the calculated values.

 PO Box 1029 Cedar Park, Texas 78630-1029, USA (512) 219-8218

Harmonic	Operating range from 902 MHz	to 928 MHz
2nd	1804	1856
3rd	2706	2784
4th	[redacted]	
5th	4510	4640
6th	[redacted]	
7th	6314	6496
8th	7216	7424
9th	[redacted]	
10th	[redacted]	
11th	9922	10208
12th	10824	11136
13th	11726	12064
14th	12628	12992
15th	13530	13920

§ FCC 15.205 Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505 1	16.69475 - 16.69525	608 - 614	[redacted]
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	[redacted]
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	[redacted]
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	[redacted]	Above 38.6
13.36 - 13.41			

Figure 13: Measurement Support Data, 15.205 Bands

Far field determination for L/M RGA antenna with phase variation over test aperture and path loss

FREQ GHz	source (dish or EUT) aperture	w'length air, m	Far Field at:	actual r meas dist, m	delta phase (rad)	Maximum pi/8 (rad)	Loss, free space, over r
0.92 GHz	0.30 m	0.326 m	0.55 m	3.0 meter	0.07	**0.39**	7.48E-05
							-41.26 dB
	0.3 m is the aperture of the DRG Antenna used for calibration. The **EUT** apreture is 0.122 m	32.61 cm	55.20 cm		This ^ column should not exceed the value in the next column,>		
		326.09 mm	552.00 mm			(22.5 deg)	
		12.84 in	21.73 in				
		1.070 ft	1.811 ft				
1.84 GHz	0.30 m	0.163 m	1.10 m	3.0 meter	0.14	**0.39**	1.87E-05
							-47.28 dB
		16.30 cm	110.40 cm				
		163.04 mm	1104.00 mm				
		6.42 in	43.46 in				
		0.535 ft	3.622 ft				
2.760 GHz	0.30 m	0.109 m	1.66 m	3.0 meter	0.22	**0.39**	8.31E-06
							-50.80 dB
3.680 GHz	0.30 m	0.082 m	2.21 m	3.0 meter	0.29	**0.39**	4.68E-06
							-53.30 dB
4.600 GHz	0.30 m	0.065 m	2.76 m	3.0 meter	0.36	**0.39**	2.99E-06
							-55.24 dB
8.280 GHz	0.30 m	0.036 m	4.97 m	3.0 meter	0.65	**0.39**	9.24E-07
					ALARM		**-60.34 dB**
8.280 GHz	0.30 m	0.036 m	4.97 m	5.0 meter	0.39	**0.39**	3.33E-07
					ALARM		**-64.78 dB**
9.200 GHz	0.30 m	0.033 m	5.52 m	5.5 meter	0.39	**0.39**	2.23E-07
					ALARM		**-66.52 dB**

Figure 14: Measurement Support Data, Measurement Distance Evaluation

