TÜV

TUV Rheinland of North America

Emissions Test Report

EUT Name: Water Transponder

EUT Model: Ptranspondit V2

FCC Title 47, Part 15, Subpart C and RSS-210 Issue 5

Prepared for:

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Report/Issue Date: 10 June 2003
Report Number: 30361246.001

Statement of Compliance

Manufacturer:	Advanced Technology Ramar Ltd. P.O. Box 110127 Research Triangle Park NC 27709 919-991-9924
Requester / Applicant:	Don Watts
Name of Equipment:	Water Transponder Model No. Ptranspondit V2
Type of Equipment:	RF Transmitter
Class of Equipment:	Class B
Application of Regulations:	FCC Title 47, Part 15, Subpart C and RSS-210 Issue 5
Test Dates:	22 May 2003

Guidance Documents:

Emissions: FCC 47 CFR Part 15, RSS-210 Issue 5

Test Methods:

Emissions: FCC Title 47, Part 15; ANSI C63.4:1992

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland of North America, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

NVLAP Signatory	10 June 2003 Date

Table of Contents

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Title 47, Part 15, Subpart C and RSS-210 Issue 5 based on the results of testing performed on *22 May* 2003 on the *Water Transponder* Model No. *Ptranspondit V2* manufactured by Advanced Technology Ramar Ltd.. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1 - Summary of Test Results

Emission	Test Method(s)	Test Parameters	Result
Radiated Emissions	47 CFR 15.209 & 15.249, ANSI C63.4:1992, RSS-210 Issue 5	9 KHz to 10 GHz, Class B	compliant
Conducted Emissions	47 CFR 15, ANSI C63.4:1992	150 kHz to 30 MHz	Not Required

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

No modifications were found to be necessary in order to achieve compliance.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 25 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174 and C-1236).

2.1.4 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2).

The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The conducted test system has a combined standard uncertainty of ± 1.2 dB. The radiated test system has a combined standard uncertainty of ± 1.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 25.

3 Product Information

Figure 1 – Photo of EUT (front)

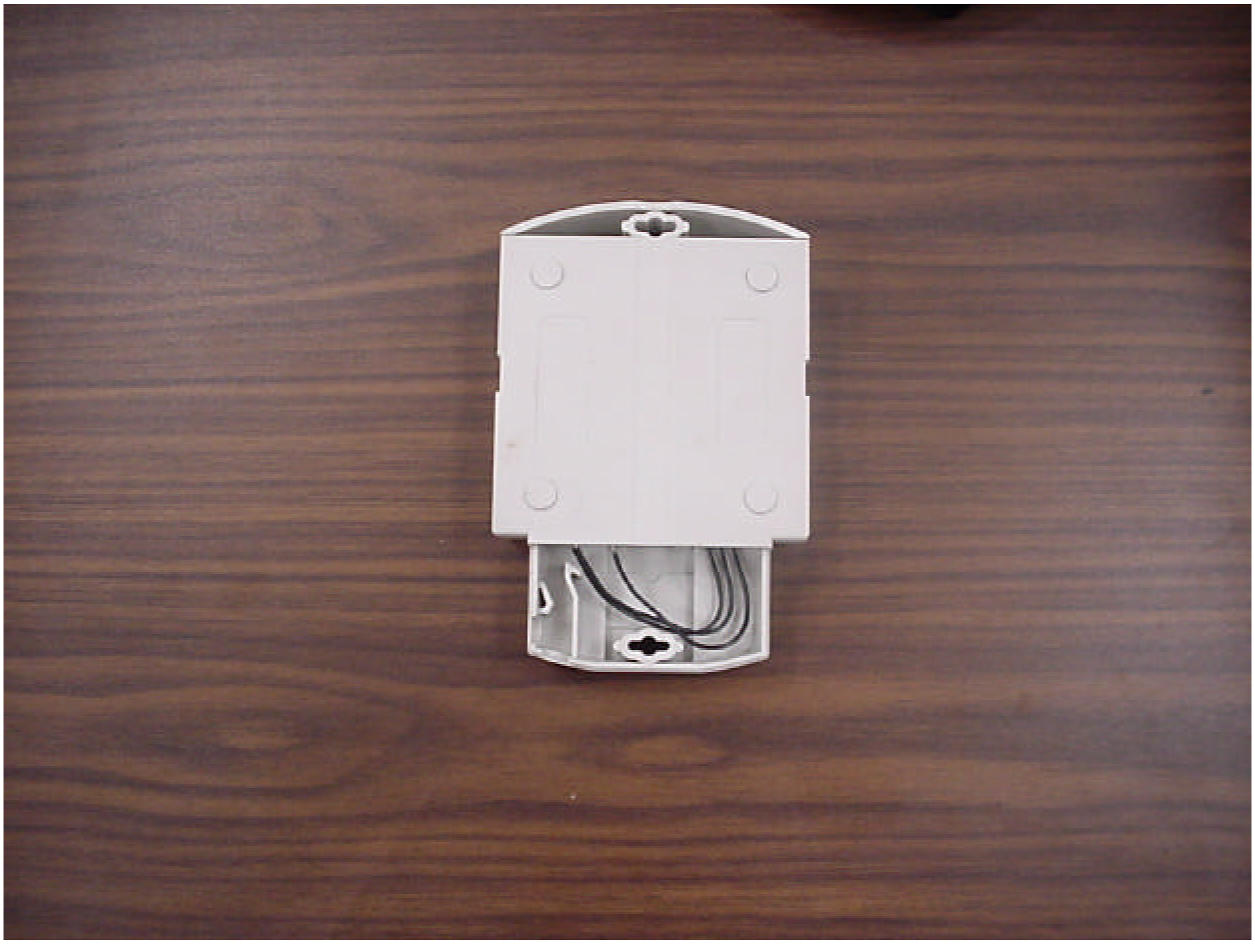

Figure 2 – Photo of EUT (back)

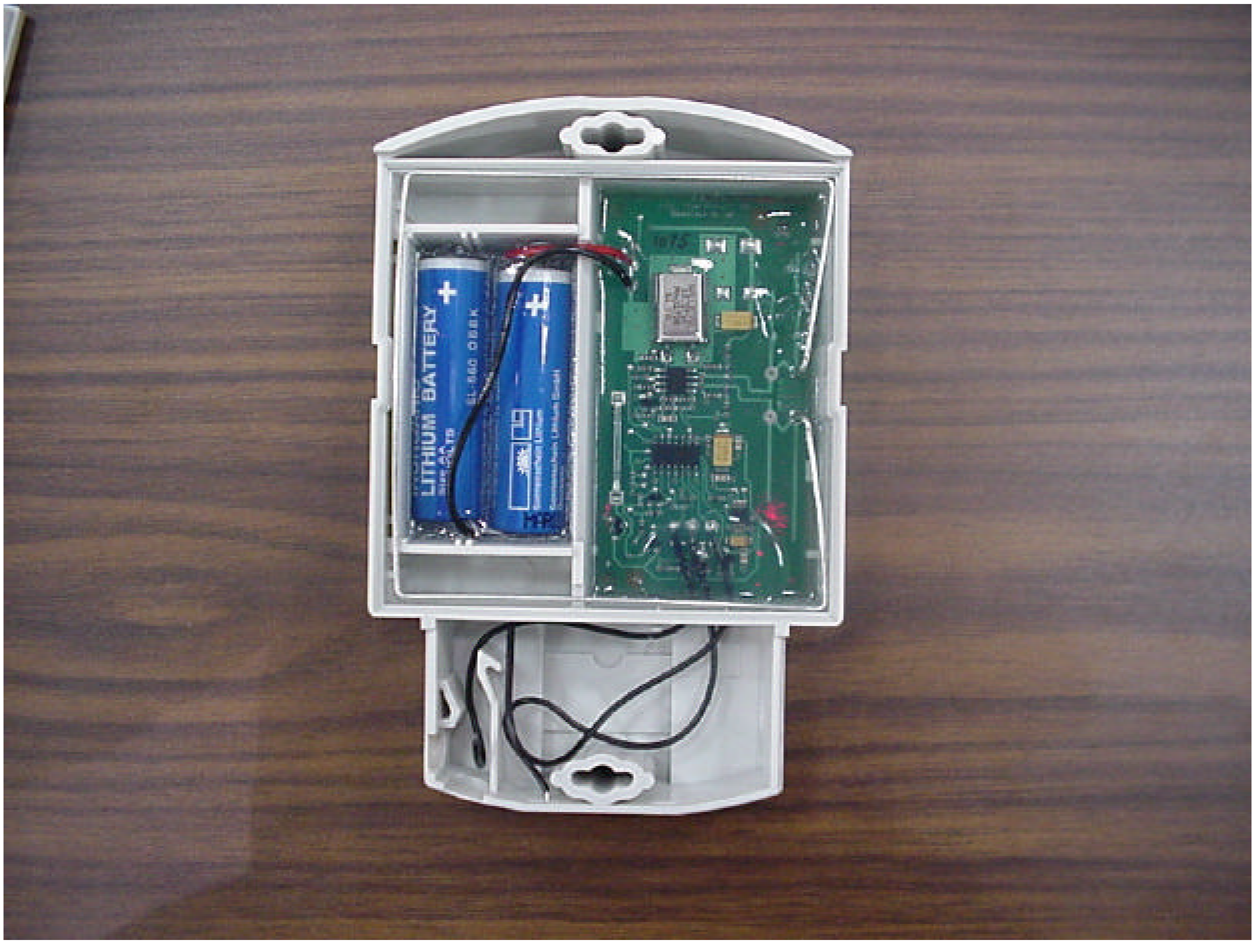

Figure 3 – Photo of EUT

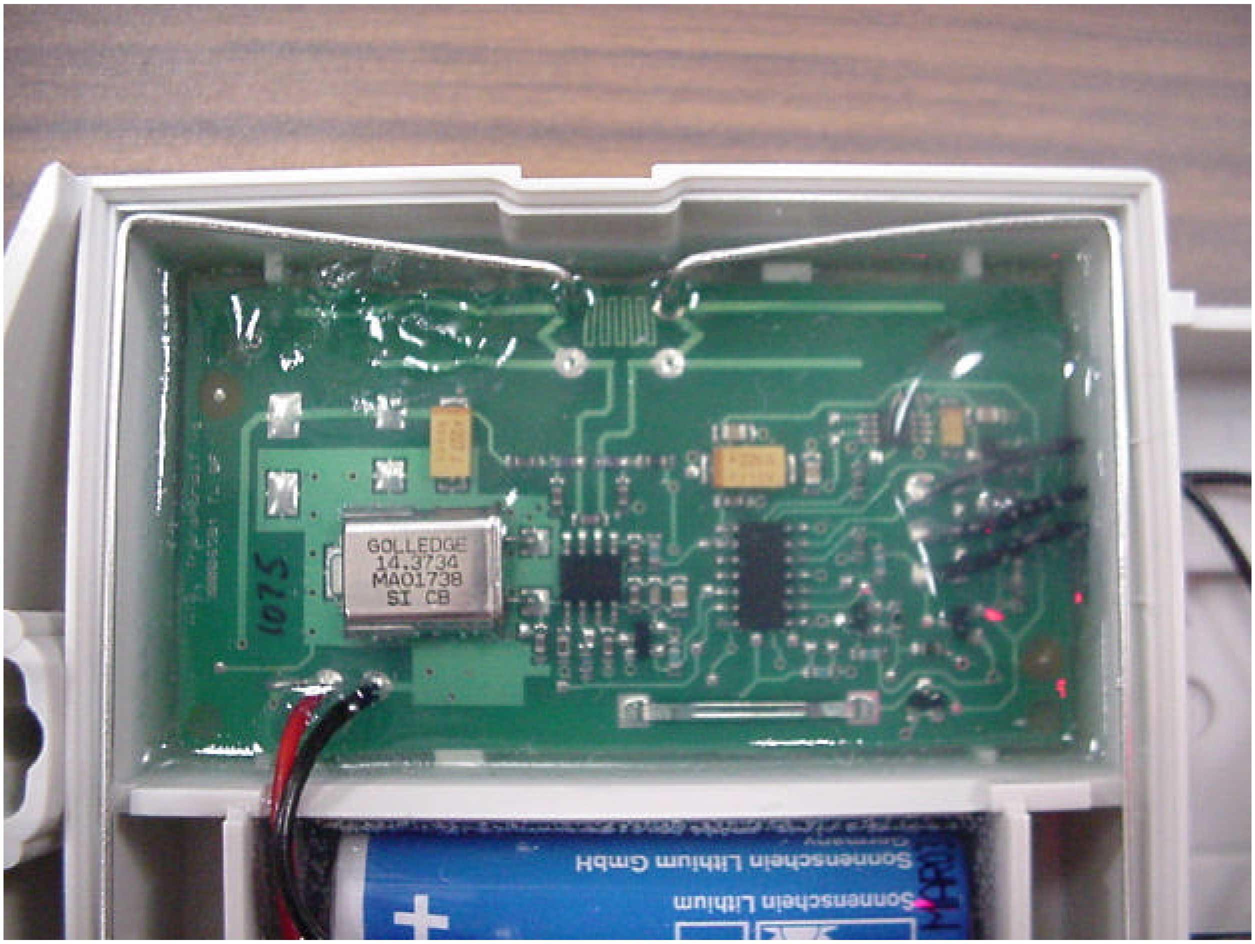

Figure 4 – Photo of EUT

3.1 Product Description

The information for all equipment used in the tested system, including: descriptions of cables, clock and microprocessor frequencies, EMI critical components, and accessory equipment has been supplied by the manufacturer and is listed in the EMC Test Plan found in Section 6.

3.2 Equipment Configuration

A description and justification of the equipment configuration is given in the EMC Test Plan. The EUT was tested as described in the EMC Test Plan and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to warm up to normal operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Equipment Configuration given in the EMC Test Plan.

3.3 Operation Mode

A description and justification of the operation mode is given in the EMC Test Plan.

In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Operation Mode given in the EMC Test Plan.

4 Emissions

4.1 Radiated Emissions

Testing was performed in accordance with 47 CFR 15.209 & 15.249, ANSI C63.4:1992, RSS-210 Issue 5. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for each 6° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3 meters at a fixed height of 1 meter. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

4.1.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, then the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

4.1.1.3 PTranspondIT® Test Fixture Description

The test fixture was designed to simulate the actual installation of a PTranspondIT® unit. The unit is always installed inside a pit buried in the ground with the lid of the pit at or slightly below finished grade. The construction of the one cubic meter container is such that the plywood and timber frame is secured with glue and without any metallic fasteners. The cast iron pit has a solid bottom and is fitted with a typical water meter. The cast iron pit is held in place by a surrounding of sand. There is at least six inches of sand at any point around the pit. The cast pit lid is arranged such that its upper surface is level and at a measured 0.8 meters distance above the surface of the turntable. A PVC membrane was installed between the surrounding sand and the container to reduce the likelihood of contaminating the test chamber. The unit under test was mounted to a wood support by securing it with a plastic tie-wrap as would typically occur in an actual installation. The front of the unit under test was facing the antenna while the turntable was at 0° rotation angle. This test configuration represents the worst-case scenario compared to the actual installation.

4.1.1.4 Deviations

There were no deviations from this test methodology.

4.1.2 Test Results

Section 0 contains preliminary test data as well as any engineering data used to determine any modifications or special accessories. Section 4.1.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.1.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

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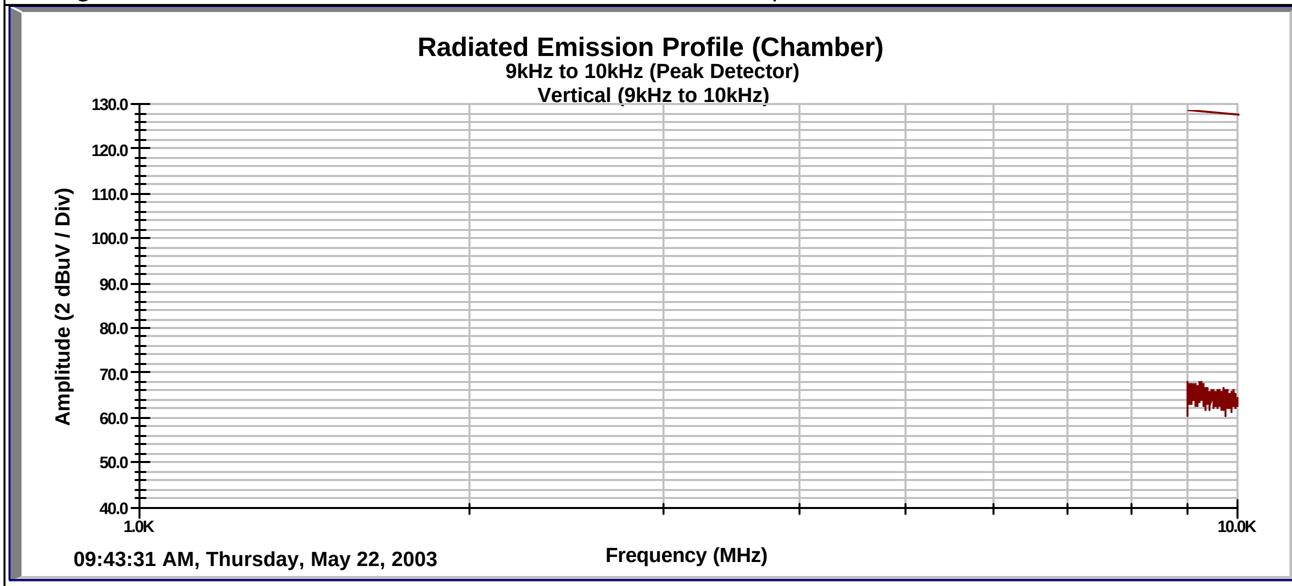
EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	67 Deg. F / 67% RH
EUT Serial	1080	**Temp / Hum out**	N/A
Distance	3m	**Line AC / Freq**	N/A
Ant Used	EMCO 6511	**Performed by**	Eugene Moses
Configuration	EUT mounted in oval meter box, inside the sand pit. RBW = 9 KHz. VBW = 30 KHz.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

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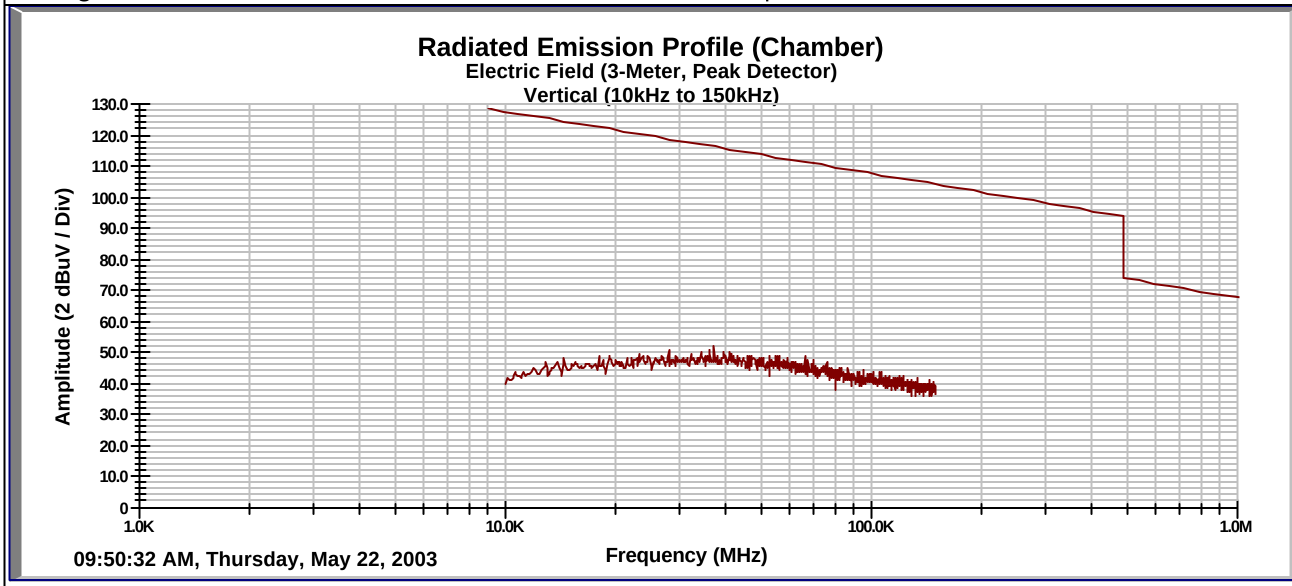
EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	67 Deg. F / 67% RH
EUT Serial	1080	**Temp / Hum out**	N/A
Distance	3m	**Line AC / Freq**	N/A
Ant Used	EMCO 6502	**Performed by**	Eugene Moses
Configuration	EUT mounted in oval meter box, inside the sand pit. RBW = 9 KHz. VBW = 30 KHz.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

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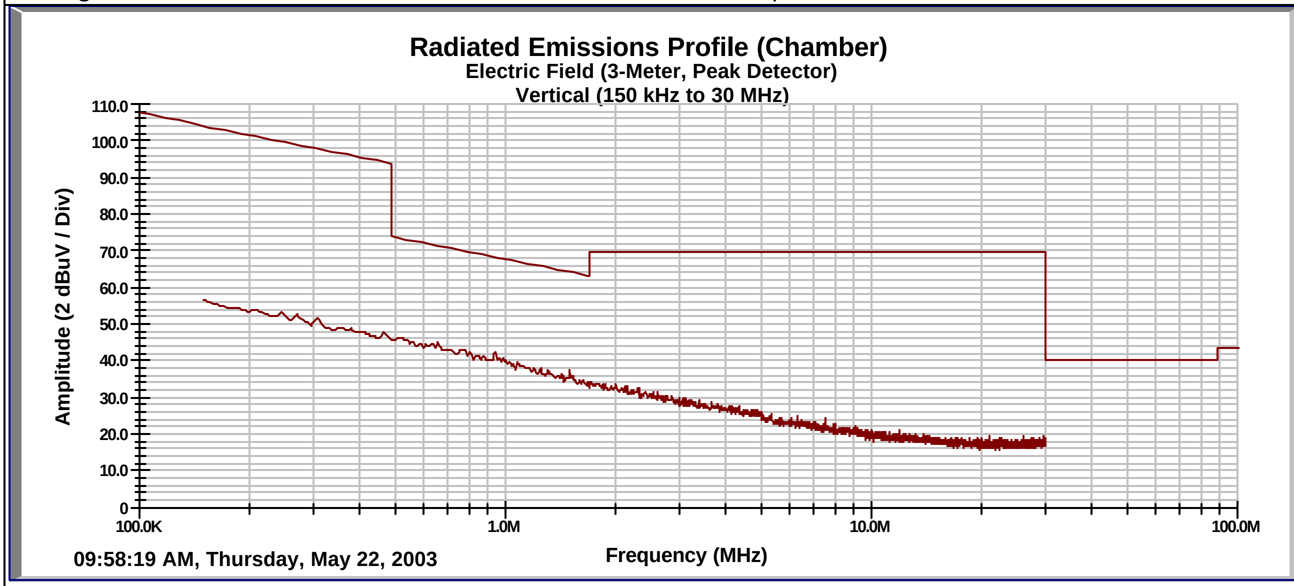
EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	67 Deg. F / 67% RH
EUT Serial	1080	**Temp / Hum out**	N/A
Distance	3m	**Line AC / Freq**	N/A
Ant Used	EMCO 6502	**Performed by**	Eugene Moses
Configuration	EUT mounted in oval meter box, inside the sand pit. RBW = 9 KHz. VBW = 30 KHz.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.6$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

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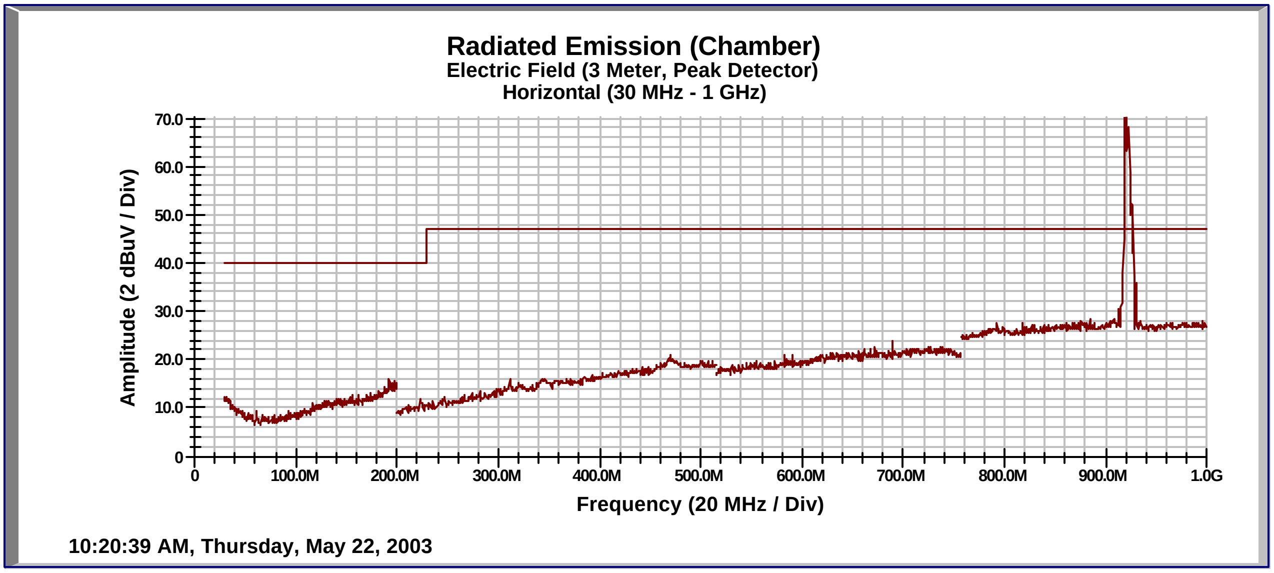
EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	67 Deg. F / 67% RH
EUT Serial	1080	**Temp / Hum out**	N/A
Distance	3m	**Line AC / Freq**	N/A
Ant Used	3110B, SAS-516	**Performed by**	Eugene Moses
Configuration	EUT mounted in oval meter box, inside the sand pit.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Measurement made with EMCO 3121C4 Dipole. Quasi-Peak value. RBW=120 KHz. VBW=300 KHz.										
919.80	H	1	105	56.71	0.00	2.40	28.55	87.66	94.00	-6.34

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

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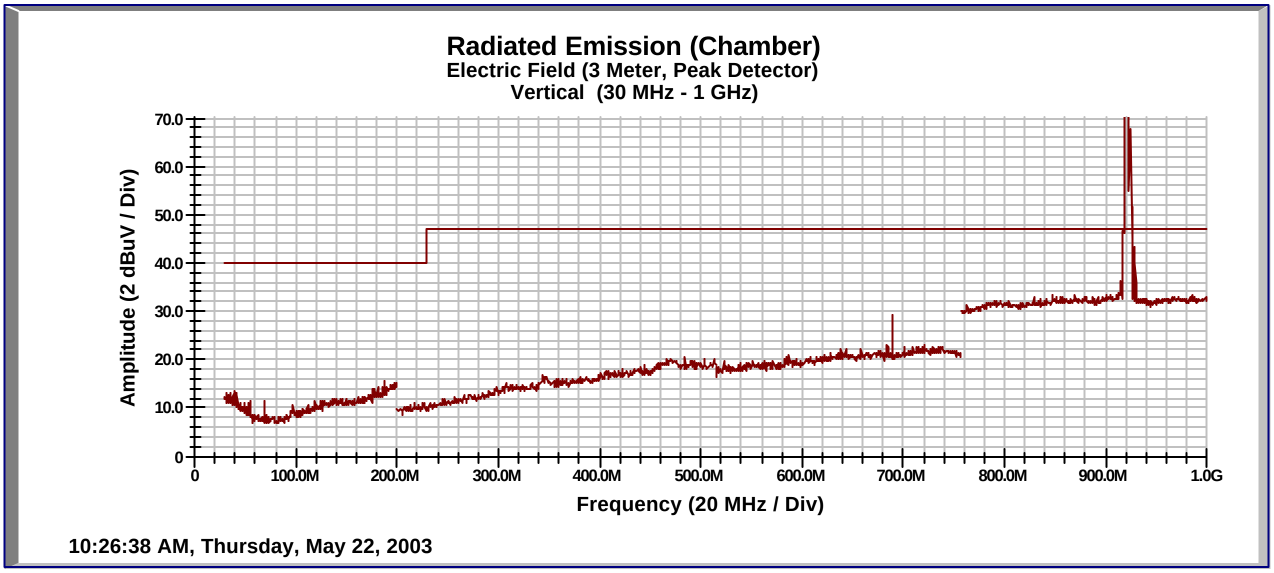
EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	67 Deg. F / 67% RH
EUT Serial	1080	**Temp / Hum out**	N/A
Distance	3m	**Line AC / Freq**	N/A
Ant Used	3110B, SAS-516	**Performed by**	Eugene Moses
Configuration	EUT mounted in oval meter box, inside the sand pit. RBW = 120 KHz. VBW = 300 KHz.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
689.80	V	1	89	5.05	0.00	2.07	19.10	26.22	47.00	-20.78
Measurement made with EMCO 3121C4 Dipole. Quasi-Peak value. RBW=120 KHz. VBW=300 KHz.										
919.80	V	1	112	58.13	0.00	2.40	28.55	89.08	94.00	-4.92

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.6$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

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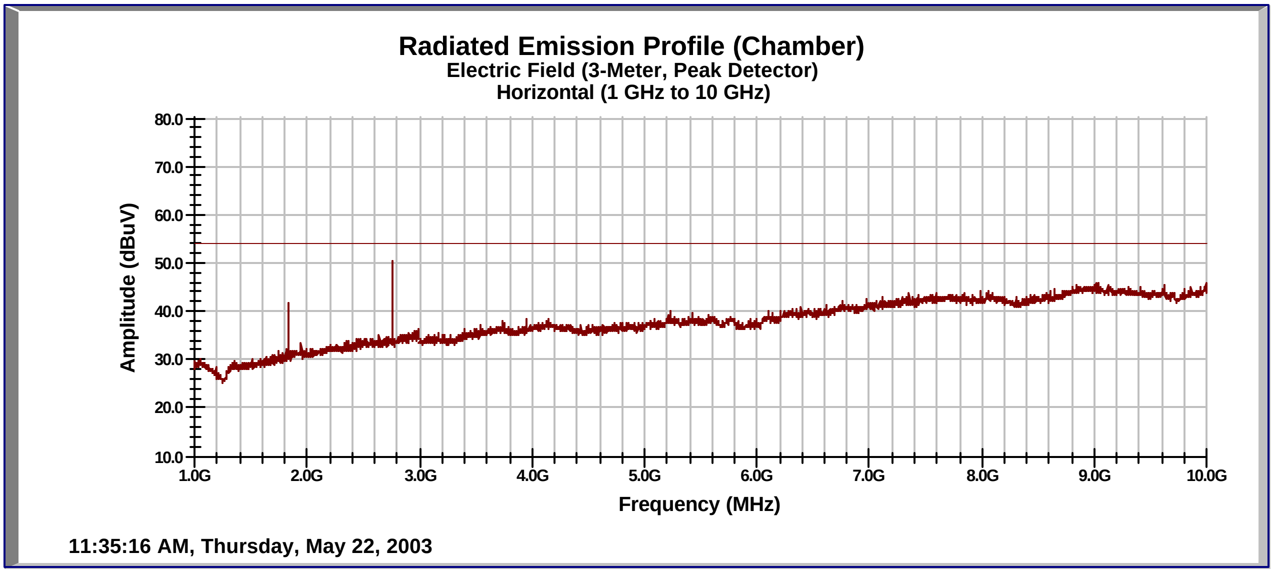
EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	67 Deg. F / 67% RH
EUT Serial	1080	**Temp / Hum out**	N/A
Distance	3m	**Line AC / Freq**	N/A
Ant Used	3115-2236	**Performed by**	Eugene Moses
Configuration	EUT mounted in oval meter box, inside the sand pit. RBW = 1 MHz. VBW = 1 MHz.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
FIM Value has 0.3 dB added for loss from high pass filter. RBW = 1 MHz. VBW = 1 MHz.										
Peak value.										
1840.00	H	1	214	50.91	36.08	4.88	29.00	48.71	74.00	-25.29
Average value.										
1840.00	H	1	214	33.11	36.08	4.88	29.00	30.91	54.00	-23.09
Peak value.										
2760.00	H	1	224	53.35	35.91	6.12	31.73	55.30	74.00	-18.70
Average value.										
2760.00	H	1	224	32.61	35.91	6.12	31.73	34.56	54.00	-19.44

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.6$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

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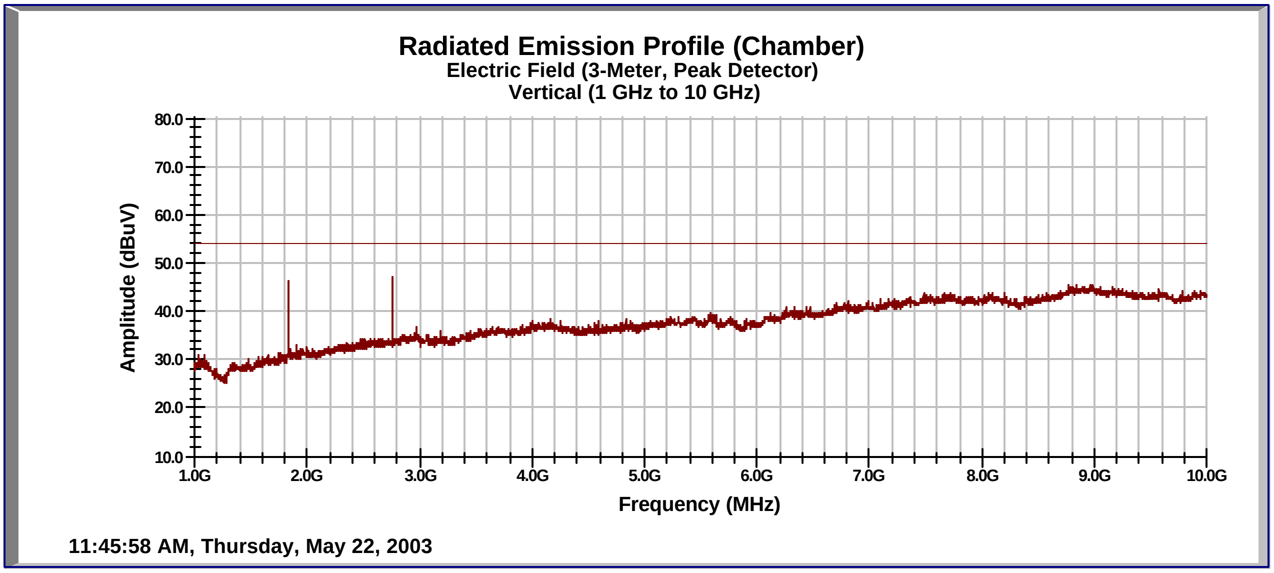
EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	67 Deg. F / 67% RH
EUT Serial	1080	**Temp / Hum out**	N/A
Distance	3m	**Line AC / Freq**	N/A
Ant Used	3115-2236	**Performed by**	Eugene Moses
Configuration	EUT mounted in oval meter box, inside the sand pit. RBW = 1 MHz. VBW = 1 MHz.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
FIM Value has 0.3 dB added for loss from high pass filter. RBW = 1 MHz. VBW = 1 MHz.										
Peak value.										
1840.00	V	1	113	53.67	36.08	4.88	29.00	51.47	74.00	-22.53
Average value.										
1840.00	V	1	113	34.47	36.08	4.88	29.00	32.27	54.00	-21.73
Peak value.										
2759.00	V	1	98	52.88	35.91	6.12	31.73	54.82	74.00	-19.18
Average value.										
2759.00	V	1	98	32.66	35.91	6.12	31.73	34.60	54.00	-19.40

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.6$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

4.1.2.2 Engineering Data

The data recorded in this section includes pre-scans, informational, and engineering data included for reference only. This data may include plots showing peak emissions in both horizontal and vertical antenna polarizations and used to select worst-case operating modes and configurations to identify frequencies that require measurement If any modifications or special accessories were required, the supporting data is contained in this section.

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EUT Name	Water Transponder	**Date**	22 May 2003
EUT Model	Ptranspondit V2	**Temp / Hum in**	71 Deg. F / 64% RH
EUT Serial	1078, 1079, 1080	**Temp / Hum out**	N/A
Distance	3M	**Line AC / Freq**	N/A
Ant Used	EMCO 3121C4 Dipole	**Performed by**	Eugene Moses

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Unit standing on table. Serial 1080 with 15k resistor. Quasi-Peak value. RBW = 120 KHz. VBW = 300 KHz										
920.00	V	1.08	144	72.65	0.00	2.40	28.56	103.61	94.00	+9.61
919.80	H	1	27	61.42	0.00	2.40	28.55	92.37	94.00	-1.63
Unit standing on table. Serial 1078 with 15k resistor. Quasi-Peak value. RBW = 120 KHz. VBW = 300 KHz										
919.80	V	1.1	141	74.23	0.00	2.40	28.55	105.18	94.00	+11.18
920.00	H	1	40	64.62	0.00	2.40	28.56	95.58	94.00	+1.58

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.6$dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

4.1.3 Photos

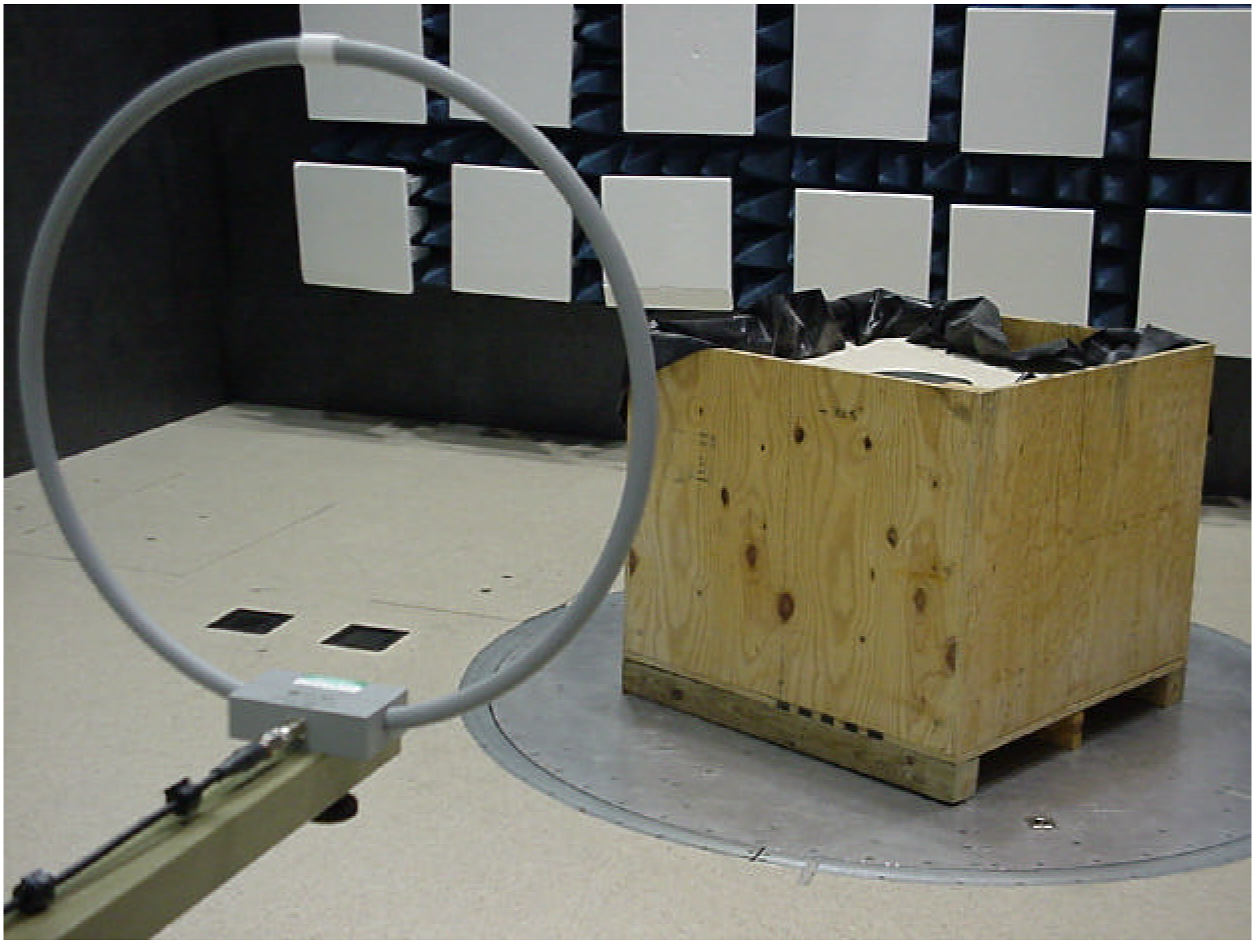

Figure 5 - Radiated Emissions Test Setup

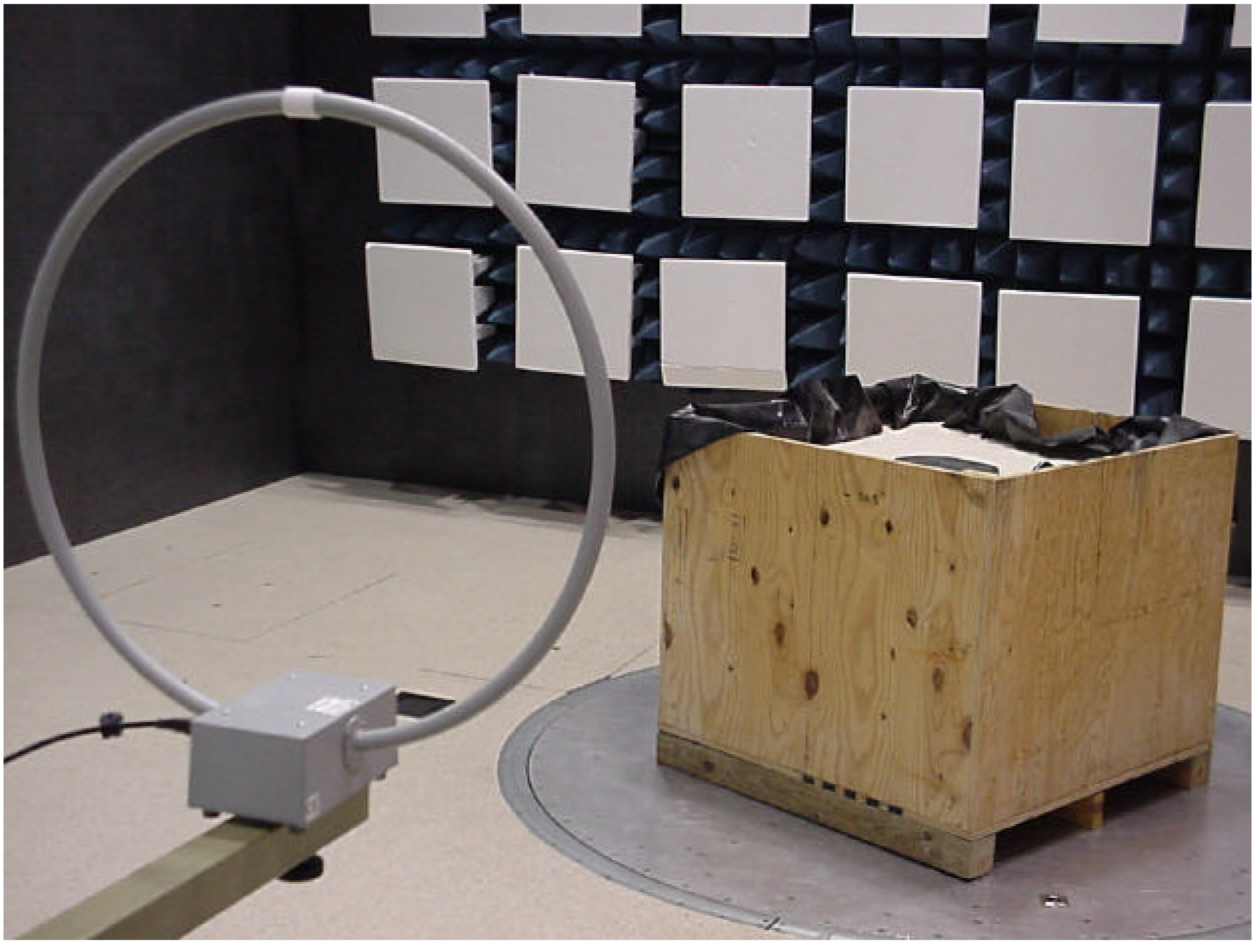

Figure 6 - Radiated Emissions Test Setup

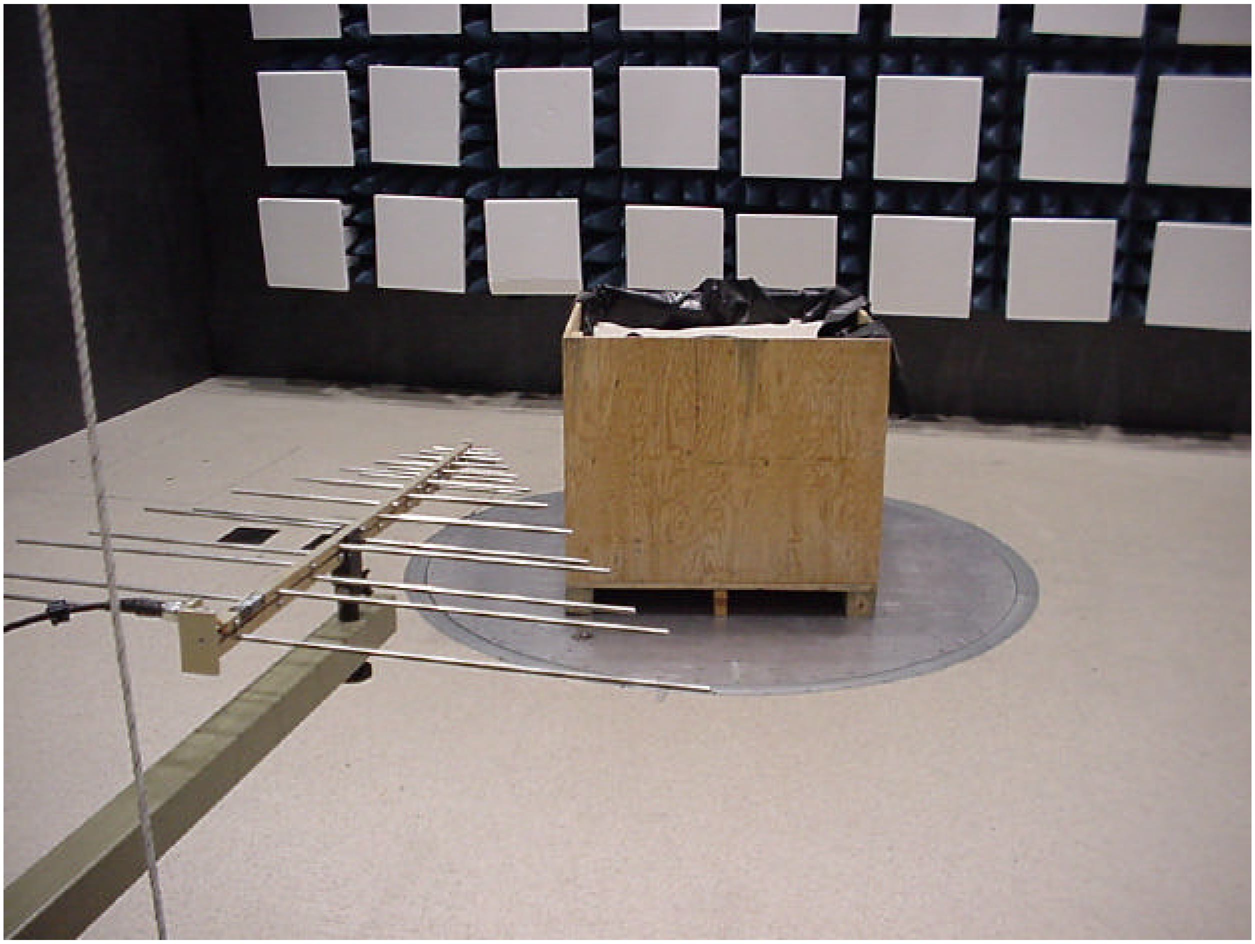

Figure 7 - Radiated Emissions Test Setup

Figure 8 - Radiated Emissions Test Setup

Figure 9 – Fundamental Test Setup

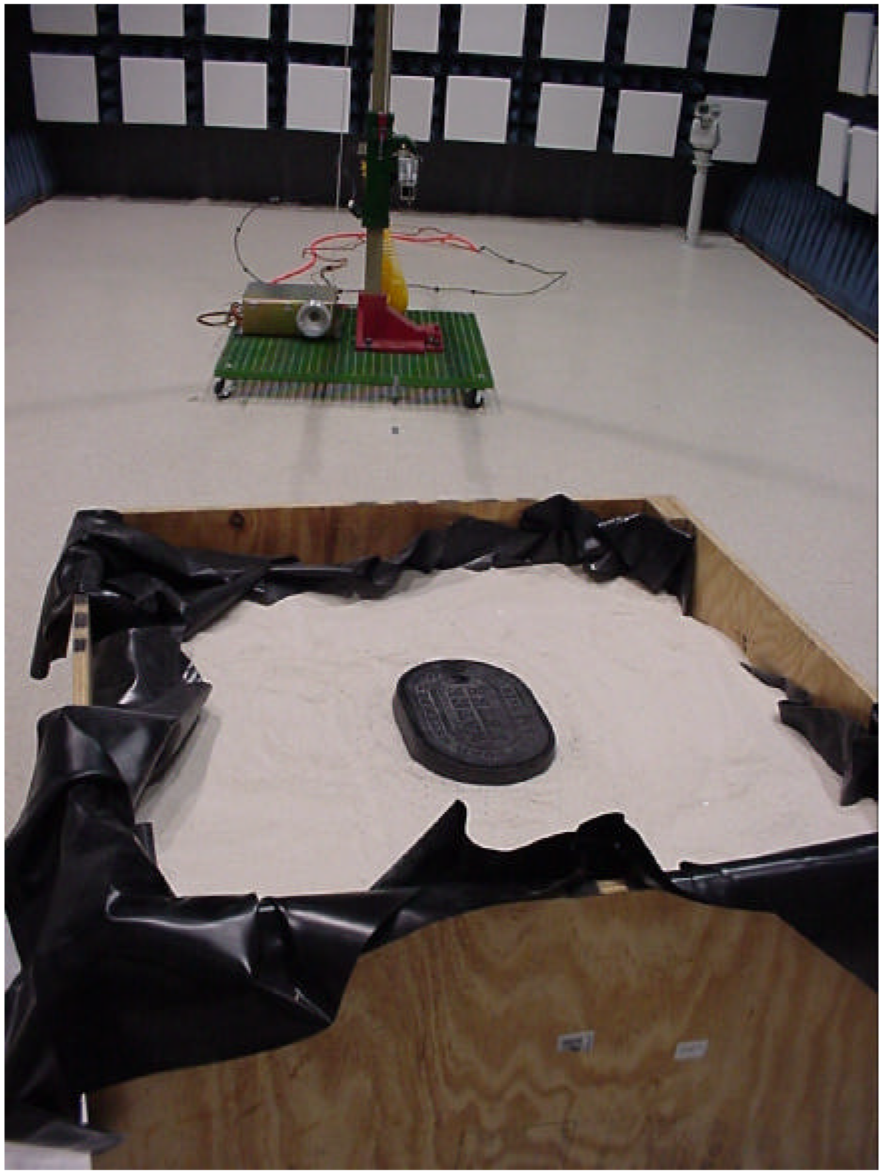

Figure 10 – Photo of Test Fixture

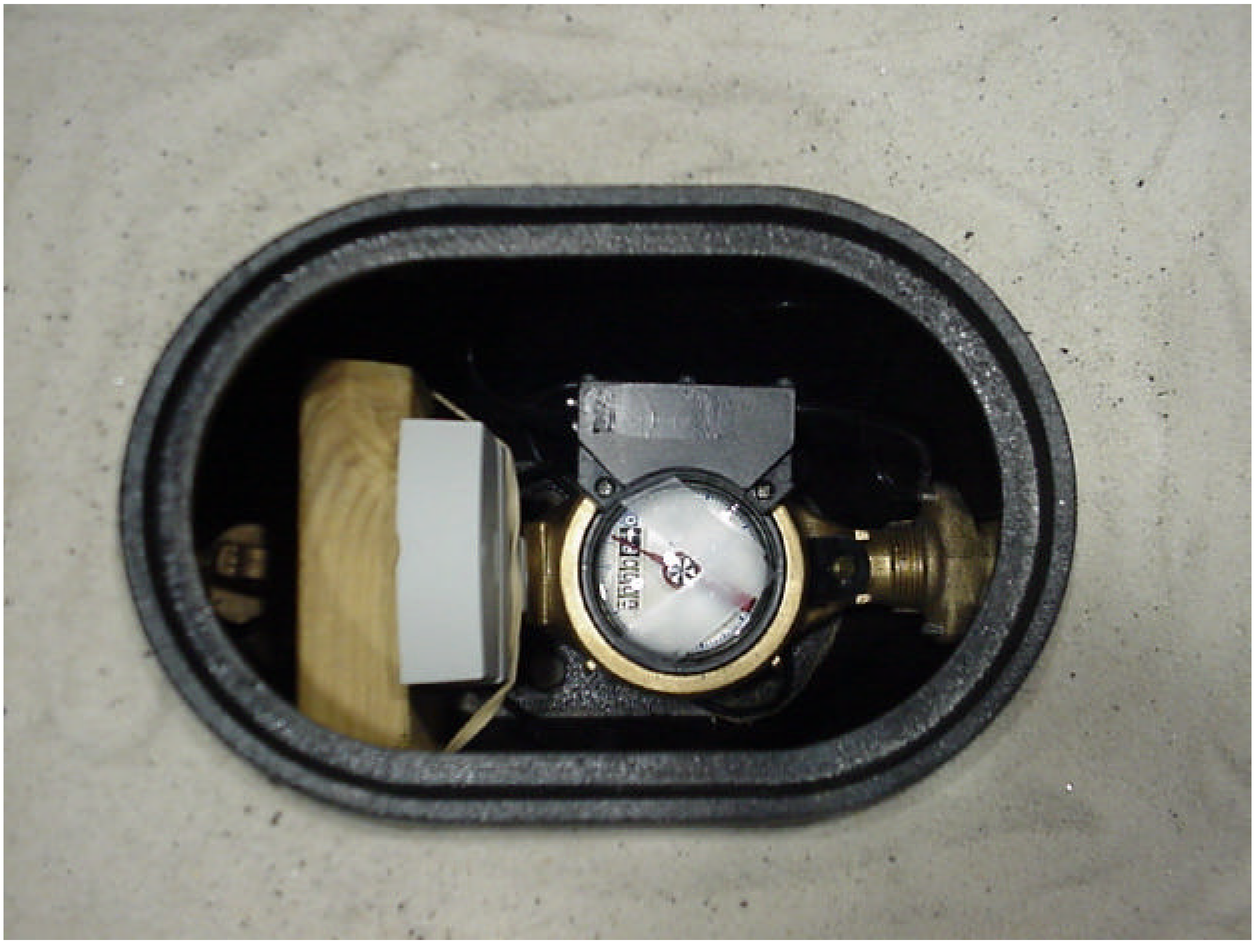

Figure 11 – Photo of EUT Inside Test Fixture.

4.1.4 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM - AMP + CBL + ACF

Where: FIM = Field Intensity Meter (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dBmV/m}{20}}$$

4.2 Conducted Emissions

This test was not performed because the unit is powered from internal batteries.

5 Test Equipment Use List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emissions (5 Meter Chamber)					
Amplifier, preamp	Agilent Technologies	8449B	3008A01480	5-May-03	5-May-04
Ant. Biconical	EMCO	3110B	3367	6-Jan-03	6-Jan-04
Ant. Log Periodic	AH Systems	SAS-516	133	3-Jan-03	3-Jan-04
Antenna Horn	EMCO	3115	2236	30-Sep-02	30-Sep-05
Antenna Loop	EMCO	6502	3336	15-Nov-02	15-Nov-03
Antenna Loop	EMCO	6511	0004-1175	29-Aug-02	29-Aug-03
Cable, Coax	Andrew	FSJ1-50A	003	31-Jan-03	31-Jan-04
Cable, Coax	Andrew	FSJ1-50A	042	31-Jan-03	31-Jan-04
Cable, Coax	Andrew	FSJ1-50A	045	31-Jan-03	31-Jan-04
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	19-Mar-03	19-Mar-04
Data Table, EMCWin	TUV EMC	EMCWin.dll	002	6-Jan-02	6-Jan-06
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	5-Aug-02	5-Aug-03

General Laboratory Equipment					
Filter, 1.5 GHz High Pass	Bonn Elektronik	BHF 1500	025155	08/11/02	08/11/03
Ant. Dipole Set BL 1-4	EMCO	3121C	9302-914	16-Sep-02	16-Sep-03

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

6 EMC Test Plan

A test plan was not provided by the manufacturer for this testing. EUT operation and configuration was based on the applicable test standards and actual application of the EUT, see Section 4.1.1.3.