Emissions
Test Report

EUT Name: MS8 PTRANSPONDIT V1

EUT Model: P TRANSPONDIT V1 A

FCC Title 47, Part 15.249, Subpart B

Prepared for:

Don Watts
Advanced Technology
P. O. Box 110127
Research Triangle Park NC 27709
Tel: 919-991-9924
Fax: 919-919-9924

Prepared by:

Flextronics Compliance Laboratories
762 Park Avenue
Youngsville, NC 27596
Tel: (919) 554-0901
Fax: (919) 556-2043
http://www.flextronics.com/

Report/Issue Date: 6 January 2003
Report Number: 5018bADV

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:	MS8 PTRANSPONDIT V1 Model No. P TRANSPONDIT V1 A
Type of Equipment:	RF Transmitter
Class of Equipment:	Class B
Application of Regulations:	FCC Title 47, Part 15.249, Subpart B
Test Dates:	8 August 2002

Guidance Documents:

Emissions: FCC 47 CFR Part 15.249, EN55022:1998

Test Methods:

Emissions: EN55022:1998, ANSI C63.4:1992, FCC CFR 47 Part 15

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by Flextronics Compliance Laboratories, 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.

Steve O'Steen
Operations Manager
NVLAP Signatory

6 January 2003
Date

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 15.249, Subpart B based on the results of testing performed on *8 August* 2002 on the *MS8 PTRANSPONDIT V1* Model No. *P TRANSPONDIT V1 A* manufactured by Advanced Technology. 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, EN55022:1998, ANSI C63.4:1992	9 KHz to 10 GHz, Class B	compliant

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 Emissions

2.1 Radiated Emissions

Testing was performed in accordance with 47 CFR 15, EN55022:1998, ANSI C63.4:1992. 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.

2.1.1 Test Methodology

2.1.1.1 Final Test

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 test fixture was designed to simulate the actual installation of a PTranspondIT®unit. A one cubic meter container was constructed with timber and plywood frame 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.

For this series of measurements, the enclosure was a Model FYLP-000, manufactured by Ford Meterbox Company. The box is oval cross section, 10" long, 7" wide and 10" high. Dimensions are inside measurements.

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, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

For test purposes, the transmitter was configured to a 20/sec PRF. Normal operation is 0.2 PRF. The device was powered by a battery with expected life of 10 years. The test configuration used would provide an expected battery life of more than one month. With a new battery at the beginning of the test, there would be no appreciable degradation over the duration of the test program of approximately one day.

2.1.1.2 Deviations

There were no deviations from this test methodology.

2.1.2 Test Results

Section 2.1.2.1 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).

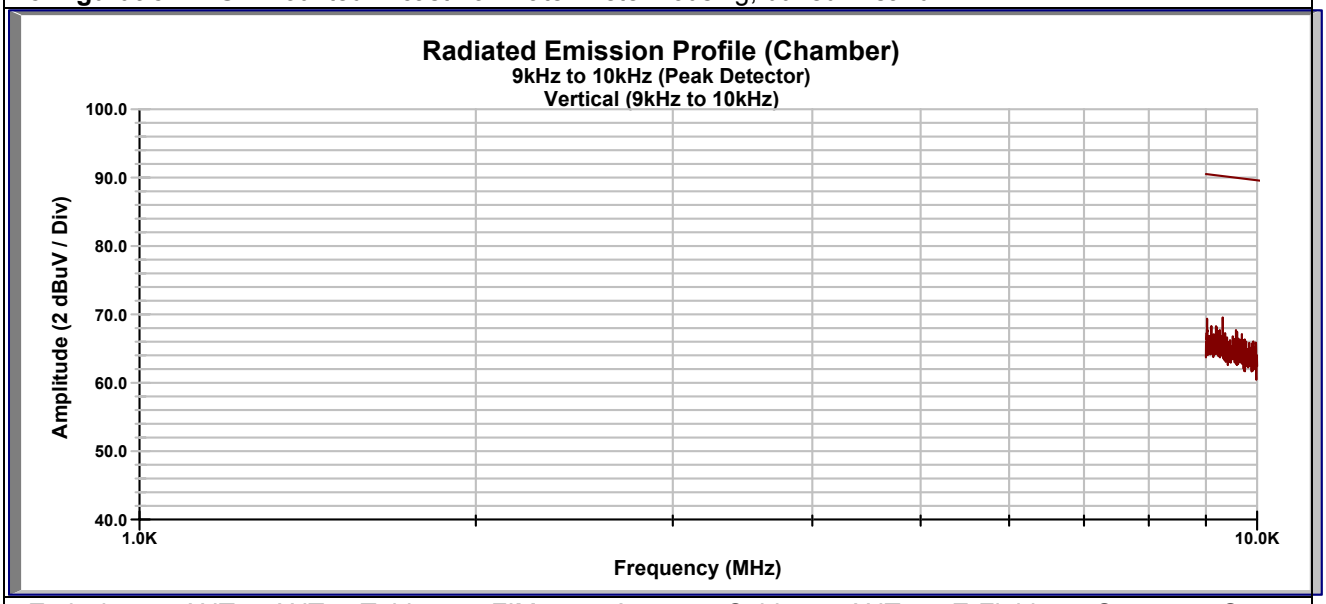
2.1.2.1 Final Data

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.

Flextronics Compliance Laboratories
762 Park Ave., Youngsville, NC 27596
Tel: (919) 554-0901, Fax: (919) 556-2043

SOP 1 Radiated Emissions

EUT Name	MS8 PTRANSPONDIT V1	**Date**	8 August 2002
EUT Model	P TRANSPONDIT V1 A	**Temp / Hum in**	74 Deg. F / 36 % RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15	**Line AC / Freq**	N/A
Dist/Ant Used	3M / 6511	**Performed by**	Eugene Moses
Configuration	EUT mounted in cast iron water meter housing, buried in sand.		



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)

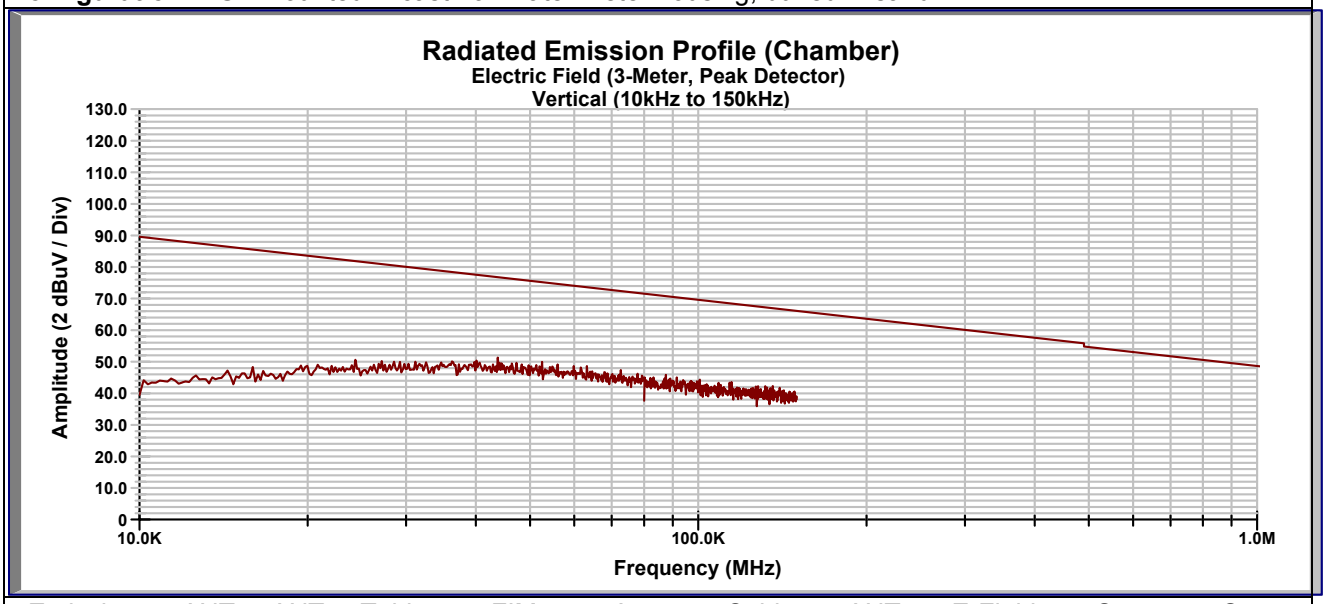
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

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

Notes:

Flextronics Compliance Laboratories
762 Park Ave., Youngsville, NC 27596
Tel: (919) 554-0901, Fax: (919) 556-2043

EUT Name	MS8 PTRANSPONDIT V1	**Date**	7 August 2002
EUT Model	P TRANSPONDIT V1 A	**Temp / Hum in**	70 Deg. F / 40 % RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15	**Line AC / Freq**	N/A
Dist/Ant Used	3M / 6502	**Performed by**	Eugene Moses
Configuration	EUT mounted in cast iron water meter housing, buried in sand.		



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)

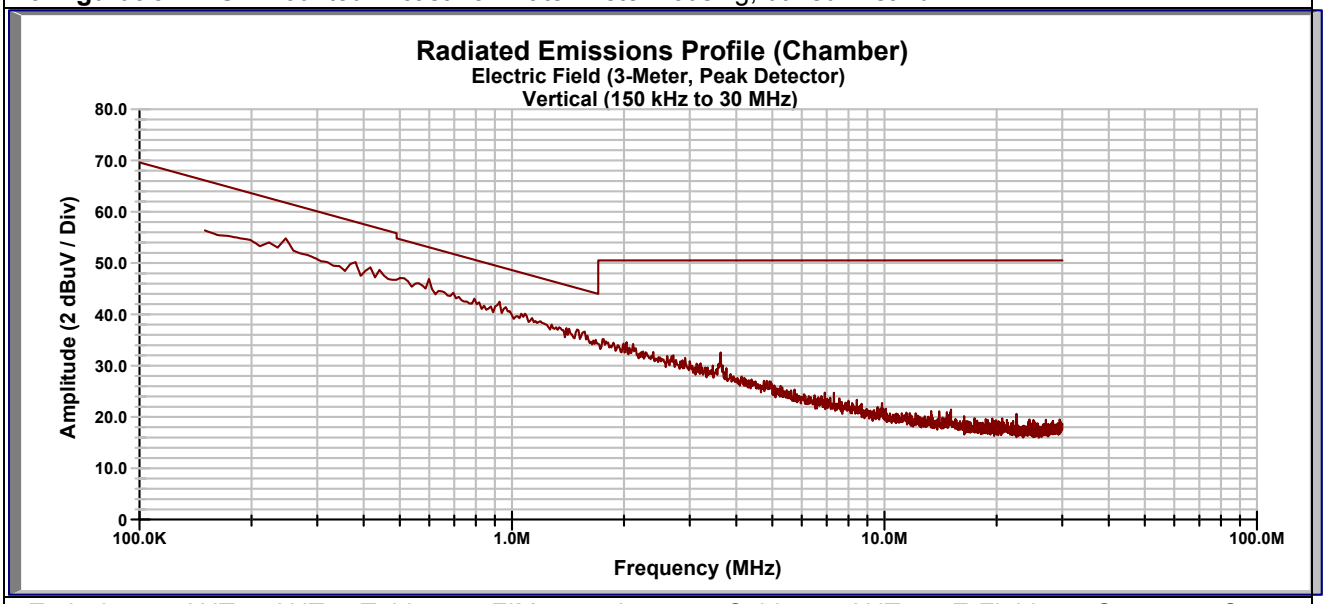
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

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

Notes:

Flextronics Compliance Laboratories
762 Park Ave., Youngsville, NC 27596
Tel: (919) 554-0901, Fax: (919) 556-2043

EUT Name	MS8 PTRANSPONDIT V1	**Date**	7 August 2002
EUT Model	P TRANSPONDIT V1 A	**Temp / Hum in**	70 Deg. F / 40 % RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15	**Line AC / Freq**	N/A
Dist/Ant Used	3M / 6502	**Performed by**	Eugene Moses
Configuration	EUT mounted in cast iron water meter housing, buried in sand.		



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)

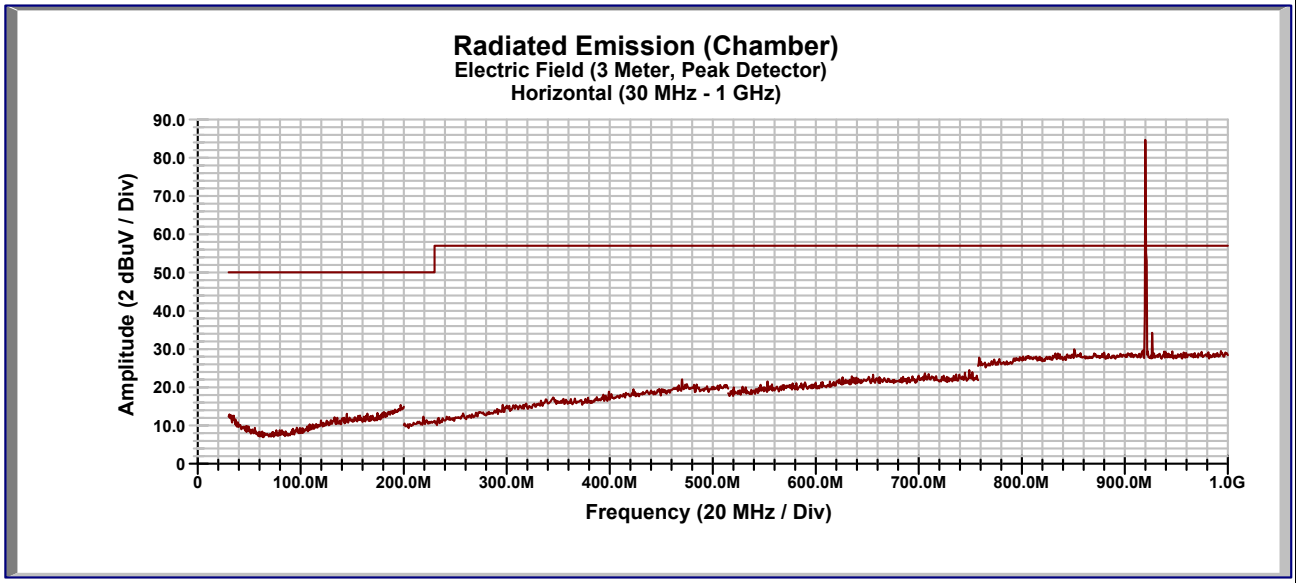
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

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

Notes:

Flextronics Compliance Laboratories
762 Park Ave., Youngsville, NC 27596
Tel: (919) 554-0901, Fax: (919) 556-2043

EUT Name	MS8 PTRANSPONDIT V1	**Date**	7 August 2002
EUT Model	P TRANSPONDIT V1 A	**Temp / Hum in**	70 Deg. F / 40 % RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15	**Line AC / Freq**	N/A
Dist/Ant Used	3M / 3110B, SAS-516	**Performed by**	Eugene Moses
Configuration	EUT mounted in cast iron water meter housing, buried in sand.		



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 A H Systems, SAS-516. Peak value.										
919.85	H	1.24	101	62.88	0.00	4.27	22.69	89.84	94.00	-4.16
Measurement was made with an EMCO 3121C4 Dipole. Peak value.										
919.85	H	1.11	122	55.16	0.00	4.27	28.56	87.99	94.00	-6.01

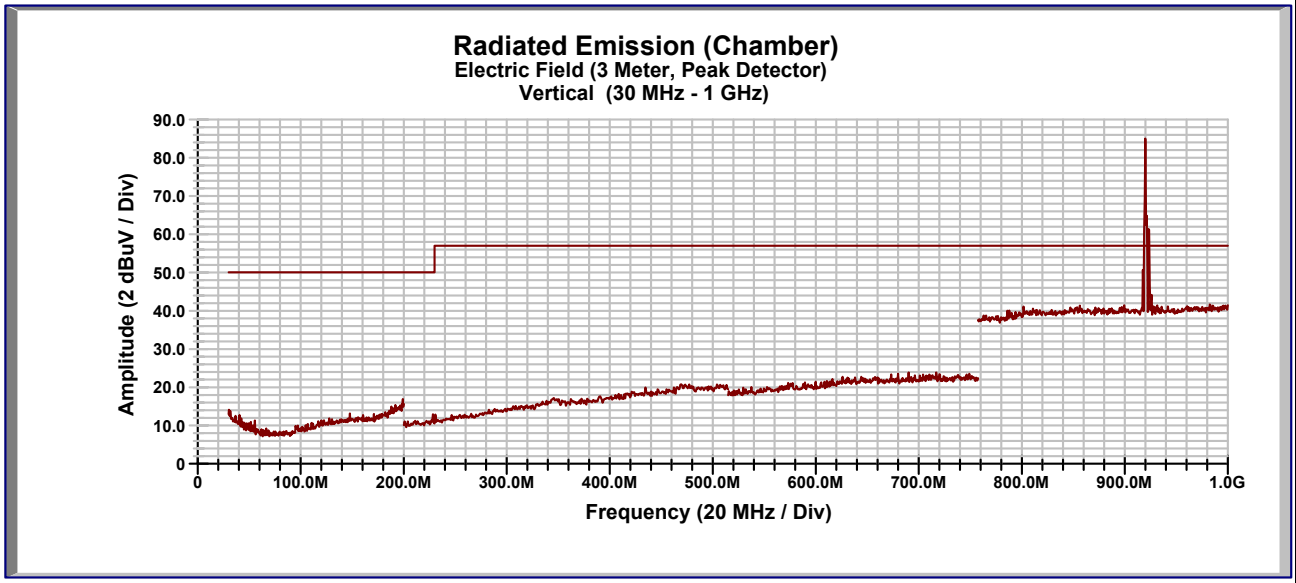
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

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

Notes: RBW = 120 kHz, VBW = 300 kHz

Flextronics Compliance Laboratories
762 Park Ave., Youngsville, NC 27596
Tel: (919) 554-0901, Fax: (919) 556-2043

EUT Name	MS8 PTRANSPONDIT V1	**Date**	7 August 2002
EUT Model	P TRANSPONDIT V1 A	**Temp / Hum in**	70 Deg. F / 40 % RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15	**Line AC / Freq**	N/A
Dist/Ant Used	3M / 3110B, SAS-516	**Performed by**	Eugene Moses
Configuration	EUT mounted in cast iron water meter housing, buried in sand		



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 A H Systems, SAS-516. Peak value.										
919.84	V	1	301	64.02	0.00	4.27	23.80	92.09	94.00	-1.91
Measurement was made with EMCO 3121C4 Dipole. Peak value.										
919.84	V	1.0	308	57.09	0.00	4.27	28.56	89.92	94.00	-4.08

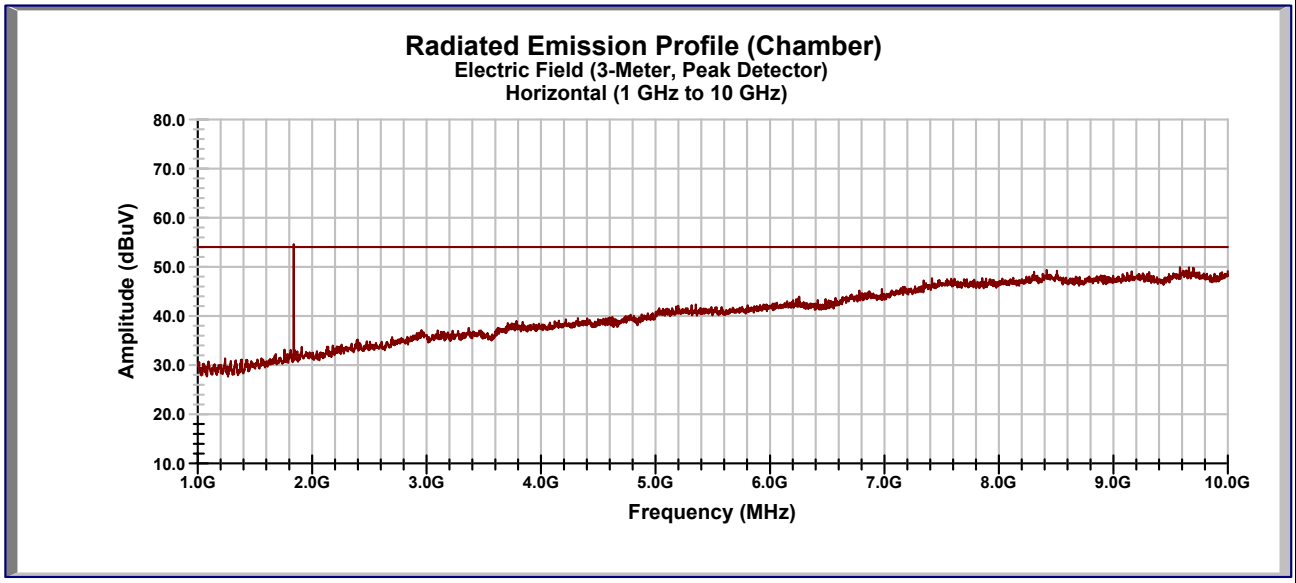
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

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

Notes: RBW = 120 kHz, VBW = 300 kHz

SOP 1 Radiated Emissions

EUT Name	MS8 PTRANSPONDIT V1	**Date**	7 August 2002
EUT Model	P TRANSPONDIT V1 A	**Temp / Hum in**	70 Deg. F / 40 % RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15	**Line AC / Freq**	N/A
Dist/Ant Used	3M / 3115-5770	**Performed by**	Eugene Moses
Configuration	EUT mounted in cast iron water meter housing, buried in sand		



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 is average.										
1840.00	H	1	41	28.97	36.43	6.50	28.40	27.43	54.00	-26.57
2760.00	H	1	265	26.79	36.37	8.03	31.22	29.67	54.00	-24.33
4598.00	H	1	265	23.86	36.37	10.45	34.17	32.11	54.00	-21.89

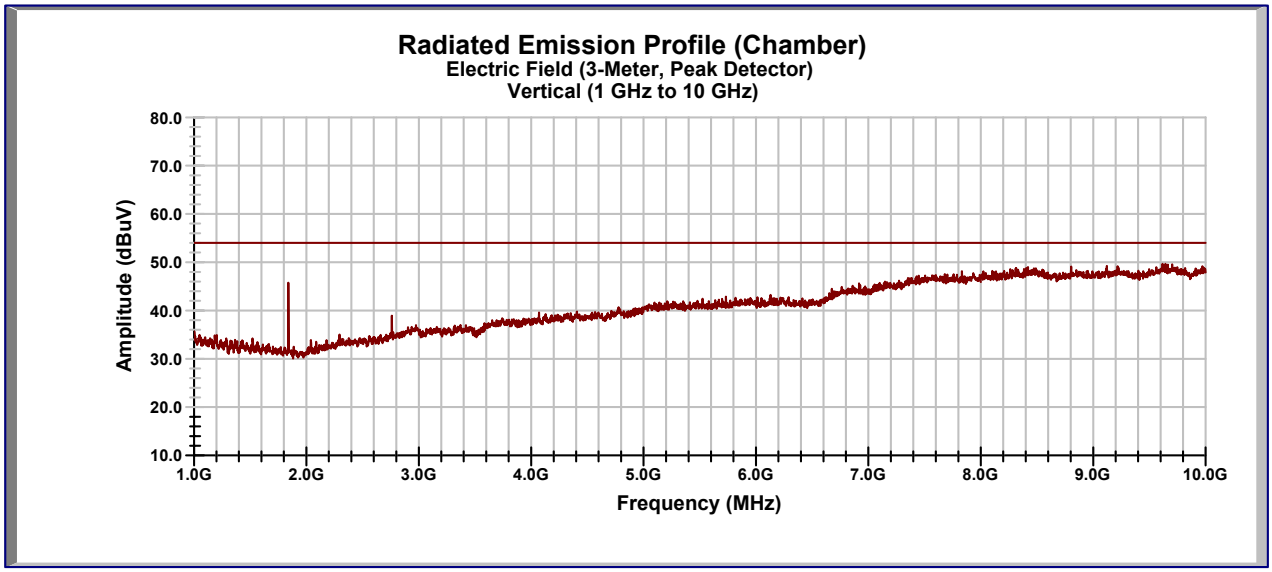
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

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

Notes: RBW = 1.0 MHz, VBW = 1.0 MHz

Flextronics Compliance Laboratories
762 Park Ave., Youngsville, NC 27596
Tel: (919) 554-0901, Fax: (919) 556-2043

EUT Name	MS8 PTRANSPONDIT V1	**Date**	7 August 2002
EUT Model	P TRANSPONDIT V1 A	**Temp / Hum in**	70 Deg. F / 40 % RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15	**Line AC / Freq**	N/A
Dist/Ant Used	3M / 3115-5770	**Performed by**	Eugene Moses
Configuration	EUT mounted in cast iron water meter housing, buried in sand		



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 is average.										
1840.00	V	1.0	65	31.78	36.43	6.50	28.30	30.15	54.00	-23.85
2760.00	V	1	265	26.80	36.37	8.03	31.27	29.73	54.00	-24.27

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: RBW = 1.0 MHz, VBW = 1.0 MHz

2.2 Conducted Emissions

The EUT was powered by an internal battery, therefore, this test was not performed.

3 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	7-Feb-02	7-Feb-03
Ant. Biconical	EMCO	3110B	3367	28-Nov-01	28-Nov-02
Antenna Loop	EMCO	6502	3336	10-Nov-01	10-Nov-02
Ant. Log Periodic	AH Systems	SAS-516	133	26-Nov-01	26-Nov-02
Antenna Horn	EMCO	3115	5770	18-Nov-01	18-Nov-02
Cable, Coax	Andrew	FSJ1-50A	031	28-Jan-02	28-Jan-03
Cable, Coax	Andrew	FSJ1-50A	034	6-Feb-02	6-Feb-03
Cable, Coax	Andrew	FSJ1-50A	045	29-Jan-02	29-Jan-03
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	15-Jul-02	15-Jul-03
Data Table, EMCWin	Flextronics EMC	EMCWin.dll	002	6-Jan-02	6-Jan-03
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	14-Aug-01	14-Aug-02
General Laboratory Equipment					
Antenna Loop	EMCO	6511	0004-1175	28-Sep-01	28-Sep-02
**Ant. Dipole Set BL 1-4	EMCO	3121C	9302-914	22-Jul-99	22-Jul-00
Meter, Multi	Extech	38096C	D023466	14-Aug-01	14-Aug-02
Meter, Multi	Fluke	79-3	69200606	14-Aug-01	14-Aug-02
Meter, Temp/Humid/Barom	Fisher	02-400	01	14-Aug-01	14-Aug-02

* 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.

** For reference measurements only.