TEST REPORT NO: RU1112/5860

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FCC ID: RXJ-MRL800

REPORT ON THE CERTIFICATION TESTING OF A SOLARTRON MOBREY MRL800 RADAR LEVEL TRANSMITTER WITH RESPECT TO THE FCC RULES CFR 47, PART 15.209 INTENTIONAL RADIATOR SPECIFICATION

TEST DATE: 28th July 2004 – 29th October 2004

TESTED BY: ---------- J CHARTERS

APPROVED BY: ---------- P GREEN
EMC PRODUCT MANAGER

DATE: ----------

Distribution:

Copy Nos: 1. Solarton Mobrey

2. FCC EVALUATION LABORATORIES

3. TRL EMC

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FS 21805

CONTENTS

Notes:

1. Component failure during test — YES [ ] NO [X]
2. If Yes, details of failure:
3. The facilities used for the testing of the product contain in this report are FCC Listed.
4. The contents of the attached applicants declarations and other supplied information are not covered by the scope of this laboratory's UKAS or FCC accreditations' and is provided in good faith.

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	RXJ-MRL800					
PURPOSE OF TEST:	Certification					
TEST SPECIFICATION:	FCC RULES CFR 47, Part 15.209					
TEST RESULT:	Compliant to Specification					
EQUIPMENT UNDER TEST:	MRL800 RADAR LEVEL TRANSMITTER					
EQUIPMENT SERIAL No:	Dev04W25-001, Dev04W25-002, Dev04W25-003					
ITU EMISSION CODE:	863MF3N					
EQUIPMENT TYPE:	RADAR DEPTH GAUGE					
PRODUCT USE:	LEVEL MEASUREMENT					
MODULATION TYPE:	FMCW					
ANTENNA TYPE:	Integral 4 Inch Horn, 6 Inch Horn, and Rod Antenna					
ALTERNATIVE ANTENNA:	Not Applicable					
FREQUENCY OF OPERATION:	5500 MHz – 6450 MHz					
CHANNEL SPACING:	Not Applicable, wideband					
NUMBER OF CHANNELS:	1					
FREQUENCY GENERATION:	SAW Resonator	[ ]	Crystal	[ ]	Synthesiser	[X]
MODULATION METHOD:	Amplitude	[ ]	Digital	[ ]	Angle	[X]
POWER SOURCE(s):	+24Vdc					
TEST DATE(s):	25th October 2004 – 29th October 2004					
ORDER No(s):	MPO44671					
APPLICANT:	Solarton Mobrey					
ADDRESS:	158 Edinburgh Avenue Slough Berkshire SL1 4UE					

TESTED BY: ---------- J CHARTERS

APPROVED BY: ---------- P GREEN
EMC PRODUCT MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	MRL800 RADAR LEVEL TRANSMITTER
EQUIPMENT TYPE:	Radar Depth Level Gauge
SERIAL NUMBER OF EUT:	Dev04W25-001, Dev04W25-002, Dev04W25-003
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.209
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	MPO44671
APPLICANT'S CONTACT PERSON(s):	Mr D Kent
E-mail address:	davidkent@solartron.com
APPLICANT:	Solarton Mobrey
ADDRESS:	158 Edinburgh Avenue Slough Berkshire SL1 4UE
TEL:	+44 (0)1753 756 600
FAX:	+44 (0)1753 787 108
MANUFACTURER:	Solarton Mobrey
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	28th July 2004 – 29th October 2004
TEST REPORT No:	RU1112/5860

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
Intentional Emission Frequency:	15.209	Average	YES
Intentional Emission Field Strength:	15.209	Average	YES
Intentional Emission Band Occupancy:	15.215(a)	Peak	YES
Intentional Emission ERP (mW):	-	-	NO
Spurious Emissions – Conducted:	15.207	Quasi Peak Average	YES
Spurious Emissions – Radiated <1000MHz:	15.209	Quasi Peak	YES
Spurious Emissions – Radiated >1000MHz:	15.209	Peak	YES
Maximum Frequency of Search:	15.33	-	
Antenna Arrangements Integral:	15.203	-	YES
Antenna Arrangements External Connector:	15.204	-	NO
Restricted Bands	15.205	-	YES
Extrapolation Factor	15.31(f)	-	YES

2. Product Use: LEVEL MEASUREMENT

3. Emission Designator: 855MF3N

4. Duty Cycle: 0.0027%

5. Temperatures: Ambient (Tnom) 22°C

6. Supply Voltages: Vnom +24Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

7. Equipment Category:
   Single channel [X]
   Two channel [ ]
   Multi-channel [ ]

8. Channel spacing:
   Narrowband [ ]
   Wideband [X]

INTRODUCTION

The Solartron Mobrey MRL800 radar level transmitters operate using FMCW modulation. The frequency range swept by the FMCW signal is 5500MHz – 6450 MHz, for this reason the units must comply with part 15.209. As the units will only be used as depth gauges the antenna will always point towards the ground inside a tank and will be tested as such. The Solartron Mobrey MRL800 radar level transmitters have 3 different antenna types listed below and all 3 antenna types were tested in the 3 different enclosure materials listed below:

Antenna Type

4 Inch Horn
6 Inch Horn
Rod Antenna

Note: Antennas are integral and cannot be changed by the customer.

Enclosure Material

Metal	approx. 2mm Thick
Concrete	approx. 35mm Thick
Plastic	approx. 12mm Thick

Note: Approximate thicknesses of material applicable to TRL laboratory only

TEST LOCATIONS

TRL Laboratory	**Site 1 – Concrete Tank**	**Site 2 – Plastic Tank**
Moss View	Underwater Films	Sarena mfg Ltd
Nipe Lane	Mollison Avenue	Sarena House
Up Holland	Waltham Cross	Beechings Way
West Lancashire	Hertfordshire	Gillingham
		Kent

The 3 different antenna types were tested in all 3 different enclosure materials at the TRL laboratory, in a concrete tank at site 1 and in a plastic tank at site 3.

MEASUREMENT PROCEDURE

The MRL800 radar level transmitters operate a FMCW signal linearly swept over the frequency range 5500MHz to 6450MHz in 5.36mSeconds (Ton). The time between sweeps is 1.969 Seconds (Toff) (see annex C). Radiated measurements were made with a spectrum analyser using a 1MHz BW and a 600 second sweep time, a preamp was also used to improve signal level. A peak detector was used to measure the signal strength. A peak to average correction factor was derived from the duty cycle as follows.

Peak to Average Factor = 20 Log (**X**) Where **X** = Ton / (Ton+Toff)

Peak to Average Factor = 20 Log (5.36mS/1.97436s)

Peak to Average Factor = -51.33 (dB)

Measurements were performed at a distance of 0.3 meters from the edge of the enclosure and extrapolated to 3m as per 15.31f(1). The distance from the EUT to the edge of the enclosure was approximately 0.3m in each case.

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209 – METAL

Ambient temperature	=	22°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	53% (<1GHz),	0.3m measurements >1GHz	[X]
Conditions	=	Anechoic Chamber	3m extrapolated from 0.3m	[X]
Supply voltage	=	+24Vdc	4 Inch Horn Antenna	[X]
Channel number	=	1	6 Inch Horn Antenna	[X]
			Rod Antenna	[X]

FREQ RANGE (MHz)	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT.	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT.	AVERAGE FIELD STRENGTH (µV/m)
1.705 - 30					-		-51.33	See Note 8
30 - 88					-		-51.33	See Note 8
88 - 216					-		-51.33	See Note 8
216 - 960					-		-51.33	See Note 8
960 - 1000					-		-51.33	See Note 8
1000 - 60000					-20		-51.33	See Note 8

	FREQ RANGE	Average Limit	Peak Limit
Limits	1.705MHz to 30MHz	30µV/m @ 30m	300µV/m @ 30m
	30MHz to 88MHz	100µV/m @ 3m	1000µV/m @ 3m
	88MHz to 216MHz	150µV/m @ 3m	1500µV/m @ 3m
	216MHz to 960MHz	200µV/m @ 3m	2000µV/m @ 3m
	960MHz to 1GHz	500µV/m @ 3m	5000µV/m @ 3m
	1GHz to 5GHz	500µV/m @ 3m	5000µV/m @ 3m

Notes:

1 Results quoted are extrapolated as indicated
2 Emissions were searched to: (**x**) 1000MHz inclusive, as per Part 15.33a
3 Extrapolation factor 20dB from 0.3m to 3m, as per Part 15.31f
4 Measurements >1GHz @ 0.3m as per Part 15.31f(1)
5 Receiver detector >1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
6 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth
7 New batteries used for battery powered products.
8 Only emissions within 20dB's of the limit are recorded
9 Measurements as per 15.35 (b) and (c)
10 (R) indicates emission in restricted band
11 See annex F for lower bandedge compliance with the restricted band 5.35 GHz -5.46 GHz

Test Method:

1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Measuring distances as Notes 1 to 4 above
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 test is shown overleaf:

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209 – CONCRETE

Ambient temperature	=	22°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	53% (<1GHz),	0.3m measurements >1GHz	[X]
Conditions	=	Anechoic Chamber	3m extrapolated from 0.3m	[X]
Supply voltage	=	+24Vdc	4 Inch Horn Antenna	[X]
Channel number	=	1	6 Inch Horn Antenna	[X]
			Rod Antenna	[X]

FREQ RANGE (MHz)	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT.	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT.	AVERAGE FIELD STRENGTH (µV/m)
1.705 - 30					-		-51.33	See Note 8
30 - 88					-		-51.33	See Note 8
88 - 216					-		-51.33	See Note 8
216 - 960					-		-51.33	See Note 8
960 - 1000					-		-51.33	See Note 8
1000 - 5000					-20		-51.33	See Note 8

	FREQ RANGE	Average Limit	Peak Limit
Limits	1.705MHz to 30MHz	30µV/m @ 30m	300µV/m @ 30m
	30MHz to 88MHz	100µV/m @ 3m	1000µV/m @ 3m
	88MHz to 216MHz	150µV/m @ 3m	1500µV/m @ 3m
	216MHz to 960MHz	200µV/m @ 3m	2000µV/m @ 3m
	960MHz to 1GHz	500µV/m @ 3m	5000µV/m @ 3m
	1GHz to 5GHz	500µV/m @ 3m	5000µV/m @ 3m

Notes:

1 Results quoted are extrapolated as indicated
2 Emissions were searched to: (**x**) 1000MHz inclusive, as per Part 15.33a
3 Extrapolation factor 20dB from 0.3m to 3m, as per Part 15.31f
4 Measurements >1GHz @ 0.3m as per Part 15.31f(1)
5 Receiver detector >1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
6 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth
7 New batteries used for battery powered products.
8 Only emissions within 20dB's of the limit are recorded
9 Measurements as per 15.35 (b) and (c)
10 (R) indicates emission in restricted band
11 See annex F for lower bandedge compliance with the restricted band 5.35 GHz -5.46 GHz

Test Method:

1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Measuring distances as Notes 1 to 4 above
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 test is shown overleaf:

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209 – PLASTIC

Ambient temperature	=	22°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	53% (<1GHz),	0.3m measurements >1GHz	[X]
Conditions	=	Anechoic Chamber	3m extrapolated from 0.3m	[X]
Supply voltage	=	+24Vdc	4 Inch Horn Antenna	[X]
Channel number	=	1	6 Inch Horn Antenna	[X]
			Rod Antenna	[X]

FREQ RANGE (MHz)	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT.	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT.	AVERAGE FIELD STRENGTH (µV/m)
1.705 - 30					-		-51.33	See Note 8
30 - 88					-		-51.33	See Note 8
88 - 216					-		-51.33	See Note 8
216 - 960					-		-51.33	See Note 8
960 - 1000					-		-51.33	See Note 8
1000 - 5000					-20		-51.33	See Note 8

	FREQ RANGE	Average Limit	Peak Limit
Limits	1.705MHz to 30MHz	30µV/m @ 30m	300µV/m @ 30m
	30MHz to 88MHz	100µV/m @ 3m	1000µV/m @ 3m
	88MHz to 216MHz	150µV/m @ 3m	1500µV/m @ 3m
	216MHz to 960MHz	200µV/m @ 3m	2000µV/m @ 3m
	960MHz to 1GHz	500µV/m @ 3m	5000µV/m @ 3m
	1GHz to 5GHz	500µV/m @ 3m	5000µV/m @ 3m

Notes:

1 Results quoted are extrapolated as indicated
2 Emissions were searched to: (**x**) 1000MHz inclusive, as per Part 15.33a
3 Extrapolation factor 20dB from 0.3m to 3m, as per Part 15.31f
4 Measurements >1GHz @ 0.3m as per Part 15.31f(1)
5 Receiver detector >1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
6 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth
7 New batteries used for battery powered products.
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Test Method:

1 As per Radio – Noise Emissions, ANSI C63.4: 2001
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3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 test is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	**X**
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	R&S	ESIB 7		630	**X**
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	YORK	CBL611/A	1618	UH191	**X**
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	**X**
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
PREAMP	AGILENT	8449B	3008A01610	572	**X**

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209 – METAL

Ambient temperature	=	22°C(<1GHz),	0.3m measurements @ fc	[X]
Relative humidity	=	53%(<1GHz),	4 Inch Horn Antenna	[X]
Conditions	=	Anechoic Chamber	6 Inch Horn Antenna	[X]
Supply voltage	=	+24Vdc	Rod Antenna	[X]

4 Inch Horn

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
6340.280	80.35	2.93	34.9	-36	-20	1285.287	-51.33	3.478
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

6 Inch Horn

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5652.505	76.85	2.95	34.8	-36	-20	851.138	-51.33	2.309
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Rod Antenna

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5739.070	84.41	2.97	34.8	-36	-20	2037.042	-51.33	5.527
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Notes:
1 Results quoted are extrapolated as indicated
2 Receiver detector @ fc = Peak, 1MHz bandwidth

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Measuring distances 3m
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209 – CONCRETE

Ambient temperature	=	22°C(<1GHz),	0.3m measurements @ fc	[X]
Relative humidity	=	53%(<1GHz),	4 Inch Horn Antenna	[X]
Conditions	=	Anechoic Chamber	6 Inch Horn Antenna	[X]
Supply voltage	=	+24Vdc	Rod Antenna	[X]

4 Inch Horn

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5767.935	78.77	2.90	34.9	-36	-20	1067.825	-51.33	2.897
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

6 Inch Horn

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5659.719	77.36	3.05	34.8	-36	-20	913.061	-51.33	2.477
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Rod Antenna

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5722.244	86.36	2.99	34.9	-36	-20	2585.235	-51.33	7.015
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Notes:
1 Results quoted are extrapolated as indicated
2 Receiver detector @ fc = Peak, 1MHz bandwidth

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Measuring distances 3m
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209 – PLASTIC

Ambient temperature	=	22°C(<1GHz),	0.3m measurements @ fc	[X]
Relative humidity	=	53%(<1GHz),	4 Inch Horn Antenna	[X]
Conditions	=	Anechoic Chamber	6 Inch Horn Antenna	[X]
Supply voltage	=	+24Vdc	Rod Antenna	[X]

4 Inch Horn

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5690.981	84.55	2.95	34.9	-36	-20	2089.926	-51.33	5.669
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

6Inch Horn

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5945.891	78.90	3.0	34.9	-36	-20	1096.478	-51.33	2.975
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Rod Antenna

FREQ. (MHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5816.032	90.40	2.97	34.9	-36	-20	4154.321	-51.33	11.272
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Notes:
1 Results quoted are extrapolated as indicated
2 Receiver detector @ fc = Peak, 1MHz bandwidth

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Measuring distances 3m
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	**X**
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	R&S	ESIB 7		630	**X**
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	YORK	CBL611/A	1618	UH191	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
PREAMP	AGILENT	8449B	3008A01610	572	**X**

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER INTENTIONAL EMISSION – BAND OCCUPANCY – PART 15.215(a)

Ambient temperature	=	22°C(<1GHz),	Conducted measurements	[X]
Relative humidity	=	53%(<1GHz),	4 Inch Horn Antenna	[X]
Conditions	=	Radio Laboratory	6 Inch Horn Antenna	[X]
Supply voltage	=	+24Vdc	Rod Antenna	[X]
Channel	=	1		

EUT Connected to 4 Inch Horn Antenna

	f lower	f higher
Band Occupancy @ -20dBc (See Annex D for band occupancy plots)	5548.1 MHz	6397.1 MHz
	Occupied Bandwidth = 849 MHz	

EUT Connected to 6 Inch Horn Antenna

	f lower	f higher
Band Occupancy @ -20dBc (See Annex D for band occupancy plots)	5545.0 MHz	6400.0 MHz
	Occupied Bandwidth = 855 MHz	

EUT Connected to Rod Antenna

	f lower	f higher
Band Occupancy @ -20dBc (See Annex D for band occupancy plots)	5551.4 MHz	6401.4 MHz
	Occupied Bandwidth = 850 MHz	

Notes:
1 Receiver detector @ fc = Peak, 1MHz bandwidth
2 See Annex D for Plots

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Conducted Measurement

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	R&S	ESIB 7		630	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	YORK	CBL611/A	1618	UH191	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
PREAMP	AGILENT	8449B	3008A01610	572	

TRANSMITTER TESTS – TEST LABORATORY

TRANSMITTER CONDUCTED EMISSIONS – AC POWER LINE Part 15.207

Ambient temperature	=	22°C(<1GHz),	4 Inch Horn Antenna	[X]
Relative humidity	=	53%(<1GHz),	6 Inch Horn Antenna	[X]
Conditions	=	Power Line Laboratory	Rod Antenna	[X]
Supply voltage	=	110V AC		
Supply Frequency	=	60Hz		

SIGNIFICANT EMISSIONS

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	LISN CORRECTION (dB)	CONDUCTOR (L or N)	EMISSION (µV)
No significant emissions within 20 dB's of the limit					

Notes: 1 See conducted emission plots in Annex E
2 Emissions more than 20dB's below the limit are not necessarily recorded

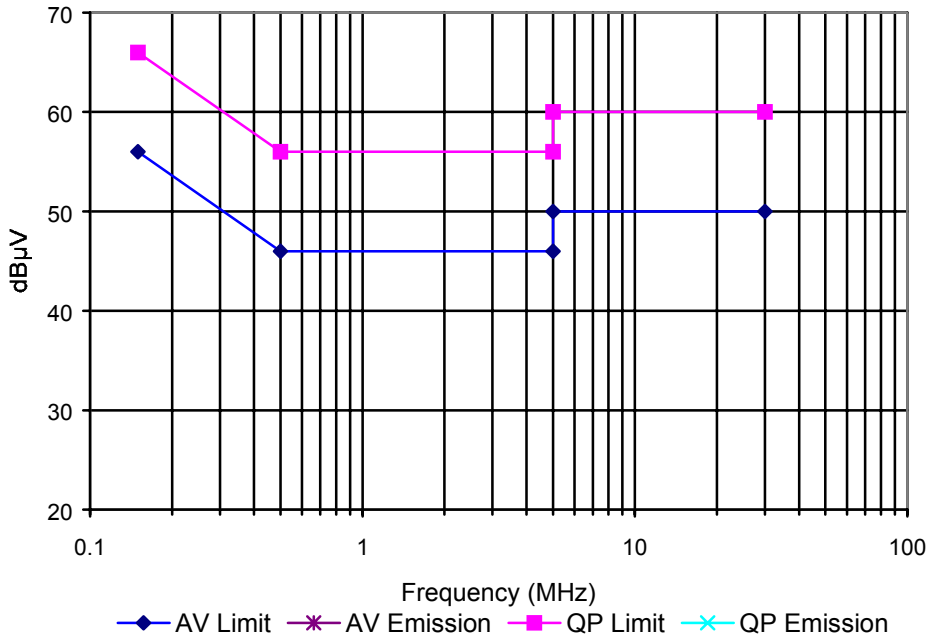
Test Method: 1 As per Radio – Noise Emissions, ANSI C63.4: 2001

The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test was:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
LISN / AMN	ROHDE & SCHWARZ	ESH3-Z5	83746/010	289	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

POWER LINE CONDUCTION EMISSIONS

Quasi Peak Limit Part 15.207



No Significant Emissions Within 20dB's of the limit

TRANSMITTER TESTS – TEST SITE 1

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209 – CONCRETE

Ambient temperature	=	30°C(<1GHz),	0.3m measurements @ fc	[X]
Relative humidity	=	40%(<1GHz),	4 Inch Horn Antenna	[ ]
Conditions	=	Site	6 Inch Horn Antenna	[X]
Supply voltage	=	+24Vdc	Rod Antenna	[X]

6 Inch Horn

FREQ. (GHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5.6.-6.5	Note 6	2.93	34.9	-36	-20	-		-
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Rod Antenna

FREQ. (GHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5.6.-6.5	Note 6	2.93	34.9	-36	-20	-		-
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Notes:
1 Results quoted are extrapolated as indicated
2 Receiver detector @ fc = Peak, 1MHz bandwidth
3 No emissions detected at all locations and orientations of antenna (see diagram annex H)
4 Water was 75cm from antenna tip depth on 3 metres
5 Concrete tank 30cm thick
6 No emissions detected
7 See photographs annex I

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Measuring distances 30cm
3 Horizontal and vertical polarisations, of the receive antenna.

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	**X**
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	R&S	ESIB 7		630	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
PREAMP	AGILENT	8449B	3008A01610	572	**X**

TRANSMITTER TESTS – TEST SITE 2

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209 – PLASTIC

Ambient temperature	=	27°C(<1GHz),	0.3m measurements @ fc	[X]
Relative humidity	=	40%(<1GHz),	4 Inch Horn Antenna	[ ]
Conditions	=	Site	6 Inch Horn Antenna	[X]
Supply voltage	=	+24Vdc	Rod Antenna	[X]

6 Inch Horn

FREQ. (GHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5.6.-6.5	Note 6	2.93	34.9	-36	-20	-		-
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Rod Antenna

FREQ. (GHz)	MEAS Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT	PRE AMP GAIN (dB)	EXTRAP. FACTOR (dB)	PEAK FIELD STRENGTH (µV/m)	PEAK TO AVERAGE FACT (dB)	AVERAGE FIELD STRENGTH (µV/m)
5.6.-6.5	Note 6	2.93	34.9	-36	-20	-		-
Peak Limit value @ fc						**5000 (µV/m) @ 3m**		
Average Limit value @ fc						**500 (µV/m) @ 3m**		

Notes:
1 Results quoted are extrapolated as indicated
2 Receiver detector @ fc = Peak, 1MHz bandwidth
3 No emissions detected at all locations and orientations of antenna (see diagram annex H)
4 Tank one was empty. Tank two water depth 1.6m .
5 Fibre Glass tank 25 mm thick
6 No emissions detected in both tank 1 and 2
7 Measurement was take above the EUT to check for reflected radiation (see diagram annex H)
8 See photograph annex I

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2001
2 Measuring distances 30cm
3 Horizontal and vertical polarisations, of the receive antenna.

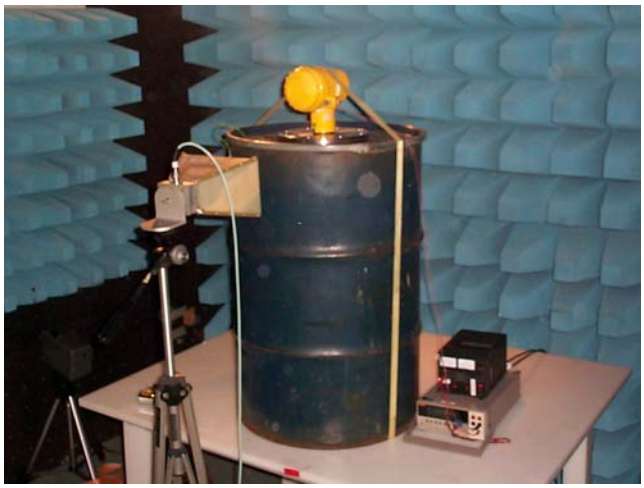
The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	**X**
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	R&S	ESIB 7		630	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
PREAMP	AGILENT	8449B	3008A01610	572	**X**

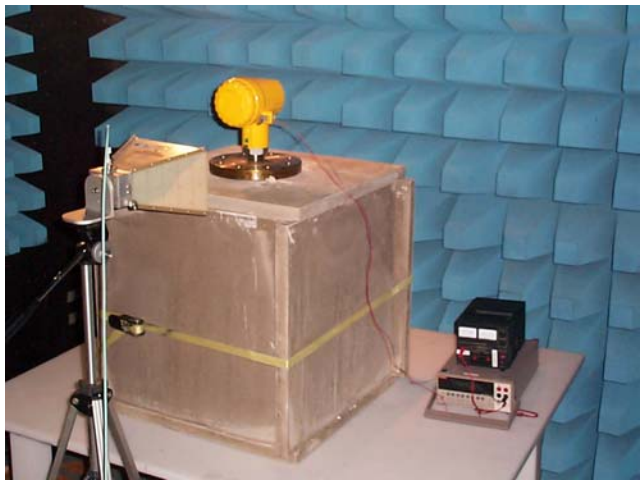
ANNEX A

PHOTOGRAPHS

PHOTOGRAPH No. 1 **TEST SETUP - METAL**



PHOTOGRAPH No. 2 **TEST SETUP - CONCRETE**



PHOTOGRAPH No. 3 **TEST SETUP - PLASTIC**

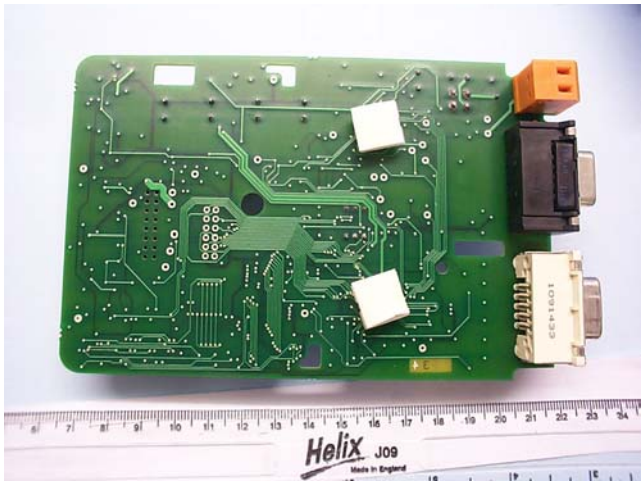
PHOTOGRAPH No. 4 **TEST SETUP - CONDUCTED**

PHOTOGRAPH No. 5 **4 Inch Horn OVERVIEW**

PHOTOGRAPH No. 6 **6 INCH HORN OVERVIEW**

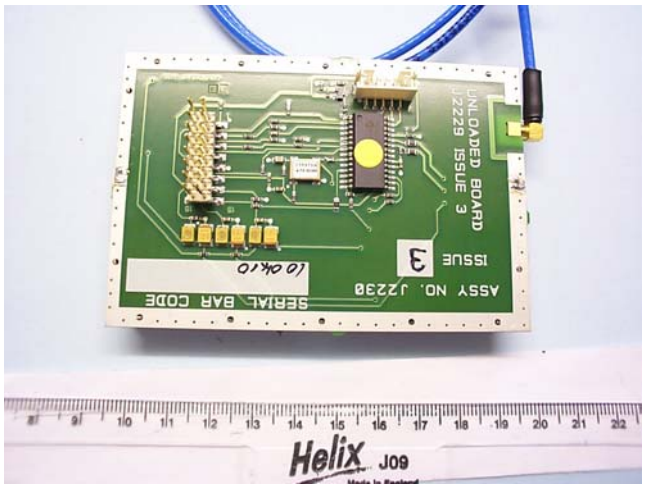
PHOTOGRAPH No. 7 **ROD ANTENNA OVERVIEW**

PHOTOGRAPH No. 8 **MAIN PCB TRACK SIDE**

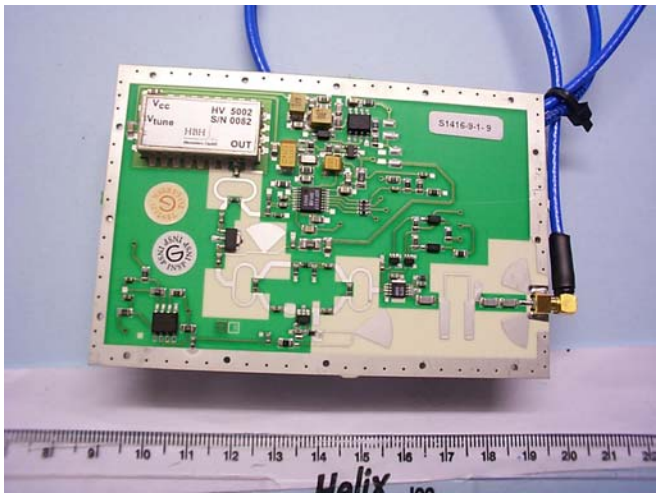


PHOTOGRAPH No. 9 **MAIN PCB COMPONENT SIDE**

PHOTOGRAPH No. 10 **RF PCB TRACK SIDE**



PHOTOGRAPH No. 11 **RF PCB COMPONENT SIDE COVER REMOVED**



ANNEX B

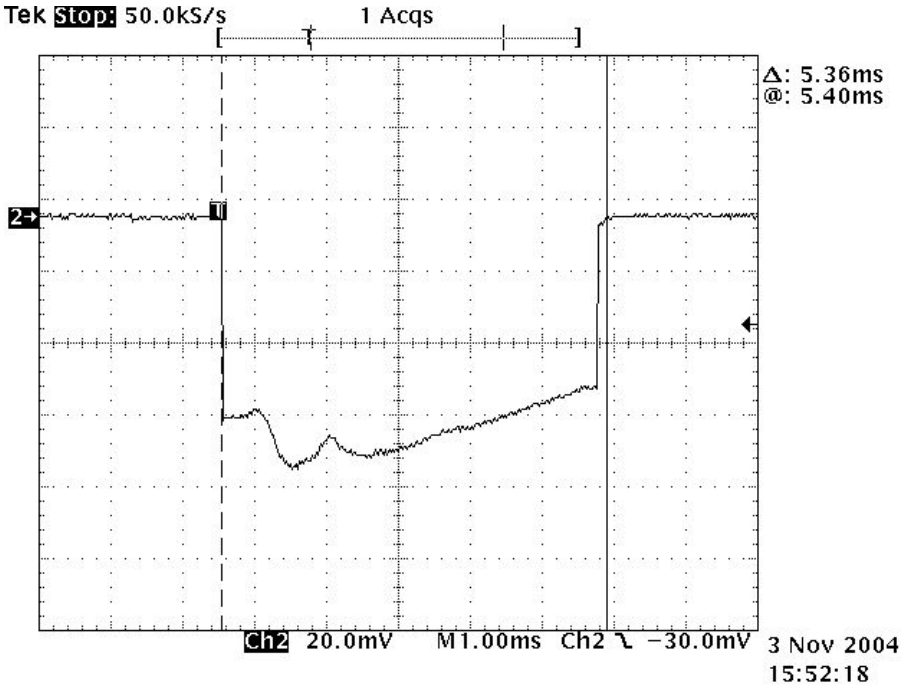
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

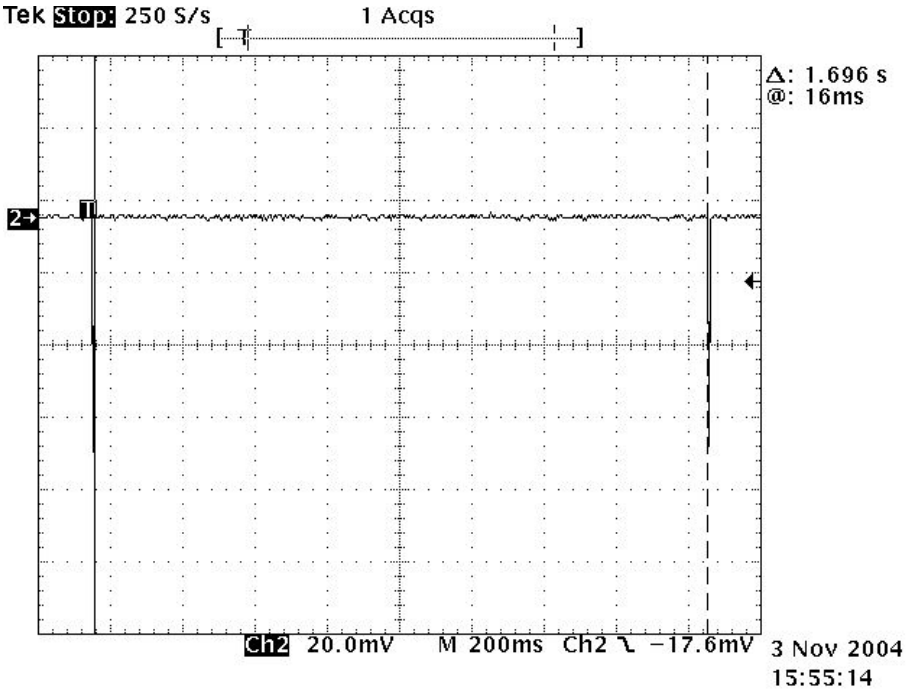
a.	TCB	-	APPLICATION	[ ]
		-	FEE	[ ]
b.	AGENT'S LETTER OF AUTHORISATION	-		[ ]
c.	MODEL(s) vs IDENTITY	-		[ ]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[ ]
e.	LABELLING	-	PHOTOGRAPHS	[ ]
		-	DECLARATION	[ ]
		-	DRAWINGS	[ ]
f.	TECHNICAL DESCRIPTION	-		[ ]
g.	BLOCK DIAGRAMS	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[ ]

ANNEX C

DUTY CYCLE PLOT(s)


Tek Stop: 50.0kS/s 1 Acqs
Δ: 5.36ms
@: 5.40ms
Ch2 20.0mV M1.00ms Ch2 ∖ −30.0mV
3 Nov 2004
15:52:18

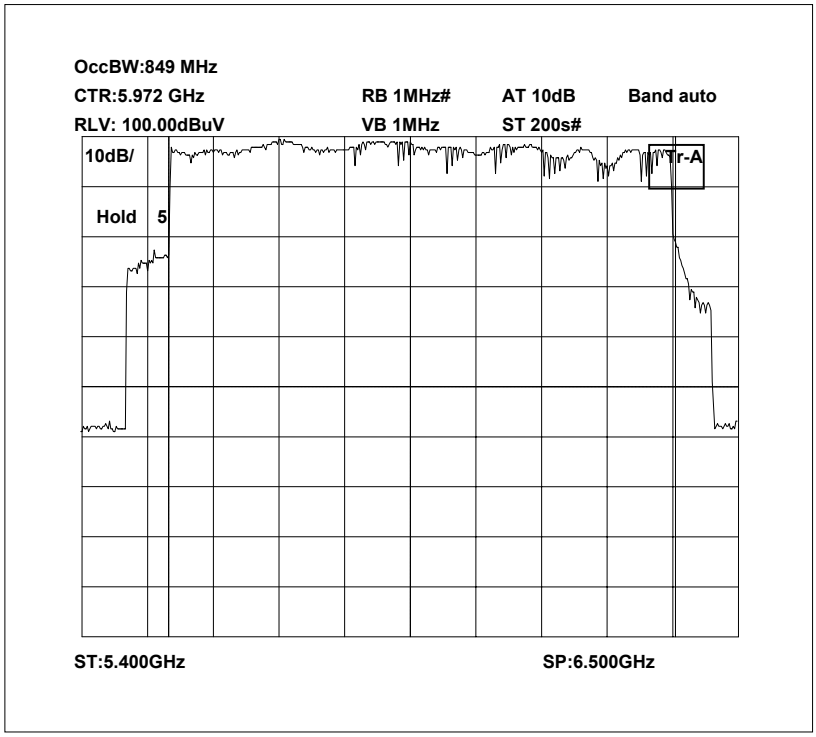
Ton


Tek Stop: 250 S/s 1 Acqs
Δ: 1.696 s
@: 16ms
Ch2 20.0mV M 200ms Ch2 ∖ −17.6mV
3 Nov 2004
15:55:14

Toff

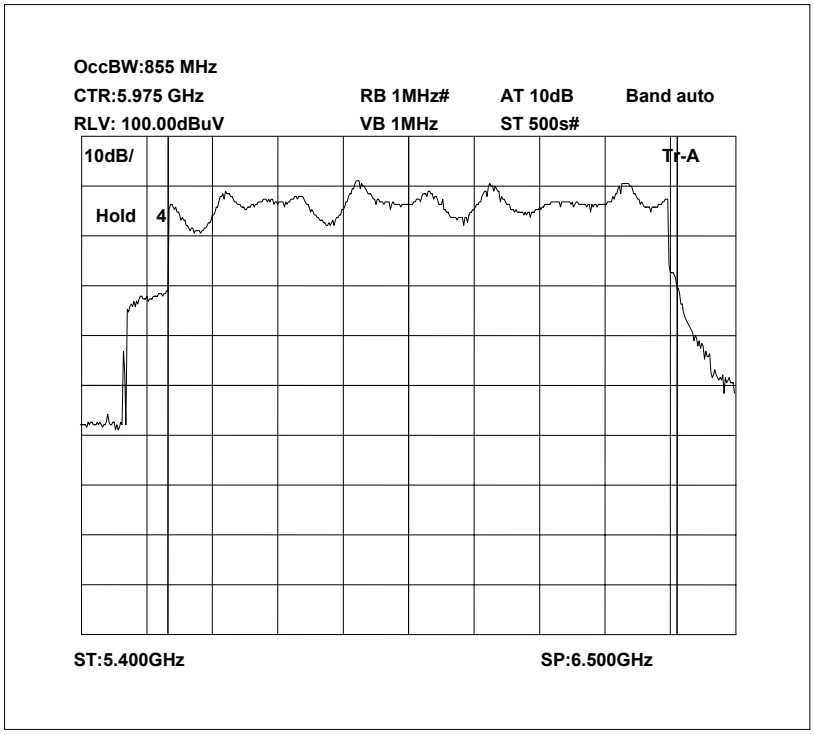
ANNEX D

BANDWIDTH OCCUPANCY



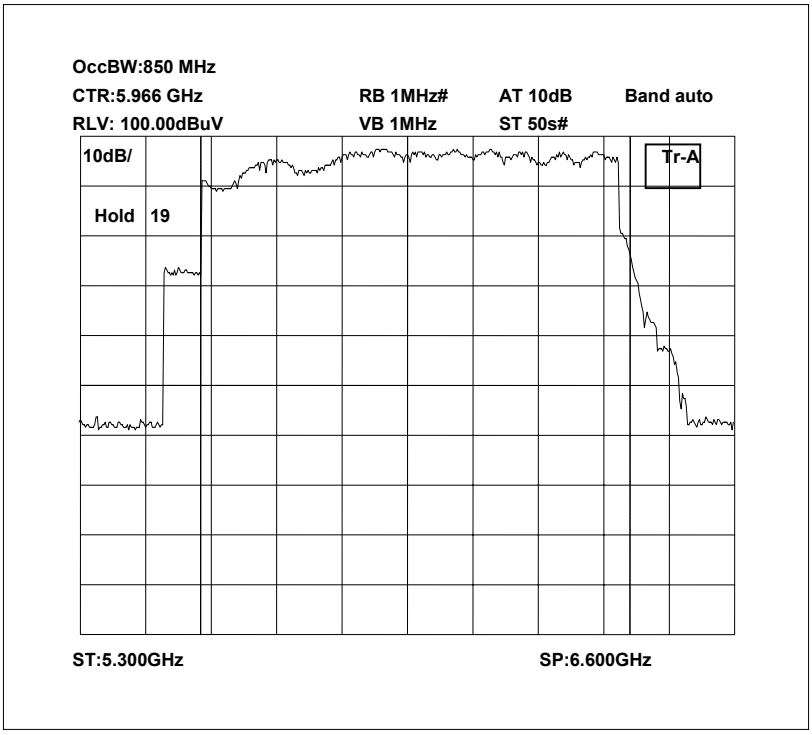
3 INCH HORN

Occupied Bandwidth = 849 MHz
f lower = 5548.1 MHz
f higher = 6397.1 MHz



6 INCH HORN

Occupied Bandwidth = 855 MHz
f lower = 5545.0 MHz
f higher = 6400.0 MHz



ROD ANTENNA

Occupied Bandwidth = 850 MHz
f lower = 5551.4 MHz
f higher = 6401.4 MHz

ANNEX E

CONDUCTED EMISSION PLOT(s)

Powerline Conduction

150kHz - 30MHz

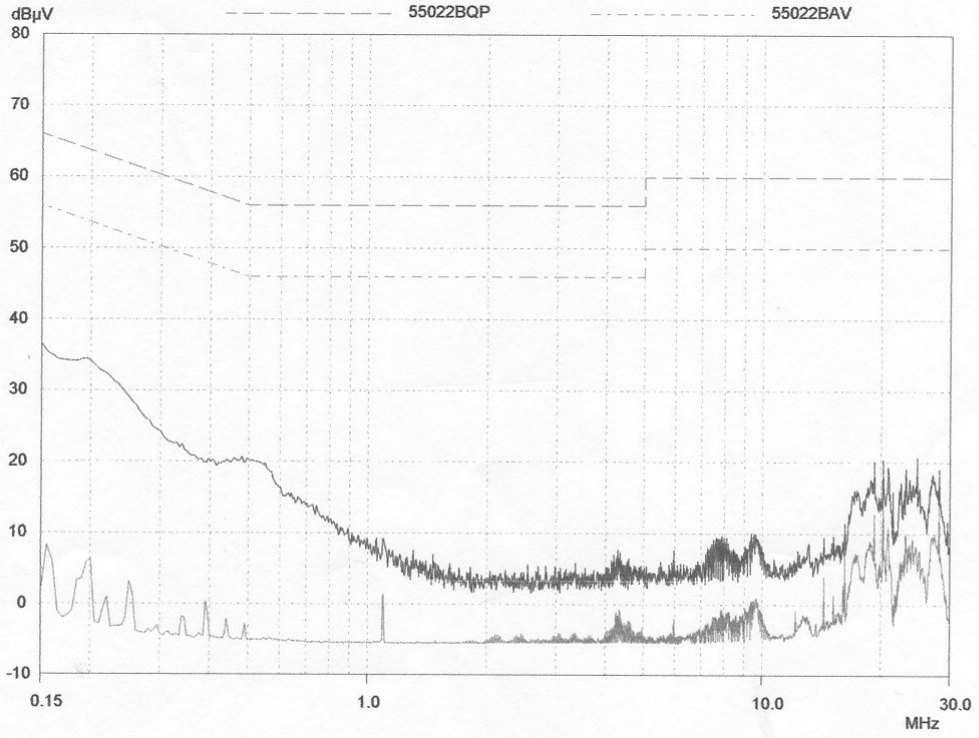
EUT:	Depth radar 3 inch horn
Manuf:	Solartron
Op Cond:	LISN UH195, cable UH21 & Receiver UH03
Operator:	J C
Test Spec:	EN55022 Class B (or Variant)
Comment:	Livel line EUT operating

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	50msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	UH21

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Subranges:	25
	Acc Margin:	20 dB



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Powerline Conduction

150kHz - 30MHz

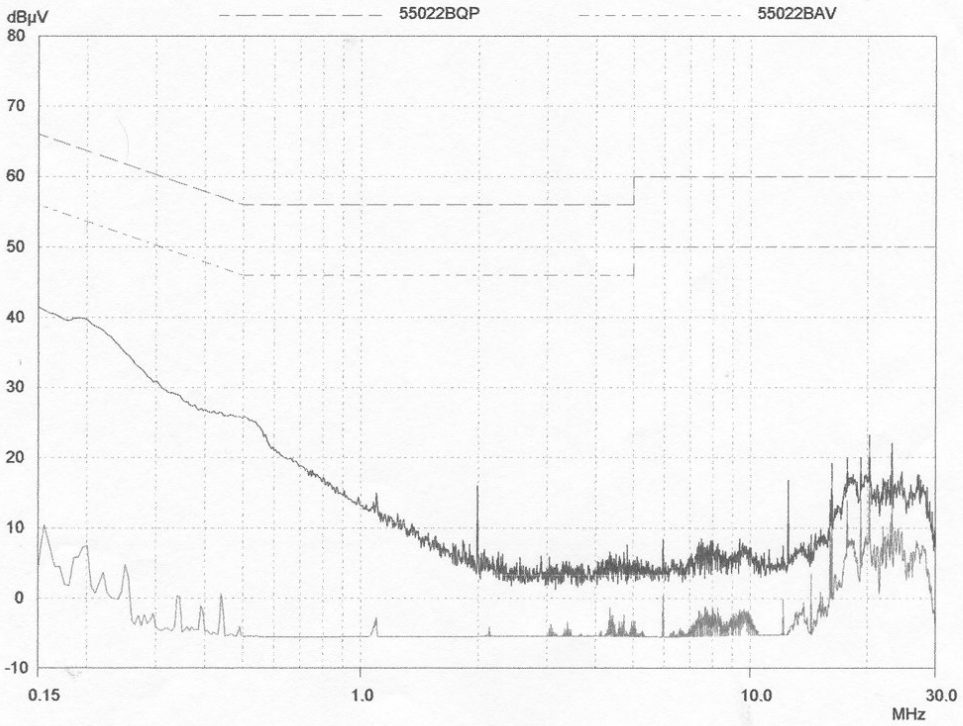
EUT:	Depth radar 6 inch horn
Manuf:	Solartron
Op Cond:	LISN UH195, cable UH21 & Receiver UH03
Operator:	J C
Test Spec:	EN55022 Class B (or Variant)
Comment:	Live line EUT operating

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	50msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	UH21

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Subranges:	25
	Acc Margin:	20 dB



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Powerline Conduction

150kHz - 30MHz

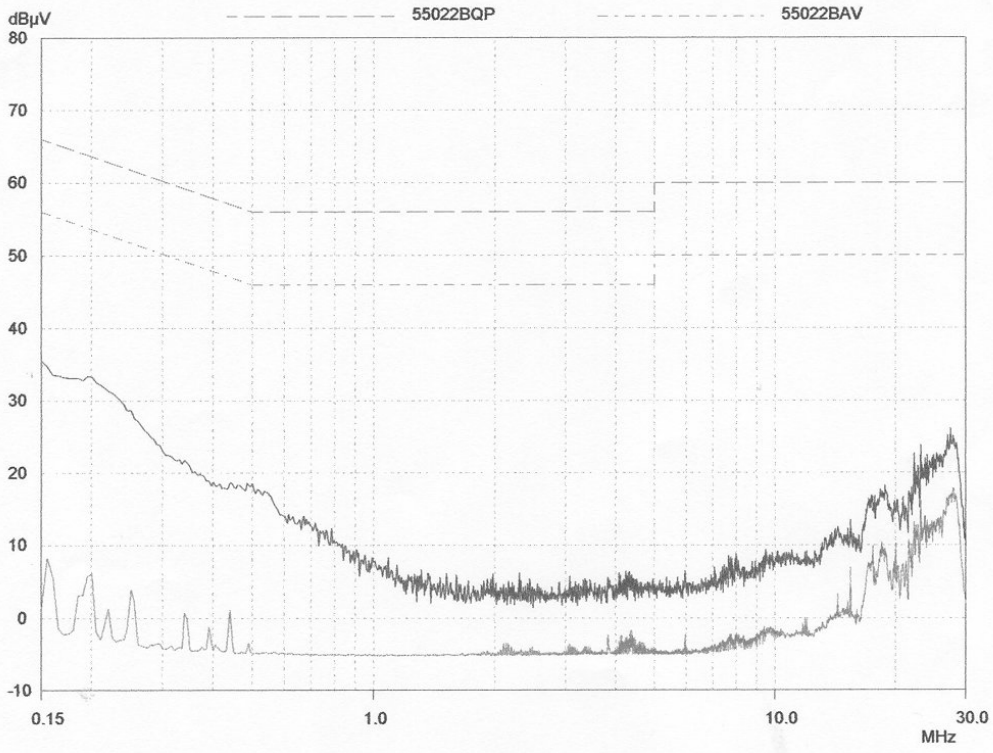
EUT:	Depth Radar Rod Antenna
Manuf:	Solartron Mobray
Op Cond:	LISN UH195, cable UH21 & Receiver UH03
Operator:	J C
Test Spec:	EN55022 Class B (or Variant)
Comment:	Live line Unit operating

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	50msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	UH21

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Subranges:	25
	Acc Margin:	20 dB



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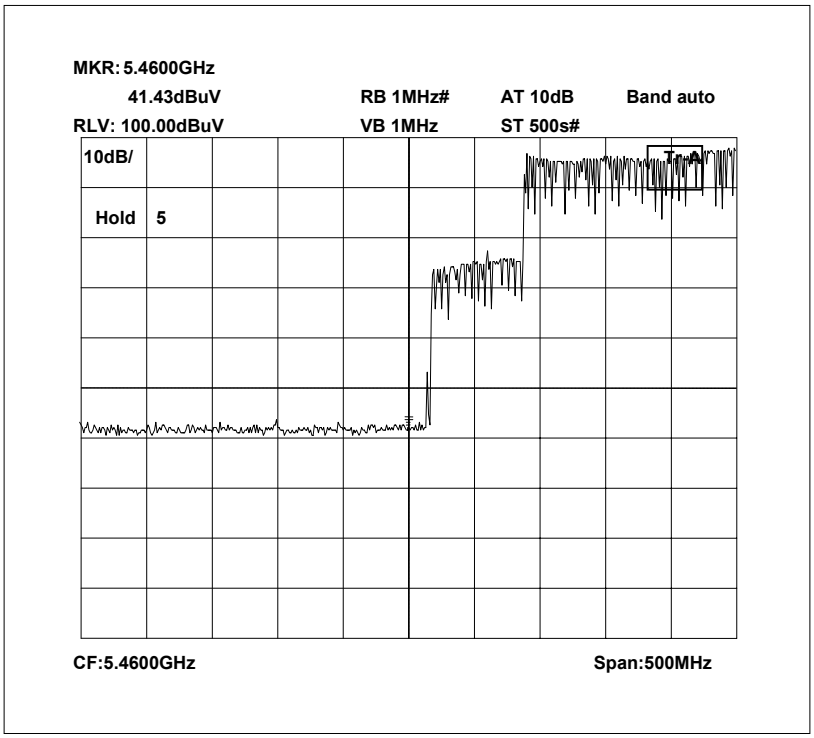
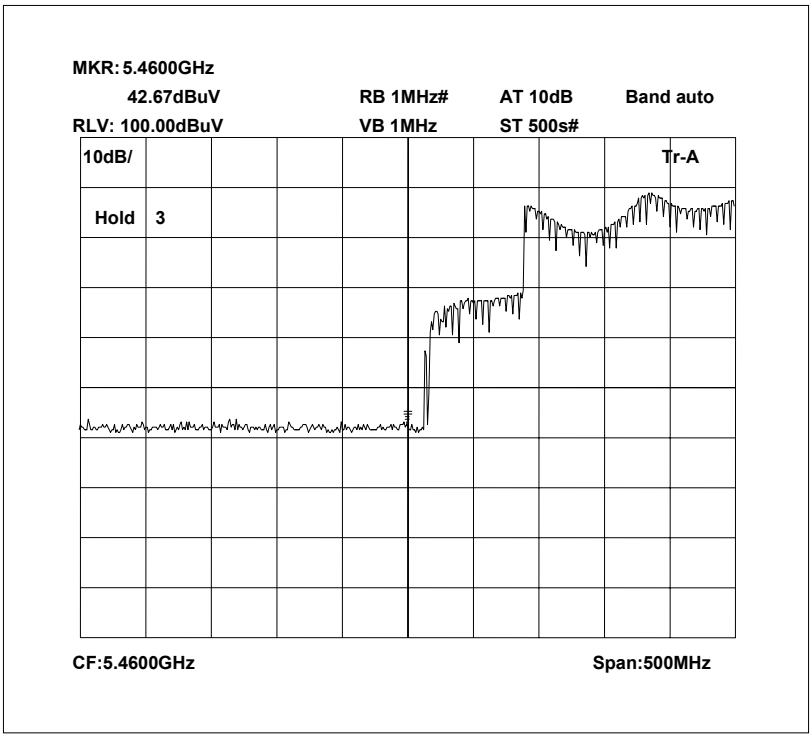
ANNEX F

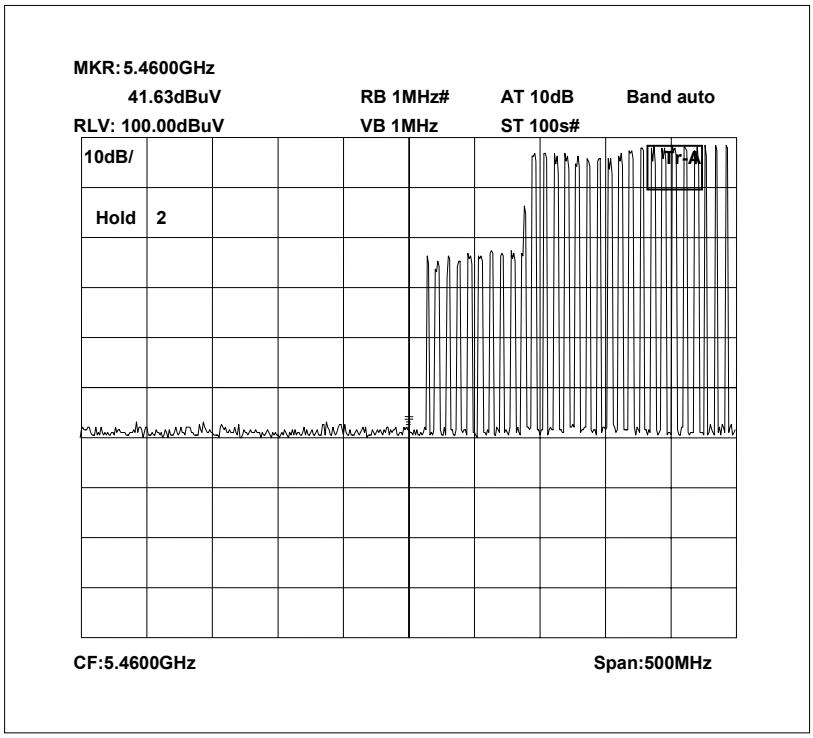
BANDEDGE COMPLIANCE WITH RESTRICTED BAND


MKR: 5.4600GHz
41.43dBuV
RB 1MHz#
AT 10dB
Band auto
RLV: 100.00dBuV
VB 1MHz
ST 500s#
10dB/
Hold
5
CF:5.4600GHz
Span:500MHz

4 INCH HORN


MKR: 5.4600GHz
42.67dBuV
RB 1MHz#
AT 10dB
Band auto
RLV: 100.00dBuV
VB 1MHz
ST 500s#
10dB/
Tr-A
Hold
3
CF:5.4600GHz
Span:500MHz

6 INCH HORN

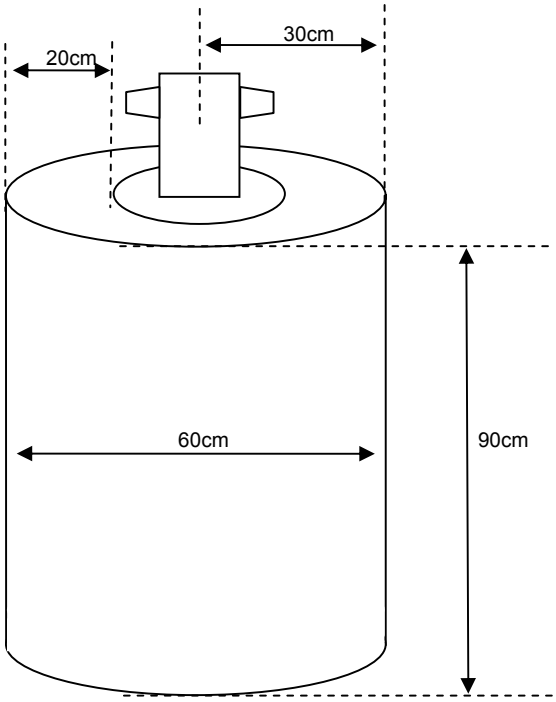

MKR: 5.4600GHz
41.63dBuV
RB 1MHz#
AT 10dB
Band auto
RLV: 100.00dBuV
VB 1MHz
ST 100s#
10dB/
Tr-A
Hold
2
CF:5.4600GHz
Span:500MHz

ROD ANTENNA

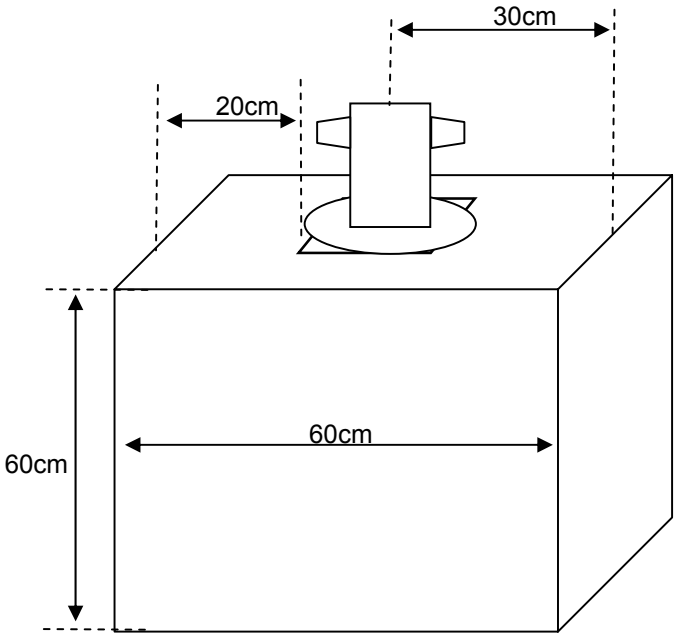
ANNEX G

ENCLOSURE DIMENSIONS

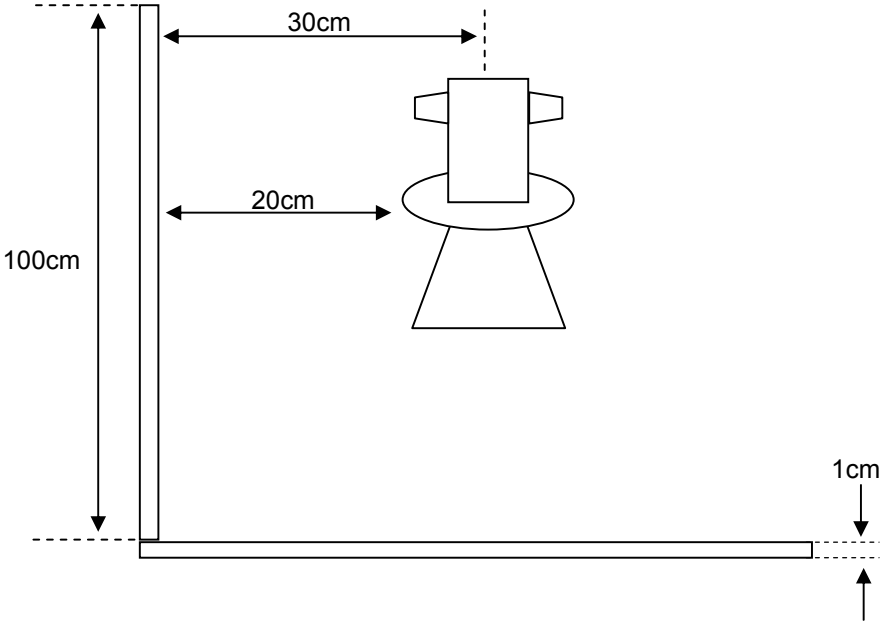
METAL ENCLOSURE



CONCRETE ENCLOSURE



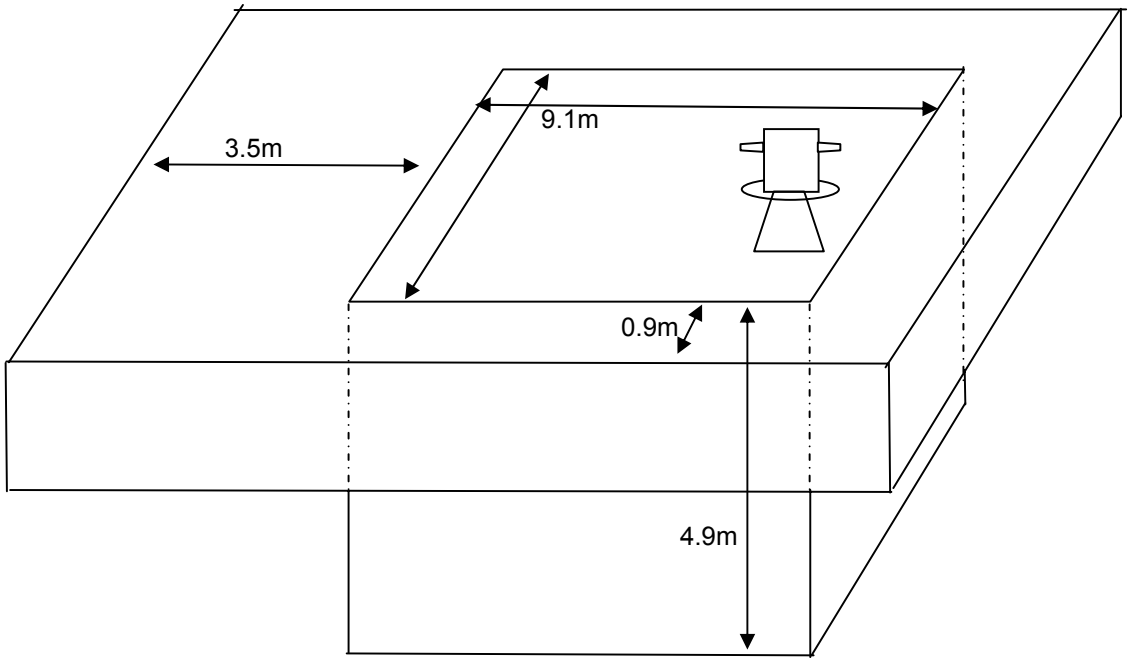
PLASTIC ENCLOSURE



ANNEX H

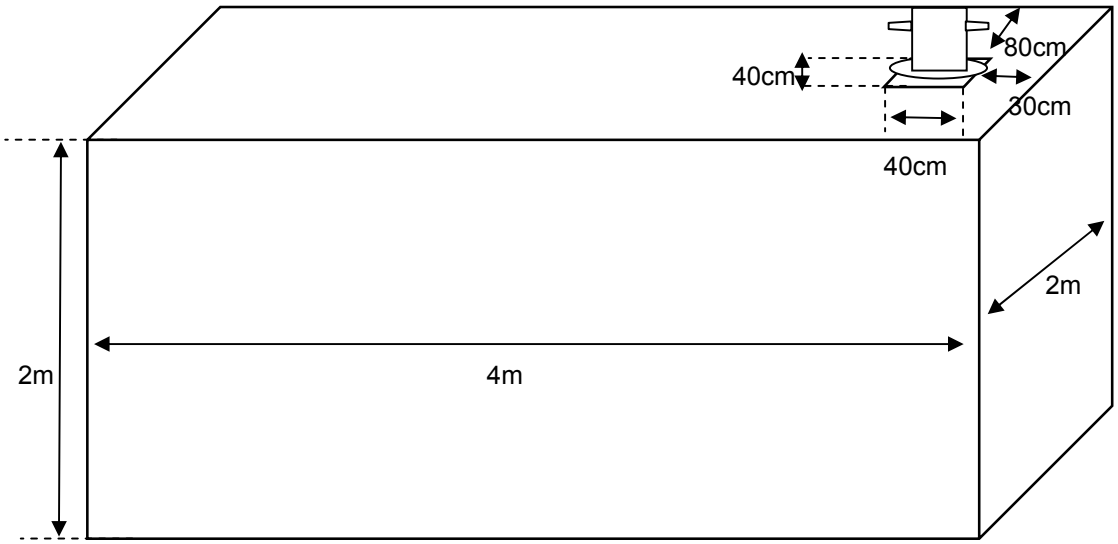
DIAGRAM OF SITE TANK DIMENSIONS

Site 1

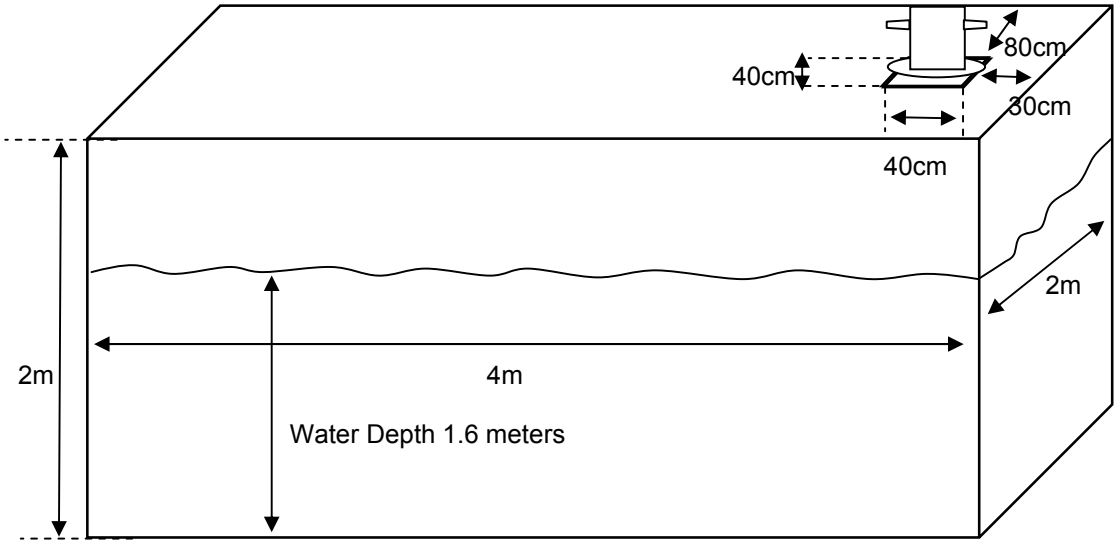


Unit suspended over the open top tank with cables

SITE 2



Site 2 Empty Tank



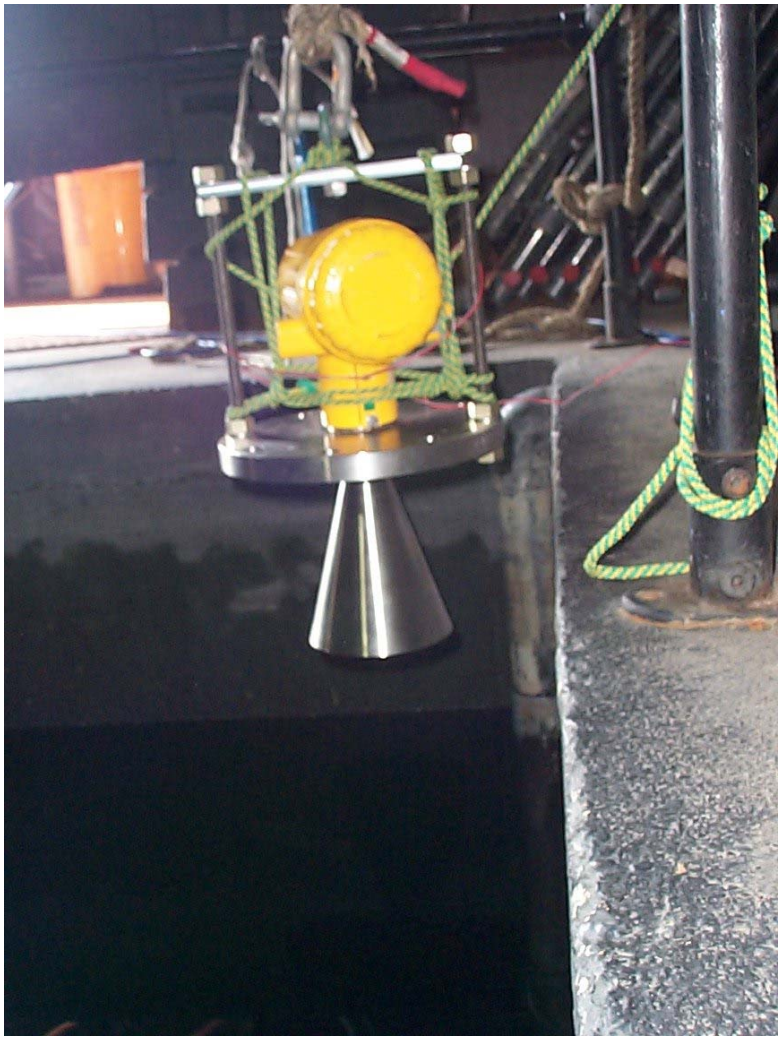
Site 2 tank containing water

ANNEX I

PHOTOGRAPHS OF SITE TESTING

PHOTOGRAPH No. 1 **ROD ANTENNA SITE 1**

PHOTOGRAPH No. 2 **HORN ANTENNA SITE 1**



PHOTOGRAPH No. 3 **SITE 1 ANTENNA LOCATION**

PHOTOGRAPH No. 4 **SITE 2 ANTENNA LOCATION**

PHOTOGRAPH No. 5 **SITE 2 ANTENNA ABOVE EUT**

PHOTOGRAPH No. 6 **SITE 2 TANK WITH WATER**