EMC Technologies (NZ) Ltd

Test Report No **80203.1**
Report date: 8 February 2008

TEST REPORT

Gallagher HR1 Hand Held Animal Tag Reader

tested to

47 Code of Federal Regulations

Code of Federal Regulations (CFR) 47

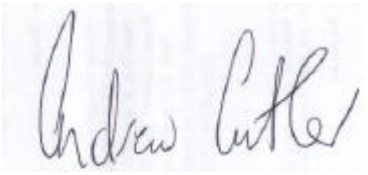
Part 15 – Radio Frequency Devices,

Subpart C – Intentional Radiators

for

Gallagher Group Ltd

This Test Report is issued with the authority of:



Andrew Cutler - General Manager

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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1. STATEMENT OF COMPLIANCE

The **Gallagher HR1 Hand Held Animal Tag Reader** complies with FCC Part 15 Subpart C as an Intentional Radiator when the methods described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

Clause	Parameter	Result
15.201	Equipment authorisation requirement.	Certification required.
15.203	Antenna requirement	Complies. Antenna is permanently attached.
15.204	External PA and antenna modifications	Not applicable. No external devices.
15.205	Restricted bands of operation	Complies. Device transmits on 134.2 kHz.
15.207	Conducted limits	Complies.
15.209	Radiated emission limits.	Complies.

3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

The client selected the test sample.

This report relates only to the sample tested.

This report contains no corrections or erasures.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

4. CLIENT INFORMATION

Company Name	Gallagher Group Ltd
Address	Private Bag 3026
City	Hamilton
Country	New Zealand
Contact	Mr Paul Young

5. DESCRIPTION OF TEST SAMPLE

Brand Name	Gallagher
Model Number	HR1
Product	Hand Held Animal Tag Reader
Manufacturer	Gallagher Group Ltd
Country of Origin	New Zealand
Serial Number	Not serialised
FCC ID	Not yet determined
Ancillary equipment	Ruddwieigh 800 Weigh Scale. Sn# 0734575009.9.03

The device tested contains is a handheld 134.2 kHz RFID animal tag reader whichcan be powered using a stand alone 12 Vdc battery or a weigh scale.

6. RESULTS

Legislation
The sample was tested in accordance with 47 CFR Part 15 Subpart C.

Methods and Procedures
The measurement methods and procedures as described in ANSI C63.4 - 2003 were used.

Section 15.201: Equipment authorisation requirement
Certification as detailed in Subpart J of Part 2 is required for this device.

Section 15.203: Antenna requirement
As can be seen from the attached photographs the device has an internal antenna that cannot be easily accessed and therefore cannot be easily modified.

Result: Complies.

Section 15.204: External radio frequency power amplifiers and antenna modifications

From the attached photographs it can be seen that it is not possible to attach an external power amplifier to this transmitter.

Result: Complies.

Section 15.205: Restricted bands of operation

The device contains a RFID transmitter that transmits on 134.2 kHz.

This falls between the restricted bands of 90 –110 kHz and 495 – 505 kHz

Result: Complies.

Section 15.207: Conducted limits

Conducted emission testing has been carried out as the device can be powered indirectly using a weigh scale that can be powered at 110 Vac.

Testing has been carried out using the supplied AC adaptor that was capable of operation between 100 – 240 Vac.

Conducted emissions testing was carried out over the frequency range of 150 kHz to 30 MHz at the Laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room.

Measurements on both the phase and neutral lines were made using either a Quasi Peak or an Average detector with a 9 kHz bandwidth.

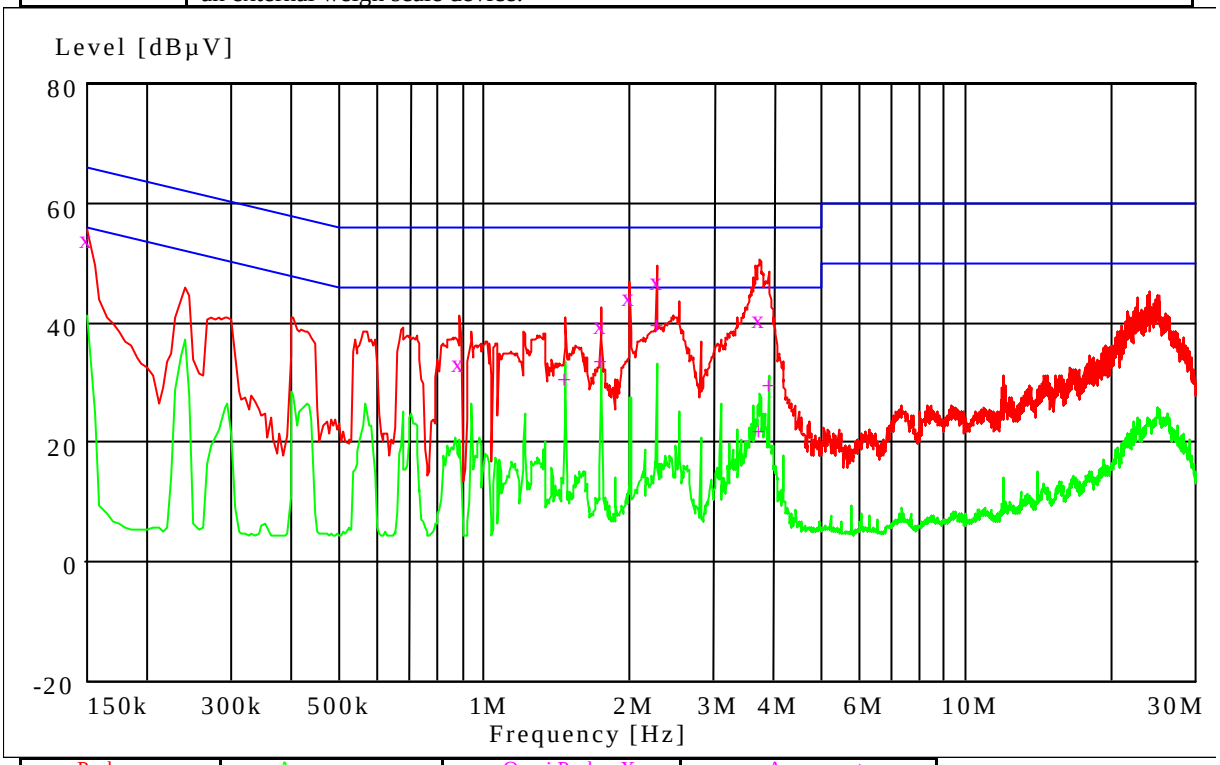
The supplied conducted emission plot is a combined plot showing the worst case of the Peak, Quasi Peak and Average levels for both phase and neutral.

Result: Complies with a 5.7 dB margin at 2.2800 MHz (Average).

Measurement uncertainty with a confidence interval of 95% is:
- Mains terminal tests (0.15 - 30 MHz) ± 2.2 dB

Conducted emissions

Comments:	Device tested when transmitting continuously on 134.2 kHz when powered at 110 Vac using an external weigh scale device.



Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.150000	54.70	66.0	11.3	L1	53.1
0.890000	34.10	56.0	21.9	L1	
1.745000	40.50	56.0	15.5	L1	
2.010000	45.10	56.0	10.9	N	
2.280000	47.60	56.0	8.4	N	
3.740000	41.70	56.0	14.3	N	

Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.150000	43.00	56.0	13.0	N	
0.240000	38.00	52.0	15.0	N	
1.475000	31.50	46.0	14.0	L1	
1.745000	34.30	46.0	11.7	N	
2.280000	40.30	46.0	5.7	N	40.3
3.740000	22.70	46.0	23.3	L1	
3.890000	30.40	46.0	15.5	N	

Section 15.209: Radiated emission limits, general requirements

Radiated emissions testing was carried out over the frequency range of 100 kHz to 1000 MHz for all other emissions other than the fundamental emission.

The 134.2 kHz emission is covered by the general requirements in this section.

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was last updated on January 27th, 2007.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

This site conforms to the requirements of CISPR 16, Part 1, Clause 16, and ANSI C63.4 - 2003.

The device was placed on the fibreglass test table that has a dielectric constant near 1 which is a total of 0.8 m above the test site ground plane.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

As the device is portable it was pre scanned in each of the three orthogonal polarities and was then formally tested in the worst case polarisation.

Above 30 MHz emissions are measured in both vertical and horizontal antenna polarisations.

Below 30 MHz measurements were made using a magnetic loop antenna that was orientated for the worst-case emission level.

The emission level was determined in field strength by taking the following into consideration:

Level(dBµV/m)= Receiver Reading(dBµV) + Antenna Factor(dB) + Coax Loss(dB)

Fundamental emission:

Measurements were made using a magnetic loop antenna and a receiver with an average detector and a peak detector both using a 9 kHz bandwidth.

Measurements were made at a distance of 10 metres.

The average limit at 300 metres (25 dBuV/m) has been extrapolated using a factor of 40 dB per decade that is defined in section 15.31 (f)(2).

The peak limit is the average limit plus 20 dB

The worst case device and loop antenna orientation is shown in the photographs.

Before making a final measurement the device was manually rotated to determine in each orientation and then the antenna orientation was maximised.

Measurements were made while the device was being powered at 12 Vdc using an external battery and when the device was being powered using the weigh scale.

The battery was replaced by an external power supply with measurements being made to determine the effect of varying the supply by +/- 15%.

Weigh scale powered

Frequency (kHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
Laying Flat				
134.200	66.1	85.0	18.9	Average
134.200	73.3	105.0	31.7	Peak
Upright 134.200	65.1	85.0	19.9	Average
134.200	73.2	105.0	31.8	Peak
Vertical				
134.200	59.6	85.0	25.4	Average
134.200	51.2	105.0	53.8	Peak

Battery powered

Frequency (kHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
Laying Flat				
134.200	71.5	85.0	13.5	Average
134.200	78.3	105.0	26.7	Peak
Upright				
134.200	71.6	85.0	13.4	Average
134.200	78.6	105.0	26.4	Peak

Field strength variation when the battery supply was varied and the device was upright when measured in peak and average

10.2 Vdc	12.0 Vdc	13.8 Vdc	Limit	Detector
69.9	71.6	72.9	85.0	Average
76.9	78.6	79.9	105.0	Peak

When the AC supply was varied no variation in output power was observed.

Result: Complies with a 13.5 dB margin when using an average detector, when battery powered.

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

Section 15.209: Spurious Emissions (below 30 MHz)

Frequency kHz	Level dBuV/m	Limit dBuV/m	Result	Detector
268.400	< 41.0	79.0	Pass	Average
268.400	< 41.0	99.0	Pass	Peak
402.600	< 34.0	75.5	Pass	Average
402.600	< 34.0	95.5	Pass	Peak
536.800	< 42.1	53.0	Pass	Quasi Peak
671.000	< 28.0	51.1	Pass	Quasi Peak
805.200	< 33.0	49.5	Pass	Quasi Peak
939.400	< 34.8	48.1	Pass	Quasi Peak
1073.600	< 32.0	49.5	Pass	Quasi Peak
1207.800	< 35.0	49.5	Pass	Quasi Peak
1342.000	< 29.0	49.5	Pass	Quasi Peak

Magnetic loop measurements were made at a distance of 10metres.

Measurements were made while the device was being powered using an external 12 Vdc battery that was fully charged and when the device was powered using an external weigh scale.

No spurious emissions were detected when the device was operated in the various modes tested.

The worst case loop antenna orientation is shown in the photographs. Before making a final measurement the device was manually rotated in each of the three axis tested and then the antenna orientation was maximised.

A receiver with an average and peak detector with a 9 kHz bandwidth was used between 110 – 490 kHz and a quasi peak detector with a 9 kHz bandwidth was used between 490 kHz – 30.0 MHz.

The 300 metre limit between 125 – 490 kHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2) and the 30 metre limit between 490 – 1705 kHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2).

The spurious emissions observed do not exceed the level of the fundament emission.

Result: Complies
Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

15.209: Spurious Emissions (above 30 MHz)

Measurements between 30 –1000 MHz have been made at a distance of 3 metres.

Measurements were made while the device was being powered using an external 12 Vdc battery and when it was powered using an external weigh scale.

Testing was carried out in each of the 3 axis of orientation.

A receiver with a quasi peak detector with a 120 kHz bandwidth was used between 30 – 1000 MHz.

The limits as described in Section 15.209 have been applied as follows:

30.0 – 88.0 MHz	100 uV/m	40 dBuV/m
88.0 – 216.0 MHz	150 uV/m	43.5 dBuV/m
216.0 – 960.0 MHz	200 uV/m	46.0 dBuV/m

All emissions observed were below the level of the fundamental emission.

Result: Complies with an 8.2 dB margin at 274.840 MHz (Vertical) when powered using the weigh scale.

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (30 – 1000 MHz) ± 4.1 dB

External 12 Vdc battery powered

Frequency MHz	Vertical dBuV/m	Hort dBuV/m	Recheck dBuV/m	Limit dBuV/m	Margin dB	Result	Antenna
Upright							
68.710	27.1			40.0	12.9	Pass	Vertical
101.590	19.4			43.5	24.1	Pass	Vertical
101.860	19.7			43.5	23.8	Pass	Vertical
103.065	26.7			43.5	16.8	Pass	Vertical
107.093	25.4			43.5	24.1	Pass	Vertical
107.910	25.6			43.5	23.8	Pass	Vertical
108.460	24.8			43.5	18.7	Pass	Vertical
109.230	24.6			43.5	18.9	Pass	Vertical
112.458	18.0			43.5	25.5	Pass	Vertical
137.420	22.0			43.5	21.5	Pass	Vertical
171.775	22.1			43.5	21.4	Pass	Vertical
206.130	21.0	27.6		43.5	15.9	Pass	Horizontal
240.485	30.3	26.7		46.0	15.7	Pass	Vertical
274.840	25.8	29.1		46.0	16.9	Pass	Horizontal
309.195	29.0	34.3		46.0	11.7	Pass	Horizontal
Laying flat							
68.720	27.8	25.8		40.0	12.2	Pass	Vertical
103.065	24.8	22.6		43.5	18.7	Pass	Vertical
137.420	26.2	25.6		43.5	17.3	Pass	Vertical
171.775	24.4	25.8		43.5	17.7	Pass	Horizontal
206.130	24.8	32.6		43.5	10.9	Pass	Horizontal
240.485	29.8	31.3		46.0	14.7	Pass	Horizontal
274.840	27.6	31.0		46.0	15.0	Pass	Horizontal
309.195	26.1	36.7		46.0	9.3	Pass	Horizontal
343.550		29.4		46.0	16.6	Pass	Horizontal
Vertical							
68.720	29.2			40.0	10.8	Pass	Vertical
103.065	24.5			43.5	19.0	Pass	Vertical
137.420	27.6	23.4		43.5	15.9	Pass	Vertical
171.775	26.2	25.3		43.5	17.3	Pass	Vertical
206.130	27.8	28.6		43.5	14.9	Pass	Horizontal
240.485	30.8	31.5		46.0	14.5	Pass	Horizontal
274.840	27.1	30.0		46.0	16.0	Pass	Horizontal
309.195	32.6	29.0		46.0	13.4	Pass	Vertical

Weigh scale powered

Frequency MHz	Vertical dBuV/m	Hort dBuV/m	Recheck dBuV/m	Limit dBuV/m	Margin dB	Result	Antenna
Laying flat							
31.178	25.0			40.0	15.0	Pass	Vertical
68.720	18.6	17.8		40.0	21.4	Pass	Vertical
103.065	21.5	19.1		43.5	22.0	Pass	Vertical
112.380	21.0			43.5	24.9	Pass	Vertical
137.420	19.8	25.1		43.5	18.4	Pass	Horizontal
171.775	25.1	28.3		43.5	15.2	Pass	Horizontal
206.130	25.0	28.5		43.5	15.0	Pass	Horizontal
240.485	30.1	34.9		46.0	11.1	Pass	Horizontal
274.840	22.2	37.8		46.0	8.2	Pass	Horizontal
309.195	28.2	34.9		46.0	11.1	Pass	Horizontal
343.550	18.0	25.5		46.0	20.5	Pass	Horizontal
652.745		36.2		46.0	9.8	Pass	Horizontal
618.390		32.3		46.0	13.7	Pass	Horizontal

All other emissions observed were at least 20 dB below the limit when measurements were attempted between 30 – 1000 MHz in both vertical and horizontal polarisations.

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applicable
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applicable
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applicable
Receiver	R & S	ESHS 10	828404/005	3728	21 Aug 2008
Mains Network	R & S	ESH2-Z5	881362/032	3628	21 Aug 2008
Receiver	R & S	ESCS 30	847124/020	E1595	1 Feb 2009
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3771	20 April 2008
Microwave Preamp	Hewlett Packard	8349B	2644A01659	-	20 April 2008
Loop Antenna	EMCO	6502	9311-2801	A-231	11 July 2008
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	7 Feb 2009
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	7 Feb 2009
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	7 Feb 2009
Horn Antenna	Electrometrics	RGA-60	6234	E1492	10 May 2009

8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was last updated on January 27th, 2007.

All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025, 2005.

All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025, 2005.

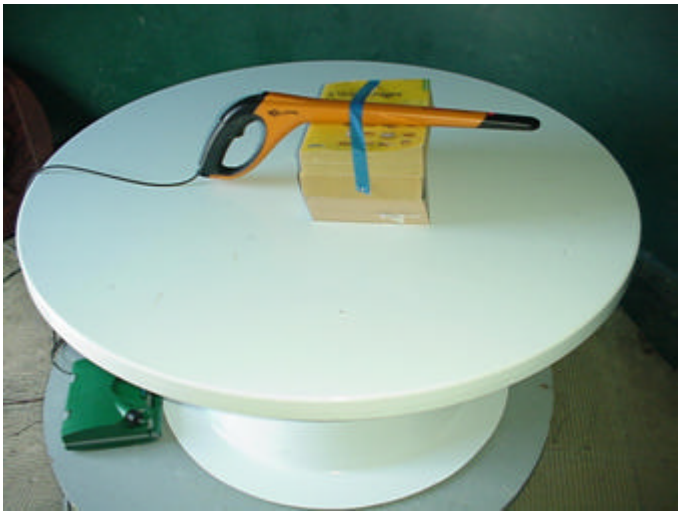
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with 46 accreditation bodies in 34 economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

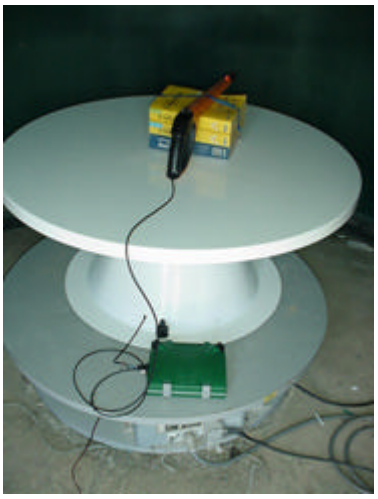
9. PHOTOGRAPHS

Below 30 MHz set up (Worst Case)

Ancillary Equipment

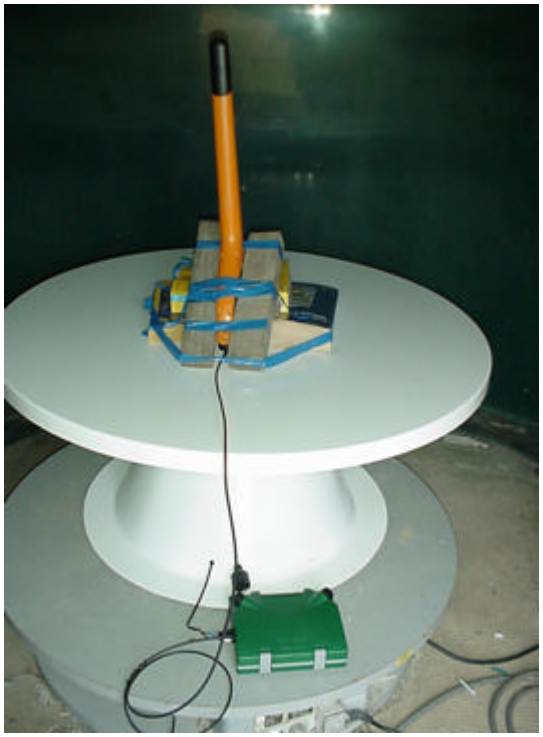
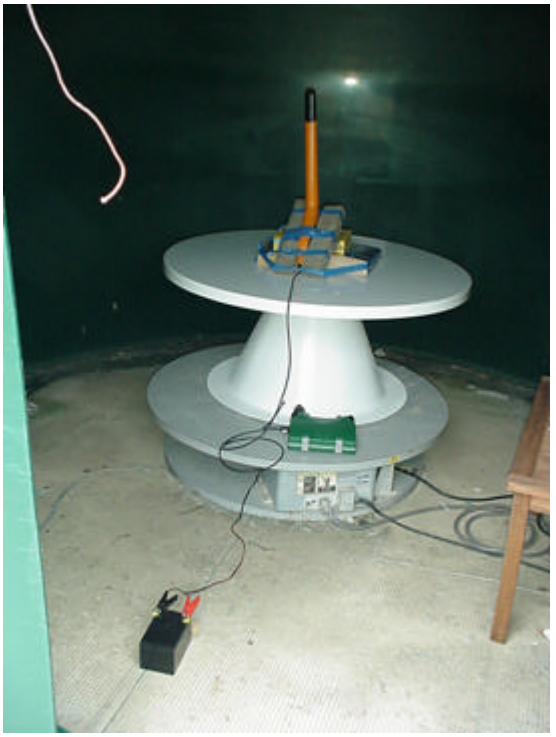
Up Right Test Set Up



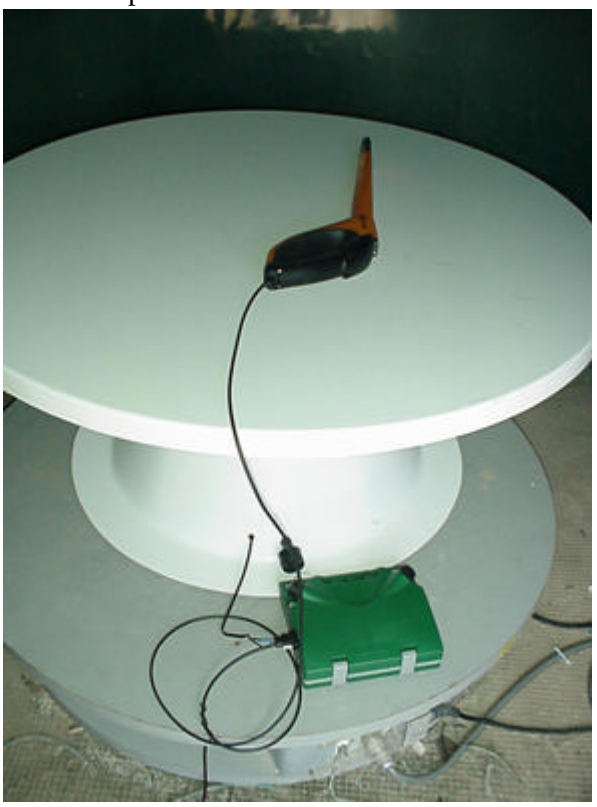


Vertical Test Set Up

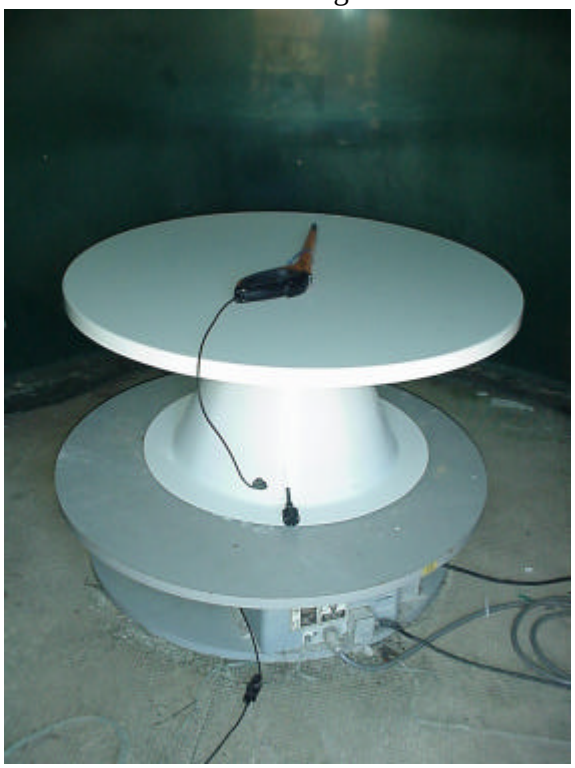


Laying Flat Test Set Up



Weigh Scale Powered Test Set Up Laying Flat



Conducted emissions test set up