

EMC Technologies (NZ) Ltd

Test Report No 70626.2b

Report date: 11 September 2007

TEST REPORT

Gallagher BR1300 Animal EID Panel Reader with Large Panel Antenna

tested to

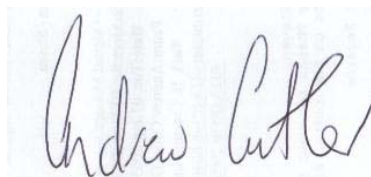
47 Code of Federal Regulations

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

EMC Technologies (NZ) Ltd

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1. STATEMENT OF COMPLIANCE

The **Gallagher BR600 Animal EID Panel Reader with Large Panel Antenna** complies with FCC Part 15 Subpart C as an Intentional Radiator when the methods, as 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 connector unique.
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 with a 15.7 dB margin at 190 kHz (Average)
15.209	Radiated emission limits - Fundamental	Complies with an 0.4 dB margin when extrapolated to 300 metres.
15.209	Radiated emission limits - Spurious emissions <30 MHz	Complies with a 20.3 dB margin at 671 kHz.
15.209	Radiated emission limits – Spurious emissions >30 MHz	Complies with a 6.0 dB margin at 43.053 MHz (Vertical) in charge mode.

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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.

NB: This report replaces report number 70626.2 in order to address a number of issues raised by the TCB in relation to the certification of this device

4. CLIENT INFORMATION

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

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5. DESCRIPTION OF TEST SAMPLE

Brand Name	Gallagher
Model Number	BR600 RFID Panel Reader
Product	Animal EID Panel Reader with Large Panel Antenna
Manufacturer	Gallagher Group Ltd
Country of Origin	New Zealand
Serial Number	Not serialised
FCC ID	Not yet determined

Ancillary Equipment

- Gallagher Weighscale 700 Animal weighing scale. Device not serialised.

- FranMar FDF0503-C Switch Mode Power Supply / Battery Charger. Device not serialised

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6. RESULTS

Standard

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 unique connector. The connector type is a Hirschmann CA series part number 932-325-100 connector.

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 transmitter transmits on 134.2 kHz.

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

Result: Complies.

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Section 15.207: Conducted limits

Conducted emission testing has been carried out as the device has provisions to allow charging of the internal batteries using a 110 Vac charger.

Testing has been carried out using a representative 110 Vac charger.

When the device is being charged the transmitter is deactivated and tags cannot be read.

No provision has been made for the transmitter to operate using an external 110 Vac supply with the only provision being made for external and internal battery operations.

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 15.7 dB margin at 0.190 MHz (Average).

Measurement uncertainty with a confidence interval of 95% is:

- Mains terminal tests (0.15 - 30 MHz) \pm 2.2 dB

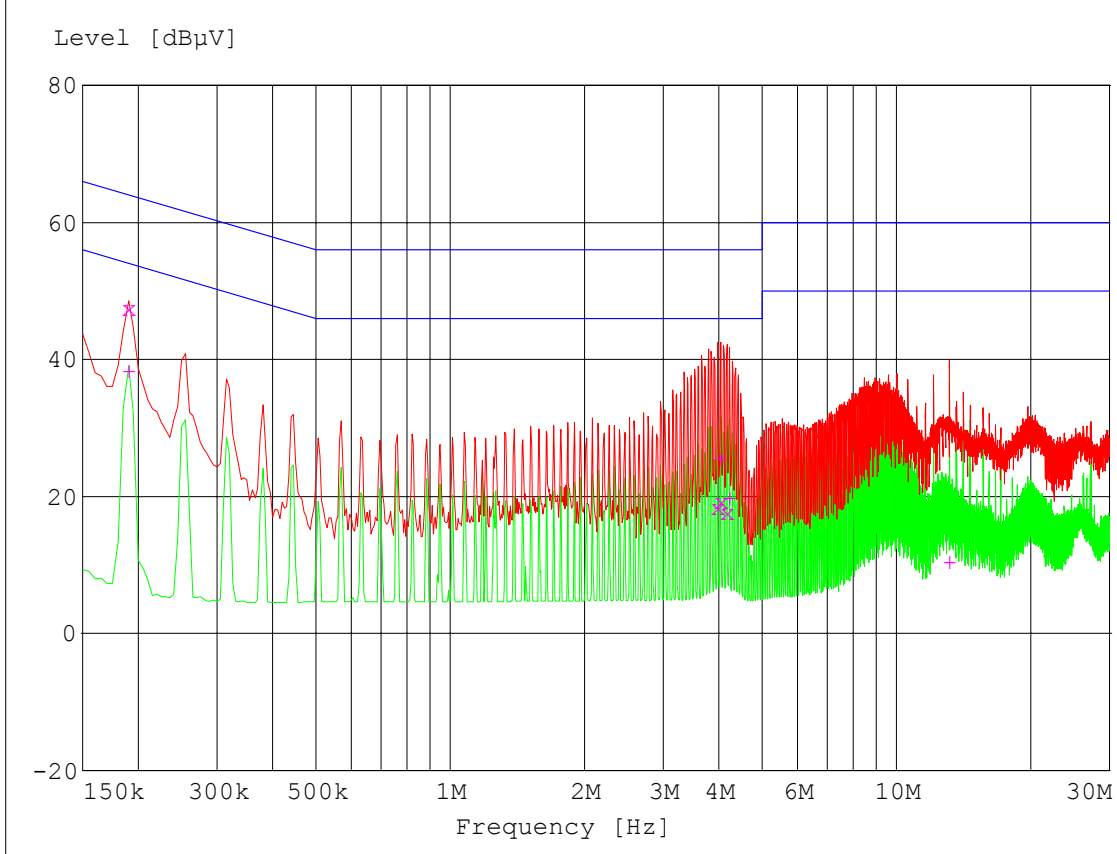
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Conducted emissions

Comments:	Device tested when powered at 110 Vac charging the transmitter internal batteries with a sample antenna attached.
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Peak -----	Average -----	Quasi Peak X	Average +
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Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.190000	47.50	64.0	16.5	N	
3.980000	18.50	56.0	37.5	N	
4.040000	19.40	56.0	36.6	N	
4.170000	17.70	56.0	38.3	N	

Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.190000	38.30	54.0	15.7	N	37.5
4.030000	25.50	46.0	20.5	L1	
4.220000	19.80	46.0	26.2	L1	
13.120000	10.40	50.0	39.6	N	

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Section 15.209: Radiated emission limits, general requirements

Radiated emissions testing was carried out over the frequency range of 100 kHz to 1000 MHz.

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 test tabletop, which is a total of 0.8 m above the test site ground plane.

Testing below 30 MHz was carried out with a large antenna panel attached and testing above 30 MHz was carried out with a small panel attached.

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.

The emission is measured in both vertical and horizontal antenna polarisations, where appropriate.

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

$$\text{Level (dB}\mu\text{V/m)} = \text{Receiver Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB)} + \text{Coax Loss (dB)}$$

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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 initially made at a distance of 10 metres then also at 30 metres.

Using these measurements a 300 metre extrapolated level has been determined as detailed in section 15.31(f)(2) as measurements were made at two distances on the radial that was determined to give the highest field strength.

The highest radial was determined during the pre screening of the device when it was rotated on the test site using a turntable.

At this point the measurement antenna was then further adjusted to give the highest field strength.

The maximum field strength was found to be where the transmitting antenna was facing the measurement antenna (see attached diagram).

Measurements were made while the device was being powered at 12 Vdc using an external battery that was fully charged.

Testing was carried out with a large antenna panel attached.

Previous testing had shown that this power configuration gave the highest field strength.

Frequency (kHz)	Average Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Distance
134.200	100.5	85.0	15.5	10 metres
134.200	76.0	65.0	11.0	30 metres
134.200	21.4	25.0	-3.6	300 metres

Frequency (kHz)	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Distance
134.200	107.1	-	-	10 metres
134.200	82.6	-	-	30 metres
134.200	31.2	45.0	-13.8	300 metres

The peak limit is the average limit plus 20 dB

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Sample Calculation (Average detector):

10 metre to 30 metre roll off = 24.5 dB

10 metres to 30 metres is 0.477 of a decade

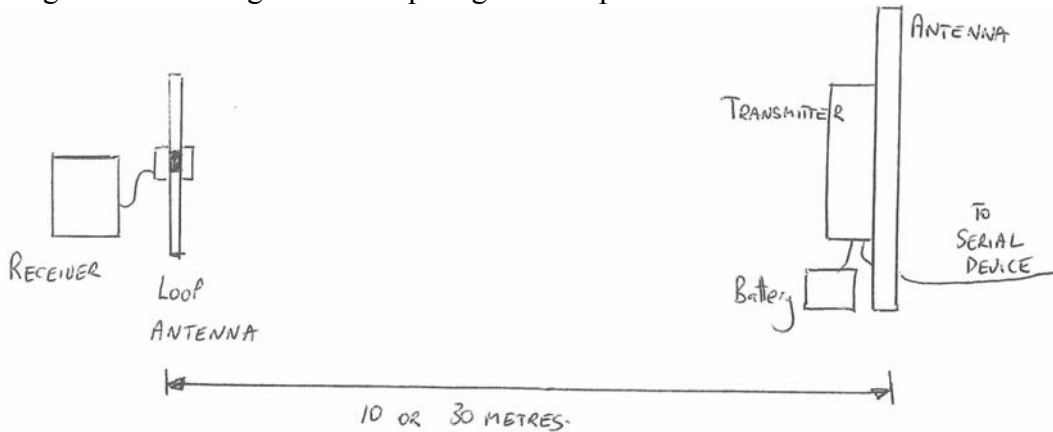
30 metres to 300 metres is 1 decade.

Therefore 10 metres to 300 metres is 1.477 of a decade

10 metres to 300 metres roll off is $24.5 \text{ dB} \times (1.477 / 0.477) = 75.9 \text{ dB}$

10 metre measurement $100.5 \text{ dBuV/m} - 75.9 \text{ dB} = 24.6 \text{ dBuV/m}$ at 300 metres

Highest field strength test set up diagram and photos.



Result: Complies with a 0.6 dB margin when measured using an average detector.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (100 kHz – 30 MHz) $\pm 4.8 \text{ dB}$

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Section 15.209: Spurious Emissions (below 30 MHz)

Frequency kHz	Level dBuV/m	Limit dBuV/m	Margin dB	Result	Detector
268.400	48.4	79.0	-30.6	Pass	Average
268.400	58.7	99.0	-40.3	Pass	Peak
402.600	55.0	75.5	-20.5	Pass	Average
402.600	62.8	95.5	-32.7	Pass	Peak
536.800	-	53.0	-	Pass	Quasi Peak
671.000	30.8	51.1	-20.3	Pass	Quasi Peak
805.200	-	49.5	-	Pass	Quasi Peak
939.400	-	48.1	-	Pass	Quasi Peak
1073.600	-	49.5	-	Pass	Quasi Peak
1207.800	-	49.5	-	Pass	Quasi Peak
1342.000	-	49.5	-	Pass	Quasi Peak

No other emissions detected from the transmitter that were within 20 dB of the applicable limit.

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

Pre screening of the device of the device was carried on the test site using a turntable which showed that the maximum field strength of the spurious emissions was in the same radial as for the fundamental emission (see fundamental test set up diagram).

At each frequency the measurement antenna was further adjusted to give the highest field strength.

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

Testing was carried out with a large antenna panel attached.

A receiver with an average detector and a peak detector using 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.

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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 limit between 110 – 490 kHz was increased by 20 dB when the peak detector was used.

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

Result: Complies with a margin of 20.3 dB at 671 kHz.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

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Section 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 that was fully charged.

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

Measurements were carried out as the device contains several digital devices.

Attached to the serial port of the device was a weighing instrument that was located approximately 10 metres away that was provided to load this port.

Data was sent to the weighing instrument using a one way link as this is how the device would typically be used.

The weighing instrument was not powered as pre-screening showed that this mode gave the worst case levels.

The transmitter used can operate with either a small or larger antenna attached.

Testing was carried out with the small antenna attached as previous pre-compliance testing had shown that emissions above 30 MHz were coming from the various digital devices contained within the product with the observed emission levels not being influenced by the type of antenna used which is designed to operate at 134 kHz.

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
216.9 – 960.0 MHz	200 uV/m	46.0 dBuV/m

Result: Complies with an 6.0 dB margin at 43.053 MHz (Vertical) when operating in charge mode.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 1000 MHz) \pm 4.1 dB

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Spurious Emissions

Device tested when being powered using an external 12 Vdc battery.

Frequency MHz	Level		Recheck dBuV/m	Limit dBuV/m	Margin dB	Result	Worst Case Antenna
	Vertical dBuV/m	Hort dBuV/m					
34.353	20.2			40.0	19.8	Pass	Vertical
68.708	17.0			40.0	23.0	Pass	Vertical
85.880	19.7			43.5	23.8	Pass	Vertical
103.063	20.3			43.5	23.2	Pass	Vertical
120.238	18.4			43.5	25.1	Pass	Vertical
137.415	28.0			43.5	15.5	Pass	Vertical
154.593	24.3	25.6		43.5	17.9	Pass	Horizontal
174.058	25.2			43.5	18.3	Pass	Vertical
188.950	29.7			43.5	13.8	Pass	Vertical
189.940	25.5			43.5	18.0	Pass	Vertical
202.150		33.8		43.5	9.7	Pass	Horizontal
206.120	22.5			43.5	21.0	Pass	Vertical
274.828	31.2	36.5		46.0	9.5	Pass	Horizontal
292.010	21.5	29.6		46.0	16.4	Pass	Horizontal
300.090		31.5		46.0	14.5	Pass	Horizontal
326.354	26.5	33.5		46.0	12.5	Pass	Horizontal
343.534	32.1	38.3	38.3	46.0	7.7	Pass	Horizontal
412.243	34.6	35.3		46.0	10.7	Pass	Horizontal
429.419	26.7			46.0	19.3	Pass	Vertical
472.363		31.0		46.0	15.0	Pass	Horizontal
480.950	26.1	34.0		46.0	12.0	Pass	Horizontal
489.540	32.0	31.2		46.0	14.0	Pass	Vertical
498.128	31.0	32.6		46.0	13.4	Pass	Horizontal
755.781	30.2			46.0	15.8	Pass	Vertical
824.488	32.7			46.0	13.3	Pass	Vertical

No further emissions detected within 20 dB of the applicable limit.

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Device operating in charge mode when powered using a 110 Vac charger

Frequency MHz	Level		Recheck dBuV/m	Limit dBuV/m	Margin dB	Result	Worst Case Antenna
	Vertical dBuV/m	Hort dBuV/m					
34.353	26.4			40.0	13.6	Pass	Vertical
43.053	34.0			40.0	6.0	Pass	Vertical
68.708	27.4			40.0	12.6	Pass	Vertical
85.880	23.8			40.0	16.2	Pass	Vertical
103.063	20.2			43.5	23.3	Pass	Vertical
120.238	22.6			43.5	20.9	Pass	Vertical
126.970	28.0			43.5	15.5	Pass	Vertical
137.415	30.3	26.5		43.5	13.2	Pass	Vertical
154.593	23.2	25.6		43.5	17.9	Pass	Horizontal
159.715		32.1		43.5	11.4	Pass	Horizontal
166.100	33.1			43.5	10.4	Pass	Vertical
173.607		34.1		43.5	9.4	Pass	Horizontal
174.058	28.6			43.5	14.9	Pass	Vertical
188.950	29.7			43.5	13.8	Pass	Vertical
189.940	26.6			43.5	16.9	Pass	Vertical
193.450		34.5	34.5	43.5	9.0	Pass	Horizontal
202.150		33.8		43.5	9.7	Pass	Horizontal
206.120	22.5			43.5	21.0	Pass	Vertical
274.828		33.0		46.0	13.0	Pass	Horizontal
292.010	21.5	29.6		46.0	16.4	Pass	Horizontal
300.090	19.5	27.0		46.0	19.0	Pass	Horizontal
326.354	26.5	29.2		46.0	16.8	Pass	Horizontal
343.534	27.8	35.1		46.0	10.9	Pass	Horizontal
412.243	32.0	33.1		46.0	12.9	Pass	Horizontal
429.419	26.7			46.0	19.3	Pass	Vertical
472.363	30.0	31.0		46.0	15.0	Pass	Horizontal
480.950	26.1	34.0		46.0	12.0	Pass	Horizontal
489.540	32.0	31.2		46.0	14.0	Pass	Vertical
498.128	32.2	34.4		46.0	11.6	Pass	Horizontal

No further emissions detected within 20 dB of the applicable limit.

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Device powered using internal batteries

Frequency MHz	Level		Recheck dBuV/m	Limit dBuV/m	Margin dB	Result	Worst Case Antenna
	Vertical dBuV/m	Hort dBuV/m					
34.353	26.4			40.0	13.6	Pass	Vertical
42.943	21.0			40.0	19.0	Pass	Vertical
68.708	22.0			40.0	18.0	Pass	Vertical
85.880	21.0			40.0	19.0	Pass	Vertical
103.063	20.2			43.5	23.3	Pass	Vertical
120.238	24.9			43.5	18.6	Pass	Vertical
126.970	28.0			43.5	15.5	Pass	Vertical
137.415	30.3	30.5		43.5	13.0	Pass	Horizontal
154.593	23.2	29.8		43.5	13.7	Pass	Horizontal
166.100	24.1			43.5	19.4	Pass	Vertical
171.450	26.3			43.5	17.2	Pass	Vertical
188.950		26.1		43.5	17.4	Pass	Horizontal
189.210	26.0			43.5	17.5	Pass	Vertical
201.978		32.6		43.5	10.9	Pass	Horizontal
206.120	22.5	30.6		43.5	12.9	Pass	Horizontal
274.828		33.2		46.0	12.8	Pass	Horizontal
292.010	21.5	30.6		46.0	15.4	Pass	Horizontal
326.358		31.3		46.0	14.7	Pass	Horizontal
343.534	29.2	35.2		46.0	10.8	Pass	Horizontal
412.243	32.0	31.9		46.0	14.0	Pass	Vertical
480.950	30.1	33.1		46.0	12.9	Pass	Horizontal
498.128	30.0	31.4		46.0	14.6	Pass	Horizontal
515.278		31.1		46.0	14.9	Pass	Horizontal
824.482	32.9			46.0	13.1	Pass	Vertical
893.193		31.9		46.0	14.1	Pass	Horizontal

No further emissions detected within 20 dB of the applicable limit.

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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
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	7 Feb 2009
Receiver	R & S	ESCS 30	847124/020	E1595	21 Dec 2007
Receiver	R & S	ESHS 10	828404/005	RFS 3728	11 July 2008
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	7 Feb 2009
Loop Antenna	EMCO	6502	9003-2485	HTS0201	11 July 2008
Mains Network	EMCO	3825/2	9206-1967	3774	8 June 2008
Variac	General Radio	1592	-	RFS 3690	Not applicable
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applicable
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	7 Feb 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 updated on January 23rd, 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.

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9. PHOTOGRAPH (S)



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Ancillary Equipment



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High frequency radiated emissions test set up



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EMC Technologies (NZ) Ltd

Test Report No 70626.2b

Report date: 11 September 2007

300 Metre Radiated Emission Extrapolation Test Set Up



Conducted Emissions Test Set Up



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