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TEST REPORT

Gallagher R Series (G03113) Smart Reader with Small Panel (G03121) Antenna

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart C – Intentional Radiators

for

Gallagher Group Ltd

A handwritten signature in black ink that reads "Andrew Cutler". The signature is written in a cursive style and is positioned above a horizontal line.

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 R Series (G03113) Smart Reader with the Small Panel (G03121) 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 connects externally to the device and has a unique non standard fitting.
15.204	External PA and antenna modifications	Noted.
15.205	Restricted bands of operation	Complies. Device transmits on 134.2 kHz with an occupied bandwidth of 725 Hz
15.207	Conducted limits	Complies. No emissions detected within 20 dB of the limit.
15.209	Radiated emission limits - Fundamental	Complies with an 0.8 dB margin (average) at 134.2 kHz when measurements are extrapolated out to 300 metres
15.209	Radiated emission limits - Spurious emissions <30 MHz	Complies with a 7.5 dB margin at 671.000 kHz (average)
15.209	Radiated emission limits – Spurious emissions >30 MHz	Complies with a 4.5 dB margin at 578.000 MHz (Horizontal)

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.

This report replaces report number 110629.3 to correct the transposition of the average and peak results in the results table on page 11.

4. CLIENT INFORMATION

Company Name	Gallagher Group Ltd
Address	Private Bag 3026
City	Hamilton 3240
Country	New Zealand
Contact	Mr Murray Long

5. DESCRIPTION OF TEST SYSTEM

Brand Name	Gallagher
Product	R Series (G03113)
Model Number	Smart Reader
Serial Number	XTESTIDX
Antenna	Small Panel (G03121) Antenna
Serial Number	Not serialised
Manufacturer	Gallagher Group Ltd
Country of Origin	New Zealand
Power Supply	FranMar FRA050-S12-8 AC Adaptor
Serial Number	Not serialised
FCC ID	Not yet determined

The system that was tested was an integrated animal management device that included

- A Sheep Crate Drafter
- A BR Series Smart Reader
- A Gallagher Weight Station Device

Typically an animal would be herded into this device and then held by the drafting device which the animal tag is read, the animal is weighed and any other animal management activities are undertaken while it is in-capacitated.

The Smart Reader is operated using an external AC power supply and had previously been tested and certified using different types of antenna.

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

This device operates with an external antenna using a unique custom connector.

The antenna panels form the sides of the sheep crate drafter.

Result: Complies.

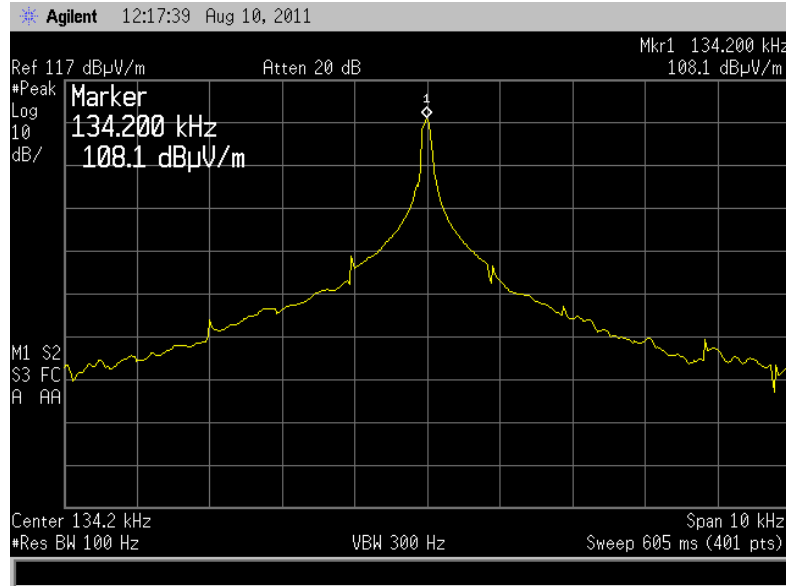
Section 15.204: External radio frequency power amplifiers and antenna modifications

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 as detailed

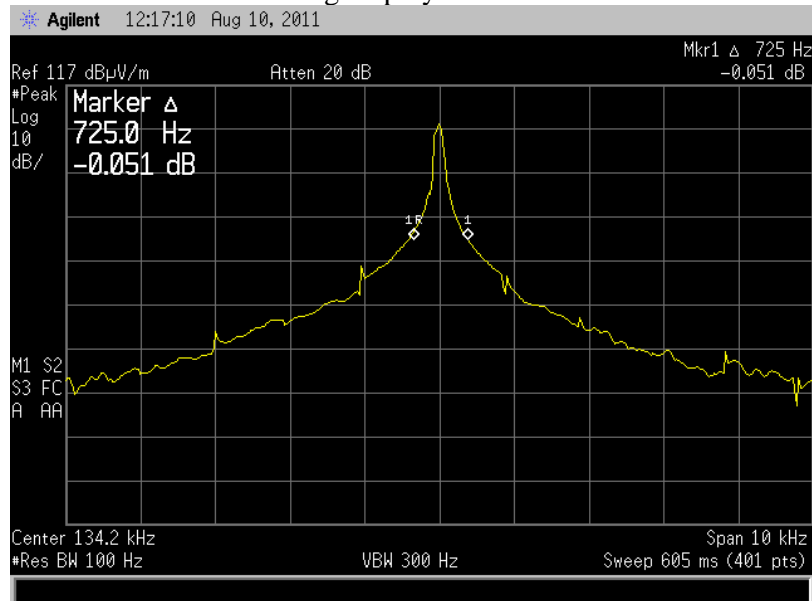


This falls between the restricted bands of 90 –110 kHz and 495 – 505 kHz.

Using a spectrum analyser the occupied bandwidth of the system has been determined when transmitting at maximum power continuously.

The occupied bandwidth as been measured at the -23 dBm points either side of the observed emission which equates to the 99% emission bandwidth.

A span of 10 kHz has been used with a resolution bandwidth of 100 Hz (1%) and a video bandwidth of 300 Hz being employed.



The occupied bandwidth is 725 Hz.

Result: Complies.

Section 15.107: Conducted limits

Conducted emission testing has been carried out when the device was powered at 120 Vac using the supplied power supply.

Testing was carried out while the device was transmitting continuously with a small panel antenna attached.

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.

Testing was carried out in accordance with section 15.207(a) using a measuring receiver and a 50 μ H / 50 ohm artificial mains network which is also known as a line impedance stabilisation network (LISN).

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.

The Class B conducted limits have been applied

Result: Complies

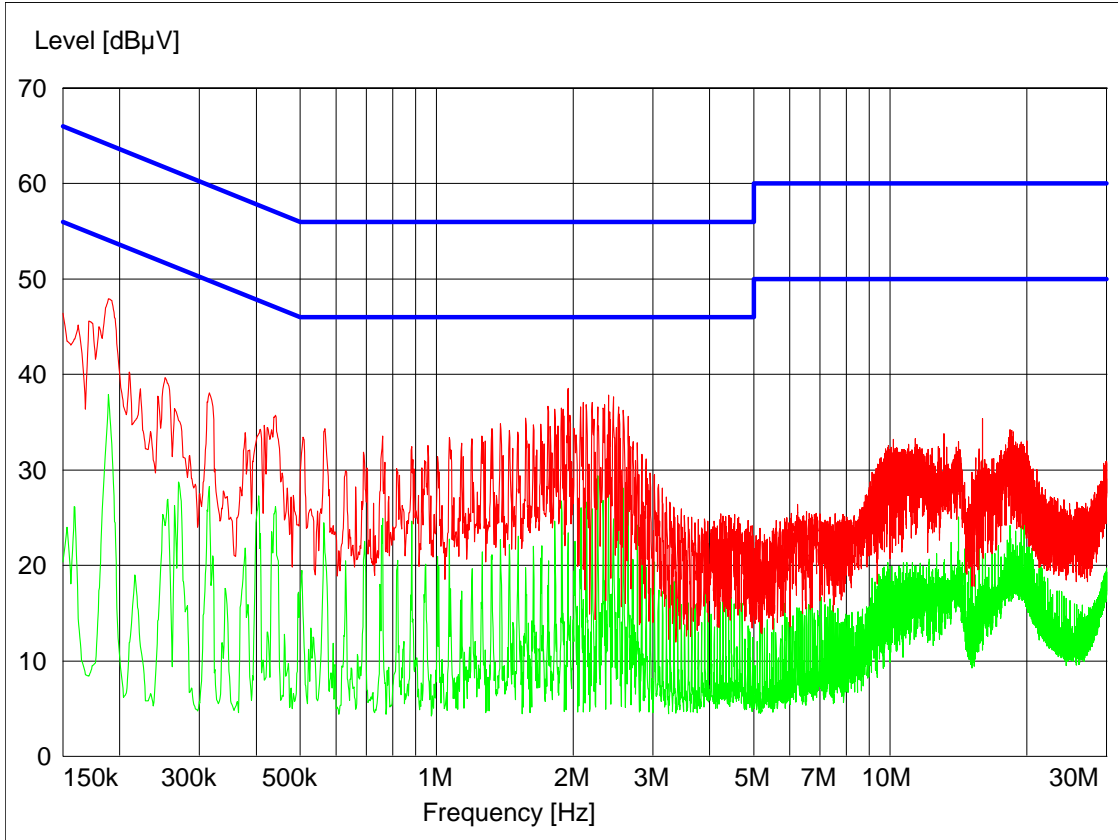
Measurement uncertainty with a confidence interval of 95% is:

Conducted emissions tests (0.15 - 30 MHz) \pm 2.2 dB

Conducted Emissions – AC Input Power Port

Setup: Device tested when transmitting continuously on 134.2 kHz when powered at 120 Vac using the supplied AC adaptor.

Peak ---
 Average --
 Quasi Peak X
 Average +



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions detected within 20 dB of the limit					

Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions detected within 20 dB of the limit					

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 and ANSI C63.4 - 2003.

Testing was carried out when the device was powered at 120 Vac using the supplied AC adaptor.

The device was placed on top of the turntable with the Smart Reader being approximately 1 metre above the ground.

Attached to the Smart Reader RS-232 port was a Gallagher Weigh Scale device.

Low frequency measurements below 30 MHz were not made on the metallic ground plane but on a grass test site at a distance of 10 metres using a magnetic loop antenna.

The centre of this loop antenna was placed 1 metre above the test site ground.

The Sheep Crate Drafter was manually positioned on the radial giving the highest field strength.

Above 30 MHz testing was carried out at the test site using a metallic ground plane where emissions were measured in both vertical and horizontal antenna polarisations.

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

Level (dB μ V/m) = Receiver Reading (dB μ V) + 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 with the limit being determined by using the extrapolation factor of 40 dB per decade limit as detailed in section 15.31 f (2).

The average limit at 300 m at 134.2 kHz is 17.8 uV/m or 25 dBuV/m and 45 dBuV/m in peak.

Frequency kHz	Detector	Distance metres	Level dBuV/m	Limit (dBuV/m)	Margin (dB)
134.200	Average	10	99.4	84.1	-15.3
134.200	Peak	10	107.0	104.1	-2.9

As the 10 metre measurements are over the limit additional measurements were made on this worst case radial at a distance of 30 metres.

Frequency kHz	Detector	Distance metres	Level dBuV/m
134.200	Average	30.0	75.1
134.200	Peak	30.0	82.7

These levels were then extrapolated to give a level at 300 metres based upon the roll off between 10m and 30 m which is 0.4771 of a decade with 10m to 300m being 1.4771 decades

Frequency kHz	Detector	10 m dBuV/m	30 m dBuV/m	Roll off dB	Total dB	300 m dBuV/m	Limit dBuV/m	Margin dB
134.200	Average	99.4	75.1	24.3	75.2	24.2	25.0	0.8
134.200	Peak	107.0	82.7	24.3	75.2	31.8	45.0	13.2

Testing was also carried out to determine whether a variation in the supply voltage would cause a significant change in field strength with the 120 Vac supply being varied by +/- 15% between 102 Vac and 138 Vac when measured using an average detector.

Voltage (Vdc)	Field Strength (dBuV/m)
102.0	99.3
120.0	99.4
138.0	99.4

Result: Complies.

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)

Magnetic loop measurements were made a distance of 10 metres.

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

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.

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). 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 fundamental emission.

Frequency kHz	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
268.400	48.7	79.0	-	Average	Noise floor
268.400	58.5	99.0	-	Peak	Noise floor
402.600	46.4	75.5	-	Average	Noise floor
402.600	60.1	95.5	-	Peak	Noise floor
536.800	< 49	53.0	-	Quasi Peak	Ambient
671.000	43.6	51.1	7.5	Quasi Peak	
805.200	< 45	49.5	-	Quasi Peak	Ambient
939.400	< 45	48.1	-	Quasi Peak	Ambient
1073.600	< 45	47.0	-	Quasi Peak	Ambient
1207.800	< 39	46.0	-	Quasi Peak	Noise floor
1342.000	< 34	45.0	-	Quasi Peak	Noise floor
1476.200	< 40	44.2	-	Quasi Peak	Ambient
1610.400	< 35	43.5	-	Quasi Peak	Noise floor

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

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

Section 15.209: Spurious Emissions (above 30 MHz)

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

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 a digital device that operates on 17.1776 MHz.

The device was tested transmitting continuously on 134.2 kHz.

Testing was carried out when the device was powered at 120 Vac using an external AC power supply.

The device was placed on top of the turntable with the Smart Reader being approximately 1 metre above the ground.

Attached to the Smart Reader RS-232 port was a Gallagher Weigh Scale device.

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
Above 960 MHz	500 uV/m	54.0 dBuV

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

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

Results:

Frequency MHz	Vertical dBuV/m	Horizontal dBuV/m	Limit dBuV/m	Margin dB	Antenna
30.300		24.1	40.0	15.9	Horizontal
51.528	15.0		40.0	25.0	Vertical
68.705	27.2		40.0	12.8	Vertical
85.883	22.5		40.0	17.5	Vertical
86.700	26.1		40.0	13.9	Vertical
103.060	33.1		43.5	10.4	Vertical
120.238	23.1		43.5	20.4	Vertical
137.416	33.8		43.5	9.7	Vertical
142.210	32.5		43.5	11.0	Vertical
168.000	31.8	31.8	43.5	11.7	Vertical
171.771			43.5	43.5	Vertical
221.300		32.0	43.5	11.5	Horizontal
274.833	29.3	31.6	46.0	14.4	Horizontal
288.500		34.1	46.0	11.9	Horizontal
296.000		30.7	46.0	15.3	Horizontal
343.548	27.9	29.3	46.0	16.7	Horizontal
412.250	35.5	35.7	46.0	10.3	Horizontal
480.963	31.2	36.7	46.0	9.3	Horizontal
498.140	30.6	33.1	46.0	12.9	Horizontal
560.750	39.7	41.1	46.0	4.9	Horizontal
578.000	36.1	41.5	46.0	4.5	Horizontal
602.000	38.8	37.1	46.0	7.2	Vertical
687.090	35.6	34.7	46.0	10.4	Vertical
755.808	35.4	36.1	46.0	9.9	Horizontal
824.518	35.6	34.6	46.0	10.4	Vertical

All other emissions detected had a margin to limit that exceeded 15 dB when measurements were attempted up to 1 GHz using 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
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3613	30/01/2014
Receiver	R & S	ESIB 40		E1595	10/06/2012
Receiver	R & S	ESHS 10	828404/005	RFS 3728	29/10/2011
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	30/01/2014
Loop Antenna	EMCO	6502	9003-2485	3798	12/06/2012
Mains Network	R & S	ESH2-Z5	881362/034	3628	29/07/2012
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 3613	30/01/2014

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 15 February, 2011.

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.

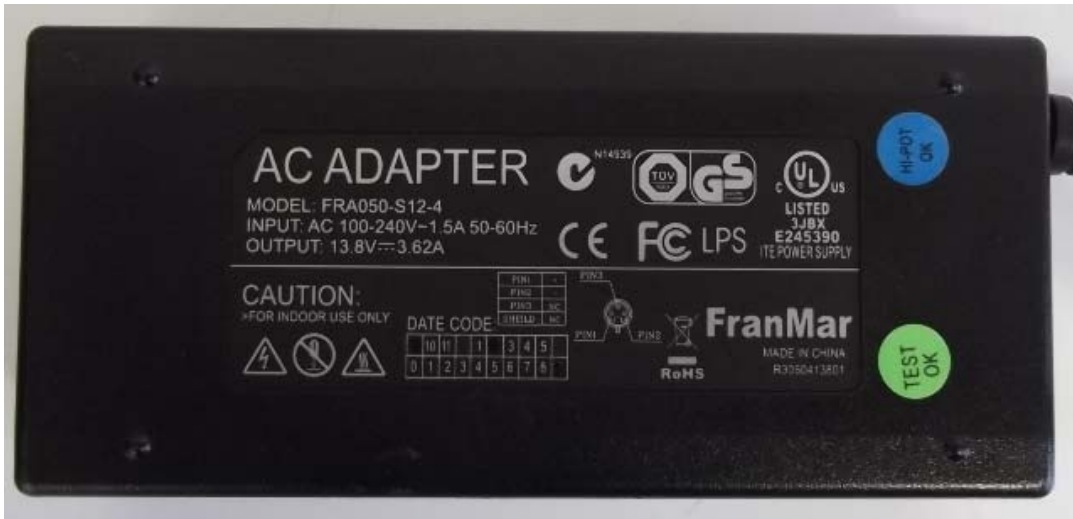
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with various accreditation bodies in a number of economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied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

9. PHOTOTGRAPHS



BR600:
600mm x 400mm Antenna Panel G03121





Conducted Emissions Test Set Up



Below 30 MHz radiated emission test set up



Above 30 MHz test set up





Ancillary equipment – Weigh scale

