

EMC Technologies (NZ) Ltd

Test Report No **200204.1**

Report date: 9 February 2010

TEST REPORT

MiFare Tear Drop Transmitter

tested to

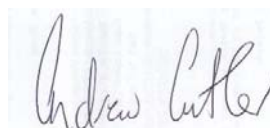
47 Code of Federal Regulations

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



EMC Technologies (NZ) Ltd

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1. STATEMENT OF COMPLIANCE

The **MiFare Tear Drop Transmitter** complies with FCC Part 15 Subpart C Intentional Radiator when the methods as described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

The results from testing are summarised in the following table:

Clause	Parameter	Result
15.201	Equipment authorisation requirement	Certification required.
15.203	Antenna requirement	Complies. Antenna internal to the device.
15.204	External PA and antenna modifications	Not applicable. No external devices.
15.205	Restricted bands of operation	Complies. Device transmits on 13.561 MHz.
15.207	Conducted limits	Complies.
15.209	Radiated emission limits - Spurious emissions <30 MHz	Complies with a 32.9 dB margin at 27.122 MHz
15.209	Radiated emission limits – Spurious emissions >30 MHz	Complies with a 3.8 dB margin at 189.840 MHz (Horizontal). Measurement falls within the window of uncertainty for this test method
15.225	Radiated emission limits - Fundamental	Complies with a 42.5 dB margin at 13.561 MHz.
15.225	Frequency stability	Complies

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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.

4. CLIENT INFORMATION

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

5. DESCRIPTION OF TEST SAMPLE

Brand Name	MiFare
Model Number	Tear Drop
Product	Transmitter
Manufacturer	Gallagher Group Ltd
Country of Origin	New Zealand
Serial Number	Sample not serialised

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6. SETUPS AND PROCEDURES

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 has an internal antenna.

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 13.561 MHz.

This falls into the band 13.110 – 14.010 MHz that is covered by Section 15.225.

Result: Complies.

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Section 15.107: Conducted emissions testing

Conducted Emissions testing was carried out over the frequency range of 150 kHz to 30 MHz which was carried out 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 using a representative AC adaptor as this can be connected to the AC mains supply either directly or indirectly.

The transmitter operates on 13.561 MHz.

Testing was initially carried out with the transmitter operating with the antenna attached.

A second test was then carried out with the antenna removed and replaced with a dummy load.

A comparison was then made between the two sets of results which show that the transmitter emission on 13.560 MHz has been suppressed when the dummy load is attached and all other emissions remain approximately the same on both sets of results.

Therefore the device is deemed to comply when this test method is applied.

The device was placed on top of the emissions table, which is 1 m x 1.5 m, 80 cm above the screened room floor which acts as the horizontal ground plane.

In addition the device was positioned 40cm away from the screened room wall which acts as the vertical ground plane.

The artificial mains network was bonded to the screened room floor.

At all times the device was kept more than 80 cm from the artificial mains network.

The Class B limits have been applied.

Measurement uncertainty with a confidence interval of 95% is:

- AC Mains port (0.15-30 MHz) \pm 2.8 dB

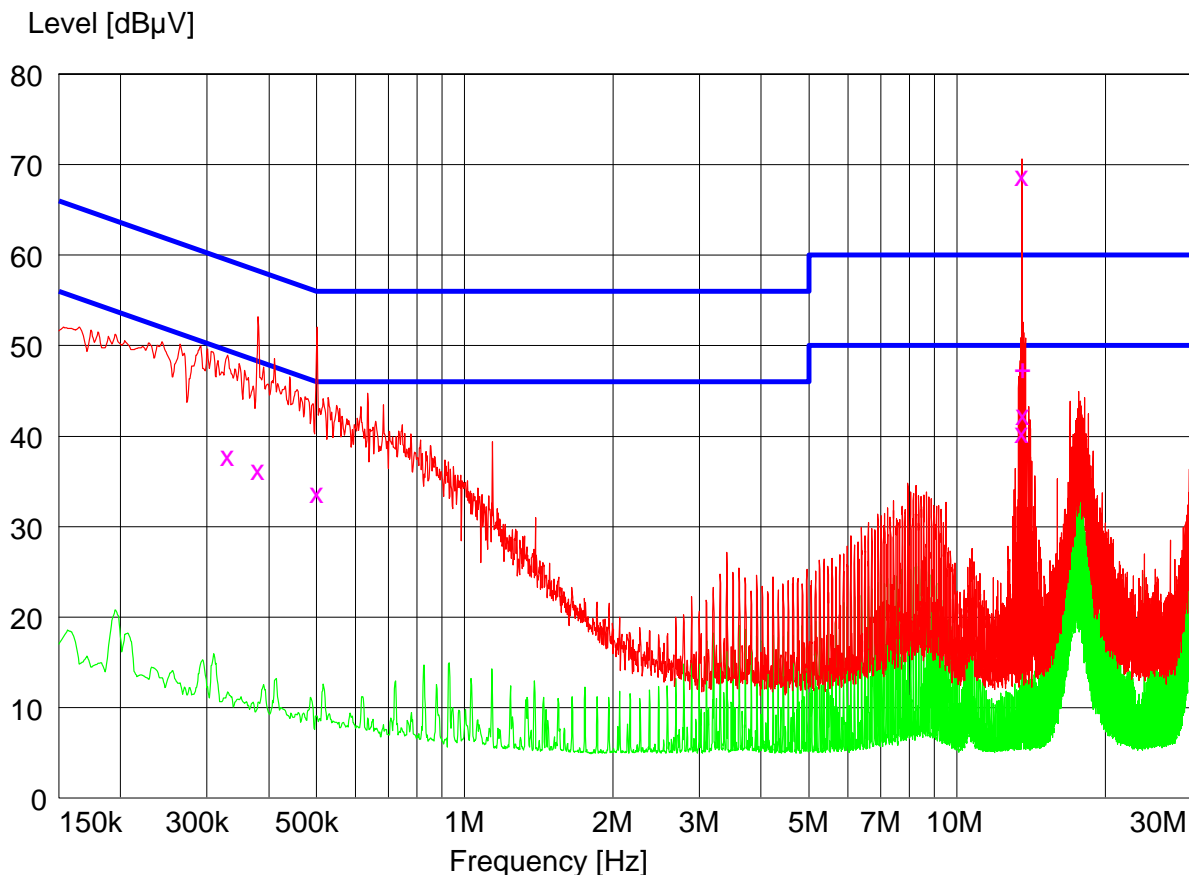
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Conducted Emissions – AC Mains Port

Setup:	The device was powered at 120Vac operating under normal stand alone conditions with the standard antenna attached
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Peak -----	Average -----	Quasi Peak X	Average +
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Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.330000	38.00	60.5	21.5	N	
0.381000	36.40	58.2	21.8	L1	
0.501000	33.90	56.0	22.1	N	
13.547000	40.60	60.0	19.4	L1	
13.560500	69.00	60.0	-9.0	N	
13.637000	42.60	60.0	17.4	L1	

Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
13.560500	47.60	50.0	2.4	N	

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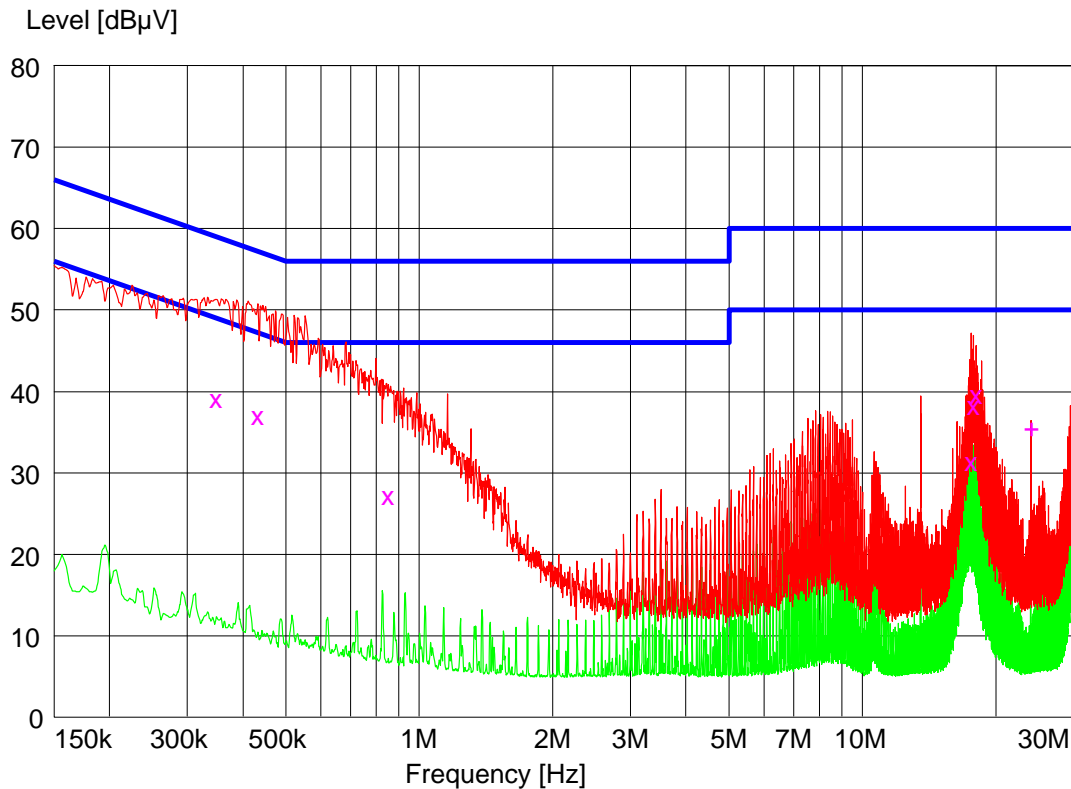
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Conducted Emissions – AC Mains Port

Setup:	The device was powered at 120Vac when operating under normal stand alone conditions with the antenna removed and replaced with a dummy load.
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Peak -----	Average -----	Quasi Peak X	Average +
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Final Quasi-Peak Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Phase	Rechecks dB μ V
0.348000	39.30	59	19.7	N	
0.432000	37.30	57	19.9	L1	
0.852000	27.40	56	28.6	L1	
17.615000	31.60	60	28.4	L1	
17.831000	38.40	60	21.6	L1	
18.060500	39.80	60	20.2	N	

Final Average Measurements

Frequency MHz	Level dB μ V	Limit dB μ V	Margin dB	Phase	Rechecks dB μ V
24.000500	35.80	50	14.2	N	

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Section 15.209: Radiated emission limits, general requirements

Radiated emissions testing was carried out over the frequency range of 13 MHz 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 from a GBUS URI device that was powered using an external DC power supply that was powered at 120 Vac.

The device was placed in the centre of the test table standing vertically upright as if it were attached to the wall with the front face facing the test antenna.

Testing was carried out in this position as can be seen from the photographs.

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.

Below 30 MHz a magnetic loop is used with the centre of the loop being 1 metre above the ground.

Above 30 MHz 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:

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

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 1000 MHz) \pm 4.1 dB
- Free radiation tests (100 kHz – 30 MHz) \pm 4.8 dB

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Section 15.209: Spurious Emissions (below 30 MHz)

Frequency MHz	Level dBuV/m	Distance metres	Limit (dBuV/m)	Margin (dB)
27.122	16.6	10	49.5	32.9

Testing was carried out when the device was transmitting continuously.

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

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

The 30 metre limit between 1.705 MHz – 30 MHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2).

The limit at 27.122 MHz when measured at 30 metres is 30 uV/m or 29.54 dBuV/m.

Therefore when scaled the limit at 10 metres will be 49.54 dBuV/m.

The spurious emission observed does not exceed the level of the fundamental emission.

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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.

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

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

The limits as described in Section 15.209 have been applied.

Frequency MHz	Vertical dBuV/m	Horizontal dBuV/m	Limit dBuV/m	Margin dB	Result	Antenna
40.680	32.6	22.6	40.0	7.4	Pass	Vertical
54.242	22.0		40.0	18.0	Pass	Vertical
67.800	27.6	19.6	40.0	12.4	Pass	Vertical
81.360	25.3	16.8	40.0	14.7	Pass	Vertical
94.920	31.0		43.5	12.5	Pass	Vertical
108.480	24.4	26.5	43.5	17.0	Pass	Horizontal
122.040	28.0	24.7	43.5	15.5	Pass	Vertical
135.600	31.2	29.3	43.5	12.3	Pass	Vertical
149.160	29.1	32.2	43.5	11.3	Pass	Horizontal
162.720	34.8	37.0	43.5	6.5	Pass	Horizontal
176.280	32.9	34.0	43.5	9.5	Pass	Horizontal
189.840	36.8	39.7	43.5	3.8	Uncert	Horizontal
203.400	29.4	34.7	43.5	8.8	Pass	Horizontal
216.970	32.3	36.7	46.0	9.3	Pass	Horizontal
230.530	27.6	32.4	46.0	13.6	Pass	Horizontal
244.090	29.3	36.8	46.0	9.2	Pass	Horizontal
257.650	20.1	29.5	46.0	16.5	Pass	Horizontal
271.210	28.2	32.2	46.0	13.8	Pass	Horizontal
284.770		29.3	46.0	16.7	Pass	Horizontal
298.330		28.5	46.0	17.5	Pass	Horizontal
312.000	29.2	30.3	46.0	15.7	Pass	Horizontal
325.560		28.3	46.0	17.7	Pass	Horizontal
339.120	31.8	36.7	46.0	9.3	Pass	Horizontal
366.240	31.4	36.1	46.0	9.9	Pass	Horizontal
393.360	32.6	35.0	46.0	11.0	Pass	Horizontal
420.480	33.4	38.9	46.0	7.1	Pass	Horizontal

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Section 15.225: Fundamental emission:

Measurements were made using a magnetic loop antenna and a receiver with a quasi peak detector 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 limit at 30 m at 13.561 MHz is 15,848 uV/m or 84.0 dBuV/m.

Therefore applying the extrapolation factor of 40 dB/ per decade, the limit is 104 dBuV/m.

Testing was carried out when the device was transmitting continuously.

The 120 Vac supply to the device was varied between 85% and 115% which showed that the radiated field strength did not vary.

Frequency MHz	Level dBuV/m	Distance metres	Limit (dBuV/m)	Margin (dB)
13.561	51.5	10	104.0	52.5

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

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

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Section 15.225: Frequency tolerance:

The frequency tolerance of carrier is required to be +/- 0.01% of operating frequency when the temperature is varied between -20 degrees and +50 degrees.

The device operates on approximately 13.561 MHz which gives a frequency tolerance of +/- 13,561 Hz.

Temperature	Frequency (MHz)	Difference (Hz)
-20.0	13.561 025	+25
-10.0	13.559 700	-1,300
+0.0	13.559 750	-1,250
+10.0	13.559 725	-1,275
+20.0	13.559 725	-1,275
+30.0	13.559 675	-1,325
+40.0	13.559 700	-1,300
+50.0	13.559 700	-1,300

Variation of the 120 Vac supply to the system at +20 degrees did not vary the frequency output

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Frequency tolerance \pm 50 Hz

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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 3613	31/01/2011
Receiver	R & S	ESCS 30	847124/020	E1595	30/01/2011
Receiver	R & S	ESHS 10	828404/005	RFS 3728	10/07/2010
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3776	28/07/2011
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	31/01/2010
Loop Antenna	EMCO	6502	9003-2485	3798	12/06/2010
Mains Network	R & S	ESH2-Z5	881362/034	3628	22/07/2010
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	31/01/2011

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, 2010.

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

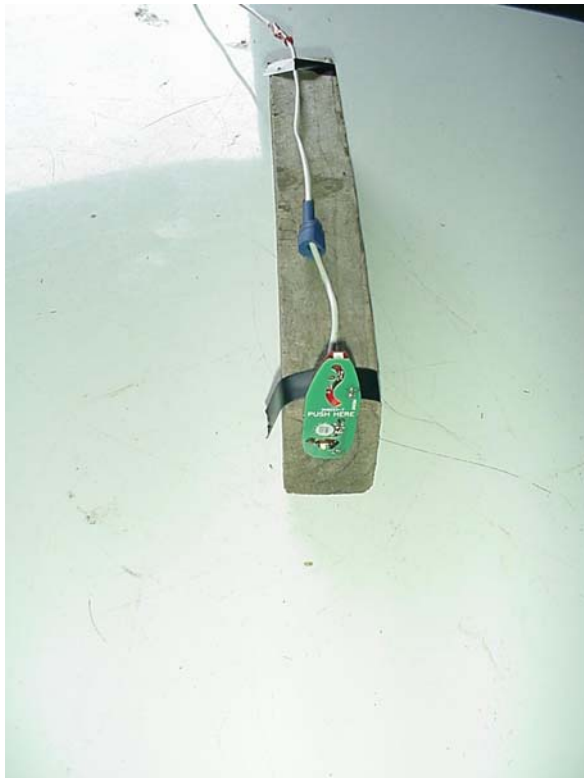
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with various accreditation bodies in a number of economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied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

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9. PHOTOGRAPHS – Radiated emissions test set up



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Ancillaries

