EMC Technologies (NZ) Ltd
PO Box 68-307
Newton, Auckland
47 MacKelvie Street
Grey Lynn, Auckland
New Zealand
Phone 09 360 0862
Fax 09 360 0861
E-Mail Address: aucklab@ihug.co.nz
Web Site: www.emctech.com.au

TEST REPORT

Invenco G6-200 Outdoor Payment Terminal

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart C

Intentional Radiators

Section 15.225
Operation within the band 13.110 -14.010 MHz

for

Invenco Group Ltd

This Test Report is issued with the authority of:

Andrew Cutler- General Manager

IANZ ACCREDITED LABORATORY

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

Table of Contents

1.	**STATEMENT OF COMPLIANCE**	**3**
2.	**RESULTS SUMMARY**	**3**
3.	**INTRODUCTION**	**4**
4.	**CLIENT INFORMATION**	**5**
5.	**DESCRIPTION OF TEST SAMPLE**	**5**
6.	**SETUPS AND PROCEDURES**	**6**
7.	**TEST EQUIPMENT USED**	**17**
8.	**ACCREDITATIONS**	**17**
9.	**PHOTOGRAPHS**	**18**

1. STATEMENT OF COMPLIANCE

The **Invenco G6-200 Outdoor Payment Terminal** complies with FCC Part 15 Subpart C sections 15.207, 15.209 and 15.225 as an Intentional Radiator when tested in accordance with ANSI C63.10 - 2013

2. RESULTS SUMMARY

The results of testing carried out in September 2016 are summarised below.

Clause	Parameter	Result
15.201	Equipment authorisation requirement	Certification of the 13.560 MHz transmitter is 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 13.560 MHz.
15.207	Conducted limits	Complies.
15.209	Radiated emission limits - Spurious emissions <30 MHz	Complies.
15.209	Radiated emission limits – Spurious emissions >30 MHz	Complies.
15.225	Radiated emission limits - Fundamental	Complies.
15.225	Frequency stability	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.

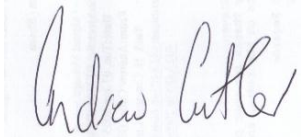
Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.



Andrew Cutler
General Manager
EMC Technologies NZ Ltd

4. CLIENT INFORMATION

Company Name	Invenco Group Ltd
Address	7 – 11 Kawana Street Northcote
City	Auckland 0627
Country	New Zealand
Contact	Mr Roger Pook

5. DESCRIPTION OF TEST SAMPLE

Brand Name	Invenco
Model Number	G6-200
Product	Outdoor Payment Terminal
Manufacturer	Invenco Group Ltd
Country of Origin	New Zealand
Serial Number	A160810276
FCC ID	2AC7B-G6OPTB

The device tested is an outdoor credit card payment terminal that would typically be installed at a petrol station allowing payment for petrol and the petrol pump.

Along with the standard payment methods the device also has a 13.560 MHz contactless card reader that uses NFC technologies.

The following frequencies are used in this device:

Clock oscillator:	27.120 MHz
Processor Clock:	325 MHz
Contactless Card Reader:	13.560 MHz

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 C63.10 – 2013 applied to the 13.560 MHz transmitter

Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for the contactless transmitting device that operates on 13.560 MHz.

The digital device contained within this device would be classed as a Class A digital device.

A digital device is marketed for use in a commercial, industrial or business environment and therefore the verification process has been applied and has been reported in a separate test report.

Section 15.203: Antenna requirement

This device has an internal antenna.

Result: Complies.

Section 15.204: External radio frequency power amplifiers and antenna modifications

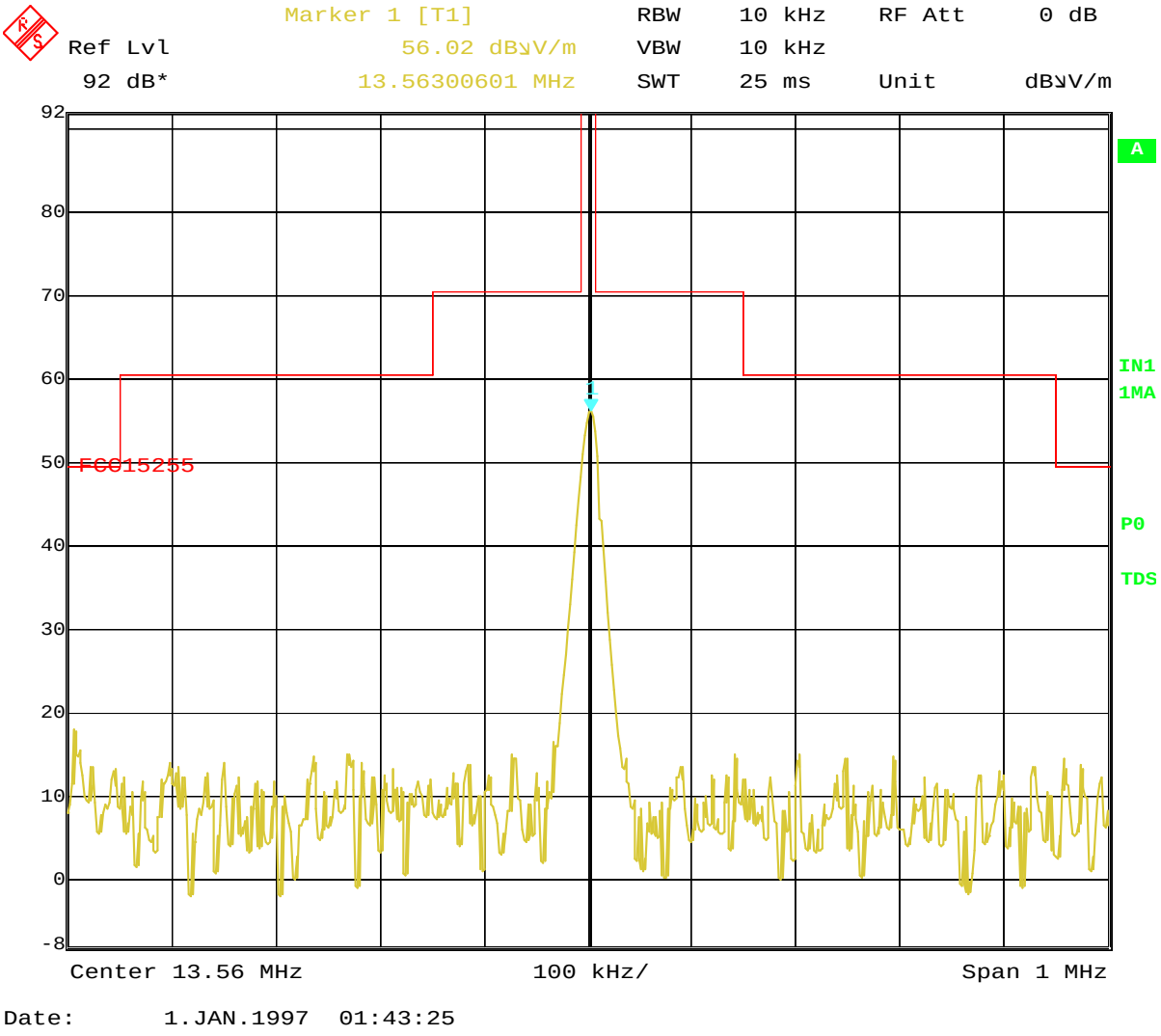
It is NOT possible to attach an external power amplifier to this transmitter.

Result: Complies.

Section 15.205: Restricted bands of operation

The transmitter transmits on approximately 13.560 MHz.

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



Result: Complies.

Section 15.207: 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 an AC power supply that was powered at 120 Vac 60 Hz which supplied the device with 24 Vdc.

Testing was carried out with the transmitter operating with the antenna attached and with the antenna removed and replaced with a dummy load.

The transmitter operates on 13.560 MHz.

The device is deemed to comply providing it complies when the test is carried out with the dummy load attached and the overall emission signature for the product remains similar with no additional emissions being detected.

This is the case with this device.

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.

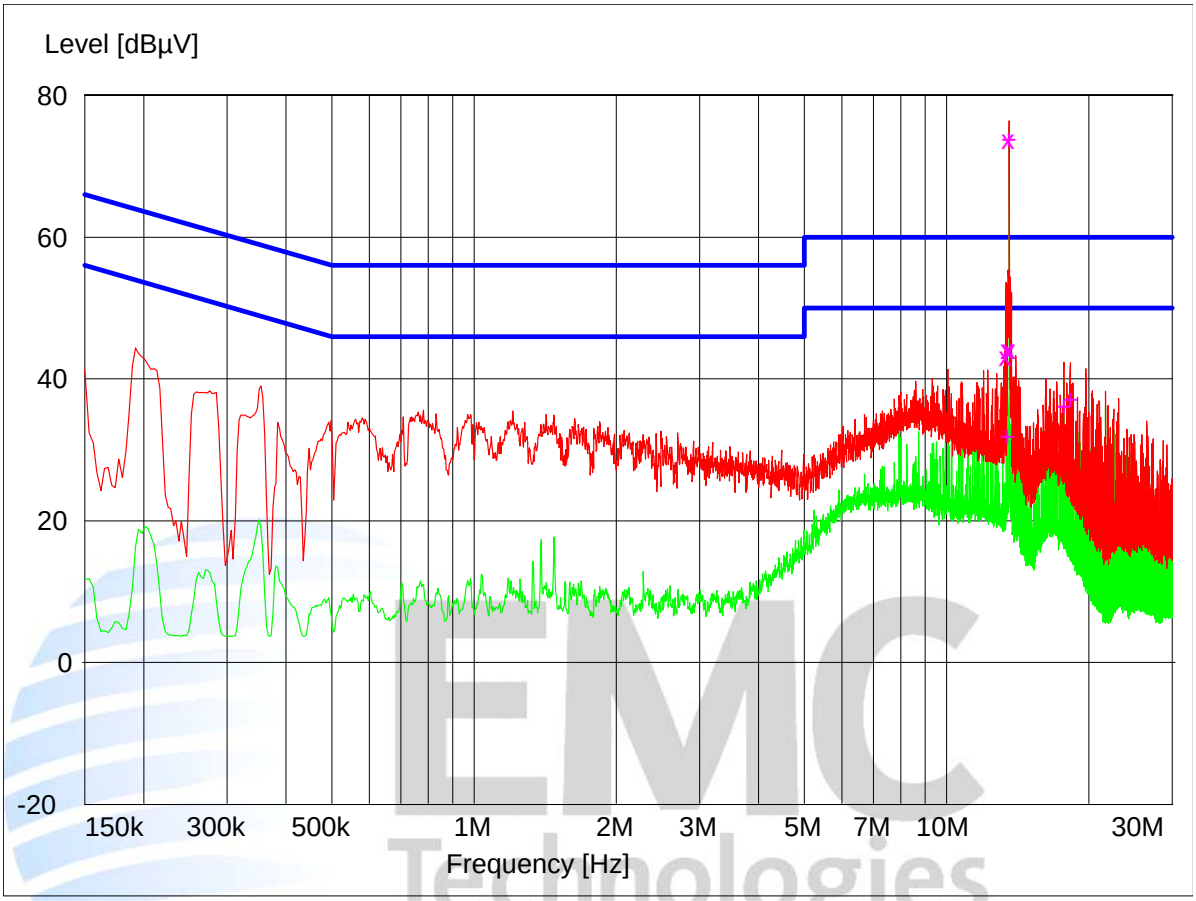
The Class B limits have been applied.

Measurement uncertainty with a confidence interval of 95% is:
- AC Mains port (0.15-30 MHz) ± 2.8 dB

Conducted Emissions – AC Input Power Port

Setup:	Device tested when powered at 120 Vac 60 Hz with the 13.560 MHz Reader operating continuously and when the Ethernet port was being addressed.

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



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
13.349000	43.20	60.0	16.8	L1	
13.493000	44.10	60.0	15.9	L1	
*13.560500	73.70	60.0	-13.7	L1	73.5
13.628000	44.10	60.0	15.9	L1	

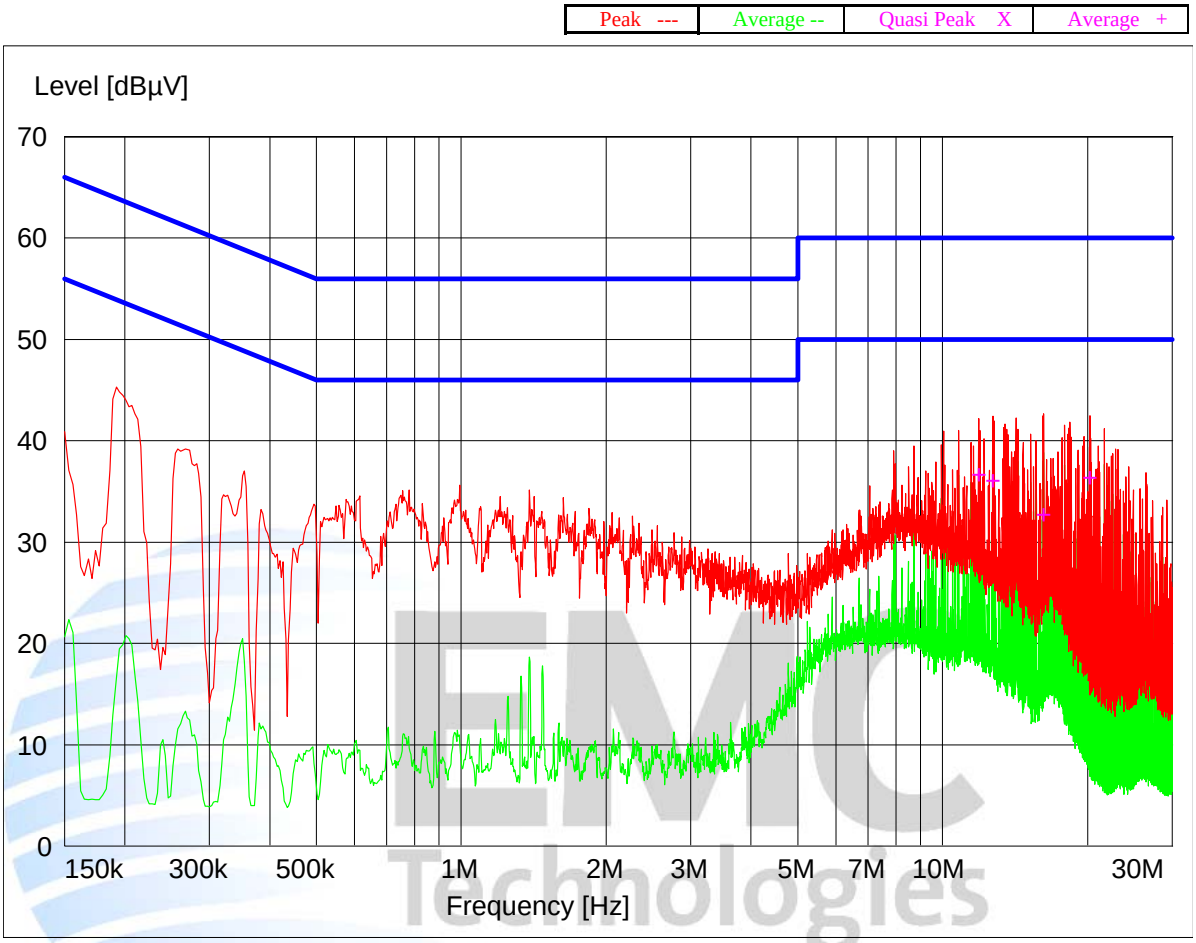
Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
13.421000	31.90	50.0	18.1	L1	
*13.560500	73.70	50.0	-23.7	L1	73.4
17.696000	36.20	50.0	13.9	L1	
18.245000	37.20	50.0	12.8	L1	

* Device transmit frequency.

Conducted Emissions – AC Input Power Port

Setup:	Device tested when powered at 120 Vac 60 Hz with the 13.560 MHz Reader antenna being terminated with a dummy load when transmitting continuously and when the Ethernet port was being addressed.



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
	No results recorded within 15 dB of the limit				

Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
11.891000	36.70	50.0	13.3	L1	
12.746000	36.10	50.0	13.9	L1	
16.229000	32.70	50.0	17.3	L1	
20.261000	36.40	50.0	13.6	L1	

Section 15.209: Radiated emission limits, general requirements

Radiated emissions testing was carried out over the frequency range of 100 kHz to 2,000 MHz as the highest frequency in use, as declared by the client, is less than 500 MHz.

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

Testing was carried out when the device was powered at 120 Vac 60 Hz using a power supply supplied by the client that provided the device with 24 Vdc.

Testing was carried out when the 13.560 MHz transmitter was operating continuously while the Ethernet port was being addressed.

The device was placed in the centre of the test table standing vertically upright with the display facing the test antenna at the zero degree position on the turntable.

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

Section 15.209: Spurious Emissions (below 30 MHz)

As this device contains digital devices that operate using frequencies below 30 MHz, low frequency measurements were attempted between 10 kHz – 30 MHz at the open area test site over a distance of 10 metres using a loop antenna the centre of which was 1 metre above the ground.

Details of the general test set up are provided in the photograph section of this report.

The general limits described in 15.209 have been applied with the 300 metre and 30 metre limits being extrapolated by a factor of 40 dB per decade as allowed for in section 15.31(d)(2).

Between 10 – 90 kHz and between 110 – 490 kHz an Average detector and a Peak detector were used.

Where a peak detector was used the limit was increased by +20 dB.

Between 90 kHz and 110 kHz band between 490 kHz and 30 MHz a Quasi Peak detector was used.

The following measurements were made when the 13.560 MHz transmitter was transmitting continuously.

Frequency MHz	Level dBuV/m	Distance metres	Limit (dBuV/m)	Margin (dB)
27.122	14.5	10.0	48.6	34.1

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 48.6 dBuV/m as detailed below.

= 29.54 dBuV/m + -40 dB/decade * (log (10) - log (30))
= 29.54 dBuV/m + -40 dB/decade * (1.000 - 1.477)
= 29.54 dBuV/m + -40 dB/decade * - 0.477
= 29.54 dBuV/m + 19.08
= 48.62 dBuV/m or 48.6 dBuV/m

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

No other emissions were detected from this device over the range of 9 kHz – 30 MHz.

Result: Complies
Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (10 kHz – 30 MHz) ± 4.8 dB

Section 15.209: Spurious Emissions (above 30 MHz)

Measurements on the 13.560 MHz transmitter have been made between 30 –2,000 MHz using a test distance of 3 metres.

Below 1000 MHz a quasi peak detector with a bandwidth of 120 kHz was used.

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

The limits as described in Section 15.209 have been applied.

Transmitter harmonic emissions

Frequency MHz	Vertical dBuV/m	Horizontal dBuV/m	Limit dBuV/m	Margin dB	Result	Antenna
40.680	32.6	23.8	40.0	7.4	Pass	Vertical
54.242	24.5		40.0	15.5	Pass	Vertical
67.803	25.3		40.0	14.7	Pass	Vertical
81.364	23.1		40.0	16.9	Pass	Vertical
108.480	25.6		43.5	17.9	Pass	Vertical
149.160	33.1		43.5	10.4	Pass	Vertical
162.720	34.8		43.5	8.7	Pass	Vertical

All other transmitter emissions observed had a margin to limit that exceeded 20 dB when measurements were attempted using vertical and horizontal polarisations.

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 - 2000 MHz) ± 4.8 dB

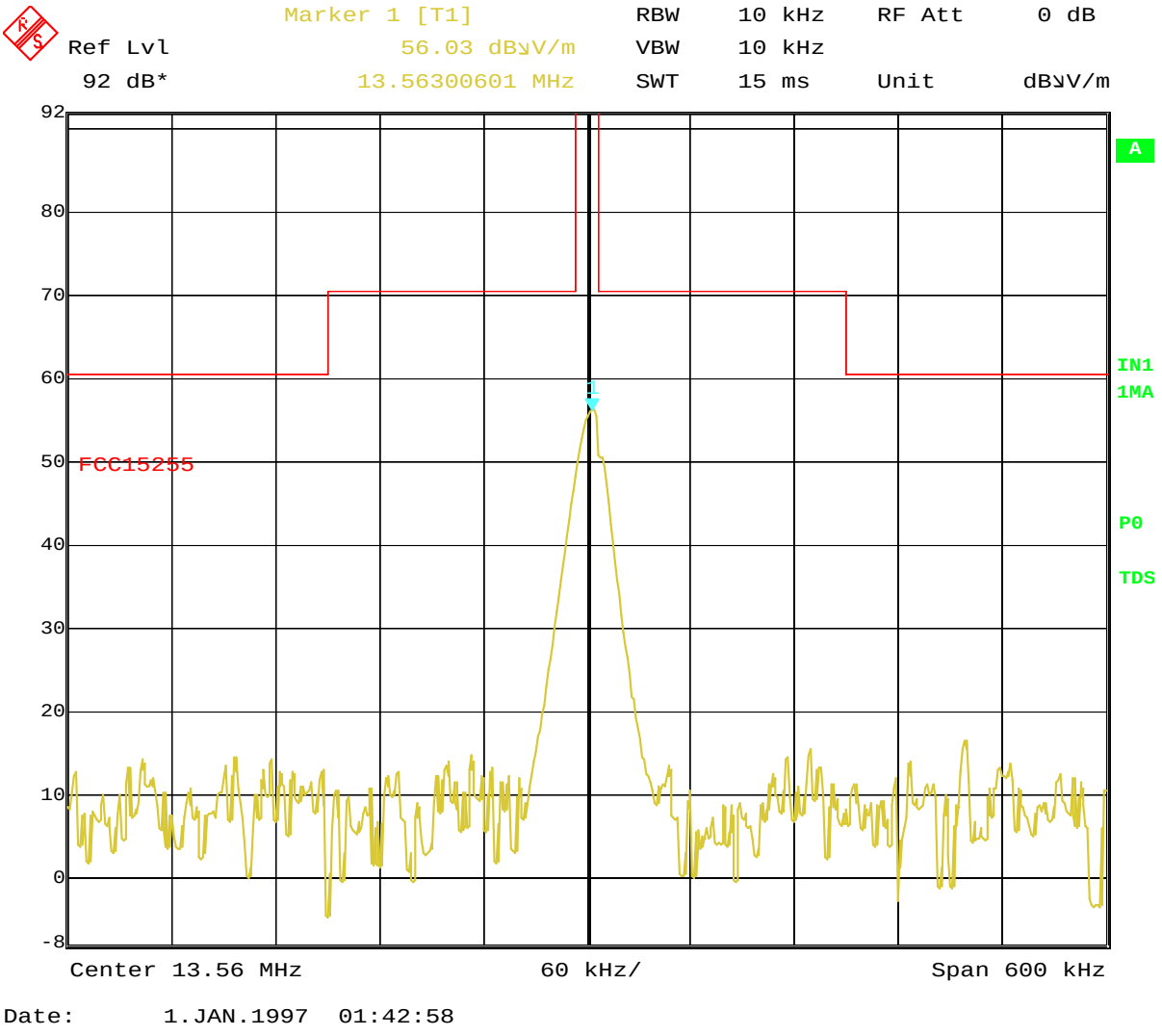
Section 15.225: Fundamental emission:

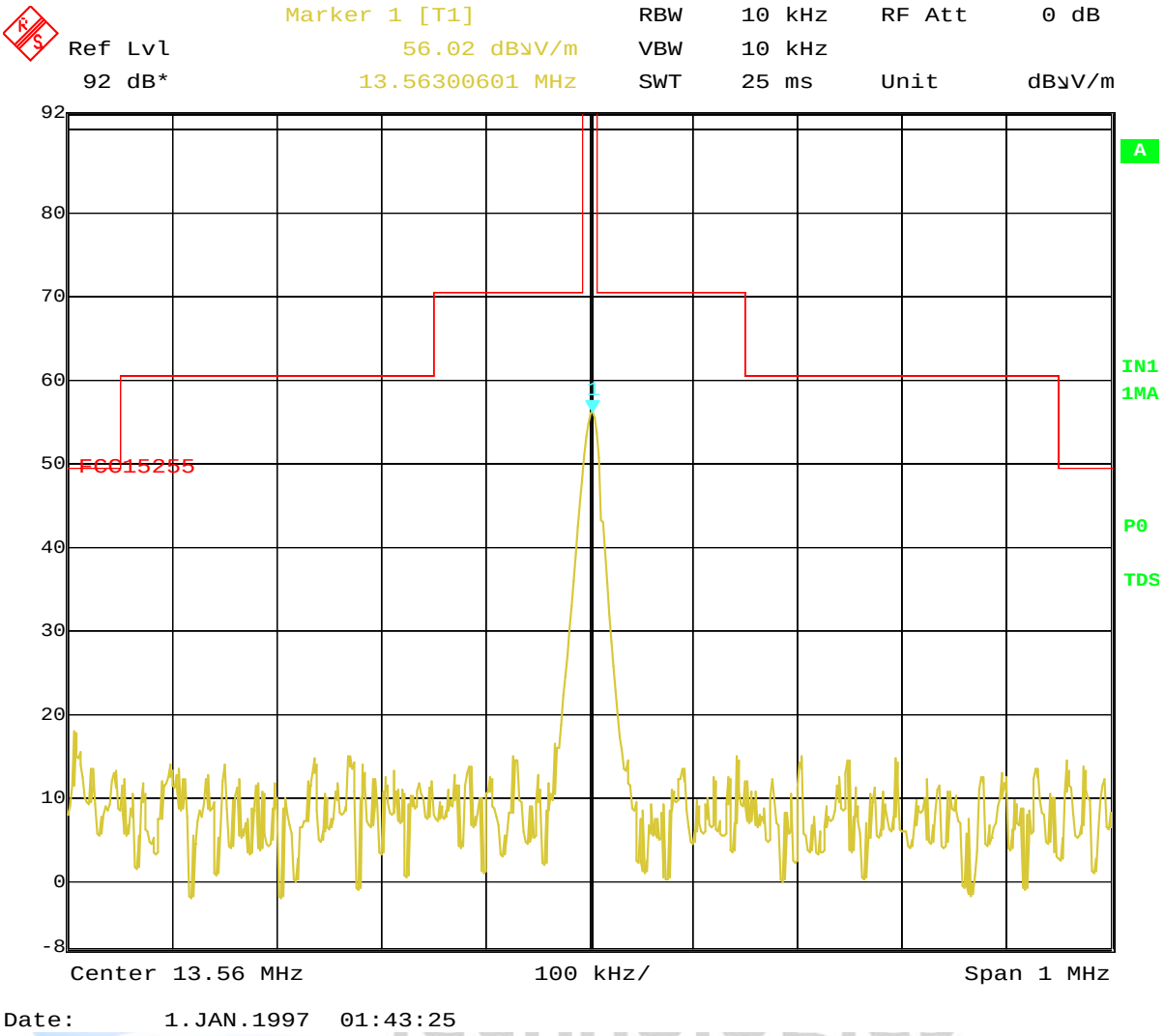
Testing was carried out when the device was transmitting continuously.

Measurements were made using a magnetic loop antenna and a receiver with a quasi peak detector using a 9 kHz bandwidth

Frequency MHz	Level dBuV/m	Distance metres	Limit (dBuV/m)	Margin (dB)
13.561	61.3	10.0	103.1	41.8

A spectrum analyser plot shows that the carrier and modulation peaks do not exceed the spurious emission limits within +/- 600 kHz of the carrier and within +/- 1 MHz of the carrier.





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 the limit at 10 metres will be
=84.0 dBuV/m + -40 dB/decade * (log (10) - log (30))
= 84.0 dBuV/m + -40 dB/decade * (1.000 - 1.477)
= 84.0 dBuV/m + -40 dB/decade * - 0.477
= 84.0 dBuV/m + 19.08
= 103.08 dBuV/m or 103.1 dBuV/m

Result: Complies.

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

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 13.560 MHz which gives a frequency tolerance of +/- 1,356 Hz.

Temperature	Frequency (MHz)	Difference (Hz)
-20.0	13.559 625	-375.0
-10.0	13.559 625	-375.0
+0.0	13.559 625	-375.0
+10.0	13.559 625	-375.0
+20.0	13.559 625	-375.0
+30.0	13.559 625	-375.0
+40.0	13.559 625	-375.0
+50.0	13.559 625	-375.0

Variation of the 24 Vdc supply to the device at +20 degrees did not vary the frequency output.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:
- Frequency tolerance ± 50 Hz

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due	Period
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic	Not applic
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic	Not applic
Biconical Antenna	Schwarzbeck	BBA 9106	-	3680	3 Feb 2018	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	4 June 2017	3 years
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	1 Dec 2017	3 years
Loop Antenna	EMCO	6502	9003-2485	3798	4 July 2017	3 years
Mains Network	R & S	ESH2-Z5	881362/032	3628	2 Oct 2016	2 years
Receiver	R & S	ESHS 10	828404/005	3728	9 June 2018	2 years
Receiver	R & S	ESIB 40	100171	EMC4003	15 Feb 2017	1 year
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic	Not applic
VHF Balun	Schwarzbeck	VHA 9103	9594	3696	3 Feb 2018	3 years

At the time of testing all test equipment was within calibration

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 in June, 2014.

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.

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.

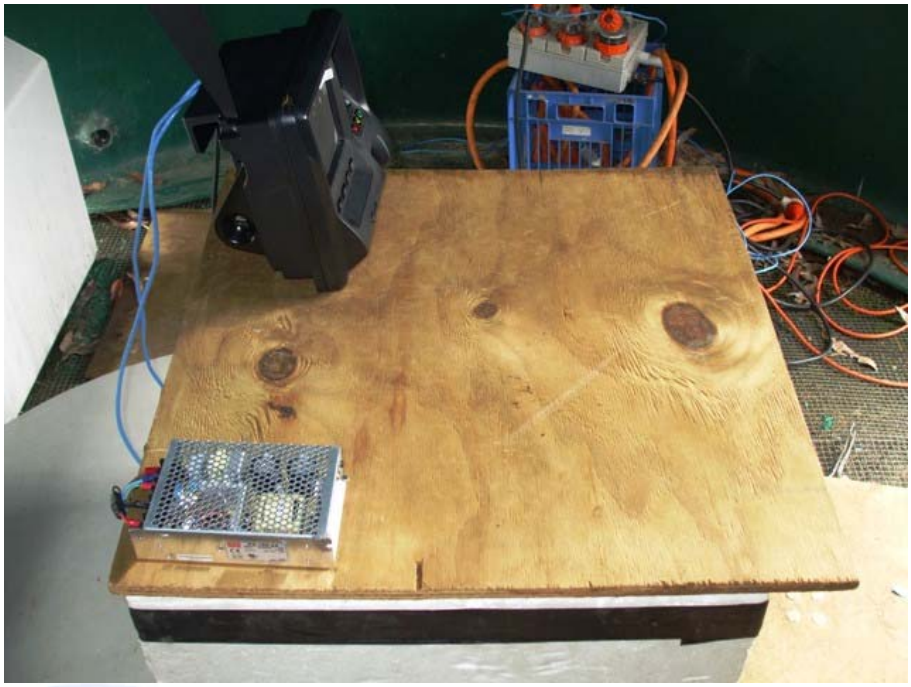
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with various accreditation bodies in a number of economies.
This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied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

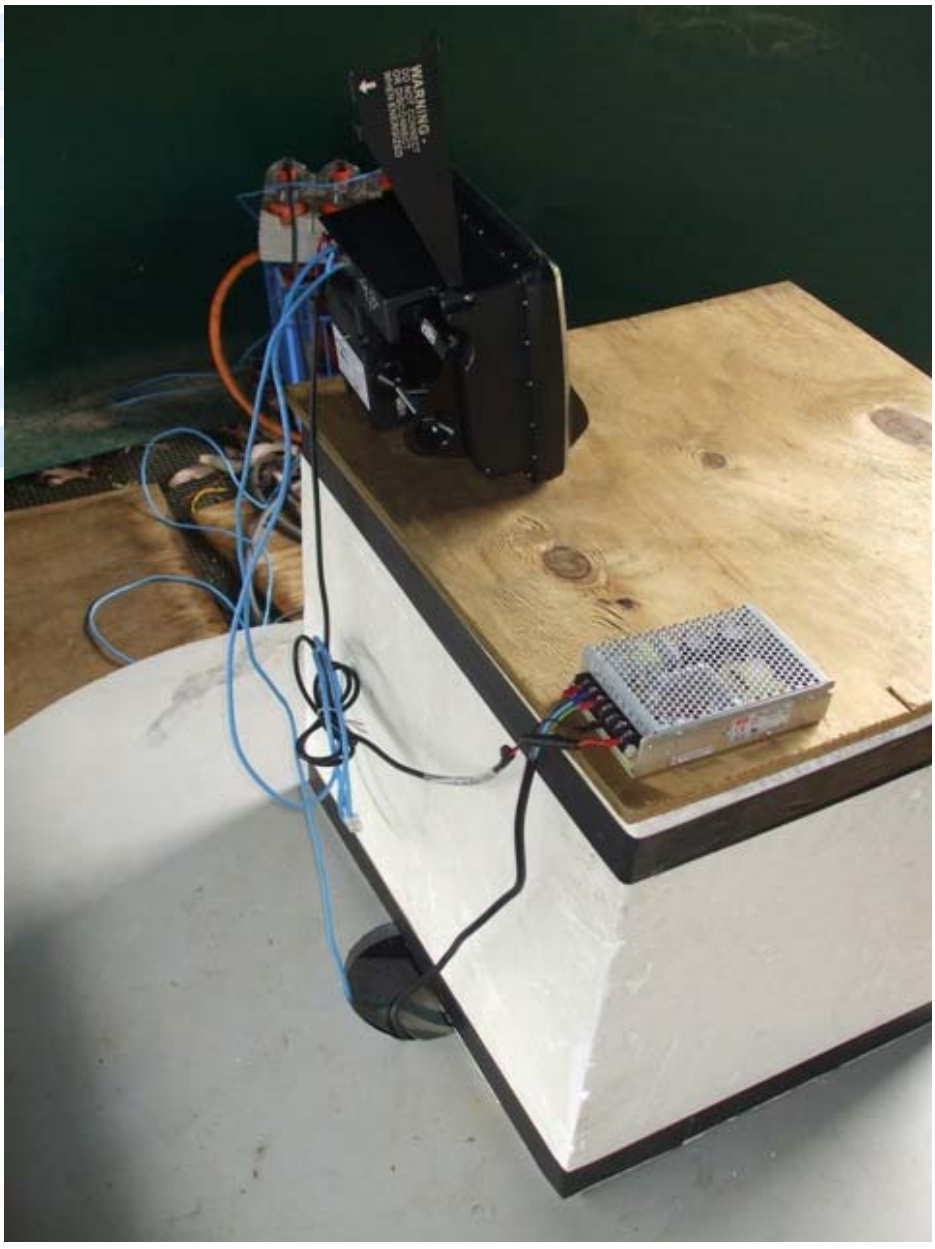
9. PHOTOGRAPHS

External Photos of the Representative Power Supply

External Photos of Device

Radiated Emission Test Set Ups





Conducted emissions test set up