TEST REPORT

Xcom 760 VHF Aircraft Transciever

tested for compliance with the

Code of Federal Regulations (CFR) 47
Part 87 –Aviation Services
and
Part 15 – Radio Frequency Devices

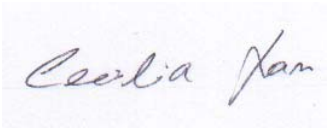
for

X-Air Australia Pty Ltd

This Test Report is issued with the authority of:

Andrew Cutler - General Manager

Prepared By:



Cecilia Lam - Office Administrator

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

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1. CLIENT INFORMATION

Company Name	Xair Australia Pty Ltd
Address	Factory 4, 24 Leda Drive Leda Business Park Burleigh Heads
State	Queensland 4220
Country	Australia
Contact	Mr Micheal Coates

2. DESCRIPTION OF TEST SAMPLE

Brand Name	Xcom
Model Tested	760
Product	VHF Aircraft Transceiver
Manufacturer	Xair Australia
Country of Origin	Australia
Serial Number	040002
FCC ID	QLDXCOMVHF

NB: This report replaces report number 40327.1. Retesting has been carried out at the nominal operating voltage of 13.8 Vdc instead of 12.0 Vdc.

3. RESULT SUMMARY

Testing was carried out in accordance with the test methods defined in 47 CFR Part 2. Listed below are the relevant Part 2 test methods and the limits defined in Part 87 and Part 15.

CLAUSE	TEST PERFORMED	RESULT
2.1041	Measurement procedures	Noted
2.1057	Frequency spectrum to be investigated	Noted
87.131	Power and emissions	Complies
2.1046	RF power output	Noted
87.133	Frequency stability	
2.1055	Frequency stability	Noted
87.135	Bandwidth of emission	Complies
2.202	Bandwidths	Noted
87.137	Types of emissions	Complies
87.139	Emission limitations	Complies
2.1049	Occupied bandwidth	Noted
2.1051	Spurious emissions at antenna terminals	Complies
2.1053	Field strength of spurious radiation	Complies
87.141	Modulation requirements	Complies
2.1047	Modulation Characteristics	Noted
2.1047(a)	Low pass filter response	Complies
2.1047(b)	Modulation limiting characteristics	Complies
15.111	Antenna conducted power measurement	Complies
1.1310	Radio frequency radiation exposure limits	Complies

4. TEST SAMPLE DESCRIPTION

The sample tested has the following specifications:

Rated Transmitter Output Power

5.5 Watts (37.4 dBm) at 13.8 Vdc with a tolerance of +1.0 dB and –0.5 dB that equates to 4.9 to 6.9 watts.

Transmitter frequency range

118.0000 – 136.9750 MHz

Test frequency

127.0000 MHz

Channel Spacing

25.0 kHz

FCC Bands

Part 87: 118.0 – 136.0 MHz

Emission Designators / Modes of operation

6K0A3E

Power Supply

External 10 – 16 Vdc supply. Typically 13.8 Vdc

5. TEST CONDITIONS

Standard Temperature and Humidity

Temperature: +25°C ± 4° maintained.
Relative Humidity: 60% ± 10% observed.

Standard Test Power Source

Standard Test Voltage: 13.8 Vdc.

Extreme Temperature

High Temperature: + 50°C maintained.
Low Temperature: - 20 °C maintained.

Extreme Test Voltages

High Voltage: 15.9 Vdc (115%)
Low Voltage: 11.7 Vdc (85%)

6. COMPLIANCE STATEMENT / ATTESTATION

Testing of the **Xcom 760 VHF Aircraft Transceiver** complies with the Code of Federal Regulations (CFR) 47 Part 87 – Aviation Services and (CFR) 47 Part 15 – Radio Frequency Devices.

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

The client selected the test sample.

The report relates only to the sample tested.

This report does not contain 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.

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

7. TEST RESULTS

Power and emissions

Measurements were carried out at the RF output terminals of the transmitter using a 30 dB power attenuator and a 50 Ω dummy load.

Measurements were carried out when the transmitter was not being modulated.

Measurements were made with the input voltage set to 13.8 Vdc.

		RF power output (dBm)	
Frequency	**Channel Spacing**	**Rated**	**Measured**
127.000	25 kHz	37.4	37.7

The manufacturers specification is 5.5 watts (37.4 dBm) with a tolerance of +1.0 dB and –0.5 dB when powered at 13.8 Vdc.

This gives a range of 36.9 dBm to 38.4 dBm that equates to 4.9 to 6.9 watts.

Testing was carried out at maximum power output.

The transmitter is used for aircraft communications in the VHF band.

Limits:
Section 87.131 specifies a limit of 55 watts for A3E emissions in the VHF band.

Result: Complies

Measurement Uncertainty: *±0.5 dB*

Frequency Stability

Frequency stability measurements were between - 30 °C and + 50°C in 10°C increments.

At each temperature the transmitter was given a period of 30 minutes to stabilise. The transmitter was then turned on and the frequency error measured after a period of 1 minute.

Measurements were made with the supply varied between 115% and 85% of the nominal supply voltage (13.8 Vdc).

Nominal Frequency: 127.000 MHz

Voltage Temp.	Frequency Error (Hz) 11.7 Vdc	13.8 Vdc	15.9 Vdc
+50°C	-221.0	-212.0	-22.0
+40°C	-130.0	-134.0	-133.0
+30°C	-49.0	-59.0	-53.0
+20°C	-75.0	-73.0	-77.0
+10°C	+170.0	+175.0	+171
0°C	+390.0	+390.0	+360.0
-10°C	+450.0	+469.0	+476.0
-20°C	+665.0	+670.0	+675.0

Limit:
Part 87.133 states that aircraft stations operating in the band 108 – 137 MHz after 1 January 1974 are required to have frequency tolerance of 30 ppm.

Testing was carried out on 127.000 MHz. 30 ppm = 30 x 127 = 3810 Hz.

Result: Complies

Measurement Uncertainty: ±30 Hz

Bandwidth of emission

In accordance with Section 87.135 the following will apply.

(a) Occupied bandwidth measurements have been made in accordance with Section 87.139(a)

(b) As the transmitter operates in the 117.975 – 136.000 MHz band after January 1, 1974 using A3E, the authorised bandwidth will be 25.0 kHz. See the table in Section 87.137(a)

(c) The necessary bandwidth has been calculated as follows:

The table in Section 87.137(a) defines an emission bandwidth of 6 kHz.

Using the formula in Section 2.202(g) where Bn = 2 * M

M = 3 kHz which is the maximum modulation frequency

Bn therefore equals 6 kHz.

Types of emissions

In accordance with Section 87.137(a):

- Class of emission is A3E
- Emission designator is 6K00A3E
- Transmitter operates above 50 MHz and operates in the band 117.975 – 136.000 MHz
- Transmitter is to be approved after January 1st, 1974
- Therefore the authorised bandwidth will be 25.0 kHz.

Emission limitations

Section 87.139 (a) defines the emission mask for this type of transmitter.

Measurements have been made using a modulation frequency of 2500 Hz at a level 16 dB higher than that needed to provide 50% modulation.

This modulation frequency was the frequency of maximum response (worst case emission mask display).

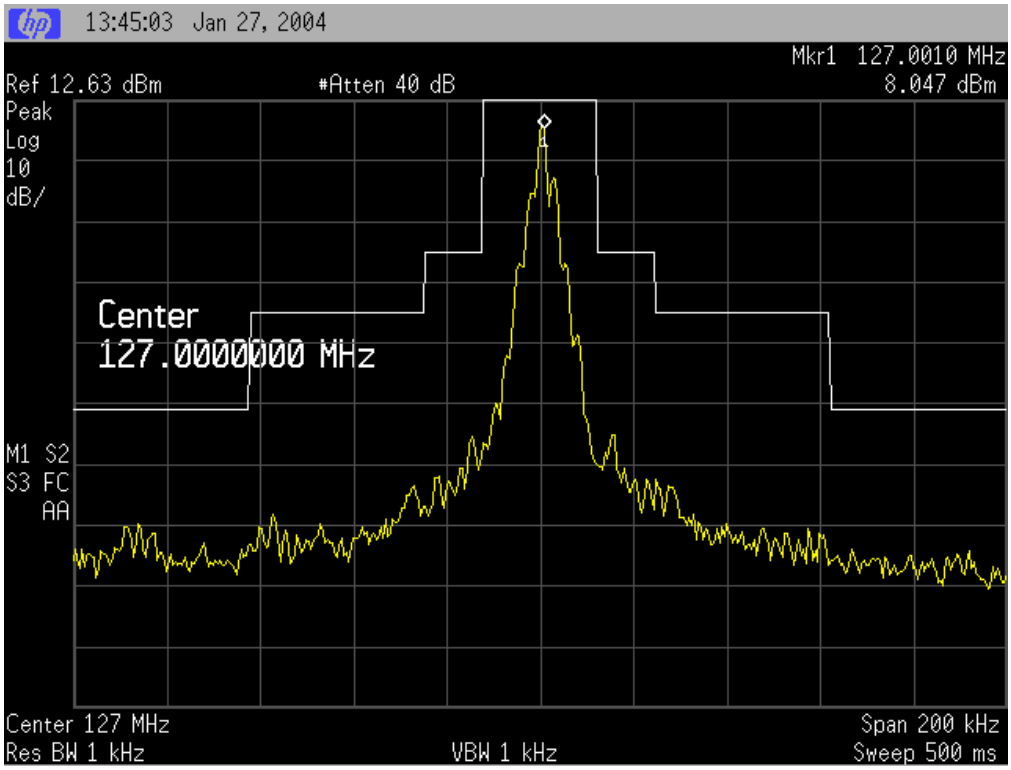
Measurements have been made with an authorised bandwidth of 25 kHz applied.

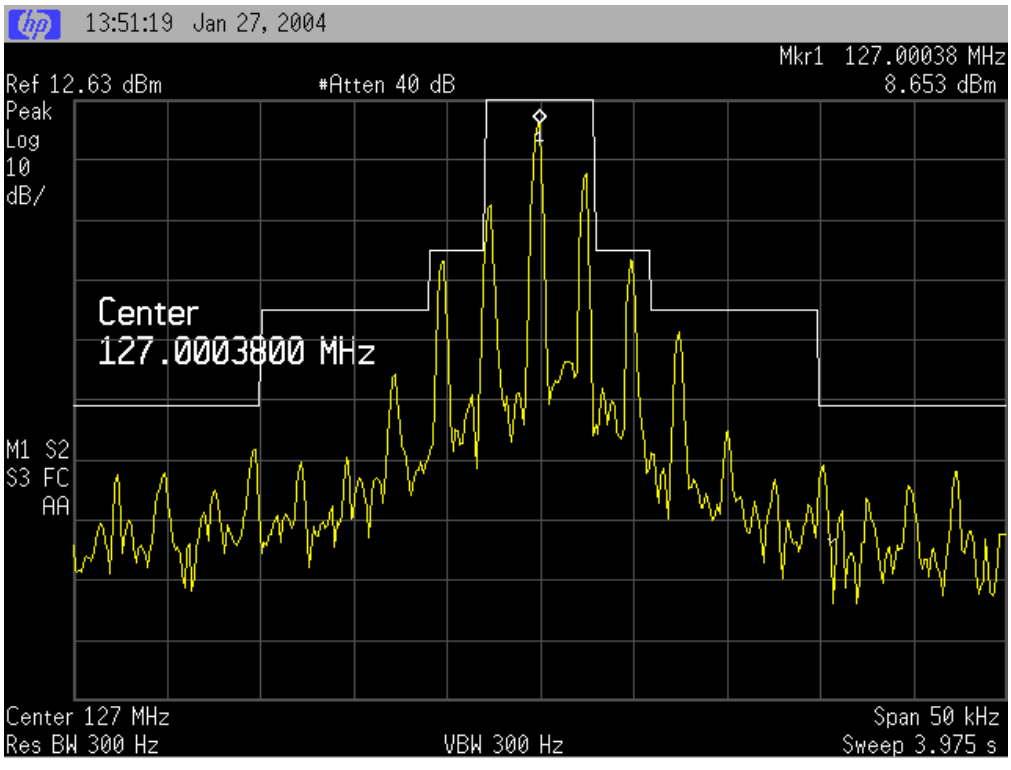
The reference level for the following emission mask measurements has been determined using a resolution bandwidth of 30 kHz with the transmitter not being modulated.

Measurements have also been made with a spectrum mask around a 6 kHz necessary bandwidth.

Measurements were made with the spectrum analyser operating in peak hold centred on the allocated frequency.

Result: Complies.





Transmitter spurious emissions at the antenna terminals

Frequency: 127.000 MHz

Measured Spurious Emission		
Spurious emission (MHz)	**Emission level (dBm)**	**Limit (dBm)**
254.000	-55.5	-13.0
381.000	-62.0	-13.0
508.000	-58.0	-13.0
635.000	-56.8	-13.0
762.000	-	-13.0
889.000	-	-13.0
1016.000	-	-13.0
1143.000	-	-13.0
1270.000	-	-13.0

Limit:
Part 87.139(a) states that any spurious emission must be attenuated by at least 43+10 log pY dB

The transmitter power is 5.5 watts. This gives an attenuation of 50.4 dB and a limit of –13.0 dBm.

Part 2.1051 states that emissions greater than 20 dB below the limit need not be specified

Part 2.1057 states that the spectrum should be investigated up to the 10th harmonic if the transmitter operates below 10 GHz.

Emissions less that –40 dBm have been reported for completeness.

No measurements were made above the 10th harmonic.

Measurements have been made with the transmitter transmitting continuously with no modulation when powered at 13.8 Vdc.

Result: Complies

Measurement Uncertainty: *±3.3 dB*

Field strength of the transmitter spurious emissions

Frequency: 127.00 00 MHz

Harmonics

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB
254.0	50.6	-46.8	-20.0	Horizontal	26.8
254.0	49.5	-47.9	-20.0	Vertical	27.9
381.0	61.2	-36.2	-20.0	Horizontal	16.2
381.0	55.0	-42.4	-20.0	Vertical	22.4
508.0	40.2	-57.2	-20.0	Horizontal	37.2
508.0	44.6	-52.8	-20.0	Vertical	32.8
635.0	43.6	-53.8	-20.0	Horizontal	33.8
635.0	48.7	-48.7	-20.0	Vertical	28.7
762.0	36.6	-60.8	-20.0	Horizontal	40.8
762.0	40.2	-57.2	-20.0	Vertical	37.2
889.0	47.1	-50.3	-20.0	Horizontal	30.3
889.0	41.8	-55.6	-20.0	Vertical	35.6
1016.0	45.1	-52.3	-20.0	Horizontal	32.3
1016.0	48.7	-48.7	-20.0	Vertical	28.7
1143.0	38.6	-58.8	-20.0	Horizontal	38.8
1143.0	41.1	-56.3	-20.0	Vertical	36.3
1270.0	38.1	-59.3	-20.0	Horizontal	39.3
1270.0	40.3	-57.1	-20.0	Vertical	37.1

Other emissions observed

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB
114.2	19.8	-77.6	-20.0	Horizontal	57.6
114.2	24.6	-72.8	-20.0	Vertical	52.8
139.8	31.2	-66.2	-20.0	Horizontal	46.2
139.8	32.4	-65.0	-20.0	Vertical	45.0
152.6	25.1	-72.3	-20.0	Horizontal	52.3
152.6	21.1	-76.3	-20.0	Vertical	56.3

No significant emissions were observed when the transmitter was being operated in stand by mode (receiving / not transmitting)

Device was tested on an open area test site at a distance of 3 metres.

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland. Details of this site have been filed with the Commission, Registration Number: 90838, which was last updated on May 12th, 2003.

The transmitter was tested while transmitting continuously while attached to a dummy load when powered at 13.8 Vdc.

The power level of each emission has been determined by replacing the transmitter with a dipole antenna that was connected to a signal generator.

The signal generator output level was then increased until the same field strength level was observed at each emission frequency.

The level recorded is the signal generator output level in dBm less any gains / losses due to the coax cable and the dipole antenna.

Limit:
All spurious emissions are to be attenuated by at least 50 + 10 log (P).

The rated power of 5.5 watts gives a limit of –20 dBm.

No measurements were made above the 10th harmonic.

Result:

Measurement Uncertainty: *±4.1 dB*

Modulation Requirements

In accordance with Section 87.141 the following will apply:

The transmitter tested has been designed to transmit speech in the range 118.0 – 136.975 MHz using amplitude modulation (A3E) with 25.0 kHz channel steps.

(a) A family of curves showing the percentage of modulation versus the modulation input voltage that shows that when using A3E the modulation percentage does not exceed 100%.

See the attached graph.

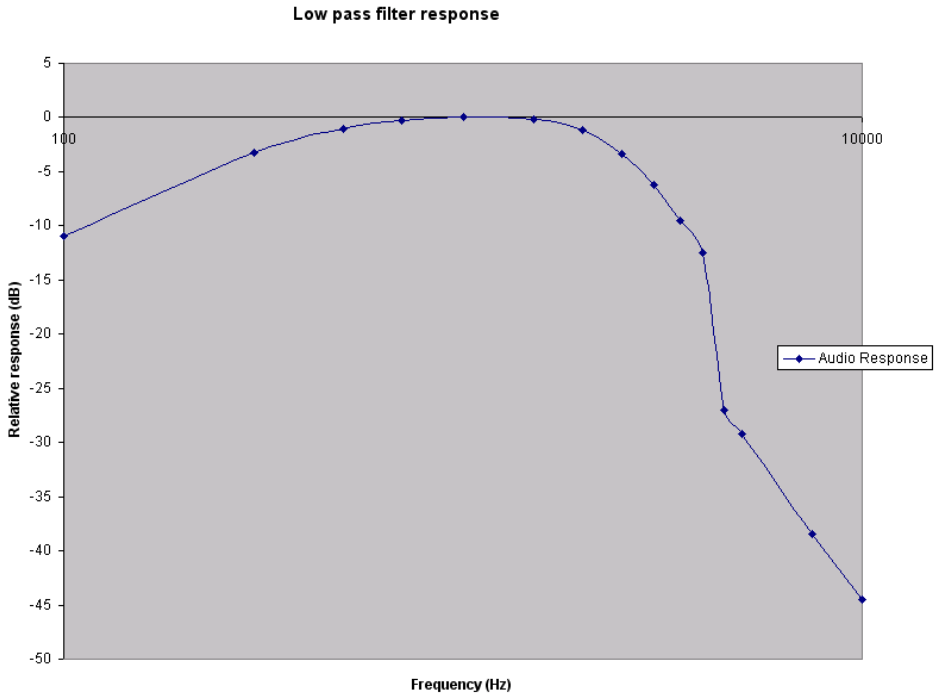
(b) Frequency response of the audio frequency low pass filter between 100 Hz and 5000 Hz.

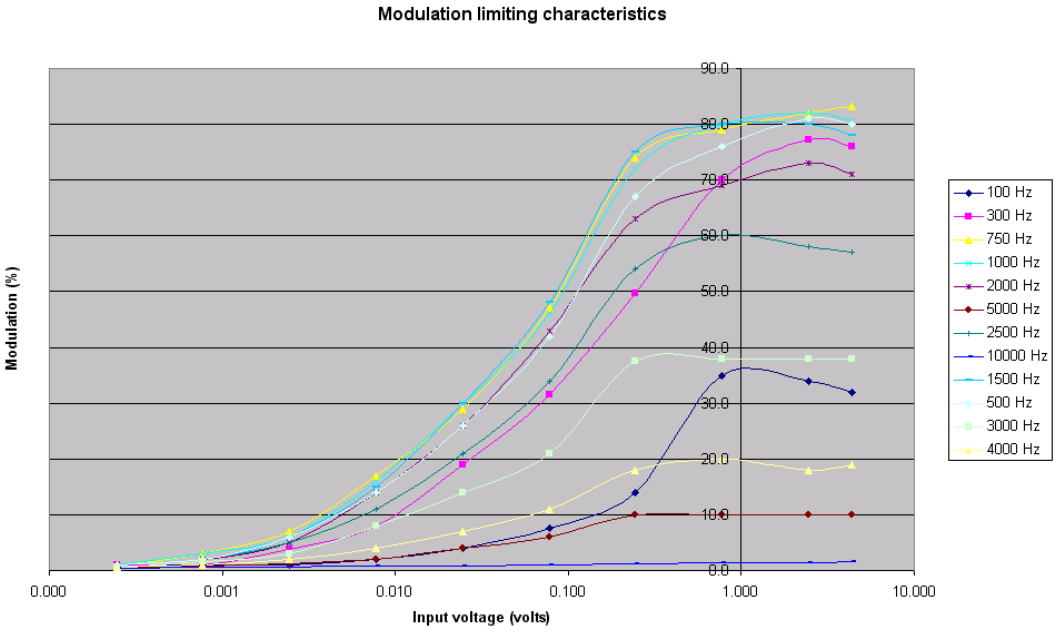
See the attached graph.

Limit:
Section 87.141(a) When A3E emission is used the modulation percentage must not exceed 100%.

Result: Complies

Measurement Uncertainty: ±1%.





Receiver Spurious emissions at antenna terminals

Receive frequency: 127.000 MHz

Intermediate frequency: 21.400 MHz

Measured Spurious Emission		
Spurious emission (MHz)	**Emission level (dBm)**	**Limit (dBm)**
148.4000	-62.1	-57.0

Testing was carried out at the antenna terminals in accordance with CFR 47 Part 15, section 15.111 using a spectrum analyser.

All other emissions observed less than –80.0 dBm.

Limit:
In accordance with CFR 47 Part 15, section 15.111 the power of any emission at the antenna terminal should not exceed 2 nW.

This gives a limit of –57.0 dBm.

Result: Complies.

Measurement Uncertainty: ***±3.3 dB***

Radio Frequency Hazard Information

As per Section 1.1310 mobile transmitters are required to be operated in a manner that ensures that the public is not exposed to RF energy levels in accordance with OST/OET Bulletin Number 65.

In accordance with this section and also Section 2.1091, this device has been classified as a remote device that could possibly be used to transmit data from a mobile vehicle.

A minimum safe distance between the user / general public and the device has been calculated below.

In accordance with Section 1.1310 the Maximum Permissible Exposure (MPE) power density limit for the General Population / Uncontrolled Exposure of 0.2 mW/m^2 or 27.5 V/m has been applied.

The minimum distance from the antenna at which the MPE is met is calculated from the equation relating field strength in V/m, transmit power in watts, transmit antenna gain and separation distance in metres:

The upper tolerance of the declared power = 6.9 watts. The nominal power = 5.5 watts.

In a typically mobile installation this transceiver would be used with a whip ¼ wave dipole type of antenna with a gain of 1.64.

$d = \sqrt{(30 * P * G) / E}$
$= \sqrt{(30 * 6.9 * 1.64) / 27.5}$
= 0.66999 metres or 67 cm

The above calculations therefore show that this device meets the MPE requirement for mobile devices providing a safe distance of at least 67 cm is provided.

A warning to this affect will need to be inserted in the equipment manual.

Result: Complies

8. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset
Aerial Controller	EMCO	1090	9112-1062	RFS 3710
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612
Log Periodic Antenna	Schwarzbeck	VUSLP 9111	9111-228	3785
UHF Dipole Antenna	Schwarzbeck	UHA 9107	-	RFS 3604
Horn Antenna	Electrometrics	RGA-60	6234	E1494
Horn Antenna	EMCO	3115	9511-4629	E1526
Measurement Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552
Oscilloscope	Tektronics	745A	B010643	1569
Signal Generator	Rohde & Schwarz	SMHU.58	838923/028	E1493
Frequency Counter	Hewlett Packard	HP 5342A	1916A01713	E1224
Attenuator 10 dB	Hewlett Packard	HP8491A	24838	E1329
Attenuator 20 dB	Weinschel	49-20-43	GC-104	E1308
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069
Rubidium Oscillator	Ball Efratom	FRS – C	4287	E1053
Thermal chamber	Contherm	M180F	86025	E1129
Thermometer	DSIR	RT200	035	E1049
Variac	General Radio	1592	-	3690

9. ACCREDITATIONS

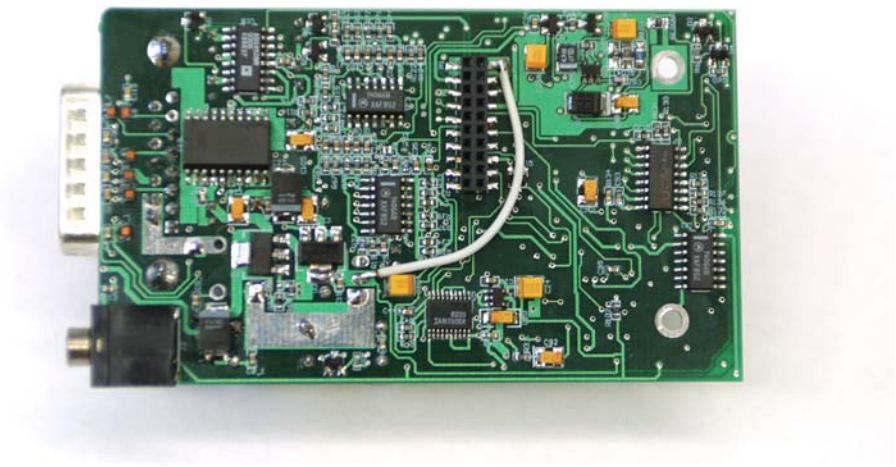
Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was last updated on May 12th, 2003.

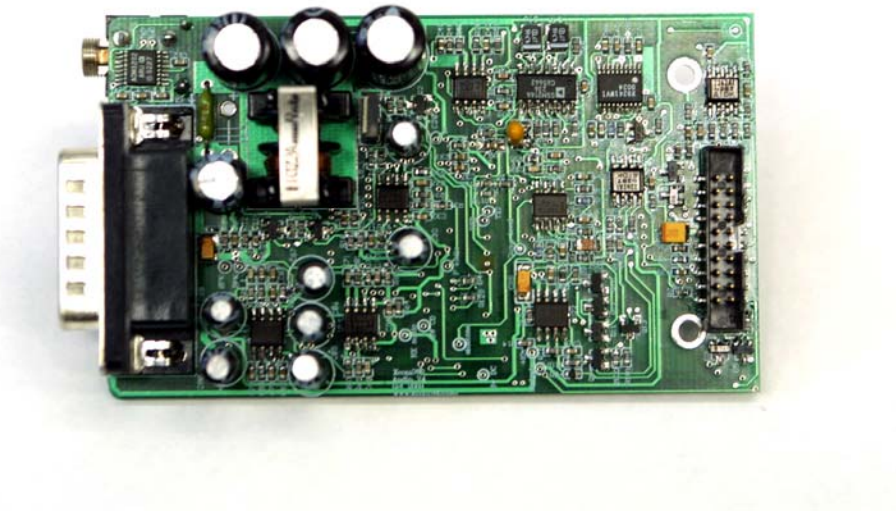
All testing has been carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to ISO/IEC 17025.

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

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.

10. PHOTOGRAPH (S)





Label

Location of label on the product

Radiated emission test set up