EMC Technologies (NZ) Ltd

Test Report No **091117.3**
Report date: 21st December 2009

TEST REPORT

Salcom 12-86-0000 & 12-86-5000
UHF Pocket Paging Transmitters

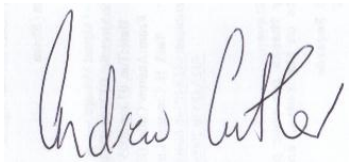
tested to the specification

EN 300 224-2 V1.1.1, 2001

Electromagnetic compatibility and Radio spectrum matters (ERM): On site paging service: Part 2: Harmonized EN under article 3.2 of the R&TTE Directive

for

Sea Air and Land Communications (SALCOM) 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

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Table of Contents

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1. STATEMENT OF COMPLIANCE

The **Salcom 12-86-0000 & 12-86-5000 UHF Pocket Paging Transmitters** comply with EN 300-224-2 V1.1.1, 2001 when tested in accordance to EN 300 224-1 V1.3.1, 2001.

2. RESULTS SUMMARY

The results from testing are summarised in the following table:

Clause	Result
Clause 7: Transmitter	Applicable.
Clause 7.1: Frequency error	Complies.
Clause 7.2.3: Carrier power (radiated)	Complies.
Clause 7.3: Adjacent channel power	Complies.
Clause 7.4: Frequency deviation.	Not applicable. Device is not modulated by analogue speech.
Clause 7.5: Spurious emissions.	Complies.
Clause 7.6: Transmitter transient behaviour.	Complies.
Clause 8: Receiver requirements	Not applicable. A receiver for this device was not presented for testing.

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3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

The test sample was selected by the client.

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	Sea Air and Land Communications Ltd
Address	PO Box 22-621
City	Christchurch
Country	New Zealand
Contact	Mr Shannon Reardon

5. DESCRIPTION OF TEST SAMPLE

Brand Name	Salcom
Model Number	12-86-0000 & 12-86-5000
Product	UHF Base Station Paging Transmitters
Manufacturer	Sea Air & Land Communications Ltd (SALCOM)
Country of Origin	New Zealand
Serial Number	0001 & 0002

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6. TEST SAMPLE DESCRIPTION

The samples tested are UHF Pocket Paging Transmitters that use POSCAG protocols.

The difference between the samples tested are that the 12-86-0000 is a key ring transmitter fitted into a case and the 12-86-5000 is a PCB without a case with provision for push buttons to be mounted if required.

Both have the following specifications:

Rated Transmitter Output Power

-10.0 dBm

Test frequencies

443.050 MHz, 456.000 MHz, 468.950 MHz

Full testing carried out on 456 MHz with limited testing carried out on 443 MHz and 468 MHz

Channel spacing

25 kHz

Band of operation

440.000 – 470.000 MHz

Deviation

+/- 4.5 kHz

Emission Types

512 POCSAG with Carrier FSK and NRZ data.

External Controls

This device has no external controls.

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7. TEST CONDITIONS

Standard Temperature and Humidity

Temperature range: +15°C to + 25°C
Relative humidity range: 40% to 70%

Extreme Temperature

High Temperature: +55°C maintained.
Low Temperature: -10 °C maintained.

Tests were carried out at these extremes of temperature.

Standard and Extreme Power Supply

3.0 Vdc nominal from a CR2032 coin cell battery.

Declared operating voltage range is 3.0 to 2.0 Vdc

Testing has been carried out over this declared range.

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8. SETUPS AND PROCEDURES

Frequency Error

Testing was carried out using external software control with carrier only being transmitted.

Nominal frequency: 456.0000 MHz

12-86-0000 Transmitter

Temp.	Low	Nominal	High
+55°C	-1500.0	-1500.0	N/a
+20°C	-500.0	-500.0	N/a
-10°C	+1500.0	+1500.0	N/a

12-86-5000 Transmitter

Temp.	Low	Nominal	High
+55°C	0.0	0.0	N/a
+20°C	-500.0	-500.0	N/a
-10°C	+1500.0	+1500.0	N/a

Limit:
Pocket stations operating between 300 – 470 MHz using 25.0 kHz spacing shall have a maximum frequency error no greater than 2500 Hz.

Result: Complies.
Measurement Uncertainty: ± 50 Hz

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Effective Radiated Power

Effective radiated carrier power measurements were made with a random bit-stream modulation applied using a +4.5 kHz deviation.

12-86-0000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
443.0500	86.7	-8.5	17.0	Vertical	45.5
443.0500	89.1	-6.1	17.0	Horizontal	43.1
456.0000	82.9	-12.3	17.0	Vertical	29.3
456.0000	83.5	-11.7	17.0	Horizontal	28.7
468.9500	79.3	-15.9	17.0	Vertical	32.9
468.9500	79.4	-15.8	17.0	Horizontal	32.8

12-86-5000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
443.0500	85.9	-9.3	17.0	Vertical	26.3
443.0500	89.3	-5.9	17.0	Horizontal	22.9
456.0000	88.2	-7.0	17.0	Vertical	24.0
456.0000	87.5	-7.7	17.0	Horizontal	24.7
468.9500	83.6	-13.7	17.0	Vertical	30.7
468.9500	90.0	-7.4	17.0	Horizontal	24.4

Limit:
The worst case power limit for UHF Pocket stations is 0.05 Watts (17.0 dBm).

Result: Complies.
Measurement Uncertainty: ± 4.1 dB

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Adjacent Channel Power

Adjacent channel power was carried out on 443.050 MHz under ambient temperature and voltage conditions as the frequency error tests were carried out in extreme conditions.

12-86-0000 Transmitter

Highest measured power: -6.1 dBm

Channel spacing: 25 kHz

Modulation: POCSAG ± 4.5 kHz

Power	+25 kHz	-25 kHz
Tx dBm	-6.1	-6.1
dBc	43.8	46.4
dBm	-49.9	-52.5

12-86-5000 Transmitter

High power measured: -5.9 dBm

Channel spacing: 25 kHz

Modulation: POCSAG ± 4.5 kHz

Power	+25 kHz	-25 kHz
Tx dBm	-5.9	-5.9
dBc	44.4	45.7
dBm	-50.3	-51.6

Limit:
The adjacent channel power for portable stations shall be no greater than 70 dBc, without the need to be below 0.2µW (-37.0 dBm).

Result: Complies
Measurement Uncertainty: ±0.5 dB

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Spurious Emissions: 443.050 MHz

12-86-0000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
886.1000	49.8	-47.6	-36.0	Vertical	11.6
886.1000	50.1	-47.3	-36.0	Horizontal	11.3
1329.1500	54.4	-43.0	-30.0	Vertical	13.0
1329.1500	55.1	-42.3	-30.0	Horizontal	12.3
1772.2000	48.9	-48.5	-30.0	Vertical	18.5
1772.2000	52.9	-44.5	-30.0	Horizontal	14.5
2215.2500	52.9	-44.5	-30.0	Vertical	14.5
2215.2500	52.0	-45.4	-30.0	Horizontal	15.4
2658.3000	-	-	-30.0	Vertical	-
2658.3000	-	-	-30.0	Horizontal	-
3101.3500	-	-	-30.0	Vertical	-
3101.3500	-	-	-30.0	Horizontal	-
3544.4000	-	-	-30.0	Vertical	-
3544.4000	-	-	-30.0	Horizontal	-
3987.4500	-	-	-30.0	Vertical	-
3987.4500	-	-	-30.0	Horizontal	-

12-86-5000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
886.1000	50.2	-47.2	-36.0	Vertical	11.2
886.1000	52.8	-44.6	-36.0	Horizontal	8.6
1329.1500	58.3	-39.4	-30.0	Vertical	9.4
1329.1500	53.2	-44.2	-30.0	Horizontal	14.2
1772.2000	58.2	-39.3	-30.0	Vertical	9.3
1772.2000	61.5	-35.9	-30.0	Horizontal	5.9
2215.2500	55.9	-41.5	-30.0	Vertical	11.5
2215.2500	56.4	-41.0	-30.0	Horizontal	11.0
2658.3000	54.2	-43.2	-30.0	Vertical	13.2
2658.3000	-	-	-30.0	Horizontal	-
3101.3500	-	-	-30.0	Vertical	-
3101.3500	-	-	-30.0	Horizontal	-
3544.4000	-	-	-30.0	Vertical	-
3544.4000	-	-	-30.0	Horizontal	-
3987.4500	-	-	-30.0	Vertical	-
3987.4500	-	-	-30.0	Horizontal	-

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Spurious Emissions: 456.000 MHz

12-86-0000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
912.0000	54.1	-43.3	-36.0	Vertical	7.3
912.0000	57.0	-40.4	-36.0	Horizontal	4.4
1368.0000	59.3	-38.1	-30.0	Vertical	8.1
1368.0000	59.4	-38.0	-30.0	Horizontal	8.0
1824.0000	54.7	-42.7	-30.0	Vertical	12.7
1824.0000	55.5	-41.9	-30.0	Horizontal	11.9
2280.0000	50.8	-46.6	-30.0	Vertical	16.6
2280.0000	52.5	-44.9	-30.0	Horizontal	14.9
2736.0000	-	-	-30.0	Vertical	-
2736.0000	-	-	-30.0	Horizontal	-
3192.0000	-	-	-30.0	Vertical	-
3192.0000	-	-	-30.0	Horizontal	-
3648.0000	-	-	-30.0	Vertical	-
3648.0000	-	-	-30.0	Horizontal	-

12-86-5000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
912.0000	54.7	-42.7	-36.0	Vertical	6.7
912.0000	54.9	-42.5	-36.0	Horizontal	6.5
1368.0000	55.5	-41.9	-30.0	Vertical	11.9
1368.0000	54.1	-43.3	-30.0	Horizontal	13.3
1824.0000	52.1	-45.3	-30.0	Vertical	15.3
1824.0000	53.5	-43.9	-30.0	Horizontal	13.9
2280.0000	54.6	-42.8	-30.0	Vertical	12.8
2280.0000	54.6	-42.8	-30.0	Horizontal	12.8
2736.0000	55.4	-	-30.0	Vertical	-
2736.0000	54.0	-43.4	-30.0	Horizontal	13.4
3192.0000	-	-	-30.0	Vertical	-
3192.0000	-	-	-30.0	Horizontal	-
3648.0000	-	-	-30.0	Vertical	-
3648.0000	-	-	-30.0	Horizontal	-

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Spurious Emissions: 468.950 MHz

12-86-0000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
937.9000	52.9	-44.5	-36.0	Vertical	8.5
937.9000	56.4	-41.0	-36.0	Horizontal	5.0
1406.8500	59.3	-38.1	-30.0	Vertical	8.1
1406.8500	56.6	-40.8	-30.0	Horizontal	10.8
1875.8000	52.7	-44.7	-30.0	Vertical	14.7
1875.8000	56.5	-40.9	-30.0	Horizontal	10.9
2344.7500	49.5	-47.9	-30.0	Vertical	17.9
2344.7500	52.1	-45.3	-30.0	Horizontal	15.3
2813.7000	-	-	-30.0	Vertical	-
2813.7000	-	-	-30.0	Horizontal	-
3282.6500	-	-	-30.0	Vertical	-
3282.6500	-	-	-30.0	Horizontal	-
3751.6000	-	-	-30.0	Vertical	-
3751.6000	-	-	-30.0	Horizontal	-

12-86-5000 Transmitter

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
937.9000	57.8	-39.6	-36.0	Vertical	3.6
937.9000	60.3	-37.1	-36.0	Horizontal	1.1
1406.8500	55.7	-41.7	-30.0	Vertical	11.7
1406.8500	57.9	-39.5	-30.0	Horizontal	9.5
1875.8000	48.2	-49.2	-30.0	Vertical	19.2
1875.8000	56.4	-41.0	-30.0	Horizontal	11.0
2344.7500	53.0	-44.4	-30.0	Vertical	14.4
2344.7500	54.7	-42.7	-30.0	Horizontal	12.7
2813.7000	-	-	-30.0	Vertical	-
2813.7000	-	-	-30.0	Horizontal	-
3282.6500	-	-	-30.0	Vertical	-
3282.6500	-	-	-30.0	Horizontal	-
3751.6000	-	-	-30.0	Vertical	-
3751.6000	-	-	-30.0	Horizontal	-

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Testing was carried out up to 4 GHz.

No other transmitter emissions were observed between harmonic emissions that were observed.

No emissions were observed when the device was operating in stand by mode

Testing was carried out at an open area test site over a distance of 3 metres.

The transmitter was tested transmitting a random bit stream modulated carrier transmitting for 5 seconds continuously.

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

Limits

Frequency Range	9 kHz – 1 GHz	1 - 4 GHz
Tx operating	0.25 uW (-36 dBm)	1 uW (-30 dBm)
Tx stand by	2 nW (-57 dBm)	20 nW (-47 dBm)

Result: Complies.

Measurement Uncertainty: ± 4.1 dB

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Transmitter Transient Performance

Results:

Frequency: 456.0000 MHz

Spacing	Period t_1 (kHz)	Period t_2 (kHz)	Period t_3 (kHz)
25.0 kHz	Less than 25.0	Less than 12.5	Nil

Limits:

Time Interval	Period	25 kHz Deviation (kHz)
T_1	10 mS	No limit applies
T_2	25 mS	No limit applies
T_3	10 mS	No limit applies

As per 8.6.3, Table 7, there is no applicable limit for Pocket Transmitters.

Results provided are for information purposes

Result: Complies
Measurement Uncertainty: Frequency ±1.6 kHz, Time ±1 ms

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25.0 kHz transmitter turn on

Green Trace = 1 kHz tone with FM deviation of 25.0 kHz.

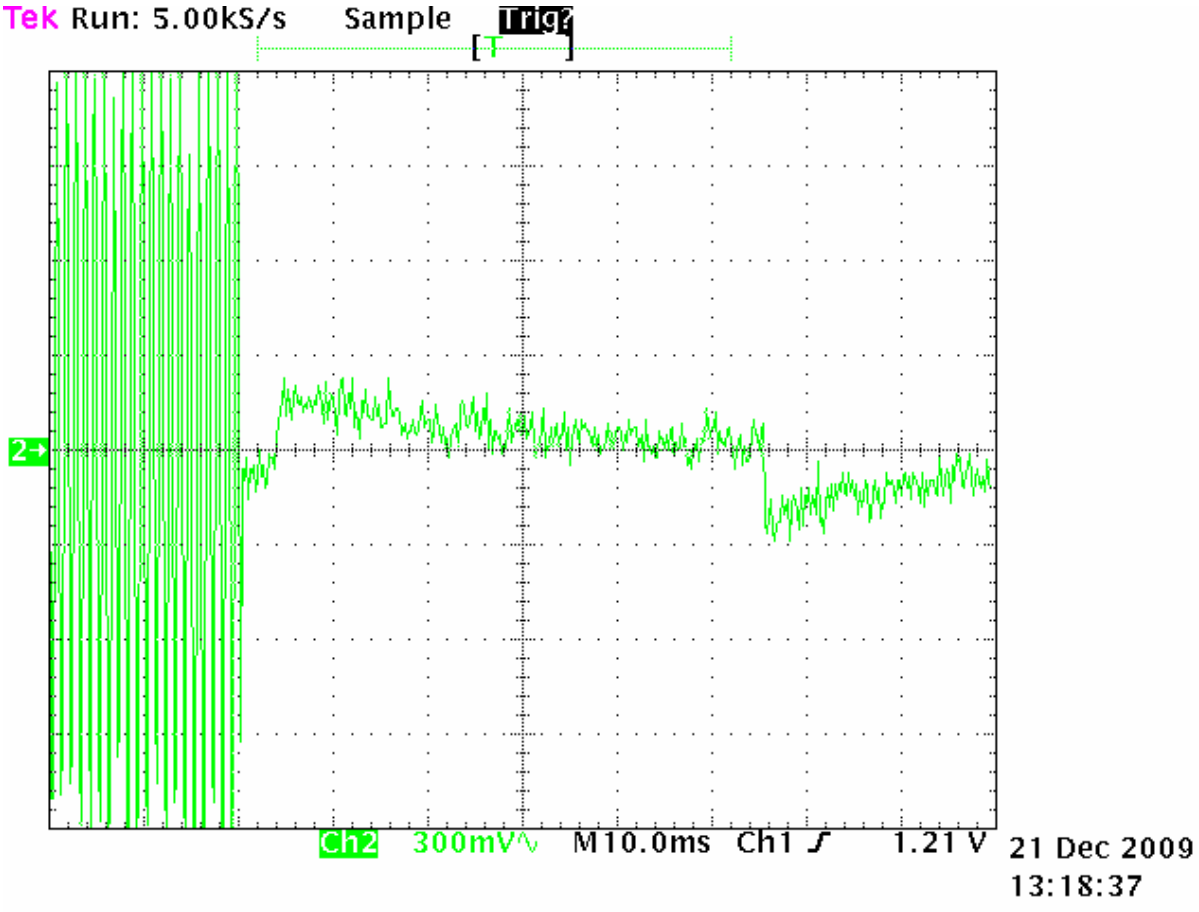
Green trace has been maximised to give full screen indication of +/- 25.0 kHz.
Therefore each Y axis division = 6.25 kHz per division.
The X axis has been set to a sweep rate of 10 mS/division.

Triggering has been set to occur 2 divisions from the left hand edge (20 mS).

*t*on occurs at 20 mS.

*t*1 occurs between 2.0 and 3.0 divisions from the left hand edge.
t2 occurs between 3.0 and 5.5 divisions from the left hand edge.

A transient response can be observed during *t*1 and *t*2.



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25.0 kHz transmitter turn off

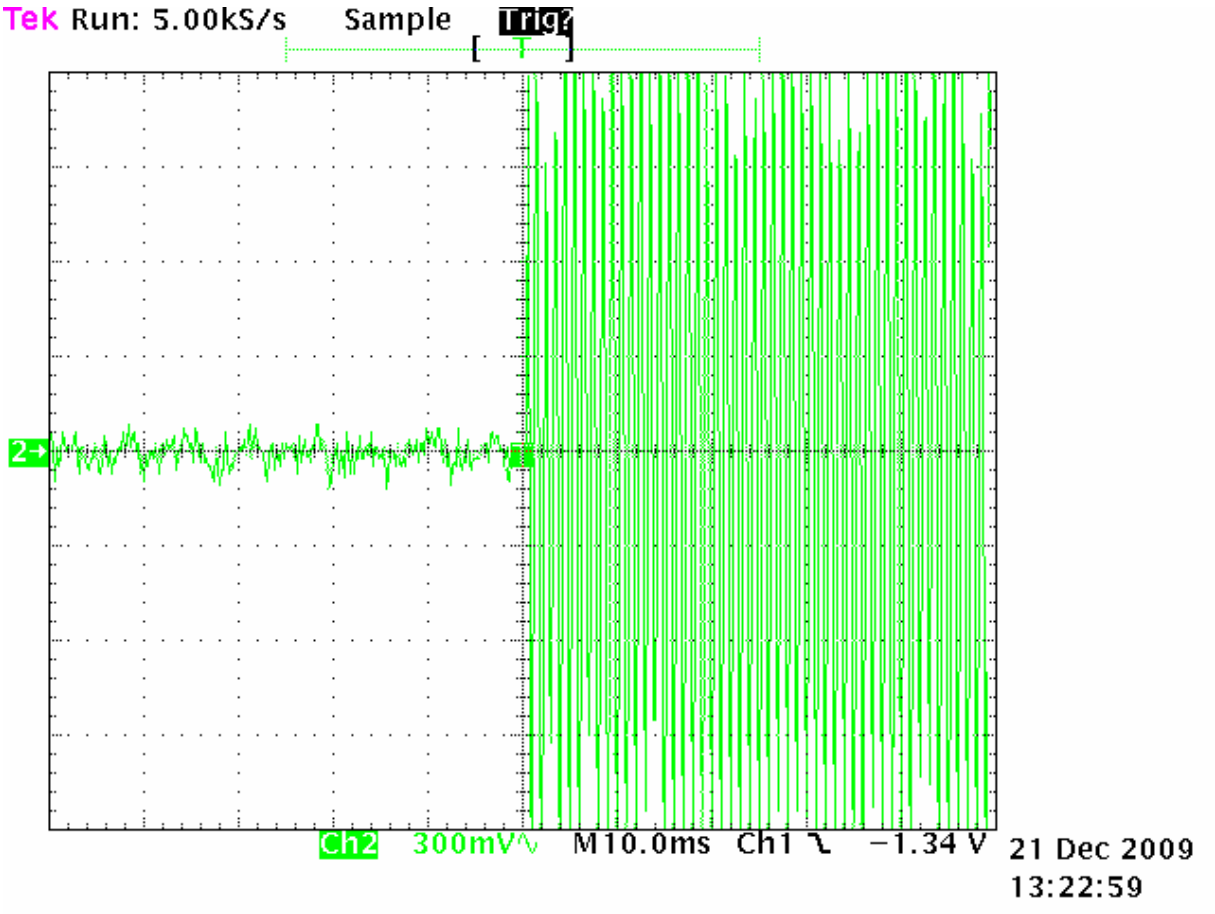
Green Trace = 1 kHz tone with FM deviation of 25.0 kHz.

Green trace has been maximised to give full screen indication of +/- 25.0 kHz.
Therefore each Y axis division = 6.25 kHz per division.
The X axis has been set to a sweep rate of 10 mS/division

The display of the 1 kHz signal rising has been positioned 5 divisions from the left hand edge (50 mS). This is position *t*off.

*t*3 occurs between 4.5 and 5.0 divisions from the left hand edge..

No transient response can be observed before *t*off.



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9. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Ref No
Aerial Controller	EMCO	1090	9112-1062	3710
Aerial Mast	EMCO	1070-1	9203-1661	3708
Biconical Antenna	Schwarzbeck	BBA 9106	-	3612
Coax Cable	Sucoflex	104PA	2736/4PA	-
Frequency Counter	Hewlett Packard	5342A	1916A01835	E1224
Horn Antenna	EMCO	3115	9511-4629	E1526
Log Periodic Antenna	Schwarzbeck	VUSLP 9111	9111-228	3785
Measurement Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595
Modulation Analyser	Rohde & Schwarz	FMA	-	E1552
Modulation Analyser	Hewlett Packard	8901B	-	E1090
Power Meter	Hewlett Packard	436A	-	E1198
Power Supply	Hewlett Packard	6032A	-	E1069
Signal Generator	Rohde & Schwarz	SMHU.58	838923/028	E1493
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3716
Storage Oscilloscope	Tektonix	TDS 754A	-	E1569
Thermal Chamber	Contherm	M180F	86025	E1129
Thermometer	DSIR	RT200	035	E1049
Turntable	EMCO	1080-1-2.1	9109-1578	3709

10. ACCREDITATIONS

The tests were carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to ISO/ IEC/ NZS 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/ NZS 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.

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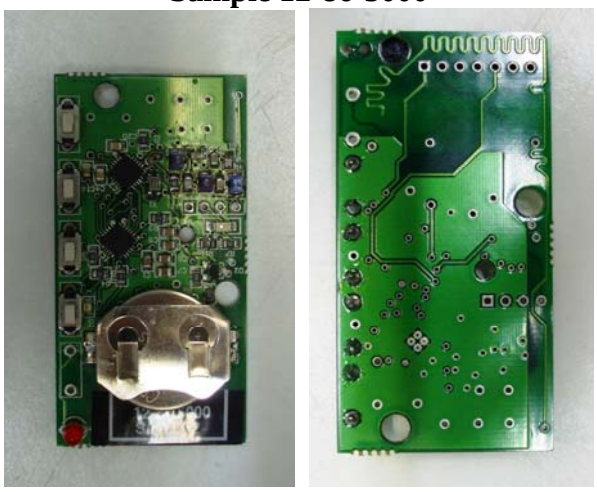
11. PHOTOGRAPH (S)

Sample 12-86-0000

Sample 12-86-5000



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