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## **TEST REPORT**

### **Salcom 12-86-0000 UHF Pocket Paging Transmitter**

*tested for compliance with the*

**Code of Federal Regulations (CFR) 47**

**Part 90 –Private Land Mobile Services**

*for*

**Sea Air and Land Communications Ltd**

Test Report issued by:

A handwritten signature in black ink, appearing to read "Andrew Cutler", is shown within a rectangular box.

**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. CLIENT INFORMATION

**Company Name** Sea Air and Land Communications Ltd  
**Address** PO Box 22-621  
**City** Christchurch  
**Country** New Zealand  
**Contact** Mr John Croft

## 2. DESCRIPTION OF TEST SAMPLE

**Brand Name** Salcom  
**Model Number** 12-86-0000  
**Product** UHF Pocket Paging Transmitter  
**Manufacturer** Sea Air and Land Communications Ltd  
**Country of Origin** New Zealand  
**Serial Number** 00001  
**FCC ID** O871286

Testing was carried out on a key ring transmitter.

This is a UHF Pocket Paging Transmitter that uses POSCAG protocols.

### 3. COMPLIANCE STATEMENT

The Salcom 12-86-0000 UHF Pocket Paging Transmitter complies with 47 CFR Part 90, section 90.217.

The results of testing carried out , between November and December 2009, in accordance with the test methods defined in 47 CFR Part 2, Part 90 and ANSI C63.4, 2003 are listed below.

CLAUSE	TEST PERFORMED	RESULT
2.1041	Measurement procedures	Noted
2.1046	RF power output	Complies
2.1049	Occupied bandwidth	Complies
2.1051	Spurious emissions at antenna terminals	Not tested
2.1053	Field strength of spurious radiation	Complies
2.1055	Frequency stability	Complies
2.1057	Frequency spectrum to be investigated	Noted
90.217	Exemption from technical standards	Complies

## 4. TEST SAMPLE DESCRIPTION

### **Rated Transmitter Output Power**

-6.0 dBm

### **Test frequency**

443.050 MHz

### **Channel spacing**

12.5 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

### **Antenna**

Integral PCB track.

## 5. TEST CONDITIONS

### Standard Temperature and Humidity

Temperature:  $+25^{\circ}\text{C} \pm 4^{\circ}$  maintained.  
Relative Humidity:  $60\% \pm 10\%$  observed.

### Extreme Temperature

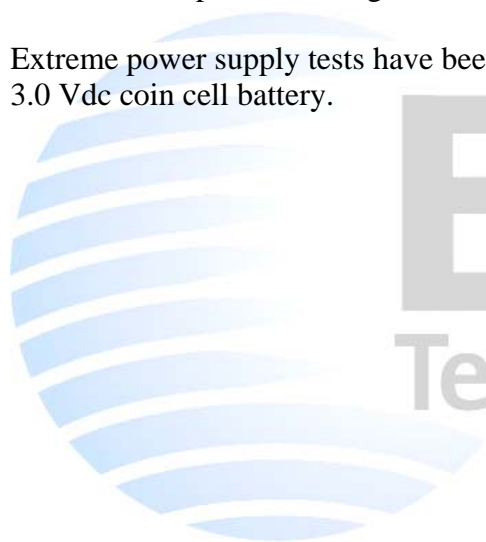
High Temperature:  $+ 50^{\circ}\text{C}$  maintained.  
Low Temperature:  $- 30^{\circ}\text{C}$  maintained.

Tests were carried out at these extremes of temperature in increments of  $10^{\circ}\text{C}$ .

### Extreme Power Supply

This device is powered using an internal 3.0 Vdc coin cell battery.

Extreme power supply tests have been carried out at 90% as this is the stated end point of the 3.0 Vdc coin cell battery.



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## 6. ATTESTATION

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

**The test sample was selected by the client.**

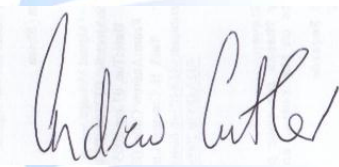
**The report relates only to the sample tested.**

**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



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## 7. TEST RESULTS

### Introduction

This transmitter has been tested in accordance with the requirements of 47 CFR Section 90.217 – Exemption from technical standards.

Such transmitters are exempt from the technical requirements set out in this subpart but must instead comply with the following.

In order for this section to apply the following needs to be demonstrated:

- The frequency of operation could be used at stations licensed below 800 MHz on any frequency listed in Subpart B and C of 47 CFR Part 90.

This transmitter can operate in the FCC band 440 – 470 MHz.

For testing purposes it has been configured to operate on 443.050 MHz, 456.000 MHz and 468.950 MHz





## RF Radiated Power Output

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	20.8	Vertical	29.3
443.0500	89.1	-6.1	20.8	Horizontal	26.9
456.0000	82.9	-12.3	20.8	Vertical	33.1
456.0000	83.5	-11.7	20.8	Horizontal	32.5
468.9500	79.3	-15.9	20.8	Vertical	36.7
468.9500	79.4	-15.8	20.8	Horizontal	36.6

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 23<sup>rd</sup> January, 2007.

**Limit:** 120 mW or 20.8 dBm

**Result:** Complies

**Measurement Uncertainty:**  $\pm 4.1$  dB

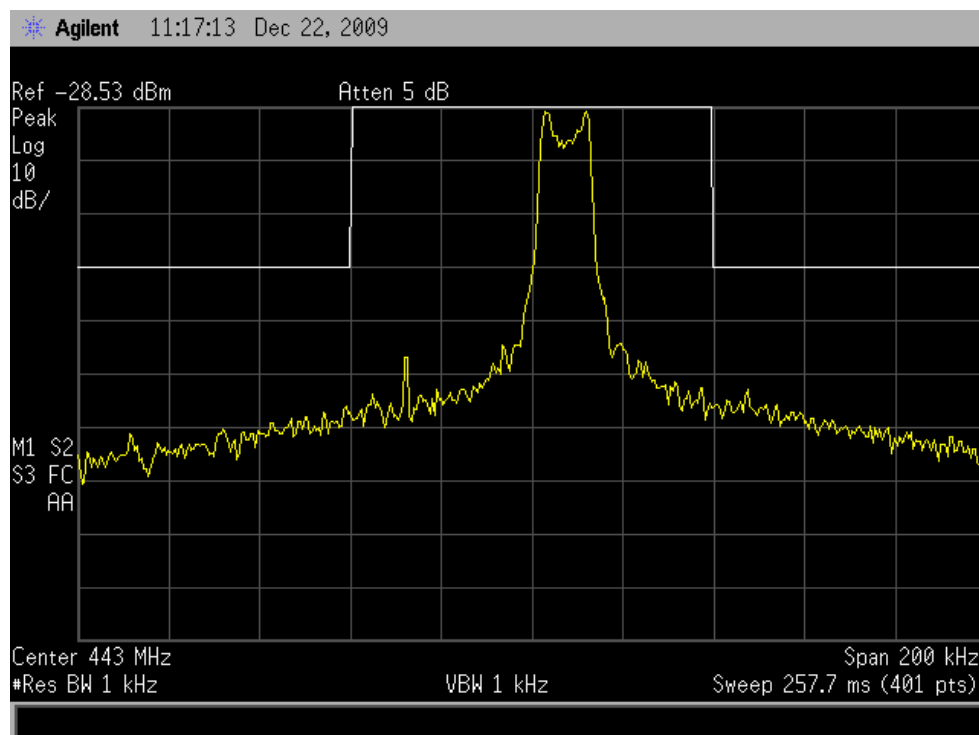
## Conducted spurious emissions

The equipment is designed to operate with a 12.5 kHz channel bandwidth.

The transmitter cannot be operated with an un-modulated carrier so all measurements have been made with reference to the modulated carrier.

Measurements have been made in the laboratory using a spectrum analyser to observe emissions close to the carrier and also the transmitter power output. See the attached plots

**12-86-0000** - Nominal Frequency: 443.050 MHz



### Limit

90.217(b) states that for equipment designed to operate with a 12.5 kHz channel bandwidth, any emission appearing on a frequency more than 25 kHz from the assigned frequency, shall be attenuated by at least 30 dB below the unmodulated carrier.

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 1.5$  dB

## Field strength of the transmitter spurious emissions

**12-86-0000** - Nominal Frequency: 443.050 MHz

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
886.1000	49.8	-47.6	-38.5	Vertical	9.1
886.1000	50.1	-47.3	-36.1	Horizontal	11.2
1329.1500	54.4	-43.0	-38.5	Vertical	4.5
1329.1500	55.1	-42.3	-36.1	Horizontal	6.2
1772.2000	48.9	-48.5	-38.5	Vertical	10.0
1772.2000	52.9	-44.5	-36.1	Horizontal	8.4
2215.2500	52.9	-44.5	-38.5	Vertical	6.0
2215.2500	52.0	-45.4	-36.1	Horizontal	9.3
2658.3000	-	-	-38.5	Vertical	-
2658.3000	-	-	-36.1	Horizontal	-
3101.3500	-	-	-38.5	Vertical	-
3101.3500	-	-	-36.1	Horizontal	-
3544.4000	-	-	-38.5	Vertical	-
3544.4000	-	-	-36.1	Horizontal	-
3987.4500	-	-	-38.5	Vertical	-
3987.4500	-	-	-36.1	Horizontal	-
4430.5000	-	-	-38.5	Vertical	-
4430.5000	-	-	-36.1	Horizontal	-

When operating on 443.050 MHz the highest power level determined was -8.5 dBm when measured using vertical polarisation and -6.1 dBm when using horizontal polarisation.

A limit of -30 dBc has been applied

Therefore limits of -38.5 dBm and -36.1 dBm have been applied

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.

No other emissions observed.

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

**Result:** Complies

**Measurement Uncertainty:**  $\pm 4.1$  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.

Measurements were made with the supply varied between nominal voltage of the battery and the stated end point of the nominal supply voltage (3.0 Vdc).

Testing was carried out using carrier only being transmitted

**12-86-0000** - Nominal frequency: 443.050 MHz

Temp.	Frequency Error (Hz)	
	2.0 Vdc	3.0 Vdc
+50°C	-500.0	-500.0
+40°C	-500.0	-500.0
+30°C	-500.0	-500.0
+20°C	-275.0	-275.0
+10°C	+100.0	+100.0
0°C	+775.0	+775.0
-10°C	+25.0	+25.0
-20°C	-75.0	-75.0
-30°C	-500.0	-500.0

### Limit:

Specified limit the stability for mobile stations less than 2.5 watts as per Part 90.213 has been applied where the frequency stability between 421 – 512 MHz is 2.5 ppm.

Testing was carried out on 443.050 MHz.  $2.5 \text{ ppm} = 2.5 \times 443.050 \text{ MHz} = 1108 \text{ Hz}$ .

**Result:** Complies

**Measurement Uncertainty:**  $\pm 30 \text{ Hz}$

## 8. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset	Cal due	Period
Aerial Contoller	EMCO	1090	9112-1062	RFS 3710	N/a	N/a
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	N/a	N/a
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	N/a	N/a
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	28/1/2010	1 year
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	28/1/2010	1 year
Log Periodic Antenna	Schwarzbeck	VUSLP 9111	9111-228	3785	28/1/2010	1 year
UHF Dipole Antenna	Schwarzbeck	UHA 9107	-	RFS 3604	28/1/2010	1 year
Horn Antenna	Electrometrics	RGA-60	6234	E1494	28/5/2010	1 year
Measurement Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595	22/8/2010	1 year
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776	26/2/2010	1 year
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552	15/9/2010	1 year
Oscilloscope	Tektronics	745A	B010643	1569	22/8/2010	1 year
Signal Generator	Rohde & Schwarz	SMHU.58	838923/028	E1493	1/11/2010	1 year
Frequency Counter	Hewlett Packard	HP 5342A	1916A01713	E1224	15/10/2010	1 year
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069	15/10/2010	1 year
Rubidium Oscillator	Ball Efratom	FRS – C	4287	E1053	N/a	N/a
Thermal chamber	Contherm	M180F	86025	E1129	14/5/2010	1 year
Thermometer	DSIR	RT200	035	E1049	14/5/2010	1 year

## 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 up dated on January 23<sup>rd</sup>, 2007.

Testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/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 NZS/ISO/IEC 17025.

## 10. PHOTOGRAPH(S)

External photos - Sample 12-86-0000





## Internal Photos PCB Sample 12-86-0000

