EMC Technologies (NZ) Ltd

Test Report No **091001.2**
Report date: 8th October 2009

TEST REPORT

SIMOCO PSRM9000 TU UHF Transceiver

tested to the

Code of Federal Regulations (CFR) 47

Part 90 –Private Land Mobile Services

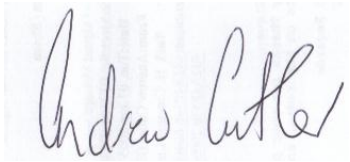
Part 22 – Public Mobile Services

Part 15 – Radio Frequency Device

for

TMC Radio Pty 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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1. CLIENT INFORMATION

Company Name	TMC Radio Pty Ltd
Address	1270 Ferntree Gully Road Scoresby
City	Victoria, 3179
Country	Australia
Contact	Mr Robert Stowell

2. DESCRIPTION OF TEST SAMPLE

Brand Name	SIMOCO
Model Number	PSRM9000 TU
Product	UHF Transceiver
Manufacturer	TMC Radio Pty Ltd
Designed in	Australia
Manufactured in	Taiwan
Serial Number	3TUX06111LVS
FCC ID	STZSRM9000TU

3. COMPLIANCE STATEMENT AND RESULT SUMMARY

The **SIMOCO PSRM9000 TU UHF Transceiver** complies with the limits defined in 47 CFR Part 15, 47 CFR Part 22, 47 CFR Part 90 and 47 CFR Part 2 when tested in-accordance with the test methods described in 47 CFR Part 2.

Clause	Description	Result
2.1046 90.205	RF power output Power and antenna height limits	Noted Complies
2.1051	Spurious emissions at antenna terminals	Complies
2.1053	Field strength of spurious radiation	Complies
2.1055 22.355 90.213	Frequency stability Frequency stability Frequency stability	Noted Complies Complies
15.109 15.111	Receiver radiated emissions Receiver local oscillator voltage	Complies Complies

Limited testing was carried out to determine whether the operation of this device without the original case has been degraded.

This report has been issued in addition to the original report 091001.1 in order to show a revised model number and to report additional testing on 440.075 MHz.

4. TEST SAMPLE DESCRIPTION

The sample tested has the following specifications:

Rated Transmitter Output Power

25.0 Watts (44.0 dBm)

Transmitter FCC frequency range

406.1 - 480 MHz

Test frequencies

Frequency MHz	Power Watts	Spacing kHz
412.950	25.0	12.5
440.075	25.0	12.5
440.075	25.0	25.0
479.975	25.0	12.5

Emission Designators / Modes of operation

11k2F3E – Analogue speech
16k0F3E – Analogue speech
8k10F1E – C4FM digital speech

Power Supply

DC voltage supply typically 12.0 Vdc

5. TEST CONDITIONS

Standard Temperature and Humidity

Temperature: +15°C to + 30° maintained.

Relative Humidity: 20% to 75% observed.

Standard Test Power Source

Standard Test Voltage: 12.0 Vdc.

Extreme Temperature

High Temperature: + 50°C maintained.

Low Temperature: - 30 °C maintained.

Extreme Test Voltages

Low Voltage: 10.8 Vdc

High Voltage: 15.6 Vdc

7. TEST RESULTS

RF power output

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 12.0 Vdc and when decreased 10% to 10.8 Vdc (minimum operational voltage) and increased 30% to 15.6 Vdc.

Testing was carried out at maximum rated output power of 25 watts (44.0 dBm).

Frequency (MHz)	Voltage (Vdc)	Rated (dBm)	Measured (dBm)
440.0750	10.8	44.0	43.1
	12.0	44.0	43.2
	15.2	44.0	43.2

Extreme testing was also performed at 440.075 MHz

Temperature	10.8 Vdc	12.0 Vdc	15.6 Vdc
+50°C	43.0	43.0	43.0
-30°C	43.2	43.2	43.2

Limits:
Clause 90.205(h) of Part 90 specifies that in the band 450 – 470 MHz the maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and the required service area.

Clause 90.205(i) of Part 90 specifies that in the band 470- 512 MHz the maximum allowable station effective radiated power (ERP) is specified in Clause 90.307 and 90.309.

Result: Complies
Measurement Uncertainty: ±0.5 dB

Transmitter spurious emissions at the antenna terminals

Frequency: 440.075 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
880.150	-55.8	-20.0
1320.225	-60.3	-20.0
1760.300	Less than -60.0 dBm	-20.0
2200.375	Less than -60.0 dBm	-20.0
2640.450	Less than -60.0 dBm	-20.0
3080.525	-52.8	-20.0
3520.600	-57.3	-20.0
4400.750	Less than -60.0 dBm	-20.0

Limit:
Part 90.210(d) Mask D, (3) on any frequency removed from the centre of the authorised bandwidth by a displacement frequency of more than 12.5 kHz shall be attenuated by at least 50 + 10 log (P) or 70 dB whichever is the lesser attenuation.

The spurious emission limit defined by Mask D has been applied as this transmitter can operate using channel spacings of 12.5 kHz.

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.

A rated power of 25.0 watts gives a limit of –20.0 dBm.

Some emissions less that –40 dBm have been reported for completeness.

No measurements were made above the 10th harmonic.

Result: Complies
Measurement Uncertainty: ±3.3 dB

Receiver spurious emissions at antenna terminals

Receive frequency: 440.075 MHz

Frequency (MHz)	Level (dBm)	Limit (dBm)
395.075	-86.6	-57.0
790.150	-89.5	-57.0

The receiver has an intermediate frequency of -45 MHz

No other emissions within 30 dB of the limit were observed.

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 (–57.0 dBm).

Result: Complies
Measurement Uncertainty: ±3.3 dB

Field strength of the transmitter spurious emissions

Frequency: 440.0750 MHz

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Antenna Polarisation	Margin (dB)
880.1500	41.3	-56.1	-20.0	Vertical	36.1
880.1500	61.0	-36.4	-20.0	Horizontal	16.4
1320.2250	55.2	-42.2	-20.0	Vertical	22.2
1320.2250	61.8	-35.6	-20.0	Horizontal	15.6
1760.3000	50.5	-46.9	-20.0	Vertical	26.9
1760.3000	57.5	-39.9	-20.0	Horizontal	19.9
2200.3750	62.1	-35.3	-20.0	Vertical	15.3
2200.3750	66.5	-30.9	-20.0	Horizontal	10.9
2640.4500	57.4	-40.0	-20.0	Vertical	20.0
2640.4500	55.8	-41.6	-20.0	Horizontal	21.6
3080.5250	67.8	-29.6	-20.0	Vertical	9.6
3080.5250	65.2	-32.2	-20.0	Horizontal	12.2
3520.6000	50.2	-47.2	-20.0	Vertical	27.2
3520.6000	50.5	-46.9	-20.0	Horizontal	26.9
3960.6750	62.6	-34.8	-20.0	Vertical	14.8
3960.6750	59.0	-38.4	-20.0	Horizontal	18.4
4400.7500	51.2	-46.2	-20.0	Vertical	26.2
4400.7500	51.4	-46.0	-20.0	Horizontal	26.0

The transmitter was tested while transmitting continuously while attached to a dummy load.

When operating in transmit mode no significant emissions were detected between the harmonic emissions that were detected.

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 January 18th, 2007

Testing was carried out using the substitution method where by the power level of each emission was determined by replacing the transmitter with a dipole antenna that was connected to a signal generator.

The signal generator output level was 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 25 watts gives a limit of –20 dBm.

No measurements were made above the 10th harmonic.

Result: Complies
Measurement Uncertainty: ±4.1 dB

Field strength of the receiver spurious emissions

Frequency: 440.0750 MHz

Frequency (MHz)	Level dBuV/m	Limit dBuV/m	Margin (dB)	Antenna Polarisation
395.075	31.0	46.0	15.0	Horizontal
790.150	44.1	46.0	1.9	Horizontal
1185.225	-	54.0	-	Vert / Hort
1580.300	-	54.0	-	Vert / Hort
1975.375	-	54.0	-	Vert / Hort
2370.450	-	54.0	-	Vert / Hort
2765.525	-	54.0	-	Vert / Hort
3160.600	-	54.0	-	Vert / Hort
3555.675	-	54.0	-	Vert / Hort
3950.750	-	54.0	-	Vert / Hort

The receiver has an intermediate frequency of 45 MHz

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 January 18th, 2007.

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

Above 1000 MHz an average detector was used with a bandwidth of 1 MHz.

The receiver was tested while receiving continuously while attached to a dummy load.

Limit:
The field strength limits as per CFR 47 Part 15, section 15.109 have been applied.

Result: Complies
Measurement Uncertainty: ±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 after a period of 1 minute.

Measurements were made with the supply decreased 10% and increased 30% from nominal battery voltage supply.

Frequency: 440.075 MHz

Temperature	10.8 Vdc	12.0 Vdc	15.6 Vdc
+50°C	-33.0	-35.0	-35.0
+20°C	-225.0	-223.0	-225.0
-30°C	+105.0	+110.0	+110.0

Limit:
Part 22.355 and Part 90.213 state that mobile station transmitters operating between 421 – 512 MHz with 12.5 kHz channelling are required to have a frequency tolerance of 2.5 ppm.

This transmitter was tested on 440.0750 MHz. 2.5 ppm = 2.5 x 440 = 1100 Hz.

Result: Complies
Measurement Uncertainty: ±30 Hz

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
Attenuator 10 dB	Hewlett Packard	HP8491A	24838	E1329
Attenuator 20 dB	Weinschel	49-20-43	GC-104	E1308
Audio Analyzer	Hewlett Packard	8903A	2216A01713	E1146
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612
Frequency Counter	Hewlett Packard	HP 5342A	1916A01713	E1224
Level generator	Anritsu	MG443B	M61689	E1143
Log Periodic	Schwarzbeck	VUSLP9111	9111-228	3785
Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552
Modulation Analyzer	Hewlett Packard	8901B	2608A00782	E1090
Oscilloscope	Tektronics	745A	B010643	1569
Power Attenuator	Weinschel	49-20-43	GC104	E1308
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069
RF Power Meter	Hewlett Packard	HP 436A	2512A22439	E1198
Selective Level Meter	Anritsu	ML422C	M35386	E1140
Signal Generator	Rohde & Schwarz	SMHU.58	838923/028	E1493
Spectrum Analyzer	Agilent	N9320A	CN063000567	E4002
Spectrum Analyzer	Hewlett Packard	EXA	-	-
Thermal chamber	Contherm	M180F	86025	E1129
Thermometer	DSIR	RT200	035	E1049
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709
Horn antenna	Electrometrics	RGA-60	6234	E1494
Pre Amplifier	Hewlett Packard	8349B	2644A01659	-

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 January 18th, 2007.

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.

10. PHOTOGRAPH (S)