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TEST REPORT

ELPRO 405U-E Ethernet Transceiver

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart A and B – Unintentional Radiators

for

ELPRO Technologies PTY Ltd

A handwritten signature in black ink, appearing to read "Andrew Cutler", is written over a light blue rectangular background.

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. STATEMENT OF COMPLIANCE

The **ELPRO 450U-E Ethernet Transceiver** complies with FCC Part 15 Subparts A and B as a Class B Unintentional Radiator when the methods as described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

The results from testing carried out on the 22nd August 2013 are summarised in the following table:

Clause	Parameter	Result
15.101	Equipment authorisation requirement.	Certification required as the Ethernet Port defines this device as a computer peripheral. The device contains a UHF transceiver module that has FCC ID: O9P-E2-450.
15.103	Exempted devices.	Device is not exempt as it contains a UHF licensed band transceiver module and a digital device.
15.107	Conducted Emissions 0.15 - 30 MHz	Complies with an 8.4 dB margin at 0.522 MHz (Average).
15.109	Radiated Emissions 30 - 5000 MHz	Complies with a 4.4 dB margin at 416.300 MHz (Horizontal).
15.111	Antenna Terminal Disturbance 30 – 950 MHz	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.

4. CLIENT INFORMATION

Company Name ELPRO Technologies Pty Ltd
Address 9/12 Billabong Street
City Stafford
State Queensland 4053
Country Australia
Contact Mr Robert Tsien

5. DESCRIPTION OF TEST SAMPLE

Brand Name ELPRO
Model Number EL-450U-E-H-460-N
Product Ethernet UHF Radio Transceiver
Manufacturer ELPRO Technologies Pty Ltd
Manufactured in Australia
Serial Number 07130000315
FCC ID O9P-450UE
Module FCC ID O9P-E2-450

6. RESULTS

Standard

The sample was tested in accordance with 47 CFR Part 15 Subparts A and B as a Digital Device and a Licensed Band Receiver with the Class B limits being applied.

Methods and Procedures

The measurement methods and procedures as described in ANSI C63.4 - 2003 were used.

Section 15.107: 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

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 40 cm 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.

The supplied plot is combined plot showing the worst case quasi peak and average results of both the phase and neutral lines to the representative AC power supply.

Quasi peak and average detectors have been used with resolution bandwidths of 9 kHz.

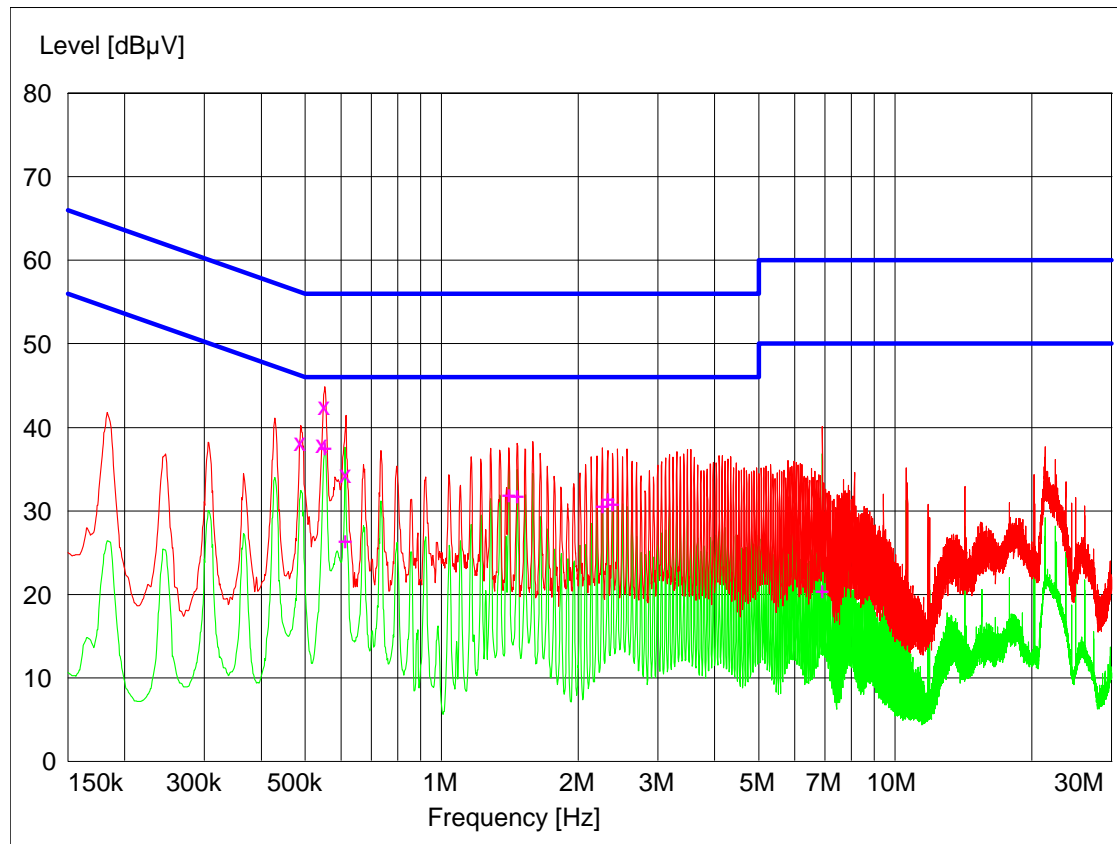
Measurement uncertainty with a confidence interval of 95% is:

- AC Mains port (0.15-30 MHz) \pm 2.8 dB

Conducted Emissions – AC Input Power Port

Setup: Device tested when powered at 115 Vac using a representative power supply while transmitting continuously with a continuous link being established with a 2nd remote transceiver.

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



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.489000	38.20	56.0	18.0	N	
0.546000	38.00	56.0	18.0	N	
0.552000	42.60	56.0	13.4	L1	
0.615000	34.50	56.0	21.5	N	

Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
0.552000	37.60	46.0	8.4	N	
0.612000	26.50	46.0	19.6	N	
1.407000	32.00	46.0	14.0	N	
1.467000	31.90	46.0	14.2	N	
2.261000	30.70	46.0	15.3	L1	
2.324000	31.60	46.0	14.4	N	
2.382500	30.90	46.0	15.1	L1	
6.909500	20.50	50.0	29.6	N	

Section 15.109: Radiated emission limits

Radiated emissions testing was carried out over the frequency range of 30 to 2000 MHz as the highest frequency in use in the receiver does not exceed 500 MHz.

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

This site conforms to the requirements of CISPR 16 and ANSI C63.4 - 2003.

Before testing was carried out, a receiver Self Test and Internal Calibration was undertaken along with a check of all connecting cables and programmed antenna factors.

The device was placed on the test tabletop, which was a total of 0.8 m above the test site ground plane.

Measurements of the radiated field were made by manually scanning between 30 and 2000 MHz in 100 kHz steps while aurally and visually monitoring for emissions.

Measurements were made at a distance of 3 meters between 30 – 2000 MHz.

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 with an automated antenna tower.

The emission is measured in both vertical and horizontal antenna polarisations using a Quasi Peak detector with a bandwidth of 120 kHz below 1 GHz.

Above 1 GHz peak and average detectors with 1 MHz bandwidths were used.

During the test, a number of ambient emissions are identified (list of which can be provided upon request).

The emission level is determined in field strength by taking the following into consideration:

Level (dB μ V/m) = Receiver Reading (dB μ V) + Antenna Factor (dB/m) + Coax Loss (dB)

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 2000 MHz) \pm 4.1 dB

Radiated Emissions 30 – 5000 MHz

The device tested laying flat on top of the test table at height of 80 cm when powered at 120 Vac using a supplied AC power supply.

Testing was carried out when the device operating on 461.3000 MHz

The following ports were terminated as described below:

- a dummy load was attached to the external antenna port
- a laptop computer located 40 metres from the device was attached to the Ethernet power using CAT 5 Ethernet cable
- the RS-232 serial port was terminated using a 3.3 kohm / 1 nF load
- the RS-485 port was loaded using a 120 ohm resistive load
- the Digital I/O port was not terminated

Frequency MHz	Vertical dBuV/m	Horizontal dBuV/m	Limit dBuV/m	Margin dB	Result	Antenna
250.000		35.8	46.0	10.2	Pass	Horizontal
282.000		37.3	46.0	8.7	Pass	Horizontal
375.000		30.9	46.0	15.1	Pass	Horizontal
416.300		41.6	46.0	4.4	Pass	Horizontal
500.000		30.7	46.0	15.3	Pass	Horizontal
625.000		31.6	46.0	14.4	Pass	Horizontal
875.000		34.8	46.0	11.2	Pass	Horizontal
1000.000		34.3	54.0	19.7	Pass	Horizontal

No further emissions were observed within 15 dB of the specified limit when measurements were attempted up to 5000 MHz using both vertical and horizontal polarisations

Result: Complies.

Section 15.111: Antenna Terminal Disturbance (30 – 950 MHz)

Measurements were made at the antenna terminal of the transceiver while it was operating in standby / receive mode using a measuring receiver with the following results recorded

Frequency: 380.000 MHz

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)
335.000	-79.3	-57.0
1340.000	-61.5	-57.0
2680.00	-68.2	-57.0
3015.000	-77.5	-57.0
3350.000	-75.3	-57.0
3685.000	-78.1	-57.0

Frequency: 512.000 MHz

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)
467.000	-78.1	-57.0
1401.000	-69.3	-57.0
1868.000	-75.4	-57.0
2335.000	-71.1	-57.0
2802.000	-71.4	-57.0
3269.000	-71.3	-57.0
3736.000	-85.1	-57.0

All other emissions observed less than -90.0 dBm.

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

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	N/a
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	N/a
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3613	17 Jan 2014
Receiver	R & S	ESIB-40	100171	R-27-1	20 Oct 2013
Receiver	R & S	ESHS 10	828404/005	RFS 3728	22 Aug 2014
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3776	26 Feb 2015
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	30 Jan 2015
Horn Antenna	EMCO	3115	9511-4629	E1526	21 Feb 2014
Mains Network	R & S	ESH2-Z5	881362/034	3628	29 Jul 2014
Variac	General Radio	1592	-	RFS 3690	N/a
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	N/a
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3613	30 Jan 2014

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 updated in July 2013.

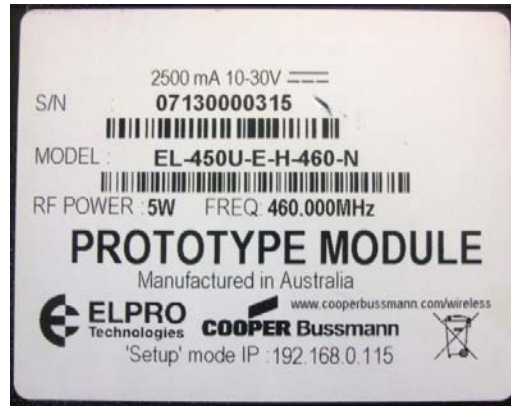
All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025, 2005.

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, 2005.

International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with 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 sample tested

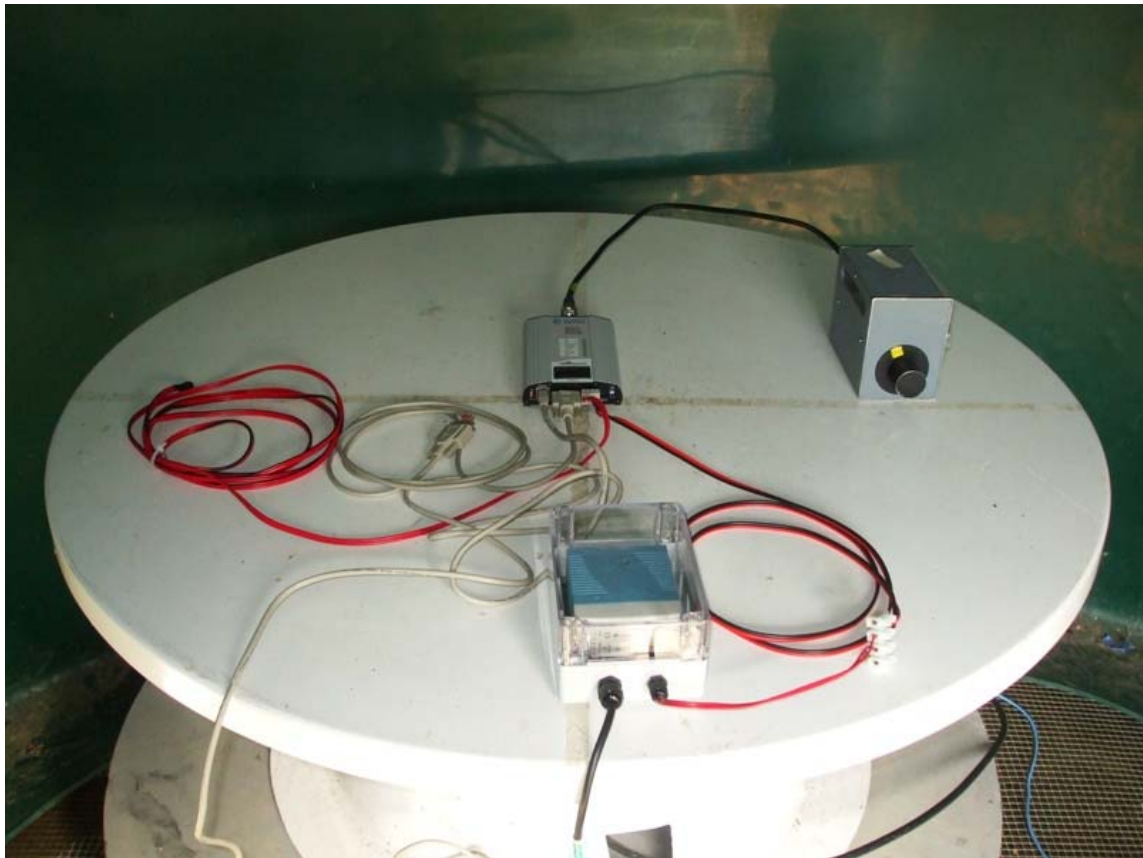






Radiated emissions test set up





Conducted emissions test set up

