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TEST REPORT

Trio Datacom QR450 UHF Remote Station

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart A + B

for

Trio Datacom Pty Ltd

This Test Report is issued with the authority of:

Andrew Cutler- General Manager

IANZ ACCREDITED LABORATORY

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 **Trio Datacom QR450 UHF Remote Station** complies with FCC Part 15 Subpart A + B as a Class A device when the Class B limits are applied and the methods as described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

The results of testing, carried out in October and November 2014 are summarised below.

Clause	Parameter	Result
15.101	Equipment authorisation requirement.	This device would be classed as a computer peripheral and a receiver. The verification process has been applied as: - the device would be a Class A device as it is marketed for commercial or business environments - the receiver contained within a transceiver.
15.103	Exempted devices.	Device is not exempt as it contains a receiver and a digital device.
15.107	Conducted Emissions 0.15 - 30 MHz	Complies.
15.109	Radiated Emissions 30 - 5000 MHz	Complies.
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 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.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

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

4. CLIENT INFORMATION

Company Name	Trio Datacom Pty Ltd
Address	41 Aster Avenue Carrum Downs 3201 Victoria
Country	Australia
Contact	Mr David Rowntree

5. TEST SAMPLE DESCRIPTION

Brand Name	Trio Datacom
Model Number	QR450
Product	UHF Remote Station
Manufacturer	Trio Datacom
Serial Number	702071, 703128
FCC I.D	NI8QR450

Product overview

The QR450 UHF Remote Station radio has the following ports:

- Two Ethernet ports
- Dual RS232 data port
- USB configuration port
- Transmit and Receive TNC connector
- DC power input

Internally there is a single printed circuit board with the following sections:

- IQ Modulator
- Two PLL's, one for the transmitter, one for the receiver.
- Four VCO's, two for the transmitter and two for the receiver
- Transmitter driver circuitry and PA module
- Transmitter low pass filter and directional coupler for the Cartesian loop
- Single conversion receiver with tracking filter and ADC to digitise the IF

The Processor section includes:

- FPGA to implement modem
- Microprocessor
- Main processor running Linux operating system with LAN interfaces

Two samples were tested that cover the receiver range of 400 -520 MHz

Testing was carried out on the following frequencies: 400, 425, 450, 484 and 518 MHz

The receiver has an intermediate frequency of 83.1625 MHz

6. RESULTS

Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart A and B with the Class B limits being applied.

Methods and Procedures

The following measurement methods and procedures have been applied:

- ANSI C63.4 – 2003

Section 15.101: Equipment authorisation requirement

The device tested is a receiver contained within a transceiver that has an Ethernet Port.

The verification process has been applied to this device because:

- the receiver is contained within a transceiver

- the device has an Ethernet port that contains a digital device

- the device is marketed for use in a commercial, industrial or business environment and would there for be classed a Class A digital device

Section 15.107: Conducted limits

Conducted emission testing has been carried out when the device was powered at 120 Vac 60 Hz using a representative AC power supply.

Conducted emission testing was carried out over the frequency range of 150 kHz to 30 MHz at the Laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room.

Testing was carried out in accordance with section 15.107(a) using a measuring receiver and a 50 uH / 50 ohm artificial mains network which is also known as a line impedance stabilisation network (LISN).

Measurements on both the phase and neutral lines were made using either a Quasi Peak or an Average detector with a 9 kHz bandwidth.

The supplied conducted emission plot is a combined plot showing the worst case of the Peak, Quasi Peak and Average levels for both phase and neutral.

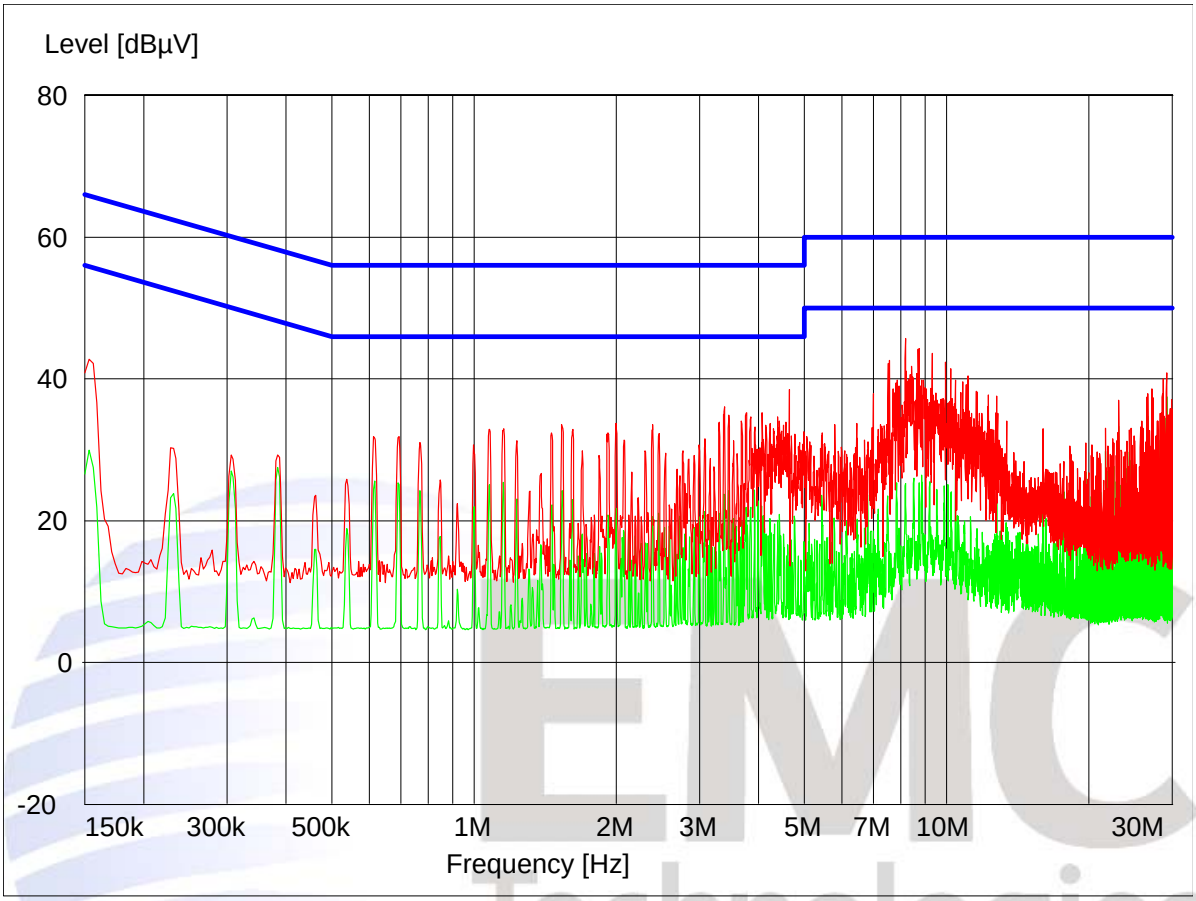
The Class B conducted limits have been applied.

Result: Complies
Measurement uncertainty with a confidence interval of 95% is:
Conducted emissions tests (0.15 - 30 MHz) ± 2.2 dB

Conducted Emissions – AC Input Power Port

Setup:	Device tested in standby / receive mode when powered at 120 Vac 60 Hz when using a representative AC power supply.

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



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions detected within 15 dB of the limit					

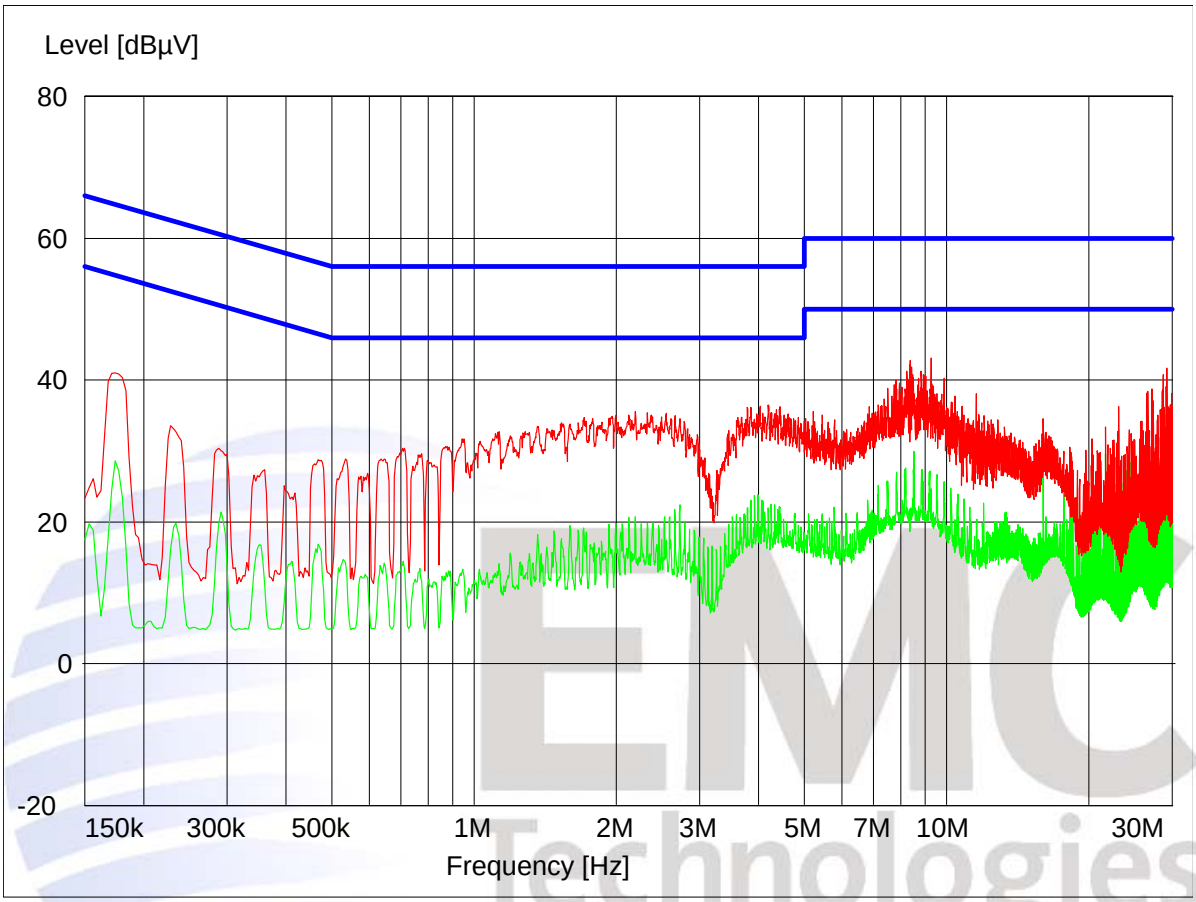
Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions detected within 15 dB of the limit					

Conducted Emissions – AC Input Power Port

Setup:	Device tested in transmit mode when powered at 120 Vac 60 Hz when using a representative AC power supply.

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



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions detected within 15 dB of the limit					

Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions detected within 15 dB of the limit					

Section 15.109: Radiated spurious emissions

Radiated emission testing was carried out over the frequency range of 30 to 5000 MHz as the receiver operates between 400 - 520 MHz with the highest local oscillator frequency being 603.1625 MHz.

Testing was carried out at the laboratory's open area test site - located at 670 Kawakawa Orere Rd, RD3, Papakura, New Zealand.

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 below 1000 MHz were made using a Quasi Peak Detector with a bandwidth of 120 kHz.

Above 1000 MHz measurements were made using a Peak Detector and an Average Detector with a bandwidth of 1 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.

All emissions were measured in both vertical and horizontal antenna polarisations.

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

Level (dBµV/m) = Receiver Reading (dBµV) + Antenna Factor (dB/m) + Coax Loss (dB) – Amplifier Gain (dB)

The Class B limits have been applied.

Receiver spurious Emissions 30-5000 MHz

The receiver has an intermediate frequency of 83.1625 MHz

Receive Frequency 400.000 MHz

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Polarity	Margin (dB)	Result
483.1625	28.1	46.0	Vertical	17.9	Pass
483.1625	24.5	46.0	Horizontal	21.5	Pass

Receive Frequency 425.000 MHz

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Polarity	Margin (dB)	Result
508.1625	30.3	46.0	Vertical	15.7	Pass
508.1625	27.8	46.0	Horizontal	18.2	Pass

Receive Frequency 450.000 MHz

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Polarity	Margin (dB)	Result
533.1625	34.6	46.0	Vertical	11.4	Pass
533.1625	27.1	46.0	Horizontal	18.9	Pass

Receive Frequency 484.000 MHz

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Polarity	Margin (dB)	Result
567.1625	33.8	46.0	Vertical	12.2	Pass
567.1625	26.8	46.0	Horizontal	19.2	Pass

Receive Frequency 518.000 MHz

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Polarity	Margin (dB)	Result
601.1625	34.6	46.0	Vertical	11.4	Pass
601.1625	26.9	46.0	Horizontal	19.1	Pass

No other emissions observed within 20 dB of the limits.

Result: Complies
Measurement Uncertainty: ±4.1 dB

General standby emissions 30-5000 MHz

The receiver was tested when a dummy load was attached to the antenna port and an Ethernet cable was attached to the Ethernet port.

Frequency MHz	Vertical dBµV/m	Horizontal dBµV/m	Limit dBµV/m	Margin dB	Result	Antenna
30.600	24.8		40.0	15.2	Pass	Vertical
32.600	23.0		40.0	17.0	Pass	Vertical
33.200	22.0		40.0	18.0	Pass	Vertical
35.400	19.2		40.0	20.8	Pass	Vertical
39.000	22.3		40.0	17.7	Pass	Vertical
39.600	22.6		40.0	17.4	Pass	Vertical
41.600	21.0		40.0	19.0	Pass	Vertical
45.000	19.5		40.0	20.5	Pass	Vertical
45.200	19.7		40.0	20.3	Pass	Vertical
56.000	24.8		40.0	15.2	Pass	Vertical
56.600	21.1		40.0	18.9	Pass	Vertical
56.800	20.1		40.0	19.9	Pass	Vertical
68.400	21.0		40.0	19.0	Pass	Vertical
70.800	20.0		40.0	20.0	Pass	Vertical
77.200	27.3		40.0	12.7	Pass	Vertical
77.400	24.0		40.0	16.0	Pass	Vertical
78.000	26.3		40.0	13.7	Pass	Vertical
79.400	22.5		40.0	17.5	Pass	Vertical
80.200	22.0		40.0	18.0	Pass	Vertical
80.600	23.0		40.0	17.0	Pass	Vertical
81.200	22.8		40.0	17.2	Pass	Vertical
82.000	20.3		40.0	19.7	Pass	Vertical
82.200	22.0		40.0	18.0	Pass	Vertical
82.600	21.0		40.0	19.0	Pass	Vertical
82.800	19.4		40.0	20.6	Pass	Vertical
85.400	21.4		40.0	18.6	Pass	Vertical
238.600	25.4	23.5	46.0	20.6	Pass	Vertical
238.800	26.0	23.8	46.0	20.0	Pass	Vertical
239.000	28.1	20.5	46.0	17.9	Pass	Vertical
239.200	26.0	22.0	46.0	20.0	Pass	Vertical
239.600	27.5	19.2	46.0	18.5	Pass	Vertical
239.800	29.4	18.0	46.0	16.6	Pass	Vertical

Result: Complies
Measurement Uncertainty: ±4.1 dB

Section 15.111: Receiver spurious emissions at antenna terminals

Testing was carried out at the antenna port.

The receiver has an intermediate frequency of 83.1625 MHz

Receive (MHz)	Emission (MHz)	Level (dBm)	Limit (dBm)
400.000	483.163	-102.7	-57.0
425.000	508.163	-99.0	-57.0
450.000	533.163	-96.0	-57.0
484.000	567.153	-99.1	-57.0
518.000	601.153	-95.0	-57.0

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

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset	Cal Due	Interval
Aerial Controller	EMCO	1090	9112-1062	3710	N/a	N/a
Aerial Mast	EMCO	1070-1	9203-1661	3708	N/a	N/a
Turntable	EMCO	1080-1-2.1	9109-1578	3709	N/a	N/a
VHF Balun	Schwarzbeck	VHA9103	-	3603	12/01/2015	3 years
Biconical Antenna	Schwarzbeck	BBA 9106	-	3612	12/01/2015	3 years
Log Periodic Antenna	Schwarzbeck	VUSLP 91111	9111-228	3785	12/01/2015	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	04/06/2017	3 years
Receiver	Rohde & Schwarz	ESIB-40	100171	4003	29/01/2015	1 year
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776	26/02/2015	1 year
Receiver	R & S	ESHS 10	828404/005	3728	27/06/2015	2 year
Mains Network	R & S	ESH2-Z5	881362/032	3628	23/10/2016	2 year

At the time of testing all test equipment was within calibration.

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 June 2014.

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.

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.

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.

9. PHOTOGRAPHS

Conducted emissions test set up

Radiated emissions setup