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TEST REPORT

4RF SR+ SQ896M141 Point to Multi-point Digital Radio

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart A + B

for

4RF Limited

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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The logo for EMC Technologies features the letters 'EMC' in a large, bold, sans-serif font. Below 'EMC', the word 'Technologies' is written in a smaller, lighter font. To the left of the text is a stylized graphic of a globe or sphere composed of horizontal, wavy lines in shades of blue and purple.

1. STATEMENT OF COMPLIANCE

The **4RF SR+ SQ896M141 Point to Multi-point Digital Radio** complies with FCC Part 15 Subpart A + B as a Class B Device when the methods as described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

The results of testing carried out between 15th and 30th of April 2014 are summarised below.

Clause	Parameter	Result
15.101	Equipment authorisation requirement.	The device tested is a receiver contained within a transceiver. The Verification compliance process will therefore apply.
15.103	Exempted devices.	Device is not exempt as it contains a receiver and digital device.
15.107	Conducted Emissions 0.15 - 30 MHz	Complies with emissions within 20 dB of the applicable limits.
15.109	Radiated Emissions 30 - 3000 MHz	Complies with a 4.3 dB margin at 45.2 MHz in vertical antenna polarisation.
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 4RF Limited
Address 26 Glover Street
Ngauranga
Wellington
Country New Zealand
Contact Mr Paul Young

5. TEST SAMPLE DESCRIPTION

Brand Name Aprisa SR+
Model Number SQ896M141
Product Point to Multi Point Digital Radio
Manufacturer 4RF Limited
Manufactured in New Zealand
Designed in New Zealand
Serial Numbers -
FCC ID UIPSQ896M141

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6. RESULTS

Standard

The sample was tested in accordance with 47 CFR Part 15 Subparts A and B as a Class B digital device.

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 to DC 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:

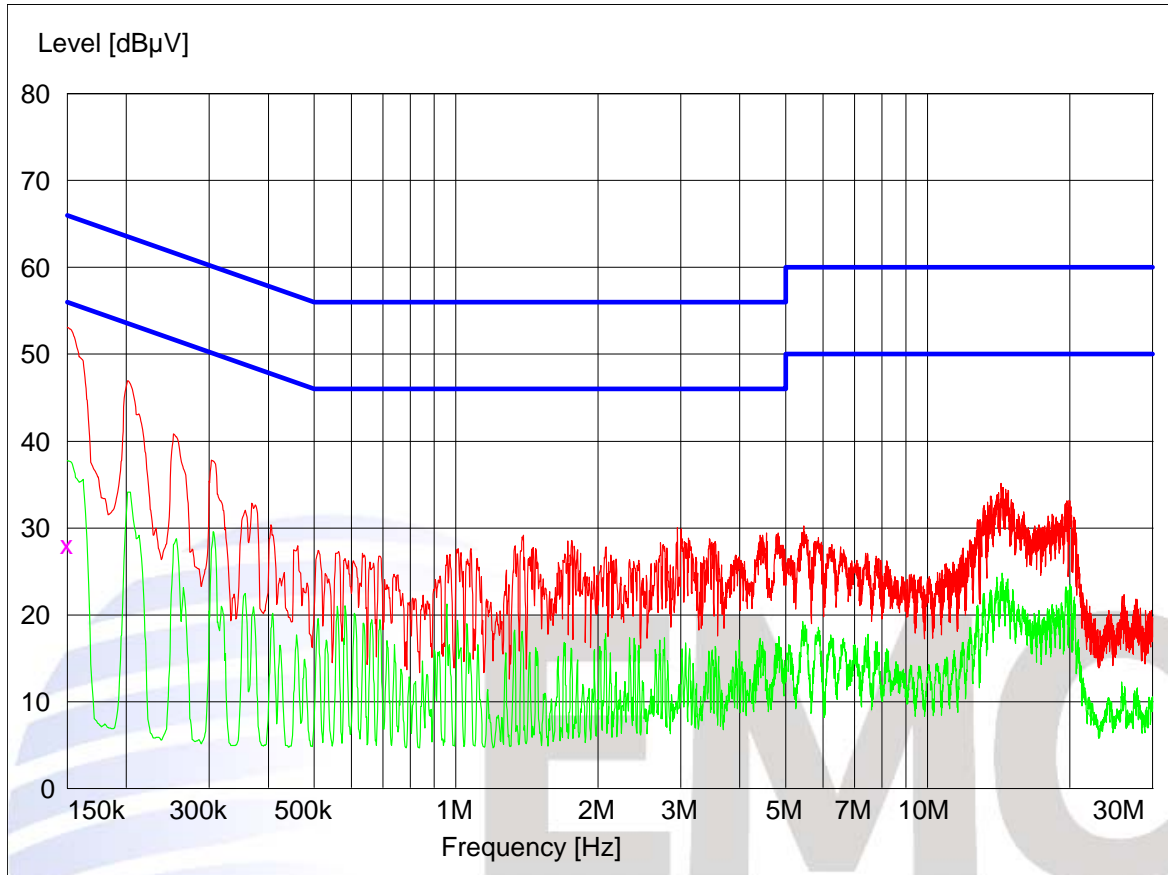
- AC Mains port (0.15 - 30 MHz) \pm 2.8 dB

Result: Complies.

Conducted Emissions – AC Input Power Port

Setup: Device powered by representative AC to DC power supply whilst in Receive mode.

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



Final Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions within 20 dB of the limit					

Final Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Phase	Rechecks dBµV
No emissions within 20 dB of the limit					

Section 15.109 – Radiated emissions

Radiated emission testing was carried out over the frequency range of 30 to 3000 MHz as the receiver operates in the 900 MHz band.

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.

Testing was carried out when the device was placed horizontally in the centre of the test table at a height of 80 cm above the ground plane.

Measurements of the radiated field were attempted at 3 metres from the device.

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

Measurements above 1000 MHz were made using a Peak Detector with a bandwidth of 1 MHz with the average limit applied.

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

The Class B limits have been applied.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 MHz – 3000 MHz) \pm 4.1 dB

Radiated emissions 30 – 3000 MHz

The device tested lying flat on top of the test table at height of 80 cm

The device was powered at 12 Vdc using a lead acid battery that was placed on the test site ground plane

50 ohm dummy loads were attached to the transmitting and receiving antenna ports

Attached to the device was a laptop computer that was attached to the Ethernet port.

Device was tested in standby / receive mode at 901.525 MHz

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Result	Antenna
31.400	31.5	40.0	8.5	Pass	Vertical
31.400	25.0	40.0	15.0	Pass	Horizontal
44.000	32.8	40.0	7.2	Pass	Vertical
44.000	23.4	40.0	16.6	Pass	Horizontal
44.500	30.8	40.0	9.2	Pass	Vertical
44.500	23.0	40.0	17.0	Pass	Horizontal
44.800	32.8	40.0	7.2	Pass	Vertical
44.800	23.6	40.0	16.4	Pass	Horizontal
45.000	34.2	40.0	5.8	Pass	Vertical
45.000	25.2	40.0	14.8	Pass	Horizontal
45.200	35.7	40.0	4.3	Pass	Vertical
45.200	26.0	40.0	14.0	Pass	Horizontal
45.600	35.0	40.0	5.0	Pass	Vertical
45.600	25.5	40.0	14.5	Pass	Horizontal
45.800	31.8	40.0	8.2	Pass	Vertical
45.800	26.3	40.0	13.7	Pass	Horizontal
56.000	24.8	40.0	15.2	Pass	Vertical
58.800	23.5	40.0	16.5	Pass	Vertical
60.200	30.5	40.0	9.5	Pass	Vertical
60.200	19.6	40.0	20.4	Pass	Horizontal
60.800	27.4	40.0	12.6	Pass	Vertical
60.800	18.7	40.0	21.3	Pass	Horizontal
62.000	26.5	40.0	13.5	Pass	Vertical
62.000	18.3	40.0	21.7	Pass	Horizontal
62.200	27.0	40.0	13.0	Pass	Vertical
62.200	18.3	40.0	21.7	Pass	Horizontal
62.800	26.5	40.0	13.5	Pass	Vertical
62.800	18.0	40.0	22.0	Pass	Horizontal
63.000	27.3	40.0	12.7	Pass	Vertical
63.200	16.0	40.0	24.0	Pass	Horizontal
68.200	33.0	40.0	7.0	Pass	Vertical
68.400	32.5	40.0	7.5	Pass	Vertical

Radiated emissions 30 – 3000 MHz continued

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Result	Antenna
68.900	27.0	40.0	13.0	Pass	Vertical
69.000	28.6	40.0	11.4	Pass	Vertical
70.800	24.6	40.0	15.4	Pass	Vertical
71.000	21.0	40.0	19.0	Pass	Vertical
78.000	22.1	40.0	17.9	Pass	Vertical
81.200	26.2	40.0	13.8	Pass	Vertical
143.400	31.8	43.5	11.7	Pass	Vertical
239.500	29.5	46.0	16.5	Pass	Vertical
600.000	35.6	46.0	10.4	Pass	Vertical
600.000	35.3	46.0	10.7	Pass	Horizontal
1200.000	43.1	54.0	10.9	Pass	Vertical
1200.000	41.3	54.0	12.7	Pass	Horizontal



Receiver radiated emissions

The device tested lying flat on top of the test table at height of 80 cm

The device was powered at 12 Vdc using a lead acid battery that was placed on the test site ground plane

50 ohm dummy loads were attached to the transmitting and receiving antenna ports

Attached to the device was a laptop computer that was attached to the Ethernet port.

Device was on the following receive frequencies:

901.025 MHz

901.525 MHz

901.975 MHz

No emissions were observed in receive mode, testing was performed up to 3 GHz.



Section 15.111 - Receiver spurious emissions at antenna terminals

Device was tested at the antenna port in receive mode on the following receive frequencies:

901.025 MHz

901.525 MHz

901.975 MHz

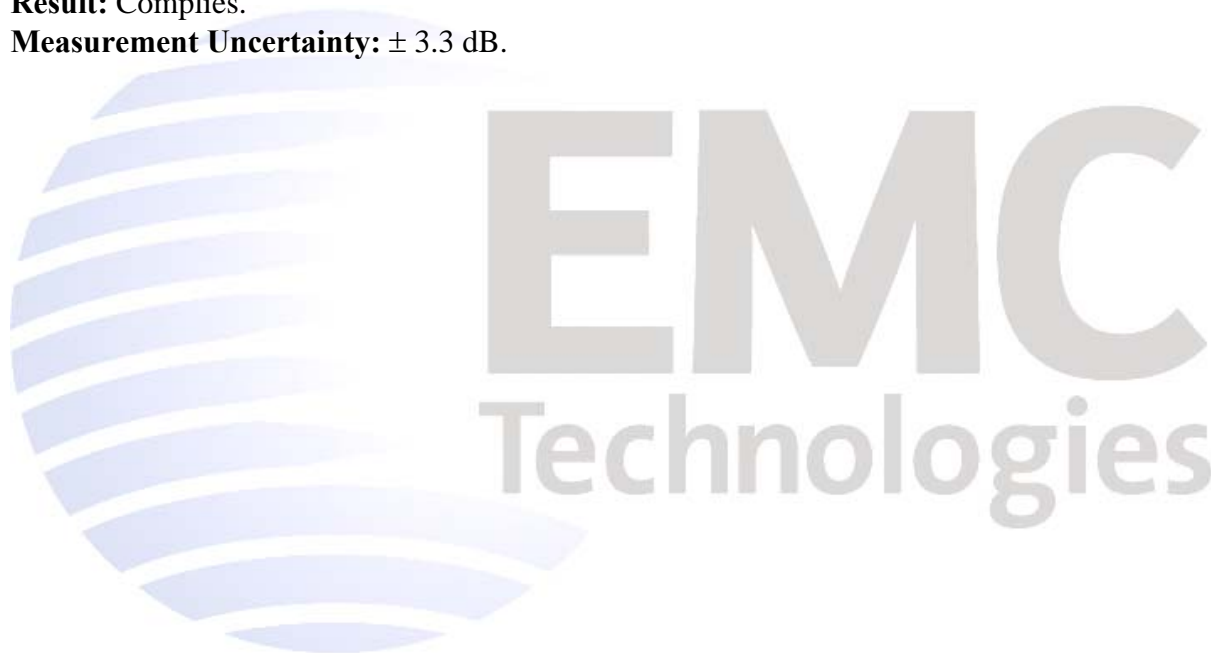
No emissions were observed in receive mode, testing was performed up to 5 GHz.

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 No	Asset Ref	Cal Due	Interval
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	N/a	-
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	N/a	-
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	N/a	-
AC Supply	APT	7008	4170003	-	N/a	-
Receiver	R & S	ESHS 10	828404/005	3728	21 Nov 2015	1 year
Mains Network	R & S	ESH2-Z5	881362/032	3628	21 Aug 2015	1 year
Receiver	R & S	ESIB-40	100171	R-27-1	21 April 2015	1 year
Spec Analyser	Hewlett Packard	E7405A	US39150142	3771	20 April 2015	1 year
Loop Antenna	EMCO	6502	9003-2485	3798	7 Feb 2015	1 year
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	7 Feb 2015	1 year
Biconical	Schwarzbeck	BBA 9106	-	RFS 3612	7 Feb 2015	1 year
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	7 Feb 2015	1 year

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.

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

External photos of the device tested

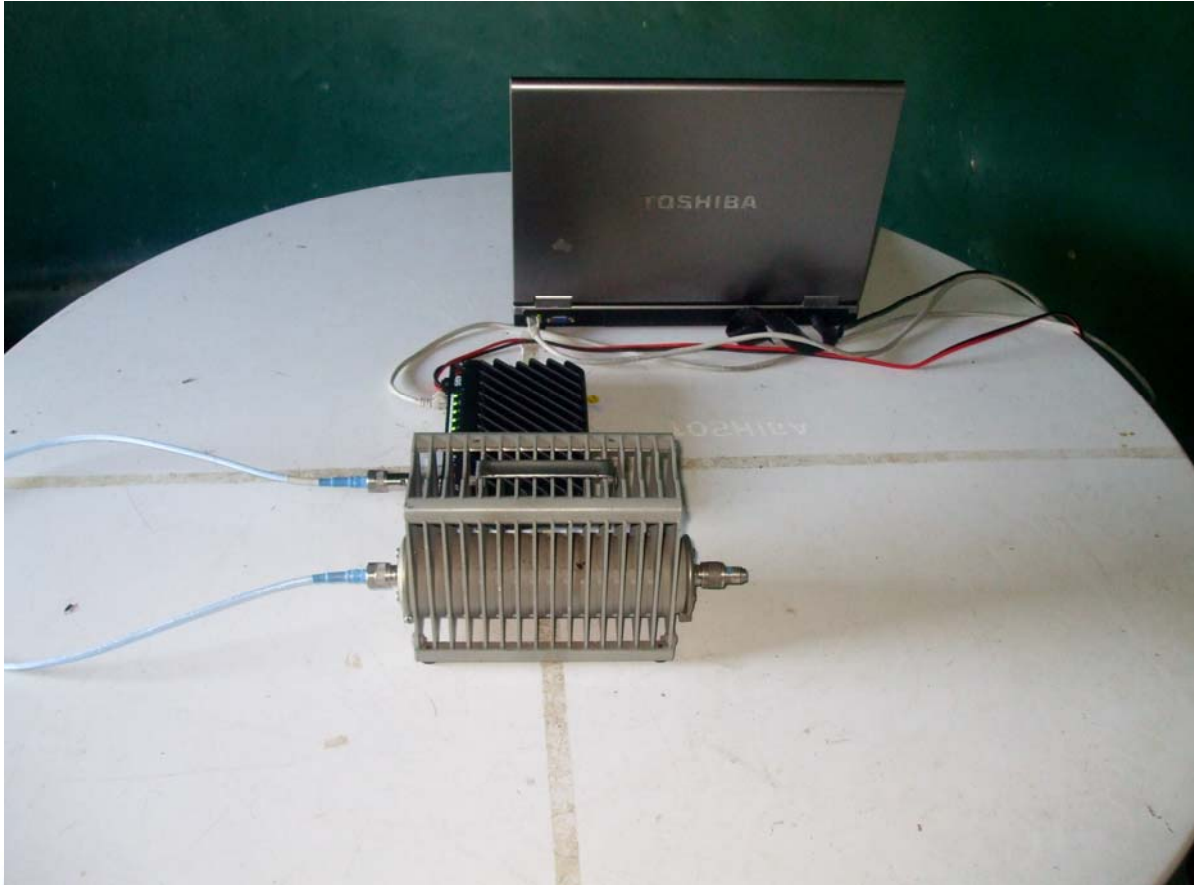


Labels



Radiated emissions test set up photos





Conducted emissions setup

