
FCC Certification Test Report

Manufacturer: RELM Wireless Corporation

Model: RPU16A

FCC ID: ARURPU416A

Rule Parts: 22

74

80

90

Test Begin Date: March 7, 2002

Test End Date: March 14, 2002

Report Issue Date: March 27, 2002

Test Result: PASS

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THIS REPORT CONTAINS 14 PAGES

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1.0 GENERAL

1.1 Introduction

The purpose of this report is to demonstrate compliance with the relevant sections of parts 22, 74, 80 and 90 of the FCC's Code of Federal Regulations.

1.2 Product Description

1.2.1 General

The Equipment Under Test (EUT), is the Model RPU16A. The RPU416A is a two way audio communication radio device manufactured by RELM Wireless Corporation. RELM Wireless is located at the following address:

RELM Wireless Corporation
7100 Technology Drive
W. Melbourne, FL. 32904

Detailed Photographs of the EUT are included separately in this filing.

1.2.2 Intended Use

The EUT is intended to be used in any environment where two way communication is required.

1.2.3 Technical Specifications

Table 1.2.3-1: Specifications

Frequency Band	450 – 470MHz
Number of Channels	16
Channel Bandwidth	
Channel Spacing	Capable of 12.5Khz and 25kHz
Output power	4 Watts Nominal

2.0 TEST FACILITY

2.1 Location

RELM Wireless Corporation performed the majority of the testing. ACS Inc. performed the radiated spurious emissions test only, located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

Radiated spurious emissions were performed on an open area test site operated by ACS, Inc. The site have been fully described, submitted to, and accepted by the FCC and Industry Canada. FCC registration number 89450 and Industry Canada Lab Code IC 4175 have been assigned in recognition of the site. The site is also in conformance with publication CISPR16.

2.2 Radiated Emission Site Description

An open area test site(OATS) was used for measuring the radiated spurious emissions. The OATS was constructed in accordance with ANSI C63.4 and consists of a 40' x 66' concrete pad covered with perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane, however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 3.2-1 below:

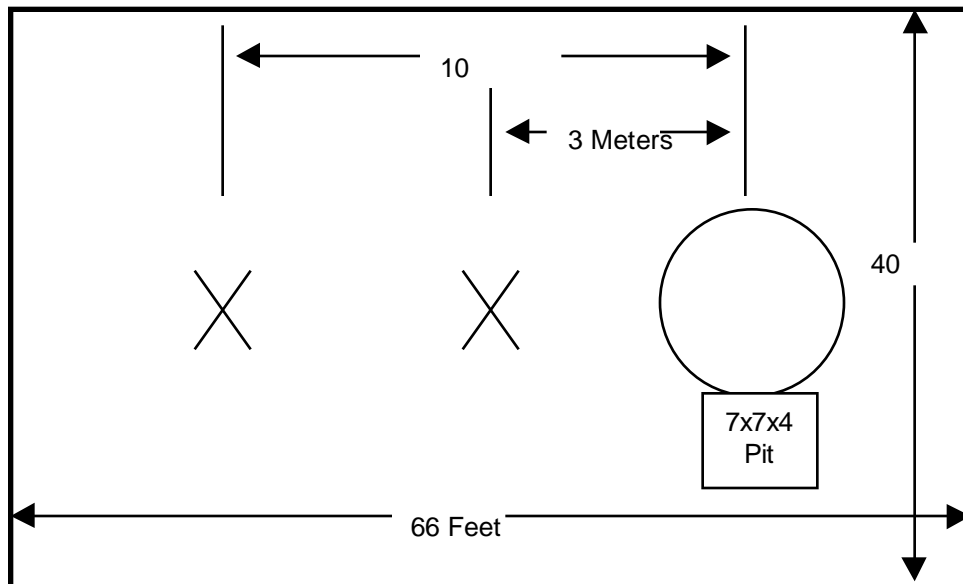


Figure 2.2-1: Open Area Test Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- 1 - ANSI C63.4-1992: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- 2 - US Code of Federal Regulations (CFR): Title 47, Part 2
- 3 - US Code of Federal Regulations (CFR): Title 47, Part 22
- 4 - US Code of Federal Regulations (CFR): Title 47, Part 74
- 5 - US Code of Federal Regulations (CFR): Title 47, Part 80
- 6 - US Code of Federal Regulations (CFR): Title 47, Part 90
- 7 – TIA/EIA 603
- 8 - FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturers specifications.

Table 4-1: Test Equipment

MFG Name	Item Name:	Model #:	Serial #	Recal Date:
Rohde & Schwarz	Spectrum Analyzer	ESMI-RF	839587/003	8/10/02
Rohde & Schwarz	Display Unit	ESAI-D	839379/011	8/10/02
Chase	Bi-Log	CBL6111	1043	10/23/02
Spectrum Technologies	Horn Antenna	DRH-0118	970102	9/9/02
Hewlett Packard	Spectrum Analyzer	8561A		8/24/02
Hewlett Packard	Communications Analyzer	8920A		4/02/02*
Hewlett Packard	Modulation Analyzer	8901A		4/11/02
Hewlett Packard	Audio Analyzer	8903B		6/22/02
LeCroy	Digital Oscilloscope	LC334A		6/21/02

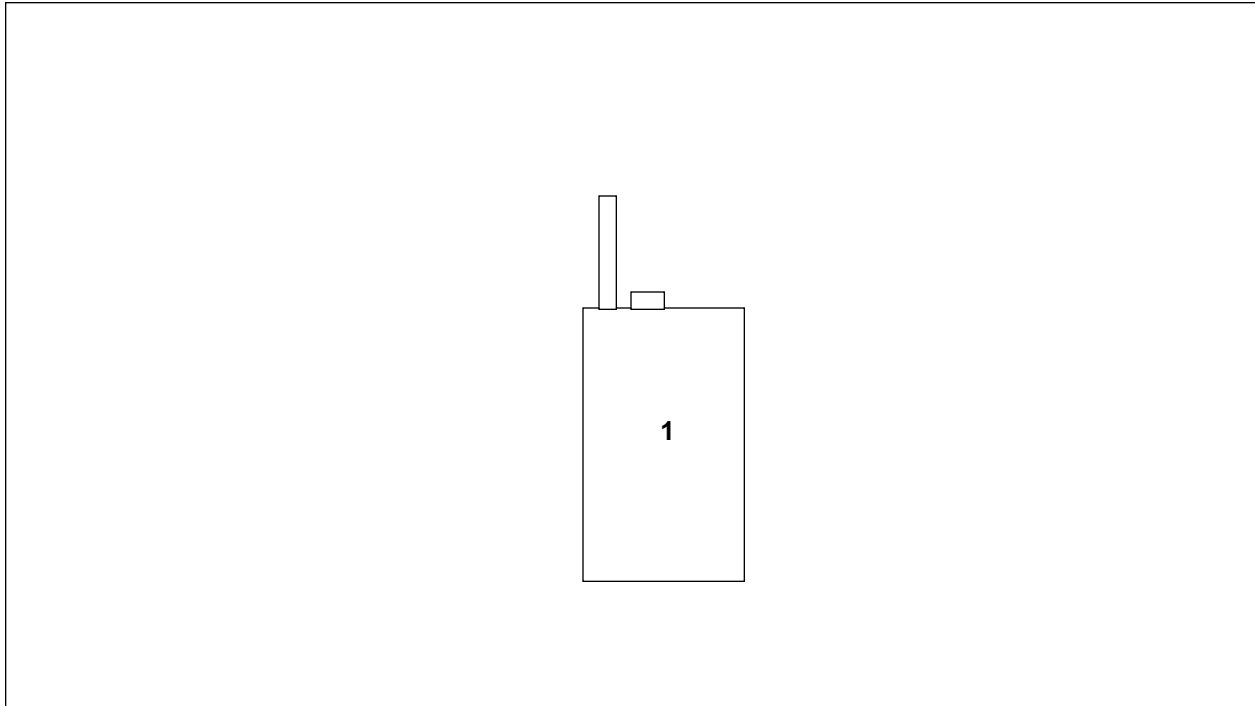
*Equipment was in calibration at the time of testing

5.0 SUPPORT EQUIPMENT

Table 5-3: Support Equipment

Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
	EUT is self supporting			

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



M = Meters

S = Shielded

U = Unshielded

Figure 6-1: EUT Test Setup

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 RECEIVER CHARACTERISTICS

7.1.1 Conducted Spurious Emissions

Freq.(MHz.)	Spur(dBm)
450.05	-83.6
460.5	-85
469.95	-90

7.1.2 Reference Sensitivity

Freq.(Mhz)	Wide Sens(uV)	Narrow Sens(uV)
450.05	0.226	0.260
460.5	0.219	0.245
469.95	0.211	0.240

7.1.3 RF Quieting

	Wide (uV)	Narrow (uV)
RF Level	0.278	0.298

7.1.4 Signal Displacement Bandwidth

Freq.(Mhz)	Wide (KHz)	Narrow (KHz)
469.95	3.8	5

7.1.5 Adjacent Channel Rejection

Freq.(MHz)	Wide Band		Narrow Band	
	Low(dB)	High(dB)	Low(dB)	High(dB)
450.05	74.6	75.3	63.7	65.6
460.5	74	74.6	63.6	64.8
469.95	73.5	73.7	62.9	63.9

7.1.6 Spurious Response Rejection

First Image		
Freq.(MHz)	Wide Band(dB)	Narrow Band(dB)
450.05	84	83.1
460.5	84.4	82.5
469.95	84.1	82

Second Image		
Freq.(MHz)	Wide Band(dB)	Narrow Band(dB)
450.05	96.1	95.7
460.5	96.2	95.5
469.95	96.3	95.3

Half Image(1st IF)

Freq.(MHz)	Wide Band(dB)	Narrow Band(dB)
450.05	93.4	92
460.5	84.2	82.3
469.95	79.2	77.5

Note: 1st IF=38.85 MHz
2nd IF=455KHz

7.1.7 Inter-modulation Rejection @ 50kHz Offset

Freq (MHz)	Wide Band		Narrow Band	
	Low(dB)	High(dB)	Low(dB)	High(dB)
450.05	65.4	65.9	64.1	64.6
460.5	64.8	65.2	63.5	63.8
469.95	64.0	64.6	62.9	63.4

7.1.8 Audio Frequency Response

See Appendix A for Audio Frequency Response curves

7.1.9 Hum and Noise Ratio

Freq.(Mhz)		Wide(dB)	Narrow(dB)
469.95	Un-squelched	54.7	48.75
	Squelched	-86dbw	-86dbw

7.1.10 Audio Distortion

Freq.(Mhz)		Wide(%)	Narrow(%)
469.95	@ rated	1.80%	1.80%
	@ -17db	1.20%	1.20%

7.1.11 Audio Squelch Sensitivity

	Wide (dB)	Narrow (dB)
Threshold	-123.4dbm/6.2dbsin	-124dbm/3.6dbsin
Tight	-116.9dbm/21.5dbsin	-117.2dbm/15.6dbsin

7.1.12 Squelch Blocking

Wide	Narrow
pass	pass

7.1.13 Receiver Attack Time

The receiver attack time was measured to be: **24mS**

7.1.14 Receiver Closing Time

The receiver closing time was measured to be: **46mS**

7.1.15 Audio Sensitivity

Wide (KHz)	Narrow (KHz)
0.59	0.36

7.1.16 Current Drain Under Standard Test Conditions

Current Drain @ Rated Audio		255 ma
	Standby/Batt. Saver	
450.05	61.4/5.88 ma	
460.5	61.2/5.72 ma	
469.95	61.3/6.08 ma	

Note: 80% batt saver on and
20% standy

7.2 TRANSMITTER CHARACTERISTICS

7.2.1 RF Output Power

Freq.(MHz)	Wide (Watts/Amps)
450.05	4.12/1.46
460.5	4.43/1.44
469.95	4.36/1.42

7.2.2 Frequency Stability

Temperature (C.)	Frequency Error (PPM)
60	0.074
50	-0.017
40	-0.095
30	0.000
25	0.076

20	0.200
10	0.625
0	1.020
-10	1.490
-20	1.620
-30	1.440

7.2.3 Modulation Limiting

See Appendix B for Modulation Limiting Response Curves

7.2.4 Carrier Attack Time

The carrier attack time was measured to be: **68mS**

7.2.5 Audio Sensitivity

Freq. (MHz)	Wide (mvRms)	Narrow (mvRms)
450.05	11.9	11.5
460.5	12.6	12.2
469.95	12.2	12.1

7.2.6 Audio Frequency Response

See Appendix C and D for Audio Frequency Response Curves

7.2.7 Audio Distortion

	Wide (%)	Narrow (%)
Distortion	0.60%	1.00%

7.2.8 FM Hum and Noise Ratio

Freq. (MHz)	Wide (dB)	Narrow (dB)
450.05	49.6	44.7
460.5	52.3	48.4
469.95	52.7	50.7

7.2.9 AM Hum and Noise Ratio

	Wide (dB)	Narrow (dB)
H/N	32.7	33.5

7.2.10 Sideband Spectrum/Emission Mask

See Appendix E for Sideband Spectrum/Emission Mask Curves

7.2.11 Conducted Spurious Emissions

See Appendix F for Conducted Spurious Data

7.2.12 Transient Frequency Behavior

See Appendix G for Transient Behavior Curves

7.2.13 Audio Low Pass Filter Frequency Response

See Appendix H for Audio Low Pass Filter Response Curves

7.2.14 Deviation Symmetry

See Appendix I for Deviation Symmetry Data

7.2.15 Deviation Variation

See Appendix J for Deviation Variation Data

7.2.16 Frequency Stability vs. Voltage

Supply	Freq. Error (PPM)
6.0	-0.162
6.5	-0.169
7.0	-0.156
7.5	-0.152
8.0	-0.162
8.5	-0.175
9.0	-0.179

7.2.17 Radiated Spurious Emissions

See Appendix K and L for Radiated Spurious Emissions Data and Graphs

7.3 SUBAUDIBLE SIGNALLING CHARACTERISTICS

7.3.1 Squelch Opening SINAD

	Wide (dB)	Narrow (dB)
460.5	-122.1dbm/8.2dbsin	-122dbm/6.0dbsin

7.3.2 Transmitter Modulation Limiting

	+ Peak		- Peak	
	Wide (KHz)	Narrow (KHz)	Wide (KHz)	Narrow (KHz)
450.03				
Instant	4.875	2.64	4.886	2.66
Steady	4.83	2.42	4.75	2.43
Highest	5.3	2.68	5.11	2.66
460.5				
Instant	4.7	2.43	4.54	2.725
Steady	4.54	2.32	4.5	2.38
Highest	4.996	2.58	4.85	2.65
469.95				
Instant	5.31	3.3	5.08	3.48
Steady	4.69	2.38	4.66	2.44
Highest	5.27	2.68	5.06	2.76

7.3.3 CTCSS Tone Distortion

	Wide	Narrow
Distortion(%)	0.9%	1.2%

7.3.4 Transmitter SINAD

	Wide(dB)	Narrow(dB)
SINAD	42.0	39.8

7.3.5 CDCSS Waveform Distortion

The CDCSS waveform distortion was measured to be: **12.5%**

7.3.6 Transmitter Hum and Noise Ratio

	Wide(dB)	Narrow(dB)
H/N	52.0	45.8

7.3.7 Transmitter Sub-audible Deviation

Freq(MHz)	Wide(Hz)	Narrow(Hz)
450.05	657	479
460.5	689	491
469.95	700	500

8.0 RF SAFETY

The EUT is considered portable equipment and is subject to SAR requirements. A SAR evaluation was performed on the EUT and the results were satisfactory. The SAR report is included in this filing separately.

9.0 CONCLUSION

The EUT meets the applicable requirements of Parts 22, 74, 80 and 90.