Engineering and Testing for EMC and Safety Compliance

Certification Application Report

RoamEO Pet Location System
154.6 MHz

White Bear Technologies
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FCC ID: UAX-RPV1

Standards Referenced for this Report	
Part 2: 2005	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 95: 2005	Personal Radio Services; Subpart J: Multi-Use Radio Service (MURS)
ANSI/TIA/EIA 603-2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

Frequency Range (MHz)	Rated Transmit Power Conducted (W)	Measured Frequency Tolerance (ppm)	Emission Designator
154.6	0.295	0.84	17K6F1D

Testing Performed and Report Prepared by Test Engineer: Daniel Baltzell

Document Number: 2006101

August 9, 2006

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Test results relate only to the product tested.

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1 General Information

The following Type Certification Report is prepared on behalf of **White Bear Technologies** in accordance with the Federal Communications Commission. The Equipment Under Test (EUT) was the **RoamEO Pet Location System, FCC ID: UAX-RPV1**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, coaxial attenuator, preamplifier and cables.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia, 20170. This site has been fully described in a report submitted to and approved by the Federal Communications Commission, to perform AC line conducted and radiated emissions testing.

1.2 Related Submittal(s)/Grant(s)

This is an original application report.

2 Tested System Details

The EUT, RoamEO, is a pet location system that operates at 154.6 MHz in the MURS, or Multi-Use Radio Service band. The RF output power was measured at 0.295W. The EUT is analog FM.

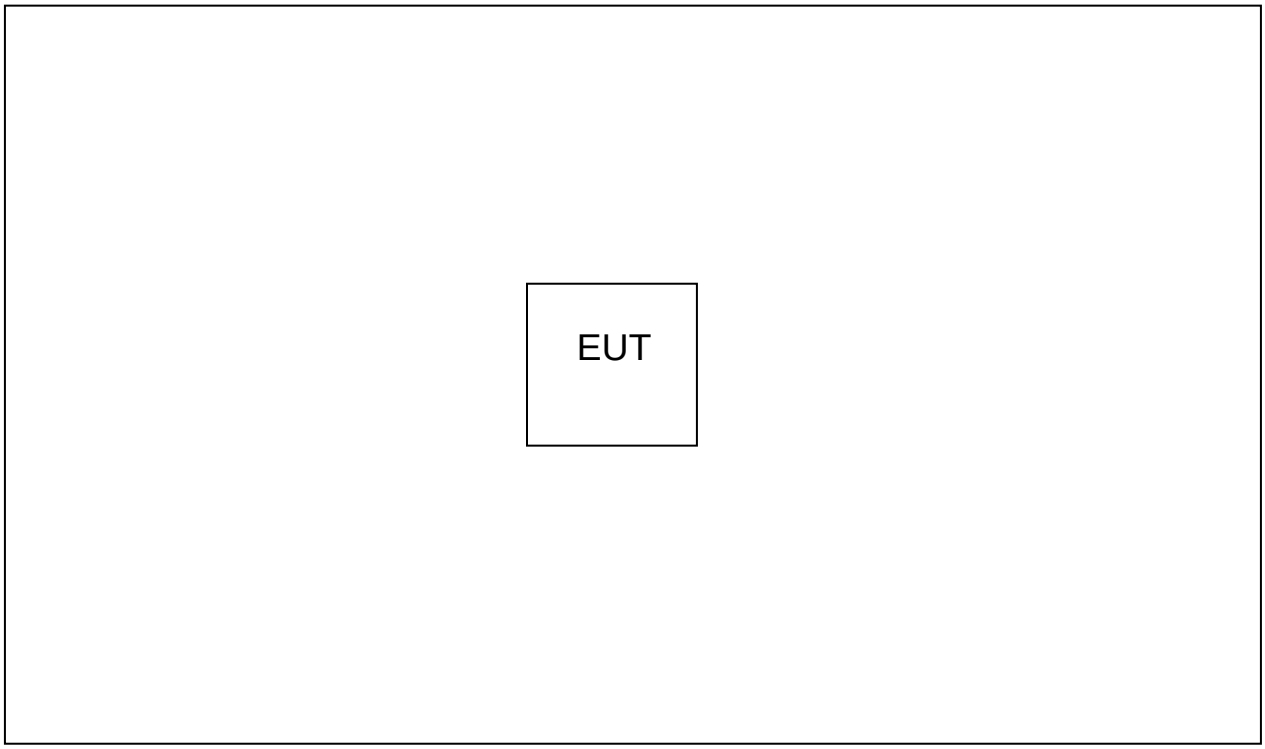
The test sample was received on July 28, 2006. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

Model Tested	RoamEO, Pet Location System
Frequency Band	154.6 MHz
Modulation Type	FM Analog
Authorized Channel Bandwidth	20 KHz
Primary Power	4.2 VDC Lithium Ion Battery
Rated Transmitter Output Power	0.295 W
Duty Cycle	Continuous 100%

Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	Cable Description	RTL Bar Code
Pet Location System	White Bear Technologies	RoamEO	N/A	UAX-RPV1	1 m unshielded power	17401

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2 §2.1033(c)(8): Voltages and Currents Through the Final Amplifying Stage

Nominal AC Voltage: 4.2 VDC
Current: 0.38 AMPS

Table 3-1: Test Equipment for Testing Voltages and Currents

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901350	Meterman	33XR	Multimeter	040402802	8/3/06

Test Personnel:

Daniel Baltzell		July 31, 2006
Test Engineer	Signature	Date Of Tests

4 FCC Rules and Regulations Part 2 §2.1046(a); Part 95.639(h): RF Power Output

4.1 Test Procedure

ANSI/TIA/EIA-603-2004, Section 2.2.1.

The EUT transmitter output was connected through an appropriate 50 ohm attenuator to a power meter.

4.2 Test Data

Table 4-1: RF Power Output: Carrier Output Power

Frequency (MHz)	Peak Power (W)
154.6	0.295

*Measurement accuracy: +/-.3 dB

4.3 Test Limits

Part §95.639(h): No MURS unit, under any condition of modulation, shall exceed 2 Watts transmitter power output.

Table 4-2: Test Equipment for Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901184/901186	Agilent	E4416A/E9323A	Power Meter/ Sensor	GB41050573/ S420.52510380	09/21/06
16793	MCU	BW-S20WS	Attenuator, 20 dB, DC-18 GHz, 5 W	0511	01/13/09

Test Personnel:

Daniel Baltzell		July 31, 2006
Test Engineer	Signature	Date Of Tests

5 FCC Rules and Regulations Part 2 §2.1051(a): Spurious Emissions at Antenna Terminals

5.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.13.

The transmitted was terminated with a 50 Ω load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 9600 bps.

5.2 Out of Band Spurious Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc.

Limits: P(dBm) – (43+10xLOG P(W))

The following frequency (in MHz) was investigated: 154.6. The worst case (unwanted emissions) channels are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

Table 5-1: Conducted Spurious Emissions –154.6 MHz

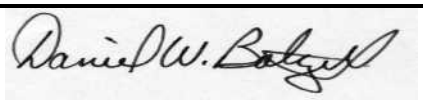
Conducted power = 0.295 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
309.2	-19.9	37.7	-57.6
463.8	-24.1	37.7	-61.8
618.4	-27.1	37.7	-64.8
773.0	-45.2	37.7	-82.9
927.6	-36.6	37.7	-74.3
1082.2	-33.1	37.7	-70.8
1236.8	-36.7	37.7	-74.4
1391.4	-36.1	37.7	-73.8
1546.0	-44.4	37.7	-82.1

Table 5-2: Test Equipment for Testing Conducted Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent	E4448A	Spectrum Analyzer	US44020346	11/2/06
16793	MCU	BW-S20WS	Attenuator, 20 dB, DC-18 GHz, 5 W	0511	1/13/09

Test Personnel:

Daniel Baltzell		July 30, 2006
Test Technician/Engineer	Signature	Date Of Test

6 FCC Rules and Regulations CFR 95.635(e)(3) and Part 2 §2.1049(c): Occupied Bandwidth (Emissions Masks)

6.1 Test Procedure

Device with digital modulation: Modulated to its maximum extent using its own internal modulation using emission mask 3 of CFR 95.635(e)(3) which is not equipped with an audio low pass filter.

ANSI/TIA/EIA-603-2004, Section 2.2.11.

6.2 In Band Spurious Test Data

Plot 6-1: Occupied Bandwidth/Emissions Masks; 154.6 MHz

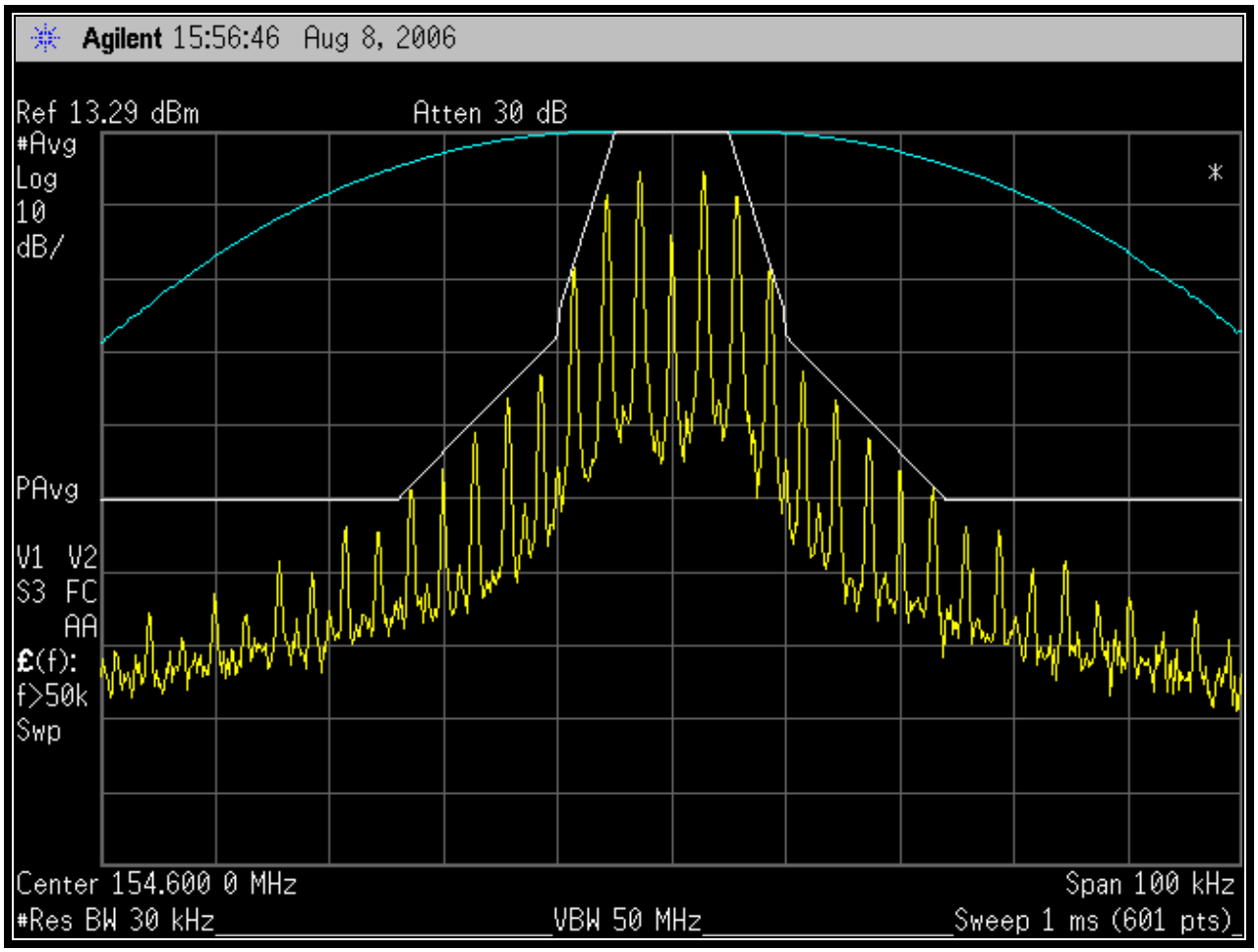


Table 6-1: Test Equipment for Testing Occupied Bandwidth/Emissions Masks

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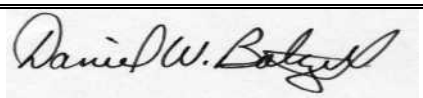
901413	Agilent	E4448A	Spectrum Analyzer	US44020346	11/2/06
16793	MCU	BW-S20WS	Attenuator, 20 dB, DC-18 GHz, 5 W	0511	1/13/09

Test Personnel:

Daniel Baltzell		August 8, 2006
Test Engineer	Signature	Date Of Test

7 FCC Rules and Regulations CFR 95.635(e)(3) and Part 2 §2.1053(a): Field Strength of Spurious Radiation

7.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.12.

The EUT was powered by an external power supply and modulated with its own internal modulation. The EUT was placed on a non-conducting table 80 cm above the ground plane. The antenna-to-EUT distance is 3 m. The EUT is rotated through 360 degrees to maximize emissions. The antenna is scanned in both vertical and horizontal polarizations. The spurious emissions levels were measured, and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half-wave dipole.

The EUT was scanned from 9 kHz to the 10th harmonic of the fundamental. The spectrum analyzer resolution bandwidth is set to 100 kHz and the video bandwidth 1 MHz for frequencies less than 1 GHz, and 1 MHz resolution/video bandwidth for frequencies over 1 GHz.

The spurious radiated emissions limit is calculated as follows:

Limits: P(dBm) – (43+10xLOG P(W))

7.2 Test Data

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

Table 7-1: Field Strength of Spurious Radiation: 154.6 MHz

Limit = 37.7
Conducted Power = 24.7 dBm = 0.295 W

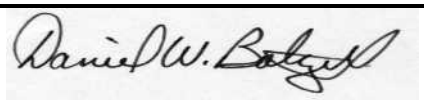
Emission Frequency (MHz)	Analyzer Reading (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBi)	Corrected Signal Generator (dBc)	Limit (dBc)	Margin (dB)
309.202	76.2	-37	0.2	1.7	60.2	37.7	-22.5
463.796	66.1	-42.8	0.2	1.6	66.1	37.7	-28.4
618.398	67.1	-40.8	0.2	0.6	65.1	37.7	-27.4
773.000	67.2	-37.6	0.4	0.1	62.6	37.7	-24.9
927.602	66.1	-36.2	0.3	0.6	60.6	37.7	-22.9
1082.204	64.9	-37.4	0.4	5.2	57.3	37.7	-19.6
1236.806	67.5	-33.7	0.5	5.8	53.1	37.7	-15.4
1546.010	64.9	-32	0.7	7.1	50.3	37.7	-12.6

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 7-2: Test Equipment for Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901053	Schaffner-Chase	CBL6112	Antenna (25 MHz – 2 GHz)	2648	11/1/06
900154	Compliance Design	Roberts Dipole	Adjustable Elements Dipole Antenna (30 - 1000 MHz)	N/A	12/21/06
900928	Hewlett Packard	HP 83752A	Synthesized Sweeper (.01 – 20 GHz)	3610A00866	11/10/06
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	8/3/06
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	8/3/06
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/3/06
900889	Hewlett Packard	85685A	RF Preselector (20 Hz - 2 GHz)	3146A01309	4/12/07
900905	Rhein Tech Labs	PR-1040	OATS 1 Preamplifier 40 dB (30 MHz – 2 GHz)	1006	3/15/07
901262	ETS	3115	Double Ridge Horn (1 – 26 GHz)	6748	4/19/08
901426	Insulated Wire Inc.	KPS-1503-3600-KPS	RF Cable, 30'	NA	12/12/06
901425	Insulated Wire Inc.	KPS-1503-2400-KPS	RF Cable, 20'	NA	12/12/06
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF Cable 36"	NA	12/12/06

Test Personnel:

Daniel Baltzell		July 28, 2006
Test Engineer	Signature	Date Of Test

8 FCC Rules and Regulations Part 95, §95.632(c); Part 2 §2.1055: Frequency Stability

8.1 Test Procedure

ANSI TIA-603-C-2004, section 2.3.1 and 2.3.2.

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +50°C.

The temperature was initially set to -30°C and a 1-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10°C through the range. A ½ hour period was observed to stabilize the EUT at each measurement step, and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal input voltage.

The worst-case test data are shown below in Table 8-1 and Table 8-2.

8.2 Frequency Stability Test Data

8.2.1 Frequency Stability/Temperature Variation

Table 8-1: Frequency Stability/Temperature Variation – 154.6 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	154.600034	0.22
-20	154.600009	0.06
-10	154.599998	-0.01
0	154.599896	-0.67
10	154.599970	-0.19
20	154.599940	-0.39
30	154.599969	-0.20
40	154.599970	-0.19
50	154.600000	0.00

8.2.2 Frequency Stability/Voltage Variation

Table 8-2: Frequency Stability/Voltage Variation – 154.6 MHz

Voltage (VAC)	Measured Frequency (MHz)	ppm
3.45	154.599880	-0.78
3.57	154.599870	-0.84
4.2	154.599880	-0.78
4.83	154.599940	-0.39

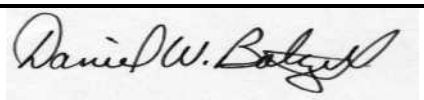
8.3 Test Limits

Part §95.632(c): (c) MURS transmitters must maintain frequency stability of 5.0 ppm, or 2.0 ppm if designed to operate with a 6.25 kHz bandwidth.

Table 8-3: Test Equipment for Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	1/20/07
901300	Agilent	53131A (225 MHz)	Universal Frequency Counter	MY40001345	11/23/06
16793	MCU	BW-S20WS	Attenuator, 20 dB, DC-18 GHz, 5 W	0511	1/13/09
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF Cable 36"	NA	12/12/06
901350	Meterman	33XR	Multimeter	040402802	8/3/06

Test Personnel:

Daniel Baltzell		July 30, 2006
Test Engineer	Signature	Date Of Tests

9 FCC Rules and Regulations Part 2 §2.202: Necessary Bandwidth and Emission Bandwidth

FCC Mask 95.635(e)(3)

Type of Emission F1D

Calculation:

B(n) =2M+2DK

where:

M = Maximum modulation in kHz = 2.9
D = Maximum deviation in kHz = 5.9
K = Constant factor = 1 (default)

B(n) = 17.6 kHz or 17K6

FCC Emission Designator 95.631(j) and 95.633(f)(2): 17K6F1D

10 Conclusion

The data in this measurement report shows that the **White Bear Technologies, Model RoamEO, Pet Location System, FCC ID: UAX-RPV1,** complies with all the applicable requirements of FCC Parts 95, 15 and 2.