EMISSIONS TEST REPORT

Report Number: 3152279BOX-002
Project Number: 3152279

Testing performed on the

VCA100 Radio

Model: BAEVCA100-V1FCGX-LF

To

CFR47 "Telecommunications"
FCC Part 22 Subpart E "Public Mobile Radio – Paging and Radiotelephone Service"
FCC Part 74 Subpart H "Experimental Radio, Auxiliary, Special Broadcast And Other Program Distributional Services – Low Power Auxiliary Stations"
FCC Part 90 Subpart I
"Private Land Mobile Radio Services – General Technical Requirements"

For

BAE Systems – Homeland Security Solutions

Test Performed by:	Test Authorized by:
Intertek – ETL SEMKO	BAE Systems – Homeland Security Solutions
70 Codman Hill Road	PTP1-2228
Boxborough, MA 01719	65 River Road
	Hudson, NH 03051

Prepared by: _____ Date: 05/12/2008
Nicholas Abbondante

Reviewed by: _____ Date: 05/13/08
Jeff Goulet

1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company:	BAE Systems – Homeland Security Solutions PTP1-2228 65 River Road Hudson, NH 03051
Contact:	Mr. Ralph Lombardo
Telephone:	(603) 885-7172
Fax:	N/A
Email:	Ralph.Lombardo@BAEsystems.com

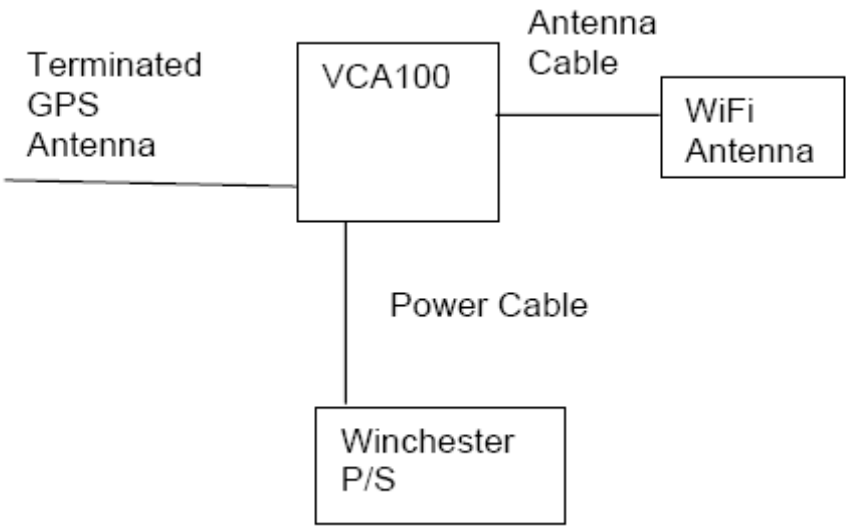
1.2 Equipment Under Test

Equipment Type:	VCA100 Radio
Model Number(s):	BAEVCA100-V1FCGX-LF
Serial number(s):	0713HNH000031
Manufacturer:	BAE Systems
EUT receive date:	05/01/2008
EUT received condition:	Prototype in Good Condition
Test start date:	05/01/2008
Test end date:	05/02/2008

1.3 Test Plan Reference: Tested according to the standards listed and ANSI/TIA-603-C-2004.

1.4 Test Configuration

1.4.1 Block Diagram



1.4.2. Cables:

Cable	Shielding	Connector	Length (m)	Qty.
WiFi Antenna Cable	Braid	SMA	4.2	1
GPS Antenna Cable	Braid	SMA	5.5	1
Power Cable	None	Plastic/Wire	3.25	1

1.4.3. Support Equipment:

Name: Antenex WiFi Antenna 2.4-2.5 GHz
Model No.: A10245
Serial No.: N/L

Name: All-Start Winchester Portable Power Generator
Model No.: WPG103
Serial No.: N/L

1.5 Mode(s) of Operation:

During testing, the EUT was powered from a nominal 12V DC power supply. The EUT was fully powered and was transmitting an unmodulated one second burst with one second intervals.

2.0 Test Summary

TEST STANDARD	RESULTS	
CFR47 Telecommunications FCC Part 24 Subpart E FCC Part 74 Subpart H FCC Part 90 Subpart I		
SUB-TEST	**TEST PARAMETER**	**COMMENT**
Radiated Emissions FCC §22.359(a), FCC §74.861(d)(3), FCC §90.210	Spurious emissions must not exceed -13 dBm ERP.	Pass

REVISION SUMMARY – The following changes have been made to this Report:

Date	Project No.	Project Handler	Page(s)	Item	Description of Change

3.0 Sample Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

Level in μV/m = [10(32 dBμV/m)/20] = 39.8 μV/m

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(48.1\ dB\mu V / 20)}$ = 254 μV/m

3.1 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.
The expanded uncertainty (k = 2) for radiated emissions from 30 to 1000 MHz has been determined to be:

±3.5 dB at 10m, ±3.8 dB at 3m

The expanded uncertainty (k = 2) for mains conducted emissions from 150 kHz to 30 MHz has been determined to be:

±2.6 dB

The expanded uncertainty (k = 2) for telecom port conducted emissions from 150 kHz to 30 MHz has been determined to be:

±3.2 for ISN and voltage probe measurements
±3.1 for current probe measurements

3.2 Site Description

Test Site(s): 2

Our OATS are 3m and 10m sheltered emissions measurement ranges located in a light commercial environment in Boxborough, Massachusetts. They meet the technical requirements of ANSI C63.4-2003 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity (12,000 lb. in Site 3) is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

The EMC Lab has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference groundplanes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Test Results: Pass

Test Standard: FCC Part 22 Subpart E, Part 74 Subpart H, Part 90 Subpart I

Test: Radiated Emissions

Performance Criterion: Spurious emissions must not exceed -13 dBm ERP.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	See Tables	Humidity (%):	See Tables	Pressure (hPa):	See Tables
Pretest Verification Performed		Yes		Equipment under Test:		BAEVCA100-V1FCGX-LF	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		0713HNH000031	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR2	05/20/2008
2	ANTENNA	EMCO	3142	9711-1225	06/05/2008
3	Site 2 10m in floor cable	ITS	RG214B/U	S2 10M FLR	09/17/2008
4	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
5	HORN ANTENNA	EMCO	3115	9610-4980	06/18/2008
6	HORN ANTENNA	EMCO	3115	9602-4675	09/24/2008
7	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	05/23/2008
8	40 GHz Cable	Megaphase	TM40-K1K1-197	7030801 002	05/23/2008
9	40 GHz Cable	Megaphase	TM40-K1K1-80	7030802 002	05/23/2008
10	1GHz High Pass Filter	Reactel, Inc	7HS-1G/10G-S11	06-1	09/18/2008
11	Synthesized Sweep Generator	Hewlett Packard	83620A	3213A01244	02/06/2009
12	Broadband Antenna	Compliance Design	B100	1852	09/13/2008
13	Broadband Antenna	Compliance Design	B200	1850	09/13/2008
14	Broadband Antenna	Compliance Design	B300	00674	09/13/2008
15	Preamplifier 1-40 GHz	MITEQ	NSP4000-NF	507145	11/09/2008

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Results:

Radiated Emissions, Substitution

Company: BAE Systems - Homeland Security Solutions
Model #: BAEVCA100-V1FCGX-LF
Serial #: 0713HNH000031
Engineer(s): Nicholas Abbondante Location: Site 2
Project #: 3152279 Date(s): 05/02/08
Standard: FCC Part 90
Barometer: BAR2 Temp/Humidity/Pressure: 20c 37% 1050mB

Rx Antenna: LOG4 HORN2
Rx Cable(s): S2 10M FLR MEG001 MEG002
Rx Preamp: PRE8 Receiver: ROS002
Tx Antenna: ANT2A ANT2B ANT2C
Tx Cable(s): MEG004 HORN3
Tx Signal Generator: HEW62 Filter: REA003
ERP or EIRP?: ERP

Test Distance (m): See Notes Voltage/Frequency: Fresh 12VDC Battery Frequency Range: 30-1800 MHz

Net = Generator Level (0.00 dBm) + (EUT reading - Generator reading) - Cable Loss + Antenna Gain (dBi or dBd)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	EUT Reading dB(uV)	Generator Reading dB(uV)	Transmit Cable Loss dB	Transmit Antenna dBi	Generator Level dBm	Net dBm	Limit dBm	Margin dB	Bandwidth
Note: 10m Test Distance											
PK	V	157.000	20.3	59.0	0.3	0.8	-20.0	-60.4	-13.0	-47.4	120/300 kHz
PK	V	314.000	17.9	51.1	0.4	-0.9	-20.0	-56.6	-13.0	-43.6	120/300 kHz
PK	V	471.000	10.2	47.0	0.5	-0.6	-20.0	-60.1	-13.0	-47.1	120/300 kHz
PK	V	628.000	11.1	46.0	0.6	2.0	-20.0	-55.6	-13.0	-42.6	120/300 kHz
PK	V	942.000	11.2	40.1	0.7	0.1	-20.0	-51.6	-13.0	-38.6	120/300 kHz
PK	V	35.280	7.8	44.6	0.1	-8.2	-20.0	-67.3	-13.0	-54.3	120/300 kHz
PK	V	112.800	11.9	58.2	0.2	-1.6	-20.0	-70.3	-13.0	-57.3	120/300 kHz
PK	V	130.880	15.8	62.9	0.2	0.5	-20.0	-69.0	-13.0	-56.0	120/300 kHz
PK	V	144.800	15.5	63.0	0.3	1.7	-20.0	-68.2	-13.0	-55.2	120/300 kHz
PK	V	166.500	9.9	58.1	0.3	-1.2	-20.0	-71.8	-13.0	-58.8	120/300 kHz
PK	V	233.400	8.7	54.1	0.3	0.4	-20.0	-67.4	-13.0	-54.4	120/300 kHz
PK	V	288.400	18.8	51.2	0.4	-0.2	-20.0	-55.1	-13.0	-42.1	120/300 kHz
PK	V	311.600	21.2	51.5	0.4	-1.0	-20.0	-53.9	-13.0	-40.9	120/300 kHz
PK	V	327.200	21.3	49.2	0.4	-0.8	-20.0	-51.2	-13.0	-38.2	120/300 kHz
PK	V	349.200	19.3	49.4	0.4	-1.7	-20.0	-54.3	-13.0	-41.3	120/300 kHz
PK	V	366.400	15.8	48.6	0.4	-1.4	-20.0	-56.9	-13.0	-43.9	120/300 kHz
PK	V	399.200	17.6	45.8	0.5	0.1	-20.0	-50.6	-13.0	-37.6	120/300 kHz
PK	V	415.600	21.8	48.2	0.5	0.7	-20.0	-48.3	-13.0	-35.3	120/300 kHz
PK	H	766.800	13.4	44.4	0.7	1.7	-20.0	-52.1	-13.0	-39.1	120/300 kHz
PK	H	801.200	15.5	44.3	0.7	2.5	-20.0	-49.2	-13.0	-36.2	120/300 kHz
Note: 3m Test Distance											
PK	V	1099.000	28.2	69.1	0.8	6.2	-20.0	-57.5	-13.0	-44.5	1/3 MHz
PK	V	1256.000	25.9	69.8	0.8	6.8	-20.0	-60.1	-13.0	-47.1	1/3 MHz
PK	V	1413.000	26.7	69.8	0.9	7.3	-20.0	-58.9	-13.0	-45.9	1/3 MHz
PK	V	1570.000	26.9	70.1	1.0	7.6	-20.0	-58.7	-13.0	-45.7	1/3 MHz
PK	V	1065.800	31.3	70.5	0.8	6.1	-20.0	-56.1	-13.0	-43.1	1/3 MHz
PK	V	1085.000	27.9	70.8	0.8	6.2	-20.0	-59.7	-13.0	-46.7	1/3 MHz
PK	V	1165.800	33.5	69.4	0.8	6.5	-20.0	-52.4	-13.0	-39.4	1/3 MHz
PK	V	1199.300	46.6	69.2	0.8	6.6	-20.0	-39.0	-13.0	-26.0	1/3 MHz
PK	V	1217.200	40.4	69.5	0.8	6.6	-20.0	-45.4	-13.0	-32.4	1/3 MHz

Radiated Emissions Setup Photos

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