EMISSIONS TEST REPORT

Report Number: 3139325BOX-001c
Project Number: 3139325

Testing performed on the

VCA100 Radio

Model: BAEVCA100-81FCGX-LF

To

FCC Part 15 Subpart B "Unintentional Radiators"

For
BAE Systems – Homeland Security Solutions

Test Performed by:	Test Authorized by:
Intertek – ETL SEMKO	BAE Systems – Homeland Security Solutions
70 Codman Hill Road	2 Forbes Road
Boxborough, MA 01719	Lexington, MA 02420

Prepared by: _____ Date: 10/27/2008
Nicholas Abbondante

Reviewed by: _____ Date: 10/27/08
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 2 Forbes Road Lexington, MA 02420
Contact:	Mr. Ralph Lombardo
Telephone:	603-885-7172
Fax:	N/A
Email:	Ralph.lombardo@baesystems.com

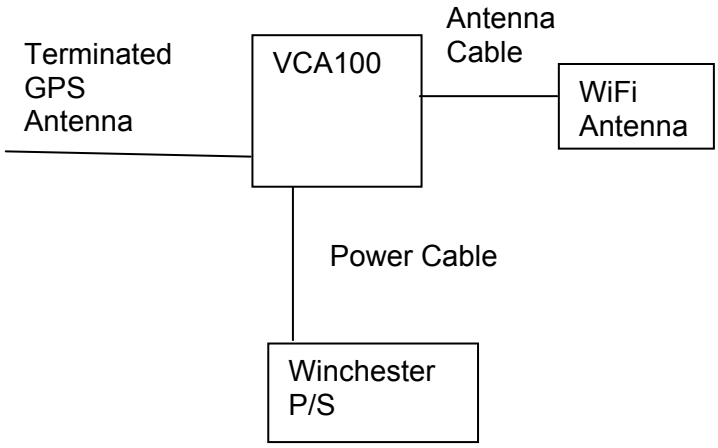
1.2 Equipment Under Test

Equipment Type:	VCA100 Radio
Model Number(s):	BAEVCA100-81FCGX-LF
Serial number(s):	0716HNH000075
Manufacturer:	BAE Systems – Homeland Security Solutions
EUT receive date:	09/02/2008
EUT received condition:	Prototype in Good Condition
Test start date:	10/15/2008
Test end date:	10/15/2008

1.3 Test Plan Reference: Tested according to the standards listed, and ANSI C63.4:2003.

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. During the FCC Part 15 Subpart B testing, the EUT was fully powered but no transmissions were occurring.

1.6 Floor Standing Equipment: Applicable:____ Not Applicable: X

2.0 Test Summary

TEST STANDARD	RESULTS	
FCC Part 15 Subpart B		
SUB-TEST	**TEST PARAMETER**	**COMMENT**
FCC Part 15 Subpart B		
Radiated Emissions Receiver Verification FCC §15.109	Spurious emissions must not exceed the FCC Part 15 Subpart B Class B limits.	Pass

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 15 Subpart B

Test: Radiated Emissions Receiver Verification, FCC §15.109

Performance Criterion: Spurious emissions must not exceed the FCC Part 15 Subpart B Class B limits.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	19	Humidity (%):	65	Pressure (hPa):	1004
Pretest Verification Performed		Yes		Equipment under Test:		BAEVCA100-81FCGX-LF	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		0716HNH000075	
Engineer's Initials:	NNA	Date Test Performed:	10/15/2008	Reviewer's Initials:		Date Reviewed:	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR1	06/01/2009
2	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
3	ANTENNA	EMCO	3142	9711-1223	02/22/2009
4	10 Meter in floor cable for site 2	ITS	RG214B/U	S2 10M FLR	09/23/2009

Software Utilized:

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

Test Details:

Radiated Emissions

Company: BAE Systems
Model #: BAEVCA100-81FCGX-LF
Serial #: 0716HNH000075
Engineers: Nicholas Abbondante
Project #: 3139325
Standard: FCC Part 15 Subpart B Class B
Receiver: R&S ESCI (ROS002)
PreAmp: PRE9 03-27-09.txt

Date(s): 10/15/08
Location: Site 2
Limit Distance (m): 3
Test Distance (m): 10

Antenna & Cables: N
Antenna: LOG2 2-22-09 V10m.txt
Cable(s): S2 10M FLR 09-23-09.txt
Barometer: BAR1

Bands: N, LF, HF, SHF
LOG2 2-22-09 H10m.txt
NONE.

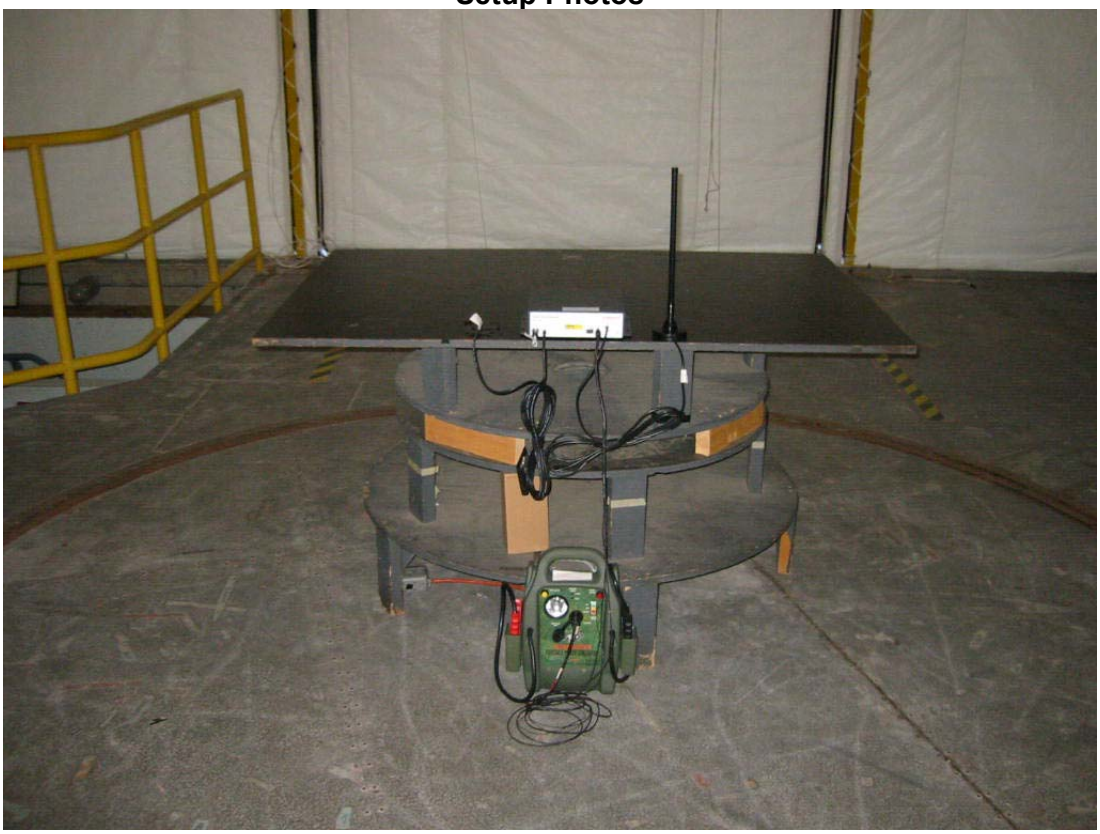
Temp/Humidity/Pressure: 19c 65% 1004mB

PreAmp Used? (Y or N): N
Voltage/Frequency: 12VDC
Frequency Range: 30-1000 MHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

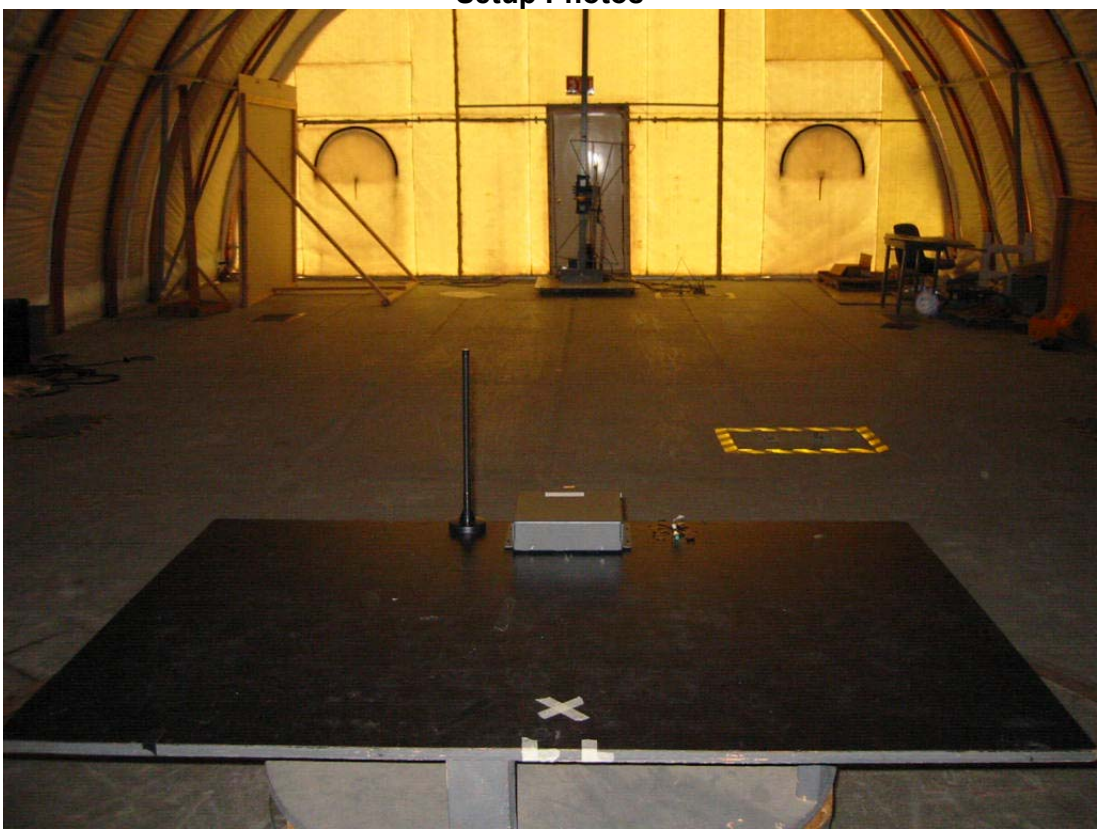
Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC
QP	V	32.500	4.8	12.9	0.8	0.0	-10.5	28.9	40.0	-11.1	120/300 kHz	
QP	V	85.440	2.5	7.5	1.8	0.0	-10.5	22.3	40.0	-17.7	120/300 kHz	
QP	V	110.268	7.6	8.6	2.0	0.0	-10.5	28.6	43.5	-14.9	120/300 kHz	RB
QP	V	114.552	7.9	8.4	2.1	0.0	-10.5	28.9	43.5	-14.6	120/300 kHz	RB
QP	V	124.464	10.8	8.2	2.2	0.0	-10.5	31.7	43.5	-11.8	120/300 kHz	RB
QP	V	130.764	11.9	8.3	2.2	0.0	-10.5	32.9	43.5	-10.6	120/300 kHz	RB
QP	V	136.644	8.3	8.6	2.3	0.0	-10.5	29.6	43.5	-13.9	120/300 kHz	RB
QP	V	146.808	11.0	10.3	2.4	0.0	-10.5	34.2	43.5	-9.3	120/300 kHz	
QP	V	150.400	2.0	10.9	2.4	0.0	-10.5	25.7	43.5	-17.8	120/300 kHz	
QP	V	166.600	7.6	11.4	2.5	0.0	-10.5	32.0	43.5	-11.5	120/300 kHz	RB
QP	V	197.100	4.6	12.0	2.2	0.0	-10.5	29.3	43.5	-14.2	120/300 kHz	
QP	V	233.200	2.3	13.1	2.4	0.0	-10.5	28.3	46.0	-17.7	120/300 kHz	
QP	V	261.600	18.1	13.4	2.6	0.0	-10.5	44.6	46.0	-1.4	120/300 kHz	RB
QP	V	278.000	0.9	13.9	2.8	0.0	-10.5	28.0	46.0	-18.0	120/300 kHz	RB
QP	V	294.400	4.4	13.7	2.8	0.0	-10.5	31.4	46.0	-14.6	120/300 kHz	
QP	V	309.800	5.9	14.5	2.8	0.0	-10.5	33.6	46.0	-12.4	120/300 kHz	
QP	V	333.000	5.6	15.4	3.0	0.0	-10.5	34.4	46.0	-11.6	120/300 kHz	RB
QP	V	366.600	10.1	16.8	3.1	0.0	-10.5	40.4	46.0	-5.6	120/300 kHz	
QP	V	392.200	11.3	17.8	3.3	0.0	-10.5	42.9	46.0	-3.1	120/300 kHz	
QP	V	425.000	5.6	17.6	3.4	0.0	-10.5	37.0	46.0	-9.0	120/300 kHz	
QP	V	433.400	2.4	17.8	3.4	0.0	-10.5	34.0	46.0	-12.0	120/300 kHz	
QP	H	436.800	6.1	17.2	3.4	0.0	-10.5	37.2	46.0	-8.8	120/300 kHz	

Setup Photos



30-1000 MHz Radiated Emissions

Setup Photos



30-1000 MHz Radiated Emissions