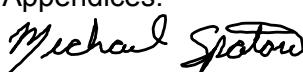
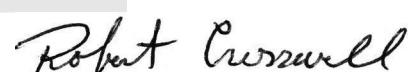


**EMC EMISSIONS - TEST REPORT (Full)**Test Report No. **3115790DEN-002** Issue Date: **Thurs 15 March 2007**Model / Serial No. **MN: F series /SN: 1113**Product Type **Tactical K9 Deployment Heat Alert System with pager**Client **Ray Allen Manufacturing**Manufacturer **Ray Allen Manufacturing**License holder **Ray Allen Manufacturing**Address **975 Ford St.****Colorado Springs, CO 80915****FCC CFR47 Part 15.247****PASS****3115790**Title 47 CFR 15: RADIO FREQUENCY  
DEVICES**36**

Tested By : Mike Spataro



Reviewed By : Robert Cresswell

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Lab Code:200264-0

The entity logos above are for reference only and may not apply to this test report.

## DIRECTORY

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## STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty for Conducted Emissions in the frequency range of 150kHz – 30MHz is calculated to be  $\pm 2.30$ dB and for Radiated Emissions is calculated to be  $\pm 3.60$ dB in the frequency range of 30MHz – 200MHz and  $\pm 3.38$ dB in the frequency range of 200MHz – 1000MHz.

EUT Received Date: 5-Feb-2007

Testing Start Date: 5-Feb-2007

Testing End Date: 13-Mar-2007

The tests were performed according to following regulations :

1. FCC CFR47 Part 15 subpart C

Emission Test Results:

**Conducted Emissions, Powerline (15.207) - NA****Test Result**

Minimum limit margin 0.0 dB at 0.0 MHz

Remarks: \_\_\_\_\_

**Radiated Emissions (15.209) - PASS****Test Result**

Minimum limit margin -13.1 dB at 38.95 MHz

Remarks: \_\_\_\_\_

**Channel Separation 15.247 (a)(1) - PASS**

Remarks: \_\_\_\_\_

**20dB Bandwidth 15.247 (a)(1)(i) - PASS**

Remarks: \_\_\_\_\_

**Number of Hopping Channel 15.247 (a)(1)(i) - PASS**

Remarks: \_\_\_\_\_

**Peak Output Power 15.247 (b)(2) - PASS****Test Result**

Minimum limit margin -47.9 dB at 902.69 MHz

Remarks: \_\_\_\_\_

**Radiated Emissions (15.205)/(15.247) (d) - PASS****Test Result**

Minimum limit margin -13.1 dB at 3610.82 MHz

Remarks: \_\_\_\_\_

**GENERAL REMARKS:**

The following remarks are to be considered as "where applicable" and are taken into account while completing any FCC/IC/ETSI radio tests at Intertek, ETL Semko.

Testing was performed in 3 different orthogonal axis to determine the worst case emissions from the device. The worst case emissions measurements are shown in this report.

**FCC CFR47 Part 15.31: Measurement Standards:** In any case where the device is powered off a battery, a fresh battery was used during test. In cases where the device is powered off an AC supply, voltage was varied per Part 15.31 to find worst case emissions.

**FCC CFR47 Part 15.35: Measurement Detector Functions and Bandwidths:** FCC Part 15.35 was utilized when performing the measurements within this report.

Whenever possible the approved test procedures specified in FCC document DA 00-705 for Frequency Hopping Spread Spectrum Systems devices was used for testing.

**Limit Calculation:**

At the time of testing, Intertek ETL Semko was unable to obtain the gain of the antenna for the EUT from the manufacturer of the EUT or from the manufacturer of the antenna. Therefore, the following calculation was used to determine the field strength limit for a test distance of 3m. This calculation assumes ideal isotropic radiation from the source.

$$P = 20 \cdot \log(E) - 95.2289$$

P is power in dBm

E is uV/m

Testing was also completed under project number 3118182.

Modifications required to pass: None

Test Specification Deviations: Additions to or Exclusions from: None

**Required Information In Accordance to FCC CFR 47 Part 2.1033:**

Rule Part 11, 15 & 18 Devices	Other Rule Part Devices	Description	Comments
<b>2.1033(b)(1)</b>	<b>2.1033(c)(1)</b>	<i>Manu. Contact</i>	See Page 1 of this report
<b>2.1033(b)(2)</b>	<b>2.1033(c)(2)</b>	<i>FCC Identifier</i>	
<b>2.1033(b)(3)</b>	<b>2.1033(c)(3)</b>	<i>Users Manual to include Operating, installation</i>	Attached as Exhibit
	<b>2.1033(c)(4)</b>	<i>Emissions Designator per 2.</i>	
	<b>2.1033(c)(5)</b>	<i>Frequency Range</i>	Not Applicable to Part 15 Devcies
	<b>2.1033(c)(6)</b>	<i>Power range and controls</i>	Not Applicable to Part 15 Devcies
	<b>2.1033(c)(7)</b>	<i>Maximum power output rating</i>	Not Applicable to Part 15 Devcies
	<b>2.1033(c)(8)</b>	<i>DC Voltage and Current suplying final RF stages</i>	Not Applicable to Part 15 Devcies
<b>2.1033(b)(3)</b>	<b>2.1033(c)(9)</b>	<i>Tune –up procedure</i>	Please refer to the users manual for applicability
<b>2.1033(b)(4&amp;5)</b>	<b>2.1033(c)(10)</b>	<i>Complete Circuit Diagrams and circuit operation description</i>	Attached as Exhibit
<b>2.1033(b)(7)</b>	<b>2.1033(c)(11)</b>	<i>Photographs/drawings of the identification label &amp; its location on the device</i>	Attached as Exhibit
<b>2.1033(b)(7)</b>	<b>2.1033(c)(12)</b>	<i>Photographs of the external and internal surfaces, and construction</i>	Attached as Exhibit
	<b>2.1033(c)(13)</b>	<i>Digital Modulation</i>	Not Applicable
<b>2.1033(b)(6)</b>	<b>2.1033(c)(14)</b>	<i>Report of Measurement Data Required by 2.1046 – 2.1057</i>	See Data
<b>2.1033(b)(8)</b>		<i>Description of publicly available support equipment used during test</i>	Refer to Appendix B of this report (Client Test Plan)
<b>2.1033(b)(9)</b>		<i>Statement of Authorization to Part 15.37 of CFR47</i>	The equipment herein is being authorized in accordance to 15.37 of the CFR47 Rules.
<b>2.1033(b)(10)</b>		<i>Direct Sequence Spread Spectrum Devices (DSSS)</i>	NA
<b>2.1033(b)(10)</b>		<i>Frequency Hopping Devices</i>	See Data
<b>2.1033(b)(11)</b>		<i>Scanning receiver construction</i>	Exhibit stating compliance to construction in accordance to 15.121.
<b>15.31</b>	<b>15.31</b>	<i>Transmitter Supply Voltage</i>	Testing herein was completed in accordance to FCC CFR47 Part 15.31

Test-setup photo(s):  
Conducted Emissions

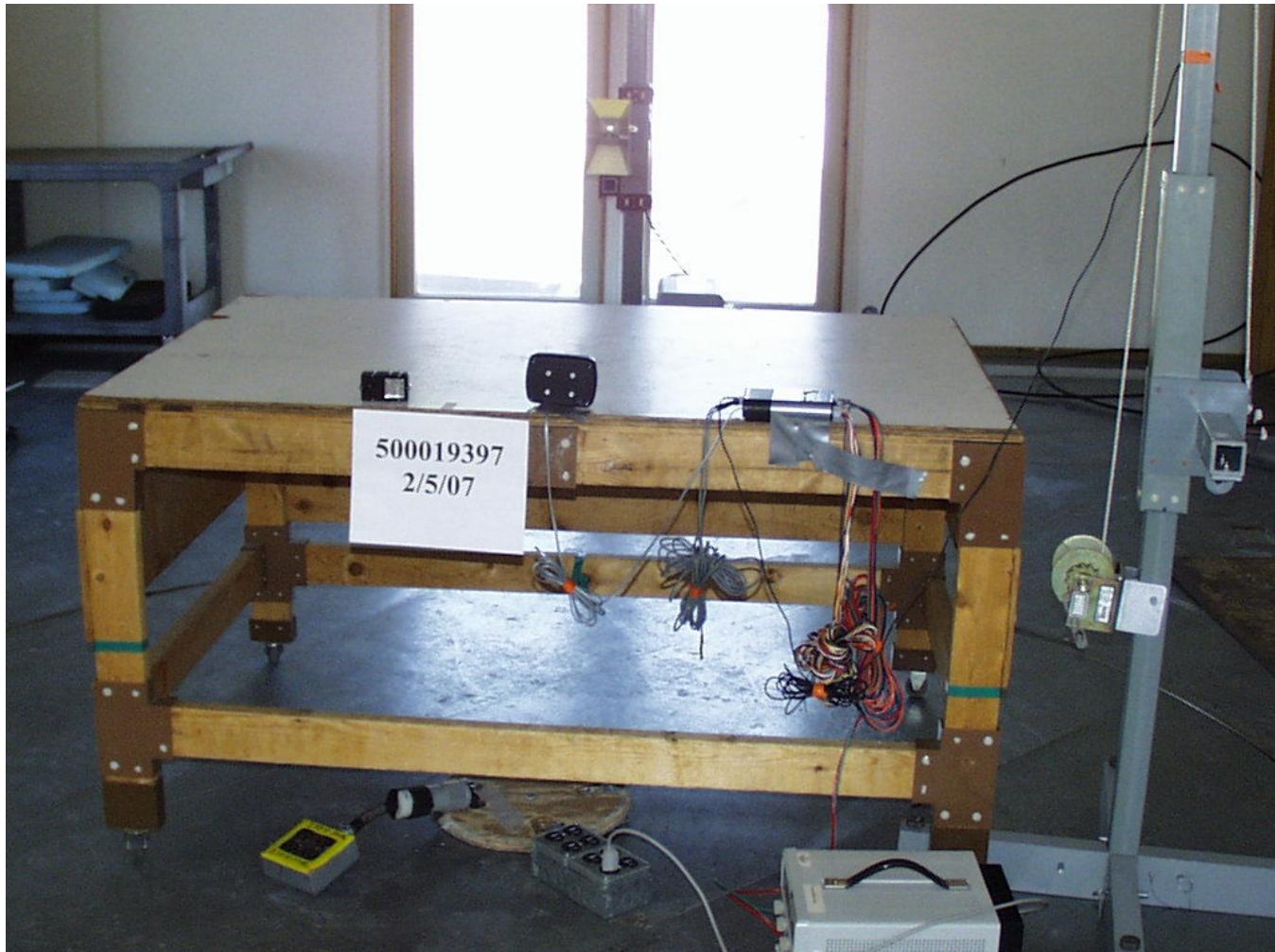
Not Applicable

Test-setup photo(s):

Radiated Unintentional Emissions:



Test-setup photo(s):  
Radiated Unintentional Emissions:



Test-setup photo(s):

Radiated Intentional Emissions:



Test-setup photo(s):  
Radiated Intentional Emissions:



Test-setup photo(s):

Radiated Intentional Emissions:



**Appendix A**

Test Data Sheets

and

Test Equipment Used

**Radiated Unintentional Emission  
15.209**

**And**

**Spurious Emission  
15.247 (d)**

# Radiated Electromagnetic Emissions

Test Report #:	3115790 Run 1	Test Area:	Pinewood Site 1 (3m)	Temperature:	23.5	°C
Test Method:	FCC Part 15.209	Test Date:	05-Feb-2007	Relative Humidity:	20.6	%
EUT Model #:	F series	EUT Power:	3.6 VDC Battery	Air Pressure:	103.4	kPa
EUT Serial #:	1113 pager and pod					
Manufacturer:	Ray Allen					
EUT Description:	Tactical K9 Deployment Heat Alert System with pager					
Notes:						

Level Key

Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
Testing from 19kHz to 30MHz with loop perpendicular.						
0.0598	75.4 Qp	0.1 / 11.4 / 0.0	86.9	V / 1.0 / 0.0	-25.2	N/A
0.400	38.8 Qp	0.1 / 10.7 / 0.0	49.6	V / 1.0 / 0.0	-46.0	N/A
7.59	25.0 Qp	0.2 / 10.8 / 0.0	36.0	V / 1.0 / 0.0	-33.5	N/A
0.0598	75.3 Qp	0.1 / 11.4 / 0.0	86.7	V / 1.0 / 180.0	-25.4	N/A
0.400	38.6 Qp	0.1 / 10.7 / 0.0	49.4	V / 1.0 / 180.0	-46.2	N/A
7.59	22.0 Qp	0.2 / 10.8 / 0.0	32.9	V / 1.0 / 180.0	-36.6	N/A
The following were maximized between 19KHz and 30MHz.						
0.0598	75.4 Qp	0.1 / 11.4 / 0.0	86.9	V / 1.0 / 30.0	-25.2	N/A
0.400	40.2 Qp	0.1 / 10.7 / 0.0	51.0	V / 1.0 / 25.0	-44.6	N/A
7.59	30.2 Qp	0.2 / 10.8 / 0.0	41.2	V / 1.0 / 215.0	-28.3	N/A
Testing from 19kHz to 30MHz with loop parallel.						
0.0598	80.7 Qp	0.1 / 11.4 / 0.0	92.1	H / 1.0 / 0.0	-20.0	N/A
0.400	36.0 Qp	0.1 / 10.7 / 0.0	46.8	H / 1.0 / 0.0	-48.8	N/A
7.59	29.8 Qp	0.2 / 10.8 / 0.0	40.8	H / 1.0 / 0.0	-28.7	N/A
0.0598	80.8 Qp	0.1 / 11.4 / 0.0	92.3	H / 1.0 / 180.0	-19.8	N/A
0.400	35.7 Qp	0.1 / 10.7 / 0.0	46.5	H / 1.0 / 180.0	-49.1	N/A
7.59	19.8 Qp	0.2 / 10.8 / 0.0	30.8	H / 1.0 / 180.0	-38.7	N/A
The following were maximized between 19kHz and 30MHz.						
0.0598	80.9 Qp	0.1 / 11.4 / 0.0	92.3	H / 1.0 / 92.0	-19.8	N/A
7.59MHz did not maximize any higher.'						
37.35	39.5 Qp	0.6 / 12.3 / 28.0	24.4	V / 1.0 / 0.0	-15.6	N/A
38.95	40.9 Qp	0.6 / 12.1 / 28.0	25.7	V / 1.0 / 0.0	-14.3	N/A
53.69	39.3 Qp	0.7 / 9.8 / 28.0	21.8	V / 1.0 / 0.0	-18.2	N/A
54.59	41.1 Qp	0.7 / 9.6 / 28.0	23.4	V / 1.0 / 0.0	-16.6	N/A
173.39	31.6 Qp	1.4 / 12.5 / 27.3	18.2	V / 1.0 / 0.0	-25.3	N/A

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
<hr/>						
37.35	38.2 Qp	0.6 / 12.3 / 28.0	23.1	V / 1.0 / 90.0	-16.9	N/A
38.95	38.8 Qp	0.6 / 12.1 / 28.0	23.6	V / 1.0 / 90.0	-16.4	N/A
53.69	39.3 Qp	0.7 / 9.8 / 28.0	21.8	V / 1.0 / 90.0	-18.2	N/A
54.59	41.2 Qp	0.7 / 9.6 / 28.0	23.5	V / 1.0 / 90.0	-16.5	N/A
173.39	30.5 Qp	1.4 / 12.5 / 27.3	17.1	V / 1.0 / 90.0	-26.4	N/A
<hr/>						
53.69	39.4 Qp	0.7 / 9.8 / 28.0	21.9	V / 1.0 / 180.0	-18.1	N/A
54.59	41.4 Qp	0.7 / 9.6 / 28.0	23.7	V / 1.0 / 180.0	-16.3	N/A
<hr/>						
53.69	40.0 Qp	0.7 / 9.8 / 28.0	22.5	V / 1.0 / 270.0	-17.5	N/A
54.59	42.3 Qp	0.7 / 9.6 / 28.0	24.6	V / 1.0 / 270.0	-15.4	N/A
173.39	36.2 Qp	1.4 / 12.5 / 27.3	22.8	V / 1.0 / 270.0	-20.7	N/A
<hr/>						
The following were maximized between 30 and 200 MHz.						
<hr/>						
38.95	42.2 Qp	0.6 / 12.1 / 28.0	26.9	V / 1.0 / 85.0	-13.1	N/A
54.59	44.5 Qp	0.7 / 9.6 / 28.0	26.8	V / 1.0 / 200.0	-13.2	N/A
173.39	39.0 Qp	1.4 / 12.5 / 27.3	25.6	V / 3.2 / 200.0	-17.9	N/A
<hr/>						
No higher emissions found: 0Deg, Horizontal.						
<hr/>						
No higher emissions found: 90Deg, Horizontal.						
<hr/>						
No higher emissions found: 180Deg, Horizontal.						
<hr/>						
No higher emissions found: 270Deg, Horizontal						
<hr/>						
Noise floor.						
195.00	21.3 Qp	1.5 / 13.7 / 27.2	9.2	H / 2.0 / 270.0	-34.3	N/A
<hr/>						
No emissions found: 0Deg, 200 to 1000MHz Vertical.						
<hr/>						
No emissions found: 90Deg, 200 to 1000MHz Vertical.						
<hr/>						
No emissions found: 180Deg, 200 to 1000MHz Vertical.						
<hr/>						
No emissions found: 270Deg, 200 to 1000MHz Vertical.						
<hr/>						
The following are noise.						
200.00	34.6 Qp	1.5 / 11.8 / 27.2	20.6	V / 1.0 / 270.0	-22.9	N/A
500.00	20.3 Qp	2.6 / 19.4 / 28.1	14.3	V / 1.0 / 270.0	-31.7	N/A
990.00	18.9 Qp	3.7 / 24.1 / 27.0	19.7	V / 1.0 / 270.0	-34.3	N/A
<hr/>						
No emissions found: 0Deg, 200 to 1000MHz Horizontal.						
<hr/>						
No emissions found: 90Deg, 200 to 1000MHz Horizontal.						
<hr/>						
No emissions found: 180Deg, 200 to 1000MHz Horizontal.						
<hr/>						
No emissions found: 270Deg, 200 to 1000MHz Horizontal.						
<hr/>						
The following are noise floor.						
250.00	23.0 Qp	1.7 / 12.2 / 26.9	10.0	H / 1.0 / 270.0	-36.0	N/A
550.00	19.4 Qp	2.6 / 19.0 / 28.1	12.9	H / 1.0 / 270.0	-33.1	N/A
995.00	18.8 Qp	3.7 / 24.0 / 27.1	19.4	H / 1.0 / 270.0	-34.6	N/A

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
No emissions found between 1 and 5 GHz Vertical.						
Noise floor.						
3997.00	35.6 Av	5.7 / 32.7 / 37.6	36.5	V / 1.0 / 270.0	N/A	-17.5
No emissions found between 1 and 5 GHz Horizontal.						
Noise floor.						
5000.00	38.5 Av	7.6 / 33.6 / 41.1	38.6	H / 1.0 / 270.0	N/A	-15.4

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
<b>***** Measurement Summary *****</b>						
38.95	42.2 Qp	0.6 / 12.1 / 28.0	26.9	V / 1.0 / 85.0	-13.1	N/A
54.59	44.5 Qp	0.7 / 9.6 / 28.0	26.8	V / 1.0 / 200.0	-13.2	N/A
5000.00	38.5 Av	7.6 / 33.6 / 41.1	38.6	H / 1.0 / 270.0	N/A	-15.4
37.35	39.5 Qp	0.6 / 12.3 / 28.0	24.4	V / 1.0 / 0.0	-15.6	N/A
53.69	40.0 Qp	0.7 / 9.8 / 28.0	22.5	V / 1.0 / 270.0	-17.5	N/A
3997.00	35.6 Av	5.7 / 32.7 / 37.6	36.5	V / 1.0 / 270.0	N/A	-17.5
173.39	39.0 Qp	1.4 / 12.5 / 27.3	25.6	V / 3.2 / 200.0	-17.9	N/A
0.0598	80.9 Qp	0.1 / 11.4 / 0.0	92.3	H / 1.0 / 92.0	-19.8	N/A
200.00	34.6 Qp	1.5 / 11.8 / 27.2	20.6	V / 1.0 / 270.0	-22.9	N/A
7.59	30.2 Qp	0.2 / 10.8 / 0.0	41.2	V / 1.0 / 215.0	-28.3	N/A
500.00	20.3 Qp	2.6 / 19.4 / 28.1	14.3	V / 1.0 / 270.0	-31.7	N/A
550.00	19.4 Qp	2.6 / 19.0 / 28.1	12.9	H / 1.0 / 270.0	-33.1	N/A
195.00	21.3 Qp	1.5 / 13.7 / 27.2	9.2	H / 2.0 / 270.0	-34.3	N/A
990.00	18.9 Qp	3.7 / 24.1 / 27.0	19.7	V / 1.0 / 270.0	-34.3	N/A
995.00	18.8 Qp	3.7 / 24.0 / 27.1	19.4	H / 1.0 / 270.0	-34.6	N/A
250.00	23.0 Qp	1.7 / 12.2 / 26.9	10.0	H / 1.0 / 270.0	-36.0	N/A
0.400	40.2 Qp	0.1 / 10.7 / 0.0	51.0	V / 1.0 / 25.0	-44.6	N/A

## Channel Separation

**15.247 (a)(1)**

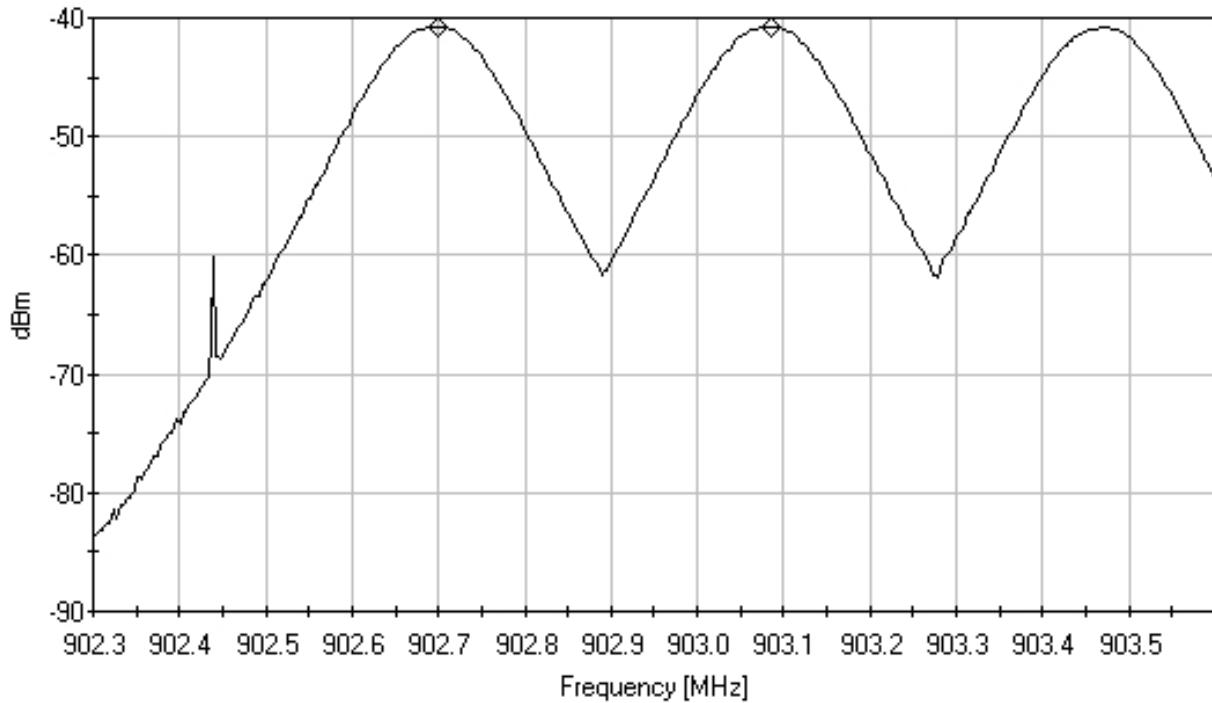
# Channel Separation

Test Report #:	3115790	Test Area:	GP-1	Temperature:	23.5	°C
Test Method:	FCC Part 15.247	Test Date:	13-Mar-2007	Relative Humidity:	20.6	%
EUT Model #:	F series	EUT Power:	3.6 VDC Battery	Air Pressure:	103.4	kPa
EUT Serial #:	1113 pager and pod					
Manufacturer:	Ray Allen					
EUT Description:	Tactical K9 Deployment Heat Alert System with pager					
Notes:	Testing for RAK9SR					
	Measurements taken with a near field probe.					

## Level Key

Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

15.247(a)(1) Channel Separation  
Ref Level -30 dBm ATTEN 5 dB  
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 5.0msec  
Marker 1: 902.699MHz -40.69 dBm Marker 2: 903.086MHz -40.74 dBm Delta: 387.0kHz



## **20dB Bandwidth**

**15.247 (a)(1)(i)**

# Bandwidth

Test Report #: **3115790**

Test Area: GP-1

Temperature: 23.5 °C

Test Method: FCC Part 15.247

Test Date: 13-Mar-2007

Relative Humidity: 20.6 %

EUT Model #: F series

EUT Power: 3.6 VDC Battery

Air Pressure: 103.4 kPa

EUT Serial #: 1113 pager and pod

Manufacturer: Ray Allen

EUT Description: Tactical K9 Deployment Heat Alert System with pager

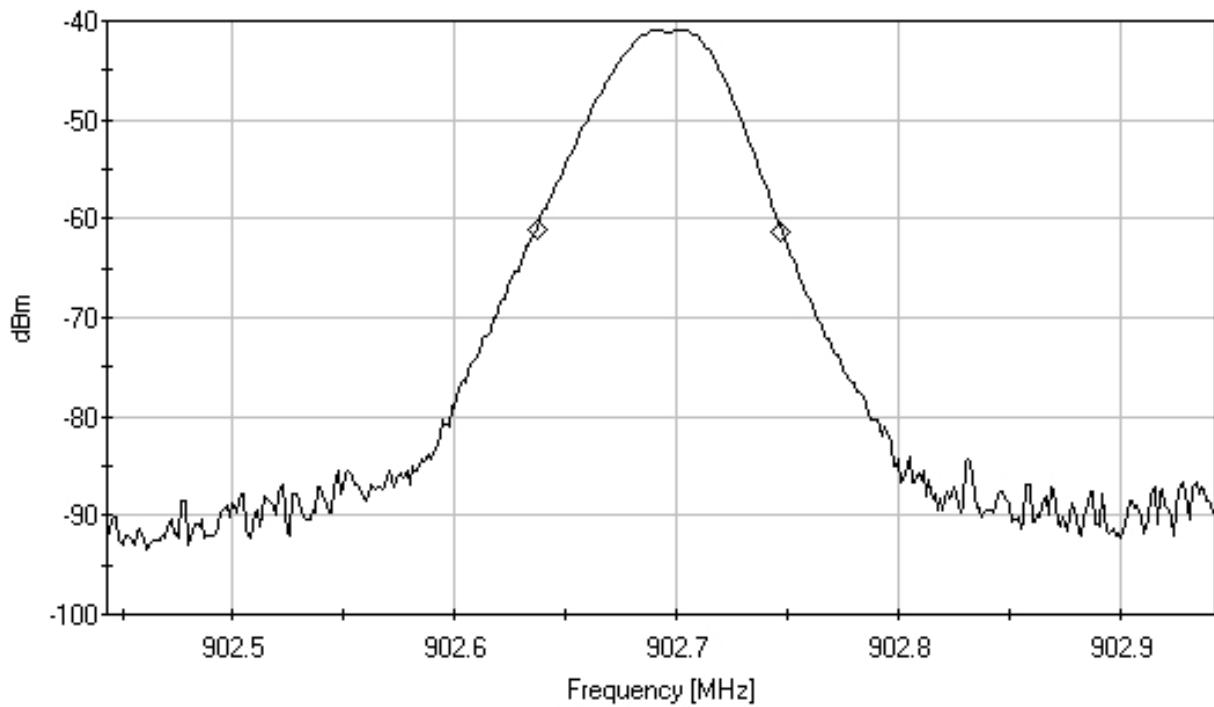
Notes: Testing for RAK9SR

Measurements taken with a near field probe.

**Level Key**

Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

15.247(a)(1)(i) 20dB Bandwidth  
Ref Level -31 dBm ATTEN 5 dB  
RES BW: 30.0kHz VID BW: 30.0kHz SWP: 5.0msec  
Marker 1: 902.637MHz -61.2 dBm Marker 2: 902.747MHz -61.25 dBm Delta: 110.0kHz



## **Number of Hopping Channels**

**15.247 (a)(1)(i)**

# Number of Hopping Channels

Test Report #: **3115790**

Test Area: GP-1

Temperature: 23.5 °C

Test Method: FCC Part 15.247

Test Date: 13-Mar-2007

Relative Humidity: 20.6 %

EUT Model #: F series

EUT Power: 3.6 VDC Battery

Air Pressure: 103.4 kPa

EUT Serial #: 1113 pager and pod

Manufacturer: Ray Allen

EUT Description: Tactical K9 Deployment Heat Alert System with pager

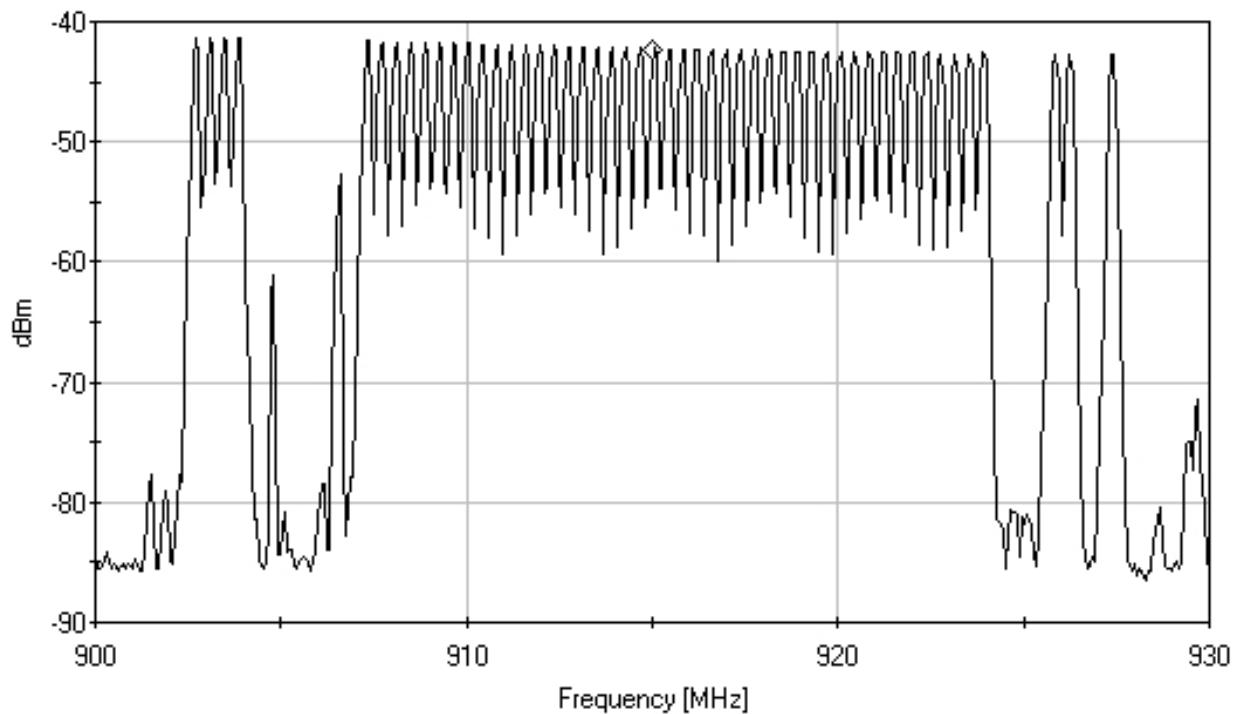
Notes: Testing for RAK9SR

Measurements taken with a near field probe.

**Level Key**

Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

15.247(a)(1)(i) Number of Hopping Channels  
Ref Level -23.5 dBm ATTEN 5 dB  
RES BW: 100.0kHz VID BW: 100.0kHz SVVP: 4.0msec  
Marker: 915.0MHz -42.25dBm



## **15.247 (b)(2), (d)/15.205 Test Data**

**Data sheets are in the following order:**

**Radiated measurements of the Fundamental and restricted band harmonics**

**Radiated near field measurements for band-edge compliance**

# Field Strength Measurements

## Fundamental and Spurious of the Transmitter

Test Report #:	<b>3115790</b>	Test Area:	Pinewood Site 1 (3m)	Temperature:	22.3	°C
Test Method:	15.247	Test Date:	09-Mar-2007	Relative Humidity:	26.9	%
EUT Model #:	F Series	EUT Power:	3.6 VDC Battery	Air Pressure:	101.3	kPa
EUT Serial #:	1113 pager and pod	Page:				
Manufacturer:	Ray Allen	Level Key				
EUT Description:	Tactical K9 Deployment Heat Alert System with pager					
Notes:	Testing for RAK9SR					

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
The following duty cycle was declared by the manufacturer.								
40%								
<b>Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.</b>								
The testing performed in accordance to FCC CFR47 Part 15.205 (restricted bands of operation) and 15.2xx emissions and delta limits were calculated as follows:								
Final Corrected Peak Measurement – Duty Cycle Correction Factor* = Final Calculated Emission								
The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.209 and 15.247 and the emission/limit delta was calculated. the DTCF is calculated as follows $20 \cdot \log_{10}(\text{duty cycle in 100mS})$ “not to exceed 20dB”								
<b>Part 15.247 and 15.205</b> Respectively								
Worst case axis determined from previous testing.								
Low Channel								
902.69	55.4 Pk	3.6 / 23.1 / 0.0	82.1	V / 1.2 / 133.0	0.0	82.1	130.0	-47.9
902.69	52.0 Pk	3.6 / 23.1 / 0.0	78.7	H / 1.0 / 133.0	0.0	78.7	130.0	-51.3
Mid Channel								
915.02	52.8 Pk	3.6 / 23.2 / 0.0	79.6	V / 1.1 / 125.0	0.0	79.6	130.0	-50.4
915.02	50.0 Pk	3.6 / 23.2 / 0.0	76.8	H / 1.1 / 189.0	0.0	76.8	130.0	-53.2
High Channel								
927.32	50.7 Pk	3.6 / 23.4 / 0.0	77.7	H / 1.4 / 157.0	0.0	77.7	130.0	-52.3
927.32	51.5 Pk	3.6 / 23.4 / 0.0	78.6	V / 1.1 / 151.0	0.0	78.6	130.0	-51.4
Low Channel Harmonics								
1805.4	55.4 Pk	3.1 / 26.6 / 37.0	48.1	V / 1.2 / 355.0	7.9	40.2	62.1	-21.9
1805.42	49.2 Pk	3.1 / 26.6 / 37.0	41.9	H / 1.4 / 50.0	7.9	34.0	62.1	-28.1
2708.11	38.6 Pk	4.2 / 29.5 / 37.8	34.6	V / 1.0 / 0.0	7.9	26.7	54.0	-27.3
2708.12	39.2 Pk	4.2 / 29.5 / 37.8	35.2	H / 1.0 / 0.0	7.9	27.3	54.0	-26.7
3610.82	50.2 Pk	5.0 / 31.7 / 38.1	48.8	V / 1.0 / 251.0	7.9	40.9	54.0	-13.1
3610.82	45.8 Pk	5.0 / 31.7 / 38.1	44.4	H / 1.6 / 160.0	7.9	36.5	54.0	-17.5
4513.52	38.6 Pk	6.6 / 32.5 / 41.2	36.6	V / 1.0 / 295.0	7.9	28.7	54.0	-25.3
4513.53	37.4 Pk	6.6 / 32.5 / 41.2	35.4	H / 1.0 / 0.0	7.9	27.5	54.0	-26.5
5416.24	34.0 Pk	6.9 / 34.3 / 40.7	34.5	H / 1.0 / 0.0	7.9	26.6	54.0	-27.4
5416.24	33.9 Pk	6.9 / 34.3 / 40.7	34.4	V / 1.0 / 0.0	7.9	26.5	54.0	-27.5
6318.94	33.2 Pk	8.2 / 35.0 / 41.5	34.9	H / 1.0 / 0.0	7.9	27.0	62.1	-35.1
6318.96	34.5 Pk	8.2 / 35.0 / 41.5	36.2	V / 1.0 / 77.0	7.9	28.3	62.1	-33.8
7221.64	33.4 Pk	8.1 / 36.3 / 42.2	35.6	H / 1.0 / 0.0	7.9	27.7	62.1	-34.4
7221.66	35.1 Pk	8.1 / 36.3 / 42.2	37.3	V / 1.0 / 95.0	7.9	29.4	62.1	-32.7

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m)	(dB)

The following duty cycle was declared by the manufacturer.

40%

**Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.**

The testing performed in accordance to FCC CFR47 Part 15.205 (restricted bands of operation) and 15.2xx emissions and delta limits were calculated as follows:

Final Corrected Peak Measurement – Duty Cycle Correction Factor\* = Final Calculated Emission

The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.209 and 15.2xx and the emission/limit delta was calculated. the DTCF is calculated as follows  $20 \log_{10}(\text{duty cycle in 100mS})$  "not to exceed 20dB"

**Part 15.247 and 15.205 Respectively**

8124.37	43.5 PK	8.3 / 37.3 / 49.9	39.4	H / 1.0 / 0.0	7.9	31.5	54.0	-22.5
8124.37	42.9 PK	8.3 / 37.3 / 49.9	38.7	V / 1.0 / 0.0	7.9	30.8	54.0	-23.2
9027.08	42.2 PK	8.5 / 38.5 / 51.2	38.1	H / 1.0 / 0.0	7.9	30.2	54.0	-23.8
9027.08	44.5 PK	8.5 / 38.5 / 51.2	40.3	V / 1.0 / 0.0	7.9	32.4	54.0	-21.6

**Mid Channel Harmonics**

1830.06	52.5 PK	3.1 / 26.7 / 37.3	45	V / 1.0 / 229.0	7.9	37.1	62.1	-25.0
1830.06	47.8 PK	3.1 / 26.7 / 37.3	40.4	H / 1.2 / 134.0	7.9	32.5	62.1	-29.6
2745.07	42.5 PK	4.3 / 29.6 / 37.9	38.5	V / 1.0 / 355.0	7.9	30.6	54.0	-23.4
2745.07	49.8 PK	4.3 / 29.6 / 37.9	45.7	H / 1.1 / 173.0	7.9	37.8	54.0	-16.2
3660.09	46.8 PK	5.1 / 31.8 / 38.3	45.4	V / 1.0 / 229.0	7.9	37.5	54.0	-16.5
3660.09	43.4 PK	5.1 / 31.8 / 38.3	42	H / 1.1 / 145.0	7.9	34.1	54.0	-19.9
4575.05	35.5 PK	6.8 / 32.7 / 41.2	33.7	H / 1.0 / 0.0	7.9	25.8	54.0	28.2
4575.09	35.5 PK	6.8 / 32.7 / 41.2	33.7	V / 1.0 / 0.0	7.9	25.8	54.0	28.2
5490.05	34.1 PK	6.7 / 34.5 / 41.1	34.2	H / 1.0 / 0.0	7.9	26.3	62.1	-35.8
5490.09	33.5 PK	6.7 / 34.5 / 41.1	33.6	V / 1.0 / 0.0	7.9	25.7	62.1	-36.4
6405.05	34.1 PK	8.3 / 35.1 / 41.7	35.9	H / 1.0 / 0.0	7.9	28.0	62.1	-34.1
6405.09	34.2 PK	8.3 / 35.1 / 41.7	36	V / 1.0 / 0.0	7.9	28.1	62.1	-34.0
7320.09	34.1 PK	8.2 / 36.5 / 41.6	37.2	V / 1.0 / 0.0	7.9	29.3	54.0	24.7
7320.09	33.0 PK	8.2 / 36.5 / 41.6	36.1	H / 1.0 / 0.0	7.9	28.2	54.0	25.8
8235.09	44.8 PK	8.4 / 37.5 / 50.0	40.7	V / 1.0 / 0.0	7.9	32.8	54.0	21.2
8235.09	43.5 PK	8.4 / 37.5 / 50.0	39.4	V / 1.0 / 0.0	7.9	31.5	54.0	22.5
9150.09	46.3 PK	8.8 / 38.6 / 50.2	43.5	V / 1.0 / 0.0	7.9	35.6	54.0	-18.4
9150.09	44.5 PK	8.8 / 38.6 / 50.2	41.7	V / 1.0 / 0.0	7.9	33.8	54.0	-20.2

**High Channel Harmonics**

1854.67	47.5 PK	3.1 / 26.8 / 37.1	40.4	V / 1.0 / 355.0	7.9	32.5	62.1	-29.6
1854.68	44.8 PK	3.1 / 26.8 / 37.1	37.6	H / 1.2 / 254.0	7.9	29.7	62.1	-32.4
2782.01	42.8 PK	4.3 / 29.7 / 38.0	38.8	V / 1.0 / 355.0	7.9	30.9	54.0	23.1
2782.01	51.4 PK	4.3 / 29.7 / 38.0	47.4	H / 1.0 / 176.0	7.9	39.5	54.0	-14.5
3709.35	43.3 PK	5.2 / 31.9 / 38.3	42.1	V / 1.0 / 234.0	7.9	34.2	54.0	-19.8
3709.35	39.9 PK	5.2 / 31.9 / 38.3	38.7	H / 1.0 / 144.0	7.9	30.8	54.0	-23.2
4636.69	35.8 PK	6.9 / 32.8 / 41.2	34.3	H / 1.0 / 0.0	7.9	26.4	54.0	-27.6
4636.69	35.5 PK	6.9 / 32.8 / 41.2	33.9	V / 1.0 / 0.0	7.9	26.0	54.0	-28.0
5564.03	34.6 PK	6.8 / 34.5 / 40.9	35	H / 1.0 / 0.0	7.9	27.1	62.1	-35.0
5564.03	35.4 PK	6.8 / 34.5 / 40.9	35.8	V / 1.0 / 0.0	7.9	27.9	62.1	-34.2
6491.37	33.5 PK	8.5 / 35.2 / 41.5	35.7	H / 1.0 / 0.0	7.9	27.8	62.1	-34.3
6491.37	33.4 PK	8.5 / 35.2 / 41.5	35.5	V / 1.0 / 0.0	7.9	27.6	62.1	-34.5
7418.71	32.9 PK	8.2 / 36.8 / 42.2	35.6	H / 1.0 / 0.0	7.9	27.7	54.0	26.3
7418.71	32.7 PK	8.2 / 36.8 / 42.2	35.5	V / 1.0 / 0.0	7.9	27.6	54.0	26.4
8346.05	40.6 PK	8.4 / 37.6 / 50.3	36.4	V / 1.0 / 0.0	7.9	28.5	54.0	-25.5
8346.05	44.5 PK	8.4 / 37.6 / 50.3	40.2	H / 1.0 / 0.0	7.9	32.3	54.0	-21.7
9273.39	45.4 PK	9.0 / 38.7 / 50.9	42.1	V / 1.0 / 0.0	7.9	34.2	62.1	-27.9
9273.39	45.4 PK	9.0 / 38.7 / 50.9	42.1	H / 1.0 / 0.0	7.9	34.2	62.1	-27.9

# Band-edge

Test Report #: **3115790**

Test Area: GP-1

Temperature: 23.5 °C

Test Method: FCC Part 15.247

Test Date: 13-Mar-2007

Relative Humidity: 20.6 %

EUT Model #: F series

EUT Power: 3.6 VDC Battery

Air Pressure: 103.4 kPa

EUT Serial #: 1113 pager and pod

Manufacturer: Ray Allen

EUT Description: Tactical K9 Deployment Heat Alert System with pager

Notes: Testing for RAK9SR

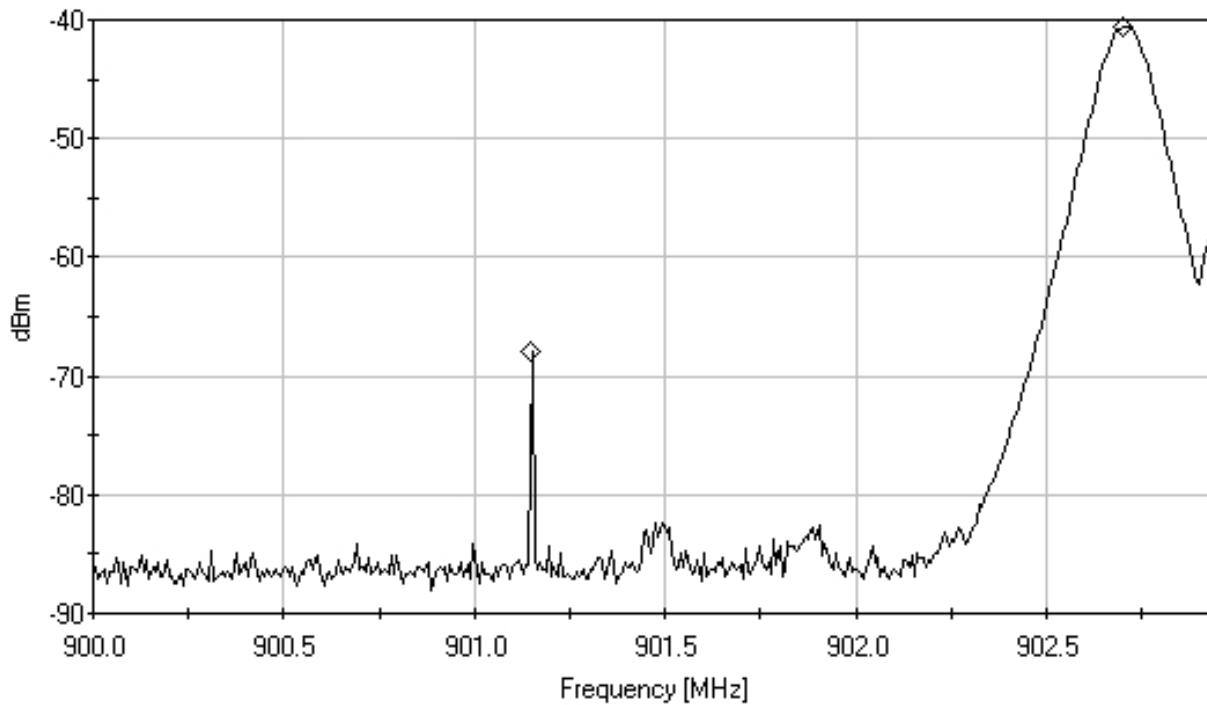
## Level Key

Pk – Peak Nb – Narrow Band

Qp – QuasiPeak Bb – Broad Band

Av - Average

15.247(d) Band-edge compliance Low Channel  
Ref Level -38.5 dBm ATTEN 5 dB  
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 5.0msec  
Marker 1: 902.7MHz -40.54 dBm Marker 2: 901.147MHz -67.9 dBm Delta: 1.553MHz

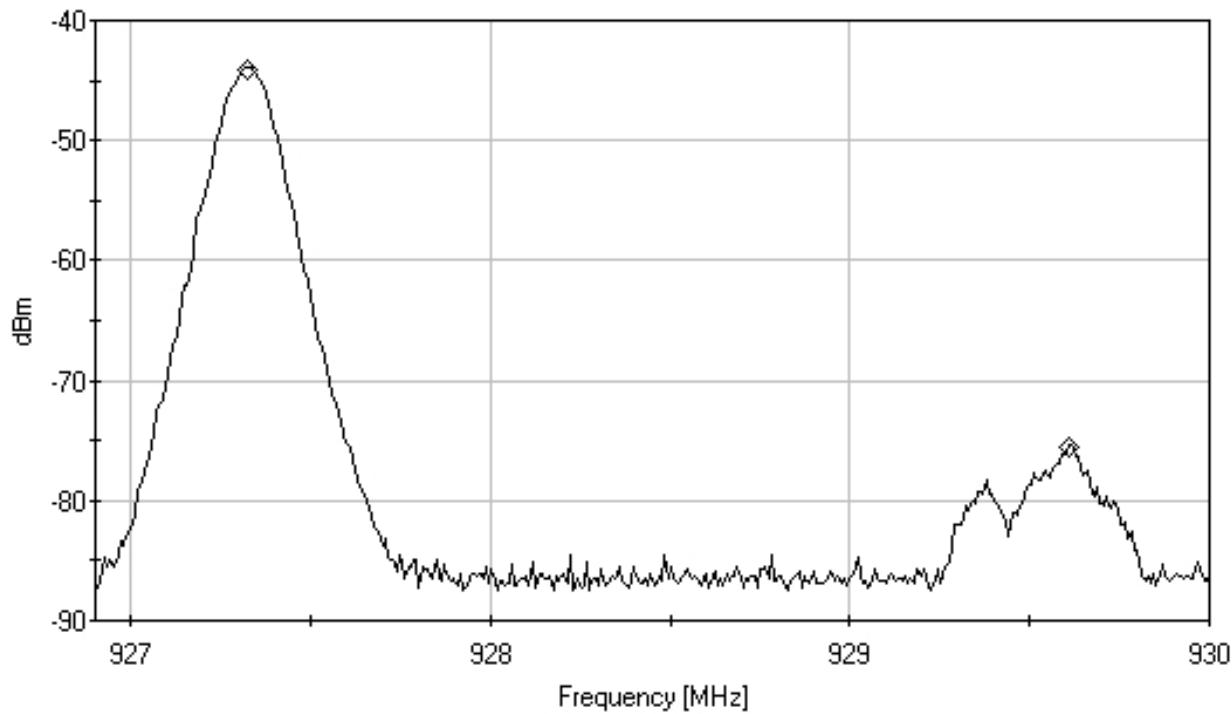


# Band-edge

Test Report #:	3115790	Test Area:	GP-1	Temperature:	23.5	°C
Test Method:	FCC Part 15.247	Test Date:	13-Mar-2007	Relative Humidity:	20.6	%
EUT Model #:	F series	EUT Power:	3.6 VDC Battery	Air Pressure:	103.4	kPa
EUT Serial #:	1113 pager and pod					
Manufacturer:	Ray Allen					
EUT Description:	Tactical K9 Deployment Heat Alert System with pager					
Notes:	Testing for RAK9SR					

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

15.247(d) Band-edge compliance High Channel  
Ref Level -41 dBm ATTEN 5 dB  
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 5.0msec  
Marker 1: 927.326MHz -44.02 dBm Marker 2: 929.612MHz -75.55 dBm Delta: 2.286MHz



## **List of Equipment Utilized for Final Test**

# Project Report

Technician Mike Spataro

Project 3115790

Begin Date: 2/5/2007 End Date: 3/13/2007

Capital Asset ID	Manufacturer	Model #	Serial #	Description	Test Performed	Service Type	Service Date	Service Due
18660	Hewlett-Packard	85662A	2318A04983	Spectrum Analyzer Display Section (set 1)	R Radiated Emissions	For Cal	12/7/2006	12/7/2007
18830	Hewlett-Packard	85650A	2811A01300	Q.P Adapter	R Radiated Emissions	For Cal	2/16/2007	2/16/2008
18832	Hewlett-Packard	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	R Radiated Emissions	For Cal	12/7/2006	12/7/2007
18837	EMCO	3115	9205-3886	Horn Antenna 1-18GHz	R Radiated Emissions	For Cal	3/6/2007	3/6/2008
18888	EMCO	3146	9402-3775	Log Periodic Antenna (200-1000MHz)	R Radiated Emissions	For Cal	10/31/2006	10/31/2007
18889	EMC TEST SYSTEMS	3109	3142	Bionical Antenna 30-300MHz	R Radiated Emissions	For Cal	10/31/2006	10/31/2007
18897	EMCO	6502	9205-2738	Magnetic loop	R Radiated Emissions	For Cal	8/8/2006	8/8/2007
18900	Avantek	AFT97-8434-10F	1007	RF Pre-Amplifier (4-8 GHz)	R Radiated Emissions	For Ver	4/4/2006	4/4/2007
18901	Avantek	AWT-18037	1002	RF Pre-Amplifier (8-18 GHz)	R Radiated Emissions	For Ver	4/4/2006	4/4/2007
18906	Mini-Circuits Lab	ZHL-42	N052792-2	Amplifier	R Radiated Emissions	For Ver	4/4/2006	4/4/2007
18912	Hewlett-Packard	8447F	3113A05545	9 kHz - 1.3GHz Pre Amp	R Radiated Emissions	For Ver	5/8/2006	5/8/2007

## Appendix B

Test Plan

and

Constructional Data Form

**To be supplied by the customer**

**Appendix C**

Measurement Protocol

And

Test Procedures

## MEASUREMENT PROTOCOL

### GENERAL INFORMATION

#### Test Methodology

Conducted and radiated emission testing is performed according to the procedures in ANSI C63.4 & CNS13438.

#### Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

### CONDUCTED EMISSIONS

The final level, expressed in dB $\mu$ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the applicable limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

- dB $\mu$ V = 20(log  $\mu$ V)
- $\mu$ V = Inverse log(dB $\mu$ V/20)

### RADIATED EMISSIONS

The final level, expressed in dB $\mu$ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB $\mu$ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the applicable limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

*Example: At a Test Frequency of 30 MHz, with a peak reading on the spectrum analyzer or measuring receiver of 14 dB $\mu$ V:*

Measured Level	+	Transducer & Cable Loss factor	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dB $\mu$ V)		(dB)		(dB $\mu$ V/m)	(dB $\mu$ V/m)		(dB $\mu$ V/m)		
<b>14.0</b>		<b>14.9</b>		<b>28.9</b>	<b>40.0</b>		<b>28.9</b>		<b>-11.1</b>

## DETAILS OF TEST PROCEDURES

### *General Standard Information*

The test methods used comply with ANSI C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

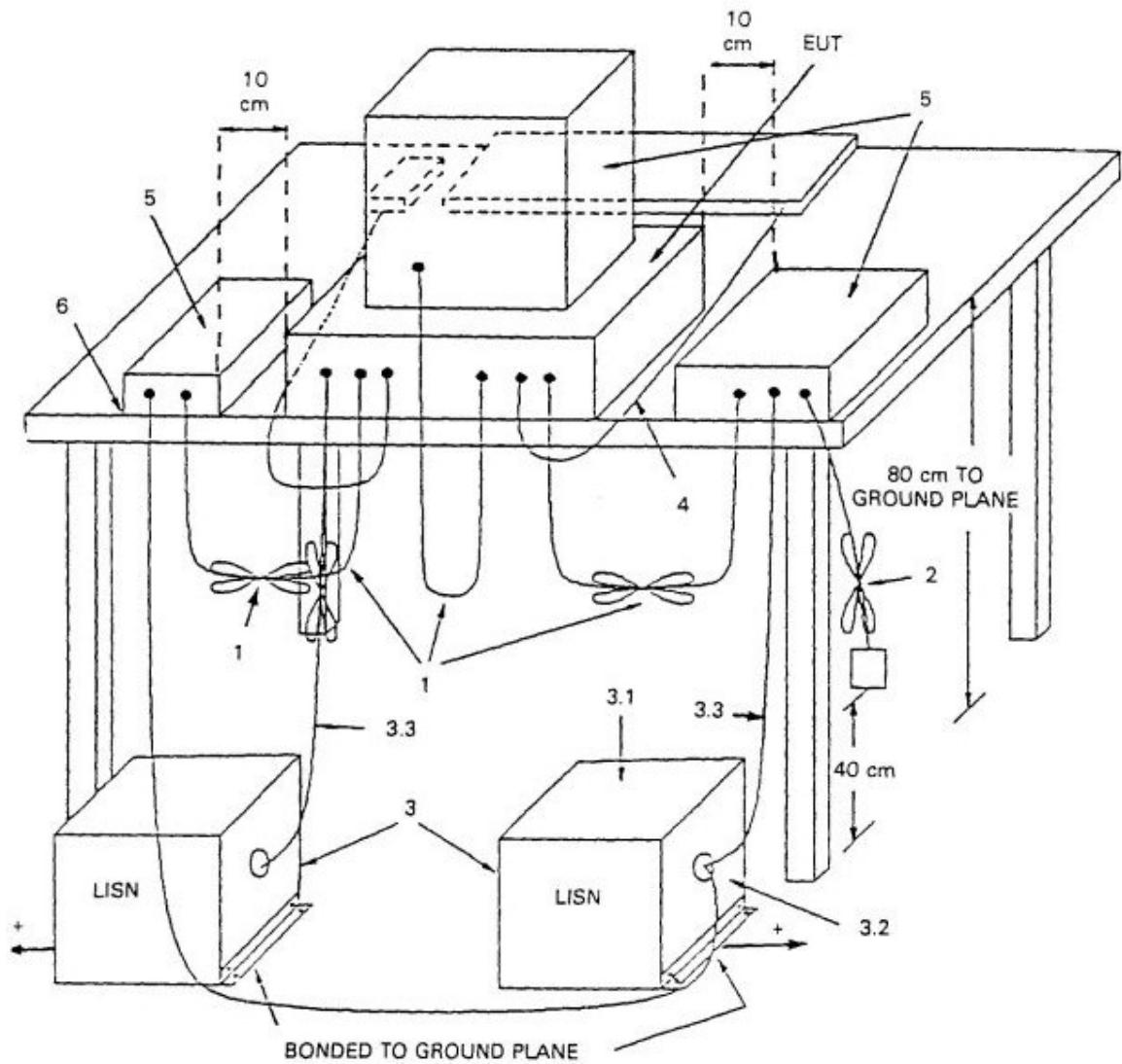
### **Conducted Emissions**

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with  $50\ \Omega/50\ \mu\text{H}$  (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

### **Radiated Emissions**

Radiated emissions from the EUT are measured in the frequency range of 30 to 22GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

## Conducted Emissions Diagram:



**Radiated Emissions Diagram:**