

EMC EMISSIONS - TEST REPORT (Full)

Test Report No. **3115787DEN-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.**

Test Criteria Applied **Colorado Springs, CO 80915**
Test Result **FCC CFR47 Part 15.247**

PASS

Test Project Number
References
Total Pages
Including
Appendices:

3115787

36

Title 47 CFR 15: RADIO FREQUENCY
DEVICES

Michael Spataro

Robert Cresswell

Tested By : Mike Spataro

Reviewed By : Robert Cresswell

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Lab Code:200264-0

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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 $\pm 2.30\text{dB}$ and for Radiated Emissions is calculated to be $\pm 3.60\text{dB}$ in the frequency range of 30MHz – 200MHz and $\pm 3.38\text{dB}$ 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 -19.1 dB at 902-927 MHz

Remarks: Conducted port measurements

Radiated Emissions (15.205)/(15.247) (d) - PASS

Test Result

Minimum limit margin -2.6 dB at 2745.06 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.

The data contained in this report is for the POD(RAK9POD) portion of the F series system.

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:

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



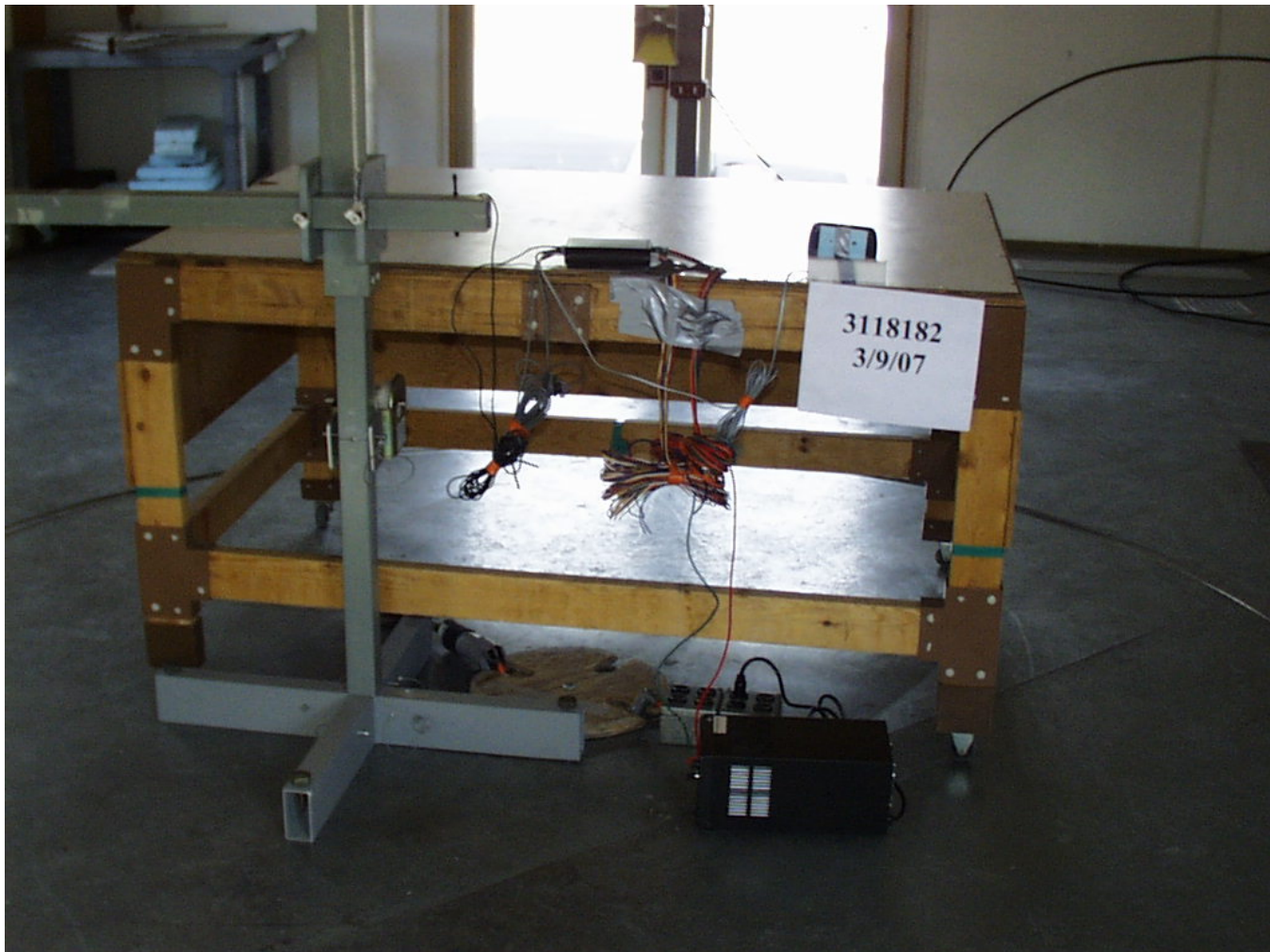
Test-setup photo(s):
Radiated Unintentional Emissions:



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



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



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 #:	3115787 Run 1	Test Area:	Pinewood Site 1 (3m)
Test Method:	FCC Part 15.209	Test Date:	05-Feb-2007
EUT Model #:	F series	EUT Power:	12.5-13.5 VDC vehicle
EUT Serial #:	1113 pager and pod		
Manufacturer:	Ray Allen		
EUT Description:	Tactical K9 Deployment Heat Alert System with pager		
Notes:	<div style="border: 1px solid black; height: 20px; width: 100%;"></div> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		

Temperature:	23.5	°C
Relative Humidity:	20.6	%
Air Pressure:	103.4	kPa

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) (dBm) (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) (dBm) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
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
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
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
The following were maximized between 30 and 200 MHz.						
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
No higher emissions found: 0Deg, Horizontal.						
No higher emissions found: 90Deg, Horizontal.						
No higher emissions found: 180Deg, Horizontal.						
No higher emissions found: 270Deg, Horizontal						
Noise floor.						
195.00	21.3 Qp	1.5 / 13.7 / 27.2	9.2	H / 2.0 / 270.0	-34.3	N/A
No emissions found: 0Deg, 200 to 1000MHz Vertical.						
No emissions found: 90Deg, 200 to 1000MHz Vertical.						
No emissions found: 180Deg, 200 to 1000MHz Vertical.						
No emissions found: 270Deg, 200 to 1000MHz Vertical.						
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
No emissions found: 0Deg, 200 to 1000MHz Horizontal.						
No emissions found: 90Deg, 200 to 1000MHz Horizontal.						
No emissions found: 180Deg, 200 to 1000MHz Horizontal.						
No emissions found: 270Deg, 200 to 1000MHz Horizontal.						
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	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
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	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
***** Measurement Summary *****						
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

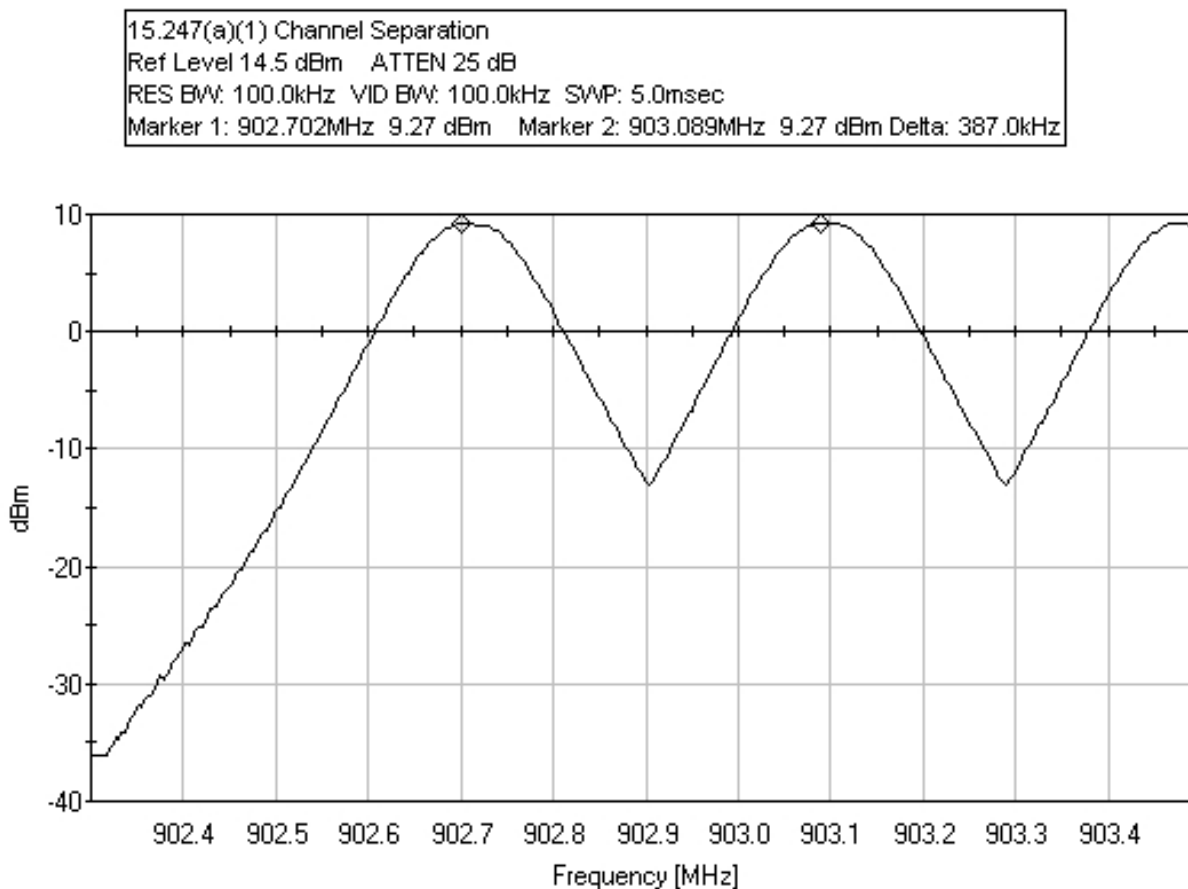
15.247 (a)(1)

Channel Separation

Test Report #:	3115787	Test Area:	GP-1
Test Method:	FCC Part 15.247	Test Date:	13-Mar-2007
EUT Model #:	F series	EUT Power:	12.5-13.5 VDC vehicle
EUT Serial #:	1113 pager and pod		
Manufacturer:	Ray Allen		
EUT Description:	Tactical K9 Deployment Heat Alert System with pager		
Notes:	Testing for RAK9POD		

Temperature:	23.5	°C
Relative Humidity:	20.6	%
Air Pressure:	103.4	kPa

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



20dB Bandwidth

15.247 (a)(1)(i)

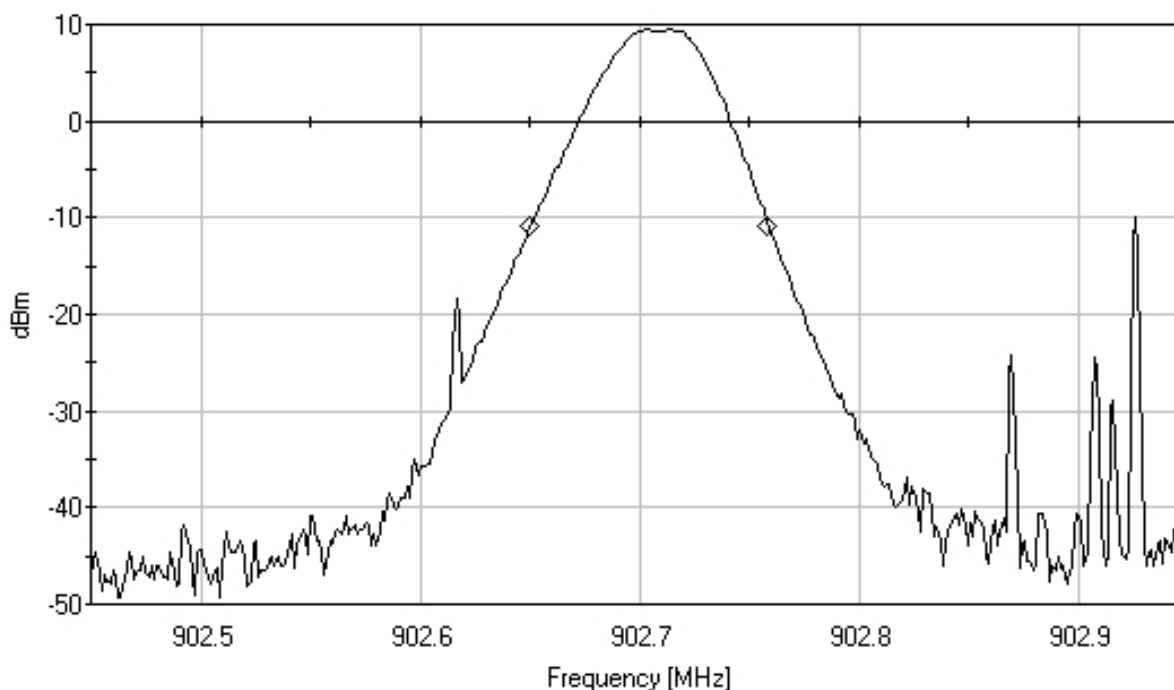
Bandwidth

Test Report #:	3115787	Test Area:	GP-1
Test Method:	FCC Part 15.247	Test Date:	13-Mar-2007
EUT Model #:	F series	EUT Power:	12.5-13.5 VDC vehicle
EUT Serial #:	1113 pager and pod		
Manufacturer:	Ray Allen		
EUT Description:	Tactical K9 Deployment Heat Alert System with pager		
Notes:	Testing for RAK9POD		

Temperature:	23.5	°C
Relative Humidity:	20.6	%
Air Pressure:	103.4	kPa

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

15.247(a)(1)(i) 20dB Bandwidth
Ref Level 14.5 dBm ATTN 25 dB
RES BW: 30.0kHz VID BW: 30.0kHz SWP: 5.0msec
Marker 1: 902.65MHz -10.94 dBm Marker 2: 902.759MHz -10.84 dBm Delta: 108.7kHz



Number of Hopping Channels

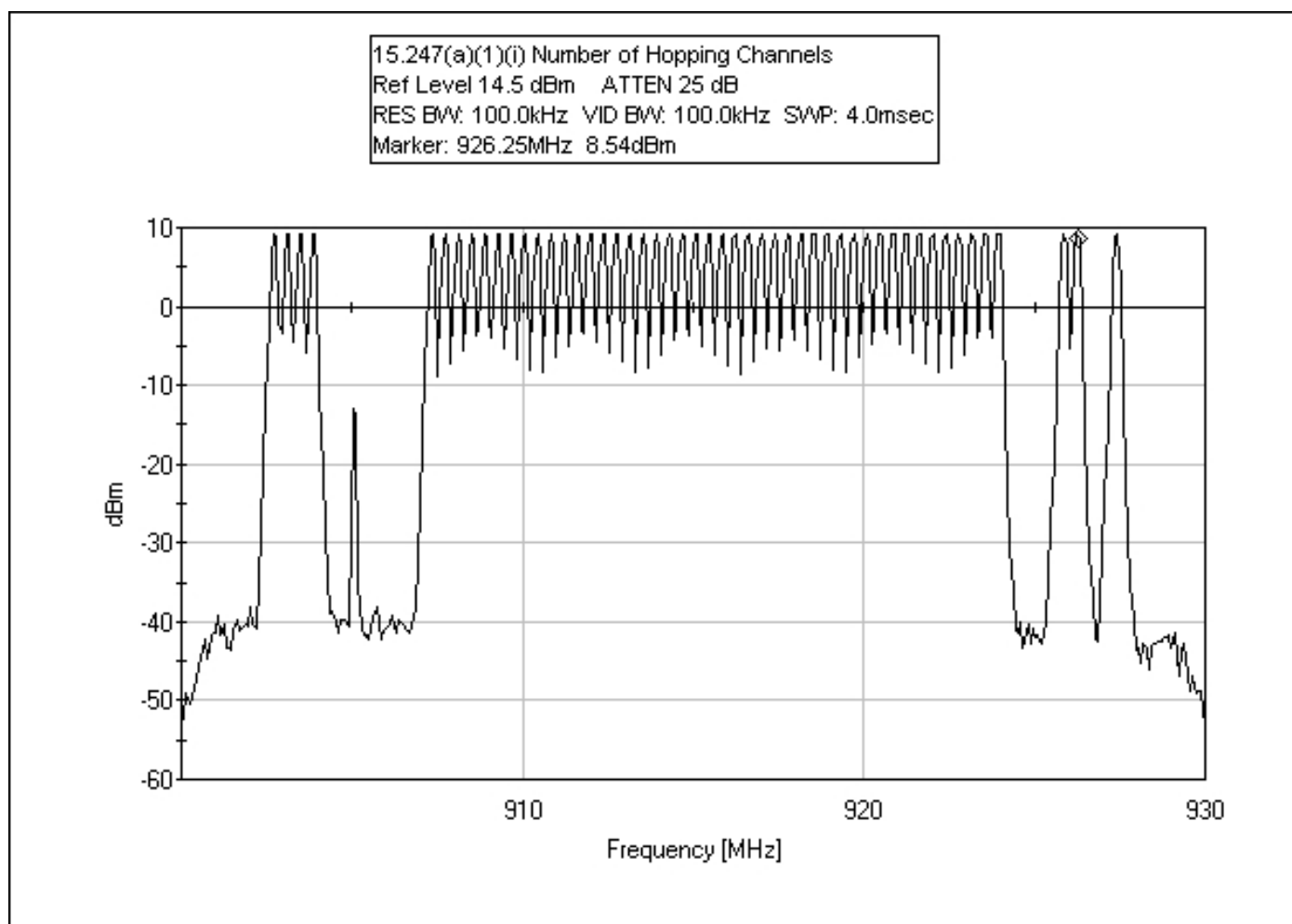
15.247 (a)(1)(i)

Number of Hopping Channels

Test Report #:	3115787	Test Area:	GP-1
Test Method:	FCC Part 15.247	Test Date:	13-Mar-2007
EUT Model #:	F series	EUT Power:	12.5-13.5 VDC vehicle
EUT Serial #:	1113 pager and pod		
Manufacturer:	Ray Allen		
EUT Description:	Tactical K9 Deployment Heat Alert System with pager		
Notes:	Testing for RAK9POD		

Temperature:	23.5	°C
Relative Humidity:	20.6	%
Air Pressure:	103.4	kPa

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



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

Data sheets are in the following order:

Conducted port measurements of the fundamental and harmonics

Radiated measurements of restricted band harmonics

Conducted port band-edge compliance

Conducted Port Measurements Fundamental and Spurious of the Transmitter

Test Report #:	3115787	Test Area:	Pinewood Site 1 (3m)	Temperature:	22.3	°C
Test Method:	15.247	Test Date:	13-Mar-2007	Relative Humidity:	26.9	%
EUT Model #:	F Series	EUT Power:	12-13VDC(Automobile)	Air Pressure:	101.3	kPa
EUT Serial #:	1113			Page:		
Manufacturer:	Ray Allen					
EUT Description:	Tactical K9 Deployment Heat Alert System with pager					
Notes:	Conducted port measurements of the fundamental and harmonics					
	Testing for RAK9POD					

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

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Correction	Final Corrected	Limit	DELTA
(MHz)	(dBm)	(dB) (dB\m) (dB)	(dBm)	(m) (DEG)	(dB)	(dBm)	(dBm)	(dB)
The following duty cycle was declared by the manufacturer.								
81%								
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 15.247 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"								
All measurements taken conducted from the antenna port.								
Low Channel								
902.7	9.6 Pk	1.3 / 0.0 / 0.0	10.9	NA	0.0	10.9	30	-19.1
Mid Channel								
915.02	9.6 Pk	1.3 / 0.0 / 0.0	10.9	NA	0.0	10.9	30	-19.1
High Channel								
927.33	9.6 Pk	1.3 / 0.0 / 0.0	10.9	NA	0.0	10.9	30	-19.1
Low Channel Harmonics								
1805.40	-53.6 Pk	2.8 / 0.0 / 0.0	-50.8	NA	1.8	-52.6	-9.1	-43.5
No other harmonics seen conducted from the low channel								
Mid Channel Harmonics								
1830.03	-56.0 Pk	2.8 / 0.0 / 0.0	-53.2	NA	1.8	-55.0	-9.1	-45.9
No other harmonics seen conducted from the mid channel								
High Channel Harmonics								
1854.67	-57.0 Pk	2.8 / 0.0 / 0.0	-54.2	NA	1.8	-56.0	-9.1	-46.9
No other harmonics seen conducted from the high channel								

Field Strength Measurements Spurious of the Transmitter

Test Report #:	3115787	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:	12-13VDC(Automobile)	Air Pressure:	101.3	kPa
EUT Serial #:	1113			Page:		
Manufacturer:	Ray Allen					
EUT Description:	Tactical K9 Deployment Heat Alert System with pager					
Notes:	Restricted Band Harmonics Only.					
	Testing for RAK9POD					

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

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

The following duty cycle was declared by the manufacturer.

81%

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 15.247 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"

Low Channel Harmonics

2708.1	16.8 Pk	4.2 / 29.7 / 0.0	50.7	V / 1.0 / 75.0	1.8	48.9	54	-5.1
2708.11	17.7 Pk	4.2 / 29.7 / 0.0	51.6	H / 1.0 / 0.0	1.8	49.8	54	-4.2
3610.8	16.1 Pk	5.0 / 31.7 / 0.0	52.8	V / 1.0 / 0.0	1.8	51.0	54	-3.0
3610.8	16.2 Pk	5.0 / 31.7 / 0.0	52.9	H / 1.0 / 0.0	1.8	51.1	54	-2.9
4513.52	34.1 Pk	6.6 / 32.3 / 41.2	31.8	V / 1.0 / 0.0	1.8	30.0	54	-24.0
4513.52	34.0 Pk	6.6 / 32.3 / 41.2	31.8	H / 1.0 / 0.0	1.8	30.0	54	-24.0
5416.24	31.4 Pk	6.9 / 34.3 / 40.7	31.8	V / 1.0 / 0.0	1.8	30.0	54	-24.0
5416.24	30.2 Pk	6.9 / 34.3 / 40.7	30.6	H / 1.0 / 0.0	1.8	28.8	54	-25.2
8124.4	39.5 Pk	8.3 / 37.1 / 49.9	35	V / 1.0 / 0.0	1.8	33.2	54	-20.8
8124.4	38.9 Pk	8.3 / 37.1 / 49.9	34.5	H / 1.0 / 0.0	1.8	32.7	54	-21.3
9027.11	41.9 Pk	8.5 / 37.9 / 51.2	37.1	V / 1.0 / 0.0	1.8	35.3	54	-18.7
9027.11	40.8 Pk	8.5 / 37.9 / 51.2	36	H / 1.0 / 0.0	1.8	34.2	54	-19.8

Mid Channel Harmonics

2745.05	16.4 Pk	4.3 / 29.8 / 0.0	50.5	H / 1.0 / 0.0	1.8	48.7	54	-5.3
2745.06	19.1 Pk	4.3 / 29.8 / 0.0	53.2	V / 1.0 / 85.0	1.8	51.4	54	-2.6
3660.05	15.7 Pk	5.1 / 31.8 / 0.0	52.5	H / 1.0 / 0.0	1.8	50.7	54	-3.3
3660.05	15.6 Pk	5.1 / 31.8 / 0.0	52.4	V / 1.0 / 0.0	1.8	50.6	54	-3.4
4575.05	31.8 Pk	6.8 / 32.5 / 41.2	29.8	H / 1.0 / 0.0	1.8	28.0	54	-26.0
4575.05	31.5 Pk	6.8 / 32.5 / 41.2	29.5	V / 1.0 / 0.0	1.8	27.7	54	-26.3
7320.05	30.1 Pk	8.2 / 36.4 / 41.6	33.1	H / 1.0 / 0.0	1.8	31.3	54	-22.7
7320.05	31.2 Pk	8.2 / 36.4 / 41.6	34.2	V / 1.0 / 0.0	1.8	32.4	54	-21.6
8235.05	39.6 Pk	8.4 / 37.1 / 50.0	35.2	V / 1.0 / 0.0	1.8	33.4	54	-20.6
8235.05	41.4 Pk	8.4 / 37.1 / 50.0	36.9	H / 1.0 / 0.0	1.8	35.1	54	-18.9
9150.05	42.1 Pk	8.8 / 38.1 / 50.2	38.7	V / 1.0 / 0.0	1.8	36.9	54	-17.1
9150.05	40.6 Pk	8.8 / 38.1 / 50.2	37.2	H / 1.0 / 0.0	1.8	35.4	54	-18.6

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

The following duty cycle was declared by the manufacturer.

81%

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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 $20 \cdot \log_{10}(\text{duty cycle in 100ms})$ "not to exceed 20dB"

High Channel Harmonics

2781.94	15.4 Pk	4.3 / 30.0 / 0.0	49.8	V / 1.0 / 0.0	1.8	48.0	54	-6.0
2781.94	15.6 Pk	4.3 / 30.0 / 0.0	49.9	H / 1.0 / 0.0	1.8	48.1	54	-5.9
3709.25	16.1 Pk	5.2 / 31.9 / 0.0	53.1	V / 1.0 / 0.0	1.8	51.3	54	-2.7
3709.25	15.6 Pk	5.2 / 31.9 / 0.0	52.6	H / 1.0 / 0.0	1.8	50.8	54	-3.2
4636.62	32.5 Pk	6.9 / 32.6 / 41.2	30.8	H / 1.0 / 0.0	1.8	29.0	54	-25.0
4636.62	32.0 Pk	6.9 / 32.6 / 41.2	30.3	V / 1.0 / 0.0	1.8	28.5	54	-25.5
7418.55	29.6 Pk	8.2 / 36.5 / 42.2	32	H / 1.0 / 0.0	1.8	30.2	54	-23.8
7418.55	29.9 Pk	8.2 / 36.5 / 42.2	32.4	V / 1.0 / 0.0	1.8	30.6	54	-23.4
8345.5	40.0 Pk	8.4 / 37.1 / 50.3	35.3	H / 1.0 / 0.0	1.8	33.5	54	-20.5
8345.5	40.8 Pk	8.4 / 37.1 / 50.3	36	V / 1.0 / 0.0	1.8	34.2	54	-19.8

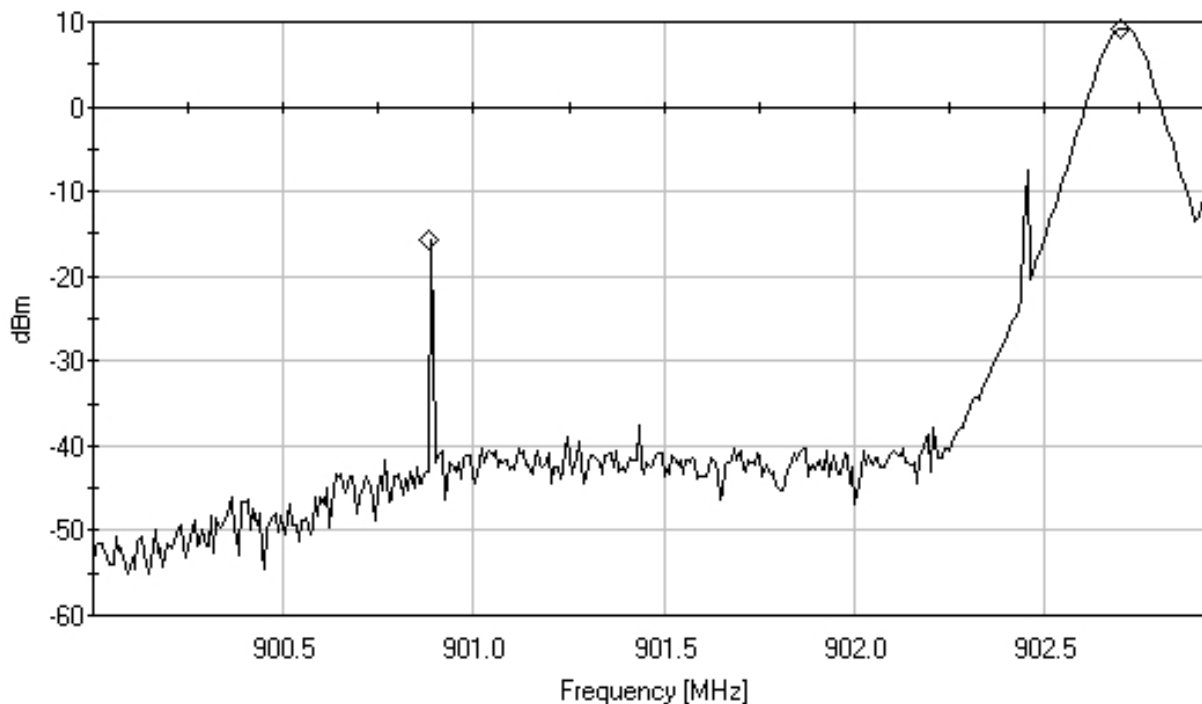
Band-edge

Test Report #:	3115787	Test Area:	GP-1
Test Method:	FCC Part 15.247	Test Date:	13-Mar-2007
EUT Model #:	F series	EUT Power:	12.5-13.5 VDC vehicle
EUT Serial #:	1113 pager and pod		
Manufacturer:	Ray Allen		
EUT Description:	Tactical K9 Deployment Heat Alert System with pager		
Notes:	Testing for RAK9POD		

Temperature:	23.5	°C
Relative Humidity:	20.6	%
Air Pressure:	103.4	kPa

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

15.247(d) Band-edge compliance Low Channel
Ref Level 15 dBm ATTN 25 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 5.0msec
Marker 1: 902.699MHz 9.3 dBm Marker 2: 900.885MHz -15.7 dBm Delta: 1.814MHz



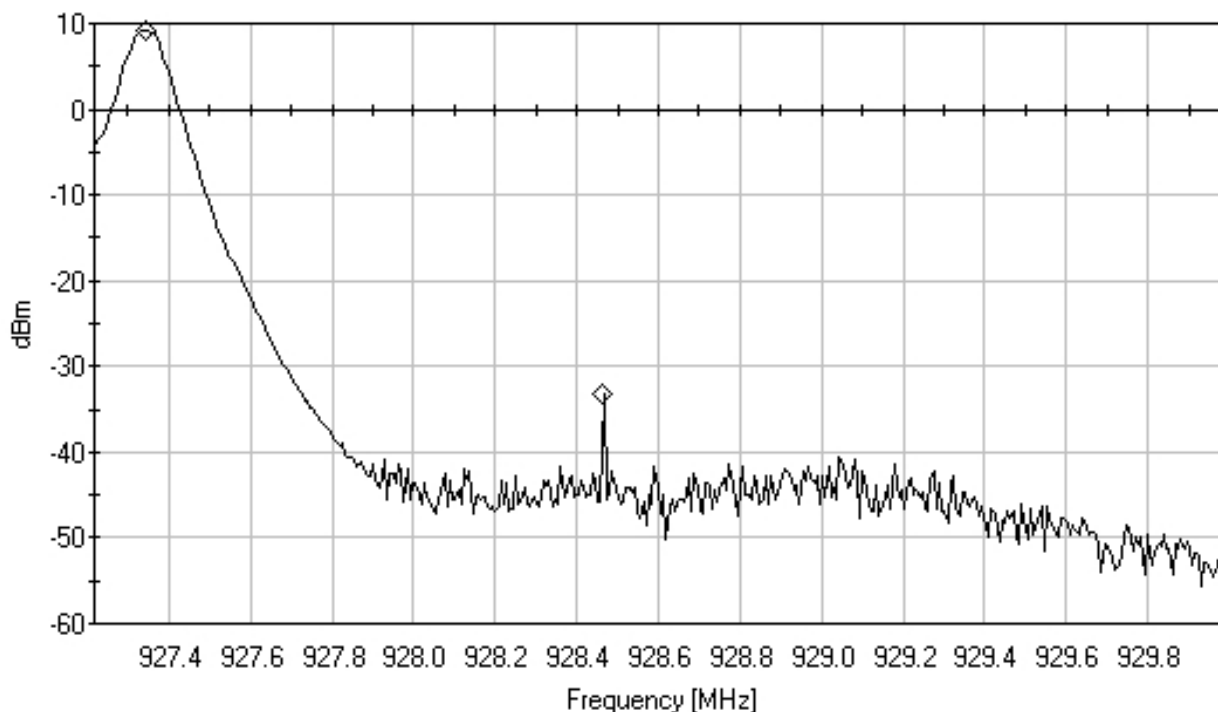
Band-edge

Test Report #:	3115787	Test Area:	GP-1
Test Method:	FCC Part 15.247	Test Date:	13-Mar-2007
EUT Model #:	F series	EUT Power:	12.5-13.5 VDC vehicle
EUT Serial #:	1113 pager and pod		
Manufacturer:	Ray Allen		
EUT Description:	Tactical K9 Deployment Heat Alert System with pager		
Notes:	Testing for RAK9POD		

Temperature:	23.5	°C
Relative Humidity:	20.6	%
Air Pressure:	103.4	kPa

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

15.247(d) Band-edge compliance High Channel
Ref Level 15 dBm ATTN 25 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 5.0msec
Marker 1: 927.342MHz 9.06 dBm Marker 2: 928.462MHz -33.25 dBm Delta: 1.12MHz



List of Equipment Utilized for Final Test

Project Report

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

Technician Mike Spataro

Project 3115787

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
18880	Hewlett-Packard	85650A	2811A01300	Q.P Adapter	R Radiated Emissions	For Cal	2/16/2007	2/16/2008
18882	Hewlett-Packard	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	R Radiated Emissions	For Cal	12/7/2006	12/7/2007
18887	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	Biconical 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
18913	Hewlett-Packard	E7405A	My44211889	Spectrum Analyzer	R Radiated Emissions	For Cal	2/23/2007	2/23/2008

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 μ 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 μ V and μ V, the following conversions apply:

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

RADIATED EMISSIONS

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ 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 μ V:

Measured Level	+	Transducer & Cable Loss factor	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dB μ V)		(dB)		(dB μ V/m)	(dB μ V/m)		(dB μ V/m)		
14.0		14.9		28.9	40.0		28.9		-11.1

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."

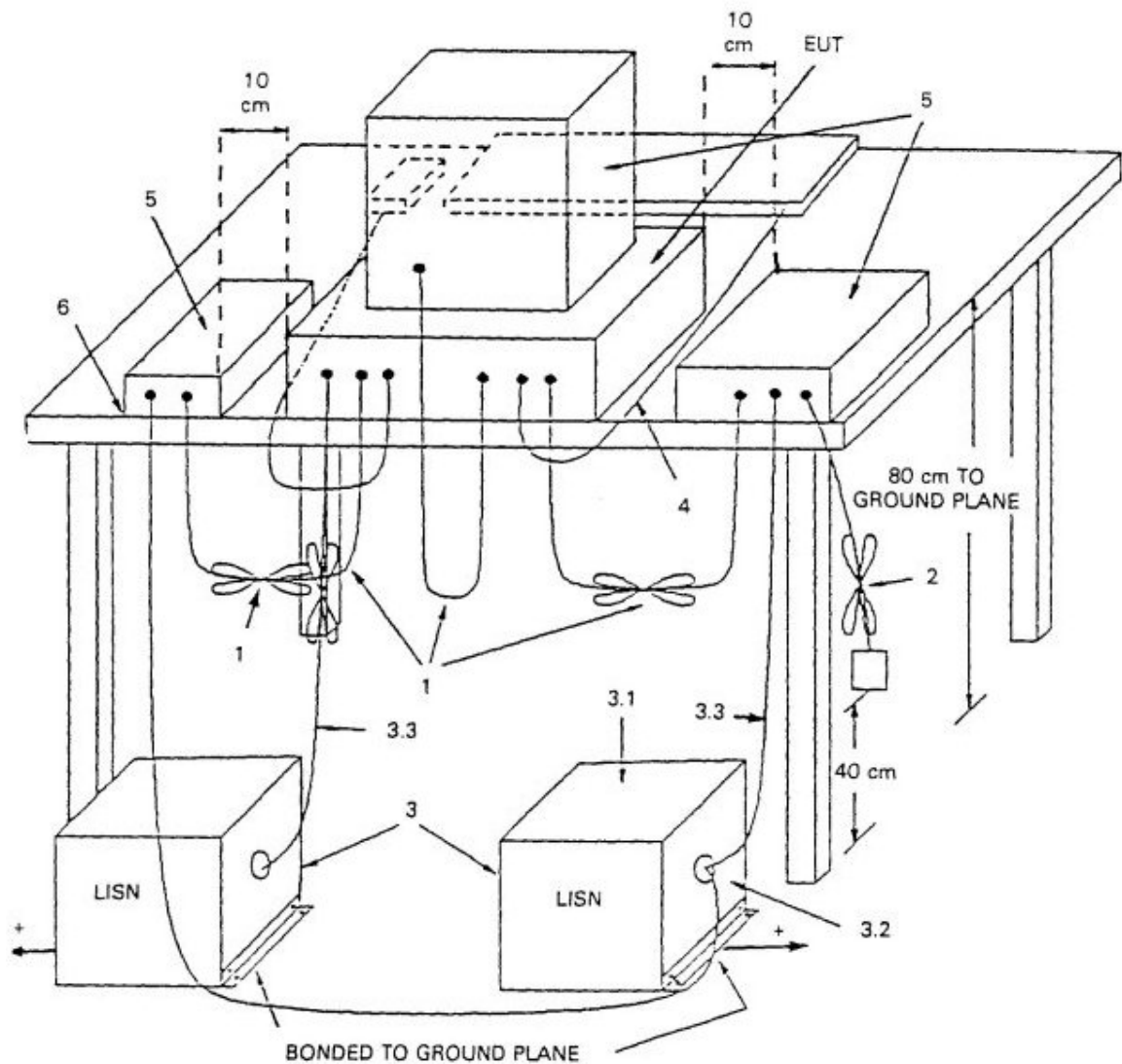
Conducted Emissions

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 Ω /50 μ 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:

