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Report On

RF Exposure Assessment of the
Orolia Limited
Z423 FastFind 220 Personal Locating Beacon
Z424 FastFind Ranger and Safelink Solo Personal Locating Beacon

Document 75942209 Report 05 Issue 1 August 2018

Product Service

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RF Exposure Assessment of the
Orolia Limited
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Z424 FastFind Ranger and Safelink Solo Personal Locating Beacon

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August 2018

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SECTION 1

REPORT SUMMARY

RF Exposure Assessment of the
Orolia Limited
Z423 FastFind 220 Personal Locating Beacon
Z424 FastFind Ranger and Safelink Solo Personal Locating Beacon

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the RF Exposure Assessment of the Orolia Limited Z423 FastFind 220 Personal Locating Beacon, Z424 FastFind Ranger and Safelink Solo Personal Locating Beacon to the requirements of the applied test specifications.

Objective	To perform RF Exposure Assessment to determine the Equipment Under Test's (EUT's) compliance of the applied rules.
Applicant	Orolia Limited
Manufacturer	Orolia Limited
Manufacturing Description	FastFind 220 Personal Locating Beacon Fastfind Ranger and Safelink Solo Personal Locating Beacon
Model Number(s)	Z423 Z424
Test Specification/Issue/Date	EN 62311:2008 CFR 47 Pt1.1310:2016 Health Canada Safety Code 6:2015 ARPANSA Radiation Protection Series No.3:2002

1.2 REGIONAL REQUIREMENTS

The table below shows the regional requirements that are referenced in this test report. A full list of the requirements is shown in Annex A.

Report Reference	Regional Requirement
EU	EN 62311:2008
FCC	CFR 47 Pt1.1310 (2016)
IC	Health Canada Safety Code 6:2015
AUS	ARPANSA Radiation Protection Series No.3:2002

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment under test was a Orolia Limited types Z423/Z424 Personal Locator Beacon also known as the Fast Find 220 Personal Locator beacon (PLB). A full technical description can be found in the manufacturer's documentation.

All reported calculations were carried out on the relevant information supplied for the Z423/Z424 Personal Locator Beacon to demonstrate compliance with the applied test specification(s). The sample assessed was found to comply with the requirements of the applied rules.

1.3.2 Supported Features

The following radio access technologies and frequency bands are supported by the equipment under test.

Radio Access Technology	Cospas-Sarsat
	Homer

Frequency Band	406 MHz
	121.5 MHz

1.3.3 Antennas

The following antennas are supported by the equipment under test.

Note: Both transmitters use the same PLB antenna but with differing gain.

No.	Model	Gain(dB)
1	PLB antenna	5.5
2	PLB antenna	-3

1.3.4 EUT Configurations

When triggered, the Fast Find 220 transmits a unique serialized ID to the Cospas-Sarsat MEOSAR satellite system at 406 MHz.

The unit's secondary homing transmitter enables search and rescue teams to home in on the exact location using a 121.5 MHz transmitter.

The two transmitters do not operate simultaneously.

1.4 BRIEF SUMMARY OF RESULTS

The wireless device described within this report has been shown to be capable of compliance with the basic restrictions related to human exposure to electromagnetic fields for both General Public and Occupational. The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

Configuration	Required Compliance Boundary (m)	
	Occupational	General Population
Cospas-Sarsat transmitter	0.2	0.2
Homer transmitter	0.2	0.2

Table 1 – Compliance Boundary Results

1.4.1 Configuration 1 - Cospas-Sarsat transmitter

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m^2)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	n/a	n/a	12.2076	60.4483	0.0324	0.1612
FCC*	0.0395	1.3533	N/A	N/A	N/A	N/A
CANADA	0.3953	13.0065	12.2076	70.0255	0.0324	0.1857
AUSTRALIA	0.3953	10.1500	12.2076	61.8588	0.0324	0.1640

* Requirement and Result in mW/cm^2

Table 2 – Occupational Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m^2)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	0.3953	2.0300	12.2076	27.7055	0.0324	0.0746
FCC*	0.0395	0.2707	N/A	N/A	N/A	N/A
CANADA	0.3953	1.5878	12.2076	24.4647	0.0324	0.0649
AUSTRALIA	0.3953	2.0300	12.2076	27.6047	0.0324	0.0733

* Requirement and Result in mW/cm^2

Table 3 – General Population Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.

1.4.2 Configuration 2 – Homer transmitter

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m^2)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	n/a	n/a	5.3231	61.0000	0.0141	0.1620
FCC*	0.0075	1.0000	5.3231	61.4000	0.0141	0.1630
CANADA	0.0752	7.1144	5.3231	51.7900	0.0141	0.1374
AUSTRALIA	0.0752	10.0000	5.3231	61.4000	0.0141	0.1630

* Requirement and Result in mW/cm^2

Table 4 – Occupational Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m^2)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	0.0752	2.0000	5.3231	28.0000	0.0141	0.0730
FCC*	0.0075	0.2000	5.3231	27.5000	0.0141	0.0730
CANADA	0.0752	1.2910	5.3231	22.0600	0.0141	0.0585
AUSTRALIA	0.0752	2.0000	5.3231	27.4000	0.0141	0.0729

* Requirement and Result in mW/cm^2

Table 5 – General Population Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.

SECTION 2

TEST DETAILS

2.1 RATIONALE FOR ASSESSMENT OF THE RF EXPOSURE

The aim of the assessment report is to evaluate the compliance boundary for a set of given input power(s) according to the basic restrictions (directly or indirectly via compliance with reference levels) related to human exposure to radio frequency electromagnetic fields.
The chosen assessment method to establish the compliance boundary in the far-field region is the reference method as defined in the relevant specifications.

The RF exposure assessment is based upon the following criteria:

The Z423/Z424 Fast Find 220 Personal Locator Beacon operates with the transmitters active on the antenna ports shown in Section 1.3.3. For each transmitter, the Radio Access Technology (RAT), EIRP inclusive of duty cycle, gain of the antenna and lowest frequency of operation are shown as they contribute to the calculation of S Field, E field and H field values according to the following formulas.

The power flux (S Field):

$$S = \frac{PG_{(\theta,\phi)}}{4\pi r^2}$$

The electric field strength (E Field):

$$E = \frac{\sqrt{30PG}_{(\theta,\phi)}}{r}$$

The magnetic field strength (H Field):

$$H = \frac{E}{\eta_o}$$

Where:

P = Average Power (W)
G = Antenna Gain (dBi)
r = Distance (cm) or (m)
η_o = 377

2.2 TEST RESULT DETAILS

The frequencies shown in the tables below have been chosen based on the lowest possible frequency that the EUT can transmit.

2.2.1 Configuration 1 - Cospas-Sarsat transmitter

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m^2)	E Field (V/m)	H Field (A/m)
1	1	1	Cospas-Sarsat	0.199	1	5.5	406	n/a	12.2076	0.0324

Table 6 – Occupational Transmitter Summary

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m^2)	E Field (V/m)	H Field (A/m)
1	1	1	Cospas-Sarsat	0.199	1	5.5	406	0.3953	12.2076	0.0324

Table 7 – General Population Transmitter Summary

2.2.2 Configuration 2 – Homer transmitter

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m^2)	E Field (V/m)	H Field (A/m)
1	1	2	Homer	0.038	94.9	-3	121.475	0.0752	5.3231	0.0141

Table 8 – Occupational Transmitter Summary

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m^2)	E Field (V/m)	H Field (A/m)
1	1	2	Homer	0.038	94.9	-3	121.475	0.0752	5.3231	0.0141

Table 9 – General Population Transmitter Summary

SECTION 3

DISCLAIMERS AND COPYRIGHT

3.1 DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

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ANNEX A

REGIONAL REQUIREMENTS

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.065 - 1	-	610	1.6/f
1 - 10	-	610/f	1.6/f
10 - 400	-	61	0.162
400 - 2000	-	3*f^0.5	0.008*f^0.5
2000 - 300000	50	140	0.36

Table A.1 – EN 62311:2008 Occupational Limits to Physical Agents Directive (EMF) 2013/35/EU

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.003 - 0.15	-	87	5
0.15 - 1	-	87	0.73/f
1 - 10	-	87/f^0.5	0.73/f
10 - 400	2	28	0.073
400 - 2000	f/200	1.375*f^0.5	0.0037*f^0.5
2000 - 300000	10	61	0.16

Table A.2 – EN 62311:2008 General Population Limits to EC Recommendation 1999/519/EC

Frequency Range (MHz)	Power Density (mW/cm^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	900/f^2	1842/f	4.89/f
30 - 300	1	61.4	0.163
300 - 1500	f/300	-	-
1500 - 100000	5	-	-

Table A.3 – CFR 47 Pt1.1310 (2016) Occupational Limits

Frequency Range (MHz)	Power Density (mW/cm^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	180/f^2	824/f	2.19/f
30 - 300	0.2	27.5	0.073
300 - 1500	f/1500	-	-
1500 - 100000	1	-	-

Table A.4 – CFR 47 Pt1.1310 (2016) General Population Limits

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
10 - 20	10	61.4	0.163
20 - 48	44.72/f^0.5	129.8/f^0.25	0.3444/f^0.25
48 - 100	6.455	49.33	0.1309
100 - 6000	0.6455*f^0.5	15.60*f^0.25	0.04138*f^0.25
6000 - 150000	50	137	0.364

Table A.5 – Health Canada Safety Code 6 Occupational Limits

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
10 – 20	2	27.46	0.0728
20 – 48	8.944/f^0.5	58.07/f^0.25	0.1540/f^0.25
48 – 300	1.291	22.06	0.05852
300 – 6000	0.02619*f^0.6834	3.142*f^0.3417	0.008335*f^0.3417
6000 – 15000	10	61.4	0.163

Table A.6 – Health Canada Safety Code 6 General Population Limits

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.1 – 1	-	614	1.63/f
1 – 10	1000/f^2	614/f	1.63/f
10 – 400	10	61.4	0.163
400 – 2000	f/40	3.07*f^0.5	0.00814*f^0.5
2000 – 300000	50	137	0.364

Table A.7 – ARPANSA Radiation Protection Series No.3 Occupational Limits

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.1 - 0.15	-	86.8	4.86
0.15 – 1	-	86.8	0.729/f
1 – 10	-	86.8/f^0.5	0.729/f
10 – 400	2	27.4	0.0729
400 - 2000	f/200	1.37*f^0.5	0.00364*f^0.5
2000 - 300000	10	61.4	0.163

Table A.8 – ARPANSA Radiation Protection Series No.3 General Population Limits