



Unit 1, The Workshop, Stable Lane, Buxton, SK17 6UG  
08451 088988

# **Report of Optical Testing of Emergency Position Indicating Radio Beacon (EPIRB) ACR Electronics Inc. Model RLB-41**

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### Background and Purpose

OptiConsulting has been contracted to test the properties of an EPIRB sample to the optical requirements of AS/NZS 4280.1 clause A.1.12 (5.3.3.3) and IEC61097-2 clause A.2.10 (5.3.3.3).

### Details of Items under Test

1 x EPIRB sample:

- ACR Electronics Inc. Model RBL-41
- Labelled: Battery Expiry: 02/2021, Date of Manufacture: 02/2015.



EPIRB Sample - Lit



EPIRB Sample – Unlit (between flashes)



EPIRB Sample

### Scope

The following tests were conducted on the EPIRB sample:

- Flash rate/duration to clauses 5.3.3.3 of AS/NZS 4280.1 (A.1.12) and IEC61097-2 (A.2.10).
- Luminous intensity to clauses 5.3.3.3 of AS/NZS 4280.1 (A.1.12) and IEC61097-2 (A.2.10).

### Details of Tests

The optical tests were conducted by Craig Gutteridge from 27-28 April 2015 at the premises of OptiConsulting. The following equipment was used:

Goniometer	Homge rotary table and tilt stage, calibrated via Inclinator (Fisco Solatronic, Model EN17, S/N YSSCEN025).
Telephotometer:	Bentham instruments telephotometer system comprising: TL1 (ACH), S/N 6130 / Gigahertz PD-9310-1 photodiode S/N 2807 / Vinculum Picoammeter SP042R, S/N C220.
Oscilloscope	PicoScope 3204 sn IJY30/079, UKAS Calibration Certificate T433289
Calibrated reference lamp(s):	NPL Polaron: P22, S/N OPT148, NPL/UKAS Cal Cert. 2014110158/3.
Electrical measurement:	Fluke 87 Digital Multimeter, S/N 51750193, Pico Technology PicoScope 3204, S/N IJY30/079, UKAS Cal Cert. T433289.
Temperature measurement:	RS 206-3738 Digital Thermometer, UKAS Cal Cert. 03665872.
Measurement conditions:	Measurement distance: 10.0m, Ambient temperature: 20 ± 3°C.

### Flash Rate and Duration

Measurements were performed using a fixed telephotometer / picoammeter / scopemeter system. Neither AS/NZS 4280.1 nor IEC61097-2 provides any definition for the flash duration, so this was taken as the time interval between the 0.75cd (instantaneous intensity) values on the rising and falling edges of the trace. A measurement uncertainty of ±5% applies.

### Luminous Intensity

Luminous intensity measurements were performed using a fixed telephotometer / picoammeter / scopemeter system, calibrated for luminous intensity against a luminous intensity standard (P22), together with a goniometer on which the light sources were fixed. The light sources were then rotated in the horizontal and vertical planes to the required angles. A measurement uncertainty of ±5% applies.

For the purposes of these tests the battery compartment was removed from the sample and the test voltages were applied by the use of a stabilised power supply unit and measured via digital multimeter.

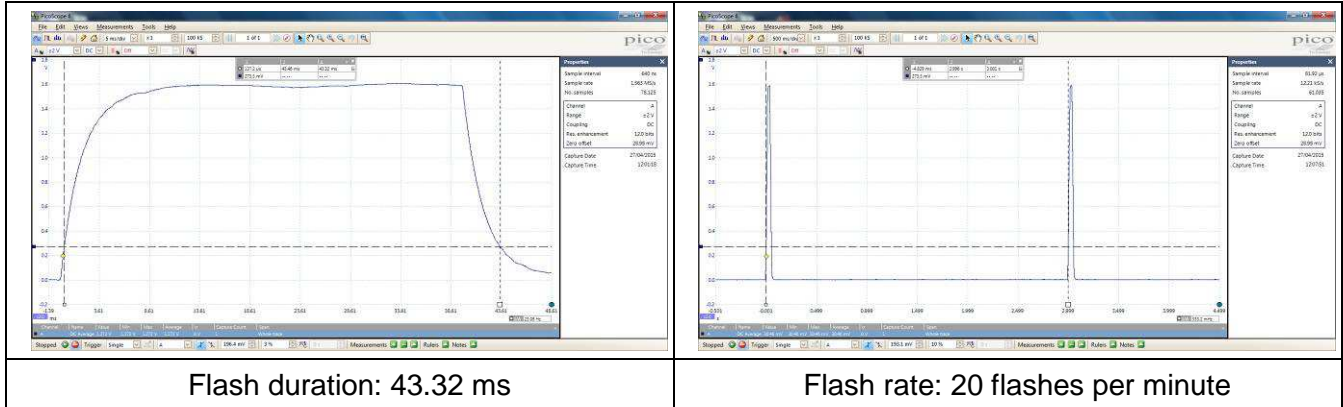
Also for the purposes of these tests, the 0° position in the horizontal plane was defined as the on switch being in the 12 o'clock position (as shown in the sample images, Page 3).

Sample voltages were set as specified by TÜV SÜD Product Service Limited as:

- 8.9V corresponding to battery voltage at ambient temperature.
- 8.7V corresponding to battery voltage at +55°C
- 7.8V corresponding to battery voltage at -20°C

### Results of Tests

#### Flash Rate and Duration Duration



#### Luminous Intensity

Measurements were conducted over all directions of the upper hemisphere as required in Clause 5.3.3.3 of AS/NZS 4280.1 (A.1.12) and the results used to calculate mean luminous intensity as defined by the 49 measurement points in Table 2 – Effective luminous intensity in Clause 5.3.3.3 of IEC 61097-2 (A.2.10).

The following table contains the results of the measurement points defined in Table 2 – Effective luminous intensity in Clause 5.3.3.3 of IEC 61097-2 (A.2.10) and is followed by a calculation of the arithmetic mean over these points, full data can be found in Appendix A.

Luminous intensity (cd) at specified angle from axis:

Azimuth °	Elevation °								
	10	20	30	40	50	60	70	80	90
0	2.1	1.0	2.1	4.3	4.1	6.8	6.5	6.7	6.2
45	1.4	0.9	1.3	2.2					
90	1.0	1.1	1.0	2.0	5.2	7.0	7.1	6.1	
135	0.8	1.3	1.8	3.4					
180	1.2	1.7	3.6	5.9	7.7	7.7	7.4	6.0	
225	0.7	1.9	3.5	4.1					
270	0.6	0.9	2.7	3.8	5.1	8.3	8.0	6.5	
315	0.6	1.8	3.8	5.0					

Arithmetic mean of the table above: **3.7 cd**.

#### Voltage

The results above correspond to the battery voltage at ambient temperature (8.9VDC).

Measurements of flash rate, duration and luminous intensity were also conducted at the voltages corresponding to -20°C (7.8VDC) and +55°C (8.7VDC), the results were found to be identical to those given above.

#### End of report



## OC-0522 Optical Testing of EPIRB

### Appendix A – Effective Luminous Intensity – Full Data Part 1

Luminous intensity at specified angle from axis:

	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
0	0.79	0.56	0.56	0.59	0.60	0.60	0.59	0.50	0.48	0.45	0.44	0.45	0.46	0.52	0.61	0.50	0.51	0.48
5	0.63	0.59	0.65	0.71	1.18	1.40	1.38	1.12	1.02	0.83	0.79	0.87	1.44	0.97	0.79	0.81	0.71	0.64
10	2.09	2.10	2.07	2.14	2.35	2.81	3.06	2.80	2.88	1.42	0.92	1.09	2.50	2.74	2.26	1.34	1.00	1.15
15	0.77	0.69	0.73	0.80	0.88	1.34	1.11	0.94	0.84	0.88	1.05	1.30	1.51	1.19	0.99	0.98	0.99	1.42
20	1.02	1.08	1.07	1.13	1.00	0.96	0.96	1.00	0.91	0.91	0.86	1.04	1.30	1.81	1.77	1.19	1.16	1.23
25	1.89	1.52	1.45	1.47	1.50	1.19	1.08	1.12	1.01	0.96	1.04	1.23	1.39	2.60	1.96	1.46	1.35	1.24
30	2.08	2.08	1.89	1.42	1.39	1.51	1.73	1.94	1.66	1.35	1.35	2.00	2.53	3.24	2.85	1.74	1.43	1.15
35	2.46	2.46	2.46	2.36	2.39	2.13	2.31	2.60	3.08	3.70	3.77	3.76	3.23	2.85	2.85	3.21	2.39	1.77
40	4.31	4.39	4.60	4.68	4.57	4.08	3.46	3.08	2.85	2.15	2.97	3.17	3.25	3.54	3.70	3.46	3.54	2.85
45	4.31	4.43	3.48	4.31	4.29	3.98	4.00	3.62	3.31	2.14	3.31	4.31	4.54	4.44	4.24	4.08	4.08	4.39
50	4.08	4.00	4.08	4.11	4.16	5.39	5.39	5.39	5.77	5.85	6.16	5.77	5.15	5.01	4.77	4.93	5.01	5.31
55	5.31	4.88	5.23	6.12	7.38	7.65	7.75	7.93	7.98	7.73	7.64	7.25	6.81	6.21	5.89	6.01	6.12	5.99
60	6.84	7.51	7.77	7.98	8.18	8.29	8.37	8.40	8.49	8.38	8.04	7.86	7.96	7.37	6.82	6.37	6.42	6.69
65	6.52	6.75	7.07	7.58	8.01	8.03	8.37	8.55	8.49	8.51	8.29	8.24	8.02	7.85	7.45	7.37	7.33	7.22
70	6.55	6.63	6.75	6.85	7.10	7.36	7.66	7.78	8.01	7.95	7.83	7.84	7.86	7.79	7.65	7.48	7.39	7.40
75	6.68	6.70	6.67	6.75	6.82	6.87	6.93	6.88	6.95	6.88	6.79	6.84	6.75	6.75	6.67	6.48	6.44	6.36
80	6.65	6.60	6.51	6.48	6.52	6.53	6.51	6.48	6.42	6.38	6.40	6.28	6.36	6.27	6.26	6.21	6.15	6.15
85	6.15	6.17	6.11	6.16	6.16	6.15	6.12	6.14	6.13	6.12	6.13	6.12	6.11	6.06	6.06	6.11	6.11	6.11
90	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15



## OC-0522 Optical Testing of EPIRB

### Appendix A – Effective Luminous Intensity – Full Data Part 2

Luminous intensity at specified angle from axis:

	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175
0	0.5	0.6	0.6	0.5	0.7	0.5	0.6	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.7
5	0.5	0.5	0.5	0.6	0.6	0.7	0.8	1.1	1.1	2.3	3.0	3.0	1.8	1.3	1.0	1.0	0.9	0.8
10	1.0	1.1	1.0	0.8	0.8	1.0	1.2	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.2	1.4
15	1.5	0.8	0.8	0.8	0.8	0.8	1.0	1.3	1.3	1.1	1.3	1.3	1.3	1.2	1.0	1.0	1.2	1.3
20	1.1	1.2	1.0	0.9	0.8	0.8	1.4	1.6	1.5	1.3	1.3	1.2	1.0	1.5	1.4	1.3	1.7	1.7
25	1.0	1.0	1.0	1.0	1.1	1.5	1.9	2.0	1.9	1.5	1.4	1.5	1.7	1.9	2.0	1.7	1.9	2.3
30	1.0	1.1	1.1	1.1	1.2	1.3	2.0	2.8	3.3	1.8	2.8	3.0	2.7	2.2	2.0	2.0	2.5	3.4
35	1.4	1.3	1.2	1.5	2.2	2.3	2.5	3.4	3.7	3.3	3.2	3.3	3.5	3.6	3.8	4.3	5.1	5.4
40	2.0	2.0	2.2	2.7	3.2	3.4	3.9	4.1	3.9	3.4	3.1	3.1	2.3	4.1	4.4	4.7	5.3	5.8
45	4.2	4.3	4.5	4.5	4.5	4.8	4.9	5.0	5.2	5.1	5.0	4.9	4.8	4.9	4.9	4.5	4.9	5.4
50	5.2	5.2	5.2	5.2	5.2	5.3	5.5	5.9	6.3	7.1	7.7	7.7	7.6	7.2	7.4	7.0	6.2	5.7
55	5.9	5.5	5.2	5.3	5.4	5.5	5.8	6.2	6.7	7.1	7.4	7.6	7.8	7.9	8.1	8.2	8.5	8.9
60	7.0	6.8	6.4	5.8	5.5	5.5	5.5	5.9	5.8	5.9	6.4	6.8	7.2	7.4	7.7	7.7	7.8	7.8
65	7.6	7.7	7.7	7.4	6.8	6.4	6.1	6.0	5.8	5.9	6.4	6.8	7.1	7.3	7.4	7.6	7.9	8.0
70	7.1	7.1	6.8	6.8	6.8	6.7	6.7	6.5	6.7	6.9	7.2	7.5	7.7	7.7	7.7	7.7	7.4	7.4
75	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.3	6.4	6.5	6.7	6.8	6.8	6.8	6.7	6.5	6.4	6.2
80	6.1	6.0	6.0	5.9	5.9	6.0	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.0	6.1	6.1	6.1
85	6.1	6.1	6.1	6.0	6.1	6.1	6.0	6.1	6.1	6.1	6.1	6.0	6.0	6.0	6.0	6.0	6.1	6.1
90	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2



## OC-0522 Optical Testing of EPIRB

### Appendix A – Effective Luminous Intensity – Full Data Part 3

Luminous intensity at specified angle from axis:

	180	185	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265
<b>0</b>	0.6	0.6	0.4	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.6	0.6	0.6
<b>5</b>	0.8	0.8	0.9	0.9	1.0	1.1	1.3	1.5	1.6	1.9	2.4	2.3	1.0	0.8	0.8	0.7	0.8	0.8
<b>10</b>	1.2	1.0	1.1	1.2	0.9	0.8	0.8	0.7	0.8	0.7	0.6	0.9	1.0	0.9	1.0	1.0	1.2	1.1
<b>15</b>	1.2	1.1	1.0	1.1	1.0	0.9	0.9	1.0	1.0	1.1	1.0	1.4	1.3	0.8	0.9	0.9	0.9	0.9
<b>20</b>	1.7	1.8	2.1	2.1	2.2	2.0	2.0	1.5	1.6	1.9	1.6	1.2	1.2	1.3	1.2	1.1	0.9	0.8
<b>25</b>	2.5	2.9	2.9	2.9	2.2	2.1	1.9	2.1	2.4	1.9	1.5	2.1	2.5	2.3	1.7	1.7	0.9	0.9
<b>30</b>	3.6	3.0	3.6	3.3	2.8	2.3	2.6	3.2	3.4	3.5	3.5	2.7	3.2	2.3	1.6	1.7	2.3	2.3
<b>35</b>	5.3	5.3	5.4	5.1	4.3	3.9	3.7	3.6	3.5	3.7	3.2	2.4	2.1	2.1	2.3	2.6	2.8	2.2
<b>40</b>	5.9	5.1	5.7	4.9	4.0	3.5	3.3	3.2	3.5	4.1	4.2	4.0	3.6	3.3	3.1	3.5	3.8	3.9
<b>45</b>	5.5	5.3	5.2	4.5	3.6	3.3	3.2	3.5	3.9	4.5	4.9	5.2	5.1	4.9	4.2	3.8	2.1	4.5
<b>50</b>	7.7	6.2	6.2	5.4	4.5	5.2	4.4	4.7	4.7	5.2	5.4	5.7	5.8	5.9	6.0	5.0	4.9	5.1
<b>55</b>	8.7	7.5	7.1	6.6	6.2	5.7	5.6	5.6	5.7	6.0	6.0	6.3	6.5	7.0	7.3	7.7	7.8	7.4
<b>60</b>	7.7	7.5	7.3	7.2	7.2	7.1	7.1	7.0	7.0	7.1	7.2	7.2	7.3	8.0	8.0	8.3	8.3	8.4
<b>65</b>	7.9	7.7	7.6	7.6	7.9	8.1	8.3	8.3	8.3	8.4	8.4	8.3	8.5	8.6	8.6	8.6	8.6	8.6
<b>70</b>	7.4	7.4	7.3	7.5	7.5	8.1	8.2	8.4	8.6	8.6	8.6	8.6	8.6	8.5	8.6	8.5	8.4	8.3
<b>75</b>	6.2	6.2	6.4	6.6	6.7	7.0	7.1	7.1	7.2	7.3	7.3	7.3	7.3	7.1	7.1	7.1	7.1	7.0
<b>80</b>	6.0	6.1	6.1	6.0	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2	6.3	6.4	6.4	6.5	6.4	6.5
<b>85</b>	6.1	6.0	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.2	6.2	6.1	6.1	6.1
<b>90</b>	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2





## OC-0522 Optical Testing of EPIRB

### Appendix A – Effective Luminous Intensity – Full Data Part 4

Luminous intensity at specified angle from axis:

	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355
<b>0</b>	0.5	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6
<b>5</b>	1.2	1.3	1.2	1.1	1.0	1.0	1.0	2.5	2.2	1.7	1.2	1.1	1.0	1.3	1.3	1.3	1.1	0.8
<b>10</b>	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.6	0.6	0.8	1.6	2.9	2.5	2.5	2.3	2.2
<b>15</b>	0.7	0.7	0.9	1.0	1.0	1.1	1.0	1.0	0.9	0.7	0.6	0.7	0.8	0.9	0.8	0.8	1.0	0.9
<b>20</b>	0.9	0.9	1.3	1.7	1.7	1.8	1.8	1.7	1.8	1.8	1.2	0.8	1.1	1.2	1.1	1.1	1.5	1.3
<b>25</b>	1.0	1.3	1.7	1.9	2.0	2.5	2.6	2.3	2.4	1.9	2.2	2.0	2.4	2.6	2.3	2.4	2.2	2.0
<b>30</b>	2.7	3.0	3.1	3.1	3.3	3.4	4.4	5.5	5.4	3.8	3.2	3.3	3.4	3.4	2.5	2.4	2.2	2.1
<b>35</b>	2.8	2.7	2.8	2.9	3.0	3.2	3.6	3.8	4.3	5.1	5.1	2.6	4.4	3.8	3.2	2.9	2.7	2.6
<b>40</b>	3.8	3.7	3.6	3.0	3.5	3.6	4.1	4.5	5.0	5.0	4.9	4.6	4.1	4.2	4.1	4.3	4.5	4.3
<b>45</b>	4.5	4.6	4.6	4.7	4.7	4.0	3.0	6.3	6.0	5.3	5.1	4.9	4.6	3.9	3.5	3.6	3.8	4.2
<b>50</b>	5.1	5.1	5.1	5.4	6.9	7.7	7.7	6.9	6.2	6.1	5.6	5.4	5.4	5.4	4.6	3.8	3.8	3.9
<b>55</b>	6.7	6.9	7.6	7.8	7.7	7.6	7.4	6.5	6.1	5.8	5.8	5.8	5.7	5.8	5.8	5.8	4.5	4.3
<b>60</b>	8.3	8.3	8.2	8.0	8.0	7.8	7.7	6.5	6.4	6.2	6.2	6.1	6.1	6.0	6.0	6.0	6.2	6.4
<b>65</b>	8.5	8.4	8.3	7.9	7.6	7.2	6.7	6.5	6.5	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.4	6.5
<b>70</b>	8.0	7.7	7.4	7.1	6.8	6.8	6.7	6.7	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.5	6.4	6.5
<b>75</b>	6.9	6.9	6.8	6.8	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.8	6.8	6.7	6.7	6.7	6.6	6.7
<b>80</b>	6.5	6.5	6.5	6.5	5.5	4.4	4.5	4.5	4.6	5.5	6.0	6.4	6.7	6.8	6.8	6.4	6.4	6.4
<b>85</b>	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.1	6.2	6.2	6.1	6.2
<b>90</b>	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2