

Solar radiation test

Customer:

McMurdo Limited
Derek Carr
Silver Point
Airport Service Road
Portsmouth
Hampshire, PO3 5PB
United Kingdom

Research Contract:

McMurdoCarrso310706MK.pdf

Target:

1 pc of S-VDR FFC System, Item 36-001-002A. Size 520*300*300 mm³, weight 9 kg.
1 pc of Smartfind/G5 EPIRB, Item 82-800-001A. Size 225*130*130 mm³, weight 0.72 kg
1 pc of E5/G5 Auto Housing Assembly, Item 82-892. Size 134*147*435 mm³, weight 2.13 kg
1 pc of Manual Bracket Assembly Simrad, Item 82-891-002B. Size 11*14*12 cm³, weight 69 g

Picture of the samples has been taken before the test.



On the left there is the E5/G5 Auto Housing Assembly, in the middle there is the S-VDR FFC System, on the top right there is the Smartfind/G5 EPIRB and below it the Manual Bracket Assembly Simrad.



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Ref. No.: McMurdoCarrtr210806TO.pdf

Test time:

Start of the test: 11th of August, 2006

End of the test: 14th of August, 2006

Test time: 80 hours

Purpose of the test:

To test the withstand of the samples to solar radiation.

Test method:

The test standard was the Solar Radiation Test specified in Clause 8.10 of the IEC 60945 (2002).

Also IEC 68-2-5 and IEC 68-2-9 were followed.

Continuous Solar radiation: $1120 \text{ W/m}^2 \pm 100 \text{ W/m}^2$.

Ambient temperature: $40 \pm 2^\circ\text{C}$

Test time: 80 hours

Validation of test method:

The maximum normal solar radiation on earth is about 1000 W/m^2 . Some days 1200 W/m^2 is reached, but it happens only for a time of few minutes. The amount of 1120 W/m^2 of solar radiation required by the standard is about 10 % more than natural solar radiation outdoors and it is suitable for functional testing of devices.

The continuous 80 h radiation in this test guarantees that the devices reach their maximum temperature at the ambient temperature of 40°C and that they stabilize. This may reveal some long term effects in the devices due to the solar radiation. But on the other hand the effect of the cyclic nature of natural sunlight is not tested in this test.

Performed actions:

Simulated radiation

The solar radiation was simulated with many metal halide lamps. This type of lamp is widely used to simulate solar radiation. The spectrum of the lamp and the AM2 spectrum in the wavelength range of 300 – 800 nm are in the figure. There are some characteristic peaks in the spectrum of the simulator lamps. These peaks have no significant effect in solar thermal testing. On the right there is a figure of the energy distribution of the simulator lamp.



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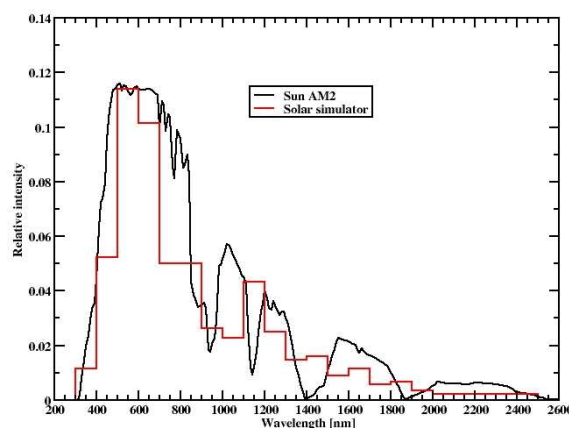
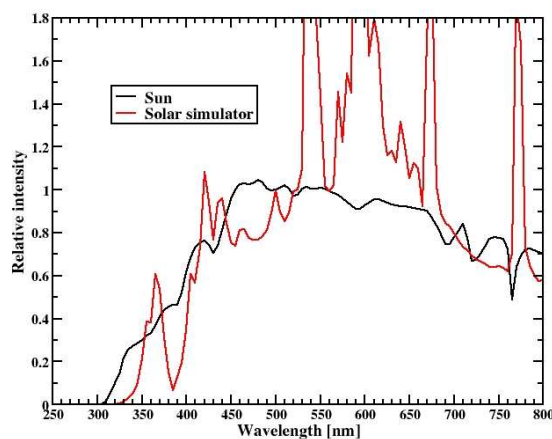


Table 1. The amounts of solar radiation, the radiation from the solar simulator and the allowed tolerances (IEC 68-2-5) in the ranges of ultraviolet (UV), visible radiation and thermal radiation (IR). Total radiation is 1120 W/m²

	UV [W/m ²]	Visible [W/m ²]	IR [W/m ²]
Sun	68	560	492
Solar simulator	60	608	452
Allowed tolerances according to IEC 68-2-5	± 30%	± 10%	± 20%

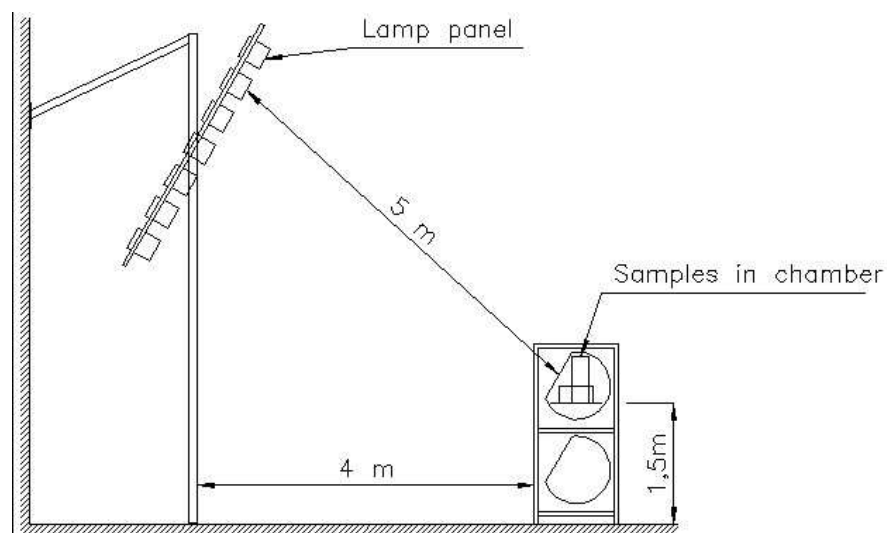
Table 2. The amounts of solar radiation, the radiation from the solar simulator and the allowed tolerances (IEC 60945) in the ranges of ultraviolet (UV), visible radiation and thermal radiation (IR). Total radiation is 1120 W/m²

	UVB [W/m ²]	UVA [W/m ²]	Visible 0.4 – 0.52 μm [W/m ²]	Visible 0.52 – 0.64 μm [W/m ²]	Visible 0.64 – 0.78 μm [W/m ²]	IR [W/m ²]
Sun	5	63	200	186	174	492
Solar simulator	2	58	170	248	190	452
Allowed tolerances (IEC 60945)	± 35%	± 25%	± 10%	± 10%	± 10%	± 20%



On the left there is a picture of the large scale solar simulator. The picture was not taken during the actual test.

The tested samples were put into the test chamber so that they would be in their normal real life positions. The test assembly can be seen in the figure.

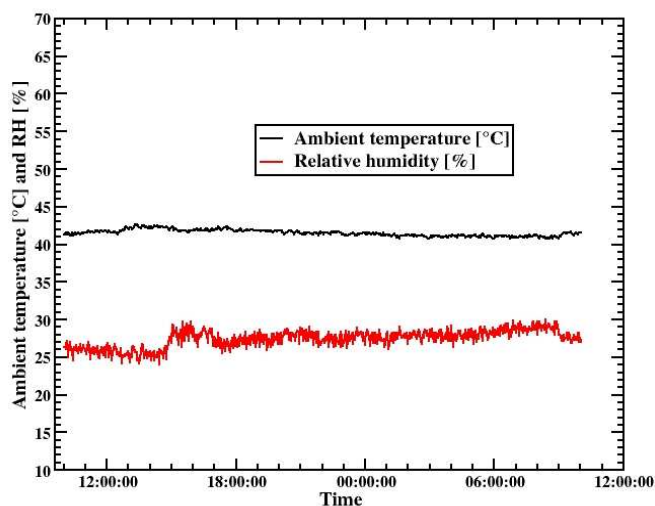


The picture was taken at the beginning of the test. The samples are in the test chamber. On the left there are behind the radiation shield the ambient temperature and the relative humidity sensors. Below the S-VDR there are a couple of wood pieces to keep the upright position of the device.



The perpendicular intensity of the simulated radiation on the samples was measured with a calibrated pyranometer to be $1130 \pm 50 \text{ W/m}^2$.

The measured ambient temperature and relative humidity data during one 24 h cycle are in the figure. The mean ambient temperature during the whole test was $41 \pm 1 \text{ }^\circ\text{C}$.



Surface temperatures of the samples:

The surface temperatures of some areas of the samples were measured at the ambient temperature of 41°C with an IR-thermometer with an emissivity value set to 0.95. The measurement took place 24 hours after the beginning of the test. The air velocity around the samples was 0 – 0.1 m/s. The temperatures of the measurement points are in the pictures.



Conclusions:

Self tests:

Self tests of S-VDR FFC System and Smartfind/G5 EPIRB were done before and after the solar radiation test. Both devices passed the self tests.

Remarks:

In the Appendix 1 there is a letter which lists the production drawing states of the products under test.

In the Appendix 2 there is the signed statement of five pages produced by the notified body.



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There were no reference samples so it is not possible to say anything about possible colour changes of the samples due to the solar radiation test.

No visible deformations in the samples were observed.

The tested samples have been sent to the attention of Mr. Carr from McMurdo Limited with an 'NOT TO BE OPENED' label on the package. Mr. Carr delivers the package to the notified body to carry out performance tests for the devices. The statement of the notified body is in Appendix 2.

Used controlling and measuring equipment:

Sample chamber temperature control: Mitsubishi FX2N PLC

Solar radiation: Calibrated Kipp&Zonen CM11 pyranometer

Temperatures: PT100 and IR-thermometer

Relative humidity: HIH-3610

All actions, operations and reporting are in accordance with IEC/ISO 17025 'General requirements for the competence of testing laboratories'.

Signatures:

In Littoinen, Finland

Timo Oksa

16th of October, 2006



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Appendix 1:

mcmurdo	
SAFETY BY DESIGN	
Solar Simulator Finland Ltd., Keskilantie 5, FIN-20660 Littoinen, Finland.	McMurdo Ltd Silver Point Airport Service Road Portsmouth PO3 5PB United Kingdom Tel: +44 (0) 23 9262 3900 Fax: +44 (0) 23 9262 3998 www.mcmurdo.co.uk
F.A.O. Mr Mikko Kortemaa	3 rd August 2006
Re: Solar Radiation Test on McMurdo Products to IEC 60945:2002 Clause 8.10	
Dear Mr. Kortemaa,	
With reference to the Solar Radiation Test being conducted by Solar Simulator Finland Ltd, to IEC 60945:2002 – Clause 8.10, it is confirmed, that the production units under test are manufactured to the Build Standard detailed on the following drawing numbers:-	
S-VDR plus Mounting Bracket Assembly	
• Drg.No.36-001F (6sheets) Iss.2	S-VDR Family Tree
G5 SMARTFIND PLUS EPIRB plus Manual and Auto Float Free Housing	
• Drg.No.82-810-XXXF (2sheets) Iss.1	E5/G5 EPIRB Family Table
• Drg.No.82-801-XXXF (2sheets) Iss.1	E5/G5 EPIRB Family Tree Thrane & Thrane
• Drg.No.82-802-XXXF (2sheets) Iss.1	SIMRAD EP50/EG50 (E5/G5) EPIRB Family Tree
Best Regards	
	
Derek Carr Approvals Engineer McMurdo Ltd	
Direct Line Phone: + 44(0) 23 9262 3940 Fax: +44(0) 23 9262 3997 E-mail derekcarr@mcmurdo.co.uk	
Registered in England No. 746603 Registered Office: 1650 Parkway, Whiteley, Fareham, Hampshire, PO15 7AH VAT No. GB 421 1393 92	

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Appendix 2: A five page statement from QinetiQ

QINETIQ/D&TS/SES/TC0613275

QinetiQ Proprietary

Certificate of Inspection EPIRB post Solar Radiation Test

QinetiQ

Certificate number: QINETIQ/D&TS/SES/TC0613275
Date of issue: 21/09/2006
Issue: 1.0

EMC Facility
QinetiQ Farnborough
Ively Road, Farnborough
Hampshire. GU14 0LX, UK
Telephone : 01252 394009
Facsimile : 01252 397058

Administrative Information

Customer: Sales Ref
Customer Representative:
Equipment under test:
Build Standard:
Test specifications:
Inspection date:
Modes of operation:
Compliance engineer:
Location of Inspection:
Test equipment used:

McMurdo Ltd
Mr D Carr, Mr N Taylor
S-VDR Capsule/EPIRB in hydrostatic housing
G5 EPIRB in hydrostatic housing and manual bracket
Declared as Production units
BS EN 61097-2: 2000 Clause 3.3.7 (IEC 60945, Clause 8.10)
1 September 2006
Standby, Self Test, Operational
P J Goddard
McMurdo Ltd, Silverpoint, Portsmouth
ARG Sartech Handheld EPIRB test receiver A194
Calibration to: 20 March 2007

Test Item Details

Item No	Item	Type
1	McMurdo S-VDR/EPIRB Capsule	C1 (36-001-002A)
2	McMurdo EPIRB	G5 (82-800-001A)
3	Hydrostatic Release Bracket for C1	36-200-002B
4	Hydrostatic Release Housing for G5	82-041A
5	Manual Bracket for G5	82-891-002B

Inspection Summary

The items had been sent to the facility of Solar Simulator Finland Ltd (SSFL) and had been subject to 80 hours of simulated solar radiation as specified in IEC 60945:2002, clause 8.10. At the conclusion of this test the staff of SSFL only conducted a visual examination of the samples. The samples were then packed and securely sealed and returned to McMurdo Ltd, Portsmouth. The SSFL test report McMurdoCarrTR210806TO details the test.

Together with Mr D Carr and Mr N Taylor we opened the package and removed the above items. They were first subject to a visual examination and I can confirm that no adverse effects were visible to the naked eye, the colours of the plastic casing appeared unchanged from other samples of the same items and the clear plastic parts showed no signs of cloudiness.

The two beacons were then subject to an 'aliveness' test using an ARG Sartech EPIRB test receiver, this measures the RF carrier frequency, data message, approximate power indication, homing signal, and will give an overall pass / fail indication. Both beacons completed a self-test successfully and the test with the ARG Sartech receiver showed the correct readings and was considered a pass.

It is therefore concluded that the requirements of the solar radiation test have been successfully met for this equipment. An annex of 4 pages shows photographs of the items as inspected.

IT IS CERTIFIED THAT THE INSPECTIONS DETAILED IN THIS CERTIFICATE HAVE BEEN CARRIED OUT AS SPECIFIED, WITH THE RESULTS AS SHOWN, TO THE REQUIREMENTS OF THE CONTRACT.

Signed (electronic)
P J Goddard
EMES Business Group,
System Evaluation Services
Farnborough

Date 29 September 2006

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Certificate of Inspection EPIRB post Solar Radiation Test

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Certificate number: QINETIQ/D&TS/SES/TC0613275
Date of issue: 21/09/2006
Issue: 1.0

EMC Facility
QinetiQ Farnborough
Ively Road, Farnborough
Hampshire. GU14 0LX, UK
Telephone : 01252 394009
Facsimile : 01252 397058

Photographic Annex



The C1 EPIRB/S-VDR capsule and release bracket.



Top view of the C1 EPIRB/S-VDR capsule.

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The G5 EPIRB beacon, rear view showing identity label.



The G5 EPIRB beacon, Top view showing retroreflective material and self-test button.

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The G5 Float-Free housing, opened to show mechanism.



The G5 Float-Free housing, top view showing identity and instruction labels.

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The G5 manual bracket.



A sample of the pictorial instruction label for the G5 was also subject to test.

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