REPORT

issued by an Accredited Testing Laboratory

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Date: 2019-06-24

Reference: MTt9P04703-01

Testing

Labino AB
Fågelsångsvägen 16
186 42 Vallentuna
Sweden

Classification of light source in accordance with IEC / SS-EN 62471

(1 appendix)

RISE Research Institute of Sweden has performed classification of the UV-light Labino BB 2.0 Artemis Mains in accordance with IEC / SS-EN 62471. The unit belongs to *Risk Group 3*.

Test object

BB 2.0 Artemis Mains. The device has eight UV-LEDs in an even circular pattern. Each UV-LED is emitting UV-light with a peak wavelength of 369 nm. See also pictures in the appendix.

Classification

The tested light source belongs to the *Risk Group 3* during normal operation.

Identification

Reference: Lisel Athanasiadis
Date: 2019-06-10
Manufacturer: Labino AB
Model: Labino BB 2.0 Artemis Mains s/n: 64854

Date of measurement

June 10-13, 2019.

Test conditions

Measurements were carried out in a temperature-stabilized laboratory with the temperature 23 °C ±2 °C. The BB 2.0 Artemis Mains light source was driven using a transformer connected to the mains outlet. According to IEC / SS-EN 62471, measurements of radiance and irradiance were performed at a distance of 200 mm from the light source in the wavelength range 300 nm to 1100 nm. No radiation was detected outside this range.

Instruments: Spectrometer Avantes Avaspec 2048FT, inv.no. 603160
Precision aperture ∅0.32 mm, inv.no. BX51898
Precision aperture ∅2.2 mm, inv.no. BX51899
Precision aperture ∅7 mm, inv.no. 901721
Reference photo detector Hamamatsu 10×10 mm, inv.no. 500963
Multimeter Keithley 2000, inv.no. 901733
Current Amplifier Keithley 427, inv.no. 500384

Test method

Applicable parts in IEC / SS-EN 62471 and Method 4432. The following hazards were found to be relevant and have been evaluated:

- Irradiance (*Actinic UV E_S, Eye UV-A E_{UVA}*)
- Radiance (*Blue Light Hazard L_B, Retinal thermal L_R*)

Accred. No. 1002
Testing
ISO/IEC 17025

In order to fulfil the *limiting apertures* and *fields of view* as specified in IEC / SS-EN 62471, radiance measurements were performed on a single LED using masking apertures, while irradiance measurements were done without masking.

Test result

Table 1. Measured light source **Labino 2.0 Artemis Mains**

	Artemis
Wavelength (nm)	369
Number of LEDs	8
Single light source size incl. lens (mm)	21,6

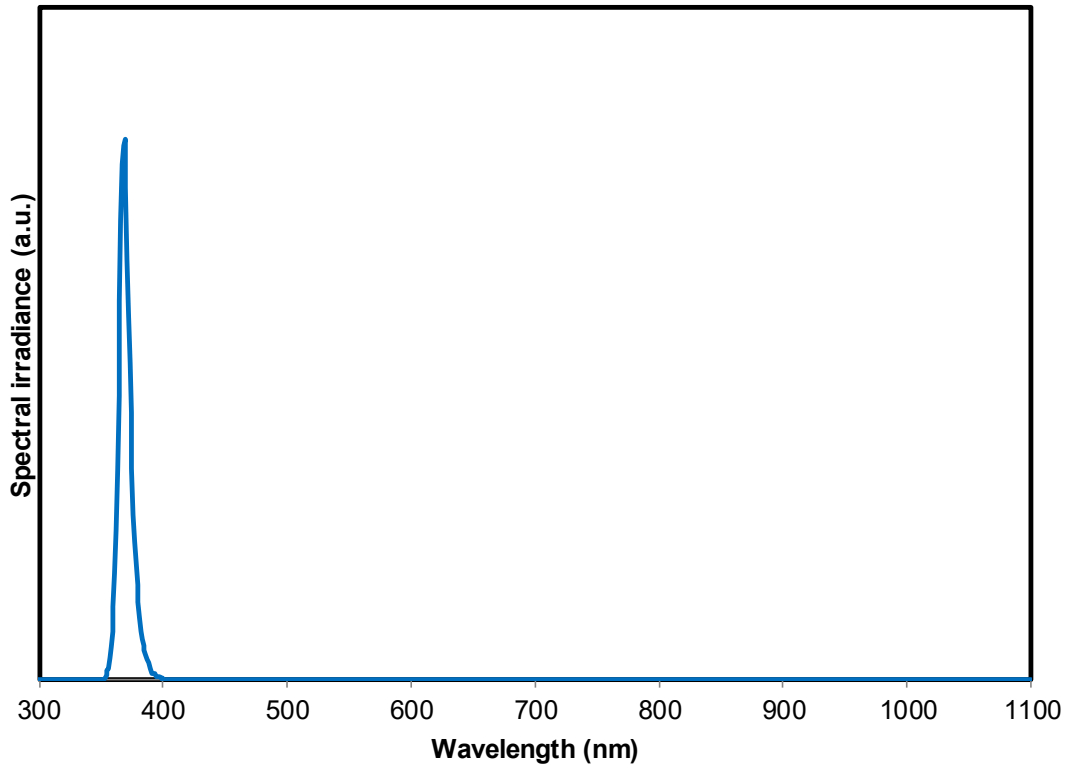

Figure 1. Relative spectral irradiance from the LEDs in BB 2.0 Artemis Mains. No irradiance was detected outside the wavelength range shown.

Table 2. Summary of results for BB 2.0 Artemis Mains based on irradiance measurement at 200 mm.

Hazard name	Wavelength range (nm)	Exposure duration (s)	Limiting aperture (rad)	Exposure limit Risk Group 2 ($W \cdot m^{-2}$)	Measurement value ($W \cdot m^{-2}$)
Actinic UV skin & eye E_S	200 - 400	10000	1.4	0,03	0,11
Eye UV-A E_{UVA}	315 - 400	300	1.4	100	1134
Blue-light small source E_B	300 - 700	N/A	0.011	N/A	-
Eye IR E_{IR}	780 - 3000	N/A	1.4	N/A	N/A
Skin thermal E_H	380 - 3000	N/A	2 π sr	N/A (large area)	-

Results based on the irradiance measurement show that the light source shall be classified as belonging to *Risk Group 3*.

Table 3. Summary of results for BB 2.0 Artemis Mains based on radiance measurement at 200 mm.

Hazard name	Wavelength range (nm)	Exposure duration (s)	Limiting aperture (rad)	Exposure limit Risk Group 1 ($W \cdot m^{-2} \cdot sr^{-1}$)	Measurement value ($W \cdot m^{-2} \cdot sr^{-1}$)
Blue light L_B	300 - 700	100	0.011	$1.00 \cdot 10^4$	$1.17 \cdot 10^3$
Retinal thermal L_R	380 - 1400	10	0.011	$2.81 \cdot 10^5$	$1.05 \cdot 10^3$
Retinal thermal (weak visual stimulus) L_{IR}	780 - 1400	N/A	0.011	N/A	N/A

Results based on the radiance measurement show that the light source shall be classified as belonging to *Risk Group 1*.

Measurement uncertainty

Irradiance: ±10 %
Radiance: ±20%
Wavelength: ±2 nm

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EA Publication EA-4/02.

Remark

The results in this report are only valid for the items tested.

RISE Research Institutes of Sweden AB
Measurement Science and Technology - Time and Optics

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Appendix
Photos of the test object

Appendix 1

Photos of the test objects

BB 2.0 Artemis Mains

REPORT

issued by an Accredited Testing Laboratory

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Testing

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186 42 Vallentuna
Sweden

Classification of light source in accordance with IEC / SS-EN 62471

(1 appendix)

RISE Research Institute of Sweden has performed classification of the UV-light Labino BB 2.0 Helios Mains in accordance with IEC / SS-EN 62471. The unit belongs to *Risk Group 3*.

Test object

BB 2.0 Helios Mains. The device has eight UV-LEDs with four closer to the centre and four further away. Each UV-LED is emitting UV-light with a peak wavelength of 369 nm. See also pictures in the appendix.

Classification

The tested light source belongs to the *Risk Group 3* during normal operation.

Identification

Reference: Lisel Athanasiadis
Date: 2019-06-10
Manufacturer: Labino AB
Model: Labino BB 2.0 Helios Mains s/n: 64858

Date of measurement

June 10-13, 2019.

Test conditions

Measurements were carried out in a temperature-stabilized laboratory with the temperature 23 °C ±2 °C. The BB 2.0 Helios Mains light source was driven using a transformer connected to the mains outlet. According to IEC / SS-EN 62471, measurements of radiance and irradiance were performed at a distance of 200 mm from the light source in the wavelength range 300 nm to 1100 nm. No radiation was detected outside this range.

Instruments: Spectrometer Avantes Avaspec 2048FT, inv.no. 603160
Precision aperture ∅0.32 mm, inv.no. BX51898
Precision aperture ∅2.2 mm, inv.no. BX51899
Precision aperture ∅7 mm, inv.no. 901721
Reference photo detector Hamamatsu 10×10 mm, inv.no. 500963
Multimeter Keithley 2000, inv.no. 901733
Current Amplifier Keithley 427, inv.no. 500384

Test method

Applicable parts in IEC / SS-EN 62471 and Method 4432. The following hazards were found to be relevant and have been evaluated:

- Irradiance (*Actinic UV E_S, Eye UV-A E_{UVA}*)
- Radiance (*Blue Light Hazard L_B, Retinal thermal L_R*)

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In order to fulfil the *limiting apertures* and *fields of view* as specified in IEC / SS-EN 62471, radiance measurements were performed on a single LED using masking apertures, while irradiance measurements were done without masking.

Test result

Table 1. Measured light source **Labino 2.0 Helios Mains**

	Helios
Wavelength (nm)	369
Number of LEDs	8
Single light source size incl. lens (mm)	21,6

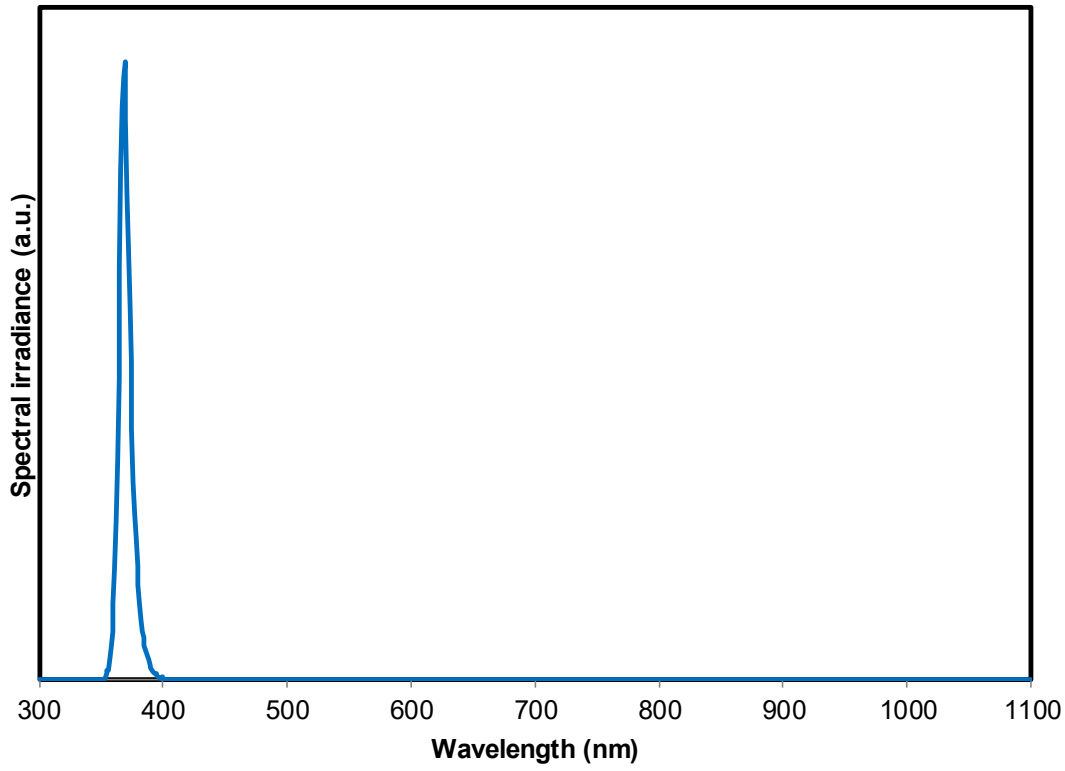

Figure 1. Relative spectral irradiance from the LEDs in BB 2.0 Helios Mains. No irradiance was detected outside the wavelength range shown.

Table 2. Summary of results for BB 2.0 Helios Mains based on irradiance measurement at 200 mm.

Hazard name	Wavelength range (nm)	Exposure duration (s)	Limiting aperture (rad)	Exposure limit Risk Group 2 ($W \cdot m^{-2}$)	Measurement value ($W \cdot m^{-2}$)
Actinic UV skin & eye E_s	200 - 400	10000	1.4	0,03	0,035
Eye UV-A E_{UVA}	315 - 400	300	1.4	100	376
Blue-light small source E_B	300 - 700	N/A	0.011	N/A	-
Eye IR E_{IR}	780 - 3000	N/A	1.4	N/A	N/A
Skin thermal E_H	380 - 3000	N/A	2 π sr	N/A (large area)	-

Results based on the irradiance measurement show that the light source shall be classified as belonging to *Risk Group 3*.

Table 3. Summary of results for BB 2.0 Helios Mains based on radiance measurement at 200 mm.

Hazard name	Wavelength range (nm)	Exposure duration (s)	Limiting aperture (rad)	Exposure limit Exempt Group ($W \cdot m^{-2} \cdot sr^{-1}$)	Measurement value ($W \cdot m^{-2} \cdot sr^{-1}$)
Blue light L_B	300 - 700	10000	0.1	100	71.9
Retinal thermal L_R	380 - 1400	10	0.011	$2.81 \cdot 10^5$	$5.42 \cdot 10^2$
Retinal thermal (weak visual stimulus) L_{IR}	780 - 1400	N/A	0.011	N/A	N/A

Results based on the radiance measurement show that the light source shall be classified as belonging to *Exempt Group*.

Measurement uncertainty

Irradiance: ±10 %
Radiance: ±20%
Wavelength: ±2 nm

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EA Publication EA-4/02.

Remark

The results in this report are only valid for the items tested.

RISE Research Institutes of Sweden AB
Measurement Science and Technology - Time and Optics

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Appendix
Photos of the test object

Appendix 1

Photos of the test objects

BB 2.0 Helios Mains

REPORT

issued by an Accredited Testing Laboratory

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Testing

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Classification of light source in accordance with IEC / SS-EN 62471

(1 appendix)

RISE Research Institute of Sweden has performed classification of the UV-light Labino BB 2.0 Ikaros Mains in accordance with IEC / SS-EN 62471. The unit belongs to *Risk Group 3*.

Test object

BB 2.0 Ikaros Mains. The device has seven UV-LEDs where 6 LEDs are in a circular pattern around one central LED. Each UV-LED is emitting UV-light with a peak wavelength of 369 nm. See also pictures in the appendix.

Classification

The tested light source belongs to the *Risk Group 3* during normal operation.

Identification

Reference: Lisel Athanasiadis
Date: 2019-06-10
Manufacturer: Labino AB
Model: Labino BB 2.0 Ikaros Mains s/n: 64849

Date of measurement

June 10-13, 2019.

Test conditions

Measurements were carried out in a temperature-stabilized laboratory with the temperature 23 °C ±2 °C. The BB 2.0 Ikaros Mains light source was driven using a transformer connected to the mains outlet. According to IEC / SS-EN 62471, measurements of radiance and irradiance were performed at a distance of 200 mm from the light source in the wavelength range 300 nm to 1100 nm. No radiation was detected outside this range.

Instruments: Spectrometer Avantes Avaspec 2048FT, inv.no. 603160
Precision aperture ∅0.32 mm, inv.no. BX51898
Precision aperture ∅2.2 mm, inv.no. BX51899
Precision aperture ∅7 mm, inv.no. 901721
Reference photo detector Hamamatsu 10×10 mm, inv.no. 500963
Multimeter Keithley 2000, inv.no. 901733
Current Amplifier Keithley 427, inv.no. 500384

Test method

Applicable parts in IEC / SS-EN 62471 and Method 4432. The following hazards were found to be relevant and have been evaluated:

- Irradiance (*Actinic UV E_S, Eye UV-A E_{UVA}*)
- Radiance (*Blue Light Hazard L_B, Retinal thermal L_R*)

In order to fulfil the *limiting apertures* and *fields of view* as specified in IEC / SS-EN 62471, radiance measurements were performed on a single LED using masking apertures, while irradiance measurements were done without masking.

Test result

Table 1. Measured light source **Labino 2.0 Ikaros Mains**

	Ikaros
Wavelength (nm)	369
Number of LEDs	7
Single light source size incl. lens (mm)	21,6

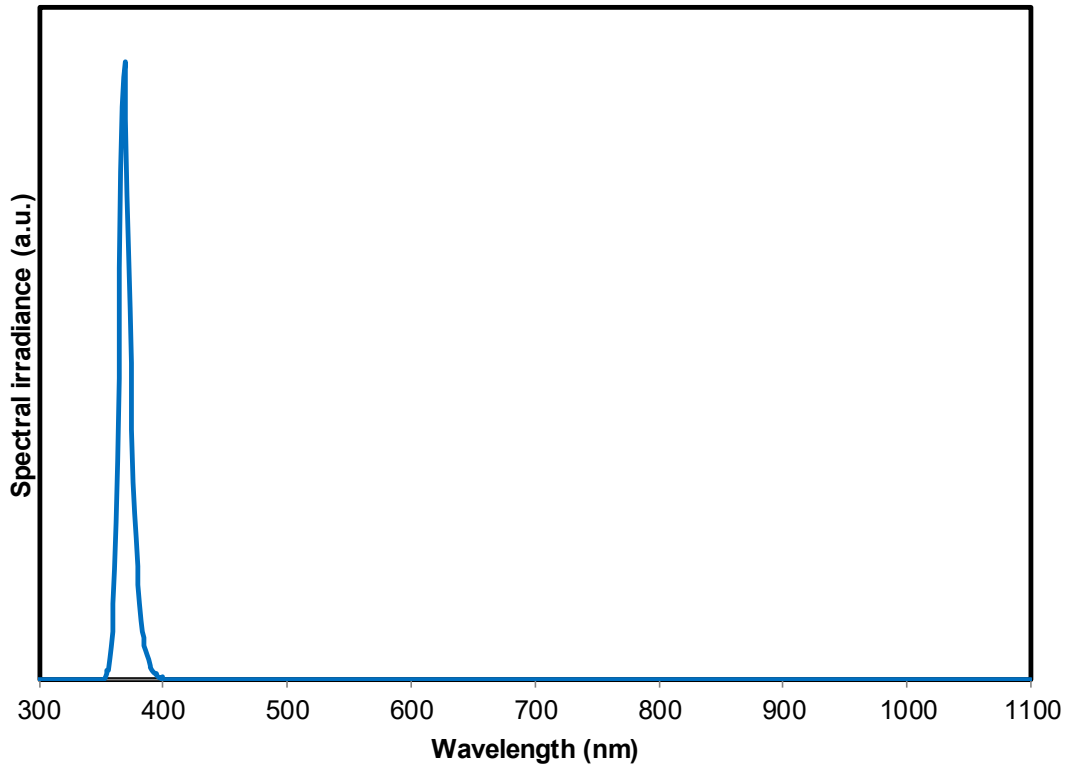

Figure 1. Relative spectral irradiance from the LEDs in BB 2.0 Ikaros Mains. No irradiance was detected outside the wavelength range shown.

Table 2. Summary of results for BB 2.0 Ikaros Mains based on irradiance measurement at 200 mm.

Hazard name	Wavelength range (nm)	Exposure duration (s)	Limiting aperture (rad)	Exposure limit Risk Group 2 ($W \cdot m^{-2}$)	Measurement value ($W \cdot m^{-2}$)
Actinic UV skin & eye E_s	200 - 400	10000	1.4	0,03	0,014
Eye UV-A E_{UVA}	315 - 400	300	1.4	100	144
Blue-light small source E_B	300 - 700	N/A	0.011	N/A	-
Eye IR E_{IR}	780 - 3000	N/A	1.4	N/A	N/A
Skin thermal E_H	380 - 3000	N/A	2 π sr	N/A (large area)	-

Results based on the irradiance measurement show that the light source shall be classified as belonging to *Risk Group 3*.

Table 3. Summary of results for BB 2.0 Ikaros Mains based on radiance measurement at 200 mm.

Hazard name	Wavelength range (nm)	Exposure duration (s)	Limiting aperture (rad)	Exposure limit Exempt Group ($W \cdot m^{-2} \cdot sr^{-1}$)	Measurement value ($W \cdot m^{-2} \cdot sr^{-1}$)
Blue light L_B	300 - 700	10000	0.1	100	70.7
Retinal thermal L_R	380 - 1400	10	0.011	$2.81 \cdot 10^5$	$4.96 \cdot 10^2$
Retinal thermal (weak visual stimulus) L_{IR}	780 - 1400	N/A	0.011	N/A	N/A

Results based on the radiance measurement show that the light source shall be classified as belonging to *Exempt Group*.

Measurement uncertainty

Irradiance: ±10 %
Radiance: ±20%
Wavelength: ±2 nm

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with EA Publication EA-4/02.

Remark

The results in this report are only valid for the items tested.

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Appendix
Photos of the test object

Appendix 1

Photos of the test objects

BB 2.0 Ikaros Mains