
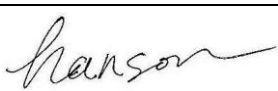




Test Report issued under the responsibility of:



| | |
|--|---|
| TEST REPORT IEC TR 62778 Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires | |
| Report Number..... : | 6023556.50P |
| Date of issue | 2018-01-02 |
| Total number of pages | 27 |
| Name of Testing Laboratory preparing the Report | DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436 |
| Applicant's name | Lumileds Malaysia Sdn. Bhd |
| Address..... | No. 3 , Lintang Bayan Lepas 8, Phase 4, Bayan Lepas Industrial Park, 11900 Penang, Malaysia |
| Test specification: | |
| Standard | IEC TR 62778:2014 (Second Edition) |
| Test procedure | CB Scheme |
| Non-standard test method | N/A |
| Test Report Form No. | IEC62778A |
| Test Report Form(s) Originator | TÜV SÜD Product Service GmbH |
| Master TRF | Dated 2016-02 |
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| General disclaimer: The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report. | |

| | | |
|---|---|---|
| Test item description | LUXEON MX L1MX-657012V500000 | |
| Trade Mark | LUMILEDS | |
| Manufacturer | Lumileds Malaysia Sdn. Bhd. No. 3 , Lintang Bayan Lepas 8, Phase 4, Bayan Lepas Industrial Park, 11900 Penang, Malaysia | |
| Model/Type reference | LUXEON MX series Detailed lists refer to Appendix 2: Model List | |
| Ratings | Max voltage: 11,7 Vdc, Max current: 1500 mA Detailed information please refer to Appendix 2: Model List. | |
| Responsible Testing Laboratory (as applicable), testing procedure and testing location(s): | | |
| <input checked="" type="checkbox"/> CB Testing Laboratory: | DEKRA Testing and Certification (Shanghai) Ltd. | |
| Testing location/ address | 3/F, #250, Jiangchangsan Road building 16 Headquarter Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436 | |
| <input type="checkbox"/> Associated CB Testing Laboratory: | | |
| Testing location/ address | | |
| Tested by (name, function, signature) | Yuelie Wu |  |
| Approved by (name, function, signature) ... | Hanson Zhang |  |
| Testing procedure: CTF Stage 1: | | |
| Testing location/ address | | |
| Tested by (name, function, signature) | | |
| Approved by (name, function, signature) | | |
| Testing procedure: CTF Stage 2: | | |
| Testing location/ address | | |
| Tested by (name + signature) | | |
| Witnessed by (name, function, signature) | | |
| Approved by (name, function, signature) | | |
| Testing procedure: CTF Stage 3: | | |
| Testing procedure: CTF Stage 4: | | |
| Testing location/ address | | |

| | | |
|---|--|--|
| Tested by (name, function, signature) | | |
| Witnessed by (name, function, signature) | | |
| Approved by (name, function, signature) | | |
| Supervised by (name, function, signature) | | |
| | | |

| | |
|--|--|
| List of Attachments (including a total number of pages in each attachment): <ul style="list-style-type: none"> ● Appendix 1: Photo Documentation ● Appendix 2: Model List ● Appendix 3: Relative Spectrum Of Tested Sample(s) ● Appendix 4: Table 6.1Based On IEC 62471:2006 ● Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences ● Appendix 6: Blue Light Hazard-forward Current Relationship (Non-mandatory Information) | |
| Summary of testing: | |
| Tests performed (name of test and test clause): <p>These tests fulfil the requirements of standard ISO/IEC 17025.</p> <p>When determining the test conclusion, the Measurement Uncertainty of test has been considered.</p> <p>The tested sample of L1MX-657012V500000 from LUXEON MX series list at appendix 2 Have been tested according to the IEC 62471(first edition, 2006-07) at 200mm and been classified as RG 2 at maximum current 1500mA.</p> <p>Have been tested according to the EN 62471:2008 at 200mm and been classified as RG 2 at maximum current 1500mA.</p> <p>Have been tested according to the IEC/TR62778:2014 and been classified as RG 2. for blue light hazard at maximum current 1500mA.</p> <p>The sample of L1MX-657012V500000 was tested at 375mA, 750mA, 1125mA and 1500mA. Current at RG1 to RG2 boundary was deducted to be 158mA.</p> <p>(See appendix 6 for detail).</p> | Testing location: <p>DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436</p> |
| Summary of compliance with National Differences (List of countries addressed):EN Standards <p>EN 62471:2008</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements</p> | |

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

N/A

| | |
|--|---|
| Test item particulars.....: See below | |
| Product evaluated.....: | <input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire |
| Rated voltage (V) | Max: 11,7 Vdc |
| Rated current (mA) | Max:1500 mA |
| Rated CCT (K).....: | 2200K / 2700K / 3000K / 3500K / 4000K / 5000K / 5700K / 6500K Details information please refer to Appendix 2: Model List. |
| Rated Luminance (Mcd/m²) | -- |
| Component report data used | <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp Report number: -- |
| Possible test case verdicts: | |
| - test case does not apply to the test object.....: N/A | |
| - test object does meet the requirement.....: P (Pass) | |
| - test object does not meet the requirement.....: F (Fail) | |
| Testing.....: -- | |
| Date of receipt of test item | 2018-01-02 |
| Date (s) of performance of tests | 2018-01-02 |
| General remarks: | |
| "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator. The product complied with the following standards: <input checked="" type="checkbox"/> IEC 62471:2006 <input checked="" type="checkbox"/> EN 62471:2008 <input type="checkbox"/> IEC/TR 62471-2:2009 <input checked="" type="checkbox"/> IEC/TR 62778:2014 | |
| Manufacturer's Declaration per sub-clause 4.2.5 of IEC60598-2: | |

| | |
|--|--|
| <p>The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided</p> | <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable</p> |
| <p>When differences exist; they shall be identified in the General product information section.</p> | |
| <p>Name and address of factory (ies) Lumileds Malaysia Sdn. Bhd. No. 3 , Lintang Bayan Lepas 8, Phase 4, Bayan Lepas Industrial Park, 11900 Penang, Malaysia</p> | |
| <p>General product information:</p> <p>L1MX-657012V500000, with ANSI bin 6500K, is part of the LUXEON MX product family. The present classification is thus valid (worst case) for all LUXEON MX products with part number L1MX–AABBCCCDEEEE0 where AA represents nominal ANSI CCT bins can be equal to 6500K or lower, and BB represents CRI ranging can be from 70 to 90 (see TR IEC62778). CCC represents voltage. Note that for 3V and 6V samples, the current is 4 times and 2 times respectively as much as that of 12V samples for same flux output and thereby share similar risk. See the appendix 2 below for an explanation of the type designation.</p> <p>In addition, LXRa-bWdd-eeee belongs to LUXEON M family of similar optical and mechanical construction as LUXEON MX family but with less brighter chips. The result of the LUXEON MX in this report is thus valid (worst case) and applicable for all LUXEON M products by virtue of having higher total luminous flux than LUXEON M. LXRa-BWdd-eeee where a represents minimum CRI (70 to 90), b represents voltage (3V, 6V or 12V), dd represents nominal ANSI CCT 6500K or lower (see TR IEC62778) and eeee represents custom binning for example minimum flux. Note that for 3V and 6V samples, the current is 4 times and 2 times respectively as much as that of 12V part for same flux output and thereby share similar risk. See the appendix 2 below for an explanation of the type designation.</p> <p>The products considered as worst case which should be evaluated at 200mm.</p> <p>The sample of L1MX-657012V500000 was tested at 200mm from the light source. CCT of spectral irradiance was found at 7525 K.</p> <p>Base on the Model list which listed on the appendix 2, The tested sample can be considered as <input type="checkbox"/> typical product <input checked="" type="checkbox"/> worst product Which the results can be reference used for the other models.</p> <p>Type test was performed according to IEC 62471:2006 procedure.</p> | |

| IEC TR 62778 | | | |
|--------------|---|--|------------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 7 | MEASUREMENT INFORMATION FLOW | | P |
| 7.1 | Basic flow | | P |
| | 'Law of conservation of luminance' applied | | N/A |
| | Use of only true luminance/radiance values | | P |
| | In case of luminaire: The light source is operated in the luminaire under similar conditions as when tested as a component | | N/A |
| | In case E_{thr} value for RG2 was established the peak value was derived from angular light distribution | | N/A |
| 7.2 | Conditions for the radiance measurement | | P |
| | Standard condition applied (200mm distance, 0,011rad field of view) | | P |
| | Non-standard condition applied | | N/A |
| 7.3 | Special cases (I): Replacement by a lamp or LED module of another type | | N/A |
| | Light source is a white light source | | N/A |
| | Evaluation done based on highest luminance | | N/A |
| | Evaluation done based on CCT value | | N/A |
| 7.4 | Special cases (II): Arrays and clusters of primary light sources | | N/A |
| | LED package is evaluated as : <input type="checkbox"/> RG0 unlimited <input type="checkbox"/> RG1 unlimited | | N/A |
| | E_{thr} of LED package applies to array | | N/A |
| 8 | RISK GROUP CLASSIFICATION | | P |
| | Risk group achieved: | | P |
| | - ..Risk Group 0 unlimited | | N/A |
| | - ..Risk Group 1 unlimited | | N/A |
| | - E_{thr} (lx) : - Distance to reach RG1..... (mm) :: | Refer to the Supplementary information of TABLE:Spectroradiometric measurement as following | P |

| IEC TR 62778 | | | |
|--------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|-------------------------------|--------------------------------------|----------------|---|---------------|---------|
| | TABLE:Spectroradiometric measurement | | | | |
| | Measurement performed on: | | <input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire | | |
| | Model number | | L1MX-657012V500000 | | |
| | Test voltage (V) | | 11,7 Vdc | | — |
| | Test current (mA) | | 1500mA | | — |
| | Test frequency (Hz)..... | | -- | | — |
| | Ambient, t(°C) | | 25°C | | — |
| | Measurement distance | | <input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm | | — |
| | Source size | | <input checked="" type="checkbox"/> Non-small <input type="checkbox"/> Small : | | — |
| | Field of view | | <input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources) | | — |
| Item | | Symb ol | Units | Result | Remark |
| Correlated colour temperature | | CCT | K | 7525 | |
| x/y colour coordinates | | | | 0,3002/0,3094 | |
| Blue light hazard radiance | | L _B | W/(m ² •sr ¹) | 7,90E+04 | @11mrad |
| Blue light hazard irradiance | | E _B | W/m ² | -- | |
| Luminance | | L | cd/m ² | 5,94E+07 | @11mrad |
| Illuminance | | E | lx | 1,88E+04 | |
| | | | | | |
| Supplementary information: | | | | | |
| Per IEC/TR 62778:2014 | | | | | |
| Eth _r = 752 lx | | | | | |
| Dmin= 999 mm | | | | | |

| IEC TR 62778 | | | |
|--------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | TABLE: Spectroradiometric measurement | | | | |
|---|--|---|--------------------------------------|---------------|---------|
| | Measurement performed on: | <input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire | | | |
| | Model number | L1MX-657012V500000 | | | |
| | Test voltage (V) | -- | | | — |
| | Test current (mA) | 1125mA | | | — |
| | Test frequency (Hz) | -- | | | — |
| | Ambient, t(°C) | 25°C | | | — |
| | Measurement distance | <input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm | | | — |
| | Source size | <input checked="" type="checkbox"/> Non-small <input type="checkbox"/> Small : | | | — |
| | Field of view | <input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources) | | | — |
| Item | | Symb ol | Units | Result | Remark |
| Correlated colour temperature | | CCT | K | 7525 | |
| x/y colour coordinates | | | | 0,3002/0,3094 | |
| Blue light hazard radiance | | L _B | W/(m ² •sr ¹) | 6,28E+04 | @11mrad |
| Blue light hazard irradiance | | E _B | W/m ² | -- | |
| Luminance | | L | cd/m ² | 4,73E+07 | @11mrad |
| Illuminance | | E | lx | 1,49E+04 | |
| | | | | | |
| Supplementary information: Per IEC/TR 62778:2014 Ethr= 754 lx Dmin= 890 mm | | | | | |

| IEC TR 62778 | | | |
|--------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | TABLE: Spectroradiometric measurement | | | | |
|---|--|---|--------------------------------------|---------------|---------|
| | Measurement performed on: | <input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire | | | |
| | Model number | L1MX-657012V500000 | | | |
| | Test voltage (V) | -- | | | — |
| | Test current (mA) | 750mA | | | — |
| | Test frequency (Hz) | -- | | | — |
| | Ambient, t(°C) | 25°C | | | — |
| | Measurement distance | <input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm | | | — |
| | Source size | <input checked="" type="checkbox"/> Non-small <input type="checkbox"/> Small : | | | — |
| | Field of view | <input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources) | | | — |
| Item | | Symb ol | Units | Result | Remark |
| Correlated colour temperature | | CCT | K | 7525 | |
| x/y colour coordinates | | | | 0,3002/0,3094 | |
| Blue light hazard radiance | | L _B | W/(m ² •sr ¹) | 4,38E+04 | @11mrad |
| Blue light hazard irradiance | | E _B | W/m ² | -- | |
| Luminance | | L | cd/m ² | 3,33E+07 | @11mrad |
| Illuminance | | E | lx | 1,05E+04 | |
| | | | | | |
| Supplementary information: Per IEC/TR 62778:2014 Ethr= 760 lx Dmin= 743 mm | | | | | |

| IEC TR 62778 | | | |
|--------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | TABLE: Spectroradiometric measurement | | | | |
|---|--|---|--------------------------------------|---------------|---------|
| | Measurement performed on: | <input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire | | | |
| | Model number | L1MX-657012V500000 | | | |
| | Test voltage (V) | -- | | | — |
| | Test current (mA) | 375mA | | | — |
| | Test frequency (Hz) | -- | | | — |
| | Ambient, t(°C) | 25°C | | | — |
| | Measurement distance | <input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm | | | — |
| | Source size | <input checked="" type="checkbox"/> Non-small <input type="checkbox"/> Small : | | | — |
| | Field of view | <input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources) | | | — |
| Item | | Symb ol | Units | Result | Remark |
| Correlated colour temperature | | CCT | K | 7525 | |
| x/y colour coordinates | | | | 0,3002/0,3094 | |
| Blue light hazard radiance | | L _B | W/(m ² •sr ¹) | 2,33E+04 | @11mrad |
| Blue light hazard irradiance | | E _B | W/m ² | -- | |
| Luminance | | L | cd/m ² | 1,80E+07 | @11mrad |
| Illuminance | | E | lx | 5,70E+03 | |
| | | | | | |
| Supplementary information: Per IEC/TR 62778:2014 Ethr= 772 lx Dmin= 543 mm | | | | | |

| IEC TR 62778 | | | |
|--------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | |
|--|--|------------|
| | TABLE: Angular light distribution | N/A |
| | | |

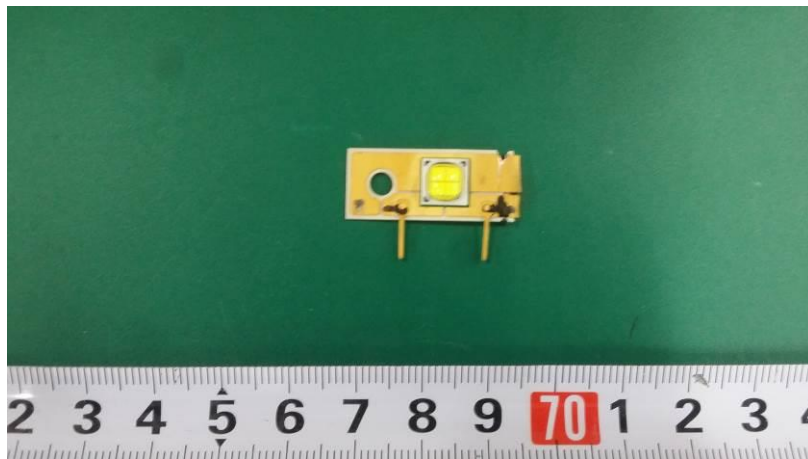
List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.

Note: This page may be removed when CTF stage 1 CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

| Clause | Measurement / testing | Testing / measuring equipment / material used, (Equipment ID) | Range used | Last Calibration date | Calibration due date |
|--------|--|---|-------------|-----------------------|----------------------|
| 7 | Irradiance measurements Radiance measurements | IDR 300 Monochromator (SH 344) | 200-3000nm | / | / |
| 7 | Radiance measurements | S009 Telescope (SH 345) | 300-1400nm | / | / |
| 7 | Radiance measurements | SRS 12 Radiance Standard (SH 348) | 300-1400nm | 2016/3/22 | 2017/3/22 |
| 7 | Irradiance measurements | CL6 Spectral irradiance standard (SH 350) | 300-3000nm | 2016/3/22 | 2017/3/22 |
| 7 | Irradiance measurements | CL7 Spectral irradiance standard (SH 351) | 200-400nm | 2016/3/22 | 2017/3/22 |
| 7 | Irradiance measurements | Photometric detector head (SH 359) | 380nm-800nm | 2016/3/22 | 2017/3/22 |
| 7 | Irradiance measurements Radiance measurements | Wattmeter (SH070) | 500V,40A | 2016/10/12 | 2017/10/12 |

Appendix 1: Photo Documentation



Overview (tested)

Appendix 2: Model List:

Part number submitted for type testing as following:

| Part number | CCT (K) | CRI | Max Voltage(V) | Max Current (mA) |
|--------------------|---------|-----|----------------|------------------|
| L1MX-657012V500000 | 6500 | 70 | 11.7 | 1500 |

Part number nomenclature for LUXEON MX series

| Part number | Designates nominal ANSI CCT /CCT (K) | designates minimum CRI | Max Voltage(V) | Max Current (mA) |
|---------------------|--------------------------------------|------------------------|----------------|------------------|
| L1MX-AABB03VDEEEEE0 | AA | BB | 3.0 | 6000 |
| L1MX-AABB06VDEEEEE0 | AA | BB | 6.0 | 3000 |
| L1MX-AABB12VDEEEEE0 | AA | BB | 11.7 | 1500 |

Where,

A A – designates CCT (22=2200K, 27=2700K, 30=3000K, 35 = 3500K; 40=4000K, 50=5000K, 57=5700K, 65=6500K)

B B – designates minimum CRI (70=70CRI; 80=80CRI; 90=90CRI)

C C C – designates voltage (12V=12V, 06V=6V, 03V=3V)

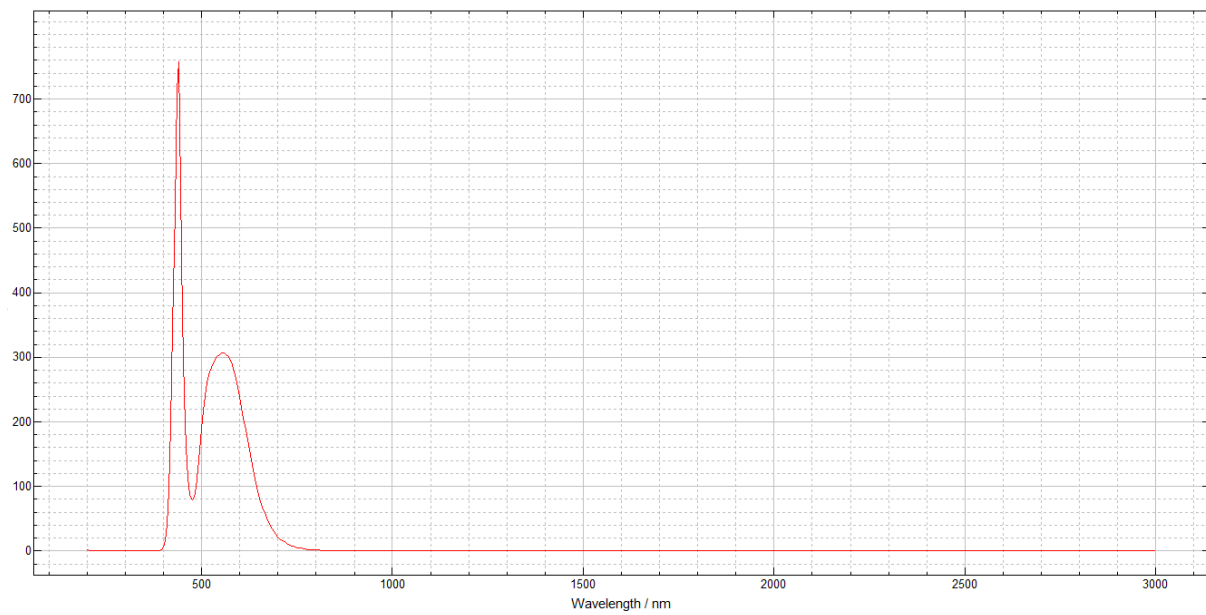
D – designates color (0=full distribution, 3=3-step, 5=5-step, 7=7-step)

E E E E – designates custom binning such as minimum luminous flux (optional)

Part number nomenclature for LUXEON M series

| Part number | Designates nominal ANSI CCT /CCT (K) | designates minimum CRI | Max Voltage(V) | Max Current (mA) |
|--|--------------------------------------|------------------------|----------------|------------------|
| LXRa-SWdd-eeee | dd | a | 11.7 | 1500 |
| LXRa-RWdd-eeee | dd | a | 6.0 | 3000 |
| LXRa-QWdd-eeee | dd | a | 3.0 | 6000 |
| Where, a - a number which designates minimum CRI (7 = 70, 8 = 80, 9 = 90) dd - a number which designates nominal CCT (22=2200K; 27 = 2700K, 30 = 3000K, 35 = 3500K, 40 = 4000K, 50 = 5000K, 57 = 5700K, 65 = 6500K) eeee - designates custom binning such as minimum luminous flux (optional) | | | | |

Appendix 3: Relative Spectrum Of Tested Sample(s)



Appendix 4: Table 6.1 Based On IEC 62471:2006

DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 1500mA, Angular subtense of the apparent source α : 25mrad

| IEC 62471 | | | | | | | | | |
|-----------|--------------------|--|--|--|-----------------|--|--|--|---------|
| Clause | Requirement + Test | | | | Result – Remark | | | | Verdict |

| Table 6.1 | Emission limits for risk groups of continuous wave lamps | | | | | | | | P |
|---|--|-----------|--------------------------------|----------------------|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 2,70E+03 | 10000 | 7,90E+04 | 4000000 | 1,01E+05 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 8,94E+05 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/ α | -- | 6000/ α | | 6000/ α | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,08 | 570 | | 3200 | |
| * Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. | | | | | | | | | |
| ** Involves evaluation of non-GLS source | | | | | | | | | |

DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 1125mA, Angular subtense of the apparent source α : 25mrad

| IEC 62471 | | | |
|-----------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result – Remark | Verdict |

| Table 6.1 Emission limits for risk groups of continuous wave lamps | | | | | | | | | P |
|---|-------------------|-----------|--------------------------------|----------------------|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 2,15E+03 | 10000 | 6,28E+04 | 4000000 | 8,02E+04 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 7,11E+05 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/ α | -- | 6000/ α | | 6000/ α | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,06 | 570 | | 3200 | |
| * Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. | | | | | | | | | |
| ** Involves evaluation of non-GLS source | | | | | | | | | |

DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 750mA, Angular subtense of the apparent source α : 25mrad

| IEC 62471 | | | | | | | | | |
|-----------|--------------------|--|--|--|-----------------|--|--|--|---------|
| Clause | Requirement + Test | | | | Result – Remark | | | | Verdict |

| Table 6.1 | Emission limits for risk groups of continuous wave lamps | | | | | | | | P |
|---|--|-----------|--------------------------------|----------------------|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 1,50E+03 | 10000 | 4,38E+04 | 4000000 | 5,59E+04 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 4,96E+05 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/ α | -- | 6000/ α | | 6000/ α | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,04 | 570 | | 3200 | |
| * Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. | | | | | | | | | |
| ** Involves evaluation of non-GLS source | | | | | | | | | |

DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 375mA, Angular subtense of the apparent source α : 25mrad

| IEC 62471 | | | | | | | | | |
|-----------|--------------------|--|--|--|-----------------|--|--|---------|--|
| Clause | Requirement + Test | | | | Result – Remark | | | Verdict | |

| Table 6.1 | Emission limits for risk groups of continuous wave lamps | | | | | | | | P |
|---|--|-----------|--------------------------------|----------------------|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 7,95E+02 | 10000 | 2,33E+04 | 4000000 | 2,98E+04 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 2,64E+04 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/ α | -- | 6000/ α | | 6000/ α | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,02 | 570 | | 3200 | |
| * Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. | | | | | | | | | |
| ** Involves evaluation of non-GLS source | | | | | | | | | |

Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences

DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 1500mA, Angular subtense of the apparent source α : 25mrad

| EN 62471 | | | | | | | | | |
|----------|--------------------|--|--|--|-----------------|--|--|--|---------|
| Clause | Requirement + Test | | | | Result – Remark | | | | Verdict |

| Table 6.1 | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | P |
|---|---|-----------|--------------------------------|--|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 2,70E+03 | 10000 | 7,90E+04 | 4000000 | 1,01E+05 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 8,94E+05 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000 0,0017 ≤ α ≤ 0,011 | -- | | | | |
| | | | | 6000/ α 0,011 ≤ α ≤ 0,1 | -- | | | | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,08 | 570 | | 3200 | |

* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian.

** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 1125mA, Angular subtense of the apparent source α : 25mrad

| EN 62471 | | | | | | | | | |
|----------|--------------------|--|--|--|-----------------|--|--|--|---------|
| Clause | Requirement + Test | | | | Result – Remark | | | | Verdict |

| Table 6.1 | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | P |
|--|---|-----------|--------------------------------|--|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 2,15E+03 | 10000 | 6,28E+04 | 4000000 | 8,02E+04 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 7,11E+05 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000 0,0017 ≤ α ≤ 0,011 | -- | | | | |
| | | | | 6000/ α 0,011 ≤ α ≤ 0,1 | -- | | | | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,06 | 570 | | 3200 | |
| <p>* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian.</p> <p>** Involves evaluation of non-GLS source</p> <p>NOTE The action functions: see Table 4.1 and Table 4.2 The applicable aperture diameters: see 4.2.1 The limitations for the angular subtenses: see 4.2.2 The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.</p> | | | | | | | | | |

DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 750mA, Angular subtense of the apparent source α : 25mrad

| EN 62471 | | | | | | | | | |
|----------|--------------------|--|--|--|-----------------|--|--|--|---------|
| Clause | Requirement + Test | | | | Result – Remark | | | | Verdict |

| Table 6.1 | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | P |
|--|---|-----------|--------------------------------|--|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 1,50E+03 | 10000 | 4,38E+04 | 4000000 | 5,59E+04 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 4,96E+05 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000 0,0017 ≤ α ≤ 0,011 | -- | | | | |
| | | | | 6000/ α 0,011 ≤ α ≤ 0,1 | -- | | | | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,04 | 570 | | 3200 | |
| <p>* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian.</p> <p>** Involves evaluation of non-GLS source</p> <p>NOTE The action functions: see Table 4.1 and Table 4.2 The applicable aperture diameters: see 4.2.1 The limitations for the angular subtenses: see 4.2.2 The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.</p> | | | | | | | | | |

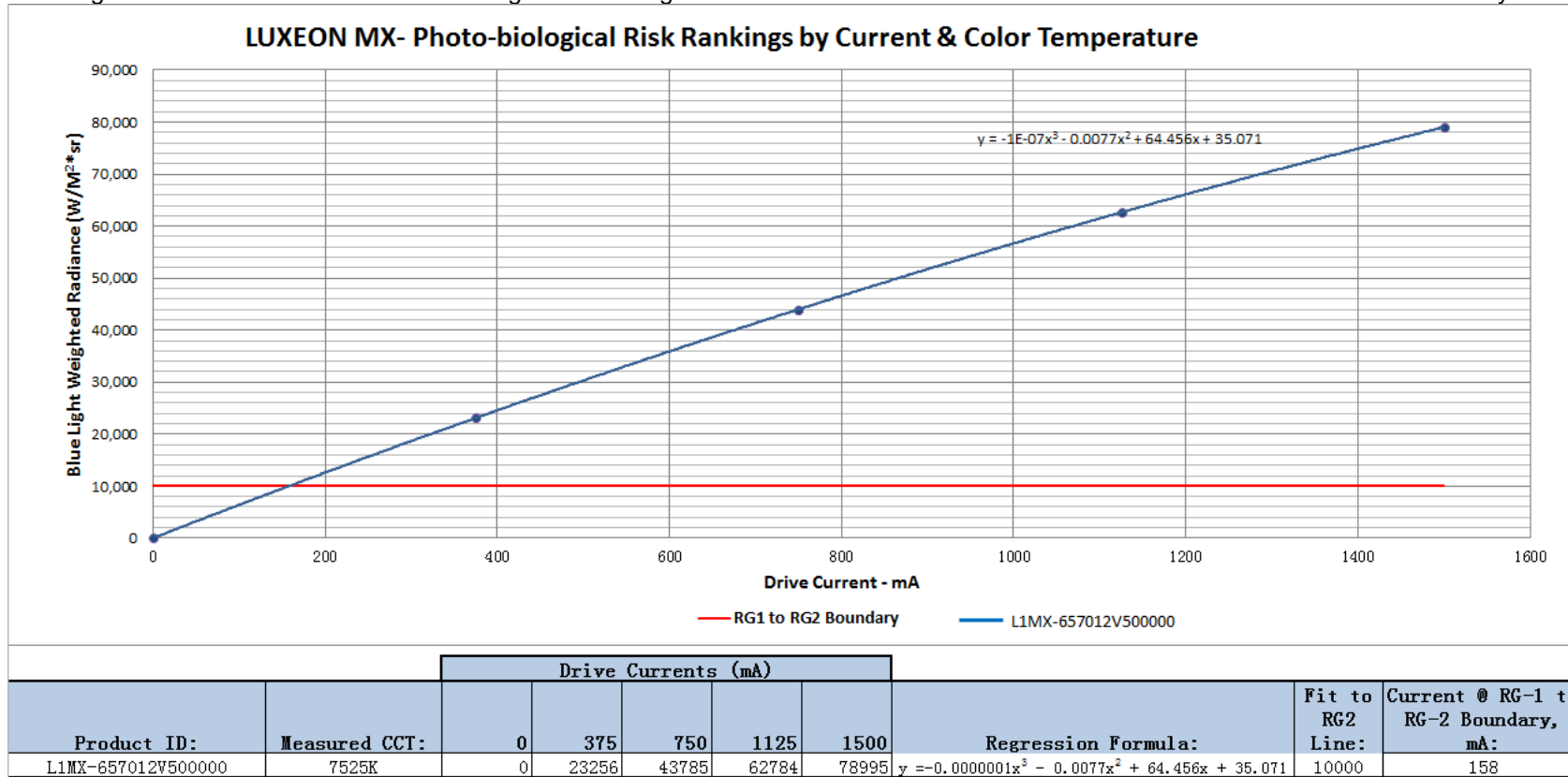
DUT: L1MX-657012V500000, Evaluation Distance: 200mm, Test current: 375mA, Angular subtense of the apparent source α : 25mrad

| EN 62471 | | | | | | | | | |
|----------|--------------------|--|--|--|-----------------|--|--|--|---------|
| Clause | Requirement + Test | | | | Result – Remark | | | | Verdict |

| Table 6.1 | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | P |
|--|---|-----------|--------------------------------|--|----------|-----------------|----------|-----------------|----------|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | E_s | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- |
| Near UV | | E_{UVA} | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- |
| Blue light | $B(\lambda)$ | L_B | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 7,95E+02 | 10000 | 2,33E+04 | 4000000 | 2,98E+04 |
| Blue light, small source | $B(\lambda)$ | E_B | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | | 400 | |
| Retinal thermal | $R(\lambda)$ | L_R | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/ α | 2,64E+04 | 28000/ α | | 71000/ α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | L_{IR} | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000 0,0017 ≤ α ≤ 0,011 | -- | | | | |
| | | | | 6000/ α 0,011 ≤ α ≤ 0,1 | -- | | | | |
| IR radiation, eye | | E_{IR} | $W \cdot m^{-2}$ | 100 | 0,02 | 570 | | 3200 | |
| <p>* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian.</p> <p>** Involves evaluation of non-GLS source</p> <p>NOTE The action functions: see Table 4.1 and Table 4.2 The applicable aperture diameters: see 4.2.1 The limitations for the angular subtenses: see 4.2.2 The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.</p> | | | | | | | | | |

Appendix 6: Blue Light Hazard-Forward Current Relationship (Non-mandatory Information)

The diagram below shows the different blue light hazards against different forward currents. It is additional information for reference only.



-----The End-----