

**Test Report No.:** Q00135788a 001

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**Client:** SCAPEQUEST PTY. LTD. TRADINGAS BATTLEFIELD SPORTS  
Unit 1, 6 Graham Street, Underwood, Brisbane, Queensland, Australia

**Test item(s):** Non - Toys

**Identification/  
Model No(s):** High grade infrared gun that includes digital radio emitter

**Sample Receiving date:** 2011-11-11

**Delivery condition:** Apparent good, Samples tested as received

**Test specification:**

**Test result:**

EN 62471:2008

Risk Group 1 (Low-Risk)

**Other Information:**

Country of Origin: China

Testing Period: 2012-03-05 to 2012-03-20

For and on behalf of  
TÜV Rheinland (Hong Kong) Ltd.



2012-03-22 Karen Leung / Assistant Laboratory Manager

Date

Name/Position

*Test result is drawn according to the kind and extent of tests performed.*

*This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.*



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**TEST REPORT  
EN 62471**
**Photobiological safety of lamps and lamp systems**

**Report Reference No.**.....: See cover page  
**Tested by**.....: See cover page  
**Approved by**.....: See cover page  
**Date of issue** .....: See cover page  
**Total number of pages** .....: See cover page

**Applicant's name**.....: See cover page  
**Address** .....: See cover page

**Test specification:**

**Standard**.....: EN 62471:2008  
**Non-standard test method**.....: N/A

**Test item description** .....: High grade infrared gun that includes digital radio emitter  
**Trade mark**.....: Not provided by the client  
**Manufacturer**.....: Same as applicant  
**Model/Type reference** .....: —  
**Ratings** .....: 1 x 7,2V / Ni-MH rechargeable battery pack  
**Tested lamp**.....  continuous wave lamps  pulsed lamps  
**Lamp classification group**.....  exempt  risk 1  risk 2  risk 3

**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** .....: 2011-11-11  
**Date (s) of performance of tests** .....: 2012-03-22

**General remarks:**

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 testing laboratory.  
"(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 comma is used as the decimal separator.  
List of test equipment must be kept on file and available for review.



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**Copy of marking plate:**

Not provided by the client

**Summary of testing:**

This test report was issued for considering the potential radiation hazards resulting from the LEDs which were incorporated in the product under normal operation only.

**General product information:**

This product is a High grade infrared gun which is incorporated with LEDs and supplies by a 1 x 7,2V Ni-MH rechargeable battery pack.



EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict
4	<b>EXPOSURE LIMITS</b>		N/A
<p>Remark:</p> <p>The original Clause 4 of IEC 62471:2006 contains provisions governing limiting values for the exposure of persons falling within the area of the health and safety of workers. Within Europe those limiting values are already covered by the Artificial Optical Radiation Directive of the directive have to be applied instead of those fixed in IEC 62471:2006.</p> <p>For information the original Clause 4 of IEC 62471:2006 was moved to the informative Annex ZB under retention of the respective numbering.</p>			

5	<b>MEASUREMENT OF LAMPS AND LAMP SYSTEMS</b>		P
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		N/A
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N/A
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		P
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		P
	Operation of the test lamp shall be provided in accordance with:		P
	– the appropriate IEC lamp standard, or		N/A
	– the manufacturer's recommendation		P
5.1.5	Lamp system operation		P
	The power source for operation of the test lamp shall be provided in accordance with:		P
	– the appropriate IEC standard, or		N/A
	– the manufacturer's recommendation		P
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P

EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict
	Maximum aperture diameter 50 mm.		P
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated.		P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		N/A
	The measurements made with an optical system.		N/A
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		N/A
5.2.2.2	Alternative method		P
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		P
5.2.3	Measurement of source size		P
	The determination of $\alpha$ , the angle subtended by a source, requires the determination of the 50% emission points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N/A
	The determination of $\Delta t$ , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N/A
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.	see table 4.1	P
5.3.2	Calculations		P
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.	see Annex C in the norm	P

<b>6</b>	<b>LAMP CLASSIFICATION</b>	<b>P</b>
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EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6.1	P
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N/A
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm		P
6.1	Continuous wave lamps		N/A
6.1.1	Except Group		N/A
	In the except group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		N/A
	– an actinic ultraviolet hazard ( $E_S$ ) within 8-hours exposure (30000 s), nor		N/A
	– a near-UV hazard ( $E_{UVA}$ ) within 1000 s, (about 16 min), nor		N/A
	– a retinal blue-light hazard ( $L_B$ ) within 10000 s (about 2,8 h), nor		N/A
	– a retinal thermal hazard ( $L_R$ ) within 10 s, nor		N/A
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 1000 s		N/A
6.1.2	Risk Group 1 (Low-Risk)		P
	In this group are lamps, which exceeds the limits for the except group but that does not pose:		P
	– an actinic ultraviolet hazard ( $E_S$ ) within 10000 s, nor		P
	– a near ultraviolet hazard ( $E_{UVA}$ ) within 300 s, nor		P
	– a retinal blue-light hazard ( $L_B$ ) within 100 s, nor		P
	– a retinal thermal hazard ( $L_R$ ) within 10 s, nor		P
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 100 s		P
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard ( $L_{IR}$ ), within 100 s are in Risk Group 1.		P
6.1.3	Risk Group 2 (Moderate-Risk)		N/A
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	– an actinic ultraviolet hazard ( $E_S$ ) within 1000 s exposure, nor		N/A
	– a near ultraviolet hazard ( $E_{UVA}$ ) within 100 s, nor		N/A
	– a retinal blue-light hazard ( $L_B$ ) within 0,25 s (aversion response), nor		N/A
	– a retinal thermal hazard ( $L_R$ ) within 0,25 s (aversion response), nor		N/A
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 10 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard ( $L_{IR}$ ), within 10 s are in Risk Group 2.		N/A
6.1.4	Risk Group 3 (High-Risk)		N/A
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N/A
6.2	Pulsed lamps		N/A
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N/A
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		N/A
	The risk group determination of the lamp being tested shall be made as follows:		N/A
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N/A
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N/A
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N/A

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Table 4.1		Spectral weighting function for assessing ultraviolet hazards for skin and eye		P
Wavelength $\lambda$ , nm	UV hazard function $S_{uv}(\lambda)$	Wavelength $\lambda$ , nm	UV hazard function $S_{uv}(\lambda)$	
200	0,030	313*	0,006	
205	0,051	315	0,003	
210	0,075	316	0,0024	
215	0,095	317	0,0020	
220	0,120	318	0,0016	
225	0,150	319	0,0012	
230	0,190	320	0,0010	
235	0,240	322	0,00067	
240	0,300	323	0,00054	
245	0,360	325	0,00050	
250	0,430	328	0,00044	
254*	0,500	330	0,00041	
255	0,520	333*	0,00037	
260	0,650	335	0,00034	
265	0,810	340	0,00028	
270	1,000	345	0,00024	
275	0,960	350	0,00020	
280*	0,880	355	0,00016	
285	0,770	360	0,00013	
290	0,640	365*	0,00011	
295	0,540	370	0,000093	
297*	0,460	375	0,000077	
300	0,300	380	0,000064	
303*	0,120	385	0,000053	
305	0,060	390	0,000044	
308	0,026	395	0,000036	
310	0,015	400	0,000030	





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Clause	Requirement + Test	Result – Remark	Verdict

<b>Table 4.1</b>	Spectral weighting function for assessing ultraviolet hazards for skin and eye	P
<sup>1</sup> Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths. * Emission lines of a mercury discharge spectrum.		



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Clause	Requirement + Test	Result – Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P
Wavelength nm	Blue-light hazard function B (λ)	Burn hazard function R (λ)
300	0,01	
305	0,01	
310	0,01	
315	0,01	
320	0,01	
325	0,01	
330	0,01	
335	0,01	
340	0,01	
345	0,01	
350	0,01	
355	0,01	
360	0,01	
365	0,01	
370	0,01	
375	0,01	
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0
470	0,62	6,2
475	0,55	5,5
480	0,45	4,5
485	0,40	4,0
490	0,22	2,2
495	0,16	1,6
500-600	$10^{[(450-\lambda)/50]}$	1,0



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Clause	Requirement + Test	Result – Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P
	600-700	0,001
	700-1050	$1,0$
	1050-1150	$10^{((700-\lambda)/500)}$
	1150-1200	0,2
	1200-1400	$0,2 \cdot 10^{0,02(1150-\lambda)}$



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 5.4 Summary of the ELs for the surface of the skin or cornea (irradiance based values)						P
Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Limiting aperture rad (deg)	EL in terms of constant irradiance $W \cdot m^{-2}$	
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 – 400	< 30000	1,4 (80)	30/t	
Eye UV-A	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 – 400	$\leq 1000$ >1000	1,4 (80)	10000/t 10	
Blue-light small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	$\leq 100$ >100	< 0,011	100/t 1,0	
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 – 3000	$\leq 1000$ >1000	1,4 (80)	18000/t <sup>0,75</sup> 100	
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	20000/t <sup>0,75</sup>	

Table 5.5 Summary of the ELs for the retina (radiance based values)						P
Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Field of view radians	EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$	
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0,25 – 10	$0,011 \cdot \sqrt{t/10}$	$10^6/t$	
			10-100	0,011	$10^6/t$	
			100-10000	$0,0011 \cdot \sqrt{t}$	$10^6/t$	
			$\geq 10000$	0,1	100	
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25	0,0017	$50000/(\alpha \cdot t^{0,25})$	
			0,25 – 10	$0,011 \cdot \sqrt{t/10}$	$50000/(\alpha \cdot t^{0,25})$	
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0,011	$6000/\alpha$	



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 6.1		Emission limits for risk groups of Pulsed (White)							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	<0.001	0,003	N/A	0,03	N/A
Near UV		$E_{UVA}$	$W \cdot m^{-2}$	10	<10	33	N/A	100	N/A
Blue light	$B(\lambda)$	$L_B$	$W \cdot m^{-2} \cdot sr^{-1}$	100	N/A	10000	4050,98	4000000	N/A
Blue light, small source	$B(\lambda)$	$E_B$	$W \cdot m^{-2}$	1,0*	N/A	1,0	N/A	400	N/A
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha = 148936,17$ ( $\alpha = 188mrad$ )	42946,86	$28000/\alpha$	N/A	$71000/\alpha$	N/A
Retinal thermal, weak visual stimulus**	$R(\lambda)$	$L_{IR}$	$W \cdot m^{-2} \cdot sr^{-1}$	$6000/\alpha = 31914.89$ ( $\alpha = 188mrad$ )	14,37	$6000/\alpha$	N/A	$6000/\alpha$	N/A
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	100	0,01	570	N/A	3200	N/A

\* 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



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 6.1	Emission limits for risk groups of Pulsed (Red)	P
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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	<0,001	0,003	N/A	0,03	N/A
Near UV		$E_{UVA}$	$W \cdot m^{-2}$	10	<10	33	N/A	100	N/A
Blue light	$B(\lambda)$	$L_B$	$W \cdot m^{-2} \cdot sr^{-1}$	100	1,34	10000	N/A	4000000	N/A
Blue light, small source	$B(\lambda)$	$E_B$	$W \cdot m^{-2}$	1,0*	N/A	1,0	N/A	400	N/A
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha = 148936,17$ ( $\alpha = 188mrad$ )	1159,85	$28000/\alpha$	N/A	$71000/\alpha$	N/A
Retinal thermal, weak visual stimulus**	$R(\lambda)$	$L_{IR}$	$W \cdot m^{-2} \cdot sr^{-1}$	$6000/\alpha = 31914,89$ ( $\alpha = 188mrad$ )	14,37	$6000/\alpha$	N/A	$6000/\alpha$	N/A
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	100	<100	570	N/A	3200	N/A

\* 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



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 6.1 Emission limits for risk groups of Pulsed (Green)									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	<0,001	0,003	N/A	0,03	N/A
Near UV		$E_{UVA}$	$W \cdot m^{-2}$	10	<10	33	N/A	100	N/A
Blue light	$B(\lambda)$	$L_B$	$W \cdot m^{-2} \cdot sr^{-1}$	100	N/A	10000	995,92	4000000	N/A
Blue light, small source	$B(\lambda)$	$E_B$	$W \cdot m^{-2}$	1,0*	N/A	1,0	N/A	400	N/A
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha = 148936,17$ ( $\alpha = 188mrad$ )	15169,18	$28000/\alpha$	N/A	$71000/\alpha$	N/A
Retinal thermal, weak visual stimulus**	$R(\lambda)$	$L_{IR}$	$W \cdot m^{-2} \cdot sr^{-1}$	$6000/\alpha = 31914,89$ ( $\alpha = 188mrad$ )	14,37	$6000/\alpha$	N/A	$6000/\alpha$	N/A
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	100	<100	570	N/A	3200	N/A

\* 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

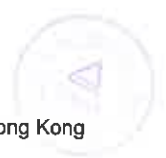


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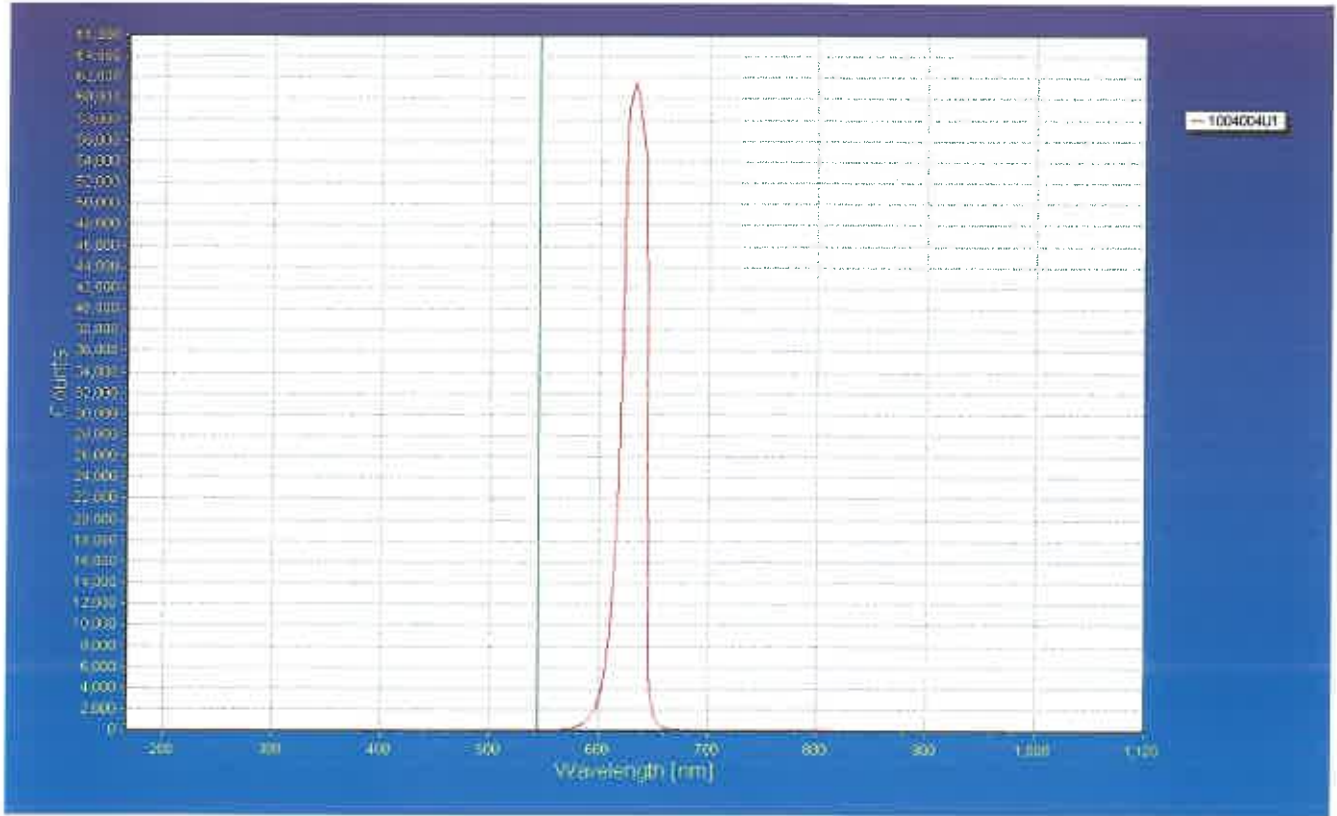
Table 6.1 Emission limits for risk groups of CW (Red)									P
Risk	Action spectrum <sub>i</sub>	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	S <sub>UV</sub> (λ)	E <sub>s</sub>	W•m <sup>-2</sup>	0,001	<0,001	0,003	N/A	0,03	N/A
Near UV		E <sub>UVA</sub>	W•m <sup>-2</sup>	10	<10	33	N/A	100	N/A
Blue light	B(λ)	L <sub>B</sub>	W•m <sup>-2</sup> •sr <sup>-1</sup>	100	0,0048	10000	N/A	4000000	N/A
Blue light, small source	B(λ)	E <sub>B</sub>	W•m <sup>-2</sup>	1,0*	N/A	1,0	N/A	400	N/A
Retinal thermal	R(λ)	L <sub>R</sub>	W•m <sup>-2</sup> •sr <sup>-1</sup>	28000/α = 560000 (α =50mrad)	29,33	28000/α	N/A	71000/α	N/A
Retinal thermal, weak visual stimulus**	R(λ)	L <sub>IR</sub>	W•m <sup>-2</sup> •sr <sup>-1</sup>	6000/α = 120000 (α =50mrad)	51,48	6000/α	N/A	6000/α	N/A
IR radiation, eye		E <sub>IR</sub>	W•m <sup>-2</sup>	100	<100	570	N/A	3200	N/A

\* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.  
 \*\* Involves evaluation of non-GLS source

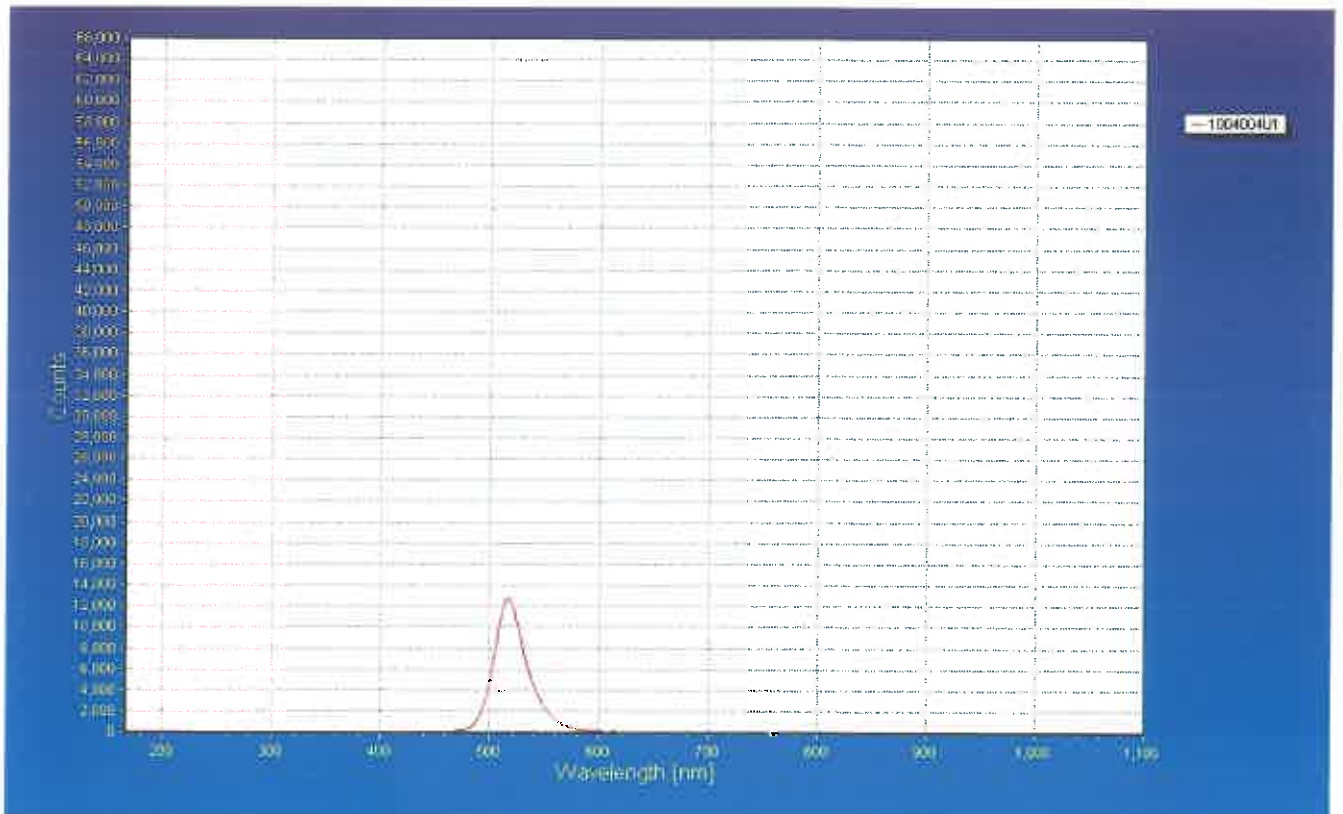




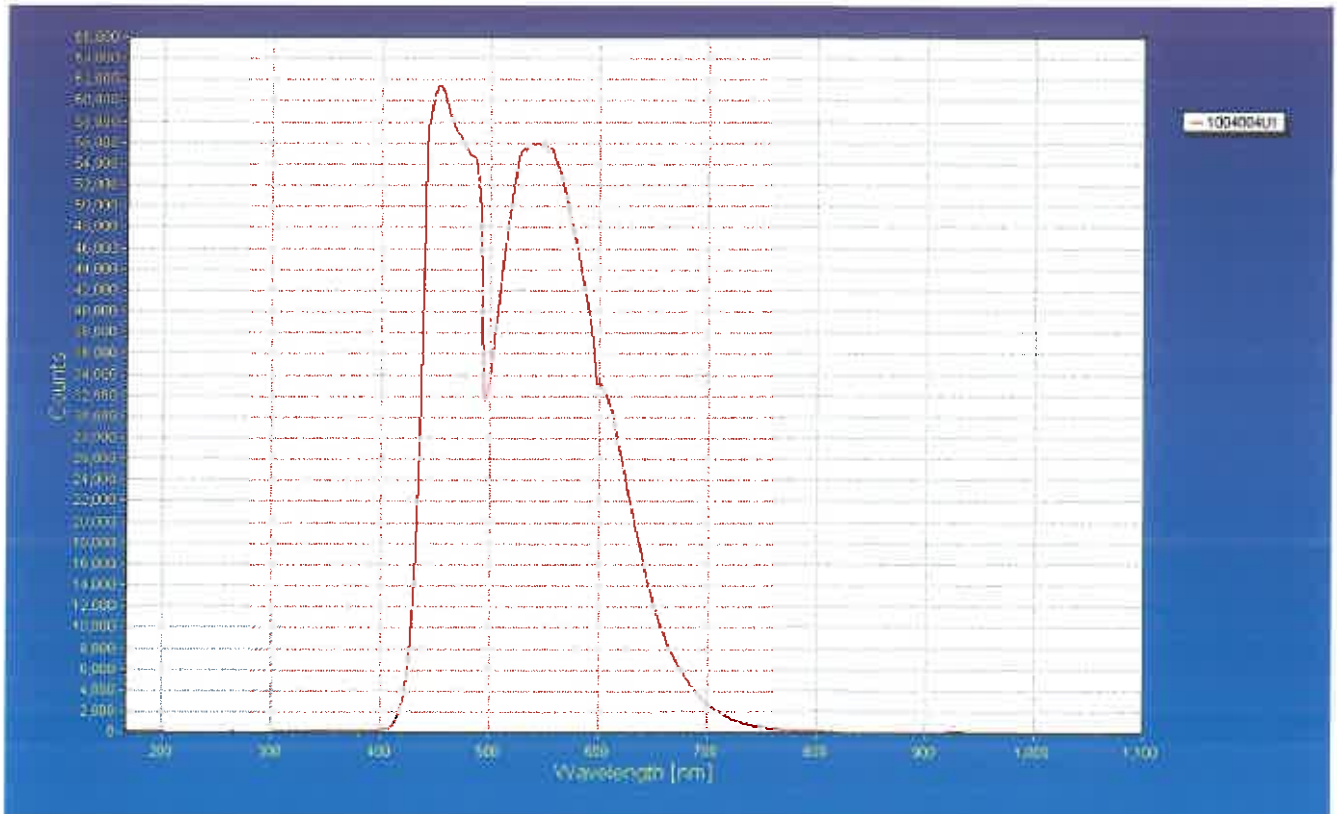
Test result:



Pulsed LED (Red)

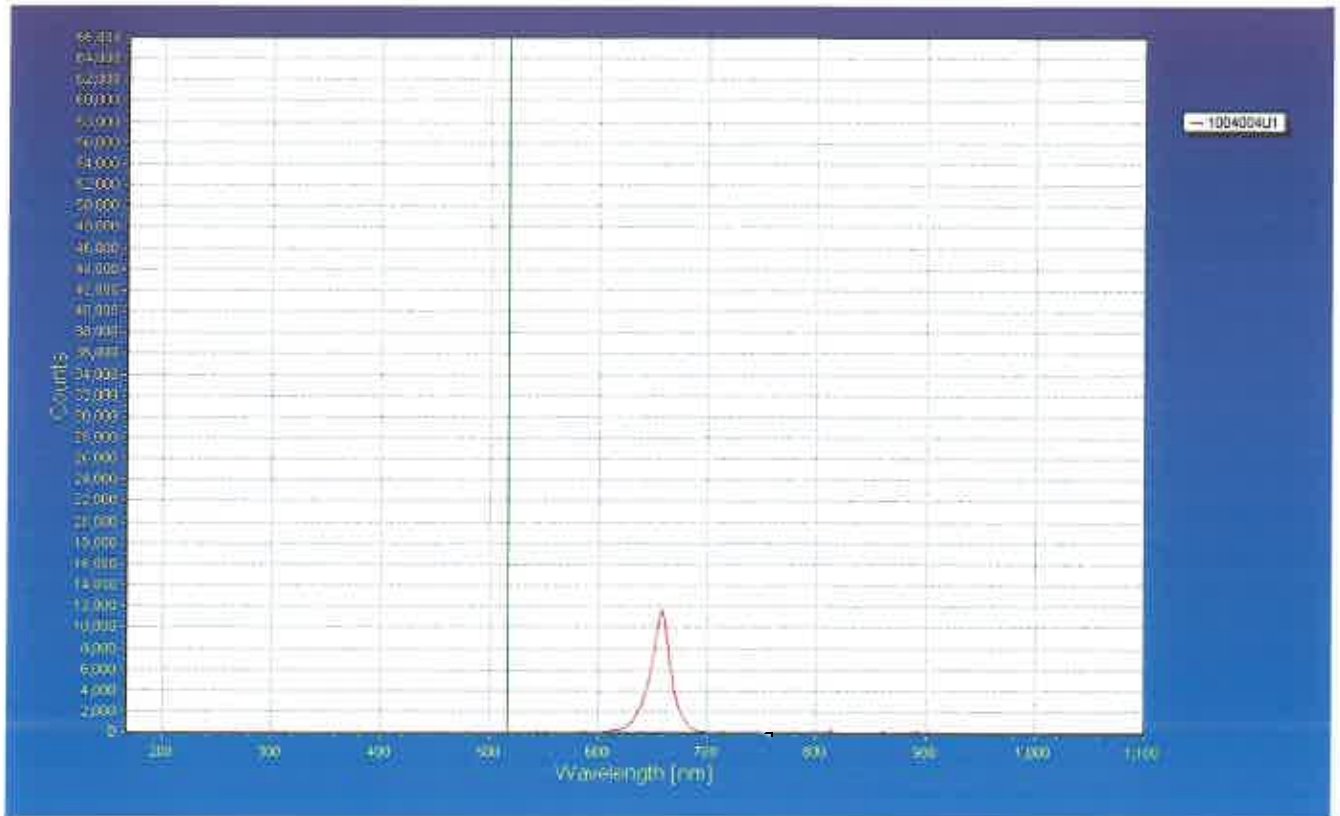


Pulsed LED (Green)



Pulsed LED (White)





CW LED (Red)



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**Photos of product:**



