

試驗報告

CNS 15592 C4529 光源及光源系統之光生物安全性 Photobiological safety of lamps and lamp systems

報告號碼	OC-2014-60035
報告發行日期	中華民國103年08月13日
實驗室名稱	台灣檢驗科技股份有限公司 光學實驗室
實驗室地址	24886 新北市五股區(新北產業園區)五權路33號
申請者名稱	華能光電科技股份有限公司
申請者地址	新北市新店區中正路542之4號6樓
委託測試要求:	
試驗標準	CNS 15592 C4529 光源及光源系統之光生物安全性 (Photobiological safety of lamps and lamp systems) (公布日期: 101年11月15日)
測試程序	與上述相同
非標準試驗方法	N/A
產品名稱	LED平板燈
品牌或商標	Energiled
生產或供應廠商	廣東肇慶立得電子有限公司
產品型號/編號	LSSSxG52xxxx (The first x=W, T, C, means CCT, W=3000 K, T=4000 K, C=6500 K The Other x=0 to 9, means serial number)
產品電性規格	AC 100 V to 240 V, 60 Hz, 36 W
試驗結果:	所送測之試驗樣品,符合上述規範無風險等級 (Exempt Group)
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台灣檢驗科技股份有限公司
光學實驗室

鄒蘊明

鄒蘊明
技術經理

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<p><input checked="" type="checkbox"/> 測試實驗室:</p> <p>測試地址.....:</p>	<p>台灣檢驗科技股份有限公司 光學實驗室</p> <p>24886 新北市五股區(新北產業園區)五權路55號</p>																														
<p>報告內容摘要:</p> <p>本試驗報告適用光源與光源系統之評價, 並將試驗結果進行光生物安全性等級分類, 其試驗結果涵蓋報告中所記載之試驗樣品或樣品組合產生之光輻射危害。</p> <p>對於其他標準之符合性需求, 可能需要額外之試驗報告。</p>																															
<p>主要測試設備:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Name</th> <th style="text-align: center;">Brand</th> <th style="text-align: center;">Model</th> <th style="text-align: center;">S/N</th> <th style="text-align: center;">Calibration Date</th> <th style="text-align: center;">Calibration Due Day</th> </tr> </thead> <tbody> <tr> <td>IDR300 system / Irradiance Calibration Source</td> <td>BENTHAM</td> <td>IDR300 / CL6</td> <td>15255 / 15093/4</td> <td>2013/2/28</td> <td>2015/2/27</td> </tr> <tr> <td>IDR300 system / Irradiance Calibration Source</td> <td>BENTHAM</td> <td>IDR300 / CL7</td> <td>15255 / 15242/2</td> <td>2013/2/28</td> <td>2015/2/27</td> </tr> <tr> <td>IDR300 system / Radiance Calibration Source</td> <td>BENTHAM</td> <td>IDR300 / SRS12</td> <td>15255 / 15243/3</td> <td>2013/2/28</td> <td>2015/2/27</td> </tr> <tr> <td>Digital Power Meter / AC Source</td> <td>YOKOGAWA / Chroma</td> <td>WT-210 / 61601</td> <td>91J837766 / 616010001728</td> <td>2014/2/20</td> <td>2015/2/19</td> </tr> </tbody> </table>		Name	Brand	Model	S/N	Calibration Date	Calibration Due Day	IDR300 system / Irradiance Calibration Source	BENTHAM	IDR300 / CL6	15255 / 15093/4	2013/2/28	2015/2/27	IDR300 system / Irradiance Calibration Source	BENTHAM	IDR300 / CL7	15255 / 15242/2	2013/2/28	2015/2/27	IDR300 system / Radiance Calibration Source	BENTHAM	IDR300 / SRS12	15255 / 15243/3	2013/2/28	2015/2/27	Digital Power Meter / AC Source	YOKOGAWA / Chroma	WT-210 / 61601	91J837766 / 616010001728	2014/2/20	2015/2/19
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標示銘版:

 **Energyled**
Part No.: LSSSCG520005
Series No.: XXXXX-XXXXX
L/N:2513-XXXXXXXX
Color: WHITE/6500K
Power consumption:36W
Input:100-240VAC
Made in Taiwan

 **Energyled**
Part No.: LSSSTG520005
Series No.: XXXXX-XXXXX
L/N:2513-XXXXXXXX
Color: WARM WHITE/4000K
Power consumption:36W
Input:100-240VAC
Made in Taiwan

 **Energyled**
Part No.: LSSSWG520005
Series No.: XXXXX-XXXXX
L/N:2513-XXXXXXXX
Color: WARM WHITE/3000K
Power consumption:36W
Input:100-240VAC
Made in Taiwan

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CNS 15592 試驗報告	
測試項目細節:	
試驗光源.....	<input checked="" type="checkbox"/> 連續輻射光源 <input type="checkbox"/> 脈衝輻射光源
試驗光源系統.....	LED 平板燈
光源風險分類類別.....	<input checked="" type="checkbox"/> 無風險 <input type="checkbox"/> 風險1 <input type="checkbox"/> 風險2 <input type="checkbox"/> 風險3
光源燈帽.....	N/A
光源燈泡.....	N/A
光源額定電性.....	AC 100 V to 240 V 60 Hz, 36 W
光源本體上額外標示.....	N/A
光源枯化點燈期.....	Aging 1h
儀器設備.....	According to standard instruments of IEC 62471:2006 / EN 62471:2008
量測溫度.....	(25 ± 2) °C
安全使用資訊.....	Exempt Group
試驗符合性判定:	
- 試驗狀況不適用試驗項目.....	N (不適用)
- 試驗狀況符合試驗項目要求.....	P (符合)
- 試驗狀況不符合試驗項目要求.....	F (不符合)
試驗:	
樣品接收日期.....	Jul. 07, 2014
測試日期.....	Jul. 07, 2014 ~ Aug. 12, 2014
一般註解:	
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產品一般資訊:

測試產品為LED平板燈, 屬白光多波長型, 一般照明用途。

該產品波長範圍和功能如下:

No.	LED 平板燈					
	Model Name	Wavelength range (nm)	Rated CCT	Power consumption	LED Quantity	Dimension (mm)
1	LSSSCG520005	400 to 790	6500 K	36 W	170 pcs	L 596 x W 596 x H 11
2	LSSSTG520005	400 to 810	4000 K			
3	LSSSWG520005	400 to 830	3000 K			

LED 規格:

No.	LED				
	Model Name	Manufacturer	Voltage	LED Light Source Model No.	Dimension (mm)
1	LSSSCG520005	LEDTECH	3.2 V (@60 mA)	LT1EL3-DE-UTV3-72	L 3.00x W 2.08 x H 0.8
2	LSSSTG520005		2.7 to 3.5 V (@20mA)	LT1EN3-DE-1UTV340SE4	
3	LSSSWG520005		2.8 to 3.6 V (@20mA)	LT1EN3-DE-1UTV330SC6	

備註:

產品風險分類為無風險等級(Exempt Group)。

我們建議風險分類應該要被標示在產品規格或使用說明上。

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CNS 15592			
章節	試驗要求	結果-備註	判定
4	曝露限制(EL'S)		P
4.1	通則		P
	本標準之曝露限制適用於連續輻射源(continuous sources), 曝露期間不小於0.01 ms, 且不大於8小時, 而曝露限制應作為曝露管制之方針(guide), 惟不應視為明確界定(precisely defined)安全與不安全之分界		P
	一般而言, 僅在輻射源之亮度超過 $10^4 \text{ cd}\cdot\text{m}^{-2}$ 時, 始需輻射源之細部光譜輻射數據, 亮度低於此值時, 將不致超過曝露限制	see clause 4.3	P
4.3	危害曝露限制		P
4.3.1	皮膚及眼睛之光化學UV 危害曝露限制		P
	入射紫外光輻射之曝露限制, 係基於皮膚或眼睛未施加保護, 且曝露期間在8小時以內之條件, 在任何一天, 連續曝露超過8小時之情況均不予考慮。有效輻射曝露之曝露限制為 $30 \text{ J}\cdot\text{m}^{-2}$		P
	為保護眼睛或皮膚免於寬頻帶輻射源所產生之紫外光曝露而造成傷害, 光輻射源(light source)之有效積分光譜照度 E_s 不得超過下列方程式所定義之位準:		P
	$E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J}\cdot\text{m}^{-2}$		P
	入射紫外光輻射之容許曝露期間, 係基於眼睛或皮膚未施加保護之條件, 以下列方程式計算:		P
	$t_{\max} = \frac{30}{E_s} \quad \text{s}$		P
4.3.2	眼睛之近UV 危害曝露限制		P
	在315 nm 至400 nm 之光譜範圍間, 對眼睛之總輻射曝露(total radiant exposure)不得超過 $10000 \text{ J}\cdot\text{m}^{-2}$, 且曝露期間不得超過1000秒。對於未施加保護之眼睛, 曝露期間超過1000秒(約為16分鐘)之UV-A 輻射照度 E_{UVA} 不得超過 $10 \text{ W}\cdot\text{m}^{-2}$ 。		P
	此項限制(specifications)可以下列方程式表示:		P
	$t_{\max} \leq \frac{10000}{E_{UVA}} \quad \text{s}$		P
4.3.3	視網膜藍光危害曝露限制		P
	為保護視網膜免於因長期藍光曝露而造成傷害, 光輻射源之光譜輻射亮度與防止藍光危害加權函數 $B(\lambda)$ 之積分值, 即藍光加權亮度 L_B , 不得超過下列方程式所定義之位準:		P

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CNS 15592			
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	$L_B \cdot t = \sum_{300}^{700} \sum_t L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \cdot \Delta t \leq 10^6 \quad \text{J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t \leq 10^4$ s $t_{\max} = \frac{10^6}{L_B}$	N
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t > 10^4$ s	P
4.3.4	視網膜藍光危害曝露限制— 小型光源		N
	角距小於0.011 弧度之光輻射源, 可導出1個以光譜輻射照度而非以光譜輻射亮度為基礎之簡化方程式。對於眼睛之光譜照度 E_λ , 防止藍光危害加權函數 $B(\lambda)$ 不得超過下列方程式所定義之位準:	see table 4.2	N
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \cdot \Delta t \leq 100 \quad \text{J} \cdot \text{m}^{-2}$	for $t \leq 100$ s	N
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad \text{W} \cdot \text{m}^{-2}$	for $t > 100$ s	N
4.3.5	視網膜熱危害曝露限制		P
	為保護視網膜免於熱傷害, 光輻射源之光譜輻射亮度與灼傷危害加權函數 $R(\lambda)$ (參照圖4.2及表4.2)之積分值, 即灼傷加權亮度 L_R , 不得超過下列方程式所定義之位準:		P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50000}{\alpha \cdot t^{0,25}} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	(10 μ s $\leq t \leq 10$ s)	P
4.3.6	視網膜熱危害曝露限制— 針對微弱視覺刺激		P
	對於紅外光熱光源或任何近紅外光光輻射源, 所產生之微弱視覺刺激不足以激發眼睛之不適應反應(activate the aversion response), 以眼睛觀察近紅外光(780nm 至1400 nm)且曝露期間超過10秒時, 其輻射亮度應限制在下列方程式所定義之位準:		P
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6000}{\alpha} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	$t > 10$ s	P
4.3.7	紅外光輻射對眼睛之曝露限制		P
	為避免對眼角膜產生熱傷害及對眼睛之水晶體造成可能之後遺症(白內障), 在波長範圍780 nm 至3000 nm 之紅外光輻射, 曝露期間小於1000秒時, 曝露限制不得超過下列方程式所定義之位準:		P
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 18000 \cdot t^{-0,75} \quad \text{W} \cdot \text{m}^{-2}$	$t \leq 1000$ s	N
	曝露期間大於1000秒時, 曝露限制不得超過下列方程式所定義之位準:		P

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章節	試驗要求	結果-備註	判定
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2}$	t > 1000 s	P
4.3.8	對皮膚之熱危害曝露限制		P
	皮膚對可見光及紅外光輻射之曝露限制, 不得超過下列方程式所定義之位準:		P
	$E_H \cdot t = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20000 \cdot t^{0.25} \quad J \cdot m^{-2}$		P

5	光源及光源系統之量測		P
5.1	量測條件		P
	量測條件應與曝露限制評估結果及對應之風險類別 (assignment of risk classification), 一併登載於試驗報告中	產品風險分類為無風險等級 (Exempt Group)	P
5.1.1	枯化點燈[lamp ageing (seasoning)]		P
	光源應進行適當期間(period of time)之枯化點燈。在光源操作之初期(initial period), 由於元件仍處於平衡調整期間(come to near equilibrium), 光輻射輸出特性將有所變動。應依對應之IEC 光源標準, 進行光源之枯化點燈。		P
5.1.2	試驗環境		P
	為維持量測之準確性, 光輻射源應於受控之環境中量測。光輻射源及量測設備受環境因素所影響。對於特定之試驗條件, 參照對應之IEC 光源標準。		P
5.1.3	外界輻射		P
	應針對外界之輻射或反射源進行查核, 以確保不對量測結果造成顯著影響		P
5.1.4	光源操作	不適用	N
	試驗光源運作條件的提供必須依照:	不適用	N
	- 對應IEC 光源標準, 或	不適用	N
	- 採行製造廠商所提供之建議條件	不適用	N
5.1.5	光源系統操作		P
	試驗光源所搭配之控制裝置(power source), 運作條件的提供必須依照:		P
	- 對應IEC 光源標準, 或	不適用	N
	- 採行製造廠商所提供之建議條件	Test Condition Input Voltage: AC (100 / 240) V 60 Hz Head of LED lamp paralleled to optical table for measurement and the measuring distance was 1415 mm to 1451 mm.	P

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CNS 15592			
章節	試驗要求	結果-備註	判定
5.2	量測程序		P
5.2.1	輻射照度量測		P
	最小入射孔徑之直徑(minimum input aperture diameter)應為7 mm		P
	最大入射孔徑之直徑(Maximum aperture diameter)應為50 mm		P
	應於光束中能顯現最大讀值之位置進行量測		P
	儀器應適當加以校正, 以利取得每單位接收面積中絕對入射輻射功率之準確讀值		P
5.2.2	輻射亮度量測		P
5.2.2.1	標準方法		P
	以光學系統進行輻射亮度量測		P
	儀器應適當加以校正, 以利取得該儀器平均視場(FOV)上每單位可接收立體角及每單位接收面積中絕對入射輻射功率之準確讀值		P
5.2.2.2	替代方法	不適用	N
	將輻射照度成像配置(set-up)修改為(alternatively)輻射亮度成像配置, 即將圓形視場光闌置於輻射源之輻射照度量測配置, 可用以進行輻射亮度量測	不適用	N
5.2.3	輻射源尺寸之量測		P
	為測定輻射源之角距 α , 需測定輻射源中50%之輻射點(emission points)		P
5.2.4	脈衝輻射光源之脈衝寬度量測	不適用	N
	為測定輻射源之標稱脈衝寬度(nominal pulse duration) Δt , 需測定到達輻射源峰值50%之期間(the time during which the emission is > 50% of its peak value)	不適用	N
5.3	分析方法		P
5.3.1	加權曲線插值		P
	為使內插值符合標準化, 針對特定之對數值進行線性內插計算, 內插值之反對數值需透過內插加權因數加以換算。	see table 4.1	P
5.3.2	計算		P
	輻射源危害值之計算, 係以合適之函數進行光譜掃描加權(performed by weighting the spectral scan), 計算加權總能量值(total weighted energy)		P
5.3.3	量測不確定度		P
	所有量測結果之品質, 須以不確定度分析加以量化		P

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章節	試驗要求	結果-備註	判定

6	光源之風險分類		P
	登載於報告中之風險類別及光源輻射產生光生物危害值之距離係為重要議題。由於光源從某些觀點可能造成危害, 建立分類模式(classification scheme)有助於光生物危害之評估	see table 6.1	P
	- 符合3.11 所定義之一般照明用光源(GLS), 輻射照度及輻射亮度之危害值應登載於報告中, 以產生 500 lux 照度之距離為基準, 惟此距離不得小於 200 mm。	一般照明用光源(GLS)	P
	- 對於所有其他種類之光輻射源, 包含脈衝輻射光源, 應將以200 mm 為基準所得出之危害值登載於報告中	不適用	N

6.1	連續輻射光源		P
6.1.1	無風險類別		P
	無風險類別之科學基礎, 係基於在本標準所規定最極端之曝露限制(end point)下, 光源不造成任何光生物危害。滿足本項要求之光源, 須符合所有下列條件:		P
	- 在8 小時(30000 秒)內之曝露期間, 不造成光化學紫外光危害(E_S),		P
	- 在1000 秒(約16 分鐘)內之曝露期間, 不造成近紫外光危害(E_{UVA}),		P
	- 在10000 秒(約2.8 小時)內之曝露期間, 不造成視網膜藍光危害(L_B),		P
	- 在10 秒內之曝露期間, 不造成視網膜熱危害(L_R),		P
	- 在1000 秒內之曝露期間, 不造成對眼睛之紅外光輻射危害(E_{IR})		P
6.1.2	風險類別1(低度風險)	不適用	N
	風險類別1(低度風險)之科學基礎, 係基於在一般之曝露限制(normal behavioral limitations on exposure)下, 光源不造成危害。滿足本項要求之光源雖超出無風險類別之限制, 惟須符合下列所有條件:	不適用	N
	- 在10000 秒內之曝露期間, 不造成光化學紫外光危害(E_S),	不適用	N
	- 在300 秒內之曝露期間, 不造成近紫外光危害(E_{UVA}),	不適用	N
	- 在100 秒內之曝露期間, 不造成視網膜藍光危害(L_B),	不適用	N

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章節	試驗要求	結果-備註	判定
	- 在 10 秒內之曝露期間, 不造成視網膜熱危害 (L_R),	不適用	N
	- 在 100 秒內之曝露期間, 不造成對眼睛之紅外光輻射危害 (E_{IR})	不適用	N
	釋放紅外光輻射而不造成強烈視覺刺激(即低於 $10 \text{ cd} \cdot \text{m}^{-2}$), 且在 100 秒內之曝露期間而不造成近紅外光視網膜危害 (L_{IR}) 之光源, 亦可列入風險類別 1(低度風險)	不適用	N
6.1.3	風險類別 2(中度風險)	不適用	N
	風險類別 2(中度風險) 之科學基礎, 係基於即使因強光輻射源(bright light sources) 造成生理不適(aversion response) 或熱不適(thermal discomfort) 之反應, 光源仍不造成危害。滿足本項要求之光源雖超出風險類別 1(低度風險) 之限制, 惟須符合下列所有條件:	不適用	N
	- 在 1000 秒內之曝露期間, 不造成光化學紫外光危害 (E_S),	不適用	N
	- 在 100 秒內之曝露期間, 不造成近紫外光危害 (E_{UVA}),	不適用	N
	- 在 0.25 秒內之曝露期間(生理不適反應), 不造成視網膜藍光危害 (L_B),	不適用	N
	- 在 0.25 秒內之曝露期間(生理不適反應), 不造成視網膜熱危害 (L_R),	不適用	N
	- 在 10 秒內之曝露期間, 不造成對眼睛之紅外光輻射危害 (E_{IR})	不適用	N
	釋放紅外光輻射而不造成強烈視覺刺激(即低於 $10 \text{ cd} \cdot \text{m}^{-2}$), 且在 10 秒內之曝露期間而不造成近紅外光視網膜危害 (L_{IR}) 之光源, 亦可列入風險類別 2(中度風險)。	不適用	N
6.1.4	風險等級 3(高度風險)	不適用	N
	風險類別 3(高度風險) 之科學基礎, 係基於即使經短暫期間或瞬間(momentary or brief exposure) 之曝露, 光源仍可能造成危害。超出風險類別 2(中度風險) 限制之光源即列為風險類別 3(高度風險)。	不適用	N
6.2	脈衝輻射光源	不適用	N
	本節(pulsed lamp criteria) 適用於單脈衝及任何脈衝寬度在 0.25 秒內之脈衝輻射光源	不適用	N
	脈衝輻射光源應在製造廠商所指定之最高標稱能量負載(highest nominal energy loading) 下進行評估。	不適用	N

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章節	試驗要求	結果-備註	判定
	對於每個脈衝, 應由輻射源所發射之加權輻射照度或亮度對整個脈衝寬度進行積分所得出, 進行下列各項光生物危害評估	不適用	N
	- 超出曝露限制之光源應列為風險類別3(高度風險)	不適用	N
	- 對於單脈衝輻射光源, 其加權輻射曝露或加權輻射亮度劑量低於EL 時, 應列為無風險類別。	不適用	N
	- 對於重複的脈衝輻射光源(repetitively pulsed lamps), 其加權輻射曝露或加權輻射亮度劑量低於EL 時, 以脈衝輻射之時間平均值(time averaged values of the pulsed emission), 依6.1 中針對連續輻射光源之風險類別進行評估	不適用	N

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Table 4.1 對皮膚及眼睛評估紫外光危害之光譜加權函數

Wavelength ¹ λ , nm	UV hazard function $S_{uv}(\lambda)$	Wavelength λ , 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

¹ 所選擇之波長為具備代表性之波長, 波長間之其他數值得以對數內插法計算。

*汞放電之發射光譜線。

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Table 4.2 評估寬頻帶光學輻射源對視網膜危害之光譜加權函數

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
600-700	0,001	1,0
700-1050		$10^{[(700-\lambda)/500]}$

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1050-1150	0,2
1150-1200	$0,2 \cdot 10^{0,02(1150-\lambda)}$
1200-1400	0,02

Table 5.4 皮膚表面或角膜之ELs彙整表(輻射照度基準值)

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	≤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	≤100 >100	< 0,011	100/t 1,0
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 – 3000	≤1000 >1000	1,4 (80)	$18000/t^{0,75}$ 100
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	$20000/t^{0,75}$

Table 5.5 視網膜之ELs彙整表(輻射亮度基準值)

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	$0,0011 \cdot \sqrt{t}$	$10^6/t$
			≥ 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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Table 6.1 連續輻射光源之危害等級輻射限制與結果

Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	S _{UV} (λ)	E _s	W•m ⁻²	0,001	1.06E-04	0,003	-	0,03	-
Near UV		E _{UVA}	W•m ⁻²	10	4.05E-05	33	-	100	-
Blue light	B(λ)	L _B	W•m ⁻² •sr ⁻¹	100	3.42E+01	10000	-	4000000	-
Blue light, small source	B(λ)	E _B	W•m ⁻²	1,0*	n/a	1,0	-	400	-
Retinal thermal	R(λ)	L _R	W•m ⁻² •sr ⁻¹	28000/α	3.68E+01	28000/α	-	71000/α	-
Retinal thermal, weak visual stimulus**	R(λ)	L _{IR}	W•m ⁻² •sr ⁻¹	6000/α	<1.00E-09	6000/α	-	6000/α	-
IR radiation, eye		E _{IR}	W•m ⁻²	100	<1.00E-09	570	-	3200	-

*小型光源之角距<0.011徑度。10000秒之視場為0.1徑度。
 **包含非GLS光源(GLS source)之評估。

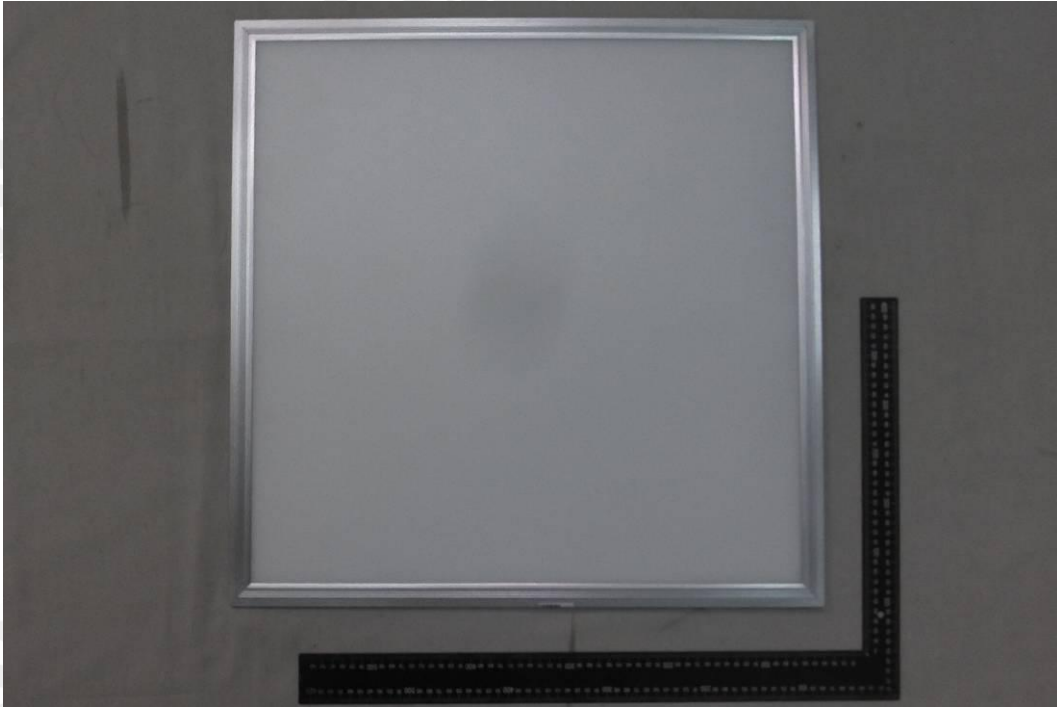
※ Remark:

All the models listed on the report were tested and evaluated upon one tested sample at least, and the test results shown on the report were summarized with the worse one among the tested samples in normal conditions

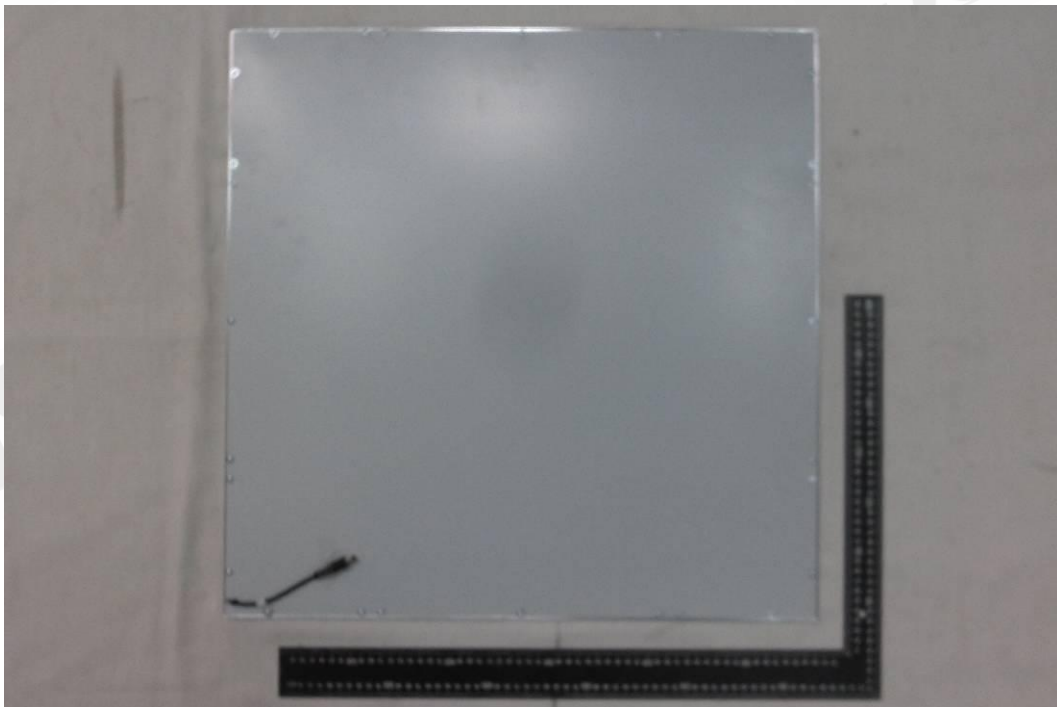
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樣品照片



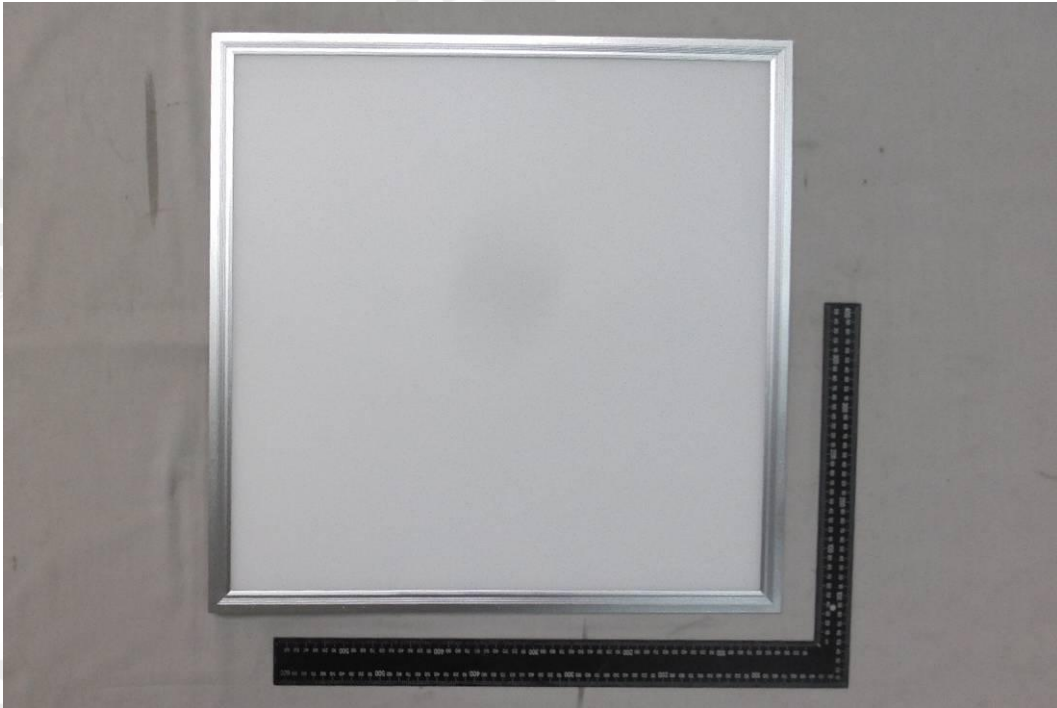
LSSSCG520005 正面



LSSSCG520005 背面

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LSSSTG520005 正面



LSSSTG520005 背面

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LSSSWG520005 正面



LSSSWG520005 背面

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Control Gear

- 以下空白 -

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