

# LED照明趋势及认证简介

Intertek Hong Kong

Gary Yu

电气及无线产品

高级经理



# 议程

01 LED照明趋势

02 LED 照明认证简介

03 公司简介



01

LED照明趋势



# INTRODUCTION 介绍



**+** 效能, 壽命



# INTRODUCTION 介绍

## Smart Lighting 智慧照明

What is **SMART LIGHTING**

什么是智慧照明



### Traditionally 传统上：

- Minimizing energy usage 减少能源使用
- With automatic power ON/OFF control (e.g. PIR sensor, timer, etc.)  
具有自动电源开/关控制（例如 PIR 传感器、定时器等）
- With light sensor to automatically control the brightness  
带光传感器，可自动控制亮度
- With remote control  
带遥控器
- Power usage data logging  
电源使用数据记录



## SMART LIGHTING as we know NOW

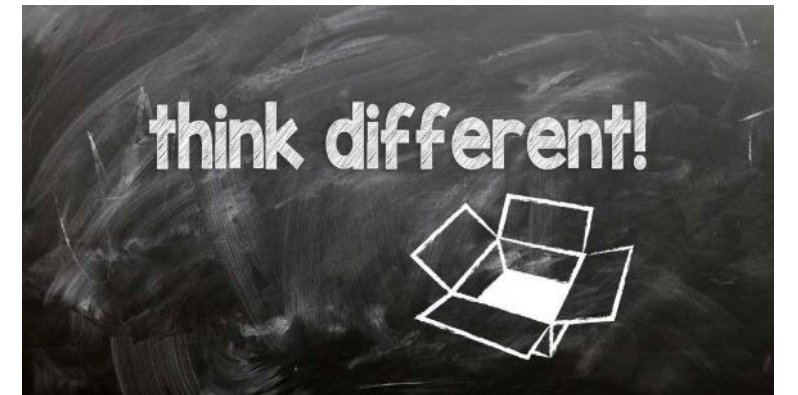
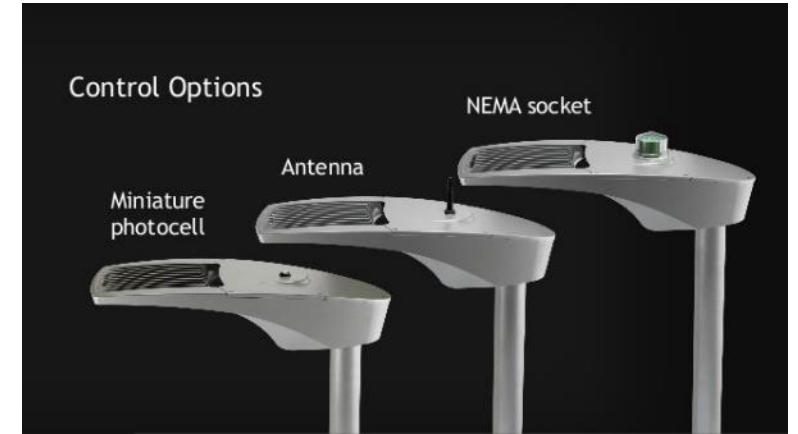
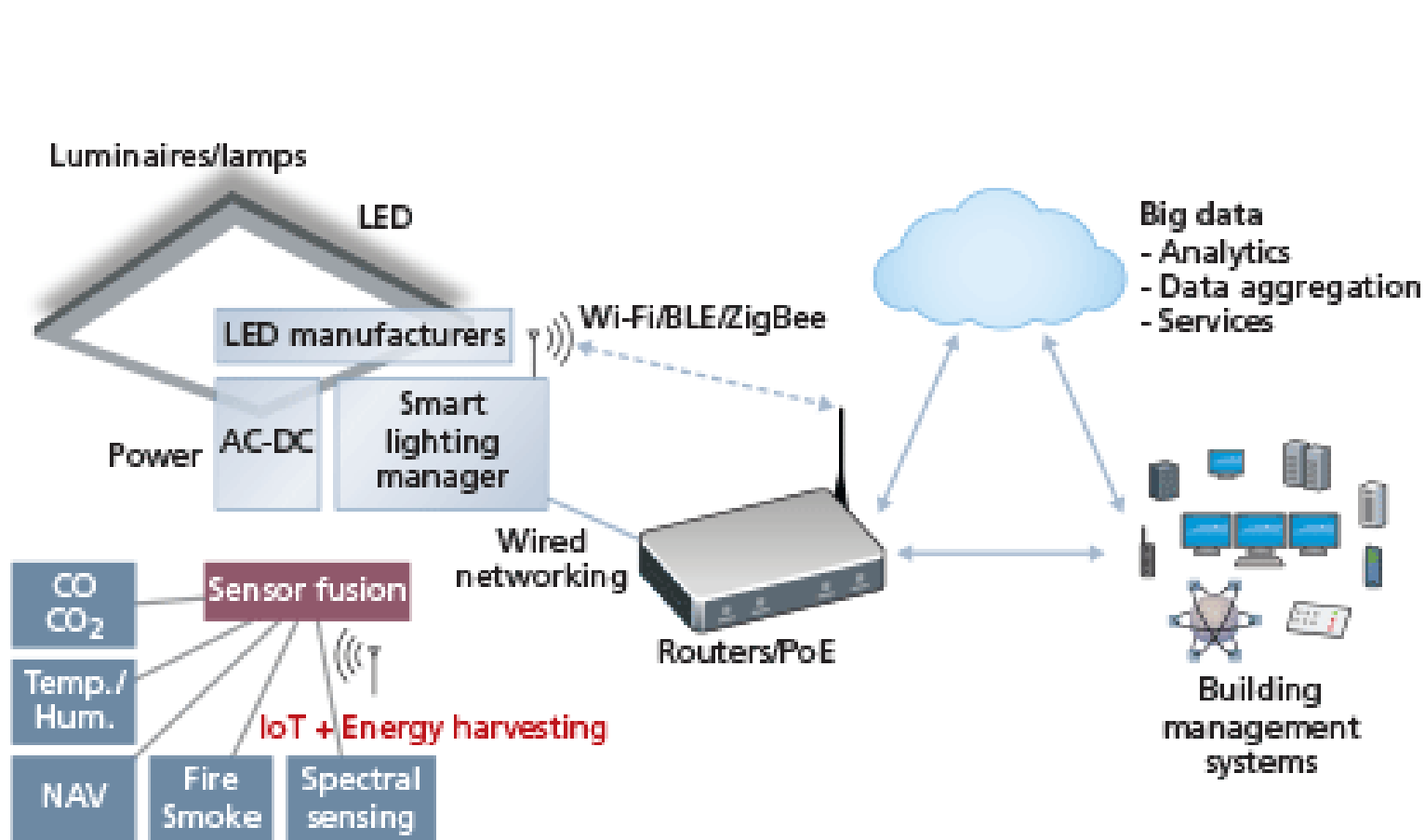
A lot more than just providing LIGHT:  
不仅仅是提供光：

- Can communicate with other lamps  
可与其他灯互相联系
- Fully automatic control that is linked to the daily life of the user  
控制系统与用户的日常生活相连
- Can be controlled through mobile phones even half way around the world  
甚至可以通过手机控制，甚至遍布地球的另一端
- Can be linked to other SMART appliances and home controllers  
(Amazon's Echo, Google's Home, Apple's Homekit ....)  
可与其他智能家电和家用控制器连接（亚马逊的Echo，谷歌的Home，苹果的Homekit....）
- Directly or indirectly connected to the Internet  
直接或间接连接到互联网
- And ..... a lot more functions 其他用途



# APPLICATION 应用

## Smart Lighting 智慧照明 → Internet of Things 物联网



# APPLICATION 应用

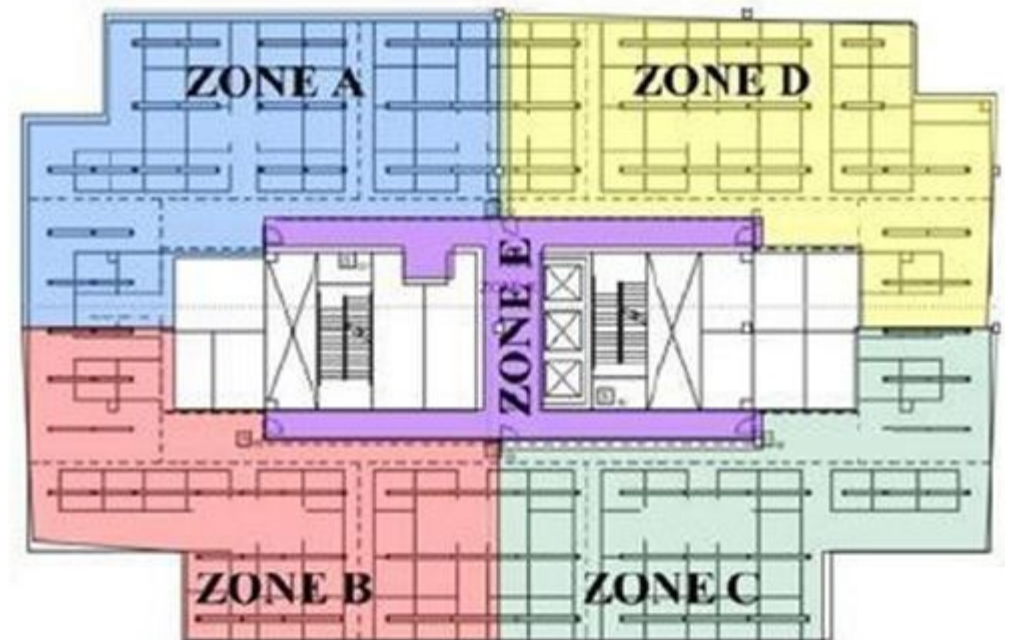


## Smart Lighting 智慧照明

Apps control  
e.g. linked to other appliances



## Control Zoning 分区控制





# APPLICATION 应用

## Health & Wellbeing 健康照明

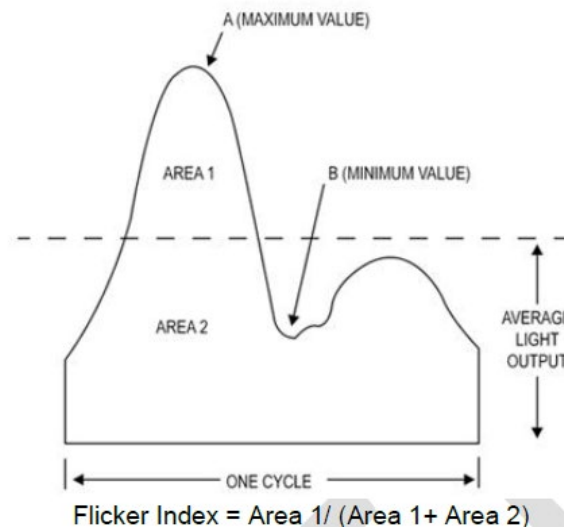
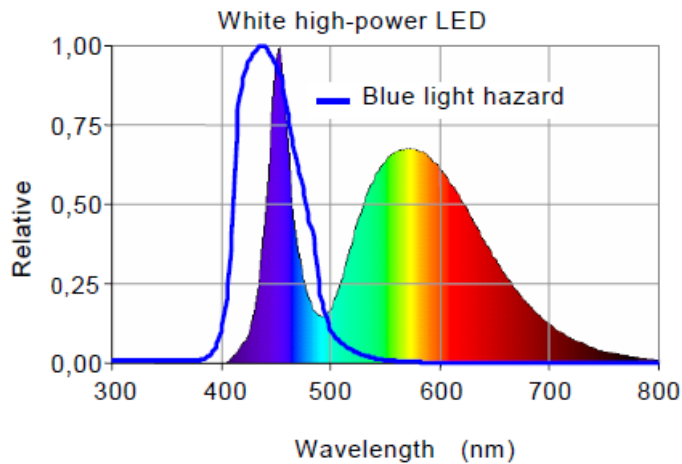
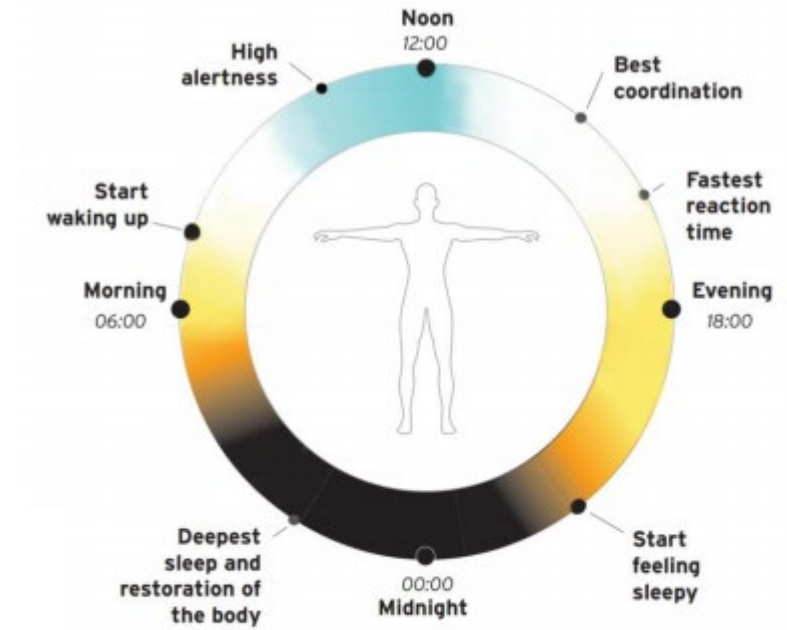
## Light Quality 光品质

Lux Vs EML (Equivalent Melanopic Lux)

EML = 勒克斯 × 黑视素比率

EML较高的光会提高警觉度，EML较低的光会促进褪黑素分泌，降低警觉度。所以，针对不同的环境应用，选择相应EML的光源。

## Circadian Lighting 昼夜节律照明



# CRI 显色指数



A quantitative measure of the ability of a light source to reveal the colors of various objects faithfully in comparison with an ideal or natural light source. 光源对物体颜色的还原能力



2700K CRI 100



2700K CRI 90



2700K CRI 80



2700K CRI 70



WELL v2, Q2 2022, Chinese

光

- L01 光接触
- L02 视觉照明设计
- L03 昼夜节律照明设计**
- L04 人工照明眩光控制
- L05 日光设计策略
- L06 日光模拟
- L07 视觉平衡
- L08 电气照明质量
- L09 使用者控制照明环境

## 概念 / 光 / 条款 L03 优化条件

### 昼夜节律照明设计

通过室内日光照射以及室外视野支持昼夜节律和心理健康。

最高 3 pts

OVERVIEW ALTERNATIVES 0 FAQ 4 VERIFICATION

#### 摘要

本WELL条款要求项目为用户提供适当的光照，以维持昼夜节律健康并且让昼夜节律与自然昼夜循环保持一致。

#### 问题

我们身体的昼夜节律通过各种线索（包括光线）来保持同步。人类已经进化出将他们的昼夜节律建立在与白天和夜晚相关联的自然光-黑暗模式的基础上。但由于人类在室内呆了很长一段时间，因此，足够水平的光照会受到影响，因为典型的室内电气光照水平通常不等于人体传统上在户外所接收的光量值<sup>1</sup>。光照不足会影响人体昼夜节律系统的功能和睡眠质量。昼夜节律紊乱与肥胖、糖尿病、抑郁和代谢失调有关<sup>2-4</sup>。夜间暴露于光照下也与不良健康影响相关，如乳腺癌、昼夜节律紊乱和睡眠障碍<sup>5,6</sup>。

#### 方案

由于人类对光线的昼夜节律响应取决于进入眼睛的光线，因此，应考虑诸如光线的光谱特性、亮度等级、持续时间和光照时间等因素。必须在住户的眼睛水平线上的垂直面上达到光照水平，以模拟进入用户眼睛的光线<sup>8</sup>。同样重要的是要考虑曝光持续时间和曝光的时间点。夜间接触强光会刺激昼夜节律系统，对睡眠质量产生负面影响<sup>9,10</sup>。

显示更少

#### 条款部分

WELL Core 收起全部

#### 部分 1

##### 适合白天活动人员的照明 (Max: 3 分)

适用于所有空间 除 住宅单元 通用住宅单元

对于白天使用的工位，人工照明用于满足以下阈值：

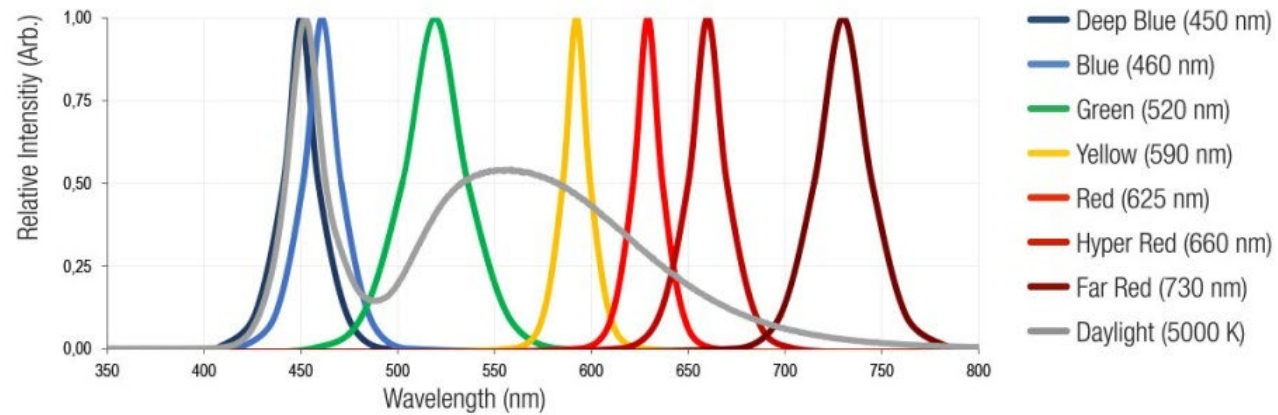
- 在常规使用空间中，所有工位的工作平面以上18英寸的高度，至少要保持四个小时的光照水平（最迟在中午开始）：



# APPLICATION 应用

Application other than general lighting 其他照明以外的应用

提供太阳光谱或更适合植物生长的波段，让植物生长。



Horticultural 植物生长灯



# APPLICATION 应用

Application other than general lighting 其他照明以外的应用

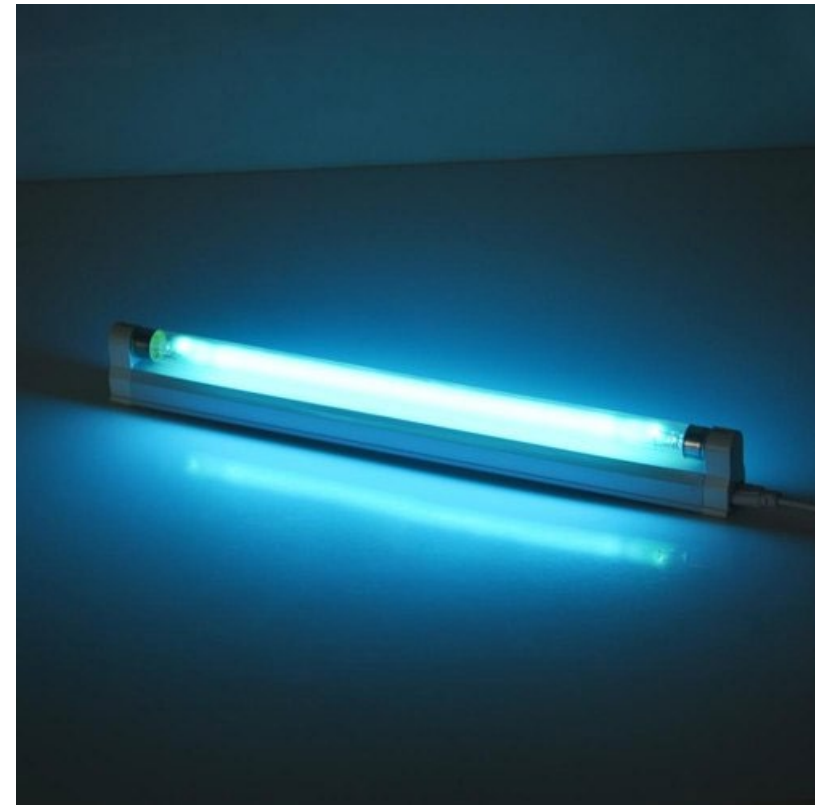
## Li-Fi 光照上网技术



Source: <https://www.led-professional.com/resources-1/articles/lifi-what-it-is-how-it-works-what-it-provides-how-to-apply-and-its-future-prospects>

应用: 医院

## Germicidal Lamps 杀菌灯



02

## LED 照明认证简介



# REGULATIONS AND STANDARDS 法规和标准



Regulatory Compliance 法规	Other areas of concern
Basic test standards : Electrical Safety 安规, and EMC (Electromagnetic Compatibility) 电磁相容性	Connectivity (e.g. ZigBee, Wi-Fi) 连接性
Energy efficiency/performance test 能效	Interoperability 互操作性 (can connect to other product brands using the same network protocol) 可以使用相同的网络协议 连接到其他品牌的产品
Chemical 化学测试	Security 安全性 (Security is always an issue when a product is connected to the internet) 当产品连接到互联网时，网络安全必须要关注
Radio control tests 无线电控制测试	

# REGULATIONS AND STANDARDS 法规和标准



## ELECTRICAL SAFETY TESTING FOR LIGHTING PRODUCT 安规

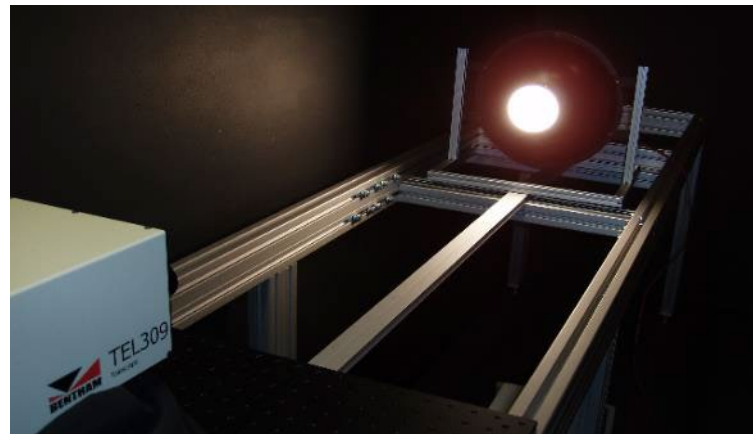
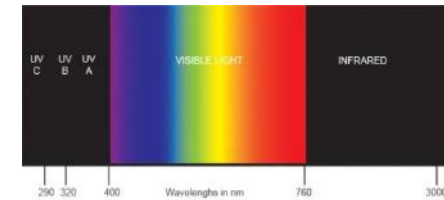
Countries / Programs	Electrical Safety and Performance
<b>North America:</b> US/Canada	<ul style="list-style-type: none"><li>• <b><u>UL 8750</u></b>: LED Equipment for Use in Lighting Products</li><li>• <b><u>UL 1993</u></b>: Stand for Self-Ballasted Lamps and Lamp Adapters</li><li>• <b><u>ANSI/UL 153</u></b>: Portable Electric Luminaires</li><li>• <b><u>UL 1598</u></b>: Luminaire</li><li>• <b><u>UL 8800</u></b> Horticultural Lighting and Systems</li><li>• <b><u>UL 8801</u></b> Photovoltaic-Powered Luminaire Systems</li></ul>
<b>Europe:</b> CE Directive i.e. Low Voltage Directive	<ul style="list-style-type: none"><li>• <b><u>EN/ IEC 62031</u></b>: LED Modules for general lighting-safety specifications</li><li>• <b><u>EN/ IEC 62560</u></b>: Self-ballasted LED-lamps for general lighting services by voltage &gt; 50 V – Safety specifications</li><li>• <b><u>EN/ IEC 60598</u></b>: Luminaires – General requirements and tests</li></ul>
<b>International:</b> IEC i.e. CB Safety Certification	<ul style="list-style-type: none"><li>• <b><u>EN/ IEC 61347</u></b>: Lamp control gears – General and safety requirement</li><li>• <b><u>EN/ IEC 62471</u></b>: Photobiological Safety of Lamps and Lamp System</li></ul>

# PHOTO-BIOLOGICAL HAZARD / SAFETY 光生物安全



## IEC 62471 Photo-biological safety

- The Spectroradiometer system were introduced, which can measure a light source with spectral range **200-1700nm. (From UVC to IRB)**, and can be further expanded to **3000nm**.
- With the Spectroradiometer system (**Double Monochromator**), we can perform the LED photo-biological safety testing (i.e. **EN 62471**) and Ultra-Violet radiation measurement according to different requirement (e.g. ErP directives)





# ELECTRICAL TESTS (ELECTRIC STRENGTH TEST) 电气强度

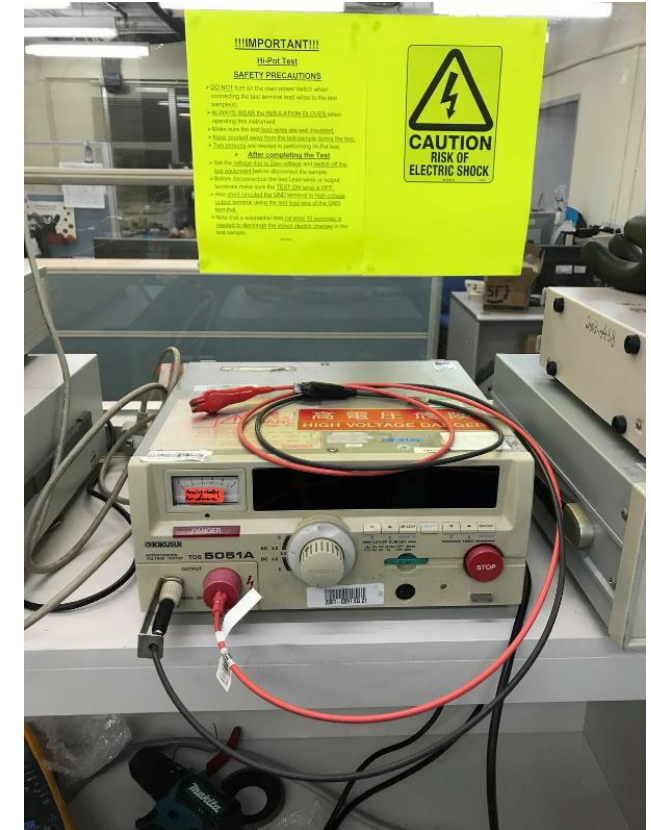
The prescribed voltage in table 10.2 applied for 60s

No flashover, breakdown or the output current higher than 100mA

试验期间不得发生闪络或击穿现象，或电流不能大于100mA

## Enclosure – Accessibility of Live Parts

Apparatus specified in IEC 60529





# REGULATIONS AND STANDARDS 法规和标准

## EMC / FCC REQUIREMENTS FOR LIGHTING PRODUCT 电磁相容性

Countries / Programs	EMC
<b>North America:</b> FCC	<b><u>FCC Part 15:</u></b> a) Radiated emission 辐射噪声 and b) Conducted emission 传导噪声
<b>Europe:</b> CE Directive (Both EMI, EMS and EMF)	<ul style="list-style-type: none"><li>• <b><u>EN55015</u></b> (EMI test applied to Equipment for general lighting purposes)</li><li>• <b><u>EN61000-3-2</u></b> &amp; <b><u>EN61000-3-3</u></b> (Public currents distribution systems up to 16A current.)</li><li>• <b><u>Immunity: EN61547</u></b> (EMS test applied to Equipment for general lighting purposes)</li><li>• <b><u>EN 62493</u></b> (Assessment of lighting equipment related to human exposure to electromagnetic fields)</li></ul>
<b>International:</b> CISPR	<b><u>CISPR 55015</u></b> (Electrical Lighting and Similar Equipment)

# REGULATIONS AND STANDARDS 法规和标准

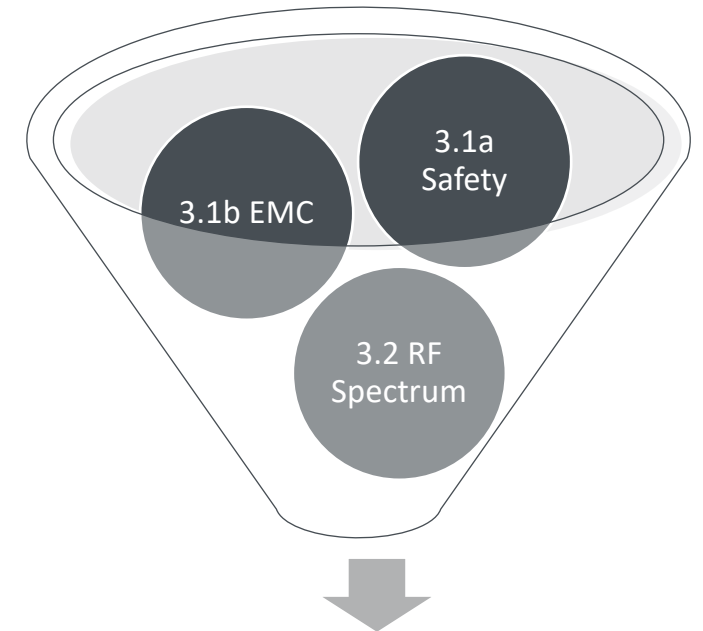
## RED (RADIO EQUIPMENT DIRECTIVE) – EUROPE ALL WIRELESS TRANSMITTERS AND RECEIVERS

RF Product		Standards
Wi-Fi / ZigBee / BT / IEEE 802.11		<ul style="list-style-type: none"> <li>EN 300328 (3.2)</li> <li>EN 301489-17 (3.1b)</li> <li>EN 301489-1 (3.1b)</li> </ul>

Unintentional RF Safety	Standards	OJ
EMF to human exposure (Lighting Equipment)	EN 62493	2015/35/EU LVD

The RED Directive has revised its scope to include cybersecurity related concerns to radio interfaces which become **mandatory in August 2024**.

### Essential Requirement (Article 3)



2014/53/EU Radio Equipment Directive

# 3M SEMI-ANECHOIC CHAMBER 三米半电波暗室



A standard 9m x 6m x 6m, 3m semi-anechoic chamber for radiated emission measurements.

Scanning frequency range: 9kHz to 40GHz

Scanning height: 1m to 4m

Turntable: Maximum weight 1,000kg



# REGULATIONS AND STANDARDS 法规和标准



## ENERGY EFFICIENCY REQUIREMENTS FOR LIGHTING PRODUCT 能效

Countries / Programs	Photometric Performance, e.g.
<b>North America:</b> i.e. ENERGY STAR 能源之星, California Energy Commission (CEC)	<ul style="list-style-type: none"><li>• <b>IES LM-79:</b> Electrical and Photometric Measurements of Solid-State Lighting Products</li><li>• <b>IES LM-80:</b> IES Approved Method for Measuring Lumen Maintenance of LED Light Sources</li><li>• <b>IES LM-82:</b> Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature</li><li>• <b>IES LM-92:</b> Optical and Electrical Measurement of Ultraviolet LEDs <b>*NEW (2022)</b></li></ul>
<b>Europe:</b> CE Directive 指令 i.e. ErP, Energy Label	<ul style="list-style-type: none"><li>• Directive EU 2019/2020 – Ecodesign requirement for light sources and separate control gears</li><li>• Directive EU 2019/2015 – Energy labelling of light sources</li></ul>
<b>International:</b> Global Market Access Program 多国认证	<ul style="list-style-type: none"><li>• IEC 62717: LED modules for general lighting</li><li>• IEC 62722: Luminaire performance</li><li>• IEC 62612: Self-ballasted LED lamps for general lighting services with supply voltages &gt; 50 V</li></ul>

# ENERGY LABEL 能源標籤



Should be ranged from 30mm to 55mm

<b>ENERGY LABEL</b> 能源標籤	
Brand 牌子	ABC 某某牌
Model 型號	HK1234
Luminous Efficacy (Lumen/W) 發光效率 (流明/瓦) Energy Efficiency Grade* 能源效益級別	110  <b>1</b>
EEL Registration Number 能源標籤登記號碼	LED 17-0001
<small>* The data are provided according to the Hong Kong Energy Efficiency Labelling Scheme administered by the Electrical and Mechanical Services Department (EMSD), Government of the Hong Kong Special Administrative Region. The registration record can be found at the EMSD website at <a href="http://www.emsd.gov.hk">www.emsd.gov.hk</a>. 資料根據香港特別行政區政府機電工程署推行的香港能源效益標籤計劃的規定列出。有關註冊記錄可查閱網址 <a href="http://www.emsd.gov.hk">www.emsd.gov.hk</a>。</small>	

Should be ranged from 60mm to 90mm

**ENERG**  
 SUPPLIER'S NAME  
 MODEL IDENTIFIER

A B C D E F G

**B**

WXYZ  
kWh/1000h

2019/2015

**ENERG**  
 SUPPLIER'S NAME  
 MODEL IDENTIFIER

A B C D E F G

**B**

WXYZ  
kWh/1000h

2019/2015

# OUR TESTING APPARATUS 我们的测试设备

Integrating Sphere 积分球,  
Goniophotometer 光度分布计

**IES LM-79:** Approved Method: Electrical and  
Photometric Measurements of Solid State Lighting

Focus on:

- Electrical Performance 电参数
- Photometric Performance 流明, 光分布 (e.g. Lumen, Light distribution)
- Color Performance CCT, CRI 色温, 显色指数





# OUR TESTING APPARATUS 我们的测试设备



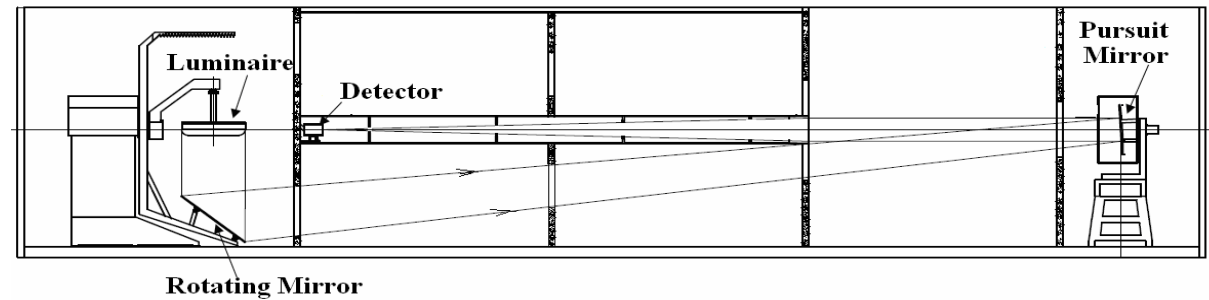
## Type C (Mirror Type) Goniophotometer 光度分布计

### Equipment Size:

Tall	4 m
Length	13 m
Max. Sample Weight	50 kg

### Chamber Size:

High	4.3 m
Wide	4.3 m
Length	15 m



# LIGHT DISTRIBUTION 光分布

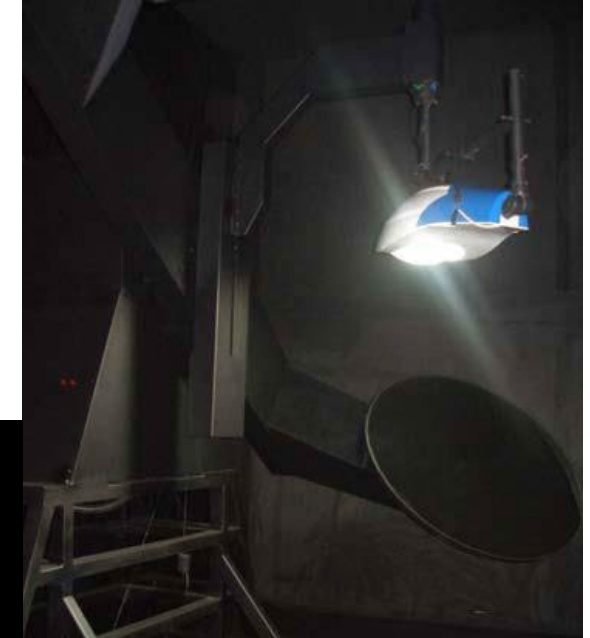
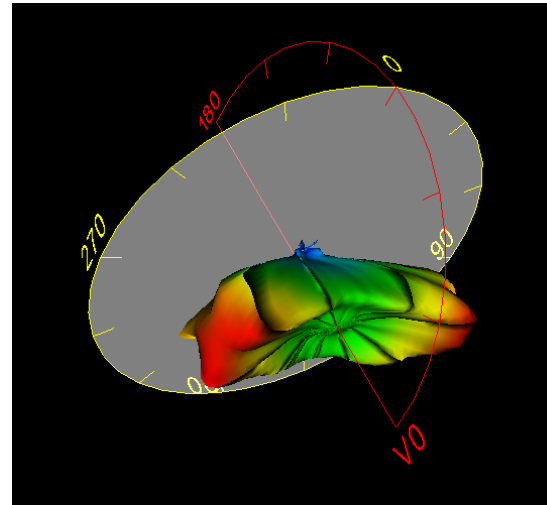


The Type C Goniophotometer system were setup and suitable to measure the spatial luminous intensity distribution of lighting luminaires, according with the requirements

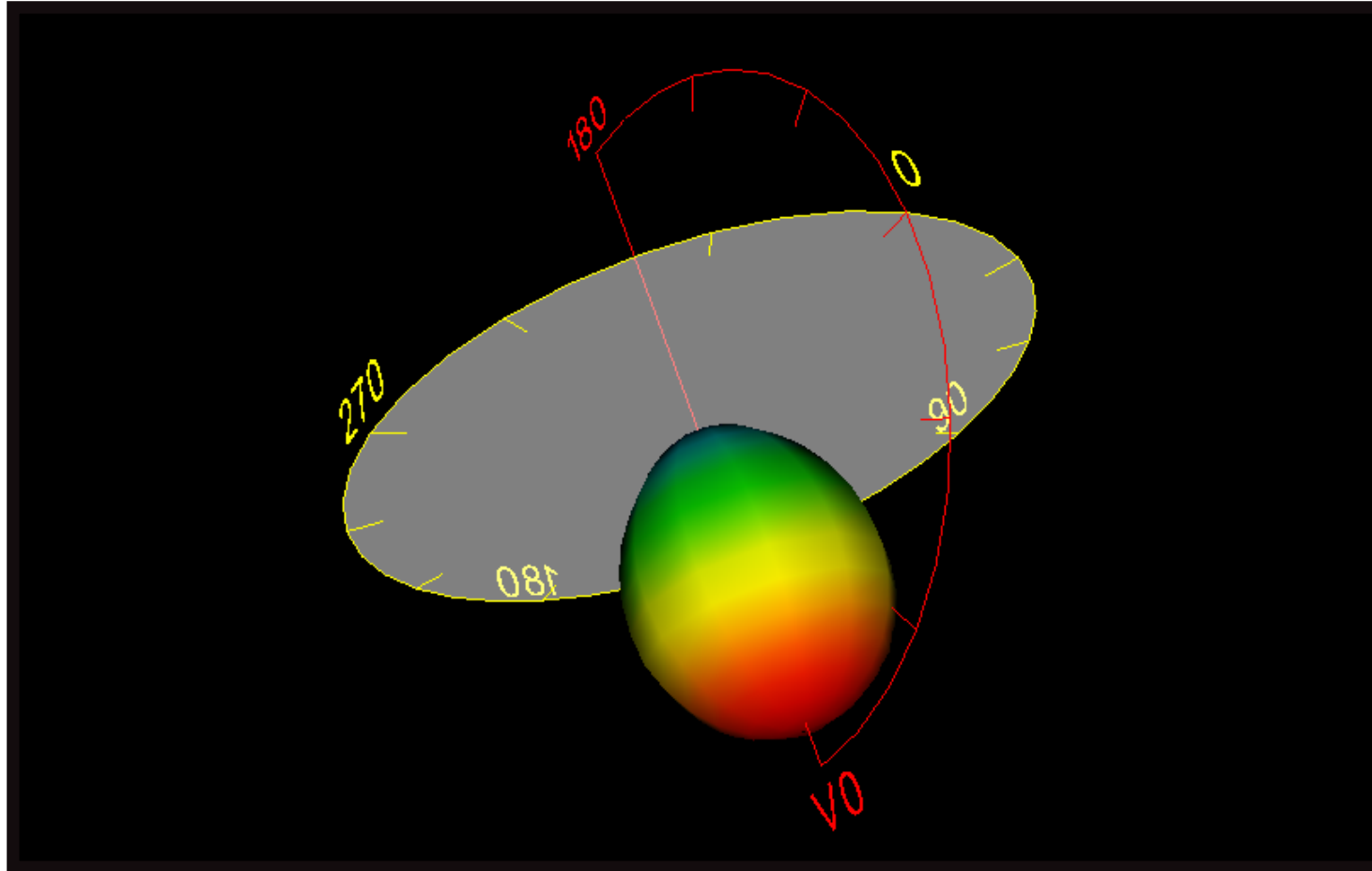
- LM79
- IEC/EN 61341

Then to analyze the luminaire photometric parameters, including:

Testing Services of Energy Star, CEC, DOE, MEPS, SASO, etc.



# LED DOWNLIGHT – LIGHT DISTRIBUTION



# OUR TESTING APPARATUS 我们的测试设备

**IES LM-80:** Approved Method: Measuring Lumen Maintenance of LED Light Sources

Focus on LED modules, arrays and devices:

*Capable to test for LED component with rated power up to 5kW!*

- At least 6,000 Hours Lumen Maintenance with data collection at a minimum of every 1,000 hours
- Electrical and Thermal Management (55°C or 85°C, and temperature selected by Manufacturer)





# REGULATIONS AND STANDARDS 法规和标准

## SECURITY (CYBERSECURITY) 网络安全

Standard / Test areas	Area of concern
ANSI/UL 2900 (Cybersecurity for Network-Connectable Products)	Network-connectable products, including NLC
IEC 62443 -4-1 (Supplier Development)/ -4-2 (Component Security Capabilities)/ -3-3 (System Security capabilities)	Securing operational technology (OT) that is used in automation and control systems, including industrial, building automation, energy sector, water/wastewater, and others.
<b>Vulnerability assessment</b> 漏洞评估	The process of <b><u>finding and measuring the severity of vulnerabilities in a system.</u></b> Vulnerability assessments yield lists of vulnerabilities, often prioritized by severity and/or business criticality. 漏洞评估会产生漏洞列表，通常会按严重性和 / 或业务关键性对其进行 <b>优先级排序</b> 。
<b>Penetration testing</b> 渗透测试	The penetration test has less to do for uncovering vulnerabilities, but more focused on <b><u>simulating a real-life attack.</u></b> The testing defenses and mapping-out simulate a real attacker in order to fulfil the goal in real world. 渗透测试更多地侧重于模拟现实生活中的攻击，测试防御措施和绘制出 <b>真实攻击者</b> 可以用来实现 <b>真实世界目标</b> 的路径

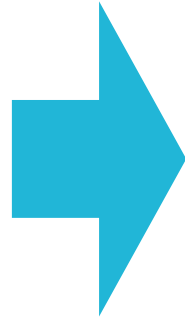
# EXAMPLE OF SYSTEM PROJECT – FROM END USER PERSPECTIVE



- Target Customer : End Product Mfr
- Industry related : Lighting
- Market : US
- Product : Smart LED lighting
- Eco System : **End User**
- Product Platform : Amazon Echo
- Used Case : End Product Design

End  
User  
(B2C)

Lighting



## Requirements 要求

### Regulatory Compliance 法规

- ETL/FCC/ Energy efficiency/Chemical, etc.

### Performance 产品性能:

- Luminous measurement / Light distribution

### Connectivity 连接性 :

- Checking the design according to communication protocol of ZigBee , Wi-Fi and BT

### Interoperability 互操作性:

- Check the Interoperability of Amazon Eco Platform

### Security 安全性:

- Product Design Review, ANSI UL 2900 of Smart Lighting

# EXAMPLE OF SYSTEM PROJECT – FROM CORPORATE PERSPECTIVE



- Target Customer : End Product Mfr
- Industry related : Lighting
- Market : US
- Product : Smart LED lighting
- Eco System : **Corporate (e.g. Hotel)**
- Product Platform : Hotel's building management system
- Used Case : End Product Design

End User (B2C)

Lighting



## Requirements 要求

### Regulatory Compliance 法规

- ETL/FCC/ Energy efficiency/Chemical, etc.

### Performance 产品性能:

- Luminous measurement / Light distribution
- System Assessment for effectiveness of collected data analysis

### Connectivity 连接性 :

- Checking the design according to communication protocol of ZigBee , Wi-Fi and BT

### Interoperability 互操作性:

- Check the Interoperability with the Hotel's center building management system

### Security 安全性:

- Product Design Review, ANSI UL 2900 of Smart Lighting
- Security assessment , FIPS and Penetration & Vulnerability test

03

公司简介



# INTERTEK致力于提供全方位ATIC解决方案



保证业务 (Assurance)  
环球市场先驱

3,000+

审计员及专家

100,000+

审核

100+

国家

TIC行业  
环球市场先驱

1,000+

实验室及办公室

80+

语言

有系统地达致质量及安全的方式



保证

A



测试

T



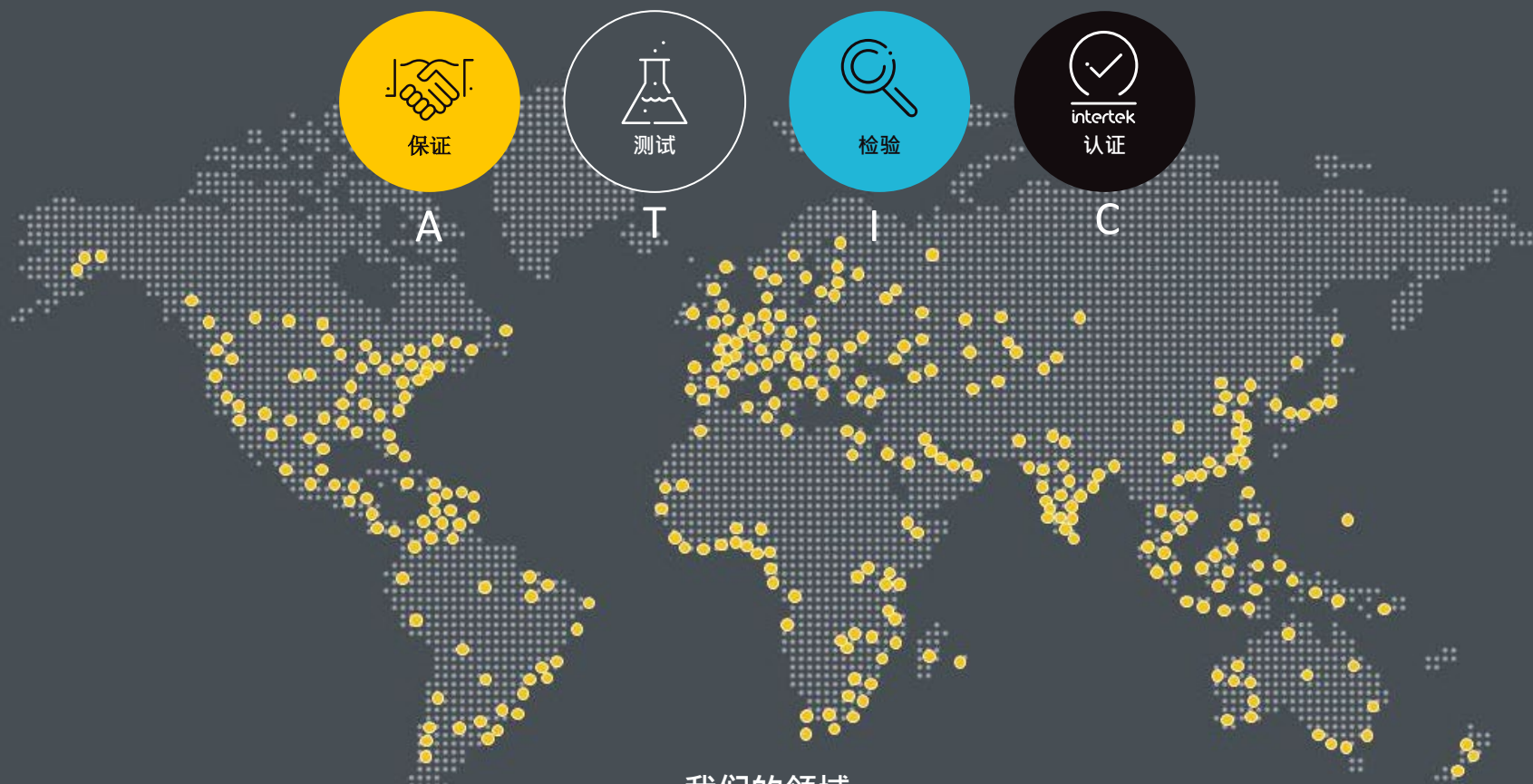
检验

I



intertek  
认证

C



我们的领域



产品



贸易



资源

# INTERTEK ELECTRICAL & NETWORK ASSURANCE



Initially part of the Edison Illuminating Company, Intertek began testing light bulbs in 1896.

Over 110 years later, we have the world's largest network of product safety, performance and EMC testing laboratories.

# CONTACT

**Gary Yu**



+852 5933 0713 / +86 147 1503 0713



[gary.yu@intertek.com](mailto:gary.yu@intertek.com)



[intertek.com.hk](http://intertek.com.hk)



**intertek**

**Total Quality. Assured.**