



# LED Testing Standards and Harmonization

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*Commission Internationale de l'Eclairage (CIE)*



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# The Need for Standardisation

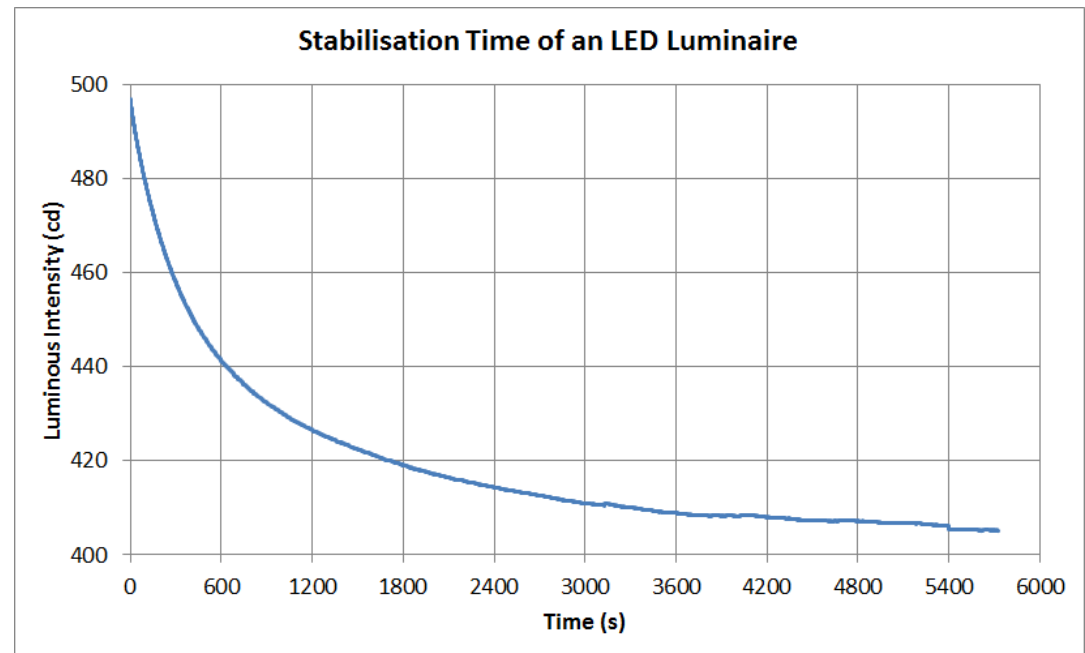
- Imagine two labs given the same SSL device to measure
- The labs are in two different countries
- Each will test with different basic test parameters
- What will happen?

# The Need for Standardisation

- Imagine Lab 1 starts a test after 30 min warmup, Lab 2 waits until full stabilisation

- Lab 1: 419.1 cd

- Lab 2: 405.2 cd



- Lab 1 measures 3.4% higher than Lab 2

\* Sample data only

# The Need for Standardisation

- Imagine Lab 1 tests the device in its designed orientation, Lab 2 tests the device sideways
- Change in burning position → Change in heat sink efficiency
- Change in heat sink efficiency → Change in SSL device temperature
- Change in SSL device temperature → Change in lumen output
- Effect typically ~ 0.5% (sometimes exceeds 1%)

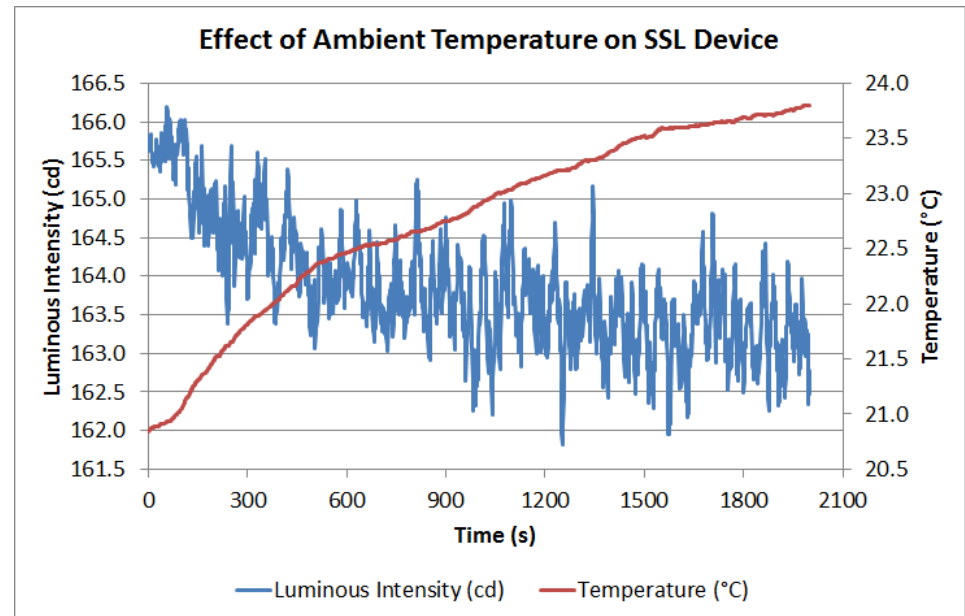


\* Sample data only, may not apply to these luminaires

# The Need for Standardisation

- Imagine Lab 1 tests at 22°C, Lab 2 tests at 25°C

- Effect typically  
~ -0.5% / °C



- Lab 1 measures 1.5% higher than Lab 2

\* Sample data only

# The Need for Standardisation

- Just taking those three effects into account:
  - ~ 5% difference in measurements between Lab 1 and Lab 2!
- Also other possible differences:
  - Applied voltage/current;
  - Quality of power supply;
  - Quality of power meters;
  - Air flow;
  - Quality of testing/measurement equipment;
  - etc...
- It is very important that:
  - the two labs apply the same test conditions; and
  - there is a minimum quality requirement for the equipment.
- And that's why we need standardisation!

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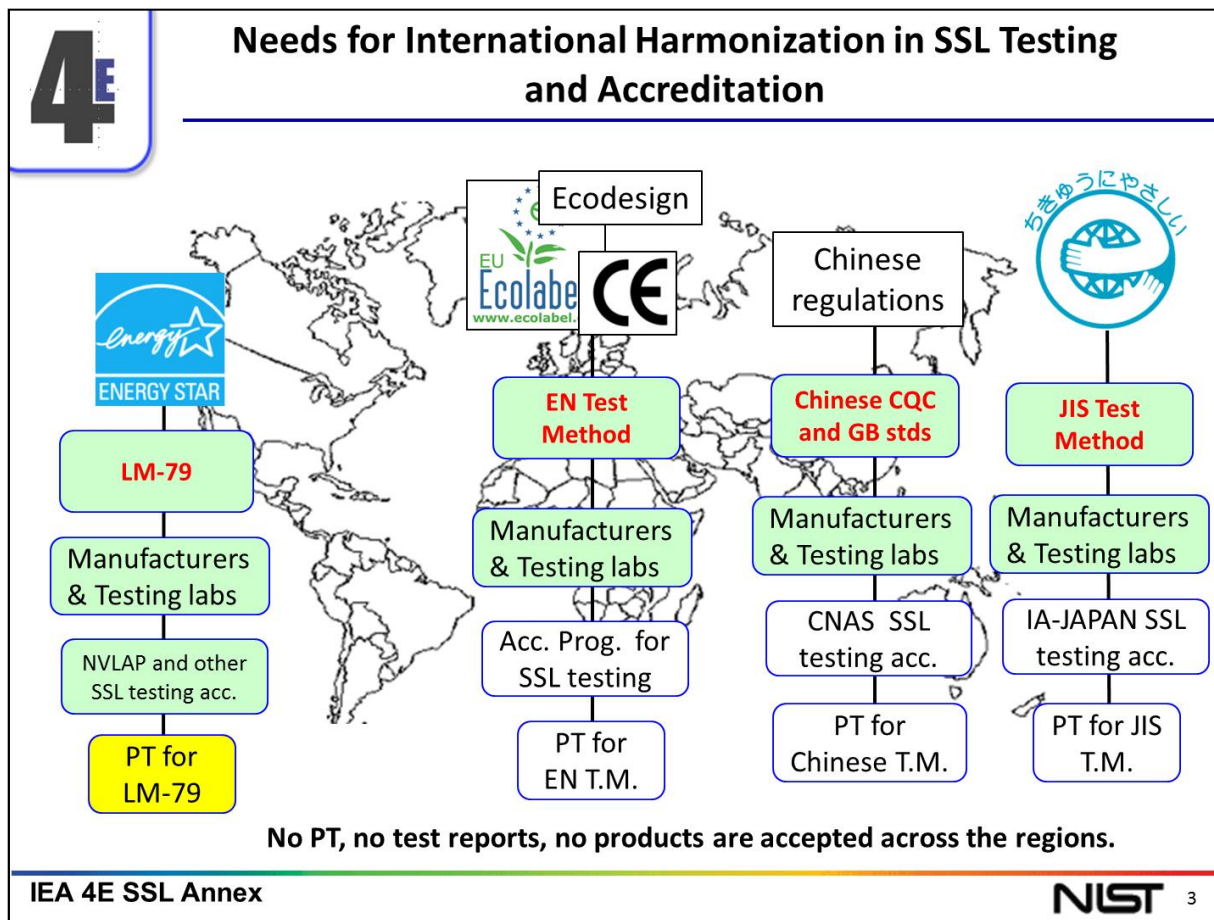
- The Need for Standardisation
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# The Current Situation

- Currently there are many different test methods used in different areas around the world for SSL products:
  - IESNA LM-79-08
  - EN test methods
  - IEC 62722, IEC 62612, IEC 62717
  - JIS C 7801 Am.1: 2012, JIS C 8152-2
  - Chinese CQC and GB standards
  - etc.
- These will have different levels of compatibility with each other.

# The Current Situation



From a presentation  
by Yoshi Ohno for the  
IEA 4E SSL Annex

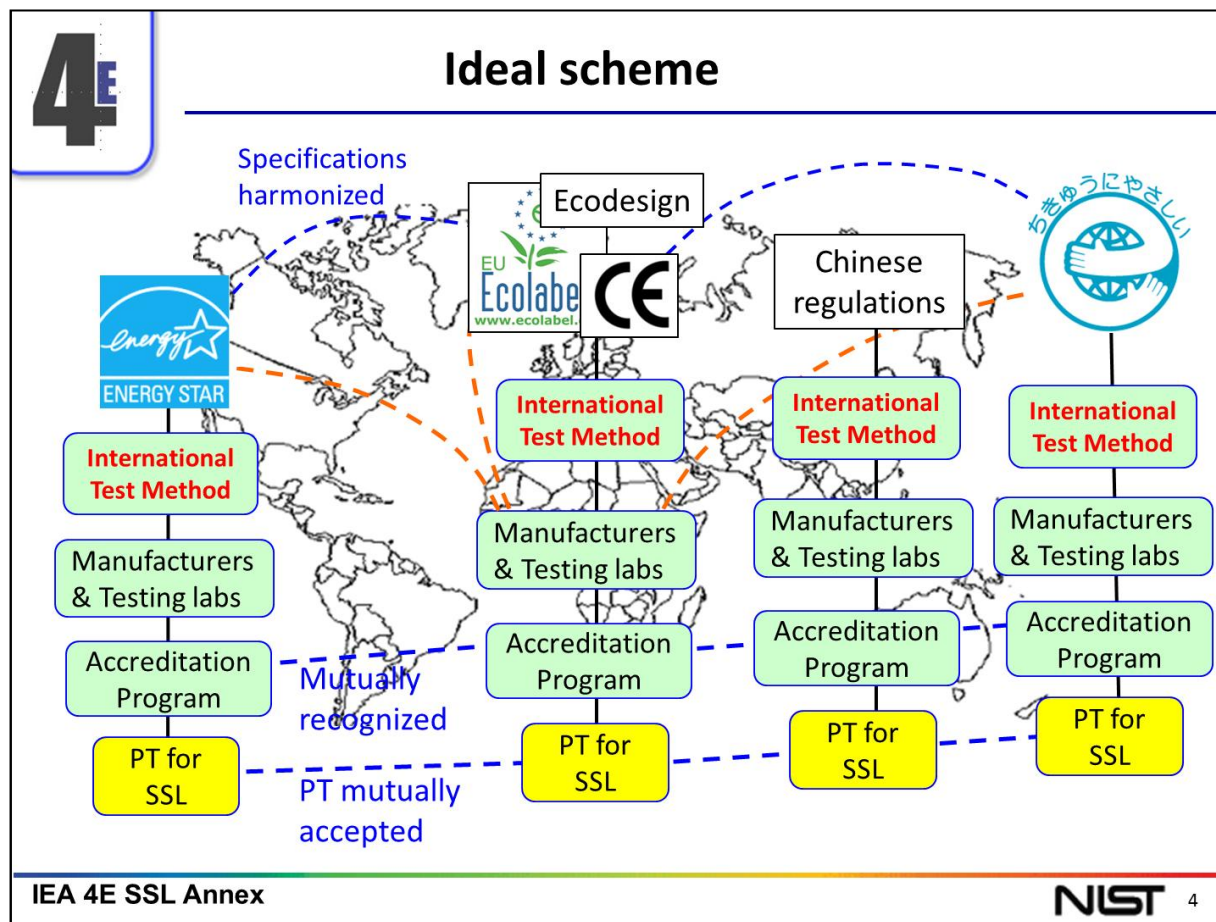
# The Current Situation

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## AIM

A unified global standard for harmonisation of testing of LEDs and SSL products

# The Ideal Situation



From a presentation  
by Yoshi Ohno for the  
IEA 4E SSL Annex

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# The Role of the CIE

- The CIE is the International Commission on Illumination
- Abbreviated to CIE from its French form: Commission Internationale de l'Eclairage
- The global peak body on matters relating to the science and art of lighting
- Responsible for creating and maintaining **standards** and technical reports within the fields such as:
  - vision and colour;
  - photometry and radiometry;
  - lighting and signalling; and
  - photobiology

# The Role of the CIE

- Has seven scientific divisions:
  - Vision and Colour;
  - Measurement of Light and Radiation;
  - Interior Environment and Lighting Design;
  - Lighting and Signalling for Transport;
  - Exterior Lighting and Other Applications;
  - Photobiology and Photochemistry;
  - Image Technology
- Each of these divisions has Technical Committees which carry out the scientific work
- CIE also has national committees with voting rights at a general assembly and which support the CIE's interests within their jurisdiction

# The Role of the CIE

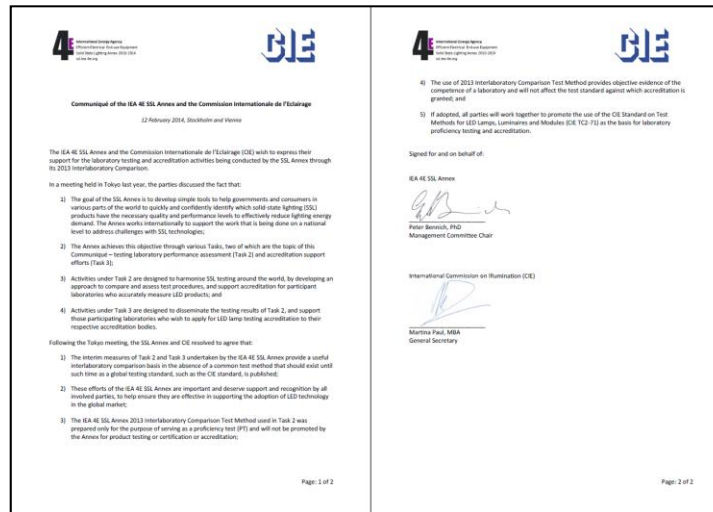
- CIE experts are on the BIPM's Consultative Committee on Photometry and Radiometry and provide advice in relation to the SI unit for light:
  - the Candela.
- Celebrated its official centenary in 2013: has been involved in standardisation and scientific research in this area for over 100 years





# The Role of the CIE

- ISO delegated standardisation in lighting and colour to CIE
  - IEC develops PRODUCT STANDARDS (IEC TC34)
  - CIE develops FUNDAMENTAL AND APPLICATION STANDARDS
- IEA 4E SSL Annex and CIE have a communique of understanding



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# The new CIE Standard Test Method

- A CIE Division 2 Technical Committee worked on the standard:
  - TC2-71: CIE Standard on Test Methods for LED Lamps, luminaires and modules
- The TC has 37 members from 16 countries in 5 continents
- Working closely with CEN-TC169-WG7
- Finalising WD3 now!

# The new CIE Standard Test Method

- Has had significant difficulties establishing a consensus amongst the stakeholders:
  - Public testing labs;
  - LED/Lighting manufacturers;
  - Test equipment manufacturers;
  - Regulatory bodies;
  - NMIs;
  - etc...

# The new CIE Standard Test Method

- Also needed a consensus with the CEN-TC169-WG7 working group, whom we were partnering in the development
- It will be technically identical to the CEN standard EN13032-4, which will also be released soon

# The new CIE Standard Test Method

- The draft Standard defines standard test conditions and requirements for equipment
- It covers electric, photometric and spectral/colorimetric properties
- It covers LED lamps, LED luminaires and LED modules
- Testing should **ideally** be performed according to the standard test conditions

# The new CIE Standard Test Method

- Some of the standard test conditions have tolerances to take into account practical laboratory situations
- Example 1:
  - The ambient test temperature should be 25°C
  - In practice it can be in the range  $25 \pm 1.2$  °C
- Example 2:
  - The air should be still
  - In practice it is allowed to be up to 0.2 m/s
- Note: complying with the limit must take into account the uncertainty of calibration of the device
  - Eg: thermometer calibration 0.2 °C

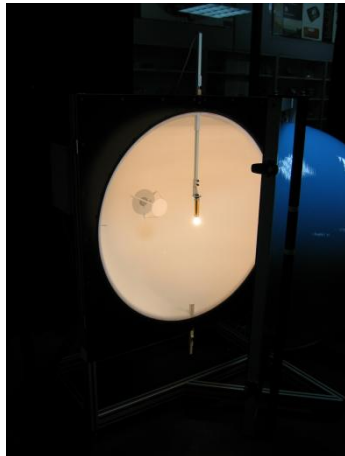
# The new CIE Standard Test Method

- If the standard test conditions are not met, then a correction must be made
- For example:
  - A test is made with ambient temperature of 23°C
  - This is outside the range  $25 \pm 1.2$  °C
  - An additional test must be made, eg: with the device in a temperature controlled chamber, to correct the measured value to what it would be if the test were performed at 25°C



# The new CIE Standard Test Method

- The standard covers measurement using both integrating spheres and goniophotometers and also other types of equipment



# The new CIE Standard Test Method

- Measurements must be traceable
  - Equipment must be properly calibrated
  - Traceability chain must be maintained back to a national laboratory (National Measurement Institute)
- All test reports must contain a statement of uncertainty of measurement
  - The standard gives a guide for how to make an uncertainty budget

# The new CIE Standard Test Method

- With support of the ISO, IEC, IEA, the new CIE Standard International Test Method for LED Lamps, LED Modules and LED Luminaires will become

**a truly global standard**

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# Thank you for your kind attention!

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