



# The key elements of testing process & Main measurement differences between LEDs and CFLs

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# Measurement method of SPD

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- SPD
- Principle to measure SPD
- Procedure to measure SPD
- key elements to consider during this process
- CFLs and LED
- Comparison of lab's equipments and operation

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# Measurement method of SPD

- SPD
  - Visible light is actually the combination of each wavelength light, expressed as SPD
  - Photometer to receive SPD
    - Mimic the photopic function of human eye, and discard color information
    - Received signal is the amount of light, total flux
  - Spectroradiometer to receive SPD
    - Received signal is SPD
    - Make photopic function calculation to get total flux
    - Make XYZ calculation to get the colorimetric parameters

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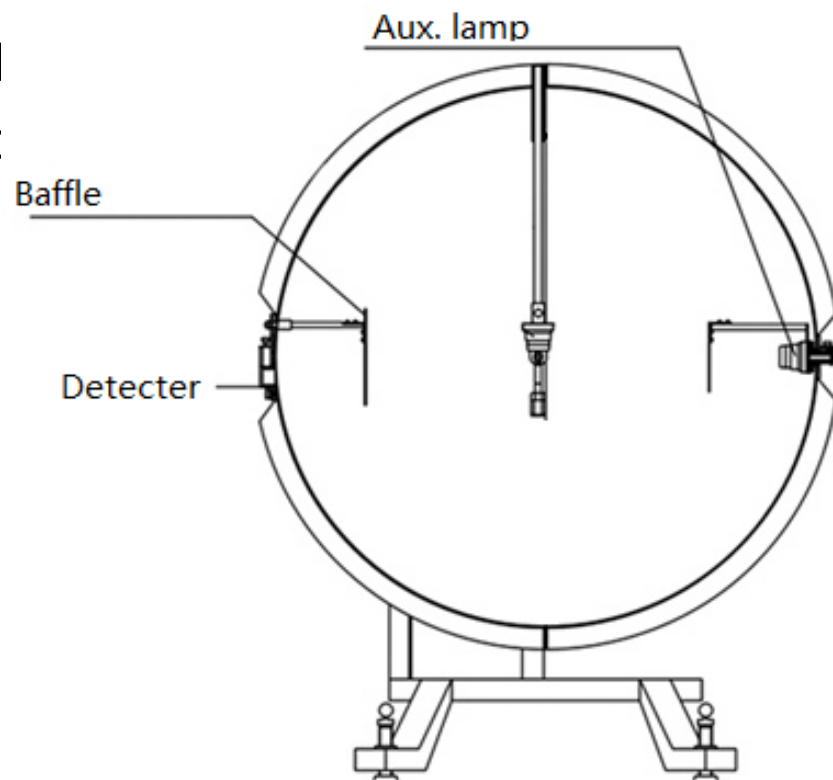
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# Measurement method of SPD

- Principle to measure SPD
  - Use spectro-radiometer instead of photometer
  - Gonio-spectroradiometer
    - Similar function with gonio-photometer
    - to get the spacial information in each direction
    - make spacial integrating / weighting
  - Integrating sphere
    - Similar function with sphere-photometer
    - Integrated / weighted SPD is got

# Measurement method of SPD

- Comparative method
  - Keep regular calibration of
  - Use standard lamp to calik
  - Make measurement
  - Perform corrections as sel



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# The key elements of testing process

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- Key element to consider during this process
  - Preparation
    - Good understanding in theory, equipment and sample;
    - Strictly controlled environment conditions
    - Standard lamp in good condition and traceability
    - Equipments in good condition and calibration
  - Operation
    - Careful operation of the std. lamp, such as mounting, burning, and storing
    - Sufficient warming up for samples and equipment
    - Properly setting of equipment parameters

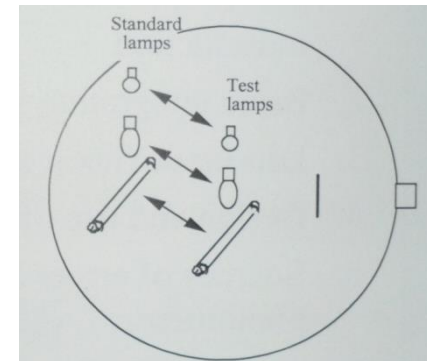
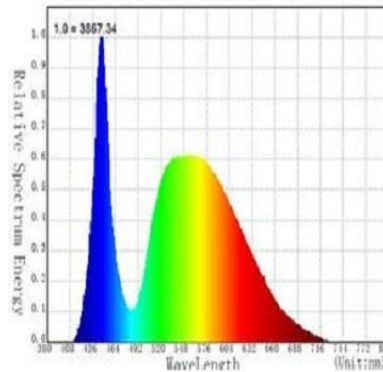
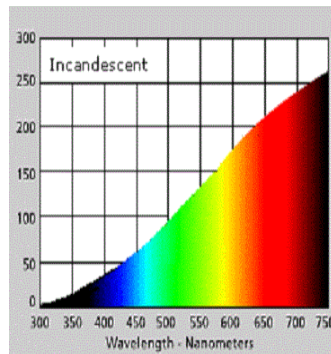
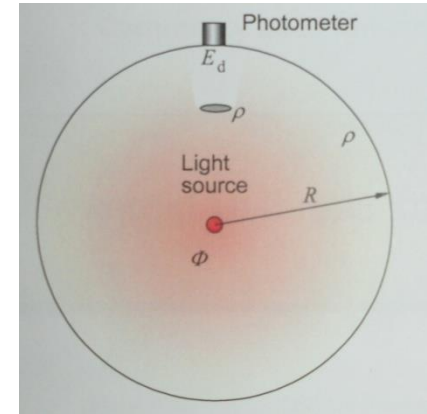
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# Main measurement differences between LEDs and CFLs

- CFLs and LED
  - LED and standard lamp
    - Significant thermal characteristics
    - Different physical appearance
    - Different light distribution
    - Significant difference in spectrum

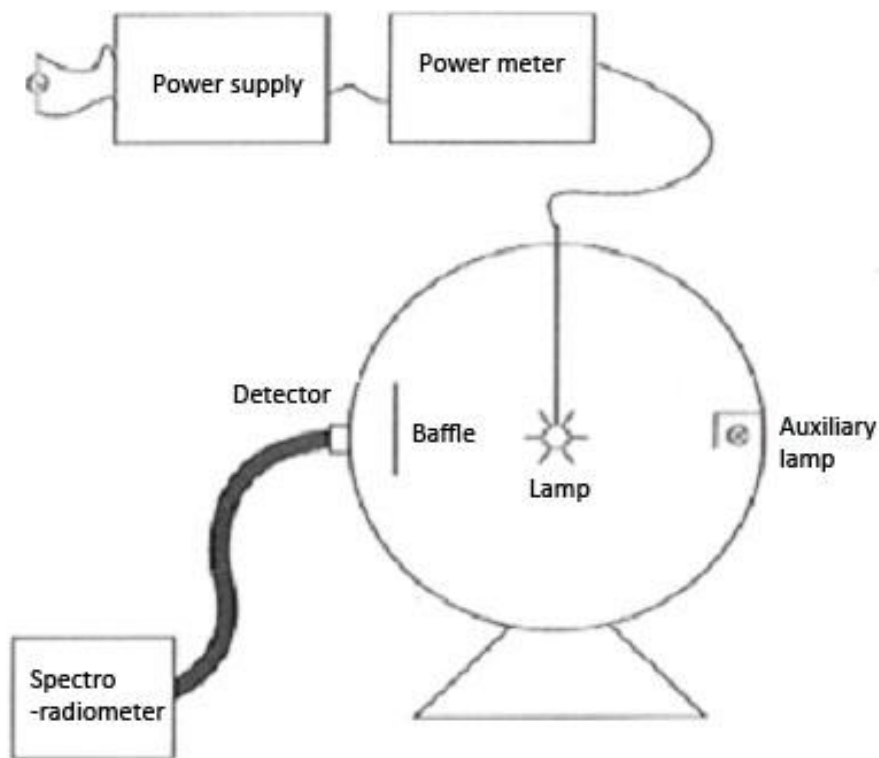


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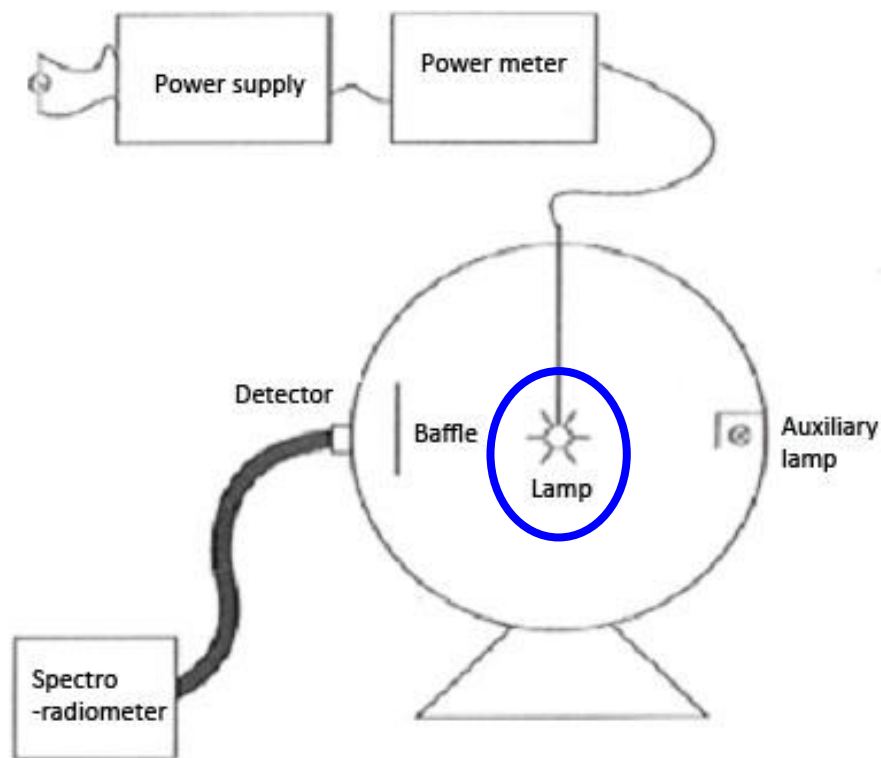
# Main measurement differences between LEDs and CFLs

- Comparison of lab's equipments and operation
  - Equipments
    - Source
    - Input
    - Circuit
    - Detector
  - Procedures
    - Testing
    - Correction
    - Characteristics of sample



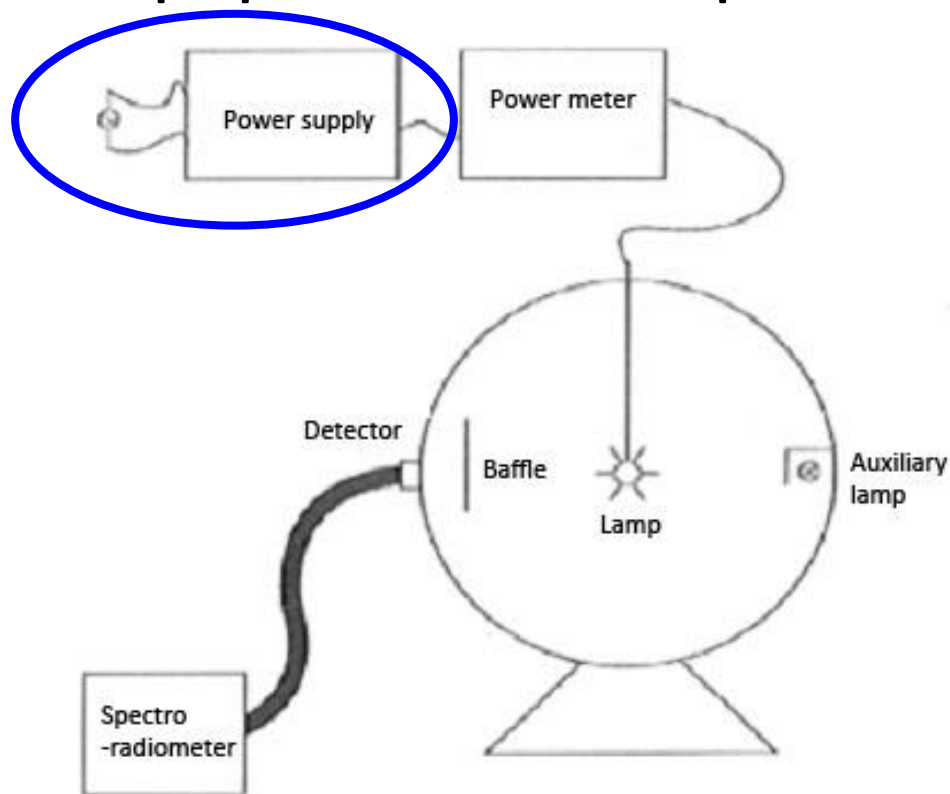
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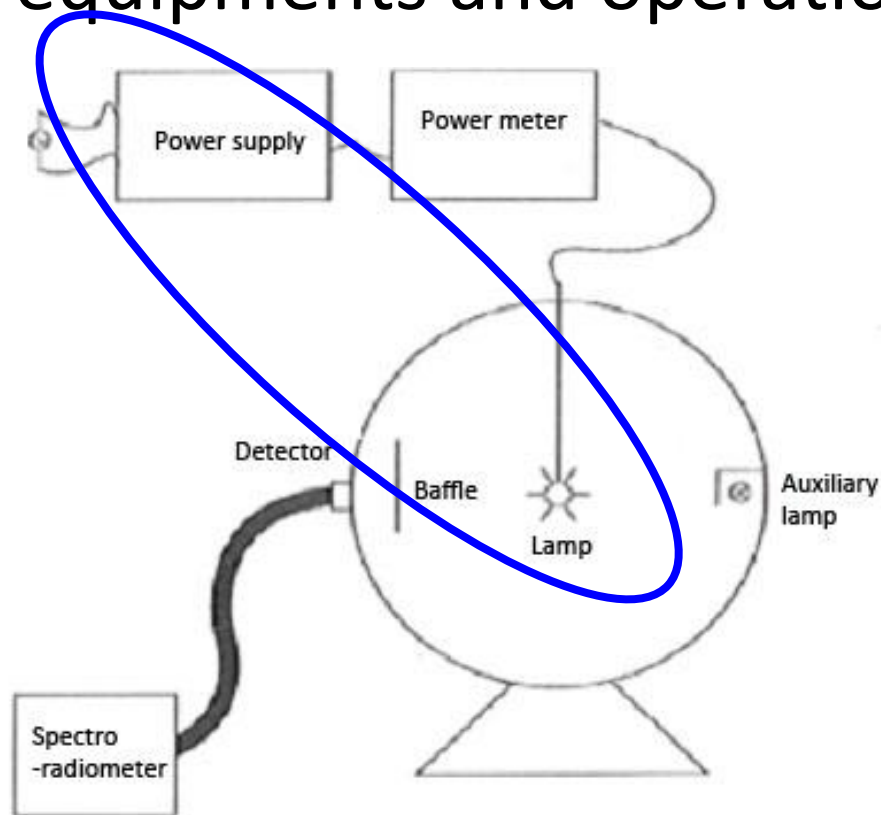
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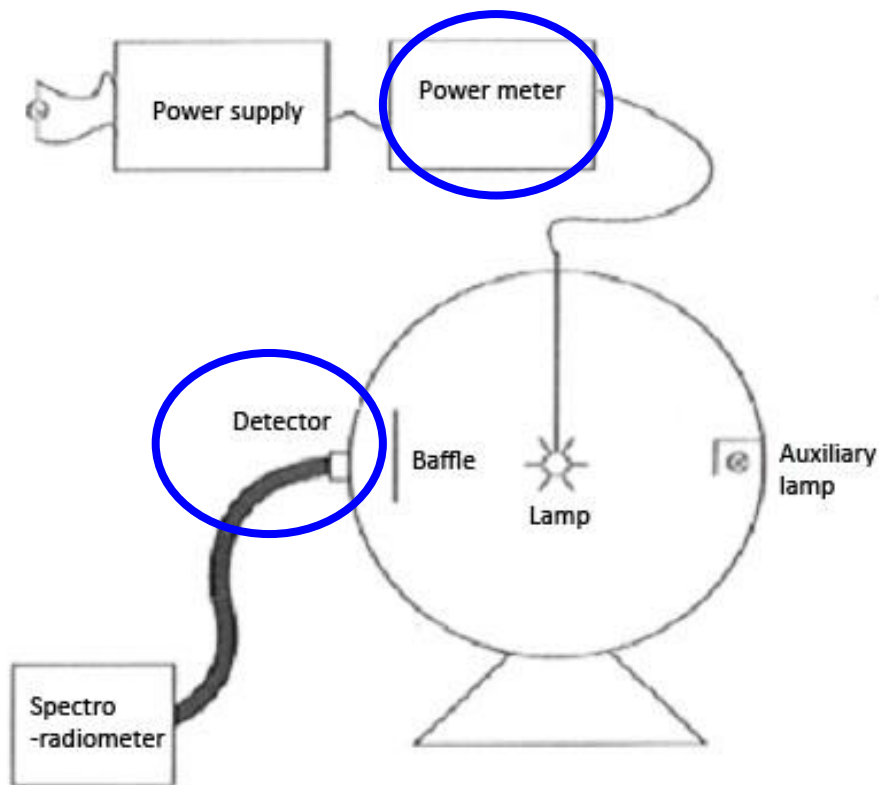
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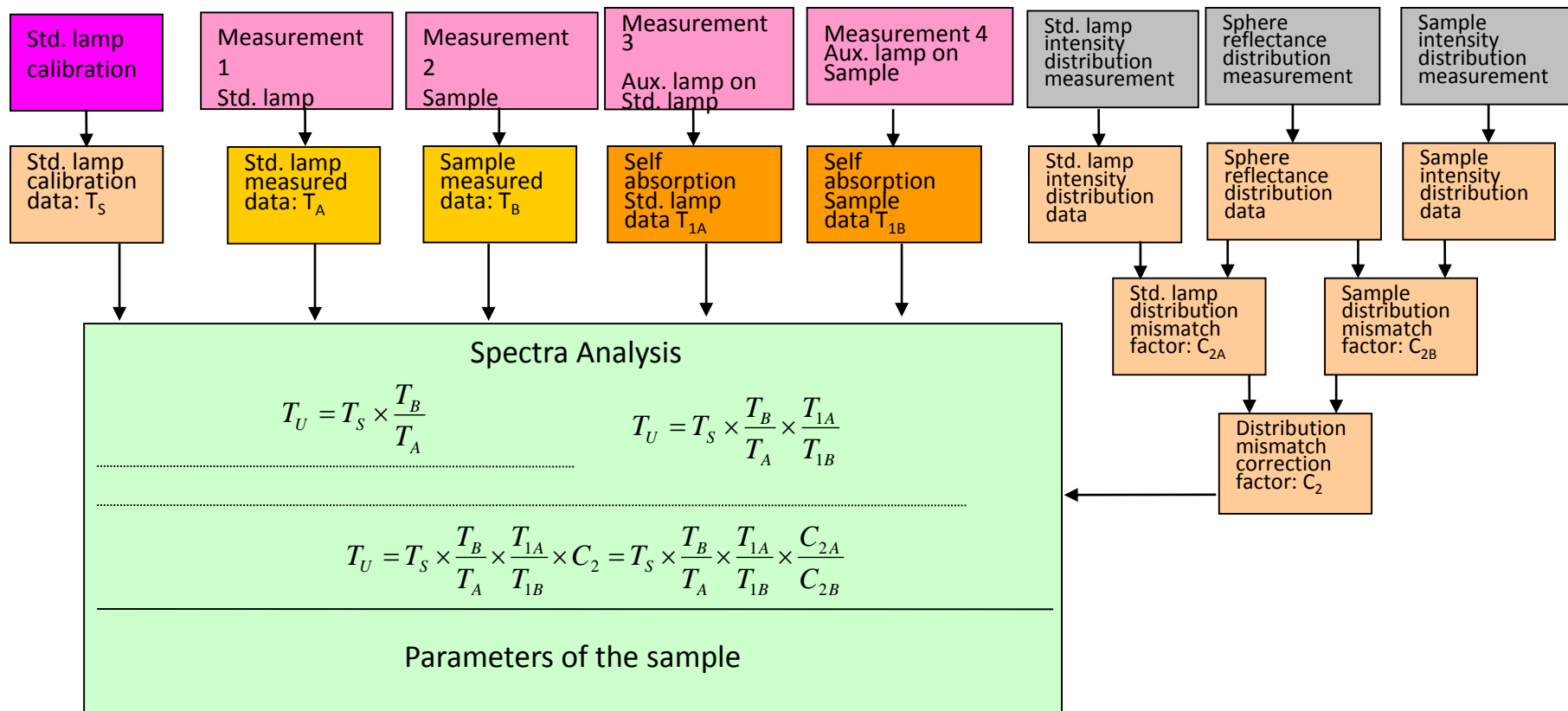


# Summary

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- Measure the SPD of the lamp.
- Use spectroradiometer instead of photometer.
- Use total radiant flux standard lamp instead of total luminous standard lamp. Spectral energy should be used.
- To get spacial distribution information, gonio-spectroradiometer should be used.

# Keys in sphere-spectroradiometer system



# Summary

- Good **understanding** of the theory, method, equipment and sample;
- Reliable **tracing** data, such as std. lamp, power-meter;
- Strict **control of the environment**, such as the input power noise, ambient;
- Careful **operation of the std. lamp**, such as mounting, burning, and storing
- Sufficient **warming up** for samples and equipment.
- Properly **setting parameters of equipment**, such as Integration time, average times

*Thank you!*





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