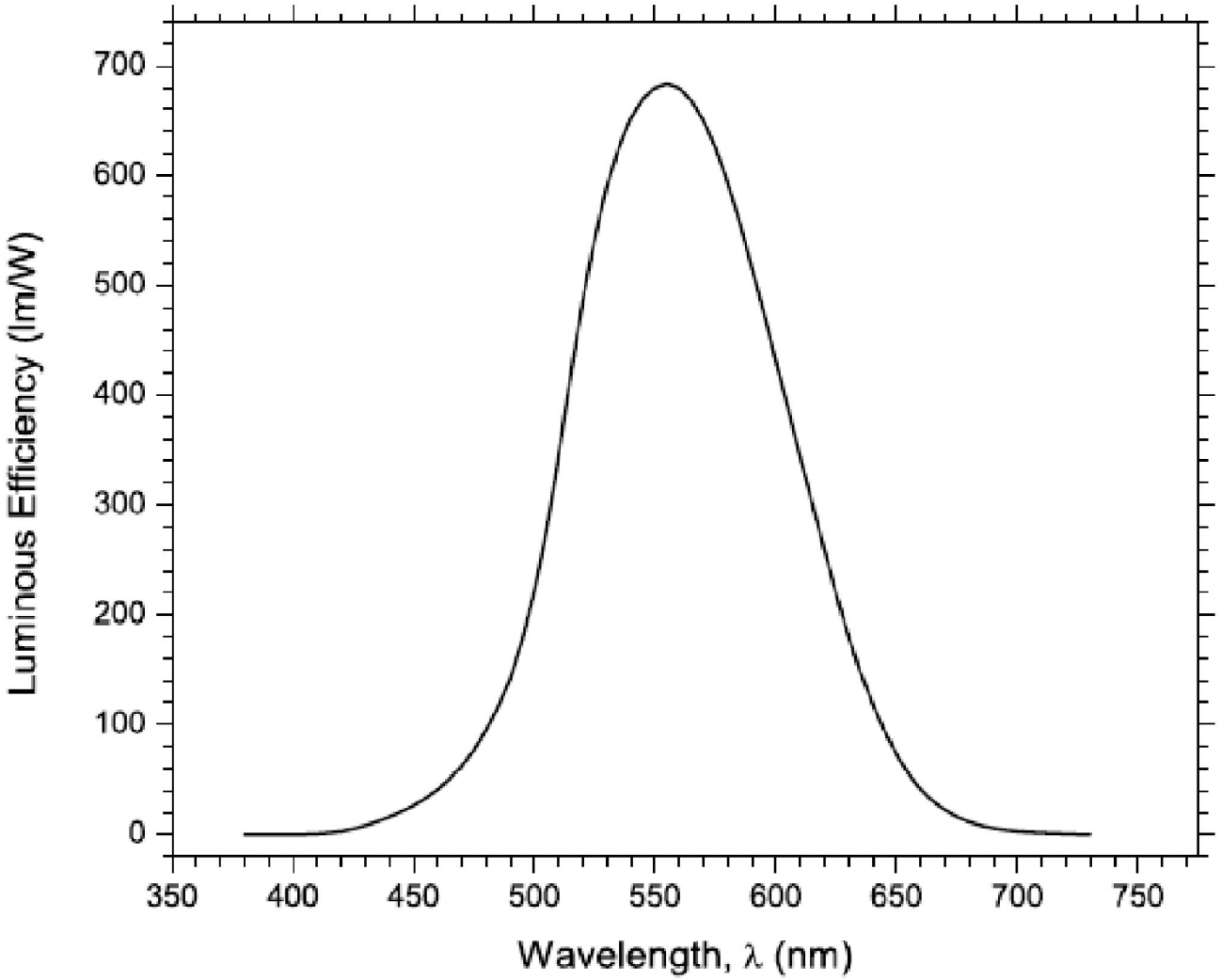
Photometry & Measurement

Photometry

- To measure the brightness of visible light, as it appears to the human eye.
- Radiometry is to measure the intensity of electromagnetic radiation at all wavelengths.
- Luminous efficiency curve models how the eye’s sensitivity varies with wavelength.
- The eye's response to light as a function of wavelength is given by the luminosity function.
- The human eye is most sensitive to visible light in the green part of the spectrum, at a wavelength of about 555 nm.
- The eye is much less sensitive to red and violet light, where the curve has values near zero.

Luminous efficiency curve



Photometry

- Photometric measurement is based on photo detectors that produce an electric signal when exposed to light.
- Luminaire - A complete lighting unit consisting of a lamp or lamps together with parts designed to distribute the light, position and protect the lamps and connections to the power supply.
- Luminaires are switched on and off based on ambient light conditions and light meters are used to measure the total amount of light incident on a point.
- When the intensity is measured at various angles from luminaire, the process is called goniophotometry.
- Two types of goniophotometer
  - Rotating mirror goniophotometer
  - Fixed multiple cell goniophotometer

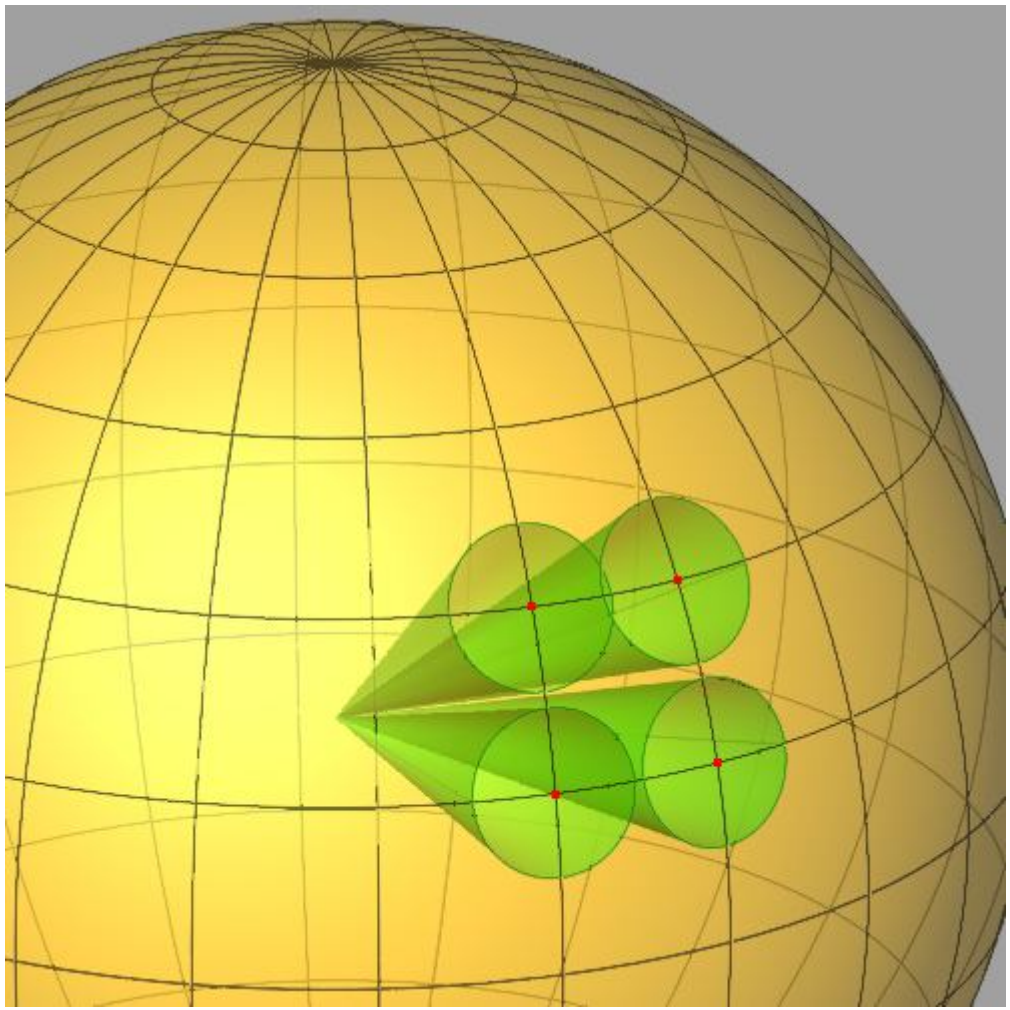
Photometry

- With the help of photometers tests are conducted to generate a report.
- Reports provide information to the lighting engineer to
  - Predict the performance of a lighting system and
  - Calculate the number of lumanaires required to provide some specific design illuminance.
- Two types of photometric tests
  - Type A photometry
  - Type B photometry

Photometry

- Spherical photometers can be used to measure the directional luminous flux produced by lamps, and consist of a large-diameter globe with a lamp mounted at its center.
- A photocell rotates about the lamp in three axes, measuring the output of the lamp from all sides.

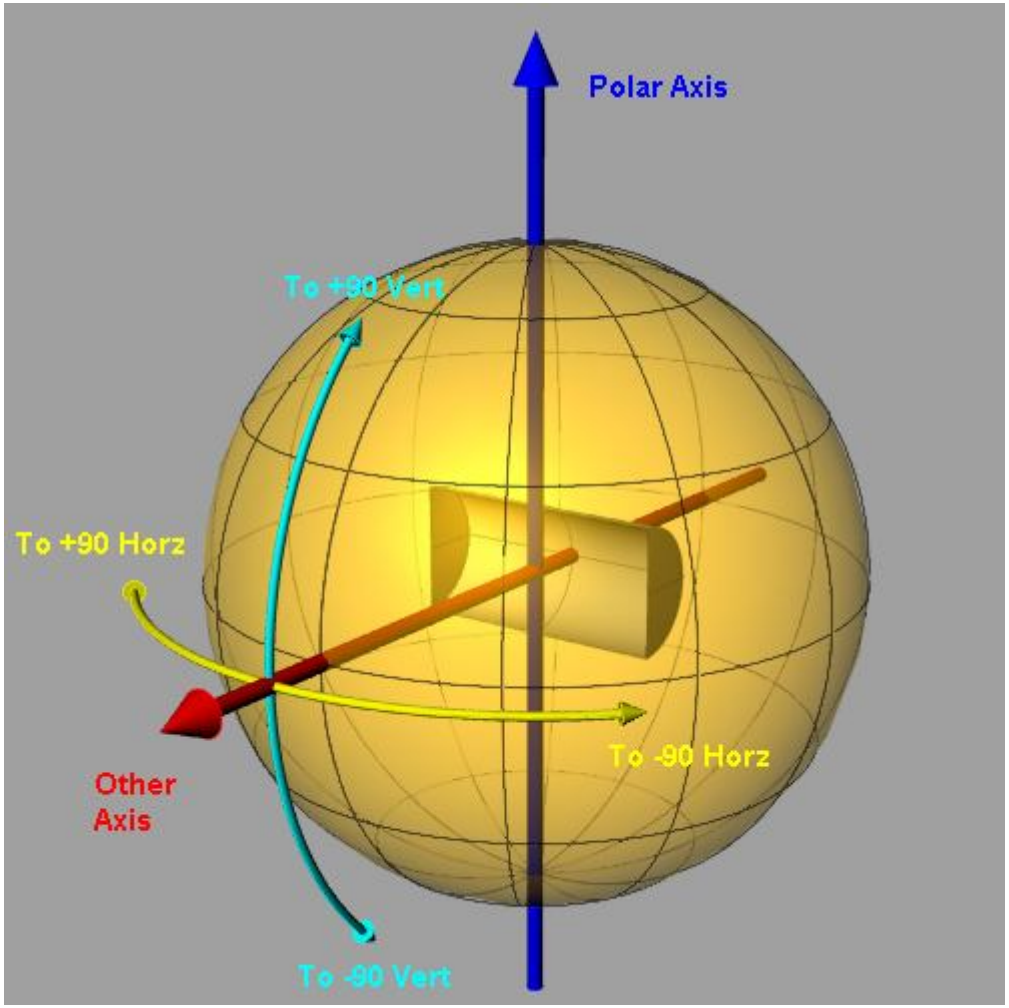
Solid Cone



Type A photometry

- Used for indoor light fixtures .
- Intensity of light distributed by the luminaire is measured at specified vertical angles around the fixture.
- The angles normally used are 0, 5, 15, 25, ... 85, 90,....175 and 180.
- Luminaires with symmetrical distribution patterns are normally photometered in one plane.
- Luminaires with asymmetrical distribution patterns are normally photometered in 13 or more planes. Eg. Fluorescent and strip luminaires.
- In each plane, the intensity is measured in all vertical angles.
- Polar axis specifies direction vector of the axis to use as the pole.

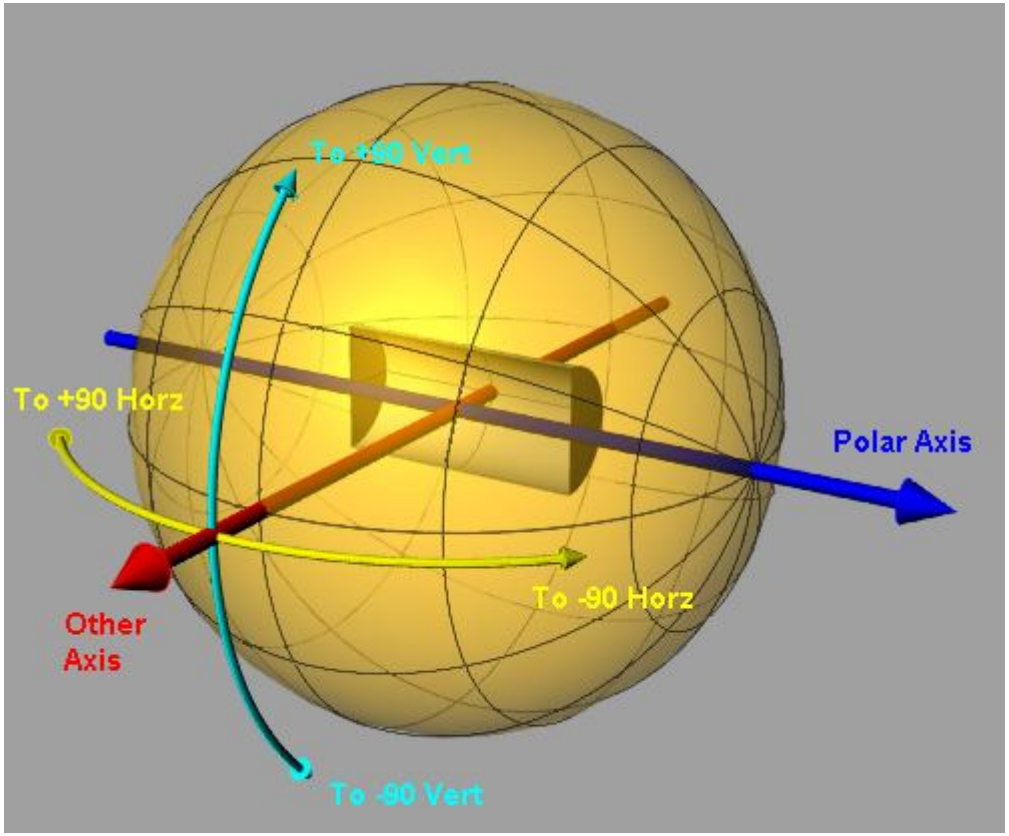
Type A photometry



Type B photometry

- Luminaire is rotated about fixed vertical and horizontal axis and measurements are taken at every angle.
- Measurements for both upward and downward angles are taken.
- It is used for floodlighting and other outdoor fixtures.

Type B photometry



Photometry report contains

- Luminaire's manufacturer's name and catalog number of luminaire.
- Lamp type and colour used for test.
- Candela distribution Curve.
  - Pictorial representation of intensity of light at various angles.
- Candela distribution table
  - Data used to plot candela distribution curve.
- Zonal flux summary
  - Lumens in each conic zone around the fixture.
- Fixture efficiency
  - Percentage of lumens which exit the fixture.

Photometry report contains

- Coefficient of utilization
  - Percentage of lamp lumens which reach the workplane
  - Used to determine the number of luminaire required to light a room.
- Spacing criteria or Spacing to Mounting Height ratio
  - Max spacing of fixtures as a function of their mounting height above the workplane to achieve uniformity of illuminance.
- Max Luminance and Luminance ratio table
  - Luminance viewed from several different angles and planes.

Photometry report contains

- Test distance
  - Distance from the luminaire to the photocell.
- Visual comfort probability table
  - To evaluate the effects of direct glare from the luminaire.