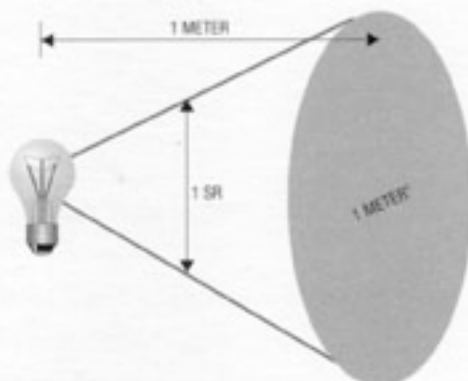
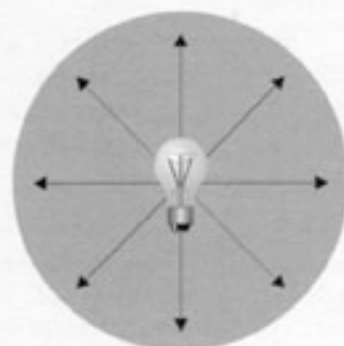


**UNITS of MEASUREMENT****IRRADIANCE & ILLUMINANCE**

*Density of light incident upon a surface.*

A 1 watt/steradian source produces  $1 \text{ W/m}^2$  at 1 m.

A 1 candela (1 lumen/steradian) source produces  $1 \text{ lm/m}^2$  (1 lux) at 1 m, and  $1 \text{ lm/ft}^2$  (1 fc) at 1 ft.

**RADIANT & LUMINOUS FLUX**

*Total light output in all directions.*

1 watt = 683.0 lumens at 555 nm.

1 watt = 1 joule per second

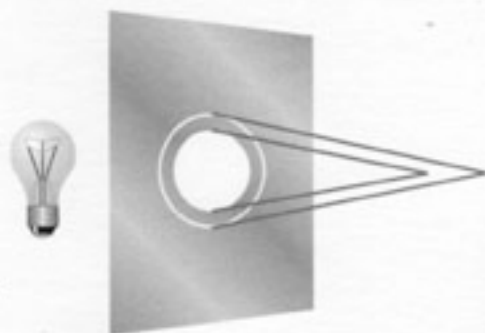
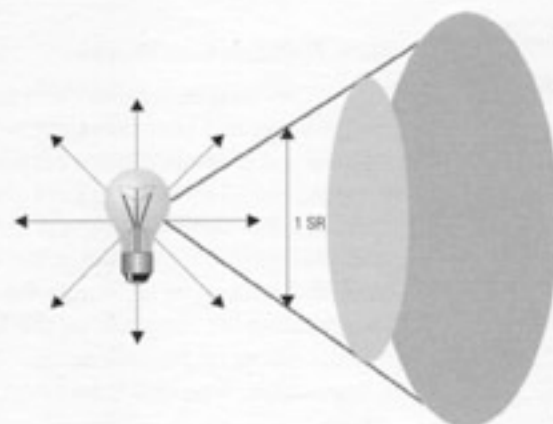
Flux is typically measured in lumens or watts, using an integrating sphere to collect light emitted in all directions. Beam power can be measured directly as long as the beam underfills the detector.

**RADIANCE & LUMINANCE**

*Light scattered or emitted by a surface.*

1 footcandle illumination on a perfectly diffusing surface produces 1 footlambert of brightness.

The sampled area increases with distance, cancelling inverse square losses to make radiance independent of distance. Typically measured  $\text{W/cm}^2/\text{sr}$ ,  $\text{lm/m}^2/\text{sr}$ , or fL.

**RADIANCE & LUMINOUS INTENSITY**

*Flux per solid angle of an isotropic source.*

A 12.6 watt isotropic source produces  $1 \text{ watt/sr}$ .

A 12.6 lumen isotropic source produces  $1 \text{ lm/sr}$ .

Mean spherical measurements can be made in a calibrated integrating sphere. Beam measurements sample only the peak of a beam.