

La metrología y la luz

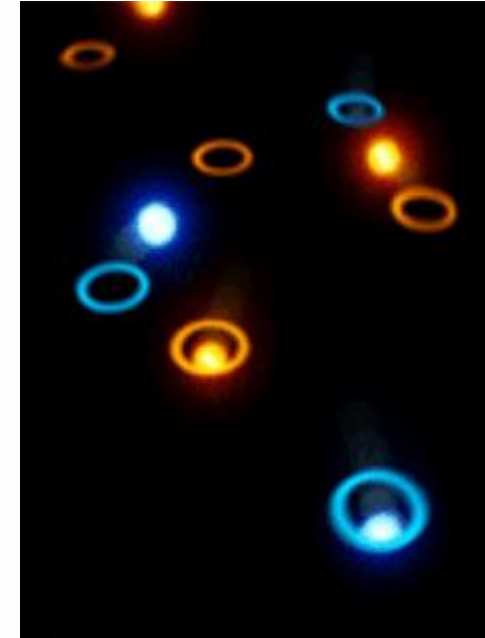
Se hizo la luz..... y somos capaces de medirla.

- M. en C. Carlos H. Matamoros García

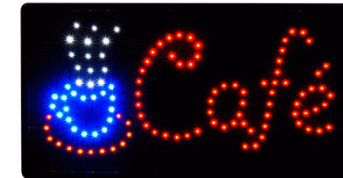
Director de Óptica y Radiometría
Centro Nacional de Metrología

Contenido

- Importancia de la luz
- Fuentes de luz
- Propiedades de la luz
- Medición de la radiación óptica
- Aplicaciones de la luz



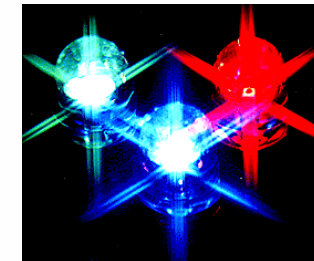
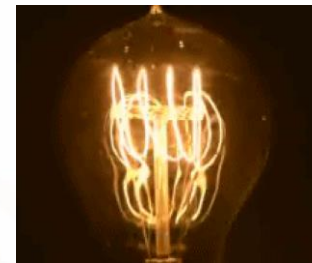
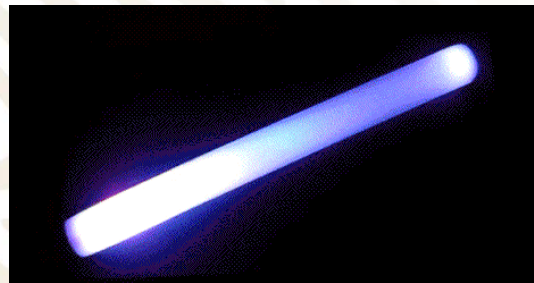
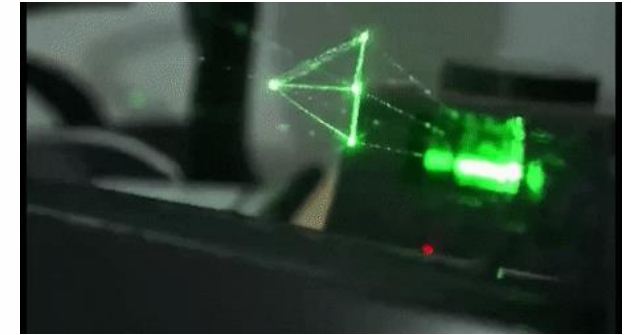
Importancia de la luz



- En la vida del ser humano la luz desempeña un papel relevante en el desarrollo de las actividades cotidianas:



Fuentes de luz



Fuentes de luz



Descarga
o HID



Incandescente



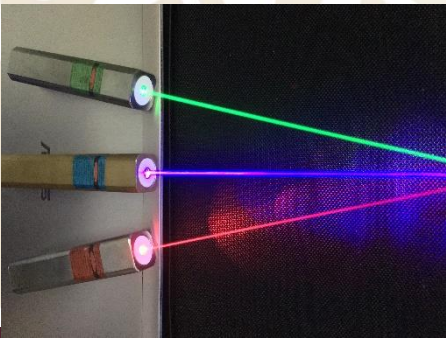
Fluorescente



LED

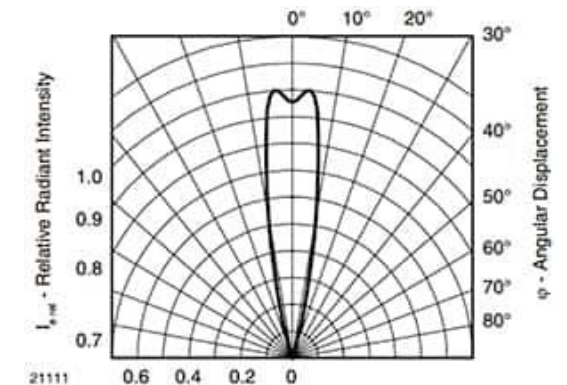
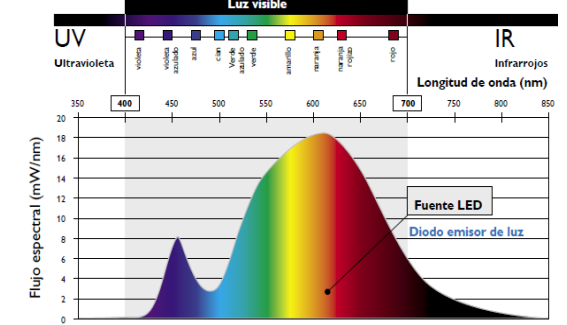
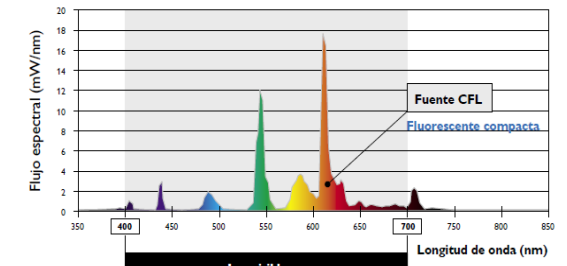


Láser



Propiedades de la luz

- Intensidad → Potencia, irradiancia, intensidad luminosa
- Frecuencia → Color, longitud de onda, espectro
- Forma de emisión/distribución → ¿cómo se emite o distribuye la radiación óptica?



Radiación óptica

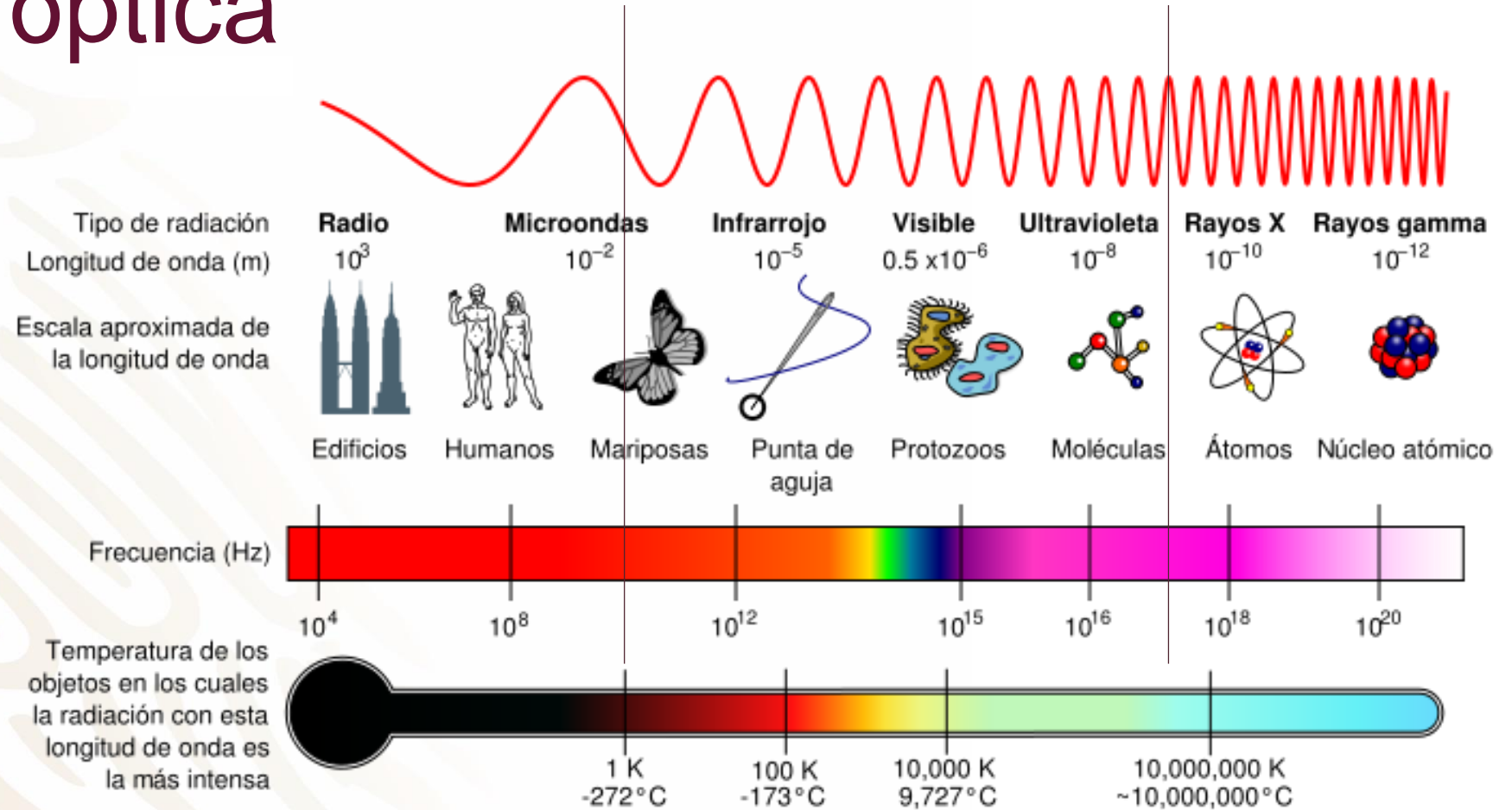
Radiación óptica

1 mm a 1 nm

10^{-3} a 10^{-9}

Radiación visible

380 nm a 830 nm

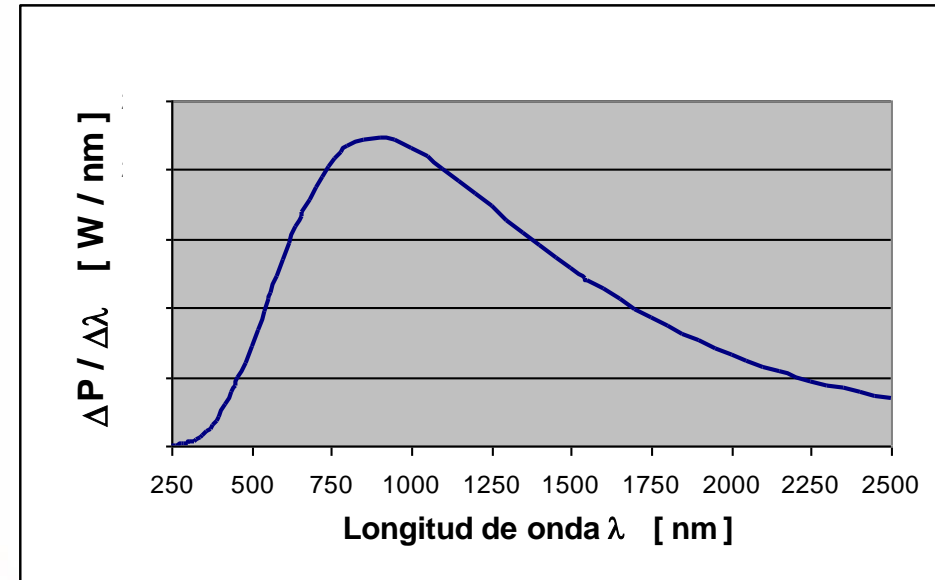
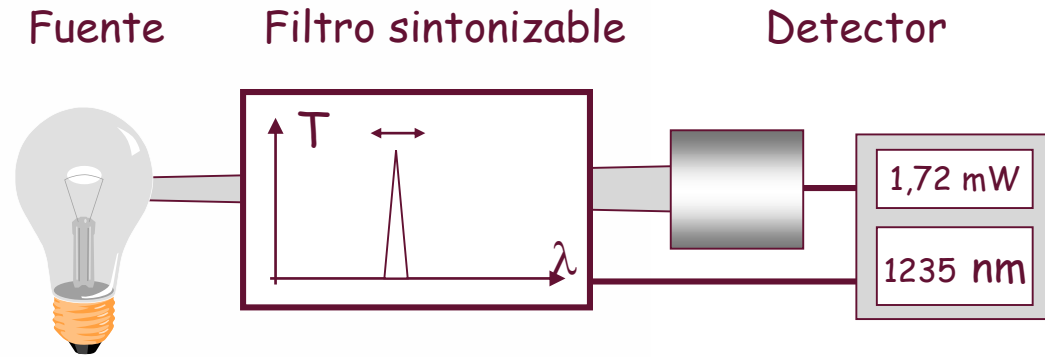


Radiometría

- Medición de la energía radiante o potencia óptica ...
- ... o magnitudes relacionadas.
- Con un filtro con un ancho de banda $\Delta\lambda$ pequeño ...
- ... o sintonizable en λ (Monocromador) ...
- ... sobre el intervalo espectral

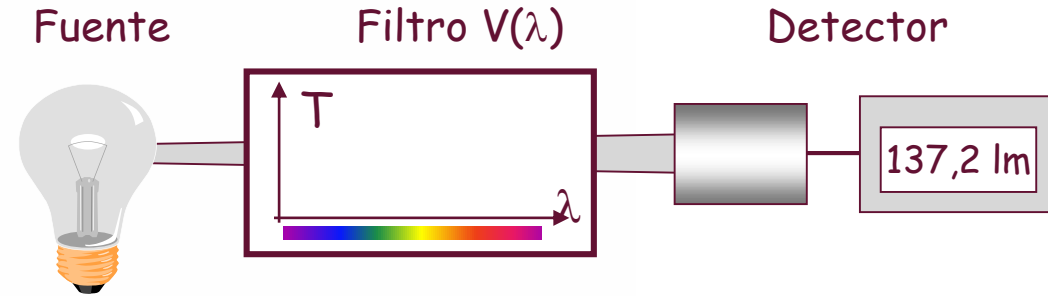
Magnitudes en Radiometría

- | | |
|--|--|
| <input type="checkbox"/> Intensidad radiante | <input type="checkbox"/> Respuesta espectral |
| <input type="checkbox"/> Radiancia | <input type="checkbox"/> Flujo radiante |
| <input type="checkbox"/> Irradiancia | <input type="checkbox"/> Potencia óptica |



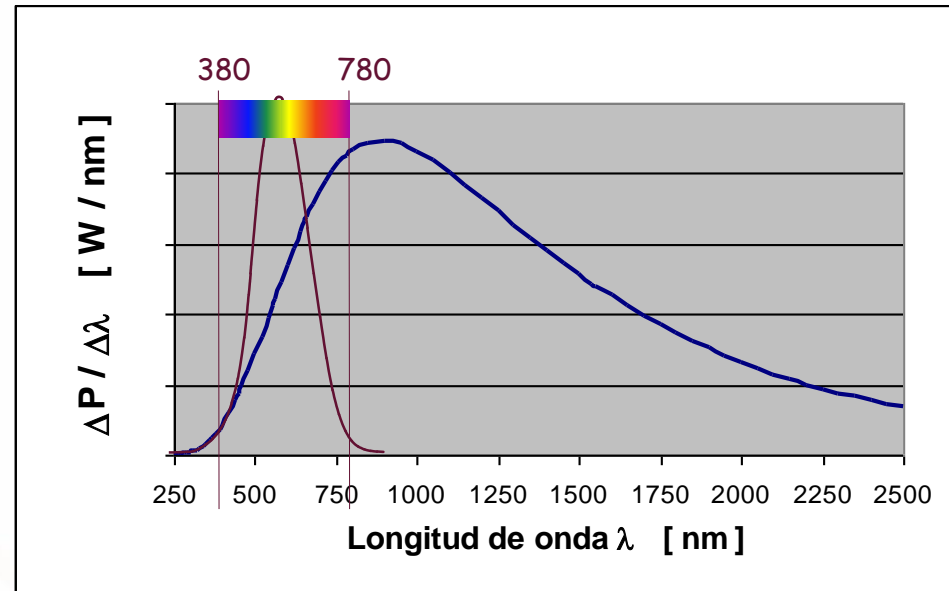
Fotometría

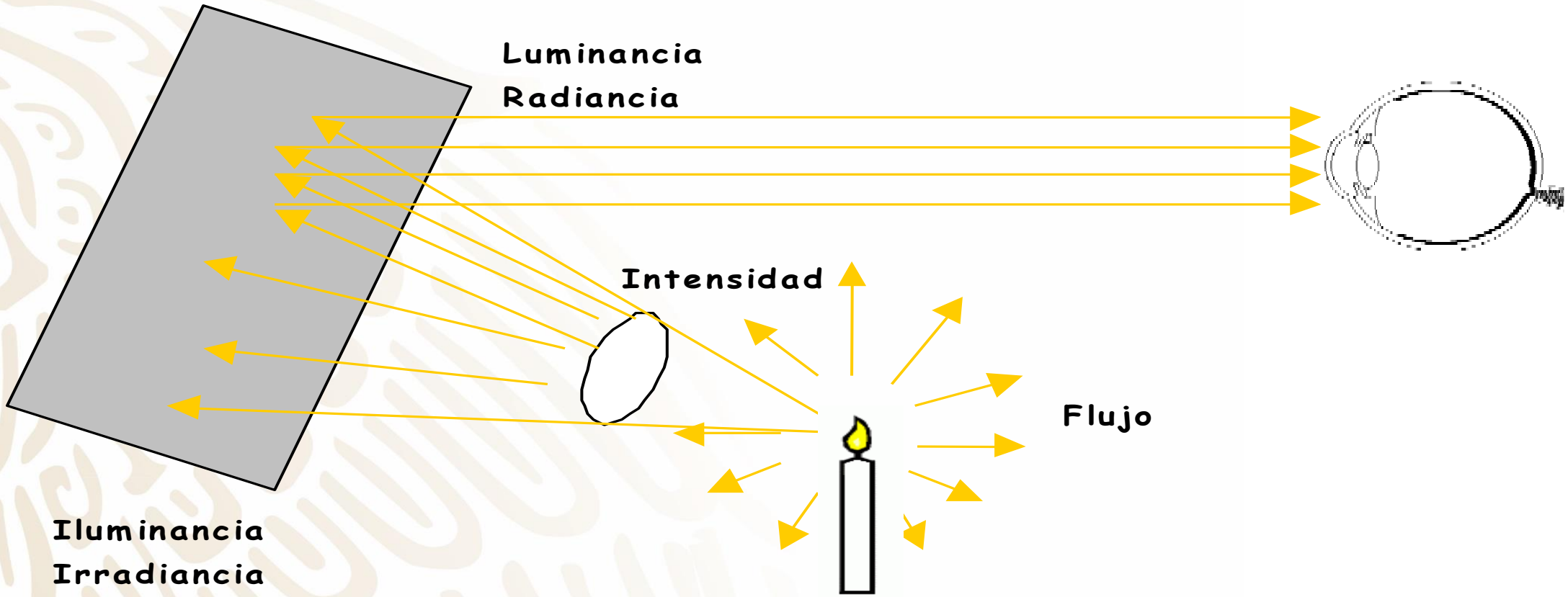
- Medición solamente en el VIS
- Medición “integral”
- Detector con un filtro con una sensibilidad espectral $V(\lambda)$



Magnitudes en Fotometría

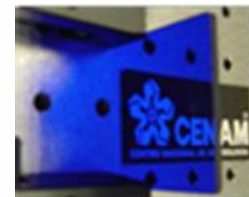
- Intensidad luminosa
- Luminancia
- Iluminancia
- Respuesta fotópica
- Flujo luminoso



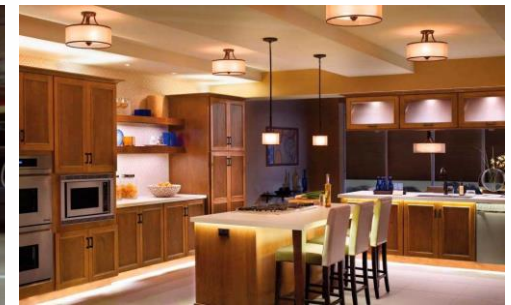
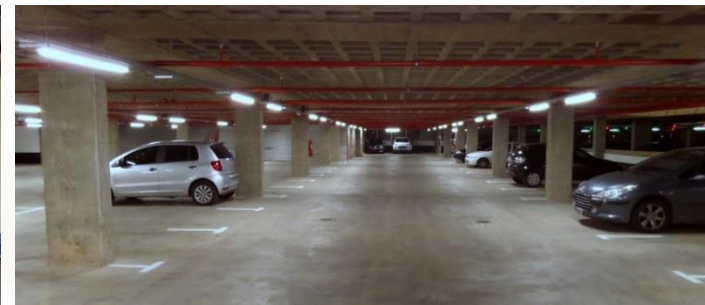
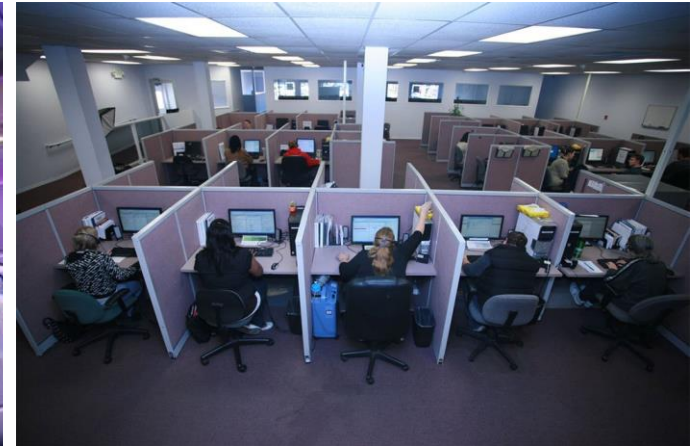


Interacción luz materia

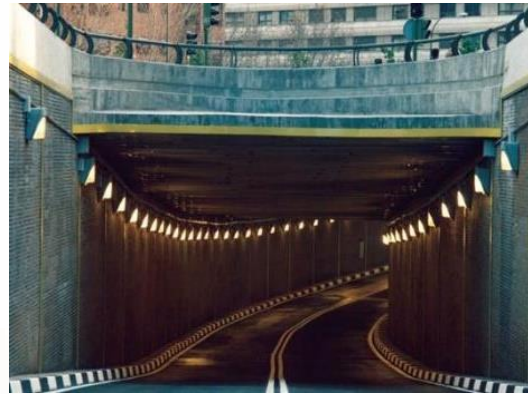
- Fenómeno
 - Transmisión
 - Absorción
 - Reflexión
 - Refracción
 - Dispersión
 - Difracción
 - Rotación
- Clasificación óptica de materiales
 - Transparentes
 - Translucidos
 - Opacos



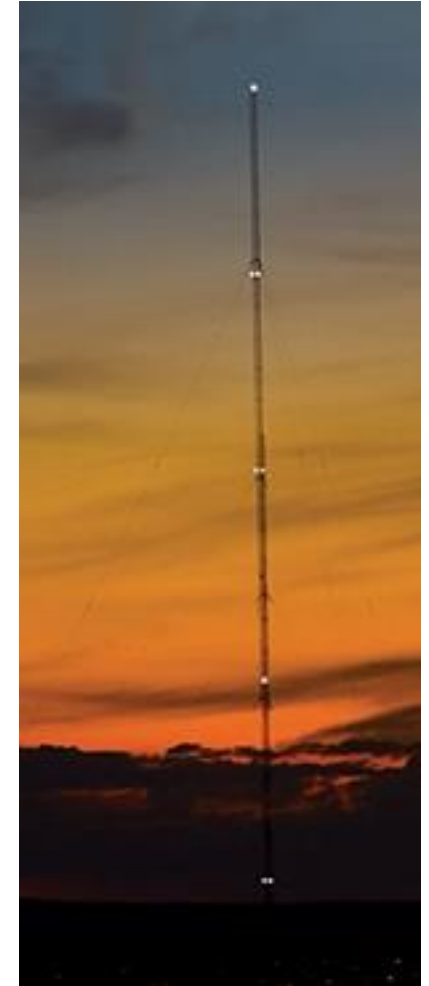
Aplicaciones de la luz



Aplicaciones de la luz



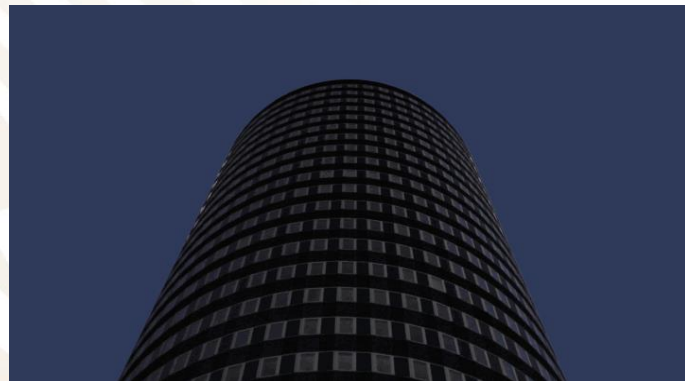
Aplicaciones de la luz



Aplicaciones de la luz



Aplicaciones de la luz



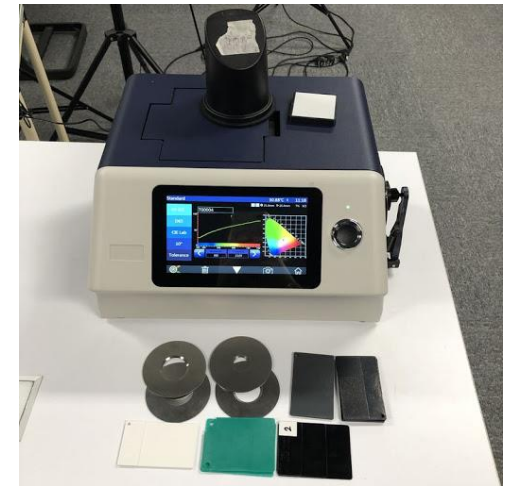
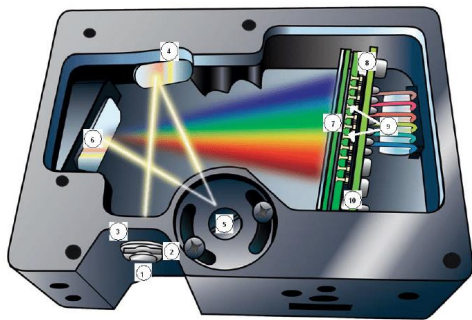
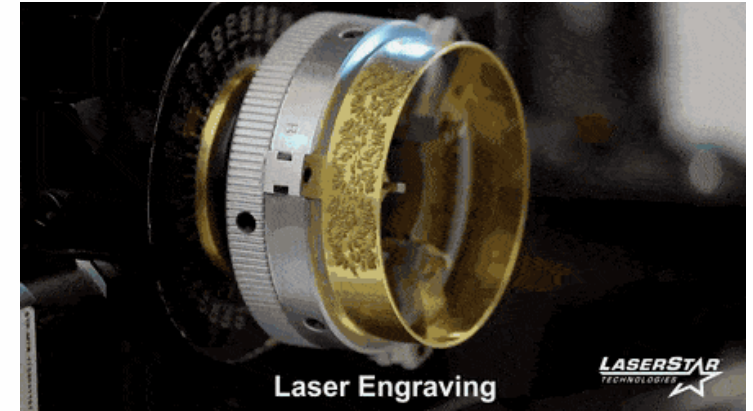


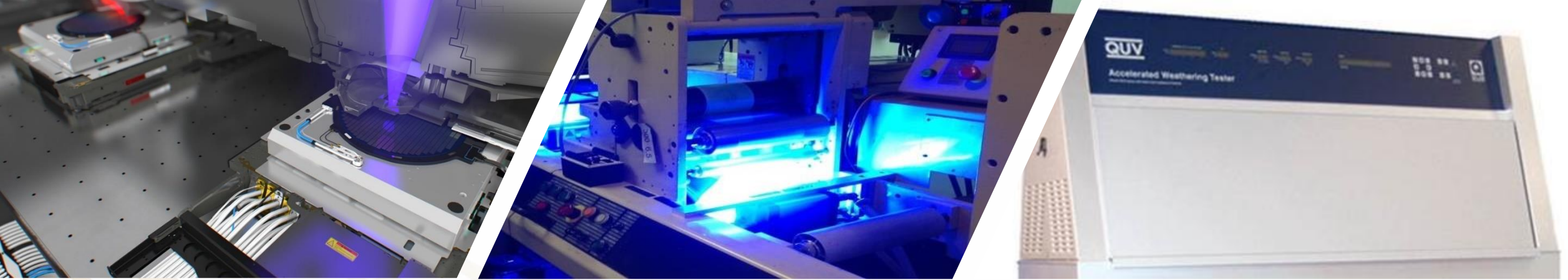
Aplicaciones de la luz

Sobre el uso de la radiación UV

- UV-C is extremely useful in disinfection of air and surfaces or sterilization of water. However, CIE and WHO **warn against the use of UV disinfection lamps to disinfect hands or any other area of skin (WHO, 2020)**.
- **UV-C can be very hazardous to humans and animals** and should only be used in carefully controlled circumstances using well-designed products, ensuring that the limits of exposure as specified in **ICNIRP (2004)** and **IEC/CIE (2006)** are not exceeded. However, the risk of skin cancer from devices that emit only UV-C is considered negligible.
- UV-C can cause photodegradation of materials and this should be considered where susceptible materials, such as plastics are in the exposed environment.
- More research is urgently needed on the safety aspects of novel UV-C sources, especially with respect to safety thresholds to avoid photokeratitis ("sunburn" of the cornea).
- For proper UVR assessment and risk management, **appropriate UVR measurements are essential**.
- **UV-C products aimed at general consumers may not be safe to use or may not be effective for disinfection.**

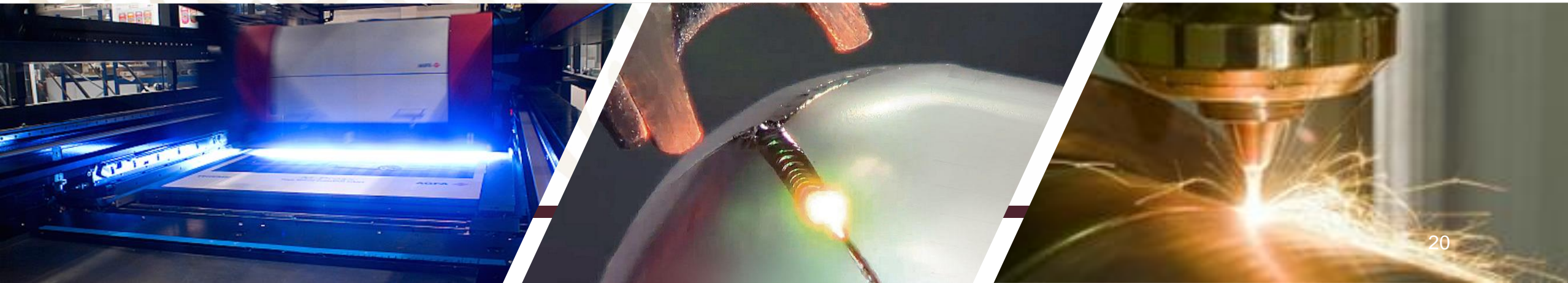
Aplicaciones de la luz





Aplicaciones de la luz

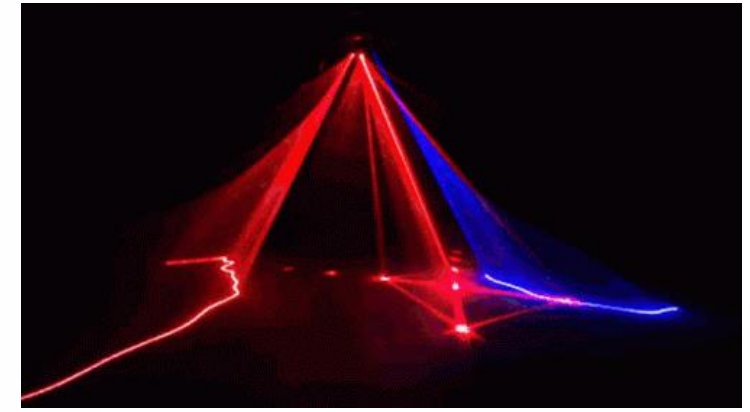
DIRECCIÓN DE ÓPTICA Y RADIOMETRÍA



Aplicaciones de la luz



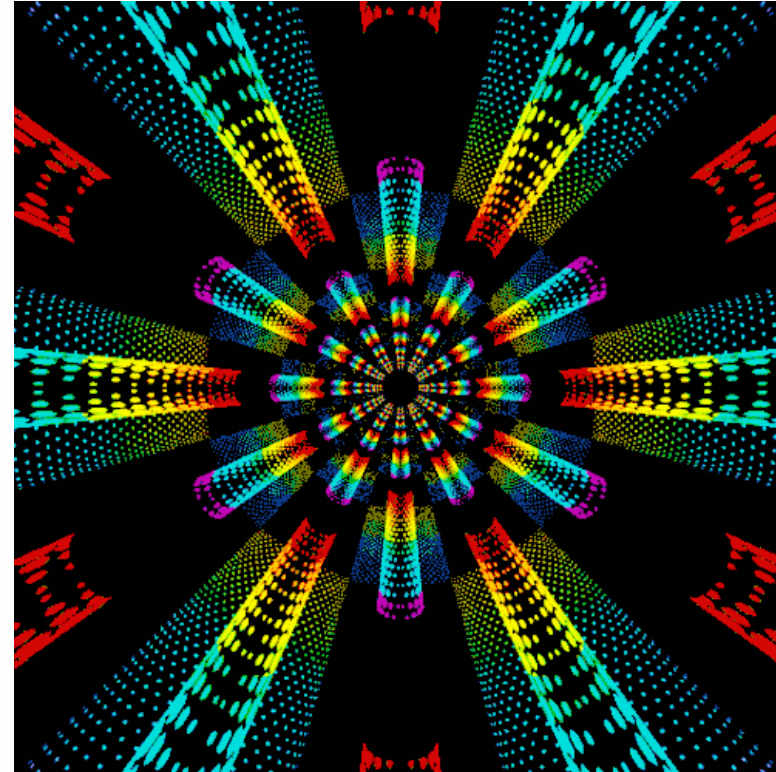
Aplicaciones de la luz



Aplicaciones de la luz



Gracias



cmatamor@cenam.mx

www.cenam.mx