DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME : 19EC602 – Microwave and Optical Engineering

III YEAR / VI SEMESTER

Unit IV – OPTICAL COMMUNICATION

Topic Optical Window and Attenuation

ATTENUATION

Attenuation is defined as the ratio of optical output power to the input power in the fiber of length L.

$\alpha = 10\log 10 P_i/P_o$ [in db/km]

where,

P_i= Input Power

P_o= Output Power, α is attenuation constant

The various losses in th e cable are due to

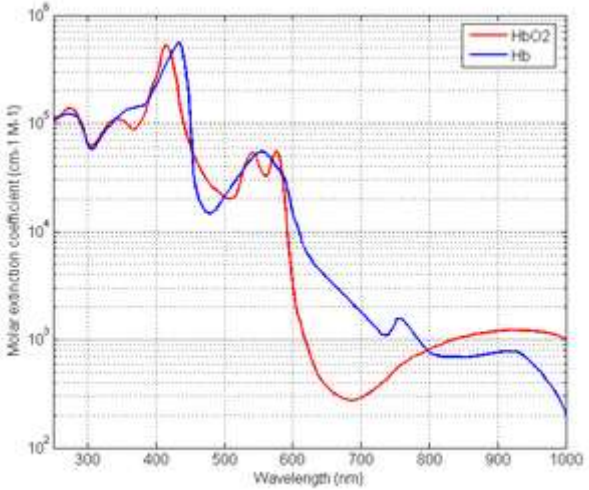
- Absorption
- Scattering
- Dispersion
- Bending

OPTICAL WINDOW

The optical window is the portion of the optical spectrum that is not blocked by the Earth's atmosphere. The window runs from around 300 nanometers (ultraviolet-B) up into the range the human eye can detect, roughly 400–700 nm and continues up to approximately 2 µm.

- Optical Window

OPTICAL WINDOW



- The **near-infrared** (**NIR**) **window** (also known as **optical window** or **therapeutic window**) defines the range of wavelengths from 650 to 1350 nanometre (nm) where light has its maximum depth of penetration in tissue.[1]
- Within the NIR window, scattering is the most dominant light-tissue interaction, and therefore the propagating light becomes diffused rapidly.
- Since scattering increases the distance travelled by photons within tissue, the probability of photon absorption also increases.

APPLICATIONS

- Fiber Optic Communication: Managing signal loss over long distances. Designing repeaters/amplifiers at specific intervals.
- Medical Imaging: In X-rays and CT scans, tissue attenuation helps differentiate between types of tissue and bone.
- Laser Systems: Protect internal optics while allowing laser beams to pass.
- Sensors and Detectors: Used in front of cameras, thermal detectors, and photodiodes to protect them from environmental exposure.

Any Query????

Thank you……