Unit-1

Lecture -4

Numerical Aperture, Polarization, Acceptance Angle

Numerical Aperture & Acceptance Angle

•From Snell's law the minimum angle that supports total internal reflection for the meridional ray is given by:

$$\sin\phi_{min} = \frac{n_2}{n_1}$$

•If the rays strikes the core-cladding interface at n angle less than this angle will be refracted out of the core and will be lost in cladding.

•Now, consider the right angled triangle on next slide.

□ we can say

$$n\sin\theta_0 = n_1\sin\theta$$

But, $\phi = \frac{\pi}{2} - \theta$ hence $n \sin\theta_0 = n_1 \cos\phi = n_1 (1 - \sin^2\phi)^{1/2}$

if ?=?,then *o* =o.- it is acceptance angle for which TIR takes place

Then, nsin *O*,= =(n/ -*n*,')'". he quantity on left side of this equation is **known as NA (Numerical Aperture).**

So, numerical Aperture is given by:

$$NA = n \sin\theta_{0.\max} = (n_1^2 - n_2^2)^{1/2} \approx n_1 \sqrt{2\Delta}$$

The parameter a is known as core-cladding index difference or Simply index difference given by A= $\frac{^{l}\ -n,^{2}}{2n,^{2}}$ od- $^{112}_{11,}$

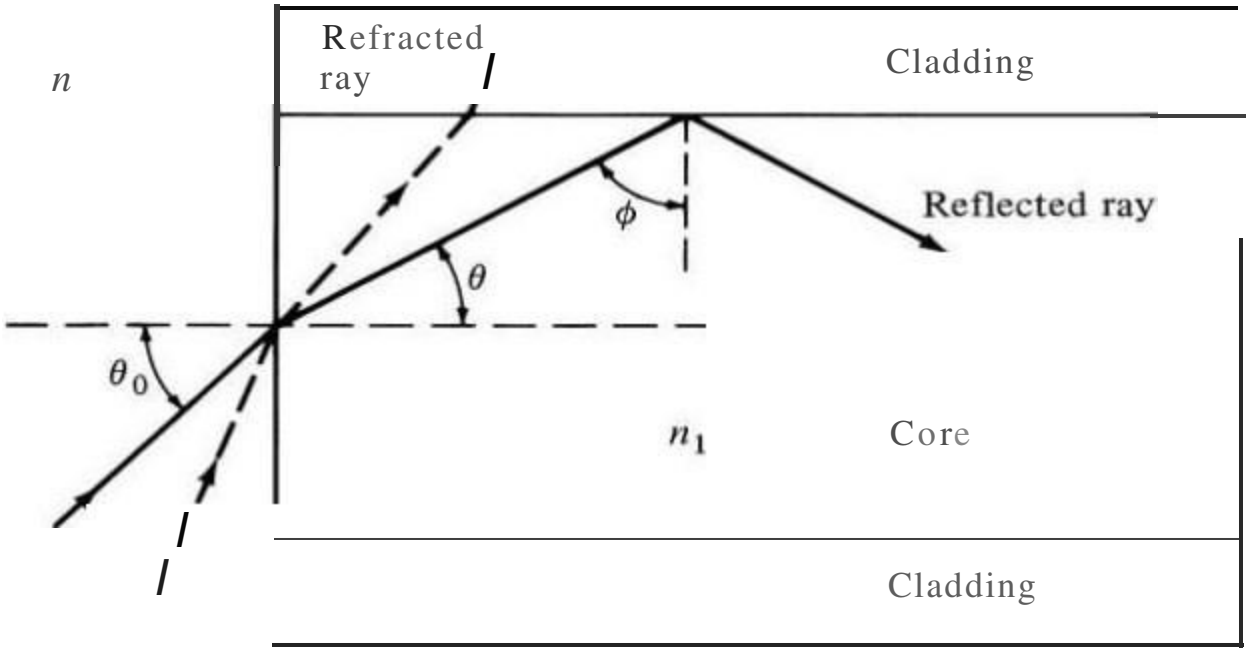

Fig. Meridional ray representation

Polarization —Light as a wave

– An electromagnetic wave has electric (E) and magnetic (H) fields. They are perpendicular