Diffraction for N-slits (Diffract "Grating")

\[ y_1 = a \sin \cot \]
\[ y_2 = a \sin (\cot + \phi) \]
\[ y_n = a \sin (\cot + (n-1)\phi) \]
\[ y_R = y_1 + y_2 + y_3 + \ldots + y_n \]
\[ y_R = 0 \cdot a e^{-i\cot} \left[ e^{i\phi_1} + e^{i\phi_2} + \ldots + e^{i\phi_n} \right] \]
\[ = a e^{-i\cot} \left[ 1 + e^{i(\phi_2 - \phi_1)} + e^{i(\phi_3 - \phi_2)} + \ldots + e^{i(\phi_n - \phi_{n-1})} \right] \]
\[ = a e^{-i\cot} e^{i\phi_1} \left[ 1 + e^{i\phi_2} + e^{i\phi_3} + \ldots + e^{i\phi_n} \right] \]
\[ = a e^{-i\cot} e^{i\phi_1} \left[ \frac{e^{i\phi_n} - 1}{e^{i\phi_1} - 1} \right] \]
\[ \left[ \frac{e^{i\frac{\pi}{2} - \frac{\pi x}{2}}}{e^{i\frac{\pi x}{2}} - 1} \right] \]
\[ \left[ \frac{e^{i\frac{\pi}{2} - \frac{\pi x}{2}}}{e^{i\frac{\pi x}{2}} - 1} \right] \]
\[ \left[ \frac{\sin \frac{Nx}{2}}{\sin \frac{x}{2}} \right] \]
\[ y_R = a e^{-i\cot} e^{i\phi_1} \times \frac{\sin \frac{Nx}{2}}{\sin \frac{x}{2}} \]

Take \( \phi_1 \) equal.
Polarization

- It establishes transverse nature of light
- Electric & mag. vectors mutually low.
  - Uncolored
  - polar & unpolarized (unpol in 2013)

Plane of polarization = who's vibration got lasted
  - Vibrate = vibration or the

Types of Polarization:
1. Plane polarized - ebc etc. vib. in straight line last to direct diff.
2. Circularly polarized - light superposed, electric vectors cress a circle. \( \theta \rightarrow \) non diff.
3. Elliptically polarized - diff. nig. \( \Delta \theta = 90^\circ \) ellipse.

Methods to produce polarized light:
- By reflect
- By refract
- By double refraction object absorb

By Reflected
- Brewster law - If \( L = i_p \), not \( i_p \).
- Postulates:
  - For 0-ray - crystal is isotropic - spherical (have small diameter)
  - For E-ray - anisotropic - heterogeneous or ellipsoid

- Nicol Prism - 2 calcite crystal, cut to 68° and joined by Canada Balsam

- If 0x is small, no TIR for 0-ray
  - If 0x is large, TIR for E-ray only

→ Nicol as Analyser:

I. If rotated 90°, for 0x, E-ray = 0
- He-Ne Laser

1. He → He^+
2. He^+ Ne → He + Ne^+

- Pop. 632.8 nm
  - 632.8 nm
  - 1150 nm
  - 2310 nm

Optics

- Optical Fibre - light as waveguide - log die (miracle fibre)

Core

Cladding

V_{cladding} > V_{core} → based on TIR

n = \sin(\theta)

- Principle of propagation - TIR

Core

Cladding

Should not be bent too (otherwise no TIR)
we use thick slabs & higher order - better than (unifundamental)
if even bowies one left - either compression or rayford
Piezoelectric Generator

\[ x - at = \log \]
\[ y - at = \text{blank} \]
\[ \text{so, we don't use it.} \]

\[ V = \frac{1}{2 \pi \sqrt{LC}} \]

\[ \text{Adm -} \quad 500 \text{ MHz} \]
\[ \text{Disadv -} \quad \text{high cost} \]
\[ \text{tidious cutting} \]

\[ 2a = \frac{1}{2L} \sqrt{\frac{1}{V}} \]

\[ \text{Magnetorestriction Method} \quad \text{(in ferromagnetic only)} \]
\[ \text{when magnetic field applied, field changes length} \]
\[ \text{convert alrgepiron, iron, nickel, cobalt,} \]

\[ \text{Magnetostriiction Oscillator} \quad \text{change length} \]
\[ 1, 1, 5, 5, 5 \text{ causes change in length} \]
\[ \text{Adv -} \quad \text{cheap - simple} \]
\[ \text{Disadv -} \quad \text{low lift factor} \]
\[ \text{dependent on temp} \]