PHYSICS 232 – CHAPTER 36: DIFFRACTION

Two-source interference:

$$I = I_0 \cos^2(\pi d \sin\theta/\lambda)$$

Maxima at ($I = I_0$ at a maximum)

$$d\sin\theta = m\lambda \quad (m = \ldots, -2, -1, 0, 1, 2, \ldots)$$

N-source interference:

$$I = I_0 \frac{\sin^2(N\pi d \sin\theta/\lambda)}{\sin^2(\pi d \sin\theta/\lambda)}$$

Principal maxima at ($I = N^2 I_0$ at a principal maximum)

$$d\sin\theta = m\lambda \quad (m = \ldots, -2, -1, 0, 1, 2, \ldots)$$

Intensity from single aperture of width a:

$$I = I_0 \frac{\sin^2(\pi a \sin\theta/\lambda)}{(\pi a \sin\theta/\lambda)^2}$$

Minima at

$$a\sin\theta = m\lambda \quad (m = \ldots, -2, -1, 1, 2, \ldots)$$

Bragg condition: maxima for crystal planes,

$$2d\sin\theta = m\lambda \quad (m = 1, 2, \ldots)$$

Rayleigh's criterion: angular resolution through circular aperture of diameter D,

$$\sin\theta = 1.22\,\frac{\lambda}{D}$$