Monochromatic λ = constant

① E-M radiation $I \propto \frac{1}{m^2}$ $\frac{I_e}{I_p} = \left(\frac{m_p}{m_e}\right)^2 \sim 4\times10^6$

for diffraction $\lambda \sim d$ X-ray see electrons

$\uparrow$ miller plane spacing $d(h,k,l)$

② electrons λ - de Broglie $p = \hbar k = \frac{\hbar\, 2\pi}{\lambda}$

see electrons + nuclei

$$\boxed{\lambda = \frac{h}{p}}$$

③ neutrons $\lambda = \frac{h}{p}$

see nuclei (mostly) also magnetic dipole of e^-

X-rays probe $n(\vec{r})$ = number density of electrons

$= \frac{\rho(\vec{r})}{e}$

Bragg scattering

$$2d \sin\theta = n\lambda \qquad n = 1, 2, 3 \ldots$$

$$\lambda \le 2d$$

Direct Lattice

Reciprocal Lattice