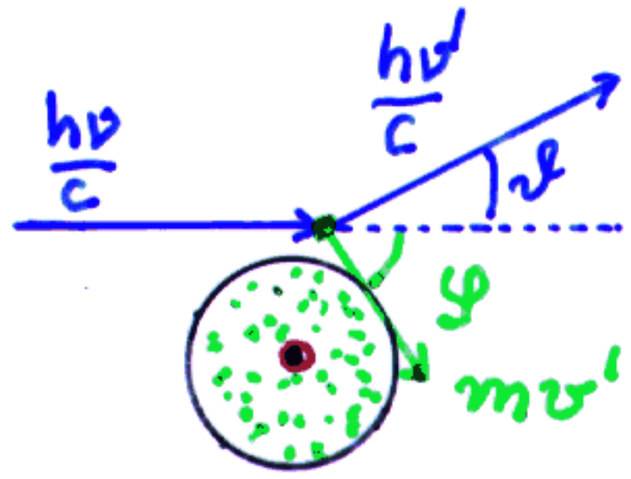
V.2.C Compton - Effekt

1922 Arthur Holley Compton

Ⓝ 1927



Streuung von Röntgenstrahlen an Elektronen (quasifrei)

$\nu' < \nu$

$\lambda' > \lambda$

$0 \leq \vartheta \leq \pi$

Elastisches Stoß aber inelastische Streuung d. Röntgenquants

Energieerhaltung:

$$h\nu + m_0c^2 = h\nu' + mc^2 = h\nu' + \frac{m_0c^2}{\sqrt{1-(v'/c)^2}}$$

Impulssatz:

I) $\frac{h\nu}{c} = \frac{h\nu'}{c}\cos\vartheta + mv'\cos\varphi$

II) $0 = \frac{h\nu'}{c}\sin\vartheta + mv'\sin\varphi$

$\rightsquigarrow$

$$\Delta\nu = \nu - \nu' = \frac{h}{m_{e0}c^2}\,\nu\cdot\nu'\,(1-\cos\vartheta)$$

$$\Delta\lambda = \lambda' - \lambda = \lambda_c \cdot (1-\cos\vartheta)$$

Compton - Wellenlänge $\lambda_c = \frac{h}{m_{e0}c} = 2{,}4263\cdot10^{-12}\,m$