Kramers-Heisenberg Formel

$\gamma(\vec{k},\alpha) + A \to \gamma(\vec{k}',\alpha') + B$

$$\frac{d\sigma}{d\Omega} = \left(\frac{\alpha\hbar}{mc}\right)^2 \frac{\omega_{k'}}{\omega_k} \Bigg| \langle B | e^{-i(\vec{k}'-\vec{k})\cdot\vec{x}} | A \rangle \, \vec{\varepsilon}^{\,*}_{\alpha'}(\vec{k}') \cdot \vec{\varepsilon}_\alpha(\vec{k})$$

$$- \frac{1}{m} \sum_N \Bigg\{ \frac{\langle B | e^{-i\vec{k}'\cdot\vec{x}} \, \hat{\vec{p}} \cdot \vec{\varepsilon}^{\,*}_{\alpha'}(\vec{k}') | N \rangle \langle N | e^{i\vec{k}\cdot\vec{x}} \, \hat{\vec{p}} \cdot \vec{\varepsilon}_\alpha(\vec{k}) | A \rangle}{E_N - (E_A + \hbar\omega_k)}$$

$$+ \frac{\langle B | e^{i\vec{k}\cdot\vec{x}} \, \hat{\vec{p}} \cdot \vec{\varepsilon}_\alpha(\vec{k}) | N \rangle \langle N | e^{-i\vec{k}'\cdot\vec{x}} \, \hat{\vec{p}} \cdot \vec{\varepsilon}^{\,*}_{\alpha'}(\vec{k}') | A \rangle}{E_N - (E_A - \hbar\omega_{k'})} \Bigg\} \Bigg|^2$$