

量子 体现在：对信号光的计数上

■ 参量下转换的相互作用密度为

$$H_I = \frac{3!}{3} \epsilon_0 \int d^3r \chi_{\text{eff}}^{(2)}(\mathbf{r}) E_p(\mathbf{r}, t) E_s(\mathbf{r}, t) E_{\text{THz}}(\mathbf{r}, t) = \int d^3r \mathcal{H}_I,$$

■ 参量下转换的转移矩阵为

$$\begin{aligned} |\mathcal{M}|^2 &= |\langle \mathbf{k}_s, \mathbf{k}_{\text{THz}} | \mathcal{H}_I | \mathbf{k}_p \rangle|^2 \\ &= \left| \frac{2\chi_{\text{eff}}^{(2)}}{(2\pi)^{3/2} \sqrt{\epsilon_0}} \sqrt{\frac{\hbar\omega_p}{2n_p^2}} \sqrt{\frac{\hbar\omega_s}{2n_s^2}} \sqrt{\frac{\hbar\omega_{\text{THz}}}{2n_{\text{THz}}^2}} \right|^2. \end{aligned}$$

■ 无穷大 NL 中的转移率的微分 为

$$d\Gamma(\mathbf{k}_p \rightarrow \mathbf{k}_s \mathbf{k}_{\text{THz}}) = \frac{2\pi}{\hbar} |\mathcal{M}|^2 \delta(\hbar\omega_p - \hbar\omega_s - \hbar\omega_{\text{THz}}) \delta^3(\mathbf{k}_p - \mathbf{k}_s - \mathbf{k}_{\text{THz}}) d^3k_s d^3k_{\text{THz}}.$$

A large gray circle containing a black letter H, which is a common symbol for Planck's constant (h).