研究内容　7 维 → 2 维：非线性卷积 → 非线性角谱

非线性三维全息

$$g^{\pm}_{3z} = A\cdot g^{\pm}_{10}\cdot g^{\pm}_{20}\cdot C\left(\mathbf{k}_3-\mathbf{k}_1-\mathbf{k}_2\right)$$

$g^{\pm}_{i0}=\delta\left(\mathbf{k}_{i\perp}\right),\ i=12$　双泵浦：平面波

$$\mathrm{d}\mathbf{k} := \mathbf{k}_1+\mathbf{k}_2+\mathbf{g}-\mathbf{k}_3=\mathbf{0}$$

$$\begin{cases} k_i^2=k_{ix}^2+k_{iy}^2+k_{iz}^2, & i=123 \\ k_{3j}=k_{1j}+k_{2j}+g_j, & j=\mathrm{xyz} \end{cases}$$

$\mathbf{k}$：完全匹配

k 空间共线匹配

$$g^{\pm}_{3z} = A\cdot g^{\pm}_{10}\cdot g^{\pm}_{20}\cdot \mathrm{sinc}\left(\mathrm{d}k\,\frac{z}{2}\right)\cdot e^{\mathrm{i}\,\mathrm{d}k\frac{z}{2}}$$

$g^{\pm}_{i0}=f\left(\mathbf{k}_{i\perp}\right),\ i=12$　双泵浦：弱约束

$C=\delta\left(\mathbf{g}\right)$　无结构：χ^2均匀

$$\mathrm{d}k := k_1+k_2-k_3$$

$$\begin{cases} k_i^2=k_{ix}^2+k_{iy}^2+k_{iz}^2, & i=123 \\ \hat{k}_3=\hat{k}_1=\hat{k}_2 \end{cases}$$

$$A=\chi_{\mathrm{eff}}\frac{k_{30}^2}{k_3^2}\cdot \mathrm{i}k_3\frac{z}{2}$$

$\approx$

k 空间横向匹配

$$g^{\pm}_{3z} = A\cdot g^{\pm}_{10}\cdot g^{\pm}_{20}\cdot \mathrm{sinc}\left(\mathrm{d}k_z\frac{z}{2}\right)\cdot e^{\mathrm{i}\,\mathrm{d}k_z\frac{z}{2}}$$

$g^{\pm}_{i0}=f\left(\mathbf{k}_{i\perp}\right),\ i=12$

$C=\delta\left(\mathbf{g}\right)$

$$\mathrm{d}k_z := k_{1z}+k_{2z}-k_{3z}$$

$$\begin{cases} k_i^2=k_{ix}^2+k_{iy}^2+k_{iz}^2, & i=123 \\ k_{3j}=2k_{1j}=2k_{2j}, & j=\mathrm{xy} \end{cases}$$

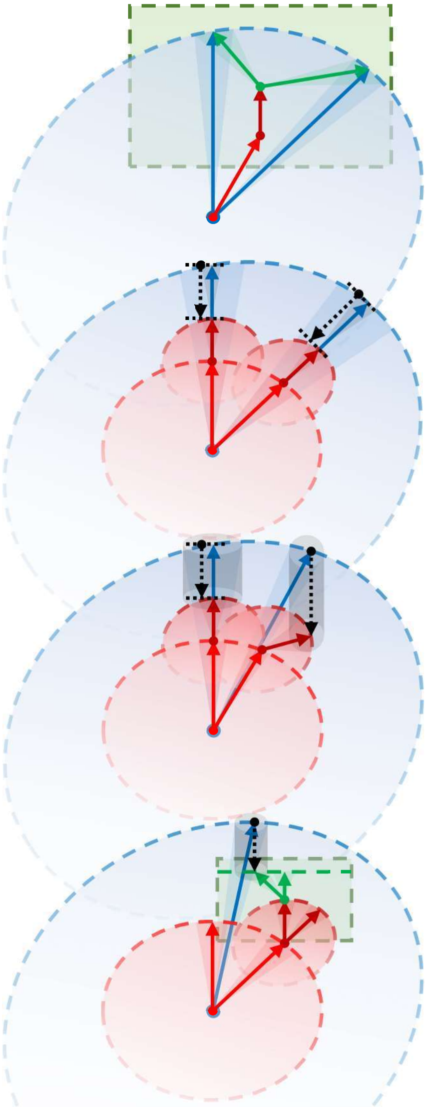
非线性角谱理论

$$g^{\pm}_{3z} = A\cdot \iiint C\cdot\left[\iint g^{\pm}_{10}\cdot g^{\pm}_{20}\cdot \mathrm{sinc}\left(\mathrm{d}k_z\frac{z}{2}\right)\cdot e^{\mathrm{i}\,\mathrm{d}k_z\frac{z}{2}}\cdot \mathrm{d}\mathbf{k}_{1\perp}\right]\cdot \mathrm{d}\mathbf{g}$$

$$\mathrm{d}k_z := k_{1z}+k_{2z}+g_z-k_{3z}$$

$$A=\chi_{\mathrm{eff}}\frac{k_{30}^2}{k_{3z}^2}\cdot \mathrm{i}k_{3z}\frac{z}{2}$$

$$\begin{cases} k_i^2=k_{ix}^2+k_{iy}^2+k_{iz}^2, & i=123 \\ k_{3j}=k_{1j}+k_{2j}+g_j, & j=\mathrm{xy} \end{cases}$$



$\int_z$ $2D_\perp$ + $1D_z$

$\int_z$ $3D$

⬇

$2D_\perp$

$2D_\perp$

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$2D_\perp$

$2D_\perp$

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$2D_\perp$

$\int_z \iiint\iint_\perp$ $6D_\perp$ + $1D_z$

$\iiint\iint_\perp$ $4D_\perp$ + $3D$

⬇

$2D_\perp$

标量非线性·傅立叶光学