Optique Onde

Travail optique

Rayon lumineux : $\vec{K} \parallel \vec{\Pi}$ $\quad \vec{K} = \frac{\omega}{c}\vec{u}$ $\quad$ **Capteur :** $\mathcal{E}(M) = \langle \|\vec{\Pi}\| \rangle_{\tau_{rep}}$

Interférence : $\mathcal{E}(M) = \mathcal{E}_1 + \mathcal{E}_2 + \varepsilon_0 c\, \vec{E}_{10} \cdot \vec{E}_{20} \left[\langle \cos((\omega_1 + \omega_2)t - (\varphi_1 + \varphi_2)) \rangle + \langle \cos((\omega_1 - \omega_2)t + \varphi_1 - \varphi_2) \rangle \right]$

$\vec{E}_i = \vec{E}_{i0} \cos(\omega_i t - \varphi_i(t))$ $\quad \mathcal{E}_i = \|\mathcal{E}\|$

$\mathcal{E}(M) = 2\mathcal{E}_0 \left(1 + \cos\left(\frac{2\pi}{\lambda}\Delta\right)\right)$

- $\omega_1 = \omega_2$
- φ_1, φ_2 indep de t (durée d'onde)
- $\vec{E}_{10} \cdot \vec{E}_{20} \neq 0$

$\Delta = \frac{ax}{D}$ $\quad i = \frac{\lambda D}{a}$

$C = \frac{\mathcal{E}_{max} - \mathcal{E}_{min}}{\mathcal{E}_{max} + \mathcal{E}_{min}}$ contraste

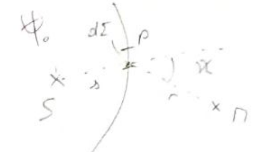
OO – OG :

Surface d'onde $\quad$ RL

Th de Malus : les surfaces $\perp$ aux RL

Eq des RL : $\frac{d}{ds}\left(n \frac{d\vec{r}}{ds}\right) = \vec{\nabla} n$

PP de Huygens - Fresnels $\quad \Psi(M) = \frac{1}{i\lambda} \iint_{\Sigma_{dif}} \Psi_0 \frac{e^{i\vec{K}\cdot\vec{s}}}{s} \frac{e^{i\vec{K}\cdot\vec{r}}}{r}\, d\Sigma$



Diffraction : nombre de Fresnel : $\mathcal{F} = \frac{e^2}{\lambda}\left(\frac{1}{D_s} + \frac{1}{D_r}\right)$

laser $\quad D_s \to \infty$ faisceau gaussien

Fresnel : $\mathcal{F} \gtrsim 1$ $\quad \Psi(M) = \frac{\Psi_0}{i\lambda} \frac{e^{iKD}}{D} \iint_{\Sigma_{dif}} \exp\left[\frac{i\pi}{\lambda D}\left((x - X)^2 + (y - Y)^2\right)\right] dX\, dY$

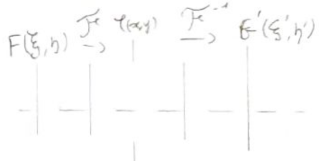
$M(x, y, D) \quad \Sigma_{dif}(X, Y, 0)$

Fraunhofer : $\mathcal{F} \lesssim 1$ $\quad \Psi(M) = \frac{\Psi_0}{i\lambda} \frac{e^{iKD}}{D} e^{\frac{iK}{2D}(x^2 + y^2)} \iint_{\Sigma_{dif}} \exp\left[-\frac{i2\pi}{D\lambda}(xX + yY)\right] dX\, dY$

Approche : $\mathcal{F} \ll 1$

Exacte : $\mathcal{F} = 0$ ① M à l'∞

Optique de Fourier : montage 4f (pas $t(\vec{r})$)



cf TF Fourier

∘ Diffraction et ...

∘ Filtrage