

**LP35**

# **Diffraction de Fraunhofer**

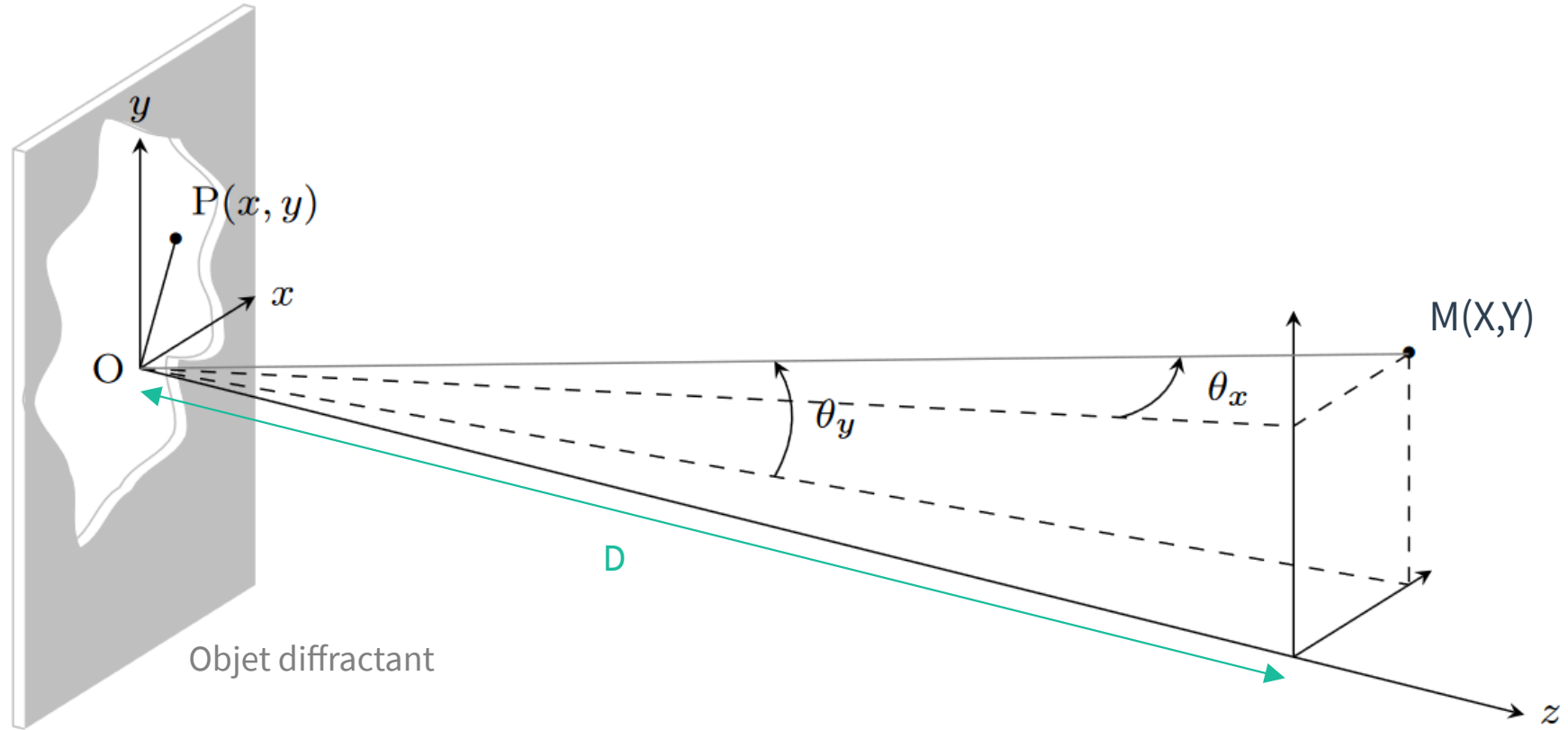
Niveau : L3

Prérequis :

- optique géométrique
- notion de diffraction
- formule de Huygens-Fresnel
- approximation scalaire
- transformée de Fourier



# Diffraction de Fraunhofer



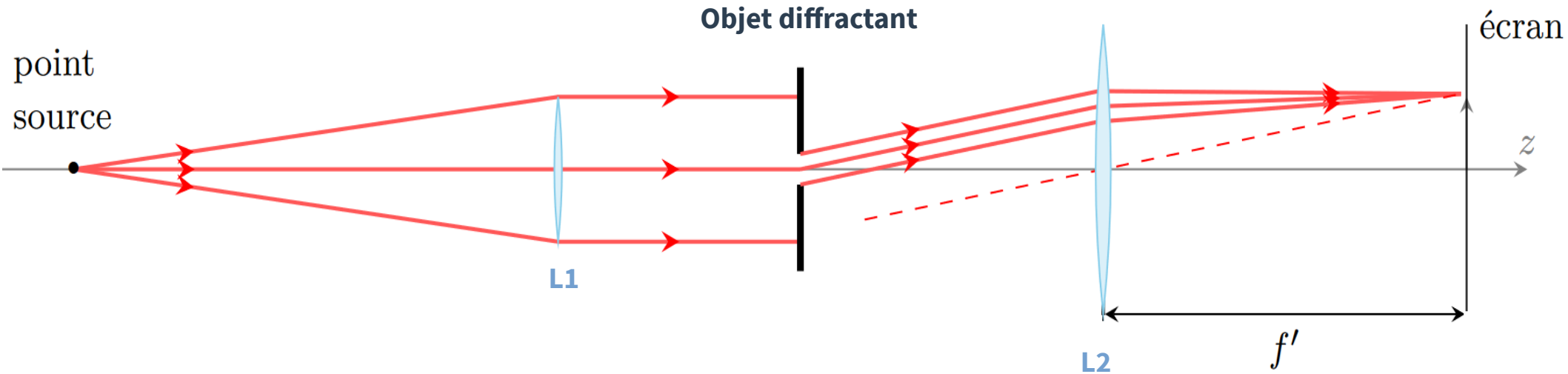
# Principe de Huygens-Fresnel

$$\Psi(M) = \frac{\Psi_0}{i\lambda} \iint_{P \in \text{Ouverture}} \frac{e^{ikr}}{r} dx dy$$

$$\text{où } r = \|\vec{PM}\|$$

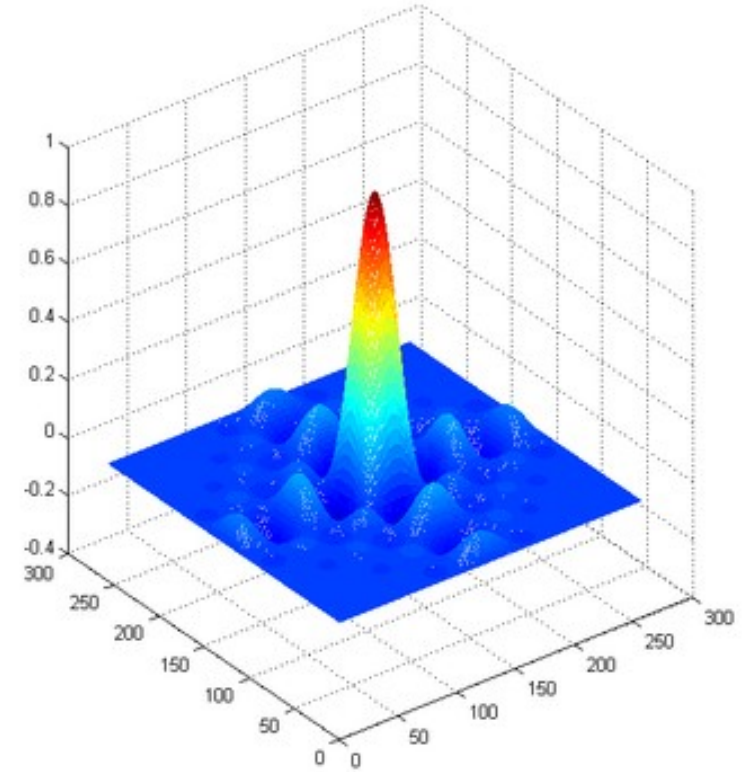
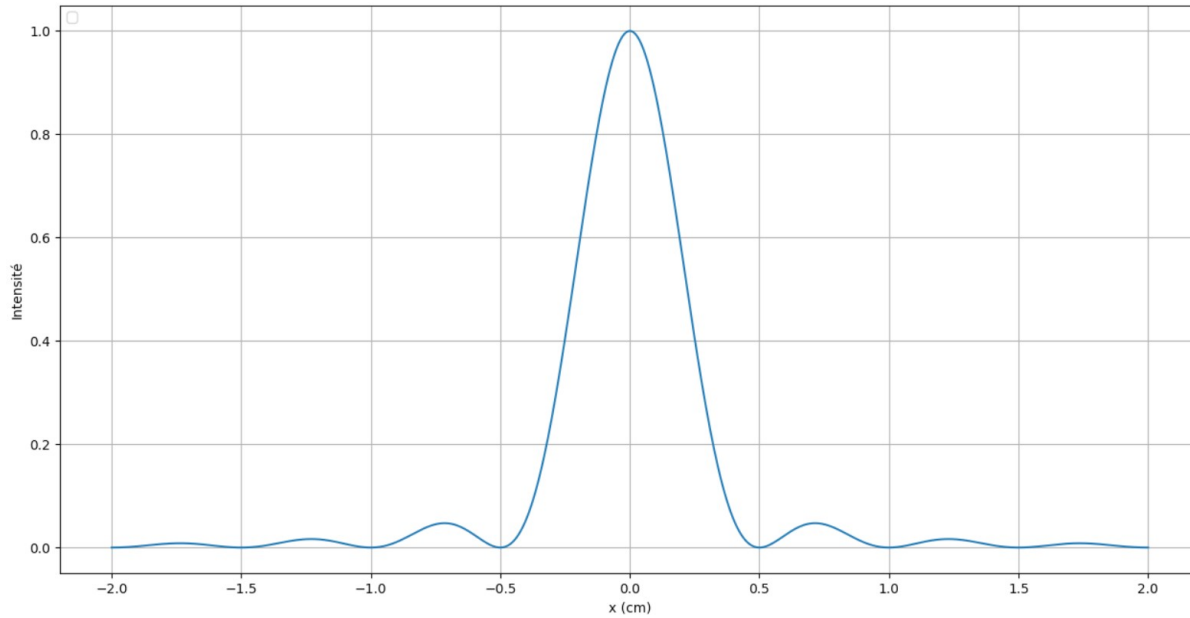


# Dispositif expérimental





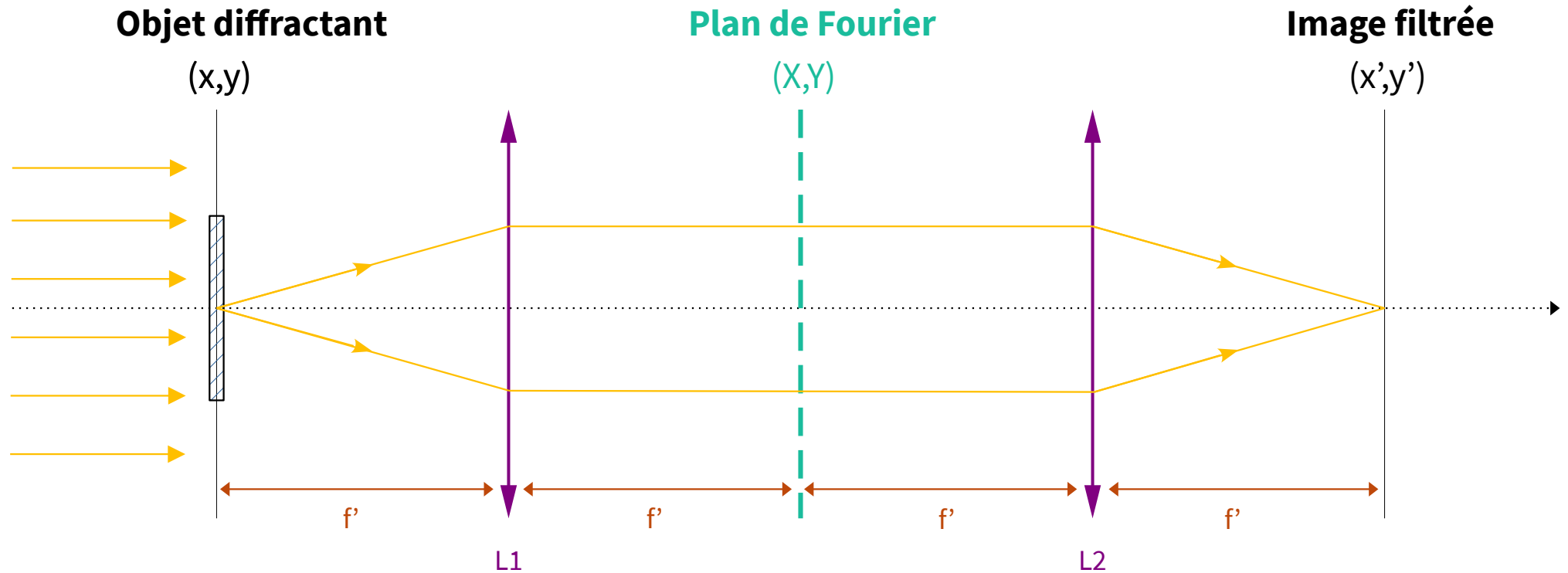
# Intensité diffractée par une fente





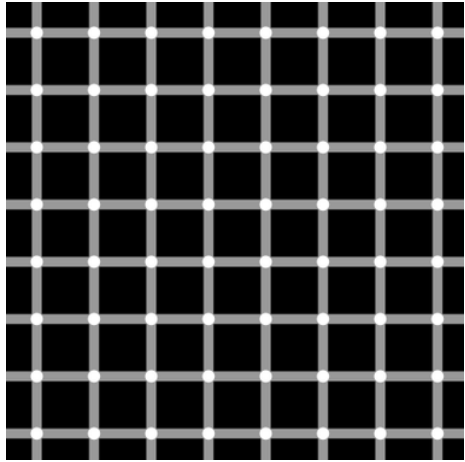


# Montage expérimental : montage 4f



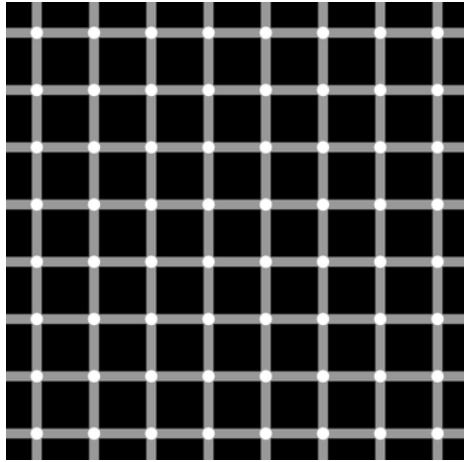


# Exemple de filtrage fréquentiel

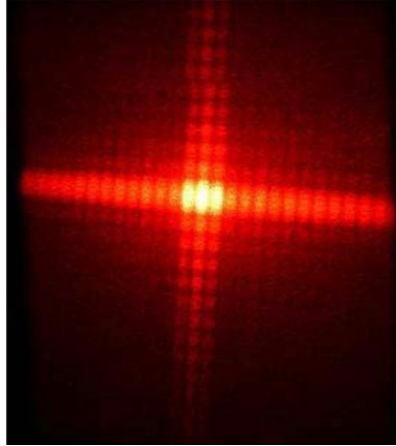


Grille

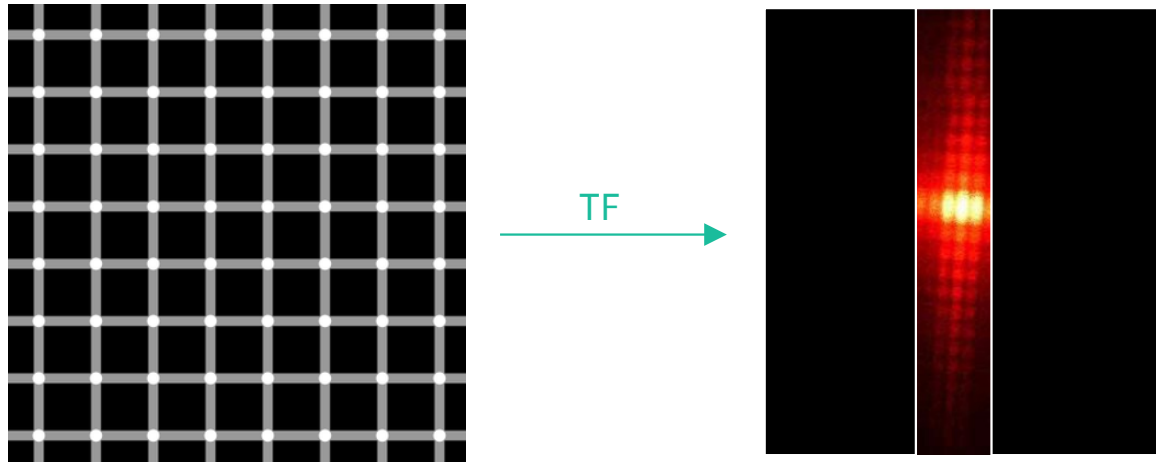
# Exemple de filtrage fréquentiel



TF →

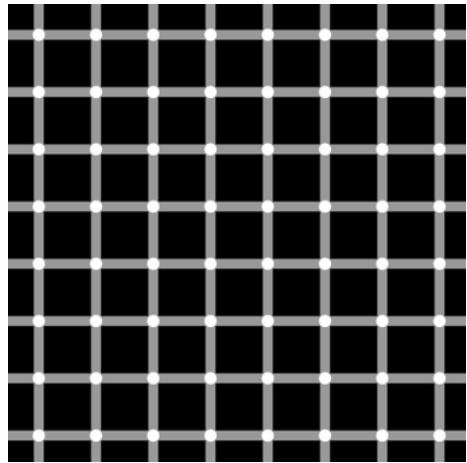


# Exemple de filtrage fréquentiel

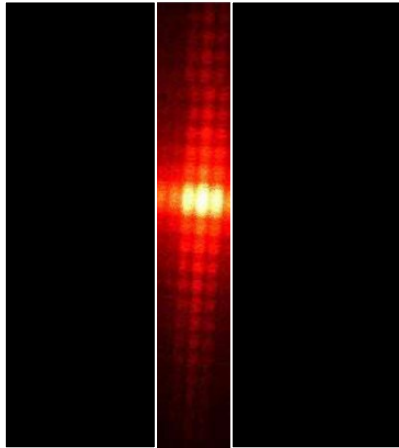


**Filtre**

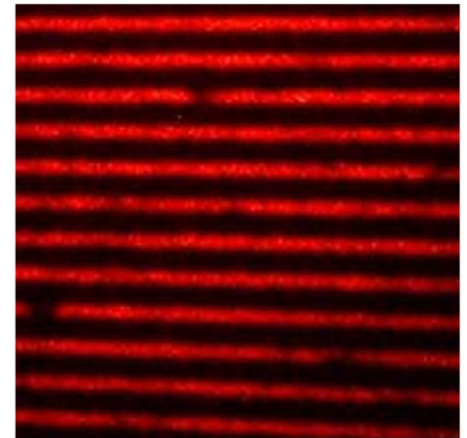
# Exemple de filtrage fréquentiel



TF →



TF →



Grille filtrée





# Exemple de strioscopie



# Exemple de strioscopie

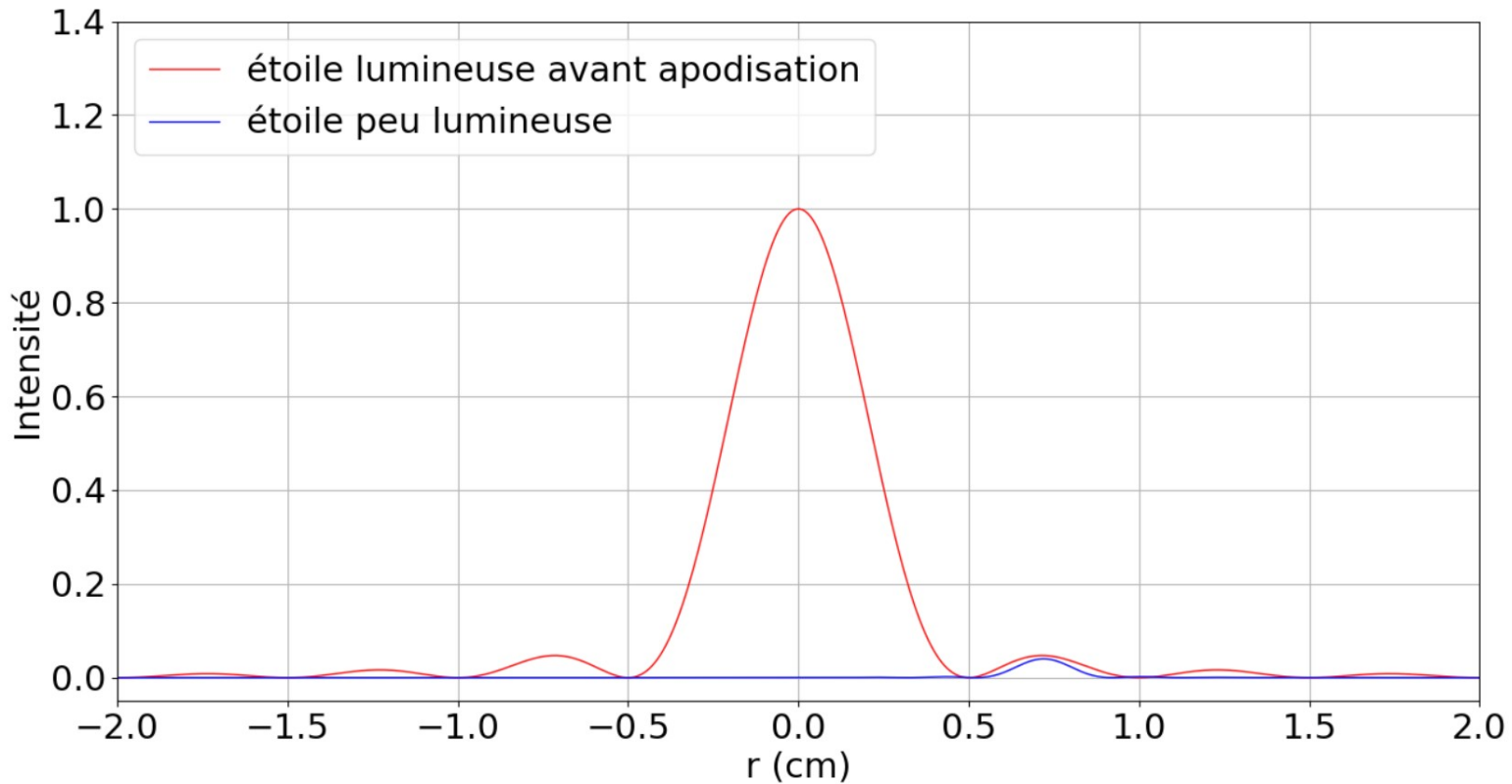


Filtrage  
passe-haut

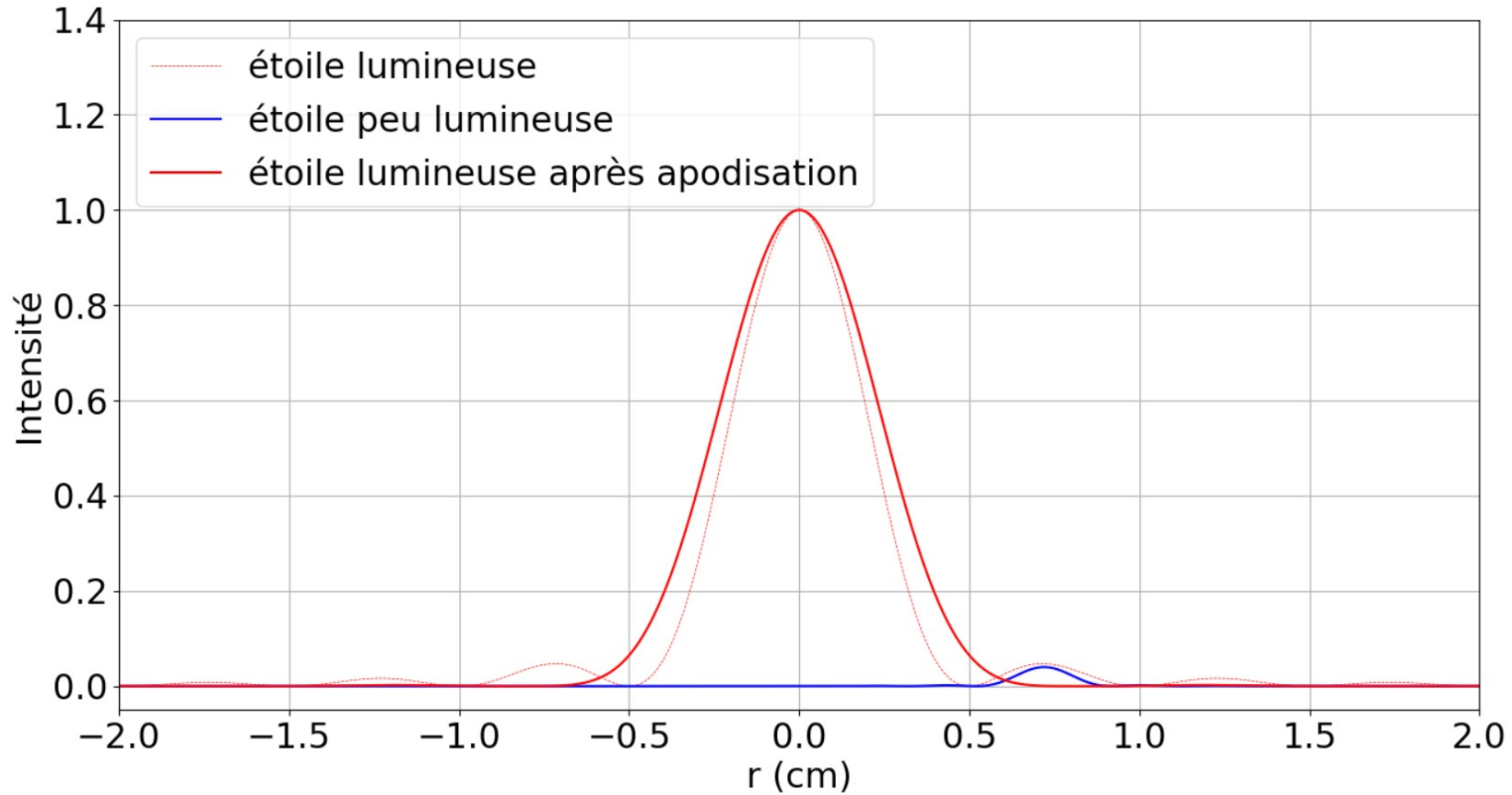




# Exemple d'apodisation

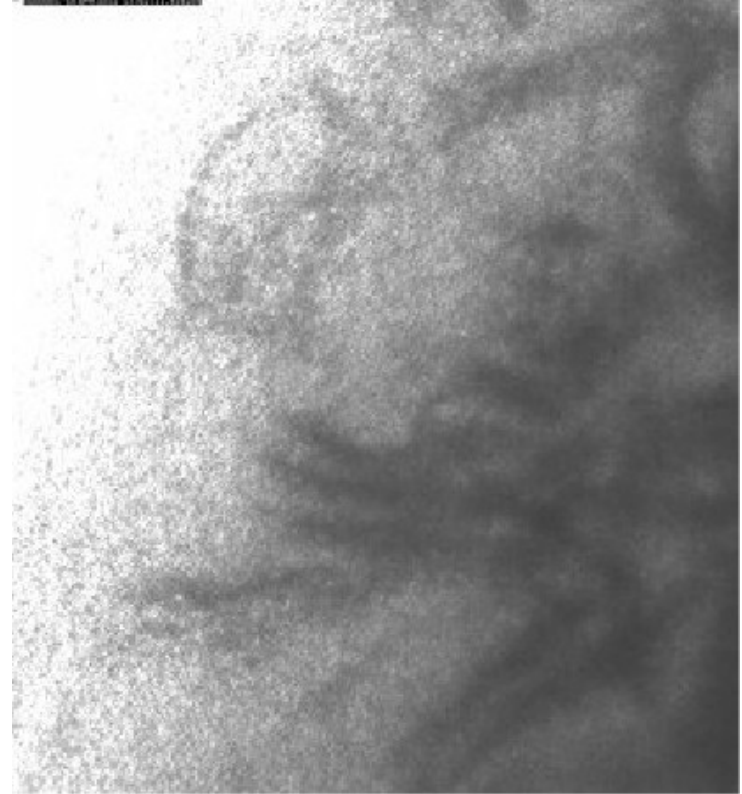
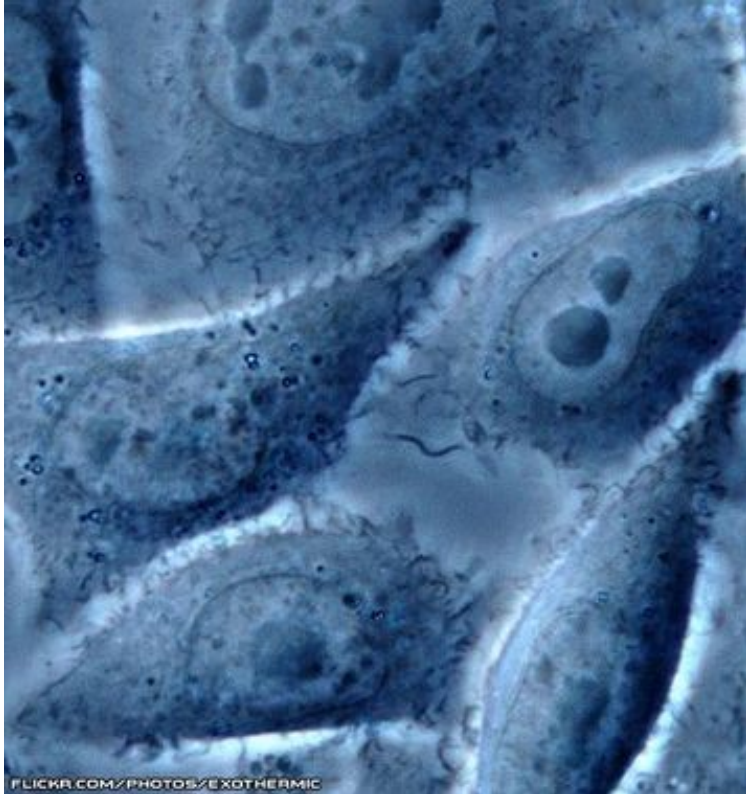


# Exemple d'apodisation





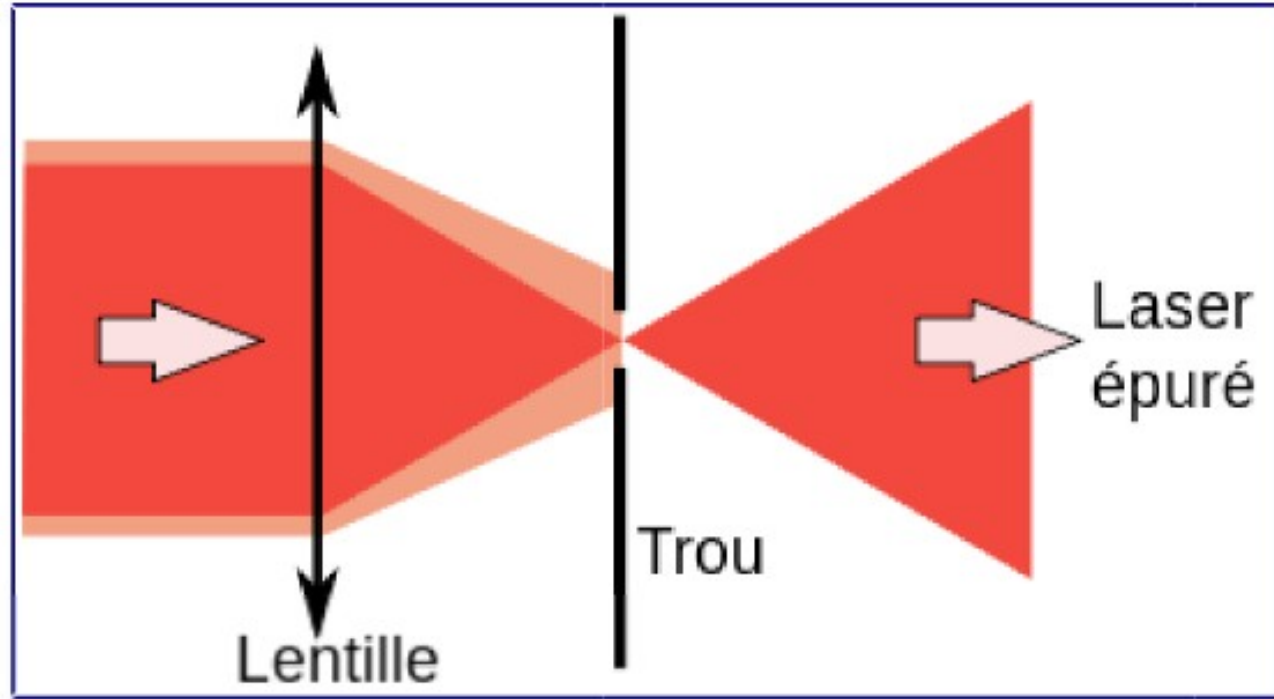
# Microscopie à contraste de phase



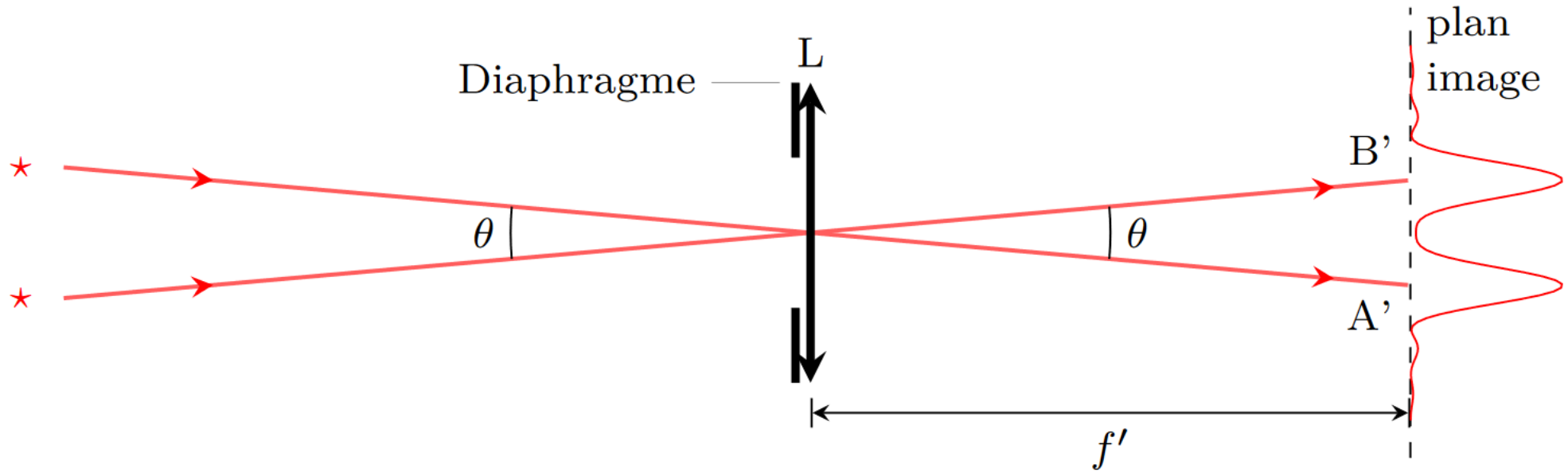




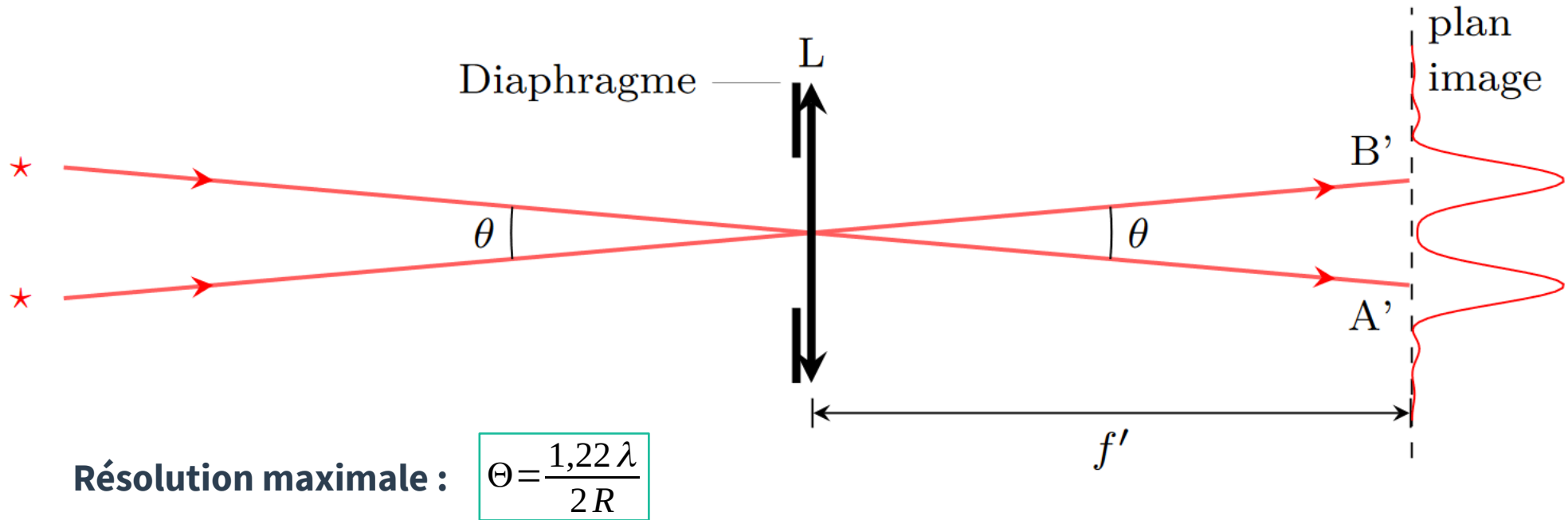
# Fonctionnement d'un laser épuré



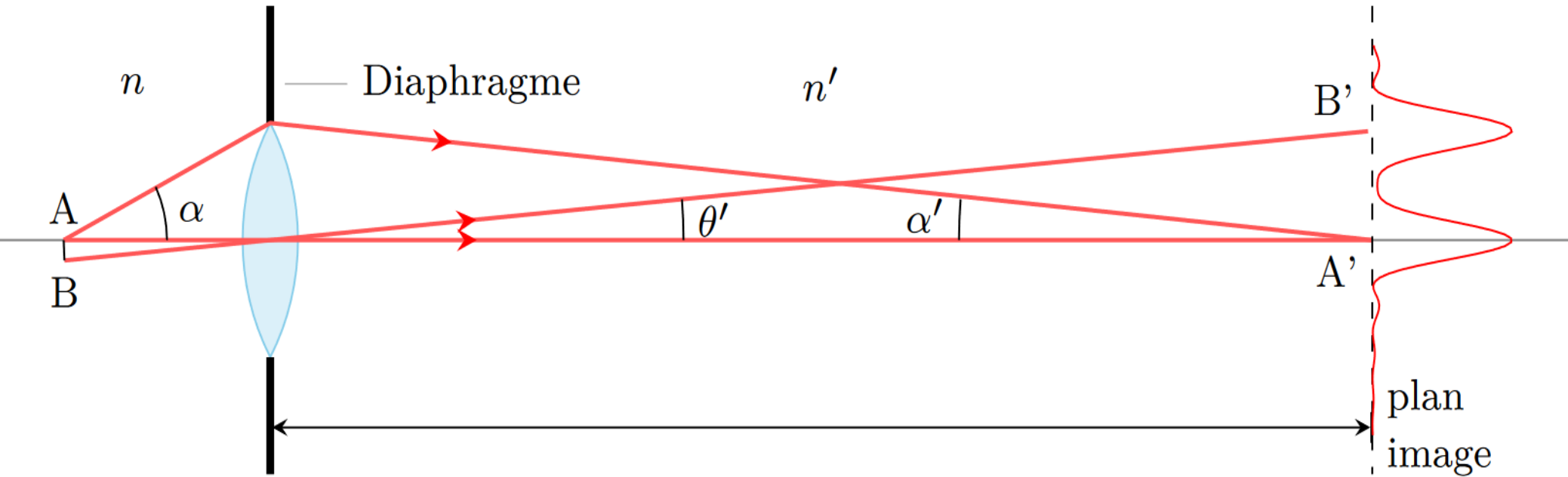
# Limite de résolution (angulaire)



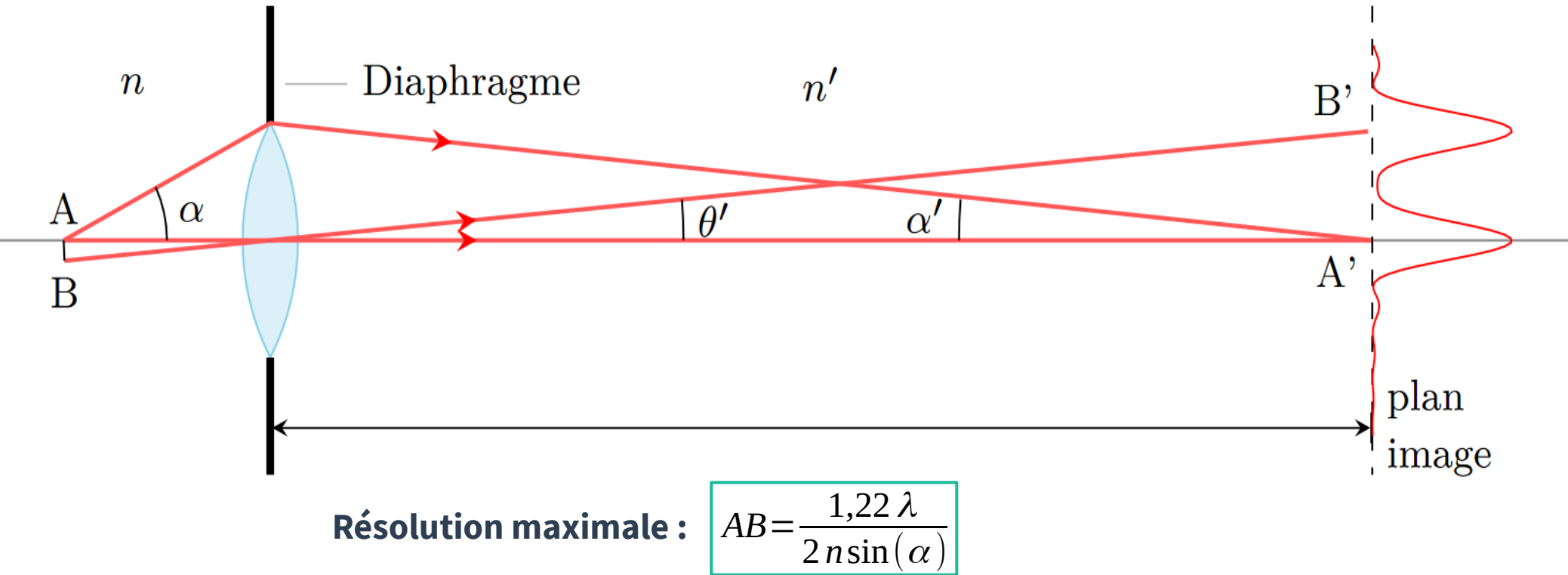
# Limite de résolution (angulaire)



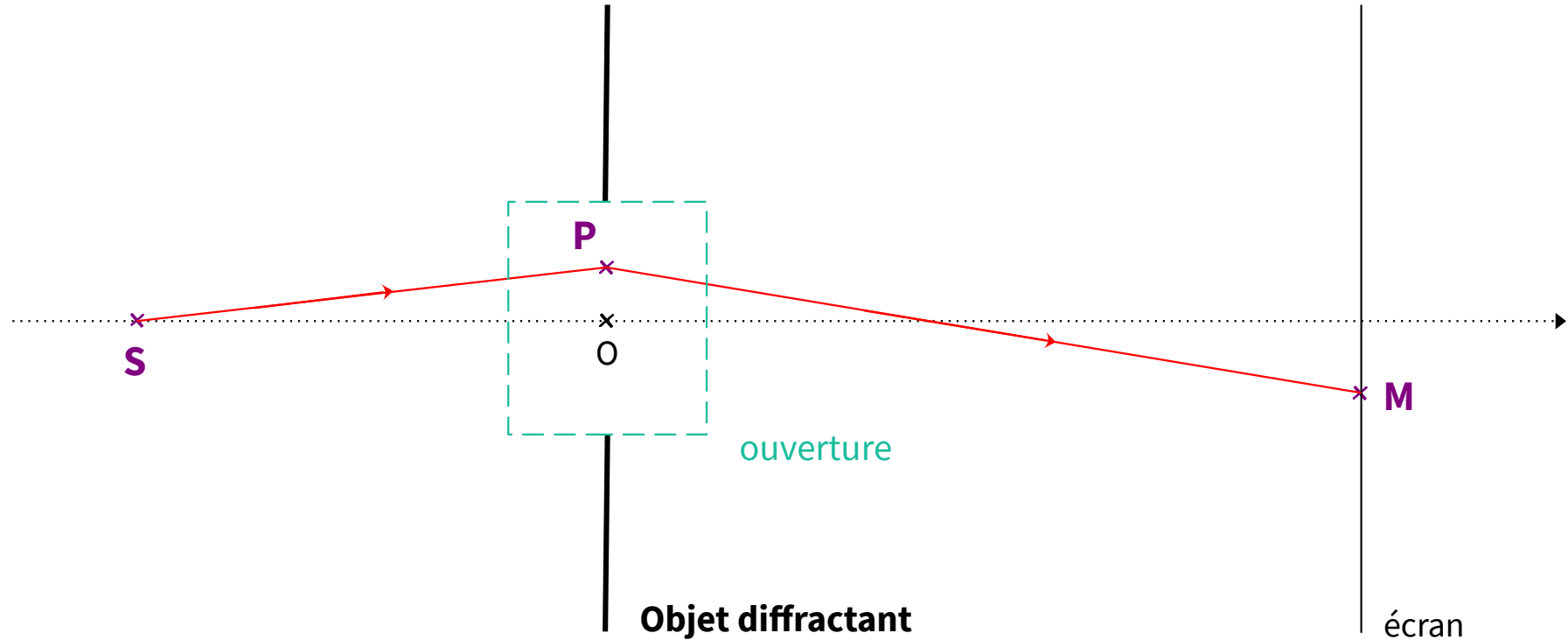
# Limite de résolution (spatiale)



# Limite de résolution (spatiale)

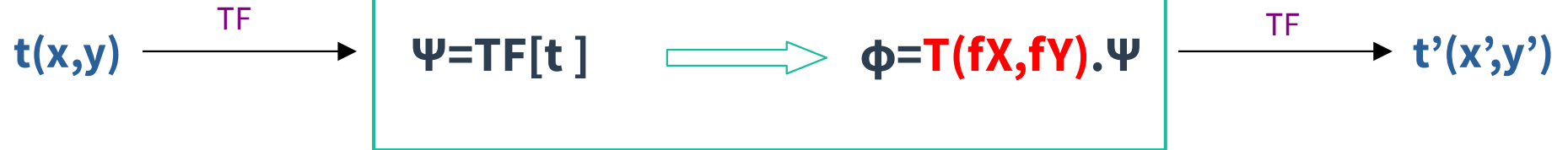


# Principe de Huygens-Fresnel



# Principe du filtrage optique

Plan de Fourier



$T(X,Y)$  est le filtre spatial