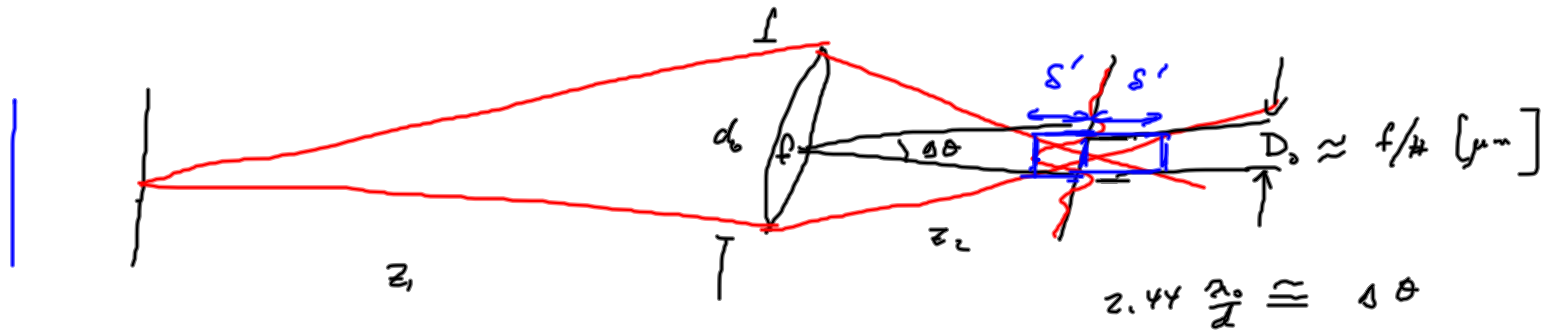


# PROBLEM SESSION 1/15/2010

7 PROBLEMS, CHOOSE 5, NO CALCULATORS

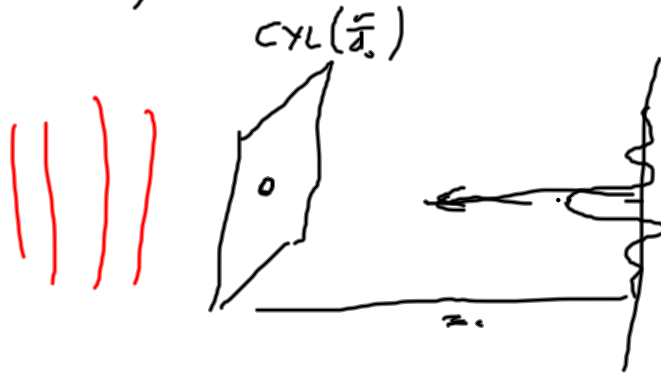


$$D_0 \approx 2.44 \frac{\lambda_0 f}{d_0} = \underbrace{2.44 \lambda_0}_{\approx 1 \mu m} \cdot \frac{f/\#}{f/\#}$$

$$2.44 \frac{\lambda_0}{2} \approx \Delta \theta$$

$$2.44 \frac{\lambda_0}{2} \cdot z_2 = D_0$$

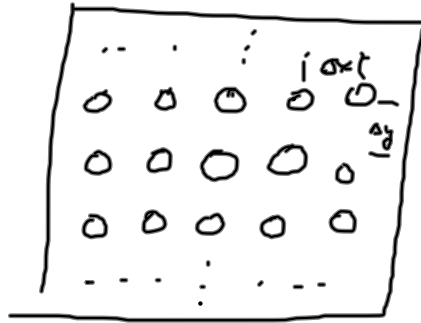
↑  
f



$$1 - \text{CYL}\left(\frac{r}{d_0}\right)$$

$$\delta\left(\frac{r}{\lambda_0 z_2}, \frac{v}{\lambda_0}\right) - \frac{\pi d_0^2}{4}$$

$$\sim \text{SOME}\left(\frac{d_0 v}{\lambda_0 z_2}\right)$$



$$1 - f(x, y)$$

$$f(x, y) = \text{comb}\left(\frac{x}{\Delta x}, \frac{y}{\Delta y}\right) * \text{cyl}\left(\frac{r}{d_0}\right)$$

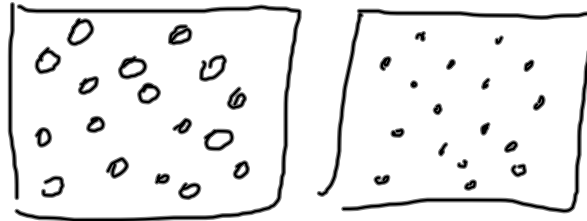
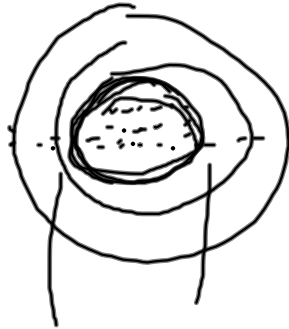
$$\Delta x, \Delta y \gg d_0$$

$$F(\xi, \eta) = (\Delta x \Delta y) \text{comb}(\Delta x \xi, \Delta y \eta) \cdot \frac{\pi d_0^2}{4} \text{sinc}(d_0 \rho)$$

$$g(x, y) = F\left(\frac{x}{\lambda_0 z_1}, \frac{y}{\lambda_0 z_2}\right) = (\Delta x \Delta y) \frac{\pi d_0^2}{4} \text{comb}\left(\frac{x}{\lambda_0 z_1 / \Delta x}, \frac{y}{\lambda_0 z_2 / \Delta y}\right) \cdot \text{sinc}\left(\frac{\sqrt{x^2 + y^2}}{\lambda_0 z_2 / d_0}\right)$$

~~comb~~ SCALE FACTOR FOR  $\text{comb}$  IS  $\frac{\lambda_0 z_1}{d_0}$

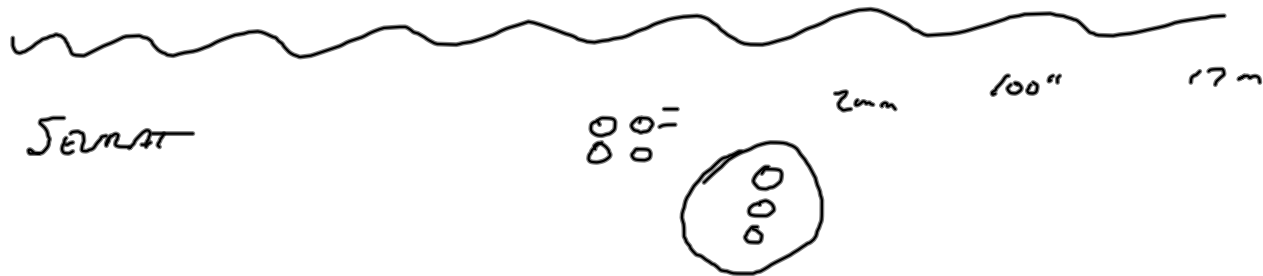
$$\text{comb} \left( \frac{\lambda_0 z_1}{\Delta x}, \frac{\lambda_0 z_2}{\Delta y} \right)$$



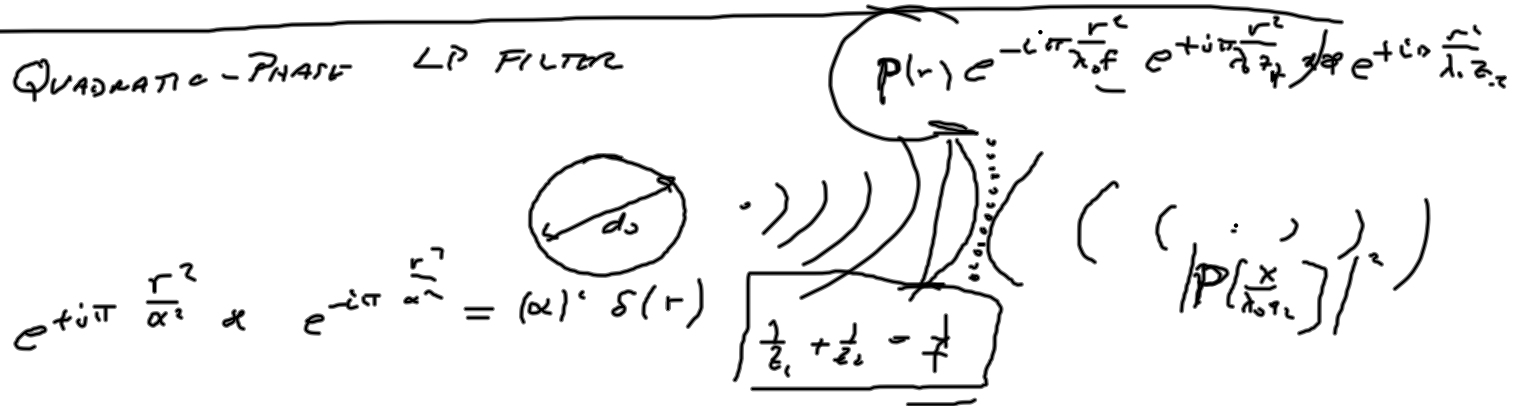
ARRAY THEOREM

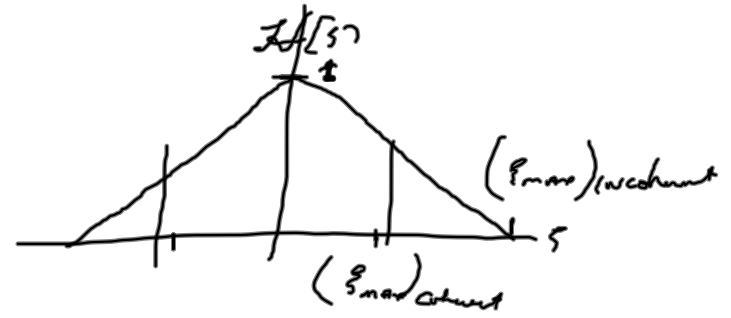
$$f(x,y) * \sum_{n=1}^N \delta(x-x_n) \rightarrow \underline{F(\xi,\eta) \cdot \sum_n e^{+2\pi i f x_n}}$$

LABYRIE STELLAR SPACER INTERFEROMETRY 1970

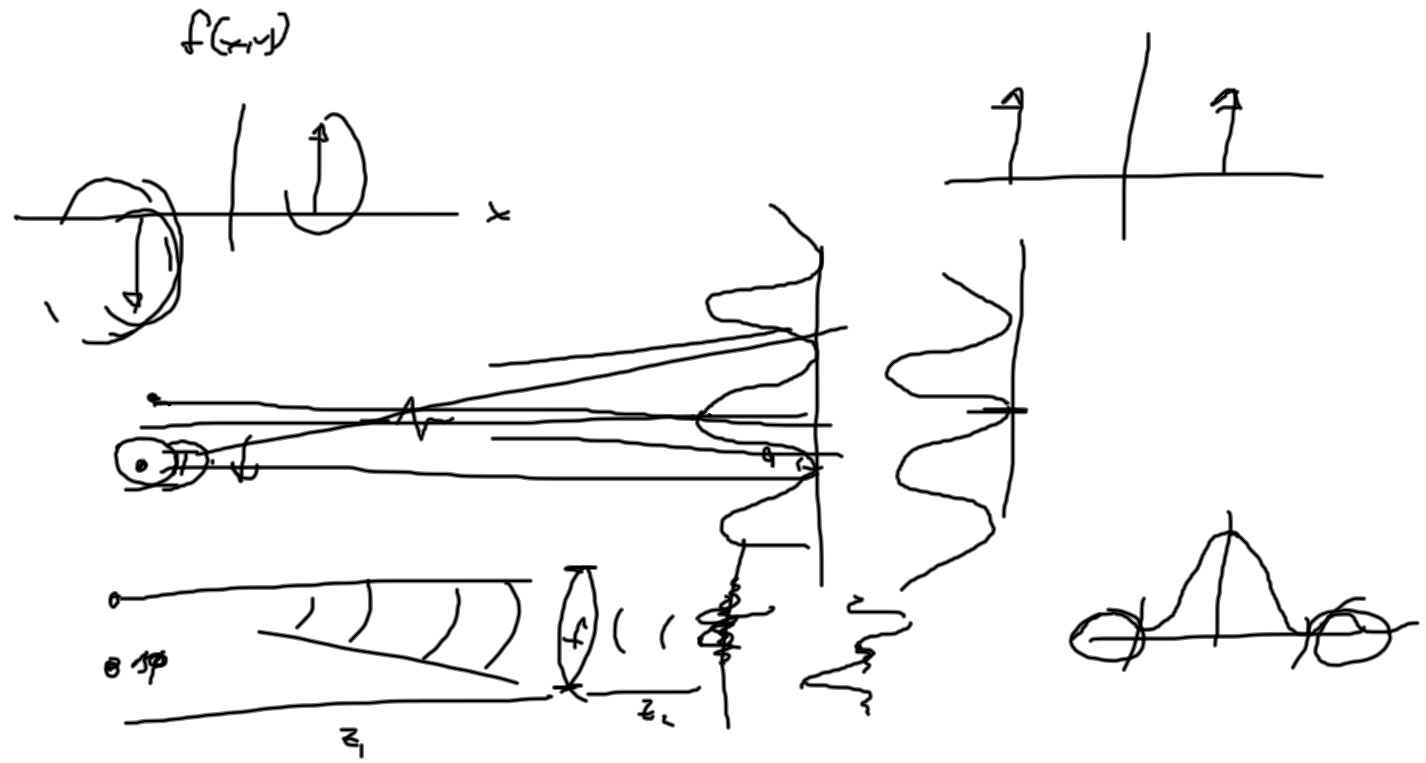


QUADRATIC-PHASE LP FILTER





$$(\xi_{max})_{inc} = 2 (\xi_{max})_{coherent}$$







5

