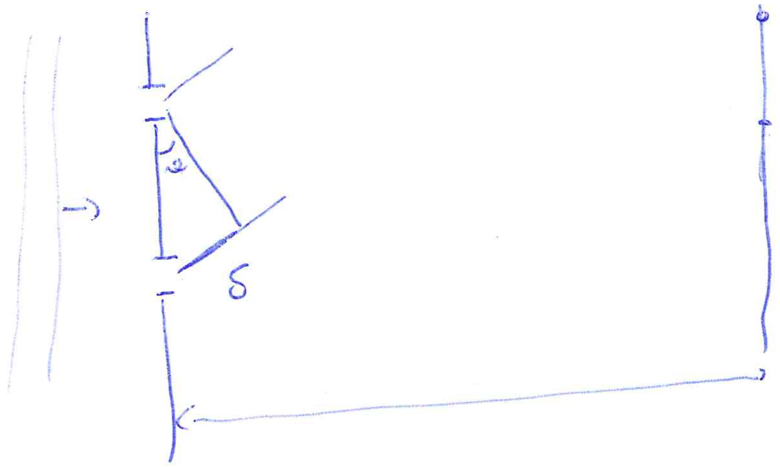


$\boxed{\delta \cong d \cdot \vartheta}$

$y \cong L \cdot \vartheta$

$y = \frac{L}{d} \delta$

$\delta = \frac{\lambda}{2}$ → first minimum...

$\delta = (2m+1)\frac{\lambda}{2}$ → MINIMA

$\delta = m\lambda$ → MAXIMA

$|e^{iky} + e^{ik(y+\delta)}|^2 = 1 + 1 + 2\cos(k \cdot \delta)$

The minimum is for

$k \cdot \delta = \pi$ → first minimum →

In our case:

$\psi = \frac{1}{\sqrt{2}}\psi_1 + \frac{1}{\sqrt{2}}\psi_2 = \frac{1}{\sqrt{2}}\left(e^{ik(y+\delta/2)} + \frac{1}{\sqrt{2}} e^{ik(y+\delta/2)}\right.$

$|\psi|^2 = \frac{1}{2}\left[1 + 1 + 2\cos(k\delta)\right]$

$k\delta = \pi$ → you get a zero...

This is true for:

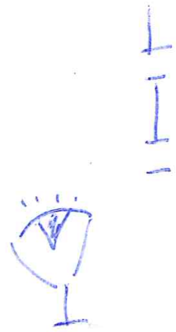
$k \cdot \delta = (2m+1)\pi$, but $k = \frac{2\pi}{\lambda}$ → $\frac{2\pi}{\lambda}\delta = (2m+1)\pi$ → $\boxed{\delta = (2m+1)\frac{\lambda}{2}}$

q.e.d.

Add a modulation $f(y^2)$ ....

$$|\psi|^2 = f(y^2)\left[1 + \cos\left(k \cdot \frac{d}{L} y\right)\right]$$

Now, let us include the detector:



$\psi_{tot}(y, \alpha_i)$

$$\psi_{tot} = \frac{1}{\sqrt{2}} \psi_1 \, \phi_1(\alpha_i) + \frac{1}{\sqrt{2}} \psi_2 \, \phi_2(\alpha_i)$$

$$|\psi_{tot}|^2 = \frac{1}{2} f(y^2)\left[|\phi_1(\alpha_i)|^2 + |\phi_2(\alpha_2)|^2 + \phi_1 \phi_2^* e^{i\omega S} + \phi_1^* \phi_2^* e^{-i\omega S}\right]$$

But $\phi_1 \phi_2^* \simeq 0$

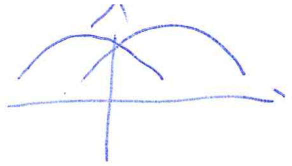
$\phi_2^* \phi_1 \simeq 0$

$$\phi_1(\alpha_i) = \prod_{k=1}^{N_A} \varphi_k^{(1)}(\alpha_k)$$

$$\phi_2(\alpha_i) \quad \prod_{k=1}^{N_A} \varphi_k^{(2)}(\alpha_k)$$

$$\phi_1 \cdot \phi_2^* = \prod_k \varphi_k^{(1)}(\alpha_k) \varphi_k^{(2)*}(\alpha_k)$$

Even if



$$\varphi_K^{(1)}(\alpha_K=0)\,\varphi_K^{(2)*}(\alpha_K=0) \cong 0.99$$

$$\rightarrow (0.99)^{N_A} \cong 0!$$

$$|\Psi_{tot}|^2 = \frac{1}{2} f(y^2) \left[|\phi_1(\alpha_i)|^2 + |\phi_2(\alpha_i)|^2 \right]$$

$$\int_{-\infty}^{\infty} d\alpha_i \, |\Psi_{tot}|^2 = f(y^2) \quad \Rightarrow \quad \text{No interference}$$