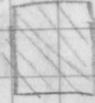


Homework 12: Two State Systems

1) Flux = 2.34×10^{18} photons/m²

1. Flux after horizontal filter? $\frac{2.34}{2} \Rightarrow 1.17 \times 10^{18}$ photons/m²

2. Rotated $\theta = 35^\circ$



What is flux now? Still only 1 filter. (1.17×10^{18})

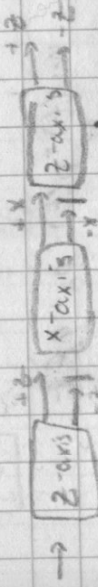
3. Polarization state after rotated filter? $\psi = a\psi_H + b\psi_V$

$\cos(35^\circ) = 0.819$ $a = 0.819$

4. $b = \sin(35^\circ)$

$b \approx 0.57$

2) Stern-Gerlach



1. $\psi = a\psi_H + b\psi_V$ $+z = \uparrow$

$a = 1$

3. Chances a $+z$ photon goes to $+x$? 0.5

5. $+z$ in step 1. Chance to be in $+z$ step 3?

$0.5 \cdot 0.5 = 0.25$

3) For 45° : $\frac{e^{i\theta}}{\sqrt{2}} (\psi_H + \psi_V)$

1. Block arm 1.

Probability detected photon is horizontal? 0.5

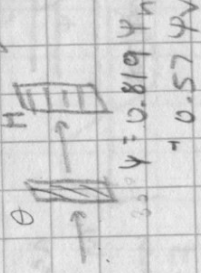
2. Unblock arm 1. Horizontal. Probability? Horizontal: $e^{i\theta} \psi_H$

$\phi = \frac{2\pi(2.11)2\pi}{\lambda} \approx 3.44$ rad

$\psi = e^{i\phi} \psi_H + \frac{e^{i\theta}}{\sqrt{2}} (\cos(6+3.44)) (\psi_H + \psi_V)$

$(1 - \frac{0.954}{\sqrt{2}})$

5. Probability the photon goes through a subsequent H filter



$P = \frac{(0.819)^2}{(0.819)^2 + (0.57)^2}$

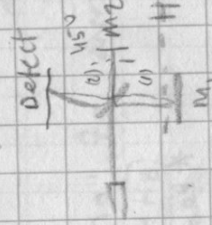
$P \approx 0.674$

$2.16 = 0$

4. Currently in $+x$. Probability of $-z$ in last step? 0.5

6. $+z$ in step 3?

0.25



$2(L_2 - L_1) = 274$ nm
 $\lambda = 500$ nm