

Homework III - PHYS652 , due friday

1. A spin 1/2 particle is in the state: $\chi = B \begin{pmatrix} 4 \\ 3i \end{pmatrix}$.
 - a) If you measure S_y , what measurement values and states (eigen spinors) can you expect (proof). With what probability will you find the value $-\hbar/2$ in the measurement?
 - b) Now, assume you really got $-\hbar/2$ in the measurement in a). Immediately after this measurement (at time $t = 0$) the electron enters an oscillating magnetic field $\mathbf{B} = B_0 \sin \omega t \hat{\mathbf{z}}$. Determine the spinor $\chi(t)$. Calculate the probability for getting the value $\hbar/2$, if you measure S_y .
 - c) What is the minimum field B_0 required (in b) for a spin-flip to occur?
2. At time $t = 0$, a spin 1/2 particle, which is in the spin up state w.r. to S_x , is put into a magnetic field $B = (0, 0, B)$, where it precesses. After a time T the direction of the magnetic field is suddenly changed to $B = (0, B, 0)$. Another time interval T later S_x is measured. What is the probability for finding $\hbar/2$?
3. shankar: 14.5.3
4. shankar: 14.5.4