

## Time Evolution of a Spin-1/2 System

Two particles are under the influence of an interaction with a Hamiltonian that is proportional to  $\hat{S}_z$ :

$$\hat{H} = \omega_0 \hat{S}_z$$

At  $t = 0$ :

1. one is in the state  $|+\rangle_x$ .
2. the other particle is in the state  $|+\rangle$

For each particle:

1. What values of energy could you measure?
  2. What are the energy eigenstates?
  3. What state is each particle in at a later time  $t$ ?
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4. What are the probabilities for each energy measurement?
  5. What is the probability that you would measure  $S_x = \frac{\hbar}{2}$  state at time  $t$ ? Does this probability change with time?
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6. What is the probability that you would measure  $S_z = \frac{\hbar}{2}$  at time  $t$ ? Does this probability change with time?
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7. Given a Hamiltonian, how would you determine which states are stationary states (states where no probabilities change with time)? Under what circumstances do measurement probabilities change with time?