

# Zander

## Spin

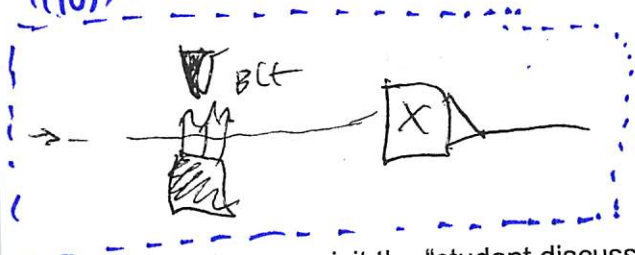
Do you think a measurement of  $S_z$  on a particle in state  $|+\rangle$ , should have a determined (formulaic) value? (That is, can you predict the experimental value in advance?)



What about the final state after the measurement, do you think there is any formula predicting that in advance of the measurement?

$$S_z = \pm \hbar \Rightarrow | \pm_z \rangle$$

(10)



(12)

$$\cos \theta |0\rangle + e^{i\phi} \sin \theta |1\rangle$$



Please revisit the "student discussion" at the bottom of the previous page. Are your responses still the same? Can you see why I would strongly disagree with the claim that  $0|\varphi\rangle$  means "a measurement of 0 on state  $|\varphi\rangle$ "?

(1)  $|\psi(0)\rangle = |0\rangle + |1\rangle$

(2)  $H(\theta) = \theta \hat{Z} = \begin{pmatrix} \theta & 0 \\ 0 & -\theta \end{pmatrix}$

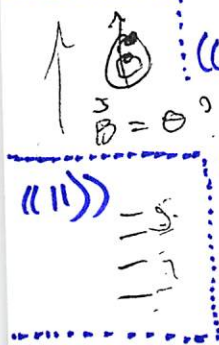
(3)  $U = e^{-i\theta \hat{Z}}$

(4)  $|\psi(t)\rangle = e^{-i\theta t} |0\rangle + e^{i\theta t} |1\rangle$

(5)  $|\psi(t)\rangle = e^{-i\theta t} (|+\rangle + |-\rangle) + e^{i\theta t} (|+\rangle - |-\rangle)$   
 $= (e^{-i\theta t} + e^{i\theta t}) |+\rangle + (e^{-i\theta t} - e^{i\theta t}) |-\rangle$   
 (norm)

(7)  $= \cos \theta t |+\rangle - i \sin \theta t |-\rangle$

(6)



(9)



(8)

