$$\langle x | \Psi \rangle = \langle x | \sum_{i=1}^{N} c_i |\phi_i\rangle \rightarrow \Psi(x) \rightsquigarrow \text{fungsi gelombang}$$

ket / keadaan kuantum

basis

kompleks

$$|\Psi(x)|^2 = \Psi^*(x)\Psi(x)$$

↳ rapat probabilitas

$$\int_{a=-\infty}^{b=\infty} |\Psi(x)|^2 \, dx = 1$$

$$|\Psi(x)|^2 \, dx$$

probabilitas menemukan partikel pada $x \rightarrow x + dx$

$$|\psi\rangle = c_1|\phi_1\rangle + c_2|\phi_2\rangle + \dots + c_N|\phi_N\rangle$$

Himpunan basis : $\{|\phi_i\rangle\}$ orthonormal

$|\psi\rangle_{spin} = c_\uparrow|\uparrow\rangle + c_\downarrow|\downarrow\rangle$ $\frac{1}{\sqrt{2}}$ $\frac{1}{\sqrt{2}}$

$$\langle\phi_i|\phi_j\rangle = \begin{cases} 1, & i=j \\ 0, & i\neq j \end{cases}$$

photon $|\psi\rangle_{photon}$

electron $|\psi\rangle_{electron}$

$\hat{i}\cdot\hat{i} = 1$

$\hat{i}\cdot\hat{j} = 0$

$$|c_i|^2 = P_r(|\phi_i\rangle)$$

$$\boxed{\sum_{i=1}^{N}|c_i|^2 = 1}$$

$+\frac{\hbar}{2}S_z\uparrow$ $\downarrow -\frac{\hbar}{2}S_z$

SG

1000 photon @ $|\psi\rangle = \frac{1}{\sqrt{2}}|H\rangle + \frac{1}{\sqrt{2}}|V\rangle$

1. $|H\rangle$
2. $|H\rangle$
3. $|V\rangle$

$\vdots$

999 $|H\rangle$

1000 $|V\rangle$

499 $\rightsquigarrow |H\rangle \to +1$

501 $\rightsquigarrow |V\rangle \to -1$

$$|\psi\rangle = \sum c_i |\phi_i\rangle$$

$$x = \bar{x} \pm \sigma \quad \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$\hat{O}|\psi\rangle = \lambda|\psi\rangle$$

besaran fisis yg mau diukur (observables)

$$\{\lambda_i\}$$

$$\lambda_1 \to |\phi_1\rangle$$

$$\lambda_2 \to |\phi_2\rangle$$

$$\vdots$$

$$\lambda_N \to |\phi_N\rangle$$

$$\langle \hat{O} \rangle = \sum \Pr(|\phi_i\rangle) . \lambda_i$$

$$= \sum_i |c_i|^2 . \lambda_i$$

$$= \frac{1}{2} \cdot (+1) + \frac{1}{2}(-1)$$

$$= 0$$

$$\Delta \hat{O} = \sqrt{\langle \hat{O}^2 \rangle - \langle \hat{O} \rangle^2}$$

$$|\psi_0\rangle = |0\rangle \otimes |0\rangle \otimes |0\rangle = \begin{bmatrix}1\\0\end{bmatrix} \otimes \begin{bmatrix}1\\0\end{bmatrix} \otimes \begin{bmatrix}1\\0\end{bmatrix} = \begin{bmatrix}1\\0\\0\\ \vdots \\0\end{bmatrix}$$

$$|\psi_1\rangle =$$

$$= \begin{bmatrix}0\\1\\0\\ \vdots\\0\end{bmatrix}$$

$$|\psi_2\rangle$$

$\vdots$

$|000\rangle$

$|001\rangle$

$|010\rangle$

$|100\rangle$

$|101\rangle$

$|101\rangle$

$|110\rangle$

$|111\rangle$

$$|\psi_7\rangle = |111\rangle = \begin{bmatrix}0\\0\\0\\0\\ \vdots\\1\end{bmatrix}$$