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Matrix representation for every "individual" spin axis

why individual?

Because S^2 where they represent the S_x^2, S_y^2, S_z^2 the absolute value of the spin quantum number [1/2], S_x, S_y, S_z represents one individual unique axis

S_x, S_y, S_z [S quantum value = 1/2]

$$S_z |s\ m\rangle = m\hbar |s\ m\rangle \qquad \chi_+ \begin{pmatrix}1\\0\end{pmatrix} \quad \chi_- \begin{pmatrix}0\\1\end{pmatrix}$$

$$(S_z)\chi_+ = \frac{1}{2}\hbar\, \chi_+$$

any spin operator derived in 2X2 matrix

m_s [orientation of the spin value]

reduced planck constant

$[\frac{1}{2}\hbar = \frac{\hbar}{2}]$

$$= \begin{pmatrix} c & d \\ e & f \end{pmatrix}\begin{pmatrix}1\\0\end{pmatrix} = \frac{\hbar}{2}\begin{pmatrix}1\\0\end{pmatrix}$$

$$\begin{pmatrix} c & 0 \\ e & 0 \end{pmatrix} = \begin{pmatrix}\frac{\hbar}{2}\\0\end{pmatrix} \qquad c = \frac{\hbar}{2} \qquad e = 0$$

$\hbar\, |s\ m\rangle$

$$S_z \chi_- = \hbar/2 (\chi_-)$$

$$\begin{pmatrix} c & d \\ e & f \end{pmatrix}\begin{pmatrix} 0 \\ 1 \end{pmatrix} = \frac{\hbar}{2}\begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$S_z = \begin{pmatrix} c & d \\ e & f \end{pmatrix}$$

$$\begin{matrix} 0 \\ 0 \end{matrix}\begin{pmatrix} d \\ f \end{pmatrix} = \begin{matrix} 0 \\ \hbar/2 \end{matrix}$$

$$d = 0$$
$$f = \hbar/2$$

$$S_z = \begin{pmatrix} \hbar/2 & 0 \\ 0 & \hbar/2 \end{pmatrix}$$

take common factor

$$S_z = \hbar/2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

Hilroy

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