2016 / 10 / 5 (수) (1)

먼저 계산하고 싶은 것은 nonsymmorphic operator를 $|J_z=\frac{1}{2}, A\rangle$에 적용했을 때 무엇을 얻을까 하는 것이다.

일단 $|J_z=\frac{1}{2}\rangle = \frac{1}{\sqrt{3}}\left(|d_{yz}\downarrow\rangle + i|d_{zx}\downarrow\rangle + |d_{xy}\uparrow\rangle \right)$

$|J_z=-\frac{1}{2}\rangle = \frac{1}{\sqrt{3}}\left(|d_{yz}\uparrow\rangle - i|d_{zx}\uparrow\rangle - |d_{xy}\downarrow\rangle \right)$

을 적고 $|J_z=\frac{1}{2}, A\rangle$에 G_x를 apply 해 보자.

$$G_x|J_z=\tfrac{1}{2}, A\rangle = \frac{1}{\sqrt{3}}\left(G_x|d_{yz}\downarrow, A\rangle + iG_x|d_{zx}\downarrow A\rangle + G_x|d_{xy}\uparrow A\rangle \right)$$

$$= \frac{1}{\sqrt{3}}\Big(i|d_{yz}\uparrow, B\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle + |d_{zx}\uparrow B\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle$$
$$-i|d_{xy}\downarrow B\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle \Big)$$

$$\boxed{\begin{array}{l} i\sigma_x|\uparrow\rangle = i|\downarrow\rangle, \quad i\sigma_x|\downarrow\rangle = i|\uparrow\rangle \\ G_x|d_{yz}A\rangle = |d_{yz}B\rangle, \quad G_x|d_{zx}A\rangle = -|d_{zx}B\rangle, \quad G_x|d_{xy}A\rangle = -|d_{xy}B\rangle \end{array}}$$

$$G_x|J_z=\tfrac{1}{2}, B\rangle = \frac{1}{\sqrt{3}}\left(G_x|d_{yz}\downarrow B\rangle + iG_x|d_{zx}\downarrow B\rangle + G_x|d_{xy}\uparrow B\rangle \right)$$

$$= \frac{1}{\sqrt{3}}\Big(i|d_{yz}\uparrow A\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle + |d_{zx}\uparrow A\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle - i|d_{xy}\downarrow A\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle \Big)$$

$$G_x|J_z=-\tfrac{1}{2}, A\rangle = \frac{1}{\sqrt{3}}\left(G_x|d_{yz}\uparrow A\rangle - iG_x|d_{zx}\uparrow A\rangle - G_x|d_{xy}\downarrow A\rangle \right)$$

$$= \frac{1}{\sqrt{3}}\Big(i|d_{yz}\downarrow B\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle - |d_{zx}\downarrow B\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle$$
$$+i|d_{xy}\uparrow B\,(-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t)\rangle \Big)$$

2016 / 10 / 5 (水) (2)

$$G_x | J_z = -\tfrac{1}{2}\ B \rangle = \frac{1}{\sqrt{3}} \Big(G_x | d_{yz} \uparrow\ B \rangle - i G_x | d_{zx} \uparrow\ B \rangle - G_x | d_{xy} \downarrow\ B \rangle \Big)$$

$$= \frac{1}{\sqrt{3}} \Big(i | d_{yz} \downarrow A\ (-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t) \rangle - | d_{zx} \downarrow A\ (-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t) \rangle$$

$$+ i | d_{xy} \uparrow A\ (-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t) \rangle \Big)$$

$$G_x | J_z = \tfrac{1}{2}, A \rangle = i\ | J_z = -\tfrac{1}{2}, B\ (-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t) \rangle$$

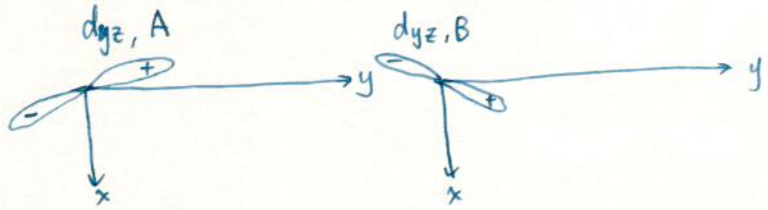
$$G_x | J_z = \tfrac{1}{2}, B \rangle = i\ | J_z = -\tfrac{1}{2}, A\ (-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t) \rangle$$

$$G_x | J_z = -\tfrac{1}{2}, A \rangle = i\ | J_z = \tfrac{1}{2}, B\ (-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t) \rangle$$

$$G_x | J_z = -\tfrac{1}{2}, B \rangle = i\ | J_z = \tfrac{1}{2}, A\ (-x+\tfrac{1}{2}, y+\tfrac{1}{2}, t) \rangle .$$

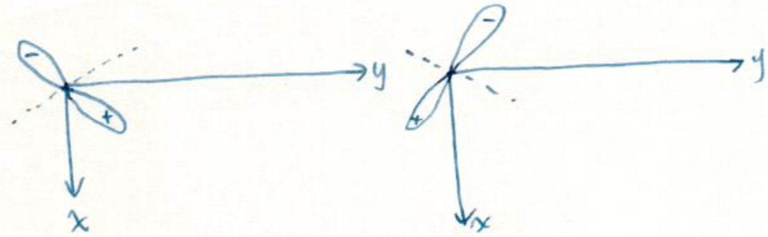
$$G_x | d_{yz}, A \rangle = | d_{yz}, B \rangle$$

$$G_x | d_{yz}, B \rangle = | d_{yz}, A \rangle$$



$$G_x | d_{zx}, A \rangle = - | d_{zx}, B \rangle$$

$$G_x | d_{zx}\ B \rangle = - | d_{zx}, A \rangle$$



$$G_x | d_{xy}, A \rangle = - | d_{xy}, B \rangle$$

$$G_x | d_{xy}, B \rangle = - | d_{xy}, A \rangle .$$