

## 117<sup>th</sup> Eigenvector

$$N_e = 4 \quad s = 0 \quad m_s = 0$$

Irred. Representation :  $\Gamma_{3,1}$

$$E_{117} = -J + U + 10W + \left( \frac{\cos(\theta_1)}{\sqrt{3}} - \sin(\theta_1) \right) \sqrt{A_1}$$

$$\begin{aligned} |\Psi_{117}\rangle &= |4, 0, 0, \Gamma_{3,1}\rangle \\ &= C_{117,1} (|0022\rangle + |0220\rangle + |2002\rangle + |2200\rangle) \\ &+ C_{117,2} (|0202\rangle + |2020\rangle) \\ &+ C_{117,3} (|02du\rangle - |02ud\rangle + |0du2\rangle - |0ud2\rangle + |20du\rangle - |20ud\rangle + |2du0\rangle - |2ud0\rangle \\ &\quad + |d02u\rangle + |d20u\rangle + |du02\rangle + |du20\rangle - |u02d\rangle - |u20d\rangle - |ud02\rangle - |ud20\rangle) \\ &+ C_{117,4} (|0d2u\rangle - |0u2d\rangle + |2d0u\rangle - |2u0d\rangle + |d0u2\rangle + |d2u0\rangle - |u0d2\rangle - |u2d0\rangle) \\ &+ C_{117,5} (|dduu\rangle - |duud\rangle - |uddu\rangle + |uudd\rangle) \end{aligned}$$

$$\begin{aligned} C_{117-1} &= \frac{t(J+U)}{\sqrt{3}} \\ &+ \left( \frac{1}{3}t \left( \sqrt{3}(U-2W) + (\cos(\theta_1) - \sqrt{3}\sin(\theta_1)) \sqrt{A_1} \right) \right) \end{aligned}$$

$$\begin{aligned} C_{117-2} &= -\frac{2t(J+U)}{\sqrt{3}} \\ &+ \left( -\frac{2}{3}t \left( \sqrt{3}(U-2W) + (\cos(\theta_1) - \sqrt{3}\sin(\theta_1)) \sqrt{A_1} \right) \right) \end{aligned}$$

$$\begin{aligned} C_{117-3} &= -\frac{J^2 + 2(U-2W)J + U^2}{4\sqrt{3}} \\ &+ \left( \frac{1}{36} \left( 12\sqrt{3}(J+U-W)W - (\sqrt{3}\cos(2\theta_1) + 3\sin(2\theta_1) - 2\sqrt{3}) A_1 \right) \right) \end{aligned}$$

$$\begin{aligned}
C_{117-4} &= \frac{J^2 + 2(U - 2W)J + U^2}{2\sqrt{3}} \\
&\quad + \left( \frac{1}{18} \left( (\sqrt{3} \cos(2\theta_1) + 3 \sin(2\theta_1) - 2\sqrt{3}) A_1 - 12\sqrt{3}(J + U - W)W \right) \right) \\
C_{117-5} &= \sqrt{3}t(J + U) \\
&\quad + \left( t \left( \sqrt{3}(U - 2W) + (\sqrt{3} \sin(\theta_1) - \cos(\theta_1)) \sqrt{A_1} \right) \right) \\
N_{117} &= \sqrt{4C_{117,1}^2 + 2C_{117,2}^2 + 16C_{117,3}^2 + 8C_{117,4}^2 + 4C_{117,5}^2}
\end{aligned}$$