123^{rd} Eigenvector

$\boldsymbol{N_e \;=\; 4 \qquad s = 0 \qquad m_s = 0}$

Irred. Representation : $\boldsymbol{\Gamma_{4,1}}$

$$E_{123} \;=\; -\frac{2A_{10}}{3}$$

$$\begin{aligned}
|\Psi_{123}\rangle &= |4,0,0,\Gamma_{4,1}\rangle \\
&= C_{123,1}\left(|0022\rangle - |2200\rangle\right) \\
&+ C_{123,2}\left(|02du\rangle - |02ud\rangle + |20du\rangle - |20ud\rangle - |du02\rangle - |du20\rangle + |ud02\rangle + |ud20\rangle\right) \\
&+ C_{123,3}\left(|0d2u\rangle + |0du2\rangle - |0u2d\rangle - |0ud2\rangle - |2d0u\rangle - |2du0\rangle + |2u0d\rangle + |2ud0\rangle \right. \\
&\qquad \left. + |d02u\rangle + |d0u2\rangle - |d20u\rangle - |d2u0\rangle - |u02d\rangle - |u0d2\rangle + |u20d\rangle + |u2d0\rangle\right)
\end{aligned}$$

$$\begin{aligned}
C_{123-1} &= -4\sqrt{2}t^2 \\
C_{123-2} &= \frac{-2A_{10}^2 + 3(J-3(U+6W))A_{10} + 9\left(4t^2 + (J-U-10W)(U+4W)\right)}{9\sqrt{2}} \\
C_{123-3} &= -\frac{1}{3}\sqrt{2}t\left(J+U-2W+\cos\left(\theta_2\right)\sqrt{A_2}\right) \\
N_{123} &= \sqrt{2C_{123,1}^2 + 8C_{123,2}^2 + 16C_{123,3}^2}
\end{aligned}$$