121$^{\text{st}}$ Eigenvector

$N_e \;=\; 4 \qquad s = 0 \qquad m_s = 0$

Irred. Representation : $\Gamma_{3,2}$

$$
E_{121} \;=\; -J + U + 10W + \left(\frac{\cos(\theta_1)}{\sqrt{3}} - \sin(\theta_1) \right) \sqrt{A_1}
$$

$$
\begin{aligned}
|\Psi_{121}\rangle \;=\;& |4,0,0,\Gamma_{3,2}\rangle \\
=\;& C_{121,1} \left(|0022\rangle - |0220\rangle - |2002\rangle + |2200\rangle \right) \\
+\;& C_{121,2} \left(|02du\rangle - |02ud\rangle - |0du2\rangle + |0ud2\rangle + |20du\rangle - |20ud\rangle - |2du0\rangle + |2ud0\rangle \right. \\
& \qquad \left. - |d02u\rangle - |d20u\rangle + |du02\rangle + |du20\rangle + |u02d\rangle + |u20d\rangle - |ud02\rangle - |ud20\rangle \right) \\
+\;& C_{121,3} \left(|dduu\rangle + |duud\rangle + |uddu\rangle + |uudd\rangle \right) \\
+\;& C_{121,4} \left(|dudu\rangle + |udud\rangle \right)
\end{aligned}
$$

$$
\begin{aligned}
C_{121-1} \;=\;& t(J+U) \\
& + \left(t(U-2W) + \left(\frac{t\cos(\theta_1)}{\sqrt{3}} - t\sin(\theta_1) \right) \sqrt{A_1} \right) \\
C_{121-2} \;=\;& \frac{1}{4} \left(-J^2 - 2UJ + 4WJ - U^2 \right) \\
& + \left((J+U-W)W - \frac{1}{12} \left(\cos(2\theta_1) + \sqrt{3}\sin(2\theta_1) - 2 \right) A_1 \right) \\
C_{121-3} \;=\;& -t(J+U) \\
& + \left(\left(\frac{t\cos(\theta_1)}{\sqrt{3}} - t\sin(\theta_1) \right) \sqrt{A_1} - t(U-2W) \right) \\
C_{121-4} \;=\;& 2t(J+U) \\
& + \left(\frac{2}{3}t \left(3(U-2W) + \left(3\sin(\theta_1) - \sqrt{3}\cos(\theta_1) \right) \sqrt{A_1} \right) \right) \\
N_{121} \;=\;& \sqrt{4C_{121,1}^2 + 16C_{121,2}^2 + 4C_{121,3}^2 + 2C_{121,4}^2}
\end{aligned}
$$