$$
\begin{aligned}
\Psi_{112} &= C_1\left(|0022\rangle - |0220\rangle - |2002\rangle + |2200\rangle\right) \\
&\quad + C_2\left(-|02du\rangle + |02ud\rangle + |0du2\rangle - |0ud2\rangle - |20du\rangle + |20ud\rangle + |2du0\rangle - |2ud0\rangle + |d02u\rangle + |d20u\rangle - |du02\rangle - |du20\rangle - |u02d\rangle - |u20d\rangle + |ud02\rangle + |ud20\rangle\right) \\
&\quad + C_3\left(|dudu\rangle + |udud\rangle\right) \\
&\quad + C_4\left(|dduu\rangle + |duud\rangle + |uddu\rangle + |uudd\rangle\right)
\end{aligned}
$$

$$
C_1 = \frac{48\,t^2 + 3\,U^2 + 3\,3^{\frac{1}{3}}\,U\left(-36\,t^2\,U + \sqrt{3}\,\sqrt{-4096\,t^6 - 336\,t^4\,U^2 - 48\,t^2\,U^4 - U^6}\right)^{\frac{1}{3}} + 3^{\frac{2}{3}}\left(-36\,t^2\,U + \sqrt{3}\,\sqrt{-4096\,t^6 - 336\,t^4\,U^2 - 48\,t^2\,U^4 - U^6}\right)^{\frac{2}{3}}}{2\,\sqrt{3}\,\left(48\,t^2 + 3\,U^2 - 3\,3^{\frac{1}{3}}\,U\left(-36\,t^2\,U + \sqrt{3}\,\sqrt{-4096\,t^6 - 336\,t^4\,U^2 - 48\,t^2\,U^4 - U^6}\right)^{\frac{1}{3}} + 3^{\frac{2}{3}}\left(-36\,t^2\,U + \sqrt{3}\,\sqrt{-4096\,t^6 - 336\,t^4\,U^2 - 48\,t^2\,U^4 - U^6}\right)^{\frac{2}{3}}\right)}
$$

$$
C_2 = \frac{-\left(48\,t^2 + 3\,U^2 + 3\,3^{\frac{1}{3}}\,U\left(-36\,t^2\,U + \sqrt{3}\,\sqrt{-4096\,t^6 - 336\,t^4\,U^2 - 48\,t^2\,U^4 - U^6}\right)^{\frac{1}{3}} + 3^{\frac{2}{3}}\left(-36\,t^2\,U + \sqrt{3}\,\sqrt{-4096\,t^6 - 336\,t^4\,U^2 - 48\,t^2\,U^4 - U^6}\right)^{\frac{2}{3}}\right)}{24\,3^{\frac{5}{6}}\,t\left(-36\,t^2\,U + \sqrt{3}\,\sqrt{-4096\,t^6 - 336\,t^4\,U^2 - 48\,t^2\,U^4 - U^6}\right)^{\frac{1}{3}}}
$$

$$
C_3 = -\left(\frac{1}{\sqrt{3}}\right)
$$

$$
C_4 = \frac{1}{2\,\sqrt{3}}
$$