

$$q_R = \left[\cos\left(\frac{\theta}{2}\right), \frac{\omega_x}{l_\omega} \sin\left(\frac{\theta}{2}\right), \frac{\omega_y}{l_\omega} \sin\left(\frac{\theta}{2}\right), \frac{\omega_z}{l_\omega} \sin\left(\frac{\theta}{2}\right) \right]$$