$$R_z(\phi) = \exp(-i\phi Z/2) = \begin{pmatrix} e^{-i\phi/2} & 0 \\ 0 & e^{i\phi/2} \end{pmatrix} = \texttt{rz}(\phi) \tag{1}$$

$$\exp(-i\phi Z_1 Z_2/2) = \texttt{rzz}(\phi) \tag{2}$$

$$H = -\sum \frac{1-Z}{2} + \omega \sum_{\text{compl.}} \frac{1-Z_a}{2}\frac{1-Z_b}{2} \sim \sum \frac{Z}{2} + \frac{\omega}{4} \sum_{\text{compl.}} (Z_a Z_b - Z_a - Z_b) \tag{3}$$

$$\begin{aligned} \exp[-i\gamma H] &= \exp[-i\gamma Z/2] \cdot \exp[-i\gamma\omega Z_a Z_b/4] \cdot \exp[i\gamma\omega Z_a/4] \cdot \exp[i\gamma\omega Z_b/4] \\ &= \texttt{rz}(\gamma) \cdot \texttt{rzz}(\gamma\omega/2) \cdot \texttt{rz}(-\gamma\omega/2) \cdot \texttt{rz}(-\gamma\omega/2) \\ &= \texttt{rz}(\gamma(1-\omega)) \cdot \texttt{rzz}(\gamma\omega/2) \end{aligned} \tag{4}$$

$$H_M = \sum X \tag{5}$$

$$\exp[-i\beta H_M] = \exp[-i\beta X] = \texttt{rx}(2\beta) \tag{6}$$