

$$\begin{array}{c}
\langle \mathbf{0}, \mathbf{0} | \\
\langle \mathbf{0}, \mathbf{1} | \\
\langle \mathbf{1}, \mathbf{0} | \\
\langle \mathbf{1}, \mathbf{1} |
\end{array}
\begin{pmatrix}
& \begin{array}{c} | \mathbf{0}, \mathbf{0} \rangle \\ | \mathbf{0}, \mathbf{1} \rangle \end{array} & \begin{array}{c} | \mathbf{1}, \mathbf{0} \rangle \\ | \mathbf{1}, \mathbf{1} \rangle \end{array} \\
1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 \\
0 & 0 & \hat{U}_{11} & \hat{U}_{12} \\
0 & 0 & \hat{U}_{21} & \hat{U}_{22}
\end{pmatrix}$$