Introductory Equations

$$\psi(A) = \psi_{1R}(\psi_{1C}(A)) = \psi_{1C}(\psi_{1R}(A)) \tag{1}$$

$$\psi(B) = \psi_{1R}(\psi_{1C}(B)) = \psi_{1C}(\psi_{1R}(B)) \tag{2}$$

$$\Gamma' = \psi(A)\psi(B)$$

$$\Gamma'_{i,j} = \langle \psi_{1C}(\psi_{1R}(A))_{ri}, \psi_{1R}(\psi_{1C}(B))_{ci} \rangle \tag{3}$$

$$\Gamma'_{i,j} = \langle \psi_{1R}(\psi_{1C}(A))_{ri}, \psi_{1C}(\psi_{1R}(B))_{ci} \rangle \tag{4}$$

$$\psi_{1C}(A) = \begin{cases} \frac{A_{i,j} + A_{i,j+1}}{\sqrt{2}} & j < col \\ \frac{A_{i,j} - A_{i,j+1}}{\sqrt{2}} & j \geq col \end{cases}$$

$$\psi_{1R}(A) = \begin{cases} \frac{A_{i,j} + A_{i+1,j}}{\sqrt{2}} & i < row \\ \frac{A_{i,j} - A_{i+1,j}}{\sqrt{2}} & i \geq row \end{cases}$$

Four Cases

1. $i < \frac{row}{2}$ and $j < \frac{col}{2}$
2. $i \geq \frac{row}{2}$ and $j < \frac{col}{2}$
3. $i < \frac{row}{2}$ and $j \geq \frac{col}{2}$
4. $i \geq \frac{row}{2}$ and $j \geq \frac{col}{2}$