

$$A = \begin{bmatrix} L_{2d} + U_x & U_y & 0 & \Delta x \\ V_x & L_{2d} + V_y & 0 & \Delta y \\ W_x & W_y & L_{2d} & i\beta I \\ \Delta x & \Delta y & i\beta I & 0 \end{bmatrix}$$

note each block has size $(n_x \times n_y) \times (n_x \times n_y)$

$$B = i\omega \begin{bmatrix} I & 0 & 0 & 0 \\ 0 & I & 0 & 0 \\ 0 & 0 & I & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

I SOLVE GENERALIZED EIGENVALUE PROBLEM

$$Ax = \lambda Bx \quad \text{IN SHIFT-AND-INVERT MODE}$$

$$\Rightarrow \text{I NEED } \underbrace{(A - \sigma B)^{-1} B}_{\hookrightarrow \text{LU}}$$