

$$\begin{aligned} \mathcal{L} = & \psi_+^\dagger \left(\partial_\tau - i\partial_x - \partial_y^2 \right) \psi_+ + \psi_-^\dagger \left(\partial_\tau + i\partial_x - \partial_y^2 \right) \psi_- \\ & - \phi \left(\psi_+^\dagger \psi_+ + \psi_-^\dagger \psi_- \right) + \frac{1}{2g^2} (\partial_y \phi)^2 \end{aligned}$$