

Calculating the Left Current

$$\hat{I}_L \propto -\frac{d}{dt} \left\langle \sum_{k \in L} \hat{a}_k^\dagger \hat{a}_k \right\rangle$$
$$\propto - \left\langle \sum_{k \in L} t_k (\hat{a}_0^\dagger \hat{a}_k - \hat{a}_k^\dagger \hat{a}_0) \right\rangle$$

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2. Take time derivative of classical quantity

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1. Take quantum time derivative
2. Map resulting operator to a classical quantity