

This is a straightforward application of the definition of $\partial_\mu, \partial^\mu$ and the K-G equation. Recall that

$$\partial_\mu = \left(\frac{\partial}{\partial t}, \nabla \right) \quad \text{and} \quad \partial^\mu = \left(\frac{\partial}{\partial t}, -\nabla \right) \quad (1)$$

and the 4-vector probability flux

$$\begin{aligned} j^\mu &= \frac{i}{2m} [\Psi^* \partial^\mu \Psi - (\partial^\mu \Psi)^* \Psi] \\ &= \frac{i}{2m} \left(\Psi^* \frac{\partial \Psi}{\partial t} - \frac{\partial \Psi^*}{\partial t} \Psi, -\Psi^* \nabla \Psi + \nabla \Psi^* \Psi \right) \end{aligned} \quad (2)$$

Then the inner product $\partial_\mu j^\mu$ is

$$\begin{aligned} \partial_\mu j^\mu &= \frac{i}{2m} \left[\frac{\partial}{\partial t} \left(\Psi^* \frac{\partial \Psi}{\partial t} - \frac{\partial \Psi^*}{\partial t} \Psi \right) + \nabla \cdot (-\Psi^* \nabla \Psi + \nabla \Psi^* \Psi) \right] \\ &= \frac{i}{2m} \left[\left(\Psi^* \frac{\partial^2 \Psi}{\partial t^2} - \frac{\partial^2 \Psi^*}{\partial t^2} \Psi \right) + (-\Psi^* \nabla^2 \Psi + \nabla^2 \Psi^* \Psi) \right] \\ &= \frac{i}{2m} \left[\underbrace{\Psi^* \left(\frac{\partial^2 \Psi}{\partial t^2} - \nabla^2 \Psi + m^2 \Psi \right)}_{\text{K-G eq.}} - \underbrace{\left(\frac{\partial^2 \Psi^*}{\partial t^2} - \nabla^2 \Psi^* + m^2 \Psi^* \right) \Psi}_{\text{conj. of K-G eq.}} \right] \\ &= 0 \end{aligned} \quad (3)$$

This shows that if we define

$$\rho(\mathbf{x}, t) = j^0(\mathbf{x}, t) = \frac{i}{2m} \left(\Psi^* \frac{\partial \Psi}{\partial t} - \frac{\partial \Psi^*}{\partial t} \Psi \right) \quad (4)$$

we would have a density conservation relation

$$\frac{\partial \rho}{\partial t} + \nabla \cdot \mathbf{j} = 0 \quad (5)$$

where \mathbf{j} is

$$\frac{i}{2m} (-\Psi^* \nabla \Psi + \nabla \Psi^* \Psi) = \frac{1}{m} \text{Im}(\Psi^* \nabla \Psi) \quad (6)$$

which is the same definition as equation (2.191).