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Mathematical Physics

Unstable particles in non-relativistic quantum mechanics?

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The Schroedinger equation is up-to-a-phase invariant under the Galilei group. This phase leads to the Bargmann's superselection rule, which forbids the existence of the superposition of states with different masses and implies that unstable particles cannot be described consistently in non-relativistic quantum mechanics. In this paper we claim that Bargmann's rule neglects physical effects and that a proper description of non-relativistic quantum mechanics requires to take into account this phase through the Extended Galilei group and the definition of its action on spacetime coordinates.

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