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The non-relativistic model of the fermion antiparticles in interaction with gauge field

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Abstract

This paper discusses various subtleties and problems related to the non-relativistic limit of fermionic quantum field theory to the Schrödinger equation. First, we discuss the concept of the single-particle state and its role in the non-relativistic limit of the field. We extend the non-relativistic limit of the Dirac equation of the action so that the non-relativistic limit of the wave functions of spin 1/2 particles and antiparticles appears simultaneously. We also study the non-relativistic limit using the Foldy–Wouthuysen transformation. Using the least substitution with the electromagnetic field in the Dirac action, we obtain the Schrödinger-Pauli equation for both the particle and the antiparticle.

Keywords: field non-relativistic limit, antiparticles, Schroedinger-Pauli equation

For full article, refer to the Persian section