

## Abstract

We develop relativistic wave equations in the framework of the new non-hermitian PT quantum mechanics. The familiar hermitian Dirac equation emerges as an exact result; we also find new models with properties that have no counterpart in hermitian quantum mechanics. For example in an 8-dimensional representation of the PT-generalized Dirac equation, non-hermitian mass matrices allow for flavor oscillation of two generations of neutrinos, even with an effective mass of zero for the neutrino. This violates what has become in recent years the conventional wisdom, that neutrinos must have mass in order to account for the observation of flavor oscillations. The PT-generalized Dirac equation is also Lorentz invariant, unitary in time, and CPT respecting, even though as a non-interacting theory it violates P and T individually. The relativistic wave equations are reformulated as canonical fermionic field theories to facilitate the study of interactions, and shown to maintain many of the canonical structures from hermitian field theory, but with tantalizing new possibilities permitted by the non-hermiticity parameter  $m_2$ .