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Axion contribution to the mass-radius relation of stellar compact objects

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A phenomenological Lagrangian for the interaction between a pseudo-scalar (axion-like) field and massive fermions is constructed and its statistical properties are discussed. For a gas comprised of neutrons which interact with axions we compute the equation of state, where causality and thermal equilibrium are explored. Numerical solution of the Tolman-Oppenheimer-Volkoff equations present the influence of this additional interaction on the mass-radius dependence for static spherical stars. According to our model the presence of the hypothetical axion can contribute up to 3% increase of a neutron star's mass. Observable properties of the system are considered within astrophysics and collider experiments.

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