

Pulsar kick velocity and strong magnetic fields

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We study the anisotropic neutrino emission from the core of neutron stars induced by the star's magnetic field. We model the core as made out of a magnetized ideal gas of strange quark matter and implement the conditions for stellar equilibrium in this environment. The calculation is performed without resorting to analytical simplifications and for temperature, density and magnetic field values corresponding to typical conditions for a neutron star's evolution. The anisotropic neutrino emission produces a rocket effect that contributes to the star's kick velocity. We find that the computed values for the kick velocity lie within the range of the observed values. We also show that neutrino quirkality flip during the birth of a neutron star, with a strange quark matter core, is an efficient mechanism to allow neutrinos to anisotropically escape, thus providing a plausible explanation for the observed neutron star kick velocities.

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