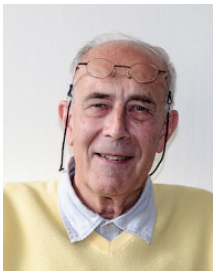

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Neutrino Scattering Rates of Neutron-star and Supernova Matter within Skyrme RPA

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Supernova explosions, which will leave behind a neutron star, are the most powerful neutrino sources. The neutrino emission is also the dominating cooling mechanism for a (proto-)neutron star, whose interior is mainly composed of extremely dense and hot nuclear matter. Neutrinos can be scattered frequently inside stars before they escape. We study the neutrino scattering rates of neutron-star and supernova matter within Skyrme RPA response functions. The neutrino scattering rates in neutron-star matter depend sensitively on the adopted interaction. The minimum scattering angle is different for different interactions because it depends on the Fermi velocity. We also find that many Skyrme interactions present the unphysical feature that the Fermi velocity of neutrons in neutron-star matter exceeds the speed of light at a density below the maximum central density of the neutron star predicted by the Skyrme interactions.

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