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Elastic neutrino scattering on nuclear systems as a probe of neutrino electromagnetic interactions

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Coherent elastic neutrino-nucleus scattering (CEvNS) is a new tool for examining the Standard Model and searching neutrino electromagnetic properties, which can be a manifestation of new physics [1]. We study the electromagnetic contribution to elastic neutrino-nucleon and neutrino-nucleus scattering processes. Following our approach developed for the case of elastic neutrino-electron [2] and neutrino-nucleon [3,4] collisions, in our formalism we account for the electromagnetic form factors of massive neutrinos: the charge, magnetic, electric, and anapole form factors of both diagonal and transition types. When treating the nucleon electromagnetic vertex, we take into account not only charge and magnetic form factors of a nucleon, but also its electric and anapole form factors. We inspect how the effects of the neutrino electromagnetic properties (in particular, millicharge, charge radii and magnetic moments) can be disentangled from those of the strange quark contributions to the nucleon's weak neutral current form factors. We also study how the neutrino electromagnetic form factors can manifest themselves in coherent elastic neutrino scattering on nuclear targets. We apply our formalism to the case of the (^{40}Ar) nucleus with neutrino energies typical for the CEvNS experiments.

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[2] K. Kouzakov, A. Studenikin, Electromagnetic properties of massive neutrinos in low-energy elastic neutrino-electron scattering, *Phys. Rev. D* 96, 099904 (2017), arXiv:1703.00401.

[3] K. Kouzakov, F. Lazarev, A. Studenikin, Electromagnetic neutrino interactions in elastic neutrino-proton scattering, *PoS (ICHEP2020)* 205.

[4] K. Kouzakov, F. Lazarev, A. Studenikin, Electromagnetic effects in elastic neutrino scattering on nucleons, 2021 *J. Phys.: Conf. Ser.* 2156 012225

In-person participation

No

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