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Elastic scattering of electromagnetic neutrinos on electrons

In the standard model neutrinos are massless left-handed fermions which very weakly interact with matter via exchange of the $W^{\pm}$ and Z_0 bosons. The development of our knowledge about neutrino masses and mixing provides a basis for exploring neutrino properties and interactions beyond the standard model (BSM). In this respect, the study of electromagnetic characteristics of massive neutrinos is of particular interest [1]. These characteristics include the electric charge (millicharge), the charge radius, the dipole magnetic and electric moments, and the anapole moment. Their effects can be searched in laboratory measurements of low-energy elastic (anti)neutrino-electron scattering in reactor, accelerator, and solar experiments.

The present contribution aims at delivering a thorough account of electromagnetic interactions of massive neutrinos in the theoretical formulation of low-energy elastic neutrino-electron scattering [2]. The formalism of neutrino charge, magnetic, electric, and anapole form factors defined as matrices in the mass basis is employed under the assumption of three-neutrino mixing. The flavor change of neutrinos traveling from the source to the detector is taken into account and the role of the source-detector distance is inspected. The effects of neutrino flavor-transition millicharges and charge radii in the scattering experiments are pointed out.

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[1] C. Giunti and A. Studenikin, *Neutrino electromagnetic interactions: A window to new physics*, Rev. Mod. Phys. **87**, 531 (2015).

[2] K. A. Kouzakov and A. I. Studenikin, *Electromagnetic properties of massive neutrinos in low-energy elastic neutrino-electron scattering*, Phys. Rev. D **95**, 055013 (2017).

Experimental Collaboration

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