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# Radiative corrections to low-energy neutral-current neutrino scattering and DAR sources

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One-loop radiative corrections introduce the dependence on the neutrino flavor in CEvNS. To consistently account for radiative corrections, we present the effective field theory of neutrinolepton and neutrino-quark interactions, embed quarks into nucleons and nucleons into nuclei. We calculate CEvNS cross sections and flavor asymmetries on the spin-0 nucleus at energies below 100 MeV including all kinematic dependence of radiative corrections. We provide a complete error budget accounting for uncertainties at nuclear, nucleon, hadronic, and quark levels, and add a perturbative error in quadrature. At 20-100 MeV energies, the uncertainty is limited by the knowledge of neutron distribution inside nuclei. Going to lower energies, hadronic contributions become the dominant source of uncertainty. To describe low-energy (anti)neutrino fluxes in modern coherent elastic neutrino-nucleus scattering experiments as well as high-energy fluxes in precision-frontier projects such as the Enhanced NeUtrino BEams from kaon Tagging (ENUBET) and the Neutrinos from STORed Muons (nuSTORM), we evaluate (anti)neutrino energy spectra from radiative muon, pion, and kaon decays at O(𝛼) level and quantify corresponding uncertainties. We discuss the corresponding changes to fluxes and neutrino-nucleus cross sections.

**Author:** TOMALAK, Oleksandr

**Presenter:** TOMALAK, Oleksandr

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