

# The devil is in the details: the role of the radiative corrections

*Wednesday 12 June 2024 09:40 (20 minutes)*

The quest for increasingly higher precision in the description of EW processes demands the introduction of so-called radiative corrections, due to higher-order vertex contributions to the couplings of interacting particles. In this talk, we will review the radiative corrections of interest for coherent elastic neutrino-nucleus scattering (CEvNS), focusing in particular on the neutrino charge radius, which represents the only non-null neutrino electromagnetic property in the standard model theory. Its value can be predicted with high accuracy and its effect is usually accounted for through the definition of a radiative correction affecting the neutrino couplings to nucleons at low energy, which results effectively in a shift of the weak mixing angle. Exploiting available CEvNS data, there have been many attempts to measure experimentally the neutrino charge radius, enabling one only to put constraints on such a quantity.

In this talk, we will discuss how to properly account for the neutrino charge radius in the CEvNS cross-section including the effects of the non-null momentum transfer in the neutrino electromagnetic form factor, which have been usually neglected when deriving the aforementioned limits. We show the impact of this effect by re-analysing the COHERENT cesium iodide and argon samples and the NCC-1701 germanium data from the Dresden-II nuclear power plant. The size of this correction is such that it will not be possible to neglect it in the analysis of data from future high-precision experiments. Furthermore, we will show how this momentum dependence can be exploited to significantly reduce the allowed values for the neutrino charge radius determination.

**Author:** DORDEI, Francesca (INFN, Cagliari (IT))

**Co-authors:** Dr GIUNTI, Carlo (Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Torino); CADEDU, Matteo; ATZORI CORONA, Mattia (University of Cagliari; INFN of Cagliari); CARGIOLI, Nicola

**Presenter:** DORDEI, Francesca (INFN, Cagliari (IT))

**Session Classification:** Talks