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Status of NUCLEUS, CRAB and ELOISE

Coherent neutrino-nucleus scattering (CEvNS) is a promising new tool in the toolbox of electroweak precision measurements at low q-transfer. It will enable precise measurements of standard model (SM) physics but also the search for new physics beyond the SM.

The NUCLEUS experiment aims for the first fully coherent CEvNS detection at a new experimental site, the Very Near Site (VNS), between the two 4 GW_{th} reactor cores of the Chooz power plant. The signature of a CEvNS event will be a nuclear recoil at the 10 eV-scale inside a CaWO₄ target crystal. Already in its prototype phase, NUCLEUS successfully demonstrated an unprecedented low detection threshold of 19.7 eV. Currently, the installation of the first phase of NUCLEUS with 10 g of target mass at the VNS is under preparation.

CRAB plans to perform a low-energy calibration that is crucial for NUCLEUS'operation. Any experiment looking for nuclear recoils at the 10 eV-scale requires a completely new type of calibration because common radioactive sources are already too energetic. CRAB intends to develop a new calibration technique relying on the capture of thermal neutrons inside the CaWO4 target crystal under emission of gamma rays of O(10 MeV) followed by a nuclear recoil with a recoil energy of about 100 eV. Currently CRAB is in its R&D phase and prepares first prototype tests. At a later stage, measurements at the TRIGA reactor at TU Wien are planned.

The recently started ELOISE project will provide reliable simulations of electromagnetic particle interactions in CaWO₄ down to O(10eV) which is a necessity for NUCLEUS and CRAB. However, all standard simulation packages have higher applicability limits above 250 eV. Furthermore, even at this "high"energy, the accuracy is only assessed for few materials but not CaWO₄. Within a time scale of four years, ELOISE plans to tackle this issue in a two-stage process: First, to evaluate the accuracy and second, if needed, to develop bespoken simulation code with increased accuracy.

In this contribution, we will first introduce the respective projects and highlight the Austrian contributions. Afterwards, we will report their current state before we finally will give an outlook to their future.

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