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TINY experiment: search for 0n2b decay with Zr-96 and Nd-150

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The TINY (Two Isotopes for Neutrinoless double beta decaY search) experiment aims to investigate neutrinoless double beta decay (0n2b) using the ^{96}Zr and ^{150}Nd isotopes. Both of them possess the crucial advantage of very high transition energy for the 0n2b process, which would allow the experimenters to obtain a higher sensitivity to the effective Majorana mass compared to other isotope candidates. However, those isotopes are not the focus for large experiments due to the unavailability of a suitable scalable detector technology.
TINY project is focused on the development of a "source=detector"technology for these two candidates. Bolometric detectors have proven their applicability for 0n2b decay searches, utilizing various absorber compounds and isotope candidates, as was done in CUORE (TeO_2 absorber), CUPID-Mo, AMoRe (Li_2MoO_4), CUPID-0 (ZnSe). These experiments have demonstrated high energy resolution and the possibility of active particle identification with scintillating cryogenic bolometers.
Following this approach, TINY will investigate dielectric absorbers containing the isotopes of interest: ^{96}Zr will be embedded into ZrO_2 crystals, measured with thermal sensors, and coupled to auxiliary light detectors for active alpha particles rejection. ^{150}Nd will be studied with magnetic $NdGaO_3$ absorbers and athermal phonon sensors. Particle identification will be achieved via pulse shape discrimination.
The successful R&D would provide technology for Zr- and Nd- -based bolometric detectors with high performance, which will be measured in the TINY pilot experiment. It will consist of a few kg scale underground demonstrator and will be able to set the best limits worldwide on the 0n2b half-lives for both ^{96}Zr and ^{150}Nd isotopes thanks to high efficiency and energy resolution.

Poster prize

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