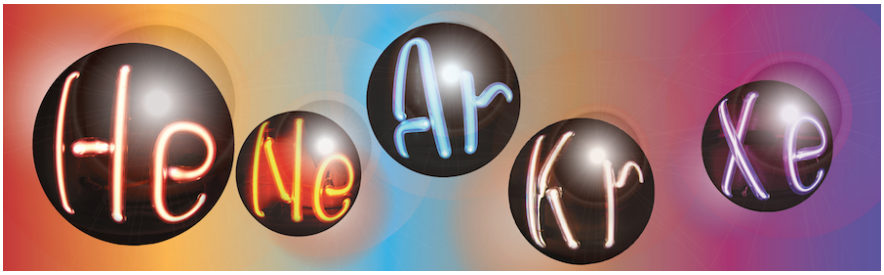

Contribution ID: **28** Type: **Oral Presentation**

Characterization of argon recoils at the keV scale with ReD and ReD+

Tuesday, 21 October 2025 14:20 (20 minutes)

The Recoil Directionality project (ReD) within the Global Argon Dark Matter Collaboration characterized the response of a liquid argon (LAr) dual-phase Time Projection Chamber (TPC) to neutron-induced nuclear recoils, to measure the charge yield Q_y at low-energy. The charge yield is a critical parameter for the experiments searching for dark matter in the form of low-mass WIMPs and measurements in Ar below 10 keV are scarce in the literature. ReD was designed to cover the gap down to 2 keV.
The ReD data taking took place in 2023 at the INFN Sezione di Catania. The TPC was irradiated by neutrons produced by an intense ^{252}Cf fission source in order to produce Ar recoils in the energy range of interest. The energy of the nuclear recoils produced within the TPC by (n,n') scattering was determined by detecting the outgoing neutrons by a dedicated neutron spectrometer made of 18 plastic scintillators. The kinetic energy of neutrons interacting in the TPC was evaluated event by-event by measuring the time of flight. ReD collected and characterized a sample of nuclear recoils down to 2 keV, thus meeting its design goal.
The ReD effort is being further extended by a new project, ReD+, at INFN Laboratori Nazionali del Sud. ReD+ is designed to reach a threshold of 0.5 keV by using the same conceptual design of ReD and improved components. A dedicated run using a deuterium-deuterium generator is then planned to achieve 0.2 keV.
In this contribution, we describe the experimental setup and present the preliminary results on Q_y measured down to 2 keV from the data analysis of ReD. We also discuss the perspectives to further lower the coverage down to the sub-keV range with ReD+.

Primary author: PANDOLA, Luciano (INFN Laboratori Nazionali di Frascati)

Presenter: PANDOLA, Luciano (INFN Laboratori Nazionali di Frascati)

Session Classification: Applications

Track Classification: Light/charge response in Noble Elements (gas, liquid, dual phase)