An Imaging detector for noble liquid experiments

V. Cicero on behalf of the PRIN 2017KC8WMB group

- We are developing an optical system that collects the scintillation light produced by charged particles in noble liquid elements (LAr, LXe) to perform a fast 3D reconstruction of events, as an alternative or complement to Time Projection Chambers.

- The basic unit of this system is a camera that consists in a coded aperture mask and a Silicon Photomultiplier (SiPM) matrix.

- We developed a 3D reconstruction algorithm based on a weighted back-propagation approach that reconstructs a map of the deposited energy in the volume. This algorithm improves on the performances of traditional techniques when a low number of photons is detected.

- Full simulation and reconstruction of neutrino events have been performed in a ~1 ton LAr cryostat geometry, equipped with 76 coded aperture mask cameras.

- We are building a prototype with 3 cameras based on available SiPM matrices on the market, and with cryogenics electronics. First tests in Liquid Argon are expected in Q2 2023.