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LArRI: a new setup for Liquid Argon Refractive index measurement

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Liquid argon, widely used as the active target in neutrino and dark matter experiments, is a scintillator with a light yield of approximately 40 photons/keV. The scintillation spectrum is centered at 128 nm, and the attenuation length is of the order of meters, depending on the purity. The addition of small amounts of xenon (approximately 10 ppb) allows for shifting the scintillation peak to 178 nm, without compromising the light yield. The longer wavelength simplifies the development of imaging systems by allowing the use of dichroic filters or lenses.
A precise knowledge of its optical properties in the VUV range can be exploited to improve the performances of liquid argon-based experiments, especially when the involved mass exceeds one ton. Moreover, the refractive index becomes a crucial parameter for the development of imaging systems.
LArRI (Liquid Argon Refractive Index) aims to directly measure the refractive index of liquid Argon (as well as other cryogenic liquids) in the VUV spectrum, using an interferometric technique. In particular, the refractive index is obtained by comparing two interference patterns, created in vacuum and in liquid, acquired with cryogenic silicon photomultipliers.In this talk we present the first results obtained, both in liquid nitrogen and in liquid argon, using a mercury lamp emitting at 254 nm and 184 nm.

Collaboration

Role of Submitter

I am the presenter

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