Contribution ID: **36** Type: **Parallel talk**

Simulating LiquidO detectors for prototype research and development

Monday 7 April 2025 17:00 (15 minutes)

LiquidO is a novel detector technology that uses the stochastic confinement of scintillator light in an opaque medium to increase particle identification efficiency. To collect this light a lattice of wavelength-shifting fibers runs through the medium, which are then read out using SiPMs. The unique particle identification down to the MeV scale and subsequent background rejection capabilities of the LiquidO technology make it ideal for neutrino detection. LiquidO will be used in the AntiMatter-Otech detector, a reactor anti-neutrino experiment currently under development for installation at the Chooz nuclear power plant. At the University of Sussex we are building prototypes to help develop technology for this future detector. My research involves simulations of such detectors, built in a Geant4 based simulation toolkit called RATPAC 2. Alongside prototyping, these simulations are used to generate large event response datasets and study light propagation. We use these datasets to design efficient algorithms for particle identification and tests with machine learning. In my presentation I will give an overview of the LiquidO technique, exploring light ball formation to illustrate why the LiquidO technique is powerful and discuss reconstruction of events.

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Session Classification: Detectors and Instrumentation

Track Classification: Detectors and Instrumentation