

Simulations of the LiquidO-based CLOUD Inner Detector

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LiquidO is an innovative technology that uses opaque liquid scintillators for particle detection. A LiquidO scintillator combines a short scattering length and a long absorption length to confine optical photons close to their creation point. A fine array of wavelength-shifting fibres is used to collect and transport the scintillation light to readout SiPMs. A LiquidO detector will have unprecedented position resolution compared to current transparent scintillators and be capable of particle identification via event topology. Proof of principle has been demonstrated by two prototypes with a third currently under construction.

The CLOUD collaboration is designing a 5-10 ton LiquidO neutrino detector. This will be an above-ground ultra-near reactor neutrino detector located in the Chooz nuclear power plant in France. This detector is the byproduct of the AntiMatter-OTech EIC/UKRI-funded project, and has both research and industry capabilities such as measuring the absolute reactor anti-neutrino flux and reactor monitoring.

This poster will discuss simulations of the CLOUD inner detector including particle identification via event topology and fibre array design. In designing the fibre array we aim to optimise reconstruction along the fibres (z-direction) without compromising the reconstruction of energy or position perpendicular to the fibres (x and y). Two broad fibre array designs are considered: z-parallel and stereo shells. A z-parallel array could achieve mm resolution in x and y, with z-position obtained at lower resolution from signal timing and intensity differences. A stereo shell array would improve the resolution in z but presents challenges for the triggering and reconstruction of events as well as the construction of the detector.

Poster prize

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