

Simulation of CLOUD, the first LiquidO reactor neutrino experiment

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LiquidO is an innovative particle detection paradigm using opaque liquid scintillators. The emitted light is confined near its creation point and captured by an array of wavelength-shifting fibers. This enables high-resolution imaging for particle identification down to the MeV scale, giving LiquidO the potential for various practical applications in particle physics.

After the successful development of two prototypes and with a third currently under construction, the next step is to build a 5 to 10-ton detector at an ultra-near site of the Chooz nuclear power plant in France, about 35 m from the reactor core. This is part of an Innovation program (EIC-Pathfinder project - AntiMatter-OTech) for monitoring nuclear reactor activity. The CLOUD collaboration, composed of 20 institutions over 11 countries, plans to execute the fundamental science programme in parallel to this project.

Constructing the detector at the ultra-near site poses challenges, as being at the surface implies a high cosmic background rate. It also imposes strict constraints on design elements such as materials and maximum building size. This poster presents the ongoing simulation effort aiming at guiding the detector design. The CLOUD collaboration is on the path to a full detector simulation, from external shielding to inner detector, using the Ratpac software developed by the SNO+ collaboration. This is a crucial step to understand the capabilities of a LiquidO-based detector operated at a nuclear power plant.

Poster prize

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CLOUD

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