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CLOUD Experiment (AntiMatter-OTech)

A New Generation of Innovation & Fundamental Neutrino Physics at Chooz

Abstract

The CLOUD collaboration pioneered the first fundamental research reactor antineutrino experiment using the novel [LiquidO](#) technology for event-wise antimatter tagging. CLOUD's program is the byproduct of the AntiMatter-OTech project (funded by EIC/UKRI), focusing on industrial reactor innovation. Located at one of the most powerful nuclear plants in Europe, the experimental setup relies on an up to 10 tonnes LiquidO detector (filled with an opaque scintillator and traversed by a dense grid of wavelength-shifting fibres) installed at EDF-Chooz's new "ultra-near" site, ~35 m from the reactor core, with minimal overburden (~3m). In the initial phase, **CLOUD-I** will detect of order 10,000 antineutrinos daily with a ≥ 100 signal-to-background discrimination for the highest possible precision of the absolute flux, also allowing explorations of physics beyond the Standard Model. Subsequent phases, **CLOUD-II** and **CLOUD-III**, will incorporate metal-doped opaque scintillators for further detection demonstration, including the first attempt at surface detection of solar neutrinos and novel techniques for a new generation of geoneutrino detection.