ID de Contribution: **67** Type: **Non spécifié**

Impact of Nickel Cryostats in the nEXO Detector

jeudi 28 novembre 2024 17:00 (30 minutes)

Keywords: nEXO, neutrinoless double beta decay, rare events, liquid xenon, shielding, hydrofluoroether, radioactivity, background reduction, nickel cryostats

Presentation Type: Oral presentation

The nEXO experiment aims to detect neutrinoless double beta decay ($0\nu\beta\beta$), a rare nuclear process that, if observed, would show that neutrinos are their own antiparticles and could provide insights into the universe's matter-antimatter asymmetry. The experiment uses 5 tonnes of liquid xenon enriched in the ^{136}Xe isotope as both the decay source and the detection medium within a Time Projection Chamber (TPC), kept in liquid form by nested cryostat vessels.

A key challenge for nEXO is minimizing radioactive background, particularly gamma radiation from uranium and thorium decay chains in detector components, which could mimic the $0\nu\beta\beta$ signal. Initially, a 32 tonnes liquid hydrofluoroether (HFE-7200) shield was planned around the TPC. Recent design changes propose switching the carbon fiber composite (CFC) cryostat vessels to chemical vapor-deposited (CVD) nickel, significantly reducing background interference by a factor of approximately 300.

Simulations and background analyses suggest that this background reduction could allow a smaller inner cryostat vessel and thinner HFE shielding, decreasing the HFE mass from 32 tonnes to 7.5 tonnes while maintaining the same background suppression. This modification could lower costs, reduce storage needs, and shorten cooling time, although thermal stability and external background effects would need close monitoring.

Auteur principal: AMY, Antoine

Orateur: AMY, Antoine

Classification de Session: Neutrino physics