

Xenon-doped argon: challenges and prospects for the dark matter search

Thursday, 21 May 2026 15:45 (30 minutes)

Xenon and argon have historically been among the most successful target materials for dark matter searches using direct-detection experiments in underground laboratories. Xenon benefits from its larger atomic size, while the lighter argon nucleus allows for larger recoil energies when struck by a GeV-scale dark matter particle, particularly in experiments that measure charge or nucleation. To extend dark matter searches further into the sub-GeV mass range, xenon-doped argon has emerged as an ideal target material. It has already been tested in ProtoDUNE, is currently under validation in the Scintillating Bubble Chamber experiment, and is a potential candidate for the DarkSide-LowMass program. In this talk, we review the current challenges facing the xenon-doped argon research program and discuss its potential impact on the dark matter and neutrino physics communities, if the technology is successfully scaled to multi-tonne detectors.

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Session Classification: Technology and R&D

Track Classification: Technology