

IsoDAR@Yemilab – A definitive search for exotic neutrinos and other BSM physics

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The IsoDAR neutrino source comprises a novel compact cyclotron capable of delivering 10 mA of 60 MeV protons in cw mode and a high-power neutrino production target. It has obtained preliminary approval to run at the new underground facility Yemilab in South Korea. IsoDAR will produce a very pure, isotropic $\bar{\nu}_e$ source, with peak neutrino energy around 6 MeV and endpoint around 15 MeV. Paired with a kton-scale detector like the planned Liquid Scintillator Counter (LSC) at Yemilab, IsoDAR can measure $\bar{\nu}_e$ disappearance through the inverse beta decay (IBD) channel. We expect about $1.67 \cdot 10^6$ IBD events, and ~ 7000 $\bar{\nu}_e - e^-$ elastic scatter events in the LSC in five years of running letting us distinguish many different models for sterile neutrinos and improving significantly on existing limits for non-standard interactions (NSI). Finally, IsoDAR@Yemilab is sensitive to new particles produced in the target (such as a light X boson, that decays to $\bar{\nu}_e \nu_e$). Beyond the physics applications, we describe the accelerator developments for IsoDAR that enable us to produce about a mole of neutrinos in five years of running. These include direct injection through a radiofrequency quadrupole, exploiting complex beam dynamics, and application of machine learning in accelerator design and optimization.

Attendance type

Virtual presentation

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