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# Yemilab (a deep underground laboratory in Korea) Physics

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Yemilab is a new underground laboratory in Jeongseon, South Korea, completed in September 2022. Situated at a depth of 1,000 m with an experimental area of 3,000 m<sup>2</sup>, the facility is poised to host world-leading experiments in astroparticle physics. This talk will provide an overview of Yemilab's infrastructure and its pivotal physics programs, which are set to explore some of the most profound questions beyond the Standard Model.

The flagship experiments at Yemilab are AMORE-II and COSINE-100U. The AMORE-II experiment will search for neutrinoless double beta decay in Mo-100 nuclei using molybdate-based scintillating crystals operated at millikelvin temperatures. Its goal is to probe the Majorana nature of neutrinos, with an ultimate sensitivity reaching an effective Majorana mass of 17-30 meV, which could provide crucial insights into the matter-antimatter asymmetry of the universe.

The COSINE-100U experiment is a direct dark matter search designed to unambiguously verify the long-standing annual modulation signal reported by the DAMA/LIBRA collaboration. This upgraded experiment will utilize the existing low-background NaI(Tl) crystals, but with a novel encapsulation technique that significantly improves light collection by approximately 45%. Operating at low temperatures, COSINE-100U will feature enhanced sensitivity, especially for low-mass dark matter searches.

Furthermore, Yemilab features a 6,300 m<sup>3</sup> multipurpose cavern intended to house a next-generation large-scale neutrino detector. This future facility will enable a broad physics program, including high-precision measurements of solar neutrinos and searches for sterile neutrinos and dark photons. This presentation will cover the status and scientific goals of these key projects, highlighting Yemilab's role in advancing the frontiers of fundamental physics.

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