INFN - Laboratori Nazionali del Gran Sasso
Via Giovanni Acitelli 22
Assergi, L'Aquila Italy

INDICO

LNGS SEMINARS

Exploring The Standard Model and New Physics Frontiers with Low-Energy Neutrino Scattering Data

Mattia Atzori Corona

INFN Tor Vergata

Neutrinos are among the most fascinating particles of the Standard Model (SM). Despite their weak interactions, they offer a unique window into fundamental physics. In this seminar, I will explore the phenomenology of low-energy neutrino scattering as a probe of the SM and its possible extensions. A remarkable process in this regime is Coherent Elastic Neutrino-Nucleus Scattering (CEvNS), a neutral current interaction in which the neutrino scatters off an entire nucleus. First observed in 2017, CEvNS features a cross-section roughly proportional to the square of the neutron number, significantly enhancing the probability of interaction at low energies. This breakthrough has opened new avenues in neutrino physics. I will present the implications of CEvNS measurements for testing electroweak interactions, nuclear structure, and potential physics beyond the SM. In this seminar, I will also highlight the synergy between CEvNS and neutrino-electron elastic scattering (vES) in constraining new physics, with an emphasis on the bounds placed on neutrino electromagnetic properties. Finally, I will introduce the NUCLEUS experiment, which employs cryogenic calorimeters with a detection threshold as low as 20 eV, nearly two orders of magnitude below current experimental capabilities, setting the stage for the next generation of CEvNS studies.

Room B. Pontecorvo

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