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Peering into the Cosmos from Deep Underground – Astroparticle Physics with Xenon Detectors

Tuesday 1 April 2025 14:45 (30 minutes)

What is the dark matter in the Universe? Astronomical observations at all scales provide indirect evidence of weakly interacting and non-baryonic particles with possible masses spanning many orders of magnitude. However, a direct detection in an experiment is still pending. Xenon time projection chambers located deep underground lead the worldwide searches for dark matter in the form of weakly interacting massive particles (WIMPs) with masses of few GeV to hundreds of TeV. WIMPs are well-motivated dark matter candidates, but the expected signals are feeble and interaction rates would be on the order of few events per tonne of xenon and year. Therefore, detectors such as XENONnT need multi-tonne targets, ultra-low backgrounds and energy thresholds of few keV. Incidentally, this makes them ideal observatories for many astroparticle physics signals beyond WIMPs: neutrinos from various sources, alternative dark matter candidates and rare nuclear decays. The talk will present recent results from XENONnT and provide an outlook on the future XLZD/DARWIN observatory as the Swiss army knife of low-energy astroparticle physics.

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