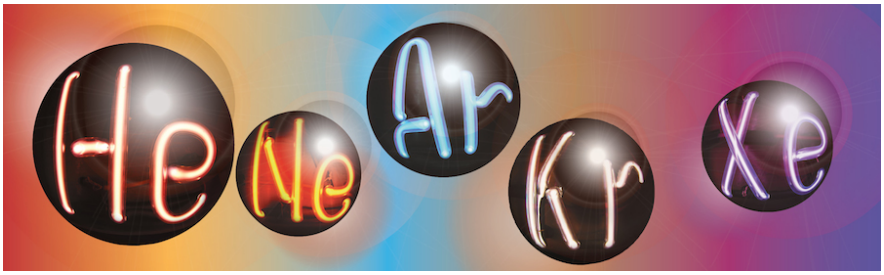

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A Tonne-scale Demonstrator for the DarkSide-20k Inner Detector at LNGS

Tuesday, 21 October 2025 16:40 (20 minutes)

DarkSide-20k is a dark matter search experiment based on a dual-phase liquid argon time projection chamber (LAr TPC), currently under construction at the Laboratori Nazionali del Gran Sasso (LNGS), Italy. The detector will use 100 tonnes of underground-sourced argon and custom cryogenic silicon photomultiplier (SiPM) arrays for efficient detection of scintillation light within a novel acrylic-based TPC structure.
To address the technical and engineering challenges of scaling up from the DarkSide-50 experience, a tonne-scale prototype detector was designed, commissioned and operated at LNGS. This demonstrator replicated the mechanical design and integrated several critical subsystems of the full DarkSide-20k Inner Detector. It was built to validate cryogenic performance, high-voltage stability, material compatibility, structural integration, and assembly procedures under realistic conditions.
This presentation will provide an overview of the demonstrator TPC design, emphasizing features shared with the DarkSide-20k detector. Results from the commissioning and testing campaign at LNGS will be presented, including cryogenic operation, liquid argon filling and monitoring, temperature mapping, and high-voltage behavior in both single and dual-phase configurations.

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