

Study of Gas Properties for Dark Matter Searches using Spherical Proportional Counters

Monday 7 April 2025 19:40 (20 minutes)

The Spherical Proportional Counter, a novel gaseous detector, has been employed in direct, light-particle dark matter searches thanks to its radiopure material construction, single-electron energy threshold, and ability to operate with low-mass nucleic gases. The detector consists of a grounded spherical shell filled with gas and a central readout anode. Gases containing low-mass nuclei such as hydrogen, carbon, and neon are used in the detector to provide good kinematic matching to light particle DM. The design of a proposed future experiment, DarkSPHERE, which could be operated in the Boulby Underground Laboratory, is well underway. Helium-methane gas mixtures, intended for use in DarkSPHERE, require characterisation. Simulation and experimental measurement of gas properties will be presented alongside studies on the effect of changing the gas composition.

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Session Classification: Poster session

Track Classification: Detectors and Instrumentation