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World-leading Dark Matter Limits with PICO-2L and PICO-60

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The PICO Collaboration, formed from the merger of the Chicago-based COUPP and the Canadian-based PICASSO experiments, uses bubble chambers to search for dark matter. Bubble chambers are a unique dark matter detector technology. They provide very high 10^{10} intrinsic electron recoil rejection, the ability to switch nuclear targets, acoustic rejection of alpha events, simple data acquisition, and low construction costs.

The PICO-2L bubble chamber exposed a heavily fluorinated C_3F_8 target fluid for 211.5 kg-days in the 2100 meter deep SNOLAB underground laboratory. In-situ measurements and measurements at the University of Montreal confirm the detector is sensitive to nuclear recoils with energies as low as 4 keV while maintaining excellent electron recoil and alpha rejection capabilities.

A background of nuclear recoil event candidates were observed during the run. The candidate events exhibit timing characteristics that are not consistent with the hypothesis of a uniform time distribution, and no evidence for a dark matter signal is claimed. Despite the background, these data provide the most sensitive direct detection constraints on WIMP-proton spin-dependent scattering to date.

World-leading results are also reported for the PICO-60 bubble chamber, a scale-up of the COUPP4 bubble chamber operated with CF_3I target fluid at the SNOLAB underground laboratory.

Oral or Poster Presentation

Oral

Primary author: HARRIS, Orin (Indiana University South Bend)

Co-author: COLLABORATION, PICO (PICO Collaboration)

Presenter: HARRIS, Orin (Indiana University South Bend)

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