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Current Status and Prospects of the DEAP-3600 Dark Matter Search

DEAP-3600 is a single-phase liquid argon (LAr) dark matter detector located 2 km underground at SNOLAB in Sudbury, Canada, searching for nuclear recoils from dark matter scattering in a 3.3-tonne LAr target. In 2019, the collaboration published a leading limit on the WIMP-nucleon spin-independent cross section, based on 231 exposure days. A new profile likelihood ratio analysis extends the exposure to 790.8 days, with unblinding in progress; it is expected to set the most stringent argon-based exclusion limit for WIMPs, ahead of next-generation experiments such as DarkSide-20k and Argo. Since the second-fill run ended in 2020, the detector has undergone upgrades to reduce shadowed-alpha and dust-related backgrounds, two dominant contributors in the WIMP region of interest. Refilling began in early 2025, followed by vacuum, gas-argon, and LAr datasets, with full data taking continuing into 2026. With these improvements, DEAP-3600 aims for background-free sensitivity at the 10^{-46} cm^2 level, advancing background modeling and detector performance for future LAr dark-matter searches.

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