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(G*) First direct detection constraints on Planck-scale mass dark matter using DEAP-3600 detector

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The DEAP-3600 experiment (Dark matter Experiment using Argon Pulseshape discrimination) at SNOLAB in Sudbury, Ontario is searching for dark matter via the elastic scattering of argon nuclei by dark matter particles as they traverse through the detector. The detector uses 255 photomultiplier tubes (PMTs) looking at ~3300kg of liquid argon in a spherical acrylic vessel. In addition to being sensitive to weakly interacting massive particles (WIMPs), DEAP-3600 is also sensitive to super-heavy dark matter candidates with masses up to the Planck scale. Sensitivity at such high masses is limited by the number density of dark matter rather than the cross-section. DEAP-3600 has the largest cross-sectional area amongst all the dark matter detectors which enables it to reach the Planck masses.

In this talk, we present the search for these superheavy candidate particles in three years of data (using a blind analysis), looking for multiple-scatter signals. A dedicated search is carried out since this multi-scatter signal is entirely different from the standard WIMP signal (usually a single scatter). Regions of interests are defined and background estimates are presented. No signal events were observed leading to direct detection constraints for dark matter masses between $8.3e6$ and $1.2e19$ GeV and dark matter-nucleon cross section between $1e-23$ and $2.4e-18$ cm²

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