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Using the profile-likelihood method to search for dark matter in DEAP-3600

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The DEAP-3600 detector based 2km underground at SNOLAB (Sudbury, Canada) is a dark matter direct detection experiment. The detector consists of a single-phase liquid argon (LAr) target, of 3279 kg mass. Currently, there have been two WIMP dark matter searches performed by the DEAP-3600 collaboration; for both results, a cut-and-count approach was employed. In this talk, the development of a profile-likelihood ratio statistical test and its application to DEAP-3600 will be presented. This test allows the WIMP search to account for the expected distribution of WIMPs and backgrounds in a multi-dimensional parameter space, and thereby perform a more sensitive search. Furthermore, we will also show how the profile-likelihood approach can be used to search for hidden photons and axion-like particles in the DEAP-3600 detector. We will discuss the expected signature from such particles, and how this approach can be used to search for them over the naturally present backgrounds.

Author: Ms KEMP, Ashlea (Royal Holloway, University of London)

Presenter: Ms KEMP, Ashlea (Royal Holloway, University of London)

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