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Simulation study of the use of internal Ar-39 beta decays for energy calibration of the DEAP-3600 detector.

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The DEAP-3600 detector uses natural liquid argon as target material for WIMP interactions. Natural argon contains the beta emitter Ar-39, which will create about 3600 beta events per second, uniformly distributed across the active detector volume. By fitting the shape of the beta spectrum from these events as a function of event position, a position-dependent energy calibration of the whole detector can be found on a timescale of about 10 minutes.

This calibration method, using intrinsic internal radioactivity, provides a fast initial calibration for preliminary analyses, and will be used regularly to monitor detector performance.

We present the fitting method used to obtain the position dependent energy calibration parameters, as well as the systematic and statistical limits inherent to this method, using Monte Carlo detector simulation results.

Author: Mr STONE, Connor (Laurentian University/University of Waterloo)

Co-authors: DEAP COLLABORATION, . (.); JILLINGS, Chris (SNOLAB)

Presenter: JILLINGS, Chris (SNOLAB)

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