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## POS-41 - A Study of Radioactive Argon Isotopes in DEAP-3600

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DEAP-3600 is a direct-detection dark matter experiment using natural liquid argon as its target material. This experiment is located 2km underground in the SNOLAB facility at VALE's Creighton Mine near Sudbury, Ontario. Natural atmospheric argon has three long-lived radioactive isotopes, one of which ( $^{39}\text{Ar}$ ) contributes significantly to the overall rate of background events in DEAP-3600. The isotopes of interest for this work are  $^{39}\text{Ar}$  and  $^{42}\text{Ar}$  which both undergo beta decay with half-lives of roughly 269 years and 32.9 years respectively, and  $^{36}\text{Ar}$  which can decay via double electron capture.  $^{36}\text{Ar}$  may also undergo the lepton number violating process of radiative neutrinoless double electron capture (0νECEC) for which a lower half-life limit on the order of  $10^{21}$  years has previously been established. The specific activities of  $^{39}\text{Ar}$  and  $^{42}\text{Ar}$  in natural argon have been measured, however the activity of  $^{42}\text{Ar}$  has been a subject of debate; this work outlines how these measurements can be made using DEAP-3600, and additionally how a search for the 0νECEC of  $^{36}\text{Ar}$  decay may be performed.

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