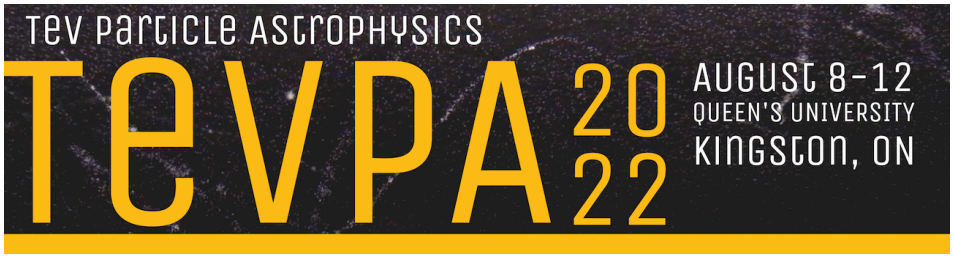

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The KDK experiment: measuring a rare decay of potassium relevant to dark matter searches

Wednesday 10 August 2022 17:10 (20 minutes)

Potassium-40 (40K) is a naturally-occurring radioactive isotope. It is a background in rare-event searches, plays a role in geochronology, and has a nuclear structure of interest to theorists. This radionuclide decays mainly by beta emission to calcium, and by electron-capture to an excited state of argon. The electron-capture decay of 40K directly to the ground state of argon has never been measured, and predicted intensities are highly variable (0–0.22%). This poorly understood intensity may impact the interpretation of the DAMA claim of dark matter discovery by constraining the signal modulation fraction [1]. The KDK (potassium decay) experiment is carrying out the first measurement of this electron-capture branch, using a novel setup at Oak Ridge National Labs [2]. KDK deploys a very sensitive inner detector to trigger on the ˜keV radiation emitted by both forms of electron capture, surrounded by a very efficient veto to distinguish between the decays to ground state and those to the excited state. We report on our latest experimental results and the process of opening the blind data set.

[1] Pradler et al, Physics Letters B 720 (2013) 399–404, http://dx.doi.org/10.1016/j.physletb.2013.02.033

[2] Stukel et al, Nuclear Inst. and Methods in Physics Research, A 1012 (2021) 165593, https://doi.org/10.1016/j.nima.2021.165593

Collaboration name

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