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Status of the KDK Experiment: A Measurement of ^{40}K Relevant for Rare-event Searches

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Potassium-40 (^{40}K) is a naturally-occurring, radioactive isotope of interest to rare-event searches as a challenging background. In particular, NaI scintillators contain ^{40}K contamination which produces an irreducible ~ 3 keV signal originating from this isotope's electron capture (EC) decays. In geochronology, the $\mathcal{O}(\text{Gy})$ lifetime of ^{40}K is utilized in dating techniques. The direct-to-ground-state EC intensity (I_{EC}) of this radionuclide has never been measured, and theoretical predictions are highly variable ($I_{\text{EC}} \sim (0.05(1) - 0.22(4))\%$). The poorly understood intensity of this branch may affect the interpretation or precision of experimental results, including those probing DM signals in the (2-6) keV region. The KDK ("potassium decay") experiment is finalizing the first measurement of this I_{EC} branch, which uses a coincidence technique between a high-resolution $\mathcal{O}(\text{keV})$ Silicon Drift Detector and a highly-efficient ($\sim 98\%$) $\mathcal{O}(\text{MeV})$ Modular Total Absorption Spectrometer (Oak Ridge National Labs) to differentiate ground and excited state EC decays of ^{40}K . We report on the status of the main ^{40}K analysis leading up to unblinding, along with a preliminary measurement of Zinc-65 decays used to test analysis methods.

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Please select: Experiment or Theory

Experiment

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