Contribution ID: **49** Type: **Nuclear and Particle Physics**

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

Friday, 18 February 2022 13:24 (12 minutes)

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 $\sim$ 3 keV signal originating from this isotope's electron capture (EC) decays. In geochronology, the $\mathcal{O}$(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 ($I_{\mathrm{EC}} \sim (0.05(1)–0.22(4))\%$). 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 $\mathcal{O}$(keV) Silicon Drift Detector and a highly-efficient ($\sim 98\%$) $\mathcal{O}$(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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Session Classification: Particle Physics