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Measuring the Unmeasured: Detecting the ^{40}K Electron Capture Directly to the ^{40}Ar Ground State with the KDK Experiment[1] BERTIS RASCO, Oak Ridge National Lab, KDK COLLABORATION — ^{40}K is a ubiquitous background for many low-energy physics experiments and for many low-energy exotic physics searches. But ^{40}K has positive uses too, it forms the basis of K-Ar geochronological dating techniques and it allows study of a third-forbidden unique β-decay. The precision of ^{40}K β-decay information is an important uncertainty in low energy exotic physics searches and is one of the limits on the K-Ar geochronology dating technique accuracy and precison. The ^{40}K β-decay information uncertainty is dominated by one branch of the ^{40}K decay that has never been experimentally measured, the electron capture decay directly to the ground state of ^{40}Ar. This unknown decay path impacts the estimated amount of ^{40}K based on the number of measured 1461 keV γ rays at the few percent level and it affects the K-Ar geochronology dating technique at the same level. With data taken at Oak Ridge National Laboratory, this small decay branch was measured by the KDK (potassium decay) collaboration by integrating an X-ray detector into the Modular Total Absorption Spectrometer (MTAS). We report details of the technique used to measure this decay branch, the expected sensitivity, and the status of the analysis.

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