Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3058** Type: **Poster Competition (Graduate Student) / Compétition affiches (Étudiant(e) 2e ou 3e cycle)**

(G*) (POS-27) The KDK Experiment: A Measurement of 40K Relevant for Rare-Event Searches

Tuesday, 7 June 2022 17:30 (2 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 ($I_{\mathrm{EC}} \sim (0.064(19)–0.22(4))\%$). The poorly understood intensity of this branch may affect the interpretation or precision of experimental results, including those probing dark matter signals in the (2-6) keV region. The KDK ("potassium decay") experiment is carrying out the first measurement of this I_{EC} branch, using a coincidence technique between a high-resolution silicon drift detector for $\mathcal{O}$(keV) X-rays and Augers, and a high-efficiency ($\sim 98\%$) Modular Total Absorption Spectrometer (Oak Ridge National Labs) for $\mathcal{O}$(MeV) gammas, to differentiate ground and excited state EC decays of ^{40}K. We report on the analysis of the main ^{40}K result, and on a measurement of ^{65}Zn decays used to test methods.

Primary authors: HARIASZ, Lilianna (Queen's University, Kingston, ON); DI STEFANO, P.C.F. (Queen's University, Kingston, ON)

Co-authors: RASCO, B.C. (Oak Ridge National Laboratory, Oak Ridge, TN); BREWER, N.T. (Oak Ridge National Laboratory, Oak Ridge, TN); DAVIS, H. (University of Tennessee, Knoxville, TN); LUKOSI, E.D. (University of Tennessee, Knoxville, TN); RYKACZEWSKI, K.P. (Oak Ridge National Laboratory, Oak Ridge, TN); STUKEL, M. (Queen's University, Kingston, ON)

Presenters: HARIASZ, Lilianna (Queen's University, Kingston, ON); DI STEFANO, P.C.F. (Queen's University, Kingston, ON)

Session Classification: PPD Poster Session & Student Poster Competition (21) | Session d'affiches PPD et concours d'affiches étudiantes (21)

Track Classification: Technical Sessions / Sessions techniques: Particle Physics / Physique des particules (PPD)