Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **4373** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) KDK+: A measurement of the rare 40K positron decay.

Monday 27 May 2024 17:30 (15 minutes)

Potassium-40 (40K) is one of the largest sources of natural radioactivity we are exposed to in daily life. It is the only isotope decaying by electron capture, beta- and beta+. The KDK collaboration has carried out the first measurement of the electron capture to ground state of 40Ar and found a branching ratio of IEC0 =(0.098±0.025)% [1,2]. In order to confirm theoretical predictions on EC/beta+ ratio, the KDK+ collaboration will remeasure the even smaller beta+ decay branch that has not been studied since the 1960s [3]. This will be done by dissolving potassium in a liquid scintillator vessel surrounded by a sodium iodide detector. Triple coincidences between the scintillation caused by the positron and two back-to-back 511keV gammas from its annihilation will be used to distinguish the signal from the background. We will present the work that consists of optimizing the compatibility of potassium with a liquid scintillator, as well as the design of the experimental setup to carry out the measurement.

[1] M. Stukel et al. (KDK Collaboration), "Rare 40K decay with implications for fundamental physics and geochronology", Phys. Rev. Lett. 131, 052503 (2023).
[2] L. Hariasz et al. (KDK Collaboration), "Evidence for ground-state electron capture of 40K", Phys. Rev. C 108, 014327 (2023).
[3] D. W. Engelkemeir et al., "Positron emission in the decay of K40", Phys. Rev. 126, 1818 (1962).

Keyword-1

Potassium 40

Keyword-2

Positron emission

Keyword-3

Author: LEMAIRE, Arnaud

Co-authors: DI STEFANO, Philippe (Queen's University); SWIDINSKY, Nicholas (Queen's University); SKENSVED, Peter

Presenter: LEMAIRE, Arnaud

Session Classification: (DNP) M3-4 Precision Measurements in nuclear and particle physics I | Mesures de précision en physique nucléaire et en physique des particules I (DPN)

Track Classification: Technical Sessions / Sessions techniques: Nuclear Physics / Physique nucléaire (DNP-DPN)