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# KDK: tweaking decay constants of potassium relevant to geochronology

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Potassium-40 (40K) is a naturally-occurring radioactive isotope whose 1.27 Ga halflife makes it useful in geochronology. Most of the time, it decays by beta emission to calcium, or by electron-capture to an excited state of argon. The electron-capture decay directly to the ground state of argon has never been observed, and predicted intensities are highly variable (0–0.22%). This poorly understood intensity affects the precision of Ar-based dating [1]. The KDK (potassium decay) experiment has carried out the first measurement of this elusive branch, using a novel setup at Oak Ridge National Lab [2]. We report [3,4] a branching ratio of 0.098%±stat0.023%±sys0.010% (68% confidence level), roughly half the commonly used prediction. Implications are illustrated for the Acapulco meteorite.

[1] Carter et al, Geochronology, 2, 355–365, 2020, https://doi.org/10.5194/gchron-2-355-2020

[2] Stukel et al, Nuclear Inst. and Methods in Physics Research, A 1012 (2021) 165593, https://doi.org/10.1016/j.nima.2021.165593

[3] Stukel et al, https://doi.org/10.48550/arXiv.2211.10319

[4] Hariasz et al, https://doi.org/10.48550/arXiv.2211.10343