Abstract Submitted
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Commissioning of a Replication Experiment to Investigate Claims of Beta-Decay Rate Fluctuations Correlated with Solar Proximity and Solar Activity[1] G.W. HITT, B. GODDARD, A.A. SOLODOV, D. BRIDI, R. EL-KHAZALI, A.F. ISAKOVIC, Khalifa University — Exponential decay is considered an immutable feature of radioactivity. While quantum mechanics predicts departure from exponential decay, it does so only in extreme time regimes for measurements; (1) comparable to the coherence time for the decay ($\leq 10^{-20}$s) [1] or (2) much longer than the half-life ($\geq 100 t_{1/2}$) [2]. Yet, from 2009, a number of studies have presented evidence to suggest [3] or refute [4] departures from exponential decay during the intermediate regime. If true, this would be evidence of new physics. To this end, the authors of [3] have presented evidence that beta-decays slightly (0.1%) but significantly accelerate with increasing proximity to and activity of the Sun and that this may be evidence of novel neutrino-nucleus interactions. Here, we present six dedicated counting experiments aimed at replicating and improving upon the approaches used in [3]. Each experiment is commissioned in a shielded, climate-controlled setting, with continuous temperature, pressure and humidity recording. Multiple detection schemes also provide additional experimental controls, relative to previous studies, against false positives.

[1] C.B. Chiu *et al.*, *PRD* **16**, 520 (1977).
[2] L.A. Khalfin, *JETP* **6**, 1053 (1958).
[3] J.H. Jenkins *et al.*, *Astropart. Phys.* **32**, 42 (2009).
[4] J.C. Hardy *et al.*, *App. Rad. Iso.* **70**, 1931 (2012).

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