Superallowed α-decay of ^{104}Te*

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The N=50 and Z=50 shell closures create the lightest island of alpha-particle emitting nuclei northeast of the doubly-magic, self-conjugate, ^{100}Sn. Neutron-deficient tellurium (Z=52) alpha-emitters were first discovered by Macfarland and Siivola [1], postulating that increased proton-neutron correlations lead to an increase in alpha-particle preformation. They coined the term "super-allowed" alpha-emitters, with enhanced preformation culminating in the decay of ^{104}Te to ^{100}Sn. Due to increased alpha preformation, ^{104}Te is predicted as the fasted alpha-emitting nucleus when accounted for decay energy. Two events of ^{104}Te were measured by Auranen et al. Despite limited statistics, the authors placed an upper limit on the half-life via the decay chain of ^{108}Xe [2]. This work reports the measurement of the decay chain of ^{108}Xe to ^{104}Te to ^{100}Sn, produced via the projectile fragmentation of ^{124}Xe at RIKEN Radioactive Ion Beam Factory (RIBF). Utilizing a fast-response scintillator-based charged-particle detector [3], we measured the decay properties of ^{104}Te, which was populated in the decay of ^{108}Xe. The results will be compared with the results of Auranen et al. and compared with numerous theoretical predictions.

[1] R. Macfarlane and A. Siivola, Phys. Rev. Lett. 14, 144 (1965)
[2] K. Auranen, et al. Phys. Rev. Lett. 121, 182501 (2018)
[3] Y. Xiao, et al. Phys. Rev. C 100, 034315 (2019).

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