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**Attempts to Manipulate the Decay Time of Radioactive Nuclei**[1]

B. FALLIN, B. GRABOW[2], W. TORNOW, Duke University / TUNL — It has been known for 20 years that electron screening strongly changes nuclear reaction cross sections at sub-Coulomb charged-particle projectile energies. The screening energy can be increased considerably if the target atoms are implanted in a metallic host and cooled to low temperature (T$\sim$10 K). The large screening in metals derives from the Debye plasma model applied to the quasi-free metallic electrons. If "time reversed," this model implies that the lifetime of radioactive nuclei placed in a metallic host can be manipulated by orders of magnitude. For $\alpha$ and $\beta^+$ decay one expects a shorter half-life, while for $\beta^-$ decay and EC, a longer half-life is expected. The results of prior experiments testing this theory are controversial; about half of the published data confirm an effect, while the other half observe no effect. We will report on our experimental studies using $^{64}$Cu and $^{65}$Zn nuclei produced at TUNL via the $^{63}$Cu(d,p) and $^{65}$Cu(p,n) reactions, respectively. For $^{64}$Cu, we detected the 511 keV annihilation $\gamma$ rays and for $^{65}$Zn the 1115.5 keV $\gamma$ rays using HPGe detectors. In both cases we did not observe a half-life change outside experimental uncertainties between measurements at room temperature and those with the samples cooled to T=12 K.

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