
# Resolving an Anomaly: The Nuclear Structure of $^{94}$Zr

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At the University of Kentucky Accelerator Laboratory, inelastic neutron scattering (INS) with the detection of emitted γ rays is a well-used tool for studying the structure of stable nuclei. In particular, lifetimes of excited states in the femtosecond region can be measured with the Doppler-shift attenuation method following inelastic neutron scattering (DSAM-INS). Several years ago, the structure of $^{94}$Zr was investigated by INS from an enriched $^{94}ZrO_2$ scattering sample. The measured level lifetimes revealed anomalous behavior unobserved in any other nucleus. These novel results were published, but later called into question. In order to confirm the anomaly, further measurements were performed, but the results differed significantly from the original data, deepening the mystery. An investigation of the scattering sample was required to reveal the source of the discrepancy; X ray diffraction, scanning electron microscopy, and even some chemistry was performed to characterize the material structure and to provide clues to the solution. Although we learned a few lessons in the process, our story still has a happy ending, as the original anomalous results had been used to motivate additional nuclear structure studies at TRIUMF laboratory in Vancouver, Canada. These results, when combined with the new Kentucky data, led to noteworthy nuclear physics.

## Tuesday, September 11, 2018

4:00 pm

**Roger W. Finlay Conference Room**

Coffee and Cookies at 3:50 pm