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Modernizing Plunger Control with Low-Cost Digital Electronics PATRICK FASANO, TRENTON KUTA, ANI APRAHAMIAN, Univ of Notre Dame — The plunger technique provides a valuable tool for measuring lifetimes of excited states in the 1-100 ps range. The plunger consists of a thin foil target and stopper foil separated by some controllable distance; beam-induced reactions occur in the target and the resulting nucleus of interest leaves the target foil and is completely stopped by the stopper foil. The Notre Dame Nuclear Science Laboratory has a plunger device which is approximately 30 years old. In the Notre Dame plunger apparatus, the separation between foils is measured via capacitance between the foils and is used to control the position of three servo motors. Our work this summer focused on a complete rebuild of the plunger control electronics including two major upgrades: (1) a precision capacitance-measuring circuit based on the phase-shift of a sinusoidal signal which follows a development in the mid 1990's, (2) and a low-cost microcontroller-based feedback loop for precisely controlling servo motors with quadrature encoder outputs. After demonstrating that the upgrades are successful, we will carry out reactions in the Nuclear Science Laboratory and measure the lifetimes of excited states in several rare earth nuclei.

Patrick Fasano
Univ of Notre Dame

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