SIMULATION AND EXPERIMENTAL STUDY OF THE MULTICHANNELING RIMFIRE GAS SWITCH

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ABSTRACT

Since 1985, the Rimfire switch has been used extensively in accelerators at Sandia National Laboratories. Demands for increased future accelerator performance require improvements to the Rimfire switch. This thesis is both a theoretical and experimental study of this switch.

Theoretical study was achieved utilizing an advanced circuit model. Through this model, insight was gained into some of the intricacies of switch operation. In addition, past models were verified and extended.

Utilizing the University of Missouri Terawatt Test Stand, experiments were conducted studying the multichanneling cascade section of the switch. The electrical affects of multichanneling and a method to force multichanneling was presented. In addition, an objective curve fitting method was used to deduce switch inductance from the measured data.

Many conclusions were made with regard to the Rimfire switch. Specific topics included advanced triggering schemes, immersion dielectric changes, jitter reduction, electrical affects of multichanneling, factors effecting multichanneling, and switch impedance calculations.