

Scintillator-photomultiplier tube calibration and noise reduction for the Neutron Incident Calibration Experiment using cosmic rays

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In the search for WIMPs, silicon detectors, such as those used in DAMIC, need to be able to distinguish between signals caused by WIMPs and signals caused by background radiation. NICE (Neutron Incident Calibration Experiment) is an initiative to calibrate these detectors for background neutron events in the 100 keV to 500 keV range. A relation can be determined between neutron energy and ionization produced in the silicon detector by scattering a known incident neutron off of the silicon detector and measuring the ionization of the silicon as well as the energy of the scattered neutron. To measure the energy of the scattered neutron, several rings of scintillator-photomultiplier tube rods will be used. However, these must also be calibrated. An optimal coupling must also be determined for the rods. It is the primary purpose of this experiment to identify and eliminate noise produced in the scintillator-PMT setups as well as to determine which coupling is most suited for use in NICE. This determination will be based on the calculated time resolution and average number of photoelectrons produced.