Abstract:
Nine 100x100x600 mm3 plastic scintillators, formerly built for the neutron time of flight measurements at iThemba LABS, were refurbished. The position resolution of these detectors was determined using muon cosmic rays and coincident measurement techniques. Average position resolution of \(~4.2\text{ cm (FWHM)}\) was found. In order to predict the time spectrum of the large-volume detector Monte Carlo simulations have been performed. These simulations aimed at anticipating the separation of statistical neutrons, prompt gamma rays and uncorrelated gamma rays from the fast neutrons emitted in the reaction of interest. One of the neutron detectors was tested using fast neutrons from the \(232\text{Th}(\alpha,xn)\) reaction at 42 MeV.

Position Measurements

The block diagram of the electronics and the setup used for the position resolution measurements.

Monte Carlo Simulations

Schematic of a large-volume neutron detector.

Some of the components of the neutron detectors, three NE102A crystals coupled to three light guides.

The position of the target, collimator and the beam dump from the neutron detector, all of which lay along the beam line.

Building the Plastic Scintillator Detectors

Schematic of the mechanism of neutron interaction with the scintillator, conversion of photons into electrons and generation of electrical current pulse.

Experimental Setup and Result

One of the neutron detector set-ups in coincidence with the AFRODITE array for time-of-flight measurements.

One of the neutron detector set-ups in coincidence with the AFRODITE array for time-of-flight measurements.

For more reading and contacts:
1scholar.sun.ac.za/bitstream/handle/10019/.../elbashers_test_2012.pdf?
2- Stellenbosch University
http://scholar.sun.ac.za

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