

The Measurement of PFNS in CIAE

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The Prompt Fission Neutron Spectrum (PFNS) data of heavy nuclear induced by neutrons is the fundamental data of nuclear reactions. In response to the current deviation of PFNS data and the poor experimental data, the experimental research on PFNS relied on white neutron source was carried out in the Chinese Spallation Neutron Spectrum (CSNS).

Using the double neutron time of flight method, a series of PFNS data of different neutron energy points can be obtained with only one successful measurement. These data can serve as experimental samples for super calculations of nuclear devices, and can also provide a large amount of experimental data for theoretical research on nuclear structure, nuclear reactions, and so on. The Cf-252 fragment source was placed in a Parallel Plate Avalanche Counter (PPAC), and the neutron detective efficiency of 48 liquid scintillator detectors used in the experiment was calibrated by measuring the neutron time of flight spectra between the PPAC and the liquid scintillator detectors. The Monte Carlo simulation of the background of the PFNS experiment in CSNS Back-n experiment hall for PFNS experiment has been completed with Geant4 and some improvements of the experimental arrangement have been adopted according to the simulation results. The experimental PFNS measurement was accomplish at Back-n and the reasonable neutron spectra have been obtained after the experiment. The time resolution between the liquid scintillation detector and the PPAC is 1.9 ns. The work lays the foundation for further research on PFNS for a series of important nuclides in the future.