NEER FY 2001
PROJECT ABSTRACT

Grant Number: 01ID14108

Project Title: Neutron Transport Methods for Accelerator-Driven Systems

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Abstract: Deterministic neutron transport computational algorithms will be developed for the calculation of the neutronic parameters of an Accelerator Driven System (ADS). In an ADS, a beam of high-energy protons from a charged particle accelerator impinges upon a target and produces a source of high-energy spallation neutrons. The neutrons, in turn, are used to (a) transmute Radioactive Wastes (RW) and (b) to produce power by driving an appropriately designed subcritical assembly of fissionable material. The high-energy spallation neutron source, the beam tube streaming path and the loosely coupled subcritical configuration in an ADS present neutronic computational challenges not present in conventional reactor physics calculations.

In this research we will use the variational nodal method as contained in the Argonne National Laboratory code VARIANT as a point of departure. We will develop methods that (a) compute neutron fluxes in the presence of the streaming void presented by the accelerator tube, (b) calculate power distribution, and (c) calculate the transmutation rate of the RW. The methods will compute higher flux harmonics, in addition to the fundamental, to aid in the stability and transient analysis of these subcritical systems.