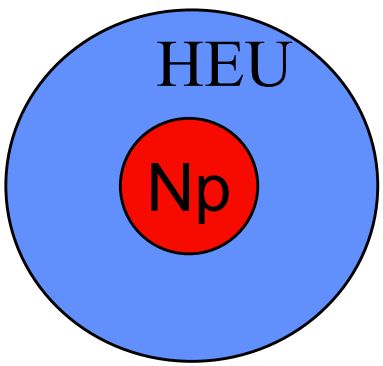
Neptunium nuclear data & criticality

FY 2003

NA22 / NNSA project

Unclassified

TA-18 LACEF Np-U assembly



Description

Neptunium is a proliferation concern: we want to know the critical mass accurately. (Until now, uncertainty is ~20%).

This project will better determine the critical mass, and better determine neptunium cross sections

Team: T-16, X-5, N-2 (NIS-6) collaboration; BNL contributions too.

Progress/issues

An initial modeling of the Np-U critical assembly led to k-eff=0.993 (expt = 1.0), using our latest actinide cross sections. We are focusing on the main cross sections that are expected to be influential:

-fission, nubar, inelastic scattering, and the energy spectra of secondary neutrons (incl prompt fission neutrons).

Important issue needs resolving: a probable deficiency in the 235U cross sections biases our results, and needs to be fixed. Godiva spectral index measurements suggest that we model the assembly spectrum as too soft.

Future

We have investigated the possibility that the fission cross section, nubar, and inelastic scattering cross sections need to be improved.

This FY04 we will focus on isses related to the inelastic scattering spectrum, and the chi prompt neutron spectrum.

Will also study neutron multiplication measurement data.

Initial analyses point to a bare neptunium critical mass in the order of 57kg

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