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Reactor Physics Studies for the APCI RACE Project: Reactor-Accelerator Coupling Experiments Project: Quarterly Progress Report January-March 2005

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Reactor Physics Studies for the AFCI RACE Project (Reactor-Accelerator Coupling Experiments Project)

Quarterly Progress Report January-March 2005

UNLV Transmutation Research Project Task 27
Principle Investigator: Denis Beller, Ph.D.

Purpose and Problem Statement

In the RACE Project of the U.S. Advanced Fuel Cycle Initiative (AFCI), a series of accelerator-driven subcritical systems (ADSS) experiments is being conducted at the Idaho State University's Idaho Accelerator Center (ISU-IAC), at will be conducted at the University of Texas (UT) at Austin, and at the Texas A&M University. In these experiments we will use electron accelerators to induce bremsstrahlung photon-neutron reactions in heavy-metal targets; this source of about 10^{12} to 10^{13} n/s will then initiate fission reactions in the subcritical systems. These systems will include a compact, transportable assembly at ISU and TRIGA reactors at UT-Austin and Texas A&M. These experiments will provide a variety of cores, fuel types and enrichments, and target/reactor configurations for many separate accelerator coupling studies. The UNLV portion of this project will be a three-year, three-phase project employing a principal investigator (as well as the UNLV TRP RACE Project Director), a graduate student, and an undergraduate student to support computational and experimental research at the ISU and the Texas universities, to integrate the UNLV Transmutation Research Project with this accelerator-driven transmutation research, and to further develop UNLV's computational infrastructure for reactor physics research.

Personnel

Principle Investigator: Research Prof. Denis Beller, Department of Mechanical Engineering, UNLV.

Students: Mr. Evgeny Stankovskiy, graduate student (Ph.D.), Department of Mechanical Engineering, came to UNLV from the Institute of Nuclear Power Engineering in Obninsk, Russia, to pursue a Ph.D. degree. He will design, conduct, and analyze an accelerator-driven subcritical experiment at UT-Austin or Texas A&M University. Mr. Timothy Beller, undergraduate student, Department of Mechanical Engineering, performed MCNPX calculations in support of experiments at the Idaho Accelerator Center.

UNLV Graduate Student Thesis Advisor: Prof. Robert Boehm, Department of Mechanical Engineering, UNLV.

National Laboratory Collaborators: Dr. George Imel, Argonne National Laboratory (director of experiments in the MUSE and TRADE programs in Europe)

DOE Collaborators: Dr. Thomas Ward, TechSource, Inc. (UNLV Russian Collaboration Science Adviser)

Summary Report

- Modeling with MCNPX continued in support of subcritical experiments at the Idaho Accelerator Center and target design for Texas RACE. We acquired the newest beta test version of the MCNPX radiation transport code, installed it, and began using it.
- We hosted the PI and students from the Texas universities for a meeting to discuss MCNP modeling of the RACE Project configurations at ISU, UT, and TAMU.
- In his role as national RACE Project Director, the PI visited Idaho State University for RACE Project budget discussions, for a meeting with both the UT PI and a graduate student, and to conduct experiments and discuss progress. He also attended the AFCI Semiannual Review Meeting where a RACE Project Technical Advisory Group meeting was held, coordinated a developing collaborative project with the European EUROTRANS project, and presented colloquia titled "RACE: The AFCI Reactor-Accelerator Coupling Experiments Project" at several universities: Texas A&M University, Univ. of Texas at Austin (UT-Austin), Univ. of California Berkeley, Univ. of Tennessee-Knoxville, Purdue Univ., and Univ. of Michigan.

Progress

Our project is a month or two behind schedule due to a delay in shipment of an accelerator from ISU to UT-Austin. It is now scheduled for shipment in June with ADSS experiments to begin in July. The UNLV RACE experiment is scheduled for mid-August.