

SEMINAR ANNOUNCEMENT

TITLE: MOZAIK: Modular Optimization Code
Package

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A modular optimization code package, MOZAIK (**M**odular **O**ptimi**Z**ation Code **P**ack**A**ge), was developed to address geometric optimization problems in nuclear-related applications. Its first mission was assigned to determine the optimum shape of the beam port moderator chamber feeding the two new beam ports to be added to the Penn State Breazeale Reactor 's (PSBR) beam port facility.

Before designing the new beam ports for the PSBR, a comprehensive study was performed to test the code's performance and its modular structure. For this purpose, one of the existing beam ports of the PSBR was modeled, and the optimal shape of its moderator tank that maximizes the thermal neutron output at the beam tube end was determined. In the physics module of MOZAIK, neutron transport simulations were performed using ORNL's TORT code. Two different optimization algorithms, Min-max and Genetic Algorithm (GA), were used in the optimizer module of MOZAIK. Strength of the neutron beam exiting the existing beam port configuration, denoted as "reference output" computed by TORT was used to evaluate the performance of the optimization calculations. In the calculations, MCNP5 was also used to generate a source data for TORT model and to verify the results of the MOZAIK.

In this talk, the main features of MOZAIK and the optimization results for the beam port design are presented. Furthermore, the performance analysis results using the two different optimizers will be discussed.