

**Blanket Design and Optimization Demonstrations  
of the First Wall/Blanket/Shield Design and Optimization System**

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In fusion reactors, the blanket performance and characteristics have a major impact on the reactor performance, size, and economics. The selection and arrangement of the blanket materials, dimensions of the different blanket zones, and different requirements of the selected materials for a satisfactory performance are the main parameters, which define the blanket performance. These parameters translate to a large number of variables and design constraints, which need to be simultaneously considered in the blanket design process. This represents a major design challenge because of the lack of a comprehensive design tool capable of determining all these variables to define the optimum blanket design and satisfying all the design constraints based on the adopted figure of merit and the blanket design criteria.

The blanket design capabilities of the First Wall/Blanket/Shield Design and Optimization System (BSDOS) have been developed to overcome this difficulty and to provide the state-of-the-art research and design tool for performing blanket design analyses. This paper describes some of these capabilities and demonstrates its use. In addition, the use of the optimization capability of the BSDOS can result in a significant blanket performance enhancement and cost saving for the reactor design under consideration. In this paper, examples are presented, which utilize an earlier version of the ITER solid breeder blanket design and a high power density self-cooled lithium blanket design to demonstrate some of the BSDOS blanket design capabilities.