Self-Consistent Modeling of DEMO with the Integrated Predictive Modeling Code BALDUR

T. Onjun[1], A. Wisitsorasak[2], P. Klaywittaphat[1], B. Chatthong[1], W. Buangam[1], J. Promping[3], and Y. Painroj[4]

[1]*Sirindhorn International Institute of Technology, Thammasat University, Pathum Thani, Thailand*
[2]*King Mongkut's University of Technology Thonburi, Bangkok, Thailand*
[3]*Thailand Institute of Nuclear Technology, Bangkok, Thailand*
[4]*Prince of Songkla University, Surat Thani, Thailand*

Abstract

Self-consistent modeling of DEMO has been carried out using the BALDUR integrated predictive modeling code in which theory-based models are used for both core and edge transport. Five designs of DEMO, including Russian design, Indian design, Korean design, Japanese design, and European design, are considered. In these simulations, a combination of NCLASS neoclassical transport and anomalous transport model, either Multi-mode (MMM95) or Mixed Bohm/gyro-Bohm (Mixed B/gB), is used to compute a core transport. The boundary is taken to be at the top of the pedestal, where the pedestal values are described using a theory-based pedestal model. This pedestal temperature model is based on a combination of magnetic and flow shear stabilization pedestal width scaling and an infinite-n ballooning pressure gradient model. The time evolution of plasma current, temperature and density profiles is simulated for each DEMO design, which can lead to a comparison of fusion performance of each design, as well as the impurity behaviors such as impurity accumulation. In addition, simulations are carried out for scans in which the plasma parameters, such as plasma density and auxiliary heating power are varied, in order to improve the plasma performance of DEMO. Finally, the ignition test will be conducted to observe the plasma response in each design after shutting down an auxiliary heating.