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SIMULATION AND ANALYSIS OF THE ITER HYBRID OPERATING MODE*

C.E. Kessel, R. Budny, and K. Indireshkumar
Princeton Plasma Physics Laboratory, PO Box 451, Princeton, NJ 08543
ckessel@pppl.gov

The ITER Hybrid Operating Mode is intended to reach long pulse lengths at sufficient neutron flux to provide for initial nuclear component testing. The operating space for this type of plasma is examined by using 0-D plasma systems analysis including flux consumption, current drive and the various engineering constraints. These constraints include limitation of flattop time at varying fusion power, the divertor heat load, first wall surface heat flux, volt-second capability, and core plasma radiation. ITER can produce pulse lengths around 2000-3000 seconds, with average neutron fluxes at the plasma surface of 0.4–0.55 MW/m^2. The repetition time for these discharges remains an issue, with the dwell time between discharges dictated by the cryosystem for the superconducting magnets. Detailed 1.5-D simulations are done using the Tokamak Simulation Code (TSC) and TRANSP to verify and examine the Hybrid plasma discharge behavior under various conditions, in particular, higher plasma density, higher impurity content, and higher stored energy. Projecting the plasma performance is also tested in the 1.5-D simulations by comparing with hybrid discharges from experiments on DIII-D. The GLF23 transport model is used for these simulations. Several issues will be discussed covering the optimization of these discharges and their control.

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