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Integrated prediction of HL-2M baseline scenario for supporting ITER

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Abstract
The baseline scenario of ITER is an inductive regime with high plasma current and controllable MHD instabilities to ensure ~400s of duration, aiming to obtain higher fusion gain compared to the hybrid or the steady state regimes [1, 2]. Cross-device studying of the baseline scenario is of significance both on the high-performance plasma physics and the operation technology (especially on the operation safety in 15MA of plasma current) for ITER. The new tokamak HL-2M operating in SWIP is dedicated to study key issues of high-performance plasma operation, as well as test advanced divertor conception (e.g., snowflake, tripod) and plasma facing components with high heat flux [3]. More than 30MW of auxiliary heating & current drive systems planned, including 19MW of NBI, 8MW of ECRH, 2MW of LHCD, and 6MW of ICRH, allows to study various operation scenarios toward ITER and fusion reactors. This paper presents the baseline scenario foreseen for HL-2M by using the integrated modeling suite CRONOS [4, 5]. In the case of 1.6 of plasma elongation and 2.2T of central magnetic field, the desired plasma current I_p is 1.8MA, which ensures the edge safety factor q_{95}~3. With an high averaged density, only NBI is considered to implement currently. Simulation results show the baseline scenario can be realized with 10MW of NBI, in the case of $1.0\times10^{20}m^{-3}$ of linear averaged density (relevant Greenwald fraction is 0.74). Central safety factor is lower than 1, indicating to be accompanied with a sawtooth oscillation, due to the inadequate off-axis current drive. The thermal stored energy W_{th} is 1.6MJ with the confinement enhancement factor $H_{98,y2}$=1. The thermal poloidal beta β_p is 0.73 and the normalized beta β_N is 2.0. The central ion temperature close to the electron temperature reaches around 5keV. Further, based on the core parameters, the heat flux on the divertor, as well as MHD activities is discussed.

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