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Modelling third field operation in the ITER pre-fusion power operation phase

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The ITER low activation phase consists of H and He plasmas, split into Pre-Fusion Power Operation phases 1 and 2 (PFPO-1 and PFPO-2). The PFPO-1 phase will include 20 MW of Electron Cyclotron Resonance Heating (ECRH) and possibly 10 MW of Ion Cyclotron Radio Frequency Heating (ICRH), while the PFPO-2 phase will include the full Heating and Current Drive (H&CD) capabilities, i.e. 73 MW of H&CD power.
The L-H power threshold displays a density optimum for ITER q95 = 3 operation at n/n_G~0.4 , where n_G is the Greenwald density. At half field for n/n_G~0.4 in PFPO-1, H-mode access is predicted to be unlikely in PFPO-1 in H and marginal in He. Accessing H-mode allows the determination of the heating power required to operate ITER in H-mode and to commission/demonstrate ELM control schemes, both of which are key to the research plan. Hence, operating 5MA/1.8T (q_95=3) plasmas is foreseen, since it makes the H-mode access more likely in PFPO-1. Scenarios have been developed for both PFPO-1 and PFPO-2 phases.
H-mode scenarios at 1.8T and low density are developed according to the limited power installed in PFPO-1, providing the density upper limit, and to the fact that low density and dominant ECRH can lead to low edge ion power flow preventing H-mode access. Hence it is important to qualify which key elements can be addressed in such plasmas to determine whether the required resources to implement the 1.8T research programme are worthwhile.
Integrated simulations of ITER 5MA/1.8T plasmas have been carried out with various 1.5D transport integrated modelling suites of codes by the ITPA topical group on Integrated Operation Scenarios (ITPA-IOS) in collaboration with the IO and with support from the ITPA Transport and Confinement and Energetic Particles groups. The present contribution reports the results of self-consistent transport and H&CD analyses to assess the efficiency of EC and IC heating in 5MA/1.8 T plasmas in L and H-modes. With a view to study H-modes at 1.8T in PFPO-2, the possibility to heat these plasmas with NBI has been assessed as well.
These issues are assessed by the application of a range of integrated modelling suites, used in association with either simplified H&CD models or more sophisticated codes for ECRH,ICRH and NBI modelling.

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