SOL modelling of the JT-60SA tokamak initial operational scenario using SOLEDGE3X-EIRENE code

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JT60SA is a tokamak constructed in Naka, Japan to support the operation of the ITER reactor [1]. In the initial research phase the device will be equipped with a full carbon first wall with no active cooling. For this reason, the preparation and assessment of the full inductive scenario with 26.5 MW of input power (the maximum available during this phase) is particularly challenging. The main aim of this work is to assess the realistic heat loads on the first wall of the vessel and to check the overall compatibility of the scrape-off layer plasma (SOL) regime with the desired core performance. To achieve this scope, the entire SOL volume within the vessel and the subdivertor region is simulated by the fluid transport code SOLEDGE3X [2], which uses a mesh extended up to the first wall and can besides handle the secondary X-point situated at the top of the tokamak vessel. Depending on the regime of operation, the interplay between the transport and atomic processes (ionization/recombination) makes this area interesting from the point of view of energy dissipation. The neutrals playing a key role in the process of detachment are treated kinetically by EIRENE Monte Carlo code [3] including additional reactions involving D_2 molecules (charge exchange and elastic collisions) [4,5]. A scan on the input power is performed to estimate the maximum total power that can be handled by the divertor targets (maximum power density 10 MW/m^2) and other plasma facing components: the dome (10 MW/m^2), baffles (up to 1 MW/m^2) and the rest of the wall (0.3 MW/m^2), as specified in the Plant Integration Document. It is found that in certain areas a substantial fraction of the deposited power is delivered by the neutrals (up to 40%). This leads to the assesment of the desired range of radiated power fraction by intrinsic carbon or possible seeded impurities with respect to the mentioned material limits and H-mode operation requirements (power through separatrix $\geq \sim$10 MW) [6]. The results are compared with the previous simulations of the nominal fully inductive scenario (auxiliary heating power 41 MW) with Ar and Ne seeding [7].

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