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# Simulation of Neutral Gas Flow in the JET Subdivertor and Comparison with Experimental Results

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Over the last few years much effort has been invested in modeling the complex geometry of divertor and subdivertor region in tokamak fusion reactors. The main goal is the investigation of the impact of neutral gas dynamics on the particle removal process, during operation. Depending on the plasma conditions, the neutral gas flow starts from viscous regime above the dome and close to divertor targets and then covers transitional and even free molecular regime in the subdivertor area. Consequently, a reliable estimate of the macroscopic parameters in such a complex system requires a tool to describe the flow in the whole range of the Knudsen number. Currently, the code, which is used in the JET activities on fluid edge plasma modeling, is the EDGE2D-EIRENE, where the EDGE2D part consists of a 2D plasma fluid code, while the EIRENE part consists of a 3D Monte-Carlo solver for neutrals, based on the BGK approximation. The standalone EIRENE code over the years has been proven to work sufficiently in neutral modelling, but no qualitative and quantitative comparison with a more complete neutral code has been performed. Consequently, the aim of this work is twofold. First, it is focused on the numerical simulation of the neutral gas flow and the calculation of overall quantities of practical interest i.e pressure, density, recirculation rates etc., inside the complex geometry of the JET subdivertor by applying and comparing the standalone EIRENE and the DSMC algorithms. Second, for validation purposes, both numerical approaches will be compared with existing JET ITER-Like Wall experimental data for the neutral gas pressure in the subdivertor. The pressure measurements were obtained with the KT5P gauge located at the end of the main vertical lower port of Octant 8. It is noted that the direct comparison between the two approaches will be performed for the case of a 2D toroidally symmetric simplified representation of subdivertor. The comparison will be focused on L-mode plasmas, which represent low, medium and high neutral gas divertor densities respectively. Based on the detailed comparison, deficits and advantages of each code will be outlined. This work was supported by EURATOM and carried out within the framework of the European Fusion Development Agreement. The views and opinions expressed herein do not necessarily reflect those of the European Commission.

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