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EMC3-EIRENE Simulations for the Impact of External Magnetic Perturbations on EAST Edge Plasma

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On the EAST tokamak, resonant magnetic perturbations (RMPs) have been successfully applied to control edge localized mode (ELM) [1]. To quantify the impact of the resulting 3D magnetic field structure on the edge plasma transport, the EMC3-EIRENE code [2] is employed, which is a coupled code package of EMC3 for fluid ions and electrons and EIRENE for kinetic neutrals. The code had been applied to axisymmetric double null divertor plasmas for EAST before [3]. Recent progress has been made in the grid generator to allow for RMP fields to be taken into account using vacuum approximation [4], and a first 3D computational mesh is constructed for shot 52327. Field-line tracing based on the 3D mesh and the intrinsic field line integration procedure of the EMC3 code yields a field structure which agrees well with that produced by the MAPs code (magnetic perturbation spectrum analysis) [5]. First plasma transport simulations have shown a clear strike-line splitting effect which is also observed experimentally. This paper presents a systematic comparison in particle and energy deposition between the 3D simulation and experimental results. It is also attempted to identify possible plasma screening effects on the RMP fields, which are not yet taken into account in the computations.

Reference:
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[3] J. Huang, et al., Plasma Phys. Control. Fusion 56 (2014) 075023.
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