Particles simulations of RMP fields effects in the COMPASS tokamak

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The use of Resonant Magnetic Perturbation (RMP) coils has extensively been demonstrated as an experimental technique for mitigating or suppressing large edge localized modes (ELMs) in a number of tokamaks. In this work, we introduce a newly developed extension of the EBdyna_go code (introduced in [1]) that was designed to resolve the full-orbit of charged particles, in a collisionless manner. The new version of the code allows to study motions in the 3D perturbed fields generated by RMPs.

The model has been applied on the COMPASS tokamak, comparing it with its extensive RMP campaign experimental database [2]. We took advantage of the diagnostics of the tokamak in order to assess the experimental effect of the RMP on the overall edge plasma conditions (density, temperature, current and rotation) and on the ELM activity.

Detailed integrated transport modelling with the METIS code [3] has been used so that the latest experimental data can be wrapped up by self-consistent simulations and the pedestal data can be used in the RMP modelling described in this contribution.

Our analysis focuses on comparing the effect on the particle transport and losses of the vacuum solution (using a Biot-Savart solver) and of a more elaborate solution that includes the plasma response to the perturbed field, calculated with the resistive MHD code MARS-F [4]. We present insights on the effect of the RMPs on the induced change on the pedestal momentum, the pedestal temperature as well as the impurity content in the edge region.

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[3] - Artaud J.F. et al. 2010 *Nucl. Fusion* **50**, 043001
[4] – Liu Y., et al. 2000 *Phys. Plasmas* **7**, 3681