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# Integrated simulation of the impacts of resonant magnetic perturbations on tungsten radiation on EAST

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Tungsten (W), widely used in tokamak plasma-facing components due to its high melting point, poses a critical challenge for fusion performance due to potential core accumulation and associated radiative losses [1]. Recent experiments on EAST have observed a remarkable 70% reduction in core W radiation following the application of resonant magnetic perturbation (RMP) fields [2], yet the underlying mechanisms remain insufficiently understood. To investigate this phenomenon, an integrated simulation framework combining the MARS-F [3], EMC3-EIRENE [4], and OMFIT [5] codes has been developed to model W sputtering, edge-core transport, and radiation under RMP fields. The MARS-F code evaluates the vacuum and plasma response fields to determine the perturbed edge magnetic topology, which is then used in EMC3-EIRENE to simulate 3D edge plasma and impurity dynamics, including a newly implemented sputtering model based on varying plasma parameters. Core W transport and radiation are simulated using the STRAHL code within OMFIT, with boundary conditions self-consistently coupled from the edge simulation.

Simulation results reveal that while RMP fields increase both erosion source and W radiation when only divertor erosion and magnetic topology are considered, a significant reduction in W radiation is reproduced only when enhanced perpendicular transport of W impurities is taken into account. A parameter scan demonstrates that increasing the perpendicular diffusivity of W by an order of magnitude leads to a ~70% reduction in core radiation power, aligning with experimental observations. This study highlights the dominant role of impurity perpendicular transport in impurity control under RMP fields and underscores the necessity of integrated edge-core modelling for accurate interpretation of impurity behavior in future reactor-relevant scenarios.

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