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3D Numerical Analysis of Radiative Edge Cooling in Wendelstein 7-X Island Divertor Scenarios[1] FLORIAN EFFENBERG, UW Madison, Y. FENG, IPP, H. FRERICHS, O. SCHMITZ, T. BARBUI, UW Madison, J. GEIGER, M. JAKUBOWSKI, R. KNIG, M. KRYCHOWIAK, H. NIEMANN, T. SUNN PEDERSEN, IPP, Y. SUZUKI, NIFS, G.A. WURDEN, LANL, W7-X-TEAM TEAM — Radiative edge cooling is a promising method for mitigation of high heat and particle fluxes in the 3D field geometry of Wendelstein 7-X. A new high mirror island configuration is investigated featuring a more uniform distribution of heat and particle fluxes on horizontal and vertical divertor targets. For an upstream density of $n_{up} = 2\times10^{19}\mathrm{m}^{-3}$ at P_{ECRH}=8MW maximum heat loads up to $q_{max} \approx 7.2\mathrm{MWm}^{-2}$ are calculated with the 3D fluid and kinetic edge transport Monte Carlo Code EMC3-EIRENE. Carbon eroded from the divertor targets is predicted to serve as effective intrinsic radiator enabling detached operational regimes at higher densities ($n_{up} > 4\times10^{19}\mathrm{m}^{-3}$). The feasibility of active control of heat and particle flux levels by impurity seeding (C_xH_y, N_2, Ne) will be discussed for the new island geometry. Impurity line radiation tends to concentrate in the islands for lower densities and causes a drop of flux levels correlated to the power loss fraction, $\Delta q \propto \frac{P_{rad}}{P_{SOL}}$. β-effects are taken into account based on the 3D MHD-equilibrium code HINT.

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