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Plasma radiation transport effects in MAST-U tokamak advanced divertor configurations[1] V. A. SOUKHANOVSKII, A. I. KHRABRY, H. A. SCOTT, Lawrence Livermore National Laboratory, D. MOULTON, J. HARRISON, Culham Centre for Fusion Energy — Divertor experiments are planned in MAST Upgrade tokamak to improve understanding of divertor geometry effects and detachment processes in standard, Super-X, and snowflake divertor configurations. This work aims at assessing plasma radiation transport effects in these divertor configurations using the CRETIN code for radiation transport and collisional-radiative modeling, and the SOLPS/EIRENE and UEDGE codes for predictive divertor plasma and neutrals modeling. Plasma opacity to line radiation can lead to enhanced photoionization, resulting in modified ionization, recombination and radiation rates in the divertor and an increased divertor detachment threshold in density. Hydrogen Lyman and Balmer series line and continuum opacities are evaluated in typical one- and two-dimensional divertor geometries. Line transfer calculations include complex line shapes due to Doppler and Stark broadening and Zeeman splitting. Lyman photon mean free paths can become comparable to spatial plasma scales in nearly detached Super-X divertor plasmas with high neutral density and large poloidal flux expansion.

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