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Divertor Heat Flux Mitigation in High-Performance H-mode Plasmas in NSTX V.A. SOUKHANOVSKII, LLNL, R. MAINGI, C.E. BUSH, ORNL, R. RAMAN, U.Washington, R. MAQUEDA, Nova Photonics, D.A. GATES, J.E. MENARD, S.F. PAUL, A.L. ROQUEMORE, R.E. BELL, R. KAITA, H.W. KUGEL, B.P. LEBLANC, PPPL — Divertor heat flux mitigation scenarios based on the radiative divertor and high poloidal magnetic flux expansion divertor geometry are studied in highly-shaped 1.0 - 1.2 MA, 6 MW NBI-heated H-mode discharges in NSTX. Radiative divertor performance was optimized by varying the additional divertor D_2 injection rate and therefore, the divertor radiated power (due to intrinsic carbon radiation) and ion momentum sink. Significant steady-state divertor peak heat flux reduction, from 8-12 MW/m^2 to 2- 4 MW/m^2 was obtained in a partially detached divertor regime with minimal core confinement degradation. In a separate experiment, the dependence of high flux expansion divertor parameters, including heat and particle fluxes, recombination rate, neutral pressure, and radiated power, on flux/area expansion factors was systematically measured by varying the X-point height and outer strike point radius. Implications of the divertor geometry for scrape-off layer power and momentum balance will be discussed using estimates from analytic 1D transport and impurity radiation modeling. Supported by the U.S. DOE under Contracts DE-AC52- 07NA27344, DE-AC02-76CH03073, DE-AC05-00OR22725, and W-7405-ENG-36.

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