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The Dependence of H-mode Energy Confinement and Transport on Collisionality in NSTX[1] STANLEY KAYE, STEFAN GERHARDT, WALTER GUTTENFELDER, RAJESH MAINGI, RON BELL, AHMED DIALLO, BENOIT LEBLANC, MARIO PODESTA, PPPL, Princeton University, Princeton NJ 08543 — A wide range of collisionality has been obtained in NSTX using two different wall conditioning techniques, one with boronization and between-shot helium glow discharge conditioning (HeGDC+B), and one with lithium evaporation (Li EVAP). Previous studies of HeGDC+B plasmas indicated a strong increase of normalized confinement with decreasing collisionality. Discharges with lithium conditioning achieved lower collisionality by a factor of two. While the confinement dependences on dimensional, engineering variables of the HeGDC+B and Li EVAP datasets differed, collisionality unified the trends, with the lower collisionality Li EVAP discharges also showing increasing normalized confinement time with decreasing collisionality when other dimensionless variables were held fixed. This increase of confinement with decreasing collisionality was driven by a large reduction in electron transport in the outer region of the plasma. This result is consistent with gyrokinetic calculations that show microtearing and Electron Temperature Gradient modes to be more stable for the lower collisionality discharges. Ion transport, near neoclassical at high collisionality, became more anomalous at lower collisionality due to the growth of hybrid TEM/KBM modes in the outer plasma region.

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