Dependence of particle transport on collisionality, rotation and MHD in NSTX

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Asbtract

The NSTX spherical torus (ST) is a low-aspect ratio tokamak (A<1.5) that is able to sustain a high plasma β operating with B_ϕ~0.35-0.55 T, I_p~0.7-1.1 MA and neutral beam injection (NBI) heating power up to 7.0 MW. One of the ST predicted benefits is the reduction of the anomalous ion transport resulting in low core (r/a<0.7) particle diffusivities in good agreement with the values predicted by neoclassical transport theory. Particle and impurity transport properties at low-aspect-ratio remain important for extrapolation to future ST-based devices such as an NHTX and CTF as well as to conventional aspect ratio schemes such as ITER. This paper will describe the results obtained from H-mode experiments aimed at studying, a) impurity transport in a $\nu^*\sim 1/T^2$ scan of NBI heated H-mode plasmas, b) the relationship between Pfirsch-Schluter particle transport and toroidal rotation and, as a by-product of a strong impurity seeding, c) the correlation between the strength of the impurity radiation emitted and the appearance of neoclassical tearing modes (NTMs). This work was supported by U.S. DoE Contract No. DE-AC02-09CH11466 at PPPL and DoE grant No. DE-FG02-99ER5452 at Johns Hopkins University.