Beta scaling of transport in microturbulence simulations

J. Candy

General Atomics, San Diego, CA 92121

(Dated: March 3, 2005)

Abstract

A systematic study of the beta (β) scaling and spatial structure of thermal and particle transport in gyrokinetic turbulence simulations is presented. Here, β is the ratio of the plasma kinetic pressure to the magnetic pressure. Results show that the nonlinear self-consistent temperature profiles exhibit a (statistically) time-stationary flattening in the vicinity of rational surfaces with a concomitant drop in the electrostatic components of the thermal diffusivity. Simultaneously, the increased magnetic fluctuation amplitude at these surfaces enhances the steady-state electromagnetic (flutter) component of the electron thermal diffusivity. The electromagnetic components of the ion transport coefficients remain close to zero, as expected on theoretical grounds. Only a weak dependence of ion energy transport on β is observed, consistent with recent tokamak experiments [C.C. Petty *et al.*, Phys. Plasmas **11** 2514 (2004)].

PACS numbers: 52.35.Ra, 52.30.Gz, 52.25.Fi, 52.65.Tt