Unified Gyrokinetic Simulations of Drift Wave Turbulence and Neoclassical Transport*

E.A. Belli, J. Candy, and P.B. Snyder

General Atomics, P.O. Box 85608, San Diego, California 92186-5608.

Five-dimensonal δf Eulerian gyrokinetic code (EGK) has been developed as a rapid prototype code for the Edge Simulation Laboratory. The purpose of this code is to explore numerical issues associated with the (μ, v_ℓ) velocity space formulation for gyrokinetics and to study physical effects associated with extensions to full F. EGK has been successfully benchmarked for ITG/TEM linear drift wave physics and the collisionless damping of the zonal flow potential, including kinetic electrons. Recently, a version of EGK, which solves the Poisson equation in vorticity form, has also performed successful simulations of neoclassical ion transport, including the self-consistent radial electric field, neglecting the poloidal variation of Φ. Using pitch angle scattering collisions and assuming the flux tube limit, this simplified code has reproduced the saturated E_r results of Satake et al. [Nucl. Fusion **45**, 1362 (2005)], who used a radially global simulation. Here we present results from a newly developed unified, global EGK code which solves drift wave physics and neoclassical physics using the same algorithms. This code extends studies of neoclassical transport to include the effects of the poloidal variation of E_r and kinetic electron dynamics.

*Supported by the US Department of Energy under DE-FG03-95ER54309.