Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Two-way Coupled Direct Simulation of Particle-laden Turbulent Flows Using Equilibrium Eulerian Approximation S. BALACHANDAR, Mechanical & Industrial Engineering Department, University of Illinois at Urbana-Champaign, BABAK SHOTORBAN, Center for Simulation of Advanced Rockets, University of Illinois at Urbana-Champain — In the equilibrium Eulerian approximation, a velocity field is calculated for particles using a truncated series expansion in terms of the carrier-phase velocity field and its temporal and spatial derivatives (Ferry & Balachandar, *Int. J. Multiphase Flow* **27,** 2001). Compared to other Eulerian-Eulerian approaches, this approach has the benefit of not solving the particle velocity differential equation; however, it is valid for sufficiently small particle time constants. The quilibrium Eulerian velocities can be used to solve the particle concentration equation (Rani & Balachandar, *Int. J. Multiphase Flow* **29**, 2003) and then the particle concentration is used to calculate the coupling term in the carrier-phase momentum equation. In order to assess the equilibrium Eulerian approximation in two-way coupling, the particle-laden homogenous turbulent shear flow is studied. Various statistics including the mean turbulent kinetic energy, its dissipation rate, the energy spectra and the Reynolds stresses are examined and compared against the results obtained through Eulerian-Lagrangian approach.

Babak Shotorban
Center for Simulation of Advanced Rockets
University of Illinois at Urbana-Champaign

Date submitted: 03 Aug 2005 Electronic form version 1.4