Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Rotation rate of rods in turbulent flow SHIMA PARSA, Wesleyan University, ENRICO CALZAVARINI, Universite de Lille 1, Lille, France, FEDERICO TOSCHI, Eindhoven University of Technology, The Netherlands, GREG VOTH, Wesleyan University — We study the motion of single small rod-like particles in turbulent flow. The orientation and position of rods are measured experimentally using Lagrangian particle tracking with images from multiple cameras in a flow between two oscillating grids. We also have performed numerical simulations of rod motion in homogeneous isotropic turbulence. The probability distribution of the rotation rate of the rods has extended tails indicating rare events with large rotation rate. Rods rotation rate is determined by the velocity gradient of the flow, so measurements of the rotation rate provides indirect access to statistics of the velocity gradient of the flow. However, tracer rods preferentially sample the flow since their orientation becomes correlated with the local axes of the velocity gradient tensor. The result is that the typical rotation rate of rods is much smaller than it would be if they were randomly oriented. The numerical simulations allow us to quantify the preferential alignment, including its dependence on rod aspect ratio. This allows measurements of the second moment of the rod rotation rate to be used to measure the energy dissipation rate in the turbulent flow.

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Date submitted: 10 Aug 2011 Electronic form version 1.4