Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Dynamics of Small Inertia-Free Spheroidal Particles in a Turbulent Channel Flow[1] NIRANJAN REDDY CHALLABOTLA, LIHAO ZHAO, HELGE I. ANDERSSON, Norwegian Univ Tech (NTNU), DEPARTMENT OF ENERGY AND PROCESS ENGINEERING TEAM — The study of small non-spherical particles suspended in turbulent fluid flows is of interest in view of the potential applications in industry and the environment. In the present work, we investigated the dynamics of inertia-free spheroidal particles suspended in fully-developed turbulent channel flow at $Re_\tau = 180$ by using the direct numerical simulations (DNS) for the Eulerian fluid phase coupled with the Lagrangian point-particle tracking. We considered inertia-free spheroidal particles with a wide range of aspect ratios from 0.01 to 50, i.e. from flat disks to long rods. Although the spheroids passively translate along with the fluid, the particle orientation and rotation strongly depend on the particle shape. The flattest disks were preferentially aligned with their symmetry axis normal to the wall, whereas the longest rods aligned parallel to the wall. Strong mean rotational spin was observed for spherical particles and this has been damped with increasing asphericity both for rod-like and disk-like spheroids. The anisotropic mean and fluctuating fluid vorticity resulted in particle spin anisotropies which exhibited a complex dependence on the particle asphericty.

[1]The Research Council of Norway, Notur and COST Action FP1005 are gratefully acknowledged

Niranjan Reddy Challabotla
Norwegian Univ Tech (NTNU)

Date submitted: 24 Jul 2015 Electronic form version 1.4