Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Drag reduction in a turbulent channel flow using a passivity-based approach PETER HEINS, BRYN JONES, University of Sheffield, ATUL SHARMA, University of Southampton — A new active feedback control strategy for attenuating perturbation energy in a turbulent channel flow is presented. Using a passivity-based approach, a controller synthesis procedure has been devised which is capable of making the linear dynamics of a channel flow as close to passive as is possible given the limitations on sensing and actuation. A controller that is capable of making the linearized flow passive is guaranteed to globally stabilize the true flow. The resulting controller is capable of greatly restricting the amount of turbulent energy that the nonlinearity can feed back into the flow. DNS testing of a controller using wall-sensing of streamwise and spanwise shear stress and actuation via wall transpiration acting upon channel flows with $Re_\tau = 100 - 250$ showed significant reductions in skin-friction drag.

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Date submitted: 31 Jul 2013 Electronic form version 1.4