Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Exploring the Potential of Turbulent Flow Control Using Vertically Aligned Nanowire Arrays[1] SEAN BAILEY, JOHN CALHOUN, CHRISTOPHER GUSKEY, MICHAEL SEIGLER, University of Kentucky, ANEESH KOKA, HENRY SODANO, University of Florida — We present evidence that turbulent flow can be influenced by oscillating nanowires. A substrate coated with vertically aligned nanowires was installed in the boundary wall of fully-developed turbulent channel flow, and the substrate was excited by a piezoceramic actuator to oscillate the nanowires. Because the nanowires are immersed in the viscous sublayer, it was previously unclear whether the small scale flow oscillations imparted into the bulk flow by the nanowires would influence the turbulent flow or be dissipated by the effects of viscosity. Our experiments demonstrated that the nanowires produced perturbations in the flow and contributed energy throughout the depth of the turbulent layer. A parallel investigation using a dynamically scaled surface of vertically aligned wires in laminar flow found that, even at low Reynolds numbers, significant momentum transport can be produced in the flow by the introduction of a travelling wave motion into the surface. These findings reflect the potential for using oscillating nanowires as a novel method of near-wall turbulent flow control.

[1]This work was supported by the Air Force Office of Scientific Research under FA9550-11-1-0140

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Date submitted: 03 Aug 2012 Electronic form version 1.4