

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

A Linear Proportional Control of Turbulent Flow in a Planar Asymmetric Diffuser¹ DONGGUN SON, HAECHEON CHOI, Seoul National University — We perform a linear proportional control of turbulent flow in a planar asymmetric diffuser (Obi diffuser) for separation delay and pressure recovery. The Reynolds number based on the half of inlet channel height (δ) and bulk mean velocity (u_b) is $Re_b = u_b\delta/\nu = 9000$, which is the same condition as done by previous experimental and numerical studies. An actuation for the control is defined at the diffuser throat ($x/\delta = 0$ to 1) as a wall-normal blowing and suction. A sensing variable (error) for the control is the difference between the instantaneous wall shear stresses at the upper and lower walls. The linear proportional control successfully suppresses the separation bubble at the lower slant wall and reduces the skin friction at the upper flat wall, resulting in the pressure recovery at the exit of diffuser. At an optimal proportional gain, the present control produces 6.7% increase in the exit pressure with delayed separation.

¹Supported by the NRF Program (NRF-2011-0028032, NRF-2012M2A8A4055647)

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Date submitted: 02 Aug 2013

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