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Turbulent boundary layer control through spanwise wall oscillation using Kagome lattice structures[1] JAMES BIRD, MATTHEW SANTER, JONATHAN MORRISON, Imperial College London — It is well established that a reduction in skin-friction and turbulence intensity can be achieved by applying in-plane spanwise forcing to a surface beneath a turbulent boundary layer. It has also been shown in DNS (M. Quadrio, P. Ricco, & C. Viotti; *J. Fluid Mech*; **627**, 161, 2009), that this phenomenon is significantly enhanced when the forcing takes the form of a streamwise travelling wave of spanwise perturbation. In the present work, this type of forcing is generated by an active surface comprising a compliant structure, based on a Kagome lattice geometry, supporting a membrane skin. The structural design ensures negligible wall normal displacement while facilitating large in-plane velocities. The surface is driven pneumatically, achieving displacements of 3 mm approximately, at frequencies in excess of 70 Hz for a turbulent boundary layer at $Re_\tau \approx 1000$. As the influence of this forcing on boundary layer is highly dependent on the wavenumber and frequency of the travelling wave, a flat surface was designed and optimised to allow these forcing parameters to be varied, without reconfiguration of the experiment. Simultaneous measurements of the fluid and surface motion are presented, and notable skin-friction drag reduction is demonstrated.

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