

Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Flow Visualization of Artificially Generated Hairpin Vortices

DANIEL SABATINO, Lafayette College, MARK PALFRAMAN, Virginia Tech — To investigate the potential mechanisms for hairpin packet formation in fully turbulent boundary layers, a flow visualization study of artificially generated hairpin vortices in an otherwise laminar boundary layer is performed. The experiments are conducted in a recently constructed free surface water channel at Lafayette College. A new method to artificially generate individual hairpin vortices is employed which utilizes a flexible membrane which is inflated to create transient hemispherical protrusions on a flat plate, zero pressure gradient laminar boundary layer. By controlling the duration of time the membrane protrudes above the wall, a single vortex can be reliably generated. This technique avoids the need for fluid injection in order to ensure uniform particle seeding for subsequent PIV measurements. Multiple generation sites are placed at different streamwise locations to allow hairpins of different maturity to interact. The characteristics of single hairpin vortices will be compared to those described in the literature along with a qualitative analysis of the interaction of two hairpin vortices.

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Date submitted: 05 Aug 2011

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