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Amplitude-modulated Excitation of an Axi-symmetric Backward-facing-step Flow: Wall-pressure-array and Velocity Measurements[1] ANTONIUS ADITJANDRA, BARRY TROSIN, AHMED NAGUIB, Michigan State University — Wall-pressure-array and velocity measurements were conducted to investigate the influence of amplitude-modulated excitation on the flow over an axi-symmetric backward-facing step. The forcing was implemented using an externally-driven Helmholtz resonator with an orifice located in the immediate vicinity of the separation point. At resonance, the fluidic disturbance produced by the resonator exhibited both unsteady and streaming components. By modulating the excitation waveform at substantially lower frequency, it was possible to couple the streaming disturbance to the flow effectively and shorten the separation bubble. The effect of both the modulation frequency and amplitude on the flow were examined, and the most effective forcing frequency was identified. Furthermore, the spatio-temporal characteristics of the wall-pressure and velocity field within and downstream of the separation bubble were captured under different forcing conditions. The results provide insight into the behavior of the flow structures and their wall-pressure signature under forced conditions.

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