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A formation time scale for vortex rings generated by pulsed planar jets BEN STEINFURTH, TIM GEFFKE, JULIEN WEISS, Technische Universitt Berlin — The flow field of a pulsed planar jet emitted from an outlet of high aspect ratio is studied experimentally. Considering that the effectivity of various flow control applications is determined by large-scale coherent vortex structures, the objective of this study is to shed some light upon the generation mechanisms of these vortices. First, flow visualizations are conducted with pulsed jets issued into a steady water tank, verifying that the concept of an optimal generation time scale ensuring the exclusive generation of a leading vortex ring exists. Then, quantitative measurements are performed employing particle image velocimetry. Based on the derivation of flow diagnostics and additional extensive hotwire measurements, the following main conclusion can be drawn: increasing the pulse width, i. e., the amount of ejected fluid of a pulsed planar jet results in saturation of the leading vortex ring in terms of its dimensions and entrainment characteristics. Beyond a certain pulse width, a trailing structure with properties similar to a steady planar jet occurs. The shear rates of this trailing jet are well below those observed inside the vortex ring. Thus, jet modulation with the identified optimal pulse width may be beneficial from a flow control perspective.

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