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Asymmetric Perturbation of Gaseous Transverse Jets[1] ANDREA BESNARD, TAKESHI SHOJI, ELIJAH HARRIS, STEPHEN SCHEIN, ROBERT M'CLOSKEY, ANN KARAGOZIAN, UCLA — These experiments explore the influence of external asymmetric helical excitation on structural and mixing characteristics of the gaseous jet in crossflow (JICF). Helical forcing is applied via an array of speakers flush mounted around the exterior of the jet exit in the injection wall of the wind tunnel. The speakers are individually operated, allowing for controlled directional azimuthal forcing about the jet exit, for example, in counterclockwise or clockwise directions, and with variable amplitudes and frequencies. There is a special focus here on at high jet-to-crossflow momentum flux ratio (e.g., $J = 41$), which are known to have a convectively unstable upstream shear layer (USL) and to create asymmetric cross-sections with typically poorer mixing characteristics[2]. Acetone PLIF imaging shows that asymmetric forcing at frequencies near the fundamental associated with the USL can greatly influence jet cross-sectional structure, in some cases with enhanced symmetrization of the counter-rotating vortex pair (CVP), more typical of jets with an absolutely unstable USL, and associated improvements in molecular mixing.

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[2]Gevorkyan, et al., JFM **790**, pp. 237-274, 2016

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