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Experimental investigation of a confined developing axisymmetric wall jet TIANQI GUO, MATTHEW RAU, PAVLOS VLACHOS, SURESH GARIMELLA, Purdue Univ — The present work reports an experimental study of an axisymmetric, confined wall jet using planar particle image velocimetry (PIV) and the dielectric liquid HFE-7100. The wall jet is formed downstream from a confined and submerged impinging round jet, 3.75 mm in diameter. Both the developing region and self-similar region of the wall jet are investigated. The experiments are conducted for Reynolds numbers (Re = Ud/υ) ranging from 1500 to 38000 and at a nozzle-to-plate spacing of four jet diameters. Image-preprocessing techniques are used to eliminate background noise and an ensemble correlation scheme is applied to improve the resolution of the measurement of the mean velocity field near the wall. A maximum measurement resolution of 36 μm is achieved. Profiles of the mean velocity, turbulent intensities, decay rate, spread rate and wall shear stress are used to characterize the influence of confinement on the wall jet development and inner layer scaling.

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