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An experimental study of flow past an oscillating cylinder SANJAY KUMAR, CARLOS LOPEZ, GERMAN FRANCISCO, DAVOOD ASKARI, Department of Engineering, The University of Texas at Brownsville, CESAR ALEJANDRO TOLEDO SUAREZ, OLIVER PROBST, Physics Department, Instituto Tecnologico y de Estudios Superiores de Monterrey (Mexico) — We present preliminary experimental results on flow past an oscillating cylinder at frequency ratios varying from 0 to 5 and oscillation amplitudes varying from $\pi/8$ to π. The experiments are conducted at Reynolds number of 185. The frequency ratio, f_R, is defined as the ratio of cylinder oscillation frequency to vortex shedding frequency from a non-oscillating cylinder. The diagnostic is done using hydrogen bubble technique for flow visualization in a plane. It is found that at one diameter downstream from the cylinder, vortex shedding frequency matches the forcing frequency (lock-on) at all f_R >1 and all amplitudes; however, for f_R <1 there is a window adjacent to $f_R = 1$ where lock-on occurs and this depends on oscillation amplitude. In the far wake at nine diameters from the cylinder, the lock-on region is centered around $f_R = 1$ and depends strongly on amplitude. The visualization of the vortical structures showed that near f_R =1.0 the vortices became very compact and well formed in the visualization plane. Their size decreases considerably at much higher f_R's in the near-wake. The motion pictures reveal interesting phenomenon of merger of vortices at certain f_R's.

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