Vortex Street behind an Oscillating Wire on a Soap Film

AARON MEYER, ILDOO KIM, X.L. WU, University of Pittsburgh — A von Kármán vortex street, a periodic array of vortices behind a bluff body is normally characterized by a single frequency $f_0$ at which the vortices shed. In this study, von Kármán vortex streets are generated on a 2D soap film using a glass-covered metal wire in a static magnetic field. When the wire is driven with electric current to make an oscillatory motion with frequency $f_e$, transverse to the mean flow, vortices shed at a frequency $f'$ differs from $f_0$. It is seen that with oscillation, $f_0$ is suppressed, $f'/f_e$ becomes a rational number, and vortices are rearranged to form an exotic spatial structure. This “frequency- locking” phenomena show some features of the sine-circle map, but the relevancy to the physical system is not clear. When the amplitude of the oscillation is large enough, the system becomes chaotic. In this chaotic regime, the energy power spectrum resembles that of 2D decaying turbulence.