Critical Velocity for Vortex Shedding in a Bose-Einstein Condensate WOO JIN KWON, GEOL MOON, SANG WON SEO, YONG-IL SHIN, Seoul National University — We present the measurements of the critical velocity for vortex shedding in a highly oblate Bose-Einstein condensate with a moving repulsive Gaussian potential. As a function of the potential barrier height V_0, the critical velocity shows a dip structure having a minimum at $V_0 = \mu$, where mu is the chemical potential of the condensate. In a condition of $V_0/\mu \approx 7$, where the radius of the density-depleted hole by the potential is close to the potential beam waist σ, we find that the critical velocity monotonically increases and approaches $0.4c$ for vanishing σ/ξ, where c is the speed of sound and ξ is the healing length of the condensate. The upper bound for the critical velocity is in good quantitative agreement with the theoretical predictions of the critical velocity of a two-dimensional superflow past a circular cylinder. We will also discuss the effects of the beam profile imperfection on the critical velocity.

Woo Jin Kwon
Seoul National University