Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Subsonic to supersonic transition in density shocks of confined microswimmers ALAN CHENG HOU TSANG, EVA KANSO, University of Southern California — Motile and driven particles confined in microfluidic channels exhibit interesting emergent behavior from propagating density bands to density shock waves. A deeper understanding of the physical mechanisms responsible for these emergent structures is relevant to a number of physical and biomedical applications. Here, we show in the context of an idealized model that a plug of microswimmers confined in a narrow channel and subject to a uniform external flow exhibit a transition of density shock waves from subsonic to supersonic regime depending on the intensity of the external flow. In the subsonic regime, density shock is formed at the back of the swimmers, whereas in the supersonic regime, density shock is formed at the front of the swimmers. This behavior results from a non-trivial interplay between hydrodynamic interactions and geometric confinement. We apply these findings to guide the development of novel mechanisms for controlling the emergent density distribution and average population speed, thus enabling processes such as sorting of cells in flow channels.

Alan Cheng Hou Tsang
University of Southern California

Date submitted: 31 Jul 2015 Electronic form version 1.4