Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Confined Swimming of Bio-Inspired Magnetic Microswimmers in Rectangular Channels FATMA ZEYNEP TEMEL, Brown University, SERHAT YESILYURT, Sabanci University — Bio-inspired microswimmers have great potential for medical procedures in conduits and vessels inside the body; hence, controlled swimming in confined spaces needs to be well understood. In this study, analysis of swimming modes of a bio-inspired microswimmer in a rectangular channel at low Reynolds number is performed with experimental and computational studies. A left-handed magnetic helical swimmer (MHS), having 0.5 mm diameter and 2 mm length, is used in experiments by utilizing rotating magnetic field actuation obtained by electromagnetic coil pairs. Three motion modes are observed in experiments depending on the rotation frequency: (i) lateral motion under the effect of gravity and surface traction at low frequencies, (ii) lateral motion under the effect of gravity and fluid forces at transition frequencies, and (iii) circular motion under the effect of fluid forces at high frequencies. Translational and angular velocities of the MHS are calculated using CFD simulations to investigate the motion modes. In addition, induced flow fields for different radial positions of the MHS are studied. Results demonstrate the significance of rotation frequency, flow fields and pressure distribution on swimming modes and behaviour of the MHS inside rectangular channels.

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Date submitted: 01 Aug 2014 Electronic form version 1.4