Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Numerical and experimental study of Newtonian and non-Newtonian flow in a spiral viscous pump GUSTAF MÅRTENSSON, Mydata Automation AB, ANDREAS GUSTAFSSON, Department of Mechanics, KTH — The need to transport small volumes of viscous media is a vital part of microfluidic devices vital to applications in biotechnology, chemistry and electronics. A novel Archimedian viscous micropump was developed in an attempt to achieve precise and accurate delivery of fluid in a robust and industrially viable package. The pump consists of a two-disc system, where one is patterned with a spiral rectangular channel of variable width and the other is smooth and has a rate of rotation Ω in order to pump the fluid. The width of the channel is variable along its length in order to achieve a constant local Reynolds number and avoid recirculation zones along the spiral, which is described $r = a + b\theta^c$, where r is the radius at the spiral centerline and θ is the angle. Numerical and analytical studies of the proposed model will be presented, exhibiting a linear relationship between the flow Q and Ω. Results from experiments with a simplified prototype will also be presented supporting the analytical and numerical studies.

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Date submitted: 10 Aug 2009 Electronic form version 1.4