Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Escaping the maze: micro-swimmers using acoustic forces to navigate[1] JEAN-FRANCOIS LOUF, BENJAMIN DOLLET, CNRS, OLIVIER STEPHAN, Universit Grenoble-Alpes, PHILIPPE MARMOTTANT, CNRS — The goal of this study is to make 3D micro-swimmers containing a bubble that can be stimulated with acoustic waves emitted by a transducer, and whose direction is accurately controlled. By using 3D micro-fabrication techniques, we designed 40x40 μm swimmers with a trapped air bubble. We then applied acoustic vibration to the bubble, which generates a strong steady flow (1-100 mm/s) behind it, an effect referred as acoustic streaming. However, independently from the orientation of the bubble and thus from the flow, the motion of the swimmer is found to be towards the transducer. This suggests that primary Bjerknes forces, i.e. acoustic radiation forces, are involved. Subsequently, using different transducers located at different points, we could be able to navigate the swimmer in a chosen direction. The next step of our study is to use a stationary wave and Bjerknes forces to bring encapsulated objects in a pressure node. Without bubbles, the effect of acoustic streaming on big objects of more than a micrometer is not sufficient to generate motion. However, with the presence of bubbles, our swimmers should be able to move.

[1]ERC BUBBLEBOOST

Jean-Francois Louf
CNRS

Date submitted: 28 Jul 2017 Electronic form version 1.4