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Formation of inverse Chladni patterns at microscale by acoustic streaming on a silicon membrane immersed in a liquid CEDRIC POULAIN, CEA, Grenoble, France, GAEL VUILLERMET, Ecole Polytechnique, FABRICE CASSET, CEA, Grenoble, France — High frequency acoustics (in the MHz range) is known to be very efficient to handle micro particles or living cells in microfluidics by taking advantage of the acoustic radiation force. Here, we will show that low frequency ($\sim 50kHz$) together with use ultra thin silicon plate can give rise to a micro streaming that enables to move particles at will. Indeed, by means of silicon membranes excited in the low ultrasound range, we show that it is possible to form inverse two-dimensional Chladni patterns of micro-beads in liquid. Unlike the well-known effect in a gaseous environment at macroscale, where gravity effects are generally dominant, leading particles towards the nodal regions of displacement, we will show that the micro scale streaming in the vicinity of the plate tends to gather particles in antinodal regions. Moreover, a symmetry breaking effect together with the streaming can trigger a whole rotation of the beads in the fluidic cavity. We demonstrate that it is possible to make the patterns rotate at a well defined angular velocity where beads actually jump from one acoustic trap to another.

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