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Net motion of acoustically levitating nano-particles: A theoretical analysis KEVIN LIPPERA, LadHyX, UMR CNRS 7646, Ecole Polytechnique, France, OLIVIER DAUCHOT, Gulliver, UMR CNRS 7083, ESPCI Paris, France, MICHAEL BENZAQUEN, LadHyX, UMR CNRS 7646, Ecole Polytechnique, France, GULLIVER-LADHYX COLLABORATION — A particle 2D-trapped in the nodal planed of a standing acoustic wave is prone to acoustic-phoretic motion as soon as its shape breaks polar or chiral symmetry. such a setup constitues an ideal system to study boundaryless 2D collective behavior with purely hydrodynamic long range interactions.
Recent studies [1] have indeed shown that quasi-spherical particles may undergo net propulsion, a feature partially understood theoretically in the particular case of infinite viscous boundary layers [2].
We here extend the theoretical results of [2] to any boundary layer thickness, by that meeting typical experimental conditions. In addition, we propose an explanation for the net spinning of the trapped particles, as observed in experiments [1].

[1] Wang, Castro, Hoyos, and Mallouk, ACS nano **6**(7) 2012
[2] Nadal and Lauga, Phys. Fluids **26**, 2014

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