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Nondecaying hydrodynamic interactions along narrow channels KAROLIS MISIUNAS, STEFANO PAGLIARA, ERIC LAUGA, JOHN R LISTER, ULRICH KEYSER, University of Cambridge — Particle-particle interactions are of paramount importance in every multi-body system as they determine the collective behaviour and coupling strength. Many well-known interactions like electro-static, van der Waals or screened Coulomb, decay exponentially or with negative powers of the particle spacing r. Similarly, hydrodynamic interactions between particles undergoing Brownian motion decay as $1/r$ in bulk, and are assumed to decay in small channels. Such interactions are ubiquitous in biological and technological systems. Here we confine two particles undergoing Brownian motion in narrow, microfluidic channels and study their coupling through hydrodynamic interactions. Our experiments show that the hydrodynamic particle-particle interactions are distance-independent in these channels. This finding is of fundamental importance for the interpretation of experiments where dense mixtures of particles or molecules diffuse through finite length, water-filled channels or pore networks.

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