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Particle-size dependent cross-over from radiation-dominated to streaming-dominated acoustophoresis in microchannels RUNE BARNKOB, HENRIK BRUUS, Technical University of Denmark, PER AUGUSTSSON, THOMAS LAURELL, Lund University — Expanding the use of microchannel acoustophoresis to handle particles smaller than 1 μm is a challenge due to the particle-size dependent cross-over from the well-understood radiation-dominated motion of microparticles to the ill-characterized streaming-dominated motion of submicron particles. Using our newly-developed, automated, temperature-controlled, and high-precision micro-PIV system (Augusstson *et al.*, Lab Chip, submitted 2011), we measure the acoustophoretic velocity fields of polystyrene particles in the range from 10 μm to below 1 μm. We use the Helmholtz decomposition theorem and discrete Fourier transform to decompose each velocity field into a gradient part from radiation and a rotation part from streaming. From the decomposed velocity fields, we obtain as expected that the particle velocity induced by acoustic radiation scales with the particle size to the power 2, while the acoustic-streaming-induced particle velocity is independent of the particle size (Barnkob *et al.*, Proc. 14th MicroTAS 2010, p. 1247). Furthermore, we study the theoretical prediction that the critical particle size for cross-over scales linearly with the width of the viscous boundary layer and thus scales linearly with buffer viscosity and inversely with actuation frequency.

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