Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Inertial migration of spherical particles in submillimeter-sized square channel flows HIROYUKI SHICHI, HIROSHI YAMASHITA, JUNJI SEKI, TOMOAKI ITANO, MASAKO SUGIHARA-SEKI, Kansai University — The distributions of neutrally buoyant spherical particles were measured at downstream cross-sections of submillimeter-sized square channels for the Reynolds number from 1 to 800. Polystyrene particles of diameter d = 30 - 70μm were suspended in water-glycerol mixture at the volume concentration of $2.5 - 11 \times 10^2 \mathrm{cm}^{-3}$, and this suspension was made to flow through square channels of width D = 400 - 800μm and length L = 50 - 600mm. The Reynolds number (Re) was defined in terms of the average flow velocity and the channel width. For the size ratio d/D = 0.075 - 0.125, we found that for Re $<$ 260, particles were focused on four equilibrium positions placed at the center of channel faces, which was in accord with previous experimental and numerical studies. For Re $>$ 450, four additional equilibrium positions were observed near the channel corners. Between these two Reynolds numbers (i.e., 260 $<$ Re $<$450), we observed new equilibrium positions located on a heteroclinic orbit connecting the channel face and corner equilibrium positions. These new equilibrium positions were shifted towards the corner equilibrium positions with increasing Re.

Hiroyuki Shichi
Kansai University

Date submitted: 30 Jul 2016 Electronic form version 1.4