Abstract Submitted
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Measurements of polystyrene bead trajectories and spatial distributions in a turbulent water flow, square duct using high-speed digital holography[1] RENE VAN HOUT, BORIS RABENCOV, JAVIER ARCA, Technion - Israel Institute of Technology — Near neutrally buoyant, polystyrene beads (583 micrometers) were tracked in a square (50x50mm^2), closed-loop, turbulent water duct at a bulk flow Reynolds number of 10,602 (friction velocity 0.0208m/s) using single view, inline digital holographic cinematography (at 1 kHz). The volume of interest (50x17.4x17.4mm^3) was positioned at the bottom part of the channel. The mean bead diameter normalized by inner wall coordinates was d^+ =14.2, with Stokes numbers of 8.5. In-house developed algorithms, fine-tuned to tracking single and overlapping beads were developed. Bead in-focus positions were determined by maximum intensity gradient method. Results showed that in agreement with literature publications, ascending beads lagged the mean streamwise water velocity while descending ones had similar velocities. Average streamwise bead velocities and number densities collapsed onto wall-normal-streamwise and spanwise-streamwise planes, indicated preferential segregation of ascending and descending beads up to a height of 100 wall units. Spanwise "lane" separation distances ranged between 150-200 wall units, larger but of the same order as the spanwise extent of coherent near-wall turbulence structures. Duct corners were nearly devoid of beads likely caused by secondary flows.

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