Abstract Submitted
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Dynamics of particle—turbulence interaction at the dissipative scales[1] HUMBERTO BOCANEGRA EVANS, Faculty of Applied Physics, Eindhoven Universiy of Technology, NICO DAM, Faculty of Mechanical Engineering, Eindhoven Universiy of Technology, WILLEM VAN DE WATER, Faculty of Applied Physics, Eindhoven University of Technology, JM BURGERSCENTRUM COLLABORATION, COST ACTION, PARTICLES IN TURBULENCE COLLABORATION — We present results of a novel phosphorescent tagging technique that is particularly suited to study particle-laden flows. Using phosphorescent droplets we probe the dynamics of particle–turbulence interaction at the dissipative length scales. We create a cloud of droplets within a chamber capable of generating homogeneous, isotropic turbulence with zero-mean flow. The droplets have Stokes number $\mathrm{St} \sim 1$, and the flow is intensely turbulent, with Reynolds number $\mathrm{Re}_\lambda \approx 500$. Using a frequency-tripled Nd:YAG laser, we can tag a variety of volumes, such as thin slabs or thin, pencil-like cylinders. The droplets in these volumes glow during a few Kolmogorov times. By tracking the fate of pencil-shaped clouds using a fast (5 kHz) camera, we come to the surprising conclusion that they disperse faster than fluid elements, with a spreading rate reaching a maximum at $\mathrm{St} \approx 2$. Sheets of tagged droplets display preferential concentration at work; we discuss statistical quantities that can capture these events.

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