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On the free-fall dynamics of highly inertial ellipsoids at Re_p of $O(1)$[1] JOHANNES MILAN GÜTTLER, GHOLAMHOSSEIN BAGHERI, Max Planck Institute for Dynamics and Self-Organization — Much is still unknown about the dynamics of inertial ellipsoids as inertial non-spherical particles in turbulence lag behind the flow to adjust their orientation. In particular, it is not quantitatively understood how particles of different shapes orient themselves in turbulent flows and how fast their orientation responds to flow fluctuations. Experiments on single particles in a quiescent medium are the first step to characterize this. We present our work on freely falling ellipsoidal particles in the 'intermediate' regime of particle Reynolds number 1-10 using shadowgraphy in an air-filled column setup. The particles are well-defined and have volumes equivalent to a diameter 140 um sphere, which became possible thanks to utilizing 2-Photon-Polymerization. The density ratio between the particles and the medium (air) is approx. 1000. The experiments were performed using three high-speed cameras to capture both the transient and the terminal state. This allows us to look into rotation/tumbling rates, terminal velocities and the transient dynamics: do stable fixed points in the orientation or oscillatory motions exist and is there a stable orientation that the particle will take? For particles with unstable transient orientation, what is the steady-state orientation?

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