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Studying colloidal particles on an emulsion droplet with digital holographic microscopy JEROME FUNG, Harvard University, Dept. of Physics, REBECCA W. PERRY, Harvard University, School of Engineering and Applied Sciences, THOMAS G. DIMIDUK, Harvard University, Dept. of Physics, VINOTHAN N. MANOHARAN, Harvard University, Dept. of Physics and School of Engineering and Applied Sciences — Interactions between colloidal particles at a curved liquid-liquid interface remain poorly understood. We study how the interactions between micron-sized polymethyl methacrylate (PMMA) particles bound to the surface of $\sim$5 μm decane droplets dispersed in an aqueous continuous phase influence the particle dynamics. We track the 3D position of up to 6 particles moving on a droplet by imaging particle-laden droplets with digital holographic microscopy and fitting the recorded holograms with Lorenz-Mie scattering calculations. We demonstrate particle tracking with $\sim$10 nm precision in all directions at up to millisecond frame rates, which allows the study of rapid particle motions. In addition, we use negative dielectrophoresis to keep the droplets far away from the walls of our sample holders during imaging. Our measurements probe the interparticle interactions and allow us to determine particle contact angles *in situ*.

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