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Formation of Extended Optical Traps by Shape-Phase Modulation - Measuring Inter-Colloidal Interactions in Tailored Potential Landscapes YOHAI ROICHMAN, DAVID G. GRIER, Soft Matter Research Center, Physics dept., New York — We describe methods for projecting holographic optical traps whose potential energy wells are extended along specified curves, typically a straight line, and whose intensity profiles also can be tailored. This class of optical traps is useful for manipulating elongated nano-items, creating anisotropic potential energy landscapes, and in particular for investigating the interactions and dynamics of micro-particles in reduced dimensionality. This new class of extended optical traps is created by modulating the shape and the phase of a complex hologram, projected by a phase-only diffractive optical element. We demonstrate rapid characterization of extended traps' potential wells through digital video microscopy of trapped colloidal spheres, and use arrays of calibrated traps for efficient measurement and screening of colloidal interactions.

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