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Precision laser beam shaper for optical lattice quantum emulation applications¹ RUDY KOHN, JINYANG LIANG, MIKE BECKER, DANIEL HEINZEN, The University of Texas — We have developed a laser beam-shaper that uses a digital micro-mirror device (DMD) in conjunction with an error diffusion algorithm as well as an iterative correction algorithm to generate laser beams with an arbitrary intensity profile. With this device, we have generated flat-top intensity profile beams with better than 0.5% rms flatness. We are in the process of implementing a controllable intensity profile optical lattice for a Bose-Hubbard gas with this beam shaper. This should allow us to carry out a precision study of the homogeneous Bose-Hubbard gas, and to circumvent problems related to sample inhomogeneity in quantum emulation. Extensions of our method might also be useful for manipulation of sample entropy and cooling, for the study of excitations, and other quantum emulation applications.

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