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Laser Wavefront Perturbations in Atom Interferometers JEREMIAH MITCHELL, Northern Illinois University, TIMOTHY KOVACHY, Northwestern University, SWAPAN CHATTOPADHYAY, Fermi National Accelerator Laboratory, Northern Illinois University — Laser wavefront perturbations act as a leading systematic in the sensitivity of phase measurement in atom interferometers. We present an analytical model of laser wavefront noise for atom interferometers. Here we examine the effect of the perturbation on the total phase measured after a 3-pulse ($\pi/2 - \pi - \pi/2$) atom interferometry sequence, by using a Fourier decomposition method on the amplitude perturbations of the main laser beam and propagating them through the entire sequence. A real world example of this is a periodic defect in a reflecting mirror being imprinted during laser beam reflection. Of great interest are higher order effects such as effective momentum kicks caused by the rate of change of the wavefront perturbation phase in the transverse plane to the laser propagation, $\partial\phi_l/\partial x, \partial\phi_l/\partial z$. This model helps to build physical intuition about the size and scaling of these effects. We also explore methods to characterize and mitigate such noise in the planned MAGIS-100 experiment.

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