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Beam Delivery System for MAGIS-100 JONAH GLICK, Northwestern University, NOAH CURFMAN, Fermilab, KENNETH DEROSE, TEJAS DESHPANDE, Northwestern University, BEN GARBER, Stanford University, STEPHEN HAHN, Fermilab, JASON HOGAN, YIJUN JIANG, Stanford University, JEREMIAH MITCHELL, University of Cambridge, ROBERT PLUNKETT, Fermilab, NATASHA SACHDEVA, Northwestern University, JAMES SANTUCCI, LINDA VALERIO, Fermilab, YIPING WANG, TIMOTHY KOVACHY, Northwestern University, MAGIS-100 COLLABORATION — MAGIS-100 is a 100 meter baseline atom interferometer which will search for wavelike dark matter and serve as a prototype gravitational wave detector in the 0.1-10 Hz frequency range. The interferometer will be assembled in the MINOS access shaft at Fermilab. As clouds of strontium atoms fall freely under gravity, a laser pulse mediated by a single photon transition on the Sr clock resonance will split the atom cloud wave function into a superposition of spatially distinct, phase coherent, momentum eigenstates. Each arm of the interferometer will accumulate phase proportional to its acceleration and, with subsequent pulses, the two states will be spatially recombined and imaged. The phase of the interference pattern produced is proportional to the local gravitational acceleration, certain systematic effects, and possible new physics. Important sources of noise for this instrument are jitter in the pointing of the interferometer beam, Doppler shifts which cause nonzero detuning, inhomogeneous laser phase and intensity profiles, temporal laser intensity and phase fluctuations, and fictitious forces emerging from the rotation of the earth. We present a design of the beam delivery system which compensates for these effects.

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