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The Effect of Imperfections and Defects on the Sensitivity to Inertial Rotations in Arrays of Coherently Coupled Atomic Interferometers JOHN TOLAND, DANIEL DAYON, CHRISTOPHER SEARCH, Stevens Institute of Technology — The ability to interferometrically detect inertial rotations via the Sagnac effect has been a strong stimulus for the development of atom interferometry because of the potential  $10^{10}$  enhancement of the rotational phase shift in comparison to optical Sagnac gyroscopes. Here we analyze ballistic transport of atomic matter waves in a one dimensional chain of N coherently coupled ring shaped atom interferometers in the presence of an inertial rotation of angular frequency,  $\Omega$ . The transmission through the interferometer chain exhibits an interference pattern as a function of the Sagnac phase shift with large regions of zero transmission interspersed with regions of near unity transmission. We numerically study the phase sensitivity of such chains for varying amounts of atomic velocity fluctuations and random disorder in the size and shapes of the rings. We show that the phase sensitivity is an order of magnitude below the shot noise limit for experimentally reasonable size and velocity fluctuations. We additionally consider the phase sensitivity of a nonuniform chain of rings containing individual defect rings. The defect states make it possible to achieve significant enhancements in the phase sensitivity in response to rotations in comparison to a uniform chain.

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