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**Enhancement of the Sagnac rotational phase shift in a coherently coupled array of atom interferometers** CHRISTOPHER SEARCH, JOHN TOLAND, MARKO ZIVKOVIC, 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 matter waves in a one dimensional chain of N coherently coupled quantum rings in the presence of a rotation of angular frequency $\Omega$. We show that the transmission probability T, as a function of the rotation rate, exhibits zero transmission stop gaps interspersed with regions of rapidly oscillating finite transmission. With increasing N, the transition from zero-transmission to the oscillatory regime becomes an increasingly sharp function of $\Omega$ with a slope $\delta T/\delta\Omega \sim N^2$. The steepness of this slope dramatically enhances the response to rotations in comparison to conventional single ring interferometers such as the Mach-Zehnder and leads to a phase sensitivity well below the standard quantum limit. The universality of our transfer matrix approach implies that the results are also applicable to the study of the Sagnac effect in ballistic conductors (such as graphene and two dimensional electron gases).

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