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Precision Atom Interferometry

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While the current generation of atom interferometric force sensors perform at levels which compete favorably with the existing state-of-the-art, the full potential of these sensors has yet to be realized. Advances in the quality of the atom optics used to manipulate atomic de Broglie waves, the brightness of the atomic sources, and attaining full control over the quantum many-body wavefunction of the ensemble of interfering particles all promise to bring the performance levels of these sensors to levels of precision which may have dramatic future scientific and technological impact.

This talk will review the performance of the current generation of sensors, describe recent experimental efforts to push the limits of sensor performance, and discuss future applications. In particular, a recent demonstration of a large area atom interferometer (>100 photon recoil momenta) based on a sequence of high-order Bragg transitions will be presented. Application of this method to the development of next generation gravity wave detectors and tests of the Equivalence Principle will be discussed.