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Rotation sensing with the BIGTOP gyroscope

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Abstract

Precision rotation sensing is useful for navigation, geophysics, and tests of fundamental physics. Atom interferometers provide, by some measures, the most sensitive method for rotation sensing achieved to date. However, the best performance requires freely falling atoms in a large experimental apparatus. Many applications, such as navigating a vehicle, will benefit from a more compact geometry. One method to achieve this is by using trapped atoms that are suspended against gravity. BIGTOP (Bragg Interferometer Gyroscope in a Time-Orbiting Potential) implements such an interferometer. It has been used to measure a rotation rates comparable to that of the Earth, and recent improvements provide an enclosed area approaching 10 mm2.