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Classical Dirac particle in the gravitational field of a ring laser ROBERT FISCHETTI, Quinnipiac University–Hamden, CT, RONALD MALLETT, University of Connecticut–Storrs, CT — Among the many unique features of Einstein's general theory of relativity that differs from Newtonian gravitational theory is the theoretical prediction that not only matter but also the directed electromagnetic radiation of light can produce a gravitational field. This has yet to be demonstrated by experiment. The ring laser which has proven quite useful in many areas of physics can also be an effective tool for examining the gravitational effects of light. This talk will examine the experimental possibilities, along with their associated theoretical underpinnings, of the gravitational effects of a ring laser. The focus will be on predictions that the electromagnetic radiation of a ring laser can (a) induce a gravitational frame dragging precession of neutral spinning particles, (b) result in the gravitational interference of two neutron beams, and (c) produce gravitational oscillations of an electron. These effects will be examined by solving the linearized Einstein gravitational field equations for the electromagnetic radiation of a ring laser. The resulting spacetime metric is then used in (a) classical relativistic spin equations for a neutral spinning particle, (b) the quantum Dirac equation for the interference of neutron beams, (c) the classical Dirac electron equation.

Robert Fischetti
Quinnipiac University–Hamden, CT

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