

Non-relativistic Limit of Dirac Equations in Gravitational Field and Quantum Effects of Gravity

WU Ni ng

Institute of High Energy Physics, P.O. Box 918-1, Beijing 100049, China
(Received: 2005-6-15; Revised:)

Abstract: Based on unified theory of electromagnetic interactions and gravitational interactions, the non-relativistic limit of the equation of motion of a charged Dirac particle in gravitational field is studied. From the Schrödinger equation obtained from this non-relativistic limit, we can see that the classical Newtonian gravitational potential appears as a part of the potential in the Schrödinger equation, which can explain the gravitational phase effects found in COW experiments. And because of this Newtonian gravitational potential, a quantum particle in the earth's gravitational field may form a gravitationally bound quantized state, which has already been detected in experiments. Three different kinds of phase effects related to gravitational interactions are studied in this paper, and these phase effects should be observable in some astrophysical processes. Besides, there exists direct coupling between gravitomagnetic field and quantum spin, and radiation caused by this coupling can be used to directly determine the gravitomagnetic field on the surface of a star.

PACS: 04.60.-m, 11.15.-q, 04.80.Cc

Key words: quantum gravity, gauge field, quantum effects of gravity

[\[Full text: PDF\]](#)

Close