



A THEORETICAL MODEL TO STUDY, WITHIN THE FRAMEWORK OF GENERAL RELATIVITY, THE GRAVITATIONAL INTERACTION BETWEEN A SINGLE PHOTON IN A CIRCULAR WAVEGUIDE AND A MASSIVE NEUTRAL PARTICLE

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Abstract

In the context of General Relativity, we propose a theoretical formulation for investigating the gravitational interaction between photons in a circular waveguide and a massive single neutral particle at rest. In particular, treating photons as massive accelerated particles, we find the acceleration and velocity operators relative to a given photon. Furthermore, by assuming the waveguide as an ideal potential well and by using the time-independent relativistic Schrödinger equation, the eigenvalue spectra of the above operators are determined as well as their eigen-wavefunctions. In addition, some related issues are discussed.

Keywords and phrases: general relativity, photons, gravitational interaction, acceleration operator, velocity operator, neutral particle, time-independent relativistic Schrödinger equation.