Available online at www.scholarsresearchlibrary.com

Extended Abstract

Archives of Physics Research, 2018, 09 (3)
(https://www.scholarsresearchlibrary.com/journals/archives-of-physics-research/)

ISSN 0976-0970
CODEN (USA): APRRC7

Matter dynamics in a unitary relativistic quantum theory

Eliade Stefanescu

Institute of Mathematics of the Romanian Academy, Romania

E-mail: eliadestefanescu@yahoo.fr

In a previous paper, we showed that the Hamilton equations of motion of a quantum particle are obtained as group velocities of the wave packet describing this particle only if the time dependent phase of a particle wave is proportional to the Lagrangian, not to the Hamiltonian as in a solution of the conventional Schrödinger equation. When a Lagrangian of relativistic form is considered, the wave packet of a quantum particle takes a physical form, with a finite spectrum of a cut off velocity (c). Based on a relativistic quantum principle, asserting the invariance of the time dependent phase for an arbitrary change of coordinates, we obtained the relativistic kinematics and dynamics, the electromagnetic field equations, the spin and the electromagnetic and gravitational interactions. When the Lagrangian is considered as a function of the Hamiltonian, we obtain a Schrödinger type equation with an additional term depending on the velocity and the momentum operator. Based on this equation, we investigate the dynamics of a relativistic quantum particle. In this framework, such a particle is described as a continuous distribution of conservative matter, according to the general theory of relativity. In an electromagnetic field, any time dependent phase variation is modified with a term proportional to a vector potential conjugated to the spatial coordinates and a scalar potential conjugated to time. However, this classical description tells us nothing about the structure of the physical world. Only Quantum Mechanics tells us something about the structure of this world. Namely, that this world is composed of species of identical quantum particles. On one hand, experimentally, it has been found that these particles are of a wavy nature. On the other hand, one could find that the simplest way to define a quantum particle is by a wave packet, with momenta conjugated to coordinates and energy conjugated to time Consider a quantum particle as a wave packet, and find that the group velocities in the coordinate and momentum spaces are in agreement with the Hamilton equations only when the Lagrangian is considered in the time dependent phases, instead of the Hamiltonian in the conventional forms of these waves as solutions of the Schrödinger equation. We define a relativistic quantum principle, and derive a wave equation for a relativistic quantum particle, the relativistic kinematics and dynamics of the particle waves, the Maxwell equations and the Lorentz force of a field interacting with the particle waves, the relativistic transform of such a field, and the spin as a characteristic of the particle waves. We consider a quantum particle as a distribution of conservative matter propagating according to the General Theory of Relativity. We obtain the dynamics of this matter in a gravitational field, the propagation in plane waves perpendicular to geodesic tracks, and equations of conservation. We describe the matter dynamics as a positively defined density and show that, according to the general theory of relativity, such a distribution can be conceive only as of a fragment of matter with a finite mass equal to a mass , as a characteristic of the matter dynamics, – the matter quantization. The group velocities of the Fourier conjugate representations in the coordinate and momentum spaces describe the dynamics of a quantum particle in agreement with the Hamiltonian equations. Under the action of an external (non-gravitational) field, the acceleration of the quantum matter has two components: 1) A component perpendicular to the velocity, given by the relativistic mechanical component of the time dependent phase, and 2) A component given by the additional field terms of this phase. A free quantum particle is described by a non-dispersing wave function , contrary to the solution of the Schrödinger equation. A coherent electromagnetic field, in resonance with a system of active quantum particles in a Fabry-Perot cavity, has a wave vector approximately proportional to the metric elements, as the resonance frequency is approximately constant – a gravitational wave can be detected by the transmission characteristics of an active Fabry-Perot cavity. In a constant gravitational field, a quantum particle undertakes a velocity and an acceleration, which, at the boundary of a black hole are null – absorption and evaporation processes at the boundary of a black hole arise only by gravitational perturbations. Generally, a quantum particle is described by a time-space volume, called graviton, with a spin 2, and a distribution of a specific matter in this volume, with a half-integer spin for Fermions and an integer spin for Bosons. A graviton Lagrangian is obtained as a curvature integral on a graviton volume, and a Hamiltonian tensor is obtained for the gravitational coordinates and velocities. In a gravitational field, the time space coordinates are deformed. In such a field, any plane wave remains perpendicular geodesic, while an additional acceleration is possible in the wave plane.

Bottom Note: *This work is partly presented at 4th International Conference on Physics September 17-18, 2018, Berlin, Germany*