3rd International Conference on

THEORETICAL AND CONDENSED MATTER PHYSICS

October 19-21, 2017   New York, USA

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Unitary relativistic quantum theory

Generally, the theory of relativity and quantum mechanics are conceived as two different theories, the first for the classical particles, and the second referring to the smallest conceivable particles, called quantum particles, which satisfy the wave equation of Schrödinger. However, when we tried to understand a quantum particle as a packet of waves as solutions of a Schrödinger equation, we came to a serious inconsistency: the group velocities of the wave packets in the two conjugated spaces, of the coordinates and of the momenta, were not in agreement with the Hamilton equations. For this agreement, instead of the Hamiltonian in the time-dependent phase of a particle wave function, one has to consider the Lagrangian. More than that, we find that, with the relativistic Lagrangian, a particle spectrum takes the physical form of a bound one, for spectrum cut-off velocity c (Figure 1). In this framework, we defined a relativistic quantum principle, asserting that any quantum particle is described by waves with scalar time dependent phases, invariant to any change of coordinates. Based on this principle, we obtain the relativistic kinematics and dynamics of a quantum particle. Describing the particle dynamics in an electromagnetic field by terms of the time dependent phase, with a vector potential conjugated to the coordinate variations, and a scalar potential conjugated to the time variation, we reobtain the Lorentz force and the Maxwell equations. These equations describe field waves propagating with the "light velocity", which, for the physical consistency, is considered the same as the cut-off velocity c. In this framework, a Schrödinger wave function is only a slowly varying amplitude of a particle wave function with a rapid oscillation given by the particle rest mass. We reobtain the proper rotation of a quantum particle called spin, and demonstrate the spin-statistics relation. We generalize a particle wave packet for a curvilinear system of coordinates and consider the gravitational field as a deformation of these coordinates. In this framework, a quantum particle is considered as a continuous distribution of matter according the theory of the general relativity.
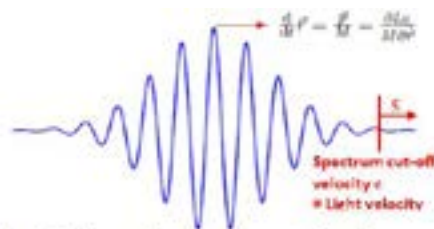

Figure 1: Wave packet of a quantum particle, with a relativistic group velocity, and a bound spectrum for a velocity c, which is equal to the propagation velocity of a field interacting with this particle.

Biography

Eliade Stefanescu graduated the Faculty of Electronics, Section of Physicist Engineers, in 1970, and obtained a PhD in Theoretical Physics in 1990. As a Scientist from 1976, a Senior Scientist III from 1978, he worked in physics and technology of semiconductor devices, and from 1978, he worked in physics of optoelectronic devices. From 1987, and from 1990 as a Senior Scientist II, he worked in the field of open quantum physics. In the years 1995-2000, he held a course called Dissipative Systems for the master degree. In 1991 he discovered that the penetrability of a potential barrier can be increased by coupling to a dissipative system, and described the decay spectrum of some cold fission modes. As a Senior Scientist I, from 1997 he developed a microscopic theory of open quantum systems, and discovered a physical principle for the heat conversion into usable energy. In 2014, he produced a unitary relativistic quantum theory. He received the Prize of the Romanian Academy for Physics in 1983, Diploma as Ordinary Member of the Academy of Romanian Scientists, Diploma and Golden Plate as Founder of the Academy of Romanian Scientists, and the Prize "Serban Titeica" (2014) for the book "Open Quantum Physics".

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J Material Sci Eng, an open access journal
ISSN: 2169-0022

Condensed Matter Physics 2017
October 19-21, 2017

Volume 6, Issue 7 (Suppl)

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