

3rd International Conference on **Nuclear and Plasma Physics**
&
4th International Conference on **Quantum Physics and Quantum Technology**
November 05-06, 2018 | London, UK



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A unitary relativistic quantum theory of the dissipative tunneling

About 25 years ago, the author found that by a dissipative coupling, the penetrability of a potential barrier is increased, not decreased as it was believed before. A dissipative coupling includes two physical effects: (1) an increase of the action of the system, which leads to a decrease of the barrier penetrability, as it was shown by Caldeira and Leggett, and (2) additional transitions resulting from the dissipative terms of Lindblad's master equation, which lead to a penetrability decrease. With the tunneling and momentum operators in Lindblad's dissipative term, the author found a good agreement of the theoretical results with the experimental spectra of some cold fission modes. However, later, important theoretical progresses appeared. First of all, he found Lindblad's theory very unsatisfactory, including a large number of unspecified parameters. Using a method of Ford, Lewis, and O'Connell for the reduced dynamics, he obtained a quantum master equation with explicit, analytical parameters, depending on the dissipative potential matrix elements, densities of the environment states, and occupation probabilities of these states, for a complex environment of other fermions, bosons, and a free electromagnetic field. More than that, he found that a particle wave function includes the Lagrangian in the time dependent phase of a particle wave function, instead of the Hamiltonian of the conventional Schrödinger equation. In this case, the wave equation includes an additional term depending on momentum and velocity, and the penetrability of a potential barrier takes an explicit form, depending on physical characteristics, velocity, and spin.

Biography

Eliade Stefanescu graduated from the Faculty of Electronics, Section of Physicist Engineers, in 1970, and obtained a PhD in Theoretical Physics in 1990. He discovered a phenomenon of penetrability enhancement of a potential barrier by dissipative coupling. He developed a microscopic theory of open quantum systems, discovered a physical principle and invented a device for heat conversion into usable energy, and produced a unitary quantum relativistic theory. He is a Member of the American Chemical Society and of Academy of Romanian Scientists. He received the Prize of Romanian Academy for Physics in 1983, and the prize "Serban Titeica" in 2014 for a book.

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