The vacuum-field theory electrodynamics and the Feynman approach legacy

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In 1948 R. Feynman presented but did not publish [1] a very interesting, in some aspects "heretical", quantum-mechanical derivation of the classical Lorentz force acting on a charged particle under the influence of an external electromagnetic field. His result was analyzed by many authors (see for example [2]) from different points of view, including its relativistic generalization. As this problem is completely classical, we reanalyze Feynman's derivation from the classical Hamiltonian dynamics point of view and construct its nontrivial generalization compatible with results [3], based on a recently devised vacuum field theory approach [3,4]. Having further obtained the classical Maxwell electromagnetic equations we present the complete legacy of Feynman's approach to the classical electrodynamics and demonstrate its compatibility with the relativistic generalization presented before in [3,4].

Moreover, we have succeeded in finding the exact analytical relationship between Feynman's approach and the vacuum field approach devised in [4] and proposed its physical explanation, based on the gauge transformations theory. Thus, the results obtained confirm the deep physical backgrounds lying in the vacuum field theory approach, based on which one can simultaneously describe the physical phenomena both in electromagnetic and gravity terms. The latter is physically linked with the particle '*inertial*' mass expression, naturally following both from Feynman's approach to the classical electrodynamics and from the vacuum field approach.

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