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Effective Hartree-Einstein Equation for the Relativistic Dynamics of the Trojan Wave Packets MATT KALINSKI, Utah State University — We find the high accuracy interpolating function for the relativistic energy-momentum relation in the classical nonrelativistic form as the ratio of the normal momentum square and the momentum dependent effective mass. The relation has the proper behavior in the short and long momentum wave vector limit. The counterintuitive factor of 2 is found to obtain the accurate dispersion relation. Based on this relation and using the hydrodynamic approach to quantum mechanics we construct the effective nonlinear Hartree-Einstein Schrödinger equation containing the relativistic mass correction in the form of the effective mass dependent on the particle position through the quantum phase of the wave function. The equation allows to study of the dynamics of the nondispersing Gaussian Trojan Wave Packets in the relativistic limit in the scalar approximation only within the nonlinear Schrödinger equation. We solve the self-consistent equations for the coefficients of the generalized Gaussian wave function in harmonic approximation. Results are compared to the solutions of Dirac and Klein-Gordon equations and the numerical simulations are also performed to compare with the approximation.

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