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Variational approach for the fully three-dimensional quantum Zakharov system[1] PADMA KANT SHUKLA, FERNANDO HAAS, Ruhr University Bochum, Bochum, Germany — The three-dimensional quantum Zakharov system is derived from a two time-scales technique and hydrodynamic equations. The Lagrangian formalism as well as the pertinent conservation laws are identified. In the adiabatic and semiclassical case, the quantum Zakharov system reduces to a quantum modified vector nonlinear Schrodinger (NLS) equation for the envelope electric field. The variational structure is used to investigate the dynamics of localized, Gaussian shaped solutions, via the Rayleigh-Ritz variational method. The formal classical limit is considered in detail. Quantum corrections are shown to prevent the collapse of localized Langmuir envelope fields, in both two and three-spatial dimensions. Moreover, the quantum terms can produce a breather-like, oscillatory behavior of the width of the approximate Gaussian solutions. The variational method is shown to preserve the essential conservation laws of the quantum modified vector NLS equation. The possibility of laboratory tests in the next generation intense laser-solid plasma compression experiment is discussed.

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Bengt Eliasson
Ruhr University Bochum

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