Abstract Submitted
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Oscillation-center theory for waves[1] D. E. RUIZ, I. Y. DODIN, Princeton University, PPPL — Linear waves, both quantum and classical, can experience ponderomotive effects when propagating in modulated media. This phenomenon is analogous to the ponderomotive effect encountered by charged particles in high-frequency electromagnetic fields. Using the Weyl calculus and generalized Lie transformations for waves, we obtain a first-principle variational theory that describes the slowly-varying, oscillation-center dynamics of waves. In this approach, the characteristic wavelength of the modulations are allowed to be comparable to that corresponding to the wave. Quantum-like effects, such as the photon recoil effect, are retained. Examples and numerical results are presented. The theory is applied to several physical systems, such as: a Schrödinger particle interacting with an oscillating electrostatic field, an electromagnetic (EM) wave propagating in a density-modulated plasma, and a Klein-Gordon particle interacting with arbitrary background and oscillatory EM fields. This work can serve as basis for future studies on the modulational instability.

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