

Abstract Submitted  
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**New exact and approximate forms for the Luttinger-Ward correlation energy functional within the GW-RPA approximation<sup>1</sup>** SOHRAB ISMAIL-BEIGI, Department of Applied Physics and Physics and Center for Research on Interface Structures and Phenomena (CRISP), Yale University — In principle, many-body Green's function approaches to electronic systems such as the Luttinger-Ward formalism allow one to compute both total energies and quasiparticle excitation spectra (i.e. band structures) simultaneously from first principles. We report on two new results that reformulate the Luttinger-Ward correlation energy functional within the GW-RPA approximation. A first expression is exact and allows for systematic and straightforward evaluation of correlation energies. The second expression is approximate but yields a family of computationally efficient approximations to the correlation energy and the self-energy operator of which the well known Coulomb-hole and screened-exchange (COHSEX) approximation is the lowest order.

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