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Hierarchy in the Static Fluctuation-Dissipation Theorem of One-Component Plasmas and Binary Ionic Mixtures JOSHUAH HEATH, KENNETH GOLDEN, University of Vermont — Fluctuation-dissipation theorems (FDTs) link transport coefficients (density response functions, conductivities, electric susceptibilities, etc.) to equilibrium n-point correlation functions. Of special importance to us is the applications of the FDT to one component plasmas and binary ionic mixtures. When applied to such systems, the fluctuation-dissipation theorem provides invaluable insight into response functions and transport coefficients across the non-equilibrium spectrum. We expand upon the work of K.I. Golden and G. Kalman (J. Stat. Phys. **3**, 87 (1972); Annals of Phys. **141**, 160 (1982)), which proposes a nonlinear response theory for magnetic field-free classical plasmas. We re-formulate the hierarchy of static fluctuation-dissipation relations in terms of external density response functions, and we derive relationships between screened and external response functions. This provides a systematic formalism for calculating higher order correlation functions in terms of lower-order ones. The screened response functions that we can calculate in the RPA (or any suitable approximation method which takes account of particle correlation effects beyond the RPA) can then provide insight into the hierarchy of static structure functions and their correlation functions.

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