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Loop Corrections in Quantum Hadrodynamics JEFF MCINTIRE, Indiana University — Although one-loop calculations provide a realistic description of bulk and single-particle nuclear properties, it is necessary to examine loop corrections to develop a systematic finite-density power-counting scheme for the nuclear many-body problem when loops are included. Moreover, it is still imperative to study exchange and correlation corrections systematically, in order to make reliable predictions for other nuclear observables. One must also verify that the natural sizes of the one-loop parameters are not destroyed by explicit inclusion of many-body corrections. The loop expansion is applied to our chiral QHD lagrangian; with the techniques of Infrared Regularization, we found that it is possible to separate out the short-range contributions and to write them as products of fields that are already present in our lagrangian. (The appropriate field variables must be re-defined at each order in loops.) The corresponding parameters implicitly include short-range effects to all orders in the interaction, so these effects need not be calculated explicitly. The remaining (long-range) contributions that must be calculated resemble those in conventional nuclear-structure calculations (e.g. ladders, rings, etc.).

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