Abstract Submitted
for the DNP07 Meeting of
The American Physical Society

Loop Corrections and Naturalness in a Chiral Effective Field Theory[1] BRIAN SEROT, JEFF MCINTIRE, Indiana University — The loop expansion is applied to a chiral effective hadronic lagrangian; with the techniques of Infrared Regularization, it is possible to separate out the short-range contributions and to write them as local 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 are nonlocal and resemble those in conventional nuclear-structure calculations. Nonlinear isoscalar scalar (σ) and vector (ω) meson interactions are included, which incorporate many-nucleon forces and nucleon substructure. Calculations are carried out at the two-loop level to illustrate these techniques at finite nuclear densities and to verify that the coupling parameters remain natural when fitted to the empirical properties of equilibrium nuclear matter. Contributions from the ωN tensor coupling are also discussed.

[1]This work was supported by DOE Contract No. DE-FG02-87ER40365.

Brian Serot
Indiana University

Date submitted: 02 Jul 2007 Electronic form version 1.4