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Pion-pion scattering from nucleon-meson fluctuations

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I present calculations of the S-wave isospin-zero and isospin-two pion-pion scattering lengths within a nucleon-meson model with parity doubling. Both scattering lengths are computed in various approximations, ranging from a mean-field calculation towards the inclusion of loop corrections by means of the FRG. I thereby elucidate subtleties concerning the truncation of the effective action w.r.t. higher-derivative pion interactions. As the main result, simultaneous agreement for the isospin-zero and isospin-two scattering lengths with experimental data within the LPA'-truncation is found. The isoscalar sigma-mass is dynamically generated by the FRG integration, and is a prediction of the model. It ends being of the order of 500 MeV, i.e., much lower than the value (> 1 GeV) found in mean-field or one-loop treatment of this or related models. Finally, the convergence of the corresponding low-energy expansion of the quantum effective action in terms of pion momenta is discussed.

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