Chiral approach to the rho meson in nuclear matter

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Abstract

In this work, the properties of the ρ meson at rest in cold symmetric nuclear matter are studied. We make use of a chiral unitary approach to pion-pion scattering in the vector-isovector channel, calculated from the lowest order Chiral Perturbation Theory (χPT) lagrangian including explicit resonance fields. Low energy chiral constraints are considered by matching our expressions to those of one loop χPT. To account for the medium corrections, the ρ couples to $\pi\pi$ pairs which are properly renormalized in the nuclear medium, accounting for both $p-h$ and $\Delta-h$ excitations. The terms where the ρ couples directly to the hadrons in the $p-h$ or $\Delta-h$ excitations are also accounted for. In addition, the ρ is also allowed to couple to $N^*(1520)-h$ components.