

# Two-pion exchange contributions to the nucleon-nucleon interaction in covariant baryon chiral perturbation theory

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Employing the covariant baryon chiral perturbation theory, we calculate the leading and next-to-leading order two-pion exchange (TPE) contributions to  $NN$  interaction up to order  $O(p^3)$ . We compare the so-obtained  $NN$  phase shifts with  $2 \leq L \leq 6$  and mixing angles with  $2 \leq J \leq 6$  with those obtained in the nonrelativistic baryon chiral perturbation theory, which allows us to check the relativistic corrections to the medium-range part of  $NN$  interactions. We show that the contributions of relativistic TPE are more moderate than those of the nonrelativistic TPE. The relativistic corrections play an important role in F-waves especially the  ${}^3F_2$  partial wave. Moreover, the relativistic results seem to converge faster than the nonrelativistic results in almost all the partial waves studied in the present work, consistent with the studies performed in the one-baryon sector.

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