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Antinucleon-nucleon interactions in covariant chiral effective field theory

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Motivated by the recent progress in developing high-precision relativistic chiral nucleon-nucleon interactions, we study the antinucleon-nucleon interaction at the leading order in the covariant chiral effective field theory. The phase shifts and inelasticities with $J \leq 1$ are obtained and compared to their non-relativistic counterparts. For most partial waves, the descriptions of phase shifts and inelasticities in the leading-order covariant chiral effective field theory are comparable to those in the next-to-leading order non-relativistic chiral effective field theory, confirming the relatively faster convergence observed in the nucleon-nucleon sector. In addition, we search for bound states/resonances near the $\bar{N}N$ threshold and find several structures that can be associated with those states recently observed by the BESIII Collaboration.

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