

HIGH-ENERGY APPROXIMATIONS  
FOR TWO-NUCLEON SCATTERING  
BASED ON THE DIRAC EQUATION  
WITH A POTENTIAL INTERACTION

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S u m m a r y

Based on the Dirac equation with direct potential interaction, the scattering of two nucleons in a singlet spin state is investigated within the Born and high-energy quasiclassical approximations. For the Yukawa potential, it is shown that the expansion of the total scattering amplitude in a series of perturbation theory with respect to the effective potential is not applicable. For potentials finite at zero, it is found that the Born scattering singlet  $S$ -phase has a non-zero high-energy asymptotics. For the potentials with Coulomb's singularity at small distances, it is obtained that the Born phase increases with energy logarithmically. For the Yukawa potential and a number of other interaction potentials, analytic expressions for perturbation terms of the second order to the Born  $S$ -phase are found. A qualitative analysis of the accuracy of the Born and eikonal high-energy approximations for the singlet  $S$ -scattering of nucleons is given.