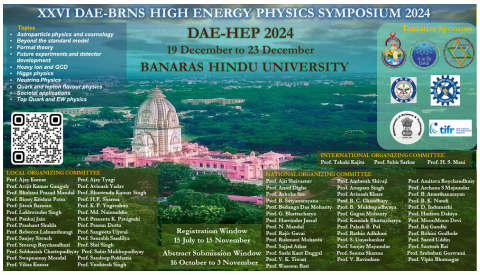

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Optical inverse potentials for Proton-Proton scattering up to 1GeV

Background: Phase shift analysis of nucleon-nucleon elastic scattering has been conducted up to 350 MeV by various research groups, employing realistic interaction potentials based on pion and meson exchange.
Purpose: Objective of this research is to develop inverse potentials for both real and imaginary scattering phase shifts by utilizing the optical potential for proton-proton interactions up to 1 GeV.
Methodology: A combination of various smoothly connected Morse components over different regions of interaction is selected as the reference potential. The reference potential comprises of two regular Morse functions to account for short- and medium-range interactions and an inverse Morse function to represent long-range interactions. Such a combination ensures that one need not include the long-range coulomb interaction separately. The potential parameters are optimized by solving the phase equation using the RK-5 method iteratively, in order to minimize the mean squared error between the calculated and experimental phase shifts using genetic algorithm.
Results: The final real and imaginary scattering phase shifts obtained using our methodology demonstrates excellent agreement with the expected ones up to 1GeV.

Field of contribution

Phenomenology

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