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Scattering phase shifts and mixing angles for an arbitrary number of coupled channels on the lattice

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We present a lattice method for determining scattering phase shifts and mixing angles for the case of an arbitrary number of coupled channels. Previous lattice studies were restricted to mixing of up to two partial waves for scattering of two spin-1/2 particles, which is insufficient for analyzing nucleon-nucleus or nucleus-nucleus scattering processes. In the proposed method, the phase shifts and mixing angles are extracted from the radial wave functions obtained by projecting the three-dimensional lattice Hamiltonian onto the partial wave basis. We use a spherical wall potential as a boundary condition along with a channel-mixing auxiliary potential to construct the full-rank S-matrix. Our method can be applied to any type of particles, but we focus here on scattering of two spin-1 bosons involving up to four coupled channels. For a considered test potential, the phase shifts and mixing angles extracted on the lattice are shown to agree with the ones calculated by solving the Schrödinger equation in the continuum.

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