Form Factors for Two-Nucleon Transfer in the Diabolical Region of Rotating Nuclei

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The theoretical investigation of rotational bands in strongly deformed nuclei by Coulomb excitation and the subsequent transfer of nucleon pairs requires the knowledge of two-nucleon transfer amplitudes between rotating eigenstates of the A- and the $A \pm 2$-systems. In a semiclassical approximation these amplitudes are obtained by integrating over transfer formfactors depending on the orientation angle of the deformed target nucleus. We use the cranking approximation based on a rotating mean field in order to calculate these transfer formfactors. There behavior is studied as a function of angular momentum, deformation and pairing correlations. In the region of diabolical points these formfactors show considerable oscillations and phase changes reflecting the microscopic single particle structure involved in these matrix elements. In this way we are able to understand the underlying microscopic structure causing the diabolical behavior of pair transfer in this region.

Probes of Pairing Correlations by Heavy-Ion Two-Neutron Transfer Reactions

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This paper reviews experimental data on rotational-band population patterns in heavy-ion neutron-pair transfer among dysprosium isotopes 160, 162, and 164. The ideas and status of diabolic pair transfer are reviewed. We show results of large (- 2600 x 2600) matrix diagonalization calculations of ground and seven lowest neutron-excited rotational bands for these dysprosium nuclei. Then the resulting wave functions are used to solve the coupled time-dependent Schroedinger equations for head-on collisions of Ni and 11 % with pair transfer. We go beyond earlier work by including ground and four lowest neutron-excitation bands in both initial and final dysprosium partner. Earlier work was limited to ground and an idealized aligned band. Both experiment and theory show the importance of population to higher bands than the lowest two, but the comparisons bring out the need for further experimental and theoretical work on more systems.