

# Separable Representation of Single and Multi-Channel Optical Potentials

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Single particle transfer reactions (d,p) involving rare isotopes are an important tool to study nuclear structure. In addition, one can connect the (d,p) process with the neutron capture process, a topic of great relevance to astrophysics and the questions around the synthesis of heavy elements. The (d,p) reaction may be viewed as a three-body  $n+p+A$  problem, in which the deuteron and the nucleus  $A$  act as participants in the reaction. A three-body description requires as input a nucleon-nucleon potential as well as effective interactions describing the  $n+A$  and  $p+A$  systems. Those interactions are usually given by optical model potentials, which are complex as well as energy dependent. Here separable representations of nucleon-nucleus optical model potentials are presented, which are based on a scheme originally developed by Ernst, Shakin, and Thaler, but now extended to describe complex as well as energy dependent optical model potentials for neutron as well as proton scattering. This scheme is then further extended to take into account core excitations of the nucleus.

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