

Some developments in few-particle scattering problem based on complex-scaling method

Rimantas Lazauskas¹

IPHC, IN2P3-CNRS/Univ. Louis Pasteur BP 28, F-67037 Strasbourg Cedex 2, France¹
`rimantas.lazauskas@iphc.cnrs.fr1`

The solution of the scattering problem in configuration space is a very difficult task both from formal (theoretical) as well as computational points of view. The principal difficulties arise from the complex asymptotic behavior of the system wave function, which may be result of either the presence of multiple scattering channels or the the systems breakup into three or more clusters. One is obliged to seek for the exact methods enabling to treat the multiparticle scattering problem by avoiding the explicit treatment of the systems wave-function at the boundaries.

In particular complex-scaling method, proposed in the late sixties by Nuttall and Cohen [1], offers very accurate and elegant formalism to treat diverse scattering problems for short range potentials [?]. Within the last few-years [4, 5] I have applied this method in handling very different scattering problems: 2-body collisions including Coulomb interaction, Optical potentials; scattering including the 3-body break-up for real and Optical short-ranged interactions; 3-body and 4-body scattering for the systems, where two-particles (clusters) are charged; 3-body break-up amplitude for n-d as well as p-d scattering. Finally, I have demonstrated that the conventional smooth complex scaling technique might be also used in describing collisions in pure Coulombic 3-body systems. These late achievements will be overviewed and discussed.

References

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