

On recent analytic results for solution of the scattering problem for sharply screened Coulomb potentials

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The scattering problem for two particles interacting via the Coulomb potential is examined for the case where the potential has a sharp cut-off at some distance [1]. The scattering wave function is constructed for two complimentary situations, firstly when the interior part of the Coulomb potential is left in the Hamiltonian and, secondly, when the long range tail is considered as the potential. The partial wave results are summed up to obtain the wave function in three dimensions. It is shown that in the domains where the wave function is expected to be proportional to the known solutions, the proportionality is given by an operator acting on the angular part of the wave function. The explicit representation for this operator is obtained in the basis of Legendre polynomials.

The Green function for sharply cut-off Coulomb potential is constructed by summing up the partial wave series. The explicit representation for the Green function in three dimensions through the Coulomb Green function is obtained in the region of the configuration space where the potential is not zero.

The zero-range potential formalism is developed for Hamiltonians which potential energy part has the short-range Coulomb singularity [2].

[1] S.L. Yakovlev, M.V. Volkov, E. Yarevsky and N. Elander, *The Impact of Sharp Screening on the Coulomb Scattering Problem in Three Dimensions* J. Phys. A: Math. Theor. 43 (2010) 245302.

[2] S.L. Yakovlev, V.A. Gradusov, *Zero range potential for particles interacting via Coulomb potential* J. Phys. A: Math. Theor. 46 (2013) 035307

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