Asymptotical structure of the three-body Coulomb Green function for the case of two charged particles

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The asymptotical structure of the three-body Coulomb Green function was studied by S.P.Merkuriev [1] using the eikonal method which was also very effective for studying three-body wave-function asymptotics [2-5].

In the present work the asymptotical structure of the three-body Coulomb Green function $R(X, X', E)$ for the case of two charged particles was explicitly derived by the stationary phase method [6] using the explicit representation for the two-body Coulomb Green function asymptotics at large parabolic coordinates [7-8]. The stationary phase points are the roots of the third power polinomial with the coefficients which depend on the three-body system configuration.

The conditions are $k_\alpha(|x_\alpha| + |x'_\alpha| - |x_\alpha - x'_\alpha|) \gg 1, \quad |y_\alpha - y'_\alpha| \gg 1$. Here the x_β and y_β are the Jacobi coordinates, the momentum transfer k_α and coordinates x_α characterize the charged pair α, $X = (x_\beta, y_\beta)^T, \quad X' = (x'_\beta, y'_\beta)^T, \quad \beta = 1, 2, 3$.

The present formalism allow to obtain the coefficient of proportionality in the expression for $R(X, X', E)$ which was not obtained before and to study the $R(X, X', E)$ asymptotics for arbitrary configurations which are allowed by the conditions of applicability.

For the special case $k_\alpha(|x_\alpha|+|x'_\alpha|-|x_\alpha-x'_\alpha|) \ll 1, \;\; k_\alpha(|x_\alpha|+|x'_\alpha|+|x_\alpha-x'_\alpha|) \gg 1, \;\; |y_\alpha-y'_\alpha| \gg 1$ we can write the similar representation, where the stationary phase points are the roots of the more complicated equation.

References:

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