ANALYTIC REPRESENTATION OF THE AMPLITUDE OF MULTI-PARTICLE COULOMB BREAKUP

Ilyin A.P.
Institute for nuclear research of NAS of Ukraine, Kyiv, Ukraine
E-mail: antonsergey47@gmail.com

In calculations of amplitudes of reactions with the yield of several charged particles in order to take into account Coulomb effects in the exterior one have to integrate numerically over the large but bound range of space. Therefore for the evaluations of such effects it is desirable to obtain analytical formulas. In the present work a general approach is developed for finding analytic approximations for amplitudes of direct Coulomb breakup of the light multi-cluster nucleus into three, four, and more charge particles in the Coulomb field of a heavy target nucleus. Effects of the excitation of target nucleus are neglected. Consecutive fragmentation of a projectile nucleus can be competing processes. Coulomb contribution of such reactions may be defined using the relevant amplitudes whose analytical form also was found by the author [1].

In this paper neglecting the interaction between light reaction's products and using zero-range model for the function of the bound state of the projectile we first lead the Coulomb breakup amplitude to the single spatial integral which contains the product of four wave functions of particles in the coulomb field of target nucleus. Then this integral is transformed into the triple contour integral. After that we by analogy write the four-fold contour integral, which corresponds to breakup into four charged particles. Further, using unlike to work [1] barely one infinitesimal linear-fractional transformation, we lead this integral to six-fold sum containing products of four Gauss hypergeometric functions with certain coefficients, from reducing of which (resetting to zero five earlier added parameters) we obtain the expression for the case of breakup into three particles. The last is represented in the form of the four-fold sum of the products of three Gauss hypergeometric functions which resemble in structure to those from the work [1].

1. A.P.Il'in // TMPh. 2006. V.146. No.2. P.259.