# Complete numerical calculation of the interaction energy for two uniformly charged spheroids. Example of heavy ions.

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The nucleus-nucleus interaction potential includes the nuclear and Coulomb parts. The calculation of the components of a nucleus-nucleus interaction potential with real Fermi distributions of the density of nucleons is a very complicated problem, especially for sufficiently heavy nuclei. In particular, this concerns the Coulomb interaction considered in the present work. While analyzing the spherical nuclei, the Coulomb interaction is usually approximated by the interaction of two uniformly charged balls. But really, many nuclei are deformed and have shape close to the spheroidal one. Here, we use the standard formula for the interaction energy of two volume charges:

$$E_{int} = \int \Phi_1(\vec{r})\rho_2(\vec{r})\, d\vec{r}, \qquad (1)$$

which includes the potential $\Phi$ created by one of the spheroids and the charge density $\rho$ in another spheroid. The volume charges can be spatially disjoint or can overlap with each other. The potential $\Phi$ is taken with the use of explicit forms considered in monographs [1,2]. In the software of the present work, we have described the general case of the interaction of two arbitrarily located spheroids and some partial cases.

1. Sretenskii L. N. Theory of the Newton Potential [in Russian]. MoscowLeningrad: OGIZ Gostekhizdat, 1946, 346 p.
2. Chandrasekhar S. Ellipsoidal Figures of Equilibrium. New Haven: Yale Univ. Press, 1969, 252 p.