Bound-state interaction potential

Application of the Distorted wave Born approximation (DWBA) to the nuclear transfer reaction $(bx) + A \rightarrow b + (Ax)$ requires the calculation of the bound-state wave function in the entrance ($b + x$ system) and exit ($A + x$ system) channels. These wave functions are calculated numerically with help of integration of the Schrodinger equation with appropriated interaction potential. In the "Nuclear transfer reaction" section of NRV project this potential can be treated in the following forms:

Woods-Saxon or Gaussian form:

$$V(r) = \frac{V_0}{1 + \exp\left[\frac{r - R_V}{a_V}\right]},$$

or

$$V(r) = V_0 \exp\left[-\frac{r^2}{R_V^2}\right]$$

where $V_0 < 0$ is the depth of the potential, $R_V = r_V A_C^{1/3}$ is its radius, A_C is the core-nucleus (b or A) mass number, and a_V is the diffuseness of the interaction potential.

The Coulomb interaction of the transferred particle (x) and core nucleus (b or A) is treated as the Coulomb interaction of the point-charge and uniformly charged sphere of radius $R_C = r_C A_C^{1/3}$:

$$V_C(r) = Z_1 Z_2 e^2 \begin{cases} \dfrac{1}{r}, & r > R_C, \\ \dfrac{1}{2R_C}\left(3 - \dfrac{r^2}{R_C^2}\right), & r \le R_C. \end{cases}$$

The button "*Adjust depth*" can be used in order to adjust the depth parameter V_0 of the potential to fit the binding energy E_b with current quantum numbers. In the case of **failure** of adjust routine user may set the *appropriate* initial value of the parameter V_0 and push button "*Adjust depth*" again.