

Interaction nucleus-nucleus potential (Spin-orbital part)

Interaction potential (IPot) is a complex function depending usually on the distance between colliding nuclei which may include the Spin-orbit component. In the “Radiative capture reaction” section of the NRV project the spin-orbital part of the IPot is treated in the following form (Thomas form)

$$V_{SO}(r) = -2\lambda_{\pi}^2(\mathbf{L} \cdot \mathbf{s})(V_{SO} + iW_{SO})\frac{1}{r}\frac{d}{dr}\left[1 + \exp\frac{r - R_{SO}}{a_{SO}}\right]^{-1},$$

where $\lambda_{\pi} = \frac{\hbar}{m_{\pi}c^2} \approx 2 \text{ fm}$, V_{SO} and W_{SO} are the depths of the spin-orbit potential, $R_{SO} = r_{SO}A_T^{1/3}$ is its radius, A_T is the target mass number, and a_{SO} is the diffuseness of the potential. Vectors \mathbf{L} and \mathbf{s} are the orbital and spin momenta, correspondingly.