Radioactive Decay with a Screened Electrostatic Interaction

Andreea I. Budaca[1], **R. Budaca**[1,2]

[1]Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, Str. Reactorului 30, RO-077125, POB MG6, Bucharest-Măgurele, Romania

[2]Academy of Romanian Scientists, Splaiul Independenţei 54, 050044, Bucharest, Romania

A new phenomenological model for the alpha decay half-lives is proposed based on the WKB theory applied to a generalized electrostatic interaction with the inclusion of a screening effect. The screening is modeled through the analytical form of the Hulthen potential. With few approximations, the model can be reduced to a simple empirical formula which recovers the universal decay law when screening is absent. Numerical applications are performed for the assertion of the impact of the screening effect on the reproduction of data for heavy and superheavy nuclei and for generating predictions for exotic nuclei. As a result, it was found that the screening effect has a systematic dependence on the shell filling.