

Analysis of Elastic α - ^{116}Sn Scattering in the Energy Region 240–480 MeV by the S Matrix Model

G.M. Onyshchenko¹, P.E. Kuznietsov¹, I.I. Yakymenko^{1,2}

¹O.I. Akhiezer Department of Theoretical Nuclear Physics and Higher Mathematics,
V. N. Karazin Kharkiv National University, Kharkiv, 61022, Ukraine

²Centre of Excellence ENSEMBLE3 sp. z o.o., 133, Wolczynska Street, Warsaw,
01-919, Poland

The elastic scattering of α -particles for nuclei ^{116}Sn is analyzed in the energy range from 240 to 480 MeV/nucleon using the original six-parameter S-matrix model. The energy dependences of the model parameters, such as the total reaction cross-sections, nuclear rainbow angles, and Fraunhofer crossover angles, were calculated along with the behaviors of the quantum deflection function and the S-matrix modulus. Regular behavior of the studied quantities indicates the model's agreement with the obtained parameters. The results are compared to those obtained by exploiting the optical model. Acceptable criteria of χ^2/N for calculations using the S-matrix model demonstrate the applicability of this model in the considered energy range.