Exploring the Role of Nuclear Structure Effects in Photofission Mechanism of ^{237}Np

Sepiani M.[1], Nasri Nasrabadi M.[1,2]

[1]*Faculty of Physics, University of Isfahan, 81746-73441, Isfahan, Iran*
[2]*Frank Laboratory of Neutron Physics, Joint Institute for Nuclear Research, IIO, Joliot-Curie 6, 141980 Dubna*

The photofission process is important for various nuclear applications and presents a multifaceted and complex phenomenon that demands exact and perfect investigations. Photofission, characterized by the excitation and subsequent fission of a nucleus induced by photon absorption, holds critical importance in fields such as nuclear energy production, nuclear medicine, and fundamental nuclear physics research. However, its complexity arises from the complicated interplay of various factors, including nuclear structure, excitation mechanisms, and reaction dynamics. By seeking the theoretical underpinnings of photofission, we attempt to know the inherent complexities of the process and clarify the underlying mechanisms governing ^{237}Np photofission. In this study, it is shown that the effects of nuclear structure such as the nuclear level density (NLD) at saddle points and fission barrier parameters play an essential role in determining the probability and characteristics of photofission reactions. By employing advanced theoretical models and nuclear reaction codes, we investigate the complicated interplay between these key factors and the photofission cross section of ^{237}Np. Theoretical calculations will be validated by the experimental data giving us a deeper understanding of the underlying mechanisms governing ^{237}Np photofission dynamics.

Keywords: Nuclear photofission, Nuclear level density, Saddle points, Fission barriers, Neptunium 237