Study of neutron induced reaction cross-section of tungsten isotope with detailed covariance analysis

Abstract

The study of neutron-induced reaction cross-sections of tungsten isotopes has become increasingly significant in the field of nuclear reactor technology. Tungsten (W), with its high atomic number, melting point, and outstanding physical properties, is considered a promising candidate material for structural and shielding applications in advanced nuclear systems, particularly fusion and fission reactors. Among its naturally occurring isotopes (182W, 183W, 184W, 186W), understanding the neutron interaction characteristics is essential for evaluating its performance and safety in reactor environments. Accurate knowledge of neutron-induced reaction cross-sections is crucial for the safe and efficient operation of nuclear reactors. There is a lack of cross section data at different neutron energies and available data have large discrepancy in published and evaluated nuclear data libraries. This research study focuses on measuring and analyzing the neutron induced reaction cross-sections of tungsten isotopes around 14 MeV neutron energy. The (n,2n), (n,p), and (n,?) reactions cross-section will be measured using off line gamma ray spectroscopy followed by neutron activation analysis (NAA) technique. The uncertainties involved in the cross-section measurements are also determined using covariance analysis. The measured reaction cross-sections are predicated using various nuclear reaction models available in TALYS and EMPIRE codes. The results are compared with existing cross-section data from libraries (e.g., ENDF, JEFF, and JENDL) or from similar experiments for validation.
Total academic project duration: 26 Week
Outcome: The neutron induced reaction cross-section will be measured for tungsten isotope around 14 MeV neutron energy with detailed covariance analysis. The experimentally measured cross-sections were validated using TALYS nuclear code.

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: M.Sc. Physics

3) Academic Project duration:

(a) Total academic project duration: 26 Weeks
(b) Student's presence at IPR for academic project work: 2 Full working Days per week

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