Seminar

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Institute for Plasma Research

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Title: Nuclear Data for fusion and astrophysical applications

Speaker: Dr. Jyoti Pandey
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Date: 28th March 2025 (Friday)

Time: 03.30 PM

Venue: Online: https://meet.google.com/kpi-nwpt-cxj

Abstract

High-quality nuclear data for an upcoming fusion reactor (ITER) is one of the fundamental prerequisites to model the reactor design and to predict the activation heating, shielding, and material damage induced by nuclear reactions. Nowadays there is a greater demand for the cross-sections and activation data for long-lived radioisotopes in the mass region A~50-60 and their impact on fusion reactor technology. Long-lived radionuclides in the mass region 50-60 may be of great concern from the viewpoint of the radioactive nuclear waste, and enhancement of extra helium and hydrogen generation during reactor operation, which may affect the neutronics of the fusion reactor up to a certain extent. The present talk highlights the need, impact, and experimental measurement of cross-section performed specially for the long-lived radionuclides in the medium mass region. Nuclear reactions in which a single nucleon or a cluster of nucleons is exchanged between the target and the projectile are primarily known as transfer reactions. These reactions are often employed in nuclear structure studies to determine the energy levels and orbital occupations of the excited states of various nuclei. They are also widely utilized in nuclear astrophysics to determine the partial decay widths of nuclear states involved in resonant reactions and to evaluate direct capture cross-sections. Additionally, they play a fundamental role in assessing whether existing nuclear models can accurately predict nuclear behavior. Transfer reactions serve as valuable spectroscopic tools due to their selectivity in populating states with pronounced single-particle or cluster characteristics. Recently, some experiments on the d+^{207}Pb reaction have been conducted, but theoretical analysis is still not satisfactory.

References:

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2. B. Pandey et al., “Measurement of 55Fe(n,p) cross-section by the surrogate-reaction method for fusion technology applications”, Physical Review C 93,021602(R) (2016).
3. M.R. Gilbert, S.L. Dudarev, S. Zheng, L.W. Packer, and J.-Ch. Sublet“Transmutation, gas production, and helium embrittlement in material under neutron irradiation”, CCFE-PR(12)02.
4. M. Spieker et al. “Accessing the Single-Particle Structure of the Pygmy Dipole Resonance in 208 Pb”. In: Physical Review Letters, 125, 102503 (2020).