

Joint seminar of the NPI of the CAS

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Mgr. Antonín Opíchal (DHIP, NPI):

Overview of Synthesis and Mass Spectrometry of Superheavy Elements: Instrumentation, Challenges, and Future Perspectives

Abstract:

The synthesis and study of superheavy elements remain at the forefront of nuclear physics, providing essential insights into nuclear structure, reaction mechanisms, and stability limits. The seminar will overview of the experimental methods and instrumentation used in heavy-ion reaction studies leading to heavy and superheavy elements, emphasizing mass spectrometry as a critical analytical technique. The research is driven by the ambitious goal of reaching the elusive 'island of stability,' a theoretically predicted region in the nuclear landscape of superheavy elements around proton number $Z = 114$ and neutron number $N = 182$. Nuclei within this region are expected to exhibit significantly enhanced stability due to nuclear shell effects. Exploring this region remains one of the central objectives of superheavy element research, promising the discovery of new, long-lived isotopes with distinctive nuclear and chemical properties. Outlook on future research directions, instrumental innovations, and the potential scientific breakthroughs in superheavy element exploration will be discussed.