NUSTAR Seminar

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Seminar Room Theory, SB3 3.170a

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Direct mass measurement of ground states and low-lying isomers in the heaviest elements with SHIPTRAP

A comprehensive understanding of the heaviest elements requires detailed studies of the quantum mechanical nuclear shell effects which determine regions of enhanced shell stabilization and allow the very own existence of such heavy nuclides as bound systems. Investigations of the nuclear structure evolution for different proton to neutron ratios around the deformed neutron shell gap at N=152 are ongoing by applying Penning-Trap Mass Spectrometry (PTMS) with the SHIPTRAP setup. Such investigations at the upper limit of the nuclear chart will provide information for a better understanding of the nature of the underlying strong interaction and will help to constrain predictions for the location of the next spherical shell closures, expected by different models at Z=114~126, N=184. In a successful experimental campaign in summer 2018, we exploited the novel Phase-Imaging Ion Cyclotron Resonance technique (PI-ICR) [1] with the relocated SHIPTRAP mass spectrometer [2] to resolve, for the first time, low-lying isomeric states in ^{251}No (Z=102) and $^{254,\ 255}$Lr (Z=103) isotopes. In addition the direct mass measurement of ^{251}No, ^{254}Lr as well as of the superheavy element ^{257}Rf (Z=104) was achieved for the first time.

Furthermore the masses of ^{254}No and ^{256}Lr were determined with unprecedented precision. In this talk an overview of the recent results will be presented. A summary of the latest optimization of the SHIPTRAP setup and its enhanced performances will be included.

[1]S.Eliseev, et al., Appl. Phys. B114, 107-128 (2014).
[2]F.Giacoppo,et al., Acta Physica Polonica B48, 423 (2017).

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