NUSTAR Seminar

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CERN, Switzerland

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Zoom Link

https://gsi-fair.zoom.us/j/94783149488

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A mass anomaly in the self-conjugate nucleus 80Zr

The nuclei that lie along the N = Z line form a rich laboratory for nuclear structure. In them, protons and neutrons occupy the same shell model orbitals, resulting in a large spatial overlap of single-particle wavefunctions and, therefore, permit unique isospin studies. In addition, midway along the N = Z line between the double-shell closures at 56Ni and 100Sn, a rapid change in nuclear shape is observed, giving rise to the most deformed ground-states in the nuclear chart. These structural phenomena leave imprints on the binding energy, that can be studied through mass spectroscopy. However, mass data in the upper N=Z region is sparse.

In this seminar, I will report on a recent experiment performed at the National Superconducting Cyclotron Laboratory that yielded the first Penning trap mass measurement of 80Zr, with N=Z=40. Our new mass values show that this nucleus is significantly lighter, and thus more bound than previously predicted. Through binding-energy indicators, we attribute this mass anomaly to the existence of a deformed double-shell closure at N=Z=40 and an increase in the Wigner energy of this exotic system. I will also show how several global nuclear mass models demonstrate difficulties with reproducing the observed phenomena and discuss our plans to revisit this region with the upcoming FRIB facility.

Convener: T. Dickel
Secretary: R. Krause / D. Press
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