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Mass spectrometry and laser spectroscopy of the heaviest elements

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High-precision mass measurements are powerful method to investigate the nuclear structure evolution in exotic nuclides. Binding energies and their differences reveal nuclear structure features such as shell closures and the onset of deformation. Recent advances in slowing down high-energy beams in buffer gas cells have opened the door to extend precision measurements in ion traps to essentially all elements. Mass measurements with Penning traps are meanwhile also feasible for the heaviest elements as demonstrated by the first direct mass measurements of nobelium and lawrencium isotopes with SHIPTRAP at GSI. These results allow mapping the strength of the neutron subshell closure at N=152 and moreover provide firm anchor points pinning down alpha-decay chains in the mass surface.
In addition, laser spectroscopic studies allow studying the impact of relativistic effects on the atomic structure of the heaviest elements. In the elements above fermium no atomic levels are experimentally known. By resonance ionization laser spectroscopy atomic levels can be identified and once levels have been identified isotope shift measurements and hyperfine spectroscopy give access to nuclear properties such as spins and moments as well as change in mean square charge radii.
In this contribution I will review recent SHIPTRAP high-precision mass measurements and discuss the prospects for laser spectroscopy of nobelium.

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