

Plenary Talk

PV VI Wed 9:45 Paulussaal

Investigating the atomic and nuclear structure of the heaviest elements — ●MICHAEL BLOCK — GSI Helmholtzzentrum für Schwerionenforschung, 64291 Darmstadt — Helmholtz-Institut Mainz, 55099 Mainz — Johannes Gutenberg-Universität Mainz, 55099 Mainz

The study of heavy and superheavy elements is a multi-faceted field of science. The heaviest of the 118 presently known chemical elements show pronounced features of relativistic effects impacting their atomic level structure and their chemical properties. With $Z\alpha \approx 1$ also quantum electrodynamics effects also become important. Moreover, superheavy nuclei are in the focus of nuclear physics with distinct features different from lighter nuclei. Their existence is thanks to nuclear shell

effects that stabilise them against the disintegration by spontaneous fission due to the strong Coulomb repulsion. This is predicted to eventually result in a central depression of the nuclear charge distribution for even to give rise to specific shapes such as bubble nuclei. The experimental study of the heaviest elements is challenging as they can only be produced artificially in nuclear reactions at accelerator facilities in atom-at-a-time quantities and are often short-lived. In recent years, we have established tailored experimental methods allowing us to extend the reach of Penning-trap mass spectrometry and resonant ionisation laser spectroscopy to heavy elements well beyond uranium. In my talk I will present the latest results on mean-square charge radii of fermium and nobelium isotopes as well as mass measurements of nuclides up to dubnium isotopes.