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Early onset of deformation in the neutron-deficient polonium isotopes identified by in-source resonant ionization laser spectroscopy

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The technique of resonant ionization spectroscopy is well known for its selectivity in the production of RIB at ISOL facilities. This feature is now also used for atomic spectroscopy on weakly-produced isotopes (<1 atom/s), otherwise not accessible by conventional laser spectroscopy techniques.

With two protons outside the lead (Z=82) closed core, the polonium isotopes (Z=84) exhibit shape coexistence on the neutron-deficient side of the nuclear chart. The influence of intruding deformed configurations on the ground state and long-lived isomers from 191Po up to the N=126 (210Po) shell closure and beyond has thus been investigated by means of in-source resonant ionization laser spectroscopy over two campaigns at CERN ISOLDE using the lsaer ion source. The isotope shifts between all the isotopes have been extracted and large-scale atomic calculations have been used to determine the electronic parameters necessary to deduce changes in the mean-square charge radii (mscr). The extracted changes in the mscr deviate much earlier than predicted by nuclear models and point towards a well-deformed ground state from 198Po downwards, much earlier than suggested by alpha-decay and in-beam studies of those isotopes.

After briefly introducing the technique and the challenges posed by the atomic calculations, we report in this contribution on the nuclear structure observables extracted (charge radii and electromagnetic moments) and their impact on our understanding of the shape coexistence phenomenon in this region of the nuclear chart.

Summary

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