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High-precision mass measurements of neutron-rich krypton isotopes

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As small as it is, about 1% of the total mass of an atom, the binding energy carries precious information regarding all the forces at play within the system. Hence, studying the evolution of binding differences along isotopic and isotonic chains can reveal nuclear structure effect such as shell closures or region of increased collectivity. In particular, the neutron-rich region between molybdenum and krypton isotopic chains is known to show such a sudden onset of collectivity around A = 100. This deformation is experimentally observed through the evolution of the mean-square charge radii [1], the energy of the first 2+ excited state [2] and, finally, the ratios between first 4+ and first 2+ excited states [3]. The A=100 region was extensively studied by many Penning trap mass spectrometers. The TOF-ICR measurement from ISOLTRAP mass spectrometer nailed the mass of 97Kr, and no irregularities in two-neutron separation energy were seen [4]. It was established as a critical point boundary [5].
New mass measurements of 96Kr, 97Kr and 98Kr were carried out during the experimental campaigns at ISOLTRAP mass spectrometer located at CERN. The measurements were performed using the multi-reflection time-of-flight mass spectrometry and time-of-flight ion-cyclotron-resonance techniques. This contribution will present preliminary results of the aforementioned experiments.

[1] I. Angeli et al., Table of experimental nuclear ground state charge radii, Atomic Data and Nuclear Data Tables, 99 (2013)
[2] F. Flavigny et al., Shape evolution in Neutron-Rich Krypton Isotopes Beyond N=60: First spectroscopy of 98,100Kr, PRL, 118 (2017)
[3] J. Dudouet et al., (_36ˆ96)Kr_30 –Low-Z Boundary of the Island of Deformation at N = 60, PRL, 118 (2017)
[4] S. Naimi et al., Critical-Point Boundary for the Nuclear Quantum Phase Transition Near A = 100 from Mass Measurements of 96,97Kr, PRL, 105 (2010)
[5] M. Albers et al., Evidence for a Smooth Onset of Deformation in the Neutron-Rich Kr Isotopes, PRL, 109 (2012)

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