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Precision mass measurements of neutron-rich chromium isotopes and the development of ground-state collectivity towards N=40

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Exotic neutron-rich nuclei around N=40 exhibit rapid structural changes with proton and neutron number. While ⁶⁸Ni₄₀ shows signatures of a doubly magic nucleus, excitation energies and transition strengths suggest a rapid development of collectivity in the ground state of neutron-rich ₂₆Fe and ₂₄Cr isotopes towards N=40. Accurate masses in this region of the nuclear chart are essential to elaborate nuclear structure in what is now called the second "island of inversion". The masses of neutron-rich chromium isotopes were too imprecisely known to address the shape of the mass surface towards ⁶⁴Cr, where a maximal quadrupole deformation is thought to be reached. Although chromium was not considered to be a well-produced "ISOL"element, successful laser-ionization developments combined with high-sensitivity mass spectrometry enabled the mass measurements of ⁵²⁻⁶³Cr during two ISOLDE experimental campaigns in October 2014 and April 2016, using the Penning-trap mass spectrometer ISOLTRAP. These measurements greatly refine our knowledge of the mass surface in this region, indicating a progressive onset of collectivity towards N=40. The results of the measurement campaigns will be presented and compared to theoretical predictions.

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