High-resolution laser spectroscopy of light gold isotopes at CRIS: investigation of the island of deformation and shape coexistence

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Since the discovery of large shape staggering in neutron-deficient mercury isotopes $Z = 80$ [1], the region around $Z = 82$ has been extensively studied due to its intriguing nuclear structure phenomena [2-3]. Recent experiments have revealed substantial shape staggering in neighbouring bismuth isotopes $Z = 83$ starting at neutron number $N = 105$ [4], which contrasts sharply with lead isotopes $Z = 82$ that remain predominantly spherical [5]. For gold isotopes $Z = 79$, earlier studies indicated an onset of strong deformation starting from neutron number $N = 107$ and persisting down to $N = 101$ [6-7]. We report recent high-resolution collinear resonance ionization spectroscopy measurements of neutron-deficient gold isotopes performed at the CRIS experiment, ISOLDE/CERN. Our experimental campaign includes high-resolution studies of the isotopes $^{181-197}$Au ($N = 102 - 118$), enabling spin measurements and determination of spectroscopic quadrupole moments. These results will shed light on our understanding of nuclear shapes and deformation phenomena near the closed-shell nucleus lead $Z = 82$, providing crucial benchmarks for theoretical models in nuclear physics.

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