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Optical mean square charge radii of Ni isotopes using collinear laser spectroscopy

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Laser spectroscopy enables a reliable determination of nuclear ground-state spins, moments and mean-square charge radii. Optical isotope shifts and hyperfine structures were measured for Ni (Z = 28) isotopes on the atomic transition $3d^9 4s^1\ ^3D_3 \rightarrow 3d^9 4p^1\ ^3P_2$ at 353.45nm. By using the COLLAPS setup at CERN-ISOLDE, measurements of $^{58-68,70}$Ni were made in the first online experiment.

The experiment provides results across N = 40 where a closed sub-shell nature has attracted substantial experimental and theoretical interest. The sub-shell gap is expected to be particularly significant for 68Ni where the excitation energy of the first 2^+ state is above 2 MeV. A signature of neutron-shell closures, which is always observed at magic number above N = 20 (i.e. \textit{N} = 28,50,82,126), would be a 'kink' in the mean square charge radii of an isotopic chain. Thus the present work provides a test of the structural significance of the N = 40 shell gap. The present preliminary results will be compared with the radii of Ga [1] and Cu [2] where weak charge radii effects at N = 40 have been observed.

[1] T. J. Procter *et al.*, Phys. Rev. C 6, 034329 (2012).

[2] M. L. Bissell *et al.*, Phys. Rev. C 93, 064318 (2016).

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