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Nuclear electromagnetic moments of scandium isotopes studied by laser spectroscopy

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Studies of exotic nuclei have revealed numerous unexpected structure phenomena, extending our knowledge of nuclear forces and nuclear quantum many-body systems [1,2,3]. The scandium isotopes, with one valence proton added in the $f_{7/2}$ orbit above the $Z = 20$ shell closure in the shell-model picture, are expected to be sensitive to the single-particle behavior, and nucleon-nucleon correlations. Nuclear electromagnetic properties of 44-49Sc were measured at ISOLDE-CERN using high-resolution collinear laser spectroscopy (COLLAPS). Together with earlier studies in the literature, this work completes the systematic trends of the electromagnetic moments of $Z = 21$ isotopes and $N = 28$ isotones when valence neutrons and protons filling the distinctive $f_{7/2}$ orbit, respectively [4]. In addition, the nuclear charge radii of scandium isotopes up to $N = 28$ shell closure have been extracted.

In this talk, the details of the COLLAPS experiment, as well as the extracted experimental results (nuclear electromagnetic moments and charge radii) of scandium isotopes will be presented. These results will then be discussed by a comparison with region systematics and with theoretical calculations by large-scale shell-model and ab-initio VS-IMSRG.

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