To derive the distribution of magnetisation in neutron-rich potassium isotopes

A. Nagpal[1,2], A. Antusek[8], N. Azaryan[2], M. Baranowski[6], M.L. Bissell[2], M. Chojnacki[2], J. Dobaczewski[1,4], J. Ginges[9], R. de Groote[10], R. Han[11], A. Hurajt[12], D. Havranek[5], M. Kortelainen[11], A. Koszorous[10], M. Kowalska[2,3], D. Paulitsch[2,7], M. Pesek[2], M. Piersa-Silkowska[2], B. Roberts[9], A. Sparks[2], H. Wibowo[1], D. Zakoucky[13].

[1]School of Physics, Engineering and Technology, University of York, York, United Kingdom
[2]CERN, European Organization for Nuclear Research, Physics Department, CH-1211 Geneva 23, Switzerland
[3]Department of Nuclear and Particle physics, Université de Genève, Switzerland.
[4]Institute of Theoretical Physics, Faculty of Physics, University of Warsaw, Warsaw, Poland
[5]Faculty of Electrical Engineering and Communication, Brno University of Technology, Brno.
[6]Faculty of Physics, Adam Mickiewicz University, 61-614 Poznan, Poland.
[7]Institute for Astro- and Particle Physics, University of Innsbruck, Innsbruck, Austria.
[8] Faculty of Materials Science and Technology, Slovak University of Technology, Trnava, Slovak Republic.
[9] School of Mathematics and Physics, The University of Queensland, Brisbane, Australia.
[10] KU Leuven, Instituut voor Kern- en Stralingsfysica, Leuven, Belgium
[11]Department of Physics, University of Jyväskylä, Accelerator Laboratory, Jyväskylä, Finland.
[12] Department of Physical and Theoretical Chemistry, Faculty of Natural Sciences, Comenius University in Bratislava, Bratislava, Slovak Republic.
[13] Nuclear Physics Institute, Acad. Sci. Czech Rep., Rez, Czech Republic

Following the N=28 shell closure, a pronounced change in the slope of the charge radii, often referred to as a "kink", has been observed in neutron-rich calcium isotopes [1,2]. However, the exact amplitude of this kink and the underlying reasons for this phenomenon remain unclear. Theoretical predictions suggest that several factors could contribute to this behaviour, including the presence of large nuclear deformations or significant radial extensions of the nuclear density distribution. To address these questions and explore the origins of the observed kink, we aim to determine the distribution of magnetization, specifically the differential hyperfine anomaly (also known as Bohr-Weisskopf effect), for ^{48}K. This will be compared with the corresponding distributions in the neighbouring isotopes ^{47}K and ^{49}K. To achieve this, we will employ the β-Nuclear Magnetic Resonance (NMR) technique [3] to measure the precise magnetic moments of these isotopes. Additionally, laser-rf double resonance spectroscopy [4] will be used to determine the hyperfine structure constant (A) with high accuracy.

The data interpretation will be done with the help of nuclear density functional theory approach with angular momentum symmetry restoration [5] to interpret the variation in these moments across different angular momentum projections and mass. We employ the Hartree-Fock-Bogoliubov formalism to determine the electric quadrupole and magnetic dipole moments of both stable and unstable isotopes using HFODD code [6]. The spectroscopic moments are then compared with experimental data available. These findings will provide valuable benchmarks for refining nuclear models and advancing our understanding of the magnetic properties and structure of neutron-rich isotopes.

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