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Single-particle structure of ^{93,94,95}Sr nuclei

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The level structure of neutron rich ^{93,94,95}Sr were studied via the \dtsr{94,95,96}, one neutron pickup reactions at TRIUMF. Excited states were populated when ^{94,95,96}Sr beams of 5.5 AMeV bombarded a 0.5 mg/cm^2 CD_2 target. The de-exciting γ-rays and outgoing charged particles were detected by using the TIGRESS and SHARC arrays, respectively. The level scheme was contructed by using both E_x vs E_γ and E_γ vs E_γ matrices. Three excited states were observed in ^{93}Sr and ^{95}Sr, respectively. A total of ten excited states were observed in ^{94}Sr of which four states were newly identified in the present experiment. Angular distribution measurements suggest spin and parity assignments for the 1880 (0^+), 2294 (0^+) and 2415 (3^+) keV levels and constrain the other five levels 2615, 2705, 2921, 3077 and 3175 keV in ^{94}Sr. In this work no γ-ray transitions were observed from the 1880 and 2294 keV levels directly to the ground state. This is consistent with spin and parity assignments of the 1880 and 2294 keV levels as 0^+. The spectroscopic factors were calculated by fitting DWBA calculations to experimental angular distribution data and taking into consideration γ-decay branching ratios. Shell model calculations were carried out to understand the present experimental observations by using updated interaction and appropriate truncation schemes. The calculation was performed by using an updated NuShellX code and $glek$ interaction. The single-particle energies of the interaction were adjusted in such a way that the calculated and experimentally observed energy levels were in good agreement in the $N \sim 56$ and $Z \sim 38$ region. In the present calculations the valence $[1d_{5/2}]$, $[2s_{1/2}]$, $[1d_{3/2}]$ and $[0g_{7/2}]$ orbitals were included for neutrons outside the N = 50 inert core. The proton degrees of freedom were varied systematically so that the effect of the proton valence space on the calculated levels could be studied. The calculated energy levels and spectroscopic factors that were predicted are in reasonable agreement with the experimental findings. This suggests that the low-energy states are predominantly neutron configurations with minor contributions from excitations between the proton $[1p_{3/2}]$ and $[1p_{1/2}]$ orbitals.

Summary

Primary author: Dr SOUMENDU SEKHAR BHATTACHARJEE, Soumendu (Post Doctoral Fellow at TIGRESS)

Co-authors: GARNSWORTHY, A. B. (TRIUMF, Vancouver, BC V6T 2A3, Canada); CHEESEMAN, A. (TRIUMF, Vancouver, BC V6T 2A3, Canada); CHESTER, A. (TRIUMF, Vancouver, BC V6T 2A3, Canada); KNAPTON, A. (Department of Physics, University of Surrey, Guildford, Surrey, GU2 7XH, United Kingdom); MATTA, A. (LPC, ENSICAEN, CNRS/IN2P3, UNICAEN, Normandie Universit\'{e}, 14050 Caen cedex, France); SANETULLAEV, A. (TRIUMF, Vancouver, BC V6T 2A3, Canada); DIGET, C. Aa. (Department of Physics, University of York, York, YO10 5DD, United Kingdom); ANDREOIU, C. (Department of Chemistry, Simon Fraser University, Burnaby, BC V5A 1S6, Canada); SVENSSON, C. E. (Department of Physics, University of Guelph, Guelph, ON, N1G 2W1, Canada); BANCROFT, C. S. (Department of Physics, Central Michigan University, Mt Pleasant, MI 48859, USA); UNSWORTH, C. (TRIUMF, Vancouver, BC V6T 2A3, Canada); MILLER, D. (TRIUMF, Vancouver, BC V6T 2A3, Canada); CROSS, D. S. (Department of Chemistry, Simon Fraser University, Burnaby, BC V5A 1S6, Canada); AMES, F. (TRIUMF, Vancouver, BC V6T 2A3, Canada); HACKMAN, G. (TRIUMF, Vancouver, BC V6T 2A3, Canada); LASSEN, J. (TRIUMF, Vancouver, BC V6T 2A3, Canada); KUHN, K. (Department of Physics, Colorado School of Mines, Golden, CO 80401, USA); WIMMER, K. (Department of Physics, The University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113-0033, Japan); MARCHETTO, M. (TRIUMF, Vancouver, BC V6T 2A3, Canada); MOUKADDAM, M. (TRIUMF, Vancouver, BC V6T 2A3, Canada); ORR, N. A. (LPC, ENSICAEN, CNRS/IN2P3, UNICAEN, Normandie Universit\'{e}, 14050 Caen cedex, France); SACHMPAZIDI, N. (Department of Physics, Central Michigan University, Mt Pleasant, MI 48859, USA); TERPSTRA, N. (Department of Physics, Central Michigan University, Mt Pleasant, MI 48859, USA); BENDER, P. C. (TRIUMF, Vancouver, BC V6T 2A3, Canada); VOSS, P. (Department of Chemistry, Simon Fraser University, Burnaby, BC V5A 1S6, Canada); BRAID, R. (Department of Physics, Colorado School of Mines, Golden, CO 80401, USA); KANUNGO, R. (Department of Astronomy and Physics, Saint Mary's University, Halifax, NS B3H 3C2, Canada); KR\"{U}CKEN, R. (TRIUMF, Vancouver, BC V6T 2A3, Canada); LAXDAL, R. (TRIUMF, Vancouver, BC V6T 2A3, Canada); CRUZ, S. (TRIUMF, Vancouver, BC V6T 2A3, Canada); BRUHN, T. (TRIUMF, Vancouver, BC V6T 2A3, Canada); DRAKE, T. (Department of Physics, University of Toronto, Toronto, ON M5S 1A7, Canada); KORTEN, W. (IRFU, CEA, Universit\'{e} Paris-Saclay, F-91191 Gif-sur-Yvette, France); CATFORD, W. N. (Department of Physics, University of Surrey, Guildford, Surrey, GU2 7XH, United Kingdom)

Presenter: Dr SOUMENDU SEKHAR BHATTACHARJEE, Soumendu (Post Doctoral Fellow at TIGRESS)

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