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Search for intermediate states in the rare earth nucleus ¹⁵⁰ Sm

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Abstract content
   (Max 300 words)
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In nuclear science, things that may seem trivial such nuclear shape, size, collective and individual motions of nucleons give very useful information about the structure of the nucleus.Quantum numbers are important in nuclear science since they are characteristic of excited states and how they decay to other states [1]. The collective motion of the nucleus can either be vibrational or rotational.The collective motion of the nucleus can either be vibrational or rotational. When the collective motion changes from vibrational to rotational rapidly the nucleus is said to be in the transitional region [2]. The N=88 rare earth neutron rich nuclei lie in this region. ¹⁵⁰Sm is one such nucleus and it is the focus of this work. The low lying 0₂⁺ state of ¹⁵⁰ Sm has octupole correlations that is related to the low lying negative parity states K^π =0⁻ [2]. Studies have already been done on the lower states of the nucleus ¹⁵⁰ Sm with the¹⁵⁰ Nd(&alpha,2n) ¹⁵⁰ Sm reaction at 25 MeV, a self-supporting target of 5 mg cm⁻², and the Jyväskylä JUROGAM II escape-suppressed &gamma −ray spectrometer array [3] consisting of 24 clover and 15 tapered HPGe detectors all in BGO shields. We also studied the higher spin states using the¹³⁶ Xe (¹⁸ O, 4n) ¹⁵⁰ Sm reaction at 75 MeV using the iThemba LABS AFRODITE spectrometer employing a cryogenic frozen xenon target.
We report our findings on the experiment that was performed recently at iThemba LABS using the reaction¹⁵⁰ Nd (⁴ He, 4n) ¹⁵⁰ Sm and the AFRODITE array spectrometer with the digital electronics. The specific focus of this work is on the structure and deformation of the intermediate spins of ¹⁵⁰Sm and to gain insight on the collective and quasi-particle structures of ¹⁵⁰ Sm.

[1] Ntshangase SS DEVELOPMENT OF A RECOIL DETECTOR AND THE STUDY OF EXOTIC ASYMMETRIC SHAPES IN NUCLEI (PhD Thesis, University of Cape Town)
[2] Bvumbi S P Investigation of octupole correlations and collective
couplings in the rare earth nucleus (PhD Thesis, University of Johannesburg)
[3] www.jyu.fi/research/accelerator/nucspec/jurogam

Apply to be
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yes

Level for award
 (Hons, MSc,
   PhD)?

MSc

Main supervisor (name and email)
and his / her institution

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