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## Determining the spectroscopic quadrupole moment $Q_{s\text{c}}$ of the first $2^+_{gs}$ state in $^{40}\text{Ar}$

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**Abstract content** (Max 300 words) [http://events.saip.org.za/getFile.py?target=\\_blank](http://events.saip.org.za/getFile.py?target=_blank) **Formatting** **Special chars**

The present study aims at determining the spectroscopic quadrupole moment  $Q_{s\text{c}}$  of the first  $2^+_{gs}$  excited state in  $^{40}\text{Ar}$  by carrying out second order Coulomb-excitation reorientation-effect measurements at safe energies. Similar measurements were done in the 1970's by Nakai et al [1,2] with no record of the distance separating two nuclear surfaces ( $S_{\text{min}}$ ). The first  $2^+_{gs}$  state at 1461 keV in  $^{40}\text{Ar}$  was populated through a safe Coulomb excitation experiment carried out at iThemba LABS (Cape Town) using 143.2 MeV  $^{40}\text{Ar}$  beams on a 1.39 mg/cm<sup>2</sup>  $^{208}\text{Pb}$  target. The scattered particles were detected using a double sided S3 silicon detector placed 10.05 mm from the target at backward angles in coincidence with the de-excitation of  $\gamma$  rays detected using 8 HPGe clover detectors in the AFRODITE array [3]. The semiclassical coupled channel Coulomb excitation code GOSIA [4] calculates theoretical integrated  $\gamma$  ray yields and normalised them to the experimental integrated  $\gamma$  ray yields (which carries information about the  $Q_{s\text{c}}$ ) is being used to extract the diagonal matrix element of the excited state which are proportional to the  $Q_{s\text{c}}$ .

References :

- 1) R. H. Spear, Phys. Rep. 73, 369 (1981).
- 2) K. Nakai, J. L. Quebert, F. S. Stephens, and R. M. Diamond, Phys. Rev. 24, 16, (1970).
- 3) M. Lipoglavsek et al., Nucl. Instr. Meth. Phys. Res. A557, 523 (2006).
- 4) Gosia Manual 2012.

**Apply to be considered for a student award (Yes / No)?**

Yes

**Level for award (Hons, MSc, PhD, N/A)?**

MSc

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