Structure and shape evolution in $^{75}\text{Ge}$

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*Poster S2-2*
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Motivation

Ge isotopes in the vicinity of the N=40 transitional region are very sensitive to shape changes with addition of nucleons due to the spacing of neutron orbitals in the fpg model space.

Higher mass N=43 isotones are known to exhibit shape evolution and the previous experiments indicate a possibility of shape change in $^{75}$Ge.

It is interesting to explore the region of triaxiality near $^{76}$Ge; the sole example of a rigid triaxial nucleus in this mass region.

High spin studies are crucial to complement results from transfer, (n,γ) reactions and β-decay studies as they provide information on new high-spin levels and assignment of spins and parities leading to a better understanding of neutron and proton configurations.
Experimental Set-up and details

Deep-inelastic reactions with $^{76}$Ge beam on thick targets of $^{208}$Pb, $^{198}$Pt, and $^{238}$U with beam energies ~ 25% above the Coulomb barrier were used to populate the excited states in $^{75}$Ge using the Gammasphere at ATLAS at ANL.
Level Scheme of $^{75}$Ge

- New positive-parity band has been identified.
- Negative-parity bands have been extended to high spins.
- Multipolarities of most of the negative parity states have been assigned from the angular correlation analysis.
New positive-parity band

A new positive-parity band has been identified by cross-correlating coincidences with the complementary recoil $^{209}$Pb from the $^{76}$Ge + $^{208}$Pb data and the same was confirmed in $^{76}$Ge on $^{198}$Pt and $^{238}$U data sets. The positive-parity was extended upto 21/2 $\hbar$ and can be interpreted to be built on the $\nu g_{9/2}$ configuration. We propose this band to have positive parity being built on the 9/2$^+$ bandhead.
Negative-parity bands

Both negative-parity bands have been extended to higher spins. From the previous works the levels above $9/2^-$ were not known.

The negative-parity states can be interpreted in terms of $\nu p_{1/2}$ coupled to the prolate deformed $^{74}\text{Ge}$ core.
A comparison of kinematic moment of inertia vs rotational frequency is plotted for $^{77}\text{Se}$ and $^{75}\text{Ge}$ yrast negative parity band (left) and the new positive parity band (right)

- A similar up bend is observed in both the nuclei for the lowest negative-parity bands which can be attributed to quasiparticle alignment.
- For the positive parity band, a similar trend can be expected but further experimental investigation is required.
Conclusion

- The level scheme of $^{75}$Ge has been extended to high spins.
- First observation of levels up to $21/2 \hbar$ for both negative parity and positive parity band.
- Spins and parities have been assigned to most of the negative parity states deduced from the angular correlation analysis.
- Comparison of the moment of inertia of $^{75}$Ge with $^{77}$Se isotone, suggests a similar structure and comparable deformation in both the nuclei.
- No evidence of triaxiality has been found in $^{75}$Ge, more experimental investigation is required.
Thank you

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