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Configuration mixing investigation in germanium isotopes through measurement of E0 transition strengths

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Experimental and theoretical studies of the germanium isotopes point increasingly toward exotic combinations of nuclear-structure effects, with indications of triaxiality, configuration mixing, and shape coexistence. A simple two-state mixing model has been used to describe 0^+ states in the even-even ^{72,74,76}Ge isotopes, and reasonable agreement with experimental data from Coulomb excitation measurements was found. More recent studies on ^{72}Ge led to the conclusion that its low-spin structure could be satisfactorily described via an admixture of two triaxial rotors.
^{76}Ge is a promising candidate for the observation of neutrinoless double-beta decay, but theoretical models have not reached agreement on the value of the nuclear matrix element for the process. A proper experimental description of mixing is thus crucial to provide a benchmark for theoretical work and obtain an accurate knowledge of the wavefunctions of the initial and final states involved.
Detailed spectroscopic studies of the ^{72,74,76,78}Ge isotopes using the GRIFFIN spectrometer at TRIUMF-ISAC are in progress with the goal of clarifying the structure of these nuclei and providing constraints for neutrinoless double-beta decay nuclear matrix element calculations. The nature of low-lying configurations in the germanium isotopes are probed through measurements of the inter-band E0 transition strength, a highly sensitive experimental observable. Indeed, E0 transitions are still poorly studied along the germanium isotopic chain, and only one E0 strength is known among the isotopes under investigation. The present studies combine electron and γ-ray spectroscopy. Initial results will be presented from data collected for the decay of ^{72}Ga to ^{72}Ge.

Authors: PORZIO, Carlotta (Università degli Studi di Milano, TRIUMF); GARNSWORTHY, A. B. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); HENDERSON, J. (LLNL); SMALLCOMBE, J. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); SMITH, J. K. (Reed College)

Co-authors: S.S., Bhattacharjee (TRIUMF); BILDSTEIN, V. (University of Guelph); BOWRY, M. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); COLEMAN, Robin (University of Guelph); DILLMANN, I. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); HACKMAN, Greg (TRIUMF); LEONI, Silvia (Università degli Studi e INFN Milano (IT)); NATZKE, C. (Colorado School of Mines); OLAIZOLA, B. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); PETERS, E. E. (University Of Kentucky); SVENSSON, C. E. (Department of Physics, University of Guelph, Guelph, Ontario); YATES , Steven (University Of Kentucky); ZIDAR, T. (Department of Physics, University of Guelph, Guelph, Ontario)

Presenter: PORZIO, Carlotta (Università degli Studi di Milano, TRIUMF)

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