Rotational Damping, Ridges and the Quasicontinuum of γ rays in ^{152}Dy

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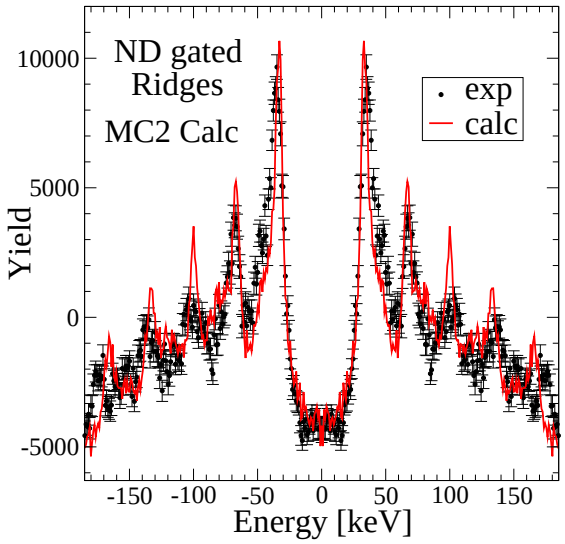
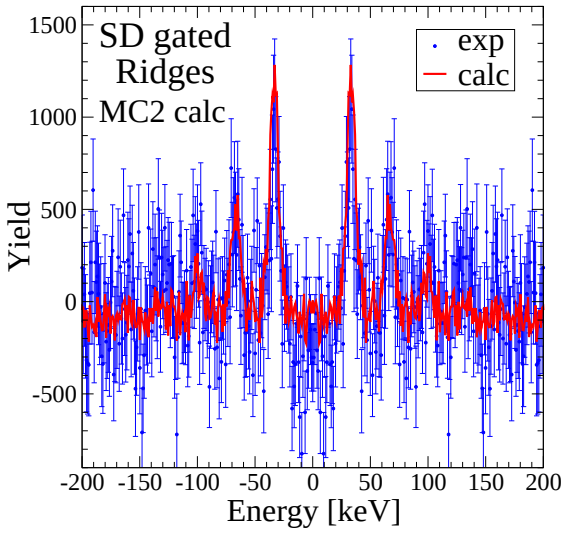
In a heavy–ion fusion evaporation reaction, the compound nucleus cools first by particle evaporation and then by emission of γ rays. At finite temperature, above the yrast line, the level density is high and the γ rays form a quasi–continuum spectrum from which individual transitions cannot be resolved [1]. Only when the γ cascades reach states near the yrast line will discrete transitions be observed. The quasi–continuum of γ rays from the feeding and decay of superdeformed and normal bands in the nucleus ^{152}Dy have been extracted in 1 – and 2 – dimensional spectra. The E_γ–E_γ correlations in the latter reveal strong ridges associated with superdeformed and normal states in this nucleus. The entry distributions for normal and superdeformed bands have also been extracted from measured fold and sum–energy distributions. A Monte Carlo model was developed to *simultaneously* describe all the quasi–continuum and ridge spectra, as well as the feeding intensity of the superdeformed bands.





The narrow ridges from γ rays emitted in the SD well are prominent in both the spectra obtained when coincidence gates are placed on clean ND and SD lines in ^{152}Dy – see figures above. Also shown are Monte Carlo simulations of the data which make use of renormalized theoretical functions [2] of the narrow Γ_μ, wide Γ_{rot} and narrow fraction I_{nar} of rotational damping functions in the ND and SD wells. The *simultaneous* reproduction of the experimentally measured QC spectra and ridges constitutes a determination of the rotational damping in the two wells.

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[1] T. Lauritsen et al., Phys. Rev. **C62**, 044316 (2000)
[2] B. Lauritzen et al., Nucl. Phy. **A457**, 61 (1986)