



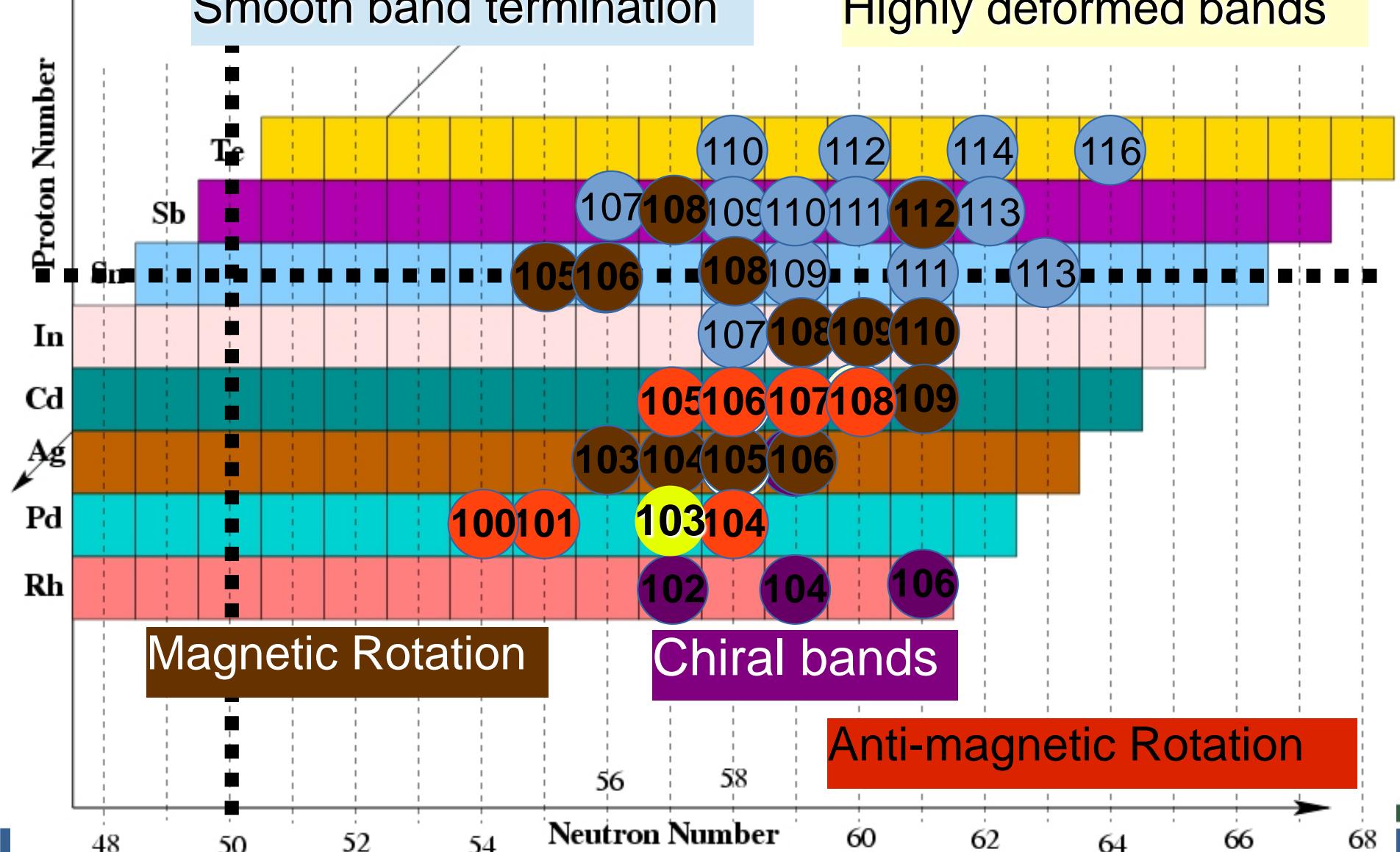
Evidence of decreasing collectivity in ^{103}Pd

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Various nuclear structure aspects





Experimental Signatures

Magnetic Rotation:

- Regular sequences of M1 transitions
- Weak or absent E2 transitions
- Decrease in B(M1) values

Anti-magnetic Rotation:

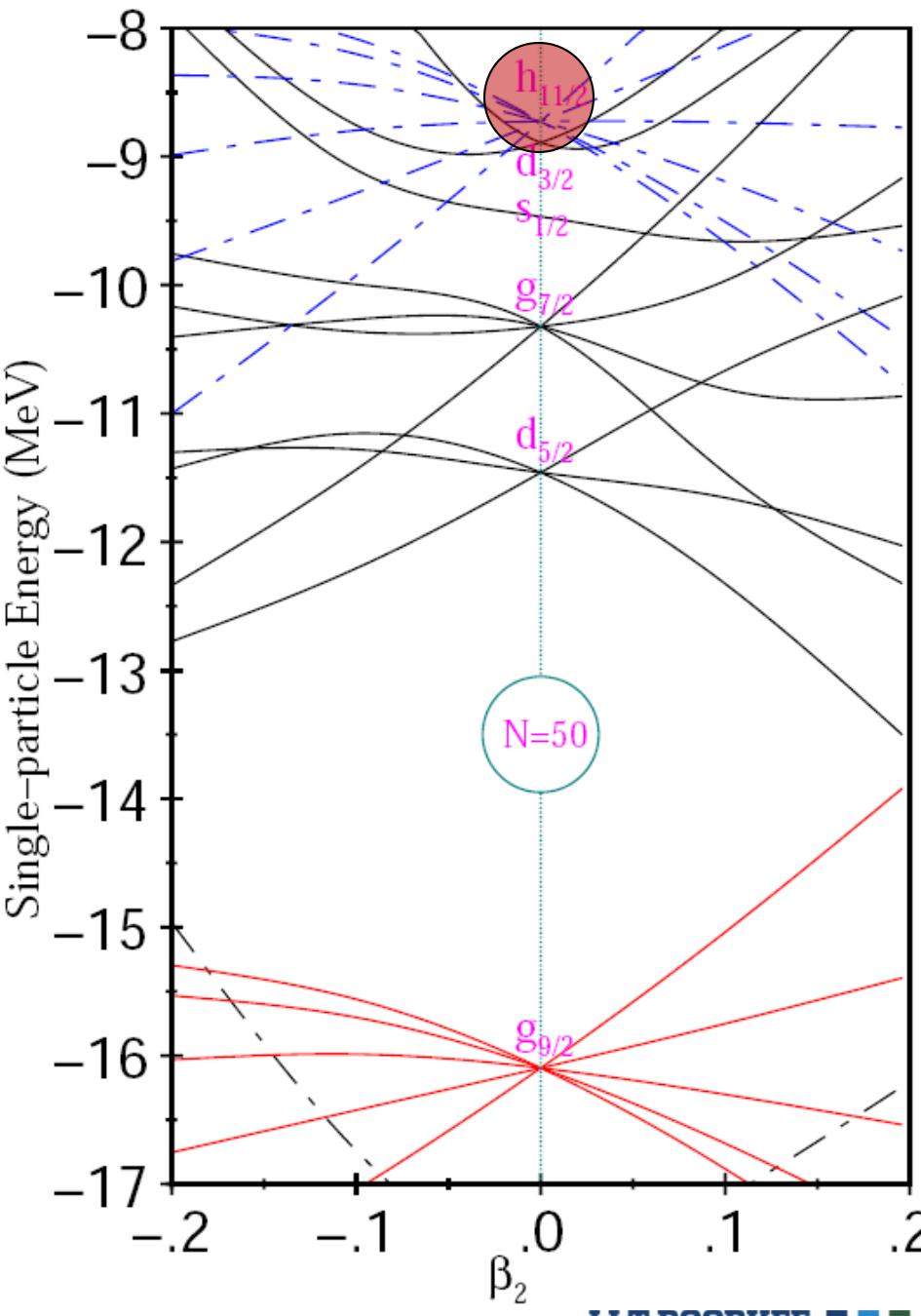
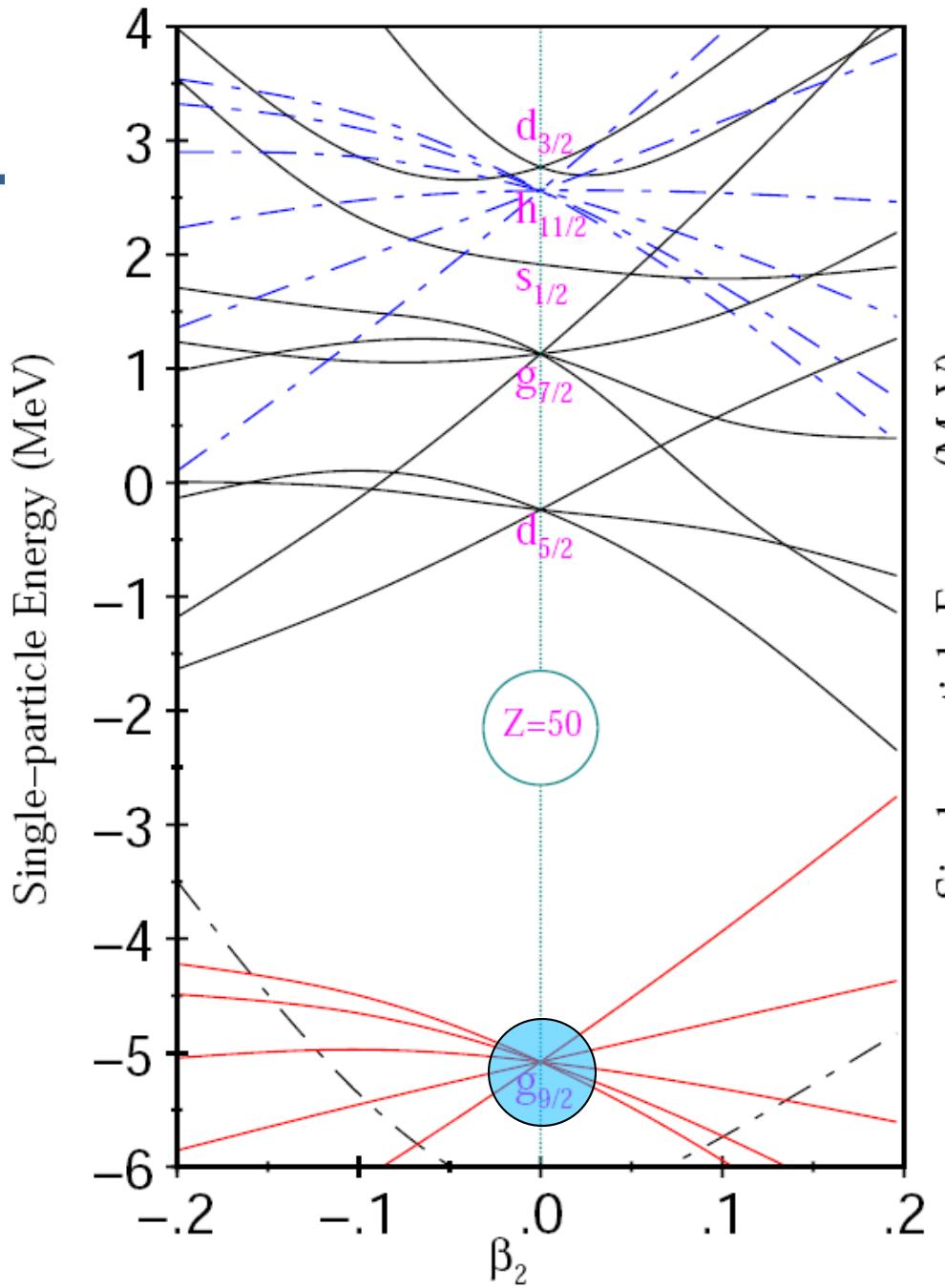
- ✓ Regular sequences of E2 transitions
- ✓ Weak or absent M1 transitions
- ✓ Decrease in B(E2) values

Chiral Bands:

- 2 Degenerate rotational bands
- $S(I)$ independent of I
- Bands connected via M1 & E2 transitions

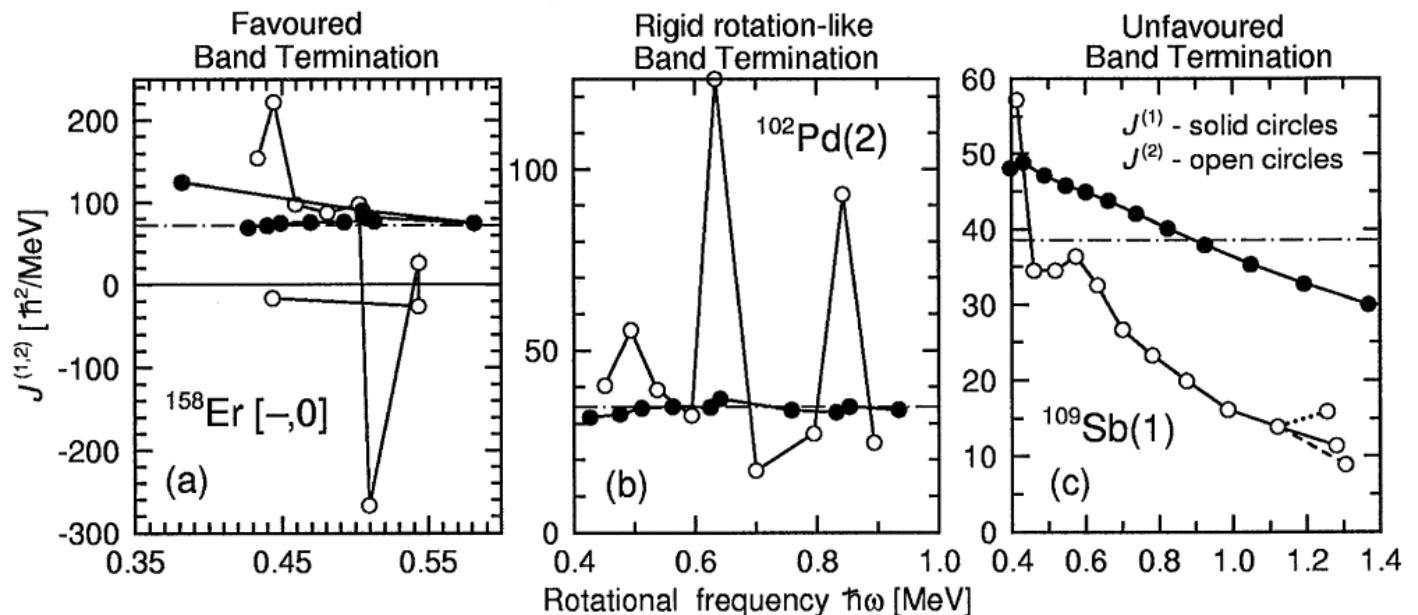
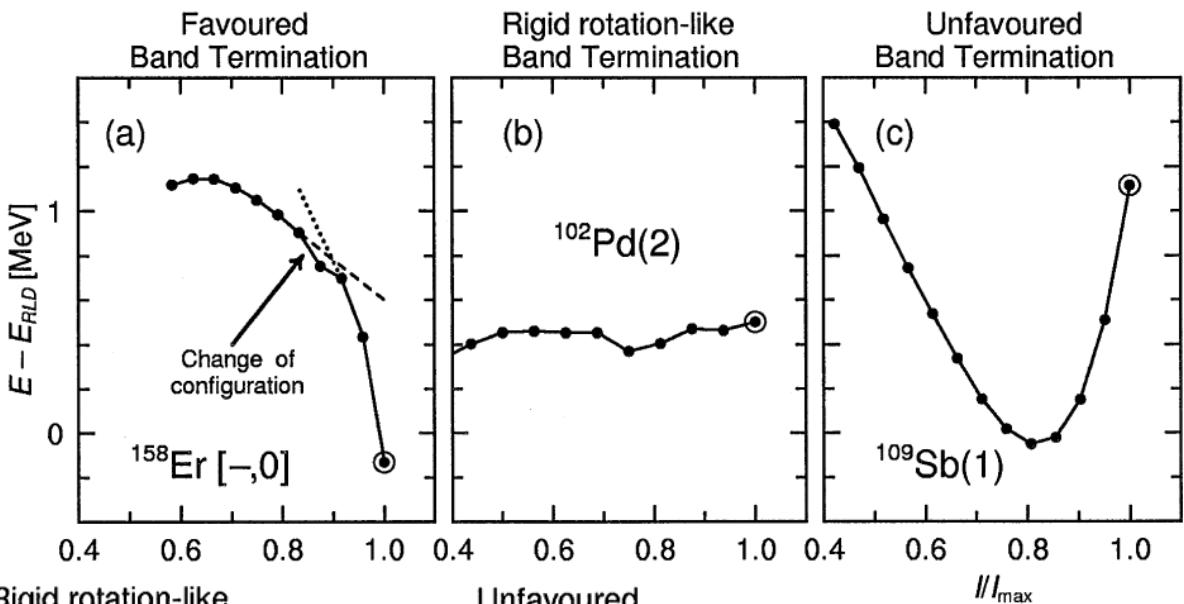
Smooth Band termination:

- Smooth decrease in $J^{(2)}$
- Characteristic decrease in B(E2) values



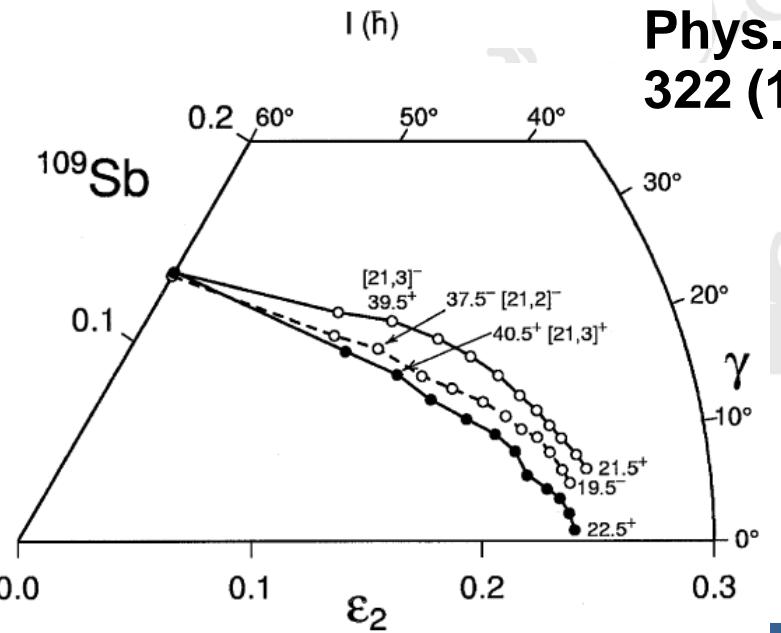
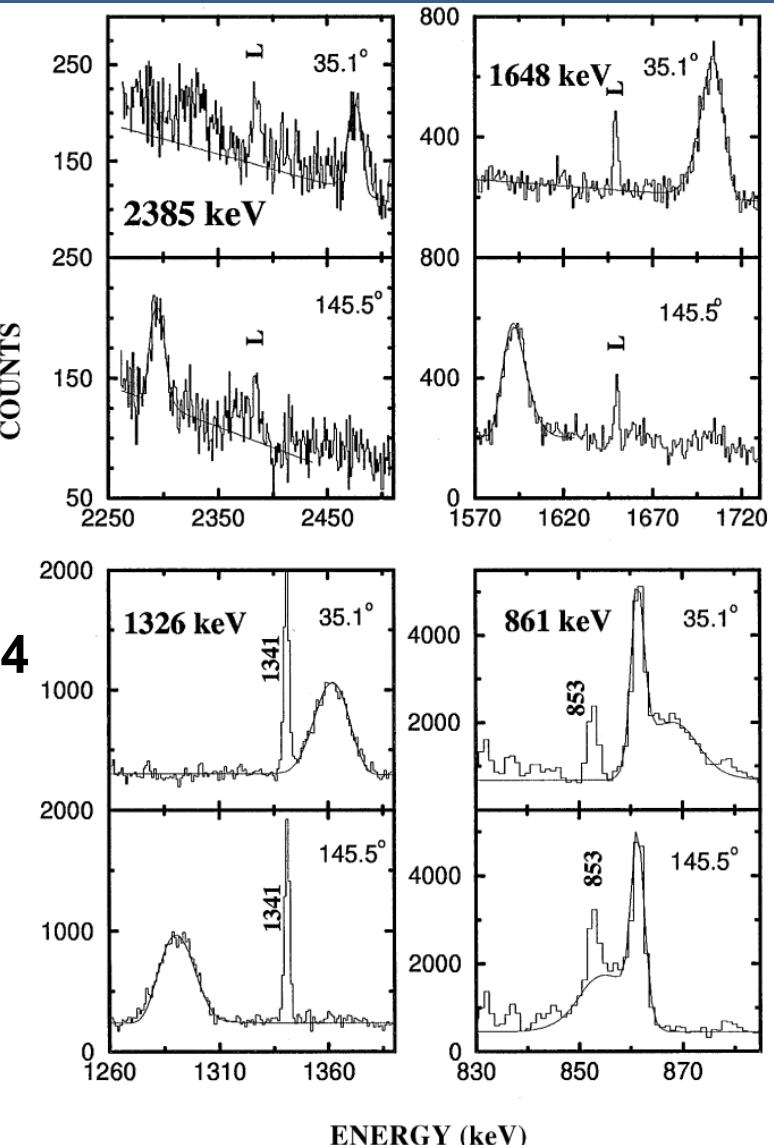
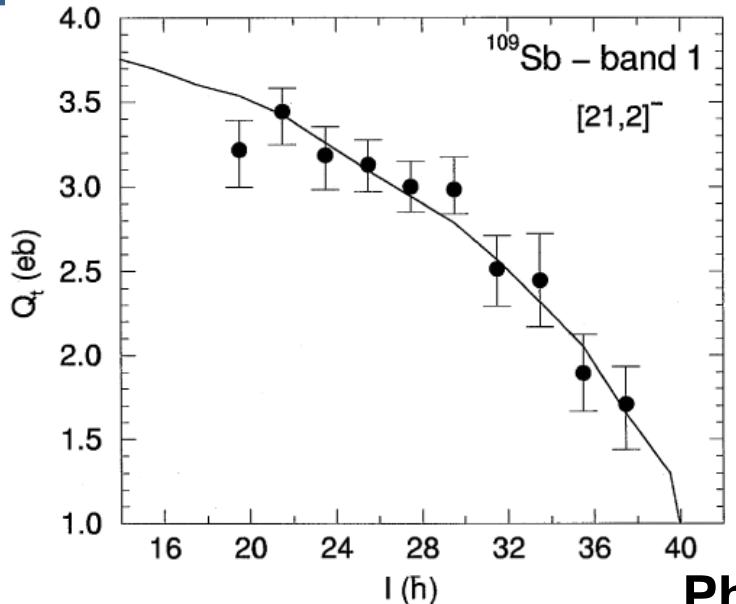
Band Termination

Energy cost for the nucleus to achieve the last units of angular momentum defines the type of band termination



Phys. Rep.,
322 (1999) 1-124

Band Termination...

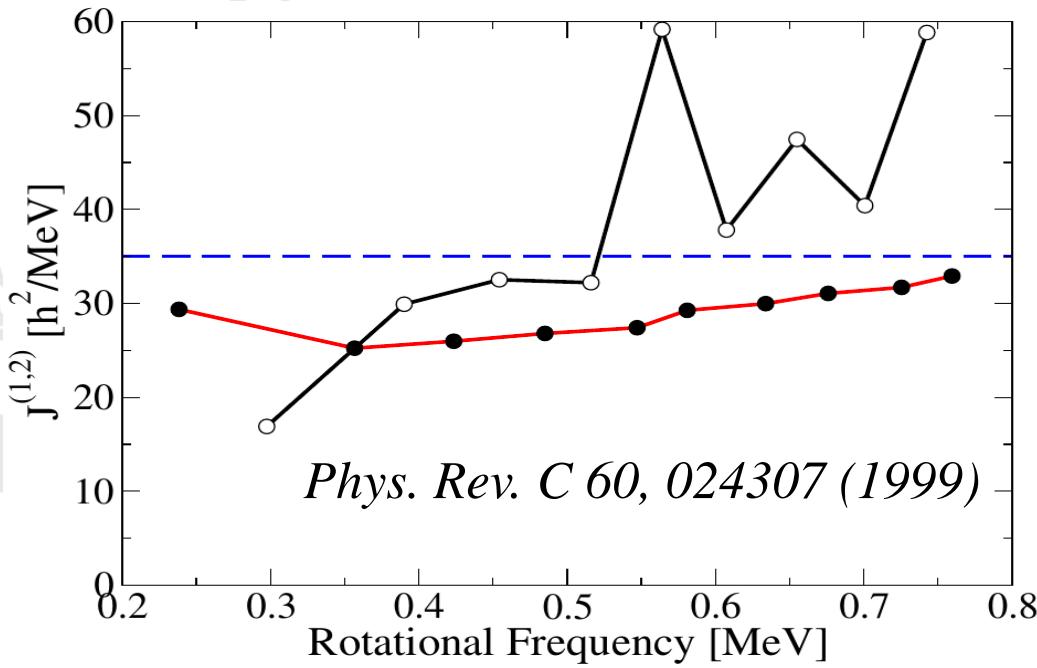


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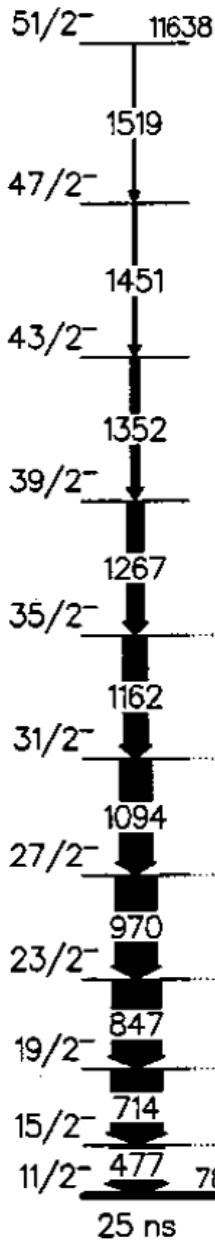
^{103}Pd case

Abstract. Nilsson-Strutinsky cranking calculations on $A \geq 100$ Ru and Pd nuclei suggest that, contrary to other mass regions, it should be possible to follow the ground state rotational bands to their termination at spins just above $I = 30\hbar$ and then also to observe other bands which terminate at higher spins. *Z. Phys. A 355, 383-387 (1996)*

$$\beta_2 = 0.162$$



Atomic Data & Nucl. Data Tables 59, 185 (1995)



Experiment

Reaction:

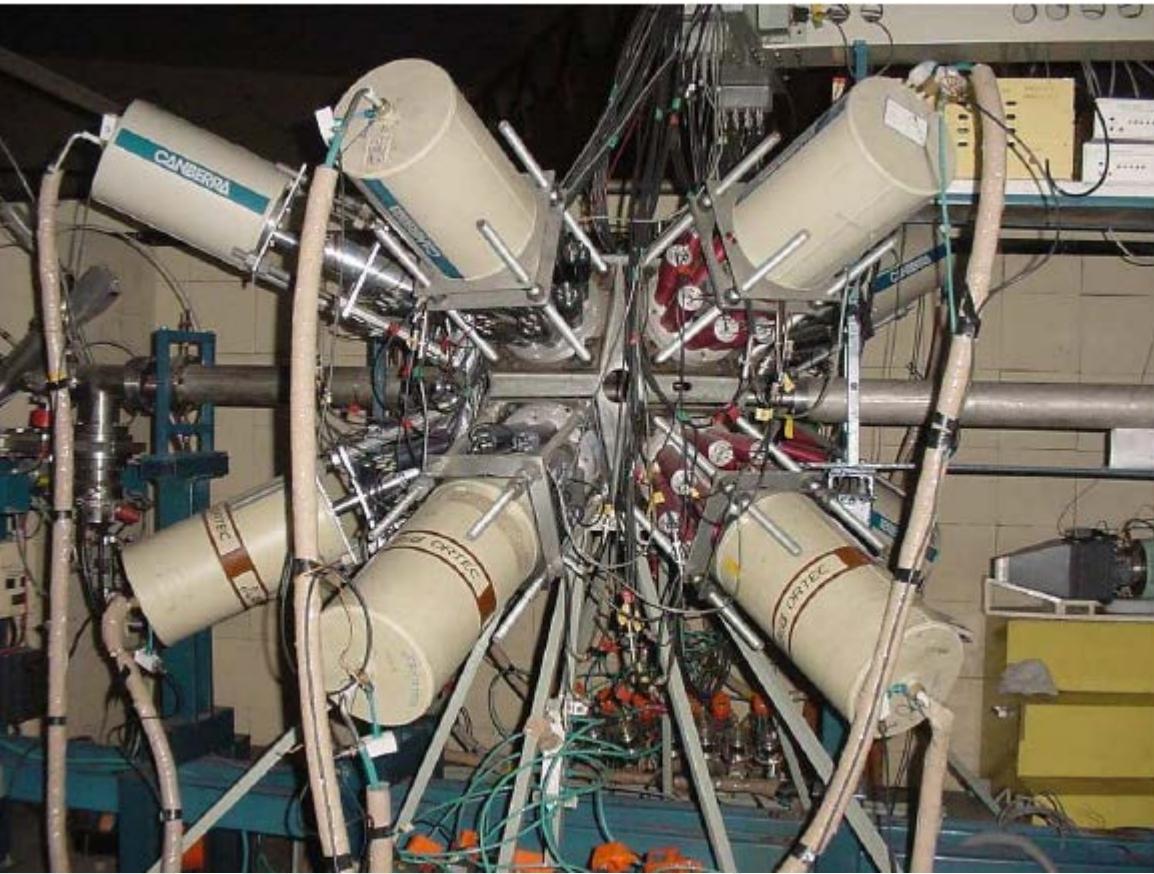
^{80}Se (^{30}Si , α 3n) ^{103}Pd
at 120 MeV

Target:

99.7 % enriched;
1 mg/cm² on 10 mg/cm²
gold

Detectors:

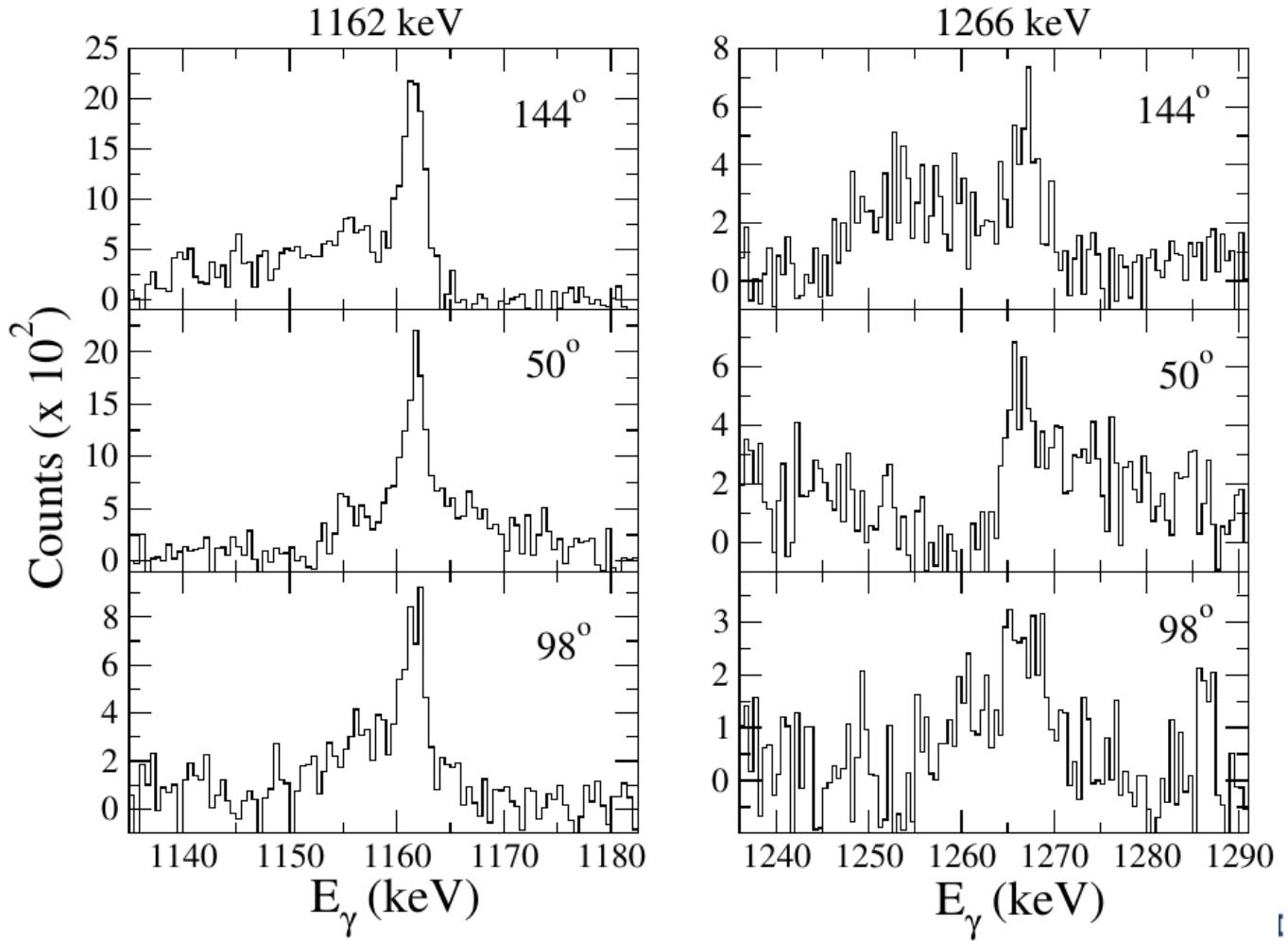
GDA at IUAC;
12 detectors at 50°, 98°,
and 140°



Cross Section ~ 60 mb

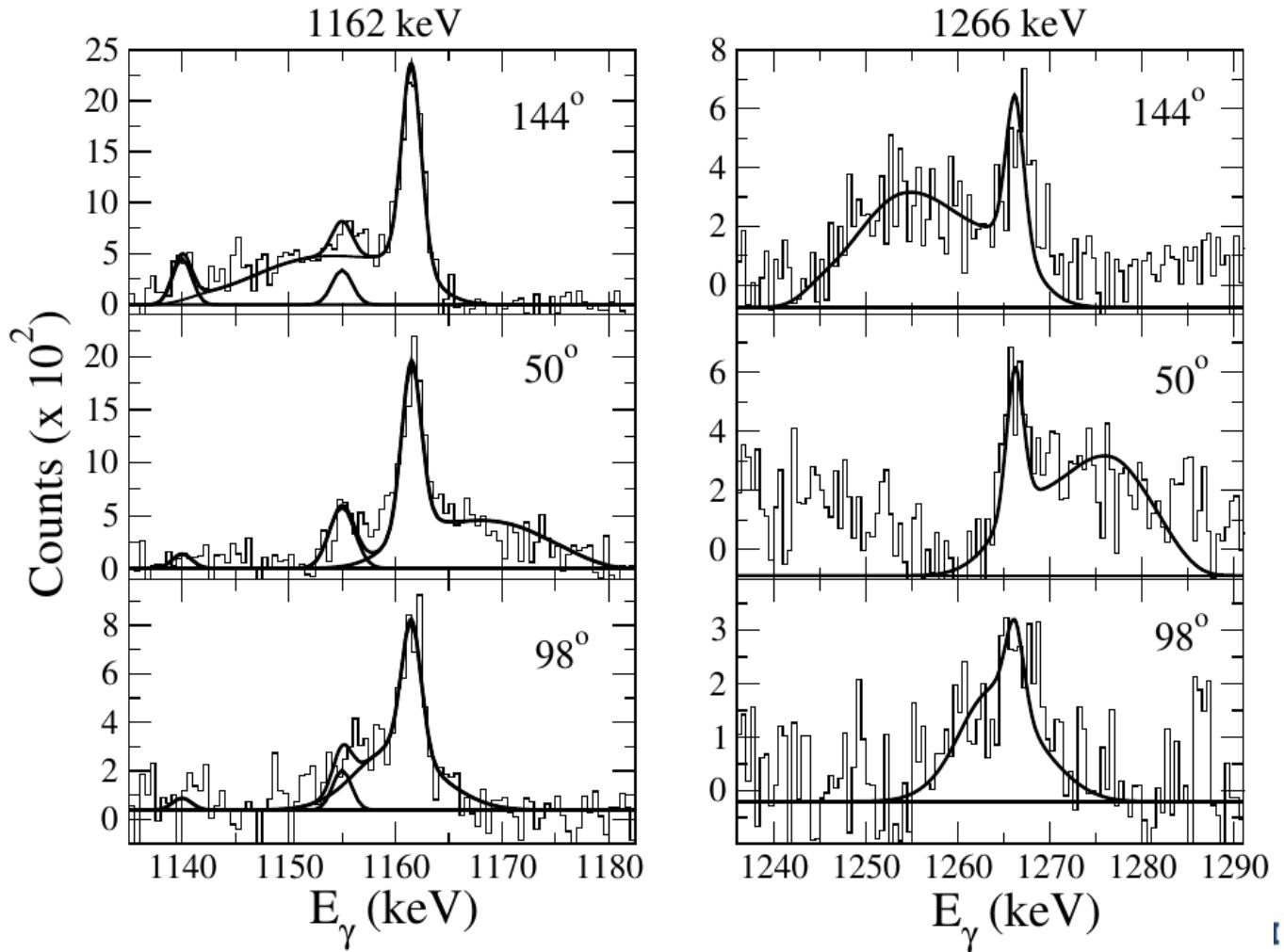
Analysis

Standard Doppler-Shift Attenuation Method was employed to extract the lifetimes of the states in the band under consideration



Analysis...

The extracted lifetimes show a decrease with increasing spin

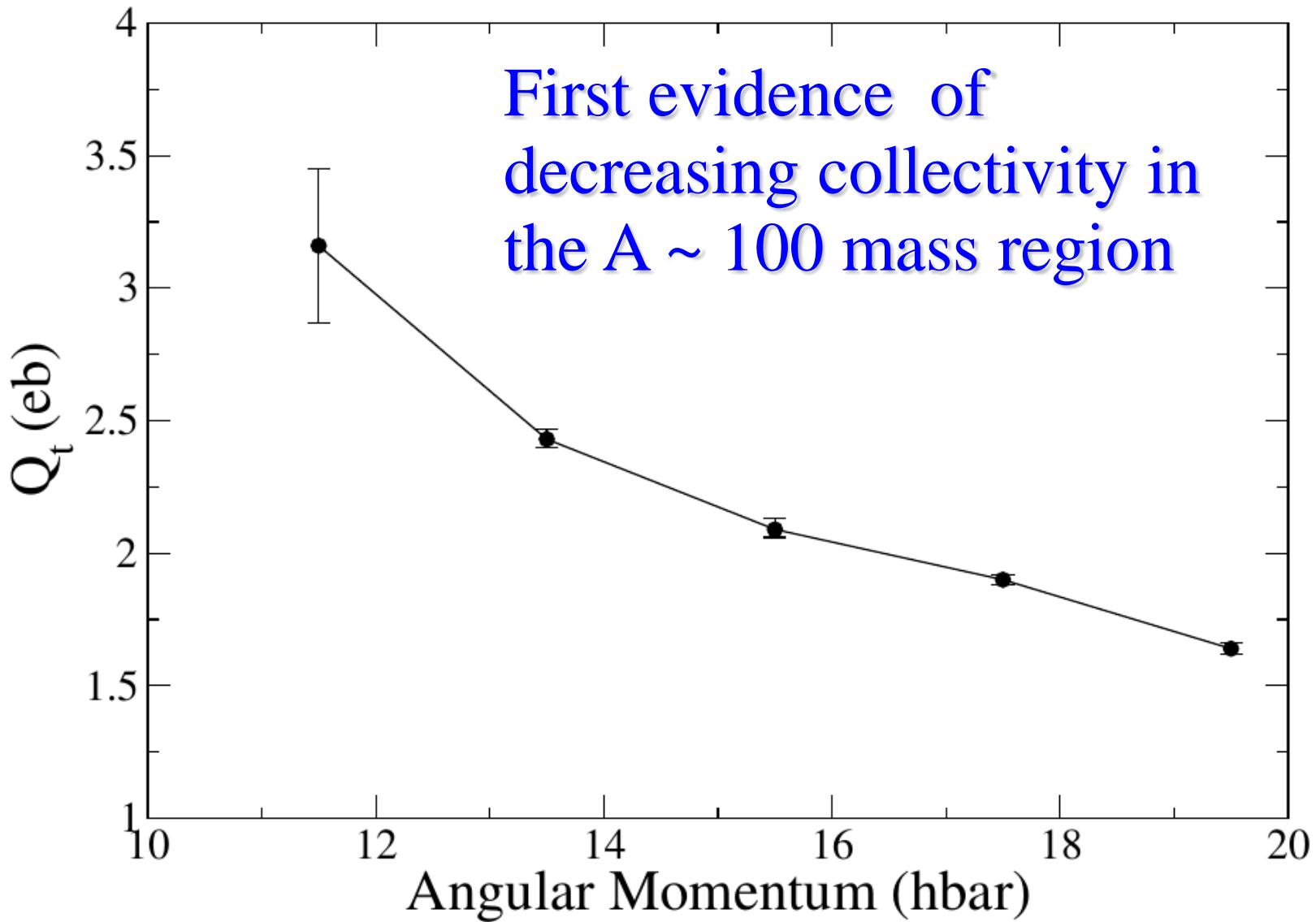




Results

- Lifetimes in the band $\pi(g_{9/2})^6 \otimes v(g_{7/2}d_{5/2})^6(h_{11/2})$ decrease.
- Dynamic Moment of Inertia shows staggering, which is typical for rigid rotation-like band termination.
- $B(E2)$ values show a characteristic decrease with increasing spin

Results





Summary

- High spin states in ^{103}Pd populated via heavy-ion fusion evaporation reaction
- Doppler-Shift Attenuation Method used to determine the lifetime.
- The deduced quadrupole values show decrease with increasing spin.
- This is the first evidence of decreasing collectivity in the $A \sim 100$ mass region, which is well established in $A \sim 110$ region.



