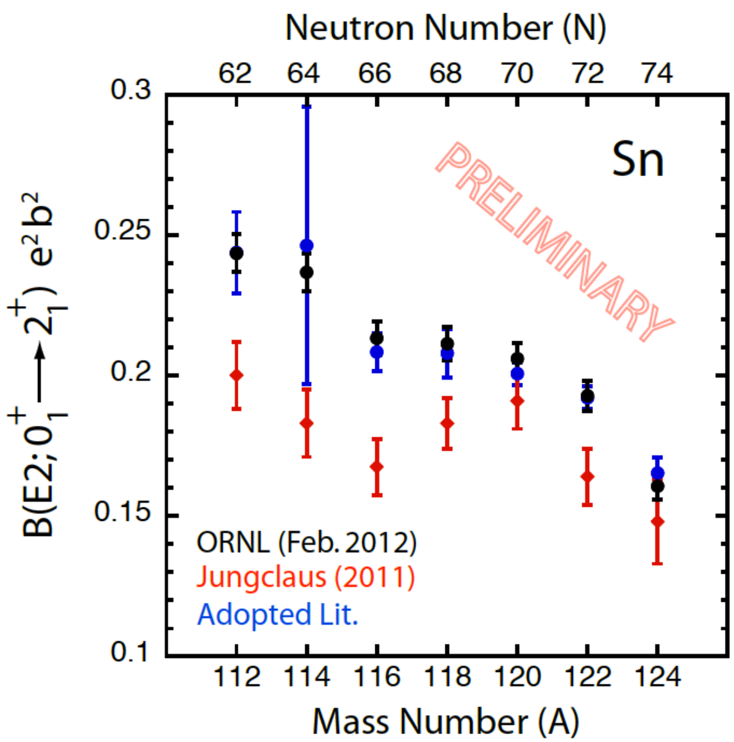
High-precision test of collective versus single-particle motion of protons and neutrons in the tin isotopes

- A recent study by Jungclaus et al. showed a dramatic departure from the previously adopted values for the first excited state lifetimes.
- Results from ORNL agree with the adopted literature but have smaller uncertainties. They disagree with the Jungclaus results.
- Tin (Sn) is the element with the greatest number of stable isotopes (i.e., fixed proton number but varying neutron number).
- Sn (Z=50) is a "magic" nucleus, i.e. especially stable, like noble gases in chemistry. "Magic" nuclei have 2, 8, 28, 50, 82… protons and/or neutrons.
- "Magic" nuclei (inert core +/- a few nucleons) are the premise for the nuclear shell model (basic microscopic model of all nuclear theory).
- These high-precision results will challenge and constrain theory.



The reduced transition probabilities, B(E2)'s, which are inversely proportional to the lifetime of the first excited state and signifies the number of nucleons involved in the state and decay, are shown. The blue points correspond to the previously adopted literature values, the red points correspond to the recent study by Jungclaus et al., and the black points correspond to the February-2012 study at HRIBF-ORNL.

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Funding sources: DOE Office of Science, Office of Nuclear Physics
Resources: Holifield Radioactive Beam Facility, ORNL