



CLARION 2 AT FLORIDA STATE UNIVERSITY

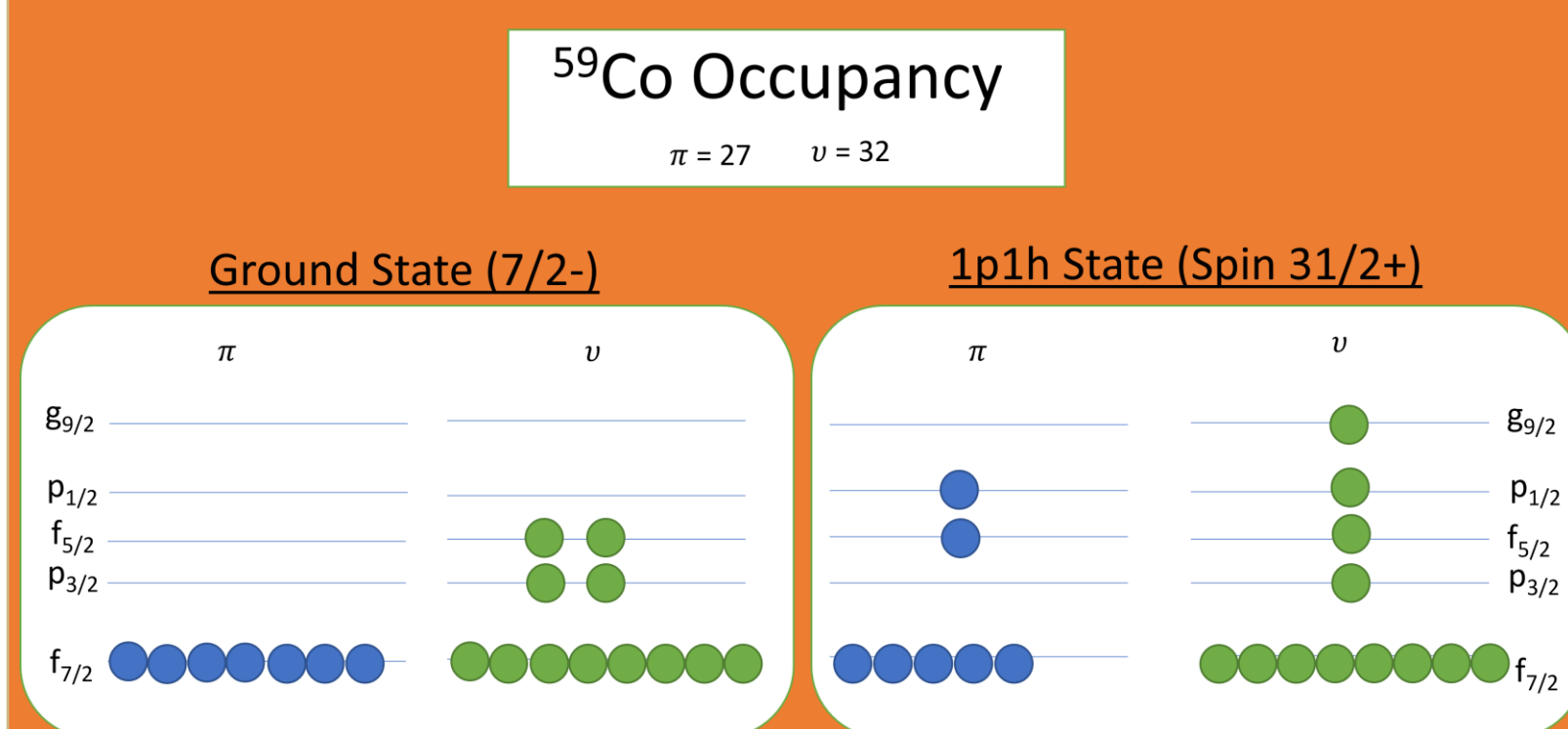


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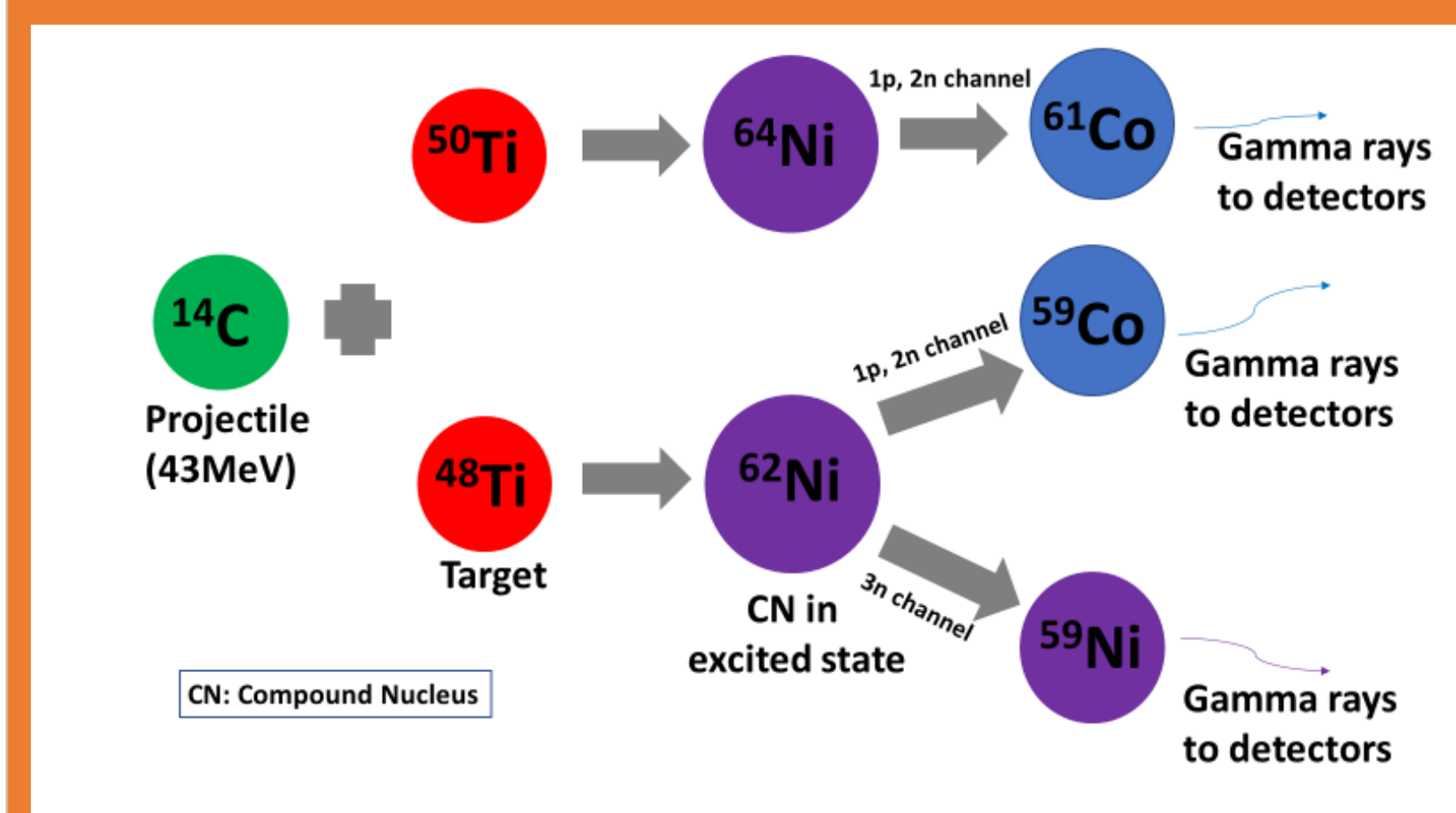
Motivation

- Understanding the mode of excitation in nuclei around the A = 60 region; single particle and collective excitations
- Understanding cross-shell excitations across the N = 40 gap into the g_{9/2} orbit

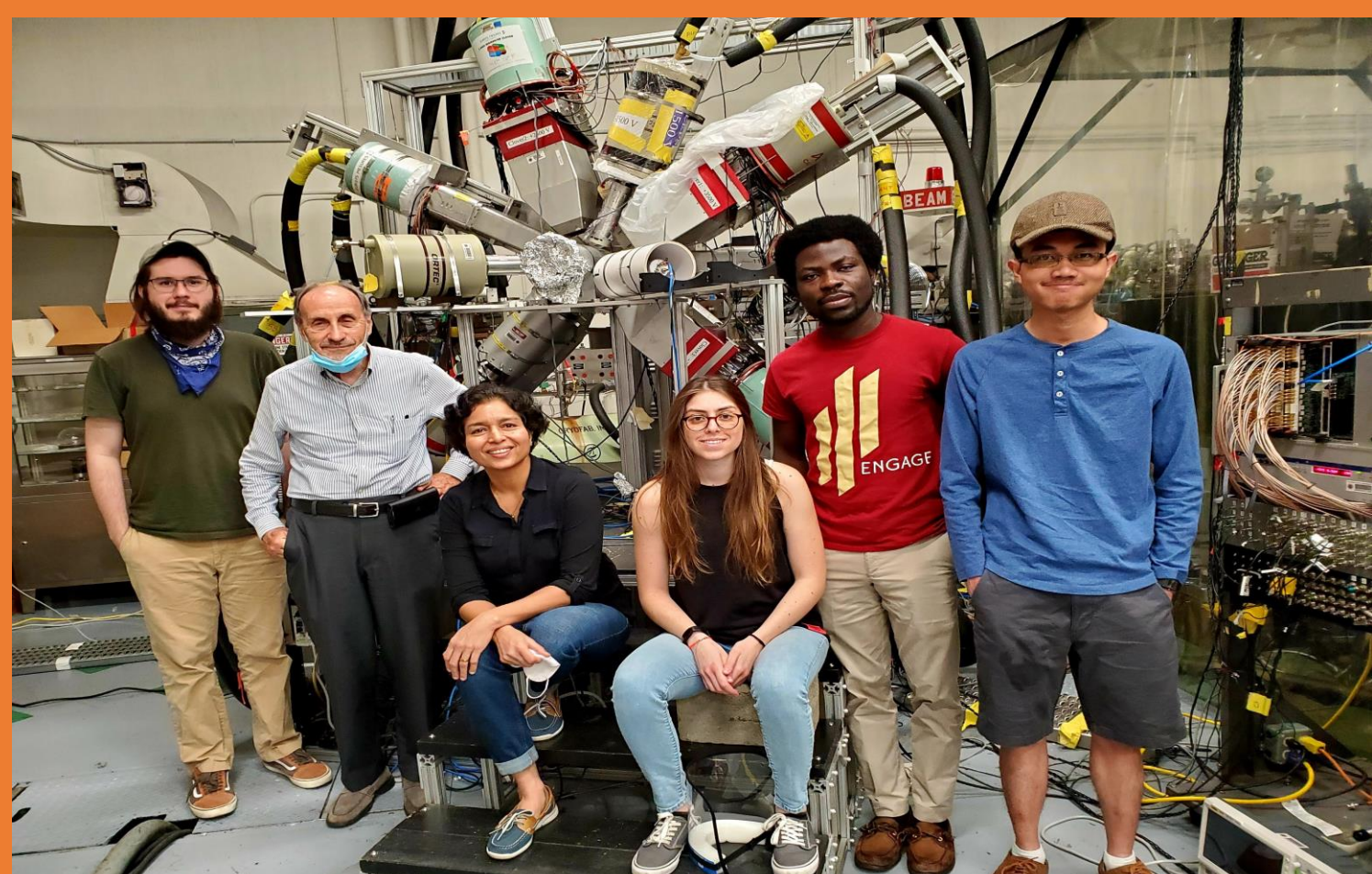


Experimental Setup

Two fusion evaporation reaction experiments were performed at the John D Fox laboratory, Florida State University

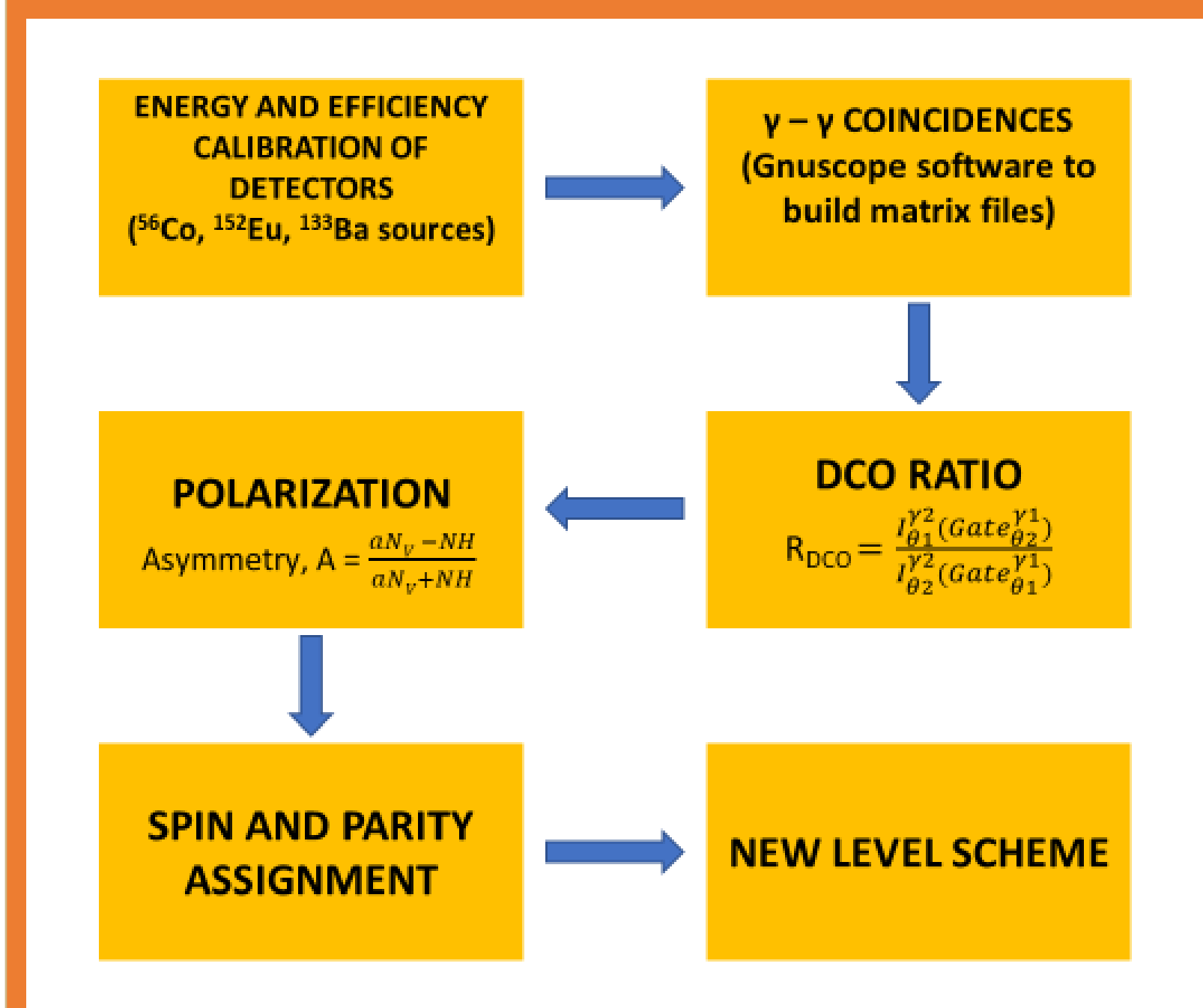


- FSU array of 6 Compton suppressed high purity germanium Clovers and several single-crystal detectors at 3 different angles
- The velocity of the recoiling nuclei is 0.015c



The detector array at the John D Fox Laboratory Florida state University

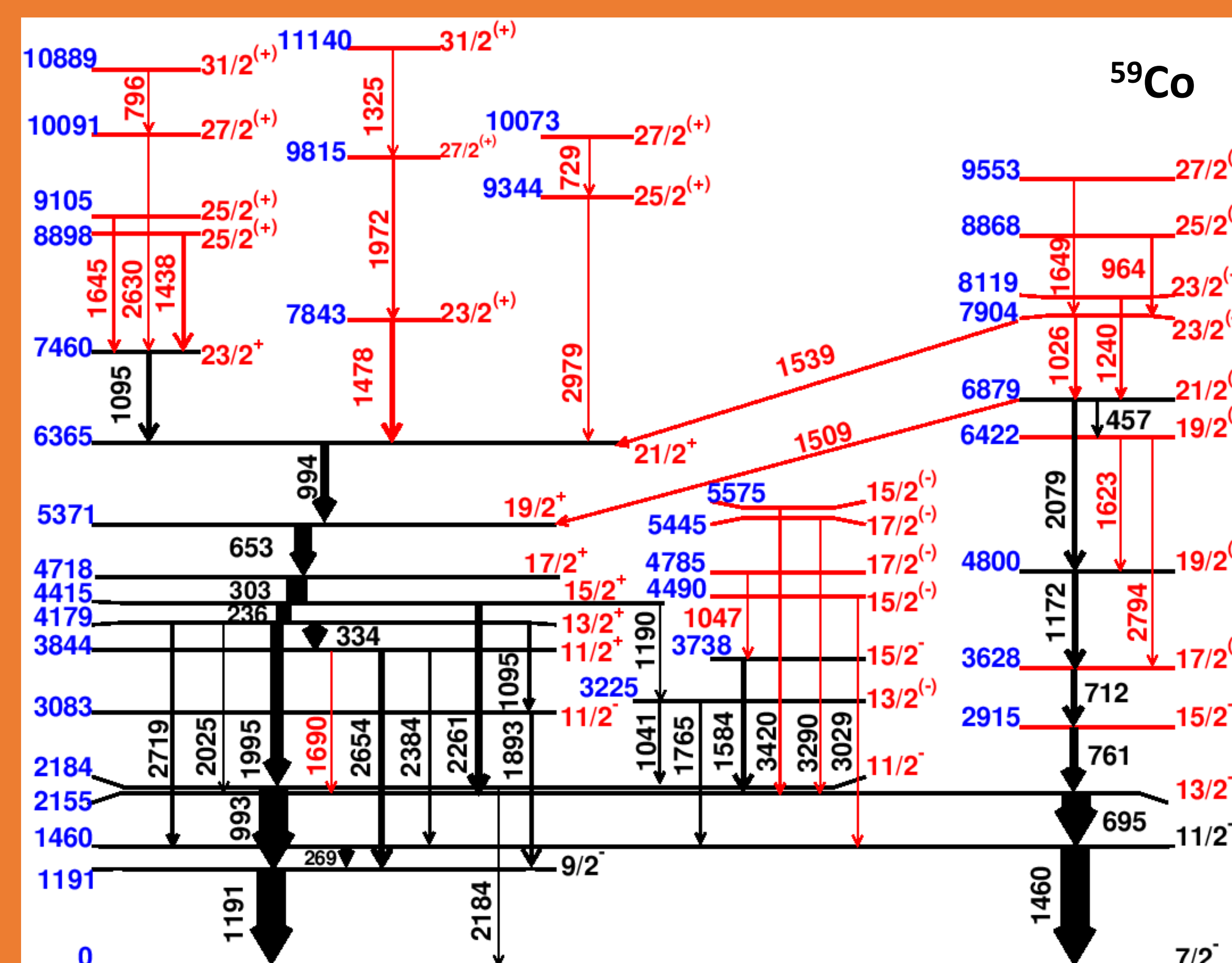
Analysis



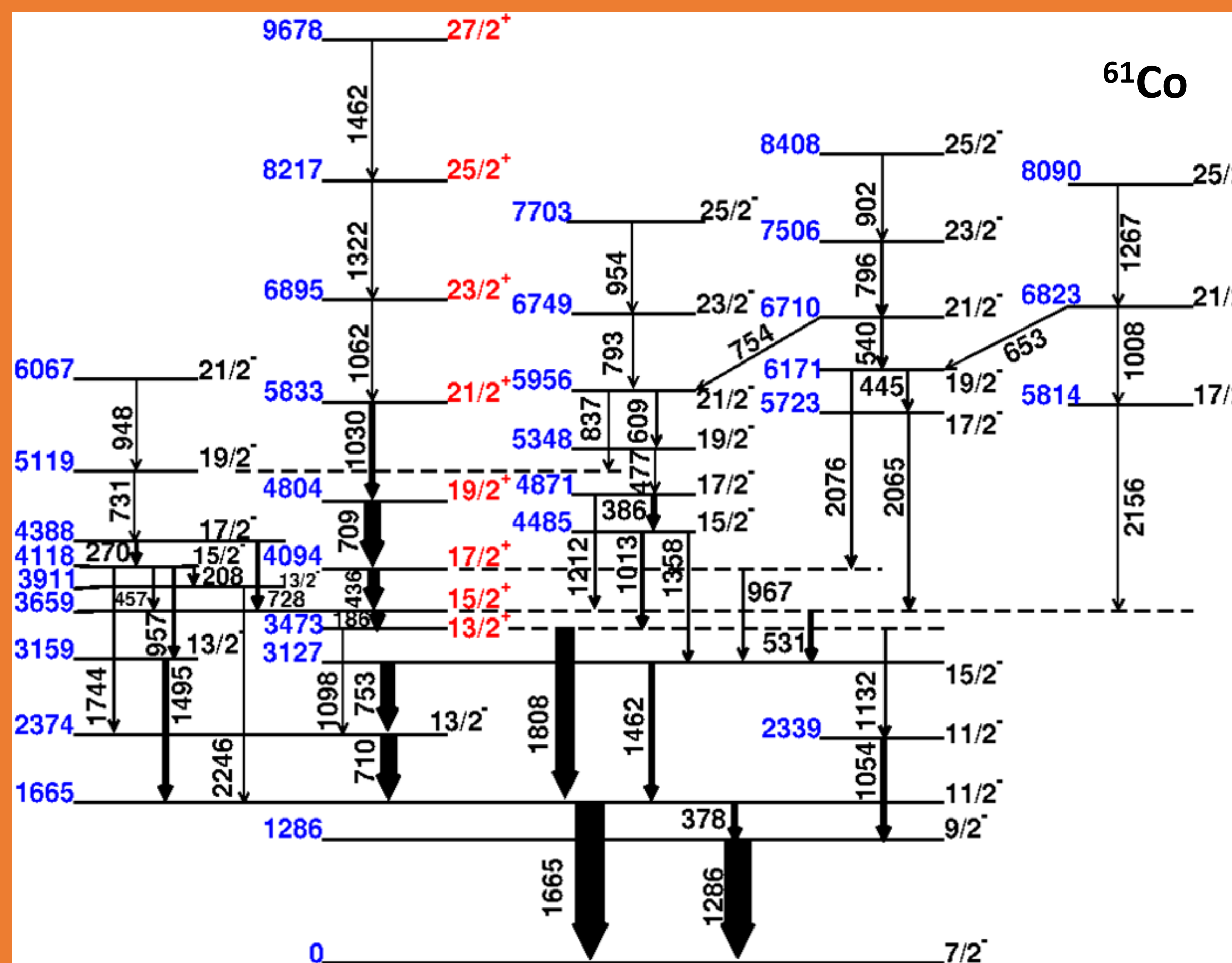
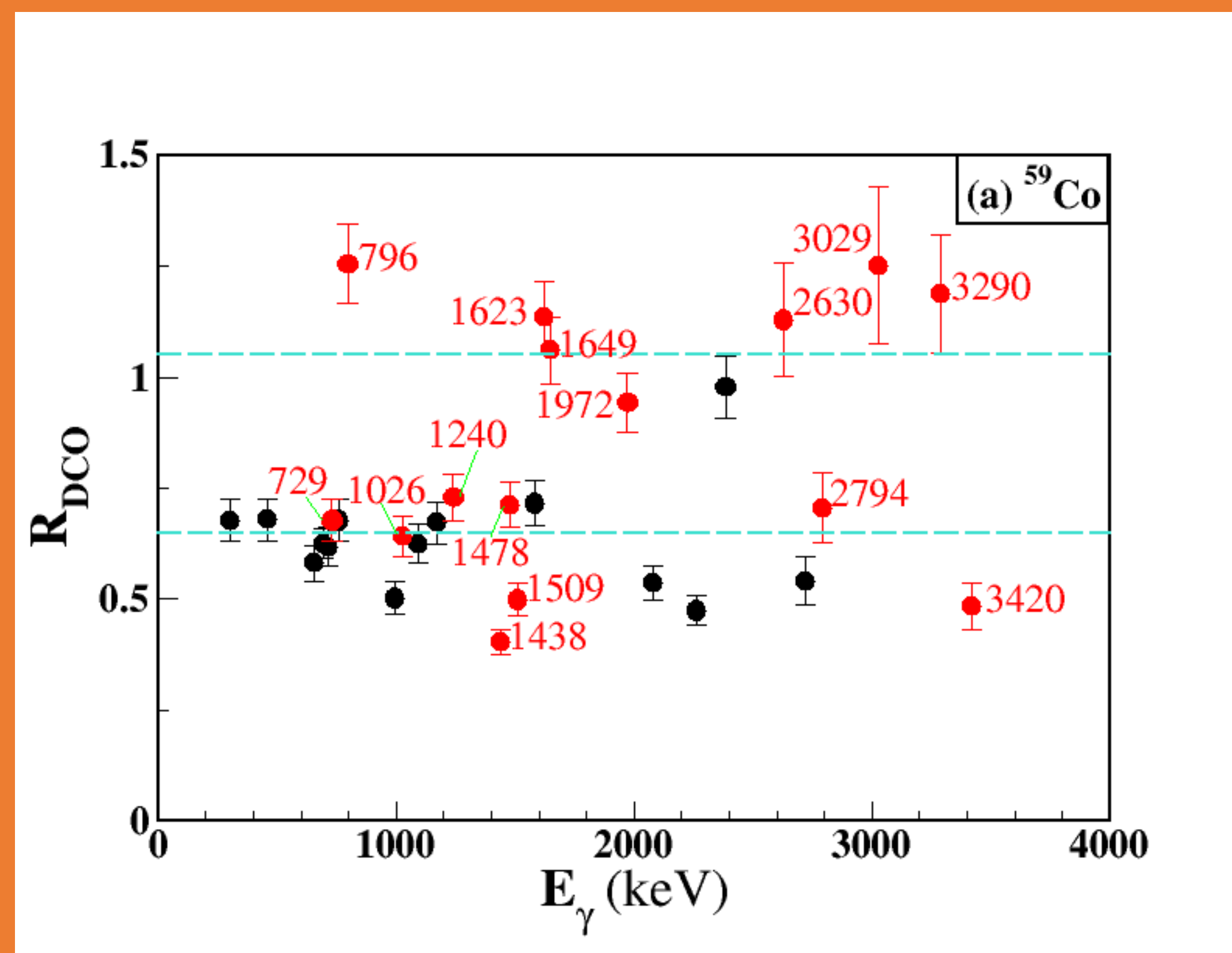
References

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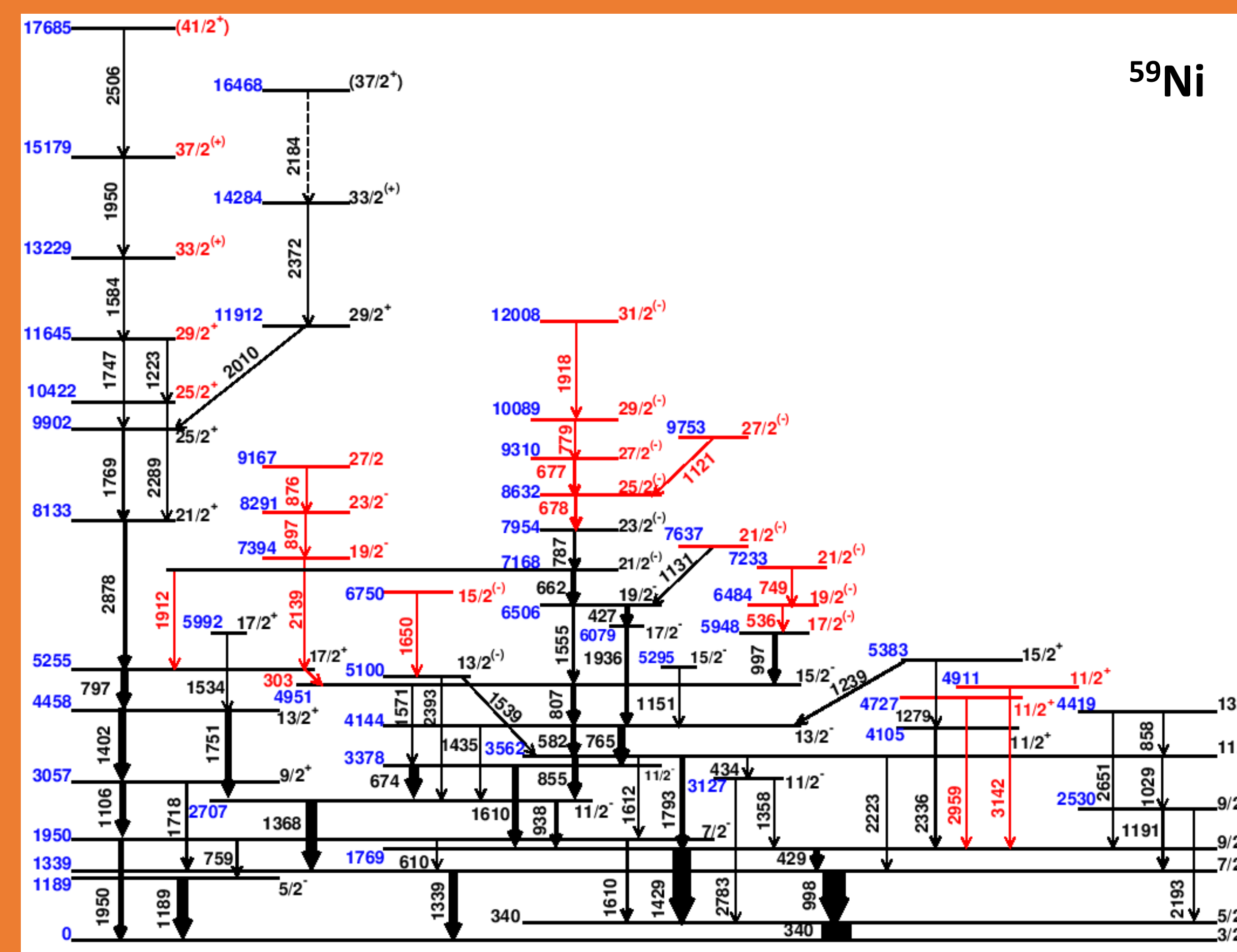
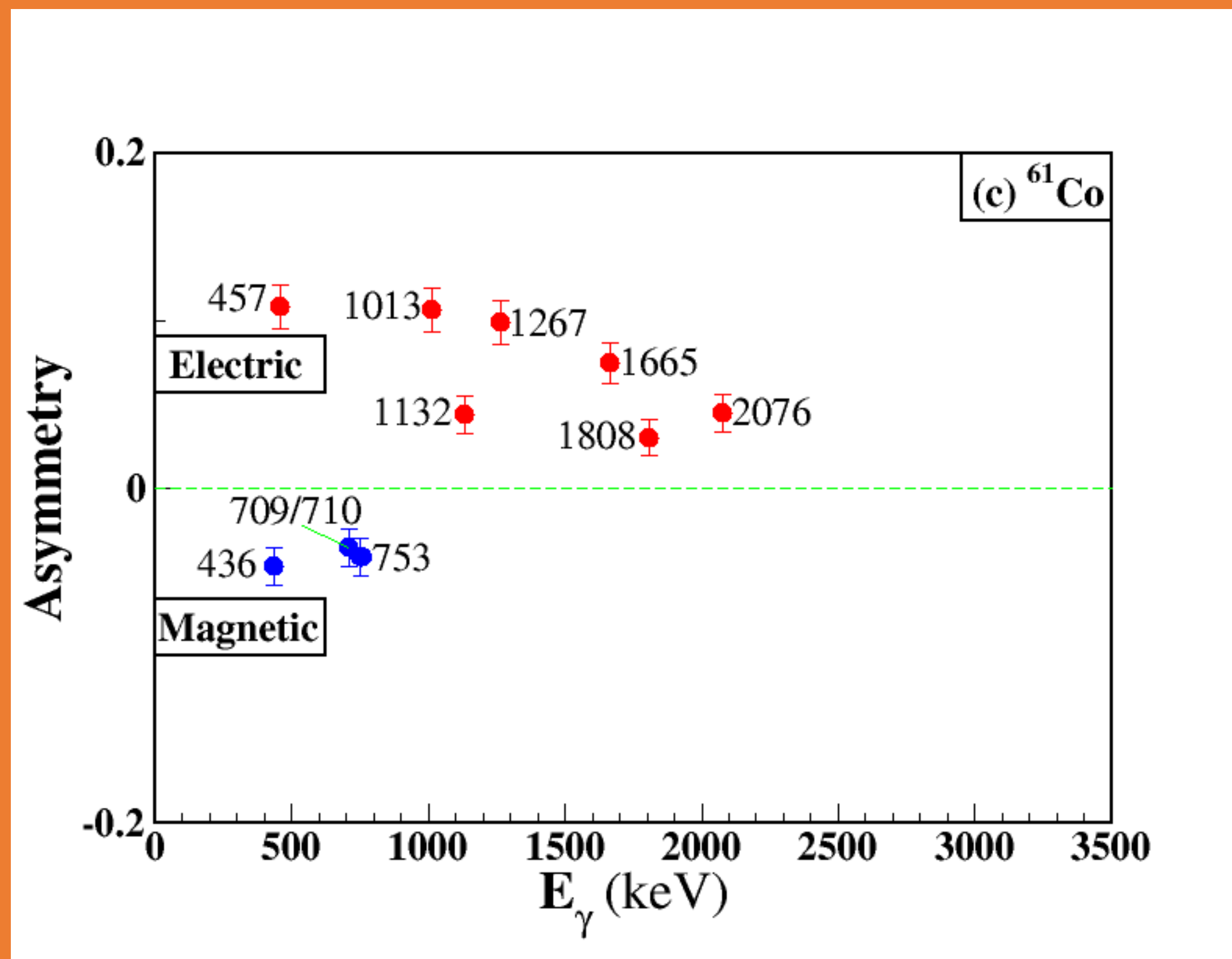
Results and Discussion



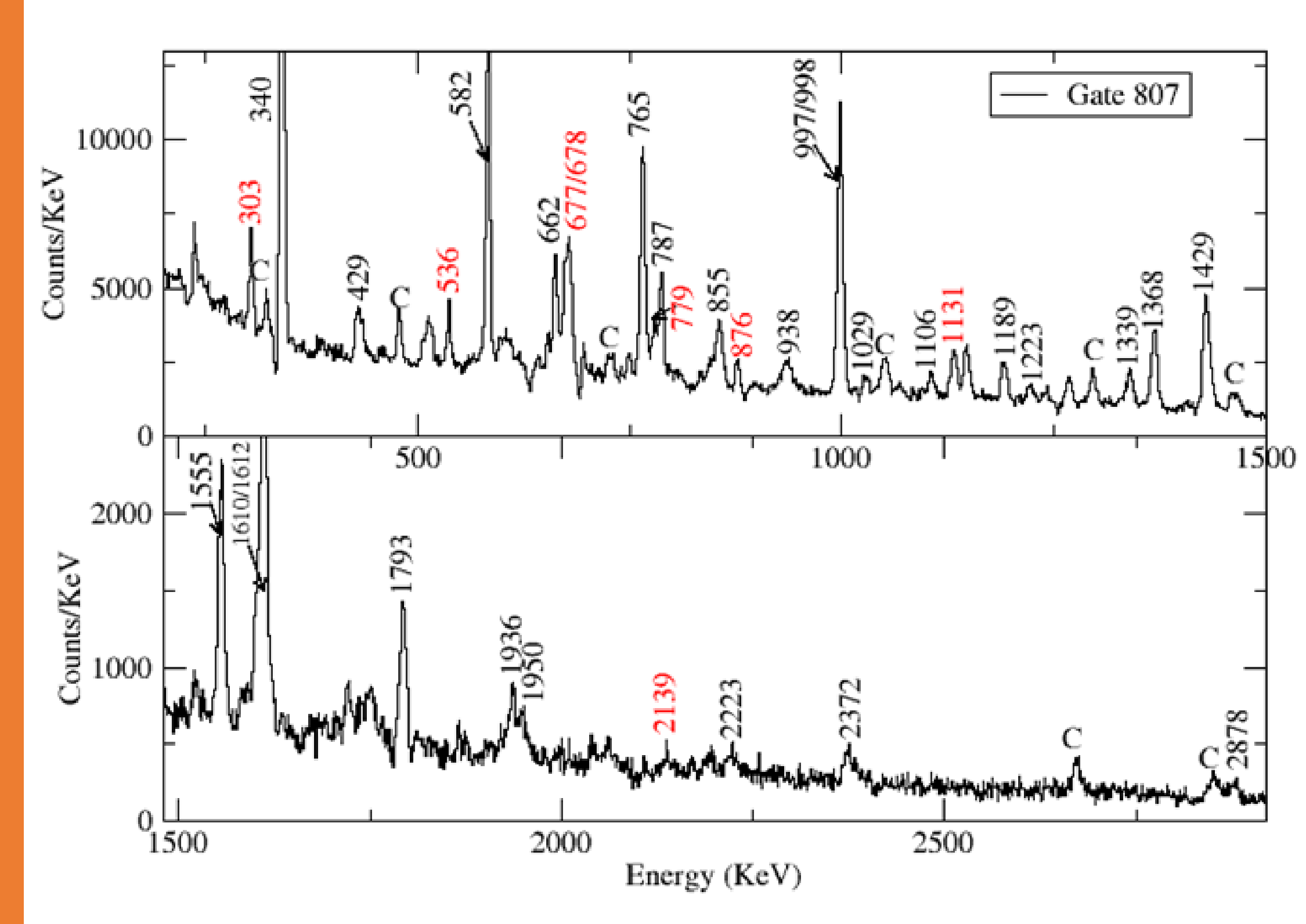
- Parity now assigned for spins above the first 11/2- in ⁵⁹Co [1]
- Positive parity states observed
- Extension of the energy level to ~11 MeV in ⁵⁹Co



- Parity in an existing band of ⁶¹Co from previous study was changed to positive in this study [2]

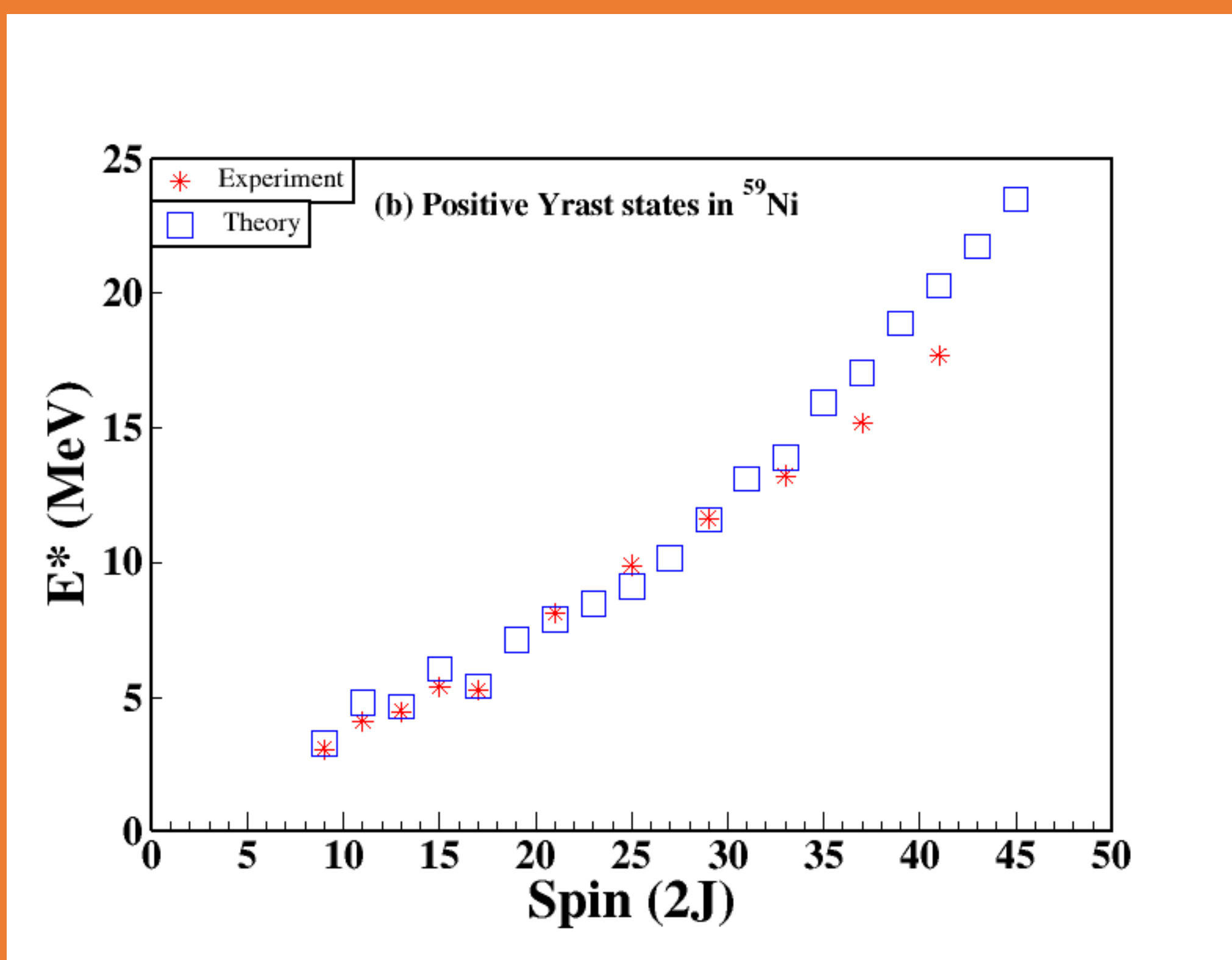
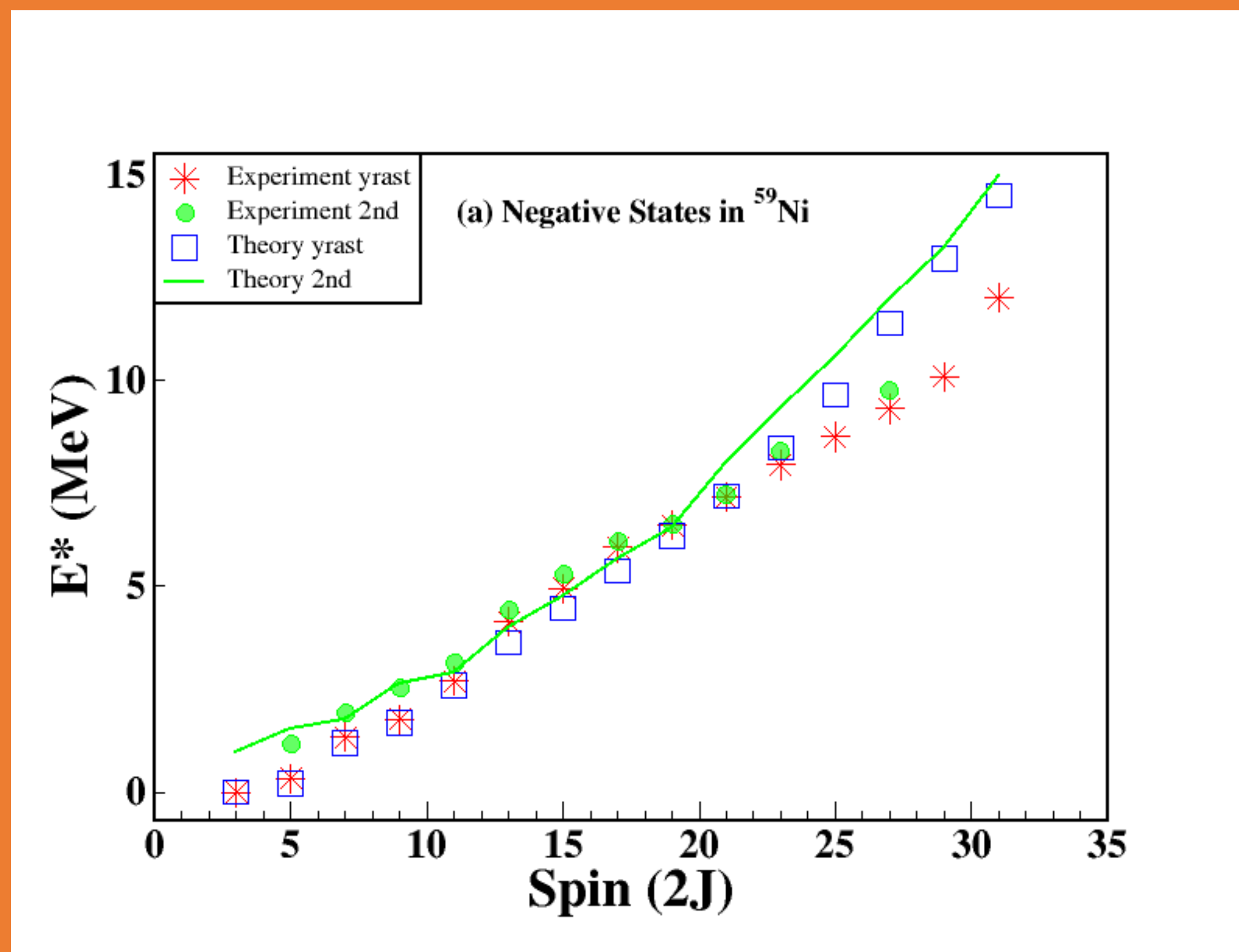
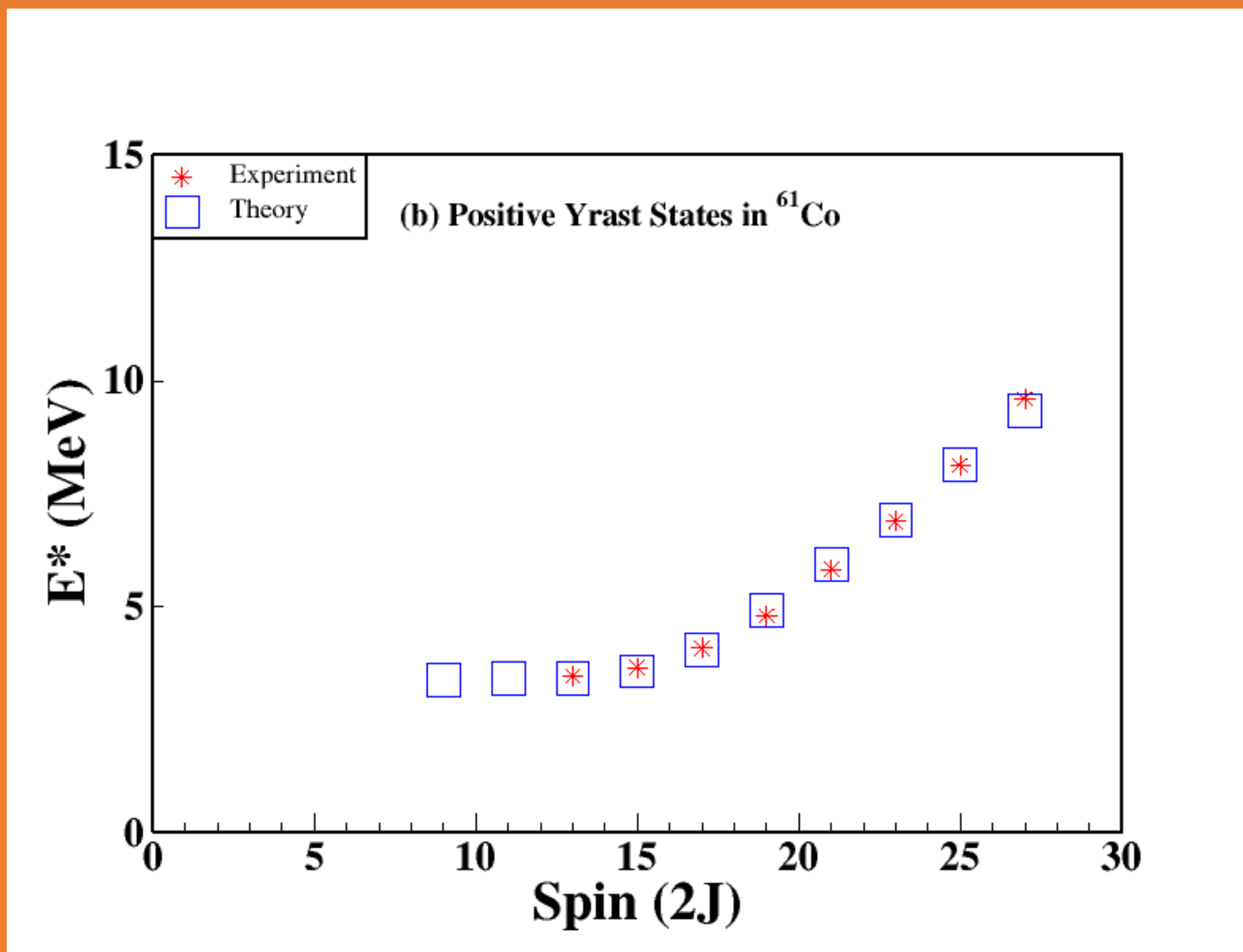
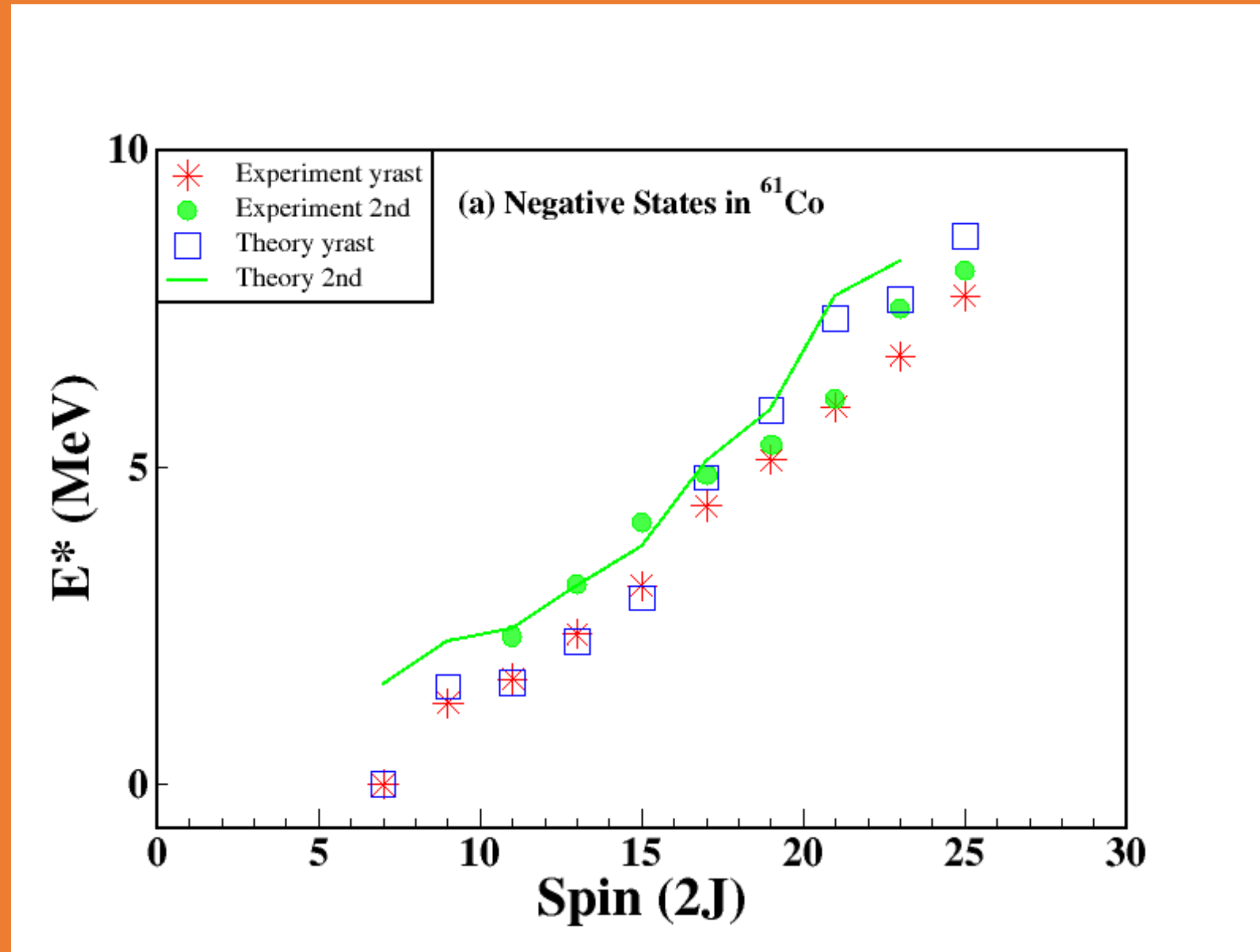


- Modifications made to some of the spins and parities of the positive parity states known from previous study of ⁵⁹Ni [3]
- Negative states extended to ~12 MeV



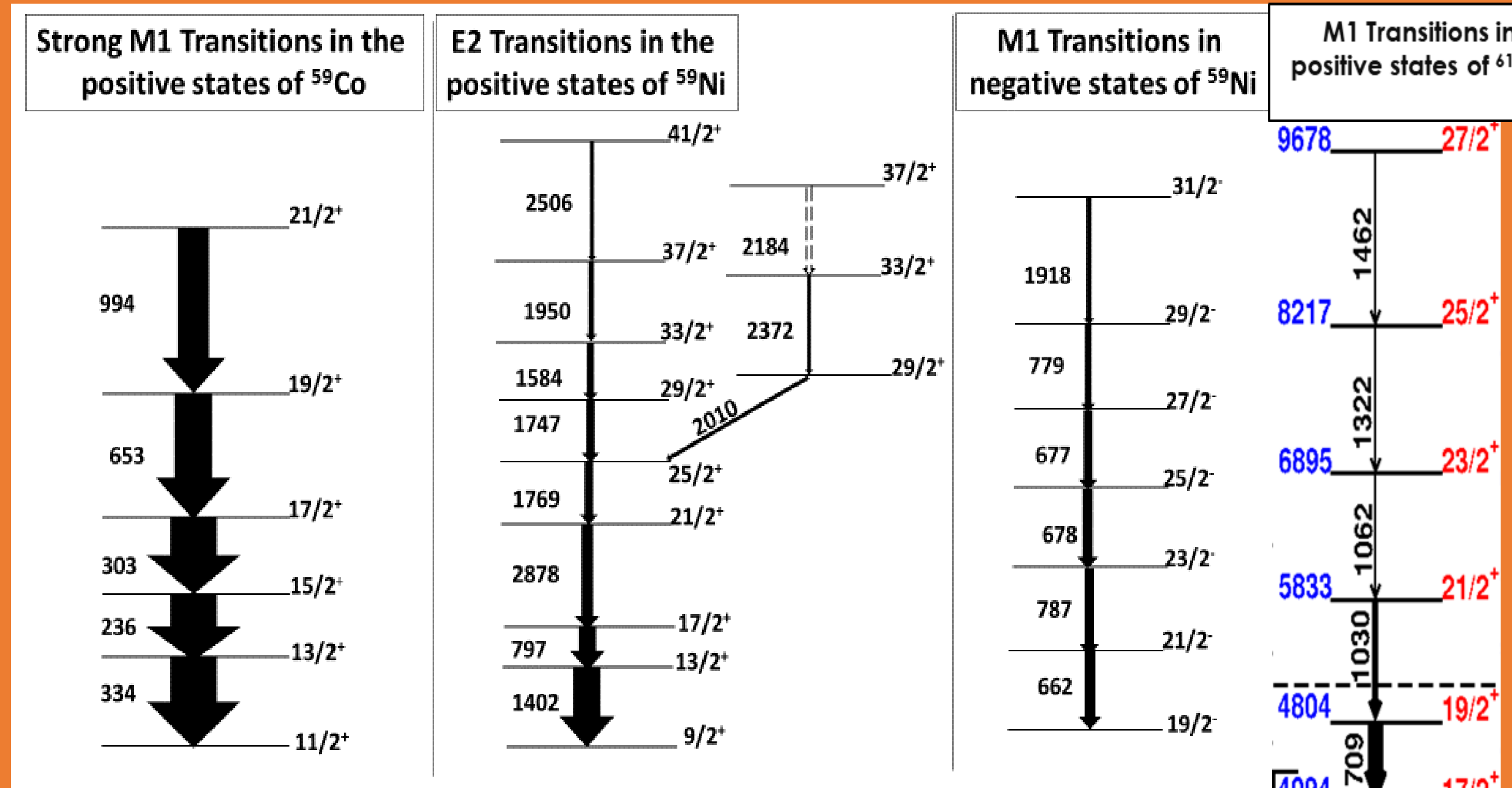
Comparison with Shell Model Calculation

- Results agree well with the shell model calculations within the fp-g_{9/2}d_{5/2} valence space [4], [6]
- Variation observed between experimental results and shell model calculation in negative state of ⁵⁹Ni at high spins



Collective Excitations

- Low-lying negative states in the nuclei represent single particle excitations
- The positive parity states and possibly the high-lying negative states in the nuclei are influenced by nucleons in the g_{9/2} orbit
- Regularity of transitions in high spin region suggests some form of collectivity; magnetic rotation and rotation due to deformation



Further Works

Further experiments are needed for the lifetime measurements of levels of magnetic rotation bands to measure transition probabilities. There is also a need for refinements of shell model calculation to include more than one nucleon in the g_{9/2} orbit.

Acknowledgement

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- Model space is taken as pf shell
- GXPf1Br interaction was used

- Model space is taken as the pf shell, 1g_{9/2}, and 2d_{5/2} orbits with restricting one-particle excitation to the 1g_{9/2} and 2d_{5/2} orbits.
- The GXPf1Br+V_{MU} interaction was used