# Article information:

New pattern in regular nuclei based on their experimental quadrupole transition rates and some new candidates | Scientific Reports
<https://www.nature.com/articles/s41598-023-31002-2>

# Article summary:

1. The energy spectra and transition rates of physical systems can be compared to three limits of random matrix theory (RMT) and Poisson distribution to predict possible correlations between the data, which may indicate hidden symmetries or related forces in the system.

2. Regular nuclei have been identified as having a specific repetition pattern in their energy levels, and this study aims to identify a similar pattern based on quadrupole transition probabilities.

3. Using empirical data, the study suggests a repetition pattern in regular nuclei based on 12 different quadrupole transitions between ground, gamma, and beta bands, and identifies several potential candidates for regular nuclei based on this pattern.

# Article rating:

Appears moderately imbalanced: The article provides some useful information, but is missing several important points or pieces of evidence that would be required to present the discussed topics in a balanced and reliable way. You are encouraged to seek a more balanced perspective on the presented issues by exploring the provided research topics and looking at different information sources.

# Article analysis:

The article discusses the regularity in nuclear systems and introduces a new observable, quadrupole transition probability ratios, to identify possible repetition patterns in regular nuclei. The authors use experimental data to suggest new candidates for regular nuclei and analyze their energy spectra using the interacting boson model (IBM) Hamiltonian.

Overall, the article provides a comprehensive overview of the research on regularity in nuclear systems and presents a novel approach to identifying regular nuclei based on quadrupole transition probabilities. However, there are some potential biases and limitations that should be considered.

One potential bias is that the article focuses primarily on the IBM Hamiltonian as a tool for analyzing nuclear structure. While this is a widely used model, it is not without its limitations and may not fully capture all aspects of nuclear behavior. Additionally, the article does not explore alternative models or approaches to studying nuclear structure.

Another limitation is that the article relies heavily on empirical data without considering potential sources of error or uncertainty in these measurements. It would be helpful to include a discussion of these issues and how they may impact the results.

Additionally, while the article presents evidence for repetition patterns in quadrupole transition probabilities, it does not thoroughly explore alternative explanations or counterarguments. For example, it is possible that these patterns are simply coincidental rather than indicative of underlying symmetries or correlations.

Finally, while the article notes some potential applications of this research (such as improving our understanding of nuclear structure), it does not fully consider any potential risks or drawbacks associated with identifying regular nuclei based on specific observables. It would be helpful to include a discussion of these issues as well.

Overall, while the article provides valuable insights into regularity in nuclear systems and introduces an interesting new approach to identifying regular nuclei, it could benefit from more thorough consideration of alternative models and approaches, potential sources of error or uncertainty in empirical data, alternative explanations for observed patterns, and potential risks associated with identifying regular nuclei based on specific observables.

# Topics for further research:

* Alternative models for analyzing nuclear structure
* Sources of error and uncertainty in nuclear data measurements
* Criticisms of the interacting boson model Hamiltonian
* Correlations between nuclear regularity and other observables
* Risks and drawbacks of identifying regular nuclei based on specific observables
* Applications of regularity in nuclear systems beyond improving our understanding of nuclear structure.

# Report location:

<https://www.fullpicture.app/item/58a3669bca16c860f0723ea73d2e9c34>