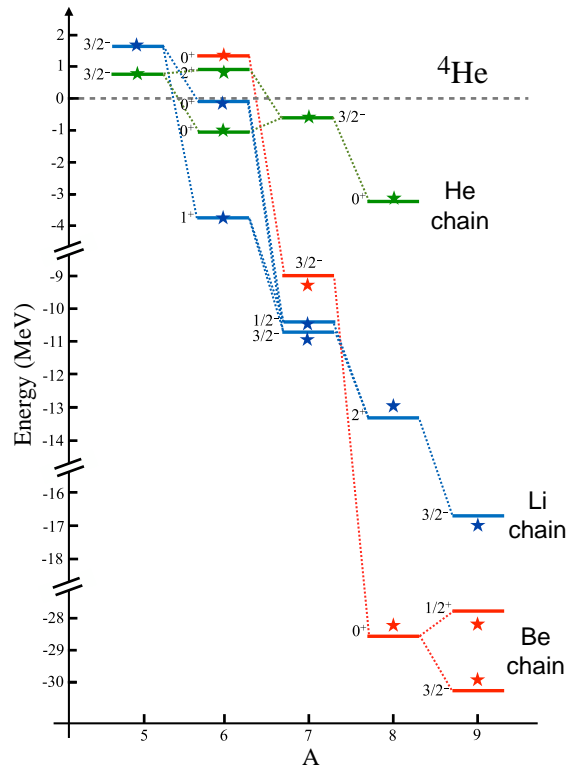




## Objectives

- A comprehensive understanding of weakly bound and unbound nuclei close to particle drip lines requires an open quantum system description.
- We carry out the optimization and uncertainty quantification of an effective interaction in the psdf-shell-model space, which expected to describe light nuclei.



Energies of the helium, lithium, and beryllium isotopic chains with  $A \leq 9$  computed using the optimized Gamow Shell Model interaction. The experimental values shown by stars.

## Impact

- Using the new interaction, very good agreement with experimental binding energies and spectra was obtained.
- The resulting covariance matrix enables quantification of statistical model errors on predictions.
- We carried out parameter reduction using a singular value decomposition analysis. We conclude that only four interaction parameters are reasonably well constrained by the binding energies of light nuclei.
- The new interaction will enable comprehensive and fully quantified studies of nuclear structure and reactions in nuclei from the psd region of the nuclear chart.

## Accomplishments

- Publication: Y. Jaganathen, R.M. Id Betan, N. Michel, W. Nazarewicz, and M. Płoszajczak, [Phys. Rev. C 96, 054316 \(2017\)](https://doi.org/10.1103/PhysRevC.96.054316)