

# Proton-Dripping Fluorine-14

First principles quantum solution for yet-to-be-measured unstable nucleus  $^{14}\text{F}$

- ❖ Apply *ab initio* microscopic nuclear theory's predictive power to major test case
- ❖ Robust predictions important for improved energy sources
- ❖ Providing important guidance for DOE-supported experiments
- ❖ Comparison with new experiment will improve theory of strong interactions
- ❖ Dimension of matrix solved for 14 lowest states  $\sim 2 \times 10^9$
- ❖ Solution takes  $\sim 2.5$  hours on 30,000 cores (Cray XT4 Jaguar at ORNL)

## Predictions:

Binding energy:  $72 \pm 4$  MeV indicating that Fluorine-14 will emit (drip) one proton to produce more stable Oxygen-13.

Predicted spectrum (Extrapolation B) for Fluorine-14 which is nearly identical with predicted spectrum of its “mirror” nucleus Boron-14. Experimental data exist only for Boron-14 (far right column).

