Contribution ID: **45** Type: **Poster**

Continuum effects for the low-lying states of drip-line oxygen isotopes

Thursday, 3 April 2008 17:40 (10 minutes)

Recently, neutron unbound low-lying states in oxygen isotopes near the drip line have been measured in several experiments. The conventional nuclear shell-model calculation, one of the most reliable methods in this mass region, cannot sufficiently explain the results. We therefore investigate the continuum effects, which have not been considered directly in the conventional shell model, for the low-lying states in oxygen isotopes near the drip line. A continuum single-particle basis is introduced and shell-model calculation is performed using this basis in a small model space. The calculated excitation strengths of the low-lying states in $^{23-26}$O are compared to those of the experiments which have recently been performed. If we restrict the single-particle wave functions to those of the harmonic oscillator, the results come back to those of the conventional shell-model calculation. Thus our method can evaluate the deference between shell model with and without continuum effects. The importance of the contribution from the continuum states, especially from the resonance state, is clearly seen.
The many-body perturbation theory to derive the effective interactions from the bare nucleon-nucleon potential is also discussed. Gamow basis, which includes not only bound states but also resonant states and non-resonant scattering states, is used for the construction of the effective interaction in several model spaces. The present state of this approach is shown.

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Session Classification: Poster

Track Classification: Collectivities and shell effects in neutron/proton-rich nuclei