

**Speaker : Gaute Hagen**

**Ab-Initio Coupled Cluster Theory for weakly bound and unbound nuclear states**

Gaute Hagen  
Physics Division, Oak Ridge National Laboratory,  
P.O. Box 2008, Oak Ridge, TN 37831, USA

Abstract

We apply ab-initio coupled cluster theory to the description of loosely bound and unbound nuclei starting from realistic nucleon-nucleon (NN) forces. Loosely bound and unbound nuclei exhibit strong coupling through continuum degrees of freedom. In order to account properly for this non-negligible coupling, a Berggren basis which treats bound, resonant and non-resonant continuum states on equal footing is used. Starting from a Berggren basis, and a realistic nucleon-nucleon interaction we are able to compute lifetimes and decay widths of a whole isotopic chains for the first time! Further, we are able to calculate halo densities since our basis has proper asymptotic behaviour. We present Coupled-Cluster ground state calculations for the helium and hydrogen chains.