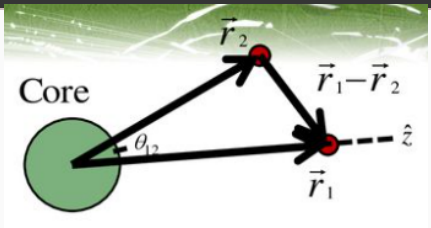
Surface Localization of the Dineutron in ^{11}Li

introduction

formation of dineutron correlation



measured **correlation angle** as a function of the intrinsic neutron momentum.

- use ^{11}Li$(p,pn)^{10}$Li to measure the neutron momentum and θ.
- use $p(\cos\theta, k)$ to calculate mean value of the correlation angle as a function of momentum **k**.
- calculated the location of dineutron and find out the density-dependent properties.

Background: Dineutron correlation

Why is dineutron correlation important?

use shell model to explain drip line nuclei:

valence particle may not be bound when neglect residual interaction.

introduced effective interaction:

$$v_{\text{eff}}(\mathbf{r}_1, \mathbf{r}_2) = \delta(\mathbf{r}_1 - \mathbf{r}_2)\left(v_0 + v_\rho\left(\frac{\rho_c((\mathbf{r}_1 + \mathbf{r}_2)/2)}{\rho_0}\right)^P\right)$$

properties of dineutron correlation

density dependent

Bertsch, G. F.; Esbensen, H. Pair Correlations near the Neutron Drip Line. Ann. Phys. 1991, 209 (2), 327–363.

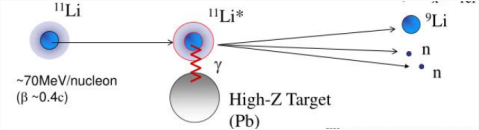
Background: ways of investigating dineutron correlation

Dipole response

weakly bound nucleus can be easily excited by external dipole field.

The E1 cluster sum rule value is directly related to the opening angle θ_{12}.

use coulomb breakup reaction:



measuring the charge radius

" ^{11}Li has a larger charge radius than ^{9}Li, indicating the two halo neutrons in ^{11}Li are distributed on one side forming the compact dineutron and not distributed symmetrically."

Sánchez, R. Nuclear Charge Radii of ^{9,11}Li: The Influence of Halo Neutrons. Phys. Rev. Lett. 2006, 96 (3), 033002.