



Nuclear Theory

Four-nucleon scattering with a correlated Gaussian basis method

S. Aoyama, K. Arai, Y. Suzuki, P. Descouvemont, D. Baye

(Submitted on 17 Jun 2011)

Elastic-scattering phase shifts for four-nucleon systems are studied in an ab -type cluster model in order to clarify the role of the tensor force and to investigate cluster distortions in low energy dd and tp scattering. In the present method, the description of the cluster wave function is extended from a simple $(0s)$ harmonic-oscillator shell model to a few-body model with a realistic interaction, in which the wave function of the subsystems are determined with the Stochastic Variational Method. In order to calculate the matrix elements of the four-body system, we have developed a Triple Global Vector Representation method for the correlated Gaussian basis functions. To compare effects of the cluster distortion with realistic and effective interactions, we employ the $AV8'$ potential as a realistic interaction and the Minnesota potential as an effective interaction. Especially for 1S_0 , the calculated phase shifts show that the tp and hn channels are strongly coupled to the dd channel for the case of the realistic interaction. On the contrary, the coupling of these channels plays a relatively minor role for the case of the effective interaction. This difference between both potentials originates from the tensor term in the realistic interaction. Furthermore, the tensor interaction makes the energy splitting of the negative parity states of ^4He consistent with experiments. No such splitting is however reproduced with the effective interaction.

Subjects: **Nuclear Theory (nucl-th)**

Cite as: [arXiv:1106.3391v1](https://arxiv.org/abs/1106.3391v1) [nucl-th]

Submission history

From: Shigeyoshi Aoyama [[view email](#)]

[v1] Fri, 17 Jun 2011 06:19:03 GMT (84kb)

[Which authors of this paper are endorsers?](#)

Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

Current browse context:

nucl-th

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1106](#)

References & Citations

- [INSPIRE HEP](#)
([refers to](#) | [cited by](#))
- [NASA ADS](#)

Bookmark([what is this?](#))

