Core-Excitation Three-Cluster Model on Borromean Nuclei

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We introduce a new model applying to the core-nucleus and two neutrons system. The Faddeev equations of ^{6}He-n-n and ^{8}He-n-n systems for ^{8}He and ^{10}He are solved, respectively. In this case the core-nucleus has 2 states (ground state (G) 0^+ and excited (X) 2^+ states) at the low lying energy levels. We handle the couple-channel separable potential $\hat{V}$ between the core-nucleus and neutron.

$$\hat{V} = -|h\rangle\langle h|, \qquad \langle p|h\rangle = g_G(p)|G\rangle + g_X(p)|X\rangle$$

where $g_{G\mathrm{or}X}(p)$, $|G\rangle$ and $|X\rangle$ are the formfactor, bases of the ground G and excited X states, respectively. Inputting only the information of subsystem energy levels and widths the model gives the coupling constant. Using these potentials we obtain some theoretical predictions in the low-lying level of ^{8}He and ^{10}He.

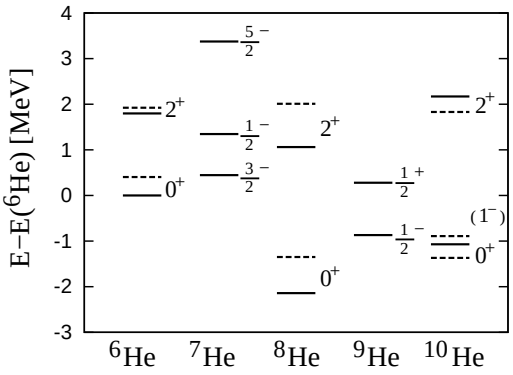

Figure 1: Energy levels of He isotopes normalized to the ^{6}He ground state energy. The dashed lines are corresponding to our theoretical predictions. The solid lines are taken from experimental data.

[1] E. Uzu, M. Yamaguchi, H. Kamada, and Y. Koike, Nucl. Phys. A 790, 286c (2007).

[2] M. Yamaguchi, Y. Koike, H. Kamada, and E. Uzu, FewBody System in Physics, 2005 (World Scientific) ed. Yupeng Yan et. al. p. 301 (2007).

[3] H. Kamada, M. Yamaguchi, E. Uzu, arXiv:1305.2301 [nucl-th]

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