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Algebraic models for shell-like quarteting of nucleons

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We introduce two algebraic models for the shell-like quarteting of nucleons. The simpler one is based on the quartet concept of Arima et al, which does not treat explicitly the degrees of freedom of the constituent nucleons. Nevertheless, the Pauli-principle is not violated in this phenomenological description, either: the quartets of four nucleons occupy different single particle space-states. The semimicrosopic model is more detailed. It is based on the definition of quartets in terms of two protons and two neutrons of [4] permutational symmetry. This model is able to take into account 0, 1, 2, 3, ... (nucleonic) major shell excitations, as opposed to the „giant" quartet excitations of the phenomenologic approach, which correspond to 4q, q = 0; 1; 2; ... nucleon excitation quanta. For both description the U(3) formalism of Elliott is applied for the calculation of the spectrum. Both of these models are easy to apply, yet the semimicroscopic approach seems to be detailed enough to account for a considerable amount of the experimental spectrum [1,2]. We expect that in addition to its applicability to the s-d shell nuclei it can also be extended to the mass region of A=92-100 of current experimental interest.

[1] J. Cseh, Phys. Lett. B, in press; arXiv:1409.0124v2 [nucl-th] (2014).
[2] J. Cseh and G. Riczu, in preparation.

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