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## Alpha correlation in term of the hyper-Pfaffian

A new theoretical approach for alpha correlation in nuclei is investigated in term of the hyper-Pfaffian [1]. The Pfaffian has been recently investigated to formulate the pairing correlation and is useful in investigating the sign-problem of Onishi formula [2], Wick's theorem, and the variational Monte Carlo [3]. While the hyper-Pfaffian, which is an extension of the Pfaffian for multi-dimensional tensor, is unfamiliar in physics.

In this contribution, we show that the overlap matrix element between M-scheme state and quartet wave function, which plays a key role in the variational Monte Carlo method, can be represented by the hyper-Pfaffian with  $k = 4$ . The hyper-Pfaffian, however, seems not to have many useful mathematical properties and is difficult for numerical computation. To overcome this difficulty, we found that the hyper-Pfaffian with  $k = 4$  for the alpha-like quartet wave function can be calculated as the sum of usual Pfaffians, by which its numerical evaluation becomes faster and feasible. The first result will be shown in [4]. (See also [4], for relevant references concerning the Pfaffian and its applications, and definitions of the hyper-Pfaffian in mathematics.) We present its formula and show the alpha correlation in the nuclear shell model.

### References

- [1] For example, J.-G. Luque, J.-Y. Thibon, *Advances in Applied Mathematics* 29 4 620 (2002).
- [2] For example, L. M. Robledo, *Phys. Rev. C* 79, 021302(R) (2009).
- [3] M. Bajdich, L. Mitas, G. Drobny, L. K. Wagner, and K. E. Schmidt, *Phys. Rev. Lett.* 96, 130201 (2006). D. Tahara and M. Imada, *J. Phys. Soc. Jpn.* 77, 114701 (2008).
- [4] Takahiro Mizusaki, Peter Schuck, *Bulletin of the Institute of Natural Sciences Senshu University*, No.50, (March 2019).

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