Application of the Monte Carlo shell model to the *ab initio* no core calculations

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Ab initio calculations for the nuclear many-body systems have become feasible, because of the rapid evolution of the computational technologies for over a decade. As the *ab initio* approaches treat all the nucleons on an equal footing, computational demands for the calculations explode exponentially as the number of nucleons and the size of basis space increase. In order to access heavier nuclei beyond the *p*-shell region with larger basis spaces by *ab initio* shell model methods, many efforts have been devoted for several years.

In this talk, as the one of these efforts, we show the recent development of the MCSM algorithm, especially for the computation of the two-body matrix elements between non-orthogonal Slater determinants and the technique of the energy-variance extrapolation. We also report the benchmark comparison of the properties in light nuclei among the Monte Carlo Shell Model, Full Configuration Interaction and No Core Full Configuration approaches. All results are found to be consistent with each other to within quoted uncertainties when they could be quantified. Where we could not obtain quantified uncertainties, the results were found to differ typically by a few percent among the available methods with very few exceptions.

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