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Roles of atomic many-body methods for accurate determination of isotope shift constants

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Isotope shift (IS) studies are traditionally used as tools to extract nuclear charge radii. Today their precise measurements also serve as the medium to probe physics supporting beyond the Standard Model (SM) of particle physics. These studies, however, demand high-accuracy calculations of IS constants that are combined with the IS measurements to infer nuclear charge radii as well as to trace fingerprints of any plausible new physics. Thus, it is imperative to employ a potential atomic many-body method to determine the IS constants reliably in multi-electron systems. However, accuracy of atomic calculations of the IS constants also depend on the adopted approach in a given atomic-body method. In this work, we intend to discuss the calculated IS constants for a number of atomic systems evaluated by employing different approaches in the relativistic coupled-cluster (RCC) theory framework and compare them with the values that are obtained from other atomic many-body methods. This would help to understand roles of atomic many-body methods for accurate determination of the IS constants.

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