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Calculations of long-range three-body interactions for Li($2S$)-Li($2S$)-Li($2P$)[1] PEI-GEN YAN, Univ of New Brunswick WIPM, LI-YAN TANG, WIPM, ZONG-CHAO YAN, Univ of New Brunswick WIPM, JAMES F BABB , ITAMP, Harvard-Smithsonian — With the rapid developments in ultracold atomic and molecular physics, accurate determinations of long-range interactions between two and three atoms are important in, for example, analyzing atomic photoassociation. Long-range interactions of two-body systems were extensively studied for S and P state atoms, however, for three-body systems studies are limited to S-state atoms. In this work, a general formula for calculating the long-range interactions among three like atoms is presented using perturbation theory up to second order, where two atoms are in identical S states and the other atom is in a P state. Unlike the case where the three atoms are in identical S states, here the first order interaction coefficients already show a dependence on the geometrical configuration of the three atoms, and nonadditive terms start to appear at the second order in energy corrections. For the Li($2\,^2S$)-Li($2\,^2S$)-Li($2\,^2P$) system, we perform precision evaluation of various dispersion coefficients using variationally generated atomic lithium wave functions in Hylleraas coordinates. These additive and nonadditive long-range dispersion coefficients may be useful in constructing a precise potential energy surface of this three lithium system.

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