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Long-range interactions between two helium atoms JUN-YI ZHANG, ZONG-CHAO YAN, Department of Physics University of New Brunswick, Fredericton, New Brunswick, Canada E3B 5A3, DANIEL VRINCEANU, Theoretical Division, Los Alamos National Laboratory Los Alamos, NM 87545, HOSSEIN SADEGHPOUR, ITAMP, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138 — The dispersion coefficients C_n (with n up to 10) for the long-range interaction between two helium atoms are calculated using variation method in Hylleraas coordinates. For the any combined system He(nS)-He($n^{'}S$) among the ground state He($1\,^1S$) and the lowest excited S states He($2\,^1S$) and He($2\,^3S$), significant improvements are made upon previous calculation and our results provide definitive values for these coefficients. For the He($1\,^1S$)-He($2\,^3P$) system, we also assess coefficients $C_6^{\pm}$ and C_6^0 using a semi-empirical method based on tabulated oscillator strengths and available photoionization cross sections. The results from the two methods agree to within 1.5%. In addition, we have calculated dispersion coefficients $C_{n\leq 10}$ for the four systems He($1\,^1S$)-He($2\,^1P$), He($2\,^1S$)-He($2\,^3P$), He($2\,^3S$)-He($2\,^3P$), and He($2\,^3P$)-He($2\,^3P$).

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