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Calculation of the dispersion interaction between two atoms

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General procedures for systematically evaluating the long range interaction between two atoms in arbitrary states have been developed for the separate cases of two homo-nuclear atoms and two hetero-nuclear atoms. Practical calculations for the dispersion coefficients, C_6 , C_8 and C_{10} are made by evaluating intermediate state sum rules of reduced matrix elements. Cases with a number of asymptotic states energetically close together are best described by recourse to the Feshbach formalism. Sets of reduced matrix elements to describe the excitation spectra of H, He, the rare gases, the alkali atoms and the alkaline-earth atoms have been gradually accumulated. Consequently, it is possible to evaluate the dispersion interaction for many combinations of the low lying states involving these atoms. The accuracy of these parameters ultimately depends on the accuracy of the representation of the excited atoms. The frozen core model used is capable of giving good agreement with relativistic many-body calculations for selected atom pairs provided the core is properly included in all aspects of dispersion calculation.