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Systematic analysis of long-range interactions between vibrating polar bialkali molecules OLIVIER DULIEU, ROMAIN VEXIAU, MAXENCE LEPERS, MIREILLE AYMAR, NADIA BOULOUFA, Laboratoire Aime Cotton, CNRS, Universite Paris-Sud, Orsay, France — The determination of the long-range anisotropic interactions between polar bialkali molecules is of crucial importance for the achievement of a quantum gas of ultracold polar molecules. In particular, the dispersion coefficient C_6 of the van der Waals interaction depends on the dynamic polarizability of the molecule evaluated at imaginary frequencies, expressed as a sum over all possible radiative transitions of electronic dipole moments. Using a mixture of up-to-date spectroscopic data and accurate ab initio data for potential energy curves, and permanent and transition dipole moments, we have obtained the values of the dispersion coefficients between identical polar molecules (LiNa, LiK, LiRb, LiCs, NaK, NaRb, NaCs, KRb, KCs, RbCs) in an arbitrary vibrational level of their electronic ground state. A careful analysis of the importance of the various kinds of transitions contributing to the sum has been performed. The C_6 values significantly decrease with increasing vibrational levels towards the sum of the C_6 coefficients between the four involved atomic pairs. For the lowest vibrational levels the C_6 parameter varies from about 10^4 atomic units for KRb up to 10^7 atomic units for NaCs, which will lead to different collisional regimes at ultracold temperature.

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