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Vibrational quantum defect for the analysis of weakly bound molecules. Application to Rubidium and cesium data. L. PRUVOST, H. JELASSI, B. VIARIS DE LESEGNO, Laboratoire Aimé Cotton, CNRS II — In the context of cold molecules physics, the spectroscopic data and their analysis play a very important role. The photoassociation spectroscopy of alkali dimmers, performed by laser excitation of cold atoms, is one of the methods providing high-resolution data about the vibrational levels lying close to the dissociation limit. Such weakly bound molecules are described by the dipole-dipole interaction, i.e. $-1/R^3$ where R is the inter-nuclear distance and their eigen energies are close to the Le Roy-Bernstein formula [1]. The discrepancies to the formula law are due to the short-range interactions of the potential and to couplings between potentials. We have expressed the discrepancies via a parameter, the vibrational quantum defect (VQD), defined similar to the atomic quantum defect [2]. The VQD deduced from the data and plotted versus the energy allows us to emphasize the couplings. Furthermore, a fit of the graph using a 2-channel model provides the value of the coupling and a characterization of the 2 potentials. We have applied the method $5s_{1/2}$-$5p_{1/2}0u+$ data of Rb2 recorded in our group [3] and $6s_{1/2}$-$6p_{1/2}0u+$ data of Cs2 recorded in Stwalley group [4]. The coupling due to spin-orbit interaction has been deduced, the perturbing levels identified and the wavefunction mixing deduced. [1] R. J. Le Roy , R. B. Bernstein, J. Chem. Phys. **52**, 3869, 1970. [2] H. Jelassi et al., Phys. Rev. A. **73**, 32501, 2006. [3] H. Jelassi et al., Phys. Rev. A. **74**, 12510, 2006. [4] H. Jelassi, et al., Phys. Rev. A **78**, 022503, 2008.

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