INVESTIGATION OF THE FINE AND HYPERFINE STRUCTURE OF THE $c^3\Sigma$ STATE IN KRb.

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The study of the hyperfine structure (HFS) in electronic transitions in diatomic molecules is a challenging task due to its experimental and theoretical complexity. We want to study the HFS of the $c^3\Sigma^+$ state in KRb. This state serves as an intermediate step for transferring cold Feshbach molecules from the $a^3\Sigma^+$ to the ground $X^1\Sigma^+$ state[1]. Due to the proximity of the $B^1\Pi$ state, perturbations caused by the spin-orbit interaction were observed[2]. This makes possible to observe transition to the mixed (c, B) pair of states from the ground $X^1\Sigma^+$ one.

By using selective Doppler-free spectroscopy techniques (about 50-90 MHz spectral resolution) we observed transitions in the $(X, v'' = 0 \rightarrow B, v' = 2)$ band system. The perturbation model used for modeling of the data is that of the effective Hamiltonian[3]. Appropriate matrix accounting for the fine and hyperfine interactions is being numerically diagonalized and the calculated term energies are compared with the experimental ones. By a non-linear least square fit, constants for the fine structure are obtained. The experimental resolution is not sufficient to observe all HF components, therefore the HFS is modeled by Fermi contact interaction of the electrons with only one of the nuclei. The recent experimental results and the model will be presented.

[1]Ni et al., Science 322, 231, 2008
[2]Okada et al., J. Chem. Phys. 105(9), 1996
[3]Ishikawa et al., J. Chem. Phys. 96(9), 1992

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