SPIN-ORBIT MIXING IN THE $A\,^1\Sigma_u^+$ AND $b\,^3\Pi_{0u}$ STATES OF THE RUBIDIUM DIMER

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The $A\,^1\Sigma_u^+$ and $b\,^3\Pi_{0u}$ states of the rubidium dimer has been re-investigated experimentally, adding to the considerable array of upper state term values determined from earlier work (performed at Laboratoire Aimé Cotton to characterize the electronic ground state). A polarization labelling experiment probed a series of levels from v=0, J=71 in the $X\,^1\Sigma_g^+$ state, and $(A\,^1\Sigma_u^+ \sim b\,^3\Pi_{0u}) \rightarrow X\,^1\Sigma_g^+$ fluorescence spectra have been recorded on an FT spectrometer following excitation of low-lying vibrational levels in the A state by a Ti:sapphire laser operating with long wavelength optics.
Data for $^{85}Rb_2$, $^{85}Rb^{87}Rb$ and $^{87}Rb_2$ are modeled using the discrete variable representation, fitting to numerical potential curves and Morse-type spin-orbit functions starting from *ab initio* potentials and spin-orbit functions. The fit has confirmed absolute vibrational numbering in the A state (the vibrational assignment in the b state looks convincing but is not definitive). The fit currently returns a root mean square residual of 0.075 cm^{-1}, which is 15 $\times$ the estimated experimental uncertainty, reflecting the fact that information particularly on the b state is still sparse. Including the $b\,^3\Pi_1$ component in the Hamiltonian did not improve the fit. Nevertheless, the fit provides useful estimates of term values and of spin-orbit mixing effects.

Work at Stony Brook was supported by NSF grant PHY 0652459 and at Temple University by NSF PHY 0555608.