WHAT IS THE $B'$ STATE OF NO$_3$?

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In the visible wavelength region, four electronic transitions of the sodium trimer were detected by Broyer et al.\textsuperscript{a} While the $A - X$ and $B - X$ systems were studied at rotational resolution\textsuperscript{b}, the $B' - X$ bands between 550 and 590 nm have not even been vibrationally analyzed. The $B'$ state life time was previously determined to be only 7 ns\textsuperscript{c}, a cause for difficulties in recording the congested bands with high resolution resonant two-photon ionization spectroscopy. By using well assigned rotational transitions in the $A - X$ system in an OODR scheme, we scanned a portion of the $B' - X$ system. Even without a rotational analysis, the rotational line pattern and especially the density of rotational states within a vibronic band help to identify different vibronic sequences. So far 15 bands could be organized into series characterized by integer vibronic angular momentum quantum numbers $j$.

The following picture evolves from our interpretation: the $B'$ state derives from the upper two surfaces of the three surface potential which is due to primarily pseudo Jahn-Teller coupling of a $2E'$ and a $2A'$ state. To an accuracy of a few wavenumbers, the vibronic band positions have been fit to a pseudo Jahn-Teller Hamiltonian yielding the energy separations between the interacting E and A states as 130 cm$^{-1}$ as well as the ratio of the curvatures of the unperturbed potentials.\textsuperscript{d}

