THE $^2\Pi_i$, $^2\Delta_i$, AND $^2\Sigma^+$ LOW-LYING STATES OF NiCl: LASER INDUCED AND FOURIER TRANSFORM EXPERIMENTS

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The $^2\Pi_{5/2}, A^2\Delta_{5/2}$ and $^2\Sigma^+$ (161 cm$^{-1}$) low-lying states of NiCl have been recently identified. Transitions linking these states to upper [21.9]$^2\Delta_{5/2}$, [24.5]$^2\Pi_{3/2}$ and [24.9]$^2\Pi_{1/2}$ states have been rotationally analyzed. Laser induced fluorescence experiments allowed the identification of the $^2\Pi_{1/2}$ (382 cm$^{-1}$) and $^2\Delta_{3/2}$ (1.646 cm$^{-1}$) spin-orbit components. All the low-lying states of NiCl associated with the nickel 3d atomic orbital are now observed. In addition we identified a new electronic state located at 21,608 cm$^{-1}$. This state is linked to all the five spin-orbit components of the $^2\Delta$, $^2\Pi_{1/2}$ and $^2\Pi_{3/2}$ states. High resolution Fourier transform experiments made possible the analysis of three of these transitions. Laser induced dispersed fluorescence suggest that this state is also linked to a new low-lying state (1,378 cm$^{-1}$) which could be a component of a quartet state of NiCl.