

# LASER-INDUCED FLUORESCENCE SPECTROSCOPY OF JET-COOLED NiF: AN INVESTIGATION OF THE $\Omega$ -TYPE DOUBLING IN THE $\Omega=1/2$ STATES OF THE $3d^9$ GROUND ELECTRONIC CONFIGURATION

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A recent paper by Hougen<sup>a</sup> presents the hypothesis that the relative parities of  $\Omega=1/2$  levels in the  $3d^9$  complex of NiF may need to be reconsidered, since the experimental determinations reported in the literature<sup>b c d</sup> via  $\Omega$ -doubling parameters differ by a sign from those obtained from Hougen's theoretical treatment. We report on an experiment that attempts to resolve the discrepancy via laser-induced fluorescence and dispersed fluorescence spectroscopy of NiF created in the molecular-jet laser-ablation apparatus at the University of New Brunswick. New data involving the  $[22.9]^2\Pi_{3/2}-X^2\Pi_{3/2}$  and  $[22.9]^2\Pi_{3/2}-[0.25]^2\Sigma_{1/2}$  transitions were obtained, in which several isotopologues of NiF could be resolved and their spectra analyzed. Dispersed fluorescence spectra were obtained by exciting parity-resolved transitions of the  $[22.9]^2\Pi_{3/2}-X^2\Pi_{3/2}$  spectrum with a narrow-bandwidth cw laser, then observing the fluorescence to the  $[0.25]^2\Sigma_{1/2}$  and  $[1.5]^2\Sigma_{1/2}^+$  states with a grating spectrometer. Changes in the dispersed fluorescence pattern as levels of the same  $J'$  with different parities were excited will be discussed, and the implications for verifying or refuting Hougen's claim will be presented.

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<sup>a</sup>J T. Hougen, *J. Mol. Spectrosc.* **267** (2011) 23–35.

<sup>b</sup>C. Dufour and B. Pinchemel, *J. Mol. Spectrosc.* **173** (1995) 70–78.

<sup>c</sup>Y. Krouti, T. Hirao, C. Dufour, A. Boulezhar, B. Pinchemel, and P. F. Bernath, *J. Mol. Spectrosc.* **214** (2002) 152-174.

<sup>d</sup>M. Tanimoto, T. Sakamaki, and T. Okabayashi, *J. Mol. Spectrosc.* **207** (2001) 66–69.