

# Molecular nitrogen photoabsorption cross sections and line widths in support of analyses of planetary atmospheres.

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February 3, 2006

## Abstract

The analyses of VUV occultation measurements of the N<sub>2</sub>-rich atmosphere of Titan require reliable photoabsorption cross sections and line widths for the approximately 100 vibronic bands of N<sub>2</sub> in the 80 to 100 nm wavelength region. We report measurements of these fundamental parameters of the absorption spectrum of <sup>14</sup>N<sub>2</sub> in the 93.5–100 nm spectral region. The room temperature absorption measurements were performed with the 6.65-meter vuv spectrometer at the Photon Factory synchrotron facility with a resolving power of approximately 125,000. A line-shape fitting routine is used to extract individual rotational line f-values and predissociation-broadened line widths within the fifteen bands reported in this study. Within individual bands, we find significant departures from the predicted line strength distributions based on isolated band models. Line width analyses within each band indicate that predissociation-broadening is often highly dependent on the rotational quantum number. We illustrate the importance of N<sub>2</sub> line widths in the analysis of Cassini occultation measurements with sample N<sub>2</sub> transmission models over selected wavelength regions. We gratefully acknowledge funding support from NASA grant NAG5-9059.

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