# Application of a VUV-FT Spectrometer and Synchrotron Radiation Source to Measurements of the NO bands

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## Introduction

Current research on the Earth's upper atmosphere requires molecular parameters of unprecedented detail and accuracy. Models of the vacuum-ultraviolet (VUV) absorbing properties of the atmosphere call for absorption cross sections with details on the scale of the Doppler linewidths. To meet these requirements, the newly developed Fourier transform (FT) spectrometers at Imperial College, London (IC) can operate with resolution up to 0.03 $cm^{-1}$ [1]. In carrying out photoabsorption cross section measurements in VUV with an FT spectrometer, there is only one choice: combination of the FT absorption spectrometer and the bandwidth limited synchrotron radiation source on beam line 12-B.

## Measurements of NO bands

We have successfully taken cross section data for all bands of NO in the wavelength range 195 –160 nm.

Analysis of the β(9,0) band at 184.8 nm and the δ(1,0) band at 182.8 nm were completed and published [2,3]. Analysis of the ε(1,0) band at 194.5 nm is also completed and accepted for publication [4]. Analysis of the β(6,0) band at 194.5 nm and γ(3,0) band at 195.5 nm are also completed and submitted for publication [5]. Molecular constants of the v = 6, 9 levels of the B $^2\Pi_r$, v = 3 level of the A $^2\Sigma^+$\$, v = 1 level of the C $^2\Pi$, and v = 1 level of the D $^2\Sigma$ have been determined. Accurate rotational line and band oscillator strengths have also been obtained for all bands reported. The band oscillator strengths obtained are compared with the previous workers, Bethke [6] and Chan *et al.* [7] in Table I. Our line by line measurement can identify accurately the transition lines belonging to the bands and exclude any overlapping transition intensity of other bands.

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## References

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Table 1. The Band Oscillator Strengths of the Absorption Bands of NO

| Wavelength | Bnads | Oscillator Strength 10(-3) | | |
|---|---|---|---|---|
| nm | | Chan[7] | Bethke[6] | CfA |
| 195.5 | γ(3,0) | 0.36 | 0.36 | 0.25 |
| 194.5 | β(6,0) | 0.037 | 0.046 | 0.049 |
| 190.9 | β(7,0)+δ(0,0) | 2.7 | 2.5 | 1.95 |
| 187.6 | γ(4,0)+β(8,0)+ε(0,0) | 2.8 | 2.5 | 2.18 |
| 184.6 | β(9,0) | 0.31 | 0.36 | 0.265 |
| 182.8 | δ(1,0) | 6 | 5.8 | 5.41 |
| 179.9 | ε(1,0) | 4.6 | 4.6 | 2.88 |