APPLICATION OF MULTISPECTRUM FITTING TO OBTAIN LINE SHAPE PARAMETERS FROM PARTIALLY RESOLVED LINES

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One of our motivations for studying HCN rotational transitions is that each component of the hyperfine structure has a distinct pressure broadening cross section. However, the lines are only resolved from one another in the Doppler limit (below 15 K), and the cross sections are predicted to differ by only 5–10%. Such small differences are on the threshold of our previous experimental precision. In this experiment we seek to measure the distinct hyperfine cross sections in order to both improve and verify the precision of our measurements. A critical tool in this process is our adoption of a multispectrum fitting procedure that simultaneously fits spectra collected under varying experimental conditions. This approach to fitting has been used successfully by other groups[a] to fit both atmospheric and laboratory infrared spectra. We have found that adopting multispectrum fitting improves our ability to identify and resolve errors in both our experiment and our line shape model. This talk will discuss our implementation of this approach and provide several examples of its merits.

[a] D. C. Benner, C. P. Rinsland, V. M. Devi, M. A. H. Smith, and D. Atkins *J. Quant. Spectrosc. Radiat. Transfer* **53**, 705 (1995).