IS C_7^- REALLY A DIFFUSE INTERSTELLAR BAND CARRIER?

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Perhaps the longest standing unsolved problem in molecular spectroscopy is that of the Diffuse Interstellar Bands (DIBs) — a series of hundreds of absorption lines present in the spectra of nearly all stars which lie behind sufficient quantities of interstellar material. Despite the fact that the first of the DIBs were observed nearly 100 years ago, none of them can yet be attributed with confidence to a molecule whose spectrum has been obtained in the laboratory.

Many astronomers and spectroscopists were hopeful that this impasse had finally been broken when John Maier's group reported[b] the gas-phase laboratory spectrum of C_7^-. Based on the best atlas of DIBs available at the time, the five strongest transitions of the C_7^- $A^2\Pi_u \leftarrow X^2\Pi_g$ band seemed a promising match.

Using the new high resolution ($\lambda/\Delta\lambda \sim 40,000$) echelle spectrometer on the 3.5 m telescope at the Apache Point Observatory, we have begun a high sensitivity survey of DIBs in a large sample of reddened stars. A preliminary analysis of the "C_7^- bands" in four stars in our sample was reported at the 1999 conference[c] and subsequently published[d].

Now that we are two years into our long-term survey, our sample includes over 20 reddened stars, with at least some of the "C_7^- bands" detected in more than 15 of them. In this talk, we re-examine the correlation between the candidate DIBs to see if they are caused by the same molecule. We also discuss the wavelength agreement between the laboratory and interstellar measurements, as well as our astronomical search for the $\Omega'' = \frac{3}{2}$ components of the C_7^- bands recently identified in the laboratory spectrum[e,f].

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[a] Supported by the Fannie and John Hertz Foundation

[b] M. Tulej, D. A. Kirkwood, M. Pachkov, & J. P. Maier, *Astrophysical Journal Letters* **506**, L69 (1998)

[c] B. J. McCall, D. G. York, & T. Oka, Talk RF09, 54th International Symposium on Molecular Spectroscopy

[d] B. J. McCall, D. G. York, & T. Oka, *Astrophysical Journal* **531**, 329 (2000)

[e] N. M. Lakin, M. Tulej, M. Pachkov, F. Güthe & J. P. Maier, Talk TC02, 55th International Symposium on Molecular Spectroscopy

[f] N. M. Lakin, M. Pachkov, M. Tulej, J. P. Maier, G. Chambaud, & P. Rosmus, *Journal of Chemical Physics* **113**, 9586 (2000)