

LABORATORY AND POSSIBLE INTERSTELLAR DETECTION OF *TRANS*-METHYL FORMATE

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The rotational spectrum of the *trans* conformational isomer of methyl formate has been assigned using pulsed jet spectroscopy. A total of 28 transitions, 19 from the A-symmetry torsional state and 9 from the E-symmetry torsional state, have been detected in the laboratory. This spectrum was expected to have strong internal rotor effects due to a low three-fold barrier to methyl group internal rotation, calculated to be around 20 cm^{-1} .^a The population of this conformer, which lies approximately 2000 cm^{-1} higher in energy than the previously assigned *cis* conformer, was enhanced through the use of an electric discharge. Transitions were found by a combination of chirped-pulse Fourier transform microwave spectroscopy, a high-sensitivity Fourier transform microwave spectrometer, and microwave-microwave double resonance spectroscopy to confirm quantum state connections. A total of five transitions (three from the A-symmetry torsional state and two from the E) have been identified in absorption in Green Bank Telescope survey scans towards Sgr-B2(N),^b showing an abundance relative to the *cis* conformer that is much higher than the relative energies would predict. This detection, if confirmed, could offer insight into the production mechanism of methyl formate in the interstellar medium.

^aM.L. Senent *et al.*, *Ap.J.* **627** (2005) 567-576.

^bGBT PRIMOS Project, <http://www.cv.nrao.edu/~aremijan/PRIMOS/index.html>.