SELF- AND AIR-BROADENING AND SHIFT COEFFICIENTS OF CH_4 LINES IN THE 3 μm REGION

V. MALATHY DEVI, D. CHRIS BENNER, *Department of Physics, The College of William and Mary, Box 8795, Williamsburg, VA 23187-8795*; M. A. H. SMITH, C. P. RINSLAND, *Atmospheric Sciences Division, NASA Langley Research Center, Mail Stop 401A, Hampton, VA 23681-2199*; G. GUELACHVILI, *Laboratoire de Physique Moleculaire et Applications (LPMA), CNRS, Universite Paris-Sud, Batiment 350, 91405 Orsay-Cedex, France*; and L. R. BROWN, *Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109*.

Self- and air-broadening and shift coefficients for numerous CH_4 transitions in the 3 μm region have been determined through analysis of high-resolution absorption spectra recorded by two different Fourier transform spectrometer (FTS) systems. The first set of spectra was recorded using the 1-m FTS at the McMath-Pierce facility of the National Solar Observatory at Kitt Peak; resolution was 0.01 cm^{-1}. This data set included both self-broadened CH_4 spectra with cell path lengths of 5, 10, 25, 150, and 2500 cm and pressures ranging from 0.4 Torr to 456 Torr, and air-broadened spectra of $^{12}CH_4$ and $^{13}CH_4$ with cell path lengths of 5, 25, 50, and 150 cm and total pressures from about 100 Torr to 400 Torr. A second set of self-broadened CH_4 spectra was recorded at higher resolution (0.0027 cm^{-1}) using the FTS of the Laboratoire de Physique Moleculaire et Applications in Orsay. Path lengths for these spectra varied from 1.7 cm to 4 m, and pressures ranged from less than 1 Torr to over 500 Torr. A multispectrum nonlinear least-squares procedure[a] was used to fit over 40 spectra simultaneously to determine self- and air-broadening and shift coefficients for more than 500 lines; most of these are in the ν_3 and $\nu_2 + \nu_4$ bands. Differences between air- and self-broadening and shifts of $^{12}CH_4$ lines will be discussed, and air-broadening and shift coefficients for $^{12}CH_4$ and $^{13}CH_4$ will be compared. We will also compare our measurements with the values on the current HITRAN compilation[b] and with other available measurements.

[a] D. Chris Benner, C. P. Rinsland, V. Malathy Devi, M. A. H. Smith, and D. Atkins, *JQSRT* **53**, 705-721 (1995).
[b] L. S. Rothman *et al.*, *JQSRT* **48**, 469-507 (1992); L. S. Rothman *et al.*, *JQSRT*, in press (1998).