THE HOT BANDS OF METHANE BETWEEN 5 AND 10 MICRONS

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The experimental line intensities of 1727 transitions between 1000 and 2000 cm^{-1}belonging to the pentad-dyad system of methane are fitted to first and second order using the effective dipole moment expansion in the polyad scheme. The nine observed bands are ν_3-ν_2, ν_3-ν_4, ν_1-ν_2, ν_1-ν_4, $2\nu_4$-ν_4, $2\nu_2$-ν_4, $2\nu_2$-ν_2, ν_2+ν_4-ν_2 and ν_2+ν_4 -ν_4. The intensities are obtained from long-path spectra recorded at 0.005 cm^{-1}resolution using the McMath Fourier transform spectrometer located at Kitt Peak National Observatory. To achieve a more stable fit for three of the 27 constants required in the second order model, 1206 intensities of the dyad (ν_2, ν_4) are refitted simultaneously with the hot band data. The fits to first and second order lead to rms values, respectively, of 21.5% and 5.0% for the 1727 hot band intensities and 6.5% and 3.0% for the 1206 dyad lines. The band strengths of all 10 pentad-dyad hot bands range from 0.93 for $2\nu_4$-ν_4 to 7.7×10^{-5} for the unobserved $2\nu_4$-ν_2 in units of cm^{-2}/atm at 296 K.

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