GLOBAL FREQUENCY AND INTENSITY ANALYSIS OF THE $\nu_{10}/\nu_7/\nu_4/\nu_{12}$ BANDS SYSTEM OF $^{12}$C$_2$H$_4$ at 10 $\mu$m USING THE $D_{2h}$ TOP DATA SYSTEM

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A global frequency and intensity analysis of the infrared tetrad located in the 600 – 1500 cm$^{-1}$ region was carried out using the tensorial formalism developed in Dijon for $X_2Y_4$ asymmetric-top molecules$^a$ and a program suite called $D_{2h}TDS$ (now part of the XTDS/SPVIEW spectroscopic software)$^b$. It relied on spectroscopic information available in the literature and retrieved from absorption spectra recorded in Brussels using a Bruker IFS 120 to 125 HR upgraded Fourier transform spectrometer, in the frame of either the present or previous work$^c$. In particular, 645 and 131 lines intensities have been respectively measured for the weak $\nu_{10}$ and $\nu_4$ bands. Including the Coriolis interactions affecting the upper vibrational levels 10$^1$, 7$^1$, 4$^1$ and 12$^1$, a total of 10737 line positions and 1870 line intensities have been assigned and fitted with global root mean square deviations of $2.6 \times 10^{-4}$ cm$^{-1}$ and 2.4 %, respectively. Relying on the results of the present work and available in the literature, a list of parameters for 65420 lines in the $\nu_{10}$, $\nu_7$, $\nu_4$ and $\nu_{12}$ bands of $^{12}$C$_2$H$_4$ was generated. The present work provides an obvious improvement over HITRAN and GEISA for the $\nu_{10}$ band (see figure), and a marginally better modeling for the $\nu_7$ band (and for the $\nu_4$ band hidden beneath it). To the best of our knowledge, this is the first time that a global intensity analysis is carried out in this range of the ethylene spectrum.