DETERMINATION OF THE $\nu_8$ BAND CENTER THROUGH THE FIRST HIGH-RESOLUTION ANALYSES OF THE $\nu_8$ and $\nu_8 + \nu_9$ SPECTRAL REGIONS OF $^{35}$ClONO$_2$

J.-M. FLAUD, J. ORPHAL, Laboratoire de Photophysique Moléculaire, C.N.R.S., Bât. 350, Université Paris-Sud, 91405 Orsay Cedex, France; W. J. LAFFERTY, Optical Technology Division, NIST, Gaithersburg, MD 20899, U.S.A; M. BIRK, and G. WAGNER, Institute for Opto-electronics, DLR, 82234 Oberpfaffenhofen, Germany.

A ro-vibrational analysis of the $C$-type $\nu_8$ fundamental band of $^{35}$ClONO$_2$ as well as the hot band, $\nu_8 + \nu_9 - \nu_9$, has been carried out using a Fourier-transform infrared spectrum of natural chlorine nitrate. This spectrum was recorded with a resolution of 0.00094 cm$^{-1}$ at a temperature of 190 K. Accurate upper state constants have been determined for both bands including the following band centers: $\nu_0(\nu_8) = 711.20763(9)$ and $\nu_0(\nu_8 + \nu_9 - \nu_9) = 714.9050(12)$ cm$^{-1}$. These constants have been used, together with a transition moment operator which takes into account the observed Herman-Wallis effect, to successfully model the experimental spectrum. Moreover the constants of the $^3$g$^1$ state have been used to model the $\nu_8 + \nu_9$ band, allowing us to assign nearly 100 Q-branch transitions and, therefore, to determine the band center of the $\nu_8 + \nu_9$ band, $\nu_0(\nu_8 + \nu_9) = 838.6269(15)$ cm$^{-1}$. Consequently we are able for the first time to obtain a precise band center of $\nu_9 : \nu_0(\nu_9) = 123.7219(20)$ cm$^{-1}$. Finally this establishes unambiguously that the band at 714.9 cm$^{-1}$ previously attributed to $\nu_5 + \nu_7 - \nu_9$ is actually the $\nu_8 + \nu_9 - \nu_9$ hot band.