NEW LINE INTENSITIES FOR THE FAR INFRARED BANDS OF THE TRANS- AND CIS-CONFORMER OF NITROUS ACID (HONO), NEW DETERMINATION OF THE TRANS-CIS CONFORMER BARRIER AND ITS IMPACT ON THE ASTROPHYSICAL DETECTION OF NITROUS ACID IN PROTOSTELLAR CLOUDS

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The first goal of this work is to improve the determination of the energy difference ($\Delta E_{Cis-Trans}$) between the ground vibrational state of the Cis- and Trans-HONO conformers of nitrous acid. For this, high resolution spectra were recorded in the 50-200 cm^{-1} spectral region at three different temperatures, 240, 270, and 296 K. The relative line intensities for the B-type transitions of pure rotational bands of Trans-HONO and Cis-HONO achieved from our measurements were combined in least squares fit computations to those measured previously by Sironneau *et al.*[1] In this way, we could improve significantly the accuracy on the HONO conformer energy difference, with a value for $\Delta E_{Cis-Trans}$ = 95.8 $\pm$ 9.2 cm^{-1} compared to $^{SIR}\Delta E_{Cis-Trans}$ = 99 $\pm$ 25 cm^{-1} in the previous study of Sironneau *et al.* The second goal is to generate a line list with absolute line intensities for the pure rotational bands in the far infrared region of Trans-HONO and Cis-HONO, with both A- and B-type transitions. This new line list proved to be more faithful for an improved detection of HONO in Astrophysical objects[2].

[1] Sironneau V, Flaud JM, Orphal J, Kleiner I, Chelin P. Absolute line intensities of HONO and DONO in the far-infrared and re-determination of the Energy Difference between the trans- and cis-species of nitrous acid. *J Mol Spectrosc* 2010;**259**:100-104

[2] Coutens A, Ligterink NFW, Loison JC, Wakelam V, Calcutt H, Drozdovskaya MN, Jørgensen JK, Müller HSP, Van Dishoeck EF, Wampfler SF. The ALMA-PILS survey: First detection of nitrous acid (HONO) in the interstellar medium. *Astronomy & Astrophysics* 2019;**623**:L13