

ISOLATED SMALL-AMPLITUDE FUNDAMENTALS EMBEDDED IN A PURE TORSIONAL BATH: FIR AND MW SPECTRA OF THE ν_{10} VIBRATIONAL MODE AND HOT TORSIONAL BANDS OF ACETALDEHYDE

V. ILYUSHIN, E. A. ALEKSEEV, OLGA DOROVSKAYA, *Radiospectrometry Department, Institute of Radio Astronomy of NASU, Kharkov, Ukraine*; MARIIA KALAMBET, *Quantum Radiophysics Department, V.N. Karazin Kharkiv National University, Kharkov, Ukraine*; L. MARGULÈS, R. A. MOTIYENKO, MANUEL GOUBET, *UMR 8523 - PhLAM - Physique des Lasers Atomes et Molécules, University of Lille, CNRS, F-59000 Lille, France*; OLIVIER PIRALI, *AILES beamline, Synchrotron SOLEIL, Saint Aubin, France*; SIGURD BAUERECKER, CHRISTOF MAUL, CHRISTIAN SYDOW, *Institut für Physikalische und Theoretische Chemie, Technische Universität Braunschweig, Braunschweig, Germany*; GEORG CH. MELLAU, *Physikalisch Chemisches Institut, Justus Liebig Universität Giessen, Giessen, Germany*; ISABELLE KLEINER, *Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA), CNRS et Universités Paris Est et Paris Diderot, Créteil, France*; JON T. HOUGEN, *Sensor Science Division, National Institute of Standards and Technology, Gaithersburg, MD, USA*.

We present^a the results of achieved progress in our analysis of the far-IR and microwave spectra of the ν_{10} vibrational state of acetaldehyde^b. The analysis of the $gs - \nu_{10}$ band near 509 cm^{-1} involves the energy levels that belong to the $v_t = 0, 1$ torsional states of ν_{10} vibrational mode as well as $v_t = 0, 1, 2, 3, 4$ torsional states of the ground vibrational state. The intervibrational interactions between ν_{10} vibrational state and torsional bath is taken explicitly into account with the help of a new program which was recently developed for fitting several isolated small-amplitude fundamentals embedded in a pure torsional bath in molecules with C_s frame and C_{3v} top. Obtained results provide significant progress in comparison with the previous fitting attempts for $gs - \nu_{10}$ band of acetaldehyde near 509 cm^{-1} . In the talk the details of the results with emphasis on the remaining fitting problems for the hot torsional bands^c of acetaldehyde will be discussed.

^aThis talk is dedicated to the memory of Dr. Jon T. Hougen (who recently passed away) in recognition of his essential contribution to this project.

^bThis work was done under support of the Volkswagen foundation. The assistance of STCU is acknowledged (partner project P686).

^cThe authors are indebted to Dr. A.R.W. McKellar for providing raw spectrum data on torsional bands of acetaldehyde from previous study.