ROVIBRATIONAL LOWEST BENDING MODE TRANSITIONS OF THE PROPYNYLIDYNE RADICAL

M. CARIS, T.F. GIESEN, H.S.P. MÜLLER, F. LEWEN, S. SCHLEMMER, *I. PHYSIKALISCHES INSTITUT, UNIVERSITY OF COLOGNE, ZÜLPICHER STR. 77, 50937 KÖLN, GERMANY*; C. DUAN, *COLLEGE OF PHYSICAL SCIENCE AND TECHNOLOGY, HUAZHONG NORMAL UNIVERSITY, WUHAN 430079, P.R. CHINA*; K.M.T. YAMADA, *AIST, TSUKUBA-WEST, 16-1 ONOGAWA, TSUKUBA, 305-8569 JAPAN*.

Precise measurements on rovibrational transitions of the $\nu_4(^2\Sigma^\mu)$ CCH bending mode of ($X^2\Pi$) C_3H have been performed using the Cologne Supersonic Jet Spectrometer for Terahertz Applications (SuJeSTA). The molecules were formed in a supersonic jet expansion when a gas mixture of C_2H_2 and CO diluted in He was introduced to an electrical discharge nozzle. Radiation of a backward wave oscillator (BWO) probes the molecular beam 40 mm downstream and spectra in the frequency range 360-600 GHz were recorded.
A strong Renner-Teller coupling effect shifts the $(^2\Sigma^\mu)$ component of the ν_4 bending mode towards lower energies and into the submillimeter region. Pure rotational transitions in the $^2\Pi_{1/2}$ and $^2\Pi_{3/2}$ ground state levels and in the v_4 = 1 $(^2\Sigma^\mu)$ excited vibration state were recorded, extending earlier data published by Yamamoto *et al.* [a] In addition, some rovibrational transitions between the ground state and the v_4 = 1 $(^2\Sigma^\mu)$ state have been identified. Thus the vibrational energy of the $\nu_4(^2\Sigma^\mu)$ state was determined precisely as 609977.1(42) MHz or 20.34664(14) cm^{-1}. Furthermore, the Coriolis coupling constant between the ground and $\nu_4(^2\Sigma^\mu)$ state has also been determined with greatly improved precision.

[a] S. Yamamoto, S. Saito, H. Suzuki, S. Deguchi, N. Kaifu, and S. Ishikawa, *Ap. J.* 348, 363-369 (1990)