THE ROTATIONAL SPECTRUM OF ACRYLONITRILE TO 1.67 THz

ZBIGNIEW KISIEL, LECH PSZCZÓŁKOWSKI, *Institute of Physics, Polish Academy of Sciences, Al. Lotników 32/46, 02-668 Warszawa, Poland*; BRIAN J. DROUIN, CAROLYN S. BRAUER, SHANSHAN YU, JOHN C. PEARSON, *Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, USA*.

Acrylonitrile (vinyl cyanide) is an astrophysical molecule of sufficient abundance for detection of its ^{13}C isotopologues.[a] In fact this molecule has been identified as one of the 'weed' species, that will contribute a plethora of lines in broadband submillimetre spectra from the new tools of radioastronomy, such as the Herschel Space Observatory or ALMA.

We presently report the first stage in extending the knowledge of the rotational spectrum of acrylonitrile well into the THz region. The spectrum was recorded with the jpl cascaded harmonic multiplication instrument[b] in the form of several broadband segments covering 390-540, 818-930, 967-1160, and 1576-1669 GHz. The analysis of the ground state spectrum has been extended up to $J = 128$, $K_a = 29$, and a combined data set of over 3000 fitted lines. It is found that transitions in all measurable vibrational states, inclusive of the ground state, show evidence of perturbations with other states. Several different perturbations between the ground state and $v_{11} = 1$ at 228 cm^{-1} were identified and have been successfully fitted, resulting in E_{11}=228.29994(3) cm^{-1}, to compare with a direct far-infrared value[c] of 228.83(18) cm^{-1}.

[a] H.S.P.Müller et al., *J. Mol. Spectrosc.*, **251**, 319-325 (2008).
[b] B.J.Drouin, F.W.Maiwald, J.C.Pearson, *Rev. Sci. Instrum.*, **76**, 093113-1-10 (2005).
[c] A.R.H.Cole, A.A.Green, *J. Mol. Spectrosc.*, **48**, 246-253 (1973).