SPECTROSCOPY OF HIGHLY EXCITED $HCNH^+$ USING INFRARED HETERODYNE VELOCITY MODULATION

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Protonated hydrogen cyanide, $HCNH^+$, is very abundant in ionized environments containing hydrogen, carbon, and nitrogen. Motivated by its important role in interstellar chemistry as the precursor for HCN and HNC, Altman *et al.* [a] studied its fundamental C-H and N-H vibrational bands in 1984. Their analysis led to the detection of $HCNH^+$ in interstellar space by Ziurys and Turner in 1985.[b] Subsequent laboratory work concentrated on the measurement of the remaining fundamental bands, the pure rotational spectrum, and several isotopomers to determine the ground state molecular structure.

We have revisited this cation using an automated color center laser and a new highly sensitive technique that combines infrared heterodyne detection with velocity modulation,[c] and recorded its high resolution spectrum in the C-H and N-H stretch regions (3000–3600 cm^{-1}). Highly excited $HCNH^+$ was produced in a water cooled discharge of CH_4, N_2, H_2, and He. In this talk we report our analysis of this very dense spectrum and discuss the chemistry and dynamics of $HCNH^+$ in our discharge with comparisons to HN_2^+ and HCN.

[a] R. S. Altman, M. W. Crofton, and T. Oka, *J. Chem. Phys*, **80**, 3911 (1984) and **81**, 4255 (1984).
[b] L. M. Ziurys and B. E. Turner, *Astrophys J.*, **302**, L31 (1986).
[c] See talk entitled "Infrared Laser Absorption Spectroscopy with Heterodyne Detection" .