OBSERVATION OF THE CH STRETCH BAND OF CH$_3^+$

E. T. WHITE, J. TANG, and T. OKA, Department of Chemistry, The University of Chicago, Chicago, IL 60637.

Ab initio calculations predict that protonated methane, CH$_3^+$, has three low energy structures that are practically equal in energy and that barriers separating their 120 equivalent minima are low$^a$. Thus CH$_3^+$ provides a new prototype of spectroscopic specimen in which the five equivalent protons are attached to the central carbon atom$^b$. We have observed, using our difference frequency spectrometer and the velocity modulation technique, a weak but rich spectrum of a carbocation containing one carbon. We believe they are transitions of CH$_3^+$ due to the formally forbidden CH stretch band based on their plasma chemical behavior and agreement with the conclusion of predissociation spectroscopy of CH$_4^{2+}$.$^c$. A preliminary observational result will be reported.