FREQUENCY COMB-REFERENCED MEASUREMENTS OF SELF- AND NITROGEN-PERTURBED LINE SHAPE PARAMETERS IN THE $\nu_1 + \nu_3$ BAND OF ACETYLENE

MATTHEW J. CICH, GARY V. LOPEZ, TREVOR J. SEARS[a], *Department of Chemistry, Stony Brook University, Stony Brook, New York 11794*; C. P. MCRAVEN, *Department of Chemistry, Brookhaven National Laboratory, Upton, New York 11973*; A. W. MANTZ, *Department of Physics, Astronomy, and Astrophysics, Connecticut College, New London, CT 06320*; and DANIEL HURTMANS, *Service de Chimie Quantique et de Photophysique(Atoms, Molecules et Atmospheres), Universite Libre de Bruxelles, Bruxelles, Belgium B-10050*.

Using an extended cavity diode laser locked to a single component of an Er-fiber-based femtosecond frequency comb, we have made precise measurements of absorption spectral line shapes in a temperature controlled cell. Varying pressures of acetylene and nitrogen were used to determine the N_2 pressure-dependent parameters for the P(11) line in the $\nu_1 + \nu_3$ combination band of acetylene at 195 739.649 513(8) GHz. The temperature dependence of the line shape was determined from measurements at several temperatures, varying from 296 K to 125 K. With the absolute frequency positions at each point on the frequency scale determined by the comb, each experimental data set has better than 10^{-4} fractional error. Parameters describing the line shape, such as pressure-dependent broadening, narrowing and shift coefficients, can be obtained with standard deviations less that 0.1%. The data have been used to test various line shape models beyond the standard Voigt approximation including those with narrowing parameters (Rautian and Galatry models) and those with speed-dependence (Speed-dependent Voigt and Speed-dependent Nelkin-Ghatak models). Fitting results will be presented and the relative performance of the models will be discussed.

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[a]also: *Department of Chemistry, Brookhaven National Laboratory, Upton, New York 11973*