Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Influence of Temperature and Hydration on Protein dynamics
J.H. ROH, University of Akron, USA, J.E. CURTIS, NIST, USA, S. AZZAM, Kent State University, USA, V.N. NOVIKOV, Russian Academy of Sciences, Russia, I. PERAL, Z. CHOWDHURI, V. GARCIA-SAKAI, NIST, USA, R.B. GREGORY, Kent State University, USA, A.P. SOKOLOV, University of Akron, USA — Protein dynamics and function are strongly influenced by temperature and hydration. Dynamic transition is believed to be closely related to onset of protein function since protein function activates at dynamic transition temperature, T_d. However, understanding of correlation between protein dynamics and function and of microscopic mechanism of the dynamics activated above T_d is sill a subject of discussion. We used neutron and light scattering measurements to study temperature and hydration dependence of protein-lysozyme dynamics in the frequency range from 100 MHz to 1 THz. Our detailed analyses of protein dynamics provide i) two onsets of anharmonicity: methyl group rotation that activates regardless of hydration at 100 K and slow relaxation process that appears only in wet proteins at 200 K, ii) slow relaxation process is the mode that activates dynamic transition and enzymatic activity, and iii) temperature dependence of slow relaxation process exhibits Arrhenius-like behavior at $T > T_d$.

J. H. Roh
University of Akron, USA

Date submitted: 03 Dec 2005 Electronic form version 1.4