

Center for Soft Matter and Biological Physics

Discussion Meeting

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**Probing Collective Motions of Proteins and Hydration Dynamics by a
Wide Range Dielectric Spectroscopy**

Friday, March 23, 2018

4:00 pm—5:00 pm

304 Robeson Hall

Studying dynamics of proteins in their biological milieu such as water is interesting because of their strong absorption in the terahertz range that contain information on their global and sub-global collective vibrational modes (conformational dynamics) and global dynamical correlations among solvent water molecules and proteins. In addition, water molecules dynamics within protein solvation layers play a major role in enzyme activity. However, due to the strong absorption of water in the gigahertz-to-terahertz frequencies, it is challenging to study properties of the solvent dynamics as well as conformational changes protein in water. In response, we have developed a highly sensitive megahertz-to-terahertz dielectric spectroscopy system to probe the hydration shells as well as large-scale dynamics of these biomolecules. . Thereby, we have deduced the conformation flexibility of proteins and compare the hydration dynamics around proteins to understand the effects of surface-mediated solvent dynamics, relationships among different measures of interfacial solvent dynamics, and protein-mediated solvent dynamics based on the complex dielectric response from 50 MHz up to 2 THz by using the system we developed. Comparing these assets of various proteins in different classes helps us shed light on the macromolecular dynamics in a biologically relevant water environment.