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Low Frequency Light Scattering Spectroscopy of Lysozyme in Solution ALFONS SCHULTE, Department of Physics, University of Central Florida, Orlando, FL 32186-2385, RONALD GEBHARDT, Physikdepartment E13, Technische Universitt Mnchen, D-85748 Garching, Germany, WALTER SCHIRMACHER, Physikdepartment E13, Technische Universitt Mnchen, D-85748 Garching, Germany
— Low-frequency Raman and Brillouin spectra provide a probe for dynamic coupling of protein motions to the solvent. We report on polarization resolved measurements of the light scattering spectrum of lysozyme in aqueous solution over the frequency range from 1 GHz to 20 THz and temperatures from 275 and 300 K. The dynamics extend over more than 3 decades and show temperature independent peaks at 1.5 THz for water and at 2 THz for the protein solution. The alpha-relaxation peaks are observed between 2 and 40 GHz, and these move to lower frequencies with decreasing temperature due to slowing down of structural relaxation. At frequencies below 2 GHz the protein solution shows an excess of quasielastic scattering as measured on both the Stokes and the Anti-Stokes side of the Rayleigh line. The excess intensity is discussed with respect to protein rotational motions and relaxations of the bound water. The apparent compressibility of the protein increases the frequency of the Brillouin line.

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