Abstract Submitted
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Relaxation dynamics of proteins MARTIN WOLF, RUDOLF GULICH, PETER LUNKENHEIMER, ALOIS LOIDL, University of Augsburg, Experimental Physics V — We provide broadband dielectric spectra on aqueous lysozyme solutions of various concentrations and analyze the three dispersion regions commonly found. The beta-dispersion, occurring in the frequency range around 10 MHz and the gamma-dispersion arising around 20 GHz can be attributed to the rotation of the polar protein molecules in the aqueous medium and the reorientational motion of the free water molecules, respectively. The nature of the third relaxation (delta-relaxation) around 100 MHz, which is often ascribed to the motion of protein-bound water molecules, is not yet fully understood and the hydration-shell dynamics of biomolecules is an ongoing field of research [1-3]. Additional insight can be gained by analyzing the subzero temperature spectra, where the beta- and gamma-dispersions, which partly superimpose the delta-relaxation for temperatures above 273 K, disappear due to the freezing of the bulk water. In contrast, the water molecules in the protein hydration shell are known to remain in the liquid state well below the freezing point. This allows to investigate the delta-relaxation in an extended temperature range and to shed new light on the hydration-shell dynamics of biomolecules.

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