

“Anomalous Absorption of Terahertz Radiation by Proteins in Water”

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Several recent studies have reported unexpected increases in the absorption of terahertz radiation by protein molecules in water. Earlier work at low frequencies established the existence of a layer of modified water between proteins and bulk water, having dielectric properties between that of water and protein and generally suggesting reduced absorption effects. With the development in the last decade of convenient laboratory sources, the dielectric properties of proteins in solution have been measured with THz radiation. Our group in particular conducted a systematic study of the simple globular protein myoglobin, and discovered that the absorption per protein molecule increases significantly at low concentrations in water, when there is sufficient water separating protein molecules. The mechanism for this increased absorption must involve a protein-water interaction creating a large dipole moment. Several proposed models will be discussed.