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Detection Enhancement of Protein Structural Vibrations: Measurements and Calculations KATHERINE NIESSEN, MENGYANG XU, SUNY at Buffalo, Physics, EDWARD SNELL, VIVIAN CODY, JAMES PACE, Hauptman-Woodward Medical Research Institute, Buffalo, NY, MARIUS SCHMIDT, University of Wisconsin, Physics, ANDREA MARKELZ, SUNY at Buffalo, Physics —
Narrow band intramolecular protein vibrations have been successfully measured using crystal anisotropy THz microscopy (CATM), a near-field technique, on protein crystals [1]. To address the question of how these motions are related to protein function we developed a variation of this technique to rapidly measure a variety of protein crystals. The variation anisotropy measurement consists of introducing a wire-grid polarizer in the THz path and rotating the polarizer between measurements, instead of the sample. While the resulting anisotropic spectra confirm reproducibility and protein specific nature of the response the signal is not directly related to the absorption spectra and in fact shows more structure than CATM. This is due to the polarization sensitivity of the electro-optical detection crystal and the changing THz polarization direction and amplitude at the detector [2]. This combination leads to an enhancement of specific resonances and increased sensitivity to rotation of the THz polarization from the sample itself. Preliminary calculations suggest that the technique is sensitive to the birefringence associated with anisotropic absorbance. The results and significance of these measurements on protein and sucrose crystals and the calculated expected response will be discussed. 1. Acbas, G., et al. (2014). Nat Commun 5. 2. Planken, P.C.M., et al. (2001). J. Opt. Soc. Am. B. 18(3).

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