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Intermediate State Dependence of Intramolecular Vibrations in Photoactive Yellow Protein YANTING DENG, MENGYANG XU, KATHERINE NIESSEN, SUNY Buffalo, Buffalo, NY, MARIUS SCHMIDT, University of Wisconsin, Milwaukee, WI, ANDREA MARKELZ, SUNY Buffalo, Buffalo, NY — Photoactive proteins provide a testbed for the role of long-range collective motions in protein function. Long-range intramolecular vibrations of the protein scaffold may provide efficient energy relaxation[1], enhancement of chromophore vibrations that promote structural transitions[2] and assistance in electron energy transfer[3]. Photoactive yellow protein (PYP) is a cytoplasmic photocycling protein associated with the negative phototactic response to blue light in halohodospira halophile. We measure the intramolecular vibrations of PYP using crystal anisotropy terahertz microscopy (CATM)[4] as a function of photoexcitation. Room temperature CATM measurements are performed in the dark and with continuous illumination at 488 nm, which is found to result in an approximately 20% steady photoexcited state (pB). We find a decrease in anisotropic absorption in frequency range 20-60 cm^{-1} with photoexcitation. This result may be due to an increase in sample disorder associated with the structural change in pB state. We compare the measured and calculated spectra using molecular dynamics and normal mode/quasiharmonic analysis to identify the nature of the motions giving rise to the resonant absorption bands. .1. Levantino, M., et al. Nat Commun, 2015. **6**. 2. Mataga, N., et al. Chem. Phys. Lett., 2002. **352**(3-4): p. 220-225. 3. Fokas, A.S., et al. Photosynth. Res., 2014. **122**(3): p. 275-292. 4. Acbas, G., et al. Nat Commun, 2014. **5**.

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