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Strong Field Control of Atomic and Molecular Dynamics: An Attosecond Resolved Study NIRANJAN SHIVARAM, HENRY TIMMERS, University of Arizona, XIAO-MIN TONG, University of Tsukuba, ARVINDER SANDHU, University of Arizona — Strong laser fields are routinely used in attosecond pump-probe studies of atomic and molecular phenomena. However, even a moderately strong field ($\sim 10^{12}$ W/cm^2) can significantly alter the electronic structure. By understanding and quantifying the effect of strong fields, one can obtain a high degree of control over the photo-absorption and photo-fragmentation processes. Here, we study the atomic and molecular response to the simultaneous presence of XUV attosecond pulse trains and strong IR fields. We describe an IR laser-dressed atom using Floquet picture. We observe quantum interference between XUV excitation paths to the Fourier components of a given Floquet state, which leads to oscillations in the ion-yield. By measuring the phase of the ion-yield oscillations, we extract the quantum phase difference between the Fourier components of that Floquet state. We obtain a quantitative understanding of how Floquet ionization channels change with intensity and what is the phase associated with each channel. We also extend our studies to molecular fragmentation processes. Our work represents real-time measurement and control of dynamics using strong-field modification of the atomic and molecular structure. This work was support by NSF grant PHY-0955274.

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