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Controlling the XUV Transparency of Helium using Two Pathway Quantum Interference CRAIG W. HOGLE, Colorado University - JILA, X.M. TONG, Tsukuba University, X. ZHOU, Colorado University - JILA, N. TOSHIMA, Tsukuba University, P. RANITOVIC, M.M. MURNANE, H.C. KAPTEYN, Colorado University - JILA — Atoms irradiated with combined femtosecond laser and extreme ultraviolet (XUV) fields will ionize through multiphoton processes, even when the energy of the XUV photon is below the ionization potential. However, in the presence of two different XUV photons and an intense laser field, it is possible to induce full electromagnetic transparency in helium. The laser field modifies the electronic structure of helium, while the presence of two different XUV photons (11^{th} and 13^{th} harmonics) leads to two distinct ionization pathways that can interfere destructively, totally suppressing the helium ionization yield. By fine-tuning the energies of the harmonic pair across the IR-modified 2p resonance in a time-resolved fashion, we show, both experimentally and theoretically, that the maximum interference occurs when the harmonics are energetically tuned into the 2p Floquet double slit created by the IR laser. The relative amplitudes of the harmonics are controlled by changing the laser intensity, and by different coatings of the XUV mirrors. This work demonstrates a new approach for coherent control in a regime of highly-excited states and strong optical fields.

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