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Control of photoemission delay in resonant two-photon transitions¹ L. ARGENTI, Univ. Central Florida, FL, USA; Univ. Autonoma de Madrid, ES, EU (UAM), A. JIMENEZ GALAN, Max Born Inst., Berlin, D, EU; UAM, R. TAIEB, J. CAILLAT, A. MAQUET, Sorbonne Univ.; UPMC Univ. Paris 6, FR, EU, F. MARTIN, UAM; IMDEA-Nanociencia, IFIMAC, Madrid, ES, EU — The emission time delay τ in one-photon absorption, which coincides with half the Wigner scattering delay τ_W , is a fundamental descriptor of the photoelectric effect. While it is hard to access τ in a direct way, it is possible to extrapolate it from the delay in two-photon transitions, $\tau^{(2)}$, measured with attosecond pump-probe schemes, provided that the contribution of the probe stage can be factored out. In absence of resonances, τ can be expressed as the energy derivative of the dipole ionization amplitude, $\tau = \partial_E \arg D_{Eq}$, and $\tau \simeq \tau^{(2)} - \tau_{cc}$ where τ_{cc} is associated to the dipole transition in the continuum. Here we show that in the presence of a resonance the correspondence between τ and $\partial_E \arg D_{Eq}$ is lost. Furthermore, while $\tau^{(2)}$ still coincides with $\partial_E \arg D_{Eq}^{(2)}$, it does not have any scattering counterpart. Indeed, $\tau^{(2)}$ can be much larger than the lifetime of an intermediate resonance in the two-photon process, or more negative than the lower bound imposed on scattering delays by causality. Finally, $\tau^{(2)}$ is controlled by the probe frequency. By varying ω_{IR} , therefore, it is possible to radically alter a photoelectron group delay.

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