Two-photon double-ionization of the H$_2$ molecule in light perpendicular to the internuclear axis: effects of pulse duration

XIAOXU GUAN, KLAUS BARTSCHAT, Drake University, BARRY SCHNEIDER, NIST, LARS KOESTERKE, TACC — Earlier [1–3], we solved the time-dependent Schrödinger equation to calculate the two-photon double ionization of the hydrogen molecule induced by non-sequential absorption of photons with a central energy of 30 eV in a short laser pulse lasting for about 1.6 femtoseconds. The linear polarization of the radiation was aligned with the internuclear axis. At the equilibrium distance $R_{eq}$, several doubly excited $^1\Sigma_{g,u}$ states, accessible through photon absorption, lie about 30 eV above the $X^1\Sigma_g$ ground state. These states are likely responsible for the significant disagreement seen in the literature for previous results on both angle-integrated and angle-differential cross sections. Here we continue to explore the fundamental role of doubly excited states on the two-photon break-up process, now for the even more difficult problem of laser polarization perpendicular to the internuclear axis. Such studies require relatively long laser pulses, thus making the calculations computationally very challenging.