

# MAPPING COMPLEX PHOTOCHEMICAL REACTIONS USING FEMTOSECOND UV-PUMP XUV-PROBE PHOTOELECTRON SPECTROSCOPY

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Time-resolved photoelectron spectroscopy has emerged as one of the premier tools to study the complex coupled motion of electrons and nuclei that underlies ultrafast photochemical processes. To study the entire reaction pathway from reactants through intermediates to products, however, requires sufficiently energetic photons to ionise all species involved. The advent of high-flux high-harmonic generation sources now puts this within reach, and we present here femtosecond photoelectron spectroscopy studies using UV-pump XUV-probe pulses. We used this approach to probe the dynamics of dissociating  $\text{CS}_2$  molecules across the entire reaction pathway upon excitation, Figure 1. Dissociation occurs either in the initially excited singlet manifold or, via intersystem crossing, in the triplet manifold. Both product channels are monitored and we show that, despite being more rapid, the singlet dissociation is the minor product and that triplet state products dominate the final yield. We will also show first results of our recent UV-pump XUV-probe studies of acetaldehyde photodissociation and aim to unravel the complex competing direct and roaming dissociation channels.

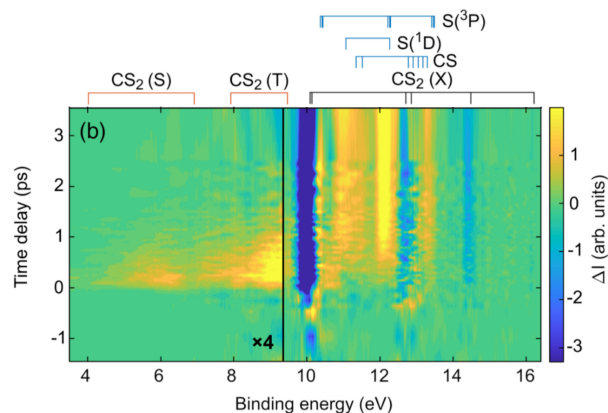


Figure 1: Time-resolved photoelectron spectroscopy of  $\text{CS}_2$  dissociation. XUV probe pulses allow us to map all intermediate and final states.