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Pulse energy and pulse duration dependence of multi-photon ionization and fragmentation of iodomethane by ultraintense hard X-rays.[1]
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Ionization and fragmentation dynamics of iodomethane molecules (CH3I) irradiated by ultraintense 8.3 keV X-ray pulses from the Linac Coherent Light Source has been studied as a function of pulse energy and pulse duration. As intuitively expected, the measured ion charge state distributions (CSD) are very sensitive to the pulse energy. On the contrary, when varying the pulse duration from 20 to 60 fs at a fixed pulse energy, we did not observe any systematic change of the CSD, indicating that in this regime ionization level is defined by the pulse fluence rather than the intensity. The measured ion kinetic energies for a given charge state, however, exhibit the opposite trend, depending on the pulse duration and being rather insensitive to the pulse energy. We discuss underlying electronic and nuclear dynamics resulting in these observations.

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