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Role of high-order dispersion on strong-field laser-molecule interactions[1] MARCOS DANTUS, MUATH NAIRAT, Michigan State University — Strong-field (10^{12}-10^{16} W/cm^2) laser-matter interactions are characterized by the extent of fragmentation and charge of the resulting ions as a function of peak intensity and pulse duration. Interactions are influenced by high-order dispersion, which is difficult to characterize and compress. Fourth-order dispersion (FOD) causes a time-symmetric pedestal, while third-order dispersion (TOD) causes a leading (negative) or following (positive) pedestal. Here, we report on strong-field interactions with pentane and toluene molecules, tracking the molecular ion and the doubly charged carbon ion C^{2+} yields as a function of TOD and FOD for otherwise transform-limited (TL) 35fs pulses. We find TL pulses enhance molecular ion yield and suppress C^{2+} yield, while FOD reverses this trend. Interestingly, the leading pedestal in negative TOD enhances C^{2+} yield compared to positive TOD. Pulse pedestals are of particular importance in strong-field science because target ionization or alignment can be induced well before the main pulse arrives. A pedestal following an intense laser pulse can cause sequential ionization or accelerate electrons causing cascaded ionization. Control of high-order dispersion allows us to provide strong-field measurements that can help address the mechanisms responsible for different product ions in the presence and absence of pedestals.

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