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Intense field ionization of methane, butane, and octane: transition from molecular to atomic response SASIKUMAR PALANIYAPPAN, ROBERT MITCHELL, ROBERT SAUER, BARRY WALKER, Department of physics and astronomy, University of Delaware — We report the ion yield measurements of C^{+n} atomic ionic fragments up to n<6 from strong/ultra strong laser field ionization of methane, butane, and octane at intensities from 10^{13} W/cm^2 to 10^{19} W/cm^{2}and try to identify the transition from a molecular response to an atomic response in terms of laser intensity when a molecule interacts with an intense laser. Measured carbon ion yields from C^{+2} to C^{+4} from CH_4, C_4H_{10}, and C_8H_{18} are almost identical. For C^{+2}, C^{+3} and C^{+4} from all these molecules, ADK results agree with the measured yields near saturation and below saturation the measured yields are higher than the ADK results. The C^{+4} ion curves for all these molecules exhibit a knee structure associated with a non sequential ionization or multiple molecular ionization mechanisms. In addition to the knee structure, ion yields of C^{+4} from all these molecules exceed the ion yields of C^{+2} and C^{+3} at $\sim 10^{14}$ W/cm^2. The C^{+4} ion yields from methane measured with both circularly and linearly polarized fields are almost identical, which rules out the recollision mechanism being the significant contribution to the knee structure. We will also present results on C^{+5} ion yields and compare these at 10^{19}W/cm^2 to the atomic response.

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