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Dependence of carbon fragments from methane in strong and ultrastrong elliptically polarized laser fields NAGITHA EKANAYAKE, BRUCE WEN, LAUREN HOWARD, SARAH WELLS, MICHAEL VIDETTO, CHRISTOPHER MANCUSO, TEODOR STANEV, ZACHARY CONDON, SARA LEMAR, ARIELLE CAMILO, ROBERT TOTH, MATTHEW DECAMP, BARRY WALKER, University of Delaware, Newark, Delaware 19716, USA — We present the ellipticity dependence of the ultrafast photoionization for C^{n+} fragments from methane. The study extends from the strong field (C^+, C^{2+}) at 10^{14} W/cm^2 to the ultrastrong field (C^{5+}) at 10^{18} W/cm^2. The measurements show that C^+ and C^{2+} ionization have limited sensitivity to the field polarization. As the laser intensity and corresponding degree of ionization increase (C^{4+}, C^{5+}), the dependence on the field polarization increases. Comparison to a semi-classical field ionization model shows that the ellipticity dependence of the relative ion yield for higher charge states comes from the field dependence of tunnelling ionization rather than nonsequential ionization due to rescattering. A movement from a molecule-like response to an atom-like response with the increase in intensity is observed. This work is supported by the Army Research Office under award no W911NF-09-1-0390 and the National Science Foundation under award no 0757953.

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