

Abstract Submitted  
for the DAMOP17 Meeting of  
The American Physical Society

**Ionization and fragmentation of methane with intense mid-infrared fields** YU HANG LAI, JUNLIANG XU, KAIKAI ZHANG, XIAOWEI GONG, KENT TALBERT, PIERRE AGOSTINI, COSMIN BLAGA, LOUIS DIMAURO, The Ohio State University, THE OHIO STATE UNIVERSITY TEAM — We investigated the ionization and fragmentation rate of methane ( $\text{CH}_4$ ) at several wavelengths between 3 and 4  $\mu\text{m}$ . We found that the amount of fragmenting ions relative to the intact molecular ions exhibit a pronounced wavelength dependence and is peaked at around 3.3 to 3.6  $\mu\text{m}$ . In contrast, the feature is absent in the same measurements with deuterated methane ( $\text{CD}_4$ ). The results suggested that the resonance of C-H bond stretching mode is playing a significant role in the dissociation processes. Moreover, by comparing the total ion yields of  $\text{CH}_4$  with that of  $\text{CD}_4$ , we found that the overall ionization rate of  $\text{CH}_4$  is also enhanced at around 3.3 to 3.6  $\mu\text{m}$ . This result has important implications in understanding tunnel ionization in the presence of vibrational resonance.

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Date submitted: 25 Jan 2017

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