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A new type of wavelength dependence in strong-field ionization DMITRI ROMANOV, Dept. of Physics, Center for Advanced Photonics Research, Temple University, KATHARINE MOORE, RYAN COMPTON, ROBERT J. LEVIS, Dept. of Chemistry, Center for Advanced Photonics Research, Temple University — It is commonly assumed that in mid-IR region the strong-field ionization approaches quasistatic limit (tunneling, or ADK regime) and ceases to depend on the laser wavelength. Contrary to this notion, ionization yields for the noble gas Xe at intensities from 10^{13}-10^{15} W cm^{-2} for wavelengths spanning from 800 to 1500nm reveal strong and counterintuitive wavelength dependence. There is an increasing ionization probability in the strong field regime as the excitation wavelength increases from 800nm to 1500 nm at fixed field intensity. The measured thresholds for the ionization event scale approximately as λ^{-2}. We developed a simple quantitative model that extends through-the-barrier tunneling with single photon ionization from a Rydberg intermediate state and captures the observed wavelength dependence. This wavelength dependence will be reduced to some degree if the ionization occurs in a strong DC electric field that is capable to independently ionize the Rydberg states. The wavelength dependence of ionization rate in the quasitstatic regime is of considerable importance for ascertaining the correct physics for various strong field processes.

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