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Complex Resonance-mediated Ionization Dynamics Driven by Intense Femtosecond XFEL Pulses in Xenon and Krypton Atoms[1] PHAY HO, ELLIOT KANTER, LINDA YOUNG, Argonne National Lab — We present the calculated multiphoton ionization dynamics of Xe and Kr atoms initiated by SASE XFEL pulses and predict the behavior of these atoms in the newly available seeded XFEL pulses with narrow bandwidth for a range of photon fluences and x-ray photon energies. Understanding of the ionization dynamics is central to realize potential applications of these pulses. The method is based on our recently developed Monte-Carlo rate equation (MCRE) approach [1], which for the first time successfully demonstrates the role of "hidden resonances" [2] and captures the responsible resonance-enhanced x-ray multiple ionization (REXMI) pathways that lead to unexpectedly high charge states in Ar, Kr and Xe. The MCRE approach efficiently accounts for photoionization, Auger decay and fluorescence processes and bound-to-bound transitions. We found that the intricate landscape of resonances hidden in various charge states leads to unusual pulse parameter dependences in ion yields revealed in both Xe and Kr atoms. The importance of these individual resonances is selectively magnified or suppressed by the pulse fluence, in addition to the atomic excitation energies covered by the XFEL photon energy and bandwidth.

[1] P. J. Ho *et al.* Phys. Rev. Lett **113**, 253001 (2014).
[2] E. P. Kanter *et al.* Phys. Rev. Lett **107**, 233001 (2012).

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