

# Theoretical studies on narrow-band hard-x-ray lasing

Chunhai Lyu,\* Stefano M. Cavaletto, Christoph H. Keitel, and Zoltán Harman  
*Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany*

(Dated: December 4, 2018)

Since the advent of x-ray free-electron lasers (XFELs), considerable efforts have been devoted to achieve x-ray pulses with better temporal coherence. Here, we put forward a scheme to generate fully coherent x-ray lasers (XRLs) based on population inversion in highly charged ions, created by fast inner-shell photoionization using XFEL pulses in a laser-produced plasma. Numerical simulations show that one can obtain high-intensity, femtosecond x-ray pulses of relative bandwidths  $\Delta\omega/\omega = 10^{-5} - 10^{-7}$  by orders of magnitude narrower than in XFEL pulses for discrete wavelengths down to the sub-ångström regime.

Contact: chunhai.lyu@mpi-hd.mpg.de