

# Catching and controlling electrons in action with fully coherent FEL

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We demonstrate both experimentally and theoretically that we can study and manipulate femto-to-attosecond electronic processes using the longitudinal coherence of multi-color extreme-ultraviolet pulses available at FERMI. Following the first demonstration of coherent control of electron emission directions based on the interference between two ionization pathways, one-photon ionization by the second harmonic and two-photon ionization by the first harmonic [1], we have demonstrated that one-photon laser enabled Auger decay of the Ne 2s hole state can be coherently controlled [2], opening a new pathway to coherent control of attosecond charge migration. We also propose another novel scheme of coherent control, which utilizes the full coherence of FERMI FEL [3], and discuss extraction of attosecond photoionization time delay. The work has been carried out with a large-scale international collaboration. I am grateful to all the collaborators.

## References

- [1] K. C. Prince et al., *Nat. Photon.*, **10**, 176 (2016).
- [2] D. Iablonskyi et al, in preparation.
- [3] K. L. Ishikawa et al, in preparation.