Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Probing high-energy final-state lifetimes with attosecond angle-resolved photoelectron spectroscopy[1] ZHENSHENG TAO, CONG CHEN, WENJING YOU, ADRA CARR, PIOTR MATYBA, JILA, University of Colorado, Boulder, TIBOR SZILVSI, MANOS MAVRIKAKIS, Department of Chemical and Biological Engineering, University of Wisconsin-Madison, MARK KELLER, National Institute of Standards and Technology (NIST), PETER OPPENEER, Department of Physics and Astronomy, Uppsala University, HENRY KAPTEYN, MARGARET MURNANE, JILA, University of Colorado, Boulder, KAPTEYN-MURNANE GROUP AT JILA TEAM, WISCONSIN TEAM, UPPUSALA COLLABORATION, NIST COLLABORATION — Photoelectron spectroscopy is one of the most important methods for extracting information about the material band structure. Final-state effects can complicate the interpretation of photoelectron data and these effects are challenging to address both experimentally and theoretically. In this work, we show that the attosecond pulse trains generated by high harmonic generation process in combination with interferometric time- and angle-resolve photoelectron spectroscopy enables a powerful tool (atto-ARPES) to directly access the final-state lifetimes in the time domain. Through our experiments on transition metals Cu(111) and Ni(111), we find the energy- and angle-dependent lifetime carries essential information about the bulk final states, which can serve as a sensitive probe for the final-state effects in solid-state photoemission.

[1]We gratefully acknowledge support from the NSF and a Gordon and Betty Moore Foundation EPiQS Award

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Date submitted: 02 Nov 2016 Electronic form version 1.4