Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

High harmonic generation based time resolved ARPES at 30 eV with 50 meV energy resolution TIMM ROHWER, EDBERT J. SIE, FAHAD MAHMOOD, NUH GEDIK, MIT — Angle-resolved photoelectron spectroscopy (ARPES) has emerged as a leading technique in identifying equilibrium properties of complex electronic systems as well as their correlated dynamics. By using femtosecond high harmonic generation (HHG) pulses, this technique can be extended to monitor ultrafast changes in the electronic structure in response to an optical excitation [1]. However, the broad bandwidth of the HHG pulses has been a major experimental limitation. In this contribution, we combine the HHG source with an off-axis Czerny-Turner XUV monochromator and a three-dimensional "ARTOF" photoelectron detector to achieve an unrivaled overall energy resolution of 50 meV in multiple harmonic energies. Moreover, the use of a stack of different gratings enables us to fine control both the photon energy and time vs. energy resolution to its particular needs. The performance of our setup is demonstrated by studies on the transition metal dichalcogenide $IrTe_2$ which undergoes a first-order structural transition and accompanied reconstruction of the band structure upon cooling without the characteristic opening of an energy gap [2]. [1] T. Rohwer et al., Nature 471 (2011) 490, [2] A. F. Fang et.al., Scientific Reports 3 (2013) 1153

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Date submitted: 06 Nov 2015 Electronic form version 1.4