Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Resonant inelastic x-ray scattering as a band structure probe of high-temperature superconductors[1] MARTON KANASZ-NAGY, Harvard University, YIFEI SHI, ISRAEL KLICH, University of Virginia, EUGENE DEMLER, Harvard University — I will analyze recent resonant inelastic x-ray scattering (RIXS) experimental data on $YBa_2Cu_3O_{6+x}$ [Minola et al., Phys. Rev. Lett. **114**, 217003 (2015)] within quasi-particle theory. This measurement has been performed with the incoming photon energy detuned at several values from the resonance maximum, and, surprisingly, the data shows much weaker dependence on detuning than expected from recent measurements on a different cuprate superconductor, $Bi_2Sr_2CuO_{6+x}$ [Guarise et al., Nat. Commun. **5**, 5760 (2014)]. I will demonstrate, that this discrepancy, originally attributed to collective magnetic excitations, can be understood in terms of the differences between the band structures of these materials. We found good agreement between theory and experiment over a large range of dopings [M. Kanasz-Nagy et al., arXiv:1508.06639]. Moreover, I will demonstrate that the RIXS signal depends sensitively on excitations at energies well above the Fermi surface, that are inaccessible to traditionally used band structure probes, such as angle-resolved photoemission spectroscopy. This makes RIXS a powerful probe of band structure, not suffering from surface preparation problems and small sample sizes, making it potentially applicable to a wide range of materials.

[1]The work of M. K.-N. was supported by the Harvard-MIT CUA, NSF Grant No. DMR-1308435, AFOSR Quantum Simulation MURI, the ARO-MURI on Atomtronics, and ARO MURI Quism program.

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Date submitted: 06 Nov 2015 Electronic form version 1.4