Abstract Submitted
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Resonant mapping of image states on metal surfaces using tunable femtosecond light[1] KEVIN KNOX, MEHMET YILMAZ, NADER ZAKI, JERRY DADAP, RICHARD OSGOOD, Columbia University, PETER JOHNSON, Brookhaven National Laboratory — We report resonant band mapping using angle-resolved two-photon photoemission measurements of image states on Cu(111) surfaces using a tunable ultrafast femtosecond optical parametric amplifier source. An optical parametrically amplified visible beam is frequency doubled to obtain a tunable fs UV source with photon energies in the 3.6 to 5 eV range. Unoccupied image states are populated by resonant excitation from the occupied sp-like surface state of Cu(111). The image state electrons are then probed by absorption of a second photon of the same energy. Since the surface and image states have different effective masses, resonant excitation occurs at different parallel momenta for each photon energy. By tuning the photon energy we are able to resonantly map both the surface and image state spectra. Our fs laser provides high signal to noise ratio and ultrafast time resolution and the resonant mapping scheme allows for precise measurement of the dispersion and reference planes (the dispersion minimum) of the occupied and excited bands.

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