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Microscopic theory of resonant soft x-ray scattering DAVID BENJAMIN, DMITRY ABANIN, Harvard University Physics Department, PETER ABBAMONTE, University of Illinois Department of Physics, EUGENE DEMLER, Harvard University Physics Department — We have developed a microscopic theory of resonant soft x-ray scattering (RSXS) that accounts for the delocalized character of valence electrons as well as excitonic and orthogonality catastrophe effects due to the core hole. We have derived a convenient and intuitive exact formula for RSXS intensities. Applying our formalism to the underdoped cuprates, we find that dynamic nesting in the band structure provides the most natural explanation for the two peaks observed in RSXS spectra. Our results give evidence for the existence of reasonably well-defined quasiparticles as far as 1.5 eV above the Fermi level in underdoped cuprates, and establish RSXS as a bulk-sensitive probe of electron quasiparticles.

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