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A two gap preformed pair model for the underdoped cuprates: application to scanning tunneling and electronic Raman spectroscopies DANIEL WULIN, CHIH-CHUN CHIEN, HAO GUO, James Frank Institute and Department of Physics, University of Chicago, DIRK MORR, Department of Physics, University of Illinois at Chicago, KATHY LEVIN, James Frank Institute and Department of Physics, University of Chicago — The controversy over whether the pseudogap arises from precursor superconductivity or from another elusive order parameter has been intensified with the discovery of the so-called two gap behavior. This two gap physics is associated with different responses and inferred spectral gaps in the nodal and anti-nodal regions as observed in angle resolved photoemission (ARPES), scanning tunneling microscopy and related quasi-particle interference (QPI) patterns and in electronic Raman scattering. We have previously shown that two gap behavior in ARPES is compatible with a pre-formed pair picture based on BCS-BEC crossover. Here we address recent STM experiments at the level of QPI and using a gap inversion procedure introduced by the Princeton group. We also consider Raman experiments in a related formalism. The two gap physics results from the presence of both condensed and non-condensed pairs associated with a stronger than BCS attraction, and associated small coherence length. Our results, which compare a variety of different inferred gaps as a function of temperature for the most part compare favorably with existing experiments and make predictions for future experimental studies.

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