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## Fermi pockets and the pseudogap in underdoped $Bi_2Sr_2CaCu_2O_8^1$

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The Fermi surface topologies of underdoped samples of the high  $T_c$  superconductor  $Bi_2Sr_2CaCu_2O_8$  have been measured with angle resolved photoemission. By examining thermally excited states above the Fermi level, we show that the observed Fermi surfaces in the pseudogap phase are actually components of enclosed hole-pockets. The spectral weight of these pockets is vanishingly small at the magnetic zone boundary, creating the illusion of Fermi "arc". The area of the pockets as measured in this study is consistent with the doping level, and hence carrier density, of the samples measured. Furthermore, the shape and area of the pockets is well reproduced by phenomenological models of the pseudogap phase as a spin liquid. The demonstration that the pseudogap in the anti-nodal region is a gap symmetric about the chemical potential is a clear indication that singlet pairing takes place in the normal state.

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