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Magnetic excitations in the superconducting and pseudogap states of the slightly underdoped high-temperature superconductor $\text{HgBa}_2\text{CuO}_{4+\delta}$ MUN CHAN, Los Alamos National Laboratory, C .J. DOROW, Y. TANG, M. J. VEIT, Y. GE, M. GREVEN, University of Minnesota, L. MANGINTHRO, Y. SIDIS, P. BOURGES, Laboratoire Léon Brillouin, France, X. ZHAO, Jilin University, China, D. L. ABERNATHY, Oak Ridge National Laboratory — We present an inelastic neutron scattering study of the dynamic magnetic susceptibility for slightly underdoped cuprate high-temperature superconductor $\text{HgBa}_2\text{CuO}_{4+\delta}$ (Hg1201, $p=0.117$, $T_c = 88$ K). Unlike more underdoped Hg1201, the magnetic spectrum exhibits an X - shaped hourglass dispersion with an incommensurate low energy response and a clear resonance mode in the superconducting state. At temperatures above T_c , the low energy incommensurate excitations disappear, replaced by a commensurate Y-shaped spectrum characteristic of the pseudogap state. The magnetic excitations become weaker with increasing temperature and are no longer discernable above the pseudogap temperature T^* . The temperature evolution of the magnetic spectrum across T_c is consistent with models based on excitations of itinerant spins with a d-wave superconducting order parameter. Our work suggests that itinerant carriers should play an integral part for the understanding of the pseudogap state as well.

Mun Chan
Los Alamos National Laboratory

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