Abstract Submitted
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Antiferromagnetic fluctuations and the pseudogap in the moderately underdoped high-temperature superconductor $HgBa_2CuO_{4+\delta}$[1] MUN CHAN, C. DOROW, M. VEIT, Y. TANG, Y. GE, M. GREVEN, Univ of Minn - Minneapolis, L. MANGIN-THRO, Y. SIDIS, P. BOURGES, Laboratoire Léon Brillouin, France, X. ZHAO, Jilin Univ., China, P. STEFFENS, Institut Laue Langevin, France, A. CHRISTIANSON, D.L. ABERNATHY, Oak Ridge National Laboratory, TN, J.T. PARK, Forschungsneutronenquelle Heinz Maier-Leibnitz, Germany — The two most salient features of the magnetic excitation spectrum of the cuprate superconductors are the hourglass dispersion and the resonance mode. Our neutron scattering measurements demonstrate that both features are either absent or significantly weakened in moderately underdoped $HgBa_2CuO_{4+\delta}$ (Hg1201; $T_c \approx 71$ K; $p \approx 0.09$). The magnetic spectrum is gapped below 27 meV, and is commensurate with the antiferromagnetic wave-vector above the gap. Above 60 meV, it disperses upward into a ring of scattering. This Y-shaped spectrum is reminiscent of that observed in the pseudogap of $YBa_2Cu_3O_{6+y}$ (YBCO). Unlike YBCO, the antiferromagnetic fluctuations of Hg1201 are rather impervious to the onset of superconductivity at T_c. Instead, a large peak in the susceptibility at about 53 meV onsets at the much higher pseudogap temperature T*. The dramatic increase of magnetic scattering below T* reveals a strong connection between magnetism and the pseudogap. The results for this structurally simple compound present a challenge for theoretical explanations that have focused largely on the hourglass dispersion and the resonance.

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