Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Antiferromagnetic fluctuations in the very underdoped high-temperature superconductor $HgBa_2CuO_{4+\delta}$[1] M. VEIT, M.K. CHAN, C. DOROW, T. YANG, G. YANG, M. GREVEN, Univ of Minn - Minneapolis, L. MANGIN-THRO, Y. SIDIS, P. BOURGES, Laboratoire Léon Brillouin, France, X. ZHAO, Jillin Univ, China, P. STEFFENS, Institut Laue Langevin, France, A. CHRISTIANSON, D.L. ABERNATHY, Oak Ridge National Laboratory, J.T. PARK, Forschungsneutronenquelle Heinz Maier-Leibnitz — We report inelastic neutron scattering measurements of magnetic fluctuations over a large energy and momentum range in the high-temperature cuprate superconductor $HgBa_2CuO_{4+\delta}$ (Hg1201) at two low doping levels (UD45: $T_c \approx 45$K, $p \approx 0.058$; UD55: $T_c \approx 55$K, $p \approx 0.063$). In both samples, the "hourglass" dispersion, thought to be universal among the cuprates, is not observed. Instead, the antiferromagnetic spectrum is commensurate just above the magnetic gap ($\sim$10 meV in both samples) and disperses outwards into a ring of scattering above $\sim$50 meV. The magnetic resonance is prominently observed in UD45 (at $\sim$20meV), but is small or non-existent in higher-doped UD55. This result runs counter to the heretofore accepted notion that the resonance is most prominent in the compounds with the highest optimal T_c. Additionally, we find that the previously reported Ising-like dispersionless excitations in optimal and moderately underdoped Hg1201 is no longer observed in UD45. We conclude that there exists a crossover near $p \sim 0.06$ between two distinct regimes.

[1]Work supported by DOE-BES.

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Date submitted: 15 Nov 2013 Electronic form version 1.4