

MAR08-2007-006561

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Observation of a Sharp Magnetic Transition at the Pseudogap Temperature in $\text{YBa}_2\text{Cu}_3\text{O}_{6.6}$

HERB MOOK, Oak Ridge National Laboratory

Polarized neutron diffraction has been used to demonstrate magnetic order in a crystal of $\text{YBa}_2\text{Cu}_3\text{O}_{6.6}$ that displays an exceptionally sharp superconducting transition. Earlier experiments showed a gradual increase of intensity of magnetically scattered neutrons from underdoped $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$ crystals for reflections that do not break translational symmetry. The present experiment confirms this but displays a much sharper transition demonstrating that the width of the magnetic transition depends on the quality of the superconducting transition. This relationship is strengthened by the fact that other magnetic properties sensitive to the superconductivity, such the resonance and excitation spectra are also exceptionally well defined when measured with the same sample. The magnetic order is observed at the temperature of the pseudogap transition and the close relationship between the quality of the magnetic properties and the superconductivity suggests that the pseudogap is directly connected to the magnetic order.