

Abstract Submitted  
for the MAR06 Meeting of  
The American Physical Society

**The optical and acoustic magnetic excitations in optimum-doped superconductor  $YBa_2Cu_3O_{6.95}$  ( $T_c = 93K$ )**<sup>1</sup> HYUNGJE WOO, The University of Tennessee, PENGCHENG DAI, The University of Tennessee / ORNL, STEPHEN HAYDEN, University of Bristol UK, HERB MOOK, ORNL, TOBY PERRING, ISIS Facility, Rutherford Appleton Laboratory UK, THOMAS DAHM, Institut für Theoretische Physik Germany, DOUGLAS SCALAPINO, UCSB, FATIH DOGAN, University of Missouri-Rolla — We use high-resolution inelastic neutron scattering to map out the full spin excitations spectra in  $YBa_2Cu_3O_{6.95}$  ( $T_c = 93K$ ), probably the most studied high-transition temperature superconductor. In the bi-layer materials where there are two magnetic ions per unit cell, magnetic excitations have two distinct symmetries: odd (or acoustic) and even (or optical) channels. We show that magnetic excitations in the acoustic channel of  $YBa_2Cu_3O_{6.95}$  are remarkably similar to that of  $YBa_2Cu_3O_{6.6}$  [1] and  $La_{1.88}Ba_{0.12}CuO_4$  [2]. That is, they have the universal hour-glass shape with incommensurate spin fluctuations below the commensurate resonance. In the optical channel, we discovered incommensurate magnetic excitations in superconducting state. We establish the both the acoustic and optical magnetic excitations spectra of  $YBa_2Cu_3O_{6.95}$  in absolute units and compare the results with underdoped  $YBa_2Cu_3O_{6.6}$  and single layer families of cuprate superconductors. [1] S. M. Hayden et al. Nature 429, 531 (2004); [2] J. M. Tranquada et al. Nature 429, 534 (2004).

<sup>1</sup>Grants: NSF-DMR0453804 and DOE DE-FG02-05ER46202

Hyungje Woo  
The University of Tennessee

Date submitted: 19 Jan 2006

Electronic form version 1.4