



## A comparison between the spin fluctuation spectra of underdoped and optimally doped $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ (poster)

Christensen, N.B.; McMorrow, D.F.; Lake, B.; Rønnow, H.M.; Hayden, S.M.; Aeppli, G.; Perring, T.G.; Tagaki, H.

*Published in:*  
Superconductivity and magnetism: Materials properties and developments. Extended abstracts

*Publication date:*  
2003

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Christensen, N. B., McMorrow, D. F., Lake, B., Rønnow, H. M., Hayden, S. M., Aeppli, G., Perring, T. G., & Tagaki, H. (2003). A comparison between the spin fluctuation spectra of underdoped and optimally doped  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  (poster). In N. H. Andersen, N. Bay, J-C. Grivel, P. Hedegård, D. McMorrow, S. Mørup, L. T. Kuhn,<sup>2</sup>A. Larsen, B. Lebech, K. Lefmann, P-E. Lindelof, S. Linderoth, & N. F. Pedersen (Eds.), *Superconductivity and magnetism: Materials properties and developments. Extended abstracts* Risø National Laboratory.

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

## A COMPARISON BETWEEN THE SPIN FLUCTUATION SPECTRA OF UNDERDOPED AND OPTIMALLY DOPED $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$

*N. B. Christensen and D. F. McMorrow (Materials Research Department, Risø National Laboratory, Denmark), B. Lake (Clarendon Laboratory, University of Oxford, UK), H. M. Rønnow (CEA Grenoble, France), S. M. Hayden (H. H. Wills Physics Laboratory, University of Bristol, UK), G. Aeppli (NEC Research Institute, New Jersey, USA), T. G. Perring (ISIS Facility, Rutherford Appleton Laboratory, UK), H. Tagaki (Institute of Solid State Physics, University of Tokyo, Japan)*

Time-of-flight neutron spectrometry has been used to study the spin excitation spectra of under doped ( $x = 0.10$ ) and optimally doped ( $x = 0.163$ )  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  (LSCO) over the full Brillouin zone at energies up to 40 meV, while retaining good resolution in both energy and wave vector. Each sample is studied in both normal and superconducting states. Our analysis allows us to obtain and compare “global views” of  $\chi''(q, \omega)$ , the imaginary part of the dynamic susceptibility, at the two doping levels. While the overall intensity distributions and absolute magnitudes of  $\chi''(q, \omega)$  are similar, there are important differences in the spectral weight redistribution upon entering the superconducting state.

When compared with results on  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ , (YBCO) our data reveals striking similarities in  $\chi''(q, \omega)$  for these two families of superconductors. These results challenge the commonly held view that the spin excitations of LSCO systems should be thought of in terms of stripe fluctuations<sup>1-2</sup> while those of YBCO can be most easily understood as arising from Fermi surface nesting.<sup>3</sup>

We discuss our results in the light of recent theories within the stripe<sup>4</sup> and Fermi surface nesting<sup>5</sup> schools of thought.

### REFERENCES

1. J. M. Tranquada et al, Nature **375**, 561 (1995)
2. J. Zaanen and O. Gunnarsson, Phys. Rev. B **40**, 7391 (1989)
3. Q. Si et al, Phys. Rev. B **47**, 9055 (1993)
4. C. D. Batista, G. Ortiz and A. V. Balatsky, Phys. Rev. B **64**, 172508 (2001)
5. M. R. Norman, Phys. Rev. B **61**, 14751 (2000)