

Iulian Hetel

Department of Physics
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Expertise

Experimental Condensed Matter Physics: pulsed laser deposition (PLD), low-temperature electronic measurements, atomic force microscopy (AFM), scanning electron microscopy (SEM), thermal treatments, thermal evaporation, ion-milling, wet etching, e-beam lithography, photolithography

Education

Ph.D. Physics, The Ohio State University, Columbus, Ohio, USA Fall 2007
Thesis: Quantum Superconductor-to-Nonsuperconductor Transition in 2D Films
Adviser: Thomas R. Lemberger

M.S. Physics, Universite de Sherbrooke, Sherbrooke, Quebec, Canada 2002
Thesis: Coexistence of Magnetism and Superconductivity in Electron-Doped Superconductors
Advisers: Patrick Fournier and Mario Poirier

Maitrise de Physique et Applications (B.S. equivalent) 2000
Universite Joseph Fourier, Grenoble, France
Thesis: Characterization of superconductors under pressure by AC susceptibility measurements
Adviser: Manuel Nunez-Regueiro (CRTBT- CNRS)

Awards and Honors

- Presidential Fellowship, Graduate School, The Ohio State University, 2006-2007 (the highest recognition for outstanding accomplishments and potential of students in graduate programs)
- Young Investigator Award, The International Conference on Strongly Correlated Electron Systems (SCES07), Spring 2007
- I2CAM Junior Travel Award, Institute for Complex Adaptive Matter, Winter 2007
- Grant-in-Aid of Research, The Ohio State Chapter of Sigma Xi (The Scientific Research Society), Fall 2006
- Ray Travel Award for Scholarship and Service, The Ohio State University, Fall 2006
- Alumni Grant for Graduate Research and Scholarship, The Ohio State University, Spring 2006
- Agence Universitaire de la Francophonie Fellowship, 1999-2000 (five fellowships in physics awarded to applicants from French-speaking countries worldwide)

Research Experience

Research Associate 2002-present
Lemberger Superconductivity Group, Department of Physics, The Ohio State University

- grew epitaxial oxide thin films (cuprates, molybdates, manganites) using pulsed laser deposition (PLD) on atomically flat substrates
- characterized films with atomic force microscopy (AFM) and scanning electron microscopy (SEM)
- measured the temperature dependence of superfluid density in $La_{2-y}Sr_yCuO_4$ films and in severely underdoped ultrathin $Y_{1-x}Ca_xBa_2Cu_3O_{7-\delta}$ films
- observed linear scaling of T_C with $n_S(0)$ in ultrathin $Y_{1-x}Ca_xBa_2Cu_3O_{7-\delta}$ films as a result of quantum fluctuations near a 2D quantum critical point

- Laboratory Supervisor** 2006-2007
Assistant to the Laboratory Supervisor 2004-2006
 Materials Preparation Facilities, Department of Physics, The Ohio State University
- trained, certified, and assisted faculty and students with metal thermal evaporation, ion-milling, wet etching, e-beam lithography, photolithography, AFM, SEM, and SQUID magnetometry
 - involved in projects including micro- and nano-fabrication, thin film multilayer deposition, magnetic storage, DNA imaging, diamond detectors, optical lattices, free-standing metal films
 - performed equipment maintenance

- Research Assistant** 2000-2002
 Centre de recherche sur les propriétés électroniques des matériaux avancés
 Université de Sherbrooke, Sherbrooke, Québec, Canada
- determined the annealing conditions for oxygenation and oxygen reduction in electron-doped superconductors
 - characterized samples using X-ray diffraction, microwave conductivity, ultrasonic interferometry, low-temperature electronic and heat transport measurements
 - discovered new signatures of antiferromagnetic order coexisting with the superconducting state in resistivity and ultrasonic velocity measurements in $Sm_{1.85}Ce_{0.15}CuO_{4-\delta}$

- Intern** January - April 2000
 Centre de Recherches sur les Très Basses Températures, Grenoble, France
- designed and constructed a new experiment to measure magnetic susceptibility at pressures up to 25 GPa

Publications

- I. Hetel**, T. R. Lemberger, M. Randeria, *Quantum Critical Behaviour in the Superfluid Density of Strongly Underdoped Ultrathin Cuprate Films*, accepted for publication, Nature Physics (2007)
- T. R. Lemberger, **I. Hetel**, J. W. Knepper, and F. Y. Yang, *Penetration depth study of very thin superconducting Nb films*, accepted for publication, Phys. Rev. B (2007)
- I. Hetel**, T. R. Lemberger, A. Tsukada, M. Naito, *Doping dependent superfluid density in $La_{2-x}Sr_xCuO_4$ thin films*, in preparation
- Y. L. Zuev, **I. Hetel**, T. R. Lemberger, *Search for Cooper-pair Fluctuations in Severely Underdoped YBCO Films*, Phys. Rev. B 74, 012502 (2006)
- R. Prozorov, D. D. Lawrie, **I. Hetel**, P. Fournier, and R. W. Giannetta, *Field-dependent diamagnetic transition in magnetic superconductor $Sm_{1.85}Ce_{0.15}CuO_{4-\delta}$* , Phys. Rev. Lett. 93, 147001 (2004).
- P. Richard, G. Riou, **I. Hetel**, S. Jandl, M. Poirier and P. Fournier, *Role of oxygen nonstoichiometry and the reduction process on the local structure of $Nd_{2-x}Ce_xCuO_{4\pm\delta}$* , Phys. Rev. B 70, 064513 (2004).
- P. Fournier, M.-E. Gosselin, S. Savard, **I. Hetel**, P. Richard and G. Riou, *Fourfold oscillations and irreversibility of the magnetoresistance in the nonmetallic regime of electron-doped cuprates*, Phys. Rev. B 69, 220501(R) (2004).

Talks and Posters

Superfluid density measurements in underdoped 2D $Y_{1-x}Ca_xBa_2Cu_3O_{7-\delta}$ films. The International Conference on Strongly Correlated Electron Systems (SCES07), Houston, USA. May 13-18, 2007 (poster)

Superfluid density measurements in underdoped 2D $Y_{1-x}Ca_xBa_2Cu_3O_{7-\delta}$ films. The I2CAM/FAPERJ/CIAR Spring School on New Phenomena in Highly Correlated Quantum Matter, Rio de Janeiro, Brazil. March 11-18, 2007 (poster)

Quantum superconductor-to-insulator transition in 2D $Y_{1-x}Ca_xBa_2Cu_3O_{7-\delta}$ films. American Physical Society March Meeting, Denver, USA. March 2007. (Abstract X9.00002)

Spin freezing in $Sm_{1.85}Ce_{0.15}CuO_{4-y}$. American Physical Society March Meeting, Los Angeles, USA. March 2005. (Abstract X12.00016, contributed talk)

Low temperature antiferromagnetic order in $Sm_{2-x}Ce_xCuO_4$. The Edward F. Hayes Graduate Research Forum, The Ohio State University, Columbus, USA. April 2003. (poster)

Coexistence of Magnetism and Superconductivity in $Sm_{2-x}Ce_xCuO_4$ Electron-doped Superconductor. M.S. defense/Physics Colloquium, Universite de Sherbrooke, Sherbrooke, Canada. July 31, 2001.

Magnetism and superconductivity in $Sm_{1.85}Ce_{0.15}CuO_{4-y}$. Canadian Institute for Advanced Research (CIAR) Superconductivity Meeting, Toronto, Canada. May 4-6, 2002. (poster)

Experimental study of electron-doped high temperature superconductors. Intelligent Materials and Systems Institute (IMSI) Colloquium, Universite de Sherbrooke, Sherbrooke, Canada. October 2001. (poster)

Teaching Experience

- Graduate Teaching Assistant, Department of Physics, The Ohio State University, 2003-2004
- Laboratory Teaching Assistant, Department of Physics, Universite de Sherbrooke, 2001-2002

Academic Service

- Graduate Student Representative, University Research Committee, Council on Research and Graduate Studies, The Ohio State University, Fall 2006 - present
- Elected Delegate, Council of Graduate Students, The Ohio State University, Fall 2006 - present
- Graduate Student Representative, Graduate Studies Committee, Department of Physics, The Ohio State University, 2004-2006

Additional Skills

- Computer Skills: VisualBasic, LabVIEW, Latex, SigmaPlot, Mathematica, Microsoft Office
- Languages: English (fluent), French (fluent), Romanian (native), Italian (conversational)

References

Dr. Thomas R. Lemberger (Ph.D. Adviser)

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Dr. Mohit Randeria (collaborator)

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Dr. Patrick Fournier (M.S. Adviser)

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Dr. Mario Poirier (M.S. Adviser)

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