



E-MRS 2007 Spring Meeting  
Strasbourg, France - May 28<sup>th</sup> to June 1<sup>st</sup>, 2007

## SYMPOSIUM N

**Solid state approaches to quantum information processing and communication**

Symposium Organizers:

**Olivier GUILLOT-NOEL**, CNRS - ENSCP, Paris, France

**Jean-Louis LE GOUET**, Laboratoire Aimé Cotton, CNRS,  
Orsay, France

**D. SUTER**, Universität Dortmund, Germany

**D A WILLIAMS**, Hitachi Cambridge Laboratory, U.K

Symposium Partners:

**Hitachi Cambridge Laboratory**



## Monday, May 28, 2007

13:25

### Welcome to symposium N

#### Session 1 : Quantum information with rare earth doped crystals, Chair: Dieter Suter

- N-1 1 14:00 **A Quantum Memory for Photons based on Controlled Reversible Inhomogeneous Broadening in Rare-Earth-Ion-doped Solids**  
M. Afzelius, S. Hastings-Simon, M. U. Staudt, B. Lauritzen, Jiri Minár, W. Tittel\*, C. Simon, N. Sangouard, H. De Riedmatten, and N. Gisin Group of Applied Physics, University of Geneva, rue de l'Ecole de Medecine 20, CH-1211 Geneva 4, Switzerland \*Institute for Quantum Information Science University of Calgary 2500 University Drive NW Calgary, Alberta, Canada T2N 1N4
- N-1 2 14:40 **Optical coherent driving of spin waves in Tm:YAG**  
A. Louchet, Y. Le Du, F. Bretenaker, T. Chaneliere, F. Goldfarb, I. Lorgere, J.-L. Le Gouet Laboratoire Aime Cotton
- N-1 3 15:05 **Optically controlled quantum NMR gates in rare-earth doped crystals**  
Ivan Lorgere Laboratoire Aimé Cotton Pérola Milman Laboratoire Matériaux et Phénomènes Quantiques Yann Ledu Laboratoire Aime cotton Olivier Guillot-Noël Laboratoire de Chimie de la Matière Condensée de Paris Philippe Goldner Laboratoire de Chimie de la Matière Condensée de Paris
- 15:30 Coffee break**
- N-1 4 15:50 **Going from ensemble to single instance quantum computing in rare-earth-ion-doped crystals**  
A. Walther, A. Amari, B. Julsgaard, S. Kröll and L. Rippe Lund Institute of Technology, Box 118, S-221 00 Lund, Sweden
- N-1 5 16:30 **Predicting Rare Earth Hyperfine Structures for Quantum Information Applications**  
Ph. Goldner, O. Guillot-Noël, Y. Le Du, F. Beaudoux, E. Antic-Fidancev Laboratoire de Chimie de la Matière Condensée de Paris CNRS UMR 7574, ENSCP 11, rue Pierre et Marie Curie, Paris, F-75005 France A. Louchet, I. Lorgere, F. Bretenaker, F. Goldfarb, T. Chanelière, J.L. Le Gouët Laboratoire Aimé Cotton CNRS UPR 3321 Bât. 505 Campus d'Orsay 91405 Orsay cedex, France

## Tuesday, May 29, 2007

#### Session 2: Preparation, Dynamics and read-out of qubits, Chair: D. Williams

- N-2 1 08:30 **Electrical readout of spin information in silicon-based quantum computers**  
K. Lips (1), C. Boehme (1, 2), A. Stegner (3), H. Huebel (3), M. Stutzmann (3), M. Brandt (3) (1)Hahn Meitner Institut Berlin, Germany (2)University of Utah, Salt Lake City, USA (3)Technische Universität München, Germany
- N-2 2 09:10 **Time-resolved population dynamics of shallow donor transitions in silicon**  
N. Q. Vinh, B. Redlich, A. F. G. van der Meer FOM Institute for Plasma Physics "Rijnhuizen", P.O. Box 1207, NL-3430 BE Nieuwegein, The Netherlands D. J. Paul, J. Freeman and S. A. Lynch University of Cambridge, Cavendish Laboratory, Madingley Road, Cambridge, CB3 0HE, U.K. C. R. Pidgeon Heriot-Watt University, Department of Physics, Riccarton, Edinburgh, EH14 4AS, U.K. L. Nikzad, B. N. Murdin Advanced Technology Institute, University of Surrey, Guildford, GU2 7XH, U.K.
- N-2 3 09:35 **Quantum confinement and role of dimension in silicon nanostructures doped with P: a parameter-free calculation of Stark effect.**  
A. Debernardi and M. Fanciulli, MDM National Laboratory, CNR-INFM, via C. Olivetti 2, 20041 Agrate Brianza (MI) Italy
- 10:00 Coffee break**
- N-2 4 10:20 **Spin-based Quantum Information Processing in Diamond**  
Fedor Jelezko 3rd Physical Institute, University of Stuttgart, Germany
- N-2 5 11:00 **Quantum Description of Nuclear Spin Cooling in a Quantum Dot**  
H. Christ, J. I. Cirac, and G. Giedke Max-Planck-Institut fuer Quantenoptik, Hans-Kopfermann-Str. 1, D-85748 Garching, Germany
- N-2 6 11:25 **Towards the optical read-out of carbon-based qubits for solid state quantum computing**  
G. Dantelle (1), A. Tiwari (1), A.A.R. Watt (1), J.J.L. Morton (1), K. Porfyrakis (1), A. Ardavan (2), G.A.D. Briggs (1) (1) University of Oxford - Department of Materials, QIP IRC - Parks Road - Oxford, OX1 3PH - UK (2) University of Oxford - Department of Physics - Clarendon Laboratory - Parks Road - Oxford, OX1 3PU - UK
- N-2 7 11:50 **Towards the Detection of Single Polychlorotriphenylmethyl Radical Derivatives**  
V. Mugnaini, 1 M. Fabrizioli, 2 I. Ratera, 1 M. Mannini, 2 A. Caneschi, 2 D. Gatteschi, 2 Y. Manassen, 3 and J. Veciana, 1 1 Institut de Ciencia de Materials de Barcelona-CSIC, Campus UAB, 08193, Bellaterra, Spain 2 Department of Chemistry and INSTM Research Unit, University of Florence, 50019, Sesto Fiorentino, Italy 3 Department of Physics, Ben Gurion University of the Negev, P.O.B 653 Beer Sheva 84105, Israel
- 12:15 Lunch Break**

#### Session 3: Entanglement, Chair: J. L. Le Gouët

- N-3 1 14:00 **Quantum optics with electron-spin ensembles in semiconductor nanodevices**  
Caspar van der Wal, University of Groningen, the Netherlands
- N-3 2 14:40 **Progress in N@C60 quantum computing**  
W. Harnheit, B. Naydenov, K. Huebener, R. S. Schoenfeld, S. Schaefer, J. Hauschild, M. Scheloske [all] Freie Universitaet Berlin, Institut fuer Experimentalphysik, Arnimallee 14, 14195 Berlin, Germany
- 15:20 Coffee Break**
- N-3 3 15:40 **Atomistic Calculation of Quantum Entanglement in Self-Assembled Quantum Dots**  
Gabriel Bester, Lixin He and Alex Zunger National Renewable Energy Laboratory

## Symposium N

- N-3 4 16:05 **Generation of Entanglement in a Quantum Wire and Application to Single-Electron Transmittivity**  
Y. Omar (1), A. Costa Jr. (2), S. Bose (3), F. Ciccarello (4), M. Palma (5), M. Zarccone (4), V. Vieira (6) (1) SQIG-IT and CEMAPRE-ISEG, Technical University of Lisbon, P-1200-781 Lisbon, Portugal (2) Departamento de Ciências Exatas, Universidade Federal de Lavras, 37200 Lavras, Brazil (3) Department of Physics and Astronomy, University College London, London WC1E 6BT, United Kingdom (4) Dipartimento di Fisica e Tecnologie Relative dell'Università degli Studi di Palermo, I-90128 Palermo, Italy (5) NEST and Dipartimento di Scienze Fisiche ed Astronomiche dell'Università degli Studi di Palermo, I-90123 Palermo, Italy (6) CFIF and Department of Physics, Instituto Superior Técnico, P-1049-001 Lisbon, Portugal

### Session 4: Poster Session, Chairs: J. Le Gouët, O. Guillot-Noël

16:30 - 18:30

- N/P 1 **Theory of soliton-based control of coupled superconducting flux qubits**  
Shigemasa Matsuo, Kanoko Furuta, Toshiyuki Fujii, and Noriyuki Hatakenaka
- N/P 2 **Current noise of quantum dot p-i-n junctions**  
Yueh-Nan Chen Department of Physics and National Center for Theoretical Sciences, National Cheng-Kung University, Taiwan
- N/P 3 **Deep Cr acceptor levels in CdTe:Cr magnetic semiconductor**  
M. Bester (a), G. Luka (a), I. Stefaniuk (a), I. S. Virt (a,b), V. D. Popovych (b), M. Kuzma (a) (a) Institute of Physics, Rzeszow University, Rejtana 16a, 35-310 Rzeszow, Poland (b) Section of Experimental Physics, Drogozbych State Pedagogical University, I. Franko st. 24, Drogozbych 82100, Ukraine
- N/P 4 **Spontaneous decay of quantum dot excitons into surface plasmons in a quantum cylindrical wire**  
Yueh-Nan Chen(1) and Guang-Yin Chen(2) (1).Center for Theoretical Sciences, No.1, University Road, Tainan City 701, Taiwan (2).Institute of Physics, National Chiao Tung University, Hsinchu 30010, Taiwan
- N/P 5 **From spectral hole-burning spectroscopy to coherent effects in Er:YSO crystal**  
E. Baldit, S. Briaudeau, P. Monnier, K. Bencheikh Laboratoire de Photonique et de Nanostructures CNRS-UPRO20, Route de Nozay, F-91460 Marcoussis, France. V. Crozatier, I. Lorgeté Laboratoire Aimé Cotton CNRS-UPR3321, Campus d'Orsay, Bât. 505, F-91405 Orsay Cedex, France. O. Guillot-Noël, P. Goldner Laboratoire de Chimie de la Matière Condensée de Paris, CNRS-UMR7574, ENSCP, 11 rue Pierre et Marie Curie, F-75231 Paris Cedex 05, France.
- N/P 6 **Room temperature Fe-induced ferromagnetic order across the Fe/(GaMn)As(001) interface**  
F. MACCHEROZZI, G. PANACCIONE, G. ROSSI, TASC infm-cnr, Trieste, Italy M. HOCHSTRASSER, Laboratorium für Festkörperphysik, Zurich C. BACK, W. WEGHSCHIEDER, G. WOLTERSODRF, M. SPERL), M. REINWALD, Institut für Experimentelle Physik, Regensburg, German
- N/P 7 **Investigation of nonuniform state transfer processes in spin nanocluster chains in crystals**  
A.I.Polyakov, M.I.Bitenbayev. Institute of Physics and Technology.
- N/P 8 **Investigation of coherent radiation phenomenon by nanostructured spin systems**  
A.I.Polyakov, M.I.Bitenbayev. Institut of Physics and Technology, Kazakhstan
- N/P 9 **Hyperfine interaction of the electron triplet state with the proton spin system in pentacene**  
M. Labuz<sup>1</sup>, A. Wal<sup>1</sup>, I. Stefaniuk<sup>1</sup>, W. Obermayr<sup>2</sup>, M. Kuzma<sup>1</sup>, <sup>1</sup> Institute of Physics, University of Rzeszow, Rejtana 16a, 35-310 Rzeszow, Poland <sup>2</sup> Institute for Electronic Engineering FH Joanneum, Werk VI Strasse 46, 8605 Kapfenberg, Austria
- N/P 10 **Nano-scale analysis of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> films surface' stoichiometry and morphology**  
M. Branescua, M. Kellyb and I. Wardc aNational Institute for Physics of Materials, P.O. Box MG-7, Bucharest, Romania bStanford University, Stanford, CA 94305, USA cCEA 810 Kifer Road, Sunnyvale, CA 94086, USA
- N/P 11 **Three Level Systems for Quantum Memories in Erbium Doped Materials**  
Sara Hastings-Simon, Matthias Staudt, Bjoern Lauritzen, Jiri Minar, Mikael Afzelius, Hugues de Riedmatten, Nicolas Sangouard, Christoph Simon, Wolfgang Tittel, Nicolas Gisin. University of Geneva

## Wednesday, May 30, 2007

### EMRS PLENARY SESSION

08:30

12:30 Lunch

14:00

### Round Table: Prospects and Issues in Solid State Approaches to Quantum Information Processing and Communication

Chair: M. Stoneham Cochair: F. Jelezko, M. Afzelius, D. Suter

19:00

### E-MRS RECEPTION PALAIS DES CONGRES