

The 3rd RIEC International Workshop on Spintronics
Solid-State Quantum Information Technology
-Spin, Photon, and Superconductivity-

October 31st – November 1st, 2007

Laboratory for Nanoelectronics and Spintronics,
Research Institute of Electrical Communication (RIEC),
Tohoku University, Sendai, Japan

Sponsors

Research Institute of Electrical Communication (RIEC),
Tohoku University

Center of Education and Research for Information Electronics Systems (CERIES),
Tohoku University

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The 3rd RIEC International Workshop on Spintronics
Solid-State Quantum Information Technology
-Spin, Photon and Superconductivity-

Invited Speakers

Markus Ansmann, *University of California, Santa Barbara*
Yasuhiko Arakawa, *University of Tokyo*
David D. Awschalom, *University of California, Santa Barbara*
Oliver Benson, *Humboldt University, Berlin*
David Gershoni, *Israel Institute of Technology*
Hideo Kosaka, *Tohoku University*
Daniel Loss, *University of Basel*
Tristan Meunier, *Delft University of Technology*
Yuzo Ohno, *Tohoku University*
Shigeo Sato, *Tohoku University*
Seigo Tarucha, *University of Tokyo*
Jaw-Shen Tsai, *NEC, Tsukuba*
Alexey V. Ustinov, *Friedrich-Alexander University Erlangen-Nuremberg*
Go Yusa, *Tohoku University*

Committee

Keiichi Edamatsu (*Chair of the workshop and "Photons and quantum dots" session*)
Koji Nakajima (*Chair of "Superconducting quantum bits" session*)
Hideo Ohno (*Chair of "Semiconductor spintronics" session*)
Hideo Kosaka
Shigeo Sato
Yuzo Ohno

Program

October 31st (Wednesday)

9:00 Opening

Session 1: Semiconductor spintronics (1)

Chair: Hideo Ohno

9:15-10:00 Manipulating single electron spins and coherence in semiconductors

[S1-1] David D. Awschalom (University of California, Santa Barbara)

10:00-10:35 Control and optical detection of nuclear spin coherence in GaAs quantum well

[S1-2] Yuzo Ohno, Y. Kondo, M. Ono, S. Matsuzaka, K. Morita, H. Sanada, H. Ohno
(Tohoku University)

10:35-10:50 Coffee break

Chair: David Awschalom

10:50-11:25 Relaxation and coherent manipulation in spin qubits

[S1-3] Tristan Meunier, F.H.L. Koppens, I.T. Vink, K.C. Nowack, H.P. Tranitz, W.
Wegscheider, L.P. Kouwenhoven, L.M.K. Vandersypen (Delft University of
Technology)

11:25-12:00 Coherent transfer of light polarization to electron spins in a semiconductor –toward
[S1-4] quantum media conversion–

Hideo Kosaka, H. Shigyou, Y. Mitsumori, Y. Rikitake, H. Imamura, T. Kutsuwa, K.
Edamatsu (Tohoku University)

12:00-13:30 Lunch

Session 2: Photons and quantum dots

Chair: Keiichi Edamatsu

13:30-14:15 Advances in quantum dots for quantum information technologies

[S2-1] Yasuhiko Arakawa (University of Tokyo)

14:15-15:00 Semiconductor Quantum Dots as Entangled Light Sources

[S2-2] David Gershoni (Israel Institute of Technology)

15:00-15:15 Coffee break

Chair: David Gershoni

15:15-16:00 Single photons on demand: New light for quantum information processing

[S2-3] M. Scholz, G. Steudle, Oliver Benson (Humboldt University, Berlin)

Poster Session

Chair: Hideo Kosaka

16:00-17:30 Posters at the lobby

Reception

18:00-20:00 Reception at Sendai Kokusai Hotel

November 1st (Thursday)

Session 3: Superconducting quantum bits

Chair: Koji Nakajima

- 9:00-9:45 Toward scalable superconducting quantum bits
[S3-1] Jaw-Shen Tsai, A.O. Niskanen, K. Harrabi, F. Yoshihara, Y. Nakamura, S. Lloyd, O. Astafiev, K. Inomata, T. Yamamoto, Yu.A. Pashkin (NEC, Tsukuba)
- 9:45-10:30 Temperature dependence of coherent oscillations in a Josephson junction
[S3-2] Alexey V. Ustinov (Friedrich-Alexander University Erlangen-Nuremberg)
- 10:30-10:45 Coffee break

Chair: Jaw-Shen Tsai

- 10:45-11:20 Recent advances in Josephson phase qubits: memory, gates, and Bell violation
[S3-3] Markus Ansmann, R. Bialczak, N. Katz, E. Lucero, R. McDermott, M. Neeley, A.D. O'Connell, M. Steffen, E. Weig, A. Cleland, J.M. Martinis (University of California, Santa Barbara)
- 11:20-11:55 Study on the quantum property of Bi2212 intrinsic Josephson junctions
[S3-4] Shigeo Sato, K. Inomata, N. Kitabatake, M. Kinjo, H.B. Wang, T. Hatano, K. Nakajima (Tohoku University)

11:55-13:30 Lunch

Session 4: Semiconductor spintronics (2)

Chair: Yuzo Ohno

- 13:30-14:15 Nuclear spins in quantum dots and interacting 2DEGs
[S4-1] Daniel Loss (University of Basel)
- 14:15-15:00 Electrical control of electronic spin and nuclear spin in quantum dots
[S4-2] Seigo Tarucha (University of Tokyo)
- 15:00-15:15 Coffee break

Chair: Daniel Loss

- 15:15-15:50 Electrically controlled quantum coherences of nuclear spins in GaAs point contacts
[S4-3] Go Yusa, K. Muraki, Y. Hirayama (Tohoku University)
- 15:50-16:25 Spatially resolved Kerr microscopy in GaAs with various doping concentration
[S4-4] Shunichiro Matsuzaka, Y. Ohno, H. Ohno (Tohoku University)
- 16:25 Closing

Posters

- P-1 Optically detected nuclear quadrupole resonance in a GaAs quantum well
Masaaki Ono, Y. Kondo, S. Matsuzaka, K. Morita, H. Sanada, Y. Ohno, H. Ohno (Tohoku University)
- P-2 Study on multi-photon activation and universal switching of Bi-2212 intrinsic Josephson junctions
Nobuhiro Kitabatake, K. Inomata, S. Sato, M. Kinjo, H. Wang, T. Hatano, K. Nakajima (Tohoku University)
- P-3 Probability of finding solutions in neuromorphic adiabatic quantum computation algorithm
Aiko Ono, S. Sato, M. Kinjo, K. Nakajima (Tohoku University)
- P-4 Photon echoes from InGaAlAs/GaAlAs semiconductor quantum dot
Yasuyoshi Mitsumori, H. Kosaka, K. Edamatsu, K. Akahane, N. Yamamoto, M. Sasaki, N. Ohtani (Tohoku University)
- P-5 A number countable electron trap in a quantum dot with nearly-zero g-factor for photon-spin quantum media conversion
Takeshi Kutsuwa, M. Kuwahara, T. Konno, K. Ono, Y. Mitsumori, H. Kosaka, K. Edamatsu (Tohoku University)
- P-6 Single photon responses in a quantum dot for quantum media conversion from a photon to an electron spin
Makoto Kuwahara, T. Kutsuwa, T. Konno, K. Ohno, Y. Mitsumori, H. Kosaka, K. Edamatsu (Tohoku University)
- P-7 Measurement of optical cross-Kerr nonlinearity induced by a few photons in a photonic crystal fiber
Nobuyuki Matsuda, R. Shimizu, Y. Mitsumori, H. Kosaka, K. Edamatsu (Tohoku University)
- P-8 Electron spin tomography using optical responses of quantum dots for photon-spin quantum state transfer
Yoshiaki Rikitake, H. Imamura, H. Kosaka (National Institute of Advanced Industrial Science and Technology)