



11th Advanced Heterostructure Workshop
December 5-10, 2004
Hapuna Beach Prince Hotel
Kohala Coast, Big Island of Hawai'i

Program

Important Notice for Presenters

- **The time schedule is tentative and depends on the chair persons. Therefore, presenters are asked to prepare for the presentation well ahead of the scheduled time, preferably before the start of the workshop.**
- For presentation an overhead projector (OHP) and a digital LCD projector are available. Presenters with PowerPoint presentations are requested to bring their own notebook and connect to the LCD projector.
- Speakers for 30 minutes presentations are asked to leave more than 10 minutes for discussion.
- Speakers for 15 minutes presentations are allowed to use OHP sheets or PowerPoint pages less than 5.
- Introduction, outline and title sheets must not be used. 5 minutes should be reserved for discussion.

Sunday, December 5

15:00 - 18:00 **Registration**

18:00 - 20:30 **Gala Reception**

Monday, December 6

08:55 – 09:00 Opening Remarks

Session 1 Quantum dots and wells I

Chairman Klaus Ploog

09:00 - 09:30 Richard Nötzel, *Twan van Lippen, and Joachim H. Wolter*,
COBRA Inter-University Research Institute, Eindhoven University of Technology, Eindhoven
Self-organized quantum dot molecules

09:30 - 10:00 T. Fukui, *P. Mohan, and J. Motohisa*,
Graduate School of Information Science and Technology, Hokkaido University, Sapporo
Fabrication of InAs Kagome lattice structure by selective area MOVPE

10:00 - 10:15 S. Nomura, *M. Yamaguchi, D. Sato, T. Akazaki, H. Tamura*,
H. Takayanagi, T. Saku, Y. Hirayama, and Y. Aoyagi
Institute of Physics, University of Tsukuba, Tsukuba
Optical investigation of the electrons in gated quantum wells and quantum-dot arrays

10:15 - 10:30 T. Nakayama and *H. Ishii*,
Department of Physics, Chiba University, Chiba
Quantum electron transport in flat-band Kagome-lattice chains

10:30 - 10:45 *Kenji Miyakoshi, Hiroyuki Tamura, and Hideaki Takayanagi*,
NTT Basic Research Laboratories, NTT Corporation, Atsugi
Hofstadter's fractal band diagram in the Kagome quantum-dot-lattice

10:45 - 11:15 **Coffee**

Session 2 Quantum dots and wells II

Chairman Elias Muñoz

11:15 - 11:30 *Klaus von Klitzing*,
Max-Planck-Institut für Festkörperforschung, Stuttgart
Microwave Induced Zero-Resistance State

11:30 - 11:45 Eva M. Weig, *Robert H. Blick, Jörg P. Kotthaus*,
Department für Physik & Center for NanoScience (CeNS),
Ludwig-Maximilians-Universität, München
Effects of phonon quantum confinement in freely suspended quantum dots

11:45 - 12:00 *M. Yamaguchi, H. Takayanagi, S. Nomura, T. Akazaki and H. Tamura*
NTT Basic Research Laboratories, NTT Corporation, Atsugi
Control and Detection of Electron and Hole States in Double-Gated Quantum Wells

12:00 - 12:30 G. S. Solomon and *Z. Xie*,
Department of Electrical Engineering, Stanford University
Single InAs quantum dot microcavities

12:30 - 12:45 G. Landwehr, *G. Sek, A. Loeffler, J.P. Reithmaier, C. Hofmann, S. Kuhn,*
S. Reitzenstein, L. Keldysh, V. Kulakovskii, T.L. Reinecke, and A. Forchel
Physikalisches Institut, Experimentelle Physik III, Universität Würzburg
Quantum dots in high quality microcavities

12:45 - 13:00 *F. Kuchar, R. Brunner, R. Meisels,*
University of Leoben
Backscattering in open quantum dots

13:00 - 20:00 **Adhoc Session**

Session 3 GaN-based devices

Chairman Takashi Fukui

20:00 - 20:30 *Siddharth Rajan, Arpan Chakraborty, Christiane Poblenz, Patrick Waltereit,*
Umesh K. Mishra, James S. Speck,
University of California, Santa Barbara

Progress in the Development of all MBE GaN-Based HEMTs

20:30 - 20:45 *Hideki Hasegawa, Junji Kotani and Tamotsu Hashizume,*
Research Center for Integrated Quantum Electronics, Hokkaido University, Sapporo
Mechanism of Gate Leakage and Current Collapse in AlGaN/GaN HFETs

20:45 - 21:00 *C. Rivera, J. L. Pau, J. Pereiro and E. Muñoz,*
ISOM, Univ. Politecnica de Madrid

Photoresponse of III-nitrides detectors in the $\lambda > 360$ nm and $\lambda < 200$ nm regions

21:00 - 21:15 *K. Tsubaki, N. Maeda, T. Saitoh, N. Kobayashi,*

Department of Electrical and Electronic Engineering, Toyo University, Toyo

Magnetoresistance and Magnetometry Phenomena in AlGaN/GaN heterostructure wafers

21:15 - 21:30 *J. M. Barker and D. K. Ferry,*

Arizona State University, Tempe

Studies of transport in GaN/AlGaN heterostructures

21:30 - 21:45 *Frank Schwier, Vladimir Polyakov*

Technische Universität Ilmenau

State of the art performance of wide bandgap RF power transistors: GaN vs. SiC

21:45 - 22:00 *Umesh Mishra,*

University of California, Santa Barbara

The Impact of the AlGaIn in the effective electron velocity in AlGaIn/GaN HEMTs

Tuesday, December 7

Session 4 Theory, modeling, simulation I

Chairman Stephen Goodnick

09:00 - 09:30 *Hiroshi Kamimura, Seiichiro Ikehata and Yasumitsu Matsuo,*
Department of Applied Physics, Faculty of Science, Tokyo University of Science
Mechanism of Superionic Conduction in Hydrogen-Bonded Systems

09:30 - 09:45 *A. Sergeev, V. Mitin, and M. Yu. Reizer,*

SUNY, University at Buffalo

Disordered Semiconductors and Low-Dimensional Structures

09:45 - 10:00 *M. Macucci and P. Marconcini,*

Dipartimento di Ingegneria dell'Informazione, Università di Pisa

Numerical analysis of mapping techniques for the electron density in mesoscopic devices

10:00 - 10:15 *M.J. Gilbert and D.K. Ferry,*

Arizona State University, Tempe

Scattering and Vortices in Quantum Transport Studies of Devices

10:15 - 10:30 *T. Rakshit, G-C Liang, A.W. Ghosh, S.Datta,*

Purdue University, West Lafayette

Negative Differential Resistance at Silicon-Molecule Heterostructure

10:30 - 10:45 V.Ryzhii, A.Satou, I.Khmyrova, M.Ryzhii, A.Chaplik, and M.S.Shur,
University of Aizu
Resonant plasma cavities based on two-dimensional electron channels:
Strict calculations of plasma oscillation spectra

10:45 - 11:15 **Coffee**

Session 5 Theory, modeling, simulation II

Chairman Tsuneya Ando

11:15 - 11:45 C. E. Pryor and M. E. Flatté,

Department of Physics and Astronomy, University of Iowa, Iowa City

Landé g-factors and orbital angular momentum quenching in semiconductor quantum dots

11:45 - 12:00 Takeshi Nakanishi, Kiyoyuki Terakura and Tsuneya Ando,

National Institute of Advanced Industrial Science and Technology, Tsukuba

Fano effects in an Aharonov-Bohm ring with a quantum dot

12:00 - 12:15 P.Hawrylak, Marek Korkusinski, Mariusz Ciorga, Michel Pioro-Ladriere, A.Sachrajda

Institute for Microstructural Sciences, National Research Council Canada

Pairing of spin excitations in lateral quantum dots

12:15 - 12:30 F.M. Peeters, M. Tadic, K. Janssens and B. Partoens,

Departement Fysica, Universiteit Antwerpen, Antwerpen

Single and vertically coupled type II self-assembled quantum dots: hole band engineering

12:30 - 12:45 Chihiro Hamaguchi,

Osaka University, Osaka

Modeling of band mixing between the GaAs conduction band and the impurity level associated with N atoms

12:45 - 20:00 **Adhoc Session**

Session 6 Theory, modeling, simulation III

Chairman David Janes

20:00 - 20:30 Alexandra Imre, Gyorgy Csaba, Paolo Lugli, Gary Bernstein, V. Metlushko, and W. Porod,

Department of Electrical Engineering, University of Notre Dame, Notre Dame

Magnetic Logic Devices

20:30 - 21:00 R. Akis, J. Bird, D. Ferry, and S. M. Goodnick,

Department of Electrical Engineering, Arizona State University, Tempe

Spin transport in III-V heterolayers and quantum point contacts

21:00 - 21:15 G. S. Solomon and M. Agrawal,

Department of Electrical Engineering, Stanford University

Spin injection efficiencies in III-V QW LEDs

21:15 - 21:30 D. Vasileska, S.S. Ahmed, C. Ringhofer and C. Heitzinger, S.M.Goodnick

Arizona State University, Tempe

3D Modeling of Unintentional Doping in Nano-Scale Devices Using Recently Proposed Fast Multipole – Monte Carlo Self-Consistent Device Simulation Scheme

21:30 - 21:45 Frank Schwier,

Technische Universität Ilmenau

A mobility model for AlGaIn/GaN 2DEGs

Wednesday, December 8

Session 7 Novel device concepts I

Chairman Jim Harris

- 09:00 - 09:30 H. Riechert, R. Averbeck, M. Galluppi, L. Geelhaar,
Infineon, Munich
Dilute Semiconductor Alloys: New Degrees of Freedom for Device Design
- 09:30 - 09:45 David B. Janes, S. Lodha and A. Scott,
Purdue University, West Lafayette
Metal/Molecule/Semiconductor Device Structures
- 09:45 - 10:00 Kenji Shiraishi, Keisaku Yamada, Kazuyoshi Torii, Yasushi Akasaka, Kiyomi Nakajima,
Mitsuru Konno, Toyohiro Chikyo, Hiroshi Kitajima, and Tsunetoshi Arikado,
Institute of Physics, University of Tsukuba
Oxygen Vacancy Induced Large Threshold Voltage Shift in the MISFET
with p+poly-Si Gate/High-k HfO₂ Dielectric Interfaces
- 10:00 - 10:15 H.J. Osten, E. Bugiel, A. Fissel, O. Kirfel,
Institute for Semiconductor Devices and Electronic Materials, University of Hannover
Epitaxial Silicon/Metal Oxide Stacks for various applications
- 10:15 - 10:30 Kanji Yoh, Marhoun Ferhat, Takuma Tsuchiya, Alexandru Riposan, Joanna M. Miranchick,
Research Center for Integrated Quantum Electronics, Hokkaido University, Sapporo
Electrical transport of a spin transistor
- 10:30 - 10:45 Detlev Grützmacher, Li Zhang, Sergey Golod, Vladimir Seleznev, Viktor Prinz, Peter Wägli,
Paul Scherrer Institut, Villingen
Scrolled Si/SiGe Heterostructures: Technology and Applications
- 10:45 - 11:15 **Coffee**

Session 8 Novel device concepts II

Chairman Henning Riechert

- 11:15 - 11:45 Hideki Hasegawa, Seiya Kasai, Miki Yumoto and Taketomo Sato,
Research Center for Integrated Quantum Electronics, Hokkaido University, Sapporo
Hexagonal BDD Quantum Circuit Architecture for Intelligent Quantum (IQ) Chips
- 11:45 - 12:00 E. Bente, R. Nötzel, Y. Barbarin, M. Heck, D. Lenstra, M.K. Smit, J. Wolter
COBRA Inter-University Research Institute, Eindhoven University of Technology, Eindhoven
Integrated extended cavity passively modelocked InGaAsP lasers
using butt-joint active-passive integration
- 12:00 - 12:15 William S. Wong, Steven E. Ready, Michael L. Chabiny, and Michael Kneissl,
Palo Alto Research Center, Palo Alto
Integration of InGaN-based optoelectronic with microfluidic channels fabricated through jet printing
- 12:15 - 12:30 J. R. Tucker*, J. S. Kline*, S. J. Robinson*, T.-C. Shen**, J.-Y. Ji**,
**University of Illinois, **Utah State University*
Integrated Process for Atom-Scale Devices in Silicon
- 12:30 - 12:45 Gerhard Abstreiter, Evelin Beham, Yann Ducommun, Jonathan Finley, Hubert Krenner,
Miro Kroutvar and Dieter Schuh,
Walter Schottky Institute, TU Munich
Control of single charges, spins and photons in novel quantum dot devices
- 12:45 - 13:00 Hiroshi Yamaguchi, Sen Miyashita, and Yoshiro Hirayama,
NTT Basic Research Laboratories
Quantum effects in piezoresistive heterostructure cantilevers
- 13:00 - 20:00 **Adhoc Session**

Session 9 Novel device concepts III

Chairman **Gottfried Landwehr**

- 20:00 - 20:30 Yoshinobu Aoyagi^{*}, ^{**}, Shinichiro Inoue^{*}, ^{**} and Kana Aoki^{***}
Tokyo Institute of Technology, **RIKEN Institute, *The University of Tokyo*
Fabrication of three dimensional and nonlinear two dimensional hetero photonic crystals and application of those crystals
- 20:30 - 20:45 Salvador Barraza-Lopez, Slava Rotkin, Karl Hess,
Beckman Institute, University of Illinois, Urbana
Semiconductor-metal transitions in carbon nanotubes, and their use to create novel heterolayer devices
- 20:45 - 21:00 Jim Harris, *Stanford University*
Stanford University, Stanford
Spintronic devices
- 21:00 - 21:15 Herb Goronkin,
Technology Acceleration Associates, Tempe
Zetta-RAM, A Molecular Memory
- 21:15 - 21:30 Tohru Nakamura, Emiko Koyama, Hideo Tokuhisa, Masahiko Kanetsato, Yasuhisa Naito,
Takao Ishida, Kiyomi Tsukagoshi, Wataru Mizutani, Yasuzo Suzuki, Yuji Kawanishi,
Synthetic Nano-Function Materials Project (SYNAF)
National Institute of Advanced Industrial Science and Technology, Tsukuba
Molecular Sensor Using Organic Thiol SAMs
- 21:30 - 21:45 Dirk Grundler,
Institut für Angewandte Physik, Universität Hamburg
In-situ grown EMR-sensors
- 21:45 – 22:00 Adarsh Sandhu, Hideaki Sanbonsugi, Masanori Abe, and Hiroshi Handa,
Nanoelectronics Research Centre, Tokyo Institute of Technology, Tokyo
High Sensitivity InSb Thin Film Nano-Hall Sensors for Medical Applications
- 22:00 – 22:15 S. Hiyamizu, H. Hino, K. Omori, T. Kitada and S. Shimomura,
Graduate School of Engineering Science, Osaka University, Osaka
Self-organized InGaAs/InAlAs quantum wire lasers with emitting wavelength of 1.3 μm grown on (775)B InP substrates by molecular beam epitaxy
- 22:15 – 22:30 Y. Ochiai, N. Kida, T. Mihara, T. Sasaki, N. Aoki and J.P. Bird,
Chiba University, Chiba
Nano-space transport in a crossed junction formed from multi walled carbon nanotubes

Thursday, December 9

Session 10 Spintronics, material properties I

Chairman **Herb Goronkin**

- 08:45 - 09:00 Stuart Parkin,
IBM Almaden Research Center, San Jose
Tunneling Spin Injection with Giant Polarization
- 09:00 - 09:30 Masaaki Tanaka, Ahsan M. Nazmul, and Satoshi Sugahara,
Department of Electronic Engineering, The University of Tokyo
Ferromagnetic Semiconductor Heterostructures for Spintronics
- 09:30 - 10:00 J.P. Leburton, *Beckman Institute, University of Illinois*
University of Illinois, Urbana
Spintronics with quantum dots

- 10:00 - 10:15 *Hiro Akinaga,*
National Institute of Advanced Industrial Science and Technology, Tsukuba
Molecular-beam epitaxy growth of zinc-blende CrAs/GaAs multilayers
- 10:15 - 10:30 *K.-J. Friedland, M. Bowen, J. Herfort and K.H. Ploog,*
Paul-Drude-Institute for Solid State Electronics, Berlin
Intrinsic contributions to the planar Hall effect in Fe and Fe₃Si films on GaAs substrates
- 10:30 - 10:45 *M. E. Itkis, X. Chi and R. C. Haddon,*
Center for Nanoscale Science and Engineering, University of California, Riverside
Bistable spin state in a phenalenyl-based organic molecular semiconductor
- 10:45 - 11:15 **Coffee**

Session 11 Spintronics, material properties II

Chairman Masaaki Tanaka

- 11:15 - 11:45 *A. Yu. Silov*, P. Blajnov*, J. H. Wolter*, N. S. Averkiev**, R. Hey***, K. H. Ploog***,*
**COBRA Inter-University Research Institute, Eindhoven University of Technology, Eindhoven,*
***Ioffe Institute, St. Petersburg, ***Paul Drude Institute for Solid State Electronics, Berlin*
Current-Induced Spin Polarization in Non-Magnetic Semiconductor
- 11:45 - 12:00 *Y. Hirayama, G. Yusa and K. Muraki,*
NTT Basic Research Laboratories & SORST-JST
Coherent control of nuclear spins in mesoscopic scale semiconductors
- 12:00 - 12:15 *A.M. Yakunin*, A. Yu. Silov*, P.M. Koenraad*, J.H. Wolter*, W. Van Roy**, J. De Boeck**,
J.-M. Tang***, M.E. Flatté***, Xiangxin Guo****, K.H. Ploog****,*
**COBRA Inter-University Research Institute, Eindhoven University of Technology, Eindhoven,*
IMEC, Leuven, ***Iowa University, *Paul Drude Institute for Solid State Electronics, Berlin*
Mn in GaAs studied by X-STM: from a single impurity to ferromagnetic delta layer
- 12:15 - 12:30 *B.T. Jonker, C. H. Li, G. Kioseoglou, A.T. Hanbicki, O.M.J. van t' Erve, M.E. Ware,
D. Gammon, R. Mallory, M. Yasar and A. Petrou,*
Naval Research Laboratory
Electrical spin pumping of quantum dots at room temperature
- 12:30 - 12:45 *D. Grundler, M. Berginski, F. Giesen, N. Hoyer, J. Podbielski, H. Rolff,
and D. Heitmann,*
Institut für Angewandte Physik, Universität Hamburg
Spin configurations and localized spin waves in magnetic nanorings
- 12:45 - 13:00 *Klaus H. Ploog,*
Paul-Drude-Institute for Solid State Electronics, Berlin
Above room-temperature ferromagnetism in rare-earth doped GaN
- 13:00 – 13:15 *Tadashi Sakashita, Satoshi Nagai, Toshihiko Ono, Tomotaka Hoshino,
Shinji Watanabe, Susumu Sasaki, Yoshiro Hirayama,*
Faculty of Engineering, Niigata University
Nuclear-Spin Behavior in Bulk and 2DEG GaAs
- 13:15 - 18:00 **Adhoc Session**
- 18:30 - **Banquet**

Friday, December 10

Session 12 Carbon nanotubes

Chairman Yoshiro Hirayama

09:00 - 09:30 *Kazuhiko Matsumoto,*

Osaka University, Institute of Scientific & Industrial Research

Carbon Nanotube Devices and Applications

09:30 - 10:00 *Yuji Awano* **, Naoki Yokoyama**,*

**Fujitsu Limited, **Fujitsu Laboratories Ltd.*

Carbon nanotube via technologies for future ULSI interconnections

10:00 - 10:15 *T. Iwai, M. Nihei, H. Shioya, A. Kawabata, D. Kondo, M. Horibe,*

Y. Awano, and N. Yokoyama,

Nanotechnology Research Center, Fujitsu Laboratories Ltd.

Heat removal properties of vertically-aligned multi-walled carbon nanotubes (MWNTs) for semiconductor devices

10:15 - 10:30 *Tsuneya Ando,*

Department of Physics, Tokyo Institute of Technology

Perfect conducting channel in metallic carbon nanotubes

10:30 - 11:00 **Coffee**

Session 13 Carbon nanotubes, quantum wires

Chairman Kazuhiko Matsumoto

11:00 - 11:30 *Tsuneya Ando,*

Department of Physics, Tokyo Institute of Technology

Theory of excitons and optical absorption in carbon nanotubes

11:30 - 12:00 *R. Munden, A. Sanders, E. Stern, and M. Reed,*

Yale University, New Haven

Electronic transport in GaN nanowire junctions

12:00 - 12:05 **Closing Remarks**