

# ***Rensselaer Physics Department Activities***

**July 2007 - December 2007**

(Rensselaer Students are underlined)

## **HONORS AND AWARDS**

### **Toh-Ming Lu**

- Elected as fellow of the American Association for the Advancement of Science (AAAS)

### **Heidi Newberg**

- Gruber Cosmology Prize, 2007
- Organized and Chaired the SEGUE/Stars Working Group session of the SDSS Fall Collaboration Meeting at Fermilab, Batavia, IL, November 3, 2007

### **Michael Shur**

- Electromagnetic Academy Fellow
- IET Fellow
- IEEE Donald Fink Best Paper Award
- IEEE Leon K. Kirchmayer Graduate Teaching Award

### **Christian Wetzel**

- Elected to Treasurer of the Electronic Materials Conference, 2007-2010.
- Program Committee Member, 2008 IEEE International Reliability Physics Symposium.
- Program Committee Member, Second International Symposium on Growth of III-Nitrides, 2008.

### **Xi-Cheng Zhang**

- Symposium co-chair, SPIE 6840 Terahertz Photonics, SPIE Asia Photonics, Beijing, Nov, 11, 2007.
- Chairman, NATO SET-124 / RTG-068 Task Group 2<sup>nd</sup> Business Meeting, Kaiserslautern, Germany, Dec. 5, 2007.
- Session chair, Advanced Workshop on Frontiers of Electronics, Cozumel, Mexico, Dec. 16, 2007.
- Co-chair, Workshop on Terahertz Imaging and Diagnostics, the International Symposium "Topical Problems of Biophotonics – 2007". Russia.

## **INVITED TALKS**

### **Joel Giedt**

- J. Giedt, "Power-counting theorem for staggered fermions," in Proceedings XXV International Symposium on Lattice Field Theory, Regensburg, Germany, July 30 - Aug. 4, 2007, Proceedings of Science (LATTICE 2007) 262.

### **Toh-Ming Lu**

- "Interface stability of metal barriers and low K dielectrics", Short course at advanced Metallization Conference, Albany, October 8, 2007.

## Heidi Newberg

- "Tails of the Milky Way," Dartmouth College Colloquium, Hanover, NH, October 24, 2007
- "The Observed Structure of the Milky Way Spheroid," Cosmic Cartography conference, Chicago, IL, Dec. 4, 2007

## Michael Shur

- Michael Shur, Recent Developments in Optical and Electrical Data Transport - from THz to UV. Photonics East, Boston, MA (2007)
- N. Pala, M. Shur, R. Gaska, Plasma Wave-based THz Biodetectors, Photonics East, Boston, MA (2007)
- Saunier, P. Lee, C. Balistreri, A. Dumka, D. Jimenez, J. Tserng, H. Q. Kao, M.Y. Chao, P.C. Chu, K. Souzis, A. Eliashevich, I. Guo, S. del Alamo, J. Joh, J. Shur, M. Progress in GaN Performances and Reliability, Device Research Conference, 2007 65th Annual Publication Date: 18-20 June 2007, pp. 35-36, ISSN: 1548-3770, ISBN: 978-1-4244-1102-3
- W.B. Jackson, M. Almanza-Workman, A. Chaiken, R. Garcia, A. Jeans, H.-J. Kim, O. Kwon, H. Luo, P. Mei, C. Perlov, C. Taussig, M. S. Shur, A. Koudymov, Large Area Flexible Electronics Fabricated Using Self-Aligned Imprint Lithography, ECS Proceedings, vol. 8, No. 1, pp. 199-204 (2007)
- M. S. Shur, D. Veksler, V. Chivukula, A. Koudymov, T. Ytterdal, B. Iñiguez, and W. Jackson, Modeling Of Thin Film Transistors With Non-Ideal Contacts, ECS Proceedings, vol. 8, No. 1, pp. 165-170 (2007)

## Gwo-Ching Wang

- A new technique to monitor surface technique of nanostructures, **G.-C. Wang**, F. Tang and T.-M. Lu, International Symposium on Smart Materials and Devices, Dec. 10, 11, 2007, Hong Kong.

## Christian Wetzel

- "... seminar on preparing proposals for NSF and other govt. agencies," C. Wetzel, RPI Grant Writing Seminar, Troy, NY, December 10, 2007.
- "Green Laser Diode Structures in Non-Polar Homoepitaxial MOVPE," C. Wetzel, DARPA/MTO Visible InGaN Injection Lasers Kickoff Meeting, Arlington, VA, November 5-6, 2007.
- "Green and Deep Green LEDs in Polarization Controlled GaN," C. Wetzel, 10<sup>th</sup> International Conference on Advanced Materials, Bangalore, India, October 8 - 13, 2007.
- "LED Development on Polar and Non-Polar GaN Substrates," C. Wetzel, 5th International Workshop on Bulk Nitride Semiconductors, Salvador, Bahia, Brazil, September 24-28, 2007.
- "Green and Deep Green LEDs in Polarization Controlled GaN," C. Wetzel, 2007 China International Forum on Solid-State Lighting, Shanghai, China, August 22-24, 2007.
- "Polarization Screening as a Concept for a Memory Cell," C. Wetzel, European Multifunctional Materials Workshop, Averøy, Norway, June 17-21, 2007.
- "High Performance Green LEDs by Homoepitaxial MOVPE", C. Wetzel, Solid State Lighting Peer Review, Washington, DC June 5, 2007.
- "Development of high efficiency green and deep green light emitters in piezoelectric group-III nitrides," C. Wetzel, The Conference on Photonic

Applications, Systems and Technologies, PhAST 2007, Baltimore, Maryland, USA, May 7-10, 2007.

- “Piezoelectric Quantum Structure for Full Spectrum Light Emitters,” C. Wetzel, The International Conference on Metallurgical Coatings and thin Films, ICMCTF 2007, San Diego, California, USA, April 23-27, 2007.

### **Xi-Cheng Zhang**

- X.-C. Zhang, “Terahertz sensing & imaging technology,” the 4th International Symposium on Nanovision Science & The 9th Takayanagi Kenjiro Memorial Symposium, Hamamatsu, Japan, Oct. 30, 2007.
- X.-C. Zhang, “THz technology,” Denso, Nagoya, Japan, Oct. 30, 2007.
- Xu Xie, Nicolas Karpowicz, Xiaofei Lu, Xiaoyu Guo, Jianming Dai, Yunqing Chen, Masashi Yamaguchi, and X.-C. Zhang, “Terahertz wave photonics in gas and its spectroscopic application,” plenary presentation, SPIE Asia Photonics, Beijing, Nov, 11, 2007.
- X.-C. Zhang, “Next Rays? T-Ray!,” seminar, College of Science, Kuwait University, Kuwait, Nov. 27, 2007.
- X-C. Zhang, “THz ABCD,” seminar, Physics Department, Kuwait University, Kuwait, Nov. 28, 2007.
- X-C. Zhang, “Terahertz Wave Technology for Standoff Detection of Explosives and other Military & Security Applications,” NATO SET-124, Kaiserslautern, Germany, Dec. 5, 2007.
- N. Karpowicz, J.M. Dai, L.L. Zhang, C.L. Zhang, X.-C. Zhang, “Recent Development in Broadband THz Spectroscopy” Advanced Workshop on Frontiers of Electronics, Cozumel, Mexico, Dec. 16, 2007
- “THz Wave Photonics: Horizons and Hurdles,” Plenary presentation, the International Symposium “Topical Problems of Biophotonics – 2007”. On a boat along River Volga between Gorky/Nizhny Novgorod to Moscow, August 4, 2007.

## **MEETING ATTENDANCE**

### **Heidi Newberg**

- “Milky Way Halo,” Bonn, Germany, May 29 to June 2, 2007
- “Women Faculty Retreat,” part of RAMP-UP, Lake George, NY, Sept. 29-30, 2007
- SDSS Fall Collaboration Meeting, Fermilab, Batavia, IL, November 2-4, 2007
- “Cosmic Cartography,” Chicago, IL, Dec. 3-4, 2007

### **Gwo-Ching Wang**

- 54<sup>th</sup> AVS International Symp., Seattle, WA, Oct. 19, 2007.
- The 8<sup>th</sup> Conference of the Asian Crystallographic Association, AsCA’07 Taipei, Taiwan, Nov. 6, 2007.
- International Symp. on Smart materials and Devices, Hong Kong, China, Dec. 10 -11, 2007, Dec. 10 -11, 2007.

### **Masashi Yamaguchi**

- “2007 Interconnect Focus Center Annual Review “, ( Oct.3-4, 2007, Atlanta, GA)
- “Dept of Homeland Security Center of Excellence Awareness & Localization of Explosives-Related Threats Site Visit”, (Oct.10, 2007, Boston, MA)

## OTHER PROFESSIONAL TRAVEL

### Joel Giedt

- traveled to Syracuse for a day to meet with collaborators.

### Heidi Newberg

- July 5-13, Beijing, China, to visit the LAMOST project at the Chinese Academy of Sciences
- Sept. 5-9, Cambridge, England, attend Gruber Cosmology Prize ceremony
- Sept. 29, Williams College, MA, attended Keck Northeast Astronomy Consortium Undergraduate Research Symposium in support of our undergraduate student Auralee Morin

### Michael Shur

- M. S. Shur Terahertz Sensing Technology, Nortrop Grumman Space Technology, September (2007)

## PRESENTATIONS

### Heidi Newberg

- “Revised Parameter Estimates for the Most Metal-Poor Candidates in SDSS-I and SEGUE,” Julie A. Krugler, T.C. Beers, Y. Lee, T. Sivarani, B. Marsteller, R. Wilhelm, C. Allende Prieto, A. Frebel, J. E., Norris, J. Johnson, I. Ivans, B. Yanny, C. Rockosi, H. Morrison, H. J. Newberg, and J. Knapp, B. A. A. S., Meeting 210, #74.02
- “The relationship between tidal debris and the smooth component of the Milky Way stellar spheroid,” Milky Way Halo Conference, June 1, 2007, Bonn, Germany
- “The history of the Sloan Digital Sky Survey,” Chinese Academy of Sciences, July 9, 2007, Beijing, China
- “Galactic Structure Results from SDSS/SEGUE,” Chinese Academy of Sciences, July 10, 2007, Beijing, China
- “The Milky Way Galaxy,” Girls in Science and Technology (GIST) summer camp, The Children’s Museum of Science and Technology, Rensselaer Technology Park, NY, July 24, 2007
- “Your Textbook is Wrong about the Milky Way,” A Passion for Physics class, Troy, NY, October 4, 2007
- “From SEGUE to LAMOST,” SDSS Fall Collaboration Meeting, Fermilab, Batavia, IL, November 3, 2007

### Fred Schubert

- E. Fred Schubert and Jong Kyu Kim “Light-Emitting Diodes – Looking back 100 years and looking forward to the next 10 years” 2007 China International Solid State Lighting Forum and Exhibition (CHINA SSL 2007), Shanghai, China, August 22–24 (August 2007)
- E. Fred Schubert and Jong Kyu Kim “Low-refractive-index materials: A new class of optical thin-film materials for solid-state lighting” *7th International Conference on the Numerical Simulation of Optoelectronic Devices (NUSOD 2007)*, Newark DE, September 24–27 (September 2007)
- E. Fred Schubert and Jong Kyu Kim “Light-emitting diodes – Looking back 100 years and looking forward to the next 10 years” *S&T/SID’s 15th Color Imaging Conference (CIC)*, Albuquerque NM, November 5–9 (November 2007)

## Gwo-Ching Wang

- What can RHEED do beyond monitoring single crystal film growth? **G.-C. Wang**, F. Tang and T.-M. Lu, 54<sup>th</sup> AVS International Symp., post discovery session, Seattle, WA, Oct. 19, 2007.
- RHEED *surface* pole figure – A new in situ technique for polycrystalline and nanostructured surface texture analysis, **G.-C. Wang**, F. Tang and T.-M. Lu, The 8<sup>th</sup> Conference of the Asian Crystallographic Association, AsCA'07 Taipei, Taiwan, Nov. 6, 2007.
- Physics at Rensselaer – People, education and research, **G.-C. Wang**, Taipei American School, Taiwan, Nov. 5, 2007.

## Christian Wetzel

- "Structural Analysis in Low V-defect Blue and Green Light Emitting Diodes", **M. Zhu**, T. Detchprohm, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, S. You, L. Liu, E. A. Preble, D. Hanser, and C. Wetzel, the 2007 Material Research Society Fall Meeting, Boston, MA, USA, November 26-30, 2007.
- "Photon Modulated Electroluminescence of Green Light Emitting Diodes," Y. Li, J. Senawiratne, Y. Xia, M. Zhu, W. Zhao, T. Detchprohm, and C. Wetzel, 7th Int'l Conference of Nitride Semiconductors, Las Vegas, NV, USA, Sept. 16-21, 2007.
- "Junction Temperature Simulation of Gallium-Nitride Green LEDs Using COMSOL" **A. Chatterjee**, J. Senawiratne, Y. Li, M. Zhu, Y. Xia, W. Zhao, J. L. Plawsky and C. Wetzel, 2007 COMSOL conference, Boston, USA, Oct. 4-6, 2007.
- "Characterization of Homoepitaxial and Heteroepitaxial GaInN/GaN Light Emitting Diodes by Transmission Electron Microscopy," **M. Zhu**, J. Senawiratne, W. Zhao, Y. Xia, Y. Li, T. Detchprohm, and C. Wetzel, Electronic Materials Conference, South Bend, IN, June 20, 2007.
- "Junction Temperature Analysis of GaInN/GaN Multi-Quantum Well Light Emitting Diodes by Micro-Raman Spectroscopy," **J. Senawiratne**, Y. Li; M. Zhu, Y. Xia, W. Zhao, T. Detchprohm, C. Wetzel, Electronic Materials Conference, South Bend, IN, June 20, 2007.
- "Spectroscopic Cathodoluminescence of V-Defects in GaInN/GaN Quantum Wells," Y Xia, T. Detchprohm, J. Senawiratne, Y. Li, W. Zhao, M. Zhu, C. Wetzel, D. Koleske, M. Crawford, S. Lee, K. Bogart, Electronic Materials Conference, South Bend, IN, June 20, 2007.
- "Characterization of Homoepitaxial and Heteroepitaxial GaInN/GaN Light Emitting Diodes by Transmission Electron Microscopy," **M. Zhu**, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, T. Detchprohm, C. Wetzel, Electronic Materials Conference, South Bend, IN, June 20, 2007.
- "V-defect Analysis in Green and Deep Green Light Emitting Diodes Structures", **M. Zhu**, T. Detchprohm, S. You, Y. Wang, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, Z. Zhang, and C. Wetzel, 7<sup>th</sup> International Conference of Nitride Semiconductors, Las Vegas, NV, USA, September 16-21, 2007.
- "Mechanisms for enhanced quantum efficiency of InGaN quantum wells grown on InGaN underlayers," M. H. Crawford, D. D. Koleske, N. A. Missert, S. R. Lee, M. A. Banas, D. M. Follstaedt, K. H. A. Bogart, G. Thaler, and K. C. Cross, Y. Xia, C. Wetzel, and E. F. Schubert, 7<sup>th</sup> International Conference of Nitride Semiconductors, Las Vegas, NV, USA, September 16-21, 2007.
- "Photon and Electron Modulated Electroluminescence of Green Light Emitting Diodes," Y. Li, W. Zhao, Y. Xia, M. Zhu, J. Senawiratne, T. Detchprohm, and C.

Wetzel, 7<sup>th</sup> International Conference of Nitride Semiconductors, Las Vegas, NV, USA, September 16-21, 2007.

- "Improved Performance of GaInN Based Deep Green Light Emitting Diodes through V-Defect Reduction," T. Detchprohm, M. Zhu, W. Zhao, Y. Xia, Y. Li, J. Senawiratne, L. Liu, D. Hanser and **C. Wetzel**, 7<sup>th</sup> International Conference of Nitride Semiconductors, Las Vegas, NV, USA, September 16-21, 2007.
- "Junction Temperature Analysis in Green Light Emitting Diode Dies on Sapphire and GaN Substrate," **J. Senawiratne**, Y. Li, M. Zhu, Y. Xia, W. Zhao, A. Chatterjee, T. Detchprohm, J. L. Plawsky, and C. Wetzel, 7<sup>th</sup> International Conference of Nitride Semiconductors, Las Vegas, NV, USA, September 16-21, 2007.
- "Very Strong Nonlinear Optical Absorption in Green GaInN/GaN Multiple Quantum Well Structures," **W. Zhao**, M. Zhu, Y. Xia, Y. Li, J. Senawiratne, S. You, T. Detchprohm, and C. Wetzel, 7<sup>th</sup> International Conference of Nitride Semiconductors, Las Vegas, NV, USA, September 16-21, 2007.
- "Super Fluorescence in Green Emission GaInN/GaN Quantum Well Structures under Pulsed Laser Excitation," **J. Senawiratne**, S. Tomasulo, T. Detchprohm, M. Zhu, Y. Li, W. Zhao, Y. Xia, P.D. Persans, and C. Wetzel, Fall Meeting of the Materials Research Society, Boston, MA, USA, Nov 26-30, 2007.
- "Green Light Emitting Diodes under Photon and Electron Beam Modulation," **Y. Li**, J. Senawiratne, Y. Xia, M. Zhu, W. Zhao, T. Detchprohm, and C. Wetzel, Fall Meeting of the Materials Research Society, Boston, MA, USA, Nov 26-30, 2007.
- "Low-V-defect Blue and Green GaInN/GaN Light Emitting Diodes," **M. Zhu**, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, S. You, T. Detchprohm, and C. Wetzel, Fall Meeting of the Materials Research Society, Boston, MA, USA, Nov 26-30, 2007.
- "Effect of Structural Properties of AlN Templates on the Optical, Electrical, and Structural Properties of n-type AlGaIn," **W. Lee**, K. Chen, Q. Dai, S. Chhajed, M.F. Schubert, F.W. Mont, J.K. Kim, C. Wetzel, and E.F. Schubert, Fall Meeting of the Materials Research Society, Boston, MA, USA, Nov 26-30, 2007.
- "Temperature dependence of the quantum efficiency in green and deep green GaInN/GaN light emitting diodes," **Y. Li**, W. Zhao, Y. Xia, M. Zhu, T. Detchprohm, E.F. Schubert, C. Wetzel, Electronic Material Conference, University Park, PA, USA, Jun 28-30, 2006.

### **Masashi Yamaguchi**

- **Masashi Yamaguchi**, and X.C.Zhang, Prototypes and Technologies for Improvised Explosive Device Detection, BomDetec Internal Preliminary Design Review (Aug. 15, 2007, Boston, MA)
- **Masashi Yamaguchi**, and X.C.Zhang, Prototypes and Technologies for Improvised Explosive Device Detection, BomDetec Preliminary Design Review (Oct. 1, 2007, Boston, MA)

### **Xi-Cheng Zhang**

- F2-C. Terahertz Sensing and Imaging in DHS Site Visit for Center of Excellent (COE), ALERT: Awareness and Localization of Explosives-Related Threats. Y.Q. Chen, J.M. Dai, A. Redo, M. Yamaguchi, X.-C. Zhang Northeastern University, Boston, Oct. 10, 2007.
- X-C. Zhang, "THz Wave Photonics in Gas and Its Spectroscopic Application," NATO SET-124, Kaiserslautern, Germany, Dec. 6, 2007.
- X-C. Zhang, "THz handheld spectrometer," NATO SET-124, Kaiserslautern, Germany, Dec. 6, 2007.

- “Subwavelength terahertz imaging using gated plasma-wave electronic devices A.V. Muravjov, D.B. Veksler, A. Redo-Sanches, X.-C. Zhang, T.A. Elkmatib, K.N. Salama, and M.S. Shur, On a boat along River Volga between Gorky/Nizhny Novgorod to Moscow, August 5, 2007.

## PAPERS PUBLISHED

### Joel Giedt

- M. Gabella, T. Gherghetta and J. Giedt, "A gravity dual and LHC study of single-sector supersymmetry breaking," *Phys. Rev. D* 76 (2007) 055001 [published 9/7/07].
- J. Giedt and E. Poppitz, "Chiral Lattice Gauge Theories and The Strong Coupling Dynamics of a Yukawa-Higgs Model with Ginsparg-Wilson Fermions," *Journal of High Energy Physics* 0710 (2007) 076 [published 10/22/07].

### Toh-Ming Lu

- “Preferred Orientation in Ru Nanocolumns Induced by Residual Oxygen”, J. P. Singh, T. Karabacak, P. Morrow, S. Pimanpang, T.-M. Lu, and G.-C. Wang, *Journal of Nanoscience and Nanotechnology* 7, 2192 (2007).
- “Self-shadowing in ballistic fan formation from point seeds,” M. Pelliccione and T.-M. Lu, *Phys. Rev. B* 75, 245431 (2007).
- “Non-local effects in thin film growth”, M. Pelliccione and T.-M. Lu, *Modern Physics Letters B*, Vol. 21, No. 19, 1207 (2007).
- “In situ reflection high energy electron diffraction surface pole figure study of biaxial texture evolution in anisotropic Mg nanoblades during shadowing growth”, F. Tang, G.-C. Wang, and T.-M. Lu, *J. Appl. Phys.* 102, 14306 (2007).
- “Plasma-Enhanced Atomic Layer Deposition of Palladium on a Polymer Substrate”, G. A. Ten Eyck, S. Pimanpang, J. S. Juneja, H. Bakhru, T.-M. Lu, G.-C. Wang, *Chemical Vapor Deposition* 13, Issue 6-7, 307 (2007).
- “Effects of three-dimensional Ehrlich-Schwoebel barrier on texture selection during Cu nanorod growth”, [Christopher G. Johansen](#), [Hanchen Huang](#), and [Toh-Ming Lu](#), *Appl. Phys. Lett.* 91, 121914 (2007).
- “Surface texture evolution of polycrystalline and nanostructured films: RHEED surface pole figure analysis”, TOPICAL REVIEW, F Tang, T Parker, G-CWang and T-M Lu, *J. Phys. D: Appl. Phys.* 40 (2007).
- “Wetting and Electro-Wetting Properties of Carbon Nanotube Templated Parylene Films”, Zuankai Wang, Ya Ou, Toh-Ming Lu and Nikhil Koratkar, *J. Phys. Chem. B*, **111** (17), 4296 (2007)
- “Ballistic Aggregations on Two-dimensional Arrays of Seeds with Oblique Incident Flux”, D.-X. Ye and T.-M. Lu, *Phys. Rev. B* 76, 235402 (2007).
- “Interface Stability of Metal Barrier and low K Dielectrics”, T.-M. Lu, Y. Ou, and P.-I. Wang, in *Materials, Processes, Integration and Reliability in Advanced Interconnects for Micro- and Nanoelectronics*, Editors: Qinghuang Lin, E. Todd Ryan, Wen-li Wu, Do Yeung Yoon, *Mat. Res. Soc. Symp. Proc.* 990-B09-05 (2007).
- “Enhancement of Cu(hfac)<sub>2</sub> chemisorption on the Paralene surface by N<sub>2</sub> plasma surface modification”, S. Pimanpang, Pei-I. Wang, Dexian Ye, Jasbir S. Juneja, G.-C. Wang, and T.-M. Lu, *J. of Electrochemical Society* 154 (10), G215 –G219 (2007).

- “Shadowing Growth of Three-dimensional Nanostructures on Periodic Arrays of Seeds: The effect of the size of the seeds”, D.-X. Ye, Charles L. Ellison, and T.-M. Lu, submitted to J. Appl. Phys.
- “Size control of Cu nanorods through oxygen-mediated growth and low-temperature sintering”, Pei-I Wang, Thomas C. Parker, Tansel Karabacak, G.-C. Wang, and T.-M. Lu, Thin Solid Films, submitted.
- Effect of Nanotips on the Hydrophilicity of Metallic Nanorod Surfaces  
D.-X. Ye and T.-M. Lu, Phys. Rev. Lett., submitted.
- “Novel photocurable epoxy siloxane polymers for photolithography and imprint lithography applications”, Pei-I Wang, O. Nalamasu, Rajat Ghoshal, Ram Ghoshal, Charles D. Schaper, Andrew Li, Toh –Ming Lu, JVST B, submitted.
- “Biaxially oriented CaF<sub>2</sub> films on amorphous substrates”, H.-F. Li, T. Parker, F. Tang, G.-C. Wang, T.-M. Lu, S. Lee, Appl. Phys. Lett., Submitted.

## Heidi Newberg

- “Less Pay, A Little Less Work,” Heidi Jo Newberg, *Motherhood: The Elephant in the Laboratory*, edited by Emily Monosson, Cornell University Press, in press
- “Maximum Likelihood Fitting of Tidal Streams with Application to the Sagittarius Dwarf
- Tidal Tails, Cole, N., Newberg, H. J., Magdon-Ismail, M., Desell, T., Dawsey, K., Hayashi, W., Liu, X., Purnell, J., Szymanski, B., Varela, C. & Wisniewski, J., *Ap. J.*, submitted
- “Candidate Milky Way satellites in the Galactic halo,” Liu, C., Hu, J., Newberg, H., and Zhao, Y., *A&A*, submitted
- “The SEGUE Stellar Parameter Pipeline. II. Validation with Galactic Globular and Open Clusters,” Lee, Y. S., Beers, T. C., Sivarani, T., Johnson, J. A., An, D., Wilhelm, R., Allende Prieto, C., Koesterke, L., Re Fiorentin, P., Bailer-Jones, C. A. L., Norris, J. E., Yanny, B., Rockosi, C. M., Newberg, H. J., Cudworth, K. M., Pan, K., A.J., submitted
- “The SEGUE Stellar Parameter Pipeline. I. Description and Initial Validation Tests,” Lee, Y. S., Beers, T. S., Sivarani, T., Allende Prieto, C., Koesterke, L., Wilhelm, R., Norris, J. E., Bailer-Jones, C. A. L., Re Fiorentin, P., Rockosi, C. M., Yanny, B., Newberg, H., Covey, K. R., *A.J.*, submitted
- “The Fifth Data Release of the Sloan Digital Sky Survey,” Adelman-McCarthy et al., *Ap.J.Suppl.*, **172**, 634, 2007
- “The Overdensity in Virgo, Sagittarius Debris, and the Asymmetric Spheroid,” Newberg, H. J., Yanny, B., Cole, N., Beers, T. C., D., Re Fiorentin, P., Schneider, D. P., and Wilhelm, R., *Ap. J.*, **668**, 221-235, 2007
- “Overdensity in Virgo, Sagittarius debris and the asymmetric spheroid,” Newberg, H., Proceedings of The Milky Way Halo – Stars and Gas – Locations, Motions, Origins (2007), <http://www.astro.uni-bonn.de/~mwhalo/proceedings/>

## Fred Schubert

- Schubert, Martin F., Sameer Chhajed, Jong Kyu Kim, E. Fred Schubert, and Jaehee Cho “Polarization of light emission by 460 nm GaInN/GaN light-emitting diodes grown on (0001) oriented sapphire substrates” *Applied Physics Letters* **91**, 051117 (August 2007)
- Schubert, Martin F., Ahmed Noemaun, Sameer Chhajed, Jong Kyu Kim, E. Fred Schubert, and Cheolsoo Sone “Encapsulation shape with non-rotational symmetry designed for extraction of polarized light from unpolarized sources” *Optics Express* **15**, 10452 (August 2007)

- **(Invited)** Schubert, E. Fred and Jong Kyu Kim “Low-refractive index materials: A new class of optical thin-film materials” *Physica Status Solidi B* **244**, 3002 (DOI: 10.1002/pssb.200675603) (August 2007)
- Chen Kaixuan X., Q. Dai, W. Lee, J. K. Kim, E. F. Schubert, W. Liu, S. Wu, X. Li, and J. A. Smart “Parasitic sub-band-gap emission originating from compensating native defects in Si doped AlGaInN” *Applied Physics Letters* **91**, 121110 (September 2007)
- Schubert, Martin F., Sameer Chhajed, Jong Kyu Kim, E. Fred Schubert, and Jaehee Cho “Linearly polarized emission from GaInN light-emitting diodes with polarization-enhancing reflector” *Optics Express* **15**, 11213 (September 2007)
- **(Invited)** Schubert, E. F., J. K. Kim, and J.-Q. Xi “Light-emitting diodes hit the centenary milestone” *Compound Semiconductors* October issue, page 20–23 (October 2007)
- Kim, Min-Ho, Martin F. Schubert, Qi Dai, Jong Kyu Kim, E. Fred Schubert, Joachim Piprek, and Yongjo Park “Origin of efficiency droop in GaN-based light-emitting diodes” *Applied Physics Letters* **91**, 183507 (October 2007)

### Michael Shur

- Pala, N. Yang, Z. Koudymov, A. Hu, X. Deng, J. Gaska, R. Simin, G. Shur, M. S., Drain-to-Gate Field Engineering for Improved Frequency Response of GaN-based HEMTs, Device Research Conference, 2007 65th Annual, 18-20 June 2007, pp. 43-44, ISSN: 1548-3770, ISBN: 978-1-4244-1102-3
- Michael Shur. Terahertz Sensing Technology, in Tutorial Book, IEEE Sensors Conference, October 26-31 (2007) pp. 252-310
- W.J. Stillman and M.S. Shur, Closing the Gap: Plasma Wave Electronic Terahertz Detectors, *Journal of Nanoelectronics and Optoelectronics*, Vol. 2, 1–13, 2007
- S. L. Romyantsev, Kristel Fobelets, Thomas Hackbarth, and Michael S. Shur, Low Frequency Noise in Insulated-Gate Strained-Si n-Channel Modulation Doped Field Effect Transistors, *Japanese Journal of Applied Physics* Vol. 46, No. 7A, pp. 4011–4015 (2007)
- V. Tokranov, S.L. Romyantsev, M. S. Shur, R. Gaska, S. Oktyabrsky, R. Jain, N. Pala, The HfO<sub>2</sub>/AlGaIn/GaN structures with HfO<sub>2</sub> deposited at ultra low pressure using e-beam, *phys. stat. sol. (RRL)* 1, No. 5, 199–201 (2007) / DOI 10.1002/pssr.200701136
- Dmitry Veksler, Andrey Muravjov, William Stillman, Nezih Pala, and Michael Shur, Detection and Homodyne Mixing of Terahertz Gas Laser Radiation by Submicron GaAs/AlGaAs FETs, in Abstracts of IEEE sensors Conference, Atlanta, GA, October 2007, p. 229-230
- W. Stillman, F. Guarin, V. Yu. Kachorovskii, N. Pala, S. Romyantsev, M.S. Shur, and D. Veksler, Nanometer Scale Complementary Silicon MOSFETs as Detectors of Terahertz and Sub-terahertz Radiation, in Abstracts of IEEE sensors Conference, Atlanta, GA, October 2007, pp. 479-480
- N. Pala, D. Veksler, A. Muravjov, W. Stillman, R. Gaska, and M. S. Shur, Resonant Detection and Modulation of Terahertz Radiation by 2DEG Plasmons in GaN Grating-Gate Structures, in Abstracts of IEEE Sensors Conference, Atlanta, GA, October 2007, pp. 291-292
- R. Rimeika, D. Čiplys, V. Poderys, R. Rotomskis, S. Balakauskas and M. S. Shur, Subsecond-response SAW humidity sensor with porphyrin nanostructure

deposited on bare and metallized piezoelectric substrate, *Electronics Letters*.  
13th Vol. 43 No. 19, September 2007

- M. S. Shur, D. Veksler, V. Chivukula, A. Koudymov, T. Ytterdal, B. Iñiguez, and W. Jackson, Modeling Of Thin Film Transistors With Non-Ideal Contacts, *ECS Proceedings*, vol. 8, No. 1, pp. 165-170 (2007)
- W.B. Jackson, M. Almanza-Workman, A. Chaiken, R. Garcia, A. Jeans, H.-J. Kim, O. Kwon, H. Luo, P. Mei, C. Perlov, C. Taussig, M. S. Shur, A. Koudymov, Large Area Flexible Electronics Fabricated Using Self-Aligned Imprint Lithography, *ECS Proceedings*, vol. 8, No. 1, pp. 199-204 (2007)
- M. E. Levinshtein, S. L. Rumyantsev, R. Tauk, S. Boubanga, N. Dyakonova, W. Knap, A. Shchepetov, S. Bollaert, Y. Rollens, and M. S. Shur, Low frequency noise in InAlAs/InGaAs modulation doped field effect transistors with 50-nm gate length, *J. Appl. Phys.* 102, 064506 (2007)
- Venkata S. Chivukula, Michael S. Shur, Daumantas Ciplys, Surface Acoustic Wave and Acousto-Optic Sensors for Biological and Medical Applications, *physica status solidi, phys. stat. sol. (a)* 204, No. 10, 3209 - 3236 (2007)
- V. Ryzhii, M. Ryzhii, Y. Hu, I. Hagiwara, and M. S. Shur, Resonant detection of modulated terahertz radiation in micromachined high-electron mobility transistor, *APPLIED PHYSICS LETTERS* 90, 203503 (2007)
- Satou, V. Ryzhii, T. Otsuji, and M.S. Shur, Resonant terahertz detection antenna utilizing plasma oscillations in lateral schottky diode, International Workshop "Tera-and Nano-Devices: Physics and Modeling" University of Aizu, Aizu-Wakamatse, Japan, October 16-19 (2006), , *IJHSES*, September (2007)
- Popov, V.V. Polischuk, O.V. Teperik, T.V. Shur, M.S., Tunable Screening of Inter-Contact Plasmons by a Recessed Gate in Field-Effect Transistor with Two-Dimensional Electron Channel, in: *Physics and Engineering of Microwaves, Millimeter and Submillimeter Waves and Workshop on Terahertz Technologies, 2007. MSMW '07. The Sixth International Kharkov Symposium, 25-30 June 2007*, Volume: 2, pp. 848-850, ISBN: 1-4244-1237-4
- Iniguez, B. Picos, R. Estrada, M. Cerdeira, A. Ytterdal, T.A. Jackson, W. Koudymov, A. Veksler, D. Shur, M.S., Modelling of Thin Film Transistors for Circuit Simulation, in: *Mixed Design of Integrated Circuits and Systems, 2007. MIXDES '07. 14th International Conference: 21-23 June 2007*, pp. 35-40, ISBN: 83-922632-9-4
- Saunier, P. Lee, C. Balistreri, A. Dumka, D. Jimenez, J. Tserng, H. Q. Kao, M.Y. Chao, P.C. Chu, K. Souzis, A. Eliashevich, I. Guo, S. del Alamo, J. Joh, J. Shur, M. Progress in GaN Performances and Reliability, *Device Research Conference, 2007 65th Annual Publication Date: 18-20 June 2007*, pp. 35-36, ISSN: 1548-3770, ISBN: 978-1-4244-1102-3
- Simin, G. Yang, Z.-J. Shur, M., High-power III-Nitride Integrated Microwave Switch with capacitively-coupled contacts, *Microwave Symposium, 2007. IEEE/MTT-S International. Publication Date: 3-8 June 2007* pp. 457-460, ISSN: 0149-645X, ISBN: 1-4244-0688-9
- S. L. Rumyantsev, C. Wetzel, M. S. Shur, Current and Optical low-frequency noise of GaInN/GaN green light emitting diodes, *Fourth SPIE International Symposium on Fluctuations and Noise, 20-24 May 2007, Florence, Italy, Proc. of SPIE Vol. 6600 66000I-1*

- T. V. Teperik, F. J. Garcia de Abajo, V. V. Popov, and M. S. Shur, Strong terahertz absorption bands in a scaled plasmonic crystal, *Applied Physics Letters* 90, 251910 (2007)
- S. L. Romyantsev, A. Dmitriev, M. Levinstein, D. Veksler, M. S. Shur, J. Palmour, M. Das, B. Hull, Generation-recombination noise in forward-biased 4H-SiC p-n diode, 20-24 May 2007, Florence, Italy, PROCEEDINGS- SPIE THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING, 2007, VOL 6600, pages 6600 1J
- R. Rimeika, D. Čiplys, P. Každailis, M. S. Shur, Anisotropic acousto-optic diffraction by leaky wave radiation in ZX-LiNbO<sub>3</sub>, *Applied Physics Letters*, vol. 90, no 18, 181935 (2007)
- Koudymov, M. S. Shur, G. Simin, R. Gaska *Journal : physica status solidi (RRL) - Rapid Research Letters* Volume : 1 Issue : 3 Pages : 116-118 Date : May 2007
- M. S. Shur, Terahertz Technology for Space Exploration and for Data Communication, *Proceedings of SPIE -- Volume 6776, Broadband Access Communication Technologies II*, Raj Jain, Benjamin B. Dingel, Shozo Komaki, Shlomo Ovadia, Editors, 67760D (Sep. 10, 2007)
- J. Mickevičius, G. Tamulaitis, and E. Kuokštis, K. Liu and M. S. Shur, J. P. Zhang and R. Gaska Well-width-dependent carrier lifetime in AlGa<sub>N</sub>/AlGa<sub>N</sub> quantum wells, *Appl. Phys. Lett.* 90, 131907 (2007)
- W. Stillman, M.S. Shur, S. Romyantsev, D. Veksler and F. Guarin, Device loading effects on nonresonant detection of terahertz radiation by silicon MOSFETs, *Electronics letters*, Vol. 43 No. 7, 29th March 2007
- Koudymov, M. S. Shur, and G. Simin, Compact Model of Current Collapse in Heterostructure Field-Effect Transistors, *IEEE Electron Device Letters*, Vol. 28, No. 5, pp. 332-335 May 2007
- V. V. Popov, M. S. Shur, G. M. Tsymbalov, and D. V. Fateev, Higher-order plasmon resonances in GaN-based field-effect transistor arrays, *International Journal of High Speed Electronics and Systems*, vol. 17, No. 3 (2007), also published in *Advanced Semiconductor Devices, Selected Topics in Electronics and Systems*, vo. 48 (2007)
- Jianyu Deng, Yuriy Bilenko, Alex Lunev, Xuhong Hu, Thomas M Katona, Jianping Zhang, Michael S. Shur and Remis Gaska, 247 nm Ultra-Violet Light Emitting Diodes, *Japanese Journal of Applied Physics*, Vol. 46, No. 12, 2007, pp. L263-L264
- E. Kuokstis, G. Tamulaitis, K. Liu, M. S. Shur, J.W. Yang and M. Asif Khan, Photoluminescence dynamics in highly nonhomogeneously excited GaN, *Appl. Phys. Lett.* 90, 161920 (2007)
- V. V. Popov, G. M. Tsymbalov, D. V. Fateev, and M. S. Shur, Higher-order plasmon resonances in GaN field-effect transistor arrays with joint and separate electron channels, Terahertz excitation of the higher-order plasmon modes in field-effect transistor arrays with common and separate two-dimensional electron channels, *Bulletin of the Russian Academy of Sciences: Physics*, Volume 71, Number 1 / January, Pages 89-92, 2007, also in В.В. Попов, Г.М. Цымбалов, Т.В. Теперик, Д.В. Фатеев, М.С. Шур, Терагерцовое возбуждение высших плазмонных мод в массивах полевых транзисторов с общим и отдельными двумерными электронными каналами, *Известия РАН. Серия физическая* - том 71, № 1, Январь 2007, С. 93-96,

- N. B. Gorev, I. F. Kodzhespirova, E. N. Privalov, N. Khuchua, L. Khvedelidze, M. S. Shur, Photocapacitance of selectively doped AlGaAs/GaAs heterostructures containing deep traps, International Journal of High Speed Electronics and Systems, International Journal of High Speed Electronics and Systems, vol. 17, No. 1 pp. 189-192 (2007), also published in Advanced Semiconductor Devices, Selected Topics in Electronics and Systems, vo. 45 (2007), pp. 189-192
- V. O. Turin, M. S. Shur, and D. B. Veksler, Simulations of field-plated and recessed gate gallium nitride-based heterojunction field-effect transistors, International Journal of High Speed Electronics and Systems, vol. 17, No. 1 pp. 19-23 (2007), also published in Advanced Semiconductor Devices, Selected Topics in Electronics and Systems, vo. 45 (2007), pp. 19-23
- P. Dmitriev, V. Yu. Kachorovskii, and M.S. Shur, Granular semiconductor/pyroelectric media as a tunable plasmonic crystal, Solid State Electronics, vol. 51, pp. 812–815 (2007)
- В.В. Попов, Г.М. Цымбалов, Т.В. Теперик, Д.В. Фатеев, М.С. Шур, Терагерцовое возбуждение высших плазмонных мод в массивах полевых транзисторов с общим и отдельными двумерными электронными каналами, Известия РАН. Серия физическая - том 71, № 1, Январь 2007, С. 93-96
- S. Marcinkevičius, K. Liu, D. Veksler, and M. S. Shur, R. Gaska, Intrinsic electric fields in AlGaN quantum well light-emitting diodes, APPLIED PHYSICS LETTERS 90, 081914 (2007)
- Michel Shur's article "Metal Semiconductor Field effect Transistors" was published in the second edition of RF and Microwave handbook edited by Mike Golio

### **Gwo-Ching Wang**

- F. Tang, G.-C. Wang, and T.-M. Lu, "In situ RHEED surface pole figure study of biaxial texture evolution in anisotropic Mg nanoblades during shadowing growth", J. Appl. Phys. 102, 014306 (2007).
- F. Tang, T. Parker, G.-C. Wang, and T.-M. Lu, "Surface texture evolution of polycrystalline and nanostructured films: RHEED surface pole figure analysis", Journal of Physics D: Applied Physics 40, R427 – R439 (2007), Invited Topical review.
- "Epitaxial multilayered Co/Cu nanocolumns grown by oblique angle deposition", A K Kar<sup>1</sup>, P Morrow<sup>1</sup>, X-T Tang<sup>1</sup>, T C Parker<sup>1</sup>, H Li<sup>1</sup>, J-Y Dai<sup>2</sup>, M Shima<sup>3</sup> and G-C Wang<sup>1</sup>  
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<sup>3</sup> Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, Troy, New York 12180-3590 J. Nanotechnology 18, 295702 (2007).
- "Unusual magnesium crystalline nanoblades grown by oblique angle vapor deposition", F. Tang, T. Parker, H.-F. Li, G.-C. Wang, and T.-M. Lu, Journal of Nanoscience and Nanotechnology 7, 3239–3244 (2007).
- "Plasma enhanced atomic layer deposition of palladium on a polymer substrate", Gregory A. Ten Eyck\*, Samuk Pimanpang<sup>‡</sup>, Jasbir S. Juneja<sup>‡</sup>, Hassaram Bakhru<sup>€</sup>, Toh-Ming Lu<sup>‡</sup>, and Gwo-Ching Wang<sup>‡</sup>, \* Rensselaer Polytechnic Institute, Dept. of Electrical, Computer, and Systems Engineering, Troy, NY

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Advanced Materials Chemical Vapor Deposition 13, Issue 6-7, 307 (2007).

- "Enhancement of Cu(hfac)<sub>2</sub> chemisorption on the Paralene surface by N<sub>2</sub> plasma surface modification", S. Pimanpang, Pei-I. Wang, Dexian Ye, Jasbir S. Juneja, G.-C. Wang, and T.-M. Lu, J. of Electrochemical Society 154 (10), G215 –G219 (2007).

## Christian Wetzel

- "Very Strong Nonlinear Optical Absorption in Green GaInN/GaN Multiple Quantum Well Structures," W. Zhao, M. Zhu, Y. Xia, Y. Li, S. You, J. Senawiratne, T. Detchprohm, and C. Wetzel; Phys. Stat. Sol. (c), accepted 2007.
- "The Quantum Efficiency of Green GaInN/GaN Light Emitting Diodes," W. Zhao, Y. Li, T. Detchprohm, and C. Wetzel; Phys. Stat. Sol. (c) **4**, 9-12, (2007).
- "V-defect Analysis in Green and Deep Green Light Emitting Diodes Structures", M. Zhu, T. Detchprohm, S. You, Y. Wang, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, Z. Zhang, and C. Wetzel, Phys. Stat. Sol. (c), accepted 2007.
- "Superluminescence in Green Emission GaInN/GaN Quantum Well Structures under Pulsed Laser Excitation", J. Senawiratne, S. Tomasulo, T. Detchprohm, M. Zhu, Y. Li, W. Zhao, Y. Xia, P.D. Persans, and C. Wetzel, Submitted to Mat. Res. Soc. Symp. Proc. Vol. 1040E (2007).
- "Structural Characterization of Homoepitaxial GaInN/GaN Light Emitting Diodes by Transmission Electron Microscopy", M. Zhu, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, T. Detchprohm, and C. Wetzel, J. Electron. Mater., accepted 2007.
- "Structural Analysis in Low V-defect Blue and Green Light Emitting Diodes", M. Zhu, T. Detchprohm, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, S. You, L. Liu, E. A. Preble, D. Hanser, and C. Wetzel, 2007 Fall Proceedings, Vol. 1040E, submitted (2007).
- "Photon Modulated Electroluminescence of GaInN/GaN Multiple Quantum Well Light Emitting Diodes," Y. Li, J. Senawiratne, W. Zhao, Y. Xia, M. Zhu, T. Detchprohm, and C. Wetzel; Phys, Stat. Sol. accepted 2007.
- "Optical properties of GaInN/GaN multi-quantum well structure and light emitting diode grown by metal organic chemical vapor phase epitaxy", J. Senawiratne, M. Zhu, W. Zhao, Y. Xia, Y. Li, T. Detchprohm, and C. Wetzel, Int. J. High Speed Elect. Syst., **17**, No. 1, 81 (2007).
- "Low-Temperature Cathodoluminescence Mapping of Green, Blue, and UV GaInN/GaN LED Dies", Y. Xia, T. Detchprohm, J. Senawiratne, Y. Li, W. Zhao, M. Zhu and C. Wetzel; in "Advances in III-V Nitride Semiconductor Materials and Devices," Proc. Mat. Res. Soc. Symp. Vol. 955, 115.45 (2007).
- "Junction Temperature Analysis in Green Light Emitting Diodes on Sapphire and GaN Substrates", J. Senawiratne, W. Zhao, T. Detchprohm, A. Chatterjee, Y. Li, M. Zhu, Y. Xia, J. L. Plawsky, and C. Wetzel, Phys. Stat. Sol., Accepted (2007).
- "Junction Temperature Analysis and Thermal Modeling of GaInN/GaN Quantum Well Light Emitting Diodes", J. Senawiratne, Y. Li, M. Zhu, Y. Xia, W. Zhao, T. Detchprohm, and C. Wetzel, J. Elect. Mater., Accepted (2007)
- "Green Light Emitting Diodes under Photon and Electron Beam Modulation," Y. Li, J. Senawiratne, Y. Xia, M. Zhu, W. Zhao, T. Detchprohm, and C. Wetzel, Fall

Meeting of the Materials Research Society, Boston, MA, USA, Nov 26- 30, 2007 (accepted).

- "Loss of Quantum Efficiency in Green Light Emitting Diode Dies at Low Temperature," Y. Li, W. Zhao, Y. Xia, M. Zhu, J. Senawiratne, T. Detchprohm, E. F. Schubert and C. Wetzel, in *Advances in III-V Nitride Semiconductor Materials and Devices*, edited by C.R. Abernathy, H. Jiang, J.M. Zavada (Mater. Res. Soc. Symp. Proc. 955E, Warrendale, PA, 2007), 0955-115-12.
- "Temperature Dependence of the Quantum Efficiency in Green Light Emitting Diode Dies," Y. Li, W. Zhao, Y. Xia, M. Zhu, J. Senawiratne, T. Detchprohm, E.F. Schubert, and C. Wetzel; *Phys, Stat. Sol.* **4**, No. 7, 2784-2787 (2007).
- "Low Temperature Electroluminescence of Green and Deep Green GaInN/GaN Light Emitting Diodes," Y. Li, W. Zhao, Y. Xia, M. Zhu, J. Senawiratne, T. Detchprohm, and C. Wetzel; *Int. J. High Speed Electronics and Systems*, Vol. **17**, No.1 25-28 (2007).

### **Masashi Yamaguchi**

- "Terahertz pulse generation from noble gases", Y.Chen, M.Yamaguchi, M.Wang, and X.-C. Zhang, *Appl.Phys.Lett.*, **91**, 25116(2007).
- "Terahertz phonon-polariton imaging for the application of chemical detection", M. Yamaguchi, M. Wang, P. Suarez, *J. High Speed Electr. System*, **17**, 355-365 (2007).
- "Ambient air used as the nonlinear media for THz wave generation", X. Xie, J. Dai, M. Yamaguchi, and X.-C. Zhang, *J. High Speed Electr. System*, **17**, 69-78 (2007).

### **Xi-Cheng Zhang**

- X. Xie, J. M. Dai, M. Yamaguchi, and X.-C. Zhang, "Ambient air used as the nonlinear media for THz wave generation," *International Journal of High Speed Electronics and Systems*, **17**, 67, 2007.
- Edited by D. Abbott and X.-C. Zhang, Special issue on T-ray imaging, sensing, & retection, *Proceedings of the IEEE*, **95** 2007.
- D. Abbott and X.-C. Zhang, "Scanning the issue T-ray imaging, sensing, & retection," *Proceedings of the IEEE*, **95**, 1509, 2007.
- H.B. Liu, H. Zhong, N. Karpowicz, Y.Q. Chen, and X.-C. Zhang, "THz spectroscopy and imaging for defense and security applications," *Proceedings of the IEEE*, **95**, 1514, 2007.
- Xu Xie, Jianming Dai, Masashi Yamaguchi and X.-C. Zhang, "Ambient Air Used as the Nonlinear Media for THz Wave Generation", *International Journal of High Speed Electronics and Systems*, **17**, No. 2, 261-270, 2007.
- Yunqing Chen, Haibo Liu and X.-C. Zhang, "Experimental and Density Functional Theory Study on THz Spectra of 4-NT and 2, 6-DNT", *International Journal of High Speed Electronics and Systems*, **17**, No. 2, 283-291, 2007.
- Hua Zhong, Albert Redo-Sanchez, and Xi-Cheng Zhang, "Standoff Sensing and Imaging of Explosive Related Chemical and Bio-Chemical Materials Using THz-TDS", *International Journal of High Speed Electronics and Systems*, **17**, No. 2, 239-249, 2007.
- Jianming Dai, Xu Xie, and X.-C. Zhang, "Terahertz Wave Amplification in Gases with the Excitation of Femtosecond Laser Pulses", *Appl. Phys. Letts.*, **91**, 211102, 2007.
- Nicholas Karpowicz, Jianming Dai, Xiaofei Lu, Liangliang Zhang, Cunlin Zhang, Yuqing Chen, Masashi Yamaguchi, Hongwei Zhao, Matthew Price-Gallagher,

Keith Johnson, Orval Mamer, Alain Lesimple, Clark Fletcher, and X.-C. Zhang, A coherent heterodyne time-domain spectrometer covering entire terahertz "gap", Appl. Phys. Letts., 2007. In pressed.

- Patric Lockhart and P.S. Dutta, Pengyu Han and X.-C. Zhang, "Terahertz Emission Mechanisms in InAsxP1-x," submitted to Appl. Phys. Letts., 2007. In pressed.
- Albert Redo-Sanchez and X.-C. Zhang, "Terahertz Science and Technology Trends," Journal of Selected Topics in Quantum Electronics, invited paper, 2007. In pressed.
- Real-time transition of a photonic crystal to a surface plasmon resonance," J. G. Han, Azad, W. L. Zhang, J. Z. Xu, J. Chen, and X.-C. Zhang, WuLi (Chinese Physics Today), **36**, 507, 2007.
- "Absorption coefficients of selected explosives and related compounds in the range of 0.1-2.8 THz," Jian Chen, Yunqing Chen, Hongwei Zhao, Glenn J. Bastiaans, and X.-C. Zhang, Optical Express, **19**, 12060, 2007.
- "THz science, technology, and applications," Jingzhou Xu and X.-C. Zhang, Peking University Press, ISBN978-7-301-12503-8, 2007.
- "Scanning the issue, T-ray imaging, sensing, and retection" D. Abbott and X.-C. Zhang, Proceedings of the IEEE **95**, 1509, 2007
- "THz spectroscopy and imaging for defense and security applications", Hai-Bo Liu, Member, IEEE, Hua Zhong, Nicholas Karpowicz, Yunqing Chen, and X.-C. Zhang, Proceedings of the IEEE **95**, 1514, 2007

## **PROPOSALS (SUBMITTED or GRANTED)**

### **Joel Giedt**

- Submitted Outstanding Junior Investigator, Office of High Energy Physics, Department of Energy proposal: "Strongly coupled supersymmetry from the lattice, warped extra dimensions and warped strings: spectrum calculations, LHC phenomenology and implications for neutrino experiments." Sole PI, amount \$203,710.

### **Toh-Ming Lu**

#### **Granted:**

- "Reliability of Cu/ultra-low-k material systems", SRC, \$118,000, funded, Feb 1, 2008-Jan 31, 2009.
- "MRI: Acquisition of surface enhanced confocal Raman-AFM", PI: Chang Ryu, Co-PI: Toh-Ming Lu, Robert Linhardt, Dick Siegel, NSF, \$445,000, Sept 1, 2007 to August 31, 2008, funded.
- "PIRE: POLYMER Education and Research Partnership between US and Korea", Toh-Ming Lu as Senior Personnel, PI: Chang Ryu, \$500K/year for five years, NSF, funded.

#### **Submitted:**

- "A novel reflection high-energy electron diffraction surface pole figure technique for in situ study of growth front biaxial texture evolution", PI: Gwo-Ching Wang, Co-PI: Toh-Ming Lu, DOE, \$688,000, May 15, 2008-May 14, 2011, pending.
- "Testing of material fatigue and rate effects at the nanoscale using isolated nanostructures", PI: C. Picu, Co-PI: G.-C. Wang and T.-M. Lu, NSF, \$475,000, June 1, 2008-May 31, 2011, pending.
- "Fundamental study of Pt nanorod catalyst-electrode structures for high efficiency

fuel cells”, PI: N. Koratkar, Co-PIs: Toh-Ming Lu, and Glenn Eisman, DOE, \$640,000, August 1, 2008 – July 31, 2011, pending.

- “Fundamental study of Pt nanorod catalyst-electrode structures for high efficiency fuel cells”, PI: N. Koratkar, Co-PIs: Toh-Ming Lu, Tansel Karabacak, and Glenn Eisman, NSF, \$225,000, August 1, 2008 – July 31, 2011, pending.
- “Hydrogenation/de-hydrogenation in Pd-coated ultra-thin Mg nanoblades”, PI: Gwo-Ching Wang, Co-PIs: Toh-Ming Lu and Shengbai Zhang, NSF, \$430,000, May 15, 2008 – May 14, 2011, pending.
- “Realization of Photonic Band Gap Materials and Photonic Heterostructures By Innovative Material Growth”, PI: S. Lin and Co-PI: T.-M. Lu, NSF, \$370,000, Feb 1, 2008- Jan 31, 2011, pending.

### **Heidi Newberg**

- “REU Supplement: Revealing the Structure of the Galactic Halo through Statistical Analysis – Middle School Teacher Training,” March 2007, \$13,444, NSF, granted
- “REU Supplement: SEI(AST): A Dynamic Grid for Astroinformatics: Data-Driven Discovery of the Milky Way Origin and Evolution from the Sloan Digital Sky Survey,” March 2007, Magdon-Ismael, Szymanski, Varela, and Newberg, March 2007, \$50,000, NSF, granted
- “National Space Grant College and Fellowship Program,” New York Space Grant consortium, Cornell University, starting April 1, 2008, \$10,000
- “Planning US Partnership in Galactic Structure with the Chinese LAMOST Telescope,” June 1, 2008, 15 months, \$150,737

### **Michael Shur**

#### **Granted:**

- Workshop on “Frontiers in Electronics”, 2007 US Dept. of Defense, L10536 \$5,000 7/1/07 – 12/31/07
- Nitride-based Terahertz Nanoelectronics, U.S. Civilian Research and Development Foundation, J90255 \$11,900 2/1/06 – 1/31/08
- Exitaxial Multifunctional Materials & Applications: Revolutionary Epitaxial Universities, J90222 \$318,255 5/1/04 – 11/30/07
- Connection One Consortium for Telecommunication Circuits and Systems Velox Semiconductor Corporation, J71098 \$50,000 4/24/06 – 4/23/08
- Connection One Consortium for Telecommunication Circuits and Systems IBM, J71097 \$100,000 5/26/06 – 5/26/08
- Modeling and Characterization of ZnO and a-Si Thin Film Transistors Hewlett Packard Co., J71068 \$158,140 11/01/05 – 12/31/09
- Workshop on “Frontiers in Electronics” 2007 US Dept. of Defense, J11895 \$10,000 9/1/07 – 2/29/08
- Workshop on “Frontiers in Electronics” 2007 National Science Foundation, J11879 \$10,000 9/1/07 – 8/31/08
- Workshop on “Frontiers in Electronics” 2007 US Dept. of Defense, J11851 \$10,000 9/1/07 – 8/31/08
- MRI: Development of Backward Wave Oscillator Tunable Broadband THz Source for THz Electronics Research, THz-Materials Research and THz-Imaging National Science Foundation, J11761 \$390,000 9/1/06 – 8/31/08
- THz Detection of Improvised Explosive Devices US Dept. of Defense, J11745 \$487,911 6/1/07 – 6/9/09

- RPI Research Site of Industry/University Cooperative Research Center “Connection One” National Science Foundation, J11536 \$210,000 11/1/04 – 10/31/08
- IGERT: Terahertz Science and Technology-A Studio-Based Approach; National Science Foundation, J11435 \$3,904,902 1/1/03 – 9/30/08

**Submitted:**

- Multi-Input Antenna Transceiver (MIMOTRX); National Science Foundation, 54205517A \$35,000 9/1/05 – 8/31/08
- Intracavity THz Laser Spectroscopy for Human Breath Analysis; National Science Foundation, 2453 \$321,132 1/1/08 – 12/31/10
- Nonlinear and Double Resonance THz Spectroscopy for Molecular Recognition US Dept. of Defense, 2398 \$1,521,981 11/15/07 – 11/14/10
- Workshop on “Frontiers in Electronics”, 2007 Air Force Research Lab, 2333 \$5,000 9/1/07 – 8/31/08
- Modeling of Nanoscale Spintronic Devices SUNY – Albany, 2332 \$83,200 8/1/07 – 7/31/08
- CMOL Technology Development Sensor Electronic Technology Inc., 2319 \$20,000 8/1/07 – 8/31/08
- High Efficiency Deep Green Light Emitting Diodes Sensor Electronic Technology Inc., 2292 \$30,000 8/1/07 – 1/31/08
- Granular Pyroelectric Semiconductor Devices for Multifunctional Applications US Dept. of Defense, 2158, 21405517A \$204,766 7/1/07 – 6/30/10
- Materials and Device Development for High Performance MW-Wave AlInGaN HFET’s and MOSHFET’s ;Universities \$816,034 5/1/05 – 4/30/10
- Amorphous and Poly-Si TFT Modeling for LCD Applications Samsung Electro-mechanics Co. Ltd., 2090 \$149,995 4/1/07 – 3/31/08
- Micro Autonomous System and Technology Center for Microelectronics Universities, 1788 \$2,500,000 5/1/07 – 4/30/12
- Granular Pyroelectric Semiconductor Devices for Multifunctional Applications US Dept. of Defense, 1721 \$235,960 10/1/06 – 9/30/09

**Gwo-Ching Wang**

**Granted:**

- Proposal on Department Change Initiative, G.-C. Wang, G. Adams, J. Schroeder, \$10K for 1 year. Submitted to RAMP-Up Advisory Board, Oct. 4, 2007, granted.
- Hands-on physics outside classroom, G.-C. Wang, D. Millard, G. Bedrosian, and S. Dwyer, NSF, \$150K, two years, 2007-2008, granted.

**Submitted:**

- REU in physics at Rensselaer, G.-C. Wang, The NSF, \$222K for 2008-2010, submitted on Sept. 12, 2007.
- Hydrogenation/dehydrogenation in Pd-coated ultrathin Mg nanoblades: Experimental study and first-principles calculations, G.-C. Wang, T.-M. Lu and S.B. Zhang, NSF, \$430K for 2008-2010, Sept. 14, 2007.
- Testing material fatigue and rate effects at the nanoscale using isolated nanostructures, R.C. Picu, G.-C. Wang and T.-M. Lu, NSF, \$475.2K 2008-2010, submitted Sept. 30, 2007.
- A Novel Reflection High-Energy Electron Diffraction *Surface Pole Figure* Technique for *in situ* Study of Growth-Front Biaxial-Texture Evolution, G.-C. Wang and T.-M. Lu, DOE, \$688K, 2008-2011, submitted Oct. 2007.

- RF graphene electronics, E. Bhat, G.-C. Wang and S. Nayak, 2008-2009, DARPA, \$928K. Submitted Oct. 2007.
- Nanorod arrays for the generation of intense THz wave, Yamaguchi, Nayak, and Wang, 2008-2011, The NSF, \$470K, Submitted Nov. 2<sup>nd</sup>, 2007.
- Application of x-ray diffraction for the determination of multi-axis lattice deformation in crystalline explosives using synchrotron radiation, Wang, Gamache (Naval Surface Warfare Center Indian Head), ONR, \$225K, 2008-2011, submitted Nov. 17, 2007.

### **Christian Wetzel**

- Research In Light-Emitting Diodes (LEDs), 7/2007 – 6/2008, \$370,299, Samsung Electro-Mechanics Company, Ltd., Suwon, South Korea, granted.
- Collaborative Research on Nanoscience related to Solid State Lighting, 10/2007 – 9/2009, \$170,000, Sandia National Laboratory, granted.
- MRI: Acquisition of a Multipurpose X-ray Diffractometer System for Advanced Materials Research and Education, 7/2008 – 6/2009. \$389,982, National Science Foundation.
- VIGIL - Green Laser Diode Structures in Non-Polar Homoepitaxial MOVPE, 1/2008 – 12/2011, \$3,728,886, Defense Advanced Research Project Agency, granted.
- Epitaxy Development of Light Emitting Diodes, 8/2007 – 7/2008, \$ 60,000, Applied Materials, granted.
- Smart Lighting Engineering Research Center, 7/2008 – 6/2013, ca \$10M, National Science Foundation, invited.
- Building Bridges from High School to Grad School: Inspiring Students Through Discovery-based Activities in Energy and the Environment, National Science Foundation

### **Masashi Yamaguchi**

#### **Submitted**

- “Advanced Location of Explosive Related Threats (ALERT)”, PI X.-C.Zhang, co-PIs B.Roysam, M.Yamaguchi, R.Radke, B.Yazici, July 2007, Department of Homeland Security (Subcontract to Northeastern University) \$2,400,000 for three years, Submitted, July 2007.
- “MURI: Study of Multimode Thermal Transport across Controllably Designed Nanoscale Junctions of Dissimilar Materials “, Theodorian Borca-Tasciuc(RPI), co-PIs P.M. Ajayan (Rice), B.Yakobson (Rice), J.Kono (Rice), D.Borca-Tasciuc (RPI), M.Yamaguchi (RPI), J.Plawsky (RPI), M.Upamanyu (Colorado School of Mines), Air force, August 2007, White paper submitted, not funded.
- “Nanorod Arrays for the Generation of Intense Terahertz Wave”, PI M.Yamaguchi, S.Nayak, and G.C.Wang, NSF, November 2007, \$470,079 submitted.

### **Xi-Cheng Zhang**

#### **Granted:**

- Army Night Vision Lab, “Sensors for explosive detection (SED)”, X.-C. Zhang, \$1.05M, (Phase I, 18 months, \$249,995, Phase II, two years, \$800,000), September, 2007. Granted.
- Idaho National Lab, THz Technology, \$90,000. one year, 2008. Granted.
- South Africa CSIR, “Ten days Rental Inspection of High Voltage Isolator with THz Waves,” \$25,000, 10 days, 2007. Granted.
- Boeing Phantom Work, “THz wave measurement,” A. Redo and X.-C. Zhang,

- \$7,500, one week, 2007. Granted.
- University of Waterloo, (Canada), “THz wave measurement,” A. Redo and X.-C. Zhang, \$3,120, one day, 2007. Granted.
- NSF SBIR “Compact THz-ABCD Spectrometer”, NSF-IIP 0740625, \$100,000 with Zomege THz Corp (Rensselaer’s share \$30,000), six months, starting on Jan. 2008. Granted.
- NSF REU on THz Photonics, \$6,000, 2008. Granted.

**Submitted:**

- JIEDDO “Field test of THz ABCD,” \$100,000 with Zomege THz Corp (Rensselaer’s share \$60,000), one week Jan. 2008. pending.
- NYSTAR Technology Transfer Incentive Program, “Miniature high performance THz spectrometer,” X.-C. Zhang and A. Redo, \$500,000, two years, 2007. Submitted.
- DHS-CenSSIS ALERT program, PI, X.-C. Zhang, co-PI, J.M. Dai, A. Redo, Y.Q. Chen, M. Yamaguchi, \$1.6M, four years, 2007. Submitted.
- DOE SBIR Phase I, InnoSense LLC, “A portable polarization discriminating THz remote sensor”, (RPI share is \$33000 for 6 months) 2007. Submitted.
- Optoelectronics Industry Development Association [OIDA], “Chirped mirrors of a pre-chirp generator for remote terahertz wave generation in laser induced air plasma,” \$10,000. PI: Prof. Zhang, co-PI: Prof. Dai. Award.
- Optoelectronics Industry Development Association [OIDA], “High speed, high voltage modulator for THz generation,” \$10,000. : Prof. Zhang, co-PI: Dr. Y.G. Zhao. Award.
- Gerber Scientific International “Development of a Leather inspection device based on a fast-reflective Terahertz imaging system” \$85,000 (10 months): Prof. Zhang, and Prof. A. Redo. Award.

## **SIGNIFICANT RESULTS OBTAINED OR NEW RESEARCH AFFILIATES**

### **Toh-Ming Lu**

**Patent Granted:**

- “Siloxane epoxy polymers as metal diffusion barriers to reduce electromigration”, P.-I. Wang, T.-M. Lu, R. Ghoshal, and R. Ghoshal, US Patent No. 7285842 (2007).

### **Michael Shur**

**Patent Granted:**

- M. Shur and R. Gaska, Electromagnetic Radiation Generation Based on an Object Characteristic, US Patent 7,235,766, June 26 (2007)
- Q. Fareed, R. Gaska and M. S. Shur, Methods of Growing Nitride-Based Film Using Varying Pulses, provisional patent filed on May 7, 2003, published: No 20040224484 US Patent 7192849, March 20 (2007)

## **VISITORS TO RENSSELAER**

### **Heidi Newberg**

- Haotong Zhang, Chinese Academy of Sciences, LAMOST, April 8- May 9. Started a collaboration on SEGUE velocity data, exchanged information about SDSS and possible LAMOST surveys.

- Brian Yanny, Fermilab, May 13-18, 2007, continue collaboration on detection of substructure in the Galactic spheroid.
- Brian Yanny, Fermilab, July 24-30, 2007, continue collaboration on detection of substructure in the Galactic spheroid.
- Peter Mack, Sept. 28-29, fixed problems with telescope dome
- Licai Deng, Chinese Academy of Science, LAMOST, November 8-9, 2007, work collaborative NSF proposal
- Alex Szalay, Johns Hopkins University, physics colloquium speaker
- Brian Yanny, Fermilab, Dec. 17-20, 2007, continue collaboration on detection of substructure in the Galactic spheroid.

## **IMPORTANT ACTIVITIES OF STUDENTS**

### **Joel Giedt**

- Grad. students: Daniel Carrero studied classical field theory in AdS(5) background. David Hunt studied top production using event simulation code that is publically available. Undergrad. students: Matthew Pevarnik and Saroosh Shabbir studied neutrino phenomenology from a warped extra dimension using Maple and Mathematica scripts they wrote.

### **Heidi Newberg**

- Melissa Anderson successfully defended her PhD thesis: "Double Dalitz Plot Analysis of Flavor and CP Modes," August 24, 2007.
- Nate Cole presented "Maximum Likelihood Fits to the Sagittarius Stream," SDSS Spring Collaboration Meeting, Drexel University, Philadelphia, PA, April 2, 2007
- Nate Cole presented "Scientific Discovery Through Computationally Intensive Maximum Likelihood Evaluation" at CDI Symposium, Troy, NY, Sept. 7, 2007.
- Nate Cole passed candidacy exam, April 24, 2007
- Nate Cole presented "Maximum Likelihood Fits to the Sagittarius Dwarf Tidal Tails," SDSS Fall Collaboration Meeting, Fermi National Accelerator Laboratory, November 3, 2007
- Ben Willett presented "N-Body Simulations of Dwarfs," SDSS Spring Collaboration Meeting, Drexel University, Philadelphia, PA, April 1, 2007
- Ben Willett attended the International Max Planck Research School 2<sup>nd</sup> Heidelberg Summer School: The Milky Way Galaxy, Heidelberg, Germany, August 29, 2007 – September 5, 2007

### **Michael Shur**

- Doctoral Thesis - D. Veksler,

## **OTHER**

### **Michael Shur**

#### **Books Edited**

- M. S Shur, Paul Maki, and James Kolodzey, Editors, Advanced Semiconductor Devices, Proceedings of the 2006 Lester Eastman Conference, Cornell, Ithaca, NY, USA 26 August 2006, Selected Topics in Electronics and Systems - Vol. 45, World Scientific, ISBN 978-981-270-858-8 (2007)
- Mehdi Anwar, Anthony J. DeMaria, Michael S. Shur, Editors, Proceedings of SPIE -- Volume 6772: Terahertz Physics, Devices, and Systems II (2007)

- Yue Kuo, Dieter G. Ast, Michael Shur, Preface, Proceedings of 2007 International Conference on semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors (ULSIC vs. TFT), ECS Transactions, Volume 8, No. 1 (2007), ISSN 1938-6737 (online), ISSN 1938-5862 (print)
- M. S. Shur, S. L. Rumyantsev and M. E. Levinshtein, Editors, SiC Materials and Devices – vol. 2, World Sci. (2007) ISBN 981-270-383-5

## **Xi-Cheng Zhang**

### **Published Books**

- J. Z. Xu and X.-C. Zhang, “THz Science and Technology,” Physics Series Book, ISBN 978-7-301-12503-8, Peking University Press. China. 2007.
- Terahertz frequency detection and identification of materials and objects, edited by R.E. Miles, X.-C. Zhang, H. Eisele, A. Krotkus, NATO Science for Peace and Security Series – B: Physics and Biophysics, ISBN 978-1-4020-6501-9, Springer, The Netherlands. 2007.