

## Ming-Cheng Cheng

Associate Professor

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### EDUCATION

6/90 Ph.D. in Electrical Engineering, Polytechnic University (Brooklyn Poly), New York.

**Thesis Title:** *Non-equilibrium Transport of Carriers in Multi-valley Semiconductors*

6/86 M.S. in System Engineering from the EE Department, Polytechnic University (Brooklyn Poly), New York.

6/80 B.S. in Electrophysics (Semiconductors), National Chiao Tung University, Hsinchu, Taiwan.

### PROFESSIONAL EXPERIENCE

- **2000 - present** Associate Professor, Department of Electrical & Computer Engineering, Clarkson University.
- **Summer 2005** Summer faculty fellow, NASA Glenn Research Center, Cleveland, OH
- **Summer 2001** Visiting faculty, at IBM Microelectronics, Burlington, VT.
- **1995 - 2000** Associate Professor, Department of Electrical Engineering, University of New Orleans.
- **1990 - 1995** Assistant Professor, Department of Electrical Engineering, University of New Orleans.
- **1984 - 1990** Research Fellow, Weber Research Institute, Polytechnic University.
- **1985 - 1988** Adjunct Lecturer, Department of Electrical Engineering, Polytechnic University.
- **1982 - 1984** Electronic Engineer, *ITT* (International Telephone & Telegraph) in Taiwan.  
Hardware design of interface circuits for Electronic Switching Systems and PCM Terminals.

### RESEARCH EXPERIENCE

- Thermal and heat flow modeling in SOI devices, interconnects, integrated circuits
- Electrothermal simulation of SOI circuits
- Charge transport and spin-polarized transport simulation
- Monte Carlo simulation and hydrodynamic modeling of semiconductor devices
- Device modeling/simulation
- Single-event upset/burnout in Silicon Carbide devices due to high energy ionizing particle radiation
- Optimization of solid-state devices, such as MOSFETs, SOIs, Si/Ge HBTs,
- Eddy current and hysteresis losses in magnetic materials

### PUBLICATIONS

#### A. Published/Accepted Journal Papers

1. S. Saikin, M. Shen, **Ming-C. Cheng**, "Spin dynamics in a compound semiconductor spintronic structure with a Schottky barrier," *J. Phys.: Condens. Matter*, vol. 18, pp. 1535–1544, January 2006.
2. Min Shen, Semion Saikin, **Ming-C. Cheng**, "Spin injection in spin FETs using a step-doping profile," *IEEE Trans. Nanotechnol.*, vol. 4, pp. 40-44, Jan. 2005.
3. Feixia Yu, **Ming-C. Cheng**, "Application of heat flow models to SOI current mirrors," *Solid-State Electronics* Vol. 48, pp. 1733–1739, Oct. 2004.
4. Jun Lin; Min Shen; **Ming-C. Cheng**, M.L. Glasser, "Efficient thermal modeling of SOI MOSFETs for fast dynamic operation," *IEEE Trans. Electron Devices*, Vol. 51, pp. 1659-1666, Oct. 2004.
5. Ming Shen, Semion Saikin, **Ming-C. Cheng**, "Monte Carlo modeling of spin injection through a Schottky barrier and spin transport in a semiconductor quantum well," *J. Appl. Phys.*, Vol. **96**, pp.4319-4325, 2004.
6. Semion Saikin, Min Shen and **Ming-C. Cheng**, "Study of Spin-Polarized Transport Properties for Spin-FET Design Optimization", *IEEE Trans. Nanotechnology*, Vol. 3, pp. 173-179, March 2004.

7. **Ming-C. Cheng**, Feixia Yu, Peter Habitz, Goodarz Ahmadi, "Analytical heat flow modeling of silicon-on-insulator devices", *Solid-State Electronics*, Vol. 48, pp. 415-426, March 2004.
8. Min Shen, Semion Saikin, **Ming-C. Cheng**, Vladimir Privman, "Monte Carlo Modeling of Spin FETs Controlled by Spin-Orbit Interaction", *Math. Computers in Simulation*, 65, pp.351-363, March 2004.
9. **Ming-C. Cheng**, F. Yu, J. Lin, M. Shen, G. Ahmadi, "Steady-State and Dynamic Heat Flow Modeling of SOI MOSFET's", *Microelectronics Reliability*, vol.44, pp.381-396, March 2004. **(Invited paper)**
10. Feixia Yu, **Ming-C. Cheng**, Peter Habitz and Goodarz Ahmadi, "Modeling of Thermal Behavior in SOI Structures", *IEEE Trans. Electron Devices*, Vol. 51, pp. 83-91, January 2004.
11. Semion Saikin, Min Sen, **Ming-C. Cheng**, Vladimir Privman, "Semiclassical Monte Carlo Model for In-Plane Transport of Spin-Polarized Electrons in III-V Heterostructures", *Journal for Applied Physics*, Vol. 94, No. 3, pp.1769-1775, August 2003.
12. **Ming-C. Cheng**, Ramitha Wettimuny, Peter Habitz, Goodarz Ahmadi, "Thermal Simulation for SOI Devices Using Thermal Circuit Models and Device Simulation," *Solid St. Electronics*, Vol. 47, No. 2, pp. 345-351, Feb 2003.
13. M. Shen, S. Saikin, **M.C. Cheng**, V. Privman, "Monte Carlo Simulation of Spin-Polarized Transport," *Lect. Notes Comp. Sci.*, Vol. 2668-II, pp. 881-891 (2003).
14. Wai-Kay Yip, Min Shen, **Ming-C. Cheng**, Robert Fithen, Goodarz Ahmadi, "Hydrodynamic modeling of short-channel devices using an upwind flux vector splitting scheme," *Computer Methods Appl. Mech & Eng*, Vol. 191, pp. 5427-5445, December, 2002.
15. Min Shen, Wai-Kay Yip and **Ming-C. Cheng**, J.J. Liou, "An Upstream Flux Splitting Method for Hydrodynamic Modeling of Deep Submicron Devices," *VLSI Design*, Vol. 13, pp. 329-334, Nov. 2001.
16. Min Shen, **Ming-C. Cheng** and J. J. Liou "A Generalized Finite Element Method for Hydrodynamic Modeling of Short-Channel Devices," *VLSI Design*, Vol. 13, pp. 79-84, Nov. 2001.
17. Min Shen, Tongju Zhou, **Ming-C. Cheng**, Robert Fithen, "Least-squares Finite Element Formulation for Hydrodynamic Modeling of Semiconductor Devices," *Computer Methods Appl. Mech & Eng*, Vol. 190, pp. 2875-2891, February 16, 2001.
18. Jun Xu and **Ming-C. Cheng**, "Design Optimization of High Performance Low Temperature MOSFET's with Low-Impurity-Density Channel below 1 Volt," *IEEE Trans. Electron Devices*, Vol. 47, p. 813, April 2000.
19. **Ming-C. Cheng**, "Physics-Based Solutions to Carrier Distribution Functions in Extreme Non-Equilibrium Situations," *J. Phys. D: Appl. Phys.* Vol. 32, pp. 3047-3057, 1999.
20. Jun Xu and **Ming-C. Cheng**, "Optimization of Deep-Submicrometer Temperature Scalable MOSFET's based on Two dimensional Numerical Simulation," *J. Phys. IV*, Vol. 8-Pr3, pp. 29-32, 1998.
21. Liangying Guo, **Ming-C. Cheng**, Yansheng Luo and Robert Fithen, "Four-Moment Hydrodynamic Modeling of a Submicron Semiconductor Device," *J. Phys. D: Applied Physics*, Vol. 31, pp.913-921, 1998.
22. **Ming-C. Cheng**, "A New Concept for Solving The Boltzmann Transport Equation in Ultra-fast Transient Situations," *VLSI Design*, Vol. 6, pp. 217-222, 1998.
23. **Ming-C. Cheng**, "Modeling of the Low Temperature Electron Distribution Function for Ultra-fast Semiconductor Devices," *J. Phys. IV*, Vol. 8-Pr3, pp. 67-70, 1998.
24. **Ming-C. Cheng**, Liangying Guo, Robert Fithen, Yansheng Luo, "A Study of Nonparabolic Hydrodynamic Modeling of a Sub-micrometer  $n^+ - n - n^+$  Device," *J. Phys. D: Appl. Phys.* Vol. 30, p.2343-2353, 1997.
25. **Ming-C. Cheng**, "Kinetic Distribution Function in Multi-valley Semiconductors Evolving at the Momentum Relaxation Scale," *J. of Phys. D: Appl. Phys.*, Vol. 30, pp. 1038-1048, 1997.
26. **Ming-C. Cheng**, R. Chennupati, Ying Wen, "Solution of the Multi-valley Boltzmann Transport Equation in Si and GaAs Based on the Time Scales of Hydrodynamic Equations," *J. Appl. Phys*, Vol.78, pp.4490-4504, 1995.
27. **Ming-C. Cheng** and Rambabu Chennupati, "Evolution of Non-equilibrium Electron Distribution Functions at Hydrodynamic Scales in Multi-valley Semiconductors," *J. Phys. D: Appl. Phys.*, vol.28, pp.160-173, 1995.
28. **Ming-C. Cheng** and Ying Wen, "Accuracy of Modeling Non-equilibrium Electron Transport in Silicon Using Hydrodynamic Transport Equations," *Compel*, Vol. 13, pp. 579-589, 1994.
29. **Ming-C. Cheng**, "Hydrodynamic Transport Models for Non-equilibrium and Hot-electron Transport in a Two-valley Semiconductor," *Semiconductor Science and Technology*, Vol. 8, pp. 682-693, 1993.

30. **Ming-C. Cheng** and Rambabu Chennupati, "Non-equilibrium Multi-valley Electron Distribution Functions in GaAs," *Compel*, Vol. 12, pp. 435-446, 1993.
31. **Ming-C. Cheng** and Lin Huang, "A Novel Approach to A Transport Model for Ultra-small Scale Compound Semiconductor Devices," *J. Appl. Phys.*, Vol. 72, pp. 3539-3549, 1992.
32. **Ming-C. Cheng**, "Influence of Forward Scattering on Small-scale Transport Phenomena of Electrons in Semiconductors," *Compel*, Vol. 11, pp. 481-488, 1992.
33. **Ming-C. Cheng** and E.E. Kunhardt, "Monte Carlo Investigation of Acoustic, Intervalley, and Intravalley Deformation Potentials of GaAs," *Solid State Commun.*, Vol. 79, pp. 651-655, 1991.
34. **Ming-C. Cheng** and E.E. Kunhardt, "A Transport Model for Carriers in Small Spatial/Temporal Scale Compound Semiconductor Devices," *Compel*, Vol. 10, pp. 277-287, 1991.
35. **M. Cheng**, and E.E. Kunhardt, "A Theory of Non-equilibrium Carrier Transport in Multi-valley Semiconductors," *J. Appl. Phys.*, Vol. 67, pp. 1907-1914, 1990.
36. **M. Cheng** and E.E. Kunhardt, "Electron Energy Distribution, Transport Parameters, and Rate Coefficients in GaAs," *J. Appl. Phys.*, Vol. 63, pp. 2322-2330, 1988.
37. E.E. Kunhardt, **M. Cheng**, and J. Wu, "Non-equilibrium Carrier Dynamics in a Semiconductor," *J. Appl. Phys.*, Vol.64, pp. 1220-1228, 1988.

## **B. Conference Papers and Presentations**

1. Ming-C. Cheng Feixia Yu , "Nonisothermal Effects in SOI CMOS Analog Integrated Circuits Based on Electrothermal Simulation," *The 8<sup>th</sup> Int. Conf. Solid-state and Integrated Circuit Technology (ICSICT 2006)*, Shanghai, China, Oct. 23-26, 2006.
2. Feixia Yu and **Ming-C. Cheng**, "Electrothermal Modeling of an SOI Differential Amplifier," *Proc. 2005 Int. Semicond. Dev. Res. Symp.*, WP7-13-01, Dec 7-9, 2005.
3. R. Mallory, M. Yasar, A. Petrou, G. Kioseoglou, A.T. Hanbicki, C.H. Li O.M.J. van't Erve, and B.T. Jonker, M. Shen, S. Saikin, **M.C. Cheng**, V. Privman, "Phonon Satellites in the Electroluminescence Spectra of Fe Spin-LEDs," Annual Conference on Magnetism & Magnetic Materials, DP-09, Oct. 31 – Nov. 3, 2005.
4. Lei Ai and **Ming-C. Cheng**, "Efficient Approach to Optimization of  $fT$  for Graded-Base SiGe HBTs," *Proc. 2005 Int. Semicond. Dev. Res. Symp.*, ISDRS – L. Ai WP7-05-03, Dec 7-9, 2005.
5. **Ming-C. Cheng**, Min Shen, Semion Saikin, "Spin Injection and Spin Current through Schottky Barriers for Spintronic Devices," *Advanced Workshop on 'Frontiers in Electronics' (WOFE)*, Palm Beach, Aruba, Dec 17-22, 2004.
6. Ming-C. Cheng, Feixia Yu, "Analytical Thermal Models for Silicon-On-Insulator MOSFET Structures," *Proc. 7th Int. Conf. Solid-state and Integrated Circuit Technology (ICSICT 2004)*, pp. 1180-1185, Beijing, China, Oct. 18-21, 2004. **(Invited talk)**
7. Feixia Yu, **Ming-C. Cheng**, "Thermal Modeling of Silicon-On-Insulator Current Mirrors," *Proc. 2004 IEEE Int. SOI Conf.*, pp. 81-83, Charleston, SC, Oct. 4 - 7, 2004.
8. M. Shen, S. Saikin, **M.C. Cheng**, V. Privman, "Monte Carlo Simulation of Spin Injection and Coherent Transport in a Heterostructure Device with a Schottky Source Contact", NSF Division of Materials Research 2004 ITR Computational Workshop, Urbana, Illinois, June 17-19, 2004.
9. **Ming-C. Cheng**, "Monte Carlo Simulation of Spin Injection Through a Schottky Contact and Spin - Polarized Transport in a Semiconductor Heterostructure," *2004 IEEE NTC Quantum Device Technology Workshop*, Potsdam, NY, May 17-21, 2004. **(Invited talk)**
10. M. Shen, S. Saikin, **M.C. Cheng**, V. Privman, "Effect of Barrier Height Engineering on Spin Injection through a Schottky Barrier," *2004 IEEE NTC Quantum Device Technology Workshop*, Potsdam, NY, May 17-21, 2004.
11. E. Shafir, S. Saikin, M. Shen, **M.C. Cheng**, V. Privman, "Modulation of Spin Orbit Interaction in a Spin FET Device," *2004 IEEE NTC Quantum Device Technology Workshop*, Potsdam, NY, May 17-21, 2004.
12. S. Saikin, M. Shen, **M.C. Cheng**, V. Privman, "Spin-polarized transport modeling," APS March Meeting 2004, Montreal, Canada, March 22-26, 2004.
13. S. Saikin, M. Shen, **M.C. Cheng**, V. Privman, "Spin-polarized Transport in Semiconductor Nanostructures," APS March Meeting 2004, Montreal, Canada, March 22-26, 2004.

14. **Ming-C. Cheng**, Lin Jun and Min Shen, "Dynamic Thermal Circuit of SOI MOSFETs for Fast Digital Operation", *Proc. 2003 IEEE Conf. On Electron Dev. & Solid State Circuits (EDSSC 2003)*, pp. 141-144, HongKong, Dec. 2003. **(Best Paper Award)**
15. **Ming-C. Cheng** and Lei Ai and, "Optimization of the Cutoff Frequency for  $\text{Si}_{1-x}\text{Ge}_x\text{HBTs}$ ", *Proc. 2003 Int. Semicond. Dev. Res. Symp.*, pp. 172-173, Washington, D.C., Dec. 2003.
16. Feixia Yu and **Ming-C. Cheng**, "Heat Flow in SOI Current Mirrors", *Proc. 2003 Int. Semicond. Dev. Res. Symp.*, pp. 392-393, Washington, D.C., December 2003.
17. **Ming-C. Cheng** and Feixia Yu, "Heat Flow Models for Silicon-On-Insulator Structures", *The 11<sup>th</sup> IEEE Int. Symp. Electron Devices for Microwave and Optoelectric Applications*, pp. 141-144, Orlando, FL, Nov. 2003.
18. Semion Saikin, Min Shen, **Ming-C. Cheng** and Vladimir Privman, "Simulation of Spin-Polarized Transport in Submicrometer Device Structures", *IEEE-Nano 2003*, San Francisco, CA, Vol. 1, pp. 91-94 (IEEE Press, Monterey, CA, 2003) Aug. 12-14, 2003.
19. Min Shen, Semion Saikin, **Ming-C. Cheng** and Vladimir Privman, "Monte Carlo Simulation of Spin-Polarized Transport," The 2003 International Conference on Computational Science and Its Applications (ICCSA2003), pp. 881-891, Montreal, Canada, May 18 - May 21 2003.
20. **Ming-C. Cheng** and Feixia Yu, "SOI Thermal Resistance and its Application To Thermal Modeling of SOI MOSFETs," Int'l Symposium on SOI Device Technologies XI, pp. 395-400, Paris, France, April 27 - May 2, 2003.
21. Feixia Yu, **Ming-C. Cheng** and Goodarz Ahmadi, "Heat Flow Modeling of SOI Structures," CAMP Technical Meeting, Saratoga Springs, NY, May 14-16, 2003.
22. Jun Lin, Min Shen, **Ming-C. Cheng** and Goodarz Ahmadi, "Transient Heat Flow Model for SOI MOSFET's," CAMP Technical Meeting, Saratoga Springs, NY, May 14-16, 2003.
23. Feixia Yu, **Ming-C. Cheng** and Goodarz Ahmadi, "Analytical Modeling of Heat Flow in SOI Structures," CAMP Fall Meeting, Clarkson University, Potsdam, NY, October 16 -18, 2002.
24. Semion Saykin, Min Shen, **Ming-C. Cheng**, and Vladimir Privman, "Spin dephasing in electron spin polarized transport in 2DEG," McGill Workshop on Advanced Materials for Nano-Science and Nano-Technology, Montreal, Quebec, Canada, October 4-6, 2002.
25. **Ming-C. Cheng**, "Physical Transport Model for Nano-scale MOS Devices, with Applications to CAD for Next-Generation ICs," SRC ADT Compact Modeling/TAD Review, Durham, NC June 18-20, 2002. **(Invited)**
26. Semion Saykin, Min Shen, **Ming-C. Cheng**, and Vladimir Privman, "Simulation of Spin Polarized Transport in 2DEG," SRC ADT Compact Modeling/TAD Review, Durham, NC June 18-20, 2002.
27. **Ming-C. Cheng**, "Device Simulation in Industry from an Engineering Viewpoint," NSF Workshop "Quantum Device Technology," Clarkson University, Potsdam, May 20-24, 2002. **(Invited)**
28. S. Saykin, **M.C. Cheng**, V. Privman, "Spin Dephasing in Electron Spin-Polarized Transport," NSF Workshop "Quantum Device Technology," Clarkson University, Potsdam, May 20-24, 2002.
29. Min Shen and **Ming-C. Cheng**, "Hydrodynamic Simulation for Semiconductor Devices based on Least Square Finite Element and Advective Upstream Split Methods," NSF Workshop "Quantum Device Technology," Clarkson University, Potsdam, May 20-24, 2002.
30. Feixia Yu, **Ming-C. Cheng** and Goodarz Ahmadi, "Heat Flow Modeling for SOI MOSFETs," CAMP Annual Technical Meeting, Saratoga Spring, NY May 13-15, 2002.
31. Ramitha Wettimuny, **Ming-C. Cheng** and Goodarz Ahmadi, "Thermal Simulation for SOI Devices Combining a Thermal Circuit with Device Simulation," CAMP Fall Meeting, Clarkson University, Potsdam, NY, Oct. 17-19, 2001.
32. Ramitha Wettimuny and **Ming-C. Cheng**, "Thermal Simulation for SOI Devices Combining a Thermal Circuit Model with Device Simulation," *2001 International Semiconductor Device Research Symposium (ISDRS'01)*, pp. 126-129, Washington, DC, Dec. 5-7, 2001.
33. Feixia Yu, **Ming-C. Cheng** and Jun Xu, "High Performance SOI DTMOS using a Retrograde Base with a Low Impurity Surface Channel," *2001 International Semiconductor Device Research Symposium (ISDRS'01)*, pp. 613-616, Washington, DC, Dec. 5-7, 2001.
34. **Ming-C. Cheng**, Ramitha Wettimuny, Feixia Yu and Peter Habitz, "Thermal Simulation for SOI Devices", *25<sup>th</sup> Annual EDS/CAS Activities in Western New York Conference*, Rochester, NY, Nov, 2001

35. **Ming-C. Cheng** and Jun Xu, "An Improved Dynamic Threshold Structure for Deep-Submicrometer SOI at Extremely Low Supply Voltage," *24th Annual EDS/CAS Activities in Western New York Conference*, Rochester, NY, Nov 1, 2000.
36. Min Shen, Wai-K.Y. and **Ming-C. Cheng**, and J.J. Liou, "An Upstream Flux Splitting Method for Hydrodynamic Modeling of Deep Submicron Devices," *The 7th Int'l Workshop for Computational Electronics (IWCE-7)*, pp. 114-115, Glasgow, Scotland, May 22-25, 2000.
37. Min Shen, **M. C. Cheng** and J. J. Liou "A Generalized Finite Element Method for Hydrodynamic Modeling of Short-Channel Devices," *The 7th Int'l Workshop for Computational Electronics (IWCE-7)*, pp. 34-35, Glasgow, Scotland, May 22-25, 2000.
38. Min Shen and **Ming-C. Cheng**, "The Least-Squares Finite Element Method for 2D Hydrodynamic Simulation of MESFET's", accepted for presentation in *Third IEEE Int'l Caracas Conf. on Devices, Circuits and Systems*, D30.1-30.6, Cancún, Mexico, March 15 - 17, 2000.
39. Jun Xu and **Ming-C. Cheng**, "A Dynamic Threshold-Voltage SOI MOSFET with a Stepped Channel Doping Profile", accepted for presentation in *Third IEEE Int'l Caracas Conf. on Devices, Circuits and Systems*, pp. D30.1-D30.5, Cancún, Mexico, March 15 - 17, 2000.
40. Wai-Kay Yip, Min Shen and **Ming-C. Cheng**, "A Flux Vector Splitting Scheme for Hydrodynamic Simulation of MESFET's", *Proc. 1999 Int'l Semicond. Device Research Symp. (ISDRS'99)*, pp. 413-416, Charlottesville, Virginia, December 1-3, 1999.
41. Jun Xu and **Ming-C. Cheng**, "Investigation of Dynamic Threshold-voltage SOI MOSFET's with Low-Impurity-Density Channels," *Proc. 1999 Int'l Semicond. Device Research Symp. (ISDRS'99)*, pp. 93-96, Charlottesville, Virginia, December 1-3, 1999.
42. Min Shen and **Ming-C. Cheng**, "Least-Square Finite Element Simulation of MESFET's Based on the Hydrodynamic Model," *Proc. 1999 Int'l Semicond. Device Research Symp. (ISDRS'99)*, pp. 241-244, Charlottesville, Virginia, December 1-3, 1999.
43. Jun Xu and **Ming-Cheng Cheng**, "Optimization of Low Temperature Deep-Submicron MOS Devices at Supply Voltage Below One Volt", *1999 AMRI Symposium*, New Orleans, February 11-12, 1999 (presentation only).
44. **Ming-Cheng Cheng** and Min Shen, "Critical Issues for Modeling of Ultra-small Semiconductor Devices", *1999 AMRI Symposium*, New Orleans, February 11-12, 1999 (presentation only).
45. Jun Xu and **Ming-C. Cheng**, "Design Optimization Of Low-Temperature And Low-Voltage Deep-Submicron MOSFET's Using Stepped-Channel-Doping Profiles", *1998 Int'l Electron Device & Materials Symposium*, (IEDMS'98), Tainan, Taiwan, Dec. 21-23, 1998.
46. **Ming-C. Cheng**, "Modeling of the Low Temperature Electron Distribution Function for Ultra-fast Semiconductor Devices", *Proc. of the 3rd European Workshop on Low Temperature Electronics (WOLTE3)*, San Miniato, Italy, June 24-26, 1998. A full length appeared in *J. Phys. IV*, Vol. 8-Pr3, pp. 67-70, 1998.
47. Jun Xu and **Ming-C. Cheng**, "Optimization of Deep-Submicrometer Temperature Scalable MOSFET's based on Two dimensional Numerical Simulation", *Proc. of the 3rd European Workshop on Low Temperature Electronics (WOLTE3)*, San Miniato, Italy, June 24-26, 1998. A full-length paper appeared in *J. Phys. IV*, Vol. 8-Pr3, pp. 29-32, 1998.
48. Liangying Guo, **Ming-C. Cheng**, Robert Fithen, and Yansheng Luo, "Nonparabolic Hydrodynamic Modeling of Submicron Semiconductor Devices", *Bull. of The American Phy. Soc.*, vol. 42, p.1558, presented in *The Int'l Conf. on Computational Physics*, August 25-28, Santa Cruz, CA, 1997.
49. Robert Fithen, Wai-Kay Yip, and **Ming-C. Cheng**, "Higher Order Generalized Upwinding for Simulation of Hydrodynamic Semiconductor Equations", *Bull. of The Am. Phy. Soc.*, vol. 42, p. 1589, presented in *The Int'l Conf. on Computational Physics*, August 25-28, Santa Cruz, CA, 1997.
50. **Ming-C. Cheng**, "A Computational Model for Simulation of Microscopic Electron Transport in non-equilibrium Situations", *Bull. of The American Phy. Soc.*, vol. 42, p. 1557, presented in *The Int'l Conf. on Computational Physics*, August 25-28, Santa Cruz, CA, 1997.
51. **Ming-C. Cheng** and Liangying Guo, "Solution of the Boltzmann Transport Equation in One-dimensional Submicron  $n^+-n-n^+$  Structures Based on Relaxation Scales of the Moments", *Proc. 1995 Int'l Semicond. Device Research Symp. (ISDRS'95)*, p. 657, Charlottesville, Virginia, December 6-8, 1995.

52. **Ming-C. Cheng**, "A New Concept for Solving the Boltzmann Transport Equation in Ultra-fast Transient Situations", *Abstract of The Fourth Int'l Workshop on Computational Electronics (IWCE'95)* p.22, Tempe, Arizona, October 30-November 2, 1995.
53. **Ming-C. Cheng**, "An Efficient Approach to Solve the Boltzmann Transport Equation in Ultra-fast Transient Situations", *The 6th Int'l Conf. on Simulation of Semicond. Devices and Processes, (SISDEP'95)*, Erlangen, Germany, September 6-8, 1995.
54. **Ming-C. Cheng**, Rambabu Chennupati and Ying Wen, "A Physical Approach to Electron Distribution Functions in GaAs and Si at Ultra-small Scales Using Multi-valley Models", *Abstracts of The 3rd Int'l Seminar on Simulation of Devices and Technologies*, p. 5, Obnisk, Russia, July, 1994.
55. **Ming-C. Cheng** and Ying Wen, "Accuracy of Modeling Non-equilibrium Transport Phenomena for Electrons in Silicon Using Hydrodynamic Transport Equations", *Proc. of the 10th Int'l NASECODE Conf.*, p.5, Dublin, Ireland, June, 1994.
56. Rambabu Chennupati and **Ming-C. Cheng**, "Evolution of Electron Distribution Functions in GaAs", *Proc. of 1994 IEEE SouthEastCon'94*, p.447, Miami, Florida, April, 1994.
57. Lin Huang, **Ming-C. Cheng**, and Ying Wen "Limitations of the Displaced Maxwellian Distribution for Hot-electron Transport in Multi-valley Semicond.", *Proc. of 1994 IEEE SouthEastCon'94*, p.444, Miami, Florida, April, 1994.
58. **Ming-C. Cheng** and Rambabu Chennupati, "Non-equilibrium Multi-valley Electron Distribution Functions in Semiconductors", *Proc. of the 9th Int'l NASECODE Conf.*, p.59, Copper Mountain, Colorado, April, 1993.
59. **Ming-C. Cheng**, "Influence of Anisotropic Scattering on Modeling of Small-scale Electron Transport in Compound Semiconductors", *Proc. of the 8th Int'l NASECODE Conf.*, p. 111, Vienna, Austria, May, 1992.
60. Lin Huang and **Ming-C. Cheng**, "Modeling of Ultra-small Scale Electron Transport in GaAs", *Proc. of IEEE SouthEastCon'92*, p.193, Birmingham, Alabama, April, 1992.
61. **Ming-Cheng Cheng**, "Modeling of Electron Transport in GaAs Including Intervalley Transfer Effects", *Bull. of Am. Phys. Soc.*, Vol. 36, p.985, March 1991.
62. **Ming-Cheng Cheng** and E.E. Kunhardt, "A Transport Model for Carriers in Small Spatial/Temporal Scale Compound Semiconductor Devices", *Proc. of the 7th Int'l NASECODE Conf.*, p.161, Copper Mountain, Colorado, April 1991.
63. E.E. Kunhardt and **M. Cheng**, "Macro-kinetic Models of Electron Transport in Semiconductors", *Bull. of the Am. Phys. Soc.*, Vol. 34, p.734, March 1989.
64. **M. Cheng** and E.E. Kunhardt, "Moment Descriptions of Electron Transport in Multi-valley Semiconductors", *Bull. of the Am. Phys. Soc.*, Vol. 34, p.734, March 1989.

#### INVITED TALKS since 07/2000

1. *Dept. of Mechanical & Aeronautical Engineering, Clarkson University*, "Application of Charge Carrier Transport and Heat Flow Models to Microelectronics Simulation," February 3, 2006.
2. *NASA Glenn Research Center, Cleveland, OH*, "Single-Event Effects in SiC Schottky Diodes induced by High Energy Ionizing Particle Radiation," August 2, 2005.
3. *CAE, Xerox, Rochester, NY*, "Charge Carrier Transport and Heat Flow Modeling for Semiconductor Devices," January 13, 2005.
4. *Microelectronics Design Center, University of Rochester, Rochester, NY*, "Electrothermal Simulation of SOI Structures," January 12, 2005.
5. *2004 IEEE NTC Quantum Device Technology Workshop, Potsdam, NY*, "Monte Carlo Simulation of Spin Injection Through a Schottky Contact and Spin-Polarized Transport in a Semiconductor Heterostructure," May 17-21, 2004.
6. *ICSICT 2004, Beijing, China*, Ming-C. Cheng, Feixia Yu, "Analytical Thermal Models for Silicon-On-Insulator MOSFET Structures," *Proc. 7th Int. Conf. Solid-state and Integrated Circuit Technology*, pp. 1180-1185, Oct. 18-21, 2004.
7. *IMEC, Leuven, Belgium*, "Thermal Modeling of SOI Structures for Integrated Circuit Application," May 7, 2003.
8. *Integrated Electronics Engineering Center and Institute for Materials Research, SUNY, Binghamton*, "Heat Flow Modeling of SOI Structures toward IC Application," December 13, 2002.

9. *Dept. of Chemical Engineering, Clarkson*, “Thermal Modeling of SOI Devices toward Integrated Circuit Application”, Oct 15, 2002.
10. *SRC ADT Compact Modeling/TAD Review, Durham, NC*, “Physical Transport Model for Nano-scale MOS Devices, with Applications to CAD for Next-Generation ICs,” June 18-20, 2002.
11. *CNRS, Marcoussis, France*, “Heat Flow Simulation for SOI Devices”, May 31, 2002.
12. *NSF Workshop “Quantum Device Technology, Clarkson University, Potsdam*, “Device Simulation in Industry from an Engineering Viewpoint,” May 20-24, 2002.
13. *ASIC Timing, Power & Synthesis Methodology Group, IBM Microelectronics, Burlington, VT*, “Simulation of Heat Flow in Interconnects and SOI Devices and Circuits,” Aug. 10, 2001
14. *ST Microelectronics, Catania, Italy*, “Low-power High-speed SOI Devices and Simulation of Thermal Effects in Microelectronics,” June 25, 2001
15. *University of Catania, Catania, Italy*, “Simulation of Solid-State Electronic Devices,” June 22, 2001
16. *IBM, Burlington*, “Simulation of Deep-submicron Semiconductor Devices with Application to Optimization of SOI MOS Devices at Low Supply Voltage”, December 1, 2000.
17. *Phys. Dept., Clarkson University*, “Physical Transport Models for Simulation of Semiconductor Devices,” November 3, 2000

## GRANT AND CONTRACT AWARDS

1. **Co-PI**, funded by NSF for \$1.6M, title: “Center for modeling of quantum dynamics, relaxation and decoherence in solid-state physics for information-technology applications,” 9/01-8/06. (PI: P. Privman; Other Co-PIs: L. Glasser, D. Mozyrsky, C. Tamon).
2. **PI**, funded by NYSTAR for \$6,800, title: “Heat flow modeling of SOI devices & integrated circuits,” 6/03-5/04. (Co-PI: G. Ahmadi).
3. **PI**, funded by NYSTAR for \$18,000, title: “Thermal modeling SOI devices,” 6/02-5/03. Co-PI: G. Ahmadi.
4. **PI**, funded by NYSTAR for \$10,000, title: “Transport models for nano-scale MOS devices with applications to CAD for next-generation ICs,” 6/2001-5/2002. (Co-PIs: G. Ahmadi. V. Privman).
5. **PI**, funded by NYSTAR for \$18,000, title: “Thermal modeling SOI devices,” 6/02-5/03. Co-PI: G. Ahmadi.
6. **PI**, donated by IBM (equivalent value: \$10,000), a software tool, DAMOCLES: A Monte Carlo Simulation for MOSFETs, SOIs and HEMTs, 3/2001.
7. **PI**, funded by SRC for \$35K, title: “Physical transport models for nano-scale MOS devices, with applications to CAD for next generation ICs,” 1/2001-12/2001. (Co-PIs: G. Ahmadi, J.J. Liou, V. Privman)
8. **Co-PI**, funded by ARO for \$150K, title: “Large Scale Systems Development Using the MacroMosaics Concept,” 9/98-9/00. (PI: M. Abdelguerfi)
9. **PI**, funded by AMRI for \$35K, title “Equivalent Circuit Models for Characterization of Spin-Tunneling Structures,” 6/99-6/00.
10. **PI**, funded by STI for \$52.5K, title: “Simulation of deep-submicron cryogenic MOS devices, 9/98-12/99.
11. **PI**, funded by Cray Research for \$150K, title: “Investigation & modeling of low power low temperature CMOS devices,” 9/97-12/18. (Co-PI: S. Whittenburg)
12. **PI**, funded by STI for \$85K, title: “Modeling of deep-submicron cryogenic MOSFETs,” 7/97-7/98.
13. **PI**, funded by NSF for \$10,000, title: “Research experience for undergraduate students in device modeling,” 6/96-5/97. (Co-PI: R. Fithen)
14. **PI**, Research Initiation Award at NSF for \$100K, title: “Improved Modeling of Ultra-fast Semiconductor Devices Using the hydro-kinetic transport theory,” 7/94-12/97.
15. **Co-PI**, donated by Mentor Graphics (equivalent value: \$8,512.3K), software tools for the microelectronics computer-aided-design and testing, 11/93. (PI: Mahdi Abdelguerfi; other Co-PI: Jinke Tang)
16. **PI**, donated by Powertronic Systems (equivalent value: \$13K), software packages for reliability analysis of solid-state electronic equipment, 7/93.
17. **Co-PI**, funded by NSF for \$9,974, title: “Short Term Scientific Exchanges: US-Turkey Cooperative Research,” 1/93. (PI: G. Richards; other Co-PIs: P. Pillay, A. Eyup)

18. **PI**, donated by Powertronic Systems (equivalent value: \$13.4K), software packages: reliability prediction and enhancement programs, 8/92.
19. **PI**, funded by Entergy for \$68K, title: Reliability of Solid-state Electronic Relaying Systems,” 7/92-12/93. (Co-PI: G. Richards)
20. **Co-PI**, funded by LEQSF Enhancement, title: A Multidisciplinary Computer-aided VLSI Design Laboratory Enhancement and Upgrade,” 5/92. (PI: M. Abdelguerfi; other Co-PIs: W. Patterson, D. Prados)
21. **PI**, \$4,700, Young Faculty Summer Support at University of New Orleans, “Charge Carrier Transport modeling in Compound Semiconductor Devices, 6/90.

## HONORS

- Outstanding Professor Award, *IEEE Student Chapter* at the University of New Orleans in 1993.
- Research Initiation Award, *National Science Foundation* in 1994.
- Distinguished Teaching Award from *The Dean's Student Organizations Council*, College of Engineering, University of New Orleans in 1995.
- Best Paper Award from IEEE Conference on Electron Devices and Solid-State Circuits in 2003 (EDSSC 2003).