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Professor Emmanuel Lorin

Correspondence language: English
Sex: Male

Contact Information

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Professor Emmanuel Lorin

Language Skills

Language	Read	Write	Speak	Understand	Peer Review
English	Yes	Yes	Yes	Yes	Yes
French	Yes	Yes	Yes	Yes	Yes

Degrees

	Doctorate, Applied Mathematics, Ecole Normale Supérieure de Cachan
	Supervisors: Jean-Michel Ghidaglia, 1998/9 - 2001/10
- 1997/6	Master's Equivalent, Pure Mathematics, Université de Paris XI (Paris-Sud)
- 1995/6	Bachelor's, Pure Mathematics, Université de Paris XI (Paris-Sud)

Recognitions

2015/1 - 2015/2	Visiting Professor - 5,000 University of California, Santa Barbara Prize / Award Visiting Professor in Mathematics Department at the University of California Santa Barbara
2014/9 - 2014/9	Invitation long program (Frontiers of Intense Lasers) KITP. - 1,200 University of California, Santa Barbara Prize / Award Invitation for 3 weeks at Kavli Institute for Theoretical Physics (KITP) at the University of California Santa Barbara.
2011/5 - 2011/7	Visiting professor - 10,000 Université de Grenoble I - Joseph Fourier Prize / Award Two-month invitation. Applied Mathematics Lab. (Jean Kutzmann) at the Universite de Grenoble I

User Profile

Research Specialization Keywords: Applied Analysis, Numerical Analysis, Mathematical and Computational Physics, Quantum Physics & Photonics

Employment

2009/7	Associate Professor Mathematics and Statistics, Carleton University Full-time, Associate Professor Tenure Status: Tenure
2007/7 - 2009/8	Assistant Professor Sciences (Mathematics), University of Ontario Institute of Technology Full-time, Assistant Professor Tenure Status: Tenure Track
2005/7 - 2007/6	CRM/ISM Postdoctoral Fellow Mathematiques, Centre de Recherches Mathematiques Full-time Tenure Status: Non Tenure Track
2002/9 - 2005/6	Maitre de Conferences (Tenured Assistant Professor) Mathematiques, Université de Paris XI (Paris-Sud) Full-time, Assistant Professor Tenure Status: Tenure Position left for personal reasons (Immigration to Canada)
2002/1 - 2002/8	Postdoctoral fellows Computer Science, University of Minnesota Full-time Tenure Status: Non Tenure Track Postdoctoral fellow at the Minnesota Supercomputing Institute

Research Funding History

Awarded [n=3]

2013/4 - 2018/4 Principal Applicant	CRSNG Decouverte, Grant **Funding Sources:** Natural Sciences and Engineering Research Council of Canada (NSERC) Total Funding - 75,000 Portion of Funding Received - 100 Funding Competitive?: Yes
2012/11 - 2013/5 Co-investigator	Computing infrastructure for mathematics and statistics, Grant **Funding Sources:** Natural Sciences and Engineering Research Council of Canada (NSERC) RTI Total Funding - 46,068 Portion of Funding Received - 0 Funding Competitive?: Yes
2010/6 - 2012/6 Co-investigator	Modeling & simulation of Magnetized Target Fusion (in collaboration with General Fusion), Grant **Funding Sources:** Mathematics of Information Technology and Complex Systems (MITACS) CLUSTER Total Funding - 133,000 Portion of Funding Received - 33 Funding Competitive?: Yes

Completed [n=1]

2012/12 - 2013/7
Principal Investigator

Stochastic optimization of laser ablation, Grant

Funding Sources:
Institut National d'Optique
Total Funding - 25,000
Portion of Funding Received - 100
Funding Competitive?: No

Student/Postdoctoral Supervision

Bachelor's [n=1]

2012/4 - 2012/8
Principal Supervisor

Keenan Lyon (Completed) , Carleton University
Thesis/Project Title: Nonlinear optics models
Present Position: Phd Student, University of Toronto

Bachelor's Honours [n=3]

2017/5 - 2017/8
Principal Supervisor

David Charles (Completed) , Carleton University
Thesis/Project Title: Digital quantum algorithm for the Dirac equation
Present Position: MSc student

2014/4 - 2014/9
Principal Supervisor

Ashkan Memarian (Completed) , Carleton University
Thesis/Project Title: Non-perturbative nonlinear optics models for intense laser-matter interaction
Present Position: MSc Student, Carleton University

2012/5 - 2011/9
Principal Supervisor

Reynaldo Arteaga (Completed) , Carleton University
Thesis/Project Title: Modeling ultrashort laser pulses with the Maxwell-Schroedinger coupling
Present Position: Employee, Hightech Company, Australia

Master's Thesis [n=3]

2015/9 - 2016/9
Principal Supervisor

Moritz Hof (Completed) , Carleton University
Thesis/Project Title: Analysis of the convergence rate of Schwarz waveform relaxation methods for the time-dependent Schroedinger equation
Present Position: Research Associate, German Armed Forced

2013/9 - 2014/4
Principal Supervisor

Hebah Rizq (Completed) , Carleton University
Thesis/Project Title: Solution to Time independent and dependent Dirac equation using atomically balanced and B-spline Basis
Present Position: Assistant Professor, University of Jeddah

2011/9 - 2012/10
Principal Supervisor

Julien Sater (Completed) , Carleton University
Thesis/Project Title: Absorbing boundary conditions in quantum relativistic mechanics for spinless particles subject to a classical electromagnetic field
Present Position: Teacher, International School in China

Doctorate [n=2]

2013/9 - 2017/9
Principal Supervisor

Marianna Lytova (Completed) , Carleton University
Thesis/Project Title: Nonperturbative nonlinear optics models analysis and simulations
Present Position: Research Associate

2013/9 - 2015/5 Principal Supervisor	Mohamed E. Mohamed (Withdrawn) , Carleton University Thesis/Project Title: High performance computing for nonlinear optics. Present Position: Carleton University, Research Associate

Post-doctorate [n=2]

2013/1 - 2013/9 Principal Supervisor	Pascal Turbis (Completed) , Carleton University/Centre de Recherches Mathematiques (CRM) Thesis/Project Title: Stochastic Optimization of laser-ablation Present Position: Professor, CEGEP-Montreal
2011/1 - 2013/8 Co-Supervisor	Francois Fillion-Gourdeau (Completed) , Carleton University/Centre de Recherches Mathematiques (CRM) Thesis/Project Title: Mathematical and numerical methods in quantum relativistic physics. I was mainly involved in the mathematical (PDE, operator theory) and computational (schemes and HPC) aspects. Portion of supervision: (at least) 50% Present Position: Research Associate, Univ. de Montreal

Research Associate [n=1]

2016/1 - 2016/8 Principal Supervisor	Fengji Hou (Completed) , Carleton University Thesis/Project Title: Analysis of convergence of Schwarz waveform relaxation method for the two-dimensional Schroedinger equation Present Position: Employee, Private company

Event Administration

2017/9 - 2018/7	Co-organizer, DD-25. International Conference on Domain Decomposition Methods, St John, Conference, 2018/7 - 2018/7
2017/7 - 2017/10	Co-organizer, Applied Analysis Day, Ottawa (Celebration of the 25th anniversary of the Fields Institute), Workshop, 2017/10 - 2017/10
2016/5 - 2017/8	Co-organizer, From Quantum Dynamics to Quantum Information Theory (Banff/CMO), Oaxaca, Workshop, 2017/8 - 2017/8
2017/4 - 2017/6	Co-organizer (session), CLEO: Conference on Lasers and Electro-Optics, Berlin, Conference, 2017/6 - 2017/6
2015/1 - 2015/5	Co-organizer, 8th Montreal Scientific Computing Days (CRM/Montreal), Workshop, 2015/5 - 2015/5
2013/5 - 2014/3	Co-organizer, Mathematical Models and Methods in Filamentation, CRM, Montreal, Workshop, 2014/3 - 2014/3
2012/11 - 2013/8	Co-organizer, Fields Workshop on Numerical Methods for Fluid Dynamics, Ottawa, Workshop, 2013/8 - 2013/8
2012/9 - 2013/5	Co-organizer, 7th Montreal Scientific Computing Days (CRM/Montreal), Workshop, 2013/5 - 2013/5

Editorial Activities

2015/9 - 2017/12	Editor, Advances in Mathematical Physics, Journal
2011/7 - 2017/8	Referee, Ann. Math. Q.., Appl. Math. Comp., APNUM, J. Comp. App. Math., CPC, J Phys. B, Eur. J. of Mech. fluids, Proc. of Royal Soc. A, Physica D, Chem. Phys., AML, JCP, Opt. Lett, Int. Comp. Math., Num. Algo, Journal

2014/3 - 2016/9	Editor, Laser Filamentation: Mathematical methods and models (Springer, CRM-Mathematical Physics-Series), Book

Organizational Review Activities

2017/3 - 2017/3	Referee, MITACS MITACS Elevate Program
2017/2 - 2017/3	Referee, Natural Sciences and Engineering Research Council of Canada (NSERC) I2I program
2015/12 - 2016/2	Referee, US Department of Energy (DOE) US Department of Energy (DOE) proposal
2015/11 - 2015/12	Referee, MITACS MITACS Elevate Program
2012/9 - 2015/5	Referee, Fonds de recherche du Québec - Nature et technologies (FRQNT) Bursaries at Master and PhD level
2013/4 - 2013/5	Referee, Natural Sciences and Engineering Research Council of Canada (NSERC) NSERC Collaborative Research and Development Program

International Collaboration Activities

2017/7 - 2017/12	Research collaboration, China Research project on nonlinear Dirac equation with member of the Computational Science Research Center (CSRC), Beijing, China
2014/5 - 2017/9	Research collaboration, United States Collaboration at Univ. California Santa Barbara (Mathematics Department)
2014/1 - 2017/7	Research collaboration,, France Collaboration at Universite de Lorraine (Institut Elie Cartan de Lorraine)

Committee Memberships

2012/1 - 2017/6	Committee Member, Thesis defence committee, University Thesis defence committee: 6 PhD and 4 MSc theses (Carleton, Ottawa University, University of Montreal)

Other Memberships

2009/7 - 2018/5	Member, Centre de Recherches Mathematiques (CRM) Member of the Applied Mathematics Laboratory at the CRM
2007/7 - 2017/12	Regular member, Centre de Recherches Mathematiques (CRM) Organization of Workshops and Conferences

Presentations

1. (2017). Analysis of convergence of SWR methods for the Schroedinger equation. Applied Analysis Day, Ottawa, Canada
   Main Audience: Researcher
   Invited?: No, Keynote?: No
2. (2017). Analysis of convergence of Schwarz waveform relaxation methods for linear and nonlinear Schroedinger equations. Mathematical and computational methods for quantum and kinetic problems, Beijing, China
   Main Audience: Researcher
   Invited?: Yes, Keynote?: No
3. (2017). Computational methods for the Dirac equation (for pair production). AMS meeting, Buffalo, United States
   Main Audience: Researcher
   Invited?: Yes, Keynote?: No
4. (2017). Nonperturbative nonlinear optics modeling. SIAM Conference on analysis of partial differential equations, Baltimore, United States
   Main Audience: Researcher
   Invited?: Yes, Keynote?: No
5. (2017). Quantum algorithm for symmetric linear first order hyperbolic systems. BIRS/CMO from Quantum Dynamics to Quantum Information, Oaxaca, Mexico
   Main Audience: Researcher
   Invited?: No, Keynote?: No
6. (2016). Schwarz waveform relaxation method for the Schroedinger equation. The 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, United States
   Main Audience: Researcher
   Invited?: Yes, Keynote?: No
7. (2016). Computational Methods in Quantum Relativistic Dynamics. Workshop Mathematics and Computational Methods in Quantum Chemistry (Fields Institute), Toronto, Canada
   Main Audience: Researcher
   Invited?: Yes, Keynote?: No
8. (2016). Some mathematical and computational methods in relativistic quantum dynamics (for pair production). CAIMS 2016, Edmonton, Canada
   Main Audience: Researcher
   Invited?: Yes, Keynote?: No
9. (2016). Multiscale nonperturbative nonlinear optics modeling. KI-NET Conference, Santa Barbara, United States
   Main Audience: Researcher
   Invited?: Yes, Keynote?: No
10. (2016). Mathematical modeling for laser-gas interaction. Symposium Molecules & Laser Fields, Orford, Canada
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No
11. (2015). From absorbing boundary conditions to domain decomposition methods. Applied Mathematics Seminar at University of California Santa Barbara, Santa Barbara, United States
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

12. (2015). Nonlinear optics modeling for filamentation. University of Ottawa, Department of Physics, Ottawa, Canada
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

13. (2015). Convergence of Schwarz waveform relaxation method for the imaginary time Schroedinger equation. Applied Mathematics, Modeling and Computational Science Conference (AMMCS 2015), Waterloo, Canada
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

14. (2015). Transparent and absorbing boundary conditions for wave equations. Applied Mathematics Seminar/ Lecture, University of California Santa Barbara, Santa Barbara, United States
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

15. (2014). Domain decomposition method for the Schroedinger equation. Applied Mathematics Seminar at UOIT, Oshawa, Canada
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

16. (2014). From absorbing boundary conditions to domain decomposition methods. Workshop on Mathematical Methods and Models in Filamentation, Montreal, Canada
    Main Audience: Researcher
    Invited?: No, Keynote?: No

17. (2014). Nonperturbative nonlinear optics modeling. KITP program: Frontiers of Intense Laser . University of California Santa Barbara, Santa Barbara, United States
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

18. (2013). Absorbing boundary conditions for quantum relativistic mechanics. Applied Mathematics, Modeling and Computational Science (AMMCS 2013), Waterloo, Canada
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

19. (2013). Absorbing boundary conditions for quantum relativistic mechanics. CAIMS 2013, Quebec city, Canada
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

20. (2012). Convergence for numerical scheme for nonconservative hyperbolic systems. CMS Winter Meeting 2012, Montreal, Canada
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

21. (2012). Absorbing boundary conditions for quantum non-relativistic and relativistic mechanics. CMS Winter Meeting 2012, Montreal, Canada
    Main Audience: Researcher
    Invited?: No, Keynote?: No

22. (2012). Multiscale nonperturbative nonlinear optics modeling. Applied Mathematics Seminar at SUNY Buffalo, Buffalo, United States
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

23. (2011). Modele Maxwell-Schroedinger pour l'interaction laser-gaz. Seminar Physics at Commissariat a l'Energie Atomique (CEA/DAM), Bruyeres-le-Chatel, France
    Main Audience: Researcher
    Invited?: Yes, Keynote?: No

24. (2011). Absorbing boundary conditions for quantum relativistic mechanics. Applied Mathematics, Modeling and Computational Science Conference (AMMCS 2011), Waterloo, Canada
Main Audience: Researcher
Invited?: Yes, Keynote?: No

25. (2011). Stochastic optimization for laser ablation. Workshop on Industrial Mathematics, Montreal, Canada
Main Audience: Researcher
Invited?: Yes, Keynote?: No

26. (2011). Nonconservative hyperbolic system approximation. Applied Mathematics, Modeling and Computational Science Conference (AMMCS 2011), Waterloo, Canada
Main Audience: Researcher
Invited?: Yes, Keynote?: No

27. (2011). Magnetized Target Fusion: modeling and simulation. Applied Mathematics Seminar at Ecole Normale Superieure (Cachan), Cachan, France
Main Audience: Researcher
Invited?: Yes, Keynote?: No

28. (2011). Modelisation multi-echelle pour l'interaction laser-gaz. Applied Mathematics Seminar at Universite de Chambery, Chambery, France
Main Audience: Researcher
Invited?: Yes, Keynote?: No

Publications

Journal Articles

1. F. Fillion-Gourdeau, E. Lorin. (2017). Simple digital quantum algorithm for linear first order hyperbolic systems. SIAM Journal on Scientific Computing.
Submitted
Refereed?: Yes

2. X. Antoine, E. Lorin. (2017). Multilevel preconditioning techniques for Schwarz waveform relaxation domain decomposition methods for real- and imaginary-time nonlinear Schroedinger equations. Applied Mathematics and Computation.
Submitted
Refereed?: Yes

3. X. Antoine, F. Hou*, E. Lorin. (2017). Two-dimensional asymptotic estimates of the convergence of SWR-DDM for stationary classical and quantum waves. ESAIM: Numerical Analysis and Mathematical Modeling (M2AN).
Accepted
Refereed?: Yes, Open Access?: No

4. X. Antoine, E. Lorin. (2017). Computational performance of simple and efficient sequential and parallel Dirac equation solvers. Computer Physics Communications. 220: 15-172.
Published
Refereed?: Yes

5. X. Antoine, E. Lorin, Q. Tang. (2017). A friendly review to absorbing boundary conditions and perfectly matched layers for classical and relativistic quantum wave equations. Molecular Physics. : 1-19.
Published
Refereed?: Yes, Open Access?: No

6. X. Antoine, E. Lorin. (2017). An analysis of Schwarz waveform relaxation domain decomposition methods for the imaginary-time linear Schroedinger and Gross-Pitaevskii equations. Numerische Mathematik.
In Press
Refereed?: Yes, Open Access?: No

7. X. Antoine, E. Lorin. (2016). Lagrange-Schwarz waveform relaxation domain decomposition methods for linear and nonlinear quantum wave problems. Applied Mathematics Letters. 57: 38-45.
Published
Refereed?: Yes, Open Access?: No

8. M. Lytova*, E. Lorin, A. Bandrauk. (2016). Propagation of intense and short circularly polarized pulses in molecule gas. From multiphoton ionization to nonlinear macroscopic effects. Physical Review A.94: 013421.
Published
Refereed?: Yes, Open Access?: No

9. F. Fillion-Gourdeau, E. Lorin, A. Bandrauk. (2016). Galerkin method for unsplit 3-D Dirac equation using atomically/kinetically balanced B-spline basis. Journal of Computational Physics. 307: 122-145.
Published
Refereed?: Yes, Open Access?: No

10. X. Antoine, E. Lorin, X.Yang. (2016). Frozen Gaussian approximation based domain decomposition methods for the linear Schroedinger equation beyond the semi-classical regime. Journal of Computational Physics. 315: 221-237.
Published
Refereed?: Yes

11. E. Lorin, X. Yang. (2016). Frozen Gaussian approximation-based two-level methods for multi-frequency time dependent Schroedinger equation. Computer Physics Communcations. 207: 145-159.
Accepted
Refereed?: Yes, Open Access?: No

12. X. Antoine, E. Lorin, A. Bandrauk. (2015). Domain Decomposition Methods and High-Order Absorbing Boundary Conditions for the Numerical Simulation of the Time Dependent Schroedinger Equation. Journal of Scientific Computing. 64(3): 620-646.
Published
Refereed?: Yes

13. A. Bandrauk, E. Lorin, M. Lytova*, A. Memarian*. (2015). Development of nonperturbative nonlinear optics models. Journal of Physics A: Mathematical & Theoretical. 48(12): 105201.
Published
Refereed?: Yes

14. A. Cournoyer, E. Lorin, P. Turbis*. (2014). Stochastic optimization of laser temporal shape for ablation. Applied Mathematics Research eXpress (AMRX). 2: 244-274.
Published
Refereed?: Yes

15. F. Fillion-Gourdeau*, E. Lorin, A. Bandrauk. (2014). A Split-Step Numerical Method for the TDDE in 3-d Axisymmetric Geometries. Journal of Computational Physics. 272: 268-304.
Published
Refereed?: Yes

16. X. Antoine, E.Lorin, J. Sater*, F. Fillion-Gourdeau*, A. Bandrauk. (2014). Absorbing boundary conditions for quantum and relativistic mechanics equations. Journal of Computational Physics. 277: 559-587.
Published
Refereed?: Yes

17. D. Chakraborty, J.-H. Jung, E. Lorin.(2013). Efficient determination of critical parameters of nonlinear Schroedinger equation with pointlike potential using generalized polynomial chaos methods. Applied Numerical Mathematics (APNUM). 72: 115-130.
    Published
    Refereed?: Yes

18. F. Fillion-Gourdeau* , E. Lorin, A. Bandrauk. (2013). Enhanced Schwinger's pair production in many-center systems. Journal of Physics B: Atomic, Molecular and Optical Physics. 46(17): 175002.
    Published
    Refereed?: Yes, Open Access?: No

19. N. Chalmers*, E. Lorin. (2013). On the numerical approximation of one-dimensional nonconservative hyperbolic systems. Journal of Computational Science. 4(1-2): 111-124.
    Published
    Refereed?: Yes

20. F. Fillion-Gourdeau*,E. Lorin, A Bandrauk. (2013). Resonantly enhanced pair production in a simple model. Physical Review Letters. 110(1): 013002.
    Published
    Refereed?: Yes, Open Access?: No

21. A. Bandrauk, F. Fillion-Gourdeau*, Emmanuel Lorin. (2013). Invited Tutorial: Atoms and molecules in intense laser fields: gauge invariance of theory and models. Journal of Physics B: atomic, Molecular and Optical Physics. 46: 153001.
    Published
    Refereed?: Yes, Open Access?: Yes

22. C. Köhler, R. Guichard, E. Lorin, S. Chelkowski, A. Bandrauk, L. Bergé, S. Skupin. (2013). Saturation of the nonlinear refractive index in atomic gases. Physical Review A. 87(4): 043811.
    Published
    Refereed?: Yes, Open Access?: No

23. F. Fillion-Gourdeau*, E. Lorin, A. Bandrauk. (2012). Numerical solution of the time-independent Dirac equation for diatomic molecules: B splines without spurious states. Physical Review A. 85(2)
    Published
    Refereed?: Yes

24. F. Fillion-Gourdeau*, E. Lorin, A. Bandrauk. (2012). Numerical solution of the time-dependent Dirac equation in coordinate space without fermion doubling. Computer Physics Communications. 183(7): 1402-1415.
    Published
    Refereed?: Yes

25. E. Lorin, S. Chelkowski, E. Zaoui*, A. Bandrauk. (2012). Maxwell-Schroedinger-Plasma model for laser-molecule interactions: towards quantum filamentation with intense ultrashort pulses. Physica D. 241(12): 1059-1071.
    Published
    Refereed?: Yes

26. F. Fillion-Gourdeau*, E. Lorin, A. Bandrauk. (2012). Relativistic Stark resonances in a simple exactly soluble model for diatomic molecule. Journal of Physics A: Mathematical and Theoretical. 45(21): 215304.
    Published
    Refereed?: Yes

27. E. Lorin, A. Bandrauk. (2012). Fast and accurate numerical computation of a micro-macro nonlinear optics model for intense and short laser pulses. Journal of Computational Science. 3(3): 159-168.
    Published
    Refereed?: Yes

28. F. Fillion-Gourdeau*, E. Lorin, A. Bandrauk. (2012). Pair production from counterpropagating lasers. Physical Review A. 86(3): 022506.
    Published
    Refereed?: Yes

29. E. Lorin, S. Chelikowski, A. Bandrauk. (2011). The WASP model: A micro-macro system of Wave-Schroedinger-Plasma equations for filamentation. Communications in Computational Physics. 9(2): 406-440.
    Published
    Refereed?: Yes

30. E. Lorin, A. Bandrauk. (2011). A simple and accurate mixed P0-Q1 solver for Maxwell-Dirac equations. Nonlinear Analysis B: Real World Applications. 12(1): 190-202.
    Published
    Refereed?: Yes, Open Access?: No

Book Chapters

1. E. Lorin, M. Lytova*, A. Bandrauk. (2016). Nonperturbative nonlinear Maxwell-Schroedinger models for intense laser pulse propagation. A. Bandrauk E. Lorin J. Moloney. Mathematical methods and models in Laser Filamentation. CRM Series in Mathematical Physics. : 167-183.
    Published, Springer
    Refereed?: Yes

Conference Publications

1. F. Fillion-Gourdeau*, E. Lorin, A. Bandrauk. (2013). Avoiding the coordinate singularity problem in the numerical solution of the Dirac equation in cylindrical coordinates.Springer Proceedings in Mathematics & Statistics. Applied Mathematics, Modeling and Computational Science (AMMCS), Waterloo, Canada
    Conference Date: 2013/6
    Paper
    Published
    Refereed?: Yes, Invited?: Yes