

# Marcos Rigol

## Assistant Professor

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## Education

- 2001 - 2004: University of Stuttgart, Stuttgart, Germany  
**PhD in Physics; Summa Cum Laude**  
Thesis: “*Numerically exact studies of ultracold atoms on optical lattices*”  
Advisor: Prof. Dr. Alejandro Muramatsu.
- 1999 - 2000: Institute of Nuclear Sciences and Technology (ISCTN), Havana, Cuba  
**Master of Science in Nuclear Physics**  
Thesis: “*Gluon, Quark and Hadron Masses from a Modified Perturbative QCD*”  
(Spanish); arXiv:hep-ph/0109016 (English version).  
Advisor: Dr. Alejandro Cabo.
- 1994 - 1999: Institute of Nuclear Sciences and Technology (ISCTN), Havana, Cuba  
**Bachelor of Science in Nuclear Physics; Summa Cum Laude**  
Thesis: “*About an Alternative Vacuum State for Perturbative QCD*” (Spanish);  
arXiv:hep-th/0109012 (English version).  
Advisor: Dr. Alejandro Cabo.

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## Academic Positions

- 2008 - Department of Physics, Georgetown University, Washington, DC, USA  
**Assistant Professor**
- 2007 - 2008 Department of Physics, University of California, Santa Cruz, USA  
**Postdoctoral Scholar** (Supervisor: Prof. B. Sriram Shastry)
- 2006 - 2007 Department of Physics and Astronomy, University of Southern California, Los Angeles, USA  
**Postdoctoral Research Associate** (Supervisor: Prof. Maxim Olshanii)
- 2004 - 2006 Department of Physics, University of California, Davis, USA  
**Postgraduate Researcher** (Supervisors: Prof. Richard T. Scalettar and  
Prof. Rajiv R. P. Singh)
- 2001 - 2004: Institute for Theoretical Physics III, University of Stuttgart, Stuttgart, Germany  
**Graduate Student** (Supervisor: Prof. Alejandro Muramatsu)
- 1999 - 2001: Center of Applied Technologies and Nuclear Development (CEADEN), Havana, Cuba  
**Junior Researcher** (Supervisor: Dr. Alejandro Cabo)

## **Short term visits**

June 2011:	Instituto de Física, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil.
Oct.-Dec. 2010:	Programs “Beyond Standard Optical Lattices” and “Disentangling Quantum Many-body Systems: Computational and Conceptual Approaches”. Kavli Institute for Theoretical Physics, University of California, Santa Barbara, USA.
September 2010:	Institute for Theoretical Physics III, University of Stuttgart, Stuttgart, Germany.
September 2009:	School of Optical Sciences, University of Arizona, Tucson, USA.
May-June 2009:	Summer Program “Quantum Simulation/Computation with Cold Atoms”. Aspen Center for Physics, Aspen, USA.
July-August 2008:	Instituto de Física de São Carlos, University of São Paulo, Brazil.
September 2007:	Institute for Theoretical Physics III, University of Stuttgart, Stuttgart, Germany.
January-June 2007:	Department of Physics, University of Massachusetts Boston, Boston, USA.
May 2006:	Institute for Theoretical Physics III, University of Stuttgart, Stuttgart, Germany.
September 2002:	Institut Non Linéaire de Nice, Sophia Antipolis, University of Nice, France.
May-August 2001:	Brazilian Center for Research in Physics (CBPF), Rio de Janeiro, Brazil.

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## **Awards and Honors**

2011:	<ul style="list-style-type: none"><li>- Young Scientist Prize – International Union of Pure and Applied Physics (IUPAP), Commission 10: Structure and Dynamics of Condensed Matter.</li><li>- Invited editor, focus issue “Out of equilibrium dynamics in strongly interacting 1D systems”, to be published by the New Journal of Physics (IOP), 2012.</li></ul>
2010:	<ul style="list-style-type: none"><li>- Invited editor, focus issue “Dynamics and Thermalization in Isolated Quantum Many-Body Systems”, published by the New Journal of Physics (IOP), May 28, 2010.</li></ul>
2000:	<ul style="list-style-type: none"><li>- First Place in the Theoretical Physics Commission, and Prize to the Most Original Work. Forum of University Students, Faculty of Physics, University of Havana, Havana, Cuba, 2000. “<i>Gluon, Quark and Hadron Masses from a Modified Perturbative QCD</i>”.</li></ul>
1999:	<ul style="list-style-type: none"><li>- Graduated with the Best Qualifications, ISCTN, 1999.</li><li>- Second Place in the Basic Sciences Commission. XIV National Scientific Forum of University Students, University of Havana, Havana, Cuba, 1999. “<i>About an Alternative Vacuum State for Perturbative QCD</i>”.</li><li>- First Place in the Theoretical Physics Commission. Forum of University Students, ISCTN, Havana, Cuba, 1999. “<i>About an Alternative Vacuum State for Perturbative QCD</i>”.</li><li>- First Place in the Theoretical Physics Commission. Forum of University Students, Faculty of Physics, University of Havana, Havana, Cuba, 1999. “<i>Proposition of a New Vacuum State for QCD</i>”.</li></ul>
1998:	<ul style="list-style-type: none"><li>- First Place in the Physics Olympiad, Faculty of Physics, University of Havana, Havana, Cuba, 1998.</li></ul>
1994:	<ul style="list-style-type: none"><li>- Participated in the XV International Physics Olympiad, Beijing, China, 1994.</li><li>- Gold Medal in the National Physics Olympiad, Cuba, 1994.</li></ul>
1993:	<ul style="list-style-type: none"><li>- Participated in the XIV International Physics Olympiad, Virginia, USA, 1993.</li><li>- Gold Medal in the National Physics Olympiad, Cuba, 1993.</li></ul>

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# Publications

## Citation Metric (as of 02/01/2012)

<http://www.researcherid.com/rid/B-3505-2008>

- Articles With Citation Data: 67
- Sum of the Times Cited: 1722
- Average Citations per Article: 25.70
- h-index: 21

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## Submitted publications and preprints

3. **J. Carrasquilla and M. Rigol**  
*Superfluid to normal phase transition in strongly correlated bosons in two and three dimensions*  
To be submitted to Phys. Rev. A
2. **L. F. Santos, A. Polkovnikov, and M. Rigol**  
*Weak and strong typicality in quantum systems*  
Submitted to Phys. Rev. Lett.; arXiv.org:1202.4764.
1. **E. Khatami, M. Rigol, A. Relaño, and A. M. García-García**  
*Quantum Quenches in Disordered Systems: Approach to Thermal Equilibrium without a Typical Relaxation Time*  
Submitted to Phys. Rev. Lett.; arXiv:1103.0787.

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## Publications in peer-reviewed journals

70. **M. Rigol and M. Srednicki**  
*Alternatives to Eigenstate Thermalization*  
Phys. Rev. Lett. **108**, 110601 (2012); arXiv:1108.0928.
69. **E. Khatami, J. S. Helton, and M. Rigol**  
*Numerical study of the thermodynamics of clinoatacamite*  
Phys. Rev. B **85**, 064401 (2012); arXiv:1102.0777.
68. **M. Olshanii, K. Jacobs, M. Rigol, V. Dunjko, H. Kennard, and V. Yurovsky**  
*A Simple Exactly Solvable Model for the Integrability-Chaos Transition in Quantum Lattice Billiards with no Selection Rules*  
Nat. Commun. **3**, 641 (2012); arXiv:1203.1972.
67. **K. He, I. I. Satija, C. W. Clark, A. M. Rey, and M. Rigol**  
*Noise Correlation Scalings: Revisiting the Quantum Phase Transition in Incommensurate Lattices with Hard-Core Bosons*  
Phys. Rev. A. **85**, 013617 (2012); arXiv:1201.2740.
66. **E. Khatami, R. R. P. Singh, and M. Rigol**  
*Thermodynamics and phase transitions for the Heisenberg model on the pinwheel distorted kagome lattice*  
Phys. Rev. B **84**, 224411 (2011); arXiv:1105.4147.
65. **C. N. Varney, K. Sun, M. Rigol, and V. Galitski**  
*Topological Phase Transitions for Interacting Finite Systems*  
Phys. Rev. B **84**, 241105(R) (2011); arXiv:1108.2507.
64. **M. A. Cazalilla, R. Citro, T. Giamarchi, E. Orignac, and M. Rigol**  
*One dimensional bosons: From condensed matter systems to ultracold gases*  
Rev. Mod. Phys. **83**, 1405-1466 (2011); arXiv:1101.5337.
63. **E. Khatami and M. Rigol**  
*Thermodynamics of strongly interacting fermions in two-dimensional optical lattices*  
Phys. Rev. A **84**, 053611 (2011); arXiv:1104.5494.

62. **M. Jreissaty, J. Carrasquilla, F. A. Wolf, and M. Rigol**  
*Expansion of Bose-Hubbard Mott insulators in optical lattices*  
 Phys. Rev. A **84**, 043610 (2011); arXiv:1108.1192.
61. **M. Rigol and M. Fitzpatrick**  
*Initial state dependence of the quench dynamics in integrable quantum systems*  
 Phys. Rev. A **84**, 033640 (2011); arXiv:1107.5811.
60. **T. Mishra, J. Carrasquilla, and M. Rigol**  
*Phase diagram of the half-filled one-dimensional  $t$ - $V$ - $V'$  model*  
 Phys. Rev. B **84**, 115135 (2011); arXiv:1108.2272.
59. **C. N. Varney, K. Sun, V. Galitski, and M. Rigol**  
*Kaleidoscope of Exotic Quantum Phases in a Frustrated XY Model*  
 Phys. Rev. Lett. **107**, 077201 (2011); arXiv:1103.4123.  
 Selected as a PRL Editors' Suggestion and for a Viewpoint in *Physics*
58. **L. F. Santos, A. Polkovnikov, and M. Rigol**  
*Entropy of Isolated Quantum Systems after a Quench*  
 Phys. Rev. Lett. **107**, 040601 (2011); arXiv:1103.0557.
57. **E. Khatami and M. Rigol**  
*Thermodynamics of the antiferromagnetic Heisenberg model on the checkerboard lattice*  
 Phys. Rev. B **83**, 134431 (2011); arXiv:1009.4700.
56. **A. C. Cassidy, C. W. Clark, and M. Rigol**  
*Generalized Thermalization in an Integrable Lattice System*  
 Phys. Rev. Lett. **106**, 140405 (2011); arXiv:1008.4794.
55. **K. He and M. Rigol**  
*Scaling of noise correlations in one-dimensional-lattice-hard-core boson systems*  
 Phys. Rev. A. **83**, 023611 (2011); arXiv:1011.4259.
54. **S. Chiesa, C. N. Varney, M. Rigol, and R. T. Scalettar**  
*Magnetism and Pairing of Two-Dimensional Trapped Fermions*  
 Phys. Rev. Lett. **106**, 035301 (2011); arXiv:1004.0970.
53. **I. Hen and M. Rigol**  
*Analytical and numerical study of trapped strongly correlated bosons in two- and three-dimensional lattices*  
 Phys. Rev. A **82**, 043634 (2010); arXiv:1005.1915.
52. **I. Hen and M. Rigol**  
*Strongly Interacting Atom Lasers in Three Dimensional Optical Lattices*  
 Phys. Rev. Lett. **105**, 180401 (2010); arXiv:1010.5553.  
 Selected as a PRL Editors' Suggestion
51. **F. A. Wolf, I. Hen, and M. Rigol**  
*Collapse and revival oscillations as a probe for the tunneling amplitude in an ultra-cold Bose gas*  
 Phys. Rev. A **82**, 043601 (2010); arXiv:1010.1776.
50. **C. N. Varney, K. Sun, M. Rigol, and V. Galitski**  
*Interaction effects and quantum phase transitions in topological insulators*  
 Phys. Rev. B **82**, 115125 (2010); arXiv:1007.3502.
49. **L. F. Santos and M. Rigol**  
*Localization and the effects of symmetries in the thermalization properties of 1D quantum systems*  
 Phys. Rev. E **82**, 031130 (2010); arXiv:1006.0729.
48. **M. Rigol**  
*Comment on "Quenches in quantum many-body systems: One-dimensional Bose-Hubbard model reexamined"*  
 Phys. Rev. A **82**, 037601 (2010); arXiv:0909.4556.
47. **M. Rigol and L. F. Santos**  
*Quantum chaos and thermalization in gapped systems*  
 Phys. Rev. A **82**, 011604(R) (2010); arXiv:1003.1403.
46. **M. A. Cazalilla and M. Rigol**  
*Focus on Dynamics and Thermalization in Isolated Quantum Many-Body Systems*  
 New J. Phys. **12**, 055006 (2010).  
 Editorial for a Focus Issue of the New Journal of Physics

45. **L. F. Santos and M. Rigol**  
*Onset of quantum chaos in one-dimensional bosonic and fermionic systems and its relation to thermalization*  
Phys. Rev. E **81**, 036206 (2010); arXiv:0910.2985.
44. **I. Hen, M. Iskin, and M. Rigol**  
*Phase diagram of the hard-core Bose-Hubbard model on a checkerboard superlattice*  
Phys. Rev. B **81**, 064503 (2010); arXiv:0911.0890.
43. **M. Rigol**  
*Quantum quenches and thermalization in one-dimensional fermionic systems*  
Phys. Rev. A **80**, 053607 (2009); arXiv:0908.3188.
42. **F. Heidrich-Meisner, S. R. Manmana, M. Rigol, A. Muramatsu, A. E. Feiguin, and E. Dagotto**  
*Quantum distillation: dynamical generation of low-entropy states of strongly correlated fermions in an optical lattice*  
Phys. Rev. A **80**, 041603(R) (2009); arXiv:0903.2017.
41. **I. Hen and M. Rigol**  
*Superfluid to Mott-insulator transition of hardcore bosons in a superlattice*  
Phys. Rev. B **80**, 134508 (2009); arXiv:0905.4920.
40. **M. Rigol, B. S. Shastry, and S. Haas**  
*Fidelity and superconductivity in two-dimensional  $t$ - $J$  models*  
Phys. Rev. B **80**, 094529 (2009); arXiv:0906.5347.
39. **M. Rigol**  
*Breakdown of Thermalization in Finite One-Dimensional Systems*  
Phys. Rev. Lett. **103**, 100403 (2009); arXiv:0904.3746.
38. **M. Rigol, G. G. Batrouni, V. G. Rousseau, and R. T. Scalettar**  
*State diagrams for harmonically trapped bosons in optical lattices*  
Phys. Rev. A **79**, 053605 (2009); arXiv:0811.2219.
37. **M. Rigol, B. S. Shastry, and S. Haas**  
*Effects of Strong Correlations and Disorder in  $d$ -Wave Superconductors*  
Phys. Rev. B **79**, 052502 (2009); arXiv:0809.1423.
36. **A. Zujev, A. Baldwin, R. T. Scalettar, V. G. Rousseau, P. J. H. Denteneer, and M. Rigol**  
*Superfluid and Mott Insulator phases of one-dimensional Bose-Fermi mixtures*  
Phys. Rev. A **78**, 033619 (2008); arXiv:0711.4635.
35. **F. Heidrich-Meisner, M. Rigol, A. Muramatsu, A. E. Feiguin, and E. Dagotto**  
*Ground-state reference systems for expanding correlated fermions in one dimension*  
Phys. Rev. A **78**, 013620 (2008); arXiv:0801.4454.
34. **M. Rigol, V. Dunjko, and M. Olshanii**  
*Thermalization and its mechanism for generic isolated quantum systems*  
Nature **452**, 854 (2008); arXiv:0708.1324.
33. **M. Rigol and B. S. Shastry**  
*Drude weight in systems with open boundary conditions*  
Phys. Rev. B **77**, 161101(R) (2008); arXiv:0801.0592.  
Selected as a PRB Editors' Suggestion
32. **M. Rigol and R. R. P. Singh**  
*Kagome lattice antiferromagnets and Dzyaloshinsky-Moriya interactions*  
Phys. Rev. B **76**, 184403 (2007); arXiv:0705.2591.
31. **M. Rigol, T. Bryant, and R. R. P. Singh**  
*Numerical Linked-Cluster Algorithms: II.  $t$ - $J$  models on the square lattice*  
Phys. Rev. E **75**, 061119 (2007); arXiv:0706.3255.
30. **M. Rigol, T. Bryant, and R. R. P. Singh**  
*Numerical Linked-Cluster Algorithms: I. Spin systems on square, triangular, and kagomé lattices*  
Phys. Rev. E **75**, 061118 (2007); arXiv:0706.3254.
29. **M. Rigol and R. R. P. Singh**  
*Magnetic Susceptibility of the Kagome Antiferromagnet  $ZnCu_3(OH)_6Cl_2$*   
Phys. Rev. Lett. **98**, 207204 (2007); arXiv:cond-mat/0701087.

28. **F. Karim Pour, M. Rigol, S. Wessel, and A. Muramatsu**  
*Supersolids in confined fermions on one-dimensional optical lattices*  
Phys. Rev. B **75**, 161104(R) (2007); arXiv:cond-mat/0608491.
27. **M. Rigol, V. Dunjko, V. Yurovsky, and M. Olshanii**  
*Relaxation in a Completely Integrable Many-Body Quantum System: An Ab Initio Study of the Dynamics of the Highly Excited States of 1D Lattice Hard-Core Bosons*  
Phys. Rev. Lett. **98**, 050405 (2007); arXiv:cond-mat/0604476.
26. **M. Rigol, A. Muramatsu, and M. Olshanii**  
*Hard-core bosons on optical superlattices: dynamics and relaxation in the superfluid and insulating regimes*  
Phys. Rev. A **74**, 053616 (2006); arXiv:cond-mat/0612415.
25. **M. Rigol, T. Bryant, and R. R. P. Singh**  
*Numerical Linked-Cluster Approach to Quantum Lattice Models*  
Phys. Rev. Lett. **97**, 187202 (2006); arXiv:cond-mat/0611102.
24. **K. Rodriguez, S. R. Manmana, M. Rigol, R. M. Noack, and A. Muramatsu**  
*Coherent matter waves emerging from Mott-insulators*  
New J. Phys. **8**, 169 (2006); arXiv:cond-mat/0606155.  
Invited paper to a special issue on Cold Atoms in Optical Lattices
23. **A. Cabo and M. Rigol**  
*Gauge invariance properties and singularity cancellations in a modified PQCD*  
Eur. Phys. J. C **47**, 95 (2006); arXiv:hep-ph/0510369.
22. **V. G. Rousseau, D. P. Arovas, M. Rigol, F. Hébert, G. G. Batrouni, and R. T. Scalettar**  
*Exact Study of the 1D Boson Hubbard Model with a Superlattice Potential*  
Phys. Rev. B **73**, 174516 (2006); arXiv:cond-mat/0601681.
21. **G. Xianlong, M. Polini, M. P. Tosi, V. L. Campo, Jr., K. Capelle, and M. Rigol**  
*Bethe-Ansatz density-functional theory of ultracold repulsive fermions in one-dimensional optical lattices*  
Phys. Rev. B **73**, 165120 (2006); arXiv:cond-mat/0512184.
20. **M. Rigol, R. T. Scalettar, P. Sengupta, and G. G. Batrouni**  
*Time of flight observables and the formation of Mott domains of fermions and bosons on optical lattices*  
Phys. Rev. B **73**, 121103(R) (2006); arXiv:cond-mat/0602283.
19. **M. Rigol**  
*Finite-temperature properties of hard-core bosons confined on one-dimensional optical lattices*  
Phys. Rev. A **72**, 063607 (2005); arXiv:cond-mat/0506419.
18. **P. Sengupta, M. Rigol, G. G. Batrouni, P. J. H. Denteneer, and R. T. Scalettar**  
*Phase Coherence, Visibility, and the Superfluid-Mott-Insulator Transition on One-Dimensional Optical Lattices*  
Phys. Rev. Lett. **95**, 220402 (2005); arXiv:cond-mat/0509560.
17. **M. Rigol, S. R. Manmana, A. Muramatsu, R. T. Scalettar, R. R. P. Singh, and S. Wessel**  
*Comment on “Novel Superfluidity in a Trapped Gas of Fermi Atoms with Repulsive Interaction Loaded on an Optical Lattice”*  
Phys. Rev. Lett. **95**, 218901 (2005); arXiv:cond-mat/0502599.
16. **M. Rigol and A. Muramatsu**  
*Free expansion of impenetrable bosons on one-dimensional optical lattices*  
Mod. Phys. Lett. B **19**, 861 (2005); arXiv:cond-mat/0507351.  
Invited Brief Review
15. **M. Rigol, V. Rousseau, R. T. Scalettar, and R. R. P. Singh**  
*Collective Oscillations of Strongly Correlated One-Dimensional Bosons on a Lattice*  
Phys. Rev. Lett. **95**, 110402 (2005); arXiv:cond-mat/0503302.
14. **C. Lavalley, M. Rigol, and A. Muramatsu**  
*Understanding strongly correlated many-body systems with quantum Monte Carlo simulations*  
phys. stat. sol. (b) **242**, 1957 (2005).  
Invited Feature Article and cover picture
13. **M. Rigol and A. Muramatsu**  
*Ground-state properties of hard-core bosons confined on one-dimensional optical lattices*  
Phys. Rev. A **72**, 013604 (2005); arXiv:cond-mat/0409132.

12. **M. Rigol and A. Muramatsu**  
*Fermionization in an Expanding 1D Gas of Hard-Core Bosons*  
Phys. Rev. Lett. **94**, 240403 (2005); arXiv:cond-mat/0410683.
11. **M. Rigol and A. Muramatsu**  
*Numerical simulations of strongly correlated fermions confined in 1D optical lattices*  
Opt. Commun. **243**, 33 (2004); arXiv:cond-mat/0412543.  
Invited paper and cover picture to a special issue on Ultracold Atoms and Degenerate Quantum Gases.
10. **M. Rigol and A. Muramatsu**  
*Emergence of Quasicondensates of Hard-Core Bosons at Finite Momentum*  
Phys. Rev. Lett. **93**, 230404 (2004); arXiv:cond-mat/0403387.
9. **M. Rigol and A. Muramatsu**  
*Confinement control by optical lattices*  
Phys. Rev. A **70**, 043627 (2004); arXiv:cond-mat/0311444.
8. **M. Rigol and A. Muramatsu**  
*Universal properties of hard-core bosons confined on one-dimensional lattices*  
Phys. Rev. A **70**, 031603(R) (2004); arXiv:cond-mat/0403078.
7. **M. Rigol and A. Muramatsu**  
*Quantum Monte Carlo study of confined fermions in one-dimensional optical lattices*  
Phys. Rev. A **69**, 053612 (2004); arXiv:cond-mat/0309670.
6. **C. Lavallo, M. Rigol, and A. Muramatsu**  
*Starken Korrelationen auf der Spur (On the track of strong correlations)*  
Physik Journal **5**, 57 (2004).  
Invited paper to a special issue on Computational Physics (in German).
5. **M. Rigol, A. Muramatsu, G. G. Batrouni, and R. T. Scalettar**  
*Local Quantum Criticality in Confined Fermions on Optical Lattices*  
Phys. Rev. Lett. **91**, 130403 (2003); arXiv:cond-mat/0304028.
4. **E. Cuervo-Reyes, M. Rigol, and J. Rubayo-Soneira**  
*Hadron spectra from a non-relativistic model with confining harmonic potential*  
Rev. Bras. Ens. Fis. **25**, 18 (2003); arXiv:physics/0112034.
3. **G. G. Batrouni, V. Rousseau, R. T. Scalettar, M. Rigol, A. Muramatsu, P. J. H. Denteneer, and M. Troyer**  
*Mott Domains of Bosons Confined on Optical Lattices*  
Phys. Rev. Lett. **89**, 117203 (2002); arXiv:cond-mat/0203082.
2. **A. Cabo and M. Rigol**  
*Constituent quark masses from a modified perturbative QCD*  
Eur. Phys. J. C **23**, 289 (2002); arXiv:hep-ph/0008003.
1. **M. Rigol and A. Cabo**  
*Modified initial state for perturbative QCD*  
Phys. Rev. D **62**, 074018 (2000); arXiv:hep-th/9909057.

## **Publications in volumes and collections**

6. **M. Rigol**  
*Dynamics and thermalization in correlated one-dimensional lattice systems*  
To appear in the book “Non-Equilibrium and Finite Temperature Quantum Gases”, edited by M. Davis, S. Gardiner, N. Nygaard, N. Proukakis, and M. Szymanska, to be published by World Scientific.
5. **F. Karim Pour, M. Rigol, S. Wessel, and A. Muramatsu**  
*Supersolid Fermions Inside Harmonic Traps*  
High Performance Computing in Science and Engineering '08, Edited by W. E. Nagel, D. B. Kröner, and M. Resch, Springer-Verlag, Berlin, Heidelberg, 2009. DOI 10.1007/978-3-540-88303-6, ISBN 978-3-540-88301-2.
4. **C. Lavallo, D. Pertot, M. Rigol, S. Wessel, and A. Muramatsu**  
*Numerical simulations of quantum gases, magnetic, and correlated electronic systems*  
High Performance Computing in Science and Engineering '05, Edited by W. E. Nagel, W. Jäger, and M. Resch, Springer-Verlag, Berlin, Heidelberg, 2006. DOI 10.1007/3-540-29064-8, ISBN 3-540-28377-5.

3. **C. Lavalle, M. Rigol, J. Hub, and A. Muramatsu**  
*Dynamics and criticality of correlated electrons and quantum gases*  
 High Performance Computing in Science and Engineering '04, Edited by E. Krause, W. Jäger and M. Resch, Springer-Verlag, Berlin, Heidelberg, 2004. DOI 10.1007/b137852, ISBN 3-540-22943-8.
  2. **C. Lavalle, M. Rigol, M. Feldbacher, M. Arikawa, F. F. Assaad, and A. Muramatsu**  
*Quantum Monte-Carlo simulations of correlated bosonic and fermionic systems*  
 High Performance Computing in Science and Engineering '03, Edited by E. Krause, W. Jäger and M. Resch, Springer-Verlag, Berlin, Heidelberg, 2003. ISBN 3-540-40850-9.
  1. **C. Lavalle, M. Rigol, M. Feldbacher, F. F. Assaad, and A. Muramatsu**  
*Thermodynamics and dynamics of correlated electron systems*  
 High Performance Computing in Science and Engineering '02, Edited by E. Krause and W. Jäger, Springer-Verlag, Berlin, Heidelberg, 2003. ISBN 3-540-43860-2.
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## **Publications in conference proceedings**

17. **E. Khatami and M. Rigol**  
*Accessing the Mott regime in 2D optical lattices with strongly interacting Fermions*  
 To appear in the Journal of Superconductivity and Novel Magnetism.  
 Proceedings of the international workshop "1st Centennial of Superconductivity: Trends on Nanoscale Superconductivity and Magnetism", Cali, Colombia, June 29 - July 1, 2011.
16. **L. F. Santos and M. Rigol**  
*Relationship between chaos and thermalization in one-dimensional quantum many-body systems*  
 Proceedings of the conference QMath11 Mathematical Results in Quantum Physics, Hradec Kralove, Czech Republic, September 6-10, 2010. Edited by P. Exner, World Scientific, Singapore, 2011. ISBN 9-814-35035-4
15. **M. Rigol and R. R. P. Singh**  
*Thermodynamic properties of quantum lattice models from Numerical Linked Cluster expansions*  
 Comput. Phys. Commun. **180**, 540-544 (2009).  
 Proceedings of the Conference on Computational Physics 2008, Ouro Preto, Brazil, August 5-9, 2008.
14. **R. R. P. Singh and M. Rigol**  
*Thermodynamic Properties of Kagome Antiferromagnets with different Perturbations*  
 J. Phys.: Conf. Ser. **145**, 012003 (2009); arXiv:0809.2621.  
 Proceedings of the International Conference on Highly Frustrated Magnetism 2008, Braunschweig, Germany, September 7-12, 2008.
13. **M. Rigol and A. Muramatsu**  
*Expansion of Tonks-Girardeau Gases on a One-Dimensional Optical Lattice*  
 AIP Conf. Proc. **850**, 47-48 (2006).  
 Proceedings of the 24th International Conference on Low Temperature Physics, Orlando, Florida, USA, August 10-17, 2005. Edited by Y. Takano, S. P. Hershfield, S. O. Hill, P. J. Hirschfeld, and A. M. Goldman, American Institute of Physics, Melville, New York, 2006.
12. **M. Rigol, V. Rousseau, R. T. Scalettar, and R. R. P. Singh**  
*Dipolar Oscillations of Strongly Correlated Bosons on One-Dimensional Lattices*  
 AIP Conf. Proc. **850**, 45-46 (2006).  
 Proceedings of the 24th International Conference on Low Temperature Physics, Orlando, Florida, USA, August 10-17, 2005. Edited by Y. Takano, S. P. Hershfield, S. O. Hill, P. J. Hirschfeld, and A. M. Goldman, American Institute of Physics, Melville, New York, 2006.
11. **M. Rigol and A. Muramatsu**  
*Numerically exact simulations for ultra-cold atoms in and out of equilibrium*  
 AIP Conf. Proc. **816**, 283-295 (2006).  
 Proceedings of the International Workshop on Effective Models for Low-Dimensional Strongly Correlated Systems, Peyresq, France, September 12-16, 2005. Edited by G. G. Batrouni and D. Poilblanc, American Institute of Physics, Melville, New York, 2006.

10. **R. T. Scalettar, M. Rigol, V. G. Rousseau, P. Sengupta, G. G. Batrouni, F. Hébert, P. J. H. Denteneer, A. Muramatsu, and M. Troyer**  
*Phase Diagram and Visibility of Optically Trapped Bosons*  
 AIP Conf. Proc. **816**, 232-245 (2006).  
 Proceedings of the International Workshop on Effective Models for Low-Dimensional Strongly Correlated Systems, Peyresq, France, September 12-16, 2005. Edited by G. G. Batrouni and D. Poilblanc, American Institute of Physics, Melville, New York, 2006.
9. **M. Rigol and A. Muramatsu**  
*Nonequilibrium dynamics of Tonks-Girardeau gases on optical lattices*  
 Laser Physics **16**, 348-353 (2006).  
 Proceedings of the 14th International Laser Physics Workshop, Kyoto, Japan, July 4-8, 2005.
8. **R. T. Scalettar, G. G. Batrouni, P. Denteneer, F. Hébert, A. Muramatsu, M. Rigol, V. Rousseau, and M. Troyer**  
*Equilibrium and Dynamical Properties of the Boson Hubbard Model in One Dimension*  
 J. Low Temp. Phys. **140**, 313-332, (2005).  
 Proceedings of the 1st International Meeting on Advances in Computational Many-Body Physics, Alberta, Canada, January 13-16, 2005.
7. **M. Rigol and A. Muramatsu**  
*Quantum criticality in ultracold atoms on optical lattices*  
 phys. stat. sol. (b) **242**, 1850-1856 (2005).  
 Proceedings of the Latin American Symposium on Solid State Physics (SLAFES) 2004, Havana, Cuba, December 6-9, 2004.
6. **M. Rigol and A. Muramatsu**  
*Exact numerical approach to hard-core bosons on one-dimensional lattices*  
 Comput. Phys. Commun. **169**, 416-420 (2005).  
 Proceedings of the Conference on Computational Physics 2004, Genoa, Italy, September 1-4, 2004.
5. **M. Rigol and A. Muramatsu**  
*Hard-core Bosons and Spinless Fermions Trapped on 1D Lattices*  
 J. Low Temp. Phys. **138**, 645-650 (2005).  
 Proceedings of the International Symposium on Quantum Fluids and Solids, Trento, Italy, July 5-9, 2004.
4. **M. Rigol, A. Muramatsu, G. G. Batrouni, and R. T. Scalettar**  
*Local Mott metal-insulator transition in confined fermions on optical lattices*  
 AIP Conf. Proc. **715**, 225-234 (2004).  
 Lectures on the Physics of Highly Correlated Electron Systems VIII: Eighth Training Course in the Physics of Correlated Electron Systems and High-Tc Superconductors, Salerno, Italy, October 6-17, 2003. Edited by A. Avella and F. Mancini, American Institute of Physics, Melville, New York, 2004.
3. **M. Rigol, A. Muramatsu, G. G. Batrouni, V. Rousseau, R. T. Scalettar, P. J. H. Denteneer, and M. Troyer**  
*Mott domains of bosons and fermions confined in optical lattices*  
 AIP Conf. Proc. **678**, 283-292 (2003).  
 Lectures on the Physics of Highly Correlated Electron Systems VII: Seventh Training Course in the Physics of Correlated Electron Systems and High-Tc Superconductors, Salerno, Italy, October 14-25, 2002. Edited by A. Avella and F. Mancini, American Institute of Physics, Melville, New York, 2003.
2. **M. Rigol and A. Cabo**  
*Zero Momentum Gluons and Perturbative QCD*  
 AIP Conf. Proc. **531**, 294-298 (2000).  
 Proceedings of 7th Mexican Workshop of Particles and Fields (MWPF VII), Mérida, Yucatán, México, November 10-17, 1999. Edited by A. Ayala, G. Contreras and G. Herrera, American Institute of Physics, Melville, New York, 2000.
1. **M. Rigol and A. Cabo**  
*On a Modified Initial State for Perturbative QCD*  
 Proceedings of NURT 1999 "II International Symposium on Nuclear and Related Techniques in Agriculture, Industry and Environment; and V Workshop on Nuclear Physics", Havana, Cuba, October 26-29, 1999. Edited by J. C. Suárez, Havana, 1999.

## Invited talks and seminars

### Invited Conference Talks

31. Workshop on Correlations and coherence in quantum systems, Évora, Portugal, October 8-12, 2012.  
*TBD*
30. XXXVI International Conference of Theoretical Physics: Correlations and Coherence at Different Scales, Ustron, Poland, September 13-18, 2012.  
*TBD*
29. Conference on “Dynamics and Thermodynamics in Isolated Quantum Systems”, Kavli Institute for Theoretical Physics, Santa Barbara, USA, August 20-24, 2012.  
*TBD*
28. 21<sup>th</sup> International Laser Physics Workshop (LPHYS’12), Calgary, Canada, July 23-27, 2012.  
*TBD*
27. Ginzburg Memorial Conference, Moscow, Russia, May 28 - June 2, 2012.  
*TBD*
26. International Nonequilibrium Winter School, Kolkata, India, December 27, 2011 - January 11, 2012.  
*Generalized Thermalization in an Integrable Lattice System*
25. Conference on Computational Physics 2011, Gatlinburg, USA, October 30 - November 3, 2011.  
*Thermodynamic properties of strongly interacting fermions in two-dimensional optical lattices*
24. Workshop on Many-Body Quantum Dynamics in Closed Systems: Challenges and Applications, BarcelonaTech University, Barcelona, Spain, September 7-9, 2011.  
*Atom Lasers in Optical Lattices: A New Generation of Coherent Matter Waves*
23. Brazilian Physics Meeting 2011, Foz do Iguaçu, Brazil, June 5-10, 2011.  
*Atom Lasers in Optical Lattices: A New Generation of Coherent Matter Waves*
22. Workshop on Integrability and its Breaking in Strongly Correlated and Disordered Systems, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, May 23-27, 2011.  
*Generalized Thermalization in an Integrable Lattice System*
21. Joint UMB-BU Colloquium on Quantum Nonequilibrium Dynamics, Boston, USA, March 26, 2011.  
*Quantum chaos and thermalization in one-dimensional many-body systems*
20. APS March Meeting 2011, Dallas, USA, March 21-25, 2011.  
*Generalized Thermalization in Integrable Systems*  
Invited Session: Simulations meet experiments on ultracold quantum gases
19. APS March Meeting 2011, Dallas, USA, March 21-25, 2011.  
*Breakdown of thermalization in finite one-dimensional systems*  
APS/GSNP/DCMP Prize Session: Heineman, Onsager, IUPAP/C10
18. 2011 AAAS Annual Meeting, Washington, DC, USA, February 17-21, 2011.  
*Atom Lasers in Optical Lattices: The Next Generation of Coherent Matter Waves*  
Invited Session: Matter Wave Magic and Technology
17. Program “Disentangling Quantum Many-body Systems: Computational and Conceptual Approaches”, Kavli Institute for Theoretical Physics, Santa Barbara, USA, October 18 - December 17, 2010.  
*Dynamics and thermalization in isolated one-dimensional systems.*
16. Program “Beyond Standard Optical Lattices”, Kavli Institute for Theoretical Physics, Santa Barbara, USA, September 13 - December 10, 2010.  
*Generalized Thermalization in Integrable Systems.*
15. Workshop on Ultracold Quantum Gases Beyond Equilibrium, Federal University of Rio Grande do Norte, Natal, Brazil, September 27 - October 1, 2010.  
*Generalized Thermalization in Integrable Systems.*
14. 19<sup>th</sup> International Laser Physics Workshop (LPHYS’10), Foz do Iguaçu, Brazil, July 5-9, 2010.  
*Breakdown of thermalization in finite one-dimensional systems.*

13. Conference on Computational Physics 2010, Trondheim, Norway, June 23-26, 2010.  
*Dynamics and thermalization in finite one-dimensional systems.*
12. Workshop on Dynamics of Strongly Correlated Quantum Systems, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, June 21-25, 2010.  
*Quantum chaos and thermalization in finite one-dimensional systems.*
11. Control of quantum correlations in tailored matter: Common perspectives of mesoscopic systems and quantum gases, Castle Reinsburg, Günzburg, Germany, November 15-19, 2009.  
*Breakdown of thermalization in finite one-dimensional systems.*
10. Ab-initio Modeling of Cold Gases, CECAM-ETHZ, Zurich, Switzerland, November 11-13, 2009.  
*Breakdown of thermalization in finite one-dimensional systems.*
9. 2009 Annual Meeting of the UK Cold-Atom/Condensed Matter Physics Network, Van Mildert College, Durham, UK, September 17-18, 2009.  
*State diagrams for harmonically trapped bosons in optical lattices*
8. Finite-Temperature Non-Equilibrium Superfluid Systems (FINESS 2009), Van Mildert College, Durham, UK, September 14-17, 2009.  
*Breakdown of thermalization in finite one-dimensional systems*
7. Conference on Computational Physics 2008, Ouro Preto, Brazil, August 5-9, 2008.  
*Numerical Linked-Cluster Approach to Quantum Lattice Models*
6. The 1<sup>st</sup> Fudan University-Georgetown University Science Symposium, Fudan University, Shanghai, China, June 19-21, 2008.  
*Thermalization and its mechanism for generic isolated quantum systems*
5. Summer School on Novel Quantum Phases and Non-equilibrium Phenomena in Cold Atomic Gases, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, August 27 - September 7, 2007.  
*Thermalization and its mechanism for generic isolated quantum systems*
4. Ruperto Carola Symposium “Ultracold Quantum Gases”, International Science Forum Heidelberg, Heidelberg, Germany, July 18-20, 2007.  
*Statistical mechanics of an integrable system after relaxation*
3. Non-equilibrium Dynamics in Interacting Systems, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, April 18 - May 05, 2006.  
*Non-equilibrium dynamics of integrable systems - do they relax to an equilibrium state?*
2. APS March Meeting 2006, Baltimore, USA, March 13-17, 2006.  
*Equilibrium and Non-equilibrium Properties of Tonks-Girardeau Gases on Optical Lattices*  
Invited Session: Dynamics and Non-equilibrium Phenomena in Optical Lattices
1. Controlled Interactions in Low-Dimensional Nanostructures, University of Stuttgart, Stuttgart, Germany, June 28, 2002.  
*Quantum Monte Carlo simulations of confined fermions in optical lattices*

### **Invited Seminars and Colloquia**

50. Rutgers, The State University of New Jersey, Piscataway, USA, March 27, 2012.  
*Generalized Thermalization in Integrable Systems*
49. The Pennsylvania State University, University Park, USA, January 17, 2012.  
*Relaxation dynamics and thermalization in isolated quantum systems*
48. Indian Association for the Cultivation of Sciences, Kolkata, India, December 26, 2011.  
*Atom Lasers in Optical Lattices: A New Generation of Coherent Matter Waves*
47. Lund University, Lund, Sweden, December 7, 2011.  
*Relaxation dynamics and thermalization in isolated quantum systems*

46. NIST Center for Neutron Research, National Institute of Standards and Technology (NIST), Gaithersburg, USA, November 17, 2011.  
*Relaxation dynamics and thermalization in isolated quantum systems*
45. Instituto de Física, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, June 14, 2011.  
*Breakdown of thermalization in finite one-dimensional systems*
44. George Mason University, Fairfax, USA, May 6, 2011.  
*Generalized Thermalization in an Integrable Lattice System*
43. Computational Materials Science Center, George Mason University, Fairfax, USA, April 11, 2011.  
*Atom Lasers in Optical Lattices: A New Generation of Coherent Matter Waves*
42. University of Southern California, Los Angeles, USA, December 14, 2010.  
*Generalized Thermalization in Integrable Systems*
41. University of California, Santa Cruz, USA, November 5, 2010.  
*Dynamics and thermalization in isolated one-dimensional systems*
40. University of California, Davis, USA, November 4, 2010.  
*Dynamics and thermalization in isolated one-dimensional systems*
39. Ludwig-Maximilians-Universität München, Munich, Germany, September 8, 2010.  
*Generalized Thermalization in Integrable Systems*
38. University of Stuttgart, Stuttgart, Germany, September 7, 2010.  
*Generalized Thermalization in Integrable Systems*
37. Centro de Ciências Naturais e Humanas, Universidade Federal do ABC (UFABC), Santo André, Brazil, July 14, 2010.  
*Breakdown of thermalization in finite one-dimensional systems*
36. Boston University, Boston, USA, April 16, 2010.  
*Breakdown of thermalization in finite one-dimensional systems*
35. University of Massachusetts, Amherst, USA, April 1, 2010.  
*Breakdown of thermalization in finite one-dimensional systems*
34. Vienna University of Technology, Vienna, Austria, December 18, 2009.  
*Quantum quenches and thermalization in finite one-dimensional systems*
33. University of Maryland, College Park, USA, July 31, 2009.  
*Breakdown of thermalization in finite one-dimensional systems*
32. National Institute of Standards and Technology (NIST), Gaithersburg, USA, April 30, 2009.  
*Breakdown of thermalization in finite one-dimensional systems*
31. Yeshiva University, New York, USA, November 11, 2008.  
*Is there thermalization in isolated quantum systems?*
30. University of Illinois, Urbana-Champaign, USA, October 29, 2008.  
*Thermalization and its mechanism for generic isolated quantum systems*
29. Instituto de Física de São Carlos, University of São Paulo, Brazil, July 31, 2008.  
*Thermalization and its mechanism for generic isolated quantum systems*
28. Microsoft Station Q, University of California, Santa Barbara, USA, April 23, 2008.  
*Thermalization and its mechanism for generic isolated quantum systems*
27. California Institute of Technology (CALTECH), Los Angeles, USA, April 21, 2008.  
*Thermalization and its mechanism for generic isolated quantum systems*
26. University of Southern California, Los Angeles, USA, April 18, 2008.  
*Thermalization and its mechanism for generic isolated quantum systems*
25. National Institute of Standards and Technology (NIST), Gaithersburg, USA, March 27, 2008.  
*Thermalization and its mechanism for generic isolated quantum systems*
24. University of California, Santa Cruz, USA, November 29, 2007.  
*Ultracold Gases and the Foundations of Quantum Statistical Mechanics*

23. University of California, Santa Cruz, USA, September 28, 2007.  
*Kagome lattice antiferromagnets and the thermodynamics of the material  $ZnCu_3(OH)_6Cl_2$*
22. University of Stuttgart, Stuttgart, Germany, September 19, 2007.  
*Thermalization and its mechanism for generic isolated quantum systems*
21. University of Stuttgart, Stuttgart, Germany, July 17, 2007.  
*Numerical linked cluster expansions and Kagome lattice quantum antiferromagnets*
20. University of Augsburg, Augsburg, Germany, July 11, 2007.  
*Statistical mechanics of an integrable system after relaxation*
19. Institute for Theoretical Atomic, Molecular and Optical Physics (ITAMP), Boston, USA, June 1, 2007.  
*Statistical mechanics of an integrable system after relaxation*
18. Massachusetts Institute of Technology (MIT), Boston, USA, May 31, 2007.  
*Finite temperature properties of the Kagome lattice antiferromagnet  $ZnCu_3(OH)_6Cl_2$*
17. University of California, Los Angeles, USA, April 11, 2007.  
*Statistical mechanics of an integrable system after relaxation*
16. Harvard University, Boston, USA, March 20, 2007.  
*Statistical mechanics of an integrable system after relaxation*
15. Georgetown University, Washington DC, USA, March 15, 2007.  
*Statistical mechanics of an integrable system after relaxation*
14. University of Massachusetts, Boston, USA, January 31, 2007.  
*Simulating Condensed Matter Systems with Ultracold Quantum Gases*
13. Pontificia Universidad Católica de Chile, Santiago, Chile, January 11, 2007.  
*Relaxation and thermalization in 1D quantum gases - the Gibbs ensemble on hold*
12. University of Southern California, Los Angeles, USA, September 15, 2006.  
*Dynamics and relaxation in 1D quantum gases - the Gibbs ensemble on hold*
11. University of Stuttgart, Stuttgart, Germany, July 10, 2006.  
*Relaxation and thermalization in 1D quantum gases - the Gibbs ensemble on hold*
10. The University of Tennessee, Knoxville, USA, May 22, 2006.  
*Equilibrium and emergent quantum criticality in ultracold gases on optical lattices*
9. Max-Planck-Institute of Quantum Optics, Garching, Germany, May 17, 2006.  
*Nonequilibrium dynamics of integrable systems - do they relax to equilibrium?*
8. Scuola Normale Superiore di Pisa, Pisa, Italy, May 11, 2006.  
*Equilibrium and Nonequilibrium Properties of Tonks-Girardeau Gases on Optical Lattices*
7. Duke University, Durham, USA, February 23, 2006.  
*Equilibrium and emergent quantum criticality in ultracold gases on optical lattices*
6. University of California, San Diego, USA, January 30, 2006.  
*Equilibrium and emergent quantum criticality in ultracold gases on optical lattices*
5. University of California, Santa Cruz, USA, October 21, 2005.  
*Hubbard models in trapped quantum gases on optical lattices*
4. University of Southern California, Los Angeles, USA, March 4, 2005.  
*Strongly correlated quantum gases on 1D lattices*
3. University of California, Davis, USA, December 9, 2004.  
*Equilibrium and nonequilibrium properties of hard-core bosons on 1D optical lattices*
2. University of Stuttgart, Stuttgart, Germany, January 30, 2003.  
*Mott domains of bosons and fermions confined in optical lattices*
1. Brazilian Center for Research in Physics (CBPF), Rio de Janeiro, Brazil, June 20, 2001.  
*On a Modified Perturbative QCD*

## Lectures in Schools

2. 2nd RRI school on Statistical Physics, Raman Research Institute, Bangalore, India, March 7-19, 2011.  
Lectured twelve hours on the following topics.
    - (i) Bose-Einstein condensation in ideal gases
    - (ii) Bose-Einstein condensation in alkali gases
    - (iii) Integrability, mappings, and exact solutions for one-dimensional lattice systems
    - (iv) The Bose-Hubbard model and the superfluid–Mott-insulator transition
    - (v) Thermalization and the eigenstate thermalization hypothesis for generic quantum systems
    - (vi) Generalized thermalization in integrable systems
  1. Summer school on Frontier Topics on Bose-Einstein Condensation in Solids and Atomic Gases, Institute of Theoretical and Applied Physics (ITAP), Turunç/Marmaris, Turkey, September 11-19, 2010.  
Lectured ten hours on the following topics.
    - (i) Quantum lattice models
    - (ii) Exact diagonalization and the Bose-Hubbard model
    - (iii) Thermalization and the eigenstate thermalization hypothesis for generic quantum systems
    - (iv) Integrability, mappings, and exact solutions for one-dimensional lattice systems
    - (v) Generalized thermalization in integrable systems
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