
Rosario Paredes Gutiérrez

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Date of birth: June 8, 1973.

Place of birth: Mexico City, México.

Current Position: Investigador Titular “B”, TC. (Associate Professor)

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Current Research Topics

Inhomogeneous quantum matter

1. Phase transitions in fermionic superfluids with dipolar interactions.
2. Formation of magnetic domains in lattices in 2 dimensions.
3. Localization in crystalline and quasicrystalline lattices in 2 dimensions.

Education

- **Bachelor in Science (Physics)** 1990 - 1996
Universidad Nacional Autónoma de México
Tesis: *Estudio Comparativo de Aerosoles Atmosféricos en tres Areas de la Zona Metropolitana de la Ciudad de México*
Asesor: Dr. Javier Miranda Martín del Campo.
- **Master in Science (Physics)** 1996 - 1998
Universidad Nacional Autónoma de México.
Asesor: Dr. Rafael Angel Barrio Paredes.
- **Doctor of Philosophy in Physics** 1998 - 2002
Universidad Nacional Autónoma de México.
Tesis: *Modelaje Teórico de Crecimiento de Sólidos*
Asesor: Dr. Rafael Angel Barrio Paredes.
- **Postdoc** 2003 - 2004
Consortium of the Americas for Interdisciplinary Science.
The University of New Mexico.
Albuquerque, NM. USA.

Professional Experience

1. Professor at the Institute of Physics, UNAM, since 2004. Visiting scholar at Oxford University, UK. Postdoctoral stay at The University of New Mexico, Albuquerque, NM. USA.
2. Lecturer at undergraduate and graduate level on Quantum Mechanics, Classical Mechanics, Contemporary Physics, Advanced Mathematics for Physics, Solid State and Quantum Many-body Physics (39 courses).
3. Supervisor of 22 thesis, Bachelor (11), Master (7), and Doctorate (4).
4. Journal reviewer.

List of Publications (Research)

1. R. Paredes-Gutiérrez, A. López-Suárez, J. Miranda, E. Andrade and A. González.
Comparative study of elemental contents in atmospheric aerosols from three sites in Mexico City.
Rev. Int. Contam. Ambient. **13**, 81 (1997).
2. J. Miranda, A. López-Suárez, R. Paredes-Gutiérrez, S. González, O.G. de Lucio, E. Andrade and M.J. Avila-Sobarzo.
A study of atmospheric aerosols from five sites in Mexico City using PIXE.
Nucl. Inst. and Meth. **136-138**, 970 (1998).
3. R. Paredes, J.L. Aragón and R.A. Barrio.
Crecimiento estocástico de sólidos.
Revista Mexicana de Física **45**, 21 (1999).
4. R. Paredes, J.L. Aragón and R.A. Barrio.
Nonperiodic hexagonal square-triangle tilings.
Phys. Rev. B **58**, 11990 (1999).
5. R. Paredes, G.G. Naumis, and R.A. Barrio.
Theoretical Method for Non-Crystalline Growth.
Journal of Non-Crystalline Solids **329**, 48 (2003).
6. R. Jáuregui, R. Paredes, and G. Toledo Sánchez.
A simple variational approach for an interacting Fermi trapped gas.
Phys. Rev. A **69**, 013606 (2004).
7. R. Paredes, and R.A. Barrio.
Two-dimensional Square-Triangle Lattices.
Journal of Non-Crystalline Solids **351**, 136 (2005).
8. R. Paredes.
Tunneling of ultracold gases in multiple wells.
Phys. Rev. A. **73**, 033616 (2006).
9. R. Paredes.
Dynamics of an interacting Bose-Einstein condensate in a three well potential.
Laser Physics, **16**, 1714 (2006).

10. R. Jáuregui, R. Paredes, and G. Toledo Sánchez.
BEC-BCS crossover of a trapped Fermi gas beyond the local density approximation
Phys. Rev. A, **76**, 011604 (2007).
11. R. Muñoz, R.P. Duarte-Zamorano y R. Paredes.
Effective Hamiltonian of an ultracold Bose gas confined in a four-well optical lattice
Rev. Mex. Fis., **53** 126 (2007).
12. E. Neri and R. Paredes.
Quantum dynamics of a Bose gas in finite n -well potentials in one dimension.
J. Phys. B: At., Mol. Opt. Phys. **42** 035301 (2009).
13. R. Jáuregui, R. Paredes, L.E.C. Rosales and G. Toledo Sánchez.
An optimized description of a confined interacting Fermi system.
J. Phys. B: At., Mol. Opt. Phys., **43** 065301 (2010).
14. S.F. Caballero Benítez, V. Romero-Rochín and R. Paredes.
Intrinsic decoherence in an ultracold Bose gas confined in a double-well potential
J. Phys. B: At., Mol. Opt. Phys., **43** 095301 (2010).
15. S.F. Caballero Benítez, V. Romero-Rochín and R. Paredes.
Delocalization to self-trapping transition of a Bose fluid confined in a double well potential.
An analysis via one- and two-body correlation properties
J. Phys. B: At., Mol. Opt. Phys., **43** 115301 (2010).
16. L.A. González-García, R.A. Zamora-Zamora and R. Paredes.
Non-equivalence of canonical and microcanonical ensembles in a bosonic Josepson junction.
Rev. Mex. de Fis., **57** 382 (2011).
17. S.F. Caballero Benítez and R. Paredes.
Phase diagram of Landau-Zener phenomena in coupled one-dimensional Bose quantum fluids
Phys. Rev. A **85**, 023605 (2012).
18. S.F. Caballero Benítez, R. Paredes and V. Romero-Rochín.
The Contact in the BCS-BEC crossover for finite range interacting ultracold Fermi gases
Phys. Lett. A **377** 1756 (2013).
19. S.F. Caballero Benítez and R. Paredes.
Glassy dynamics and Landau-Zener phenomena in trapped iquasi-one-dimensional coupled Bose-Einstein condensates
Phys. Rev. A **87**, 053603 (2013).
20. A. Camacho-Guardian and R. Paredes.
Intrinsic decoherence and purity in a Bose quantum fluid in a triple well potential
Las. Phys., **24** 8, 085501 (2014).

21. A. Camacho-Guardian, M. Mendoza-López, V. Romero-Rochín and R. Paredes.
Energetic cooling below the BEC transition: a quantum kinetic description within the Bogoliubov approximation
J. Phys. B: At., Mol. Opt. Phys., **47** 215304 (2014).
22. S.F. Caballero Benítez and R. Paredes.
Phase transitions in ultracold Bose gases confined in optical lattices
Phys. Scripta, **90** 068009 (2015).
23. A. Camacho-Guardian and R. Paredes.
Superfluidity of a dipolar Fermi gas in 2D optical lattices bilayer
Annalen Der Physik, **528** 11, 778-784 (2016).
24. A. Camacho-Guardian, G.A. Domínguez-Castro and R. Paredes.
Bound states and Cooper pairs of molecules in 2D optical lattices bilayer
Annalen Der Physik, **528** 6, 580-587 (2016).
25. A. Camacho-Guardian and R. Paredes.
Supersolid phases of dipolar fermions in a 2D lattices bilayer array
Phys. Rev. A, **94**, 043638 (2016).
26. A. Camacho-Guardian, R. Paredes, S.F. Caballero-Benítez.
Quantum simulation of competing orders with fermions in quantum optical lattices
Phys. Rev. A, **96**, 051602R (2017).
27. G.A.Domínguez Castro and R. Paredes.
p-wave Superfluid Phases of Fermi Molecules in a Bilayer Lattice Array
Annalen Der Physik, **528** 6, 1800316 (2019).
28. G.A.Domínguez-Castro and R. Paredes.
The Aubry-André model as the hobbyhorse for understanding the localization phenomenon
European Journal of Physics, **40**, 045403, (2019).
29. L.A. González-García, S.F Caballero-Benítez and R. Paredes.
Localization of weakly interacting bosons in two dimensions: disorder vs lattice geometry effects
Sci. Rep., **9**, 11049 (2019).
30. R. Zamora-Zamora, G.A. Domínguez-Castro, C. Trallero-Giner R. Paredes and V. Romero-Rochín.
Validity of Gross-Pitaevskii solutions of harmonically confined gases in reduced dimensions
J. Phys. Commun., **3**, 085003 (2019).
31. E. Neri, S.F. Caballero-Benítez, V. Romero-Rochín and R. Paredes.
Pairing and molecule formation along the BEC-BCS crossover for finite range potentials
Physica Scripta, **95** 3, 034013 (2020).
32. C. Madroñero, G.A. Domínguez-Castro, L. A. González-García and R. Paredes.
Persistence of ferromagnetic domains in a disordered 2D lattice
Phys. Rev. A, **102** 033304, (2020).
33. J.C. Sandoval-Santana, R. Zamora-Zamora, R. Paredes and and V. Romero-Rochín.
Intrinsic decoherence and recurrences in a large ferromagnetic $F = 1$ spinor Bose-Einstein condensate

- Symmetry*, **13**, 18 (2021).
34. G.A. Domínguez-Castro and R. Paredes.
Enhanced transport of two interacting quantum walkers in a one-dimensional quasicrystal with power-law Hopping
Phys. Rev. A, **104**, 033306 (2021).
 35. G.A. Domínguez-Castro and R. Paredes.
Artificial Neural Network for the Single-Particle Localization Problem in Quasiperiodic One-Dimensional Lattices
Rev. Mex. Fis., **69**, 020502 (2022).
 36. L. A. González-García, H. Alva-Sánchez and R. Paredes.
Localization in quasicrystalline lattices in two dimensions
Entropy, **24**, 1628 (2022).
 37. G.A. Domínguez-Castro and R. Paredes.
Localization of Pairs in One-Dimensional Quasicrystals with Power-Law Hopping
Phys. Rev. B, **106**, 134208 (2022).
 38. C. Madroñero and R. Paredes.
Dynamic stability in spinor Bose gases in moiré lattices with square and hexagonal symmetries
Phys. Rev. A, **107**, 033316 (2023).
 39. M.I. Morales-Amador, V. Romero-Rochín and R. Paredes.
Critical exponents and fluctuations at BEC in a 2D harmonically trapped ideal gas
Submitted to *J. Phys. B At. Mol. and Opt. Phys.*, (2023).
 40. J.C. Obeso-Jureidini, G. A. Domínguez-Castro, E. Neri, R. Paredes and V. Romero-Rochín.
Universal correlations along the BEC-BCS crossover
Submitted to *New Journal of Physics*, (2023).

List of Publications (Conferences)

1. J. Miranda, I. Crespo, A. López-Suárez, B. Pablo, and R. Paredes-Gutiérrez.
Comparative study of elemental contents in atmospheric aerosols from three sites in Mexico City
en *Third Conference on Urban Climatology*,
p. 583, AIP Conf. Proc. (1997).
2. R. Paredes, G. Toledo-Sánchez, and R. Jáuregui.
Trapped Fermi gas properties. A variational approach.
en *Interactions in Ultracold Gases: From atoms to molecules*,
Eds. M. Weidemuller and C. Zimmermann, Wiley (2002).
3. R. Paredes.
Gases atómicos a temperaturas cercanas al cero absoluto
en *Revista Digital Universitaria* 6, 1 (2005).
4. R. Paredes.
Gases atómicos ultrafríos: Condensación de Bose-Einstein y Gases Degenerados de Fermi.
en *Escuela de Verano*,
Eds. R. Jáuregui and y M. Torres, (2006).

5. (*) L. A. González García and R. Paredes.
Uniones de Josephson en gases de Bose ultrafríos.
Propiedades termodinámicas en el ensemble canónico.
en *Interacción de Radiación con Materia, Simposio Nacional 2010*
ISBN: 978-607-422-351-4.
pp 45-54 Eds, UAEMex (2012).
6. R. Paredes.
Materia Ultrafría.
en *Perspectivas de la Física para el siglo XXI*
disponible en <http://scifunam.fisica.unam.mx/mir/copit/index.html>
Editores: O. Miramontes y K. Volke, (2013).
7. (*) A. Camacho-Guardian and R. Paredes.
Superfluid and Supersolid Phases in Optical Lattices in Two Dimensions.
en *Proceedings of the Latin American School of Physics Marcos Moshinsky ELAF2017*
ISBN: 978-0-7354-1645-1, AIP Conference Proceedings **1950**, 010002 (2018).
doi: 10.1063/1.5031687, <https://doi.org/10.1063/1.5031702>
8. K. Volke-Sepúlveda, A. Balbuena Ortega, S Bucio-Pacheco, S. López- Huidobro, L. Pérez-García, A. V. Arzola, A. Huerta-Hernández, J. A. Seman, A. Domínguez-Castro, and R. Paredes.
Dynamics of vortex propagation in wave fields: from order to disorder and beyond.
en *SPIE OPTO 2019*
Proceedings **10935**, Complex Light and Optical Forces XIII; 109350S (2019).
<https://doi.org/10.1117/12.2512303>
9. R. Paredes.
Simulando Transiciones de Fase en el Régimen Cuántico
en *Analogías y Conexiones en la Física*
disponible en <http://scifunam.fisica.unam.mx/mir/copit/>
Editores: K. Volke, J. Flores, O. Miramontes y S. Sánchez (2020).
10. (*) G.A. Domínguez-Castro and R. Paredes.
Unconventional superfluidity in ultracold dipolar gases.
en *Proceedings of the Quantum Fest 2019*
ISBN: 978-0-7354-1645-1, AIP Conference Proceedings **1950**, 010002 (2020).
<https://doi.org/10.1088/1742-6596/1540/1/012002>