Sofía Martínez Garaot

Department of Physical Chemistry
University of the Basque Country (UPV/EHU)

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ResearcherID: R-3584-2018
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Education

- PhD in Physics
  University of Basque Country (2016)
  Thesis: “Shortcuts to adiabaticity in the double well”

- Master degree in Physics and Materials Technology
  University of Basque Country (2011)
  Master thesis: “Shortcuts to adiabaticity for non-Hermitian systems”

- Bachelor degree in Physics
  University of Oviedo (2010)

Professional Experience

- Assistant Professor
  Department of Physical-Chemistry, University of the Basque Country
  October 2024 - Present

- Postdoctoral Research Fellow
  Department of Physical Chemistry, University of the Basque Country
  April 2016 - October 2023

- PhD student in Quantum Science and Technology
  Department of Physical Chemistry, University of the Basque Country
  February 2012 - February 2016

Journal Publications

1. From Quantum Probabilities to Quantum Amplitudes
   S. Martinez-Garaot, M. Pons, and D. Sokolovski
   Entropy 22, 1389 (2021)

2. Shortcut-to-Adiabaticity-Like Techniques for Parameter Estimation in Quantum Metrology
   M. Cabedo-Olaya, J. G. Muga, and **S. Martínez-Garaot**
   Entropy 22, 1251 (2020)

3. Time-dependent harmonic potentials for momentum or position scaling
   J. G. Muga, **S. Martínez-Garaot**, M. Pons, M. Palmero, and A. Tobalina
   Phys. Rev. Research 2, 043162 (2020)

4. Trapped-ion Fock state preparation by potential deformation
   M. A. Simon, M. Palmero, **S. Martínez-Garaot**, and J. G. Muga
   Phys. Rev. Research 2, 023372 (2020)

5. Interferometer for force measurement via a shortcut to adiabatic arm guiding
   A. Rodríguez-Prieto, **S. Martínez-Garaot**, I. Lizuain, and J. G. Muga
   Phys. Rev. Research 2, 023328 (2020)

6. Symmetries of (NxN) non-Hermitian Hamiltonian matrices
   A. Alana, **S. Martínez-Garaot**, M. A. Simon, and J. G. Muga
   Journal of Physics A: Mathematical and Theoretical 53, 135304 (2020)

7. Noise Sensitivities for an Atom Shuttled by a Moving Optical Lattice via Shortcuts to Adiabaticity
   X.-J. Lu, A. Ruschhaupt, **S. Martínez-Garaot**, and J. G. Muga
   Entropy 22, 262 (2020)

8. Shortcuts to adiabaticity: Concepts, methods, and applications
   D. Guéry-Odelin, A. Ruschhaupt, A. Kiely, E. Torrontegui, **S. Martínez-Garaot**, and J. G. Muga
   Rev. Mod. Phys. 91, 045001 (2019)

9. Asymmetric heat transport in ion crystals
   M. A. Simón, **S. Martínez-Garaot**, M. Pons, and J. G. Muga
   Phys. Rev. E 100, 032109 (2019)

10. Shortcuts to adiabaticity in optical waveguides
    H.-C. Chung, **S. Martínez-Garaot**, X. Chen, J. G. Muga, and S.-Y. Tseng
    Europhysics Letters 127, 34001 (2019)

11. Nonlinear mixing of Bogoliubov modes in a bosonic Josephson junction
    S. Martínez-Garaot, G. Pettini, and M. Modugno
    Phys. Rev. A 98, 043624 (2018)

12. Interferometer with a driven trapped ion
    S. Martínez-Garaot, A. Rodríguez-Prieto, and J. G. Muga
    Phys. Rev. A 98, 043622 (2018)

13. Hamiltonian design to prepare arbitrary states of four-level systems
    Yi-Chao Li, D. Martínez-Cercós, **S. Martínez-Garaot**, Xi Chen, and J. G. Muga
    Phys. Rev. A 97, 013830 (2018)

14. Fast atom transport and launching in a nonrigid trap
    A. Tobalina, M. Palmero, **S. Martínez-Garaot**, and J. G. Muga
    Sci. Rep. 7, 5753 (2017)

15. Fast phase gates with trapped ions
    M. Palmero, **S. Martínez-Garaot**, D. Leibfried, D. J. Wineland, and J. G. Muga
    Phys. Rev. A 95, 022328 (2017)

16. Shortcuts to adiabaticity in optical waveguides using fast quasiadiabatic dynamics
    S. Martínez-Garaot, J. G. Muga, and S.-Y. Tseng
    Opt. Exp. 25, 159 (2017)

17. Fast driving between arbitrary states of a quantum particle by trap deformation
    S. Martínez-Garaot, M. Palmero, J. G. Muga, and D. Guéry-Odelin
    Phys. Rev. A 94, 063418 (2016)

18. Fast bias inversion of a double well without residual particle excitation
    S. Martínez-Garaot, M. Palmero, D. Guéry-Odelin, and J. G. Muga
    Phys. Rev. A 92, 053406 (2015)

19. Fast quasiadiabatic dynamics

S. Martínez-Garaot, A. Ruschhaupt, J. Gillet, Th. Busch, and J. G. Muga
Phys. Rev. A 92, 043406 (2015)

20. Fast separation of two trapped ions
M. Palmero, **S. Martínez-Garaot**, U. G. Poschinger, A. Ruschhaupt, and J. G. Muga
New J. Phys. 17, 093031 (2015)

21. Fast expansions and compressions of trapped-ion chains
M. Palmero, **S. Martínez-Garaot**, J. Alonso, J. P. Home, and J. G. Muga
Phys. Rev. A 91, 053411 (2015)

22. Shortcuts to adiabaticity in three-level systems using Lie transforms
S. Martínez-Garaot, E. Torrontegui, and J. G. Muga
Phys. Rev. A 89, 053408 (2014)

23. Compact and high conversion efficiency mode-sorting asymmetric Y junction using shortcuts to adiabaticity
S. Martínez-Garaot, S.-Y. Tseng, and J. G. Muga
Opt. Lett. 39, 2306 (2014)

24. Hamiltonian engineering via invariants and dynamical algebra
E. Torrontegui, **S. Martínez-Garaot**, and J. G. Muga
Phys. Rev. A 89, 043408 (2014)

25. Vibrational Mode Multiplexing of Ultracold Atoms
S. Martínez-Garaot, E. Torrontegui, X. Chen, M. Modugno, D. Guéry- Odelin, S.-Y. Tseng, and J. G. Muga
Phys. Rev. Lett. 111, 213001 (2013)

26. Engineering fast and stable splitting of matter waves
E. Torrontegui, **S. Martínez-Garaot**, M. Modugno, X. Chen, and J. G. Muga
Phys. Rev. A 87, 033630 (2013)

27. Shortcuts to adiabaticity
E. Torrontegui, S. Ibáñez, **S. Martínez-Garaot**, M. Modugno, A. del Campo, D. Guéry-Odelin, A. Ruschhaupt, X. Chen, and J. G. Muga
Adv. At. Mol. Opt. Phys. 62, 117 (2013)

28. Erratum: Shortcuts to adiabaticity for non-Hermitian systems [Phys. Rev. A 84, 023415 (2011)]
S. Ibáñez, **S. Martínez-Garaot**, Xi Chen, E. Torrontegui, and J. G. Muga
Phys. Rev. A 86, 019901 (2012)

29. Shortcuts to adiabaticity: Fast-forward approach
E. Torrontegui, **S. Martínez-Garaot**, A. Ruschhaupt, and J. G. Muga
Phys. Rev. A 86, 013601 (2012)

30. Shortcuts to adiabaticity for non-Hermitian systems
S. Ibáñez, **S. Martínez-Garaot**, X. Chen, E. Torrontegui, and J. G. Muga
Phys. Rev. A 84, 023415 (2011)

Presentations

- Posters at national conferences

2020 XII Jornadas de Jóvenes investigadores en Física Atómica y Molecular, Bilbao (Spain)
2018 Cold atom workshop, Bilbao (Spain)
2016 V Jornadas de investigación de la facultad de ciencia y tecnología, Bilbao (Spain)
2014 STA2014, Shanghai (China)

2012 STA2012, Bilbao (Spain)

Organization

- Organization of international conferences

  2018 Cold atom workshop, Bilbao (Spain)
  2012 STA2012, Bilbao (Spain)

- Organization of courses

  2018 Comunicación visual aplicada a la ciencia, University of Basque Country (Spain)

- Popular science

  2018 Pint of Science, Bilbao (Spain)
  2019 Pint of Science, Bilbao (Spain)
  2022 Pint of Science, Bilbao (Spain)

Teaching

2021/2022 School year
Bilbao, Spain
- Interfaces and colloids, Grad in Chemistry

2020/2021 School year
Bilbao, Spain
- Interfaces and colloids, Grad in Chemistry
- Thermodynamics and Chemical Kinetics, Grad in Biology
- Chemistry II, Grad in Physics

2019/2020 School year
Bilbao, Spain
- Interfaces and colloids, Grad in Chemistry
- Chemistry II, Grad in Physics

2018/2019 School year
Bilbao, Spain
- Interfaces and colloids, Grad in Chemistry

2017/2018 School year
Bilbao, Spain
- Interfaces and colloids, Grad in Chemistry
- Thermodynamics and Chemical Kinetics, Grad in Biology

2016/2017 School year
Bilbao, Spain
- Chemistry II, Grad in Physics

2015/2016 School year
Bilbao, Spain
- Experimentation in Chemical Physics, Grad in Chemistry

2014/2015 School year
Bilbao, Spain
- Chemistry II, Grad in Physics

Master thesis

- Supervision
  2022 University of Basque Country
  “Machine learning to optimize quantum control”

  2020 University of Basque Country
  “Shortcut-to-adiabaticity techniques applied to quantum metrology”

  2017 University of Basque Country
  “Hamiltonian design to prepare the states of four-level systems”

  2016 University of Basque Country
  “Fock-state creation by deformations of the trapping potential”

- Panel member

  2020 University of Basque Country
  “Dynamics and Thermodynamics of driven quantum system”

  2020 University of Basque Country
  “Group Theory of modulated photonic crystals”

  2019 University of Basque Country
  “Shortcuts to adiabaticity: Analysis of a proposal of energy costs”

Visiting scholar

Xi Chen Group
Shanghai University, Shanghai (China)
June 2014 - August 2014 (2 month visit)

Xi Chen Group
Shanghai University, Shanghai (China)
July 2013 (2 week visit)

Xi Chen Group
Shanghai University, Shanghai (China)
August 2012 (1 month visit)

Languages

English: C1
Basque: C1