

Rubén Seoane Souto

PERSONAL INFORMATION	Sor Juana Inés de la Cruz 3 Madrid, Spain 28049 Website: https://rubenseoanes.github.io/ ORCID: 0000-0002-2978-3534	+34 913336875 ruben.seoane@csic.se Researcher ID: N-8483-2016
ACADEMIC POSITIONS	Group leader – CAM talento fellow Materials Science Institute of Madrid (ICMM) , Spanish Research Council (CSIC)	4/2023 to present
	Marie Curie research fellow Department of theoretical condensed matter physics, Universidad Autónoma de Madrid	1/2023 to 3/2023
	Postdoctoral researcher Center for Quantum Devices, Niels Bohr Institute University of Copenhagen	11/2022 to 12/2022
	Researcher Solid state division and Nanolund, Lund university, Visiting researcher at Center for Quantum Devices University of Copenhagen	11/2020 to 10/2022
	Posdoctoral researcher Solid state division and Nanolund, Lund university, Visiting researcher at Center for Quantum Devices University of Copenhagen	11/2018 to 10/2020
	Adjunct professor (during the Ph.D. studies) Department of theoretical condensed matter physics, Universidad Autónoma de Madrid	10/2016-10/2018
	Doctoral student Department of theoretical condensed matter physics, Condensed matter Physics center (IFIMAC) Universidad Autónoma de Madrid Supervisors: Prof. Alfredo Levy Yeyati and Prof. Álvaro Martín-Rodero	1/2013-10/2016
RESEARCH VISITS	Laboratoire Ondes et Matière d'Aquitaine , CNRS Université de Bordeaux Supervisor: Dr. Rémi Avriller	4/2016-7/2016
EDUCATION	Universidad Autónoma de Madrid , Madrid, Spain Ph.D., Condensed matter physics, nanophysics and biophysics , Thesis title: <i>Quench dynamics in interacting and superconducting nanojunctions</i> . Supervisors: Prof. Alfredo Levy Yeyati and Prof. Álvaro Martín Rodero Master's degree, Master in condensed matter physics and nanotechnology , Master thesis: <i>Electronic transport through molecular transistors in the polaronic regime</i> Supervisors: Prof. Alfredo Levy Yeyati, Prof. Álvaro Martín Rodero and Prof. Rosa C. Monreal Universidad Complutense de Madrid , Madrid, Spain Extended Bachelor in Physics (5 years degree), <ul style="list-style-type: none">Undergraduate thesis: <i>Strong coupling correlation functions and semiclassical strings</i>Supervisor: Rafael Hernández Redondo, Ph.D.Topic: String theory	15/6/2018 7/2013 7/2012

- Quantum transport
- Topological states of matter
- Mesoscopic superconductivity
- Quantum technologies

Articles as first author (or equal contribution to first) are **highlighted** in yellow, and articles as corresponding author appear with *.

1. M. Alvarado, A. Levy Yetati, R. Aguado, and **R. Seoane Souto**. *Characterizing local Majorana properties using Andreev states*. [arXiv:2507.20591 \(2025\)](#) [accepted in PRB].
2. R. A. Dourado, J. Danon, M. Leijnse, and **R. Seoane Souto**. *Measuring coherence factors of states in superconductors through local current*. [Phys. Rev. B **112**, 174515 \(2025\)](#).
3. A. K. Ghosh, **R. Seoane Souto**, V. Azimi-Mousolou, A. M. Black-Schaffer, and P. Holmvall. *Quantum state transfer and maximal entanglement between distant qubits using a minimal quasicrystal pump*. [arXiv:2507.00854 \(2025\)](#) [accepted PRB].
4. M. Nitsch, L. Maffi, V. V. Baran, **R. Seoane Souto**, J. Paaske, M. Leijnse, and M. Burrello. *The poor man's Majorana tetron*. [Phys. Rev. X Quantum **6**, 030365 \(2025\)](#).
5. L. Borgongino, **R. Seoane Souto**, A. Paghi, G. Senesi, K. Skibinska, L. Sorba, F. Giazotto, and E. Strambini. *Biharmonic-drive tunable Josephson diode*. [Nano Lett. **25** 14451–14458 \(2025\)](#).
6. A. Maiani and **R. Seoane Souto**. *Impurity States in Altermagnetic Superconductors*. [Phys. Rev. B **111**, 224506 \(2024\)](#). **Editor's suggestion**
7. G. Giavaras, **R. Seoane Souto**, M. J. Calderon, and R. Aguado. *Flux-tunable parity-protected qubit based on a single full-shell nanowire Josephson junction*. [Phys. Rev. B **111**, 235432 \(2025\)](#).
8. D. M. Pino, **R. Seoane Souto**, M. J. Calderón, Ramón Aguado, and J. Carlos Abadillo-Uriel. *Theory of superconducting proximity effect in hole-based hybrid semiconductor-superconductor devices*. [Phys. Rev. B **111**, 235432 \(2025\)](#). **Editor's suggestion**
9. R. A. Dourado, M. Leijnse, and **R. Seoane Souto**. *Majorana sweet spots in 3-site Kitaev chains*. [Phys. Rev. B **111**, 235409 \(2025\)](#). **Editor's suggestion**
10. A. Maiani, A. C. C. Drachmann, L. Galletti, C. Schrade, Y. Liu, **R. Seoane Souto**, and S. Vaitiekėnas. *Percolative supercurrent in superconductor-ferromagnetic insulator bilayers*. [Phys. Rev. B **111**, 174509 \(2025\)](#). **Editor's suggestion**
11. **R. Seoane Souto***, V. V. Baran, M. Nitsch, L. Maffi, J. Paaske, M. Leijnse, and M. Burrello. *Majorana modes in quantum dots coupled via a floating superconducting island*. [Phys. Rev. B **111**, 174501 \(2025\)](#). **Editor's suggestion**
12. M. Valentini, **R. Seoane Souto**, M. Borovkov, P. Krogstrup, Y. Meir, Martin Leijnse, J. Danon, and G Katsaros. *Subgap-state-mediated transport in superconductor-semiconductor hybrid islands: Weak and strong coupling regimes*. [Phys. Rev. Research **7**, 023022 \(2025\)](#).
13. D. Scheer, **R. Seoane Souto**, F. Hassler, and J. Danon. *Tunable diode effect in a superconducting tunnel junction with biharmonic drive*. [New J. Phys. **27** 033013 \(2025\)](#).
14. M. Alvarado, A. Levy Yeyati, R. Aguado, and **R. Seoane Souto**. *Interplay between Majorana and Shiba states in a minimal Kitaev chain coupled to a superconductor*. [Phys. Rev. B **110**, 245144 \(2024\)](#).
15. I. Sardinero, **R. Seoane Souto**, and P. Buset *Topological superconductivity in a magnetic-texture coupled Josephson junction*. [Phys. Rev. B **110**, L060505 \(2024\)](#).

16. J. Benestad, A. Tsintzis, **R. Seoane Souto**, M. Leijnse, E. van Nieuwenburg, and J. Danon. *Machine-learned tuning of artificial Kitaev chains from tunneling-spectroscopy measurements*. *Phys. Rev. B* **110**, 075402 (2024).
17. M. Geier, **R. Seoane Souto**, J. Schulenburg, S. Asaad, M. Leijnse, and K. Flensberg. *A fermion-parity qubit in a proximitized double quantum dot*. *Phys. Rev. Research* **6**, 023281 (2024).
18. **R. Seoane Souto**^{*}, D. Kuzmanovski, I. Sardinero, P. Buset, and A. V. Balatsky. *P-wave pairing near a spin-split Josephson junction*. *J. Low Temp. Phys.* **217**, 106–120 (2024).
19. **R. Seoane Souto**^{*}, M. Leijnse, C. Schrade, M. Valentini, G. Katsaros, and J. Danon. *Tuning the Josephson diode response with an ac current*. *Phys. Rev. Research* **6**, L022002 (2024).
20. M. Nitsch, **R. Seoane Souto**, S. Matern, and M. Leijnse. *Transport-based fusion that distinguishes between Majorana and Andreev bound states*. *Phys. Rev. B* **109**, 165404 (2024).
21. A. Tsintzis, **R. Seoane Souto**, K. Flensberg, J. Danon, and M. Leijnse. *Roadmap towards Majorana qubits and nonabelian physics in quantum dot-based minimal Kitaev chains*. *Phys. Rev. X Quantum* **5**, 010323 (2024).
22. D. M. Pino, **R. Seoane Souto**, and R. Aguado. *Minimal Kitaev-transmon qubit based on double quantum dots*. *Phys. Rev. B* **109**, 075101 (2024).
23. D. Razmadze, **R. Seoane Souto**, E. C. T. O’Farrell, P. Krogstrup, M. Leijnse, C. M. Marcus, and S. Vaitiekėnas. *Supercurrent transport through 1e-periodic full-shell Coulomb islands*. *Phys. Rev. B* **107**, L081301 (2024).
24. M. Valentini, O. Sagi, L. Baghumyan, T. de Gijss, J. Jung, S. Calcaterra, A. Ballabio, J. Aguilera Servin, K. Aggarwal, M. Janik, T. Adletzberger, **R. Seoane Souto**, M. Leijnse, J. Danon, C. Schrade, E. Bakkers, D. Chrastina, G. Isella, G. Katsaros. *Parity-conserving Cooper-pair transport and ideal superconducting diode in planar Germanium*. *Nature Commun.* **15**, 169 (2024).
25. **R. Seoane Souto**^{*}, A. Tsintzis, M. Leijnse, and J. Danon. *Probing Majorana localization in minimal Kitaev chains through a quantum dot*. *Phys. Rev. Research* **5**, 043182 (2023).
26. R. Debbarma, A. Tsintzis, M. Aspegren, **R. Seoane Souto**, S. Lehmann, K. Dick, M. Leijnse, and C. Thelander, *Josephson junction π -0 transition induced by orbital hybridization in a double quantum dot*. *Phys. Rev. Lett.* **131**, 256001 (2023).
27. S. Chakraborty, D. Nikolić, **R. Seoane Souto**, W. Belzig, and J. C. Cuevas. *DC Josephson effect between two Yu-Shiba-Rusinov bound states*. *Phys. Rev. B* **108**, 094518 (2023).
28. A. Maiani, K. Flensberg, M. Leijnse, C. Schrade, S. Vaitiekėnas, and **R. Seoane Souto**^{*}. *Nonsinusoidal current-phase relations in semiconductor-superconductor-ferromagnetic insulator devices*. *Phys. Rev. B* **107**, 245415 (2023).
29. D. Razmadze, **R. Seoane Souto**, L. Galletti, A. Maiani, Y. Liu, P. Krogstrup, C. Schrade, A. Gyenis, C. M. Marcus, and S. Vaitiekėnas. *Supercurrent reversal in ferromagnetic hybrid nanowire Josephson junctions*. *Phys. Rev. B* **107**, L081301 (2023). (Equal author contribution with first)
30. **R. Seoane Souto**^{*}, M. Leijnse, and C. Schrade, *The Josephson diode effect in supercurrent interferometers*. *Phys. Rev. Lett.* **129**, 267702 (2022).
Selected as best article by GEFES (Spanish Physical Society)
31. **R. Seoane Souto**^{*}, M. M. Wauters, K. Flensberg, M. Leijnse, and M. Burrello, *Multiterminal transport spectroscopy of subgap states in Coulomb-blockaded superconductors*. *Phys. Rev. B* **106**, 235425 (2022).
32. A. Tsintzis, **R. Seoane Souto**, and M. Leijnse. *Creating and detecting poor man’s Majorana bound states in interacting quantum dots*. *Phys. Rev. B* **106**, L201404 (2022)

33. M. Nitsch, **R. Seoane Souto**, and M. Leijnse. *Interference and parity blockade in transport through a Majorana box*. *Phys. Rev. B* **106**, L201305 (2022)
34. S. D. Escribano, A. Maiani, M. Leijnse, K. Flensberg, Y. Oreg, A. Levy Yeyati, E. Prada, and **R. Seoane Souto***. *Semiconductor-ferromagnet-superconductor planar heterostructures for 1D topological superconductivity*. *NPJ Quantum Mater.* **7**, 81 (2022)
35. **R. Seoane Souto*** and M. Leijnse. *Fusion rules in a Majorana single-charge transistor*. *SciPost Phys.* **12**, 161 (2022)
36. S. Krøjer, **R. Seoane Souto***, and K. Flensberg. *Demonstrating Majorana nonabelian exchange using fast adiabatic charge-transfer*. *Phys. Rev. B* **105**, 045425 (2022)
37. S. Vaitiekėnas, **R. Seoane Souto**, Y. Liu, P. Krogstrup, K. Flensberg, M. Leijnse, C. M. Marcus. *Evidence for spin-polarized bound states in semiconductor–superconductor–ferromagnetic-insulator islands*. *Phys. Rev. B* **105**, L041304 (2022)
38. **R. Seoane Souto***, A. E. Feiguin, A. Martín-Rodero, and A. Levy Yeyati. *Transient dynamics of a magnetic impurity coupled to superconducting electrodes: exact numerics versus perturbation theory*. *Phys. Rev. B* **104**, 214506 (2021)
39. D. Kuzmanovski , **R. Seoane Souto**, and A. V. Balatsky. *Persistent current noise in narrow Josephson junctions*. *Phys. Rev. B* **104**, L100505 (2021)
40. A. Maiani, **R. Seoane Souto***, M. Leijnse, and K. Flensberg. *Topological superconductivity in semiconductor-superconductor-magnetic insulator heterostructures*. *Phys. Rev. B* **103**, 104508 (2021)
41. **R. Seoane Souto***, D. Kuzmanovski, and A. V. Balatsky. *Signatures of odd-frequency pairing in the Josephson junction current noise*. *Phys. Rev. Research* **2**, 043193 (2020)
42. D. Kuzmanovski, **R. Seoane Souto**, and A. V. Balatsky. *Odd-frequency superconductivity near a magnetic impurity in a conventional superconductor*. *Phys. Rev. B* **101**, 094505 (2020)
43. **R. Seoane Souto***, K. Flensberg, and M. Leijnse. *Timescales for charge transfer based operations on Majorana systems*. *Phys. Rev. B* **101**, 081407 (Rapid communication) (2020)
44. R. Avriller, **R. Seoane Souto**, A. Martín-Rodero, and A. Levy Yeyati. *Build-up of Vibron-Mediated Electron Correlations in Molecular Junctions*. *Phys. Rev. B* **99**, 121403 (Rapid communication) (2019)
45. **R. Seoane Souto***, R. Avriller, A. Levy Yeyati, and A. Martín-Rodero. *Transient dynamics in interacting nanojunctions within self-consistent perturbation theory*. *New J. Phys.* **20**, 083039 (2018)
46. **R. Seoane Souto**, A. Martín-Rodero, and A. Levy Yeyati. *Quench dynamics in superconducting nanojunctions: Metastability and dynamical Yang-Lee zeros*. *Phys. Rev. B* **96**, 165444 (2017)
47. **R. Seoane Souto***, A. Martín-Rodero, and A. Levy Yeyati. *Analysis of universality in transient dynamics of coherent electronic transport*. *Fortschr. Phys.* **65**, 1600062 (2017)
48. **R. Seoane Souto***, A. Martín-Rodero, and A. Levy Yeyati. *Andreev Bound States Formation and Quasiparticle Trapping in Quench Dynamics Revealed by Time-Dependent Counting Statistics*. *Phys. Rev. Lett.* **117**, 267701 (2016)
49. **R. Seoane Souto**, R. Avriller, R. C. Monreal, A. Martín-Rodero, and A. Levy Yeyati. *Transient dynamics and waiting time distribution of molecular junctions in the polaronic regime*. *Phys. Rev. B* **92**, 125435 (2015)
50. **R. Seoane Souto**, A. Levy Yeyati, A. Martín-Rodero, R. C. Monreal, *Dressed tunneling approximation for electronic transport through molecular transistors*. *Phys. Rev. B* **89**, 085412 (2014)

PREPRINTS

1. M. Tjøtta, D. Shah, K. Modi, M. Valentini, **R. Seoane Souto**, G. Katsaros, and J. Danon *Full Shapiro spectroscopy of current-phase relationships*. [arXiv:2511.14313 \(2025\)](#).
2. I. Sardinero, J. Cayao, **R. Seoane Souto**, and P. Burset. *Odd-frequency Pairing in Josephson Junctions Coupled by Magnetic Textures*. [arXiv:2510.08171 \(2025\)](#).
3. M. Nitsch, V. Svensson, W. Samuelson, K. Nestmann, J. Danon, K. Flensberg, **R. Seoane Souto**, and M. Leijnse. *Adiabatic nonabelian braiding of imperfect Majoranas*. [arXiv:2507.11039 \(2025\)](#).
4. C. González-Sánchez, I. Sardinero, J. Cuadra, A. Spuri, J. A. Moreno, H. Suderow, E. Scheer, P. Burset, A. Di Bernardo, **R. Seoane Souto**, and E. J. H. Lee. *Signatures of edge states in antiferromagnetic van der Waals Josephson junctions*. [arXiv:2505.18578 \(2025\)](#).
5. A. Bordin, F. J. Bennebroek Evertsz', B. Roovers, J. D. Torres Luna, W. D. Huisman, F. Zatelli, G. P. Mazur, S. L. D. ten Haaf, G. Badawy, E. P. A. M. Bakkers, C.-X. Liu, **R. Seoane Souto**, N. van Loo, and L. P. Kouwenhoven. *Probing Majorana localization of a phase-controlled three-site Kitaev chain with an additional quantum dot*. [arXiv:2504.13702 \(2025\)](#).
6. D. Kuzmanovski, **R. Seoane Souto**, P. J. Wong, and A. V. Balatsky. *Mobile Topological Su-Schrieffer-Heeger Soliton in a Josephson Metamaterial*. [arXiv:2312.03456 \(2023\)](#).

MONOGRAPHS

[Quench dynamics in interacting and superconducting nanojunctions](#). 2020
Springer Thesis series recognizing outstanding Ph.D. research. ISBN: 978-3-030-36594-3

BOOK CHAPTERS

[Subgap states in semiconductor-superconductor devices for quantum technologies: Andreev qubits and minimal Majorana chains](#). 2024
R. Seoane Souto and R. Aguado
In, [New Trends and Platforms for Quantum Technologies](#). editors. R. Aguado, R. Citro, M. Lewenstein, and M. Stern. Lecture Notes in Physics, vol. 1025. Springer, Cham. [[arXiv:2404.06592 \(2024\)](#)].

PATENTS

Improved plano-convex lens projector, [ES2570808B1](#) 5/2016
Participation on the invention and design: 50%

REFEREE AND
EVALUATION

- Reviewer of the Danish Research council (NWO Talent Programme) since 2025
- Regular referee of journals of the American Physical Society, including Physical Review Letters, Physical Review B and Physical Review Research. Referee Springer Nature journals, including Nature, Nature Physics, Communications Physics, and Scientific Reports.

GRANTS AND
FELLOWSHIPS

Fellowships

- *Nanoscale superconductors meet quantum technologies* 04/2023 - 03/2028
Comunidad de Madrid Talento program. Budget 475,000 €
Including 200 k€ to begin my own group
- *Dynamics, transport, and non-local properties of topological superconductors* 01/2023 - 01/2025
Marie Skłodowska-Curie Grant Agreement No. 10103324: Budget 125,192 €
Top 2% applicant.
- *Dynamics, transport, and non-local properties of topological superconductors* 01/2023 - 01/2026
Vieira y Clavijo Junior fellowship: Budget 112,828 €
(Resigned due to incompatibility with other fellowships.)

Grants as principal investigator

- *Nanoscale superconductors meet quantum technologies* 1/2023 - 12/2025
Spanish Research Agency: Budget 37,500 €
- *Andreev bound states in the continuum* 1/2022 - 12/2022
Nanolund seedling project: Budget 100,000 SEK (9,693 €)
- *Transport signatures of odd-frequency superconductivity in nanostructures* 1/2020 - 12/2020
Nanolund seedling project: Budget 100,000 SEK (9,693 €)

Student grants

- Predoctoral grant from the national research agency 1/2013 - 10/2016
21,500€ per year, including tuition fee (total 92,750 €)
Department of theoretical condensed matter physics
Universidad Autónoma de Madrid
Supervisors: Prof. Alfredo Levy Yeyati and Prof. Álvaro Martín-Rodero
- M.Sc. studentship (4,000 €) 1/2013 - 10/2016
Master's degree in condensed matter physics and nanotechnology
Universidad Autónoma de Madrid
- Summer research fellowship from the Ignacio Cirac program chair (2700€) 7/2012 - 9/2012
Quantum photonics with solids and atoms group
Institute of photonic sciences (ICFO)
Supervisor: Prof. Hugues de Riedmatten
- Spanish undergraduate research fellowship (2,700 €) 1/2012 - 7/2012
Theoretical physics department II, Universidad Complutense de Madrid
Supervisor: Dr. Rafael Hernández Redondo

Travel grants

- Lindau Nobel Laureate meeting, Lindau (Germany).
Granted by Ragnar Söderberg and Lindau Nobel Laureate Meeting foundations, 5,500 €
- Workshop in bound states in superconductors and interfaces, Dresden (Germany)
Granted by Lunds Tekniska Högskola, 8,664 SEK (861 €)
- International school and symposium on nanoscale transport and photonics.
Granted by Nippon Telegraph and Telephone Corporation, 2600 €

Access to high-performance computational facilities granted by the Spanish supercomputing network

- *Coherent control of Andreev bound states in superconducting quantum dots* 11/2016 - 4/2017
Estimated cost: 2,571.75 €
Responsible of the project proposal, intermediate reports and justification.
- *Transient transport properties of superconducting quantum dots* 11/2015 - 11/2016
Estimated cost: 4,572.00 €
Responsible of the project proposal, intermediate reports and justification.
- *Theoretical study of Majorana single-charge transistor using numerical renormalization group* 7/2015 - 11/2015
Estimated cost: 3,817.62 €
Responsible of the project proposal, intermediate reports and justification.

PARTICIPATION IN FUNDED PROJECTS	<i>Foundations of nonlocal and nonabelian condensed-matter systems.</i>	11/2020 to present
	Coordinator: Prof. Karsten Flensberg. P.I. at Lund university: Prof. Martin Leijnse	
	ERC Synergy grant. Budget: 9,975,273 €	
	<i>2D hybrid materials as a platform for topological quantum computing.</i>	11/2018 to 10/2020
	Coordinator: Prof. Klaus Ensslin. P.I. at Lund university: Prof. Martin Leijnse	
	Quantera project. Budget: 1,047,258 €	
	<i>Dynamics, superconductivity and topology in hybrid nanostructures.</i>	1/2017 - 10/2018
	Principal investigator: Prof. Alfredo Levy Yeyati.	
	Granted by MINECO, FIS2017-84860-R. Budget: 157,300 €	
	<i>Interactions, topology and non-stationary effects in quantum transport.</i>	1/2014 - 1/2018
	Principal investigator: Prof. Alfredo Levy Yeyati.	
	Granted by MINECO, FIS2014-55486-P. Budget: 48,400 €	
	<i>Correlated electrons in hybrid nanostructures: from transport properties to quantum information processing.</i>	12/2013 - 12/2014
	Principal investigator: Prof. Alfredo Levy Yeyati.	
	Granted by MINECO, FIS2011-26516. Budget: 47,000 €	

AWARDS AND
DISTINCTIONS

- Best article award for *The Josephson diode effect in supercurrent interferometers*, *Phys. Rev. Lett.* **129**, 267702 (2022). 6/2023
Awarded by GEFES (Spanish Physical Society)
- Junior Scientist Ideas Award 3/2022
Awarded by Nanolund
- Seal of Excellence Certificate delivered by the European Commission 3/2021
For the project proposal: *Simulating transport and dynamics of non-local and non-abelian quasiparticles* (STONNES)
Horizon 2020's Marie Skłodowska-Curie actions call H2020-MSCA-IF-2020.
- Best question award 12/2020
SPICE-Workshop Coherent order and transport in spin-active systems. Cash prize 50 €.
- Junior Scientist Ideas Award 4/2020
Awarded by Nanolund
- Seal of Excellence Certificate delivered by the European Commission 3/2020
For the project proposal: *Dynamical aspects of Majorana fermions out-of-equilibrium: non-local properties and quantum operations* (DYNAMO)
Horizon 2020's Marie Skłodowska-Curie actions call H2020-MSCA-IF-2019.
- Springer Thesis award for outstanding Ph.D. research 8/2019
Invitation to publish doctoral thesis in Springer Theses series. Cash prize 500 €.

Student awards

- Young researcher 1st prize in material science 12/2017
Awarded by Instituto Nicolás Cabrera. Cash prize 400 €.
- Best student poster award 8/2016
Awarded by the International Union of pure and applied Physics.
33rd international conference on the physics of semiconductors, Beijing.
Cash prize 2,500 ¥.
- Young researcher 2nd prize in material science 12/2015
Awarded by Instituto Nicolás Cabrera. Cash prize 100 €.

SUPERVISION
EXPERIENCE

Postdoctoral researchers

- Miguel Alvarado since 2024
Materials Science Institute of Madrid (ICMM-CSIC)
Co-supervised with R. Aguado

PhD thesis

- José Luis del Olmo, PhD thesis on superconducting devices since 2024
Materials Science Institute of Madrid (ICMM-CSIC)
Co-directed with R. Aguado

Master theses direction

- Nicolás Martínez-Valero, master thesis on artificial Kitaev chains 2024
Materials Science Institute of Madrid (ICMM-CSIC)
- Jakob Westerberg, *Theory of Time-Dependent Transport and Levitons in Nanowires* 23/4/2021
Solid State Division, Lund University
Co-directed with M. Leijnse
- Svend K. Møller, *Detecting Majorana Bound States*. 27/8/2020
Center for Quantum Devices, Copenhagen University
Co-directed with K. Flensberg

Bachelor theses direction

- Adrien Delpoux, *Tight-Binding models of Nanowires*. 4/6/2020
Université Toulouse III, Paul Sabatier
Co-directed with A. Tsintzis and M. Leijnse

TEACHING
EXPERIENCE

Lund university.

- Theory of superconductivity, course for Ph.D. students. 6/12/2019
Guest lecture on topological superconductivity and Majorana fermions.
- Universidad Autónoma de Madrid. Average evaluation 4.5/5 in internal performance assessments
- Experimental Techniques: Optics and Thermodynamics. Courses: 2016-2018
Third year course of the physics degree.
Responsible of the weekly practices, holding office hours and grading reports.
- Physics I. Courses: 2015-2018
Introductory Physics course for chemical engineers: Mechanics and thermodynamics
Responsible of the weekly homework sessions, holding office hours and grading problem sets.
- Laboratory of general physics. Courses: 2014-2017
Introductory Physics course, chemical degree.
Responsible of the weekly practices, holding office hours and grading reports.

PRESENTATIONS **Invited speaker**

1. *Towards Ideal Supercurrent Rectification in Josephson Junctions* . 11/08/2025
30th International Conference on Low-Temperature Physics Bilbao (Spain)
2. *Characterizing low-energy states in Kitaev chains*. 4/06/2025
Workshop on Superconductor-Semiconductor Hybrids 2025 Copenhagen (Denmark)
3. *Majorana states in minimal Kitaev chains*. 4/12/2024
JYU Quantum electronics, superconductivity, and topology workshop. Jyväskylä (Finland)
4. *Minimal Kitaev chains: toward braiding and fusion*. 22/5/2024
Quantum matter for quantum Technologies. Ingelheim (Germany)
5. *Majorana Qubits and Non-Abelian Physics in Minimal Kitaev Chains*. 12/3/2024
Workshop on Superconductor-Semiconductor Hybrids. Copenhagen (Denmark)
6. *Tunable supercurrent diode effect in interferometers*. 20/6/2023
NanoSeries2023. Madrid (Spain)
7. *Superconductor-semiconductor hybrid devices for quantum science and technology* 20/3/2023
International meeting on superconducting quantum materials and nanodevices. Budba (Montenegro)
8. *Superconductor-semiconductor hybrid devices for quantum science and technology* 18/11/2022
Modern Aspects in Quantum Materials and Quantum Technology. Greifswald (Germany)
9. *Magnetism and spin-polarized bound states in semiconductor-superconductor-ferromagnetic wires* 14/10/2022
Northern Lights conference: Magnetism, Topology, and Superconductivity. Reykjavik (Iceland)
10. *Super-semi-ferro as a new platform for quantum technologies* 11/10/2022
Nanolund annual meeting. Lund (Sweden)
11. *Spin-polarized bound states in semiconductor-superconductor-ferromagnetic platforms* 18/1/2022
Young investigators online workshop on unconventional superconductivity. online
12. *Time scales for charge-transfer based operations on Majorana systems* 9/9/2019
Q Rob workshop. Microsoft, Redmond (USA)

Oral presentations

1. *Characterizing low-energy states in Kitaev chains* 25/9/2025
QTech Budapest conference – Suprahybrids Budapest (Hungary)
2. *Subgap states in semiconductor-superconductor devices for quantum technologies* 23/5/2025
Workshop: Center for quantum technologies Trondheim (Norway)
3. *Majorana states in quantum dot systems* 21/5/2025
Superconducting Quantum Circuits Meet Quantum Materials. Bad Honnef (Germany)
4. *Toward braiding and fusion with Poor man's Majorana states*. 19/12/2024
Progress on Realization of Topological States of Matter. Honolulu (USA)

5. *Minimal Kitaev chains: toward braiding and fusion.* 3/6/2024
Quantum matter working group meeting (Nordita). Stockholm (Sweden)
6. *Poor man's Majorana states in quantum dot systems.* 12/6/2023
Bound states in superconducting devices. Budapest (Hungary)
7. *Fine-tuned Majorana states in quantum dot systems.* 25/5/2023
Quantum Matter International Conference. Madrid (Spain)
8. *Andreev bound states in the continuum* 11/10/2022
Nanolund annual meeting. Lund (Sweden)
9. *Magnetism and spin-polarized bound states in superconductor-ferromagnetic wires* 22/8/2022
29th Meeting of the European Physical society, condensed matter division. Manchester (UK)
10. *Majorana fusion rules in a single-charge topological transistor* 15/3/2022
APS March meeting Chicago (USA)
11. *Charge-transfer based operations on Majorana systems* 15/12/2021
722. WE-Heraeus-Seminar Online
12. *Charge-transfer based operations revealing non-abelian statistics of Majorana states* 15/3/2021
APS March meeting Online
13. *Odd frequency superconductivity in quantum dot systems.* 28/9/2020
Nanolund annual meeting Lund (Sweden)
14. *Revealing non-abelian statistics of Majorana states using charge-transfer operations.* 2/9/2020
Meeting of the European Physical society, condensed matter division, GEFES Online
15. *Time scales for charge-transfer based operations on Majorana systems.* 22/11/2019
Entangled states of matter, CRC183 Berlin (Germany).
16. *Time scales for charge-transfer based operations on Majorana systems.* 9/9/2019
Q-Rob workshop at Microsoft headquarters Redmond (USA).
17. *Quench Dynamics in superconducting nanojunctions: metastability and dynamical phase transitions.* 10/4/2019
Workshop on Bound states in superconductors and interfaces Dresden (Germany)
18. *Quench dynamics in superconducting nanojunctions.* 15/11/2017
International school and symposium on nanoscale transport and photonics Atsugi (Japan)
19. *Quench dynamics in superconducting nanojunctions: metastability and dynamical Yang-Lee zeros.* 2/8/2017
Nanophysics, from fundamental to applications: reloaded Quy Nhơn
20. *Quench dynamics and counting statistics in interacting nanojunctions: quasi-particles trapping.* 20/9/2016
10th RES (national supercomputing network) conference León (Spain)
21. *Electronic Time Dependent Counting Statistics in interacting Nanojunctions.* 11/4/2016
Nonequilibrium condensed matter and biological system Madrid (Spain)
22. *Non-stationary and noise properties of molecular junctions in the polaronic regime.* 19/12/2015
Nicolás Cabrera Young Research Meeting Miraflores (Spain)

Poster presentations

1. *The parity qubit in double quantum dots.* 7/05/2024
Quantum Matter confernece Donostia (Spain)
2. *Magnetism and spin-polarized bound states in semiconductor-superconductor-ferromagnet wires.* 30/05/2022
Novel Quantum Phases in Superconducting Heterostructures Bad Honnef
3. *Optimal manipulation of Majorana bound states using quantum dots.* 12/1/2021
Advances in Scalable Hardware Platforms for Quantum Computing Online
4. *Time scales for charge-transfer based operations on Majorana systems.* 6/11/2019
Quantum life workshop Copenhagen (Denmark).
5. *Time scales of charge transfer based operations of a topological qubit.* 22/7/2019
Summer School Nanotechnology meets Quantum Information Donostia (Spain).

6. *Quench dynamics in superconducting nanojunctions: Andreev bound states formation and dynamical phase transitions.* 30/6/2019 - 5/7/2019
Poster displayed during the Lindau Nobel Laureate meeting Lindau (Germany).
7. *Quench dynamics in superconducting nanojunctions.* 25/7/2018
International Conference on Superlattices, Nanostructures and Nanodevices.
8. *Self-consistent dynamics in interacting nanojunctions: the fate of bistability.* 25/7/2018
International Conference on Superlattices, Nanostructures and Nanodevices Madrid (Spain)
9. *Transient dynamics and Full Counting statistics in superconducting nanojunctions.* 2/8/2015
33rd International Conference on the Physics of Semiconductors Beijing (China)
Best poster award
10. *Non-stationary transport properties of molecular junctions in the polaronic regime.* 30/7/2015
Frontiers of Quantum and Mesoscopic Thermodynamics Prague (Czech Republic)
11. *Non-stationary transport properties of molecular junctions in the polaronic regime.* 3/6/2015
Nano Electromechanical Systems and beyond Bordeaux (France)

Seminars

1. *Majorana states for quantum technologies* 30/9/2025
University of Pisa, Pisa (Italy)
2. *Superconductividad topológica ¿Una ruta para tecnologías cuánticas?* 4/6/2025
Universidad Nacional Autónoma de México (Mexico)
3. *Majorana states for quantum technologies* 14/4/2025
Alicante University, (Spain)
4. *Interacting artificial Kitaev chains* 13/1/2025
Budapest University, (Hungary)
5. *Minimal Kitaev chains* 29/10/2024
ISTA, Klosterneuburg (Viena)
6. *Minimal Kitaev chains: coherent experiments with Majorana states* 10/6/2024
Uppsala University (Sweden)
7. *Poor man's Majorana in double dots* 20/3/2023
Nordita, Stockholm (Sweden)
8. *Super-semi-ferro as a platform for quantum science and technology* 7/3/2023
Autonomous University of Madrid (Spain)
9. *Superconductor-semiconductor hybrids for quantum science and technology* 21/2/2023
Spanish Research Council (Spain)
10. *Supercurrent reversal in semiconductor-superconductor-ferromagnetic wires* 21/9/2022
Nordita, Stockholm (Sweden)
11. *Spin-polarized bound states in semiconductor-superconductor-ferromagnetic wires* 20/9/2022
University of Copenhagen (Denmark)
12. *The Josephson diode effect in supercurrent interferometers* 17/5/2022
Virtual Science Forum (Online)
13. *Fusion rules in a Majorana single-charge transistor* 13/1/2022
University of Copenhagen (Denmark)
14. *Quantum transport in topological superconductors: role of non-abelian quasiparticles* 16/6/2021
Aachen University (Germany)
15. *Dynamics of magnetic impurities coupled to superconductors.* 12/5/2021
Niels Bohr institute, University of Copenhagen (Denmark)
16. *Spin-polarized bound states in semiconductor-superconductor-ferromagnetic islands* 16/2/2021
Autonomous University of Madrid (Spain)
17. *Time scales for charge-transfer based operations on Majorana systems* 23/6/2020
Nordita, Stockholm (Sweden)

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| 18. <i>Odd-frequency superconductivity close to magnetic impurities</i>
Lund university (Sweden) | 27/5/2020 |
| 19. <i>Odd-frequency superconductivity close to magnetic impurities</i>
Lund university (Sweden) | 17/4/2020 |
| 20. <i>Time scales for charge-transfer based operations on Majorana systems</i>
Niels Bohr institute, University of Copenhagen (Denmark). | 30/10/2019 |
| 21. <i>Quench dynamics in interacting and superconducting nanojunctions</i>
Nordita, Stockholm (Sweden) | 10/4/2019 |
| 22. <i>Counting statistics reveal quasiparticle trapping in superconducting nanojunctions</i>
Niels Bohr institute, University of Copenhagen (Denmark) | 30/1/2019 |
| 23. <i>Counting statistics revealing dynamical phase transitions.</i>
Lund university (Sweden) | 16/11/2018 |
| 24. <i>Quench dynamics in interacting and superconducting nanojunctions</i>
Lund university (Sweden) | 25/7/2018 |
| 25. <i>Quench dynamics in interacting and superconducting nanojunctions</i>
Würzburg university (Germany) | 9/7/2018 |
| 26. <i>Counting statistics in superconducting nanojunctions</i>
Autonomous University of Madrid (Spain) | 13/12/2017 |
| 27. <i>Electronic time dependent counting statistics in interacting nanojunctions</i>
Autonomous University of Madrid (Spain) | 27/4/2016 |
| 28. <i>Inelastic effects in transport through molecular junctions</i>
Autonomous University of Madrid (Spain) | 11/3/2015 |

Public engagement in science

- Superconductivity experimental show at European Researchers night, Madrid (Spain). 27/9/2024
- Superconductivity experimental show at Madrid's Science week, Madrid (Spain). 8/3/2024
- Open session of the CIVIS assembly, hybrid, Marseille (France). 27/1/2023
Presentation about: *Non-local states for quantum technologies*
- Farad student job fair, Lund (Sweden). 28/1/2020
- Forskar Grand Prix, Helsingborg (Sweden). 26/9/2019
Short presentation to a young audience of about 200 high school students

INTERNATIONAL SCHOOLS

- Nanotechnology meets Quantum Information, San Sebastián. 22-26/7/2019
- Quantum transport in topological materials, Madrid. 4-8/9/2017
- Capri spring school on transport in nanostructures, Capri. 8-12/4/2013