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 4/2023 to present
Materials Science Institute of Madrid (ICMM) ,
Spanish Research Council (CSIC)

Marie Curie research fellow 1/2023 to 3/2023
Department of theoretical condensed matter physics,
Universidad Autónoma de Madrid

Postdoctoral researcher 11/2022 to 12/2022
Center for Quantum Devices, Niels Bohr Institute
University of Copenhagen

Researcher 11/2020 to 10/2022
Solid state division and Nanolund, Lund university,
Visiting researcher at Center for Quantum Devices
University of Copenhagen

Posdoctoral researcher 11/2018 to 10/2020
Solid state division and Nanolund, Lund university,
Visiting researcher at Center for Quantum Devices
University of Copenhagen

Adjunct professor (during the Ph.D. studies) 10/2016-10/2018
Department of theoretical condensed matter physics,
Universidad Autónoma de Madrid

Doctoral student 1/2013-10/2016
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

RESEARCH VISITS

Laboratoire Ondes et Matiere d'Aquitaine, CNRS 4/2016-7/2016
Université de Bordeaux
Supervisor: Dr. Rémi Avriller

EDUCATION

Universidad Autónoma de Madrid, Madrid, Spain

Ph.D., Condensed matter physics, nanophysics and biophysics, 15/6/2018

Thesis title: *Quench dynamics in interacting and superconducting nanojunctions.*
Supervisors: Prof. Alfredo Levy Yeyati and Prof. Álvaro Martín Rodero

Master's degree, Master in condensed matter physics and nanotechnology, 7/2013

Master thesis: *Electronic transport through molecular transistors in the polaronic regime*
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), 7/2012

- Undergraduate thesis: *Strong coupling correlation functions and semiclassical strings*
- Supervisor: Rafael Hernández Redondo, Ph.D.
- Topic: String theory

RESEARCH INTERESTS

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

REFEREED JOURNAL PUBLICATIONS

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

1. M. Nitsch, L. Maffi, V. V. Baran, **R. Seoane Souto**, J. Paaske, M. Leijnse, and M. Burrello. *The poor man's Majorana tetron.* arXiv:2411.11981 (2024) [Accepted in Phys. Rev. X Quantum].
2. A. Maiani and **R. Seoane Souto**. *Impurity States in Altermagnetic Superconductors.* Phys. Rev. B **111**, 224506 (2024). **Editor's suggestion**
3. 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).
4. 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**
5. 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**
6. 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**
7. **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**
8. 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).
9. 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).
10. 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).
11. I. Sardinero, **R. Seoane Souto**, and P. Burset *Topological superconductivity in a magnetic-texture coupled Josephson junction.* Phys. Rev. B **110**, L060505 (2024).
12. 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).
13. M. Geier, **R. Seoane Souto**, J. Schulenborg, S. Asaad, M. Leijnse, and K. Flensberg. *A fermion-parity qubit in a proximitized double quantum dot.* Phys. Rev. Research **6**, 023281 (2024).
14. **R. Seoane Souto***, D. Kuzmanovski, I. Sardinero, P. Burset, and A. V. Balatsky. *P-wave pairing near a spin-split Josephson junction.* J. Low Temp. Phys. **217**, 106–120 (2024).
15. **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).

16. 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).

17. 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).

18. D. M. Pino, **R. Seoane Souto**, and R. Aguado. *Minimal Kitaev-transmon qubit based on double quantum dots*. Phys. Rev. B **109**, 075101 (2024).

19. D. Razmadze, **R. Seoane Souto**, E. C. T. O'Farrell, P. Krogstrup, M. Leijnse, C. M. Marcus, and S. Vaitiekenas. *Supercurrent transport through 1e-periodic full-shell Coulomb islands*. Phys. Rev. B **107**, L081301 (2024).

20. M. Valentini, O. Sagi, L. Baghumyan, T. de Gijsel, 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).

21. **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).

22. 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).

23. 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).

24. 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).

25. 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)

26. **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)

27. **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).

28. 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)

29. M. Nitsch, **R. Seoane Souto**, and M. Leijnse. *Interference and parity blockade in transport through a Majorana box*. Phys. Rev. B **106**, L201305 (2022)

30. 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)

31. **R. Seoane Souto*** and M. Leijnse. *Fusion rules in a Majorana single-charge transistor*. SciPost Phys. **12**, 161 (2022)

32. S. Krøjer, **R. Seoane Souto***, and K. Flensberg. *Demonstrating Majorana nonabelian exchange using fast adiabatic charge-transfer*. Phys. Rev. B **105**, 045425 (2022)

33. 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)

34. **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)

35. D. Kuzmanovski , **R. Seoane Souto**, and A. V. Balatsky. *Persistent current noise in narrow Josephson junctions.* Phys. Rev. B **104**, L100505 (2021)

36. A. Maiani, **R. Seoane Souto***, M. Leijnse, and K. Flensberg. *Topological superconductivity in semiconductor-superconductor-magnetic insulator heterostructures.* Phys. Rev. B **103**, 104508 (2021)

37. **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)

38. 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)

39. **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)

40. 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)

41. **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)

42. **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)

43. **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)

44. **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)

45. **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)

46. **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. Alvarado, A. Levy Yetati, R. Aguado, and R. Seoane Souto. *Characterizing local Majorana properties using Andreev states.* arXiv:2507.20591 (2025).

2. R. A. Dourado, J. Danon, M. Leijnse, and R. Seoane Souto. *Measuring coherence factors of states in superconductors through local current.* arXiv:2507.20696 (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. 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).

5. L. Borgongino, R. Seoane Souto, A. Paghi, G. Senesi, K. Skibinska, L. Sorba, F. Giazotto, and E. Strambini. *Biharmonic-drive tunable Josephson diode.* arXiv:2504.08691 (2025).

6. 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).

7. 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).

8. L. Borgongino, R. Seoane Souto, A. Paghi, G. Senesi, K. Skibinska, L. Sorba, F. Giazotto, and E. Strambini. *Biharmonic-drive tunable Josephson diode.* arXiv:2504.08691 (2025).

9. 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

Foundations of nonlocal and nonabelian condensed-matter systems. 11/2020 to present
Coordinator: Prof. Karsten Flensberg. P.I. at Lund university: Prof. Martin Leijnse
ERC Synergy grant. Budget: 9,975,273 €

2D hybrid materials as a platform for topological quantum computing. 11/2018 to 10/2020
Coordinator: Prof. Klaus Ensslin. P.I. at Lund university: Prof. Martin Leijnse
Quantera project. Budget: 1,047,258 €

Dynamics, superconductivity and topology in hybrid nanostructures. 1/2017 - 10/2018
Principal investigator: Prof. Alfredo Levy Yeyati.
Granted by MINECO, FIS2017-84860-R. Budget: 157,300 €

Interactions, topology and non-stationary effects in quantum transport. 1/2014 - 1/2018
Principal investigator: Prof. Alfredo Levy Yeyati.
Granted by MINECO, FIS2014-55486-P. Budget: 48,400 €

Correlated electrons in hybrid nanostructures: from transport properties to quantum information processing. 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 1^{st} 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 2^{nd} 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

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

Oral presentations

1. *Subgap states in semiconductor-superconductor devices for quantum technologies* 23/5/2025
   Workshop: Center for quantum technologies Trondheim (Norway)
2. *Majorana states in quantum dot systems* 21/5/2025
   Superconducting Quantum Circuits Meet Quantum Materials. Bad Honnef (Germany)
3. *Toward braiding and fusion with Poor man's Majorana states.* 19/12/2024
   Progress on Realization of Topological States of Matter. Honolulu (USA)
4. *Minimal Kitaev chains: toward braiding and fusion.* 3/6/2024
   Quantum matter working group meeting (Nordita). Stockholm (Sweden)
5. *Poor man's Majorana states in quantum dot systems.* 12/6/2023
   Bound states in superconducting devices. Budapest (Hungary)
6. *Fine-tuned Majorana states in quantum dot systems.* 25/5/2023
   Quantum Matter International Conference. Madrid (Spain)
7. *Andreev bound states in the continuum* 11/10/2022
   Nanolund annual meeting. Lund (Sweden)

8. *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)

9. *Majorana fusion rules in a single-charge topological transistor* 15/3/2022
APS March meeting Chicago (USA)

10. *Charge-transfer based operations on Majorana systems* 15/12/2021
722. WE-Heraeus-Seminar Online

11. *Charge-transfer based operations revealing non-abelian statistics of Majorana states* 15/3/2021
APS March meeting Online

12. *Odd frequency superconductivity in quantum dot systems.* 28/9/2020
Nanolund annual meeting Lund (Sweden)

13. *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

14. *Time scales for charge-transfer based operations on Majorana systems.* 22/11/2019
Entangled states of matter, CRC183 Berlin (Germany).

15. *Time scales for charge-transfer based operations on Majorana systems.* 9/9/2019
Q–Rob workshop at Microsoft headquarters Redmond (USA).

16. *Quench Dynamics in superconducting nanojunctions: metastability and dynamical phase transitions.* 10/4/2019
Dresden (Germany)
Workshop on Bound states in superconductors and interfaces

17. *Quench dynamics in superconducting nanojunctions.* 15/11/2017
International school and symposium on nanoscale transport and photonics Atsugi (Japan)

18. *Quench dynamics in superconducting nanojunctions: metastability and dynamical Yang-Lee zeros.* 2/8/2017
Nanophysics, from fundamental to applications: reloaded Quy Nhơn

19. *Quench dynamics and counting statistics in interacting nanojunctions: quasi-particles trapping.* 20/9/2016
10^{th} RES (national supercomputing network) conference León (Spain)

20. *Electronic Time Dependent Counting Statistics in interacting Nanojunctions.* 11/4/2016
Nonequilibrium condensed matter and biological system Madrid (Spain)

21. *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 manipultion 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 nanojuncions: 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 nanojuncions.* 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
   33^{rd} 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. *Characterizing low-energy states in Kitaev chains* 27/5/2025
   Delft University, Delft (Netherlands)
2. *Majorana states for quantum technologies* 14/4/2025
   Alicante University, (Spain)
3. *Interacting artificial Kitaev chains* 13/1/2025
   Budapest University, (Hungary)
4. *Minimal Kitaev chains* 29/10/2024
   ISTA, Klosterneuburg (Viena)
5. *Minimal Kitaev chains: coherent experiments with Majorana states* 10/6/2024
   Uppsala University (Sweden)
6. *Poor man's Majorana in double dots* 20/3/2023
   Nordita, Stockholm (Sweden)
7. *Super-semi-ferro as a platform for quantum science and technology* 7/3/2023
   Autonomous University of Madrid (Spain)
8. *Superconductor-semiconductor hybrids for quantum science and technology* 21/2/2023
   Spanish Research Council (Spain)
9. *Supercurrent reversal in semiconductor-superconductor-ferromagnetic wires* 21/9/2022
   Nordita, Stockholm (Sweden)
10. *Spin-polarized bound states in semiconductor-superconductor-ferromagnetic wires* 20/9/2022
    University of Copenhagen (Denmark)
11. *The Josephson diode effect in supercurrent interferometers* 17/5/2022
    Virtual Science Forum (Online)
12. *Fusion rules in a Majorana single-charge transistor* 13/1/2022
    University of Copenhagen (Denmark)
13. *Quantum transport in topological superconductors: role of non-abelian quasiparticles* 16/6/2021
    Aachen University (Germany)
14. *Dynamics of magnetic impurities coupled to superconductors.* 12/5/2021
    Niels Bohr institute, University of Copenhagen (Denmark)
15. *Spin-polarized bound states in semiconductor-superconductor-ferromagnetic islands* 16/2/2021
    Autonomous University of Madrid (Spain)
16. *Time scales for charge-transfer based operations on Majorana systems* 23/6/2020
    Nordita, Stockholm (Sweden)
17. *Odd-frequency superconductivity close to magnetic impurities* 27/5/2020
    Lund university (Sweden)
18. *Odd-frequency superconductivity close to magnetic impurities* 17/4/2020
    Lund university (Sweden)
19. *Time scales for charge-transfer based operations on Majorana systems* 30/10/2019
    Niels Bohr institute, University of Copenhagen (Denmark).
20. *Quench dynamics in interacting and superconducting nanojunctions* 10/4/2019
    Nordita, Stockholm (Sweden)
21. *Counting statistics reveal quasiparticle trapping in superconducting nanojunctions* 30/1/2019
    Niels Bohr institute, University of Copenhagen (Denmark)

22. *Counting statistics revealing dynamical phase transitions.* 16/11/2018
Lund university (Sweden)

23. *Quench dynamics in interacting and superconducting nanojunctions* 25/7/2018
Lund university (Sweden)

24. *Quench dynamics in interacting and superconducting nanojunctions* 9/7/2018
Würzburg university (Germany)

25. *Counting statistics in superconducting nanojunctions* 13/12/2017
Autonomous University of Madrid (Spain)

26. *Electronic time dependent counting statistics in interacting nanojunctions* 27/472016
Autonomous University of Madrid (Spain)

27. *Inelastic effects in transport through molecular junctions* 11/3/2015
Autonomous University of Madrid (Spain)

Public engagement in science

- Superconductivity experimental show at the 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, Helsinborg (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