Curriculum vitæ

Rafael Sánchez

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Brief Vita

1977: Born in Castellón de la Plana (Spain).
1995-2000: Undergraduate student. Universidad Autónoma de Madrid.
2000: Degree in Physics. Departamento de Física Teórica. Universidad Autónoma de Madrid.
2000-2002: Programmer for Software AG España.
2003-2007: PhD student, under the supervision of Prof. Gloria Platero. Instituto de Ciencia de Materiales de Madrid–CSIC.
2006: *I3P* pre-doctoral grant.
February 4, 2008: Doctor in Physics. Universidad Autónoma de Madrid.
2008-2010: Postdoc in the group of Prof. Markus Büttiker, Université de Genève.
2011-2012: *JAE-Doc* grant. Instituto de Ciencia de Materiales de Madrid–CSIC.
2012-2015: *Juan de la Cierva* grant. Instituto de Ciencia de Materiales de Madrid–CSIC.
2015-2017: Visiting professor. Universidad Carlos III de Madrid.
2017-2018: *Jóvenes Investigadores* research fellow. Universidad Carlos III de Madrid.
Since 2018: *Ramón y Cajal* research fellow. Universidad Autónoma de Madrid.

Projects as Principal Investigator

Title: Nanocircuitos para la manipulación de flujos de calor y su conversión en potencia eléctrica.
Reference: FIS2015-74472.
Funding entity: Ministerio de Economía y Competitividad, Spain.
Center: Universidad Carlos III de Madrid.
Total Amount: 156100€
Starting date: 16 January, 2017.
Duration: 3 years.

Title: Electric and heat currents in the quantum regime.
Reference: RYC-2016-20778.
Funding entity: Ministerio de Ciencia e Innovación, Spain.
Center: Universidad Autónoma de Madrid.

Total Amount: 308600€
Starting date: 16 February, 2018.
Duration: 5 years.

Title: Transporte y manipulación del calor en el régimen cuántico.
Reference: PID2019-110125GB-I00.
Funding entity: Ministerio de Ciencia e Innovación, Spain.
Center: Universidad Autónoma de Madrid.
Total Amount: 38720€
Starting date: 1 June, 2020.
Duration: 3 years.

Participation in research projects

Title: Charge and Spin Quantum Transport Properties in Nanodevices, MAT-2002/02465 (Ministerio de Ciencia y Educación, Spain).
Leader: Gloria Platero.
2003-2005.

Title: Spin Pumps in Double Quantum Dots. Joint Project: CSIC/CONACYT.
Leaders: Gloria Platero, Ernesto Cota.
2004/2005.

Title: Charge and Spin Quantum Transport Properties in Nanodevices, MAT-2005/00644 (Ministerio de Ciencia y Educación, Spain).
Leader: Gloria Platero.
2006-2008.

Title: EU Network "Marie Curie", 'Fundamentals of Nanoelectronics", 504574.
Network Leader: Colin Lambert.
Spanish Leader: Fernando Sols.
2004-2007.

Title: Adiabatic and Non-Adiabatic Transport in Double Quantum Dots as Charge and Spin Pumps, HA-2005-2007. DAAD-MEC.
Leaders: Peter Hänggi and Gloria Platero.
2006-2008.

Title: Mesoscopic Physics: Transport, Correlations and Entanglement, 200020-121807.
Leader: Markus Büttiker.
2008-2009.

Title: Sub kT Low Energy Transistors and Sensors, SUBTLE (Strep project 034236).
Leader: Lukas Worschech.

01/10/2006 – 30/09/2009.

Title: Materiaux aux proprietés electroniques exceptionnelles, MaNEP, S16046.
Leaders: Øystein Fisher.
2008-2010

Title: Dinámica Electrónica y Transporte de Carga y Espín en Nanodispositivos y en Sistemas Nanoelectromecánicos, MAT2008-02626/NAN (Ministerio de Ciencia y Educación, Spain).
Leader: Gloria Platero.
2009-2011.

Title: NANOPOWER, VII FP, Collaborative project N. 256959.
Leader: Luca Gammaitoni.
2010-2013.

Title: Nanoelectronics: Concepts, Theory and Modelling (NanoCTM). Marie Curie Initial Training Network (ITN), no. 234970, UE
Leader: Colin Lambert.
2010-2013.

Title: Acción Integrada Madrid-Berlín, DE2009-0074, "Transport through Triple Quantum Dots"
Leaders: Gloria Platero, Tobias Brandes (Technische Universität Berlin).
01/01/2010 – 31/12/2011.

Title: Transporte coherente de carga y espín en nanodispositivos, MAT2011-24331 (Ministerio de Economía y Competitividad, Spain).
Leader: Gloria Platero.
2012-2014.

Title: COST MP1209 "Thermodynamics in the Quantum Regime".
Leader: Janet Anders.
2013-2017.

Title: Termoelectricidad: Nuevas Teorías. Redes de Excelencia 2016, MAT2016-82015-REDT (Ministerio de Economía y Competitividad, Spain).
Leader: Andrés Cantarero.
01/07/2017-30/06/2019.

Contribution to Conferences

Trends in Nanotechnology (TNT2004) International Conference.
Segovia, 13-17 September, 2004.
Phantoms Foundation.

Poster: *Electronic pumping in AC-driven quantum dots*, E. Cota, R. Sánchez, R. Aguado, G. Platero.

5th International Conference on Low Dimensional Structures and Devices (LDSD 2004).
Cancún (México), 12-17 December 2004.
Invited talk: *AC-Driven Double Quantum Dots Operating as Spin Pumps and Bipolar Spin Filters*, G. Platero, E. Cota, R. Aguado and R. Sánchez.

16th International Conference on Electronic Properties of Two-Dimensional Electron Systems.
Alburquerque, New Mexico, USA, 2005.
Sandia National Laboratories.
Poster: *Spin filter effect in an ac-driven double quantum dot*, R. Sánchez, E. Cota, R. Aguado, G. Platero.

Transport in mesoscopic and single-molecule systems Symposium.
Copenhague, 2005.
Niels Bohr Institute, University of Copenhaguen.
Poster: *Photon-assisted tunneling in double quantum dots as spin pumps*, R. Sánchez, G. Platero, R. Aguado, E. Cota.

Trends in Nanotechnology (TNT2005) International Conference.
Oviedo, 2005.
Phantoms Foundation.
Poster: *Spin-filter effect in an ac-driven double quantum dot and photon-assisted tunneling effect*, R. Sánchez, G. Platero, R. Aguado, E. Cota.

Nanoscale Dynamics and Quantum Coherence. Marie Curie Workshop.
Invited talk: *AC-Driven Double Quantum Dots Operating as Spin Pumps and Bipolar Spin Filters*, G. Platero and R. Sánchez.
Catania, October 2005.

4th International Conference on Quantum dots
Chamonix, France, 1-5 May 2006.
Oral: *Double Quantum Dots as Spin Pumps and Spin Filters*, R. Sánchez, G. Platero, E. Cota, R. Aguado.

2nd International Conference on Transport Phenomena in Micro and Nanodevices (ECI, Engineering Conferences International).
Barga, Italy, 11-15 June 2006.
Invited talk: *Spin transport in AC-Driven Double Quantum Dots*, G. Platero, R. Sánchez, E. Cota and R. Aguado.

14th European Conference on Mathematics for Industry (ECMI 2006).
Leganés, 10-14 July 2006.
Invited talk: *AC-driven double quantum dots operated as spin pumps and bipolar spin filters*, R. Sánchez, G. Platero.

DPG Spring Meeting of the Condensed Matter division, 2007.

Regensburg, Germany, 26-30 March 2007.
Oral: *Electron transport in quantum dots in the spin blockade regime*, C. López-Monís, M. Busl,R. Sánchez, J. Iñarrea, G. Cuniberti and G. Platero.

14th International Conference on Superlattices, Nano-structures and Nano-devices.
Istambul, Turkey, 30 July – 4 August 2006.
Oral: *Photoassisted Tunneling through Double Quantum Dots*, G. Platero, R. Sánchez.

International Conference on Electronic Properties of Two-Dimensional Systems and Modulated Semiconductor Structures, EP2DS 17.
Genova, Italy, 15-20 July 2007.
Poster: *Electron Spin Resonance in Double Quantum Dots*, R. Sánchez, C. López Monís, J. Iñarrea and G. Platero.
Poster: *Electron and Phonon Counting Statistics in ac Driven Quantum Dots*, R. Sánchez, G. Platero and T. Brandes.
Poster: *Shot noise in AC-driven spin pumps*, R. Sánchez, F.J. Kaiser, S. Kohler, P. Hänggi and G. Platero.

Research Training Network NANO, Fundamentals of nanoelectronics. Annual meeting, 2007.
Portorož, Slovenja, 02-07 September 2007.
Invited talk: *Spin transport in double quantum dots*, G. Platero, R. Sánchez, C. López-Monís and J. Iñarrea.
Oral: *Electron and phonon correlations in a driven quantum dot*, R. Sánchez, G. Platero and T. Brandes.

DPG Spring Meeting of the Condensed Matter division, 2008.
Berlin, Germany, 25-29 February 2008.
Oral: *Coherent spin rotations in double quantum dots*, R. Sánchez, C. López-Monís and G. Platero.
Oral: *Electron and phonon correlations in a driven two level quantum dot*, R. Sánchez, G. Platero and T. Brandes.
Oral: *Electron bunching in stacks of coupled quantum dots*, S. Kohler, R. Sánchez, P. Hänggi and G. Platero.

Research Training Network NANO, Fundamentals of nanoelectronics. Annual meeting, 2008.
Bremen, Germany, 07-11 April 2008.
Oral: *Electron bunching in stacks of coupled quantum dots*, R. Sánchez, S. Kohler and G. Platero.

Frontiers of Quantum and Mesoscopic Thermodynamics.
Prague, Czech Republic, 28 July – 02 August 2008.
Invited talk: *Spin transport in double quantum dots: role of hyperfine interaction*, G. Platero, C. López-Monís, J. Iñarrea and R. Sánchez.

DPG Spring Meeting of the Condensed Matter division, 2009.
Dresden, Germany, 22-27 March, 2009.
Oral: *Electron-Spin-Resonance (ESR) in Triple Quantum Dots*, M. Busl, R. Sánchez and G. Platero.

SUBTLE Meeting.
Perugia, Italy, 11-12 May 2009.

Oral: *Coulomb drag in quantum dot systems*, R. Sánchez, R. López, D. Sánchez and M. Büttiker.

WE-Heraeus Seminar on *Noise and full counting statistics in mesoscopic transport*.
Bad Honnef, Germany, 18-20 May 2009.
Poster: *Fluctuations induced transport in capacitively coupled conductors*, R. Sánchez, R. López, D. Sánchez and M. Büttiker.

Rencontre Romande sur les Systèmes Fortement Correlés.
Genéve, Switzerland, 26 June 2009.
Oral: *Correlated transport in capacitively coupled conductors*, R. Sánchez, R. López, D. Sánchez and M. Büttiker.

5th International School and Conference on Spintronics and Quantum Information Technology (SPINTECH).
Kraków, Poland, 7-11 July 2009.
Poster: *Spin dynamics in triangular triple dots*, M. Busl, R. Sánchez and G. Platero.

18th International Conference on Electronic Properties of Two-Dimensional Electron Systems.
Kobe, Japan, 19-24 July 2009.
Poster: *Coherent spin phenomena in triple quantum dots*, M. Busl, R. Sánchez and G. Platero.

SUBTLE Meeting.
Würzburg, Germany, 21-22 September 2009.
Oral: *Fluctuation relations and noise induced transport in coupled conductors*, R. Sánchez, R. López, D. Sánchez and M. Büttiker.

DPG Spring Meeting of the Condensed Matter division, 2010.
Regensburg, Germany, 21-26 March, 2010.
Oral: *Control of Spin Blockade by AC Magnetic Fields in Triple Quantum Dots*, M. Busl, R. Sánchez and G. Platero.

ITN Meeting 2010. Nanoelectronics – Concepts, Theory and Modeling.
Bremen, Germany, 17-21 May, 2010.
Poster: *Control of spin blockade in triple quantum dots*, M. Busl, R. Sánchez and G. Platero.
Poster: *Transport through hot spots*, R. Sánchez and M. Büttiker.

Workshop on physics of micro and nano scale systems.
Ystad, Sweden, 20-24 June, 2010.
Oral: *Nonlinear transport relations in coupled conductors*, R. López, D. Sánchez, R. Sánchez and M. Büttiker.

Annual Meeting of the Swiss Physical Society.
Basel, Switzerland, 21-22 June, 2010.
Oral: *Mesoscopic Coulomb drag, broken detailed balance and fluctuation relations*, R. Sánchez, R. López, D. Sánchez and M. Büttiker.

Conference Quantum Dot 2010.
Nottingham, U.K., 26-30 May, 2010.
Poster: *Electron spin resonance in triple quantum dots*, M. Busl, R. Sánchez and G. Platero.

Noise in dynamical systems at the micro and nanoscale.
La Tenuta dei Ciclamini, Avigliano Umbro, Italy, 6-8 August, 2010.
Invited talk: *Transport via correlated fluctuations*, R. Sánchez and M. Büttiker.

Workshop on Quantum Spintronics.
Acquafredda di Maratea, Italy, 17-21 October, 2010.
Poster: *Electron spin resonance in triple quantum dots*, M. Busl, R. Sánchez and G. Platero.

New trends in nonlinear dynamics: heat control and thermoelectric efficiency (HEAT2010).
Ettore Majorane Centre, Erice, Italy, 23-28 October, 2010.
Poster: *Transport via correlated fluctuations*, R. Sánchez and M. Büttiker.

Fluctuation Phenomena in Interdisciplinary Science.
Barcelona, Spain, 27-29 April, 2011.
Invited talk: *Transport from hot spots*, R. Sánchez.

Nonlinear spin and charge transport through nanoscopic systems.
Palma de Mallorca, Spain, 6-9 June, 2011.
Poster: *Transport from hot spots*, R. Sánchez and M. Büttiker.

Frontiers of Quantum and Mesoscopic Thermodynamics.
Prague, Czech Republic, 25-30 July, 2011.
Invited talk: *Transport from hot spots*, R. Sánchez and M. Büttiker.

Energy Harvesting at micro and nanoscale. NiPS Summer School 2011
Perugia, Italy, 1-6 August, 2011.
Invited talk: *Current from hot spots*, M. Büttiker, R. Sánchez, B. Sothmann, R. López, D. Sánchez and A. N. Jordan.

Nonequilibrium Fluctuation Relations In Quantum Systems.
Palma de Mallorca, Spain, 22-24 September, 2011.
Invited talk: *Transport from fluctuating gates*, R. Sánchez.

Madrid Workshop on Open Quantum Systems. Markovian and non-Markovian approaches to Complex Quantum Systems: Coherence, Correlation and Entanglement.
Madrid, Spain, 3-5 October, 2011.
Oral: *Excess noise induced transport*, R. Sánchez and M. Büttiker.
Oral: *Coherent dynamics of electrons in ac driven quantum dot arrays*, C.E. Creffield, M. Busl, A. Gómez-León, R. Sánchez and G. Platero.

Towards Zero-Power ICT. ZEROPOWER Workshop.
Cork, Ireland, 25-27 October, 2011.

Oral: *Effect of intrinsic noise on the conductance of open quantum dots*, B. Sothmann, R. Sánchez, A. N. Jordan and M. Büttiker.

International Physics School. Fundamentals of Nanoelectronics.
Tenerife, Spain, 12-17 February, 2012.
Invited talk: *Purification of entanglement in open qubits*, R. Sánchez and G. Platero.

APS March Meeting 2012.
Boston, U.S.A., 27 February-2 March, 2012.
Oral: *The mesoscopic chaotic cavity as a rectifying heat engine*, A. N. Jordan B. Sothmann, R. Sánchez and M. Büttiker.

DPG Spring Meeting of the Condensed Matter division, 2012.
Berlin, Germany, 25-30 March, 2012.
Oral: *Dynamic production of entanglement in spin blockade quantum dots*, R. Sánchez and G. Platero.
Oral: *Current from hot spots*, R. Sánchez and M. Büttiker.
Oral: *Noise-induced currents in open quantum dots*, B. Sothmann, R. Sánchez, A. N. Jordan and M. Büttiker.

XXIII Sitges Conference on Statistical Mechanics. Understanding and Managing Randomness in Physics, Chemistry and Biology.
Sitges, Spain, 4-8 June, 2012.
Invited talk: *Rectification of thermal fluctuations in electrical conductors*, R. Sánchez, B. Sothmann, A. N. Jordan and M. Büttiker.

Annual Meeting of the Swiss Physical Society, 2012.
Zurich, Switzerland, 21-22 June, 2012.
Invited talk: *Rectification of thermal fluctuations in a chaotic cavity heat engine*, B. Sothmann, R. Sánchez, A. N. Jordan and M. Büttiker.

Symposium on Quantum and Optical Dynamics in Transport Phenomena.
Madrid, Spain, 29 June, 2012.
Invited talk: *Rectification of fluctuations in electrical conductors*, R. Sánchez.

International Conference on Superlattices, Nanostructures and Nanodevices, ICSNN 2012.
Dresden, Germany, 22-27 July, 2012.
Oral: *Coherent charge and spin dynamics in double quantum dots driven by ac magnetic fields*, A. Gómez-León, R. Sánchez and G. Platero.

31st International Conference on the Physics of Semiconductors, ICPS 2012.
Zurich, Switzerland, 29 July-3 August, 2012.
Poster: *Bipolar Spin Blockade and Dark State Leakage Mechanisms in Triple Quantum Dot Circuits*, M. Busl, L. Gadreau, G. Granger, A. Kam, G. Platero, A. Sachrajda, R. Sánchez, S. Studenikin, Z. R. Wasilewski.
Poster: *Maximal entanglement out of transport through double quantum dots*, R. Sánchez and G. Platero.

TNT 2012. Trends in Nanotechnology.
Madrid, Spain, 10-14 September, 2012.
Oral: *Maximal entanglement out of transport through double quantum dots*, R. Sánchez and G. Platero.

Nanoelectronics: Concepts, Theory and Modeling. Network meeting and workshop on thermoelectric transport.
Cargèse, France, 21-27 October, 2012.
Invited talk: *Harvesting fluctuations at electrical hot spots*, R. Sánchez.

Sexto encuentro de la red de Física de Sistemas Fuera del Equilibrio. Nonlinear transport, dynamics and fluctuations in condensed matter physics.
Madrid, Spain, 20-22 November, 2012.
Oral: *Rectification of thermal fluctuations in electrical conductors*, R. Sánchez.

DPG Spring Meeting of the Condensed Matter division, 2013.
Regensburg, Germany, 10-15 March, 2013.
Oral: *Role of coherent state superpositions in the bipolar spin blockade of a triple quantum dot*, M. Busl, G. Granger, L. Gaudreau, R. Sánchez, A. Kam, M. Pioro-Ladrière, S. A. Studenikin, P. Zawadzki, Z. R. Wasilewski, A. S. Sachrajda and G. Platero.
Oral: *Detection of single-electron heat transfer statistics*, R. Sánchez and M. Büttiker.

APS March Meeting 2013.
Baltimore, Maryland, U.S.A., 18-22 March, 2013.
Oral: *Energy-harvesting at the Nanoscale*, A. N. Jordan, B. Sothmann, R. Sánchez and M. Büttiker.

IMAGINENANO 2013.
Bilbao, Spain, 23-26 April, 2013.
Oral: *Powerful and efficient energy harvesting with resonant-tunneling quantum dots*, B. Sothmann, A. N. Jordan, R. Sánchez and M. Büttiker.

20th International Conference on Electronic Properties of Two-Dimensional Systems and Modulated Semiconductor Structures, EP2DS-20.
Wrocław, Poland, 1-5 July, 2013.
Poster: *Transport via coherent state superpositions in triple quantum dots*, M. Busl, G. Granger, L. Gaudreau, R. Sánchez, A. Kam, M. Pioro-Ladrière, S. A. Studenikin, P. Zawadzki, Z. R. Wasilewski, A. S. Sachrajda and G. Platero.

XXXIV Reunión Bienal de la Real Sociedad Española de Física.
Valencia, Spain, 15-19 July, 2013.
Oral: *Role of coherent state superpositions in the bipolar spin blockade of a triple quantum dot*, R. Sánchez, M. Busl, G. Granger, L. Gaudreau, A. Kam, M. Pioro-Ladrière, S. A. Studenikin, P. Zawadzki, Z. R. Wasilewski, A. S. Sachrajda and G. Platero.

Nanoelectronics: Concepts, Theory and Modeling. Final network meeting and workshop.
Poznań, Poland, 23-27 September, 2013.
Poster: *Transport in triple quantum dots*, F. Gallego-Marcos, R. Sánchez and G. Platero.

Physique de la matière condensée, cours 2012-13. College de France.
Paris, France, 12 November, 2013.
Invited: *Three-terminal quantum-dot thermoelectrics*, Björn Sothmann, R. Sánchez, A. N. Jordan and M. Büttiker.
http://www.college-de-france.fr/site/antoine-georges/seminar-2013-11-05-10h45__1.htm

Quantum Thermoelectrics: Dynamics, Fluctuations and Non-linearities.
Aachen, Germany, 24-27 November, 2013.
Invited talk: *Statistics of charge and heat in quantum dot thermal engines*, R. Sánchez.

VII Reunión Bienal del Grupo Especializado de Física del Estado Sólido, GEFES 2014.
Ciudad Real, Spain, 22-24 January, 2014.
Poster: *Energy-harvesting at the Nanoscale*, R. Sánchez, A. N. Jordan, B. Sothmann and M. Büttiker.
Poster: *Superexchange blockade of triple quantum dots*, R. Sánchez, F. Gallego-Marcos and G. Platero.
Poster: *Quantum Coherent Transport through AC Driven Quantum Dots Arrays*, F. Gallego-Marcos, R. Sánchez and G. Platero.

DPG Spring Meeting of the Condensed Matter division, 2014.
Dresden, Germany, 30 March-4 April, 2014.
Oral: *Superexchange transport and blockade in triple quantum dots*, R. Sánchez, G. Granger, F. Gallego-Marcos, S. A. Studenikin, A. S. Sachrajda and G. Platero.
Oral: *Resonant tunneling energy harvesters*, A. N. Jordan, B. Sothmann, R. Sánchez and M. Büttiker.

Encuentro de la Red Española de Sistemas Fuera del Equilibrio.
Barcelona, Spain, 12-13 June, 2014.
Oral: *Thermal rectification in mesoscopic circuits*, R. Sánchez, B. Sothmann, A. N. Jordan and M. Büttiker.

2nd. School and conference on Spin-based quantum information processing, 2014.
Konstanz, Germany, 18-21 August, 2014.
Poster: *Long-range transfer of spin qubits*, R. Sánchez, G. Granger, A. S. Sachrajda and G. Platero.

Condensed Matter in Paris, JMC14 CMD25, 2014.
Paris, France, 24-29 August, 2014.
Oral: *Three terminal mesoscopic energy harvesters*, R. Sánchez, A. N. Jordan, B. Sothmann and M. Büttiker.

Perspectives in quantum thermoelectricity: time-dependent systems, correlations and measurements.
Marseille, France, 12 November, 2014.
Invited talk: *Charge and heat correlations in three terminal quantum dot heat engines*, R. Sánchez.

DPG Spring Meeting of the Condensed Matter division, 2015.
Berlin, Germany, 15-20 March, 2015.
Oral: *Quantum Hall thermoelectrics*, R. Sánchez, B. Sothmann and A. N. Jordan.
Oral: *Quantum Nernst engines*, B. Sothmann, R. Sánchez and A. N. Jordan.

Oral: *Interference of real and virtual transitions in quantum dot chains*, F. Gallego-Marcos, R. Sánchez and G. Platero.
Poster: *Long-range transfer of spin qubits*, R. Sánchez, G. Granger, L. Gaudreau, F. Gallego-Marcos, M. Pioro-Ladrière, S. A. Studenikin, A. S. Sachrajda and G. Platero.

Second Quantum Thermodynamics Conference.
Mallorca, Spain, 19-24 April, 2015.
Oral: *Three terminal quantum Hall thermoelectrics*, R. Sánchez, B. Sothmann and A. N. Jordan.

19th International Conference on Electron Dynamics in Semiconductors, Optoelectronics and Nanostructures, EDISON'19.
Salamanca, Spain, 29 June - 2 July, 2015.
Oral: *Chiral thermoelectrics*, B. Sothmann, R. Sánchez and A. N. Jordan.
Oral: *Interference of real and virtual transitions in quantum dot chains*, F. Gallego-Marcos, R. Sánchez and G. Platero.

Frontiers of Quantum and Mesoscopic Thermodynamics, FQMT'15.
Prague, Czech Republic, 27 July - 1 August, 2015.
Invited talk: *Three terminal quantum Hall thermoelectrics*, R. Sánchez, B. Sothmann and A. N. Jordan.
Poster: *Long-range transfer of spin qubits*, R. Sánchez, G. Granger, L. Gaudreau, F. Gallego-Marcos, M. Pioro-Ladrière, S. A. Studenikin, A. S. Sachrajda and G. Platero.

Third Conference on Quantum Thermodynamics.
Porquerolles, France, 11-16 October, 2015.
Poster: *Thermoelectricity without absorbing energy from the heat sources*, R. Whitney, R. Sánchez, F. Haupt and J. Splettstoesser.

IX Reunión Bienal del Grupo Especializado de Física del Estado Sólido, GEFES 2016.
Cuenca, Spain, 13-15 January, 2016.
Invited talk: *Quantum Hall thermoelectrics*, R. Sánchez.
Poster: *Coupled Landau-Zener Stückelberg quantum dot interferometers*, F. Gallego-Marcos, R. Sánchez and G. Platero.

DPG Spring Meeting of the Condensed Matter division, 2016.
Regensburg, Germany, 6-11 March, 2016.
Oral: *Energy harvester with coupled quantum dots*, H. Thierschmann, R. Sánchez, B. Sothmann, F. Arnold, C. Heyn, W. Hansen, H. Buhmann, L. W. Molenkamp.

Nonequilibrium condensed matter and biological systems.
Madrid, Spain, 9-11 March, 2016.
Oral: *Interference of real and virtual transitions in quantum dot chains*, F. Gallego-Marcos, R. Sánchez and G. Platero.
Oral: *Role of inelasticity in the symmetry of the Onsager matrix*, G. Roselló, R. López and R. Sánchez.

Fourth Quantum Thermodynamics Conference.
Erice, Italy, 8-13 May, 2016.

Invited talk: *Electronic charge and heat flows in coupled quantum dots*, R. Sánchez.
Poster: *Role of inelasticity in the symmetry of the Onsager matrix*, G. Roselló, R. López and R. Sánchez.

ICPS2016 International Conference on the Physics of Semiconductors.
Beijing, China, 31 July - 5 August, 2016.
Poster: *Coupled Landau-Zener-Stückelber quantum dot inteferometers*, F. Gallego-Marcos, R. Sánchez and G. Platero.

New trends in quantum heat transport and thermoelectrics.
Trieste, Italy, 22-26 August, 2016.
Invited talk: *Chiral heat currents in the quantum Hall regime*, R. Sánchez, B. Sothmann, A. N. Jordan.

Coupled Mathematical Models for Physical and Biological Nanoscale Systems and Their Applications.
Banff (Alberta), Canada, 28 August - 2 September, 2016.
Invited talk: *Control of electronic heat flows in coupled quantum dots*, R. Sánchez.
Invited talk*: *Long range transport and dark states in quantum dot arrays*, F. Gallego-Marcos, R. Sánchez, G. Platero.

Jornadas de Investigación del Instituto Gregorio Millán Barbany.
Leganés (Madrid), Spain, 19-20 January, 2017.
Oral: *Chiral heat currents in the quantum Hall regime*, R. Sánchez.

Many paths to interference: a journey between quantum dots and single molecule junctions.
Dresden, Germany, 18-20 April, 2017.
Oral: *Interference-induced thermoelectricity with quantum Hall edge states*, R. Sánchez, B. Sothmann, A. N. Jordan.

14th Granada seminar. Quantum Systems In and Out of Equilibrium: Fundamentals, dynamics and applications.
Granada, Spain, 20-23 June, 2017.
Oral: *Control of electronic heat flows in coupled quantum dots*, R. Sánchez.

Challenges in Nonlinear Systems.
Leganés, Spain, 6-7 July, 2017.
Poster: *Thermoelectricity without absorbing energy from the heat sources*, R. Sánchez, R. S. Whitney, F. Haupt, J. Splettstoesser.
Invited talk: *Two qubit manipulation with driven fields*, G. Platero, F. Gallego-Marcos, R. Sánchez.

Frontiers of Quantum and Mesoscopic Thermodynamics, FQMT'17.
Prague, Czech Republic, 9-15 July, 2017.
Invited talk: *All-thermal transistor based on stochastic switching*, R. Sánchez, H. Thierschmann, L. W. Molenkamp.
Poster: *Thermoelectricity without absorbing energy from the heat sources*, R. Sánchez, R. S. Whitney, F. Haupt, J. Splettstoesser.

Mesoscopic Transport and Quantum Coherence, QTC2017 .

Espoo, Finland, 5-8 August, 2017.
Poster: *Non-invasive refrigeration with superconducting single-electron junctions*, R. Sánchez.
Poster: *Thermoelectricity without absorbing energy from the heat sources*, R. Sánchez, R. S. Whitney, F. Haupt, J. Splettstoesser.

X GEFES 2018 meeting.
Valencia, Spain, 24-26 January, 2018.
Poster: *Mesoscopic gates for electronic all-thermal devices*, R. Sánchez, H. Thierschmann, L. W. Molenkamp.
Poster: *Thermoelectricity without absorbing energy from the heat sources*, R. Sánchez, R. S. Whitney, F. Haupt, J. Splettstoesser.

DPG Spring Meeting of the Condensed Matter division, 2018.
Berlin, Germany, 11-16 March, 2018.
Oral: *Single-electron thermal devices coupled to a mesoscopic gate*, R. Sánchez, H. Thierschmann, L. W. Molenkamp.
Poster: *Correlation-induced refrigeration with superconducting single-electron transistors*, R. Sánchez.

20th International Conference on Superlattices, Nanostructures and Nanodevices – ICSNN2018.
Madrid, Spain, 23-27 July, 2018.
Oral: *All-thermal transistor based on stochastic switching*, R. Sánchez, H. Thierschmann, L. W. Molenkamp.
Poster: *Non-invasive refrigeration with superconducting single-electron junctions*, R. Sánchez.

34th International Conference on the Physics of Semiconductors, ICPS2018
Montpellier, France, 29 July - 3 August, 2018.
Poster: *Experimental realisation of a quantum dot energy harvester*. G. Jaliel, R. Puddy, R. Sánchez, A. N. Jordan, B. Sothmann, H. Beere, J. Griffiths, D. Ritchie, Ch. Smith

Workshop Thermoelectricity: New Theories.
Valencia, Spain, 27-28 September, 2018.
Oral: *Power generation using autonomous Maxwell demons*, R. Sánchez.

Workshop Open questions on energy transport & conversion in nanoscale quantum systems.
Marseille, France, 15-16 November, 2018.
Poster: *Correlation-induced refrigeration with superconducting single-electron transistors*, R. Sánchez.
Poster: *Mesoscopic gates for electronic all-thermal devices*, R. Sánchez, H. Thierschmann, L. W. Molenkamp.

Rencontres de Moriond – Quantum Mesoscopic Physics.
La Thuile, Italy, 16-23 March, 2019.
Oral: *A non-equilibrium system as a demon*, R. Sánchez, J. Splettstoesser, R. S. Whitney.
Poster: *Cooling by Cooper pair splitting*, R. Sánchez, P. Burset, A. Levy Yeyati.

Quantum Thermal Machines Workshop.
Erlangen, Germany, 8-10 July, 2019.
Invited talk: *Non-equilibrium systems acting as a demon*, R. Sánchez.

Frontiers of Quantum and Mesoscopic Thermodynamics, FQMT'19.

Prague, Czech Republic, 14-20 July, 2019.
Invited talk: *Non-equilibrium systems as demons*, R. Sánchez, J. Splettstoesser, R. S. Whitney.
Poster: *Cooling by Cooper pair splitting*, R. Sánchez, P. Burset, A. Levy Yeyati.
Poster: *Thermal transistor and thermometer based on Coulomb coupled conductors*, J. Yang, C. Elouard, J. Splettstoesser, B. Sothmann, R. Sánchez, A. N. Jordan.

XXII INC Young Researchers Meeting.
Miraflores de la Sierra, Spain, 19 December, 2019.
Poster: *Cooling by Cooper pair splitting*, R. Sánchez, P. Burset, A. Levy Yeyati.

Quantum Thermodynamics of Nonequilibrium Systems.
Online/San Sebastián, Spain, 13-16 October, 2020. dipc.ehu.es/qtdneq20/
Poster: *Andreev-Coulomb drag in coupled quantum dots*, S. M. Tabatabaei, D. Sánchez, A. Levy Yeyati, R. Sánchez.

QTD 2020 - Conference on Quantum Thermodynamics.
Online/Barcelona, Spain, 19-23 October, 2020. qtd2020.icfo.eu/
Oral: *Cooling by Cooper pair splitting*, R. Sánchez, P. Burset, A. Levy Yeyati. Video
Poster: *Andreev-Coulomb drag in coupled quantum dots*, S. M. Tabatabaei, D. Sánchez, A. Levy Yeyati, R. Sánchez.

A CIVIS e-journey into Nano.
Online, 15 December, 2020. civis.eu/
Oral: *Quantum thermoelectrics of mesoscopic conductors*, R. Sánchez.

The European Conference Physics of Magnetism 2021 (PM'21).
Online/Poznań, Poland, 28 June - 2 July, 2021. ifmpan.poznan.pl/
Invited talk: *Andreev-Coulomb drag in coupled quantum dots*, R. Sánchez.

Frontiers of Quantum and Mesoscopic Thermodynamics, FQMT'21.
Online/Prague, Czech Republic, 18-24 July, 2021. fqmt.fzu.cz/21/
Invited talk: *Interference-induced extrinsic thermoelectrics*, R. Sánchez, C. Gorini and G. Fleury.

Quantum Thermodynamics Conference, QTD2021.
Online/Genève, Switzerland, 4-8 October, 2021. qtd2021.ch/
Poster: *Extrinsic thermoelectric response of coherent conductors*, R. Sánchez, C. Gorini and G. Fleury.

International Symposium on Novel maTerials and quantum Technologies, ISNTT 2021.
Online/Atsugi, Japan, 14-17 December, 2021. brl.ntt.co.jp/event/isntt2021/
Invited: *Extrinsic thermoelectric response of quantum conductors*, R. Sánchez.

XXIII INC Young Researchers Meeting.
Miraflores de la Sierra, Spain, 17 December, 2021.
Poster: *Interference induced thermoelectric response of ballistic conductors*, J. Balduque Picazo, R. Sánchez.

IFIMAC Day 2022 “10 years of IFIMAC”.
Madrid, Spain, 14 June, 2022.
Poster: *Resonant tunneling energy harvesters: improving performance via quantum interference*, J. Balduque Picazo, R. Sánchez.
Poster: *Andreev-Coulomb heat engines*, S. M. Tabatabaei, D. Sánchez, A. Levy-Yeyati, R. Sánchez.

Quantum Thermodynamics Conference QTD2022.
Online/Belfast, Ireland, 27 June - 1 July, 2022. blogs.qub.ac.uk/qtd2022/
Poster: *Resonant tunneling energy harvesters: improving performance via quantum interference*, J. Balduque Picazo, R. Sánchez.
Poster: *Andreev-Coulomb heat engines*, S. M. Tabatabaei, D. Sánchez, A. Levy-Yeyati, R. Sánchez.

Assistance to Conferences without public contribution

Nanoscale Dynamics, Coherence and Computation, Annual meeting, 2003.
Calvià, Mallorca, Spain 2003.
RTN / Marie-Curie Network.

Nanoscale Dynamics, Coherence and Computation, Annual meeting, 2004.
Hamburg, Germany 2004.
RTN / Marie-Curie Network.

Recent Advances in Quantum Thermodynamics with a focus on many-body interactions.
Online, 06/07/2021.

Seminars

Spin pumping in ac driven double quantum dots
18 July 2006, Institut für Theorische Physik, Technische Universität Berlin, Berlin.

Electron-phonon correlations in driven quantum dots
12 February 2008, Département de Physique Théorique, Université de Genève, Genève.

Electron and boson correlations in driven quantum dots
16 December 2008, Universitat de les Illes Balears, Palma de Mallorca.

Correlated transport in capacitively coupled conductors
13 August 2009, Lunds Univesitet, Lund.

Mesoscopic Coulomb drag, broken detailed balance and fluctuation relations
29 September 2009, Département de Physique Théorique, Université de Genève, Genève.

Mesoscopic Coulomb drag, broken detailed balance and fluctuation relations
3 November 2009, Institut für Theorische Physik A, RWTH Aachen, Aachen.

Current from hot spots
2 March 2010, Département de Physique Théorique, Université de Genève, Genève.

Transport via correlated fluctuations
14 June 2010, Institut für Theorische Physik, Technische Universität Berlin, Berlin.

Current via correlated fluctuations
14 July 2010, Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC), Madrid.

Optimal energy quanta to charge conversion
9 August 2011, Institut für Theorische Physik, Technische Universität Berlin, Berlin.

Rectification of thermal fluctuations in electrical conductors
10 April 2012, Departamento de Física de Materiales, Universidad Complutense de Madrid, Madrid.

Statistics of charge and heat in quantum dot thermal engines
8 July 2013, Département de Physique Théorique, Université de Genève, Genève.

Superexchange blockade in triple quantum dots
4 December 2013, Dahlem Center for Complex Quantum Systems, Freie Universität Berlin, Berlin.

Long distance tunneling in triple quantum dots
19 June 2014, Département de Physique Théorique, Université de Genève, Genève.

Three terminal energy harvesting with quantum dots
13 March 2015, Instituto Gregorio Millán, Universidad Carlos III de Madrid, Leganés.

Quantum Hall thermoelectrics
13 April 2015, Dipartimento di Fisica, Università di Genova, Genoa.

Quantum dot three-terminal heat engines
28 September 2015, Centre of Excellence in Low Temperature Quantum Phenomena and Devices, Aalto University.

Quantum dot three-terminal heat engines
28 January 2016, Lehrstuhl für Technische Physik, Universität Würzburg, Würzburg.

Mesoscopic three-terminal heat engines
11 February 2016, Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC), Madrid.

Circuitos de calor, nano
27 April 2016, Universidad Carlos III de Madrid, Leganés.

Mesoscopic thermocouples
13 June 2016, Semiconductor Physics Group, University of Cambridge, Cambridge.

Chiral thermoelectric systems
14 July 2016, Quantum meetings, Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC-CSIC), Palma de Mallorca.

Mesoscopic gates for electronic all-thermal devices
27 September 2017, Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid, Madrid.

Mesoscopic gates for electronic all-thermal devices
19 October 2017, Département de Physique Appliquée, Université de Genève, Genève.

Single-electron all-thermal devices
28 November 2017, Fakultät für Physik, Universität Duisburg-Essen, Duisburg.

Mesoscopic gates for electronic all-thermal devices
20 December 2017, Departamento de Física Atómica, Molecular y Nuclear, Universidad Complutense de Madrid, Madrid.

Thermal transistor based on stochastic switching
7 February 2018, Instituto Gregorio Millán, Universidad Carlos III de Madrid, Leganés.

Thermal devices with quantum dots
16 April 2018, NanoLund, Lunds Universitet, Lund.

Introduction to quantum transport, thermoelectrics, and mesoscopic heat engines, (with J. Splettstoesser).
1 June 2018, Kavli Institute for Theoretical Physics, University of California, Santa Barbara, USA.

Sympathy for the demon: Thermoelectrics without heat
11 October 2018, Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC), Madrid.

Mesoscopic energy harvesting
25 October 2019, Université de Strasbourg, Strasbourg.

The year of the demon
19 December 2019, Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid.

Interference induced thermoelectric response
2 February 2021, Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid.

Quantum thermoelectrics: using interference, entanglement and non-equilibriumness

11 March 2021, IfiMAC-ICMM Joint Seminar Series. Video

Rectification of mesoscopic heat currents
4 April 2022, Aalto Quantum Physics Seminars, Aalto University, Helsinki.

Rectification of mesoscopic heat currents
12 May 2022, Chalmers University of Technology, Göteborg.

Colloquia

Mesoscopic thermoelectronics
2 March 2016, Department of Physics and Astronomy, University of Rochester.

Mesoscopic thermo-electronics
5 July 2018, Eugene Wigner Cooloquium. Institut für Theoretische Physik, Technische Universität Berlin.

Short stages

2006 (1 week): University of Manchester. Collaboration with Prof. Dr. Tobias Brandes.

16–23 July, 2006: Technische Universität Berlin. Collaboration with Prof. Dr. Tobias Brandes.

2006 (2 weeks): Universität Augsburg. Collaboration with Dr. Sigmund Kohler and Prof. Dr. Peter Hänggi.

15–28 April, 2007: Universität Augsburg. Collaboration with Dr. Sigmund Kohler and Prof. Dr. Peter Hänggi.

May–June, 2008: Université de Genève. Collaboration with Prof. Dr. Markus Büttiker.

9–15 August, 2009: Lunds Universitet. Visitor in the group of Prof. Hongqi Xu.

2–6 November, 2009: RWTH Aachen. Collaboration with Prof. Janine Splettstößer.

19–25 June 2011: Université de Genève. Collaboration with Prof. Dr. Markus Büttiker.

11–16 December 2011: Technische Universität Berlin. Visitor in the group of Prof. Dr. Tobias Brandes.

19–22 June 2012: Université de Genève. Collaboration with Prof. Dr. Markus Büttiker.

1–12 July, 2013: Université de Genève. Collaboration with Prof. Dr. Markus Büttiker.

2-6 December, 2013: Freie Universität Berlin. Visitor in the group of Prof. Dr. Piet Brouwer.

16–20 June, 2014: Université de Genève. Collaboration with Dr. Björn Sothmann.

18–23 January, 2015: RWTH Aachen. Collaboration with Dr. Federica Haupt, Dr. Robert Whitney and Prof. Janine Splettstößer.

12–17 April, 2015: Università di Genova. Collaboration with Dr. Alessandro Braggio and Dr. Björn Sothmann.

28–30 September, 2015: Aalto University, Helsinki. Visitor in the group of Prof. Jukka Pekola.

27-29 January, 2016: Universität Würzburg. Visitor in the group of Prof. Sven Höfling.

28 February-12 March, 2016: University of Rochester. Visitor in the group of Prof. Andrew N. Jordan.

12–15 June, 2016: University of Cambridge. Collaboration with the group of Prof. Charles G. Smith.

11–16 July, 2016: Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC-CSIC), Palma de Mallorca. Collaboration with the group of Dr. Rosa López.

18–22 October, 2017: Département de Physique Appliquée, Université de Genève, Genève. Visitor in the group of Prof. Nicolas Brunner.

26–29 November, 2017: Fakultät für Physik, Universität Duisburg-Essen, Duisburg. Collaboration with the group of Prof. Björn Sothmann.

15–17 April, 2018: NanoLund, Lunds Universitet, Lund. Collaboration with the group of Prof. Peter Samuelsson.

29 May–23 June, 2018: Kavli Institute for Theoretical Physics, University of California Santa Barbara. Invited participation in the KITP program: Thermodynamics of quantum systems: Measurement, engines, and control (Santa Barbara, USA, 29 May–20 July, 2018).

4–6 July, 2018: Institut für Theoretische Physik, Technische Universität Berlin. Visitor in the group of Dr. Gernot Schaller.

1–4 September, 2019: Department of Microtechnology and Nanoscience - MC2, Chalmers University of Technology, Göteborg. Collaboration with the group of Prof. Janine Splettstoesser.

3–6 April, 2022: Department of Applied Physics - Aalto University, Helsinki. Visitor in the group of Prof. Jukka Pekola.

10–13 May, 2022: Department of Microtechnology and Nanoscience - MC2, Chalmers University of

Technology, Göteborg. Collaboration with the group of Prof. Janine Splettstoesser.

PUBLICATIONS

1. R. Sánchez, E. Cota, R. Aguado and G. Platero
   Spin filter effect in an AC-driven double quantum dot
   Physica E **34** , 405 (2006).

2. R. Sánchez, G. Platero, R. Aguado and E. Cota
   Photon-assisted tunneling in ac driven quantum dot spin pumps
   phys. stat. sol. (a) **203**, 1154 (2006).

3. R. Sánchez, E. Cota, R. Aguado and G. Platero
   Spin-filtering through excited states in double-quantum-dot pumps
   Phys. Rev. B **74**, 35326 (2006).

4. R. Sánchez, G. Platero, R. Aguado and E. Cota
   Removing spin blockade by photon-assisted tunneling in double quantum dots
   phys. stat. sol. (b) **243**, 3932 (2006).

5. R. Sánchez, G. Platero, R. Aguado and E. Cota
   Spin currents in AC-driven double quantum dots
   phys. stat. sol. (c) **4**, 497 (2007).

6. R. Sánchez, G. Platero and T. Brandes
   Resonance fluorescence in transport through quantum dots: noise properties
   Phys. Rev. Lett. **98**, 146805 (2007).

7. R. Sánchez, S. Kohler, P. Hänggi and G. Platero
   Electron bunching in stacks of coupled quantum dots
   Phys. Rev. B **77**, 035409 (2008).
   Confirmed experimentally:
   E. E. Vdovin, Yu. N. Khanin and M. Henini, *Observation of the anomalous temperature dependence of resonance tunneling through zero-dimensional states in a quantum well with dynamic coulomb interaction between the tunneling channels*, JETP Lett. **96**, 529 (2012).

8. R. Sánchez, C. López Monís, J. Iñarrea and G. Platero
   Electron spin resonance in double quantum dots
   Physica E **40**, 1457 (2008).

9. R. Sánchez, G. Platero and T. Brandes
   Phonon emission in two levels quantum dots
   Physica E **40**, 1157 (2008).

10. R. Sánchez, F.J. Kaiser, S. Kohler, P. Hänggi and G. Platero
    Shot noise in spin pumps
    Physica E **40**, 1276 (2008).

11. R. Sánchez, C. López-Monís and G. Platero
Coherent spin rotations in open driven double quantum dots
Phys. Rev. B **77**, 165312 (2008).
Erratum: Coherent spin rotations in open driven double quantum dots [Phys. Rev. B 77, 165312 (2008)]
Phys. Rev. B **79**, 119903(E) (2009).

12. J. Villavicencio, I. Maldonado, R. Sánchez, E. Cota and G. Platero
Tunnel spectroscopy in ac-driven quantum dot nanoresonators
Appl. Phys. Lett. **92**, 192102 (2008).

13. R. Sánchez, G. Platero and T. Brandes
Resonance fluorescence in driven quantum dots: electron and photon correlations
Phys. Rev. B **78**, 125308 (2008).

14. R. Sánchez, S. Kohler and G. Platero
Spin correlations in spin blockade
New J. Phys. **10**, 115013 (2008).
Invited contribution to focus issue on "Quantum dissipation in unconventional environments".

15. M. Busl, C. López-Monís, R. Sánchez, J. Iñarrea and G. Platero
Spin dynamics in double quantum dots in the spin blockade regime
Physica E **42**, 643 (2010).

16. M. Busl, R. Sánchez and G. Platero
Control of spin blockade by ac magnetic fields in triple quantum dots
Phys. Rev. B (Rapid Communications) **81**, 121306 (2010).

17. M. Busl, R. Sánchez and G. Platero
Electron spin resonance in triple quantum dot interferometers
Physica E **42**, 830 (2010).

18. R. Sánchez, R. López, D. Sánchez and M. Büttiker
Mesoscopic Coulomb drag, broken detailed balance and fluctuation relations
Phys. Rev. Lett. **104**, 076801 (2010).
Confirmed experimentally:
D. Bischoff *et al., Measurement back-action in stacked graphene quantum dots*, Nano Lett. **15**, 6003 (2015).

19. R. Sánchez and M. Büttiker
Optimal energy quanta to current conversion
Phys. Rev. B **83**, 085428 (2011).
Editor's suggestion.
Highlighted in *le journal de l'UNIGE* **45**, 14, March 2011, Université de Genève.
Confirmed experimentally:
H. Thierschmann *et al.*, Nature Nanotech. **10**, 854 (2015). (35)

20. M. Busl, R. Sánchez and G. Platero
Electron spin resonance in triple quantum dots
J. Phys.: Conf. Ser. **245**, 012016 (2010).

21. B. Sothmann, R. Sánchez, A. N. Jordan and M. Büttiker
Rectification of thermal fluctuations in a chaotic cavity heat engine
Phys. Rev. B **85**, 205301 (2012).
Confirmed experimentally:
B. Roche *et al., Harvesting dissipated energy with a mesoscopic ratchet*, Nature Communications, **6** 6738 (2015).
F. Hartmann *et al., Voltage fluctuation to current converter with Coulomb-coupled quantum dots*, Phys. Rev. Lett., **114**, 146805 (2015).

22. M. Busl, G. Granger, L. Gaudreau, R. Sánchez, A. Kam, M. Pioro-Ladrière, S. A. Studenikin, P. Zawadzki, Z. R. Wasilewski, A. S. Sachrajda and G. Platero
Bipolar spin blockade and coherent state superpositions in a triple quantum dot
Nature Nanotechnol. **8**, 261 (2013).

23. R. Sánchez and M. Büttiker
Detection of single-electron heat transfer statistics
Europhys. Lett. **100**, 47008 (2012).
Erratum: Europhys. Lett. **104**, 49901 (2013).

24. A. N. Jordan, B. Sothmann, R. Sánchez and M. Büttiker
Powerful and efficient energy harvester with resonant-tunneling quantum dots
Phys. Rev. B **87**, 075312 (2013).
Confirmed experimentally:
G. Jaliel *et al., Experimental realization of a quantum dot energy harvester*, Phys. Rev. Lett., **123**, 117701 (2019). (47)

25. R. Sánchez and G. Platero
Dark Bell states in tunnel-coupled spin qubits
Phys. Rev. B (Rapid Communications) **87**, 081305 (2013).

26. B. Sothmann, R. Sánchez, A. N. Jordan and M. Büttiker
Powerful energy harvester based on resonant-tunneling quantum wells
New J. Phys. **15**, 095021 (2013).
Invited contribution to focus issue on "Thermoelectric effects in nanostructures".

27. R. Sánchez, B. Sothmann, A. N. Jordan and M. Büttiker
Correlations of heat and charge currents in quantum dot thermoelectric engines
New J. Phys. **15**, 125001 (2013).
Invited contribution to focus issue on "Thermoelectric effects in nanostructures".

28. R. Sánchez, F. Gallego-Marcos and G. Platero
Superexchange blockade in triple quantum dots
Phys. Rev. B (Rapid Communications) **89**, 161402 (2014).

29. R. Sánchez, G. Granger, L. Gaudreau, A. Kam, M. Pioro-Ladrière, S. A. Studenikin, P. Zawadzki, A. S. Sachrajda and G. Platero
Long-range spin transfer in triple quantum dots
Phys. Rev. Lett. **112**, 176803 (2014).

30. B. Sothmann, R. Sánchez and A. N. Jordan
Quantum Nernst engines

Europhys. Lett. **107**, 47003 (2014).
Highlighted in *Revista de Física* **28**(4), December 2014 of the Royal Spanish Physical Society.

31. B. Sothmann, R. Sánchez and A. N. Jordan
TOPICAL REVIEW: Thermoelectric energy harvesting with quantum dots
Nanotechnology **26**, 032001 (2015).

32. F. Gallego-Marcos, R. Sánchez and G. Platero
Photon assisted long-range tunneling
J. Appl. Phys. **117**, 112808 (2015).

33. R. Sánchez, B. Sothmann and A. N. Jordan
Chiral thermoelectrics with quantum Hall edge states
Phys. Rev. Lett. **114**, 146801 (2015).

34. R. Sánchez, B. Sothmann and A. N. Jordan
Heat diode and engine based on quantum Hall edge states
New J. Phys. **17**, 075006 (2015).
Invited contribution to focus issue on "Quantum Thermodynamics".

35. H. Thierschmann, R. Sánchez, B. Sothmann, F. Arnold, C. Heyn, W. Hansen, H. Buhmann and L. W. Molenkamp
Three-terminal energy harvester with coupled quantum dots
Nature Nanotech. **10**, 854 (2015).

36. R. Sánchez, B. Sothmann and A. N. Jordan
Effect of incoherent scattering on three-terminal quantum Hall thermoelectrics
Physica E **75**, 86 (2016).
Invited contribution to the special issue on "Frontiers in quantum electronic transport" - in memory of Markus Büttiker.

37. R. S. Whitney, R. Sánchez, F. Haupt and J. Splettstoesser
Thermoelectricity without absorbing energy from the heat sources
Physica E **75**, 257 (2016).
Invited contribution to the special issue on "Frontiers in quantum electronic transport" - in memory of Markus Büttiker.

38. F. Gallego-Marcos, R. Sánchez and G. Platero
Coupled Landau-Zener-Stückelberg quantum dot interferometers
Phys. Rev. B **93**, 075424 (2016).

39. H. Thierschmann, R. Sánchez, B. Sothmann, H. Buhmann and L. W. Molenkamp
Thermoelectrics with Coulomb coupled quantum dots
C. R. Physique **17**, 1109 (2016).
Invited contribution to the special issue on "Quantum thermoelectric phenomena".

40. R. Sánchez, H. Thierschmann and L. W. Molenkamp
All-thermal transistor based on stochastic switching
Phys. Rev. B (Rapid Communications) **95**, 241401 (2017).
Editor's suggestion.

41. G. Roselló, R. López and R. Sánchez
Dynamical Coulomb blockade of thermal transport
Phys. Rev. B **95**, 235404 (2017).

42. R. Sánchez, H. Thierschmann and L. W. Molenkamp
Single-electron thermal devices coupled to a mesoscopic gate
New J. Phys. **19**, 113040 (2017).

43. R. Sánchez
Correlation-induced refrigeration with superconducting single-electron transistors
Appl. Phys. Lett. **111**, 223103 (2017).
Featured article.

44. A. Marcos-Vicioso, C. López-Jurado, M. Ruiz-García, and R. Sánchez
Thermal rectification with interacting electronic channels: Exploiting degeneracy, quantum superpositions and interference
Phys. Rev. B, **98**, 035414 (2018).

45. R. Sánchez, P. Burset and A. Levy Yeyati
Cooling by Cooper pair splitting
Phys. Rev. B (Rapid Communications) **98**, 241414 (2018).
Editor's suggestion.

46. R. Sánchez, J. Splettstoesser and R. S. Whitney
Nonequilibrium system as a demon
Phys. Rev. Lett., **123**, 216801 (2019).

47. G. Jaliel, R. K. Puddy, R. Sánchez, A. N. Jordan, B. Sothmann, I. Farrer, J. P. Griffiths, D. A. Ritchie and C. G. Smith
Experimental realization of a quantum dot energy harvester
Phys. Rev. Lett. **123**, 117701 (2019).
Editor's suggestion.

48. J. Yang, C. Elouard, J. Splettstoesser, B. Sothmann, R. Sánchez and A. N. Jordan
Thermal transistor and thermometer based on Coulomb-coupled conductors
Phys. Rev. B **100**, 045418 (2019).

49. D. Sánchez, R. Sánchez, R. López and B. Sothmann
Nonlinear chiral refrigerators
Phys. Rev. B **99**, 245304 (2019).

50. D. Goury and R. Sánchez
Reversible thermal diode and energy harvester with a superconducting quantum interference single-electron transistor
Appl. Phys. Lett. **115**, 092601 (2019).
Featured article.

51. R. Sánchez, P. Samuelsson and P. P. Potts
Autonomous conversion of information to work in quantum dots
Phys. Rev. Research **1**, 033066 (2019).

52. F. Hajiloo, R. Sánchez, R. S. Whitney and J. Splettstoesser
Quantifying nonequilibrium thermodynamic operations in a multi-terminal mesoscopic system
Phys. Rev. B **102**, 155405 (2020).
Editor's suggestion.

53. S. M. Tabatabaei, D. Sánchez, A. Levy Yeyati and R. Sánchez
Andreev Coulomb drag in coupled quantum dots
Phys. Rev. Lett. **125**, 247701 (2020).

54. G. Manzano, R. Sánchez, R. Silva, G. Haack, J. B. Brask, N. Brunner and P. P. Potts
Hybrid thermal machines: generalized thermodynamic resources for multitasking
Phys. Rev. Research **2**, 043302 (2020).

55. G. Fleury, C. Gorini and R. Sánchez
Scanning probe-induced thermoelectrics in a quantum point contact
Appl. Phys. Lett. **119**, 043101 (2021).

56. R. Sánchez, C. Gorini and G. Fleury
Extrinsic thermoelectric response of coherent conductors
Phys. Rev. B **104**, 115430 (2021).
Erratum: Phys. Rev. B **105**, 139903 (2022).

57. I. Díaz and R. Sánchez
The qutrit as a heat diode and circulator
New J. Phys. **23**, 125006 (2021).

58. S. M. Tabatabaei, D. Sánchez, A. Levy Yeyati and R. Sánchez
Nonlocal quantum heat engines made of hybrid superconducting devices
Phys. Rev. B **XXX**, xxxxxx (2022).

Book chapters

1. *Rabi dynamics in driven tunneling devices*
R. Sánchez and G. Platero
in *Progress in Industrial Mathematics at ECMI 2006*. Mathematics in Industry **12**, L. L. Bonilla, M. Moscoso, G. Platero and J. M. Vega (eds.), Springer Verlag, 444 (2007). (doi: 10.1007/978-3-540-71992-2_67)
Print ISBN: 978-3-540-71991-5
Online ISBN: 978-3-540-71992-2

2. *Triangular triple quantum dots driven by ac magnetic fields*
G. Platero, R. Sánchez and M. Busl
in *Spintronics in Nanoscale Devices*, edited by E. R. Hedin and Y. S. Joe.
Pan Stanford Publishing, 2013.
Print ISBN: 978-981-4411-69-1
eBook ISBN: 978-981-4411-70-7

3. *Transport out of locally broken detailed balance*
   R. Sánchez
   in *Coupled Mathematical Models for Physical and Biological Nanoscale Systems and Their Applications*, edited by L. L. Bonilla, E. Kaxiras and R. Melnik.
   Springer Proceedings in Mathematics & Statistics, vol. **232**. Springer, 2018.
   Print ISBN: 978-3-319-76598-3
   Online ISBN: 978-3-319-76599-0
   arXiv:1701.03071

4. *Quantum thermodynamics of nanoscale thermoelectrics and electronic devices*
   R. S. Whitney, R. Sánchez and J. Splettstoesser
   in *Thermodynamics in the quantum regime: Recent progress and outlook*, edited by F. Binder, L. Correa, C. Gogolin, J. Anders, G. Adesso.
   Fundamental Theories of Physics, vol. **195**. Springer, 2018.
   Print ISBN: 978-3-319-99045-3
   eBook ISBN: 978-3-319-99046-0
   arXiv:1805.04297

Patents

- *Device and Method for Harvesting Energy*
  A. N. Jordan, B. Sothmann, R. Sánchez and M. Büttiker
  U.S. Provisional Patent Application No. 61/757,860. January 29, 2013.

- *Quantum well nano-engine and method for harvesting thermal energy*
  A. N. Jordan, B. Sothmann, R. Sánchez and M. Büttiker
  U.S. Provisional Patent Application No. 61/884,299. September 30, 2013.

- *Heat engine and method for harvesting thermal energy*
  A. N. Jordan, B. Sothmann, R. Sánchez and M. Büttiker
  U.S. Patent Application PCT/US2014/0013694. January 29, 2014.
  Publication No.: US 2015/0357540 A1. December 10, 2015.

Outreach publications

- M. Büttiker and R. Sánchez
  Nanoelectronics: A closer look at charge drag
  Nature Nanotechnol. (News and Views) **6**, 757 (2011).

- R. Sánchez and M. Büttiker
  Heat fluctuations of nanoscale converters
  Nanoenergy Letters **5**, 9 (2013).

- A. N. Jordan, B. Sothmann, R. Sánchez and M. Büttiker
  Powerful and efficient energy harvesting with resonant-tunneling quantum dots
  Nanoenergy Letters **6**, 11 (2013).

- R. Sánchez
  Efecto Nernst cuántico
  Webpage of Grupo Especializado de Fśica del Estado Sólido (GEFES) de la Real Sociedad Española de Física. Link

- R. Sánchez
  Interferencia en una doble rendija virtual
  Webpage of Grupo Especializado de Fśica del Estado Sólido (GEFES) de la Real Sociedad Española de Física. Link

- R. Sánchez
  Propiedades quirales de la propagación del calor
  Webpage of Grupo Especializado de Fśica del Estado Sólido (GEFES) de la Real Sociedad Española de Física. Link

- D. Sánchez and R. Sánchez
  Termoelectricidad cuántica: conversión de energía a escala nanométrica
  Revista Española de Física, Vol. 34, No 1, pp. 11-16 (2020).

Certifications

- Acreditación *Profesor contratado doctor*, ANECA, 2018.
- Acreditación *Profesor ayudante doctor*, ANECA, 2018.
- Acreditación *Profesor de universidad privada*, ANECA, 2018.

Teaching

- Université de Genève:
  Méthodes mathématiques pour physiciens I (problems, in French) (2008/09).

- Universidad Carlos III de Madrid:
  Calculus (in English) (2015/16*).
  Cálculo diferencial aplicado (in Spanish) (2015/16*, 2016/17).
  Álgebra lineal (in Spanish) (2015/16, 2016/17).

- Universidad Autónoma de Madrid:
  Técnicas experimentales I (in Spanish) (2018/19).
  Física de la materia condensada (in Spanish) (2018/19-2021/22).
  Fundamentos de Física III (in Spanish) (2019/20*-2021/22*).
  Prácticas externas (academic tutor) (2020/21-2021/22).

* marks subjects of problem session supervision only.

Supervision

PhD thesis

- 2013-2017: Fernando Gallego-Marcos.
  Title: *Electronic, heat and ultra cold atoms transport in quantum dot systems*.
  Universidad Complutense de Madrid.
  Cosupervised with Gloria Platero. Defended on 28/04/2017. Outstanding grade.

Master thesis

- 2017/18: Master internship (*Soutenance de stage M2 ICFP*) of Donald Goury.
  Title: *Thermo-electrical effects in hybrid junctions with tunable gaps: thermal diode and current generator*.
  International Centre for Fundamental Physics - École Normale Supérieure. Defended on 03/07/2018.

- 2020/21: Israel Díaz López
  Title: *Heat transport in supeconducting qutrits*.
  Universidad Autónoma de Madrid. Defended on 25/06/2021.

Bachelor thesis

- 2016/17: Alejandro Marcos Vicioso.
  Title: *Modelo de nano-diodos térmicos por efectos de interferencia cuántica*.
  Escuela Politécnica Superior, Universidad Carlos III de Madrid. Defended on 16/10/2017. Outstanding grade.

- 2018/19: Livia Josefa Leganés Fernández.
  Title: *Generación de transporte de carga y calor en sistemas de dos islas metálicas*.
  Universidad Autónoma de Madrid. Defended on 01/07/2019.

- 2019/20: Miguel Rodríguez Gómez
  Title: *Demonio de Maxwell en sistemas cuánticos: la infomación es física*.
  Universidad Autónoma de Madrid. Defended on May 2020.

- 2019/20: Jorge Vega Martín
  Title: *Interruptor y diodo térmico por dos cúbits acoplados*.
  Universidad Autónoma de Madrid. Defended on July 2020.

- 2020/21: Miguel Calvo Carrera
  Title: *Transporte coherente de calor en sistemas con propiedades topológicas*.
  Universidad Autónoma de Madrid. Co-supervised with A. Levy Yeyati. Defended on 03/06/2021.

- 2020/21: Daniel García Pina
  Title: *Entrelazamiento de qubits mediante baños térmicos*.
  Universidad Autónoma de Madrid. Defended on 02/07/2021.

- 2021/22: Irene Ada Picatoste Fernández
  Title: *Demonios de Maxwell autónomos en sistemas cuánticos*.
  Universidad Autónoma de Madrid. Defended on 01/07/2022.

Others

- Irene Ada Picatoste Fernández
  GEFES Research awards for undergraduate student 2022.
  Title of the project: *Role of fluctuations in quantum systems operating as autonomous Maxwell demons*.

Conference organization

- Nonlinear transport, dynamics and fluctuations in condensed matter physics. 20-22 November, 2012, Madrid.
  Local Committee.
- Challenges in nonlinear systems. 6-7 July, 2017, Leganés.
  Organization Committee.
- CMD2020GEFES. 31 August - 4 September, 2020, Madrid (on-line).
  Organization of mini-colloquium "Quantum thermoelectrics and heat currents at the nanoscale". (2-4 September).
- Physics of Magnetism 2023 (PM'23). 26-30 June, 2023, Poznań (Poland). www.ifmpan.poznan.pl/pm23/
  Member of the Advisory Committee.

Additional education

- *Emergence of Quantum Phases in Novel Materials.*
  Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC). 2013.

Languages

Spanish: Native.
English: Fluent.
French: Fluent.
German: Very basic.

Other merits

- Member of Real Sociedad Española de Física since 14 March, 2014. Grupo Especializado de Física del Estado Sólido. No. 4494.
- 2009, 2010:
  Seminar organization of the *Atelier de physique théorique*, Université de Genève.
- July 2014 - September 2015:
  Seminar organization of the *Seminarios Alternativos*, Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC).

- September 2015 - September 2016:
  Seminar organization, Instituto Gregorio Millán, Universidad Carlos III de Madrid.
- February 2018 - July 2022:
  Seminar organization of the *Informal seminars*, Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid.
- Reported as a referee for:
  - *Physical Review B*
  - *Physical Review Letters*
  - *Journal of Physics: Condensed Matter*
  - *Journal of Physics D: Applied Physics*
  - *Physical Review A*
  - *Nanotechnology*
  - *Europhysics Letters*
  - *New Journal of Physics*
  - *European Physical Journal B*
  - *Journal of Physics B: Atomic, Molecular and Optical Physics*
  - *Solid State Communications*
  - *Physical Review E*
  - *Nanoscale Research Letters*
  - *Physica Status Solidi B: Basic Solid State Physics*
  - *Journal of Applied Physics*
  - *Nature Communications*
  - *Physica E*
  - *Physical Review Applied*
  - *Semiconductor Science and Technology*
  - *European Physical Journal Special Topics*
  - *Scientific Reports*
  - *Journal of Low Temperature Physics*
  - *Physica Scripta*
  - *Communications Physics*
  - *Journal of Physics Communications*
  - *Nano Letters*
  - *Reviews of Modern Physics*
- Outreach contributor to *Revista Española de Física*, edited by Real Sociedad Española de Física.
- Member of PhD thesis defense committees:

- Maria Begoña Busl. *Nanoscopic systems driven by magnetic and electric fields*. Universidad Autónoma de Madrid. May 2012.
- Fernando Domínguez Tijero. *Decoherence phenomena in quantum dot arrays and fractional Josephson effect*. Universidad Autónoma de Madrid. November 2012.
- Álvaro Gómez-León. *Dynamical and topological properties of periodically driven nanostructures*. Universidad Complutense de Madrid. January 2014.
- Hugo Imanol Aramberri del Vigo. *Low dimensional effects in Topological Insulators*. Universidad Autónoma de Madrid. January 2016.
- Konstantine Katcko. *Probing inorganic and organic paths through spin-driven transport*. Université de Strasbourg. 25 October, 2019.
- Jordi Picó Cortés. *AC dynamics of quantum dots and Josephson junctions for quantum technologies*. Universidad Autónoma de Madrid. 13 December 2021.
- Bayan Karimi. *Circuit Quantum Thermodynamics – from photonic heat transport to ultrasensitive nanocalorimetry*. Aalto University, Helsinki. 5 April, 2022.

- External evaluation of PhD thesis:
  - Maria Isabel Alomar Bennàssar. *Spin and charge transport in htermally and ac driven nanodevices*. Universitat de les Illes Balears. 2016/17.
  - Elina Potanina. *Optimization of quantum pumps*. Aalto University. October 2019.

- Speaker at the *Jornada de Divulgación de la Investigación: Departamento de Física Teórica de la Materia Condensada*. Facultad de Ciencias, Universidad Autónoma de Madrid. 13 April, 2018.

- Speaker at the *Jornada de Divulgación de la Investigación: Departamento de Física Teórica de la Materia Condensada*. Facultad de Ciencias, Universidad Autónoma de Madrid. 26 April, 2019.

- Speaker at the *Jornada de Divulgación de la Investigación: Departamento de Física Teórica de la Materia Condensada*. Facultad de Ciencias, Universidad Autónoma de Madrid. 4 October, 2019.

- Contribution to the outreach video *Theoretical Condensed Matter Physics (UAM)*, realized by the Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid. July, 2019.
  https://dep.ftmc.uam.es/promotional-video-theoretical-condensed-matter-physics-uam/

- Speaker at the *Jornada Divulgación de Optativas cuarto curso grado Física*. Facultad de Ciencias, Universidad Autónoma de Madrid. 12 March, 2021.

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  ResearcherID: J-9404-2012
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