CVA Date	09-02-21

Parte A. DATOS PERSONALES

Nombre y apellidos	Rosa López Gonzalo		
DNI	07505487N	Edad	47
Research code 7	Researcher ID	7401491135	
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A.1. Situación profesional actual

Institution	Universitat de les Illes Balears		
Department/Center	Institute of Interdisciplinary Physics and Complex Systems IFISC		
Address	Crta. Valldemossa, km. 7.5		
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Position	Catedrática de Universidad	Fecha inicio	22-12-2020
UNESCO code	221029 - Física del Estado Sólido		
Keywords	Quantum Transport, Strongly Correlated, Toplogical systems, Thermoelectricity, Quantum Thermodynamics		

A.2. Formación académica *(título, institución, fecha)*

Licenciatura/Grado/ Doctorado	University	Año
Degree in Physics	Autónoma de Madrid	1996
PhD in Physics	Autónoma de Madrid	2002

A.3. Scientific production

Sexenios evaluated positively by the CNAI: 3
Last recognized year for the sexenio: 2014
Total citations (1) *Google Scholar*): 3139 (2) WoS 2459
Índice h (Google Scholar): 31 (WoS): 28
Número de artículos con 10 o más citas (índice i-10): 58
Artículos en revistas de Física Interdisciplinar: 16 Physical Review Letters +1 Comment. 41 Physical Review B (5 Rapid Communications), 5 New Journal of Physics, 1 Featured in Physics 2 Editorial Suggestion

Parte B. Brief Summary of the CV 1997-2002 PhD: *Nonequilibrium Transport Properties in Low Dimensional Systems: Kondo Effect in Quantum Dots and Nonlinear Dynamics in Multiple-Quantum-Well Systems*. Supervised by : Prof. Investigación Gloria Platero Coello (ICMM, CSIC).2002-2004 Postdoctoral staying in the group of Prof. Markus Büttiker (Geneva University, Switzerland). 2004-2008 Ramón y Cajal Fellowship at the Balearic Islands University (UIB). 2008-2011 Profesor Contratado Doctor I3 at the UIB. 2011-Profesor Titular de Universidad. Universidad de las Islas Baleares. 2020. Catedrática de Universidad at UIB. Associated Researcher at the Institute of Interdisciplinary Physics and Complex Systems (UIB-CSIC).

Research topics

1. ***Transport in artificial magnetic impurities.*** We have investigated the quantum transport in the Kondo regime in different setups. We mention our studies on the transport in a quantum capacitor when an adiabatic modulation (RC circuit) is applied and also in the photon-assisted tunneling regime, when there are non conventional contacts as

ferromagnetic leads, superconductors, topological contacts. We have considered the presence interactions as the spin-orbit interaction, a magnetic field, or a quantum dot inserted in an Aharanov-Bohm interferometer. Additionally we have studied the Kondo effect in carbon nanotubes that exhibit the SU(4) symmetry and in three quantum dots showing SU(3) Kondo physics. Besides, we have analyzed the Kondo effect in quantum dots connected to reservoirs with spin-dependent chemical potentials. Recently, we have investigated the Kondo effect in thermoelectricity in single and double quantum dot systems.

2. **Thermoelectricity and Quantum thermodynamics.** We have developed a formalism within the Scattering theory formalism to address thermoelectrical transport when there is a voltage and thermal gradient applied to the sample. Our formalism allows to compute heat and charge responses to those gradients in the nonlinear regime. We have applied such formalism to investigate the magnetic field asymmetries in quantum Hall bar setups containing an antidot. Besides, we have address the thermoelectrical transport in topological setups containing Majorana fermions. We have presented a study of the Seebeck coeficiente in the presence of strong correlations in carbon nanotubes. Rectification and nonlinear transport effects have been also reported in quantum dots. Finally, from the quantum thermodynamics side we have recently started to investigate in this topic. Here we have proposed Maxwell demon protocols applied to nano devices to work as heat engines or refrigerators. We have verified the fluctuation-dissipation theorem out of equilibrium in topological setups and in double quantum dots that exhibit the Coulomb drag effect. Here, we have considered the effect of an electromagnetic environment and its influence in the transport. Additionally, a recent study on the stalling currents in electrostatic double quantum dots have been reported.
3. **Quantum Materials**. In the last years our activity has been focused on the characterization of the topological states in quantum nanowires. Here we have considered different geometries and analyzed the appearance of nontrivial phases in the spectrum. We have investigated the orbital effects in topological systems associated to the magnetic field action and also the interplay between strongly correlated phenomena and Majorana physics.

Parte C. RELEVANT SCIENTIFIC ACHIEVEMENTS

C.1. Publications

1. Mesoscopic Coulomb drag, broken detailed balance and fluctuation relations R. Sánchez, R. López, D. Sánchez, and M. Büttiker, Physical Review Letters 104, 076801 (2010). Citas: 101. We predict the occurrence of the Coulmb drag effect in double quantum dots coupled electrostatically. We additionally demonstrated the fulfillment of the nonlinear fluctuation relations in the nonlinear transport regime.
2. *Josephson current in strongly correlated double quantum dots* R. Zitko, M. Lee, R. López, R. Aguado, M-S. Choi, Physical Review Letters **105**, 116803 (2010). Citas 34. Índice de impacto: 7.489. We investigate the Josephson current when it exhibits a 0 or π-junction behavior in double quantum dots coupled in a series. This is the minimal model, a dimer, to understand the interplay between Kondo physics and states that are precursors of topological states, the Shiba states.
3. *Fluctuations relations for spintronics,* R. López, J-S. Lim, and D. Sánchez, Physical Review Letters 108, 246603 (2012). Here, we investigate the fluctuation theorems in a topological system out of equilibrium.
4. *Transport measurement of Andreev bound states in a Kondo-correlated quantum dot*, B-K. Kim, Y-H. Ahn, J-J. Kim, M-S. Choi, M-H. Bae, K. Kang, J-S. Lim, R López, Phys. Rev. Lett. **110** 076803 (2013). This is a collaboration with an experimental group. In this work we analyze the transition from the 0-junction behavior to π-junction behavior when the Kondo temperature changes with respect to the superconducting gap. The super current reflects such transition as experimentally is demonstrated.
5. *Scattering theory of nonlinear thermoelectric transport*, D. Sánchez, and R. López, Physical Review Letters 110 (2), 026804 (2013). Formulation of a gauge invariance theory for the nonlinear transport in nano conductors that are driven by electrical and thermal gradients.
6. *Cotunneling Drag Effect in Coulomb-Coupled Quantum Dot*, A. J. Keller, J. S. Lim, David Sánchez, Rosa López, S. Amasha, J. A. Katine, Hadas Shtrikman, and D. Goldhaber-Gordo, Phys. Rev. Lett. 117, 066602 (2016). This is a experimental collaboration in which

the Coulomb drag effect was measured in double quantum dots in the cotunneling regime .

7. Thermally Driven Out-of-Equilibrium Two-Impurity Kondo System, M.A. Sierra, R. López, J-S. Lim, Phys. Rev. Lett. 121, 096801, (2018). The two-impurity Kondo problem is addressed from the thermoelectrical point of view. We consider a thermal gradient applied to the contacts and we investigate the heat and charge currents and the influence of such gradients in the Kondo to the antiferromagnetic phase.
8. Nonlinear Chiral Refrigerators. D. Sánchez, R. Sánchez, R. López, B. Sothmann, Phys.l Rev. B 99, 245304 (2019). We propose a refrigerator being a mutiterminal topological system. In particular we consider a three terminal quantum Hall bar in which we insert two scatters, two quantum dots. From the chirality and the energy dependent transmission at the scatters the heat at the third terminal can be extracted working the system as a refrigerator.

C.2. Proyectos

1. Project Title: Unidad de Excelencia Maria de Maeztu (Information processing in and by complex systems.) (MDM-2017-0711). Duration: from 01/07/2018 to 30/06/2022. Budget: 2.000.000 euros. Principal investigator: Claudio Miraso, Ingo Fisher. Budget: 2 million euros.

2. Project Title: Transporte en Materiales Cuánticos en la Nanoscala MAT2017-82639. Proyectos de I+D de “Excelencia” 2017. Duration from 01/01/2018 to 31/12/2020. Principal investigator: Rosa López, David Sánchez. 84.000 euros

3. Project Title: Spin, energy and topology at quantum transport (SET@QT)FIS2014-52564-P. Proyectos de I+D de “Excelencia” 2014. Duration: from 01/01/2015 to 31/12/2017. I Principal investigator: Rosa López, David Sánchez.

4. Project Title: Título del proyecto: Termoelectricidad: nuevas teorías. MAT2016-82015-RED. Duration (2018-2020). Investigador Principal Red Andrés Cantarero. Investigador Principal nodo UIB-IFISC Rosa López. Budget:18.500 euros.

5. Project Title: Quantum Thermodynamics. COST - Action Cost. 2406 - EC DG-RTD Duration: from 2013 to: 2016. Investigador/a Principal: Janet Anders.

6. Project Title:: Transporte e Información en Sistemas Cuánticos. Programa Nacional de Investigación Fundamental No Orientada - Ministerio de Ciencia e Innovación. FIS2011 23526. Budget : 183.920 euros. Duration: 2012 to: 2014. Principal Investigator: Llorens Serra Crespí.

7. Project Title: Red Española de Física de sistemas fuera de equilibrio. ACCO - Acción complementaria nacional Empresa/Administración financiadora: MECI - Ministerio de Educación y Ciencia Número de proyecto/contrato: FIS2010-11438-E. Budget : 15.000 euros .Duration: from 2012 tp 2012. Principal Investigator: Ignacio Paganobarraga.

8. Project Title: Transporte cuántico en nanoestructuras e información cuántica Tipo de contrato/Programa: Programa Nacional de Investigación Fundamental No Orientada MECI - Ministerio de Educación y Ciencia. FIS2008 00781. Budget : 195.340 euros. Duration: from 2009 to: 2011. Principal investigator Llorens Serra.

9. Project Title: Centro Nacional de Física de Partículas, Astropartículas y Nuclear. CONI - Programa CONSOLIDER-Ingenio 2010 MECI - Ministerio de Educación y Ciencia. CSD2007-00042 Budget: 10 million euros Duración, desde: 2007 hasta: 2012. Investigador/a Principal: Antoni Pich Zardoy.

10. Project Title: Información cuántica y dinámica electrónica en nanoestructuras.PNFI - Programa Nacional de Física. MECI - Ministerio de Educación y Ciencia. FIS2005-02796. Budget: 104.720 euros. Duration: from 2005 to 2008 Principal Investigator: Montserrat Casas Ametller.

C.3. Conferencias: Conferencias invitadas más relevantes en los últimos 10 años:

1. Title: *Magnetic fluctuations in hybrid multiterminal systems.* Congreso 20th International Conference on Noise and Fluctuations (Pisa, Italia, 2009)
2. Title: *Josephson current in double quantum dots.* Congreso: Out of equilibrium systems, Nonlinear systems, nanoscience and fluid dynamics, (Madrid, España 2010)
3. Title: *Two impurity Kondo effect revisited.* Conference on Quantum Engineering of States and Devices (Obergurl, Austria, 2010)
4. Title: *Nonliner relations in coupled mesoscopic conductors.* Congreso: Workshop on the physics of micro and nano scale systems (Ystad, Suecia 2010)
5. Title: *Josephson current in carbon nanotubes with spin orbit interaction.* Congreso: Charge and heat dynamics in nano-systems (Orsay, Francia 2011)
6. Title: *Efecto Kondo en dobles quantum dot.* Congreso: EP2DS 19 (Tallahasse, EE.UU 2011)
7. Title: Josephson current in carbon nanotubes. Congreso: Reunión Bienal del Grupo Especializado de Estado Sólido (Sevilla, España 2012)
8. Title: *Semi plenaria Scattering theory of Thermoelectrical nonlinear transport.* Congreso: 27th International Conference on Low Temperature (Buenos Aires, Argentina 2014)
9. Title: *Majorana thermoelectrical detection.* Congreso: 25th Conference of the Condensed Matter Division of the European Physical Society (Paris, Francia 2014)
10. Title: AC and DC transport in RC quantum circuits. Congreso: Quantum Thermodynamics conference COST (Berlin 2014).
11. Title: Coulomb drag in quantum dots: Congreso: AC driven quantum systems. (Bariloche 2016)
12. Title: The Kondo effect in Thermoelectrics. Congreso: International Workshop on Magnetism & Superconductivity at the Nanoscale (Comarruga 2019).
13. Title: Nonchiral refrigerators. Conference (online). Quantum thermodynamics of Non-Equilibrium Systems, San Sebastian (2020).

C.4 Activities I+D+I

Organization of Conferences/workshops:
1.- Majorana states in Condensed Matter: Towards topological quantum computation, 2017 International conference.
2.- 2nd Conference on Quantum Thermodynamics, 2015. International conference.
3.- Nonlinear spin and charge transport through nanoscopic systems, 2011. International conference
4.- Nanomediterráneo 3, 2011. Spanish meeting.
5.- Nonequilibrium Fluctuation Relations In Quantum Systems, 2011. International conference.

C.5.Participation in committees: participation in numerous tesis committees, scientific committee in conferences. Referee in diverse scientific agencies: ANEP, NSF, ERC. Evaluator in the Ramón y Cajal, Spanish Research Grant Program evaluator. Referee of numerous scientific journals, PRL, Entropy, NJP, PRB, Nanoletters, etc

C.6 Student Training and teaching: Four master thesisMáster@UIB. Supervision of four postdoctoral researchers. Supervision of five final degree project. Teaching in two Master degrees @ UIB and @ IFISC. Teaching in Science degree (mainly in Physics) during 20 years. 19 years at the UIB. Approximately 2000 hours of teaching with more than 200 hours in master.
PhD theses supervised:
- Javier Osca Cotarelo, Majorana physics in hybrid nanowires, topological phases and transport. Cum laude. 2016. Co-supervised with Dr. Llorens Serra
- Guillem Rosselló Rosselló, Heat and Charge transport in nanostructures: interference, AC-driving, environment, and feedback. Cum Laude.