CV FULL VERSION (08/02/2021)

PERSONAL INFORMATION

Family name, name: Torrontegui, Erik
Birth: 27/04/1985, Bilbao
Nationality: Spanish

mail: eriktorrontegui@gmail.com
URL for publications: link to my publication list at arXiv
Google Scholar profile URL: https://scholar.google.co.il/citations?user=WvbdV6IAAAAJ&hl=en

RESEARCH INTEREST

- Quantum technologies
- Quantum control
- Quantum thermodynamics
- Quantum computing
- Quantum sensing
- Quantum transients
- Cold atoms, trapped ions, superconducting circuits

CURRENT POSITION

2020 – **Visiting Professor**, Department of Physics, Universidad Carlos III de Madrid, UC3M, Spain.

2020 – **Associated researcher**, Institute of Fundamental Physics - Spanish Research Council, IFF-CSIC, Madrid, Spain.

JOB EXPERIENCE

2017 –2020 **QUITEMAD Research Fellow**, Institute of Fundamental Physics - Spanish Research Council, IFF-CSIC, Madrid, Spain.

2016 – 2017 **Postdoctoral researcher**, The Hebrew University of Jerusalem, within the Army Research Laboratory of United States "A Novel Ultrafast Pulse Platform for Quantum Technology", The Hebrew University of Jerusalem, Israel. *(1 research triennium)*

2014 – 2016 **Basque Government Postdoctoral Researcher**, The Hebrew University of Jerusalem, Israel.

2013 – 2014 **Postdoctoral Researcher**, Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain. *(1 research triennium)*

2008 – 2012 **PhD Researcher**, Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.

FELLOWSHIPS, GRANTS, AND AWARDS

2019 **Research contract** awarded by Community of Madrid, QUITEMAD.

2017 **Research contract** awarded by Community of Madrid, QUITEMAD.

2015 **Extraordinary prize for a PhD in Sciences**, University of the Basque Country, Spain.

2014 **Postdoctoral Fellowship** awarded by The Hebrew University. €12k

2012 Income by the Basque Government because my Ph.D. thesis was awarded with mark "Cum Laude". The latter is the highest mark in the Spanish academic system. €4.5k

2008 **PhD Fellowship** awarded by the Basque Gov. €86.4k

2003 **Bachelor Fellowship** awarded by the Basque Gov. (5 years). €2.6k

TEACHING ACTIVITIES

2021 **Teacher** of the course "Physics II" engineering physics, Department of Physics, UC3M, Spain.

Teacher of the course "Physics II" of electrical engineering & mechanical engineering, Department of Physics, UC3M, Spain.

2020 **Teacher** of the course "Physics I" of aerospace engineering, Department of Physics, UC3M, Spain.

Teacher of the course "Physics I" of energy engineering, Department of Physics, UC3M, Spain.

Teacher of the course "Physics" of engineering physics, Department of Physics, UC3M, Spain.

2016 **Teacher** of the course "Quantum thermodynamics" of the master Physical and Theoretical chemistry, The Fritz Haber Research Center for Molecular Dynamics-Institute of Chemistry, The Hebrew University of Jerusalem, Israel.

2012 **Teacher** of the course "Experimentation in Chemical Physics", Faculty of Science and Technology/ Department of Physical Chemistry, University of the Basque Country, Spain.

2011 **Teacher** of the course "Introduction to experimentation in Chemical Physics", Faculty of Science and Technology/ Department of Physical Chemistry, University of the Basque Country, Spain.

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2020 Supervising of the Bachelor thesis of **Mr. Alex González Fernández**, Topology analysis of quantum neural networks, IFF-CSIC, Spain.

2020 Supervising of the Bachelor thesis of **Mr. Ivan Panadero Muñoz**, The quantum camera, IFF-CSIC, Spain.

2020 Supervising of the Bachelor thesis of **Mr. Julián Ferreiro Vélez**, Development of new quantum neural networks, IFF-CSIC, Spain.

2019 Supervising of the Bachelor thesis of **Mr. Javier González Conde**, Quantum machine learning, IFF-CSIC, Spain *now PhD at UPV/EHU (Spain).*

2019 Supervising, together with Prof. J. J. García-Ripoll, of the Bachelor thesis of **Mr. Andrés Ruiz-Chamorro**, Quantum control & design of quantum gates with superconducting circuits, IFF-CSIC, Spain.

2018 Supervising of the PhD student **Mr. Fernando Gago**, Superconducting circuits inspired quantum technologies optimized with coherent control, IFF-CSIC, Spain *now PhD at Kassel University (Germany).*

2018 Supervising, together with Prof. J. J. García-Ripoll, of the Bachelor thesis of **Mrs. Victoria Aguilar,** The role of entanglement in neural networks, IFF-CSIC, Spain.

2016 Supervising the research work of the postdoc and PhD student **Mr. A. Levy** and **Mr. I. Schaefer**, The Hebrew University of Jerusalem, Israel. *Two articles together.*

2014 Supervising the research work of the postdoc student **Mrs S. Martínez-Garaot**, Faculty of Science and Technology/ Department of Physical Chemistry, University of the Basque Country, Spain. *Three articles together.*

2013 Supervising, together with Prof. J. G. Muga, the Bachelor thesis "Detecting quantum backflow in a BEC" and the research work of the PhD. student **Mr. M. Palmero**, Faculty of Science and Technology/ Department of Physical Chemistry, University of the Basque Country, Spain. *Two articles together.*

2013 Supervising the research work of the PhD. student **Mrs S. Martínez-Garaot**, Faculty of Science and Technology/ Department of Physical Chemistry, University of the Basque Country, Spain. *Five articles together.*

2012 Supervising, together with Prof. J. G. Muga, the research work of the PhD. student **Mrs S. Ibáñez**, Faculty of Science and Technology/ Department of Physical Chemistry, University of the Basque Country, Spain. *Four articles together.*

PUBLICATIONS

Research articles:

[41] ***Large Quantum Delocalization of a Levitated Nanoparticle using Optimal Control: Applications for Force Sensing and Entangling via Weak Forces,*** T. Weiss, M. Rodá-Llordes,

E. Torrontegui, M. Aspelmeyer, and O. Romero-Isart, arXiv:2012.12260 (2020), submitted to Phys. Rev. Lett.
[40] ***Multi-GHz repetition rate, multi-watt average power, ultraviolet laser pulses for fast trapped-ion entanglement operations,*** M. I. Hussain, D. Heinrich, M. Guevara-Bertsch, E. Torrontegui, J. J. García-Ripoll, C. F. Roos,a and R. Blatt, arXiv:2007.03404 (2020), accepted in Phys. Rev. Appl.
[39] ***Invariant-based inverse engineering of time-dependent, coupled harmonic oscillators,*** A. Tobalina, E. Torrontegui, I. Lizuain, M. Palmero, and J. G. Muga, Phys. Rev. A 102, 063112 (2020)
[38] ***Speed-up Quantum Perceptron via Shortcuts to Adiabaticity,*** Y. Ban, X. Chen, E. Torrontegui, E. Solano, and J. Casanova, arXiv:2003.09938, submitted to Quantum Techn. (2020)
[37] ***Quantum Control of Frequency-Tunable Transmon Superconducting Qubits,*** J. J. García-Ripoll, A. Ruiz-Chamorro, and E. Torrontegui, Phys. Rev. Appl. **14** (4), 044035 (2020)
[36] ***Ultra-fast two-qubit ion gate using sequences of resonant pulses,*** E. Torrontegui, D. Heinrich, M. I. Hussain, R. Blatt, and J. J. García-Ripoll, New J. Phys. **22** (10), 103024 (2020)
[35] ***Single-atom heat engine as a sensitive thermal probe,*** A. Levy, M. Göb, B. Deng, K. Singer, E. Torrontegui, and D. Wang, New J. Phys. **22** (9), 093020 (2020)
[34] ***Shortcuts to adiabaticity: concepts, methods, and applications,*** D. Guéry-Odelin, A. Ruschhaupt, A. Kiely, E. Torrontegui, S. Martínez-Garaot and J. G. Muga, Rev. Mod. Phys. **91** 045001 (2019)
[33] ***Modulated continuous wave control for energy-efficient electron-nuclear spin coupling,*** J. Casanova, E. Torrontegui, M. B. Plenio, J. J. García Ripoll, and E. Solano, Phys. Rev. Lett. **122** 010407 (2019)
[32] ***Unitary quantum perceptron as universal approximator,*** E. Torrontegui and J. J. García-Ripoll, EPL, **125** 30004 (2019)
[31]***Transient non-confining potentials for speeding-up a single ion heat pump,*** E. Torrontegui, S. T. Dawkins, M. Göb, and K. Singer, New J. Phys. **20** 105001 (2018)
[30] ***Noise resistant quantum control using dynamical invariants,*** A. Levy, A. Kiely, J. G. Muga, R. Kosloff, and E. Torrontegui, New J. Phys. **20** 025006 (2018)
[29] ***Invariant-based inverse engineering of crane control parameters,*** S. González-Resines, D. Guéry-Odelin, A. Tobalina, I. Lizuain, E. Torrontegui, and J. G. Muga, Phys. Rev. Appl. **8** 054008 (2017)
[28] ***Action noise-assisted quantum control,*** A. Levy, E. Torrontegui, and, R. Kosloff, Phys. Rev. A **96** 033417 (2017)
[27] ***Energy consumption for shortcuts to adiabaticity,*** E. Torrontegui, I. Lizuain, S. González-Resines, A. Tobalina, A. Ruschhaupt, R. Kosloff, and J. G. Muga, Phys. Rev. A **96** 022133 (2017)
[26] ***Activated and non activated dephasing in a spin bath,*** E. Torrontegui and R. Kosloff, New. J. Phys, **18** (9) 093001 (2016)
[25] ***Shortcuts to adiabaticity in three-level systems using Lie transforms,*** S. Martínez-Garaot, E. Torrontegui, X. Chen, and J. G. Muga, Phys. Rev. A. **89,** 053408 (2014)
[24] ***Hamiltonian engineering via invariants and dynamical algebra,*** E. Torrontegui, S. Martínez- Garaot, and J. G. Muga, Phys. Rev. A. **89,** 043408 (2014)
[23] ***Fast transport of two ions in an anharmonic trap,*** M. Palmero, E. Torrontegui, D. Guéry-Odelin, and J. G. Muga, Phys. Rev. A. **88,** 053423 (2013)
[22] ***Vibrational mode multiplexing of ultracold atoms,*** S. Martínez-Garaot, E. Torrontegui, Xi Chen, M- Modugno, D. Guéry-Odelin, Shuo-Yen Tseng, and J. G. Muga, Phys. Rev. Lett. **111,** 213001 (2013)
[21] ***Shortcut to adiabaticity in internal bosonic Josepshon junctions,*** A. Yuste, B. Juliá-Díaz, E. Torrontegui, J. Martorell, J. G. Muga, and A. Polls, Phys. Rev. A. **88,** 043647 (2013)
[20] ***The quest for absolute zero in presence of external noise,*** E. Torrontegui and R. Kosloff, Phys. Rev. E. **88,** 032103 (2013)
[19] ***Detecting quantum backflow by the density of a Bose-Einstein condensate,*** M. Palmero, E. Torrontegui, J. G. Muga, and M. Modugno, Phys. Rev. A. **87,** 053618 (2013)

[18] ***Engineering fast and stable splitting of matter waves,*** E. Torrontegui, S. Martínez-Garaot, M. Modugno, and J. G. Muga, Phys. Rev. A. **87,** 033630 (2013)
[17] ***Fast generation of spin-squeezed states in bosonic Josephson junctions,*** B. Juliá-Díaz, E. Torrontegui, J. Martorell, J. G. Muga, and A. Polls, Phys. Rev. A. **86,** 063623 (2012)
[16] ***Multiple Schrödinger pictures and dynamics in shortcuts to adiabaticity,*** S. Ibáñez, X. Chen, E. Torrontegui, A. Ruschhaupt and J. G. Muga, Phys. Rev. Lett. **109,** 100403 (2012)
[15] ***Erratum: Shortcuts to adiabaticity for non-Hermitian systems [Phys. Rev. A. 84, 023415 (2011)],*** S. Ibáñez, S. Martínez-Garaot, X. Chen, E. Torrontegui and J. G. Muga, Phys. Rev. A. **86,** 019901 (2012)
[14] ***Shortcuts to adiabaticity: fast-forward approach,*** E. Torrontegui, S. Martínez-Graot, A. Ruschhaupt and J. G. Muga, Phys. Rev. A. **86,** 013601 (2012)
[13] ***Fast transitionless expansions of cold atoms in optical Gaussian beam traps,*** E. Torrontegui, X. Chen, M. Modugno, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, Phys. Rev. A. **85,** 033605 (2012)
[12] ***Fast transport of Bose-Einstein condensates,*** E. Torrontegui, X. Chen, M. Modugno, S. Schmidt, A. Ruschhaupt and J. G. Muga, New J. Phys. **14**, 013031 (2012)
[11] ***Optimal trajectories for efficient atomic transport without final excitation,*** X. Chen, E. Torrontegui, D. Stefanatos, J-S. Li and J. G. Muga, Phys. Rev. A. **84,** 043415 (2011)
[10] ***Simulation of quantum collinear chemical reactions with ultracold atoms,*** E. Torrontegui, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, J. Phys. B. **44,** 195302 (2011)
[9] ***Shortcuts to adiabaticity for non-Hermitian systems,*** S. Ibáñez, S. Martínez-Garaot, X. Chen, E. Torrontegui and J. G. Muga, Phys. Rev. A. **84,** 023415 (2011)
[8] ***Lewis-Riesenfeld invariants and transitionless quantum driving,*** X. Chen, E. Torrontegui and J. G. Muga, Phys. Rev. A. **83,** 062116 (2011)
[7] ***Explanation and observability of diffraction in time,*** E. Torrontegui, J. Muñoz, Y. Ban and J. G. Muga, Phys. Rev. A. **83,** 043608 (2011)
[6] ***Fast atomic transport without vibrational heating,*** E. Torrontegui, S. Ibañez, X. Chen, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, Phys. Rev. A. **83,** 013415 (2011)
[5] ***Shortcuts to adiabaticity processes,*** J. G. Muga, X. Chen, E. Torrontegui, S. Ibáñez, I. Lizuain, and A. Ruschhaupt, J. Phys. Conf. Series **306,** 012022 (2011)
[4] ***Shortcuts to Adiabaticity (Atajos a la Adiabaticidad),*** J. G. Muga, X. Chen, E. Torrontegui, S. Ibáñez, and I. Lizuain, Óptica Pura y Aplicada. **44,** 3 479 (2010)
[3] ***Cold atom dynamics in crossed laser beam waveguides,*** E. Torrontegui, J. Echanobe, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, Phys. Rev. A. **82,** 043420 (2010)
[2] ***Classical picture of post-exponential decay,*** E. Torrontegui, J. G. Muga, J. Martorell and D. W. L. Sprung, Phys. Rev. A. **81,** 042714 (2010)
[1] ***Enhanced observability of quantum postexponential decay using distant detectors,*** E. Torrontegui, J. G. Muga, J. Martorell and D. W. L. Sprung, Phys. Rev. A. **80**, 012703 (2009)

Book chapters:

[C2] ***Shortcuts to Adiabaticity,*** E. Torrontegui, S. Ibáñez, S. Marínez-Garaot, M. Modugno, A. del Campo, D. Guéry-Odelin, A. Ruschhaupt, Xi Chen, and J. G. Muga, Advances in Atomic, Molecular, and Optical Physics **62**, 117-170, Elsevier 2013
[C1] ***Quantum decay at long times,*** E. Torrontegui, J. G. Muga, J. Martorell and D. W. L. Sprung, Advances in Quantum Chemistry **60**, 485-535, Elsevier 2010

RESEARCH PROJECTS

Main researcher:

[3] ***A novel ultrafast platform for quantum technology,*** reference: W911NF-15-1-0250, MRs: R. Kosloff, A. Retzker y E. Torrontegui, period: 01/06/2015-31/05/201, institution: the Army Research Office of the U.S., budget: 115k$
[2] ***Quantum thermodynamics and quantum control,*** reference: POS_2013_1_138, MR: E. Torrontegui, period: 01/04/2013-31/12/2015, institution: Gobierno Vasco, budget: 110k€

[1] ***Quantum dynamics and control of matter waves***, reference: DOCREC12/04, MR: E. Torrontegui, period: 11/02/2013-11/08/2013, institution: UPV/EHU, budget: 10.4k€

Participation:

[11] ***QUITEMAD-CM***, reference: PS2018-TCS4342, MR: M. A. Martín-Delgado, period: 01/01/2019-31/12/2022, institution: Comunidad de Madrid, budget: 840k€

[10] ***Frontiers in quantum simulations***, reference: PGC2018-094792-B-100, MR: D. Porras, period: 01/01/2019-31/12/2011, institution: Ministerio Ciencia, Innovación y Universidades, budget: 175k€

[9] ***Tecnologías cuánticas con qubits y campos***, reference: FIS2015-708561, MR: J. J. García-Ripoll, period: 01/01/2016-31/12/2018, institution: Ministerio Ciencia, Innovación y Universidades, budget: 101k€

[8] ***QUITEMAD-CM***, reference: PS2013-ICE2801, MR: M. A. Martín-Delgado, period: 01/01/2015-31/12/2018, institution: Comunidad de Madrid, budget: 700k€

[7] ***Materia cuántica de principios a aplicaciones***, reference: MINECOG 15/P30, MR: J. G. Muga, period: 01/01/2016-31/12/2018, institution: Ministerio Ciencia, Innovación y Universidades, budget: 334k€

[6] ***Quantum information science and technology***, reference: IT986-16, MR: J. G. Muga, period: 01/01/2016-31/12/2021, institution: Gobierno Vasco, budget: 796k€

[5] ***Dispositivos y dinámicas cuánticas: fundamentos y aplicaciones***, reference: FIS2012-36673-C03-01, MR: J. G. Mugas, period: 01/01/2013-31/12/2015, institution: Ministerio Ciencia, Innovación y Universidades, budget: 184k€

[4] ***Ciencia y tecnología cuántica y espacial***, reference: UFI11/551, MR: A. Oleaga-Páramo, period: 01/11/2011-31/12/2016, institution: Universidad del País Vascos, budget: 102k€

[3] ***Quantum information science and technology***, reference: IT472-10, MR: J. G. Muga, period: 01/01/2010-31/12/2015, institution: Gobierno Vasco, budget: 562k€

[2] ***Quantum information science and technology***, reference: —, MR: J. G. Muga, period: 12/05/2008-12/05/2010, institution: Universidad del País Vasco, budget: 99k€

[1] ***Dinámica y control de átomos ultrafríos***, reference: —, MR: J. G. Muga, period: 01/12/2006-01/12/2009, institution: Ministerio de Educación, Política y Deporte, budget: 43k€

Other research projects:

[1] ***Shortcuts to adiabaticity (STA2012)***, reference: RC-2012-2-86, IP: J. G. Muga, period: 01/01/2012-31/12/2012, institution: Gobierno Vasco, budget: 5k€

IMPACT - TECHNOLOGICAL TRANSFER

Cites > 2600, *h*-index=23, 6 articles > 100 cites.

My research work has led to, so far, up to 12 experimental developments in top flight groups in different quantum platforms as cold atoms, trapped ions, and NV centers.

Based on my proposal Phys. Rev. Lett. **109**, 100403 (2012) are the experiments:

[12] *Phys. Rev. Applied **11**, 034030 (2019)* for the generation of controlled Z-gates.

[11] *Nature Physics **13**, 330 (2017)* for the internal state control of a NV-center.

[10] *Nat. Comm. **7**, 12479 (2016)* for the fast population inversion of atoms.

Based on my proposal Adv. in AMO physics **62**, 117 Elsevier (2013) are the experiments:

[9] *Sci. Adv. **4**, 5909 (2018)* for the friction suppression in finite time thermodynamics.

[8] *NJP. **20**, 065003 (2018)* to generate gates with superconducting Xmon qubits.

[7] *PRA **97**, 013628 (2018)* to cool down neutral atoms.

[6] *PRA **95**, 042345 (2016)* to measure Berry phase.

Based on my proposal New J. Phys. **20**, 025006 (2018) is the experiment:

[5] *NJP **20**, 095002 (2018)* to optimally transfer atoms between different locations.

Based on my proposal Phys. Rev. A **83**, 013415 (2011) are the experiments:

[4] *PRL* ***120****, 010501 (2018)* for the transport of ions.
[3] *Nat. Comm.* ***7****, 12999 (2016)* for the efficient displacement of ions.

Based on my proposal Phys. Rev. A **96**, 033417 (2017) is the experiment:

[2] *NJP* ***20****, 013008 (2018),* test non-equilibrium work relations in the quantum regime

Based on my proposal Phys. Rev. Lett. **111**, 213001 (2013) is the experiment:

[1] *NJP* ***20****, 055005 (2018)* for the fast loading of BECs in an optical lattice

Nowadays, I am giving theoretical support to the group of Prof. K. Singer (Kassel, Germany) and we are collaborating in the experimental implementation of quantum engines trough the project *"Single Ion Heat Engine".* I am also collaborating with the group of Prof. C. Wunderlich (Siegen, Germany) for the experimental implementation of quantum neural networks based on my proposal in EuroPhys Lett, **125** 30004 (2019). Moreover, I collaborate with the group of Prof. R. Blatt (Innsbruck, Austria) in a joint theoretical/experimental work for the implementation of two-qubit fast gates with trapped ions.

I have developed different high-quality free-software programs.

[3] Simulation of coupled-transmons dynamics
https://journals.aps.org/prapplied/supplemental/10.1103/PhysRevApplied.14.044035

[2] Design and training of neural networks for *quantum machine learning*
https://iopscience.iop.org/article/10.1209/0295-5075/125/30004

[1] Quantum propagators for the *dynamics of quantum systems*
http://quinfog.hbar.es/outreach/notebooks/lanczos-chebyshev-evolution/

OUTREACH AND POPULARIZATION

2019 The work Euro Phys. Lett., **125** 30004 (2019) becomes EPL highlights of 2019 and cover of the printed version. https://iopscience.iop.org/journal/0295-5075/page/Highlights-of-2019

2019 The Spanish Research Council highlights our work Phys. Rev. Lett. 122, 010407 (2019), Spain. https://www.csic.es/en/node/454596

2016 In March/April my publication Adv. in AMO physics **62**, 117 Elsevier (2013) received enough citations to place it in the 1% of its academic field based on a highly cited threshold for the field and publication years. [Data from Essential Science Indicators; Web of Science]

2016 The Executive Office of The President of the U. S. highlights our work J. Phys. B: At. Mol. Opt. Phys. 44 195302 (2011) to represent only with two papers the field of "simulations" in Advancing Quantum Information Science: National Challenges and Opportunities (July 2016), United States. https://www.whitehouse.gov/sites/whitehouse.gov/files/images/Quantum_Info_Sci_Report_2016_07_22%20final.pdf

2012 The work Phys. Rev. A 86, 01360 (2012) is selected in the month of July to appear in the Kaleidoscope section of APS. https://journals.aps.org/pra/kaleidoscope/pra/86/1/013601

CONFERENCE/SEMINAR ORGANIZATION

2021 **Organizer**, Congress *Quantum information in Spain ICE 2021*.
IFF-CSIC, Madrid, Spain.

2016 **Local organizer**, Workshop *Quantum thermal machines*.
The Hebrew University of Jerusalem, Israel.

2012 **Local organizer**, International Workshop *Shortcuts to Adiabaticity*.
University of the Basque Country, Spain.

2011 **Local organizer**, Seminars by *Cohen Tannoudji: "Atomic clocks with ultracold atoms".*
University of the Basque Country, Spain.

2010 **Local organizer**, Series of seminars *Series of talks by Sir Michael Berry.*
University of the Basque Country, Spain.

2010 **Local organizer**, International Workshop *Solid State Systems for Quantum Information Processing*. University of the Basque Country, Spain.

2009 **Local organizer**, International Workshop *Quantum Information and Solid-State Systems*. University of the Basque Country, Spain.

2009 **Local organizer**, International Workshop *Demons in physics: Quantum Valves and one-way barriers*. University of the Basque Country, Spain.

SCIENTIFIC, TECHNICAL AND ASSESSMENT COMMITTEES

- Guest editor of Entropy for the special issue "Trapped ion quantum information".
- Member of the Spanish evaluation agency since 2014.
- Design of the subjects ''Quantum technologies" and "Quantum computation and information", engineering physics degree, UC3M.
- Evaluation committee: PhD Yue Ban (06/2013 UPV), Master defenses (11/2020 UC3M).
- Scientific committee: congress "Shortcuts to Adiabaticity" (07/2012).
- Coordinator of the subjects "Quantum control" and "Quantum thermodynamics" on the upcoming inter-university master on quantum technologies, CSIC.
- Physics department coordinator: upcoming master on quantum technologies, UC3M.

CONGRESSES AND SEMINARS

Congresses:

2019 **- *Ultrafast two qubit ion gate using sequences of resonant pulses.*** QSC2019. Madrid, Spain (17-10-2019).

- *Ultrafast gates for trapped ions using resonant controls.* Kick-off meeting of COST Action on "Trapped ions: Progress in Classical and Quantum Applications". Granada, Spain (06-03-2019).

2018 **- *The quantum neuron.*** Workshop Q-MATH. Madrid, Spain (15-11-2018).

- *Unitary quantum perceptron as universal approximator.* Congress Quantum machine learning and biomimetic quantum technologies. Bilbao, Spain (20-03-2018).

- *Optical ultra-fast gates for trapped ions improved by optimal coherent control* Workshop Quantum Simulation & Computation: Advantage, Scalability, and Verification. Bilbao, Spain (12-02-2018).

2017 **- *Optical ultra-fast gates for trapped ions improved by optimal coherent control.*** Gordon Research Conference on Quantum Control of Light and Matter. South Hadley, United States (08-11-2017).

2016 **- *Ultrafast quantum gates.*** ARO/LPS Quantum Computing. Denver, United States (08-08-2016).

2015 **- *Activated and non-activated dephasing in NV-center dynamics.*** Workshop "Thermodynamics on the quantum regime", Telluride, United States (161-07-2015).

2012 **- *Fast splitting of matter waves*,** Workshop "Shortcuts to Adiabaticitys", Bilbao, Spain (20-07-2012).

Seminars:

2020 **- *Universal quantum neural network*** IQOQI, Innsbruck, Austria (05-02-2020).

2019 **- *Fast review on quantum control.*** IFF-IQOQI Workshop, Madrid, Spain (07-11-2019).

2018 **- *Quantum machine learning.*** UCM, Madrid, Spain (13-12-2018).

- *Machine learning y la neurona cuántica.* UCM, Madrid, Spain (30-11-2018).

2017 **- *Quantum neural networks as efficient unitary operations.*** UPV/EHU, Spain (18-12-2018).

- *Decoherence produced by a spin bath.* University of Kassel, Kassel, Germany (27-06-2017).

2016 **- *Fast-forward approach.*** University of Maryland, Maryland, United States (15-08-2016).

- *The surrogate Hamiltonian*. Weizmann Institute, Rehovot, Israel (13-07-2016).

- Analyzing decoherence of a spin bath. The Hebrew University, Jerusalem,. Israel (31-03-2016).

2013 ***- Efficient control of quantum systems.*** Shanghai University, Shanghai, China (21-08-2013).
- Óptica atómica: Dinámica y control de ondas de materia. UCM, Spain, España (22-02-2013).

STAYS AND VISITS TO OTHER INSTITUTIONS

CENTER / HOST(S) / START / DURATION

19. IQOQI-Innsbruck (Austria) / *O.Romero-Isart & R. Blatt* / 02-Feb-2020 / 7 days
18. UPV/EHU (Spain) / *E. Solano* / 11-Nov-2019 / 5 days
17. HUJI (Israel) / *R. Kosloff* / 27-Ago-2018 / 15 days
16. UPV/EHU (Spain) / *E. Solano* / 18-Dec-2017 / 5 days
15. UPV/EHU (Spain) / *J. G. Muga* / 03-Nov-2017 / 15 days
14. HUJI (Israel) / *R. Kosloff* / 07-Sep-2017 / 19 days
13. UPV/EHU (Spain) / *J. G. Muga* / 03-Jul-2017 / 15 days
12. Universität Kassel (Germany) / *C. P. Koch* / 26-Jun-2017 / 5 days
11. HUJI (Israel) / *R. Kosloff* / 15-Mar-2017 / 19 days
10. Maryland University (United States) / *C.Monroe & C. Jarzynski* / 02-Ago-2016 / 17 days
9. UPV/EHU (Spain) / *J. G. Muga* / 01-Oct-2015 / 15 days
8. UPV/EHU (Spain) / *J. G. Muga* / 02-Jun-2014 / 15 days
7. Shanghai University (China) / *X. Chen* / 15-Ago-2013 / 15 days
6. HUJI (Israel) / *R. Kosloff* / 08-May-2013 / 15 days
5. Universitat Barcelona (Spain) / *A. Polls & J. Martorell* / 03-Jun-2012 / 10 days
4. Max Planck Institute (Germany) / *G. Hegerfeldt* / 03-Ago-2011 / 10 days
3. HUJI (Israel) / *R. Kosloff* / 01-May-2011 / 2 months, 17 days
2. Max Planck Institute (Germany) / *G. Hegerfeldt* / 31-Jul-2010 / 1 month
1. Paul Sabatier University (France) / *D. Guéry-Odelin* / 06-Jul-2010 / 15 days

EDUCATION

2012 **PhD in Theoretical physics** (*cum laude & extraordinary award*), Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.

2010 **Master in Chemistry of surfaces and materials (DEA)** *(10/10)*, Faculty of Science and Technology/Department of Physical Chemistry, University of the Basque Country, Spain.

2008 **Bachelor in Physics (Licenciatura)**, Faculty of Science and Technology, University of the Basque Country, Spain.

OTHER MERITS

- Referee for the following journals: *Phys. Rev. Lett., Phys. Rev. A, Phys. Rev. E, New. J. Phys., Scientific Reports, and Elsevier editorial*.
- ANECA certificates
  - Profesor contratado doctor
  - Profesor de universidad privada
  - Profesor ayudante doctor