José Carlos Abadillo-Uriel

CV

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Positions

Research Engineer, *Université Grenoble Alpes, CEA*, France, Department of Physics. **2020–Currently**
IRIG-MEM-LSIM

Research Associate, *University of Wisconsin-Madison*, USA, Department of Physics. **2018–2020**
Condensed Matter Theory

Education

PhD in Condensed Matter Physics, *Universidad Autónoma de Madrid*, Instituto de Ciencia de Materiales de Madrid, CSIC, Title: Quantum properties of nanostructured semiconductors: spin-orbit, entanglement and valley physics. **2014–2018**
Advisor: María José Calderón. **Funded by FPI predoctoral grant.**

Master in Fundamental Physics, *Universidad Complutense*, Madrid, Dissertation: *Super-radiance in hyperbolic metamaterials*. **2012–2013**
Advisor: Luis Martín-Moreno

Degree in Physics, *Universidad Complutense*, Madrid. **2007–2012**
Specialization in Fundamental Physics

Languages

Spanish: Mothertongue

English: Fluent

French: Basic

Research Interests

- Semiconductor quantum computation.
- Hole spin-orbit qubits.
- Decoherence processes in condensed matter systems.
- Multi-qubit gates and electron-electron interactions.
- Quantum information.

Publications

Journal publications:.

- *Hole spin manipulation in inhomogeneous and non-separable electric fields.* Biel Martinez, **José Carlos Abadillo-Uriel**, Esteban A. Rodríguez-Mena, Yann-Michel Niquet. Phys. Rev. B **106**, 235426 (2022)
- *A single hole spin with enhanced coherence in natural silicon*. N. Piot, B .Brun, V. Schmitt, S. Zihlmann, V. Michal, A. Apra, **J.C. Abadillo-Uriel**, X. Jehl, B. Bertrand, H. Niebojewski, L. Hutin, M. Vinet, M. Urdampilleta, T. Meunier, Y-M. Niquet, R. Maurand, S. De Franceschi. Nature Nanotechnology (2022)
- *Two-body Wigner molecularization in asymmetric quantum dot spin qubits.* **J.C. Abadillo-Uriel**, B. Martinez, M. Filippone, Y-M. Niquet. Phys. Rev. B **104**, 195305 (2021)
- *Long-range two-hybrid-qubit gates mediated by a microwave cavity with red sidebands.* **J.C. Abadillo-Uriel**, C. King, S.N. Coppersmith, M. Friesen. Phys. Rev. A **104**, 032612 (2021)
- *Coherent Control and Spectroscopy of a Semiconductor Quantum Dot Wigner Molecule.* J. Corrigan, J.P. Dodson, H. E. Ercan, **J.C. Abadillo-Uriel**, B. Thorgrimsson, T.J. Knapp, N. Holman, T. McJunkin, S. F Neyens, E.R. MacQuarrie, R. H Foote, L.F. Edge, M. Friesen, S.N. Coppersmith, M.A. Eriksson. Phys. Rev. Lett. **127**, 127701 (2021)
- *Charge qubit in a triple quantum dot with tunable coherence*. B. Kratochwil, J. V. Koski, A. J. Landig, P. Scarlino, **J. C. Abadillo-Uriel**, C. Reichl, S. N. Coppersmith, W. Wegscheider, Mark Friesen, A. Wallraff, T. Ihn, and K. Ensslin. Phys. Rev. Research **3**, 013171 (2021)
- *Strong photon coupling to the quadrupole moment of an electron in solid state.* Jonne V. Koski, Andreas J. Landig, Maximilian Russ, **J. C. Abadillo-Uriel**, Pasquale Scarlino, Benedikt Kratochwil, Christian Reichl, Werner Wegscheider, Guido Burkard, Mark Friesen, Susan N. Coppersmith, Andreas Wallraff, Klaus Ensslin, Thomas Ihn. Nature Physics volume **16**, pages 642-646 (2020)
- *Enhancing the dipolar coupling of a $S - T_0$ qubit with a transverse sweet spot.* **J. C. Abadillo-Uriel**, M. A. Eriksson, S. N. Coppersmith, Mark Friesen. Nature Communications **10**, 5641 (2019)
- *Virtual-photon-mediated spin-qubit–transmon coupling.* A. J. Landig, J. V. Koski, P. Scarlino, C. Müller, **J. C. Abadillo-Uriel**, B. Kratochwil, C. Reichl, W. Wegscheider, S. N. Coppersmith, Mark Friesen, A. Wallraff, T. Ihn, K. Ensslin. Nature Communications **10**, 5037 (2019)
- *Signatures of atomic-scale structure in the energy dispersion and coherence of a Si quantum-dot qubit.* **J. C. Abadillo-Uriel**, Brandur Thorgrimsson, Dohun Kim, L. W. Smith, C. B. Simmons, Daniel R. Ward, Ryan H. Foote, J. Corrigan, D. E. Savage, M. G. Lagally, M. J. Calderón, S. N. Coppersmith, M. A. Eriksson, and Mark Friesen. Phys. Rev. B **98**, 165438 (2018)
- *2-dimensional semiconductors pave the way towards dopant based quantum computing.* **J. C. Abadillo-Uriel**, Belita Koiller, M. J. Calderón. Beilstein J. Nanotechnol. **9**, 2668 (2018)
- *Electric-field tuning of the valley splitting in silicon corner dots.* David J. Ibberson, Léo Bourdet, **J. C. Abadillo-Uriel**, Imtiaz Ahmed, Sylvain Barraud, María J. Calderón, Yann-Michel Niquet, M. Fernando Gonzalez-Zalba. Appl. Phys. Lett. **113**, 053104 (2018).
- *Entanglement control and magic angles for acceptor qubits in Si.* **J. C. Abadillo-Uriel**, Joe Salfi, Xuedong Hu, Sven Rogge, M. J. Calderón, Dimitrie Culcer. Appl. Phys. Lett. **113**, 012102 (2018).
- *Spin qubit manipulation of acceptor bound states in group IV quantum wells.* **J. C. Abadillo-Uriel**, M. J. Calderón. New Journal of Physics 19, **4**, 043027 (2017).
- *Interface effects on acceptor qubits in silicon and germanium.* **J. C. Abadillo-Uriel**, M. J. Calderón. Nanotechnology **27**, 024003 (Cover article) (2016).

Preprints:.

- *Non-reciprocal Pauli Spin Blockade in a Silicon Double Quantum Dot.* T. Lundberg, D. J. Ibberson, J. Li, L. Hutin, **J. C. Abadillo-Uriel**, M. Filippone, B. Bertrand, A. Nunnenkamp, C-M. Lee, N. Stelmashenko, J. W. A. Robinson, M. Vinet, L. Ibberson, Y-M. Niquet, M. F. Gonzalez-Zalba. arXiv:2110.09842 [cond-mat.mes-hall]
- *Tunable hole spin-photon interaction based on g-matrix modulation.* V. P. Michal, **J. C. Abadillo-Uriel**, S. Zihlmann, R. Maurand, Y.-M. Niquet, M. Filippone. arXiv:2204.00404 [cond-mat.mes-hall]
- *Strong coupling between a photon and a hole spin in silicon.* C. X. Yu, S. Zihlmann, **J. C. Abadillo-Uriel**, V. P. Michal, N. Rambal, H. Niebojewski, T. Bedecarrats, M. Vinet, E. Dumur, M. Filippone, B. Bertrand, S. De Franceschi, Y-M. Niquet, R. Maurand. arXiv:2206.14082 [cond-mat.mes-hall]
- *Hole spin driving by strain-induced spin-orbit interactions.* **J. C. Abadillo-Uriel**, Esteban A. Rodríguez-Mena, Biel Martinez, Yann-Michel Niquet arXiv:2212.03691 [cond-mat.mes-hall]

Congresses and seminars

Silicon Quantum Electronics Workshop 2022 (Orford, Canada): Talk: "Achieving strong spin-photon coupling with a semiconductor hole qubit"

Quantum Information in Spain (Granada, Spain): Talk: "Achieving strong spin-photon coupling with a semiconductor hole qubit"

APS March Meeting 2022 (Chicago, USA): Talk: "Two-body Wigner molecularization in asymmetric quantum dot spin qubits"

Silicon Quantum Electronics Workshop 2021 (online): Talk: "Wigner molecularization in asymmetric quantum dots"

Member of the organizing committee in the Silicon Quantum Electronics Workshop 2019 (San Sebastián, Spain): http://siqew2019.dipc.org/

APS March Meeting 2019 (Boston, USA): Talk: "Exploring the sweet spot regime of singlet-triplet qubits coupled to a microwave resonator"

Silicon Quantum Electronics Workshop 2018 (Sydney, Australia): Talk: "Exploring the sweet spot regime of singlet-triplet qubits coupled to a microwave resonator"

20th ICSNN (Madrid): Talk: "Entanglement control and magic angles for acceptor qubits in Si"

20th ICSNN (Madrid): Poster: "Tunable energy dispersion in Si quantum-dot qubits with atomic-scale disorder"

X Gefes Meeting (Valencia): Talk: "A gate-induced entanglement switch and decoherence free subspace in acceptor qubits in Si"

Silicon Quantum Electronics Workshop 2017 (Intel Jones Farm, Hillsboro): Talk: "Full tunability and coherence of acceptor qubits"

Bienal RSEF 2017 (Santiago de Compostela): Talk: "Full tunability and coherence of acceptor qubits"

ICE-4 2017 (Madrid): Talk: "Full tunability and coherence of acceptor qubits"

APS March Meeting 2017 (New Orleans): Talk: "Manipulability of acceptor qubits in group IV quantum wells."

International Conference on Small Science 2016 (Prague): Invited talk: "Interface effects on acceptor silicon qubits."

Silicon Quantum Electronics Workshop 2016 (Delft): Poster: "Electrical tuning of intervalley tunneling in disordered silicon double quantum dots"

APS March Meeting 2016 (Baltimore): Talk: "Interface effects on acceptor silicon qubits"

GEFES 2016 (Cuenca): Poster: "Interface effects on acceptor silicon qubits".

Seminar at the ICMM-CSIC theory department: Talk: "Interface effects on acceptor silicon qubits"

SpinTech VIII (Basel, 2015): Poster: "Interface effects on acceptor levels in Si and Ge".

Short stay invitations

University of Wisconsin-Madison, Madison, United States of America. From 3/7/2015 to 4/6/2015
University of New South Wales, Sydney, Australia. From 9/15/2016 to 12/12/2016.
University of Wisconsin-Madison, Madison, United States of America. From 8/21/2017 to 10/27/2017

Computer skills

Software: LaTeX, Microsoft Office, Adobe Illustrator, Adobe Photoshop

OSs: Linux, Windows, Mac OS

Languages: Python, Fortran, C, Visual Basic

Scientific software: Mathematica, Matlab, Comsol

Supervision and outreach

Undergraduate project supervision: Samuel Hori. University of Wisconsin-Madison (2020).

Outreach: participation in the activities of the "Science Week" at the ICMM-CSIC (2015-2017).

References

- María José Calderón (ICMM-CSIC).
  E-mail: calderon@icmm.csic.es
- Mark Friesen (University of Wisconsin-Madison).
  E-mail: friesen@physics.wisc.edu
- Susan Coppersmith (School of Physics, UNSW).
  E-mail: snc@physics.wisc.edu
- Yann-Michel Niquet (CEA, Grenoble).
  E-mail: yann-michel.niquet@cea.fr
- Dimitrie Culcer (School of Physics, UNSW).
  E-mail: d.culcer@unsw.edu.au