Sofia Arranz Regidor, PhD Candidate

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EDUCATION

QUEEN'S UNIVERSITY   Kingston, ON, CANADA
Doctor of Philosophy in Physics, S. Hughes Group   Sep 2021 - Present
Funding: Funded by NSERC Discovery Grant, NSERC CREATE Student, and National Research Council (NRC) of Canada.
Coursework: Photonics Problem Solving (A+) / Electromagnetic Theory (A+)/ Science Leadership and Management.

QUEEN'S UNIVERSITY   Kingston, ON, CANADA
Master of Science in Physics (Promoted to PhD program in Aug, 2021), S. Hughes Group   Jan 2020 - Aug 2021
Coursework: Advanced Quantum Theory (A+) / High Performance Computational Physics (A+) / Nonlinear and Quantum Optics (A-) / Quantum Field Theory (A+).

UNIVERSITY OF THE BASQUE COUNTRY/QUEEN'S UNIVERSITY   Bilbao, SPAIN/ Kingston, ON, CANADA
Physics Bachelor   Sep 2015 - Sep 2019
Coursework: Laser Optics (A) / Solid State Physics (A+) / Intro to General Relativity (A-)/ Nuclear and Particle Physics (A+) / Advanced Physics Laboratory (A).

MIGUEL DE CERVANTES EUROPEAN UNIVERSITY   Valladolid, SPAIN
Technical Architecture Bachelor   Sep 2008 - Jun 2011

TECHNICAL WORK EXPERIENCE

QUEEN'S UNIVERSITY   Kingston, ON, CANADA
Teacher Assistant (TA)   Jan 2020 - Present
Courses as TA: High Performance Computational Physics (Grad/UG), Solid State Physics (Grad/UG), Laser Optics (UG), Dynamics and Introductory Physics (UG). Running tutorials and laboratory sessions, and assisting during the lectures with questions and technical support. Other tasks include marking assignments and exams, , proctoring, course planning with instructors.

ANSYS CANADA (FORMERLY LUMERICAL)   Vancouver, BC, CANADA
Physics Internship   May 2022 - Aug 2022
Study of Quantum Scattering Theory using the Input-Output formalism commonly used to solve bosonic linear systems, and application to nonlinear waveguide quantum electrodynamics (QED) systems. Implementation using Python and a Lumerical Photonic Simulation Solver (INTERCONNECT) in order to develop a quantum version of the latest Ansys qINTERCONNECT.

ESS BILBAO   Bilbao, SPAIN
Physics Internship   Oct 2019 - Dec 2019
Beam Dynamics calculation for LINACS (Linear Accelerators) using Python and General Particle Tracer. Electrostatic and resonant cavity calculations studying different models as Buncher cavities, including the Multi Harmonic Buncher and the Radio Frequency Quadrupole.

INSTITUTO DE CIENCIAS MATERIALES DE MADRID (ICMM -CSIC)   Madrid, SPAIN
Physics Internship   Jun 2019 - Jul 2019
Surface Nanostructuring for Space and Terrestrial Communications Group. Preparation and characterization of RF coatings boarded on space satellites (anodic oxidation and electroless). Electron emission measurements by electron and photon irradiation. X-ray Photoemission Spectroscopy, Energy-dispersive X-ray Spectroscopy and Scanning Electron Microscopy.

APAREJO TECHNICAL STUDIO   Valladolid, SPAIN
Technical Architecture Internship   Dec 2010 - Jul 2011
Work visits, development of architectural plans made by AutoCAD and measurements with Presto. Collaboration on health and safety projects and topographic survey of a property.

SCIENTIFIC JOURNAL PUBLICATIONS

• **Sofia Arranz Regidor**, Gavin Crowder, Howard Carmichael, and Stephen Hughes (2021). **Modeling quantum light-matter interactions in waveguide QED with retardation, nonlinear interactions, and a time-delayed feedback: Matrix product states versus a space-discretized waveguide model**, Phys. Rev. Research **3**, 023030, (2021). [**doi link**] [25-page detailed Paper, with more than 25 figures and 100 formulas, collecting 24 citations as of Sep, 2022]
• **Sofia Arranz Regidor** and Stephen Hughes (2021). **Cavity-like strong coupling in macroscopic waveguide QED using three coupled qubits in the deep non-Markovian regime**, Phys. Rev. A Letters **104**, L031701 (2021). [**doi link**] [5-page prestigious Letter plus Supplementary Material, collecting 8 citations as of Sep, 2022]
• **Sofia Arranz Regidor** and Stephen Hughes (2022). **Probing dressed states and quantum nonlinearities in a strongly coupled three-qubit waveguide system under optical pumping**, Submitted in Phys. Rev. A. [**arXiv link**]

CONFERENCE PRESENTATIONS AND CONTRIBUTIONS

• **Sofia Arranz Regidor** and Stephen Hughes. **Strong coupling and multi-photon correlations in waveguide QED using three coupled qubits**. Poster presentation at the 16th International Conference on Near-Field Optics, Nanophotonics and Related Techniques (NFO16) [major international conference]; 29 August - 2 September 2022; Victoria, BC, Canada.
• Stephen Hughes, Gavin Crowder, and **Sofia Arranz Regidor**, **Modelling few quanta dynamics in waveguide-QED systems with a time-delayed coherent feedback**, International Conference on Control of Self-Organizing Nonlinear Systems, 29 August - 2 September, 2021; Potsdam, Germany. [Invited Talk, Presented by supervisor, S. Hughes]

LEADERSHIP AND TEAMWORK

GEnder MINorities In Physics (GEMINI-P) Queen's University Group   Aug 2022 - Present
Group Member. GEMINI-P is a Queen's University - Department of Physics, Engineering Physics and Astronomy group formed to address gender and equity related issues in the field of physics. Main responsibilities: Run the mentorship program which invites undergraduate students in the Department of Physics, Engineering Physics and Astronomy to receive support, guidance and advice from mentors.

Queen's University Spanish and Latin American Students' Association (QSALSA)   Sept 2022 - Present
Executive Committee Member. QSALSA promotes Spanish and Latin American culture on campus and in the Kingston community by hosting weekly dance classes such as Salsa, Bachata and Tango, and organizing weekly Spanish speaking events for students to learn and practice their Spanish speaking skills. Main responsibilities: • Responsible for drafting and sending out the bi-monthly email newsletter • Act as a liaison between event plans from the Event Coordinator and corresponding advertisement by the Head of Marketing • Maintain and update the club's website • Assist the Head of Marketing as a spokesperson in marketing events.

Queen's Physics Theory Journal Club   Mar 2022 - May 2023
Club Member. The Queen's Physics Theory Journal Club fosters a community between students interested in theoretical physics with a special focus on Condensed Matter Physics, Optics and Quantum Physics, running weekly meetings where the club members share a topic of interest to be discussed.

TECHNICAL SKILLS AND RESEARCH AREAS OF EXPERTISE

• **Scientific Coding and Programming:** Python, MPI (Parallel Programming), Numba, Fortran, ODEs, PDEs, RK4 (Runge–Kutta methods), FDTD (finite-difference time-domain) Method, Methods for Solving Open Quantum Systems.
• **Experience in various Operating Systems:** Linux/Ubuntu, Windows - Knowledge of UNIX navigation.
• **Scientific Writing and Presentations:** LaTeX, Beamer Presentations, Overleaf Research Documents in LaTeX.
• **Proficient at Independent Research and Team Research, and Methods of Data Analysis**
• **Computational Quantum Optics and Quantum simulations with Qubits in Cavities and Waveguides**
• **Quantum Master Equations, Experience with QuTiP (Quantum Toolbox in Python) Package**
• **Wrote my own Python code on Matrix Product States (MPS) to solve complex problems in Waveguide-QED**
• **Soft Skills:** Excellent Time Management and Organization Skills. High Level Communication Skills.