YASSER SALEEM

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AREA OF INTEREST AND EXPERTISE

Electronic and optical properties of graphene based nanostructures, many body properties of 2D materials, high performance computing for material science.

EDUCATION

Doctorate in Philosophy | **Physics** January 2019 – Present
Electronic and Optical Properties of Bilayer Graphene
Supervisor: Prof. Paweł Hawrylak
University of Ottawa

Fast-track Master's Degree | **Physics** January – December 2018
Electronic and Optical Properties of Bilayer Graphene
Supervisor: Prof. Paweł Hawrylak
University of Ottawa

Honors Bachelor Degree | **Physics** September 2013 – December 2017
Course based
Supervisor: Prof. Paweł Hawrylak
University of Ottawa

PUBLICATIONS

Saleem, Y., Baldo, L. N., Delgado, A., Szulakowska L., Hawrylak, P., Journal of Physics: Condensed Matter, 31(30), 305503 (2019)
Oscillations of the bandgap with size in armchair and zigzag graphene quantum dots

Saleem, Y., Cygorek, M., Korkusinski, M., Hawrylak, P., Physical Review B, 105(20), 205105 (2022)
Quantum simulator of extended bipartite Hubbard model with broken sublattice symmetry: Magnetism, correlations, and phase transitions

Puzantian B., Saleem, Y., Korkusinski, M., Hawrylak, P., submitted to Nanomaterials (2022)
Edge states and strain-driven topological phase transitions in quantum dots in topological insulators"

Saleem, Y., Sadecka, K., Korkusinski, M., Hawrylak, P., in preparation for Nature Nanotechnology (2022)
Excitons in gated bilayer graphene quantum dots"

Korkusinski, M., Saleem, Y., Miravet, D., Hawrylak, P., in preparation for Nature Physics (2022)
Spontaneous spin and valley symmetry broken states of interacting electrons in a bilayer graphene quantum dot"

SKILLS

Programming: C, C++, CSharp, MATLAB (advanced), Bash (intermediate), Python, Fortran (basic)
High performance computing: OpenMP, MPI
Generalized Tools in Quantum Mechanics: Hartree-Fock method, configuration interaction, Bethe-Salpeter equation, multi-orbital tight-binding model, highly optimized calculations of Coulomb matrix elements, diagonalization of large sparse matrices, basic DFT using Abinit and Octopus
Theoretical understanding of condensed matter physics:
- tight-binding approximation, $\vec{k} \cdot \vec{p}$, Hartree-Fock, configuration interaction, Hubbard and extended Hubbard model.

CURRENT PROJECTS AND RESEARCH

Spontaneous spin and valley symmetry broken states in a bilayer graphene quantum dot
University of Ottawa

Optical properties of bilayer graphene quantum dots
University of Ottawa

Topological properties of HgTe quantum dots
University of Ottawa

SCIENTIFIC ACTIVITY

International Internship, Poland   April – May 2022
Collaboration with Wroclaw University of Science and Technology

HONORS AND AWARDS

Remarkable undergraduate student University of Ottawa   2018
https://science.uottawa.ca/en/undergraduate-student-soars-success-research-graphene-quantum-dots

Admission's Scholarship   2018 - 2023
University of Ottawa

Dean's Honour List   Fall 2017
University of Ottawa

CONFERENCES AND PRESENTATIONS

**Broken Sublattice Symmetry Effects and Phase Transitions in Triangular
Artificial Graphene Quantum Dots**   May 2022

2022 CAP Congress

**Phase Transitions and the Nature of the Ground State in Triangular Artificial
Graphene Quantum Dots**   March 2022

APS March Meeting 2022

International Workshop on Quantum Circuits in 2D Materials   May 2022
Quantum simulator of extended bipartite Hubbard model with broken sublattice symmetry

International Workshop on Quantum Circuits in 2D Materials   June 2019

Poster presentation on: Oscillations of the bandgap with size in armchair and zigzag graphene
quantum dots

EXPERIENCE

Teaching Assistant: Winter 2018-Fall 2021
Courses: Quantum Mechanics I, Mechanics, General Relativity, Electricity and Magnetism,
Solid State Physics, Theoretical Physics I, Modern Physics, Physics Help Center
University of Ottawa

Undergraduate Reasearch Assistant   Summer 2017
Supervisor: Prof. Pawel Hawrylak, University of Ottawa

Physics Tutoring for the University   2017
University of Ottawa