Hassan Allami

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Position

2019 to 2022 Postdoctoral Fellow, **University of Ottawa**, Canada
FIELD: Theoretical Condensed Matter
TOPIC: Plosmons in Intermediate Band Materials
Advisor: Prof. Jacob KRICH

2022 to present Postdoctoral Fellow, **University of Ottawa**, Canada
FIELD: Theoretical Condensed Matter
TOPIC: Coded Topological Qubits in Quantum Dot Arrays
Advisor: Prof. Pawel HAWRYLAK

Education

2013 to 2019 PhD in PHYSICS, **University of Utah**, USA
FIELD: Theoretical Condensed Matter
TOPIC: Strongly Correlated Systems, Quantum Magnetism and Superconductivity
Advisor: Prof. Oleg STARYKH

2007 to 2010 M.Sc. in PLASMA ENGINEERING, **Shahid Beheshti University**, Iran
THESIS: Fractional Approach to Anomalous Transport Modelling
Advisor: Prof. Babak SHOKRI

2003 to 2007 B.Sc. in ELECTRICAL ENGINEERING, **Tehran University**, Iran
PROJECT: Planning Teaching Methods for Introducing Special Relativity to the Engineering Undergraduate Students in Electromagnetic Courses
Advisor: Prof. Jalil RASHED

Publications

JOURNAL:

Majorana excitons in a Kitaev chain of semiconductor quantum dots in a nanowire
Nanomaterials **13(16)**, 2293 (2022), M. Mohseni, H. Allami, D. Miravet, D. J. Gayowsky, M. Korkusinski, P. Hawrylak

Lossless plasmons in highly mismatched alloys
Applied Physics Letters **120**, 252102 (2022), H. Allami, J. J. Krich

Absorption spectrum of doped highly mismatched alloys
Physical Review B, under revision (2022), H. Allami, J. J. Krich

Plasma frequency in doped highly mismatched alloys
Physical Review B **103**, 035201 (2021), H. Allami, J. J. Krich

Superfluid-insulator transition and BEC-BCS crossover in the Rashba moat band
Physical Review B **99**, 104505 (2019), H. Allami, O. Starykh, D. Pesin

Effects of Bounded Space in the Solutions of Time-Space Fractional Diffusion Equation
Physical Review E **82**, 066404 (2010), H. Allami, B. Shokri

Plasma Markovian Noise Studied with a Fractional Relaxation Model
Physical Review E **84**, 026401 (2011), M. Vahabi, H. Allami, B. Shokri

CONFERENCE:

Poisson drift diffusion modeling of valley photovoltaic devices
IEEE 49th Photovoltaics Specialists Conference, Philadelphia, PA, US (2022)
D. Xia, H. Allami, J. J. Krich

Lossless plasmons in highly mismatched alloys
E-MRS Spring Conference, Virtual (2022)
H. Allami, J. J. Krich

Plasma frequency in doped highly mismatched alloys
APS March Meeting, Virtual (2021)
H. Allami, J. J. Krich

Plasma Oscillations of Intermediate Bands in Highly Mismatched Alloys
OSA Advanced Photonics Congress (AP), Washington, DC, US (2020)
H. Allami, J. J. Krich

Superfluid-Insulator Transition and BEC-BCS Crossover in a Rashba Moat Band
APS March Meeting, Los Angeles, CA, US (2018)
H. Allami, D. Pesin, O. Starykh

Numerical Solution of Fractional Diffusion Equation in Finite Domain with Memory
37^{th} *IEEE International Conference on Plasma Science*, Norfolk, VA, US (2010)
Y. Ahmadizadeh, H. Allami, B. Shokri

Workshops

Winter 2023	QSciTech-QuantumBC Quantum Chemistry Workshop, *Université de Sherbrooke, UBC, CMC Microsystems*, (online)
Summer 2022	International Workshop on Quantum Circuits in 2D Materials, *Universities of Ottawa*, (Ottawa, Ontario)
Summer 2021	NSERC CREATE TOP-SET Summer School on Photovoltaics, *Universities of Ottawa, McMaster, and Sherbrooke*, (online)
Summer 2020	NSERC CREATE TOP-SET Summer School on Photovoltaics, *Universities of Ottawa, McMaster, and Sherbrooke*, (online)
Summer 2016	FTPI Summer School on Advances in Strongly Correlated Electronic Systems, *University of Minnesota*, (Minneapolis, Minnesota)
Winter 2015	Theory Winter School on Frustrated Magnetism, *The National High Magnetic Field Laboratory*, (Tallahassee, Florida)

Research Experience

Postdoc Period:

Plasmon Dynamics in Highly Mismatched Alloys:
Green's function techniques, Intermediate Bands, Highly Mismatched Alloys,
Band Anti-Crossing model, spectral density functions, plasma oscillations.

Haldane Chain Qubit in Quantum Dots:
Qubits, Two-qubit gates, Haldane chain, Topological phase, Quantum dots,
Exact Diagonalization, Matrix product state.

PhD Period:

Insulator-Superconductor Transition in 2D Material with Spin-Orbit-Coupling:
two particle Shcrödinger equation, variational technique,
BCS wavefunction and self-consistent equations,
path integral and action treatment at finite temperature, and fluctuation analysis.

Electron-Magnon Scattering in Low-dimensional Anti-ferromagnets:
magnetic intercalated graphite materials, anti-ferromagnetic triangular lattice,
geometric magnetic frustration, Heisenberg model, Holstein-Primakoff transformation,
magnons and spin waves, electron-magnon interaction and magneto-resistivity,
Green's functions and diagrammatic techniques.

M.Sc. Period:

Anomalous Transport and Fractional Partial Differential Equations:
Continuous Time Random Walk models such as Lévy flight and
their connection to Fractional Differential Equations,
Numerical methods for solving Partial Fractional Differential Equations.

Teaching Experience

Spring 2019	Teaching Assistant for General Physics (Mechanics and Thermodynamics)
Fall 2018	Teaching Assistant for General Physics (Mechanics and Thermodynamics)
Spring 2018	Teaching Assistant for Solid State Physics (graduate level)
Fall 2017	Teaching Assistant for Statistical Mechanics (graduate level)
Summer 2017	Teaching Assistant for General Physics (Mechanics and Thermodynamics)
Spring 2017	Teaching Assistant for Electrodynamics (graduate level)
Fall 2016	Teaching Assistant for Electrodynamics and Classical Mechanics (graduate level)
Spring 2016	Teaching Assistant for Electrodynamics (graduate level)
Fall 2015	Teaching Assistant for Electrodynamics and Classical Mechanics (graduate level)
Spring 2014	Teaching Assistant for General Physics (Mechanics and Thermodynamics)
Fall 2013	Teaching Assistant for Classical Mechanics (senior undergraduate level)
Summer 2013	Teaching Assistant for General Physics (Electricity and Optics)
Fall 2011	Instructor for a graduate course in Plasma Physics (for half of a semester)
Summer 2006	Teacher for low income students (Sirik-Hormozgan)
Spring 2006	Teacher for low income students (Khormoj-Bushehr)
Summer 2005	Teacher for low income students (Zabol-Sistan Va Baluchestan)
2003 to 2006	Tutor for high school mathematics
2003 to 2004	Teaching Assistant for mathematics and physics in Nikan High School

Honors

2023	First award for at QSciTech-QuantumBC Quantum Chemistry Workshop
2020	First award for at TOP-SET Annual Challenge
2015	Outstanding graduate student in Physics and Astronomy
2011	Scored 980 in GRE Physics Subject test
2010	First rank in the master program
2007	Ranked 8^{th} among more than 1400 participants of the M.Sc. entrance exam
2003	Ranked 226^{th} among about 400,000 participants of the undergraduate entrance exam
2001	Semifinalist in the nation-wide mathematics students Olympiad
2000	Semifinalist in the nation-wide computer students Olympiad
2000	Semifinalist in the nation-wide mathematics students Olympiad

Computer Skills

General:	Linux, LaTex, spreadsheet software, several graphic design software
Engineering:	worked on several projects with HFSS, PSpice, HSpice, Quartus, ModelSim, OPNET
Programming: and Mathematics	High Performance Computing, Python, Mathematica, MATLAB, with experience in Maple, HTML, C++

References

Available on request.