Ramin Abolfath, PhD

Assistant Professor, Clinical Medical Physicist & Data Scientist

Department of Physics and Astronomy
Medical Physics Graduate Program
Howard University
Washington, DC 20059
Phone: 214-682-9662 (cell)
Emails:
ramin.abolfath@howard.edu
rabolfath@summithealth.com
ramin1.abolfath@gmail.com
HU link: https://profiles.howard.edu/ramin-abolfath
Google scholar link: Ramin Abolfath - Google Scholar
ORCID ID: https://orcid.org/0000-0001-5722-2526

Summary

- Physicist with current research interests in
  1) Nano-dosimetry and particle therapy
  2) Theoretical modlings of radiation dose rate FLASH-UHDR vs. CDR
  3) Simulation and Detection of thermo-acoustic and scintillation quenching, thermal spikes, and shock waves
  4) Radiobiology models, DNA, and lipid-membrane damage
  5) Risk management, normal tissue toxicity vs. tumor control
  6) Data Science Machine / Deep Learning (ML/AI) Processes in Medical Imaging (CT, MRI, PET), Radiobiology and Post Irradiation Toxicity Analysis, and ML of chemical reactions of billions of atoms.

Education

- **PhD Topological Structures in Condensed Matter Physics** 1997
  Quantum Hall Effects, Superconductivity, and Exotic States of Materials
  Started at Sharif University of Technology, finalized at Indiana University, Bloomington, IN. PhD advisor: Prof. Steve Girvin, the Eugene Higgins Professor of Physics and deputy provost for science and technology at Yale University and Dr. Nasser Nafari, Phys Dept, Sharif U. Tech.

- **MS Theoretical Physics** 1992
  Cosmology, String Theory and Quantum Field Theory
  Sharif University of Technology, Iran

- **BS Engineering** 1989
  Iran University of Science and Technology

- **CAMPEP-accredited Medical Physics Residency** 2015
  Department of Therapeutic Radiology,
  Yale University School of Medicine and Smilow Cancer Hospital at Yale New Haven

- **CAMPEP-accredited Medical Physics Certificate Program** 2016
  University of Florida at Gainesville

PROFESSIONAL EXPERIENCE

- **Assistant Professor**, 08/2024 - present
  Department of Physics and Astronomy
  Medical Physics Graduate Program
  Howard University
  Washington, DC 20059

- **Clinical Medical Physicist,** 01/2019 to present
  (New Jersey Certified Physicist)
  Department of Radiation Oncology
  New Jersey Urology
  Summit Health
  West Orange, NJ

- **Adjunct Assistant Professor:** U. Texas MD Anderson Cancer Center, Depts. of Radiation Physics and Oncology, 01/2020 to present. Member of FLASH-therapy consortium, Developing Theoretical Models for Ultra High Dose FLASH-therapy.

- **Research Fellow:** U. Penn, Dept. of Radiation Oncology, 09/2018 to present. Developing computational tools for clinical analysis of brain post-irradiation toxicity in proton therapy.

- **Research Fellow:** Yale U. Dept. of Radiology, 09/2018-09/2019. Developing a 3D Convolution Neural Network Algorithm for Tumor / Tissue Toxicity Recognition in MRI/PET/CT DICOM imaging.

- **Clinical Medical Physicist,** 02/2017 to 07/2018
  Department of Radiation Oncology

St. Vincent's Medical Center
Bridgeport, CT

- **Research Fellowship,** 09/2016 to 02/2017
  Department of Radiation Oncology, The Roberts Proton Therapy Center at Perelman School of Medicine at the University of Pennsylvania – Developing Proton Arc Therapy for Varian Technologies. The project funded by Varian Medical Systems at Palo Alto. The aim of project was to develop new technology for the Varian linear accelerators.

- **Research Fellowship,** 09/2015 – 09/2016
  Department of Radiation Physics, Division of Radiation Oncology,
  U. Texas MD Anderson Cancer Center – modeling radio-biological effects in particle therapy for clinical trials.

- **Medical Physics Resident,** 07/2012 – 07/2015
  Department of Therapeutic Radiology,
  Yale University School of Medicine and Smilow Cancer Hospital at Yale New Haven

- **Lecturer,** 01/2008 – 07/2012
  Department of Physics, University of Texas at Dallas

- **Assistant Instructor** 07/2007 – 12/2009
  Department of Radiation Oncology
  University of Texas Southwestern Medical Center, Dallas

- **Research Associate** 01/2004 – 07/2007
  National Research Council of Canada,
  Institute for Microstructural Sciences, Ottawa

- **Postdoctoral Research Scientist,** 01/2003 - 01/2004
  Albert Einstein Medical Center, Department of Biochemistry, Bronx, New York

- **Postdoctoral Research Scientist,** 09/1999 – 01/2003
  University of Texas at Austin

- 01/1997 – 0/1999
  Lecturer: Department of Physics, Sharif University of Technology
  Lecturer: Department of Physics, Tehran University
  Researcher: Institute for Theoretical Physics and Mathematics, IPM, Tehran
  Staff Member: Atomic Energy Organization of Iran, Tehran

CLINICAL EXPERIENCE

- **Quality Assurance**
  - Patient Specific QA:
    - IMRT, VMAT (RapidArc) QA:
      1) Phantom measurement using film for 2D dose distribution and ion chamber for point dose measurement
      2) Portal Dosimetry
      3) MapCHECK

4) ArcCheck
5) Delta4

- In vivo dosimetry for TBI and other routine clinical cases
  1) Diode detectors
  2) Optically Stimulated Luminescence Dosimeters (OSLDs)
  3) Thermo Luminescence Dosimeters (TLDs)
- QA of Therapy Equipment (AAPM TG-142)
  1) Daily
  2) Monthly
  3) Annual
- Calibration of X-ray and Electron beams, AAPM protocol TG-51
- QA of CT Simulator
- QA of HDR Brachytherapy

- **Treatment Planning**
  - 3DCRT, IMRT (Conventional and RapidArc), SRS on iPlan, Brachytherapy
- **Treatment Planning Systems**
  - ECLIPSE
  - ADAC Pinnacle Treatment Planning
  - iPlan (BrainLab)
  - BrachyVision
- **R & V System**
  - MOSAIQ
  - ARIA
- **Acceptance Testing and Commissioning**
  - Experienced in end to end testing for acceptance and commissioning of Linear Accelerator
  - Recently (Jan-Feb 2013) did commissioning of Varian's Trilogy machine
  - Commissioning of Varian Miami Applicator Set used for HDR
- **Special procedures**
  - SRS/SBRT & gamma-knife
  - TBI
  - TSET
  - HDR: GammaMed/Nucletron, machine QA, Oncentra, Planning, source change, …

Technical & Computational Skills

- Machine Learning including Deep Learning, Kearas with Tensor Flow, Theano and CNTK backends and Convolution Neural Network for disease recognition and radiomics classification in 2D/3D medical imaging
- Advanced Statistics: Stochastic processes, Monte Carlo simulations, Markov chain, Bayesian inference
- Hands on optimization technics, conjugated gradient, simulated annealing, genetic algorithm, multivariate non-linear regression techniques, decision trees, percolation, fractal surface morphology, random graph/network theory, large scale and ab-initio molecular dynamics simulations for chemical reactions and protein folding, matrix manipulations, finite difference and finite elements and strong mathematical and analytical skills in biostatistics. Nano/Micro-dosimetry, MKM, MCDS-RMF modeling in radiobiology
- Hands on Programming with

- Python, R, Microsoft SQL 2017
- C/C++/C#, java, fortran and matlab scripting
- Statistical analysis using SAS programming
- OS, windows, linux, shell scripting, Open MP/MPI and parallel programming
- Graphical interface software, Origin
- Microsoft office tools Word, Excel, PowerPoint, Outlook, …
- Clinical data visualization, DICOM image analysis and fusion, PET/MRI/CT
- Clinical planning systems, Eclipse and Varian Technologies

Other Related Experiences

- Highly experienced with biostatistical analysis
- Modeling in-vitro and in-vivo cell survival data
- In depth Monte Carlo simulation, Geant4, Geant4-DNA, MCNP, TOPAS
- In depth analysis on image change post treatment clinical data
- Proficient with radiotherapy modalities, image analysis, registration and fusion, PET/CT/MRI quality controls including noise, contrast, resolution, … analysis
- Excellent in writing scientific papers and verbal communication skills
- Good problem solving and organizational skills

Recent Radiation Oncology Research Experiences

- Machine / deep learning analysis post radiation imaging and radiation therapy.
- Multi-scale and patient data driven modeling of Cell / Tissue Toxicity in Radiation Therapy.
    - Modeling in-vivo and in-vitro cell survival, tumor control probability and normal tissue toxicity driven by nano-meter scale DNA damage and enzymatic kinetics repair and misrepair mechanisms. Stochastic nano-dosimetry modeling and Chromosome aberrations. High performance computational design and data mining in coarse-grained Monte Carlo and molecular simulations and interfacing with treatment planning systems.
- Image (MR / PET) and RBE guided Optimization Techniques in Radiation Therapy treatment planning systems, developing multi-objective optimization techniques for proton / ion LET guided Therapy.
- Modeling chemo and immune therapy in multi-modality Radiation Therapy.

Grant writing experience:

- Co-Pi on a Swiss National Foundation grant proposal, etitled, “Peroxidation reaction dynamics after FLASH irradiation: from liposomes containing amino acids and thiols to cells, normal brain, and Glioblastoma-bearing mice”, SNF-proposal 2023 by P. Froidevaux, MC Vozenin and R Abolfath.
- Consultant on R16 grant proposal – awarded by NIH/NCI – San Jose State University
- Consultant on R15 grant proposal – awarded by NIH/NCI – UT Arlington
- A P01 on FLASH-therapy – UT MD Anderson
- Development of multi-scale computational platforms of the biologic response data as a function of dose, LET, ionization density and ion type for biologically driven optimization in particle radiotherapy. The proposal is ready for submission to NIH/NCI as R03/R21.

Honors and Awards:

- Junior associate member of the Abdus Salam International Center for Theoretical Physics, Strada Costiera 11, Trieste, Italy, 1998.

- Award from the French Government to visit the Department of Physics of Universite Paul Sabatier in Toulouse as a visiting scientist, 1999.
- Travel award for one year PhD research study as exchange student in Indiana University, 1995-1996.
- Travel award, Landau Institute, Chernogolovka, Russia, summer 1994.
- Travel award, ICTP, Trieste, Italy, 1993.
- Five **national awards** for achieving ranked 1st in the different national competitions in physics during my education in Iran.

Highlighted Research Contributions:

- My recent paper on FLASH-Therapy selected as the highest ranked paper in Jan/Feb by a radiation oncology committee in MD Anderson Cancer Center.
- Member of Ultra High Dose FLASH-Therapy consortium, MD Anderson Cancer Center, Houston – Developing Radiobiology Multiscale Computational Platform
- My latest research article on proton therapy was highlighted and published in Europhys News:
  https://www.europhysicsnews.org/vol-50-no-3-highlights
  https://epjd.epj.org/epjd-news/1686-epjd-highlight-optimising-proton-beam-therapy-with-mathematical-models
- Nano-dosimetric Kinetic Model and Variable Relative Biological Effectiveness of Proton and Ion Beams**,** selected for the **"Best in Physics"** abstract - AAPM meeting, 2016.
- Interfacing Geant4 Monte Carlo simulator of ionizing radiation with a large scale molecular dynamic simulation to model DNA damage induced by the exposure of ionizing radiation and free radicals, **Phys. Med. Biol.** 58, 7143-7157 (2013).
- Developing a large-scale DNA simulation with ReaxFF, J. Phys. Chem. A 115, 11045 (2011), and Graphene Oxide, J. Phys. Chem. 116, 1820 (2012).
  Animations: http://qmsimulator.wordpress.com/
  Animations on graphene oxide: http://qmsimulatorGOJPC.wordpress.com/
- My online talk on "molecular simulations of radio-biological effects: DNA damage by ionizing radiation", presented in Center for Mathematical Medicine at Fields Institute, U. Toronto in Dec. 2011 is available:
  http://www.fields.utoronto.ca/programs/scientific/CMM/11-12/seminars/online
- Proposed **optical control of DNA radio-sensitivity**, J. Phys. Chem. B 113, 6938 (2009); Journal of Computational Chemistry (in press).
- Discovered **quantum Hall ferrimagnetism**: Phys. Rev. Lett. 97, 186802 (2006), Phys. Rev. B 77, 165430 (2008).
- Introduced **Piezomagnetism in Quantum Dots**, Phys. Rev. Lett. 98, 207203 (2007); Phys. Rev. Lett. 101, 207202 (2008).
- Most cited paper: **Theory of magnetic anisotropy in (III,Mn)V ferromagnets**, Phys. Rev. B 63, 054418 (2001). Number of citations: ~ 500.

Publications & Projects Under Progress:

1) Fahed Alsanea, Ramin Abolfath, Uwe Titt, Sam Beddar, Scintillation Quenching at FLASH-UHDR

Data Science / AI projects:

2) **Ramin Abolfath et al.,** Tissue and tumor auto-segmentation and predicting dose distributions in prostate cancer patients using U-Net architecture and deep learning.

3) **Ramin Abolfath et al.,** Reduction of metal artifacts in CT images and eclipse treatment planning systems for patients under radiation therapy with hip prosthesis implants using convolution neural network and deep learning.

4) **Ramin Abolfath et al.,** Reduction of metal artifacts in CT images and eclipse treatment planning systems for patients under radiation therapy with hip prosthesis implants using convolution neural network and deep learning.

Publications in peer reviewed journal

1. Ramin Abolfath, Sedigheh Fardirad, Houda Kacem, Marie-Catherin Vozenin, Abbas Ghasemizad, *A Monte Carlo simulation framework for investigating the effect of inter-track coupling on H2O2 productions at ultra-high dose rates*, Med Phys. 2025;52:e17972. https://doi.org/10.1002/mp.17972
2. Martin Radler, Niayesh Afshordi, Reza Taleei, Radhe Mohan, Ramin Abolfath, Julie Lascaud, *A semiclassical description of the immediate temperature and pressure distribution surrounding the track of heavy ions with therapeutic energies*, Phys. Med. Biol. 70 (2025) 115010. https://doi.org/10.1088/1361-6560/add83b
3. **Ramin Abolfath**, Niayesh Afshordi, Sohrab Rahvar, Adri van Duin," Martin Radler, Julie Lascaud, Reza Taleei, Katia Parodi, Radhe Mohan, *A molecular dynamics simulation framework for investigating ionizing radiation-induced nano-bubble interactions at ultra-high dose rates,* Eur. Phys. J. D 78:141 (2024). https://doi.org/10.1140/epjd/s10053-024-00928-1
4. Alexander Baikalov, **Ramin Abolfath**, Radhe Mohan, Emil Schuler, Jan Wilkens, Stefan Bartzsch, *Intertrack interaction at ultra-high dose rates and its role in the FLASH effect,* Front. Phys. 11:1215422 (2023). doi: 10.3389/fphy.2023.1215422
5. **Ramin Abolfath**, Alexander Baikalov, Stefan Bartzsch, Emil Schuler, Radhe Mohan, *A stochastic reaction-diffusion modeling investigation of FLASH ultra-high dose rate response in different tissues, Special issue on Multidisciplinary Approaches to the FLASH radiotherapy in Medical Physics Section of Frontier in Physics,* ***11****:1060910 (2023). DOI 10.3389/fphy.2023.1060910*
6. Santosh KC, **Ramin Abolfath,** *Towards the Ionizing Radiation Induced Bond Dissociation Mechanism in Oxygen, Water, Guanine and DNA Fragmentation: A Density Functional Theory Simulation,* Scientific Reports **12**, 19853 (2022), https://doi.org/10.1038/s41598-022-23727-3
7. **Ramin Abolfath,** Mitra Khalili, Alireza G. Senejani, Balachandran Kodery, Robert Ivker, The Dependence of Compensation Dose on Systematic and Random Interruption Treatment Time in Radiation Therapy, Onco 2, 264-281 (2022). DOI: https://doi.org/10.3390/onco2030015
8. **Ramin Abolfath**, Alexander Baikalov, Stefan Bartzsch, Niayesh Afshordi, Radhe Mohan, *The effect of non-ionizing excitations on the diffusion of ion species and inter-track correlations in FLASH ultra-high dose rate radiotherapy*, available on ArXiv: 2201.07887 **Phys. Med. Biol. 67** 105005 (2022). DOI: https://doi.org/10.1088/1361-6560/ac69a6

9. A. Baikalov, **R. Abolfath**, R. Mohan, D. Grosshans, J. Wilkens, S. Bartzsch, *Modeling the effects of inter-spur interactions at FLASH dose rates,* **Physica Medica** 94:S77 (2022), DOI: 10.1016/S1120-1797(22)01607-6.

10. Huagang Yan, David J. Carlson, Ramin Abolfath, Wu Liu, *Microdosimetric Investigation and a Novel Model of Radiosensitization in the Presence of Metallic Nanoparticles,* ***Pharmaceutics***, *13,* 2191 *(*2021) https://doi.org/10.3390/pharmaceutics13122191

11. Alejandro Bertolet, **Ramin Abolfath**, David J. Carlson, Robert A. Lustig, Christine Hill-Kayser, Michelle Alonso-Basanta, Alejandro Carabe, *Correlation of LET with MRI changes in brain and potential implications for normal tissue complication probability for meningioma patients treated with pencil beam scanning proton therapy,* **International Journal of Radiation Oncology, Biology, Physics** (**Red Journal**), 112, P237-246 (2022) https://doi.org/10.1016/j.ijrobp.2021.08.027.

12. **Ramin Abolfath**, David Grosshans, and Radhe Mohan, *Oxygen depletion in FLASH ultra-high dose rates: A molecular dynamics simulation,* **Med. Phys.** 47, 6551 (2020).

13. **Ramin Abolfath**, Yusuf Helo, David Carlson, Rob Stewart, David Grosshans, and Radhe Mohan, *New Approach in Microdosimetry of Proton Beam,* **Med. Phys.** Jul;47(7):3184-3190 (2020). doi: 10.1002/mp.14165.

14. **Ramin Abolfath,** Chris Peeler, Dragan Mirkovic, David Grosshans, and Radhe Mohan, *A DNA damage multi-scale model for NTCP in proton and hadron therapy,* **Med. Phys.** Apr;47(4):2005-2012 (2020). doi: 10.1002/mp.14034.

15. **Ramin Abolfath**, Yusuf Helo, Lawrence Bronk, Alejandro Carabe, David Grosshans, and Radhe Mohan, *Renormalization of radiobiological response functions by energy loss fluctuations and complexities in chromosome aberration induction: from cell to tissue deactivation theory for proton therapy.* **Eur. J. Phys. D**. 73, 64 (2019). DOI: 10.1140/epjd/e2019-90263-5

Selected as the Journal's Highlight:

https://epjd.epj.org/epjd-news/1686-epjd-highlight-optimising-proton-beam-therapy-with-mathematical-models

Highlighted in Europhys News:

https://www.europhysicsnews.org/vol-50-no-3-highlights

16. **Ramin Abolfath**, Rob Stewart, Yusuf Helo, Alejandro Carabe, David Grosshans, and Radhe Mohan, *New Approach in Microdosimetry of Proton Beam.* Selected as SNAP Oral presentation in AAPM 2019, St. Antonio.

17. **Ramin Abolfath**, Chris R. Peeler, Mark Newpower, Lawrence Bronk, David Grosshans, and Radhe Mohan, *A model for relative biological effectiveness of therapeutic proton beams based on a global fit of cell survival data*, **Sci. Rep.** 7, 8340 (2017).

18. **Ramin M. Abolfath,** David Carlson, Zhe Chen, Ravinder Nath, *A molecular dynamics simulation of DNA damage induction by ionizing radiation,* **Phys. Med. Biol.** 58, 7143-7157 (2013).

19. **Ramin M. Abolfath,** Fanqing Guo, Zhe Chen, Ravinder Nath, *First Principle Calculation*

of Quantum Yield in Photodynamic Therapy, **Med. Phys.** 41, 266 (2014).

20. Hassan Abbas, **Ramin M. Abolfath,** Zhe Chen, Ravinder Nath, *Dosiemtric Impact of Patient Positioning Uncertainty in SBRT Treatments,* **Med. Phys.** 41, 346 (2014).

21. **Ramin M. Abolfath,** Anna Trojnar, Bahman Roostaei, Thomas Brabec, Pawel Hawrylak, *Dynamical magnetic and nuclear polarization in complex spin systems: semi-magnetic II–VI quantum dots,* **New J. Phys.** 15, 063039 (2013).

22. **Ramin M. Abolfath**, Marek Korkusinski, Thomas Brabec, and Pawel Hawrylak**,** *Spin Textures in Strongly Coupled Electron Spin and Magnetic or Nuclear Spin Systems in Quantum Dots,* **Phys. Rev. Lett.** 108, 247203 (2012).

23. **Ramin M. Abolfath,** Adri van Duin, and Thomas Brabec, *Reactive Molecular Dynamics study on the first steps of DNA-damage by free hydroxyl radicals,* **J. Phys. Chem. A** 115, 11045 (2011). Animations and ppt presentations can be found at: http://qmsimulator.wordpress.com/

24. **Ramin M. Abolfath**, *Optical control of DNA-base radio-sensitivity*, **J. Phys. Chem. B 113, 6938 (2009),** preprint arXiv:0907.4721.

25. **Ramin M. Abolfath,** Thomas Brabec, *Optical control of the initial OH radical induced DNA-backbone damage*, **Journal of Computational Chemistry 31, 2601 (2010).**

26. **Ramin M. Abolfath,** Lech Papiez, P*rotection strategy of sensitive body organs in radiation therapy,* **Med. Phys.** 36, 3013 (2009), preprint arXiv:0907.4943.

27. Lech Papiez, **Ramin M. Abolfath**, *Variable Beam Dose Rate and DMLC-IMRT to moving body anatomy – algorithms and implications,* **Med. Phys.** 35 4837 (2008).

28. **R. M. Abolfath**, L. Papiez, S. Stojadinovic, and T. Solberg, *Optical Enhancement of DNA-Base Radio-Resistivity,* **Med. Phys.** 36, 2634 (2009).

29. Michal Hammel, Yaping Yu, Brandi L. Mahaney, Brandon Cai, Ruiqiong Ye, Barry M. Phipps, Robert P. Rambo, Greg L. Hura, Martin Pelikan, Sairei So, **Ramin M. Abolfath**, David J. Chen, Susan P. Lees-Miller, and John A. Tainer, Ku and DNA dependent Protein Kinase Dynamic Conformations and Assembly Regulate DNA Binding and the Initial Non-homologous End Joining Complex, **THE JOURNAL OF BIOLOGICAL CHEMISTRY**, VOL. 285, NO. 2, pp. 1414–1423 (2010).

30. **Ramin M. Abolfath** and Kyeongjae Cho, *Computational studies for reduced graphene oxide in hydrogen-rich environment*, **J. Phys. Chem. A** 116, 1820 (2012); MD movies: http://qmsimulatorGOJPC.wordpress.com/

31. Cheng Gong, Muge Acik, **Ramin M. Abolfath,** Yves Chabal, and Kyeongjae Cho, *Graphitization of Graphene Oxide with Ethanol during Thermal Reduction,* **J. Phys. Chem. C.** 116, 9969 (2012).

32. **Ramin M. Abolfath**; P. K. Biswas, R. Rajnarayanam, Thomas Brabec, Reinhard Kodym; Lech Papiez, *Multiscale QM/MM Molecular Dynamics Study on the First Steps of Guanine-Damage by Free Hydroxyl Radicals in Solution* **J. of Phys. Chem. A** 116, 3940 (2012).

33. **Ramin M. Abolfath,** Thomas Brabec, *Performance engineering of semiconductor spin qubit systems***, Phys. Rev. B** 82, 075311 (2010), preprint arXiv:1001.2313. Selected for the August 2010 issue of Virtual Journal of Quantum Information, and August 23, 2010 issue of Virtual Journal of Nanoscale Science and Technology.

34. **Ramin M. Abolfath,** *Para-ortho transition of artificial H_2 molecule in lateral quantum dots doped with magnetic impurities*, **Phys. Rev. B,** 80, 165332 (2009); preprint arXiv:0907.4726.

35. Ramin M. Abolfath, Thomas Brabec, Pawel Hawrylak, *Closed-Shell Semi-magnetic Quantum Dots,* **Phys. Rev. Lett. (in press).**

36. Ramin M. Abolfath, Anna Trojnar, Bahman Roostaei, Thomas Brabec, Pawel Hawrylak, *Dynamical Magnetic Polarization in Semi-magnetic II-VI Quantum Dots,* submitted to **Phys. Rev. B.** arXiv:1202.5352

37. **Ramin M. Abolfath**, Chang-Yu Hsieh, Pawel Hawrylak, Performance engineering in semiconductor triple quantum dot spin coded-qubit systems, submitted to **Phys. Rev. Lett.**

38. **Ramin M. Abolfath,** Andre Petukhov, Igor Zutic, *Piezomagnetic Quantum Dots*, **Phys. Rev. Lett.** 101, 207202 (2008), arXiv:0707.2805.

39. **R. Abolfath**, R. Timmerman, T. Solberg, D. Saha, M. Story, P. Derose, and H. Hamidian, Computational Analysis of the Dose and Dose-Rate Dependence of DNA Double-Strand Break Repairs**, Med. Phys.** 35, 2818 (2008).

40. L. Papiez and **R. Abolfath**, Variable Beam Dose Rate and DMLC IMRT to Moving Body Anatomy, **Med. Phys.** 35, 2746 (2008).

41. **R. Abolfath** and L. Papiez, Genetic Optimizers and Control of DMLC IMRT Delivery to Moving Body Anatomy**, Med. Phys.** 35, 2750 (2008).

42. **Ramin M. Abolfath**, Pawel Hawrylak, and Igor Zutic, *Tailoring Magnetism in Quantum Dots*, **Phys. Rev. Lett.** 98, 207203 (2007), cond-mat/0612489.

43. Ramin M. Abolfath, and Pawel Hawrylak, *Quantum Hall Ferrimagnetism in lateral quantum dot molecules*, **Phys. Rev. Lett.** 97, 186802 (2006), cond-mat/0607638. Selected for the Nov. 31, 2006 issue of Virtual Journal of Nanoscale Science and Technology.

44. Carlos F. Destefani, Chris McDonald, **Ramin M. Abolfath**, Pawel Hawrylak, Thomas Brabec, *Nonadiabatic coherent control of electron spin based coded qubit,* **Phys. Rev. B** 78, 165331 (2008)**.**

45. **Ramin M. Abolfath**, Pawel Hawrylak, and Igor Zutic, *Electronic states of magnetic quantum dots,* **New Journal of Physics** *9, 353* (2007); Part of Focus on Spintronics in Reduced Dimensions.

46. **Ramin M. Abolfath**, and Pawel Hawrylak, *Spin transitions induced by a magnetic field in quantum dot molecules,* **Phys. Rev. B** 77, 165430 (2008), cond-mat/0612529. Selected for the May 12, 2008 issue of Virtual Journal of Nanoscale Science and Technology.

47. **Ramin M. Abolfath**, and Pawel Hawrylak, *Real Space Hartree-Fock Configuration Interaction Method For Complex Lateral Quantum Dot Molecules*, **J. Chem. Phys.** 125,

034707 (2006), cond-mat/0511741. Selected for the July 31, 2006 issue of Virtual Journal of Nanoscale Science and Technology.

48. **Ramin M. Abolfath**, W. Dybalski, Pawel Hawrylak, *Theory of a two-level artificial molecule in laterally coupled quantum Hall droplets*, **Phys. Rev. B** 73, 075314 (2006),cond-mat/0509585.
49. **Ramin M. Abolfath**, Pawel Hawrylak, Michel Pioro-Ladriere, and Andy Sachrajda, *Quantum Hall Droplets in Coupled Lateral Quantum Dots*, **Physica E** 34, 636 (2006).
50. M. Pioro-Ladriere, A. S. Sachrajda, P. Hawrylak, **R. Abolfath**, J. Lapointe, P. Zawadzki, S. Studinikin, *Quantum Molecule in Low Electron Limit*, **Physica E** 34, 437 (2006).
51. M. Pioro-Ladriere, **R. Abolfath**, P. Zawadzki, J. Lapointe, S. Studinikin, A. S. Sachrajda, and P. Hawrylak, *Charge Sensing of an Artificial H2 Molecule*, **Phys. Rev. B** 72, 125307 (2005), cond-mat/0504009. Selected for the September 19, 2005 issue of Virtual Journal of Nanoscale Science and Technology.
52. Dimitri Antoniou, **Ramin Abolfath**, and Steven D. Schwartz, *Transition Path Sampling Study of Classical Rate Promoting Vibrations*, **J. Chem. Phys.** 121, 6442 (2004).
53. Alvaro S. Nunez, J. Fernndez-Rossier, **M. Abolfath**, and A. H. MacDonald, *Optical Control of the Magnetization Damping in Ferromagnetic Semiconductors*, **J. Magn. Magn. Mater.** 272, 1913 (2004).
54. **M. Abolfath**, R. Khomeriki, and K. Mullen, *Theory of the tunneling resonances of the bilayer electron systems in strong magnetic field***, Phys. Rev. B** 69, 165321 (2004), cond-mat/0208236.
55. J. Fernndez-Rossier, Alvaro S. Nunez, **M. Abolfath**, and A. H. MacDonald, *Optical spin transfer in ferromagnetic semiconductors*, cond-mat/0304492.
56. M. Abolfath, A. H. MacDonald, and Leo Radzihovsky, *Microscopic theory of critical currents in quantum Hall superfluids*, **Phys. Rev. B** 68, 155318 (2003), cond-mat/0305295.
57. T. Jungwirth, **M. Abolfath**, Jairo Sinova, J. Kucera, A.H. MacDonald, *Boltzmann theory of engineered anisotropic magnetoresistance in (Ga,Mn)As*, **Appl. Phys. Lett.** 81, 4029 (2002), cond-mat/0206416.
58. **M. Abolfath**, Leo Radzihovsky and A. H. MacDonald, *Global Phase Diagram for Bilayer Quantum Hall Ferromagnets*, **Phys. Rev. B** 65, 233306 (2002), cond-mat/0110049. Selected for the June 10, 2002 issue of Virtual Journal of Nanoscale Science and Technology.
59. R. Khomeriki, **M. Abolfath**, and K. Mullen, *Solitons in Polarized Double-layer Quantum Hall Systems*, **Phys. Rev. B** 65, R121310 (2002), cond-mat/0112177.
60. **M. Abolfath** and A. Langari, *Quantum Ferrimagnets in Magnetic Field*, **Phys. Rev. B** 63, 144414 (2001), cond-mat/0101194.
61. **M. Abolfath**, T. Jungwirth, and A.H. MacDonald, *Mean-field Theory of Magnetic Properties of Mn(III)V Semiconductors*, **Physica E**, 10, 161 (2001), cond-mat/0103341.
62. **M. Abolfath**, Kieran Mullen, and H.T.C. Stoof, *Massive Skyrmions in Quantum Hall Ferromagnets*, **Phys. Rev. B** 63, 075315 (2001), cond-mat/0005195.

63. **M. Abolfath**, T. Jungwirth, J. Brum, and A.H. MacDonald, *Theory of Magnetic Anisotropy in (III,Mn)V Ferromagnets*, **Phys. Rev. B** 63, 054418 (2001), cond-mat/0006093.
64. **M. Abolfath**, H. Hamidian, and A. Langari, *Quantum Ferrimagnets*, cond-mat/9901063.
65. **M. Abolfath**, Ramin Golestanian, and T. Jungwirth, *Finite Temperature Behavior of the* nu=1 *Quantum Hall Effect in Bilayer Electron Systems*, **Phys. Rev. B** 61, 4762 (2000), cond-mat/9906374.
66. A. Langari, **M. Abolfath**, and M. A. Martin-Delgado, *Phase Diagram of Ferrimagnetic Ladders with Bond-alternation*, **Phys. Rev. B** 61, 343 (2000), cond-mat/9910103.
67. **M. Abolfath** and M.R. Ejtehadi, *Field Theory of the Skyrme Lattice in Quantum Hall Ferromagnets*, **Phys. Rev. B** 58, 10665 (1998), cond-mat/9807236.
68. **M. Abolfath**, *Quantum Fluctuations of Classical Skyrmions in Quantum Hall Ferromagnets*, **Phys. Rev. B** 58, 2013 (1998), cond-mat/9712260.
69. **M. Abolfath**, J..J. Palacios, H.A. Fertig, S.M. Girvin, A.H. MacDonald, *A Critical Comparison of Field Theory and Microscopic Wavefunctions for Skyrmions in Quantum Hall Ferromagnets*, **Phys. Rev. B** 56, 6795 (1997), cond-mat/9705125.
70. **M. Abolfath**, L. Belkhir, and N. Nafari, *Quantum Hall Effect in Single Wide Quantum Wells*, **Phys. Rev. B** 55, 10643 (1997), cond-mat/9608072.

Member:

- American Physical Society (APS), GMED member at large.
- American Chemical Society (ACS).
- The American Association of Physicists in Medicine (AAPM).
- Radiation Research Society.

Invited Talks:

- 5th Flash Radiotherapy and Particle Therapy Conference (FRPT 2025), taking place from 10-12 December 2025 in Prague, Czech Republic.
- FLASH Workshop 2025 from July 1-3 2025, Heidelberg, the German Cancer Research Center (DKFZ).
- Workshop on Programmable Quantum Simulators based on 2D Materials (PQS2D) & Quantum Theory of Materials, Nanostructures and Devices (QTMND) June 18 – 20, 2025, the Fairmont Le Château Montebello, Canada
- Cancer Research: Howard University Guppy Talk Highlights Student and Early Faculty Projects, April 2025
- Howard University, DC, Multi-scale Modeling of FLASH radiotherapy (June 1, 2023).
- Waterloo University, Theoretical Modeling of FLASH-UHDR (March 23, 2023).
- Indiana University, FLASH Radiotherapy (June 15, 2022).
- New York Proton Center, A Multiscale Model for FLASH UHDR effects: Implementation of molecular dynamics with Monte Carlo track-structure (Feb. 15, 2021).
- Washington University, A Multiscale Model for FLASH UHDR effects: Implementation of molecular dynamics with Monte Carlo track-structure (Feb. 23, 2021).
- University of Delhi - Ramjas College, A Path to Computational Nanodosimetry in Radiation Physics (March 4, 2021).

- Technical University of Munich and the Helmholtz Centre Munich, Germany, A Multiscale Model for FLASH UHDR effects: Implementation of molecular dynamics with Monte Carlo track-structure (Dec. 15, 2020).
- U. Texas at Arlington, Physics Colloquium, Toward Modeling Biological Responses at FLASH Ultra-High-Dose Radio-Therapy (Oct. 14, 2020).
- St. Jude Research Children Hospital, Memphis, Multi-scale cell deactivation modeling in proton Therapy (07-05-2018).
- New England Chapter of AAPM, UMass Lowell, Radio biological modeling in particle therapy (11-2-2018).
- National Institute of Standard (NIST), Washington DC, Recent Topics in Proton Therapy (12-5-2017).
- University of Washington, Seattle, Biological Modeling of Particle Therapy (11-11-2016).
- Massachusetts general hospital (MGH) & Harvard Medical School: Towards First Principle Modeling of Biological Responses of Ionizing Radiation (05-27-2015).
- MD-Anderson: Towards First Principle Modeling of Biological Responses of Ionizing Radiation (06-02-2015).
- University of Houston: Biological Responses of Therapeutic Ionizing Radiation (02-12-2016).
- University of Texas Southwestern Medical Center (UTSW): Biological Responses of Therapeutic Ionizing Radiation (11-09-2015).
- University of Texas at Austin – physics colloquium: Biological Responses of Therapeutic Ionizing Radiation (10-14-2015).
- New England Chapter of AAPM (EAAPM) Young Investigators' Symposium at Dana-Farber Cancer Institute, Harvard Medical School, Boston, MA (04-24-2015).
- British Columbia Cancer Agency and University of Victoria, Canada: Towards First Principle Modeling of Biological Responses of Ionizing Radiation (03-31-2015).
- New England Chapter of AAPM (EAAPM) Young Investigators' Symposium at Dana-Farber Cancer Institute, Harvard Medical School, Boston, MA (05-02-2014).
- Yale Radiation Oncology seminars at Smilow Cancer Hospital: Radiation Measurements for Radiation Therapy (11-11-2013).
- Yale Radiobiology & Radiotherapy seminars: Biophysical Modeling and Computational Approaches in Simulation of DNA Damage-Repair Mechanism, (10-09-2013).
- Molecular Modeling of Radiation interaction with biological systems: Radio-biological effects and DNA damage by ionizing radiation, Dept. Phys., Sothern Connecticut State University, New Haven (April, 2013).
- Molecular Modeling of Radiation interaction with biological systems: Radio-biological effects and DNA damage by ionizing radiation, Dept. Radiation Oncology, Yale University, New Haven (March 2, 2012).
- Molecular Simulations of Chemical Reactions, Young State University, Ohio (April 2012).
- Molecular simulations of radio-biological effects: DNA damage by ionizing radiation, Center for Mathematical Medicine, Fields Institute, U. Toronto (Dec. 2011).
- Computational modeling of magnetic materials, GE corporation (Sept. 2011).
- Computational modeling of DNA-damage and spin control of radio-sensitivity, San Diego State University (May 2011).
- Magnetic Quantum Dots, University of Texas at Dallas (Feb. 2009).
- Application of computer simulation and optimizing treatment planning in radiation oncology, University of Texas at Dallas (April 2008).
- Piezomagnetic Quantum Dots, Jackson State University, Jackson (June 2007).
- Correlations in coupled quantum dots, University of Ottawa, Ottawa (Feb. 2006).

- Theory of Artificial Molecules in Laterally Coupled Quantum Hall Droplets, Cornell University, Ithaca (Nov. 2005).
- Real Space Hartree-Fock Configuration Interaction Method For Complex Lateral Quantum Dot Molecules, Purdue University, West Lafayette, Indiana (Nov. 2005).
- Real Space Hartree-Fock Configuration Interaction Method For Complex Lateral Quantum Dot Molecules, State University of New York at Buffalo, Buffalo, New York (Nov. 2005).
- Correlated Electrons in Quantum Hall Bilayers and Quantum Dot Molecules, Queens University, Kingston (Oct. 2005).
- Quantum Dot Molecules, Ottawa University, Ottawa (Dec. 2005).
- Understanding Transition Path Sampling, Columbia University, New York (Sept. 2003).
- Recent Developments in Transition Path Sampling, and Optical Spin Transfer in Ferromagnetic Semiconductors, NEC, Princeton (Sept. 2003).
- Ferromagnetic Semiconductors, Rice University, Houston (April 2003).
- Anisotropic Magnetoresistance in (III,Mn)V Ferromagnets, University of Arkansas, Fayetteville (March 2001).
- Skyrmions: Topological Order in Quantum Hall Ferromagnets, Washington University, St. Louis (Nov. 2000).
- Finite Temperature Behavior of the nu=1 Quantum Hall Effect in Bilayer Electron Systems, The University of Oklahoma, Norman (June 1999).

Teaching Experience & Development

- Medical Physics courses at Howard University (currently teaching):
  - Radiation Dosimetry and Measurement
  - Health Physics and protection
  - Radiobiology
- Physics courses:
  - Undergrad Quantum Mechanics II, PHYS 4302, Univ. of Texas at Dallas.
  - Graduate Many Body Physics I and II, University of Ottawa.
- Undergraduate course taught:
  - Quantum Mechanics I and II, PHYS 4301-4302, Univ. of Texas at Dallas, textbooks: Griffiths, and Gasiorowicz (Spring 2009 to present).
  - Calculus based general physics, phys 2425, Richland College, textbook: Halliday-Resnick-Walker (Summer 2010).
  - Algebra based general physics, PHYS 1402, Richland College, textbook: Physics, Walker 4th Edition (Fall 2010).
  - Fundamental Physics, Mathematical Physics, Thermodynamics, Classical Mechanics, E&M, Sharif University of Technology (1997-1999).
- Graduate courses taught:
  - Electrodynamics II, PHYS 5322, Univ. of Texas at Dallas, textbook: Jackson (Fall 2010).
  - Quantum Mechanics I, Phys. 6300, Univ. of Texas at Dallas, textbook: Sakurai-Napolitano (Fall 2010).
  - Quantum Mechanics II, Phys. 6301, Univ. of Texas at Dallas, textbook: Sakurai-Napolitano and Sakurai Advanced QM, (Spring 2011).
  - Many Body Physics I and II, University of Ottawa, Canada, textbooks: Mahan, Fetter-Walecka, Negele-Orland, and Kadanoff-Baym, (Fall 2005 and Spring 2006).
  - Solid State Physics, Many body Systems, Mathematical Physics, Statistical Physics, Thermodynamics, Classical Mechanics, Sharif University of Technology and Tehran University (1997-1999).