

## **Curriculum Vitae**

**Mark C. Harvey, Ph.D.**

*Department of Physics*

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### EDUCATION

**Doctor of Philosophy**, Nuclear Physics, Hampton University, Hampton, VA, 2001

**Master of Science**, Physics, Hampton University, Hampton, VA, 1995

**Bachelor of Science**, Physics, Virginia State University, Petersburg, VA, 1992, Cum Laude

### ACADEMIC/RESEARCH EXPERIENCE

**Associate Professor of Physics**, Texas Southern University, Houston, TX, August 2017 – Present

- Director of Health Physics program
- Radiation Dose Assessment using Monte Carlo Simulation Techniques and Radiation Measurement Apparatuses
- Principal Investigator, Contract – Texas Southern University, Texas Commission on Environmental Quality (TCEQ) 582-20-10298, 2019
- Co-Investigator, HBCU Collision Collaboration - J/psi Peripheral Collision Analysis and Detection, National Science Foundation EIR-1901420, 2019
- Co-Investigator, Undergraduate Peer-Mentor Project-Based Program in STEM at Texas Southern University, National Science Foundation HRD-1719318, 2017

**Assistant Professor of Physics**, Texas Southern University, Houston, TX, August 2011 – 2017

- Director of Health Physics program
- Radiotherapy Dose Assessment using Monte Carlo Simulation Techniques
- Measurements of Stray Radiation Doses in Radiotherapy
- Co-Moderator for the "Teaching Nuclear and Accelerator Science" Session at the 24<sup>th</sup> International Conference On the Application of Accelerators in Research and Industry (2016)
- Principal Investigator, Medical Health Physics Scholarship Program at Texas Southern University, U.S. Nuclear Regulatory Commission NRC-HQ-84-16-FOA-0001, 2016
- Principal Investigator, Medical Health Physics Scholarship Program at Texas Southern University, U.S. Nuclear Regulatory Commission NRC-HQ-84-14-FOA-0003, 2014
- Co-Investigator, Unified Approach to Increase STEM Undergraduate Students Employment in the Department of the Navy, Office of Naval Research ONR FOA 14-002, 2014

**Visiting Assistant Professor of Physics**, Texas Southern University, Houston, TX, August 2009 – July 2011

- Director of Health Physics program

- Validation studies of Monte Carlo calculations against measured data for low-activity radionuclides
- Co-Investigator, Faculty Support for Developing Radiation Dosimetry Research in Health Physics using Monte Carlo Techniques at Texas Southern University, U.S. Nuclear Regulatory Commission HR-FN-1009-NED02, 2010

**Ruth L. Kirschstein National Research Service Awards (NRSA) Research Fellow (Radiation Physics)**, The University of Texas M. D. Anderson Cancer Center, Houston, TX, June 2008 – June 2009

- Principal Investigator, Secondary Neutron Exposures in Pediatric Proton Radiotherapy, National Institutes of Health F32, 2008
  - Used Monte Carlo techniques to evaluate differences in the therapeutic absorbed dose and secondary neutron production in proton therapy based on the nuclear physics model

**Visiting Assistant Professor of Physics**, Texas Southern University, Houston, TX, January 2008 – May 2008

- Instructor for following courses:
  - *College Physics I Lecture (algebra based); Topics covered:*
    - *Newton's Laws; Translational Dynamics*
    - *Conservation of Energy and Momentum*
    - *Rotational Dynamics*
    - *Thermodynamics; Sound Waves*
  - *Physical Science; Topics covered:*
    - *Force and Motion; Work and Energy*
    - *Thermodynamics; Sound Waves*
    - *Optics and Wave Effects; Electricity and Magnetism*
    - *Atomic Physics; Nuclear Physics*

**Post-Doctoral Fellow (Radiation Physics)**, The University of Texas M. D. Anderson Cancer Center, Houston, TX, July 2006 – December 2007

- Research Grant (Awarded): "Secondary Neutron Exposures in Pediatric Proton Radiotherapy"
  - *Grant submitted to the National Institutes of Health for Postdoctoral Fellowship Award*
- Used Monte Carlo techniques to develop a novel method for the delivery of the beam in proton radiotherapy
  - *Paper accepted to journal Medical Physics (1<sup>st</sup> author)*
- Used Monte Carlo techniques to (1) validate it against measured data and (2) study the effects of beam size, shape, and orientation on the proton beam dose profile through the treatment nozzle
  - *Papers accepted for publication to journal Medical Physics (2<sup>nd</sup> author)*

**Post-Doctoral Fellow (Experimental Radiation Oncology)**, The University of Texas M. D. Anderson Cancer Center, Houston, TX, July 2005 – June 2006

- Coded original Perl script to produce header and image files from DICOM files using the DCMTK Toolkit for use in ventilation software

- Ventilation study:
  - *Comparative analysis examining differences between breath-hold and dynamic ventilation*

**Visiting Assistant Professor of Physics**, Rochester Institute of Technology, Rochester, NY, September 2004 – June 2005

- Instructor for following courses:
  - *College Physics I Lecture (algebra based); Topics covered:*
    - *Newton's Laws; Translational Dynamics*
    - *Conservation of Energy and Momentum*
    - *Rotational Dynamics*
  - *College Physics I Laboratory*
  - *University Physics II Lecture (calculus based); Topics covered:*
    - *Rotations; Complex Rotations*
    - *Equilibrium and Elasticity*
    - *Oscillations; Transverse mechanical waves*
    - *Interference; Diffraction*
    - *Thermodynamics*
  - *University Physics II Workshop*

**Post-Doctoral Research Assistant (PHENIX Experiment)**, Brookhaven National Laboratory, Upton, NY, October 2001 – August 2004

- Detailed data analysis of the differential invariant cross section of identified charged hadrons ( $\pi$ , K, p) in p-p collisions at the Relativistic Heavy Ion Collider (RHIC).
- Presented research at national conferences and international conferences (Quark Matter 2004, Hot Quarks 2004).
- Technical support for the PHENIX Time Expansion Chamber (TEC) detector. Duties included the following:
  - *Ordered electronic components for Front-End Modules (FEM) and Pre-amp Shaper (PS) Boards*
  - *Tested the TEC FEM and PS Board electronics*
  - *Supervised the testing of TEC electronic modules*
  - *Installed FEM and PS Boards into racks located in the PHENIX experimental hall*

**Ph.D. Candidate Research Assistant**, Hampton University Department of Physics, Hampton, VA, 1995 - 2001

**National Institute for Nuclear and High Energy Physics, Nuclear Physics Division, Amsterdam, Holland, The Netherlands**

- Conducted detailed analysis of research data on the experiment "Inclusive Scattering of Electrons from a Polarized Helium 3 Gas Target".
- Prepared Ph.D. dissertation on this work.
- Operated and monitored computer software; operated data acquisition system during the experiment for the beam, target and detector systems as part of collaboration team duties

- Developed numerical computer simulation codes (Monte Carlo) to model the experimental data

**Thomas Jefferson National Accelerator Facility (TJNAF), Physics Division, Newport News, VA**

- Collaborated on experiments in the Hall C facility as a target operator, data acquisition system operator and shift leader.
- Presented research results at several national conferences:
  - *The American Physical Society (APS)*
  - *The APS Division of Nuclear Physics (DNP)*
  - *The National Alliance of Research Centers of Excellence (NARCE)*
- Assisted in construction of several scintillator detectors for radiation measurements.

**Graduate Research Assistant, Hampton University Department of Physics, Hampton, VA, 1992-1995**

- Collaborated on experiment at TJNAF to map the magnetic field of the Hall C spectrometers.
- Participated in the Hampton University Graduate Student (HUGS) Nuclear and High Energy Physics Summer School.
- Instructed two semesters of an introductory college physics laboratory course as a teacher's assistant.

**ACADEMIC HONORS AND AWARDS**

- College of Science, Engineering and Technology, Distinguished Teaching Award, Texas Southern University, 2015
- Provost's Core Curriculum Teaching Excellence Award, Texas Southern University, 2014
- Award of Honor, 1<sup>st</sup> Place Faculty Oral Presentation, Research Week 2014, Texas Southern University
- Award of Honor, 2<sup>nd</sup> Place Faculty Poster Presentation, Research Week 2013, Texas Southern University
- Research Grant Awarded by the Nuclear Regulatory Commission for Scholarships in Medical Health Physics
- Research Grant Awarded by the National Institutes of Health for Postdoctoral Fellowship Award:
  - "Secondary Neutron Exposures in Pediatric Proton Radiotherapy"
- Paper selected by the American Physical Society for online publication showcase in the *Virtual Journal of Biological Physics Research*, which focuses on frontier research
  - "Feasibility studies of a passive scatter proton therapy nozzle without a range modulator wheel," originally published in *Medical Physics* 35, 2243 (2008)
- Physics National Honors Society (Sigma Pi Sigma)
- Presentation Award; Hot Quarks 2004 Workshop
- Brookhaven Mentor Service Award
- NARCE Poster Presentation Award

- USDA (Civil Rights Department) Certificate of Appreciation Service Award

## GRANT FUNDING

Principal Investigator, Secondary Neutron Exposures in Pediatric Proton Radiotherapy, National Institutes of Health F32, 2008

Co-Investigator, Faculty Support for Developing Radiation Dosimetry Research in Health Physics using Monte Carlo Techniques at Texas Southern University, Nuclear Regulatory Commission HR-FN-1009-NED02, 2010

Principal Investigator, Medical Health Physics Scholarship Program at Texas Southern University, U.S. Nuclear Regulatory Commission NRC-HQ-84-14-FOA-0003, 2014

Co-Investigator, Unified Approach to Increase STEM Undergraduate Students Employment in the Department of the Navy, Office of Naval Research ONR FOA 14-002, 2014

Principal Investigator, Medical Health Physics Scholarship Program at Texas Southern University, U.S. Nuclear Regulatory Commission NRC-HQ-84-16-FOA-0001, 2016

Co-Investigator, Undergraduate Peer-Mentor Project-Based Program in STEM at Texas Southern University, National Science Foundation HRD-1719318, 2017

Principal Investigator, Contract – Texas Southern University, Texas Commission on Environmental Quality (TCEQ) 582-20-10298, 2019

Co-Investigator, HBCU Collision Collaboration – J/psi Peripheral Collision Analysis and Detection, National Science Foundation EiR-1901420, 2019

## SKILLS

C, C++, Perl, FORTRAN, ROOT data analysis package, statistical data analysis, analytical problem solving, numerical computer simulation (Monte Carlo) programming, Geant4, MCNPX, Physics Analysis Workstation (PAW++), UNIX/Linux, Windows XP, Microsoft Office, Latex

## SEMINARS, TALKS AND POSTER PRESENTATIONS

- The American Physical Society
- The National Society of Black Physicists
- The APS Division of Nuclear Physics
- Quark Matter 2004; Hot Quarks 2004
- Health Physics Society
- American Association of Physicists in Medicine

## JOURNAL REVIEWER

Reviewer, Physics in Medicine and Biology, 2009 – present

## SELECTED REFEREED PUBLICATIONS

### Health Physics

Ozain-Porterie, A.M., Quach, T., **Harvey, M.C.**, "Measurement of the Background Gamma Dose Rates in Houston, Texas: A Descriptive Summary of an Undergraduate Research Mentored Project Performed by Students Underrepresented in the Health Physics Profession" *Health Phys.* 115(6) 787 (2018).

### Medical Physics

Taddei, P. J., Mahajan, A., Mirkovic, D., Zhang, R., Geibeler, A., Kornguth, D., **Harvey, M.**, Woo, S., Newhauser, W.D., "Predicted risks of second malignant neoplasm incidence and mortality due to secondary neutrons in a girl and boy receiving proton craniospinal irradiation" *Phys. Med. Biol.* **55** 7067 (2010).

**Harvey, M. C.**, Polf, J. C., Smith, A. R., Mohan, R., "Feasibility Studies of a Passive Scatter Proton Therapy Nozzle without a Range Modulator Wheel" *Med. Phys.*, **35**, (2008).

Polf, J. C., **Harvey, M. C.**, Titt, U., Newhauser, W. D. and Smith, A. R., "Initial Beam Size Study for Passive Scatter Proton Therapy – Part I: Monte Carlo Verification" *Med. Phys.*, **34**, (2007).

Polf, J. C., **Harvey, M.C.**, and Smith, A.R., "Initial Beam Size Study for Passive Scatter Proton Therapy – Part II: Changes in Delivered Depth Dose Profiles" *Med. Phys.*, **34**, (2007).

### Relativistic Heavy Ion Physics

Measurement of transverse single-spin asymmetries for mid-rapidity production of neutral pions and charged hadrons in polarized p+p collisions at  $\sqrt{s} = 200$  GeV. By PHENIX Collaboration (S.S. Adler et al.). *Phys. Rev. Lett.* 95, (2005).

Mid-rapidity direct-photon production in p+p collisions at  $\sqrt{s} = 200$  GeV. By PHENIX Collaboration (S.S. Adler et al.). *Phys. Rev. D* 71, (2005).

Formation of dense partonic matter in relativistic nucleus-nucleus collisions at RHIC: Experimental evaluation by the PHENIX collaboration. PHENIX Collaboration (K. Adcox et al.) *Nucl.Phys. A* 757 (2005) 184-283

Bose-Einstein Correlations of Charged Pion Pairs in Au + Au Collisions at  $\sqrt{s_{NN}} = 200$  GeV. By PHENIX Collaboration (S.S. Adler et al.). *Phys. Rev. Lett.* 93, (2004).

Measurement of Non-Random Event-by-Event Fluctuations of Average Transverse Momentum in  $\sqrt{s_{NN}} = 200$  GeV Au+Au and p+p Collisions, (S. Adler, et al.). *Phys. Rev. Lett.* 93, (2004).

Absence of Suppression in Particle Production at Large Transverse Momentum in  $\sqrt{s_{NN}} = 200$  GeV d+Au Collisions, S.S. Adler et al., *Phys. Rev. Lett.* 91, (2003).

Scaling properties of proton and anti-proton production in  $\sqrt{s_{NN}} = 200$  GeV Au+Au collisions, S.S. Adler et al., Phys. Rev. Lett 91, (2003).

### **Electromagnetic Physics**

Measurements of Electron Proton Elastic Cross-Sections for  $0.4 < Q^2 < 5.5$  (GeV/c)<sup>2</sup>. By Jefferson Lab E94110 Collaboration (M.E. Christy et al.). Phys. Rev. C 70, 015206 (2004)

Measurement of the Electric Form-Factor of the Neutron at  $Q^2 = 0.5$ -GeV<sup>2</sup>/c<sup>2</sup> AND  $1.0$ -GeV<sup>2</sup>/c<sup>2</sup>. By Jefferson Lab E93-026 Collaboration (G. Warren et al.). Phys. Rev. Lett. 92, 042301, (2004).

High Resolution Spectroscopy of the B-12( $\lambda$ ) Hypernucleus Produced by the (e, e-prime K+) Reaction. By HNSS Collaboration (T. Miyoshi et al.). Phys. Rev. Lett., 90, 232502, (2003).

Spin-Dependent Electron Proton Scattering in the Delta-Excitation Region. (L.D. van Buuren et al). Phys. Rev. Lett., 89, 012001, (2002).

Spin Momentum Correlation in Quasielastic Electron Scattering from Deuterium. (I. Passchier et al.). Phys. Rev. Lett. 88, 102302 (2002).

Experiments with Longitudinally Polarized Electrons in a Storage Ring Using a Siberian Snake. (H.R. Poolman et al.). Phys. Rev. Lett. 84, (2000)

Recoil Detection with a Polarized He-3 Target. (D.W. Higinbotham et. al). Nucl. Instrum. Meth. A444, (2000).

### **ABSTRACTS**

1. Harvey, Mark, NIKHEF experiment 94-05 Collaboration. 1998. Asymmetries in Inclusive Scattering of Electrons from Polarized Helium 3. Abstract for poster presentation, National Alliance of Research Centers of Excellence (NARCE), NARCE Conference, Mayaguez, Puerto Rico.
2. Harvey, Mark, NIKHEF experiment 94-05 Collaboration. 1999. Inclusive Scattering of Polarized Electrons from Polarized Helium 3. Abstract for platform presentation, American Physical Society (APS) Century of Physics, Atlanta, GA.
3. Harvey, Mark, NIKHEF experiment 94-05 Collaboration. 1999. Measurement of the Transverse Asymmetry in the Inclusive Quasielastic Scattering of Polarized Electrons from Polarized Helium 3. Abstract for platform presentation, APS Division of Nuclear Physics, Fall Meeting, Asilomar, CA.
4. Harvey, Mark, NIKHEF experiment 94-05 Collaboration. 2001. Inclusive Scattering of Electrons from Polarized Helium 3. Abstract for platform presentation, Brookhaven National Laboratory, Postdoctoral Interview, Upton, NY.

5. Harvey, Mark, NIKHEF experiment 94-05 Collaboration. 2001. Inclusive Scattering of Electrons from Polarized Helium 3. Abstract for platform presentation, Stony Brook University, Postdoctoral Interview, Stony Brook, NY.
6. Harvey, Mark, PHENIX Collaboration. 2002. Identified Charged Hadrons in Polarized p+p Collisions at RHIC. Abstract for platform presentation, APS Division of Nuclear Physics, Fall Meeting, East Lansing, MI.
7. Harvey, Mark, PHENIX Collaboration. 2003. Particle Spectra of Identified Charged Hadrons from p+p Collisions at RHIC. Abstract for platform presentation, American Physical Society, Spring Meeting, Philadelphia, PA.
8. Harvey, Mark, PHENIX Collaboration. 2003. Transverse Momentum Spectra and Yield Ratios of Identified Charged Hadrons in p+p Collisions at RHIC. Abstract for platform presentation, APS Division of Nuclear Physics, Fall Meeting, Tucson, AZ.
9. Harvey, Mark, PHENIX Collaboration. 2004. Identified Charged Hadrons at Midrapidity in p-p Collisions at RHIC. Abstract for poster presentation, The Seventeenth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions (Quark Matter 2004), Oakland, CA.
10. Harvey, Mark, PHENIX Collaboration. 2004. Identified Charged Hadrons in p-p Collisions at RHIC. Abstract for platform presentation, 2004 Annual Conference of the National Society of Black Physicists and Black Physics Students Joint Meeting with the National Society of Hispanic Physicists, Washington, DC.
11. Harvey, Mark, PHENIX Collaboration. 2004. Measurement of Invariant Differential Cross Sections and Ratios of Identified Charged Hadrons in p-p Collisions at RHIC. Abstract for platform presentation, Workshop for Young Scientist on the Physics of Ultra-Relativistic Nucleus-Nucleus Collisions, Taos Valley, NM.
12. Harvey, Mark, PHENIX Collaboration. 2005. Measurement of Invariant Differential Cross Sections of Identified Charged Hadrons in p-p Collisions at RHIC. Abstract for platform presentation, Rochester Institute of Technology Physics Department Seminar Series, Rochester, NY.
13. Harvey, Mark, Jerimy C. Polf, Alfred R. Smith. 2007. Dose Delivery Variations in Passively Scattered Proton Beams due to Changes in Beam Size. Abstract for platform presentation, 2007 Annual Conference of the National Society of Black Physicists and Black Physics Students Joint Meeting with the National Society of Hispanic Physicists, Boston, MA.
14. Harvey, Mark, Jerimy C. Polf, Radhe Mohan. 2007. Feasibility of a Treatment Nozzle without a Range Modulator Wheel using the Passive Scattering Technique. Abstract submitted for poster presentation, 49<sup>th</sup> Annual Meeting of The American Association of Physicists in Medicine (July 22-26, 2007), Minneapolis, MN.
15. Harvey, Mark, Phillip J. Taddei, Dragan Mirkovic, Wayne D. Newhauser. 2009. Therapeutic Absorbed Dose and Secondary Neutron Production in Proton Therapy. Abstract for platform presentation, University of Arizona Department of Radiation Oncology Seminar, Tucson, AZ.



16. Harvey, Mark, Phillip J. Taddei, Dragan Mirkovic, Wayne D. Newhauser. 2009. Stray Neutron Radiation in Proton Therapy. Abstract for platform presentation, University of Texas Radiation Physics Department Medical Physics Seminar, Houston, TX.
17. Harvey, Mark, Phillip J. Taddei, Dragan Mirkovic, Wayne D. Newhauser. 2009. Nuclear Model Evaluation of Uncertainties in Therapeutic Absorbed Dose and Secondary Neutron Production in Proton Radiotherapy using MCNPX. Abstract submitted for platform presentation, 51<sup>st</sup> Annual Meeting of The American Association of Physicists in Medicine (July 26-30, 2009), Anaheim, CA.
18. Harvey, Mark, Steve Avery, Paul Gueye. 2012. Calculations of the Therapeutic Absorbed Dose and Secondary Neutron Production in Proton Therapy Using the Geant4 Monte Carlo Toolkit. Abstract submitted for platform presentation, 57<sup>th</sup> Annual Meeting of the Health Physics Society in Sacramento, California (July 22 – 26, 2012)
19. Harvey, Mark, Julianne Pollard, Zhifei Wen, Song Gao. 2013. Measurement of Secondary Neutrons Produced in the (gamma, n) Reaction From the TrueBeam Linac Head. Abstract submitted for poster presentation, 55<sup>th</sup> Annual Meeting of The American Association of Physicists in Medicine (August 4-8, 2013), Indianapolis, IN.
20. Harvey, Mark, Julianne Pollard, Zhifei Wen, Song Gao. 2014. Measurement of the Neutron Ambient Dose Equivalent from the TrueBeam Linac Head and Varian 2100 Clinac. Abstract submitted for poster presentation, 56<sup>th</sup> Annual Meeting of The American Association of Physicists in Medicine (July 20-24, 2014), Austin, TX.
21. Harvey, Mark, Zayne Belal. 2015. Proton and Alpha-Particle Transport in Water at the Cellular Level using Monte Carlo Techniques. Abstract submitted for platform presentation, Department of Mechanical Engineering, Nuclear Engineering Teaching Lab, (February 13, 2015), The University of Texas, Austin, TX.
22. Harvey, Mark, Zayne Belal. 2015. Proton and Alpha Particle Transport in Water at the Cellular Level using Monte Carlo Techniques. Abstract submitted for platform presentation, 60<sup>th</sup> Annual Meeting of the Health Physics Society, (July 12 – 16, 2015), Indianapolis, IN.
23. Harvey, Mark. 2015. Health Physics Program and Research at Texas Southern University. Platform presentation, South Texas Chapter of the Health Physics Society Affiliate's Fair, (September 19, 2015), San Antonio, TX.
24. Harvey, Mark, Zayne Belal. 2016. Proton and Alpha-Particle Transport in Water at the Cellular Level using Monte Carlo Techniques. Abstract submitted for platform presentation, Department of Physics, (March 8, 2016), University of Houston, Houston, TX.
25. Harvey, Mark, Zayne Belal. 2017. Secondary Neutron Production in Proton Radiotherapy using Monte Carlo Techniques, (April 17, 2017), University of Houston – Clear Lake, Clear Lake City, TX.

## ACADEMIC/RESEARCH INTEREST

- medical health physics & environmental health physics
- scatter gamma radiation dose rate and spectroscopy production at NSLS-II
- radiation biology
- radiochemistry
- particle production of identified charged hadrons in p+p collisions
- resonance particle production in p+p collisions
- J/psi particle production in ultra-peripheral collisions
- magnetic and electric form factors'; asymmetry measurements
- polarized electron beam-fixed target experiments
- pion, kaon and proton electro-production
- nuclear magnetic resonance

## PROFESSIONAL AFFILIATIONS

Member, National Society of Black Physicists, 2002 – present

Member, American Physical Society, 1998 – 1999, 2003 – present

Member, Health Physics Society, 2010 – present

Member, American Association of Physicists in Medicine, 2009 – present

Committee member – Minority Recruitment Subcommittee of American Association of Physicists in Medicine, 2005 – 2011