

## Rodney D. Wiersma, Ph.D.

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Department of Radiation and Cellular Oncology  
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### ACADEMIC APPOINTMENTS

2011 - Assistant Professor, Department of Radiation and Cellular Oncology, University of Chicago, IL  
2009 - 2011 Instructor, Department of Radiation and Cellular Oncology, University of Chicago, IL  
2009 - Committee on Medical Physics, The University of Chicago, IL

### TRAINING

2006 - 2008 Stanford University, Stanford, USA  
*Postdoctoral Scholar* in Medical Physics  
*Supervisor:* Prof. Lei Xing  
2002 - 2006 Max-Planck-Institute for Solid State Research, Stuttgart, Germany  
*Doctor of Philosophy* in Physics  
*Thesis:* Investigations of the  $vT=1$  Exciton Superfluidic State in 2D Electron Bilayer Systems  
*Supervisor:* Prof. Klaus von Klitzing (Nobel Laureate 1985)  
1999 - 2002 Simon Fraser University, Vancouver, Canada  
*Master of Science* in Physics  
*Thesis:* Carbon Doping of GaSb  
*Supervisor:* Prof. Simon P. Watkins  
1995 - 2002 University of Alberta, Edmonton, Canada  
*Bachelor of Science with Honors* in Physics

### CERTIFICATION

2010 - American Board of Radiology (DABR) in Therapeutic Radiologic Physics  
2009 - State of Illinois IEMA Division of Nuclear Safety

### SCHOLARSHIP

#### Book chapter publications

- 1) **Rodney D. Wiersma**, Nadeem Riaz, and Lei Xing, Real-Time Imaging for Radiation Therapy Guidance, in *Biomedical Mathematics: Promising Directions in Imaging, Therapy Planning, and Inverse Problems*, Yair Censor, Ming Jiang, and Ge Wang (editors), Medical Physics Publishing, p509–542, 2010.

#### Peer-reviewed publications in the primary literature

- 1) Grelewicz, Z. and **Wiersma, R. D.**, Combined MV+kV inverse treatment planning for optimal kV dose incorporation in IGRT, **MEDICAL PHYSICS**, submitted
- 2) Xinmin Liu, PhD, Andrew H. Belcher, BS, Zachary Grelewicz, BS, **Rodney D. Wiersma, PhD**, Robotic real-time translational and rotational head motion correction during frameless stereotactic radiosurgery, **International Journal of Radiation Oncology \* Biology \* Physics**, submitted
- 3) Bradley P. McCabe and **Rodney D. Wiersma**, Respiratory gating quality assurance: a simple method to achieve millisecond temporal resolution, **MEDICAL PHYSICS**, submitted
- 4) Andrew Belcher, Xinmin Liu, Zachary Grelewicz, Erik Pearson, and **Rodney Wiersma**, Development of a real-time 6DOF robotic motion phantom for radiation therapy, **MEDICAL PHYSICS**, accepted
- 5) Grelewicz, Z. and **Wiersma, R. D.**, Combined MV+kV inverse treatment planning for optimal kV dose incorporation in IGRT, **Phys. Med. Biol.**, 59 (7), 1607-21, (2014)
- 6) **Rodney D. Wiersma**, S. L. Tomarken, Zachary Grelewicz, Andrew H. Belcher, and Hyejoo Kang, Spatial and temporal performance of 3D optical surface imaging for real-time head position tracking, **MEDICAL PHYSICS** 40 (11), 111712 (2013)
- 7) Kang, H. J.; Grelewicz, Z.; **Wiersma, R. D.**, Development of an automated region of interest selection method for 3D surface monitoring of head motion, **MEDICAL PHYSICS** Volume: 39 Issue: 6 Pages: 3270-3282 (2012)
- 8) Li, Ji; **Wiersma, Rodney D.**; Stepaniak, Christopher J.; et al., Improvements in dose accuracy delivered with static-MLC IMRT on an integrated linear accelerator control system, **MEDICAL PHYSICS** Volume: 39 Issue: 5 Pages: 2456-2462 (2012)
- 9) Grelewicz, Zachary; Kang, Hyejoo; **Wiersma, Rodney D.**, An EPID based method for performing high accuracy calibration between an optical external marker tracking device and the LINAC reference frame, **MEDICAL PHYSICS** 39 (5), 2771-2779 (2012)
- 10) Liu, Wu; **Wiersma, Rodney D.**; Xing, Lei, Optimized Hybrid Megavoltage-Kilovoltage Imaging Protocol for Volumetric Prostate Arc Therapy, **International Journal of Radiation Oncology \* Biology \* Physics**, Volume: 78 (2), 595-604, (2010)
- 11) **Rodney D. Wiersma**, Zhifei Wen, Meredith Sadinski, Karl Farrey and Kamil Yenice, Development of a frameless stereotactic radiosurgery system based on real-time 6D position monitoring and adaptive head motion compensation, **Phys. Med. Biol.**, 55 (2), 389-401, (2010)
- 12) Weihua Mao, Annie Hsu, Nadeem Riaz, Louis Lee, **Rodney Wiersma**, Gary Luxton, Christopher King, Lei Xing, Timothy Solberg, Image-Guided Radiotherapy in Near Real Time With Intensity-Modulated Radiotherapy Megavoltage Treatment Beam Imaging, **International Journal of Radiation Oncology \* Biology \* Physics**, 75 (2), 603-610, (2009)
- 13) Nadeem Riaz, Piyush Shanker, **Rodney Wiersma**, Olafur Gudmundsson, Weihua Mao, Bernard Widrow and Lei Xing, Predicting respiratory tumor motion with multi dimensional adaptive filters and support vector regression, **Phys. Med. Biol.**, 54 (19), 5735-5748, (2009)
- 14) **Wiersma R. D.**, Riaz N, Dieterich S, Suh Y, Xing L., Use of MV and kV imager correlation for maintaining continuous real-time 3D internal marker tracking during beam interruptions, **Phys Med Biol.**, 54 (1), 89-103 (2009)
- 15) Liu W, **Wiersma R. D.**, Mao W, Luxton G, Xing L., Real-time 3D internal marker tracking during arc radiotherapy by the use of combined MV-kV imaging, **Phys Med Biol.**, 53 (24), 7197-213 (2008)
- 16) Mao W, Riaz N, Lee L, Wiersma R. D., Xing L., A fiducial detection algorithm for real-time image guided IMRT based on simultaneous MV and kV imaging, **Med Phys.**, 35 (8), 3554-64 (2008)
- 17) Mao W, **Wiersma R. D.**, Xing L., Fast internal marker tracking algorithm for onboard MV and kV imaging systems, **Med Phys.**, 35 (5), 1942-9 (2008)
- 18) **R. D. Wiersma**, W. Mao, and L. Xing, Combined kV and MV imaging for real-time tracking of implanted fiducial markers, **Med. Phys.**, 35 (4), 1191-1198 (2008)

- 19) **Wiersma, R. D.**; Lok, JCS; Tiemann, L, W. Dietsche, K. von Klitzing. Investigations of the  $\nu(T)=1$  exciton condensate, **INTERNATIONAL JOURNAL OF MODERN PHYSICS B**, (21), 1256-1265 (2007)
- 20) **R. D. Wiersma** and L. Xing, Examination of Geometric and Dosimetric Accuracies of Gated Step-and-Shoot Intensity Modulated Radiation Therapy, **Med. Phys.**, 34 (10), 3962 - 3970 (2007)
- 21) **R. D. Wiersma**, J. G. S. Lok, L. Tiemann, W. Dietsche, K. von Klitzing, D. Schuh, M., W. Wegscheider, Investigations of the  $\nu T=1$  exciton condensate, **Physica E-Low Dimensional Systems & Nanostructures**, 35 (2), 320-326, (2006)
- 22) **R. D. Wiersma**, J. G. S. Lok, W. Dietsche, K. von Klitzing, D. Schuh, M. Bichler, H. -P. Tranitz, and W. Wegscheider, Role of density imbalance in the  $\nu T=1$  exciton condensate state for electron bilayer systems, **Physica Status Solidi**, 243, No. 14, (2006)
- 23) **R. D. Wiersma**, J. G. S. Lok, S. Kraus, W. Dietsche, K. von Klitzing, et al., Activated Transport in the  $\nu T=1$  Exciton Condensate at Balanced and Imbalanced Densities Measured in Drag and Counter-flow Configuration, **Physica E**, 34 (1-2): 16-21, (2006)
- 24) **R. D. Wiersma**, J. G. S. Lok, S. Kraus, W. Dietsche, K. von Klitzing, D. Schuh, M. Bichler, H. - P. Tranitz, and W. Wegscheider, Activated Transport in the Separate Layers that form the  $\nu T=1$  Exciton Condensate, **Physical Review Letters**, 93, 266805 (2004)
- 25) **R. D. Wiersma**, J. A. H. Stotz, C. X. Wang, M. L. W. Thewalt, and S. P. Watkins, Electrical and optical properties of carbon doped GaSb, **Physical Review B**, 67, 165202 (2003)
- 26) S. P. Watkins, **R. D. Wiersma**, C. X. Wang, O. J. Pitts, and C. R. Bolognesi, Structural Effects of Carbon in GaSb Grown by Metalorganic Vapor Phase Epitaxy, **Journal of Crystal Growth** (2003)
- 27) X. K. Chen, **R. D. Wiersma**, C. X. Wang, O. J. Pitts, C. Dale, C. R. Bolognesi, S. P. Watkins, Local vibrational mode of carbon in GaSb and GaAsSb, **Applied Physics Letters**, 80, 1942 (2002)
- 28) **R. D. Wiersma**, J. A. H. Stotz, O. J. Pitts, C. X. Wang, M. L. W. Thewalt, and S. P. Watkins, P-type carbon doping of GaSb, **Journal of Electrical Materials**, 30, 1429 (2001)

## Invited talks

- 1) **Cloud Based TG142 QA**, Department of Radiation Oncology, Stanford University, Palo Alto, 2014
- 2) **Frameless SRS based on Robotic Head Motion Cancellation**, key note speaker at AAPM Midwest Chapter Meeting, Northwest Community Hospital, Arlington Heights, 2013
- 3) **Dynamically Adaptive kV Aperture for Low Dose Real-Time Prostate Motion Tracking during Radiation Therapy by Combined MV-kV Imaging**, Cancer Research Foundation, Chicago, 2011
- 4) **A Frameless Stereotactic Radiosurgery System Based On Real-Time 6D Position Monitoring and Adaptive Head Motion Compensation**, Varian Medical Systems, Palo Alto, 2011
- 5) **Fluoroscopy**, Refresher Course, RSNA, Chicago, 2010
- 6) **Development of a frameless stereotactic radiosurgery system based on real-time 6D position monitoring and adaptive head motion compensation**, Department of Radiation Oncology, UCSD, San Deigo, 2010
- 7) **Treating a Moving Target Under the Guidance of Hybrid kV and MV Imaging**, AAPM, Philadelphia, PA, 2010
- 8) **MV+kV Internal Motion TRacking**, Department of Radiation Oncology, UCSD, San Deigo, USA, 2008
- 9) **Real-time Tracking of Implanted Fiducial Markers using Combined Onboard kV Fluoroscopy and MV EPID Imaging**, ASTRO, Boston, USA, 2008

- 10) **Managing intra-fraction organ motion I: 4D CT and IGRT treatment planning**, Stanford IGRT Short Course, Stanford University, Stanford, 2008
- 11) **Precision of Gated Step-and-Shoot Intensity Modulated Radiation Therapy**, Visiting Professor Research Symposium, Stanford University, Stanford, 2007
- 12) **Investigations of the  $v_T=1$  Exciton Condensate and Possible Novel Devices**, 14<sup>th</sup> International Winterschool on New Developments in Solid State Physics, Mauterndorf, Austria, 2006
- 13) **Activated Transport in the Separate Layers that form the  $v=1$  Exciton Condensate**, Electronic Properties of Two-Dimensional System 16 (EP2DS-16), Albuquerque, New Mexico, 2005

### Conference Oral Presentations

- 1) **Development of a 4DOF Robotic Frameless SRS System for Both Translational and Rotational Head Motion Cancellation**, AAPM, Indianapolis, Indiana, 2013
- 2) **A Frameless Stereotactic Radiosurgery System Based On Real-Time 6D Position Monitoring and Adaptive Head Motion Compensation**, Faculty Lecture Series, Dept. of Radiation and Cellular Oncology, The University of Chicago, Chicago, 2010
- 3) **Development of a Gated Frameless Stereotactic Radiosurgery/Radiotherapy System with Real-Time 3D Position Monitoring and Adaptive Head Motion Compensation**, International Conference of Computers in Radiation Therapy, Amsterdam, 2010
- 4) **Development of a Dynamic KV Collimator for Low Diagnostic Dose Real-Time 3D Motion Tracking During Radiation Therapy by Combined MV-KV Imaging**, AAPM, Anaheim, 2009
- 5) **Real-Time Tracking of Implanted Fiducial Markers Using Combined MV and kV Imaging Marker Tracking**, AAPM, Houston, 2008
- 6) **Dosimetric Consequences of Electronic Delay on Gated Radiation Therapy**, ASTRO, Los Angeles, 2007
- 7) **Dosimetric Precision of Gated Step-and-Shoot Intensity Modulated Radiation Therapy**, AAPM, Minneapolis, 2007
- 8) **Temporal Precision of Gated Step-and-Shoot Intensity Modulated Radiation Therapy**, AAPM, Minneapolis, 2007
- 9) **P-type Carbon Doping of GaSb**, Pacific Center for Advanced Materials and Microstructures (PCAMM) Conference, Simon Fraser University, Burnaby, 2001
- 10) **P-type Carbon Doping of GaSb**, Canadian Association of Physics Meeting, University of Victoria, Victoria, 2001

### Conference Oral Presentations by Wiersma Lab members

- 1) **Optimal Feedback Control with Feed Forward for a Robotic 4D Stage in Frameless Stereotactic Radiosurgery**, X Liu, AAPM, Austin, TX, 2014
- 2) **Development and Evaluation of a Real-Time Robotic 6D Quality Assurance Phantom**, A. Belcher, AAPM, Austin, TX, 2014
- 3) **Quality Assurance and Imaging Dose in IGRT Procedures**, E. Pearson, AAPM, Indianapolis, Indiana, 2013
- 4) **KV OBI Spectroscopy: Measurement Vs Monte Carlo Simulation**, Z. Grelewicz, AAPM, Indianapolis, Indiana, 2013
- 5) **Combined MV+kV Beam Optimization for Enabling Real-Time KV Tumor Tracking**, Z. Grelewicz, AAPM, Indianapolis, Indiana, 2013
- 6) **An Automated Optimal ROI Discovery Method for Real-Time 3D Surface Image Monitoring of Head Motion**, H.J. Kang, AAPM/COMP, Vancouver, 2011

- 7) **An EPID Based Method for High Accuracy Calibration of An Optical External Marker Tracking Device with the LINAC Reference Frame**, Z Grelewicz, AAPM/COMP, Vancouver, 2011
- 8) **Development of a Gated Frameless Stereotactic Radiosurgery/Radiotherapy System with Real-Time 3D Position Monitoring and Adaptive Head Motion Compensation**, Z. Wen, ASTRO, Chicago, 2009
- 9) **A Feasibility Study On Frameless Gated Head Stereotactic Radiosurgery/Radiotherapy Via Real-Time Optical Position Monitoring and Adaptive Head Motion Compensation**, Z. Wen, AAPM, Anaheim, 2009

## Posters by Wiersma Lab members

- 1) **Combining CBCT Dose Into IMRT Treatment Planning**, Z. Grelewicz, AAPM, Austin, TX, 2014
- 2) **Respiratory Gating Quality Assurance: A Simple Method to Achieve Millisecond Temporal Resolution**, B. McCabe, AAPM, Austin, TX, 2014
- 3) **A Novel Sub-Pixel MTF Calculation Algorithm for Arbitrarily Shaped QA Phantoms**, A. Sibley, AAPM, Austin, TX, 2014
- 4) **Simulation and Design of a Real-Time 6D Head Motion Compensation Platform Based On a Stewart Platform Approach**, A. Belcher, AAPM, Charlotte, 2012
- 5) **The Use of a Proportional-Integral-Derivative Design for Optimized Real-Time Head Motion Correction in Frameless SRS**, J Rosenfield, AAPM/COMP, Vancouver, 2011
- 6) **The Effect of Breathing Motion On the Delivery of Linac-Based Intensity Modulated Total Marrow Irradiation (IM-TMI)**, M Surucu, AAPM/COMP, Vancouver, 2011
- 7) **The Use of a Proportional-Integral-Derivative Design for Optimized Real-Time Head Motion Correction in Frameless SRS**, J Rosenfield, AAPM/COMP, Vancouver, 2011
- 8) **Investigation of Combined MV-KV Prostate Treatment Dose Planning for Real-Time MV-KV IGRT**, Z Grelewicz, AAPM 2010, Philadelphia, PA

## PATENTS

### Granted

Title: ***3D real-time tracking of human anatomy using combined kV and MV imaging***

Inventors: Rodney D. Wiersma, Weihua Mao, Lei Xing

Number: United States Patent Application 20090208074

Status: Licenced to Varian Medical Systems, Palo Alto, USA

### Pending

Title: **Systems and Methods for Radiation Treatment Planning Using Combined Imaging and Treatment Dose**

Inventors: Rodney D. Wiersma and Zachary Grelewicz

Agents: Quarler & Brady LLP, 148385.00008

Status: Under review

Title: **Using a Moving Imaging System to Monitor Anatomical Position as a Function of Time**

Inventors: Wu Liu, Rodney D. Wiersma, Nadeem Raiz, Jing Wang, Lei Xing

Agents: LUMEN PATENT FIRM, PALO ALTO, CA US

Status: Under review Appl. No.: 12/802952

## **IRB**

### **Granted**

Title: **Real-Time Head Position Stabilization of Healthy Volunteers**

Principal Investigator: Rodney D. Wiersma

Protocol Number: IRB14-0535

Status: Under review

### **Pending**

Title: **Real-Time Head Position Monitoring of Patients Undergoing Radiation Therapy**

Principal Investigator: Rodney D. Wiersma

Protocol Number: IRB14-0040

Status: Granted and collecting clinical data

## **FUNDING**

### **Current**

American Cancer Society (ACS) Research Scholar Grant (RSG)

PI: Wiersma – 25% effort

“Frameless SRS Based on Robotic Motion Cancellation”

11/01/2013 – 11/30/2017, \$720,000

Department Start-up Grant

PI: Wiersma

01/01/2009 – present, \$125,000

### **Past**

Cancer Research Foundation

PI: Wiersma – 10% effort

“Real-Time Tracking of Implanted Markers during Radiation Treatment by Use of Simultaneous kV and MV imaging”

01/01/2011 – 31/12/2011, \$75,000

Department of Defense Prostate Cancer Training Award

PI: Wiersma – 100% effort

“*Real-Time Tracking of Implanted Markers during Radiation Treatment by Use of Simultaneous kV and MV imaging*”

02/01/08 - 12/01/08, \$125,000

## **HONORS**

- |                |   |
|----------------|---|
| 2014           | Feature article on Medical Physics Web, “Combined MV/kV planning enables real-time tracking”.   |
| 2010 -<br>2010 | American Cancer Society grant reviewer for Epidemiology and Clinical Research<br>Feature article on Medical Physics Web, “Stereotactic Radiosurgery: Losing the Frame”. |
| 2007           | ASTRO travel award  |
| 2004           | Selected to attend 54th Nobel Laureates Meeting in Lindau, Germany  |
| 2002 - 2006    | Deutsche Promotionstipendium (German PhD Scholarship)   |
| 2002           | SFU graduate research award   |

1996 - 1999 Alberta Rutherford Scholarship for undergraduate studies

## PROFESSIONAL ACTIVITIES

2014 **Abstract Reviewer**, 2014 AAPM Meeting, Austin, TX  
2014 - **Journal Reviewer**, Diseases of the Esophagus  
2013 **Abstract Reviewer**, 2013 AAPM Meeting, Indianapolis, TX  
2013 **Book Reviewer**, Princeton University Press, Princeton, NJ  
2012 **Abstract Reviewer**, 2012 AAPM Meeting, Charlotte, NC  
2010-2014 **Grant Reviewer**, Epidemiology and Clinical Research, American Cancer Society  
2010 **Moderator**, AAPM Meeting, Philadelphia, PA  
2010 **Abstract Reviewer**, 2010 AAPM Meeting, Philadelphia, PA  
2009 - **Journal Reviewer**, Journal of Applied Clinical Medical Physics  
2009 - **Journal Reviewer**, International Journal of Radiation Oncology-Biology-Physics  
2009 - **Journal Reviewer**, Transactions on Biomedical Engineering  
2008 - **Associate Editor**, Medical Physics  
2009 - **Journal Reviewer**, Physics in Medicine and Biology  
2007 - **Journal Reviewer**, Physica E-Low Dimensional Systems & Nanostructures  
2006 - **Member**, American Association of Physicists in Medicine (AAPM)  
2000 - **Member**, American Physics Society (APS)

## TEACHING

### The college (B.A., B.S.)

2009 - BIOS 29326, **Introduction to Medical Physics**. An advanced undergraduate course for physics majors in their 3<sup>rd</sup> or 4<sup>th</sup> years. 4-5 x 1.5 hour lectures, spring quarter

### Graduate programs (Ph.D.)

2009 - MPHY 35100, **Physics of Radiation Therapy**. A first year core graduate course for students in the graduate program for medical physics. 3 x 1.5 hour lectures, winter quarter

### Graduate medical education (residency and clinical fellowships)

2009 - Incoming Resident Summer Course. Lectures on IMRT optimization and IGRT. 2 x 2-hour lectures, summer quarter

### Students, postdocs residents directly supervised

2013 - **Adam Sibley**, medical physics graduate student, research rotation with ongoing research work, resulted in a presentation at AAPM 2014.  
2013 - 2014 **Bradley McCabe**, medical physics resident, research study on temporal RT gating delay, work submitted to the journal of Med Phys, presently a medical physicist at the University of Chicago.  
2013 - 2014 **David Grossman**, computer science undergraduate, 1 quarter lab assistant  
2013 - 2014 **Mahajabin Rahman**, Undergraduate, Physics, part-time lab assistant  
2013 - **Abdul Mroue**, medical physics certificate student, research on GPU MC simulation on image analysis algorithms, presently UChicago medical physics resident.  
2013 - **Xinmin Liu**, current postdoctoral scholar.  
2013 - **Andrew Belcher**, medical physics graduate student, primary PhD thesis advisor.  
2012 - 2013 **Charles Guo**, math undergraduate student, lab programming assistant.  
2011 - 2012 **Spencer Tomarken**, physics undergraduate summer student, presently MIT physics graduate student.

- 2010 - 2011 **Hyejoo Kang**, postdoctoral scholar, presently a medical physicist at the University of Chicago.
- 2009 - **Zachary Grelewicz**, medical physics graduate student, primary PhD thesis advisor
- 2009 - 2011 **Mederdith Sadinski**, physics undergraduate student, was her honors B.Sc. thesis advisor, presently University of Chicago medical physics graduate student.
- 2009 - 2011 **Zhifei Wen**, medical physics resident, research study on real-time SRS head motion correction, presently faculty MD Anderson.

## **CLINICAL**

- 2014 - Provide medical physics coverage for the University of Illinois Chicago (UIC).
- 2014 - Perform HDR procedures. One of two authorized medical physicists on UC faculty.
- 2012 - Designed, implemented, and manage TG142 quality assurance.
- 2012 - Created a cloud based quality assurance software system.
- 2009 - Conduct CT and Linac commissioning and quality assurance.