

Dr. Mária Martišíková

Group: **Novel Detection Techniques for Ion Beams** (E0406)
at the German Cancer Research Center (DKFZ) in Heidelberg
Group leader

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Research Field **Medical Physics / Ion Beam Radiotherapy**

Aim: Improvement of the precision and efficiency of ion beam radiotherapy.

Research Focus Connection of the highly precise ion radiotherapy with novel radiation detection techniques: Research and development of radiation measurement methods, exploiting the possibilities of novel 2D radiation detectors:

- ▶ **Radiochromic films** (EBT)
- ▶ **Semiconductor-based detectors**: -diagnostic X-ray imagers (flat-panel / EPID)
- Timepix detector developed at CERN

Research Topics

- Development of **quality assurance measurement methods** for ion beams: enhancing speed and spatial resolution
- Ion Radiography: **Imaging with ion beams**, as a novel high resolution modality for image-guided radiotherapy
- **In-vivo visualization of ion beam** in the treated patient by means of secondary charged particles
- Investigations of **nuclear interactions** of ion beams with matter – development of a particle identification method

Methods developed within the research projects are continuously transferred to the clinical practice at the Heidelberg Ion-Beam Therapy facility in Heidelberg - the first European clinical facility for external beam treatments with both, protons and heavier ions.

Education and Career Path

- 1993 - 1997 **Gymnasium** in Bratislava, Slovakia
Graduation with distinction
- 1997 – 2002 **Study of physics:** Comenius University in Bratislava, Slovakia
Specialization: Nuclear and Particle physics
Diploma thesis: "Time-projection chamber for particle tracking and identification at ALICE experiment" (in Slovak)
Graduation with distinction
- 2002 – 2005 **PhD studies:** Hamburg University, Germany
Field: Particle physics; Experiment: H1 at DESY in Hamburg, Germany
Topic: "Jet Shapes in Charm Photoproduction at HERA"
- 2006 **Postdoctoral researcher** at the 'Deutsches Elektronen SYnchrotron' (DESY, Hamburg, Germany);
- 2007 – 2012 **Postdoctoral researcher** at the German Cancer Research Center (DKFZ), Heidelberg, Germany; Division Medical Physics in Radiation Oncology, Group "Heavy Ion Therapy Project";
- 2012 - 2016 **Postdoctoral researcher** at the Heidelberg University Hospital, Germany; Division of Radiation Oncology and Radiation Therapy; Bridge working group "Medical Physics in Ion Beam Radiotherapy"
- since 2016 **Group leader** at the German Cancer Research Center (DKFZ), Germany; Division of Medical Physics in Radiation Oncology – permanent contract

Prizes / Awards / Honors

- 2006 Admission to the competitive "**Intramural Postdoc Program**" of the DKFZ
- 2009 **500 downloads the article** "Analysis of uncertainties in Gafchromic EBT film dosimetry of photon beams" by M. Martišíková & O. Jäkel published in *Physics in Medicine and Biology* → belongs to the 3 % of most accessed articles among all IOP Journals in the first 1/2-year of 2009
- 2010 **Young Scientist Award** - The Best Oral Presentation at the International Conference on Solid State Dosimetry in Sydney, Australia
- 2012 Admission to the '**Olympia Morata Program**' within the framework of the Excellence Initiative of the Heidelberg University, Germany
- 2013 Awarded as one of the **Top 20 Referees** (from 1283 active referees) of the journal *Physics in Medicine and Biology* in 2012
- 2013 Klaus-Georg und Sigrid Hengstberger **Prize for Young Scientists** of the Heidelberg University
- 2015 Offer of a **professorship at the University of Stockholm** (associated professor for medical physics), declined
- 2016 Application for a **W3-professorship for Medical Physics** at the Medical Faculty Heidelberg, Heidelberg University: "secundo loco"

Research grantsTotal amount of more than **799,450 Euro**

- 2006 Functional MR Microscopy by diffusion (PI);
Funded by the **German Academic Exchange Service (DAAD)**
- 2006 Clinical implementation of new methods for dosimetry in radiation therapy with heavy ion beams - investigations of radiochromic films (PI);
Funded by the **Intramural Funding Programme of the German Cancer Research Center**
- 2007 Continuation (PI)
- 2008 Development and clinical implementation of new methods for dosimetry in radiation therapy with heavy ion beams - investigations of a flat-panel detector (PI);
Funded by the **German Research Foundation (DFG)**
- 2010 Continuation (PI)
- 2012 New High Precision Detection Techniques for Ion Radiotherapy - investigation of the Timepix detector for dosimetry and ion radiography (PI);
Funded by the **Olympia Morata Program of the University of Heidelberg**
- 2012 Ion spectroscopy for improvement of the physical beam model for therapy planning in ion beam therapy (PI);
Funded by the **German Cancer Aid**
- 2012 Travel Grant;
Funded by the **German Academic Exchange Service**
- 2012 Ion radiography for motion detection (responsible for this project part);
Funded by the **German Research Foundation (DFG)** as a part of the Clinical Research Group "Heavy Ion Therapy" (KFO 214)
- 2013 Prize for young researchers of the Heidelberg University
Funded by the **Hengstberger Foundation**
- 2014 - 2016 Bonus program "Third Party Funding" by the **Heidelberg University Hospital**

Publications**Printed**

- 22 publications in journals with peer-review
- 11 publications as the first author, 5 as the last author
- In total more than 210 citations by other authors

Participation in conferences

- More than 75 conference contributions
- 35 of them as "presenting author"
- 25 oral presentations, including the following invited:

Invited Presentations

- 2009 International Summer School on Nuclear Physics Methods and Accelerators in Biology and Medicine, Bratislava, Slovakia
- 2011 9th Latin American Symposium on Nuclear Physics and Applications, Quito, Ecuador
- 2011 13th Conference on Astroparticle, Particle, Space Physics and Detectors for Physics Applications, Como, Italy
- 2012 11th International Conference on Nucleus-Nucleus Collisions, San Antonio, Texas, USA
- 2012 Physics Colloquium of the Technical University in Dortmund, Germany
- 2013 Colloquium of the Physics Faculty, Technical University of Dortmund, Germany
- 2013 Heraeus-Workshop "Development of High-Resolution Pixel Detectors and their Use in Science and Society", Bad Honef, Germany
- 2013 Workshop on Physics Instrumentation for Cancer Diagnostics and Cancer Therapy, Heidelberg, Germany

Peer-review commitment more than 50 review reports for the following journals:

Medical Physics

Physics in Medicine and Biology: **awarded as one of the Top 20 referees in 2012**

International Journal of Radiation Oncology Biology Physics

Scientific Reports - Nature

Radiotherapy and Oncology

Physica Medica - European Journal of Medical Physics

Nuclear Instruments and Methods in Physics Research A

American Institute of Physics

Radiation Oncology

Zeitschrift für Medizinische Physik

Radiation Measurements

Journal of Radiation Research

Radiation Physics and Chemistry

Measurement Science and Technology

Review of Scientific Instruments

Radiation Protection Dosimetry

European Physical Journal – Applied Physics

Membership in committees

- 2009 Member of the abstract evaluation committee at the "International Summer School on Nuclear Physics Methods and Accelerators in Biology and Medicine" in Bratislava, Slovakia
- 2011 Member of the abstract evaluation committee at the "Latin American Symposium on Nuclear Physics Applications" in Quito, Ecuador
- 2013 and 2015 Member of the selection committee of the "International PhD-Program" of the German Cancer Research Center;

1. and 2. round; respectively

- 2014 Scientific chair and main organizer of the symposium „Precision, Speed and Flexibility: New Radiation Detection Methods for Ion Beam Radiotherapy“ with about 60 participants
- 2015 Member of the abstract review committee for the “World Congress on Medical Physics and Biomedical Engineering”, Toronto, Canada
- 2015-2016 Head of the organizing committee for the “2. Heidelberg Symposium on Ion Beam Radiotherapy” in Heidelberg, Germany;
- 2016 Member of the appointment committee for a W3-professorship for translational surgical oncology at the National Center for Tumor Diseases (NCT) in Dresden, Germany

Student supervision

PhD-theses

Julia Telsemeyer: ”Investigation of an amorphous silicon detector for ion radiography”

Bernadette Hartmann: ”Ion spectroscopy for ion beam therapy using a pixelized semiconductor detector”

Giulia Arico: ”Ion spectroscopy for improvement of the physical beam model for therapy planning in ion beam therapy”

Tim Gehrke: “Ion radiography for target motion monitoring in ion beam radiotherapy ”

Master and Diploma theses

Bernadette Hartmann: ”Quality assurance in heavy ion therapy – investigations towards new detectors”

Lucas Huber: ”Patient positioning by ion radiography”

Klaus Gwosch: ”Non-invasive monitoring of carbon ion beam therapy by tracking of secondary ions - an initial study”

Juan Carlos Leal: “Flat-panel detector for exit beam monitoring in carbon ion radiotherapy”

Merle Reinhart: ”Measurement of secondary tracking yield and 3D reconstruction of beam image in ion beam radiotherapy”

Tanja Gaa: ”Detection of material inhomogeneities by measurement of secondary ions in carbon ion radiotherapy”

Kathrin Spindeldreier: “Enhanced studies of energy loss, fragmentation and beam monitoring in therapeutic ion beams”

Raya Gallas: “Experimental determination of helium ion fragmentation at therapeutic energies”

Simon Berke: “Investigation of the Detector Response of a Timepix Detector in Therapeutic Ion Beams”

Bachelor theses

Jan-Eric Meissner: ”Untersuchung zur Auswertung von EBT2-Filmen nach Photonen- und Ionenbestrahlung”

Sonja Schellhammer: ”Ion spectroscopy in proton beams”

Prizes awarded to students under my supervision

- 2010 Julia Engelke: PTCOG Young Fellow Travel Award – to Chiba, Japan
- 2010 Julia Engelke: EPI2kx Young Investigator Award + invitation for a talk to Leuven, Belgium
- 2010 Julia Engelke: IEEE MIC Trainee Award – Travel support to Knoxville, USA
- 2011 Julia Engelke: Travel stipend of the DAAD to AAPM in Vancouver, Canada
- 2012 Julia Telsemeyer: EPI2kx Student Award, Sydney, Australia
- 2012 Bernadette Hartmann: Travel stipend of the DAAD to AAPM in Charlotte, NC, USA
- 2012 Bernadette Hartmann: IEEE NSS Travel stipend to Anaheim, CA, USA
- 2012 Bernadette Hartmann: First prize IEEE NSS "Student Paper Award", Anaheim, CA, USA
- 2013 Giulia Arico: PTCOG Young Fellow Travel Award – Travel stipend to Essen
- 2013 Bernadette Hartmann: Travel stipend of the University in Heidelberg to PTCOG in Essen
- 2014 Kathrin Spindeldreier: PTCOG Young Fellow Travel Award – Travel award to Shanghai, China
- 2014 Giulia Arico: Stipend of more than 8 000 € for a 5-months scientific stay in the National Institute of Radiological Sciences awarded by the „Japan Society for Promotion of Science“
- 2015 Tim Gehrke: Travel support to ESTRO Course "Ion Radiotherapy" in Paris from „Verein zur Förderung der Tumorthherapie mit schweren Ionen“
- 2015 Tim Gehrke: IEEE MIC travel support to San Diego, CA, USA
- 2015 Merle Reinhart: Christoph-Schmelzer Preis 2015 for Master Thesis
- 2016 Tim Gehrke: PTCOG Young Fellow Travel Award – Travel stipend to Prague
- 2016 Raya Gallas: Otto-Haxel Award for the best Master thesis in experimental physics in summer term 2016, Faculty of Physics and Astronomy, Heidelberg University

Acronyms:	PTCOG	Particle Therapy Co-operative Group (organizes the most important conference in the field of ion radiotherapy)
	EPI2kx	International Workshop on Portal Imaging
	IEEE	Institute of Electrical and Electronics Engineers (the world's largest professional association for advancement of technology)
	MIC	Medical Imaging Conference
	NSS	Nuclear Science Symposium
	AAPM	American Association of Physicists in Medicine
	ESTRO	European Society for Radiotherapy and Oncology