

CV – PROF. MICHAEL FRIEBE

(Age: 52, married, 2 children age 20+22)



Current Position

Endowed Professor of Catheter Technologies + Image Guided Surgery („verbeamtet“) at the Otto-von-Guericke-University (OVGU) in Magdeburg, Germany (www.ovgu.de/friebe + www.inka-md.de + www.friebelab.org).

Education

- “Abitur”, 1984, Technisches Gymnasium Pforzheim, Grade “1.7”
- **Dipl.-Ing.**, Electrical Engineering, 1988, Duale HS Stuttgart, Germany – B.Sc. equivalent, Grade “Gut”
- **Master of Science**, Technology Management, 1992, Golden Gate University, San Francisco, GPA 3.85 (of 4)
- **Master of Science**, Brewing and Distilling Technology, 2016, Heriot Watt University, Edinburgh, A-
- **Doctor rer. medic.** Medical Physics, 1995, University of Witten, Germany – PhD equivalent, Grade “cum laude” – Thesis Topic: “*Ortsauflösende Temperaturmessung im Niedrigfeld- und Hochfeld Kernspintomographen ...*”

Work Experience

- 1984-1985: Military Service 1. ABC Abw. Btl. 750, Bruchsal, Germany, Priv. 3rd Cl.
- 1985-1988: Student Fellow at IBM Research Laboratories in Böblingen, Germany
- 1988-1993: Magnetic Resonance Imaging R&D and Project Engineer / Product Manager in San Francisco, USA at University of California San Francisco and TOSHIBA MRI Inc. in South San Francisco, responsible product manager for an interventional MRI system
- 1993: Returned to Germany and founded NEUROMED AG, which became the largest independent radiology / Imaging services provider in Central Europe (50 empl., € 15 Mio. Rev.)
- 2001: Sale of NEUROMED AG to UMS AG, continued as CEO Central Europe for UMS (150 empl. € 35 Mio Rev.)
- 2003: Started TOMOVATION GmbH, investment / development and trading company in Medical Imaging (TOMOgraphy + InnoVATION), sold in 2008 to ALLIANCE Medical, Inc., Warwick UK, continued as Managing Director and CEO Central Europe till 2011 (1.500 empl., € 400 Mio Rev.)
- since 2011-2014: CEO of IDTM GmbH, Management and Innovation Consultant, Industry Fellow TUM-IAS and affiliated Professor TU München
- *since Dec. 2014, professor of catheter technologies and image guided therapies at the OVGU in Magdeburg, Germany (www.inka-md.de). Grew the chair from 4 to 20 employees in 30 month. Annual Budget approx. € 1 Mio. 31 invention disclosures plus additionally over € 1,75 Mio. in additional funding acquired. Since 01/2015 over 100 publications, currently 17 PhD students, 3 Post-Docs and 10 ongoing MSc. thesis students (completed 31 MSc. thesis).*

Additional Assignments

- Former board member of US publicly traded companies (INTRAOPMEDICAL, Inc.; BIOPHAN, Inc., Mobile PET Systems, Inc.)
- Former board member of ECKERT&ZIEGLER BEGIG AG, Berlin (www.ezag.de)
- Currently Vice-Chairman of SURGICEYE GmbH (Munich - www.surgiceye.com) and on the advisory board of 4 Medical Technology Start-Up companies (Munich - www.micro-dimensions.de, Vienna - www.piurimaging.com, Cologne - www.desino.de, Bochum - www.innotom.com)
- Board of Advisors to unternehmerTUM (<http://www.unternehmertum.de>), München (TU München) and to the Technologie- und Gründerzentrums OVGU (<http://www.tugz.ovgu.de>), Magdeburg

Awards

- 2006: Introduced in the „Business Angel Heaven of Fame“
- 2011: Elected Germany's BUSINESS ANGEL OF THE YEAR 2011 (<http://www.business-angels.de/dr-michael-friebe/>)
- 2013: Rudolf-Diesel-Industry-Fellow of the TU München (TUM Institute of Advanced Studies – www.tum-ias.de) and Professor affiliated with the TUM chair for Computer Aided Medical Procedures (TUM-CAMP) <http://campar.in.tum.de/Main/MichaelFriebe>
- 2014: TeachInfAward TUM Faculty of Informatics for the Best Lecture (Translational Technology Entrepreneurship) <https://www.in.tum.de/forschung/auszeichnungen/detail/newsarticle/teachinfaward-der-fachschaft-informatik-verliehen-im-rahmen-des-absolventenfestes-2014.html>
- 2014: Honorary Professor of Bioengineering at the Misr (Egypt) University of Science and Technology (www.must.edu.eg)
- 2017: Appointed member of the Medical Faculty of the Otto-von-Guericke-University
- IEEE EMBS Distinguished Lecturer for 2016/2017 (<http://www.embs.org/about-embs/awards-recognition/distinguished-lecturers-program/distinguished-lecturers/>)
- Hugo Junkers Price 2017 – Basic Research – https://www.hugo-junkers-preis.de/fileadmin/user_upload/PM_HJP_Preisverleihung_2017_final.pdf

Patents+ Publications

- >75 Patent-Applications, Utilitypatents, non-disclosed Inventions (https://www.researchgate.net/profile/Michael_Friebe/publications?pubType=patent) – see separate section in this document
- >150 Publications – https://www.researchgate.net/profile/Michael_Friebe – see separate section in this document
- Regular speaker on Medical Technology Innovation, Innovation Generation, Entrepreneurship, Start-Up Investments, Graduate Education

Invited scientific Lectures since 01/2016

- German-Egyptian Peer Expert Symposium on Healthcare “Ressource Management and Health Technology Assessment”, Conrad Hotel, Cairo April 26 invited by DAAD
- IEEE EMBS Turkey, Istanbul, Acibadem University, May 7 2016, “Innovation Generation Approaches for valuable medical technology products”,
- IEEE EMBS NL, June 13 2016, “Should ‘cheap’ and ‘easy to use’ be the most important value propositions for medical technology developments?”
- QUT IHBI, Brisbane, July 2016, “Innovation Generation Approaches for valuable Medical Technology Product Developments and the path to Entrepreneurship – Pitfalls and Opportunities”
- Indian Institute of Technology, Delhi + Karagphur, “Reverse Innovation for Medical Product Design”, February 2017
- BMSC College, Bangalore, “Exponential Technologies and their Implications for Medical Technology Products”, February 2017
- University of Manitoba, Winnipeg, Canada, “Design Strategies for MedTec Disruption”, May 2017 – IEEE EMBS Biomedical Conference
- Vanderbilt University, Nashville Tennessee, “Intraoperative Radiation Therapy”, VUSE Laboratories of Prof. Robert Webster, May 2017
- Johns Hopkins University, Baltimore, LCSR community, invited by Prof. Emad Boctor, “How to avoid developing the wrong MedTec products - revisit value propositions”, May 2017
- Jordan University of Science and Technology (JUST), Irbid, invited by the IEEE EMBS chapter of Jordan, “Exponential Healthcare Innovation and their impact and present development strategies”, August 2017
- ARABHEALTH, Biomedical Engineering Conference, January 2018, invited by the organizers and IEEE, Keynote on Reverse Medical Innovations – <https://www.arabhealthonline.com/ahcongress/en/Home/biomedeng.html>
- IEEE Middle East Conference March 2018, Tunis – <http://mecbme.ieee.tn>

Miscellaneous

- DAAD Visiting Professor Grant for MISR / CAIRO University (Feb./Mar. 2016), Queensland University of Technology Brisbane (2017/2018)
- Lead several ZIM and industry sponsored research projects
- Organiser and Chair of the 5th European BME IDEA conference, June 2017, Magdeburg, www.healthcare-innovation.de
- Reviewer for scientific peer-reviewed Journals (Physica Medica, MITAT, Medical Devices: Evidence and Research, Reports in Medical Imaging, Journal of Nuclearmedicine and Radiation Therapy, Biomedical Engineering Journal; MAGMA; Innovation and Entrepreneurship in Healthcare, International Journal of Computer Assisted Radiology and Surgery)
- Member of IEEE EMBS, ISMRM, RSNA, SMIT, CARS, ISCAS
- Hobbies: swimming, walking + climbing, nature, family

LIST OF UNIVERSITY COURSES TAUGHT

- **MSC: INSTRUMENTS FOR IMAGE GUIDED SURGERIES** at OVGU, 4 SWS, 6 ECTS, graduate engineering students (every winter semester), Biomedical Materials, Biomedical Compatibility, Therapy Tools, ...
- **MSC: INNOVATION GENERATION FOR THE HEALTHCARE DOMAIN**, OVGU and TUM, 4 SWS, 6 ECTS, graduate engineering students (every summer semester at OVGU) – TUM lecture at <http://campar.in.tum.de/Chair/TeachingWs15IGEHD>
- **MSC: IMAGE GUIDED SURGERIES: FROM BENCH TO BEDSIDE AND BACK TO BENCH**, OVGU and TUM, 4 SWS, 6 ECTS, graduate engineering students (every winter semester at OVGU) – TUM lecture at <http://campar.in.tum.de/Chair/TeachingSs15ImageGuidedSurgeries>
- **MSC: TRANSLATIONAL TECHNOLOGY ENTREPRENEURSHIP**, OVGU and TUM, 2 SWS, 5 ECTS, graduate engineering Students and PhD Students (every 4 semester in the summer) – <http://campar.in.tum.de/Chair/TeachingSs14TransTecEnt>
- **BSC: MEDICAL TECHNOLOGY DEVELOPMENT AND REGULATORY ISSUES**, OVGU, 2 SWS, 3 ECTS, undergraduate medical technology students, every winter semester starting WS 2016/2017.

Descriptive statement on teaching strategy and philosophy

Please see the enclosed journal paper (Image guided surgery with graduate students - a new lecture format. *Michael Friebe*, Jörg Traub. Current Directions in Biomedical Engineering. Volume 1, Issue 1, Pages 475-479, ISSN (Online) 2364-5504, DOI: [10.1515/cdbme-2015-0114](https://doi.org/10.1515/cdbme-2015-0114), May 2016) as an example for excellence in teaching and Innovation Generation through students and as an additional statement on the teaching and research strategy.

In Image Guided Surgeries (IGS), incremental innovation is normally not a technology push (technology delivered) but rather a pull (by learning and working with the clinical users) from understanding how these surgeries are performed. Engineers need to understand that only through proper observation, procedure know-how and subsequent analysis and evaluation, clinically relevant innovation can be generated. And, it is also essential to understand the associated health economics that could potentially come with new technological approaches. We created a new lecture format (6 ECTS) for graduate students that combined the basics of image guided procedures with innovation tools (Design Thinking, Lean Engineering, Value Proposition Canvas, Innovation Games) and actual visits of a surgical procedure. The students had to attend these procedures in small groups and had to identify and work on one or more innovation projects based on their observations and based on a prioritisation of medical need, pains and gains of the stakeholders, and ease of implementation. Almost 200 graduate students completed this training in the past 5 years with excellent results for the participating clinicians, and for the future engineers. This paper presents the lecture content, the setup, some statistics and results with the hope that other institutions will follow to offer similar programs that not only help the engineering students identify what clinically relevant innovation is (invention x clinical implementation), but that also pave the path for future interdisciplinary teams that will lead to incremental and disruptive innovation.

PUBLICATION LIST

Also see <http://www.inka-md.de/?Publications> for the chair publications since 2015

BOOKS

1. Michael Friebe (2017). *International Healthcare Vision 2037. New Technologies, Educational Goals and Entrepreneurial Challenges*. Edited by Michael Friebe, 09/2017; Otto-von-Guericke-Universität, Magdeburg, Germany., ISBN: 978-3-944722-59-7, DOI: <https://doi.org/10.24352/UB.OVGU-2017-76>
2. Michael Friebe (2017). *Instruments for Image Guided Procedures - IIGP — Book 2. Review summaries for minimal invasive and image guided technologies and clinical procedures..* Edited by Michael Friebe, 03/2017; Otto-von-Guericke-Universität, Magdeburg, Germany., ISBN: 978-3-944722-55-9, DOI: <https://doi.org/10.24352/UB.OVGU-2017-018>. Available for download <http://edoc2.bibliothek.uni-halle.de/hs/download/pdf/66210?originalFilename=true>
3. Michael Friebe (2016). *Instruments for Image Guided Procedures - IIGP. Review summaries for minimal invasive and image guided technologies and clinical procedures.* Edited by Michael Friebe, 04/2016; Otto-von-Guericke-Universität, Magdeburg, Germany., ISBN: 978-3-944722-37-5, DOI: <https://doi.org/10.24352/UB.OVGU-2017-017>. Available for download <http://edoc2.bibliothek.uni-halle.de/hs/id/55874>

BOOK CHAPTERS

1. Michael Friebe (2012). *Start-Up Investments im Medizintechnik-Bereich*. Leitfaden für Business Angels, 1. Auflage edited by Günther U., Kirchof R., 03/2012: chapter Start-up Investments im Medizintechnik-Bereich – Für welchen Business Angel ist diese Branche geeignet – und für wen nicht?; GoingPublic Media AG., ISBN: 978-3-943021-33-2
2. Michael Friebe (2000). *Medtec Zertifizierung und Servicekomponenten*. Praxishandbuch Technischer Kundendienst, Edited by Breunig L., 03/2000: chapter Medtec Zertifizierung und Servicekomponenten; WEKA media., ISBN: 978-3-8111-4544-3

JOURNAL PUBLICATIONS

Currently there are 8 journal papers in review or press.

1. Friebe, M. (2017). *Exponential Technologies + Reverse Innovation = Solution for Future Healthcare Issues? What Does It Mean for University Education and Entrepreneurial Opportunities?* Open Journal of Business and Management, 5, 458-469. <https://doi.org/10.4236/ojbm.2017.53039>
2. P. Poudel, A. Illanes, C. Arens, C. Hansen, M. Friebe (2017). *Active contours extension and similarity indicators for improved 3D segmentation of thyroid ultrasound images*. In SPIE Medical Imaging, Orlando, Florida, United States, February 2017. International Society for Optics and Photonics. DOI: <https://doi.org/10.1117/12.2254029>
3. Axel Boese, Akhil K. Sivankutty, Alfredo Illanes, Michael Friebe (2017). *Intravascular endoscopy improvement through narrow-band imaging*. Int J CARS 2017. DOI: <https://doi.org/10.1007/s11548-017-1579-4>
4. T. Wunderling, B. Gollaa, P. Poudel, C. Arens, M. Friebe, C. Hansen (2017). *Comparison of thyroid segmentation techniques for 3D ultrasound*. In SPIE Medical Imaging, Orlando, Florida, United States,

February 2017. International Society for Optics and Photonics. DOI: <https://doi.org/10.1117/12.2254234>

5. Michael Friebe (2017). *Healthcare Translation and Entrepreneurial Training in and for Egypt -- Case Study and Potential Impact Analysis*. Open Journal of Business and Management, 5: 51--62. 2017. DOI: <https://doi.org/10.4236/ojbm.2017.51005>
6. Michael Friebe (2016). *Computed tomography and magnetic resonance imaging contrast media injectors: Technical feature review - What is really needed?* Medical Devices: Evidence and Research 07/2016; 2016(9). DOI: <https://doi.org/10.2147/MDER.S106338>
7. Fredrick Johnson Joseph, Alexander van Oepen, Michael Friebe (2016). *Breast sentinel lymph node biopsy with imaging towards minimally invasive surgery*. Biomedical Engineering. DOI: <https://doi.org/10.1515/bmt-2016-0164>
8. Franziska Schulz, Michael Friebe (2016). *SIRT and Its Unresolved Problems—Is Imaging the Solution? A Review*. Journal of Cancer Therapy 07/2016; 2016(7). DOI: <https://doi.org/10.4236/jct.2016.77054>
9. Thomas Gerlach, Michael Friebe (2016). *Image guided laryngoscopy versus laryngectomy surgery: Patient safety and system review*. Cogent Engineering, 2016, S. , ISSN 2331-1916, DOI: <https://doi.org/10.1080/23311916.2016.1256563>
10. Alexander van Oepen, Axel Boese, Michael Friebe (2016). *Imaging of 188Re filled double-balloon for β -radiation therapy with handheld, tracked gamma camera/ultrasound hybrid - a feasibility trial*. International Journal of Computer Assisted Radiology and Surgery 06/2016; 2016(11 (Suppl 1)).
11. Michael Friebe, Jörg Traub (2015). *Image guided surgery innovation with graduate students - a new lecture format*. 09/2015; 1(1). DOI: <https://doi.org/10.1515/cdbme-2015-0114>
12. Axel Boese, Georg Rose, Michael Friebe, Thomas Hoffmann, Steven Serowy, Martin Skalej, W. Mailänder, G. Cattaneo (2015). *Increasing the visibility of thin NITINOL vascular implants*. 09/2015; 1(1). DOI: <https://doi.org/10.1515/cdbme-2015-0120>
13. Martin Horn, Stefan Paepke, E. Klein, Thomas Wendler, Michael Friebe (2015). *Hybrid interventional imaging for non-surgical sentinel lymph node staging*. International Journal of Computer Assisted Radiology and Surgery 06/2015; 10(1).
14. Axel Boese, Philipp Huendorf, Oliver Buck, Michael Friebe (2015). *Prototype Shielded Balloon Catheter For Interventional Rhenium-188 Radiation Therapy During Handheld SPECT/US Hybrid Imaging/Biopsy Procedure*. International Journal of Computer Assisted Radiology and Surgery 06/2015; 10(1).
15. Axel Boese, Thomas Hoffmann, Martin Skalej, Michael Friebe, Oliver Beuing (2015). *Changing the stiffness of vascular catheters intra interventional*. Interventional Neuroradiology 01/2015; Volume 21(Supplement 1 2015).
16. Michael Friebe, Philipp Matthies, Sung Oh Cho (2014). *Low Energy Radiation Therapy - feasibility of using a field emission miniature X-ray tube for intraoperative treatments under MRI guidance*. International Journal of Computer Assisted Radiology and Surgery 06/2014; 2014(9).
17. Philipp Matthies, Asli Okur, Thomas Wendler, Nassir Navab, Michael Friebe (2013). *Combination of intra-operative freehand SPECT imaging with MR images for guidance and navigation*. Conference proceedings: ... Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Conference 07/2013; 2013. DOI: <https://doi.org/10.1109/EMBC.2013.6610267>

- 18.S Bock, S Dahl, SP Tacke, M Schneider, A Hartmann, M Kramer, HW Henke, M Friebe, GA Krombach (2013). *Intramyokardiale Injektion im Schweinmodell zur Entwicklung eines MR-kompatiblen passiven Kathetersystems für die bildgesteuerte Therapie*. RöFo - Fortschritte auf dem Gebiet der R 04/2013; 185(S 01). DOI: <https://doi.org/10.1055/s-0033-1346619>
- 19.F Schoth, C Plumhans, N Kraemer, A Mahnken, M Friebe, R W Günther, G Krombach: *Evaluation of an Interactive Breath-Hold Control System in CT-Guided Lung Biopsy*. RöFo - Fortschritte auf dem Gebiet der R 02/2010; 182(6). DOI: <https://doi.org/10.1055/s-0029-1245141>
- 20.F Schoth, Y Temur, M Dadak, AH Mahnken, M Friebe, RW Günther, GA Krombach (2010). *Zeitersparnis beim Einsatz eines interaktiven Atemkontrollsystems bei der CT-gesteuerten Lungenbiopsie*. RöFo - Fortschritte auf dem Gebiet der R 04/2009; 181. DOI: <https://doi.org/10.1055/s-0029-1221378>
- 21.GA Krombach, A Perez-Bouza, M Wehner, T Plum, M Friebe, RW Günther, C Hohl (2009). *MRT geführte Angioplastie von Stenosen bei 3T: Verteilung Kontrastmittel-markierter Flüssigkeiten zur lokalen Prevention von Restenosen*. RöFo - Fortschritte auf dem Gebiet der R 04/2009; 181(S 01). DOI: <https://doi.org/10.1055/s-0029-1221564>
- 22.Gabriele A Krombach, Martin Wehner, Alberto Perez-Bouza, Linda Kaimann, Sylvia Kinzel, Thorsten Plum, Daniel Schibur, Michael Friebe, Rolf W Günther, Christian Hohl (2008). *Magnetic Resonance-Guided Angioplasty With Delivery of Contrast-Media Doped Solutions to the Vessel Wall: An Experimental Study in Swine*. Investigative radiology 07/2008; 43(7). DOI: <https://doi.org/10.1097/RLI.0b013e31817ee519>
- 23.GA Krombach, S Schmitz, M Friebe, T Plum, M Distelmaier, M Hellmann, RW Günther, C Hohl: (2008). *Interventionelle MRT bei 3 Tesla: Durchführbarkeit endovaskulärer Interventionen*. RöFo - Fortschritte auf dem Gebiet der R 01/2008; 180(S 1). DOI: <https://doi.org/10.1055/s-2008-1073817>
- 24.D Sachtler, M Friebe, U Jorczyk (2007). *Simulation des elektrischen Verhaltens MR-kompatibler Implantate unter Verwendung von PSpice*. RöFo - Fortschritte auf dem Gebiet der R 01/2007; 179. DOI: <https://doi.org/10.1055/s-2007-977002>
- 25.G. Schaefers, M. Friebe, A. Melzer (2005). *Status QUO: Standards for Mr Safety Testing and Labeling of Devices*. Europace 10/2005; 7. DOI: <https://doi.org/10.1016/j.eupc.2005.08.111>
- 26.E. Immel, J. Spillner, A. Melzer, G. Schaefers, T. Bertsch, G. Lorenz, M. Friebe (2005). *Visualization of intraluminal tissue in inductively coupled MR resonant stents*. Minimally Invasive Therapy & Allied Technologies 01/2005; 14(4).
- 27.D. Grönemeyer, RMM Seibel, A. Melzer, A. Schmidt, M. Deli, M. Friebe, M. Busch (1995). *Future of advanced guidance techniques by interventional CT and MRI*. Minimally Invasive Therapy & Allied Technologies 10/1995; 4(5-6-5-6). DOI: <https://doi.org/10.3109/13645709509152803>

PATENTS

plus 15 undisclosed inventions to be published, plus 25 international applications

1. Axel Boese, Michael Friebe, Holger Fritzsche. *RESEKTOSKOP MITBDREHMECHANISMUS*. Ref. No: DE 10 2015 122713, Year: 12/2015
2. Axel Boese, Michael Friebe. *CLIP ZUR BEHANDLUNG VON ANEURYSM UND ZUM VERSCHLUSS RÖHRENFÖRMIGER ANATOMISCHER STRUKTUREN..* Ref. No: DE 10 2015 121374, Year: 12/2015
3. Michael Friebe, Axel Boese, Johannes Krug: *GUIDEWIRE*. Ref. No: EP15167450, Year: 05/2015
4. Michael Friebe: *OPERATING TABLE*. Ref. No: WO2015150415, Year: 03/2015
5. Michael Friebe, Axel Boese. *ABLATION CATHETER*. Ref. No: EP15160031, Year: 03/2015
6. Michael Friebe, Axel Boese. *IN VIVO IMPLANT DIAGNOSTICS DEVICE*. Ref. No: EP15156186, Year: 02/2015
7. Michael Friebe, Stefan Hellwig. *INJECTION DEVICE*. Ref. No: WO2015121040, Year: 01/2015
8. Michael Friebe, Nassir Navab. *APPLICATOR AND RECEPTACLE FOR A RADIOACTIVE SOURCE FOR BRACHYTHERAPY*. Ref. No: WO2015040129, Year: 09/2014
9. Michael Friebe, Stefan Hellwig. *FERNÜBERWACHUNGSSYSTEM FÜR SUPRALEITENDE MAGNETSYSTEME*. Ref. No: DE 10 2014 008 734, Year: 06/2014
10. Michael Friebe. *OPERATIONSTISCH*. Ref. No: DE 10 2014 104 529, Year: 03/2014
11. Michael Friebe, Stefan Hellwig. *INJEKTIONSEINRICHTUNG*. Ref. No: DE 10 2014 101763, Year: 02/2014
12. N Navab, A Katouzian, R Ghotbi, C Hennersperger, Michael Friebe. *INTELLIGENT IMPLANTED HEALTH SENSING DEVICE AND ASSEMBLY*. Ref. No: US20150164372, Year: 07/2013
13. Michael Friebe, Nassir Navab. *APPLIKATOR UND DEPOT FÜR EINE RADIOACTIVE STRAHLENQUELLE ZUR BRACHYTHERAPIE*. Ref. No: DE 10 2013 110375, Year: 06/2013
14. Michael Friebe. *NAVIGATIONSAUFSATZ*. Ref. No: DE 10 2013 109486, Year: 05/2013
15. Michael Friebe. *APPLIKATOR FÜR DIE MAGNETRESONANZTOMOGTAPHIE*. Ref. No: DE 10 2013 109853, Year: 05/2013
16. Michael Friebe, Philipp Matthies. *HANDHELD HYBRID-, DIAGNOSE- UND NIEDERENERGIEBESTRAHKUNGSSYSTEM*. Ref. No: DE 10 2013 001989, Year: 02/2013
17. Michael Friebe, Jörg Traub, Thomas Wendler. *HYBRIDES BILDGEBUNGSSYSTEM FÜR INTRAOPERATIVE UND DIAGNOSTISCHE ANWENDUNGEN*. Ref. No: DE 10 2012 008765, Year: 05/2012
18. Michael Friebe, Hassan El-Azzazi, Isabella Geiger. *SYSTEM FÜR DIE GERIATRISCHE NOTFALL- UND VITALPARAMETERKOMMUNIKATION*. Ref. No: DE 10 2012 000769, Year: 05/2012
19. Michael Friebe. *MEDIKAMENTENINFUSOR FÜR DIE ANWENDUNG IN STARK MAGNETISCHEN FELDERN*. Ref. No: DE 10 2011 018604, Year: 05/2011
20. Michael Friebe, Gabrielle Krombach. *KATHETEREINRICHTUNG*. Ref. No: DE 10 2008 057255, Year: 02/2010
21. Michael Friebe, Gabrielle Krombach. *KATHETEREINRICHTUNG FÜR PERKUTANE EINGRIFFE*. Ref. No: DE 10 2008 019304, Year: 07/2009
22. Michael Friebe. *VERFAHREN UND SYSTEM ZUR VERSORGUNG EINES ABGESCHIRMTEN MEDIZINISCHEN BILDGEBUNGSRAUMES MIT ELEKTRISCHER ENERGIE*. Ref. No: DE 10 2007 001370, Year: 04/2009

23. Michael Friebe, Gabrielle Krombach. *CATHETER FOR USE IN MAGNETIC RESONANCE*. Ref. No: DE 10 2007 016674, Year: 10/2008
24. Michael Friebe, Paul Coenen, Ralf Jauster. *INFUSION TUBE FOR PUMPING DEVICE*. Ref. No: DE 10 2007 003609, Year: 12/2007
25. Michael Friebe, Oliver Schroer, Daniel Sachtler. *DATEN-ENERGIE HYBRIDLEITUNG FÜR DIE ANWENDUNG IN DER MRT*. Ref. No: DE 10 2007 021844, Year: 05/2007
26. Michael Friebe. *INTERFERENCE FIELD DETECTING METHOD FOR MRI SYSTEM*. Ref. No: DE 10 2006 024919, Year: 05/2006
27. Michael Friebe. *MRT SYSTEM*. Ref. No: DE 10 2006 006952, Year: 02/2006
28. Michael Friebe, Dietrich Baumgart. *STENT ZUM EINFÜHREN IN MENSCHLICHE KÖRPERHÖHLE*. Ref. No: DE 10 2005 052226, Year: 10/2005
29. Michael Friebe, Stefan Hellwig. *MAGNETIC RESONANCE TOMOGRAPH FOR CARRYING OUT A BIOPSY*. Ref. No: DE 10 2005 046077, Year: 04/2005
30. Michael Friebe, Martin Busch. *METHOD FOR ACQUISITION AND EVAKUATION OF DATA IN A NUCLEAR-SPIN TOMOGRAPH*. Ref. No: DE000004317028, Year: 11/1994
31. Michael Friebe, Dietrich Grönemeyer, Rainer Seibel. *EINRICHTUNG FÜR DIE MINIMAL INVASIVE THERAPIE UND MIKROTHERAPIE*. Ref. No: DE000004216983, Year: 12/1993

CONFERENCE PROCEEDINGS

1. Abdurahman, S.; Frysch, R.; Bismark, R.; Friebe, M.; Beuing, O.; and Rose, G. Beam hardening correction for bi-material objects using Grangeat-based consistency measure. In *Proc IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*, Atlanta, USA, October 2017.
2. Abdurahman, S.; Frysch, R.; Bismark, R.; Friebe, M.; Beuing, O.; and Rose, G. Strahlauhfärtungskorrektur mithilfe von Grangeat-Konsistenzbedingungen für Kegelstrahl-CT. In *52. Jahrestagung der Deutschen Gesellschaft für Neuroradiologie e.V.*, Köln, Deutschland, Oktober 2017.
3. AlMaatoq, M.; Boese, A.; and Friebe, M. Concept of a multilayer biopsy needle for magnetic resonance imaging interventions (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
4. Balakrishnan, S.; Poudel, P.; Menze, B.; Illanes, A.; and Friebe, M. Intra-operative fusion of MRI and Ultrasound using optical inside-out tracking of multiple virtual markers for thyroid interventions (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
5. Boese, A.; Akhil, K.; and Friebe, M. Evaluation and image quality comparison of ultra-thin fibre endoscopes (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
6. Boese, A.; and Friebe, M. SMARTSCOPE - portable, easy to use and cheap smartphone endoscopic system (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
7. Boese, A.; Sivankutty, A.; and Friebe, M. Can vascular endoscopy combined with narrow band imaging improve diagnostic (accepted). In *Proc of the 14th Congress of the World Federation of Interventional and Therapeutic Neuroradiology*, Budapest, Hungary, 2017.

8. Fritzsche, H.; Boese, A.; and Friebe, M. INNOLAB - Image guided surgery and therapy lab - Run by engineers at a university hospital for interdisciplinary and useful innovation with clinicians (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
9. Fuentealba, P.; Illanes, A.; and Ortmeier, F. Progressive Fetal Distress Estimation by Characterization of Fetal Heart Rate Decelerations Response Based on Signal Variability in Cardiotocographic Recordings (accepted). In *Proc IEEE Comput Cardiol*, Rennes, France, September 2017.
10. Haritopoulos, M.; Krug, J.; Illanes, A.; Friebe, M.; and Nandi, A. Cyclostationary Analysis of ECG Signals Acquired Inside an Ultra-High Field MRI Scanner (accepted). In *Proc EUSIPCO*, Kos, Greece, 2017.
11. Iftikhar, M.; Abdurahman, S.; Odenbach, R.; van Oepen, A.; and Friebe, M. Interventional limited angle CT concept (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
12. Illanes, A.; Abdurahman, S.; and Friebe, M. A novel algorithm for efficient detection and segmentation of metals for artefact reduction in computed tomography (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
13. Illanes, A.; Maldonado, I.; Boese, A.; and Friebe, M. Empirical mode decomposition and time varying modelling for carotid audio signal analysis (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
14. Illanes, A.; Schaufler, A.; Maldonado, I.; Boese, A.; and Friebe, M. Time-varying Acoustic Emission Characterization for Guidewire Coronary Artery Perforation Identification (accepted). In *Proc IEEE Comput Cardiol*, Rennes, France, September 2017.
15. Illanes, A.; Krug, J.; and Friebe, M. Towards an automatization of the ASTM-F2119 standard for MRI compatible needle artefact assessment (accepted). In *Proc ESMRMB*, pages Abstract xxx, Barcelona, Spain, October 2017.
16. Johns, J.; Fritzsche, H.; Boese, A.; and Friebe, M. Technical approaches to avoid air bubbles for improved patient safety during TURB (accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.
17. Krug, J.; Schmidt, M.; Rose, G.; and Friebe, M. A Database of Electrocardiogram Signals Acquired in Different Magnetic Resonance Imaging Scanners (accepted). In *Proc IEEE Comput Cardiol*, Rennes, France, September 2017.
18. Krug, J.; Goerlitz, M.; and Friebe, M. Position determination of biopsy needles in interventional MRI using spin echo images with inverted read out gradients (accepted). In *Proc ESMRMB*, pages Abstract 609, Barcelona, Spain, October 2017.
19. Krug, J.; Goerlitz, M.; and Friebe, M. Susceptibility determination using a portable 0.55T small-bore MRI system (accepted). In *Proc ESMRMB*, pages Abstract 608, Barcelona, Spain, October 2017.
20. Krug, J.; Beyer, J.; Illanes, A.; and Friebe, M. Failure prevention and detection of superconductive MRI cooling systems using vibration sensors (accepted). In *Proc ESMRMB*, pages Abstract 611, Barcelona, Spain, October 2017.
21. Landes, R.; Illanes, A.; van Oepen, A.; Goepfner, D.; Gollnick, H.; and Friebe, M. Differentiating PPIX from its precursors as a strategy for drug-light interval assessment in photodynamic therapy

(accepted). In *Book of abstracts 51st annual conference of the German Society for Biomedical Engineering*, Dresden, Germany, September 2017.

22. Maldonado, I.; Illanes, A.; Boese, A.; and Friebe, M. Characterization of a Carotid Distention Waveform from Audio Signals Acquired with a Stethoscope (accepted). In *Proc IEEE Comput Cardiol*, Rennes, France, September 2017.
23. Odenbach, R.; Chen, Y.; Sengupta, S.; Webster, R.; Barth, E.; and Friebe, M. 3D-printed Z-frame marker for MRI-guided interventions (accepted). In *Proc of CURAC*, Hannover, Germany, October 2017.
24. Ali, G.; Krug, J.; and Friebe, M. A four-electrode radiofrequency ablation system designed for more complex and tumor specific ablation patterns (accepted). In *Proc BioSpine 2017, 6th International Congress on Biotechnologies for Spinal Surgery*, Berlin, Germany, April 2017.
25. Balakrishnan, S.; and Friebe, M. Real-time MRI/US fusion using inside-out tracking of virtually generated markers (ORtoMVM) for hepatic interventional procedures (accepted). In *CARS 2017 Computer Assisted Radiology and Surgery*, Barcelona, Spain, June 2017.
26. Boese, A.; Johnson, F.; Ebert, T.; Pashazadeh, A.; Arens, C.; and Friebe, M. Trans-oral miniature X-ray radiation delivery system with endoscopic optical feedback (accepted). In *CARS 2017 Computer Assisted Radiology and Surgery*, Barcelona, Spain, June 2017.
27. Boese, A.; Sivankutty, A.; and Friebe, M. Intravascular Endoscopy Improvement through Narrow Band Imaging (accepted). In *CARS 2017 Computer Assisted Radiology and Surgery*, Barcelona, Spain, June 2017.
28. van Oepen, A.; Abdurahman, S.; and Friebe, M. Low-budget limited angle computed tomography device based on a miniaturized x-ray tube and stationary high-resolution flat panel detector (accepted). In *CARS 2017 Computer Assisted Radiology and Surgery*, Barcelona, Spain, June 2017.
29. Pashazadeh, A.; Illanes, A.; Johnson, F.; Boese, A.; and Friebe, M. Miniature CNT-based X-ray tube: Assessment for use in intraoperative radiation Therapy (accepted). In *CARS 2017 Computer Assisted Radiology and Surgery*, Barcelona, Spain, June 2017.
30. van Oepen, A.; Boese, A.; and Friebe, M. Imaging of ¹⁸⁸Re filled double-balloon for beta radiation therapy with handheld, tracked gamma camera/ultrasound hybrid - a feasibility trial. In *CARS 2016 Computer Assisted Radiology and Surgery*, Heidelberg, June 2016.
31. Abadi, H.; Krug, J.; Illanes, A.; and Friebe, M. Passive artifact behavior prediction of interventional tools in high-field MRI using a 0.55T portable benchtop MR scanner. In *Proc IEEE Eng Med Biol Soc*, Orlando, USA, 2016.
32. Abdurahman, S.; Frysich, R.; Bismark, R.; Friebe, M.; and Rose, G. Calibration Free Beam Hardening Correction Using Grangeat-Based Consistency Measure. In *Proc IEEE NSS/MIC Conference*, 2016.
33. Yeshaswini Nagaraj, Bjoern Menze, Michael Friebe. Evaluation of Novel Inside-Out approach for single slice US/ MRI fusion procedure in MRI suite. In *Society for Medical Innovation and Technology - SMIT*, Delft, The Netherlands; 10/2016
34. Robert Odenbach, Axel Boese, Michael Friebe. MRI-safe and remote-controlled micro-positionable instrument guidance device for image guided interventions. In *Society for Medical Innovation and Technology - SMIT*, Delft, The Netherlands; 10/2016

35. Alfredo Illanes, Axel Boese, Michael Friebe. Time varying spectral analysis of blood flow sounds acquired with a portable digital stethoscope connected to a smart phone. In *Society for Medical Innovation and Technology - SMIT*, Delft, The Netherlands; 10/2016
36. Michael Friebe, Axel Boese, Jörg Traub, Stefan Hellwig. Should 'cheap' and 'easy to use' be primary attributes for MedTec product developments? MRI Injector Example. In *Society for Medical Innovation and Technology - SMIT*, Delft, The Netherlands; 10/2016
37. Marwah Al-Maatoq, Johannes Krug, Michael Friebe. The tip is the key – RFA needle modification using PEEK for reduced susceptibility artifact in MRI. In *Society for Medical Innovation and Technology - SMIT*, Delft, The Netherlands; 10/2016
38. Alfredo Illanes, Johannes Krug, Michael Friebe. Agreements on the susceptibility artefacts assessment in MRI: a multi user study under consideration of the standard guidelines. *ESMRMB*, Vienna, Austria; 10/2016
39. Axel Boese, Michael Friebe. A simple system to create defined movements of objects in the MR scanner. *ESMRMB*, Vienna, Austria; 10/2016
40. Yeshaswini Nagaraj, Christian Benedicks, Philipp Matthies, Michael Friebe. Advanced Inside-Out tracking approach for real-time combination of MRI and US images in the radio-frequency shielded room using combination markers. *IEEE EMBS*, Orlando; 08/2016
41. Prabal Poudel, Christian Hansen, Julian Sprung, Michael Friebe. 3D Segmentation of Thyroid Ultrasound Images using Active Contours. *IEEE EMBS*, Orlando; 08/2016
42. Hamideh Abadi, Johannes Krug, Alfredo Illanes, Michael Friebe. Passive artifact behavior prediction of interventional tools in high-field MRI using a 0.55T portable benchtop MR scanner. *IEEE EMBS*, Orlando; 08/2016
43. Alfredo Illanes, Johannes Krug, Hamideh Abadi, Michael Friebe. Distortion indicator algorithm for simple artefact assessment of passive MRI markers. *IEEE EMBS*, Orlando; 08/2016
44. Axel Boese, Holger Fritzsche, Martin Schostak, Michael Friebe. Innovation mit und für den Mediziner am Beispiel der Urologie. *Kontroversen in der Urologie*, Magdeburg, Germany; 01/2016
45. Alexander van Oepen, Axel Boese, Michael Friebe. Minimally invasive tumor extraction combined with subsequent intraoperative radiation. *IGIC 2015*, Mannheim; 11/2015
46. P. Matthies, B. Frisch, J. Vogel, T. Lasser, M. Friebe, N. Navab. Inside-Out Tracking for Flexible Hand-held Nuclear Tomographic Imaging. *IEEE Nuclear Science Symposium and Medical Imaging Conference*, November 2015, San Diego, USA, 11/2015
47. Johannes W. Krug, Rui Zhang, Georg Rose, Michael Friebe. Hall sensors for respiratory motion detection in MRI. *ESMRMB*, Edinburgh; 10/2015
48. Axel Boese, Georg Rose, Michael Friebe, Thomas Hoffman, Steffen Serowy, Martin Skalej, Werner Mailänder, Giorgio Cattaneo. Increasing the visibility of thin NITINOL vascular implants. *49th annual conference of the German Society for Biomedical Engineering - BMT 2015*, Lübeck; 09/2015
49. Michael Friebe, Jörg Traub. Image Guided Surgery Innovation with Graduate Students - a new lecture format. *49th annual conference of the German Society for Biomedical Engineering - BMT 2015*, Lübeck, Germany; 09/2015
50. Alexander van Oepen, Axel Boese, Michael Friebe. Novel device for minimally-invasive tumor removal. *SMIT 2015*; 09/2015 -- best poster award.

51. Robert Odenbach, Johannes Krug, Axel Boese, Michael Friebe. MRI-compatible setup for endoscopic brain surgeries using a flexible, micro-positionable needle holder. *SMIT 2015 - Brno*; 09/2015
52. Axel Boese, Philipp Huendorf, Oliver Buck, Michael Friebe. Prototype Shielded Balloon Catheter For Interventional Rhenium-188 Radiation Therapy During Handheld SPECT/US Hybrid Imaging/ Biopsy Procedure. *CARS, Barcelona*; 06/2015
53. Martin Horn, Stefan Paepke, Evelyn Klein, Thomas Wendler, Michael Friebe. Hybrid Interventional Imaging For Non-Surgical Sentinel Lymph Node Staging. *CARS, Barcelona*; 06/2015
54. Michael Friebe, Philipp Matthies, Amin Katouzian, Sung Oh Cho. Miniaturized cold emission low energy X-ray tubes for MRI guided intraoperative radiation therapy. *1st Conference on Image-Guided Interventions, Magdeburg*; 10/2014
55. Michael Friebe, Amin Katouzian, Gabriele Krombach, Heinz-Werner Henke. MRI biopsy with semi-automated biopsy needle in Slicer 3D environment. *1st Conference on Image-Guided Interventions, Magdeburg*; 10/2014
56. Bock S., Dahl S., Tacke S., Schneider M., Hartmann A., Kramer M., Henke HW, Friebe M., Krombach G. Development of a passive-trackable catheter system to perform MR-guided minimal invasive intramyocardial injections – in vivo and consecutive ex vivo study. *10th Interventional MRI Symposium 2014, Leipzig*; 10/2014
57. Michael Friebe, Jörg Traub, Thomas Wendler, Stefan Wiesner. Hybrid interventional imaging for non-surgical SLNB Staging. *SMIT 2014, SHANGHAI*; 09/2014
58. E. Nasonova, M. Durst, C. Gringen, E. Farreif, M. Friebe, A. Haase, M. Schwaiger, R. Schulte. Compensating for Metabolic Dynamics in ¹³C Chemical Shift Separation. *ISMRM, Toulouse*; 05/2014
59. E. Nasonova, M. Durst, C. Gringen, E. Farreif, A. Haase, M. Schwaiger, R. Schulte, Michael Friebe. Reconstruction of Carbon-13 Metabolic MR Images Using Constrained Optimization. *ISMRM, Toulouse*; 05/2014
60. Elena Nasonova, Markus Durst, Concetta Gringeri, Eliane V Farrell, Michael Friebe, Axel Haase. Reconstruction of Carbon-13 Metabolic MR Images using Constrained Optimisation. *Joint Annual Meeting ISMRM-ESMRM. Milan, Italy*; 05/2014
61. Elena Nasonova, M. Durst, C. Gringen, E. Farreif, A. Haase, M. Schwaiger, R. Schulte, Michael Friebe. Compensating for Metabolite Dynamics in ¹³C Chemical Shift Separation. *Joint Annual Meeting ISMRM-ESMRM. Milan, Italy*; 05/2014
62. Elena Nasonova, Markus Durst, Concetta Gringeri, Eliane V Farrell, Michael Friebe, Axel Haase, Markus Schwaiger, Rolf F Schulte. Compensating for Metabolite Dynamics in ¹³C Chemical Shift Separation. *Joint Annual Meeting ISMRM-ESMRM. Milan, Italy*; 05/2014
63. M Friebe, D Sachtler, S Hellwig, M Schlüter, G Sakas, U Jorczyk. Autonomous navigation assistant for MRI guided interventions. *20th Internat. Conference of the Society for Medical Innovation and Technology - SMIT 2008, Wien*; 08/2008
64. Michael Friebe, GA Krombach, A Buecker, JE Pfeffer, C Hohl, J Temur, S Kinzel, RW Guenther. Development of a catheter for MRI-guided intramyocardial injection. *Proc. Intl. Soc. Mag. Reson. Med*; 01/2007