Scientific Curriculum Vitae

Personal Information

Name	Peter Kuess
Date of Birth	September 8th 1982
Place of Birth	Klagenfurt am Wörthersee, Austria
Nationality	Austrian
Degrees	Priv. Doz. Mag. rer. nat., PhD
Orcid	0000-0003-2961-1692

Professional Address

Division Medical Radiation Physics, Department of Radiation Oncology
Medical University of Vienna / AKH Wien
Währinger Gürtel 18–20, 1090 Vienna, Austria
(+43)01 40400-72730
peter.kuess@meduniwien.ac.at

Summary of scientific work

First or senior author	*17*
Co-author	*35*
Total number of publications	***52***
Hirsch index	*16 (Scopus)*
Conference contributions	> 20

Teaching Summary

SWS in MUW PhD Programme	*6.51*
SWS in MUW Medical Degree Programme	*13.92*
Lectures at TU Vienna	*3*
Lectures at FHWN	*6*
(Co)supervised BSc Students	*6*
(Co)supervised MSc Students	*16*

Research Activities

- Dosimetry: Photons (kV and MV), Protons, and Carbon ions
- Image Processing: Radiomics, Textural Analysis, Deep Learning
- Automation in Radiation Oncology
- Image Guided Radiotherapy: Multimodal Imaging, Adaptive Radiotherapy
- MRI in Radiotherapy
- Pre-Clinical Research

Clinical Activities

- Quality assurance
- Periodic checks of linear accelerators and imaging units for IGRT
- Commissioning and periodic checks of imaging units for particle therapy
- Commissioning of dosimetric equipment for particle therapy
- Maintenance and trainings of X-ray units for pre-clinical research for MedUni and external users

Education

06/2023 **Venia docendi (Habilitation) at the Medical University Vienna in *Medical Physics***.

12/2018 **Fachanerkennung für Medizinische Physik**.
according to ÖGMP (Job title "Medizinphysiker")

10/2009–06/2014 **PhD in Medical Physics**, *Medical University of Vienna*.
Automated analysis of positron emission tomography (PET) based in-vivo monitoring in hadron therapy; Supervisor: Prof. Dr. Dietmar Georg

06/2009 **Master of Science in Physics**, *Vienna Environmental Research Accelerator (VERA), Nuclear Physics and Isotopic Research, Faculty of Physics, in cooperation with the Institute of Atomic and Subatomic Physics*.
Exploring AMS for the measurement of the (n,gamma) cross-section of ^{209}Bi at energies relevant for nuclear astrophysics and nuclear technology; Supervisors: Prof. Dr. Robin Golser, Dr. Anton Wallner

10/2003–06/2009 **Diploma Study in Physics**, *University of Vienna*.

06/2002 **Matura**, mit gutem Erfolg.
school leaving examination

09/1997–06/2002 **High School**, *HTL for IT und Business*, Villach.

Professional Experience

since 12/2014 **Assisstant post-doc**, *Medical University of Vienna, Department of Radiation Oncology, Division of Medical Physics*.
Paternity Leave (07/2019–12/2019)
Part-time Medical Physicist at EBG MedAustron (02/2018–07/2022)

02/2010–11/2014 **Scientific assistant**, *Medical University of Vienna, Department of Radiation Oncology, Division of Medical Physics*.
employed within the ENVISION project

List of Publications: Peter Kuess

[1] S. Helmbrecht, A. Santiago, W. Enghardt, P. Kuess, and F. Fiedler. "On the feasibility of automatic detection of range deviations from in-beam PET data." *Phys. Med. Biol.* 57 (2012), pp. 1387–97. DOI: 10.1088/0031-9155/57/5/1387.

[2] P. Kuess, W. Birkfellner, W. Enghardt, S. Helmbrecht, F. Fiedler, and D. Georg. "Using statistical measures for automated comparison of in-beam PET data." *Med. Phys.* 39 (2012), pp. 5874–81. DOI: 10.1118/1.4749962.

[3] J. Góra, J. Hopfgartner, P. Kuess, B. Paskeviciute, D. Georg, J. Hopfgartner, P. Kuess, B. Paskeviciute, and D. Georg. "Is there room for combined modality treatments? Dosimetric comparison of boost strategies for advanced head and neck and prostate cancer". *J. Radiat. Res.* 54 Suppl 1 (2013), pp. i97–112. DOI: 10.1093/jrr/rrt067.

[4] P. Kuess, S. Helmbrecht, F. Fiedler, W. Birkfellner, W. Enghardt, J. Hopfgartner, and D. Georg. "Automated evaluation of setup errors in carbon ion therapy using PET: feasibility study." *Med. Phys.* 40 (2013), p. 121718. DOI: 10.1118/1.4829595.

[5] D. Georg, J. Hopfgartner, J. Góra, P. Kuess, G. Kragl, D. Berger, N. Hegazy, G. Goldner, and P. Georg. "Dosimetric considerations to determine the optimal technique for localized prostate cancer among external photon, proton, or carbon-ion therapy and high-dose-rate or low-dose-rate brachytherapy". *Int. J. Radiat. Oncol. Biol. Phys.* 88 (2014), pp. 715–722. DOI: 10.1016/j.ijrobp.2013.11.241.

[6] P. Kuess, E. Bozsaky, J. Hopfgartner, G. Seifritz, W. Dörr, and D. Georg. "Dosimetric challenges of small animal irradiation with a commercial X-ray unit". *Z. Med. Phys.* 24 (2014), pp. 363–372. DOI: 10.1016/j.zemedi.2014.08.005.

[7] P. Andrzejewski, P. Kuess, B. Knäusl, K. Pinker, P. Georg, J. Knoth, D. Berger, C. Kirisits, G. Goldner, T. Helbich, R. Pötter, and D. Georg. "Feasibility of dominant intraprostatic lesion boosting using advanced photon-, proton- or brachytherapy." *Radiother. Oncol.* 117 (2015), pp. 509–514. DOI: 10.1016/j.radonc.2015.07.028.

[8] J. Góra, P. Kuess, M. Stock, P. Andrzejewski, B. Knäusl, B. Paskeviciute, G. Altorjai, and D. Georg. "ART for head and neck patients: On the difference between VMAT and IMPT". *Acta Oncol.* 54 (2015), pp. 1166–1174. DOI: 10.3109/0284186X.2015.1028590.

[9] S. Helmbrecht, P. Kuess, W. Birkfellner, W. Enghardt, K. Stützer, D. Georg, and F. Fiedler. "Systematic analysis on the achievable accuracy of PT-PET through automated evaluation techniques". *Z. Med. Phys.* 25 (2015), pp. 146–155. DOI: 10.1016/j.zemedi.2014.08.004.

[10] K. Frings, S. Gruber, P. Kuess, M. Kleiter, and W. Dörr. "Modulation of radiation-induced oral mucositis by thalidomide : Preclinical studies". *Strahlenther. Onkol.* 192 (2016), pp. 561–568. DOI: 10.1007/s00066-016-0989-5.

[11] P. Kuess, D. Georg, H. Palmans, and W. Lechner. "Technical Note: On the impact of the incident electron beam energy on the primary dose component of flattening filter free photon beams". *Med. Phys.* 43 (2016), pp. 4507–4513. DOI: 10.1118/1.4954849.

[12] S. Walsh, E. Roelofs, P. Kuess, P. Lambin, B. Jones, D. Georg, and F. Verhaegen. "A validated tumor control probability model based on a meta-analysis of low, intermediate, and high-risk prostate cancer patients treated by photon, proton, or carbon-ion radiotherapy". *Med. Phys.* 43 (2016), pp. 734–747. DOI: 10.1118/1.4939260.

[13] N. Kostiukhina, D. Georg, S. Rollet, P. Kuess, A. Sipaj, P. Andrzejewski, H. Furtado, I. Rausch, W. Lechner, E. Steiner, H. Kertész, and B. Knäusl. "Advanced Radiation DOSimetry phantom (ARDOS): a versatile breathing phantom for 4D radiation therapy and medical imaging". *Phys. Med. Biol.* 62 (2017), pp. 8136–8153. DOI: 10.1088/1361-6560/aa86ea.

[14] P. Kuess, P. Andrzejewski, D. Nilsson, P. Georg, J. Knoth, M. Susani, J. Trygg, T. H. Helbich, S. H. Polanec, D. Georg, and T. Nyholm. "Association between pathology and texture features of multi parametric MRI of the prostate". *Phys. Med. Biol.* 62 (2017), pp. 7833–7854. DOI: 10.1088/1361-6560/aa884d.

[15] P. Kuess, T. T. Böhlen, W. Lechner, A. Elia, D. Georg, and H. Palmans. "Lateral response heterogeneity of Bragg peak ionization chambers for narrow-beam photon and proton dosimetry". *Phys. Med. Biol.* 62 (2017), pp. 9189–9206. DOI: 10.1088/1361-6560/aa955e.

[16] W. Lechner, P. Kuess, D. Georg, and H. Palmans. "Equivalent (uniform) square field sizes of flattening filter free photon beams". *Phys. Med. Biol.* 62 (2017), pp. 7694–7713. DOI: 10.1088/1361-6560/aa83f5.

[17] M. Linke, H. T. T. Pham, K. Katholnig, T. Schnöller, A. Miller, F. Demel, B. Schütz, M. Rosner, B. Kovacic, N. Sukhbaatar, B. Niederreiter, S. Blüml, P. Kuess, V. Sexl, M. Müller, M. Mikula, W. Weckwerth, A. Haschemi, M. Susani, M. Hengstschläger, M. J. Gambello, and T. Weichhart. "Chronic signaling via the metabolic checkpoint kinase mTORC1 induces macrophage granuloma formation and marks sarcoidosis progression". *Nat. Immunol.* 18 (2017), pp. 293–302. DOI: 10.1038/ni.3655.

[18] A. Garpebring, P. Brynolfsson, P. Kuess, D. Georg, T. H. Helbich, T. Nyholm, and T. Löfstedt. "Density estimation of grey-level co-occurrence matrices for image texture analysis". *Phys. Med. Biol.* 63 (2018), p. 195017. DOI: 10.1088/1361-6560/aad8ec.

[19] S. Gruber, M. Arnold, N. Cini, V. Gernedl, S. Hetzendorfer, L.-M. Kowald, P. Kuess, J. Mayer, S. Morava, S. Pfaffinger, A. Rohorzka, and W. Dörr. "Radioprotective Effects of Dermatan Sulfate in a Preclinical Model of Oral Mucositis—Targeting Inflammation, Hypoxia and Junction Proteins without Stimulating Proliferation". *Int. J. Mol. Sci.* 19 (2018), p. 1684. DOI: 10.3390/ijms19061684.

[20] S. Gruber, N. Cini, L.-M. Kowald, J. Mayer, A. Rohorzka, P. Kuess, and W. Dörr. "Upregulated epithelial junction expression represents a novel parameter of the epithelial radiation response to fractionated irradiation in oral mucosa". *Strahlenther. Onkol.* 194 (2018), pp. 771–779. DOI: 10.1007/s00066-018-1302-6.

[21] S. Gruber, K. Frings, P. Kuess, and W. Dörr. "Protective effects of systemic dermatan sulfate treatment in a preclinical model of radiation-induced oral mucositis". *Strahlenther. Onkol.* 194 (2018), pp. 675–685. DOI: 10.1007/s00066-018-1280-8.

[22] S. Khachonkham, R. Dreindl, G. Heilemann, W. Lechner, H. Fuchs, H. Palmans, D. Georg, and P. Kuess. "Characteristic of EBT-XD and EBT3 radiochromic film dosimetry for photon and proton beams". *Phys. Med. Biol.* 63 (2018), p. 065007. DOI: 10.1088/1361-6560/aab1ee.

[23] M. Khan, G. Heilemann, P. Kuess, D. Georg, and A. Berg. "The impact of the oxygen scavenger on the dose-rate dependence and dose sensitivity of MAGIC type polymer gels". *Phys. Med. Biol.* 63 (2018), 06NT01. DOI: 10.1088/1361-6560/aab00b.

[24] M. Kowaliuk, E. Bozsaky, S. Gruber, P. Kuess, and W. Dörr. "Systemic administration of heparin ameliorates radiation-induced oral mucositis—preclinical studies in mice". *Strahlenther. Onkol.* 194 (2018), pp. 686–692. DOI: 10.1007/s00066-018-1300-8.

[25] M. Stock, D. Georg, A. Ableitinger, A. Zechner, A. Utz, M. Mumot, G. Kragl, J. Hopfgartner, J. Góra, T. T. Böhlen, L. Grevillot, P. Kuess, P. Steininger, H. Deutschmann, and S. Vatnitsky. "The technological basis for adaptive ion beam therapy at MedAustron: Status and outlook". *Z. Med. Phys.* 28 (2018), pp. 196–210. DOI: 10.1016/j.zemedi.2017.09.007.

[26] S. Walsh, E. Roelofs, P. Kuess, Y. Van Wijk, B. Vanneste, A. Dekker, P. Lambin, B. Jones, D. Georg, and F. Verhaegen. "Towards a clinical decision support system for external beam radiation oncology prostate cancer patients: Proton vs. photon radiotherapy? a radiobiological study of robustness and stability". *Cancers* 10 (2018), p. 55. DOI: 10.3390/cancers10020055.

[27] M. Clausen, S. Khachonkham, S. Gruber, P. Kuess, R. Seemann, B. Knäusl, E. Mara, H. Palmans, W. Dörr, and D. Georg. "Phantom design and dosimetric characterization for multiple simultaneous cell irradiations with active pencil beam scanning". *Radiat. Environ. Biophys.* 58 (2019), pp. 563–573. DOI: 10.1007/s00411-019-00813-1.

[28] M. Daniel, P. Kuess, P. Andrzejewski, T. Nyholm, T. Helbich, S. Polanec, F. Dragschitz, G. Goldner, D. Georg, and P. Baltzer. "Impact of androgen deprivation therapy on apparent diffusion coefficient and T2w MRI for histogram and texture analysis with respect to focal radiotherapy of prostate cancer". *Strahlenther. Onkol.* 195 (2019), pp. 402–411. DOI: 10.1007/s00066-018-1402-3.

[29] M. Kowaliuk, I. Schröder, P. Kuess, and W. Dörr. "Heparin treatment mitigates radiation-induced oral mucositis in mice by interplaying with repopulation processes". *Strahlenther. Onkol.* 195 (2019), pp. 534–543. DOI: 10.1007/s00066-018-01423-4.

[30] P. Kuess, T. T. Böhlen, W. Lechner, A. Elia, D. Georg, and H. Palmans. "Reply to Comment on "Lateral response heterogeneity of Bragg peak ionization chambers for narrow-beam photon and proton dosimetry"". *Phys. Med. Biol.* 64 (2019), p. 198002. DOI: 10.1088/1361-6560/ab3ba0.

[31] F. Padilla-Cabal, P. Kuess, D. Georg, H. Palmans, L. Fetty, and H. Fuchs. "Characterization of EBT3 radiochromic films for dosimetry of proton beams in the presence of magnetic fields". *Med. Phys.* 46 (2019), pp. 3278–3284. DOI: 10.1002/mp.13567.

[32] S. Sarsarshahi, Z. Madjd, E. Bozsaky, J. Kowaliuk, P. Kuess, M. H. Ghahremani, and W. Dörr. "An evaluation of the effect of bortezomib on radiation-induced urinary bladder dysfunction". *Strahlenther. Onkol.* 195 (2019), pp. 934–939. DOI: 10.1007/s00066-019-01497-8.

[33] L. Fetty, M. Bylund, P. Kuess, G. Heilemann, T. Nyholm, D. Georg, and T. Löfstedt. "Latent Space Manipulation for High-Resolution Medical Image Synthesis via the StyleGAN". *Z. Med. Phys.* 30 (2020), pp. 305–314. DOI: 10.1016/j.zemedi.2020.05.001.

[34] L. Fetty, T. Löfstedt, G. Heilemann, H. Furtado, N. Nesvacil, T. Nyholm, D. Georg, and P. Kuess. "Investigating conditional GAN performance with different generator architectures, an ensemble model, and different MR scanners for MR-sCT conversion". *Phys. Med. Biol.* 65 (2020), p. 105004. DOI: 10.1088/1361-6560/ab857b.

[35] H. Fuchs, A. Elia, A. Resch, P. Kuess, and D. Georg. "Computer assisted beam modeling for particle therapy". *Med. Phys.* 48 (2020), pp. 841–851. DOI: 10.1002/mp.14647.

[36] S. Khachonkham, S. Gruber, E. Mara, R. Preuer, P. Kuess, W. Dörr, D. Georg, and M. Clausen. "RBE variation in prostate carcinoma cells in active scanning proton beams in vitro measurements in comparison with phenomenological models". *Physica Med.* 77 (2020), pp. 187–193. DOI: 10.1016/j.ejmp.2020.08.012.

[37] J. Kowaliuk, S. Sarsarshahi, J. Hlawatsch, A. Kastsova, M. Kowaliuk, A. Krischak, P. Kuess, L. Duong, and W. Dörr. "Translational Aspects of Nuclear Factor-Kappa B and Its Modulation by Thalidomide on Early and Late Radiation Sequelae in Urinary Bladder Dysfunction". *Int. J. Radiat. Oncol. Biol. Phys.* 107 (2020), pp. 377–385.

[38] P. Kuess, S. Haupt, J. Osorio, L. Grevillot, H. Fuchs, D. Georg, and H. Palmans. "Characterization of the PTW-34089 type 147 mm diameter large-area ionization chamber for use in light-ion beams". *Phys. Med. Biol.* 65 (2020), 17NT02. DOI: 10.1088/1361-6560/ab9852.

[39] E. Mara, M. Clausen, S. Khachonkham, S. Deycmar, C. Pessy, W. Dörr, P. Kuess, D. Georg, and S. Gruber. "Investigating the impact of alpha/beta and LET_d on relative biological effectiveness in scanned proton beams: An in vitro study based on human cell lines". *Med. Phys.* 47 (2020), mp.14212. DOI: 10.1002/mp.14212.

[40] J. Osorio, P. Kuess, A. Carlino, M. Stock, S. Vatnitsky, and H. Palmans. "Beam monitor calibration of a synchrotron-based scanned light-ion beam delivery system". *Z. Med. Phys.* 31 (2020), pp. 154–165. DOI: 10.1016/j.zemedi.2020.06.005.

[41] G. Heilemann, M. Matthewman, P. Kuess, G. Goldner, D. Georg, and L. Zimmermann. "Can Generative Adversarial Networks help to overcome the limited data problem in segmentation?" *Z. Med. Phys.* (2021). DOI: 10.1016/j.zemedi.2021.11.006.

[42] S. Irmak, L. Fetty, D. Georg, P. Kuess, and W. Lechner. "Cone beam CT based validation of neural network generated synthetic CTs for radiotherapy in the head region". *Med. Phys.* 48 (2021), pp. 4560–4571. DOI: 10.1002/mp.14987.

[43] P. Kuess, W. Lechner, D. Georg, and H. Palmans. "Reply to comment on 'Lateral response heterogeneity of Bragg peak ionization chambers for narrow-beam photon and proton dosimetry'". *Phys. Med. Biol.* 66 (2021), p. 168001. DOI: 10.1088/1361-6560/AC16BF.

[44] L. Zimmermann, M. Buschmann, H. Herrmann, G. Heilemann, P. Kuess, T. Nyholm, D. Georg, and N. Nesvacil. "An MR only acquisition and artificial intelligence based image processing protocol for photon and proton therapy using a low field MR". *Z. Med. Phys.* 31 (2021), pp. 78–88. DOI: 10.1016/j.zemedi.2020.10.004.

[45] H. Fuchs, L. Zimmermann, N. Reisz, M. Zeilinger, A. Ableitinger, D. Georg, and P. Kuess. "Efficient full Monte Carlo modelling and multi-energy generative model development of an advanced X-ray device". *Z. Med. Phys.* (2022). DOI: 10.1016/j.zemedi.2022.04.006.

[46] B. Knäusl, P. Kuess, M. Stock, D. Georg, P. Fossati, P. Georg, and L. Zimmermann. "Possibilities and challenges when using synthetic computed tomography in an adaptive carbon-ion treatment workflow". *Z. Med. Phys.* (2022). DOI: 10.1016/j.zemedi.2022.05.003.

[47] P. Kuess, N. Sejkora, A. Klampfer, S. Madlener, P. Weiss, S. Schmied, D. Georg, S. Özdemir-Fritz, G. Grömer, and A. Hirtl. "Characterising novel space suit textiles in proton beams using radiotherapy-based dosimetry". *Advances in Space Research* (2022). DOI: 10.1016/j.asr.2022.06.058.

[48] A. F. Resch, F. P. Cabal, M. Regodic, W. Lechner, G. Heilemann, P. Kuess, D. Georg, and H. Palmans. "Accelerating and improving radiochromic film calibration by utilizing the dose ratio in photon and proton beams". *Med. Phys.* (2022). DOI: 10.1002/mp.15828.

[49] L. Zimmermann, B. Knäusl, M. Stock, C. Lütgendorf-Caucig, D. Georg, and P. Kuess. "An MRI sequence independent convolutional neural network for synthetic head CT generation in proton therapy". *Z. Med. Phys.* 32 (2022), pp. 218–227. DOI: 10.1016/j.zemedi.2021.10.003.

[50] G. Heilemann, L. Zimmermann, R. Schotola, W. Lechner, M. Peer, J. Widder, G. Goldner, D. Georg, and P. Kuess. "Generating deliverable DICOM RT treatment plans for prostate VMAT by predicting MLC motion sequences with an encoder-decoder network". *Med. Phys.* (2023). DOI: 10.1002/mp.16545.

[51] L. Chen, P. Platzer, C. Reschl, M. Schafasand, A. Nachankar, C. L. Hajdusich, P. Kuess, M. Stock, S. Habraken, and A. Carlino. "Validation of a deep-learning segmentation model for adult and pediatric head and neck radiotherapy in different patient positions". *Physics and Imaging in Radiation Oncology* 29 (2024), p. 100527. DOI: 10.1016/j.phro.2023.100527.

[52] M. Moll, G. Heilemann, D. Georg, D. Kauer-Dorner, and P. Kuess. "The role of artificial intelligence in informed patient consent for radiotherapy treatments – a case report". *Strahlentherapie und Onkologie* (2024). DOI: 10.1007/s00066-023-02190-7.