

FOREWORD AND ACKNOWLEDGEMENTS

This volume comprises the accepted contributions of the First International Workshop on Magnetic Particle Imaging (IWMPPI). The workshop has been organized by the Institute of Medical Engineering at the University of Lübeck, Germany, in March 2010. It gives an overview on recent results of a novel imaging modality based on magnetic nanoparticles.

The magnetic particle imaging (MPI) concept falls into the category of functional imaging and, hence, the magnetic nanoparticles may serve as tracers of metabolic processes. Since the particles of choice consist of super-paramagnetic iron oxide (SPIO) cores coated with biopolymers, imaging of the metabolism may be possible without any radioactive agents. These particles are subjected to an oscillating magnetic field and, subsequently, react with a nonlinear re-magnetization. This behavior can be detected with appropriate receive coils. Due to the nonlinearity, the induced signal in the receive coils contains harmonics of the fundamental frequency of the drive field. These harmonics can be used to determine the nanoparticle concentration. For spatial encoding an additional magnetic gradient field, is superimposed onto the drive field such that a field-free point is established within the volume of interest. Only particles located at the field-free point contribute to the desired signal in the receive coils. Particles outside are saturated and do not further show any re-magnetization dynamics upon the excitation by the drive field.

Today, there are quite interesting challenges within the practical set-up of a scanning device and also in the design of new MPI nanoparticles. Scientists from chemical engineering, biology, electrical engineering, physics, computer sciences and medicine (see Fig. 1) discussed the promises and challenges of magnetic particle imaging during the workshop in spring 2010.

As chair of the workshop I would like to thank my co-chair, J. Borgert, Philips Research Hamburg, and the members of the program committee for the selection of works included in this book: C. Alexiou, University Erlangen; J. Barkhausen, University Clinics Schleswig-Holstein, Campus Lübeck; J. Borgert, Philips Research Hamburg; J. Bulte, Johns Hopkins University, School of Medicine, Baltimore; T. M. Buzug, University of Lübeck; S. Conolly, UC Berkeley; O. Dössel, University of Karlsruhe; S. Dutz, IPHT Jena; Z. A. Fayad, Mount Sinai School of Medicine, NY; D. Finas, University Clinics Schleswig-Holstein, Campus

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Fig. 1. Participants of the First International Workshop on Magnetic Particle Imaging, University of Lübeck, March 2010.

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Thorsten M. Buzug
Workshop Chair
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Institute of Medical Engineering
University of Lübeck
buzug@imt.uni-luebeck.de