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Guest Editorial

Recent impetus in magnetic particle imaging

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Abstract

Since its beginnings in 2001, MPI has shown more than ever a very high innovation potential. As expected, the number of publications is increasing and the interest in MPI is greater than ever. This certainly has to do with the growing number of commercial systems currently in operation. To this end, this editorial introduces topics in the current IJMPI Volume 7 No. 1 (2021) that reflect well the breadth of our field. More particular, these topics ranges from novel reconstruction techniques based on deep image priors, methods to improve spatial selectivity, tracer characterization, and new scanner geometries. These are four very exciting topics on MPI that are worth diving into.

Dear colleagues and MPI enthusiasts. I hope you are well these days. As a scientist who has been with MPI since its beginnings in 2001, I am still fascinated by this tomographic imaging modality, which, compared to others, offers a high potential for innovation in all kind of areas. As expected, the number of publications on MPI is increasing and interest in MPI is greater than ever. This certainly also has to do with the growing number of commercial systems currently in operation. When I compare the early days of MPI with today, I am pleased to note that our field has become very diverse in terms of the methods we use to answer key questions in our field.

For example, the current IJMPI Volume 7 No. 1 (2021) contains a range of topics that well represent the activity of our field. The first paper by Sören Dittmer *et al.* focuses on the investigation of a novel reconstruction approach based on deep image priors, which the authors compared to Kaczmarz-type methods [1]. The research focuses on publicly available datasets using a system matrix acquisition.

The next work by Kulthisa Sajjamark *et al.* addresses a method to improve spatial selectivity for magnetic fluid hyperthermia (MFH) using magnetic flux confinement [2]. To increase spatial selectivity, the authors propose a strategy to increase the selection field gradient in MPI. According to their findings, this strategy can achieve a 27 % reduction in the "theranostic field of the therapy". They found that this technique increases the magnetic field gradient in the z-direction from 2.5 T m^{-1} to 3.4 T m^{-1}.

The next paper by Patrick Vogel *et al.* is about the tracer Synomag®, which the authors presented as a new high-performance tracer for MPI [3]. They report that Synomag® particles show almost four times higher sig-

nal in a traveling wave MPI scanner compared to the established tracer Resovist®.

The final paper in this IJMPI volume by Carlos Chinchilla *et al.* focuses on a simulation study of a 2D projection image reconstruction method for a field-free line scanner in single-sided MPI scanner topology [4]. The authors present a proof-of-concept simulation study of image reconstruction for a single-sided field-free line scanner using non-uniform magnetic fields. They implemented a filtered back-projection algorithm enabling them to perform 2D image reconstruction over a 4×4 cm^2 field of view with spatial resolution down to 2 mm in the noise-free case.

These are four exciting topics on MPI and I hope you enjoy reading them as I did.

Yours sincerely - Volkmar

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