Multi-Dimensional X-Space Magnetic Particle Imaging.

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Public Summary:
Magnetic Particle Imaging (MPI) is a promising new medical imaging tracer modality with potential applications in human angiography, cancer imaging, in vivo cell tracking and inflammation imaging. Here we demonstrate both theoretically and experimentally that multidimensional MPI is a linear shift-invariant imaging system with an analytic point spread function. We also introduce a fast image reconstruction method that obtains the intrinsic MPI image with high SNR via a simple gridding operation in x-space. We also demonstrate a method to reconstruct large FOV images using partial field-of-view scanning, despite the loss of first harmonic image information due to direct feedthrough contamination. We conclude with the first experimental test of multidimensional x-space MPI.Magnetic Particle Imaging (MPI) is a promising new medical imaging tracer modality with potential applications in human angiography, cancer imaging, in vivo cell tracking and inflammation imaging. Here we demonstrate both theoretically and experimentally that multidimensional MPI is a linear shift-invariant imaging system with an analytic point spread function. We also introduce a fast image reconstruction method that obtains the intrinsic MPI image with high SNR via a simple gridding operation in x-space. We also demonstrate a method to reconstruct large FOV images using partial field-of-view scanning, despite the loss of first harmonic image information due to direct feedthrough contamination. We conclude with the first experimental test of multidimensional x-space MPI.

Scientific Abstract:
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