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Scaling of Magnetic Particle Imaging for Sub-micrometer Resolution SAM MULLEY, DANIEL MILLER, HAN SONG, PALLAVI DHAGAT, ALBRECHT JANDER, Oregon State University, TANIA VU, Oregon Health and Science University, OREGON HEALTH AND SCIENCE UNIVERSITY COLLABORATION — In this work, we discuss the potential for scaling magnetic particle imaging (MPI) systems to resolve intracellular distributions of magnetic marker particles in biological samples, and present preliminary experimental results. MPI is a tomographic method developed for *in vivo* imaging [1]. It utilizes the nonlinear response of magnetic particles. A magnetic field is established within the scanning volume such that it is zero at only one point. Only particles within this field free point respond to a small ac magnetic field and can be detected inductively. An image is formed by moving the field free point relative to the sample. Previous work has achieved a spatial resolution of 1 mm [2]. We will present a theoretical analysis showing that sub-micrometer spatial resolution can, in principle, be achieved. Our first laboratory implementation has demonstrated a spatial resolution of 1 mm. We continue to scale and optimize the system for a first-ever demonstration of tomographic imaging of sub-cellular structures and processes in real-time.

[1] B. Gleich and J. Weizenecker, Nature, v. 435, p. 1214, 2005
[2] B. Gleich, et al., Phy. Med. Bio., v. 54, p.L1, 2009

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