

# Philips demonstrates feasibility of a new imaging technique based on magnetic particles

June 30 2005

---

Scientists at Philips Research have been active in developing a completely new imaging technique called Magnetic Particle Imaging (MPI) and have demonstrated the feasibility of the technique. Although still in the early research stages, the new technique offers potential as a valuable addition to the current armory of imaging techniques for medical imaging and materials analysis. Results of the work have been published in the June 30 edition of *Nature*.

The idea behind MPI is to produce spatial images by measuring the magnetic fields generated by magnetic particles in a tracer. While previous approaches to realize this resulted in relatively poor spatial resolution or low sensitivity, the method invented by Philips generates high-resolution images at low dosages. This is achieved by combining the nonlinear magnetization curve of the small magnetic particles with an inhomogeneous magnetic field.

The particles are subjected to a time-varying sinusoidal magnetic field with sufficiently high amplitude to drive their magnetization into the non-linear region. This induces high-frequency harmonics in the resulting time-varying magnetization that can be easily extracted from the fundamental or drive frequency by filtering. If the magnetic particles are simultaneously exposed to a time-constant magnetic field of sufficiently large magnitude, the particle magnetization becomes saturated and the generation of harmonics is suppressed. This opens the possibility of

producing an imaging device in which the time-constant field is constructed such that the magnitude of the field drops to zero at a single point in the field known as the 'field-free point' and increases in magnitude towards the edges. A signal containing harmonics will then be detected only from magnetic particles located in the vicinity of the field-free point; at all other points the magnetic particles are fully saturated by the time-constant field and produce no signal. So by scanning the field-free point through the volume of interest, it is possible to develop a 3D image of the magnetic-particle distribution. Movement of the field-free point can be achieved either mechanically or by field-induced movement. Both techniques have been investigated by the Philips researchers.

The researchers have evaluated the new MPI technique using commercially-available magnetic tracers. Conducted on 'phantom' objects, these investigations have demonstrated the feasibility of MPI and show that it has potential to be developed into an imaging method characterized by both high spatial resolution and high sensitivity. The expected high sensitivity leads to the presumption that the technique could become a valuable addition to other medical imaging modalities.

Besides its potential in medical imaging, MPI also shows promise as an imaging technique for materials research - specifically in the investigation of cracks and cavities in insulating materials like polymers or ceramics.

Source: Philips

Citation: Philips demonstrates feasibility of a new imaging technique based on magnetic particles (2005, June 30) retrieved 26 April 2024 from <https://phys.org/news/2005-06-philips-feasibility-imaging-technique-based.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.