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Institute of Neurosciences and Medicine
Medical Imaging Physics (INM-4)

ENDEAVOURS
science creating solutions

# Magnetic Field-Assisted Imaging for Positron Emitters in Weakly Positron-Absorbing Objects

## Technology Description

Our innovative technology introduces a method and device for the two-dimensional imaging of positron emitter distributions in weakly positron-absorbing objects. Traditional positron emission tomography (PET) faces challenges in accurately quantifying positron-emitter density distributions, especially in large-surface objects with low volume or material density, such as thin sections of biological material or organ parts. Our solution leverages the presence of a magnetic field to guide escaping positrons along spiral paths, allowing their precise localization and imaging without the need for tomographic reconstruction.

## Problem

Conventional PET methods, while effective in many applications, struggle to accurately quantify positron-emitter density distributions in thin or low-density objects. Escaping positrons from such objects pose challenges in tracking and quantifying their distribution, leading to systematic underestimation.

## Solution

Our technology utilizes the Lorentz force in the presence of a magnetic field to force escaping positrons into spiral paths along magnetic field lines. By employing a positron absorber and a conventional PET scanner in a magnetic field, we achieve precise localization of positrons' impact points on the absorber. This enables the direct measurement of two-dimensional positron-emitter density distributions without the need for complex tomographic reconstruction.

## Potential Use

The technology offers versatile applications in various fields, including pre-clinical research, human medicine, neurosciences, and plant biology. It provides a flexible and contactless method for quantifying metabolic processes in thin structures like plant leaves. The ability to dynamically and accurately measure escaping positrons opens new possibilities for understanding and quantifying metabolic activities in weakly positron-absorbing objects.

This patented technology not only addresses existing challenges in motion detection but also opens new possibilities for faster and more reliable MRI scans, ultimately improving diagnostic accuracy and efficiency.

**Interesting for the following sectors**

- Medical Imaging
- Pharmaceutical Research and Development
- Neuroscience
- Agricultural Biotechnology

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**Keywords**
Positron emission tomography (PET), Magnetic field Positron absorber, Two-dimensional imaging, Metabolic processes

**More Information**
go.fzj.de/to-165

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## Development Status and Next Steps

The technology's operating principle has been successfully demonstrated on a 3T TimTrio MWBrainPET scanner from Siemens, a PET/MR hybrid detector system operating at 3 Tesla magnetic field strength.

We are open to collaborations with and licensing to research institutions, medical facilities, and technology developers interested in further validating and implementing this innovative imaging technology. Collaborators can explore applications in specific areas and help refine and expand the capabilities of the technology.

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