A Reconstruction-Agnostic Fan Phantom for Task-Relevant PET Spatial Resolution Assessment

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ABSTRACT

Researchers at the University of California, Davis have developed a fan-pattern paper phantom enabling continuous and reconstruction-agnostic evaluation of PET spatial resolution under clinical and AI-based reconstruction conditions.

FULL DESCRIPTION

This PET spatial resolution phantom uses a laser-cut fan pattern on radioactive paper sealed between plastic sheets, allowing modulation transfer function (MTF)-based continuous characterization of spatial resolution. Compatible with diverse nuclear medicine imaging systems and reconstruction methods—including iterative and AI-enhanced algorithms—it facilitates rapid, robust, and reproducible assessment of effective spatial resolution. The phantom provides a practical, disposable tool to optimize PET system performance and better inform radiologists of the smallest detectable features in clinical practice.

APPLICATIONS

- Clinical PET/CT centers optimizing reconstruction protocols.
- Radiology departments enhancing diagnostic confidence in nuclear medicine.
- Research institutions developing new PET reconstruction algorithms.
- Manufacturers of nuclear imaging equipment for system validation.
- Preclinical small animal PET imaging studies requiring precise spatial resolution evaluation.
- Quality control and regulatory compliance for imaging systems.

FEATURES/BENEFITS

- Supports both conventional and AI-based reconstruction methods (reconstruction-agnostic).
- Cuts cost and waste with a low-cost, disposable laser-cut radioactive paper design.
- Enables continuous spatial-resolution measurement instead of discrete, rod-based sizing.
- Delivers rapid spatial-resolution evaluation in under 5 minutes for routine use.
- Improves measurement confidence by increasing reproducibility/repeatability and reducing uncertainty.
- Works across a wide range of nuclear medicine imaging systems.
- Optimizes PET protocols by improving characterization of effective imaging performance.
- Reveals the effective spatial resolution achieved by modern iterative and AI-based PET reconstructions (where prior methods provide limited insight).
- Eliminates dependence on discrete rod-size phantoms by enabling continuous resolution assessment.
- Enables practical, reliable evaluation of the smallest clinically detectable features.
- Removes barriers to routine and research use by making spatial-resolution measurement fast and robust.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

AI-based reconstruction, continuous spatial resolution, fan-pattern phantom, modulation transfer function, nuclear medicine imaging, PET spatial resolution, quality assurance, radioactive paper phantom, reconstruction-agnostic, validation tool

CATEGORIZED AS

- **Imaging**
  - Medical
  - Other
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