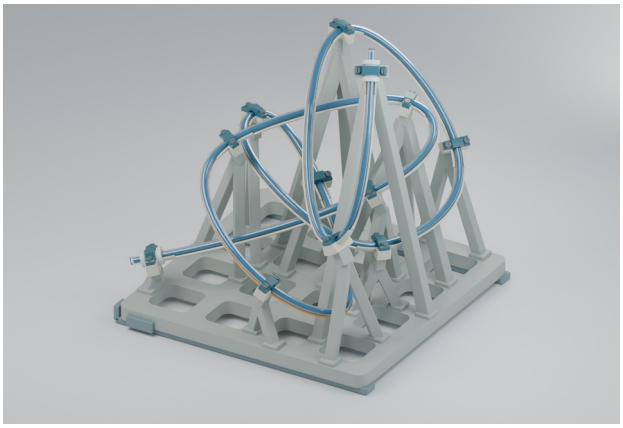
Master's Thesis

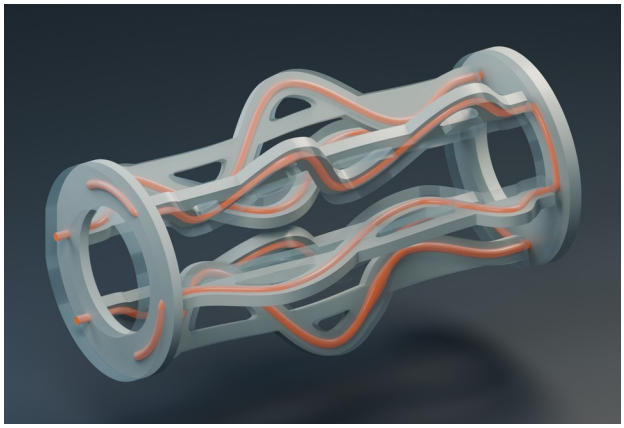
Chair of Imaging and Computer Vision | RWTH AACHEN UNIVERSITY

Design and MRI Characterization of a Calibration Phantom for PET Detectors

We calibrate PET detectors by moving a small radioactive source from point to point inside the scanner. Could a single stationary scan give us the information we need? The two designs below are starting points. You'll optimize the geometry, build your phantom and use MRI to measure the actual 3D shape of its water-filled channel.



Tube on a printed carrier. The frame holds replaceable tubing along a path adapted from a published simulation.



Six-vane phantom. The orange channel runs through the printed vanes. Passages in the end rings connect them into one continuous fluid path.

Your project

Optimize the channel geometry. Vary the path and cross-section in simulation. Use a measure such as Fisher information to compare how well each shape lets you calibrate interaction depth and transverse position in the detector crystals.

Build your design. Choose MR-compatible materials and print the parts on our 3D printers. Assemble the phantom, fill it with water and check for leaks and trapped air.

Measure the as-built shape with MRI. Segment the water-filled channel, trace its centreline and compare its measured 3D shape with CAD. A repeat MR scan can provide fresh geometric ground truth before each PET acquisition.

Prepare the PET test. Turn the MRI measurement into a source map registered to the PET scanner. Plan the acquisition and analysis for a later comparison with our moving-source reference.

Who we are looking for

This project suits a master's student in biomedical engineering, medical physics, mechanical or electrical engineering, or a related field. If you enjoy building things and using data to find out how well they work, you'll use both skills here. Experience with CAD or Python is welcome.

Apply to Julian Thull

Send a short CV, relevant experience and your preferred start date to
julian.thull@lfb.rwth-aachen.de

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