

Welcome to the 7th edition of the PetVision Newsletter!

Welcome to the **7th edition of the PetVision Newsletter!** We are pleased to bring you the March 2026 edition of the PetVision Newsletter. The PetVision EIC Pathfinder project has reached its halfway point, advancing the development of an affordable, modular PET scanner designed to improve cancer diagnostic access.

PetVision is structured in nine separate Work Packages (WPs): WP1 Project Management and Coordination; WP2 System design; WP3 Development of ASIC; WP4 Development of integrated photo-sensor; WP5 Front end readout and DAQ; WP6 Production and Integration; WP7 (Pre)clinical research evaluation; WP8 Exploitation, Impacts and Communication; WP9 Ethics requirements.

This newsletter is focusing on advancements in Work Package 2 (System Design) and the release of the YRT-PET Toolkit.

In next newsletter we will present you the work done so far in WP3 Development of ASIC and in WP4 Development of integrated photo-sensor.

About the project

Over 2.7 million people in the EU were diagnosed with cancer in 2020, while 1.3 million people lost their lives to it. Cancer cases are predicted to increase by 24% by 2035, making it the leading cause of death in the EU. The current leading imaging diagnostic technique sensitive to cancer is Positron Emission Tomography (PET). Due to the high implementation cost of PET, this highly sensitive diagnostics is only available in less than 0,5 % of the medical centers in the world. One of the main components of the overall cost is the cost of PET scanners. The main objective of PetVision EIC Pathfinder project is to develop a flexible, modular PET scanner, based on planar detector panels with exquisite time-of-flight (TOF) resolution and sensitivity. It will enable affordable, fast and precise dynamic scanning, and hence improve access to early cancer detection and therapy follow-up, paving the way for personalized medicine.

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Open-Source YRT-PET Toolkit Expands Flexibility in PET Image Reconstruction

A new open-source software platform, **YRT-PET**, developed by a team of researchers that includes members of the PetVision project, aims to broaden research and development possibilities in PET image reconstruction.

Designed as a high-performance, GPU-accelerated engine, YRT-PET provides a flexible alternative to vendor-specific reconstruction software while maintaining image quality comparable to established tools. Its release addresses a longstanding need in the PET community for transparent, customizable reconstruction frameworks that can support method development, cross-platform evaluation, and reproducible research.

Built in C++ with CUDA support, YRT-PET leverages modern graphics processing units to achieve fast computational performance suitable for demanding reconstruction workflows, including dynamic imaging and motion-compensated studies. The platform incorporates advanced modeling features such as time-of-flight information, point-spread function modeling, and corrections for physical and system effects. A modular plugin architecture allows compatibility with multiple scanner geometries and data formats, while Python bindings make the system accessible for rapid prototyping and algorithm development.

The authors evaluated YRT-PET across different PET systems and reconstruction scenarios, demonstrating that it can deliver reconstruction quality on par with commercial software while offering greater transparency and adaptability. Because the toolkit is fully open-source, researchers can inspect, modify, and extend its algorithms — an advantage for institutions developing novel reconstruction techniques, exploring quantitative imaging improvements, or comparing performance across platforms.

Overall, YRT-PET represents an important step toward more open and collaborative innovation in PET imaging, providing the research community with a powerful and extensible reconstruction engine designed to keep pace with evolving scanner technology and methodological advances.

Advancing Detector Performance: Key Results from Work Package 2

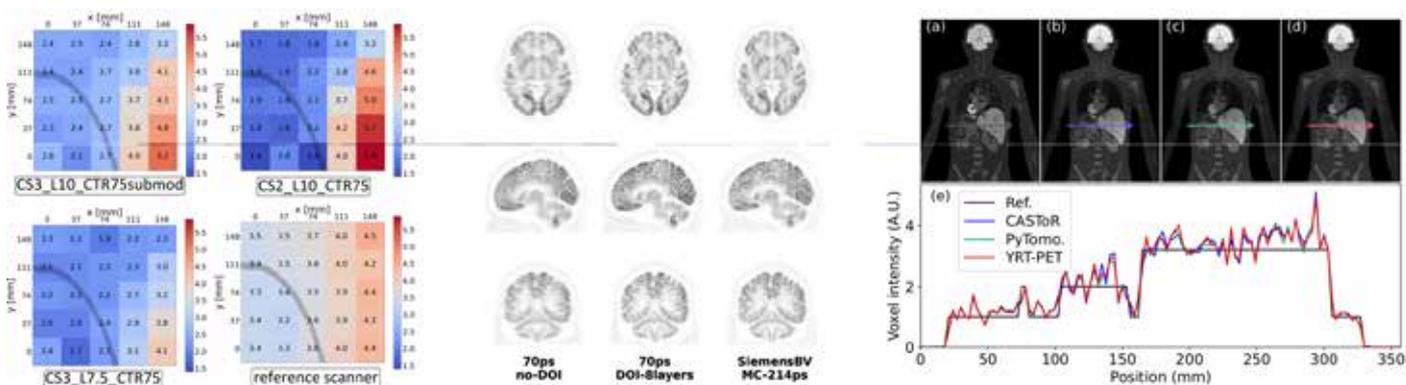
Work Package 2 (WP2) plays a central role in ensuring that the PetVision scanner achieves its ambitious performance goals. Its main objective is to evaluate and optimize the key components responsible for detecting signals in PET imaging—specifically scintillator crystals, silicon photomultipliers (SiPMs), and readout electronics. These elements must work together seamlessly to deliver extremely precise timing, which is essential for improving image quality and enabling faster and more accurate diagnosis.

During the last year, the team conducted extensive experimental measurements to compare different scintillator materials. A dedicated testing setup was developed to measure coincidence time resolution (CTR), a critical performance indicator that

determines how precisely the scanner can identify the origin of detected signals. The results confirmed that Fast-LGSO scintillators remain the best-performing option currently available. At the same time, high-quality LYSO crystals from a second manufacturer demonstrated equally strong performance, providing an important alternative supply option and increasing robustness for future production.

Researchers also evaluated the performance of complete single-pixel detector units, combining scintillators, SiPM sensors, and advanced FastIC+ readout electronics. These tests achieved a CTR of 85 picoseconds, representing excellent performance and bringing the project closer to its target of 75 picoseconds. This milestone demonstrates that the selected detector technologies are capable of delivering the fast and precise signal detection required for the next-generation scanner.

In parallel, simulation studies played a key role in optimizing the scanner design. These studies explored how factors such as crystal size, detector layout, and readout strategies influence image quality and resolution. The results helped refine the system design and contributed to scientific publications and the development of an open-source image reconstruction platform (YRT-PET), which will support future research and innovation in PET imaging.



Results of simulation studies: spatial resolution within the FOV in brain scanning configuration (left); effect of depth-of-interaction measurement on reconstructed images (center); comparison of image quality with YRT-PET reconstruction (right).

WP2 activities also contributed to training the next generation of researchers, with several master's students conducting studies on detector performance, cooling solutions, and system simulations. This work strengthens the scientific foundations of the project while building expertise for future development.

Overall, Work Package 2 has successfully validated key detector components and provided essential data to guide the design of the PetVision scanner. These results reduce technical risks, confirm the feasibility of the planned system performance, and lay the groundwork for building and testing integrated detector modules in the next phase of the project.

You can meet us here:

- 21st European Molecular Imaging Meeting (Ljubljana, Slovenia, March 2026)
- MEDAMI 2026: Deployment of Nuclear Medicine Technologies to Low- and Medium-Income Countries (Valencia, Spain, May 2026)
- NDIP26- Conference on New Developments in Photodetection (Troyes, France, July 2026)
- 6th Jagiellonian Symposium on Advances in Particle Physics and Medicine (Kraków, Poland, July 2026)
- TWEPP 2026" Topical Workshop on Electronics for Particle Physics (Barcelona, Spain, September 2026)
- 2026 IEEE NSS MIC RTSD (Granada, Spain, November 2026)

