PetVision Newsletter; 9th edition
November 2026

Welcome to the Ninth Edition of the PetVision Newsletter!

The PetVision framework spans nine dedicated Work Packages (WPs) covering everything from chip design to clinical evaluation. This month, we take a deep dive into the integration phase and digital backbone of our system:

- **Managing Data with Precision (WP5):** Discover our advances in high-speed data acquisition, synchronization, and the digital architecture that processes PET imaging data.
- **Bringing the System Together: Prototype Development (WP6):** Learn about our breakthroughs in transforming the PetVision concept into a fully functional physical prototype tailored for clinical environments.

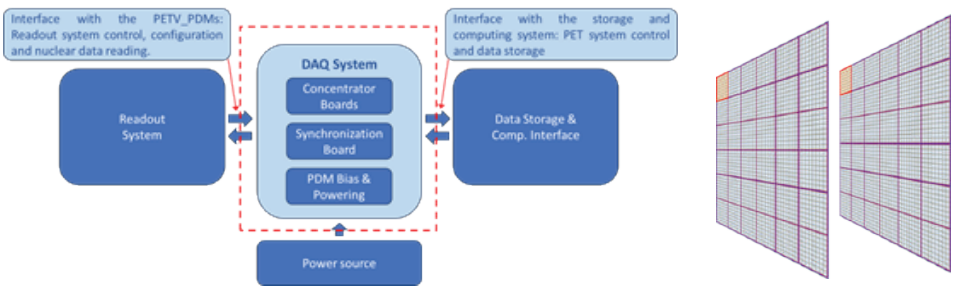
In our next edition, we will shift focus to the validation and future dissemination of our technology, highlighting **(Pre)clinical research evaluation (WP7)** and **Exploitation, Impacts and Communication (WP8)**. Thank you for following our journey toward more accessible healthcare.

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.

Managing Data with Precision: Advances in Work Package 5

Work Package 5 (WP5) focuses on developing the Data Acquisition (DAQ) system—the digital backbone that collects, synchronizes, and processes signals from the PetVision detector modules. This system ensures that the vast amount of data generated during PET imaging is accurately captured, precisely timed, and efficiently transferred for further processing and image reconstruction.
In past period the team successfully designed and tested key components of the DAQ architecture. At the heart of the system are specialized Concentrator Boards, which are scalable digital blocks, each capable of collecting data from more than a thousand detector channels. These boards process signals from more than 18 thousand similar channels in parallel, assigning a unique identifier based on their position within the detector, extending the timestamp range and preserving energy information for every recorded nuclear event. Furthermore, they manage communication with detector modules and transmit validated data to central storage systems using high-speed network connections. Prototype testing demonstrated reliable performance, with data transmission speeds reaching 1 gigabit per second, each block—confirming the system's ability to handle the demanding data rates required for high-resolution PET imaging.
Another major achievement was the development of the Synchronization Board, a central timing unit that ensures precise coordination across the entire scanner. This board distributes a highly stable reference clock and processes trigger signals from all detector modules, identifying events that occur with a simultaneity lower than 2 ns in different parts of the system. Accurate synchronization is essential for achieving PetVision's ambitious timing resolution target (under 100ps) and ensuring reliable image reconstruction.
The team also validated critical communication interfaces between system components, including high-speed data links and control connections. These interfaces allow detector modules, electronics, and control systems to operate seamlessly together, ensuring reliable system performance and scalability. Extensive testing confirmed that the DAQ architecture can support the large number of detector channels planned for the full PetVision scanner.

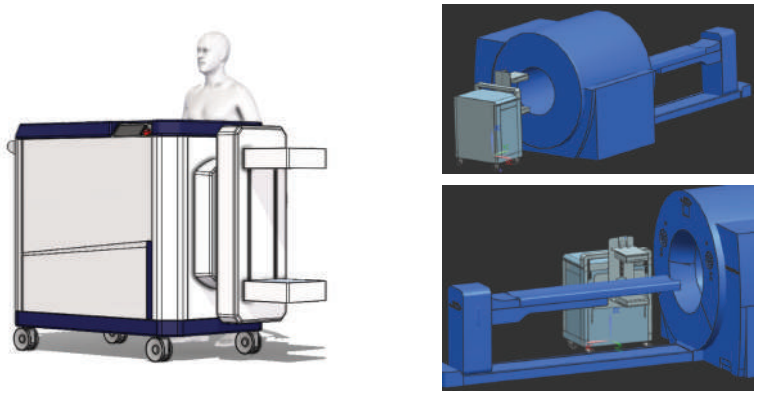


DAQ system internal blocks and its interfaces and the coincidence areas.

The overall system design follows a modular and scalable approach, enabling flexible expansion from small prototypes to full-scale clinical systems. This architecture allows the PetVision scanner to grow in capability while maintaining high performance and reliability.
In summary, work has successfully established the foundation of the PetVision data acquisition system. By demonstrating reliable high-speed data handling, precise timing synchronization, and scalable system architecture, this work package ensures that the scanner can capture and process imaging data with the accuracy needed to support next-generation PET imaging.

Bringing the System Together: Prototype Development in Work Package 6

Our work in this Work Package focuses on transforming the PetVision concept into a fully functional physical prototype. Its main objective is to integrate detector modules, electronics, cooling, and mechanical structures into a complete system that can be tested in realistic clinical environments. This step is essential for demonstrating the feasibility, usability, and performance of the PetVision scanner beyond individual components.
Building on Prototype V0, whose mechanical architecture was designed for compatibility with existing PET and PET-CT rooms, the team has moved to the next design iteration, Prototype V1. Feedback collected on V0 has been translated into a more compact and fully motorized system.
In V1, the panel mechanics, high-voltage electronics, cooling unit and electronics rack are housed in a single mobile cart. Motorized axes control the distance between the two detector panels, their rotation and the height of the column, so the scanner can be aligned with any standard CT bed and adapted to different body regions. A control panel with an emergency stop is integrated into the housing, and hospital-grade castors keep the system easy to move between rooms.
On the integration side, an Interface Control Document now defines how detector modules, readout boards, cooling plates and mechanics fit together, with connectors selected for all subsystem interfaces. Limiting panel rotation to ±90° simplified the design considerably: cables and cooling lines follow a managed service loop instead of rotary joints. A dedicated synchronization and trigger card distributes a low-jitter clock to all readout boards, and a timing calibration method, already validated on an earlier prototype, has been adapted to the two-panel geometry.



The mechanical design features highly flexible geometry, centred on modular detector panels.

The next milestones are a coordinated design freeze across partners, followed by a test panel with dummy detector modules in early 2027 to verify thermal and mechanical performance before V1 is released for manufacturing. A survey of the clinical PET-CT room at TUM has already confirmed the space and access needed to bring the system into a hospital setting.
Overall, Work Package 6 is taking PetVision from a first prototype to a mobile, clinically compatible scanner, ready for full system assembly as the detector modules are delivered.

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