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Teaching Old PETs New Signals

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Legacy ex-clinical positron emission tomography (PET) systems continue to offer powerful capabilities when coupled with modern digital data acquisition (DDAQ) systems. At the University of Cape Town, revitalised PET hardware is being transformed into a flexible experimental platform for applied nuclear physics, radiation detection, multimodal imaging studies, and student education and training.

The reimagined toolkit enables a wide range of PETs: from emission tomography (PET) and particle tracking (PEPT), to spectroscopy, and hybrid systems integrating X-ray CT or low-field MRI. The development of high-speed, high-resolution DDAQ systems enables access to full event-level data, significantly enhancing the information content and processing flexibility of acquired signals. These advances support emerging measurement modalities, including angular gamma correlation and positronium lifetime imaging, with potential sensitivity to localised chemical and material environments.

A newly acquired X-ray CT tomograph, commissioned in 2025, enables high-resolution structural imaging complementing positron-derived functional and dynamic data, opening new opportunities for multimodal analysis. The resulting platform combines legacy detector design with modern computational modelling and real-time event processing, paving the way for next-generation applications in nuclear instrumentation, imaging, and flow dynamics research.

Primary author: LEADBEATER, Thomas (University of Cape Town)

Presenter: LEADBEATER, Thomas (University of Cape Town)

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