

Reflections on Time-of-Flight for PET imaging

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The benefits of measuring the time difference between the arrival of the two photons from positron annihilation was recognized from the very early days of PET imaging in the 1960s. However, at that time the scintillator light decay time and the timing of the electronics was insufficient to implement a measurement of time-of-flight (TOF) that could have a beneficial effect on the image quality. The first PET devices to realistically explore TOF were not developed until the 1980s by groups at LETI in France, Washington University, St Louis and Houston, Texas. The TOF resolution achieved by the LETI system was around 750 ps. However, during the 1980s, the emphasis in PET imaging was more focused on achieving better spatial resolution and sensitivity, neither of which was a strength of the early TOF scanners. Following the development of 3D PET imaging and the emergence of new, fast scintillators in the early 2000s, the interest in TOF was revived and is now one of the most important parameters to optimize in new PET scanner designs. To set the scene for the meeting, this presentation will briefly review the progress in TOF measurement and highlight some of the milestones in achieving the current timing resolution of around 200 ps in commercial PET scanners.

Author: Dr TOWNSEND, David W.

Presenter: Dr TOWNSEND, David W.

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