
Medical Imaging Achieved Without Tomography



A research team, led by investigators at the University of California, Davis, and Hamamatsu Photonics, has demonstrated the first experimental cross-sectional medical image that doesn't require tomography. The work, published 14 October in *Nature Photonics*, could allow medical imaging with better sensitivity and time resolution.

Normally, X-ray computed tomography (CT), single-photon emission computed tomography (SPECT), and positron emission tomography (PET) measure one- or two-dimensional photon emissions from the imaged object, which are used to reconstruct cross-sectional images through iterative algorithms. In the case of PET imaging, radioactive decay produces positrons which are annihilated on colliding with electrons. Positron-electron annihilation creates two photons in opposite directions. Because the scintillation detectors used are slow, timing information is lost and tomographic reconstruction is necessary.

Instead, the technology under development uses ultrafast Cherenkov photon-based detectors that can detect annihilation photon arrival times. This information can be used to pinpoint their origins based on the detection time differences. The detector's ultrafast speed (32 picoseconds) is possible because it detects Cherenkov photons when the annihilation photons strike the detector, rather than using a scintillation-based method.

Given that these detectors capture the information present in the travel time of the annihilation photons, this could lead to the development of more compact clinical equipment. The study describes various tests they that they conducted with their new detectors, including on a test object that mimics the human brain, to create cross-sectional medical images.

Source: [Nature Photonics](#)

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