AbstractID: 9764 Title: Advanced CT Source and Detector Technologies

The source and detector subsystems are critical for the performance of a CT scanner. Technical advances in these components have been necessary to enable the progress that CT has achieved in recent years, and, in some respects, improvements in these technologies have driven system-level advances. It is appropriate, therefore, to explore what further advances are possible in these components and what these changes would mean to CT system performance. We will examine these issues with a particular focus on the desire to improve dose-efficiency, scanning speed, and volumetric coverage, and to develop new applications.

X-ray sources fir clinical CT have become much more powerful and rugged, evolutions driven by the increase in scanning speed. Modern sources allow for a small amount of beam deflection to improve projection sampling. Wider volumetric coverage in a single rotation will be facilitated if the sources with multiple spot locations in the axial direction. Very rapid kVp switching would provide improved multi-energy imaging.

The predominant technology in CT detectors is energy integrating devices composed of scintillators with coupled photodiodes. While CT detectors have high DQE compared to some other x-ray based technologies, there is room for improvement, especially at low exposure rates and high spatial frequencies. Direct conversion detectors could provide higher spatial sampling frequencies without loss of geometric efficiency from reflectors. Photon counting detectors could provide a significant improvement in performance, especially if the detectors also provide energy discrimination. The challenges and opportunities from these technologies will be discussed.

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