

Implementation and Characterization of Single Photon Transmission Scanning for Attenuation Correction in PET

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A hardware upgrade for any ECAT 933-04 has been developed which allows transmission scans to be performed in real-time employing an orbiting single photon gamma ray point source. The upgrade is transparent to existing scanner hardware. This implementation is characterized in terms of uniformity, transaxial resolution, axial resolution, sensitivity and accuracy of measured Attenuation Correction Factors (ACFs).

This work demonstrates that resulting scans can be used to produce calculated attenuation correction maps in one eighth the time as compared to coincidence mode transmission scans with equivalent statistics. The work also demonstrates the fundamental limit to accuracy of ACF data obtained using single photon methods on PET tomographs employing BGO detectors with wide energy windows. This limit indicates correct ACFs cannot be measured using this method, as can the slower coincidence method; however, the dramatic speed increase and excellent resolution of the single photon method allows for efficient calculated attenuation corrections to PET LOR data.