Contribution ID: **2** Type: **Contributed Poster**

Position Resolution Considerations for the SmartPET Imaging System

Thursday, 15 September 2005 10:30 (30 minutes)

The SmartPET collaboration is investigating the e_cacy of using two planar High-Purity Germanium (HPGe) double-sided strip detectors as a Compton imaging Positron Emission Tomography (PET) system. Monte Carlo simulations suggest that a large proportion of interactions within the detectors will occur within a small spatial and temporal window, introducing signi_cant ambiguities within the position and energy measurements made by the detectors. The a_ect of this ambiguity on the quality/quantity of information used for image reconstruction is the subject of this study.

Each detector in the system is to act as a single layer Compton camera, thus the interaction sequences of annihilation -rays need to be tracked within a detector volume, and the location and energy deposit of each interaction determined. The resulting information can then be used, depending on the interaction sequence combination, to backproject either a cone of response (as in standard Compton imaging) or a line of response (as in standard PET) into the image space.

Each detector has an active area of 60mm x 60mm x 20mm and a strip pitch of 5mm. Position resolution in the plane of the detector will be achieved by analysis of the signals from strips neighbouring the primary charge collector, and is expected to be around 1mm when a single interaction occurs within the volume between two orthogonal strips (intersection volume). Depth resolution will be obtained by measuring the timing separation between the front and rear signals. When multiple interactions occur within one intersection volume the position resolution will be degraded. The resulting signal is likely to be misinterpreted as a single interaction, or, the presence of multiple interactions may be correctly identifed but the position and energy information of each interaction will be irretrievable or subject to a large uncertainty. Preliminary analysis of simulated signals indicate that the detected position will be (approximately) the average of the true interaction positions, and the detected energy the sum of the true interaction energies.

This study will present the probability of multiple interactions occurring within an intersection volume, the probability that those interactions will be indistinguishable from a single interaction, and the a_ect the incorrect measurements have on the accuracy of backprojected lines/cones.

Primary author: Mr BEVERIDGE, Toby (Monash University, Australia)

Co-author: Prof. LEWIS, Robert (Monash University, Australia)

Presenter: Prof. LEWIS, Robert (Monash University, Australia)

Session Classification: P : Coffee and Poster Session

Track Classification: New Techniques for Positron Emission Tomography