Contribution ID: **88** Type: **poster**

Geometric Sensitivity of ClearPET(TM) Neuro

Tuesday 9 May 2006 14:00 (1 hour)

ClearPET(TM) Neuro is a small animal PET scanner dedicated to brain studies on rats and primates. It belongs to the ClearPET family of small animal PET scanners that are developed within the Crystal Clear Collaboration (CERN) and use the same detector block design with LSO and LuYAP crystals in phoswich configuration, directly coupled with multi-anode photomultiplier tubes.
ClearPET(TM) Neuro consists of 20 modules each with 4 detector blocks in line with 8x8x2 crystal matrices. Due to the extension of the photomultiplier tubes there are axial and transaxial gaps between the crystal blocks. To compensate for these gaps each second module is axially shifted and the scanner rotates during data acquisition. However, the design of ClearPET Neuro still leads to a specific geometric sensitivity, characterized by inhomogeneous and - depending on the measurement set-up - even incomplete sinogram data.
With respect to reconstruction techniques, homogeneous and complete data sets are a 'must' for analytical reconstruction methods like Filtered Backprojection and the use of Fourier Rebinning, whereas iterative methods take the geometrical sensitivity into account during the reconstruction process. Nevertheless, also here a homogeneous as possible geometric sensitivity over the field of view is highly desirable.
Therefore this contribution aims at studying the impact of different scanner geometries (axial shift, scanner radius) and different measurement set-ups (scanner rotation, various axial bed positions) on the geometric sensitivity. For that purpose a data set of coincident events is computed for certain settings that contains each possible crystal combination once. The lines or response are rebinned into normalizing sinograms and backprojected into sensitivity images using STIR (Software for Tomographic Image Reconstruction) tools. Both, normalizing sinograms and sensitivity images mirror the geometric sensitivity and therefore provide information which setting enables complete and homogeneous (as far as possible) data sets. An optimal measurement set-up and scanner geometry in terms of homogeneous geometric sensitivity is found by analyzing the sensitivity images.

Author: Dr GUNDLICH, Brigitte (Forschungszentrum Jülich GmbH)

Co-author: Dr WEBER, Simone (Forschungszentrum Jülich GmbH)

Presenter: Dr GUNDLICH, Brigitte (Forschungszentrum Jülich GmbH)

Session Classification: Poster Session :Simulation, Modeling, Reconstruction

Track Classification: • System simulation, design and implementation