SMALL ANIMAL POSITRON EMISSION TOMOGRAPHY SCANNERS DESIGN OPTIMIZED FOR STATISTICAL RECONSTRUCTION METHODS

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Positron emission tomography (PET) Scanners are commonly designed bearing in mind analytical reconstruction methods. High sampling density is one of the main design goals. On the other hand, iterative methods are less sensitive to the sampling density, their performance being more related to the properties of the System Response Matrix. In small animal PET scanners, iterative techniques have proved to yield superior image quality.

Specific design strategies can be followed in order to obtain optimal results with iterative techniques. For example, reducing the size of the crystals beyond certain point will not further improve the resolution of iterative methods because the average number of counts in each Line of Response will decrease and the relative importance of noise will be larger.

We discuss the main issues (number of LOR's, size of the crystals, noise level) to be consider during the design of high resolution and high sensitivity PET scanners, in order to optimize the images obtained with iterative reconstructions, and comment on the improvement achievable in the image quality of a typical clinical study, and on the quantitative estimate of design parameters.