Optimizing Singles Count Rate for Brain FDG Imaging with an ADAC Scintillation Camera

With the increase in the use of Scintillation Cameras for Coincidence Imaging (CI), questions arise concerning testing Of particular importance is the optimization of the singles count rate to minimize the random fraction and, yet, have the maximum true coincidence rate possible. To aid in assessing the optimum singles count rate, the Noise Equivalent Count Rate (NECR, $[\text{true coincidence rate}]^2$/total coincidences) was measured over a count range for an ADAC Vertex Plus camera operating in the coincidence mode. To simulate brain imaging, a circular cylinder with fillable sphere (concentration of 5:1 relative to the phantom) was imaged over a singles count rate of 1.5 Million cps per detector to 100 kcps. An additional phantom with equal activity was placed where a patient's chest would be in an actual scan to simulate events outside of the FOV. The low count rate image was used to determine the scatter fraction so that the true and random fractions could be determined for each measurement. The NECR was found to peak at 1.0 Mcps with an approximate 10 % drop at 1.2 Mcps and 0.8 Mcps. The hot spheres were analyzed for image quality and resolution as a function of count rate, also. Based on these results, patient images for brain CI are obtained for singles count rate over a range of 0.9 to 1.1 Mcps/detector.