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Performance evaluation of a large axial field-of-view PET scanner: SET-2400W

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The SET-2400W is a newly designed whole-body PET scanner with a large axial field of view (20 cm). Its physical performance was investigated and evaluated. The scanner consists of four rings of 112 BGO detector units (22.8 mm in-plane × 50 mm axial × 30 mm depth). Each detector unit has a 6 (in-plane) × 8 (axial) matrix of BGO crystals coupled to two dual photomultiplier tubes. They are arranged in 32 rings giving 63 two-dimensional image planes. Sensitivity for a 20-cm cylindrical phantom was 6.1 kcps/kBq/m*l* (224 kcps/μCi/m*l*) in the 2D clinical mode, and to 48.6 kcps/kBq/m*l* (1.8 Mcps/μCi/m*l*) in the 3D mode after scatter correction. In-plane spatial resolution was 3.9 mm FWHM at the center of the field-of-view, and 4.4 mm FWHM tangentially, and 5.4 mm FWHM radially at 100 mm from the center. Average axial resolution was 4.5 mm FWHM at the center and 5.8 mm FWHM at a radial position 100 mm from the center. Average scatter fraction was 8% for the 2D mode and 40% for the 3D mode. The maximum count rate was 230 kcps in the 2D mode and 350 kcps in the 3D mode. Clinical images demonstrate the utility of an enlarged axial field-of-view scanner in brain study and whole-body PET imaging.

Key words: positron emission tomography, performance evaluation, whole body scan, 2D