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STUDY OF UNIVERSAL GAMMA CAMERA IN MECHANICAL RESPECTS

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Toshiba has developed a Universal, Multipurpose Gammacamera capable of obtaining ECT images without changing the position of the patient. It can also perform ordinary image using a conventional gammacamera that has a large field detector. This report is a study of this equipment with reference to its mechanism.
The Universal Gammacamera consists of the gantry, which rotates the two detectors; the table, which can position the tabletop in longitudinal and transverse directions not only by motor drive but manually, and can also move vertically; and the control section.
This equipment has seven movements: detector rotation, arm rotation, radius movement of the detectors in opposed position and rotation of the detectors in the gantry, and longitudinal and transverse movements of the tabletop and vertical movement of the table. Description will be made of the effects of accuracy of these mechanical movements and the advantages of these functions.

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DEVELOPMENT OF UNIVERSAL GAMMACAMERA

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The Universal Gammacamera is a multipurpose type Gammacamera which has one or two large field detectors. It can not only obtain ECT images by combining the data processing device GMS-80A, but ordinary and whole-body imaging as well. The detector is a GCA-401-5 type detector (Effective field 350 mm dia.; intrinsic resolution 1.8 mm). The equipment is composed of the detector; the gantry, which rotates the detectors through 360°; the table, which can move the tabletop longitudinally and transversely; and the control section. It provides ECT and Whole-body images without having to change the patient's position.
By combining longitudinal and transverse movements of the tabletop, detector rotation, arm rotation and radius movement of the detectors in opposed position, a normal image of any region of the patient's body can be obtained. In the case of 2-detector type, simultaneous 2-direction imaging can be performed.
In whole-body imaging, three types of scanning, 1 to 3 passes by tabletop movement are possible. An image with a maximum effective field of 60 cm x 200 cm can be obtained. With the 2-detector type, the anterior and posterior views of the patient can be obtained on one film at the same time, thereby reducing the time necessary for measurement.

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DEVELOPMENT OF A SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY(SPECT).

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We developed the SPECT system using a rotating scintillation camera and estimated the fundamental performance of this system.

This system consists of the rotating scintillation camera (GAMMA VIEW-T) and the data processor (EDR-4200 series). The reconstruction of the image is performed by filtered back projection and the reconstruction time is 30 sec/slice for 64 views collection by the improved software of back projection.
At 200mm distance from the collimator, the spatial resolutions in FWHM are 12.4mm and 14.2mm for the UF and HR collimators, respectively. In Liver phantom study, the cold spot of 10mm in diameter could be resolved clearly.

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COLLIMATOR PERFORMANCE ANALYSIS OF MULTI-LAYER POSITRON EMISSION COMPUTED TOMOGRAPHS.

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Image quality for multi-layer positron emission computed tomographs is determined by various geometrical parameters such as detector ring radius, patient port radius, depth, slit width and thickness of slice shield collimators. Evaluation of slice shield collimators is carried out using theoretical formulas (1) for uniform cylindrical sources. This approach permits calculation of system performance in terms of sensitivity, scatter fraction, and high-counting rate characteristics. Predicted performance for a multi-layer whole-body device under construction is presented, taking electronic counting efficiency into account.

This work was carried out under contract with the Agency of Industrial Science and Technology, Ministry of International Trade and Industry.

(1) E. Tanaka, et al.: Abstracts of 4th Symposium on Physical and Technical Aspects of Transmission and Emission Computed Tomography, 1981, pp 77-78.