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EMISSION COMPUTED TOMOGRAPH : HEADTOME-II.
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The HEADTOME-II is an emission computed tomograph dedicated to brain studies. 64 NaI rectangular crystals (each of them is coupled to a photomultiplier tube) are arranged on a circle of 42 cm diameter and build up a detector ring, which enables highly sensitive measurements in both positron and single photon studies. One of these two studies can easily be selected by changing collimators and software programs. Since three sets of the detector ring described above are stacked together, three transverse sectional images are obtained simultaneously in single photon studies and five images in positron studies.

In single photon studies, data are collected with the rotations of both the collimator and the detector rings. The spatial resolution is 11 mm FWHM and the sensitivity is 58.5 kcps/μCi/mℓ(Tc-99m). Linear count rate characteristic up to 700 kcps is observed.

In positron studies, data are collected with the rotation-and-wobble of detector rings. The spatial resolution is 10 mm FWHM and the sensitivity is 25 kcps/μCi/mℓ(intra ring slice), 33 kcps/μCi/mℓ(inter ring slice).

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WHOLE-BODY POSITRON COMPUTED TOMOGRAPH.
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The details of a positron computed tomograph which had veen developed and has been in the clinical test were described. The tomograph consists of a scanner, a couch, an operator's console and an image processor. The scanner equipped with three detector rings enables five-slice data acquisition for the whole-body scanning. The detector consists of four BGO scintillators and two photomultipliers. In each ring, 40 detectors are arranged with unequal spacings on an continuously rotating disc. The coincidence circuits mounted on the rotating disc detect the coincident events among the detectors and generate the detector address signals for the image processor. An optical transmission device, a rotary photocoupler, is used to transmit a 32 bits parallel data on the rotary disc to the stationary image processor. The spatial resolution was measured to be 9.5-12 mm FWHM.

This work was conducted under contract with the Agency of Industrial Science and Technology, MITI, Japan.

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BETA DOSE MEASUREMENTS USING TLD(LIF:MG, CU) AND COMPARISON WITH THE CALCULATED DOSES.
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The response of thermoluminescent LiF:Mg, Cu (NTL-50) to beta radiation was examined. The disks of LiF:Mg, Cu(average thickness of 140 mg/cm²) were exposed to beta sources of various maximum energies ranged from 0.067 MeV (Ni-63) to 1.17 MeV (P-32) using polycarbonate films as an absorber of skin tissue equivalent. The dose rates measured in this way were compared with those calculated from the beta dose functions developed by Loevinger et al. The dose calculations in air were performed as point sources whereas those using absorber as definite plane sources. The dose rates in air as a function of distance from the source decreased nearly with inverse squars law. On the other hand, the dose rates as a function of absorber thickness decreased nearly with exponential function. Both dose rates measured in air and using the absorber showed similar tendencies to each calculated dose, however, the LiF:Mg, Cu dosimeter seriously underestimated the doses both in air and using the absorber in comparison with the calculated ones. These underestimation would be probably due to the thick layer of the dosimeters.

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DEVELOPMENT OF NUCLEAR MEDICINE DATA PROCESSING SYSTEM WITH LARGE-SCALE IMAGE MEMORY.
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A new nuclear-medicine data processing system with large-scale image memory, the GMS-55A, has been developed to achieve higher speeds for data collection and processing, higher quality of displayed images, and greater ease of operation.
Features: (1) The image memory (512 x 512 x 512 bit; up to 8 pieces) is directly connected to the display circuit; data collection and processing can be performed while referring to this "visual" memory. (2) This also allows frame-mode collection for every 5 milliseconds maximum, drastically reducing processing time. (3) The display at 256 gray levels in 512 x 512 matrix gives high-quality images comparable to analog images of gamma cameras. Gray levels and color scales can be easily selected with function keys. (4) All software can be operated in the conversational mode. (5) Programs are arranged in two groups (basic and clinical) for efficient and flexible operation. (6) Up to 90 protocols for data collection conditions can be registered. (7) A high-speed arithmetic unit for ECT reconstruction can be incorporated.
These features make it possible to adapt this system for both routine uses and research purposes.