performance and the scintigrams by L.E.M. were compared with those of IV. The methods are as follows:

1) Sensitivity was examined without colimator.
2) Uniformity was examined with window of PHA on three portion of photo peak (lower, center, and upper portion) which shows in normal and in an exaggrated field uniformity.
3) Specific resolution was investigated by using lead bar phantom.
4) Resolution distance were measured at using two thin tubes containing radio nuclides of gamma ray energy from 92 keV to 247 keV.
5) Resolution distance were also measured at various distance from ditector surface to source using above mentioned line source.
6) Counting loss of maximum counting rate was examined by decaying source method.
7) Scintigrams of myocardium, kidney and celebral cisterna were obtained using by Tl-201 (Hg X-ray 65 keV to 82 keV), Tc-99mDTPA (140 keV), In-111DTPA (172 keV), Two scintigrams obtained by L.E.M. and IV. The same patient were comapred critically.

The results showed that system performance and scintigrams were proved better in L.E.M. than in IV. Sensitivity of L.E.M. system was higher than that of IV system by the factor of about two hold in the Tc-99m source. Uniformity with window of PHA on lower and upper portions of photo peak were worse compared with centered photo peak.

Specific resolution by lead bar phantom were 3 mm in L.E.M. and 3.5 mm in IV. Resolution distance at various distance from 2.5 to 20 cm were always better in L.E.M. than in IV. Resolution distance were 5 mm by L.E.M. and 7 mm by IV in source to ditector distance 2.5 cm. Counting loss started to appear at 200Kcps by L.E.M. and at 12Kcps by IV. Scintigrams of the organs showed that L.E.M. provide us with good images in short time compared with IV. However, it is limited in low energy region.

The most effective utility of L.E.M. is to be mobile and even collimator can be changeable easily. L.E.M. could be used not only in CCU, ICU and operation room for an emergency examination but also would be used as standard gamma camera for extensive examination by connecting with mini computer and micro dot imager system.

Rhombic Coordinate Systems for Scintillation Cameras

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New position computation methods for scintillation cameras are investigated both theoretically and experimentally. To date, scintillation point coordinates have been calculated along two axes, x axis and y axis, which cross at 90°. However there are several coordinate systems for scintillation camera position arithmetics, where two axes cross obliquely. Two of these coordinate systems are investigated. One of them consists of the Cartesian x axis and an axis which crosses the x axis at 60°. The other system uses the y axis and an axis crossing the y axis at 60°. These coordinate systems are called the "X rhombic" and "Y rhombic" systems, respectively. These systems are more symmetrical than the ordinary Cartesian coordinate system for a hexagonal array of photomultiplier tubes (PMTs).

A comparative evaluation is made for these three systems. The scintillation camera detector used in the experiments consists of a 12 inch NaI scintillation crystal and nineteen 2 inch PMTs. Signals from these 19 PMTs are converted to nine line-signals for "X rhombic," and five line-signals for "Y rhombic". Positioning signals are calculated by conventional Delay-line method. Measurement of spatial resolution and uniformity are made with ^{57}Co (122 keV) gamma-rays.

Results of these experiments are as follows: No difference in spatial resolution is found among the three systems. However, the uniformity of the Y rhombic system is inferior to the other two systems. A certain amount of distortion which cannot be corrected remained in the Y rhombic system.

After investigation of the experimental results, it is found that the Y rhombic system is suitable for high-speed scintillation camera and the X rhombic system for high-resolution scintillation camera applications.

Operating Characteristics of a Multi-Crystal Positron Camera

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A multi-crystal positron camera has been constructed for diagnostic investigations with short-lived positron emitters produced by the NIRS cyclotron. The camera has two identical detectors each consisting of a rectangular array of 14 × 14 small crystals (20 mmϕ × 38 mm) viewed by an array of 112 photomultiplier tubes (38 mmϕ). Each crystal in the detector is in coincidence with 25 crystals in the opposite detector to form 4096 coincidence crystal pairs in total. The electronic system is simplified by OR-ing the signals from the photomultiplier tubes in each row and column prior to coincidence operation between the detectors. Signals presenting four coordinates for the crystal pairs are converted to 4-bit binary code each and are further packed into 12-bits (64 × 64 levels). Coindence events are stored in one of two 4KW 18-bit memories and the accumulated data are decoded and displayed on a CRT as an image focused in any plane between the detectors.

Detection efficiency and high countrate characteristics of the camera system were tested as a function of coincidence resolving time and energy discrimination level. From these results, we selected these parameters to be 24 nsec as the coincidence resolving time and 50 keV as the discrimination level. The detection efficiency of the camera without collimators was 18.4 cps/μCi for a plane source of 15×15 cm^2 in air, positioned at the center of the detectors separated by 50 cm. The high countrate characteristics were also tested with a phantom of goldfish-shaped toy balloon filled up with $^{11}CO_2$ gas (initial activity: 127 mCi). The maximum coincidence rate was 120 kcps, but a clear image was observed below 60 kcps.

Application and Evaluation of the Computer Program for the Correction of Non-uniformity of Gamma Camera

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In order to study the effect of correction of non-uniformity of gamma camera for better images, a computer program inherent to Scintipac 200 (Shimazu) was evaluated.

A flood phantom (40 cm in diameter, 1 cm thick) filled with Tc-pertechnetate was used. A image of the phantom was taken by LFOV gamma camera (Searl Inc.) with high resolution collimetor. The data with 25,000K counts were simultaneousl, stored in Scintipac to be used as original data for the correction of non-uniformity. Various numbers of bakelite plate absorber (3 × 3 cm, 1 mm thick) or filtration paper (3×3 cm) moistened with ^{99m}Tc-pertechnetate were placed on the phantom to make cold or hot spots, respectively. The distinguishability of those cold and hot spots were