# A. Instrument, Computer

## 1

DEVELOPMENT OF REAL-TIME CORRECTION EQUIP-
MENT FOR ENERGY-SIGNAL NONUNIFORMITY AND
POSITION-CALCULATION NONLINEARITY IN GAMMA
CAMERAS. M.Nishikawa,T.Kihara,H.Nishimura
and M.Kakegawa (Toshiba, Nasu Works)

This new correction equipment stores, in
the memory corresponding to the position of
Gamma camera detector surface, correction
coefficients used to correct nonuniformity
of energy signals and the correction vector
quantities used to correct nonlinearity in
position calculation. Real-time correction
can thus be made by the following sequence:
(1) For each scintillation event that passes
through PHA for which slightly broader win-
dow has been set, the energy signal is first
corrected, followed by PHA processing once
again, and (2) the correction vector is
added to the scintillation position signal,
which has passed through PHA, to achieve
linearity correction. In order not to
adversely affect the counting rate charac-
teristics of the Gamma camera, two high-
speed sum-of-products calcualtion modules
are used in the correction calculation
circuit (particularly interpolation calcu-
lation to perform smooth linearity correc-
tion) so that processing for each event can
be completed in 2 microseconds.
Calibration for the energy correction is
made using the data collected under uniform
irradiation, while two slit phantom images
(one vertical and one horizontal) and one
uniformity image are used for linearity
calibration. It is also possible to execute
these processings on-site.

## 3

ASSESSMENTS OF THE PERFORMANCE OF A 200 Kev
COLLIMATOR FOR 67Ga IMAGING. T.Matumoto,
T.A.Iinuma,F.Shishido, Y.Tateno. National
Institute of Radiological Sciences. Chiba.

The performance of an imaging system with
a 200 Kev collimator for 67Ga imaging is eva
-luated by using physical parameters and ROC
analysis on the lesion detectability of hu-
man observers. The specification of the
designed collimator is as follows: max. en-
ergy; 200 Kev, hole size; hexagon, number of
hole; 5700, septum thickness; 1.08 mm,system
sensitivity; 280,98 (cpm/$\mu$Ci)for 93, 184 Kev,
geometric resolution; 14.0 mm and system
resolution at 10 cm distance from the colli-
mator- surface; 14.3 mm.
The first, by the phantom study,the basic
performance (sensitivity and resolution) of
the imaging system with the collimator is
compared with the system attached the anoth-
er collimator (max. energy;400 Kev, system
sensitivity; 101,35,12 (cpm/$\mu$Ci) for 93,184,
296 Kev, respectively, system resolution at
10cm;11.7 mm). The second, using a digital
computer, a process of the imaging system
with the collimator for the 200 and 400 Kev
is simulated. Twenty observers are asked to
see the X ray films of simulated image and
to judge whether or not there are defects in
the image. Results of the assessments of
the lesion detectability for the imaging
system by means of ROC analysis, it was ob-
tained the fact that the performance of the
system with 200 Kev-collimator was superior
to that of the system with 400 Kev collima-
·tor.

## 4

Two Detector Type Multipurpose Gamma Camera
System; Use as Whole Body Imager. Y.Akiyama,
N.Yui, M.Koakutsu and F.Kinoshita. Chiba
Cancer Center Hospital. Chiba.

A gamma camera system which has ability
of conventional imaging, whole body imaging
and single photon radionuclide computed
tomography was installed in our hospital.
We presented the ability of this system as
used for RCT several times. The use as a
whole body imaging device was presented at
this society.
The dose to a patient from a radiopharma-
ceutical is usually calculated with the equ-
ation published by the Society's Medical
Internal Radiation Dose ( MIRD ) Committee.
The equation of this calculation is
D = Ãs Σ Δ•Φ   where D is mean dose of each
organ; Ãs is cumulated activity in source
organ; Δ is equilibrium dose constant; and
Φ is the specific absorbed fraction. The
value of Δ and Φ are tabulated in MIRD Pam-
phlet, but the knowledge of whole body RI
distributions is necessary for the value
of Ãs. And, these distributions were obta-
ined by utilizing this system as a whole
body imager.

## 6

A METHOD FOR DERIVATIVE CALCULATION OF NOISY
TIME-ACTIVITY CURVE AND ITS APPLICATION TO
RADIOISOTOPE DYNAMIC ANALYSIS. K.Murase,
M.Ishine,M.Koizumi,T.Mochizuki,S.Inastuki,
A.Iio,K.Hamamoto and K.Yamamoto*).
Ehime University School of Medicine. Ehime.
*)Kouchi Medical School. Kouchi.

A method for calculating the slope or the
derivative of time-activity curves that
contain statistical fluctuations is pro-
posed. The algorithm presented here is
based on consideration of a digital differ-
entiation as a digital filtering. For
design of an effective differentiating
filter, the Chebyshev-type min-max method is
used and for minimization of the weighted
Chebyshev error the Remez exchange algorithm
is used. The usefulness of this method was
investigated using the Monte Carlo technique
As an example of the application to the
radioisotope dynamic analysis, a renogram-
curve analysis was presented. The ratio
between the bilateral slopes of the reno-
gram's second segments determined by this
method correlated well with the renal plasma
flow ratio(r=0.97, n=16).
Finally, the functional images of the slope
of the renogram's second segments were
constructed and they were ascertained to be
useful clinically.