Table 2. ^{40}K& ^{137}Cs sensitivity Data forl Plastic Scintillator System. Integra Background (0.1-2.0 MeV) 1.87×10^4 cpm (125.0 cpm/l Volume)

Total Detector Volume (l)		150	Total Detector Volume (l)		150
^{40}K	Spectrometic Half-resolution (%)	18.35	^{137}Cs	Spectrometric Half-resolution)%)	31.3
	Width of Energy Band (MeV)	0.64		Width of Energy Band (MeV)	0.44
	Background (cpm)	2.71×10^3		Background (cpm)	3.44×10^3
	Partial Energy Peak Sensitivity (cpm/gK)	8.35		Partial Energy Peak Sensitivity (cpm/μCi)	3.99×10^4
	Contribution from ^{137}Cs	negligible		Contribution from ^{40}K (cpm/gK)	6.90

Table 3. Counting Efficiency of ^{40}K & ^{137}Cs in Various Sizes of Phantom

		^{40}K			^{137}Cs		
		10 kg Phantom 56.1 gK	30 kg Phantom 137 gK	70 kg Phantom 419 gK	10 kg Phantom 0.16 μCi	30 kg Phantom 0.52 μCi	70 kg Phantom 1.26 μCi
8″ NaI Standard Chair Method	400-CH PHA (%)	0.40	0.36	0.32	0.151	0.149	0.148
	Dual-CH PHA (%)	0.48	0.44	0.40	0.157	0.156	0.156
8″ NaI Arc Bed Method	400-CH PHA (%)	0.18	0.17	0.15	0.082	0.075	0.074
	Dual-CH PHA (%)	0.20	0.19	0.18	0.085	0.079	0.077
Plastic Scintillator System	400-CH PHA (%)	6.60	5.75	4.88	2.45	2.13	2.03
	Dual-CH PHA (%)	3.64	3.23	2.83	1.03	0.91	0.86

Basic Studies on the Whole Body Counting. (Report II)

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The medium level whole body counter has built for the clinical use in the Radioisotope Laboratory of the Chiba University Hospital in July 1966, The counter system is set in the small room roughly shielded from the external radiation with 25 cm thick concrete wall. Four detectors are hanged from the ceiling above the couch that can be pushed in on the rail into the shielded room. Four 3×3 inch NaI scintillation crystals with photomultiplier tubes are equipped in the detectors. They are positioned about 60 cm above the couch without any lead collimators so that the sensitive area of the system covers the entire length of the couch. The outputs of the four detectors are fed together into a

medical spectrometer. The patient, radioactive, is counted on with supine and prone position, and then the arithmetical mean of the two counts is calculated. This procedure is effective in lessening the errors from the depth variation of the activity in the body. Using ^{131}I sources in the compartmentalized phantoms simulated to the standard-sized man, the basic experiments were done on the detectors arrangement, on the gamma-ray spectrometric measurement, and on the lower range of activity detectable. Each detector is fixed at a certain distance above the couch so that the best iso-count line is obtained on the entire surface of the couch. With the various size of the patients' bodies and with the various radioisotope distribution patterns in the patients, the scattered-region counting of ^{131}I gamma-rays (from 50 to 200 keV) gave the best value with the least variations in counts for the known amount of activity. The minimum dose of ^{131}I in the patients is one tenth of a microcurie.

A Quantitative Linear Scanning Whole Body Counter

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There has been no whole body counter to quantitate the distribution of tracer in a certain body section. Therefore, a whole body counter capable of quantitating the distribution of radioisotope in the body was planned. Six crystals of 2×2 inch NaI (Tl) shielded with 15 cm thick iron was placed 50 cm off the center of the 10 cm thick hexagonal iron ring at 2, 4, 6, 8, 10, and 12 hour position of the ring. The most part of the ring is covered with 50 cm thick iron in the direction from center to outside, since the 40 cm 15 cm thick, 50 cm long cylindrical shield of each detector shields the detectors from background in the opposite side of the ring.

Subject on the bed moving through the ring at an optimal speed is counted through slit collimators. Six speeds in driving the bed and two collimators are available at present.

Information from the crystals are recorded as a graph and counts at the same time. Calibration is performed using a 100 channel pulse height analyser. Each scintillator had better resolution than 8.1% and that with 6 crystals together 9.4%. ^{40}K peak in the background was too small to interfere with the analysis of gamma energies adjacent to ^{40}K, ^{137}Cs, ^{131}I, ^{59}Fe, and etc. tested in a water phantom showed no significant change in counts by changing geometry.

The digital recording of information from each detector is planned for the next step of improvement.

This device enables the quantitation of radioisotope distributed in body sections, and total body counts at the same time, and the pattern of linear scanning is also available for diagnosis. It is apparent that the clinical usefulness of this counter is much larger than the already existing types of whole body counters or ordinary liner scanners.

The distribution of i.v. ^{131}I-MAA in Fallot's syndrome, intra- and extra-thyroidal uptake of ^{131}I, % utilization of ^{59}Fe, % uptake of ^{198}Au-colloid by the liver and so on are being planned for the study with this counter.