In order to establish positron emission tomography as a quantitative method, we evaluated count rate characteristics of POSITOLUMICA-II using three phantoms: a) a lucite cylinder 5 cm inner diameter and 22 cm long filled with water, b) a lucite cylinder 20 cm inner diameter and c) a chest phantom. The results were as follows. 1) Total coincidence rate (sum of coincidence event rates from on time and delayed windows) was a constant (660 kcps) for very high activity concentrations. 2) Below those concentrations count losses increased with the activity concentration. Although the relationship between count losses and true coincidence rate depended strongly on the phantom configurations, its relationship to single count rate was independent on the phantoms. The result 1) was because the maximum data transfer rate was limited by a rotating photo-coupler employed in the system, and it cannot be corrected. The result 2) was from count losses of single detection and can be corrected by an experimental calibration curve (correction factor vs. single rate) independent of object configurations.

We performed electrocardiographic gating in positron emission computed tomography with POSITOLUMICA-II. We obtained end-systolic and end-diastolic images from 10-15 minuits after injection of 13 ammonia and 600-750 heat beats were required with 50 msec duration of sampling-time each. From these images we found that 1) end-systolic and end-diastolic image indicated those morphological character of each phase. 2) Because of partial volume effect, maximal counts of the images of end-systolic phase were higher than those of end-diastolic phase. 3) The counts of left ventricular blood pool at end-systolic phase were higher than those of end-diastolic phase. This program was thought to be useful at steady-state study, but at dynamic study it may take too long time.