Sequential image data were collected using a camera-computer system in a 64×64 matrix form with frame time of 150 to 300 msec, for about 3 minutes, while the patient taking tidal breath. Images being same phase in each respiratory cycle of sequential images were summed to obtain a single breath data based on the global time-activity curve over the whole lung field. The three groups consisted of normal, restrictive and obstructive lung function group have been evaluated with a fundamental-harmonic Fourier analysis and demonstrated the delay of phase angle in the obstructive group. In this study, using terms up to the second harmonics, the difference of phase angle among the three groups was reduced. The values of the expiratory phase angle over the whole lung among the three groups were 211.4±16.6° (N=8), 202.0±18.6° (N=4) and 243.0±24.6° (N=6) respectively. Its prolongation in the obstructive group may explain the delay of phase angle which was shown with a fundamental-harmonic analysis. The value of the ventilation fraction over the whole lung among the three groups were 13.3±4.3% 16.0±2.0% and 9.7±3.2% respectively and it increased in the restrictive group and decreased in the obstructive group.

The purpose of this study was to assess the effects of background count-rate (BGC) on the ventilation indexes (VI’s), and to establish a reasonable method to correct it. Xe-133 was inhaled with semi-equilibrium method and washed out with air. Three ROI’s were made for BGC correction; an entire thorax (ROI1), and an area covering radioactivity within the lungs and its scatter (ROI2), and the area over the genuine lungs (ROI3). We calculated the mean BGC per matrix in the region between ROI1 and ROI2 in each frame data, and the total BGC during the entire period of study, and defined them as sequential and overall BGC, respectively. The washout curves over the ROI3 and/or any lung region of interest were analyzed between the end of semi-equilibrium and 120 sec after washout started. These T1/2R and T1/2exp, and T1(A/H) previously reported were calculated with and without subtracting the BGC. The VI’s without BGC correction showed larger values than the corrected ones. When VI’s were once calculated without considering BGC, the true VI’s could not be calculated by using simple formulae or coefficients. Calculation of T1/2R and T1/2exp required sequential BGC correction, but T1(A/H), simply a correction of either sequential or total BGC correction. In conclusion the best VI was the T(A/H) as simply calculated after a correction of the total BGC.