Purpose or Objective: The purpose of this study is to quantitatively estimate gamma ($\gamma$) passing rates from characteristics of respiratory motion.

Material and Methods: A VMAT plan for lung cancer patients, which was designed using Pinnacle3 (ver. 9.2; Philips Ltd, USA), was used. Measurements were performed on the Elekta Synergy (Elekta Oncology Systems Ltd, Crawley, UK), which has a 160-leaf independently moving MLC with 5-mm leaf width. Beam energy was set to 6 MV photon beam. The i-MRT Phantom (IBA Dosimetry GmbH, Schwarzenbruck, Germany) was set on a motor-driven base (QUASAR Programmable Respiratory Motion Platform; Modus Medical, London, ON, Canada). The motor-driven base moved in a direction parallel to the couch direction at angle of 0 deg. A total of 148 respiratory patterns was tested. The doses delivered to the Gafchromic EBT3 films (Kodak, Rochester, NY), inserted in the coronal plane of the i-MRT Phantom, were compared with under moving and static conditions without dose normalization. The irradiated films were scanned in the same orientation using a resolution of 72 dpi in the 16-bit red-channel color scale. Four pinholes were made on each film to identify the irradiated center. All of the films were analyzed using commercially available radiation dosimetry software (DD system, ver. 10.4; R'Tech Inc., Tokyo, Japan). The passing rates of the $\gamma$ with the criterion of 3%/3 mm and $\gamma$ were calculated in the area receiving more than 30% of the isodose. In addition, mean respiratory position ($\mu$) and its standard deviations ($\sigma$) were calculated from respiratory curves during beam irradiation.

Results: Absolute value of $\mu$ ($\mid \mu \mid$) and $\sigma$ ranged from 0.0 to 8.5 mm, and from 1.5 to 6.7 mm, respectively. Multi-regression analysis revealed that the impact of $\sigma$ on the $\gamma$ had 0.66-fold greater than that of $\mid \mu \mid$. The $\gamma$ of the $\gamma$ and the $\mid \mu \mid$ were 83.1±14.0% (range, 38.7-100.0%), and 8.7±3.1 mm (range, 4.6-14.2 mm), respectively. A strong correlation between the $\gamma$ and $\mid \mu \mid$ was observed ($R=0.90$).