

## THE ATTENUATION EFFECTS OF THE CARBON FIBER RESPIRATORY CONTROL BOARD WITH DIFFERENT MEASUREMENT FIELD SIZES AND GANTRY ANGLES IN PHOTON BEAMS

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**Purpose** : The Carbon Fiber Respiratory Control Board (CFRCB) (Blessing-Cathay Corp.) was used to suppress the organ motions due to respiratory. The attenuation effects of CFRCB will affect the dose accuracy in radiation treatment plans. The purpose of this study is to evaluate the attenuation effects with different measurement field sizes and gantry angle due to the Carbon Fiber Respiratory Control Board.

**Materials and Methods** : The CT numbers of CFRCB would be analyzed to predict the electron density and attenuation of each components. The attenuation factors of CFRCB were measured with rotated gantry angles in 6 MV and 10 MV using a Varian iX Linac machine. In the measurements, the CFRCB compressed from anterior (gantry= 180°) to the center of plastic water phantoms. A PTW 30013 0.6cc farmer chamber was placed in plastic water phantoms and measured with different field sizes. The attenuation factors would be calculated and compared between different field sizes and photon energy with paired t-test. The Gafchromic EBT3 films replaced the farmer chamber to perform the attenuation of the compressor in 2D.

**Results** : In phantom attenuation measurements, there were no attenuation effects in gantry angle 300° to 60° (posterior). In gantry angle 165° to 195° (anterior), the mean attenuations were 25.17% vs 20.21% (in 6 MV vs 10 MV) in smaller field size 10x10 cm<sup>2</sup>, and 23.53% vs 19.20% in larger field size. In the other gantry angles, the mean attenuations were 9.51% vs 7.31% (in 6 MV vs 10 MV) in smaller field size, and 8.57% vs 6.84% in larger field size. In larger field size and higher photon energy, the attenuation factors were significantly decrease ( $p < 0.01$ ). The largest attenuation of the compressor was in diameter 1cm of beam center, that is the position of the screw. The attenuation due to the respiratory suppression plate was lower than the attenuation of the screw, but it should also be concerned.

**Conclusions** : The attenuation effects were decrease when measured with higher energy, larger field size. Therefore, CFRCB can control and decrease the respiratory motions efficiently and comfortably, but the attenuation effect should be considered. When the tumor targets are blocked by CFRCB, the CFRCB should not be used in treatment or the attenuation effects must be calculated by the planning system.

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Key words: Carbon Fiber Respiratory Control Board (CFRCB), Attenuation effects, Field size, Gantry angle