

AbstractID: 7071 Title: Time-Delay Measurement of Phase Gated Treatment with a Varian Real-Time Position Management System Using Computed Radiography

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Purpose:

Respiratory gating systems have been developed to reduce treatment uncertainty caused by organ motions related to respiration. The time-delay between when the gating signal is triggered and when the beam is turned on may affect the actual radiation dose delivered. In this study, we investigated the time delay for a Varian real-time position management(RPM) respiratory gating treatment system.

Method and Materials:

A motion phantom with infrared markers was used to simulate a respiration signal. An infrared camera was used to observe the motion of the phantom and to plot out a true position-versus-time curve. Computed Radiography(CR) images were taken with a Varian Clinac 21EX at 10% intervals of the simulated breathing cycle with a 2% window. On the CR images, the center of a metal disk attached to the phantom was used to determine the measured position of the phantom relative to a stationary disk. The RPM curve and measured curve were both normalized. The RPM curve was then shifted relative to the measured curve in steps of 0.1 milliseconds, and correlation between the two curves was measured at each step using MATLAB. The time shift corresponding to the greatest correlation was defined as the time delay in the gating system.

Results:

Three measurements were taken and averaged (arithmetic mean) to determine the time delay. The time-delay between the actual beam-on time and the RPM beam-on triggering signal was found to be 0.513 ± 0.077 seconds.

Conclusion:

This work shows that there is a significant time delay between the gating signal and the time when the radiation beam is turned on for the Varian RPM system. The effect of time-delay on patient dosimetry needs to be further investigated.

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