

Isocenter Optimization for Linac-based SRS/SBRT

Mac Clements¹, Samuel Hancock², Ryan Young³

1. Medical Physics, Radiological Imaging Technology 2. Medical Physics, Southeast Health, MO 3. Radiological Imaging Technology

✉ **Corresponding author:** Mac Clements, mac@radimage.com**Categories:** Medical Physics**Keywords:** isocenter optimization, stereotactic radiosurgery, Elekta synergy**How to cite this abstract**

Clements M, Hancock S, Young R (June 16, 2016) Isocenter Optimization for Linac-based SRS/SBRT. Cureus 8(6): a86

Abstract

Objectives: To develop a new method to quantify the volumetric radiation isocenter for linac based SRS/SBRT and to minimize the deviation from the centroid of the isocenter for all combinations of gantry, collimator, and table rotation angle.

Methods: A set of EPID images of a ball-bearing phantom were acquired in order to quantify the contributions of gantry, collimator, and table rotation to the overall isocenter accuracy of a linear accelerator. The combination of angles were chosen in order to characterize the full range of available gantry, collimator, and table rotational deviation. Cross-plane deviations with gantry and collimator rotation were minimized by a combination of a calibration of MLC leaf position offset and adjustment of beam position steering for each available energy. Deviations of the table axis from the gantry isocenter were determined, and adjustments to minimize deviations for contemporary Elekta linac tables were applied. The maximum deviation from isocenter after optimization for all combinations of gantry, collimator, and table rotation angles was then determined.

Results: Multiple Elekta linacs have been evaluated and optimized. The combination of gantry and collimator rotation deviation typically contributed 0.6mm to 0.8mm to the total deviation. The maximum total deviation after optimization was found to be 0.68mm to 1mm, depending primarily on the effect of non-uniform table axis deviation with rotation. The results are estimated to be accurate to approximately 0.1mm.

Conclusions: A new method to minimize total deviation from radiation beam isocenter and target position was developed and successfully applied to several Elekta linear accelerators. The total maximum deviation from isocenter with the optimization method can be reduced to the combined effects of gantry arm flex due to gravitational force, and non-uniform table rotational deviation. The method can be utilized to achieve sub-mm accuracy of total deviation from isocenter for conventional linear accelerators.

Open Access**Abstract****Published 06/16/2016****Copyright**© **Copyright** 2016

Clements et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 3.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Distributed under

Creative Commons CC-BY 3.0