

AbstractID: 6532 Title: The Implications of Monitor Unit and SSD Rounding Errors on Delivered Dose

Purpose: To investigate the individual and overall contributions of Monitor Unit and SSD rounding errors on delivered dose for different treatment regions.

Method and Materials: Treatment planning computers are configured to calculate treatment monitor units (MUs) to at least one decimal place, but because the ion chambers in many linear accelerators can not measure radiation to this accuracy, treatment plan MUs are often rounded off to the nearest whole number. Further more, treatment planning systems can calculate radiation source-skin distances (SSDs) to millimeter accuracy, while the optical distance indicators (ODIs) on linear accelerators generally require rounding to the nearest half centimeter. Acceptable treatment plans were generated to obtain MUs and SSDs to at least one decimal places. Treatment MUs and SSDs from these plans were then rounded and put back into the plans to obtain the real world deliverable plans. The isodose distributions and Dose-Volume Histograms (DVHs) for individual and total contributions of these two rounding errors were then compared and analyzed for different treatment regions.

Results: Our results show distortions of isodose distributions and Dose-Volume Histograms (DVH) as a result of the compounded rounding errors in MU calculations and ODI SSD readings. In particular, we found that normal tissue dose constraints, which appeared to be satisfied in the original computer plan, could be exceeded by up to 6% when rounding errors were taken into account, particularly in sites with relatively short radiation effective path-lengths, like the head and neck. The effects of MU rounding error appear to be greater than those ODI SSD rounding error and less significant for sites with long radiation effective path lengths such as lung tumors.

Conclusions: This work indicates the potential overdose or underdose as a result of MU and SSD rounding errors.