AbstractID: 1973 Title: The Effect of Scatter Dose Estimation in Tomotherapy Planning

Constrained optimization is used in helical tomotherapy to calculate the appropriate beam pattern, position, and intensity based on the prescription. At first, all possible beamlets are computed with full scatter dose and stored on the hard drive. During plan optimization, beamlets are retrieved into system memory to calculate the dose distribution over the entire treatment volume. However, because of memory limitations of the operating system, scatter portion of the beamlets cannot be loaded into RAM and must be estimated in each optimization iteration. After the plan is optimized and approved, a Full Dose computation is performed to display the actual final dose distribution. There are dose differences between the beamlets and Full Dose computations because of the scatter dose estimation. For small targets, the difference is minimal. However, for large targets such as in the Total Marrow Irradiation (TMI) cases, the effect can be much more pronounced since the small scatter contributions from a very large number of beamlets can add up to a noticeable difference. In these cases, the parameters that control the level of the scatter approximation can be adjusted to minimize the difference between beamlets and Full Dose computation. While currently this is done manually to balance between dose accuracy and computation performance, an adaptive scatter beamlets calculator is being developed. In this model, the maximum amount of pre-calculated scatter dose will be automatically loaded into the system memory based on the sizes of the targets and sensitive structures.