AbstractID: 10378 Title: Modeling the Elekta XVI CBCT beam in a commercial treatment planning system

Purpose:

To investigate the feasibility of modeling the kilovoltage beam from a cone beam CT system in a model-based treatment planning system. And to further investigate the accuracy of CBCT dose calculations using the planning system and inclusion of the dose in patient treatment plan.

Method and Materials:

The beam data from an Elekta XVI CBCT system has been entered into the Philips Pinnacle treatment planning system (TPS) and the beams for various filters are modeled in the TPS. The data was obtained from measurements and Monte Carlo simulation which were recently published[1]. The kilovoltage x ray generator has been modeled in Pinnacle as an added machine and both manual and auto-modeling has been employed to match the measured data. The Pinnacle system's capabilities were previously extended to dose calculations at the kilovoltage energy range[2]. Similar work was recently performed for a Varian OBI kilovoltage CBCT system[3].

Results:

The agreement between modeled and measured depth dose and cross profiles is reasonably well. The depth dose values agree to within 2% at depths beyond 1 cm. The cross profiles at three depths (1, 5, and 10 cm) and in two directions (X, Y) agree to within 2% in regions within the field, with larger discrepancies observed in the beam penumbra. The modeled beams are used to compute dose in phantom and the results are compared with TLD measurements.

Conclusion:

The dose from Elekta XVI kilovoltage CBCT can be accurately modeled in the Pinnacle treatment planning system. Inclusion of this dose in treatment plans can lead to more accurate dose prediction, especially when the doses to organs at risk are of importance.