

## AbstractID: 5739 Title: An objective approach to establishing tolerances on photon beam modeling using the Equivalent Uniform Dose

**Purpose:** To perturb a photon beam model in a controlled manner and to examine the consequences for the Equivalent Uniform Doses (EUD) of the target and organs at risk in external beam radiation therapy of the prostate.

**Method and Materials:** We have developed seven similar but different therapy beam models in the Pinnacle<sup>®</sup> Treatment Planning System. One model generates beam data close to the golden data provided by Varian<sup>®</sup> and serves as the reference model for this study. The six other models are modifications of the reference model designed to result in controlled deviations of a particular region of the dose profiles (descending depth dose, build-up, horns, tail, penumbra and field width). We have analyzed the consequences of planning with these perturbed models on the quality of 4 prostate treatment plans in terms of the EUDs of the PTV, rectum and bladder in comparison with the reference model. Monitor units were kept constant for all plans.

**Results:** to maintain a change in the EUD to the prostate, bladder or rectum of less than 2%, tolerances on the various regions of the dose profiles are as follows: descending depth dose 2%; horns 3%; field width  $\pm 1$ mm. Deviations in the build-up region and tail of  $\pm 10\%$  and  $\pm 5\%$  respectively did not change the EUDs of any structure by more than 2%.

**Conclusion:** Currently accepted tolerances on photon beam modeling are broadly internally consistent in so far as they result in similar effects on plan dosimetry, at least for 4 field conformal prostate treatments.