AbstractID: 14001 Title: Comparison of Measured D-max for Irregular Electron Cutout Fields to Treatment Planning System Prediction and Nominal Open Field D-Max

Purpose: For irregular electron cutouts, not only output factors but also depths of maximum dose (D-max) are often measured experimentally, increasing workload of clinical physicists and slowing clinical workflow. The purpose of this study is to investigate whether the D-max of the corresponding open field or the D-max of the cutout derived from the treatment planning system (TPS) can be used.

Method and Materials: Seven cutouts for electron beams with energies ranging from 9 to 21 MeV were planned for patients using Pinnacle 8.0m without heterogeneity correction. To determine D-max, the depth doses (PDDs) of these cutouts were generated in the TPS with flat-surfaced water phantom geometry. PDDs were then compared with PDDs measured in a PTW scanning water phantom and corresponding open field PDDs. Because of the broad characteristic of PDDs near D-max of these energy electron beams, a range of depths with PDD values > 99.5% on either side of D-max were compared.

Results: Within 0.5% dose variation, the D-max ranges obtained from the TPS overlapped with those from measurements and nominal D-max of open fields. For five of the seven cutouts, output factors measured at depths obtained from TPS, measurement, or corresponding open field resulted in less than 1% difference.
For the other two cutouts, which showed the least overlap, less than 2% difference in output factors measured at the nominal depth of open-field or measured Dmax was observed.

Conclusion: For irregular electron cutouts, it is not necessary to measure the unique D-max for the cutout field. Cutout factors within 2% measured at either nominal D-max of the corresponding open field or the calculated D-max from the treatment planning system can be achieved.