AbstractID: 6535 Title: Clinical Implementation of Varian Enhanced Dynamic Wedges into the Pinnacle Treatment Planning System: Monte Carlo Dosimetry and Patient-Specific Quality Assurance Techniques

Purpose: To present a commissioning study of enhanced dynamic wedges (EDWs) into the Pinnacle^3 treatment planning system (TPS) and to evaluate various QA techniques for validating the treatment plans using EDWs.

Method and Materials: Dose distribution modeling for EDW fields in the Pinnacle^3 TPS is based on a combination of open-field beam data and the Varian "Golden Segmented Treatment Table" (GSTT) unique to each photon beam. To validate the EDW models, dose profiles of 6- and 10-MV photon beams from a Clinac 2100C/D were measured in water for depths from near-surface to 31.5 cm for a wide range of field sizes and wedge angles using a linear detector array of 25 energy-compensated diodes (LDA-25) to integrate the dose at multiple points in the EDW field for each exposure. The EDW output factors for square fields from 4 to 20 cm wide were measured in solid water using a cylindrical ionization chamber at a depth of 10 cm on central axis. The 6- and 10-MV photon beams emerging from the treatment head of the Clinac 2100C/D were fully simulated using the BEAMnrc and DOSXYZnrc was used to calculate the central-axis percentage depth doses and dose profiles for the open and dynamically-wedged fields in a water phantom. Film and MapCHECK data were compared with Pinnacle^3 and MC predictions.

Results: (1) Pinnacle collapsed-cone convolution algorithm and MC simulations agreed with the measured EDW dose distributions to an accuracy of better than 3%. (2) Measured EDW output factors used for monitor-unit calculation in Pinnacle^3 TPS agreed with the MC predictions within 1-2%. (3) EDW-based treatment plans were satisfactorily validated using MapCHECK and chamber measurements.

Conclusions: We have successfully modeled EDWs into the Pinnacle^3 TPS and demonstrated that MapCHECK and films dosimetry constitute valuable QA tools for validating planned dose distributions resulting from dynamically-wedged beams.