

Purpose: To evaluate the Eclipse analytical anisotropic algorithm (AAA) modeling of flattening filter free (FFF) megavoltage photon beams for a new Varian linear accelerator, TruebeamSTx <Sup>TM<SUP> used for Gated SBRT.

Materials and methods: With the new Varian TruebeamSTx, Eclipse AAA was configured by using the measured dosimetric data. The TruebeamSTx can operate 6 and 10 MV photon beams free of the flattening filter (FFF). FFF photon beams are especially suitable for use of SBRT since they can operate at high dose rate (1400MU/min for 6MVFFF, 2400MU/min for 10MVFFF). Gated IMRT, RapidArc and gated RapidArc have routinely been used for SBRT, using the FFF photon beams. The accuracy of treatment plans with field sizes as small as 1x1 sq. cm are evaluated by measurement performed using films, ion chamber, and also with a Delta4 measurement system (ScandiDos). For gated treatments, measurements were done on a Respiratory Gating Platform (Standard Imaging) with motion simulating the actual patient breathing pattern.

Results: The dosimetric leaf gap of the HD120MLC was adjusted to 1.7 mm with leaf transmission set to 0.015 so the calculated isodose distribution has the best fit with the measurement. The comparison between Eclipse and measured isodose distribution show an agreement of better than 95% using a gamma index of (3%/3mm). For gated RapidArc, the difference of FWHM of the measured and calculated profiles is found to be less than 0.2 mm with target size larger than 3 cm in diameter, and less than 1 mm for 1 cm diameter target size.

Conclusions: The Eclipse AAA (V8.9) is found to be within 1mm accuracy for target volume as small as 1 cm in diameter. No major difference of the isodose distribution produced between the WFF and the FFF beams.