AbstractID: 3107 Title: Quantitative Verification of IMRT Intensity Maps Using an Amorphous Silicon Electronic Portal Imager

Purpose: Common quality assurance procedures for intensity modulated radiotherapy include ionization chamber and/or film measurements in phantom for comparison with point doses and dose distributions predicted by the treatment planning system. We have developed a method to quantitatively compare individual intended fluence maps with measured intensity distributions using an aS500 amorphous silicon electronic portal imager (EPI).

Method and Materials: A software program recognizes the intensity map and extracts the intensity in each bixel relative to the maximum bixel value. A simple single-bixel scatter model was applied to account for scatter in the imager. The software quantitatively compares normalized bixel values in the EPI intensity map with the fluence map exported from the Corvus treatment planning system after correction for scatter.

Results: Applying the scatter correction reduces the deviation between EPI maps and planned fluence maps, decreasing the correlation coefficient from 0.59 to 0.24. For 14 gantry angles and a total of 1663 bixels, we compared EPI intensity maps with scatter-corrected planned fluence maps. The mean error was 1.0% ± 4.1% (1σ) with scatter correction, and 2.4% ± 4.9% (1σ) without scatter correction. Our clinical intensity maps utilize ten intensity levels. When rounded to the nearest intensity level, 69% of all bixels agree with the predicted intensity level, while 99% of bixels are within 10% of the predicted intensity. The majority of bixels in disagreement have low intensity. The mean error for bixels with a planned relative intensity of 10% was 6.3% ± 5.2%.

Conclusion: Future refinement of the normalization and scatter correction methods will improve agreement in the low intensity bixels. This would improve the sensitivity of this tool and potentially allow it to replace the more time consuming film and ionization chamber techniques commonly used for IMRT quality assurance.