AbstractID: 4923 Title: A New Software Tool for Quantitative Verification of IMRT Fluence Maps

Purpose: To provide a mechanism for quantitative verification of each bixel in an IMRT fluence map within minutes.

Method and Materials: A software tool called Super-IMPOSE (Intensity Map Pre-treatment OverSight & Evaluation) was developed to quantitatively verify fluence maps using an Electronic Portal Imager (EPI). This software imports EPI-measured fluence maps along with TPS-calculated maps and compares them by bixel. We developed a convolution algorithm to correct the raw fluence map for the effects of scatter within the imager, along with an edge detection and registration algorithm. Deviations between the predicted and measured bixel values are displayed as a matrix of percentage deviations, with maximum, mean, and standard deviation values calculated for each row, each column, and the entire map. Clinical applicability was investigated using IMRT plans delivered using a Varian accelerator with aS500 EPI. A set of 16 fluence maps from 6 different patients was selected, spanning a wide range of size and complexity, and employing both 0.5cm and 1cm bixel sizes.

Results: The mean and standard deviation values for the bixel intensity differences were 1.9% and 1.4% for the 1cm bixel maps, and 3.2% and 1.8% for 0.5cm bixel maps. These differences are relatively small compared to the bixel intensity step size of 10%, making it relatively easy to assure that the correct intensity level was delivered to a bixel. Gross errors, such as an incorrect DMLC file or jaw setting, are easily detected by visual inspection or the resulting large mean and standard deviation values.

Conclusion: This software tool facilitates accurate and expeditious IMRT delivery QA, allowing verification of all maps in a matter of minutes. The development of a more accurate convolution kernel will allow further reduction in comparison uncertainties. Clinical use will allow the establishment of a numerical threshold for a map to “pass” verification.