AbstractID: 10619 Title: A Systematic Methodology in dosimetric verification of Anisotropic Analytical Algorithm in Eclipse Treatment Planning System

Purpose: A series of practical phantoms were constructed to investigate the accuracy of photon dose calculations performed by the Anisotropic Analytical Algorithm (AAA) in homogeneous and inhomogeneous media.

Method and Materials: A total of seven heterogeneous and homogeneous phantoms with solid water (SW) and cork, SW with MapCHECK or MatriXX were constructed to investigate the difference between dose calculated by AAA in Eclipse treatment planning system (TPS) and measured dose using Varian 23 IX LINAC. Ion Chamber was used for point dose measurements and film, MapCHECK, MatriXX were used for 2D dose measurements. A detailed analysis of data computed by the AAA algorithm was carried out and data were compared against measurements. To better appraise the performance of AAA, data obtained from the pencil beam convolution (PBC) algorithm implemented in Eclipse were also added in the comparison.

Results: AAA calculation has showed better than PBC in agreement with measurement from both ion chamber and 2D dosimeters. As planar dose evaluation, MapCHECK yielded a pass rate ranging from 88.5% to 95.5% for AAA, and 69.7% to 81.9% for PBC based on 1% difference and 1mm distance to agreement for different phantoms. The film dose distribution showed as well that AAA calculation is better than PBC in agreement with measurements. Generally, the better agreement of AAA than PBC calculation with measurement is more obvious in heterogeneous than homogeneous phantoms.

Conclusions: Eclipse TPS dose calculation AAA showed better agreement with dose measurement in both heterogeneous (more significant) and homogeneous phantom than PBC using three different types of 2D dosimetry system and ion chamber. The design of measurements and construction of phantoms represent a simple, efficient, and accurate means for verifying dose calculation algorithms in TPS.