

AbstractID: 9560 Title: Evaluation of hybrid plan IMRT QA with a 2D ionization chamber array

**Purpose:** To evaluate suitability of a Helical Dosimetry® system (IBA), consisting from a 2D ion chamber array and a dedicated plastic phantom for hybrid plan IMRT QA.

**Methods and Materials:** For verification of IMRT and rotational dose delivery techniques the 2D array was placed horizontally in the phantom. A dose calculation of the hybrid treatment plan was performed on a CT scan of the phantom with unchanged treatment parameters. The measurements are compared with the calculated dose distribution in the active plane of the detector to verify the dose delivery. The angular dependence of the detector response was measured in 6 and 18 MV x-ray beams. Due to the large amount of air cavities in the 2D array detector, the performance of the dose calculation algorithms was investigated both for pencil beam convolution (PBC) and the AAA algorithm of the Varian Eclipse TPS. In addition, the attenuation of the iBeam™ carbon couch top was quantified with 2D array measurements at different gantry angles.

**Results:** Discrepancies with the calculation relative to the maximum field dose of up to 7% observed were due to the couch top attenuation and angular dependence of the detector. For IMRT treatment fields delivered to the backside of the detector and passing through the couch, the couch top attenuation contribution was approximately 4%. The angular dependence of the detector added another 3%. For beams with angles parallel to the detector plane, the AAA calculation showed better agreement with the measurement than the PBC. For the evaluation of the total dose of the hybrid plan the  $\Delta\text{dose}=3\%$  and  $\Delta\text{distance}=3\text{mm}$  criterion could be applied in the gamma evaluation.

**Conclusions:** The Helical Dosimetry® system is a feasible solution for hybrid plan IMRT QA. It is advised to account for couch top attenuation and to apply advanced dose calculation algorithms.