AbstractID: 11621 Title: Beam Attenuation and Beam Spoiling Properties of an Electromagnetic Array used for Patient Localization and Tumor Tracking

Purpose: To investigate the beam attenuation and beam spoiling properties of the Calypso electromagnetic array used for patient localization and tumor tracking during the radiation delivery

Method and Materials: One of the main components of the Calypso 4D system is an electromagnetic array placed above patients who are implanted with transponders. We measured both the narrow and board beam attenuation properties of the array including the effect of beam angle (0 to 90 degree). A photon diode placed in cylindrical graphite buildup cap was used for narrow geometry, field size of 1 cm ×1 cm , and a 0.6 cc cylindrical farmer chamber placed in a polystyrene buildup cap for broad geometry, field size of 10 cm × 10 cm. For broad beam geometry, distances of 2, 5, and 10 cm between the chamber and the array were used. Measurements were performed using a Varian Clinac IX linear accelerator with 6 MV and 15 MV photon beams. Beam spoiling properties of the array was studied by placing the array above a water equivalent phantom with an imbedded Markus parallel plate chamber and measuring depth doses. Depth doses were measured for both 6 MV and 15 MV photon beams with 10 cm × 10 cm field size for distances of 2, 5, and 10 cm between array and phantom surface.

Results: Narrow beam geometry attenuation is 1.5 % and 1.3% for 6 MV and 15 MV beam respectively. Beam angle dependence is more pronounced at angles greater than 70 degrees with attenuation greater than 5%. Broad beam attenuation, in clinical cases, is nonexistent due to scatter contribution. Spoiling properties could be appreciable.

Conclusion: Attenuation properties of the array may be ignored for treatment delivery for most clinical cases. Spoiling effect could be appreciable depending on array distance to patient surface.