AbstractID: 9571 Title: 3D Dose Distribution of the Elekta Gamma Knife

Purpose: To design and implement a novel three-dimensional (3D) radiochromic film phantom for use with the Gamma Knife (GK). Use of radiochromic film and a flat bed white light scanner will allow greater resolution than gel-based 3D dosimeters. In addition, this method does not require sophisticated imaging tools such as CT or MRI machines.

Method and Materials: A spherical Virtual Water phantom was constructed to hold up to a 4.7cm thick stack of radiochromic film made of film slices 5cm in diameter. This stack size is large enough to capture the entire dose distribution resulting from the GK fields. The resolution capable with this phantom depends on the scanner in use and the thickness of the radiochromic film, which in this case allows a resolution of up to $0.004x0.003x0.2mm^3$. Monte Carlo methods show that the presence of a thick stack of film does not significantly disturb the measured dose distribution.

Results: Using this film phantom it is possible to obtain a three dimensional representation of the dose distribution of a GK unit. Due to the size of the films and the thickness of the stack, all the dose distribution information can be obtained in one exposure. This technique allows a higher scanning resolution to be achieved than is commonly obtained with gel dosimetry, which is on the order of $1x1x2mm^3$.

Conclusion: Fully characterizing any radiation field requires knowledge of the dose distribution as well as the absolute value of the dose. This film phantom provides a method for mapping the dose distribution of a three dimensional radiation field with excellent resolution.