Study On the Magnetic Field Effect On the Exradin W1 Plastic Scintillation Detector

Z Wen*, F Therriault-Proulx , C Owens , G Ibbott , S Beddar , UT MD Anderson Cancer Center, Houston, TX

Presentations

SU-F-J-50 (Sunday, July 31, 2016) 3:00 PM - 6:00 PM Room: Exhibit Hall

Purpose: To study the response of the Exradin W1 plastic scintillator detector to a 6 MV photon field in the presence of a strong magnetic field (B).

Methods: An Exradin W1 scintillator detector coupled to a SuperMax two-channel electrometer, both manufactured by Standard Imaging, Inc., was first calibrated in a Co-60 beam. The Cerenkov Light Ratio (CLR) was obtained following the procedure recommended by the manufacturer. Subtracting signal in channel 2 multiplied by CLR from the signal in channel 1 should lead to a Cerenkov-free signal. The W1 scintillator was placed in a plastic phantom inside a dipole electromagnet (GMW Associates) that could produce a strong B field, and irradiated using a 6 MV beam from an Elekta Versa HD LINAC. Signals from both channels of the W1 scintillator were acquired as a function of B (0 - 1.5 T).

Results: The signals from both channels increased as a function of the B field strength. At 1.5 T, channel 1 increased by 11% compared to the baseline (B=0 T), while channel 2 increased by 22%. Applying the recommended Cerenkov correction led to a 2% difference between dose measurement with and without a magnetic field. The values between B=0.3 T and B=1.5 T remained constant.

Conclusion: Signals from the Exradin W1 plastic scintillation detector increased as the B field increased. This increase mainly comes from a change in the amount of Cerenkov light coupled within the optical fiber. Removing the Cerenkov component following the procedure recommended by the manufacturer showed to be an effective way to measure dose accurately in strong magnetic fields. The cause for the residual 2% difference is currently under investigation.