AbstractID: 11242 Title: Proton beam dosimetry using Gafchromic EBT film

Purpose: Gafchromic EBT film characteristics for dose, dose rate, film orientation, air gap, tilt angle, beam energy and temporal stability were investigated in a clinical proton beam dosimetry. **Methods and Materials:** The EBT film was sandwiched between solid water slabs and irradiated in both parallel and perpendicular arrangements against the beam incident direction. Calibration films were irradiated in the dose range of 20 cGy–1000 cGy at mid spread out Bragg Peak (SOBP) in a reference condition. The optical density changes due to dose, dose rate and proton beam energies were studied. Depth doses measured with EBT film were compared with those obtained with a plane-parallel ion-chamber. The responses of the exposed films were measured by a Macbeth TD932 densitometer and a Vidar Dosimetry Pro Advantage™ scanner. Measurements were made at finite time post irradiation for temporal response. **Results:** There was no noticeable optical density change over dose rates ranging from 32 to 640 cGy min^{-1}. There was an increase in optical density of up to 0.04 units one month after irradiation within the dose range studied. The difference in optical densities between perpendicular and parallel configurations tends to be rather small, within ±0.02 OD units. Air gaps between the film and slabs caused significant perturbation in the depth dose distribution when the film is parallel to the beam axis. By tilting the film plane a few degrees away the beam axis, air gap artifacts was eliminated. Depth dose profiles measured with Gafchromic EBT film agreed with the one measured with an ion chamber although EBT film appears to have an under-response in the distal end of SOBP. **Conclusions:** Gafchromic EBT film has unnoticeable dependences of dose rate and proton beam energy. The Gafchromic EBT film could be a useful detector for proton dosimetry measurements with proper precaution and correction.