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Development of a GEM-based Imaging Detector for Small Field Dosimetry for Proton Therapy Beams[1] ERIN FRANCE, Cameron University, ALEXANDER KLYACHKO, DMITRI NICHIPOROV, Indiana University — In order to fully utilize the advantages of proton therapy, the beam range, the beam alignment with the tumor and the real-time dose distribution must be accurately known. Small proton fields (with characteristic sizes of less than 3 cm) are often used in radiosurgery, ophthalmic treatments, and as patch fields to augment dose distributions. Accurate planning and quality assurance of such fields are challenging. Gas electron multiplier (GEM)-based dose imaging detectors are capable of providing improved position resolution, dose rate linearity, fast response and accurate reproduction of depth-dose distributions. The purpose of this project is to develop a double-GEM dose imaging detector with the optical readout of scintillation light using a CCD camera, intended for small field measurements. The detector was tested in a 205 MeV proton beam at the Indiana University Cyclotron, during the Indiana University Physics 2012 REU funded by the NSF. It demonstrated linearity in dose rate up to 75 Gy/min. Lateral profiles measured with the GEM detector and radiochromic film agree within 0.4 mm (one pixel size) at 50% isodose. After initial start-up, the detector response was stable within ±5% over a 40 hour time period.

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