
Proton Radiography for detection of proton range errors in proton radiation therapy

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Abstract

Proton radiography can be used to detect proton range errors due to daily anatomical changes in the patient along the beam path before irradiation. A prototype radiography system has been built and tested at the Northwestern Medicine Chicago Proton Center to study the sensitivity of detecting small changes in water equivalent thickness (WET) within a pediatric head phantom that can lead to proton range errors. WET changes in the phantom were created by inserting various tissue equivalent materials inside a 4 cm cubic cavity in the posterior fossa of the brain. Proton radiographs were taken of the phantom with each insert in AP and lateral views. Difference images were then created from pairs of radiographs with different inserts. Our results show that we are able to detect WET changes as little as 0.6 mm from these difference images.

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