

Depth dose characterization of narrow proton beams.

Narrow proton beams with sizes down to several millimeters are used for stereotactic radiosurgery of intracranial targets. Depth dose characterization of these narrow beams is complicated by the detector alignment and the effects of proton disequilibrium. In the measurements described the possibility of obtaining depth dose distributions for narrow proton beams has been investigated using a large area parallel plate ionization chamber technique. A waterproof 10 cm collector size parallel plate ionization chamber with an air gap of 3 mm was made by Exradin. Chamber was operated at a bias of 1000V providing 100% collection efficiency. Polarity effects were found to be negligible at this bias at different depths within the water phantom. Ionization depth dose curves from the large detector were combined with beam profiles measured at different depths with film to produce point-detector depth dose curves. Converted distributions were compared to data from diode, diamond detectors, and radiochromic film. An analysis of applicability of these detectors for depth dose measurements in narrow proton beams is presented.