

AbstractID: 1766 Title: Effective and virtual sources of a passive proton therapy beam line with double scattering

We present experimental methods and data to model a source for a 235 MeV proton beam with a passive double scattering line, using an approach similar to that proposed for electron beams. We consider ten different measurement conditions with ranges in water between 6 and 25 cm, different scattering elements, and pristine and modulated beams. Effective point sources, derived from a linear fit of the inverse-square root of the dose in air, are in the range 205-230cm from isocenter, depending on the energy, scattering and experimental conditions. Virtual point sources, calculated from a linear back projection of FWHM of lateral profiles for a 10cmx10cm half-beam aperture, in air, at distances up to 30 cm from isocenter, are in the range of 245-255 cm. Scatter from the aperture and small field sizes affect the latter calculation. Penumbra projections are used to model a Gaussian extended source, with values for the FWHM up to 7 cm. Scatter-compensated modulated beams have parameters close to the pristine case within the uncertainties of the experimental method. A Monte Carlo code has been used to evaluate the effect of each scatter contribution. Some uncertainties in the source parameters from in air measurements, including the source position, have only minor effects in the final beam modelling for clinical applications, where the effect of multiple scattering inside the patient is predominant.

Partially supported by Varian Medical Systems and Ion Beam Applications.