AbstractID: 3781 Title: Validation of DSAR algorithm for Intensity Modulated Neutron Radiotherapy

Purpose:
To validate the differential scatter air ratio dose calculation algorithm for Intensity Modulated Neutron Radiotherapy (IMNRT).
Materials and Methods:
Our current treatment planning system uses a differential Scatter Air Ratio (dSAR) technique to calculate neutron dose distributions from a d(48.5) + Be cyclotron. An empirical function was used to fit the profiles at different depths. Intensity modulated beams are delivered using the segmental MLC (sMLC) technique. Application of the dSAR method to small beam segments used for IMNRT has been investigated. Beam profiles for rectangular fields ranging from 2 x 2 cm^2 to 10 x 10 cm^2 were measured using a 0.3 cc TE chamber and compared to that predicted by the empirical profile function. This chamber has a diameter of 6 mm and a wall thickness of 2.5 mm. Point dose measurements using the dual ionization chamber technique and individual profile measurements were performed to validate the dose calculation accuracy for small irregular segments.
Results:
For field sizes ranging from 2 x 2 cm^2 to 10 x 10 cm^2, measured profiles agreed with the dSAR calculations to within 5% at 2.5 cm depth, and to within 3% at 10 cm depth, inside the field. The pdd's matched to within 2% of that calculated by the treatment planning system. For irregularly shaped segments, absolute point dose measurements matched to within 2% along the central axis and to within 3% for off-axis points. For some irregular segment profiles, large deviations were observed in the penumbral region, particularly at shallower depths. This was due primarily to partial volume effects resulting from the large diameter of the ionization chamber used for measuring these profiles. However, all measured profiles agreed with the calculated profiles to within 5% inside the segments.
Conclusions:
The dSAR dose calculation algorithm has been validated for IMNRT.