AbstractID: 2712 Title: Error analysis of an Independent MU calculation program for IMRT fields

Purpose: To evaluate the accuracy of an independent monitor unit calculation program for dose-per-MU verification of IMRT fields. The MU calculation program runs on a PC and is based on a scatter-factor-based empirical model to determine D/MU. This algorithm provides a head-scatter model for IMRT fields.

Method and Materials: The D/MU of IMRT fields at the same point (mostly the isocenter) was compared between treatment planning system and the independent MU calculation program. Here MU for an IMRT field refers to the total MU. The fractional MU of each segment of an IMRT field, defined as the MU for the segment per total MU, was assumed to be the same. The commercial treatment planning system is based on a pencil-beam convolution algorithm with headscatter modeling. D/MU of a subset of IMRT fields, which is delivered to an IMRT phantom, was compared among the treatment planning system calculations, the independent MU calculations, and measurements.

Results: Among 24 patients examined, the difference of D/MU for all IMRT fields delivered to a point agreed to within 7% for 91% (22/24) of patients, the same acceptance criteria using measurement, with the maximum error of 8.4%. This error is slightly worse then the measurement, where 100% of patients are within 7% limit. When each individual IMRT field is examined, 21% (33/160) of the fields have a discrepancy larger than 7%. Most of those fields (78.8%) lie in the valley region of an IMRT field.

Conclusion: The independent MU calculation program can effectively verify the dose calculation accuracy for most IMRT fields. Only in few instances (9%), which invariably involves the calculation point to be in very low dose region, actual measurements are needed to further verify the accuracy of dose calculation for IMRT field.