Implementation of Enhanced Dynamic Wedge Calculations in a Treatment Planning System Based on Primary and Scatter Components.

Although dynamic wedges are available on most modern machines, it is not obvious how best to implement such option in a planning system. For the Varian enhanced dynamic wedges , the dose vs. collimator position relationship is contained in the segmented treatment table (STT). We modeled the enhanced dynamic wedge beams as a superposition of 20 static beams using STT tables to generate field sizes and beam weighting. We tested this summation technique on our in-house treatment planning system (Dplan), which uses the primary and scatter dose model. Wedge factors, absolute doses, profiles and depth doses were measured (ion chamber and film) and compared with the calculated results. Because our model calculates dynamic wedge fields exactly the way they are delivered, it predicts the absolute dose and dose distribution very accurately. The wedge factors agreed to within 0.5%. The profiles were also in a good agreement, with discrepancies of less then 2% in a low gradient regions and about 4% in the penumbra region. Depth doses agreed to less than 1.5%. This method of generating dynamic wedges uses only STTs as input data and does not require any additional measurements for a treatment planning software. The measurements are needed only for verification. This approach is direct, fast (calculation time for a 20x20 EDW field is below 1 min.) and does not contain approximations inherent to algorithms based on beam libraries.