Mixed-beam 3D conformal therapy:
Dosimetric verification

For certain treatment scenarios, a significant dosimetric improvement may be realized by the use of an en-face electron beam combined with intensity-modulated photon beams at angles nearly orthogonal to the electron beam. This combination produces the desired dose uniformity within the target, while significantly reducing exit dose to tissues below the target. All the beams are jointly designed in a 3-D planning system with IMRT capability, and we call the result 'mixed-beam 3-D conformal therapy.'

Implementation of this approach presents some practical concerns often not associated with electron-beam therapy. Immobilization is critical for accurate dose delivery, yet clearance of the electron applicator system from the patient and immobilization device must be assured. Both photon and electron dose calculation models may have increased uncertainty near the skin surface, possibly affecting the design of the mixed-beam technique. For these reasons, a system for reliable and efficient in-vivo dosimetry is crucial to implementing quality mixed-beam conformal therapy.

We have evaluated the accuracy and reproducibility of MOSFET detectors (Thomson&Nielsen) for this purpose. The detectors' energy, modality, and angular dependence have been investigated. Extensive comparisons to other detector systems have been completed in phantoms, with and without the presence of heterogeneities. Accuracy of dose readings near the surface have also been evaluated.

The results of these evaluations have established the MOSFET system as very well suited to mixed-beam in-vivo dosimetry.

We will show the range of clinical scenarios modeled in these evaluations, and discuss the comparison test findings.