We have developed a methodology by which the exit signal as measured by a 738-element xenon chamber can be compared to the prescribed fluence sinogram. This allows for quick detection of errors that can result from the delivery pattern of the multi-leaf collimator (MLC) and/or misalignment of the patient. The presence of a CT detector on the gantry of the tomotherapy unit makes this procedure possible.

The heart of this technique is the development of the matrix d_{ij}: the ensemble of signal values in the detector element i per unit of fluence at leaf j. Specifically, d_{ij} represents the total effect that each individual leaf has on the detector. For our case d_{ij} has the dimensions 496 *x* 20. If *a priori* knowledge of this matrix exists, then the delivered fluence for each leaf can be found by inverting d_{ij} and multiplying this result by the detector signal recorded.

We have delivered a ring or torus-shaped treatment, which was optimized over 72 projections. The signal detected by each element was recorded throughout the delivery process. These signals comprised a vector (496 *x* 1). The inverse of the matrix d_{ij} was multiplied by this vector to yield the delivered fluence from the MLC.