The dosimetric goal of Total body irradiation (TBI) is to irradiate the patient uniformly. To overcome the obstacles associated with machine and patient geometries, a variety of approaches have been devised and implemented clinically as described in the AAPM Report 17. Perhaps the most widespread approach treats the patient at a large SSD, yet this requires a large treatment room that some facilities may not possess. Since 1999, our institution has treated 127 TBI patients using a small-room technique. Originally described by Chui et al, the technique uses a conventional linear accelerator and a gravity-oriented "double-wedge" fixed to the collimator, shown in Figure 1, to treat patients who lay on a short table on the floor below the gantry.\textsuperscript{1} While Chui et al provide a good starting point for implementing this small-room technique, several aspects have not been fully described. The aim of this work is to convey our experience in the clinical implementation of this technique as well as addressing the shortcomings of its original description. The result is a simple, yet effective TBI technique that may be performed in any treatment vault containing a conventional linear accelerator, without restrictions on room size.

Following construction of the universal treatment devices, including the double-wedge, beam spoiler table, and patient support table, commissioning consists of measurements for the determination of output, tissue-phantom ratio, effective source distance, and off-axis factor. Dose is calculated by applying these factors per patient-specific measurements to an arbitrary point. Typically, ten calculation points are located at mid-separation along the mid-sagittal plane from the head to the ankles. The measurements and calculations are repeated for the supine and prone positions. When areas of unacceptably high dose are calculated, custom compensators are constructed from 5-mm thick sheets of polymethyl methacrylate and placed over the patient on top of the beam spoiler table. The typical planned dose homogeneity is within 2\% per calculations.

To investigate the accuracy of the dose delivery technique, an anthropomorphic phantom was simulated and treated as a patient using standard procedures and incorporating custom compensation discussed above. In total, 128 thermoluminescent dosimeters (TLDs) were placed in the phantom for irradiation in the supine and prone positions. Concentrations of TLDs were located in the planes of the selected calculation points, i.e. the head, neck, sternum, lung, umbilicus, and pelvis. Results showed the average dose to these locations differed from the prescribed dose by -3.5\%, 3.4\%, 2.6\%, 9.5\%, 2.8\%, and 0.5\%, respectively. Since the calculations assume homogeneous tissue, the non-uniformity near the lung was anticipated.

To investigate the dosimetric size of the radiation field, ionization chamber measurements were taken on one lateral side of the treatment area at a constant depth of 5 cm and mirrored over the mid-sagittal plane. A few measurements on the contralateral side were within 1\%, indicating the left and right halves of the field are similar. Figure 2 shows the relative beam intensity for this area.

In conclusion, the results above, and others not shown, have fully characterized a small-room technique capable of meeting the dosimetric goal of TBI.

\textsuperscript{1} Chui et al. Total Body Irradiation with an arc and a gravity-oriented compensator. IJROBP 39(5) pp 1191-5, 1997.