Introduction

A TrueBeam linear accelerator (TB-LINAC) is designed to deliver standard flattened and flattening-filter-free (FFF) beams. In our institute, three TB-LINAC units are installed. In this work, composite data of the three units and multi-unit comparison are presented.

Methods

Each TB-LINAC can deliver photon beams from 4MV to 15MV, electron beams from 6MeV to 22MeV, and 6MV-FFF and 10MV-FFF. Dosimetric characteristics are systematically measured for commissioning including percent depth dose (PDD), beam profile, relative scatter factor, dynamic leaf shift, output factor and MLC leakage. Critic considerations of Pion of FFF photon beams and dosimetric penumbra are investigated.

Results

All measured PDDs and profiles of photon and electron matched well across the three machines. Beam data were quantitatively compared and combined through average to yield composite beam data. The discrepancies among the machines were quantified using standard deviation (SD). For example, the mean SD of the PDDs among the three units is 0.12%, and the mean SD of the profiles is 0.40% for 10MV-FFF open fields. The variations of Pion of the chamber CC13 is 1.2±0.1% under 6MV-FFF and 2.0±0.5% from dmax to the 18cm-off-axis point at 35cm depth under 40x40cm2. The measured relative output factors range from 0.866 to 1.141 with the mean discrepancy of 0.06±0.04% among the three units. The measured wedge factors range from 0.863 to 1.254 with the mean overall discrepancy of 0.04±0.04%. The mean MLC transmission and dynamic leaf shift were measured from 1.0% to 1.5% and from 0.77mm to 0.96 mm from 4MV to 15MV. The mean penumbra of various photon beams are measured from 5.88±0.09mm to 5.99±0.13mm from 4MV to 15MV at 10cm depth of 10x10 cm2.

Conclusion

Dosimetric data demonstrated that the three units could and had been matched well. The systematically measured data might be useful for future reference.