AbstractID: 4541 Title: Measurement of Neutron Background in Electron Beams from a Dedicated IORT Linear Accelerator and a Conventional Linear Accelerator

Purpose: To measure the neutron background for an electron-only (IORT) and a conventional linear accelerator. **Methods & Materials:** A Siemens Mevatron ME [6 (not used), 9, 12, 15 and 18 MeV] and several Varian Clinacs [6 (not used), 9, 12, 16 and 20 MeV] were used in this study. Bubble (Type BD-PND; BTI Bubble Technology Industries) and track-etch detectors (TE) (Luxel+, Ja; Landauer) were used in these experiments. The detectors were placed at 1m from the target at azimuthal angles of 0°, 45°, 90°, 135° and 180°. **Results:** For conventional electrons at 0° the neutron leakages (Sv/Gy) are: $2x10^{-5}$ at 12 MeV, $1.0x10^{-4}$ at 16 MeV and $4x10^{-4}$ at 20 MeV. For angles >0°, the leakage is almost angle independent [$2x10^{-6}$ at 12 MeV; $(0.5\text{-}2)x10^{-5}$ at 16 MeV and $(2\text{-}4)x10^{-5}$ at 20 MeV]. For the ME, the neutron leakage was lower than for the conventional linac and also independent of angle for angles >0° {[0°: $6x10^{-6}$ at 12 MeV; $2x10^{-5}$ at 15 MeV; $5x10^{-5}$ at 18 MeV]; [other angles: $(2\text{-}5x10^{-7}$ at 12 MeV; $(0.7\text{-}1.0)x10^{-6}$ at 15 MeV; $(2\text{-}4)x10^{-6}$ at 18 MeV]}. Using the upper limit of $5x10^{-7}$ Sv/Gy at 12 MeV for angles >0° and assuming a workload of 200Gy/wk and an inverse square factor of 10, the neutron dose is 0.01 mSv/wk. For the primary beam at 12 MeV, the 10x higher dose is compensated by the attenuation in the primary beamstopper[†]. **Conclusions:** Measurements have been made of the neutron leakage from an IORT machine and a conventional linear accelerator. The results show that the IORT has a leakage well below that of the conventional machine and that at 12 MeV for the IORT machine, the leakage is sufficiently low at all angles as not to be a regulatory problem.

[†] G. Loi. et. al. Phys. Med. Biol. 51:695-702;2006