AbstractID: 13087 Title: Measurement of photoneutron depth dose equivalent and beam profiles of a high-energy X-ray beam of Varian 2100C medical linear accelerator by Thermoluminescent and CR-39 detectors.

Purpose: To measure depth-dose-equivalent(DDE) and beam-profiles(BP) of photoneutrons produced by 18MV photon beam.

Materials and Methods: 18MV photon beam of Varian-2100C LINAC was used to measure DDE and BP of photoneutrons. Specially designed dry-phantom, to accommodate Thermoluminescent(TL) and CR-39 detectors, was used. Mixer of photons and photoneutrons, and photons were measured by TLD-600 and LTD-700, respectively. Glow curves were generated at calibration depth of 6MV beam of $10\times10cm^2$ for dose range 0-400cGy. DDE measured at depths 0–20cm for 5×5–$30\times30cm^2$, while BP at d_{max} and 10cm in cross-plane for $10\times10cm^2$ and $20\times20cm^2$. Measurements were done upto 15cm beyond the photon field edge. TLDs were read by Harshaw reader and CR-39 by the supplier(Landauer). Factors in 10CFR20 regulation were used for DE conversion.

Results: TLDs provided DE for total neutrons, while CR-39 for total, fast plus intermediate and thermal neutrons. DDE obtained by normalizing DE with that at d_{max}(photons). DDE for total neutron DE, of both detectors, decrease exponentially with depth and have no statistically significant differences($p>0.05$). DDE for fast plus intermediate neutrons(CR-39) also decreases exponentially with depth, while DDE for thermal neutrons exhibit buildup region and attain maximum at depth, thereafter decreases in samilar manner as photons depth doses. Central axis DE, for all type of neutrons, at 0 and d_{max}increases with field size. BP at d_{max} and 10cm for total neutron DE, have maximum normalized values at central axis and remain almost constant within 90% photon isodose region and then decreases rapidly between 90%-20% photon isodose region. Beyond 20% to the end point of measurement the decrease is only 5%.

Conclusion: Study demonstrates the way to measure DDE and BP for photoneutrons and will help to compute neutron DE in critical organs and can eliminate the fear of using high-energy photons beams in IMRT and IGRT treatments.