AbstractID: 3009 Title: Exposure of an ultrasound system for prostate localization to neutrons

Purpose: Ultrasound systems are commonly used for confirming prostate localization. At our center, these devices are used for both photon and proton treatments. The question arose as to whether the neutron environment in the proton room would adversely affect their operation and, lacking any manufacturer's information regarding neutron exposure to the instrument, it was decided to determine the neutron dose around the ultrasound unit in a treatment room housing a 6/18 MV linear accelerator.
Methods and Materials: The ultrasound device is stored at the side of the room when not in use, close to the primary beam for a gantry angle of 90°. TLDs were placed on all four sides of the device, on the wall along the gantry rotation axis and on both sides of a short maze. The purpose of the TLDs on the walls was to provide a constancy check; this was particularly true for the TLD on the gantry axis since the readings should be independent of the gantry angle.
Results: Six sets of TLDs were left in for periods of 16, 5.5, 4, 2, 1 and 2 days. For those periods, the number of MUs delivered to all the patients was computed using the record and verify system. The average number of MUs per day for both energies was 16,000 ± 20% and for 18 MV was 7,900 ± 9%. The variation is due to the change in the number of IMRT treatments delivered with time. The results are 0.366, 0.145, 0.140 and 0.176 mrem/MU (proximal/distal to source; proximal/distal to beam) for neutrons and 0.230, 0.083, 0.078 and 0.176 mrem/MU for photons.
Conclusions: Based on use till now, the results establish a lower limit of 1650 rem on the neutron dose that the ultrasound system can tolerate.