

AbstractID: 13372 Title: The perturbation correction factors for plane-parallel ion chamber dose measurements in the build-up region of megavoltage photon beams

**Purpose:** To calculate perturbation factors for plane-parallel ion chamber dose measurements in the build-up region of megavoltage photon beams. **Method and Materials:** We simulated NACP-02 and ROOS plane-parallel chambers by using the EGSnrc/cavity user code and calculated dose to water  $(D_{\text{air}})_{\text{pp}}$  in build-up region for 6 and 18 MV photon beam. Also, the dose to air in the chamber with no wall  $D_{\text{air}}$  is calculated. The perturbation correction factor for presence of wall and cavity,  $P_{\text{wall}}$  and  $P_{\text{repl}}$ , were calculated from  $P_{\text{repl}} = (D_w / D_{\text{air}}) / (\bar{L} / \rho)_{\text{air}}^w$  and  $P_{\text{wall}} = D_{\text{air}} / (D_{\text{air}})_{\text{pp}}$  where  $D_w$  represents dose to water calculated with cylindrical slab of 0.02 cm thickness and 1.0 cm radius,  $(\bar{L} / \rho)_{\text{air}}^w$  is the average restricted mass collision stopping-power ratio of water to air. The overall perturbation factors  $P_Q$  (the product of  $P_{\text{repl}}$  and  $P_{\text{wall}}$ ) were calculated from  $[D_w / (D_{\text{air}})_{\text{pp}}] / (\bar{L} / \rho)_{\text{air}}^w$ . The field sizes were  $10 \times 10 \text{ cm}^2$  and  $30 \times 30 \text{ cm}^2$  at a source-surface distance of 100 cm. **Results:**  $P_{\text{wall}}$  at depths of 0.1 cm to 2 cm for ROOS ranged from 1.016 to 1.022 for 6 MV and for NACP-02 varied from 0.919 to 1.028. For 18 MV,  $P_{\text{wall}}$  of both chambers was a similar tendency.  $P_{\text{repl}}$  for ROOS and NACP-02 in 6 MV was 0.921 and 0.951, respectively, at 0.1 cm and nearly unity at 1 cm. In 18 MV beam,  $P_{\text{repl}}$  for ROOS and NACP-02 was 0.931 and 0.911, respectively, at 0.1 cm.  $P_Q$  for ROOS in 6 MV varied from 0.972 to 1.025 at depths of 0.1 cm to 2 cm and  $P_Q$  for NACP-02 varied from 0.847 to 1.026. Similarly,  $P_Q$  for ROOS in 18 MV was 0.946 to 1.015 and for NACP-02 was 0.803 to 1.023 at depths of 0.1 cm to 3.5 cm. **Conclusions:** It was found that ROOS is more suitable than NACP-02 for dose measurements in the build-up region of megavoltage photon beams.