

AbstractID: 3535 Title: Comparison of LDR to PDR Dose Distributions: A Monte Carlo Study

**Purpose:**

1) To validate a Monte Carlo (MC) model of the Ir-192 pulsed-dose rate (PDR) source inside the Fletcher-Williamson (FW) ovoid using radiochromic film measurements. 2) To compare the FW dose distributions in water to those of Cs-137 low-dose rate (LDR) pellet inside the Selectron Fletcher-Suit-Delclos (FSD) ovoid\*.

**Method and Materials:**

Detailed mechanical drawings of the FW colpostat were obtained from the vendor. MCNPX 2.5e MC code was used to model the small right FW ovoid and an Ir-192 source (mHDR v2) centered within the ovoid. MC models of actual and virtual Ir-192 source in air were also run to derive the conversion from contained to apparent activity. MD-55 radiochromic film was placed in a polystyrene phantom at a plane parallel to and displaced medially 2.0 cm from the long axis of the colpostat. To compare with the FSD ovoid, MC runs in a 30 cm water sphere were run for common ovoid loadings of 5, 10, 15, and 20 mgRaeq.

**Results:**

MCNPX calculated dose relative to film measurements is within  $\pm 2\%$  or 2mm distance-to-agreement for 92% of the dose grid. For the FW simulations in water, the overall shapes were found to be similar in regions away from the shields to those obtained for the FSD ovoid; however, large but localized deviations were found in high dose-gradient regions close to the rectal and bladder shields, mainly due to differences in source and shields geometry.

**Conclusion:**

The dose distributions predicted by MCNPX are in good agreement with the film results. Dose-rate atlases calculated in clinically-relevant 2D planes around the FW and FSD ovoids provide information to aid in the transfer of current LDR intracavitary brachytherapy practice to that using PDR for treatment of gynecological cancers.

**Conflict of Interest:**

Partial support by Nucletron Corporation.

\* Gifford, Med. Phys. 31, 1808, (2004)