

## **Impact of the Applicator and Dummy Pellets on the TG-43 Parameters of Selectron Cs-137 Source**

### **Introduction**

In this study, dose rate distribution around a spherical  $^{137}\text{Cs}$  pellet source, from a low dose rate (LDR) Selectron remote afterloading system, have been determined using Experimental and Monte Carlo Simulation techniques.

### **Materials and Methods:**

Monte Carlo simulations were performed using MCNP4C code, for a single pellet source in water medium and Plexiglas and measurements were performed in Plexiglas phantom material using LiF TLD chips. Absolute dose rate distribution and the TG-43 dosimetric parameters such as dose rate constant, radial dose functions and anisotropy functions were obtained for a single pellet source. In order to investigate the effect of the applicator, and surrounding pellets on dosimetric parameters of the source, the simulations were repeated for 6 different arrangements with a single active source and five non-active pellets inside central metallic tubing of a vaginal cylindrical applicator. In commercial treatment planning systems (TPS) the attenuation effects of the applicator and inactive spacers on total dose are neglected.

### **Results**

The results indicate that this effect could lead to overestimation of the calculated anisotropy function by up to 7% along the longitudinal axis of the applicator especially beyond the applicator tip. The radial dose function and anisotropy function of the new source design have been tabulated for each configuration.

### **Conclusions**

Impact of the Applicator and Dummy Pellets on the TG-43 Parameters of Selectron Cs-137 Source has been determined using TLD and Monte Carlo calculations. The results indicate neglecting the applicator and dummy pellets could cause significant errors in  $F(r, \theta)$ .