

AbstractID: 3907 Title: Optimized Source Selection for Low Dose Rate Brachytherapy

**Purpose:** To introduce the method of the optimized source selection for the LDR Brachytherapy, and investigate its effectiveness as compared to the regular trial and error source selection.

**Method and Materials:** An in-house method of optimized source strength ratios was developed to replace the trial and error guess work for the LDR therapy with sealed  $^{137}\text{Cs}$  sources. Inverse treatment planning philosophy was applied to the whole process. The desired dose to the reference points is first specified. The corresponding optimal plan is then defined, and the source selection program is run to produce an actual loading plan with the available sources. These actual sources are then used to calculate the final dose distribution. Treatment plans obtained with this method were compared to the plans obtained with the regular technique. Also optimal plans produced by our method were compared to the actual plans selected by the segmentation algorithm.

**Results:** The difference between the optimal and the actual plans is determined by the available inventory. In our tests we achieved a relative difference a few percent at the expense of the dose rate. We noticed a significant difference between the regular plans and optimized plans. The regular method produced clinically acceptable plans after several iterations. The results depend on the personal experience. With our method the desired 3D dose distribution was achieved at a first try.

**Conclusion:** Utilizing our source selection method treatment plans closest to the clinically optimal can be produced in a short amount of time. The results are independent of the personal experience and the most limiting factor was the discreteness of the available inventory. Keeping the statistics on the frequently requested source strengths for the optimal plans helps in ordering the clinically relevant replacement or additional sources, and minimizing the quantity of idle sources in the inventory.