

## AbstractID: 5272 Title: Clinical Evaluation of the Performance of a Fuzzy Logic Guided Parameter Optimization for Inverse Treatment Planning

**Purpose:** To evaluate the effectiveness of a Fuzzy Logic guided parameter optimization method for inverse treatment planning, in comparison with the results achieved by routine trial-and-error method.

**Method and Materials:** The optimization algorithm was developed and integrated into a commercial planning system (Varian Eclipse). 10 prostate IMRT cases previously planned and approved by experienced planners were re-optimized using this automated method with the same beam geometry. The original dose-volume histogram (DVH) constraints were used as the initial parameter setup of the automated method. For each organ, the output dose was evaluated based on the percentage of dose received by a specific percentage of volume. The average dose difference between the automated and manual plans was calculated over a set of specified percentage volumes (99%, 80%, 60%, 40%, 20%, 10%, 5%, 1%). In addition, an experienced clinical physicist evaluated the acceptability of the plans generated by the automated method in terms of isodose distributions and DVHs.

**Results:** Adoption of the automated method achieved both a comparable coverage of the planning target volume (PTV) and a substantial dose sparing of organs at risk (OARs). The mean dose was reduced by 30% for bladder, and 25% for rectum. There were few hot spots observed on OARs due to the over-emphasis of PTV dose coverage.

**Conclusion:** Preliminary results show that the automated parameter optimization method results in a significant dose reduction of OARs while maintaining a comparable PTV dose coverage. The automated method is able to relieve the burden of routine trial-and-error procedures done by planners, and has the potential to improve the resulting plan. However, minor manual intervention is still necessary to incorporate certain case-specific information, which is beyond the capability of the automated method.

This study is partially supported by a research grant from Varian Medical Systems.